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1. About this Guide

This guide details the steps required to configure a load balanced Epic EHR environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any Epic EHR 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 with Epic EHR. For full specifications of available models please refer to https://www.loadbalancer.org/products.

Some features may not be available or fully supported in all cloud platforms due to platform specific limitations. For more details, please refer to the "Main Differences to our Standard (Non-Cloud) Product" section in the appropriate cloud platform Quick Start Guide or check with Loadbalancer.org support.

3. Software Versions Supported

3.1. Loadbalancer.org Appliance

- V8.9.1 and later

Note: The screenshots used throughout this document aim to track the latest Loadbalancer.org software version. If you’re using an older version, or the very latest, the screenshots presented here may not match your WebUI exactly.

3.2. Epic EHR

- All versions

4. Epic EHR

The Epic EHR (Electronic Health Records) software suite brings together essential tools for clinicians and patients in the healthcare space.

Epic Hyperspace is a clinician-facing platform. It’s a front-end client used to access most parts of the Epic software suite, including patient charts, prescribing, and even print services.

Epic MyChart is a patient-facing web portal. It gives patients the ability to view their medical records and test results, manage their appointments and prescriptions, and more.

5. Load Balancing Epic EHR

Note: It’s highly recommended that you have a working Epic EHR environment first before...
5.1. Persistence (aka Server Affinity)
The Epic EHR applications require sessions to stick to the same real server. Source IP address affinity is used to achieve this.

5.2. Virtual Service (VIP) Requirements
To provide load balancing and HA for Epic EHR, the following VIPs are required:

- Hyperspace
- Hyperspace redirect (to force inbound HTTP traffic to use HTTPS)

Optionally, additional VIPs may be required as follows:

- MyChart
- MyChart redirect (to force inbound HTTP traffic to use HTTPS)

5.3. 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>Redirect to HTTPS (not strictly load balanced)</td>
</tr>
<tr>
<td>443</td>
<td>TCP/HTTPS</td>
<td>Web Services</td>
</tr>
</tbody>
</table>

6. Deployment Concept

VIP = Virtual IP Address
The load balancer can be deployed as a single unit, although Loadbalancer.org recommends a clustered pair for resilience & high availability. Please refer to the section Configuring HA - Adding a Secondary Appliance in the appendix for more details on configuring a clustered pair.

7. Loadbalancer.org Appliance – the Basics

7.1. 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.

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.

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.

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.

7.2. Initial Network Configuration
After boot up, follow the instructions on the appliance console to configure the management IP address, subnet mask, default gateway, DNS servers and other network and administrative settings.

Be sure to set a secure password for the load balancer, when prompted during the setup routine.

7.3. Accessing the Appliance 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.

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

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 which can be used to configure layer 7 services. Click **Dismiss** if you’re following a guide or want to configure the appliance manually or click **Accept** to start the wizard.

**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

**Live Chat** - Start a live chat session with one of our Support Engineers
7.4. 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 v8.11.1 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:

   **Software Update**

   **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.

   **Archive:** Choose File [No file chosen]
   **Checksum:** Choose File [No file chosen]

   ![Upload and Install button](image)

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.

### 7.5. 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 / GSLB</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>HAPProxy persistence table replication</td>
</tr>
<tr>
<td>TCP</td>
<td>9000 *</td>
<td>Gateway service (Centralized/Portal Management)</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>
</tbody>
</table>
### Protocol, Port, Purpose

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Port</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP</td>
<td>9443 *</td>
<td>WebUI - HTTPS</td>
</tr>
<tr>
<td>TCP</td>
<td>25565 *</td>
<td>Shuttle service (Centralized/Portal Management)</td>
</tr>
</tbody>
</table>

**Note**

The ports used for SSH, GSLB, SNMP, the WebUI, the fallback page, the gateway service and the shuttle service can be changed if required. For more information, please refer to Service Socket Addresses.

---

### 7.6. 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 the section Configuring HA - Adding a Secondary Appliance of the appendix.

---

### 8. Appliance Configuration for Epic EHR

#### 8.1. Configuring VIP 1 – Hyperspace

**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. Hyperspace.

3. Set the Virtual Service IP Address field to the required IP address, e.g. 192.168.85.150.

4. Set the Ports field to 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. In the Persistence section click Advanced to expand the menu.

9. Set Timeout to 60 (the default units are minutes).
10. Click Update.

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. Define the Label for the real server as required, e.g. Hyperspace_Srv_1.
3. Set the Real Server IP Address field to the required IP address, e.g. 192.168.85.200.
4. Click Update.
5. Repeat these steps to add additional servers as required.

8.2. Configuring VIP 2 – Hyperspace Redirect

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. Hyperspace_redirect.
3. Set the Virtual Service IP Address field to the same IP address used for the Hyperspace VIP, e.g. 192.168.85.150.
4. Set the Ports field to 80.
5. Set the Layer 7 Protocol to HTTP Mode.
6. Click Update to create the virtual service.
7. Click **Modify** next to the newly created VIP.

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

9. Set **Force to HTTPS** to **Yes**.

10. Click **Update**.

### 8.3. Configuring VIP 3 – MyChart (Optional)

**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. **MyChart**.

3. Set the **Virtual Service IP Address** field to the required IP address, e.g. **192.168.85.151**.

4. Set the **Ports** field to **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. In the **Persistence** section click **Advanced** to expand the menu.
9. Set **Timeout** to **60** (the default units are minutes).
10. Click **Update**.

### 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. Define the **Label** for the real server as required, e.g. **MyChart_Srv_1**.
3. Set the **Real Server IP Address** field to the required IP address, e.g. **192.168.85.210**.
4. Click **Update**.
5. Repeat these steps to add additional servers as required.

### 8.4. Configuring VIP 4 – MyChart Redirect (Optional)

8. If the optional **MyChart** VIP has been configured then this redirect VIP must also be configured to ensure proper operation of the load balanced MyChart service.

#### 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. **MyChart_redirect**.
3. Set the **Virtual Service IP Address** field to the same IP address used for the MyChart VIP, e.g. **192.168.85.151**.
4. Set the **Ports** field to **80**.
5. Set the Layer 7 Protocol to **HTTP Mode**.

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

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

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

9. Set **Force to HTTPS** to **Yes**.

10. Click **Update**.

---

8.5. **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**.

9. **Testing & Verification**

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

9.1. **Using System Overview**

   The System Overview can be viewed in the WebUI. It shows a graphical view of all VIPs & RIPs (i.e. the Hyperspace and MyChart 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 all servers of both services are healthy and available to accept connections:
10. 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.

11. Further Documentation

For additional information, please refer to the Administration Manual.
12. Appendix

12.1. 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 fully configured first, then the Secondary appliance can be added to create an HA pair. Once the HA pair is configured, load balanced services must be configured and modified on the Primary appliance. The Secondary appliance will be automatically kept in sync.

Note

For Enterprise Azure, the HA pair should be configured first. For more information, please refer to the Azure Quick Start/Configuration Guide available in the documentation library.

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 Configuration</td>
<td>Interface IP addresses, bonding configuration and VLANs</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Routing</td>
<td>Default gateways and static routes</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>System Date &amp; time</td>
<td>Time and date related settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Physical – Advanced Configuration</td>
<td>Various appliance settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Portal Management</td>
<td>Portal management settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Security</td>
<td>Security settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>SNMP Configuration</td>
<td>SNMP settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Graphing</td>
<td>Graphing settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>License Key</td>
<td>Appliance licensing</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Backup &amp; Restore</td>
<td>Local XML backups</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Software Updates</td>
<td>Appliance software updates</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Fallback Page</td>
<td>Fallback page configuration</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Firewall Script</td>
<td>Firewall (iptables) configuration</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Firewall Lockdown</td>
<td>Appliance management lockdown settings</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Wizard</td>
<td></td>
</tr>
</tbody>
</table>
**Important** Make sure that where any of the above have been configured on the Primary appliance, they’re also configured on the Secondary.

**Configuring the 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*.

#### Create a Clustered Pair

![Create a Clustered Pair](image)

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:

![Create a Clustered Pair](image)

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.

Note: Clicking the Restart Heartbeat button on the Primary appliance will also automatically restart heartbeat on the Secondary appliance.

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

Note: For details on testing and verifying HA, please refer to Clustered Pair Diagnostics.
## 13. Document Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Change</th>
<th>Reason for Change</th>
<th>Changed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0.0</td>
<td>22 February 2022</td>
<td>Initial version</td>
<td></td>
<td>AH</td>
</tr>
<tr>
<td>1.0.1</td>
<td>28 September 2022</td>
<td>Updated layer 7 VIP and RIP creation screenshots</td>
<td>Reflect changes in the web user interface</td>
<td>AH</td>
</tr>
<tr>
<td>1.0.2</td>
<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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<tr>
<td></td>
<td></td>
<td>Added one level of section numbering</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>Added software update instructions</td>
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<tr>
<td></td>
<td></td>
<td>Added table of ports used by the appliance</td>
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<td></td>
<td>Reworded 'Further Documentation' section</td>
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<td></td>
<td>Removed references to the colour of certain UI elements</td>
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<td>1.0.3</td>
<td>2 February 2023</td>
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<td>Branding update</td>
<td>AH</td>
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<tr>
<td>1.0.4</td>
<td>7 March 2023</td>
<td>Removed conclusion section</td>
<td>Updates across all documentation</td>
<td>AH</td>
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<tr>
<td>1.1.0</td>
<td>24 March 2023</td>
<td>New document theme</td>
<td>Branding update</td>
<td>AH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modified diagram colours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
About Loadbalancer.org

Loadbalancer.org’s mission is to ensure that its clients’ businesses are never interrupted. The load balancer experts ask the right questions to get to the heart of what matters, bringing a depth of understanding to each deployment. Experience enables Loadbalancer.org engineers to design less complex, unbreakable solutions - and to provide exceptional personalized support.

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