BIG-IP® Application Security Manager™: Implementations

Version 13.1

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Preventing DoS Attacks on Applications

What is a DoS attack?

A *denial-of-service attack (DoS attack)* or *distributed denial-of-service attack (DDoS attack)* makes a victim's resource unavailable to its intended users, or obstructs the communication media between the intended users and the victimized site so that they can no longer communicate adequately. Perpetrators of DoS attacks typically target sites or services, such as banks, credit card payment gateways, and e-commerce web sites.

Application Security Manager™ (ASM) helps protect web applications from DoS attacks aimed at the resources that are used for serving the application: the web server, web framework, and the application logic. Advanced Firewall Manager™ (AFM) helps prevent network, SIP, and DNS DoS and DDoS attacks.

HTTP-GET attacks and page flood attacks are typical examples of application DoS attacks. These attacks are initiated either from a single user (single IP address) or from thousands of computers (distributed DoS attack), which overwhelms the target system. In page flood attacks, the attacker downloads all the resources on the page (images, scripts, and so on) while an HTTP-GET flood repeatedly requests specific URLs regardless of their place in the application.

About recognizing DoS attacks

Application Security Manager™ determines that traffic is a DoS attack based on calculations for transaction rates on the client side (TPS-based) or latency on the server side (stress-based). You can specify the thresholds that you want the system to use, or let the system automatically detect reasonable thresholds based on examining traffic patterns.

***Note:** You can set up both methods of detection to work independently or you can set them up to work concurrently to detect attacks on both the client side and server side. Whichever method detects the attack handles DoS protection.*

You can also have the system proactively identify and prevent automated attacks by web robots. In addition, the system can protect web applications against DoS attacks on heavy URLs. Heavy URL protection implies that during a DoS attack, the system protects the heavy URLs that might cause stress on the server.

You can view details about DoS attacks that the system detected and logged in the event logs and DoS reports. You can also configure remote logging support for DoS attacks when creating a logging profile.

When to use different DoS protections

Application Security Manager™ provides several different types of DoS protections that you can set to protect applications. This table describes when it is most advantageous to use the different protections. You can use any combination of the protections.

DoS Protection	When to Use
Proactive bot defense	To stop DoS attacks before they compromise the system. Affords great protection and stops non-human traffic before it gets to ASM.

DoS Protection	When to Use
Bot signatures	To allow requests from legitimate (benign) bots, and instruct the system how to handle malicious bots (you can ignore, log, or block them). Logging malicious bots gives them visibility in the reports.
TPS-based detection	To focus protection on the client side to detect an attack right away, mostly by looking at the requests per seconds thresholds.
Stress-based detection	To focus protection on the server side where attacks are detected when a server slowdown occurs. This protection provides more accurate DoS detection based on latency and requests per second thresholds.
Behavioral detection	To use behavioral analysis and machine learning of traffic flows to automatically discover and mitigate DoS attacks.
Heavy URL protection	If application users can query a database or submit complex queries that may slow the system down.
CAPTCHA challenge	To stop non-human attackers by presenting a character recognition challenge to suspicious users.

About proactive bot defense

Application Security Manager™ (ASM) can proactively defend your applications against automated attacks by web robots, called *bots* for short. This defense method, called *proactive bot defense*, can prevent layer 7 DoS attacks, web scraping, and brute force attacks from starting. By preventing bots from accessing the web site, proactive bot defense protects against these attacks as well.

Working together with other DoS protections, proactive bot defense helps identify and mitigate attacks before they cause damage to the site. This feature inspects most traffic, but requires fewer resources than traditional web scraping and brute force protections. You can use proactive bot defense in addition to the web scraping and brute force protections that are available in ASM security policies. Proactive bot defense is enforced through a DoS profile, and does not require a security policy.

When clients access a protected web site for the first time, the system sends a JavaScript challenge to the browser. Therefore, if you plan to use this feature, it is important that clients use browsers that allow JavaScript.

If the client successfully evaluates the challenge and resends the request with a valid cookie, the system allows the client to reach the server. Requests that do not answer the challenge remain unanswered and are not sent to the server. Requests sent to non-HTML URLs without the cookie are dropped and considered to be bots.

You can configure lists of URLs to consider safe so that the system does not need to validate them. This speeds up access time to the web site. If your application accesses many cross-domain resources and you have a list of those domains, you may want to select an option that validates cross-domain requests to those domains.

Proactive bot defense and CORS

Cross-Origin Resource Sharing (CORS) is a way that web sites can allow resources from another origin access to your site (that is, domain + protocol + port) such as when using AJAX, @font-face, and a few other cases. Proactive Bot Defense blocks CORS requests even for legitimate users. CORS requests are blocked because browsers typically do not include the required cookies when allowing cross-domain requests to prevent session riding by attackers trying to access live sessions and sensitive data from other domains.

Therefore, if you enable Proactive Bot Defense and your web site uses CORS, we recommend that you add the CORS URLs to the proactive bot URL whitelist. Those URLs will not be defended from bots proactively, but they will not be blocked, and will still be protected by other enabled DoS detections and mitigations.

A common type of cross-domain request is when an HTML page references resources from other domains, such as embedded images, style sheets (CSS), and JavaScript. Proactive Bot Defense supports this type of cross-domain request, and you can configure specific domains from which to allow resources in the **Cross-Domain Requests** setting.

About configuring TPS-based DoS protection

When setting up DoS protection, you can configure the system to prevent DoS attacks based on transaction rates (TPS-based anomaly detection). If you use TPS-based anomaly protection, the system detects DoS attacks from the client side using the following calculations:

Transaction rate detection interval

A short-term average of recent requests per second (for a specific URL or from an IP address) that is updated every 10 seconds.

***Note:** The averages for IP address and URL counts are done for each site, that is, for each virtual server and associated DoS profile. If one virtual server has multiple DoS profiles (implemented using a local traffic policy), then each DoS profile has its own statistics within the context of the virtual server.*

Transaction rate history interval

A longer-term average of requests per second (for a specific URL or from an IP address) calculated for the past hour that is updated every 10 seconds.

If the ratio of the transaction rate detection interval to the transaction rate during the history interval is greater than the percentage indicated in the **TPS increased by** setting, the system considers the web site to be under attack, or the URL, IP address, or geolocation to be suspicious. In addition, if the transaction rate detection interval is greater than the **TPS reached** setting (regardless of the history interval), then again, the respective URL, IP address, or geolocation is suspicious or the site is being attacked.

Note that TPS-based protection might detect a DoS attack simply because many users are trying to access the server all at once, such as during a busy time or when a new product comes out. In this case, the attack might be a false positive because the users are legitimate. But the advantage of TPS-based DoS protection is that attacks can be detected earlier than when using stress-based protection. So it is important to understand the typical maximum peak loads on your system when setting up DoS protection, and to use the methods that are best for your application.

About configuring stress-based DoS protection

When setting up DoS protection, you can configure the system to prevent DoS attacks based on the server side (stress-based detection). In stress-based detection, it takes a latency increase and at least one suspicious IP address, URL, heavy URL, site-wide entry, or geolocation for the activity to be considered an attack.

***Note:** The average latency is measured for each site, that is, for each virtual server and associated DoS profile. If one virtual server has multiple DoS profiles (implemented using a local traffic policy), then each DoS profile has its own statistics within the context of the virtual server.*

Stress-based DoS protection also includes Behavioral DoS. When enabled, the system examines traffic behavior to automatically detect DoS attacks. Behavioral DoS reviews the offending traffic, and mitigates the attack with minimal user intervention required.

Stress-based protection is less prone to false positives than TPS-based protection because in a DoS attack, the server is reaching capacity and service/response time is slow: this is impacting all users. Increased latency can be used as a trigger step for detecting an L7 attack. Following the detection of a significant latency increase, it is important to determine whether you need further action. After examining the increase in the requests per second and by comparing these numbers with past activity, you can identify suspicious versus normal latency increases.

About Behavioral DoS protection

Behavioral DoS (BADoS) provides automatic protection against DDoS attacks by analyzing traffic behavior using machine learning and data analysis. Working together with other BIG-IP® DoS protections, Behavioral DoS examines traffic flowing between clients and application servers in data centers, and automatically establishes the baseline traffic/flow profiles for Layer 7 (HTTP) and Layers 3 and 4.

For example, in the case of a DDoS attack from a botnet, each request may be completely legal but many requests all at once can slow down or crash the server. Behavioral DoS can mitigate the attack by slowing down the traffic no more than necessary to keep the server in good health.

Behavioral DoS continuously monitors server health and loading, by means of a customer feedback loop, to ensure the real-time correlations, and validate server conditions, attacks, and mitigations. Any subsequent anomalies are put on watch, and the system applies mitigations (slowdowns or blocks) as needed.

This is how Behavioral DoS works:

- Learns typical behavior of normal traffic
- Detects an attack based on current conditions (server health)
- Finds behavior anomaly (what and who changed to cause congestion?)
- Mitigates by slowing down suspicious clients
- Improves with experience

You enable Behavioral DoS, which requires minimal configuration, in a DoS profile in the Stress-based detection settings. Because the system is tracking the traffic data, it adapts to changing conditions so there are no thresholds to specify. You set the level of mitigation that you want to occur, ranging from no mitigation (learning only) to aggressive protection (proactive DoS protection). The system can quickly detect Layer 7 DoS attacks, characterize the offending traffic, and mitigate the attack.

You can use a DoS profile that has Behavioral DoS enabled to protect one or, at most, two virtual servers.

About DoS mitigation methods

When setting up either transaction-based or stress-based DoS protection, you can specify *mitigation methods* that determine how the system recognizes and handles DoS attacks. You can use the following methods:

- JavaScript challenges (also called Client-Side Integrity Defense)
- CAPTCHA challenges
- Request blocking (including Rate Limit or Block All)

You can configure the system to issue a JavaScript challenge to analyze whether the client is using a legal browser (that can respond to the challenge) when the system encounters a suspicious IP address, URL, geolocation, or site-wide criteria. If the client does execute JavaScript in response to the challenge, the system purposely slows down the interaction. The Client Side Integrity Defense mitigations are enacted only when the Operation Mode is set to blocking.

Based on the same suspicious criteria, the system can also issue a CAPTCHA (character recognition) challenge to determine whether the client is human or an illegal script. Depending on how strict you want to enforce DoS protection, you can limit the number of requests that are allowed through to the server or block requests that are deemed suspicious.

You can also use can use request blocking in the DoS profile to specify conditions for when the system blocks requests. Note that the system only blocks requests during a DoS attack when the Operation Mode for TPS-based or stress-based detection is set to Blocking. You can use request blocking to rate limit or block all requests from suspicious IP addresses, suspicious countries, or URLs suspected of being under attack. Site-wide rate limiting also blocks requests to web sites suspected of being under attack. If you block all requests, the system blocks suspicious IP addresses and geolocations except those on the whitelist. If you are using rate limiting, the system blocks some requests depending on the threshold detection criteria set in the DoS profile.

The mitigation methods that you select are used in the order they appear on the screen. The system enforces the methods only as needed if the previous method was not able to stem the attack.

About geolocation mitigation

You can mitigate DoS attacks based on geolocation by detecting traffic from countries sending suspicious traffic. This is part of the mitigation methods in the DoS profile for stress-based and TPS-based anomalies, and this method helps protect against unusual activity as follows:

- Geolocation-based Client Side integrity: If traffic from countries matches the thresholds configured in the DoS profile, the system considers those countries suspicious, and sends a JavaScript challenge to each suspicious country.
- Geolocation-based CAPTCHA challenge: If traffic from countries matches the thresholds configured in the DoS profile, the system considers those countries suspicious, and issues a CAPTCHA challenge to each suspicious country.
- Geolocation-based request blocking: The system blocks all, or some, requests from suspicious countries.

In addition, you can add countries to a geolocation whitelist (traffic from these countries is never blocked) and a blacklist (traffic from these countries is always blocked when a DoS attack is detected).

About heavy URL protection

Heavy URLs are URLs that may consume considerable server resources per request. Heavy URLs respond with low latency most of the time, but can easily reach high latency under specific conditions (such as DoS attacks). Heavy URLs are not necessarily heavy all the time, but tend to get heavy especially during attacks. Therefore, low rate requests to those URLs can cause significant DoS attacks and be hard to distinguish from legitimate clients.

Typically, heavy URLs involve complex database queries; for example, retrieving historical stock quotes. In most cases, users request recent quotes with weekly resolution, and those queries quickly yield responses. However, an attack might involve requesting five years of quotes with day-by-day resolution, which requires retrieval of large amounts of data, and consumes considerably more resources.

Application Security Manager™ (ASM) allows you to configure protection from heavy URLs in a DoS profile. You can specify a latency threshold for automatically detecting heavy URLs. If some of the web site's URLs could potentially become heavy URLs, you can manually add them so the system will keep an eye on them, and you can add URLs that should be ignored and not considered heavy.

ASM™ measures the tail latency of each URL and of the whole site for 24 hours to get a good sample of request behavior. A URL is considered *heavy* if its average tail latency is more than twice that of the site latency for the 24-hour period.

About cross-domain requests

Proactive bot defense in a DoS profile allows you to specify which cross-domain requests are legal. *Cross-domain requests* are HTTP requests for resources from a different domain than the domain of the resource making the request.

If your application accesses many cross-domain resources and you have a list of those domains, you can validate cross-domain requests to those domains.

For example, your web site uses two domains, `site1.com` (the main site) and `site2.com` (where resources are stored). You can configure this in the DoS profile by enabling proactive bot defense, choosing one of the **Allowed configured domains** options for the **Cross-Domain Requests** setting, and specifying both of the web sites in the list of related site domains. When the browser makes a request to `site1.com`, it gets cookies for both `site1.com` and `site2.com` independently and simultaneously, and cross domain requests from `site1.com` to `site2.com` are allowed.

If only `site1.com` is configured as a related site domain, when the browser makes a request to `site1.com`, it gets a cookie for `site1.com` only. If the browser makes a cross-domain request to get an image from `site2.com`, it gets a cookie and is allowed only if it already has a valid `site1.com` cookie.

About site-wide DoS mitigation

In order to mitigate highly distributed DoS attacks, such as those instigated using large scale botnets attacking multiple URLs, you can specify when to use site-wide mitigation in a DoS profile. You can configure site-wide mitigation for either TPS-based or stress-based DoS protection. In this case, the whole site can be considered suspicious as opposed to a particular URL or IP address. Site-wide mitigation goes into effect when the system determines that the whole site is experiencing high-volume traffic but is not able to pinpoint and handle the problem.

The system implements site-wide mitigation method only as a last resort because it may cause the system to drop legitimate requests. However, it maintains, at least partially, the availability of the web site, even when it is under attack. When the system applies site-wide mitigation, it is because all other active detection methods were unable to stop the attack.

The whole site is considered suspicious when configured thresholds are crossed, and in parallel, specific IP addresses and URLs could also be found to be suspicious. The mitigation continues until the maximum duration elapses or when the whole site stops being suspicious. That is, there are no suspicious URLs, no suspicious IP addresses, and the whole site is no longer suspicious.

About CAPTCHA challenges in DoS detection

A CAPTCHA (or visual character recognition) challenge displays characters for a client to identify before they can access a web site or application. Whether the client can correctly identify the characters determines whether the client is human or is likely an illegal script. You can configure a CAPTCHA challenge as part of the mitigation policy for TPS-based DoS detection, stress-based DoS detection, or as part of proactive bot defense. If you have configured it, the system a CAPTCHA challenge to suspicious traffic.

The system provides a standard CAPTCHA response that clients will see. You can customize the response if you want.

About DoS protection and HTTP caching

HTTP caching enables the BIG-IP® system to store frequently requested web objects (or static content) in memory to save bandwidth and reduce traffic load on web servers. The Web Acceleration profile has the settings to configure caching.

If you are using HTTP caching along with DoS protection, you need to understand how DoS protection for cached content works. In this case, URLs serving cached content are considered a DoS attack if they exceed the relative **TPS increased by** percentage (and not the explicit **TPS reached** number). Requests to static or cacheable URLs are always mitigated by rate limiting. This is true even during periods of mitigation using client-side integrity or CAPTCHA, and when those mitigations are not only URL-based.

Overview: Preventing DoS attacks on applications

You can configure the Application Security Manager™ to protect against DoS attacks on web applications. Depending on your configuration, the system detects DoS attacks based on transactions per second (TPS) on the client side, stress-based server latency, heavy URLs, geolocation, suspicious browsers, and failed CAPTCHA responses. Behavioral DoS (BADoS), part of stress-based detection, automatically discovers and mitigates DoS attacks using behavioral data.

You configure DoS protection for Layer 7 by creating a DoS profile with Application Security enabled. You then associate the DoS profile with one or more virtual servers representing applications that you want to protect. DoS protection is a system protection that is not part of a security policy.

The main factors in establishing the prevention policy are:

- Attackers: The clients that initiate the actual attacks. They are represented by their IP addresses and the geolocations they come from.
- Servers: The web application servers that are under attack. You can view them site-wide as the pairing of the virtual server and the DoS profile, by the URL, or as a pool member.
- BIG-IP system: The middle tier that detects attacks and associated suspicious entities, then mitigates the attacks, or blocks or drops requests depending on the options you configure in the DoS profile.

Task Summary

Configuring DoS protection for applications

You can configure Application Security Manager™ to protect against and mitigate DoS attacks, and increase system security.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click **Create**.
   The Create New DoS Profile screen opens.
3. In the **Name** field, type the name for the profile, then click **Finished**.
4. In the list of DoS profiles, click the name of the profile you just created, and click the **Application Security** tab.
   This is where you set up application-level DoS protection.
5. In the **General Settings**, for **Application Security**, click **Edit** and select the **Enabled** check box.
   General settings that you can configure are displayed.
6. To configure **Heavy URL Protection**, edit the setting for which URLs to include or exclude, or use automatic detection.

   Another task describes heavy URL protection in more detail.
7. To set up DoS protection based on the country where a request originates, edit the **Geolocations** setting, selecting countries to allow or disallow.
   a) Click **Edit**.
   b) Move the countries for which you want the system to block traffic during a DoS attack into the **Geolocation Blacklist**.
   c) Move the countries that you want the system to allow (unless the requests have other problems) into the **Geolocation Whitelist**.
   d) Use the Stress-based or TPS-based Detection settings to select appropriate mitigations by geolocation in the **How to detect attackers and which mitigation to use** settings.
   e) When done, click **Close**.

8. If you have written an iRule to specify how the system handles a DoS attack and recovers afterwards, enable the **Trigger iRule** setting.
9. To better protect an applications consisting of one page that dynamically loads new content, enable **Single Page Application**.
10. If your application uses many URLs, in **URL Patterns**, you can create logical sets of similar URLs with the varying part of the URL acting like a parameter. Click **Not Configured** and type one or more URL patterns, for example, `/product/*.php`.

    The system then looks at the URL patterns that combine several URLs into one and can more easily recognize DoS attacks, for example, on URLs that might be less frequently accessed by aggregating the statistics from other similar URLs.
11. If you want to use performance acceleration, in **Performance acceleration**, select the TCP fastL4 profile to use as the fast-path for acceleration.

    The profiles listed are those created in **Local Traffic** > **Profiles** > **Protocol** > **Fast L4**.
12. Click **Update** to save the DoS profile.

You have created a DoS profile that provides basic DoS protection including TPS-based detection and heavy URL detection (automatically enabled).

Next, consider configuring additional levels of DoS protection such as stress-based protection, proactive bot defense, and behavioral DoS. Look at the other options available under Application Security and adjust as needed. For example, if using geolocation, use the stress-based or TPS-based detection settings to select appropriate mitigations. Also, you need to associate the DoS profile with a virtual server before it protects against DoS attacks.

Creating a whitelist for DoS protection

You can create a whitelist which is a list of IP addresses that the system does not examine when performing DoS protection.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. In the list of DoS profiles, click the name of the profile for which you want to specify a whitelist.
   The DoS profile properties tab opens.
3. To omit checking for DoS attacks on certain trusted addresses, edit the **Default Whitelist** setting:
   a) In the Shared Objects frame on the the right side of the screen, next to **Address Lists**, click +.
   b) In the Properties panel below, type a name, then one at a time, type trusted IP addresses or subnets that do not need to be examined for DoS attacks, and click **Add**.

   Note: *You can add up to 20 IP addresses.*

   c) When you are done, click **Update**.
   The new whitelist is added to the Address Lists.
   d) To use the new whitelist, after **Default Whitelist**, type the name of the whitelist you added.
4. If you want to create a separate whitelist for HTTP traffic instead of the default whitelist, for **HTTP Whitelist**, select **Override Default** and create a whitelist as you would for the default whitelist.
5. When you are done, click **Update**.

The whitelist you created either for the default or for HTTP is created as a shared object that can be used for all DoS protection. You can use it in any DoS profile including those that contain DoS protection for applications, networks, SIP, and/or DNS.

Using proactive bot defense

For you to use proactive bot defense, client browsers accessing your web site must be able to accept JavaScript. Because this defense mechanism uses reverse lookup, you need to configure a DNS Server (**System** > **Configuration** > **Device** > **DNS**) and a DNS Resolver (**Network** > **DNS Resolvers** > **DNS Resolver List**) for it to work.

You can configure Application Security Manager™ (ASM) to protect your web site against attacks by web robots (called *bots*, for short) before the attacks occur. Proactive bot defense checks all traffic (except whitelisted URLs) coming to the web site, not simply suspicious traffic. This DoS protection uses a set of JavaScript evaluations and bot signatures to make sure that browsers visiting your web site are legitimate.

Important: *Proactive bot defense has limitations if your web site uses Cross-Origin Resource Sharing (CORS), for example, with AJAX requests.*

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click the name of an existing DoS profile (or create a new one, then open it), and click the **Application Security** tab.
3. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.
   The screen displays additional settings.
4. On the left, click **Proactive Bot Defense**.
5. Set the **Operation Mode** to specify when to implement proactive bot defense.

Option	Description
During Attacks	Checks all traffic during a DoS attack, and prevents detected attacks from escalating.
Always	Checks all traffic at all times, and prevents DoS attacks from starting.

   Important: *If you enable Proactive Bot Defense and your web site uses CORS (Cross-Origin Resource Sharing), we recommend that you add the CORS URLs to the proactive bot URL whitelist.*

   The system enables Bot Signatures to enforce Proactive Bot Defense. By default, the system blocks requests from highly suspicious browsers and displays a default CAPTCHA (or visual character recognition) challenge to browsers that are suspicious.
6. By default, the **Block requests from suspicious browsers** setting and check boxes are enabled. If you do not want to block suspicious browsers or send a CAPTCHA challenge, you can clear the **Block Suspicious Browsers** or **CAPTCHA Challenge** check boxes.

   You can also change the CAPTCHA response by clicking **CAPTCHA Settings**. (Another task explains how to configure CAPCHA when setting up DoS protection.)
7. In the **Grace Period** field, type the number of seconds to wait before the system blocks suspected bots.

   The default value is **300** seconds.

   The grace period allows web pages (including complex pages such as those which include images, JS, and CSS) the time to be recognized as non-bots, receive validation, and completely load without unnecessarily dropping requests.

   The grace period begins after the client is validated, a configuration change occurs, or when proactive bot defense starts as a result of a detected DoS attack or high latency.

8. Using the **Cross-Domain Requests** setting, specify how the system validates cross-domain requests (such as requests for non-HTML resources like embedded images, CSS style sheets, XML, JavaScript, or Flash).

   Cross-domain requests are requests with different domains in the Host and Referrer headers.

Option	Description
Allow all requests	Allows requests arriving to a non-HTML URL referred by a different domain and without a valid cookie if they pass a simple challenge. The system sends a challenge that tests basic browser capabilities, such as HTTP redirects and cookies.
Allow configured domains; validate in bulk	Allows requests to other related internal or external domains that are configured in this section, and validates the related domains in advance. The requests to related site domains must include a valid cookie from one of the site domains; the external domains are allowed if they pass a simple challenge. Choose this option if your web site does not use many domains, and then include them all in the lists below. Also, if your website uses CORs, select this option and then specify the WebSocket domain in the Related Site Domains list.
Allow configured domains; validate upon request	Allows requests to other related internal or external domains that are configured in this section. The requests to related site domains must include a valid cookie from the main domain; the external domains are allowed if they pass a simple challenge. Choose this option if your web site uses many domains, and include the main domain in the list below.

9. If you selected one of the **Allow configured domains** options in the last step, you need to add **Related Site Domains** that are part of your web site, and **Related External Domains** that are allowed to link to resources in your web site.
10. In the **URL Whitelist** setting, add the resource URLs for which the web site expects to receive requests and that you want the system to consider safe.

    Type URLs in the form `/index.html`, then click **Add.**. Wildcards are supported.

    Tip: *If your web site uses CORS, add the CORS URLs to the whitelist, otherwise, they will be blocked.*

    The system does not perform proactive bot defense on requests to the URLs in this list.
11. Click **Update** to save the DoS profile.

You have now configured proactive bot defense which protects against DDoS, web scraping, and brute force attacks (on the virtual servers that use this DoS profile). By creating a bot defense logging profile, you can view a Bot Defense event log at **Security** > **Event Logs** > **Bot Defense**.

The system sends a JavaScript challenge to traffic accessing the site for the first time. Legitimate traffic answers the challenge correctly, and resends the request with a valid cookie; then it is allowed to access the server. The system drops requests sent by browsers that do not answer the system's initial JavaScript challenge (considering those requests to be bots). The system also automatically enables bot signatures and blocks bots known to be malicious.

If proactive bot detection is always running, ASM™ filters out bots before they manage to build up an attack on the system and cause damage. If using proactive bot defense only during attacks, once ASM detects a DoS attack, the system uses proactive bot defense for the duration of the attack.

Proactive bot defense is used together with the active mitigation methods specified in TPS- and stress-based detection. Any request that is not blocked by the active mitigation method still has to pass the proactive bot defense mechanism to be able to reach the server (unless it is on the URL whitelist). Proactive bot defense blocks requests to CORS (Cross-Origin Resource Sharing) URLs not on the URL whitelist.

Configuring bot defense logging

Before beginning to configure bot defense logging, ensure that you have configured remote logging to Splunk for your system. Both the F5 DevCentral and Splunk websites have information on how to configure BIG-IP to send logs to a Splunk platform. Local logging is not recommended.

1. On the **Main** tab, click **Security** > **Event Logs** > **Logging Profiles**.
   The Logging Profile screen opens.
2. Click the name of an existing logging profile (or create a new one, then open it).
   The Logging Profile Properties screen opens.
3. Enable **Bot Defense**.
   The Bot Defense tab opens.
4. From the **Bot Defense** tab, select your preconfigured **Remote Publisher** from the drop down list.
5. Enable the log details you want to capture.
6. Click **Update** to save the logging profile.
7. On the Main tab, click **Local Traffic** > **Virtual Servers** > **Virtual Server List**.
8. Select the virtual server to associate the bot defense logging profile to.
   The Properties tab opens.
9. Click the **Security** > **Policies** tab.
10. Enable **DoS Protection Profile**.
11. In the **Log Profile** section, select the bot defense profile from the ui**Available** list and move it to the **Selected** list.
12. Click **Update** to save the Policy Settings.

You can view the bot defense logs by navigating to **Security** > **Event Logs** > **Bot Defense** > **Requests**.

Configuring bot signature checking

If you need to create custom bot signatures and categories for your application, you should do this before configuring bot signature checking. Navigate to **Security** > **Options** > **DoS Protection** > **Bot Signatures List**. Otherwise, you can use the system-supplied bot signatures and categories listed in the same place.

Because this defense mechanism uses reverse lookup, you need to configure a DNS Server (**System** > **Configuration** > **Device** > **DNS**) and a DNS Resolver (**Network** > **DNS Resolvers** > **DNS Resolver List**) for it to work.

Bot signature checking is typically used with proactive bot defense (and is enabled by default when you use proactive bot defense). The system performs bot signature checking, which identifies known bots as legitimate or malicious based on their HTTP characteristics. You can specify whether to ignore, report, or block certain categories of malicious or benign bots. You can also disable specific bot signatures, if needed.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click the name of an existing DoS profile (or create a new one, then open it), and click the **Application Security** tab.
3. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.
   The screen displays additional settings.
4. On the left, click **Bot Signatures** to display the settings.
5. For the **Bot Signature Check** setting, select **Enabled** if it is not already selected.

6. In the **Bot Signature Categories** field, for each category of bots, both malicious and benign, select the action to take when a request matches a signature in that category.

Option	Action
None	Ignore requests in this category.
Report	Log requests in this category.
Block	Block and report requests in this category.

   You can select one action for all malicious or all benign categories, or have different actions for separate categories.

   Note:

   These settings override the **Proactive Bot Defense** settings. For example, requests from bots in any category, if set to **Block**, are always blocked.

7. If certain signatures need to be disabled, in the **Bot Signatures List**, move the signatures to the **Disabled Signatures** list.
8. Click **Update** to save the DoS profile.

You have specified how to perform bot signature checking on your system. By comparing the bot signatures with requests, the system can identify those made by different categories of bots and will ignore, report, or block requests from bots it discovers.

If using bot signature checking, you will want to keep the signatures up to date. You can configure bot signatures (and all other signatures) to be updated automatically or update them manually using the Security Updates feature. A security update downloads the latest new and updated bot signatures and attack signatures.

Configuring TPS-based DoS detection

You can configure Application Security Manager™ to mitigate DoS attacks based on transaction rates using TPS-based DoS protection.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click the name of an existing DoS profile (or create a new one, then open it), and click the **Application Security** tab.
3. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.

   If **Application Security** is disabled, click **Enabled**.

   The screen displays additional settings.
4. On the left, under Application Security, click **TPS-based Detection**.
   The screen displays TPS-based DoS Detection settings.
5. Click **Edit All**.

   You can also edit each setting separately instead of editing them all at once.

   The screen opens the settings for editing.
6. For **Operation Mode**, select the option to determine how the system reacts when it detects a DoS attack.

Option	Description
Transparent	Displays data about DoS attacks on the DoS reporting screens, but does not block requests, or perform any of the mitigations.

Option	Description
Blocking	Applies the necessary mitigation steps to suspicious IP addresses, geolocations, URLs, or the entire site. Also displays information about DoS attacks on the DoS reporting screens.

Select **Off** to turn this type of DoS Detection off.

The screen displays additional configuration settings when you select an operation mode.

7. For **Thresholds Mode**, select whether to let the system automatically determine thresholds (**Automatic**) or to set the threshold values manually (**Manual**) for the DoS profile.

   If you choose to set the values manually, more fields are shown in the **How to detect attackers and which mitigation to use** setting, and you can adjust the threshold values. The default values are reasonable for most installations. If using automatic thresholds, the system sets the values using a wide range to begin with, then calculates the values using 7 days of historical data and sets threshold values to the highest levels during normal activity (to minimize false positives). The system updates thresholds every 12 hours.

8. For **How to detect attackers and which mitigation to use**, specify how to identify and stop DoS attacks. By default, source IP addresses and URLs are used to detect DoS attacks. You can specify other detection methods, and, if setting thresholds manually, adjust the thresholds for each of the settings as needed.

Option	Description
By Source IP	Specifies conditions for when to treat an IP address as an attacker. For automatic thresholds, one threshold is used for all source IP addresses.
By Device ID	Specifies conditions for when to treat a device as an attacker. For automatic thresholds, one threshold is used for all device IDs.
By Geolocation	Specifies when to treat a particular country as an attacker. If using automatic thresholds, the system calculates thresholds for the top 20 geolocations, setting different thresholds for every hour of the day. Thus, thresholds calculated at 9:00AM are based on data from 8:00-9:00AM, and are used at 8:00AM next day.
By URL	Specifies when the system treats a URL as under attack. For automatic thresholds, one threshold is used for all URLs. (Heavy URLs are not included in the calculations.)
Site Wide	Specifies conditions for how to determine when the entire web site is under attack. For automatic thresholds, one threshold value is used for the entire site.

At least one mitigation method must be selected before you can edit the detection settings. If the specified thresholds in the settings are reached, the system limits the number of requests per second to the history interval and uses the selected mitigation methods described here.

Option	Description
Client Side Integrity Defense	Sends a JavaScript challenge to determine whether the client is a legal browser or an illegal script. Only used when the **Operation Mode** is set to **Blocking**.
CAPTCHA Challenge	Issues a CAPTCHA challenge to the traffic identified as suspicious by source IP address, geolocation, URL, or site wide.
Request Blocking	Specifies how and when to block (if the operation mode is set to **Blocking**) or report (if the operation mode is set to **Transparent**)

Option	Description
	suspicious requests. Select **Block All** to block all suspicious requests or **Rate Limit** to reduce the number of suspicious requests.

9. For the **Prevention Duration** setting, specify the time spent in each mitigation step until deciding to move to the next mitigation step.

Option	Description
Escalation Period	Specifies the minimum time spent in each mitigation step before the system moves to the next step when preventing attacks against an attacker IP address or attacked URL. During a DoS attack, the system performs attack prevention for the amount of time configured here for the mitigation methods that are enabled. If after this period the attack is not stopped, the system enforces the next enabled prevention step. Type a number between `1` and `3600`. The default is `120` seconds.
De-escalation Period	Specifies the time spent in the final escalation step until retrying the steps using the mitigation methods that are enabled. Type a number (greater than the escalation period) between `0` (meaning the steps are never retried) and `86400` seconds. The default value is `7200` seconds (2 hours).

   DoS mitigation is reset after 2 hours, even if the detection criteria still hold, regardless of the value set for the **De-escalation Period**. If the attack is still taking place, a new attack occurs and mitigation starts over, retrying all the mitigation methods. If you set the **De-escalation Period** to less than 2 hours, the reset occurs more frequently.

10. Click **Update** to save the DoS profile.

You have now configured a DoS profile to prevent DoS attacks based on the client side (TPS-based detection). When the system receives too many requests per second for a source IP address, device ID, URL, or site wide, it is considered suspicious. The attack starts if the system detects at least one suspicious entity. The attack ends when there are no suspicious entities for a period of two minutes.

Next, you need to associate the DoS profile with the application's virtual server. You also have the option of configuring stress-based detection, heavy URL protection, or proactive bot defense in your DoS profile.

Configuring behavioral & stress-based DDoS protection

You can configure Application Security Manager™ to mitigate Layer 7 DDoS attacks based on server latency and traffic behavior. Behavioral DDoS protection is based on continuous machine learning of traffic and flow characteristics, and detects attacks very quickly.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click the name of an existing DoS profile (or create a new one, then open it), and click the **Application Security** tab.
3. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.
   The screen displays additional settings.
4. On the left, under Application Security, click **Behavioral & Stress-based Detection**.
   The screen displays Behavioral & Stress-based DoS Detection settings.
5. Click **Edit All**.

   You can also edit each setting separately instead of editing them all at once.

   The screen opens the settings for editing.

6. For **Operation Mode**, select the option to determine how the system reacts when it detects a DoS attack.

Option	Description
Transparent	Displays data about DoS attacks on the DoS reporting screens, but does not block requests, or perform any of the mitigations.
Blocking	Applies the necessary mitigation steps to suspicious IP addresses, geolocations, URLs, or the entire site. Also displays information about DoS attacks on the DoS reporting screens.

   Select **Off** to turn this type of DoS Detection off.

   The screen displays additional configuration settings when you select an operation mode.

7. For **Thresholds Mode**, select whether to let the system automatically determine thresholds (**Automatic**) or to set the threshold values manually (**Manual**) for the DoS profile.

   If you choose to set the values manually, more fields are shown in the **Stress-based Detection and Mitigation** setting, and you can adjust the threshold values. The default values are reasonable for most installations. If using automatic thresholds, the system sets the values using a wide range to begin with, then calculates the values using 7 days of historical data and sets threshold values to the highest levels during normal activity (to minimize false positives). Thereafter, the system updates thresholds every 12 hours.

8. For **Stress-based Detection and Mitigation**, specify how to identify and stop DoS attacks. By default, source IP addresses and URLs are enabled to detect DoS attacks. You can specify other detection methods, and, if setting thresholds manually, adjust the thresholds for each of the settings as needed.

Option	Description
By Source IP	Specifies conditions for when to treat an IP address as an attacker. The system calculates one automatic threshold for the most accessed source IP addresses, and another threshold for the rest.
By Device ID	Specifies conditions for when to treat a device as an attacker. For automatic thresholds, one threshold is calculated for highly accessed device IDs, and another for the rest.
By Geolocation	Specifies when to treat a particular country as an attacker. If using automatic thresholds, the system calculates thresholds for the top 20 geolocations, setting different thresholds for every hour of the day. Thus, thresholds calculated at 9:00AM are based on data from 8:00-9:00AM, and are used at 8:00AM next day.
By URL	Specifies when the system treats a URL as under attack. For automatic thresholds, one threshold is calculated for highly accessed URLs, and another for the rest. (Heavy URLs are not included in the calculations.)
Site Wide	Specifies conditions for how to determine when the entire web site is under attack. For automatic thresholds, one threshold is used sitewide.

   At least one mitigation method must be selected before you can edit the detection settings. If the specified thresholds in the settings are reached, the system limits the number of requests per second to the history interval and uses the selected mitigation methods described here. These methods do not apply to Behavioral DoS.

Option	Description
Client Side Integrity Defense	Sends a JavaScript challenge to determine whether the client is a legal browser or an illegal script. Only used when the **Operation Mode** is set to **Blocking**.
CAPTCHA Challenge	Issues a CAPTCHA challenge to the traffic identified as suspicious by source IP address, geolocation, URL, or site wide.
Request Blocking	Specifies how and when to block (if the operation mode is set to **Blocking**) or report (if the operation mode is set to **Transparent**) suspicious requests. Select **Block All** to block all suspicious requests or **Rate Limit** to reduce the number of suspicious requests.

9. For the **Behavioral Detection and Mitigation** settings, specify how to mitigate DDoS attacks discovered based on behavior.

Option	Description
Bad actors behavior detection	Lets the system identify IP addresses of bad actors by examining traffic behavior and anomaly detection.
Request signatures detection	Examines requests and creates behavioral signatures describe patterns found in attacks the system has identified. Select **Use approved signatures only** if you want to verify that the system-generated signatures are valid before letting the system use them.
Mitigation	Specifies the level of mitigation to perform for attacks discovered using behavioral DoS. • **Conservative Protection**: If **Bad actors behavior detection** is enabled, slows down and rate limits requests from anomalous IP addresses based on anomaly detection confidence and server health. If **Request signatures detection** is enabled, blocks requests that match behavioral signatures. • **Standard Protection**: If **Bad actors behavior detection** is enabled, slows down requests from anomalous IP addresses based on its anomaly detection confidence and server health. Rate limits requests from anomalous IP addresses and, if necessary, rate limits all requests based on server health. Limits the number of concurrent connections from anomalous IP addresses and, if necessary, limits the number of all concurrent connections based on server health. If **Request signatures detection** is enabled, blocks requests that match behavioral signatures. • **Aggressive Protection**: If **Bad actors behavior detection** is enabled, does all that standard protection does plus it proactively performs all protection actions (even before an attack). Increases the impact of the protection techniques. If **Request signatures detection** is enabled, blocks requests that match behavioral signatures. Increases the impact of blocked requests. • **No Mitigation**: Learns and monitors traffic behavior, but takes no action.

10. For the **Prevention Duration** setting, specify the time spent in each mitigation step until deciding to move to the next mitigation step.

Option	Description
Escalation Period	Specifies the minimum time spent in each mitigation step before the system moves to the next step when preventing attacks against an attacker IP address or attacked URL. During a DoS attack, the system performs attack prevention for

Option	Description
	the amount of time configured here for the mitigation methods that are enabled. If after this period the attack is not stopped, the system enforces the next enabled prevention step. Type a number between `1` and `3600`. The default is `120` seconds.
De-escalation Period	Specifies the time spent in the final escalation step until retrying the steps using the mitigation methods that are enabled. Type a number (greater than the escalation period) between `0` (meaning the steps are never retried) and `86400` seconds. The default value is `7200` seconds (2 hours).

DoS mitigation is reset after 2 hours, even if the detection criteria still hold, regardless of the value set for the **De-escalation Period**. If the attack is still taking place, a new attack occurs and mitigation starts over, retrying all the mitigation methods. If you set the **De-escalation Period** to less than 2 hours, the reset occurs more frequently.

11. Click **Update** to save the DoS profile.

You have now configured a DoS profile to prevent DoS attacks automatically based on server health and/or Behavioral DoS. The BIG-IP® system monitors server health and estimates the server load based on Layer 7 statistics including TPS, pending transactions, request drop rate, and so on. If the system detects potential attack conditions, the mitigation starts working (depending on the level of behavioral protection you selected) seconds after an attack begins.

Note: *If using stress-based or behavioral DoS protection, the system may falsely detect an attack in the event of a runtime failure (such as a backend server being down) or a configuration issue (such as the system having no pool or the pool having no pool members).*

The mitigation process starts with the list of suspicious IP addresses and slows down suspicious clients. The system may also perform ingress rate shaping. The suspicious clients are tagged as a result of the Layer 7 behavioral analysis.

Next, associate the DoS profile with the application's virtual server. You also have the option of configuring TPS-based detection, proactive bot defense, or heavy URL protection in your DoS profile.

Configuring heavy URL protection

To use heavy URL protection, F5 recommends that you configure stress-based anomaly settings in the DoS profile. That way the system can detect low-volume attacks on heavy URLs when no other high-volume attacks are underway. Also, you must enable at least one of the URL-based prevention policy methods in the TPS-based Anomaly or stress-based Anomaly settings in the DoS profile.

You can configure Application Security Manager™ (ASM) to prevent DoS attacks on heavy URLs. Heavy URLs are URLs on your application web site that may consume considerable resources under certain conditions. By tracking URLs that are potentially heavy, you can mitigate DoS attacks on these URLs before response latency exceeds a specific threshold.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click the name of an existing DoS profile (or create a new one, then open it), and click the **Application Security** tab.
3. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.
   The screen displays additional settings.
4. In the General Settings, next to **Heavy URL Protection**, click **Edit**.

5. To have the system automatically detect heavy URLs, select **A URL is considered heavy if its portion of transactions with latency above this threshold is higher than usual for this site**, and adjust the latency threshold if necessary.

   The default value is `1000` milliseconds.

   The system detects heavy URLs by measuring the latency tail ratio, which is the number of transactions whose latency is consistently greater than the threshold.
6. If you expect certain URLs to be heavy (have high latency) at times, add them to the **Configure a list of Heavy URLs** setting:
   a) Type each URL in the form `/query.html`. The URLs in this list may include wildcards, such as `/product/*`.
   b) Type the threshold in milliseconds at which point you want the URL to be considered heavy.
   c) Click **Add**, adding as many URLs as you need to.

   If you are not sure which URLs to add to the Heavy URLs list, leave this setting unconfigured and let the system automatically detect heavy URLs.

   If you want to add a wildcard URL to the heavy URL list, you also must add the wildcard URL to the **URL Patterns** field on this screen. A wildcard not added to the URL Patterns will not function as a wildcard.
7. In the **Configure a list of URLs which are excluded from being automatically detected as Heavy URLs** setting, type the URLs not to consider heavy, and click **Add**.

   The URLs in this list may include wildcards, such as `/product/*` .
8. Click **Update** to save the DoS profile.

You have now configured a DoS profile that includes heavy URL protection. Heavy URLs are detected based on reaching higher latency under certain conditions. ASM tracks the probability distribution of server latency, which is called heavy tailed.

To validate automatic detection, you can view the URL Latencies report (**Security** > **Reporting** > **DoS** > **URL Latencies**) periodically to check that the latency threshold that you used is close to the value in the latency histogram column for all traffic. You should set the latency threshold so that approximately 95% of the requests for the virtual server have lower latency.

By reviewing the URL Latencies report and sorting the URLs listed by latency, you can make sure that the URLs that you expect to be heavy are listed in the DoS profile. Also, if the system detects too many (or too few) heavy URLs, you can increase (or decrease) the latency threshold.

Recording traffic during DoS attacks

If you have DoS protection enabled, you can configure the system to record traffic during DoS attacks. By reviewing the recorded traffic in the form of a TCP dump, you can diagnose the attack vectors and attackers, observe whether and how the attack was mitigated, and determine whether you need to change the DoS protection configuration.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click the name of an existing DoS profile (or create a new one, then open it), and click the **Application Security** tab.
3. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.
   The screen displays additional settings.
4. On the left, under Application Security, click **Record Traffic**.
5. For **Record Traffic During Attacks**, click **Edit**, then select the **Enabled** check box.
   The screen displays additional configuration settings.

6. For **Maximum TCP Dump Duration**, click **Edit**, then type the maximum number of seconds (from 1 - 300) for the system to record traffic during a DoS attack.

   The default value is `30` seconds.
7. For **Maximum TCP Dump Size**, type the maximum size (from 1 - 50) allowed for the TCP dump.

   When the maximum size is reached, the dump is complete. The default value is `10` MB.
8. For **TCP Dump Repetition**, specify how often to perform TCP dumps during a DoS attack:
   - To record traffic once during an attack, select **Dump once per attack**.
   - To record traffic periodically during an attack, select **Repeat dump after** and type the number of seconds (between 1 - 3600) for how long to wait after completing a TCP dump before starting the next one.
9. Click **Update** to save the DoS profile.

When the system detects a DoS attack, it performs a TCP dump to record the traffic on the virtual server where the attack occurred. The files are located on the system in `/shared/dosl7/tcpdumps`. The name of the file has the format: `<yyyy_mm_dd_hh:mm:ss>-<attack_ID>-<seq_num>.pcap`, including the time the dump started, the ID of the attack in logs and reports, and the number of the TCP dump since the attack started. If traffic being recorded is SSL traffic, it is recorded encrypted.

If working with F5 support, you can collect the TCP dump files into a QuickView file so that support personnel can help determine the cause of the DoS attack, and recommend ways of preventing future attacks.

Configuring CAPTCHA for DoS protection

You can configure a CAPTCHA challenge as part of the mitigation policy for TPS-based DoS detection, behavioral & stress-based DoS detection, or as part of proactive bot defense. A CAPTCHA (or visual character recognition) challenge determines whether the client is human or an illegal script.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click the name of an existing DoS profile (or create a new one, then open it), and click the **Application Security** tab.
3. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.
   The screen displays additional settings.
4. On the left, under Application Security, select an option to configure TPS-based, behavioral & stress-based, or proactive bot defense, and select CAPTCHA as one of the mitigation methods.
   a) For **TPS-based Detection**, in the **How to detect attackers and which mitigation to use** setting, edit the source IP, device ID, geolocation, URL, or site-wide mitigation, and select **CAPTCHA Challenge**.
   b) For **Behavioral & Stress-based Detection**, in the **Stress-based Detection and Mitigation** setting, edit the source IP, device ID, geolocation, URL, or site-wide mitigation, and select **CAPTCHA Challenge**.
   c) For **Proactive Bot Defense**, in the **Block requests from suspicious browsers** setting, select **CAPTCHA Challenge** to challenge a suspected bot.
5. To customize the CAPTCHA response that the system sends as a challenge to suspicious users, click **CAPTCHA Settings**.

   The **CAPTCHA Settings** link is only available after you select a CAPTCHA challenge.

   The Application Security General Settings area opens and displays the CAPTCHA Response.
6. In the **CAPTCHA Response** setting, specify the text the system sends as a challenge to users.

Note: This setting appears only if one or more of the CAPTCHA Challenge options is selected.

a) From the **First Response Type** list, select **Custom**.

b) Edit the text (HTML) in the **First Response Body** field.

You can use the following variables within the challenge or response.

Variable	Use
`%DOSL7.captcha.image%`	Displays the CAPTCHA image in data URI format.
`%DOSL7.captcha.change%`	Displays the change CAPTCHA challenge icon.
`%DOSL7.captcha.solution%`	Displays the solution text box.
`%DOSL7.captcha.submit%`	Displays the **Submit** button.

c) Click **Show** to see what it looks like.

7. In the **CAPTCHA Response** setting, specify the text the system sends to users if they fail to respond correctly to the CAPTCHA challenge.
   a) From the **Failure Response Type** list, select **Custom** if you want to change the text.
   b) If customizing the text, edit the text in the **Failure Response Body** field.
   You can use the same variables in the text to send a second challenge.
   c) Click **Show** to see what it looks like.
8. Click **Update** to save the DoS profile.

You have now configured a CAPTCHA challenge for potential DoS attackers that helps with filtering out bots. The system sends a character recognition challenge only on the first request of a client session. If it is solved correctly, the request is sent to the server. Subsequent requests in the session do not include the challenge. If the client fails the first challenge, the CAPTCHA response is sent. If that also fails, the client is handled according to the mitigation methods selected in the DoS profile.

Associating a DoS profile with a virtual server

You must first create a DoS profile separately, to configure denial-of-service protection for applications, the DNS protocol, or the SIP protocol. For application-level DoS protection, the virtual server requires an HTTP profile (such as the default http).

You add denial-of-service protection to a virtual server to provide enhanced protection from DoS attacks, and track anomalous activity on the BIG-IP® system.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the name of the virtual server you want to modify.
3. On the menu bar, from the Security menu, choose Policies.
4. To enable denial-of-service protection, from the **DoS Protection Profile** list, select **Enabled**, and then, from the **Profile** list, select the DoS profile to associate with the virtual server.
5. Click **Update** to save the changes.

DoS protection is now enabled, and the DoS Protection profile is associated with the virtual server.

Implementation Result

When you have completed the steps in this implementation, you have configured the Application Security Manager™ (ASM) to protect against L7 DoS attacks. If using proactive bot defense, ASM™ protects against DDoS, web scraping, and brute force attacks (on the virtual servers that use this DoS profile) before the attacks can harm the system. Depending on the configuration, the system may also detect DoS attacks based on transactions per second (TPS) on the client side, server latency, or both.

In TPS-based detection mode, if the ratio of the transaction rate during the history interval is greater than the TPS increased by percentage, the system considers the URL to be under attack, the IP address or country to be suspicious, or possibly the whole site to be suspicious.

In stress-based detection mode, if there is a latency increase and at least one suspicious IP address, country, URL, or heavy URL, the system considers the URL to be under attack, the IP address or country to be suspicious, or possibly the whole site to be suspicious.

If you enabled heavy URL protection, the system tracks URLs that consume higher than average resources and mitigates traffic that is going to those URLs.

If you chose the blocking operation mode, the system applies the necessary mitigation steps to suspicious IP addresses, URLs, or geolocations, or applies them site-wide. If using the transparent operation mode, the system reports DoS attacks but does not block them.

If you are using iRules® to customize reaction to DoS attacks, when the system detects a DoS attack based on the configured conditions, it triggers an iRule and responds to the attack as specified in the iRule code.

After traffic is flowing to the system, you can check whether DoS attacks are being prevented, and investigate them by viewing DoS event logs and reports.

Viewing DoS Reports, Statistics, and Logs

Overview: Viewing DoS reports and logs

Once you have configured DoS protection on the BIG-IP® system, you can view charts, reports, statistics and event logs that show information about DoS attacks and mitigations in place on the system (**Security** > **Reporting** > **DoS**). For example, you can view the **DoS Dashboard** screen, which shows at-a-glance whether or not the system is under attack, the type of attack and IP addresses of the source and destination of monitored traffic. The DoS Dashboard screen also indicates the impact of DoS attacks on your virtual servers, in addition to overall system health.

The **DoS Analysis** screen you can view reports of transaction outcomes, and correlate the impact of system detection and the mitigation of DoS attacks to system health and performance indicators. The reports and event logs on the DoS Analysis screen help you to understand whether the DoS protection you have implemented is protecting your application's performance, or whether you need to fine-tune the configuration. In addition, you can adjust the time line to view historical attacks and their trends, which can provide insight into the DoS threats your application commonly faces.

Dimensions

A searchable label for a specific behavior or behavior trends monitored by the BIG-IP system. Each dimension lists one or more entities that provides the specific attributes of statistics data. For example, when viewing activity from multiple virtual servers, the dimension **Virtual Servers** will list each individual virtual server that is monitored as an entity within that dimension. You can select one or more entities to filter monitored statistics with the corresponding charts and dimensions on the screen.

Filter statistics data using the Dimensions pane

By default, the charts and dimensions tables display unfiltered data that is relevant to all monitored BIG-IP® system aspects. You can filter the displayed data by selecting entities within dimensions in the Dimensions pane.

Important: *Applying filters in the Dimensions pane updates all statistics displayed on screen with data that corresponds to your selection.*

1. On the Main tab, click **Security** > **Reporting** > **DoS** > **Analysis**.
2. Locate the Dimensions pane on the right side of the screen.
3. Review DoS activity according to traffic module, and filter information by traffic module by selecting one of the buttons in the Dimensions pane.

   Tip: *Clear the module filter by clicking the selected module.*
4. Review data according to pre-configured device group, and filter the displayed data according to a specific configuration by selecting an option from **Device Group**.
5. Review dimension entities and their statistics in table form by expanding a dimension widget. To filter by dimension entities, select one or more entities from that dimension.

   For example: You can filter by selecting individual Virtual Servers or Applications to display statistics in the charts that are specific to your selection. You can select entities from multiple dimensions that have corresponding data.

6. You can adjust the table view by selecting the Dimensions pane handle and dragging it to the left side of the screen.

   Tip: *You can expand the pane to full screen view by double-clicking the Dimensions pane handle.*

7. Clear all filter selections or those for a dimension:
   - To clear all selections, click the gear icon at the top of the Dimensions pane and select **Clear All**.
   - To clear selections for a dimension, click the options icon (three horizontal lines to the left of the title), and select **Clear Selection**.

About comparison charts

The AVR charts display aggregated statistics for your entire BIG-IP® system. You can create customized charts based on specific, compatible data of interest, with a comparison chart. You create comparison charts using dimension entities to highlight specific data metrics, or to compare multiple entities in one chart.

Create a comparison chart using the Dimensions pane

You can create new charts that present statistic information about your BIG-IP® system for selected entities from a dimension in the Dimensions pane. Once a new chart is created, you can adjust the metric value that is presented. You can create multiple comparison charts per screen.

1. On the Main tab, click **Security** > **Reporting** > **DoS** > **Analysis**.
2. In the Dimensions pane, expand a dimension widget to view its entity list.
3. Select one or more dimension entities for the comparison chart by clicking the entity title. You can also select entities in other dimensions that have compatible data.

   Note: *Selecting entities automatically filters information in the Charts pane and compatible data in other dimensions. You can remove these filters once the comparison chart is created.*

4. Click the dimension's menu icon and select **Add Comparison Chart**.

   Tip: *You can right click one of the selected entities to view the dimension widget menu.*

   A comparison chart displays in the Charts pane.
5. Adjust the displayed metric unit by selecting a different metric from the list next to the comparison chart title.

   By default, the chart displays data by the selected Sort By metric for the entity's dimension.

   Note: *Comparison charts persist in the Charts pane until they are removed. You can remove a comparison chart by selecting the* ***X*** *icon in the top right corner of the chart.*

The new comparison chart displays data for the selected entities in the Charts pane over the selected time period.

Investigating DoS attacks and mitigation

Before you can investigate DoS attacks, you need to have created a DoS profile so that the system is capturing the analytics on the system. You must associate the DoS profile with one or more virtual servers.

You can use the DoS Dashboard screen for an overview of DoS attack activity on your BIG-IP® system, and corresponding system information during DoS attacks.

1. On the Main tab, click **Security** > **Reporting** > **DoS** > **Dashboard**.

__Tip:__ For quick navigation to the DoS Dashboard screen, on the Main tab to go ***Statistics*** *>* ***DoS Visibility****.*

The DoS Dashboard screen opens and displays system information about all DoS attacks over a default time range.

2. Use the time settings at the top of the screen to set a time range or refresh the information on screen.

   To immediately update the statistics on screen, adjust the time range or refresh settings.

   Note: *Time range settings are persistent when navigating between the DoS Dashboard and Analysis screens.*

Time Focus	Select the time range of the displayed data. ***Note:*** *Additional time options become available as your system gathers more data.*
Currently Selected Time Range	Displays the current time range of the displayed data.
Auto-Refresh Interval Selector	Select how frequently the data on this screen is refreshed.
Manual Refresh	Click **Refresh** to trigger an immediate refresh of the displayed data.
Manual Time Adjustment Handles	Set the data to a specific window of time within the currently selected time range. Use the handles at either end of the time line to define the specific time you want to examine. Use the handle above the time line to display data that is outside the selected time range. ***Note:*** *Adjusting the time range to display previous data stops the auto-refresh so you can focus on a specific data point.*

   You can zoom into a specific time range within a chart. Select an area within the chart and then click the magnifying glass icon.

   Note: *Selecting a time range within the chart stops the screen's auto-refresh settings.*

3. Review the charts and tables that provide high-level information about your system's status.

   Tip: *You can filter the entire screen's displayed data to correspond with a specific data point by selecting entities in the charts, tables or map.*

4. Review the Attack Duration and Attacks areas for recent or ongoing DoS attacks.
5. Review the Attack Duration area to determine the duration of each DoS attack over the selected time period, including ongoing attacks. In the Attack Duration chart, each horizontal bar represents an individual attack and indicates the start and end time of the attack, and the severity.

   An ongoing attack extends to the end of the chart.

   You can view additional attack information in the chart:

   - Hover over an individual attack to view attack details, including Attack ID, Mitigation, Severity, Trigger and Vector.
   - Hover over the chart area to view the number of attacks that occurred at a specific time in the chart legend.
6. Review the Attacks area to determine the distribution of DoS attacks over the selected time period.

- Use the # of Attacks table to view a breakdown of the number of attacks according to the attack severity.

  Note: *You can select one or more values in this table to filter the entire screen according to an attack severity level.*

- Use the # of Attacks per Protocol chart to view the breakdown of attacks according to severity of attack and transaction protocol.
- Use the table in this area to examine the details of each attack, according to Attack ID.

  Note: *You can view more information by hovering over the table's data.*

7. Review the Virtual Servers area to determine the impact of DoS attack's on your system's virtual servers.
   - Use the # of Virtual Servers table to view a breakdown of your virtual servers health status according to each virtual server's latency, client concurrent connections and throughput.
   - Use the Virtual Servers Health chart to view a breakdown of virtual servers according to health score for each performance indicator that is used to evaluate health status.
   - Use the table in this area to examine the health and corresponding attack details for each virtual server.
8. Review the tiles in the System Health area for a quick view of your BIG-IP system's health status. Each health tile is color coded according to the overall severity of each parameter for the entire system. Severity ranges are as follows: Good, Moderate, Unhealthy and Critical.

   Note: *In a multi-blade system, each health parameter also displays the slots with the highest system activity.*

   - Use the TMM CPU Usage tile to determine the status of the TMM's CPU usage, and if the system has crossed any critical thresholds.

     Note: *You can select from the drop-down icon to view a list of the busiest cores. For a multi-blade system, a list of the busiest cores is available for each slot.*

   - Use the Memory Usage tile to determine your system's average TMM memory usage (out of total RAM allocated to TMM processes), and if the system has crossed any critical thresholds.
   - Use the Client Throughput tile to determine the average rate of bits per seconds transmitted during client-side transactions with your BIG-IP system.
   - Use the Client Connections tile to determine the average number of client concurrent connections with your BIG-IP system over the selected time period.
9. Review the Countries area for information about the geolocation of traffic handled by your BIG-IP system.
   - Filter location information by client IP or the intended destination IP. Select Source to filter by client IP/country or Destination(Network) to filter by the server IP/country.
   - Use the map to evaluate the global distribution of traffic, and the frequency of attacks from a country origin or destination. Countries are color-coded according to the frequency of attacks. You can select a country within the map to filter the entire screen by IPs from that destination or origin.

     Note: *Countries in grey do not have sufficient traffic information.*

   - Use the table in this area to examine the traffic information by country.
10. To view more details of your DoS activity, click **Security** > **Reporting** > **DoS** > **Analysis**.

    Tip: *From the Dashboard, you can automatically filter specific Attack IDs or Virtual Servers in the DoS Analysis screen, by selecting the chart icon (📈) from a table row.*

You can continue to review the system snapshot using the DoS Dashboard screen. As a result, you become more familiar with you system's activities during DoS attacks. You can also view the statistics in graphical charts and in tables, focusing on the specific data you need using attack and dimension filters.

Analyzing DoS impact on your system

Before you can investigate DoS attacks, you need to have created a DoS profile so that the system is capturing the analytics on the system. You must associate the DoS profile with one or more virtual servers.

You can use the DoS Analysis screen to analyze the impact of DoS attacks on your BIG-IP® system, traffic, or to detect any system performance issues.

1. On the Main tab, click **Security** > **Reporting** > **DoS** > **Analysis**.
   The DoS Analysis screen displays the aggregated statistics of system information for the selected time period.

   Tip: *To drill down into specific system information in the charts, use the settings in the Dimensions pane to highlight data of interest.*

2. Use the time settings at the top of the screen to set a time range or refresh the information on screen.

   To immediately update the statistics on screen, adjust the time range or refresh settings.

   Note: *Time range settings are persistent when navigating between the DoS Dashboard and Analysis screens.*

Time Focus	Select the time range of the displayed data. ***Note:*** *Additional time options become available as your system gathers more data.*
Currently Selected Time Range	Displays the current time range of the displayed data.
Auto-Refresh Interval Selector	Select how frequently the data on this screen is refreshed.
Manual Refresh	Click **Refresh** to trigger an immediate refresh of the displayed data.
Manual Time Adjustment Handles	Set the data to a specific window of time within the currently selected time range. Use the handles at either end of the time line to define the specific time you want to examine. Use the handle above the time line to display data that is outside the selected time range. ***Note:*** *Adjusting the time range to display previous data stops the auto-refresh so you can focus on a specific data point.*

   You can zoom into a specific time range within a chart. Select an area within the chart and then click the magnifying glass icon.

   Note: *Selecting a time range within the chart stops the screen's auto-refresh settings.*

3. Review the BIG-IP Health area to detect any BIG-IP device health issues.

   - Use the Memory Usage (GB) chart to analyze the distribution of system memory that is currently in use.

Note: *In a multi-blade system, the chart displays the system average of all blades.*

- Use the Top Busiest CPU Cores (%) chart to view the percent usage of the top five busiest TMM CPU cores. If your BIG-IP system has five CPU cores or fewer, this chart displays all active TMM CPU cores.

Note: *In a multi-blade system, the chart displays the top five busiest slots of all CPU cores.*

4. Review the Virtual Servers area to define the health or performance status of your virtual servers. Select a single entity from the **Virtual Servers** dimension to display data.

   Important: *The statistics displayed in the Virtual Servers charts represent the metrics that are specific to a single virtual server, and are not affected by all dimension filters.*

   - Use the Average New Connections (conn/s) chart to analyze the average number of new system connections per second.
   - Use the Average Concurrent Connections (conn/s) chart to analyze the average number of simultaneous connections per second that your BIG-IP system maintains.
   - Use the Connections Activity chart to analyze the average number of unsuccessful connections out of all attempted transactions and why the transaction was unsuccessful.
   - Use the Average Throughput in bits/s chart to analyze the average number of bits transferred per second during each part of the transaction process.
   - Use the Total Health chart to determine the health score of your virtual servers. The health score is a percent value, where a higher score indicates good virtual server health. The total score is calculated using the pre-defined thresholds for CPU, memory, throughput and connections.
   - Use the Max Number of Attacks chart to analyze the number and type of detected attacks over the selected time period.
   - Use the Distinct Count of IPs chart to analyze the number of concurrent connecting IP addresses to a single virtual server, and the number of IP addresses that were deemed as malicious by the BIG-IP system.
5. Review the Attacks area to analyze the characteristics of a single attack.

   Note: *Select a single entity from the* ***Attack IDs*** *dimension to display data.*

   - Use the Number of IPs Participating in an Attack chart to analyze the number of IP addresses involved in carrying out the selected attack.

     Note: *In a multi-blade system, the number of IP addresses shown includes all blades.*

   - Use the Attack Severity chart to analyze the severity score of the selected attack. The attack score is a percent value, where a higher score indicates greater attack severity and potential for impact. The score is based on a scale from the duration of the attack (based on start and end time), number of attacking IP addresses and the number of mitigation events per second.
6. Review the HTTP area for application traffic activity and to evaluate how DoS attacks impact traffic performance.
   - Use the Transaction Outcomes (Average TPS) chart to analyze the outcome assigned by the BIG-IP system to the application request and response exchange.
   - Use the Server Latency (ms) chart to determine the time required for a server response once the BIG-IP system sends a request.
   - Use the Throughput (bps) chart to determine the average number of bytes per second processed by the BIG-IP system during application requests and responses.
   - Use the Client Types chart to analyze the means by which HTTP requests are initiated.
7. Review the Network area to evaluate the number and type of network transactions that were monitored by the BIG-IP system.

8. Review the DNS Transaction Outcomes area to evaluate the outcome assigned by the BIG-IP system to the DNS request and response exchange.
9. Review the SIP Transaction Outcomes area to evaluate the outcome assigned by the BIG-IP system to the SIP request and response exchange.

You can continue to review system statistics on the entire system to monitor activity during, or after DoS attacks. You can focus on the specific data you need using the filters and comparison chart option provided in the Dimensions pane.

Displaying DoS Application Event logs

You can display DoS Application Event logs to see whether L7 DoS attacks have occurred, and view information about the attacks. The logs show details about the DoS events.

1. On the Main tab, click **Security** > **Event Logs** > **DoS** > **Application Events**.
   The DoS Application Events screen opens, and if Layer 7 DoS attacks were detected, it lists the details about the DoS attack such as the start and end times, how it was detected and mitigated, the attack ID, and so on.
2. If DoS attacks are listed, review the list of attacks to see what has occurred, when it occurred, the mitigation, and the severity of the attack.
3. From the event log, click the **Attack ID** link for an attack or event to display information about the attack in a graphical chart.

Viewing URL Latencies reports

For the URL Latencies report to include useful information, you need to have created a DoS profile and associated it with the application's virtual server for the system to capture the latency statistics for the application.

You can display a report that shows information about the latency of traffic to specific web pages in your application. The report lists the latency for each URL separately, and one row lists the latency for all URLs combined. You can use this report to check that the latency threshold that you used is close to the value in the latency histogram column for all traffic.

1. On the Main tab, click **Security** > **Reporting** > **DoS** > **URL Latencies**.
   The URL Latencies reporting screen opens.
2. From the **Time Period** list, select the time period for which you want to view URL latency, or specify a custom time range.
3. If you want to filter the information by virtual server, DoS profile, URL, or detection criteria, specify the ones for which you want to view the URL latency, and click **Filter**.

   By default, the report displays information for all items.
4. Adjust the chart display options as you want.

Display Option	Description
Display Mode	Select whether to display the information as **Cumulative** or as related to the respective latency range, **Per Interval**.
Unified Scale	Select this check box to display all histograms using a single scale for all URLs, rather than a separate scale for each one.
Order by	Select the order in which to display the statistics: by the average server latency, the number of transactions, the histogram latency ranges (in milliseconds), or by how heavy URLs were detected (automatically detected or manually set).

5. Review the latency statistics.

- The report shows the latency for the most active URLs.
- The Aggregated row summarizes the statistics for the URLs not included in the report.
- The Overall Summary shows the latency of all traffic.

6. To focus in on the specific latency details for one row, click the latency histogram.
A magnified view of the histogram is displayed in a separate window. The latency histogram shows the percentage of transactions for each range of latency (0-2 ms, 2-4 ms, and so on up to 10000 ms or 10 seconds).

The URL Latencies report shows how fast your web application returns web pages and can show typical latency for applications (meaning virtual servers associated with a DoS profile) on your system. It can help you to identify slow pages with latency problems that may require additional troubleshooting by application developers.

You can also use the URL Latencies report for the following purposes:

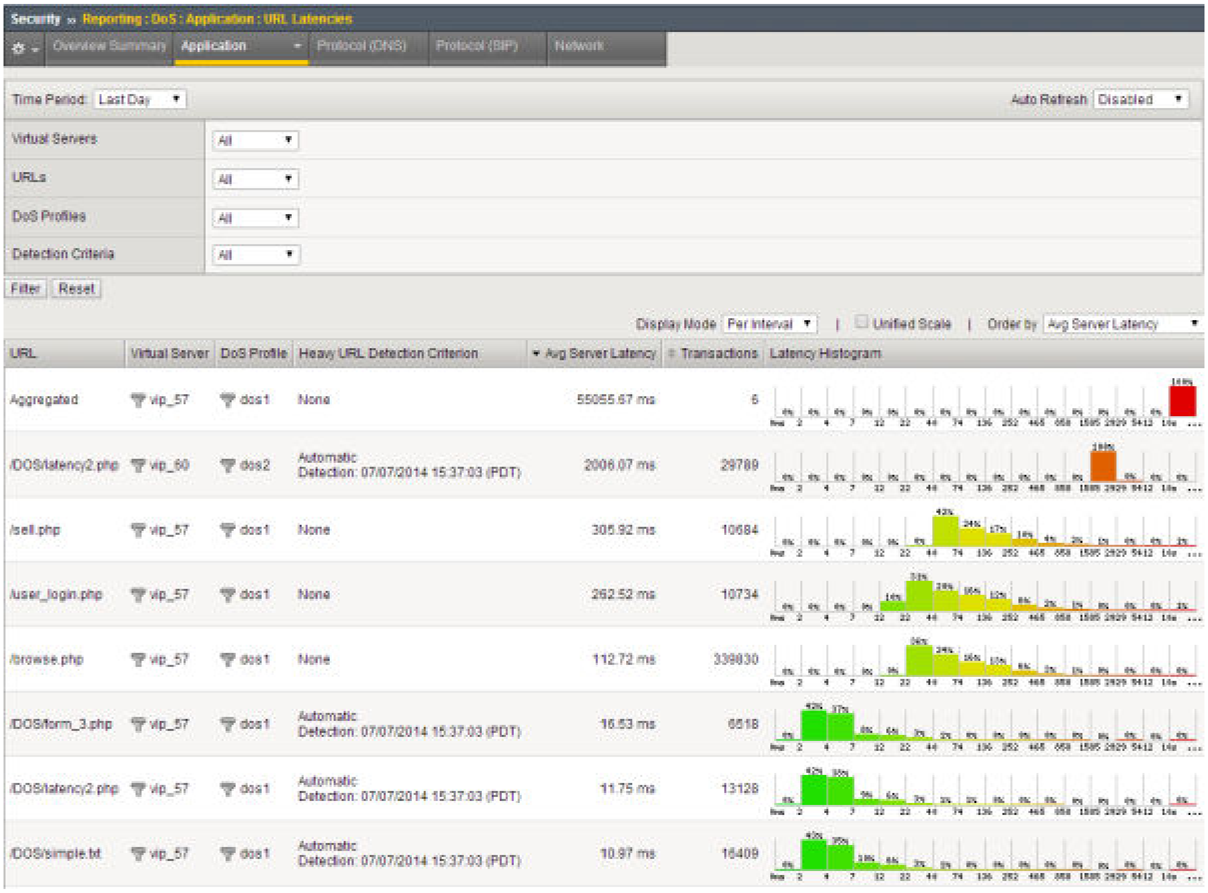
- To determine the threshold latencies, especially the heaviness threshold.

  Tip: *Set the heaviness threshold to approximately 90-95% of the latency distribution for the site. Filter the data by site (that is, by virtual server and DoS profile), and check the latency distribution in the histogram of the Total row.*

- To track the current heavy URLs. You can add or remove manually configured heavy URLs depending on the information in the report.
- To monitor the latency distribution.

Sample URL Latencies report

This figure shows a sample URL Latencies report for a system that has two DoS profiles and two virtual servers. It shows the latency for several web pages ranging from 10.97 ms to 2006.07 ms. One page (`/DOS/latency2.php`) has very high latency and might require some troubleshooting. In this case, the system determined that URL to be "heavy" based on traffic. While investigating the latency of URLs that take longer to display, if it is acceptable, you may decide to add them to the list of heavy URLs in the DoS profile so they do not trigger DoS mitigation.



Time Period: Last Day

Auto Refresh: Disabled

Virtual Servers: All

URLs: All

DoS Profiles: All

Detection Criteria: All

Display Mode: Per Interval | □ Unified Scale | Order by: Avg Server Latency

URL	Virtual Server	DoS Profile	Heavy URL Detection Criterion	▾ Avg Server Latency	Transactions	Latency Histogram
Aggregated	vip_57	dos1	None	55055.67 ms	6	
/DOS/latency2.php	vip_60	dos2	Automatic Detection: 07/07/2014 15:37:03 (PDT)	2006.07 ms	29789	
/sell.php	vip_57	dos1	None	305.92 ms	10684	
/user_login.php	vip_57	dos1	None	262.52 ms	10734	
/browse.php	vip_57	dos1	None	112.72 ms	339830	
/DOS/form_3.php	vip_57	dos1	Automatic Detection: 07/07/2014 15:37:03 (PDT)	16.53 ms	6518	
/DOS/latency2.php	vip_57	dos1	Automatic Detection: 07/07/2014 15:37:03 (PDT)	11.75 ms	13128	
/DOS/simple.txt	vip_57	dos1	Automatic Detection: 07/07/2014 15:37:03 (PDT)	10.97 ms	16409	

Figure 1: Sample URL Latencies report

Creating customized DoS reports

You can create a customized DoS reporting screen so that it shows the specific data you are interested in, such as the top DoS attacks and server latency.

1. On the Main tab, click **Security** > **Reporting** > **DoS** > **Custom Page**.
   The DoS Custom Page screen opens, and shows default widgets (sections) you may find useful.
2. Review the charts and tables provided, and click the configuration icon to adjust or delete them, as needed.
   - To modify the widget and change what it displays, click the gear icon and select **Settings**. On the popup screen, adjust the values that control what is displayed.
   - To remove the widget from the custom page, click the gear icon and select **Delete**.
3. To create a new widget to your specifications, click **Add Widget**.
   The Add New Widget popup screen opens where you can select custom options for what to include, the time frame, and how to display the information.
4. Continue adjusting the custom page so that it shows the information you want.

   You can drag and drop the widgets to change the order in which they are displayed. You can set the time range for all widgets or for each one separately.
5. To save the information shown in the custom report to a file or email attachment, click **Export** and choose your options.

   You can also export the data from a single widget by selecting **Export** from the configuration icon.

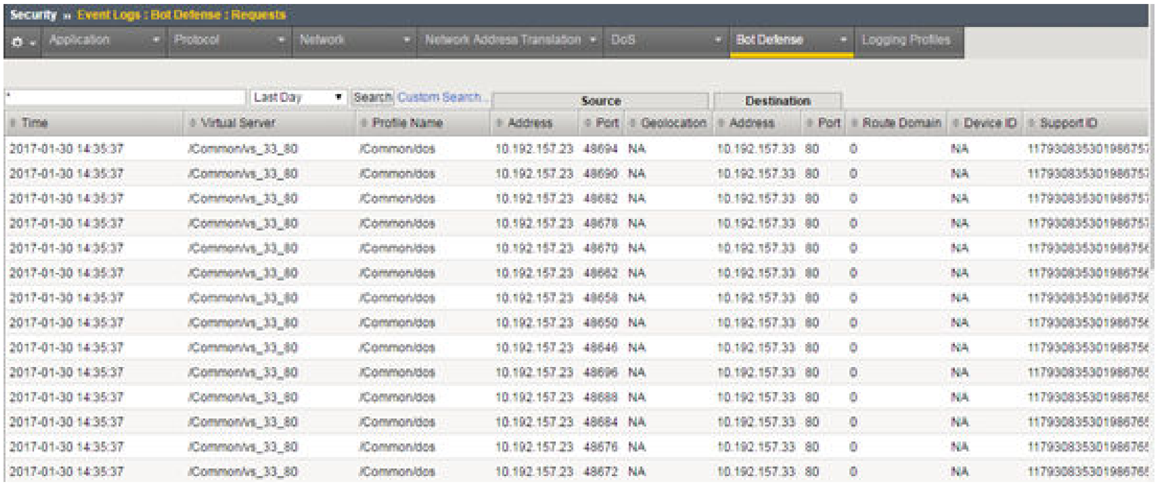
You have created a custom page that includes the information you need to monitor your system. As you use the reports to investigate DoS attacks, you can adjust the custom page to include additional data that you need. You can save the reports or send them to others who want to review the data.

Logging bot defense requests

You can create a logging profile to log bot defense requests on systems set up to do proactive bot defense.

1. On the Main tab, click **Security** > **Event Logs** > **Logging Profiles**.
   The Logging Profiles list screen opens.
2. Click **Create**.
   The Create New Logging Profile screen opens.
3. In the **Profile Name** field, type a unique name for the profile.
4. Select **Bot Defense**.
5. To log bot defense attacks locally, select **Local Publisher**.
6. To send the log to a remote reporting server (such as Splunk, Arcsight, or syslog), from **Remote Publisher**, select the name of the publisher.
7. Select which requests to include in the log:
   - Log Illegal Requests: Requests that failed the proactive bot defense tests, such as suspicious browser or wrong CAPTCHA responses. Note that JS challenges that are never responded to are not included here.
   - Log Captcha Challenged Requests: Requests that are responded to a Captcha challenge as part of the suspicious browser tests.
   - Log Challenged Requests: Requests that are responded to with a JS challenge for new clients or clients renewing their cookies.
   - Log Bot Signature Matched Requests: Requests that matched any of the Bot signatures with the action block or report.
   - Log Legal Requests: Requests that passed through.
8. Click **Finished**.
9. Associate this logging profile with the virtual server being protected with bot defense:
   a) Go to **Local Traffic** > **Virtual Servers**, then click the virtual server.
   b) Under **Security**, select **Policies**.
   c) In the **Log Profile** setting, move the log profile from Available to Selected.
   d) Click **Update**.
10. After passing traffic, you can view the bot defense event log: Click **Security** > **Event Logs** > **Bot Defense**.

    Use the arrow keys to scroll to see the full details for each bot defense request.



			Source			Destination				
Time	Virtual Server	Profile Name	Address	Port	Geolocation	Address	Port	Route Domain	Device ID	Support ID
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48694	NA	10.192.157.33	80	0	NA	117930835301986757
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48690	NA	10.192.157.33	80	0	NA	117930835301986757
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48682	NA	10.192.157.33	80	0	NA	117930835301986757
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48678	NA	10.192.157.33	80	0	NA	117930835301986757
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48670	NA	10.192.157.33	80	0	NA	117930835301986756
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48662	NA	10.192.157.33	80	0	NA	117930835301986756
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48658	NA	10.192.157.33	80	0	NA	117930835301986756
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48650	NA	10.192.157.33	80	0	NA	117930835301986756
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48646	NA	10.192.157.33	80	0	NA	117930835301986756
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48696	NA	10.192.157.33	80	0	NA	117930835301986765
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48688	NA	10.192.157.33	80	0	NA	117930835301986765
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48684	NA	10.192.157.33	80	0	NA	117930835301986765
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48676	NA	10.192.157.33	80	0	NA	117930835301986765
2017-01-30 14:35:37	/Common/vs_33_80	/Common/dos	10.192.157.23	48672	NA	10.192.157.33	80	0	NA	117930835301986765

Configuring DoS Policy Switching

Overview: Configuring DoS policy switching

You can configure the BIG-IP® system to protect against Layer 7 DoS attacks applying unique profiles in different situations, or on different types of traffic.

In this example, you configure DoS protection for Layer 7 by creating two DoS profiles with Application Security enabled. You associate the DoS profiles with virtual servers representing the applications that you want to protect. You also create a local traffic policy with rules that assign different DoS protections depending on the traffic. Then you associate the local traffic policy with the virtual servers.

This example divides traffic into three categories:

- Employees: A unique DoS profile, assigned to employees, reports DoS attacks but does not drop connections when there is an attack.
- Internal users: No DoS protection is applied to internal users.
- Others: The strictest DoS protection is applied using the default DoS profile for all other users; the system blocks DoS attacks that occur on other traffic.

Many other options are available for configuring DoS policy switching. This is simply one way to illustrate how you can configure multiple DoS protections using a local traffic policy to determine different conditions and actions. By following the steps in this example, you can see the other options that are available on the screens, and can adjust the example for your needs.

Task Summary

About DoS protection and local traffic policies

To provide additional flexibility for configuring DoS protection, you can use local traffic policies together with DoS protection. The advantage of creating local traffic policies is that you can apply multiple DoS protection policies to different types of traffic, using distinct DoS profiles. However, you need to be aware of certain considerations when using this method.

Local traffic policies can include multiple rules. Each rule consists of a condition and a set of actions to be performed if the respective condition holds. So you can create a local traffic policy that controls Layer 7 DoS protection and includes multiple rules. If you do, every rule must include one of the following Layer 7 DoS actions:

- Enable DoS protection using the default DoS profile (`/Common/dos`)
- Enable DoS protection from a specific DoS profile
- Disable DoS protection

***Important:** Make sure that the local traffic policy with DoS protection includes a default rule with no condition that applies to traffic that does not match any other rule. In addition, be sure that each rule (including the default one), has an L7 DoS action in it, possibly in addition to other actions.*

A default rule is required because the local traffic policy action applies not only to the request that matched the condition, but also to the following requests in the same TCP connection, even if they do not match the condition that triggered the action unless subsequent requests on the same connection match a different rule with a different L7 DoS action.

This requirement ensures that every request will match some rule (even the default one), and will trigger a reasonable Layer 7 DoS action. This way a request will not automatically enforce the action of the previous request on the same connection, which can yield unexpected results.

A typical action for the default rule in case of Layer 7 DoS is to create a rule with no condition and simply enable DoS protection. In this case, the action the rule takes is to use the DoS policy attached to the virtual server. In the example of configuring DoS policy switching, the third rule, `others`, is the default rule.

Creating a DoS profile for Layer 7 traffic

To define the circumstances under which the system considers traffic to be a Denial of Service (DoS attack), you create a DoS profile. For the DoS policy switching example, you can create a special DoS profile, for employees, that does not block traffic. It only reports the DoS attack.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click **Create**.
   The Create New DoS Profile screen opens.
3. In the **Name** field, type`employee_l7dos_profile` for the profile, then click **Finished**.
4. In the list of DoS profiles, click the name of the profile you just created, and click the **Application Security** tab.
5. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.
   The screen displays additional settings.
6. On the left, under Application Security, click **TPS-based Detection**.
   The screen displays TPS-based DoS Detection settings.
7. For **Operation Mode**, select the option to determine how the system reacts when it detects a DoS attack.

Option	Description
Transparent	Displays data about DoS attacks on the DoS reporting screens, but does not block requests, or perform any of the mitigations.
Blocking	Applies the necessary mitigation steps to suspicious IP addresses, geolocations, URLs, or the entire site. Also displays information about DoS attacks on the DoS reporting screens.

   Select **Off** to turn this type of DoS Detection off.

   The screen displays additional configuration settings when you select an operation mode.
8. Use the default values for the other settings.
9. Click **Update** to save the DoS profile.

You have now created a simple DoS profile to report DoS attacks based on transaction rates using TPS-based DoS protection.

Modifying the default DoS profile

The BIG-IP® system includes a default DoS profile that you can modify to specify when to use DoS protection. For the DoS policy switching example, you can modify the default DoS profile and use it for people other than employees or internal users who are accessing applications. This example creates a strict default DoS profile that drops requests considered to be an attack.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.

2. Click the profile called **dos**, and click the **Application Security** tab.
   The DoS Profile Properties screen opens.
3. On the left, under Application Security, click **General Settings**, and ensure that **Application Security** is enabled.
   The screen displays additional settings.
4. On the left, under Application Security, click **TPS-based Detection**.
   The screen displays TPS-based DoS Detection settings.
5. In the TPS-based DoS Detection settings, ensure that the **Operation Mode** is set to **Blocking**.
6. On the left, under Application Security, click **Behavioral & Stress-based Detection**.
   The screen displays Behavioral & Stress-based DoS Detection settings.
7. In the Behavioral & Stress-based Detection settings, edit the **Operation Mode**, and select **Blocking**.
8. Use the default values for the other settings.
9. Click **Update** to save the DoS profile.

You have now modified the default DoS profile that will be used for people other than employees or internal users. For these users, the system drops connections from attacking IP addresses, and for requests directed to attacked URLs.

Creating a local traffic policy for DoS policy switching

You can create a local traffic policy to impose different levels of DoS protection on distinct types of Layer 7 traffic.

1. On the Main tab, click **Local Traffic** > **Policies**.
2. Click **Create**.
   The New Policy screen opens.
3. In the **Policy Name** field, type a name for the local traffic policy.
4. From the **Strategy** list, select **first**.

   The system applies the first rule that matches the criteria specified.
5. If you see a **Type** setting, leave it set to **Traffic Policy**.
6. Click **Create Policy** to create the local traffic policy.
7. Click **Save Draft** to save the local traffic policy.

You have now created a draft local traffic policy, but it does not direct traffic yet.

Next, you need to add rules to the local traffic policy to specify the DoS protection that should occur for different types of Layer 7 traffic.

Creating policy rules for DoS policy switching

Before you can add rules to the local traffic policy, you need to have created the policy, and it must be in draft form. For this example, you need two DoS profiles that enable Application Security and perform DoS protection: one for employees, `employee_l7dos_profile`, and another for other people accessing the system not internally (enable **Application Security** on the default `dos` profile).

You can add rules to define conditions and perform specific actions for different types of Layer 7 traffic. This example creates three rules to implement different DoS protection for employees, for internal personnel, and for others.

1. On the Main tab, click **Local Traffic** > **Policies**.
2. Click the name of the draft local traffic policy that you want to control Layer 7 DoS.
3. In the Rules area, click **Create**.
   The New Rule screen opens.

4. Create a rule to define DoS protection for employees:
   a) In the **Name** field, type the name `employees`.
   b) In the Match all of the following conditions area, click +.
   c) In the same area, from the lists, select **HTTP Host**, **host**, and **ends with**; then, after **any of**, in the lower field, type `employee.my_host.com`, and click **Add**.
   d) To specify a unique DoS profile for employees, in the Do the following when the traffic is matched area, select **Enable**, **l7dos**, then after **from profile**, select **employee_l7dos_profile** (or a previously created custom DoS profile).
   e) Click **Save** to add the rule to the policy.
5. Create a rule to define DoS protection for internal personnel:
   a) In the **Name** field, type the name `internal`.
   b) In the Match all of the following conditions area, click +.
   c) In the same area, from the lists select **HTTP Host**, **host**, and **ends with**; then, after **any of**, in the lower field, type `internal.my_host.com`, and click **Add**.
   d) To turn off DoS protection for employees working internally, in the Do the following when the traffic is matched area, select **Disable** and **l7dos**.
   e) Click **Save** to add the rule to the policy.
6. Create a rule to define DoS protection for anyone else not handled by the first two rules:
   a) In the **Name** field, type the name `others`.
   b) Leave Match all of the following conditions set to **All traffic**.
   c) To specify DoS protection for all others, in the Do the following when the traffic is matched area, select **Enable**, **l7dos**, then after **from profile**, select **dos** (or a previously created custom DoS profile).
   d) Click **Save** to add the rule to the policy.

   This last rule is the default rule, which applies if the other two rules do not apply. If you do not include a rule like this, and traffic does not match any other rule, the previous rule that was applied is used again.
7. Click **Save Draft** to save the draft local traffic policy with the rules.
   The Policy List Page opens.
8. Select the check box next to the draft policy you edited, and click **Publish**.

You have now created and published a local traffic policy that defines DoS protection for employees, for internal traffic, and for others.

Next, you need to associate the DoS profiles and the local traffic policy with the virtual server that connects to the application server you are protecting.

Associating a DoS profile with a virtual server

You must first create a DoS profile separately, to configure denial-of-service protection for applications, the DNS protocol, or the SIP protocol. For application-level DoS protection, the virtual server requires an HTTP profile (such as the default http).

You add denial-of-service protection to a virtual server to provide enhanced protection from DoS attacks, and track anomalous activity on the BIG-IP® system.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the name of the virtual server you want to modify.
3. On the menu bar, from the Security menu, choose Policies.
4. To enable denial-of-service protection, from the **DoS Protection Profile** list, select **Enabled**, and then, from the **Profile** list, select the DoS profile to associate with the virtual server.

5. Click **Update** to save the changes.

DoS protection is now enabled, and the DoS Protection profile is associated with the virtual server.

Associating a published local traffic policy with a virtual server

After you publish a local traffic policy, you associate that published policy with the virtual server created to handle application traffic.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the name of the virtual server you want to modify.
3. On the menu bar, click **Resources**.
4. In the Policies area, click the **Manage** button.
5. For the **Policies** setting, select the local traffic policy you created from the **Available** list and move it to the **Enabled** list.
6. Click **Finished**.

The published policy is associated with the virtual server.

Implementation results

When you have completed the steps in this implementation, you have configured the Application Security Manager™ to protect against Layer 7 DoS attacks. By using a local traffic policy, you distinguished between three types of traffic: employees, internal users, and others.

The first rule in the local traffic policy identifies employees by the last line of the host header in the request, which says `employee.my_host.com`. You created a special DoS profile for employees that reports transaction-based DoS attacks but does not drop connections.

The second rule in the local traffic policy identifies internal users by the last line of the host header in the request, which says `internal.my_host.com`. In the policy, you specified that there should be no DoS protection for internal users.

A third rule acts as the default rule and applies to any traffic that was not identified by the first two rules. All other traffic uses the default DoS profile (`dos`) assigned on the Security tab of the virtual server where traffic is directed to the application. You modified the default DoS profile to block transaction-based and server stress-based DoS attacks that the system detects.

After creating the local traffic policy with Layer 7 DoS rules, you also associated it with the virtual server. Different types of traffic directed to the virtual server now have distinct DoS protections assigned to them.

Using Shun with Layer 7 DoS

Overview: Using Shun with Layer 7 DoS

Layer 7 DoS in Application Security Manager™ (ASM) is set up to automatically add IP addresses to a shun list (also called *auto-blacklisting*). The BIG-IP® system stops traffic that is thought to be causing a DoS attack, by adding it to a shun list for a limited time. L7 DoS maintains the shun list and auto-blacklisting works at Layer 7 when you configure an L7 DoS profile and attach it to a virtual server.

Furthermore, by integrating L7 DoS shun with an IP intelligence policy, the auto-blacklisting stops traffic at Layer 3 saving system resources. The auto-blacklisting works at Layer 3 when:

- You configure an L7 DoS profile and an IP intelligence policy, and then associate both with a virtual server, and
- You are using mitigations other than device ID or URL in the DoS profile.

The DoS profile you create should include all of the DoS mitigations you want to use for the application. For example, you could enable these protections:

- Proactive Bot Defense with CAPTCHA challenge
- Stress-based Detection with Request Blocking and Rate Limiting
- Heavy URL Protection set to automatic detection

Source IP addresses that are thought to be causing a DoS attack based on the mitigations you configured fall into the category of application denial of service blacklist, for which the IP intelligence policy is configured to drop. Together, and using fewer resources, the DoS profile and IP intelligence policy protect the web application from DoS attacks.

Task Summary

About the DoS shun list

A *shun list* is a temporary list of IP addresses that have been sending lots of traffic that is failing 90%, or more, of the time. The failures occur as a result of any of the mitigation methods in use in the DoS profile, including CAPTCHA, request blocking, client-side integrity defense, proactive bot defense, and so on. The system creates a shun list of clients that repeatedly fail to respond to DoS JavaScript challenges, undergo high block ratios in rate limiting, or have been repeatedly handled by any of the other DoS mitigations. While these clients are on the shun list, all traffic they send is blocked.

Shun list features are set up using system variables. By default, the shun list is enabled, and clients remain on the list and are blocked for 120 seconds. The default value for the minimum ratio of successful responses to JavaScript challenges is 10% (to keep clients off the shun list). A client being considered for the shun list must be sending a minimum of 10 requests per second. Advanced users can change the default values, if necessary, by adjusting the system variables from the command line.

Shun List system variables

The shun list is automatically managed with predefined conditions and thresholds set using system variables. These system variables are set to reasonable values by default. Do not change these variables unless you are an advanced BIG-IP® system user.

Variable	Default Value	What It Specifies
dosl7d.shun_list	enable	Whether to use the shun list to block IP addresses.
dosl7d.min_challenge_success_ratio	10%	The minimum percentage of good transactions per IP address (or else the system adds it to the shun list).
dosl7d.min_challenge_rps	10	The minimum requests per second before the system can apply shun mitigation.
dosl7d.shun_prevention_time	120	The time in seconds (from 1-1000) to keep the IP address on the shun list.

For example, to disable the shun list, on the command line, type:

```
(tmos)# modify sys db dosl7d.shun_list value disable
```

Configuring DoS protection for applications

You can configure Application Security Manager™ to protect against and mitigate DoS attacks, and increase system security.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click **Create**.
   The Create New DoS Profile screen opens.
3. In the **Name** field, type the name for the profile, then click **Finished**.
4. In the list of DoS profiles, click the name of the profile you just created, and click the **Application Security** tab.
   This is where you set up application-level DoS protection.
5. In the **General Settings**, for **Application Security**, click **Edit** and select the **Enabled** check box.
   General settings that you can configure are displayed.
6. To configure **Heavy URL Protection**, edit the setting for which URLs to include or exclude, or use automatic detection.

   Another task describes heavy URL protection in more detail.
7. To set up DoS protection based on the country where a request originates, edit the **Geolocations** setting, selecting countries to allow or disallow.
   a) Click **Edit**.
   b) Move the countries for which you want the system to block traffic during a DoS attack into the **Geolocation Blacklist**.
   c) Move the countries that you want the system to allow (unless the requests have other problems) into the **Geolocation Whitelist**.
   d) Use the Stress-based or TPS-based Detection settings to select appropriate mitigations by geolocation in the **How to detect attackers and which mitigation to use** settings.
   e) When done, click **Close**.
8. If you have written an iRule to specify how the system handles a DoS attack and recovers afterwards, enable the **Trigger iRule** setting.
9. To better protect an applications consisting of one page that dynamically loads new content, enable **Single Page Application**.
10. If your application uses many URLs, in **URL Patterns**, you can create logical sets of similar URLs with the varying part of the URL acting like a parameter. Click **Not Configured** and type one or more URL patterns, for example, `/product/*.php`.

The system then looks at the URL patterns that combine several URLs into one and can more easily recognize DoS attacks, for example, on URLs that might be less frequently accessed by aggregating the statistics from other similar URLs.

11. If you want to use performance acceleration, in **Performance acceleration**, select the TCP fastL4 profile to use as the fast-path for acceleration.

    The profiles listed are those created in **Local Traffic** > **Profiles** > **Protocol** > **Fast L4**.
12. Click **Update** to save the DoS profile.

You have created a DoS profile that provides basic DoS protection including TPS-based detection and heavy URL detection (automatically enabled).

Next, consider configuring additional levels of DoS protection such as stress-based protection, proactive bot defense, and behavioral DoS. Look at the other options available under Application Security and adjust as needed. For example, if using geolocation, use the stress-based or TPS-based detection settings to select appropriate mitigations. Also, you need to associate the DoS profile with a virtual server before it protects against DoS attacks.

Using an IP Intelligence policy with L7 DoS

You can create an IP intelligence policy that blocks traffic from IP addresses that are on the shun list because they are in a specific blacklist category. For IP addresses that were blocked originally as a result of DoS Layer 7 protections, this IP intelligence policy causes traffic from those IP addresses to be dropped temporarily.

1. On the Main tab, click **Security** > **Network Firewall** > **IP Intelligence** > **Policies**.
   The IP Intelligence Policies screen opens.
2. Click **Create** to create a new IP Intelligence policy.
3. In the **Name** field, type a name for the IP intelligence profile, such as `ip-intell-l7`.
4. Leave the **Default Action** list set to **Drop**.
5. For **Blacklist Matching Policy**, specify the action for the application DoS category.
   a) For **Blacklist Category**, select **application_denial_of_service**.

      L7 DoS classifies bad IP addresses in the shun list as **application_denial_of_service** by default. Other categories are for use if you purchased an IPI subscription (or IP intelligence database). Refer to information on IP intelligence blocking.
   b) For **Action**, select **Drop**.
   c) For **Log Blacklist Category Matches**, select **Yes**.
   d) Click **Add**.
6. Click **Finished**.

The IP intelligence policy now connects using the shun list at the IP level to problems discovered originally at the application level. This allows the system to slow down DoS attacks using fewer system resources.

The IP intelligence policy needs to be associated with a virtual server, or you can assign a global IP intelligence policy to all virtual servers.

Associating a DoS profile and IP intelligence policy with a virtual server

Before you can accomplish this task, you must first create a DoS profile in Application Security Manager™ (ASM) to protect your application. You also need an IP intelligence policy that tells the shun list to temporarily drop traffic from IP addresses that have been sending suspicious traffic.

You can add DoS protection and an IP intelligence policy to a virtual server to provide enhanced protection from DoS attacks, and use the shun list to recognize attackers.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the virtual server that you want to have DoS protection and use the shun list.
3. On the menu bar, from the Security menu, choose Policies.
4. To specify the shun list action for Layer 7 DoS, from the **IP Intelligence** list, select **Enabled**, and then, from the **Policy** list, select the IP intelligence policy (for example, **ip-intelligence**) to associate with the virtual server.

   You can also apply one IP intelligence policy at the global level that applies to all virtual servers on the system (**Security** > **Network Firewall** > **IP Intelligence**).
5. To enable denial-of-service protection, from the **DoS Protection Profile** list, select **Enabled**, and then, from the **Profile** list, select the DoS profile to associate with the virtual server.
6. Click **Update** to save the changes.

The application represented by the virtual server now has DoS protection, and uses the shun list. If ASM discovers lots of malicious traffic coming from one IP address, that IP address is added to the shun list. Traffic from that IP address is blocked immediately for two minutes (using the default value). After that, traffic from the IP address is allowed through to ASM and, if necessary, is handled by other DoS mitigations specified in the DoS profile. If problems still exist, the IP address is added back onto the shun list.

Result of using shun list with Layer 7 DoS

Now you have associated both a DoS profile and an IP intelligence policy with the virtual server representing the application. Here's a general idea of what happens next:

- A client is sending lots of traffic from one IP address to the web application.
- Layer 7 DoS first inspects the traffic even before it gets to Application Security Manager™.
- If the client is blocked more than 90% of the time and it is sending at least 10 requests per second, the client IP address is put on the shun list.
- Traffic from the IP address on the shun list is blocked at the IP level (Layer 3) for two minutes.
- After that, the IP address is removed from the shun list.
- Traffic from the IP address is allowed through to L7 DoS where it is inspected according to the protections in the DoS profile.
- If the traffic is successful more than 10% of the time, it is allowed and handled by L7 DoS. Otherwise, that IP address is added back onto the shun list.

If DoS mitigation is performed by URL or device ID, the IP addresses are not shunned at the IP level, but are shunned at Layer 7.

Creating Login Pages for Secure Application Access

About login pages

Most web applications use login pages as a way to secure the application and authenticate application users. A *login page* specifies the login URL in a web application that users must pass through to get to the authenticated URLs at the heart of the application.

Authenticated URLs are URLs that become accessible to users only after they successfully log in to the login URL. A *logout URL* is a URL that, if accessed, forces users to return to the login URL before re-accessing authenticated URLs. System administrators use these special URLs to prevent forceful browsing by causing users to pass through the login URL before viewing the restricted authenticated URLs. In addition to specifying the login URL, login pages in the security policy can also enforce access validation by defining access permissions for users.

In Application Security Manager™ (ASM), security policies use login pages for several features:

- Login enforcement for secure application access
- Session awareness
- Brute force attack prevention
- Integration with database security

Login enforcement specifies the authenticated URLs and logout URLs for the application. Session awareness provides tracking information of user sessions so that you can investigate suspicious activity and the attacker. Brute force protection prevents hackers from staging multiple attempts to guess user names and passwords so that they can log on to the application. Database security integration can use login pages to provide event notification and user data to a third-party database monitoring system.

About creating login and logout pages

Your web application might contain URLs that should be accessed only through other URLs. For example, in an online banking application, account holders should be able to access their account information only by logging on through a login screen first. You can create login pages manually, or have the system create them automatically.

Application Security Manager™ (ASM) adds login pages for you automatically if you use certain options. The options are **Detect Login Pages** and **Learn from Responses** in the Learning and Blocking Settings. If you create the security policy automatically using the **Comprehensive** policy template, the system sets these options by default. If you are using **Fundamental**, you can explicitly set these options. These options cause ASM to detect login pages in the web application and add them to the security policy when sufficient legitimate traffic has accessed the application.

You can also create login or logout pages manually by specifying the login or logout URLs used by the application. The same URL can be used as both a login URL and a logout URL.

Creating login pages automatically

Login pages specify a login URL that presents a site that users must pass through to gain access to the web application. Your existing security policy can detect and create login pages automatically if you use certain options.

***Note:** If you are creating a security policy automatically and selected **Comprehensive** as the policy template, the default options are already set to create login pages automatically. If you are using the **Fundamental** policy template, the steps here explain the options to configure ASM™ to automatically detect and create login pages for your application.*

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. Ensure that the **Learning Mode** is set to **Automatic**.
   The system examines the traffic to the web application, and after processing sufficient legitimate traffic, the system builds the security policy automatically by adding and enforcing elements with minimal manual intervention. A few learning suggestions require your review before they are added.
3. In the Policy Building Settings area, expand **Sessions and Logins** and ensure that **Detect login pages** is selected.

   This setting must be selected if you want to automatically detect login pages.
4. In the Policy Building Process area, expand **Options** and ensure that **Learn from responses** is selected.
5. Click **Save** to save your settings.
6. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy looks for login pages by examining traffic to the web application. When a login page is found, the Policy Builder suggests adding the login form to the security policy. Because the suggestion is learned from responses and responses are considered trusted, if the **Learning Mode** is **Automatic**, the login page is typically added to the policy right away.

If the **Learning Mode** is **Manual**, the login page is added to the learning suggestions on the Traffic Learning screen where you can add it to the policy. The login pages in the security policy are included in the Login Pages List.

You can use the login pages for login enforcement, brute force protection, or session awareness.

Creating login pages manually

Before you can create a login page manually, you need to be familiar with the login URL or URLs the application the security policy is protecting.

In your security policy, you can create a login page manually to specify a login URL that presents a site that users must pass through to gain access to the web application. The login URL commonly leads to the login page of the web application.

***Note:** You can also have the system create login pages automatically by selecting **Detect login pages** on the Learning and Blocking Settings screen.*

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins**.
   The Login Pages List screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Login Page screen opens.
4. For the **Login URL** setting, specify a URL that users must pass through to get to the application.
   a) From the list, select the type of URL: **Explicit** or **Wildcard**.
   b) Select either **HTTP** or **HTTPS** based on the type of traffic the web application accepts.
   c) Type an explicit URL or wildcard expression in the field.

When you click in the field, the system lists URLs that it has seen, and you can select a URL from the list. Or, you can type explicit URLs in the format `/login`, and wildcard URLs without the slash, such as `*.php`.

Wildcard syntax is based on shell-style wildcard characters. This table lists the wildcard characters that you can use so that the entity name can match multiple objects.

Wildcard Character	Matches
*	All characters
?	Any single character.
[abcde]	Exactly one of the characters listed.
[!abcde]	Any character not listed.
[a-e]	Exactly one character in the range.
[!a-e}	Any character not in the range.

Note that wildcards do not match regular expressions.

5. From the **Authentication Type** list, select the method the web server uses to authenticate the login URL's credentials with a web user.

Option	Description
None	The web server does not authenticate users trying to access the web application through the login URL. This is the default setting.
HTML Form	The web application uses a form to collect and authenticate user credentials. If using this option, you also need to type the user name and password parameters written in the code of the HTML form.
HTTP Basic Authentication	The user name and password are transmitted in Base64 and stored on the server in plain text.
HTTP Digest Authentication	The web server performs the authentication; user names and passwords are not transmitted over the network, nor are they stored in plain text.
NTLM	Microsoft LAN Manager authentication (also called Integrated Windows Authentication) does not transmit credentials in plain text, but requires a continuous TCP connection between the server and client.
JSON/AJAX Request	The web server uses JSON and AJAX requests to authenticate users trying to access the web application through the login URL. For this option, you also need to type the name of the JSON element containing the user name and password.

6. In the Access Validation area, define at least one validation criteria for the login page response.

   If you define more than one validation criteria, the response must meet all the criteria before the system allows the user to access the application login URL.

   Note: *The system checks the access validation criteria on the response of the login URL only if the response has one of the following content-types: text/html, text/xml, application/sgml, application/xml, application/html, application/xhtml, application/x-asp, or application/x-aspx.*

7. Click **Create** to add the login page to the security policy.
   The new login page is added to the login pages list.
8. Add as many login pages as needed for your web application.
9. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy now has one or more login pages associated with it. They are included in the Login Pages List.

You can use the login pages you created for login enforcement, brute force protection, or session awareness.

Login page access validation criteria

Following are descriptions of the access validation criteria for the response to the login URL. You configure one or more of these validations when defining a login page manually. A login attempt is only successful if all of the specified validation criteria are satisfied.

Access validation	Define in login page as
A string that should appear in the response	A string that must appear in the response for the system to allow the user to access the authenticated URL; for example, `Successful Login`.
A string that should NOT appear in the response	A string that indicates a failed login attempt and prohibits user access to the authenticated URL; for example, `Authentication failed`.
Expected HTTP response status code	An HTTP response code that the server must return to the user to allow access to the authenticated URL; for example, `200`.
Expected validation header name and value (for example, Location header)	A header name and value that the response to the login URL must match to permit user access to the authenticated URL.
Expected validation domain cookie name	A defined domain cookie name that the response to the login URL must match to permit user access to the authenticated URL.
Expected parameter name (added to URI links in the response)	A parameter that must exist in the login URL's HTML body to allow access to the authenticated URL.

Enforcing login pages

Login enforcement settings prevent forceful browsing attacks where attackers gain access to restricted parts of the web application by supplying a URL directly. You can use login enforcement to force users to pass through one URL (known as the *login URL*) before being allowed to display a different URL (known as the *target URL*) where they can access restricted pages and resources.

Login enforcement indicates how the security policy implements login pages including an optional expiration time, a list of URLs that require authentication to get to, and a list of URLs used to log out of the application. You can also use authenticated URLs to enforce idle time-outs on applications that are missing this functionality.

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins** > **Login Enforcement**.
   The Login Enforcement screen opens.
2. If you want the login URL to be valid for a limited time, set **Expiration Time** to **Enabled**, and type a value, in seconds (1-99999) that indicates how long the session will last.
   If enabled, the login session ends after the number of seconds has passed.
3. For the **Authenticated URLs** setting, specify the target URLs that users can access only by way of the login URL:
   a) In the **Authenticated URLs (Wildcards supported)** field, type the target URL name in the format `/private.php` (wildcards are allowed).
   b) Click **Add** to add the URL to the list of authenticated URLs.

c) Repeat to add as many authenticated URLs as needed.

4. Click **Save** to save your settings.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

If you specify authenticated URLs and a user tries to access them, bypassing the login URL (specified in a Login Page), the system issues the `Login URL bypassed` violation. If a user session is idle and exceeds the expiration time, the system issues the `Login URL expired` violation, logs the user out, and as a result, the user can no longer reach the authenticated URLs. For both login violations, if the enforcement mode is blocking, the system now sends the Login Page Response to the client (see **Application Security** > **Policy** > **Response Pages**).

Creating logout pages

Before you can create a logout page, you need to be familiar with the logout URL the application uses.

In your security policy, you can create a logout page to specify a logout URL that users go to when they log out of the web application. The logout URL can be the same as the login URL.

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins** > **Logout Pages List**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
4. For the **Logout URL (Explicit only)** setting, specify a URL that users go to when they log out of the application.
   a) Select either **HTTP** or **HTTPS** based on the type of traffic the web application accepts.
   b) Type an explicit URL in the format `/logout.html`.
5. Optionally, type strings that should or should not appear in the request.
6. Click **Create**.
7. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy now has a logout page associated with it included in the Logout Pages List. Logout URLs are automatically added to the list of allowed URLs.

Mitigating Brute Force Attacks

About brute force attacks

Brute force attacks are attempts to break in to secured areas of a web application by trying exhaustive, systematic, user name/password combinations to discover legitimate authentication credentials.

To prevent brute force attacks, the Application Security Manager™ tracks the number of failed attempts to reach the configured login URLs. The system considers it to be an attack if the failed logon rate increased at a very high rate or if failed logins reached a certain number.

About configuring brute force protection

You can add default brute force protection when creating a security policy. If you do, the policy simply needs to know for which login pages to enforce brute force protection. The system creates a default brute force configuration that applies to all defined login URLs that are not associated with any other brute force configuration.

You can have the system detect and create login pages automatically, or you can create them manually. But at least one login URL must be defined in the security policy to protect against brute force attacks. Then you can either use the default brute force configuration or create a new configuration.

Brute force security includes both session-based and dynamic brute force protection.

Session-based mitigation

Counts the number of failed login attempts that occur during one session, based on a session cookie. When the number of login attempts during a session exceeds the number specified, the system triggers the `Brute Force: Maximum login attempts are exceeded violation`, and applies the blocking policy. If the violation is set to block and too many login attempts are made, the client is blocked for a number of seconds.

Dynamic mitigation

Detects and mitigates brute force attacks based on statistical analysis of the traffic. You configure dynamic mitigation to determine when the system should consider the login URL to be under attack, and how to react to an attack. The system mitigates attacks when the volume of unsuccessful login attempts is significantly greater than the typical number of failed logins. You activate this method by setting the operation mode to either alarm or alarm and block.

Overview: Mitigating brute force attacks

You can configure Application Security Manager™ (ASM) to protect against brute force attacks. The system detects brute force attacks based on failed login rates. Therefore, the security policy needs to have login pages for the web applications you want to protect. ASM can create login pages automatically by observing traffic, or you can create them yourself.

Task summary

Creating login pages automatically

Login pages specify a login URL that presents a site that users must pass through to gain access to the web application. Your existing security policy can detect and create login pages automatically if you use certain options.

***Note:** If you are creating a security policy automatically and selected **Comprehensive** as the policy template, the default options are already set to create login pages automatically. If you are using the **Fundamental** policy template, the steps here explain the options to configure ASM™ to automatically detect and create login pages for your application.*

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. Ensure that the **Learning Mode** is set to **Automatic**.
   The system examines the traffic to the web application, and after processing sufficient legitimate traffic, the system builds the security policy automatically by adding and enforcing elements with minimal manual intervention. A few learning suggestions require your review before they are added.
3. In the Policy Building Settings area, expand **Sessions and Logins** and ensure that **Detect login pages** is selected.

   This setting must be selected if you want to automatically detect login pages.
4. In the Policy Building Process area, expand **Options** and ensure that **Learn from responses** is selected.
5. Click **Save** to save your settings.
6. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy looks for login pages by examining traffic to the web application. When a login page is found, the Policy Builder suggests adding the login form to the security policy. Because the suggestion is learned from responses and responses are considered trusted, if the **Learning Mode** is **Automatic**, the login page is typically added to the policy right away.

If the **Learning Mode** is **Manual**, the login page is added to the learning suggestions on the Traffic Learning screen where you can add it to the policy. The login pages in the security policy are included in the Login Pages List.

You can use the login pages for login enforcement, brute force protection, or session awareness.

Creating login pages manually

Before you can create a login page manually, you need to be familiar with the login URL or URLs the application the security policy is protecting.

In your security policy, you can create a login page manually to specify a login URL that presents a site that users must pass through to gain access to the web application. The login URL commonly leads to the login page of the web application.

***Note:** You can also have the system create login pages automatically by selecting **Detect login pages** on the Learning and Blocking Settings screen.*

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins**.
   The Login Pages List screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.

3. Click **Create**.
   The New Login Page screen opens.
4. For the **Login URL** setting, specify a URL that users must pass through to get to the application.
   a) From the list, select the type of URL: **Explicit** or **Wildcard**.
   b) Select either **HTTP** or **HTTPS** based on the type of traffic the web application accepts.
   c) Type an explicit URL or wildcard expression in the field.

   When you click in the field, the system lists URLs that it has seen, and you can select a URL from the list. Or, you can type explicit URLs in the format `/login`, and wildcard URLs without the slash, such as `*.php`.

   Wildcard syntax is based on shell-style wildcard characters. This table lists the wildcard characters that you can use so that the entity name can match multiple objects.

Wildcard Character	Matches
*	All characters
?	Any single character.
[abcde]	Exactly one of the characters listed.
[!abcde]	Any character not listed.
[a-e]	Exactly one character in the range.
[!a-e}	Any character not in the range.

   Note that wildcards do not match regular expressions.
5. From the **Authentication Type** list, select the method the web server uses to authenticate the login URL's credentials with a web user.

Option	Description
None	The web server does not authenticate users trying to access the web application through the login URL. This is the default setting.
HTML Form	The web application uses a form to collect and authenticate user credentials. If using this option, you also need to type the user name and password parameters written in the code of the HTML form.
HTTP Basic Authentication	The user name and password are transmitted in Base64 and stored on the server in plain text.
HTTP Digest Authentication	The web server performs the authentication; user names and passwords are not transmitted over the network, nor are they stored in plain text.
NTLM	Microsoft LAN Manager authentication (also called Integrated Windows Authentication) does not transmit credentials in plain text, but requires a continuous TCP connection between the server and client.
JSON/AJAX Request	The web server uses JSON and AJAX requests to authenticate users trying to access the web application through the login URL. For this option, you also need to type the name of the JSON element containing the user name and password.

6. In the Access Validation area, define at least one validation criteria for the login page response.

   If you define more than one validation criteria, the response must meet all the criteria before the system allows the user to access the application login URL.

> ***Note:*** *The system checks the access validation criteria on the response of the login URL only if the response has one of the following content-types: text/html, text/xml, application/sgml, application/xml, application/html, application/xhtml, application/x-asp, or application/x-aspx.*

7. Click **Create** to add the login page to the security policy.
   The new login page is added to the login pages list.
8. Add as many login pages as needed for your web application.
9. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy now has one or more login pages associated with it. They are included in the Login Pages List.

You can use the login pages you created for login enforcement, brute force protection, or session awareness.

Configuring automatic brute force protection

For brute force attack prevention to work, at least one login URL has to be defined. You can define login URLs, or you can let the system detect them automatically (see the sections on creating login pages).

To prevent hackers from gaining access to a web application by performing multiple login attempts, you can add brute force protection to a security policy. You can use a default configuration that is easy to set up, as explained here, or create a custom configuration. The Default brute force configuration implements automatic brute force protection.

1. On the Main tab, click **Security** > **Application Security** > **Anomaly Detection** > **Brute Force Attack Prevention**.
   The Brute Force Attack Prevention screen opens where you can view a list of the login URLs that are protected against brute force attacks. The system includes a default configuration that protects all login pages except those which have custom configurations.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. To protect all login pages that are included in your security policy, you can use the Default brute force configuration provided. Click the **Login URL** to enable the login URL named **Default**.
4. To verify the configuration, click the **Default** login page.
   The default Brute Force Protection Configuration screen opens.
5. Select the **Brute Force Protection** check box.
6. Review the remaining settings. However, using the default values is recommended.
7. If you made changes, click **Save** to save them.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

The system detects and mitigates brute force attacks based on statistical analysis of failed login attempts. The system protects all defined login pages in the security policy. If you create a custom configuration, the system protects that particular login URL as specified in the configuration. All other login URLs use the default configuration unless you disable it.

Creating a custom brute force protection

Before brute force attack prevention can work, at least one login URL must be defined. You can define login URLs, or you can let the system detect them automatically (see the sections on creating login pages). For brute force protection to work, the `Brute Force: Maximum login attempts are exceeded` violation must be set to **Block** and **Alarm**on the Learning and Blocking Settings screen. The policy's enforecement mode must also be set to **Blocking**. For selected mitigation actions to work, the mitigation response pages must be configured in **Security** > **Application Security** > **Policy** > **Response Pages**.

To prevent hackers from gaining access to a web application by performing multiple login attempts, you can add brute force protection to a security policy. Brute force attacks may originate from a single source (Source IP or Device ID) or from multiple sources (a distributed attack). ASM brute force protection detects single source and distributed attacks. Credential stuffing attacks are detected by looking up credentials used in login attempt in a credentials stuffing dictionary.

There are

1. On the Main tab, click **Security** > **Application Security** > **Anomaly Detection** > **Brute Force Attack Prevention**.
   The Brute Force Attack Prevention screen opens where you can view a list of the login URLs that are protected against brute force attacks. The system includes a default configuration that protects all login pages except those which have custom configurations.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. To create a custom configuration for a particular login URL, click the **Create** button.

   Note: *Custom configuration of explicit logins for brute force protection is recommended only in cases where your application requires different thresholds for each login URL.*

   The New Brute Force Protection Configuration screen opens.
4. For the **Login Page** setting, select a previously created login page from the list (or create a new one). If you need to manually create a login page in the security policy, click the **Create** button.

   The login page specifies the URL that you want to protect against brute force attacks using a configuration different from the default.
5. For the **IP Address Whitelist** setting, click the arrow to go to a screen where you can add the IP addresses and subnets from which traffic is known to be safe.

   Important: *The system adds any whitelist IP addresses to the centralized IP address exceptions list. The exceptions list is common to both brute force prevention and web scraping detection configurations.*
6. In the Source-based Brute Force Protection area, set the **Detection Period**.

   The default value is `10` minutes.
7. Set the **Maximum Prevention Duration**.

   The default value is `10` minutes.
8. Set a threshold trigger for a **Username** and the action to take when the threshold is reached. Use **Never** to disable monitoring of this element.

   The default failed login attempts is `3`. The default action is **Alarm and CAPTCHA**.
9. Set a threshold trigger for a **Device ID** and the action to take when the threshold is reached. Use **Never** to disable monitoring of this element.

   Note: *To use Device ID for tracking, client browsers accessing your web site must be able to accept JavaScript.*

   The default failed login attempts is `3`. The default action is **Alarm and CAPTCHA**.
10. Set a threshold trigger for an **IP Address**. and the action to take when the threshold is reached. Use **Never** to disable monitoring of this element.

    The default failed login attempts is **20**. The default action is **Alarm and CAPTCHA**.

    Important: *A threshold which is too low will erroneously trigger mitigation on legitimate traffic behind a NAT. If you have a really large NAT, consider adding it to the Whitelist to prevent traffic blockage.*

11. Set the threshold trigger for **Client Side Integrity Bypass Mitigation** and the action to takewhen the threshold is reached.

    The default successful challenges with failed logins for an IP Address / Device ID / Username is **3**. The default action is **Alarm and CAPTCHA**.

    Important: *Legitimate users who have disabled JavaScripting on their browsers for security reasons will fail a client side integrity challenge.*

12. Set a threshold for **CAPTCHA Bypass Mitigation** and the action to take when the threshold is reached. Use **Never** to disable monitoring of this element.

    The default CAPTCHA bypass mitigation threshold is **5** successful challenges with failed login attempts from an IP Address / Device ID.

    Note: *If CAPTCHA mitigation is not enabled, there is no point in configuring CAPTCHA bypass mitigation. Mitigation responses are configured in **Security** > **Application Security** > **Policy** > **Response Pages***

13. In the Distributed Brute Force Protection area, set the **Detection Period**.

    The default detection period is **15** minutes.

14. Set the **Maximum Prevention Duration**.

    The default detection period is **60** minutes.

15. Set the number of failed login attempts to trigger a **Detected Distributed Attack**. Use **Never** to disable monitoring of this element.

    The default number of failed login attempts is **100**.

16. Set the number of login attempts that match known leaked credentials dictionaries to trigger a **Detect Crednetial Stuffing** attack. Use **Never** to disable monitoring of this element.

    The default number of login attempts with leaked credentials is **100**.

17. Select the Distributed Brute Force Protection **Mitigation** option. The default action is **Alarm and CAPTCHA**.

If a source-based and a distributed brute force attack are simultaneously taking place, the system will take the most severe mitigation action between all the actions that were triggered. This includes actions configured for Username, Device ID, Source IP, Client Side Integrity bypass detection, CAPTCHA bypass detection, and distributed attack detection. For example, a distributed brute force attack has reached its threshold and is set to **Alarm and CAPTCHA** while a Device ID has reached its threshold and is set to **Alarm and Blocking Page**, the attacks will be mitigated with **Alarm and Blocking Page.**

Viewing brute force attack reports

Before you can look at the brute force attack statistics, you need to have configured source-based or dynamic brute force protection.

You can display charts that show information about brute force attacks. A single brute force attack can have hundreds of event logs. The charts provide visibility into what applications are being attacked, the login URL, and start and end times of an attack.

1. On the Main tab, click **Security** > **Reporting** > **Application** > **Brute Force Attacks**.
   The Brute Force Attacks reporting screen opens.
2. From the **Time Period** list, select the time period for which you want to view information about brute force attacks.
3. To focus in on the specific details you want more information about, point to the chart or click it.
   The system displays information about the item.
4. If you want to export the report to a file or send it by email, click **Export** and select the options.

To send reports by email, you need to specify an SMTP configuration (**System** > **Configuration** > **Device** > **SMTP**).

You can continue to review the details about brute force attacks on the report screen. As a result, you become more familiar with what caused the attacks and what applications are most vulnerable, and you see the mitigation methods that are in place.

Displaying brute force event logs

You can display event logs to see whether brute force attacks have occurred, and view information about the attacks.

1. On the Main tab, click **Security** > **Event Logs** > **Application** > **Brute Force Attacks**.
   The Brute Force Attacks event log opens.
2. If the log is long, use the **Attack Start Time**, **Number of Login Attempts** and/or **Newest** column heading to filter the list and show more specific entries. For more targeted filtering, open the **Filter** dialog box (magnifying glass icon).
3. Review the list of brute force attacks to see which security policy detected the attack, which login URLs were attacked, and the start and end times of the attack.

Detecting and Preventing Web Scraping

Overview: Detecting and preventing web scraping

Web scraping is a technique for extracting information from web sites that often uses automated programs, or bots (short for web robots), opening many sessions, or initiating many transactions. You can configure Application Security Manager™ (ASM) to detect and prevent various web scraping activities on the web sites that it is protecting.

Note: *The BIG-IP® system can accurately detect web scraping anomalies only when response caching is turned off.*

ASM™ provides the following methods to address web scraping attacks. These methods can work independently of each other, or they can work together to detect and prevent web scraping attacks.

- *Bot detection* investigates whether a web client source is human by detecting human interaction events such as mouse movements and keyboard strokes, by detecting irregular sequences of those events, and by detecting rapid surfing.
- *Session opening* detects an anomaly when either too many sessions are opened from an IP address or when the number of sessions exceeds a threshold from an IP address. Also, session opening can detect an attack when the number of inconsistencies or session resets exceeds the configured threshold within the defined time period. This method also identifies as an attack an open session that sends requests that do not include an ASM cookie.
- *Session transactions anomaly* captures sessions that request too much traffic, compared to the average amount observed in the web application. This is based on counting the transactions per session and comparing that to the average amount observed in the web application.
- *Fingerprinting* captures information about browser attributes in order to identify a client. It is used when the system fails to detect web scraping anomalies by examining IP addresses, ASM cookies, or persistent device identification.
- *Suspicious clients* used together with fingerprinting, specifies how the system identifies and protects against potentially malicious clients; for example, by detecting scraper extensions installed in a browser.
- *Persistent client identification* prevents attackers from circumventing web scraping protection by resetting sessions and sending requests.

Task Summary

Prerequisites for configuring web scraping

For web scraping detection to work properly, you should understand the following prerequisites:

- The web scraping mitigation feature requires that the DNS server is on the DNS lookup server list so the system can verify the IP addresses of legitimate bots. Go to **System** > **Configuration** > **Device** > **DNS** to see if the DNS lookup server is on the list. If not, add it and restart the system.
- Client browsers need to have JavaScript enabled, and support cookies for anomaly detection to work.
- Consider disabling response caching. If response caching is enabled, the system does not protect cached content against web scraping.
- The Application Security Manager™ does not perform web scraping detection on legitimate search engine traffic. If your web application has its own search engine, we recommend that you add it to the system. Go to **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Search Engines**, and add it to the list.

Adding allowed search engines

The Application Security Manager™ does not perform web scraping detection on traffic from search engines that the system recognizes as being legitimate. You can optionally add other legitimate search engines to the search engines list.

1. On the **Main** tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Search Engines**.
   The Search Engines screen opens, and displays a list of the search engines that are considered legitimate.
2. Click **Create**.
   The New Search Engine screen opens.
3. In the **Search Engine** field, type the name.
4. In the **Bot Name** field, type the search engine bot name, such as `googlebot`.

   ***Tip:** You can get this name from the user-agent header of a request that the search engine sends.*

5. In the **Domain Name** field, type the search engine crawler's domain name; for example, `yahoo.net`.
6. Click **Create**.

   ***Note:** For this feature to work, the DNS server must be on the DNS lookup server list on the BIG-IP® system (**System** > **Configuration** > **Device** > **DNS**). The system uses reverse DNS lookup to verify search engine requests.*

   The system adds the search engine to the list.

The system does not perform web scraping detection on traffic originating from the search engines on the search engines list.

Allowed search engines

By default, Application Security Manager™ (ASM) allows requests from these well-known search engines and legitimate web robots:

- Ask (.ask.com)
- Baidu (.baidu.com, .baidu.jp)
- Bing (.msn.com)
- Google (.googlebot.com)
- Yahoo (.yahoo.net)
- Yandex (.yandex.com .yandex.net, .yandex.ru,)

You can add other search engines to the allowed search engine list; for example, if your web application uses an additional search engine. The list applies globally to all security policies on the system. ASM does not perform web scraping detection on traffic from any search engine listed.

Detecting web scraping based on bot detection

Application Security Manager™ can mitigate web scraping on application web sites by investigating whether a client is human or a web robot. This is called *bot detection*. The bot detection method protects web applications against rapid surfing by measuring how frequently URLs are accessed and whether pages are refreshed too often. The system can also detect non-human clients by detecting bad sequences in human interaction events.

1. On the Main tab, click **Security** > **Application Security** > **Anomaly Detection** > **Web Scraping**.
   The Web Scraping screen opens.

2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. For the **Bot Detection** setting, select either **Alarm** or **Alarm and Block** to indicate how you want the system to react when it detects that a bot is sending requests to the web application.

   If you choose **Alarm and Block**, the security policy enforcement mode needs to be set to **Blocking** before the system blocks web scraping attacks.

   Note: *The system can accurately detect a human user only if clients have JavaScript enabled and support cookies in their browsers.*

   The screen displays the Bot Detection tab and more settings related to bot detection. Detecting web scraping based on session opening and session transactions is discussed in other sections
4. For the **IP Address Whitelist** setting, click the arrow to go to a screen where you can add the IP addresses and subnets from which traffic is known to be safe.

   Important: *The system adds any whitelist IP addresses to the centralized IP address exceptions list. The exceptions list is common to both brute force prevention and web scraping detection configurations.*
5. If you plan to use fingerprinting to monitor behavior by browser (and collect its attributes) rather than by session, select the **Fingerprinting Usage** check box.
   The screen displays additional settings; a separate task explains how to use fingerprinting to detect web scraping.
6. If you want to protect client identification data (when using Bot Detection or Session Opening detection), specify the persistence settings.
   a) Select the **Persistent Client Identification** check box.
   b) For **Persistent Data Validity Period**, type how long you want the client data to persist in minutes. The default value is `120` minutes.

   Note: *This setting enforces persistent storage on the client and prevents easy removal of client data. Be sure that this behavior is compatible with the application privacy policy.*

   The system maintains client data and prevents removal of this data from persistent storage for the validity period specified.
7. On the Bot Detection tab, for the **Rapid Surfing** setting, specify the maximum number of page refreshes or different pages that can be loaded within a specified number of seconds before the system suspects a bot.

   The default value is **Maximum 120 page refreshes, or 30 different pages loaded within 30 seconds**.
8. For **Grace Interval**, type the number of requests to allow while determining whether a client is human.

   The default value is `100`.
9. For **Blocking Period**, type the number of requests that cause the `Web Scraping Detected` violation if no human activity was detected during the grace period.

   The default value is `500`.

   Reaching this interval causes the system to reactivate the grace period.
10. For **Safe Interval**, type the number of requests to allow after human activity is detected, and before reactivating the grace threshold to check again for non-human clients.

    The default value is `2000`.
11. To track event sequences in the browser and detect irregular sequences, for **Event Sequence Enforcement**, select **Enabled**.
12. Click **Save** to save your settings.

13. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
    The Learning and Blocking Settings screen opens.
14. To ensure that web scraping violations are learned, in the Policy Building Settings area, expand **Bot Detection** and select **Web scraping detected**, if it is not already selected.
15. Click **Save** to save your settings.
16. To put the security policy changes into effect immediately, click **Apply Policy**.

The system checks for rapid surfing, and if too many pages are loaded too quickly, it logs Web Scraping detected violations in the event log, and specifies the attack type of bot detection. If you enforced event sequencing, the system tracks the sequence of events in the browser, thus preventing bots that can imitate human mouse, keyboard, or touch events. If an irregular sequence of events is detected during the grace period, the client continues to receive the JavaScript challenge that tries to detect a human. When the grace period is over, if the sequences were irregular, the system starts to block requests from the client.

After setting up bot detection, you can also set up fingerprinting, session opening, and session transactions anomaly detection for the same security policy. If you want to implement proactive bot defense for additional protection against web robots, you can set that up by configuring DoS protection.

Detecting web scraping based on session opening

You can configure how the system protects your web application against session opening web scraping violations that result from too many sessions originating from a specific IP address, inconsistencies detected in persistent storage, and when the number of session resets exceeds the threshold.

1. On the Main tab, click **Security** > **Application Security** > **Anomaly Detection** > **Web Scraping**.
   The Web Scraping screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. For the **Session Opening** setting, select either **Alarm** or **Alarm and Block** to indicate how you want the system to react when it detects a large increase in the number of sessions opened from a. specific IP address, or when the number of session resets or inconsistencies exceeds the set threshold.

   If you choose **Alarm and Block**, the security policy enforcement mode needs to be set to **Blocking** before the system blocks web scraping attacks.

   The screen displays the Session Opening tab and more settings.
4. For the **IP Address Whitelist** setting, click the arrow to go to a screen where you can add the IP addresses and subnets from which traffic is known to be safe.

   Important: *The system adds any whitelist IP addresses to the centralized IP address exceptions list. The exceptions list is common to both brute force prevention and web scraping detection configurations.*
5. If you plan to use fingerprinting to monitor behavior by browser (and collect its attributes) rather than by session, select the **Fingerprinting Usage** check box.
   The screen displays additional settings; a separate task explains how to use fingerprinting to detect web scraping.
6. If you want to protect client identification data (when using Bot Detection or Session Opening detection), specify the persistence settings.
   a) Select the **Persistent Client Identification** check box.
   b) For **Persistent Data Validity Period**, type how long you want the client data to persist in minutes. The default value is `120` minutes.

***Note:** This setting enforces persistent storage on the client and prevents easy removal of client data. Be sure that this behavior is compatible with the application privacy policy.*

The system maintains client data and prevents removal of this data from persistent storage for the validity period specified.

7. To detect session opening anomalies by IP address, on the Session Opening tab, select the **Session Opening Anomaly** check box.
8. For the **Prevention Policy** setting, select one or more options to direct how the system should handle a session opening anomaly attack.

Option	Description
Client Side Integrity Defense	When enabled, the system determines whether a client is a legitimate browser or an illegal script by sending a JavaScript challenge to each new session request. Legitimate browsers can respond to the challenge; scripts cannot.
Rate Limiting	When enabled, the system drops random sessions exhibiting suspicious behavior until the session opening rate is the same as the historical legitimate value. If you select this option, the screen displays an option for dropping requests from IP addresses with a bad reputation.
Drop IP Addresses with bad reputation	This option is available only if you have enabled rate limiting. When enabled, the system drops requests originating from IP addresses that are in the system's IP address intelligence database when the attack is detected; no rate limiting will occur. (Attacking IP addresses that do not have a bad reputation undergo rate limiting, as usual.) You also need to set up IP address intelligence, and at least one of the IP intelligence categories must have its Alarm or Block flag enabled.

9. For the **Detection Criteria** setting, specify the criteria under which the system considers traffic to be a session opening anomaly attack.

Option	Description
Sessions opened per second increased by	The system considers traffic to be an attack if the number of sessions opened per second increased by this percentage. The default value is `500%`.
Sessions opened per second reached	The system considers traffic to be an attack if the number of sessions opened per second is equal to or greater than this number. The default value is `50` sessions opened per second.
Minimum sessions opened per second threshold for detection	The system only considers traffic to be an attack if this value plus one of the sessions opened values is exceeded. The default value is `25` sessions opened per second.

***Note:** The **Detection Criteria** values all work together. The minimum sessions value and one of the sessions opened values must be met for traffic to be considered an attack. However, if the minimum sessions value is not reached, traffic is never considered an attack even if the **Sessions opened per second increased by** value is met.*

10. For **Prevention Duration**, type a number that indicates how long the system prevents an anomaly attack by logging or blocking requests. The default is `1800` seconds.

    If the attack ends before this number of seconds, the system also stops attack prevention.
11. If you enabled **Persistent Client Identification** and you want to detect session opening anomalies based on inconsistencies, select the **Device Identification Integrity** check box, and set the maximum number of integrity faulty events to allow within a specified number of seconds.

The system tracks the number of inconsistent device integrity events within the time specified, and if too many events occurred within the time, a Web scraping detection violation occurs.

12. If you enabled **Persistent Client Identification** and you want to track cookie deletion events, in the **Cookie Deletion Detection** setting, specify how to detect cookie deletion. You can use either one or both options.
    a) To use persistent device identification to detect cookie deletion events, select the **Enabled by Persistent Device Identification** check box, and set the maximum number of cookie deletions to allow within a specified number of seconds.
    b) If you enabled **Fingerprinting Usage**, to use fingerprinting to detect cookie deletion events, select the **Enabled by Fingerprinting** check box, and set the maximum number of cookie deletions to allow within a specified number of seconds.

    The system tracks the number of cookie deletion events that occur within the time specified, and if too many cookies were deleted within the time, a Web scraping detection violation occurs.
13. For **Prevention Duration**, type a number that indicates how long the system prevents an anomaly attack by logging or blocking requests. The default is `1800` seconds.

    If the attack ends before this number of seconds, the system also stops attack prevention.
14. Click **Save** to save your settings.
15. To put the security policy changes into effect immediately, click **Apply Policy**.

The system checks for too many sessions being opened from one IP address, too many cookie deletions, and persistent storage inconsistencies depending on the options you selected. The system logs violations in the web scraping event log along with information about the attack including whether it is a Session Opening Anomaly by IP Address or Session Resets by Persistent Client Identification attack type and when it began and ended. The log also includes the type of violation (Device Identification Integrity or Cookie Deletion Detection) and the violation numbers.

After setting up web scraping detection by session opening, you can also set up bot detection, fingerprinting, and session transactions anomaly detection for the same security policy.

Detecting web scraping based on session transactions

You can configure how the system protects your web application against harvesting, which is detected by counting the number of transactions per session and comparing that number to a total average of transactions from all sessions. Harvesting may cause session transaction anomalies.

1. On the Main tab, click **Security** > **Application Security** > **Anomaly Detection** > **Web Scraping**. The Web Scraping screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. For the **Session Transactions Anomaly** setting, select either **Alarm** or **Alarm and Block** to indicate how you want the system to react when it detects a large increase in the number of transactions per session.

   If you choose **Alarm and Block**, the security policy enforcement mode needs to be set to **Blocking** before the system blocks web scraping attacks.

   The screen displays the Session Transactions Anomaly tab and more settings.
4. For the **IP Address Whitelist** setting, click the arrow to go to a screen where you can add the IP addresses and subnets from which traffic is known to be safe.

   Important: *The system adds any whitelist IP addresses to the centralized IP address exceptions list. The exceptions list is common to both brute force prevention and web scraping detection configurations.*

5. On the Session Transactions Anomaly tab, for the **Detection Criteria** setting, specify the criteria under which the system considers traffic to be a session transactions anomaly attack.

Option	Description
Session transactions above normal by	The system considers traffic in a session to be an attack if the number of transactions in the session is more than normal by this percentage (and minimum session value is met). Normal refers to the average number of transactions per session for the whole site during the last hour. The default value is `500%`.
Sessions transactions reached	The system considers traffic to be an attack if the number of transactions per sessions is equal to or greater than this number (and minimum session value is met). The default value is `400` transactions.
Minimum session transactions threshold for detection	The system considers traffic to be an attack only if the number of transactions per session is equal to or greater than this number, and at least one of the sessions transactions numbers was exceeded. The default value is `200` transactions.

Important: *The* ***Detection Criteria*** *values all work together. The minimum sessions value and one of the sessions transactions values must be met for traffic to be considered an attack. However, if the* ***Minimum session transactions threshold*** *is not reached, traffic is never considered an attack even if the* ***Sessions transactions above normal by*** *value is met.*

6. For **Prevention Duration**, type a number that indicates how long the system prevents an anomaly attack by logging or blocking requests. The default is `1800` seconds.

   If the attack ends before this number of seconds, the system also stops attack prevention.
7. Click **Save** to save your settings.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

When the system detects a session that requests too many transactions (as compared to normal), all transactions from the attacking session cause the `Web Scraping detected` violation to occur until the end of attack or until the prevention duration expires.

After setting up web scraping detection based on session transactions, you can also set up bot detection, fingerprinting, and session opening anomaly detection for the same security policy.

Using fingerprinting to detect web scraping

Application Security Manager™ (ASM) can identify web scraping attacks on web sites that ASM™ protects by using information gathered about clients through fingerprinting or persistent identification. *Fingerprinting* is collecting browser attributes and associating the detected behavior with the browser using those attributes. The system can use the collected information to identify suspicious clients (potential bots) and recognize web scraping attacks more quickly.

1. On the Main tab, click **Security** > **Application Security** > **Anomaly Detection** > **Web Scraping**.
   The Web Scraping screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. To have the system detect browsers and bots by collecting browser attributes, select the **Fingerprinting Usage** check box.
   The screen enables fingerprinting and displays the **Suspicious Clients** setting, which works together with the fingerprinting feature.
4. If you want the system to detect suspicious clients using fingerprinting data, for the **Suspicious Clients** setting, select **Alarm and Block**.
   The system displays a new Suspicious Clients tab.

5. To configure how the system determines which clients are suspicious, adjust the setting on the Suspicious Clients tab:
   a) For the **Scraping Plugins** setting, select the **Detect browsers with Scraping Extensions** check box, and move the browser extensions you do not want to allow to the **Disallowed Extensions** list.
   If ASM detects a browser with a disallowed extension, the client is considered suspicious, and ASM logs and blocks requests from this client to the web application.
   b) In the **Prevention Duration** field, type the number of seconds for which the system prevents requests from a client after ASM determines it to be suspicious.
6. Click **Save** to save your settings.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

The system now collects browser attributes to help with web scraping detection, and tracks behavior by browser rather than session. This way a bot cannot stay undetected by opening a new session. If you also enabled the **Suspicious Clients** setting, when the system detects suspicious clients using information obtained by fingerprinting, the system records the attack data, and blocks the suspicious requests.

In addition to using fingerprinting, you can also set up bot detection, session opening, and session transactions anomaly detection for the same security policy.

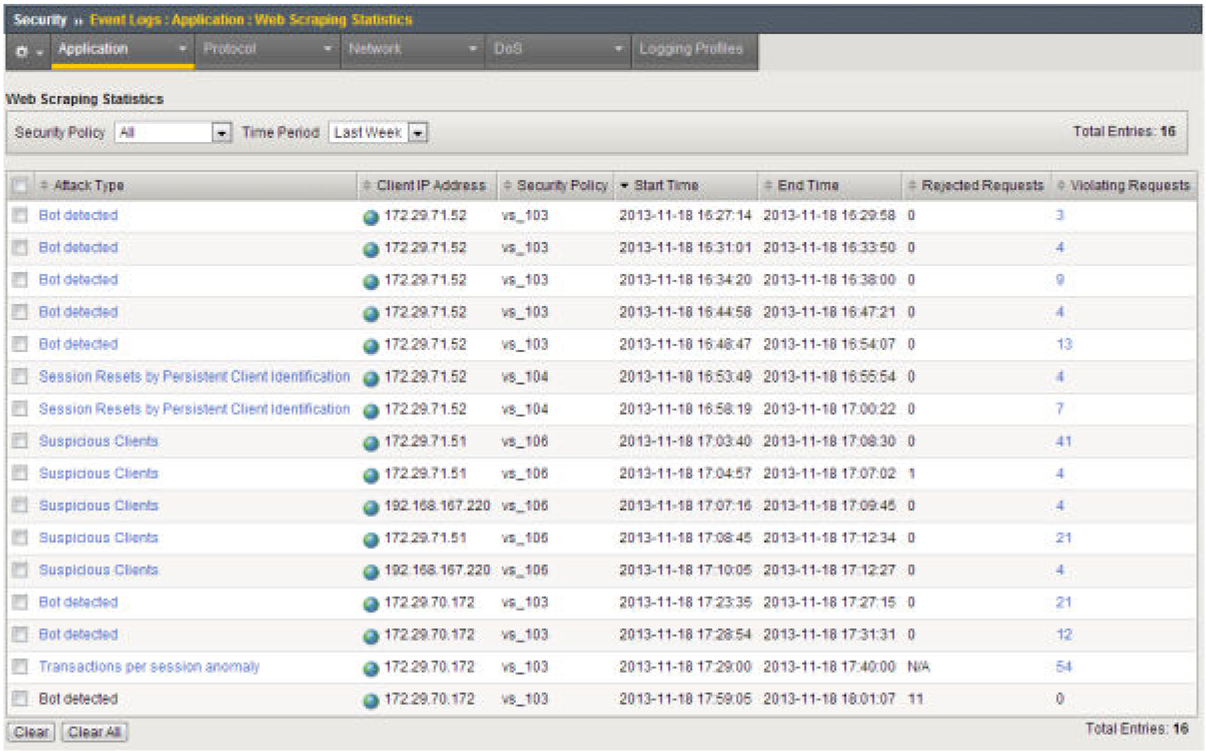
Displaying web scraping event logs

You can display event logs to see whether web scraping attacks have occurred, and view information about the attacks.

1. On the Main tab, click **Security** > **Event Logs** > **Application** > **Web Scraping Statistics**.
   The Web Scraping Statistics event log opens.
2. If the log is long, you can filter the list by security policy and time period to show more specific entries.
3. Review the list of web scraping attacks to see the web scraping attack type that occurred, the IP address of the client that caused the attack, which security policy detected the attack, and the start and end times of the attack.
4. Examine the web scraping statistics shown, and click the attack type links to see what caused the attack.
5. To learn more about the requests that caused the web scraping attack, click the number of violating requests.
   The Requests screen opens where you can investigate the requests that caused the web scraping attacks.

Web scraping attack examples

This figure shows a Web Scraping Statistics event log on an Application Security Manager™ (ASM) system where several web scraping attacks, with different attack types, have occurred.


Security » Event Logs : Application : Web Scraping Statistics
Application
Protocol
Network
DoS
Logging Profiles
Clear
Clear All

Web Scraping Statistics

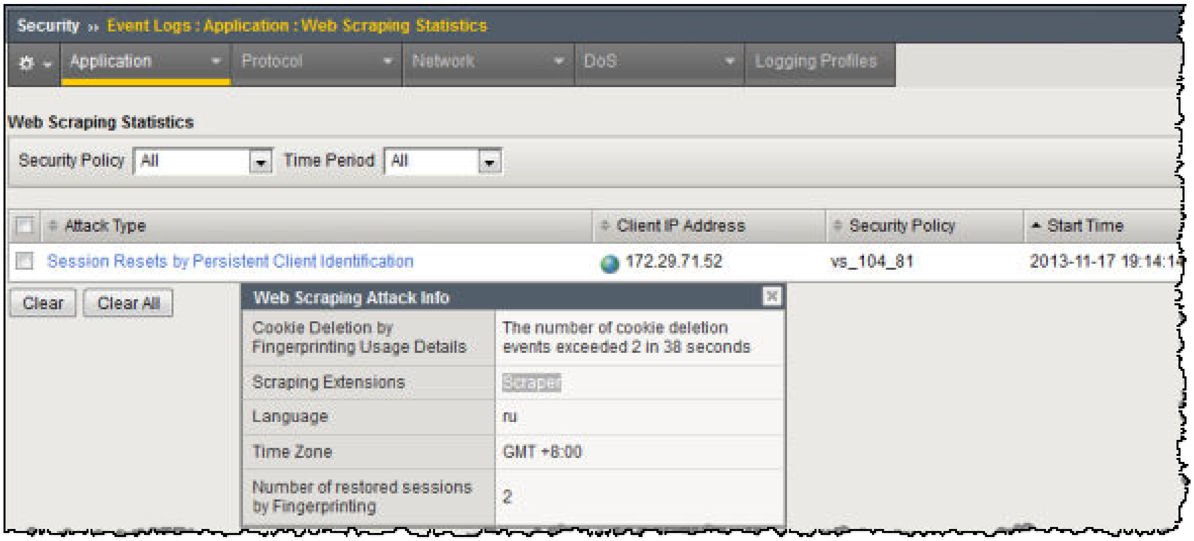
Security Policy: All Time Period: Last Week Total Entries: 16

Attack Type	Client IP Address	Security Policy	Start Time	End Time	Rejected Requests	Violating Requests
Bot detected	172.29.71.52	vs_103	2013-11-18 16:27:14	2013-11-18 16:29:58	0	3
Bot detected	172.29.71.52	vs_103	2013-11-18 16:31:01	2013-11-18 16:33:50	0	4
Bot detected	172.29.71.52	vs_103	2013-11-18 16:34:20	2013-11-18 16:38:00	0	9
Bot detected	172.29.71.52	vs_103	2013-11-18 16:44:58	2013-11-18 16:47:21	0	4
Bot detected	172.29.71.52	vs_103	2013-11-18 16:48:47	2013-11-18 16:54:07	0	13
Session Resets by Persistent Client Identification	172.29.71.52	vs_104	2013-11-18 16:53:49	2013-11-18 16:55:54	0	4
Session Resets by Persistent Client Identification	172.29.71.52	vs_104	2013-11-18 16:58:19	2013-11-18 17:00:22	0	7
Suspicious Clients	172.29.71.51	vs_106	2013-11-18 17:03:40	2013-11-18 17:08:30	0	41
Suspicious Clients	172.29.71.51	vs_106	2013-11-18 17:04:57	2013-11-18 17:07:02	1	4
Suspicious Clients	192.168.167.220	vs_106	2013-11-18 17:07:16	2013-11-18 17:09:45	0	4
Suspicious Clients	172.29.71.51	vs_106	2013-11-18 17:08:45	2013-11-18 17:12:34	0	21
Suspicious Clients	192.168.167.220	vs_106	2013-11-18 17:10:05	2013-11-18 17:12:27	0	4
Bot detected	172.29.70.172	vs_103	2013-11-18 17:23:35	2013-11-18 17:27:15	0	21
Bot detected	172.29.70.172	vs_103	2013-11-18 17:28:54	2013-11-18 17:31:31	0	12
Transactions per session anomaly	172.29.70.172	vs_103	2013-11-18 17:29:00	2013-11-18 17:40:00	N/A	54
Bot detected	172.29.70.172	vs_103	2013-11-18 17:59:05	2013-11-18 18:01:07	11	0

Total Entries: 16

Figure 2: Web scraping statistics event log

The next figure shows details on a web scraping attack started on November 17 at 7:14PM. The attack type was Session Resets by Persistent Client Identification, and it occurred when the number of cookie deletions detected through the use of fingerprinting exceeded the configured threshold.


Security » Event Logs : Application : Web Scraping Statistics
Application
Protocol
Network
DoS
Logging Profiles
Clear
Clear All

Web Scraping Statistics

Security Policy: All Time Period: All

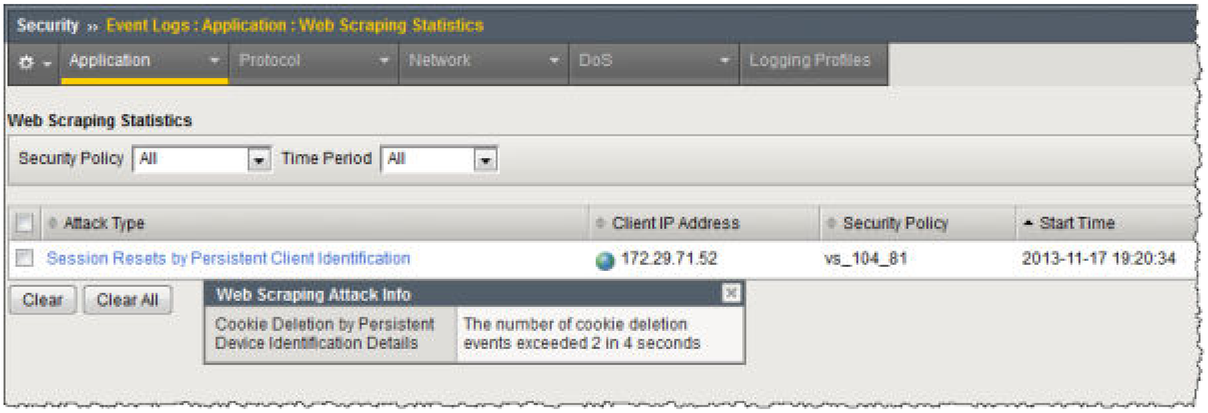
Attack Type	Client IP Address	Security Policy	Start Time
Session Resets by Persistent Client Identification	172.29.71.52	vs_104_81	2013-11-17 19:14:1

Web Scraping Attack Info

Cookie Deletion by Fingerprinting Usage Details	The number of cookie deletion events exceeded 2 in 38 seconds
Scraping Extensions	Scraper
Language	ru
Time Zone	GMT +8:00
Number of restored sessions by Fingerprinting	2

Figure 3: Example cookie deletion attack (fingerprinting)

The next figure shows details on a web scraping attack started on November 17 at 7:20PM. The attack type was Session Resets by Persistent Client Identification. It occurred when the number of cookie deletions detected through the use of persistent client identification exceeded the configured threshold (more than 2 in 4 seconds).


Security » Event Logs : Application : Web Scraping Statistics
Application
Protocol
Network
DoS
Logging Profiles
Clear
Clear All

Web Scraping Statistics

Security Policy: All   Time Period: All

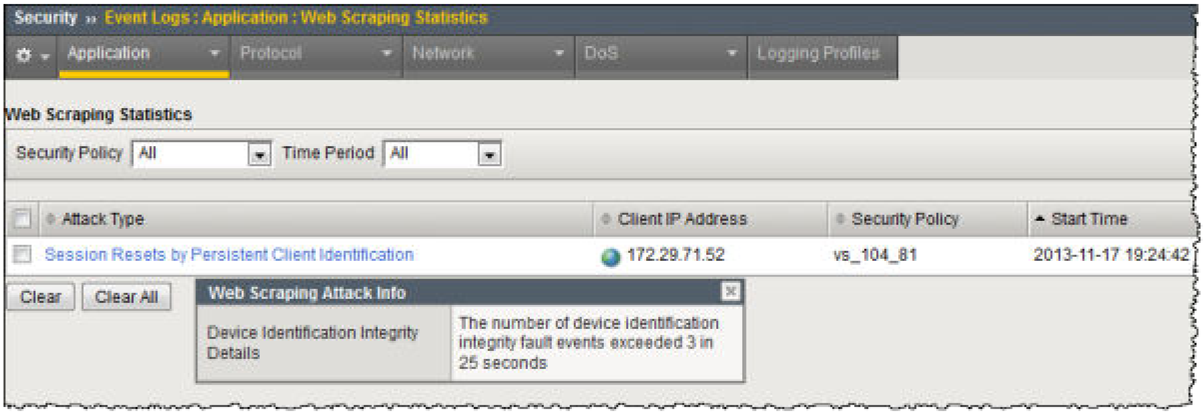
Attack Type	Client IP Address	Security Policy	Start Time
Session Resets by Persistent Client Identification	172.29.71.52	vs_104_81	2013-11-17 19:20:34

Web Scraping Attack Info

Cookie Deletion by Persistent Device Identification Details	The number of cookie deletion events exceeded 2 in 4 seconds

Figure 4: Example cookie deletion attack (persistent client ID)

The next figure shows details on a web scraping attack started on November 17 at 7:24PM. The attack type was Session Resets by Persistent Client Identification. It occurred when the number of integrity fault events detected through the use of persistent client identification exceeded the configured threshold (more than 3 in 25 seconds).


Security » Event Logs : Application : Web Scraping Statistics
Application
Protocol
Network
DoS
Logging Profiles
Clear
Clear All

Web Scraping Statistics

Security Policy: All   Time Period: All

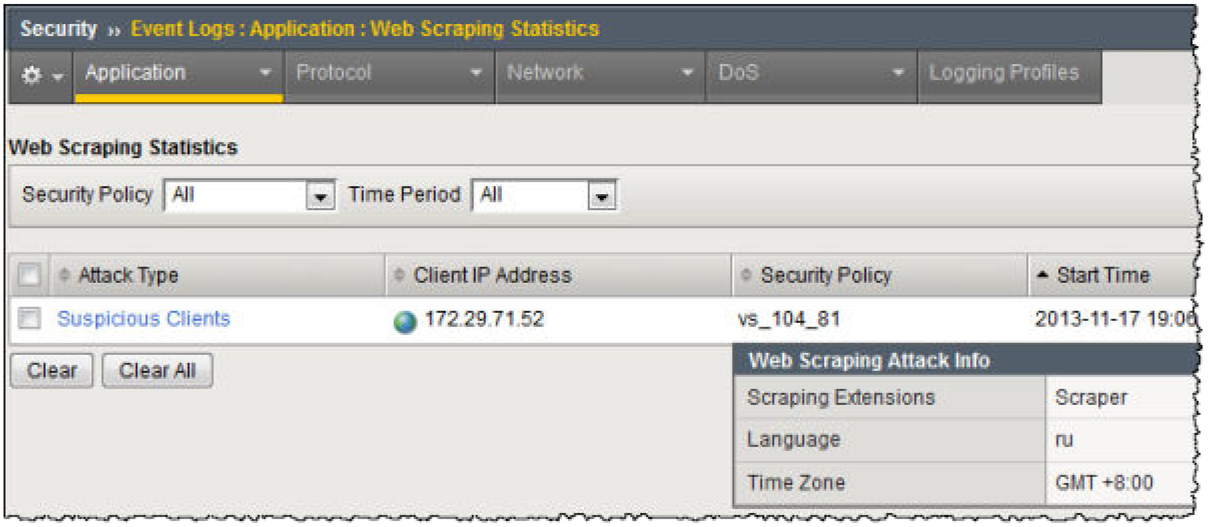
Attack Type	Client IP Address	Security Policy	Start Time
Session Resets by Persistent Client Identification	172.29.71.52	vs_104_81	2013-11-17 19:24:42

Web Scraping Attack Info

Device Identification Integrity Details	The number of device identification integrity fault events exceeded 3 in 25 seconds

Figure 5: Example device ID integrity attack

The next figure shows details on a suspicious clients attack that occurred when a client installed the disallowed Scraper browser plug-in.


Security » Event Logs : Application : Web Scraping Statistics
Application
Protocol
Network
DoS
Logging Profiles
Clear
Clear All

Web Scraping Statistics

Security Policy: All   Time Period: All

Attack Type	Client IP Address	Security Policy	Start Time
Suspicious Clients	172.29.71.52	vs_104_81	2013-11-17 19:06

Web Scraping Attack Info

Scraping Extensions	Scraper
Language	ru
Time Zone	GMT +8:00

Figure 6: Example disallowed plug-in attack

Web scraping attack types

Web scraping statistics specify the attack type so you have more information about why the attack occurred. This shows the web scraping attack types that can display in the web scraping event log.

Attack Type	Description
Bot activity detected	Indicates that there are more JavaScript injections than JavaScript replies. Click the attack type link to display the detected injection ratio and the injection ratio threshold. ***Note:** You cannot configure the Bot activity detected ratio values. This attack type can occur only when the security policy is in Transparent mode.*
Bot Detected	Indicates that the system suspects that the web scraping attack was caused by a web robot.
Session Opening Anomaly by IP	Indicates that the web scraping attack was caused by too many sessions being opened from one IP address. Click the attack type link to display the number of sessions opened per second from the IP address, the number of legitimate sessions, and the attack prevention state.
Session Resets by Persistent Client Identification	Indicates that the web scraping attack was caused by too many session resets or inconsistencies occurring within a specified time. Click the attack type link to display the number of resets or inconsistencies that occurred within a number of seconds.
Suspicious Clients	Indicates that the web scraping attack was caused by web scraping extensions on the browser. Click the attack type link to display the scraping extensions found in the browser.
Transactions per session anomaly	Indicates that the web scraping attack was caused by too many transactions being opened during one session. Click the attack type link to display the number of transactions detected on the session.

Viewing web scraping statistics

Before you can look at the web scraping attack statistics, you need to have configured web scraping protection.

You can display charts that show information about web scraping attacks that have occurred against protected applications.

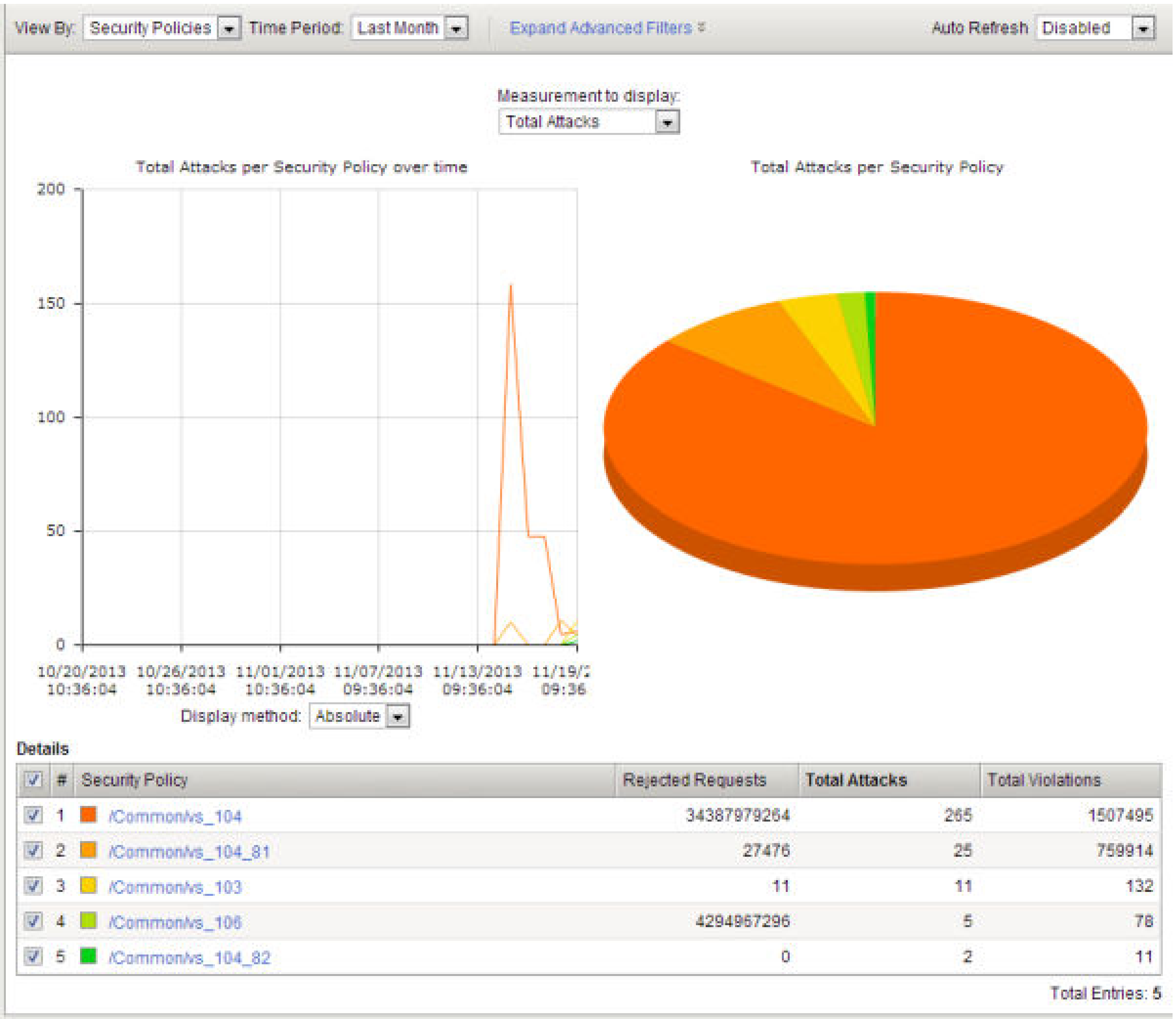
1. On the Main tab, click **Security** > **Reporting** > **Application** > **Web Scraping Statistics**.
   The Web Scraping Statistics screen opens.
2. From the **Time Period** list, select the time period for which you want to view information about web scraping attacks.
3. If you want to export the report to a file or send it by email, click **Export** and select the options.

   To send reports by email, you need to specify an SMTP configuration (**System** > **Configuration** > **Device** > **SMTP**).

The statistics show the total number of web scraping attacks, violations, and rejected requests that occurred. You can review the details about the attacks and see that mitigation is in place.

Web scraping statistics chart

This figure shows a Web Scraping Statistics chart on an Application Security Manager™ (ASM) test system where many web scraping attacks occurred during a short period of time.



View By: Security Policies Time Period: Last Month Auto Refresh: Disabled

Measurement to display: Total Attacks

Display method: Absolute

Details

☑	#		Security Policy	Rejected Requests	Total Attacks	Total Violations
☑	1	🟧	/Common/vs_104	34387979264	265	1507495
☑	2	🟧	/Common/vs_104_81	27476	25	759914
☑	3	🟨	/Common/vs_103	11	11	132
☑	4	🟩	/Common/vs_106	4294967296	5	78
☑	5	🟩	/Common/vs_104_82	0	2	11

Total Entries: 5

Figure 7: Web scraping statistics chart

You can use this chart to see the number of rejected requests, web scraping attacks, and total violations that occurred on the web applications protected using the five security policies listed at the bottom.

Implementation Result

When you have completed the steps in this implementation, you have configured the Application Security Manager™ to protect against web scraping. The system examines mouse and keyboard activity for non-human actions. Depending on your configuration, the system detects web scraping attacks based on bot detection, session opening violations, session transaction violations, and fingerprinting.

After traffic is flowing to the system, you can check whether web scraping attacks are being logged or prevented, and investigate them by viewing web scraping event logs and statistics.

If fingerprinting is enabled, the system uses browser attributes to help with detecting web scraping. If using fingerprinting with suspicious clients set to alarm and block, the system collects browser attributes and blocks suspicious requests using information obtained by fingerprinting. If you enabled event sequencing, the system looks for irregular event sequences to detect bots.

If you chose alarm and block for the web scraping configuration and the security policy is in the blocking operation mode, the system drops requests that cause the Web scraping detected violation. If you chose alarm only (or the policy is in the transparent mode), web scraping attacks are logged only but not blocked.

Setting Up IP Intelligence Blocking

Overview: Setting up IP intelligence blocking

In Application Security Manager™, you can use IP Intelligence blocking in a security policy to block requests from IP addresses that have questionable reputations. IP addresses from which attacks or spam have originated are included in an IP intelligence database, along with the category describing the problem. The BIG-IP® system must connect to the IP intelligence database before you can use IP Intelligence blocking.

You can configure a security policy to log (alarm) or block requests from IP addresses of questionable reputation, and to perform different actions depending on the categories of problems. For example, you can block requests from IP addresses associated with Windows exploits and log requests from scanners.

You can create a whitelist of IP addresses that might be in the database, and allow them to access the web application regardless of their IP reputation. This is a way to ensure that traffic from known sources is not blocked because of IP Intelligence data.

You can also use iRules to instruct the system how to use IP Intelligence information.

Task summary

Downloading the IP intelligence database

The requirements for using IP Intelligence are:

- The system must have an IP Intelligence license.
- The system must have an Internet connection either directly or through an HTTP proxy server.
- The system must have DNS configured (go to **System** > **Configuration** > **Device** > **DNS**).

Important: *IP Intelligence is enabled by default if you have a license for it. You only need to enable it if it was previously disabled.*

To enable IP Intelligence on the BIG-IP® system, you enable auto-update to download the IP intelligence database to the system.

1. Log in to the command line for the BIG-IP® system.
2. To determine whether IP intelligence auto-update is enabled, type the following command: `tmsh list sys db iprep.autoupdate`
   If the value of the `iprep.autoupdate` variable is `disable`, IP intelligence is not enabled. If it is `enable`, your task is complete. No further steps are necessary.
3. If disabled, at the prompt, type `tmsh modify sys db iprep.autoupdate value enable`
   The system downloads the IP intelligence database and stores it in the binary file, `/var/IpRep/F5IpRep.dat`. It is updated every 5 minutes.
4. If the BIG-IP system is behind a firewall, make sure that the BIG-IP system has external access to `vector.brightcloud.com` using port `443`.

   That is the IP Intelligence server from which the system gets IP Intelligence information.
5. (Optional) If the BIG-IP system connects to the Internet using a forward proxy server, set these system database variables.

a) Type `tmsh modify sys db proxy.host value hostname` to specify the host name of the proxy server.
b) Type `tmsh modify sys db proxy.port value port_number` to specify the port number of the proxy server.
c) Type `tmsh modify sys db proxy.username value username` to specify the user name to log in to the proxy server.
d) Type `tmsh modify sys db proxy.password value password` to specify the password to log in to the proxy server.

The IP Intelligence feature remains enabled unless you disable it with the command `tmsh modify sys db iprep.autoupdate value disable`.

You can create iRules® to instruct the system how to handle traffic from IP addresses with questionable reputations, or use Application Security Manager™ to configure IP Intelligence blocking.

Blocking IP addresses with bad reputations

You can configure a security policy to log and block requests from source IP addresses that, according to an IP intelligence database, have a bad reputation and could cause a potential attack.

1. On the Main tab, click **Security** > **Application Security** > **IP Addresses** > **IP Intelligence**. The IP Intelligence screen opens.
2. In the **Current edited policy** list near the top of the screen, verify that the edited security policy is the one you want to work on.
3. Select the **IP Intelligence** check box. The screen refreshes, and displays additional configuration options.
4. For the **IP Address Whitelist** setting, click the arrow to go to a screen where you can specify any IP addresses you want to allow, even if they are found in the IP intelligence database.

   Important: *The system adds any whitelist IP addresses to the centralized IP address exceptions list. The exceptions list is common to both brute force prevention and web scraping detection configurations.*

   The system updates the whitelist with the allowed IP addresses.
5. In the IP Intelligence Categories area, select **Alarm** or **Block**, or both, for the categories of IP addresses you are interested in.

   - Select **Alarm** to cause the system to log the IP Intelligence data (IP Intelligence category and status) on the Requests screen whenever a request is from a source IP address in that category.
   - Select **Block** to stop requests sent from a source IP address that matches that category

   Tip: *To select all categories at once, click the* ***Alarm*** *or* ***Block*** *column name check boxes.*
6. Click **Save**.

The system matches source IP addresses to those in the IP Intelligence database. When a match is found, the violation `Access from malicious IP address` occurs. The system determines what category of reputation the IP address has, then logs or blocks the IP address according to how the IP Intelligence categories are set.

Reviewing IP intelligence statistics

After you set up IP intelligence blocking on the Application Security Manager™, you can review statistics concerning how many requests were received from IP addresses with questionable reputations. You can also view the requests from those IP addresses.

1. On the Main tab, click **Security** > **Reporting** > **Application**.
   The Charts screen opens.
2. In the Charts area, next to **View by**, click **IP Intelligence**.
   The chart shows details about IP addresses that were used to send the illegal requests, grouped according to their reputation in the IP intelligence database.
3. Hover over the pie chart or look at the Details table below it to see the categories of IP addresses with questionable reputations.
4. Under Chart Path on the left, click **View Requests** to see the requests from IP addresses in the IP intelligence database.
   The Requests list opens.
5. Click any request to view details about the request.
   The screen expands to show more information about the request. IP Intelligence information is shown in the **Source IP Address** field in the request details. The details include the category of the malicious IP address and information about when the IP intelligence database was last updated.
6. If you have set up remote logging, you can also review IP intelligence data on the remote logger.

Based on the statistics and IP Intelligence categories that the IP addresses fall into, you can adjust what happens (alarm or block) when the system receives requests from IP addresses in different categories.

Creating an iRule to log IP intelligence information

Before you can create an iRule to log IP Intelligence information, your system must have IP Intelligence enabled.

You use iRules® to log IP Intelligence categories to the file `/var/log/ltm`. This is an example of the type of iRule you can write.

1. On the Main tab, click **Local Traffic** > **iRules**.
   The iRule List screen opens, displaying any existing iRules.
2. Click **Create**.
   The New iRule screen opens.
3. In the **Name** field, type a name, such as `my_irule`.

   The full path name of the iRule cannot exceed 255 characters.
4. In the **Definition** field, type the iRule using Tool Command Language (Tcl) syntax.

   For example, to log all IP addresses and any associated IP Intelligence categories, type the following iRule:

```
when CLIENT_ACCEPTED {
              log local0. "IP Intelligence for IP address [IP::client_addr]:
              [IP::reputation [IP::client_addr]]"
            }
```

Tip: For complete and detailed information iRules syntax, see the F5 Networks DevCentral web site (`http://devcentral.f5.com`).

5. Click **Finished**.
   The new iRule appears in the list of iRules on the system.

When traffic is received from an IP address with a questionable reputation and that is included in the IP intelligence database, the system prints the IP Intelligence information in the `/var/log/ltm` log.

For complete and detailed information about iRules syntax, see the F5 Networks DevCentral web site, `http://devcentral.f5.com`.

Creating an iRule to reject requests with questionable IP addresses

Before you can create an iRule to reject requests based on an IP address reputation, your system must have IP Intelligence enabled.

You can use iRules® to reject requests from IP addresses that have questionable reputations and are listed in the IP intelligence database. This is an example of the type of iRule you can write.

1. On the Main tab, click **Local Traffic** > **iRules**.
   The iRule List screen opens, displaying any existing iRules.
2. Click **Create**.
   The New iRule screen opens.
3. In the **Name** field, type a name, such as `my_irule`.

   The full path name of the iRule cannot exceed 255 characters.
4. In the **Definition** field, type the iRule using Tool Command Language (Tcl) syntax.

   For example, to reject requests from IP addresses listed in the IP intelligence database because they could be Windows Exploits or Web Attacks, type the following iRule:

```
when HTTP_REQUEST {
    set ip_reputation_categories [IP::reputation [IP::client_addr]]
    set is_reject 0
    if {($ip_reputation_categories contains "Windows Exploits")} {
       set is_reject 1
    }
    if {($ip_reputation_categories contains "Web Attacks")} {
       set is_reject 1
    }
    if {($is_reject)} {
        log local0. "Attempted access from malicious IP address [IP::client_addr]
        ($ip_reputation_categories), request was rejected"
        HTTP::respond 200 content
        "<HTML><HEAD><TITLE>Rejected Request</TITLE>
        </HEAD><BODY>The request was rejected. <BR>
        Attempted access from malicious IP address</BODY></HTML>"
    }
}
```

> ***Tip:*** *For complete and detailed information about iRules syntax, see the F5 Networks DevCentral web site (`http://devcentral.f5.com`).*

5. Click **Finished**.
   The new iRule appears in the list of iRules on the system.

When the system receives traffic from an IP address that is included in the IP intelligence database, the system prints the IP Intelligence information in the `/var/log/ltm` log.

IP intelligence categories

Along with the IP address, the IP intelligence database stores the category that explains the reason that the IP address is considered untrustworthy.

Category Name	Description
Anonymous Proxy	IP addresses that are associated with web proxies that shield the originator's IP address (such as proxy and anonymization services).

Category Name	Description
Botnets	IP addresses of computers that are infected with malicious software (Botnet Command and Control channels, and infected zombie machines) and are controlled as a group by a Bot master, and are now part of a botnet. Hackers can exploit botnets to send spam messages, launch various attacks, or cause target systems to behave in other unpredictable ways.
Cloud-based Services	IP addresses and networks that are used by cloud providers.
Denial-of-Service	IP addresses that have launched denial-of-service (DoS) attacks, distributed denial-of-service (DDoS) attacks, anomalous SYN flood attacks, or anomalous traffic detection. These attacks are usually requests for legitimate services, but occur at such a fast rate that targeted systems cannot respond quickly enough and become bogged down or unable to service legitimate clients.
Infected Sources	Active IP addresses that issue HTTP requests with a low reputation index score, or that are known malicious web sites offering or distributing malware, shell code, rootkits, worms, or viruses.
Mobile Threats	IP addresses of malicious and unwanted mobile applications.
Phishing Proxies	IP addresses that host phishing sites, and other kinds of fraud activities, such as ad click fraud or gaming fraud.
Scanners	IP addresses that are involved in reconnaissance, such as probes, host scan, domain scan, and password brute force, typically to identify vulnerabilities for later exploits.
Tor Proxies	IP addresses acting as exit nodes for the Tor Network. Exit nodes are the last point along the proxy chain and make a direct connection to the originator’s intended destination.
Web Attacks	IP addresses involved in cross site scripting, iFrame injection, SQL injection, cross domain injection, or domain password brute force.
Windows Exploits	Active IP addresses that have exercised various exploits against Windows resources by offering or distributing malware, shell code, rootkits, worms, or viruses using browsers, programs, downloaded files, scripts, or operating system vulnerabilities.

Managing IP Address Exceptions

Overview: Managing IP address exceptions

An *IP address exception* is an IP address that you want the system to treat in a specific way for a security policy. For example, you can specify IP addresses from which the system should always trust traffic, IP addresses for which you do not want the system to generate learning suggestions for the traffic, and IP addresses for which you want to exclude information from the logs. You can use the IP address exception feature to create exceptions for IP addresses of internal tools that your company uses, such as penetration tools, manual or automatic scanners, or web scraping tools. You can add an IP address exception, and instruct the system how to handle traffic coming from that address.

You can view a centralized list of IP address exceptions, and you can add new IP address exceptions to the list. The list of IP address exceptions shows exceptions that you add directly to the list, or those which you add from other locations, as shown by the following examples:

- When creating a security policy, you can specify IP addresses that you want the Policy Builder to always trust.
- When creating a security policy that is integrated with a vulnerability assessment tool, you can configure the scanner IP address as an IP address exception.
- When setting up anomaly detection (such as for DoS, brute force, and web scraping protections), you can specify IP addresses that the system should consider legitimate (called *whitelists*).
- When setting up IP address intelligence, you can add IP addresses that the system should allow even if the IP address is in the IP intelligence database.

The IP Address Exceptions list shows in one location all of the IP exceptions configured for this security policy. You can view or modify IP exceptions both from the centralized IP exception list and from the specific feature screens.

This implementation describes how to create, delete, and update the list of IP address exceptions.

Creating IP address exceptions

For each security policy, you can create a list of IP address exceptions, and indicate how you want the system to handle the traffic from these IP addresses. From the centralized IP Address Exceptions list, you can configure whitelists or blacklists to allow or block traffic from an IP address or subnet.

1. On the Main tab, click **Security** > **Application Security** > **IP Addresses** > **IP Address Exceptions**. The IP Address Exceptions screen opens, and displays a centralized list of configured IP address exceptions.
2. Click **Create**. The New IP Address Exception screen opens.
3. In the **IP Address** field, type the IP address that you want the system to trust.

   ***Note:** To add a route domain, type `%n` after the IP address where `n` is the route domain identification number.*

4. In the **Netmask** field, type the netmask of the IP address exception.

   If you omit the netmask value, the system uses a default value of `255.255.255.255`. So to block the `10.10.0.0` subnet, specify `10.10.0.0` as the IP address and `255.255.0.0` as the Netmask.

5. To consider traffic from this IP address as being safe, for the **Policy Builder trusted IP** setting, select **Enabled**.
   The system adds this IP address to the **Trusted IP Addresses** list on the Learning and Blocking Settings screen.
6. To ignore this IP address when performing brute force and web scraping detection, for the **Ignore in Anomaly Detection and do not collect Device ID** setting, select **Enabled**.
   The system adds this IP address to the **IP Address Whitelist** setting on the anomaly detection screens for configuring brute force and web scraping.
7. If you do not want the system to generate learning suggestions for traffic sent from this IP address, for the **Ignore in Learning Suggestions** setting, select **Enabled**.

   Note: *Application Security Manager does not generate learning suggestions for requests that result in the web server returning HTTP responses with 400 or 404 status codes unless the security policy is configured to learn and block traffic (the* ***Ignore in Learning Suggestions*** *check box cannot be selected and the* ***Block this IP Address*** *cannot be set to* ***Never Block this IP)****.*

8. For **Block this IP Address**:
   - To never block traffic from this IP address, select **Never block this IP Address**.
   - To always block traffic from this IP address, select **Always block this IP**.
   - To block according to policy rules, select **Policy Default**.
9. To disable logging for this address, enable **Never log traffic from this IP Address**.
   The system does not log requests or responses sent from this IP address, even if the traffic is illegal, and even if your security policy is configured to log all traffic.
10. To consider traffic from this IP address to be legitimate even if it is found in the IP Intelligence database, for the **Ignore IP Address Intelligence** setting, select **Enabled**.
    The system adds this IP address to the **IP Address Whitelist** setting on the IP Address Intelligence screen.
11. Click **Create**.
    The IP Address Exceptions screen opens and shows all of the exceptions configured for the security policy including the one you created.

You can view and manage all of your IP address exceptions from the centralized IP Address Exceptions screen.

Deleting IP address exceptions

If you no longer want an IP address on the exceptions list, you can delete the IP address exceptions.

1. On the Main tab, click **Security** > **Application Security** > **IP Addresses** > **IP Address Exceptions**.
   The IP Address Exceptions screen opens, and displays a centralized list of configured IP address exceptions.
2. Select the IP address exception you want to delete and click **Delete**.
   The IP address exception is deleted from the list.
3. You can also delete IP address exceptions from the anomaly detection whitelists, the IP address intelligence whitelist, and the policy building configuration. On any of these screens, select the IP address, and click **Delete**.
   The system removes the IP address from the whitelist on the screen. However, the IP address remains on the IP Address Exceptions screen with the related setting changed. For example, if you deleted the IP address from an anomaly detection whitelist, the Anomaly Detection column for that IP address in the exceptions list changes from Ignore IP to say Include IP.
4. In the editing context area, click **Apply Policy** to put the changes into effect.

Updating IP address exceptions

You can update IP address exceptions from the centralized list of IP address exceptions.

1. On the Main tab, click **Security** > **Application Security** > **IP Addresses** > **IP Address Exceptions**.
   The IP Address Exceptions screen opens, and displays a centralized list of configured IP address exceptions.
2. Click the IP address of the IP address exception you want to modify.
   The IP Address Exception Properties screen opens.
3. Change the settings as needed.
4. Click **Update**.
5. In the editing context area, click **Apply Policy** to put the changes into effect.

Disallowing Application Use at Specific Geolocations

Overview: Disallowing application use in certain geolocations

Geolocation software can identify the geographic location of a client or web application user. *Geolocation* refers either to the process of assessing the location, or to the actual assessed location.

For applications protected by Application Security Manager™, you can use geolocation enforcement to restrict or allow application use in specific countries. You adjust the lists of which countries or locations are allowed or disallowed in a security policy. If an application user tries to access the web application from a location that is not allowed, the `Access from disallowed GeoLocation` violation occurs. By default, all locations are allowed, and the violation learn, alarm, and block flags are enabled.

Requests from certain locations, such as RFC-1918 addresses or unassigned global addresses, do not include a valid country code. The geolocation is shown as **N/A** in both the request, and the list of geolocations. You have the option to disallow N/A requests whose country of origination is unknown.

Disallowing application use in certain geolocations

Before you can set up geolocation enforcement, you need to create a security policy. If the BIG-IP®system is deployed behind a proxy, you might need to set the **Trust XFF Header** option in the security policy properties. Then the system identifies the location using the address from the XFF header instead of the source IP address.

You can set up a security policy to allow or disallow access to the web application by users in specific countries, areas, or from anonymous proxies.

1. On the Main tab, click **Security** > **Application Security** > **Geolocation Enforcement**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the **Geolocation List** setting, use the move buttons to adjust the lists of allowed and disallowed geolocations. To restrict traffic from anonymous proxies, move **Anonymous Proxy** to the disallowed geolocations list.

   If no geolocations are disallowed, the list displays the word **None**. The screen shows the value **N/A** in the list of geolocations for cases where a user is in a location that cannot be identified, for example, if using RFC-1918 addresses or unassigned global addresses.

   ***Tip:** You can approach geolocation enforcement by specifying either which locations you want to disallow or which locations you want to allow.*
4. Click **Save** to save your settings.
5. In the editing context area, click **Apply Policy** to put the changes into effect.

If a user in a disallowed location attempts to access the web application, the security policy (if in blocking mode) blocks the user and displays the violation `Access from disallowed Geolocation`.

Setting up geolocation enforcement from a request

You can restrict application use in certain geolocations by using the Requests list. This is an easy way to restrict users in a certain country from accessing the web application. By examining illegal request details, you can disallow the locations from which frequent problems are originating.

1. On the Main tab, click **Security** > **Event Logs** > **Application** > **Requests**.
   The Requests screen opens and shows all illegal requests that have occurred for all security policies.
2. Filter the Requests List to show the illegal requests for the security policy for which you want to disallow the geolocation causing the problem.
3. In the Requests List, click anywhere on a request.
   The screen displays details about the request including any violations associated with the request, and other details, such as the geolocation.
4. In the Request Details area, the **Geolocation** setting displays the country, and if the country is not on the disallowed geolocation list, you see **Disallow this Geolocation**. If you want to disallow that location, click it.
   The system asks you to verify that you want to disallow this geolocation. When you verify that you do, the system adds the country to the Disallowed Geolocations list for that policy.
5. Apply the change to the security policy: on the Main tab, click **Security** > **Application Security** > **Policy**, make sure it is the correct current edited policy, and then click **Apply Policy**.

If a user in a disallowed location attempts to access the web application, the security policy (if in blocking mode) blocks the user and displays the violation `Access from disallowed Geolocation`.

Protecting Sensitive Data with Data Guard

About protecting sensitive data with Data Guard

In some web applications, a response may contain sensitive user information, such as credit card numbers or social security numbers (U.S. only). The Data Guard feature can prevent responses from exposing sensitive information by masking the data (this is also known as *response scrubbing*). Data Guard scans text in responses looking for the types of sensitive information that you specify.

***Note:** When you mask the data, the system replaces the sensitive data with asterisks (****). F5 Networks recommends that you enable this setting especially when the security policy enforcement mode is transparent. Otherwise, when the system returns a response, sensitive data could be exposed to the client.*

Using Data Guard, you can configure custom patterns using PCRE regular expressions to protect other forms of sensitive information, and indicate exception patterns not to consider sensitive. You can also specify which URLs you want the system to examine for sensitive data.

The system can also examine the content of responses for specific types of files that you do not want to be returned to users, such as Microsoft Office documents, PDFs, ELF binary files, Mach object files, or Windows portable executables. File content checking causes the system to examine responses for the file content types you select. You can configure the system to block sensitive file content (according to the blocking setting of the `DataGuard: Information Leakage Detected` violation).

Response headers that Data Guard inspects

Data Guard examines responses that have the following content-type headers:

- "text/..."
- "application/x-shockwave-flash"
- "application/sgml"
- "application/x-javascript"
- "application/xml"
- "application/x-asp"
- "application/x-aspx"
- "application/xhtml+xml"

You can configure one additional user-defined response content-type using the system variable `user_defined_accum_type`. If response logging is enabled, these responses can also be logged.

Protecting sensitive data

You can configure the system to protect sensitive data. If a web server response contains a credit card number, U.S. Social Security number, or pattern that matches a pattern, then the system responds based on the enforcement mode setting.

1. On the Main tab, click **Security** > **Application Security** > **Data Guard**.
   The Data Guard screen opens.

2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Select the **Data Guard** check box.
4. If you want the system to consider credit card numbers as sensitive data, select the **Credit Card Numbers** check box.
5. If you want the system to consider U.S. social security numbers (in the form `nnn-nn-nnnn`, where `n` is an integer) as sensitive data, select the **U.S. Social Security Numbers** check box.
6. To specify additional sensitive data patterns that occur in the application:
   a) Select the **Custom Patterns** check box.
   b) In the **New Pattern** field, type a PCRE regular expression to specify the sensitive data pattern, then click **Add**. For example, `999-[/d][/d]-[/d][/d][/d][/d]`.

      ***Tip:** You can validate the regular expression using the tool at **Security** > **Options** > **Application Security** > **RegExp Validator**.*

   c) Add as many custom patterns as needed for the application.
7. To specify data patterns not to consider sensitive:
   a) Select the **Exception Patterns** check box.
   b) In the **New Pattern** field, type a PCRE regular expression to specify the sensitive data pattern, then click **Add**.
   c) Add as many custom patterns as needed for the application.
8. If, in responses (when not blocked), you want the system to replace the sensitive data with asterisks (****), select the **Mask Data** check box.

   This setting is not relevant if blocking is enabled for the violation, because the system blocks responses containing sensitive data.
9. To review responses for specific file content (for example, to determine whether someone is trying to download a sensitive type of document):
   a) For the **File Content Detection** setting, select the **Check File Content** check box.
      The screen displays a list of available file types.
   b) Move the file types you want the system to consider sensitive from the **Available** list into the **Members** list.
10. To specify which URLs to examine for sensitive data, use the **Enforcement Mode** setting:

    - To inspect all URLs, use the default value of **Ignore URLs in list**, and do not add any URLs to the list.
    - To inspect all but a few specific URLs, use the default value of **Ignore URLs in list**, and add the exceptions to the list.
    - To inspect only specific URLs, select **Enforce URLs in list**, and add the URLs to check to the list.

    When adding URLs, you can type either explicit (`/index.html`) or wildcard (`*xyz.html`) URLs.
11. Click **Save** to save your settings.

When the system detects sensitive information in a response, it generates the `Data Guard: Information leakage detected` violation (if the violation is set to alarm or block). If the security policy enforcement mode is set to blocking and the violation is set to block, the system does not send the response to the client.

Masking Credit Card Numbers in Logs

Overview: Masking credit card numbers in logs

Application Security Manager™ (ASM) can mask credit card numbers in request logs. By default, when you create a security policy, the option to mask credit card numbers is enabled. Wherever credit card numbers appear in logs and violation details, they will be replaced by asterisks.

Keeping the **Mask Credit Card Numbers in Request Log** option enabled is required for PCI compliance. You must use this option in addition to Data Guard and masking sensitive parameters to comply with the Protect Stored Cardholder Data requirement. Data Guard masks sensitive information, such as credit card numbers and social security numbers, in responses.

Sensitive parameters can conceal sensitive information that is passed as parameters, such as credit card numbers. Making a parameter sensitive guarantees that its values are always masked in logs. Using sensitive parameters is good for form fields that are designated to contain sensitive data (like credit card numbers). But since a user can include credit card numbers in other places, enabling the **Mask Credit Card Numbers in Request Log** option looks for them anywhere in the request and masks them, providing an additional layer of security.

Masking credit card numbers in request logs

You can make sure that a security policy is set up to mask credit card numbers in logs and violations. This protects sensitive information, specifically credit card numbers, more securely.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Policy Properties**.
   The Policy Properties screen for the current edited policy opens.
2. Select the **Mask Credit Card Numbers in Request Log** check box if it is not already enabled.
3. Click **Save** to save your settings.

The system now looks for occurrences of credit card numbers in request logs, violations, suggestions, and reports and replaces them with asterisks.

Displaying Reports and Monitoring ASM

ASM Reporting Tools

You can use several reporting tools in Application Security Manager ™(ASM) to analyze incoming requests, track trends in violations, generate security reports, and evaluate possible attacks. The statistics and monitoring reporting tools are described in this table.

Reporting Tool	Description
Application security overview	Displays a summary of all configured security policies showing the active security policies, attacks that have occurred, anomaly statistics, and networking and traffic statistics. You can save the information or send it as an email attachment.
Requests summary	Summarizes the requested URLs for security policies.
Event correlation	Displays a list of incidents. Incidents aggregate illegal requests that are likely to be part of a suspected attack on the web application. Incidents separate false positive events from malicious activity and facilitate incident response. Incidents originate from a single source, either a Device ID, or, if not available, a Source IP. Incidents are triggered based on single or multiple correlation heuristics applied to illegal requests. Refer to the online help for details on how to view incidents: **Event Logs** > **Event Correlation**.
Charts	Displays graphical reports about security policy violations and provides tools that let you view the data by different criteria, drill down for more data, create customized reports, and send or export reports.
Charts scheduler	Allows you to periodically generate specific reports and distribute them using email.
DoS Attacks report	Displays graphic charts about DoS attacks, viewed by selected category, and includes the attack start and end times.
Brute Force Attacks report	Displays graphic charts about brute-force attacks, viewed by selected category, and includes the attack start and end times.
Web Scraping statistics	Displays graphic charts about web scraping attacks, viewed by selected category, and includes the attack start and end times.
Session Tracking status	Displays the users, sessions, and IP addresses that the system is currently tracking, and for which the system is taking action as a result of having triggered one of the violation detection thresholds.
PCI Compliance report	Displays a printable Payment Card Industry (PCI) compliance report for each security policy showing each security measure required for PCI-DSS 1.2, and compliance details.
CPU Utilization report	Displays the amount of the available CPU that the Application Security Manager uses over a period of time.

Displaying an application security overview report

To view data in the security overview, the system must be logging data internally. Some default logging profiles are already set up on the system but you may want to customize them.

The Application Security Manager™ (ASM) can display a security overview where you can quickly see what is happening on your system. The overview is configurable and can include statistics concerning attack types, violations, and anomalies, traffic summaries, transactions per second, throughput, and top requested URLs, IP addresses, and request types. You can also export the statistics into a PDF, and email them as an attachment.

1. On the Main tab, click **Security** > **Overview** > **Application** > **Traffic**.
   The Overview Traffic screen opens and summarizes ASM system activity at a glance.
2. If using device groups, from the **Device Group** list, select a device group to narrow down the statistics.
3. To change the default time frame for all widgets, select a time period from the **Override time range to** list.
4. From the **Security Policy** list, select a security policy to narrow down the statistics.

   By default, statistics for all active security policies are shown.
5. Review the summary statistics (organized into areas called *widgets*) to determine what is happening on the system.
6. If you want to create a new area of information customized to your specifications, at the bottom of the screen, click **Add Widget**.
   The Add New Widget popup screen opens.
7. Optionally, for each widget, you can adjust the time range, data measurements, and format of data to display from the **Time Period** list (Last Hour, Last Day, Last Week, Last Month, or Last Year) or the configuration gear settings.

   You can also delete any widget that you do not need on the screen.
8. To save the summary as a PDF file on your computer:
   a) Click the **Export** link.
   b) In the popup screen that opens, click **Export** again to save the file on your computer.
9. To send the report as an email attachment, click the **Export** link.

   ***Note:** To send email, you need to configure an SMTP server. If one is not configured, on the Main tab, click **System** > **Configuration** > **Device** > **SMTP**, and then click **Create** to configure one first.*

   a) Click **Send the report file via E-Mail as an attachment**.
   b) In the **Target E-Mail Address(es)** field, type the one or more email addresses (separated by commas or semi-colons).
   c) From the **SMTP Server** list, select the SMTP server.
   d) Click **Export**.

   The systems sends an email with the PDF to the specified addresses.

You can adjust the overview and create widgets for the information you are interested in.

Analyzing requests with violations

To review requests with violations, you need to have a security policy that is already handling traffic that is causing violations. If no violations have occurred, you will not see illegal requests listed in the Requests List.

In the Requests List event log, you can view details about a request, including viewing the violation rating, the full request itself, and any violations associated with it. You can also drill down to view detailed descriptions of the violations and potential attacks. When viewing details about an illegal request, if you decide that the request is trusted and you want to allow it, you can accept the violations shown for this specific request.

1. On the Main tab, click **Security** > **Event Logs** > **Application** > **Requests**.
   The Requests screen opens, where, by default, you view an event log displaying illegal requests for all security policies.
2. In the Requests List, click a request to view information about the request and any violations associated with it.
   The screen refreshes, showing the Request Details area, where you see any violations associated with the request and other details, such as the security policy it relates to, the support ID, the violation rating, and potential attacks that it could cause.
3. Use the Violation area elements to view details about a violation associated with an illegal request:
   - To view details about this specific violation such as the file type, the expected and actual length of the query, or similar relevant information, click the violation name.
   - To display a general description of that type of violation, click the info icon to the left of the violation name.
4. For violations that you want to allow (false positives), click the **Learn** button.

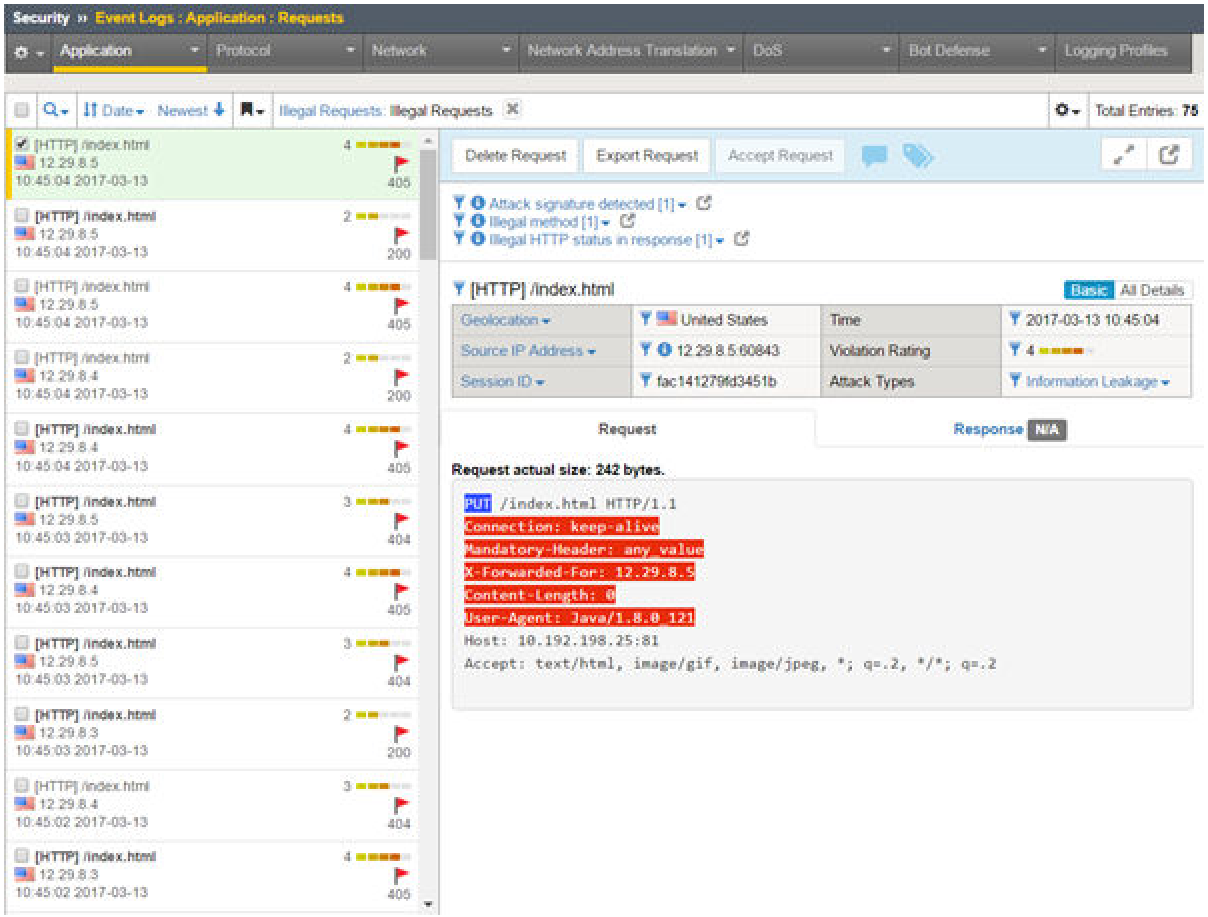
   Some violations cannot be learned; the **Learn** button is unavailable in this case.

   If there are learning suggestions, the violation’s learning screen opens, and you can accept or clear the suggestions one at a time.
5. To view the actual contents of the request, click **HTTP Request** or **HTTP Response**.
6. When you are done looking at the request details, click **Close**.

The Requests List provides information about a request such as: the request category, the time of the request, its violation rating, the source IP address of the request, the server response code, and the requested URL itself. Icons on each request line provide additional status information such as whether the request is legal or illegal, blocked, truncated, or has a response. By reviewing the request details, you can investigate whether it was an attack or a false positive.

How to view a request

To see if any violations have recently occurred, you can examine the Requests event log. It is a good idea to look for spikes and irregular behavior in the Requests log because these usually indicate suspicious activity. As shown in the following figure, you may see several illegal requests. The violation ratings (numbers from 1-5) indicate how likely a request is to be an attack (typically 4 or 5) or a false positive (often 1 or 2). In the figure, the first request has been selected and details appear on the right.



Request	Source IP	Time	Rating	Status
[HTTP] /index.html	12.29.8.5	10:45:04 2017-03-13	4	405
[HTTP] /index.html	12.29.8.5	10:45:04 2017-03-13	2	200
[HTTP] /index.html	12.29.8.5	10:45:04 2017-03-13	4	405
[HTTP] /index.html	12.29.8.4	10:45:04 2017-03-13	2	200
[HTTP] /index.html	12.29.8.4	10:45:04 2017-03-13	4	405
[HTTP] /index.html	12.29.8.5	10:45:03 2017-03-13	3	404
[HTTP] /index.html	12.29.8.4	10:45:03 2017-03-13	4	405
[HTTP] /index.html	12.29.8.5	10:45:03 2017-03-13	3	404
[HTTP] /index.html	12.29.8.3	10:45:03 2017-03-13	2	200
[HTTP] /index.html	12.29.8.4	10:45:02 2017-03-13	3	404
[HTTP] /index.html	12.29.8.3	10:45:02 2017-03-13	4	405

Attack signature detected [1]
Illegal method [1]
Illegal HTTP status in response [1]

[HTTP] /index.html

Geolocation	United States	Time	2017-03-13 10:45:04
Source IP Address	12.29.8.5:60843	Violation Rating	4
Session ID	fac141279fd3451b	Attack Types	Information Leakage

Request actual size: 242 bytes.

```
PUT /index.html HTTP/1.1
Connection: keep-alive
Mandatory-Header: any_value
X-Forwarded-For: 12.29.8.5
Content-Length: 0
User-Agent: Java/1.8.0_121
Host: 10.192.198.25:81
Accept: text/html, image/gif, image/jpeg, *; q=.2, */*; q=.2
```

Figure 8: Sample Requests event log

Generating PCI Compliance reports

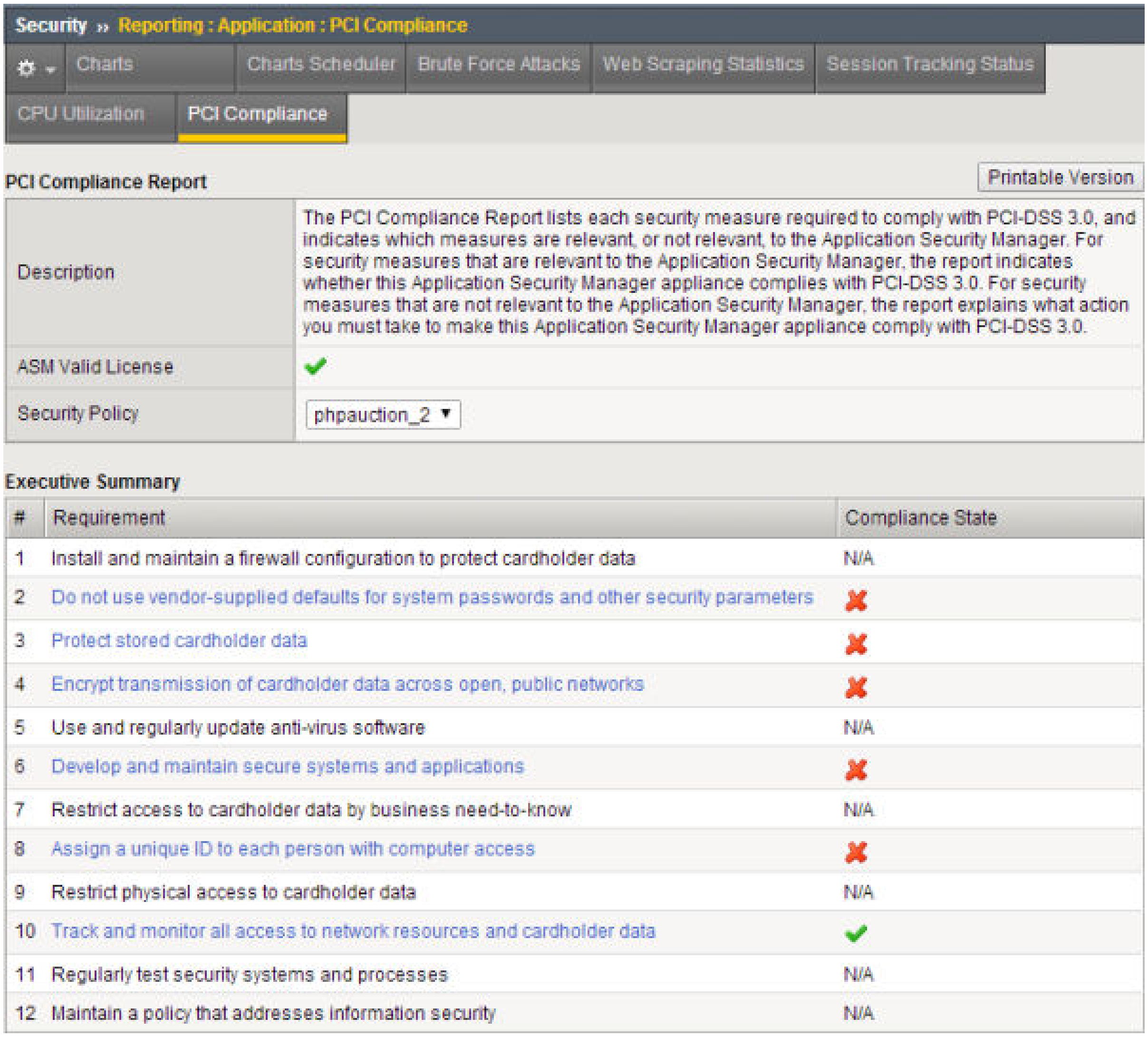
A PCI Compliance report displays details on how closely the security policy of a web application meets Payment Card Industry (PCI) security standards, PCI-DSS 3.0. You can create printable versions of PCI compliance reports for each web application to assure auditors that the BIG-IP® system and your web applications are secure.

1. On the Main tab, click **Security** > **Reporting** > **Application** > **PCI Compliance**.
   The PCI Compliance screen opens showing a compliance report for the current security policy.
2. To learn more about items that are PCI compliant (items with a green check mark), those which are partially compliant, or those which are not PCI compliant (items with a red X), click the item link in the Requirement column.
   The screen shows information about how to make an item PCI-compliant.
3. Optionally, in the Details list, you can click a hyperlink (blue text) to go directly to the screen where you can adjust the non-compliant settings.
4. To create a PDF version of the report that you can save, open, or print, click **Printable Version**.
5. To display a PCI compliance report for a different security policy, in the PCI Compliance Report area, from the **Security Policy** list, select a different policy name.
   A PCI compliance report for the selected policy opens.

The PCI Compliance report lists the security measures that are required to comply with PCI standards. The report indicates which requirements Application Security Manager™ can help enforce, and allows you to view details about what to configure differently to meet compliance standards.

Sample PCI Compliance report

This sample PCI Compliance report examines the security policy called **phpauction_2**. It shows five requirements that do not comply with PCI-DSS 3.0 (marked with red Xs). Application Security Manager™ has settings that support bringing these requirements into compliance.



PCI Compliance Report

Description	The PCI Compliance Report lists each security measure required to comply with PCI-DSS 3.0, and indicates which measures are relevant, or not relevant, to the Application Security Manager. For security measures that are relevant to the Application Security Manager, the report indicates whether this Application Security Manager appliance complies with PCI-DSS 3.0. For security measures that are not relevant to the Application Security Manager, the report explains what action you must take to make this Application Security Manager appliance comply with PCI-DSS 3.0.
ASM Valid License	✓
Security Policy	phpauction_2 ▼

Executive Summary

#	Requirement	Compliance State
1	Install and maintain a firewall configuration to protect cardholder data	N/A
2	Do not use vendor-supplied defaults for system passwords and other security parameters	✗
3	Protect stored cardholder data	✗
4	Encrypt transmission of cardholder data across open, public networks	✗
5	Use and regularly update anti-virus software	N/A
6	Develop and maintain secure systems and applications	✗
7	Restrict access to cardholder data by business need-to-know	N/A
8	Assign a unique ID to each person with computer access	✗
9	Restrict physical access to cardholder data	N/A
10	Track and monitor all access to network resources and cardholder data	✓
11	Regularly test security systems and processes	N/A
12	Maintain a policy that addresses information security	N/A

Figure 9: Sample PCI Compliance report

Logging Application Security Events

About logging profiles

Logging profiles determine where events are logged, and which items (such as which parts of requests, or which type of errors) are logged. Events can be logged either locally on the system and viewed in the Event Logs, or remotely by the client's server. The system forwards the log messages to the client's server using the Syslog service. Each logging profile can specify local or remote logging, but not both.

You can use one logging profile for Application Security, Protocol Security, Network Firewall, DoS Protection and Bot Defense. The system includes two logging profiles that log data locally for Application Security: one to log all requests and another to log illegal requests. Other logging profiles are included for global-network and local-dos. You can use the system-supplied logging profiles, or you can create a custom logging profile. The system-supplied logging profiles cannot be edited.

The logging profile records requests to the virtual server. By default, when you create a security policy, the system associates the log illegal requests profile to the virtual server associated with the policy. You can change which logging profile is associated with the security policy by editing the virtual server.

***Note:** If running Application Security Manager™ on a BIG-IP® system using Virtualized Clustered Multiprocessing (vCMP), for best performance, F5 recommends configuring remote logging to store Application Security Manager logs remotely rather than locally.*

A logging profile has two parts: the storage configuration and the storage filter. The storage configuration specifies where to store the logs, either locally or remotely. The storage filter determines what information is stored. For remote logging, you can send logging files for storage on a remote system (in CSV format), on a reporting server (as key/value pairs), or on an ArcSight server (in CEF format). Note that configuring external logging servers is not handled by F5 Networks.

How to use multiple logging profiles

You can assign multiple logging profiles to one virtual server. Here are some examples of how to use multiple logging profiles:

Log Illegal Requests locally, All requests remotely

You can log all requests locally using just one logging profile. But you can save resources by logging illegal requests locally and logging all requests remotely. You would create two logging profiles:

- Local storage with illegal requests
- Remote storage of all requests

Multiple SIEM Systems

If your company uses multiple security information and event management (SIEM) systems to collect logs and other security related information (for example, Splunk and ArcSight), you could set up three logging profiles.

- Local storage with illegal requests
- Remote filter in Splunk format (user-defined format with Splunk field names).
- Remote filter in Arcsight format (user-defined format with ArcSight field names)

Creating a logging profile for local storage

You can create a custom logging profile to log application security events locally on the BIG-IP® system.

1. On the Main tab, click **Security** > **Event Logs** > **Logging Profiles**.
   The Logging Profiles list screen opens.
2. Click **Create**.
   The Create New Logging Profile screen opens.
3. In the **Profile Name** field, type a unique name for the profile.
4. Select the **Application Security** check box.
   The screen displays additional fields.
5. On the Application Security tab, for **Configuration**, select **Advanced**.
6. In the **Storage Destination** list, be sure that **Local Storage** is selected.
7. Optional: To ensure that the system logs requests for the security policy, even when the logging utility is competing for system resources, select the **Guarantee Local Logging** check box.
8. From the **Response Logging** list, select one of the following options.

Option	Description
Off	Do not log responses.
For Illegal Requests Only	Log responses for illegal requests.
For All Requests	Log responses for all requests. Used when the Storage Filter **Request Type** is set to **All Requests**. (Otherwise, logs only illegal requests.)

   By default, the system logs the first 10000 bytes of responses, up to 10 responses per second. You can change the limits by using the response logging system variables.
9. To further specify the types of requests that the system or server logs, set up the Storage Filter. From the **Request Type** list, select one of the following options.

Option	Description
Illegal requests only	Log illegal requests only.
Illegal requests, and requests that include staged attack signatures	Log illegal requests and requests that trigger attack signatures in staging (even though those requests are allowed).
All requests	Log all requests.

   To further filter what gets logged, use the Advanced storage filter options.
10. Click **Finished**.

When you store the logs locally, the logging utility may compete for system resources. Using the **Guarantee Local Logging** setting ensures that the system logs the requests in this situation, but may result in a performance reduction in high-volume traffic applications.

After creating the logging profile, you need to associate it with the virtual server used by the security policy. You can associate only one local logging profile with the virtual server.

Setting up remote logging

To set up remote logging for Application Security Manager™, you need to have created a logging profile with Application Security enabled.

You can configure a custom logging profile to log application security events remotely on syslog or other reporting servers.

1. On the Main tab, click **Security** > **Event Logs** > **Logging Profiles**.
   The Logging Profiles list screen opens.
2. Click **Create**.
   The Create New Logging Profile screen opens.
3. In the **Profile Name** field, type a unique name for the profile.
4. Select the **Application Security** check box.
   The screen displays additional fields.
5. On the Application Security tab, for **Configuration**, select **Advanced**.
6. From the **Storage Destination** list, select **Remote Storage**.
   Additional fields related to remote logging are displayed.
7. From the **Logging Format** list, select the appropriate type:
   - To store traffic on a remote logging server in CSV format, select **Comma Separated Values**.
   - To store traffic on a reporting server (such as Splunk) using a preconfigured storage format with key-value pairs in the log messages, select **Key-Value Pairs**.
   - If your network uses ArcSight logs, select **Common Event Format (ArcSight)**. Log messages are in Common Event Format (CEF).
   - To store logs on the BIG-IQ system, select **BIG-IQ**.
8. For the **Protocol** setting, select the protocol that the remote storage server uses: **TCP** (the default setting), **TCP-RFC3195**, or **UDP**.
9. For **Server Addresses**, specify one or more remote servers, reporting servers, or ArcSight servers on which to log traffic. Type the **IP Address**, **Port** (default is `514`), and click **Add**.
10. If using the **Comma-Separated Values** logging format, for **Facility**, you can optionally select the facility category of the logged traffic. The possible values are **LOG_LOCAL0** through **LOG_LOCAL7**.

    Tip: *If you have more than one security policy you can use the same remote logging server for both applications, and use the facility filter to sort the data for each.*

11. If you are using the **Comma-Separated Values** logging format, in the **Storage Format** setting, you can specify how the log displays information, which traffic items the server logs, and what order it logs them:
    a) To determine how the log appears, select **Field-List** to display the items in the **Selected Items** list in CSV format with a delimiter you specify; select **User-Defined** to display the items in the **Selected Items** list in addition to any free text you type in the **Selected Items** list.
    b) To specify which items appear in the log, move items from the **Available Items** list into the **Selected Items** list.
    c) To control the order in which predefined items appear in the server logs, select an item in the **Selected Items** list, and click the **Up** or **Down** button.
12. If you want the system to send a report string to the remote system log when a brute force attack or web scraping attack starts and ends, select **Report Detected Anomalies**.
13. To further specify the types of requests that the system or server logs, set up the Storage Filter. From the **Request Type** list, select one of the following options.

Option	Description
Illegal requests only	Log illegal requests only.
Illegal requests, and requests that include staged attack signatures	Log illegal requests and requests that trigger attack signatures in staging (even though those requests are allowed).
All requests	Log all requests.

To further filter what gets logged, use the Advanced storage filter options.

14. Click **Finished**.

When you create a logging profile for remote storage, the system stores the data for the associated security policy on one or more remote systems.

Next, you need to associate the logging profile with the virtual server used by the security policy.

Associating a logging profile with a security policy

A logging profile determines where events are logged and what details are included. By default, when you create a security policy, the system associates the Log Illegal Requests profile with the virtual server used by the policy. You can change which logging profile is associated with the security policy or assign a new one to the virtual server.

1. Click **Local Traffic** > **Virtual Servers**
2. Click the name of the virtual server used by the security policy.
   The system displays the general properties of the virtual server.
3. From the Security menu, choose Policies.
   The system displays the policy settings for the virtual server.
4. Ensure that the **Application Security Policy** setting is **Enabled**, and that **Policy** is set to the security policy you want.
5. For the **Log Profile** setting:
   a) Check that it is set to **Enabled**.
   b) From the **Available** list, select the profile to use for the security policy, and move it into the **Selected** list.

   You can assign only one local logging profile to a virtual server, but it can have multiple remote logging profiles.
6. Click **Update**.

Information related to traffic controlled by the security policy is logged using the logging profile or profiles specified in the virtual server.

About logging responses

If you enable response logging in the logging profile, the system can log only responses that include the following content headers:

- "text/..."
- "application/x-shockwave-flash"
- "application/sgml"
- "application/x-javascript"
- "application/xml"
- "application/x-asp"

- "application/x-aspx"
- "application/xhtml+xml"
- "application/soap+xml"
- "application/json"

The system cannot log other responses.

About ArcSight log message format

If your network uses ArcSight logs, you can create a logging profile so that the log information is saved using the appropriate format. Application Security Manager stores all logs on a remote logging server using the predefined ArcSight settings for the logs. The log messages are in Common Event Format (CEF).

The basic format is:

```
CEF:Version|Device Vendor|Device Product|Device Version
   |Device Event Class ID|Name|Severity|Extension
```

About syslog request format

Application Security Manager™ can log security events to the `/var/log/asm` file on the system if you need to. Logging to this file is off by default. You can turn the logging on using the `send_content_events` system variable from the command line, or on the System Variables screen: **Security** > **Options** > **Application Security** > **Advanced Configuration** > **System Variables**.

Note: *F5 recommends enabling the* `send_content_events` *parameter only for troubleshooting purposes due to a potential decrease in performance.*

Here is the format of the syslog request followed by descriptions of the fields:

```
<Rejection Description> <Request Violation> <Support ID> <Source IP>
<XFF IP> <Source Port> <Destination IP> <Destination Port> <Route Domain>
<HTTP Classifier> <Scheme> <Geographic Location> <Request> <Username>
<Session ID> <Violation Rating>
```

Field	What it contains
Rejection Description	Empty unless the request is blocked by the security policy.
Request Violations	A comma separated list of the violations that occurred during enforcement of the request or response.
Support ID	An ID number assigned to the request by the system to allow the system administrator to track it.
Source IP	The IP address from which the request originated.
XFF IP	The X-Forwarded-For (XFF) IP address located in the XFF header and which represents the end client's IP address.
Source Port	The port from which the request originated.
Destination IP	The IP address to which the request is sent, generally, the virtual server IP address.
Destination Port	The port to which the request is sent.
Route Domain	The route domain (network traffic segment) where the request originated.

Field	What it contains
HTTP Classifier	The name of the ASM security policy.
Scheme	Whether the request was made using HTTP or HTTPS.
Geographic Location	The two-letter country code of origin based on the source IP address.
Request	The actual request made including headers (up to 128 bytes).
Username	Name of the user associated with the request.
Session ID	ID number assigned to the request to allow the system administrator to track requests by session.
Violation Rating	Rating between 1 and 5 that ranks the severity of any violations associated with the request. 1 is most likely a false positive and 5 is most likely an attack.

Filtering logging information

The storage filter of an application security logging profile determines the type of requests the system or server logs. You can create a custom storage filter for a logging profile so that the event logs include the exact information you want to see.

1. On the Main tab, click **Security** > **Event Logs** > **Logging Profiles**.
   The Logging Profiles list screen opens.
2. In the Profile Name column, click the logging profile name for which you want to set up the filter.

   Note: *This profile must be one that you created and not one of the system-supplied profiles, which cannot be edited.*

   The Edit Logging Profile screen opens.
3. From the **Storage Filter** list, select **Advanced**.
   The screen displays additional settings.
4. For the **Logic Operation** setting, specify the filter criteria to use.

Option	Description
OR	Select this operator to log the data that meets one or more of the criteria.
AND	Select this operator to log the data that meets all of the criteria.

5. For the **Request Type** setting, select the requests that you want the system to store in the log, **All Requests** or **Illegal Requests Only**.
6. For the **Protocols** setting, select whether logging occurs for both HTTP and HTTPS protocols or a specific protocol.
7. For the **Response Status Codes** setting, select whether logging occurs for all response status codes or only for specific ones.
8. For the **HTTP Methods** setting, select whether logging occurs for all methods or only for specific ones.
9. For the **Request Containing String** setting, select whether the request logging is for any string or dependent on a specific string that you specify.
10. Click **Update**.

The system logs application security data that meets the criteria specified in the storage filter.

Viewing application security logs

You can view locally stored system logs for the Application Security Manager™ on the BIG-IP® system. These are the logs that include general system events and user activity.

Tip: *If you prefer to review the log data from the command line, you can find the application security log data in the* `/var/log/asm` *file.*

1. Click **System** > **Logs**
2. Click **Application Security**.

The system displays application security data that meets the criteria specified in the logging profile.

Preventing Session Hijacking and Tracking User Sessions

Overview: Preventing session hijacking

Session hijacking, also called *cookie hijacking*, is the exploitation of a valid computer session to gain unauthorized access to an application. The attacker steals (or hijacks) the cookies from a valid user and attempts to use them for authentication. Application Security Manager™ (ASM™) can prevent session hijacking by tracking clients with a device ID. The *device ID* is a unique identifier that ASM creates by sending JavaScript to get information about the client device. If the client browser does not accept JavaScript, the client receives a message saying to enable JavaScript to view the page content. Clients that do not accept JavaScript are stopped even when the security policy is in transparent mode.

ASM stores the device ID along with other client data (including the message key or session ID) in a cookie that remains with the client for the length of the HTTP session. The system periodically checks that the device ID of the client is the same one that was assigned when the session started.

If the device ID or message key changes during the session or the session timed out, the system considers that to be an attack and issues an ASM cookie hijacking violation. It looks like an attacker has stolen cookies from a legitimate user and is trying to gain illegal access. Note that the ASM cookie hijacking violation only occurs if you enabled the Learn, Alarm, or Block settings for the violation.

You set up session hijacking along with session tracking. However, you do not have to track user sessions to set up hijacking prevention.

Task Summary

Preventing session hijacking

You can use Application Security Manager™ to prevent session hijacking by tracking the device ID and session ID of each user.

***Note:** To use device ID for tracking, client browsers accessing your web site must be able to accept JavaScript, or they will be blocked even when working in transparent mode.*

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins** > **Session Tracking**. The Session Tracking screen opens.
2. In the Session Hijacking area, for **Detect Session Hijacking by Device ID Tracking**, select the **Enabled** check box.

   ***Note:** When you are using device ID to track traffic, make sure that the **Accept XFF** setting is enabled in the HTTP profile that is assigned to the virtual server.*
3. Click **Save** to save your settings.
4. To set the blocking modes for the hijacking violation, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   a) In the General Settings, set the **Enforcement Mode** to **Blocking**.

      This setting blocks all requests that cause violations, and which are set to block.
   b) In the Policy Building Settings, expand Cookies, and for the `ASM Cookie Hijacking` violation, select **Learn**, **Alarm**, and **Block**.
   c) Click **Save**.

5. To put the security policy changes into effect immediately, click **Apply Policy**.

Any client that does not accept JavaScript is now prevented from reaching the web site. If the system detects session hijacking, it issues the `ASM Cookie Hijacking` violation. The event log includes a description of why it happened:

- `Message key mismatch between cookies`
- `Device ID mismatch`
- `Device ID mismatch and message key mismatch between cookies`

Because the security policy enforcement mode is set to blocking, the request is blocked and the client receives the cookie hijacking response page. By default, ASM erases the cookies for the session, and redirects the client to the login page. If the client is legitimate, the login should be successful. Attackers that had attempted to hijack the session are blocked.

Configuring the response to cookie hijacking

You can configure the blocking response that the system sends in response to a session (or cookie) hijacking attempt.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Response Pages**.
   The Response Pages screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Cookie Hijacking Response Page**.
4. For the **Response Type** setting, select **Erase Cookies**.

   You can use other options such as the **Default Response** page, **Custom Response** page, or **SOAP Fault**. But **Erase Cookies** is the recommended and default response to cookie hijacking.

   The system deletes client side domain cookies to block the application user.
5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If the enforcement mode is blocking and a session hijacking attempt is blocked, the system erases the browser cookies, and displays the cookie hijacking response page.

Overview: Tracking user sessions using login pages

You can track user sessions using login pages configured from within Application Security Manager™ (ASM™), or have the policy retrieve the user names from Access Policy Manager®(APM®). This implementation describes how to set up session tracking for a security policy using login pages. The advantage of using session tracking is that you are able to identify the user, session, device ID, or IP address an attack.

Login pages, created manually or automatically, define the URLs, parameters, and validation criteria required for users to log in to the application. User and session information is included in the system logs so you can track a particular session or user. The system can log activity, or block a user or session if either generates too many violations.

If you configure session awareness, you can view the user and session information in the application security charts.

Task Summary

Creating login pages automatically

Login pages specify a login URL that presents a site that users must pass through to gain access to the web application. Your existing security policy can detect and create login pages automatically if you use certain options.

***Note:** If you are creating a security policy automatically and selected **Comprehensive** as the policy template, the default options are already set to create login pages automatically. If you are using the **Fundamental** policy template, the steps here explain the options to configure ASM™ to automatically detect and create login pages for your application.*

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. Ensure that the **Learning Mode** is set to **Automatic**.
   The system examines the traffic to the web application, and after processing sufficient legitimate traffic, the system builds the security policy automatically by adding and enforcing elements with minimal manual intervention. A few learning suggestions require your review before they are added.
3. In the Policy Building Settings area, expand **Sessions and Logins** and ensure that **Detect login pages** is selected.

   This setting must be selected if you want to automatically detect login pages.
4. In the Policy Building Process area, expand **Options** and ensure that **Learn from responses** is selected.
5. Click **Save** to save your settings.
6. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy looks for login pages by examining traffic to the web application. When a login page is found, the Policy Builder suggests adding the login form to the security policy. Because the suggestion is learned from responses and responses are considered trusted, if the **Learning Mode** is **Automatic**, the login page is typically added to the policy right away.

If the **Learning Mode** is **Manual**, the login page is added to the learning suggestions on the Traffic Learning screen where you can add it to the policy. The login pages in the security policy are included in the Login Pages List.

You can use the login pages for login enforcement, brute force protection, or session awareness.

Creating login pages manually

Before you can create a login page manually, you need to be familiar with the login URL or URLs the application the security policy is protecting.

In your security policy, you can create a login page manually to specify a login URL that presents a site that users must pass through to gain access to the web application. The login URL commonly leads to the login page of the web application.

***Note:** You can also have the system create login pages automatically by selecting **Detect login pages** on the Learning and Blocking Settings screen.*

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins**.
   The Login Pages List screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.

3. Click **Create**.
   The New Login Page screen opens.
4. For the **Login URL** setting, specify a URL that users must pass through to get to the application.
   a) From the list, select the type of URL: **Explicit** or **Wildcard**.
   b) Select either **HTTP** or **HTTPS** based on the type of traffic the web application accepts.
   c) Type an explicit URL or wildcard expression in the field.

   When you click in the field, the system lists URLs that it has seen, and you can select a URL from the list. Or, you can type explicit URLs in the format `/login`, and wildcard URLs without the slash, such as `*.php`.

   Wildcard syntax is based on shell-style wildcard characters. This table lists the wildcard characters that you can use so that the entity name can match multiple objects.

Wildcard Character	Matches
*	All characters
?	Any single character.
[abcde]	Exactly one of the characters listed.
[!abcde]	Any character not listed.
[a-e]	Exactly one character in the range.
[!a-e}	Any character not in the range.

   Note that wildcards do not match regular expressions.
5. From the **Authentication Type** list, select the method the web server uses to authenticate the login URL's credentials with a web user.

Option	Description
None	The web server does not authenticate users trying to access the web application through the login URL. This is the default setting.
HTML Form	The web application uses a form to collect and authenticate user credentials. If using this option, you also need to type the user name and password parameters written in the code of the HTML form.
HTTP Basic Authentication	The user name and password are transmitted in Base64 and stored on the server in plain text.
HTTP Digest Authentication	The web server performs the authentication; user names and passwords are not transmitted over the network, nor are they stored in plain text.
NTLM	Microsoft LAN Manager authentication (also called Integrated Windows Authentication) does not transmit credentials in plain text, but requires a continuous TCP connection between the server and client.
JSON/AJAX Request	The web server uses JSON and AJAX requests to authenticate users trying to access the web application through the login URL. For this option, you also need to type the name of the JSON element containing the user name and password.

6. In the Access Validation area, define at least one validation criteria for the login page response.

   If you define more than one validation criteria, the response must meet all the criteria before the system allows the user to access the application login URL.

Note: The system checks the access validation criteria on the response of the login URL only if the response has one of the following content-types: text/html, text/xml, application/sgml, application/xml, application/html, application/xhtml, application/x-asp, or application/x-aspx.

7. Click **Create** to add the login page to the security policy.
   The new login page is added to the login pages list.
8. Add as many login pages as needed for your web application.
9. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy now has one or more login pages associated with it. They are included in the Login Pages List.

You can use the login pages you created for login enforcement, brute force protection, or session awareness.

Setting up session tracking

You can use session tracking to track, enforce, and report on user sessions, device IDs, and IP addresses. To perform tracking, you enable session awareness and indicate how to associate the application user name with the session. You can also determine whether to track violations and perform logging or blocking actions based on the number of violations per user, session, and IP address.

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins** > **Session Tracking**.
   The Session Tracking screen opens.
2. In the Session Tracking Configuration area, select the **Session Awareness** check box.
3. From the **Application Username** list, select **Use All Login Pages** to track login sessions for all of the login pages in the security policy.
4. In the Violation Detection Actions area, select the **Track Violations and Perform Actions** check box.
5. In the **Violation Detection Period** field, type the number of seconds that indicates the sliding time period to count violations for violation thresholds.

   The default is `900` seconds.
6. If you want the system to block all activity for a user, session, device ID, or IP address when the number of violations exceeds the threshold within the violation detection period, specify one or more of the following settings on the Block All tab.

Option	Description
Blocked URLs	Specify which URLs to block after the number of violations exceeds the enabled thresholds. To block all URLs, select **Block all URLs**. To block authenticated URLs protected by login pages, select **Block Authenticated URLs**.
Username Threshold	Select **Enable** and specify the number of violations allowed before the system starts to block this user's activity.
Session Threshold	Select **Enable** and specify the number of violations allowed before the system starts to block activity for this HTTP session.
Device ID Threshold	Select **Enable** and specify the number of violations allowed per device ID before the system starts to block activity for this device.
IP Address Threshold	Select **Enable** and specify the number of violations allowed before the system starts to block the activity for this IP address.
Block All Period	Specify how long to block users, sessions, or IP addresses if the number of violations exceeds the threshold. To block the user, session, or IP address

Option	Description
	indefinitely, click **Infinite**. Otherwise, click **User-defined** and type the number of seconds to block the traffic. The default is `600` seconds.

__Note:__ For the system to block requests, the security policy Enforcement Mode must be set to blocking and some violations must be set to block.

7. If you want the system to log activity when the number of violations for user, session, device ID, or IP address, exceeds the threshold during the violation detection period, specify one or more of the following settings on the Log All Requests tab.

Option	Description
Username Threshold	Select **Enable** and specify the number of violations allowed before the system starts logging this user's activity for the log all requests period.
Session Threshold	Select **Enable** and specify the number of violations allowed before the system starts logging activity for this HTTP session for the log all requests period.
Device ID Threshold	Select **Enable** and specify the number of violations allowed before the system starts to log requests for this device.
IP Address Threshold	Select **Enable** and specify the number of violations allowed before the system starts logging the activity of this IP address for the log all requests period.
Log All Requests Period	Specify how long the system should log all requests when any of the enabled thresholds is reached. Type the number of seconds in the field.

8. If you want more tolerant blocking for selected violations, such as those prone to false positives, specify one or more of the following settings on the Delay Blocking tab.

Option	Description
Username Threshold	Select **Enable** and specify the number of violations a user must cause before the system begins blocking this user for the delay blocking period.
Session Threshold	Select **Enable** and specify the number of violations users must cause (during the violation detection period) before the system begins blocking this HTTP session for the delay blocking period.
Device ID Threshold	Select **Enable** and specify the number of violations allowed per device ID before the system starts to block illegal requests from the device.
IP Address Threshold	Select **Enable** and specify the number of violations allowed before the system begins blocking this IP address for the delay blocking period.
Delay Blocking Period	Type the number of seconds that the system should block the user, session, or IP address when any of the enabled thresholds is reached.
Associated Violations	Move the violations for which you want delay blocking from the **Available** list into the **Selected** list. If the selected violations occur, the system does not block traffic until one of the enabled thresholds is reached. At that point, the system blocks traffic causing those violations for the user, session, or IP address, but allows other transactions to pass.

__Note:__ For the system to block requests, the security policy Enforcement Mode must be set to blocking and some violations must be set to block.

9. Click **Save** to save your settings.

After you set up session tracking, if any enabled threshold exceeds the number of violations during the detection period, the system starts the configured actions (block all, log all requests, or delay blocking).

Monitoring user and session information

To monitor user and session information, you first need to set up session tracking for the security policy.

You can use the reporting tools in Application Security Manager™ to monitor user and session details, especially when you need to investigate suspicious activity that is occurring with certain users, sessions, or IP addresses.

1. On the Main tab, click **SecurityReporting ApplicationSession Tracking Status**.
   The Session Tracking Status screen opens and shows the users, sessions, and IP addresses that the system is currently tracking for this security policy.
2. From the **Action** list, select the action by which to filter the data.

Action	Description
All	Specifies that the screen displays all entries. This is the default value.
Block All	Specifies that the system displays sessions whose requests the system blocks after the configured threshold was reached.
Log All Requests	Specifies that the system displays sessions whose requests the system logs after the configured threshold was reached.
Delay Blocking	Specifies that the system displays sessions whose requests the system delayed blocking until the configured threshold was reached.

3. From the **Scope** list, specify the scope (username, session, or IP address) by which to filter the data.

Option	Description
Alt	Specifies that the screen displays all entries. This is the default value.
Username	Specifies that the system displays usernames whose illegal requests exceeded the security policy’s threshold values.
Session	Specifies that the system displays identification numbers of illegal sessions that exceeded the security policy’s threshold values.
IP Address	Specifies that the system displays IP addresses where illegal requests from these IP addresses exceeded the security policy’s threshold values.
Device ID	Specifies that the system displays device IDs where illegal requests from these devices exceeded the security policy’s threshold values.

4. If you want to filter the information by value, in the **Value** field, type the username, session identification number, IP address, device ID, or string. If empty, the screen displays all entries.
5. When you finish specifying the filter details, click **Go**.
   The Session Tracking Status list now shows the information specified in the Filter setting.

After you set up session tracking, you can monitor the specific requests that cause violations by examining each request and reviewing graphical charts.

Tracking specific user and session information

To monitor user and session information, you first need to set up session tracking for the security policy.

You can configure Application Security Manager™ to log, block, or delay blocking requests from a specific username, session, or source IP address.

1. On the Main tab, click **Security** > **Reporting** > **Application** > **Session Tracking Status**.
   The Session Tracking Status screen opens and shows the users, sessions, and IP addresses that the system is currently tracking for this security policy.

2. Next to the Session Tracking Status list, click **Add**.
   The Add Session to Tracking screen opens.
3. From the **Action** list, select the action that the system will take if it detects the specified username, session, or IP address.

Action	Description
Block All	Specifies that the system blocks all requests from a specific username, session ID, IP address, or device ID for the configured period of time.
Log All Requests	Specifies that the system blocks all requests from a specific username, session ID, IP address, or device ID for the configured period of time.
Delay Blocking	Specifies that the system will delay blocking the associated violations from a specific username, session ID, IP address, or device ID until the threshold is reached; then they will be blocked for the configured period of time.

4. From the **Scope** list, specify whether the system is tracking a specific Username (the default value), Session, IP Address, or device ID.
5. In the **Value** field, type the unique username, session identification number, or IP address that you want to track, based on what you selected in the **Scope** option.
6. Click **Add**.
   The system adds the entry to the Session Tracking list and immediately begins to enforce it.

If the system detects the specific username, session, or IP address, it takes that action you configured for it.

Overview: Tracking application security sessions using APM

You can track sessions using login pages configured from within Application Security Manager™ (ASM™), or have the policy retrieve the user names from Access Policy Manager® (APM®). This implementation describes how to set up session tracking for a security policy using APM to verify user credentials. Then, you can set up session awareness from within ASM to identify the user, session, or IP address that instigated an attack.

If you configure session tracking, you can view the user and session information in the application security charts.

Prerequisites for setting up session tracking with APM

In order to set up session tracking from within Application Security Manager™ (ASM™) so that the security policy retrieves the user names from Access Policy Manager ® (APM®), you need to perform basic these system configuration tasks according to the needs of your networking configuration:

- Run the setup utility and create a management IP address.
- License and provision ASM, APM, and Local Traffic Manager™ (LTM®).
- Configure a DNS address (**System** > **Configuration** > **Device** > **DNS**).
- Configure an NTP server (**System** > **Configuration** > **Device** > **NTP**).
- Restart ASM (at the command line, type `tmsh restart /sys service asm`).

Task summary

Use the following tasks to set up application security session tracking with APM authentication integrated.

Creating a VLAN

VLANs represent a logical collection of hosts that can share network resources, regardless of their physical location on the network. You create a VLAN to associate physical interfaces with that VLAN.

1. On the Main tab, click **Network** > **VLANs**.
   The VLAN List screen opens.
2. Click **Create**.
   The New VLAN screen opens.
3. In the **Name** field, type a unique name for the VLAN.
4. In the **Tag** field, type a numeric tag, between 1-4094, for the VLAN, or leave the field blank if you want the BIG-IP system to automatically assign a VLAN tag.

   The VLAN tag identifies the traffic from hosts in the associated VLAN.
5. If you want to use Q-in-Q (double) tagging, use the **Customer Tag** setting to perform the following two steps. If you do not see the **Customer Tag** setting, your hardware platform does not support Q-in-Q tagging and you can skip this step.
   a) From the **Customer Tag** list, select **Specify**.
   b) Type a numeric tag, from 1-4094, for the VLAN.

   The customer tag specifies the inner tag of any frame passing through the VLAN.
6. For the **Interfaces** setting,
   a) From the **Interface** list, select an interface number.
   b) From the **Tagging** list, select **Untagged**.
   c) Click **Add**.
7. For the **Hardware SYN Cookie** setting, select or clear the check box.

   When you enable this setting, the BIG-IP system triggers hardware SYN cookie protection for this VLAN.

   Enabling this setting causes additional settings to appear. These settings appear on specific BIG-IP platforms only.
8. For the **Syncache Threshold** setting, retain the default value or change it to suit your needs.

   The **Syncache Threshold** value represents the number of outstanding SYN flood packets on the VLAN that will trigger the hardware SYN cookie protection feature.

   When the **Hardware SYN Cookie** setting is enabled, the BIG-IP system triggers SYN cookie protection in either of these cases, whichever occurs first:

   - The number of TCP half-open connections defined in the LTM® setting **Global SYN Check Threshold** is reached.
   - The number of SYN flood packets defined in this **Syncache Threshold** setting is reached.
9. For the **SYN Flood Rate Limit** setting, retain the default value or change it to suit your needs.

   The **SYN Flood Rate Limit** value represents the maximum number of SYN flood packets per second received on this VLAN before the BIG-IP system triggers hardware SYN cookie protection for the VLAN.
10. Click **Finished**.
    The screen refreshes, and displays the new VLAN in the list.

Creating a self IP address for a VLAN

Ensure that you have at least one VLAN configured before you create a self IP address.

Self IP addresses enable the BIG-IP® system, and other devices on the network, to route application traffic through the associated VLAN.

1. On the Main tab, click **Network** > **Self IPs**.
2. Click **Create**.
   The New Self IP screen opens.
3. In the **Name** field, type a unique name for the self IP address.
4. In the **IP Address** field, type an IPv4 or IPv6 address.

   This IP address should represent the address space of the VLAN that you specify with the **VLAN/ Tunnel** setting.
5. In the **Netmask** field, type the network mask for the specified IP address.

   For example, you can type `255.255.255.0`.
6. From the **VLAN/Tunnel** list, select the VLAN to associate with this self IP address.
   - On the internal network, select the internal or high availability VLAN that is associated with an internal interface or trunk.
   - On the external network, select the external VLAN that is associated with an external interface or trunk.
7. Use the default values for all remaining settings.
8. Click **Finished**.
   The screen refreshes, and displays the new self IP address.

The BIG-IP system can now send and receive TCP/IP traffic through the specified VLAN.

Creating a local traffic pool for application security

You can use a local traffic pool with Application Security Manager™ system to forward traffic to the appropriate resources.

Note: *Instead of doing it now, you can optionally create a pool if creating a virtual server during security policy creation.*

1. On the Main tab, click **Local Traffic** > **Pools**.
   The Pool List screen opens.
2. Click **Create**.
   The New Pool screen opens.
3. In the **Name** field, type a unique name for the pool.
4. In the Resources area, for the **New Members** setting, add to the pool the application servers that host the web application:
   a) Type an IP address in the **Address** field.
   b) In the **Service Port** field, type a port number (for example, type `80` for the HTTP service), or select a service name from the list.
   c) Click **Add**.
5. Click **Finished**.

The BIG-IP® system configuration now includes a local traffic pool containing the resources that you want to protect using Application Security Manager™.

Creating a virtual server to manage HTTPS traffic

You can create a virtual server to manage HTTPS traffic.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the **Create** button.

The New Virtual Server screen opens.

3. In the **Name** field, type a unique name for the virtual server.
4. In the **Service Port** field, type `443` or select **HTTPS** from the list.
5. From the **Configuration** list, select **Advanced**.
6. From the **HTTP Profile** list, select **http**.
7. For the **SSL Profile (Client)** setting, from the **Available** list, select **clientssl**, and using the Move button, move the name to the **Selected** list.
8. (Optional) From the **SSL Profile (Server)** list, select **serverssl**.

   Note: *This setting ensures that there is an SSL connection between the HTTP virtual server and the external HTTPS server.*

9. From the **Source Address Translation** list, select **Auto Map**.
10. From the **Default Pool** list, select the pool that is configured for application security.
11. Click **Finished**.

The HTTPS virtual server appears in the Virtual Server List screen.

Creating a simple security policy

Before you can create a security policy, you must perform the minimal system configuration tasks required according to the needs of your networking environment.

You can use Application Security Manager™ to create a robust, yet simple, security policy that is tailored to protect your web application. This is the easiest way to create a security policy.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies** > **Policies List**.
   The Policies List screen opens.
2. Click **Create New Policy**.

   You only see this button when no policy is selected.
3. In the **Policy Name** field, type a name for the policy.
4. Leave **Policy Type**, set to **Security**.
5. For **Policy Template**, select **Fundamental**.
6. For **Virtual Server**, click **Configure new virtual server** to specify where to direct application requests.
   a) For **What type of protocol does your application use?**, select **HTTP**, **HTTPS**, or both.
   b) In the **Virtual Server Name** field, type a unique name.
   c) In the **HTTP Virtual Server Destination** field, type the address in IPv4 (`10.0.0.1`) or IPv6 (`2001:ed8:77b5:2:10:10:100:42/64`) format, and specify the service port.

   Tip: *If you want multiple IP addresses to be directed here, use the* ***Network*** *setting.*

   d) In the HTTP Pool Member setting, specify the addresses of the back-end application servers.
   e) From the **Logging Profile** list, select a profile such as **Log illegal requests** to determine which events are logged on the system.
7. In the upper right corner, click **Advanced**.

   You can use default values for the Advanced settings but it's a good idea to take a look at them.

   - If you selected **Fundamental** or **Comprehensive** for the **Policy Template**, **Learning Mode** is set to **Automatic** and **Enforcement Mode** is set to **Blocking**.

> ***Tip:*** *If you need to change these values, set application language to a value other than* ***Auto detect****.*

- If you know the **Application Language**, select it or use **Unicode (utf-8)**.
- To add specific protections (enforcing additional attack signatures) to the policy, for **Server Technologies**, select the technologies that apply to the back-end application servers.
- You can configure trusted IP addresses that you want the security policy to consider safe.

8. Click **Create Policy** to create the security policy.

ASM™ creates a security policy that immediately starts protecting your application. The enforcement mode of the security policy is set to Blocking. Traffic that is considered to be an attack such as traffic that is not compliant with HTTP protocol, has malformed payloads, uses evasion techniques, performs web scraping, contains sensitive information or illegal values is blocked. Other potential violations are reported but not blocked.

The system examines the traffic to the web application making suggestions for more specifically building the security policy. The Policy Builder selectively learns new entities like file types, parameters, and cookies used in requests to the application. When ASM processes sufficient traffic, it automatically adds the entities to the security policy, and enforces them.

The system applies a basic set of attack signatures to the security policy and puts them in staging (by default, for 7 days). If you specified server technologies, additional attack signatures are included. ASM reports common attacks discovered by comparison to the signatures but does not block these attacks until the staging period is over and they are enforced. That gives you a chance to be sure that these are actual attacks and not legitimate requests.

> ***Tip:*** *This is a good point at which send some traffic to test that you can access the application being protected by the security policy and check that traffic is being processed correctly by the BIG-IP® system. Send the traffic to the virtual server destination address.*

Creating an access profile

You create an access profile to provide the access policy configuration for a virtual server that establishes a secured session.

1. On the Main tab, click **Access** > **Profiles / Policies**.
   The Access Profiles (Per-Session Policies) screen opens.
2. Click **Create**.
   The New Profile screen opens.
3. In the **Name** field, type a name for the access profile.

   > ***Note:*** *A access profile name must be unique among all access profile and any per-request policy names.*

4. From the **Profile Type** list, select **SSL-VPN**.
   Additional settings display.
5. From the **Profile Scope** list, retain the default value or select another.
   - **Profile**: Gives a user access only to resources that are behind the same access profile. This is the default value.
   - **Virtual Server**: Gives a user access only to resources that are behind the same virtual server.
   - **Global**: Gives a user access to resources behind any access profile that has global scope.
6. To configure timeout and session settings, select the **Custom** check box.
7. In the **Inactivity Timeout** field, type the number of seconds that should pass before the access policy times out. Type `0` to set no timeout.

If there is no activity (defined by the **Session Update Threshold** and **Session Update Window** settings in the Network Access configuration) between the client and server within the specified threshold time, the system closes the current session.

8. In the **Access Policy Timeout** field, type the number of seconds that should pass before the access profile times out because of inactivity.

   Type `0` to set no timeout.
9. In the **Maximum Session Timeout** field, type the maximum number of seconds the session can exist.

   Type `0` to set no timeout.
10. In the **Max Concurrent Users** field, type the maximum number of users that can use this access profile at the same time.

    Type `0` to set no maximum.
11. In the **Max Sessions Per User** field, type the maximum number of concurrent sessions that one user can start.

    Type `0` to set no maximum.

    Note: *Only a user in the administrator, application editor, manager, or resource administrator role has access to this field.*
12. In the **Max In Progress Sessions Per Client IP** field, type the maximum number of concurrent sessions that can be in progress for a client IP address.

    When setting this value, take into account whether users will come from a NAT-ed or proxied client address and, if so, consider increasing the value accordingly. The default value is 128.

    Note: *Only a user in the administrator, application editor, manager, or resource administrator role has access to this field.*

    Note: *F5 does not recommend setting this value to* `0` *(unlimited).*
13. Select the **Restrict to Single Client IP** check box to restrict the current session to a single IP address.

    This setting associates the session ID with the IP address.

    Note: *Only a user in the administrator, application editor, manager, or resource administrator role has access to this field.*

    Upon a request to the session, if the IP address has changed the request is redirected to a logout page, the session ID is deleted, and a log entry is written to indicate that a session hijacking attempt was detected. If such a redirect is not possible, the request is denied and the same events occur.
14. To configure logout URIs, in the Configurations area, type each logout URI in the **URI** field, and then click **Add**.
15. In the **Logout URI Timeout** field, type the delay in seconds before logout occurs for the customized logout URIs defined in the **Logout URI Include** list.
16. To configure SSO:

    - For users to log in to multiple domains using one SSO configuration, skip the settings in the SSO Across Authentication Domains (Single Domain mode) area. You can configure SSO for multiple domains only after you finish the initial access profile configuration.
    - For users to log in to a single domain using an SSO configuration, configure settings in the SSO Across Authentication Domains (Single Domain mode) area, or you can configure SSO settings after you finish the initial access profile configuration.
17. In the **Domain Cookie** field, specify a domain cookie, if the application access control connection uses a cookie.
18. In the **Cookie Options** setting, specify whether to use a secure cookie.

- If the policy requires a secure cookie, select the **Secure** check box to add the **secure** keyword to the session cookie.
- If you are configuring an LTM access scenario that uses an HTTPS virtual server to authenticate the user and then sends the user to an existing HTTP virtual server to use applications, clear this check box.

19. If the access policy requires a persistent cookie, in the **Cookie Options** setting, select the **Persistent** check box.

    This sets cookies if the session does not have a webtop. When the session is first established, session cookies are not marked as persistent; but when the first response is sent to the client after the access policy completes successfully, the cookies are marked persistent. Persistent cookies are updated for the expiration timeout every 60 seconds. The timeout is equal to session inactivity timeout. If the session inactivity timeout is overwritten in the access policy, the overwritten value will be used to set the persistent cookie expiration.
20. From the **SSO Configurations** list, select an SSO configuration.
21. In the Language Settings area, add and remove accepted languages, and set the default language.

    A browser uses the highest priority accepted language. If no browser language matches the accepted languages list, the browser uses the default language.
22. Click **Finished**.

The access profile displays in the Access Profiles List. Default-log-setting is assigned to the access profile.

To add an SSO configuration for multiple domains, click **SSO / Auth Domains** on the menu bar. To provide functionality with an access profile, you must configure the access policy. The default access policy for a profile denies all traffic and contains no actions. Click **Edit** in the **Access Policy** column to edit the access policy.

Configuring an access policy

You configure an access policy to provide authentication, endpoint checks, and resources for an access profile. This procedure configures a simple access policy that adds a logon page, gets user credentials, submits them to an authentication type of your choice, then allows authenticated users, and denies others.

1. On the Main tab, click **Access** > **Profiles / Policies**.
   The Access Profiles (Per-Session Policies) screen opens.
2. Click the name of the access profile you want to edit.
3. On the menu bar, click **Access Policy**.
4. For the **Visual Policy Editor** setting, click the **Edit access policy for Profile** ***`policy_name`*** link.
   The visual policy editor opens the access policy in a separate window or tab.
5. Click the **(+)** icon anywhere in the access policy to add a new item.

   Note: *Only an applicable subset of access policy items is available for selection in the visual policy editor for any access profile type.*

   A popup screen opens, listing predefined actions on tabs such as General Purpose, Authentication, and so on.
6. On the Logon tab, select **Logon Page** and click the **Add Item** button.
   The Logon Page Agent properties screen opens.
7. Click **Save**.
   The Access Policy screen reopens.
8. On the rule branch, click the plus sign **(+)** between **Logon Page** and **Deny**.
9. Set up the appropriate authentication and client-side checks required for application access at your company, and click **Add Item**.

10. Change the Successful rule branch from **Deny** to **Allow** and click the **Save** button.
11. If needed, configure further actions on the successful and fallback rule branches of this access policy item, and save the changes.
12. At the top of the screen, click the **Apply Access Policy** link to apply and activate your changes to this access policy.
13. Click the **Close** button to close the visual policy editor.

To apply this access policy to network traffic, add the access profile to a virtual server.

***Note:** To ensure that logging is configured to meet your requirements, verify the log settings for the access profile.*

Adding the access profile to the virtual server

Before you can perform this task, you need to create an access profile using Access Policy Manager®.

You associate the access profile with the virtual server created for the web application that Application Security Manager™ is protecting.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the name of the virtual server that manages the network resources for the web application you are securing.
3. In the Access Policy area, from the **Access Profile** list, select the access profile that you configured earlier.
4. Click **Update**.

Your access policy is now associated with the virtual server.

Setting up ASM session tracking with APM

You can use session tracking to track, enforce, and report on user sessions and IP addresses. To perform tracking, you enable session awareness and indicate how to associate the application user name with the session.

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins** > **Session Tracking**.
   The Session Tracking screen opens.
2. In the Session Tracking Configuration area, select the **Session Awareness** check box.
3. From the **Application Username** list, select **Use APM Usernames and Session ID**.
4. In the Violation Detection Actions area, select the **Track Violations and Perform Actions** check box.
5. In the **Violation Detection Period** field, type the number of seconds that indicates the sliding time period to count violations for violation thresholds.

   The default is `900` seconds.
6. If you want the system to block all activity for a user, session, device ID, or IP address when the number of violations exceeds the threshold within the violation detection period, specify one or more of the following settings on the Block All tab.

Option	Description
Blocked URLs	Specify which URLs to block after the number of violations exceeds the enabled thresholds. To block all URLs, select **Block all URLs**. To block authenticated URLs protected by login pages, select **Block Authenticated URLs**.

Option	Description
Username Threshold	Select **Enable** and specify the number of violations allowed before the system starts to block this user's activity.
Session Threshold	Select **Enable** and specify the number of violations allowed before the system starts to block activity for this HTTP session.
Device ID Threshold	Select **Enable** and specify the number of violations allowed per device ID before the system starts to block activity for this device.
IP Address Threshold	Select **Enable** and specify the number of violations allowed before the system starts to block the activity for this IP address.
Block All Period	Specify how long to block users, sessions, or IP addresses if the number of violations exceeds the threshold. To block the user, session, or IP address indefinitely, click **Infinite**. Otherwise, click **User-defined** and type the number of seconds to block the traffic. The default is `600` seconds.

***Note:** For the system to block requests, the security policy Enforcement Mode must be set to blocking and some violations must be set to block.*

7. If you want the system to log activity when the number of violations for user, session, device ID, or IP address, exceeds the threshold during the violation detection period, specify one or more of the following settings on the Log All Requests tab.

Option	Description
Username Threshold	Select **Enable** and specify the number of violations allowed before the system starts logging this user's activity for the log all requests period.
Session Threshold	Select **Enable** and specify the number of violations allowed before the system starts logging activity for this HTTP session for the log all requests period.
Device ID Threshold	Select **Enable** and specify the number of violations allowed before the system starts to log requests for this device.
IP Address Threshold	Select **Enable** and specify the number of violations allowed before the system starts logging the activity of this IP address for the log all requests period.
Log All Requests Period	Specify how long the system should log all requests when any of the enabled thresholds is reached. Type the number of seconds in the field.

8. If you want more tolerant blocking for selected violations, such as those prone to false positives, specify one or more of the following settings on the Delay Blocking tab.

Option	Description
Username Threshold	Select **Enable** and specify the number of violations a user must cause before the system begins blocking this user for the delay blocking period.
Session Threshold	Select **Enable** and specify the number of violations users must cause (during the violation detection period) before the system begins blocking this HTTP session for the delay blocking period.
Device ID Threshold	Select **Enable** and specify the number of violations allowed per device ID before the system starts to block illegal requests from the device.
IP Address Threshold	Select **Enable** and specify the number of violations allowed before the system begins blocking this IP address for the delay blocking period.
Delay Blocking Period	Type the number of seconds that the system should block the user, session, or IP address when any of the enabled thresholds is reached.

Option	Description
Associated Violations	Move the violations for which you want delay blocking from the **Available** list into the **Selected** list. If the selected violations occur, the system does not block traffic until one of the enabled thresholds is reached. At that point, the system blocks traffic causing those violations for the user, session, or IP address, but allows other transactions to pass.

***Note:** For the system to block requests, the security policy Enforcement Mode must be set to blocking and some violations must be set to block.*

9. Click **Save** to save your settings.

After you set up session tracking, if any enabled threshold exceeds the number of violations during the detection period, the system starts the configured actions for block all, log all requests, and delay blocking.

Test that you can log in to the web application through the Access Policy Manager™ logon page. You can also test that the security policy works by generating violations and reviewing the application security logs.

Monitoring user and session information

To monitor user and session information, you first need to set up session tracking for the security policy.

You can use the reporting tools in Application Security Manager™ to monitor user and session details, especially when you need to investigate suspicious activity that is occurring with certain users, sessions, or IP addresses.

1. On the Main tab, click **SecurityReporting ApplicationSession Tracking Status**.
   The Session Tracking Status screen opens and shows the users, sessions, and IP addresses that the system is currently tracking for this security policy.
2. From the **Action** list, select the action by which to filter the data.

Action	Description
All	Specifies that the screen displays all entries. This is the default value.
Block All	Specifies that the system displays sessions whose requests the system blocks after the configured threshold was reached.
Log All Requests	Specifies that the system displays sessions whose requests the system logs after the configured threshold was reached.
Delay Blocking	Specifies that the system displays sessions whose requests the system delayed blocking until the configured threshold was reached.

3. From the **Scope** list, specify the scope (username, session, or IP address) by which to filter the data.

Option	Description
Alt	Specifies that the screen displays all entries. This is the default value.
Username	Specifies that the system displays usernames whose illegal requests exceeded the security policy's threshold values.
Session	Specifies that the system displays identification numbers of illegal sessions that exceeded the security policy's threshold values.
IP Address	Specifies that the system displays IP addresses where illegal requests from these IP addresses exceeded the security policy's threshold values.

Option	Description
Device ID	Specifies that the system displays device IDs where illegal requests from these devices exceeded the security policy's threshold values.

4. If you want to filter the information by value, in the **Value** field, type the username, session identification number, IP address, device ID, or string. If empty, the screen displays all entries.
5. When you finish specifying the filter details, click **Go**.
   The Session Tracking Status list now shows the information specified in the Filter setting.

After you set up session tracking, you can monitor the specific requests that cause violations by examining each request and reviewing graphical charts.

Mitigating Open Redirects

Overview: Mitigating open redirects

Application Security Manager™ (ASM) can protect users from open redirects. An *open redirect* is a vulnerability where the server tries to redirect the user to a target domain that is not defined in the security policy. This vulnerability is one of the OWASP top ten application security risks.

Spammers use open redirects in phishing attacks to get users to visit malicious sites without knowing it. Often, the request includes a parameter, which contains a URL that redirects a user to an external web application without any validation. An example of this vulnerability is a request such as: `https://www.good.com/redirect.php?url=http://www.evil.com`.

This type of request may result in a response containing a Location header that points to a new target. For example:

```
HTTP/1.1 200 OK
Location: http://www.evil.com
```

You can configure redirection protection and the domains where users are permitted to be redirected on a response header in an existing security policy. By default, redirection protection is enabled in ASM with a pure wildcard configured as an allowed domain (effectively providing no enforcement). You can adjust the settings so that the security policy allows redirect to specific domains, and protects against unvalidated redirects.

This feature does not affect internal redirection, which is always allowed. For example, the following example would be allowed even if redirection protection is enabled on the system.

```
Location: /<anotherpage>/<thisserver>/internal_redirect.php
```

Task Summary

Mitigating open redirects

You can configure an existing security policy in Application Security Manager™ (ASM) to protect users from being redirected by unvalidated redirects. By enabling redirection protection, you can help prevent users from being redirected to questionable phishing or malware web sites.

1. On the Main tab, click **Security** > **Application Security** > **Headers** > **Redirection Protection**. The Redirection Protection screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Make sure that the **Redirection Protection** check box is selected.
4. In the **Allowed Redirection Domains** setting, configure the domains where users can be redirected.
   a) In the **Domain Name** field, type the name of the domain (in English-only, such as `yahoo.com`), or its IP address.

      If protection is enabled and no domains are configured, then only relative URIs are allowed (for example, `/login.php`).

b) If you want users to be able to be redirected to sub-domains of the specified domain, select **Include Sub-domains**.

   If this check box is selected for `f5.com`, for example, then redirects to `www.f5.com`, `mail.f5.com`, and `websupport.f5.com` are also allowed. If it is not selected, redirection to sub-domains, such as `www.f5.com`, is not allowed. You need to add all allowed domains and sub-domains explicitly in that case.

c) Click **Add**.
   The system adds the domain to the security policy's list of allowed redirection domains.

You can add up to 100 redirection domains. If you are using the Policy Builder for automatic policy building, you can leave the * wildcard configured to **Add All Entities** in the policy. When the tightening period is over and the policy is stable, the system will have added the redirection domains occurring within the traffic that it saw (if any), and then the system deletes the wildcard. If not using the Policy Builder, consider removing the * wildcard.

5. In the **Allowed Redirection Domains** setting, select the * wildcard and click the **Enforce** button to delete it.
6. Click **Save** to save your settings.

If ASM™ receives a request that attempts to redirect the user to a domain other than one that is listed in the redirection protection, the system issues an `Illegal redirection attempt` violation, which is an attack type of Open/Unvalidated Redirects. The violation is set to Learn, Alarm, and Block, by default. If the policy is in transparent mode, responses are always forwarded to the client. If the policy is in blocking mode, illegal redirection attempts are blocked.

Adjusting how open redirects are learned

You can adjust the explicit entities learning settings for redirection domains. Explicit learning settings specify when the system adds, or suggests you add, redirection domains to the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the Policy Building Settings area, expand **Redirection Protection**.
4. For the **Learn New Redirection Domains** setting, select the option for when to make Learning suggestions (based on real traffic).

Option	Description
Never (wildcard only)	Specifies that when false positives occur, the system suggests relaxing the settings of the wildcard. The system does not add domains to the list of allowed redirection domains, and does not remove the wildcard (regardless of the **Learning Mode**).
Always	Creates a comprehensive whitelist policy that includes all observed domains to the list of allowed redirection domains. If **Learning Mode** is set to **Automatic**, it adds explicit domains to the security policy. When the security policy is stable, the * wildcard is removed. If **Learning Mode** is set to **Manual**, the system suggests adding explicit domains. This is the default value.

5. If adding redirection domains, adjust the number in **Maximum Learned Redirection Domains** if necessary.
6. Click **Save** to save your settings.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy now learns new redirection domains according to the Redirection Protection settings you specified.

Enforcing redirection domains

After you create a security policy and traffic is sent to the web application, the system adds domains where users are redirected. Redirection protection is enabled by default with a pure wildcard. You can review the redirection domains that are ready to be enforced, and add them to the security policy if they are valid places users should be going.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Traffic Learning**. The Enforcement Readiness summary is on the bottom right.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. To enforce all entities that are ready to be enforced, click **Enforce Ready Entities**.

   If you click this button, you are done. Continue only if you want to review learning suggestions for redirection domains.
4. In the Enforcement Readiness Summary, check to see if a number appears in the Have Suggestions column next to redirection domains.

   A number greater than zero indicates that an Illegal Redirection Attempt occurred, and the system made a learning suggestion.
5. Click the number in the Have Suggestions column.
6. Select the domains to which you want the security policy to allow users to be redirected, and click **Accept**.
7. Click **Learning and Blocking Settings**, expand **Redirection Protection**, and check to be sure that the Learn, Alarm, and Block settings for the `Illegal Redirection Attempt` violation are selected.

The system adds selected redirection domains to the security policy and allows users to be redirected to them. Attempts at redirection to other domains will be blocked when the system is in blocking mode.

On the Policy Building Status (Automatic) screen, you can review the status of the security policy, see the policy elements that were added including the redirection domains, and view details about them.

Implementation results

When you configure redirection protection, Application Security Manager™ (ASM) protects users from being redirected to a web site that is not listed in the allowed redirection domains. If the pure wildcard is listed as an allowed domain, ASM™ allows redirection to all domains. If you want to check whether users are redirected by the application, you can leave the wildcard as an allowed domain and let the system learn the redirect domains.

For the allowed domains, the system does not enforce protocol differences: HTTPS and HTTP are treated the same.

ASM sets the explicit entities learning for redirection domains in the general policy building settings. The security policy learns, by default, all domains (Add All Entities) where users are redirected. If you are using automatic learning, the system adds to the security policy the redirect domains that match the pure wildcard. When the security policy is stable, the system removes the wildcard redirect domain from the security policy, and allows users to be redirected only to the redirect domains that were added to the policy.

If you are building the security policy manually, the system learns and suggests that you add the redirect domains that it detects. You can determine whether there are redirection domains with learning suggestions by looking at the Enforcement Readiness Summary. After you add the legitimate redirect domains to the security policy, you can consider removing the wildcard redirect domain from the security policy. As a result, the policy on redirects becomes more strictly enforced.

Setting Up Cross-Domain Request Enforcement

About cross-domain request enforcement

Cross-Origin Resource Sharing (CORS) is an HTML5 feature that enables one website to access the resources of another website using JavaScript within the browser. On occasion, your web application might need to share resources with another external website that is hosted on a different domain. Using Application Security Manager™, you can safely allow CORS by specifying the conditions that state when a foreign web application is allowed to access your web application, after making a cross-domain request. This feature is called *cross-domain request enforcement*.

You enable cross-domain request enforcement as part of the Allowed HTTP or WebSocket URL properties within a security policy. Then you can specify which domains can access the response generated by requesting this URL (the "resource"). For HTTP URLs, you can also configure how to overwrite CORS response headers that are returned by the web server.

This feature does not affect internal redirection, which is always allowed. For example, `Location: /anotherpage/onthisserver/internal_redirect.php` would be allowed even if cross-domain request enforcement is enabled on the system.

Setting up cross-domain request enforcement

For this task, the security policy needs to have an allowed HTTP or WebSocket URL.

If you want to allow your application website to access the resources of another website, you can add cross-domain request enforcement to an existing HTTP or WebSocket URL. This procedure shows how to enable Cross-Origin Resource Sharing (CORS) support on your application server for either type of URL.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
   The Allowed HTTP URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Locate the HTTP or WebSocket URL that needs CORs support:
   a) From the Allowed URLs menu, choose either Allowed HTTP URLs or Allowed WebSocket URLs.
   b) In either the Allowed URLs List or the Allowed WebSocket URLs List, click the URL you want to modify.

   The Allowed HTTP URL Properties screen or WebSocket URL Properties screen for the URL opens.
4. From either **URL Properties** list, select **Advanced**.
5. Click the HTML5 Cross-Domain Request Enforcement tab.
6. For **Enforcement Mode**, specify the option to determine how to handle CORS requests.

Select this option	To do this
Disabled	Do nothing related to cross-domain requests. Pass CORS requests exactly as set by the server.
Remove all CORS headers	Remove all CORS headers from the response. The response is sent to the browser, and the browser does not allow cross-origin requests.

Select this option	To do this
Replace CORS headers (HTTP URLs only)	Replace the CORS header in the response with another header specified on the tab, including allowed origins, allowed methods, allowed headers, and so on. The browser enforces the policy. Then after **Replace with** specify the protocol, origin, and port for replacing CORS headers.
Enforce on ASM	Allow cross-origin resource sharing as configured in the **Allowed Origins** setting. CORS requests are allowed from the domains specified as allowed origins. ASM enforces the policy. Specify the protocol, origin, and port of allowed origins

For maximum security, F5 recommends that you select **Enforce on ASM**.

The tab now includes additional settings determined by the option you selected.

7. For the **Allowed Origins** setting, add the origins that are allowed to share data returned by this URL.
   a) For **Protocol**, select the appropriate protocol for the allowed origin.
   b) For **Origin Name**, type the domain name or IP address with which the URL can share data.

      Wildcards are allowed in the names. For example: `*.f5.com` will match `b.f5.com`; however it will not match `a.b.f5.com`.
   c) For **Port**, select the port that other web applications can use to request data from your web application, or use the * wildcard for all ports.
   d) If you want to allow sub-domains to receive data, select the **Include Sub-Domains** check box.
   e) Click **Add** to add the origins.
      The origins that can share data with the URL are included in the list.
8. Click **Update**.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy allows requests for the HTTP or WebSocket URL to access the resources of other websites hosted in a different domain according to the enforcement conditions that you configured.

ASM extracts the Origin (domain) of the request from the Origin header. If the Origin header is missing or has more than one occurrence, ASM issues an `Illegal cross-origin request` violation if it is set to alarm or block. If the violation is set to block in the URL section of the Learning and Blocking Settings (and the Enforcement Mode of the security policy is set to blocking), the system blocks the request.

If a request comes from a domain that does not belong to the application and is not specified in the list of allowed origins, the system also issues an `Illegal cross-origin request` violation. If the violation is set to block (and the Enforcement Mode is set to blocking), the request is blocked.

Replacing CORS headers in requests

For this task, the security policy needs to have an allowed HTTP URL. Also, the OPTIONS method must be on the Allowed Methods list.

CORS headers are enforced by all popular browsers. The browser reads the allowed origins from the Access-Control-Allowed-Origin headers in the response. If the subsequent request from that page does not match any of the allowed origins, the browser will not place the request. In many situations, the servers do not populate those headers properly, so you can have ASM™ replace the CORS headers.

If you want ASM to replace CORS headers when enforcing HTML5 cross-domain requests, you can update an existing HTTP URL. This task does not apply to WebSocket URLs, only HTTP URLs.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
   The Allowed HTTP URLs screen opens.

2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. From the Allowed HTTP URLs List, click the name of the URL you want to modify.
   The Allowed HTTP URL Properties screen opens.
4. From the **Allowed URL Properties** list, select **Advanced**.
5. On the HTML5 Cross-Domain Request Enforcement tab, for **Enforcement Mode**, select **Replace CORS headers**.
   The tab now includes additional settings where you define how to overwrite CORS response headers returned by the web server.
6. In the **Allowed Origins** setting, add the origins that are allowed to share data returned by this URL.

   Select **Replace with**, then specify the origin names:

   a) For **Protocol**, select the appropriate protocol for the allowed origin.
   b) For **Origin Name**, type the domain name or IP address that you want to allow to share your data with.

      Wildcards are allowed in the names. For example: `*.f5.com` will match `b.f5.com`, but it will not match `a.b.f5.com`.
   c) For **Port**, select the port that other web applications can use to request data from your web application, or use the * wildcard for all ports.
   d) If you want to allow sub-domains to receive data, select the **Include Sub-Domains** check box.
   e) Click **Add** to add the origins.
      The origins that can share data with the URL are included in the list.
7. Optionally, for **Allowed Methods**, specify which methods other applications may use when requesting this URL from another domain. Select **Replace with**, then move the methods to allow from the **Available Methods** to the **Allowed Methods** list.

   Important: *Any method you allow here must also be in the Allowed Methods list in the security policy (**Security** > **Application Security** > **Headers** > **Methods**).*
8. Optionally, for **Allowed Headers**, select **Replace with**, then type the headers that other applications can use when requesting this URL from another domain.

   Allowed headers are request headers sent by clients. For example, to allow clients to send Ajax requests, type `X-Requested-With`, and to allow XML requests, type `Content-Type`.
9. Optionally, for **Exposed Headers**, select **Replace with**, then specify the headers that JavaScript can expose and share with other applications when requesting this URL from another domain.

   Exposed headers are the headers the server returns in the response. For example, to discover server side web application technology, type `X-Powered-By`.
10. Optionally, for **Allow Credentials**, select **Replace with**, then specify whether requests from applications in another domain can include user credentials.
11. Optionally, for **Maximum Age**, select **Replace with**, then specify the number of seconds that the results of a preflight request can be cached or use the default.
12. Click **Update**.
13. To add methods, such as OPTIONS, required to replace headers:
    a) Click **Security** > **Application Security** > **Headers** > **Methods**.
    b) Click **Create**.
    c) In the **Method** setting, select **OPTIONS**.
    d) Click **Create**.
14. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy passes the CORS request to the application server. ASM replaces the header of the response with the header you specified, and returns the response.

If this request is authorized by the web server, the browser allows the foreign domain to send its original request. If the request from that page does not match any of the allowed origins, the browser declines the request.

How cross-domain request enforcement works

If you enable cross-domain request enforcement, the system must authorize requests (typically AJAX requests) made from one domain to another. When a client makes a request to another origin, the browser sends a preflight request to determine whether JavaScript from another domain may access your resource.

When processing a modification request, the browser sends a preflight request if it has no previously cached allowed origins (that is, this is the first time the browser goes to the foreign domain for such requests). The preflight request uses an OPTIONS HTTP method and CORS-related headers to check whether the server authorizes that origin.

The CORS-related headers that are included in a preflight request are:

Header	Description
Origin	Determines requesting origin.
Access-Control-Request-Method	Indicates which methods are used in the actual request (other than simple methods).
Access-Control-Request-Headers	Indicates which headers are used in the actual request (other than simple headers).

In response to the preflight request, the system uses these CORS response headers:

Header	Description
Access-Control-Allow-Origin	List of origins the resource may be shared among (support wildcard).
Access-Control-Allow-Credentials	Indicates whether actual request may include user credentials (true/false).
Access-Control-Allow-Methods	Indicates which methods can be used during the actual request.
Access-Control-Allow-Headers	Indicates which request headers can be used during the actual request.
Access-Control-Max-Age	Indicates how long (in seconds) to cache the results of a preflight request in the browser.
Access-Control-Expose-Headers	Indicates which response headers are safe to expose to JavaScript.

The browser uses the response to determine whether to allow the JavaScript to make the actual request. If the cross-domain request is authorized, the server processes the actual requests by rechecking the origin and including another response header:

Header	Description
Access-Control-Expose-Headers	Indicates which response headers are safe to expose to JavaScript.

The browser then allows the foreign domain to send its original requests.

If you do not enable cross-domain request enforcement, the system removes all cross-origin request headers and CORS is not allowed for the URL.

If you select **Enforce on ASM** as the CORS Enforcement Mode, ASM™ permits access according to the allowed origins. So, when using this option, there is no need for a preflight request because ASM itself checks the origin. Unlike using the **Replace CORS headers** setting, ASM, not the browser, does the enforcement.

Implementing Web Services Security

Overview: Implementing web services security

Web services security adds another level of protection to XML-based web applications by embedding security-related data within SOAP messages. For web services that Application Security Manager™ protects, you can use web services security to do the following:

- Encrypt and decrypt parts of SOAP messages
- Digitally sign parts of SOAP messages
- Verify parts of SOAP messages using digital signatures

If you want to use features such as encryption, you can add web services security to an existing security policy that has an associated XML profile. You can enforce web services security only for URLs.

Task Summary

About client and server certificates

Client and server certificates are XML digital signatures that ensure the integrity of the message data, and can authenticate the identity of the document signer. By importing client and server certificates, the system can perform encryption and decryption of SOAP messages.

The system uses client and server certificates differently:

Server Certificates
Decrypt SOAP messages from a web client to a web service, or sign SOAP messages from a web service back to a web client.

Client Certificates
Encrypt SOAP messages from a web service to a web client, or verify SOAP messages from a web client to a web service.

Adding client and server certificates

To use web services security for encryption, decryption, and digital signature signing and verification, you must upload client and server certificates onto the Application Security Manager™. The system uses these certificates to process Web Services Security markup in SOAP messages within requests and responses to and from web services.

You must import both client and server certificates to perform encryption and decryption on the Application Security Manager.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Certificates Pool**.
   The Certificates Pool screen opens.
2. Add one server certificate, and a client certificate for each client that you want to access the XML application. For each certificate you want to add, perform these steps:

   Note: *The server and client certificates must be PEM files in x509v3 format. Also, the server certificate should contain the server's private key.*

a) Click **Add**.
   The Create New Certificate screen opens.
b) For **Name**, type a name for the certificate.
c) For **Type**, select **Client** or **Server**, as appropriate.
d) For the **.PEM File** setting, either select **Upload File** from the list, then browse to and upload a certificate, or select **Paste text** to paste a copy of the certificate in the field.
e) To store the certificate even if it is expired or untrusted, enable the **Save Expired/Untrusted Certificate** setting.
f) Click **Add**.

The system adds the certificate to the certificates pool.

You have added client or server certificates to the system's database. You can configure a security policy to use these certificates in an associated XML profile. The certificates in the pool can be used for any web applications.

Enabling encryption, decryption, signing, and verification of SOAP messages

Before you can complete this task, you first must have created a security policy, created and associated an XML profile with the policy, and uploaded security certificates onto the system.

You can use the web services security features of Application Security Manager™ to off load encryption and decryption of SOAP messages from the application server. Web services security can also handle verification of digital signatures and digital signing of SOAP messages.

1. On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **XML Profiles**.
   The XML Profiles screen opens.
2. Click the name of the XML profile for which you want to configure web services security, or create a new profile.
   The XML Profile Properties screen opens.
3. For the **Web Services Security** setting, select **Enabled**.
4. Click **Web Services Security Configuration**.
   The XML Profile Properties screen displays Web Services Security Configuration options.
5. For **Server Certificate**, select one server certificate from the list, or click **Create** to add a new certificate to the configuration.

   A Request area appears after you specify the certificate.

   The system uses the server certificate to decrypt SOAP messages from a web client to a web service, or sign SOAP messages from a web service back to a web client.
6. For **Client Certificates**, select names from the **Available** list and then move them into the **Members** list.
   The system uses the client certificates to encrypt SOAP messages from a web service to a web client, or to verify SOAP messages from a web client to a web service.
7. In the Request area, for **Action**, select the action you want the system to perform in SOAP message requests.

   - Select **Verify and Decrypt** to decrypt and verify digitally signed SOAP messages. F5 recommends that you use this value.
   - Select **Decrypt** to decode encrypted SOAP messages.
   - Select **Verify** to validate digitally signed SOAP messages. This option is available only if you imported client certificates, but no server certificate.
8. For **Role/Actor**, select a role to determine which security headers you want the system to process in SOAP message requests.

Role	Description
Do not check role/actor	Process all security headers regardless of the role. This is the default setting.
Custom role/actor	Process security headers that contain the role you type in the adjacent box.
next	Process security headers that contain the role **next** or `http://www.w3.org/2003/05/soap-envelope/role/next`.
none	Process security headers that contain the role **none** or `http://www.w3.org/2003/05/soap-envelope/role/none`.
ultimateReceiver	Process security headers that contain the role **ultimateReceiver** or `http://www.w3.org/2003/05 /soap-envelope/role/ultimateReceiver`.

9. Select the **Enforce And Verify Defined Elements** check box to confirm that elements defined in the Namespaces and Elements area of the screen and contained in the request are signed and verified.

   This setting also enforces the options **SOAP Body in Request Must Be Signed and Verified** and **Enforce Timestamp In Request**.
10. In the Response area, for **Action**, select the action you want the system to perform on the elements defined in the Namespaces and Elements area of the screen for SOAP message responses.
    - Select **Encrypt** to encrypt the elements.
    - Select **Sign** to digitally sign the elements.
    - Select **Sign, Then Encrypt** to first digitally sign and then encrypt the elements. F5 recommends that you use this value.
    - Select **Encrypt, Then Sign** to first encrypt, then digitally sign the elements.

    Note: *For the action to occur, you must also select* ***Apply Action To Defined Elements****.*
11. To limit how long a security header is valid:
    a) Enable the **Add Timestamp** setting.
    b) Type the length of time (in seconds) the timestamp should be valid. The default is `300` seconds.

    If you want the timestamp to be valid for an unlimited amount of time, enter `0`. The maximum value is `134217728` seconds.
12. For **Role/Actor**, select a role to insert into the security header of SOAP messages.

Role	Description
Do not assign role/ actor	If the document contains a security header without a role, the system inserts the cryptographic information into the security header. This is the default setting.
Assign custom role/ actor	If the document contains a security header with a custom role, the system inserts the cryptographic information into the existing security header. In the field, type the custom role/actor attribute.
next	If the document contains a security header with the **next** role, the system inserts the cryptographic information into that security header.
none	If the document contains a security header with the **none** role, the system inserts the cryptographic information into that security header.
ultimateReceiver	If the document contains a security header with the **ultimateReceiver** role, the system inserts the cryptographic information into that security header.

13. If the response action includes signing, for **Signature Algorithm**, select the type of signature algorithm used to sign parts of SOAP messages in responses that match the response elements that you configure in the Namespaces and Elements area of the screen.
    - Select **RSA-SHA-1** (the default value) to use the RSA public cryptosystem for encryption and authentication.
    - Select **HMAC-SHA-1** to use secret-key hashing.

    Tip: *Be sure your clients support this type of encryption.*
14. If the response action includes encryption, for **Encryption Algorithm** and **Key Transport Algorithm**, select the types of encryption to use for the elements and keys.
15. Select the **Apply Action To Defined Elements** check box to perform the action you selected.
16. In the Namespaces and Elements area of the Web Services Security Configuration, configure these settings to specify how to process the XML document:
    a) For **Namespace Mappings**, add the namespace mappings (prefix and URLs) the system uses for XPath queries:
    b) Select the **SOAP Body In Request Must Be Signed And Verified** check box to verify that requests contain a SOAP body that is digitally signed and verified.

       If not, the system issues a `Verification Error` violation.
    c) Select the **Enforce Timestamp In Request** check box to verify that the SOAP request contains a valid timestamp.

       If the request has no timestamp, the `Missing Timestamp` violation occurs. If the timestamp is expired, the system issues the `Expired Timestamp` violation.
17. Specify which parts of the XML document you want the system to process:
    - If you want the response action to apply to the whole SOAP message (`/soapenv:Envelope/soapenv:Body`), select the **Apply Action to Entire Response Body Value** check box.
    - To specify which parts of requests and responses you want the system to process, use the **Elements** setting to add XPath expressions to define the parts of the SOAP message to encrypt.
18. If you are updating an existing profile, click **Update**. If you are creating a new profile, click **Create**.

The security policy that is associated with the XML profile now includes web services security for the XML application.

Writing XPath queries

You can write up to three XPath queries to define the content that you are looking for in XML documents. When writing XPath queries, you use a subset of the XPath syntax described in the XML Path Language (XPath) standard at `http://www.w3.org/TR/xpath`.

These are the rules for writing XPath queries for XML content-based routing.

1. Express the queries in abbreviated form.
2. Map all prefixes to namespaces.
3. Use only ASCII characters in queries.
4. Write queries to match elements and attributes.
5. Use wildcards as needed for elements and namespaces; for example, `//emp:employee/*`.
6. Do not use predicates in queries.

Syntax for XPath expressions

This table shows the syntax to use for XPath expressions.

Expression	Description
`Nodename`	Selects all child nodes of the named node.
`@Attname`	Selects all attribute nodes of the named node.
`/`	Indicates XPath step.
`//`	Selects nodes that match the selection no matter where they are in the document.

XPath query examples

This table shows examples of XPath queries.

Query	Description
`/a`	Selects the root element `a`.
`//b`	Selects all `b` elements wherever they appear in the document.
`/a/b:*`	Selects any element in a namespace bound to prefix `b`, which is a child of the root element `a`.
`//a/b:c`	Selects elements in the namespace of element `c`, which is bound to prefix `b`, and is a child of element `a`.

Configuring blocking actions for web services security

It only makes sense to select learning and blocking settings for web services security errors if you previously created a security policy to protect a web application that uses XML formatting or employs web services. The security policy must have an XML profile (with web services security enabled) associated with it.

You can select which web services security errors must occur for the system to learn, log, or block requests that trigger the errors. These errors are subviolations of the parent violation, `Web Services Security failure`.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Adjust the **Enforcement Mode** setting if needed.
   - To block traffic that causes violations, select **Blocking**.
   - To allow traffic even if it causes violations (allowing you to make sure that legitimate traffic would not be blocked), select **Transparent**.

   You can only configure the Block flag on violations if the enforcement mode is set to **Blocking**.
4. From the list, select **Advanced**.
5. Expand the **Content Profiles** setting.
   The content profile violations and **Web Services Security failure** subviolations are displayed.
6. Review the **Web Services Security failure** setting and adjust the **Learn**, **Alarm**, and **Block** flags as required.
7. For Web Services Security failure subviolations, enable or disable the web services subviolations, as required for your application.

   Tip: *For an explanation of any individual subviolation, click it.*

The selected subviolations are the ones that will cause the `Web Services Security failure` violation to occur.

8. Click **Save** to save your settings.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

If a request causes one of the enabled errors to occur, web services security stops parsing the document. How the system reacts depends on how you configured the blocking settings for the `Web Services Security failure` violation:

- If configured to Learn or Alarm when the violation occurs, the system does not encrypt or decrypt the SOAP message, and sends the original document to the web service.
- If configured to Block when the violation occurs, the system blocks the traffic and prevents the document from reaching its intended destination. The system sends a blocking response page. If the XML profile associated with the policy is configured to use an XML blocking response page, it uses the XML response. Otherwise, it uses the default response page.
- If a web services security violation occurs on an entity in staging, for example, a URL in staging associated with an XML profile, the violation (set to alarm or block) is not enforced.

Fine-tuning Advanced XML Security Policy Settings

Fine-tuning XML defense configuration

Before you can perform this task, you must have created a security policy for an application that uses web services or XML, and created and associated an XML profile with the policy.

The defense configuration in an XML profile provides formatting and attack pattern checks for the XML data. The defense configuration complements the validation configuration to provide comprehensive security for XML data and web services applications. If your XML application has special requirements, you can adjust the defense configuration settings. This is an advanced task that is not required when creating a security policy for an XML application.

1. On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **XML Profiles**.
   The XML Profiles screen opens.
2. Click the name of the XML profile for which you want to modify the advanced defense configuration settings.
   The XML Profile Properties screen opens.
3. On the XML Firewall Configuration tab, from the **Defense Configuration** list, select **Advanced**.
   The screen displays additional defense configuration settings.
4. For the **Defense Level** setting, select the protection level you want for the application.

   The defense level determines the granularity of the security inspection for the XML application. You can choose **High**, **Medium**, or **Low** and let the system determine the defense level settings. Or you can set the level, then adjust any of the settings to create a **Custom** defense level.
5. Adjust the defense configuration settings as required by your application and traffic.
6. Optionally, modify the attack signatures, meta characters, or sensitive data for this XML profile on the appropriate tabs.
7. Click **Update** to update the XML profile.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

A trade-off occurs between ease of configuration and defense level. The higher the defense level, the more you may need to refine the security policy. For example, if you use the default defense level of **High**, the XML security is optimal; however, when you initially apply the security policy, the system may generate false-positives for some XML violations. However, a **Low** defense level may not protect the application as strictly but may cause fewer false positives.

The system checks requests that contain XML data to be sure that the data complies with the various document limits defined in the defense configuration of the security policy's XML profile. The system generally examines the message for compliance to boundaries such as the message's size, maximum depth, and maximum number of children. When the system detects a problem in an XML document, it causes the `XML data does not comply with format settings` violation, if the violation is set to Alarm or Block.

Advanced XML defense configuration settings

This table describes the defense configuration settings. The **Defense Level** setting in an XML profile determines the default values for the setting, or you can adjust them. A value of **Any** indicates unlimited; that is, up to the boundaries of an integer type.

Setting	Description	Default Values
Defense Level	Specifies the level of protection that the system applies to XML documents, applications, and services. If you change any of the default settings, the system automatically changes the defense level to **Custom**.	High, Medium, Low
Allow DTDs	Specifies, when enabled, that the XML document can contain Document Type Definitions (DTDs).	High: Disabled, Medium: Enabled, Low: Enabled
Allow External References	Specifies, when enabled, that the XML document is allowed to list external references using operators, such as schemaLocation and SYSTEM.	High: Disabled, Medium: Disabled, Low: Enabled
Tolerate Leading White Space	Specifies, when enabled, that leading white spaces at the beginning of an XML document are acceptable.	High: Disabled, Medium: Disabled, Low: Enabled
Tolerate Close Tag Shorthand	Specifies, when enabled, that the close tag format </>, which is used in the XML encoding for Microsoft Office Outlook Web Access, is acceptable.	High: Disabled, Medium: Disabled, Low: Enabled
Tolerate Numeric Names	Specifies, when enabled, that the entity and namespace names can start with an integer (0-9). Note that this is a compatibility option for use with Microsoft Office Outlook Web Access.	High: Disabled, Medium: Disabled, Low: Enabled
Allow Processing Instructions	Specifies, when enabled, that the system allows processing instructions in the XML request. If you upload a WSDL file that references valid SOAP methods, this setting is inactive.	High: Enabled, Medium: Enabled, Low: Enabled
Allow CDATA	Specifies, when enabled, that the system permits the existence of character data (CDATA) sections in the XML document part of a request.	High: Disabled, Medium: Enabled, Low: Enabled
Maximum Document Size	Specifies, in bytes, the largest acceptable document size.	High: 1024000, Medium: 10240000, Low: Any
Maximum Elements	Specifies the maximum number of elements that can be in a single document.	High: 65536, Medium: 512000, Low: Any

Setting	Description	Default Values
Maximum Name Length	Specifies, in bytes, the maximum acceptable length for element and attribute names.	High: 256, Medium: 1024, Low: Any
Maximum Attribute Value Length	Specifies, in bytes, the maximum acceptable length for attribute values.	High: 1024, Medium: 4096, Low: Any
Maximum Document Depth	Specifies the maximum depth of nested elements.	High: 32, Medium: 128, Low: Any
Maximum Children Per Element	Specifies the maximum acceptable number of child elements for each parent element.	High: 1024, Medium: 4096, Low: Any
Maximum Attributes Per Element	Specifies the maximum number of attributes for each element.	High: 16, Medium: 64, Low: Any
Maximum NS Declarations	Specifies the maximum number of namespace declarations allowed in a single document.	High: 64, Medium: 256, Low: Any
Maximum Namespace Length	Specifies the largest allowed size, in bytes, for a namespace prefix in the XML part of a request.	High: 256, Medium: 1024, Low: Any

Masking sensitive XML data

Before you can perform this task, you must have created a security policy, and created and associated an XML profile with the policy.

You can mask sensitive XML data so that it does not appear in the interface or logs. You set this up in the XML profile of a security policy.

1. On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **XML Profiles**.
   The XML Profiles screen opens.
2. Click the name of the XML profile for which you want to mask sensitive data.
   The XML Profile Properties screen opens.
3. Click the Sensitive Data Configuration tab.
   The screen displays Sensitive Data Configuration settings.
4. For **Namespace**, select one of the options:

Option	Use
Any Namespace	When the sensitive data can appear in an element or attribute in any namespace.
Custom	When the sensitive data appears in an element or attribute in a particular namespace. Type the namespace prefix that can contain sensitive data.
No Namespace	When no namespace in the XML document has an element or attribute with a value that contains sensitive data.

5. For **Name**:
   a) Select **Element** or **Attribute** to indicate whether the sensitive data appears as a value of either an XML element or an attribute.
   b) In the field, type the XML element or attribute whose value can contain sensitive data. Entries in this field are case-sensitive.

6. Click **Add** to add the information you entered in the **Namespace** and **Name** fields to the Sensitive Data table and the XML profile.
7. Click **Update** to update the XML profile.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

The system checks requests that contain XML data and if they contain sensitive data, that data is masked in logs and in request content shown in the Application Security Manager™.

Overriding meta characters based on content

Before you can perform this task, you must have previously created a JSON, XML, Google Web Toolkit (GWT), or Plain Text content profile.

You can have the system check for allowed or disallowed meta characters based on the content of a request as defined in content profiles (XML, JSON, GWT, or Plain Text). In addition, you can override the security policy settings so that the system avoids checking for meta characters in particular content.

1. On the Main tab, point to**Security** > **Application Security** > **Content Profiles** and click a content profile type (**XML**, **JSON**, **GWT**, or **Plain Text**).
2. In the profiles list, click the name of the content profile for which you want to override meta character checks.
   The profile properties screen opens.
3. Click the Meta Characters tab (for XML) or Value Meta Characters (for JSON, plain text, or GWT).
4. Select the appropriate check box:
   - For JSON, plain text, or GWT profiles, select the **Check characters** check box to have the system check for meta characters in JSON data.
   - For XML profiles, select **Check element value characters** to check meta characters in XML elements, and select **Check attribute value characters** to check meta characters in XML attributes.
5. In the **Global Security Policy Settings** list, review the meta characters that are assigned to the security policy, and which are allowed or disallowed in the content profile.
6. From the **Global Security Policy Settings** list, move any meta characters that you want to override for this content profile into the **Overridden Security Policy Settings** list.
7. Set the meta character to **Allow** or **Disallow** in the overridden settings list (the opposite from the global setting).
8. Click **Update** to update the content profile.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

If the content matches that defined in the content profile, meta characters are allowed or disallowed according to the overriden meta character settings in the content profile.

Managing SOAP methods

Before you can perform this task, you must have created a security policy, and created and associated an XML profile with the policy.You must have already uploaded a WSDL document in the XML profile.

When using a WSDL document in the XML profile, the system includes the relevant SOAP methods in the validation configuration. You can enable or disable the SOAP methods, as needed.

1. On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **XML Profiles**.
   The XML Profiles screen opens.

2. Click the name of the XML profile for which you want to enable or disable one or more SOAP methods.
   The XML Profile Properties screen opens.
3. On the XML Fireweall Configuration tab, in the Validation Configuration area, the **Valid SOAP Methods** table lists the SOAP methods used by the WSDL file you uploaded previously. Select or clear the **Enabled** check box for each method that you want to enable (allow) or disable (not allow).
4. Click **Update** to update the XML profile.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

The XML profile is updated if you changed which SOAP methods are allowed by the security policy. If you disable a SOAP method, and a request contains that method, the system issues the `SOAP method not allowed violation`, and blocks the request if the enforcement mode is set to blocking.

Adding JSON Support to an Existing Security Policy

Overview: Adding JSON support to existing security policies

JSON (JavaScript® Object Notation) is a data-interchange format often used to pass data back and forth between an application and a server. This implementation describes how to add JSON support to an existing security policy for an application that uses JSON for data transfer. You create a JSON profile to define what the security policy enforces and considers legal when it detects traffic that contains JSON data.

You add JSON support to a security policy by completing these tasks.

Task Summary

Creating a JSON profile

Before you can complete this task, you need to have already created a security policy for your application.

This task describes how to create a JSON profile that defines the properties that the security policy enforces for an application sending JSON payloads or WebSocket payloads in JSON format.

Note: *The system supports JSON in UTF-8 and UTF-16 encoding. WebSocket allows only UTF-8.*

1. On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **JSON Profiles**.
2. Click **Create** to create a new JSON profile, or edit the `Default` JSON profile (by clicking it). The Create New JSON Profile screen opens.
3. Type a name for the profile.
4. Adjust the maximum values that define the JSON data for the AJAX application, or use the default values.
5. If you want the system to tolerate and not report warnings about JSON content, select the **Tolerate JSON Parsing Warnings** check box.

   If the system cannot parse JSON content, it generates the violation `Malformed JSON data`, regardless of whether this setting is enabled or disabled.
6. To parse parameters in a JSON payload as parameters (recommended), ensure that **Parse Parameters** is enabled.

   The system extracts parameters from JSON content whenever the JSON profile is used; for example, with URLs, WebSocket URLs, or parameters that use a JSON profile.

   The security policy parses parameters extracted from the JSON payload the same as other parameters. Also, the Attack Signatures, Value Metacharacters, and Sensitive Data Configuration tabs are removed from the screen, so you can skip to the last step.
7. If the signatures included in the security policy are not sufficient for this JSON profile, you can change them.

   a) On the Attack Signatures tab, in the **Global Security Policy Settings** list, select any specific attack signatures that you want to enable or disable for this profile, and then move them into the **Overridden Security Policy Settings** list.

   Tip: *If no attack signatures are listed in the* ***Global Security Policy Settings*** *list, create the profile, update the attack signatures, then edit the profile.*

b) After you have moved any applicable attack signatures to the **Overridden Security Policy Settings** list, enable or disable each of them as needed:

   - **Enabled** - Enforces the attack signature for this JSON profile, although the signature might be disabled in general. The system reports the violation `Attack Signature Detected` when the JSON in a request matches the attack signature.
   - **Disabled** - Disables the attack signature for this JSON profile, although the signature might be enabled in general.

8. To allow or disallow specific meta characters in JSON data (and thus override the global meta character settings), click the Value Meta Characters tab.
   - Select the **Check characters** check box, if it is not already selected.
   - Move any meta characters that you want allow or disallow from the **Global Security Policy Settings** list into the **Overridden Security Policy Settings** list.
   - In the **Overridden Security Policy Settings** list, change the meta character state to **Allow** or **Disallow**.
9. To mask sensitive JSON data (replacing it with asterisks), click the Sensitive Data Configuration tab.
   - In the **Element Name** field, type the JSON element whose values you want the system to consider sensitive.
   - Click **Add**.

   Important: *If the JSON data causes violations and the system stops parsing the data part way through a transaction, the system masks only the sensitive data that was fully parsed.*

   Add any other elements that could contain sensitive data that you want to mask.
10. Click **Create** (or **Update** if editing the Default profile).
    The system creates the profile and displays it in the JSON Profiles list.

This creates a JSON profile that affects the security policy when you associate the profile with a URL, WebSocket URL, or parameter.

Next, you need to associate the JSON profile with any URLs, WebSocket URLs, or parameters that might include JSON data.

Associating a JSON profile with a URL

Before you can associate a JSON profile with a URL, you need to have created a security policy with policy elements including application URLs, and the JSON profile.

You can associate a JSON profile with one or more explicit or wildcard URLs.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. From the Allowed URLs List, click the name of a URL that might contain JSON data.
   The Allowed URL Properties screen opens.
4. Next to **Allowed URL Properties**, select **Advanced**.
   The screen refreshes to display additional configuration options.
5. Click the **Header-Based Content Profiles** tab, and in the **Request Header Name** field, type the explicit string or header name that defines when the request is treated as the **Parsed As** type; for example, `content-type`.

   This field is not case sensitive.

   Note: *If the URL always contains JSON data, for **Request Body Handling** select **JSON**.*

6. In the **Request Header Value** field, type the wildcard (including *, ?, or [chars]) for the header value that must be matched in the **Request Header Name** field; for example, `*json*`.

   This field is case sensitive.
7. From the **Request Body Handling** list, select **JSON**.
   The system automatically creates a `Default` JSON profile, and assigns it as the profile when you select **JSON** in this field.
8. From the **Profile Name** list, either leave the default, select a JSON profile appropriate for this URL, or click **Create** to quickly create a new JSON profile.
9. Click **Add**.

   Add as many header types as you need to secure this URL, clicking **Add** after specifying each one.
10. To override the global meta character settings for this URL, adjust the meta character policy settings:
    - In the Meta Characters tab, select the **Check characters on this URL** check box, if it is not already selected.
    - Move any meta characters that you want allow or disallow from the **Global Security Policy Settings** list into the **Overridden Security Policy Settings** list.
    - In the **Overridden Security Policy Settings** list, change the meta character state to **Allow** or **Disallow**.
11. Click **Update**.
12. To put the security policy changes into effect immediately, click **Apply Policy**.

The JSON profile is associated with the URL.

Continue to associate JSON profiles with any URLs in the application that might contain JSON data.

Associating a JSON profile with a parameter

You need to have created a security policy with policy elements including parameters and a JSON profile before starting this procedure.

You can associate a JSON profile with a parameter.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the Parameters List area, click the name of a parameter to which to assign a JSON profile.
   The Parameter Properties screen opens.
4. For the **Parameter Value Type** setting, select **JSON value**.
   The system automatically creates a `Default` JSON profile, and assigns it as the profile when you select **JSON value** in this field.
5. From the **JSON Profile** list, either leave the default, select a JSON profile appropriate for this parameter, or click **Create** to quickly create a new JSON profile for this parameter.
6. Click **Update**.
   The system associates the JSON profile with the parameter.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

Continue to associate JSON profiles with any parameters in the application that might contain JSON data.

Implementation result

You have manually added JSON support to the active security policy. The policy can now secure applications that use JSON for data transfer between the client and the server. If web application traffic includes JSON data, the system checks that it meets the requirements that you specified in the JSON profile.

Creating Security Policies for AJAX Applications

Application security for applications that use AJAX

Application Security Manager™ can protect AJAX applications including those that use JSON or XML for data transfer between the client and the server. If the AJAX application uses XML for data transfer, the security policy requires that an XML profile be associated with a URL or parameter. If the AJAX application uses JSON for data transfer, the security policy requires that a JSON profile be associated with a URL or parameter. If the AJAX application uses HTTP for data transfer, no profile is needed.

Some web applications use AJAX authentications that submit the login form as an AJAX POST request, with the login details and response in JSON format. If so, you can create a login page with an authentication type of JSON/AJAX Request to protect against brute force attacks. You can use this login URL when configuring session awareness or login enforcement.

You can also set up AJAX blocking response behavior for applications so that if a violation occurs during AJAX-generated traffic, the system displays a message or redirects the application user to another location.

Overview: Creating a security policy for applications that use AJAX

AJAX (Asynchronous JavaScript and XML) applications make requests to the server and send responses to the client formatted using XML or JavaScript Object Notation (JSON). You can create a security policy automatically for applications that use AJAX.

Creating a simple security policy

Before you can create a security policy, you must perform the minimal system configuration tasks required according to the needs of your networking environment.

You can use Application Security Manager™ to create a robust, yet simple, security policy that is tailored to protect your web application. This is the easiest way to create a security policy.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies** > **Policies List**.
   The Policies List screen opens.
2. Click **Create New Policy**.

   You only see this button when no policy is selected.
3. In the **Policy Name** field, type a name for the policy.
4. Leave **Policy Type**, set to **Security**.
5. For **Policy Template**, select **Fundamental**.
6. For **Virtual Server**, click **Configure new virtual server** to specify where to direct application requests.
   a) For **What type of protocol does your application use?**, select **HTTP**, **HTTPS**, or both.
   b) In the **Virtual Server Name** field, type a unique name.
   c) In the **HTTP Virtual Server Destination** field, type the address in IPv4 (`10.0.0.1`) or IPv6 (`2001:ed8:77b5:2:10:10:100:42/64`) format, and specify the service port.

*Tip: If you want multiple IP addresses to be directed here, use the **Network** setting.*

d) In the HTTP Pool Member setting, specify the addresses of the back-end application servers.
e) From the **Logging Profile** list, select a profile such as **Log illegal requests** to determine which events are logged on the system.

7. In the upper right corner, click **Advanced**.

   You can use default values for the Advanced settings but it's a good idea to take a look at them.

   - If you selected **Fundamental** or **Comprehensive** for the **Policy Template**, **Learning Mode** is set to **Automatic** and **Enforcement Mode** is set to **Blocking**.

     *Tip: If you need to change these values, set application language to a value other than **Auto detect**.*

   - If you know the **Application Language**, select it or use **Unicode (utf-8)**.
   - To add specific protections (enforcing additional attack signatures) to the policy, for **Server Technologies**, select the technologies that apply to the back-end application servers.
   - You can configure trusted IP addresses that you want the security policy to consider safe.

8. Click **Create Policy** to create the security policy.

ASM™ creates a security policy that immediately starts protecting your application. The enforcement mode of the security policy is set to Blocking. Traffic that is considered to be an attack such as traffic that is not compliant with HTTP protocol, has malformed payloads, uses evasion techniques, performs web scraping, contains sensitive information or illegal values is blocked. Other potential violations are reported but not blocked.

The system examines the traffic to the web application making suggestions for more specifically building the security policy. The Policy Builder selectively learns new entities like file types, parameters, and cookies used in requests to the application. When ASM processes sufficient traffic, it automatically adds the entities to the security policy, and enforces them.

The system applies a basic set of attack signatures to the security policy and puts them in staging (by default, for 7 days). If you specified server technologies, additional attack signatures are included. ASM reports common attacks discovered by comparison to the signatures but does not block these attacks until the staging period is over and they are enforced. That gives you a chance to be sure that these are actual attacks and not legitimate requests.

Tip: This is a good point at which send some traffic to test that you can access the application being protected by the security policy and check that traffic is being processed correctly by the BIG-IP® system. Send the traffic to the virtual server destination address.

Implementation result

The Real Traffic Policy Builder® creates a security policy that can protect applications that use AJAX with JSON or XML for data transfer between the client and the server. The system examines the traffic and creates an appropriate profile. If the application uses XML, the security policy includes one or more XML profiles associated with URLs or parameters. If the application uses JSON, the security policy includes one or more JSON profiles associated with URLs or parameters.

Overview: Adding AJAX blocking and login response behavior

Normal policy blocking and login response behavior could interfere with applications that use AJAX. If you want to display a message or redirect traffic without interfering with the user experience while browsing to an AJAX-featured web application, you need to enable AJAX blocking behavior (JavaScript injection). You can implement blocking and login response behavior for applications that use AJAX with JSON or XML for data transfer.

Important: *You can implement AJAX blocking behavior only for applications developed using one of the following frameworks:*

- Microsoft® ASP.NET
- jQuery
- Prototype®
- MooTools

By default, if you enable AJAX blocking behavior, when an AJAX request results in a violation that is set to **Block**, Application Security Manager performs the default AJAX response page action. The system presents a login response if the application user sends an AJAX request that attempts to directly access a URL that should only be accessed after logging in.

Note: *Enabling AJAX blocking behavior has performance implications.*

Configuring the blocking response for AJAX applications

Before you can complete this task, you need to have already created a security policy for your web application. The application needs to have been developed using ASP.NET, jQuery, Prototype®, or MooTools to use AJAX blocking behavior.

When the enforcement mode of the security policy is set to blocking and a request triggers a violation (that is set to block), the system displays the AJAX blocking response according to the action set that you define. If a login violation occurs when requesting the login URL, the system sends a login response page, or redirects the user.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Response Pages**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click the **AJAX Response Page** tab.
4. Select the **Enable AJAX blocking behavior (JavaScript injection)?** check box.
   The system displays the default blocking response and login response actions for AJAX.
5. For the **Default Response Page action** setting, select the type of response you want the application user to receive when they are blocked from the application:
   - **Custom Response** lets you specify HTML text or upload a file to use as a replacement for the frame or browser page that generated the AJAX request. Include the text, then click **Show** to preview the response.
   - **Popup message** displays text in a popup window (default text is included).
   - **Redirect URL** redirects the user to the URL you specify. You can also include the support ID. For example: `http://www.example.com/blocking_page.php?support_id=<%TS.request.ID()%>`.
6. For the **Login Page Response action**, select the type of response (types are the same as for default response page in Step 5).
7. Click **Save**.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

Securing Web Applications Created with Google Web Toolkit

Overview: Securing Java web applications created with Google Web Toolkit elements

Google Web Toolkit (GWT) is a Java framework that is used to create AJAX applications. When you add GWT enforcement to a security policy, the Security Enforcer can detect malformed GWT data, request payloads and parameter values that exceed length limits, attack signatures, and illegal meta characters in parameter values. This implementation describes how to add GWT support to an existing security policy for a Java web application created with GWT elements.

Task summary

Creating a Google Web Toolkit profile

Before you can begin this task, you need to create a security policy for the web application that you are creating using Google Web Toolkit (GWT).

A GWT profile defines what the security policy enforces and considers legal when it detects traffic that contains GWT data.

Note: *The system supports GWT in UTF-8 and UTF-16 encoding.*

1. On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **GWT Profiles**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Create New GWT Profile screen opens.
4. Type a name and optional description for the profile.
5. For the **Maximum Total Length of GWT Data** setting, specify the maximum byte length for the request payload or parameter value that contains GWT data.

   The default is `10000` bytes.

Option	Description
Any	Specifies that there are no length restrictions.
Length	Specifies, in bytes, the maximum data length that is acceptable.

6. For the **Maximum Value Length** setting, specify the longest acceptable value for a GWT element that occurs in a document that the security policy allows.

   The default is `100` bytes.

Option	Description
Any	Specifies that there are no length restrictions.
Length	Specifies, in bytes, the maximum acceptable length.

7. Clear the **Tolerate GWT Parsing Warnings** check box if you want the system to report warnings about parsing errors in GWT content.

8. To change the security policy settings for specific attack signatures for this GWT profile, from the **Global Security Policy Settings** list, select the attack signatures and then move them into the **Overridden Security Policy Settings** list.

   ***Note:** If no attack signatures are listed in the **Global Security Policy Settings** list, create the profile, update the attack signatures, then edit the profile.*

9. In the **Overridden Security Policy Settings** list, enable or disable each attack signature as needed:

Option	Description
Enabled	Enforces the attack signature for this GWT profile, although the signature might be disabled in general. The system reports the Attack Signature Detected violation when the GWT data in a request matches the attack signature.
Disabled	Deactivates the attack signature for this GWT profile, although the signature might be enabled in general.

10. To allow or disallow specific meta characters in GWT data (and thus override the global meta character settings), click the Value Meta Characters tab.
    a) Select the **Check characters** check box, if it is not already selected.
    b) Move any meta characters that you want allow or disallow from the **Global Security Policy Settings** list into the **Overridden Security Policy Settings** list.
    c) In the **Overridden Security Policy Settings** list, change the meta character state to **Allow** or **Disallow**.
11. Click **Create**.
    The system creates the profile and displays it in the GWT Profiles list.

The security policy does not enforce the GWT profile settings until you associate the GWT profile with any URLs that might include GWT data.

Associating a Google Web Toolkit profile with a URL

Before you can associate a Google Web Toolkit (GWT) profile with a URL, you need to create a security policy with policy elements, including application URLs and the GWT profile.

When you associate a GWT profile with a URL in a security policy, the Security Enforcer can apply specific GWT checks to the associated requests.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the Allowed URLs List area, click the name of a URL that might contain GWT data.
   The Allowed URL Properties screen opens.
4. From the **Allowed URL Properties** list, select **Advanced**.
5. For the **Header-Based Content Profiles** setting, specify the characteristics of the traffic to which the GWT profile applies.
   a) In the **Request Header Name** field, type the explicit string or header name that defines when the request is treated as the **Parsed As** type; for example, `Content-Type`.

      This field is not case-sensitive.
   b) In the **Request Header Value** field, type a wildcard character (including *, ?, or [chars]) for the header value; for example, `*gwt*`.

      This field is case-sensitive.
   c) For the **Parsed As** setting, select **GWT**.
   d) For the **Profile Name** setting, select the GWT profile that you created from the list.

   e) Click **Add**.
      The system adds the header and profile information to the list.

6. (Optional) If you have multiple headers and profiles defined, you can adjust the order of processing.
7. Click **Update**.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

When the system receives traffic that contains the specified URLs, the Security Enforcer applies the checks you established in the GWT profile, and takes action according to the corresponding blocking policy.

Implementation result

You have now added Google Web Toolkit (GWT) support to a security policy. When the Security Enforcer detects GWT traffic that matches the URLs defined in the security policy, the selected parameters are enforced as you have indicated.

Adding Server Technologies to a Policy

Overview: Adding server technologies to a policy

It is not always easy to determine which server technologies apply to the applications for which you are creating security policies. Server technologies can be server-side applications, frameworks, programs, web servers, operating systems, and so on, and they are associated with one or more sets of attack signatures that can be added to the policy. This allows you to assign a more selective set of attack signatures to the policy, that is, signatures that specifically apply to the technologies used in the application being protected.

When you first create a security policy, you have the opportunity to select server technologies that you know about. Once the policy is created, you can have it automatically detect server technologies. In this case, the policy can detect appropriate server technologies, and can continue to detect new server technologies if the back-end server infrastructure changes, if new systems are added, or if an attack signature update adds a new server technology that is appropriate for the policy.

The system can automatically detect the server technology on Request headers and payloads only when a successful response code is received (1xx/2xx/3xx). For Responses, server technology can be detected only if "Content-Type" header is in the response. The system also learns technologies from error responses, such as 4xx and 5xx status codes (even if they are not listed in the **HTTP Response Status Codes used to learn traffic** in the Learning and Blocking Settings).

You can also manually add server technologies to the policy if you determine that certain ones are appropriate for the applications being protected and want to apply them right away.

Automatically adding server technologies

A security policy can automatically detect the server technologies that the applications it protects are using. You can also view a list of server technologies and add them manually.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the Policy Building Settings area, expand **Server Technologies** and select **Enable Server Technology Detection**.
3. Click **Save** to save your settings.
4. Click the arrow next to **Enable Server Technology Detection**.
   The Policy: Server Technologies screen opens where you can see which server technologies are applied to the current security policy.
5. Click **Add Server Technology** to see the server technologies that are discoverable, and select any that you know apply to the applications being protected, and click **Save**.

   If manually adding a server technology that has implied technologies, you see a notification that lists the additional server technologies that will be added. For example, if you add ASP.NET, IIS and Microsoft Windows are also included.
6. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy is set up to automatically detect server technologies and make suggestions to add them to the policy. If using automatic learning, the system adds the detected technologies when sufficient time and traffic has passed. If the **Learning Mode** is **Manual**, you need to specifically accept the learning suggestions to add the sever technologies on the Traffic Learning screen.

When server technologies are included in the policy, the system creates a user-defined signature set for each server technology. If the technology has related or implied server technologies, they are added as well. The signature sets are added to the security policy with the Learn, Alarm, Block flags set, and new signatures are put into staging. The system learns server technologies from responses regardless of the **Learn from response** flag setting in the **Learning and Blocking Settings** .

If you later delete server technologies and want to delete the associated user-defined signature sets, you can go to **Options** > **Application Security** > **Attack Signatures** > **Attack Signature Sets** and delete the sets there. Deleting the user-defined signature sets alone, however, does not remove the server technology from the list.

Refining Security Policies with Learning

About learning

You can use learning resources to help build a security policy, particularly if you are building a security policy manually. When building a security policy manually, the learning mode is set to Manual, and when building a policy automatically, the learning mode is Automatic.

When you send client traffic through the Application Security Manager™ (ASM), the learning data provides information on requests or responses that do not comply with the current security policy and have triggered a violation. The reason for triggering a violation can be either an actual attack on the site, or a false positive (typically seen during the process of building a policy).

ASM™ generates learning suggestions for requests that cause violations and do not pass the security policy checks. The system also suggests adding legitimate entities such as URLs, file types, or parameters that often appear in requests. You can examine the requests that cause learning suggestions, and then use the suggestions to refine the security policy. In some cases, learning suggestions may contain recommendations to relax the security policy. When dealing with learning suggestions, make sure to relax the policy only where false positives occurred, and not in cases where a real attack caused a violation. You can use the violation ratings to help determine how likely a request was caused by an attack.

If you are generating a security policy automatically, ASM handles much of the learning for you, adjusting the security policy based on traffic characteristics. In that case, the learning screens show only the elements that the security policy is in the process of learning, or those which require manual intervention to be resolved.

About learning suggestions

Application Security Manager™ (ASM) generates learning suggestions for violations if the Learn flag is enabled for the violations on the Learning and Blocking Settings screen. When the system receives a request that triggers a violation, the system updates the Traffic Learning screen with learning suggestions using information from the violating request. From this screen, you can review the learning suggestions to determine whether the request triggered a legitimate security policy violation, or if the violation represents a need to update the security policy.

The system can also generate suggestions based on legitimate activity, such as adding a valid URL or host name to the security policy.

Next to each suggestion, ASM assigns a *learning score* that measures the strength of the suggestion by showing a percentage that indicates how close the system is to recommending that you accept the suggestion. The learning score is also influenced by the violation rating: the lower the rating of the violations, the higher the score.

If the system is working in automatic learning mode, when the learning score reaches 100%, the system can accept and enforce most of the suggestions. If and when the system enforces the suggestions depends on which learning mode *auto-apply* setting you have chosen. It is possible to limit auto-apply to specific days and hours. You can accept suggestions manually at any time. If you are using manual learning, when the learning score reaches 100% (or before that if you know the suggestions are valid), you need to accept the suggestions manually.

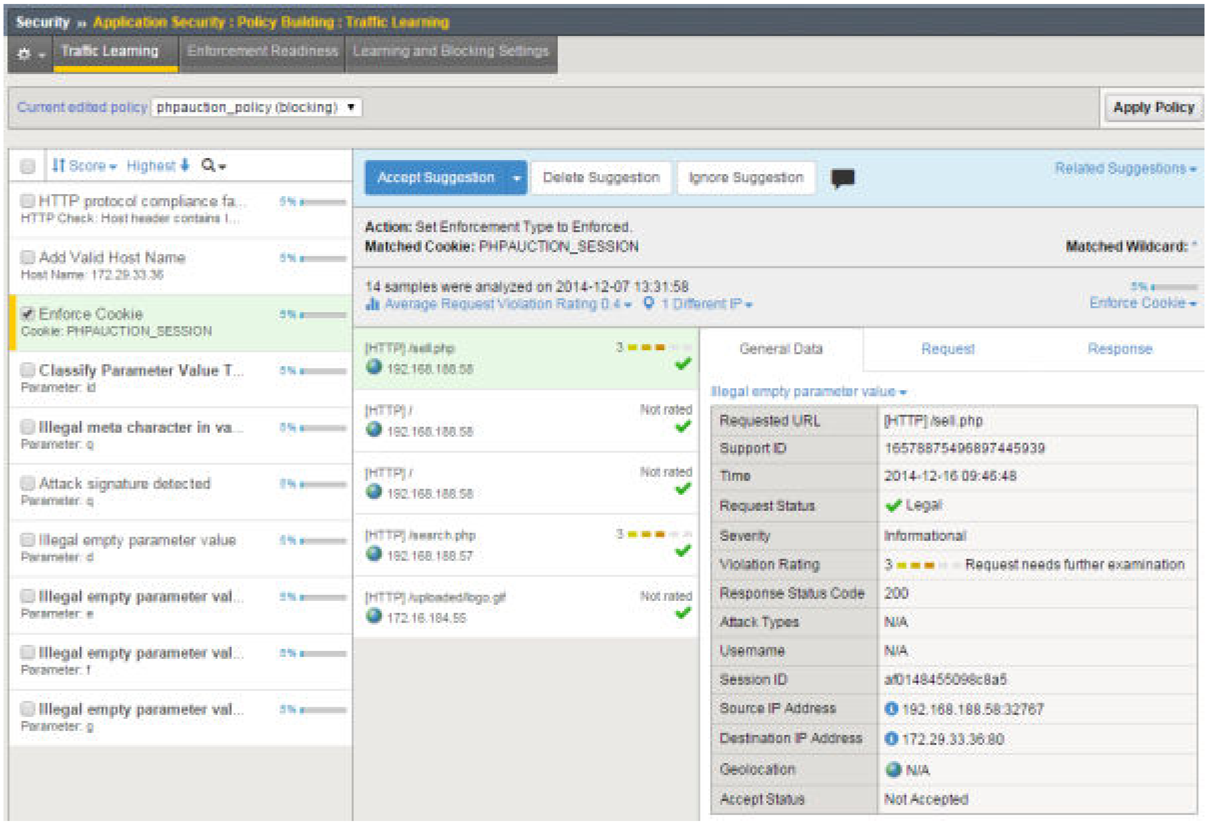
Making decisions about which learning suggestions to accept requires a general understanding of application security, and specific knowledge of the protected application (for example, recognizing valid traffic). For example, you should consider accepting a learning suggestion when you see that it is associated with many requests from many different source IP addresses. As long as they are valid, repeated requests may indicate legitimate traffic behavior that warrants relaxing the security policy.

You can also review the violation rating for requests by selecting the suggestion. Learning suggestions associated with requests having a low average violation rating are more likely to be false positives and can be accepted. But if a request has a high violation rating, the learning suggestion should not be accepted. Instead, it should be cleared because it is most likely indicative of an attack.

The Traffic Learning screen also displays violations for which the system does not generate learning suggestions. Typically, these violations are related to RFC compliance and system resources; the resolution for these violations may be to disable the violation rather than to change the configuration. The system displays these violations along with the learning suggestions to ease the security policy management tasks.

What suggestions look like

This figure shows the Traffic Learning screen with several suggestions on it. As an example, on the left, the suggestion to enforce a cookie is highlighted; the information on the right shows what caused the suggestion. The HTTP violations are listed, and one is selected showing details about the request. The cookie `PHPAUCTION_SESSION` matched the * wildcard in the Allowed Cookies list in several requests so the suggestion is to add and enforce the cookie. If you accept the suggestion, the cookie is added to the Enforced Cookies list.



Current edited policy: phpauction_policy (blocking)

□ HTTP protocol compliance fa... 5%
HTTP Check: Host header contains I...

□ Add Valid Host Name 5%
Host Name: 172.29.33.36

☑ Enforce Cookie 5%
Cookie: PHPAUCTION_SESSION

□ Classify Parameter Value T... 5%
Parameter: id

□ Illegal meta character in va... 5%
Parameter: q

□ Attack signature detected 5%
Parameter: q

□ Illegal empty parameter value 5%
Parameter: d

□ Illegal empty parameter val... 5%
Parameter: e

□ Illegal empty parameter val... 5%
Parameter: f

□ Illegal empty parameter val... 5%
Parameter: g

Action: Set Enforcement Type to Enforced.
Matched Cookie: PHPAUCTION_SESSION
Matched Wildcard: *

14 samples were analyzed on 2014-12-07 13:31:58 5%
Average Request Violation Rating 0.4 · 1 Different IP · Enforce Cookie

[HTTP] /sell.php 3 ✓
192.168.188.58

[HTTP] / Not rated ✓
192.168.188.58

[HTTP] / Not rated ✓
192.168.188.58

[HTTP] /search.php 3 ✓
192.168.188.57

[HTTP] /uploaded/logo.gif Not rated ✓
172.16.184.55

Illegal empty parameter value

Requested URL	[HTTP] /sell.php
Support ID	16578875496897445939
Time	2014-12-16 09:46:48
Request Status	✓ Legal
Severity	Informational
Violation Rating	3 Request needs further examination
Response Status Code	200
Attack Types	N/A
Username	N/A
Session ID	af0148455098c8a5
Source IP Address	192.168.188.58:32767
Destination IP Address	172.29.33.36:80
Geolocation	N/A
Accept Status	Not Accepted

Figure 10: Traffic Learning screen with suggestions

What violations are unlearnable?

Some violations that occur indicate a real problem with a request that cannot be learned. These are called *unlearnable violations*. For example, requests for access from disallowed users, disallowed sessions, and disallowed IP addresses are unlearnable. In addition, the system considers requests that trigger the following HTTP protocol compliance violations to be unlearnable:

- Bad HTTP version
- Unparsable request content
- Null in request

They are considered unlearnable because these violations indicate behavior that is never acceptable, so the security policy will never be changed to allow them. Consequently, the violating requests are not used for automatic or manual learning (even if they include additional violations that could be learned). No learning suggestions are created for requests containing these violations. Also, the violation rating for these transactions is always set to 5 (the highest severity).

Configuring how entities are learned

You can adjust the learning settings for file types, URLs, parameters, cookies, and redirection domains. Learning settings specify when Real Traffic Policy Builder® adds, or suggests you add, explicit entities to the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. In the Policy Building Settings area, click the entity (**File Types**, **URLs**, **Parameters**, **Cookies**, and **Redirection Protection**) to show the settings. Then from the **Learn New `entity`** setting, select the option that determines which Learning suggestions the system provides (based on real traffic).

Option	Description
Never (wildcard only)	Specifies that when false positives occur, the system suggests relaxing the settings of the wildcard. This option results in a security policy that is easy to manage, but is not as strict. If it is running in automatic learning mode, the Policy Builder does not add explicit entities that match a wildcard to the security policy. The wildcard entity remains in the security policy. The Policy Builder changes the attributes of any matched wildcard. If it is running in manual learning mode, Policy Builder suggests changing the attributes of matched wildcard entities, but does not suggest that you add explicit entities that match the wildcard entity.
Selective	Applies only to * wildcard entity. When false positives occur, adds an explicit entity with relaxed settings. This option serves as a good balance between security, policy size, and ease of maintenance. If using automatic learning, the policy includes explicit entities that do not match the attributes of the * wildcard, and does not remove the * wildcard. If usingmanuial learning, the system suggests adding explicit entities that match the * wildcard. (This option is not available for redirection protection.)
Compact	Applies only to the * wildcard. Specifies that the policy includes the most commonly used entities (while enforcing all others types with a wildcard rule), also provides a pre-populated list of known disallowed file types, and includes top-level URLs such as /abc/*. This option serves as a good balance between **Selective** and **Always** making a smaller, more compact policy, with fewer suggestions.

Option	Description
	When using Automatic learning, the system adds explicit entities that do not exist in the policy but which match the attributes of the * wildcard. The Policy Builder does not remove the * wildcard file type from the security policy. For Manual learning, the system suggests adding explicit entities that match the * wildcard file type. (This option is not available for cookies or redirection protection.)
Always	Creates a comprehensive whitelist policy that includes all web site entities. This option results in a large, more granular configuration with stricter security. If Policy Builder is running, it adds explicit entities that match a wildcard to the security policy. When the security policy is stable, the * wildcard is removed. If Policy Builder is not running, the system suggests adding explicit entities that match the wildcard. (This option is not available for cookies.)

5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy now learns new file types, parameters, URLs, cookies, and redirection domains according to the learning settings you specified.

Learning from responses

When learning to build a policy, you can have the system examine responses as well as requests for entities to include in the security policy. This is called *learning from responses*, and the system does this by default in automatic mode. Learning from responses is supported in manual mode but is not enabled by default. You may want to learn from responses because a response might include more information about the web application than is found in the request, or if you want to have the system learn login pages automatically.

You can disable this setting in automatic mode if your application does not need to examine responses for entities to add to the security policy, or if the application does not use dynamic parameters.

Note: *This setting applies only to what entities can be learned from the response content, such as URLs and parameters. The system does not learn from violations that occur in responses, such as Data Guard leakage. Learning from violations is enabled by selecting the Learn flag of the respective violation.*

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. If you do not want the security policy to include elements found in responses when building the security policy, in the Policy Building Process area, expand **Options** and clear the **Learn from responses** check box.

   Tip: *You can also have the system learn only from requests that return specific response codes.*

   If the setting is not enabled, the Policy Builder never learns from responses.
5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If you disabled the **Learn from responses** check box, the Policy Builder never adds to the security policy elements found in responses. If the check box is enabled, the Policy Builder adds elements found in valid responses to the security policy (meaning those that do not generate violations).

Learning based on response codes

When using automatic or manual learning, the system learns from legitimate traffic including transactions that return response codes of 1xx, 2xx, and 3xx. These classes of codes are added by default to the policy building settings. You can change which response codes are listed, or add specific response codes, such as those used by the web application you are protecting.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. In the Policy Building Process area, expand **Options**.
5. In the **Add** field following **HTTP Response Status Codes used to learn traffic**, type the response code you want to add (for example, add specific codes like `304` or a class of codes like `4xx`), then click **Add**. Use these formats.

Response code	Description
`1xx`	All informational responses (the request was received; continuing to process it). Included by default.
`2xx`	All successful responses (the request was received, understood, accepted, and processed successfully). Included by default.
`3xx`	All redirection (the client needs to take additional action on the request). Included by default.
`4xx`	Server failed to fulfill the response as a result of client syntax or input errors.
`5xx`	All server error responses (the server failed to fulfill a request).
Specific codes such as `100`, `306`, `400`, or `404`	Refer to your web application or the Hypertext Transfer Protocol -- HTTP/1.1 specification (RFC-2616).

6. Click **Save** to save your settings.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

The Policy Builder extracts information for the security policy from traffic transactions that return the specified HTTP response status codes.

Reviewing learning suggestions

Before you can see learning suggestions on the system, it needs to have had some traffic sent to it.

After you create a security policy and begin sending traffic to the application, the system provides learning suggestions concerning additions to the security policy based on the traffic it sees. For example, you can have users or testers browse the web application. By analyzing the traffic to and from the application, Application Security Manager™ generates learning suggestions or ways to fine-tune the security policy to better suit the traffic and secure the application.

***Note:** This task is primarily for building a security policy manually. If you are using the automatic learning mode, this task applies to resolving suggestions that require manual intervention, or for speeding up the enforcement of policy elements.*

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Traffic Learning**. The Traffic Learning screen opens, and lists suggestions based on traffic patterns and violations that the system has detected.
2. Take a look at the Traffic Learning screen to get familiar with it.

   With no suggestions selected, the right pane displays sections that facilitate the reviewer decision-making process. These include graphical charts that summarize policy activity, a summary of top violations in **Reduce Potential False-positive Alerts**, an enforcement readiness summary and a summary of suggestions to add new entity or delete an obsolete entity.
3. To change the order in which the suggestions are listed, or refine what is included in the list, use the filters at the top of the column. Click the search icon to see basic and advanced filters.
4. Review the learning suggestions as follows.

   a) Select a learning suggestion. Information is displayed about the action the system will take if you accept the suggestion, and what caused the suggestion.

   b) Select a suggestion to learn more about what caused it by looking at the action, the number of samples it is based on, the violations caused and their violation ratings, and if available, by examining samples of the requests that caused the suggestion.

   c) Select a request to view data about the request on the right, including any violations it generated, the contents of the request itself, and the response (if any).

   By examining the requests that caused a suggestion, you can determine whether it should be accepted.

   d) To add comments about the suggestion and the cause, click the Add Comment icon 💬 to the right of the suggestion commands, and type the comments.
5. Decide how to respond to the suggestion. You can start with the suggestions that have the highest learning scores, or those which you know to be valid for the application. These are the options.

Option	What happens
Accept Suggestion	The system modifies the policy by taking the suggested action, such as adding an entity that is legitimate. If the entity that triggered the suggestion can be placed in staging (file types, URLs, parameters, cookies, or redirection domains), clicking **Accept Suggestion** displays a second option, **Accept suggestion** and enable staging on Matched <<entity>>. Click this option to accept the suggestion and place the matched entity in staging.
Delete Suggestion	The system removes the learning suggestion, but the suggestion reoccurs if new requests cause it. The learning score of the suggestion starts over from zero in that case.
Ignore Suggestion	The system does not change the policy and stops showing this suggestion on the Traffic Learning screen now and in the future. You can view ignored suggestions by filtering by status ignored.

***Note:** If you are working in automatic learning mode, when the learning score reaches 100%, the system can accept most of the suggestions if you selected the Learning Mode Auto-apply Policy, or you can accept suggestions manually at any time. If you are using manual learning, when the learning score reaches 100% (or before that if you know the suggestions are valid), you need to accept the suggestions manually.*

If you know that a suggestion is valid, you can accept it at any time even before the learning score reaches 100%. The ones that reach 100% have met all the conditions so that they are probably legitimate entities.

6. To put the security policy changes into effect immediately, click **Apply Policy**.

By default, a security policy is put into an enforcement readiness period for seven days. During that time, you can examine learning suggestions and adjust the security policy making sure that users can access the application. The security policy then includes elements unique to your web application.

It is a good idea to periodically review the learning suggestions on the Traffic Learning screen to determine whether the violations are legitimate and caused by an attack, or if they are false positives that indicate a need to update the security policy. Typically, a wide recurrence of violations at some place in the policy (with a low violation rating and a high learning score) indicates that they might be false positives, and hence the policy should be changed so that they will not be triggered anymore. If the violations seem to indicate true attacks (for example, they have a high violation rating), the policy should stay as is, and you can review the violations that it triggered.

Viewing requests that caused learning suggestions

To review requests that are related to learning suggestions, you need to have a security policy that is already handling traffic. If the **Learn** flag is disabled for a violation, you will not see learning suggestions for that violation. If no violations have occurred, you will only see learning suggestions for adding legitimate entities to the security policy.

Before you process a learning suggestion, it is very helpful to examine the details of sample requests that caused the learning suggestion. By viewing the requests, you can determine whether to accept each one, or not. If the suggestion is based on a violation, you can see whether the violation was caused by an attack, or if it is a false positive.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Traffic Learning**.
   The Traffic Learning screen opens, and lists suggestions based on traffic patterns and violations that the system has detected.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the left column, select the learning suggestion that you want to learn more about.
   Sample requests associated with the suggestions show on the right, with the average violation rating. (Legal requests have no violation rating.)
4. Select the request that you want to review more closely.
   The request details are displayed on the right, including any violations the request generated, the contents of the request itself, and the response (if any).
5. Review the information about the request on the General Data tab.

   Tip: *If the request caused violations, they are listed at the top. Click the down arrow to examine the violation occurrences and description.*

   The Request Status and a flag highlight requests considered to be illegal. These are the ones you need to examine most closely.
6. To examine the request or response itself, click **Request** or **Response**.
   The actual content of the request or response is displayed in the tab.
7. On the Traffic Learning screen, continue to review the learning suggestions and associated requests.

When you finish reviewing the requests associated with learning suggestions, you can accept, delete, or ignore the suggestions.

Viewing and allowing ignored suggestions

If the system is not generating learning suggestions that you would expect to see, or when suggestions do not appear consistently, you can view learning suggestions that were previously ignored. You can also change the status of those suggestions so that if the situation reoccurs, the suggestion will be included on the Traffic Learning screen.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Traffic Learning**.
   The Traffic Learning screen opens, and lists suggestions based on traffic patterns and violations that the system has detected.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Above the list of suggestions, click the Open Filter icon.
   The filter popup screen opens.
4. In the filter popup screen, click **Advanced Filter**.
5. From the **Status** list, select **Ignored**.
6. Click **Apply Filter**.
   Suggestions that were previously ignored are displayed in the list.
7. Review the ignored suggestions and decide how to handle them:

   - If the suggestion should continue to be ignored, do nothing. Click the Reset Filter (X) above the list to return to the current suggestions.
   - If you do not want this suggestion to be ignored in the future, click **Delete Suggestion**.
   - If you want to implement this previously ignored suggestion, click **Accept Suggestion**.

   If you delete the suggestion, it is removed from the ignored suggestions list, and it will not be ignored if the conditions that caused it occur again. If you accept the suggestion, the suggested change is made to the security policy, and it is removed from the list of ignored suggestions.

About enforcement readiness

When you are creating a security policy, you specify an enforcement readiness period that indicates a staging period for entities and attack signatures (typically 7 days). When entities or attack signatures are in staging, the system does not enforce them. Instead, the system posts learning suggestions for staged entities.

When the enforcement readiness period is over and no learning suggestions are added for the staging period duration (the default is 7 days), the file type, URL, parameter, cookie, signature, or redirection domain is considered ready to be enforced. Particularly if you are using manual learning, you can delve into the details to see if you want to enforce these entities in the security policy. From the Enforcement Readiness summary on the Traffic Learning screen, you can enforce selected entities to the security policy, or you can enforce all of the entities and signatures that are ready to be enforced. If you are using automatic learning, you can still enforce entities manually, but the Policy Builder enforces entities according to the learning and blocking settings. So you do not need to enforce entities in the security policy.

Enforcing entities

When you create a security policy and traffic is sent to the web application, the system makes learning suggestions about files types, URLs, parameters, cookies, and redirection domains to add to the security policy. You can review the entities and signatures that are ready to be enforced, and enforce them in the security policy.

***Note:** This task is primarily for building a security policy using manual learning. If you are using the automatic learning mode, the system cab automatically enforce entities in the security policy, if you selected the Learning Mode Auto-apply Policy, when it has processed sufficient traffic and sessions over enough time, from different IP addresses, to determine the legitimacy of the file types, URLs, parameters, cookies, methods, and so on. .*

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Traffic Learning**.
   The Enforcement Readiness summary is on the bottom right.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Below the charts on the right, review the Enforcement Readiness Summary to see if there are entities that are ready to be enforced. If there are, select the entities you want the security policy to enforce, and click **Enforce Ready Entities**.

   If you select this option, you are done with this task. Continue only if you want to enforce selected entities or signatures instead of enforcing all entities ready to be enforced.
4. In the Enforcement Readiness Summary, check to see if a number appears in the Not Enforced column.

   A number greater than zero indicates that entities of that type are in staging, or have wildcard entities configured so that the security policy learns all explicit entities that match them.
5. Click the number in the Not Enforced column.
   The allowed file types, URLs, parameters, cookies, signatures, or redirection protection list opens showing the entities that you can enforce.
6. Select the entities you want the security policy to enforce, and click **Enforce**.

The system removes the selected entities or signatures from staging, and enforces them in the security policy. If any of the entities are wildcards that are learning explicit entities, the system deletes the wildcards.

Exploring security policy action items

Even though you are done creating a security policy, Application Security Manager™ (ASM) might have additional action items it recommends for you to do based on your current system configuration and current security policies.

1. On the Main tab, click **Security** > **Overview** > **Application** > **Action Items**.
   The Action Items screen opens.
2. Examine the Action Items screen for information about recommended actions that you need to complete.
3. Review the Suggested Action Items area, which lists system tasks and security policy tasks that the system recommends.

   Examples of system-wide action items include updating attack signatures, restarting the system, and setting up synchronization so that all configuration data from this system is duplicated on another system in a device group. Action items related to the security policy include enforcing entities that are ready to be enforced and applying changes previously made to the security policy.
4. Click the links in the Suggested Action Items area to go to the screen where you can perform the recommended actions.
5. In the Quick Links area, click any of the links to gain access to common configuration and reporting screens.

6. If you are using the Automatic Learning Mode, you can see a summary of the policy elements learned in automatic mode for each security policy on the system.

By looking at the recommended Action Items and system reports, you can find out what additional steps you can take to tighten your security policy.

Changing How a Security Policy is Built

Overview: Changing how a security policy is built

Application Security Manager™ (ASM) completely configures the policy building settings according to the selections you make when you create a security policy. These settings are used for both automatic and manual policy building. You can review the settings, and change them later if needed.

The policy building settings control:

- Whether traffic is blocked if a violation occurs
- Whether ASM automatically builds the security policy
- How inclusive the security policy is
- How new entities (file types, URLs, parameters, and so on) are learned: never learn new entities, learn if there are violations on an entity (selective mode), learn all entities that are discovered in the traffic.
- Which violations to enforce and how to enforce them
- Which IP addresses to trust traffic and data from
- Whether learning is available for every particular attribute

There are two levels of policy building settings: basic and advanced. The basic settings are sufficient for most installations, and require less work. Selecting the policy template causes ASM to choose reasonable values for the advanced settings.

The advanced level allows you to view and change all of the configuration settings if you want further control over security policy details. However, in most cases, you do not need to change the default values of these settings. F5 recommends that you use the default settings unless you are technically familiar with the web application being protected, and with ASM.

Task summary

Changing how to build a security policy

If you are an advanced user, you can review or adjust the settings that the system uses to build or fine-tune a security policy. In most cases, you do not need to change the values of these settings.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Adjust the **Enforcement Mode** setting if needed.
   - To block traffic that causes violations, select **Blocking**.
   - To allow traffic even if it causes violations (allowing you to make sure that legitimate traffic would not be blocked), select **Transparent**.

   You can only configure the Block flag on violations if the enforcement mode is set to **Blocking**.
4. For **Learning Mode**, select how you want the Policy Builder to build the security policy.
   - If you want the Policy Builder to automatically build the security policy, select **Automatic**.

- If you want the Policy Builder to make suggestions and manually decide what to include, select **Manual**.
- If you do not want the system to suggest policy changes, select **Disabled**.

If you selected **Automatic** or **Manual**, the system examines traffic and makes suggestions about how to tighten the security policy. If you are using automatic learning, the system enforces the suggestions when it is reasonable to do so. If you are using manual learning, you need to examine the changes and accept, delete, or ignore them on the Traffic Learning screen. If you disabled this option, the system does not do any learning for this policy, it makes no suggestions, and the **Learn** flag for all violations becomes inactive.

5. For **Learning Speed**, select how fast to build the security policy:

Option	Description
Fast	Builds a security policy using lower threshold values for the rules so they are likely to meet the thresholds more quickly; for example, this setting is useful for smaller web sites with less traffic. Selecting this value may create a less accurate security policy.
Medium	Builds a security policy based on greater threshold values for the rules. This is the default setting and is recommended for most sites.
Slow	Builds a security policy using even higher thresholds for the rules and takes longer to meet them; for example, this value is useful for large web sites with lots of traffic. Selecting this value may result in fewer false positives and create a more accurate security policy.

A faster learning speed causes the system to make more learning suggestions for changes to the policy in a shorter time. A slower learning speed causes the system to examine more traffic before making learning suggestions.

If you are using automatic learning and a faster learning speed, the system enforces the learning suggestions more quickly. If you are using automatic and slower learning, it takes longer to build and enforce the security policy. If you are using manual learning at any learning speed, you have to manually enforce the learning suggestions.

6. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
The screen displays the advanced configuration details for policy building.
7. Expand any setting by clicking it.

   The Policy Building Settings provide blocking settings for violations, learning settings for entities (file types, URLs, parameters, cookies, and redirection domains).

   The Policy Building Process settings let you adjust details about how the security policy is built, such as minimizing false positives, allowing trusted IP addresses, whether to learn from responses, and the advanced settings let you adjust rules for when to relax or tighten the security policy.
8. Review the settings and modify them as needed. Refer to the online help for details on each of the settings.
9. Click **Save** to save your settings.
10. To put the security policy changes into effect immediately, click **Apply Policy**.

By adjusting the policy building settings, you change the way that Application Security Manager™ creates the security policy.

Adding trusted IP addresses to a security policy

In a security policy, you can include a list of IP addresses that you want the system to consider safe or trusted. Take care when specifying trusted IP addresses. *Trusted IP addresses* are typically internal IP addresses to which only trusted users have access. You configure all trusted IP addresses as *IP address exceptions*.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. To use a global list of trusted IP addresses, in the Policy Building Process area, select **Advanced** (on the right), then expand **Trusted IP Addresses**.
   a) Select **Address List** and click **Save**.
   b) If the list is empty or you want to add trusted IP addresses, click the arrow next to **Trusted IP Addresses** to jump to the IP Address Exceptions list where you can specify which IP addresses to consider safe.
5. To trust all IP addresses (for internal or test environments), in the Policy Building Process area, expand **Trusted IP Addresses**, and select **All IP Addresses**.

   Warning: *Use this option only in test environments where all clients are known to be legitimate, and the goal is to quickly build a security policy for the production environment. If you are not using it in the proper environment, the policy could be compromised as each request will be considered legitimate, and all violations will be considered false positives and disabled in the policy.*

6. Click **Save** to save your settings.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

Application Security Manager™ (ASM) processes traffic from trusted clients differently than traffic from untrusted clients. For clients with trusted IP addresses, the rules are configured so that ASM™ requires less traffic (by default, only 1 user session) to update the security policy or make suggestions about adding an entity or making other changes. It takes more traffic from untrusted clients to change or suggest changes to the security policy (for example, if using the default values).

Learning host names automatically

The security policy maintains a list of the host names that can access the web application. Your security policy can automatically learn host names from requests if you use certain options.

Note: *If you are creating a security policy with automatic learning, the default option for all policy templates is already set to learn host names automatically. The steps here explain the options to configure ASM™ to automatically detect and learn host names for your application if the option has been disabled.*

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. Ensure that the **Learning Mode** is set to **Automatic**.
   The system examines the traffic to the web application, and after processing sufficient legitimate traffic, the system builds the security policy automatically by adding and enforcing elements with minimal manual intervention. A few learning suggestions require your review before they are added.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. In the Policy Building Settings area, expand **Headers** and ensure that **Learn Host Names** is selected.

   Tip: *Click the arrow next to the setting to jump to the list of host names already recognized by the security policy.*

5. Click **Save** to save your settings.

6. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy searches headers for valid host names. When a host name is found, ASM creates a suggestion to add the host name to the policy. When the learning score reaches 100%, the suggestion is automatically accepted, or you can accept the suggestion manually on the Traffic Learning screen. The host names in the security policy (also called the host headers) are included in the Host Names list.

Classifying the content of learned parameters

When using automatic learning, you can instruct the system to examine and classify the content of learned parameters. If the system detects legitimate XML or JSON data in parameters, the system adds (or suggests adding) XML or JSON content profiles to the security policy and configures them using the data found.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the General Settings, for **Learning Mode**, ensure that it is set to **Automatic**.
4. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
5. In the Policy Building Settings area, expand **Parameters**.
6. Select **Classify Value Content of Learned Parameters**.
7. Click **Save** to save your settings.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

If XML or JSON data is discovered in parameters, the system creates the appropriate content profile and add it (or suggests adding it) to the security policy.

Specifying whether to learn integer parameters

Integer parameters are parameters with a data type that is numeric and can include only whole numbers. If a security policy is learning parameters (when **Learn New Parameters** is set to **Selective** or **Add All Entities**), you can specify whether the Policy Builder suggests adding integer parameters to the security policy. This option is available only when the learning mode is set to automatic.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. In the Policy Building Settings area, expand **Parameters**.
5. Set **Learn New Parameters** to either **Always** or **Selective**.
6. Select **Learn Integer Parameters**.
7. Click **Save** to save your settings.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

When the Application Security Manager™ receives a request that includes an entity (for example, a URL) containing an integer parameter, the system collects the parameter value from the web application's response to the request and suggests adding it to the security policy.

Specifying when to learn dynamic parameters

Dynamic parameters are those whose values are regenerated when the user accesses an application. For example, a session ID is a dynamic parameter, and it is linked to a user session. The system can extract dynamic parameters from parameters, URLs, and file types. You can specify the conditions under which the Policy Builder suggests adding dynamic parameters to the security policy. This option is available only when the learning mode is set to automatic.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Ensure that the **Learning Mode** is set to **Automatic**.
4. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
5. In the Policy Building Settings area, expand **Parameters**.
6. Set **Learn New Parameters** to either **Always** or **Selective**.
7. For **Learn Dynamic Parameters**, select one or more of the check boxes to specify the conditions under which the Policy Builder adds dynamic parameters to the security policy.

Option	Description
All HIDDEN Fields	Adds to the security policy all hidden form input parameters, seen in responses, as dynamic content value parameters.
Using statistics - FORM parameters	Adds parameters from forms as dynamic content value parameters.
Using statistics - link parameters	Adds parameters from links as dynamic content value parameters.
Statistics: Configure parameters as dynamic if <num>...	Specifies the number (<num>) of unique value sets that must be seen for a parameter before the system considers it a dynamic content value. The default value is `10`.

8. In the Policy Building Process area, expand **Options** and ensure that **Learn from responses** is selected.
9. Click **Save** to save your settings.
10. To put the security policy changes into effect immediately, click **Apply Policy**.

When the Application Security Manager™ receives a request that includes an entity (for example, a file extension or URL) containing a dynamic parameter, the system collects the parameter value or name from web application's response to the request and suggests adding it to the security policy.

Collapsing entities in a security policy

When using automatic policy building, the system automatically simplifies your security policy by combining several similarly named explicit entities into wildcard entities. For example, multiple parameters beginning with `param` are combined into `param*`. You can specify which entities should be collapsed and after how many occurrences.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.

2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. To collapse URLs, in the Policy Building Settings area, expand **URLs**.
   a) Select **Collapse many common URLs into one wildcard URL**.

      The system collapses URLs only in the same directory (with the same prefix path), and if they have the same file extension. For example, the system collapses the URLs `/aaa/x.php`, `/aaa/y.php`, and `/aaa/z.php` into `/aaa/*.php`.
   b) In the adjacent **occurrences** field, type the number of occurrences (2 or more) the system must detect before collapsing URLs into one entity. The default value is `500`.
   c) In the following **depth** field, type the minimum depth for collapsing path segments (for example, `/aa/bb/x.php` has a depth of 3). The default value is **2**.
5. To collapse parameters, in the Policy Building Settings area, expand **Parameters**.
   a) Select **Collapse many common Parameters into one wildcard Parameter**.
   b) In the adjacent **occurrences** field, type the number of occurrences (2 or more) the system must detect before collapsing them to one entity. The default value is `10`.
6. To collapse cookies, in the Policy Building Settings area, expand **Cookies**.
   a) Select **Collapse many common Cookies into one wildcard Cookie**.
   b) In the adjacent **occurrences** field, type the number of occurrences (2 or more) the system must detect before collapsing them to one entity. The default value is `10`.
7. Click **Save** to save your settings.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

When the traffic includes sufficient occurrences of the URLs, parameters, cookies, and/or content profiles, the system collapses multiple similar entities into a wildcard entity in the appropriate list unless the collapse would lead to a loss of security policy information.

Changing how cookies are enforced

You can change the way cookies are enforced in the security policy. To make these changes, you need to understand how your application uses cookies. Does the application server set most or all of the cookies, and are they not modified on the client? Or does your application allow cookies to be modified?

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
3. In the Policy Building Settings area, expand **Cookies** and ensure that **Learn New Cookies** is set to **Selective**.
4. In the cookies settings, consider how to set the **Learn and enforce new unmodified cookies** check box. Are cookies set by the application server and not modified on the client side?

   - If yes, clear this check box and make sure the * cookie wildcard is an enforced cookie. Only the cookies that are modified or created on the client side are learned as allowed cookies.
   - If no, select this check box and make sure the * cookie wildcard is an allowed cookie.

   Check the * cookie wildcard by viewing **Security** > **Application Security** > **Headers** > **Cookies List**.

   Note: *Security policies created using the comprehensive template are set to learn and enforce new unmodified cookies by default.*

5. Click **Save** to save your settings.
6. In the editing context area, click **Apply Policy** to put the changes into effect.

If **Learn and enforce new unmodified cookies** is selected, the system creates new enforced cookies if these two conditions are met:

- The * cookie wildcard is an allowed cookie
- **Learn New Cookies** is set to **Selective**

If you clear the **Learn and enforce new unmodified cookies** check box, the system learns the modified cookies when:

- The * cookie wildcard is an enforced cookie
- **Learn New Cookies** is set to **Selective**
- The Learn flag of the `Modified domain cookie(s)` violation is selected

If a request causes the `Modified domain cookie(s)` violation, the system changes their type from "enforced" to "allowed" (in the GUI they are moved between the tabs).

In cases where you want all cookies to be enforced, the * cookie wildcard must be an allowed cookie. If you do not want all cookies to be enforced, the * cookie wildcard must be an enforced cookie. In either case, set **Learn New Cookies** to **Never (wildcard only)** and clear the **Learn and enforce new unmodified cookies** check box.

Limiting the maximum number of policy elements

When building a security policy using automatic or manual learning, the system has reasonable limits for the maximum number of file types, URLs, parameters, cookies, and redirection domains that the system can learn and add to the security policy. These limits work fine for most situations. You can adjust the limits, if needed. Note that you can always add an entity manually even after the limits are reached.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. In the Policy Building Settings area, expand the type of entity for which you want to adjust the limit (**File Types**, **URLs**, **Parameters**, **Cookies**, or **Redirection Protection**), and in the appropriate **Maximum Learned** setting, adjust the maximum number of elements that the Policy Builder can add to the security policy.

   - **Maximum Learned File Types**
   - **Maximum Learned HTTP URLs**
   - **Maximum Learned WebSocket URLs**
   - **Maximum Learned Parameters**
   - **Maximum Learned Cookies**
   - **Maximum Learned Redirection Domains**

   Default values differ depending on the **Learn New** setting.
5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If the Policy Builder reaches the specified limit, it stops adding that type of security policy element. If this happens, you may need to intervene.

- If the web site requires more than the maximum number of elements, you can increase the limits, or reconsider the type of the policy (you may not need to include all the elements explicitly).

- If the site includes a dynamic element that the Policy Builder cannot learn (such as dynamic sessions in URL or dynamically generated parameter names), either configure the security policy to include the element (for example, dynamic sessions in URL), or clear the element type. The Policy Builder should not be configured to learn that element type in such an environment.
- If you want to maintain the limits, you can add the required entities manually.

Classifying the content of requests to URLs

When using automatic learning, you can instruct the system to examine and classify the content of requests to URLs. If the system detects legitimate XML, JSON, or Google Web Toolkit (GWT) data in requests to URLs configured in the security policy, the system adds XML, JSON, or GWT content profiles to the security policy and configures them using the data found.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the General Settings, for **Learning Mode**, ensure that it is set to **Automatic**.
4. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
5. In the Policy Building Settings area, expand **URLs**.
6. For **Learn New HTTP URLs** or **Learn New WebSocket URLs**, specify **Selective** or **Always** to determine when to add explicit URLs to the security policy.

   - Choose **Selective** to add explicit URLs that do not match the * wildcard.
   - Choose **Always** to create a comprehensive whitelist of all the website URLs.

   Using these options activates the **Classify Request Content of Learned URLs** check box.
7. Select **Classify Request Content of Learned URLs**.
8. Click **Save** to save your settings.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

If XML, JSON, or GWT data is discovered in requests to URLs in the security policy, the system creates the appropriate content profiles and adds them to the policy.

Specifying the file types for wildcard URLs

For security policies that are tracking URLs (policies that use the comprehensive template), the system adds a wildcard URL instead of explicit URLs for commonly used file types. You can adjust the list of file types that are changed to wildcard URLs.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. In the Policy Building Settings area, expand **URLs**.
5. In the **File types for which wildcard HTTP URLs will be configured** setting, add or delete the file types for which the Policy Builder creates a wildcard URL instead of adding an explicit URL.

   Common file types are included by default. Note that the setting is unavailable in policies that do not include URLs (such as if Learn New HTTP URLs is set to Never).

- To add file types, in the File types field adjacent to the **Add** button, type the file extension and click **Add**.
- To remove file types, select the file type and click **Delete**.

6. Click **Save** to save your settings.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

For the file types listed, the Policy Builder adds wildcards instead of explicit URLs when encountering them in web application traffic. Also, the wildcards are added to the policy as non-case sensitive; for example, `.jpg` URLs are added as ***.[Jj][Pp][Gg]** instead of **image1.jpg**, **IMAGE2.JPG**, and **image3.jpg**.

Disabling full policy inspection

Application Security Manager™ provides full functionality, and performs full policy inspection, and holds in memory information about the configuration of entities that are included in a security policy. In rare cases, such as on systems with limited memory or when instructed to do so by F5 Support, you might need to disable full policy inspection.

***Note:** F5 does not recommend disabling full policy inspection.*

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
4. To turn on memory optimization and limit the elements that the security policy stores in memory, in the Policy Building Process area, expand **Options** and clear the **Full Policy Inspection** check box.
5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If you disable the **Full Policy Inspection** check box, the system does not store all the information about the policy elements in memory, thus it enables memory optimization. However, you lose some functionality. When the setting is disabled, the system cannot collapse URLs, WebSocket URLs, parameters, or content profiles (the collapse settings are cleared, become unavailable, and cannot be changed). The system no longer performs classification for parameters, URLs, or WebSocket URLs.

Disabling full policy inspection causes `pabnagd` (policy building daemon) to restart in 5 minutes. The delay allows time to disable the check box on more than one policy. The restart does not affect traffic throughput.

Stopping and starting automatic policy building

You can use the Real Traffic Policy Builder® to automatically build a security policy in two ways: with automatic learning or manual learning. When you set Learning Mode to automatic, the Policy Builder makes suggestions on how to update the security policy and updates the security policy when the policy building rules are met. It does this by automatically enforcing the suggested changes, adding file types, URLs, parameters, and so on for the web application. The Policy Builder also operates when you set Learning Mode to manual. In this case, the Policy Builder examines traffic, and makes suggestions on what to add to the security policy or what to change in the policy settings but you have to implement them.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.

The Learning and Blocking Settings screen opens.

2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the General Settings, for **Learning Mode**, select how you want to build the security policy:

Option	Who builds the security policy?
Automatic	The Policy Builder. It examines traffic, makes suggestions, and enforces most suggestions after sufficient traffic over a period of time from various users makes it reasonable to add them. You may have to enforce a few suggestions manually, and you have the option of enhancing the policy manually.
Manual	The Policy Builder and you together. The Policy Builder examines traffic and makes suggestions on what to add to the security policy. You need to manually handle the suggestions on the Traffic Learning screen, and optionally adjust the security policy.
Disabled	You. The Policy Builder does not do any learning for the security policy, and makes no suggestions. Based on your knowledge of the web application, you can manually add entities to the security policy and adjust the policy building settings.

4. Click **Save** to save your settings.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

If you set learning mode to automatic, the Policy Builder automatically discovers and populates the security policy with the policy elements (such as file types, URLs, parameters, and cookies). If you are using manual learning, the Policy Builder examines traffic and makes suggestions on ways to adjust the security policy; changes are implemented only when you approve them. You can manually accept, delete, or ignore the suggestions on the Traffic Learning screen.

If you disable the learning mode, all learning suggestions are deleted and no more learning takes place; the security policy remains the same unless you manually change it. If you enable manual or automatic learning later, the learning process starts over. Regardless of the learning mode, you can always monitor the policy and manually change it.

Configuring Security Policy Blocking

About security policy blocking

You can configure how Application Security Manager™ handles requests that violate the security policy in several ways.

Method	Description
Blocking actions	Blocking actions for each of the security policy violations, along with the enforcement mode, determine the action that will be taken when the violation occurs. If a violation set to alarm or block occurs on an entity that is in staging, it is not enforced.
Evasion techniques	Sophisticated hackers have figured out coding methods that normal attack signatures do not detect. These methods are known as *evasion techniques*. You can choose which evasion techniques you want Application Security Manager to identify, and configure blocking actions that occur if any of the selected techniques is detected.
HTTP Protocol Compliance	The system performs validation checks on HTTP requests to ensure that the requests are formatted properly. You can configure which validation checks are enforced by the security policy.
Web Services Security	You can configure which web services security errors must occur for the system to learn, log, or block requests that trigger the errors.
Response pages	When the enforcement mode of the security policy is blocking, and a request (or response) triggers a violation for which the Block action is enabled, the system returns the response page to the client. If you configure login pages, you can also configure a response page for blocked access.

Changing security policy enforcement

Security policies can be in one of two enforcement modes: transparent or blocking. The *enforcement mode* specifies whether the system simply logs or blocks a request that triggers a security policy violation. You can manually change the enforcement mode for a security policy depending on how you want the system to handle traffic that causes violations.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. For the **Enforcement Mode** setting, specify how to treat traffic that causes violations.
   - To block traffic that causes violations (that are set to block), select **Blocking**.
   - To stop allow traffic even if it causes violations so you can review the violations, select **Transparent**.
4. Click **Save** to save your settings.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

When the enforcement mode is set to *transparent*, traffic is not blocked even if a violation is triggered. The system typically logs the violation event (if the Learn flag is set on the violation). You can use this mode along with an enforcement readiness period when you first put a security policy into effect to make sure that no false positives occur that would stop legitimate traffic.

When the enforcement mode is set to *blocking*, traffic is blocked if it causes a violation (that is configured for blocking), and the enforcement readiness period is over. You can use this mode when you are ready to enforce a security policy.

Configuring blocking actions for violations

You can configure the Learn, Alarm, and Block flags, or *blocking actions*, for each violation. The blocking actions (along with the enforcement mode) determine how the system processes requests that trigger the corresponding violation.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Adjust the **Enforcement Mode** setting if needed.
   - To block traffic that causes violations, select **Blocking**.
   - To allow traffic even if it causes violations (allowing you to make sure that legitimate traffic would not be blocked), select **Transparent**.

   You can only configure the Block flag on violations if the enforcement mode is set to **Blocking**.
4. From the list, select **Advanced**.
5. Review each of the Policy Building Settings so you understand how the security policy handles requests that cause the associated violations, and adjust if necessary. You need to expand most of the settings to see the violations.

   Tip: *To the right of Policy Building Settings, click **Blocking Settings** to see and adjust all of the violations at once.*

Option	What happens when selected
Learn	The system generates learning suggestions for requests that trigger the violation (except learning suggestions are not generated for requests that return HTTP responses with 400 or 404 status codes).
Alarm	When selected, the system marks requests that trigger the violation as illegal. The system also records illegal requests in the Charts screen, the system log (`/var/log/asm`), and possibly in local or remote logs (depending on the settings of the logging profile).
Block	The system blocks requests that trigger the violation when (1) the security policy is in the blocking enforcement mode, (2) a violation occurs, and (3) the entity is enforced. The system sends the blocking response page (containing a Support ID to identify the request) to the client.

6. Expand the violations that are links to display more granular details or subviolations for which you can enable blocking properties.

   You can enable or disable blocking subviolations for HTTP protocol compliance, evasion techniques, and web services security.
7. Click **Save** to save your settings.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

Entities in staging, attack signatures in staging, and wildcards set to add all entities do not cause violations, and consequently are not blocked. But if the enforcement mode is blocking and violations are set to Block, traffic causing those violations is blocked. If violations are set to Alarm, the system logs the violations. For violations set to Learn, the system generates learning suggestions if the violation occurs.

You can now configure the response that the system sends when a request is blocked.

Configuring HTTP protocol compliance validation

The first security checks that Application Security Manager™ performs are those for RFC compliance with the HTTP protocol. The system validates HTTP requests to ensure that the requests are formatted properly. For each security policy, you can configure which HTTP protocol checks the system performs, and specify what happens if requests are not compliant.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the Policy Building Settings area, for the **HTTP protocol compliance failed** violation, set the blocking settings as needed.

Select this Option	When You Want to
Learn	Generate learning suggestions for requests that trigger the violation.
Alarm	Record requests that trigger the violation in ASM Charts, the system log (`/var/log/asm`), and possibly in local or remote logs (depending on the logging profile settings).
Block	Block requests that trigger the violation (the enforcement mode must be set to **Blocking**).

3. Expand the **HTTP protocol compliance failed** setting.
   The HTTP subviolations are displayed.
4. Select or clear the HTTP protocol checks, as required.

   Tip: *For an explanation of any individual HTTP validation, click it.*

5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If the `HTTP protocol compliance failed` violation is set to **Learn**, **Alarm**, or **Block**, the system performs the protocol compliance checks. If the **Enforcement Mode** is set to **Blocking** and the violation is set to block, the system blocks requests that are not compliant with the selected HTTP protocol validations.

If a request is too long and causes the `Request length exceeds defined buffer size` violation, the system stops validating protocol compliance for that request.

Configuring blocking actions for evasion techniques

For every HTTP request, Application Security Manager™ examines the request for evasion techniques, which are coding methods that attackers use to avoid detection by attack signatures and intrusion prevention systems. You can enable or disable the blocking properties of specific evasion techniques in the `Evasion technique detected` violation.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.

3. Adjust the **Enforcement Mode** setting if needed.
    - To block traffic that causes violations, select **Blocking**.
    - To allow traffic even if it causes violations (allowing you to make sure that legitimate traffic would not be blocked), select **Transparent**.

    You can only configure the Block flag on violations if the enforcement mode is set to **Blocking**.
4. Review the **Evasion technique detected** violation and adjust the **Learn**, **Alarm**, and **Block** flags as required.
5. Expand the **Evasion technique detected** setting.
   The evasion technique subviolations are displayed.
6. Enable or disable the evasion technique subviolations, as required.

    Tip: *For an explanation of an individual subviolation, click it.*
7. Click **Save** to save your settings.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

If a request uses any of the selected evasion techniques, the system reacts according to how you configured the blocking settings for the `Evasion technique detected` violation. If the **Enforcement Mode** is set to **Blocking** and the violation is set to block, the system blocks requests that use selected evasion techniques.

Configuring blocking actions for web services security

It only makes sense to select learning and blocking settings for web services security errors if you previously created a security policy to protect a web application that uses XML formatting or employs web services. The security policy must have an XML profile (with web services security enabled) associated with it.

You can select which web services security errors must occur for the system to learn, log, or block requests that trigger the errors. These errors are subviolations of the parent violation, `Web Services Security failure`.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Adjust the **Enforcement Mode** setting if needed.
    - To block traffic that causes violations, select **Blocking**.
    - To allow traffic even if it causes violations (allowing you to make sure that legitimate traffic would not be blocked), select **Transparent**.

    You can only configure the Block flag on violations if the enforcement mode is set to **Blocking**.
4. From the list, select **Advanced**.
5. Expand the **Content Profiles** setting.
   The content profile violations and **Web Services Security failure** subviolations are displayed.
6. Review the **Web Services Security failure** setting and adjust the **Learn**, **Alarm**, and **Block** flags as required.
7. For Web Services Security failure subviolations, enable or disable the web services subviolations, as required for your application.

    Tip: *For an explanation of any individual subviolation, click it.*

The selected subviolations are the ones that will cause the `Web Services Security failure` violation to occur.

8. Click **Save** to save your settings.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

If a request causes one of the enabled errors to occur, web services security stops parsing the document. How the system reacts depends on how you configured the blocking settings for the `Web Services Security failure` violation:

- If configured to Learn or Alarm when the violation occurs, the system does not encrypt or decrypt the SOAP message, and sends the original document to the web service.
- If configured to Block when the violation occurs, the system blocks the traffic and prevents the document from reaching its intended destination. The system sends a blocking response page. If the XML profile associated with the policy is configured to use an XML blocking response page, it uses the XML response. Otherwise, it uses the default response page.
- If a web services security violation occurs on an entity in staging, for example, a URL in staging associated with an XML profile, the violation (set to alarm or block) is not enforced.

Configuring What Happens if a Request is Blocked

Overview: Configuring what happens if a request is blocked

The Application Security Manager™ has a default blocking response page that it returns to the client when the client request, or the web server response, is blocked by the security policy. The system also has a login response page for login violations. You can change the way the system responds to blocked logins or blocked requests.

***Note:** The system issues response pages only when the enforcement mode is set to **Blocking**.*

A security policy can respond to blocked requests in these ways:

- Default response
- Custom response
- Redirect URL
- SOAP fault
- Erase Cookies

The system uses default pages in response to a blocked request or blocked login. If the default pages are acceptable, you do not need to change them and they work automatically. However, if you want to customize the response, or include XML or AJAX formatting in the blocking responses, you need to enable the blocking behavior first. You enable XML blocking on the XML profile, AJAX blocking on the AJAX response page, and Cookie Hijacking on the Session Tracking screen.

All default response pages contain a variable, `<%TS.request.ID()%>`, that the system replaces with a support ID number when it issues the page. Customers can use the support ID to identify the request when making inquiries.

Configuring responses to blocked requests

You can configure the blocking response that the system sends to the user when the security policy blocks a client request.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Response Pages**.
   The Response Pages screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. On the Default Response Page tab, for the **Response Type** setting, select one of the following options.

Option	System Response to Blocked Request
Default Response	The system returns the system-supplied response page in HTML. No further configuration is needed.
Custom Response	The system returns a response page with HTML code that you define.
Redirect URL	The system redirects the user to a specified web page.
SOAP Fault	The system returns the system-supplied blocking response page in XML format. You cannot edit the text, but you need to select **Use XML Blocking Response Page** on the XML profile.

Option	System Response to Blocked Request
Erase Cookies	The system deletes all client side domain cookies. As a result, the system blocks web application users once, and redirects them to the login page. Legitimate users can login and get new cookies. This feature is primarily for session hijacking.

The settings on the screen change depending on the selection that you make for the **Response Type** setting.

4. If you selected the **Custom Response** option, you can either modify the default text or upload an HTML file.

   To modify the default text:

   a) For the **Response Headers** setting, type the response header you want the system to send.
   b) For the **Response Body** setting, type or paste the text you want to send to a client in response to an illegal blocked request. Use standard HTTP syntax.
   c) Click **Show** to see what the response will look like.

   To upload a file containing the response:

   a) In the **Response Body**, for the **Upload File** setting,click **Choose File** to specify an HTML file that contains the response you want to send to blocked requests.
   b) Click **Upload** to upload the file into the response body.
5. If you selected the **Redirect URL** option, then in the **Redirect URL** field, type the URL to which the system redirects the user, for example, `http://www.myredirectpage.com`.

   The URL should be for a page that is not within the web application itself.

   For example, to redirect the blocking page to a URL with a support ID in the query string, type the URL and the support ID in the following format:

   ```
   http://www.myredirectpage.com/block_pg.php?support_id= <%TS.request.ID()%>
   ```

   The system replaces `<%TS.request.ID%>` with the relevant support ID so that the blocked request is redirected to the URL with the relevant support ID.
6. Click **Save** to save your settings.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

If the enforcement mode is blocking and a request is blocked, the system displays the selected response page, erases session cookies, or redirects the user to another URL depending on the option you selected. If a request causes multiple violations and results in more than one type of blocking page, only one will appear in this order:

- AJAX Response Page
- Cookie Hijacking Response Page
- XML Response Page
- Login Response Page
- Default Response Page

Configuring responses to blocked logins

You can configure the blocking response that the system sends to the user when the security policy blocks a client attempt to log in to the application. This occurs when Application Security Manager™ mitigates brute force login attacks.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Response Pages**.
   The Response Pages screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.

3. On the Default Response Page tab, for the **Response Type** setting, select one of the following options.

Option	System Response to Blocked Request
Default Response	The system returns the system-supplied response page in HTML. No further configuration is needed.
Custom Response	The system returns a response page with HTML code that you define.
Redirect URL	The system redirects the user to a specified web page.
SOAP Fault	The system returns the system-supplied blocking response page in XML format. You cannot edit the text, but you need to select **Use XML Blocking Response Page** on the XML profile.
Erase Cookies	The system deletes all client side domain cookies. As a result, the system blocks web application users once, and redirects them to the login page. Legitimate users can login and get new cookies. This feature is primarily for session hijacking.

   The settings on the screen change depending on the selection that you make for the **Response Type** setting.

4. If you selected the **Custom Response** option, you can either modify the default text or upload an HTML file.

   To modify the default text:

   a) For the **Response Headers** setting, type the response header you want the system to send.
   b) For the **Response Body** setting, type or paste the text you want to send to a client in response to an illegal blocked request. Use standard HTTP syntax.
   c) Click **Show** to see what the response will look like.

   To upload a file containing the response:

   a) In the **Response Body**, for the **Upload File** setting,click **Choose File** to specify an HTML file that contains the response you want to send to blocked requests.
   b) Click **Upload** to upload the file into the response body.

5. If you selected the **Redirect URL** option, then in the **Redirect URL** field, type the URL to which the system redirects the user, for example, `http://www.myredirectpage.com`.

   The URL should be for a page that is not within the web application itself.

   For example, to redirect the blocking page to a URL with a support ID in the query string, type the URL and the support ID in the following format:

   ```
   http://www.myredirectpage.com/block_pg.php?support_id= <%TS.request.ID()%>
   ```

   The system replaces `<%TS.request.ID%>` with the relevant support ID so that the blocked request is redirected to the URL with the relevant support ID.

6. Click **Save** to save your settings.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

If a user violates one of the preconditions when requesting the target URL of a configured login page, the system displays the selected response page or redirect URL depending on the option you selected.

Customizing responses to blocked XML requests

You can configure the blocking response that the system sends to the user when the security policy blocks a client request that contains XML content, which does not comply with the settings of an XML profile in the security policy.

Note: *If you want to use the default SOAP response (SOAP Fault), you only need to enable XML blocking on the profile.*

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Response Pages**.
   The Response Pages screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click the **XML Response Page** tab.
4. For the **Response Type** setting, select **Custom Response**.
5. In the **Response Headers** field, type the response header you want the system to send.

   Tip: *Paste the default response header to use the system response that you can then edit.*
6. In the **Response Body** field:

   - If you want to specify the content to send the client in response to an illegal blocked request, type the text using XML syntax.
   - To upload a file containing the XML response, specify an XML file and click **Upload** to upload the file into the response body.

   Click **Show** to see what the response will look like.
7. Click **Save** to save your settings.
8. Make sure that the XML profile the application is using has blocking enabled:
   a) On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **XML Profiles**.
   b) Click name of the XML profile used by the application.
   c) Make sure that the **Use XML Blocking Response Page** check box is selected.
   d) Click **Update**.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

Configuring the blocking response for AJAX applications

Before you can complete this task, you need to have already created a security policy for your web application. The application needs to have been developed using ASP.NET, jQuery, Prototype®, or MooTools to use AJAX blocking behavior.

When the enforcement mode of the security policy is set to blocking and a request triggers a violation (that is set to block), the system displays the AJAX blocking response according to the action set that you define. If a login violation occurs when requesting the login URL, the system sends a login response page, or redirects the user.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Response Pages**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click the **AJAX Response Page** tab.
4. Select the **Enable AJAX blocking behavior (JavaScript injection)?** check box.
   The system displays the default blocking response and login response actions for AJAX.
5. For the **Default Response Page action** setting, select the type of response you want the application user to receive when they are blocked from the application:

   - **Custom Response** lets you specify HTML text or upload a file to use as a replacement for the frame or browser page that generated the AJAX request. Include the text, then click **Show** to preview the response.
   - **Popup message** displays text in a popup window (default text is included).

- **Redirect URL** redirects the user to the URL you specify. You can also include the support ID. For example: `http://www.example.com/blocking_page.php?support_id=<%TS.request.ID()%>`.

6. For the **Login Page Response action**, select the type of response (types are the same as for default response page in Step 5).
7. Click **Save**.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

Adding Entities to a Security Policy

Adding File Types to a Security Policy

About adding file types

In a security policy, you can manually specify the file types that are allowed (or disallowed) in traffic to the web application being protected. This is only if you are not using the recommended automatic policy building. When you are using automatic policy building, Application Security Manager™ determines which file types to add, based on legitimate traffic.

When you create a security policy, a wildcard file type of *, representing all file types, is added to the file type list. If **Learn New File Types** is set to **Compact**, **Always** or **Selective** then, during the enforcement readiness period, the system examines the file types in the traffic and makes learning suggestions that you can review and add the file types to the policy as needed. This way, the security policy includes the file types that are typically used. If **Learn New File Types** is set to **Always**, when you think all the file types are included in the security policy, you can remove the * wildcard from the allowed file types list. . If **Learn New File Types** is set to **Compact**, **Selective** or **Never**, the * wildcard is designed to stay in the policy and represent all file types that are not listed in **Allowed File Types**.

Adding allowed file types

You can manually add allowed file types, which are file types that the security policy accepts in traffic to the web application being protected.

1. On the Main tab, click **Security** > **Application Security** > **File Types**.
   The Allowed File Types screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Add Allowed File Type screen opens.
4. For **File Type**, choose a type:

Option	Description
Explicit	Specifies a unique file type, such as JPG or HTML. Type the file type (from 1 to 255 characters) in the adjacent box.
No Extension	Specifies that the web application has a URL with no file type. The system automatically assigns this file type the name **no_ext**. The slash character (/) is an example of a **no_ext** file type.
Wildcard	Specifies that the file type is a wildcard expression. Any file type that matches the wildcard expression is considered legal. The pure wildcard (*) is automatically added to the security policy so you do not need to add it. But you can add other wildcards such as `htm*`. Type a wildcard expression in the adjacent box.

5. For the length settings, adjust the values as needed. This is optional.

Option	Specifies
URL Length	The maximum acceptable length, in bytes, for a URL in the context of an HTTP request containing this file type. The default is `100` bytes.

Option	Specifies
Request Length	The maximum acceptable length, in bytes, for the whole HTTP request that applies to this file type. The default is `5000` bytes.
Query String Length	The maximum acceptable length, in bytes, for the query string portion of a URL that contains the file type. The default is `1000` bytes.
POST Data Length	The maximum acceptable length, in bytes, for the POST data of an HTTP request that contains the file type. The default is `1000` bytes

6. By default, the **Perform Staging** check box is selected. We recommend that you keep it selected.
7. If you want the system to validate responses for this file type, select the **Apply Response Signatures** check box.

   Selecting this option enables attack signatures (that are designed to inspect server responses) to filter responses.
8. Click **Create**.
   The Allowed File Types screen opens and lists the new file type.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy allows the file type that you added. If the file type is in staging, the system informs you when learning suggestions are available or when it is ready to be enforced.

Wildcard syntax

The syntax for wildcard entities is based on shell-style wildcard characters. This table lists the wildcard characters that you can use in the names of file types, URLs, parameters, or cookies so that the entity name can match multiple objects.

Wildcard Character	Matches
*	All characters
?	Any single character
[abcde]	Exactly one of the characters listed
[!abcde]	Any character not listed
[a-e]	Exactly one character in the range
[!a-e]	Any character not in the range

Adding disallowed file types

For some web applications, you may want to deny requests for certain file types. In this case, you can create a set of disallowed file types. Adding disallowed file types is useful for file types that you know should never appear on your site (such as `.exe`files), or for files on your site that you never want users from the outside to reach (such as `.bak` files).

Note that in the Learning and Blocking Settings, when **Learn New File Types** is set to **Compact** or **Always**, the system automatically adds the following disallowed file types:

- Server side technologies or source code: php, aspx, ashx, jsp, lua, cgi, do, java, py, pl
- Certificate files: pem, crt, cer, key, der, p7b, p7c, pfx, p12
- Backup files: bak, bkp, bck, old, tmp, temp, sav, save
- Configuration files: ini, conf, reg, cfg, config,
- Data files: dat, eml, log, exe1, hta, htr, htw, ida, idc, idq, nws, pol, printer, shtm, shtml, stm, wmz
- Executable files: exe, msi, bin, cmd, com, bat, dll, sys

1. On the Main tab, click **Security** > **Application Security** > **File Types** > **Disallowed File Types**.
   The Disallowed File Types screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Disallowed File Type screen opens.
4. In the **File Type (Explicit only)** field, type the file type that the security policy does not allow (for example, `jpg` or `exe`).

   ***Note:** File types are case-sensitive unless you cleared **Security Policy is case sensitive** when you created the policy.*

   ---
5. Click **Create**.
   The Disallowed File Types screen opens and lists the new file type.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

The system categorizes both disallowed file types, and requested file types not configured in the security policy as illegal file types. When the Application Security Manager™ receives a request with a disallowed file type, the system ignores, learns, logs, or blocks the request depending on the settings you configure for the `Illegal File Type` violation on the Learning and Blocking Settings screen.

Adding potential disallowed file types

Potential disallowed file types are candidates for addition to the Disallowed File Types list in a security policy. These file types might occur in malicious requests such as information leakage, remote code execution, and other attacks. Potential disallowed file types are applied globally to all traffic while disallowed files types are configured per security policy. You must accept each potential disallowed file type suggestion manually while the system automatically enforces all Disallowed File Types suggestions automatically.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Potential Disallowed File Types**.
2. Click **Create**.
   The New Potential Disallowed File Type properties screen opens.
3. In the **File Type (Explicit only)** field, type the potentially malicious file type to add.
4. Click **Create**.
   The Potential Disallowed File Types screen opens and lists the new file type as `Yes`in the User-defined column.

The system automatically checks all traffic for all policies against this list. If a potential disallowed file type is not observed in traffic, the Policy Builder generates a suggestion to tighten the policy by adding the potential disallowed file type to the Disallowed File Types list. If a disallowed file type is later observed in traffic, the Policy Builder generates a suggestion to remove the disallowed file type from the policy.

***Note:** You must manually accept all suggestions to remove a file type from the Disallowed File Types list. Policy Builder does not automatically implement the suggestion.*

Adding Parameters to a Security Policy

About adding parameters to a security policy

Parameters are an integral part of any web application, and they need to be protected so clients cannot access them, modify them, or view sensitive data. When you define parameters in a security policy, you increase the security of the web application and prevent web parameter tampering.

Application Security Manager™ evaluates parameters, meta characters, query string lengths, and POST data lengths as part of a positive security logic check. When the security policy includes known parameters, you are creating a whitelist of acceptable parameters. The system allows traffic that includes the parameters that you configure in a security policy.

Security policies can include parameters defined as global parameters, URL parameters, and flow parameters. You can further specify parameters as being particular value types: static content, dynamic content, dynamic parameter name, user-input, JSON, or XML. You can also create parameters for which the system does not check or verify the value.

Creating global parameters

Global parameters are parameters that are not associated with specific URLs or application flows. The advantage of using global parameters is that you can configure a global parameter once, and the system enforces the parameter wherever it occurs. You create a global parameter to address these conditions:

- The web application has a parameter that appears in several URLs or flows.
- You want the Application Security Manager™ to enforce the same parameter attributes on all parameters.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Add Parameter screen opens.
4. In the Create New Parameter area, for the **Parameter Name** setting, specify the type of parameter you want to create.
   - To create a named parameter, select **Explicit**, then type the name.
   - To use pattern matching, select **Wildcard**, then type a wildcard expression. Any parameter name that matches the wildcard expression is permitted by the security policy.
   - To create an unnamed parameter, select **No Name**. The system creates a parameter with the label, `UNNAMED`.
5. For the **Parameter Level** setting, select **Global**.

   The parameter can occur anywhere and is not associated with a specific URL or flow.
6. Leave the **Perform Staging** check box selected if you want the system to evaluate traffic before enforcing this parameter.

   Staging helps reduce the occurrence of false positives.
7. Specify whether the parameter requires a value:
   - If the parameter is acceptable without a value, leave the **Allow Empty Value** setting enabled.
   - If the parameter must always include a value, clear the **Allow Empty Value** check box.
8. To allow users to send a request that contains multiple parameters with the same name, select the **Allow Repeated Occurrences** check box.

   Important: *Before enabling this check box, consider that requests containing multiple parameters of the same name could indicate an attack on the web application (HTTP Parameter Pollution).*

9. If you want to treat the parameter you are creating as a sensitive parameter (data not visible in logs or the user interface), enable the **Sensitive Parameter** setting.
10. For the **Parameter Value Type** setting, select the format of the parameter value.
    Depending on the value type you select, the screen refreshes to display additional configuration options.
11. Click **Create** to add the new parameter to the security policy.
12. To put the security policy changes into effect immediately, click **Apply Policy**.

When you first create a global parameter, the system places the parameter in staging by default and does not block requests even if a violation occurs and the system is configured to block the violation. The system makes learning suggestions that you can accept or clear.

Creating URL parameters

URL parameters are parameters that are defined in the context of a URL. You can use a URL parameter when it does not matter where users were before they accessed this URL, or whether the parameter was in a GET or POST request. You can create a parameter that goes with a URL that already exists in the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Add Parameter screen opens.
4. In the Create New Parameter area, for the **Parameter Name** setting, specify the type of parameter you want to create.

   - To create a named parameter, select **Explicit**, then type the name.
   - To use pattern matching, select **Wildcard**, then type a wildcard expression. Any parameter name that matches the wildcard expression is permitted by the security policy.
   - To create an unnamed parameter, select **No Name**. The system creates a parameter with the label, `UNNAMED`.
5. For the **Parameter Level** setting, select **URL**, then for the **URL Path** setting, select a protocol from the list, and then type the URL in this format: `/url_name.ext`.

   When you begin to type the URL, the system lists all URLs that include the character you typed, and you can select the URL from the list.
6. Leave the **Perform Staging** check box selected if you want the system to evaluate traffic before enforcing this parameter.

   Staging helps reduce the occurrence of false positives.
7. Specify whether the parameter requires a value:

   - If the parameter is acceptable without a value, leave the **Allow Empty Value** setting enabled.
   - If the parameter must always include a value, clear the **Allow Empty Value** check box.
8. To allow users to send a request that contains multiple parameters with the same name, select the **Allow Repeated Occurrences** check box.

   Important: *Before enabling this check box, consider that requests containing multiple parameters of the same name could indicate an attack on the web application (HTTP Parameter Pollution).*
9. If you want to treat the parameter you are creating as a sensitive parameter (data not visible in logs or the user interface), enable the **Sensitive Parameter** setting.
10. For the **Parameter Value Type** setting, select the format of the parameter value.
    Depending on the value type you select, the screen refreshes to display additional configuration options.

11. Click **Create** to add the new parameter to the security policy.
12. To put the security policy changes into effect immediately, click **Apply Policy**.

When you define a URL parameter, the system applies the security policy to the parameter attributes in the context of the associated URL, and ignores the flow information. When you first create a URL parameter, the system places the parameter in staging by default and does not block requests even if a violation occurs and the system is configured to block the violation. The system makes learning suggestions that you can accept or clear.

Creating flow parameters

Before you can create a flow parameter, you need to first have created the flow to which the parameter applies. If the source URL is a referrer URL, that HTTP URL must already be defined in the security policy as well.

You define parameters in the context of a flow when it is important to enforce that the target HTTP URL receives a parameter only from a specific referrer URL. Flow parameters provide very tight, flow-specific security for web applications. With this increased protection comes an increase in maintenance and configuration time. Note that if your application uses dynamic parameters, you need to manually add those to the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Add Parameter screen opens.
4. In the Create New Parameter area, for the **Parameter Name** setting, specify the type of parameter you want to create.
   - To create a named parameter, select **Explicit**, then type the name.
   - To use pattern matching, select **Wildcard**, then type a wildcard expression. Any parameter name that matches the wildcard expression is permitted by the security policy.
   - To create an unnamed parameter, select **No Name**. The system creates a parameter with the label, `UNNAMED`.
5. In the **Parameter Level** setting, select **Flow**, and then for **From URL** define where the flow must come from:
   - If the source URL is an entry point, click **Entry Point**.
   - If the source URL is a referrer URL (already defined in the policy), click **URL Path**, select the protocol used for the URL, then type the referrer URL associated with the flow.

   When you begin to type the URL, the system lists all referrer URLs that include the character you typed, and you can select the URL from the list.
6. In the **Parameter Level** setting, for **Method**, select the HTTP method (**GET** or **POST**) that applies to the target referrer URL (already defined in the policy).
7. In the **Parameter Level** setting, for **To URL**, select the protocol used for the URL, then type the target URL.
8. Leave the **Perform Staging** check box selected if you want the system to evaluate traffic before enforcing this parameter.

   Staging helps reduce the occurrence of false positives.
9. If the parameter is required in the context of the flow, select the **Is Mandatory Parameter** check box.

   Note that only flows can have mandatory parameters.
10. Specify whether the parameter requires a value:
    - If the parameter is acceptable without a value, leave the **Allow Empty Value** setting enabled.
    - If the parameter must always include a value, clear the **Allow Empty Value** check box.

11. To allow users to send a request that contains multiple parameters with the same name, select the **Allow Repeated Occurrences** check box.

    Important: *Before enabling this check box, consider that requests containing multiple parameters of the same name could indicate an attack on the web application (HTTP Parameter Pollution).*

12. If you want to treat the parameter you are creating as a sensitive parameter (data not visible in logs or the user interface), enable the **Sensitive Parameter** setting.
13. For the **Parameter Value Type** setting, select the format of the parameter value.
    Depending on the value type you select, the screen refreshes to display additional configuration options.
14. Click **Create** to add the new parameter to the security policy.
15. To put the security policy changes into effect immediately, click **Apply Policy**.

When you create a parameter that is associated with a flow, the system verifies the parameter in the context of the flow. For example, if you define a parameter in the context of a GET request, and a client sends a POST request that contains the parameter, the system generates an `Illegal Parameter` violation.

Creating sensitive parameters

The Application Security Manager™ stores incoming requests in plain text format. Some requests include sensitive data in parameters, such as an account number, that you want to hide from system users. You can create sensitive parameters as described in the procedure, following, or by enabling the **Sensitive Parameter** setting when creating or editing any parameter. All parameters defined as sensitive, regardless of how you configured them, appear in the Sensitive Parameters list.

1. On the Main tab, click **Security** > **Application Security** > **Parameters** > **Sensitive Parameters**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Sensitive Parameter screen opens.
4. In the **Parameter Name** field, type the name of the user-input parameter, exactly as it occurs in the HTTP request, for which you do not want the system to store the actual value.

   In this example, `account` is the sensitive parameter:

   ```
   http://www.siterequest.com/bank.php?account=12345
   ```

   Tip: *If a parameter of this name already exists in the security policy, click it in the parameter list, and enable the* ***Sensitive Parameter*** *setting instead of creating a new sensitive parameter.*

5. Click **Create** to add the new parameter to the security policy.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

When you create sensitive parameters, the system replaces the sensitive data, in the stored request and in logs, with asterisks (***).

Disallowing file uploads in parameters

Because most web applications do not legitimately allow users to upload executable code, you can disallow parameters containing binary executable content. To do this, you add a user-input parameter with the file upload data type to a security policy, and use the option to prevent uploading of executable files. You can also specify a maximum length for the parameter.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.
2. Click **Create**.
   The Add Parameter screen opens.

3. Type the name for the new explicit parameter.
4. For the **Parameter Level** setting, select where in a request the parameter is located.

Option	Description
Global	The parameter can occur anywhere and is not associated with a specific URL or flow.
URL	The parameter occurs in the specific URL that you provide.
Flow	The parameter occurs in the specific entry point URL or referrer URL that you provide.

5. Leave the **Perform Staging** check box selected if you want the system to evaluate traffic before enforcing this parameter.

   Staging helps reduce the occurrence of false positives.
6. Specify whether the parameter requires a value:
   - If the parameter is acceptable without a value, leave the **Allow Empty Value** setting enabled.
   - If the parameter must always include a value, clear the **Allow Empty Value** check box.
7. To allow users to send a request that contains multiple parameters with the same name, select the **Allow Repeated Occurrences** check box.

   Important: *Before enabling this check box, consider that requests containing multiple parameters of the same name could indicate an attack on the web application (HTTP Parameter Pollution).*
8. For the **Parameter Value Type** setting, select **User-input value**.
9. On the Data Type tab, for the **Data Type** setting, select **File Upload**.
10. To enforce limits on the size of the parameter, in the **Maximum Length** setting, select **Value** and type the maximum number of bytes for a parameter value.
11. Ensure that **Disallow File Upload of Executables** is selected.
12. Click **Create**.
    The screen refreshes, and the new parameter appears in the parameters list.
13. To put the security policy changes into effect immediately, click **Apply Policy**.

If a client sends an HTTP request that includes a user-input parameter containing a binary executable file, the system issues the `Disallowed file upload content detected` violation. This is considered *parameter tampering*. If the violation is set to block (it is, by default) and the enforcement mode is set to blocking, the request is blocked.

If a parameter in a request exceeds the maximum length specified, the system presents an `Illegal parameter value length violation`. By default it is set to alarm; that means if a request triggers this violation, the system records the request in the Charts screen, the Syslog (`/var/log/asm`), and may record the request in the local log (the Requests screen) and/or in a remote log, according to the logging profile.

Creating navigation parameters

If you want the security policy to differentiate between pages in the web application that are generated by requests with the same URL name but with different parameter and value pairs, and to build the appropriate flows, you must specify the exact names of the parameters that trigger the creation of the pages in the web application. These parameters are called *navigation parameters*. A navigation parameter cannot be a wildcard.

1. On the Main tab, click **Security** > **Application Security** > **Parameters** > **Navigation Parameters**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.

The New Navigation Parameter screen opens.

4.
5. In the **Navigation Parameter** field, type the name of the parameter passed to the web server for dynamic page-building purposes.
6. Click **Create** to add the new parameter to the security policy.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

Creating parameters with dynamic content

Dynamic content value (DCV) parameters are parameters where the web application sets the value on the server side (so, for example, the content can change depending on who the user is). When you create a DCV parameter, you also specify where and how to get the dynamic information. For example, in an auction application, you can configure the price parameter as a DCV parameter to keep users from tampering with the price.

You can also use DCV parameters for user identities in web applications that use sessions. As an example, user identity is often passed between pages as a hidden parameter, which could be exploited by malicious users, unless protected.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Add Parameter screen opens.
4. In the Create New Parameter area, for the **Parameter Name** setting, specify the type of parameter you want to create.
   - To create a named parameter, select **Explicit**, then type the name.
   - To use pattern matching, select **Wildcard**, then type a wildcard expression. Any parameter name that matches the wildcard expression is permitted by the security policy.
   - To create an unnamed parameter, select **No Name**. The system creates a parameter with the label, `UNNAMED`.
5. For the **Parameter Level** setting, select the appropriate type, typically **Global** or **URL**.
6. For the **Parameter Value Type** setting, select **Dynamic content value**.
7. Click **Create**.

   ***Note:** You should define the extractions for a DCV parameter before you apply the security policy that includes the parameters. Otherwise, the system warns you that the security policy contains dynamic parameters with no extractions defined.*

   A popup screen opens asking if you want to define extractions.
8. Click **OK**.
   The Create New Extraction screen opens. The **Name** field shows the name of the parameter you created.
9. From the **Extracted Items Configuration** list, select **Advanced**.
10. Use the **Extract From** setting to specify which items the system searches for dynamic parameter values.

Use This Option	When
File Types	You want the system to extract dynamic parameters from responses to requests for certain file types that exist in the security policy. Select the file type and click **Add**.

Use This Option	When
URLs	You want the system to extract dynamic parameters from responses to requests for the listed URLs. To add the URLs, select the protocol, type the URL and click **Add**. If the URL is not in the security policy, it is added.
RegExp	You want the system to extract dynamic parameters from responses to requests that match a regular expression pattern.
Extract From All Items	You want the system to extract dynamic parameters from all text-based URLs and file types.

11. From the **Extracted Methods Configuration** list, select **Advanced**.
12. Select the appropriate check boxes to specify how to get the dynamic parameter values.

Select This Option	When
Search in Links	You want the system to extract dynamic parameter values from links (href tags) within the server response to a URL.
Search Entire Form	You want the system to extract dynamic parameter values from all parameters in a form in the HTML response to a requested URL.
Search Within Form	You want the system to extract dynamic parameter values from a specific parameter within in a form. Also specify the **Form Index** and the **Parameter Index**.
Search in XML	You want the system to extract dynamic parameter values from within XML entities. Type the XPath specification in the **XPath** field.
Search in Response Body	You want to the system to search for dynamic parameter values in the body of the response. You can also specify how many incidents the system should find, a prefix, a RegExp value, or a prefix to search for.

13. Click **Create** to add the extraction properties to the parameter.
14. Click **Update** to save the changes.
15. To put the security policy changes into effect immediately, click **Apply Policy**.

When the Application Security Manager receives a request that contains an entity (for example, a file extension or URL) with a dynamic content value parameter, the system extracts the parameter value from the web application response and stores it away. The next time the system receives a request containing that parameter, it uses the stored value to validate the dynamic content value parameter. The system verifies that the client is not changing the parameter value that the server sets from one request to the next, or using the values from a different user.

By default, the system saves up to 950 values that it finds for a dynamic content value parameter. If the number of values exceeds 950, the system replaces the first-extracted values with the new values.

Creating parameters with dynamic names

Before you can make a parameter with a dynamic name, you must have created a flow parameter.

In some web applications, flow parameters have dynamic names. When you create a parameter with a dynamic name, you also specify the manner in which Application Security Manager™ discovers the parameter names.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.
2. In the Parameters List, click the name of the flow parameter that you want to have a dynamic name. The Parameter Properties screen opens where you can edit the flow parameter.
3. For the **Parameter Value Type** setting, select **Dynamic parameter name**.
4. On the Dynamic Parameter Properties tab, for the **Extract Parameter from URL** setting, select the protocol to use and type the URL from which you want the system to extract the dynamic parameter.

5. Specify whether the system searches for the parameter name in a form or the response body:
   - To search in forms, select **Search Within Form**, and specify values for **Form Index** and **Parameter Index**.
   - To search in the response body, select **Search parameters in response body (in form elements names only)**. In the **By Pattern** field, type a regular expression to search for parameter names in input elements in the forms. Select **Check parameter value** to verify the parameter value in addition to the name matched in the **By Pattern** field.
6. Click **Update** to save the changes.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

The system extracts the parameters from the web server responses and then uses the extracted parameters to enforce the dynamic parameter associated with the flow.

Changing character sets for parameter values

The character sets for parameter values are the characters and meta characters that the security policy accepts in a parameter value. You can view and modify the character set that is allowed in a parameter value.

1. On the Main tab, click **Security** > **Application Security** > **Parameters** > **Character Sets** > **Parameter Value**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Use the **View** option to filter the character set.
4. For each character or meta character, change the state, as required.

State	Description
Allow	The security policy permits this character or meta character in parameter values.
Disallow	The security policy does not permit this character or meta character in parameter values.

5. Click **Save** to save the changes.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If a request includes a parameter with a disallowed character, the system generates an `Illegal parameter` violation (if that violation is set to Alarm or Block).

Changing character sets for parameter names

The character sets for parameter names are the characters and meta characters that the security policy accepts in a parameter name. You can view and modify the character set that is allowed in a parameter name.

1. On the Main tab, click **Security** > **Application Security** > **Parameters** > **Character Sets** > **Parameter Name**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Use the **View** option to filter the character set.
4. For each character or meta character, change the state, as required.

State	Description
Allow	The security policy permits this character or meta character in parameter names.
Disallow	The security policy does not permit this character or meta character in parameter names.

5. Click **Save** to save the changes.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If a request includes a parameter name with a disallowed character, the system generates an `Illegal parameter` violation (if that violation is set to Alarm or Block).

Adjusting the parameter level

You can adjust how the system determines what parameters it adds (automatic policy building) or suggests you add (manual learning) to the security policy. In most cases, you do not need to change the default values of these settings.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Expand **Parameters** and for the **Parameter Level** setting, select the level of parameter to add.

Option	Description
Global	Add parameters at the global level for all URLs in the security policy. Make learning suggestions based on the properties of entities that already exist in the security policy. Default value for **Fundamental** policy template.
URL	Add parameters at the URL level, only for specific URLs. Make learning suggestions based on real traffic. Default value for **Comprehensive** policy template.

   Note: *This option applies only to the attack signature and illegal meta character violations.*

4. Click **Save** to save your settings.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy now adds parameters according to the level you specified.

Parameter Value Types

When you add a parameter to the security policy, you specify its parameter value type. The parameter value type indicates the format of the parameter. You can configure global, URL, and flow parameters as any value type, except the dynamic parameter name type. You can configure only flow parameters as dynamic parameter names.

Parameter Value Type	Description
Dynamic content value	*Dynamic parameters* are parameters whose values can change, and are often linked to a user session. When you create a new parameter of this type, you must also define dynamic parameter extraction properties. The server sets the value for dynamic content value (DCV) parameters. DCV parameters are often associated with applications that use session IDs for client sessions.
Dynamic parameter name	If using flow parameters with names that change dynamically, you can use this parameter type. If you select this type, you also need to specify the URL from which the system can extract dynamic parameter name parameters.
Ignore value	If you do not want the system to perform validity checks on the parameter value, select this value type. Regarding signatures, this value type prevents the system from performing parameter-based signature checks on the parameter value, but it does perform other relevant signature checks.

Parameter Value Type	Description
JSON value	The JSON value type is for parameters that contain JSON data that is validated according to a JSON profile that defines the format of the data. Select an existing JSON profile or create a new one.
Static content value	Static parameters are those that have a known set of values. A list of country names or a yes/no form field are both examples of static parameters. If you select this type, you also need to specify the static values for the parameter in the Parameter Static Values list. For example, a credit card payment parameter in a shopping application may be static and have the static values MasterCard®, Visa®, and American Express®.
User-input value	User-input parameters are those that require users to enter or provide some sort of data. This is the most commonly used parameter value type. Comment, name, and phone number fields on an online form are all examples of user-input parameters. You can also configure user-input parameters even if the parameter is not really user input. For example, if a parameter has a wide range of values or many static values, you may want to configure the parameter as a user-input parameter instead of as a static content parameter. By default, the system looks for attack patterns within all alpha-numeric user-input parameters. For each parameter, you can enable or disable a specific attack signature.
XML value	XML parameters are those whose parameter value contains XML data that is validated according to an XML profile that defines the format of the data. Select an existing XML profile or create a new one.

How the system processes parameters

When you create any type of parameter, the system automatically places the parameter in staging and does not block requests even if a violation occurs and the system is configured to block that violation. Based on examining traffic, the system makes learning suggestions that you can accept or clear. If you create wildcard parameters, you also have the option of enabling learning for explicit entities.

The system enforces parameters in the following order:

- Flow parameters
- URL parameters
- Global parameters

If a parameter is defined more than once in the request context, the system applies only the more specific definition. For example, parameter `param_1` is defined as a static content global parameter, and also defined as a user-input URL parameter. When the Application Security Manager™ receives a request for the parameter in a URL that matches a URL defined in the security policy, and the parameter is defined on both the global and URL level, the system generates any violations based on the URL parameter definition.

About path parameters

Path parameters are parameters that are attached to path segments in the URI. You can configure Application Security Manager™ (ASM) to enforce path parameters as needed in your organization. Path parameters can be ignored, or treated as parameters, or as an integral part of URLs.

Although path parameters are not widely used, they could serve as covert back doors to potential attacks even for server applications that do not use path parameters. For example, an application could copy a URI with path parameters containing attack signatures to the body of the response.

Path parameters can have multiple parameters in the same path segment separated by semicolons. A semicolon also separates the path segment from the parameters; for example, `/path/`

`name;param1;p2;p3`. Each parameter can optionally equal a value; for example, `param=value;p2`. If a path parameter has more than one value, the values are separated by commas, such as `param=val1,val2,val3`.

Path parameters are extracted from requests, but not from responses.

Enforcing path parameter security

A URI path parameter is the part of a path segment that occurs after its name. You can configure how a security policy handles path parameters that are attached to path segments in URIs. You can enforce different levels of security based on your needs.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies**.
   The Policies List screen opens.
2. Click the name of the security policy you want to work on.
   The Policy Summary opens.
3. From the list, select **Advanced**.
4. Scroll down to **Handle Path Parameters**, and select how you want to treat path parameters in URIs.

Option	Description
As Parameter	The system normalizes and enforces path parameters. For each path parameter, the system removes it from the URL as part of the normalization process, finds a corresponding parameter in the security policy (first at the matching URL level, and if not found, then at the Global level), and enforces it according to its attributes like any other parameter.
As URL	The system does not normalize or enforce path parameters, and treats them as an integral part of the URL.
Ignore	The system removes path parameters from URLs as part of the normalization process, but does not enforce them.

5. Click **Save**.
6. In the editing context area, click **Apply Policy** to put the changes into effect.

Path parameters in URIs are handled as specified in the security policy properties

***Note:** The maximum number of path parameters collected in one URI path is 10. All the rest of the parameters (from the eleventh on, counting from left to right) are ignored as parameters, but are still stripped from the URI as part of the normalization process.*

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Overview: Securing Base64-Encoded Parameters

Base64 encoding is a convenient encoding method that uses a compact presentation, and is relatively unreadable to the casual observer. Many applications apply base64 encoding to binary data, for inclusion in URLs or in hidden web form fields. Unfortunately, it is also possible to mask application attacks in base64-encoded data. To provide better security for applications that use base64 encoding, Application Security Manager™ can decode user-input parameter values that are base64-encoded.

Adding base64 decoding to a new user-input parameter

If your application uses base64 encoding, the system can apply base64 decoding to a user-input parameter. When the decoding is successful, the system applies the parameter checks specified in the security policy. When the decoding is not successful, the system issues the `Illegal base64 encoded value` violation and responds to the offending request according the associated blocking policy.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Add Parameter screen opens.
4. Type the name for the new explicit parameter.
5. For the **Parameter Level** setting, select where in a request the parameter is located.

Option	Description
Global	The parameter can occur anywhere and is not associated with a specific URL or flow.
URL	The parameter occurs in the specific URL that you provide.
Flow	The parameter occurs in the specific entry point URL or referrer URL that you provide.

6. Leave the **Perform Staging** check box selected if you want the system to evaluate traffic before enforcing this parameter.

   Staging helps reduce the occurrence of false positives.
7. For the **Parameter Value Type** setting, select **User-input value**.
8. On the Data Type tab, for the **Data Type** setting, select either **Alpha-Numeric** or **File Upload**.
9. Select the **Base64 Decoding** check box if you want the system to apply base64 decoding to values for this parameter.
10. Configure any other properties that apply to this new parameter.
11. Click **Create**.
    The screen refreshes, and the new parameter appears in the parameters list.
12. To put the security policy changes into effect immediately, click **Apply Policy**.

Adding base64 decoding to an existing user-input parameter

When enabled, the system can decode base64 encoding in a user-input parameter. If the decoding is successful, the system applies the parameter checks specified in the security policy. If the decoding is not successful, the system issues the `Illegal base64 encoded value` violation and responds to the offending request according to the associated blocking policy.

1. On the Main tab, click **Security** > **Application Security** > **Parameters** > **Parameters List**.
2. In the Parameters List filter, select **Parameter Value Type** in the left list, **User-input value** in right list, and click **Go**.
   The screen refreshes and lists only user-input parameters.
3. In the Parameter Name column, click the name of the parameter to which you want to add base64 decoding.
   The Parameter Properties screen opens.
4. On the Data Type tab, select the **Base64 Decoding** check box so the system applies base64 decoding to values for this parameter.

   ***Note:** The base64 decoding setting is available only for user-input parameters of the alpha-numeric or file upload data type.*
5. Click **Update**.
   The screen refreshes, and displays the parameters list.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

Adding URLs to a Security Policy

About adding URLs

In a security policy, you can manually specify the HTTP or WebSocket URLs that are allowed (or disallowed) in traffic to the web application being protected. If you are using automatic policy building (and the policy includes learning URLs), Application Security Manager™ (ASM) can determine which URLs to add, based on legitimate traffic. If a WebSocket profile is associated with the security policy virtual server, ASM can also add WebSocket URLs to the policy.

When you create a security policy, wildcard URLs of * (representing all HTTP or WebSocket URLs) are added to the Allowed HTTP and WebSocket URLs lists. During the enforcement readiness period, the system examines the URLs in the traffic and makes learning suggestions that you can review and add the URLs to the policy as needed. This way, the security policy includes the HTTP and WebSocket URLs that are typically used. When you think all the URLs are included in the security policy, you can remove the * wildcards from the allowed URLs lists.

About referrer URLs

Referrer URLs are web pages that request other URLs within a web application. For example, an HTML page can request a GIF, JPG, or PNG image file. The HTML page is the referrer, and the GIF, JPG, and PNG files are non-referrers. In lists of URLs, non-referrer URLs appear in blue and referrer URLs appear in gold.

A referrer in Application Security Manager™ is similar to the HTTP Referer header. Use referrers for complex objects, such as HTML pages, but not for embedded objects, such as GIF files.

Adding allowed HTTP URLs

You can manually add *allowed HTTP URLs*, which are URLs from which the security policy accepts traffic en route to the web application being protected.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
   The Allowed HTTP URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Allowed HTTP URL screen opens.
4. For **URL**, choose a type and protocol, and then type the URL name or wildcard.

Option	Description
Explicit	Specifies a unique URL, such as `/index.html`. Choose **HTTP** or **HTTPS**, and type the URL in the adjacent field.
Wildcard	Specifies that the URL is a wildcard expression. Any URL that matches the wildcard expression is considered legal. The pure wildcard (*) is automatically added to the security policy so you do not need to add it. But you can add other wildcards such as `/main/*`. Select **HTTP** or **HTTPS**, and type a wildcard expression in the adjacent field.

5. By default, the **Perform Staging** check box is selected. F5 recommends that you keep it selected.
6. If you want to view more options, next to **Create New Allowed URL**, select **Advanced**.
7. If the attack signatures included in the security policy apply differently to this allowed URL, you can adjust them on the Attack Signatures tab.
   a) Ensure that **Check attack signatures on this URL** is selected.

   b) From the **Global Security Policy Settings** list, move any attack signatures whose global settings you want to override into the **Overridden Security Policy Settings** and adjust the state as needed (from **Enabled** to **Disabled** or vice versa).

   Tip: *The most common action you perform here is to disable an attack signature for a specific URL.*

   Overridden attack signatures are preceded with a yellow alert triangle in the attack signature list, and you can filter the list to view them.

8. To process requests for this URL according to the header content, create header-based content profiles.

   The task, *Enforcing requests for HTTP URLs based on header content*, provides details on how to do this.

9. To protect the application from being able to harbor illegitimate frames and iframes (inline frames) with malicious code in the application, set up protection from clickjacking:

   a) For **Clickjacking Protection**, select the **Enabled** check box.

   b) From the **Allow Rendering in Frames** list, select an option to determine whether to allow this URL to be rendered in a frame or iframe.

10. For wildcard URLs, leave **Wildcard Match Includes Slashes** selected.

    When this option is selected, an asterisk in a wildcard matches any number of path segments (separated by slashes); when cleared, an asterisk matches at most one segment.

11. For wildcard URLs, in the Meta Characters tab, you can specify whether to check for meta characters in the URL, and which ones to allow or disallow.

    a) The **Check characters on this URL** setting is enabled by default so that the system verifies meta characters in the URL. (If you do not want to check for meta characters, clear the check box and skip to the next step.)

    b) To specify which meta characters to allow or disallow, from the **Global Security Policy Settings** list, select any meta characters that you want to specifically allow or disallow, and move them to the **Overridden Security Policy Settings** list.

    c) For each meta character that you moved, set the state to **Allow** or **Disallow**.

    Note: *The Overridden Security Policy Settings take precedence over the global settings for the web application character set.*

12. Click **Create**.
    The Allowed URLs screen opens and lists the new URL.

13. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy allows requests for the URL or URLs matching the wildcard that you added. If the URL is in staging, the system informs you when learning suggestions are available or when it is ready to be enforced.

Wildcard syntax

The syntax for wildcard entities is based on shell-style wildcard characters. This table lists the wildcard characters that you can use in the names of file types, URLs, parameters, or cookies so that the entity name can match multiple objects.

Wildcard Character	Matches
*	All characters
?	Any single character
[abcde]	Exactly one of the characters listed
[!abcde]	Any character not listed

Wildcard Character	Matches
[a-e]	Exactly one character in the range
[!a-e]	Any character not in the range

Allowed HTTP URL properties

These tables describe the properties (both Basic and Advanced settings) that define HTTP URLs that the security policy will allow.

New allowed HTTP URL properties

Property	Description
URL	Specifies an HTTP URL that the security policy allows. The available types are: • **Explicit**: Specifies that the URL is a unique HTTP URL. Type the URL in the adjacent field using the format `/index.html`. • **Wildcard**: Specifies a wildcard expression. Any HTTP URL that matches is considered legal. For example, typing `*` specifies that any HTTP URL is allowed by the security policy. Type a wildcard expression in the adjacent field.
Protocol	Specifies whether the protocol for the URL is HTTP or HTTPS.
Perform Staging	Specifies that the system places this URL in staging. Learning suggestions produced by requesting staged URLs are logged in the Learning screens. Review staging status on the Allowed HTTP URLs screen. If a URL is in staging, point to the icon to display staging information. When you are no longer getting learning suggestions, you can disable this setting. If you enforce a URL, this setting is cleared.
Check Flows to this URL	Specifies that the security policy validates flows to the URL (if configured). If this setting is disabled, the system ignores the flows to the URL. When you select this check box, additional settings appear.
URL is Entry Point	(Visible when **Check Flows to this URL** is selected.) Specifies that this URL is a page through which a visitor can enter the web application.
URL is Referrer	(Visible when **Check Flows to this URL** is selected.) Specifies that the URL is a URL from which a user can access other URLs in the web application.
URL can change Domain Cookie	Specifies that the security policy does not block an HTTP request where the domain cookie was modified on the client side. Note that this setting is applicable only if the URL is a referrer.
URL with Navigation Parameter	Specifies that you want to associate a navigation parameter with this URL. You must have a navigation parameter defined in the security policy to view this option.
Select Navigation Parameter	Specifies a list of navigation parameters that you can associate with this URL.
Navigation Parameter Value	Indicates the value of the navigation parameter.
Clickjacking Protection	Specifies that the system adds the `X-Frame-Options` header to the domain cookie's response header. This is done to protect the web application against clickjacking. *Clickjacking* occurs when attacker lures a user to click illegitimate frames and iframes because the attacker hid them on legitimate

Property	Description
	visible website buttons. Therefore, enabling this option protects the web application from other web sites hiding malicious code behind them. The default is disabled. After you enable this option, you can select whether, and under what conditions, the browser should allow this URL to be rendered in a frame or iframe.
Allow Rendering in Frames	Specifies the conditions for when the browser should allow this URL to be rendered in a frame or iframe. • **Never**: Specifies that this URL must never be rendered in a frame or iframe. The web application instructs browsers to hide, or disable, frame and iframe parts of this URL. • **Same Origin Only**: Specifies that the browser may load the frame or iframe if the referring page is from the same protocol, port, and domain as this URL. This limits the user to navigate only within the same web application. • **Only From URL**: Specifies that the browser may load the frame or iframe from a specified domain. Type the protocol and domain in URL formatfor example, `http://www.mywebsite.com`. Do not enter a sub-URL, such as `http://www.mywebsite.com/index`.
Wildcard Match Includes Slashes	Specifies that an asterisk in a wildcard URL matches any number of path segments (separated by slashes); when cleared, specifies that an asterisk matches at most one segment. For example: the wildcard `/art/*` matches `/art/abc/index.html` if the wildcard match includes slashes (default value), but does not match it if the check box is cleared. In that case, it matches `/art/go.html` (only one segment below `/art`).
HTML5 Cross-Domain Request Enforcement	CORS (Cross-Origin Resource Sharing) lets one website access the resources of another website using JavaScript (within the browser). Web applications may share resources with other websites hosted on a different domain. When the option is selected, the system protects a specific URL in your web application from cross-origin resource sharing. You can configure which domains can access the response generated by requesting this URL (the resource), and how to overwrite CORS response headers returned by the web server.
URL Description	Describes the URL (optional).

Header-Based Content Profiles

Property	Description
Request Header Name	Specifies an explicit header name that must appear in requests for this URL. This field is not case-sensitive.
Request Header Value	Specifies a simple pattern string (glob pattern matching) for the header value that must appear in legal requests for this URL; for example, `*json*`, `xml_method?`, or `method[0-9]`. If the header includes this pattern, the system assumes the request contains the type of data you select in the **Request Body Handling** setting. This field is case-sensitive.
Request Body Handling	Indicates how the system parses the content of requests for the allowed URL: • **Apply Content Signatures**: Do not parse the content; scan the entire payload with full-content attack signatures.

Property	Description
	- **Apply Value and Content Signatures**: Do not parse the content or extract parameters; process the entire payload with value and full-content attack signatures. - **Disallow**: Block requests for an URL containing this header content. Log the Illegal Request Content Type violation. - **Do Nothing**: Do not inspect or parse the content. Handle the header of the request as specified by the security policy. - **Form Data**: Parse content as posted form data in either URL-encoded or multi-part formats. Enforce the form parameters according to the policy. - **GWT**: Perform checks for data in requests, based on the configuration of the GWT (Google Web Toolkit) profile associated with this URL. - **JSON**: Review JSON data using an associated JSON profile, and use value attack signatures to scan the element values. - **XML**: Review XML data using an associated XML profile.
Profile Name	Specifies the XML, JSON, or GWT profile the security policy uses when examining requests for this URL if the header content is parsed as XML, JSON, or GWT. You can also create or view the XML, JSON, or GWT profile from this option.

HTML5 Cross-Domain Request Enforcement

Property	Description
Allow HTML5 Cross-Origin Requests	Allows all CORS requests to this URL, and displays additional settings.
Allowed Origins	Allows you to specify a list of origins allowed to share data returned by this URL.
Allowed Methods	Allows you to specify a list of methods that other web applications hosted in different domains can use when requesting this URL.
Allowed Headers	Allows you to specify a list of request headers that other web applications hosted in different domains can use when requesting this URL. Or you can delete non-simple headers returned in response to requests.
Exposed Headers	Allows you to specify a list of response headers that are safe to expose to JavaScript, and can be shared with web applications hosted in different domains. Or you can allow only simple headers to be exposed.
Allow Credentials	Specifies whether requests from other web applications hosted in different domains may include user credentials.
Maximum Age	Specifies how long (in seconds) to cache in the browser the results of a preflight request (a special request that the browser sends to your web application to determine if JavaScript from another domain may access your resource).

Meta Characters

Property	Description
Check characters on this URL	Specifies that the system verifies meta characters on this wildcard URL. You can change which meta characters are allowed or disallowed.

Methods Enforcement

Property	Description
Override policy allowed methods	Specifies that the system allows you to override allowed methods for this URL. When selected, global policy settings for methods are listed, and you can change what is allowed or disallowed for this URL.

Learning Settings for HTTP URLs

These settings are on the Learning and Blocking Settings screen.

Setting	Description
Learn New HTTP URLs	Specifies how to add, or suggests that you add URLs to the security policy if you are creating a wildcard URL. • **Add All Entities**: The system suggests you add explicit URLs that match the wildcard to the security policy creating a comprehensive whitelist of all the URLs on the web site. You can review suggestions on the Traffic Learning screen. • **Selective**: When false positives occur, the system adds or suggests adding an explicit URL with relaxed settings that avoid the false positive. This option is a good balance between security, policy size, and ease of maintenance. • **Never (wildcard only)**: The system does not add URLs that match the wildcard to the security policy, and suggests changing the attributes of matched wildcard entities.
Maximum Learned HTTP URLs	Limits the number of URLs that the security policy allows. The default is `10000`.
Learn Allowed Methods on URLs	If selected, when the system learns a new URL with a method, it selects the override methods enforcement setting. If using automatic learning, suggestions are made for the new URL only. For manual learning, suggestions are made to add the method to the URL and to the policy as well.
Classify Request Content of Learned HTTP URLs	If the system detects legitimate XML or JSON data for URLs in the security policy, the system adds or suggests you add XML or JSON profiles to the security policy and configures their attributes according to the data it detects.
Collapse many common URLs into one wildcard URL	Collapses many common explicit URLs into one wildcard URL with a common prefix and suffix. The system collapses URLs only in the same directory (with the same prefix path) and the same file extension. The system creates a wildcard with no slash.
File types for which wildcard URLs will be configured (e.g. *.jpg)	Specifies the file types for which to create a wildcard URL instead of adding explicit URLs. The system includes several by default.

Adding disallowed HTTP URLs

For some web applications, you may want to deny requests for certain URLs. In this case, you can create a set of disallowed URLs. Adding disallowed URLs is useful, for example, to prevent access to an administrative interface to the web application such as `/admin/config.php`.

1. On the Main tab, click **Security** > **Application Security** > **URLs** > **Disallowed URLs** > **Disallowed HTTP URLs**.

The Disallowed HTTP URLs screen opens.

2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Disallowed HTTP URL screen opens.
4. For the **URL (Explicit only)** setting, select **HTTP** or **HTTPS** as the protocol for the URL, and type the URL that the security policy considers illegal; for example, `/index.html`.

   Note: *URLs are case-sensitive unless you cleared the* ***Security Policy is case sensitive*** *option when you created the policy.*

5. Click **Create**.
   The Disallowed HTTP URLs screen opens and lists the URL.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If a requested URL is on the disallowed HTTP URLs list, the system ignores, learns, logs, or blocks the request depending on the settings you configure for the `Illegal URL` violation on the Learning and Blocking Settings screen. You can view learning suggestions for disallowed HTTP URLs on the Traffic Learning screen.

Creating allowed WebSocket URLs

You can manually create *allowed WebSocket URLs*, which are URLs from which the security policy accepts messages over WebSocket connections. You do this if you have a short list of WebSocket URLs to protect and you know their paths.

Note: *If you are using automatic learning, the security policy protects WebSocket URLs automatically, and you do not have to add them. Learning settings for WebSocket URLs are on the Learning and Blocking Settings screen.*

1. On the Main tab, click **Security** > **Application Security** > **URLs** > **Allowed URLs** > **Allowed WebSocket URLs**.
   The Allowed WebSocket URLs screen opens.
2. Click **Create**.
   The New Allowed WebSocket URL screen opens.
3. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
4. Next to **Create New Allowed WebSocket URL**, select **Advanced**.
5. For **WebSocket URL**, choose a type and protocol, and then type the URL name or wildcard.

Type	Description
Explicit	Specifies a specific WebSocket URL, such as `/chat.room.com/websocket`. Select **WS** (for unencrypted text) or **WSS** (for encrypted text), and type the URL in the adjacent field.
Wildcard	Specifies a wildcard expression to represent a number of URLs. Any URL that matches the wildcard expression is considered legal. The pure wildcard (*) is automatically added to the security policy so you do not need to add it. But you can add other wildcards such as `/main/*`. Select **WS** (for unencrypted text) or **WSS** (for encrypted text), and type a wildcard expression in the adjacent field.

6. Retain the default selected **Perform Staging** check box.

   Keep it selected so you can check for false positives before enforcing the new URL.
7. For wildcard WebSocket URLs, leave **Wildcard Match Includes Slashes** selected.

When this option is selected, an asterisk in a wildcard matches any number of path segments (separated by slashes); when cleared, an asterisk matches at most one segment.

8. On the Message Handling tab, leave **Check Message Payload** enabled.

   Based on the traffic and the selections in the **Payload Enforcement** setting, the **Check Message Payload** setting causes the system to validate the format of WebSocket messages.

9. For the **WebSocket Extensions** list, leave the default value **Remove Headers** to select what happens to messages that have WebSocket extensions.

   Other options to ignore extensions (Dangerous! Not recommended.) or block messages with extensions are available, but F5 recommends using the default.

   The system removes the `Sec-WebSocket-Extensions` header from the message and allows the WebSocket to be established so messages can be exchanged.

10. For **Allowed Message Payload Formats**, select the format or formats that you want to enforce for WebSocket messages: click **JSON** or **Binary**.

    At least one format must be selected. (Initially, **Plain Text** is always selected.) If you are using a different format and not verifying plain text in messages, you can clear **Plain Text**.

11. For **Payload Enforcement**, choose how to validate the message content.

    - To verify plain text or JSON formatting, select the previously created content profile, or create a new one.
    - To enforce binary messages, for **Maximum Binary Message Size**, click **Length** and type the largest binary message (in bytes) to allow. The default value is `10000` bytes.

12. For **Maximum Frame Size**, adjust the frame size, if necessary.

    The default value is `10000` bytes.

13. For **Maximum Frames per Fragmented Message**, adjust the number, if necessary.

    The default value is `100` frames.

14. For wildcard WebSocket URLs, on the Meta Characters tab, you can overwrite the global URL character set, and allow or disallow specific meta characters in the WebSocket URL if you need to.

    a) The **Check characters on this URL** setting is enabled by default so that the system verifies meta characters in the URL. (If you do not want to check for meta characters, clear the check box and skip to the next step.)

    b) To specify which meta characters to allow or disallow, from the **Global Security Policy Settings** list, select any meta characters that you want to specifically allow or disallow, and move them to the **Overridden Security Policy Settings** list.

    c) For each meta character that you moved, set the state to **Allow** or **Disallow**.

    Note: *The Overridden Security Policy Settings take precedence over the global settings for the web application character set.*

15. If your web site uses CORS (Cross-Origin Resource Sharing), click the HTML5 Cross-Domain Request Enforcement tab.

    a) For **Enforcement Mode**, select **Enforce on ASM**.

    b) On the HTML5 Cross-Domain Request Enforcement tab, specify how to enforce CORS on this WebSocket URL. For details, see *Setting Up Cross-Domain Request Enforcement*.

16. Click **Create**.
    The Allowed WebSockets URLs screen opens and lists the new WebSocket URL.

17. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy allows requests for the WebSocket URLs that you added. If the WebSocket URL is in staging, the system informs you when learning suggestions are available or when it is ready to be enforced.

Adding disallowed WebSocket URLs

For some web applications, you might want to deny requests for certain WebSocket URLs. In this case, you can create a set of disallowed WebSocket URLs.

1. On the Main tab, click **Security** > **Application Security** > **URLs** > **Disallowed URLs** > **Disallowed WebSocket URLs**.
   The Disallowed WebSocket URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Disallowed WebSocket URL screen opens.
4. For the **WebSocket URL (Explicit only)** setting, select **WS** or **WSS** as the protocol for the URL, and type the WebSocket URL that the security policy considers illegal; for example, `/index.html`.

   Note: *URLs are case-sensitive unless you cleared the* ***Security Policy is case sensitive*** *option when you created the policy.*
5. Click **Create**.
   The Disallowed WebSocket URLs screen opens and lists the URL.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If a requested URL is on the disallowed WebSocket URLs list, the system ignores, learns, logs, or blocks the request depending on the settings you configure for the `Illegal URL` violation on the Learning and Blocking Settings screen. You can view learning suggestions for disallowed WebSocket URLs on the Traffic Learning screen.

Enforcing requests for HTTP URLs based on header content

Before you can enforce requests for URLs using header content, you need to have added an allowed HTTP URL.

When you manually create a new allowed HTTP URL, the system reviews requests for the URL using HTTP parsing. The system automatically creates a default header-based content profile for HTTP, and you cannot delete it. However, requests for an URL may contain other types of content, such as JSON, XML, or other proprietary formats.

You can use header-based content profiles to configure how the system recognizes and enforces requests for this URL according to the header content in the request. You can also use header-based content profiles to block traffic based on the type of header and header value in requests for a URL.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
   The Allowed HTTP URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the Allowed URLs List, click the name of the URL for which you want to specify legal header content.
   The Allowed HTTP URL Properties screen opens where you can modify the properties of the URL.
4. From the **Allowed URL Properties** list, select **Advanced**.
5. On the Header-Based Content Profiles tab, specify the header and value as follows:
   a) In the **Request Header Name** field, type the explicit header name that must appear in requests for this URL. This field is not case-sensitive.

b) In the **Request Header Value** field, type the pattern string for the header value to find in legal requests for this URL, for example, `*json*`, `xml_method?`, or `method[0-9]`. This field is case-sensitive.

If a header value includes this pattern, the system assumes that the request contains the type of data you select in the **Request Body Handling** setting.

c) From the **Request Body Handling** list, specify how the system recognizes and enforces requests for this URL according to the requests' header content:

Option	Result
Apply Content Signatures	Do not parse the content; scan the entire payload with full-content attack signatures.
Apply Value and Content Signatures	Do not parse the content or extract parameters; process the entire payload with value and full-content attack signatures. This option provides basic security for protocols other than HTTP, XML, JSON, and GWT; for example, use `*amf*` as the header value for a content-type of Action Message Format.
Disallow	Block requests for an URL containing this header content. The system logs the `Illegal Request Content Type` violation.
Do Nothing	Do not inspect or parse the content. Handle the header of the request as specified by the security policy.
Form Data	Parse content as posted form data in either URL-encoded or multi-part formats. Enforce the form parameters according to the policy.
GWT	Examine data in requests, based on the configuration of a GWT (Google Web Toolkit) profile associated with this URL.
JSON	Examine JSON data using an associated JSON profile, and use value attack signatures to scan the element values.
XML	Examine XML data using an associated XML profile.

d) If the content is GWT, JSON, or XML, for **Profile Name**, select an existing profile or click the Create (+) button to create one. (The other options do not require special profiles.)

e) Click **Add**.

6. Click **Update**.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

If the system detects a request for a URL that contains header content that is disallowed in the URL's Header-Based Content Profile, the `Illegal request content type` violation occurs.

Specifying characters legal in URLs

When you create a security policy, you select a language encoding (or let the system determine it automatically) that determines the characters that can be used in URLs. You can view or modify which characters the security policy allows or disallows in URLs.

1. On the Main tab, click **Security** > **Application Security** > **URLs** > **Character Set**.
   The URLs Character Set screen opens, where you can view the character set, and state of each character.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Use the **View** filter to display the set of characters that you want to see.

***Tip:** To restore the default character set definitions, you can click the **Restore Defaults** button at any time.*

4. To modify which characters the system should permit or prohibit in the name of a wildcard URL, click **Allow** or **Disallow** next to the character.
5. Click **Save** to save the changes.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy checks that URLs in requests do not include any disallowed characters. For example, by disallowing the characters <, >, ', and |, a security policy protects against many cross-site scripting attacks and injection attacks.

Overriding methods on URLs

You can define a list of methods that are allowed or disallowed for a specific URL. The list overrides the list of methods allowed or disallowed globally at the policy level.

If you are using automatic learning, on the Learning and Blocking Settings screen, under URLs, you can select **Learn Methods on URLs**; the system automatically learns overridden methods at the URL level. In that case, you do not need to perform this task.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
   The Allowed HTTP URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. From the Allowed HTTP URLs List, click the name of the URL you want to modify.
   The Allowed HTTP URL Properties screen opens.
4. From the **Allowed URL Properties** list, select **Advanced**.
5. Toward the bottom of the screen, click the Methods Enforcement tab.
6. Select the **Override policy allowed methods** check box.
7. In the Method Enforcement tab, from the **Global Security Policy Settings** list, select any specific methods that you want to enable or disable for this URL, and then move them into the **Overridden Security Policy Settings** list.
   The screen lists the methods in the state opposite from the global setting.
8. If the method you want to override is not listed, click **Create Custom Method** to add a new method to the security policy. Type the method name, and select whether the new method should act as GET or POST.
9. Click **Update**.
10. To put the security policy changes into effect immediately, click **Apply Policy**.

The methods you selected are treated differently for this URL than for the rest of the security policy. If the method causes an `Illegal method` violation due to URL level enforcement, the description reads `Illegal method for URL`. (If the violation is caused at the policy level, the description reads `Illegal method for policy`.) If the URL is in staging, and the violation is due to override, the violation does not block even if it is in blocking mode.

Configuring flows to URLs

Before you can configure a flow, you should have created the explicit HTTP URL for which you want to add the flow.

A *flow* defines the access path leading from one explicit HTTP URL to another, between a referrer URL and a target URL in a web application. For example, a basic web page may include a graphic and hyperlinks to other pages in the application. The calls from the basic page to the other pages make up the flow. You can configure flows to a URL.

Note: Configuring flows is an optional task. Unless you need the enhanced security of configured flows, F5 Networks recommends that you do not configure flow-based security policies due to their complexity.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
   The Allowed HTTP URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. From the Allowed HTTP URLs List, click the name of the URL you want to modify.
   The Allowed HTTP URL Properties screen opens.
4. From the **Allowed URL Properties** list, select **Advanced**.
5. If you want the system to verify flows to this URL, select the **Check Flows To URL** check box.
6. On the menu bar, click **Flows to URL**.
   The Flows to URL screen opens and shows the flows to that specific URL.
7. Above the Flows to URL area, click **Create**.
   The Create a New Flow popup screen opens.
8. For the **Referrer URL** setting, specify how the client enters the application.
   - If you want the client to enter the application from this URL, select **Entry Point**.
   - To specify the path of a referrer URL that refers to other URLs in the application, select **URL Path**; for example, type `/index.html`.
9. From the **Protocol** list, select the appropriate protocol, **HTTP** or **HTTPS**.
10. From the **Method** list, select the HTTP method that the URL expects a visitor to use to access the authenticated URL, for example, **GET** or **POST**.
11. In the **Frame Target** field, type the index (`0-29`, or `99`) of the HTML frame in which the URL belongs, if the web application uses frames.

    Tip: *If your web application does not use frames, type the value `1`.*
12. If this flow can contain a query strings or POST data, select the **Allow QS/PD** check box.
13. If you want the system to verify query strings or POST data for this flow, select the **Check QS/PD** check box.
14. Click **OK**.
    The popup screen closes, and on the Flows to URL screen, you see the HTTP URLs from which the URL can be accessed.
15. To view the entire application flow, click **Security** > **Application Security** > **URLs** > **Flows List**.
16. To view the flow or modify the flow properties, click the URL in the Flows list.
17. To put the security policy changes into effect immediately, click **Apply Policy**.

You now have the option of creating parameters that are associated with the flow.

Creating flow parameters

Before you can create a flow parameter, you need to first have created the flow to which the parameter applies. If the source URL is a referrer URL, that HTTP URL must already be defined in the security policy as well.

You define parameters in the context of a flow when it is important to enforce that the target HTTP URL receives a parameter only from a specific referrer URL. Flow parameters provide very tight, flow-specific security for web applications. With this increased protection comes an increase in maintenance and configuration time. Note that if your application uses dynamic parameters, you need to manually add those to the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Parameters**.

2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Add Parameter screen opens.
4. In the Create New Parameter area, for the **Parameter Name** setting, specify the type of parameter you want to create.

   - To create a named parameter, select **Explicit**, then type the name.
   - To use pattern matching, select **Wildcard**, then type a wildcard expression. Any parameter name that matches the wildcard expression is permitted by the security policy.
   - To create an unnamed parameter, select **No Name**. The system creates a parameter with the label, `UNNAMED`.
5. In the **Parameter Level** setting, select **Flow**, and then for **From URL** define where the flow must come from:

   - If the source URL is an entry point, click **Entry Point**.
   - If the source URL is a referrer URL (already defined in the policy), click **URL Path**, select the protocol used for the URL, then type the referrer URL associated with the flow.

   When you begin to type the URL, the system lists all referrer URLs that include the character you typed, and you can select the URL from the list.
6. In the **Parameter Level** setting, for **Method**, select the HTTP method (**GET** or **POST**) that applies to the target referrer URL (already defined in the policy).
7. In the **Parameter Level** setting, for **To URL**, select the protocol used for the URL, then type the target URL.
8. Leave the **Perform Staging** check box selected if you want the system to evaluate traffic before enforcing this parameter.

   Staging helps reduce the occurrence of false positives.
9. If the parameter is required in the context of the flow, select the **Is Mandatory Parameter** check box.

   Note that only flows can have mandatory parameters.
10. Specify whether the parameter requires a value:

    - If the parameter is acceptable without a value, leave the **Allow Empty Value** setting enabled.
    - If the parameter must always include a value, clear the **Allow Empty Value** check box.
11. To allow users to send a request that contains multiple parameters with the same name, select the **Allow Repeated Occurrences** check box.

    Important: *Before enabling this check box, consider that requests containing multiple parameters of the same name could indicate an attack on the web application (HTTP Parameter Pollution).*
12. If you want to treat the parameter you are creating as a sensitive parameter (data not visible in logs or the user interface), enable the **Sensitive Parameter** setting.
13. For the **Parameter Value Type** setting, select the format of the parameter value.
    Depending on the value type you select, the screen refreshes to display additional configuration options.
14. Click **Create** to add the new parameter to the security policy.
15. To put the security policy changes into effect immediately, click **Apply Policy**.

When you create a parameter that is associated with a flow, the system verifies the parameter in the context of the flow. For example, if you define a parameter in the context of a GET request, and a client sends a POST request that contains the parameter, the system generates an `Illegal Parameter` violation.

Configuring dynamic flows to URLs

Before you can configure a dynamic flow, you must have created the explicit HTTP URL for which you want to add the dynamic flow.

Some web applications contain HTTP URLs with dynamic names, for example, the links to a server location for file downloads, where the file name may be unique to each user. You can configure the system to detect these URLs by creating a dynamic flow. For the dynamic flow, you specify a regular expression that describes the dynamic name, and associate the flow with the URL.

1. On the Main tab, click **Security** > **Application Security** > **URLs**.
   The Allowed HTTP URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. From the Allowed HTTP URLs List, click the name of the URL you want to modify.
   The Allowed HTTP URL Properties screen opens.
4. On the menu bar, click **Dynamic Flows from URL**.
   The Flows to URL screen opens and shows the flows to that specific URL.
5. Above the Dynamic Flows to URL area, click **Create**.
   The Create a New Dynamic Flow popup screen opens.
6. In the **Prefix** field, type a fixed substring that appears near the top of the HTML source page before the dynamic URL.

   The prefix may be the name of a section in combination with HTML tags, for example, `<title>Online Banking</title>`.
7. For the **RegExpValue** setting, type a regular expression that specifies the set of URLs that make up the dynamic flow, for example, a set of archive files.
8. For the **Suffix** setting, type a fixed string that occurs in the referring URL's source code, and is physically located after the reference to the dynamic name URL.
9. Click **OK**.
   The popup screen closes, and on the Dynamic Flows from URL screen, you see the dynamic flow extraction properties.
10. To put the security policy changes into effect immediately, click **Apply Policy**.

The regular expression describes the dynamic URL name. The Application Security Manager extracts dynamic URL names from the URL responses associated with the dynamic flow.

Configuring dynamic session IDs in URLs

If an application uses dynamic information in URLs (for example, user names), the Application Security Manager™ cannot use its normal functions to extract and enforce HTTP URLs or flows because the URI contains a dynamic element. If the web application that you are securing could contain dynamic information in a URL, you can allow dynamic session IDs in URLs. (You only need to configure this setting if you know that your application works this way.)

1. On the Main tab, click **Security** > **Application Security** > **Security Policies**.
   The Policies List screen opens.
2. Click the name of the security policy you want to work on.
   The Policy Summary opens.
3. From the list, select **Advanced**.
4. For the **Dynamic Session ID in URL** setting, specify how the security policy should process URLs that use dynamic sessions.

Use this option	When
Custom pattern	The security policy uses a user-defined regular expression to recognize a dynamic session ID in URLs. Type a regular expression in the **Value** field, and a description in the **Description** field.
Default pattern	The security policy uses the default regular expression (`\/sap\([^)]+\)`) for recognizing dynamic session IDs in URLs.
Disabled	The security policy does not enforce dynamic session IDs in URLs. This is the default value.

5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

Normally, if the system receives a request in which the dynamic session information does not match the settings in the security policy, the system issues the `Illegal session ID in URL` violation. When you allow dynamic session IDs in URLs, ASM extracts the dynamic session information from requests or responses, based on the pattern that you configure. For requests, the system applies the pattern to the URI up to, but not including, the question mark (?) character in a query string.

Note: *The system can extract dynamic information only from illegal URLs.*

Adding Cookies

About cookies

Many web-based applications use cookies to help users navigate the web site efficiently and perform certain functions. For example, web servers may use cookies to authenticate users logging in to secure applications, or an application can use cookies to store user preferences. Whether using automatic policy building or manually creating a security policy, you may want to add cookies that the web application uses.

You may want a security policy to ignore certain known and recognized cookie headers that are included in HTTP requests. For example, if cookies can change on the client side legitimately, you can create *allowed cookies*.

You may also want a security policy to prevent changes to specific cookies, such as session-related cookies that are set by the application. If so, you can create *enforced cookies*. The cookie in the request must not be modified, or it generates the Modified Domain Cookie violation.

In addition, some PHP applications treat cookies as parameters and use the value of the cookie as input to the application. For that reason, you can have the system check attack signatures on the cookie (as you can for parameters). You can apply attack signatures only to allowed cookies, because enforced cookies are set by the server, and therefore, are considered to be secure.

Both allowed and enforced cookies can be put in staging when they are created so that you can make sure that they do not cause false positives during the staging period.

If you are using automatic policy building, the security policy adds cookies automatically. If manually building a security policy, the manual traffic learning screens suggest cookies to add.

About pure wildcard cookies

When you create a security policy, it includes a pure wildcard (*) and it is created as an allowed cookie in the Allowed Cookies list. You cannot delete the pure wildcard from the security policy but you can change its type from allowed to enforced. The allowed cookie wildcard allows all cookies, and you can specify which cookies the users cannot change in the enforced cookies list .This is considered a negative security model, because you allow all cookies except the ones you specify.

However, new cookies are added to the security policy (or not) based on the **Learn New Cookies** value of the matched wildcard in the Learning and Blocking settings. The value can be **Never (wildcard only)** or **Selective**. The default value differs depending on the deployment scenario you use to create the policy.

The following deployments create pure wildcard cookies using the value **Never (wildcard only)**, thus they do not add (or suggest to add) explicit cookies to the security policy:

- All templates (including Rapid Deployment policy)
- Automatic policy building with Fundamental policy template
- Vulnerability assessment

All other policy templates create the pure wildcard cookie with **Learn New Cookies** set to **Selective**. So it adds (if building the policy automatically) or suggests to add (if building the policy manually) explicit cookies encountered in the traffic to the security policy.

In **Selective** mode, the system learns cookies that violate the settings of the wildcard. In particular, cookies that do not change are learned as enforced cookies. Most cookies are added to the security policy as allowed cookies, and are checked for the configured signature set. These are captured by the * pure wildcard. The exceptions are the enforced cookies and cookies that need to be exempted from some of the signature checks. These are whitelisted.

Wildcard syntax

The syntax for wildcard entities is based on shell-style wildcard characters. This table lists the wildcard characters that you can use in the names of file types, URLs, parameters, or cookies so that the entity name can match multiple objects.

Wildcard Character	Matches
*	All characters
?	Any single character
[abcde]	Exactly one of the characters listed
[!abcde]	Any character not listed
[a-e]	Exactly one character in the range
[!a-e]	Any character not in the range

About cookies and learning

When you create a security policy that includes cookies, the system adds new cookies (or suggests that you add them) to the security policy (or not) based on the Learn New Cookies value. The value can be Never (do not add cookies) or Selective (add cookies that match the wildcard). The default value differs depending on the policy template you use to create the policy.

The following deployments create pure wildcard cookies using the value Never, thus they do not add (or suggest to add) explicit cookies to the security policy by default:

- Rapid Deployment policy
- Automatic policy building with Fundamental policy type
- Vulnerability assessment

All other templatex create the pure wildcard cookie with Learn New Cookies set to Selective. So the system adds (if building the policy automatically) or suggests to add (if building the policy manually) explicit cookies encountered in the traffic to the security policy.

You could start by having the wildcard set to selective in the allowed cookies, get a list of all the cookies that your web application uses, then move them to the enforced list. This would make it easier to add the cookies that your web application uses and that you want to enforce to the security policy.

About adding cookies

Application Security Manager™ (ASM) allows you to add cookies with different characteristics to security policies.

You can specify the cookies that you want to allow, and the ones you want to enforce in a security policy:

- Allowed cookies: The system allows these cookies and clients can change them.
- Enforced cookies: The system enforces the cookies in the list (not allowing clients to change them) and allows clients to change all others.

If the cookies in the web application change, you can edit or delete the cookies.

Adding allowed cookies

You manually add allowed cookies to a security policy when you want a security policy to ignore those cookies. You may want to add allowed cookies for certain known and recognized cookie headers that are often included in HTTP requests. For example, if clients can change certain cookies legitimately and they are not session-related (like cookies assigned by single sign-on servers), you can specify these cookies as allowed in the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Headers**.
   The Cookies List screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Cookie screen opens.
4. For **Cookie Name** identify the cookie.
   a) From the list, select whether the system identifies the cookie by a specific name (**Explicit**), or by a regular expression (**Wildcard**).

      The pure wildcard (*) is automatically added to the security policy so you do not need to add it. But you can add other wildcards such as `*site.com`.
   b) In the field, type either the name of the cookie, or the pattern string for the wildcard to match cookie names.
5. For **Cookie Type**, select **Allowed**.
6. Leave the **Perform Staging** check box selected if you want the security policy to evaluate traffic before enforcing this entity.

   Staging helps reduce the occurrence of false positives.
7. If you want the system to add the HttpOnly attribute to the response header of the domain cookie, select the **Insert HttpOnly attribute** check box.

   This attribute prevents the cookie from being modified or intercepted on the client side, by unwanted third parties that run scripts on the web page. The client's browser allows only pure HTTP or HTTPS traffic to access the protected cookie.
8. If you want the system to add the Secure attribute to the response header of the domain cookie, select the **Insert Secure attribute** check box.

   This attribute ensures that cookies are returned to the server only over SSL, which prevents the cookie from being intercepted. It does not, however, guarantee the integrity of the returned cookie.
9. If this is a custom cookie that may include base64 encoding, select the **Base64 Decoding** check box.
   If the cookie contains a Base64 encoded string, the system decodes the string and continues with its security checks.

10. To adjust the attack signature settings for this cookie, use the Attack Signatures tab. Tip: The most common action you perform here is to disable a specific attack signature for a specific cookie.
    a) If you want to override the attack signature settings for this cookie, select the **Check attack signatures on this cookie** check box.
       When this option is selected, the system displays a list of attack signatures.
    b) From the **Global Security Policy Settings** list, move any attack signatures whose global settings you want to override into the **Overridden Security Policy Settings** and adjust the state as needed.
11. Click **Create**.
    The new cookie is created and added to the list.
12. To put the security policy changes into effect immediately, click **Apply Policy**.

The system ignores allowed cookies in requests, and allows clients to change allowed cookies in the list.

Adding enforced cookies

You manually add enforced cookies to a security policy when you want a security policy to prevent clients from changing those cookies.

1. On the Main tab, click **Security** > **Application Security** > **Headers**.
   The Cookies List screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Cookie screen opens.
4. For **Cookie Name** identify the cookie.
   a) From the list, select whether the system identifies the cookie by a specific name (**Explicit**), or by a regular expression (**Wildcard**).

      The pure wildcard (*) is automatically added to the security policy so you do not need to add it. But you can add other wildcards such as `*site.com`.
   b) In the field, type either the name of the cookie, or the pattern string for the wildcard to match cookie names.
5. For **Cookie Type**, select **Enforced**.
6. Leave the **Perform Staging** check box selected if you want the security policy to evaluate traffic before enforcing this entity.

   Staging helps reduce the occurrence of false positives.
7. If you want the system to add the HttpOnly attribute to the response header of the domain cookie, select the **Insert HttpOnly attribute** check box.

   This attribute prevents the cookie from being modified or intercepted on the client side, by unwanted third parties that run scripts on the web page. The client's browser allows only pure HTTP or HTTPS traffic to access the protected cookie.
8. If you want the system to add the Secure attribute to the response header of the domain cookie, select the **Insert Secure attribute** check box.

   This attribute ensures that cookies are returned to the server only over SSL, which prevents the cookie from being intercepted. It does not, however, guarantee the integrity of the returned cookie.
9. Click **Create**.
   The new cookie is created and added to the list.
10. To put the security policy changes into effect immediately, click **Apply Policy**.

If a request contains a modified or unsigned enforced cookie header and the Modified domain cookie(s) violation is set to alarm or block, the system logs and/or blocks the request (when the system is in blocking mode). Note that the request is not blocked if the enforced cookie is in staging, or if the security policy is in transparent mode.

Changing the order in which wildcard cookies are enforced

If you create several wildcard cookies, the security policy adds each new one to the top of the wildcard cookies list. The cookie wildcards are enforced from the top of the list down. You can change the order in which a security policy enforces wildcard cookies.

1. On the Main tab, click **Security** > **Application Security** > **Headers** > **Cookie Wildcards Order**.
   The Cookie Wildcards Order screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the **Wildcard Cookies** list, adjust the order of the cookie wildcards by using the **Up** and **Down** buttons putting the cookies you want to enforce first at the top of the list.
4. Click **Save** to save the changes.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

The system enforces the cookie wildcards from the top down.

Editing cookies

You can edit cookies as required by changes in the web application that the security policy is protecting.

1. On the Main tab, click **Security** > **Application Security** > **Headers**.
   The Cookies List screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Select either the Enforced Cookies or Allowed Cookies tab to locate the cookie you want to edit.
4. In the Cookie Name column, click the cookie name.
   The Edit Cookie screen opens.
5. In the Cookie Properties area, make the required changes to the cookie.
6. Click **Update** to save the changes.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

Deleting cookies

You can delete cookies that are no longer needed in your security policy. If a cookie changes in your application, you may want to delete the old cookie and let Application Security Manager™ add the new cookie (or suggest adding it).

1. On the Main tab, click **Security** > **Application Security** > **Headers**.
   The Cookies List screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Select either the Enforced Cookies or Allowed Cookies tab to locate the cookie you want to edit.
4. In the Enforced Cookies or Allowed Cookies list, select the check box next to the cookie you want to delete.
5. Click **Delete** to delete the entity, and click **OK** when asked to confirm.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

Specifying when to add explicit cookies

You can specify the circumstances under which Application Security Manager™ adds, or suggests you add, explicit cookies to the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Expand **Cookies**, in the **Learn New Cookies** setting, select the option you want.

Option	Description
Never (wildcard only)	The system does not add or suggest that you add cookies that match the wildcard to the policy. When false positives occur, the system suggests relaxing the settings of the wildcard entity. This option results in a security policy that is easy to manage but may not be as strict.
Selective	The system adds or suggests that you add cookies that match the wildcard to the policy. When false positives occur, the system adds or suggests that you add an explicit entity with relaxed settings that avoid the false positive. This option provides a good balance between security, policy size, and ease of maintenance.

4. Click **Save** to save the changes.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

Configuring the maximum cookie header length

You specify a maximum cookie header length so that the system knows the acceptable maximum length for the cookie header in an incoming request. This setting is useful primarily in preventing buffer overflow attacks.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies**.
   The Policies List screen opens.
2. Click the name of the security policy you want to work on.
   The Policy Summary opens.
3. From the list, select **Advanced**.
4. For the **Maximum Cookie Header Length** setting, select one of the options.

Option	Description
Any	Specifies that the system accepts requests with cookie headers of any length.
Length with a value in bytes	Specifies that the system accepts cookie headers up to that length. The default maximum length is **8192** bytes.

5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

The system calculates and enforces the cookie header length based on the sum of the length of the cookie header name and value. Requests with headers that are longer than the maximum length cause an Illegal header length violation.

Overview: Configuring advanced cookie protection

Many of the Application Security Manager™ (ASM) security features store ASM™ cookies on clients as part of the traffic security enforcement. Examples of security features that use cookies for validation are cookie enforcement, parameter enforcement, CSRF protection, login enforcement, session tracking, and anomaly detection. Cookie enforcement is also called *domain cookies*; cookies for the other features are called *other ASM cookies*.

The system applies a random security key unique to each deployment and uses it in conjunction with an encryption algorithm. The combination of the randomly generated key and the selected algorithms is called the *security context*. Normally, you do not have to change the cookie protection settings. However, in cases where you suspect a security breach has occurred, or if you want a different balance between speed and security, you can reconfigure cookie protection.

By default, when you initially start the system, it automatically generates a security key and sets the cookie security level to secure. You can change the encryption schema to provide faster cookie protection by reconfiguring cookie protection.

If you want to use the same security context on other systems, you can set up advanced cookie configuration settings on one BIG-IP® system and export them. You can then import the settings on the other systems. You can configure all your systems to use the same cookie protection, or apply different settings to the systems. However, if you have multiple ASM-enabled devices that share traffic (and are not synchronized using device groups), it is recommended that those systems should all use the same cookie protection settings.

If synchronizing multiple ASM systems using device groups, you can configure the settings you want to use for all systems on one and then synchronize the systems.

Reconfiguring cookie protection

Application Security Manager™ (ASM) automatically configures cookie protection. If you need to adjust cookie protection due to a security breach or because you want to change the current protection level, you can reconfigure cookie protection.

***Note:** This is an advanced configuration task that is required only in special circumstances.*

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Cookie Protection**.
   The Cookie Protection screen opens.
2. Review the data and time specified in the **Latest Generation/Import Configuration Time** setting to see when cookie protection was last configured.
3. To review the details of the cookie protection, click **View Algorithms Configuration**.
   The screen shows the specific algorithms the system uses to protect domain and other ASM cookies.
4. If you decide that you want to change the cookie configuration, click **Reconfigure Cookie Protection.**
   The Reconfigure Cookie Protection screen opens.
5. For **Grace Period Until signing with new Security Context**, type the amount of time in minutes that must pass before the system begins signing ASM cookies with the new key and algorithm that you are configuring.

   The default value is `30` minutes. Initially when you start the system, this is the period the system waits to apply the new security context for the new release.
6. For **Grace Period To Accept Old Cookies**, type the amount of time in minutes that must pass before the system stops accepting traffic with ASM cookies that use the old key and algorithm.

   The default value is `2880` minutes (48 hours).
7. For **Algorithm Selection**, select the overall cookie security level to apply: **Secure** or **Fast**.

   ***Tip:** The **Secure** setting uses more system resources.*

   Changing this setting changes the Scramble and Mac algorithms used for cookie protection.
8. If you want to review the actual algorithms used for the cookies, you can do this:
   a) For the **Cookie Protection Configuration** setting, select **Advanced**.
   The screen shows additional settings.
   b) Review the scramble and Mac algorithms used for the domain cookies and other ASM cookies, and adjust them if needed.
   If you use settings other than the defaults, the **Algorithm Selection** changes to **Custom**.

9. Click **Reconfigure**.
   The system regenerates a new security context but waits to start using it until it surpasses the grace period until signing value.
10. If you need to extend either of the grace periods, click **Extend** and type the number of minutes to add and click **Save**.

Importing cookie protection configuration

If you want to use the same cookie configuration settings on more than one Application Security Manager™ (ASM) system (especially systems that share traffic), you can export the settings from one system and import them onto another one. This task explains how to import the settings.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Cookie Protection**.
   The Cookie Protection screen opens.
2. Click **Import**.
   The Import Cookie Protection Configuration screen opens.
3. From the **Import Method** list, select **Upload file** and locate the previously exported configuration file.

   The exported file has a name such as `ASM_Cookie_Protection_Configuration_2013-08-15_08-22.txt`.
4. To review the details of the cookie protection, click **View Algorithms Configuration**.
   The screen shows the specific algorithms the system uses to protect domain and other ASM cookies.
5. For **Grace Period Until signing with new Security Context**, type the amount of time in minutes that must pass before the system begins signing ASM cookies with the new key and algorithm that you are configuring.

   The default value is `30` minutes. Initially when you start the system, this is the period the system waits to apply the new security context for the new release.
6. For **Grace Period To Accept Old Cookies**, type the amount of time in minutes that must pass before the system stops accepting traffic with ASM cookies that use the old key and algorithm.

   The default value is `2880` minutes (48 hours).
7. Click **Import**.
   The system imports the security context but waits to start using it until the grace period until signing is up.
8. If you need to extend either of the grace periods, click **Extend** and type the number of minutes to add and click **Save**.

Exporting cookie protection configuration

If you want to use the same cookie configuration settings on more than one Application Security Manager™ system, you can export the settings from one system and import them onto another one. This task explains how to export the settings to a file.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Cookie Protection**.
   The Cookie Protection screen opens.
2. Click **Export**.
   The system exports the cookie protection configuration to a file with a name such as `ASM_Cookie_Protection_Configuration_2013-08-15_08-22.txt`.

Adding Allowed Methods to a Security Policy

Adding allowed methods

All security policies accept standard HTTP methods by default. If your web application uses HTTP methods other than the default allowed methods (GET, HEAD, and POST), you can add them to the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Headers** > **Methods**.
   The Methods screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
4. For the **Method** setting, select the type of method to allow:
   - To use an existing HTTP method to act as a GET or POST action, select **Predefined** then select the system-supplied method to add to the allowed methods list.
   - To add an option that is not predefined, select **Custom**, and then in the **Custom Method** field, type the name of a method.
5. If using flows in the security policy, from the **Allowed Method Properties** list, select **Advanced**, then from the **Act as Method** list, select an option:
   - If you do not expect requests to contain HTTP data following the HTTP header section, select **GET**.
   - If you expect requests to contain HTTP data following the HTTP header section, select **POST**.
6. Click **Create**.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

The method is added to the allowed methods list. The system treats any incoming HTTP request that uses an HTTP method other than an allowed method as an invalid request. The system ignores, learns, logs, or blocks the request depending on the settings configured for the `Illegal Method` violation under Headers on the Learning and Blocking Settings screen.

Securing Applications That Use WebSocket

Overview: Securing applications that use WebSocket connections

WebSocket is an HTML5 protocol that simplifies and speeds up communication between clients and servers. Once a connection is established through a handshake, messages can be passed back and forth while keeping the connection open.

For example, WebSocket connections are used for bi-directional, real-time applications such as support chats, news feeds, immediate quotes, or collaborative work. It is important to secure the content that is exchanged, otherwise an attacker could potentially gain access to the application server.

If your application uses WebSocket protocol, your security policy can protect WebSocket connections from exploits related to the protocol. If the policy uses automatic learning, the system handles much of the work for you. If you are using manual learning, you can add content profiles and WebSocket URLs to the security policy to protect WebSocket traffic.

This use case presumes that you have already created the security policy for the web application. It tells you what you need to do so that the system can recognize and secure WebSocket traffic.

Task Summary

About WebSocket security

Many web applications use two-way communication channels between the client and the server. The WebSocket Protocol, specified in RFC 6455, defines a way to speed up and simplify the communication.

Application Security Manager™ (ASM) provides security for WebSocket connections in security policies by adding WebSocket URLs (`ws://` and `wss://`) and defining defense measures in a WebSocket profile. The WebSocket protocol allows extensions to add features to the basic framing protocol. The WebSocket URL informs ASM how to handle the extensions. The WebSocket URL also defines the allowed message format, size, and whether it is enforced.

You cannot associate parameters with WebSocket URLs. Therefore, any parameters in the request are handled at the global level.

WebSocket security can protect against many threats, including those listed in this table.

Threat	How WebSocket Security Prevents It
Server stack abuse	Enforces mandatory headers in the request.
Session riding or CSRF	Denies access to requests coming from origins not in the configured whitelist.
Information leakage	Enforces login sessions for `ws://` and `wss://` URLs.
XSS, SQL injection, command shell injection, and other threats that attack signatures prevent	Uses attack signatures to examine parameter content in each WebSocket text message. If it finds them, closes the WebSocket connection and logs it in the Request log.
Server exploits	Examines text messages for RFC compliance, illegal meta characters, and null characters.
Cache poisoning	Enforces message masking for client text messages to avoid caching false content.

Threat	How WebSocket Security Prevents It
Buffer overflow	Limits message size, frame size, and enforces correct frame format. If messages are in JSON format, validates content.
Exhausted server socket resources	Limits the time for sending a message and time between messages.

About WebSocket and login enforcement

If your application uses *login enforcement*, you can specify authenticated WebSocket URLs that can only be accessed after login. To do this, the security policy needs to include at least one login page. You specify the WebSocket and WebSocket Secure (`ws://` and `wss://`) URLs that must be authenticated on the login enforcement screen.

See *Creating Login Pages for Secure Application Access* for how to set up login enforcement for WebSocket URLs.

About WebSocket and cross-domain request enforcement

To prevent access to a WebSocket from an unauthorized origin, you can add more security to it. You can enable cross-domain request enforcement as part of the Allowed WebSocket URL properties within a security policy.

See *Setting Up Cross-Domain Request Enforcement* for how to set up cross-domain request enforcement for WebSocket URLs.

Securing WebSocket applications: The easy way

You can use Application Security Manager™ to secure applications that use WebSocket connections. The easiest way to do this is to create a security policy that uses automatic learning. That way, the system builds the policy for you when you tell it how to recognize WebSocket traffic.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies** > **Policies List**.
   The Policies List screen opens.
2. With no policy selected, click **Create New Policy**.
   a) Type a name for the policy.
   b) For **Policy Template**, select **Comprehensive**.
   c) For **Virtual Server**, configure the local traffic settings for the virtual server.
   d) Click **Create policy**.

   The system creates a security policy, but the policy does not yet support WebSocket.
3. Click **Local Traffic** > **Virtual Servers**, open the virtual server you created, select the **Advanced** configuration settings, and from the **WebSocket Profile** list, select **websocket**, and when done, click **Update** to save your changes.

   For details, see *Recognizing WebSocket Traffic*.

   The system uses the default WebSocket profile for the application.
4. Start sending traffic to the web application that uses WebSocket connections.

The system starts examining the application traffic, and builds the security policy as usual. The system adds Allowed WebSocket URLs to the security policy along with other policy elements when ASM sees enough traffic from various users.

In Comprehensive policies, the system examines and classifies request content of learned WebSocket URLs, and creates a JSON profile if needed. The system stabilizes the security policy when sufficient sessions over a period of time include the same elements.

In Fundamental policies, the system learns URLs selectively, and classification is turned off, by default. Most WebSocket traffic is treated as plain text, and URLs with binary messages are learned (assuming they are the exception). The system does not learn JSON automatically because JSON is seen as plain text, and no violation is issued.

Creating a WebSocket profile

If you want the BIG-IP® system to recognize WebSocket traffic, you need a WebSocket profile. For most purposes, you can use the default `websocket` profile included with the system and skip this task. If you need to adjust the masking options, you can create a new WebSocket profile.

1. On the Main tab, click **Local Traffic** > **Profiles** > **Services** > **WebSocket**.
2. Click **Create**.
   The New WebSocket Profile screen opens.
3. In the **Name** field, type a name for the WebSocket profile.
4. Select the **Custom** check box at the right so you can edit the screen.
5. From the **Masking** list, select an option:

Option	When you want to do this
Preserve	Preserve the mask of the packet received, and make no change. ASM and other modules receive masked frames.
Unmask	Remove the mask from the packet and remask it using the same mask when sending the traffic to the server. (Default value.)
Selective	Preserve the mask of the packet received, and make no changes unless an Application Security Policy is associated with the virtual server. In that case, unmask the packet, allow ASM™ to examine the WebSocket payload, and remask it when sending the traffic to the server.
Remask	Remove the mask received from the client. The system generates a new, random mask when sending the traffic to the server.

6. Click **Finished**.

Next, you can associate the WebSocket profile with the virtual server that handles applications with WebSocket connections. For example, this could be the virtual server associated with an Application Security Policy created for WebSocket applications.

Recognizing WebSocket traffic

If you want the system to recognize and handle WebSocket traffic, you need to associate a WebSocket profile with the virtual server that handles the traffic. For example, this could be the virtual server associated with a security policy that you want to secure an application with WebSocket connections.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the name of the virtual server associated with the security policy that you want to secure WebSocket traffic.
3. From the **Configuration** list, select **Advanced**.
4. Make sure that **HTTP Profile** is set to **http**.
5. From the **WebSocket Profile** list, select **websocket**, or the name of the profile you created.

   The `websocket` profile is a default profile included with the system.
6. Click **Update** to save the changes.

The WebSocket profile is associated with the virtual server. The system can now recognize WebSocket traffic.

Creating a JSON profile

Before you can complete this task, you need to have already created a security policy for your application.

This task describes how to create a JSON profile that defines the properties that the security policy enforces for an application sending JSON payloads or WebSocket payloads in JSON format.

***Note:** The system supports JSON in UTF-8 and UTF-16 encoding. WebSocket allows only UTF-8.*

1. On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **JSON Profiles**.
2. Click **Create** to create a new JSON profile, or edit the `Default` JSON profile (by clicking it).
   The Create New JSON Profile screen opens.
3. Type a name for the profile.
4. Adjust the maximum values that define the JSON data for the AJAX application, or use the default values.
5. If you want the system to tolerate and not report warnings about JSON content, select the **Tolerate JSON Parsing Warnings** check box.

   If the system cannot parse JSON content, it generates the violation `Malformed JSON data`, regardless of whether this setting is enabled or disabled.
6. To parse parameters in a JSON payload as parameters (recommended), ensure that **Parse Parameters** is enabled.

   The system extracts parameters from JSON content whenever the JSON profile is used; for example, with URLs, WebSocket URLs, or parameters that use a JSON profile.

   The security policy parses parameters extracted from the JSON payload the same as other parameters. Also, the Attack Signatures, Value Metacharacters, and Sensitive Data Configuration tabs are removed from the screen, so you can skip to the last step.
7. If the signatures included in the security policy are not sufficient for this JSON profile, you can change them.
   a) On the Attack Signatures tab, in the **Global Security Policy Settings** list, select any specific attack signatures that you want to enable or disable for this profile, and then move them into the **Overridden Security Policy Settings** list.

      ***Tip:** If no attack signatures are listed in the **Global Security Policy Settings** list, create the profile, update the attack signatures, then edit the profile.*

   b) After you have moved any applicable attack signatures to the **Overridden Security Policy Settings** list, enable or disable each of them as needed:

      - **Enabled** - Enforces the attack signature for this JSON profile, although the signature might be disabled in general. The system reports the violation `Attack Signature Detected` when the JSON in a request matches the attack signature.
      - **Disabled** - Disables the attack signature for this JSON profile, although the signature might be enabled in general.
8. To allow or disallow specific meta characters in JSON data (and thus override the global meta character settings), click the Value Meta Characters tab.

   - Select the **Check characters** check box, if it is not already selected.
   - Move any meta characters that you want allow or disallow from the **Global Security Policy Settings** list into the **Overridden Security Policy Settings** list.
   - In the **Overridden Security Policy Settings** list, change the meta character state to **Allow** or **Disallow**.

9. To mask sensitive JSON data (replacing it with asterisks), click the Sensitive Data Configuration tab.
   - In the **Element Name** field, type the JSON element whose values you want the system to consider sensitive.
   - Click **Add**.

   Important: *If the JSON data causes violations and the system stops parsing the data part way through a transaction, the system masks only the sensitive data that was fully parsed.*

   Add any other elements that could contain sensitive data that you want to mask.
10. Click **Create** (or **Update** if editing the Default profile).
    The system creates the profile and displays it in the JSON Profiles list.

This creates a JSON profile that affects the security policy when you associate the profile with a URL, WebSocket URL, or parameter.

Next, you need to associate the JSON profile with any URLs, WebSocket URLs, or parameters that might include JSON data.

Creating a plain text content profile

Before you can complete this task, you need to have already created a security policy for your application.

You can create a plain text content profile that defines the properties that a security policy enforces for unstructured text content, such as those used in WebSocket messages. Note that the system creates a default plain text profile in advance for * wildcard URLs (unless this was an upgrade from a previous version). You can use the default profile for other URLs, and also edit it if it applies to multiple URLs including the *, instead of creating new ones.

1. On the Main tab, click **Security** > **Application Security** > **Content Profiles** > **Plain Text Profiles**.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The Create New Plain Text Profile screen opens.
4. For **Profile Name**, type the name of the profile.
5. Adjust the maximum values that define the length of the text messages, or use the default values.
6. In the Attack Signatures tab, determine which patterns to look for in the text:
   a) If the text content does not need to be reviewed for potential threats, clear the **Check attack signatures** check box. Otherwise, leave it selected and the system will use the attack signatures to look for threats.
   b) If checking signatures, in the **Global Security Policy Settings** list, select any specific attack signatures that you want to enable or disable for this profile, and then move them into the **Overridden Security Policy Settings** list.
   c) Once you have moved any applicable attack signatures to the **Overridden Security Policy Settings** list, enable or disable each of them as needed.

Option	Description
Enabled	Enforces the attack signature for this text profile, although the signature might be disabled for the policy in general. The system reports the violation `Attack Signature Detected` when the text in a request matches the attack signature.
Disabled	Disables the attack signature for this text profile, although the signature might be enabled in general.

*Tip: If no attack signatures are listed in the **Global Security Policy Settings** list, create the profile, update the attack signatures, then edit the profile.*

7. To allow or disallow specific meta characters in the text (and thus override the global meta character settings), click the Value Meta Characters tab.
   a) Select the **Check characters** check box, if it is not already selected.
   b) Move any meta characters that you want allow or disallow from the **Global Security Policy Settings** list into the **Overridden Security Policy Settings** list.
   c) In the **Overridden Security Policy Settings** list, change the meta character state to **Allow** or **Disallow**.
8. Click **Create**.
   The system creates the profile and displays it in the Plain Text Profiles list.

This creates a plain text content profile that affects the security policy when you associate the profile with a URL, such as a WebSocket URL. Once associated, the security policy checks the content of text being sent to the WebSocket URL.

Next, you need to associate the plain text content profile with the WebSocket URLs so the system can verify the content of the messages being sent over the WebSocket connection. You can create the WebSocket URLs manually if not using automatic learning.

Creating allowed WebSocket URLs

You can manually create *allowed WebSocket URLs*, which are URLs from which the security policy accepts messages over WebSocket connections. You do this if you have a short list of WebSocket URLs to protect and you know their paths.

***Note:** If you are using automatic learning, the security policy protects WebSocket URLs automatically, and you do not have to add them. Learning settings for WebSocket URLs are on the Learning and Blocking Settings screen.*

1. On the Main tab, click **Security** > **Application Security** > **URLs** > **Allowed URLs** > **Allowed WebSocket URLs**.
   The Allowed WebSocket URLs screen opens.
2. Click **Create**.
   The New Allowed WebSocket URL screen opens.
3. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
4. Next to **Create New Allowed WebSocket URL**, select **Advanced**.
5. For **WebSocket URL**, choose a type and protocol, and then type the URL name or wildcard.

Type	Description
Explicit	Specifies a specific WebSocket URL, such as `/chat.room.com/websocket`. Select **WS** (for unencrypted text) or **WSS** (for encrypted text), and type the URL in the adjacent field.
Wildcard	Specifies a wildcard expression to represent a number of URLs. Any URL that matches the wildcard expression is considered legal. The pure wildcard (*) is automatically added to the security policy so you do not need to add it. But you can add other wildcards such as `/main/*`. Select **WS** (for unencrypted text) or **WSS** (for encrypted text), and type a wildcard expression in the adjacent field.

6. Retain the default selected **Perform Staging** check box.

   Keep it selected so you can check for false positives before enforcing the new URL.
7. For wildcard WebSocket URLs, leave **Wildcard Match Includes Slashes** selected.

When this option is selected, an asterisk in a wildcard matches any number of path segments (separated by slashes); when cleared, an asterisk matches at most one segment.

8. On the Message Handling tab, leave **Check Message Payload** enabled.

   Based on the traffic and the selections in the **Payload Enforcement** setting, the **Check Message Payload** setting causes the system to validate the format of WebSocket messages.
9. For the **WebSocket Extensions** list, leave the default value **Remove Headers** to select what happens to messages that have WebSocket extensions.

   Other options to ignore extensions (Dangerous! Not recommended.) or block messages with extensions are available, but F5 recommends using the default.

   The system removes the `Sec-WebSocket-Extensions` header from the message and allows the WebSocket to be established so messages can be exchanged.
10. For **Allowed Message Payload Formats**, select the format or formats that you want to enforce for WebSocket messages: click **JSON** or **Binary**.

    At least one format must be selected. (Initially, **Plain Text** is always selected.) If you are using a different format and not verifying plain text in messages, you can clear **Plain Text**.
11. For **Payload Enforcement**, choose how to validate the message content.

    - To verify plain text or JSON formatting, select the previously created content profile, or create a new one.
    - To enforce binary messages, for **Maximum Binary Message Size**, click **Length** and type the largest binary message (in bytes) to allow. The default value is `10000` bytes.
12. For **Maximum Frame Size**, adjust the frame size, if necessary.

    The default value is `10000` bytes.
13. For **Maximum Frames per Fragmented Message**, adjust the number, if necessary.

    The default value is `100` frames.
14. For wildcard WebSocket URLs, on the Meta Characters tab, you can overwrite the global URL character set, and allow or disallow specific meta characters in the WebSocket URL if you need to.
    a) The **Check characters on this URL** setting is enabled by default so that the system verifies meta characters in the URL. (If you do not want to check for meta characters, clear the check box and skip to the next step.)
    b) To specify which meta characters to allow or disallow, from the **Global Security Policy Settings** list, select any meta characters that you want to specifically allow or disallow, and move them to the **Overridden Security Policy Settings** list.
    c) For each meta character that you moved, set the state to **Allow** or **Disallow**.

    Note: *The Overridden Security Policy Settings take precedence over the global settings for the web application character set.*
15. If your web site uses CORS (Cross-Origin Resource Sharing), click the HTML5 Cross-Domain Request Enforcement tab.
    a) For **Enforcement Mode**, select **Enforce on ASM**.
    b) On the HTML5 Cross-Domain Request Enforcement tab, specify how to enforce CORS on this WebSocket URL. For details, see *Setting Up Cross-Domain Request Enforcement*.
16. Click **Create**.
    The Allowed WebSockets URLs screen opens and lists the new WebSocket URL.
17. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy allows requests for the WebSocket URLs that you added. If the WebSocket URL is in staging, the system informs you when learning suggestions are available or when it is ready to be enforced.

Adjusting learning settings for WebSocket URLs

You can adjust the policy building settings for WebSocket URLs if you need to change how WebSocket URLs are learned, or how WebSocket violations are handled.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the Policy Building Settings, expand **URLs** to view the settings.
4. Specify how WebSocket URLs are added to the security policy in **Learn New WebSocket URLs**.

Option	Description
Never (wildcard only)	Do not add explicit WebSocket URLs; just use a wildcard and relax the settings if it causes false positives.
Selective	Add explicit WebSocket URLs that do not match the attributes of the * wildcard.
Add All Entities	Add all WebSocket URLs used on the website.

5. Review the **Learn**, **Alarm**, **Block** (if in blocking enforcement mode) settings of the WebSocket-related violations to see if they are set as you want them to be.
6. For **Maximum Learned WebSocket URLs**, use the default value of `10000`.

   This option is available only if you are using **Selective** or **Add All Entities** for learning.
7. Click **Save** to save your settings.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

The WebSocket URL learning settings are changed.

Classifying the content of requests to WebSocket URLs

You can instruct the system to automatically examine and classify the content of requests to WebSocket URLs. If the system detects legitimate JSON, plain text, or binary data in requests to URLs allowed in the security policy, the system adds the content profiles to the security policy, and configures them using the data found.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. In the General Settings, for **Learning Mode**, ensure that it is set to **Automatic**.
4. On the right side of the Learning and Blocking Settings screen, select **Advanced**.
   The screen displays the advanced configuration details for policy building.
5. In the Policy Building Settings area, expand **URLs**.
6. For **Learn New HTTP URLs**, specify when the system should add explicit URLs to the security policy.

   - Choose **Selective** to add explicit URLs that do not match the * wildcard.
   - Choose **Add All Entries** to create a comprehensive whitelist of all the website URLs.

   Using these options activates the **Classify Client Message Payload Format of Learned WebSocket URLs** check box.

7. Select **Classify Client Message Payload Format of Learned WebSocket URLs**.
8. Click **Save** to save your settings.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

If JSON, binary, or plain text data is discovered in requests to WebSocket URLs, the system classifies the data and makes learning suggestions regarding each format of data (binary, JSON, and plain text). The policy suggests adding, then after examining sufficient traffic, creates the appropriate content profiles, and adds them to the policy.

It is useful to view the learning suggestions regarding classification. The benefit of seeing the suggestions is being able to see sample requests that lead the system to choose the respective payload formats.

Adding disallowed WebSocket URLs

For some web applications, you might want to deny requests for certain WebSocket URLs. In this case, you can create a set of disallowed WebSocket URLs.

1. On the Main tab, click **Security** > **Application Security** > **URLs** > **Disallowed URLs** > **Disallowed WebSocket URLs**.
   The Disallowed WebSocket URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Disallowed WebSocket URL screen opens.
4. For the **WebSocket URL (Explicit only)** setting, select **WS** or **WSS** as the protocol for the URL, and type the WebSocket URL that the security policy considers illegal; for example, `/index.html`.

   Note: *URLs are case-sensitive unless you cleared the* ***Security Policy is case sensitive*** *option when you created the policy.*

5. Click **Create**.
   The Disallowed WebSocket URLs screen opens and lists the URL.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If a requested URL is on the disallowed WebSocket URLs list, the system ignores, learns, logs, or blocks the request depending on the settings you configure for the `Illegal URL` violation on the Learning and Blocking Settings screen. You can view learning suggestions for disallowed WebSocket URLs on the Traffic Learning screen.

Associating a profile with a WebSocket URL

Before you can associate a text or JSON content profile with a WebSocket URL, you need to have created a security policy with policy elements including WebSocket URLs, and a text or JSON content profile.

You can associate a text or JSON content profile, or both, with one or more existing explicit or wildcard WebSocket URLs. The associated profiles specify the format you want to enforce for WebSocket payloads.

1. On the Main tab, click **Security** > **Application Security** > **URLs** > **Allowed URLs** > **Allowed WebSocket URLs**.
   The Allowed WebSocket URLs screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. From the Allowed WebSocket URLs List, click the name of a WebSocket URL that can contain unstructured text or JSON data.

The Allowed WebSocket URL Properties screen opens.

4. In the **Allowed Message Payload Formats** setting, select **Plain Text** or **JSON** or both.
5. For the **Payload Enforcement** setting, from the **Plain Text Profile** or **JSON Profile** lists, select the content profiles to enforce.
6. Click **Update**.
7. To put the security policy changes into effect immediately, click **Apply Policy**.

The Plain Text and JSON profiles are associated with the WebSocket URL, and ASM™ verifies the content of the messages being sent over the WebSocket connection.

Continue to associate Plain Text or JSON profiles with any WebSocket URLs in the application that might contain unstructured text or JSON data.

WebSocket violations

This table lists the violations that Application Security Manager™ can detect in WebSocket traffic.

Violation	Cause
`Bad WebSocket handshake request`	A problem occurred while establishing a WebSocket connection. The request did not comply with protocol.
`Failure in WebSocket framing protocol`	A framing protocol error occurred while parsing the message.
`Illegal cross-origin request`	The request did not come from the same origin as the traffic, and is not on the list of allowed origins in the HTTP or WebSocket URL.
`Illegal number of frames per message`	The request contains more frames than the WebSocket URL allows.
`Illegal WebSocket binary message length`	The binary message is longer than the WebSocket URL allows.
`Illegal WebSocket extension`	The message has an extension that the WebSocket URL does not allow.
`Illegal WebSocket frame length`	The message exceeds the maximum frame size permitted by the WebSocket URL.
`Mask not found in client frame`	The mask bit in the client frame is not set, and it needs to be.
`Null character found in WebSocket text message`	The system found a null character in a text message having has a content profile.
`Text content found in binary only WebSocket`	The WebSocket URL allows only binary content, but the message includes plain text.

Configuring HTTP Headers that Require Special Treatment

About mandatory headers

A *mandatory header* is a header that must appear in a request for the request to be considered legal by the system. If a request does not contain the mandatory header and the `Mandatory HTTP header is missing` violation is set to alarm or block, the system logs or blocks the request. This violation is not set to alarm or block by default, so you have to set the blocking policy if you want to alarm or block requests that do not include a mandatory header.

You can use mandatory headers to make sure, for example, that requests are passing a proxy (which introduces such a header) before they reach the Application Security Manager™.

You configure mandatory headers on the HTTP Headers screen.

About header normalization

Header normalization is a process whereby the Application Security Manager™ buffers the contents of request headers to change them into a standard format that can be more easily checked for discrepancies. Normalizing deals with special characters (such as percent encoding), non-ASCII text, URL paths and parameters, Base64 encoded binary content, non-printable characters, HTML codes, and many other formats that may be used in headers that could potentially hide malicious code.

Not all headers need to be normalized. You should normalize referer headers, and custom headers containing binary data, URLs, or other encoded information. But there is a performance trade-off when using normalization, so you should implement it only when needed.

You configure header normalization on the HTTP Headers screen when you select the option to check signatures for the header.

About default HTTP headers

Application Security Manager™ (ASM) includes the default HTTP headers listed in the table.

Header Name	Description
* (wildcard)	This wildcard HTTP header checks signatures against all requests unless they match another HTTP header. No normalization settings are selected by default, but you can edit them. Realize that enabling normalization on the wildcard header may impact performance. The **Base64 Decoding** and **Mandatory** check boxes are unavailable for this header.
referer	When requests have referer headers, they include URLs. The system checks signatures against them, performs URL normalization, and validates the URL syntax. Violations are issued if problems are encountered during normalization. The other settings are not typically relevant for this header.
cookie	Cookies have their own process for normalization and attack signature check and so the cookie as a header is always excluded from the normalization and attack signature check. You cannot change the settings, but you can configure the settings of a specific cookie by clicking the **Cookie configuration** link.

Header Name	Description
authorization	Although the user name may be encoded as Base64, the Base64 decoding is always off for this header; the reason for this is that the user name (and password) are only part of the Authorization header value. ASM™ detects what and when to decode, so the generic Base64 setting should always be off. Therefore, the **Base64 Decoding** check box is unavailable for this header. Realize that enabling normalization on the authorization header may impact performance.

You cannot delete any of the default HTTP headers.

Overview: Configuring HTTP headers

This is an advanced task not required in all environments.

Application Security Manager™ (ASM) lets you configure custom headers that deserve special treatment in your security policy. You can add these types of headers:

- Mandatory headers
- Headers that require Base64 decoding
- Headers to exclude from signature checks
- Headers that need to be normalized

The security policy can recognize requests with these headers and handles them with special consideration. For example, if your application uses custom headers that must occur in every request, you can configure mandatory headers in the security policy. Or, if some request headers include binary content encoded in Base64, you can instruct ASM™ to decode the data and examine it for discrepancies.

You can also specify many different options to normalize an HTTP header for which you want to check signatures.

Configuring HTTP headers

You add HTTP headers to a security policy when you need to define certain headers that require special treatment when found in requests. For example, if you are receiving false positives for a certain type of header, you can create the header and exclude it from signature checks.

1. On the Main tab, click **Security** > **Application Security** > **Headers** > **HTTP Headers**.
   The HTTP Headers screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Header screen opens.
4. From the **Name** list, select a standard HTTP header name type or select **Custom** and type the custom header name that appears in requests.
5. If you want this to be a header that is required in every request, select the **Mandatory** check box.
   If a request does not include this header, the `Mandatory HTTP header is missing` violation occurs (if set to alarm or block).
6. If you want the security policy to check this header against attack signatures, select the **Check Attack Signatures** check box. Otherwise, this header is excluded from signature checks.
   If the check box is selected, the screen displays additional settings for header normalization and the Attack Signatures tab.
7. If this is a custom header that may include base64 encoding, select the **Base64 Decoding** check box.

*Note: When this check box is selected, the options **Percent Decoding**, **Url Normalization**, and **Normalization Violations** are unavailable because they are not compatible with Base64 decoding.*

The system performs decoding on the header and if decoding fails, the Illegal Base64 Value violation occurs (if set to alarm or block).

8. If you want to normalize this header, select the options you need.

Option	Description
Percent Decoding	This option normalizes referer headers or custom headers that may include strings with encoded percent codes (%xx) that replace certain characters, perform unescaping, and require other checks. This is included in URL normalization and thus is not available when checking the URL Normalization option.
Url Normalization	This option normalizes URLs in referer headers or custom headers that may include URLs with multiple slashes, directory traversal, or which require backslash replacement or path parameter removal. Includes percent decoding also.
HTML Normalization	This option removes non-printable characters, comment delimiters, HTML, hex, and decimal codes, and other HTML extras.

9. If you want evasion violations to be issued in case of problems while normalizing the header, select the **Evasion Techniques Violations** check box.

This check box is only available if using **Percent Decoding** or **Url Normalization**.

10. If the attack signatures included in the security policy apply differently to this HTTP header, you can adjust them on the Attack Signatures tab.

a) Ensure that **Check Attack Signatures** is selected.

b) From the **Global Security Policy Settings** list, move any attack signatures whose global settings you want to override into the **Overridden Security Policy Settings** and adjust the state as needed (from **Enabled** to **Disabled** or vice versa).

***Tip:** The most common action you perform here is to disable an attack signature for a specific URL.*

Overridden attack signatures are preceded with a yellow alert triangle in the attack signature list, and you can filter the list to view them.

11. Click **Create**.
The HTTP Headers screen opens and lists the new header.

When ASM™ receives a request with the type of header you created, the system performs the special considerations indicated in the HTTP header.

Configuring the maximum HTTP header length

You specify a maximum HTTP header length so that the system knows the acceptable maximum length for the HTTP header in an incoming request. This setting is useful primarily in preventing buffer overflow attacks.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies**.
The Policies List screen opens.

2. Click the name of the security policy you want to work on.
The Policy Summary opens.

3. From the list, select **Advanced**.

4. For the **Maximum HTTP Header Length** setting, select one of the options.

Option	Description
Any	Specifies that the system accepts requests with HTTP headers of any length.
Length with a value in bytes	Specifies that the system accepts HTTP headers up to that length. The default maximum length is **8192** bytes.

5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

The system calculates and enforces the HTTP header length based on the sum of the length of the HTTP header name and value. Requests with headers that are longer than the maximum length cause an Illegal header length violation.

Implementation Result

When Application Security Manager™ receives requests, the system checks the header to see if it matches any of the HTTP headers other than the wildcard header. If the request header matches one of the headers, the system performs the configured options for that header.

You can review suggestions related to violations that occur on the Traffic Learning screen. HTTP header violations are listed under Evasion Techniques in the section Evasion Techniques Detected in Headers. You can examine the requests to see if they are legitimate or false positives. If they are false positives, you can consider turning off evasion violations or normalization for the header. You can drill down and view the headers causing violations. If a header violation is a false positive, you can also disable normalization from the Evasion Techniques Detected in Headers screen.

If signature violations occur in the header, the system suggests disabling the signature that cause the violation, or disabling the signature check for that header. If a header declared mandatory is missing, the system suggests disabling the violation or making the missing header non-mandatory.

If the Base64 violation occurs in the header, the system suggests disabling the violation or disabling the Base64 decoding for that header.

Changing Security Policy Settings

About security policy settings

The security policy settings determine how the security policy is built. You initially specify the values of these settings when you create the policy. You can change the values, but understand that the security policy will have different characteristics than it originally did.

Editing an existing security policy

When you create a security policy, the system uses default values for some of the settings. You can access a security policy for editing either from the Policies List or from the **Current edited security policy** setting. (For parent policies, it is the **Current edited parent policy**.) The **Current edited security policy** setting appears at the top of almost every security policy screen throughout Application Security Manager™.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. Make any changes that are required for that security policy, such as to general settings, URLs, parameters, and so on.
3. Click **Save** to save your settings.
4. To put the security policy changes into effect immediately, click **Apply Policy**.
5. To edit other security policies, from the **Current edited policy** list, select the security policy you want to edit.

Changing security policy enforcement

Security policies can be in one of two enforcement modes: transparent or blocking. The *enforcement mode* specifies whether the system simply logs or blocks a request that triggers a security policy violation. You can manually change the enforcement mode for a security policy depending on how you want the system to handle traffic that causes violations.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. For the **Enforcement Mode** setting, specify how to treat traffic that causes violations.
   - To block traffic that causes violations (that are set to block), select **Blocking**.
   - To stop allow traffic even if it causes violations so you can review the violations, select **Transparent**.
4. Click **Save** to save your settings.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

When the enforcement mode is set to *transparent*, traffic is not blocked even if a violation is triggered. The system typically logs the violation event (if the Learn flag is set on the violation). You can use this mode along with an enforcement readiness period when you first put a security policy into effect to make sure that no false positives occur that would stop legitimate traffic.

When the enforcement mode is set to *blocking*, traffic is blocked if it causes a violation (that is configured for blocking), and the enforcement readiness period is over. You can use this mode when you are ready to enforce a security policy.

Adjusting the enforcement readiness period

For each security policy, you can configure the number of days used as the *enforcement readiness period*, also called *staging*. Security policy entities and attack signatures remain in staging for this period of time before the system suggests that you enforce them. Staging allows you to test security policy entities and attack signatures for false positives without enforcing them. The default value of `7` days works well for most situations so you typically do not need to change it.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Policy Properties**.
   The Policy Properties screen for the current edited policy opens.
2. For the **Enforcement Readiness Period**, type the number of days you want the entities or signatures to be in staging.

   The default value is `7` days.
3. Click **Save** to save your settings.
4. To put the security policy changes into effect immediately, click **Apply Policy**.

During the enforcement readiness period, the system does not block traffic, even if requests trigger violations against the security policy and the violations are set to **Block**. The security policy provides suggestions when requests match the attack signatures or do not adhere to the security policy entity's settings.

If you are using automatic policy building and the system has processed sufficient traffic, after the enforcement readiness period is over, the Policy Builder automatically enforces the security policy entities and the attack signatures that did not cause violations during the period.

Viewing whether a security policy is case-sensitive

When you first create a security policy, you have the advanced option of making a security policy case-sensitive or not. By default, the option **Security Policy is case sensitive** is selected, and the security policy treats file types, URLs, and parameters as case-sensitive. You cannot change this setting after the security policy is created, but you can view how it is set.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Policy Properties**.
   The Policy Properties screen for the current edited policy opens.
2. Review the **Policy is case sensitive** setting.

   If the value is **Yes**, the security policy is case-sensitive; if the value is **No**, the policy is not case-sensitive.
3. Click **Cancel** when you are done.

Differentiating between HTTP and HTTPS URLs

When creating a security policy, you can determine whether a security policy differentiates between HTTP and HTTPS URLs. Later, you can view the setting, but you can change it only if the security policy contains no URLs that have the same name and use different protocols.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies**.
   The Policies List screen opens.
2. Click the name of the security policy you want to work on.
   The Policy Summary opens.
3. Review the **Differentiate between HTTP and HTTPS URLs** setting.

If the **Enabled** check box is selected, the security policy differentiates between HTTP and HTTPS URLs. Otherwise, it does not, and creates protocol-independent URLs.

4. Click **Cancel** when you are done.

If the **Differentiate between HTTP and HTTPS URLs** setting is disabled, the security policy configures URLs without specifying a specific protocol. This is useful for applications that behave the same for HTTP and HTTPS, and it keeps the security policy from including the same URL twice.

Specifying the response codes that are allowed

You can specify which responses a security policy permits. By default, the Application Security Manager™ accepts all response codes from 100 to 399 as valid responses. Response codes from 400 to 599 are considered invalid unless added to the Allowed Response Status Codes list. By default, 400, 401, 404, 407, 417, and 503 are on the list as allowed HTTP response status codes.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Policy Properties**.
   The Policy Properties screen for the current edited policy opens.
2. From the list, select **Advanced**.
3. If you want to allow additional responses for the **Allowed Response Status Codes** setting, in the **New Allowed Response Status Code** field, type the HTTP response status code, between `400` and `599`, that the security policy should consider a legal response, and click **Add**.
4. If you do not want to allow any response codes between `400` and `599`, click **Remove All**.
5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

The security policy considers legal responses that return response codes that are listed as allowed response codes. If a response contains a response status code from 400 to 599 that is not on the list, the system issues the violation, `Illegal HTTP status in response`. If you configured the security policy to block this violation, the system blocks the response.

Activating ASM iRule events

An iRule is a script that lets you customize how you manage traffic on the BIG-IP® system. You can write iRules® to modify a request or response, or to cause an action to occur. For detailed information on iRules, see the F5 Networks DevCentral web site, `http://devcentral.f5.com`. If you are using iRules to perform actions based on Application Security Manager™ iRule events, you must instruct ASM™ to trigger iRule events. By default, the trigger iRule event setting is disabled.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Policy Properties**.
   The Policy Properties screen for the current edited policy opens.
2. From the list, select **Advanced**.
3. If you have written iRules to process application security events, for the **Trigger ASM iRule Events** setting, select the **Enabled** check box.

   Leave this option disabled if you have not written any ASM iRules, or you have written iRules not for ASM (triggered by the Local Traffic Manager™).
4. For the **ASM iRules Event Mode** setting, select the mode to use.
   - Recommended: If you are writing new iRules, such as those that perform a specific action after handling requests, select **Normal Mode**. Whenever ASM processes a request, it triggers an `ASM_REQUEST_DONE` event.
   - Not recommended: If you are using iRules that use `ASM_REQUEST_VIOLATION`, select **Compatibility Mode**. Whenever ASM processes a request with a violation, it triggers an `ASM_REQUEST_VIOLATION` event. F5 recommends that you rewrite the iRules using `ASM_REQUEST_DONE` in the **Normal Mode**.

5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

If you write iRules that process ASM iRule events and assign them to a specific virtual server, when the trigger iRules setting is enabled, ASM triggers iRule events for requests. If the trigger iRules setting is not enabled, no iRule events occur for ASM iRule events.

Application security iRule events

These are the events that iRules® can subscribe to in Application Security Manager™.

Application Security iRule Event	Description
`ASM_REQUEST_DONE`	Occurs when Application Security Manager finishes processing a request in Normal mode (regardless of whether a violation occurred or not). The system triggers this event after deciding what to do with the request, block it or forward it, but before actually executing that action, so you can specify a change to that action.
`ASM_REQUEST_BLOCKING`	Occurs when Application Security Manager is generating an error response to the request that caused a violation, and gives the iRule a chance to modify the response before it is sent. Allows you to modify the blocking page.
`ASM_RESPONSE_VIOLATION`	Occurs when Application Security Manager detects a response that violates a security policy.
`ASM_REQUEST_VIOLATION`	Deprecated. Use `ASM_REQUEST_DONE` instead. Occurs when Application Security Manager detects a request that violates a security policy when using Compatibility mode only.

Notes

From any of these events, you can use the `ASM::fingerprint` command to get fingerprinting information from a request. For example:

```
when ASM_REQUEST_DONE {
    log local0.[ASM::fingerprint]
}
```

If fingerprinting information is available, this example returns the fingerprint ID. If it is not available, the example returns `0`.

The fingerprint ID is a number representing the client's browser. If requests coming from a particular fingerprint ID contain violations, you could mark that ID as suspicious and treat future requests from that ID differently.

Allowing XFF headers in requests

You can configure Application Security Manager™ (ASM) to trust XFF (X-Forwarded-For) headers or customized XFF headers in requests. For example, you could do this if ASM is deployed behind an internal or other trusted proxy. Then, the system uses the IP address that initiated the connection to the proxy instead of the internal proxy's IP address. This option is useful for logging, web scraping, anomaly detection, and the geolocation feature.

You should not configure trusted XFF headers if you think the HTTP header may be spoofed, or crafted, by a malicious client.

1. On the Main tab, click **Security** > **Application Security** > **Policy** > **Policy Properties**.
   The Policy Properties screen for the current edited policy opens.
2. From the list, select **Advanced**.
3. For the **Trust XFF Header** setting, select the **Enabled** check box.
   The screen displays the **Custom XFF Headers** configuration option.
4. If your web application uses custom XFF headers, in the **Custom XFF Headers** setting, add them as follows:
   a) In the **New Custom XFF Header** field, type the XFF header that the system should trust.
   b) Click **Add**.

   You can add up to five custom XFF headers.
5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

When you trust XFF headers, the system has confidence in XFF headers in the request. If you added custom XFF headers, the system recognizes and trusts them. If deployed behind a proxy, ASM uses the initiating IP address rather than the address of the proxy.

Adding host names

You can manually add legitimate host names to a security policy, for example, if users can access the application from multiple host names. If you are using automatic policy building, the system automatically adds domain names to the security policy so adding them in that case is optional.

1. On the Main tab, click **Security** > **Application Security** > **Headers** > **Host Names**.
   The Host Names screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Above the list of host names, click the **Create** button.
   The New Host Name screen opens.
4. In the **Host Name** field, type the host name that is used to access the web application (either a domain name or an IP address).
5. If you also want to use all sub-domains of the specified host name to access the web application, select the **Include Sub-domains** check box.
6. If you want to make sure all the traffic to the host is not blocked even if it has blocking violations, select **Policy is always transparent for this host**.

   This is useful when deploying the policy on a new application that needs to be tested before moving to blocking mode while still securing other applications protected by the same policy.

   This setting causes the policy to operate in transparent mode only for the application identified with this host name, while still working in blocking mode on other applications protected by the policy. For a host name with different enforcement, the event log shows the blocking override reason as `Host name is configured as transparent`.
7. Click **Create**.
8. To put the security policy changes into effect immediately, click **Apply Policy**.

The host name is added to the list of host names that can legitimately be used to access the web application that the security policy is protecting. The list shows the enforcement mode of the host name (transparent or blocking).

About adding multiple host names

If users can access a web application using multiple host names or IP addresses, you can add the multiple host names or IP addresses to the security policy that protects the application. The system uses this list of host names as follows:

- The Policy Builder considers the host names in the list to be legitimate internal links and forms, and learns security policy entities from them, and also from relative URLs that do not contain a domain name.
- The CSRF feature uses the list to distinguish between internal and external links and forms, and the system inserts the CSRF token only into internal links and forms.

The Application Security Manager™ (ASM) identifies web application-related host names as fully qualified domain names (FQDNs) in requests or responses. If you include sub-domains with the host name, the system matches all sub-domains when evaluating FQDNs, and inserts ASM™ cookies into responses from the sub-domains of the host name. When an application uses several sub-domains, ASM cookie-based features (like CSRF protection, Login Pages, and Dynamic Sessions ID in URL) require ASM cookies to be inserted from the correct domain.

Protecting against cross-site request forgery (CSRF)

Cross-site request forgery (CSRF) is an attack where a user is forced to carry out unauthorized actions (such as a bank transfer) within a web application where the user is currently authenticated. You can configure a security policy to protect against CSRF attacks, including specifying which URLS you want the system to examine.

CSRF protection provides two enforcement options:

- Verify CSRF Token: The system inserts a CSRF token to application URLs using JavaScript injection. Requests without a valid CSRF token are blocked. If the system detects a CSRF attack, it issues a CSRF attack detected violation. To prevent token hijacking, the system reviews the token expiration date. If the token is expired, the system issues the CSRF authentication expired violation.
- Verify Origin: The system blocks requests without a valid Origin header(such as a CSRF request, which has no Origin header). This enforcement option can protect an AJAX request of an application, because AJAX requests always contain an Origin header. If all protected URLs are configured with **Verify Origin**, the system does not do JavaScript injection. If the system detects a request without a valid Origin header, it issues a CSRF attack detected violation.

CSRF attacks specifically target state-changing requests (for example, transferring funds or changing an email address). State-changing requests are usually POST requests,but, in some cases, may be performed using GET requests. There are two modes for entering URLs for CSRF protection:

- **Simple Edit Mode**: Defines URLs for CSRF token verification during a POST method.
- **Advanced Edit Mode**: Defines URLs for additional methods, required parameters and enforcement actions.

1. On the Main tab, click **Security** > **Application Security** > **CSRF Protection**.
   The CSRF Protection screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Select the **CSRF Protection** check box.
4. Specify which part of the application you want to protect against CSRF attacks:
   - To protect SSL requests only in the secured part of the application, select the **SSL Only** check box.
   - To protect the entire web application, leave the **SSL Only** check box cleared.
5. If you want the CSRF token (which is injected into responses) to expire:
   a) For **Expiration Time**, select **Enabled**.
   b) In the field, type the amount of time, in seconds (1 to 99999), after which the token should expire.

      The default is 600 seconds.
6. In the **URLs List (for POST requests with CSRF token verification only)** setting, select **Simple Edit Mode** and specify at least one URL (and its method) that you want the system to examine.

The system considers all URLs that are not on the list to be safe unless it discovers another problem .

If you need to specify methods other than POST, or request parameters, or use the **Verify Origin** enforcement option, you should select **Advanced Edit Mode**.

a) Select the **Method** for request verification.

b) Type the URL in the format `/index.html`.

   You can also use wildcards for URLs; for example, `/myaccount/*.html`, `/*/index.php`, or `/index.?html`.

c) Click **Add**.

d) Repeat steps a through c to add all of the potentially unsafe URLs that you want the system to examine.

7. From the URL list, in the **Required Parameters** column, define any required parameters for the URL.
8. From the URL list, in the **Enforcement Action** column, select the enforcement action to take.
9. Click **Save** to save your settings.
10. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
    The Learning and Blocking Settings screen opens.
11. Select the **Advanced** setting, and in the Policy Building Settings area, expand **CSRF Protection**, then click the appropriate **Learn**, **Alarm**, and **Block** settings in the two CSRF violations.

    Tip: *If you want to block CSRF attacks, click* ***Block*** *for* `CSRF attack detected`*. Also, in the General Settings area, check that* ***Enforcement Mode*** *is set to* ***Blocking****.*

12. Click **Save** to save your settings.
13. To put the security policy changes into effect immediately, click **Apply Policy**.

Configuring General ASM System Options

Changing your system preferences

You can change the default user interface and system preferences for the Application Security Manager™ (ASM), and configure which fields are displayed in the Request List of the Reporting screen.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Preferences**.
2. In the GUI Preferences area, for **Records Per Screen**, type the number of entries to display (between 1-100). (The default value is `20`.)

   This setting determines the maximum number of security policies, file types, URLs, parameters, flows, headers, and XML and JSON profiles to display in lists throughout ASM™.
3. For **Titles Tooltip Settings**, select an option for how to display tooltips.

Option	Description
Do not show tooltips	Never display tooltips or icons.
Show tooltip icons	Display an icon if a tooltip is available for a setting, show the tooltip when you move the cursor over the icon.
Show tooltips on title mouseover	Do not display an icon, but show the tooltip when you move the cursor over the setting name. This is the default setting.

4. For **Default Configuration Level**, select **Advanced** to display all possible settings, or **Basic** to display only the essential settings, on screens with that option.

   The default is **Basic**.
5. For **Apply Policy Confirmation Message**, you can specify whether to display a popup message asking if you want to perform the **Apply Policy** operation each time you change a security policy.
6. If you are using a high-availability configuration, for the **Sync** setting, select the **Recommend Sync when Policy is not applied** check box to display the Sync Recommended message at the top of the screen when you change a security policy, to remind you to perform a ConfigSync with the peer device.
7. For the **Logging** setting, select the **Write all changes to Syslog** check box to record all changes made to security policies in the Syslog (`/var/log/asm`).

   Note: *The system continues to log system data regardless of whether you enable policy change logging.*
8. Click **Save** to save your settings.

The adjusted settings are used throughout the ASM system.

Adjusting system variables

System variables control how Application Security Manager™ (ASM) works. They apply system-wide. You can review and adjust the values of the system variables if the default values are not appropriate for your installation.

Important: *You generally do not need to change the default values of the system variables. F5 Networks recommends that you consult with technical support before adjusting them.*

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **System Variables**.
   The System Variables screen opens.
2. Locate the system variable you want to change and view the description.
3. In the **Parameter Value** field, type the new value for the variable.
4. Click **Save**.

   If the value you typed is not valid, the system displays a message indicating the valid range or values.
5. On the Main tab, click **System** > **Configuration** > **Device** > **General**, and click **Reboot** to restart the system using the new value.

   If using device management to synchronize ASM systems, you must restart ASM on all of the systems in the device group for the change to take effect on all of them.

   Tip: *If the parameter name is shown in boldface text, the value has been changed from the default. The default value is displayed below the parameter value.*

The system uses the adjusted value for the system variable. On the System Variables screen, you can click **Restore Defaults** to change the values back to their original values.

Incorporating external antivirus protection

Before you can incorporate antivirus protection, you need to have an ICAP server setup in your network.

You can configure the Application Security Manager™ (ASM) to connect with an Internet Content Adaptation Protocol (ICAP) server to check requests for viruses. (ASM was tested with McAfee VirusScan, Trend Micro InterScan, Symantec Protection Engine, and Kaspersky Antivirus products, and may work with others.) You can also set up antivirus checking for HTTP file uploads and SOAP web service requests.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Integrated Services** > **Anti-Virus Protection**.
   The Anti-Virus Protection screen opens.
2. For the **Server Host Name/IP Address** setting, type the fully qualified domain name of the ICAP server, or its IP address.

   Note: *If you specify the host name, you must first configure a DNS server by selecting* ***System*** *>* ***Configuration*** *>* ***Device*** *>* ***DNS****.*
3. For **Server Port Number**, type the port number of the ICAP server.

   The default value is `1344`.
4. If you want to perform virus checking even if it may slow down the web application, select the **Guarantee Enforcement** check box.
5. Click **Save** to save your settings.
6. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
7. For each security policy, configure, as needed, the blocking policy for antivirus protection.
   a) Ensure that the **Current edited policy** is the one for which you want antivirus protection.
   b) Expand **Policy General Features** and for the `Virus Detected` violation, select either or both of the **Alarm** and **Block** check boxes.

      To set the violation to **Block**, the **Enforcement Mode** must be set to **Blocking**.
   c) Click **Save** to save the settings.

8. For each security policy, configure, as needed, antivirus scanning for file uploads or SOAP attachments.

   Note: *Performing antivirus checks on file uploads may slow down file transfers.*

   a) On the Main tab, click **Security** > **Application Security** > **Integrated Services** > **Anti-Virus Protection**.
   b) Ensure that the **Current edited policy** is the one that may include HTTP file uploads or SOAP requests.
   c) To have the external ICAP server inspect file uploads for viruses before releasing the content to the web server, select the **Inspect file uploads within HTTP requests** check box.
   d) To perform anti-virus scanning on SOAP attachments, if the security policy includes one or more XML profiles, in the **XML Profiles** setting, move the profiles from the **Antivirus Protection Disabled** list to the **Antivirus Protection Enabled** list. Alternately, click **Create** to quickly add a new XML profile, with default settings, to the configuration. You can then add the new profile to the **Antivirus Protection Enabled** list.
   e) Click **Save** to save the settings.
9. To put the security policy changes into effect immediately, click **Apply Policy**.

If the `Virus Detected` violation is set to Alarm or Block in the security policy, the system sends requests with file uploads to an external ICAP server for inspection. The ICAP server examines the requests for viruses and, if the ICAP server detects a virus, it notifies ASM, which then issues the `Virus Detected` violation.

If antivirus checking for HTTP file uploads and SOAP web service requests is configured, the system checks the file uploads and SOAP requests before releasing content to the web server.

Creating user accounts for application security

User accounts on the BIG-IP® system are assigned a user role that specifies the authorization level for that account. While an account with the user role of Administrator can access and configure everything on the system, you can further specialize administrative accounts for application security.

1. On the Main tab, click **System** > **Users**.
2. Click **Create**.
   The New User properties screen opens.
3. From the **Role** list, select a user role for security policy editing.
   - To limit security policy editing to a specific administrative partition, select **Application Security Editor**.
   - To allow security policy editing on all partitions, select **Application Security Administrator**.
4. If you selected **Application Security Editor**, then from the **Partition Access** list, select the partition in which to allow the account to create security policies.

   You can select a single partition name or **All**.
5. From the **Terminal Access** list, select whether to allow console access using `tmsh` commands.
6. Click **Finished**.

The BIG-IP system now contains a new user account for administering application security.

- Application Security Editors have permission to view and configure most parts of the Application Security Manager™ on specified partitions.
- Application Security Administrators have permission to view and configure all parts of the Application Security Manager, on all partitions. With respect to application security objects, this role is equivalent to the Administrator role.

Validating regular expressions

The RegExp Validator is a system tool designed to help you validate your regular expression syntax. You can type a regular expression in the RegExp Validator, provide a test string pattern, and let the tool analyze the data. The tool is included with Application Security Manager™.

1. Click **Security** > **Options** > **Application Security** > **RegExp Validator**
2. From the **RegExp Type** list, select either **PCRE** or **RE2** (recommended) as the RegExp engine.

   Tip: *As of BIG-IP® version 11.2, the system's regular expression library and signatures changed from PCRE to RE2 to increase performance and lower false positives. The system still supports the PCRE library for systems that have user-defined signatures configured in PCRE.*

3. Specify how you want the validator to work:
   - In the **RegExp** field, type the regular expression you want to validate.
   - Or in the **RegExp** field, type the regular expression to use to verify a test string, and then in the **Test String** field, type the string.
4. Click the **Validate** button.
   The screen shows the results of the validation.

The validation result indicates whether the regular expression is valid or not. The first RegExp match displays the result of the verification check (if specified) including if there are matches or not.

Working with Violations

About violations

Application Security Manager™ can detect violations that occur in requests. Violations occur when some aspect of a request or response does not comply with the security policy. You can configure the blocking settings for any violation in a security policy to determine how the system will treat requests with violations. When a violation occurs in a request, the system can learn, alarm, or block the request (blocking is only available when the enforcement mode is set to blocking).

In the Violations List you can view a list of all of the violations that are supplied on the system, along with the violation type and severity. The severity level is adjustable, as needed.

You can also create user-defined or custom violations with unique specifications that you want the system to detect.

Viewing descriptions of violations

You can view detailed descriptions of each violation to learn what causes that type of violation, and the type of security risks it could be related to.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Violations List**.
   The Violations List screen opens.
2. Click the violation you are interested in learning about.
   A popup screen shows the violation description, risks, and examples, if available.
3. To view violations that have occurred for the current edited security policy, on the Main tab, click **Security** > **Application Security** > **Policy Building** > **Traffic Learning**.
   The Traffic Learning screen opens and lists learning suggestions many of which are related to violations that the system found against the security policy.

You can view descriptions for all the violations that can occur and see how the blocking settings are configured for the security policy currently being edited.

Changing severity levels of violations

You can change the severity levels of security policy violations for all application security events that occur system-wide. If violations occur, the system displays the events and severity level on the Security Alerts screen and logs the message in the Syslog. This is an optional task that you need to do only if you want to change the default severity levels of violations.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Violations List**.
2. Review the list of built-in violations and severities.
3. To change the severity of a violation, click the violation name.
   The Built-In Violation Details popup screen opens where you can view information about the violation and the current severity level.
4. From the **Severity** list, select the severity level you want to use for the violation.

   The available severities are: **Emergency**, **Alert**, **CriticalError**, **Warning**, **Notice**, and **Informational**.
5. Click **Update**.

The new severity level is shown in the violations list. If the changed violation occurs, the system uses the new severity level. Changes made to the event severity levels for security policy violations apply globally to all security policies on the Application Security Manager™.

Types of violations

This table describes the types of violations that can occur. On the **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Violations List**, you can get details about the violations (and change the severity) by clicking the violation. You also can view descriptions of each violation by clicking the violation on the Learning and Blocking Settings screen.

Violation Type	Description
RFC violations	Occur when the format of an HTTP request violates the HTTP RFCs. RFC documents are general specifications that summarize Internet and networking standards. RFCs, as they are commonly known, are published by the International Engineering Task Force (IETF). For more information on RFCs, see `http://www.ietf.org/rfc`.
Access violations	Occur when an HTTP request tries to gain access to an area of a web application, and the system detects a reference to one or more entities that are not allowed (or are specifically disallowed) in the security policy.
Length violations	Occur when an HTTP request contains an entity that exceeds the length setting that is defined in the security policy.
Input violations	Occur when an HTTP request includes a parameter or header that contains data or information that does not match, or comply with, the security policy. Input violations most often occur when the security policy contains defined user-input parameters.
Cookie violations	Occur when the cookie values in the HTTP request do not comply with the security policy. Cookie violations may indicate malicious attempts to hijack private information.
Negative security violations	Occur when an incoming request contains a string pattern that matches an attack signature in one of the security policy's attack signature sets, or when a response contains exposed user data, for example, a credit card number.
Other violations	Refers to user-defined violations. If your system includes user-defined violations, they occur when instructed by the iRules® that were developed to activate them.

About violation rating

You or the security manager can examine requests that cause violations to determine whether the requests are real attacks or false positives. To simplify the task of identifying false positives, each transaction with one or more violations has a violation rating associated with it. The violation rating ranks the transaction from 1 to 5, where 5 indicates the highest probability of a real attack with high severity. This table explains how to interpret the violation ratings.

Rating	Description
5	Request is most likely a threat so consider clearing any learning suggestions associated with it.
4	Request looks like a threat but requires examination before clearing the suggestion.
3	Request needs further examination.
2	Request looks like a false positive but requires examination.

Rating	Description
1	Request is most likely a false positive. If it is, then consider accepting learning suggestions to add this to the security policy.

The violation rating is included with information on screens in Application Security Manager™, such as:

- Requests lists
- Manual learning suggestions
- Application Security reports and charts

The system assigns the violation rating by assessing the combination of violations occurring in a transaction. The violation rating is assigned to the transaction as a whole rather than the individual violations in the request. This is because real attacks often include multiple violations within one transaction. The violation rating takes into consideration the impact of the violations on the business.

Requests with high violation ratings are likely to be real attacks, and you can review them to analyze threats to your web applications. You can filter the requests in the Requests list to focus on the high-rated illegal requests with ratings of 4 or 5.

You can review requests with low violation ratings and if they are false positives you can accept the request to adopt the learning suggestions for the security policy.

Investigating potential attacks

You can investigate potential attacks by reviewing violation ratings of illegal requests. Requests with a high violation rating are more likely to be attacks that you may want to investigate.

1. On the Main tab, click **Security** > **Event Logs** > **Application** > **Requests**.
   The Requests screen opens, where, by default, you view an event log displaying illegal requests for all security policies.
2. From the Requests List filter, adjust the **Violation Rating** slider to 4-5, and click **Apply Filter**.
   The Requests List displays illegal requests with a violation rating of 4 or 5.
3. In the Requests List, click a request to view information about the request and any violations associated with it.
   The screen refreshes, showing the Request Details area, where you see any violations associated with the request and other details, such as the security policy it relates to, the support ID, the violation rating, and potential attacks that it could cause.
4. Use the Violation area elements to view details about a violation associated with an illegal request:

   - To view details about this specific violation such as the file type, the expected and actual length of the query, or similar relevant information, click the violation name.
   - To display a general description of that type of violation, click the info icon to the left of the violation name.

By reviewing the high-rated illegal requests, you can determine whether your application is being attacked and get an idea of where the attacks are coming from and what the attackers are doing. As a result, you may decide to modify the security policy or take other steps that do not involve Application Security Manager™ such as modifying firewall settings or changing the application.

Overview: Creating user-defined violations

You can create user-defined violations so that Application Security Manager™ (ASM) can detect new threats or protect against application-specific vulnerabilities. After creating the violation, you can then configure the system to alert or block requests that cause it. You need to write iRules®to detect the customized attack conditions and issue the violation. In the security policy properties, you then need to activate iRule events.

The iRules are written using application security events and commands. For detailed information on iRules, see the F5 Networks DevCentral web site, `http://devcentral.f5.com`.

Creating user-defined violations

You can create up to 28 user-defined violations for situations not covered by the built-in violations. User-defined violations are helpful for mitigating zero-day attacks, and to protect your web application against specific vulnerabilities not yet protected by Application Security Manager™ (ASM). You can write iRules® to detect new attack conditions and issue the violation.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Violations List**.
2. Click **User-Defined Violations**.
3. Click **Create**.
   The Create New User-Defined Violation popup screen opens.
4. In the **Violation Name** field, type a name for the violation using alphanumeric characters and underscores only.

   The recommended format is an uppercase alphanumeric string starting with `VIOLATION`, having words separated by underscores; for example, `VIOLATION_SLOW_POST`.

   The name is used as reference in the `ASM::custom_violation` and `ASM::violation name` iRule commands, and in APIs, iControl®, and TMAPI.
5. In the **Violation Title** field, type descriptive text for the violation. It is typically similar to the name but in a more friendly format.

   This text appears wherever the violation is referred to, including configuration of blocking settings, the proxy log, and reports.
6. From the **Type** list, select the category of the violation, or leave it set to **Unspecified**.
7. From the **Severity** list, select the severity level of the violation.

   The available severities are: **Informational**, **Notice**, **Warning**, **Error**, **Critical**, **Alert**, and **Emergency**.
8. From the **Attack Type** list, select one of the existing attack types.

   If none of the specific attack types is appropriate, select **Other Application Attacks** or **Other Application Activity**.

   The attack type is shown when you click the Info icon next to the violation name on the Learning and Blocking Settings screen.
9. In the **Description** field, type a description of the violation.
   The description is shown when you click the Info icon next to the violation name on the Learning and Blocking Settings screen.
10. Click **Create**.

The custom violation is added to the list of user-defined violations. You can edit all attributes of a user-defined violation except the name.

You should now set up the blocking settings (Alarm and Block only) for the user-defined violation enabling the violation for specific security policies. You also need to write iRules that issue the custom violations based on the conditions available using the `ASM::raise violation_name [violation_details]` command. ASM™ blocks requests according to the violation's blocking settings and operation mode, and logs details in the Requests log. For detailed information on iRules, see the F5 Networks DevCentral web site, `http://devcentral.f5.com`.

Enabling user-defined violations

Application security iRule events must be activated in the security policy to enable user-defined violations.

You enable user-defined violations by configuring the Alarm and Block flags, or blocking actions, for user-defined violations. The blocking actions (along with the enforcement mode) determine how the system processes requests that trigger the violation.

1. On the Main tab, click **Security** > **Application Security** > **Policy Building** > **Learning and Blocking Settings**.
   The Learning and Blocking Settings screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Adjust the **Enforcement Mode** setting if needed.
   - To block traffic that causes violations, select **Blocking**.
   - To allow traffic even if it causes violations (allowing you to make sure that legitimate traffic would not be blocked), select **Transparent**.

   You can only configure the Block flag on violations if the enforcement mode is set to **Blocking**.
4. For each user-defined violation (listed in Other Violations), set the Alarm and Block settings.

Option	Description
Alarm	If selected, the system records requests that trigger the violation in the Charts screen, the system log (`/var/log/asm`), and possibly in local or remote logs (depending on the settings of the logging profile).
Block	If selected (and the enforcement mode is set to **Blocking**), the system blocks requests that trigger the violation.

5. Click **Save** to save your settings.
6. To put the security policy changes into effect immediately, click **Apply Policy**.

Once you have an iRule that determines when to issue the user-defined violation (and the enforcement mode is set to blocking), the specified alarm or block action occurs when the system detects the violation.

Sample iRules for user-defined violations

You can write iRules® to activate user-defined violations that you created and enabled in a security policy.

***Note:** The examples in this topic may not work depending on your configuration. Some examples include multiple ways of setting them up, or may require additional code. For more information about iRules, refer to* `devcentral.f5.com`.

The following application security iRule issues a user-defined violation called `VIOLATION_NOT_BROWSER` if the request was not sent using Internet Explorer, Mozilla Firefox, Safari, Chrome, or Opera.

```
    when ASM_REQUEST_DONE {
       if { {not [HTTP::header "User Agent"]match_regexp "(IE|Mozilla|Safari|Chrome|
Opera)" } and {[llength [IP::reputation [ASM::client_ip]]] > 0} }
       { ASM::raise VIOLATION_NOT_BROWSER
       }
    }
```

The following application security iRule issues a user-defined violation when there are too many ASM™ violations.

```
when ASM_REQUEST_DONE {
   if {[ASM::violation count] > 3 and [ASM::severity] eq "Error"} {
   ASM::raise VIOLATION_TOO_MANY_VIOLATIONS
   }
}
```

This iRule uses an ASM event to log in `/var/log/ltm` all available information about the request that was enforced by ASM.

```
when ASM_REQUEST_DONE {
#Get and log info as it was done before v11.5.
log local0. "==============Previous style: Start==========="
set x [ASM::violation_data]
for {set i 0} {$i<7} {incr i} {
log local0. [lindex $x $i]
}
log local0.
"==============Previous style: Done==========="
#Using the new command (V11.5 or later) log all available information about
#the enforced request.
log local0.
"==============New style Start==========="
#display ASM policy which enforced request
log local0. "ASM Policy: [ASM::policy];"
#log some part of request using iRule commands Method, URI,
log local0. "Request string: [HTTP::method] [HTTP::uri];"
#log payload from request using ASM::payload command and HTTP::payload or
#log Query string.
log local0. "Payload ASM payload [ASM::payload];"
log local0. "Payload HTTP payload [HTTP::payload];"
log local0. "Query String [HTTP::query];"

# log information about request processed by ASM policy
#support ID
log local0. "SupportID: [ASM::support_id];"
#request status for current moment
log local0. "Request Status: [ASM::status];"
#Severity of attack detected in request
log local0. "Severity: [ASM::severity];"
#client IP
log local0. "ClientIP: [ASM::client_ip];"
# number of violations ASM detected in the request
log local0. "Number Violations: [ASM::violation count]"
# log all ASM violation iControl names detected in the request
log local0. "Violations Names: [ASM::violation names];"
# log all Attack types detected in request
log local0. "Attack Types: [ASM::violation attack_types];"
# log all violation details detected in the request.
set details [ASM::violation details]
if { [llength $details]>0 } {
set i 0
foreach pair $details {
if { [lindex $pair 0] contains "viol_name"} {
#Log violation Name
log local0. "Violation Number: $i; $pair"
incr i
} else {
#log other details for violation
set key [lindex $pair 0]
set value [lindex $pair 1]
log local0. "----------$pair----------"
if {$key contains "parameter_data.name" || $key contains
"parameter_data.value"} {
  #decode parameter name from base64.
  if {[catch {b64decode $value} decoded_value] == 0}{
  log local0. "$key ---- $decoded_value"
  } else {
  log local0. "$key ---- $value"
  }
  } else {
  #log other details
  log local0. "$key ---- $value"
  }
  }
  }
  }
  #Log all violation details as one string. Could be cut.
  log local0. "Violation details: [ASM::violation details];"
  log local0. "==============New style Done==========="
  }
```

When raising user-defined violations within an ASM iRule, you can specify additional violation details to include in the log as shown in the following example. You need to create the violations in ASM.

```
#Raise with lappend

 when ASM_REQUEST_DONE {
  # log support id for enforced request
  log local0. "SupportID: [ASM::support_id];"
  #log request status
  log local0. "Request Status: [ASM::status];"
  #log severity of request
  log local0. "Severity: [ASM::severity];"
  #log Client IP
  log local0. "ClientIP: [ASM::client_ip];"
  #log number of different violations detected in request
  log local0. "Number Violations: [ASM::violation count]"
  #log iControl violation names
  log local0. "Violations Names: [ASM::violation names];"

  # Raise 3 user-defined violations without any details
  ASM::raise violation1
  ASM::raise violation2
  ASM::raise violation3
  # Raise a user-defined violation with custom details
    set x []
    set y1 []
    set y2 []
    lappend y1 "key1" "value_field1"
    lappend y2 "key2" "value_field2"
    lappend x $y1
    lappend x $y2
    log local0. "Raise Violation4 [ASM::raise violation4  $x]"
  #Log the number and names of detected violations.
  #ASM logs detected and raised violations.
  #Log the number of different violations detected in the request
  log local0. "Number of Violations: [ASM::violation count]"
  #log iControl violation names
  log local0. "Violations Names: [ASM::violation names];"
```

The following iRule shows how to use request blocking with a blocking response page.

```
 #RequestBlockingWithBRP

 #Use new ASM iRule commands in old ASM iRule event.

 when ASM_REQUEST_BLOCKING {
  log local0. "==============OLD style start==========="
  set x [ASM::violation_data]
  for  {set i 0} {$i<7} {incr i} {
    log local0. [lindex $x $i]
  }
  log local0. "==============OLD style Done==========="


  log local0. "==============New style Start==========="
  log local0. "SupportID: [ASM::support_id];"
  log local0. "Request Status: [ASM::status];"
  log local0. "Severity: [ASM::severity];"
  log local0. "ClientIP: [ASM::client_ip];"
  log local0. "Number Violations: [ASM::violation count]"
  log local0. "Violations Names: [ASM::violation names];"
  log local0. "Attack Types: [ASM::violation attack_types];"
  log local0. "Violation details: [ASM::violation details];"

  #check if illegal parameter violation was detected
  #then change Blocking response page.
  if {([ASM::violation names] contains "VIOLATION_PARAM")} {
    log local0. "VIOLATION_PARAM detected, let's customize reject page"
    HTTP::header remove Content-Length
    HTTP::header insert header_1 value_1
    set response "<html><head></body><html>"
    ASM::payload replace 0 [ASM::payload length] ""
    ASM::payload replace 0 0 $response
    }

    }
```

The following example iRule shows how to use all ASM iRule events and commands.

```
 #alliRulesforUDV

 #Example with all ASM iRule events and commands

 when HTTP_REQUEST {
  # get LTM policy matched rule and chosen ASM security policy
  set policy [POLICY::names matched]
  log local0. "Matched policy [POLICY::names matched]"
  log local0. "Matched rule in policy [POLICY::rules matched]"
  log local0. "ASM policy [ASM::policy] enforcing"
}

 #New ASM iRule event introduced in 11.5

 when ASM_REQUEST_DONE {
  log local0. "=========Old iRule Data======"
  log local0. "Compatibility Mode is triggered"
  set x [ASM::violation_data]
  for  {set i 0} {$i<7} {incr i} {
    log local0. [lindex $x $i]
  }
  log local0. "=========Old iRule Data Done======"

  log local0. "=========New iRule Data======"
  log local0. "SupportID: [ASM::support_id];"
  log local0. "Request Status: [ASM::status];"
  log local0. "Severity: [ASM::severity];"
  log local0. "ClientIP: [ASM::client_ip];"
  log local0. "Number Violations: [ASM::violation count]"
  log local0. "Violations Names: [ASM::violation names];"
  log local0. "Attack Types: [ASM::violation attack_types];"
  log local0. "Violation details: [ASM::violation details];"
  log local0. "=========New iRule Data Done======"
}

# Old ASM iRule events which were before 11.5.0
```

```
when ASM_REQUEST_VIOLATION {
  log local0. "=========Old iRule Data======"
  log local0. "Compatibility Mode is triggered"
  set x [ASM::violation_data]
  for  {set i 0} {$i<7} {incr i} {
    log local0. [lindex $x $i]
  }
  log local0. "=========Old iRule Data Done======"
  log local0. "=========New iRule Data======"
  log local0. "SupportID: [ASM::support_id];"
  log local0. "Request Status: [ASM::status];"
  log local0. "Severity: [ASM::severity];"
  log local0. "ClientIP: [ASM::client_ip];"
  log local0. "Number Violations: [ASM::violation count]"
  log local0. "Violations Names: [ASM::violation names];"
  log local0. "Attack Types: [ASM::violation attack_types];"
  log local0. "Violation details: [ASM::violation details];"
  log local0. "=========New iRule Data Done======"
}

when ASM_RESPONSE_VIOLATION {
  log local0. "=========Old iRule Data======"
  log local0. "Compatibility Mode is triggered"
  set x [ASM::violation_data]
  for  {set i 0} {$i<7} {incr i} {
    log local0. [lindex $x $i]
  }
  log local0. "=========Old iRule Data Done======"
  log local0. "=========New iRule Data======"
  log local0. "SupportID: [ASM::support_id];"
  log local0. "Request Status: [ASM::status];"
  log local0. "Severity: [ASM::severity];"
  log local0. "ClientIP: [ASM::client_ip];"
  log local0. "Number Violations: [ASM::violation count]"
  log local0. "Violations Names: [ASM::violation names];"
  log local0. "Attack Types: [ASM::violation attack_types];"
  log local0. "Violation details: [ASM::violation details];"
  log local0. "=========New iRule Data Done======"
}

when ASM_REQUEST_BLOCKING {
  log local0. "=========Old iRule Data======"
  log local0. "Compatibility Mode is triggered"
  set x [ASM::violation_data]
  for  {set i 0} {$i<7} {incr i} {
    log local0. [lindex $x $i]
  }
  log local0. "=========Old iRule Data Done======"
  log local0. "=========New iRule Data======"
  log local0. "SupportID: [ASM::support_id];"
  log local0. "Request Status: [ASM::status];"
  log local0. "Severity: [ASM::severity];"
  log local0. "ClientIP: [ASM::client_ip];"
  log local0. "Number Violations: [ASM::violation count]"
  log local0. "Violations Names: [ASM::violation names];"
  log local0. "Attack Types: [ASM::violation attack_types];"
  log local0. "Violation details: [ASM::violation details];"
  log local0. "=========New iRule Data Done======"
}
```

Deleting user-defined violations

You can delete user-defined violations if you no longer need them.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Violations List**.

2. Click **User-Defined Violations**.
3. Select the user-defined violation that you want to delete.
4. Click **Delete**.
   The deleted violation is moved to the list of Historical Violations.

The deleted user-defined violation and details about it remain on the system in the Historical Violations list. From there, you can restore previously removed user-defined violations if you need to.

Exporting and importing user-defined violations

You can export user-defined violations to back them up, or for importing onto another Application Security Manager™ system.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Advanced Configuration** > **Violations List**.
2. Click **User-Defined Violations**.
3. Select the user-defined violations to export.
4. Click **Export**.
   The violations are saved in an XML file with the name, date, and time stamp: `user_defined_violations_yyyy-mm-dd_hh-mm.xml`.
5. To import the user-defined violations onto another system, navigate to the User-Defined Violations List on the other system, click **Import**, and specify the exported file.

Maintaining Security Policies

Overview: Importing and exporting security policies

You can export or import security policies from one Application Security Manager™ (ASM) system to another.

You can export a security policy as a binary archive file or as a readable XML file. For example, you might want to export a security policy protecting one web application to use it as a baseline policy for another similar web application. You might want to export a security policy to archive it on a remote system before upgrading the system software, to create a backup copy, to replace an existing policy, or to merge with another security policy.

You can import a security policy that was previously exported from another ASM™ system. When you import a security policy, you can import it as an inactive security policy or so that it replaces an existing security policy. If you replace an existing policy, the replaced policy is automatically archived with the inactive security policies.

About security policy export formats

Application Security Manager™ can export security policies in binary or XML format. The XML or archive file includes the partition name, the name of the security policy, and the date and time it was exported. For example, a policy called `finance` in the `Common` partition is exported to a file called `Common_finance__2014-04-28_12-10-00__source.device` with either a `.plc` (binary) or `.xml` extension. The time used in the file name is the policy version timestamp (which includes the source hostname where the policy was last modified, the time modified, and the policy name).

An exported security policy includes any user-defined attack signature sets that are in use by the policy, but not the actual signatures. Therefore, it is a good idea to make sure that the attack signatures and user-defined signatures are the same on the two systems.

If you save the policy as an XML file, you can open it to view the configured settings of the security policy in a human readable format.

In addition when exporting to XML, you can save the security policy in a compact format, which results in a smaller XML file. The compact XML format does not include information about the staging state of attack signatures. Also, information about the following items is only included if it was changed from the default values:

- Meta-character sets
- Learn, Alarm, and Block settings for violations
- Response pages
- IP address intelligence Alarm and Block settings

Exporting security policies

You can export a security policy and save it in a file. The exported security policy can be used as backup, or you can import it onto another system.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies**.
   The Policies List screen opens.
2. From the Policies list, select the security policy that you want to export, then click **Export**.
   The Export policy popup screen opens.

3. For **Export policy format**, select an export method.
   - To save the security policy as an XML file, select **XML format**.
   - To save the security policy as a policy archive file (`.plc` file), select **Binary format**.
4. For **Compact format** , if you want to reduce the size of the XML file, click **Enabled**.
5. Click **Export Policy**.
   The system exports the security policy in the format you specified.

The exported security policy includes all of the policy details, including entities that use default values, unless you selected the compact format option. If using the compact format, values unchanged from the default values are not exported.

The exported security policy includes any user-defined signature sets that are in the policy, but not the user-defined signatures themselves. Optionally, you can export user-defined signatures from the Attack Signature List (to see the list, go to **Security** > **Options** > **Application Security** > **Attack Signatures** > **Attack Signatures List**).

Importing security policies

Before you import a security policy from another system, make sure that the attack signatures and user-defined signatures are the same on both systems. You also need access to the exported policy file.

You can import a security policy that was previously exported from another Application Security Manager™system.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies**.
   The Policies List screen opens.
2. Click **Import Policy**.
   The Import Security Policy screen opens.
3. For **Imported Policy File**, click **Select File** to navigate to a previously exported security policy.

   The exported security policy can be in XML (regular or compact) or binary (`.plc`) format.

   The system shows the name of the policy you plan to import and the policy encoding.
4. For the **Import Target** setting, select how to import the security policy.
   - To place the uploaded policy into the list of inactive policies for later use, select **Inactive Security Policies List**.
   - To replace the currently active policy with the security policy you are importing, select **Replaced Policy** and select the policy to replace from the list.
5. For **Import Target**, select how to import the policy:
   - To treat the imported policy as a new security policy, select **New Policy**.
   - To replace an existing policy with the imported policy, select **Replace Policy**.

   The system imports the security policy and displays a success status message when the operation is complete.

If you replaced an existing policy, the imported security policy completely overwrites the existing security policy. Also, the imported policy is then associated with the virtual server and local traffic policy that was previously associated with the policy you replaced. The replaced policy is automatically archived with the inactive security policies.

Overview: Comparing security policies

Application Security Manager™ has a Policy Diff feature that lets you compare two security policies, view the differences between them, and copy the settings from one policy to the other. You can use the comparison for auditing purposes, to make two policies act similarly, or to simply view the differences between two security policies. The Policy Diff feature is particularly useful for comparing a security policy in staging and a production version. You can compare active security policies (with or without Policy Builder running), inactive security policies, and exported security policies. When you import security policies that were exported from another system, they are placed in the inactive policies list.

You need to have a user role on the BIG-IP® system of Administrator or Web Application Security Editor to use Policy Diff to compare security policies.

Comparing security policies

Before you can compare security policies, the two policies must be on the same BIG-IP system, or accessible from the system you are using (such as imported policies). They must also have the same language encoding, the same protocol independence (**Differentiate between HTTP and HTTPS URLs**) configuration, and the same case sensitivity configuration. You can compare policies even if they are running Policy Builder, but because they are constantly changing, the comparison is done on copies of the policies to avoid corrupting them.

***Note:** Only users with a role of Administrator, Application Security Administrator, or Application Security Editor can use Policy Diff to compare security policies.*

You can compare two security policies to review the differences between them. While the two security policies are being compared, the system prevents other users from saving changes to them.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies** > **Policy Diff**.
2. From the **First Policy** and **Second Policy** lists, select the security policies you want to compare or merge, or browse to search your computer for an exported security policy.

   The two security policies you are comparing can be active, inactive, policies imported in binary or XML format, or a combination of both.
3. If you plan to merge security policy attributes, it is a good idea to safeguard the original security policy. In the **Working Mode** field, select how you want to work.

Option	Description
Work on Original	Incorporate changes to one (or both) of the original security policies depending on the merge options you select without making a copy of it.
Make a Copy	Make a copy of the security policy into which you are incorporating changes.
Work on Copy	Work on a copy of the original security policy. First, a copy is made, then incorporate possible changes on the original policies. If comparing one or more policies with Policy Builder enabled, this option is automatically selected (and the other options become unavailable).

4. Click the **Calculate Differences** button to compare the two security policies.

   ***Note:** The system does not compare navigation parameters. They are ignored and do not appear in the results.*

   The Policy Differences Summary lists the number of differences for each entity type.
5. Click any row in the Policy Differences Summary to view the differing entities with details about the conflicting attributes.
   The system displays a list of the differing entities and shows details about each entity's conflicting attributes.
6. Review the differences between the two policies and determine whether or not you want to merge attributes from one policy to the other.

Configuring ASM with Local Traffic Policies

Overview: Configuring ASM with local traffic policies

Application Security Manager™ applies security policy rules to traffic that is controlled and defined using a local traffic policy. To provide more flexibility in selecting the traffic, you can edit the local traffic policy and add rules to it.

This implementation shows how to create a security policy and edit at the local traffic policy that is created. The example provided describes how to add rules to the local traffic policy so that the security policy applies only to administrative traffic beginning with `/admin`. No security policy applies to the other traffic.

Many other options are available for configuring local traffic policies with ASM. By following through the steps in this example, you can see the other options that are available on the screens, and can adjust the example for your needs.

Task Summary

About application security and local traffic policies

When you use Application Security Manager™ (ASM) to create a security policy attached to a virtual server, the BIG-IP® system automatically creates a local traffic policy. The local traffic policy forms a logical link between the local traffic components and the application security policy.

By default, the system automatically creates a simple local traffic policy directs all HTTP traffic coming to the virtual server to the ASM™ security policy that you created. ASM examines the traffic to ensure that it meets the requirements of the security policy. If that is all you need to do, your task is done. If, however, you want more flexibility, such as applying different security policies depending on the type of traffic or disabling ASM for certain types of traffic, you can use the local traffic policy to do that.

Local traffic policies can include multiple rules. Each rule consists of a condition and one or more actions to be performed if the condition holds. So you can create a local traffic policy that works with ASM and includes multiple rules that do different things depending on the conditions you set up. In this type of traffic policy, the rules perform these actions:

- Enable ASM enforcing a specific security policy
- Disable ASM

For example, you may want a local traffic policy directed to a specific URL to enforce a security policy. As a default rule, all other traffic could disable ASM. You can also direct people using different aspects of an application (or different applications) to various security policies. Many other options are available for directing ASM traffic using local traffic policies.

About application security and manually adding local traffic policies

If you create a security policy not attached to a virtual server, the system creates the security policy but does not create a local traffic policy. However, you will need to have a virtual server and local traffic policy to select the traffic for the security policy to enforce.

In that case, you can develop the security policy, adding the features that you want to use. Without a virtual server, the system cannot build the security policy automatically until you have traffic going through. But you can manually develop the security policy by adding entities such as file types, URLs, assigning server technologies, and so on.

When you are ready to enforce the security policy and start sending traffic through the system, create a virtual server with an http profile, and enable the security policy you created in the virtual server resources. When you save the virtual server, the system automatically creates a default local traffic policy that enforces the security policy on all traffic. You can edit the local traffic policy rules if you want more flexibility concerning how the security policies are implemented.

Creating a simple security policy

Before you can create a security policy, you must perform the minimal system configuration tasks required according to the needs of your networking environment.

You can use Application Security Manager™ to create a robust, yet simple, security policy that is tailored to protect your web application. This is the easiest way to create a security policy.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies** > **Policies List**.
   The Policies List screen opens.
2. Click **Create New Policy**.

   You only see this button when no policy is selected.
3. In the **Policy Name** field, type a name for the policy.
4. Leave **Policy Type**, set to **Security**.
5. For **Policy Template**, select **Fundamental**.
6. For **Virtual Server**, click **Configure new virtual server** to specify where to direct application requests.
   a) For **What type of protocol does your application use?**, select **HTTP**, **HTTPS**, or both.
   b) In the **Virtual Server Name** field, type a unique name.
   c) In the **HTTP Virtual Server Destination** field, type the address in IPv4 (`10.0.0.1`) or IPv6 (`2001:ed8:77b5:2:10:10:100:42/64`) format, and specify the service port.

   Tip: *If you want multiple IP addresses to be directed here, use the* ***Network*** *setting.*

   d) In the HTTP Pool Member setting, specify the addresses of the back-end application servers.
   e) From the **Logging Profile** list, select a profile such as **Log illegal requests** to determine which events are logged on the system.
7. In the upper right corner, click **Advanced**.

   You can use default values for the Advanced settings but it's a good idea to take a look at them.

   - If you selected **Fundamental** or **Comprehensive** for the **Policy Template**, **Learning Mode** is set to **Automatic** and **Enforcement Mode** is set to **Blocking**.

   Tip: *If you need to change these values, set application language to a value other than* ***Auto detect****.*

   - If you know the **Application Language**, select it or use **Unicode (utf-8)**.
   - To add specific protections (enforcing additional attack signatures) to the policy, for **Server Technologies**, select the technologies that apply to the back-end application servers.
   - You can configure trusted IP addresses that you want the security policy to consider safe.
8. Click **Create Policy** to create the security policy.

ASM™ creates a security policy that immediately starts protecting your application. The enforcement mode of the security policy is set to Blocking. Traffic that is considered to be an attack such as traffic that is not compliant with HTTP protocol, has malformed payloads, uses evasion techniques, performs web scraping, contains sensitive information or illegal values is blocked. Other potential violations are reported but not blocked.

The system examines the traffic to the web application making suggestions for more specifically building the security policy. The Policy Builder selectively learns new entities like file types, parameters, and cookies used in requests to the application. When ASM processes sufficient traffic, it automatically adds the entities to the security policy, and enforces them.

The system applies a basic set of attack signatures to the security policy and puts them in staging (by default, for 7 days). If you specified server technologies, additional attack signatures are included. ASM reports common attacks discovered by comparison to the signatures but does not block these attacks until the staging period is over and they are enforced. That gives you a chance to be sure that these are actual attacks and not legitimate requests.

Tip: *This is a good point at which send some traffic to test that you can access the application being protected by the security policy and check that traffic is being processed correctly by the BIG-IP® system. Send the traffic to the virtual server destination address.*

Creating local traffic policy rules for ASM

Before you can use the local traffic policy with ASM™, you need a security policy associated with a virtual server.

You can add rules to define conditions and perform specific actions for different types of application traffic in a local traffic policy. This example creates two rules to implement different security protection for different traffic.

1. On the Main tab, click **Local Traffic** > **Policies**.
2. Click the name of the local traffic policy associated with the security policy.
3. To edit the policy, click **Create Draft**.
4. In the Draft Policies list, click the name of the draft policy.
5. In the Rules area, click **Create** to create a rule that defines when traffic is handled by the security policy.
6. In the **Name** field, type the name `admin`.
7. In the Match all of the following conditions area, click **+** and specify these conditions:
   a) For the first condition, select **HTTP URI**.
   b) For the second condition, select **path**.
   c) For the third condition, select **begins with**.
   d) For the fourth condition, by the field below **any of**, type `/admin` and click **Add**.

   This rule looks for requests with a URI that begins with `/admin`.
8. In Do the following when the traffic is matched, click **+** and specify the actions:
   a) For the first action, select **Enable**.
   For the second action, select **asm**.
   b) Next to **for policy**, select the security policy you created.
9. Click **Save** to add the rule to the local traffic policy.
   The admin rule is added to the list.
10. In the Rules area, click the rule called **default**.

    The **default** rule was added to the local traffic policy when the system created it.

    The screen displays the General Properties of the rule.
11. To change the default action for all other traffic, in the Do the following when the traffic is matched area, edit the action that is shown there.
    a) For the first action, select **Disable**.
    b) For the second action, select **asm**.

c) To save the rule, click **Save**.

The default rule now disables ASM protection for other traffic.

12. To save the updated policy, click **Save Draft**.
The Policy List Page opens.
13. Select the check box next to the draft policy you edited, and click **Publish**.

You have edited and published the local traffic policy so that administrative traffic must meet the security policy you assigned to it. But other traffic is not subject to that security policy.

Implementation results

When you have completed the steps in this implementation, you have configured the Application Security Manager™ (ASM) to enforce security policy rules only on traffic with a URI beginning with `/admin`. All other traffic bypasses ASM™.

This is simply one way to illustrate how you can use a local traffic policy to determine different conditions and specify multiple actions instead of having all traffic treated the same way. We encourage you to explore the local traffic policy options and documentation to learn how to use this flexible feature to best suit your needs.

Automatically Synchronizing Application Security Configurations

Overview: Automatically synchronizing ASM systems

This implementation describes how to set up multiple BIG-IP® systems running Application Security Manager™ (ASM) so that they automatically synchronize their security policies and ASM™ configurations. In addition, the ASM devices can fail over to one another if any of the devices goes offline. For synchronizing local traffic configuration data, you can manually synchronize that data as needed.

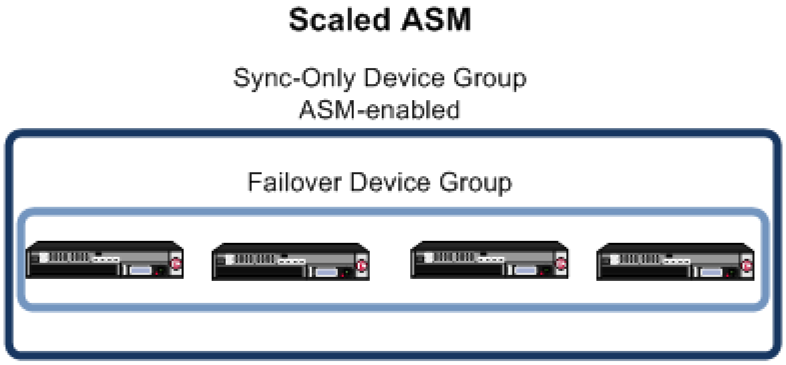

Figure 11: Automatically synchronizing ASM configuration data

In this case, multiple BIG-IP systems are all processing similar traffic for one or more web applications behind a router (or load balancer). All systems are running BIG-IP ASM™ and are in the local trust domain. You organize the systems into two device groups: one Sync-Failover device group for all systems (not ASM-enabled) and one Sync-Only device group with ASM-enabled for all of the systems. The ASM configurations and web applications are automatically duplicated on all of the systems. You can manually synchronize the BIG-IP configuration of the systems in the Sync-Failover device group.

Task summary

About device management and synchronizing application security configurations

You can use device management to set up several BIG-IP® systems running Application Security Manager™ (ASM) so that the systems synchronize their security policies and configurations, and fail over to one another if a system goes offline for any reason. By using application security synchronization, you can set up application security and create security policies on one system, and can propagate them to other systems in an application security device group. In BIG-IP ASM™, a *device group* is two or more BIG-IP devices using the same configuration and providing consistent security policy enforcement.

You can set up application security synchronization, for example, behind an Application Delivery Controller where multiple BIG-IP systems running Application Security Manager are deployed as members of a pool. The options and security policies on all of the systems stay in sync regardless of where you update them.

When you set up ASM™ synchronization, in addition to security policies, other settings such as custom attack signatures, logging profiles, SMTP configuration, anti-virus protection, system variables, and policy templates, are synchronized with all devices in the ASM-enabled device group.

Considerations for application security synchronization

When using device management with Application Security Manager™ (ASM™), you need to be aware of the following considerations that apply specifically to application security synchronization.

- A BIG-IP® system with Application Security Manager can be a member of only one ASM-enabled device group.
- All BIG-IP systems in a device group must be running the same version (including hot fix updates) of Application Security Manager (version 11.0 or later).
- The BIG-IP systems in the ASM-enabled device group synchronize application security configuration data and security policies, providing consistent enforcement on all the devices.
- Real Traffic Policy Builder® can run on only one system per security policy. For example, you can set up automatic security policy building on one system that is a member of an ASM-enabled device group, the policy is built on that system and then automatically updated on all of the systems in the device group.
- If using a VIPRION® platform (with multiple blades), it is considered one device, and you need to add only the master blade to the device trust and group.

Performing basic network configuration for synchronization

You need to perform basic networking configuration for each of the BIG-IP® systems whose Application Security Manager™ (ASM) configurations you want to synchronize.

1. Install the same BIG-IP system version (including any hot fixes) on each device.
2. Provision LTM® and ASM™ on each device (**System** > **Resource Provisioning**).
3. On each device, create one or more VLANs, depending on your networking configuration (**Network** > **VLANs**).
4. On each device, create a self IP (**Network** > **Self IPs**).

   When creating the self IP, set **Traffic Group** to **traffic-group-local-only (non-floating)**.
5. On each device, create a default gateway, if needed (**Network** > **Routes**).
6. On each device, configure DNS (**System** > **Configuration** > **Device** > **DNS**) and NTP (**System** > **Configuration** > **Device** > **NTP**) so they are set to the same time.
7. Verify connectivity between the devices (self IP address to self IP address). For example, use this command to ensure communications: `ping -I vlan_interface device_self_IP`
8. If your company requires special device certificates, install them on each device (**System** > **Device Certificates** and click **Import**).

The basic networking setup is complete for the BIG-IP ASM systems for which you want to share security policies and configurations.

Next, on each device, specify the IP address to use when synchronizing configuration objects to the local device:

Specifying an IP address for config sync

Before configuring the config sync address, verify that all devices in the device group are running the same version of BIG-IP® system software.

You perform this task to specify the IP address on the local device that other devices in the device group will use to synchronize their configuration objects to the local device.

Note: *You must perform this task locally on each device in the device group.*

1. Confirm that you are logged in to the device you want to configure.
2. On the Main tab, click **Device Management** > **Devices**.
   This displays a list of device objects discovered by the local device.
3. In the Name column, click the name of the device to which you are currently logged in.
4. Near the top of the screen, click **ConfigSync**.
5. From the **Local Address** list, retain the displayed IP address or select another address from the list.

   F5 Networks recommends that you use the default value, which is the self IP address for the internal VLAN. This address must be a non-floating (static) self IP address and not a management IP address.

   ***Important:** If the BIG-IP device you are configuring is accessed using Amazon Web Services, then the internal self IP address that you select must be an internal private IP address that you configured for this EC2 instance as the **Local Address**.*
6. Click **Update**.

After performing this task, the other devices in the device group can synchronize their configurations to the local device whenever a sync operation is initiated.

Establishing device trust

Before you begin this task, verify that:

- Each BIG-IP® device that is to be part of the local trust domain has a device certificate installed on it.
- The local device is designated as a certificate signing authority.

You perform this task to establish trust among devices on one or more network segments. Devices that trust each other constitute the *local trust domain*. A device must be a member of the local trust domain prior to joining a device group.

By default, the BIG-IP software includes a local trust domain with one member, which is the local device. You can choose any one of the BIG-IP devices slated for a device group and log into that device to add other devices to the local trust domain. For example, devices `Bigip_1`, `Bigip_2`, and `Bigip_3` each initially shows only itself as a member of the local trust domain. To configure the local trust domain to include all three devices, you can simply log into device `Bigip_1` and add devices `Bigip_2` and `Bigip_3` to the local trust domain; there is no need to repeat this process on devices `Bigip_2` and `Bigip_3`.

1. On the Main tab, click **Device Management** > **Device Trust** > **Device Trust Members**.
2. Click **Add**.
3. From the **Device Type** list, select **Peer** or **Subordinate**.
4. Type a device IP address, administrator user name, and administrator password for the remote BIG-IP® device with which you want to establish trust. The IP address you specify depends on the type of BIG-IP device:
   - If the BIG-IP device is an appliance, type the management IP address for the device.
   - If the BIG-IP device is a VIPRION® device that is not licensed and provisioned for vCMP®, type the primary cluster management IP address for the cluster.
   - If the BIG-IP device is a VIPRION device that is licensed and provisioned for vCMP, type the cluster management IP address for the guest.
   - If the BIG-IP device is an Amazon Web Services EC2 device, type one of the Private IP addresses created for this EC2 instance.
5. Click **Retrieve Device Information**.
6. Verify that the certificate of the remote device is correct, and then click **Device Certificate Matches**.
7. In the **Name** field, verify that the name of the remote device is correct.
8. Click **Add Device**.

After you perform this task, the local device is now a member of the local trust domain. Also, the BIG-IP system automatically creates a special Sync-Only device group for the purpose of synchronizing trust information among the devices in the local trust domain, on an ongoing basis.

Repeat this task to specify each device that you want to add to the local trust domain.

Creating a Sync-Failover device group

This task establishes failover capability between two or more BIG-IP® devices. If an active device in a Sync-Failover device group becomes unavailable, the configuration objects fail over to another member of the device group and traffic processing is unaffected. You perform this task on any one of the authority devices within the local trust domain.

Repeat this task for each Sync-Failover device group that you want to create for your network configuration.

1. On the Main tab, click **Device Management** > **Device Groups**.
2. On the Device Groups list screen, click **Create**.
   The New Device Group screen opens.
3. In the **Name** field, type a name for the device group.
4. From the **Group Type** list, select **Sync-Failover**.
5. In the **Description** field, type a description of the device group.

   This setting is optional.
6. From the **Configuration** list, select **Advanced**.
7. For the **Members** setting, select a host name from the **Available** list for each BIG-IP device that you want to include in the device group, including the local device. Use the Move button to move the host name to the **Includes** list.

   The **Available** list shows any devices that are members of the device's local trust domain but not currently members of a Sync-Failover device group. A device can be a member of one Sync-Failover group only. Also, for vCMP-provisioned systems on platforms that contain a hardware security module (HSM) supporting FIPS multi-tenancy, the FIPS partitions on the guests in the device group must be identical with respect to the number of SSL cores allocated to the guest's FIPS partition and the maximum number of private SSL keys that the guest can store on the HSM.
8. From the **Sync Type** list:

   - Select **Automatic with Incremental Sync** when you want the BIG-IP system to automatically sync the most recent BIG-IP configuration changes from a device to the other members of the device group. In this case, the BIG-IP system syncs the configuration data whenever the data changes on any device in the device group.
   - Select **Manual with Incremental Sync** when you want to manually initiate a config sync operation. In this case, the BIG-IP system syncs the latest BIG-IP configuration changes from the device you choose to the other members of the device group. We strongly recommend that you perform a config sync operation whenever configuration data changes on one of the devices in the device group.
   - Select **Manual with Full Sync** when you want to manually initiate a config sync operation. In this case, the BIG-IP system syncs the full set of BIG-IP configuration data from the device you choose to the other members of the device group. We strongly recommend that you perform a config sync operation whenever configuration data changes on one of the devices in the device group.
9. In the **Maximum Incremental Sync Size (KB)** field, retain the default value of `1024`, or type a different value.

   This value specifies the total size of configuration changes that can reside in the incremental sync cache. If the total size of the configuration changes in the cache exceeds the specified value, the BIG-IP system performs a full sync whenever the next config sync operation occurs.

10. For the **Network Failover** setting, select or clear the check box:
    - Select the check box if you want device group members to handle failover communications by way of network connectivity. This is the default value and is required for active-active configurations.
    - Clear the check box if you want device group members to handle failover communications by way of serial cable (hard-wired) connectivity.

    For active-active configurations, you must select network failover, as opposed to serial-cable (hard-wired) connectivity.
11. In the **Link Down Time on Failover** field, use the default value of `0.0`, or specify a new value.

    This setting specifies the amount of time, in seconds, that interfaces for any external VLANs are down when a traffic group fails over and goes to the standby state. Specifying a value other than `0.0` for this setting causes other vendor switches to use the specified time to learn the MAC address of the newly-active device.

    Important: *This setting is a system-wide setting, and does not apply to this device group only. Specifying a value in this field causes the BIG-IP system to assign this value to the global bigdb variable* `failover.standby.linkdowntime`.
12. Click **Finished**.

You now have a Sync-Failover type of device group containing BIG-IP devices as members.

Syncing the BIG-IP configuration to the device group

Before you sync the configuration, verify that the devices targeted for config sync are members of a device group and that device trust is established.

This task synchronizes the BIG-IP® configuration data from the local device to the devices in the device group. This synchronization ensures that devices in the device group operate properly. When synchronizing self IP addresses, the BIG-IP system synchronizes floating self IP addresses only.

Important: *You perform this task on either of the two devices, but not both.*

1. On the Main tab, click **Device Management** > **Overview**.
2. In the Device Groups area of the screen, click the arrow next to the name of the relevant device group.
   The screen expands to show a summary and details of the sync status of the selected device group, as well as a list of the individual devices within the device group.
3. In the Devices area of the screen, choose the device that shows a sync status of `Changes Pending`.
4. In the Sync Options area of the screen, select **Push the selected device configuration to the group**.
5. Click **Sync**.
   The BIG-IP system syncs the configuration data of the selected device to the other members of the device group.

After performing this task, all BIG-IP configuration data that is eligible for synchronization to other devices is replicated on each device in the device group.

Specifying IP addresses for failover communication

You perform this task to specify the local IP addresses that you want other devices in the device group to use for continuous health-assessment communication with the local device. You must perform this task locally on each device in the device group.

Note: *The IP addresses that you specify must belong to route domain* `0`.

1. Confirm that you are logged in to the device you want to configure.
2. On the Main tab, click **Device Management** > **Devices**.
   This displays a list of device objects discovered by the local device.
3. In the Name column, click the name of the device to which you are currently logged in.
4. Near the top of the screen, click **Failover Network**.
5. Click **Add**.
6. From the **Address** list, select an IP address.

   The unicast IP address you select depends on the type of device:

Platform	Action
Appliance without vCMP	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`) and the static management IP address currently assigned to the device.
Appliance with vCMP	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`) and the unique management IP address currently assigned to the guest.
VIPRION without vCMP®	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`). If you choose to select unicast addresses only (and not a multicast address), you must also specify the existing, static management IP addresses that you previously configured for all slots in the cluster. If you choose to select one or more unicast addresses and a multicast address, then you do not need to select the existing, per-slot static management IP addresses when configuring addresses for failover communication.
VIPRION with vCMP	Select a self IP address that is defined on the guest and associated with an internal VLAN on the host (preferably VLAN `HA`). If you choose to select unicast failover addresses only (and not a multicast address), you must also select the existing, virtual static management IP addresses that you previously configured for all slots in the guest's virtual cluster. If you choose to select one or more unicast addresses and a multicast address, you do not need to select the existing, per-slot static and virtual management IP addresses when configuring addresses for failover communication.

   Important: *Failover addresses should always be static, not floating, IP addresses.*
7. From the **Port** list, select a port number.

   We recommend using port **1026** for failover communication.
8. To enable the use of a failover multicast address on a VIPRION® platform (recommended), then for the **Use Failover Multicast Address** setting, select the **Enabled** check box.
9. If you enabled **Use Failover Multicast Address**, either accept the default **Address** and **Port** values, or specify values appropriate for the device.

   If you revise the default **Address** and **Port** values, but then decide to revert to the default values, click **Reset Defaults**.
10. Click **Finished**.

After you perform this task, other devices in the device group can send failover messages to the local device using the specified IP addresses.

Creating a Sync-Only device group

You perform this task to create a Sync-Only type of device group. When you create a Sync-Only device group, the BIG-IP® system can then automatically synchronize configuration data in folders attached to the device group (such as security policies and acceleration applications) with the other devices in the group, even when some of those devices reside in another network.

***Note:** You perform this task on any one BIG-IP device within the local trust domain; there is no need to repeat this process on the other devices in the device group.*

1. On the Main tab, click **Device Management** > **Device Groups**.
2. Find the **Partition** list in the upper right corner of the BIG-IP Configuration utility screen, to the left of the **Log out** button.
3. From the **Partition** list, pick partition `Common`.
4. On the Device Groups list screen, click **Create**.
   The New Device Group screen opens.
5. Type a name for the device group, select the device group type **Sync-Only**, and type a description for the device group.
6. From the **Configuration** list, select **Advanced**.
7. For the **Members** setting, select a host name from the **Available** list for each BIG-IP device that you want to include in the device group. Use the Move button to move the host name to the **Includes** list.

   The list shows any devices that are members of the device's local trust domain.
8. For the **Automatic Sync** setting, specify whether configuration synchronization occurs manually or automatically:

   - Select the check box when you want the BIG-IP system to automatically sync the BIG-IP configuration data whenever a config sync operation is required. In this case, the BIG-IP system syncs the configuration data whenever the data changes on any device in the device group.
   - Clear the check box when you want to manually initiate each config sync operation. In this case, F5 networks recommends that you perform a config sync operation whenever configuration data changes on one of the devices in the device group.
9. For the **Full Sync** setting, specify whether the system synchronizes the entire configuration during synchronization operations:

   - Select the check box when you want all sync operations to be full syncs. In this case, every time a config sync operation occurs, the BIG-IP system synchronizes all configuration data associated with the device group. This setting has a performance impact and is not recommended for most customers.
   - Clear the check box when you want all sync operations to be incremental (the default setting). In this case, the BIG-IP system syncs only the changes that are more recent than those on the target device. When you select this option, the BIG-IP system compares the configuration data on each target device with the configuration data on the source device and then syncs the delta of each target-source pair.

   If you enable incremental synchronization, the BIG-IP system might occasionally perform a full sync for internal reasons. This is a rare occurrence and no user intervention is required.
10. In the **Maximum Incremental Sync Size (KB)** field, retain the default value of `1024`, or type a different value.

    This value specifies the total size of configuration changes that can reside in the incremental sync cache. If the total size of the configuration changes in the cache exceeds the specified value, the BIG-IP system performs a full sync whenever the next config sync operation occurs.
11. Click **Finished**.

You now have a Sync-Only type of device group containing BIG-IP devices as members.

Enabling ASM synchronization on a device group

You need to have already set up the BIG-IP®systems you want to synchronize in a device trust and a device group. Application Security Manager™ (ASM) must be provisioned on all the systems in the device group.

You can enable ASM™ synchronization on a device group to synchronize security policies and configurations on all devices in the device group. You do this task on one system; for example, the active system in an active-standby pair.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Synchronization**.
   The system displays a list of device groups of which this device is a member.
2. For **Device Group**, select the device group whose members you want to synchronize.
3. Click **Save**.

The BIG-IP ASM systems that you want to share security policies and configurations are part of a device group with ASM synchronization.

Synchronizing an ASM-enabled device group

You need to have set up the BIG-IP® Application Security Manager™ (ASM) systems you want to synchronize in a Sync-Failover device group that is ASM™-enabled.

You can manually synchronize security policies and configuration of systems in an ASM-enabled device group.

1. On one system in the ASM-enabled failover device group, create an application security policy.
   Because the two systems are not in sync, you see a **Changes Pending** status message on the screen.
2. Click the **Changes Pending** message.

   Tip: *You can also click* ***Device Management*** *>* ***Overview****.*

   The Overview screen opens.
3. In the Device Groups area of the screen, click the arrow next to the name of the relevant device group.
   The screen expands to show a summary and details of the sync status of the selected device group, as well as a list of the individual devices within the device group.
4. In the Devices area of the screen, choose the device that shows a sync status of `Changes Pending`.
5. In the Sync Options area of the screen, select **Push the selected device configuration to the group**.
6. Click **Sync**.
   The BIG-IP system syncs the configuration data of the selected device to the other members of the device group.
7. Verify that the devices are synchronized.

   For example, log in to another device in the device group and verify that the security policy you created also resides on that system. Click **Security** > **Application Security** > **Security Policies** and see if the policy is listed.

Except for static self IP addresses, the entire set of BIG-IP configuration data including ASM™ security policies and configuration is replicated on one or more devices in the ASM-enabled device group. If the active device is not available, the standby device becomes active and handles traffic.

You can create new security policies or update existing ones on any of the devices in the group, or update the ASM configuration options. You can manually synchronize changes you make on one device with the other devices in the ASM-enabled device group.

Implementation result

You have set up multiple BIG-IP® systems running Application Security Manager™ (ASM) so that they automatically synchronize their ASM security policies and ASM configuration data. In addition, with this implementation, you can manually synchronize the local traffic configuration, as needed.

You can create new security policies or update existing ones on any of the devices in the group, or update the ASM™ configuration options. Any ASM changes you make on one device are automatically synchronized with the other devices in the ASM-enabled Sync-Only device group.

If Attack Signatures **Update Mode** is scheduled for automatic update, the attack signature update settings are synchronized. Each device in the device group updates itself independently according to the configured schedule. If you manually upload attack signatures or click **Update Signatures** to update from the server, the update is propagated to all of the devices in the device group.

Manually Synchronizing Application Security Configurations

Overview: Manually synchronizing ASM systems

This implementation describes how to set up two BIG-IP® systems running Application Security Manager™ (ASM) so that you can synchronize their security policies and configurations. With this implementation, the BIG-IP systems can fail over to one another, and you can manually sync all of the BIG-IP configuration data, including ASM policy data.

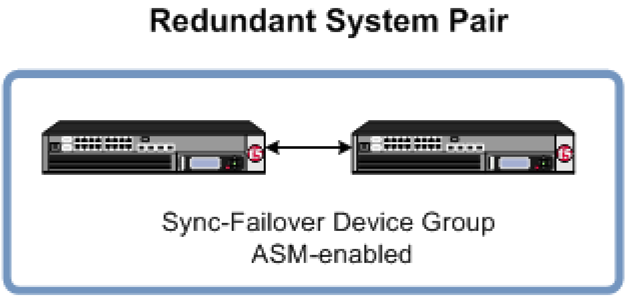

Figure 12: Manually synchronizing ASM configuration data

The two BIG-IP systems are set up for redundancy: one active and the other standby. Both systems are in the local trust domain and in the same Sync-Failover device group. If one system is unavailable, the other system begins to process application traffic. You can manually synchronize the systems. The ASM™ configurations and security policies are duplicated on both systems.

You can use this implementation as the basis for more complex configurations. For example, if you have multiple redundant pairs each supporting a different web application, you can use this implementation to set up each pair. You could create a Sync-Failover device group for each pair and then synchronize the data within each pair only. In this configuration, you all devices reside in the local trust domain.

Task summary

About device management and synchronizing application security configurations

You can use device management to set up several BIG-IP® systems running Application Security Manager™ (ASM) so that the systems synchronize their security policies and configurations, and fail over to one another if a system goes offline for any reason. By using application security synchronization, you can set up application security and create security policies on one system, and can propagate them to other systems in an application security device group. In BIG-IP ASM™, a *device group* is two or more BIG-IP devices using the same configuration and providing consistent security policy enforcement.

You can set up application security synchronization, for example, behind an Application Delivery Controller where multiple BIG-IP systems running Application Security Manager are deployed as members of a pool. The options and security policies on all of the systems stay in sync regardless of where you update them.

When you set up ASM™ synchronization, in addition to security policies, other settings such as custom attack signatures, logging profiles, SMTP configuration, anti-virus protection, system variables, and policy templates, are synchronized with all devices in the ASM-enabled device group.

Considerations for application security synchronization

When using device management with Application Security Manager™ (ASM™), you need to be aware of the following considerations that apply specifically to application security synchronization.

- A BIG-IP® system with Application Security Manager can be a member of only one ASM-enabled device group.
- All BIG-IP systems in a device group must be running the same version (including hot fix updates) of Application Security Manager (version 11.0 or later).
- The BIG-IP systems in the ASM-enabled device group synchronize application security configuration data and security policies, providing consistent enforcement on all the devices.
- Real Traffic Policy Builder® can run on only one system per security policy. For example, you can set up automatic security policy building on one system that is a member of an ASM-enabled device group, the policy is built on that system and then automatically updated on all of the systems in the device group.
- If using a VIPRION® platform (with multiple blades), it is considered one device, and you need to add only the master blade to the device trust and group.

Performing basic network configuration for synchronization

You need to perform basic networking configuration for each of the BIG-IP® systems whose Application Security Manager™ (ASM) configurations you want to synchronize.

1. Install the same BIG-IP system version (including any hot fixes) on each device.
2. Provision LTM® and ASM™ on each device (**System** > **Resource Provisioning**).
3. On each device, create one or more VLANs, depending on your networking configuration (**Network** > **VLANs**).
4. On each device, create a self IP (**Network** > **Self IPs**).

   When creating the self IP, set **Traffic Group** to **traffic-group-local-only (non-floating)**.
5. On each device, create a default gateway, if needed (**Network** > **Routes**).
6. On each device, configure DNS (**System** > **Configuration** > **Device** > **DNS**) and NTP (**System** > **Configuration** > **Device** > **NTP**) so they are set to the same time.
7. Verify connectivity between the devices (self IP address to self IP address). For example, use this command to ensure communications: `ping -I vlan_interface device_self_IP`
8. If your company requires special device certificates, install them on each device (**System** > **Device Certificates** and click **Import**).

The basic networking setup is complete for the BIG-IP ASM systems for which you want to share security policies and configurations.

Next, on each device, specify the IP address to use when synchronizing configuration objects to the local device:

Specifying an IP address for config sync

Before configuring the config sync address, verify that all devices in the device group are running the same version of BIG-IP® system software.

You perform this task to specify the IP address on the local device that other devices in the device group will use to synchronize their configuration objects to the local device.

***Note:** You must perform this task locally on each device in the device group.*

1. Confirm that you are logged in to the device you want to configure.
2. On the Main tab, click **Device Management** > **Devices**.
   This displays a list of device objects discovered by the local device.
3. In the Name column, click the name of the device to which you are currently logged in.
4. Near the top of the screen, click **ConfigSync**.
5. From the **Local Address** list, retain the displayed IP address or select another address from the list.

   F5 Networks recommends that you use the default value, which is the self IP address for the internal VLAN. This address must be a non-floating (static) self IP address and not a management IP address.

   Important: *If the BIG-IP device you are configuring is accessed using Amazon Web Services, then the internal self IP address that you select must be an internal private IP address that you configured for this EC2 instance as the* ***Local Address****.*
6. Click **Update**.

After performing this task, the other devices in the device group can synchronize their configurations to the local device whenever a sync operation is initiated.

Establishing device trust

Before you begin this task, verify that:

- Each BIG-IP® device that is to be part of the local trust domain has a device certificate installed on it.
- The local device is designated as a certificate signing authority.

You perform this task to establish trust among devices on one or more network segments. Devices that trust each other constitute the *local trust domain*. A device must be a member of the local trust domain prior to joining a device group.

By default, the BIG-IP software includes a local trust domain with one member, which is the local device. You can choose any one of the BIG-IP devices slated for a device group and log into that device to add other devices to the local trust domain. For example, devices `Bigip_1`, `Bigip_2`, and `Bigip_3` each initially shows only itself as a member of the local trust domain. To configure the local trust domain to include all three devices, you can simply log into device `Bigip_1` and add devices `Bigip_2` and `Bigip_3` to the local trust domain; there is no need to repeat this process on devices `Bigip_2` and `Bigip_3`.

1. On the Main tab, click **Device Management** > **Device Trust** > **Device Trust Members**.
2. Click **Add**.
3. From the **Device Type** list, select **Peer** or **Subordinate**.
4. Type a device IP address, administrator user name, and administrator password for the remote BIG-IP® device with which you want to establish trust. The IP address you specify depends on the type of BIG-IP device:
   - If the BIG-IP device is an appliance, type the management IP address for the device.
   - If the BIG-IP device is a VIPRION® device that is not licensed and provisioned for vCMP®, type the primary cluster management IP address for the cluster.
   - If the BIG-IP device is a VIPRION device that is licensed and provisioned for vCMP, type the cluster management IP address for the guest.
   - If the BIG-IP device is an Amazon Web Services EC2 device, type one of the Private IP addresses created for this EC2 instance.
5. Click **Retrieve Device Information**.
6. Verify that the certificate of the remote device is correct, and then click **Device Certificate Matches**.
7. In the **Name** field, verify that the name of the remote device is correct.
8. Click **Add Device**.

After you perform this task, the local device is now a member of the local trust domain. Also, the BIG-IP system automatically creates a special Sync-Only device group for the purpose of synchronizing trust information among the devices in the local trust domain, on an ongoing basis.

Repeat this task to specify each device that you want to add to the local trust domain.

Creating a Sync-Failover device group

This task establishes failover capability between two or more BIG-IP® devices. If an active device in a Sync-Failover device group becomes unavailable, the configuration objects fail over to another member of the device group and traffic processing is unaffected. You perform this task on any one of the authority devices within the local trust domain.

Repeat this task for each Sync-Failover device group that you want to create for your network configuration.

1. On the Main tab, click **Device Management** > **Device Groups**.
2. On the Device Groups list screen, click **Create**.
   The New Device Group screen opens.
3. In the **Name** field, type a name for the device group.
4. From the **Group Type** list, select **Sync-Failover**.
5. In the **Description** field, type a description of the device group.

   This setting is optional.
6. From the **Configuration** list, select **Advanced**.
7. For the **Members** setting, select a host name from the **Available** list for each BIG-IP device that you want to include in the device group, including the local device. Use the Move button to move the host name to the **Includes** list.

   The **Available** list shows any devices that are members of the device's local trust domain but not currently members of a Sync-Failover device group. A device can be a member of one Sync-Failover group only. Also, for vCMP-provisioned systems on platforms that contain a hardware security module (HSM) supporting FIPS multi-tenancy, the FIPS partitions on the guests in the device group must be identical with respect to the number of SSL cores allocated to the guest's FIPS partition and the maximum number of private SSL keys that the guest can store on the HSM.
8. From the **Sync Type** list:

   - Select **Automatic with Incremental Sync** when you want the BIG-IP system to automatically sync the most recent BIG-IP configuration changes from a device to the other members of the device group. In this case, the BIG-IP system syncs the configuration data whenever the data changes on any device in the device group.
   - Select **Manual with Incremental Sync** when you want to manually initiate a config sync operation. In this case, the BIG-IP system syncs the latest BIG-IP configuration changes from the device you choose to the other members of the device group. We strongly recommend that you perform a config sync operation whenever configuration data changes on one of the devices in the device group.
   - Select **Manual with Full Sync** when you want to manually initiate a config sync operation. In this case, the BIG-IP system syncs the full set of BIG-IP configuration data from the device you choose to the other members of the device group. We strongly recommend that you perform a config sync operation whenever configuration data changes on one of the devices in the device group.
9. In the **Maximum Incremental Sync Size (KB)** field, retain the default value of `1024`, or type a different value.

   This value specifies the total size of configuration changes that can reside in the incremental sync cache. If the total size of the configuration changes in the cache exceeds the specified value, the BIG-IP system performs a full sync whenever the next config sync operation occurs.

10. For the **Network Failover** setting, select or clear the check box:

    - Select the check box if you want device group members to handle failover communications by way of network connectivity. This is the default value and is required for active-active configurations.
    - Clear the check box if you want device group members to handle failover communications by way of serial cable (hard-wired) connectivity.

    For active-active configurations, you must select network failover, as opposed to serial-cable (hard-wired) connectivity.
11. In the **Link Down Time on Failover** field, use the default value of `0.0`, or specify a new value.

    This setting specifies the amount of time, in seconds, that interfaces for any external VLANs are down when a traffic group fails over and goes to the standby state. Specifying a value other than `0.0` for this setting causes other vendor switches to use the specified time to learn the MAC address of the newly-active device.

    Important: *This setting is a system-wide setting, and does not apply to this device group only. Specifying a value in this field causes the BIG-IP system to assign this value to the global bigdb variable* `failover.standby.linkdowntime`*.*
12. Click **Finished**.

You now have a Sync-Failover type of device group containing BIG-IP devices as members.

Syncing the BIG-IP configuration to the device group

Before you sync the configuration, verify that the devices targeted for config sync are members of a device group and that device trust is established.

This task synchronizes the BIG-IP® configuration data from the local device to the devices in the device group. This synchronization ensures that devices in the device group operate properly. When synchronizing self IP addresses, the BIG-IP system synchronizes floating self IP addresses only.

Important: *You perform this task on either of the two devices, but not both.*

1. On the Main tab, click **Device Management** > **Overview**.
2. In the Device Groups area of the screen, click the arrow next to the name of the relevant device group.
   The screen expands to show a summary and details of the sync status of the selected device group, as well as a list of the individual devices within the device group.
3. In the Devices area of the screen, choose the device that shows a sync status of `Changes Pending`.
4. In the Sync Options area of the screen, select **Push the selected device configuration to the group**.
5. Click **Sync**.
   The BIG-IP system syncs the configuration data of the selected device to the other members of the device group.

After performing this task, all BIG-IP configuration data that is eligible for synchronization to other devices is replicated on each device in the device group.

Specifying IP addresses for failover communication

You perform this task to specify the local IP addresses that you want other devices in the device group to use for continuous health-assessment communication with the local device. You must perform this task locally on each device in the device group.

Note: *The IP addresses that you specify must belong to route domain* `0`*.*

1. Confirm that you are logged in to the device you want to configure.
2. On the Main tab, click **Device Management** > **Devices**.
   This displays a list of device objects discovered by the local device.
3. In the Name column, click the name of the device to which you are currently logged in.
4. Near the top of the screen, click **Failover Network**.
5. Click **Add**.
6. From the **Address** list, select an IP address.

   The unicast IP address you select depends on the type of device:

Platform	Action
Appliance without vCMP	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`) and the static management IP address currently assigned to the device.
Appliance with vCMP	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`) and the unique management IP address currently assigned to the guest.
VIPRION without vCMP®	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`). If you choose to select unicast addresses only (and not a multicast address), you must also specify the existing, static management IP addresses that you previously configured for all slots in the cluster. If you choose to select one or more unicast addresses and a multicast address, then you do not need to select the existing, per-slot static management IP addresses when configuring addresses for failover communication.
VIPRION with vCMP	Select a self IP address that is defined on the guest and associated with an internal VLAN on the host (preferably VLAN `HA`). If you choose to select unicast failover addresses only (and not a multicast address), you must also select the existing, virtual static management IP addresses that you previously configured for all slots in the guest's virtual cluster. If you choose to select one or more unicast addresses and a multicast address, you do not need to select the existing, per-slot static and virtual management IP addresses when configuring addresses for failover communication.

   Important: *Failover addresses should always be static, not floating, IP addresses.*
7. From the **Port** list, select a port number.

   We recommend using port **1026** for failover communication.
8. To enable the use of a failover multicast address on a VIPRION® platform (recommended), then for the **Use Failover Multicast Address** setting, select the **Enabled** check box.
9. If you enabled **Use Failover Multicast Address**, either accept the default **Address** and **Port** values, or specify values appropriate for the device.

   If you revise the default **Address** and **Port** values, but then decide to revert to the default values, click **Reset Defaults**.
10. Click **Finished**.

After you perform this task, other devices in the device group can send failover messages to the local device using the specified IP addresses.

Enabling ASM synchronization on a device group

You need to have already set up the BIG-IP®systems you want to synchronize in a device trust and a device group. Application Security Manager™ (ASM) must be provisioned on all the systems in the device group.

You can enable ASM™ synchronization on a device group to synchronize security policies and configurations on all devices in the device group. You do this task on one system; for example, the active system in an active-standby pair.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Synchronization**. The system displays a list of device groups of which this device is a member.
2. For **Device Group**, select the device group whose members you want to synchronize.
3. Click **Save**.

The BIG-IP ASM systems that you want to share security policies and configurations are part of a device group with ASM synchronization.

Synchronizing an ASM-enabled device group

You need to have set up the BIG-IP® Application Security Manager™ (ASM) systems you want to synchronize in a Sync-Failover device group that is ASM™-enabled.

You can manually synchronize security policies and configuration of systems in an ASM-enabled device group.

1. On one system in the ASM-enabled failover device group, create an application security policy. Because the two systems are not in sync, you see a **Changes Pending** status message on the screen.
2. Click the **Changes Pending** message.

   Tip: *You can also click* ***Device Management*** > ***Overview****.*

   The Overview screen opens.
3. In the Device Groups area of the screen, click the arrow next to the name of the relevant device group. The screen expands to show a summary and details of the sync status of the selected device group, as well as a list of the individual devices within the device group.
4. In the Devices area of the screen, choose the device that shows a sync status of `Changes Pending`.
5. In the Sync Options area of the screen, select **Push the selected device configuration to the group**.
6. Click **Sync**. The BIG-IP system syncs the configuration data of the selected device to the other members of the device group.
7. Verify that the devices are synchronized.

   For example, log in to another device in the device group and verify that the security policy you created also resides on that system. Click **Security** > **Application Security** > **Security Policies** and see if the policy is listed.

Except for static self IP addresses, the entire set of BIG-IP configuration data including ASM™ security policies and configuration is replicated on one or more devices in the ASM-enabled device group. If the active device is not available, the standby device becomes active and handles traffic.

You can create new security policies or update existing ones on any of the devices in the group, or update the ASM configuration options. You can manually synchronize changes you make on one device with the other devices in the ASM-enabled device group.

Implementation result

You have now set up two BIG-IP® systems running Application Security Manager™ (ASM) so that you can synchronize their security policies and configurations. With this implementation, you manually synchronize the ASM and BIG-IP configurations.

The two BIG-IP systems are in the same Sync-Failover device group. If one system becomes unavailable, the other system begins processing application traffic.

Synchronizing Application Security Configurations Across LANs

Overview: Synchronizing ASM systems across LANs

This implementation describes how to set up multiple BIG-IP® systems running Application Security Manager™ (ASM) so that you can synchronize their security policies and configurations for disaster recovery. You can use this implementation to synchronize BIG-IP ASM™ security policies and configurations on systems that reside in different network segments or LANs, such as those in separate offices or data centers. Note that traffic must be routable between the network segments. If a disaster occurs at one of the offices and both devices are disabled, the latest security policies are still available on the systems in the other location.

This implementation also configures failover between systems in a redundant pair on a particular network segment. If one of the devices in a pair goes offline for any reason, the other device in the pair begins processing the application traffic.

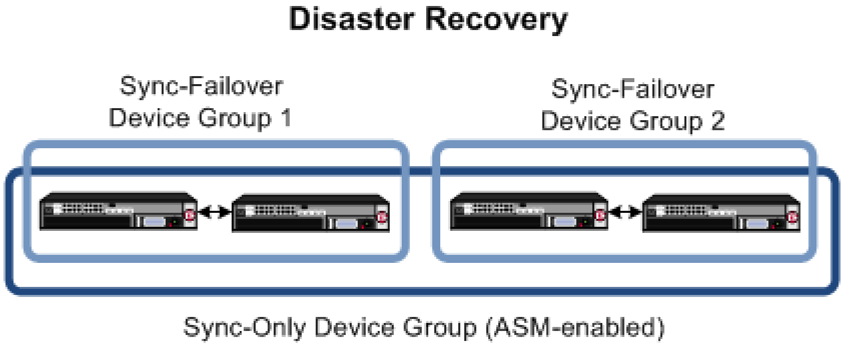
Disaster Recovery
Sync-Failover Device Group 1
Sync-Failover Device Group 2
Sync-Only Device Group (ASM-enabled)

Figure 13: Automatically synchronizing ASM configuration data across LANs

In the figure, two sets of BIG-IP systems are set up for redundancy: one active and the other standby. Each pair is in a different network segment (LAN), and there can be additional pairs, as needed. Each LAN has one pair of devices, where both have the same default routing, but routing is not the same for the devices in the other LAN.

All of the systems are running ASM and are in the trust domain. Three device groups are set up: one Sync-Failover device group for each pair (not ASM-enabled), and one Sync-Only device group with ASM enabled using automatic synchronization for all of the systems. The systems automatically duplicate the ASM configurations and security policies on all of the systems. You can manually synchronize the BIG-IP configurations of each pair of systems when needed.

Task summary

About device management and synchronizing application security configurations

You can use device management to set up several BIG-IP® systems running Application Security Manager™ (ASM) so that the systems synchronize their security policies and configurations, and fail over to one another if a system goes offline for any reason. By using application security synchronization, you can set up application security and create security policies on one system, and can propagate them to other systems in an application security device group. In BIG-IP ASM™, a *device group* is two or more BIG-IP devices using the same configuration and providing consistent security policy enforcement.

You can set up application security synchronization, for example, behind an Application Delivery Controller where multiple BIG-IP systems running Application Security Manager are deployed as members of a pool. The options and security policies on all of the systems stay in sync regardless of where you update them.

When you set up ASM™ synchronization, in addition to security policies, other settings such as custom attack signatures, logging profiles, SMTP configuration, anti-virus protection, system variables, and policy templates, are synchronized with all devices in the ASM-enabled device group.

Considerations for application security synchronization

When using device management with Application Security Manager™ (ASM™), you need to be aware of the following considerations that apply specifically to application security synchronization.

- A BIG-IP® system with Application Security Manager can be a member of only one ASM-enabled device group.
- All BIG-IP systems in a device group must be running the same version (including hot fix updates) of Application Security Manager (version 11.0 or later).
- The BIG-IP systems in the ASM-enabled device group synchronize application security configuration data and security policies, providing consistent enforcement on all the devices.
- Real Traffic Policy Builder® can run on only one system per security policy. For example, you can set up automatic security policy building on one system that is a member of an ASM-enabled device group, the policy is built on that system and then automatically updated on all of the systems in the device group.
- If using a VIPRION® platform (with multiple blades), it is considered one device, and you need to add only the master blade to the device trust and group.

Performing basic network configuration for synchronization

You need to perform basic networking configuration for each of the BIG-IP® systems whose Application Security Manager™ (ASM) configurations you want to synchronize.

1. Install the same BIG-IP system version (including any hot fixes) on each device.
2. Provision LTM® and ASM™ on each device (**System** > **Resource Provisioning**).
3. On each device, create one or more VLANs, depending on your networking configuration (**Network** > **VLANs**).
4. On each device, create a self IP (**Network** > **Self IPs**).

   When creating the self IP, set **Traffic Group** to **traffic-group-local-only (non-floating)**.
5. On each device, create a default gateway, if needed (**Network** > **Routes**).
6. On each device, configure DNS (**System** > **Configuration** > **Device** > **DNS**) and NTP (**System** > **Configuration** > **Device** > **NTP**) so they are set to the same time.
7. Verify connectivity between the devices (self IP address to self IP address). For example, use this command to ensure communications: `ping -I vlan_interface device_self_IP`
8. If your company requires special device certificates, install them on each device (**System** > **Device Certificates** and click **Import**).

The basic networking setup is complete for the BIG-IP ASM systems for which you want to share security policies and configurations.

Next, on each device, specify the IP address to use when synchronizing configuration objects to the local device:

Specifying an IP address for config sync

Before configuring the config sync address, verify that all devices in the device group are running the same version of BIG-IP® system software.

You perform this task to specify the IP address on the local device that other devices in the device group will use to synchronize their configuration objects to the local device.

***Note:** You must perform this task locally on each device in the device group.*

1. Confirm that you are logged in to the device you want to configure.
2. On the Main tab, click **Device Management** > **Devices**.
   This displays a list of device objects discovered by the local device.
3. In the Name column, click the name of the device to which you are currently logged in.
4. Near the top of the screen, click **ConfigSync**.
5. From the **Local Address** list, retain the displayed IP address or select another address from the list.

   F5 Networks recommends that you use the default value, which is the self IP address for the internal VLAN. This address must be a non-floating (static) self IP address and not a management IP address.

   ***Important:** If the BIG-IP device you are configuring is accessed using Amazon Web Services, then the internal self IP address that you select must be an internal private IP address that you configured for this EC2 instance as the **Local Address**.*
6. Click **Update**.

After performing this task, the other devices in the device group can synchronize their configurations to the local device whenever a sync operation is initiated.

Establishing device trust

Before you begin this task, verify that:

- Each BIG-IP® device that is to be part of the local trust domain has a device certificate installed on it.
- The local device is designated as a certificate signing authority.

You perform this task to establish trust among devices on one or more network segments. Devices that trust each other constitute the *local trust domain*. A device must be a member of the local trust domain prior to joining a device group.

By default, the BIG-IP software includes a local trust domain with one member, which is the local device. You can choose any one of the BIG-IP devices slated for a device group and log into that device to add other devices to the local trust domain. For example, devices `Bigip_1`, `Bigip_2`, and `Bigip_3` each initially shows only itself as a member of the local trust domain. To configure the local trust domain to include all three devices, you can simply log into device `Bigip_1` and add devices `Bigip_2` and `Bigip_3` to the local trust domain; there is no need to repeat this process on devices `Bigip_2` and `Bigip_3`.

1. On the Main tab, click **Device Management** > **Device Trust** > **Device Trust Members**.
2. Click **Add**.
3. From the **Device Type** list, select **Peer** or **Subordinate**.
4. Type a device IP address, administrator user name, and administrator password for the remote BIG-IP® device with which you want to establish trust. The IP address you specify depends on the type of BIG-IP device:

   - If the BIG-IP device is an appliance, type the management IP address for the device.

- If the BIG-IP device is a VIPRION® device that is not licensed and provisioned for vCMP®, type the primary cluster management IP address for the cluster.
- If the BIG-IP device is a VIPRION device that is licensed and provisioned for vCMP, type the cluster management IP address for the guest.
- If the BIG-IP device is an Amazon Web Services EC2 device, type one of the Private IP addresses created for this EC2 instance.

5. Click **Retrieve Device Information**.
6. Verify that the certificate of the remote device is correct, and then click **Device Certificate Matches**.
7. In the **Name** field, verify that the name of the remote device is correct.
8. Click **Add Device**.

After you perform this task, the local device is now a member of the local trust domain. Also, the BIG-IP system automatically creates a special Sync-Only device group for the purpose of synchronizing trust information among the devices in the local trust domain, on an ongoing basis.

Repeat this task to specify each device that you want to add to the local trust domain.

Creating a Sync-Failover device group

This task establishes failover capability between two or more BIG-IP® devices. If an active device in a Sync-Failover device group becomes unavailable, the configuration objects fail over to another member of the device group and traffic processing is unaffected. You perform this task on any one of the authority devices within the local trust domain.

Repeat this task for each Sync-Failover device group that you want to create for your network configuration.

1. On the Main tab, click **Device Management** > **Device Groups**.
2. On the Device Groups list screen, click **Create**.
   The New Device Group screen opens.
3. In the **Name** field, type a name for the device group.
4. From the **Group Type** list, select **Sync-Failover**.
5. In the **Description** field, type a description of the device group.

   This setting is optional.
6. From the **Configuration** list, select **Advanced**.
7. For the **Members** setting, select a host name from the **Available** list for each BIG-IP device that you want to include in the device group, including the local device. Use the Move button to move the host name to the **Includes** list.

   The **Available** list shows any devices that are members of the device's local trust domain but not currently members of a Sync-Failover device group. A device can be a member of one Sync-Failover group only. Also, for vCMP-provisioned systems on platforms that contain a hardware security module (HSM) supporting FIPS multi-tenancy, the FIPS partitions on the guests in the device group must be identical with respect to the number of SSL cores allocated to the guest's FIPS partition and the maximum number of private SSL keys that the guest can store on the HSM.
8. From the **Sync Type** list:

   - Select **Automatic with Incremental Sync** when you want the BIG-IP system to automatically sync the most recent BIG-IP configuration changes from a device to the other members of the device group. In this case, the BIG-IP system syncs the configuration data whenever the data changes on any device in the device group.
   - Select **Manual with Incremental Sync** when you want to manually initiate a config sync operation. In this case, the BIG-IP system syncs the latest BIG-IP configuration changes from the device you choose to the other members of the device group. We strongly recommend that you

perform a config sync operation whenever configuration data changes on one of the devices in the device group.

- Select **Manual with Full Sync** when you want to manually initiate a config sync operation. In this case, the BIG-IP system syncs the full set of BIG-IP configuration data from the device you choose to the other members of the device group. We strongly recommend that you perform a config sync operation whenever configuration data changes on one of the devices in the device group.

9. In the **Maximum Incremental Sync Size (KB)** field, retain the default value of `1024`, or type a different value.

   This value specifies the total size of configuration changes that can reside in the incremental sync cache. If the total size of the configuration changes in the cache exceeds the specified value, the BIG-IP system performs a full sync whenever the next config sync operation occurs.
10. For the **Network Failover** setting, select or clear the check box:

    - Select the check box if you want device group members to handle failover communications by way of network connectivity. This is the default value and is required for active-active configurations.
    - Clear the check box if you want device group members to handle failover communications by way of serial cable (hard-wired) connectivity.

    For active-active configurations, you must select network failover, as opposed to serial-cable (hard-wired) connectivity.
11. In the **Link Down Time on Failover** field, use the default value of `0.0`, or specify a new value.

    This setting specifies the amount of time, in seconds, that interfaces for any external VLANs are down when a traffic group fails over and goes to the standby state. Specifying a value other than `0.0` for this setting causes other vendor switches to use the specified time to learn the MAC address of the newly-active device.

    Important: *This setting is a system-wide setting, and does not apply to this device group only. Specifying a value in this field causes the BIG-IP system to assign this value to the global bigdb variable* `failover.standby.linkdowntime`.
12. Click **Finished**.

You now have a Sync-Failover type of device group containing BIG-IP devices as members.

Syncing the BIG-IP configuration to the device group

Before you sync the configuration, verify that the devices targeted for config sync are members of a device group and that device trust is established.

This task synchronizes the BIG-IP® configuration data from the local device to the devices in the device group. This synchronization ensures that devices in the device group operate properly. When synchronizing self IP addresses, the BIG-IP system synchronizes floating self IP addresses only.

Important: *You perform this task on either of the two devices, but not both.*

1. On the Main tab, click **Device Management** > **Overview**.
2. In the Device Groups area of the screen, click the arrow next to the name of the relevant device group.
   The screen expands to show a summary and details of the sync status of the selected device group, as well as a list of the individual devices within the device group.
3. In the Devices area of the screen, choose the device that shows a sync status of `Changes Pending`.
4. In the Sync Options area of the screen, select **Push the selected device configuration to the group**.
5. Click **Sync**.

The BIG-IP system syncs the configuration data of the selected device to the other members of the device group.

After performing this task, all BIG-IP configuration data that is eligible for synchronization to other devices is replicated on each device in the device group.

Specifying IP addresses for failover communication

You perform this task to specify the local IP addresses that you want other devices in the device group to use for continuous health-assessment communication with the local device. You must perform this task locally on each device in the device group.

***Note:** The IP addresses that you specify must belong to route domain* `0`.

1. Confirm that you are logged in to the device you want to configure.
2. On the Main tab, click **Device Management** > **Devices**.
   This displays a list of device objects discovered by the local device.
3. In the Name column, click the name of the device to which you are currently logged in.
4. Near the top of the screen, click **Failover Network**.
5. Click **Add**.
6. From the **Address** list, select an IP address.

   The unicast IP address you select depends on the type of device:

Platform	Action
Appliance without vCMP	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`) and the static management IP address currently assigned to the device.
Appliance with vCMP	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`) and the unique management IP address currently assigned to the guest.
VIPRION without vCMP®	Select a static self IP address associated with an internal VLAN (preferably VLAN `HA`). If you choose to select unicast addresses only (and not a multicast address), you must also specify the existing, static management IP addresses that you previously configured for all slots in the cluster. If you choose to select one or more unicast addresses and a multicast address, then you do not need to select the existing, per-slot static management IP addresses when configuring addresses for failover communication.
VIPRION with vCMP	Select a self IP address that is defined on the guest and associated with an internal VLAN on the host (preferably VLAN `HA`). If you choose to select unicast failover addresses only (and not a multicast address), you must also select the existing, virtual static management IP addresses that you previously configured for all slots in the guest's virtual cluster. If you choose to select one or more unicast addresses and a multicast address, you do not need to select the existing, per-slot static and virtual management IP addresses when configuring addresses for failover communication.

   ***Important:** Failover addresses should always be static, not floating, IP addresses.*

7. From the **Port** list, select a port number.

   We recommend using port **1026** for failover communication.
8. To enable the use of a failover multicast address on a VIPRION® platform (recommended), then for the **Use Failover Multicast Address** setting, select the **Enabled** check box.

9. If you enabled **Use Failover Multicast Address**, either accept the default **Address** and **Port** values, or specify values appropriate for the device.

   If you revise the default **Address** and **Port** values, but then decide to revert to the default values, click **Reset Defaults**.
10. Click **Finished**.

After you perform this task, other devices in the device group can send failover messages to the local device using the specified IP addresses.

Creating a Sync-Only device group

You perform this task to create a Sync-Only type of device group. When you create a Sync-Only device group, the BIG-IP® system can then automatically synchronize configuration data in folders attached to the device group (such as security policies and acceleration applications) with the other devices in the group, even when some of those devices reside in another network.

Note: *You perform this task on any one BIG-IP device within the local trust domain; there is no need to repeat this process on the other devices in the device group.*

1. On the Main tab, click **Device Management** > **Device Groups**.
2. Find the **Partition** list in the upper right corner of the BIG-IP Configuration utility screen, to the left of the **Log out** button.
3. From the **Partition** list, pick partition `Common`.
4. On the Device Groups list screen, click **Create**.
   The New Device Group screen opens.
5. Type a name for the device group, select the device group type **Sync-Only**, and type a description for the device group.
6. From the **Configuration** list, select **Advanced**.
7. For the **Members** setting, select a host name from the **Available** list for each BIG-IP device that you want to include in the device group. Use the Move button to move the host name to the **Includes** list.

   The list shows any devices that are members of the device's local trust domain.
8. For the **Automatic Sync** setting, specify whether configuration synchronization occurs manually or automatically:

   - Select the check box when you want the BIG-IP system to automatically sync the BIG-IP configuration data whenever a config sync operation is required. In this case, the BIG-IP system syncs the configuration data whenever the data changes on any device in the device group.
   - Clear the check box when you want to manually initiate each config sync operation. In this case, F5 networks recommends that you perform a config sync operation whenever configuration data changes on one of the devices in the device group.
9. For the **Full Sync** setting, specify whether the system synchronizes the entire configuration during synchronization operations:

   - Select the check box when you want all sync operations to be full syncs. In this case, every time a config sync operation occurs, the BIG-IP system synchronizes all configuration data associated with the device group. This setting has a performance impact and is not recommended for most customers.
   - Clear the check box when you want all sync operations to be incremental (the default setting). In this case, the BIG-IP system syncs only the changes that are more recent than those on the target device. When you select this option, the BIG-IP system compares the configuration data on each target device with the configuration data on the source device and then syncs the delta of each target-source pair.

If you enable incremental synchronization, the BIG-IP system might occasionally perform a full sync for internal reasons. This is a rare occurrence and no user intervention is required.

10. In the **Maximum Incremental Sync Size (KB)** field, retain the default value of `1024`, or type a different value.

    This value specifies the total size of configuration changes that can reside in the incremental sync cache. If the total size of the configuration changes in the cache exceeds the specified value, the BIG-IP system performs a full sync whenever the next config sync operation occurs.
11. Click **Finished**.

You now have a Sync-Only type of device group containing BIG-IP devices as members.

Enabling ASM synchronization on a Sync-Only device group

You need to have set up the BIG-IP®systems you want to synchronize in a device trust and a device group. Application Security Manager™ (ASM) must be provisioned on all the systems in the device group.

You can enable ASM™ synchronization on a device group to synchronize security policies and configurations on all devices in the device group. You do this task on one system, for example, the active system in an active-standby pair.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Synchronization**.
   The system displays a list of device groups of which this device is a member.
2. For **Device Group**, select the Sync-Only device group you created.
3. Click **Save**.

The BIG-IP ASM™ systems that you want to share security policies and configurations are part of a Sync-Only device group with ASM synchronization.

Synchronizing an ASM-enabled device group

You need to have set up the BIG-IP® Application Security Manager™ (ASM) systems you want to synchronize in a Sync-Failover device group that is ASM™-enabled.

You can manually synchronize security policies and configuration of systems in an ASM-enabled device group.

1. On one system in the ASM-enabled failover device group, create an application security policy.
   Because the two systems are not in sync, you see a **Changes Pending** status message on the screen.
2. Click the **Changes Pending** message.

   Tip: *You can also click **Device Management** > **Overview**.*

   The Overview screen opens.
3. In the Device Groups area of the screen, click the arrow next to the name of the relevant device group.
   The screen expands to show a summary and details of the sync status of the selected device group, as well as a list of the individual devices within the device group.
4. In the Devices area of the screen, choose the device that shows a sync status of `Changes Pending`.
5. In the Sync Options area of the screen, select **Push the selected device configuration to the group**.
6. Click **Sync**.
   The BIG-IP system syncs the configuration data of the selected device to the other members of the device group.
7. Verify that the devices are synchronized.

For example, log in to another device in the device group and verify that the security policy you created also resides on that system. Click **Security** > **Application Security** > **Security Policies** and see if the policy is listed.

Except for static self IP addresses, the entire set of BIG-IP configuration data including ASM™ security policies and configuration is replicated on one or more devices in the ASM-enabled device group. If the active device is not available, the standby device becomes active and handles traffic.

You can create new security policies or update existing ones on any of the devices in the group, or update the ASM configuration options. You can manually synchronize changes you make on one device with the other devices in the ASM-enabled device group.

Implementation result

You have set up disaster recovery for multiple BIG-IP® systems running Application Security Manager™ (ASM). Each office or data center has an active system and a standby that takes over if the active system should fail. You must manually synchronize the BIG-IP configuration from one system to the other if you change the configuration.

You can create new security policies or update existing ones on any of the devices in the group, or update the ASM™ configuration options (**Application Security**>**Options**). Any changes you make on one device are automatically synchronized with the other devices in the ASM-enabled Sync-Only device group.

If Attack Signatures **Update Mode** is scheduled for automatic update, the attack signature update settings are synchronized. Each device in the device group updates itself independently according to the configured schedule. If you manually upload attack signatures or click **Upload Signatures** to update from the server, the update is propagated to all of the devices in the device group.

Integrating ASM with Database Security Products

Overview: Integrating ASM with database security products

You can deploy Application Security Manager™ (ASM) with database security products, such as IBM® InfoSphere® Guardium® to increase security visibility, receive alerts about suspicious activity, and prevent attacks. When integrated with database security, ASM™ provides information about each HTTP request and database query to the database security product's logging and reporting system. This allows the database security system to correlate the web transaction with the database query to make a security assessment of the transaction.

Before you can integrate ASM with a database security product, the database security server itself must have been configured, and be accessible from ASM. On the BIG-IP ®system, you specify the host name or IP address of the database security server. Then, you enable database security integration for one or more security policies that are set up to protect web application resources.

When using database security, Application Security Manager monitors web application traffic and sends information about the users, the requests, and the reporting events to the database security server. The following figure shows an example of how ASM can integrate with the IBM InfoSphere Guardium Database Activity Monitoring Appliance.

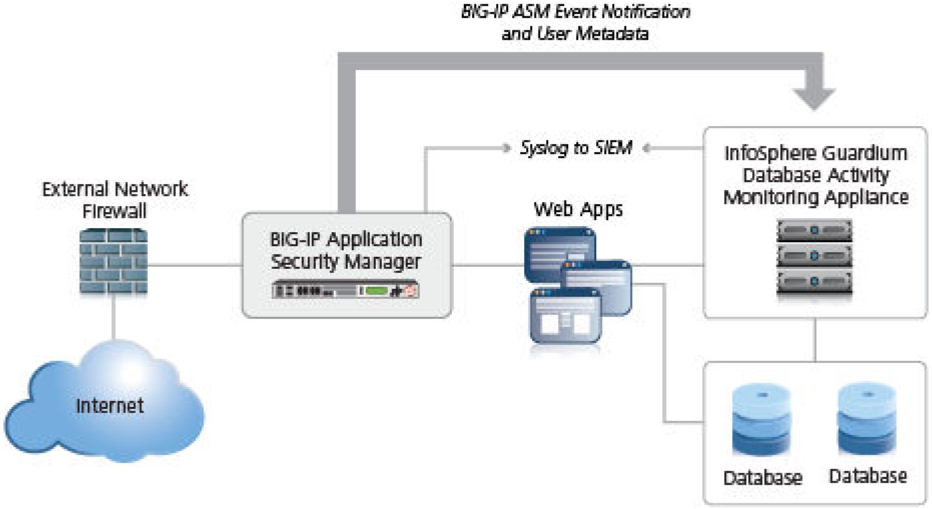
BIG-IP ASM Event Notification and User Metadata
Syslog to SIEM
External Network Firewall
BIG-IP Application Security Manager
Web Apps
InfoSphere Guardium Database Activity Monitoring Appliance
Internet
Database
Database

Figure 14: Integrating ASM with external database security example

The security policy can get user names from requests using login pages configured from within ASM, or the policy can retrieve the user names from Access Policy Manager® (APM). This implementation describes how to integrate with an external database security server using login pages.

When using login pages for the application, you define the URLs, parameters, and validation criteria required for users to log in to the application. User and session information is included in the system logs so you can track a particular session or user. The system can log activity, or block a user or session if either generates too many violations.

Task Summary

Creating a simple security policy

Before you can create a security policy, you must perform the minimal system configuration tasks required according to the needs of your networking environment.

You can use Application Security Manager™ to create a robust, yet simple, security policy that is tailored to protect your web application. This is the easiest way to create a security policy.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies** > **Policies List**.
   The Policies List screen opens.
2. Click **Create New Policy**.

   You only see this button when no policy is selected.
3. In the **Policy Name** field, type a name for the policy.
4. Leave **Policy Type**, set to **Security**.
5. For **Policy Template**, select **Fundamental**.
6. For **Virtual Server**, click **Configure new virtual server** to specify where to direct application requests.
   a) For **What type of protocol does your application use?**, select **HTTP**, **HTTPS**, or both.
   b) In the **Virtual Server Name** field, type a unique name.
   c) In the **HTTP Virtual Server Destination** field, type the address in IPv4 (`10.0.0.1`) or IPv6 (`2001:ed8:77b5:2:10:10:100:42/64`) format, and specify the service port.

   Tip: *If you want multiple IP addresses to be directed here, use the* ***Network*** *setting.*

   d) In the HTTP Pool Member setting, specify the addresses of the back-end application servers.
   e) From the **Logging Profile** list, select a profile such as **Log illegal requests** to determine which events are logged on the system.
7. In the upper right corner, click **Advanced**.

   You can use default values for the Advanced settings but it's a good idea to take a look at them.

   - If you selected **Fundamental** or **Comprehensive** for the **Policy Template**, **Learning Mode** is set to **Automatic** and **Enforcement Mode** is set to **Blocking**.

     Tip: *If you need to change these values, set application language to a value other than* ***Auto detect****.*

   - If you know the **Application Language**, select it or use **Unicode (utf-8)**.
   - To add specific protections (enforcing additional attack signatures) to the policy, for **Server Technologies**, select the technologies that apply to the back-end application servers.
   - You can configure trusted IP addresses that you want the security policy to consider safe.
8. Click **Create Policy** to create the security policy.

ASM™ creates a security policy that immediately starts protecting your application. The enforcement mode of the security policy is set to Blocking. Traffic that is considered to be an attack such as traffic that is not compliant with HTTP protocol, has malformed payloads, uses evasion techniques, performs web scraping, contains sensitive information or illegal values is blocked. Other potential violations are reported but not blocked.

The system examines the traffic to the web application making suggestions for more specifically building the security policy. The Policy Builder selectively learns new entities like file types, parameters, and cookies used in requests to the application. When ASM processes sufficient traffic, it automatically adds the entities to the security policy, and enforces them.

The system applies a basic set of attack signatures to the security policy and puts them in staging (by default, for 7 days). If you specified server technologies, additional attack signatures are included. ASM reports common attacks discovered by comparison to the signatures but does not block these attacks until the staging period is over and they are enforced. That gives you a chance to be sure that these are actual attacks and not legitimate requests.

Tip: *This is a good point at which send some traffic to test that you can access the application being protected by the security policy and check that traffic is being processed correctly by the BIG-IP® system. Send the traffic to the virtual server destination address.*

Creating login pages manually

Before you can create a login page manually, you need to be familiar with the login URL or URLs the application the security policy is protecting.

In your security policy, you can create a login page manually to specify a login URL that presents a site that users must pass through to gain access to the web application. The login URL commonly leads to the login page of the web application.

Note: *You can also have the system create login pages automatically by selecting* ***Detect login pages*** *on the Learning and Blocking Settings screen.*

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins**.
   The Login Pages List screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Click **Create**.
   The New Login Page screen opens.
4. For the **Login URL** setting, specify a URL that users must pass through to get to the application.
   a) From the list, select the type of URL: **Explicit** or **Wildcard**.
   b) Select either **HTTP** or **HTTPS** based on the type of traffic the web application accepts.
   c) Type an explicit URL or wildcard expression in the field.

   When you click in the field, the system lists URLs that it has seen, and you can select a URL from the list. Or, you can type explicit URLs in the format `/login`, and wildcard URLs without the slash, such as `*.php`.

   Wildcard syntax is based on shell-style wildcard characters. This table lists the wildcard characters that you can use so that the entity name can match multiple objects.

Wildcard Character	Matches
*	All characters
?	Any single character.
[abcde]	Exactly one of the characters listed.
[!abcde]	Any character not listed.
[a-e]	Exactly one character in the range.
[!a-e}	Any character not in the range.

   Note that wildcards do not match regular expressions.
5. From the **Authentication Type** list, select the method the web server uses to authenticate the login URL's credentials with a web user.

Option	Description
None	The web server does not authenticate users trying to access the web application through the login URL. This is the default setting.
HTML Form	The web application uses a form to collect and authenticate user credentials. If using this option, you also need to type the user name and password parameters written in the code of the HTML form.
HTTP Basic Authentication	The user name and password are transmitted in Base64 and stored on the server in plain text.
HTTP Digest Authentication	The web server performs the authentication; user names and passwords are not transmitted over the network, nor are they stored in plain text.
NTLM	Microsoft LAN Manager authentication (also called Integrated Windows Authentication) does not transmit credentials in plain text, but requires a continuous TCP connection between the server and client.
JSON/AJAX Request	The web server uses JSON and AJAX requests to authenticate users trying to access the web application through the login URL. For this option, you also need to type the name of the JSON element containing the user name and password.

6. In the Access Validation area, define at least one validation criteria for the login page response.

   If you define more than one validation criteria, the response must meet all the criteria before the system allows the user to access the application login URL.

   Note: *The system checks the access validation criteria on the response of the login URL only if the response has one of the following content-types: text/html, text/xml, application/sgml, application/xml, application/html, application/xhtml, application/x-asp, or application/x-aspx.*

7. Click **Create** to add the login page to the security policy.
   The new login page is added to the login pages list.
8. Add as many login pages as needed for your web application.
9. In the editing context area, click **Apply Policy** to put the changes into effect.

The security policy now has one or more login pages associated with it. They are included in the Login Pages List.

You can use the login pages you created for login enforcement, brute force protection, or session awareness.

Enforcing login pages

Login enforcement settings prevent forceful browsing attacks where attackers gain access to restricted parts of the web application by supplying a URL directly. You can use login enforcement to force users to pass through one URL (known as the *login URL*) before being allowed to display a different URL (known as the *target URL*) where they can access restricted pages and resources.

Login enforcement indicates how the security policy implements login pages including an optional expiration time, a list of URLs that require authentication to get to, and a list of URLs used to log out of the application. You can also use authenticated URLs to enforce idle time-outs on applications that are missing this functionality.

1. On the Main tab, click **Security** > **Application Security** > **Sessions and Logins** > **Login Enforcement**.
   The Login Enforcement screen opens.
2. If you want the login URL to be valid for a limited time, set **Expiration Time** to **Enabled**, and type a value, in seconds (1-99999) that indicates how long the session will last.

If enabled, the login session ends after the number of seconds has passed.

3. For the **Authenticated URLs** setting, specify the target URLs that users can access only by way of the login URL:
   a) In the **Authenticated URLs (Wildcards supported)** field, type the target URL name in the format `/private.php` (wildcards are allowed).
   b) Click **Add** to add the URL to the list of authenticated URLs.
   c) Repeat to add as many authenticated URLs as needed.
4. Click **Save** to save your settings.
5. To put the security policy changes into effect immediately, click **Apply Policy**.

If you specify authenticated URLs and a user tries to access them, bypassing the login URL (specified in a Login Page), the system issues the `Login URL bypassed` violation. If a user session is idle and exceeds the expiration time, the system issues the `Login URL expired` violation, logs the user out, and as a result, the user can no longer reach the authenticated URLs. For both login violations, if the enforcement mode is blocking, the system now sends the Login Page Response to the client (see **Application Security** > **Policy** > **Response Pages**).

Configuring a database security server

To integrate Application Security Manager™ (ASM) with a third-party database security product, you need to configure the database security server on ASM™. You can configure one database security server per system.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Integrated Services** > **Database Security**.
   The Database Security Configuration screen opens.
2. In the **Server Host Name/IP Address** field, type the host name or IP address of the database security server.

   Note: *If using SSL to establish a secured session between the BIG-IP ®system and the database security server, type the IP address of a virtual server configured for the secure connection. The virtual server uses any open IP address for the destination, the IBM Guardium port (16016, by default) for the service port, `serverssl` or a customized profile for the **SSL Profile (Server)** setting, and specifies a default pool (containing one member, the database security server, using its IP address and service port, typically, 16016).*

3. For **Server Port Number**, type the port number of the database server.

   The default value is 16016, the port used by IBM® InfoSphere® Guardium.®
4. If you want the system to wait for an ACK response from the database security server before sending the request to the application server, from the **Request Hold Timeout** list, select **Enabled** and type the number of milliseconds to wait for the response.

   The default value is 5 milliseconds.

   When this setting is enabled, the system forwards the request to the application server as soon as the database security server sends an ACK, or when the timeout has passed. If you leave this setting disabled, the system forwards the request to the application server immediately.
5. Click **Save**.
   The system saves the configuration settings.

The Application Security Manager is now configured to connect to the database security server.

For ASM to forward request data to the database security server, you next need to enable database security integration in one or more security policies.

Enabling database security integration in a security policy

Before you can enable database security integration, you need to have created a security policy to protect your web application. For the policy to retrieve the user names of those making requests, you need to create login pages in Application Security Manager™ (ASM).

You enable database security integration in a security policy so that ASM™ forwards request information to a third-party database server.

1. On the Main tab, click **Security** > **Application Security** > **Integrated Services** > **Database Security**.
   The Database Security screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. If you haven't configured your database security server, click the link in the message and do that now.
4. Select the **Database Security Integration** check box.
5. For **User Source**, select **Use Login Pages** to have the system use an ASM login page to determine the user source.

   If there is no login page configured in the security policy, click the login pages link to open a popup screen where you can add one.
6. Click **Save**.
   The system saves the configuration settings.

The Application Security Manager connects to the database security server and can forward request data about traffic to it.

Implementation result

You have set up a BIG-IP® system to use Application Security Manager™ (ASM) to secure application traffic and use login pages to check user credentials.

Client traffic is routed to the virtual server for the web application. ASM™ analyzes the request and checks for security violations. ASM also verifies user credentials on the login page and sends the database security server a request notification. When ASM receives an acknowledgment from the database security server or the request hold timeout is over, ASM forwards traffic that meets the security policy requirements to the application.

The database security server includes the application and user information provided by ASM, so it can be viewed in logs and reports on that system. The database security server can perform a more in-depth security assessment of the web request.

If you want to review reports and event logs that associate the user name with the session information on the BIG-IP system, you can set up session tracking (by enabling session awareness). When session awareness is enabled, you can see the user names on the Event Logs: Application: Requests screen in the General Details section of specific requests. In addition, the Reporting: Application: Charts screen displays the users who sent the illegal requests.

Integrating ASM and APM with Database Security Products

Overview: Integrating ASM and APM with database security products

You can deploy Application Security Manager™ (ASM) and Access Policy Manager®(APM®) with database security products, such as IBM® InfoSphere® Guardium® to increase security visibility, receive alerts about suspicious activity, and prevent attacks. When integrated with database security, ASM™ can provide information about each HTTP request and database query. This allows the database security system to correlate the web transaction with the database query to make a security assessment of the transaction. ASM also provides application level details to improve the database security system's logging and reporting.

For you to integrate ASM with a database security product, the database security server itself must have been configured and accessible on the network. On the BIG-IP® system, you specify the host name or IP address of the database security server. Then, you enable database security integration for one or more security policies that are set up to protect web application resources.

When using database security, Application Security Manager monitors web application traffic and sends information about the users, the requests, and reporting events to the database security server. The following figure shows an example of how ASM can integrate with the IBM InfoSphere Guardium Database Activity Monitoring Appliance.

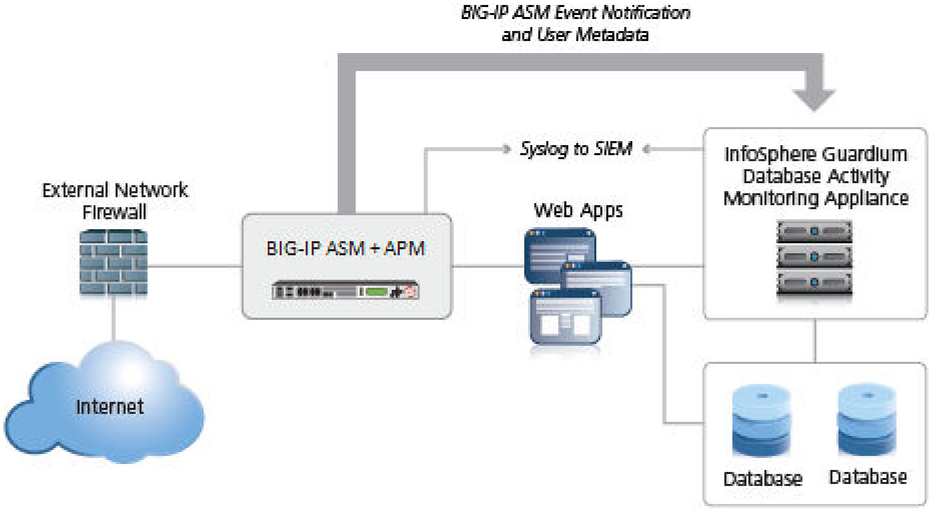

Figure 15: Integrating ASM and APM with external database security example

The security policy can get user names from requests using login pages configured from within ASM, or the policy can retrieve the user names from Access Policy Manager®(APM). This implementation describes how to integrate ASM and APM™ with an external database security server. APM handles user authentication in this case and provides the information that is sent to the database security server.

Prerequisites for integrating ASM and APM with database security

In order to integrate a database security server from within Application Security Manager™ (ASM™) so that the security policy retrieves the user names from Access Policy Manager ®(APM®), you need to perform basic these system configuration tasks according to the needs of your networking configuration:

- Run the setup utility and create a management IP address.
- License and provision ASM, APM, and Local Traffic Manager™ (LTM®).
- Configure a DNS address (**System** > **Configuration** > **Device** > **DNS**).
- Configure an NTP server (**System** > **Configuration** > **Device** > **NTP**).
- Restart ASM (at the command line, type `tmsh restart /sys service asm`).

Task Summary

Creating a VLAN

VLANs represent a logical collection of hosts that can share network resources, regardless of their physical location on the network. You create a VLAN to associate physical interfaces with that VLAN.

1. On the Main tab, click **Network** > **VLANs**.
   The VLAN List screen opens.
2. Click **Create**.
   The New VLAN screen opens.
3. In the **Name** field, type a unique name for the VLAN.
4. In the **Tag** field, type a numeric tag, between 1-4094, for the VLAN, or leave the field blank if you want the BIG-IP system to automatically assign a VLAN tag.

   The VLAN tag identifies the traffic from hosts in the associated VLAN.
5. If you want to use Q-in-Q (double) tagging, use the **Customer Tag** setting to perform the following two steps. If you do not see the **Customer Tag** setting, your hardware platform does not support Q-in-Q tagging and you can skip this step.
   a) From the **Customer Tag** list, select **Specify**.
   b) Type a numeric tag, from 1-4094, for the VLAN.

   The customer tag specifies the inner tag of any frame passing through the VLAN.
6. For the **Interfaces** setting,
   a) From the **Interface** list, select an interface number.
   b) From the **Tagging** list, select **Untagged**.
   c) Click **Add**.
7. For the **Hardware SYN Cookie** setting, select or clear the check box.

   When you enable this setting, the BIG-IP system triggers hardware SYN cookie protection for this VLAN.

   Enabling this setting causes additional settings to appear. These settings appear on specific BIG-IP platforms only.
8. For the **Syncache Threshold** setting, retain the default value or change it to suit your needs.

   The **Syncache Threshold** value represents the number of outstanding SYN flood packets on the VLAN that will trigger the hardware SYN cookie protection feature.

   When the **Hardware SYN Cookie** setting is enabled, the BIG-IP system triggers SYN cookie protection in either of these cases, whichever occurs first:

   - The number of TCP half-open connections defined in the LTM® setting **Global SYN Check Threshold** is reached.
   - The number of SYN flood packets defined in this **Syncache Threshold** setting is reached.
9. For the **SYN Flood Rate Limit** setting, retain the default value or change it to suit your needs.

   The **SYN Flood Rate Limit** value represents the maximum number of SYN flood packets per second received on this VLAN before the BIG-IP system triggers hardware SYN cookie protection for the VLAN.
10. Click **Finished**.

The screen refreshes, and displays the new VLAN in the list.

Creating a self IP address for a VLAN

Ensure that you have at least one VLAN configured before you create a self IP address.

Self IP addresses enable the BIG-IP® system, and other devices on the network, to route application traffic through the associated VLAN.

1. On the Main tab, click **Network** > **Self IPs**.
2. Click **Create**.
   The New Self IP screen opens.
3. In the **Name** field, type a unique name for the self IP address.
4. In the **IP Address** field, type an IPv4 or IPv6 address.

   This IP address should represent the address space of the VLAN that you specify with the **VLAN/ Tunnel** setting.
5. In the **Netmask** field, type the network mask for the specified IP address.

   For example, you can type `255.255.255.0`.
6. From the **VLAN/Tunnel** list, select the VLAN to associate with this self IP address.

   - On the internal network, select the internal or high availability VLAN that is associated with an internal interface or trunk.
   - On the external network, select the external VLAN that is associated with an external interface or trunk.
7. Use the default values for all remaining settings.
8. Click **Finished**.
   The screen refreshes, and displays the new self IP address.

The BIG-IP system can now send and receive TCP/IP traffic through the specified VLAN.

Creating a local traffic pool for application security

You can use a local traffic pool with Application Security Manager™ system to forward traffic to the appropriate resources.

***Note:** Instead of doing it now, you can optionally create a pool if creating a virtual server during security policy creation.*

1. On the Main tab, click **Local Traffic** > **Pools**.
   The Pool List screen opens.
2. Click **Create**.
   The New Pool screen opens.
3. In the **Name** field, type a unique name for the pool.
4. In the Resources area, for the **New Members** setting, add to the pool the application servers that host the web application:
   a) Type an IP address in the **Address** field.
   b) In the **Service Port** field, type a port number (for example, type `80` for the HTTP service), or select a service name from the list.
   c) Click **Add**.
5. Click **Finished**.

The BIG-IP® system configuration now includes a local traffic pool containing the resources that you want to protect using Application Security Manager™.

Creating a virtual server to manage HTTPS traffic

You can create a virtual server to manage HTTPS traffic.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the **Create** button.
   The New Virtual Server screen opens.
3. In the **Name** field, type a unique name for the virtual server.
4. In the **Service Port** field, type `443` or select **HTTPS** from the list.
5. From the **Configuration** list, select **Advanced**.
6. From the **HTTP Profile** list, select **http**.
7. For the **SSL Profile (Client)** setting, from the **Available** list, select **clientssl**, and using the Move button, move the name to the **Selected** list.
8. (Optional) From the **SSL Profile (Server)** list, select **serverssl**.

   Note: *This setting ensures that there is an SSL connection between the HTTP virtual server and the external HTTPS server.*

9. From the **Source Address Translation** list, select **Auto Map**.
10. From the **Default Pool** list, select the pool that is configured for application security.
11. Click **Finished**.

The HTTPS virtual server appears in the Virtual Server List screen.

Creating a simple security policy

Before you can create a security policy, you must perform the minimal system configuration tasks required according to the needs of your networking environment.

You can use Application Security Manager™ to create a robust, yet simple, security policy that is tailored to protect your web application. This is the easiest way to create a security policy.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies** > **Policies List**.
   The Policies List screen opens.
2. Click **Create New Policy**.

   You only see this button when no policy is selected.
3. In the **Policy Name** field, type a name for the policy.
4. Leave **Policy Type**, set to **Security**.
5. For **Policy Template**, select **Fundamental**.
6. For **Virtual Server**, click **Configure new virtual server** to specify where to direct application requests.
   a) For **What type of protocol does your application use?**, select **HTTP**, **HTTPS**, or both.
   b) In the **Virtual Server Name** field, type a unique name.
   c) In the **HTTP Virtual Server Destination** field, type the address in IPv4 (`10.0.0.1`) or IPv6 (`2001:ed8:77b5:2:10:10:100:42/64`) format, and specify the service port.

   Tip: *If you want multiple IP addresses to be directed here, use the* ***Network*** *setting.*

   d) In the HTTP Pool Member setting, specify the addresses of the back-end application servers.
   e) From the **Logging Profile** list, select a profile such as **Log illegal requests** to determine which events are logged on the system.

7. In the upper right corner, click **Advanced**.

   You can use default values for the Advanced settings but it's a good idea to take a look at them.

   - If you selected **Fundamental** or **Comprehensive** for the **Policy Template**, **Learning Mode** is set to **Automatic** and **Enforcement Mode** is set to **Blocking**.

     Tip: *If you need to change these values, set application language to a value other than* ***Auto detect****.*

   - If you know the **Application Language**, select it or use **Unicode (utf-8)**.
   - To add specific protections (enforcing additional attack signatures) to the policy, for **Server Technologies**, select the technologies that apply to the back-end application servers.
   - You can configure trusted IP addresses that you want the security policy to consider safe.
8. Click **Create Policy** to create the security policy.

ASM™ creates a security policy that immediately starts protecting your application. The enforcement mode of the security policy is set to Blocking. Traffic that is considered to be an attack such as traffic that is not compliant with HTTP protocol, has malformed payloads, uses evasion techniques, performs web scraping, contains sensitive information or illegal values is blocked. Other potential violations are reported but not blocked.

The system examines the traffic to the web application making suggestions for more specifically building the security policy. The Policy Builder selectively learns new entities like file types, parameters, and cookies used in requests to the application. When ASM processes sufficient traffic, it automatically adds the entities to the security policy, and enforces them.

The system applies a basic set of attack signatures to the security policy and puts them in staging (by default, for 7 days). If you specified server technologies, additional attack signatures are included. ASM reports common attacks discovered by comparison to the signatures but does not block these attacks until the staging period is over and they are enforced. That gives you a chance to be sure that these are actual attacks and not legitimate requests.

Tip: *This is a good point at which send some traffic to test that you can access the application being protected by the security policy and check that traffic is being processed correctly by the BIG-IP® system. Send the traffic to the virtual server destination address.*

Creating an access profile

You create an access profile to provide the access policy configuration for a virtual server that establishes a secured session.

1. On the Main tab, click **Access** > **Profiles / Policies**.
   The Access Profiles (Per-Session Policies) screen opens.
2. Click **Create**.
   The New Profile screen opens.
3. In the **Name** field, type a name for the access profile.

   Note: *A access profile name must be unique among all access profile and any per-request policy names.*

4. From the **Profile Type** list, select **SSL-VPN**.
   Additional settings display.
5. From the **Profile Scope** list, retain the default value or select another.

   - **Profile**: Gives a user access only to resources that are behind the same access profile. This is the default value.

- **Virtual Server**: Gives a user access only to resources that are behind the same virtual server.
- **Global**: Gives a user access to resources behind any access profile that has global scope.

6. To configure timeout and session settings, select the **Custom** check box.
7. In the **Inactivity Timeout** field, type the number of seconds that should pass before the access policy times out. Type `0` to set no timeout.

   If there is no activity (defined by the **Session Update Threshold** and **Session Update Window** settings in the Network Access configuration) between the client and server within the specified threshold time, the system closes the current session.
8. In the **Access Policy Timeout** field, type the number of seconds that should pass before the access profile times out because of inactivity.

   Type `0` to set no timeout.
9. In the **Maximum Session Timeout** field, type the maximum number of seconds the session can exist.

   Type `0` to set no timeout.
10. In the **Max Concurrent Users** field, type the maximum number of users that can use this access profile at the same time.

    Type `0` to set no maximum.
11. In the **Max Sessions Per User** field, type the maximum number of concurrent sessions that one user can start.

    Type `0` to set no maximum.

    Note: *Only a user in the administrator, application editor, manager, or resource administrator role has access to this field.*
12. In the **Max In Progress Sessions Per Client IP** field, type the maximum number of concurrent sessions that can be in progress for a client IP address.

    When setting this value, take into account whether users will come from a NAT-ed or proxied client address and, if so, consider increasing the value accordingly. The default value is 128.

    Note: *Only a user in the administrator, application editor, manager, or resource administrator role has access to this field.*

    Note: *F5 does not recommend setting this value to `0` (unlimited).*
13. Select the **Restrict to Single Client IP** check box to restrict the current session to a single IP address.

    This setting associates the session ID with the IP address.

    Note: *Only a user in the administrator, application editor, manager, or resource administrator role has access to this field.*

    Upon a request to the session, if the IP address has changed the request is redirected to a logout page, the session ID is deleted, and a log entry is written to indicate that a session hijacking attempt was detected. If such a redirect is not possible, the request is denied and the same events occur.
14. To configure logout URIs, in the Configurations area, type each logout URI in the **URI** field, and then click **Add**.
15. In the **Logout URI Timeout** field, type the delay in seconds before logout occurs for the customized logout URIs defined in the **Logout URI Include** list.
16. To configure SSO:

    - For users to log in to multiple domains using one SSO configuration, skip the settings in the SSO Across Authentication Domains (Single Domain mode) area. You can configure SSO for multiple domains only after you finish the initial access profile configuration.

- For users to log in to a single domain using an SSO configuration, configure settings in the SSO Across Authentication Domains (Single Domain mode) area, or you can configure SSO settings after you finish the initial access profile configuration.

17. In the **Domain Cookie** field, specify a domain cookie, if the application access control connection uses a cookie.
18. In the **Cookie Options** setting, specify whether to use a secure cookie.
    - If the policy requires a secure cookie, select the **Secure** check box to add the **secure** keyword to the session cookie.
    - If you are configuring an LTM access scenario that uses an HTTPS virtual server to authenticate the user and then sends the user to an existing HTTP virtual server to use applications, clear this check box.
19. If the access policy requires a persistent cookie, in the **Cookie Options** setting, select the **Persistent** check box.

    This sets cookies if the session does not have a webtop. When the session is first established, session cookies are not marked as persistent; but when the first response is sent to the client after the access policy completes successfully, the cookies are marked persistent. Persistent cookies are updated for the expiration timeout every 60 seconds. The timeout is equal to session inactivity timeout. If the session inactivity timeout is overwritten in the access policy, the overwritten value will be used to set the persistent cookie expiration.
20. From the **SSO Configurations** list, select an SSO configuration.
21. In the Language Settings area, add and remove accepted languages, and set the default language.

    A browser uses the highest priority accepted language. If no browser language matches the accepted languages list, the browser uses the default language.
22. Click **Finished**.

The access profile displays in the Access Profiles List. Default-log-setting is assigned to the access profile.

To add an SSO configuration for multiple domains, click **SSO / Auth Domains** on the menu bar. To provide functionality with an access profile, you must configure the access policy. The default access policy for a profile denies all traffic and contains no actions. Click **Edit** in the **Access Policy** column to edit the access policy.

Configuring an access policy

You configure an access policy to provide authentication, endpoint checks, and resources for an access profile. This procedure configures a simple access policy that adds a logon page, gets user credentials, submits them to an authentication type of your choice, then allows authenticated users, and denies others.

1. On the Main tab, click **Access** > **Profiles / Policies**.
   The Access Profiles (Per-Session Policies) screen opens.
2. Click the name of the access profile you want to edit.
3. On the menu bar, click **Access Policy**.
4. For the **Visual Policy Editor** setting, click the **Edit access policy for Profile** ***`policy_name`*** link.
   The visual policy editor opens the access policy in a separate window or tab.
5. Click the **(+)** icon anywhere in the access policy to add a new item.

   Note: *Only an applicable subset of access policy items is available for selection in the visual policy editor for any access profile type.*

   A popup screen opens, listing predefined actions on tabs such as General Purpose, Authentication, and so on.
6. On the Logon tab, select **Logon Page** and click the **Add Item** button.

The Logon Page Agent properties screen opens.

7. Click **Save**.
   The Access Policy screen reopens.
8. On the rule branch, click the plus sign **(+)** between **Logon Page** and **Deny**.
9. Set up the appropriate authentication and client-side checks required for application access at your company, and click **Add Item**.
10. Change the Successful rule branch from **Deny** to **Allow** and click the **Save** button.
11. If needed, configure further actions on the successful and fallback rule branches of this access policy item, and save the changes.
12. At the top of the screen, click the **Apply Access Policy** link to apply and activate your changes to this access policy.
13. Click the **Close** button to close the visual policy editor.

To apply this access policy to network traffic, add the access profile to a virtual server.

Note: *To ensure that logging is configured to meet your requirements, verify the log settings for the access profile.*

Adding the access profile to the virtual server

Before you can perform this task, you need to create an access profile using Access Policy Manager®.

You associate the access profile with the virtual server created for the web application that Application Security Manager™ is protecting.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the name of the virtual server that manages the network resources for the web application you are securing.
3. In the Access Policy area, from the **Access Profile** list, select the access profile that you configured earlier.
4. Click **Update**.

Your access policy is now associated with the virtual server.

Configuring a database security server

To integrate Application Security Manager™ (ASM) with a third-party database security product, you need to configure the database security server on ASM™. You can configure one database security server per system.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Integrated Services** > **Database Security**.
   The Database Security Configuration screen opens.
2. In the **Server Host Name/IP Address** field, type the host name or IP address of the database security server.

   Note: *If using SSL to establish a secured session between the BIG-IP ®system and the database security server, type the IP address of a virtual server configured for the secure connection. The virtual server uses any open IP address for the destination, the IBM Guardium port (16016, by default) for the service port,* `serverssl` *or a customized profile for the* ***SSL Profile (Server)*** *setting, and specifies a default pool (containing one member, the database security server, using its IP address and service port, typically, 16016).*

3. For **Server Port Number**, type the port number of the database server.

   The default value is 16016, the port used by IBM® InfoSphere® Guardium.®
4. If you want the system to wait for an ACK response from the database security server before sending the request to the application server, from the **Request Hold Timeout** list, select **Enabled** and type the number of milliseconds to wait for the response.

   The default value is 5 milliseconds.

   When this setting is enabled, the system forwards the request to the application server as soon as the database security server sends an ACK, or when the timeout has passed. If you leave this setting disabled, the system forwards the request to the application server immediately.
5. Click **Save**.
   The system saves the configuration settings.

The Application Security Manager is now configured to connect to the database security server.

For ASM to forward request data to the database security server, you next need to enable database security integration in one or more security policies.

Enabling database security integration with ASM and APM

Before you can enable database security integration, you need to have created a security policy to protect your web application. For the policy to retrieve the user names of those making requests, you need to have set up Access Policy Manager®(APM®) on the BIG-IP® system.

You enable database security integration in a security policy so that Application Security Manager™ (ASM) forwards request information to a third-party database server.

1. On the Main tab, click **Security** > **Application Security** > **Integrated Services** > **Database Security**.
   The Database Security screen opens.
2. In the **Current edited security policy** list near the top of the screen, verify that the security policy shown is the one you want to work on.
3. Select the **Database Security Integration** check box.
4. For **User Source**, select **Use APM Usernames and Session ID**.

   The system uses Access Policy Manager (APM) user names and session ID to determine the user source. You can choose this option only if you have APM licensed and provisioned.
5. Click **Save**.
   The system saves the configuration settings.

The Application Security Manager connects to the database security server and can forward request data to it.

Implementation result

You have set up a BIG-IP® system to use Application Security Manager™ (ASM) to secure application traffic, and Access Policy Manager™ (APM) to check user credentials.

Client traffic is routed to the virtual server for the web application. At first, traffic is handled by the APM module. APM® verifies user credentials and allows those with valid credentials to use web application. APM also sends user names and session IDs of valid users to ASM™. After that, ASM checks for security violations and forwards traffic that meets the security policy requirements to the backend server.

The database security server includes the application and user information provided by ASM and APM, so it can be viewed in logs and reports on that system. The database security server can perform a more in depth security assessment of the web request.

If you want to review reports and event logs that associate the user name with the session information on the BIG-IP system, you can set up session tracking (by enabling session awareness). When session awareness is enabled, you can see the user names on the Event Logs: Application: Requests screen in the General Details section of specific requests. IN addition, the Reporting: Application: Charts screen displays the users who sent the illegal requests.

Securing FTP Traffic

Overview: Securing FTP traffic using default values

This implementation describes how to secure FTP traffic the easy way--by using default values. When you use an FTP security profile, the BIG-IP® system inspects FTP traffic for network vulnerabilities. A default FTP security profile is included in the system that you can use. To activate security checks for FTP traffic, you enable protocol security in an FTP service profile, and associate the service profile with a virtual server.

You can use the default configuration to protect against the following FTP security risks:

- Port scanning exploits
- Anonymous FTP requests
- Command line length exceeds the defined length
- Potentially dangerous FTP commands
- Traffic that fails FTP protocol compliance checks
- Brute force attacks (due to excessive FTP login attempts)
- File stealing exploits

Task summary

Creating an FTP service profile with security enabled

The easiest method for initiating FTP protocol security for your FTP virtual server traffic is to use the system default settings. You do this by enabling protocol security for the system-supplied FTP service profile, and then associating that service profile with a virtual server.

1. On the Main tab, click **Local Traffic** > **Profiles** > **Services** > **FTP**.
   The FTP profile list screen opens.
2. In the **Name** column, click **ftp**.
   The Properties screen for the system-supplied FTP profile opens.
3. If you want to disable IPv6 translation, in the Settings area, clear the **Translate Extended** check box.
4. Retain the **Data Port** setting default value of **20**.
5. To enable FTP security checks, select the **Protocol Security** check box.
   The Protocol Security tab opens.
6. Click **Update**.

You now have a security-enabled service profile that you can associate with a virtual server so that FTP protocol checks are performed on the traffic that the FTP virtual server receives.

Enabling protocol security for an FTP virtual server

When you enable protocol security for an FTP virtual server, the system scans any incoming FTP traffic for vulnerabilities before the traffic reaches the FTP servers.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the **Create** button.
   The New Virtual Server screen opens.

3. In the **Name** field, type a unique name for the virtual server.
4. In the **Destination Address** field, type the IP address in CIDR format.

   The supported format is address/prefix, where the prefix length is in bits. For example, an IPv4 address/prefix is `10.0.0.1` or `10.0.0.0/24`, and an IPv6 address/prefix is `ffe1::0020/64` or `2001:ed8:77b5:2:10:10:100:42/64`. When you use an IPv4 address without specifying a prefix, the BIG-IP® system automatically uses a `/32` prefix.

   ***Note:** The IP address you type must be available and not in the loopback network.*
5. In the **Service Port** field, type `21` or select **FTP** from the list.
6. In the Configuration area, for the **FTP Profile** setting, select the default profile, `ftp`.
7. From the **Source Address Translation** list, select **Auto Map**.
8. For the **Default Pool** setting, either select an existing pool from the list, or click the Create (+) button and create a new pool.
9. Click **Finished**.

The custom FTP virtual server appears in the Virtual Servers list.

Reviewing violation statistics for security profiles

You can view statistics and transaction information for each security profile that triggers security violations.

1. On the Main tab, click **Security** > **Event Logs** > **Protocol** and click **HTTP**, **FTP**, **SMTP**, or **DNS**. The appropriate statistics screen opens listing all violations for that protocol, with the number of occurrences.
2. Type a Support ID, if you have one, to filter the violations and view one in particular.
3. Click a violation's hyperlink to see details about the requests causing the violation.

   On the Statistics screen, in the left column, you can review information regarding the traffic volume for each security profile configured.

Overview: Securing FTP traffic using a custom configuration

This implementation describes how to secure FTP traffic using a custom configuration. When you use an FTP security profile, the BIG-IP® system inspects FTP traffic for network vulnerabilities. A default FTP security profile is included in the system that you can modify, or you can create a new one as described in the tasks included here. To activate security checks for FTP traffic, you enable protocol security in an FTP service profile, and associate the service profile with a virtual server.

You can customize an FTP security profile to generate alarms or block requests for the following FTP security risks:

- Port scanning exploits
- Anonymous FTP requests
- Command line length exceeds the defined length
- Specific FTP commands
- Traffic that fails FTP protocol compliance checks
- Brute force attacks (excessive FTP login attempts)
- File stealing exploits

Task summary

Creating a custom FTP profile for protocol security

You create a custom FTP profile when you want to fine-tune the way that the BIG-IP®system manages FTP traffic. This procedure creates an FTP service profile that optimizes FTP traffic in the LAN, and enables Protocol Security in the profile so it can scan for vulnerabilities specific to the protocol.

1. On the Main tab, click **Local Traffic** > **Profiles** > **Services** > **FTP**.
   The FTP profile list screen opens.
2. Click **Create**.
   The New FTP Profile screen opens.
3. In the **Name** field, type a unique name for the profile.
4. From the **Parent Profile** list, select the default **ftp** profile.
5. Select the **Custom** check box.
6. If you want to disable IPv6 translation, in the Settings area, clear the **Translate Extended** check box.
7. For the **Inherit Parent Profile** setting, select the check box.
   This optimizes data channel traffic.
8. Retain the **Data Port** setting default value of **20**.
9. To enable FTP security checks, select the **Protocol Security** check box.
   The Protocol Security tab opens.
10. Click **Finished**.

The custom FTP profile now appears in the FTP profile list screen.

Creating a security profile for FTP traffic

An *FTP security profile* provides security checks that are applicable to the FTP protocol. You can create an FTP profile that specifies whether the system allows, logs, or blocks commands and requests from servers that use the FTP protocol.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **FTP**.
   The Security Profiles: FTP screen opens.
2. Click the **Create** button.
   The New FTP Security Profile screen opens.
3. In the **Profile Name** field, type a unique name for the profile.
4. In the Defense Configuration area, select **Alarm** or **Block** for the defenses you want to activate.

FTP Defense	Description when set to Block
Active Mode	Prevents port scanning and other active mode exploits.
Anonymous FTP Requests	Prevents unauthorized access by prohibiting anonymous users
Command Length Restriction	Prevents buffer overflow attacks by limiting command line length. Specify the maximum number of characters allowed in a command.
FTP Commands	Protects against unwanted FTP commands. Move the commands you do not want to allow into the Disallowed list.
FTP Protocol Compliance Failed	Protects against non-RFC compliant commands and also disallows syntax errors.
Maximum Login Retries	Prevents brute force attacks by limiting login retries. Specify the maximum attempts a user can try to log on, the maximum number of

FTP Defense	Description when set to Block
	login attempts allowed from a specific client IP address, and how long to block users before they can try again.
Passive Mode	Prevents passive mode exploits such as file stealing.

Option	Description
Alarm	The system logs any requests that trigger the violation.
Block	The system blocks any requests that trigger the violation.
Alarm and Block	The system both logs and blocks any requests that trigger the violation.

If you do not enable either **Alarm** or **Block** for a violation, the system does not perform the corresponding security check.

5. Click **Create**.
   The screen refreshes, and you see the new security profile in the list.

The BIG-IP® system automatically assigns this service profile to FTP traffic that a designated virtual server receives.

Modifying associations between service profiles and security profiles

Before you can modify associations between service profiles and security profiles, you must have created at least one security profile.

When you enable the **Protocol Security** setting on an FTP, HTTP, or SMTP service profile, the system automatically assigns the first-listed security profile to the service profile you configured for that profile. You can review and modify the current associations between the service profiles and the security profiles for each protocol.

1. On the Main tab, click **Security** > **Protocol Security** > **Profiles Assignment**.
   The Profiles Assignment screen opens.
2. From the Profiles Assignment menu, select the service profile type.
3. For each traffic profile, select the protocol security profile to use from the list in the Assigned Security Profile column.
4. Click **Save**.

Configuring an FTP virtual server with a server pool

You can configure a local traffic virtual server and a default pool for your network's FTP servers.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the **Create** button.
   The New Virtual Server screen opens.
3. In the **Name** field, type a unique name for the virtual server.
4. In the **Destination Address/Mask** field, type an address, as appropriate for your network.

   The supported format is address/prefix, where the prefix length is in bits. For example, an IPv4 address/prefix is `10.0.0.1` or `10.0.0.0/24`, and an IPv6 address/prefix is `ffe1::0020/64` or `2001:ed8:77b5:2:10:10:100:42/64`. When you use an IPv4 address without specifying a prefix, the BIG-IP® system automatically uses a `/32` prefix.
5. In the **Service Port** field, type `21` or select **FTP** from the list.
6. From the **FTP Profile** list, select either **ftp** or a custom profile.

7. From the **Source Address Translation** list, select **Auto Map**.
8. In the Resources area of the screen, for the **Default Pool** setting, click the **Create (+)** button.
   The New Pool screen opens.
9. In the **Name** field, type a unique name for the pool.
10. In the Resources area, for the **New Members** setting, select the type of new member you are adding, then type the information in the appropriate fields, and click **Add** to add as many pool members as you need.
11. Click **Finished** to create the pool.
    The screen refreshes, and reopens the New Virtual Server screen. The new pool name appears in the **Default Pool** list.
12. Click **Finished** to create the virtual server.
    The screen refreshes, and you see the new virtual server in the list.

The custom FTP virtual server appears in the Virtual Servers list.

Reviewing violation statistics for security profiles

You can view statistics and transaction information for each security profile that triggers security violations.

1. On the Main tab, click **Security** > **Event Logs** > **Protocol** and click **HTTP**, **FTP**, **SMTP**, or **DNS**.
   The appropriate statistics screen opens listing all violations for that protocol, with the number of occurrences.
2. Type a Support ID, if you have one, to filter the violations and view one in particular.
3. Click a violation's hyperlink to see details about the requests causing the violation.

   On the Statistics screen, in the left column, you can review information regarding the traffic volume for each security profile configured.

Securing SMTP Traffic

Overview: Securing SMTP traffic using system defaults

This implementation describes how to secure SMTP traffic using system defaults. When you create an SMTP security profile, the BIG-IP® Advanced Firewall Manager™ (AFM) provides several security checks for requests sent to a protected SMTP server. When you enable a security check, the system either generates an alarm for, or blocks, any requests that trigger the security check.

You can configure the SMTP security profile to include the following checks:

- Verify SMTP protocol compliance, as defined in RFC 2821.
- Validate incoming mail using several criteria.
- Inspect email and attachments for viruses.
- Apply rate limits to the number of messages.
- Validate DNS SPF records.
- Prevent directory harvesting attacks.
- Disallow or allow some of the SMTP methods, such as VRFY, EXPN, and ETRN, that spam senders typically use to attack mail servers.
- Reject the first message from a sender, because legitimate senders retry sending the message, and spam senders typically do not. This process is known as *greylisting*. The system does not reject subsequent messages from the same sender to the same recipient.

Task Summary

Creating an SMTP service profile with security enabled

The easiest method for initiating SMTP protocol security for your SMTP virtual server traffic is to use the system default settings. You do this by enabling protocol security for the system-supplied SMTP service profile, and then associating that service profile with a virtual server.

1. On the Main tab, click **Local Traffic** > **Profiles** > **Services** > **SMTP**.
   The SMTP profile list screen opens.
2. In the **Name** column, click **smtp**.
   The Properties screen for the system-supplied SMTP profile opens.
3. Select the **Protocol Security** check box to enable SMTP security checks.
4. Click **Update**.

You now have a security-enabled service profile that you can associate with a virtual server so that SMTP protocol checks are performed on the traffic that the SMTP virtual server receives.

Creating an SMTP virtual server with protocol security

When you enable protocol security for an SMTP virtual server, the system scans any incoming SMTP traffic for vulnerabilities before the traffic reaches the SMTP servers.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the **Create** button.
   The New Virtual Server screen opens.

3. In the **Name** field, type a unique name for the virtual server.
4. In the **Destination Address** field, type the IP address in CIDR format.

   The supported format is address/prefix, where the prefix length is in bits. For example, an IPv4 address/prefix is `10.0.0.1` or `10.0.0.0/24`, and an IPv6 address/prefix is `ffe1::0020/64` or `2001:ed8:77b5:2:10:10:100:42/64`. When you use an IPv4 address without specifying a prefix, the BIG-IP® system automatically uses a `/32` prefix.

   ***Note:** The IP address you type must be available and not in the loopback network.*
5. In the **Service Port** field, type `25` or select **SMTP** from the list.
6. In the Configuration area, for the **SMTP Profile** setting, select the default profile, `smtp`.
7. From the **Source Address Translation** list, select **Auto Map**.
8. For the **Default Pool** setting, either select an existing pool from the list, or click the Create (+) button and create a new pool.
9. Click **Finished**.

The custom SMTP virtual server appears in the Virtual Servers list.

Reviewing violation statistics for security profiles

You can view statistics and transaction information for each security profile that triggers security violations.

1. On the Main tab, click **Security** > **Event Logs** > **Protocol** and click **HTTP**, **FTP**, **SMTP**, or **DNS**. The appropriate statistics screen opens listing all violations for that protocol, with the number of occurrences.
2. Type a Support ID, if you have one, to filter the violations and view one in particular.
3. Click a violation's hyperlink to see details about the requests causing the violation.

   On the Statistics screen, in the left column, you can review information regarding the traffic volume for each security profile configured.

Overview: Creating a custom SMTP security profile

This implementation describes how to secure SMTP traffic. When you create an SMTP security profile, the system provides several security checks for requests sent to a protected SMTP server. When you enable a security check, the system either generates an alarm for, or blocks, any requests that trigger the security check.

You can configure the SMTP security profile to include the following checks:

- Verify SMTP protocol compliance as defined in RFC 2821.
- Validate incoming mail using several criteria.
- Inspect email and attachments for viruses.
- Apply rate limits to the number of messages.
- Validate DNS SPF records.
- Prevent directory harvesting attacks.
- Disallow or allow some of the SMTP methods, such as VRFY, EXPN, and ETRN, that spam senders typically use to attack mail servers.
- Reject the first message from a sender, because legitimate senders retry sending the message, and spam senders typically do not. This process is known as *greylisting*. The system does not reject subsequent messages from the same sender to the same recipient.

Task summary

Creating a custom SMTP service profile

You create an SMTP service profile optimized for security when you want to fine-tune the way that the BIG-IP®system scans SMTP traffic for vulnerabilities.

1. On the Main tab, click **Local Traffic** > **Profiles** > **Services** > **SMTP**.
   The SMTP profile list screen opens.
2. Click **Create**.
   The New SMTP Profile screen opens.
3. In the **Name** field, type a unique name for the profile.
4. From the **Parent Profile** list, select the existing SMTP profile from which you want the new profile to inherit settings. The default is **smtp**.
5. Select the **Custom** check box.
6. Select the **Protocol Security** check box to enable SMTP security checks.
7. Click **Finished**.

The custom SMTP service profile now appears in the SMTP list screen.

Creating a security profile for SMTP traffic

The SMTP security profile provides security checks that are applicable to the SMTP protocol.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **SMTP**.
   The Security Profiles: SMTP screen opens.
2. Click the **Create** button.
   The New SMTP Security Profile screen opens.
3. In the **Profile Name** field, type a unique name for the profile.
4.
5. In the Defense Configuration area, select **Alarm** or **Block** for the SMTP defenses you want to activate.

Option	Description
Alarm	The system logs any requests that trigger the violation.
Block	The system blocks any requests that trigger the violation.
Alarm and Block	The system both logs and blocks any requests that trigger the violation.

6. Click **Create**.
   The screen refreshes, and you see the new security profile in the list.

The BIG-IP® system automatically assigns this service profile to SMTP traffic that a designated virtual server receives.

Enabling anti-virus protection for email

You can warn or block against email attachments containing a suspected virus. To do this, you configure the Application Security Manager™ to act as an ICAP client, and make sure that the SMTP profile has anti-virus options selected. This prompts an external ICAP server to inspect email and email attachments for viruses before releasing the content to the SMTP server.

1. On the Main tab, click **Security** > **Options** > **Application Security** > **Integrated Services** > **Anti-Virus Protection**.
   The Anti-Virus Protection screen opens.

2. For the **Server Host Name/IP Address** setting, type the fully qualified domain name of the ICAP server, or its IP address.

   Note: *If you specify the host name, you must first configure a DNS server by selecting **System** > **Configuration** > **Device** > **DNS**.*

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3. For **Server Port Number**, type the port number of the ICAP server.

   The default value is `1344`.
4. If you want to perform virus checking even if it may slow down the web application, select the **Guarantee Enforcement** check box.
5. Click **Save**.
6. On the Main tab, click **Security** > **Options** > **Protocol Security** > **Advanced Configuration**.
   The Advanced Configuration screen opens.
7. In the System Variables area, ensure that the values for the **icap_uri** (URI for the ICAP service), and **virus_header_name** (header name used) internal parameters correspond to your ICAP server's settings.

   By default, the system supports an ICAP server with McAfee anti-virus protection. If your organization uses a different ICAP server, update the parameters and save your changes.

ICAP Server	icap_uri Value
McAfee VirusScan	/REQMOD
Trend Micro InterScan Web Security	/reqmod
Kaspersky	/av/reqmod
Symantec	/symcscanreq-av-url

ICAP Server	virus_header_name Value
McAfee VirusScan	X-Infection-Found,X-Virus-Name
Trend Micro InterScan Web Security	X-Virus-ID
Kaspersky	X-Virus-ID
Symantec	X-Violations-Found

8. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **SMTP**.
   The Security Profiles: SMTP screen opens.
9. Click an existing SMTP security profile name or create a new one.
   The (New) SMTP Profile Properties screen opens.
10. For the **Virus Detection** setting, select the **Alarm** or **Block** options as required.

Option	Description
Alarm	The system logs any requests that trigger the virus detected violation, and displays them on the Protocol Security statistics screen.
Block	The system blocks any email requests that trigger the virus detected violation.
Alarm and Block	The system both logs and blocks any requests that trigger the virus detected violation.

11. Click **Create** to create a new profile, or **Update** to update an existing one.

All incoming email attachments will be inspected for viruses.

Modifying associations between service profiles and security profiles

Before you can modify associations between service profiles and security profiles, you must have created at least one security profile.

When you enable the **Protocol Security** setting on an FTP, HTTP, or SMTP service profile, the system automatically assigns the first-listed security profile to the service profile you configured for that profile. You can review and modify the current associations between the service profiles and the security profiles for each protocol.

1. On the Main tab, click **Security** > **Protocol Security** > **Profiles Assignment**.
   The Profiles Assignment screen opens.
2. From the Profiles Assignment menu, select the service profile type.
3. For each traffic profile, select the protocol security profile to use from the list in the Assigned Security Profile column.
4. Click **Save**.

Creating and securing an SMTP virtual server and pool

Configure a virtual server and a default pool for your network's SMTP servers, and assign the custom SMTP service profile. When the virtual server receives SMTP traffic, the SMTP security profile created in Application Security Manager™ scans for security vulnerabilities, and then the virtual server can be configured to perform other actions (such as load balancing) on traffic that passes the scan.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. Click the **Create** button.
   The New Virtual Server screen opens.
3. In the **Name** field, type a unique name for the virtual server.
4. In the **Destination Address/Mask** field, type an address, as appropriate for your network.

   The supported format is address/prefix, where the prefix length is in bits. For example, an IPv4 address/prefix is `10.0.0.1` or `10.0.0.0/24`, and an IPv6 address/prefix is `ffe1::0020/64` or `2001:ed8:77b5:2:10:10:100:42/64`. When you use an IPv4 address without specifying a prefix, the BIG-IP® system automatically uses a `/32` prefix.
5. In the **Service Port** field, type `25` or select **SMTP** from the list.
6. From the **Configuration** list, select **Advanced**.
7. From the **SMTP Profile** list, select the custom SMTP profile that you created.
8. From the **Source Address Translation** list, select **Auto Map**.
9. In the Resources area of the screen, for the **Default Pool** setting, click the **Create (+)** button.
   The New Pool screen opens.
10. In the **Name** field, type a unique name for the pool.
11. In the Resources area, for the **New Members** setting, select the type of new member you are adding, then type the information in the appropriate fields, and click **Add** to add as many pool members as you need.
12. Click **Finished** to create the pool.
    The screen refreshes, and reopens the New Virtual Server screen. The new pool name appears in the **Default Pool** list.
13. Click **Finished**.

The custom SMTP virtual server appears in the Virtual Servers list.

Reviewing violation statistics for security profiles

You can view statistics and transaction information for each security profile that triggers security violations.

1. On the Main tab, click **Security** > **Event Logs** > **Protocol** and click **HTTP**, **FTP**, **SMTP**, or **DNS**. The appropriate statistics screen opens listing all violations for that protocol, with the number of occurrences.
2. Type a Support ID, if you have one, to filter the violations and view one in particular.
3. Click a violation's hyperlink to see details about the requests causing the violation.

   On the Statistics screen, in the left column, you can review information regarding the traffic volume for each security profile configured.

Working with Anti-Bot Mobile Application SDK

About anti-bot mobile application SDK

You can configure the BIG-IP® system to detect traffic coming from known mobile applications and determine which of the requests to allow to continue to your server application. The ability to distinguish mobile application traffic from browser traffic is important because mobile applications do not usually run JavaScript code coming from the server. Therefore, responding with JavaScript-based challenges, such as Client Side Integrity and CAPTCHA, breaks the application. You can configure the anti-bot mobile application SDK so the system does not respond to mobile application traffic with those challenges (as it does to browser clients), but rather tests them for human activity.

Attackers can easily generate traffic that mimics the behavior of a mobile app by setting the User-Agent string and sending HTTP requests that are similar to those sent by authentic applications. Attackers might even log in as a valid registered user in those cases, and perform automated tasks, such as content scraping and other web attacks, from their attacked HTTP client tool.

You can reliably detect traffic from your mobile applications by using the Anti-Bot Mobile Application SDK. The SDK authenticates your application with BIG-IP® system security, something that tools emulating mobile applications cannot do. See the *ASM Anti-Bot Mobile Application SDK* for details on how to build your mobile application. See this *Appdome article* for details on integrating apps with the F5 Anti-Bot Mobile SDK.

***Note:** This feature detects only mobile applications running with the ASM® Anti-Bot Mobile Application SDK.*

Importing Android mobile application publisher certificates

You identify Android mobile applications by the certificate used to sign them. We do not trust the name of the application as this name can be spoofed if the application was not installed from the Google Play store. If you want to detect mobile applications running on Android devices, you first have to upload the certificates of their publishers, the signing parties.

1. Locate and open the .apk application file with an archive extractor.
2. Extract the META-INF/APPDOME.RSA file.
3. In the directory where you extracted the .RSA file, install the OpenSSL package (version 1.0 or later), if not already installed.
4. Run the following commands:
   a) `openssl pkcs7 -print_certs -inform der -in CERT.RSA -out cert.crt`
   b) `openssl x509 -inform pem -in /tmp/cert.crt -outform der -out /tmp/cert.der`
5. On the Main tab, click **System** > **Certificate Management** > **Traffic Certificate Management** > **SSL Certificate List** > **Import**.
   The Import SSL Certificates and Keys screen opens.
6. For **Import Type**, select **Certificate** and enter the certificate name.
7. Select the **Certificate Source**, and either upload or copy and paste the cert.der certificate file.
8. Click **Import**.

Configuring a DoS profile to detect mobile applications

Before configuring your DoS profile, you must have first uploaded the publisher certificates that you will use in the DoS profile.

You can use an existing DoS profile or create a new one for use with your mobile application detection.

The mobile application user does not see a CAPTCHA challenge and the mobile application is not presented with the Client Side Integrity challenge. Client-Side Integrity and CAPTCHA challenges used in other features such as DoS mitigation, Web Scraping prevention and Brute Force attack prevention will **not** be applied to mobile app traffic in order not to break them. However, to strengthen the security in those features with mobile application clients, you can use a challenge for human behavior as a replacement for those challenges. Use this challenge if most of the requests sent by your mobile applications are preceded with some human interaction, typically tapping the screen. This is especially important for the login operation monitored by the Brute Force protection feature. It checks that the request was indeed triggered by a human and not generated automatically. However, if your mobile application might log in automatically without user intervention, you should disable this option and select the Always passed option.

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles screen opens, where you can create a new profile (step 2) or use an existing profile (step 3).
2. To create a new DoS profile:
   a) Click **Create**.
   The New DoS Profile screen opens.
   b) Type a **Name** and **Description**.
   c) Click **Finished**.
   The DoS Profiles screen opens.
   d) Click the name of the profile you just created, and go to step 4.
3. To use an existing profile, click the name of the DoS profile you want to use.
   The Properties screen opens.
4. Click **Application Security**.
5. On the left, click **Mobile Applications**.
6. In the Mobile Applications area, click **Edit** and then select **Enabled**.
7. **iOS**: Click **Edit** in the **iOS** section if your mobile applications run on iOS devices.
   a) Enter the mobile application package names individually that you allow access to your server application and click **Add**.

   Mobile applications are identified by their package names (also known as Bundle IDs), for example, `com.f5.app1`.
   b) Alternately, if you want to detect authentic mobile application traffic without checking which application sent the request, select **Allow Any Package Name**.
   c) Select **Allow Jailbroken Devices** to allow requests from jailbroken devices. This is **not** recommended because it allows unchecked applications with spoofed identities in the system.
8. **Android**: Click **Edit** in the **Android** section if your mobile applications run on Android devices.
   a) Assign the mobile application publisher certificates that are allowed access to your server application by moving them to the **Assigned publisher certificate** list . The uploaded certificate names appear in the **Available publisher certificate** list but not all certificates on the list belong to mobile application publishers.
   b) Alternately, if you want to detect authentic mobile application traffic without checking which application sent the request, select **Allow Any Publisher**.

   c) Select **Allow Rooted Devices** to allow requests from rooted devices. This is **not** recommended because rooted devices can allow attackers to hijack sessions of mobile applications for a limited time. .

9. ,To specify advanced options, for **Advanced**, click **Edit**.
   a) If your mobile application is in testing phase you can select **Allow Emulators**.

      Use this option with care because emulators can be abused to create automated attacks on your server application.

   b) If you want to specify the action to take when a CAPTCHA or Client Side Integrity challenge needs to be presented, select an option from the list:

Option	Description
Always passed	The traffic is passed without incident.
Challenged for human behavior	The SDK checks for human interactions with the screen in the last few seconds. If none are detected, the traffic is blocked.

10. Click **Update** to update the profile.
11. On the Main tab, click **Local Traffic** > **Virtual Servers** > **Virtual Server List**.
12. Click the name of the virtual server to attach the DoS profile to.
    The Policy Settings screen opens.
13. In **Log Profile**, add the DoS profile to **Selected**.
14. Click **Update** to update the profile.

Mobile application traffic

Mobile application requests are logged in Bot Defense logs, and also in the Application (ASM) request log if an ASM® policy is configured. A typical use case for logs is troubleshooting requests that were accidentally blocked or passed. In Bot Defense request logs, you can see the action taken for that request, and also see the attributes of the mobile applications such as the application display name, version, or whether it was from a jailbroken or rooted device. This way you can track the reason for blocking an application. For example, if the request was blocked because it did not match any of the allowed application package names or publishers, you see the actual application's display name and the reason, `Mobile application does not match profile criteria`.

Setting up mobile application request logs

You can monitor the traffic coming from mobile applications that use the mobile application SDK in the logs and in the charts.

1. On the Main tab, click **Security** > **Event Logs** > **Logging Profiles**.
2. Select the name of an existing profile and go to step 4, or click **Create** to create a new profile.
3. If you create a new profile, on the Create New Logging Profile screen:
   a) Enter a **Profile Name** and optional **Description**.
   b) Click **Finished**.
   c) On the Logging Profiles screen, click the name of the profile you created.
4. On the Edit Logging Profile screen, enable **Bot Defense**.
   The screen displays the Bot Defense area.
5. Enable **Local Publisher**.
6. Optional: Select a **Remote Publisher** for your remote logging system such as Splunk.
7. Enable the types of requests to see in the logs, most typically **Log Illegal Requests**.
8. Click **Update** to save the logging profile properties.

9. On the Main tab, click **Local Traffic** > **Virtual Servers** > **Virtual Server List**.
10. Select the virtual serve to attach the login profile to.
    The Policy Settings screen opens.
11. In **Log Profile**, add the DoS profile to **Selected**.
12. Click **Update** to update the profile.
13. Run mobile application traffic to generate logs.
14. On the Main tab, click **Security** > **Event Logs** > **Bot Defense**.

    Mobile application requests have Client Type set as **Mobile Application**. Scroll very far to the right to see the Client Type column. You can filter the requests by this criterion.
15. If you deploy an ASM policy for your application, on the Main tab, click **Security** > **Event Logs** > **Application** > **Requests**.

    Just as in the Bot Defense log, requests coming from mobile applications can be filtered by their Client Type.

    The same request logged in both Bot Defense and Applications Requests logs will have the same Support ID, so its records can be correlated.

An interesting use case is to track requests that were blocked because no human behavior was found in Web Scraping or Brute Force features, although the Challenge for Human Behavior option was selected when client side challenges were required. Once you realize that the request was blocked in the ASM® Application log, you can look for the matching entry of the same request in the Bot Defense log. You can do this by searching the same Support ID in that log. Observe the Human Behavior Indication attribute in the log: if it was not Human Detected, then the request was blocked because no tap screen event was recorded prior to the request.

Viewing mobile application traffic statistics charts

You can get important insights about the traffic accessing your server applications, and specifically traffic coming from mobile applications, by looking at the DoS analysis HTTP traffic charts. You can see the composition of the HTTP traffic to your application by looking at the Client Types chart. You can see how much of the traffic came from mobile applications, from browsers, and from bots, at any time on the selected time period. You can also narrow the chart to certain applications by selecting a specific virtual server, OS name, and jailbreak status on the dimension inspector.

1. On the Main tab, click **Security** > **Reporting** > **DoS** > **Analysis**.
2. At the top of the far right pane, in the Dimension Inspector, select **HTTP** and use the scroll bar to scroll down to and click **Client Types**.
3. Select the mobile application traffic to display its chart.
4. You can further narrow the results by selecting specific attributes of mobile application traffic in the Dimension Inspector.

   For example, you can filter traffic coming from Android rooted devices in the Dimension Inspector by selecting: **Client Type = Mobile Application**, **OS Name = Android** and **Jailbreak = True**.

Working with Passive Monitoring

Overview: Configuring the BIG-IP System Passive Monitoring

You can configure a physical interface on a BIG-IP ®system to operate in *passive mode*. In this mode, the interface accepts mirrored traffic from another device for analysis of Layer 7 traffic.

Passive mode behavior

Using a configured ASM passive monitoring policy and/or ASM DoS profile, the system analyzes the mirrored traffic, displays the resulting reports and sends the resulting analytics data and log messages to a remote analytics and logging server. The mirrored traffic never leaves the system, and the BIG-IP system never acts on the headers and payload. The logs report the actions the system would have taken if it were not in passive mode.

Benefits of DoS Layer 7 passive monitoring

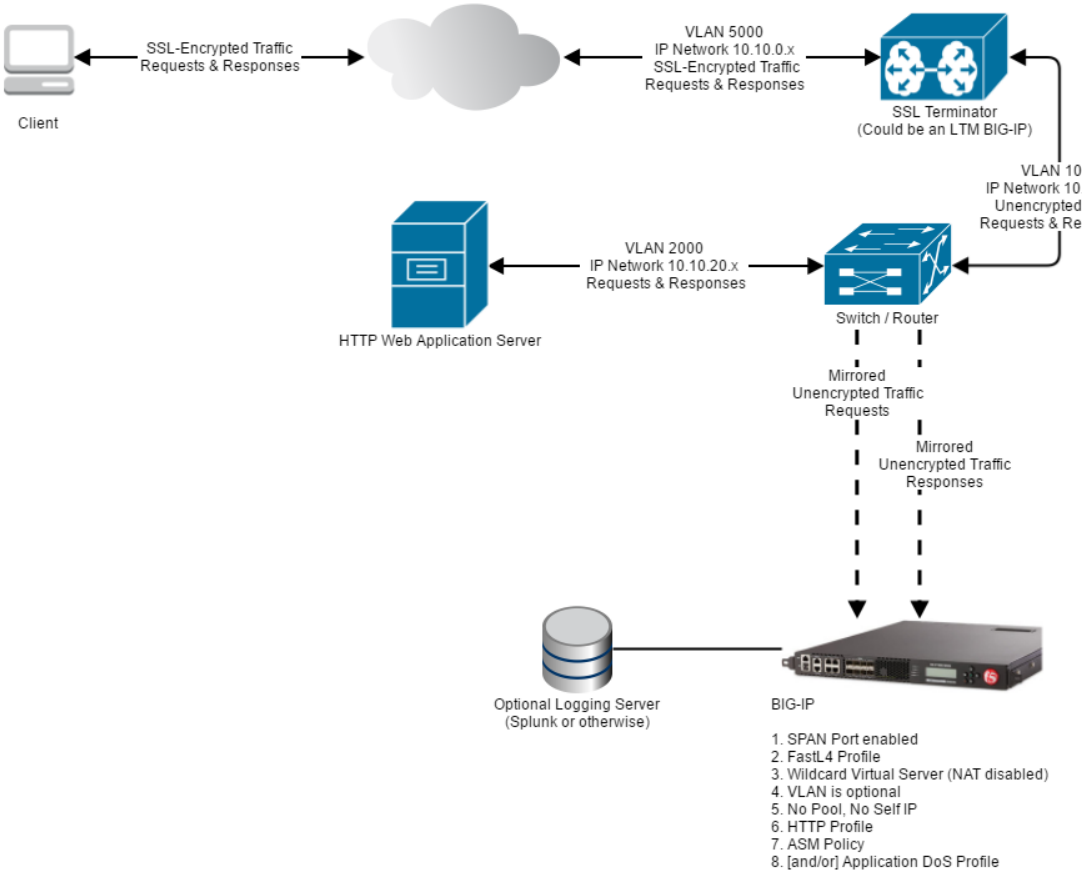
It allows Layer 7 monitoring of attacks and discovers system vulnerabilities while being quick and easy to deploy. The existing network topology does not need to be changed and VLANS and IP addresses are not configured.

Sample configuration

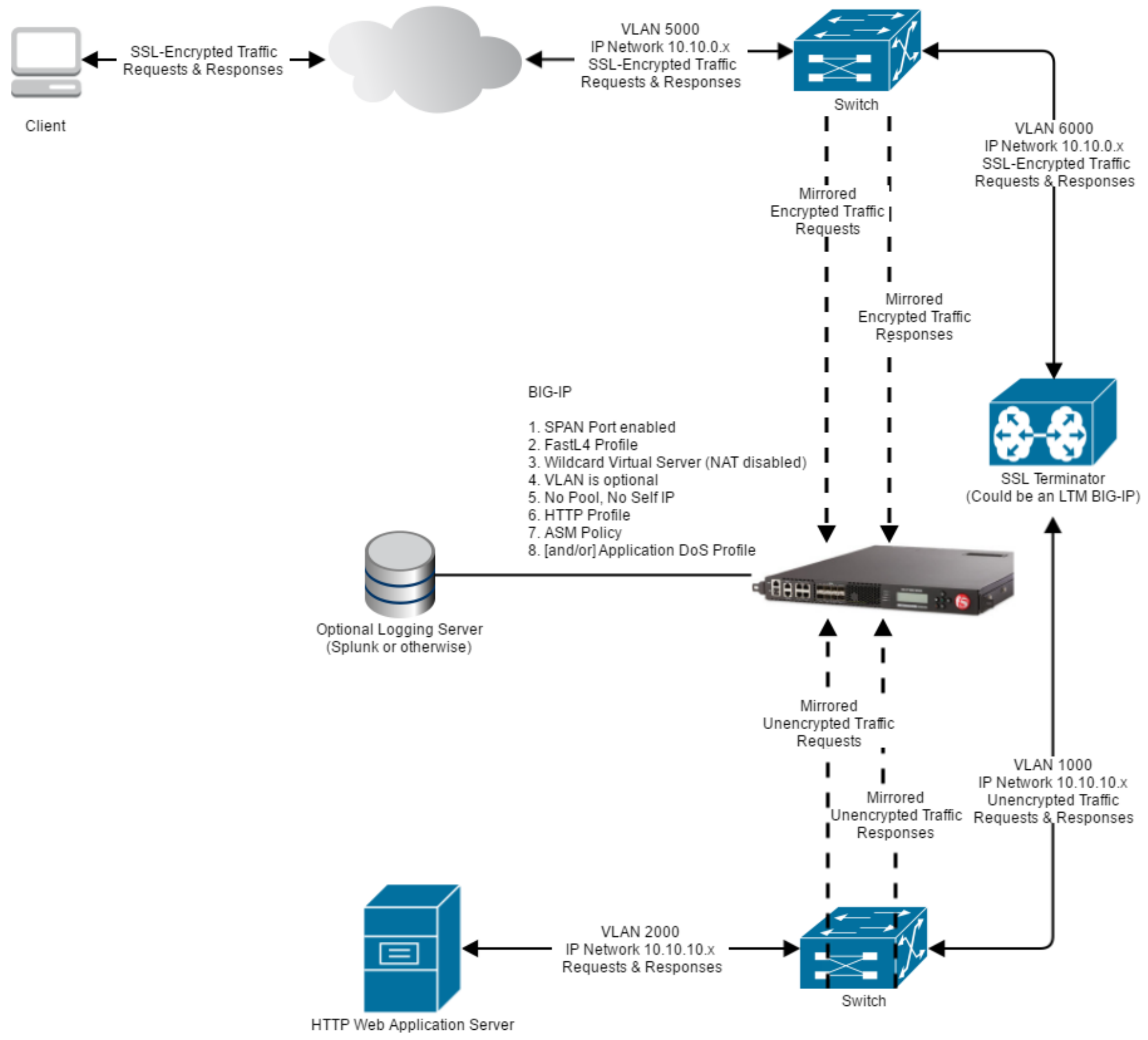
There are two passive monitoring options, and their sample configurations are different.

- ASM Layer 7 policy: DoSL7 and ASM need to be mirrored after the SSL terminator since they need to work with unencrypted data.
- ASM DoS profile: Network DoS needs to work on traffic mirrored before the SSL terminator. Otherwise, we are not protecting the SSL terminator.

This illustration shows a configuration for ASM policy passive monitoring.



This illustration shows a configuration for DoS profile passive monitoring



Common use case

Passive monitoring of DoS Layer 7 is for evaluation purposes only.

Prerequisite configuration

Before you begin to configure your ASM passive mode policy or your DoS profile, ensure that you have set up your network and configured your BIG-IP system according to the *BIG-IP Passive Monitoring Configuration Guide*. You need an SSL terminator to open mirrored traffic for analysis.

- DoS Layer 7 and ASM traffic works on unencrypted data so their traffic needs to be mirrored after the SSL terminator.
- Network DoS works on encrypted data so its traffic needs to be mirrored before the SSL terminator.

In addition, you need to enable the appropriate database variable depending on the configuration you are using. This allows you to associate the ASM policy or DoS profile with a FastL4 virtual server, which is required for this feature. If you are configuring passive monitoring with a DoS profile, on the command line, type the following:

```
tmsh modify sys db dosl7.fastl4_allow value enable
```

If you are configuring passive monitoring with an ASM security policy, type the following:

```
tmsh modify sys db asm.fastl4_allow value enable
```

Creating a passive monitoring ASM security policy

Only certain features are supported for passive monitoring. Unsupported features must be disabled in the security policy.

1. On the Main tab, click **Security** > **Application Security** > **Security Policies** > **Policies List**. The Policies List screen opens.
2. Click **Create New Policy**.

   You only see this button when no policy is selected.
3. In the **Policy Name** field, enter a meaningful name to reflect that this is a passive monitoring policy.
4. Leave **Policy Type** set to Security.
5. Set the **Policy Template** to Passive Monitoring
6. Set the **Enforcement Mode** to Transparent.
7. Click **Create Policy** to create the security policy.

ASM creates the passive monitoring security policy.

Now you must configure the policy's **Learning and Blocking Settings**.

Passive security policy supported features

The following details the ASM security policy features and what is supported in passive mode.

Feature	Parts Supported	Parts Not Supported
Enforcement Mode	Transparent	Blocking If this is selected, blocked transactions will be shown in the logs as being blocked, while they are actually passed.
Violations Settings	Learn, Alarm	Block If this is selected, blocked transactions will be shown in the logs as being blocked, while they are actually passed.
Policy Building	Manual, Automatic Based on IP addresses only (including trusted IPs) Centralized Policy Builder (Requires a Separate Forwarding Port)	Learning based on Device ID is not supported.
Attack Signatures	Fully Supported (Request and Response)	-
Content Profiles	Fully Supported	Content-Based Routing
File Types	Fully Supported	-

Feature	Parts Supported	Parts Not Supported
IP Intelligence	Fully Supported	-
Geolocation Enforcement	Fully Supported	-
Headers	Fully Supported	-
Dynamic Session ID in URL	Fully Supported	-
Vulnerability Assessments	Resolutions are supported according to the features they enable as specified in this table. (Requires a Separate Forwarding Port)	-
Antivirus protection (ICAP)	None	Not Supported
Database Security	None	Not Supported
Bypassing of Search Engines	None	Not Supported
Login Enforcement	None	Not Supported
Session Tracking	None	Not Supported
CSRF Protection	Only Verify Origin enforcement mode is supported.	Verify CSRF Token is not supported.
Web Scraping	None	Not Supported
Single Page Application	None	Not Supported
Content-Based Routing (CBR)	None	Not Supported
Brute Force	• Alarm • Automatic detection of Login Page • Statistics are collected	Any action except for "Alarm" • Device ID • Alarm and Blocking Page • Alarm and CAPTCHA • Alarm and Client Side Integrity • Alarm and Client Side Integrity Followed by CAPTCHA • Alarm and Drop • Alarm and Honeypot Page
CORS (Cross-Origin Request Sharing)	Only when "Enforce on ASM" is selected, and only for alarming a violation upon an illegal origin.	• Remove all CORS headers • Replace CORS headers" CORS headers are not modified.
WebSocket Enforcement	All Except ---->	Remove all CORS headers WebSocket Extensions: • Remove Headers is not supported • Block is supported only for logging
URL Enforcement	All Except ---->	URL Flows

Feature	Parts Supported	Parts Not Supported
Parameters	All Except ---->	Dynamic Extractions
Data Guard	• Detection and triggering violations • Mask Data: only affecting response logging (local and remote)	Mask Data: Masking the responses on the network will not be done.
Cookies	Allowed Cookies	Enforced Cookies
iRules	None	Not Supported
Logging and Reporting	• Local Event Log • Remote Event Log (requires a separate forwarding port) • Response Logging • Event Correlation • ASM Charts • Chart Schedule • Brute Force Attacks Statistics	• Web Scraping Reports • Session Tracking Reports

Passive monitoring DoS profile

Creating a passive monitoring DoS profile

1. On the Main tab, click **Security** > **DoS Protection** > **DoS Profiles**.
   The DoS Profiles list screen opens.
2. Click **Create**.
   The Create New DoS Profile screen opens.
3. In the **Name** field, type the name for the profile, then click **Finished**.
4. In the list of DoS profiles, click the name of the profile you just created, and click the **Application Security** tab.
5. In the **General Settings** tab, for **Application Security**, click **Edit** and select the **Enabled** check box.
   General settings are displayed. The following features are supported. All other features are not supported in passive mode.

Feature	Parts Supported	Parts Not Supported
Heavy URL Protection	Fully Supported	-
Geolocations	Fully Supported: • Blacklist • Whitelist	-
Trigger iRule	IN_DOSL7_ATTACK event	Blocking or modifying traffic from iRules

6. In the **TPS-based Detection** tab, select **Transparent** for the **Operation Mode**.

The Operation Mode settings are displayed. The following features are supported. All other features are not supported in passive mode.

Feature	Parts Supported	Parts Not Supported
Thresholds Mode	Fully Supported: • Manual • Automatic	-
How to detect attackers and which mitigation to use	• Client Side Integrity Defense • CAPTCHA Challenge • Request Blocking	-
Prevention Duration	No prevention	Resolutions are supported according to the features they enable as specified in this table.

7. In the **Behavioral & Stress-based Detection** tab, select **Transparent** for the **Operation Mode**.
   The Operation Mode settings are displayed. The following features are supported. All other features are not supported in passive mode.

Feature	Parts Supported	Parts Not Supported
Thresholds Mode	Fully Supported: • Manual • Automatic	-
Stress-based Detection and Mitigation	• Client Side Integrity Defense • CAPTCHA Challenge • Request Blocking	Detection of Server Stress is done as "best effort". In case the switch that is doing the mirroring becomes congested, a Layer 7 DoS attack may be detected, although the problem is actually at the Layer 3 switch.
Behavioral Detection and Mitigation: Bad actors behavior detection	Detection	Mitigation
Behavioral Detection and Mitigation: Request signatures detection	Detection	Mitigation
Behavioral Detection and Mitigation: Mitigation	No Mitigation	• Conservative Protection • Standard Protection • Aggressive Protection

Passive monitoring volumentric DoS Layer 7

The following details the ASM volumetric DoS Layer 7 features and what is supported in passive mode.

Features	Parts Supported	Parts Not Supported
TPS-Based Detection	• Transparent Mode	-

Features	Parts Supported	Parts Not Supported
(Enforcement mode)	• Blocking Mode* **(See NOTE below)**	
Stress-based Detection (Enforcement mode)	• Transparent Mode • Blocking Mode* **(See NOTE below)**.	Detection of Server Stress is done as "best effort". In case the switch that is doing the mirroring becomes congested, a Layer 7 DoS attack may be detected, although the problem is actually at the Layer 3 switch.
Mitigation	• Transparent • Client Side Integrity Defense* **(See NOTE below)** • CAPTCHA Challenge* **(See NOTE below)** • Request Blocking* **(See NOTE below)**	-
Thresholds Mode	Fully Supported: • Manual • Automatic	-
Heavy URL Protection	Fully Supported	-
Record Traffic	Supported on single host VS	Not supported on catch-all Virtual Servers (those with any/any destination)
Bot Signatures	• Report • Block* **(See NOTE below)** • Search Engines (Requires a Separate Forwarding Port)	-
Geolocations	Fully Supported: • Blacklist* **(See NOTE below)** • Whitelist	-
Proactive Bot Defense	None	Not Supported
Single Page Application	None	Not Supported
Trigger iRule	IN_DOSL7_ATTACK event	Blocking or modifying traffic from iRules
Logging and Reporting	Fully Supported: • DoS Visibility • Local Event Log • Remote Event Log (Requires a Separate Forwarding Port)	Note: Server Health and average server latency is on "best effort": In case the switch that is doing the mirroring becomes congested, these values may be wrong.

Features	Parts Supported	Parts Not Supported
		The server health may be shown as low, although the problem is actually at the L3 layer switch.

Note:** All the "block" or "mitigation" parts mentioned above are for reporting purposes only. The traffic is always sent to the server without mitigation. When selecting blocking mode and a specific mitigation, all the reports will show as if the mitigation was applied, or the traffic was blocked. This is a "what if" report, and is supported. However, using this mode will show error messages in /var/log/ltm such as the following:* ***Feb 25 18:33:46 bigip29 err tmm2[26547]: 011f0016:3: http_process_state_prepend - Invalid action:0x109010 Server sends too much data. serverside (1.1.1.1:80 -> 1.1.1.2:9785) clientside (1.1.1.2:45710 -> 1.1.1.3:80) (Server side: vip=/Common/vs_39_80 profile=http pool=/Common/ pool_80 server_ip=1.1.1.1)

Passive monitoring behavioral analysis DoS Layer 7

The following details the ASM behavrioral analysis DoS Layer 7 features and what is supported in passive mode.

Features	Parts Supported	Parts Not Supported
Mitigation	-	• Conservative Protection • Standard Protection • Aggressive Protection
Bad actors behavior detection	Detection	Mitigation
Request signatures detection	Detection	Mitigation
Logging and Reporting	Fully Supported: • DoS Visibility • Local Event Log • Remote Event Log	Note: • Server Health and average server latency is on "best effort": • In case the switch that is doing the mirroring becomes congested, these values may be wrong. • The server health may be shown as low, although the problem is actually at the L3 layer switch. • A Layer 7 DoS attack may be detected, although the problem is actually at the Layer 3 switch.

Passive monitoring test considerations

When testing the passive monitoring feature, keep the following observations in mind.

Feature	Notes	Observations when feature is enabled
Login Enforcement	-	Even after a successful login, every request for the Authenticated URL would cause a violation.
Session Tracking	Includes Session Hijacking and Session Awareness.	Request is not logged after the first 10 requests and there is no violation.
Web Scraping	-	Request is not logged after the first 10 requests and there is no violation.
Single Page Application	-	This feature is completely based on injected JavaScript. Since JavaScript is not injected in passive mode, the feature does not work.
CSRF Protection	Verify CSRF Token is not supported.	The enforcement based on origin works the same as for inline BIG-IP systems. CSRF token enforcement does not work because it is based on JavaScript and cookies injection. Every Request to URL where token verification is required raises a CSRF violation.
Brute Force	The following are not supported: • Blocking Mode • Session-based • Device ID • Client Side Integrity Defense • Rate Limiting	Under one of the following conditions, a request is not logged after the first 10 requests and there is no violation: **1.** Blocking mode/violation + username based + Alarm and CAPTCHA. **2.** Blocking mode/violation + username based + Alarm and CS-challenge. **3.** Blocking mode/violation + IP based + Alarm and CAPTCHA. **4.** Blocking mode/violation + IP based + Alarm and CS-challenge. **5.** Device ID based. **6.** Detect Distributed Attack + any of the conditions 1 through 5. **7.** Credential Stuffing + any of the conditions 1 through 5.

Feature	Notes	Observations when feature is enabled
		8. As in all other use cases, Blocking mode does not block any request.
CORS	The following are not supported: • Remove all CORS headers • Replace CORS headers CORS headers are not modified.	CORS headers are not removed and not replaced.
WebSocket Enforcement	The following are not supported: • Remove all CORS headers • WebSocket Extensions: Remove Headers is not supported. Block is supported only for logging.	CORS headers are not removed and not replaced.
Enforced Cookies	-	Every request with one enforced cookie included causes a violation.
URL Flow	-	Every request for the configured URL causes a violation.
Dynamic Extractions	-	Every request related to dynamic extraction causes a violation.
Session Tracking Reports	-	Reports only show the first 10 requests.
Web Scraping Reports	-	Statistics are not reported.
Policy Builder	Learning based on Device ID is NOT supported.	No effect on traffic after enabling Device ID. Policy builder still learns suggestions from IP
Anti-Virus protection (ICAP)	-	Violation is not detected and there is no side effect.
Database Security	-	Not tested
Bypassing of Search Engines	-	No matter what User Agent / XFF value is used, only the first 10 requests are logged. There is no violation
iRules	-	**1.** If ASM_REQUEST_DONE event triggers for request, then IO_PLUGIN|ERR appear in bd.log and request is not logged (Bug 655562). **2.** If ASM_REQUEST_BLOCKING event triggers for request,

Feature	Notes	Observations when feature is enabled
		then request logged as illegal only (Bug 655818). **3.** If ASM_RESPONSE_VIOLATION event triggers for request, then request is not logged (Bug 655823).

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Export Regulation Notice

This product may include cryptographic software. Under the Export Administration Act, the United States government may consider it a criminal offense to export this product from the United States.

RF Interference Warning

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This unit generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Any modifications to this device, unless expressly approved by the manufacturer, can void the user's authority to operate this equipment under part 15 of the FCC rules.

Canadian Regulatory Compliance

This Class A digital apparatus complies with Canadian ICES-003.

Standards Compliance

This product conforms to the IEC, European Union, ANSI/UL and Canadian CSA standards applicable to Information Technology products at the time of manufacture.

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