BIG-IP® Network Firewall: Policies and Implementations

Version 11.6

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Chapter 1

About the Network Firewall

What is the BIG-IP Network Firewall?

The BIG-IP® Network Firewall provides policy-based access control to and from address and port pairs, inside and outside of your network. Using a combination of contexts, the network firewall can apply rules in a number of different ways, including: at a global level, on a route domain, on a per-virtual server level, for a self IP address, or for the management port. Firewall rules are combined in firewall policies, which can contain multiple context and address pairs, and can be applied directly to any context except the management port. Rules for the management port context are defined inline, and do not require a separate policy.

By default, the Network Firewall is configured in *ADC mode*, a default allow configuration, in which all traffic is allowed through the firewall, and any traffic you want to block must be explicitly specified.

The system is configured in this mode by default so all traffic on your system continues to pass after you provision Advanced Firewall Manager™. You should create appropriate firewall rules to allow necessary traffic to pass before you switch Advanced Firewall Manager to Firewall mode. In *Firewall mode*, a default deny configuration, all traffic is blocked through the firewall, and any traffic you want to allow through the firewall must be explicitly specified.

About firewall modes

The BIG-IP® Network Firewall provides policy-based access control to and from address and port pairs, inside and outside of your network. By default, the network firewall is configured in ADC mode. This means it is a *default allow* configuration, in which all traffic is allowed to virtual servers and self IPs on the system, and any traffic you want to block must be explicitly specified. This applies only to the virtual server and self IP levels on the system.

Important: *If a packet does not match any rule in any context on the firewall, the Global Reject or Global Drop rule drops the packet (Global Drop) or drops the packet and sends the appropriate reject message (Global Reject) even when the system is in a default allow configuration. In addition, the Global Drop or Global Reject rule does not drop or reject traffic to the management port. Management port rules must be specifically configured and applied.*

Configuring the Network Firewall in ADC mode

If you have changed the firewall setting to Firewall mode, you can configure the BIG-IP® Network Firewall back to ADC mode.

Note: *The firewall is configured in ADC mode, by default.*

1. On the Main tab, click **Security** > **Options** > **Network Firewall**.
   The Firewall Options screen opens.
2. From the **Virtual Server & Self IP Contexts** list, select the default action **Accept** for the self IP and virtual server contexts.
3. Click **Update**.
   The virtual server and self IP contexts for the firewall are changed.

Configuring the Network Firewall to drop or reject traffic that is not specifically allowed

You can configure the BIG-IP® Network Firewall to drop or reject all traffic not explicitly allowed. In Advanced Firewall Manager™ this is called *Firewall mode*, and this is also referred to as a *default deny* policy. Firewall mode applies a default deny policy to all self IPs and virtual servers.

1. On the Main tab, click **Security** > **Options** > **Network Firewall**.
   The Firewall Options screen opens.
2. From the **Virtual Server & Self IP Contexts** list, select the default action for the self IP and virtual server contexts.
   - Select **Drop** to silently drop all traffic to virtual servers and self IPs unless specifically allowed.
   - Select **Reject** to drop all traffic to virtual servers and self IPs unless specifically allowed, and to send the appropriate reject message for the protocol.
3. Click **Update**.
   The default virtual server and self IP firewall context is changed.

Configuring the Network Firewall to globally drop or reject traffic

If traffic to or from the BIG-IP® Network Firewall does not match a rule, the global rule handles the traffic. You can set the global rule to drop traffic or to reject traffic. The global rule rejects unmatched traffic by default.

Note: *Management port traffic is not handled by the global rule. Management port rules must be explicitly defined for the management port context.*

1. On the Main tab, click **Security** > **Options** > **Network Firewall**.
   The Firewall Options screen opens.
2. From the **Global Context** list, select the default action for the global rule, when the traffic matches no other rule.
   - Select **Drop** to drop traffic silently.
   - Select **Reject** to drop traffic, and send the appropriate reject message for the protocol.
3. Click **Update**.
   The global firewall action is changed.

Chapter 2

Firewall Rules and Rule Lists

About firewall rules

The BIG-IP® Network Firewall uses rules to specify traffic handling actions. Rules are collected in policies, which are applied at the global context, to a route domain, to a virtual server, or to a self IP address. Rules for the management port do not require a policy, but are defined directly in the management port context.

A rule includes:

Context
The category of object to which the rule applies. Rules can be global and apply to all addresses on the BIG-IP system that match the rule, or they can be specific, applying only to a specific virtual server, self IP address, route domain, or the management port.

Rule or Rule List
Specifies whether the configuration applies to this specific rule, or to a group of rules.

Source Address
One or more addresses, geographic locations, or address lists to which the rule applies. The source address refers to the packet's source.

Source Port
The ports or lists of ports on the system to which the rule applies. The source port refers to the packet's source.

VLAN
Specifies VLANs to which the rule applies. The VLAN source refers to the packet's source.

Destination Address
One or more addresses, geographic locations, or address lists to which the rule applies. The destination address refers to the packet's destination.

Destination Port
The ports or lists of ports to which the rule applies. The destination port refers to the packet's destination.

iRule
Specifies an iRule that is applied to the rule. An iRule can be started when the firewall rule matches traffic.

iRule sampling
When you select an iRule to trigger in a firewall rule, you can select the how frequently the iRule is triggered, for sampling purposes. The value you configure is `one out of n` times the iRule is triggered. For example, set this field to `5` to trigger the iRule one out of every five times the rule matches a flow.

Protocol
The protocol to which the rule applies. The firewall configuration allows you to select one specific protocol from a list of more than 250 protocols. The list is separated into a set of common protocols, and a longer set of other protocols. To apply a rule to more than one protocol, select **Any**.

Schedule
Specifies a schedule for the firewall rule. You configure schedules to define days and times when the firewall rule is made active.

Action
Specifies the action (accept, accept decisively, drop, or reject) for the firewall rule.

Logging

Specifies whether logging is enabled or disabled for the firewall rule.

Firewall actions

These listed actions are available in a firewall rule.

Firewall actions are processed within a context. If traffic matches a firewall rule within a given context, that action is applied to the traffic, and the traffic is processed again at the next context.

Firewall action	Description
Accept	Allows packets with the specified source, destination, and protocol to pass through the current firewall context. Packets that match the rule, and are `accepted`, traverse the system as if the firewall is not present.
Drop	Drops packets with the specified source, destination, and protocol. Dropping a packet is a silent action with no notification to the source or destination systems. Dropping the packet causes the connection to be retried until the retry threshold is reached.
Reject	Rejects packets with the specified source, destination, and protocol. Rejecting a packet is a more graceful way to deny a packet, as it sends a destination unreachable message to the sender. For example, if the protocol is TCP, a TCP RST message is sent. One benefit of using Reject is that the sending application is notified, after only one attempt, that the connection cannot be established.
Accept Decisively	Allows packets with the specified source, destination, and protocol to pass through the firewall. Packets that match the rule, and are `accepted decisively`, traverse the system as if the firewall is not present, and are not processed by rules in any further context after the `accept decisively` action applies. If you want a packet to be accepted in one context, and not to be processed in any remaining context or by the default firewall rules, specify the `accept decisively` action. For example, if you want to allow all packets from Network A to reach every server behind your firewall, you can specify a rule that accepts decisively at the global context, from that Network A, to any port and address. Then, you can specify that all traffic is blocked at a specific virtual server, using the virtual server context. Because traffic from Network A is accepted decisively at the global context, that traffic still traverses the virtual server.

About Network Firewall contexts

With the BIG-IP® Network Firewall, you use a context to configure the level of specificity of a firewall policy. For example, you might make a global context rule to block ICMP ping messages, and you might make a virtual server context rule to allow only a specific network to access an application.

Context is processed in this order:

1. Global
2. Route domain
3. Virtual server/self IP
4. Global drop or reject*

The firewall processes policies and rules in order, progressing from the global context, to the route domain context, and then to either the virtual server or self IP context. Management port rules are processed separately, and are not processed after previous rules. Rules can be viewed in one list, and viewed and reorganized separately within each context. You can enforce a firewall policy on any context except the management port. You can also stage a firewall policy in any context except management. Management port rules are configured as inline rules specific to the management port.

Important: *You can configure the global drop or reject context. The global drop or reject context is the final context for all traffic, except Management port traffic. Note that even though it is a global context, it is not processed first, like the main global context, but last. If a packet matches no rule in any previous context, the global drop or reject rule rejects the traffic. The default global rule is global reject.*

Notice: *Management port traffic is not affected by the global drop or reject rule, or by global rules in general. Management port rules must be specifically configured and applied.*

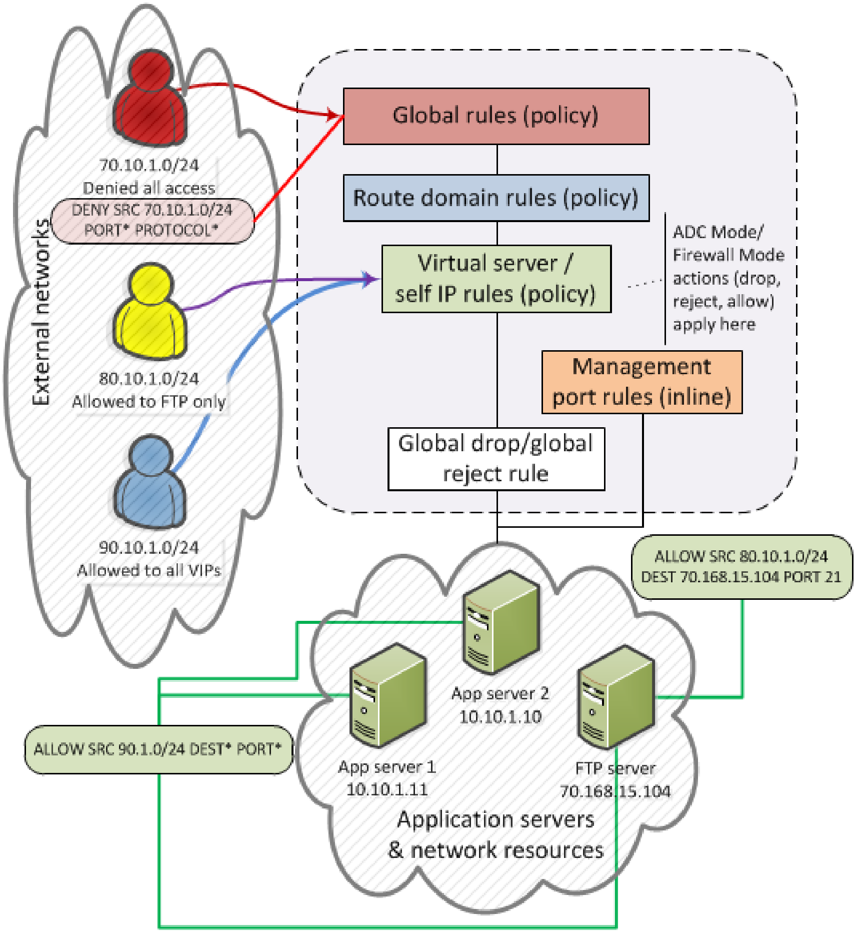

External networks
70.10.1.0/24
Denied all access
DENY SRC 70.10.1.0/24 PORT* PROTOCOL*
80.10.1.0/24
Allowed to FTP only
90.10.1.0/24
Allowed to all VIPs
Global rules (policy)
Route domain rules (policy)
Virtual server / self IP rules (policy)
ADC Mode/ Firewall Mode actions (drop, reject, allow) apply here
Management port rules (inline)
Global drop/global reject rule
ALLOW SRC 80.10.1.0/24 DEST 70.168.15.104 PORT 21
ALLOW SRC 90.1.0/24 DEST* PORT*
App server 2
10.10.1.10
App server 1
10.10.1.11
FTP server
70.168.15.104
Application servers & network resources

Figure 1: Firewall context processing hierarchy example

Firewall context descriptions

When you create a firewall rule, you can select one of these listed contexts. Rules for each context form their own list and are processed both in the context hierarchy, and in the order within each context list.

Firewall context	Description
Global	Global policy rules are collected in this firewall context. Global rules apply to all traffic that traverses the firewall, and global rules are checked first.

Firewall context	Description
Route Domain	Route domain policy rules are collected in this context. Route domain rules apply to a specific route domain defined on the server. Route domain policy rules are checked after global rules. If you have not configured a route domain, you can apply route domain rules to Route Domain 0, which is effectively the same as the global rule context; however, if you configure another route domain after this, Route Domain 0 is no longer usable as a global context.
Virtual Server	Virtual server policy rules are collected in this context. Virtual server policy rules apply to the selected existing virtual server only. Virtual server rules are checked after route domain rules.
Self IP	Self IP policy rules apply to a specified self IP address on the device. Self IP policy rules are checked after route domain rules.
Management Port	The management port context collects firewall rules that apply to the management port on the BIG-IP® device. Management port rules are checked independently of any other rules.
Global Reject	The Global Reject rule rejects all traffic that does not match any rule in a previous context, excluding Management Port traffic, which is processed independently.

Creating a network firewall management port rule

If you are going to specify address lists, user lists, or port lists with this rule, you must create these lists before creating the firewall rule, or add them after you save the rule.

Create a network firewall management port rule to manage access from an IP or web network address to the BIG-IP® management port.

Note: *You cannot add rules created with this task to a rule list at a later time. You must create rules for a rule list from within the rule list.*

Important: *You can only add management port rules as inline rules. For all other contexts, you must add rules to policies.*

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. In the Rules area, click **Add** to add a firewall rule to the list.
3. From the **Context** list, select **Management Port**.
4. In the **Name** and **Description** fields, type the name and an optional description.
5. From the **State** list, select the rule state.
   - Select **Enabled** to apply the firewall rule to the given context and addresses.
   - Select **Disabled** to set the firewall rule to not apply at all.
   - Select **Scheduled** to apply the firewall rule according to the selected schedule.
6. From the **Schedule** list, select the schedule for the firewall rule.

   This schedule is applied when you set the firewall rule state as **Scheduled**.
7. From the **Protocol** list, select the protocol to which the firewall rule applies.
   - Select **Any** to apply the firewall rule to any protocol.
   - Select the protocol name to apply the rule to a single protocol.

Important: *ICMP is handled by the BIG-IP system at the global or route domain level. Because of this, ICMP messages receive a response before they reach the virtual server context. You cannot create an inline rule for ICMP or ICMPv6 on a Self IP context. You can apply a rule list to a self IP that includes a rule for ICMP or ICMPv6; however, such a rule will be ignored. To apply firewall actions to the ICMP protocol, create a rule with the* `global` *or* `route domain` *context. ICMP rules are evaluated only for ICMP forwarding requests, and not for the IP addresses of the BIG-IP system itself.*

Note: *Note that you must select a protocol if you specify ports.*

8. In the **Source** list, specify IP addresses and geolocated sources to which this rule applies.
   - From the **Address/Region** list, select **Any** to have the rule apply to any packet source IP address or packet source geographic location.
   - From the **Address/Region** list, select **Specify** and click **Address** to specify one or more packet source IP addresses to which the rule applies. When selected, you can type single IP addresses into the **Address** field, then click **Add** to add them to the address list.
   - From the **Address/Region** list, select **Specify** and click **Address List** to select a predefined list of packet source addresses to which the rule applies. To use an address list with this rule, select the address list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
   - From the **Address/Region** list, select **Specify** and click **Address Range** to specify a contiguous range of packet source IP addresses to which the rule applies. When selected, you can type a start and end IP address in the fields, then click **Add** to add the IP address range to the address list.
   - From the **Address/Region** list, select **Specify** and click **Country/Region** to identify the geographic origin of packet sources, and to apply rules based on selected geographic locations. When selected, a field appears in which you can select a country. For many countries, an extra field appears after you select the country, in which you can select a state or province. If you do not select a specific state or province, the entire country is selected. After you select a geographic location, click **Add** to add it to the Source address list.
9. From the Source **Port** list, select the type of packet source ports to which this rule applies.
   - Select **Any** to have the rule apply to any packet source port.
   - Select **Specify** and click **Port** to specify one or more packet source ports to which the rule applies. When selected, you can type single port numbers into the **Port** field, then click **Add** to add them to the port list.
   - Select **Specify** and click **Port Range** to specify a list of contiguous packet source port numbers to which the rule applies. When selected, you can type the start and end ports into the fields, then click **Add** to add the ports to the port list.
   - Select **Specify** and click **Port List** to select a predefined list of packet source ports to which the rule applies. To use a port list with this rule, select the port list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
10. From the Destination **Address/Region** list, select the type of packet destination address to which this rule applies.
    - Select **Any** to have the rule apply to any IP packet destination address.
    - Select **Specify** and click **Address** to specify one or more packet destination IP addresses to which the rule applies. When selected, you can type single IP addresses into the **Address** field, then click **Add** to add them to the address list.
    - Select **Specify** and click **Address List** to select a predefined list of packet destination addresses to which the rule applies. To use an address list with this rule, select the address list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.

- Select **Specify** and click **Address Range** to specify a contiguous range of packet destination IP addresses to which the rule applies. When selected, you can type a start and end IP address in the fields, then click **Add** to add the IP address range to the address list.

11. From the Destination **Port** list, select the type of packet destination ports to which this rule applies.
    - Select **Any** to have the rule apply to any port inside the firewall.
    - Select **Specify** and click **Port** to specify one or more packet destination ports to which the rule applies. When selected, you can type single port numbers into the **Port** field, then click **Add** to add them to the port list.
    - Select **Specify** and click **Port Range** to specify a list of contiguous packet destination port numbers to which the rule applies. When selected, you can type the start and end ports into the fields, then click **Add** to add the ports to the port list.
    - Select **Specify** and click **Port List** to select a predefined list of packet destination ports to which the rule applies. To use a port list with this rule, select the port list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
12. From the **Action** list, select the firewall action for traffic originating from the specified source address on the specified protocol. Choose from one of the these actions:

Option	Description
Accept	Allows packets with the specified source, destination, and protocol to pass through the firewall. Packets that match the rule, and are accepted, traverse the system as if the firewall is not present.
Drop	Drops packets with the specified source, destination, and protocol. Dropping a packet is a silent action with no notification to the source or destination systems. Dropping the packet causes the connection to be retried until the retry threshold is reached.
Reject	Rejects packets with the specified source, destination, and protocol. When a packet is rejected the firewall sends a destination unreachable message to the sender.
Accept Decisively	Allows packets with the specified source, destination, and protocol to pass through the firewall, and does not require any further processing by any of the further firewalls. Packets that match the rule, and are accepted, traverse the system as if the firewall is not present.

13. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
14. Click **Finished**.
    The list screen and the new item are displayed.

The new firewall rule is created.

About redundant and conflicting rules

When you create rules on the network firewall, it is possible that a rule can either overlap or conflict with an existing rule.

Redundant rule

A rule which has address, user, region, or port information that completely overlaps with another rule, with the same action. In the case of a redundant rule, the rule can be removed with no net change in packet processing because of the overlap with a previous rule or rules.

Conflicting rule

A conflicting rule is a special case of a redundant rule, in which address, user, region or port information overlaps with another rule, but the rules have different actions, and thus conflict.

Tip: *A rule might be called conflicting even if the result of each rule is the same. For example, a rule that applies to a specific IP address is considered in conflict with another rule that applies to the same IP address, if one has an* `Accept` *action and the other has an action of* `Accept Decisively`*, even though the two rules accept packets.*

On a rule list page, redundant or conflicting rules are indicated in the **State** column with either `(Redundant)` or `(Conflicting).`

Viewing and removing redundant and conflicting rules

You must have staged or enforced rules configured on your system that are redundant or conflicting.

View and remove redundant or conflicting rules to simplify your configuration and ensure that your system takes the correct actions on packets.

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. From the **Type** list, select whether you want to view **Enforced** or **Staged** policies.

   Note: *If you select to view **Staged** policies, you can not view management port rules, as they cannot be staged.*

3. View the firewall rule states in the **State** column.

   Each rule is listed as Enabled, Disabled, or Scheduled. In addition, a rule may have one of the following states. View and adjust rules with these states, if necessary.

   (Redundant)
   The rule is enabled, disabled, or scheduled, and redundant. All the functionality of this rule is provided by a previous rule or rules. Hover the mouse over the **State** column to see why the rule is considered redundant, and possible solutions. Typically you can disable or delete a redundant rule with no net effect on the system.

   (Conflicting)
   The rule is enabled, disabled, or scheduled, and conflicting. All the match criteria of this rule is covered by another rule or rules, but this rule has a different action. Hover the mouse over the **State** column to see why the rule is considered conflicting, and possible solutions. Typically you should disable or delete a conflicting rule. Because the rule criteria is matched prior to the conflicting rule, there it typically no net change in processing. Note that the **Accept** and **Accept Decisively** actions are treated as conflicting by the system.

   (Conflicting & Redundant
   The rule is enabled, disabled, or scheduled, and conflicting or redundant with the actions of more than one other rule. Typically you should disable or delete a conflicting and redundant rule.

4. Resolve conflicting or redundant rules by editing, deleting, or disabling them. Click a rule name to edit, delete, or disable it, and complete the required action.

The firewall rule list is adjusted.

About stale rules

On the rule list page, you can determine whether a rule is stale, infrequently used, or never used. A *stale* rule is one that has not been hit in a long time. In addition, a rule may never be hit, or may be hit infrequently.

Note: *Use discretion when tuning rules, and delete rules only when you are sure they are no longer needed.*

On the active rules page, or the page of rules for a policy, the **Count** column displays the number of times a rule has been hit. A count of `0` may indicate a rule that will never be hit, and can be removed without changing packet processing. A rule with a low count, when other rules have a high count, may indicate a rule that is stale, and no longer needed.

Use the **Latest Match** column to confirm rule status. A status of **Never** indicates the rule has never been matched, and may be irrelevant. A very long time since the last match indicates a rule that is likely no longer needed.

You can view stale rules from the stale rules reporting page. Go to **Security** > **Reporting** > **Network** > **Stale Rules**.

Viewing and removing unused or infrequently used rules

You must have staged or enforced rules configured on your system, and the system must be processing traffic, to determine whether rules or hit.

View and remove infrequently used or unused rules to reduce firewall processing and simplify your rules, rule lists, and policies.

Caution: *Before you remove a rule that is infrequently hit, or never hit, make sure that doing so will not create a security issue. A rule may be hit infrequently, or never, but may still be a required part of a security solution for a very specific or rare attack.*

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. From the **Type** list, select whether you want to view **Enforced** or **Staged** policies.

   Note: *If you select to view **Staged** policies, you can not view management port rules, as they cannot be staged.*
3. View the rule hit count in the **Count** column.

   The rule hit count shows how many total times a rule has been hit. A very low number indicates that the rule is infrequently hit. A count of `0` indicates the rule has never been hit.
4. View the latest match date in the **Latest Match** column.

   The latest match column lists the last time the rule was hit. An old date indicates that the rule has not been hit in a long time. `Never` indicates that the rule has never been hit.
5. Resolve infrequently hit rules by editing, deleting, or disabling them. Click a rule name to edit, delete, or disable it, and complete the required action.

The firewall rule list is adjusted.

About firewall rule lists

The BIG-IP® Network Firewall uses rule lists to collect multiple rules. Rule lists function differently depending on how you create them with Advanced Firewall Manager™ (AFM™).

If you create a rule list with Security > Network Firewall > Rule Lists > Create:

This type of rule list is defined with a name and optional description. Once you create a rule list of this type, you can create and add one or more individual firewall rules to it. You can only add firewall rules by creating them from within the rule list. This type of rule list cannot be used on its own, but must be selected in an Active Rules list, or in a Policy Rules list.

If you create a rule list with Security > Network Firewall > Active Rules > Add and select the Type as Rule List:

This type of rule list is defined with a name and optional description. You can specify a context (Global, Route Domain, Virtual Server, or Self IP). However, you cannot add individual rules to this rule list. Instead, you select a single rule list you have already created, or one of the predefined rule lists. This type of rule list is used to activate a rule list in the configuration.

If you create a rule list with Security > Network Firewall > Policies > *`policy_name`* > Add and select the Type as Rule List:

This type of rule list is defined with a name and optional description. You cannot specify a context as the context is determined by the policy. You cannot add individual rules to this rule list. Instead, you select a single rule list you have already created, or one of the predefined rule lists. This type of rule list is used to activate a rule list in a policy.

Creating a network firewall rule list

Create a network firewall rule list, to which you can add firewall rules.

1. On the Main tab, click **Security** > **Network Firewall** > **Rule Lists**.
   The Rule Lists screen opens.
2. Click the **Create** button to create a new rule list.
3. In the **Name** and **Description** fields, type the name and an optional description.
4. Click **Finished**.
   The list screen and the new item are displayed.

The firewall rule list appears in the list.

Add firewall rules to the rule list to define source, destination, and firewall actions.

Adding a Network Firewall rule to a rule list

Before you add a firewall rule to a rule list, you must create a rule list.

Add a network firewall rule to a rule list so you can collect rules and apply them at once in a policy.

1. On the Main tab, click **Security** > **Network Firewall** > **Rule Lists**.
   The Rule Lists screen opens.
2. In the list, click the name of a rule list you previously created.
   The Rule List properties screen opens.
3. In the Rules area, click **Add** to add a firewall rule to the list.

4. In the **Name** and **Description** fields, type the name and an optional description.
5. From the **State** list, select the rule state.
   - Select **Enabled** to apply the firewall rule to the given context and addresses.
   - Select **Disabled** to set the firewall rule to not apply at all.
   - Select **Scheduled** to apply the firewall rule according to the selected schedule.
6. From the **Schedule** list, select the schedule for the firewall rule.

   This schedule is applied when you set the firewall rule state as **Scheduled**.
7. In the **Source** list, specify IP addresses and geolocated sources to which this rule applies.
   - From the **Address/Region** list, select **Any** to have the rule apply to any packet source IP address or packet source geographic location.
   - From the **Address/Region** list, select **Specify** and click **Address** to specify one or more packet source IP addresses to which the rule applies. When selected, you can type single IP addresses into the **Address** field, then click **Add** to add them to the address list.
   - From the **Address/Region** list, select **Specify** and click **Address List** to select a predefined list of packet source addresses to which the rule applies. To use an address list with this rule, select the address list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
   - From the **Address/Region** list, select **Specify** and click **Address Range** to specify a contiguous range of packet source IP addresses to which the rule applies. When selected, you can type a start and end IP address in the fields, then click **Add** to add the IP address range to the address list.
   - From the **Address/Region** list, select **Specify** and click **Country/Region** to identify the geographic origin of packet sources, and to apply rules based on selected geographic locations. When selected, a field appears in which you can select a country. For many countries, an extra field appears after you select the country, in which you can select a state or province. If you do not select a specific state or province, the entire country is selected. After you select a geographic location, click **Add** to add it to the Source address list.
8. From the Source **Port** list, select the type of packet source ports to which this rule applies.
   - Select **Any** to have the rule apply to any packet source port.
   - Select **Specify** and click **Port** to specify one or more packet source ports to which the rule applies. When selected, you can type single port numbers into the **Port** field, then click **Add** to add them to the port list.
   - Select **Specify** and click **Port Range** to specify a list of contiguous packet source port numbers to which the rule applies. When selected, you can type the start and end ports into the fields, then click **Add** to add the ports to the port list.
   - Select **Specify** and click **Port List** to select a predefined list of packet source ports to which the rule applies. To use a port list with this rule, select the port list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
9. From the Source **VLAN/Tunnel** list, select the VLAN on which this rule applies.
   - Select **Any** to have the rule apply to traffic on any VLAN through which traffic enters the firewall.
   - Select **Specify** to specify one or more VLANs on the firewall to which the rule applies. To use a VLAN with this rule, move the VLAN from the **Available** list to the **Selected** list by clicking the << button. Similarly, to remove the VLAN from this rule, click the >> button to move the VLAN from the **Selected** list to the **Available** list.
10. From the Destination **Address/Region** list, select the type of packet destination address to which this rule applies.
    - Select **Any** to have the rule apply to any IP packet destination address.

- Select **Specify** and click **Address** to specify one or more packet destination IP addresses to which the rule applies. When selected, you can type single IP addresses into the **Address** field, then click **Add** to add them to the address list.
- Select **Specify** and click **Address List** to select a predefined list of packet destination addresses to which the rule applies. To use an address list with this rule, select the address list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
- Select **Specify** and click **Address Range** to specify a contiguous range of packet destination IP addresses to which the rule applies. When selected, you can type a start and end IP address in the fields, then click **Add** to add the IP address range to the address list.
- Select **Specify** and click **Country/Region** to identify the geographic packet destination, and to apply rules based on specific geographic locations. When selected, a field appears in which you can select a country. For many countries, an extra field appears after you select the country, in which you can select a state or province. If you do not select a specific state or province, the entire country is selected. After you select a geographic location, click **Add** to add it to the Destination address list.

11. From the Destination **Port** list, select the type of packet destination ports to which this rule applies.
    - Select **Any** to have the rule apply to any port inside the firewall.
    - Select **Specify** and click **Port** to specify one or more packet destination ports to which the rule applies. When selected, you can type single port numbers into the **Port** field, then click **Add** to add them to the port list.
    - Select **Specify** and click **Port Range** to specify a list of contiguous packet destination port numbers to which the rule applies. When selected, you can type the start and end ports into the fields, then click **Add** to add the ports to the port list.
    - Select **Specify** and click **Port List** to select a predefined list of packet destination ports to which the rule applies. To use a port list with this rule, select the port list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
12. From the **Protocol** list, select the protocol to which the firewall rule applies.
    - Select **Any** to apply the firewall rule to any protocol.
    - Select the protocol name to apply the rule to a single protocol.

    Important: *ICMP is handled by the BIG-IP system at the global or route domain level. Because of this, ICMP messages receive a response before they reach the virtual server context. You cannot create an inline rule for ICMP or ICMPv6 on a Self IP context. You can apply a rule list to a self IP that includes a rule for ICMP or ICMPv6; however, such a rule will be ignored. To apply firewall actions to the ICMP protocol, create a rule with the* `global` *or* `route domain` *context. ICMP rules are evaluated only for ICMP forwarding requests, and not for the IP addresses of the BIG-IP system itself.*

    Note: *Note that you must select a protocol if you specify ports.*
13. Optionally, from the **iRule** list, select an iRule to start if the rule matches traffic.
14. When you select an iRule to start in a firewall rule, you can enable iRule sampling, and select how frequently the iRule is started, for sampling purposes. The value you configure is `one out of n` times the iRule is triggered. For example, to trigger the iRule one out of every five times the rule matches a flow, select `Enabled`, then set this field to `5`.
15. From the **Action** list, select the firewall action for traffic originating from the specified source address on the specified protocol. Choose from one of the these actions:

Option	Description
Accept	Allows packets with the specified source, destination, and protocol to pass through the firewall. Packets that match the rule, and are accepted, traverse the system as if the firewall is not present.

Option	Description
Drop	Drops packets with the specified source, destination, and protocol. Dropping a packet is a silent action with no notification to the source or destination systems. Dropping the packet causes the connection to be retried until the retry threshold is reached.
Reject	Rejects packets with the specified source, destination, and protocol. When a packet is rejected the firewall sends a destination unreachable message to the sender.
Accept Decisively	Allows packets with the specified source, destination, and protocol to pass through the firewall, and does not require any further processing by any of the further firewalls. Packets that match the rule, and are accepted, traverse the system as if the firewall is not present.

16. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
17. Click **Finished**.
    The list screen and the new item are displayed.

A new firewall rule is created, and appears in the Rules list.

Activating a rule list in a policy

The rule list is a container in which you can select and activate one of the rule lists that you created previously, or one of the predefined system rule lists, to apply a collection of rules at one time, to a policy.

1. On the Main tab, click **Security** > **Network Firewall** > **Policies**.
   The Policies screen opens.
2. Click the name of a firewall policy to edit that policy.
   The Firewall Policy screen opens.
3. In the Rules area, click **Add** to add a firewall rule list to the policy.
4. In the **Name** and **Description** fields, type the name and an optional description.
5. From the **Order** list, set the order for the firewall rule.

   You can specify that the rule be first or last in the rule list, or before or after a specific rule.
6. From the **Type** list, select whether you are creating a standalone network firewall rule or creating the rule from a predefined rule list.

   Note: *If you create a firewall rule from a predefined rule list, only the **Name**, **Description**, **Order**, **Rule List**, and **State** options apply, and you must select or create a rule list to include.*
7. From the **Rule List** setting, select a rule list to activate in the policy or configuration.
8. From the **State** list, select the rule state.
   - Select **Enabled** to apply the firewall rule to the given context and addresses.
   - Select **Disabled** to set the firewall rule to not apply at all.
   - Select **Scheduled** to apply the firewall rule according to the selected schedule.
9. Click **Finished**.
   The list screen and the new item are displayed.

The firewall rule list you selected is activated.

Chapter 3

Firewall Rule Addresses and Ports

About firewall rule addresses and ports

In a Network Firewall rule, you have several options for defining addresses and ports. You can use one or more of these options to configure the ports and addresses to which a firewall rule applies.

***Note:** You can use any combination of inline addresses, ports, address lists, and port lists in a firewall rule.*

Any (address or port)

In both **Source** and **Destination** address and port fields, you can select **Any**. This specifies that the firewall rule applies to any address or port.

Inline addresses

An inline address is an IP address that you add directly to the network firewall rule, in either the **Source** or **Destination Address** field. You can specify a single IP address, multiple IP addresses, a contiguous range of IP addresses, or you can identify addresses based on their geographic location. IP addresses can be either IPv4 or IPv6, depending on your network configuration.

Address lists

An address list is a preconfigured list of IP addresses that you add directly to the BIG-IP® system. You can select this list of addresses to use in either the **Source** or **Destination Address** field. An address list can also contain other address lists, and geographic locations.

Inline ports

An inline port is a port that you add directly to the network firewall rule, in either the **Source** or **Destination Port** field. You can add a single port, or a contiguous port range.

Port lists

A port list is a preconfigured list of ports that you add directly to the BIG-IP system. You can select this list of ports to use in either the **Source** or **Destination Port** field. You can also add port lists to other port lists.

About address lists

An address list is simply a collection of addresses saved on the server, including IP addresses, contiguous IP address ranges, geographic locations, and other (nested) address lists. You can define one or more address lists, and you can select one or more address lists in a firewall rule. Firewall address lists can be used in addition to inline addresses that are specified within a particular rule.

Creating an address list

Create an address list to apply to a firewall rule, in order to match IP addresses.

1. On the Main tab, click **Security** > **Network Firewall** > **Address Lists**.
   The Address Lists screen opens.
2. Click **Create** to create a new address list.
3. In the **Name** and **Description** fields, type the name and an optional description.
4. In the Addresses area, add and remove addresses.

- To add an IP address, type the address and press **Enter**.
- To add an IP address range, type the start and end IP addresses, separated by a dash, and press **Enter**.
- To add an existing address list, start typing the name of the address list. A list of items (address lists and geographic locations) will appear. Select the address list and press **Enter**.
- To add a geographic location, start typing the name of the geographic location. A list of items (address lists and geographic locations) will appear. Select the geographic location and press **Enter**.
- To remove an address, select the address in the Addresses list and click the **X**.

Address lists can contain IP addresses, IP address ranges, geographic locations, other address lists, or any combination of these.

5. Click **Finished**.
   The list screen and the new item are displayed.

About port lists

A *port list* is simply a collection of ports saved on the server. A port list can also contain other port lists. You can define one or more port lists, and you can specify one or more port lists in a firewall rule. Firewall port lists can be used in addition to inline ports, specified within a particular firewall rule or policy.

Creating a port list

Create a port list to apply to a firewall rule, in order to match ports.

1. On the Main tab, click **Security** > **Network Firewall** > **Port Lists**.
   The Port Lists screen opens.
2. Click **Create** to create a new port list.
3. In the **Name** and **Description** fields, type the name and an optional description.
4. In the Ports area, add and remove ports.
   - To add a single port, type the port number and press the **Enter** key.
   - To add a contiguous range of ports, type the first port number, a dash, and the last port number, then press the **Enter** key.
   - To add an existing port list to the current port list, start typing the name of the port list. A list of port lists that match the typed input appear below the field. Select the port list you want to add, then press the **Enter** key.
   - To remove a port, port range, or port list, select the entryin the Ports area and click the small **X** to the right of the entry.
5. Click **Finished**.
   The list screen and the new item are displayed.

Chapter 4

Network Firewall Schedules

About Network Firewall schedules

With a Network Firewall schedule, you can configure date ranges, days of the week, and time ranges for when a firewall rule is applied.

A schedule must be selected in a firewall rule or rule list, to apply to that firewall rule or rule list. The firewall rule or rule list must also be set to the Scheduled state.

When you configure a schedule for a rule list, the rules within the rule list can only be enabled when the rule list is enabled by the schedule. This means that even if the individual rules in a rule list have schedules, the rules are not enabled by their schedules unless the rule list is also enabled by the rule list schedule.

Creating a schedule

Create a schedule to define the times, dates, and days of the week for when a firewall rule is applied.

1. On the Main tab, click **Security** > **Network Firewall** > **Schedules**.
   The Schedules screen opens.
2. Click **Create** to create a new firewall schedule.
3. In the **Name** and **Description** fields, type the name and an optional description.
4. In the **Date Range** area, define the range of dates over which the schedule applies.
   - Select **Indefinite** to have the schedule apply immediately, and run indefinitely. This makes the schedule active until you change the date range, or delete the schedule.
   - Select **Until** to have the schedule apply immediately, and define an end date and ending time. This makes the schedule active now, and disables it when the end date and ending time is reached. Click in the field to choose an end date from a popup calendar, and set the ending time with the sliders.
   - Select **After** to have the schedule apply after the specified date and starting time, and run indefinitely. This makes the schedule active starting on the selected date and time, until you change the start date, or delete the schedule. Click in the field to choose a start date from a pop-up calendar, and set the starting time with the sliders.
   - Select **Between** to apply the schedule starting on the specified start date and starting time, and ending on the specified end date and ending time. Click in the fields to choose the start and end dates from a pop-up calendar, and set the starting and ending time with the sliders.
5. In the Time Range area, define the times over which the firewall rule applies.
   - Select **All Day** to have the schedule apply all day, for every day specified in the date range.
   - Select **Between** to apply the schedule starting at the specified time, and ending at the specified time each day. Select the start and end hours and minutes from the popup screen, or click **Now** to set the current time.

   Note: *Specify the hours according to a 24-hour clock. For example, you can specify 3:00 PM with the setting* `15`*.*
6. In the Days Valid area, select the days of the week when the schedule is valid. Select check boxes for days of the week when the rule applies, and clear check boxes for days of the week when the schedule does not apply.
7. Click **Finished**.
   The list screen and the new item are displayed.

Chapter 5

Configuring BIG-IP Network Firewall Policies

About firewall policies

The BIG-IP® Network Firewall policies combine one or more rules or rule lists, and apply them as a combined policy to one or more contexts. You can configure a context to use a specific firewall policy. However, firewall context precedence still applies, so rules at the global context, for example, apply even if they contradict rules applied at a lower precedence context; for example, at a virtual server.

Notice: *Global firewall rules are included in an automatic policy called* ***Global****.*

You can apply a Network Firewall policy as a staged policy, while enforcing an existing firewall policy, or no policy. A *staged policy* allows you to evaluate the effect a policy has on traffic by analyzing the system logs, without actually modifying traffic based on the firewall rules.

Creating a Network Firewall policy

Create a BIG-IP® Network Firewall policy to collect and apply one or more firewall rules or rule lists globally, to a virtual server, route domain, or self IP address.

1. On the Main tab, click **Security** > **Network Firewall** > **Policies**.
   The Policies screen opens.
2. Click **Create** to create a new policy.
3. Type a name and optional description for the firewall policy.
4. Click **Finished**.

The Policies screen shows the new policy in the policy list.

Define firewall rules and rule lists for the policy to affect traffic.

Creating a Network Firewall policy rule

If you are going to specify address lists or port lists to use with this rule, you must create these lists before creating the firewall policy rule, or add them after you save the policy rule.

Create a Network Firewall policy rule to manage access from an IP or web network address to a specified network location, server, or address behind a BIG-IP® system.

Note: *You cannot add rules created with this task to a rule list at a later time. You must create rules for a rule list from within the rule list. Similarly, you cannot use the rules created in a policy to apply as inline rules in another context, though you can use rule lists in a policy rule.*

1. On the Main tab, click **Security** > **Network Firewall** > **Policies**.
   The Policies screen opens.
2. Click the name of the network firewall policy to which you want to add rules.
3. In the Rules area, click **Add** to add a firewall rule to the list.
4. In the **Name** and **Description** fields, type the name and an optional description.
5. From the **Type** list, select whether you are creating a standalone network firewall policy rule or creating a rule list.

Note: *If you create a firewall policy rule list, only the* ***Name****,* ***Description****,* ***Order****,* ***Rule List****, and* ***State****options apply, and you must select or create a rule list to include.*

6. From the **State** list, select the rule state.
   - Select **Enabled** to apply the firewall policy rule or rule list to the addresses and ports specified.
   - Select **Disabled** to set the firewall policy rule or rule list to not apply at all.
   - Select **Scheduled** to apply the firewall policy rule or rule list according to the selected schedule.
7. From the **Schedule** list, select the schedule for the firewall policy rule.

   This schedule is applied when the firewall policy rule state is set to **Scheduled**.
8. From the **Protocol** list, select the protocol to which the firewall rule applies.
   - Select **Any** to apply the firewall rule to any protocol.
   - Select the protocol name to apply the rule to a single protocol.

   Important: *ICMP is handled by the BIG-IP system at the global or route domain level. Because of this, ICMP messages receive a response before they reach the virtual server context. You cannot create an inline rule for ICMP or ICMPv6 on a Self IP context. You can apply a rule list to a self IP that includes a rule for ICMP or ICMPv6; however, such a rule will be ignored. To apply firewall actions to the ICMP protocol, create a rule with the* `global` *or* `route domain` *context. ICMP rules are evaluated only for ICMP forwarding requests, and not for the IP addresses of the BIG-IP system itself.*

   Note: *Note that you must select a protocol if you specify ports.*
9. In the **Source** list, specify IP addresses and geolocated sources to which this rule applies.
   - From the **Address/Region** list, select **Any** to have the rule apply to any packet source IP address or packet source geographic location.
   - From the **Address/Region** list, select **Specify** and click **Address** to specify one or more packet source IP addresses to which the rule applies. When selected, you can type single IP addresses into the **Address** field, then click **Add** to add them to the address list.
   - From the **Address/Region** list, select **Specify** and click **Address List** to select a predefined list of packet source addresses to which the rule applies. To use an address list with this rule, select the address list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
   - From the **Address/Region** list, select **Specify** and click **Address Range** to specify a contiguous range of packet source IP addresses to which the rule applies. When selected, you can type a start and end IP address in the fields, then click **Add** to add the IP address range to the address list.
   - From the **Address/Region** list, select **Specify** and click **Country/Region** to identify the geographic origin of packet sources, and to apply rules based on selected geographic locations. When selected, a field appears in which you can select a country. For many countries, an extra field appears after you select the country, in which you can select a state or province. If you do not select a specific state or province, the entire country is selected. After you select a geographic location, click **Add** to add it to the Source address list.
10. From the Source **Port** list, select the type of packet source ports to which this rule applies.
    - Select **Any** to have the rule apply to any packet source port.
    - Select **Specify** and click **Port** to specify one or more packet source ports to which the rule applies. When selected, you can type single port numbers into the **Port** field, then click **Add** to add them to the port list.
    - Select **Specify** and click **Port Range** to specify a list of contiguous packet source port numbers to which the rule applies. When selected, you can type the start and end ports into the fields, then click **Add** to add the ports to the port list.

- Select **Specify** and click **Port List** to select a predefined list of packet source ports to which the rule applies. To use a port list with this rule, select the port list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.

11. From the Source **VLAN/Tunnel** list, select the VLAN on which this rule applies.
    - Select **Any** to have the rule apply to traffic on any VLAN through which traffic enters the firewall.
    - Select **Specify** to specify one or more VLANs on the firewall to which the rule applies. To use a VLAN with this rule, move the VLAN from the **Available** list to the **Selected** list by clicking the << button. Similarly, to remove the VLAN from this rule, click the >> button to move the VLAN from the **Selected** list to the **Available** list.
12. From the Destination **Address/Region** list, select the type of packet destination address to which this rule applies.
    - Select **Any** to have the rule apply to any IP packet destination address.
    - Select **Specify** and click **Address** to specify one or more packet destination IP addresses to which the rule applies. When selected, you can type single IP addresses into the **Address** field, then click **Add** to add them to the address list.
    - Select **Specify** and click **Address List** to select a predefined list of packet destination addresses to which the rule applies. To use an address list with this rule, select the address list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
    - Select **Specify** and click **Address Range** to specify a contiguous range of packet destination IP addresses to which the rule applies. When selected, you can type a start and end IP address in the fields, then click **Add** to add the IP address range to the address list.
    - Select **Specify** and click **Country/Region** to identify the geographic packet destination, and to apply rules based on specific geographic locations. When selected, a field appears in which you can select a country. For many countries, an extra field appears after you select the country, in which you can select a state or province. If you do not select a specific state or province, the entire country is selected. After you select a geographic location, click **Add** to add it to the Destination address list.
13. From the Destination **Port** list, select the type of packet destination ports to which this rule applies.
    - Select **Any** to have the rule apply to any port inside the firewall.
    - Select **Specify** and click **Port** to specify one or more packet destination ports to which the rule applies. When selected, you can type single port numbers into the **Port** field, then click **Add** to add them to the port list.
    - Select **Specify** and click **Port Range** to specify a list of contiguous packet destination port numbers to which the rule applies. When selected, you can type the start and end ports into the fields, then click **Add** to add the ports to the port list.
    - Select **Specify** and click **Port List** to select a predefined list of packet destination ports to which the rule applies. To use a port list with this rule, select the port list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
14. Optionally, from the **iRule** list, select an iRule to start if the rule matches traffic.
15. When you select an iRule to start in a firewall rule, you can enable iRule sampling, and select how frequently the iRule is started, for sampling purposes. The value you configure is `one out of n` times the iRule is triggered. For example, to trigger the iRule one out of every five times the rule matches a flow, select `Enabled`, then set this field to `5`.
16. From the **Action** list, select the firewall action for traffic originating from the specified source address on the specified protocol. Choose from one of the these actions:

Option	Description
Accept	Allows packets with the specified source, destination, and protocol to pass through the firewall. Packets that match the rule, and are accepted, traverse the system as if the firewall is not present.

Option	Description
Drop	Drops packets with the specified source, destination, and protocol. Dropping a packet is a silent action with no notification to the source or destination systems. Dropping the packet causes the connection to be retried until the retry threshold is reached.
Reject	Rejects packets with the specified source, destination, and protocol. When a packet is rejected the firewall sends a destination unreachable message to the sender.
Accept Decisively	Allows packets with the specified source, destination, and protocol to pass through the firewall, and does not require any further processing by any of the further firewalls. Packets that match the rule, and are accepted, traverse the system as if the firewall is not present.

17. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
18. Click **Finished**.
    The list screen and the new item are displayed.

The new firewall policy rule is created.

Setting a global firewall policy

You can create a virtual server with a firewall policy, to provide policy-based network firewall actions at the virtual server.

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. Under **Active Network Firewall Rules**, click the **Global** link.
   The **Global Firewall Rules** screen opens.
3. To enforce rules from a firewall policy in the selected context, in the Network Firewall area: from the **Enforcement** list, select **Enabled** and then select the firewall policy to enforce from the **Policy** list.
4. To stage rules from a firewall policy in the selected context, in the Network Firewall area: from the **Staging** list, select **Enabled** and then select the firewall policy to stage from the **Policy** list.

The policy rules you selected are enforced at the global level. If you chose to stage policy rules, the results of those rules are logged, but not enforced.

Configuring a route domain with a firewall policy

Before you can configure a route domain with a firewall policy, you need a pre-existing route domain.

Route domains are useful for multi-tenant configurations. You can set firewall policies for enforcement and staging on an existing route domain, and create a route domain on a BIG-IP® system to segment (isolate) traffic on your network.

1. On the Main tab, click **Network** > **Route Domains**.
   The Route Domain List screen opens.
2. Click the name of the route domain to show the route domain configuration.
3. Click the Security tab.

4. To enforce rules from a firewall policy on the route domain: in the Network Firewall area: from the **Enforcement** list, select **Enabled** and then select the firewall policy to enforce from the **Policy** list.
5. To stage rules from a firewall policy on the route domain: in the Network Firewall area, from the **Staging** list, select **Enabled** and then select the firewall policy to stage from the **Policy** list.
6. Click **Update** to save the changes to the route domain.

Setting network firewall policies for a self IP address

Ensure that you have created a self IP address.

You can enforce or stage a firewall policy at the self IP context. Stage a firewall policy to check the results of the firewall policy in the logs without affecting traffic.

1. On the Main tab, click **Network** > **Self IPs**.
2. Click on the self IP address to which you want to add a network firewall policy.
3. Click the **Security** tab.
4. To enforce rules from a firewall policy on the self IP: in the Network Firewall area, from the **Enforcement** list, select **Enabled** and then select the firewall policy to enforce from the **Policy** list.
5. To stage rules from a firewall policy on the self IP: in the Network Firewall area, from the **Staging** list, select **Enabled** and then select the firewall policy to stage from the **Policy** list.
6. Click **Update** to save the changes to the self IP.

The selected self IP now enforces or stages rules according to your selections.

Creating a virtual server with a firewall policy

You can create a virtual server with a firewall policy, to provide policy-based network firewall actions at the virtual server.

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. For the **Destination** setting, in the **Address** field, type the IP address you want to use for the virtual server.

   The IP address you type must be available and not in the loopback network.
5. In the **Service Port** field, type `*` or select *** All Ports** from the list.
6. Click **Finished**.
7. Click the name of the virtual server you want to modify.
8. On the menu bar, click **Security** > **Policies**.
   The screen displays firewall rule settings.
9. To enforce rules from a firewall policy on the virtual server, in the Network Firewall area, from the **Enforcement** list, select **Enabled**, then select the firewall policy to enforce from the **Policy** list.
10. To stage rules from a firewall policy on the virtual server, in the Network Firewall area, from the **Staging** list, select **Enabled**, then select the firewall policy to stage from the **Policy** list.
11. Click **Update** to save the changes.

The policy rules you selected are enforced on the virtual server. If you chose to stage policy rules, the results of those rules are logged, but not enforced.

About firewall policy compilation

When you apply a rule list or policy to a context, the rule list or policy requires some server resources to compile. You can view the resources used on a context for the last rule compilation, by viewing compiler statistics on the context page. Compiler statistics are displayed for several items.

Activation Time
Displays the time at which firewall policies or rule lists were last activated on this context.

Compilation Duration
Displays the amount of time required to compile the rule sets or policies at the last activation.

Compilation Size
Displays the file size of the compiled rule sets or policies, after the last activation.

Maximum Transient Memory
Displays the maximum memory used to compile the rule sets or policies during the last activation.

Viewing compilation statistics for a firewall rule or policy

You can view the most recent compilation statistics for a rule list or policy on the Global Context, or on a Route Domain, Self IP, or Virtual Server.

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. From the **Context** list, select **All**.
3. View statistics using one of the following options.

Context	To view compilation statistics
Global	Click **Global**. From **Policy Settings**, select **Advanced**.
Virtual Server	Click the name of a virtual server. Click the **Security** tab, and select **Policies**. From **Policy Settings**, select **Advanced**.
Route Domain	Click the number of a route domain. Click the **Security** tab. From **Policy Settings**, select **Advanced**.
Self IP	Click the name of a self IP. Click the **Security** tab. From **Policy Settings**, select **Advanced**.

Attention: *The Global Context is always called **Global**. A virtual server or self IP has the name you assigned when you created it; for example,* `vs_http_134` *or* `self_lb_11`*. A route domain is identified with a number; for example,* `0`.

Statistics are displayed for the most recent rule list and policy compilation on the selected context.

Viewing enforced and staged policy rule logs

With BIG-IP® Advanced Firewall Manager™, you can choose to enforce either inline firewall rules or a firewall policy for a specific context. You can also choose to stage policies for a specific context. *Staged policies* apply all of the specified firewall rules to the policy context, but do not enforce the firewall action. Therefore, the result of a staged policy is informational only, and the result can be analyzed in the firewall logs.

A staged policy on a particular context might not behave the same after you change it to an enforcement policy. Because there can be multiple staged policies on different contexts, the staged policy results you see (in logs and stats) are actually the aggregate of *all* staged policies on all contexts. Thus, if you enforce a previously staged policy on one or more contexts, but other staged policies remain on other contexts that you do not enforce, the actual enforced results might differ from what you expected from viewing logs and statistics for staged rules.

Important: *You must enable logging for a policy, if you want to view the results of staged or enforced rules in the logs.*

Viewing Network Firewall enforced policy events on the local BIG-IP system

Ensure that the BIG-IP® system is configured to log the types of events you want to view, and to store the log messages locally on the BIG-IP system.

When the BIG-IP system is configured to log events locally, you can view those events using the Configuration utility.

1. On the Main tab, click **Security** > **Event Logs** > **Network** > **Firewall**.
   The Network Firewall event log displays.
2. To search for enforced policy events, in the search field, type `Enforced`, then click **Search**.
3. To narrow your search for enforced events, click **Custom Search**. Drag the `Enforced` text from the **Policy Type** column to the custom search table. Narrow your search further by dragging other items from the log display, for example, from the **action**, **policy**, or **rule** columns. the event data that you want to search for from the Event Log table into the Custom Search table, and then click **Search**.

Viewing Network Firewall staged policy events on the local BIG-IP system

Ensure that the BIG-IP® system is configured to log the types of events you want to view, and to store the log messages locally on the BIG-IP system.

When the BIG-IP system is configured to log events locally, you can view those events using the Configuration utility.

Important: *You must enable logging for a policy, if you want to view the results of staged or enforced rules in the logs.*

1. On the Main tab, click **Security** > **Event Logs** > **Network** > **Firewall**.
   The Network Firewall event log displays.
2. To search for staged policy events, in the search field, type `Staged`, then click **Search**.

3. To narrow your search for staged policy events, click **Custom Search**. Drag the `Staged` text from the **Policy Type** column to the custom search table. Narrow your search further by dragging other items from the log display. For example, from the **action**, **policy**, or **rule** columns, you can drag event data that you want to search for from the Event Log table into the Custom Search table, and then click **Search**.

Chapter 6

IP Address Intelligence in the Network Firewall

About IP intelligence policies in the Network Firewall

In the BIG-IP® Network Firewall, you can configure policies to check traffic against an IP intelligence database. Such traffic can be handled automatically if it originates from known-bad or questionable IP addresses. In addition, you can configure policies to automatically query *feed lists* that specify blacklist and whitelist IP address entries, and assign default classes and blacklist or whitelist behaviors to those feed lists. You can control the actions for each IP intelligence category by specifying such actions in a policy, and you can configure default action and default logging for each policy. Furthermore, you can configure logging and actions per category. You can apply IP Intelligence policies at the global context, to a virtual server, or on a route domain.

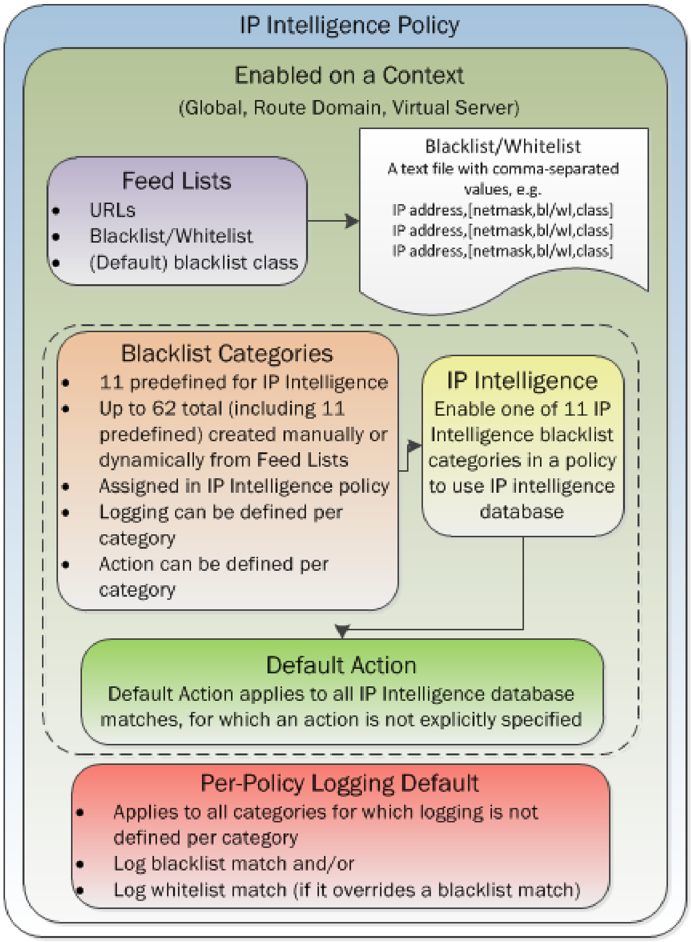

IP Intelligence Policy
Enabled on a Context
(Global, Route Domain, Virtual Server)
Feed Lists
URLs
Blacklist/Whitelist
(Default) blacklist class
Blacklist/Whitelist
A text file with comma-separated values, e.g.
IP address,[netmask,bl/wl,class]
IP address,[netmask,bl/wl,class]
IP address,[netmask,bl/wl,class]
Blacklist Categories
11 predefined for IP Intelligence
Up to 62 total (including 11 predefined) created manually or dynamically from Feed Lists
Assigned in IP Intelligence policy
Logging can be defined per category
Action can be defined per category
IP Intelligence
Enable one of 11 IP Intelligence blacklist categories in a policy to use IP intelligence database
Default Action
Default Action applies to all IP Intelligence database matches, for which an action is not explicitly specified
Per-Policy Logging Default
Applies to all categories for which logging is not defined per category
Log blacklist match and/or
Log whitelist match (if it overrides a blacklist match)

Figure 2: IP Intelligence Policy container and included elements

Enabling IP address intelligence

The requirements for using IP address 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 address intelligence is enabled by default. You only need to enable it if it was previously disabled.*

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

1. Log in to the command line for the BIG-IP® system.
2. To determine whether IP intelligence 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.
3. 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 address intelligence feature remains enabled unless you disable it with the command `tmsh modify sys db iprep.autoupdate value disable`.

You can configure IP intelligence for Advanced Firewall Manager by assigning IP intelligence policies to the global, route domain, or virtual server context.

IP address 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
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 Provider Networks	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

Category Name	Description
	a fast rate that targeted systems cannot respond quickly enough and become bogged down or unable to service legitimate clients.
Illegal Web sites	IP addresses that contain criminally obscene or potentially criminal internet copyright and intellectual property violations.
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.
Phishing	IP addresses that host phishing sites, and other kinds of fraud activities, such as ad click fraud or gaming fraud.
Proxy/Anonymous Proxies	IP addresses that are associated with web proxies that shield the originator's IP address (such as proxy and anonymization services). This category also includes TOR anonymizer addresses.
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.
Spam Sources	IP addresses that are known to distribute large amounts of spam email by tunneling spam messages through proxy, anomalous SMTP activities, and forum spam activities.
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.

About IP intelligence blacklist categories

Blacklist categories are categories you can use to differentiate between types of blacklisted URLs. You can specify up to 62 blacklist categories, including 11 that are predefined on the system. A blacklist category definition consists only of a name and description. You can specify actions and logging options for each blacklist category you create, and for predefined categories, in an IP Intelligence policy. The 11 predefined blacklist categories are automatically available for selection in an IP Intelligence policy.

Creating a blacklist category

You can create a blacklist category to configure policy-based responses to specific types of addresses. Then you can specify an address as belonging to a blacklist category so you can see the types of categories that are triggered in the logs, and so you can provide unique responses on a per-category basis.

1. On the Main tab, click **Security** > **Network Firewall** > **IP Intelligence** > **Blacklist Categories**.
   The Blacklist Categories screen opens.
2. Click **Create** to create a new IP Intelligence blacklist category.
3. In the **Name** field, type a name for the blacklist category.
4. In the **Description** field, type a description for the blacklist category.
5. Click **Finished**.
   The list screen and the new item are displayed.

About IP intelligence feed lists

A *feed list* retrieves blacklists and whitelists from specified URLs. You can use a feed list to dynamically update blacklists and whitelists.

A feed list can retrieve multiple feeds from FTP, HTTP, or HTTPS addresses. You can specify whether a feed is a blacklist or whitelist, and the default category for the feed list. You can also configure a polling interval.

After a blacklist or whitelist is defined in a feed list, you add the feed list to an IP Intelligence policy. The list is then used by the policy to retrieve feeds and dynamically adjust the blacklist and whitelist policy.

Feed list settings and IP Intelligency policy

Feed lists dynamically define IP addresses that have been blacklisted or whitelisted. The IP Intelligence policy uses feed lists to dynamically filter traffic.

A feed list defines the feeds that dynamically update the IP address intelligence database for your systems.

Feed list setting	Description
URL	Select **FTP**, **HTTP**, or **HTTPS**, then specify the URL for the feed. Feeds are typically text files. An example for a local file might be `http://172.10.1.23/feed.txt` .
List Type	**Whitelist** or **Blacklist**. Specifies the default classification for all URLs in the feed for which a category is not specified.
Blacklist Category	Specifies a default category for the list. This is the default blacklist category for all blacklist URLs in the feed for which a category is not specified. On the BIG-IP® system, you can specify a total of 62 categories; however, 9 categories are used by the IP Intelligence database.
Poll Interval	Specifies how often the feed URL is polled for new feeds.
Username	The user name to access the feed list file, if required.
Password	The password to access the feed list file, if required.
Feed URLs	In this area you can add, replace, or delete feed URLs from the feed list.

A feed is a simple comma-separated value (CSV) file. The file contains four comma-separated values per line.

Position	Value	Definition
1	IP Address	The IP address to be blacklisted or whitelisted. This is the only field that is required in each entry in the file. All other entries are optional. ***Important:*** *If you append a route domain with a percentage sign and the route domain number, the route domain is not used.*

Position	Value	Definition
2	Network Mask	(Optional) The network mask for the IP address as a CIDR (such as, `24` for `255.255.255.0`). This field is optional.
3	Whitelist/Blacklist	(Optional) Identifies whether the IP address is a whitelist or blacklist address. You can type `wl`, `bl`, `whitelist`, or `blacklist`, with any capitalization. Leave this field blank to retain the default specified for the feed.
4	Category	(Optional) Type the category name for the entry. Leave this field blank to take the default specified for the feed.

In this feed list file example, only the first entry specifies a value for every field. The third and fourth entries, 10.10.0.12 and 10.0.0.12, will be set to blacklist or whitelist entries depending on the setting for the feed. 10.10.0.12 is specified with a category of `botnets`; however, if the default setting for the feed is a whitelist, this is ignored. When an IP address has both a blacklist and a whitelist entry from the configuration, the whitelist entry takes precedence.

```
10.0.0.2,32,bl,spam_sources
10.0.0.3,,wl,
10.10.0.12,,botnets
10.0.0.12,,,
10.0.0.13,,bl,
```

Creating a feed list

You can add whitelist and blacklist IP addresses to your configuration automatically by setting up feeds and capturing them with a feed list.

1. On the Main tab, click **Security** > **Network Firewall** > **IP Intelligence** > **Feed Lists**.
   The Feed Lists screen opens.
2. Click **Create** to create a new IP Intelligence feed list.
3. In the **Name** field, type a name for the feed list.
4. Configure Feed URLs with an HTTP, HTTPS, or FTP URL, the list type, the blacklist category, and the polling interval. Specify a user name and password, if required to access the feed list.

   A feed URL includes the actual URL to the text file, and information about the defaults for that file. Within the feed file, however, any URL can be configured to be a whitelist or blacklist entry, and assigned to a blacklist category.
5. Click the **Add** button to add a feed URL to the feed list.
6. Click **Finished**.
   The list screen and the new item are displayed.

Configuring a policy to check addresses against IP intelligence

You can verify IP addresses against the preconfigured IP Intelligence database, and against IPs from your own feed lists, by creating an IP Intelligence policy.

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 policy.
4. To add feed lists to the policy, click the name of an **Available** feed list, and then add it to the **Selected** list.
5. Set the default action for the policy to Accept or Drop.

   - Select **Accept** to allow packets from uncategorized addresses on the feed list.
   - Select **Drop** to drop packets from uncategorized addresses on the feed list.

   The default action applies to addresses that are not assigned a blacklist category in the feed list. The IP Intelligence feature uses the action specified in a feed list entry, when available.
6. Set the default log actions.

   - **Log Black List Category Matches** logs IP addresses that match blacklist categories.
   - **Log White List Overrides** logs only whitelist matches that override blacklist matches.
   - Select both **Log Black List Category Matches** and **Log White List Overrides** to log all black list matches, and all whitelist matches that override blacklist matches.

   Note: *Whitelist matches always override blacklist matches.*
7. To configure matching actions and logging for custom blacklist categories, add Blacklist Categories in the Blacklist Matching Policy area. Select a category from the list of predefined and user-defined blacklist categories, and set the default action and default logging action for the category, then click **Add** to add the blacklist category to the policy.

   Note: *The default action for a blacklist category is always* ***Reject****.*
8. In the Blacklist Matching Policy area, for each category, you can select a default action.

   - Select **Use Policy Default** to use the default action.
   - Select **Accept** to allow packets from sources of the specified type, as identified by the IP address intelligence database.
   - Select **Drop** to drop packets from sources of the specified type, as identified by the IP address intelligence database.
9. In the Blacklist Matching Policy area, you can set the log action for each blacklist category. You can set log actions for **Log Blacklist Category Matches**, and for **Log Whitelist Overrides**.

   - **Use Policy Default** uses the default log action you configure for the policy.
   - **Yes** logs the item for the selected category.
   - **No** does not log the item for the selected category.

   Note: *Whitelist matches always override blacklist matches.*
10. Click **Add** to add a customized category to the policy. You can also replace a selected policy in the list, by clicking **Replace**.

11. To remove a customized category from the policy, select the category in the Blacklist Matching Policy area and click **Delete**.
12. Click **Finished**.
    The list screen and the new item are displayed.

Assigning a global IP Intelligence policy

You can assign an IP Intelligence policy globally, to apply blacklist and whitelist matching actions and logging to all traffic.

1. On the Main tab, click **Security** > **Network Firewall** > **IP Intelligence** > **Policies**.
   The IP Intelligence Policies screen opens.
2. From the **Global Policy** list, select the IP Intelligence policy to apply to all traffic on the BIG-IP system.
3. Click **Update**.
   The list screen and the updated item are displayed.

The specified IP Intelligence policy is applied to all traffic.

Assigning an IP Intelligence policy to a virtual server

You can assign an IP Intelligence policy to a virtual server, to apply blacklist and whitelist matching actions and logging to traffic on that virtual server only.

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. From the **Security** menu, choose **Policies**.
4. Next to **IP Intelligence**, select **Enabled**, then select the IP intelligence policy to apply to traffic on the virtual server.
5. Click **Update**.
   The list screen and the updated item are displayed.

The specified IP Intelligence policy is applied to traffic on the selected virtual server.

Assigning an IP Intelligence policy to a route domain

You can assign an IP Intelligence policy to a route domain, to apply blacklist and whitelist matching actions and logging to route domain traffic.

1. On the Main tab, click **Network** > **Route Domains**.
   The Route Domain List screen opens.
2. In the Name column, click the name of the relevant route domain.
3. From the **IP Intelligence Policy** list, select an IP Intelligence policy to enforce on this route domain.
4. Click **Update**.
   The system displays the list of route domains on the BIG-IP system.

The specified IP Intelligence policy is applied to traffic on the route domain.

Chapter 7

Deploying the BIG-IP Network Firewall in ADC Mode

About deploying the network firewall in ADC mode

The BIG-IP® Network Firewall provides policy-based access control to and from address and port pairs inside and outside of your network. By default, the network firewall is configured in ADC mode, which is a default allow configuration, in which all traffic is allowed through the firewall, and any traffic you want to block must be explicitly specified.

To understand this firewall scenario, imagine that your prerequisite system load-balances all traffic from the Internet to several internal servers. The internal servers are:

Device and location	IP address	Traffic type
Externally accessible FTP server	70.168.15.104	FTP
Application virtual server	192.168.15.101	HTTP, FTP
Server on internal network	10.10.1.10	HTTP, HTTPS
Server on internal network	10.10.1.11	HTTP, HTTPS

The system does not have a separate route domain configured, however you can use Route Domain 0, which is essentially the same as a global rule.

In order for traffic from the internal application virtual server to reach the external network virtual server, you must create a VLAN and enable both internal and external virtual servers on it. In this scenario, these VLANs are specified:

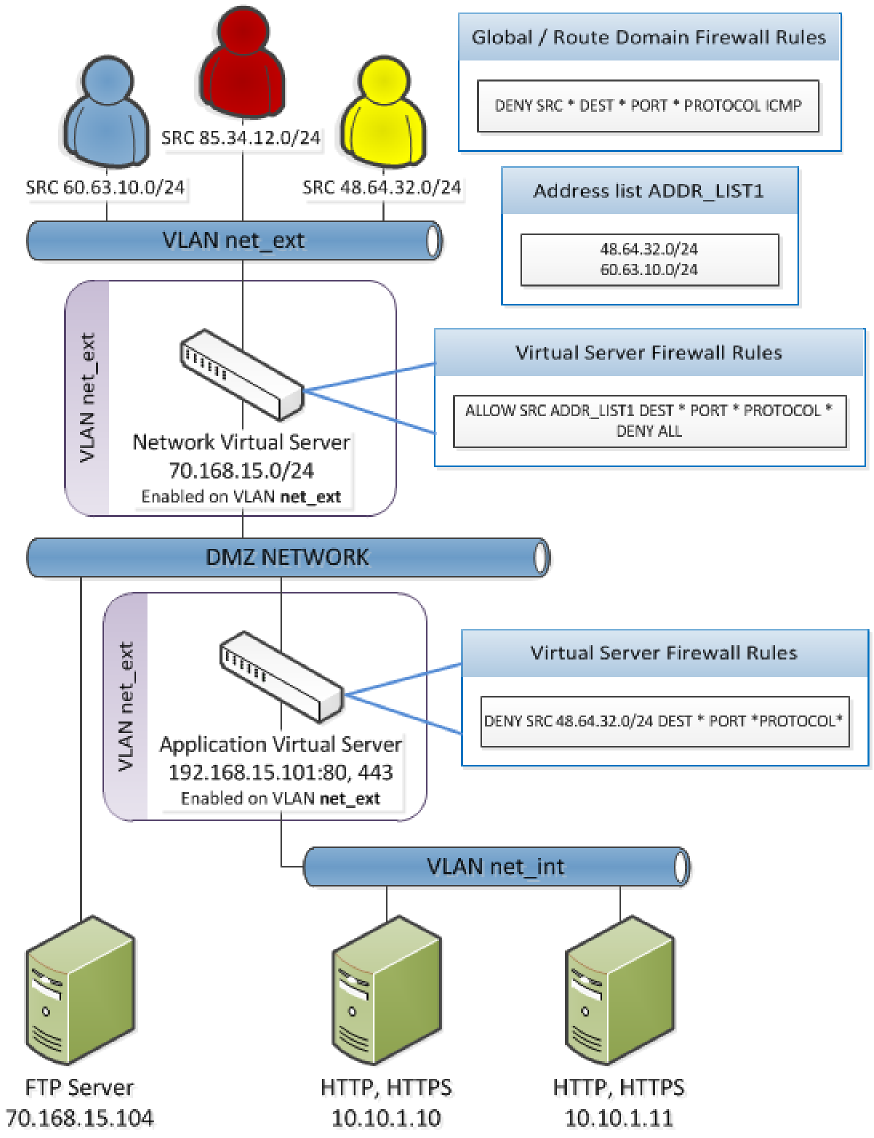
VLAN	Configuration
net_ext	Enabled on 70.168.15.0/24, 192.168.15.101
net_int	Includes pool members 10.10.1.10, 10.10.1.11

In addition, in this firewall configuration, there are three external networks that must be firewalled:

Network	Policy
60.63.10.0/24	Allow all access
85.34.12.0/24	Deny all access
48.64.32.0/24	Allow FTP, deny HTTP and HTTPS

To set up this scenario, you configure addresses, ports, and firewall rules specific to these networks, ports, and addresses. You will also configure a firewall rule that denies all ICMP traffic, to prevent pinging of network devices.

Figure 3: Firewall in ADC mode configuration scenario



Configuring the Network Firewall in ADC mode

If you have changed the firewall setting to Firewall mode, you can configure the BIG-IP® Network Firewall back to ADC mode.

Note: *The firewall is configured in ADC mode, by default.*

1. On the Main tab, click **Security** > **Options** > **Network Firewall**.
   The Firewall Options screen opens.
2. From the **Virtual Server & Self IP Contexts** list, select the default action **Accept** for the self IP and virtual server contexts.
3. Click **Update**.
   The virtual server and self IP contexts for the firewall are changed.

Creating a VLAN for the network firewall

Create a VLAN with tagged interfaces, so that each of the specified interfaces can process traffic destined for 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.

   For purposes of this implementation, name the VLAN `net_ext`.
4. For the **Interfaces** setting:
   a) From the **Interface** list, select an interface number.
   b) From the **Tagging** list, select **Tagged**.
   c) Click **Add**.
5. If you want the system to verify that the return route to an initial packet is the same VLAN from which the packet originated, select the **Source Check** check box.
6. From the **Configuration** list, select **Advanced**.
7. In the **MTU** field, retain the default number of bytes (**1500**).
8. If you want to base redundant-system failover on VLAN-related events, select the **Fail-safe** check box.
9. From the **Auto Last Hop** list, select a value.
10. From the **CMP Hash** list, select a value.
11. To enable the **DAG Round Robin** setting, select the check box.
12. Click **Finished**.
    The screen refreshes, and displays the new VLAN in the list.

The new VLAN appears in the VLAN list.

Enable the new VLAN on both the network virtual server and the application virtual server.

Configuring an LTM virtual server with a VLAN for Network Firewall

For this implementation, at least two virtual servers and one at least one VLAN are assumed, though your configuration might be different.

You enable two virtual servers on the same VLAN to allow traffic from hosts on one virtual server to reach or pass through the other. In the Network Firewall, if you are using multiple virtual servers to allow or deny traffic to and from specific hosts behind different virtual servers, you must enable those virtual servers on the same VLAN.

Tip: *By default, the virtual server is set to share traffic on* ***All VLANs and Tunnels****. This configuration will work for your VLANs, but in the firewall context specifying or limiting VLANs that can share traffic provides greater security.*

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. From the **VLAN and Tunnel Traffic** list, select **Enabled on**. Then, for the **VLANs and Tunnels** setting, move the VLAN or VLANs on which you want to allow the virtual servers to share traffic from the **Available** list to the **Selected** list.
4. Click **Update** to save the changes.
5. Repeat this task for all virtual servers that must share traffic over the VLAN.

The virtual servers on which you enabled the same VLAN can now pass traffic.

Adding a firewall rule to deny ICMP

Use this task to create a firewall rule at the Global context, that denies ICMP packets globally.

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. In the Rules area, click **Add** to add a firewall rule to the list.
3. From the **Context** list, select the **Global** context.
4. In the **Name** field, type **deny_icmp**.
5. From the **Type** list, select **Rule**.
6. From the **State** list, select **Enabled**.
7. From the Protocol list, select **ICMP**.
8. In the **ICMP Message** area, from the **Type** list, select `Any`, and click the **Add** button.

   Tip: *You can optionally deny only ICMP ping requests, by selecting* `Echo (8)` *from the* ***Type*** *list, and clicking* ***Add****.*

9. Leave the **Source** area configured to allow **Any** address, port, and VLAN.
10. Leave the **Destination** area configured to allow **Any** address or port.
11. From the **Action** list, select **Drop** or **Reject**.
    These options either drop ICMP packets from any source and port to any port and address, or send a reject message and reset the the connection.
12. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
13. Click **Finished**.
    The list screen and the new item are displayed.

A new firewall rule is created, and appears in the firewall rule list. This firewall rule denies all access to and from all sources and destinations on the ICMP protocol.

Creating an address list

Use this procedure to specify the address list to apply to allow access to specific source addresses.

1. On the Main tab, click **Security** > **Network Firewall** > **Address Lists**.
   The Address Lists screen opens.
2. Click **Create** to create a new address list.

3. In the name field, type `ADDR_LIST1`.
4. In the Addresses area, add the following addresses: `48.63.32.0/24` and `60.63.10.0/24`. Click **Add** after you type each address.
5. Click **Finished**.
   The list screen and the new item are displayed.

Denying access with firewall rules on the network virtual server

The firewall rules in this example apply in the virtual server context. For purposes of this example, the external network-facing virtual server has an IP address of `70.168.15.0/24`. The network virtual server is configured with a pool that includes a publically accessible FTP server at `70.168.15.104`, and an application virtual server at `192.168.15.101`.

Use this task to create a firewall rule that allows all traffic from the networks on the address list ADDR_LIST1, and another firewall rule that denies all traffic. This serves the purpose of allowing all traffic from the networks that are allowed access, and denying all other traffic.

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. In the Rules area, click **Add** to add a firewall rule to the list.
3. Select the **Virtual Server** context, then select the external network virtual server (in this example, `70.168.15.0/24`).
4. In the **Name** field, type `allow_addr_list`.
5. From the **Type** list, select **Rule**.
6. From the **State** list, select **Enabled**.
7. From the Protocol list, select **Any**.
8. In the **Source** area, from the **Address** list, select **List**.
9. From the **Source Available** list, select `ADDR_LIST1`, then click the **<<** button to move `ADDR_LIST1` to the **Selected** list.
10. Leave the **Destination** area configured with the default **Any** / **Any** settings.
11. From the **Action** list, select **Accept**.
    This allows packets from any source on the list to the any destination and port on any protocol on the DMZ network.
12. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
13. Click the **Repeat** button.
    The rule is saved, and a new rule creation page opens, with the same information, so you can create a similar rule.
14. In the **Name** field, type `deny_all`.
15. In the **Source** area, in the **Address** list, select **Any**.
16. Leave the **Destination** area configured to deny access to **Any** address or port.
17. From the **Action** list, select **Reject**.
    This creates a deny all rule for the virtual server.
18. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
19. Click **Finished**.

The list screen and the new item are displayed.

20. From the **Context** list, select **Virtual Server**.
21. From the **Virtual Server** list, select the network virtual server.
22. Click the **Filter** button.

The list screen opens, and all firewall rules that apply to the virtual server are displayed.

Denying access with firewall rules on the application virtual server

The firewall rules in this example apply in the virtual server context. For purposes of this example, the application virtual server on the internal network has an IP address of `192.168.15.101`, and is configured to load balance traffic to servers `10.10.1.10` and `10.10.1.11` on ports `80` and `443`.

Use this task to create a firewall rule that denies all traffic from the network `48.64.32.0/24` to the internal application servers behind the virtual server **192.168.15.101**.

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. In the Rules area, click **Add** to add a firewall rule to the list.
3. Select the **Virtual Server** context, then select the application virtual server (in this example, `192.168.15.101`).
4. In the **Name** field, type deny_network_48
5. From the **Type** list, select **Rule**.
6. From the **State** list, select **Enabled**.
7. From the **Schedule** list, select **None**.
8. From the Protocol list, select **Any**.
9. In the **Source** area, from the **Address** list, select **Specify**.
10. In the address field, type `48.64.32.0/24`.
11. Leave the **Destination** area configured to deny access to **Any** address or port.
12. From the **Action** list, select **Drop** or **Reject**.
    This drops packets from the `48.64.32.0` network to any source.
13. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
14. Click **Finished**.
    The list screen and the new item are displayed.
15. From the **Context** list, select **Virtual Server**.
16. From the **Virtual Server** list, select the application virtual server.
17. Click the **Filter** button.

The firewall rules are created, and are displayed on the list screen for the application virtual server.

Chapter 8

Deploying the BIG-IP Network Firewall in Firewall Mode

About Firewall mode in the Network Firewall

The BIG-IP® Advanced Firewall Manager™ (AFM™) provides policy-based access control to and from address and port pairs, inside and outside of your network. In this scenario, the network firewall is configured in *Firewall mode*, a default deny configuration, in which all traffic is blocked through the firewall, and any traffic you want to allow must be explicitly specified.

To understand this firewall scenario, imagine that your prerequisite system load-balances all traffic from the Internet to several internal servers. The internal servers are:

Device and location	IP address	Traffic type
Server on DMZ network	70.168.15.104	FTP
Server on internal network	10.10.1.10	HTTP, HTTPS
Server on internal network	10.10.1.11	HTTP, HTTPS

In order for traffic from the internal application virtual server to reach the external network virtual server, you must create a VLAN and enable both internal and external virtual servers on it. In this scenario, these VLANs are specified:

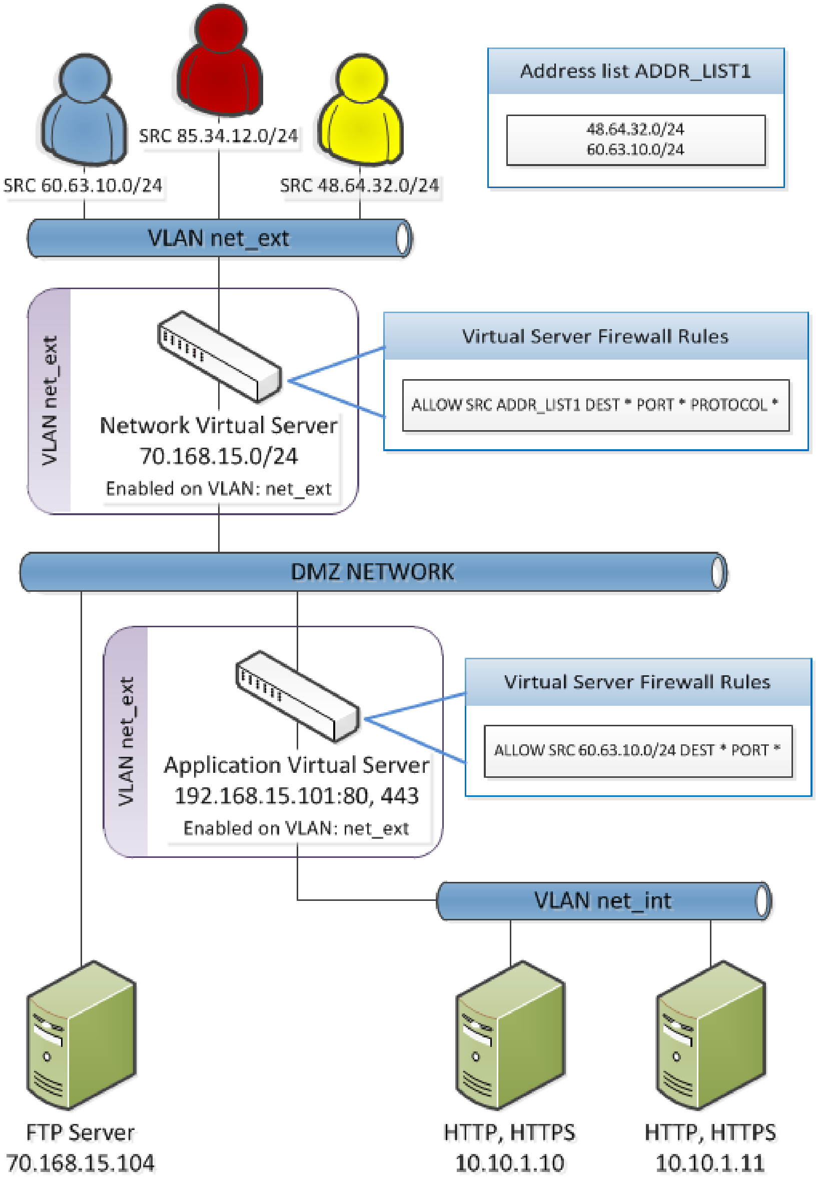
VLAN	Configuration
net_ext	Enabled on 70.168.15.0/24, 192.168.15.101
net_int	Includes pool members 10.10.1.10, 10.10.1.11

In addition, in this firewall configuration, there are three external networks that must be firewalled:

Network	Policy
60.63.10.0/24	Allow all access
85.34.12.0/24	Deny all access
48.64.32.0/24	Allow FTP, deny HTTP and HTTPS

To set up this scenario, you configure addresses, ports, and firewall rules specific to these networks, ports, and addresses.

Figure 4: Firewall configuration scenario



Configuring the Network Firewall to drop or reject traffic that is not specifically allowed

You can configure the BIG-IP® Network Firewall to drop or reject all traffic not explicitly allowed. In Advanced Firewall Manager™ this is called *Firewall mode*, and this is also referred to as a *default deny* policy. Firewall mode applies a default deny policy to all self IPs and virtual servers.

1. On the Main tab, click **Security** > **Options** > **Network Firewall**.
   The Firewall Options screen opens.
2. From the **Virtual Server & Self IP Contexts** list, select the default action for the self IP and virtual server contexts.
   - Select **Drop** to silently drop all traffic to virtual servers and self IPs unless specifically allowed.

- Select **Reject** to drop all traffic to virtual servers and self IPs unless specifically allowed, and to send the appropriate reject message for the protocol.

3. Click **Update**.
   The default virtual server and self IP firewall context is changed.

Creating a VLAN for the network firewall

Create a VLAN with tagged interfaces, so that each of the specified interfaces can process traffic destined for 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.

   For purposes of this implementation, name the VLAN `net_ext`.
4. For the **Interfaces** setting:
   a) From the **Interface** list, select an interface number.
   b) From the **Tagging** list, select **Tagged**.
   c) Click **Add**.
5. If you want the system to verify that the return route to an initial packet is the same VLAN from which the packet originated, select the **Source Check** check box.
6. From the **Configuration** list, select **Advanced**.
7. In the **MTU** field, retain the default number of bytes (**1500**).
8. If you want to base redundant-system failover on VLAN-related events, select the **Fail-safe** check box.
9. From the **Auto Last Hop** list, select a value.
10. From the **CMP Hash** list, select a value.
11. To enable the **DAG Round Robin** setting, select the check box.
12. Click **Finished**.
    The screen refreshes, and displays the new VLAN in the list.

The new VLAN appears in the VLAN list.

Enable the new VLAN on both the network virtual server and the application virtual server.

Configuring an LTM virtual server with a VLAN for Network Firewall

For this implementation, at least two virtual servers and one at least one VLAN are assumed, though your configuration might be different.

You enable two virtual servers on the same VLAN to allow traffic from hosts on one virtual server to reach or pass through the other. In the Network Firewall, if you are using multiple virtual servers to allow or deny traffic to and from specific hosts behind different virtual servers, you must enable those virtual servers on the same VLAN.

Tip: *By default, the virtual server is set to share traffic on* ***All VLANs and Tunnels****. This configuration will work for your VLANs, but in the firewall context specifying or limiting VLANs that can share traffic provides greater security.*

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. From the **VLAN and Tunnel Traffic** list, select **Enabled on**. Then, for the **VLANs and Tunnels** setting, move the VLAN or VLANs on which you want to allow the virtual servers to share traffic from the **Available** list to the **Selected** list.
4. Click **Update** to save the changes.
5. Repeat this task for all virtual servers that must share traffic over the VLAN.

The virtual servers on which you enabled the same VLAN can now pass traffic.

Creating an address list

Use this procedure to specify the address list to apply to allow access to specific source addresses.

1. On the Main tab, click **Security** > **Network Firewall** > **Address Lists**.
   The Address Lists screen opens.
2. Click **Create** to create a new address list.
3. In the name field, type `ADDR_LIST1`.
4. In the Addresses area, add the following addresses: `48.63.32.0/24` and `60.63.10.0/24`. Click **Add** after you type each address.
5. Click **Finished**.
   The list screen and the new item are displayed.

Allowing access from networks on an address list with a firewall rule

The firewall rules in this example apply in the virtual server context. For purposes of this example, the external network-facing virtual server is named `ex_VS` and has an IP address of `70.168.15.0/24`.

Create a firewall rule that allows traffic from the networks on `ADDR_LIST1` to the DMZ network, which includes an FTP server that is publicly addressed, and two internal servers on a second virtual server.

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. In the Rules area, click **Add** to add a firewall rule to the list.
3. From the **Context** list, select **Virtual Server**, and then select the external virtual server (in the example, **ex_VS**).
4. In the **Name** field, type `allow_addr_list`.
5. From the **Type** list, select **Rule**.
6. From the **State** list, select **Enabled**.
7. From the **Protocol** list, select **Any**.

8. In the Source area, from the **Address** list, select **Specify**, and click **Address List**.
9. From the list, select **/Common/ADDR_LIST1**, then click **Add** to add **ADDR_LIST1** to the list.
10. Leave the **Destination** area configured with the default **Any** / **Any** settings.
11. From the **Action** list, select **Accept**.
    This allows packets from any source on the list to the any destination and port on any protocol on the DMZ network.
12. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
13. Click **Finished**.
    The list screen and the new item are displayed.

A new firewall rule is created, and appears in the firewall rule list.

Allowing access from a network to a virtual server with a firewall rule

The firewall rules in this example apply in the virtual server context. For purposes of this example, the application virtual server is behind the network virtual server with an IP address of `192.168.15.101` and configured for traffic on ports 80 and 443.

Use this procedure to create a firewall rule that allows traffic from a specific external network to the HTTP and HTTPS servers behind an application virtual server.

1. On the Main tab, click **Security** > **Network Firewall** > **Active Rules**.
   The Active Rules screen opens.
2. In the Rules area, click **Add** to add a firewall rule to the list.
3. In the Context field, select `Virtual Server`, and select the application virtual server (in the example, `192.168.15.101`.
4. In the **Name** field, type `allow_app_vs`.
5. From the **Type** list, select **Rule**.
6. From the **State** list, select **Enabled**.
7. From the Protocol list, select **Any**.
8. In the **Source** area, from the **Address** list, select **Specify**.
9. In the address field, type `60.63.10.0/24`, then click the **Add** button.
10. Leave the **Destination** area configured with the default **Any** / **Any** settings.
11. From the **Action** list, select **Accept**.
    This allows packets from the specified source to any destination and port on any protocol on the internal virtual server. You could specify HTTP and HTTPS protocols, and the internal server addresses, but since these are the only addresses and protocols behind the virtual server, that level of granularity is not necessary.
12. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
13. Click **Finished**.
    The list screen and the new item are displayed.

A new firewall rule is created, and appears in the firewall rule list.

Chapter 9

HTTP Protocol Security

Overview: Securing HTTP traffic

You can secure HTTP traffic by using a default configuration or by customizing the configuration. You can adjust the following security checks in an HTTP security profile:

- HTTP protocol compliance validation
- Evasion technique detection
- Length checking to help avoid buffer overflow attacks
- HTTP method validation
- Inclusion or exclusion of certain files by type
- Mandatory header enforcement

You can also specify how you want the system to respond when it encounters a violation. If the system detects a violation and you enabled the Block flag, instead of forwarding the request, the system can either send a blocking response page or redirect the client to a different location.

Creating an HTTP virtual server to use with HTTP protocol security

When you enable protocol security for an HTTP virtual server, the system scans any incoming HTTP traffic for vulnerabilities before the traffic reaches the HTTP 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 `80` (for HTTP) or `443` (for HTTPS), or select **HTTP** or **HTTPS** from the list.
6. In the Configuration area, for the **HTTP Profile** setting, select the default profile, `http`.
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 HTTP virtual server appears in the Virtual Servers list.

Attaching an HTTP protocol security profile to a virtual server

The easiest method for adding HTTP protocol security to your HTTP virtual server is to use the system default profile. You do this by configuring a virtual server with the **HTTP profile** `http`, and then associating the default HTTP protocol security profile `http_security` with the virtual server.

1. On the Main tab, click **Local Traffic** > **Virtual Servers**.
   The Virtual Server List screen opens.
2. In the **Name** column, click the virtual server you previously created.
   The Properties screen for the virtual server opens.
3. From the **Security** menu, choose **Policies**.
4. From the **Protocol Security** list, select **Enabled**.
5. From the **Profile** list, select `http_security`.

   This configures the virtual server with the default HTTP protocol security profile.
6. Click **Update**.

You now have a virtual server configured so that HTTP protocol checks are performed on the traffic that the HTTP virtual server receives.

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 HTTP security profile

This implementation describes how to set up the BIG-IP® system to perform security checks on your HTTP virtual server traffic customized to the needs of your environment. Custom configuration of HTTP security and traffic management requires creating an HTTP security profile, and fine tuning this profile so it protects HTTP traffic the way you want. Once you have all HTTP settings specified, you create a virtual server, attach the custom HTTP security profile, and add a default pool to handle the HTTP traffic.

Task summary

Creating a custom HTTP profile
Creating a security profile for HTTP traffic
Configuring an HTTP virtual server with an HTTP security profile

Reviewing violation statistics for security profiles

Creating a custom HTTP profile

An HTTP profile defines the way that you want the BIG-IP®system to manage HTTP traffic.

1. On the Main tab, click **Local Traffic** > **Profiles** > **Services** > **HTTP**.
   The HTTP profile list screen opens.
2. Click **Create**.
   The New HTTP Profile screen opens.
3. In the **Name** field, type a unique name for the profile.
4. From the **Parent Profile** list, select **http**.
5. Select the **Custom** check box.
6. Modify the settings, as required.
7. Click **Finished**.

The custom HTTP profile now appears in the HTTP profile list screen.

Creating a security profile for HTTP traffic

Before performing this procedure, verify that you have installed and provisioned BIG-IP® Advanced Firewall Manager™ (AFM) on the BIG-IP system.

An *HTTP security profile* specifies security checks that apply to HTTP traffic, and that you want the BIG-IP® system to enforce. In the security profile, you can also configure remote logging and trusted XFF headers.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **HTTP**.
   The Security Profiles: HTTP screen opens.
2. Click the **Create** button.
   The New HTTP Security Profile screen opens.
3. In the **Profile Name** field, type a unique name for the profile.
4. If you want the system to trust XFF (X-Forwarded-For) headers in the requests:
   a) Select the **Trust XFF Header** check box.

      Select this option if the BIG-IP system 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.

      The screen refreshes and provides an additional setting.

   b) In the **New Custom XFF Header** field, type the header that you want the system to trust, then click **Add**.

      You can add up to five custom XFF headers.

5. If you want the security profile to be case-sensitive, leave the **Profile is case sensitive** check box selected. Otherwise, clear the check box.

   Note: *You cannot change this setting after you create the security profile.*

6. Modify the blocking policy settings by clicking **HTTP Protocol Checks** and **Request Checks**, selecting the appropriate options, and enabling the **Block** or **Alarm** options as needed.

> ***Note:*** *If you do not enable either **Alarm** or **Block** for a protocol check, the system does not perform the corresponding security verification.*

- **Alarm**: The system logs any requests that trigger the security profile violation.
- **Block**: The system blocks any requests that trigger the security profile violation.
- **Alarm** and **Block**: The system both logs and blocks any requests that trigger the security profile violation.

7. Click **Blocking Page** if you want to configure the blocking response page.
8. 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 HTTP traffic that a designated virtual server receives.

Configuring an HTTP virtual server with an HTTP security profile

You can configure a local traffic virtual server and a default pool for your network's HTTP servers. When the virtual server receives HTTP traffic, an HTTP security profile can scan for security vulnerabilities, and load balance 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** 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 `443` or select **HTTPS** from the list.
6. From the **HTTP Profile** list, select the `http` 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.
13. In the Name column, click the name of the relevant virtual server.
    This displays the properties of the virtual server.
14. From the **Security** menu, choose **Policies**.
15. From the **Protocol Security** list, select **Enabled**.

16. From the **Protocol Security Profile** list, select your custom HTTP security profile.
17. Click **Update** to save the changes.

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: Increasing HTTP traffic security

The HTTP security profile consists of many different security checks for the various components of HTTP traffic. This implementation shows you how to fine-tune your HTTP security profile as required by your environment. The custom checks are described under the assumption that you have already created a custom HTTP security profile but have no other prerequisite or special order. You need configure only the custom checks that you are interested in.

You can achieve a greater level of security when you configure the system to perform the following checks:

- HTTP Protocol Checks that are related to RFC compliance and actions to take resulting from a violation
- Request Checks, such as length, allowable HTTP request methods, inclusion or exclusion of file types, and custom headers that must occur in every request
- Blocking Page configuration which describes the page to display in the event of a blocked request when a violation is encountered

About RFC compliance and validation checks

When the BIG-IP® system receives an HTTP request from a client, the first validation check that the system performs is to ensure that it is RFC protocol compliant. If the request passes the compliance checks, the system applies the security profile to the request. So that your system fully validates RFC compliance, keep the following HTTP Protocol Checks enabled (they are enabled by default):

- **Several Content-Length headers**: This security check fails when the incoming request contains more than one content-length header.
- **Null in request**: This security check fails when the incoming request contains a null character.
- **Unparsable request content**: This security check fails when the Advanced Firewall Manager™ is unable to parse the incoming request.

Modifying HTTP protocol compliance checks

F5 Networks® recommends that you retain the default properties for the HTTP protocol security checks. This task allows you to take additional precautions such as enabling the Block flag for the HTTP Protocol Checks setting, even if you enable only the Alarm flag for the other security checks. When you do this, the system blocks all requests that are not compliant with HTTP protocol standards, and performs additional security checks only on valid HTTP traffic.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **HTTP**.
   The Security Profiles: HTTP screen opens.
2. In the HTTP Security Profiles area, in the Profile Name column, click the name of the security profile that you are modifying.
   The HTTP Profile Properties screen opens.
3. On the HTTP Protocol Checks tab, for the **HTTP Protocol Checks** setting, select the check boxes for the protocol checks that you want the system to validate.
4. Select **Alarm** or **Block** to indicate how you want the system to respond to a triggered violation.

   The default setting is **Alarm**.

   - **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.
5. Click **Update** to retain changes.

The BIG-IP® system is now enabled for compliance checks on all valid HTTP traffic.

About evasion techniques checks

Advanced Firewall Manager™ can examine HTTP requests for methods of application attack that are designed to avoid detection. When found, these coding methods, called *evasion techniques*, trigger the Evasion technique detected violation. By creating HTTP security profiles, you can detect evasion techniques, such as:

- Directory traversal, for example, `a/b/../c` turns into `a/c`
- Multiple decoding passes
- Multiple backslash characters in a URI, for example, `\\servername`
- Bare byte decoding (higher than ASCII-127) in a URI
- Apache whitespace characters `(0x09, 0x0b, or 0x0c)`
- Bad unescape

By default, the system logs requests that contain evasion techniques. You can also block requests that include evasion techniques.

Configuring HTTP protocol evasion techniques blocking policy

You can use HTTP security profiles to detect, log, alarm, and block evasion techniques detected in HTTP traffic.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **HTTP**.

The Security Profiles: HTTP screen opens.

2. In the HTTP Security Profiles area, in the Profile Name column, click the name of the security profile that you are modifying.
   The HTTP Profile Properties screen opens.
3. On the HTTP Protocol Checks tab, for the **Evasion Techniques Checks** setting, select or clear the **Alarm** or **Block** check boxes, as required.

Option	Description
Alarm	The system logs any requests that trigger the violation. This is the default setting.
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.

4. Click **Update** to retain changes.

About the types of HTTP request checks

By creating HTTP security profiles, you can perform several types of checks on HTTP requests to ensure that the requests are well-formed and protocol-compliant.

Length checks
Specify valid maximum lengths for request components to help prevent buffer overflow attacks.

Method checks
Specify which HTTP methods the system allows in requests.

File type checks
Specify which file types users can or cannot access.

Mandatory headers
Specify custom headers that must occur in every request.

Null in request
This security check fails when the incoming request contains a null character.

Unparsable request content
This security check fails when the system is unable to parse the incoming request.

Configuring length checks for HTTP traffic

Before performing this procedure, verify that you have installed and provisioned BIG-IP® Advanced Firewall Manager™ (AFM) on the BIG-IP system.

You can specify valid maximum lengths for request components in HTTP security profiles to prevent buffer overflow attacks. You can set maximum lengths for URLs, query strings, POST data, and the entire request.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **HTTP**.
   The Security Profiles: HTTP screen opens.
2. In the Profile Name column, click the name of the security profile for which you want to configure length checking.

The Profile Properties screen opens.

3. Click the Request Checks tab.
4. For each option of the **Length Checks** setting, specify **Any** to allow any length or click **Length** and specify the maximum length you want to allow.
5. Select **Alarm** or **Block**, to indicate how you want the system to respond to a triggered violation.

   The default setting is **Alarm**.

   - **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. For the **Request Length Exceeds Defined Buffer Size** setting, select or clear **Alarm** and **Block**, as needed.

   - **Alarm**: The system logs any requests that are longer than allowed by the **long_request_buffer_size** internal parameter (the default is 10,000,000 bytes).
   - **Block** The system blocks any requests that are longer than allowed by the **long_request_buffer_size** internal parameter (the default is 10,000,000 bytes).
   - **Alarm** and **Block**The system both logs and blocks any requests that trigger the violation.

7. Click **Update** to retain changes.

Specifying which HTTP methods to allow

Before performing this procedure, verify that you have installed and provisioned BIG-IP® Advanced Firewall Manager™ (AFM) on the BIG-IP system.

The HTTP security profile accepts certain HTTP methods by default. The default allowed methods are GET, HEAD, and POST. The system treats any incoming HTTP request that includes an HTTP method other than the allowed methods as a violating request. Later, you can decide how to handle each violation.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **HTTP**.
   The Security Profiles: HTTP screen opens.
2. In the Profile Name column, click the name of the security profile for which you want to modify allowable HTTP methods.
   The Profile Properties screen opens.
3. Click the Request Checks tab.
4. For the **Methods** setting, specify which HTTP methods to allow:

   The default allowed methods are GET, HEAD, and POST.

   - From the **Available** list, select the methods you want to allow in a request and move them to the **Allowed** list.
   - To add a new method to the **Available** list: type the name in the **Method** field, click **Add** to add it to the list, and move it to the **Allowed** list.

5. Select **Alarm** or **Block**, to indicate how you want the system to respond to a triggered violation.

   The default setting is **Alarm**.

   - **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 **Update** to retain changes.

Including or excluding files by type in HTTP security profiles

Before performing this procedure, verify that you have installed and provisioned BIG-IP® Advanced Firewall Manager™ (AFM) on the BIG-IP system.

By default, an HTTP security profile permits all file types in a request. For tighter security, you can create a list that specifies either all file types you want to allow, or a list specifying all the file types you do not want allowed.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **HTTP**.
   The Security Profiles: HTTP screen opens.
2. In the Profile Name column, click the name of the security profile you want to update.
   The Profile Properties screen opens.
3. Click the Request Checks tab.
4. For the **File Types** setting, specify whether you want to create a list of allowed or disallowed file types, and which files you want in the list.
   - To create a list of file types that are permitted in requests, select **Define Allowed**.
   - To create a list of file types not permitted, select **Define Disallowed**.
   - Select file types from the **Available** list, and move them to the **Allowed** or **Disallowed** list.
   - To add a new file type, type the name in the **File Type** field, click **Add** to add it to the **Available** list, and then move it to the **Allowed** or **Disallowed** list.

   Important: *If the profile is case-sensitive, the file types are case-sensitive. For example,* ***jsp*** *and* ***JSP*** *will be treated as separate file types.*
5. Select **Alarm** or **Block**, to indicate how you want the system to respond to a triggered violation.

   The default setting is **Alarm**.
   - **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.

The page you configured is displayed every time one of the security checks set to **Block** has been violated.

Configuring a mandatory header for an HTTP security profile

Before performing this procedure, verify that you have installed and provisioned BIG-IP® Advanced Firewall Manager™ (AFM) on the BIG-IP system.

When the BIG-IP® system is managing an application that uses custom headers that must occur in every request, you can specify mandatory HTTP headers in the security profile. The system verifies that all requests contain those headers. If a request does not contain the mandatory header, the system issues the Mandatory HTTP header is missing violation, and takes the action that you configure: Alarm, Block, or both.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **HTTP**.
   The Security Profiles: HTTP screen opens.
2. In the Profile Name column, click the name of the security profile for which you want to configure a Mandatory Header alarm.
   The Profile Properties screen opens.
3. Click the Request Checks tab.
4. For the **Mandatory Headers** setting, specify the header that must be in the request:

a) In the **Header** field, type the name of the mandatory header, and click the **Add** button to add it to the **Available** list.
b) Move the new mandatory header from the **Available** list to the **Mandatory** list.
c) Select or clear the **Alarm** or **Block** check boxes as required.

Option	Description
Alarm	The system logs any responses that trigger the **Mandatory HTTP header is missing** violation. This is the default setting.
Block	The system blocks any requests that trigger the **Mandatory HTTP header is missing** violation.
Alarm and Block	The system both logs and blocks any requests that trigger the **Mandatory HTTP header is missing** violation.

5. Click **Update** to retain changes.

All HTTP requests are checked for the mandatory headers you have selected.

Configuring the blocking response page for HTTP security profiles

If your HTTP security profile is set up to block requests that violate one or more of the security checks, the system displays a page, called the blocking response page, on the client's screen. The default blocking response page states that the request was rejected, and provides a support ID. You can also configure the system to redirect the client to a specific web site instead of displaying the blocking response page.

1. On the Main tab, click **Security** > **Protocol Security** > **Security Profiles** > **HTTP**.
   The Security Profiles: HTTP screen opens.
2. In the Profile Name column, click the name of the security profile for which you want to configure a blocking page.
   The Profile Properties screen opens.
3. Click the Blocking Page tab.
4. For the **Response Type** setting, select one of the options:
   - **Default Response**: Specifies that the system returns the system-supplied blocking response page. Though you cannot edit the HTML code on the default blocking page, you can copy it into a custom response and edit it.
   - **Custom Response**: Specifies that the system returns a response page that you design or upload.
   - **Redirect URL**: Specifies that the system redirects the client to the specified URL.
   - **SOAP Fault**: Specifies that the system displays a blocking page in standard SOAP fault message format. Though you cannot edit the SOAP fault code, you can copy it into a custom response and edit it.

   The settings on the screen change depending on the selection that you make for the Response Type setting.
5. If you selected the **Custom Response** option, you can either create a new response or upload an HTML file.
   - To create a custom response, make the changes you want to the default responses for the **Response Header** and **Response Body** settings using HTTP syntax for the content, and click **Upload**.
   - To upload an HTML file for the response body, navigate to an existing HTML response page, and click **Upload**.

6. If you selected **Redirect URL**, type the full path of the web page to which the system should redirect the client in the **Redirect URL** field.
7. Click **Update** to retain changes.

The system displays the response page when a violation occurs on any of the security checks set to **Block**.

Overview: Configuring Local Protocol Security Event Logging

You can configure the BIG-IP® system to log detailed information about protocol security events and store those logs locally.

Important: *The BIG-IP Advanced Firewall Manager™ (AFM) must be licensed and provisioned and DNS Services must be licensed before you can configure Protocol Security event logging.*

Creating a local Protocol Security Logging profile
Configuring a virtual server for Protocol Security event logging
Viewing Protocol Security event logs locally on the BIG-IP system
Disabling logging

Creating a local Protocol Security Logging profile

Create a custom Logging profile to log BIG-IP system network firewall 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 New Logging Profile screen opens.
3. In the **Profile Name** field, type a unique name for the profile.
4. Select the **Protocol Security** check box, to enable the BIG-IP system to log HTTP, FTP, DNS, and SMTP protocol request events.
5. In the HTTP, FTP, and SMTP Security area, from the **Publisher** list, select **local-db-publisher**.
6. In the DNS Security area, from the **Publisher** list, select **local-db-publisher**.
7. Select the **Log Dropped Requests** check box, to enable the BIG-IP system to log dropped DNS requests.
8. Select the **Log Filtered Dropped Requests** check box, to enable the BIG-IP system to log DNS requests dropped due to DNS query/header-opcode filtering.

   Note: *The system does not log DNS requests that are dropped due to errors in the way the system processes DNS packets.*

9. Select the **Log Malformed Requests** check box, to enable the BIG-IP system to log malformed DNS requests.
10. Select the **Log Rejected Requests** check box, to enable the BIG-IP system to log rejected DNS requests.
11. Select the **Log Malicious Requests** check box, to enable the BIG-IP system to log malicious DNS requests.
12. Click **Finished**.

Assign this custom protocol security Logging profile to a virtual server.

Configuring a virtual server for Protocol Security event logging

Ensure that at least one Log Publisher exists on the BIG-IP® system.

Assign a custom Protocol Security Logging profile to a virtual server when you want the BIG-IP system to log Protocol Security events on the traffic the virtual server processes.

Note: *This task applies only to systems provisioned at a minimum level (or higher) for* ***Local Traffic (LTM)****. You can check the provisioning level on the* ***System*** *>* ***Resource Provisioning*** *screen.*

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 **Security** > **Policies**.
   The screen displays firewall rule settings.
4. From the **Log Profile** list, select **Enabled**. Then, for the **Profile** setting, move the profiles that log specific events to specific locations from the **Available** list to the **Selected** list.
5. Click **Update** to save the changes.

Viewing Protocol Security event logs locally on the BIG-IP system

Ensure that the BIG-IP® system is configured to log the types of events you want to view, and to store the log messages locally on the BIG-IP system.

When the BIG-IP system is configured to log events locally, you can view those events using the Configuration utility.

1. On the Main tab, click **Security** > **Event Logs** > **Protocol** > **DNS**.
   The Protocol Security event log displays.
2. To search for specific events, click **Custom Search**. Drag the event data that you want to search for from the Event Log table into the Custom Search table, and then click **Search**.

Disabling logging

Disable Network Firewall, Protocol Security, or DoS Protection event logging when you no longer want the BIG-IP® system to log specific events on the traffic handled by specific resources.

Note: *You can disable and re-enable logging for a specific resource based on your network administration needs.*

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 **Security** > **Policies**.
   The screen displays firewall rule settings.
4. From the **Log Profile** list, select **Disabled**.
5. Click **Update** to save the changes.

The BIG-IP system does not log the events specified in this profile for the resources to which this profile is assigned.

Implementation result

You now have an implementation in which the BIG-IP® system logs specific Protocol Security events locally.

Overview: Configuring Remote Protocol Security Event Logging

You can configure the BIG-IP® system to log information about BIG-IP system Protocol Security events and send the log messages to remote high-speed log servers.

Important: *The Advanced Firewall Manager™ (AFM™) must be licensed and provisioned before you can configure Protocol Security event logging.*

When configuring remote high-speed logging of Protocol Security events, it is helpful to understand the objects you need to create and why, as described here:

Object	Reason
Pool of remote log servers	Create a pool of remote log servers to which the BIG-IP system can send log messages.
Destination (unformatted)	Create a log destination of Remote High-Speed Log type that specifies a pool of remote log servers.
Destination (formatted)	If your remote log servers are the ArcSight, Splunk, IPFIX, or Remote Syslog type, create an additional log destination to format the logs in the required format and forward the logs to a remote high-speed log destination.
Publisher	Create a log publisher to send logs to a set of specified log destinations.
Logging profile	Create a custom Logging profile to enable logging of user-specified data at a user-specified level, and associate a log publisher with the profile.
LTM® virtual server	Associate a custom Logging profile with a virtual server to define how the BIG-IP system logs security events on the traffic that the virtual server processes.

This illustration shows the association of the configuration objects for remote high-speed logging.

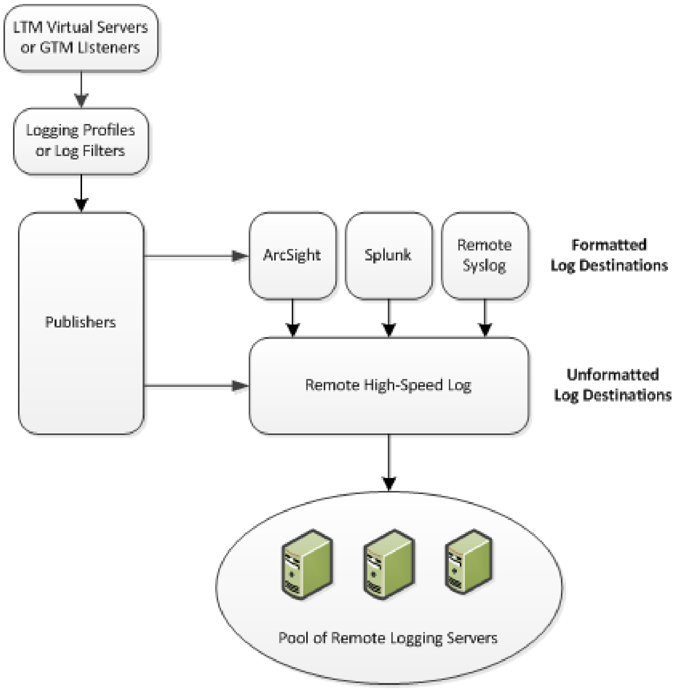

LTM Virtual Servers or GTM Listeners
Logging Profiles or Log Filters
Publishers
ArcSight
Splunk
Remote Syslog
Formatted Log Destinations
Remote High-Speed Log
Unformatted Log Destinations
Pool of Remote Logging Servers

Figure 5: Association of remote high-speed logging configuration objects

Task summary

Perform these tasks to configure Protocol Security event logging on the BIG-IP® system.

***Note:** Enabling remote high-speed logging impacts BIG-IP system performance.*

Creating a pool of remote logging servers
Creating a remote high-speed log destination
Creating a formatted remote high-speed log destination
Creating a publisher
Creating a custom Protocol Security Logging profile
Configuring a virtual server for Protocol Security event logging
Disabling logging

Creating a pool of remote logging servers

Before creating a pool of log servers, gather the IP addresses of the servers that you want to include in the pool. Ensure that the remote log servers are configured to listen to and receive log messages from the BIG-IP® system.

Create a pool of remote log servers to which the BIG-IP system can send log messages.

1. On the Main tab, click the applicable path.
   - **DNS** > **Delivery** > **Load Balancing** > **Pools**
   - **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. Using the **New Members** setting, add the IP address for each remote logging server that you want to include in the pool:
   a) Type an IP address in the **Address** field, or select a node address from the **Node List**.
   b) Type a service number in the **Service Port** field, or select a service name from the list.

   Note: *Typical remote logging servers require port* `514`*.*

   c) Click **Add**.
5. Click **Finished**.

Creating a remote high-speed log destination

Before creating a remote high-speed log destination, ensure that at least one pool of remote log servers exists on the BIG-IP® system.

Create a log destination of the **Remote High-Speed Log** type to specify that log messages are sent to a pool of remote log servers.

1. On the Main tab, click **System** > **Logs** > **Configuration** > **Log Destinations**.
   The Log Destinations screen opens.
2. Click **Create**.
3. In the **Name** field, type a unique, identifiable name for this destination.
4. From the **Type** list, select **Remote High-Speed Log**.

   Important: *If you use log servers such as Remote Syslog, Splunk, or ArcSight, which require data be sent to the servers in a specific format, you must create an additional log destination of the required type, and associate it with a log destination of the* ***Remote High-Speed Log*** *type. With this configuration, the BIG-IP system can send data to the servers in the required format.*

   The BIG-IP system is configured to send an unformatted string of text to the log servers.
5. From the **Pool Name** list, select the pool of remote log servers to which you want the BIG-IP system to send log messages.
6. From the **Protocol** list, select the protocol used by the high-speed logging pool members.
7. Click **Finished**.

Creating a formatted remote high-speed log destination

Ensure that at least one remote high-speed log destination exists on the BIG-IP® system.

Create a formatted logging destination to specify that log messages are sent to a pool of remote log servers, such as Remote Syslog, Splunk, or ArcSight servers.

1. On the Main tab, click **System** > **Logs** > **Configuration** > **Log Destinations**.
   The Log Destinations screen opens.
2. Click **Create**.
3. In the **Name** field, type a unique, identifiable name for this destination.

4. From the **Type** list, select a formatted logging destination, such as **IPFIX**, **Remote Syslog**, **Splunk**, or **ArcSight**.

   Important: *ArcSight formatting is only available for logs coming from Advanced Firewall Manager (AFM), Application Security Manager™ (ASM), and the Secure Web Gateway component of Access Policy Manager® (APM®). IPFIX is not available for Secure Web Gateway. Remote Syslog formatting is the only type supported for logs coming from APM. The Splunk format is a predefined format of key value pairs.*

   The BIG-IP system is configured to send a formatted string of text to the log servers.
5. If you selected **Remote Syslog**, from the **Syslog Format** list, select a format for the logs, and then from the **High-Speed Log Destination** list, select the destination that points to a pool of remote Syslog servers to which you want the BIG-IP system to send log messages.

   Important: *For logs coming from Access Policy Manager® (APM®), only the BSD Syslog format is supported.*

6. If you selected **Splunk** or **IPFIX**, from the **Forward To** list, select the destination that points to a pool of high-speed log servers to which you want the BIG-IP system to send log messages.
7. Click **Finished**.

Creating a publisher

Ensure that at least one destination associated with a pool of remote log servers exists on the BIG-IP® system.

Create a publisher to specify where the BIG-IP system sends log messages for specific resources.

1. On the Main tab, click **System** > **Logs** > **Configuration** > **Log Publishers**.
   The Log Publishers screen opens.
2. Click **Create**.
3. In the **Name** field, type a unique, identifiable name for this publisher.
4. For the **Destinations** setting, select a destination from the **Available** list, and click **<<** to move the destination to the **Selected** list.

   Note: *If you are using a formatted destination, select the destination that matches your log servers, such as Remote Syslog, Splunk, or ArcSight.*

5. Click **Finished**.

Creating a custom Protocol Security Logging profile

Create a logging profile to log Protocol Security events for the traffic handled by the virtual server to which the profile is assigned.

Note: *You can configure logging profiles for HTTP and DNS security events on Advanced Firewall Manager™, and FTP and SMTP security events on Application Security Manager™.*

1. On the Main tab, click **Security** > **Event Logs** > **Logging Profiles**.
   The Logging Profiles list screen opens.

2. Click **Create**.
   The New Logging Profile screen opens.
3. Select the **Protocol Security** check box, to enable the BIG-IP system to log HTTP, FTP, DNS, and SMTP protocol request events.
4. In the HTTP, FTP, and SMTP Security area, from the **Publisher** list, select the publisher that the BIG-IP system uses to log HTTP, FTP, and SMTP Security events.
5. In the DNS Security area, from the **Publisher** list, select the publisher that the BIG-IP system uses to log DNS Security events.
6. Select the **Log Dropped Requests** check box, to enable the BIG-IP system to log dropped DNS requests.
7. Select the **Log Filtered Dropped Requests** check box, to enable the BIG-IP system to log DNS requests dropped due to DNS query/header-opcode filtering.

   Note: *The system does not log DNS requests that are dropped due to errors in the way the system processes DNS packets.*

8. Select the **Log Malformed Requests** check box, to enable the BIG-IP system to log malformed DNS requests.
9. Select the **Log Rejected Requests** check box, to enable the BIG-IP system to log rejected DNS requests.
10. Select the **Log Malicious Requests** check box, to enable the BIG-IP system to log malicious DNS requests.
11. From the **Storage Format** list, select how the BIG-IP system formats the log. Your choices are:

Option	Description
None	Specifies the default format type in which the BIG-IP system logs messages to a remote Syslog server, for example: `"management_ip_address","bigip_hostname","context_type", "context_name","src_ip","dest_ip","src_port", "dest_port","vlan","protocol","route_domain", "acl_rule_name","action","drop_reason`
Field-List	This option allows you to: • Select from a list, the fields to be included in the log. • Specify the order the fields display in the log. • Specify the delimiter that separates the content in the log. The default delimiter is the comma character.
User-Defined	This option allows you to: • Select from a list, the fields to be included in the log. • Cut and paste, in a string of text, the order the fields display in the log.

12. Click **Finished**.

Assign this custom Protocol Security Logging profile to a virtual server.

Configuring a virtual server for Protocol Security event logging

Ensure that at least one Log Publisher exists on the BIG-IP® system.

Assign a custom Protocol Security Logging profile to a virtual server when you want the BIG-IP system to log Protocol Security events on the traffic the virtual server processes.

*Note: This task applies only to systems provisioned at a minimum level (or higher) for **Local Traffic (LTM)**. You can check the provisioning level on the **System** > **Resource Provisioning** screen.*

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 **Security** > **Policies**.
   The screen displays firewall rule settings.
4. From the **Log Profile** list, select **Enabled**. Then, for the **Profile** setting, move the profiles that log specific events to specific locations from the **Available** list to the **Selected** list.
5. Click **Update** to save the changes.

Disabling logging

Disable Network Firewall, Protocol Security, or DoS Protection event logging when you no longer want the BIG-IP® system to log specific events on the traffic handled by specific resources.

Note: You can disable and re-enable logging for a specific resource based on your network administration needs.

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 **Security** > **Policies**.
   The screen displays firewall rule settings.
4. From the **Log Profile** list, select **Disabled**.
5. Click **Update** to save the changes.

The BIG-IP system does not log the events specified in this profile for the resources to which this profile is assigned.

Implementation result

You now have an implementation in which the BIG-IP® system logs specific Protocol Security events and sends the logs to a specific location.

Chapter 10

Preventing Attacks with Eviction Policies and Connection Limits

- *What are eviction policies and connection limits?*

What are eviction policies and connection limits?

An *eviction policy* provides the system with guidelines for how aggressively it discards flows from the flow table. You can customize the eviction policy to prevent flow table attacks, where a large number of slow flows are used to negatively impact system resources. You can also set how the system responds to such flow problems in an eviction policy, and attach such eviction policies globally, to route domains, and to virtual servers, to protect the system, applications, and network segments with a high level of customization.

A *connection limit* provides a hard limit to the number of connections allowed on a virtual server or on a route domain. If you set such a limit, all connection attempts above this limit are not allowed.

Creating an eviction policy

You can create eviction policies to control the granularity and aggressiveness with which the system discards flows.

1. On the Main tab, click **System** > **Configuration** > **Local Traffic** > **Eviction Policies**.
2. Click **Create**.
   The **New Eviction Policy** screen opens.
3. In the **Name** field, type a name for the eviction policy.
4. In the **Trigger** fields, type a high and low water mark for the eviction policy.

   This measure specifies the percentage of the quota, for this context, before flow eviction starts (high water mark) and ends (low water mark).
5. Enable **Slow Flow Monitoring** to monitor flows that are considered slow by the system, and specify the slow flow threshold in bytes per second.

   This combination of settings monitors the system for flows that fall below the slow flow threshold for more than 30 seconds.
6. In the **Grace Period** field you can set a grace period, in seconds, between the detection of slow flows that meet the threshold requirement, and purging of slow flows according to the **Slow Flow Throttling** settings.
7. In the Slow Flow Throttling area, set the slow flow throttling options.

Option	Description
Disabled	Slow flows are monitored, but not removed from the system when the threshold requirement is met for 30 seconds.
Absolute	Slow flows are removed from the system when the threshold requirement is met for 30 seconds. Setting an absolute limit removes all slow flows beyond the specified absolute number of flows.
Percent	Slow flows are removed from the system when the threshold requirement is met for 30 seconds. Setting a percentage limit removes that percentage of slow flows above the specified monitoring setting, so the default value of 100% removes all slow flows above the slow flow threshold, after the grace period.

8. In the Algorithms area, configure the strategies that the eviction policy uses to remove flows by moving algorithms from the **Available** list to the **Selected** list, and configuring applicable settings for the algorithms.
9. Click **Finished**.

The eviction policy appears in the Eviction Policy List.

To use an eviction policy, associate it with a virtual server or a route domain.

Eviction policy strategy algorithms

This table lists the BIG-IP® eviction policy algorithms and associated configuration information.

In an eviction policy, you specify one or more algorithms, or any combination of algorithms, to determine how traffic flows are dropped when the eviction policy threshold limits are reached. Selected algorithms are processed at the same time as a combined strategy, not in a specific order, so the combination of algorithms determines the final strategy used to remove flows. This strategy biases or weights the final algorithm toward the outcomes you have selected, though these choices are not absolute.

Important: *You must specify at least one algorithm to use to determine how traffic is dropped with an eviction policy, otherwise flows are removed at random when the eviction policy threshold is reached.*

Algorithm	Description
Bias Idle	Biases flow removal toward the existing flows that have been idle, with no payload bytes, for the longest.
Bias Oldest	Biases flow removal toward the oldest existing flows.
Bias Bytes	Biases flow removal toward the flows with the fewest bytes. When this algorithm is selected, add a value to the field **Minimum Time Delay** in the Strategy Configuration area. This value determines the period of time for which a flow is allowed to exist, at a minimum, before it is subject to removal through the Bias Bytes algorithm.
Low Priority Route Domains	Biases flow removal toward flows on low priority route domains. When this algorithm is selected, use the **Low Priority Route Domains** setting in the **Strategy Configuration** area to move low priority route domains from the **Available** list to the **Selected** list.
Low Priority Virtual Servers	Biases flow removal toward flows on low priority virtual servers. When this algorithm is selected, use the **Low Priority Virtual Servers** setting in the **Strategy Configuration** area to move low priority virtual servers from the **Available** list to the **Selected** list.
Low Priority Countries	Biases flow removal toward flows from lower priority countries. When this algorithm is selected, in the **Low Priority Countries** setting in the **Strategy Configuration** area, select low priority countries from the list and click **Add** to add them to the low priority list.
Low Priority Ports and Protocols	Biases flow removal toward flows on low priority ports and protocols. When this algorithm is selected, use the **Low Priority Ports and Protocols** setting in the **Strategy Configuration** area to add ports,

Algorithm	Description
	protocols, and combinations to the low priority ports and protocols list (you must also specify a name).

Limiting global connections and flows

You must first create an eviction policy before you can assign one globally. The system includes a global eviction policy, by default.

Assign global connection limits and an eviction policy to prevent possible attacks or overflows on system flows.

1. On the Main tab, click **System** > **Configuration** > **Local Traffic** > **General**.
   The Local Traffic General Settings screen opens.
2. From the **Eviction Policy** list, select the eviction policy to apply globally.

   > ***Note:*** *Note that the global context requires an eviction policy. If you do not apply a custom eviction policy, the system default policy,* `default-eviction-policy` *is applied and selected in this field.*

3. Click **Update** to apply the changes.
   The eviction policy is applied to the context.

Limiting connections and flows on a virtual server

You must first create an eviction policy before you can assign one to a virtual server.

Assign connection limits and an eviction policy to a virtual server to enact granular control over possible attacks or overflows on system flows.

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. From the **Configuration** list, select **Advanced**.
4. In the **Connection Limit** field, type a number that specifies the maximum number of concurrent open connections.
5. From the **Eviction Policy** list, select an eviction policy to apply to the virtual server.
6. Click **Update** to apply the changes.
   The eviction policy is applied to the context.

Limiting connections and flows on a route domain

Before performing this task, confirm that you have a configured route domain, or use the common route domain `0`. You must add VLANs to a route domain for the route domain to effect traffic.

Assign connection limits and an eviction policy to a route domain to enact granular control over possible attacks or overflows on system flows.

1. On the Main tab, click **Network** > **Route Domains**.
   The Route Domain List screen opens.

2. In the Name column, click the name of the relevant route domain.
3. In the **Connection Limit** field, type the maximum number of concurrent connections allowed for the route domain. Setting this to `0` turns off connection limits. The default is `0`.
4. From the **Eviction Policy** list, select an eviction policy to apply to this route domain.
5. Click **Update**.
   The system displays the list of route domains on the BIG-IP system.

The route domain now applies the connection limit and eviction policy to flows and connections.

Chapter 11

Local Logging with the Network Firewall

Overview: Configuring local Network Firewall event logging

You can configure the BIG-IP® system to log detailed information about BIG-IP system Network Firewall events and store those logs on the BIG-IP system.

Important: *The BIG-IP system Advanced Firewall Manager™ (AFM™) must be licensed and provisioned before you can configure Network Firewall event logging.*

Task summary

Perform these tasks to configure logging of AFM processes on the BIG-IP® system.

Note: *Enabling logging impacts BIG-IP system performance.*

Task summary

Perform these tasks to configure Network Firewall logging locally on the BIG-IP® system.

Note: *Enabling logging and storing the logs locally impacts BIG-IP system performance.*

Creating a local Network Firewall Logging profile
Configuring a virtual server for Network Firewall event logging
Viewing Network Firewall event logs locally on the BIG-IP system
Creating a Network Firewall rule from a firewall log entry
Disabling logging

Creating a local Network Firewall Logging profile

Create a custom Logging profile to log BIG-IP® system Network Firewall 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 New Logging Profile screen opens.
3. In the **Profile Name** field, type a unique name for the profile.
4. Select the **Network Firewall** check box.
5. In the Network Firewall area, from the **Publisher** list, select **local-db-publisher**.
6. Set an **Aggregate Rate Limit** to define a rate limit for all combined network firewall log messages per second. Beyond this rate limit, log messages are not logged.
7. For the **Log Rule Matches** setting, select how the BIG-IP system logs packets that match ACL rules. You can select any or all of the options. When an option is selected, you can configure a rate limit for log messages of that type.

Option	Description
Option	Enables or disables logging of packets that match ACL rules configured with:
Accept	`action=Accept`
Drop	`action=Drop`
Reject	`action=Reject`

8. Select the **Log IP Errors** check box, to enable logging of IP error packets. When enabled, you can configure a rate limit for log messages of this type.
9. Select the **Log TCP Errors** check box, to enable logging of TCP error packets. When enabled, you can configure a rate limit for log messages of this type.
10. Select the **Log TCP Events** check box, to enable logging of open and close of TCP sessions. When enabled, you can configure a rate limit for log messages of this type.
11. Enable the **Log Translation Fields** setting to log both the original IP address and the NAT-translated IP address for Network Firewall log events.
12. Enable the **Always Log Region** setting to log the geographic location when a geolocation event causes a network firewall event.
13. From the **Storage Format** list, select how the BIG-IP system formats the log. Your choices are:

Option	Description
None	Specifies the default format type in which the BIG-IP system logs messages to a remote Syslog server, for example: `"management_ip_address","bigip_hostname","context_type","context_name","src_ip","dest_ip","src_port","dest_port","vlan","protocol","route_domain","acl_rule_name","action","drop_reason`
Field-List	This option allows you to: • Select from a list, the fields to be included in the log. • Specify the order the fields display in the log. • Specify the delimiter that separates the content in the log. The default delimiter is the comma character.
User-Defined	This option allows you to: • Select from a list, the fields to be included in the log. • Cut and paste, in a string of text, the order the fields display in the log.

14. In the IP Intelligence area, from the **Publisher** list, select **local-db-publisher**.

    Note: *The IP Address Intelligence feature must be enabled and licensed.*

15. Set an **Aggregate Rate Limit** to define a rate limit for all combined IP Intelligence log messages per second. Beyond this rate limit, log messages are not logged.
16. Enable the **Log Translation Fields** setting to log both the original IP address and the NAT-translated IP address for IP Intelligence log events.
17. In the Traffic Statistics area, from the **Publisher** list, select **local-db-publisher**.
18. Enable the **Active Flows** setting to log the number of active flows each second.
19. Enable the **Reaped Flows** to log the number of reaped flows, or connections that are not established because of system resource usage levels.

20. Enable the **Missed Flows** setting to log the number of packets that were dropped because of a flow table miss. A flow table miss occurs when a TCP non-SYN packet does not match an existing flow.
21. Enable the **SYN Cookie (Per Session Challenge)**setting to log the number of SYN cookie challenges generated each second.
22. Enable the **SYN Cookie (White-listed Clients)** setting to log the number of SYN cookie clients whitelisted each second.
23. Click **Finished**.

Assign this custom Network Firewall Logging profile to a virtual server.

Configuring a virtual server for Network Firewall event logging

Ensure that at least one log publisher exists on the BIG-IP® system.

Assign a custom Network Firewall Logging profile to a virtual server when you want the BIG-IP system to log Network Firewall events on the traffic that the virtual server processes.

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 **Security** > **Policies**.
   The screen displays firewall rule settings.
4. From the **Log Profile** list, select **Enabled**. Then, for the **Profile** setting, move the profiles that log specific events to specific locations from the **Available** list to the **Selected** list.

   Note: *If you do not have a custom profile configured, select the predefined logging profile **global-network** to log Advanced Firewall Manager™ events. Note that to log global, self IP, and route domain contexts, you must enable a Publisher in the **global-network** profile.*

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

Viewing Network Firewall event logs locally on the BIG-IP system

Ensure that the BIG-IP® system is configured to log the types of events you want to view, and to store the log messages locally on the BIG-IP system.

When the BIG-IP system is configured to log events locally, you can view those events using the Configuration utility.

1. On the Main tab, click **Security** > **Event Logs** > **Network** > **Firewall**.
   The Network Firewall event log displays.
2. To search for specific events, click **Custom Search**. Drag the event data that you want to search for from the Event Log table into the Custom Search table, and then click **Search**.

Creating a Network Firewall rule from a firewall log entry

You must be logging Network Firewall traffic to create a rule from the Network Firewall logs.

You can create a rule from the local log, from an enforced or staged rule or policy. You might use this to change the action taken on specific traffic that is matched by a more general rule. You can also use this to replicate a rule and change some parameter, such as the source or destination ports. Note that the rule you create from a log entry already has some information specified, such as source and destination address and ports, protocol, and VLAN. You can change any of this information as required.

1. On the Main tab, click **Security** > **Event Logs** > **Network** > **Firewall**.
   The Network Firewall event log displays.
2. Select the search parameters to show the desired log results, then click **Search**.
3. Select a log entry, and click **Create Rule**.
4. From the **Context** list, select the context for the firewall rule.

   For a firewall rule in a rule list, the context is predefined and cannot be changed.
5. In the **Name** and **Description** fields, type the name and an optional description.
6. From the **Type** list, select whether you are creating a standalone network firewall rule or creating the rule from a predefined rule list.

   Note: *If you create a firewall rule from a predefined rule list, only the* ***Name****,* ***Description****,* ***Order****,* ***Rule List****, and* ***State*** *options apply, and you must select or create a rule list to include.*
7. From the **State** list, select the rule state.
   - Select **Enabled** to apply the firewall rule to the given context and addresses.
   - Select **Disabled** to set the firewall rule to not apply at all.
   - Select **Scheduled** to apply the firewall rule according to the selected schedule.
8. From the **Schedule** list, select the schedule for the firewall rule.

   This schedule is applied when you set the firewall rule state as **Scheduled**.
9. From the **Protocol** list, select the protocol to which the firewall rule applies.
   - Select **Any** to apply the firewall rule to any protocol.
   - Select the protocol name to apply the rule to a single protocol.

   Important: *ICMP is handled by the BIG-IP system at the global or route domain level. Because of this, ICMP messages receive a response before they reach the virtual server context. You cannot create an inline rule for ICMP or ICMPv6 on a Self IP context. You can apply a rule list to a self IP that includes a rule for ICMP or ICMPv6; however, such a rule will be ignored. To apply firewall actions to the ICMP protocol, create a rule with the* `global` *or* `route domain` *context. ICMP rules are evaluated only for ICMP forwarding requests, and not for the IP addresses of the BIG-IP system itself.*

   Note: *Note that you must select a protocol if you specify ports.*
10. In the **Source** list, specify IP addresses and geolocated sources to which this rule applies.
    - From the **Address/Region** list, select **Any** to have the rule apply to any packet source IP address or packet source geographic location.
    - From the **Address/Region** list, select **Specify** and click **Address** to specify one or more packet source IP addresses to which the rule applies. When selected, you can type single IP addresses into the **Address** field, then click **Add** to add them to the address list.
    - From the **Address/Region** list, select **Specify** and click **Address List** to select a predefined list of packet source addresses to which the rule applies. To use an address list with this rule, select the address list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.

- From the **Address/Region** list, select **Specify** and click **Address Range** to specify a contiguous range of packet source IP addresses to which the rule applies. When selected, you can type a start and end IP address in the fields, then click **Add** to add the IP address range to the address list.
- From the **Address/Region** list, select **Specify** and click **Country/Region** to identify the geographic origin of packet sources, and to apply rules based on selected geographic locations. When selected, a field appears in which you can select a country. For many countries, an extra field appears after you select the country, in which you can select a state or province. If you do not select a specific state or province, the entire country is selected. After you select a geographic location, click **Add** to add it to the Source address list.

11. From the Source **Port** list, select the type of packet source ports to which this rule applies.

- Select **Any** to have the rule apply to any packet source port.
- Select **Specify** and click **Port** to specify one or more packet source ports to which the rule applies. When selected, you can type single port numbers into the **Port** field, then click **Add** to add them to the port list.
- Select **Specify** and click **Port Range** to specify a list of contiguous packet source port numbers to which the rule applies. When selected, you can type the start and end ports into the fields, then click **Add** to add the ports to the port list.
- Select **Specify** and click **Port List** to select a predefined list of packet source ports to which the rule applies. To use a port list with this rule, select the port list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.

12. From the Source **VLAN/Tunnel** list, select the VLAN on which this rule applies.

- Select **Any** to have the rule apply to traffic on any VLAN through which traffic enters the firewall.
- Select **Specify** to specify one or more VLANs on the firewall to which the rule applies. To use a VLAN with this rule, move the VLAN from the **Available** list to the **Selected** list by clicking the << button. Similarly, to remove the VLAN from this rule, click the >> button to move the VLAN from the **Selected** list to the **Available** list.

13. From the Destination **Address/Region** list, select the type of packet destination address to which this rule applies.

- Select **Any** to have the rule apply to any IP packet destination address.
- Select **Specify** and click **Address** to specify one or more packet destination IP addresses to which the rule applies. When selected, you can type single IP addresses into the **Address** field, then click **Add** to add them to the address list.
- Select **Specify** and click **Address List** to select a predefined list of packet destination addresses to which the rule applies. To use an address list with this rule, select the address list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.
- Select **Specify** and click **Address Range** to specify a contiguous range of packet destination IP addresses to which the rule applies. When selected, you can type a start and end IP address in the fields, then click **Add** to add the IP address range to the address list.
- Select **Specify** and click **Country/Region** to identify the geographic packet destination, and to apply rules based on specific geographic locations. When selected, a field appears in which you can select a country. For many countries, an extra field appears after you select the country, in which you can select a state or province. If you do not select a specific state or province, the entire country is selected. After you select a geographic location, click **Add** to add it to the Destination address list.

14. From the Destination **Port** list, select the type of packet destination ports to which this rule applies.

- Select **Any** to have the rule apply to any port inside the firewall.
- Select **Specify** and click **Port** to specify one or more packet destination ports to which the rule applies. When selected, you can type single port numbers into the **Port** field, then click **Add** to add them to the port list.

- Select **Specify** and click **Port Range** to specify a list of contiguous packet destination port numbers to which the rule applies. When selected, you can type the start and end ports into the fields, then click **Add** to add the ports to the port list.
- Select **Specify** and click **Port List** to select a predefined list of packet destination ports to which the rule applies. To use a port list with this rule, select the port list and click the **Add** button. Similarly, to remove the list from this rule, select the list and click the **Delete** button.

15. Optionally, from the **iRule** list, select an iRule to start if the rule matches traffic.
16. When you select an iRule to start in a firewall rule, you can enable iRule sampling, and select how frequently the iRule is started, for sampling purposes. The value you configure is `one out of n` times the iRule is triggered. For example, to trigger the iRule one out of every five times the rule matches a flow, select `Enabled`, then set this field to `5`.
17. From the **Action** list, select the firewall action for traffic originating from the specified source address on the specified protocol. Choose from one of the these actions:

Option	Description
Accept	Allows packets with the specified source, destination, and protocol to pass through the firewall. Packets that match the rule, and are accepted, traverse the system as if the firewall is not present.
Drop	Drops packets with the specified source, destination, and protocol. Dropping a packet is a silent action with no notification to the source or destination systems. Dropping the packet causes the connection to be retried until the retry threshold is reached.
Reject	Rejects packets with the specified source, destination, and protocol. When a packet is rejected the firewall sends a destination unreachable message to the sender.
Accept Decisively	Allows packets with the specified source, destination, and protocol to pass through the firewall, and does not require any further processing by any of the further firewalls. Packets that match the rule, and are accepted, traverse the system as if the firewall is not present.

18. From the **Logging** list, enable or disable logging for the firewall rule.

    A logging profile must be enabled to capture logging info for the firewall rule.
19. Click **Finished**.
    The list screen and the new item are displayed.

The new firewall policy rule is created from the log entry.

Disabling logging

Disable Network Firewall, Protocol Security, or DoS Protection event logging when you no longer want the BIG-IP® system to log specific events on the traffic handled by specific resources.

Note: *You can disable and re-enable logging for a specific resource based on your network administration needs.*

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 **Security** > **Policies**.
   The screen displays firewall rule settings.

4. From the **Log Profile** list, select **Disabled**.
5. Click **Update** to save the changes.

The BIG-IP system does not log the events specified in this profile for the resources to which this profile is assigned.

Implementation result

You now have an implementation in which the BIG-IP® system logs specific Network Firewall events and stores the logs in a local database on the BIG-IP system.

Chapter 12

Remote High-Speed Logging with the Network Firewall

Overview: Configuring remote high-speed Network Firewall event logging

You can configure the BIG-IP® system to log information about the BIG-IP system Network Firewall events and send the log messages to remote high-speed log servers.

Important: *The BIG-IP system Advanced Firewall Manager™ (AFM™) must be licensed and provisioned before you can configure Network Firewall event logging.*

When configuring remote high-speed logging of Network Firewall events, it is helpful to understand the objects you need to create and why, as described here:

Object	Reason
Pool of remote log servers	Create a pool of remote log servers to which the BIG-IP system can send log messages.
Destination (unformatted)	Create a log destination of Remote High-Speed Log type that specifies a pool of remote log servers.
Destination (formatted)	If your remote log servers are the ArcSight, Splunk, IPFIX, or Remote Syslog type, create an additional log destination to format the logs in the required format and forward the logs to a remote high-speed log destination.
Publisher	Create a log publisher to send logs to a set of specified log destinations.
Logging profile	Create a custom Logging profile to enable logging of user-specified data at a user-specified level, and associate a log publisher with the profile.
LTM® virtual server	Associate a custom Logging profile with a virtual server to define how the BIG-IP system logs security events on the traffic that the virtual server processes.

This illustration shows the association of the configuration objects for remote high-speed logging.

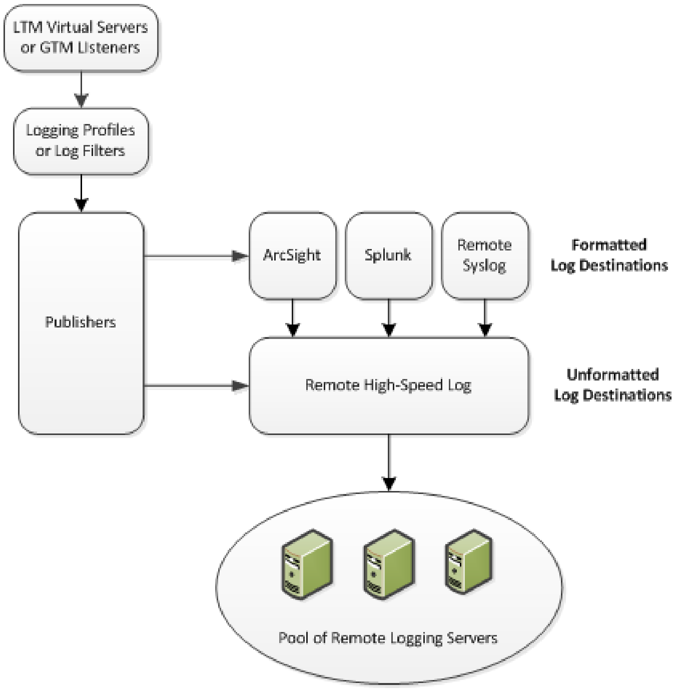

LTM Virtual Servers or GTM Listeners
Logging Profiles or Log Filters
Publishers
ArcSight
Splunk
Remote Syslog
Formatted Log Destinations
Remote High-Speed Log
Unformatted Log Destinations
Pool of Remote Logging Servers

Figure 6: Association of remote high-speed logging configuration objects

Task summary

Perform these tasks to configure remote high-speed network firewall logging on the BIG-IP® system.

Note: *Enabling remote high-speed logging impacts BIG-IP system performance.*

Creating a pool of remote logging servers
Creating a remote high-speed log destination
Creating a formatted remote high-speed log destination
Creating a publisher
Creating a custom Network Firewall Logging profile
Configuring a virtual server for Network Firewall event logging
Disabling logging

Creating a pool of remote logging servers

Before creating a pool of log servers, gather the IP addresses of the servers that you want to include in the pool. Ensure that the remote log servers are configured to listen to and receive log messages from the BIG-IP® system.

Create a pool of remote log servers to which the BIG-IP system can send log messages.

1. On the Main tab, click the applicable path.
   - **DNS** > **Delivery** > **Load Balancing** > **Pools**
   - **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. Using the **New Members** setting, add the IP address for each remote logging server that you want to include in the pool:
   a) Type an IP address in the **Address** field, or select a node address from the **Node List**.
   b) Type a service number in the **Service Port** field, or select a service name from the list.

   Note: *Typical remote logging servers require port `514`.*

   c) Click **Add**.
5. Click **Finished**.

Creating a remote high-speed log destination

Before creating a remote high-speed log destination, ensure that at least one pool of remote log servers exists on the BIG-IP® system.

Create a log destination of the **Remote High-Speed Log** type to specify that log messages are sent to a pool of remote log servers.

1. On the Main tab, click **System** > **Logs** > **Configuration** > **Log Destinations**.
   The Log Destinations screen opens.
2. Click **Create**.
3. In the **Name** field, type a unique, identifiable name for this destination.
4. From the **Type** list, select **Remote High-Speed Log**.

   Important: *If you use log servers such as Remote Syslog, Splunk, or ArcSight, which require data be sent to the servers in a specific format, you must create an additional log destination of the required type, and associate it with a log destination of the* ***Remote High-Speed Log*** *type. With this configuration, the BIG-IP system can send data to the servers in the required format.*

   The BIG-IP system is configured to send an unformatted string of text to the log servers.
5. From the **Pool Name** list, select the pool of remote log servers to which you want the BIG-IP system to send log messages.
6. From the **Protocol** list, select the protocol used by the high-speed logging pool members.
7. Click **Finished**.

Creating a formatted remote high-speed log destination

Ensure that at least one remote high-speed log destination exists on the BIG-IP® system.

Create a formatted logging destination to specify that log messages are sent to a pool of remote log servers, such as Remote Syslog, Splunk, or ArcSight servers.

1. On the Main tab, click **System** > **Logs** > **Configuration** > **Log Destinations**.
   The Log Destinations screen opens.
2. Click **Create**.
3. In the **Name** field, type a unique, identifiable name for this destination.

4. From the **Type** list, select a formatted logging destination, such as **IPFIX**, **Remote Syslog**, **Splunk**, or **ArcSight**.

   Important: *ArcSight formatting is only available for logs coming from Advanced Firewall Manager (AFM), Application Security Manager™ (ASM), and the Secure Web Gateway component of Access Policy Manager® (APM®). IPFIX is not available for Secure Web Gateway. Remote Syslog formatting is the only type supported for logs coming from APM. The Splunk format is a predefined format of key value pairs.*

   The BIG-IP system is configured to send a formatted string of text to the log servers.
5. If you selected **Remote Syslog**, from the **Syslog Format** list, select a format for the logs, and then from the **High-Speed Log Destination** list, select the destination that points to a pool of remote Syslog servers to which you want the BIG-IP system to send log messages.

   Important: *For logs coming from Access Policy Manager® (APM®), only the BSD Syslog format is supported.*

6. If you selected **Splunk** or **IPFIX**, from the **Forward To** list, select the destination that points to a pool of high-speed log servers to which you want the BIG-IP system to send log messages.
7. Click **Finished**.

Creating a publisher

Ensure that at least one destination associated with a pool of remote log servers exists on the BIG-IP® system.

Create a publisher to specify where the BIG-IP system sends log messages for specific resources.

1. On the Main tab, click **System** > **Logs** > **Configuration** > **Log Publishers**.
   The Log Publishers screen opens.
2. Click **Create**.
3. In the **Name** field, type a unique, identifiable name for this publisher.
4. For the **Destinations** setting, select a destination from the **Available** list, and click **<<** to move the destination to the **Selected** list.

   Note: *If you are using a formatted destination, select the destination that matches your log servers, such as Remote Syslog, Splunk, or ArcSight.*

5. Click **Finished**.

Creating a custom Network Firewall Logging profile

Create a custom Logging profile to log messages about BIG-IP® system Network Firewall events.

1. On the Main tab, click **Security** > **Event Logs** > **Logging Profiles**.
   The Logging Profiles list screen opens.
2. Click **Create**.
   The New Logging Profile screen opens.
3. In the **Name** field, type a unique name for the profile.
4. Select the **Network Firewall** check box.

5. In the Network Firewall area, from the **Publisher** list, select the publisher the BIG-IP system uses to log Network Firewall events.
6. Set an **Aggregate Rate Limit** to define a rate limit for all combined network firewall log messages per second. Beyond this rate limit, log messages are not logged.
7. For the **Log Rule Matches** setting, select how the BIG-IP system logs packets that match ACL rules. You can select any or all of the options. When an option is selected, you can configure a rate limit for log messages of that type.

Option	Description
Option	Enables or disables logging of packets that match ACL rules configured with:
Accept	`action=Accept`
Drop	`action=Drop`
Reject	`action=Reject`

8. Select the **Log IP Errors** check box, to enable logging of IP error packets. When enabled, you can configure a rate limit for log messages of this type.
9. Select the **Log TCP Errors** check box, to enable logging of TCP error packets. When enabled, you can configure a rate limit for log messages of this type.
10. Select the **Log TCP Events** check box, to enable logging of open and close of TCP sessions. When enabled, you can configure a rate limit for log messages of this type.
11. Enable the **Log Translation Fields** setting to log both the original IP address and the NAT-translated IP address for Network Firewall log events.
12. Enable the **Log Geolocation IP Address** setting to specify that when a geolocation event causes a network firewall action, the associated IP address is logged.
13. From the **Storage Format** list, select how the BIG-IP system formats the log. Your choices are:

Option	Description
None	Specifies the default format type in which the BIG-IP system logs messages to a remote Syslog server, for example: `"management_ip_address","bigip_hostname","context_type","context_name","src_ip","dest_ip","src_port","dest_port","vlan","protocol","route_domain","acl_rule_name","action","drop_reason`
Field-List	This option allows you to: • Select from a list, the fields to be included in the log. • Specify the order the fields display in the log. • Specify the delimiter that separates the content in the log. The default delimiter is the comma character.
User-Defined	This option allows you to: • Select from a list, the fields to be included in the log. • Cut and paste, in a string of text, the order the fields display in the log.

14. In the IP Intelligence area, from the **Publisher** list, select the publisher that the BIG-IP system uses to log source IP addresses, which are identified and configured for logging by an IP Intelligence policy.

Note: *The IP Address Intelligence feature must be enabled and licensed.*

15. Set an **Aggregate Rate Limit** to define a rate limit for all combined IP Intelligence log messages per second. Beyond this rate limit, log messages are not logged.
16. Enable the **Log Translation Fields** setting to log both the original IP address and the NAT-translated IP address for IP Intelligence log events.
17. In the Traffic Statistics area, from the **Publisher** list, select the publisher that the BIG-IP system uses to log traffic statistics.
18. Enable the **Active Flows** setting to log the number of active flows each second.
19. Enable the **Reaped Flows** to log the number of reaped flows, or connections that are not established because of system resource usage levels.
20. Enable the **Missed Flows** setting to log the number of packets that were dropped because of a flow table miss. A flow table miss occurs when a TCP non-SYN packet does not match an existing flow.
21. Enable the **SYN Cookie (Per Session Challenge)**setting to log the number of SYN cookie challenges generated each second.
22. Enable the **SYN Cookie (White-listed Clients)** setting to log the number of SYN cookie clients whitelisted each second.
23. Click **Finished**.

Assign this custom network firewall Logging profile to a virtual server.

Configuring a virtual server for Network Firewall event logging

Ensure that at least one log publisher exists on the BIG-IP® system.

Assign a custom Network Firewall Logging profile to a virtual server when you want the BIG-IP system to log Network Firewall events on the traffic that the virtual server processes.

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 **Security** > **Policies**.
   The screen displays firewall rule settings.
4. From the **Log Profile** list, select **Enabled**. Then, for the **Profile** setting, move the profiles that log specific events to specific locations from the **Available** list to the **Selected** list.

   Note: *If you do not have a custom profile configured, select the predefined logging profile* ***global-network*** *to log Advanced Firewall Manager™ events. Note that to log global, self IP, and route domain contexts, you must enable a Publisher in the* ***global-network*** *profile.*

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

Disabling logging

Disable Network Firewall, Protocol Security, or DoS Protection event logging when you no longer want the BIG-IP® system to log specific events on the traffic handled by specific resources.

Note: *You can disable and re-enable logging for a specific resource based on your network administration needs.*

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 **Security** > **Policies**.
   The screen displays firewall rule settings.
4. From the **Log Profile** list, select **Disabled**.
5. Click **Update** to save the changes.

The BIG-IP system does not log the events specified in this profile for the resources to which this profile is assigned.

Implementation result

You now have an implementation in which the BIG-IP® system logs specific Network Firewall events and sends the logs to a remote log server.

Chapter 13

SNMP Trap Configuration

Overview: BIG-IP SNMP agent configuration

You can use the industry-standard SNMP protocol to manage BIG-IP® devices on a network. To do this, you must configure the SNMP agent on the BIG-IP system. The primary tasks in configuring the SNMP agent are configuring client access to the SNMP agent, and controlling access to SNMP data.

Task summary

Perform these tasks to configure SNMP on the BIG-IP system.

Specifying SNMP administrator contact information and system location information
Configuring SNMP manager access to the SNMP agent on the BIG-IP system
Granting community access to v1 or v2c SNMP data
Granting user access to v3 SNMP data

Specifying SNMP administrator contact information and system location information

Specify contact information for the SNMP administrator, as well as the physical location of the BIG-IP system running an SNMP agent.

1. On the Main tab, click **System** > **Agent** > **Configuration**.
2. In the Global Setup area, in the **Contact Information** field, type contact information for the SNMP administrator for this BIG-IP system.

   The contact information is a MIB-II simple string variable. The contact information usually includes both a user name and an email address.
3. In the **Machine Location** field, type the location of the system, such as `Network Closet 1`.

   The machine location is a MIB-II simple string variable.
4. Click **Update**.

Configuring SNMP manager access to the SNMP agent on the BIG-IP system

Gather the IP addresses of the SNMP managers that you want to have access to the SNMP agent on this BIG-IP® system.

Configure the SNMP agent on the BIG-IP system to allow a client running the SNMP manager to access the SNMP agent for the purpose of remotely managing the BIG-IP system.

1. On the Main tab, click **System** > **Agent** > **Configuration**.
2. In the **Client Allow List** area, for the **Type** setting, select either **Host** or **Network**, depending on whether the IP address you specify is a host system or a subnet.

   Note: *By default, SNMP is enabled only for the BIG-IP system loopback interface (127.0.0.1).*
3. In the **Address** field, type either an IP address or network address from which the SNMP agent can accept requests.
4. If you selected **Network** in step 2, type the netmask in the **Mask** field.
5. Click **Add**.
6. Click **Update**.

The BIG-IP system now contains a list of IP addresses for SNMP managers from which SNMP requests are accepted.

Granting community access to v1 or v2c SNMP data

To better control access to SNMP data, you can assign an access level to an SNMP v1 or v2c community.

***Note:** SNMPv1 does not support Counter64 OIDs, which are used for accessing most statistics. Therefore, for SNMPv1 clients, an `snmp walk` command skips any OIDs of type Counter64. F5 Networks recommends that you use only clients that support SNMPv2 or higher.*

1. On the Main tab, click **System** > **Agent** > **Access (v1, v2c)**.
2. Click **Create**.
3. From the **Type** list, select either **IPv4** or **IPv6**.
4. In the **Community** field, type the name of the SNMP community for which you are assigning an access level.
5. From the **Source** list, select **All**, or select **Select** and type the source IP address in the field that displays.
6. In the **OID** field, type the OID for the top-most node of the SNMP tree to which the access applies.
7. From the **Access** list, select an access level, either **Read Only** or **Read/Write**.

   ***Note:** When you set the access level of a community or user to read/write, and an individual data object has a read-only access type, access to the object remains read-only. In short, the access level or type that is the most secure takes precedence when there is a conflict.*

8. Click **Finished**.

The BIG-IP system updates the `snmpd.conf` file, assigning only a single access setting to the community as shown in this sample `snmpd.conf` file.

Example snmpd.conf file

In the following sample code from an `snmpd.conf` file, string `rocommunity public default` identifies a community named public that has the default read-only access-level. This access-level prevents any allowed SNMP manager in community public from modifying a data object, even if the object has an access type of read/write. The string `rwcommunity public1` identifies a community named public1 as having a read/write access-level. This access-level allows any allowed SNMP manager in community public1 to modify a data object under the tree node `.1.3.6.1.4.1.3375.2.2.10.1` (ltmVirtualServ) on the local host `127.0.0.1`, if that data object has an access type of read/write.

```
rocommunity public default
rwcommunity public1 127.0.0.1  .1.3.6.1.4.1.3375.2.2.10.1
```

Granting user access to v3 SNMP data

To better control access to SNMP data, you can assign an access level to an SNMP v3 user.

1. On the Main tab, click **System** > **Agent** > **Access (v3)**.
2. Click **Create**.
3. In the **User Name** field, type the name of the user for which you are assigning an access level.
4. In the Authentication area, from the **Type** list, select a type of authentication to use, and then type and confirm the user's password.
5. In the Privacy area, from the **Protocol** list, select a privacy protocol, and either type and confirm the user's password, or select the **Use Authentication Password** check box.
6. In the **OID** field, type the OID for the top-most node of the SNMP tree to which the access applies.
7. From the **Access** list, select an access level, either **Read Only** or **Read/Write**.

   Note: *When you set the access level of a community or user to read/write, and an individual data object has a read-only access type, access to the object remains read-only. In short, the access level or type that is the most secure takes precedence when there is a conflict.*

8. Click **Finished**.

The BIG-IP system updates the `snmpd.conf` file, assigning only a single access setting to the user.

Overview: SNMP trap configuration

SNMP *traps* are definitions of unsolicited notification messages that the BIG-IP® alert system and the SNMP agent send to the SNMP manager when certain events occur on the BIG-IP system. Configuring SNMP traps on a BIG-IP system means configuring how the BIG-IP system handles traps, as well as setting the destination to which the notifications are sent.

The BIG-IP system stores SNMP traps in two specific files:

`/etc/alertd/alert.conf`
Contains default SNMP traps.

Important: *Do not add or remove traps from the* `/etc/alertd/alert.conf` *file.*

`/config/user_alert.conf`
Contains user-defined SNMP traps.

Task summary

Perform these tasks to configure SNMP traps for certain events and set trap destinations.

Enabling traps for specific events

Setting v1 and v2c trap destinations

Setting v3 trap destinations

Viewing pre-configured SNMP traps

Creating custom SNMP traps

Enabling traps for specific events

You can configure the SNMP agent on the BIG-IP® system to send, or refrain from sending, notifications to the traps destinations.

1. On the Main tab, click **System** > **SNMP** > **Traps** > **Configuration**.
2. To send traps when an administrator starts or stops the SNMP agent, verify that the **Enabled** check box for the **Agent Start/Stop** setting is selected.
3. To send notifications when authentication warnings occur, select the **Enabled** check box for the **Agent Authentication** setting.
4. To send notifications when certain warnings occur, verify that the **Enabled** check box for the **Device** setting is selected.
5. Click **Update**.

The BIG-IP system automatically updates the `alert.conf` file.

Setting v1 and v2c trap destinations

Specify the IP address of the SNMP manager in order for the BIG-IP® system to send notifications.

1. On the Main tab, click **System** > **SNMP** > **Traps** > **Destination**.
2. Click **Create**.
3. For the **Version** setting, select either `v1` or `v2c`.
4. In the **Community** field, type the community name for the SNMP agent running on the BIG-IP system.
5. In the **Destination** field, type the IP address of the SNMP manager.
6. In the **Port** field, type the port number on the SNMP manager that is assigned to receive the traps.
7. Click **Finished**.

Setting v3 trap destinations

Specify the destination SNMP manager to which the BIG-IP® system sends notifications.

1. On the Main tab, click **System** > **SNMP** > **Traps** > **Destination**.
2. Click **Create**.
3. For the **Version** setting, select `v3`.
4. In the **Destination** field, type the IP address of the SNMP manager.
5. In the **Port** field, type the port number on the SNMP manager that is assigned to receive the traps.
6. From the **Security Level** list, select the level of security at which you want SNMP messages processed.

Option	Description
Auth, No Privacy	Process SNMP messages using authentication but without encryption. When you use this value, you must also provide values for the **Security Name**, **Authentication Protocol**, and **Authentication Password** settings.
Auth and Privacy	Process SNMP messages using authentication and encryption. When you use this value, you must also provide values for the **Security Name**, **Authentication Protocol**, **Authentication Password**, **Privacy Protocol**, and **Privacy Password** settings.

7. In the **Security Name** field, type the user name the system uses to handle SNMP v3 traps.
8. In the **Engine ID** field, type an administratively unique identifier for an SNMP engine. (This setting is optional.) You can find the engine ID in the `/config/net-snmp/snmpd.conf` file on the BIG-IP system. Please note that this ID is identified in the file as the value of the oldEngineID token.

9. From the **Authentication Protocol** list, select the algorithm the system uses to authenticate SNMP v3 traps.

   When you set this value, you must also enter a value in the **Authentication Password** field.
10. In the **Authentication Password** field, type the password the system uses to handle an SNMP v3 trap.

    When you set this value, you must also select a value from the **Authentication Protocol** list.

    Note: *The authentication password must be at least 8 characters long.*
11. If you selected **Auth and Privacy** from the **Security Level** list, from the **Privacy Protocol** list, select the algorithm the system uses to encrypt SNMP v3 traps. When you set this value, you must also enter a value in the **Privacy Password** field.
12. If you selected **Auth and Privacy** from the **Security Level** list, in the **Privacy Password** field, type the password the system uses to handle an encrypted SNMP v3 trap. When you set this value, you must also select a value from the **Privacy Protocol** list.

    Note: *The authentication password must be at least 8 characters long.*
13. Click **Finished**.

Viewing pre-configured SNMP traps

Verify that your user account grants you access to the advanced shell.

Pre-configured traps are stored in the `/etc/alertd/alert.conf` file. View these SNMP traps to understand the data that the SNMP manager can use.

Use this command to view the SNMP traps that are pre-configured on the BIG-IP® system: `cat /etc/alertd/alert.conf`.

Creating custom SNMP traps

Verify that your user account grants you access to tmsh.

Create custom SNMP traps that alert the SNMP manager to specific SNMP events that occur on the network when the pre-configured traps do not meet all of your needs.

1. Log in to the command line.
2. Create a backup copy of the file `/config/user_alert.conf`, by typing this command: `cp /config/user_alert.conf` *`backup_file_name`*
   For example, type: `cp /config/user_alert.conf /config/user_alert.conf.backup`
3. With a text editor, open the file `/config/user_alert.conf`.
4. Add a new SNMP trap.

   The required format is:

```
alert alert_name "matched message" {
    snmptrap OID=".1.3.6.1.4.1.3375.2.4.0.XXX"
   }
```

- *`alert_name`* represents a descriptive name. The *`alert_name`* or *`matched_message`* value cannot match the corresponding value in any of the SNMP traps defined in the `/etc/alertd/alert.conf` or `/config/user_alert.conf` file.
- *`matched_message`* represents the text that matches the Syslog message that triggers the custom trap. You can specify either a portion of the Syslog message text or use a regular expression. Do not include the Syslog prefix information, such as the date stamp and process ID, in the match string.
- The *`XXX`* portion of the OID value represents a number that is unique to this OID. Specify any OID that meets all of these criteria:
    - Is in standard OID format and within the range `.1.3.6.1.4.1.3375.2.4.0.300` through `.1.3.6.1.4.1.3375.2.4.0.999`.
    - Is in a numeric range that can be processed by your trap receiving tool.
    - Does not exist in the MIB file `/usr/share/snmp/mibs/F5-BIGIP-COMMON-MIB.txt`.
    - Is not used in another custom trap.

As an example, to create a custom SNMP trap that is triggered whenever the system logs switchboard failsafe status changes, add the following trap definition to `/config/user_alert.conf`.

```
alert SWITCHBOARD_FAILSAFE_STATUS "Switchboard Failsafe (.*)" {
          snmptrap OID=".1.3.6.1.4.1.3375.2.4.0.500"
     }
```

This trap definition causes the system to log the following message to the file `/var/log/ltm`, when switchboard failsafe is enabled: `Sep 23 11:51:40 bigip1.askf5.com lacpd[27753]: 01160016:6: Switchboard Failsafe enabled`.

5. Save the file.
6. Close the text editor.
7. Restart the `alertd` daemon by typing this command: `bigstart restart alertd`

   If the `alertd` daemon fails to start, examine the newly-added trap entry to ensure that the format is correct.

Overview: About troubleshooting SNMP traps

When the BIG-IP® alert system and the SNMP agent send traps to the SNMP manager, you can respond to the alert using the recommended actions for each SNMP trap.

AFM-related traps and recommended actions

This table provides information about the AFM™-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
BIGIP_TMM_TMMERR_DOS_ATTACK_START (.1.3.6.1.4.1.3375.2.4.0.133)	The start of a possible DoS attack was registered.	Determine your response to this type of DoS attack, if required.

Trap name	Description	Recommended action
BIGIP_TMM_TMMERR_DOS_ATTACK_STOP (.1.3.6.1.4.1.3375.2.4.0.134)	The end of a possible DoS attack was detected.	None, informational.
BIGIP_DOSPROTECT_DOSPROTECT_AGGRREAPEROID (.1.3.6.1.4.1.3375.2.4.0.22)	The flow sweeper started or stopped.	None, informational.

ASM-related traps and recommended actions

This table provides information about the ASM™-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipAsmRequestBlocked (.1.3.6.1.4.1.3375.2.4.0.38)	The BIG-IP® system blocked an HTTP request because the request contained at least one violation to the active security policy.	Check the HTTP request to determine the cause of the violation.
bigipAsmRequestViolation (.1.3.6.1.4.1.3375.2.4.0.39)	The BIG-IP system issued an alert because an HTTP request violated the active security policy.	Check the HTTP request to determine the cause of the violation.
bigipAsmFtpRequestBlocked (.1.3.6.1.4.1.3375.2.4.0.79)	The BIG-IP system blocked an FTP request because the request contained at least one violation to the active security policy.	Check the FTP request to determine the cause of the violation.
bigipAsmFtpRequestViolation (.1.3.6.1.4.1.3375.2.4.0.80)	The BIG-IP system issued an alert because an FTP request violated the active security policy.	Check the FTP request to determine the cause of the violation.
bigipAsmSmtpRequestBlocked (.1.3.6.1.4.1.3375.2.4.0.85)	The BIG-IP system blocked an SMTP request because the request contained at least one violation to the active security policy.	Check the SMTP request to determine the cause of the violation.
bigipAsmSmtpRequestViolation (.1.3.6.1.4.1.3375.2.4.0.86)	The BIG-IP system issued an alert because an SMTP request violated the active security policy.	Check the SMTP request to determine the cause of the violation.
bigipAsmDosAttackDetected (.1.3.6.1.4.1.3375.2.4.0.91)	The BIG-IP system detected a denial-of-service (DoS) attack.	Determine the availability of the application by checking the response time of the site. Check the BIG-IP ASM logs: • Identify the source IP of the attack and observe other violations from the same source. Determine if the source IP is

Trap name	Description	Recommended action
		attacking other resources. Consider blocking the source IP in the ACL. • Identify the URL that is under attack. Consider disabling the URL, if the attack is not mitigated quickly.
bigipAsmBruteForceAttackDetected (.1.3.6.1.4.1.3375.2.4.0.92)	The BIG-IP system detected a brute force attack.	Check the BIG-IP ASM logs: • Identify the source IP of the attack and observe other violations from the same source. Determine if the source IP is attacking other resources. Consider blocking the source IP in the ACL. • Identify the user name that is under attack. Consider contacting the user and locking their account.

Application Visibility and Reporting-related traps and recommended actions

This table provides information about the Application Visibility and Reporting (AVR) notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipAvrAlertsMetricSnmp (.1.3.6.1.4.1.3375.2.4.0.105)	A BIG-IP system AVR SNMP metric changed.	Information only, no action required.
bigipAvrAlertsMetricSmtp (.1.3.6.1.4.1.3375.2.4.0.106)	A BIG-IP system AVR SMTP metric changed.	Information only, no action required.

Authentication-related traps and recommended actions

This table provides information about the authentication-related notifications that an SNMP manager can receive.

Trap Name	Description	Recommended Action
bigipTamdAlert (.1.3.6.1.4.1.3375.2.4.0.21)	More than 60 authentication attempts have failed within one second, for a given virtual server.	Investigate for a possible intruder.
bigipAuthFailed (.1.3.6.1.4.1.3375.2.4.0.27)	A login attempt failed.	Check the user name and password.

DoS-related traps and recommended actions

This table provides information about the denial-of-service (DoS)-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipAggrReaperStateChange (.1.3.6.1.4.1.3375.2.4.0.22)	The state of the aggressive reaper has changed, indicating that the BIG-IP® system is moving to a distress mode.	Use the default denial-of-service (DoS) settings. You can also add rate filters to survive the attack.
bigipDosAttackStart (.1.3.6.1.4.1.3375.2.4.0.133)	The BIG-IP system detected a DoS attack start.	Check the attack name in the notification to determine the kind of attack that is detected.
bigipDosAttackStop (.1.3.6.1.4.1.3375.2.4.0.134)	The BIG-IP system detected a DoS attack stop.	Information only, no action required.

General traps and recommended actions

This table provides information about the general notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipDiskPartitionWarn (.1.3.6.1.4.1.3375.2.4.0.25)	Free space on the disk partition is less than the specified limit. By default, the limit is 30% of total disk space.	Increase the available disk space.
bigipDiskPartitionGrowth (.1.3.6.1.4.1.3375.2.4.0.26)	The disk partition use exceeds the specified growth limit. By default, the limit is 5% of total disk space.	Increase the available disk space.
bigipUpdatePriority (.1.3.6.1.4.1.3375.2.4.0.153)	There is a high priority software update available.	Download and install the software update.
bigipUpdateServer (.1.3.6.1.4.1.3375.2.4.0.154)	Unable to connect to the F5® server running update checks.	Verify the server connection settings.
bigipUpdateError (.1.3.6.1.4.1.3375.2.4.0.155)	There was an error checking for updates.	Investigate the error.

GTM-related traps and recommended actions

This table provides information about the GTM™-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipGtmBoxAvail (.1.3.6.1.4.1.3375.2.4.0.77)	The BIG-IP® system has come UP.	Information only, no action required.
bigipGtmBoxNotAvail (.1.3.6.1.4.1.3375.2.4.0.78)	The BIG-IP system has gone DOWN.	Information only, no action required.
bigipGtmBig3dSslCertExpired (.1.3.6.1.4.1.3375.2.4.0.81)	The certificate `/config/big3d/client.crt` has expired.	Replace the certificate.

Trap name	Description	Recommended action
bigipGtmBig3dSslCertWillExpire (.1.3.6.1.4.1.3375.2.4.0.82)	The certificate `/config/big3d/client.crt` will expire soon.	Replace the certificate.
bigipGtmSslCertExpired (.1.3.6.1.4.1.3375.2.4.0.83)	The certificate `/config/gtm/server.crt` has expired.	Replace the certificate.
bigipGtmSslCertWillExpire (.1.3.6.1.4.1.3375.2.4.0.84)	The certificate `/config/gtm/server.crt` will expire soon.	Replace the certificate.
bigipGtmPoolAvail (.1.3.6.1.4.1.3375.2.4.0.40)	A global traffic management pool is available.	Information only, no action required.
bigipGtmPoolNotAvail (.1.3.6.1.4.1.3375.2.4.0.41)	A global traffic management pool is not available.	Information only, no action required.
bigipGtmPoolDisabled (.1.3.6.1.4.1.3375.2.4.0.42)	A global traffic management pool is disabled.	Check the status of the pool.
bigipGtmPoolEnabled (.1.3.6.1.4.1.3375.2.4.0.43)	A global traffic management pool is enabled.	Information only, no action required.
bigipGtmLinkAvail (.1.3.6.1.4.1.3375.2.4.0.44)	A global traffic management link is available.	Information only, no action required.
bigipGtmLinkNotAvail (.1.3.6.1.4.1.3375.2.4.0.45)	A global traffic management link is not available.	Check the status of the link, as well as the relevant detailed log message.
bigipGtmLinkDisabled (.1.3.6.1.4.1.3375.2.4.0.46)	A global traffic management link is disabled.	Check the status of the link.
bigipGtmLinkEnabled (.1.3.6.1.4.1.3375.2.4.0.47)	A global traffic management link is enabled.	Information only, no action required.
bigipGtmWideIpAvail (.1.3.6.1.4.1.3375.2.4.0.48)	A global traffic management wide IP is available.	Information only, no action required.
bigipGtmWideIpNotAvail (.1.3.6.1.4.1.3375.2.4.0.49)	A global traffic management wide IP is unavailable.	Check the status of the wide IP, as well as the relevant detailed log message.
bigipGtmWideIpDisabled (.1.3.6.1.4.1.3375.2.4.0.50)	A global traffic management wide IP is disabled.	Check the status of the wide IP.
bigipGtmWideIpEnabled (.1.3.6.1.4.1.3375.2.4.0.51)	A global traffic management wide IP is enabled.	Information only, no action required.
bigipGtmPoolMbrAvail (.1.3.6.1.4.1.3375.2.4.0.52)	A global traffic management pool member is available.	Information only, no action required.
bigipGtmPoolMbrNotAvail (.1.3.6.1.4.1.3375.2.4.0.53)	A global traffic management pool member is not available.	Check the status of the pool member, as well as the relevant detailed log message.
bigipGtmPoolMbrDisabled (.1.3.6.1.4.1.3375.2.4.0.54)	A global traffic management pool member is disabled.	Check the status of the pool member.

Trap name	Description	Recommended action
bigipGtmPoolMbrEnabled (.1.3.6.1.4.1.3375.2.4.0.55)	A global traffic management pool member is enabled.	Information only, no action required.
bigipGtmServerAvail (.1.3.6.1.4.1.3375.2.4.0.56)	A global traffic management server is available.	Information only, no action required.
bigipGtmServerNotAvail (.1.3.6.1.4.1.3375.2.4.0.57)	A global traffic management server is unavailable.	Check the status of the server, as well as the relevant detailed log message.
bigipGtmServerDisabled (.1.3.6.1.4.1.3375.2.4.0.58)	A global traffic management server is disabled.	Check the status of the server.
bigipGtmServerEnabled (.1.3.6.1.4.1.3375.2.4.0.59)	A global traffic management server is enabled.	Information only, no action required.
bigipGtmVsAvail (.1.3.6.1.4.1.3375.2.4.0.60)	A global traffic management virtual server is available.	Information only, no action required.
bigipGtmVsNotAvail (.1.3.6.1.4.1.3375.2.4.0.61)	A global traffic management virtual server is unavailable.	Check the status of the virtual server, as well as the relevant detailed log message.
bigipGtmVsDisabled (.1.3.6.1.4.1.3375.2.4.0.62)	A global traffic management virtual server is disabled.	Check the status of the virtual server.
bigipGtmVsEnabled (.1.3.6.1.4.1.3375.2.4.0.63)	A global traffic management virtual server is enabled.	Information only, no action required.
bigipGtmDcAvail (.1.3.6.1.4.1.3375.2.4.0.64)	A global traffic management data center is available.	Information only, no action required.
bigipGtmDcNotAvail (.1.3.6.1.4.1.3375.2.4.0.65)	A global traffic management data center is unavailable.	Check the status of the data center, as well as the relevant detailed log message.
bigipGtmDcDisabled (.1.3.6.1.4.1.3375.2.4.0.66)	A global traffic management data center is disabled.	Check the status of the data center.
bigipGtmDcEnabled (.1.3.6.1.4.1.3375.2.4.0.67)	A global traffic management data center is enabled.	Information only, no action required.
bigipGtmAppObjAvail (.1.3.6.1.4.1.3375.2.4.0.69)	A global traffic management application object is available.	Information only, no action required.
bigipGtmAppObjNotAvail (.1.3.6.1.4.1.3375.2.4.0.70)	A global traffic management application object is unavailable.	Check the status of the application object, as well as the relevant detailed log message.
bigipGtmAppAvail (.1.3.6.1.4.1.3375.2.4.0.71)	A global traffic management application is available.	Information only, no action required.
bigipGtmAppNotAvail (.1.3.6.1.4.1.3375.2.4.0.72)	A global traffic management application is unavailable.	Check the status of the application, as well as the relevant detailed log message.

Trap name	Description	Recommended action
bigipGtmJoinedGroup (.1.3.6.1.4.1.3375.2.4.0.73)	The BIG-IP system joined a global traffic management synchronization group.	Information only, no action required.
bigipGtmLeftGroup (.1.3.6.1.4.1.3375.2.4.0.74)	The BIG-IP system left a global traffic management synchronization group.	Information only, no action required.
bigipGtmKeyGenerationExpiration (.1.3.6.1.4.1.3375.2.4.0.95)	A generation of a DNSSEC key expired.	Information only, no action required.
bigipGtmKeyGenerationRollover (.1.3.6.1.4.1.3375.2.4.0.94)	A generation of a DNSSEC key rolled over.	Information only, no action required.
bigipGtmProberPoolDisabled (.1.3.6.1.4.1.3375.2.4.0.99)	A global traffic management prober pool is disabled.	Check the status of the prober pool.
bigipGtmProberPoolEnabled (.1.3.6.1.4.1.3375.2.4.0.100)	A global traffic management prober pool is enabled.	Information only, no action required.
bigipGtmProberPoolStatusChange (.1.3.6.1.4.1.3375.2.4.0.97)	The status of a global traffic management prober pool has changed.	Check the status of the prober pool.
bigipGtmProberPoolStatusChangeReason (.1.3.6.1.4.1.3375.2.4.0.98)	The reason the status of a global traffic management prober pool has changed.	The action required is based on the reason given.
bigipGtmProberPoolMbrDisabled (.1.3.6.1.4.1.3375.2.4.0.103)	A global traffic management prober pool member is disabled.	Check the status of the prober pool member.
bigipGtmProberPoolMbrEnabled (.1.3.6.1.4.1.3375.2.4.0.104)	A global traffic management prober pool member is enabled.	Information only, no action required.
bigipGtmProberPoolMbrStatusChange (.1.3.6.1.4.1.3375.2.4.0.101)	The status of a global traffic management prober pool member has changed.	Check the status of the prober pool member.
bigipGtmProberPoolMbrStatusChangeReason (.1.3.6.1.4.1.3375.2.4.0.102)	The reason the status of a global traffic management prober pool member has changed.	The action required is based on the reason given.

Hardware-related traps and recommended actions

This table provides information about hardware-related notifications that an SNMP manager can receive. If you receive any of these alerts, contact F5® Networks technical support.

Trap name and Associated OID	Description	Recommended action
bigipAomCpuTempTooHigh (.1.3.6.1.4.1.3375.2.4.0.93)	The AOM is reporting that the air temperature near the CPU is too high.	Check the input and output air temperatures. Run an iHealth® report and troubleshoot based on the results. If the condition persists, contact F5 Networks technical support.
bigipBladeNoPower (.1.3.6.1.4.1.3375.2.4.0.88)	A blade lost power.	Contact F5 Networks technical support.

Trap name and Associated OID	Description	Recommended action
bigipBladeTempHigh (.1.3.6.1.4.1.3375.2.4.0.87)	The temperature of a blade is too high.	This trap might be spurious. If the condition persists, contact F5 Networks technical support.
bigipBladeOffline (.1.3.6.1.4.1.3375.2.4.0.90)	A blade has failed.	Remove the blade. Contact F5 Networks technical support.
bigipChmandAlertFanTrayBad (.1.3.6.1.4.1.3375.2.4.0.121)	A fan tray in a chassis is bad or was removed.	Replace the fan tray. If the condition persists, contact F5 Networks technical support.
bigipCpuTempHigh	The CPU temperature is too high.	Check the input and output air temperatures. Run an iHealth report and troubleshoot based on the results. If the condition persists, contact F5 Networks technical support.
bigipCpuFanSpeedLow (.1.3.6.1.4.1.3375.2.4.0.5)	The CPU fan speed is too low.	Check the CPU temperature. If the CPU temperature is normal, the condition is not critical. If the condition persists, contact F5 Networks technical support.
bigipCpuFanSpeedBad (.1.3.6.1.4.1.3375.2.4.0.6)	The CPU fan is not receiving a signal.	Check the CPU temperature. If the CPU temperature is normal, the condition is not critical. If the condition persists, contact F5 Networks technical support.
bigipSystemCheckAlertFanSpeedLow (.1.3.6.1.4.1.3375.2.4.0.115)	The system fan speed is too low.	This condition is critical. Replace the fan tray. These appliances do not have fan trays: 1600, 3600, 3900, EM4000, 2000, 4000. If the condition persists, contact F5 Networks technical support.
bigipSystemCheckAlertVoltageHigh (.1.3.6.1.4.1.3375.2.4.0.114)	The system voltage is too high.	Review additional error messages in the log files. Unplug the system. Contact F5 Networks technical support. **Note:** *This alert does not happen for standby power.*
bigipSystemCheckAlertVoltageLow (.1.3.6.1.4.1.3375.2.4.0.123)	The system voltage is too low.	Review additional error messages in the log files. Unplug the system. Contact F5 Networks technical support. **Note:** *This alert does not happen for standby power.*
bigipSystemCheckAlertMilliVoltageHigh (.1.3.6.1.4.1.3375.2.4.0.124)	The system milli-voltage is too high.	Review additional error messages in the log files. Unplug the system. Contact F5 Networks technical support. **Note:** *This alert does not happen for standby power.*

Trap name and Associated OID	Description	Recommended action
bigipSystemCheckAlertMilliVoltageLow (.1.3.6.1.4.1.3375.2.4.0.127)	The system milli-voltage is too low.	Review additional error messages in the log files. Unplug the system. Contact F5 Networks technical support. **Note:** *This alert does not happen for standby power.*
bigipSystemCheckAlertTempHigh (.1.3.6.1.4.1.3375.2.4.0.113)	The system temperature is too high.	Check the system and air temperatures. If the condition persists, contact F5 Networks technical support.
bigipSystemCheckAlertCurrentHigh (.1.3.6.1.4.1.3375.2.4.0.125)	The system current is too high.	Review additional error messages in the log files. Unplug the system. Contact F5 Networks technical support. **Note:** *This alert does not happen for standby power.*
bigipSystemCheckAlertCurrentLow (.1.3.6.1.4.1.3375.2.4.0.128)	The system current is too low.	Review additional error messages in the log files. Unplug the system. Contact F5 Networks technical support. **Note:** *This alert does not happen for standby power.*
bigipSystemCheckAlertPowerHigh (.1.3.6.1.4.1.3375.2.4.0.126)	The system power is too high.	Review additional error messages in the log files. Unplug the system. Contact F5 Networks technical support. **Note:** *This alert does not happen for standby power.*
bigipSystemCheckAlertPowerLow (.1.3.6.1.4.1.3375.2.4.0.129)	The system power is too low.	Review additional error messages in the log files. Unplug the system. Contact F5 Networks technical support. **Note:** *This alert does not happen for standby power.*
bigipChassisTempHigh (.1.3.6.1.4.1.3375.2.4.0.7)	The temperature of the chassis is too high.	Contact F5 Networks technical support.
bigipChassisFanBad (.1.3.6.1.4.1.3375.2.4.0.8)	The chassis fan is not operating properly.	Replace the fan tray. If the condition persists, contact F5 Networks technical support.
bigipChassisPowerSupplyBad (.1.3.6.1.4.1.3375.2.4.0.9)	The chassis power supply is not functioning properly.	Verify that the power supply is plugged in. In the case of a dual-power-supply system, verify that both power supplies are plugged in. Contact F5 Networks technical support.
bigipLibhalBladePoweredOff (.1.3.6.1.4.1.3375.2.4.0.119)	A blade is powered off.	Contact F5 Networks technical support.

Trap name and Associated OID	Description	Recommended action
bigipLibhalSensorAlarmCritical (.1.3.6.1.4.1.3375.2.4.0.120)	The hardware sensor on a blade indicates a critical alarm.	Review any additional error messages that your receive, and troubleshoot accordingly. If the condition persists, contact F5 Networks technical support.
bigipLibhalDiskBayRemoved (.1.3.6.1.4.1.3375.2.4.0.118)	A disk sled was removed from a bay.	Information only, no action required.
bigipLibhalSsdLogicalDiskRemoved (.1.3.6.1.4.1.3375.2.4.0.117)	An SSD logical disk was removed from the BIG-IP® system.	Information only, no action required.
bigipLibhalSsdPhysicalDiskRemoved (.1.3.6.1.4.1.3375.2.4.0.116)	An SSD physical disk was removed from the BIG-IP system.	Information only, no action required.
bigipRaidDiskFailure (.1.3.6.1.4.1.3375.2.4.0.96)	An disk in a RAID disk array failed.	On `www.askf5.com`, see *SOL10856: Overview of hard drive mirroring*. If the problem persists, contact F5 Networks technical support.
bigipSsdMwiNearThreshold (.1.3.6.1.4.1.3375.2.4.0.111)	An SSD disk is reaching a known wear threshold.	Contact F5 Networks technical support.
bigipSsdMwiReachedThreshold (.1.3.6.1.4.1.3375.2.4.0.112)	An SSD disk is worn out.	If this is the first alert, the disk might continue to operate for a short time. Contact F5 Networks technical support.
bigipNetLinkDown (.1.3.6.1.4.1.3375.2.4.0.24)	An interface link is down.	This alert applies to L1 and L2, which are internal links within the device connecting the CPU and Switch subsystems. These links should never be down. If this occurs, the condition is serious. Contact F5 Networks technical support.
bigipExternalLinkChange (.1.3.6.1.4.1.3375.2.4.0.37)	The status of an external interface link has changed to either UP, DOWN, or UNPOPULATED.	This occurs when network cables are added or removed, and the network is reconfigured. Determine whether the link should be down or up, and then take the appropriate action.
bigipPsPowerOn (.1.3.6.1.4.1.3375.2.4.0.147)	The power supply for the BIG-IP system was powered on.	Information only, no action required, unless this trap is unexpected. In that case, verify that the power supply is working and that system has not rebooted.
bigipPsPowerOff (.1.3.6.1.4.1.3375.2.4.0.148)	The power supply for the BIG-IP system was powered off.	Information only, no action required, unless power off was unexpected. In that case, verify that the power supply is working and that system has not rebooted.
bigipPsAbsent (.1.3.6.1.4.1.3375.2.4.0.149)	The power supply for the BIG-IP system cannot be detected.	Information only, no action required when the BIG-IP device is operating with one power supply. For BIG-IP devices with two power supplies

Trap name and Associated OID	Description	Recommended action
		installed, verify that both power supplies are functioning correctly and evaluate symptoms.
bigipSystemShutdown (.1.3.6.1.4.1.3375.2.4.0.151)	The BIG-IP system has shut down.	Information only, no action required when the shut down was expected. Otherwise, investigate the cause of the unexpected reboot.
bigipFipsDeviceError (.1.3.6.1.4.1.3375.2.4.0.152)	The FIPS card in the BIG-IP system has encountered a problem.	Contact F5 Networks technical support.

High-availability system-related traps and recommended actions

This table provides information about the high-availability system-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipStandby (.1.3.6.1.4.1.3375.2.4.0.14)	The BIG-IP® system has switched to standby mode.	Review the log files in the `/var/log` directory and then search for core files in the `/var/core` directory. If you find a core file, or find text similar to fault at location `xxxx stack trace:`, contact F5® Networks technical support.
bigipStandByFail (.1.3.6.1.4.1.3375.2.4.0.75)	In failover condition, this standby system cannot become active.	Investigate failover condition on the standby system.
bigipActive (.1.3.6.1.4.1.3375.2.4.0.15)	The BIG-IP system has switched to active mode.	Information only, no action required.
bigipActiveActive (.1.3.6.1.4.1.3375.2.4.0.16)	The BIG-IP system is in active-active mode.	Information only, no action required.
bigipFeatureFailed (.1.3.6.1.4.1.3375.2.4.0.17)	A high-availability feature has failed.	View high-availability processes and their current status.
bigipFeatureOnline (.1.3.6.1.4.1.3375.2.4.0.18)	A high-availability feature is responding.	View high-availability processes and their current status.
bigipTrafficGroupStandby (.1.3.6.1.4.1.3375.2.4.0.141)	The status of a traffic group has changed to stand by.	Information only, no action required. To determine the reason for the failover, review the LTM® log `/var/log/ltm` and search for keywords active or standby. Additionally, you can run the `tmsh` command `tmsh show sys ha-status` to view the failover conditions.
bigipTrafficGroupActive (.1.3.6.1.4.1.3375.2.4.0.142)	The status of a traffic group has changed to active.	Information only, no action required. To determine the reason for the failover, review the LTM log `/var/log/ltm` and search for keywords active or standby. Additionally, you can run the `tmsh` command `tmsh show`

Trap name	Description	Recommended action
		`sys ha-status` to view the failover conditions.
bigipTrafficGroupOffline (.1.3.6.1.4.1.3375.2.4.0.143)	The status of a traffic group has changed to offline.	Information only, no action required.
bigipTrafficGroupForcedOffline (.1.3.6.1.4.1.3375.2.4.0.144)	The status of a traffic group has changed to forced offline.	Information only, no action required.
bigipTrafficGroupDeactivate (.1.3.6.1.4.1.3375.2.4.0.145)	A traffic group was deactivated.	Information only, no action required. To determine the reason for the deactivation, review the LTM log `/var/log/ltm` and search for the keyword deactivate.
bigipTrafficGroupActivate (.1.3.6.1.4.1.3375.2.4.0.146)	A traffic group was activated.	Information only, no action required. To determine the reason for the deactivation, review the LTM log `/var/log/ltm` and search for the keyword activate.

License-related traps and recommended actions

This table provides information about the license-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipLicenseFailed (.1.3.6.1.4.1.3375.2.4.0.19)	Validation of a BIG-IP® system license has failed, or the dossier has errors.	Occurs only when first licensing the system or adding a module key (such as HTTP compression) to an existing system. If using automatic licensing, verify connectivity to the outside world, fix the dossier if needed, and try again.
bigipLicenseExpired (.1.3.6.1.4.1.3375.2.4.0.20)	The BIG-IP license has expired.	Call F5® Networks technical support.
bigipDnsRequestRateLimiterEngaged (.1.3.6.1.4.1.3375.2.4.0.139)	The BIG-IP DNS Services license is rate-limited and the system has reached the rate limit.	Call F5 Networks technical support to upgrade your license.
bigipGtmRequestRateLimiterEngaged (.1.3.6.1.4.1.3375.2.4.0.140)	The BIG-IP GTM™ license is rate-limited and the system has reached the rate limit.	Call F5 Networks technical support to upgrade your license.
bigipCompLimitExceeded (.1.3.6.1.4.1.3375.2.4.0.35)	The compression license limit is exceeded.	Purchase additional compression licensing from F5 Networks.
bigipSslLimitExceeded (.1.3.6.1.4.1.3375.2.4.0.36)	The SSL license limit is exceeded, either for transactions per second (TPS) or for megabits per second (MPS).	Purchase additional SSL licensing from F5 Networks.

LTM-related traps and recommended actions

This table provides information about the LTM®-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipUnsolicitedRepliesExceededThreshold (.1.3.6.1.4.1.3375.2.4.0.122)	The BIG-IP® system DNS cache received unsolicited query replies exceeding the configured threshold.	Check the BIG-IP system logs to determine if the system is experiencing a distributed denial-of-service (DDoS) attack.
bigipNodeRate (.1.3.6.1.4.1.3375.2.4.0.130)	A local traffic management node has received connections exceeding the configured rate-limit.	Consider provisioning more resources on the BIG-IP system for this virtual server.
bigipNodeDown (.1.3.6.1.4.1.3375.2.4.0.12)	A BIG-IP system health monitor has marked a node as down.	Check the node and the cable connection.
bigipNodeUp (.1.3.6.1.4.1.3375.2.4.0.13)	A BIG-IP system health monitor has marked a node as up.	Information, no action required.
bigipMemberRate (.1.3.6.1.4.1.3375.2.4.0.131)	A local traffic management pool member has received connections exceeding the configured rate-limit.	Consider provisioning more resources on the BIG-IP system for this virtual server.
bigipVirtualRate (.1.3.6.1.4.1.3375.2.4.0.132)	A local traffic management virtual server has received connections exceeding the configured rate-limit.	Consider provisioning more resources on the BIG-IP system for this virtual server.
bigipLtmVsAvail (.1.3.6.1.4.1.3375.2.4.0.135)	A local traffic management virtual server is available to receive connections.	Information only, no action required.
bigipLtmVsUnavail (.1.3.6.1.4.1.3375.2.4.0.136)	A local traffic management virtual server is not available to receive connections.	Check the virtual server.
bigipLtmVsEnabled (.1.3.6.1.4.1.3375.2.4.0.137)	A local traffic management virtual server has beenwas enabled.	Information only, no action required.
bigipLtmVsDisabled (.1.3.6.1.4.1.3375.2.4.0.138)	A local traffic management virtual server has beenwas disabled.	Information only, no action required.
bigipServiceDown (.1.3.6.1.4.1.3375.2.4.0.10)	A BIG-IP system health monitor has detected a service on a node to be stopped and thus marked the node as down.	Restart the service on the node.
bigipServiceUp (.1.3.6.1.4.1.3375.2.4.0.11)	A BIG-IP system health monitor has detected a service on a node to be running and has therefore marked the node as up.	Information only, no action required.

Trap name	Description	Recommended action
bigipPacketRejected (.1.3.6.1.4.1.3375.2.4.0.34)	The BIG-IP system has rejected some packets.	Check the detailed message within this trap and act accordingly.
bigipInetPortExhaustion (.1.3.6.1.4.1.3375.2.4.0.76)	The TMM has run out of source ports and cannot open new communications channels with other machines.	Either increase the number of addresses available for SNAT automapping or SNAT pools, or lower the idle timeout value if the value is excessively high.

Logging-related traps and recommended actions

This table provides information about the logging-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipLogEmerg (.1.3.6.1.4.1.3375.2.4.0.29)	The BIG-IP® system is unusable. This notification occurs when the system logs a message with the log level LOG_EMERG.	Check the detailed message within this trap and within the `/var/log` files to determine which process has the emergency. Then act accordingly.
bigipLogAlert (.1.3.6.1.4.1.3375.2.4.0.30)	The BIG-IP system requires immediate action to function properly. This notification occurs when the system logs a message with the log level LOG_ALERT.	Check the detailed message within this trap and within the `/var/log` files to determine which process has the alert situation. Then act accordingly.
bigipLogCrit (.1.3.6.1.4.1.3375.2.4.0.31)	The BIG-IP system is in critical condition. This notification occurs when the system logs a message with the log level LOG_CRIT.	Check the detailed message within this trap and within the `/var/log` files to determine which process has the critical situation. Then act accordingly.
bigipLogErr (.1.3.6.1.4.1.3375.2.4.0.32)	The BIG-IP system has some error conditions. This notification occurs when the system logs a message with the log level LOG_ERR.	Check the detailed message within this trap and within the `/var/log` files to determine which processes have the error conditions. Then act accordingly.
bigipLogWarning (.1.3.6.1.4.1.3375.2.4.0.33)	The BIG-IP system is experiencing some warning conditions. This notification occurs when the system logs a message with the log level LOG_WARNING.	Check the detailed message within this trap and within the `/var/log` files to determine which processes have the warning conditions. Then act accordingly.

Network-related traps and recommended actions

This table provides information about the network-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipARPConflict (.1.3.6.1.4.1.3375.2.4.0.23)	The BIG-IP ®system has detected an ARP advertisement for any of its own ARP-enabled addresses. This can occur for a virtual server address or a self IP address.	Check IP addresses and routes.

vCMP-related traps and recommended actions

This table provides information about the virtual clustered multiprocessing (vCMP®)-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipVcmpAlertsVcmpPowerOn (.1.3.6.1.4.1.3375.2.4.0.107)	The BIG-IP® system powered on a vCMP guest from a suspended or powered-off state.	Information only, no action required.
bigipVcmpAlertsVcmpPowerOff (.1.3.6.1.4.1.3375.2.4.0.108)	The BIG-IP system powered off a vCMP guest.	Information only, no action required.
bigipVcmpAlertsVcmpHBLost (.1.3.6.1.4.1.3375.2.4.0.109)	The BIG-IP system cannot detect a heartbeat from a vCMP guest.	Check the guest and restart, if necessary.
bigipVcmpAlertsVcmpHBDetected (.1.3.6.1.4.1.3375.2.4.0.110)	The BIG-IP system detected a heartbeat from a new or returning vCMP guest.	Information only, no action required.

VIPRION-related traps and recommended actions

This table provides information about the VIPRION®-related notifications that an SNMP manager can receive.

Trap name	Description	Recommended action
bigipClusterdNoResponse (.1.3.6.1.4.1.3375.2.4.0.89)	The cluster daemon failed to respond for 10 seconds or more.	Start the cluster daemon.
bigipClusterPrimaryChanged (.1.3.6.1.4.1.3375.2.4.0.150)	The primary cluster has changed.	Information only, no action required.

About customized MIB entries

Customized MIB entries are defined in a TCL file named `custom_mib.tcl` that you create and save on the BIG-IP® system in the directory `/config/snmp/`. You must register the customized MIB entries and provide callback to the newly registered MIB using the TCL command `register_mib` in this format: `register_mib oid callback type`. The three arguments for the command are described in this table.

Argument	Description
oid	A customized OID with a format of `.1.2.3.4` with a limit of four digits. The common root of a customized MIB OID on the BIG-IP system is `.1.3.6.1.4.1.3375.2.100.`
callback	A TCL procedure that is called when the registered MIB OID is browsed. The procedure cannot have any arguments. The return value of the procedure is returned for the registered MIB entry.
type	The type of MIB entry you are customizing. Four types are supported: INT, STRING, GAUGE, and COUNTER.

Here is sample TCL code for two custom MIBs:

```
register_mib ".1" system_descr string
register_mib ".2" tmmcpucnt int

proc system_descr {}
{
set status [catch {exec uname -a} result]
return $result
}

proc tmmcpucnt {}
{
set status [catch {exec tmctl  cpu_status_stat | grep cpu | wc -l} result]
return $result
}
```

Note: *Customized MIB entries are read-only through SNMP.*

Task summary

Perform this task to create a custom MIB entry.

Creating custom MIB entries

You can add customized MIB entries to a BIG-IP® system to provide visibility to statistics and information that are not available through standard MIBs. These statistics and information can help you make decisions about optimizing the BIG-IP system configuration.

1. Create a TCL file named `custom_mib.tcl` that contains the customized MIB entries you want to use on the BIG-IP system.

   Ensure accuracy of the TCL procedures you use in the file. Avoid errors, such as infinite loops, which can affect how `snmpd` works.

   Note: *`snmpd` restarts after being unresponsive for longer than the heartbeat time interval configured in `config/snmp/bigipTrafficMgmt.conf`.*

2. Save the TCL file to the `/config/snmp/` directory on the BIG-IP system.

   Note: *After you save `custom_mib.tcl`, you can modify the file at any time; however, your changes become effective only after you restart `snmpd`.*

3. Restart `snmpd`.
   Customized MIB entries are registered. If logging is turned on, you might see log entries in `/var/log/snmpd.log`, such as `custom mib initialization completed. total 4 custom mib entry registered.`

Use a MIB browser or `snmpwalk` to obtain the values of the newly registered MIB entries. Use this information to help you manage your network traffic.

About enterprise MIB files

The enterprise MIB files contain F5 Networks specific information. All OIDS for the BIG-IP® system data are contained in the F5 enterprise MIB files, including all interface statistics (**1.3.6.1.4.1.3375.2.1.2.4** (**sysNetwork.sysInterfaces**)). These enterprise MIB files reside on the BIG-IP system:

`F5-BIGIP-COMMON-MIB.txt`
Contains information that the SNMP manager can use to help manage F5-specific notifications (SNMP traps) that all other BIG-IP MIB files reference.

`F5-BIGIP-SYSTEM-MIB.txt`
Contains information that the SNMP manager can use to help manage BIG-IP system objects, such as global statistic data, network information, and platform information.

`F5-BIGIP-LOCAL-MIB.txt`
Contains information that the SNMP manager can use to help manage BIG-IP local traffic objects, such as virtual servers, pools, nodes, profiles, health monitors, iRules®, and SNATs.

`F5-BIGIP-GLOBAL-MIB.txt`
Contains information that the SNMP manager can use to help manage global traffic objects, such as wide IPs, virtual servers, pools, links, servers, and data centers.

`F5-BIGIP-APM-MIB.txt`
Contains information that the SNMP manager can use to help manage access policy objects, such as profiles, statistics, lease pools, and ACLs.

`F5-BIGIP-WAM-MIB.txt`
Contains information that the SNMP manager can use to help manage traffic acceleration objects, such as applications, profiles, and statistics.

Task summary

Perform these tasks when working with MIB files.

Downloading enterprise and NET-SNMP MIBs to the SNMP manager
Viewing objects in enterprise MIB files
Viewing SNMP traps in F5-BIGIP-COMMON-MIB.txt
Viewing dynamic routing SNMP traps and associated OIDs
Monitoring BIG-IP system processes using SNMP
Collecting BIG-IP system memory usage data using SNMP
Collecting BIG-IP system data on HTTP requests using SNMP
Collecting BIG-IP system data on throughput rates using SNMP
Collecting BIG-IP system data on RAM cache using SNMP
Collecting BIG-IP system data on SSL transactions using SNMP
Collecting BIG-IP system data on CPU usage based on a predefined polling interval
Collecting BIG-IP system data on CPU usage based on a custom polling interval
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Collecting BIG-IP system performance data on active connections using SNMP

Downloading enterprise and NET-SNMP MIBs to the SNMP manager

View the set of standard SNMP MIB files that you can download to the SNMP manager, by listing the contents of the BIG-IP® system directory `/usr/share/snmp/mibs`.

Download compressed files that contain the enterprise and NET-SNMP MIBs.

1. Click the **About** tab.
2. Click **Downloads**.
3. Click **Download F5 MIBs (mibs_f5.tar.gz)** or **Download NET-SNMP MIBs (mibs_netsnmp.tar.gz)**.
4. Follow the instructions on the screen to complete the download.

Viewing objects in enterprise MIB files

You must have the `Administrator` user role assigned to your user account.

View information about a BIG-IP system object by listing the contents of an enterprise MIB file.

1. Access a console window on the BIG-IP system.
2. At the command prompt, list the contents of the directory `/usr/share/snmp/mibs`.
3. View available objects in the relevant MIB file.

Viewing SNMP traps in F5-BIGIP-COMMON-MIB.txt

Verify that you have the `Administrator` user role assigned to your user account.

When an F5-specific trap sends a notification to the SNMP manager, the SNMP manager receives a text message describing the event or problem that has occurred. You can identify the traps specified in the F5-BIGIP-COMMON-MIB.txt file by viewing the file.

1. Access a console window on the BIG-IP system.
2. At the command prompt, list the contents of the directory `/usr/share/snmp/mibs`.
3. View the F5-BIGIP-COMMON-MIB.txt file. Look for object names with the designation NOTIFICATION-TYPE.

Viewing dynamic routing SNMP traps and associated OIDs

Verify that you have the `Administrator` user role assigned to your user account.

When you want to set up your network management systems to watch for problems with dynamic routing, you can view SNMP MIB files to discover the SNMP traps that the dynamic routing protocols send, and to find the OIDs that are associated with those traps.

1. Access a console window on the BIG-IP system.
2. At the command prompt, list the contents of the directory `/usr/share/snmp/mibs`.
3. View the following dynamic routing MIB files:

    - BGP4-MIB.txt

- ISIS-MIB.txt
- OSPF6-MIB.txt
- OSPF-MIB.txt
- OSPF-TRAP-MIB.txt
- RIPv2-MIB.txt

Monitoring BIG-IP system processes using SNMP

Ensure that your SNMP manager is running either SNMP v2c or SNMP v3, because all BIG-IP® system statistics are defined by 64-bit counters, and only SNMP v2c and SNMP v3 support 64-bit counters. Ensure that you have downloaded the F-5 Networks enterprise and NET-SNMP MIBs to the SNMP manager.

You can monitor a specific process on the BIG-IP system using SNMP. To do this you can use the `HOST-RESOURCES` MIB and write a script to monitor the process.

Write a script to monitor a BIG-IP system process using the `HOST-RESOURCES` MIB.

For example, this command determines the number of TMM processes currently running on the system:

```
snmpwalk -v2c -c public localhost hrSWRunName | egrep "\"tmm(.[0-9]+)?\"" |
wc -l
```

The script can now query the BIG-IP system about the status of processes.

Collecting BIG-IP system memory usage data using SNMP

You can use an SNMP command with OIDs to gather data on the number of bytes of memory currently being used on the BIG-IP® system.

Note: *To interpret data on memory use, you do not need to perform a calculation on the collected data.*

Write an SNMP command to gather data on the number of bytes of memory currently being used on the BIG-IP system.

For example, this SNMP command collects data on current memory usage, where `public` is the community name and `bigip` is the host name of the BIG-IP system: `snmpget -c public bigip sysGlobalStat.sysStatMemoryUsed.0`

The SNMP manager can now query the BIG-IP system about CPU and memory usage.

Collecting BIG-IP system data on HTTP requests using SNMP

You can use SNMP commands with an OID to gather and interpret data on the number of current HTTP requests on the BIG-IP® system. The following table shows the required OIDs for polling data on HTTP requests.

Performance Graph	Graph Metrics	Required SNMP OIDs
HTTP Requests	HTTP Requests	sysStatHttpRequests (.1.3.6.1.4.1.3375.2.1.1.2.1.56)

The following table shows the required calculations for interpreting metrics on HTTP requests.

Performance Graph	Graph Metric	Required calculations for HTTP requests
HTTP Requests	HTTP Requests	<DeltaStatHttpRequests> / <interval>

1. For each OID, perform two separate pools, at an interval of your choice. For example, poll OID `sysStatHttpRequests (.1.3.6.1.4.1.3375.2.1.1.2.1.56)`twice, at a 10-second interval. This results in two values, `<sysStatHttpRequests1>` and `<sysStatHttpRequests2>`.
2. Calculate the delta of the two poll values. For example:

```
<DeltaStatHttpRequests> = <sysStatHttpRequests2> - <sysStatHttpRequests1>
```

3. Perform the calculation on the OID deltas. The value for *`interval`* is 10. For example, to calculate the value of the HTTP Requests graph metric:

```
(<DeltaStatHttpRequests>) / <interval>
```

Collecting BIG-IP system data on throughput rates using SNMP

You can use SNMP commands with various OIDs to gather and interpret data on the throughput rate on the BIG-IP® system. The following table shows the individual OIDs that you must poll, retrieving two separate poll values for each OID.

Performance Graph	Graph Metrics	Required SNMP OIDs
Throughput (summary graph)	Client Bits Client Bits Server Bits Server Bits	sysStatClientBytesIn (.1.3.6.1.4.1.3375.2.1.1.2.1.3) sysStatClientBytesOut (.1.3.6.1.4.1.3375.2.1.1.2.1.5) sysStatServerBytesIn (.1.3.6.1.4.1.3375.2.1.1.2.1.10) sysStatServerBytesOut (.1.3.6.1.4.1.3375.2.1.1.2.1.12)
Client-side Throughput (detailed graph)	Client Bits In Client Bits Out	sysStatClientBytesIn (.1.3.6.1.4.1.3375.2.1.1.2.1.3) sysStatClientBytesOut (.1.3.6.1.4.1.3375.2.1.1.2.1.5)
Server-side Throughput (detailed graph)	Server Bits In Server Bits Out	sysStatServerBytesIn (.1.3.6.1.4.1.3375.2.1.1.2.1.10) sysStatServerBytesOut (.1.3.6.1.4.1.3375.2.1.1.2.1.12)
HTTP Compression Rate (detailed graph)	Compression	sysHttpCompressionStatPrecompressBytes (.1.3.6.1.4.1.3375.2.1.1.2.22.2)

The following table shows the required calculations for interpreting metrics on throughput rates.

Performance Graph	Graph Metrics	Required calculations for throughput rates
Throughput (summary graph)	Client Bits Server Bits Compression	((<DeltaStatClientBytesIn> + <DeltasysStatClientBytesOut>)*8 / <interval> ((<DeltaStatServerBytesIn> + <DeltaServersslStatServerBytesOut>)*8 / <interval> (<DeltaHttpStatPrecompressBytes>)*8 / <interval>
Throughput (detailed graph)	Client Bits In Client Bits Out Server Bits In Server Bits Out Compression	(<DeltaStatClientBytesIn>)*8 / <interval> (<DeltaStatClientBytesOut>*8) / <interval> (<DeltaStatServerBytesIn >*8) / <interval> (<DeltaStatServerBytesOut>*8) / <interval> (<DeltaHttpStatPrecompressBytes>*8) / <interval>

1. For each OID, perform two separate pools, at an interval of your choice. For example, poll OID `sysStatServerBytesIn (.1.3.6.1.4.1.3375.2.1.1.2.1.10)`twice, at a 10-second interval. This results in two values, `<sysStatServerBytesIn1>` and `<sysStatServerBytesIn2>`.
2. Calculate the delta of the two poll values. For example, for the Server Bits In graphic metric, perform this calculation:

   ```
   <DeltaStatServerBytesIn> = <sysStatServerBytesIn2> - <sysStatServerBytesIn1>
   ```

3. Perform the calculation on the OID deltas. The value for *`interval`* is 10. For example, to calculate the value of the Server Bits In graph metric:

   ```
   (<DeltaStatServerBytesIn>) / <interval>
   ```

Collecting BIG-IP system data on RAM cache using SNMP

You can use an SNMP command with various OIDs to gather and interpret data on RAM cache use. The following table shows the required OIDs for polling for data on RAM Cache use.

Performance Graph	Graph Metric	Required SNMP OIDs
RAM Cache Utilization	Hit Rate	sysWebAccelerationStatCacheHits (.1.3.6.1.4.1.3375.2.1.1.2.23.2) sysWebAccelerationStatCacheMisses (.1.3.6.1.4.1.3375.2.1.1.2.23.3)
CPU Cache Utilization	Byte Rate	sysWebAccelerationStatCacheHitBytes (.1.3.6.1.4.1.3375.2.1.1.2.23.5) sysWebAccelerationStatCacheMissBytes (.1.3.6.1.4.1.3375.2.1.1.2.23.6)
RAM Cache Utilization	Eviction Rate	sysWebAccelerationStatCacheEvictions (.1.3.6.1.4.1.3375.2.1.1.2.23.10), sysWebAccelerationStatCacheHits (.1.3.6.1.4.1.3375.2.1.1.2.23.2) sysWebAccelerationStatCacheMisses (.1.3.6.1.4.1.3375.2.1.1.2.23.3)

The following table shows the required calculations for interpreting metrics on RAM Cache use.

Performance Graph	Graph Metric	Required SNMP OIDs
RAM cache Utilization	Hit Rate	<sysWebAccelerationStatCacheHits1>) / (<sysWebAccelerationStatCacheHits1> + <sysWebAccelerationStatCacheMisses1>) / *100
RAM cache Utilization	Byte Rate	<sysWebAccelerationStatCacheHitBytes1) / (<sysWebAccelerationStatCacheHitBytes1> +

Performance Graph	Graph Metric	Required SNMP OIDs
		<sysWebAccelerationStatCacheMissBytes1>) / *100
RAM cache Utilization	Eviction Rate	<sysWebAccelerationStatCacheEvictions1>) / (<sysWebAccelerationStatCacheHits1> + <sysWebAccelerationStatCacheMisses1>) / *100

1. For each OID, poll for data. For example, poll OID `sysWebAccelerationStatCacheHits(.1.3.6.1.4.1.3375.2.1.1.2.23.2)`. This results in a value `<sysWebAccelerationStatCacheHits>`.
2. Poll OID `sysWebAccelerationStatCacheHits(.1.3.6.1.4.1.3375.2.1.1.2.23.2)`. This results in a value `<sysWebAccelerationStatCacheMisses>`.
3. Perform the calculation using the OID data. For example, to calculate the value of the Hit Rate graphic metric:

```
<sysWebAccelerationStatCacheHits> / <sysWebAccelerationStatCacheHits1> + <>)
 *100).
```

Collecting BIG-IP system data on SSL transactions using SNMP

You can use SNMP commands with an OID to gather and interpret data on SSL performance. The following table shows the individual OIDS that you must use to poll for SSL transactions using SNMP.

Performance Graph	Graph Metrics	Required SNMP OIDs
SSL TPS	SSL TPS	sysClientsslStatToNativeConns (.1.3.6.1.4.1.3375.2.1.1.2.9.6)
SSL TPS	SSL TPS	sysClientsslStatTotCompatConns (.1.3.6.1.4.1.3375.2.1.1.2.9.9)
SSL TPS	SSL TPS	sysServersslStatTotNativeConns (.1.3.6.1.4.1.3375.2.1.1.2.10.6)
SSL TPS	SSL TPS	sysServersslStatTotCompatConns (.1.3.6.1.4.1.3375.2.1.1.2.10.9)

The following table shows the required calculations for interpreting metrics on SSL transactions using SNMP.

Performance Graph	Graph Metric	Required calculations for SSL TPS
SSL TPS	SSL TPS	<DeltaClientsslStatClientTotConns>) / (<interval>

1. For each OID, poll for data. For example, poll OID `sysClientsslStatToNativeConns (.1.3.6.1.4.1.3375.2.1.1.2.23.2)` and `sysClientsslStatTotCompatConns (.1.3.6.1.4.1.3375.2.1.1.2.9.9)`.
2. Add the two values together. This results in the value `sysClientsslStartTotConns1`.
3. Poll the two OIDs again, within ten seconds of the previous polls.
4. Again, add the two values together. This results in the value `sysClientsslStatToComms2`.

5. Calculate the delta of the two sums:

```
<DeltaClientsslStatTotConns> = <sysClientsslStatTotConns2> -
<sysClientsslStatTotConns1>.
```

6. Perform the calculation on the OID deltas. The value for interval is 10. For example, to calculate the value of the SSL transactions using SNMP:

```
(<DeltaClientsslStatClientTotConns>) / <interval>
```

Collecting BIG-IP system data on CPU usage based on a predefined polling interval

For the CPU[0-n] and Global Host CPU Usage graph metrics, you can instruct the BIG-IP® system to gather and collect CPU usage data automatically, based on a predifined polling interval. Use the sysMultiHostCpu and sysGlobalHostCpu MIBs.

The following table shows the required OIDs for automatic collection of CPU[0-n] graphic metrics.

Performance Graph	Graph Metric	Required SNMP OIDs
CPU Usage	CPU[0-n]	**5-second Polling Interval** sysMultiHostCpuUser5s (.1.3.6.1.4.1.3375.2.1.7.5.2.1.12) sysMultiHostCpuNice5s (.1.3.6.1.4.1.3375.2.1.7.5.2.1.13) sysMultiHostCpuSystem5s (.1.3.6.1.4.1.3375.2.1.7.5.2.1.14) sysMultiHostCpuIdle5s (.1.3.6.1.4.1.3375.2.1.7.5.2.1.15) sysMultiHostCpuIrq5s (.1.3.6.1.4.1.3375.2.1.7.5.2.1.16) sysMultiHostCpuSoftirq5s (.1.3.6.1.4.1.3375.2.1.7.5.2.1.17) sysMultiHostCpuIowait5s (.1.3.6.1.4.1.3375.2.1.7.5.2.1.18) sysMultiHostCpuUsageRatio5s (.1.3.6.1.4.1.3375.2.1.7.5.2.1.19) sysMultiHostCpuUsageRatio (.1.3.6.1.4.1.3375.2.1.7.5.2.1.11)
CPU Usage	CPU[0-n]	**1-minute Polling Interval** sysMultiHostCpuUser1m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.20) sysMultiHostCpuNice1m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.21) sysMultiHostCpuSystem1m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.22) sysMultiHostCpuIdle1m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.23) sysMultiHostCpuIrq1m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.24) sysMultiHostCpuSoftirq1m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.25) sysMultiHostCpuIowait1m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.26) sysMultiHostCpuUsageRatio1m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.26)
CPU Usage	CPU[0-n]	**5-minute Polling Interval** sysMultiHostCpuUse5m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.28) sysMultiHostCpuNice5m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.29) sysMultiHostCpuSystem5m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.30) sysMultiHostCpuIdle5m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.31) sysMultiHostCpuIrq5m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.32) sysMultiHostCpuSoftirq5m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.33) sysMultiHostCpuIowait5m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.34) sysMultiHostCpuUsageRatio5m (.1.3.6.1.4.1.3375.2.1.7.5.2.1.35)

The following table shows the required OIDs for automatic collection of Global Host CPU Usage graph metrics.

Performance Graph	Graph Metric	Required SNMP OIDs
CPU Usage	Global Host CPU Usage	**5-second Polling Interval** sysMultiHostCpuUser5s (.1.3.6.1.4.1.3375.2.1.1.2.20.14) sysMultiHostCpuNice5s (.1.3.6.1.4.1.3375.2.1.1.2.20.15) sysMultiHostCpuSystem5s (.1.3.6.1.4.1.3375.2.1.1.2.20.16) sysMultiHostCpuIdle5s (.1.3.6.1.4.1.3375.2.1.1.2.20.17) sysMultiHostCpuIrq5s (.1.3.6.1.4.1.3375.2.1.1.2.20.18) sysMultiHostCpuSoftirq5s (.1.3.6.1.4.1.3375.2.1.1.2.20.19) sysMultiHostCpuIowait5s (.1.3.6.1.4.1.3375.2.1.1.2.20.20) sysMultiHostCpuUsageRatio5s (.1.3.6.1.4.1.3375.2.1.1.2.20.21) sysMultiHostCpuUsageRatio (.1.3.6.1.4.1.3375.2.1.1.2.20.13)
CPU Usage	Global Host CPU Usage	**1-minute Polling Interval** sysMultiHostCpuUser1m (.1.3.6.1.4.1.3375.2.1.1.2.20.22) sysMultiHostCpuNice1m (.1.3.6.1.4.1.3375.2.1.1.2.20.23) sysMultiHostCpuSystem1m (.1.3.6.1.4.1.3375.2.1.1.2.20.24) sysMultiHostCpuIdle1m (.1.3.6.1.4.1.3375.2.1.1.2.20.25) sysMultiHostCpuIrq1m (.1.3.6.1.4.1.3375.2.1.1.2.20.26) sysMultiHostCpuSoftirq1m (.1.3.6.1.4.1.3375.2.1.1.2.20.27) sysMultiHostCpuIowait1m (.1.3.6.1.4.1.3375.2.1.1.2.20.28) sysMultiHostCpuUsageRatio1m (.1.3.6.1.4.1.3375.2.1.1.2.20.29)
CPU Usage	Global Host CPU Usage	**5-minute Polling Interval** sysMultiHostCpuUse5m (.1.3.6.1.4.1.3375.2.1.1.2.20.30) sysMultiHostCpuNice5m (.1.3.6.1.4.1.3375.2.1.1.2.20.31) sysMultiHostCpuSystem5m (.1.3.6.1.4.1.3375.2.1.1.2.20.32) sysMultiHostCpuIdle5m (.1.3.6.1.4.1.3375.2.1.1.2.20.33)) sysMultiHostCpuIrq5m (.1.3.6.1.4.1.3375.2.1.1.2.20.34) sysMultiHostCpuSoftirq5m (.1.3.6.1.4.1.3375.2.1.1.2.20.35) sysMultiHostCpuIowait5m (.1.3.6.1.4.1.3375.2.1.1.2.20.36) sysMultiHostCpuUsageRatio5m (.1.3.6.1.4.1.3375.2.1.1.2.20.37)

Collecting BIG-IP system data on CPU usage based on a custom polling interval

For the CPU[0-n], Global Host CPU, and TMM CPU Usage graph metrics, an alternative to instructing the BIG-IP® system to collect CPU usage data automatically, is to do it maually, based on a custom polling interval. For the CPU[0-n] and Global Host CPU graph metrics, use the sysMultiHostCpu and sysGlobalHostCpu MIBs. For the TMM CPU Usage graphic metric, use the sysStatTm MIB.

The following table shows the required SNMP OIDs for collecting CPU data manually.

Performance Graph	Graph Metric	Required SNMP OIDs
CPU Usage	CPU[0-n]	sysMultiHostCpuUser (.1.3.6.1.4.1.3375.2.1.7.5.2.1.4) sysMultiHostCpuNice (.1.3.6.1.4.1.3375.2.1.7.5.2.1.5) sysMultiHostCpuSystem (.1.3.6.1.4.1.3375.2.1.7.5.2.1.6) sysMultiHostCpuIdle (.1.3.6.1.4.1.3375.2.1.7.5.2.1.7) sysMultiHostCpuIrq (.1.3.6.1.4.1.3375.2.1.7.5.2.1.8) sysMultiHostCpuSoftirq (.1.3.6.1.4.1.3375.2.1.7.5.2.1.9) sysMultiHostCpuIowait (.1.3.6.1.4.1.3375.2.1.7.5.2.1.10)

Performance Graph	Graph Metric	Required SNMP OIDs
CPU Usage	Global Host CPU Usage	sysGlobalHostCpuCount (.1.3.6.1.4.1.3375.2.1.1.2.20.4) sysGlobalHostActiveCpu (.1.3.6.1.4.1.3375.2.1.1.2.20.5) sysGlobalHostCpuUser (.1.3.6.1.4.1.3375.2.1.1.2.20.6) sysGlobalHostCpuNice (.1.3.6.1.4.1.3375.2.1.1.2.20.7) sysGlobalHostCpuSystem (.1.3.6.1.4.1.3375.2.1.1.2.20.8) sysGlobalHostCpuIdle (.1.3.6.1.4.1.3375.2.1.1.2.20.9) sysGlobalHostCpuIrq (.1.3.6.1.4.1.3375.2.1.1.2.20.10) sysGlobalHostCpuSoftirq (.1.3.6.1.4.1.3375.2.1.1.2.20.11) sysGlobalHostCpuIowait (.1.3.6.1.4.1.3375.2.1.1.2.20.12)
CPU Usage	TMM CPU Usage	sysStatTmTotalCycles (.1.3.6.1.4.1.3375.2.1.1.2.1.41) sysStatTmIdleCycles (.1.3.6.1.4.1.3375.2.1.1.2.1.42) sysStatTmSleepCycles (.1.3.6.1.4.1.3375.2.1.1.2.1.43) sysTmmStatTmUsageRatio5s (.1.3.6.1.4.1.3375.2.1.8.2.3.1.37.[tmm_id]) sysTmmStatTmUsageRatio1m (.1.3.6.1.4.1.3375.2.1.8.2.3.1.38.[tmm_id]) sysTmmStatTmUsageRatio5m (.1.3.6.1.4.1.3375.2.1.8.2.3.1.39.[tmm_id])

The following table shows the formulas for calculating metrics on CPU use.

Performance Graph	Graph Metric	Required calculations for CPU use
CPU Usage	CPU[0-n]	(<DeltaCpuUsers>) + (<DeltaCpuNice> + <DeltaCpuSystem> / (<DeltaCpuUsers>) + <DeltaCpuNice> + <DeltaCpuIdle> + <DeltaCpuSystem> + <DeltaCpulrq> + <DeltaCpuSoftirq> + <DeltaCpulowait>) *100
CPU Usage	Global Host CPU Usage	(<DeltaCpuUsers>) + (<DeltaCpuNice> + <DeltaCpuSystem> / (<DeltaCpuUsers>) + <DeltaCpuNice> + <DeltaCpuIdle> + <DeltaCpuSystem> + <DeltaCpulrq> + <DeltaCpuSoftirq> + <DeltaCpulowait>) *100
CPU Usage	TMM CPU Usage	((<DeltaTmTotalCycles>) - (<DeltaTmidleCycles> + <DeltaTmSleepCycles>)) / <DeltaTmTotalCycles>) *100

1. Poll the OID `sysMultiHostCpuUser (.1.3.6.1.4.1.3375.2.1.7.5.2.1.4)` twice, at a 10-second interval. This results in two values, `sysMultiHostCpuUser1and` and `sysMultiHostCpuUser2`.
2. Calculate the delta of the two poll values. For example:

```
<DeltaCpuUser> = <sysMultiHostCpuUser2> - <sysMultiHostCpuUser1>.
```

3. Repeat steps 1 and 2 for each OID pertaining to the **CPU[0-n]** graph metric.
4. Repeat steps 1 and 2 again, using the OIDs from the MIBs **sysStatTm**and **sysGlobalHostCpu**.
5. Calculate the values of the graphic metrics using the formulas in the table above.

Collecting BIG-IP system performance data on new connections using SNMP

You can use SNMP commands with various OIDs to gather and interpret data on the number of new connections on the BIG-IP® system. The following table shows the required OIDs for the Performance graphs in the Configuration utility.

Performance Graph	Graph Metrics	Required SNMP OIDs
New Connections Summary	Client Accepts Server Connects	sysTcpStatAccepts (.1.3.6.1.4.1.3375.2.1.1.2.12.6) sysStatServerTotConns (.1.3.6.1.4.1.3375.2.1.1.2.1.14)
Total New Connections	Client Accepts Server Connects	sysStatClientTotConns(.1.3.6.1.4.1.3375.2.1.1.2.1.7) sysStatServerTotConns (.1.3.6.1.4.1.3375.2.1.1.2.1.14)
New Client SSL Profile Connections	SSL Client SSL Server	sysClientsslStatTotNativeConns (.1.3.6.1.4.1.3375.2.1.1.2.9.6), sysClientsslStatTotCompatConns (.1.3.6.1.4.1.3375.2.1.1.2.9.9) sysServersslStatTotNativeConns(.1.3.6.1.4.1.3375.2.1.1.2.10.6), sysServersslStatTotCompatConns (.1.3.6.1.4.1.3375.2.1.1.2.10.9)
New Accepts/ Connects	Client Accepts Server Connects	sysTcpStatAccepts (.1.3.6.1.4.1.3375.2.1.1.2.12.6) sysTcpStatConnects (.1.3.6.1.4.1.3375.2.1.1.2.12.8)

The following table shows the required calculations for interpreting metrics on new connections.

Performance Graph	Graph Metrics	Required SNMP OIDs
New Connections Summary	Client Accepts Server Connects	<DeltaTcpStatAccept> / <interval> <DeltaStatServerTotConns> / <interval>
Total New Connections	Client Connects Server Connects	<DeltaStatClientTotConns> / <interval> <DeltaStatServerTotConns> / <interval>
New Client SSL Profile Connections	SSL Client SSL Server	(<DeltaClientsslStatTotNativeConns> + <DeltaClientsslStatTotCompatConns>) / <interval> (<DeltaServersslStatTotNativeConns> + <DeltaServersslStatTotCompatConns>) / <interval>
New Accepts/ Connects	Client Accepts Server Connects	<DeltaTcpStatAccepts> / <interval> <DeltaTcpStatConnects> / <interval>

1. For each OID, perform two separate polls, at an interval of your choice.

   For example, for the client accepts metric, poll OID `sysTcpStatAccepts (.1.3.6.1.4.1.3375.2.1.1.2.12.6)` twice, at a 10-second interval. This results in two values, `<sysTcpStatAccepts1>` and `<sysTcpStatAccepts2>`.

2. Calculate the delta of the two poll values.

   For example, for the client accepts metric, perform this calculation:

   ```
   <DeltaTcpStatAccepts> = <sysTcpStatAccepts2> - <sysTcpStatAccepts1>
   ```

3. Perform a calculation on the OID deltas. The value for *`interval`* is the polling interval. For example, to calculate the value of the client accepts metric:

   ```
   <DeltaTcpStatAccepts> / <interval>
   ```

Collecting BIG-IP system performance data on active connections using SNMP

Write an SNMP command with the various OIDs shown in the table to gather and interpret data on the number of active connections on the BIG-IP® system.

Note: *To interpret data on active connections, you do not need to perform any calculations on the collected data.*

Performance Graph	Graph Metrics	Required SNMP OIDs
Active Connections Summary	Connections	sysStatClientCurConns (.1.3.6.1.4.1.3375.2.1.1.2.1.8)
Active Connections Detailed	Client Server SSL Client SSL Server	sysStatClientCurConns (.1.3.6.1.4.1.3375.2.1.1.2.1.8) sysStatServerCurConns (.1.3.6.1.4.1.3375.2.1.1.2.1.15) sysClientsslStatCurConns (.1.3.6.1.4.1.3375.2.1.1.2.9.2) sysServersslStatCurConns (.1.3.6.1.4.1.3375.2.1.1.2.10.2)

About the RMON MIB file

The BIG-IP® system provides the remote network monitoring (RMON) MIB file, RMON-MIB.txt. This file contains remote network monitoring information. The implementation of RMON on the BIG-IP system differs slightly from the standard RMON implementation, in the following ways:

- The BIG-IP system implementation of RMON supports only these four of the nine RMON groups: statistics, history, alarms, and events.
- The RMON-MIB.txt file monitors the BIG-IP system interfaces (that is, sysIfIndex), and not the standard Linux interfaces.
- For hardware reasons, the packet-length-specific statistics in the RMON statistics group offer combined transmission and receiving statistics only. This behavior differs from the behavior described in the definitions of the corresponding OIDs.

Chapter 14

Logging Network Firewall Events to IPFIX Collectors

Overview: Configuring IPFIX logging for AFM

You can configure the BIG-IP® system to log information about Advanced Firewall Manager™ (AFM™) processes and send the log messages to remote IPFIX collectors.

The BIG-IP system supports logging of AFM events over the IPFIX protocol. IPFIX logs are raw, binary-encoded strings with their fields and field lengths defined by IPFIX templates. *IPFIX collectors* are external devices that can receive IPFIX templates and use them to interpret IPFIX logs.

The configuration process involves creating and connecting the following configuration objects:

Object	Reason
Pool of IPFIX collectors	Create a pool of IPFIX collectors to which the BIG-IP system can send IPFIX log messages.
Destination	Create a log destination to format the logs in IPFIX templates, and forward the logs to the IPFIX collectors.
Publisher	Create a log publisher to send logs to a set of specified log destinations.

Task summary

Perform these tasks to configure IPFIX logging of AFM processes on the BIG-IP® system.

***Note:** Enabling IPFIX logging impacts BIG-IP system performance.*

Assembling a pool of IPFIX collectors
Creating an IPFIX log destination
Creating a publisher
Creating a custom Network Firewall Logging profile
Configuring an LTM virtual server for Network Firewall event logging with IPFIX

Assembling a pool of IPFIX collectors

Before creating a pool of IPFIX collectors, gather the IP addresses of the collectors that you want to include in the pool. Ensure that the remote IPFIX collectors are configured to listen to and receive log messages from the BIG-IP® system.

These are the steps for creating a pool of IPFIX collectors. The BIG-IP system can send IPFIX log messages to this pool.

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. Using the **New Members** setting, add the IP address for each IPFIX collector that you want to include in the pool:
   a) Type the collector's IP address in the **Address** field, or select a node address from the **Node List**.
   b) Type a port number in the **Service Port** field.

By default, IPFIX collectors listen on UDP or TCP port `4739` and Netflow V9 devices listen on port `2055`, though the port is configurable at each collector.

c) Click **Add**.

5. Click **Finished**.

Creating an IPFIX log destination

A log destination of the **IPFIX** type specifies that log messages are sent to a pool of IPFIX collectors. Use these steps to create a log destination for IPFIX collectors.

1. On the Main tab, click **System** > **Logs** > **Configuration** > **Log Destinations**.
   The Log Destinations screen opens.
2. Click **Create**.
3. In the **Name** field, type a unique, identifiable name for this destination.
4. From the **Type** list, select **IPFIX**.
5. From the **Protocol** list, select **IPFIX** or **Netflow V9**, depending on the type of collectors you have in the pool.
6. From the **Pool Name** list, select an LTM® pool of IPFIX collectors.
7. From the **Transport Profile** list, select **TCP**, **UDP**, or any customized profile derived from TCP or UDP.
8. The **Template Retransmit Interval** is the time between transmissions of IPFIX templates to the pool of collectors. The BIG-IP system only retransmits its templates if the **Transport Profile** is a **UDP** profile.

   An *IPFIX template* defines the field types and byte lengths of the binary IPFIX log messages. The logging destination sends the template for a given log type (for example, NAT44 logs or customized logs from an iRule) before sending any of those logs, so that the IPFIX collector can read the logs of that type. The logging destination assigns a template ID to each template, and places the template ID into each log that uses that template.

   The log destination periodically retransmits all of its IPFIX templates over a UDP connection. The retransmissions are helpful for UDP connections, which are lossy.
9. The **Template Delete Delay** is the time that the BIG-IP device should pause between deleting an obsolete template and re-using its template ID. This feature is helpful for systems that can create custom IPFIX templates with iRules.
10. The **Server SSL Profile** applies Secure Socket Layer (SSL) or Transport Layer Security (TLS) to TCP connections. You can only choose an SSL profile if the **Transport Profile** is a **TCP** profile. Choose an SSL profile that is appropriate for the IPFIX collectors' SSL/TLS configuration.

    SSL or TLS requires extra processing and therefore slows the connection, so we only recommend this for sites where the connections to the IPFIX collectors have a potential security risk.
11. Click **Finished**.

Creating a publisher

A publisher specifies where the BIG-IP® system sends log messages for IPFIX logs.

1. On the Main tab, click **System** > **Logs** > **Configuration** > **Log Publishers**.
   The Log Publishers screen opens.
2. Click **Create**.

3. In the **Name** field, type a unique, identifiable name for this publisher.
4. Use the Log Destinations area to select an existing IPFIX destination (perhaps along with other destinations for your logs): click any destination name in the **Available** list, and click **<<** to move it to the **Selected** list.
5. Click **Finished**.

Creating a custom Network Firewall Logging profile

Create a custom Logging profile to log messages about BIG-IP® system Network Firewall events.

1. On the Main tab, click **Security** > **Event Logs** > **Logging Profiles**.
   The Logging Profiles list screen opens.
2. Click **Create**.
   The New Logging Profile screen opens.
3. In the **Name** field, type a unique name for the profile.
4. Select the **Network Firewall** check box.
5. In the Network Firewall area, from the **Publisher** list, select the publisher the BIG-IP system uses to log Network Firewall events.
6. Set an **Aggregate Rate Limit** to define a rate limit for all combined network firewall log messages per second. Beyond this rate limit, log messages are not logged.
7. For the **Log Rule Matches** setting, select how the BIG-IP system logs packets that match ACL rules. You can select any or all of the options. When an option is selected, you can configure a rate limit for log messages of that type.

Option	Description
Option	Enables or disables logging of packets that match ACL rules configured with:
Accept	`action=Accept`
Drop	`action=Drop`
Reject	`action=Reject`

8. Select the **Log IP Errors** check box, to enable logging of IP error packets. When enabled, you can configure a rate limit for log messages of this type.
9. Select the **Log TCP Errors** check box, to enable logging of TCP error packets. When enabled, you can configure a rate limit for log messages of this type.
10. Select the **Log TCP Events** check box, to enable logging of open and close of TCP sessions. When enabled, you can configure a rate limit for log messages of this type.
11. Enable the **Log Translation Fields** setting to log both the original IP address and the NAT-translated IP address for Network Firewall log events.
12. Enable the **Log Geolocation IP Address** setting to specify that when a geolocation event causes a network firewall action, the associated IP address is logged.
13. From the **Storage Format** list, select how the BIG-IP system formats the log. Your choices are:

Option	Description

None	Specifies the default format type in which the BIG-IP system logs messages to a remote Syslog server, for example:
	`"management_ip_address","bigip_hostname","context_type",`
	`"context_name","src_ip","dest_ip","src_port",`

Option	Description

	`"dest_port","vlan","protocol","route_domain",`
	`"acl_rule_name","action","drop_reason`

Field-List	This option allows you to: • Select from a list, the fields to be included in the log. • Specify the order the fields display in the log. • Specify the delimiter that separates the content in the log. The default delimiter is the comma character.
User-Defined	This option allows you to: • Select from a list, the fields to be included in the log. • Cut and paste, in a string of text, the order the fields display in the log.

14. In the IP Intelligence area, from the **Publisher** list, select the publisher that the BIG-IP system uses to log source IP addresses, which are identified and configured for logging by an IP Intelligence policy.

    Note: *The IP Address Intelligence feature must be enabled and licensed.*

15. Set an **Aggregate Rate Limit** to define a rate limit for all combined IP Intelligence log messages per second. Beyond this rate limit, log messages are not logged.
16. Enable the **Log Translation Fields** setting to log both the original IP address and the NAT-translated IP address for IP Intelligence log events.
17. In the Traffic Statistics area, from the **Publisher** list, select the publisher that the BIG-IP system uses to log traffic statistics.
18. Enable the **Active Flows** setting to log the number of active flows each second.
19. Enable the **Reaped Flows** to log the number of reaped flows, or connections that are not established because of system resource usage levels.
20. Enable the **Missed Flows** setting to log the number of packets that were dropped because of a flow table miss. A flow table miss occurs when a TCP non-SYN packet does not match an existing flow.
21. Enable the **SYN Cookie (Per Session Challenge)**setting to log the number of SYN cookie challenges generated each second.
22. Enable the **SYN Cookie (White-listed Clients)** setting to log the number of SYN cookie clients whitelisted each second.
23. Click **Finished**.

Assign this custom network firewall Logging profile to a virtual server.

Configuring an LTM virtual server for Network Firewall event logging with IPFIX

Ensure that at least one log publisher exists on the BIG-IP® system.

Assign a custom Network Firewall Logging profile to a virtual server when you want the BIG-IP system to log Network Firewall events to IPFIX collectors on the traffic that the virtual server processes.

Note: *This task applies only to LTM®-provisioned systems.*

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 **Security** > **Policies**.
   The screen displays firewall rule settings.
4. From the **Log Profile** list, select **Enabled**. Then, for the **Profile** setting, move the profiles that log specific events to IPFIX collectors from the **Available** list to the **Selected** list.

   Note: *To log global, self IP, and route domain contexts, you must enable a Publisher in the* ***global-network*** *profile.*

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

Overview: Configuring IPFIX logging for AFM
Creating a custom Network Firewall Logging profile

Implementation result

Now you have an implementation in which the BIG-IP® system logs messages about AFM™ events and sends the log messages to a pool of IPFIX collectors.

Note: *Network firewall events are logged only for rules or policies for which logging is enabled.*

Appendix A

IPFIX Templates for AFM Events

Overview: IPFIX Templates for AFM Events

The IP Flow Information Export (IPFIX) Protocol is a logging mechanism for IP events. This appendix defines the IPFIX Information Elements (IEs) and Templates used to log F5's Application Firewall Manager (AFM) events. An *IE* is the smallest form of useful information in an IPFIX log message, such as an IP address or a timestamp for the event. An *IPFIX template* is an ordered collection of specific IEs used to record one IP event, such as the acceptance of a network packet.

About IPFIX Information Elements for AFM events

Information Elements (IEs) are individual fields in an IPFIX template. An IPFIX template describes a single Advanced Firewall Manager™(AFM™) event.

IANA-defined IPFIX Information Elements

IANA maintains a list of standard IPFIX Information Elements (IEs), each with a unique Element Identifier. The F5® AFM™ IPFIX implementation uses a subset of these IEs to publish AFM events. This subset is summarized in the table.

Information Element (IE)	**ID**	**Size (Bytes)**
destinationIPv4Address	12	4
destinationIPv6Address	28	16
destinationTransportPort	11	2
ingressVRFID	234	4
observationTimeMilliseconds	323	8
protocolIdentifier	4	1
sourceIPv4Address	8	4
sourceIPv6Address	27	16
sourceTransportPort	7	2

IPFIX enterprise Information Elements

IPFIX provides for enterprises to define their own Information Elements. F5® currently uses the following non-standard IEs for AFM™ events:

Information Element (IE)	**ID**	**Size (Bytes)**
aclPolicyName	12276 - 26	Variable
aclPolicyType	12276 - 25	Variable
aclRuleName	12276 - 38	Variable
action	12276 - 39	Variable

Information Element (IE)	ID	Size (Bytes)
attackType	12276 - 46	Variable
bigipHostName	12276 - 10	Variable
bigipMgmtIPv4Address	12276 - 5	4
bigipMgmtIPv6Address	12276 - 6	16
contextName	12276 - 9	Variable
contextType	12276 - 24	Variable
destinationGeo	12276 - 43	Variable
deviceProduct	12276 - 12	Variable
deviceVendor	12276 - 11	Variable
deviceVersion	12276 - 13	Variable
dosAttackEvent	12276 - 41	Variable
dosAttackId	12276 - 20	4
dosAttackName	12276 - 21	Variable
dosPacketsDropped	12276 - 23	4
dosPacketsReceived	12276 - 22	4
dropReason	12276 - 40	Variable
errdefsMsgNo	12276 - 4	4
flowId	12276 - 3	8
ipfixMsgNo	12276 - 16	4
ipintelligencePolicyName	12276 - 45	Variable
ipintelligenceThreatName	12276 - 42	Variable
logMsgDrops	12276 - 96	4
logMsgName	12276 - 97	Variable
logprofileName	12276 - 95	Variable
messageSeverity	12276 - 1	1
msgName	12276 - 14	Variable
partitionName	12276 - 2	Variable
saTransPool	12276 - 37	Variable
saTransType	12276 - 36	Variable
sourceGeo	12276 - 44	Variable
sourceUser	12276 - 93	Variable
transDestinationIPv4Address	12276 - 31	4
transDestinationIPv6Address	12276 - 32	16
transDestinationPort	12276 - 33	2
transIpProtocol	12276 - 27	1
transRouteDomain	12276 - 35	4

Information Element (IE)	ID	Size (Bytes)
transSourceIPv4Address	12276 - 28	4
transSourceIPv6Address	12276 - 29	16
transSourcePort	12276 - 30	2
transVlanName	12276 - 34	Variable
vlanName	12276 - 15	Variable

***Note:** IPFIX, unlike NetFlow v9, supports variable-length IEs, where the length is encoded within the field in the Data Record. NetFlow v9 collectors (and their variants) cannot correctly process variable-length IEs, so they are omitted from logs sent to those collector types.*

About individual IPFIX templates for each event

F5® uses IPFIX templates to publish AFM™ events.

Network accept or deny

This IPFIX template is used whenever a network packet is accepted or denied by an AFM™ firewall.

Information Element (IE)	ID	Size (Bytes)	Notes
aclPolicyName	12276 - 26	Variable	This IE is omitted for NetFlow v9.
aclPolicyType	12276 - 25	Variable	This IE is omitted for NetFlow v9.
aclRuleName	12276 - 38	Variable	This IE is omitted for NetFlow v9.
action	12276 - 39	Variable	This IE is omitted for NetFlow v9.
bigipHostName	12276 - 10	Variable	This IE is omitted for NetFlow v9.
bigipMgmtIPv4Address	12276 - 5	4	
bigipMgmtIPv6Address	12276 - 6	16	
contextName	12276 - 9	Variable	This IE is omitted for NetFlow v9.
contextType	12276 - 24	Variable	This IE is omitted for NetFlow v9.
observationTimeMilliseconds	323	8	
destinationGeo	12276 - 43	Variable	This IE is omitted for NetFlow v9.
destinationIPv4Address	12	4	
destinationIPv6Address	28	16	
destinationTransportPort	11	2	
deviceProduct	12276 - 12	Variable	This IE is omitted for NetFlow v9.
deviceVendor	12276 - 11	Variable	This IE is omitted for NetFlow v9.
deviceVersion	12276 - 13	Variable	This IE is omitted for NetFlow v9.

Information Element (IE)	ID	Size (Bytes)	Notes
dropReason	12276 - 40	Variable	This IE is omitted for NetFlow v9.
msgName	12276 - 14	Variable	This IE is omitted for NetFlow v9.
errdefsMsgNo	12276 - 4	4	
flowId	12276 - 3	8	
ipfixMsgNo	12276 - 16	4	
protocolIdentifier	4	1	
messageSeverity	12276 - 1	1	
partitionName	12276 - 2	Variable	This IE is omitted for NetFlow v9.
ingressVRFID	234	4	
saTransPool	12276 - 37	Variable	This IE is omitted for NetFlow v9.
saTransType	12276 - 36	Variable	This IE is omitted for NetFlow v9.
sourceGeo	12276 - 44	Variable	This IE is omitted for NetFlow v9.
sourceIPv4Address	8	4	
sourceIPv6Address	27	16	
sourceTransportPort	7	2	
sourceUser	12276 - 93	Variable	This IE is omitted for NetFlow v9.
transDestinationIPv4Address	12276 - 31	4	
transDestinationIPv6Address	12276 - 32	16	
transDestinationPort	12276 - 33	2	
transIpProtocol	12276 - 27	1	
transRouteDomain	12276 - 35	4	
transSourceIPv4Address	12276 - 28	4	
transSourceIPv6Address	12276 - 29	16	
transSourcePort	12276 - 30	2	
transVlanName	12276 - 34	Variable	This IE is omitted for NetFlow v9.
vlanName	12276 - 15	Variable	This IE is omitted for NetFlow v9.

DoS device

Information Element (IE)	ID	Size (Bytes)	Notes
action	12276 - 39	Variable	This IE is omitted for NetFlow v9.
bigipHostName	12276 - 10	Variable	This IE is omitted for NetFlow v9.
bigipMgmtIPv4Address	12276 - 5	4	
bigipMgmtIPv6Address	12276 - 6	16	
contextName	12276 - 9	Variable	This IE is omitted for NetFlow v9.

Information Element (IE)	ID	Size (Bytes)	Notes
observationTimeMilliseconds	323	8	
destinationIPv4Address	12	4	
destinationIPv6Address	28	16	
destinationTransportPort	11	2	
deviceProduct	12276 - 12	Variable	This IE is omitted for NetFlow v9.
deviceVendor	12276 - 11	Variable	This IE is omitted for NetFlow v9.
deviceVersion	12276 - 13	Variable	This IE is omitted for NetFlow v9.
dosAttackEvent	12276 - 41	Variable	This IE is omitted for NetFlow v9.
dosAttackId	12276 - 20	4	
dosAttackName	12276 - 21	Variable	This IE is omitted for NetFlow v9.
dosPacketsDropped	12276 - 23	4	
dosPacketsReceived	12276 - 22	4	
msgName	12276 - 14	Variable	This IE is omitted for NetFlow v9.
errdefsMsgNo	12276 - 4	4	
flowId	12276 - 3	8	
ipfixMsgNo	12276 - 16	4	
messageSeverity	12276 - 1	1	
partitionName	12276 - 2	Variable	This IE is omitted for NetFlow v9.
ingressVRFID	234	4	
sourceIPv4Address	8	4	
sourceIPv6Address	27	16	
sourceTransportPort	7	2	
vlanName	12276 - 15	Variable	This IE is omitted for NetFlow v9.

IP intelligence

Information Element (IE)	ID	Size (Bytes)	Notes
action	12276 - 39	Variable	This IE is omitted for NetFlow v9.
attackType	12276 - 46	Variable	This IE is omitted for NetFlow v9.
bigipHostName	12276 - 10	Variable	This IE is omitted for NetFlow v9.
bigipMgmtIPv4Address	12276 - 5	4	
bigipMgmtIPv6Address	12276 - 6	16	
contextName	12276 - 9	Variable	This IE is omitted for NetFlow v9.
contextType	12276 - 24	Variable	This IE is omitted for NetFlow v9.
observationTimeMilliseconds	323	8	

Information Element (IE)	ID	Size (Bytes)	Notes
destinationIPv4Address	12	4	
destinationIPv6Address	28	16	
destinationTransportPort	11	2	
deviceProduct	12276 - 12	Variable	This IE is omitted for NetFlow v9.
deviceVendor	12276 - 11	Variable	This IE is omitted for NetFlow v9.
deviceVersion	12276 - 13	Variable	This IE is omitted for NetFlow v9.
msgName	12276 - 14	Variable	This IE is omitted for NetFlow v9.
errdefsMsgNo	12276 - 4	4	
flowId	12276 - 3	8	
ipfixMsgNo	12276 - 16	4	
ipintelligencePolicyName	12276 - 45	Variable	This IE is omitted for NetFlow v9.
ipintelligenceThreatName	12276 - 42	Variable	This IE is omitted for NetFlow v9.
protocolIdentifier	4	1	
messageSeverity	12276 - 1	1	
partitionName	12276 - 2	Variable	This IE is omitted for NetFlow v9.
ingressVRFID	234	4	
saTransPool	12276 - 37	Variable	This IE is omitted for NetFlow v9.
saTransType	12276 - 36	Variable	This IE is omitted for NetFlow v9.
sourceIPv4Address	8	4	
sourceIPv6Address	27	16	
sourceTransportPort	7	2	
transDestinationIPv4Address	12276 - 31	4	
transDestinationIPv6Address	12276 - 32	16	
transDestinationPort	12276 - 33	2	
transIpProtocol	12276 - 27	1	
transRouteDomain	12276 - 35	4	
transSourceIPv4Address	12276 - 28	4	
transSourceIPv6Address	12276 - 29	16	
transSourcePort	12276 - 30	2	
transVlanName	12276 - 34	Variable	This IE is omitted for NetFlow v9.
vlanName	12276 - 15	Variable	This IE is omitted for NetFlow v9.

Log Throttle

Information Element (IE)	ID	Size (Bytes)	Notes
bigipHostName	12276 - 10	Variable	This IE is omitted for NetFlow v9.
bigipMgmtIPv4Address	12276 - 5	4	
bigipMgmtIPv6Address	12276 - 6	16	
observationTimeMilliseconds	323	8	
deviceProduct	12276 - 12	Variable	This IE is omitted for NetFlow v9.
deviceVendor	12276 - 11	Variable	This IE is omitted for NetFlow v9.
deviceVersion	12276 - 13	Variable	This IE is omitted for NetFlow v9.
msgName	12276 - 14	Variable	This IE is omitted for NetFlow v9.
errdefsMsgNo	12276 - 4	4	
ipfixMsgNo	12276 - 16	4	
messageSeverity	12276 - 1	1	
contextType	12276 - 24	Variable	This IE is omitted for NetFlow v9.
contextName	12276 - 9	Variable	This IE is omitted for NetFlow v9.
logprofileName	12276 - 95	Variable	This IE is omitted for NetFlow v9.
logMsgName	12276 - 97	Variable	This IE is omitted for NetFlow v9.
logMsgDrops	12276 - 96	4	

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