LOADBALANCER

DEPLOYMENT GUIDE

Load Balancing GE HealthCare DoseWatch

Version 1.0

Table of Contents

1. About this Guide

This guide details the steps required to configure a load balanced GE HealthCare DoseWatch (DW) environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any DW configuration changes that are required to enable load balancing.

1.1. Acronyms Used in the Guide

Acronym	Description
DW	DoseWatch

2. Prerequisites

1. Have access to the VMware Hypervisor environment to enable the Loadbalancer.org Virtual Appliance (VA) to be deployed and configured.
2. Have sufficient available Hypervisor CPU and memory resources to allocate to the VA based on the required throughput - for details refer to Virtual Hardware Resource Requirements.
3. Ensure that firewalls and other network devices are configured to allow management and other required access to the VA - for details of all ports used refer to Ports Used by the Appliance.
4. Ensure that firewalls and other network devices are configured to allow client/test access to all Virtual Services (VIPs).
5. Ensure that firewalls and other network devices are configured to allow load balancer access to all DW servers.
6. Have IP addresses for the VA and all required Virtual Services.

3. Software Versions Supported

3.1. Loadbalancer.org Appliance

- V8.9.0 & later

3.2. GE HealthCare DW

- V3.3.0 & later

4. Load Balancing DW

> **Note** It's highly recommended that you have a working DW environment first before implementing the load balancer.

4.1. Virtual Services (VIP) Requirements

To provide load balancing and HA for DW, the following VIPs are required:

Ref.	VIP Name	Use	Mode	Port(s)	Persistence Mode	Health Check
VIP 1	DATALINK_POOL1	DoseWatch DataLink Main Listener (Raw or all)	L4 SNAT	2001	Source IP	External Script
VIP 2	DATALINK_POOL2	**Optional** - DoseWatch DataLink Alternative Listener (RDSR or all)	L4 SNAT	2003	Source IP	External Script
VIP 3	DATALINK_POOL3	**Optional** - DoseWatch DataLink MPPS Listener (MPPS or all)	L4 SNAT	2002	Source IP	External Script

5. Ports Used by the Appliance

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

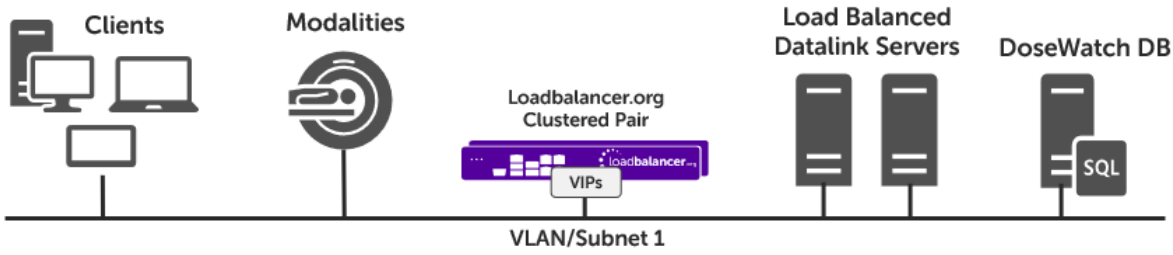
Protocol	Port	Purpose
TCP	22 *	SSH
TCP & UDP	53 *	DNS / GSLB
TCP & UDP	123	NTP
TCP & UDP	161 *	SNMP
UDP	6694	Heartbeat between Primary & Secondary appliances in HA mode
TCP	7778	HAProxy persistence table replication
TCP	9000 *	Gateway service (Centralized/Portal Management)
TCP	9080 *	WebUI - HTTP (disabled by default)
TCP	9081 *	Nginx fallback page
TCP	9443 *	WebUI - HTTPS
TCP	25565 *	Shuttle service (Centralized/Portal Management)

> **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.

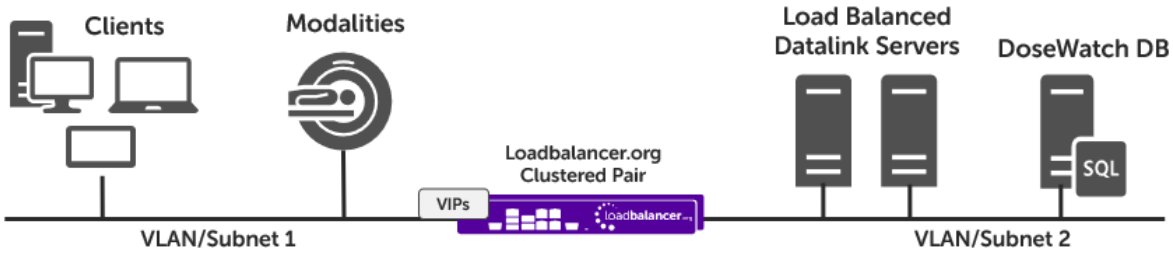
6. Deployment Concept

Both two-arm mode and single-arm mode are supported. If two-arm mode is required, an additional network interface can be added once the appliance has bee deployed and initial network configuration has been completed. This is covered in Additional Configuration for Two-arm Mode.

6.1. Single-arm Mode



6.2. Two-arm Mode

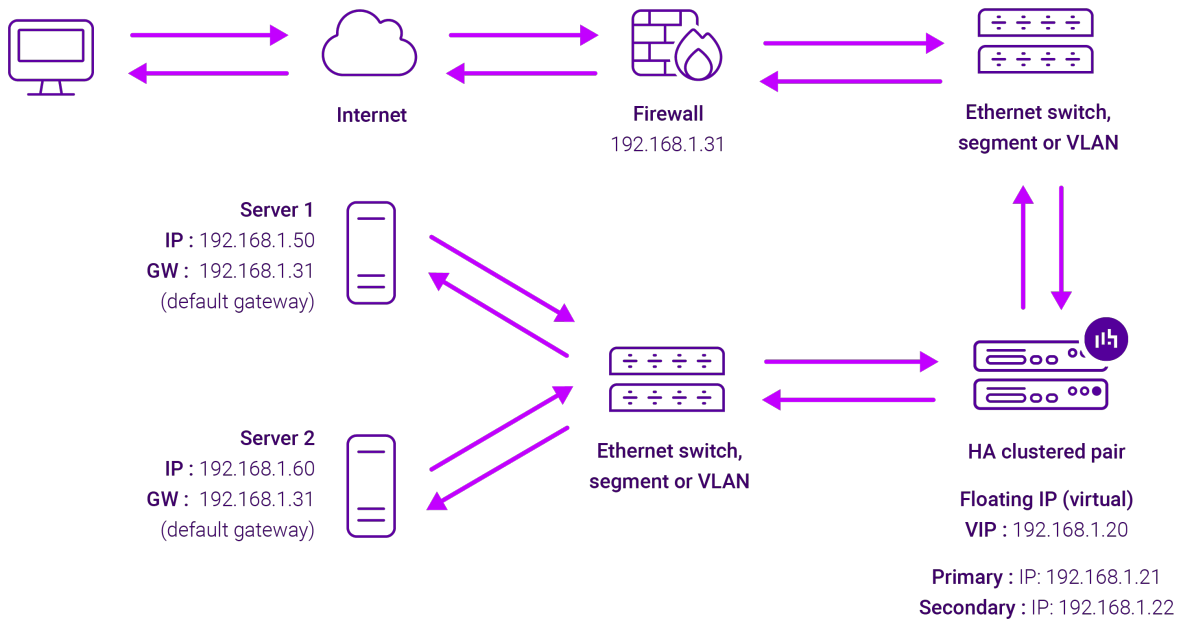


7. Load Balancer Deployment Methods

For DW, layer 4 SNAT mode is used. This mode is described below and is used for the configurations presented in this guide.

7.1. Layer 4 SNAT Mode

Layer 4 SNAT mode is a high performance solution, although not as fast as Layer 4 NAT mode or Layer 4 DR mode. The image below shows an example network diagram for this mode.



- Real Servers in the cluster can be on any accessible network including across the Internet or WAN.
- Layer 4 SNAT mode is not transparent, an iptables SNAT rule translates the source IP address to be the load balancer rather than the original client IP address.
- Layer 4 SNAT mode can be deployed using either a one-arm or two-arm configuration. For two-arm deployments, **eth1** is typically used for client side connections and **eth0** is used for Real Server connections, although this is not mandatory since any interface can be used for any purpose.
- Requires no mode-specific configuration changes to the load balanced Real Servers.
- Port translation is possible with Layer 4 SNAT mode, e.g. VIP:80 → RIP:8080 is supported.
- You should not use the same RIP:PORT combination for layer 4 SNAT mode VIPs and layer 7 SNAT mode VIPs because the required firewall rules conflict.

8. Configuring DW for Load Balancing

8.1. Layer 4 SNAT Mode

Layer 4 SNAT mode VIPs do not require any mode specific configuration changes to the load balanced Real Servers (DW Servers).

9. Appliance Installation & Configuration for DW

9.1. Overview

For DW deployments, 2 load balancer appliances must be installed and configured and then paired to create an active/passive HA clustered pair.

The following is an overview of the installation and configuration process:

1. Deploy 2 Virtual Appliances - refer to Section 9.2
2. Configure the management IP address and other network settings on **both** appliances - refer to Section 9.3
3. Run a software update check on **both** appliances - refer to Section 9.5
4. Configure the appliance security mode on **both** appliances - refer to Section 9.6
5. Verify network connections and configure any additional settings on **both** appliances - refer to Section 9.7
6. Configure the required load balanced services on the **Primary** appliance - refer to Section 9.8
7. Verify that everything is working as expected on the **Primary** appliance - refer to Section 10
8. Configure the HA Pair on the **Primary** appliance - this will replicate all load balanced services to the Secondary appliance, once configured the Secondary appliance will be kept in-sync automatically - refer to Section 11
9. Configure any required optional settings on **both** appliances - refer to Section 12

9.2. Virtual Appliance Installation

9.2.1. Download & Extract the Appliance

1. Download the Virtual Appliance.
2. Unzip the contents of the file to your chosen location.

9.2.2. Virtual Hardware Resource Requirements

The resource requirements depend on the particular virtual appliance used. The following GE HealthCare VAs are available:

- **v1000** - 2 vCPUs, 4GB RAM, 20GB Drive
- **v4000** - 4 vCPUs, 8GB RAM, 20GB Drive
- **vUltimate** - 8 vCPUs, 16GB RAM, 20GB Drive

Please refer to the technical documentation for the site to determine which appliance to use and obtain the download link.

9.2.3. VMware vSphere Client

The steps below apply to VMware ESX/ESXi & vSphere Client v6.7 and later.

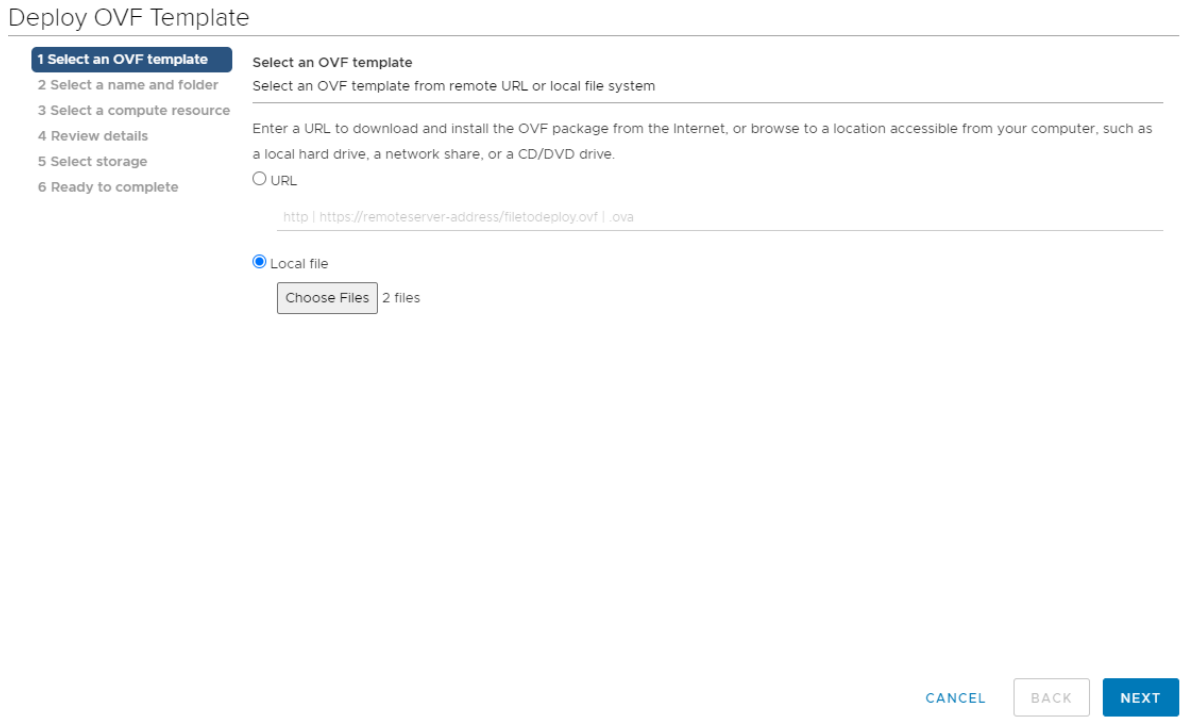
9.2.3.1. Upgrading to the latest Hardware Version

When the appliance is deployed, the virtual hardware version is set to 11. This enables compatibility with ESX version 6.0 and later. You can upgrade to a later hardware version if required.

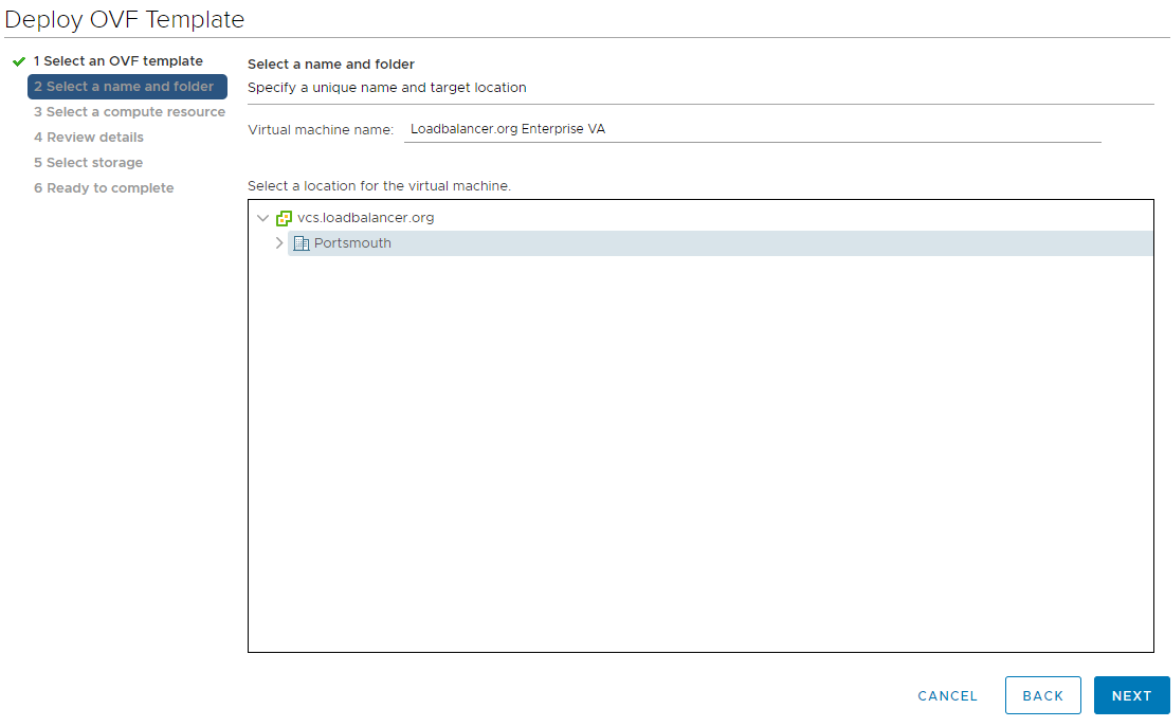
> **Note** Create a snapshot or backup of the virtual machine first before upgrading.

9.2.3.2. Installing the Appliance using vSphere Client

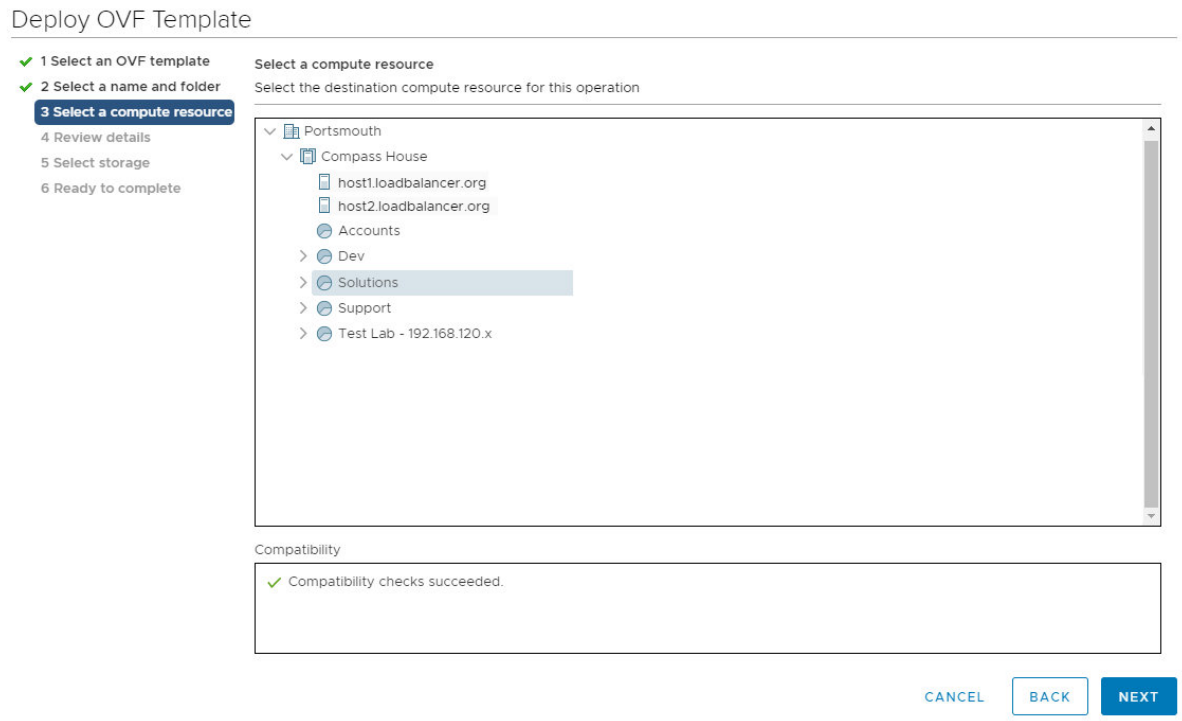
1. Right-click the inventory object where the appliance is to be located and select **Deploy OVF Template**.
2. In the **Select an OVF Template** screen, select the **Local File** option, click **Browse**, navigate to the download location, select the **.ova** file and click **Next**.



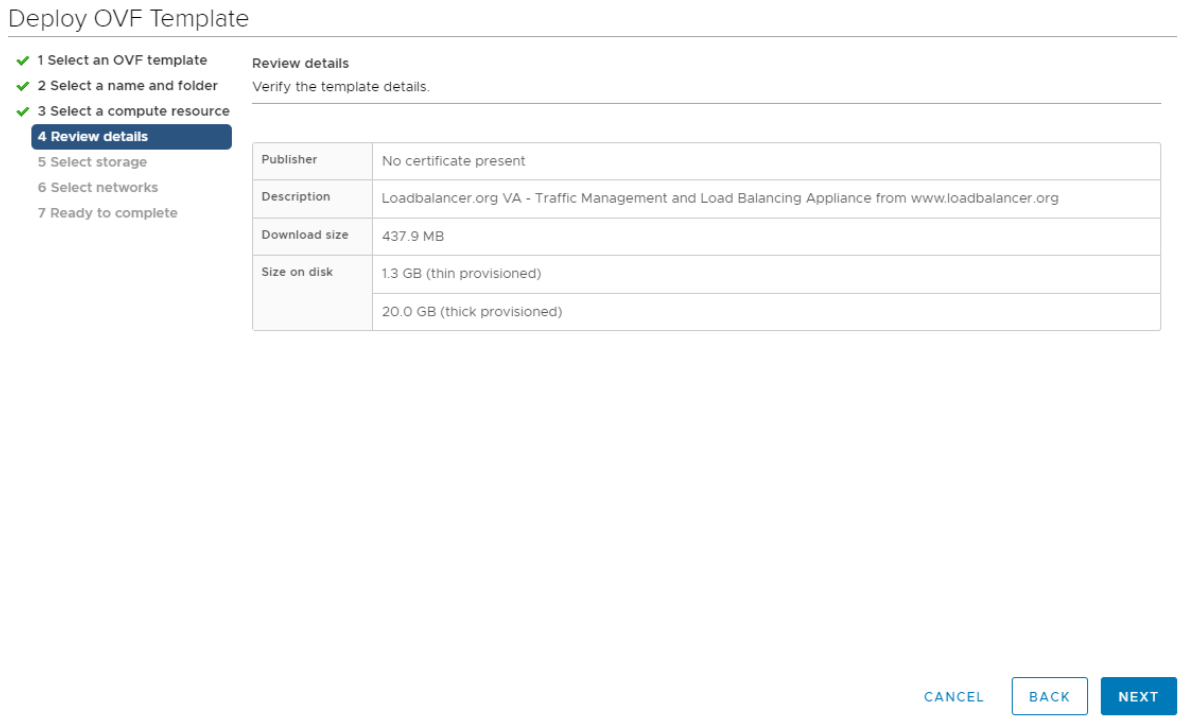
3. In the **Select a name and folder** screen, type a suitable name for the appliance - this can be up to 80 characters in length.
4. Select the required location for the appliance - by default this will be the location of the inventory object from where the wizard was started and click **Next**.



5. In the **Select a compute resource** screen, select the required compute resource for the appliance - by default this will be the inventory object from where the wizard was started and click **Next**.

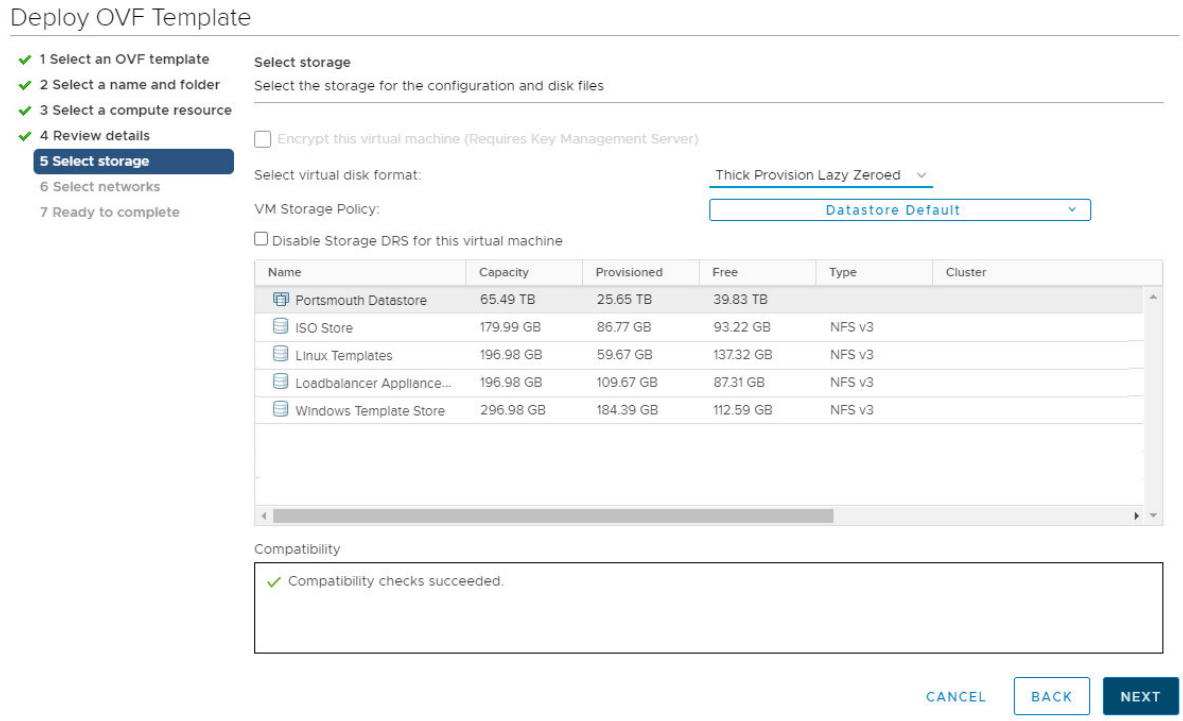


6. In the **Review details** screen, verify the template details and click **Next**.

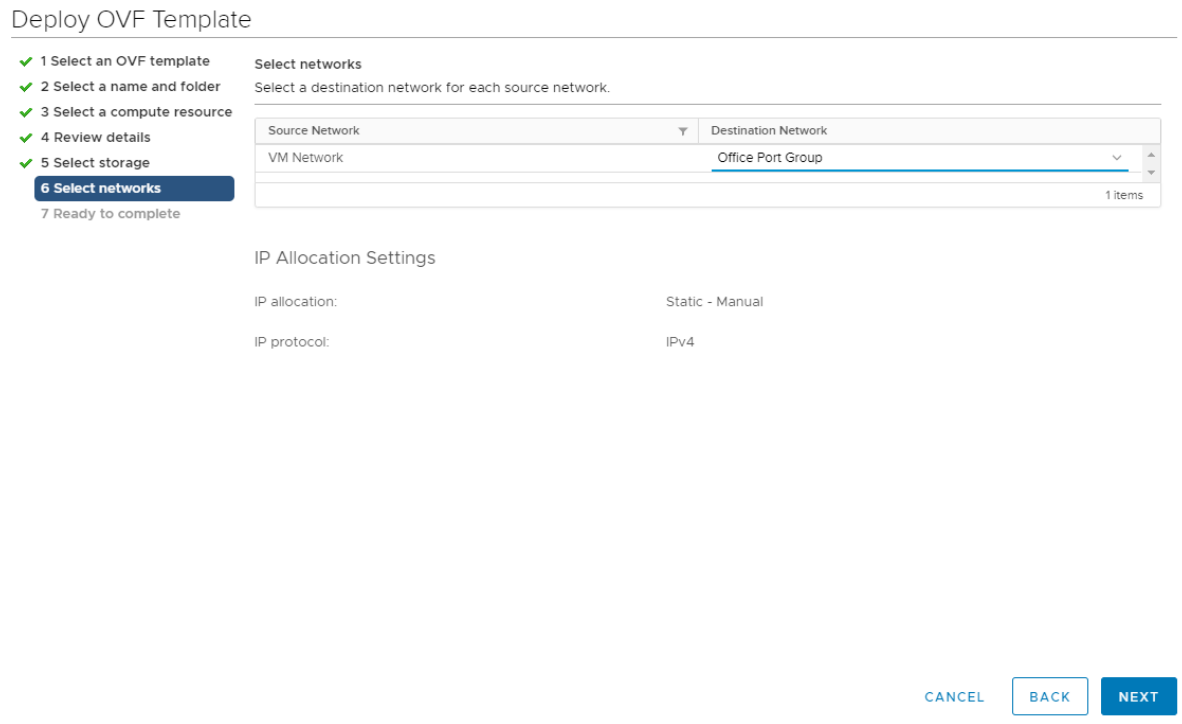


7. In the **Select Storage** screen, first select the required storage location for the appliance.
8. Now select the required disk format and click **Next**.

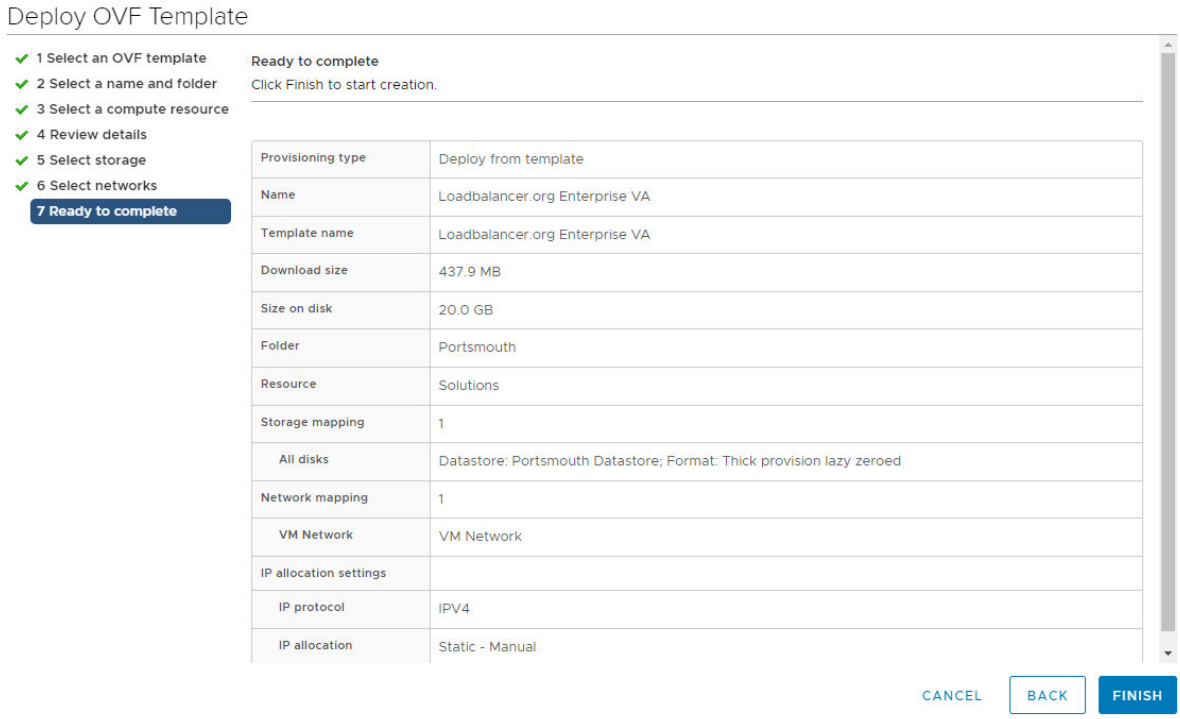
> **Note** Loadbalancer.org recommends selecting a thick provision format. By default the appliance disk is 20GB.



9. In the **Select Networks** screen, select the required destination network using the drop-down next to **VM Network** and click **Next**.



10. In the **Ready to complete** screen, review the settings and click **Finish** to create the virtual appliance. To change a setting, use the **Back** button to navigate back through the screens as required.



9.2.3.3. Configure Network Adapters

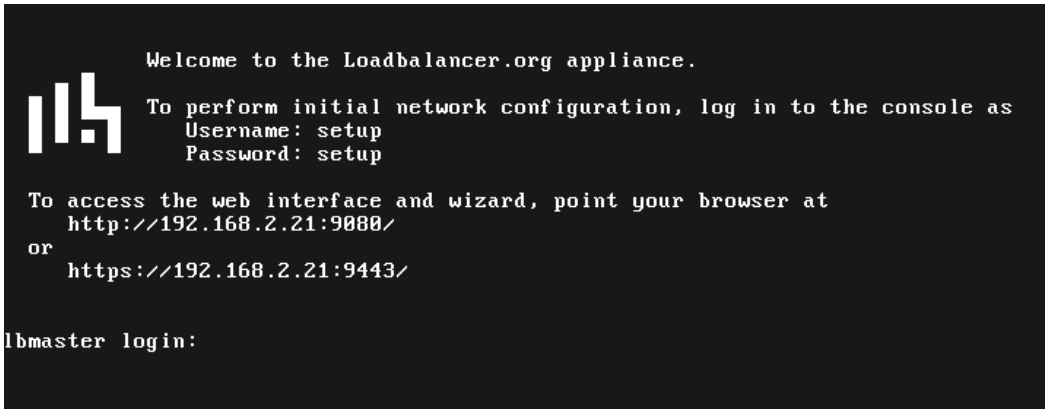
The appliance has 4 network adapters. By default only the first adapter is connected which is the requirement for GE HealthCare deployments. This will be **eth0** when viewed in the appliance WebUI.

9.2.3.4. Start the Appliance

Now power up the appliance.

9.3. Configuring Initial Network Settings

After power up, the following startup message is displayed on the appliance console:



As mentioned in the text, to perform initial network configuration, login as the "setup" user at the appliance console.

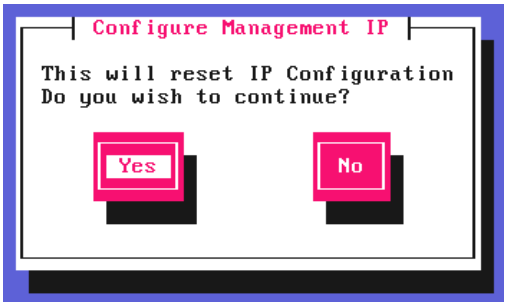
Once logged in, the Network Setup Wizard will start automatically. This will enable you to configure the management IP address and other network settings for the appliance.

login to the console:

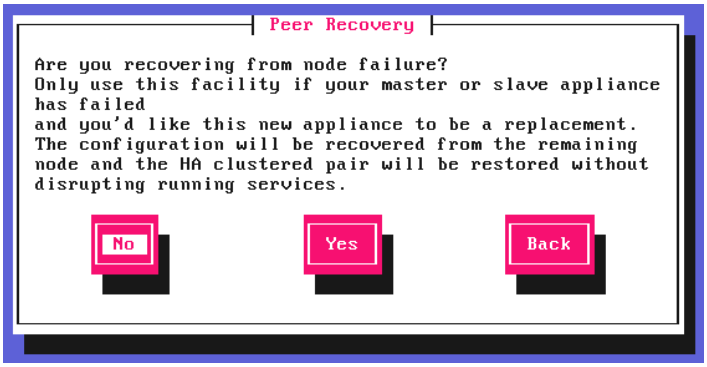
Username: setup
Password: setup

A series of screens will be displayed that allow network settings to be configured:

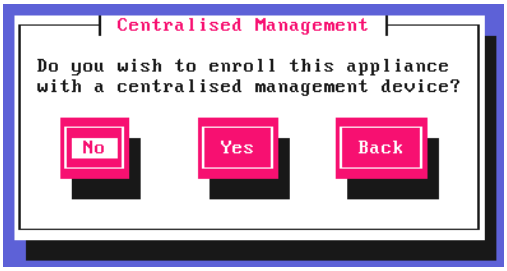
In the **Configure Management IP** screen, leave **Yes** selected and hit **Enter** to continue.



In the **Peer Recovery** screen, leave **No** selected and hit **Enter** to continue.

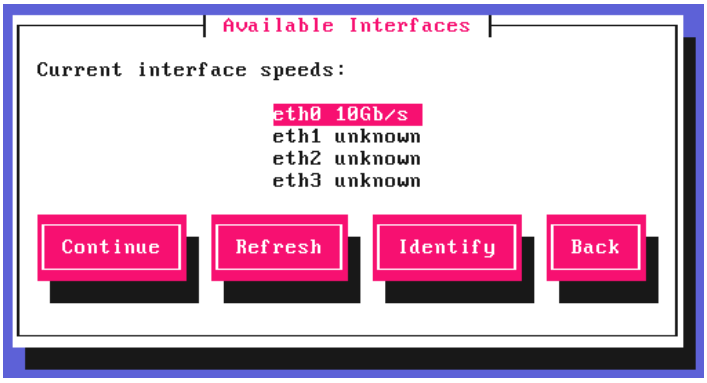


In the **Centralized Management** screen, if you have been provided with Management Server details select **Yes**, otherwise leave **No** selected, then hit **Enter** to continue.

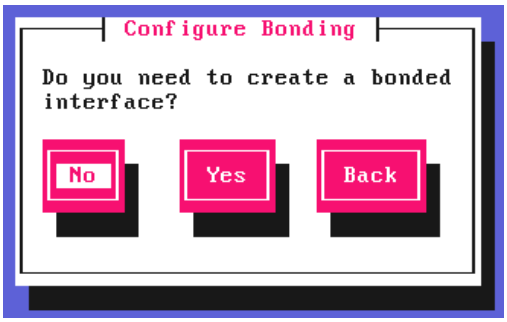


> **Note** For information on how to modify Centralized Management settings via the WebUI, please refer to Portal Management & Appliance Adoption.

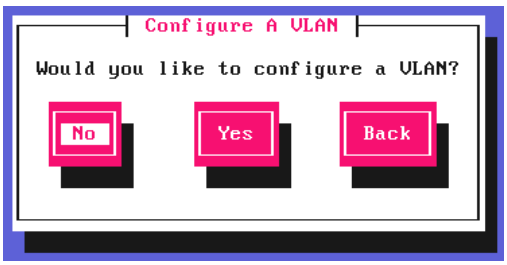
In the **Available Interfaces** screen, a list of available interfaces will be displayed, hit **Enter** to continue.



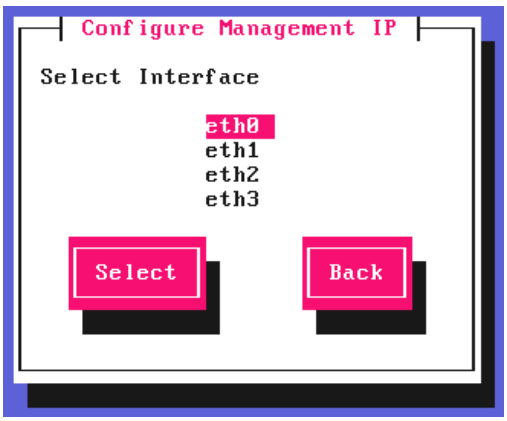
In the **Configure Bonding** screen, leave **No** selected, then hit **Enter** to continue.



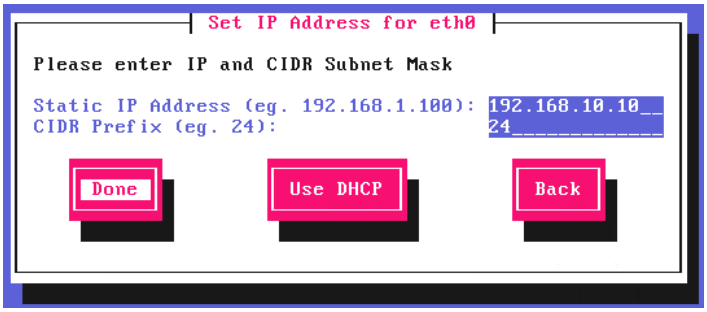
In the **Configure a VLAN** screen, leave **No** selected, then hit **Enter** to continue.



In the **Configure Management IP** screen, select **eth0** and hit **Enter** to continue.

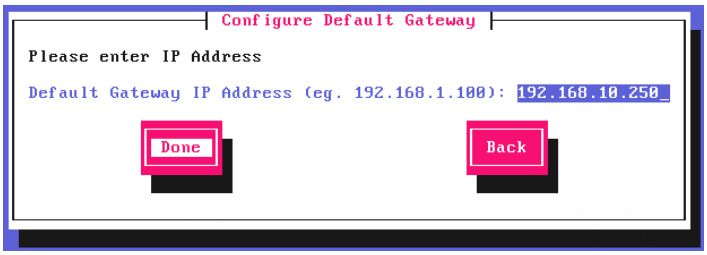


In the **Set IP address** screen, specify the required management address in the *Static IP Address* & *CIDR Prefix* fields, select **Done** and hit **Enter** to continue.

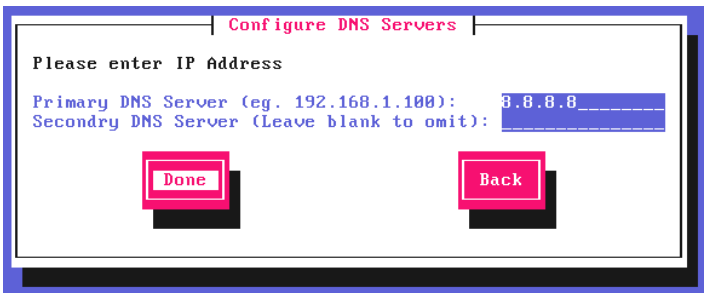


> **Note** A subnet mask such as 255.255.255.0 is not valid, in this case enter 24 instead.

In the **Configure Default Gateway** screen, enter the required *Default Gateway IP Address*, select **Done** and hit **Enter** to continue.

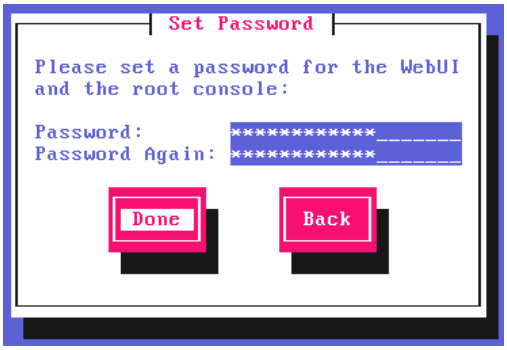


In the **Configure DNS Servers** screen, configure the required DNS server(s), select **Done** and hit **Enter** to continue.

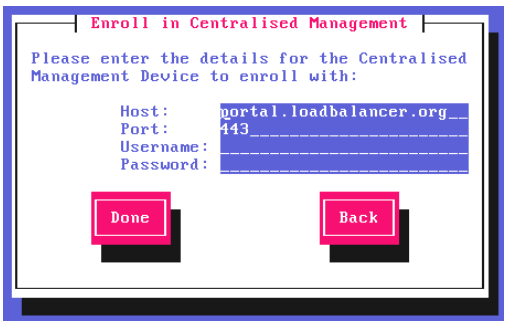


In the **Set Password** screen, hit **Enter** to continue.

Enter the *Password* you'd like to use for the **loadbalancer** WebUI user account and the **root** Linux user account. Repeat the password, select **Done** and hit **Enter** to continue.

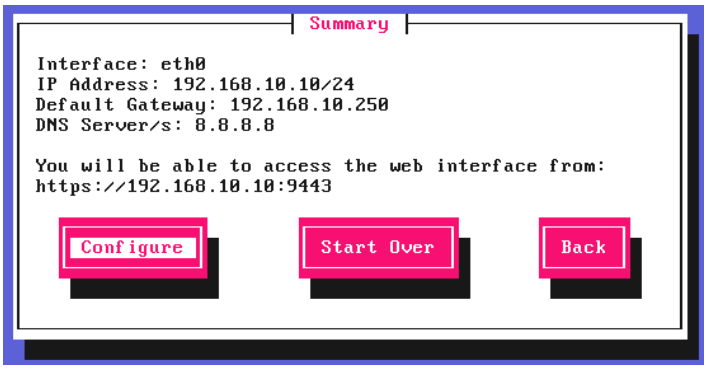


If you selected **Yes** when asked if you want to enroll for Centralized Management, you'll now be prompted for the details. Default values for the *Host* and *Port* are set and can be changed if required. Enter the *Username* and *Password* for the management server account you'd like the appliance to be associated with, select **Done** and hit **Enter** to continue.



In the **Summary** screen, check all settings. If everything is correct, leave **Configure** selected and hit **Enter** to continue. All settings will be applied. If you need to change a setting, use the **Back** button.

> **Note** For v8.13.2 and later, once the settings have been applied the appliance will check if a software update is available. If an update is found, it will be installed automatically.



Once the configuration has been written, the **Configuration Complete** screen and message will be displayed. Click **OK** to exit the wizard and return to the command prompt.

9.4. 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.

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

   https://<IP-address-configured-during-the-network-setup-wizard>:9443/lbadmin/

   > **Note** You'll receive a warning about the WebUI's SSL 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.

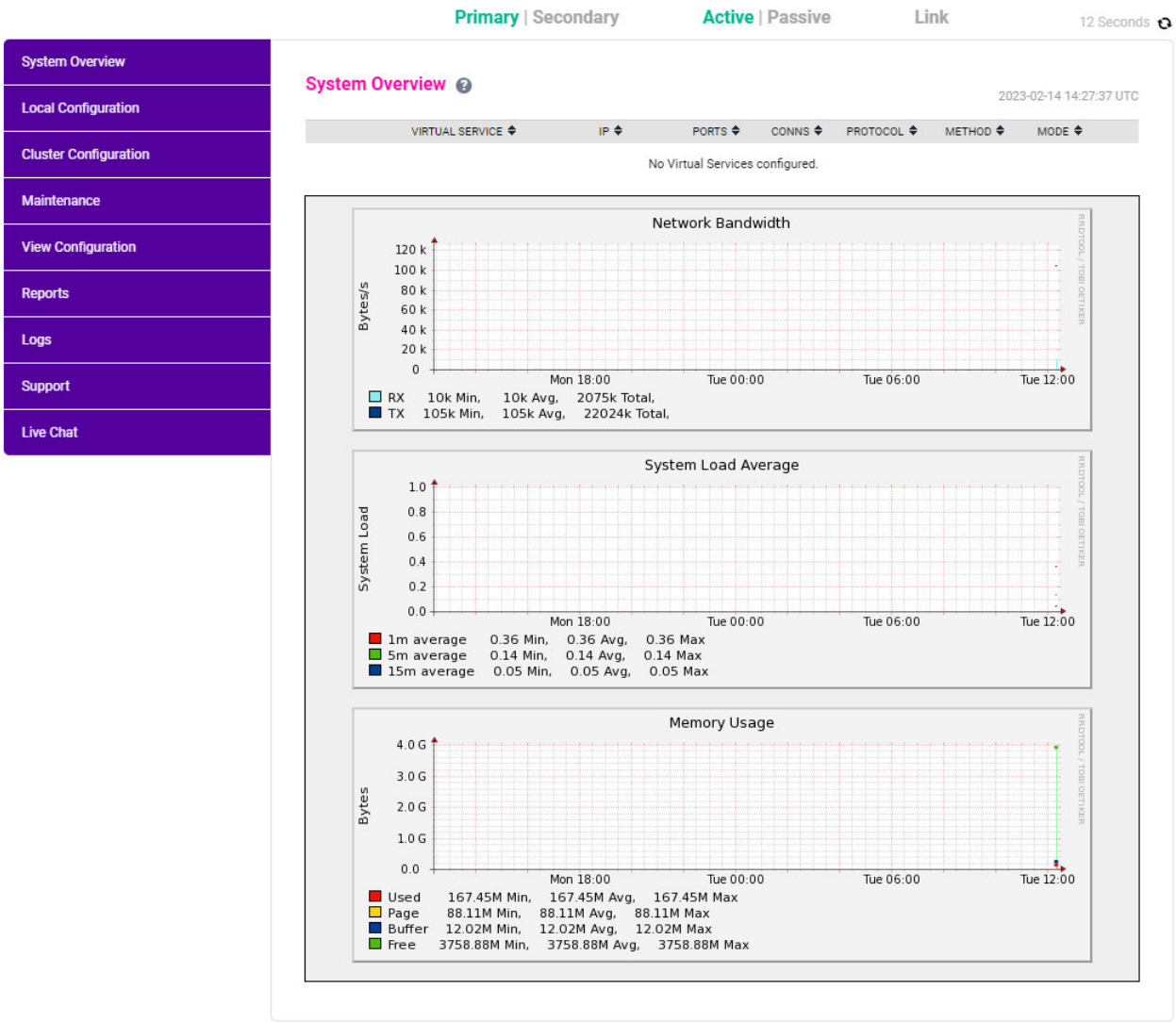
   > **Note** If you need to change the port, IP address or protocol that the WebUI listens on, please refer to Service Socket Addresses.

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

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

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

   Once logged in, the WebUI will be displayed as shown below:



9.4.1. 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 creating 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

9.5. Appliance Software Update

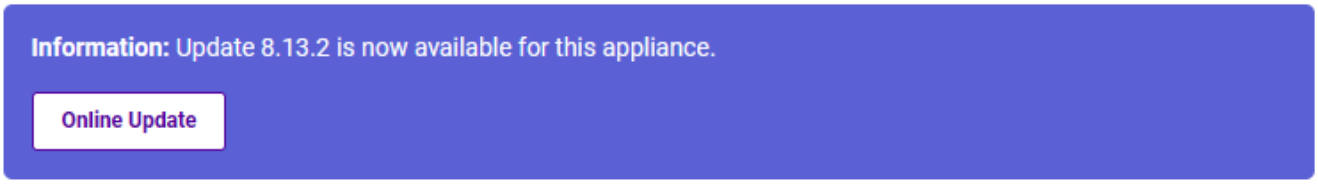
We recommend that the appliance is kept up to date to ensure that you benefit from the latest bug fixes, security updates and feature improvements. Both online and offline update are supported.

> **Note** For full details, please refer to Appliance Software Update in the Administration Manual.

> **Note** Services may need to be restarted/reloaded after the update process completes or in some cases a full appliance restart may be required. We therefore recommend performing the update during a maintenance window.

9.5.1. Online Update

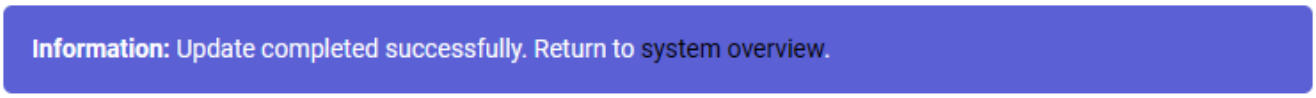
The appliance periodically contacts the Loadbalancer.org update server (**update.loadbalancer.org**) and checks for updates. This is the default behavior and can be disabled if preferred. If an update is found, a notification similar to the example below will be displayed at the top of the WebUI:



Click **Online Update**. A summary of all new features, improvements, bug fixes and security updates included in the update will be displayed. Click **Update** at the bottom of the page to start the update process.

> **Important** Do not navigate away whilst the update is ongoing, this may cause the update to fail.

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



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

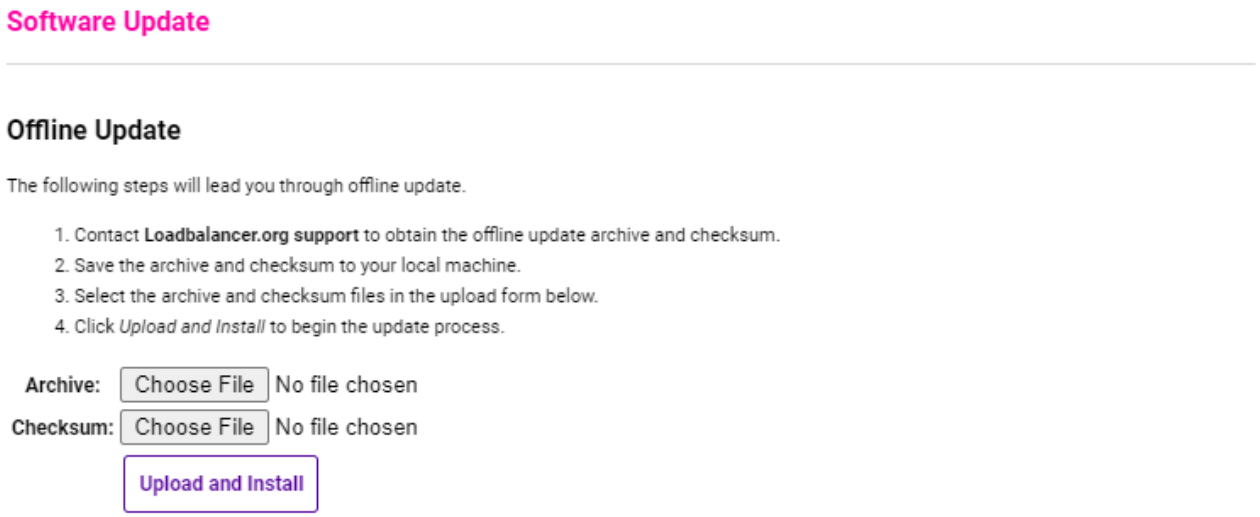
9.5.2. Offline Update

If the appliance does not have access to the Internet, offline update can be used.

To check for the latest version, please refer to our product roadmap page available here. To obtain the latest offline update files contact support@loadbalancer.org.

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:



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.

9.6. Configuring the Appliance Security Mode

To enable shell commands to be run from the WebUI, the appliance Security Mode must be configured:

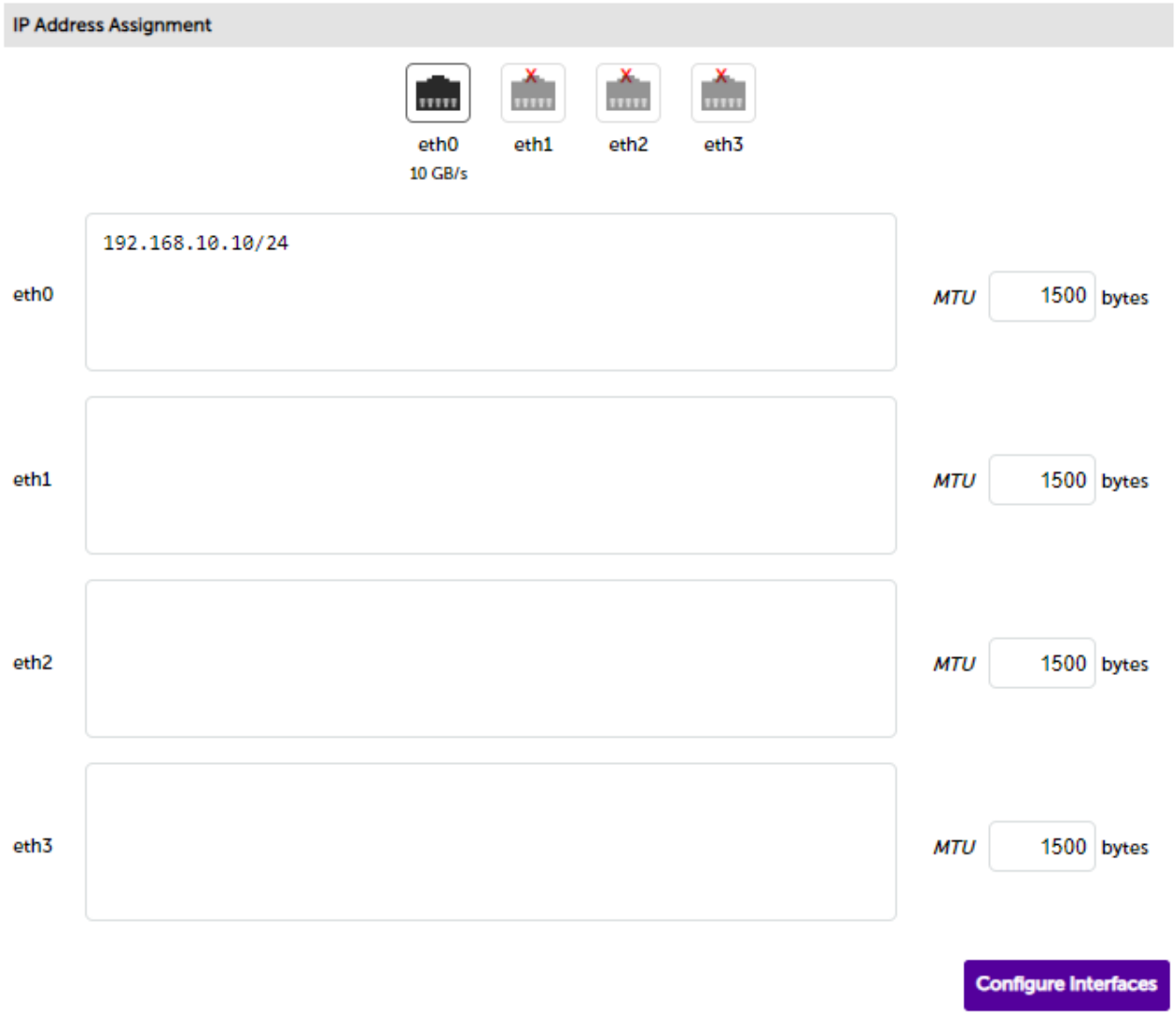
1. Using the WebUI, navigate to: *Local Configuration > Security*.
2. Set *Appliance Security Mode* to **Custom**.
3. Click **Update**.

9.7. Appliance Network Configuration

The standard DW network configuration requires 1 network adapter.

9.7.1. Verify Network Connections

1. Verify that the adapter is connected to the appropriate virtual switch/network using the Hypervisor management tool.
2. Using the appliance WebUI navigate to: *Local Configuration > Network Interface Configuration*.



3. Verify that the network is configured as required.

> **Note** The IP address/CIDR prefix for **eth0** was set during the Network Setup Wizard and will be shown here, e.g. **192.168.10.10/24**.

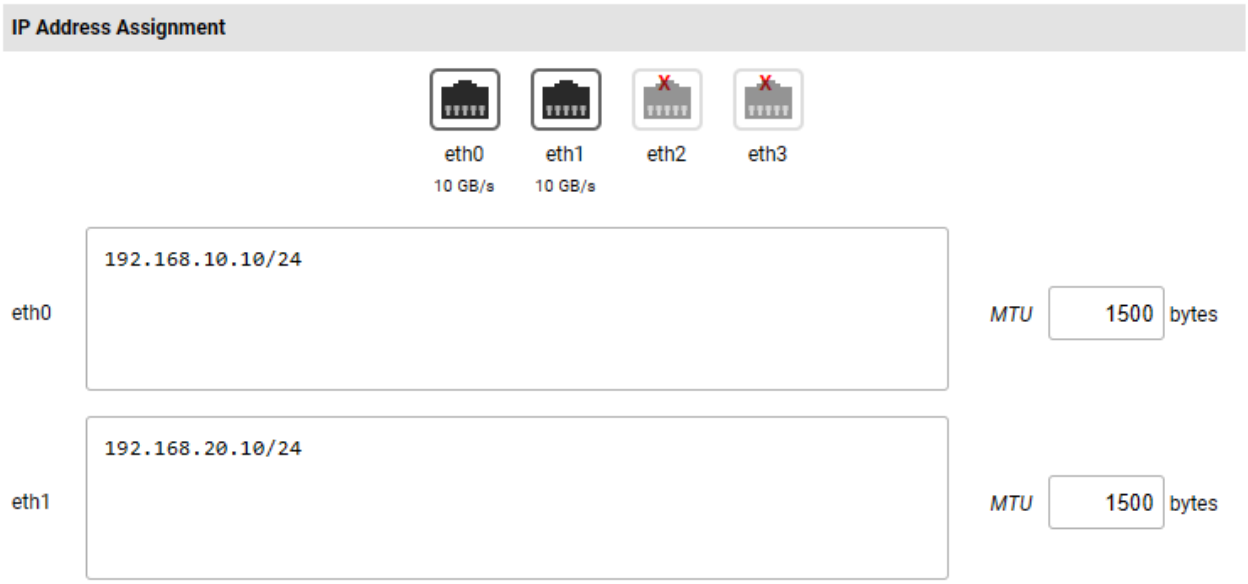
9.7.2. Additional Configuration for Two-arm Mode

9.7.2.1. Connect Network Adapter 2 (eth1)

1. Using vSphere Client, right-click the appliance and select **Edit Settings**.
2. Network adapter 1 should already be connected to the management network. This will be **eth0** when viewed in the appliance WebUI.
3. Select the required Network for Network Adapter 2 and enable (check) the ***Connected*** checkbox. This will be **eth1** when viewed in the appliance WebUI.
4. Click **OK**.

9.7.2.2. Configure eth1

1. Using the appliance WebUI, navigate to *Local Configuration > Network Interface Configuration*.



2. Specify the required IP address for eth1, e.g. **192.168.20.10/24**.
3. Click **Configure Interfaces**.

9.7.3. Configuring Hostname & DNS

1. Using the WebUI, navigate to: *Local Configuration > Hostname & DNS*.
2. Set the required *Hostname* and *Domain Name*.
3. Configure additional DNS servers if required.
4. Click **Update**.

9.7.4. Configuring NTP

1. Using the WebUI, navigate to: *Local Configuration > System Date & Time*.
2. Select the required *System Timezone*.
3. Define the required NTP servers.
4. Click **Set Timezone & NTP**.

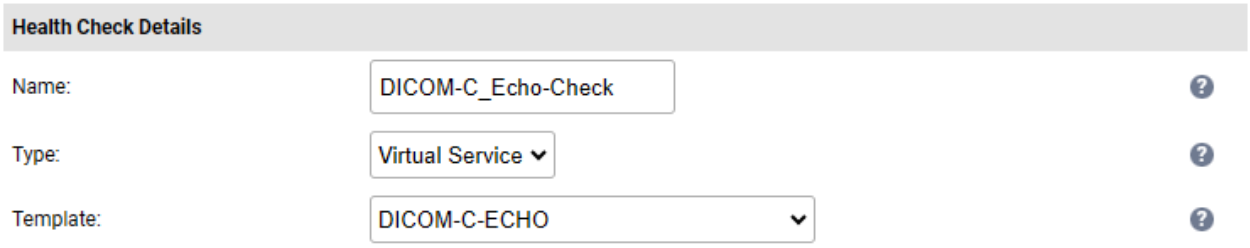
9.8. Configuring Load Balanced Services

9.8.1. Custom Health Check Configuration

A customized **DICOM C-Echo** health check is required for each Virtual Service.

9.8.1.1. DICOM-C_Echo-Check-VIP1

1. Using the WebUI, navigate to *Cluster Configuration > Health Check Scripts* and click **Add New Health Check**.
2. Enter the following details:



- Specify an appropriate *Label* for the health check, e.g. **DICOM-C_Echo-Check-VIP1**.
- Set *Type* to **Virtual Service**.
- Using the *Template* dropdown select **DICOM-C-ECHO** from the list.
- Change the **aec** and **aet** data to match the related DICOM Listener:

```
aet=LOADBALANCER
aec=DW_SCP
```

3. Click **Update** to save the new health check script.

9.8.1.2. DICOM-C_Echo-Check-VIP2

> **Note** If VIP 2 is not required, this health check is not needed. For more details, see the note in VIP 2 - DATALINK_POOL2.

1. Using the WebUI, navigate to *Cluster Configuration > Health Check Scripts* and click **Add New Health Check**.
2. Specify an appropriate *Label* for the health check, e.g. **DICOM-C_Echo-Check-VIP2**.
3. Set *Type* to **Virtual Service**.
4. Using the *Template* dropdown select **DICOM-C-ECHO** from the list.
5. Change the **aec** and **aet** data to match the related DICOM Listener:

```
aet=LOADBALANCER
aec=DW_MPPS_SCP
```

6. Click **Update** to save the new health check script.

9.8.1.3. DICOM-C_Echo-Check-VIP3

> **Note** If VIP 3 is not required, this health check is not needed. For more details, see the note in VIP 3 - DATALINK_POOL3.

1. Using the WebUI, navigate to *Cluster Configuration > Health Check Scripts* and click **Add New Health Check**.
2. Specify an appropriate *Label* for the health check, e.g. **DICOM-C_Echo-Check-VIP3**.
3. Set *Type* to **Virtual Service**.

4. Using the *Template* dropdown select **DICOM-C-ECHO** from the list.
5. Change the **aec** and **aet** data to match the related DICOM Listener:

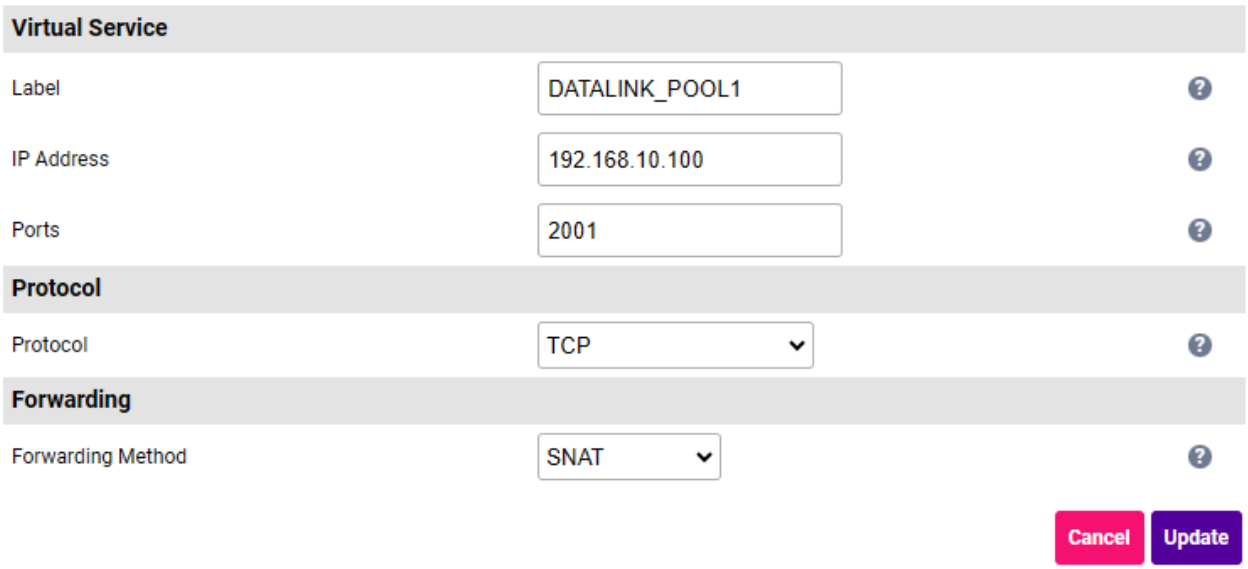
```
aet=LOADBALANCER
aec=DW_RDSR_SCP
```

6. Click **Update** to save the new health check script.

9.8.2. VIP 1 - DATALINK_POOL1

9.8.2.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 4 – Virtual Services* and click **Add a new Virtual Service**.
2. Enter the following details:



- Specify an appropriate *Label* for the Virtual Service, e.g. **DATALINK_POOL1**.
- Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.10.100**.
- Set the *Ports* field to **2001**.

> **Note**
>
> For new sites specify port 2001.
>
> For sites already in production specify the port currently being used.

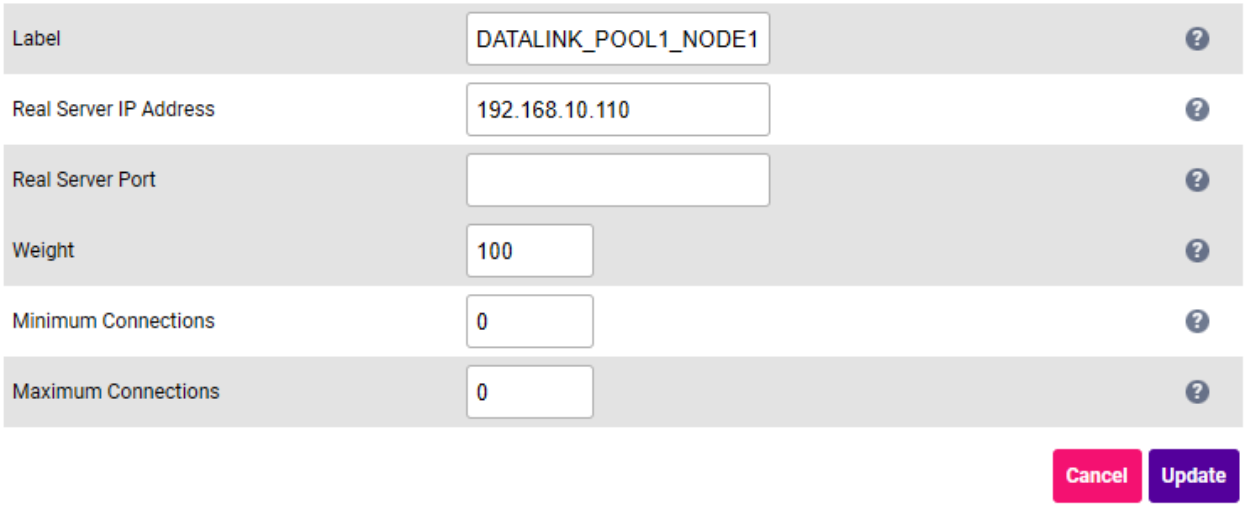
- Leave the *Protocol* set to **TCP**.
- Set the *Forwarding Method* set to **SNAT**.

3. Click **Update** to create the Virtual Service.
4. Now click **Modify** next to the newly created VIP.

5. Scroll to the *Persistence* section.
    - Ensure that the *Enable* checkbox is enabled (checked).
6. Scroll to the *Health Checks* section.
    - Set *Check Type* to **External Script**.
    - Set *External Script* to the health check created above, e.g. **DICOM-C_Echo-Check-VIP1**.
7. Leave all other settings at their default value.
8. Click **Update**.

9.8.2.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 4 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



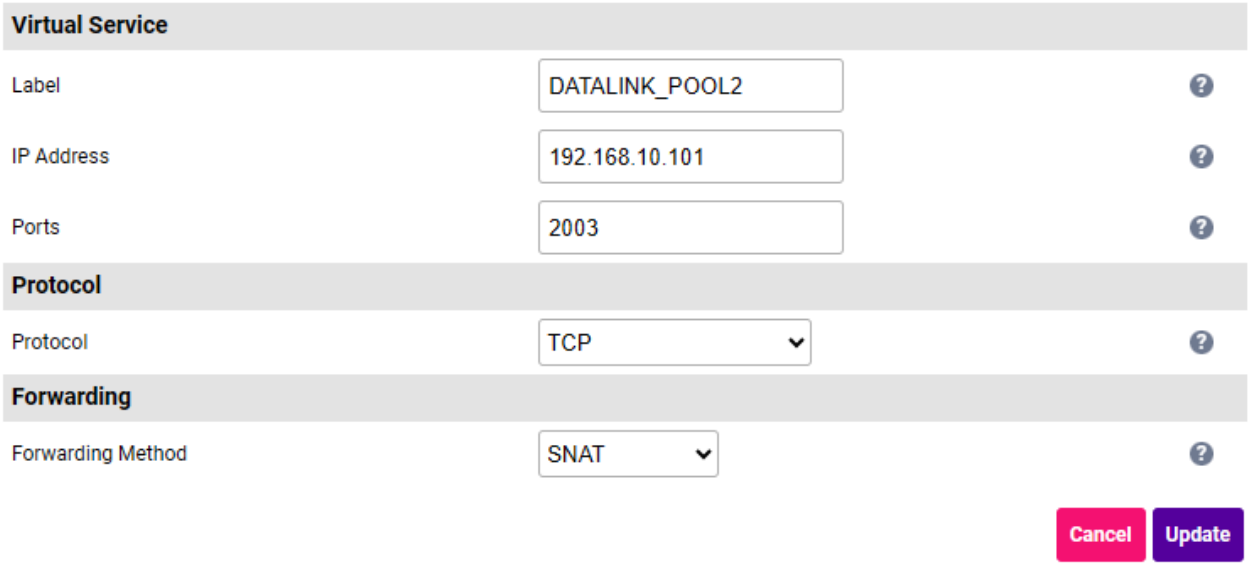
    - Specify an appropriate *Label* for the RIP, e.g. **DATALINK_POOL1_NODE1**.
    - Change the *Real Server IP Address* field to the required IP address, e.g. **192.168.10.110**.
    - Leave the *Real Server Port* field blank.
3. Leave all other settings at their default value.
4. Click **Update**.
5. Repeat these steps to add additional Real Server(s).

9.8.3. VIP 2 - DATALINK_POOL2

> **Note** VIP 2 is optional. It is only required in sites that have multiple DICOM listeners. If VIP 2 is required, make sure that **aec** and **aet** in the associated DICOM health check script are set correctly as described in DICOM-C_Echo-Check-VIP2.

9.8.3.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 4 – Virtual Services* and click **Add a new Virtual Service**.
2. Enter the following details:



   - Specify an appropriate *Label* for the Virtual Service, e.g. **DATALINK_POOL2**.
   - Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.10.101**.
   - Set the *Ports* field to **2003**.

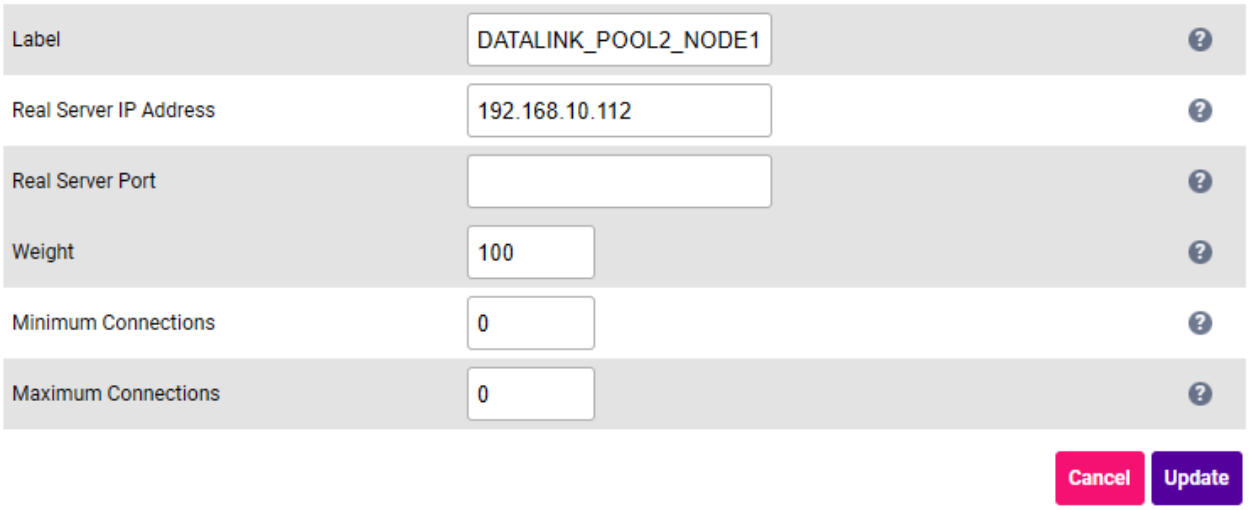
   > **Note** Adapt the port specified to suit the requirements of the site.

   - Leave the *Protocol* set to **TCP**.
   - Set the *Forwarding Method* set to **SNAT**.
3. Click **Update** to create the Virtual Service.
4. Now click **Modify** next to the newly created VIP.
5. Scroll to the *Persistence* section.
   - Ensure that the *Enable* checkbox is enabled (checked).
6. Scroll to the *Health Checks* section.
   - Set *Check Type* to **External Script**.
   - Set *External Script* to the health check created above, e.g. **DICOM-C_Echo-Check-VIP2**.
7. Leave all other settings at their default value.
8. Click **Update**.

9.8.3.2. Define the Associated Real Servers (RIPs)

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

2. Enter the following details:



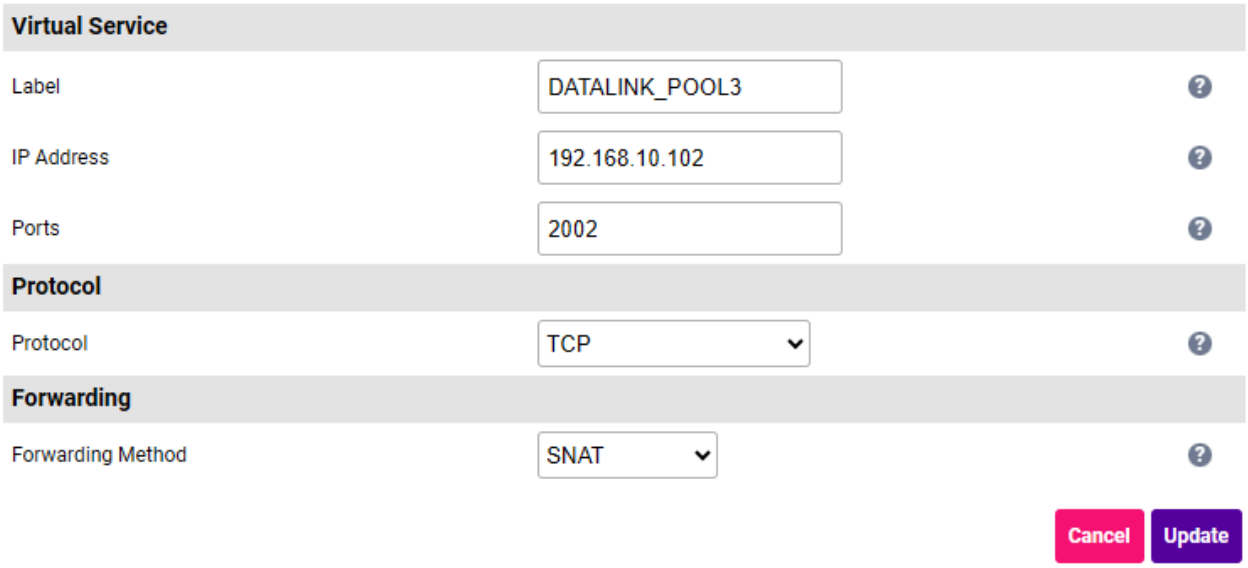
   - Specify an appropriate *Label* for the RIP, e.g. **DATALINK_POOL2_NODE1**.
   - Change the *Real Server IP Address* field to the required IP address, e.g. **192.168.10.112**.
   - Leave the *Real Server Port* field blank.
3. Leave all other settings at their default value.
4. Click **Update**.
5. Repeat these steps to add additional Real Server(s).

9.8.4. VIP 3 - DATALINK_POOL3

> **Note** VIP 3 is optional. It is only required in sites that have multiple DICOM listeners. If VIP 3 is required, make sure that **aec** and **aet** in the associated DICOM health check script are set correctly as described in DICOM-C_Echo-Check-VIP3.

9.8.4.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 4 – Virtual Services* and click **Add a new Virtual Service**.
2. Enter the following details:



- Specify an appropriate *Label* for the Virtual Service, e.g. **DATALINK_POOL3**.
- Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.10.102**.
- Set the *Ports* field to **2002**.

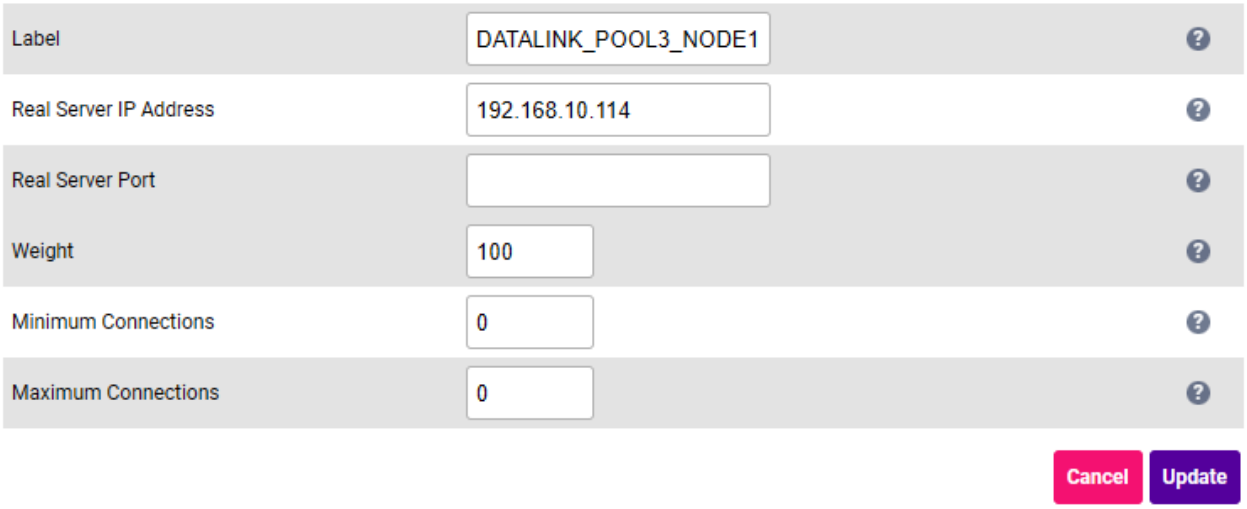
> **Note** Adapt the port specified to suit the requirements of the site.

- Leave the *Protocol* set to **TCP**.
- Set the *Forwarding Method* set to **SNAT**.

3. Click **Update** to create the Virtual Service.
4. Now click **Modify** next to the newly created VIP.
5. Scroll to the *Persistence* section.
   - Ensure that the *Enable* checkbox is enabled (checked).
6. Scroll to the *Health Checks* section.
   - Set *Check Type* to **External Script**.
   - Set *External Script* to the health check created above, e.g. **DICOM-C_Echo-Check-VIP3**.
7. Leave all other settings at their default value.
8. Click **Update**.

9.8.4.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 4 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



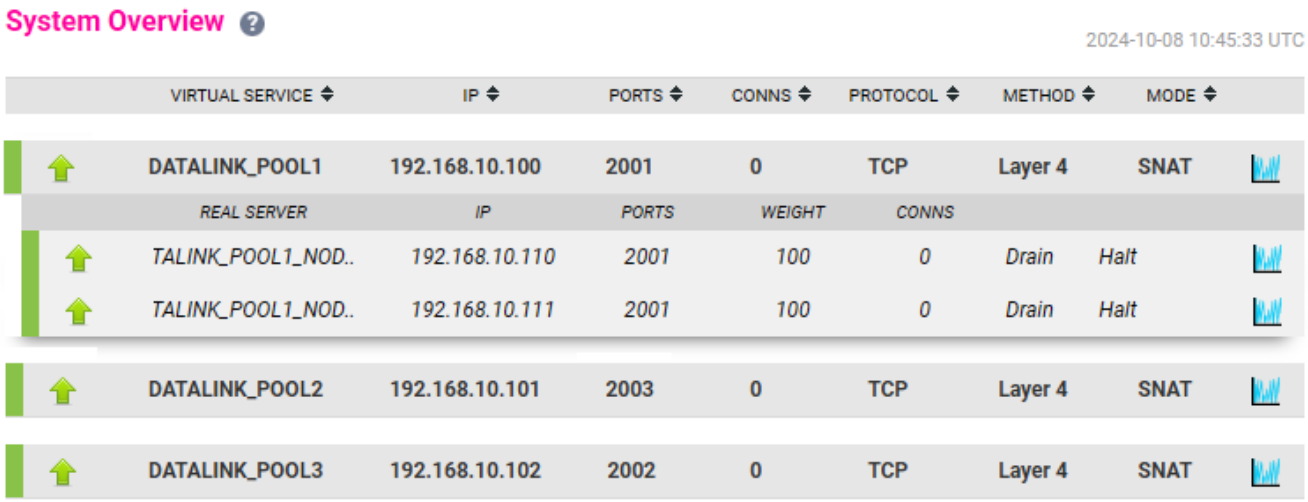
- Specify an appropriate *Label* for the RIP, e.g. **DATALINK_POOL3_NODE1**.
- Change the *Real Server IP Address* field to the required IP address, e.g. **192.168.10.114**.
- Leave the *Real Server Port* field blank.

3. Leave all other settings at their default value.
4. Click **Update**.
5. Repeat these steps to add additional Real Server(s).

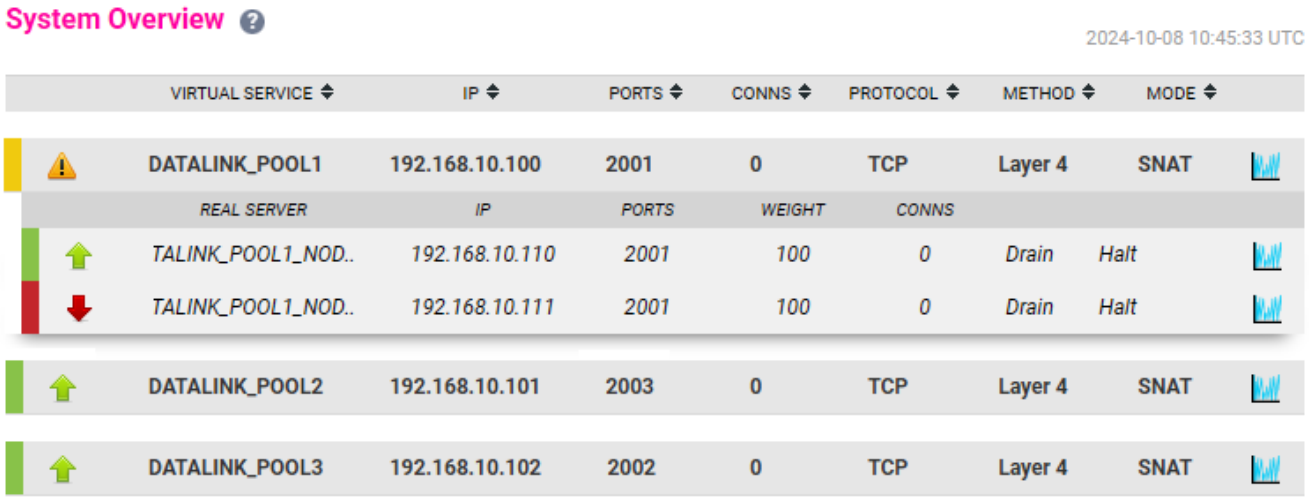
10. Testing & Verification

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

The System Overview can be viewed in the WebUI. It shows a graphical view of all VIPs & RIPs (i.e. the DW servers) and shows the state/health of each server as well as the state of each cluster as a whole. The example below shows that all servers are healthy (green) and available to accept connections:



If one of the servers within a cluster fails its health check, that server will be colored red and the cluster will be colored yellow as shown below:



If the services are up (green) verify that clients can connect to the VIPs and access all services.

> **Note** Make sure that DNS points at the VIP rather than individual servers.

Once you have completed the verification process, continue to the next section and add a Secondary appliance to form the HA (active/passive) clustered pair.

11. 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.

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.

11.1. 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:

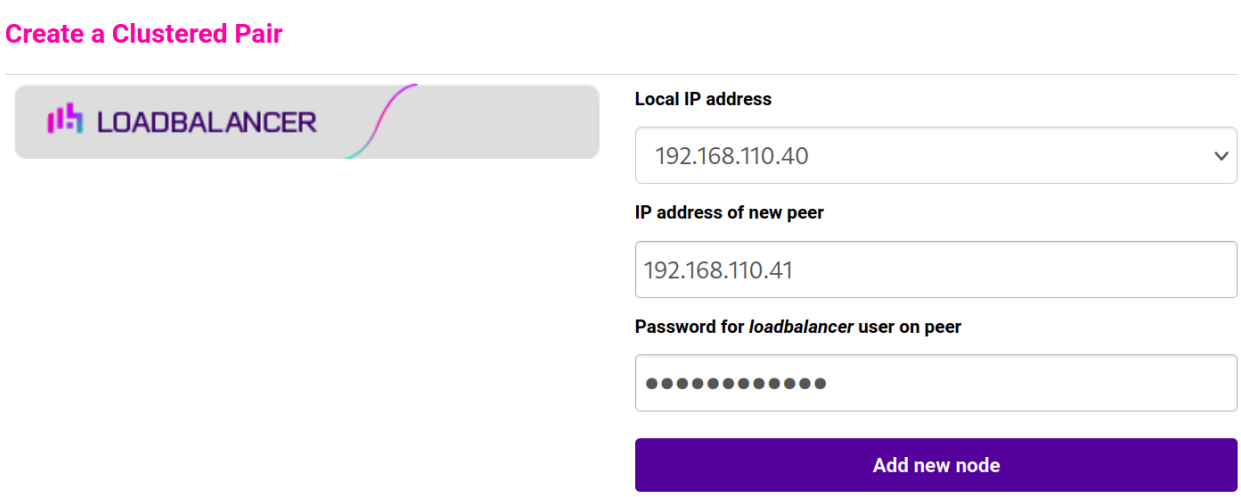
WebUI Main Menu Option	Sub Menu Option	Description
Local Configuration	Hostname & DNS	Hostname and DNS settings
Local Configuration	Network Interface Configuration	Interface IP addresses, bonding configuration and VLANs
Local Configuration	Routing	Default gateways and static routes

WebUI Main Menu Option	Sub Menu Option	Description
Local Configuration	System Date & time	Time and date related settings
Local Configuration	Physical – Advanced Configuration	Various appliance settings
Local Configuration	Portal Management	Portal management settings
Local Configuration	Security	Security settings
Local Configuration	SNMP Configuration	SNMP settings
Local Configuration	Graphing	Graphing settings
Local Configuration	License Key	Appliance licensing
Maintenance	Backup & Restore	Local XML backups
Maintenance	Software Updates	Appliance software updates
Maintenance	Firewall Script	Firewall (iptables) configuration
Maintenance	Firewall Lockdown Wizard	Appliance management lockdown settings

> **Important** Make sure that where any of the above have been configured on the Primary appliance, they're also configured on the Secondary.

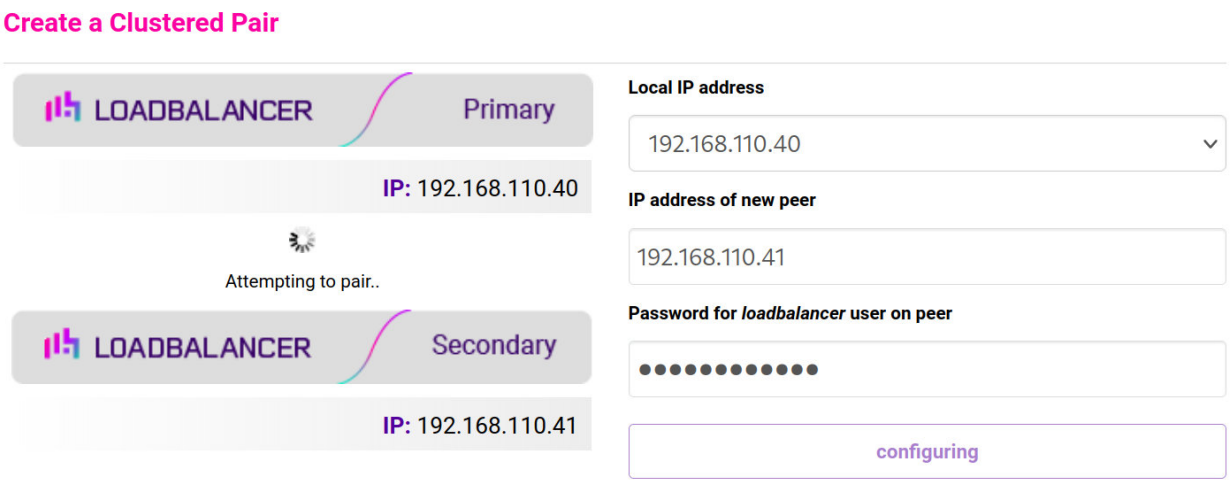
11.2. Configuring the HA Clustered Pair

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*.

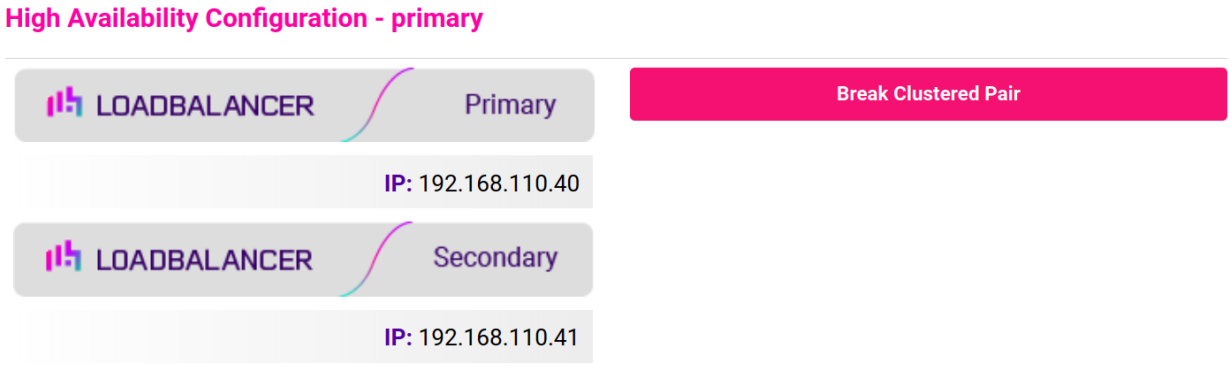


3. Specify the IP address and the *loadbalancer* user's password for the Secondary (peer) appliance as shown in the example above.
4. Click **Add new node**.

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.

> **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.

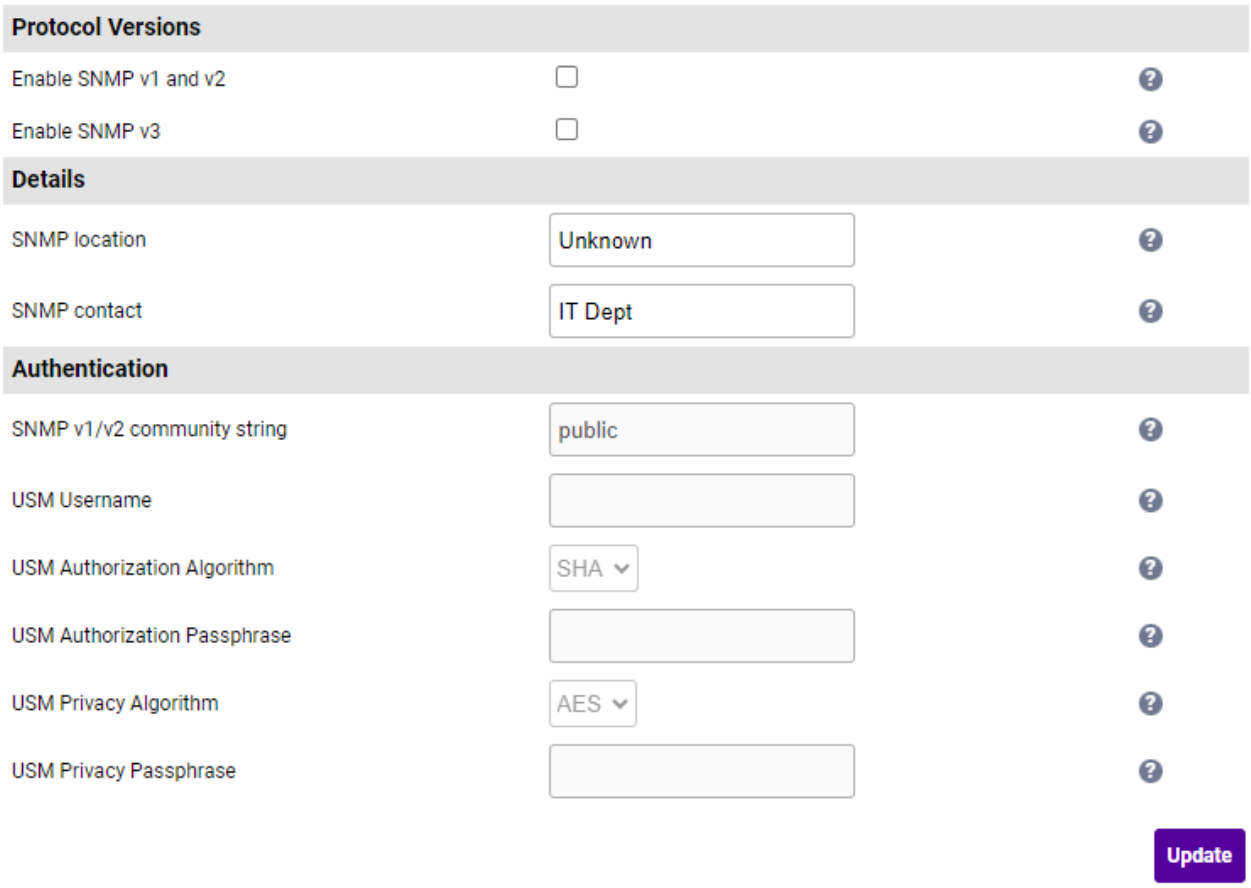
12. Optional Appliance Configuration

12.1. SNMP Configuration

The appliance supports SNMP v1, v2 and v3.

To configure SNMP:

1. Using the WebUI, navigate to: *Local Configuration > SNMP Configuration*.



2. Enable the required SNMP version(s).
3. Enter the required *SNMP location* and *SNMP contact*.
4. For SNMP v1 & v2:
   - Enter the required *SNMP v1/v2 community string*.
5. For SNMP v3:
   - Specify the *USM Username*.
   - Select the required *USM Authorization Algorithm*.
   - Specify the *USM Authorization Passphrase*, it should be at least 8 characters.
   - Select the required *USM Privacy Algorithm*.
   - Specify *USM Privacy Passphrase*, it should be at least 8 characters.
6. Click **Update**.
7. Restart SNMPD using the **Restart SNMPD** button at the top of the screen.

> **Note** Valid characters for the *Community string*, *USM Username*, *USM Authorization Passphrase* and *USM Privacy Passphrase* fields are: **a-z A-Z 0-9 [ ] # ~ _ * ! = - $ % ? { } @ : ; ^**

> **Note** For more information about the various OIDs and associated MIBs supported by the appliance, please refer to SNMP Reporting.

> **Note** If you need to change the port, IP address or protocol that SNMP listens on, please refer to Service Socket Addresses.

12.2. Configuring Email Alerts for Virtual Services

Email alerts can be configured for layer 4 and layer 7 Virtual Services. This enables emails to be sent when one or more of the associated Real Servers fail their health check and also when they subsequently start to pass their health check.

12.2.1. Layer 4

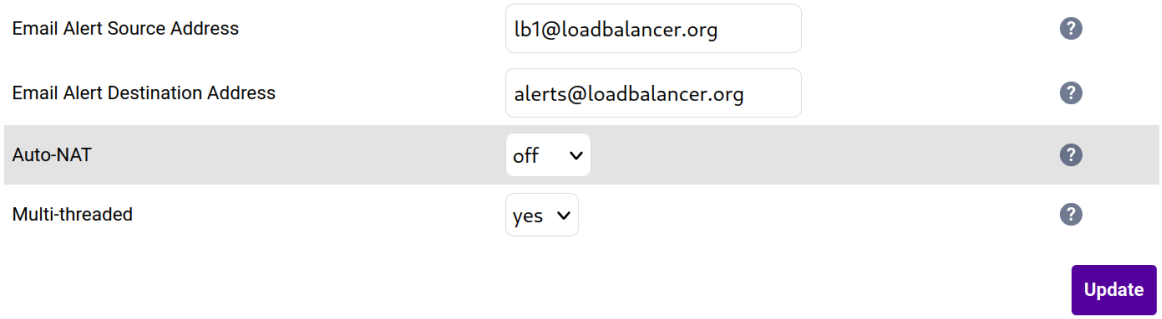
For layer 4 Virtual Services, settings can be configured globally for all VIPs or individually per VIP.

12.2.1.1. Global Layer 4 Email Settings

Once configured, these settings apply to all layer 4 VIPs by default.

To configure global email alert settings for layer 4 services:

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 4 Advanced Configuration*.



2. Enter an appropriate email address in the *Email Alert Source Address* field.

```
e.g. lb1@loadbalancer.org
```

3. Enter an appropriate email address in the *Email Alert Destination Address* field.

```
e.g. alerts@loadbalancer.org
```

4. Click **Update**.

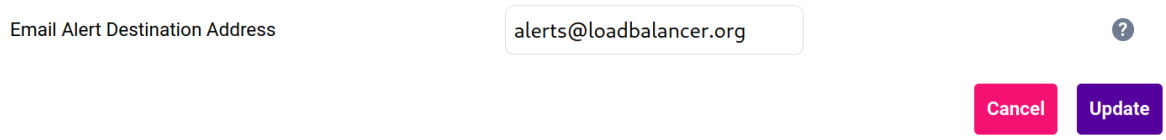
12.2.1.2. VIP Level Settings

> **Note** VIP level settings override the global settings.

Once configured, these settings apply to the individual VIP.

To configure VIP level email alerts:

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 4 Virtual Service* and click **Modify** next to the VIP to be configured.
2. Scroll down to the *Fallback Server* section.



3. Enter an appropriate email address in the *Email Alert Destination Address* field.

```
e.g. alerts@loadbalancer.org
```

4. Click **Update**.

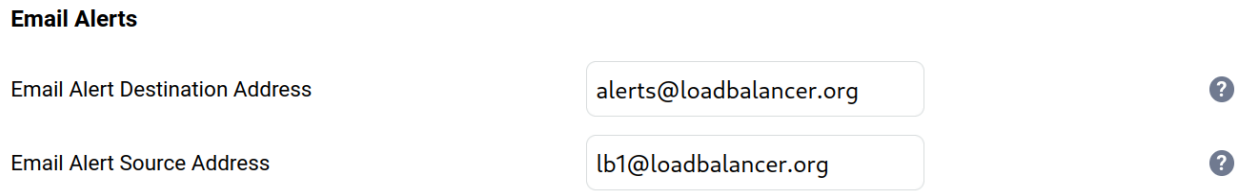
> **Note** You can set the *Email Alert Source Address* field as explained above if required to configure a default source address.

12.3. Configuring Email Alerts for Heartbeat

Email alerts can be setup for heartbeat once a clustered pair has been configured. This enables alerts to be sent when the primary/secondary communication state has changed. This can occur when the secondary appliance takes over from the primary, when the primary takes over from the secondary and also when there is a communication issue between the 2 appliances.

To configure email alert settings for Heartbeat:

1. Using the WebUI, navigate to: *Cluster Configuration > Heartbeat Configuration*.
2. Scroll down to the **Email Alerts** section.



3. Enter an appropriate email address in the *Email Alert Destination Address* field.
4. Enter an appropriate email address in the *Email Alert Source Address* field.
5. Click **Modify Heartbeat Configuration**.

12.4. Configuring a Smart Host (SMTP relay)

For Heartbeat (and layer 4 services), email alerts are sent from the load balancer directly to the mail server defined in the destination domain's DNS MX record by default. Alternatively, a custom smart host (mail relay server) can be specified. A smart host is an email server through which approved devices can send emails. Where possible, we recommend that you use a smart host for email alerts as this often helps improve the deliverability of emails.

To configure a Smart Host:

1. Using the WebUI, navigate to: *Local Configuration > Physical - Advanced Configuration*.
2. Scroll down to the *SMTP Relay* section.
3. Specify the FQDN or IP address of the *Smart Host*.
4. Click **Update**.

> **Note** By default the *Smart Host* is set as the destination email domain's DNS MX record when the *Email Alert Destination Address* is configured. It must either be left at its default setting or a custom smart host must be configured to enable email alerts to be sent.

13. Technical Support

If you require any assistance please contact support@loadbalancer.org.

14. Further Documentation

For additional information, please refer to the Administration Manual.

15. Document Revision History

Version	Date	Change	Reason for Change	Changed By
1.0	3 October 2025	Initial version		RJC

LOADBALANCER

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