LineRate

Getting Started Guide

Overview

This guide is your starting point to learn about F5® LineRate®. We'll walk you through installing F5® LineRate®, as well the basics that you need to know to use the command line interface (CLI). The guide then continues with configuring basic examples, including management access, configuring a load balancer (reverse proxy), including SSL setup, and configuring a forward proxy.

About the Examples

We provide a detailed architecture example, including all naming, IP addresses, and other settings, so you can focus on understanding how to use the software, not on what to name things.

At the end of the guide, we have a complete annotated example of everything you configured for you to refer to.

After completing this example configuration, you will be better prepared to plan for your F5® LineRate® implementation.

Contents

The guide is broken into the following sections:

About This Guide

Audience

This guide is intended for experienced network administrators and network architects who understand your organization's existing TCP/IP network and who need to set up basic load balancing and SSL services using F5® LineRate®.

Conventions

This guide uses the following symbols and typographic conventions.

Convention	Definition
`Monospaced bold`	Text in a monospaced bold font represents commands or other text that you type exactly as you see it.
`<angle bracket>`	Text in a monospaced bold font inside angle brackets represents a placeholder that describes what you must type.
`[square brackets]`	Text in a monospaced bold font inside square brackets represents an optional command or option.
Monospaced	Text in a monospaced font represents output or results the system displays.
Bold	Text in bold shows keys to press and items to select or click, such as menu items or buttons.
	Shows the beginning of a procedure.
 **Caution**	Cautions contain critical information about configuring your system or data.
 **Note**	Notes contain important information that may affect how you install or configure your system.
 **Tip**	Tips contain best practices or useful information to help you when configuring your system.
	Shows that the content is for advanced users.

Example IP Addresses

Throughout this guide, we use example IP addresses for both internal (private) and external (public) uses.

For private addresses, we use the IP addresses designated in RFC 1918:

- 10.0.0.0 - 10.255.255.255 (10/8 prefix)
- 172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
- 192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

For public addresses, we use the IP addresses designated for documentation in RFC 5737:

- 192.0.2.0/24 (TEST-NET-1)
- 198.51.100.0/24 (TEST-NET-2)
- 203.0.113.0/24 (TEST-NET-3)

Searching the Guide

The search box at the top-right of each page lets you enter a term or phrase to search for. By default, the system searches all pages in the F5® LineRate® content. Searches are not case sensitive. By default, searches find plurals and other matches from word stems, such as tests, testing, tested, and tester if you search for test.

You can search for a single term such as:

```
interface
```

Or

```
certificate
```

You can also search for an exact phrase surrounded by double quotes such as:

```
"real server"
```

Or

```
"IP address"
```

Relevance Level

By default, the system sorts the search results by relevance. The relevance is determined by a weighting algorithm that takes into consideration the page title, content, tags, and attachments. The relevance is also affected by the page rating (thumb up or down) and by how often other users select a page to view from similar searches.

Searches can return a large number of results. You can narrow your searches a number of ways by:

- Limiting your search to a specific tree
- Using term modifiers
- Using Boolean operators

Limiting a Search to Specific Tree

If you only want to search one area or tree of a guide, you can limit your search to that tree. For example, if you only want to search the Configure Command tree of the 2.6 Release of the CLI Reference Guide for the term "interface," you can enter your search like this:

```
+(path:087Release_2.6/200CLI_Reference_Guide/Configure_Commands/*) AND interface
```

You can further narrow the search using the term modifiers and Boolean operators (described below):

```
+(path:087Release_2.6/200CLI_Reference_Guide/Configure_Commands/*) AND interface
    AND CARP

+(path:087Release_2.6/*) AND load AND balancer
```

Note: For a tree-specific search, words in quotes are not treated as a specific phrase. The search does an OR search for any words in quotes, so you may not want to use quotes and use AND instead, as shown in the example above.

A few steps to help with this type of search:

1. Navigate to the tree you want to search.
2. In your browser's address bar, copy the address of the page.
   - You only need the part after the "https://docs.lineratesystems.com/".
3. Using the syntax example above, type in your search and paste in the path of the page you want to search.

Term Modifiers

The search supports modifying query terms to provide a wide range of searching options.

Wildcard Searches

The guides support single- and multiple-character wildcard searches with single terms (not within phrase queries).

To perform a single-character wildcard search, use the ? symbol.

To perform a multiple-character wildcard search, use the * symbol.

The single-character wildcard search looks for terms that match that with the single character replaced. For example, to search for "text" or "test" you can use the search:

```
te?t
```

The multiple-character wildcard search looks for 0 or more characters. For example, to search for test, tests or tester, you can use the search:

```
test*
```

You can also use the wildcard searches in the middle of a term.

```
te*t
```

Note: You cannot use a * or ? symbol as the first character of a search.

Fuzzy Searches

The guide supports fuzzy searches based on the Levenshtein Distance or Edit Distance algorithm. To do a fuzzy, search use the tilde ~ symbol at the end of a single word. Fuzzy searches work for multiple characters. For example, to search for a term similar in spelling to "roam" use the fuzzy search:

```
roam~
```

This search will find terms like foam and roams.

You can add an optional parameter to specify the required similarity. The value is between 0 and 1. With a value closer to 1, only terms with a higher similarity will be matched. For example:

```
roam~0.6
```

The default is 0.5.

Proximity Searches

The guide supports finding words that are within a specific distance from each other. To do a proximity search, use the tilde ~ symbol at the end of a phrase. For example, to search for a "feature" and "standard" within 10 words of each other in a document use the search:

```
"feature standard"~10
```

Boosting a Term

The guide provides the relevance level of matching documents based on the terms found. To boost a term, use the caret ^ symbol with a boost factor (a number) at the end of the term you are searching. The higher the boost factor, the more relevant the term will be.

Boosting allows you to control the relevance of a document by boosting its term. For example, if you are searching for:

```
mindtouch search
```

and you want the term "mindtouch" to be more relevant boost it using the ^ symbol along with the boost factor next to the term. You would type:

```
mindtouch^4 search
```

This will make documents with the term mindtouch appear more relevant. You can also boost phrases as in the example:

```
"mindtouch search"^4 "Apache"
```

By default, the boost factor is 1. Although the boost factor must be positive, it can be less than 1 (e.g. 0.2)

Boolean Operators

Boolean operators allow terms to be combined through logic operators. MindTouch supports AND, +, OR, NOT, and - as Boolean operators.

 **Note:** Boolean operators must be ALL CAPS**.**

OR

The OR operator is the default conjunction operator. This means that if there is no Boolean operator between two terms, the OR operator is used. The OR operator links two terms and finds a matching document if either of the terms exist in a document. This is equivalent to a union using sets. The symbol || can be used in place of the word OR.

To search for documents that contain either "mindtouch search" or just "mindtouch" use the query:

```
"mindtouch search" mindtouch
```

or

```
"mindtouch search" OR mindtouch
```

AND

The AND operator matches documents where both terms exist anywhere in the text of a single document. This is equivalent to an intersection using sets. You can use the symbol && in place of the word AND.

To search for documents that contain "mindtouch search" and "Advanced" use the query:

```
"mindtouch search" AND "Advanced"
```

+

The + (required operator) requires that the term after the + symbol exist somewhere in a document.

To search for documents that must contain "search" and may contain "advanced," use the query:

```
+search advanced
```

NOT

The NOT operator excludes documents that contain the term after NOT. This is equivalent to a difference using sets. You can use the symbol ! in place of the word NOT.

To search for documents that contain "mindtouch search" but not "Advanced" use the query:

```
"mindtouch search" NOT "Advanced"
```

 **Note:** The NOT operator cannot be used with just one term. For example, the following search will return no results:
NOT "mindtouch search"

Grouping

The guide supports using parentheses to group clauses to form sub queries. This can be very useful if you want to control the Boolean logic for a query.

To search for either "mindtouch" or "search" and "advanced" use the query:

```
(mindtouch OR search) AND advanced
```

This eliminates any confusion and makes sure you that website must exist and either term mindtouch or search may exist.

Escaping Special Characters

The Guide supports escaping special characters that are part of the query syntax. The current list of special characters is:

+ - && || ! ( ) { } [ ] ^ " ~ * ? : \

To escape these character use the \ before the character. For example, to search for (1+1):2 use the query:

```
\(1\+1\)\:2
```

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LineRate Overview

F5® LineRate® is the industry's first purely software-defined network appliance delivering advanced performance, availability, and scale to web and secure web services. You install F5® LineRate® natively on a server platform or as a virtual appliance on a hypervisor to create a highly scalable network appliance.

Reverse Proxy

The F5® LineRate® reverse proxy capability provides a full-proxy front-end to the web and secure web services on back-end servers of the application. To successfully manage load, health, and availability of the application, F5® LineRate® constantly monitors the traffic flows from the client to the back-end servers to ensure the delivery of the application services. F5® LineRate® provides several discrete services including health monitoring, transaction statistics, and traffic management to ensure balanced usage of back-end servers and rapid client service.

Forward Proxy

The F5® LineRate® forward proxy capability provides a proxy function from one network to another. A common use case for a forward proxy is for connections from your private network to the Internet.

A forward proxy lets you insert custom logic created with scripts. Scripts can perform a variety of functions, including gathering usage statistics, redirecting requests to your own cache, blocking of access to specific sites, managing cookies, and much more.

To use a forward proxy effectively, be sure to create and attach a virtual IP that includes the range of Internet IP addresses you want to go through the forward proxy.

Caution: When attaching a virtual IP to a forward proxy, the virtual IP must not include any of the system's own IP addresses. For a virtual IP with a single IP address, do not set the virtual IP's IP address to one of the system's own IP addresses. For a virtual IP with a range of addresses, you must ensure that the IP address range does not contain any of the system's own IP addresses. This may mean you need to break the virtual IP into multiple virtual IPs. See Configuring a range for a virtual IP with forward proxy for more detail and an example.

F5® LineRate® Security

F5® LineRate® uses several security measures to mitigate Denial of Service (DoS) attacks. These measures greatly reduce the system's vulnerability to DoS attacks. In general, the system ignores ("black-holes") requests to IP addresses and ports that are not configured on an interface or virtual IP.

The sections below provide additional details.

IP-based Protocols

The sections below describe how the system handles IP-based protocols.

UDP

The system discards most UDP requests, with the exception of DNS request responses.
The system accepts the following traffic:

- MOUNT (dynamic port number)
- NFS (port 2049)
- RPCBIND (port 111)
- STAT (dynamic port number)

Aside from the RPCBIND service, these Sun RPC services have dynamically assigned port numbers which are then discovered by the client via RPCBIND. Client traffic returning on ephemeral ports will also be accepted and processed.
All other traffic on ports without bound sockets in the LISTEN state is discarded without processing or ICMP generation.

These services are all NFS-related. These ports will be open and active only when using the PXE boot feature in F5® LineRate®.

TCP

The system accepts TCP traffic only on IPs and ports configured on virtual IPs, for the REST server, for the SSH server, and for active TCP connections initiated by the F5® LineRate®, such as those to real servers. TCP traffic directed to other IPs and ports on the system not in those categories will be dropped without acknowledgement or ICMP generation.

CARP

The system accepts and processes all inbound CARP traffic.

ICMP

The system accepts ICMPv4 messages with the following [Type, Code] pairs:

- [0x00, 0x00] - Echo Reply
- [0x08, 0x00] - Echo Request*
- [0x03, 0x03] - Destination Port Unreachable
- [0x03, 0x04] - Destination Requires Fragmentation
- [0x0B, 0x00] - Time Exceeded

The system accepts ICMPv6 messages with the following [Type, Code] pairs:

- [0x81, 0x00] - Echo Reply
- [0x80, 0x00] - Echo Request*
- [0x01, 0x04] - Destination Port Unreachable
- [0x02, 0x00] - Packet Too Big
- [0x03, 0x00] - Time Exceeded
- [0x87, 0x00] - Neighbor Solicitation
- [0x88, 0x00] - Neighbor Advertisement

* - When not in gateway (IP forwarding) mode, the following criteria must be met:

- Destination IP address for the incoming request must be an address assigned to the ingress interface, or a CARP IP address on the ingress interface or an IP address on a loopback interface.
- The ICMP response must route out the ingress interface (reverse path filtering).
- The source IP address must be within the same IP subnet as the destination. This means that ICMP "pings" are only responded to when initiated from a host local to one of the F5® LineRate® system's interfaces.

All other ICMP traffic is ignored without processing.

Other

Any inbound IP traffic not explicitly referenced above is dropped without any processing.

Non-IP-based Protocols

The sections below describe how the system handles non-IP-based protocols.

ARP, LACP, and VLAN

The system accepts and processes all ARP, LACP, and VLAN traffic normally and responds appropriately.

Other

The system drops, without processing, any non-IP traffic not explicitly mentioned above.

What's Next

The rest of this *Getting Started Guide* describes how to install F5® LineRate® and takes you through an example configuration. Continue with Installing LineRate.

Technical Support

Support tools are available to help you answer your questions whenever and wherever you need help. From the documentation to the global technical community you can collaborate with on DevCentral, F5® LineRate® self-service tools help you solve issues quickly and proactively.

The LineRate Support page can help you find the resources you need.

System Requirements

Overview

The F5® LineRate® software does not require any specific software for installation. The software includes the LineRate OS (LROS) and installs directly on a server as the primary operating system.

Hardware Requirements for Dedicated Servers

Below are the hardware requirements for dedicated servers.

	Minimum hardware requirements	Recommended hardware requirements
Processors	Intel® Westmere Class Processor, 2 sockets x 6 cores	Intel® Sandy Bridge or Ivy Bridge Class Processor, 2 sockets x 6 cores
Interfaces	**1 Gigabit (functional, low performance):** Intel 82576 NIC Intel 82574L NIC Broadcom 5716 NIC **10 Gigabit (high performance):** 10 Gb Intel® 82599 NIC or 10 Gb Emulex BE3 NIC	2 x 10 Gb Intel® 82599 NIC

	Minimum hardware requirements	Recommended hardware requirements
RAM	8 GB RAM (performance configuration) 4+ GB available RAM (testing configuration. Memory usage depends on configuration and load.)	24 GB RAM
Disk space	64 GB locally-attached hard disk	Locally-attached hard disk, at least 40 GB larger than installed system RAM

Hardware Requirements for the VMWare vSphere Environment

Below are the required virtual resources.

	F5® LineRate Precision™ Load Balancer	F5® LineRate Point™ Load Balancer
Disk space	22 GB (The .ova file contains a sparse virtual disk image that can grow to 22 GB. The datastore should have 22 GB of available space.)	22 GB (The .ova file contains a sparse virtual disk image that can grow to 22 GB. The datastore should have 22 GB of available space.)
Virtual CPUs	2 (minimum) 4 (recommended)	2 (minimum) 4 (recommended)
Virtual RAM	4 GB (minimum) 8 GB (recommended)	2 GB (minimum) 4 GB (recommended)
Interfaces	3, e1000 drivers are supported	3, e1000 drivers are supported

NOTE: The e1000 driver can achieve over 1Gb of throughput; there is no need to use other drivers to support performance over 1Gb on this interface.

Hardware Requirements for the KVM Hypervisor Environment

Below are the required virtual resources.

Disk space	Virtio disk backed by a qcow2 image
Virtual CPUs	2 (minimum)
Virtual RAM	2 GB (minimum for F5® LineRate Point™ Load Balancer) 4 GB (minimum for F5® LineRate Precision™ Load Balancer)
Interfaces	3 Virtio network interfaces

What's Next

After making sure your hardware meets the requirements, you are ready to install the F5® LineRate® software. See Installing F5® LineRate®.

Installing LineRate

Overview

This section provides a link to the F5® LineRate® download page and describes the methods available for installing or launching F5® LineRate® software.

Downloads

You can access downloads for the F5® LineRate® with your F5 account. If you do not have a F5 account, you can create one when you go to the buy page.

Note: For Amazon EC2, you do not need to download a file. However, for BYOL products, you do have to select the edition you want, register, then use the registration key for licensing, as described below. To launch F5® LineRate® on Amazon EC2, go to the AWS marketplace.

To download the software:

1. Go to linerate.f5.com/try to select the edition you want, register, and download F5® LineRate®.
   - If you already have an F5 account, click **LOGIN**.
   - For other licensing options, contact sales.
2. Download the file you need, based on your installation method.
   - Be sure to keep the email that contains your registration key. You will need the registration key to enable the license. See Configuring Licensing.

Release Notes

Release Notes for F5® LineRate® 2.6.1

Open Source License Notice (PDF) for F5® LineRate® 2.6.1

Note: You will need to use your F5® login to access the release materials.

Installation or Launch Methods

You can install F5® LineRate® using any of the following methods. Continue the installation process by clicking the link for the method you want.

Installation type	Method	Click to continue
Amazon EC2	Run F5® LineRate® as a virtual machine in the Amazon EC2 environment.	Using LineRate in Amazon EC2
Bare metal	Local disk on dedicated server—Use dedicated hardware and install directly on the server.	Installing to a Local Disk on a Dedicated Server
Bare metal	Diskless software deployment—Use Preboot eXecution Environment (PXE) boot on one or more F5® LineRate® systems over your network.	Diskless Software Deployment
KVM hypervisor	Install as a guest in a KVM hypervisor.	Installing as a Guest in a KVM Hypervisor
VMWare vSphere	Use the vSphere Client to install on a virtual machine.	Installing on VMWare VSphere

What's Next

After you install, you are ready to start configuring F5® LineRate®:

- To use the CLI, see Accessing the LineRate CLI.
- To use F5® LineRate Manager, the GUI, see Accessing LineRate Manager.

Installing to a Local Disk on a Dedicated Server

Overview

This section walks you through the steps of installing F5® LineRate® software onto a commercial off-the-shelf server using the downloaded file. For the system requirements, see System Requirements.

Installation Options and Process Overview

You can install the F5® LineRate® software using one of two methods:

- DVD—Use this method with an internal or external DVD drive connected to the server. USB-connected and virtual DVD drives also use this method. The software image needed for this method is a ".iso.gz" file. Example: LROS-2.2.0-RC4-R-x64.iso.gz
- USB—Use with a hard drive or flash drive connected to a USB port or with a virtual USB. Be sure that your server supports using a USB drive as the system boot device. The software image needed for this method is a ".usb.gz" file. Example: LROS-2.2.0-RC4-R-x64.usb.gz

Note: During the installation process, you must select the drive to use for the software installation. The list of drives displayed may not give enough information to help you uniquely identify a drive. To ensure the software is installed on the disk you intend, you may want to remove all hard drives from the server, leaving just the one you want to use for the F5® LineRate® installation. Be sure that you know the size of the remaining hard drive, so you can distinguish it from any USB drives, which will also display in the list.

Caution: The F5® LineRate® software installation removes the operating system and all data from the hard drive where you install the software. Be sure that any data you need is backed up to another location.

You must complete the following tasks to install the F5® LineRate® software:

Create installation media

- Configure the server's BIOS settings.
- Configure the server to boot from the installation drive.
- Install the F5® LineRate® software.
  - Continue with Configuring the Server's BIOS Settings.

Creating Installation Media

To create a DVD for installation:

1. Unzip the downloaded .iso.gz file using **zip**, **gunzip**, or a similar utility, based on the operating system that you are using.
   - The zip file contains one large .iso file.
2. Use blank DVD media and DVD creation or "burning" software to put the unzipped .iso file onto the blank DVD.
   - For Mac users, you can use the built-in Disk Utility.
   - For Windows users, you can use a free utility like ISO Recorder or Free ISO Burner. Note that the .iso file is a full disc image, so be certain to select the option in your DVD creation software to put a full disc image onto the DVD. Do not use the option to create a data disc.

To create a USB drive for installation:

Caution: The process of creating a bootable USB drive erases all data on the USB drive. Be sure that any important data on the USB drive is saved elsewhere before performing the steps below.

1. Unzip the downloaded .usb.gz file using **zip**, **gunzip**, or a similar utility based on the operating system that you are using.
   - The zip file contains one large .usb file.
2. Connect the USB drive to the PC.
   - The USB drive must have a capacity of at least 2 GB.
3. Select a disk utility that can copy the .usb file to the raw disk.

- The .usb file is a full disk image, including file system format and must be copied to the raw disk, replacing any filesystem that was previously on the USB disk.
- For a PC running Apple MacOS or Linux, you can use the **dd** utility from the terminal command line.
- For a PC running Microsoft Windows, you will need to find third party software to perform the copy of the .usb file to the raw disk.

4. Copy the .usb file from the PC onto the USB drive, using the disk utility such as **dd**.
   - Continue with Configuring the Server's BIOS Settings.

Configuring the Server's BIOS Settings

The F5® LineRate® software requires specific BIOS settings on the server before you install the software. The names and locations of the BIOS settings may vary, but look for something similar to those described below.

To configure the server's BIOS settings:

1. Edit the server's BIOS.
2. If you see an option to optimize defaults, select that option.
3. Enable simultaneous multithreading.
   - This may also be called hyperthreading. You may find it under **Advanced > Processor** settings.
4. Disable nonuniform memory architecture (NUMA).
   - You may find it under **Advanced > ACPI Configuration** settings.
5. Enable Intel AES-NI.
   - You may find it under **Advanced > Processor** settings.
6. Enable Intel Turbo Mode technology.
   - This may also be called Turbo Boost Technology. You may find it under **Advanced > Processor** settings.
7. Save the BIOS settings.
   - Stay in the BIOS and continue with Configuring the Server to Boot from the Installation Drive.

Configuring the Server to Boot from the Installation Drive

For the installation process, you must set your server to boot from the drive where you will place the installation image. You will change this option later.

To configure the server to boot from the installation drive:

1. (Continuing from the previous section) From the server's BIOS, find and select the boot order option.
   - The boot order option may be in a boot-related menu or in an advanced options or other options menu.

2. Change the boot order to put the installation drive type first.
   - Your installation drive will be either an internal DVD drive, a USB hard drive, or a USB flash drive.
3. Save your changes.
4. Exit the BIOS.
   - Continue with Installing the F5® LineRate® Software.

Installing the F5® LineRate® Software

After you configure the server's BIOS, you are ready to install the F5® LineRate® software.

Caution: The F5® LineRate® software installation removes the operating system and any data from the hard drive where you install the F5® LineRate® software. Be sure that any data you need is backed up to another location.

To install the F5® LineRate® software:

1. Power on or reboot the server.
   - As the system restarts, the status of the initial setup displays until the installation options display.
2. From the Select an Option screen, select the **install** option and press **Enter**.
   - A list of all storage devices connected to the server displays in the Install on Device screen. The name of each device is based on the controller installed in the server.
3. Select the device where you want to install the F5® LineRate® software and press **Enter**.
4. From the Dumpdev size screen, enter the amount of disk space to use for the dump device and press **Enter**.
   - The dumpdev is a partition on the hard disk used to create a snapshot of the system in the event of a catastrophic system error. This snapshot can be used to diagnose the cause of the system error. The size of the dumpdev needs to be at least as large as the system memory. After installation, you cannot resize the dumpdev without reinstalling the system. By default, the dumpdev output is text and is fast.
   - You can edit the default size now, if needed. The default amount of disk space is the same as the amount of RAM currently installed in the server, which is typically the ideal setting. If you might increase the amount of RAM in this system in the future, you can increase the dumpdev size to be equal to the greatest amount of RAM that this server might have.
   - You should ensure that you have least 20 GB of remaining disk space available after subtracting the size of the dumpdev from the available disk space. Although you may lower the size of the dumpdev to less than the amount of system RAM, this is strongly discouraged. Lowering the size of the dumpdev too much may make diagnosing catastrophic system errors difficult, if one should occur.
   - Use M for MB and G for GB.
5. When prompted to commit the configuration, select **Yes** and press **Enter**.

- The process takes about five minutes and displays progress information.

6. When you see the prompt to reboot, press **Enter**.
7. While the system reboots, remove the installation media.
8. Enter the system BIOS and set the server to boot first from the drive where you installed F5® LineRate®.
9. Save your BIOS changes.
10. Reboot the server.
    - When you see the login prompt, the installation is complete and successful.
    - If the server does not restart automatically, you may need to manually restart it.
    - If the restart fails, be sure to capture the information on the screen and contact LineRate support.

What's Next?

After you install, you are ready to configure licensing.

Diskless Software Deployment

Overview

Diskless software deployment lets you boot one or more F5® LineRate® systems over your network using the Preboot eXecution Environment (PXE), also called net boot.

The sections that follow describe the general process for configuring diskless software deployment for F5® LineRate® using the downloaded file. You must determine the implementation specifics based on your environment.

For the system requirements, see System Requirements.

Required for Diskless Software Deployment

The following are required for using diskless software deployment:

- Network interface on the server where you want to run F5® LineRate® that supports PXE booting
- F5® LineRate® diskless media, which is a tarball containing all of the files needed. Do not use the .iso or .usb installation files.
- BIO configuration
- Network File System (NFS) share
- Trivial File Transfer Protocol (TFTP) service
- DHCP server

The following sections describe environment setup requirements in more detail.

Configuring the Server's BIOS Settings

The F5® LineRate® software requires specific BIOS settings on the server before you install the software. The names and locations of the BIOS settings may vary, but look for something similar to those described below.

To configure the server's BIOS settings:

Connect a monitor and keyboard to the server.

- Power on the server and access the server's BIOS settings.
- If you see an option to optimize defaults, select that option.
- Enable simultaneous multithreading.
  - This may also be called hyperthreading. You may find it under **Advanced > Processor** settings.
- Disable nonuniform memory architecture (NUMA).
  - You may find it under **Advanced > ACPI Configuration** settings.
- Enable Intel AES-NI.
  - You may find it under **Advanced > Processor** settings.
- Enable Intel Turbo Mode technology.
  - This may also be called Turbo Boost Technology. You may find it under **Advanced > Processor** settings.
- Set the BIOS to only boot from the network.
- Save the BIOS settings.

NFS Share

An NFS share provides the PXE client with both the operating system kernel program and a root file system, which makes up the rest of F5® LineRate® system. The system uses NFS version 2.0 and does not require a writable export point.

The exact configuration of the NFS service is unique to your environment. The only requirement is that the root of the installation tree be an export point. This can have implications, because some NFS implementations require all export points be explicitly exported and prevent subtrees of an export point from being mounted by a client. In these scenarios, each version of F5® LineRate® will need an explicitly configured export point, rather than a parent tree being exported alone. Refer to your NFS vendor documentation to see if this applies to your NFS service implementation.

Extract the F5® LineRate® distribution file (tarball) using your favorite archive tool into a location that you will be serving it from. After extraction, you can move or rename the top-level directory. Be sure to retain the file mode bits during extraction.

After the extraction is complete, make the top-level directory an export point within the NFS configuration. Use the resulting path in the Root Path DHCP option described in the previous section. For example, if your NFS server has an IP address of 10.0.1.100, and the F5® LineRate® distribution was extracted and exported to `/srv/nfs/lros_v2.0`, your DHCP redirection service would be configured to set the DHCP Root Path option to:

```
10.0.1.100:/srv/nfs/lros_v2.0
```

The export point configuration using Linux's kernel based NFS server might look like something:

```
# /etc/exports

#

/srv/nfs/lros_v2.0    *(ro,all_squash)
```

Notice that the export point does not need to be writable or have any UID/GID mapping configured for F5® LineRate® to operate correctly.

TFTP Service

The diskless deployment requires a TFTP service running on the standard TFTP port (UDP port 69). The IP address of this service must be in the PXE-specific DHCP options provided by the DHCP redirection service and can reside alongside any combination of the other services or an entirely independent machine. However, unlike the NFS service, it must not require access via a gateway (router) and be must present on the same subnet as the client itself.

The exact configuration of the TFTP service is dependent on your environment. Refer to your TFTP vendor documentation. You can use any standards-compliant (RFC 1350) TFTP service for the diskless software deployment.

After configuring the NFS service, copy the file called `lros.pxe` (found in the extracted `boot` subdirectory) to the root of your TFTP server. We recommend giving the file a new name that includes the F5® LineRate® version, for example, `lros_v2.0.pxe`. This is the boot file that you configure in the DHCP settings.

DHCP Server Configuration

Booting a F5® LineRate® system over a network requires a DHCP server that can provide PXE-specific options to a PXE-enabled client system. You can configure the DHCP server using one of the following methods:

- Combined DHCP/redirection service—Replace or configure existing DHCP services to provide both the standard DHCPOFFER with client IP address for all clients and PXE extension tags for clients that are PXE enabled.
- Separate DHCP/redirection services—Add PXE-enabled DHCP services to the existing DHCP infrastructure. These services, known as DHCP Proxies, only respond to PXE-enabled clients and only provide redirection extensions in the DHCP message.
  - You can use either separate servers or reuse the servers running the standard DHCP services. The latter requires the Proxy service to listen on port 4011, because the existing DHCP service is already bound to the standard DHCP port (UDP port 67). The standard DHCP service needs to reply to PXE-enabled clients with option 60 set to a value of `PXEClient` to indicate to the client to follow up with an interrogation on port 4011.
  - The IP-granting DHCP service need only provide the Class Identifier option with the SIAddr field set to the redirection server. The DHCP redirection service can use of the UUID to distinguish between clients and to conditionally provide different PXE options.

How you configure the DHCP service depends on both the method and the DHCP service implementation. Since there is no single standard configuration format between DHCP service vendors, refer to the documentation for your DHCP service for configuration specifics.

Unless otherwise stated, all DHCP options, header fields, and protocol states conform to the standard DHCP specifications.

The DHCPOFFER from the redirection service is expected to set the header fields accordingly and contain the following PXE-specific tags:

Setting (option number, if applicable)	**Description**
SIAddr	• SIAddr (proxy DHCP server)—If using a DHCP proxy server, it should respond with this field set to the IP address of the boot server. • SIAddr (Boot DHCP server)—The boot DHCP server should respond with the IP address of the NFS server in this field, if it will not be included in the Root Path value.
SName or TFTP Server (66)	IP address or host name of the TFTP server. • SName—Use this field if *not* using Option Overloading. • TFTP Server—Use this field if using Option Overloading.
Bootfile or	Path from the TFTP root to the boot file on the TFTP server. • Bootfile—Use this field if *not* using Option Overloading. • Bootfile Name—Use this field if using Option Overloading.

Setting (option number, if applicable)	Description
Bootfile Name (67)	
Root Path (17)	Path to the top-level directory of the NFS share, in the format: **ip_address:/top-level_directory_of_NFS_share** For example: **10.0.1.100:/srv/nfs/lros_v2.0** If the IP address of the NFS server is given in SIAddr, then use only the path. For example: **/srv/nfs/lros_v2.0**
Class Identifier (60)	Boot DHCP server should return this exact string: `PXEClient`
Router (3)	Optional. Use only if the NFS server is on a different subnet from the F5® LineRate® and TFTP servers.

How F5® LineRate® Works When Using Diskless Software Deployment

For most functions, F5® LineRate® works the same when using diskless software deployment as it does for regular disk installations. A few functions operate differently:

- If you make configuration changes, you can save them using the **write** command. However, the changes will not be retained when you next reboot the system.
- When backing up the system, you must send the backup to a network location, not a local directory.
- You can use the **copy** command to copy files. However, the files will not be retained in the new location when you next reboot the system.
- The **upgrade** command is not available. To upgrade to a new version, you must extract a new tarball with the upgraded version to the NFS server and make any required DHCP configuration changes.
- When you use the **show version** command, the system includes the PXE boot information:

```
PXE Boot Info:
Root Path: nfs://10.1.1.2/boot/bootsystem
```

```
PXE Path: tftp://10.1.1.2/pxebooters/bootsystem
```

What's Next?

After you install, you are ready to configure licensing.

Installing as a Guest in a KVM Hypervisor

Overview

You can install F5® LineRate® as a guest in a KVM hypervisor using the downloaded .iso file and libvirt. For the minimum required virtual resources, see System Requirements.

Performance Tuning

To improve performance, we recommend using one or both of the following methods:

- VirtIO NIC multiqueue
- CPU pinning

Best Practice: We recommend conducting performance tests before and after making any performance tuning changes.

VirtIO NIC Multiqueue

F5® LineRate® supports multiple send and receive queues on VirtIO network interfaces. This feature allows multiple vCPUs to be sending and receiving traffic simultaneously, improving network throughput.

If you are using KVM (2.0.0 or later) and libvirt (1.2.2 or later), you can enable VirtIO multiqueue support. The optimal number of queues depends on the number of vCPUs in the F5® LineRate® guest, as shown below.

vCPUs	Queues
1	1

vCPUs	Queues
2	1
4	1
6	2
8	2
12	4
16	6
24	8
32	10

To enable VirtIO multiqueue support:

1. After creating the guest with VirtIO NICs, shut down the guest.
2. Manually edit the XML description of the guest.
3. In every <interface> section, add the following element using the table above to determine the queues value:

   ```
   <driver name='vhost' queues='8'/>
   ```
4. Save the file.
5. Restart the guest.

CPU Pinning

Virtual machines share vCPUs with the hypervisor host. In many situations, you can improve F5® LineRate® performance by coordinating which vCPUs are used by the host and the guest.

You want to pin the guest vCPUs to hypervisor vCPUs that are not used by the host's network drivers.

To implement CPU pinning:

1. Run some traffic through F5® LineRate®.
2. Look in the following files to determine the vCPUs the host is using for network traffic:
   - /proc/interrupts—Shows which host vCPUs are servicing physical NIC interrupts.
   - /sys/class/net/$DEV/device/local_cpulist—Shows which host vCPUs are connected to the physical NICs.
3. Use the **`virsh capabilities`** command see all of the host vCPUs.
4. Use virt-manager or edit the guest's XML file to provide the proper CPU pinning.
   - In the example below, the vcpu is the number of the guest vCPU, starting with 0. The cpuset is the host CPU that is not being used by the host's network drivers:

```
<vcpu placement='static'>16</vcpu>
<cputune>
    <vcpupin vcpu='0' cpuset='8'/>
    <vcpupin vcpu='1' cpuset='9'/>
    <vcpupin vcpu='2' cpuset='10'/>
    <vcpupin vcpu='3' cpuset='11'/>
    <vcpupin vcpu='4' cpuset='12'/>
    <vcpupin vcpu='5' cpuset='13'/>
    <vcpupin vcpu='6' cpuset='14'/>
    <vcpupin vcpu='7' cpuset='15'/>
    <vcpupin vcpu='8' cpuset='24'/>
    <vcpupin vcpu='9' cpuset='25'/>
    <vcpupin vcpu='10' cpuset='26'/>
    <vcpupin vcpu='11' cpuset='27'/>
    <vcpupin vcpu='12' cpuset='28'/>
    <vcpupin vcpu='13' cpuset='29'/>
    <vcpupin vcpu='14' cpuset='30'/>
    <vcpupin vcpu='15' cpuset='31'/>
</cputune>
```

What's Next?

After you install, you are ready to configure licensing.

Installing on VMWare vSphere

Overview

You can install F5® LineRate® as a guest in your VMWare vSphere environment using the downloaded .ova file. For the minimum required virtual resources, see System Requirements.

Default Settings

The default settings configured in the .ova file are:

- Virtual CPUs - Four
- Virtual RAM - 8 GB
- Interfaces - Three (one for management and two for the data path)
  - The management interface (em0) is configured to acquire an IP address from a DHCP server. See more information below.

You can change these settings, but these are the minimum supported requirements for a production system. For functional testing, 2 Virtual CPUs and 4 GB RAM may suffice, but performance will suffer at higher traffic loads.

Installing on vSphere

After downloading the .ova file, you can install from the vSphere Client. For more detailed installation information, see the VMWare documentation.

The .ova file has three networks defined:

- Management—Bound to interface em0.

- Network A—Bound to interface em1.
- Network B—Bound to interface em2.

During installation, you must attach each of these interfaces to a network. Networks A and B are interfaces dedicated to the data path. For example, in the case of configuring a proxy, the Network A might correspond to the external network and Network B to an internal network, or vice versa.

To install on vSphere:

1. From the vSphere Client, select **File > Deploy OVF Template**.
2. Enter a URL to download the .ova file or click **Browse** to select the downloaded file and click **Next**.
3. Verify the template details and click **Next**.
4. Enter a name for the deployment, select a location, and click **Next**.
5. Select the host or cluster for the deployment and click **Next**.
6. Select a datastore for the virtual machine files and click **Next**.
    - The .ova file contains a sparse virtual disk image that can grow to 22 GB. The datastore should have 22 GB of available space.
7. Select the type of provisioning and click **Next**.
8. For the three network interfaces listed in Source Networks, assign the Destination Networks to use and click **Next**.
    - We recommend assigning your management network to the Management interface and assigning one of the other interfaces to your external network and the other to your internal network.
9. Verify the options and click **Finish**.
10. Power on the virtual machine.

Management IP Address and DHCP

The network interface designated as the Management interface (em0*)* is configured to acquire its IP address from a DHCP server. If you plan to configure IP-based services for the management interface, such as "allow to" for SSH and REST, these services will not work if the DHCP server assigns the interface a new IP address.

To avoid issues with the possible assignment of a new IP address, use one of the following methods:

- Configure the DHCP server to always assign the same IP address.
- Assign a static IP address to the management interface as described below.

After configuring one of these alternatives, you can SSH to the VMWare instance on the network you assigned to the interface and log in using the default credentials. See Logging In.

Assigning a Static IP Address to the Management Interface

If there is no DHCP server on the network assigned to the Management interface or if you want to avoid possible changes to the DHCP-assigned IP address, you can assign a static IP.

Note: Before disabling DHCP, add the static IP address and a default route (as described below), or you may lose the connection to the Management interface.

The steps below use the CLI. You can also use the REST API.

To assign a static IP address to em0:

1. Log in as admin.
   - See Logging In.
2. Use the following commands to set the static IP address:

   ```
   config
   interface <interface_name>
   ip address <ip_address> <netmask>
   ip route 0.0.0.0/0 <router_address>
   ```
3. Use the following commands to disable DHCP.

   ```
   interface <interface_name>
   no ip address DHCP
   ```

   Note: If the interface being configured is the same one you used to access the CLI, you may lose your SSH connection if the <ip_address> and <router_address> are not the same as those assigned by DHCP.
4. Write the configuration:

   ```
   write
   ```

Continue with the rest of the configuration either in the vSphere Client console or by using SSH to access the Management interface.

Keep in mind that until you assign a static IP address and write the configuration, the management interface may switch to different IP addresses, for instance if you move the host machine to a different network or restart the VM.

Configuring vSwitches and Hosts to Permit CARP and Failover

If you plan to use CARP, you must change the vSwitch and host settings in the vSphere Client:

- For each vSwitch that your F5® LineRate® installation is attached to, you must change the vSwitch security settings (edit vSwitch properties) to accept Promiscuous Mode, MAC Address Changes, and Forged Transmits.
- For each vSphere host where F5® LineRate® is installed, you must set the Net.ReversePathFwdCheckPromisc (Advanced Settings > Net) to 1.

Editing the VM Settings

If needed, you can edit the default settings (right-click the virtual machine and select **Edit Settings**) to increase the CPUs, RAM, or network interfaces, depending on the resources available in vSphere.

The default settings are the minimum requirements.

What's Next?

After you install, you are ready to configure licensing.

Using LineRate in Amazon EC2

Overview

You can run F5® LineRate® in Amazon's Compute Cloud (Amazon EC2).

Launching and Accessing F5® LineRate®

Launching and accessing F5® LineRate® in Amazon EC2 is similar to using other Linux/ UNIX software available in EC2.

Note the following before you start:

- When launching an instance, you will need to provide an SSH key pair. You will use this key pair with SSH to access the CLI instead of a password. If you are not familiar with using SSH key pairs, see the AWS documentation.
- Alternatively, you can configure a password for the admin user in the User Data (more information below).
- If you do not already have one, set up an Amazon or Amazon Web Services (AWS) account.
- Use F5® LineRate® in a virtual private cloud (VPC).
- Amazon currently supports licenses up to 1G.

To launch and access F5® LineRate® in Amazon EC2:

1. Sign up for one of the following products available from the AWS Marketplace:
    - LineRate Point Load Balancer - BYOL/Free - https://aws.amazon.com/marketplace/pp/B00UB87L1W

- LineRate Precision Load Balancer - BYOL/Free - https://aws.amazon.com/marketplace/pp/B00UB6HR40

2. Launch the instance.
   - Ensure the Security Group allows access to SSH (TCP port 22), and optionally, F5® LineRate Manager via HTTPS (default TCP port 8443). The 1-Click Security group allows access both ports.
   - Select the SSH key pair you want to use to access this instance.
3. After the instance launches, log in with SSH using login admin and the key pair specified when the instance was launched.
   - To access F5® LineRate Manager, you must first configure a password. You can do this manually via the CLI or by specifying password configuration in the User Data when launching the instance (more information below).
4. For a BYOL instance, configure licensing.
   - For the Starter Edition (free), see Enabling a Starter Edition License. For a purchased license, see Enabling a Purchased License.

Additional licenses to add in when they become available:

- LineRate Point Load Balancer - 25 Mbit - https://aws.amazon.com/marketplace/pp/B00TFXJ888
- LineRate Point Load Balancer - 200Mbit - https://aws.amazon.com/marketplace/pp/B00TFXJ9RS
- LineRate Point Load Balancer - 1 Gbit - https://aws.amazon.com/marketplace/pp/B00TFXJBRQ
- LineRate Precision Load Balancer - 25 Mbit - https://aws.amazon.com/marketplace/pp/B00TFXJEL4
- LineRate Precision Load Balancer - 200 Mbit - https://aws.amazon.com/marketplace/pp/B00TFXJHWA
- LineRate Precision Load Balancer - 1 Gbit - https://aws.amazon.com/marketplace/pp/B00TFXJGB2

You should not change the default root volume size. By default, the root volume, where all of your data is stored, is deleted when you terminate the instance.

User Data

When F5® LineRate® boots and does not find a startup-config file, it will generate the default startup-config and then process the EC2 User Data. If a startup-config has been previously saved, user data processing is disabled.

The user data must contain a header (first) line to indicate how the content should be processed. The first line options are:

- !lros-config—Content is interpreted as configure content. This is the format seen from "show running-config". Only configure commands are permitted.
- !lros-shell—Content is interpreted as input to the CLI. To enter configure commands, you must enter the configure sub-mode with "configure", just as in the CLI.

For example, to use the EC2 user data to configure a password of "changeme" for the admin user, you can use the following user data:

```
!lros-config
username admin
  secret encrypted "$2a$04$nPAilt2BM.T36UN2rAtwxutQa8Ta4xSJF3rCMam4p6I4k42Rm/FDC"
```

Or, to use the EC2 user data to install the async npm module and configure a script, use the following user data:

```
!lros-shell
scripting npm install "async"
configure
  script EXAMPLE
    source inline ENDSCRIPT
var async = require("async");
ENDSCRIPT
   admin-status online
```

Amazon limits the user data to 16 KB of data. For instructions on setting the User Data when launching an instance, see the AWSEC2 documentation.

Licensing

Bring your Own License (BYOL) products require you to obtain and install a license for the F5® LineRate® to function. Start the F5® LineRate® instance in EC2, then see either Enabling a Starter Edition License (free) or Enabling a Purchased License to set up licensing. A BYOL license is locked to the instance. You cannot clone the instance or move it to another region.

Hourly (not BYOL) products will be automatically licensed based on the properties of the specific product.

Disabled Features

The following F5® LineRate® features are not available in the EC2 environment, due to EC2's limitations:

- CARP—Amazon EC2 networking does not support CARP.
- Sub-interfaces and VLANs—Amazon EC2 does not support VLANs. EC2 Networking is layer 3 and up.
- IPv6—Amazon EC2 does not support private IPv6 addresses.
- Port channel—Amazon EC2 does not support any link aggregation. EC2 Networking is layer 3 and up.

Configuring F5® LineRate® in EC2

After you launch, access, and license the instance in Amazon EC2, use the Getting Started Guide (CLI-based content) or the LineRate Manager Guide (GUI-based content) to learn how to configure the system.

Configuring Interfaces

All interfaces will be initially configured with DHCP enabled and will automatically receive an IP address. The default route will be set from DHCP on the primary interface. See ip address dhcp.

We recommend that you review the interface configuration. See Show Interface Commands.

You can manually configure secondary IP addresses. See Interface Mode Commands.

You can attach and detach elastic network interfaces (ENIs) only when the instance is in the stopped state. The interface configuration is tied to the driver name, so take care when changing the interfaces (ENIs) attached to an instance.

Troubleshooting

If the F5® LineRate® instance becomes unavailable and automatically restarts, additional information useful to support will be collected and stored as long as the instance isn't stopped. Stopping the instance deletes the logs. If you stop the instance, this information will be lost and support will not be able to diagnose the issue. These logs will be preserved if the instance is only rebooted.

What's Next?

For BYOL products, you must install the license. See either Enabling a Starter Edition License (free) or Enabling a Purchased License.

For non-BYOL products, you are ready to configure the management access to the system. You may want to review Using the Command Line Interface to become familiar with the F5® LineRate® command line interface (CLI) and Working with Bases.

Accessing the LineRate CLI

Overview

You can access the F5® LineRate® CLI to configure and manage the system several ways. You can also use the REST API to configure and manage the system. For more information about using the REST API, see Accessing the REST Server.

Accessing the CLI

You can access the CLI in the following ways:

- Using SSH. See Configuring Management Interfaces.
- Using a serial connection. See Using a Serial Connection. (Not available for Amazon EC2 instances.)
- Directly using a monitor and keyboard connected to the system. (Not available for Amazon EC2 instances.)

Using a Serial Connection

Note: This method is not available for Amazon EC2 instances.

You can access the system to use the CLI using two COM ports: COM1 and COM2. The specific procedure for connecting to the serial interfaces depends on the mechanism you use (for example, terminal server, IPMI Serial Over LAN, usb-to-serial, etc.).

By default, the system sends boot messages to COM1.

Use the following settings from the remote system to access the COM ports.

Baud rate	115200
Data bits	8
Parity bit	None
Stop bit	1
Flow control	None

Logging in to the CLI

You must log in to the F5® LineRate® software to configure and manage your server.

Use the default settings the first time:

- Username—admin
- Password—changeme

We highly recommend that you change the password for the admin login, after you have logged in.

Note: For Amazon EC2, the default username "admin" has no password. Instead, the admin user has an SSH key configured from the EC2 key pair specified when you launched the EC2 instance. To access F5® LineRate Manager, you must set a password either via the EC2 User Data or the F5® LineRate® CLI over SSH.

When you first log in, the F5® LineRate® prompt includes "UNLICENSED" before the standard prompt (hostname followed by the hash sign). By default, the initial prompt is: UNLICENSED:LROS#. After you configure licensing, the prompt changes to LROS#.

To change or configure the admin password:

Enter configuration mode by typing:

```
configure
```

1. Type:
   ```
   username admin
     secret "<password>"
   ```
   - Use the double quotes if the password contains non-alphanumeric characters.
2. Save your changes by typing:
   ```
   write
   ```

What's Next

After you access the CLI, you are ready to configure licensing.

Configuring Licensing

Overview

This section describes how to configure licensing. After you install F5® LineRate®, you can configure the system. To run traffic on the system, you must activate licensing.

Note: If you subscribed to an hourly product (not BYOL) in the AWS Marketplace, you can skip the licensing procedures below. Your instance is automatically licensed. If you subscribed to a BYOL product in the AWS Marketplace, you must follow the steps for the appropriate version in the sections below.

Activating a Starter Edition License

A Starter Edition license defines the rate limits for HTTP requests, TCP connections, and Mb per second. For information about how the limits work, see About Licensing.

To acquire a Starter Edition license, the system must be able to access the license and phone home servers and will use the phone home feature to send usage and configuration data to F5.

For the system to access the Internet and use phone home, the system must have the following:

- IP address on an interface
- Default route to reach the Internet
- Phone home configuration with a F5 username and password

You should not need to configure DNS, because the system defaults will work in most cases. For information about configuring DNS, see IP Mode Commands.

If you have already configured the Starter Edition license, but something is not working properly, see Troubleshooting Licensing.

To activate a Starter Edition license:

1. Go to linerate.f5.com/try to select the Starter Edition, register, and download F5® LineRate®.
   - If you already have an F5 account, click **LOGIN**.
   - Be sure to keep the email that contains your registration key. You will need the registration key to enable the Starter Edition license.
2. Install or launch F5® LineRate®.
   - See Installing LineRate. For Amazon EC2, see Launching F5® LineRate®.
3. Log in to F5® LineRate®.
   - See Accessing the LineRate CLI.
4. To see the names of the interfaces, type:
   `show interfaces`
   - A list of all interfaces on the system displays. It is possible for the system to have an interface that F5® LineRate® cannot detect.
   - The first line is the interface name and its status. The interface name is based on the driver for the interface type. The remaining lines list the information available about the interface (typically, manufacturer, model, MAC address, speed in kilobits, and more).
   - Below are the names used for some common interfaces:
     - em—Intel 1Gb interface
     - igb—Intel 1Gb interface
     - bce—Broadcom 1Gb interface
     - ix—Intel 10 Gb interface
     - oce—Emulex 10 Gb interface
     - xn—Xen netfront interface (used by Amazon EC2)
     - lo—Loopback interface (internal interface)
     - po—Port channel interface
5. Make sure the F5® LineRate® system is properly configured to access the Internet.
   - For virtual environments, DHCP is enabled by default, and you should not need to configure anything.
   - For other environments, do one of the following:

To use DHCP	To manually configure a default route and IP address
• Use the following commands to enable DHCP on one interface: **`config`** **`interface <interface_name>`** **`ip address dhcp`**	• Use the following commands to configure an IP route and an IP address on an interface: **`config`** **`ip route 0.0.0.0/0 <default_gateway_ip>`** **`interface <interface_name>`** **`ip address <ip_address>`**

6. Check network connectivity to ensure that phone home works properly.
   - Using bash mode, you can use ping or telnet to make sure you can both resolve and reach api.f5.com, asb.f5.com, and activate.f5.com before configuring phone home. See Bash Mode Commands for instructions on using system tools available in the bash shell.
7. Use the following commands to configure the information needed for the Starter Edition license:
   ```
   licensing
   regkey <key>
   phone-home
   userid "<f5_username>" secret "<password>"
   ```
   - If you are using Amazon EC2, the system returns the following message:
     WARNING: Phone-home will gather system usage information and send to F5 Networks. Details on the information collected can be found at http://docs.lineratesystems.com/AwsPhoneHomeTerms. To complete phone-home configuration set a username and password and accept phone-home terms.
   - You received the registration key in an email after downloading the F5® LineRate® installation file.
   - If you need help with your F5 credentials, go to linerate.f5.com/try and click **LOGIN** to retrieve your username or password. For more information about what phone home does, see Phone Home Mode Commands
8. If you are using Amazon EC2, the following additional phone home commands are required to confirm you agree to data collection as described in AWS Phone Home Terms:
   ```
   accept-terms "I AGREE"
   ```
9. Do one of the following:

To automatically install the license	To manually install the license

• Set licensing activation to auto:
`licensing`
`activation auto`
  • The system accesses the licensing server and automatically installs the license.
	1. Generate the system dossier using the following command:
	`show licensing dossier`
	2. Copy the dossier.
	3. Go to https://activate.f5.com.
	4. Click **Activate License**.
	5. Paste in your dossier and follow the directions on the page.
	6. Either download the license file or copy the license that displays.
	7. Install the license using one of the following methods:
	  • To install from a file (exec mode):
	`license install base <uri>`
	  • URI of the license file to install. System supports file:// protocol. If the protocol prefix is not given, start the URI with a / for an absolute path and start without a / for a relative path from /home/

To automatically install the license	To manually install the license
	linerate. A maximum file size of 100 kB is enforced. Protect URIs with quotes (for example, "file:///home/linerate/license" or just "license"). • To paste the license (config mode): **`licensing`** **`feature base`** <paste the license text and press **Enter**> **`quit`**

10. To save the configuration, type:
    `write`
    - After you configure licensing, the prompt change to LROS#. If the prompt remains UNLICENSED:LROS#, confirm the license as described in Confirming the License.

Activating a Purchased License

To purchase a subscription license, go to linerate.f5.com/try. For other licensing options, contact sales.

After you install F5® LineRate®, you can install the license.

The following are required for your purchased license to automatically renew:

- The credit card on file must be active and must process the purchase or renewal.
- The F5® LineRate® hardware must have Internet connectivity.
- A F5® LineRate® interface must be configured with either DHCP or a default route and IP address.
- F5® LineRate® must have licensing set to auto.

Note: If your F5® LineRate® system does not meet one or more of the criteria, you can manually install and renew the license before the license period expires. See Manually Installing a Purchased License.

The rate limits for HTTP requests, TCP connections, and Mb per second are based on the license you purchased. For more information about how licenses work, see About Licensing.

Currently, the only feature you can license is called base.

To activate a purchased license:

1. Go to linerate.f5.com/try to purchase and download F5® LineRate®.

- If you already have an F5 account, click **LOGIN**.
- Be sure to keep the email that contains your registration key. You will need the registration key to enable the Starter Edition license.

2. Install or launch F5® LineRate®.
   - See Installing LineRate. For Amazon EC2, see Launching and Accessing LineRate.
3. Log in to F5® LineRate®.
   - See Accessing the LineRate CLI.
4. To see the names of the interfaces, type:
   `show interfaces`
   - A list of all interfaces on the system displays. It is possible for the system to have an interface that F5® LineRate® cannot detect.
   - The first line is the interface name and its status. The interface name is based on the driver for the interface type. The remaining lines list the information available about the interface (typically, manufacturer, model, MAC address, speed in kilobits, and more).
   - Below are the names used for some common interfaces:
     - em—Intel 1Gb interface
     - igb—Intel 1Gb interface
     - bce—Broadcom 1Gb interface
     - ix—Intel 10 Gb interface
     - oce—Emulex 10 Gb interface
     - xn—Xen netfront interface (used by Amazon EC2)
     - lo—Loopback interface (internal interface)
     - po—Port channel interface
5. Make sure the F5® LineRate® system is properly configured to access the Internet.
   - For virtual environments, DHCP is enabled by default, and you should not need to configure anything.
   - For other environments, do one of the following:

To use DHCP	To manually configure a default route and IP address
• Use the following commands to enable DHCP on one interface: **`config`** **`interface <interface_name>`** **`ip address dhcp`**	• Use the following commands to configure an IP route and an IP address on an interface: **`config`** **`ip route 0.0.0.0/0 <default_gateway_ip>`** **`interface <interface_name>`** **`ip address <ip_address>`**

6. Check your network connectivity after configuring your default route and IP address.
   - Using bash mode, you can use ping or telnet to make sure you can both resolve and reach api.f5.com, asb.f5.com, and activate.f5.com before configuring phone home. See Bash Mode Commands for instructions on using system tools available in the bash shell.
7. Install the registration key using the following commands:
   `config`

```
licensing
regkey <key>
```

- You received the registration key in an email after downloading the F5® LineRate® installation file.

8. Set licensing activation to auto:
   ```
   activation auto
   ```
   - The system accesses the licensing server and automatically installs the license.
   - After you configure licensing, the prompt changes to LROS#. If the prompt remains UNLICENSED:LROS#, confirm the license as described in Confirming the License.
9. (Optional) Configure phone home credentials:

   - If your license expires, which happens only if the renewal payment is not made, the system starts using a Starter Edition license after expiration. However, the system can only activate the Starter Edition license if valid phone home credentials are configured and phone home is working.

   - If you need help with your F5 credentials, go to linerate.f5.com/try and click **LOGIN** to retrieve your username or password. For more information about what phone home does, see Phone Home Mode Commands.
     ```
     phone-home
     userid "<f5_username>" secret "<password>"
     ```

10. To save the configuration, type:
    ```
    write
    ```

---->section break<----

Activating an Offering License (for Volume Licensing)

To purchase volume licensing for Point™ Load Balancer, contact sales. After you install a Point™ Load Balancer instance, you can activate the offering license. The offering license is the license you activate on each Point™ Load Balancer instance.

Note: For offering licenses, we recommend that you configure your orchestration system to start up and configure licensing using the REST API.

The following are required to activate the offering license and for it to automatically renew:

- Two or more Volume License Manager (VLM) license managers must be configured, licensed, and running. See Configuring VLM.
- The offering registration key must be available. See Configuring VLM.
- The IP addresses for the three license managers must be available.
- The Point™ Load Balancer hardware must have access to the license managers.

- Point™ Load Balancer must have licensing set to auto.

The rate limits for HTTP requests, TCP connections, and Mb per second are based on the license you purchased. For more information about how licenses work, see About Licensing.

Currently, the only feature you can license is called base.

If your Point™ Load Balancer hardware does not have access to the license managers, you can manually activate an offering license. See Manually Activating an Offering License.

To activate a volume offering license on each Point™ Load Balancer instance:

- Check your network connectivity after configuring your default route and IP address.
  - Using bash mode, you can use ping the system can reach the license managers on port 6200 (default). See Bash Mode Commands for instructions on using system tools available in the bash shell.
- Install the offering registration key using the following commands:
  config
  licensing
  regkey <offering_regkey>
  - You must retrieve the registration key from a license manager instance. See Configuring VLM.
- Set licensing activation to auto:
  activation auto
  - The system accesses the licensing server and automatically installs the license.
  - After you configure licensing, the prompt changes to LROS#. If the prompt remains UNLICENSED:LROS#, confirm the license as described in Confirming the License.
- To save the configuration, type:
  write

1. Install Point™ Load Balancer using the file the file provided by F5® sales personnel.
   - If you do not have the file, see Downloading Point™ Load Balancer.
2. Make sure the license managers are configured.
   - See Configuring VLM.
3. Log in to Point™ Load Balancer.
   - See Accessing the LineRate CLI.
4. To see the names of the interfaces, type:
   show interfaces
   - A list of all interfaces on the system displays. It is possible for the system to have an interface that F5® LineRate® cannot detect.
   - The first line is the interface name and its status. The interface name is based on the driver for the interface type. The remaining lines list the information available about the interface (typically, manufacturer, model, MAC address, speed in kilobits, and more).
   - Below are the names used for some common interfaces:
     - em—Intel 1Gb interface
     - igb—Intel 1Gb interface

- bce—Broadcom 1Gb interface
- ix—Intel 10 Gb interface
- oce—Emulex 10 Gb interface
- xn—Xen netfront interface (used by Amazon EC2)
- lo—Loopback interface (internal interface)
- po—Port channel interface

5. Make sure the F5® LineRate® system is properly configured to access a volume license manager.
   - For virtual environments, DHCP is enabled by default, and you should not need to configure anything.
   - For other environments, do one of the following:

To use DHCP	To manually configure a default route and IP address
• Use the following commands to enable DHCP on one interface: **config** **interface <interface_name>** **ip address dhcp**	• Use the following commands to configure an IP route and an IP address on an interface: **config** **ip route 0.0.0.0/0 <default_gateway_ip>** **interface <interface_name>** **ip address <ip_address>**

6. Configure the license manager IP addresses and instance description:

```
config
licensing
volume-license-manager <ip_address1>
volume-license-manager <ip_address2>
volume-license-manager <ip_address3>
description <instance_description>
```

Downloading Point™ Load Balancer

If you do not have the F5® LineRate Point™ Load Balancer installation file, you can download one. You can also use this procedure to upgrade to a new version of Point™ Load Balancer.

To download Point™ Load Balancer:

1. Go to downloads.f5.com.
2. Register and log in.
3. Click **Find a Download**.
4. Click F5 Linerate Application Proxy in the product listing.
5. Click the product name.
6. To accept the terms of the EULA, click **I Accept**.
7. Select an appropriate image type from the list to download.

Upgrading or Renewing a License

If you upgrade your license to different tier or manually renew your license from the linerate.f5.com/try site, you must take some action for the license change to take effect.

If you want to upgrade your license, you need to cancel your existing license on linerate.f5.com/try, then purchase a new one.

To renew your license, go to linerate.f5.com/try and purchase the renewal.

To make the changed license take effect:

- Do one of the of the following in the F5® LineRate® command line interface (CLI):

If you receive a new registration key	If you do *not* receive a new registration key
1. Install the new registration key that you received in an email using the following commands: **`config`** **`licensing`** **`regkey <key>`** • If licensing is set to auto, the system will retrieve the changed license automatically. 2. If licensing activation is *not* set to auto, continue with step 5 (**`show licensing dossier`**) in Manually Installing a Purchased License.	• Do one of the following: • If licensing is set to auto, tell the system to update the license information now: **`config`** **`license refresh base`** • If licensing activation is *not* set to auto, continue with step 5 (**`show dossier`**) in Manually Installing a Purchased License.

Confirming the License

To confirm that the license is activated, use the **`show licensing brief`** command. This command shows your license and status or a warning if the license was not activated. It also shows the expiration date and the applicable limits.

What's Next

You are now ready to configure the management access to the system. You may want to review Using the Command Line Interface to become familiar with the F5® LineRate® command line interface (CLI) and Working with Bases.

Manually Activating an Offering License

Manually Activating an Offering License

If your Point™ Load Balancer hardware cannot access your license managers, you cannot automatically activate the offering license. The offering license also cannot renew automatically at the end of the default seven-day license period.

In this situation, you want to use a long-term offering license.

Caution: Before configuring a long-term offering license, be sure that you understand how they work. See Understanding Offering Licenses.

The following are required to manually activate the offering license:

- The offering registration key must be available. See Configuring VLM.
- You must be able to log in to a VLM license manager.

To manually activate an offering license:

1. Make sure the license managers are configured.
   - See Configuring VLM.
2. Install Point™ Load Balancer using the file the file provided by F5® sales personnel.
   - If you do not have the file, see Downloading Point™ Load Balancer.
3. Log in to Point™ Load Balancer.
   - See Accessing the LineRate CLI.
4. Configure one license manager IP address and instance description:
   ```
   config
   licensing
   volume-license-manager <ip_address>
   description <instance_description>
   ```
   - The IP address is not used for manual installation of the offering license, but at least one IP address is required. It does not have to be an active IP address.
5. Install the offering registration key using the following commands:
   ```
   config
   ```

licensing
regkey <offering_reg_key>

- You must configure and license a license manager to get the offering registration key. See Configuring VLM.

6. Generate the system dossier using the following command:
   show licensing dossier
7. Copy the dossier.
8. From a license manager, configure the offering dossier:
   bash
   lrvlm-lease [--hostname <hostname>] [--port <port>] --offering-regkey <volume_reg_key> --dossier <dossier> [--ip-addr <ip_address>] [--description <descr>] [--long-term]
   - For REST, use lrs/api/v1.0/exec/volumeLicenseManager/<offering_reg_key>/lease.
   - The system returns the offering license.
9. From the Point™ Load Balancer instance, install the license using one of the following methods:
   - To install from a file (exec mode):
     license install base <uri>
     - URI of the license file to install. System supports file:// protocol. If the protocol prefix is not given, start the URI with a / for an absolute path and start without a / for a relative path from /home/linerate. A maximum file size of 100 kB is enforced. Protect URIs with quotes (for example, "file:///home/linerate/license" or just "license").
   - To paste the license (config mode):
     licensing
     feature base
     <paste the license text and press **Enter**>
     quit
   - After you configure licensing, the prompt changes to LROS#. If the prompt remains UNLICENSED:LROS#, confirm the license as described in Confirming the License.
10. (Optional) Configure phone home credentials:
    - If your license expires, which happens only if the renewal payment is not made, the system starts using a Starter Edition license after expiration. However, the system can only activate the Starter Edition license if valid phone home credentials are configured and phone home is working.
    - Internet access is required for the Starter Edition license to activate.
    - If you need help with your F5 credentials, go to linerate.f5.com/try and click **LOGIN** to retrieve your username or password. For more information about what phone home does, see Phone Home Mode Commands.
      phone-home
      userid "<f5_username>" secret "<password>"
11. To save the configuration, type:
    write

Manually Installing a Purchased License

Manually Installing a Purchased License

If your F5® LineRate® hardware does not have Internet connectivity, your purchased license cannot install automatically and cannot automatically renew at the end of the license period. You can manually install the license initially and manually renew the license before the license period ends.

To manually install a purchased license:

1. Go to linerate.f5.com/try to purchase and download F5® LineRate®.
   - If you already have an F5 account, click **LOGIN**.
   - Be sure to keep the email that contains your registration key. You will need the registration key to enable the Starter Edition license.
2. Copy the registration key.
3. Log in to F5® LineRate®.
4. Install the registration key using the following commands:
   ```
   config
   licensing
   regkey <key>
   ```
5. Generate the system dossier using the following command:
   ```
   show licensing dossier
   ```
6. Copy the dossier.
7. Go to https://activate.f5.com.
8. Click **Activate License**.
9. Paste in your dossier and follow the directions on the page.
10. Either download the license file or copy the license that displays.
11. From the F5® LineRate® system, install the license using one of the following methods:
    - To install from a file (exec mode):
      ```
      license install base <uri>
      ```

      - URI of the license file to install. System supports file:// protocol. If the protocol prefix is not given, start the URI with a / for an absolute path and start without a / for a relative path from /home/linerate. A maximum file size of 100 kB is enforced. Protect URIs with quotes (for example, "file:///home/linerate/license" or just "license").

- To paste the license (config mode):
  licensing
  feature base
  <paste the license text and press **Enter**>
  quit
- After you configure licensing, the prompt changes to LROS#. If the prompt remains UNLICENSED:LROS#, confirm the license as described in Confirming the License.

12. (Optional) Configure phone home credentials:

    - If your license expires, which happens only if the renewal payment is not made, the system starts using a Starter Edition license after expiration. However, the system can only activate the Starter Edition license if valid phone home credentials are configured and phone home is working.
    - Internet access is required for the Starter Edition license to activate.
    - If you need help with your F5 credentials, go to linerate.f5.com/try and click **LOGIN** to retrieve your username or password. For more information about what phone home does, see Phone Home Mode Commands.
      phone-home
      userid "<f5_username>" secret "<password>"

13. To save the configuration, type:
    write

Troubleshooting Licensing for Version 2.6.1

Starter Edition License

If you want to use the Starter Edition license, the system will need to be able to "phone home" to report usage and configuration data.

To enable a Starter Edition license, the system will need:

- An interface configured with an IP address.
- A route to a gateway which connects to the internet.
- An F5 username/password.

You should not need to configure DNS, because the system defaults will work in most cases. For information about configuring DNS, see IP Mode Commands.

Troubleshooting Starter Edition License Deployments

If your system does not have a valid license configured, the CLI prompt will be prefixed with "UNLICENSED:" to reflect its unlicensed status. Example:

```
For documentation see: http://docs.lineratesystems.com/licensing
   base: base license is not configured.
   UNLICENSED:host-162#
```

Determine If an Interface Is Configured with a Route to the Internet

Try:

```
bash "ping -t4 8.8.8.8"
```

You can interrupt the ping by pressing "c" while holding the Control key (Ctrl-c). If you get a response back saying "`ping: sendto: No route to host`", see Configuring Data Interfaces for help configuring an IP address and a default route.

```
UNLICENSED:LROS# bash "ping -t4 8.8.8.8"
PING 8.8.8.8 (8.8.8.8): 56 data bytes
ping: sendto: No route to host
ping: sendto: No route to host
^C

UNLICENSED:LROS# ip route 0.0.0.0/0 10.1.0.1
UNLICENSED:LROS# bash "ping -t4 8.8.8.8"
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: icmp_seq=0 ttl=49 time=40.072 ms
64 bytes from 8.8.8.8: icmp_seq=1 ttl=49 time=38.992 ms
^C
```

Verify That DNS Is Working Properly

If you see something like this after sending a ping command, DNS is not properly configured:

```
UNLICENSED:LROS# bash "ping -t4 api.f5.com"
killed by signal 14
```

If you can ping Internet sites by IP address, but not by hostname, DNS is probably not configured correctly. By default, the system is configured with two domain name servers (8.8.8.8 and 8.8.4.4). These are the Google Public DNS servers. If DNS is not working with these servers, you can configure the system to use your own servers. For information about configuring DNS, see ip dns.

When configured properly, you should see something like this after sending the ping command:

```
UNLICENSED:LROS# ping -t4 api.f5.com
   PING api.f5.com (104.219.106.164): 56 data bytes
   64 bytes from 104.219.106.164: icmp_seq=0 ttl=247 time=30.326 ms
   64 bytes from 104.219.106.164: icmp_seq=1 ttl=247 time=30.606 ms
   64 bytes from 104.219.106.164: icmp_seq=2 ttl=247 time=31.017 ms
   64 bytes from 104.219.106.164: icmp_seq=3 ttl=247 time=31.405 ms

--- api.f5.com ping statistics ---
   4 packets transmitted, 4 packets received, 0.0% packet loss
   round-trip min/avg/max/stddev = 30.326/30.838/31.405/0.409 ms
```

Do You Have an F5® Account Configured?

Go to linerate.f5.com/try and register for an F5® account: click **LOGIN**, then click **Register**. Once you have registered, use this command:

```
LROS(config)# phone-home
LROS(config-phone-home)# userid "<f5_username>" secret "<password>"<f5_username>
```

If your account still isn't working, it's likely that your username or password is incorrect.To see if your account is registering properly, try:

```
LROS(config)# bash "sudo tail -f /var/log/controller.messages"
```

If you see messages about login failures (example below), go to https://linerate.f5.com/login and use the 'Retrieve Password' button to reset your login credentials, then try again.

```
Sep 4 16:13:01 host-114-data LROS: Phone-home: Login failed. No session cookie received.
```

After your username and password are accepted by the server, you should see a log message like:

```
Sep 4 16:13:07 host-114-data LROS: INFO: base license is now active and expiring
   09/18/2013 16:13:07
```

Configuring a Purchased License

If you purchased a license, see Enabling a Purchased License.

Using the Command Line Interface

Overview

The following sections describe the basics of using the F5® LineRate® command line interface (CLI). If you are an experienced user of other networking device CLIs, such as Cisco IOS®, you should find that the F5® LineRate® CLI works very similarly to those devices.

Getting CLI Help

At any point in the CLI, you can display help for the available commands by typing the question mark key (**?**) or the **Tab** key. The table below explains how to use these two keys.

Help example	Result
`?`	List of available commands.
`s?`	List of available commands that start with the letter s.
c**Tab**	System either completes the command that begins with the letter c (if there is only one) or lists all available commands that start with c.
`<command> ?`	List of available options for the command.

Some commands have options that are less frequently used and are considered advanced options. The advanced options do not display in the help when you first type the question mark. But if advanced options are available, typing question mark will display the non-advanced options along with the message, "Advanced options are also available. Press ? again for list." Typing question mark again will display all options, including the advanced options.

Command Completion

The individual words that make up a command do not have to be typed out fully. The system will accept partial words as long as each word has enough characters to be uniquely identified. So the commands **`show running-config brief`** and **`sh run b`** will both be accepted by the system and produce the same result. Note that newer versions of the F5® LineRate® software will often add more commands, options, and keywords and will occasionally deprecate commands or options. So it is possible that a command with partial keywords may be unique on one version of the F5® LineRate® software, but ambiguous on a different version.

In addition to accepting partial commands, the system also accepts partial object names. For example, if you have just one real server and its name is rsweb1, you can go into configuration mode for that real server using **`real-server rTab`**. The system autocompletes the **`rTab`** as rsweb1.

If you have multiple real servers configured with the names rsweb1, rsweb2, and rsweb3, typing **`real-server rTab`** results in a list of the existing real servers with names that start with the letter r.

Running Config and Startup Config

Changes you make to the configuration of the F5® LineRate® software take effect immediately. The F5® LineRate® software has two configurations:

- Running config—The configuration you are currently running, including changes you have made since you last saved the configuration. The system has a default running config that it runs if it cannot find a startup config. The current running config can be displayed with the command **`show running-config`**.
- Startup config—The saved configuration that the system will use when you next restart the F5® LineRate® software. The startup config can be displayed with the command **`show startup-config`**.

Comparing Running Config and Startup Config

As you make changes to your configuration, you may want to compare the current running config to the saved startup config to determine what has changed since you last saved the configuration.

To compare the running config and the startup config:

- Type:
  `show running-config diffs`
  - Lines with a - show they were removed from the startup config.
  - Lines with a + show they were added to the running config.
  - Lines with no - or + show the context of the changed lines.

Saving to the Startup Config

When you have made configuration changes that you want in the startup config, you must save them.

To save the startup config:

- Type:
  `write`

This saves all changes currently in the running config to the startup config.

Command Line Modes

The CLI has multiple modes. The mode you are currently in is always reflected in the prompt. When you first log in to the system, you are in exec mode. Commands available in exec mode do not change the running configuration, but do take effect immediately. The prompt for exec mode is simply the hostname followed by a hash sign:

```
LROS#
```

Exec mode commands are always available, regardless of what mode you are in. For example, you can use the `show` or `write` commands, shown in the sections above, at any time.

To change from exec mode to config mode:

- Type:
  `configure`

As you enter commands to change the configuration, the mode changes based on the command you last entered. Each mode has a specific set of commands available. The modes stack, and the prompt changes to show the mode you are in.

For example, the prompt below shows that you are in configure real-server mode for the real-server called rs1:

```
LROS(config-rserver:rs1)#
```

To change from any config mode to exec mode:

- Do one of the following:
  - Type:
    `end`
  - Press **Ctrl+z**.

If you are further down the config mode stack, you can move one level up the mode stack.

To change from the current config mode to the mode one level up:

- Type:
  `exit`

Command History

You can access the history of commands you have entered in the following ways.

History example	Result
Up or down arrow key	Scrolls through the list of previously used commands.
Ctrl+r **`<phrase>`**	Searches backwards for and lists any used command that contains with the sequence of characters <phrase>. Pressing Ctrl-r again continues the search backward, finding the next command that contains <phrase>.

Single-value vs. Multiple-value Commands

CLI command are generally one of the following types:

- Single-value—The command accepts only one value and replaces the existing value with the last value set. For example, when setting the base for any object, the object can have only one direct base. If you set the base again, the new base **replaces** the previous one.

  The following commands first create the real server called rs1, then set it to use the base called base1.

  ```
  real-server rs1
  base base1
  ```

The following command, when already in real server config mode for rs1, replaces the base that rs1 uses to be base2. The previous base (base1) is no longer applicable to rs1.

```
base base2
```

- Multiple-value—The command accepts multiple values and either creates a new object with the value or puts you into configuration mode for an existing value. For example, when creating real servers, you can create and name as many real servers as you need. Each time you use the **real-server** command and follow it with a word, the system **creates** a real server with the word as its name. If a real-server with the name exists, the system puts you into **configuration mode** for that real server.

  The following command creates a real server named rs1:

  ```
  real-server rs1
  ```

  The following command creates a real server named rs2:

  ```
  real-server rs2
  ```

  The following command puts you into configuration mode for the existing real server called rs1:

  ```
  real-server rs1
  ```

Using the Pager

Some CLI commands cause the system to respond with more output than fits on a single terminal screen. When this happens, the system will only output a single page of text, then pause and display the prompt **--More--**. From this prompt, you can perform the following actions:

Command	Result
<space>	Outputs the next page of text. If the full output has been displayed, returns to the normal system prompt.
b	Goes back one page of text, outputting the previous page.
Up arrow key	Scrolls backward one line at a time.
Down arrow key	Scrolls forward one line at a time.
q	Quits displaying output and returns you to the normal prompt.
/<searchphrase>	Searches forward through the output. To search forward through the output, enter a slash character, followed by the phrase you want to search for, then press **Enter**.
?<searchphrase>	Search backward through the output.
n	Repeats the last search.

Command	Result
`h`	Displays additional help on the pager. Press `q` when done viewing the help message.

What's Next

For information about bases, see Working with Bases.

Working with Bases

Overview

A "base" in F5® LineRate® is a type of template that allows you to reuse common portions of configuration across multiple objects. Each base can inherit from another base, overriding properties from that base. This lets you create basic configurations that you can reuse and build upon.

Using Bases (Templates)

You can create a base for the following objects:

- Real server
- Virtual IP
- SSL profile

Best Practice: A best practice is to create the most basic base for each object type that includes all settings common to an object. You may also want to create a second tier of bases that inherit settings from the basic base and then add settings for variations you need.

Throughout this guide, when we create an object that can have a base, we go through creating an example base. For an example of how to create a base, see Creating a Real Server Base (CLI) or Creating a Real Server Base (F5® LineRate Manager).

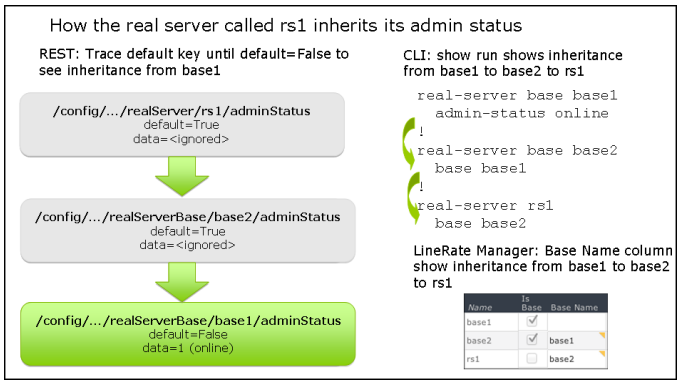
Inheritance

Bases can inherit properties from another base. The object takes its values from the most specific configuration. For example, an object looks for its settings as follows:

1. Its own settings

2. The base it is configured to inherit from
3. The base that its base is configured to inherit from

The diagram below shows how a real server inherits its admin status in the REST API, the CLI, and F5® LineRate Manager. Here, we use the /config tree in REST.

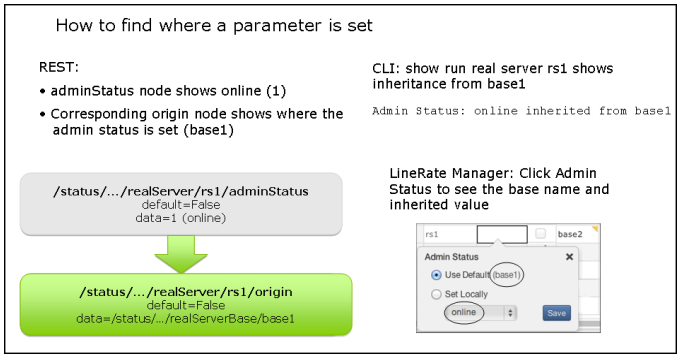


For information about how to temporarily override the base for a setting, then return to inheriting from the base, see

- CLI— no command usage for objects with a base
- F5® LineRate Manager—Understanding the Use Default Option
- REST—Changing Configurations Locally, Then Back to the Base

Finding Where A Parameter Is Set

You can see where an object is getting its configuration using the CLI show command or the the REST origin node associated with an object, as shown in the diagram below. Here, we use the /status tree in REST.

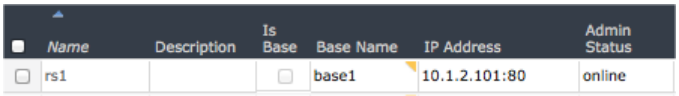


To see where a real server is getting its configuration:

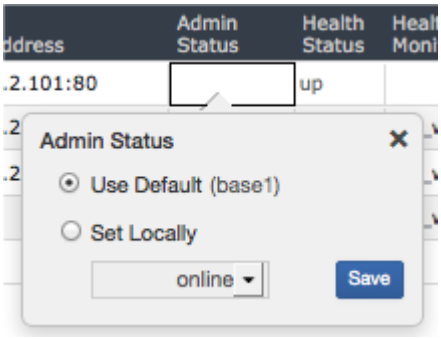
- In the CLI, type:
  show real-server <real server="server" name="name">

```
example_host# show real-server rs1
show real-server rs1
   Configuration
   Address: 10.1.2.101:80 set locally
   Admin Status: online inherited from base1
   Max. Connections: 0 default
   TCP Options: <none> default
...
```

- In F5® LineRate Manager:
  1. Look at the Base Name column for the real server to see if the real server has a base.
     - In the example below, the real server rs1 has a base called base1.



  2. If the object has a base, for the parameter you want, see if the yellow triangle appears. No triangle means the parameter is inherited from the base.
     - In the example above, Admin Status does not have a yellow triangle, so the real server is inheriting its admin status from the base.
  3. To confirm the inheritance, click the parameter cell.
     - In the example below, the Use Default option and (base1) show that the real server is inheriting its admin status from the base called base1.



What's Next

For information about configuring interfaces, see Configuring Management Interfaces.

Configuring Management Interfaces

Overview

An initial, basic management configuration includes the following key functions:

- Configuring the host name
- Configuring the management interface
- Configuring SSH

Configuring the Host Name

You should first configure a host name for the system. The default host name is LROS.

For this example, we are naming the host example_host.

To configure the host name:

1. Type:
   `configure`
2. Type:
   `hostname example-host`
   - The prompt will change to reflect the new host name.
3. To check the host name setting, type:
   `show run`
   `hostname example-host`
4. Type:
   `write`

Configuring the Management Interface

You must assign an IP address to an interface to use for management. F5® LineRate® supports both static and dynamically assigned IPv4 and IPv6 addresses. In virtual environments such as VMWare or Amazon EC2, all interfaces are configured dynamically via DHCP by default. In EC2, we recommend the management interface be left configured to use DHCP.

F5® LineRate® supports both IPv4 and IPv6. You can specify the IP address and subnet mask in any of the following formats:

- **`192.0.2.1/24`**— example of an IPv4 address with a 24-bit subnet mask using CIDR notation.
- **`192.0.2.1 255.255.255.0`**—equivalent to above using net mask notation.
- **`2001:DB8::/64`**—example of an IPv6 address with a 64 bit subnet mask using CIDR notation.

If you need more information about IP addresses and subnet masks, see these sites for more information:

- http://en.wikipedia.org/wiki/IP_address
- http://en.wikipedia.org/wiki/CIDR_notation

If you want the management interface to obtain its IP address dynamically using DHCP, see ip address dhcp.

In this example, we are configuring one management interface as a static IP address, as shown in the diagram in Configuring Load Balancing:

- Management (on em0)—10.10.10.10/24

To configure the management interface:

1. Type:
   `show interfaces`
   - A list of all interfaces on the system displays. It is possible for the system to have an interface that F5® LineRate® cannot detect.
   - The first line is the interface name and its status. The interface name is based on the driver for the interface type. The remaining lines list the information available about the interface (typically, manufacturer, model, MAC address, speed in kilobits, and more).
   - Below are the names used for some common interfaces:
     - em—Intel 1Gb interface
     - igb—Intel 1Gb interface
     - bce—Broadcom 1Gb interface
     - ix—Intel 10 Gb interface
     - oce—Emulex 10 Gb interface
     - xn—Xen netfront interface (used by Amazon EC2)
     - lo—Loopback interface (internal interface)

- po—Port channel interface

2. Type:
   configure
3. Type:
   interface em0
4. Type:
   ip address 10.10.10.10/24
5. To check the interface settings, type:
   show interfaces
   ```
   em0 is up, line protocol is up
   Hardware is Intel82540EM, address is 0800.279e.0b3a
   Internet address is 10.10.10.10/24, broadcast is 10.10.10.255
   ...
   ```
6. Type:
   write

Configuring the admin User Password (Amazon EC2 Only)

In the Amazon EC2 environment, the admin user does not have a password by default. If you want to log in using a password instead of an SSH key, you must assign a password to the admin user. See User Name Mode Commands.

Configuring SSH

You should also configure secure shell (SSH) to permit access to the system using SSH.

By default, when the F5® LineRate® is first installed, SSH is automatically configured to allow incoming connections from any SSH client and to allow incoming connections to any IP address configured on the system on TCP port 22. Although this is convenient for first connecting to and configuring the system, best security practices are to limit SSH connections to only those networks and IP addresses where access is required. So you should remove the automatic settings and replace them with settings that limit access. Typically, you want to allow access only from your management network. You can allow from more than one management network, if needed.

Caution: If you are currently logged into the system via SSH, you may disconnect yourself by changing the allow to or allow from settings if your current connection would no longer be allowed under the new settings. In order to avoid this, you may need to first add additional allow to or allow from lines, possibly make a new connection to the system, using a connection that will be allowed with the new settings, then remove any unwanted allow to or allow from lines.

In this example, we first add the setting for allowing incoming connections from hosts on the 10.10.0.0/24 management subnet and also add the setting to allow incoming connections to only the management IP address. We then remove both of the "any" settings that were added automatically.

To configure SSH:

1. Type:
   configure
2. Type:
   ssh
3. Type:
   allow from 10.10.0.0/24
4. Type:
   no allow from any
5. Type:
   allow to 10.10.10.10 22
6. Type:
   no allow to any
7. To check the SSH settings, type:
   show run

   ```
   ...
   ssh
   allow from 10.10.0.0/24
   allow to 10.10.10.10 22
   ...
   ```
7. Type:
   write

Management Access Example

After configuring management access as described above, you can use the **show run** command to see the configuration. We have annotated the example command output below. Comment lines start with an exclamation mark (!).

```
LROS(config)# show run
Building configuration...
!
! Hostname setting.
!
hostname example-host
!
! Default user name and encrypted password.
!
```

```
username admin
  secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/QeaZH8WnWRzVEkPt0MgS"
  uid 2000
!
! IP address configured on the interface called em0 for management access.
!
interface em0
 ip address dhcp
 ip address 10.10.10.10 255.255.255.0
!
! IP address configured on the interface called em1 for data.
!
! Default SSL configuration. See Configuring SSL.
!
ssl profile self-signed
 attach primary-certificate self-signed
 attach private-key self-signed
!
! SSH configuration to limit access to the F5® LineRate® system.
!
ssh
 allow from 10.10.0.0/24
 allow to 10.10.10.10 22
!
! Default REST server configuration.
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
! Default certificate and key called self-signed. For information about
certificates, see Configuring SSL.
!
certificate self-signed
pem-format
-----BEGIN CERTIFICATE-----
MIIDOjCCAiKgAwIBAgIJAPm1YLOdNan3MA0GCSqGSIb3DQEBBQUAMBwxGjAYBgNV
BAMTEWxyb3MtZGVmYXVsdC1ob3N0MCAXDTEyMDMyNzEwMDczN1oYDzIyODYwMTEw
MTAwNzM3WjAcMRowGAYDVQQDExFscm9zLWRlZmF1bHQtaG9zdDCCASIwDQYJKoZI
hvcNAQEBBQADggEPADCCAQoCggEBAL4QCxbazhzBnPW4GHBQebKWRVax9khfPpWp
+YbJztXo1weTcXHvRuhEsmTkvDdJTkgoWgdOvGBPblrYiBXivkNo9eC6oBkzuW0T
gY6XjR6p4AFSMkRDh3RCIfxC2s7lSANjYe15BkcibMeak6/4BxFIF12XNQxjR64Z
pJ5NM8ygc4SM8dkB7kUe5FTg4xEi+DR9/TZqZ1y/3lTa+atW/On7nLcgB7z/m1hk
mp8NCdw4xzNCbIJdX5WG1dbIbFD8uOsPoHyoGUtdYJ9exDCuAgX3xRU5Ll87fT3x
WUz5xw13zZ7NrrAaCG8h6ugfLNKPkxi28tL+TNZHzDPFbyeNiMUCAwEAAaN9MHsw
HQYDVR0OBBYEFO61P0Y4qwK3WC20wP2kDNbZ8X18MEwGA1UdIwRFMEOAFO61P0Y4
```

```
qwK3WC20wP2kDNbZ8X18oSCkHjAcMRowGAYDVQQDExFscm9zLWRlZmF1bHQtaG9z
dIIJAPm1YLOdNan3MAwGA1UdEwQFMAMBAf8wDQYJKoZIhvcNAQEFBQADggEBAHUm
y8HavCdrjabf2Ajs1TX87zeZmR0RYkezL/feZ+xri+DDHal+uJMu0DUpPpoR0YyI
jorz6t79uq1DT8jGCalLjjiCvr6E2Sz0cXJ2aKE45eu4GMuMz/ohczm0LyexP01J
gqfp8Q5cvr/xQik8eLpxgCIjZ0188e8OQRNetwgzbi579bjkKglLCJfjQZE9ot14
0Pmz5DG1QtCClOA0Ppdz7y+P1PLNwpRxKN0cjl6fH1P9qeZvBoDPp6X72nMEOknl
eT2JxS0Vofyp9rDlGVusuP1EFzM/BCh/dHq4SMmHuQqgc/dzCJruLrztj/hgGXKk
PK7/nxRt+C72hde2OaU=
-----END CERTIFICATE-----
quit
!
key self-signed
pem-format
-----BEGIN RSA PRIVATE KEY-----
MIIEowIBAAKCAQEAvhALFtrOHMGc9bgYcFB5spZFVrH2SF8+lan5hsnO1ejXB5Nx
ce9G6ESyZOS8N0lOSChaB068YE9uWtiIFeK+Q2j14LqgGTO5bROBjpeNHqngAVIy
REOHdEIh/ELazuVIA2Nh7XkGRyJsx5qTr/gHEUgXXZc1DGNHrhmknk0zzKBzhIzx
2QHuRR7kVODjESL4NH39NmpnXL/eVNr5q1b86fuctyAHvP+bWGSanw0J3DjHM0Js
gl1flYbV1shsUPy46w+gfKgZS11gn17EMK4CBffFFTkuXzt9PfFZTPnHDXfNns2u
sBoIbyHq6B8s0o+TGLby0v5M1kfMM8VvJ42IxQIDAQABAoIBAGXakSbJUWWFuIjS
BH7EEcPL1hLUwggcypxH/8nlAmwOIJYVxNjrAtPcZMG+9sKmDUaMIVsDLd5rEteq
bJtV7OKRMBsjyEJZPsieiHKS8vR40uvCUd/VVJTQEAhxB3OS2dm++67Yia27XBJH
21eVEqyHNsZYDvy5g6NgaKDQ/K5ubCfpkXji9OKfT8AGFR6kKPra1oG1w+YUR8qh
F7H4o9yo+Adr0un2QZOKowG7mwmTE7L4a4nIfS09sFeNKYDW0hohp2qrX6HY/HJd
2iy1SuUUzfWGuqYVwAUQKz9UvuqezK2H3xnP/S//gDUWJZ+lXmMKx38j+gFxqBld
RxRcxs0CgYEA9xXNtlvEqg17vfm+vh84loV3MTypYpCq3RRND+yqwyZdAdzaie4Z
nEt1H7V/ry5HmaH4XTXKer3X3SWJIdbZeNXmcZnatZi2XqVmhhmCMR0rHXuwA4GA
qMlCwOwZS1N2tJxGwmkHC5lGy6J21TL68PQIafeAYrBl3zW330W+I78CgYEAxOuN
gODEx4/8pHvgjlq+wlgbA5oXDCGTDlY0Kt9RcPgwjnkQtW7KY3slGDrfPdIWfSRj
tNNTsqUA4cfxF9yWykFC+aifUfn6lutHrq5SUAc/heoatvL7XAMlVQnHltqYinZL
rDOat7wkby2WIQPZbXKOojWcVLf5DND/E0y0pHsCgYAgjyL4cMdNkVFJC2vzKbIP
Q68dMd0wO9gIIfC1tH4cESYYZL33hwSg7+CTORuGPhb5S7qqrbfszK9xWMzlRKaL
ocQoHBoR6/m8JxeHfD0Hs8xGqlHbZGlL1JmTSolav7jYu+8nFyfyg1Qs6U+3cGxY
7A9fx1mHp68E5tM//LS9iQKBgQCEWtJcKjb47wVfRMfUxpdqpq9Zh2swQyzFORmN
K1Zg+OAiEqsxV0r+/FkdZQyBT8C/0gKWGmgqLY9fMfURFbngLWcnyLd08PEGGROw
DAjVM1n11zineL+Lw62G77DP6xMWFZadIn4+Ol2+wEQk4qJ0VsgZrLDrnE/v1lVr
kmXkGwKBgHUodQ38HGIdAw+XUDksvvjs+TGVHkGXj4B2r4YlWUEIYV/kEEHlVxDX
+KR//WjiMrt1o3cmILMrQLOEX4NFTh0kmzYGTc+4BiE1Y2krxEqxyVYou+iDITCz
2oA1A+w/eMlx4CwZr8HeV6U2kdtx/nEvWpadImNLvkx6GXdRT3e/
-----END RSA PRIVATE KEY-----
quit
example-host(config)#
```

What's Next

After configuring management access, you are ready to configure a reverse proxy or a forward proxy. See Configuring a Reverse proxy or Configuring a Forward Proxy.

Configuring a Forward Proxy

Overview

The F5® LineRate® forward proxy capability provides a proxy function from one network to another. A common use case for a forward proxy is for connections from your private network to the Internet.

More about Forward Proxies

A forward proxy lets you insert custom logic created with scripts. Scripts can perform a variety of functions, including gathering usage statistics, redirecting requests to your own cache, blocking of access to specific sites, managing cookies, and much more.

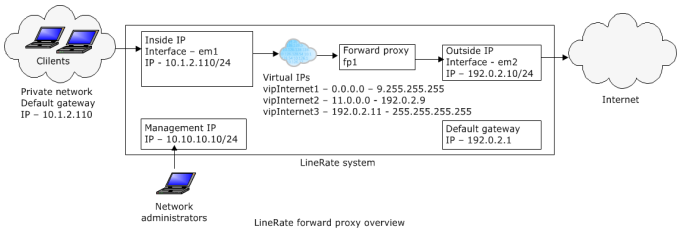
To use a forward proxy effectively, be sure to create and attach a virtual IP that includes the range of Internet IP addresses you want to go through the forward proxy.

Caution: When attaching a virtual IP to a forward proxy, the virtual IP must not include any of the system's own IP addresses. For a virtual IP with a single IP address, do not set the virtual IP's IP address to one of the system's own IP addresses. For a virtual IP with a range of addresses, you must ensure that the IP address range does not contain any of the system's own IP addresses. This may mean you need to break the virtual IP into multiple virtual IPs. See Configuring a range for a virtual IP with forward proxy for more detail and an example.

Example Configuration

The diagram below shows the configuration for a forward proxy from a private network to the Internet. Requests from clients in the private network go to the default gateway, which is a F5® LineRate® interface configured with the inside IP address (for example, 10.1.2.110). The virtual IP configured with

a range of IP addresses listens for requests on the configured TCP port. This example shows the forward proxy configured to intercept TCP port 80, the typical port for HTTP traffic. The virtual IP passes the request to the forward proxy, where a script may intercept the request and perform specific functions, then passes the request to the outside interface and on to the Internet.



LineRate forward proxy overview

What's Next

After determining that you want to configure a forward proxy, you are ready to configure the data interfaces. See Configuring Data Interfaces.

Configuring Data Interfaces

Overview

An initial, basic configuration for a forward proxy includes the following key functions:

- Configuring the data interfaces
- Configuring the default IP route (gateway) on F5® LineRate®
- Configuring the default IP route on clients

Configuring the Data Interfaces

You must assign an IP address to at least two interfaces to use for data. The F5® LineRate® software supports both IPv4 and IPv6.

For general information about the IP addresses and formats, see Configuring Management Interfaces.

Note: For virtual environments, all interfaces are configured by default to obtain their IP address via DHCP and to set the system default route with the lowest numbered DHCP-enabled interface. Because the proxy configuration depends on the IP address of the "outside" data interface, you likely want to disable DHCP for that interface and assign a static IP address.

Note: For Amazon EC2, interfaces by default have IP source/destination check enabled. This will prevent any packets from leaving/arriving at the EC2 interface (eni) that don't match the IP address AWS has associated with that interface. For forward proxy configurations, you must disable source/destination check on the "inside" interface. See http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/using-eni.html#change_source_dest_check.

In this example, we are configuring two interfaces as shown in the diagram in Configuring a Forward Proxy:

- Inside to the virtual IP (on em1)—10.1.2.110/24
- Outside to the Internet (on em2)—192.0.2.10/24

To configure the data interfaces:

1. Type:
   show interfaces
   - A list of all interfaces on the system displays. It is possible for the system to have an interface that F5® LineRate® cannot detect.
   - The first line is the interface name and its status. The interface name is based on the driver for the interface type. The remaining lines list the information available about the interface (typically, manufacturer, model, MAC address, speed in kilobits, and more).
   - Below are the names used for some common interfaces:
     - em—Intel 1Gb interface
     - igb—Intel 1Gb interface
     - bce—Broadcom 1Gb interface
     - ix—Intel 10 Gb interface
     - oce—Emulex 10 Gb interface
     - xn—Xen netfront interface (used by Amazon EC2)
     - lo—Loopback interface (internal interface)
     - po—Port channel interface
2. Type:
   configure
3. Type:
   interface em1
4. Type:
   ip address 10.1.2.110/24
5. Type:
   interface em2
6. Type:
   ip address 192.0.2.10/24
7. To check the interface settings, type:
   show interfaces

```
em0 is up, line protocol is up
Hardware is Intel82540EM, address is 0800.279e.0b3a
Internet address is 10.10.10.10/24, broadcast is 10.10.10.255 (static)
...
em1 is up, line protocol is up
Hardware is Intel82540EM, address is 0800.27bc.5b47
Internet address is 10.1.2.110/24, broadcast is 10.1.2.255 (static)
...
```

```
em2 is up, line protocol is up
Hardware is Intel82540EM, address is 0800.2738.ce7e
Internet address is 192.0.2.10/24, broadcast is 192.0.2.255 (static)
...
```

8. Type:
   write

Configuring the Default IP Route (Gateway) on F5® LineRate®

You should also configure the default IP route (gateway). For this forward proxy example, the inside IP address is the default gateway for all clients to the Internet.

For general information about the IP addresses and formats, see Configuring Management Interfaces.

To configure the default IP route:

1. Type:
   configure
2. Type:
   ip route 0.0.0.0/0 192.0.2.1
3. To check the default route setting, type:
   show ip route
   - If you configured IPv6, use this command: **show ipv6 route**

```
Codes: C - connected, S - static

Gateway of last resort is 192.0.2.1 to network 0.0.0.0 (static)

S    0.0.0.0/0 via 192.0.2.1, em2, MTU 1500
C    10.1.2.0/24 is directly connected, em1, MTU 1500
SC   10.1.2.110/32 is directly connected, lo0, MTU 16384
C    10.10.10.0/24 is directly connected, em0, MTU 1500
SC   10.10.10.10/32 is directly connected, lo0, MTU 16384
C    192.0.2.0/24 is directly connected, em2, MTU 1500
SC   192.0.2.10/32 is directly connected, lo0, MTU 16384
```

4. Type:
   write

Configuring the Default IP Route on Clients

You should also configure the default IP route on clients to work with the forward proxy. In this example, each client's default IP route should point to the inside IP address of F5® LineRate® (10.1.2.110).

What's Next

After configuring the data interfaces, you are ready to configure the virtual IP. See Configuring the Virtual IP.

Configuring the Virtual IP

Overview

In this forward proxy example, you want the virtual IP to listen for requests from all possible Internet IP addresses on port 80. Therefore, you want to configure the virtual IPs that cover the full range from 0.0.0.0 to 255.255.255.255, but that exclude the IP addresses configured on any F5® LineRate® interface.

You can attach a virtual IP to only one forward proxy. You cannot use the same virtual IP for both a reverse proxy and forward proxy.

To configure a virtual IP address, complete the following tasks:

1. Create a virtual IP base.
2. Create a virtual IP.

Note: Be sure that you also configure the same IP address on an interface as described in Configuring Data Interfaces.

Creating a Virtual IP Base

We recommend creating one or more virtual IP bases. For general information about bases in F5® LineRate®, see Working with Bases. A base lets you configure the most common settings that you want for your virtual IPs. You can also create more than one virtual IP base for settings that you need to be different or more specific for some virtual IPs.

In this example, we are creating a single virtual IP base called vipbase_web1. We recommend giving each virtual IP base a meaningful name that helps identify the base. For example, you might use the application type (such as serving similar web content) or security settings (such as SSL) in the name.

To create an example virtual IP base:

Step	Command	Description
1	`configure`	Puts F5® LineRate® into configure mode.
2	`virtual-ip base vipbase_web1`	Names the base vipbase_web1.
3	`admin-status online`	Brings the virtual IP online, so it is ready for use.
4	`service http`	Sets the service type to HTTP for layer 7 web traffic.
5	`keepalive-timeout 5`	Sets the keepalive timeout to 10 seconds. This is the time the system waits for a specific client to send a request before closing the connection, reclaiming connection resources. For most use cases, this setting will affect the number of simultaneous connections that the system will have open. A lower setting will usually result in fewer simultaneous open connections. A good rule of thumb is to set this number no higher than 500,000 divided by the number of expected connections per second at peak load. For example, if the system is expected to process up to 100,000 connections per second, 500,000 divided by 100,000 is 5. So the setting should be 5 seconds in this example.

Creating the Virtual IPs

After creating the virtual IP base, you can create a virtual IP. We recommend giving each virtual IP a meaningful name that helps identify the virtual IP. For example, you might use the application or service type (such as serving similar web content) or security settings (such as SSL) in the name.

For this example, we are configuring a range of IP addresses that cover the entire range of IP addresses on port 80 (HTTP). However, to avoid creating a loop, we must create three virtual IPs to cover the entire range, with IP address ranges that exclude the IP addresses configured on the interfaces (management, inside, and outside). For more information about virtual IP addresses for forward proxies, see Configuring a range for a virtual IP with forward proxy.

To create the virtual IPs:

1. Type:
   `configure`

2. Type:
   virtual-ip vipInternet1
3. Type:
   base vipbase_web1
4. Type:
   ip range 0.0.0.0 9.255.255.255 80
5. Type:
   virtual-ip vipInternet2
6. Type:
   base vipbase_web1
7. Type:
   ip range 11.0.0.0 192.0.2.9 80
8. Type:
   virtual-ip vipInternet3
9. Type:
   base vipbase_web1
10. Type:
    ip range 192.0.2.11 255.255.255.255 80
11. Type:
    show run brief

```
...

virtual-ip base vipbase_web1
 service http
  keepalive-timeout 5
 admin-status online
!
virtual-ip vipInternet1
 ip range 0.0.0.0 9.255.255.255 80
 base vipbase_web1
!
virtual-ip vipInternet2
 ip range 11.0.0.0 192.0.2.9 80
 base vipbase_web1
!
virtual-ip vipInternet3
 ip range 192.0.2.11 255.255.255.255 80
 base vipbase_web1
...
```

5. Type:
   write

What's Next

After configuring the virtual IP, you are ready to configure the forward proxy itself. See Configuring the Forward Proxy.

Configuring the Forward Proxy

Creating a Forward Proxy

For this example, you now need to configure the forward proxy itself. You must give the forward proxy a name, attach the virtual IP to it, and put the forward proxy online. In addition, it is a best practice to always set the response timeout and the keepalive timeout.

To create an example forward proxy:

Step	Command	Description
1	`configure`	Puts F5® LineRate® into configure mode.
2	`forward-proxy fp1`	Names the forward proxy fp1.
3	`admin-status online`	Brings the forward proxy online, so it is ready for use.
4	`service http`	Sets the service type to HTTP for layer 7 web traffic.
5	`response-timeout 5`	Sets the response timeout to 5 seconds. This is the time the system waits for the HTTP server to respond to a request. If the server does not respond in this time, the system sends an HTTP 504 error to the client and closes the connection. This ensures that connections are closed and system resources are reclaimed if the server does not respond. Consider the amount of time you're willing to wait for a target web server to respond to any request. The response-timeout must always be configured to be higher than the amount of time it takes for any of the web servers to respond to a request.

Step	Command	Description
6	**keepalive-timeout 10**	Sets the keepalive timeout to 10 seconds. This is the time the system waits for a new HTTP request from a client to a server. If there are no active HTTP transactions (that is, no active requests or responses) to a server for the specified time (in seconds), the system closes the TCP connection to the server, reclaiming resources. This also helps avoid problems that some HTTP servers have when connections are kept open indefinitely.
7	**attach virtual-ip vipInternet1**	Attaches the first virtual IP we created earlier.
8	**attach virtual-ip vipInternet2**	Attaches the second virtual IP we created earlier.
9	**attach virtual-ip vipInternet3**	Attaches the third virtual IP we created earlier.

Complete Forward Proxy Example

After configuring the forward proxy, as described above, you can use the **show run brief** command to see the complete forward proxy configuration.

```
example-host# show run brief


Building configuration...

!
   hostname example-host
   !
   username admin
    secret encrypted "$2a$04$6tMnAZDinG2Xs/Jk4dA7MupGD4EjXA12SYC7BOQvAHDoyqyd9JNEe"
    uid 2000
   !
   ip dns
    name-server 8.8.8.8 8.8.4.4
    admin-status online
   !
   interface em0
    ip address dhcp
```

```
 ip address 10.10.10.10 255.255.255.0
!
interface em1
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.110 255.255.255.0
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.10 255.255.255.0
!
interface em3
 no ip dhcp client request router
 ip address dhcp
!
ip route 0.0.0.0/0 192.0.2.1
!
ssl profile self-signed
 attach primary-certificate self-signed
 attach private-key self-signed
!
forward-proxy fp1
 service http
  response-timeout 5
  keepalive-timeout 10
 attach virtual-ip vipInternet1
 attach virtual-ip vipInternet2
 attach virtual-ip vipInternet3
 admin-status online
!
virtual-ip base vipbase_web1
 service http
  keepalive-timeout 5
 admin-status online
!
virtual-ip vipInternet1
 ip range 0.0.0.0 9.255.255.255 80
 base vipbase_web1
!
virtual-ip vipInternet2
 ip range 11.0.0.0 192.0.2.9 80
 base vipbase_web1
```

```
!
virtual-ip vipInternet3
 ip range 192.0.2.11 255.255.255.255 80
 base vipbase_web1
!
ssh
 allow from 10.10.0.0/24
 allow to 10.10.10.10 22
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
certificate self-signed
 ! Cert data not shown in brief output
!
key self-signed
 ! Key data not shown in brief output
```

Configuring a Reverse Proxy

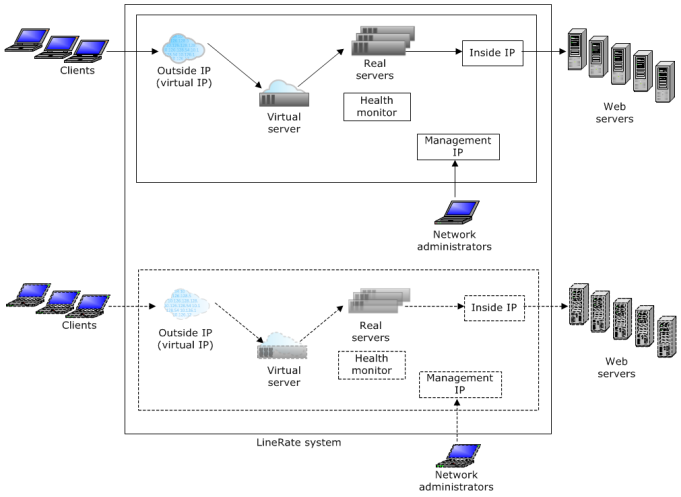
Overview

The F5® LineRate® system provides a full-proxy front-end to the web and secure web services on back-end servers of the application. As a full proxy, F5® LineRate® provides a logical front-end to the client's connection to the web and secure web services of the application.

More about Reverse Proxies

To successfully manage load, health, and availability of the application, F5® LineRate® constantly monitors the traffic flows from the client to the back-end servers to ensure the delivery of the application services. F5® LineRate® provides several discrete services including health monitoring, transaction statistics, and traffic management to ensure balanced usage of back-end servers and rapid clients service.

The diagram below shows a basic F5® LineRate® configuration for a load balancing use case. You can have multiple load balancer configurations in the F5® LineRate® software, as shown by the second configuration in the diagram. Clients access the virtual IP, which goes through a virtual server. Based on the load balancing algorithm set in the virtual server, it passes client requests through the real servers and the inside IP address to the web servers.



LineRate system with two load balancer configurations

What's Next

After determining that you want to configure a reverse proxy, you are ready to configure the data interfaces. See Configuring Data Interfaces.

Configuring Data Interfaces

Overview

An initial, basic configuration includes the following key functions:

- Configuring the data interfaces
- Configuring the default route (gateway)

Configuring the Data Interfaces

The F5® LineRate® software supports both IPv4 and IPv6.

The recommended configuration for performance and security reasons is to configure IP addresses on at least two interfaces.

For general information about the IP addresses and formats, see Configuring the Management Interface.

Note: For virtual environments, all interfaces are configured by default to obtain their IP address via DHCP and to set the system default route with the lowest numbered DHCP-enabled interface. Because the proxy configuration depends on the IP address of the "outside" data interface, you likely want to disable DHCP for that interface and assign a static IP address.

In this example, we are configuring two data interfaces as shown in the diagram in Configuring Load Balancing:

- Outside for the virtual IP (on em1)—192.0.2.1/24
- Inside to web servers (on em2)—10.1.2.1/24

To configure the data interfaces:

1. Type:
   show interfaces
   - A list of all interfaces on the system displays. It is possible for the system to have an interface that F5® LineRate® cannot detect.
   - The first line is the interface name and its status. The interface name is based on the driver for the interface type. The remaining lines list the information available about the interface (typically, manufacturer, model, MAC address, speed in kilobits, and more).
   - Below are the names used for some common interfaces:
     - em—Intel 1Gb interface
     - igb—Intel 1Gb interface
     - bce—Broadcom 1Gb interface
     - ix—Intel 10 Gb interface
     - oce—Emulex 10 Gb interface
     - xn—Xen netfront interface (used by Amazon EC2)
     - lo—Loopback interface (internal interface)
     - po—Port channel interface

2. Type:
   configure
3. Type:
   interface em1
4. Type:
   ip address 192.0.2.1/24
5. Type:
   interface em2
6. Type:
   ip address 10.1.2.1/24
7. To check the interface settings, type:
   show interfaces

```
em0 is up, line protocol is up
Hardware is Intel82540EM, address is 0800.279e.0b3a
 Internet address is 10.10.10.10/24, broadcast is 10.10.10.255 (static)
...
em1 is up, line protocol is up
Hardware is Intel82540EM, address is 0800.27bc.5b47
Internet address is 192.0.2.1/24, broadcast is 192.0.2.255 (static)
...
em2 is up, line protocol is up
Hardware is Intel82540EM, address is 0800.2738.ce7e
Internet address is 10.1.2.1/24, broadcast is 10.1.2.255 (static)
...
```

8. Type:
   write

Configuring the Default IP Route (Gateway)

You should also configure the default IP route (gateway). You can configure additional static IP routes, as needed, to permit access to your networks.

For general information about the IP addresses and formats, see Configuring the Management Interface.

To configure the default IP route:

1. Type:
   configure
2. Type:
   ip route 0.0.0.0/0 192.0.2.2
3. To check the default route setting, type:
   show ip route
4. If you configured IPv6, use this command:
   show ipv6 route

```
Codes: C - connected, S - static

Gateway of last resort is 192.0.2.2 to network 0.0.0.0

S     0.0.0.0/0 via 192.0.2.2, em0, MTU 1500
C     10.0.2.0/24 is directly connected, em0, MTU 1500
C     10.0.3.0/24 is directly connected, em1, MTU 1500
C     10.0.4.0/24 is directly connected, em2, MTU 1500
C     10.1.2.0/24 is directly connected, em2, MTU 1500
C     192.0.2.1/24 is directly connected, em1, MTU 1500
C     10.200.0.1/24 is directly connected, em0, MTU 1500
```

5. Type:
   write

Data Interfaces Example

After configuring the data interfaces as described above, you can use the **show run** command to see the configuration. We have annotated the example command output below. Comment lines start with an exclamation mark (!).

```
LROS(config)# show run
Building configuration...

!
! Hostname setting.
!
hostname example-host
!
```

```
! Default user name and encrypted password.
!
username admin
 secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/QeaZH8WnWRzVEkPt0MgS"
 uid 2000
!
interface em0
 ip address dhcp
 ip address 10.200.0.1 255.255.255.0
!
! IP address configured on the interface called em1 for data.
!
interface em1
 no ip dhcp client request routrer
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
! IP address configured on the interface called em2 for data.
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.1 255.255.255.0
!
! Default route configured for a router at 192.0.2.2.
!
ip route 0.0.0.0/0 192.0.2.2
!
! Default SSL configuration. See Configuring SSL.
!
ssl profile self-signed
 attach primary-certificate self-signed
 attach private-key self-signed
!
! SSH configuration to limit access to the F5® LineRate® system.
!
ssh
 allow from 10.200.0.0/24
 allow to 10.200.0.1 22
!
! Default REST server configuration.
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
! Default certificate and key called self-signed. For information about certificates,
    see Configuring SSL.
!
certificate self-signed
 pem-format
-----BEGIN CERTIFICATE-----
```

```
MIIDOjCCAiKgAwIBAgIJAPm1YLOdNan3MA0GCSqGSIb3DQEBBQUAMBwxGjAYBgNV
BAMTEWxyb3MtZGVmYXVsdC1ob3N0MCAXDTEyMDMyNzEwMDczN1oYDzIyODYwMTEw
MTAwNzM3WjAcMRowGAYDVQQDExFscm9zLWRlZmF1bHQtaG9zdDCCASIwDQYJKoZI
hvcNAQEBBQADggEPADCCAQoCggEBAL4QCxbazhzBnPW4GHBQebKWRVax9khfPpWp
+YbJztXo1weTcXHvRuhEsmTkvDdJTkgoWgdOvGBPblrYiBXivkNo9eC6oBkzuW0T
gY6XjR6p4AFSMkRDh3RCIfxC2s7lSANjYe15BkcibMeak6/4BxFIF12XNQxjR64Z
pJ5NM8ygc4SM8dkB7kUe5FTg4xEi+DR9/TZqZ1y/3lTa+atW/On7nLcgB7z/m1hk
mp8NCdw4xzNCbIJdX5WG1dbIbFD8uOsPoHyoGUtdYJ9exDCuAgX3xRU5Ll87fT3x
WUz5xw13zZ7NrrAaCG8h6ugfLNKPkxi28tL+TNZHzDPFbyeNiMUCAwEAAaN9MHsw
HQYDVR0OBBYEFO61P0Y4qwK3WC20wP2kDNbZ8X18MEwGA1UdIwRFMEOAFO61P0Y4
qwK3WC20wP2kDNbZ8X18oSCkHjAcMRowGAYDVQQDExFscm9zLWRlZmF1bHQtaG9z
dIIJAPm1YLOdNan3MAwGA1UdEwQFMAMBAf8wDQYJKoZIhvcNAQEFBQADggEBAHUm
y8HavCdrjabf2Ajs1TX87zeZmR0RYkezL/feZ+xri+DDHal+uJMu0DUpPpoR0YyI
jorz6t79uq1DT8jGCalLjjiCvr6E2Sz0cXJ2aKE45eu4GMuMz/ohczm0LyexP01J
gqfp8Q5cvr/xQik8eLpxgCIjZ0188e8OQRNetwgzbi579bjkKglLCJfjQZE9ot14
0Pmz5DG1QtCClOA0Ppdz7y+P1PLNwpRxKN0cjl6fH1P9qeZvBoDPp6X72nMEOknl
eT2JxS0Vofyp9rDlGVusuP1EFzM/BCh/dHq4SMmHuQqgc/dzCJruLrztj/hgGXKk
PK7/nxRt+C72hde2OaU=
-----END CERTIFICATE-----
quit
!
key self-signed
 pem-format
-----BEGIN RSA PRIVATE KEY-----
MIIEowIBAAKCAQEAvhALFtrOHMGc9bgYcFB5spZFVrH2SF8+lan5hsnO1ejXB5Nx
ce9G6ESyZOS8N0lOSChaB068YE9uWtiIFeK+Q2j14LqgGTO5bROBjpeNHqngAVIy
REOHdEIh/ELazuVIA2Nh7XkGRyJsx5qTr/gHEUgXXZc1DGNHrhmknk0zzKBzhIzx
2QHuRR7kVODjESL4NH39NmpnXL/eVNr5q1b86fuctyAHvP+bWGSanw0J3DjHM0Js
gl1flYbV1shsUPy46w+gfKgZS11gn17EMK4CBffFFTkuXzt9PfFZTPnHDXfNns2u
sBoIbyHq6B8s0o+TGLby0v5M1kfMM8VvJ42IxQIDAQABAoIBAGXakSbJUWWFuIjS
BH7EEcPL1hLUwggcypxH/8nlAmwOIJYVxNjrAtPcZMG+9sKmDUaMIVsDLd5rEteq
bJtV7OKRMBsjyEJZPsieiHKS8vR40uvCUd/VVJTQEAhxB3OS2dm++67Yia27XBJH
21eVEqyHNsZYDvy5g6NgaKDQ/K5ubCfpkXji9OKfT8AGFR6kKPra1oG1w+YUR8qh
F7H4o9yo+Adr0un2QZOKowG7mwmTE7L4a4nIfS09sFeNKYDW0hohp2qrX6HY/HJd
2iy1SuUUzfWGuqYVwAUQKz9UvuqezK2H3xnP/S//gDUWJZ+lXmMKx38j+gFxqBld
RxRcxs0CgYEA9xXNtlvEqg17vfm+vh84loV3MTypYpCq3RRND+yqwyZdAdzaie4Z
nEt1H7V/ry5HmaH4XTXKer3X3SWJIdbZeNXmcZnatZi2XqVmhhmCMR0rHXuwA4GA
qMlCwOwZS1N2tJxGwmkHC5lGy6J21TL68PQIafeAYrBl3zW330W+I78CgYEAxOuN
gODEx4/8pHvgjlq+wlgbA5oXDCGTDlY0Kt9RcPgwjnkQtW7KY3slGDrfPdIWfSRj
tNNTsqUA4cfxF9yWykFC+aifUfn6lutHrq5SUAc/heoatvL7XAMlVQnHltqYinZL
rDOat7wkby2WIQPZbXKOojWcVLf5DND/E0y0pHsCgYAgjyL4cMdNkVFJC2vzKbIP
Q68dMd0wO9gIIfC1tH4cESYYZL33hwSg7+CTORuGPhb5S7qqrbfszK9xWMzlRKaL
ocQoHBoR6/m8JxeHfD0Hs8xGqlHbZGlL1JmTSolav7jYu+8nFyfyg1Qs6U+3cGxY
7A9fx1mHp68E5tM//LS9iQKBgQCEWtJcKjb47wVfRMfUxpdqpq9Zh2swQyzFORmN
K1Zg+OAiEqsxV0r+/FkdZQyBT8C/0gKWGmgqLY9fMfURFbngLWcnyLd08PEGGROw
DAjVM1n11zineL+Lw62G77DP6xMWFZadIn4+Ol2+wEQk4qJ0VsgZrLDrnE/v1lVr
kmXkGwKBgHUodQ38HGIdAw+XUDksvvjs+TGVHkGXj4B2r4YlWUEIYV/kEEHlVxDX
+KR//WjiMrt1o3cmILMrQLOEX4NFTh0kmzYGTc+4BiE1Y2krxEqxyVYou+iDITCz
2oA1A+w/eMlx4CwZr8HeV6U2kdtx/nEvWpadImNLvkx6GXdRT3e/
-----END RSA PRIVATE KEY-----
quit

example-host(config)#
```

What's Next

After configuring the data interfaces, you are ready to configure load balancing. See Configuring Load Balancing.

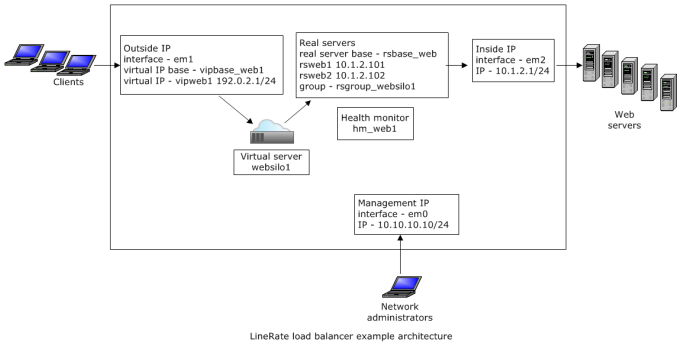
Configuring Load Balancing

Overview

The figure below shows a very simple example load balancing architecture, with all of the basic elements you need. It includes the specific names and IP addresses that we use throughout the rest of this section.

This example architecture assumes the following:

- The system has three physical interfaces.
- The architecture uses two real servers.
- You have two web servers.



LineRate load balancer example architecture

The remainder of this section walks through how to create this architecture with the F5® LineRate® software.

Configuring a Virtual IP Address

The load balancer requires at least one virtual IP address. The virtual IP address is a configuration object that represents the outside interface that clients connect to. In this example, we will configure one virtual IP, but you can configure more, depending on your needs.

To configure a virtual IP address, complete the following tasks:

- Create a virtual IP base.
- Create a virtual IP.

Creating a Virtual IP Base

We recommend creating one or more virtual IP bases. For general information about bases in F5® LineRate®, see Working with Bases. A base lets you configure the most common settings that you want for your virtual IPs.You can also create more than one virtual IP base for settings that you need to be different or more specific for some virtual IPs.

In this example, we are creating a single virtual IP base called vipbase_web1. We recommend giving each virtual IP base a meaningful name that helps identify the base. For example, you might use the application type (such as serving similar web content) or security settings (such as SSL) in the name.

To create an example virtual IP base:

Step	Command	Description
1	`configure`	Puts F5® LineRate® into configure mode.
2	`virtual-ip base vipbase_web1`	Names the base vipbase_web1.
3	`admin-status online`	Brings the virtual IP online, so it is ready for use.
4	`service http`	Sets the service type to HTTP for layer 7 load balancing of web traffic.
5	`keepalive-timeout 5`	Sets the keepalive timeout to 5 seconds. This is the time the system waits for a specific client to send a request before closing the connection, reclaiming connection resources. For most use cases, this setting will affect the number of simultaneous connections that the system will have open. A lower setting will

Step	Command	Description
		usually result in fewer simultaneous open connections. A good rule of thumb is to set this number no higher than 500,000 divided by the number of expected connections per second at peak load. For example, if the load balancer is expected to process up to 100,000 connections per second, 500,000 divided by 100,000 is 5. So the setting should be 5 seconds in this example.

Creating a Virtual IP

Note: Be sure that you also configure the same IP address on an interface as described in Configuring Data Interfaces.

After creating the virtual IP base, you can create a virtual IP. We recommend giving each virtual IP a meaningful name that helps identify the virtual IP. For example, you might use the application or service type (such as serving similar web content) or security settings (such as SSL) in the name.

For this example, we are using the IP address of the outside interface (em1) that we configured already to create the virtual IP, and we are using the virtual IP base we already created. You must also include the TCP port number on which the clients will contact the load balancer.

To create a virtual IP:

1. Type:
   configure
2. Type:
   virtual-ip vipweb1
3. Type:
   base vipbase_web1
4. Type:
   ip address 192.0.2.1 443
5. Type:
   show run brief

```
...
virtual-ip base vipbase_web1
 service http
  keepalive-timeout 5
 admin-status online
!
virtual-ip vipweb1 ip 192.0.2.1 443 base vipbase_web1
...
```

Note: Notice how with having set just the base and IP address (and port), the show run brief output lists the virtual IP on just one line. This lets you review a long list of virtual IPs to find differences or patterns in names and IP addresses.

5. Type:
   `write`

Configuring a Health Monitor

A health monitor can monitor multiple real servers. The health monitor for web servers (HTTP) opens a connection to the web server, sends an HTTP request to the web server for something (possibly a specific web page), looks at the response, and determines if the response is correct. The configuration settings on the health monitor object determine what to request from the web server and what the response should be.

In this example, we are creating a single health monitor called hm_web1. We recommend giving each health monitor a meaningful name that helps identify the health monitor. For example, you might use the application or service (such as serving similar web content) or how you are monitoring in the name.

To create an example of the health monitor:

Step	Command	Description
1	**`configure`**	Puts F5® LineRate® into configure mode.
2	**`health-monitor hm_web1`**	Names the health monitor hm_web1.
3	**`interval 5`**	Sets the health monitor to start a health check every 5 seconds.
4	**`timeout 1`**	Sets the timeout to 1 second. The health monitor will determine an individual health probe to fail if it does not respond within this time. One use of this setting is to test the server's response time.
5	**`server-down "8/10"`**	Sets the threshold for marking the server DOWN to the failure of 8 out the last 10 health probes. If the health probe fails 8 out of the last 10 times, the system takes the server offline.
6	**`server-up "9/10"`**	Sets the threshold for marking the server UP to the success of 9 out the last 10 health probes. If the health

Step	Command	Description
		probe succeeds 9 out of the last 10 times, the system puts the server back online.
7	**`type http`**	Sets the health monitor type to HTTP for web use.
8	**`request-method GET`**	Sets the type of request the health monitor will send to a GET request.
9	**`request-target "/health.html"`**	Sets the specific web page that the health monitor will request. If the health monitor is able to retrieve the page, receiving a `200 OK` response from the server, the server's health probe is deemed successful.
10	**`admin-status online`**	Brings the health monitor online, so it is ready for use.

Configuring Real Servers

Real servers are another required configuration object of the F5® LineRate® load balancer. Real servers represent and point to actual web servers that the load balancer is distributing client requests to.

To configure real servers, complete the following tasks:

- Create a real server base.
- Create a real server.

Creating a Real Server Base

We recommend creating one or more real server bases. For general information about bases in F5® LineRate®, see Working with Bases. A base lets you configure common settings that you want for your real servers. You can also create more than one real server base for settings that you need to be different for some real servers.

In this example, we are creating a single real server base called rsbase_web. We recommend giving each real server base a meaningful name that helps identify how the base will be used. For example, you might use the application type (such as serving similar web content), hardware capabilities (such as CPU or memory), or security settings (such as SSL) in the name.

To create an example of the real server base:

Step	Command	Description
1	`configure`	Puts F5® LineRate® into configure mode.
2	`real-server base rsbase_web`	Names the base rsbase_web.
3	`max-connections 1000`	Sets the maximum connections to the real server at 1000. F5® LineRate® will not open more than 1000 connections to any server.
4	`admin-status online`	Brings the real server online, so it is ready for use.
5	`attach health-monitor hm_web1`	Attaches a health monitor called hm_web1. See Configuring a Health Monitor.
7	`service http`	Sets the service type to HTTP, which sets this real server to be compatible with layer 7 load balancing, for web use. The service setting on a real server must match the service setting on any virtual server to which the real server is attached.
8	`keepalive-timeout 10`	Sets the keepalive timeout of the HTTP service to 10 seconds. If there are no requests that get sent to a connection for 10 seconds, the load balancer closes the connection to the server, reclaiming resources. This can help avoid problems that some web servers have when connections are kept open indefinitely.
9	`response-timeout 60`	Sets the response-timeout of the HTTP service to 60 seconds. The load balancer closes the connection if the HTTP server takes longer than 60 seconds to respond to a request. Consider the amount of time the web server takes to respond to any request. The response-timeout on the load balancer must always be configured to be higher than the amount of time it takes for any of the web servers to respond to a request.
10	`response-idle-timeout 60`	Sets the response-idle-timeout of the HTTP service to 60 seconds. The load balancer closes the connection if it takes longer than 60 seconds either to receive any part of the response from the HTTP server or to transmit any part of the response to the client. Consider the size of a typical response for your application as well as the user environment to set this value. For example, an application where users

Step	Command	Description
		download HD videos using mobile devices would need longer timeout than simple web pages due to mobile bandwidth and device processing limitations.

Creating Real Servers

After creating the real server base, you can create a real server. We recommend giving each real server a meaningful name that helps identify the real server. For example, you might use the application type (such as serving similar web content), hardware capabilities (such as CPU or memory), or security settings (such as SSL) in the name.

In this example, we are creating two real servers (rsweb1 and rsweb2) that inherit properties from our real server base and assigning them the IP addresses of two actual web servers. You must also include the TCP port number on which the load balancer will contact the server.

To create real servers:

1. Type:
   configure
2. Type:
   real-server rsweb1
3. Type:
   base rsbase_web
4. Type:
   ip address 10.1.2.101 8080
5. Type:
   real-server rsweb2
6. Type:
   base rsbase_web
7. Type:
   ip address 10.1.2.102 8080
8. Type:
   show run brief

```
real-server base rsbase_web
 max-connections 1000
 service http
  response-timeout 60
  response-idle-timeout 60
  keepalive-timeout 10
attach health-monitor hm_web1
admin-status online
!
```

```
real-server rsweb1 ip 10.1.2.101 8080 base rsbase_web
real-server rsweb2 ip 10.1.2.102 8080 base rsbase_web
...
```

Notice how with having set just the base and IP address (and port), the show run brief output lists the real-servers on just one line. This lets you review a long list of real-servers to find differences or patterns in names and IP addresses.

9. Type:
   `write`

Creating a Real Server Group

You can use real server groups create logical groups of real servers. A real server can be a member of multiple groups. You can use the groups to show information about the real servers or to attach the group to a virtual server for load balancing.

We recommend giving each real server group a meaningful name that helps identify the group use. For example, you might set up a real server group based on the application, floor location (all servers in a specific rack), or data center (all servers in data center).

In this example, we are creating a real server group (rsgroup_websilo1) and are adding the two real servers we already created, using a regular expression. We will then attach this real server group to a virtual server.

To create a real server group:

1. Type:
   `configure`
2. Type:
   `real-server group rsgroup_websilo1`
3. Type:
   `members by regex "rsweb.*"`
4. Type:
   `write`

Configuring a Virtual Server

Each load balancing (reverse proxy) configuration requires at least one virtual server. The virtual server is a configuration object that acts as a reverse proxy and ties together one or more virtual IPs and real servers. You also set the load balancing algorithm on the virtual server.

We recommend giving each virtual server a meaningful name that helps identify the server use. For example, you might name a virtual server based on the application and the resources that the virtual server is load balancing traffic to (real servers).

In this example, we are creating a virtual server and are attaching the virtual IP and real server group to it. We will also set the load balancing algorithm.

To create a virtual server:

1. Type:
   configure
2. Type:
   virtual-server websilo1
3. Type:
   attach virtual-ip vipweb1 default
4. Type:
   attach real-server group rsgroup_websilo1
5. Type:
   lb-algorithm round-robin
6. Type:
   service http
7. Type:
   show run brief

   ```
   ...
   virtual-server websilo1
    lb-algorithm round-robin
    service http
    attach virtual-ip vipweb1 default
    attach real-server group rsgroup_websilo1
   ...
   ```
8. Type:
   write

Load Balancing Example

After configuring load balancing, as described above, you can use the **show run brief** command to see the configuration. We have annotated the load balancing configuration in the example command output below. Comment lines start with an exclamation mark (!).

```
example-host(config)# show run brief
Building configuration...
!
hostname example-host
```

```
!
username admin
 secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/QeaZH8WnWRzVEkPt0MgS"
 uid 2000
!
interface em0
 ip address dhcp
 ip address 10.10.10.10 255.255.255.0
!
interface em1
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.1 255.255.255.0
!
ip route 0.0.0.0/0 192.0.2.2
!
! Health monitor and its configuration.
!
health-monitor hm_web1
 interval 5
 timeout 1
 server-down "8/10"
 server-up "9/10"
 type http
   request-method GET
   request-target "/health.html"
 admin-status online
!
! Default SSL configuration. See Configuring SSL.
!
ssl profile self-signed
 attach primary-certificate self-signed
 attach private-key self-signed
!
! Real server base and its configuration.
!
real-server base rsbase_web
 admin-status online
 max-connections 1000
 service http
 response-timeout 60
r esponse-idle-timeout 60
 keepalive-timeout 10
 attach health-monitor hm_web1
!
! Real servers showing their names, IP addresses, and base in a single line.
!
real-server rsweb1 ip 10.1.2.101 8080 base rsbase_web
real-server rsweb2 ip 10.1.2.102 8080 base rsbase_web
```

```
!
! Virtual IP base and its configuration.
!
virtual-ip base vipbase_web1
 service http
   keepalive-timeout 5
 admin-status online
!
! Virtual IP showing its name, IP address, and base in a single line.
!
virtual-ip vipweb1 ip 192.0.2.1 443 base vipbase_web1
!
! Real server group showing the regular expression used for group members.
!
real-server group rsgroup_websilo1
 members by regex "rsweb.*"
!
! Virtual server and its configuration.
!
virtual-server websilo1
 lb-algorithm round-robin
 service http
 attach virtual-ip vipweb1 default
 attach real-server group rsgroup_websilo1
!
ssh
 allow from 10.10.0.0/24
 allow to 10.10.10.10 22
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
certificate self-signed
! Cert data not shown in brief output
!
key self-signed
! Key data not shown in brief output
example-host(config-vserver-http:websilo1)#
```

What's Next

After you configure the load balancer, you can test the load balancer (Monitoring and Troubleshooting Load Balancing) or add security by configuring SSL (Configuring SSL).

Monitoring and Troubleshooting Load Balancing

Overview

This section provides a few possible errors you might encounter while setting up a load balancing or SSL offload use case and how to resolve those issues.

Solutions

Seeing "404 Not Found" errors when attempting to access a new virtual server, but real-server logs do not show any error_log messages that match

The most common issue surrounding 404 errors, especially with a new virtual server, is a missing "default" virtual IP for the virtual server.

When the virtual server is using the service type HTTP, the virtual server parses the HTTP request headers and looks for a hostname match to a given virtual server. If no hostname match is found, the proxy will respond to the client with a 404 error and not pass the request to the real server. This will also happen with requests that request the URL with the IP address of the virtual IP and not using an FQDN.

For example, the following virtual server has a hostname set and no default virtual IP for requests.

```
!
virtual-server vs1
 service http
  tcp-multiplex
  hostname www.f5.com
 attach virtual-ip vip1
 attach real-server group reals
!
```

When a request is made to the IP address of the virtual-ip we receive a "404 Not Found" message:

```
curl 201.0.50.1:8080/
<html><head><title>Status 404 Not Found</title></head><body><h1>Status 404 Not
   Found</h1></body></html>
```

If we append the Host: header to the request using our defined hostname, the error goes away:

```
curl 201.0.50.1:8080/ -H "Host: www.f5.com"
<html>
<head>
<title>Welcome to the virtual-server!</title>
</head>
<body bgcolor="white" text="black">
<center><h1>Welcome to the virtual-server!</h1></center>
</body>
</html>
```

Similarly, if we use a Host: header name that is not defined for the virtual server, we will get a 404 error:

```
curl 201.0.50.1:8080/ -H "Host: www.f5something.com"
<html><head><title>Status 404 Not Found</title></head><body><h1>Status 404 Not
   Found</h1></body></html>
```

Attaching the virtual IP with the "default" setting will allow all of these unmatched requests to be proxied to the back-end real servers.

```
!
virtual-server vs1
 service http
  tcp-multiplex
  hostname www.f5.com
 attach virtual-ip vip1 default
 attach real-server group reals
!
```

These 404 response codes can be monitored on the system with SNMP or viewed from the CLI. The load-balancer statistics are where we can find the current count of HTTP internal response codes, as none of these will match a defined virtual server:

lrs01# show load-balancer statistics detailed
    <output omitted>
        httpInternalResp404: 6

Seeing "502 Bad Gateway" error messages when attempting to access a virtual server

The most common issue surrounding 502 errors, especially with a new virtual server, is when the real servers are either marked down with a failed health monitor or their admin status is set to offline. The default setting for a new real server base is admin status offline.

Check the real servers to make sure they are all in admin status online.

```
lrs01# show real group reals
reals Group Members
Name  Address     Port  Svc   Admin    Health  Conns  Rx Mbps  Tx Mbps
-------------------------------------------------------------------
rs1   201.0.51.1  8080  http  offline  up      0      0.0      0.0
rs2   201.0.51.2  8080  http  offline  up      0      0.0      0.0
rs3   201.0.51.3  8080  http  offline  up      0      0.0      0.0
rs4   201.0.51.4  8080  http  offline  up      0      0.0      0.0
rs5   201.0.51.5  8080  http  offline  up      0      0.0      0.0
```

If the real servers are offline, change their real server base to admin status online or edit each real server individually to set the admin status online.

Check the real servers to make sure they are all passing their health monitor checks and are marked as "up."

```
lrs01# show real group reals
reals Group Members
Name  Address     Port  Svc   Admin   Health  Conns  Rx Mbps  Tx Mbps
-------------------------------------------------------------------
rs1   201.0.51.1  8080  http  online  down    0      0.0      0.0
rs2   201.0.51.2  8080  http  online  down    0      0.0      0.0
rs3   201.0.51.3  8080  http  online  down    0      0.0      0.0
rs4   201.0.51.4  8080  http  online  down    0      0.0      0.0
rs5   201.0.51.5  8080  http  online  down    0      0.0      0.0
```

Check the health monitor settings to make sure that the configuration is correct and that the request target is available on each of the real servers.

```
lrs01# show real group reals
reals Group Members
Name  Address     Port  Svc   Admin   Health  Conns  Rx Mbps  Tx Mbps
-------------------------------------------------------------------
rs1   201.0.51.1  8080  http  online  up      0      0.0      0.0
rs2   201.0.51.2  8080  http  online  up      0      0.0      0.0
```

Seeing "couldn't connect to host" error messages when attempting to access a virtual server

The most common issue surrounding "couldn't connect to host" error messages is when the virtual IP is admin status offline. The default setting for a virtual IP base is admin status offline.

Check your virtual IP or virtual server to make the virtual IP is online:

```
lrs01# show virtual-server vs1
Configuration
  LB Algorithm:             round-robin
  Service Type:             http
  Real Server Groups:
    Name                    Weight
    reals                   1 (default)
  Real Servers:
    <none>
  Virtual IPs:
    Name                    Address     Port Svc  Admin
    vip1                    201.0.50.1  8080 http offline
```

Make sure your virtual IP base or virtual IP is set to admin status online:

```
!
virtual-ip vip1
 ip address 201.0.50.1 8080
 admin-status offline
!
```

Some of my real servers may be more heavily loaded than others. How can I see this?

Use a real server group and **`show real group <name>`** to get all of the traffic and connection distribution counts for each real server.

```
!
real-server rs1 ip 201.0.51.1 8080 base rsb
real-server rs2 ip 201.0.51.2 8080 base rsb
real-server rs3 ip 201.0.51.3 8080 base rsb
real-server rs4 ip 201.0.51.4 8080 base rsb
real-server rs5 ip 201.0.51.5 8080 base rsb
!
real-server group reals
 members by regex "rs.*"
!
```

```
lrs01# show real group reals
reals Group Members
Name  Address     Port  Svc   Admin   Health  Conns  Rx Mbps  Tx Mbps
------------------------------------------------------------------------
rs1   201.0.51.1  8080  http  online  up      2      87.0     0.2
rs2   201.0.51.2  8080  http  online  up      2      87.0     0.2
rs3   201.0.51.3  8080  http  online  up      2      87.1     0.2
rs4   201.0.51.4  8080  http  online  up      2      87.0     0.2
rs5   201.0.51.5  8080  http  online  up      2      86.9     0.2
```

If you do not have real server groups, use the **show real-server <name> statistics detailed** command for each real server and look at the connections opened rates and total opened to see if the connections are distributed appropriately.

Configuring SSL

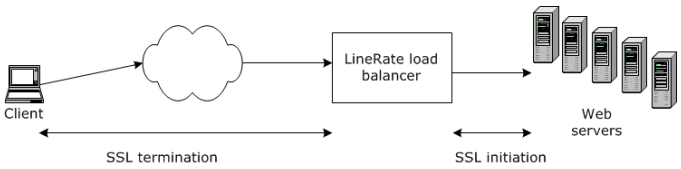
Secure Sockets Layer (SSL) and Transport Layer Security (TLS) are closely related technologies that provide communication security over an insecure network, such as the Internet. TLS is a standardized protocol, defined by IETF RFCs, and is the successor to the non-standardized SSL protocol. The F5® LineRate® software supports both TLS and SSL, for both service type TCP and service type HTTP, but the system and documentation refers to both protocols collectively as "SSL," following the most common industry terminology.

SSL Types Supported in the F5® LineRate® Software

The F5® LineRate® software supports two types of SSL connections:

- SSL termination—SSL connection from the client to the F5® LineRate® load balancer.
- SSL initiation—SSL connection from the F5® LineRate® load balancer to the web server.

The diagram below shows the two types of SSL.



SSL configuration in LineRate

By using the SSL termination feature in F5® LineRate®, you can move the computationally intensive SSL processing off your web servers and onto F5® LineRate®, allowing your web servers to concentrate on performing application tasks. Or, if your application requires greater security on your internal network, you can use SSL initiation together with SSL termination to provide end-to-end SSL security, while still allowing the F5® LineRate® to do full layer 7 load balancing.

For more information, see Managing SSL.

SSL Termination

Before beginning to set up SSL termination, you will need the following:

- Primary certificate file that identifies the website you wish to set up on the F5® LineRate® system
- Private key file that corresponds to the primary certificate
- Chain certificate files (also called intermediate certificates) that correspond to the primary certificate are only required if their primary certificate uses them.

To set up SSL termination, you must complete the following tasks:

1. Set up the private key.
2. Set up certificates.
3. Configure SSL on the virtual IP.

Setting Up the Private Key for SSL Termination

You set up a private key object to correspond to each primary certificate you need. The system supports using one private key to generate more than one primary certificate and the use of separate private keys for individual primary certificates.

You need access to your private key file. The F5® LineRate® software supports keys in PEM format.

Best Practices:

- Configure primary certificates and corresponding keys for each cipher type that clients may use, then attach the configured certificate/key pairs to the SSL profile. For example, for clients that support ECC or RSA ciphers, you may want to configure and attach both RSA and ECC certificates and keys.
- Give each key a meaningful name that helps identify the key. For example, you might use the domain name or security settings in the name.

In this example, we will create a key object in the configuration, give it a name (key_secure.example.com), and paste the key text into it.

To set up the private key for SSL termination:

1. Open the private key file in a text editor and copy the text.
2. In another window, log in to F5® LineRate® using SSH.
3. Type:
   `configure`

4. Type:
   `key key_secure.example.com`
5. Type:
   `pem-format`
6. Paste the text from the private key file and press **Enter**.
7. Type:
   `quit`
8. Type:
   `write`

Note: When installing an SSL certificate on the F5® LineRate®, you must remove any passphrases from the certificate file.

When the system first starts the SSL web service, it cannot wait for user input to enter a passphrase before the services will start.

To remove a passphrase using openssl:

1. Make a copy of your SSL key file keeping the original intact.
2. Use openssl to enter the passphrase and output a new key file:
   `openssl rsa -in key.pem -out newkey.pem`
3. Use this new file newkey.pem as your SSL private key for upload into F5® LineRate®.

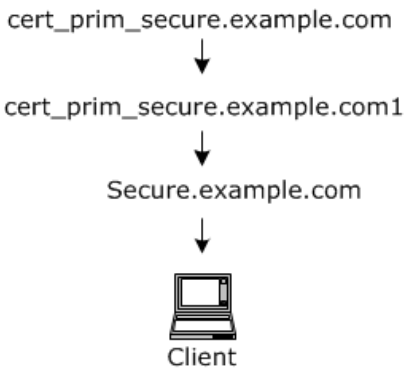
Setting Up Certificates for SSL Termination

To set up certificates, you must have access to your certificate files. The F5® LineRate® software supports PEM format certificates.

Best Practices:

- Give each certificate a meaningful name that helps identify the certificate. For example, you might use the domain name or security settings in the name.
- Configure primary certificates and corresponding keys for each cipher type that clients may use, then attach the configured certificate/key pairs to the SSL profile. For example, for clients that support ECC or RSA ciphers, you may want to configure and attach both RSA and ECC certificates and keys.

In this example, we will assume that your primary certificate only requires a single chain certificate. So we will create two certificate objects in the configuration, give them names (cert_prim_secure.example.com and cert_chain_secure.example.com1, as shown below), and paste the certificate text into them.



Certificate chain example

In this example, cert_prim_secure.example.com is the certificate that identifies the website "secure.example.com" and cert_chain_secure.example.com1 is the chain certificate required for that primary certificate. We have to create an SSL profile (ssl_prof_secure.example.com) and attach the private key, and the certificates to it. We then attach the SSL profile to the virtual IP. We recommend giving each profile a meaningful name that helps identify it. For example, you might use the domain name or security settings in the name.

Attaching an SSL profile to a virtual IP configures that virtual IP to always use SSL. It will no longer accept connections from clients unless they perform SSL negotiation.

Note: When installing an SSL certificate on the F5® LineRate®, you must remove any passphrases from the certificate file.

When the system first starts the SSL web service, it cannot wait for user input to enter a passphrase before the services will start.

To remove a passphrase using openssl:

1. Make a copy of your SSL key file keeping the original intact.
2. Use openssl to enter the passphrase and output a new key file:
   `openssl rsa -in key.pem -out newkey.pem`
3. Use this new file newkey.pem as your SSL private key for upload into F5® LineRate®.

To set up certificates for SSL termination:

1. Open the primary certificate file in a text editor and copy the text.
2. Type:
   `configure`
3. Type:
   `certificate cert_prim_secure.example.com`

4. Type:
   pem-format
5. Paste the text from the certificate file and press Enter.
6. Type:
   quit
7. Open the second certificate file in a text editor and copy the text.
8. Type:
   certificate cert_chain_secure.example.com1
9. Type:
   pem-format
10. Paste the text from the certificate file and press Enter.
11. Type:
    quit
12. Type:
    show cert brief

```
Certificate Subject Common Name (CN)
------------------------------------------------------------
cert_chain_secure.example.com1 Example Corp Intermediate CA
cert_prim_secure.example.com secure.example.com
self-signed lros-default-host
Certificate Bundle
-------------------------------------------
```

13. Type:
    write

Configuring SSL Termination

After you set up the private key and certificates you can create an SSL profile and attach it to a virtual IP.

In this example, cert_prim_secure.example.com is the certificate that identifies the website "secure.example.com" and cert_chain_secure.example.com1 is the chain certificate required for that primary certificate. We have to create an SSL profile (ssl_prof_secure.example.com) and attach the private key, and the certificates to it. We then attach the SSL profile to the virtual IP. We recommend giving each profile a meaningful name that helps identify it. For example, you might use the domain name or security settings in the name.

Attaching an SSL profile to a virtual IP configures that virtual IP to always use SSL. It will no longer accept connections from clients unless they perform SSL negotiation.

To configure SSL termination:

1. Type:
   configure

2. Type:
   ssl profile ssl_prof_secure.example.com
3. Type:
   attach key key_secure.example.com
4. Type:
   attach certificate cert_prim_secure.example.com
5. Type:
   attach chain-certificate cert_chain_secure.example.com1
6. Type:
   virtual-ip vipweb1
7. Type:
   attach ssl profile ssl_prof_secure.example.com
8. Type:
   show virtual-ip vipweb1

```
Configuration
 Address:       192.0.2.1:443   set locally
 Address Range: <unspecified>   default
 Admin Status:  online          default
 SSL Profile:   ssl_prof_secure.example.com   set locally
...
```

9. Type:
   show run brief

```
...
ssl profile ssl_prof_secure.example.com
 attach certificate cert_prim_secure.example.com
 attach key key_secure.example.com
 attach chain-certificate cert_chain_secure.example.com1
...
certificate cert_chain_secure.example.com1
! Cert data not shown in brief output
!
certificate cert_prim_secure.example.com
! Cert data not shown in brief output
!
certificate self-signed
! Cert data not shown in brief output
!
key key_secure.example.com
! Key data not shown in brief output
!
key self-signed
! Key data not shown in brief output
...
```

10. Type:
    write

Configuring SSL Initiation

In many cases, the default settings for SSL initiation work well.

In this example, we will set up the SSL initiation profile (ssl_prof_init1), using the defaults, and attach it to the real server base (rsbase_web). We recommend giving each profile a meaningful name that helps identify it. For example, you might use the security settings in the name.

Attaching an SSL profile to a real server configures that real server to always use SSL. If the web server is not configured to accept an SSL connection from the F5® LineRate® system, the system will not be able to send traffic to that web server.

To configure SSL initiation:

1. Type:
   configure
2. Type:
   ssl profile ssl_prof_init1
3. Type:
   real-server base rsbase_web
4. Type:
   attach ssl profile ssl_prof_init1
5. Type:
   show run brief
   ```
   ...
   real-server base rsbase_web
    max-connections 100
    idle-timeout 10
    service http
     response-timeout 60
     response-idle-timeout 60
     keepalive-timeout 10
    attach ssl profile ssl_prof_init1
    attach health-monitor hmweb
    admin-status online
   ...
   ```
6. Type:
   write

SSL Example

After configuring SSL, as described above, you can use the **`show run brief`** command to see the configuration. We have annotated the SSL configuration in the example command output below. Comment lines start with an exclamation mark (!).

```
example-host(config)# show run brief

Building configuration...
!
hostname example-host
!
username admin
 secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/QeaZH8WnWRzVEkPt0MgS"
 uid 2000
!
interface em0
 ip address dhcp
 ip address 10.200.0.1 255.255.255.0
!
interface em1
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.1 255.255.255.0
!
ip route 0.0.0.0/0 192.0.2.2
!
health-monitor hm_web1
 interval 5
 timeout 1
 server-down "8/10"
 server-up "9/10"
 type http
  request-method GET
  request-target "/health.html"
 admin-status online
!
! Default certificate configuration remains unchanged.
!
ssl profile self-signed
 attach certificate self-signed
 attach key self-signed
!
! Name of the SSL initiation profile we created.
!
```

```
ssl profile ssl_prof_init1
!
! Name of the SSL termination profile we created and the certificates and key
   configured.
!
ssl profile ssl_prof_secure.example.com
 attach certificate cert_prim_secure.example.com
 attach key key_secure.example.com
 attach chain-certificate cert_chain_secure.example.com1
!
! The real server shows the attached SSL initiation profile.
!
real-server base rsbase_web
 max-connections 1000
 service http
  response-timeout 60
  response-idle-timeout 60
  keepalive-timeout 10
 attach ssl profile ssl_prof_init1
 attach health-monitor hm_web1
 admin-status online
!
real-server rsweb1 ip 10.1.2.101 8080 base rsbase_web
real-server rsweb2 ip 10.1.2.102 8080 base rsbase_web
!
virtual-ip base vipbase_web1
admin-status online
service http
keepalive-timeout 5
!
! The virtual IP shows the attached SSL termination profile.
!
virtual-ip vipweb1
 ip address 192.0.2.1 443
 base vipbase_web1
 attach ssl profile ssl_prof_secure.example.com
!
real-server group rsgroup_websilo1
 members by regex "rsweb.*"
!
virtual-server websilo1
 lb-algorithm round-robin
 service http
 attach virtual-ip vipweb1 default
 attach real-server group rsgroup_websilo1
!
ssh
 allow from 10.200.0.0/24
 allow to 10.200.0.1 22
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
```

```
!
! The certificates and key we set up are listed, but the details do not display in the
   brief show output.
! The default certificate and key (self-signed) remain unchanged.
!
certificate cert_chain_secure.example.com1
! Cert data not shown in brief output
!
certificate cert_prim_secure.example.com
! Cert data not shown in brief output
!
certificate self-signed
! Cert data not shown in brief output
!
key key_secure.example.com
! Key data not shown in brief output
!
key self-signed
! Key data not shown in brief output
```

What's Next

After you have completed all the sections of *Configuring a Reverse Proxy*, you have a basic load balancing setup that uses SSL, as shown in Configuring Load Balancing.

For the complete configuration, see Complete Example Show Run Output.

Complete Example Show Run Output

Overview

This section provides a complete, annotated **`show run brief`** output of the whole configuration example in this guide. Lines starting with ! are annotations added to help explain the output.

Show Run Brief of Example Configuration

```
example_host(config)# show run brief

Building configuration...
!
! Hostname setting.
!
hostname example_host
!
! Default user name and encrypted password.
!
username admin
 secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/QeaZH8WnWRzVEkPt0MgS"
 uid 2000
!
! Default DNS configuration.
!
ip dns
 name-server 8.8.8.8 8.8.8.4.4
 admin-status online
!
! Phone home configuration.
phone-home
 userid "f5login" secret encrypted "B50EJk3UeN8=4"
!
! IP address configured on the interface called em0 for management access.
!
interface em0
 ip address dhcp
```

```
 ip address 10.110.10.10 255.255.255.0
!
! IP address configured on the interface called em1 for data.
!
interface em1
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
! IP address configured on the interface called em2 for data.
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.1 255.255.255.0
!
! Default route configured for a router at 192.0.2.2.
!
ip route 0.0.0.0/0 192.0.2.2
!
! Health monitor and its configuration.
!
health-monitor hm_web1
 interval 5
 timeout 1
 server-down "8/10"
 server-up "9/10"
 type http
  request-method GET
  request-target "/health.html"
 admin-status online
!
! Default certificate configuration remains unchanged.
!
ssl profile self-signed
 attach certificate self-signed
 attach key self-signed
!
! Name of the SSL initiation profile we created.
!
ssl profile ssl_prof_init1
!
! Name of the SSL termination profile we created and the certificates and key
   configured.
!
ssl profile ssl_prof_secure.example.com
 attach certificate cert_prim_secure.example.com
 attach key key_secure.example.com
 attach chain-certificate cert_chain_secure.example.com1
!
! Real server base and its configuration.
!
real-server base rsbase_web
 max-connections 1000
```

```
 service http
  response-timeout 60
  response-idle-timeout 60
  keepalive-timeout 10
 attach ssl profile ssl_prof_init1
 attach health-monitor hm_web1
 admin-status online
!
! Real servers showing their names, IP addresses, and base in a single line for each.
!
real-server rsweb1 ip 10.1.2.101 8080 base rsbase_web
real-server rsweb2 ip 10.1.2.102 8080 base rsbase_web
!
! Virtual IP base and its configuration.
!
virtual-ip base vipbase_web1
 service http
  keepalive-timeout 5
 admin-status online
!
! Virtual IP and its configuration.
!
virtual-ip vipweb1
 ip address 192.0.2.1 443
 base vipbase_web1
 attach ssl profile ssl_prof_secure.example.com
!
! Real server group showing the regular expression used for group members.
!
real-server group rsgroup_websilo1
members by regex "rsweb.*"
!
! Virtual server and its configuration.
!
virtual-server websilo1
 lb-algorithm round-robin
 service http
 attach virtual-ip vipweb1 default
 attach real-server group rsgroup_websilo1
!
! SSH configuration to limit access to the F5® LineRate® system.
!
ssh
 allow from 10.200.0.0/24
 allow to 10.200.0.1 22
!
! Default REST server configuration.
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
```

```
! The certificates and key we set up are listed, but the details do not display in the
   brief show output.
! The default certificate and key (self-signed) remain unchanged.
!
certificate cert_chain_secure.example.com1
! Cert data not shown in brief output
!
certificate cert_prim_secure.example.com
! Cert data not shown in brief output
!
certificate self-signed
! Cert data not shown in brief output
!
key key_secure.example.com
! Key data not shown in brief output
!
key self-signed
! Key data not shown in brief output
```

What's Next

Use the other sections of the Getting Started Guide to walk through this example configuration. Refer to the CLI Reference Guide for information about individual commands.

Configuring A/B Testing

Overview

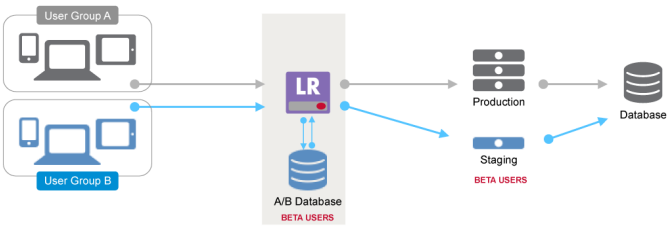
Testing new versions of a web application can be a challenge. Testing a staging environment using QA teams, test plans, and voluntary internal users is a great start. But even with excellent internal testing, many applications still encounter issues when the new version is deployed from staging to production. This often results in a painful rollback of the application or infrastructure change until fixes are available.

Using F5® LineRate®, you can take control of your application traffic, transparently directing a portion of your users or traffic to your staging environment. F5® LineRate® lets you easily increase or decrease the amount of traffic your staging environment receives as you gain confidence in your new application version.

The remainder of this example assumes you have configured the management interfaces already (Configuring Management Interfaces).

Steering Specific Users to Staging

With a short Node.js script, F5® LineRate® can enforce per-user steering decisions at the network level. In the example architecture diagram below, F5® LineRate® extracts the user's identity from a cookie in each request and then performs a high performance database lookup in a MySQL database to determine where to send the request. The script automatically populates the database with users as they use the application. The interaction with the MySQL database is provided by the open source mysql module from the Node.js community.



For additional details about how F5® uses F5® LineRate® to enforce user acceptance testing on its global intranet web applications, see the case study.

What's Next

This example will walk through creating a basic A/B testing configuration using Bugzilla. The example does not describe how to configure Bugzilla, but the script example uses a Bugzilla cookie to determine which system (production or staging environment) to send the client to.

Continue with Configuring Data Interfaces.

Configuring Data Interfaces

Overview

An initial, basic configuration includes the following key functions:

- Configuring the data interfaces
- Configuring the default route (gateway)

Configuring the Data Interfaces

The F5® LineRate® software supports both IPv4 and IPv6.

The recommended configuration for performance and security reasons is to configure IP addresses on at least two interfaces.

For general information about the IP addresses and formats, see Configuring the Management Interface.

Note: For virtual environments, all interfaces are configured by default to obtain their IP address via DHCP and to set the system default route with the lowest numbered DHCP-enabled interface. Because the proxy configuration depends on the IP address of the "outside" data interface, you likely want to disable DHCP for that interface and assign a static IP address.

In this example, we are configuring four data interfaces, one for each virtual IP, as shown in the diagram in Configuring Load Balancing:

- em1—192.0.2.1/24
- em2—192.0.2.2/24
- em3—192.0.2.3/24
- em4—192.0.2.4/24

To configure the data interfaces:

1. Type:
   show interfaces
   - A list of all interfaces on the system displays. It is possible for the system to have an interface that F5® LineRate® cannot detect.
   - The first line is the interface name and its status. The interface name is based on the driver for the interface type. The remaining lines list the information available about the interface (typically, manufacturer, model, MAC address, speed in kilobits, and more).
   - Below are the names used for some common interfaces:
     - em—Intel 1Gb interface
     - igb—Intel 1Gb interface
     - bce—Broadcom 1Gb interface
     - ix—Intel 10 Gb interface
     - oce—Emulex 10 Gb interface
     - xn—Xen netfront interface (used by Amazon EC2)
     - lo—Loopback interface (internal interface)
     - po—Port channel interface
2. Type:
   configure
3. Type:
   interface em1
   ip address 192.0.2.1/24
   interface em2
   ip address 192.0.2.2/24
   interface em3
   ip address 192.0.2.3/24
   interface em4
   ip address 192.0.2.4/24
4. To check the interface settings, type:
   show interfaces

```
em0 is up, line protocol is up
  Hardware is Intel82545EM, address is 000c.29e2.c3f2
  Internet address is 192.168.150.147/24, broadcast is 192.168.150.255 (dhcp)
    DHCP Lease expires at 01/14/2015 09:06:01
  Internet address is 10.10.10.10/24, broadcast is 10.10.10.255 (static)
  MTU 1500 bytes, BW 1000000 Kbit
  Full-duplex, 1 Gb/s, auto-negotiation: on
    17383 packets input, 1581193 bytes
    Received 3003 multicast
    0 input errors
    0 packets dropped
    27842 packets output, 1170264 bytes
    Sent 0 multicast/broadcast
```

```
    0 output errors
em1 is up, line protocol is up
  Hardware is Intel82545EM, address is 000c.29e2.c3fc
  Internet address is 192.168.150.148/24, broadcast is 192.168.150.255 (dhcp)
    DHCP Lease expires at 01/14/2015 09:06:00
  Internet address is 192.0.2.1/24, broadcast is 192.0.2.255 (static)
  MTU 1500 bytes, BW 1000000 Kbit
  Full-duplex, 1 Gb/s, auto-negotiation: on
    30789 packets input, 2000448 bytes
    Received 30682 multicast
    0 input errors
    0 packets dropped
    5 packets output, 1110 bytes
    Sent 0 multicast/broadcast
    0 output errors
em2 is up, line protocol is up
  Hardware is Intel82545EM, address is 000c.29e2.c306
  Internet address is 192.168.150.149/24, broadcast is 192.168.150.255 (dhcp)
    DHCP Lease expires at 01/14/2015 09:06:00
  Internet address is 192.0.2.2/24, broadcast is 192.0.2.255 (static)
  MTU 1500 bytes, BW 1000000 Kbit
  Full-duplex, 1 Gb/s, auto-negotiation: on
    30789 packets input, 2000448 bytes
    Received 30683 multicast
    0 input errors
    0 packets dropped
    4 packets output, 768 bytes
    Sent 0 multicast/broadcast
    0 output errors
em3 is up, line protocol is up
  Hardware is Intel82545EM, address is 000c.29e2.c310
  Internet address is 192.168.150.151/24, broadcast is 192.168.150.255 (dhcp)
    DHCP Lease expires at 01/14/2015 09:06:00
  Internet address is 192.0.2.3/24, broadcast is 192.0.2.255 (static)
  MTU 1500 bytes, BW 1000000 Kbit
  Full-duplex, 1 Gb/s, auto-negotiation: on
    30791 packets input, 2001132 bytes
    Received 30682 multicast
    0 input errors
    0 packets dropped
    5 packets output, 1110 bytes
    Sent 0 multicast/broadcast
    0 output errors
em4 is up, line protocol is up
  Hardware is Intel82545EM, address is 000c.29e2.c31a
  Internet address is 192.168.150.150/24, broadcast is 192.168.150.255 (dhcp)
    DHCP Lease expires at 01/14/2015 09:06:01
  Internet address is 192.0.2.4/24, broadcast is 192.0.2.255 (static)
```

```
    MTU 1500 bytes, BW 1000000 Kbit
    Full-duplex, 1 Gb/s, auto-negotiation: on
      30790 packets input, 2000790 bytes
      Received 30627 multicast
      0 input errors
      0 packets dropped
      8614 packets output, 2802279 bytes
      Sent 0 multicast/broadcast
      0 output errors

...
```

5. Type:
   write

Configuring the Default IP Route (Gateway)

You should also configure the default IP route (gateway). You can configure additional static IP routes, as needed, to permit access to your networks.

For general information about the IP addresses and formats, see Configuring the Management Interface.

To configure the default IP route:

1. Type:
   configure
2. Type:
   ip route 0.0.0.0/0 192.0.2.5
3. To check the default route setting, type:
   show ip route
4. If you configured IPv6, use this command:
   show ipv6 route

```
Codes: C - connected, S - static

Gateway of last resort is 192.0.2.5 to network 0.0.0.0 (static)

S    0.0.0.0/0 via 192.0.2.5, em1, MTU 1500
C    10.10.10.0/24 is directly connected, em0, MTU 1500
SC   10.10.10.10/32 is directly connected, lo0, MTU 16384
C    192.0.2.0/24 is directly connected, em1, MTU 1500
SC   192.0.2.1/32 is directly connected, lo0, MTU 16384
SC   192.0.2.2/32 is directly connected, lo0, MTU 16384
SC   192.0.2.3/32 is directly connected, lo0, MTU 16384
SC   192.0.2.4/32 is directly connected, lo0, MTU 16384
```

```
C    192.168.150.0/24 is directly connected, em4, MTU 1500
SC   192.168.150.147/32 is directly connected, lo0, MTU 16384
SC   192.168.150.148/32 is directly connected, lo0, MTU 16384
SC   192.168.150.149/32 is directly connected, lo0, MTU 16384
SC   192.168.150.150/32 is directly connected, lo0, MTU 16384
SC   192.168.150.151/32 is directly connected, lo0, MTU 16384
```

5. Type:
   `write`

Data Interfaces Example

After configuring the data interfaces as described above, you can use the **`show run`** command to see the configuration. We have annotated the example command output below. Comment lines start with an exclamation mark (!).

```
example-host(config)# show run brief

Building configuration...

!
   hostname example-host
   !
   username admin
    secret encrypted "$2a$04$q8CxSOtnUCryO9HoYAGOFOPC/LOv62wa71ZI0.AG5QD3DnDpMGnz6"
    uid 2000
   !
   ip dns
    name-server 8.8.8.8 8.8.4.4
    admin-status online
   !
   interface em0
    mtu 1500
    ip address dhcp
    ip address 10.0.2.15 255.255.255.0
    ip address 10.10.10.10 255.255.255.0
   !
   interface em1
    mtu 1500
    no ip dhcp client request router
    ip address dhcp
    ip address 192.0.2.1 255.255.255.0
   !
```

```
interface em2
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.2 255.255.255.0
!
interface em3
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.3 255.255.255.0
!
interface em4
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.4 255.255.255.0
!
ip route 0.0.0.0/0 192.0.2.5
!
ssl profile self-signed
 attach certificate self-signed
 attach key self-signed
!
ssh
 allow from 10.10.10.0/24
 allow to 10.10.10.10 22
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
certificate self-signed
 ! Cert data not shown in brief output
!
key self-signed
 ! Key data not shown in brief output
```

What's Next

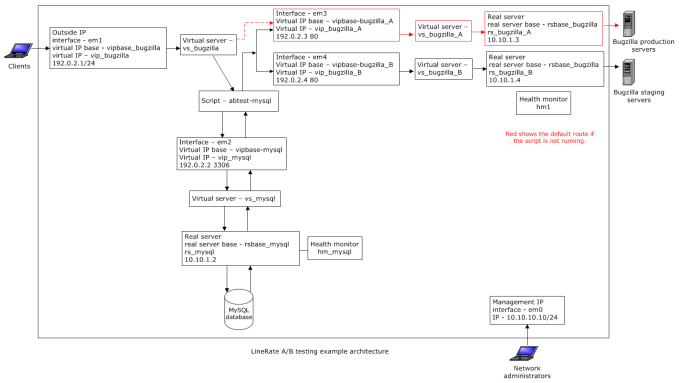
After configuring the data interfaces, you are ready to configure load balancing. See Configuring Load Balancing.

Configuring Load Balancing

Overview

The A/B testing configuration can use fewer objects than we've used in this example. However, we've provided the slightly more complex example to give you flexibility for your configuration. For this configuration, we are using the following:

- Five physical interfaces on the F5® LineRate® system.
- The architecture uses:
    - Four virtual IP bases with one virtual IP created using each base (four virtual IPs in total).
    - Two real server bases with one real server created using one base and two real servers using the other base (three real severs in total).
    - Two health monitors.
    - Four virtual servers.
- A MySQL server.
- Two Bugzilla servers: production and staging.



The remainder of this section walks through how to create this architecture with the F5® LineRate® software.

Configuring the Virtual IP Addresses

The load balancer requires at least one virtual IP address. The virtual IP address is a configuration object that represents the outside interface that clients connect to. In this example, we will configure four virtual IPs.

To configure a virtual IP address, complete the following tasks:

1. Create a virtual IP base.
2. Create a virtual IP.

Creating the Virtual IP Bases

We recommend creating one or more virtual IP bases. For general information about bases in F5® LineRate®, see Working with Bases. A base lets you configure the most common settings that you want for your virtual IPs. You can create more than one virtual IP base for settings that you need to be different or more specific for some virtual IPs.

We are creating four virtual IP bases to permit flexibility in the future. Each base will correspond to a virtual IP that we will create next.

To create the virtual IP bases:

1. Type:
```
configure
virtual-ip base vipbase_mysql
admin-status online
service tcp
```

```
virtual-ip base vipbase__bugzilla
admin-status online
service http
keepalive-timeout 60
virtual-ip base vipbase_bugzilla_A
admin-status online
service http
keepalive-timeout 60
virtual-ip base vipbase_bugzilla_B
admin-status online
service http
keepalive-timeout 30
```

2. write

Creating the Virtual IPs

After creating the virtual IP bases, you can create the virtual IPs. We recommend giving each virtual IP a meaningful name that helps identify the virtual IP. For example, you might use the application or service type (such as serving similar web content) or security settings (such as SSL) in the name.

We are creating four virtual IPs to permit flexibility in the future:

- vip_mysql—To connect to the MySQL database.
- vip_bugzilla—To connect to Bugzilla initially.
- vip_bugzilla_A—To connect to the Bugzilla A instance (production system).
- vip_bugzilla_B—To connect to the Bugzilla B instance (staging environment).

To create a virtual IP:

1. Type:
```
configure
virtual-ip vip_mysql
base vipbase_mysql
ip address 192.0.2.2 3306
virtual-ip vip_bugzilla
base vipbase_bugzilla
ip address 192.0.2.1 80
virtual-ip vip_bugzilla_A
base vipbase_bugzilla_A
ip address 192.0.2.3 80
virtual-ip vip_bugzilla_B
base vipbase_bugzilla_B
ip address 192.0.2.4 80
```
2. Type:
```
show run brief
 ...
```

```
virtual-ip base vipbase_bugzilla
 service http
  keepalive-timeout 60
 admin-status online
!
virtual-ip base vipbase_bugzilla_A
 service http
  keepalive-timeout 60
 admin-status online
!
virtual-ip base vipbase_bugzilla_B
 service http
  keepalive-timeout 30
 admin-status online
!
virtual-ip base vipbase_mysql
 service tcp
 admin-status online
!
virtual-ip vip_bugzilla ip 192.0.2.1 80 base vipbase_bugzilla
virtual-ip vip_bugzilla_A ip 192.0.2.3 80 base vipbase_bugzilla_A
virtual-ip vip_bugzilla_B ip 192.0.2.4 80 base vipbase_bugzilla_B
virtual-ip vip_mysql ip 192.0.2.2 3306 base vipbase_mysql
...
```

3. Type:
   write

Configuring the Health Monitors

A health monitor can monitor multiple real servers. The health monitor for web servers (HTTP) opens a connection to the web server, sends an HTTP request to the web server for something (possibly a specific web page), looks at the response, and determines if the response is correct. The configuration settings on the health monitor object determine what to request from the web server and what the response should be.

In this example we are creating two health monitors (hm_mysql and hm1), using the default settings.

To create the the health monitors:

1. Type:
   configure
   health-monitor hm_mysql
   type tcp
   admin-status online
   health-monitor hm1

```
type http
admin-status online
```

2. Type:
```
write
```

Configuring Real Servers

Real servers are another required configuration object of the F5® LineRate® load balancer. Real servers represent and point to actual web servers that the load balancer is distributing client requests to.

To configure real servers, complete the following tasks:

1. Create a real server base.
2. Create a real server.

Creating a Real Server Base

We recommend creating one or more real server bases. For general information about bases in F5® LineRate®, see Working with Bases. A base lets you configure common settings that you want for your real servers. You can also create more than one real server base for settings that you need to be different for some real servers.

In this example, we are creating two real server bases called rsbase_mysql and rsbase_bugzilla.

To create the real server bases:

1. Type:
```
configure
real-server base rsbase_mysql
service tcp
attach health-monitor hm_mysql
admin-status online
real-server base rsbase_bugzilla
service http
attach health-monitor hm1
admin-status online
```

2. Type:
```
write
```

Creating Real Servers

After creating the real server bases, you can create the real servers.

In this example, we are creating three real servers (rs_mysql, rs_bugzilla_A, and rs_bugzilla_B) that inherit properties from the real server bases and assigning them the IP addresses of two actual web servers. You must also include the TCP port number on which the load balancer will contact the server.

To create real servers:

1. Type:
   configure
   real-server rs_mysql
   ip address 10.10.10.2 3306
   base rsbase_mysql
   real-server rs_bugzilla_A
   ip address 10.10.10.3 80
   base rsbase_bugzilla
   real-server rs_bugzilla_B
   ip address 10.10.10.4 80
   base rsbase_bugzilla
2. Type:
   show run brief

```
...
health-monitor hm1
 type http
 admin-status online
!
health-monitor hm_mysql
 type tcp
 admin-status online
!
...
!
real-server base rsbase_bugzilla
 service http
 attach health-monitor hm1
 admin-status online
!
real-server base rsbase_mysql
 service tcp
 attach health-monitor hm_mysql
 admin-status online
!
real-server rs_bugzilla_A ip 10.10.10.3 80 base rsbase_bugzilla
real-server rs_bugzilla_B ip 10.10.10.4 80 base rsbase_bugzilla
real-server rs_mysql ip 10.10.10.2 3306 base rsbase_mysql
...
```

3. Type:
   write

Configuring the Virtual Servers

Each load balancing (reverse proxy) configuration requires at least one virtual server. The virtual server is a configuration object that acts as a reverse proxy and ties together one or more virtual IPs and real servers. You also set the load balancing algorithm on the virtual server.

In this example, we are creating four virtual servers and are attaching the corresponding virtual IP and real server to each one. We will also set the load balancing algorithm.

To create the virtual servers:

1. Type:
   configure
   virtual-server vs_mysql
   service tcp
   attach virtual-ip vip_mysql
   attach real-server rs_mysql
   virtual-server vs_bugzilla
   service http
   attach virtual-ip vip_bugzilla
   attach real-server rs_bugzilla
   virtual-server vs_bugzilla_A
   service http
   attach virtual-ip vip_bugzilla_A
   attach real-server rs_bugzilla_A
   virtual-server vs_bugzilla_B
   service http
   attach virtual-ip vip_bugzilla_B
   attach real-server rs_bugzilla_B
2. Type:
   write
3. Type:
   show run brief

```
...
virtual-server vs_bugzilla
 service http
 attach virtual-ip vip_bugzilla
 attach real-server rs_bugzilla
!
virtual-server vs_bugzilla_A
 service http
 attach virtual-ip vip_bugzilla_A
 attach real-server rs_bugzilla_A
!
virtual-server vs_bugzilla_B
```

```
    service http
    attach virtual-ip vip_bugzilla_B
    attach real-server rs_bugzilla_B
   !
   virtual-server vs_mysql
    service tcp
    attach virtual-ip vip_mysql
    attach real-server rs_mysq
   ...
```

Load Balancing Example

After configuring load balancing, as described above, you can use the **`show run brief`** command to see the configuration.

```
example-host(config)# show run brief

Building configuration...

!
   hostname example-host
   !
   username admin
    secret encrypted "$2a$04$q8CxSOtnUCryO9HoYAGOFOPC/LOv62wa71ZI0.AG5QD3DnDpMGnz6"
    uid 2000
   !
   ip dns
    name-server 8.8.8.8 8.8.4.4
    admin-status online
   !
   interface em0
    mtu 1500
    ip address dhcp
    ip address 10.10.10.10 255.255.255.0
   !
   interface em1
    mtu 1500
    no ip dhcp client request router
    ip address dhcp
    ip address 192.0.2.1 255.255.255.0
   !
   interface em2
    mtu 1500
```

```
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.2 255.255.255.0
!
interface em3
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.3 255.255.255.0
!
interface em4
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.4 255.255.255.0
!
ip route 0.0.0.0/0 192.0.2.5
!
health-monitor hm1
 type http
 admin-status online
!
health-monitor hm_mysql
 type tcp
 admin-status online
!
ssl profile self-signed
 attach certificate self-signed
 attach key self-signed
!
real-server base rsbase_bugzilla
 service http
 attach health-monitor hm1
 admin-status online
!
real-server base rsbase_mysql
 service tcp
 attach health-monitor hm_mysql
 admin-status online
!
real-server rs_bugzilla_A ip 10.10.10.3 80 base rsbase_bugzilla
real-server rs_bugzilla_B ip 10.10.10.4 80 base rsbase_bugzilla
real-server rs_mysql ip 10.10.10.2 3306 base rsbase_mysql
```

```
!
!
virtual-ip base vipbase_bugzilla
 service http
  keepalive-timeout 60
 admin-status online
!
virtual-ip base vipbase_bugzilla_A
 service http
  keepalive-timeout 60
 admin-status online
!
virtual-ip base vipbase_bugzilla_B
 service http
  keepalive-timeout 30
 admin-status online
!
virtual-ip base vipbase_mysql
 service tcp
 admin-status online
!
virtual-ip vip_bugzilla ip 192.0.2.1 80 base vipbase_bugzilla
virtual-ip vip_bugzilla_A ip 192.0.2.3 80 base vipbase_bugzilla_A
virtual-ip vip_bugzilla_B ip 192.0.2.4 80 base vipbase_bugzilla_B
virtual-ip vip_mysql ip 192.0.2.2 3306 base vipbase_mysql
!
!
virtual-server vs_bugzilla
 service http
 attach virtual-ip vip_bugzilla
 attach real-server rs_bugzilla
!
virtual-server vs_bugzilla_A
 service http
 attach virtual-ip vip_bugzilla_A
 attach real-server rs_bugzilla_A
!
virtual-server vs_bugzilla_B
 service http
 attach virtual-ip vip_bugzilla_B
 attach real-server rs_bugzilla_B
!
virtual-server vs_mysql
```

```
 service tcp
 attach virtual-ip vip_mysql
 attach real-server rs_mysql
!
ssh
 allow from any
 allow from 10.10.10.0/24
 allow to 10.10.10.10 22
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
certificate self-signed
 ! Cert data not shown in brief output
!
key self-signed
 ! Key data not shown in brief output
```

What's Next

After you configure the load balancer, you are ready to configure the script and database. See Creating the A/B Script and MySQL Database.

Creating the A/B Script and MySQL Database

Overview

Now that we have the load balance configured, we need to add the logic and database that determines which Bugzilla instance requests go to. We need to configure the following:

- A F5® LineRate® script
- A MySQL database

This example does not describe how to configure the Bugzilla system. You can use the F5® LineRate® and MySQL configurations described for A/B testing of any system.

As shown in the diagram in Configuring Load Balancing, requests coming into vip_bugzilla will be sent through the script, then to the MySQL database:

- If the user is configured in the database as a beta user, the request will be set through vip_bugzilla_B to rs_bugzilla_B and on to the staging Bugzilla instance.
- If the user is not configured in the database as a beta user, the request will be set through vip_bugzilla_A to rs_bugzilla_A and on to the production Bugzilla instance.

Creating the Script

You can create the script inline in your F5® LineRate® configuration or as a file that you specify. In this example, we'll create the script inline.

To create the script:

1. Type:
```
config
script abtest-mysql
source inline "ENDWORD_abtest_mysql"
```
2. Copy the script text from the section below.

3. Paste the script.
4. Press **Enter**.
5. Type:
   `write`

Customizable Node.js Code

The following code is the full Node.js script that can be loaded on F5® LineRate® to implement web request steering based on a table of users stored in a database.

```
/*-
 * Copyright (c) 2013-2015, F5 Networks, Inc. All rights reserved.
 *
 * No part of this software may be reproduced or transmitted in any
 * form or by any means, electronic or mechanical, for any purpose,
 * without express written permission of F5 Networks, Inc.
 */
// Included modules
var assert = require('assert')
  , os = require('os')
  , http = require('http')
  , vsm = require('lrs/virtualServerModule')
  , mysql = require('mysql')
  , Cookies = require('cookies');
var proxyhost = os.hostname();
var vs = vsm.find('Bugzilla');
var vs_a = vsm.find('Bugzilla-A');
var vs_b = vsm.find('Bugzilla-B');
var logged_in = false;
// Log to a database
var connection = mysql.createConnection({
  host     : '172.27.96.242',
  user     : 'root',
  password : 'root',
  database : 'abtesting',
});
var onRequest= function(request, response, next) {
  var cookie = new Cookies( request, response );
  var Userid = cookie.get("Bugzilla_login");
  if( !logged_in ) {
    console.log("WARNING: No Database, Defaulting to A: "+ Userid + "@" + request.connection.
remoteAddress + request.url);
    // Just send to A for now.
    vs_a.newRequest(request, response, next);
    return;
  }
  if( !Userid) {
    console.log("WARNING: No Userid, Defaulting to A: "+ Userid + "@" + request.connection.
remoteAddress + request.url);
    // Just send to A for now.
    vs_a.newRequest(request, response, next);
    return;
  }
  // Add the user to the database automatically if they don't already exist
  connection.query('SELECT count(*) as rowcount from abtest where userid=' + Userid, function(err,
rows, fields) {
    if (err) throw err;
    var match = rows[0].rowcount;
    //console.log("Rows: " + match);
    if (match === 0 ) {
      connection.query('INSERT INTO abtest (userid, ip) values(' + Userid + ', "' + request.connection.
```

```
remoteAddress + '")', function(err, rows, fields) {
        if (err) throw err;
      });
    }
  });
  // Decide which server to send to
  connection.query('SELECT opt_in from abtest where userid=' + Userid, function(err, rows, fields) {
    if (err) throw err;
    var opt_in = rows[0].opt_in;
    if( !opt_in ) {
      console.log("Sending to A: " + Userid + "@" + request.connection.remoteAddress + request.url);
      vs_a.newRequest(request, response, next);
      return;
    } else {
      console.log("Sending to B: " + Userid + "@" + request.connection.remoteAddress + request.url);
      vs_b.newRequest(request, response, next);
      return;
    }
  });

} // onRequest
var onExist = function(vs) {
    if(vs.id == 'Bugzilla') {
    vs.on('request', onRequest);
    console.log('VSM ' + vs.id + ' exists.');
    connection.connect();
    console.log('Database connected.');
    logged_in = true;
  }
}
vsm.on('exist', 'Bugzilla', onExist);
ENDWORD_abtest_mysql
```

Configuring the MySQL Database

This example assumes that you have a MySQL server available for use. The following code provides the basic configuration for the MySQL database.

```
--
-- Table structure for table `abtest`
--
DROP TABLE IF EXISTS `abtest`;
CREATE TABLE `abtest` (
`id` int(11) NOT NULL AUTO_INCREMENT,
`ip` varchar(20) DEFAULT NULL,
`opt_in` int(11) DEFAULT '0',
`userid` int(11) DEFAULT NULL,
PRIMARY KEY (`id`)
) ENGINE=MyISAM AUTO_INCREMENT=7 DEFAULT CHARSET=latin1;
--
-- Dumping data for table `abtest`
--
LOCK TABLES `abtest` WRITE;
/*!40000 ALTER TABLE `abtest` DISABLE KEYS */;
INSERT INTO `abtest` VALUES (1,'192.168.44.118',1,1),(2,'172.18.48.128',0,1886),(3,'192.168.44.
33',0,873),(4,'192.168.44.44',1,1887),(5,'172.27.96.50',1,188),(6,'172.27.96.1',0,853);
/*!40000 ALTER TABLE `abtest` ENABLE KEYS */;
UNLOCK TABLES;
```

What's Next

To check your configuration, see Complete Example Show Run Output.

Complete Show Run and Testing

Overview

This section provides a complete, annotated **`show run brief`** output of the whole configuration example in this guide.

Show Run Brief of Example Configuration

```
example_host(config)# show run brief

Building configuration...

!
   hostname example_host
   !
   username admin
    secret encrypted "$2a$04$q8CxSOtnUCryO9HoYAGOFOPC/LOv62wa71ZI0.AG5QD3DnDpMGnz6"
    uid 2000
   !
   ip dns
    name-server 8.8.8.8 8.8.4.4
    admin-status online
   !
   interface em0
    mtu 1500
    ip address dhcp
    ip address 10.10.10.10 255.255.255.0
   !
```

```
interface em1
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
interface em2
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.2 255.255.255.0
!
interface em3
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.3 255.255.255.0
!
interface em4
 mtu 1500
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.4 255.255.255.0
!
ip route 0.0.0.0/0 192.0.2.5
!
health-monitor hm1
 type http
 admin-status online
!
health-monitor hm_mysql
 type tcp
 admin-status online
!
ssl profile self-signed
 attach certificate self-signed
 attach key self-signed
!
real-server base rsbase_bugzilla
 service http
 attach health-monitor hm1
 admin-status online
!
```

```
real-server base rsbase_mysql
 service tcp
 attach health-monitor hm_mysql
 admin-status online
!
real-server rs_bugzilla_A ip 10.10.10.3 80 base rsbase_bugzilla
real-server rs_bugzilla_B ip 10.10.10.4 80 base rsbase_bugzilla
real-server rs_mysql ip 10.10.10.2 3306 base rsbase_mysql
!
!
virtual-ip base vipbase_bugzilla
 service http
  keepalive-timeout 60
 admin-status online
!
virtual-ip base vipbase_bugzilla_A
 service http
  keepalive-timeout 60
 admin-status online
!
virtual-ip base vipbase_bugzilla_B
 service http
  keepalive-timeout 30
 admin-status online
!
virtual-ip base vipbase_mysql
 service tcp
 admin-status online
!
virtual-ip vip_bugzilla ip 192.0.2.1 80 base vipbase_bugzilla
virtual-ip vip_bugzilla_A ip 192.0.2.3 80 base vipbase_bugzilla_A
virtual-ip vip_bugzilla_B ip 192.0.2.4 80 base vipbase_bugzilla_B
virtual-ip vip_mysql ip 192.0.2.2 3306 base vipbase_mysql
!
!
virtual-server vs_bugzilla
 service http
 attach virtual-ip vip_bugzilla
 attach real-server rs_bugzilla
!
virtual-server vs_bugzilla_A
 service http
 attach virtual-ip vip_bugzilla_A
```

```
 attach real-server rs_bugzilla_A
!
virtual-server vs_bugzilla_B
 service http
 attach virtual-ip vip_bugzilla_B
 attach real-server rs_bugzilla_B
!
virtual-server vs_mysql
 service tcp
 attach virtual-ip vip_mysql
 attach real-server rs_mysql
!
ssh
 allow from any
 allow from 10.10.10.0/24
 allow to 10.10.10.10 22
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
script abtest-mysql
 ! Source data not shown in brief output
!
certificate self-signed
 ! Cert data not shown in brief output
!
key self-signed
 ! Key data not shown in brief output
```

Testing the Configuration

You should test the configuration to make sure it is working properly.

To test the configuration:

1. If you want to see a graph of the testing, set up a line graph.
   - See Graphing the Tests.
2. Access the IP address configured for vip_bugzilla using a production login.
3. Check that you have accessed the production system.
4. Repeat steps 1 and 2 a couple of times to make sure it always works.

5. Access the IP address configured for vip_bugzilla using a beta login.
   - For information about changing a login to use the beta version in MySQL, see the next section below.
6. Check that you have accessed the beta system.
7. Repeat steps 4 and 5 a couple of times to make sure it always works.
8. Set the script to admin status offline, and access the system again.
   This simulates what happens if the script stops running for some reason. It should take you to the production system.

Configuring Logins in the MySQL Database

Several GUI tools are available for various platforms to manage MySQL databases. You can use one of these or the command line as shown below.

To configure logins in the MySQL database:

1. From a shell prompt, log in to your MySQL server by typing:
   `mysql -uroot -proot -h mysqlhost abtesting`
2. To see the current contents of the database, type:
   `mysql> select * from abtest;`

```
+----+----------------+--------+--------+
| id | ip             | opt_in | userid |
+----+----------------+--------+--------+
|  1 | 192.168.44.118 |      1 |      1 |
|  2 | 172.18.48.128  |      0 |   1886 |
|  3 | 192.168.44.33  |      0 |    873 |
|  4 | 192.168.44.44  |      1 |   1887 |
|  5 | 172.27.96.50   |      1 |    188 |
|  6 | 172.27.96.1    |      1 |    853 |
+----+----------------+--------+--------+
```

3. To set user 6 to be opted in to the "B" (beta) version of the site, type:
   `mysql> update abtest set opt_in=1 where userid=853;`
4. To change user 6 back to the "A" (production) side, type:
   `mysql> update abtest set opt_in=0 where userid=853;`
5. After changing the user's opt_in status, reload the Bugzilla page a few times to confirm that the user is routed to the appropriate version of the site.

Graphing the Tests

You can observe the effects of the testing by configuring graphing in F5® LineRate Manager.

To graph the tests:

1. Log in to F5® LineRate Manager.

- See Accessing LineRate Manager.

2. Configure a line chart using the following two statistics:
   - Virtual Server, vs_bugzilla_A, HTTP Requests (Initiation), Proxy HTTP Request Rate (requests/s) and Virtual Server, vs_bugzilla_B, HTTP Requests (Initiation), Proxy HTTP Request Rate (requests/s)
   - See Creating Line Charts.
   - As you send requests through the system, the graphs will reflect which virtual server is taking the traffic and should look something like the following graph.

What's Next

This example shows how using F5® LineRate® and a fairly simple script using F5® LineRate Scripting can let you configure A/B testing. You can enhance the script in a number of ways to configure more complex use cases.

To learn more about the CLI commands used in the example, see the CLI Reference Guide.

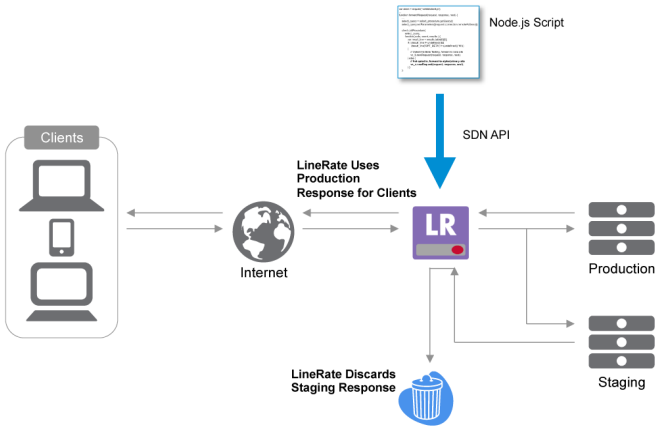
Configuring Traffic Replication

Overview

Web application development and test teams understand how difficult it is to simulate real-world users and production traffic in their staging and test environments.

F5® LineRate® helps you find issues earlier by replicating real-world production traffic into your staging or test environments, allowing you to deploy your application with confidence. With a short Node.js script installed on F5® LineRate®, you can send each web request to both the production environment and the staging environment.

The response from the production environment is passed back to the user, as usual. The response received from staging can be analyzed in your F5® LineRate® script, including comparing it to the production response. But F5® LineRate® absorbs and discards the staging response after analysis, so it doesn't affect your production traffic at all.



What's Next

This example will walk through creating a basic traffic replication configuration. Continue with xxx.

Configuring Data Interfaces

Overview

An initial, basic configuration includes the following key functions:

- Configuring the data interfaces
- Configuring the default route (gateway)

Configuring the Data Interfaces

The F5® LineRate® software supports both IPv4 and IPv6.

The recommended configuration for performance and security reasons is to configure IP addresses on at least two interfaces.

For general information about the IP addresses and formats, see Configuring the Management Interface.

In this example, we are configuring two data interfaces as shown in the diagram in Configuring Load Balancing:

- Outside for the virtual IP (on em1)—192.0.2.1/24
- Inside to web servers (on em2)—10.1.2.1/24

To configure the data interfaces:

1. Type:
   `show interfaces`
   - A list of all interfaces on the system displays. It is possible for the system to have an interface that F5® LineRate® cannot detect.
   - The first line is the interface name and its status. The interface name is based on the driver for the interface type. The remaining lines list the information available about the interface (typically, manufacturer, model, MAC address, speed in kilobits, and more).

- Below are the names used for some common interfaces:
  - em—Intel 1Gb interface
  - igb—Intel 1Gb interface
  - bce—Broadcom 1Gb interface
  - ix—Intel 10 Gb interface
  - oce—Emulex 10 Gb interface
  - lo—Loopback interface (internal interface)

2. Type:
   `configure`
3. Type:
   `interface em1`
4. Type:
   `ip address 192.0.2.1/24`
5. Type:
   `interface em2`
6. Type:
   `ip address 10.1.2.1/24`
7. To check the interface settings, type:
   `show interfaces`
   ```
   em0 is up, line protocol is up
   Hardware is Intel82540EM, address is 0800.279e.0b3a
    Internet address is 10.10.10.10/24, broadcast is 10.10.10.255 (static)
   ...
   em1 is up, line protocol is up
   Hardware is Intel82540EM, address is 0800.27bc.5b47
   Internet address is 192.0.2.1/24, broadcast is 192.0.2.255 (static)
   ...
   em2 is up, line protocol is up
   Hardware is Intel82540EM, address is 0800.2738.ce7e
   Internet address is 10.1.2.1/24, broadcast is 10.1.2.255 (static)
   ...
   ```
8. Type:
   `write`

Configuring the Default IP Route (Gateway)

You should also configure the default IP route (gateway). You can configure additional static IP routes, as needed, to permit access to your networks.

For general information about the IP addresses and formats, see Configuring the Management Interface.

To configure the default IP route:

1. Type:
   configure
2. Type:
   ip route 0.0.0.0/0 192.0.2.2
   - You can specify the <gateway IP address> in any of the following formats:
     - 192.0.2.2/24—for a 24-bit subnet mask
     - 192.0.2.2 255.255.255.255
3. To check the default route setting, type:
   show ip route
4. If you configured IPv6, use this command:
   show ipv6 route

```
Codes: C - connected, S - static

Gateway of last resort is 192.0.2.2 to network 0.0.0.0

S    0.0.0.0/0 via 192.0.2.2, em0, MTU 1500
C    10.0.2.0/24 is directly connected, em0, MTU 1500
C    10.0.3.0/24 is directly connected, em1, MTU 1500
C    10.0.4.0/24 is directly connected, em2, MTU 1500
C    10.1.2.0/24 is directly connected, em2, MTU 1500
C    192.0.2.1/24 is directly connected, em1, MTU 1500
C    10.200.0.1/24 is directly connected, em0, MTU 1500
```

5. Type:
   write

Data Interfaces Example

After configuring the data interfaces as described above, you can use the **show run** command to see the configuration. We have annotated the example command output below. Comment lines start with an exclamation mark (!).

```
LROS(config)# show run
Building configuration...

!
! Hostname setting.
!
hostname example-host
!
! Default user name and encrypted password.
!
username admin secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/
   QeaZH8WnWRzVEkPt0MgS" uid 2000
!
interface em0
 ip address dhcp
 ip address 10.200.0.1 255.255.255.0
```

```
!
! IP address configured on the interface called em1 for data.
!
interface em1
 no ip dhcp client request routrer
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
! IP address configured on the interface called em2 for data.
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.1 255.255.255.0
!
! Default route configured for a router at 192.0.2.2.
!
ip route 0.0.0.0/0 192.0.2.2
!
! Default SSL configuration. See Configuring SSL.
!
ssl profile self-signed
 attach primary-certificate self-signed
 attach private-key self-signed
!
! SSH configuration to limit access to the F5® LineRate® system.
!
ssh
 allow from 10.200.0.0/24
 allow to 10.200.0.1 22
!
! Default REST server configuration.
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
! Default certificate and key called self-signed. For information about certificates,
   see Configuring SSL.
!
certificate self-signed
 pem-format
-----BEGIN CERTIFICATE-----
MIIDOjCCAiKgAwIBAgIJAPm1YLOdNan3MA0GCSqGSIb3DQEBBQUAMBwxGjAYBgNV
BAMTEWxyb3MtZGVmYXVsdC1ob3N0MCAXDTEyMDMyNzEwMDczN1oYDzIyODYwMTEw
MTAwNzM3WjAcMRowGAYDVQQDExFscm9zLWRlZmF1bHQtaG9zdDCCASIwDQYJKoZI
hvcNAQEBBQADggEPADCCAQoCggEBAL4QCxbazhzBnPW4GHBQebKWRVax9khfPpWp
+YbJztXo1weTcXHvRuhEsmTkvDdJTkgoWgdOvGBPblrYiBXivkNo9eC6oBkzuW0T
gY6XjR6p4AFSMkRDh3RCIfxC2s7lSANjYe15BkcibMeak6/4BxFIF12XNQxjR64Z
pJ5NM8ygc4SM8dkB7kUe5FTg4xEi+DR9/TZqZ1y/3lTa+atW/On7nLcgB7z/m1hk
mp8NCdw4xzNCbIJdX5WG1dbIbFD8uOsPoHyoGUtdYJ9exDCuAgX3xRU5Ll87fT3x
WUz5xw13zZ7NrrAaCG8h6ugfLNKPkxi28tL+TNZHzDPFbyeNiMUCAwEAAaN9MHsw
```

```
HQYDVR0OBBYEFO61P0Y4qwK3WC20wP2kDNbZ8X18MEwGA1UdIwRFMEOAFO61P0Y4
qwK3WC20wP2kDNbZ8X18oSCkHjAcMRowGAYDVQQDExFscm9zLWRlZmF1bHQtaG9z
dIIJAPm1YLOdNan3MAwGA1UdEwQFMAMBAf8wDQYJKoZIhvcNAQEFBQADggEBAHUm
y8HavCdrjabf2Ajs1TX87zeZmR0RYkezL/feZ+xri+DDHal+uJMu0DUpPpoR0YyI
jorz6t79uq1DT8jGCalLjjiCvr6E2Sz0cXJ2aKE45eu4GMuMz/ohczm0LyexP01J
gqfp8Q5cvr/xQik8eLpxgCIjZ0188e8OQRNetwgzbi579bjkKglLCJfjQZE9ot14
0Pmz5DG1QtCClOA0Ppdz7y+P1PLNwpRxKN0cjl6fH1P9qeZvBoDPp6X72nMEOknl
eT2JxS0Vofyp9rDlGVusuP1EFzM/BCh/dHq4SMmHuQqgc/dzCJruLrztj/hgGXKk
PK7/nxRt+C72hde2OaU=
-----END CERTIFICATE-----
quit
!
key self-signed
 pem-format
-----BEGIN RSA PRIVATE KEY-----
MIIEowIBAAKCAQEAvhALFtrOHMGc9bgYcFB5spZFVrH2SF8+lan5hsnO1ejXB5Nx
ce9G6ESyZOS8N0lOSChaB068YE9uWtiIFeK+Q2j14LqgGTO5bROBjpeNHqngAVIy
REOHdEIh/ELazuVIA2Nh7XkGRyJsx5qTr/gHEUgXXZc1DGNHrhmknk0zzKBzhIzx
2QHuRR7kVODjESL4NH39NmpnXL/eVNr5q1b86fuctyAHvP+bWGSanw0J3DjHM0Js
gl1flYbV1shsUPy46w+gfKgZS11gn17EMK4CBffFFTkuXzt9PfFZTPnHDXfNns2u
sBoIbyHq6B8s0o+TGLby0v5M1kfMM8VvJ42IxQIDAQABAoIBAGXakSbJUWWFuIjS
BH7EEcPL1hLUwggcypxH/8nlAmwOIJYVxNjrAtPcZMG+9sKmDUaMIVsDLd5rEteq
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ocQoHBoR6/m8JxeHfD0Hs8xGqlHbZGlL1JmTSolav7jYu+8nFyfyg1Qs6U+3cGxY
7A9fx1mHp68E5tM//LS9iQKBgQCEWtJcKjb47wVfRMfUxpdqpq9Zh2swQyzFORmN
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+KR//WjiMrt1o3cmILMrQLOEX4NFTh0kmzYGTc+4BiE1Y2krxEqxyVYou+iDITCz
2oA1A+w/eMlx4CwZr8HeV6U2kdtx/nEvWpadImNLvkx6GXdRT3e/
-----END RSA PRIVATE KEY-----
quit

example-host(config)#
```

What's Next

After configuring the data interfaces, you are ready to configure load balancing. See Configuring Load Balancing.

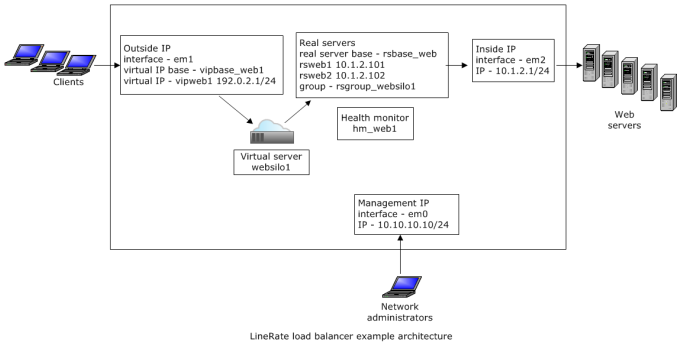
Configuring Load Balancing

Overview

The figure below shows a very simple example load balancing architecture, with all of the basic elements you need. It includes the specific names and IP addresses that we use throughout the rest of this section.

This example architecture assumes the following:

- The system has three physical interfaces.
- The architecture uses two real servers.
- You have two web servers.



LineRate load balancer example architecture

The remainder of this section walks through how to create this architecture with the F5® LineRate® software.

Configuring a Virtual IP Address

The load balancer requires at least one virtual IP address. The virtual IP address is a configuration object that represents the outside interface that clients connect to. In this example, we will configure one virtual IP, but you can configure more, depending on your needs.

To configure a virtual IP address, complete the following tasks:

- Create a virtual IP base.
- Create a virtual IP.

Creating a Virtual IP Base

We recommend creating one or more virtual IP bases. For general information about bases in F5® LineRate®, see Working with Bases. A base lets you configure the most common settings that you want for your virtual IPs.You can also create more than one virtual IP base for settings that you need to be different or more specific for some virtual IPs.

In this example, we are creating a single virtual IP base called vipbase_web1. We recommend giving each virtual IP base a meaningful name that helps identify the base. For example, you might use the application type (such as serving similar web content) or security settings (such as SSL) in the name.

To create an example virtual IP base:

Step	Command	Description
1	`configure`	Puts F5® LineRate® into configure mode.
2	`virtual-ip base vipbase_web1`	Names the base vipbase_web1.
3	`admin-status online`	Brings the virtual IP online, so it is ready for use.
4	`service http`	Sets the service type to HTTP for layer 7 load balancing of web traffic.
5	`keepalive-timeout 5`	Sets the keepalive timeout to 5 seconds. This is the time the system waits for a specific client to send a request before closing the connection, reclaiming connection resources. For most use cases, this setting will affect the number of simultaneous connections that the system will have open. A lower setting will

Step	Command	Description
		usually result in fewer simultaneous open connections. A good rule of thumb is to set this number no higher than 500,000 divided by the number of expected connections per second at peak load. For example, if the load balancer is expected to process up to 100,000 connections per second, 500,000 divided by 100,000 is 5. So the setting should be 5 seconds in this example.

Creating a Virtual IP

After creating the virtual IP base, you can create a virtual IP. We recommend giving each virtual IP a meaningful name that helps identify the virtual IP. For example, you might use the application or service type (such as serving similar web content) or security settings (such as SSL) in the name.

For this example, we are using the IP address of the outside interface (em1) that we configured already to create the virtual IP, and we are using the virtual IP base we already created. You must also include the TCP port number on which the clients will contact the load balancer.

To create a virtual IP:

1. Type:
   configure
2. Type:
   virtual-ip vipweb1
3. Type:
   base vipbase_web1
4. Type:
   ip address 192.0.2.1 443
5. Type:
   show run brief

```
...
virtual-ip base vipbase_web1
 service http
  keepalive-timeout 5
 admin-status online
!
virtual-ip vipweb1 ip 192.0.2.1 443 base vipbase_web1
...
```

Note: Notice how with having set just the base and IP address (and port), the show run brief output lists the virtual IP on just one line. This lets you review a long list of virtual IPs to find differences or patterns in names and IP addresses.

5. Type:
   `write`

Configuring a Health Monitor

A health monitor can monitor multiple real servers. The health monitor for web servers (HTTP) opens a connection to the web server, sends an HTTP request to the web server for something (possibly a specific web page), looks at the response, and determines if the response is correct. The configuration settings on the health monitor object determine what to request from the web server and what the response should be.

In this example, we are creating a single health monitor called hm_web1. We recommend giving each health monitor a meaningful name that helps identify the health monitor. For example, you might use the application or service (such as serving similar web content) or how you are monitoring in the name.

To create an example of the health monitor:

Step	Command	Description
1	**`configure`**	Puts F5® LineRate® into configure mode.
2	**`health-monitor hm_web1`**	Names the health monitor hm_web1.
3	**`interval 5`**	Sets the health monitor to start a health check every 5 seconds.
4	**`timeout 1`**	Sets the timeout to 1 second. The health monitor will determine an individual health probe to fail if it does not respond within this time. One use of this setting is to test the server's response time.
5	**`server-down "8/10"`**	Sets the threshold for marking the server DOWN to the failure of 8 out the last 10 health probes. If the health probe fails 8 out of the last 10 times, the system takes the server offline.
6	**`server-up "9/10"`**	Sets the threshold for marking the server UP to the success of 9 out the last 10 health probes. If the health

Step	Command	Description
		probe succeeds 9 out of the last 10 times, the system puts the server back online.
7	**`type http`**	Sets the health monitor type to HTTP for web use.
8	**`request-method GET`**	Sets the type of request the health monitor will send to a GET request.
9	**`request-target "/health.html"`**	Sets the specific web page that the health monitor will request. If the health monitor is able to retrieve the page, receiving a `200 OK` response from the server, the server's health probe is deemed successful.
10	**`admin-status online`**	Brings the health monitor online, so it is ready for use.

Configuring Real Servers

Real servers are another required configuration object of the F5® LineRate® load balancer. Real servers represent and point to actual web servers that the load balancer is distributing client requests to.

To configure real servers, complete the following tasks:

- Create a real server base.
- Create a real server.

Creating a Real Server Base

We recommend creating one or more real server bases. For general information about bases in F5® LineRate®, see Working with Bases. A base lets you configure common settings that you want for your real servers. You can also create more than one real server base for settings that you need to be different for some real servers.

In this example, we are creating a single real server base called rsbase_web. We recommend giving each real server base a meaningful name that helps identify how the base will be used. For example, you might use the application type (such as serving similar web content), hardware capabilities (such as CPU or memory), or security settings (such as SSL) in the name.

To create an example of the real server base:

Step	Command	Description
1	`configure`	Puts F5® LineRate® into configure mode.
2	`real-server base rsbase_web`	Names the base rsbase_web.
3	`max-connections 1000`	Sets the maximum connections to the real server at 1000. F5® LineRate® will not open more than 1000 connections to any server.
4	`admin-status online`	Brings the real server online, so it is ready for use.
5	`attach health-monitor hm_web1`	Attaches a health monitor called hm_web1. See Configuring a Health Monitor.
7	`service http`	Sets the service type to HTTP, which sets this real server to be compatible with layer 7 load balancing, for web use. The service setting on a real server must match the service setting on any virtual server to which the real server is attached.
8	`keepalive-timeout 10`	Sets the keepalive timeout of the HTTP service to 10 seconds. If there are no requests that get sent to a connection for 10 seconds, the load balancer closes the connection to the server, reclaiming resources. This can help avoid problems that some web servers have when connections are kept open indefinitely.
9	`response-timeout 60`	Sets the response-timeout of the HTTP service to 60 seconds. The load balancer closes the connection if the HTTP server takes longer than 60 seconds to respond to a request. Consider the amount of time the web server takes to respond to any request. The response-timeout on the load balancer must always be configured to be higher than the amount of time it takes for any of the web servers to respond to a request.
10	`response-idle-timeout 60`	Sets the response-idle-timeout of the HTTP service to 60 seconds. The load balancer closes the connection if it takes longer than 60 seconds either to receive any part of the response from the HTTP server or to transmit any part of the response to the client. Consider the size of a typical response for your application as well as the user environment to set this value. For example, an application where users

Step	Command	Description
		download HD videos using mobile devices would need longer timeout than simple web pages due to mobile bandwidth and device processing limitations.

Creating Real Servers

After creating the real server base, you can create a real server. We recommend giving each real server a meaningful name that helps identify the real server. For example, you might use the application type (such as serving similar web content), hardware capabilities (such as CPU or memory), or security settings (such as SSL) in the name.

In this example, we are creating two real servers (rsweb1 and rsweb2) that inherit properties from our real server base and assigning them the IP addresses of two actual web servers. You must also include the TCP port number on which the load balancer will contact the server.

To create real servers:

1. Type:
   configure
2. Type:
   real-server rsweb1
3. Type:
   base rsbase_web
4. Type:
   ip address 10.1.2.101 8080
5. Type:
   real-server rsweb2
6. Type:
   base rsbase_web
7. Type:
   ip address 10.1.2.102 8080
8. Type:
   show run brief

```
real-server base rsbase_web
 max-connections 1000
 service http
  response-timeout 60
  response-idle-timeout 60
  keepalive-timeout 10
attach health-monitor hm_web1
admin-status online
!
```

```
real-server rsweb1 ip 10.1.2.101 8080 base rsbase_web
real-server rsweb2 ip 10.1.2.102 8080 base rsbase_web
...
```

Notice how with having set just the base and IP address (and port), the show run brief output lists the real-servers on just one line. This lets you review a long list of real-servers to find differences or patterns in names and IP addresses.

9. Type:
   `write`

Creating a Real Server Group

You can use real server groups create logical groups of real servers. A real server can be a member of multiple groups. You can use the groups to show information about the real servers or to attach the group to a virtual server for load balancing.

We recommend giving each real server group a meaningful name that helps identify the group use. For example, you might set up a real server group based on the application, floor location (all servers in a specific rack), or data center (all servers in data center).

In this example, we are creating a real server group (rsgroup_websilo1) and are adding the two real servers we already created, using a regular expression. We will then attach this real server group to a virtual server.

To create a real server group:

1. Type:
   `configure`
2. Type:
   `real-server group rsgroup_websilo1`
3. Type:
   `members by regex "rsweb.*"`
4. Type:
   `write`

Configuring a Virtual Server

Each load balancing (reverse proxy) configuration requires at least one virtual server. The virtual server is a configuration object that acts as a reverse proxy and ties together one or more virtual IPs and real servers. You also set the load balancing algorithm on the virtual server.

We recommend giving each virtual server a meaningful name that helps identify the server use. For example, you might name a virtual server based on the application and the resources that the virtual server is load balancing traffic to (real servers).

In this example, we are creating a virtual server and are attaching the virtual IP and real server group to it. We will also set the load balancing algorithm.

To create a virtual server:

1. Type:
   configure
2. Type:
   virtual-server websilo1
3. Type:
   attach virtual-ip vipweb1 default
4. Type:
   attach real-server group rsgroup_websilo1
5. Type:
   lb-algorithm round-robin
6. Type:
   service http
7. Type:
   show run brief

   ```
   ...
   virtual-server websilo1
    lb-algorithm round-robin
    service http
    attach virtual-ip vipweb1 default
    attach real-server group rsgroup_websilo1
   ...
   ```
8. Type:
   write

Load Balancing Example

After configuring load balancing, as described above, you can use the **show run brief** command to see the configuration. We have annotated the load balancing configuration in the example command output below. Comment lines start with an exclamation mark (!).

```
example-host(config)# show run brief
Building configuration...
!
hostname example-host
```

```
!
username admin secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/
   QeaZH8WnWRzVEkPt0MgS" uid 2000
!
interface em0
 ip address dhcp
 ip address 10.10.10.10 255.255.255.0
!
interface em1
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.1 255.255.255.0
!
ip route 0.0.0.0/0 192.0.2.2
!
! Health monitor and its configuration.
!
health-monitor hm_web1
 interval 5
 timeout 1
 server-down "8/10"
 server-up "9/10"
 type http
   request-method GET
   request-target "/health.html"
 admin-status online
!
! Default SSL configuration. See Configuring SSL.
!
ssl profile self-signed
 attach primary-certificate self-signed
 attach private-key self-signed
!
! Real server base and its configuration.
!
real-server base rsbase_web
 admin-status online
 max-connections 1000
 service http
 response-timeout 60
r esponse-idle-timeout 60
 keepalive-timeout 10
 attach health-monitor hm_web1
!
! Real servers showing their names, IP addresses, and base in a single line.
!
real-server rsweb1 ip 10.1.2.101 8080 base rsbase_web
real-server rsweb2 ip 10.1.2.102 8080 base rsbase_web
!
```

```
! Virtual IP base and its configuration.
!
virtual-ip base vipbase_web1
 service http
   keepalive-timeout 5
 admin-status online
!
! Virtual IP showing its name, IP address, and base in a single line.
!
virtual-ip vipweb1 ip 192.0.2.1 443 base vipbase_web1
!
! Real server group showing the regular expression used for group members.
!
real-server group rsgroup_websilo1
 members by regex "rsweb.*"
!
! Virtual server and its configuration.
!
virtual-server websilo1
 lb-algorithm round-robin
 service http
 attach virtual-ip vipweb1 default
 attach real-server group rsgroup_websilo1
!
ssh
 allow from 10.10.0.0/24
 allow to 10.10.10.10 22
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
certificate self-signed
! Cert data not shown in brief output
!
key self-signed
! Key data not shown in brief output
example-host(config-vserver-http:websilo1)#
```

What's Next

After you configure the load balancer, you can test the load balancer (Monitoring and Troubleshooting Load Balancing) or add security by configuring SSL (Configuring SSL).

Configuring SSL

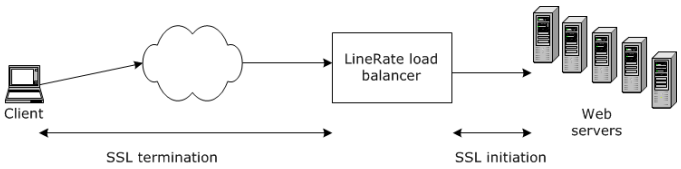
Secure Sockets Layer (SSL) and Transport Layer Security (TLS) are closely related technologies that provide communication security over an insecure network, such as the Internet. TLS is a standardized protocol, defined by IETF RFCs, and is the successor to the non-standardized SSL protocol. The F5® LineRate® software supports both TLS and SSL, for both service type TCP and service type HTTP, but the system and documentation refers to both protocols collectively as "SSL," following the most common industry terminology.

SSL Types Supported in the F5® LineRate® Software

The F5® LineRate® software supports two types of SSL connections:

- SSL termination—SSL connection from the client to the F5® LineRate® load balancer.
- SSL initiation—SSL connection from the F5® LineRate® load balancer to the web server.

The diagram below shows the two types of SSL.



SSL configuration in LineRate

By using the SSL termination feature in F5® LineRate®, you can move the computationally intensive SSL processing off your web servers and onto F5® LineRate®, allowing your web servers to concentrate on performing application tasks. Or, if your application requires greater security on your internal network, you can use SSL initiation together with SSL termination to provide end-to-end SSL security, while still allowing the F5® LineRate® to do full layer 7 load balancing.

SSL Termination

Before beginning to set up SSL termination, you will need the following:

- Primary certificate file that identifies the website you wish to set up on the F5® LineRate® system
- Private key file that corresponds to the primary certificate
- Chain certificate files (also called intermediate certificates) that correspond to the primary certificate are only required if their primary certificate uses them.

To set up SSL termination, you must complete the following tasks:

1. Set up the private key.
2. Set up certificates.
3. Configure SSL on the virtual IP.

Setting Up the Private Key for SSL Termination

You set up a private key object to correspond to each primary certificate you need. The system supports using one private key to generate more than one primary certificate and the use of separate private keys for individual primary certificates.

You need access to your private key file. The F5® LineRate® software supports keys in PEM format.

Best Practices:

- Configure primary certificates and corresponding keys for each cipher type that clients may use, then attach the configured certificate/key pairs to the SSL profile. For example, for clients that support ECC or RSA ciphers, you may want to configure and attach both RSA and ECC certificates and keys.
- Give each key a meaningful name that helps identify the key. For example, you might use the domain name or security settings in the name.

In this example, we will create a key object in the configuration, give it a name (key_secure.example.com), and paste the key text into it.

To set up the private key for SSL termination:

1. Open the private key file in a text editor and copy the text.
2. In another window, log in to F5® LineRate® using SSH.
3. Type:
   `configure`
4. Type:
   `key key_secure.example.com`

5. Type:
   `pem-format`
6. Paste the text from the private key file and press **Enter**.
7. Type:
   `quit`
8. Type:
   `write`

Note: When installing an SSL certificate on the F5® LineRate®, you must remove any passphrases from the certificate file.

When the system first starts the SSL web service, it cannot wait for user input to enter a passphrase before the services will start.

To remove a passphrase using openssl:

1. Make a copy of your SSL key file keeping the original intact.
2. Use openssl to enter the passphrase and output a new key file:
   `openssl rsa -in key.pem -out newkey.pem`
3. Use this new file newkey.pem as your SSL private key for upload into F5® LineRate®.

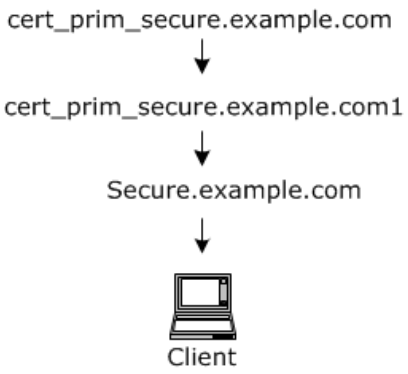
Setting Up Certificates for SSL Termination

To set up certificates, you must have access to your certificate files. The F5® LineRate® software supports PEM format certificates.

Best Practices:

- Give each certificate a meaningful name that helps identify the certificate. For example, you might use the domain name or security settings in the name.
- Configure primary certificates and corresponding keys for each cipher type that clients may use, then attach the configured certificate/key pairs to the SSL profile. For example, for clients that support ECC or RSA ciphers, you may want to configure and attach both RSA and ECC certificates and keys.

In this example, we will assume that your primary certificate only requires a single chain certificate. So we will create two certificate objects in the configuration, give them names (cert_prim_secure.example.com and cert_chain_secure.example.com1, as shown below), and paste the certificate text into them.



Certificate chain example

In this example, cert_prim_secure.example.com is the certificate that identifies the website "secure.example.com" and cert_chain_secure.example.com1 is the chain certificate required for that primary certificate. We have to create an SSL profile (ssl_prof_secure.example.com) and attach the private key, and the certificates to it. We then attach the SSL profile to the virtual IP. We recommend giving each profile a meaningful name that helps identify it. For example, you might use the domain name or security settings in the name.

Attaching an SSL profile to a virtual IP configures that virtual IP to always use SSL. It will no longer accept connections from clients unless they perform SSL negotiation.

Note: When installing an SSL certificate on the F5® LineRate®, you must remove any passphrases from the certificate file.

When the system first starts the SSL web service, it cannot wait for user input to enter a passphrase before the services will start.

To remove a passphrase using openssl:

1. Make a copy of your SSL key file keeping the original intact.
2. Use openssl to enter the passphrase and output a new key file:
   `openssl rsa -in key.pem -out newkey.pem`
3. Use this new file newkey.pem as your SSL private key for upload into F5® LineRate®.

To set up certificates for SSL termination:

1. Open the primary certificate file in a text editor and copy the text.
2. Type:
   `configure`
3. Type:
   `certificate cert_prim_secure.example.com`

4. Type:
   pem-format
5. Paste the text from the certificate file and press Enter.
6. Type:
   quit
7. Open the second certificate file in a text editor and copy the text.
8. Type:
   certificate cert_chain_secure.example.com1
9. Type:
   pem-format
10. Paste the text from the certificate file and press Enter.
11. Type:
    quit
12. Type:
    show cert brief

```
Certificate Subject Common Name (CN)
------------------------------------------------------------
cert_chain_secure.example.com1 Example Corp Intermediate CA
cert_prim_secure.example.com secure.example.com
self-signed lros-default-host
Certificate Bundle
-------------------------------------------
```

13. Type:
    write

Configuring SSL Termination

After you set up the private key and certificates you can create an SSL profile and attach it to a virtual IP.

In this example, cert_prim_secure.example.com is the certificate that identifies the website "secure.example.com" and cert_chain_secure.example.com1 is the chain certificate required for that primary certificate. We have to create an SSL profile (ssl_prof_secure.example.com) and attach the private key, and the certificates to it. We then attach the SSL profile to the virtual IP. We recommend giving each profile a meaningful name that helps identify it. For example, you might use the domain name or security settings in the name.

Attaching an SSL profile to a virtual IP configures that virtual IP to always use SSL. It will no longer accept connections from clients unless they perform SSL negotiation.

To configure SSL termination:

1. Type:
   configure

2. Type:
   ssl profile ssl_prof_secure.example.com
3. Type:
   attach key key_secure.example.com
4. Type:
   attach certificate cert_prim_secure.example.com
5. Type:
   attach chain-certificate cert_chain_secure.example.com1
6. Type:
   virtual-ip vipweb1
7. Type:
   attach ssl profile ssl_prof_secure.example.com
8. Type:
   show virtual-ip vipweb1

```
Configuration
 Address:       192.0.2.1:443   set locally
 Address Range: <unspecified>   default
 Admin Status:  online          default
 SSL Profile:   ssl_prof_secure.example.com   set locally
...
```

9. Type:
   show run brief

```
...
ssl profile ssl_prof_secure.example.com
 attach certificate cert_prim_secure.example.com
 attach key key_secure.example.com
 attach chain-certificate cert_chain_secure.example.com1
...
certificate cert_chain_secure.example.com1
! Cert data not shown in brief output
!
certificate cert_prim_secure.example.com
! Cert data not shown in brief output
!
certificate self-signed
! Cert data not shown in brief output
!
key key_secure.example.com
! Key data not shown in brief output
!
key self-signed
! Key data not shown in brief output
...
```

10. Type:
    write

Configuring SSL Initiation

In many cases, the default settings for SSL initiation work well.

In this example, we will set up the SSL initiation profile (ssl_prof_init1), using the defaults, and attach it to the real server base (rsbase_web). We recommend giving each profile a meaningful name that helps identify it. For example, you might use the security settings in the name.

Attaching an SSL profile to a real server configures that real server to always use SSL. If the web server is not configured to accept an SSL connection from the F5® LineRate® system, the system will not be able to send traffic to that web server.

To configure SSL initiation:

1. Type:
   configure
2. Type:
   ssl profile ssl_prof_init1
3. Type:
   real-server base rsbase_web
4. Type:
   attach ssl profile ssl_prof_init1
5. Type:
   show run brief
   ```
   ...
   real-server base rsbase_web
    max-connections 100
    idle-timeout 10
    service http
     response-timeout 60
     response-idle-timeout 60
     keepalive-timeout 10
    attach ssl profile ssl_prof_init1
    attach health-monitor hmweb
    admin-status online
   ...
   ```
6. Type:
   write

SSL Example

After configuring SSL, as described above, you can use the **`show run brief`** command to see the configuration. We have annotated the SSL configuration in the example command output below. Comment lines start with an exclamation mark (!).

```
example-host(config)# show run brief

Building configuration...
!
hostname example-host
!
username admin secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/
    QeaZH8WnWRzVEkPt0MgS" uid 2000
!
interface em0
 ip address dhcp
 ip address 10.200.0.1 255.255.255.0
!
interface em1
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.1 255.255.255.0
!
ip route 0.0.0.0/0 192.0.2.2
!
health-monitor hm_web1
 interval 5
 timeout 1
 server-down "8/10"
 server-up "9/10"
 type http
  request-method GET
  request-target "/health.html"
 admin-status online
!
! Default certificate configuration remains unchanged.
!
ssl profile self-signed
 attach certificate self-signed
 attach key self-signed
!
! Name of the SSL initiation profile we created.
!
ssl profile ssl_prof_init1
```

```
!
! Name of the SSL termination profile we created and the certificates and key
   configured.
!
ssl profile ssl_prof_secure.example.com
 attach certificate cert_prim_secure.example.com
 attach key key_secure.example.com
 attach chain-certificate cert_chain_secure.example.com1
!
! The real server shows the attached SSL initiation profile.
!
real-server base rsbase_web
 max-connections 1000
 service http
  response-timeout 60
  response-idle-timeout 60
  keepalive-timeout 10
 attach ssl profile ssl_prof_init1
 attach health-monitor hm_web1
 admin-status online
!
real-server rsweb1 ip 10.1.2.101 8080 base rsbase_web
real-server rsweb2 ip 10.1.2.102 8080 base rsbase_web
!
virtual-ip base vipbase_web1
admin-status online
service http
keepalive-timeout 5
!
! The virtual IP shows the attached SSL termination profile.
!
virtual-ip vipweb1
 ip address 192.0.2.1 443
 base vipbase_web1
 attach ssl profile ssl_prof_secure.example.com
!
real-server group rsgroup_websilo1
 members by regex "rsweb.*"
!
virtual-server websilo1
 lb-algorithm round-robin
 service http
 attach virtual-ip vipweb1 default
 attach real-server group rsgroup_websilo1
!
ssh
 allow from 10.200.0.0/24
 allow to 10.200.0.1 22
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
```

```
! The certificates and key we set up are listed, but the details do not display in the
   brief show output.
! The default certificate and key (self-signed) remain unchanged.
!
certificate cert_chain_secure.example.com1
! Cert data not shown in brief output
!
certificate cert_prim_secure.example.com
! Cert data not shown in brief output
!
certificate self-signed
! Cert data not shown in brief output
!
key key_secure.example.com
! Key data not shown in brief output
!
key self-signed
! Key data not shown in brief output
```

What's Next

After you have completed all the sections of *Configuring a Reverse Proxy*, you have a basic load balancing setup that uses SSL, as shown in Configuring Load Balancing.

For the complete configuration, see Complete Example Show Run Output.

Complete Example Show Run Output

Overview

This section provides a complete, annotated **`show run brief`** output of the whole configuration example in this guide. Lines starting with ! are annotations added to help explain the output.

Show Run Brief of Example Configuration

```
example_host(config)# show run brief

Building configuration...
!
! Hostname setting.
!
hostname example_host
!
! Default user name and encrypted password.
!
username admin secret encrypted "$2a$04$7TYufYOKVQ8i8bblVtZ1ierxZXzcH5mR/
    QeaZH8WnWRzVEkPt0MgS" uid 2000
!
! Default DNS configuration.
!
ip dns
 name-server 8.8.8.8 8.8.8.4.4
 admin-status online
!
! Phone home configuration.
phone-home
 userid "f5login" secret encrypted "B50EJk3UeN8=4"
!
! IP address configured on the interface called em0 for management access.
!
interface em0
 ip address dhcp
 ip address 10.110.10.10 255.255.255.0
```

```
!
! IP address configured on the interface called em1 for data.
!
interface em1
 no ip dhcp client request router
 ip address dhcp
 ip address 192.0.2.1 255.255.255.0
!
! IP address configured on the interface called em2 for data.
!
interface em2
 no ip dhcp client request router
 ip address dhcp
 ip address 10.1.2.1 255.255.255.0
!
! Default route configured for a router at 192.0.2.2.
!
ip route 0.0.0.0/0 192.0.2.2
!
! Health monitor and its configuration.
!
health-monitor hm_web1
 interval 5
 timeout 1
 server-down "8/10"
 server-up "9/10"
 type http
  request-method GET
  request-target "/health.html"
 admin-status online
!
! Default certificate configuration remains unchanged.
!
ssl profile self-signed
 attach certificate self-signed
 attach key self-signed
!
! Name of the SSL initiation profile we created.
!
ssl profile ssl_prof_init1
!
! Name of the SSL termination profile we created and the certificates and key
   configured.
!
ssl profile ssl_prof_secure.example.com
 attach certificate cert_prim_secure.example.com
 attach key key_secure.example.com
 attach chain-certificate cert_chain_secure.example.com1
!
! Real server base and its configuration.
!
real-server base rsbase_web
 max-connections 1000
 service http
```

```
  response-timeout 60
  response-idle-timeout 60
  keepalive-timeout 10
 attach ssl profile ssl_prof_init1
 attach health-monitor hm_web1
 admin-status online
!
! Real servers showing their names, IP addresses, and base in a single line for each.
!
real-server rsweb1 ip 10.1.2.101 8080 base rsbase_web
real-server rsweb2 ip 10.1.2.102 8080 base rsbase_web
!
! Virtual IP base and its configuration.
!
virtual-ip base vipbase_web1
 service http
  keepalive-timeout 5
 admin-status online
!
! Virtual IP and its configuration.
!
virtual-ip vipweb1
 ip address 192.0.2.1 443
 base vipbase_web1
 attach ssl profile ssl_prof_secure.example.com
!
! Real server group showing the regular expression used for group members.
!
real-server group rsgroup_websilo1
members by regex "rsweb.*"
!
! Virtual server and its configuration.
!
virtual-server websilo1
 lb-algorithm round-robin
 service http
 attach virtual-ip vipweb1 default
 attach real-server group rsgroup_websilo1
!
! SSH configuration to limit access to the F5® LineRate® system.
!
ssh
 allow from 10.200.0.0/24
 allow to 10.200.0.1 22
!
! Default REST server configuration.
!
rest-server
 allow from any
 allow to any 8443
 attach ssl profile self-signed
!
```

```
! The certificates and key we set up are listed, but the details do not display in the
   brief show output.
! The default certificate and key (self-signed) remain unchanged.
!
certificate cert_chain_secure.example.com1
! Cert data not shown in brief output
!
certificate cert_prim_secure.example.com
! Cert data not shown in brief output
!
certificate self-signed
! Cert data not shown in brief output
!
key key_secure.example.com
! Key data not shown in brief output
!
key self-signed
! Key data not shown in brief output
```

What's Next

Use the other sections of the Getting Started Guide to walk through this example configuration. Refer to the CLI Reference Guide for information about individual commands.

Creating the Traffic Replication Script

[some intro]

Customizable Node.js Code

The following code is the full Node.js script that can be loaded on LineRate to implement production traffic replication to a staging environment.

```
var vsm = require('lrs/virtualServerModule');
var http = require('http');

function ReplicateTraffic(scenarioName, primaryVSName, secondaryPort) {
    var self = this;
    self.primaryVS = primaryVSName;
    self.port = secondaryPort;

    //We need a secondary port that we expect is a loopback virtual IP that
    //goes to the secondary virtual server like this:
    //
    //virtual-server vsSecondary
    //  attach vipSecondary default
    //  attach real-server group ... !your secondary servers here
    //
    //virtual-ip vipSecondary
    //  admin-status online
    //  ip address 127.0.0.1 15000 !15000 is the secondary port
    //
    //

    vsm.on('exist', primaryVSName, function(vs) {
        vs.on('request', function(req, res, next) {
            self.replicate(req, res, next);
        });
    });
}

ReplicateTraffic.prototype.cloneReq = function(req) {
    var newReq = http.request({ host: "127.0.0.1",
                                port: this.port,
                                method: req.method,
                                path: req.url,
                                headers: req.headers},
                              function() {});
    return newReq;
}
```

```
ReplicateTraffic.prototype.replicate = function(req, res, next) {
    if(req.method == 'GET' || req.method == 'HEAD') {
        // Only do GET and HEAD
        var newReq = this.cloneReq(req);
        // Loop request through a dummy vip
        newReq.on('response', function(res) { console.log('saw B resp'); });
        newReq.end();
    }
    next();
}

var repl = new ReplicateTraffic("xxx",
                                'vsAandB',
                                15000);
```