Load Balancing Storage Made Easy File Fabric
Version 1.2.0
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1. About this Guide

This guide details the steps required to configure a load balanced Storage Made Easy File Fabric environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any File Fabric configuration changes that are required to enable load balancing.

For more information about initial appliance deployment, network configuration and using the Web User Interface (WebUI), please also refer to the Administration Manual.

2. Loadbalancer.org Appliances Supported

All our products can be used for load balancing File Fabric. For full specifications of available models please refer to https://www.loadbalancer.org/products. Some features may not be supported in all cloud platforms due to platform specific limitations, please check with Loadbalancer.org support for further details.

3. Software Versions Supported

3.1. Loadbalancer.org Appliance

- V8.3.8 and later

Note: The screenshots used throughout this document aim to track the latest Loadbalancer.org software version. If using an older software version, note that the screenshots presented here may not match the WebUI exactly.

3.2. File Fabric

- Version 1906.00 and later

4. Storage Made Easy File Fabric

Storage Made Easy provides an on-premises Enterprise File Fabric solution which is storage agnostic and can be used either with a single storage back-end or multiple public/private storage systems. In the event of the latter, the File Fabric unifies the view across all access clients and implements a common control and governance policies through the use of its cloud control features.

The product is supplied as a software ‘appliance’ which is run inside of a hypervisor and consists of a pre-configured, ‘hardened’ operating system (CentOS) and the File Fabric Application provided by Storage Made Easy.

5. Load Balancing File Fabric

Note: It’s highly recommended that you have a working File Fabric environment first before implementing the load balancer.

5.1. Load Balancing & HA Requirements
To deploy File Fabric as an HA deployment, 4 SME File Fabric instances are needed. When configured as per the Storage Made Easy guides, the topology will be as follows:

- 2 SME Web servers
- 2 SME SQL servers

5.2. Persistence (aka Server Affinity)
Load balancing File Fabric requires source IP address affinity. This is true for both the layer 4 and layer 7 based load balancing methods described in this document.

5.3. Virtual Service (VIP) Requirements
To provide load balancing and HA for File Fabric, the following VIPs are required:

- Web portal access
- SQL
- Memcache
- SFTP

5.4. Port Requirements
The following table shows the ports that are load balanced:

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocols</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>TCP/HTTP</td>
<td>Web Portal Access over HTTP</td>
</tr>
<tr>
<td>443</td>
<td>TCP/HTTPS</td>
<td>Web Portal Access over HTTPS</td>
</tr>
<tr>
<td>3306</td>
<td>TCP/SQL</td>
<td>SQL Service</td>
</tr>
<tr>
<td>2200</td>
<td>TCP/SFTP</td>
<td>SFTP Service</td>
</tr>
<tr>
<td>11211</td>
<td>TCP/Memcache</td>
<td>Memcache Service</td>
</tr>
</tbody>
</table>

6. Deployment Concept
7. Load Balancer Deployment Methods

The load balancer can be deployed in 4 fundamental ways: **Layer 4 DR mode**, **Layer 4 NAT mode**, **Layer 4 SNAT mode**, and **Layer 7 SNAT mode**.

For File Fabric, using a combination of layer 4 DR mode and layer 7 SNAT mode is recommended. It is also possible to only use layer 7 SNAT mode, however the performance of this setup is not as great and client source IP addresses are not passed through to the SME servers on the back end. Both of these setups are described below and are used for the configurations presented in this guide. For configuring using a combination of layer 4 DR mode and layer 7 SNAT mode please refer to **Appliance Configuration for File Fabric – Using Layer 4 DR Mode and Layer 7 SNAT Mode**. For configuring using only layer 7 SNAT mode refer to **Appliance Configuration for File Fabric – Using Only Layer 7 SNAT Mode**.

7.1. Layer 4 DR Mode

One-arm direct routing (DR) mode is a very high performance solution that requires little change to your existing infrastructure.

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VIPs = Virtual IP Addresses

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Note: The load balancer can be deployed as a single unit, although Loadbalancer.org recommends a clustered pair for resilience & high availability. Please refer to Configuring HA - Adding a Secondary Appliance for more details on configuring a clustered pair.

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Note: Kemp, Brocade, Barracuda & A10 Networks call this **Direct Server Return** and F5 call it **nPath**.
DR mode works by changing the destination MAC address of the incoming packet to match the selected Real Server on the fly which is very fast.

When the packet reaches the Real Server it expects the Real Server to own the Virtual Services IP address (VIP). This means that you need to ensure that the Real Server (and the load balanced application) respond to both the Real Server’s own IP address and the VIP.

The Real Servers should not respond to ARP requests for the VIP. Only the load balancer should do this. Configuring the Real Servers in this way is referred to as **Solving the ARP problem**. For more information please refer to **DR Mode Considerations**.

On average, DR mode is 8 times quicker than NAT for HTTP, 50 times quicker for Terminal Services and much, much faster for streaming media or FTP.

The load balancer must have an Interface in the same subnet as the Real Servers to ensure layer 2 connectivity required for DR mode to work.

The VIP can be brought up on the same subnet as the Real Servers, or on a different subnet provided that the load balancer has an interface in that subnet.

Port translation is not possible with DR mode, e.g. VIP:80 → RIP:8080 is not supported.

DR mode is transparent, i.e. the Real Server will see the source IP address of the client.

### 7.2. Layer 7 SNAT Mode

Layer 7 SNAT mode uses a proxy (HAProxy) at the application layer. Inbound requests are terminated on the load balancer and HAProxy generates a new corresponding request to the chosen Real Server. As a result, Layer 7 is typically not as fast as the Layer 4 methods. Layer 7 is typically chosen when either enhanced options such as SSL termination, cookie based persistence, URL rewriting, header insertion/deletion etc. are required, or when the network topology prohibits the use of the layer 4 methods.
Because layer 7 SNAT mode is a full proxy, any server in the cluster can be on any accessible subnet including across the Internet or WAN.

Layer 7 SNAT mode is not transparent by default, i.e. the Real Servers will not see the source IP address of the client, they will see the load balancer’s own IP address by default, or any other local appliance IP address if preferred (e.g. the VIP address). This can be configured per layer 7 VIP. If required, the load balancer can be configured to provide the actual client IP address to the Real Servers in 2 ways. Either by inserting a header that contains the client’s source IP address, or by modifying the Source Address field of the IP packets and replacing the IP address of the load balancer with the IP address of the client. For more information on these methods please refer to Transparency at Layer 7.

Layer 7 SNAT mode can be deployed using either a one-arm or two-arm configuration. For two-arm deployments, eth0 is normally used for the internal network and eth1 is used for the external network although this is not mandatory.

Requires no mode-specific configuration changes to the load balanced Real Servers.

Port translation is possible with Layer 7 SNAT mode, e.g. VIP:80 → RIP:8080 is supported.

You should not use the same RIP:PORT combination for layer 7 SNAT mode VIPs and layer 4 SNAT mode VIPs because the required firewall rules conflict.

**7.3. Our Recommendation**

Where possible, we recommend that the combination of Layer 4 Direct Routing (DR) mode and Layer 7 SNAT mode is used. This mode offers the best possible performance for the DR mode services, since replies go directly from the Real Servers to the client and not via the load balancer. It’s also relatively simple to implement. Ultimately, the final choice does depend on your specific requirements and infrastructure.

If DR mode cannot be used, for example if the real servers are located in remote routed networks, then SNAT mode is recommended. SNAT mode is also recommended if it is not possible to make network adaptor changes to the SME servers, for example if you do not own or do not control the infrastructure.
If the load balancer is deployed in AWS, Azure, or GCP, layer 7 SNAT mode must be used as layer 4 direct routing is not currently possible on these platforms.

8. Configuring File Fabric for Load Balancing

Ensure that a working, HA File Fabric deployment is in place prior to deploying a load balancer.

Refer to the following Storage Made Easy documentation for guidance on how to achieve this:

- Installation: Getting Started: File Fabric On-Premises
- File Fabric HA Master - Master Database with Automatic Failover
- SME How to configure SFTP

When using the load balancer setup that makes use of layer 4 DR mode, the ARP problem must be solved on each SME server. Please refer to Solving the ARP Problem for instructions on how to do this.

9. Loadbalancer.org Appliance – the Basics

9.1. Virtual Appliance

A fully featured, fully supported 30 day trial is available if you are conducting a PoC (Proof of Concept) deployment. The VA is currently available for VMware, Virtual Box, Hyper-V, KVM, XEN and Nutanix AHV and has been optimized for each Hypervisor. By default, the VA is allocated 2 vCPUs, 4GB of RAM and has a 20GB virtual disk. The Virtual Appliance can be downloaded here.

| Note | The same download is used for the licensed product, the only difference is that a license key file (supplied by our sales team when the product is purchased) must be applied using the appliance’s WebUI. |
| Note | Please refer to Virtual Appliance Installation and the ReadMe.txt text file included in the VA download for additional information on deploying the VA using the various Hypervisors. |
| Note | The VA has 4 network adapters. For VMware only the first adapter (eth0) is connected by default. For HyperV, KVM, XEN and Nutanix AHV all adapters are disconnected by default. Use the network configuration screen within the Hypervisor to connect the required adapters. |

9.2. Initial Network Configuration

After boot up, follow the instructions on the appliance console to configure the management IP address, subnet mask, default gateway, DNS Server and other network settings.

| Important | Be sure to set a secure password for the load balancer, when prompted during the setup routine. |
9.3. Accessing the WebUI

The WebUI is accessed using a web browser. By default, users are authenticated using Apache authentication. Users can also be authenticated against LDAP, LDAPS, Active Directory or Radius - for more information, please refer to External Authentication.

There are certain differences when accessing the WebUI for the cloud appliances. For details, please refer to the relevant Quick Start / Configuration Guide.

A number of compatibility issues have been found with various versions of Microsoft Internet Explorer and Edge. The WebUI has been tested and verified using both Chrome & Firefox.

1. Using a browser, navigate to the following URL:


   You’ll receive a warning about the WebUI’s certificate. This is due to the default self signed certificate that is used. If preferred, you can upload your own certificate - for more information, please refer to Appliance Security Features.

2. Log in to the WebUI using the following credentials:

   **Username**: loadbalancer  
   **Password**: <configured-during-network-setup-wizard>

   To change the password, use the WebUI menu option: Maintenance > Passwords.

Once logged in, the WebUI will be displayed as shown below:
3. You'll be asked if you want to run the Setup Wizard. Click Dismiss if you're following a guide or want to configure the appliance manually. Click Accept to start the Setup Wizard.

**Note**

The Setup Wizard can only be used to configure Layer 7 services.

### Main Menu Options

- **System Overview** - Displays a graphical summary of all VIPs, RIPS and key appliance statistics
- **Local Configuration** - Configure local host settings such as IP address, DNS, system time etc.
- **Cluster Configuration** - Configure load balanced services such as VIPs & RIPS
- **Maintenance** - Perform maintenance tasks such as service restarts and taking backups
- **View Configuration** - Display the saved appliance configuration settings
- **Reports** - View various appliance reports & graphs
- **Logs** - View various appliance logs
- **Support** - Create a support download, contact the support team & access useful links
9.4. Appliance Software Update

To ensure that the appliance(s) are running the latest software version, we recommend a software update check is performed.

Determining the Current Software Version

The software version is displayed at the bottom of the WebUI as shown in the example below:

Checking for Updates using Online Update

1. Using the WebUI, navigate to: **Maintenance > Software Update**.
2. Select **Online Update**.
3. If the latest version is already installed, a message similar to the following will be displayed:
   
   **Information:** Version v8.9.0 is the current release. No updates are available

4. If an update is available, you'll be presented with a list of new features, improvements, bug fixes and security related updates.
5. Click **Online Update** to start the update process.
   
   **Note** Do not navigate away whilst the update is ongoing, this may cause the update to fail.

6. Once complete (the update can take several minutes depending on download speed and upgrade version) the following message will be displayed:

   **Information:** Update completed successfully.

7. If services need to be reloaded/restarted or the appliance needs a full restart, you'll be prompted accordingly.

Using Offline Update

If the load balancer does not have access to the Internet, offline update can be used.
To perform an offline update:

1. Using the WebUI, navigate to: Maintenance > Software Update.
2. Select Offline Update.
3. The following screen will be displayed:

   **Offline Update**

   The following steps will lead you through offline update.

   1. Contact support@loadbalancer.org to obtain the offline update archive and checksum.
   2. Save the archive and checksum to your local machine.
   3. Select the archive and checksum files in the upload form below.
   4. Click Upload and Install to begin the update process.

<table>
<thead>
<tr>
<th>Archive: Choose File</th>
<th>No file chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checksum: Choose File</td>
<td>No file chosen</td>
</tr>
<tr>
<td>Upload and Install</td>
<td></td>
</tr>
</tbody>
</table>

4. Select the Archive and Checksum files.
5. Click Upload and Install.
6. If services need to be reloaded/restarted or the appliance needs a full restart, you'll be prompted accordingly.

### 9.5. Ports Used by the Appliance

By default, the appliance uses the following TCP & UDP ports:

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Port</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP</td>
<td>22</td>
<td>SSH</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>53</td>
<td>DNS</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>123</td>
<td>NTP</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>161</td>
<td>SNMP</td>
</tr>
<tr>
<td>UDP</td>
<td>6694</td>
<td>Heartbeat between Primary &amp; Secondary appliances in HA mode</td>
</tr>
<tr>
<td>TCP</td>
<td>7778</td>
<td>HAProxy persistence table replication</td>
</tr>
<tr>
<td>TCP</td>
<td>9080</td>
<td>WebUI - HTTP (disabled by default)</td>
</tr>
<tr>
<td>TCP</td>
<td>9081</td>
<td>Nginx fallback page</td>
</tr>
<tr>
<td>TCP</td>
<td>9443</td>
<td>WebUI - HTTPS</td>
</tr>
</tbody>
</table>
9.6. HA Clustered Pair Configuration
Loadbalancer.org recommend that load balancer appliances are deployed in pairs for high availability. In this guide a single unit is deployed first, adding a secondary unit is covered in Configuring HA - Adding a Secondary Appliance.

10. Appliance Configuration for File Fabric – Using Layer 4 DR Mode and Layer 7 SNAT Mode

10.1. Duplicate Service Function
As of version 8.3.8 of the Loadbalancer.org appliance, the Duplicate Service button can be used to save time during initial configuration. This function duplicates the configuration of a given virtual service along with all of the associated back end real servers which have been defined. This is useful for deployments where multiple, very similar virtual services are used, with only minor changes between them. It saves time as the same settings and real servers do not need to be repeatedly defined.

First, fully create the initial virtual service as directed. Then click the Modify button for the virtual service in question, click the Duplicate Service button near the top, and make the necessary changes for the new, duplicated virtual service.

This feature is available for both layer 4 and layer 7 virtual services.

10.2. Layer 4 Direct Routing Configuration
Configuring VIP 1 – SME Web Portal
Configuring the Virtual Service (VIP)
1. Using the web user interface, navigate to Cluster Configuration > Layer 4 – Virtual Services and click on Add a new Virtual Service.
2. Define the Label for the virtual service as required, e.g. SME_WebPortal.
3. Set the Virtual Service IP Address field to the required IP address, e.g. 192.168.86.84.
4. Set the Ports field to 80,443.
5. Leave the Protocol set to TCP.
7. Click Update to create the virtual service.
8. Click **Modify** next to the newly created VIP.

9. Ensure that the **Persistence Enable** checkbox is checked and that the **Timeout** is set to **1800**.

10. Leave the **Health Checks Check Type** set to **Connect to port**.

11. Click **Update**.

---

**Defining the Real Servers (RIPs)**

1. Using the web user interface, navigate to **Cluster Configuration > Layer 4 – Real Servers** and click on **Add a new Real Server** next to the newly created VIP.

2. Define the **Label** for the real server as required, e.g. **SMEWEB01**.

3. Set the **Real Server IP Address** field to the required IP address, e.g. **192.168.86.78**.

4. Click **Update**.

5. Repeat these steps to add additional SME servers as required.
Configuring VIP 2 – SME SFTP

Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to **Cluster Configuration > Layer 4 – Virtual Services** and click on **Add a new Virtual Service**.

2. Define the **Label** for the virtual service as required, e.g. **SME_SFTP**.

3. Set the **Virtual Service IP Address** field to the required IP address, e.g. **192.168.86.84**.

4. Set the **Ports** field to **2200**.

5. Leave the **Protocol** set to **TCP**.

6. Leave the **Forwarding Method** set to **Direct Routing**.

7. Click **Update** to create the virtual service.

8. Click **Modify** next to the newly created VIP.
9. Ensure that the Persistence Enable checkbox is checked and that the Timeout is set to 1800.

10. Leave the Health Checks Check Type set to Connect to port.

11. Click Update.

### Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to Cluster Configuration > Layer 4 – Real Servers and click on Add a new Real Server next to the newly created VIP.

2. Define the Label for the real server as required, e.g. SMEWEB01.

3. Set the Real Server IP Address field to the required IP address, e.g. 192.168.86.78.

4. Click Update.

5. Repeat these steps to add additional SME servers as required.

### 10.3. Layer 7 SNAT Mode Configuration

To load balance the SQL and Memcache services, layer 7 virtual services should be used. This is because layer 4 direct routing mode does not provide any real benefit or advantage for these services.

To set up layer 7 virtual services for SQL and Memcache, follow the appropriate instructions from the next section of this document, Appliance Configuration for File Fabric – Using Only Layer 7 SNAT Mode, i.e.: © Copyright Loadbalancer.org • Documentation • Load Balancing Storage Made Easy File Fabric
11. Appliance Configuration for File Fabric – Using Only Layer 7 SNAT Mode

11.1. Duplicate Service Function
As of version 8.3.8 of the Loadbalancer.org appliance, the **Duplicate Service** button can be used to save time during initial configuration. This function duplicates the configuration of a given virtual service along with all of the associated back end real servers which have been defined. This is useful for deployments where multiple, very similar virtual services are used, with only minor changes between them. It saves time as the same settings and real servers do not need to be repeatedly defined.

First, fully create the initial virtual service as directed. Then click the **Modify** button for the virtual service in question, click the **Duplicate Service** button near the top, and make the necessary changes for the new, duplicated virtual service.

This feature is available for both layer 4 and layer 7 virtual services.

![Layer 7 - Modify Virtual Service](image)

11.2. Configuring VIP 1 – SME Web Portal

**Configuring the Virtual Service (VIP)**

1. Using the web user interface, navigate to **Cluster Configuration > Layer 7 – Virtual Services** and click on **Add a new Virtual Service**.
2. Define the **Label** for the virtual service as required, e.g. **SME_WebPortal**.
3. Set the **Virtual Service IP Address** field to the required IP address, e.g. **192.168.86.84**.
4. Set the **Virtual Service Ports** field to **80,443**.
5. Set the **Layer 7 Protocol** to **TCP Mode**.
6. Click **Update** to create the virtual service.
7. Click **Modify** next to the newly created VIP.
8. Set **Persistence Mode** to **Source IP**.
9. Set **Health Checks** to **Connect to port**.
10. In the **Other** section click **Advanced** to expand the menu.
11. Check the **Timeout** checkbox.
12. Set **Client Timeout** to **5m** (this is 5 minutes).
13. Set **Real Server Timeout** to **5m**.
14. Click **Update**.

### 11.3. Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to **Cluster Configuration > Layer 7 – Real Servers** and click on **Add a new Real Server** next to the newly created VIP.
2. Enter an appropriate name for the server in the **Label** field, e.g. SMEWEB01.
3. Change the **Real Server IP Address** field to the required IP address, e.g. 192.168.86.78.
4. Click **Update**.
5. Repeat these steps to add additional servers as required.

11.4. Configuring VIP 2 – SME SFTP

Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to Cluster Configuration > Layer 7 – Virtual Services and click on Add a new Virtual Service.
2. Define the Label for the virtual service as required, e.g. SME_SFTP.
3. Set the Virtual Service IP Address field to the required IP address, e.g. 192.168.86.84.
4. Set the Virtual Service Ports field to 2200.
5. Set the Layer 7 Protocol to TCP Mode.
6. Click Update to create the virtual service.

7. Click Modify next to the newly created VIP.
8. Set Persistence Mode to Source IP.
9. Set *Health Checks* to *Connect to port*.

10. In the *Other* section click *Advanced* to expand the menu.

11. Check the *Timeout* checkbox.

12. Set *Client Timeout* to 5m (this is 5 minutes).

13. Set *Real Server Timeout* to 5m.

14. Click *Update*.

![Timeout settings in the Other section](image)

**11.5. Defining the Real Servers (RIPs)**

1. Using the web user interface, navigate to *Cluster Configuration > Layer 7 – Real Servers* and click on *Add a new Real Server* next to the newly created VIP.

2. Enter an appropriate name for the server in the *Label* field, e.g. SMEWEB01.

3. Change the *Real Server IP Address* field to the required IP address, e.g. 192.168.86.78.

4. Click *Update*.

5. Repeat these steps to add additional servers as required.

![Layer 7 Add a new Real Server](image)

**11.6. Configuring VIP 3 – SME SQL**

**Configuring the Virtual Service (VIP)**

1. Using the web user interface, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click on *Add a new Virtual Service*. 

![Layer 7 Add a new Virtual Service](image)
2. Define the *Label* for the virtual service as required, e.g. **SME_SQL_VIP**.

3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.86.81**.

4. Set the *Virtual Service Ports* field to **3306**.

5. Set the *Layer 7 Protocol* to **TCP Mode**.

6. Click **Update** to create the virtual service.

7. Click **Modify** next to the newly created VIP.

8. Set *Persistence Mode* to **Source IP**.

9. Set *Health Checks* to **Connect to port**.

10. In the *Other* section click **Advanced** to expand the menu.

11. Check the *Timeout* checkbox.

12. Set *Client Timeout* to **5m** (this is 5 minutes).

13. Set *Real Server Timeout* to **5m**.

14. Click **Update**.

### 11.7. Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to **Cluster Configuration > Layer 7 – Real Servers** and click on **Add a new Real Server** next to the newly created VIP.
2. Enter an appropriate name for the server in the *Label* field, e.g. SMESQL01.

3. Change the *Real Server IP Address* field to the required IP address, e.g. 192.168.86.82.

4. Click Update.

5. Repeat these steps to add additional servers as required.

11.8. Configuring VIP 4 – SME Memcache

**Configuring the Virtual Service (VIP)**

1. Using the web user interface, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click on *Add a new Virtual Service*.

2. Define the *Label* for the virtual service as required, e.g. SME_MEMCACHE_VIP.

3. Set the *Virtual Service IP Address* field to the required IP address, e.g. 192.168.86.86.

4. Set the *Virtual Service Ports* field to 11211.

5. Set the *Layer 7 Protocol* to TCP Mode.

6. Click Update to create the virtual service.
7. Click **Modify** next to the newly created VIP.
8. Set **Persistence Mode** to **Source IP**.
9. Set **Health Checks** to **Connect to port**.
10. In the **Other** section click **Advanced** to expand the menu.
11. Check the **Timeout** checkbox.
12. Set **Client Timeout** to **5m** (this is 5 minutes).
13. Set **Real Server Timeout** to **5m**.
14. Click **Update**.

![Other section of the Load Balancer interface](Image)

### 11.9. Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to **Cluster Configuration > Layer 7 – Real Servers** and click on **Add a new Real Server** next to the newly created VIP.
2. Enter an appropriate name for the server in the **Label** field, e.g. **SMESQL01**.
3. Change the **Real Server IP Address** field to the required IP address, e.g. **192.168.86.82**.
4. Click **Update**.
5. Repeat these steps to add additional servers as required.

![Layer 7 Add a new Real Server interface](Image)

### 11.10. Finalizing the Configuration
To apply the new settings, HAProxy must be reloaded. This can be done using the button in the "Commit changes" box at the top of the screen or by using the **Restart Services** menu option:

1. Using the WebUI, navigate to: **Maintenance > Restart Services**.
2. Click **Reload HAProxy**.

### 12. Testing & Verification

For additional guidance on diagnosing and resolving any issues you may have, please also refer to **Diagnostics & Troubleshooting**.

#### 12.1. Using System Overview

The System Overview can be viewed in the WebUI. It shows a graphical view of all VIPs & RIPv (i.e. the SME servers) and shows the state/health of each server as well as the state of the cluster as a whole. The example below shows that both SME servers are healthy, across all 5 virtual services, and available to accept connections:
12.2. Layer 4 Direct Routing Specific Check

If using the setup that combines layer 4 DR mode and layer 7 SNAT mode, it is possible to specifically check that layer 4 DR mode has been correctly configured (including verifying that the real servers have been modified correctly in regards to the **ARP problem**).

After sending traffic to the layer 4 DR mode virtual services, check that connections are not in the **SYN_RECV** state and that they are **ESTABLISHED**. This can be done through the load balancer’s WebUI, by navigating to **Reports > Layer 4 Current Connections**.

If there are a significant number of connections in the **SYN_RECV** state then that implies that the **ARP problem** has not been correctly resolved on the back end real servers.

### Layer 4 Current Connections

<table>
<thead>
<tr>
<th>IPVS connection entries</th>
<th>source</th>
<th>virtual</th>
<th>destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP 08:44 FIN WAIT</td>
<td>192.168.86.2:56718</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 01:18 FIN WAIT</td>
<td>192.168.86.2:56842</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 01:28 FIN WAIT</td>
<td>192.168.86.2:56044</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 00:45 FIN WAIT</td>
<td>192.168.86.2:56222</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 00:38 FIN WAIT</td>
<td>192.168.86.2:56378</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 01:42 FIN WAIT</td>
<td>192.168.86.2:56912</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 00:45 FIN WAIT</td>
<td>192.168.86.2:56786</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 00:32 FIN WAIT</td>
<td>192.168.86.2:37500</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:80</td>
</tr>
<tr>
<td>TCP 01:49 FIN WAIT</td>
<td>192.168.86.2:56714</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 00:38 FIN WAIT</td>
<td>192.168.86.2:56744</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 08:38 FIN WAIT</td>
<td>192.168.86.2:56732</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 08:45 FIN WAIT</td>
<td>192.168.86.2:56884</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 01:18 FIN WAIT</td>
<td>192.168.86.2:56846</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 00:52 FIN WAIT</td>
<td>192.168.86.2:56752</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 08:59 FIN WAIT</td>
<td>192.168.86.2:56784</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 08:32 FIN WAIT</td>
<td>192.168.86.2:37500</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:80</td>
</tr>
<tr>
<td>IP 04:54 NONE</td>
<td>192.168.86.2:8</td>
<td>119.53.147.255:0</td>
<td>192.168.86.78:8</td>
</tr>
<tr>
<td>TCP 00:38 FIN WAIT</td>
<td>192.168.86.2:56720</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 00:38 FIN WAIT</td>
<td>192.168.86.2:56726</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 08:44 FIN WAIT</td>
<td>192.168.86.2:56756</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
<tr>
<td>TCP 14:57 ESTABLISHED</td>
<td>192.168.86.2:56932</td>
<td>192.168.86.85:443</td>
<td>192.168.86.78:443</td>
</tr>
</tbody>
</table>

12.3. SFTP Service Check

For details on how to perform a check of the SFTP service, see [Testing the SFTP Service](#).

13. Technical Support

For more details about configuring the appliance and assistance with designing your deployment please don’t hesitate to contact the support team using the following email address: support@loadbalancer.org.

14. Further Documentation

For additional information, please refer to the [Administration Manual](#).
15. Appendix

15.1. Solving the ARP Problem

When using Layer 4 DR mode, the ARP problem must be solved. This involves configuring each Real Server to be able to receive traffic destined for the VIP, and ensuring that each Real Server does not respond to ARP requests for the VIP address – only the load balancer should do this. The steps below are for Windows 2012 and later.

Windows Server 2012 & Later

Windows Server 2012 and later support Direct Routing (DR) mode through the use of the Microsoft Loopback Adapter that must be installed and configured on each load balanced (Real) Server. The IP address configured on the Loopback Adapter must be the same as the Virtual Service (VIP) address.

Note

If a Real Server is included in multiple DR mode VIPs, IP addresses for each VIP must be added to the Loopback Adapter.

In addition, steps must be taken to set the strong/weak host behavior on each Real Server. This is used to either prevent or allow interfaces to receive packets destined for a different interface on the same server.

Important

The following 3 steps must be completed on each Real Server.

Step 1 of 3: Install the Microsoft Loopback Adapter

1. Click Start, then run hdwwiz to start the Hardware Installation Wizard.
2. Once the Wizard has started, click Next.
3. Select Install the hardware that I manually select from a list (Advanced), click Next.
4. Select Network adapters, click Next.
5. Select **Microsoft & Microsoft KM-Test Loopback Adapter**, click **Next**.

6. Click **Next** to start the installation, when complete click **Finish**.

**Step 2 of 3: Configure the Loopback Adapter**

1. Open Control Panel and click **Network and Sharing Center**.

2. Click **Change adapter settings**.

3. Right-click the new Loopback Adapter and select **Properties**.

   **Note** You can configure IPv4 or IPv6 addresses or both depending on your requirements.

**IPv4 Addresses**

1. Uncheck all items except **Internet Protocol Version 4 (TCP/IPv4)** as shown below:
2. Ensure that **Internet Protocol Version (TCP/IPv4)** is selected, click **Properties** and configure the IP address to be the same as the Virtual Service address (VIP) with a subnet mask of **255.255.255.255**, e.g. **192.168.2.20/255.255.255.255** as shown below:

3. Click **OK** then click **Close** to save and apply the new settings.

Note: **192.168.2.20** is an example, make sure you specify the correct VIP address.
IPv6 Addresses

1. Uncheck all items except Internet Protocol Version 6 (TCP/IPv6) as shown below:

2. Ensure that Internet Protocol Version (TCP/IPv6) is selected, click Properties and configure the IP address to be the same as the Virtual Service (VIP) and set the Subnet Prefix Length to be the same as your network setting, e.g. 2001:470:1f09:e72::15/64 as shown below:
3. Click **OK** then click **Close** to save and apply the new settings.

**Step 3 of 3: Configure the strong/weak host behavior**

Either Network Shell (**netsh**) commands or PowerShell cmdlets can be used to set the required strong/weak host behavior.

The commands in this section assume that the LAN Adapter is named "**net**" and the Loopback Adapter is named "**loopback**" as shown in the example below:

### Option 1 - Using Network Shell (**netsh**) Commands

To configure the correct strong/weak host behavior run the following commands:

For IPv4 addresses:

```bash
netsh interface ipv4 set interface "net" weakhostreceive=enabled
netsh interface ipv4 set interface "loopback" weakhostreceive=enabled
netsh interface ipv4 set interface "loopback" weakhostsend=enabled
```

For IPv6 addresses:

```bash
netsh interface ipv6 set interface "net" weakhostreceive=enabled
netsh interface ipv6 set interface "loopback" weakhostreceive=enabled
netsh interface ipv6 set interface "loopback" weakhostsend=enabled
netsh interface ipv6 set interface "loopback" dadtransmits=0
```

### Option 2 - Using PowerShell Cmdlets

For IPv4 addresses:

```powershell
Set-NetIpInterface -InterfaceAlias loopback -WeakHostReceive enabled -WeakHostSend enabled
```

---

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Set-NetIpInterface -InterfaceAlias net -WeakHostReceive enabled -AddressFamily IPv4

For IPv6 Addresses:

Set-NetIpInterface -InterfaceAlias loopback -WeakHostReceive enabled -WeakHostSend enabled -DadTransmits 0 -AddressFamily IPv6

Set-NetIpInterface -InterfaceAlias net -WeakHostReceive enabled -AddressFamily IPv6

15.2. Testing the SFTP Service

When using SFTP, it should be possible to access the SFTP virtual service using pre-configured SME web portal credentials.

It should be possible to access the SFTP service via the VIP address, by using an SFTP client and appropriate credentials:
15.3. Configuring HA - Adding a Secondary Appliance

Our recommended configuration is to use a clustered HA pair of load balancers to provide a highly available and resilient load balancing solution.

We recommend that the Primary appliance is configured first and then the Secondary should be added. Once the Primary and Secondary are paired, all load balanced services configured on the Primary are automatically replicated to the Secondary over the network using SSH/SCP.

Note

For Enterprise Azure, the HA pair should be configured first. In Azure, when creating a VIP using an HA pair, 2 private IPs must be specified – one for the VIP when it’s active on the Primary and one for the VIP when it’s active on the Secondary. Configuring the HA pair first, enables both IPs to be specified when the VIP is created.

The clustered HA pair uses Heartbeat to determine the state of the other appliance. Should the active device (normally the Primary) suffer a failure, the passive device (normally the Secondary) will take over.

Non-Replicated Settings

A number of settings are not replicated as part of the Primary/Secondary pairing process and therefore must be manually configured on the Secondary appliance. These are listed by WebUI menu option in the table below:
<table>
<thead>
<tr>
<th>WebUI Main Menu Option</th>
<th>Sub Menu Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Configuration</td>
<td>Hostname &amp; DNS</td>
<td>Hostname and DNS settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Network Interface</td>
<td>All network settings including IP address(es), bonding configuration and VLANs</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Routing</td>
<td>Routing configuration including default gateways and static routes</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>System Date &amp; time</td>
<td>All time and date related settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Physical – Advanced</td>
<td>Various settings including Internet Proxy, Management Gateway,</td>
</tr>
<tr>
<td></td>
<td>Configuration</td>
<td>Firewall connection tracking table size, NIC offloading, SMTP relay,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>logging and Syslog Server</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Security</td>
<td>Appliance security settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>SNMP Configuration</td>
<td>Appliance SNMP settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Graphing</td>
<td>Appliance graphing settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>License Key</td>
<td>Appliance licensing</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Software Updates</td>
<td>Appliance software update management</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Firewall Script</td>
<td>Appliance firewall (iptables) configuration</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Firewall Lockdown Wizard</td>
<td>Appliance management lockdown settings</td>
</tr>
</tbody>
</table>

**Important** Make sure that if these settings/updates have been configured on the Primary appliance, they’re also configured on the Secondary appliance.

### Adding a Secondary Appliance - Create an HA Clustered Pair

**Note** If you have already run the firewall lockdown wizard on either appliance, you’ll need to ensure that it is temporarily disabled on both appliances whilst performing the pairing process.

1. Deploy a second appliance that will be the Secondary and configure initial network settings.
2. Using the WebUI on the Primary appliance, navigate to: *Cluster Configuration > High-Availability Configuration*.
3. Specify the IP address and the loadbalancer user's password for the Secondary (peer) appliance as shown in the example above.

4. Click Add new node.

5. The pairing process now commences as shown below:

6. Once complete, the following will be displayed on the Primary appliance:

7. To finalize the configuration, restart heartbeat and any other services as prompted in the "Commit changes" message box at the top of the screen.
Clicking the **Restart Heartbeat** button on the Primary appliance will also automatically restart heartbeat on the Secondary appliance.

For more details on configuring HA with 2 appliances, please refer to **Appliance Clustering for HA**.

For details on testing and verifying HA, please refer to **Clustered Pair Diagnostics**.
# 16. Document Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Change</th>
<th>Reason for Change</th>
<th>Changed By</th>
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<td>1.0.0</td>
<td>17 December 2019</td>
<td>Initial version</td>
<td></td>
<td>IBG, AH</td>
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<tr>
<td>1.0.1</td>
<td>3 September 2020</td>
<td>New title page</td>
<td>Branding update</td>
<td>AH</td>
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<td></td>
<td></td>
<td>Updated Canadian contact details</td>
<td>Change to Canadian contact details</td>
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<tr>
<td>1.1.0</td>
<td>1 December 2021</td>
<td>Converted the document to AsciiDoc</td>
<td>Move to new documentation system</td>
<td>AH, RJC, ZAC</td>
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<td>28 September 2022</td>
<td>Updated layer 7 VIP and RIP creation screenshots</td>
<td>Reflect changes in the web user interface</td>
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<td>5 January 2023</td>
<td>Combined software version information into one section</td>
<td>Housekeeping across all documentation</td>
<td>AH</td>
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<td>Added one level of section numbering</td>
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<td>Added software update instructions</td>
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<td>Added table of ports used by the appliance</td>
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<td>Reworded ‘Further Documentation’ section</td>
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<td>Removed references to the colour of certain UI elements</td>
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<td>Modified diagram colours</td>
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