LOADBALANCER

DEPLOYMENT GUIDE

Load Balancing GE HealthCare True PACS SP3

Version 1.0

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1. About this Guide

This guide details the steps required to configure a load balanced GE HealthCare True PACS (TP) SP3 environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any TP configuration changes that are required to enable load balancing.

1.1. Acronyms Used in the Guide

Acronym	Description
TP	True PACS
WFC	Workflow Core
CCS	Centralized Configuration Service

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 TP 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 TP

- TP SP3

4. Load Balancing TP SP3

> **Note** It's highly recommended that you have a working TP SP3 environment first before implementing the load balancer.

4.1. Virtual Services (VIP) Requirements

To provide load balancing and HA for TP SP3, the following VIPs are required:

Ref.	VIP Name	Mode/Type	Port(s)	Persistence Mode	Health Check
VIP 1	WFC_RMQAMQP	L7 SNAT	8080	None	Connect to Port
VIP 2	WFC_443_Mutual_Auth	L7 SNAT	8081	None	No Checks, Always On
VIP 2-B1	WFC_inference_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B2	WFC_profiling_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B3	WFC_patient_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B4	WFC_CCS_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B5	WFC_auth_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B6	WFC_outboundhl7_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B7	WFC_inboundnotification_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B8	WFC_eventnotificationmanager_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B9	WFC_outboundeventpolling_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B10	WFC_metadata_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B11	WFC_studymanagement_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B12	WFC_xe_443	Backend Only	-	None	HTTPS (GET)
VIP 2-B13	WFC_recordmanager_443	Backend Only	-	None	HTTPS (GET)
VIP 3	WFC_10443_No_Auth	L7 SNAT	8082	None	No Checks, Always On
VIP 3-B1	WFC_masterfiledata_10443	Backend Only	-	None	HTTPS (GET)
VIP 3-B2	WFC_masterfileapp_10443	Backend Only	-	None	HTTPS (GET)
VIP 3-B3	WFC_xeui_10443	Backend Only	-	None	HTTPS (GET)
VIP 3-B4	WFC_WSO2_oauth2_10443	Backend Only	-	None	HTTPS (GET)

Note

VIPs with references in the format **VIP <number>-B<number>** are ***Backend Only*** VIPs. These are used to define a pool of Real Servers. ACLs are then used by the 'parent' VIP to determine which ***Backend Only*** VIP should be selected based on the requested URL.

In addition, the following CPACS Virtual Services may also be needed depending on the specific site requirements:

Important

For VIPs that utilize Layer 4 DR Mode, the "ARP Problem" must be solved to enable DR mode to operate correctly - this requires some additional configuration steps on each load balanced Real Server. For more details about the ARP problem and how to solve it for Linux and Windows servers please refer to DR Mode Considerations.

> **Note** Clicking on the VIP reference will open the relevant page in the Centricity PACS deployment guide.

Ref.	Remote Ref.	VIP Name	Mode	Port(s)	Persist Mode	Health Check
VIP 4	VIP 1	EA_XDS_Service	L4 DR	80	None	HTTP (GET)
VIP 5	VIP 2	EA_Dicom_Service	L4 DR	104	None	HTTP (GET)
VIP 6	VIP 3	EA_Secure_Dicom_Service	L4 DR	2762	None	HTTP (GET)
VIP 7	VIP 4	EA_HL7_Service	L4 DR	2575	None	HTTP (GET)
VIP 8	VIP 5	EA_Secure_HL7_Service	L4 DR	2576	None	HTTP (GET)
VIP 9	VIP 6	EA_Study_Management_Service	L4 DR	443	None	HTTP (GET)
VIP 10	VIP 10	ZFP	L7 SNAT	443	Source IP	HTTPS (GET)
VIP 11	VIP 11	UV	L7 SNAT	443	Source IP	HTTPS (GET)
VIP 12	VIP 12	Dakota	L7 SNAT	SP1: 8080, SP2: 8443	Source IP	SP1: Connect to port, SP2: HTTPS (GET)
VIP 13	VIP 13	WFM_Play_Group	L7 SNAT	SP1: 8080, SP2: 9443	Source IP	HTTPS (GET)
VIP 14	VIP 14	WFM_tomcat_Group	L7 SNAT	SP1: 9096, SP2: 9096,3443	Source IP	HTTPS (GET)
VIP 15	VIP 15	XE_Standalone	L7 SNAT	8443,9449	Source IP	HTTPS (GET)

4.2. SSL Termination

SSL Termination is configured on the load balancer for the following VIPs:

- VIP1 - **WFC_RMQAMQP**
- VIP2 - **WFC_443_Mutual_Auth**
- VIP3 - **WFC_10443_No_Auth**

And for the Following CPACS VIPs:

- VIP 12 - **Dakota**
- VIP 13 - **WFM_Play_Group**

This provides a corresponding HTTPS Virtual Service for these VIPs. Certificates in PEM or PFX format can be uploaded to the load balancer.

5. Ports Used by the Appliance

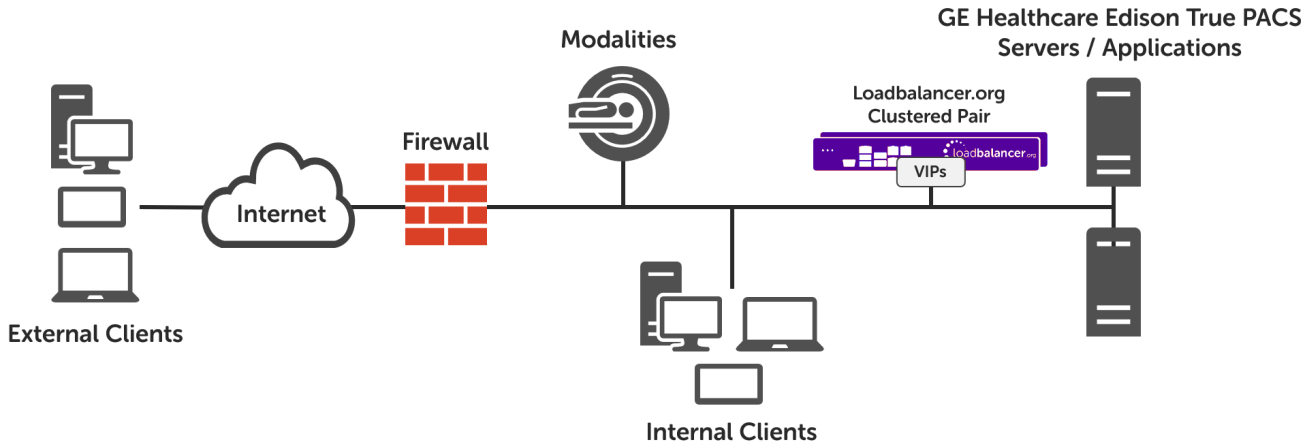
By default, the appliance uses the following TCP & UDP ports:

Protocol	Port	Purpose
TCP	22	SSH
TCP & UDP	53	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 for ADC Portal comms
TCP	9080	WebUI - HTTP (disabled by default)
TCP	9081	Nginx fallback server
TCP	9443	WebUI - HTTPS
TCP	25565	Shuttle service for ADC Portal comms

> **Note** All ports listed above except port 123 (NTP) can be changed if required.

- To change the port used for heartbeat, refer to Configuring High Availability
- To change the port used for HAProxy replication, refer to Layer 7 - Advanced Configuration
- To change other ports, refer to Service Socket Addresses

6. Deployment Concept

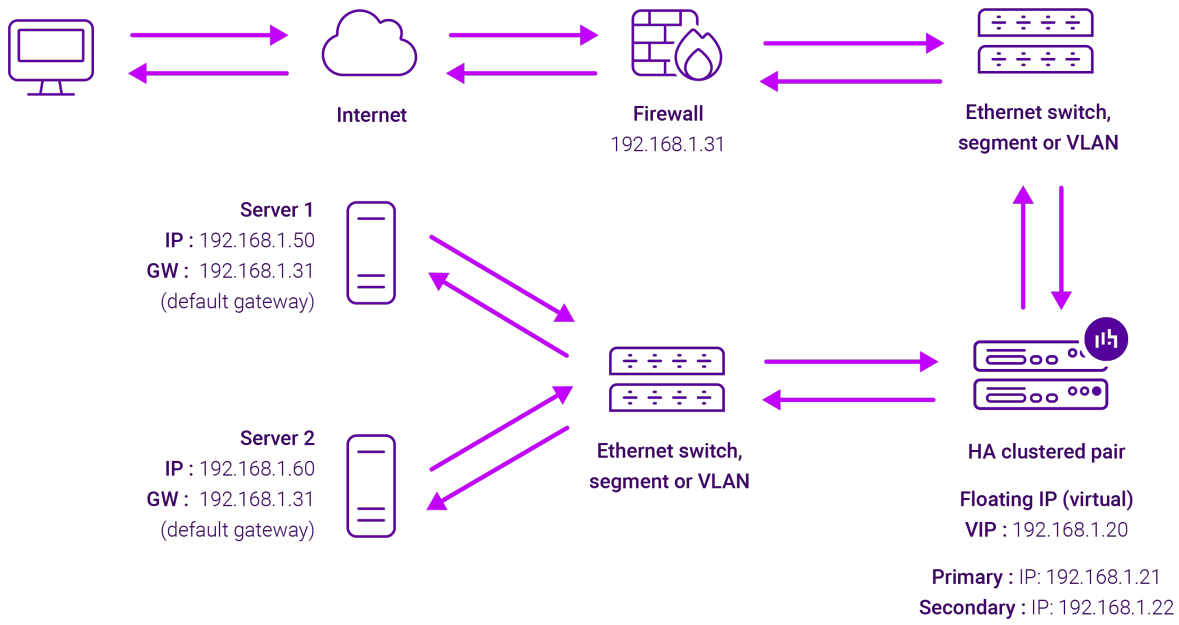


7. Load Balancer Deployment Methods

For TP, layer 7 SNAT mode is used. This mode is described below and is used for the configurations presented in this guide.

7.1. 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. The image below shows an example network diagram for this mode.



- Because layer 7 SNAT mode is a full proxy, Real Servers in the cluster can be on any accessible network 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, **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 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.

8. Configuring TP for Load Balancing

8.1. Layer 7 SNAT Mode

Layer 7 SNAT mode VIPs do not require any mode specific configuration changes to the load balanced Real Servers (TP Servers).

9. Appliance Installation & Configuration for TP

9.1. Overview

For TP 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. Restart services on the **Primary** appliance - refer to Section 9.8.22
8. Verify that everything is working as expected on the **Primary** appliance - refer to Section 10
9. 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
10. 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.

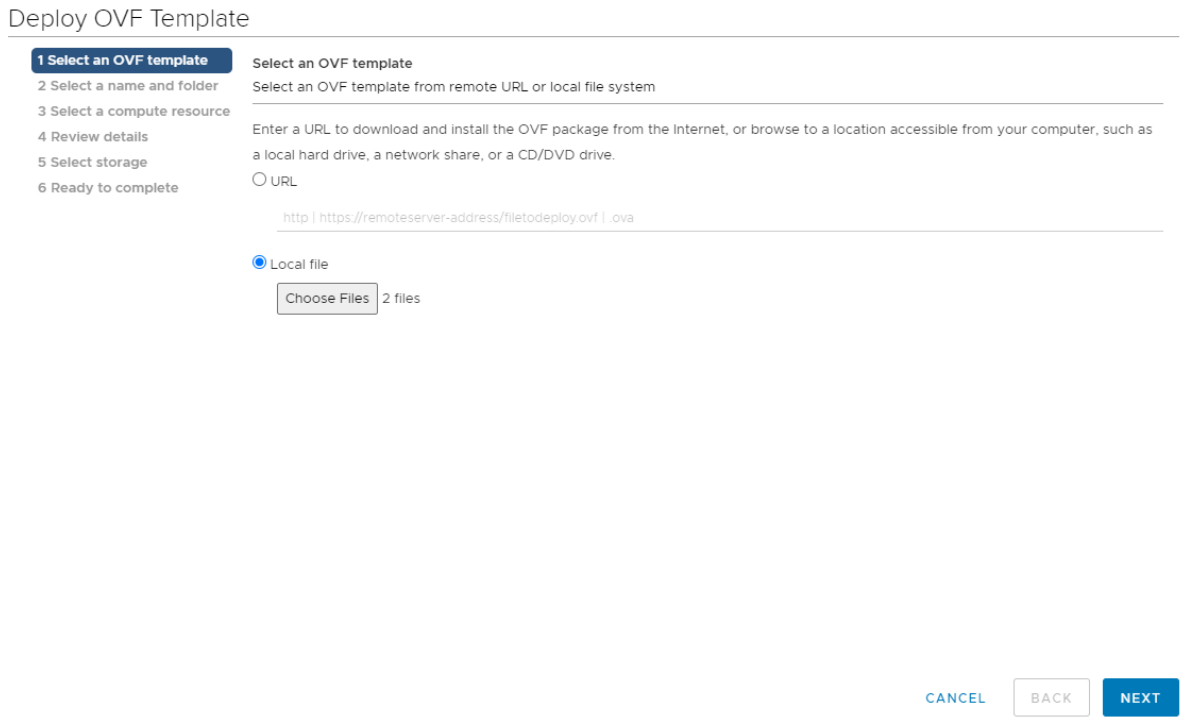
9.2.3.1. Upgrading to the latest Hardware Version

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.

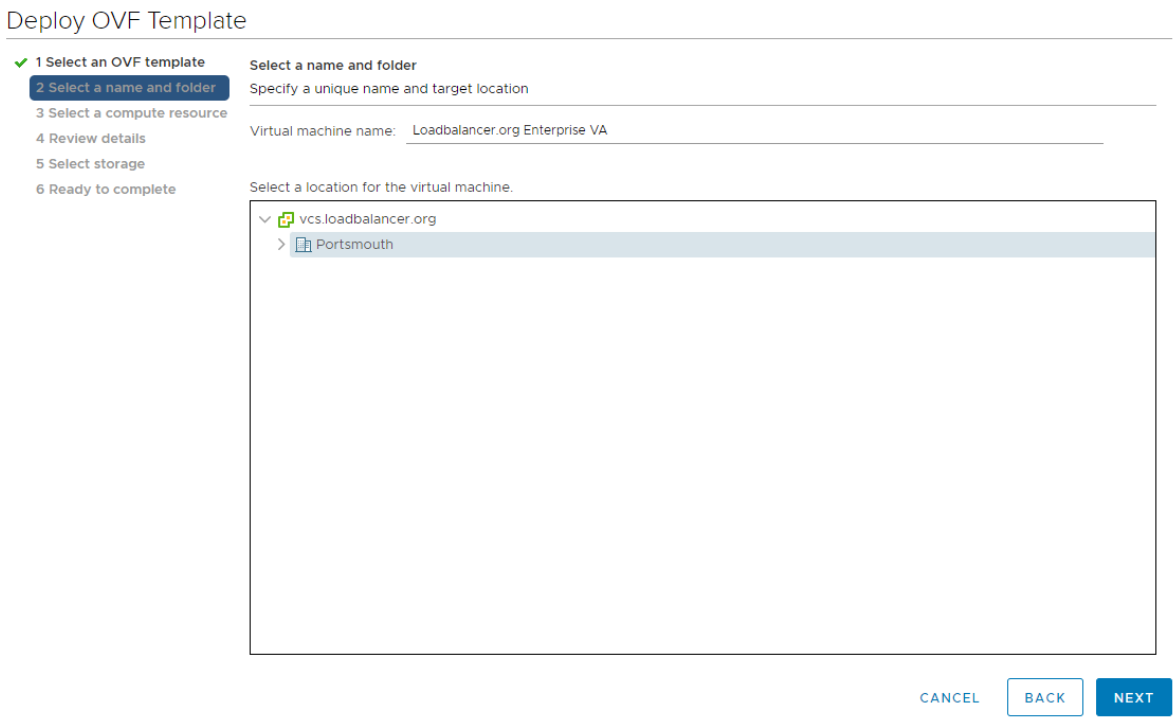
> **Note** Create a snapshot or backup of the virtual machine first before upgrading.

9.2.3.2. Installing the Appliance using vSphere Client

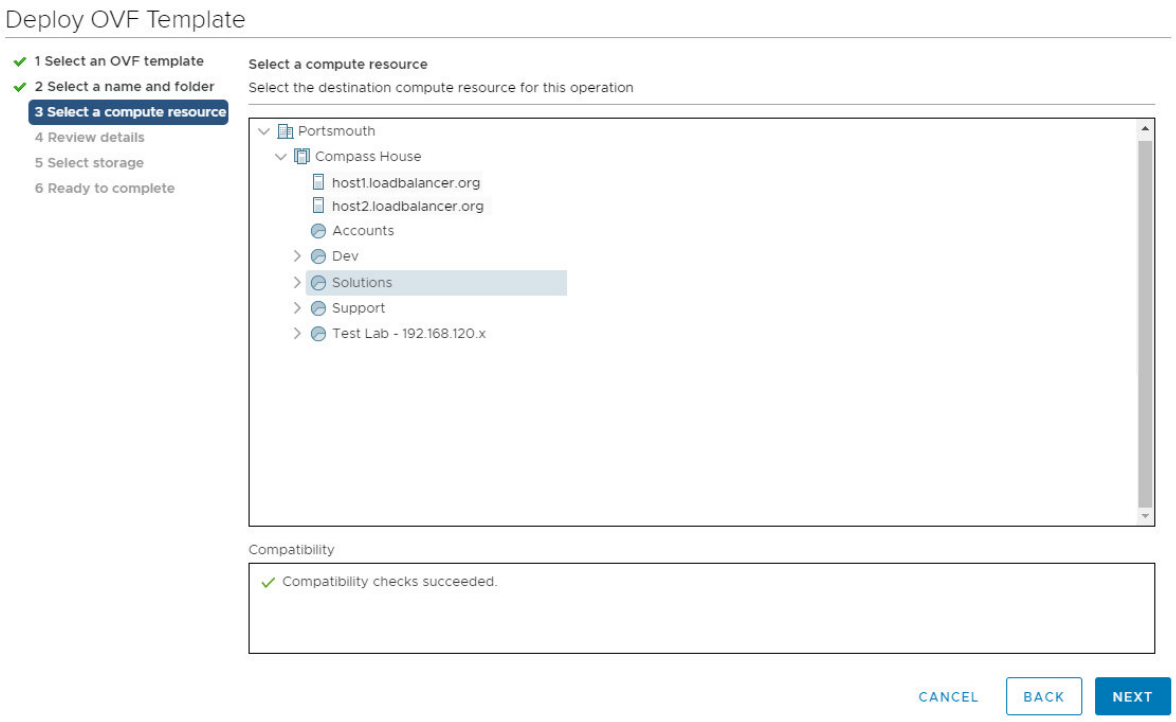
1. Right-click the inventory object where the appliance is to be located and select **Deploy OVF Template**.
2. In the **Select an OVF Template** screen, select the **Local File** option, click **Browse**, navigate to the download location, select the **.ova** file and click **Next**.



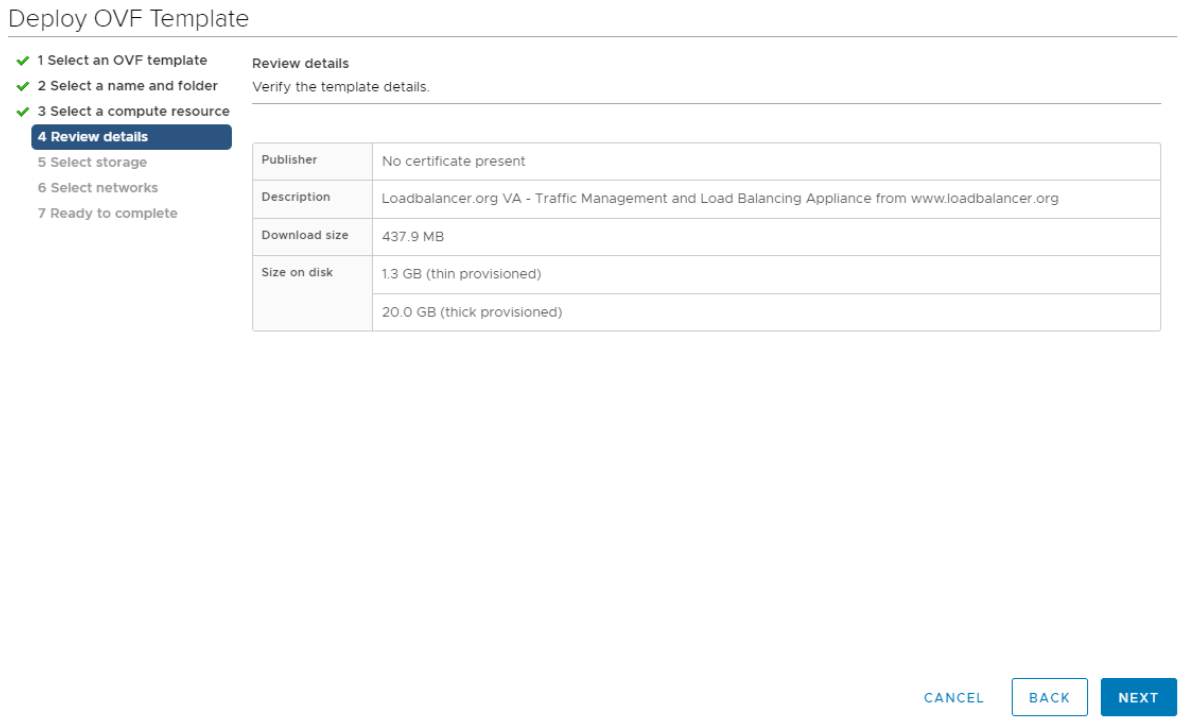
3. In the **Select a name and folder** screen, type a suitable name for the appliance - this can be up to 80 characters in length.
4. Select the required location for the appliance - by default this will be the location of the inventory object from where the wizard was started and click **Next**.



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**.

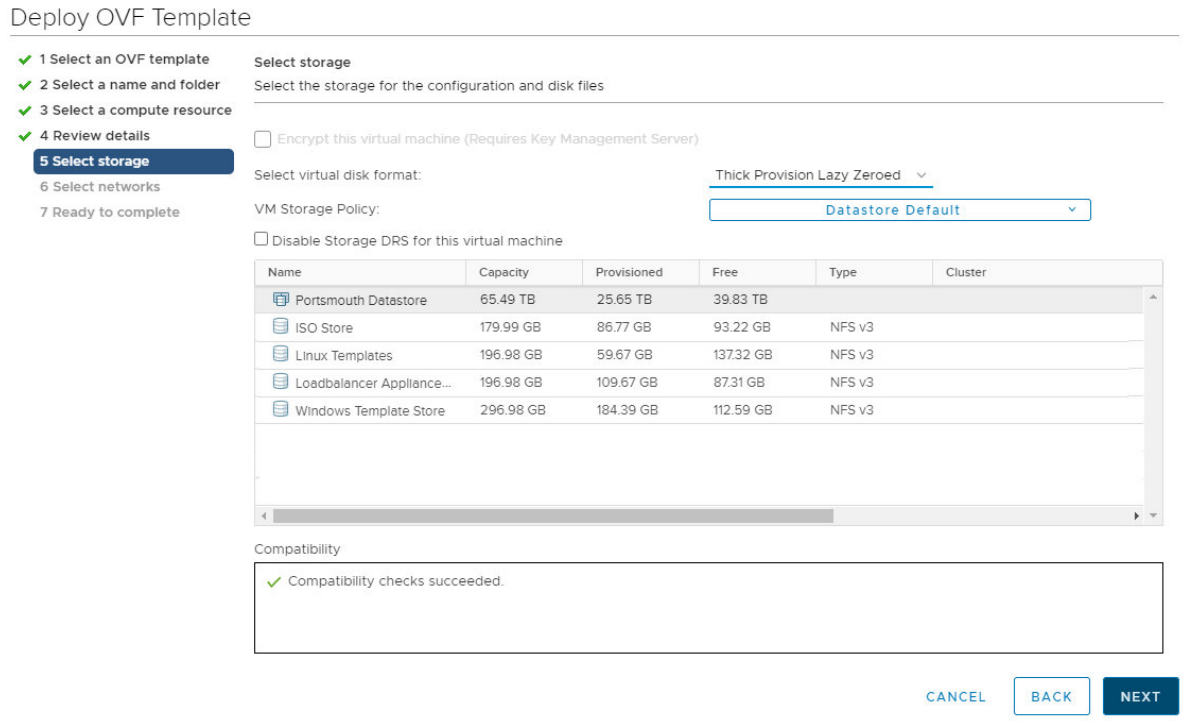


6. In the **Review details** screen, verify the template details and click **Next**.

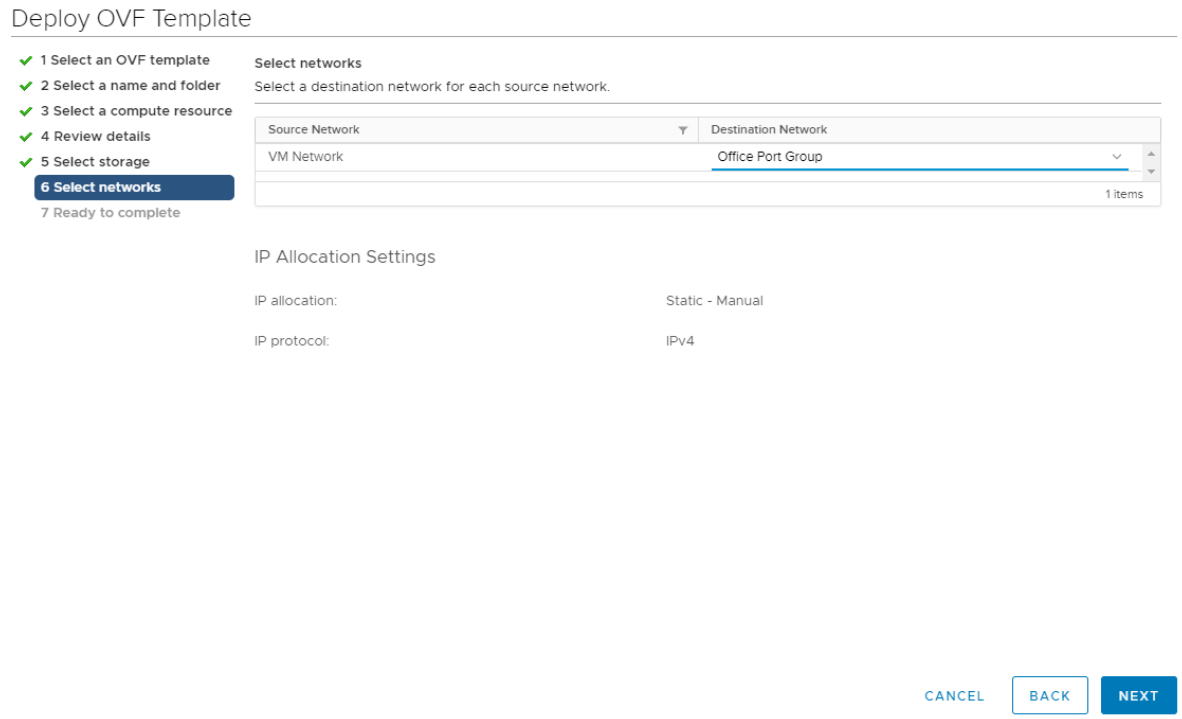


7. In the **Select Storage** screen, first select the required storage location for the appliance.
8. Now select the required disk format and click **Next**.

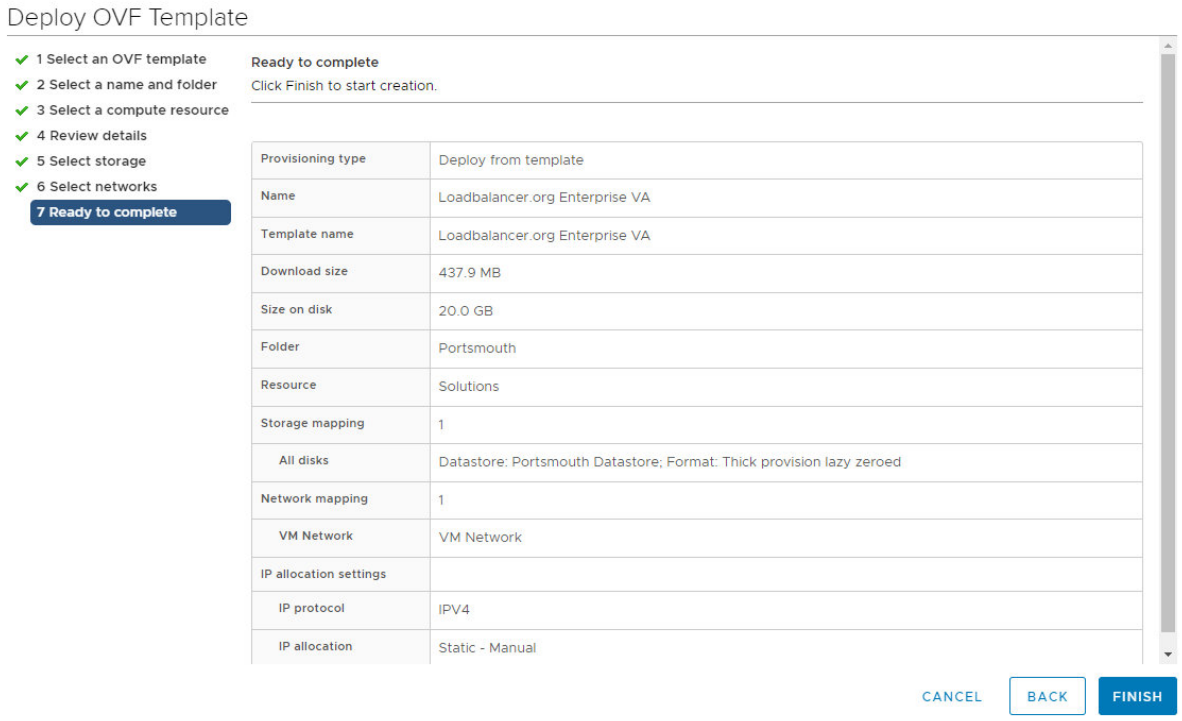
> **Note** Loadbalancer.org recommends selecting a thick provision format. By default the appliance disk is 20GB.



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

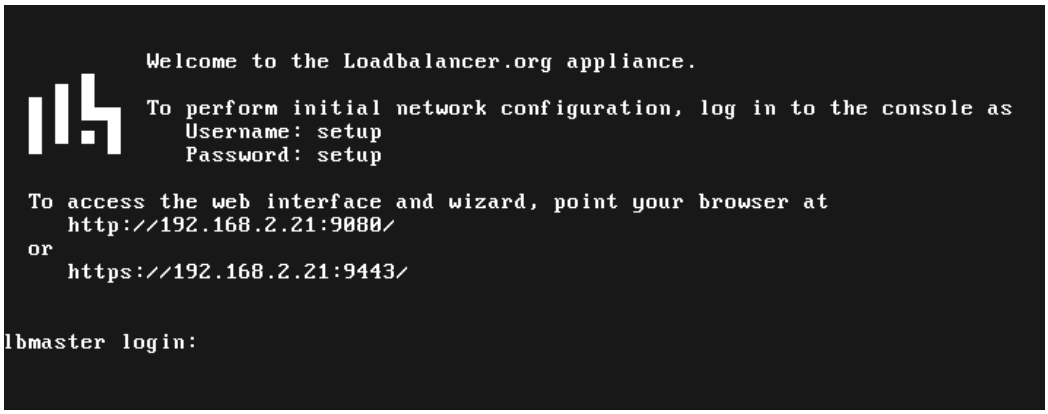
The appliance has 4 network adapters. By default only the first adapter is connected which is the requirement for GE HealthCare deployments. This will be **eth0** when viewed in the appliance WebUI.

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.

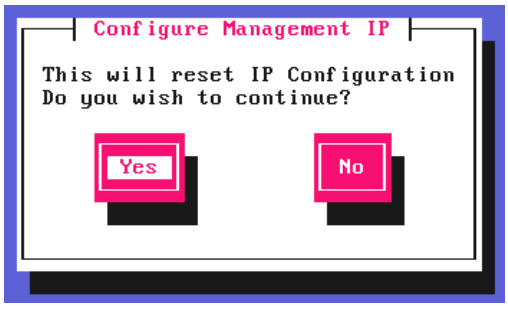
Once logged in, the Network Setup Wizard will start automatically. This will enable you to configure the management IP address and other network settings for the appliance.

login to the console:

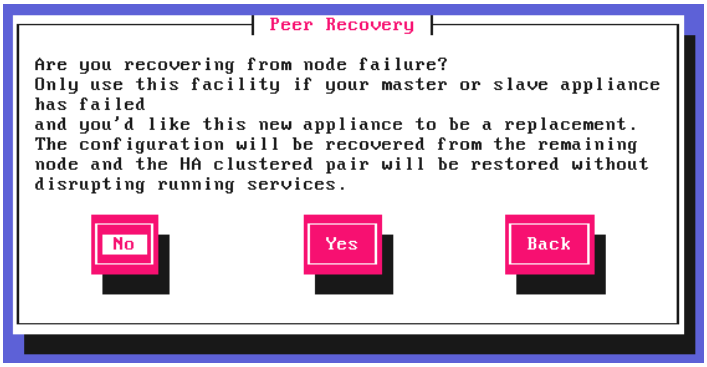
Username: setup
Password: setup

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

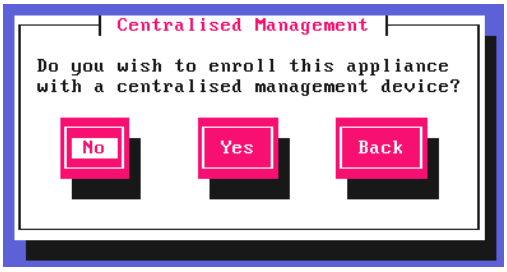
In the **Configure Management IP** screen, leave **Yes** selected and hit **Enter** to continue.



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

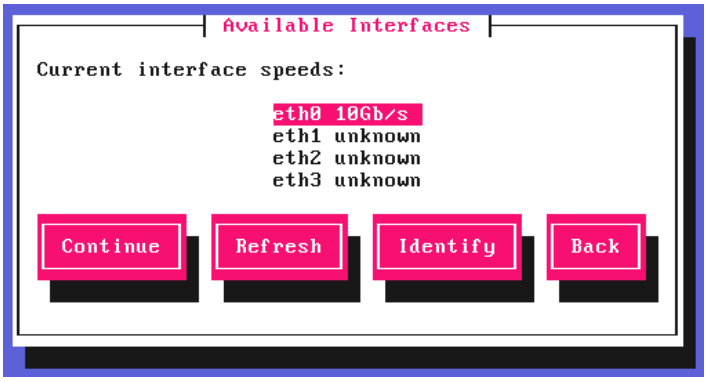


In the **Centralized Management** screen, if you have been provided with Management Server details select **Yes**, otherwise leave **No** selected, then hit **Enter** to continue.

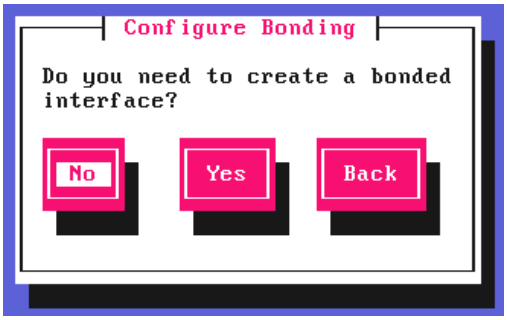


> **Note** For information on how to modify Centralized Management settings via the WebUI, please refer to Portal Management & Appliance Adoption.

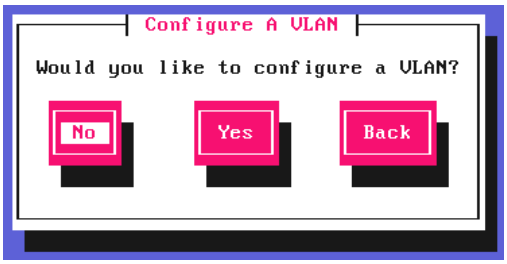
In the **Available Interfaces** screen, a list of available interfaces will be displayed, hit **Enter** to continue.



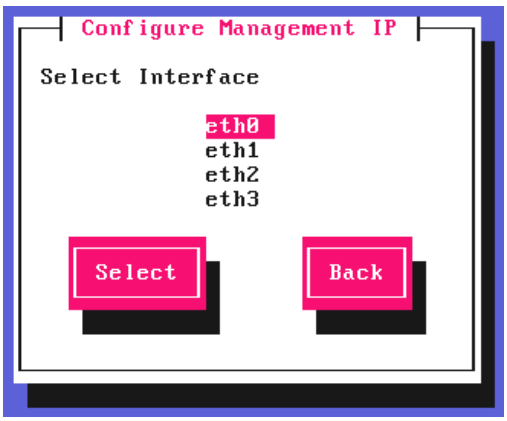
In the **Configure Bonding** screen, leave **No** selected, then hit **Enter** to continue.



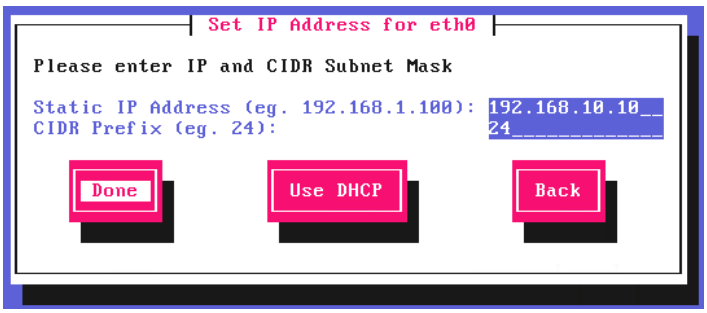
In the **Configure a VLAN** screen, leave **No** selected, then hit **Enter** to continue.



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

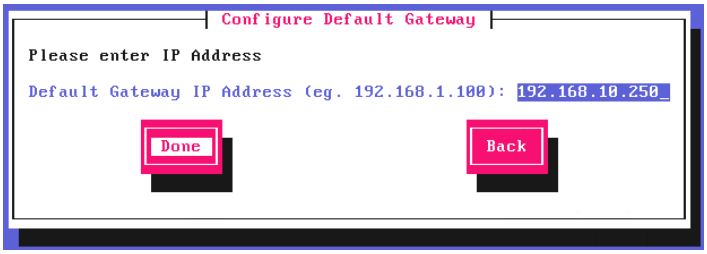


In the **Set IP address** screen, specify the required management address in the *Static IP Address* & *CIDR Prefix* fields, select **Done** and hit **Enter** to continue.

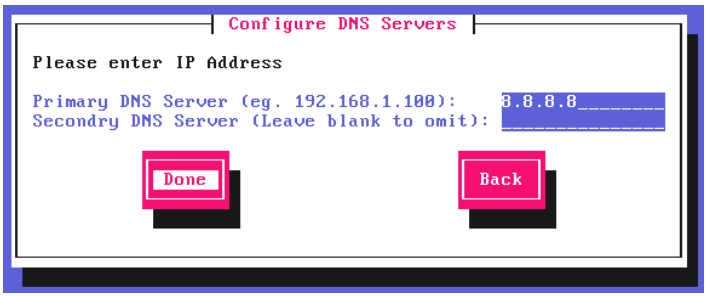


> **Note** A subnet mask such as 255.255.255.0 is not valid, in this case enter 24 instead.

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

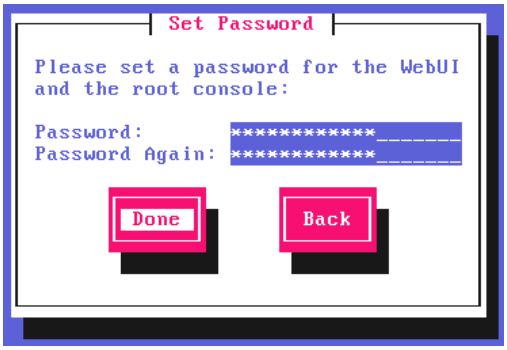


In the **Configure DNS Servers** screen, configure the required DNS server(s), select **Done** and hit **Enter** to continue.

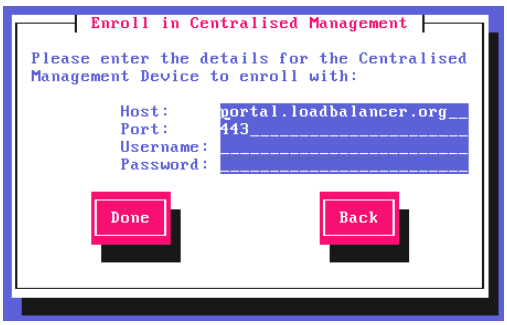


In the **Set Password** screen, hit **Enter** to continue.

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.

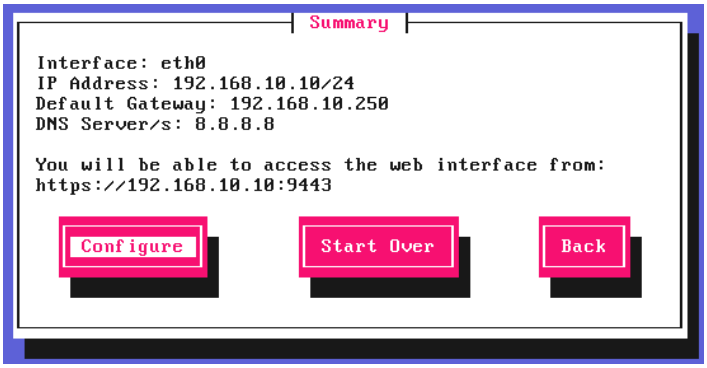


If you selected **Yes** when asked if you want to enroll for Centralized Management, you'll now be prompted for the details. Default values for the *Host* and *Port* are set and can be changed if required. Enter the *Username* and *Password* for the management server account you'd like the appliance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

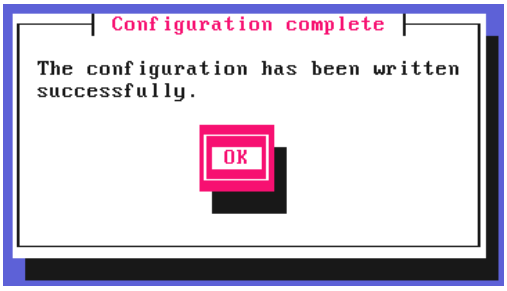


In the **Summary** screen, check all settings. If everything is correct, leave **Configure** selected and hit **Enter** to continue. All settings will be applied. If you need to change a setting, use the **Back** button.

> **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.

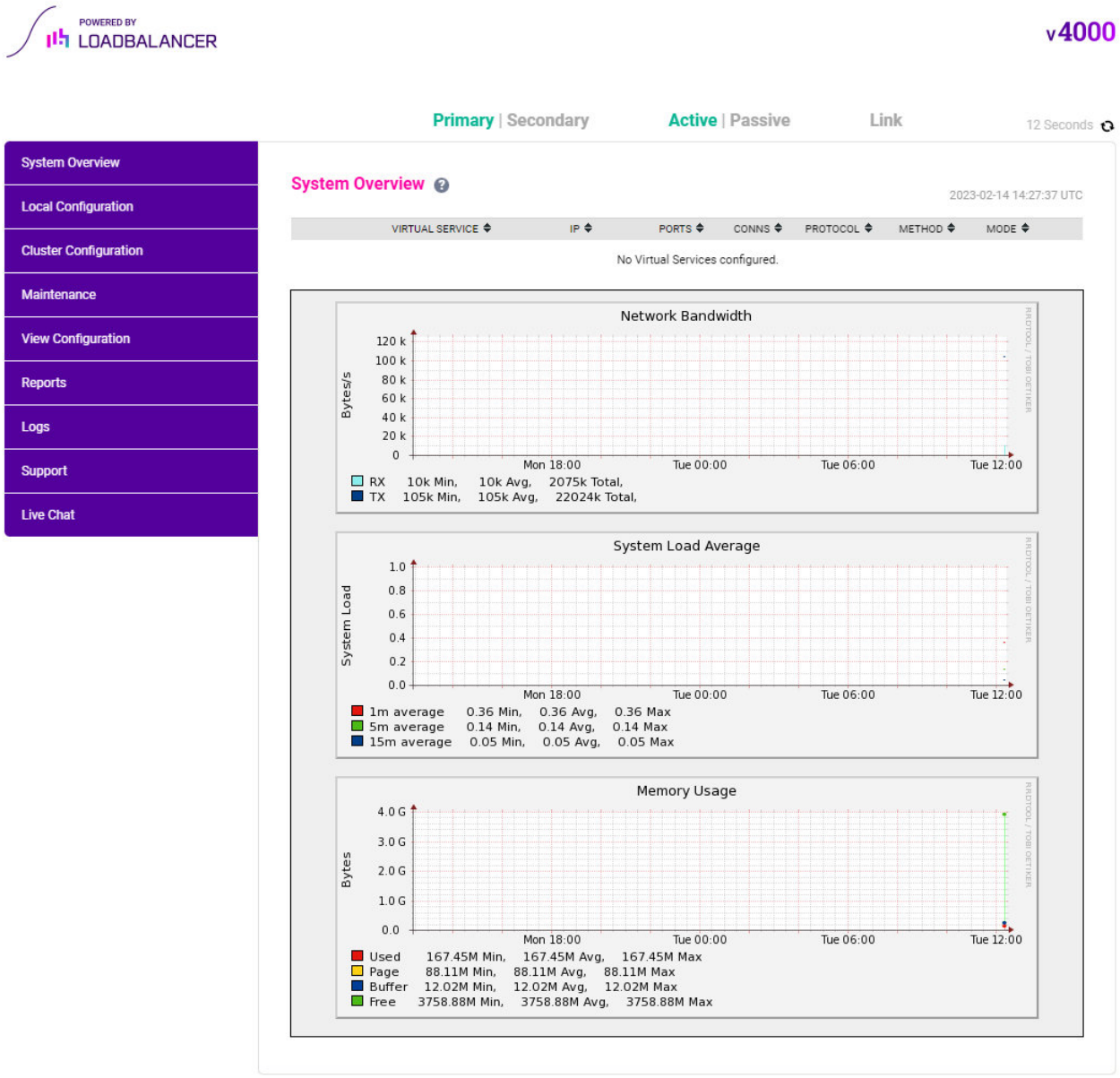
   > **Note** If you need to change the port, IP address or protocol that the WebUI listens on, please refer to Service Socket Addresses.

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

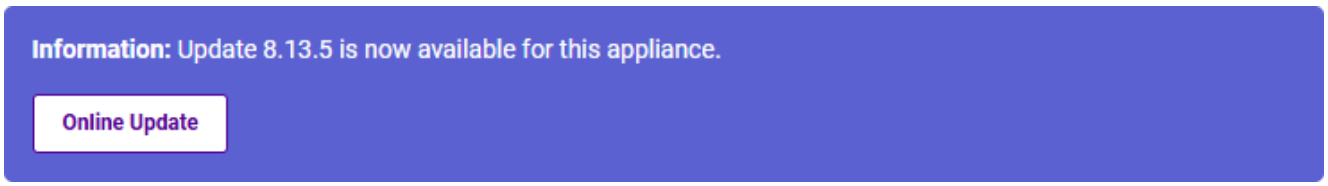
We recommend that the appliance is kept up to date to ensure that you benefit from the latest bug fixes, security updates and feature improvements. Both online and offline update are supported.

> **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

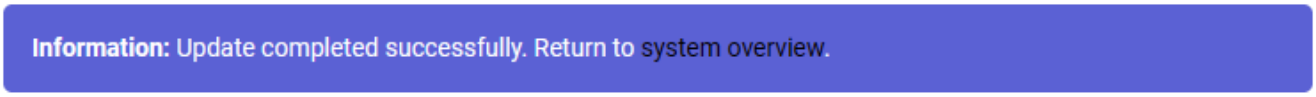
The appliance periodically contacts the Loadbalancer.org update server (**update.loadbalancer.org**) and checks for updates. This is the default behavior and can be disabled if preferred. If an update is found, a notification similar to the example below will be displayed at the top of the WebUI:



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.

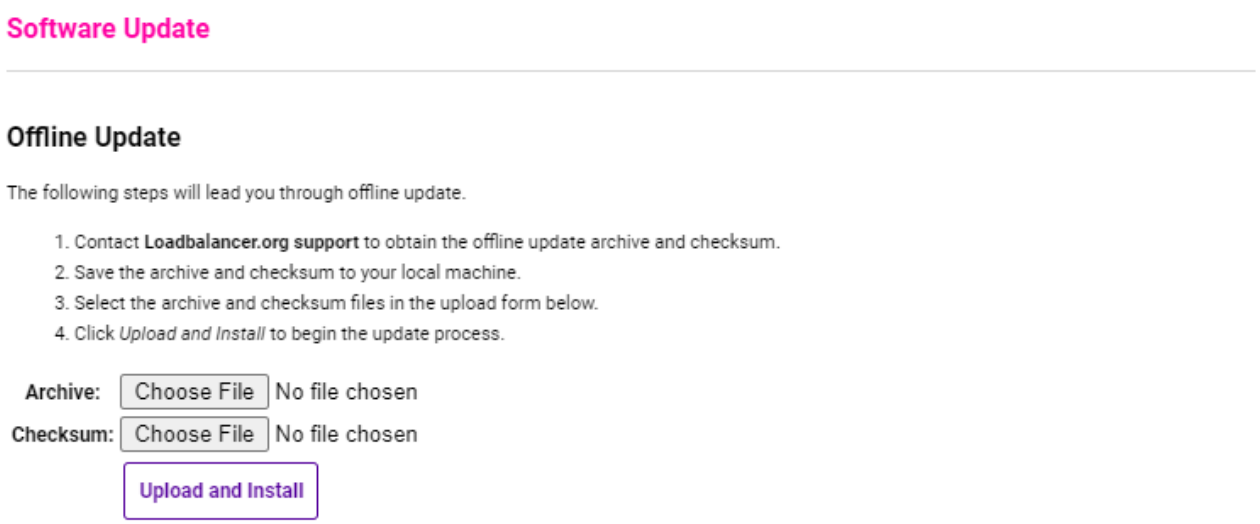
9.5.2. Offline Update

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:

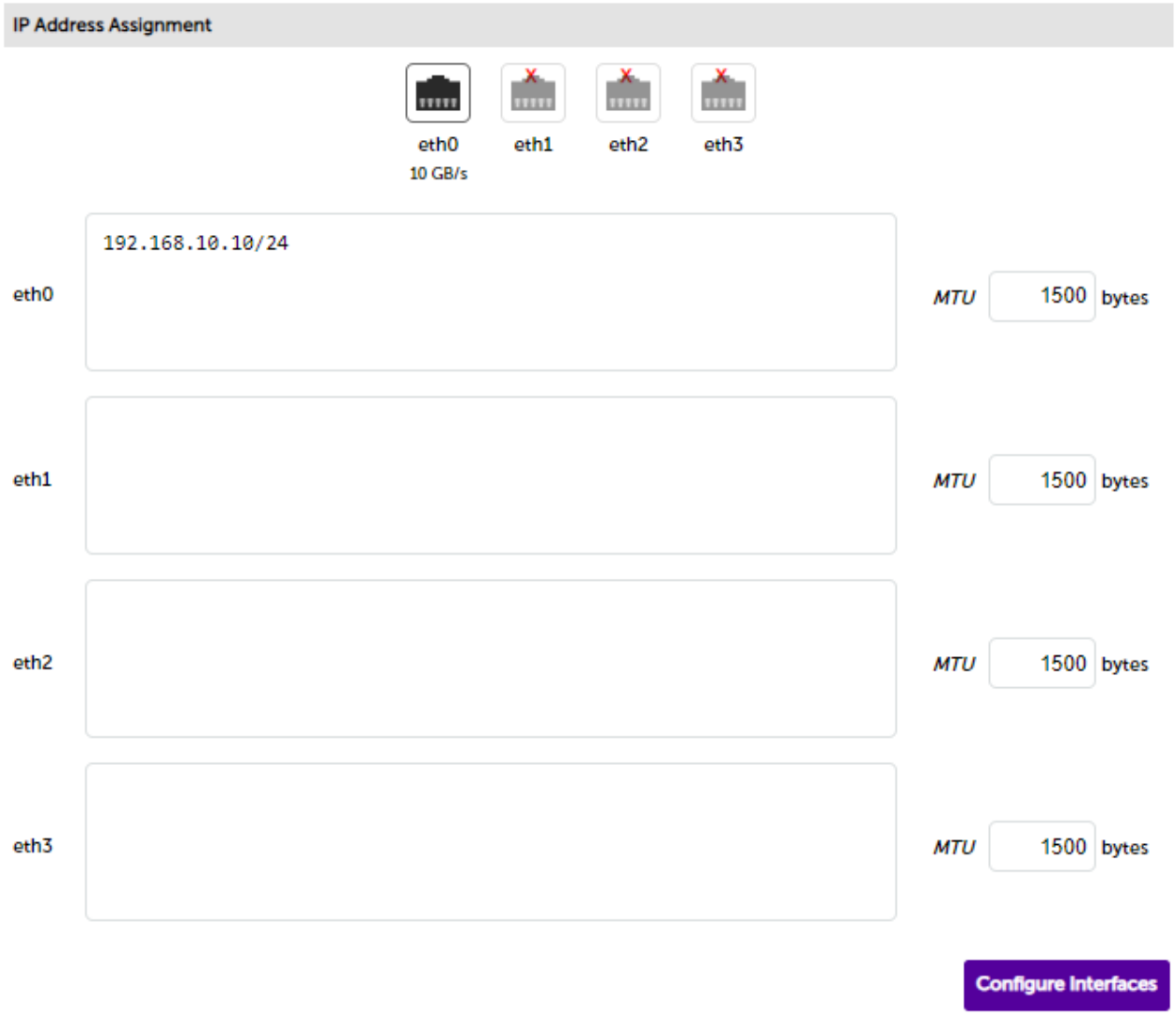
1. Using the WebUI, navigate to: *Local Configuration > Security*.
2. Set *Appliance Security Mode* to **Custom**.
3. Click **Update**.

9.7. Appliance Network Configuration

The standard TP 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. 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**.

9.7.3. 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**.

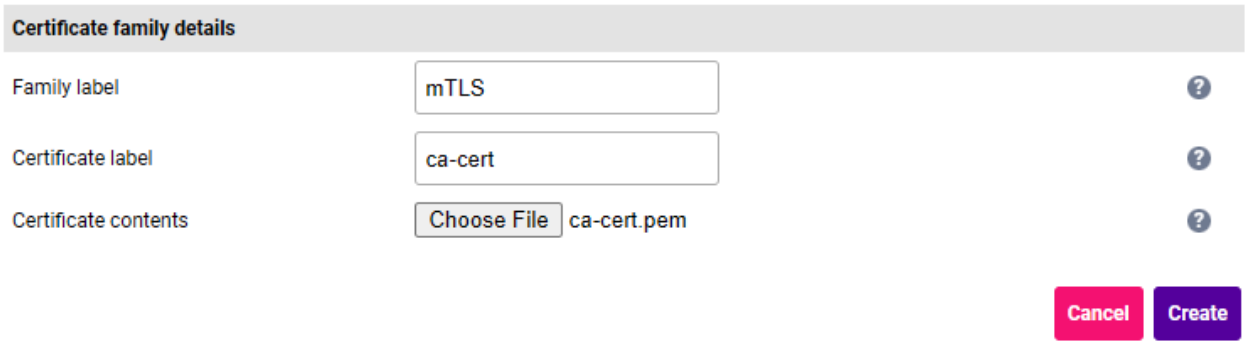
9.8. Configuring Load Balanced Services

9.8.1. Certificates

9.8.1.1. Upload the CA Certificate for mTLS

> **Note** These certificates are selected using the *CA Certificate* dropdown when configuring Virtual Services with SSL termination and the *Verify Server Certificate* dropdown when configuring Real Servers.

1. Using the WebUI, navigate to *Cluster Configuration > CA Certificate Families*.
2. Click **Create Family** and enter the following details:

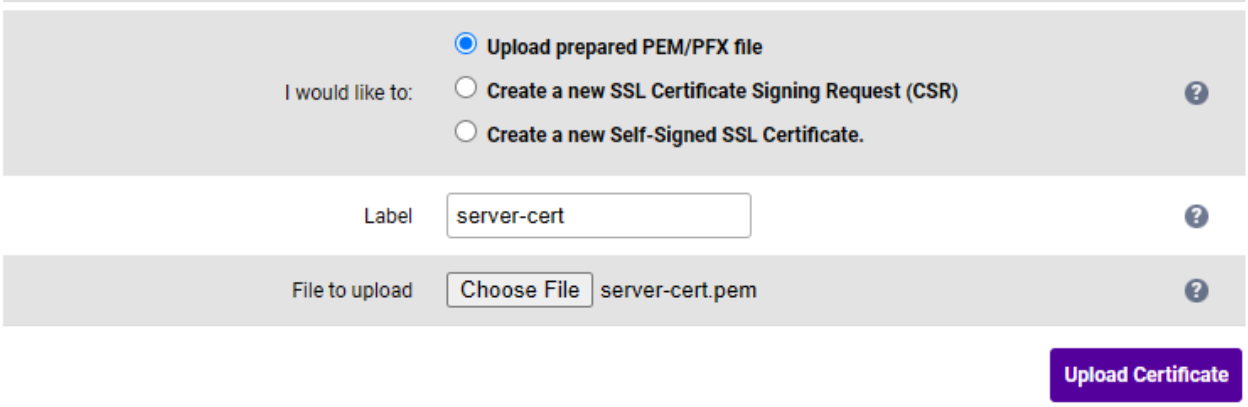


   - Specify an appropriate *Family label*, e.g. **mTLS**.
   - Specify an appropriate *Certificate label*, e.g. **ca-cert**.
   - Click **Choose File** and select the relevant PEM file.
3. Click **Create**.

9.8.1.2. Upload Certificate(s) for use with Front-end mTLS

> **Note** These certificates are selected using the *SSL Certificate* dropdown when configuring Virtual Services.

1. Using the WebUI, navigate to *Cluster Configuration > SSL Certificate* and click **Add a new SSL Certificate**.
2. Select the option **Upload prepared PEM/PFX file**.
3. Enter the following details:



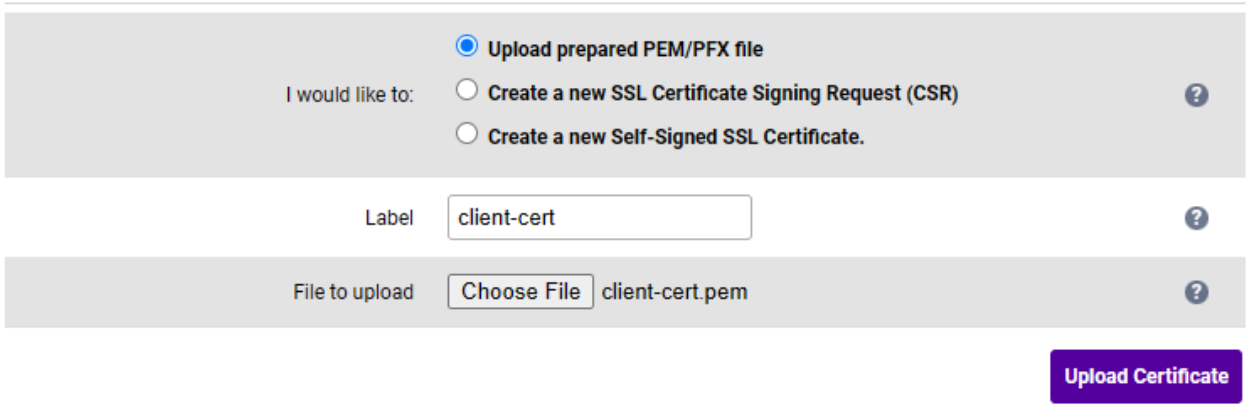
- Specify an appropriate *Label*, e.g. **server-cert**.
- Click **Choose File**.
- Browse to and select the relevant PEM or PFX file.
- For PFX files specify the password if required.

4. Click **Upload Certificate**.
5. Repeat these steps if additional certificates must be uploaded.

9.8.1.3. Upload Certificate(s) for use with Back-end mTLS

> **Note** These certificates are selected using the *Send Client Certificate* dropdown when configuring Real Servers.

1. Using the WebUI, navigate to *Cluster Configuration > SSL Certificate* and click **Add a new SSL Certificate**.
2. Select the option **Upload prepared PEM/PFX file**.
3. Enter the following details:



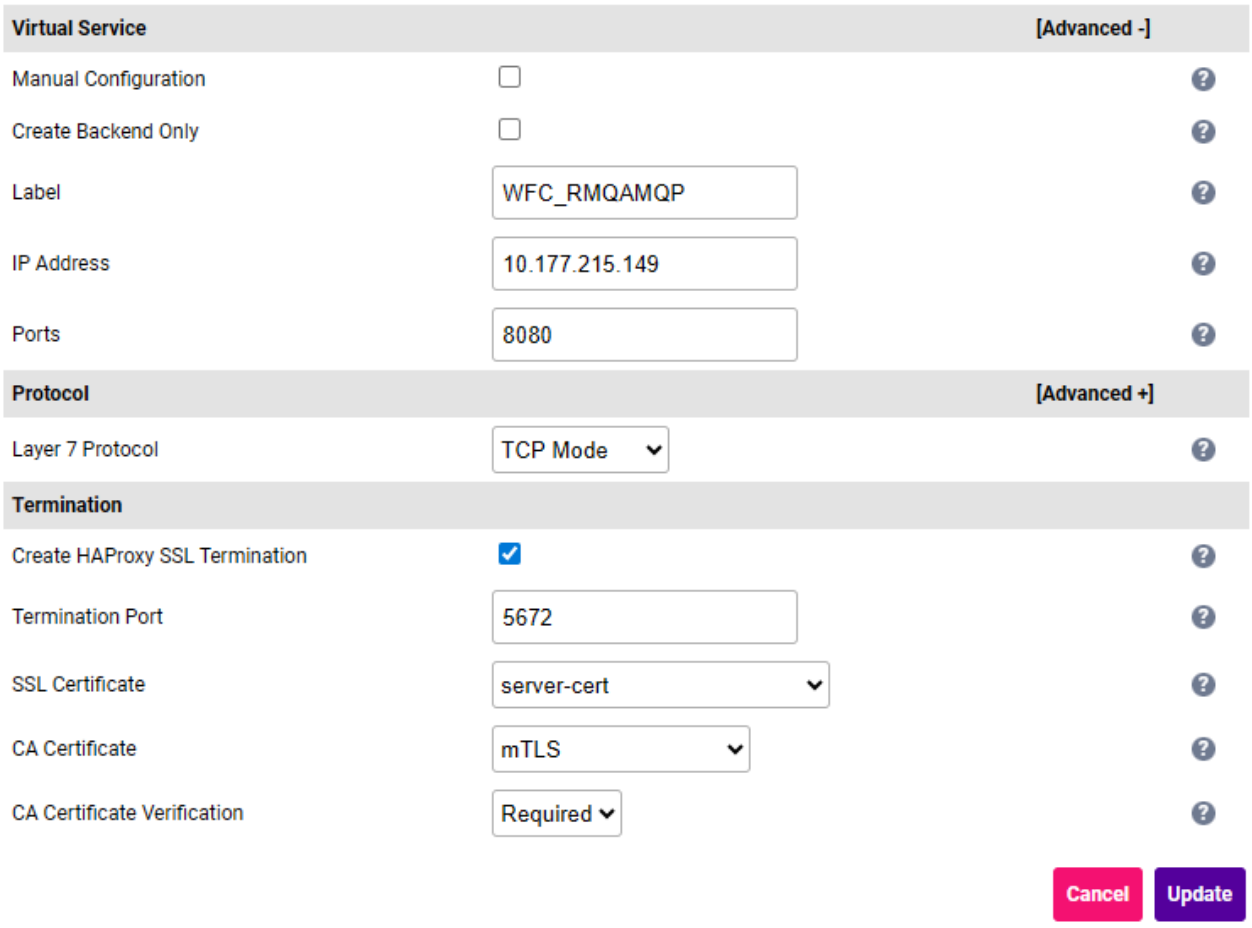
- Specify an appropriate *Label*, e.g. **client-cert**.
- Click **Choose File**.
- Browse to and select the relevant PEM or PFX file.
- For PFX files specify the password if required.

4. Click **Upload Certificate**.
5. Repeat the above steps if additional certificates must be uploaded.

9.8.2. VIP 1 - WFC_RMQAMQP

9.8.2.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]** in the *Virtual Service* heading bar.
3. Scroll to the *Termination* section.
   - Enable (check) the *Create HAProxy SSL Termination* checkbox.
4. Enter the following details:



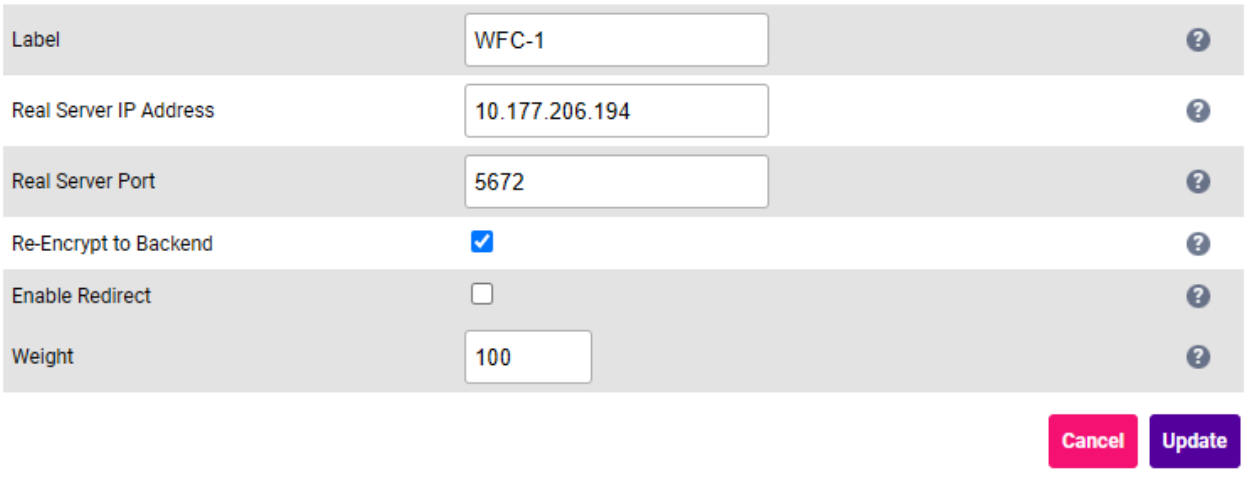
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_RMQAMQP**.
- Set the *Virtual Service IP Address* field to the required IP address, e.g. **10.177.215.149**.
- Set the *Ports* field to **8080**.
- Set the *Layer 7 Protocol* to **TCP Mode**.
- Set the *Termination Port* to **5672**.
- Set the *SSL Certificate* to the appropriate certificate for the site, e.g. **server-cert**.

- Set the *CA Certificate* to the appropriate certificate for the site, e.g. **mTLS**.
- Set *CA Certificate Verification* to **Required**.

5. Click **Update** to create the Virtual Service.
6. Now click **Modify** next to the newly created VIP.
7. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
8. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
9. Scroll to the *Health Checks* section and click **[Advanced]**.
   - Set the *Check Type* to **Connect to Port**.
   - Set the *Check Port* to **4672**.
10. Scroll to the *SSL* section.
    - Ensure that *Enable Backend Encryption* is enabled (checked).
11. Leave all other settings at their default value.
12. Click **Update**.

9.8.2.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



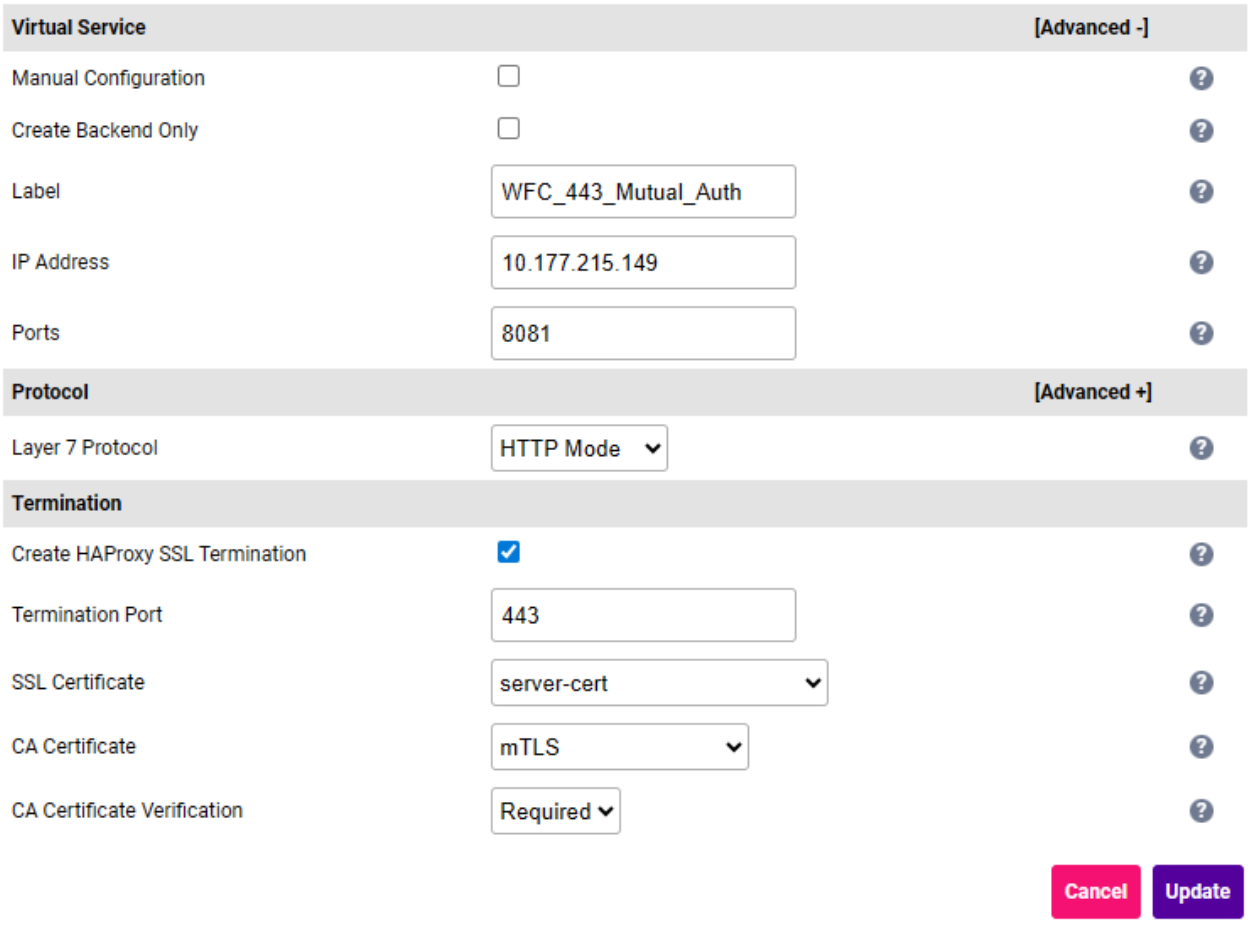
- Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **5672**.
- Ensure that *Re-Encrypt to Backend* is enabled (checked).

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.3. VIP 2 - WFC_443_Mutual_Auth

9.8.3.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]** in the *Virtual Service* heading bar.
3. Scroll to the *Termination* section.
   - Enable (check) the *Create HAProxy SSL Termination* checkbox.
4. Enter the following details:



   - Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_443_Mutual_Auth**.
   - Set the *Virtual Service IP Address* field to the required IP address, e.g. **10.177.215.149**.

- Set the *Ports* field to **8081**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.
- Set the *Termination Port* to **443**.
- Set the *SSL Certificate* to the appropriate certificate for the site, e.g. **server-cert**.
- Set the *CA Certificate* to the appropriate certificate for the site, e.g. **mTLS**.
- Set *CA Certificate Verification* to **Required**.

5. Click **Update** to create the Virtual Service.
6. Now click **Modify** next to the newly created VIP.
7. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
8. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
9. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **No checks, Always On**.
10. Scroll to the *ACL Rules* section.
11. Using the **Add Rule** button, add the following ACL rules:
    - **Rule 1**

```
Type:            path_reg
Bool:            Equals
URL/Text:        /api/v[0-9]*/configstore
Action:          Use Backend
Location/Value:  WFC_CCS_443
```

    - **Rule 2**

```
Type:            path_reg
Bool:            Equals
URL/Text:        /api/v[0-9]*/inference
Action:          Use Backend
Location/Value:  WFC_inference_443
```

    - **Rule 3**

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/profiling
Action:          Use Backend
Location/Value:  WFC_profiling_443
```

- Rule 4

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/inboundnotification
Action:          Use Backend
Location/Value:  WFC_inboundnotification_443
```

- Rule 5

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/outboundeventpolling
Action:          Use Backend
Location/Value:  WFC_outboundeventpolling_443
```

- Rule 6

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/outboundhl7
Action:          Use Backend
Location/Value:  WFC_outboundhl7_443
```

- Rule 7

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/patient
Action:          Use Backend
Location/Value:  WFC_patient_443
```

- Rule 8

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/auth
Action:          Use Backend
Location/Value:  WFC_auth_443
```

- Rule 9

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/eventnotificationmanager
Action:          Use Backend
Location/Value:  WFC_eventnotificationmanager_443
```

- **Rule 10**

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/metadata
Action:          Use Backend
Location/Value:  WFC_metadata_443
```

- **Rule 11**

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/studymanagement
Action:          Use Backend
Location/Value:  WFC_studymanagement_443
```

- **Rule 12**

```
Type:            path_beg
Bool:            Equals
URLText:         /XERService
Action:          Use Backend
Location/Value:  WFC_xe_443
```

- **Rule 13**

```
Type:            path_reg
Bool:            Equals
URLText:         /api/v[0-9]*/recordmanager
Action:          Use Backend
Location/Value:  WFC_recordmanager_443
```

12. Scroll to the *Other* section.
    - Set *Force to HTTPS* to **Yes**.
    - Set the *HTTPS Redirect Code* to **301 (Moved Permanently)**.
    - Set the *HTTPS Redirect Port* to **443**.
13. Leave all other settings at their default value.
14. Click **Update**.

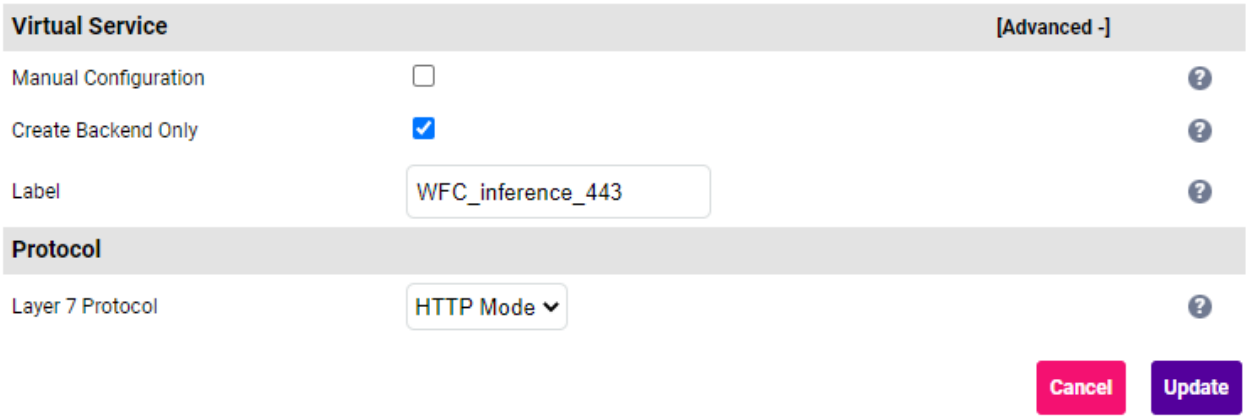
9.8.3.2. Define the Associated Real Servers (RIPs)

This VIP has no associated Real Servers. Instead, the ACLs defined above are used to route traffic to the appropriate Backend Only Virtual Service.

9.8.4. VIP 2-B1 - WFC_inference_443

9.8.4.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



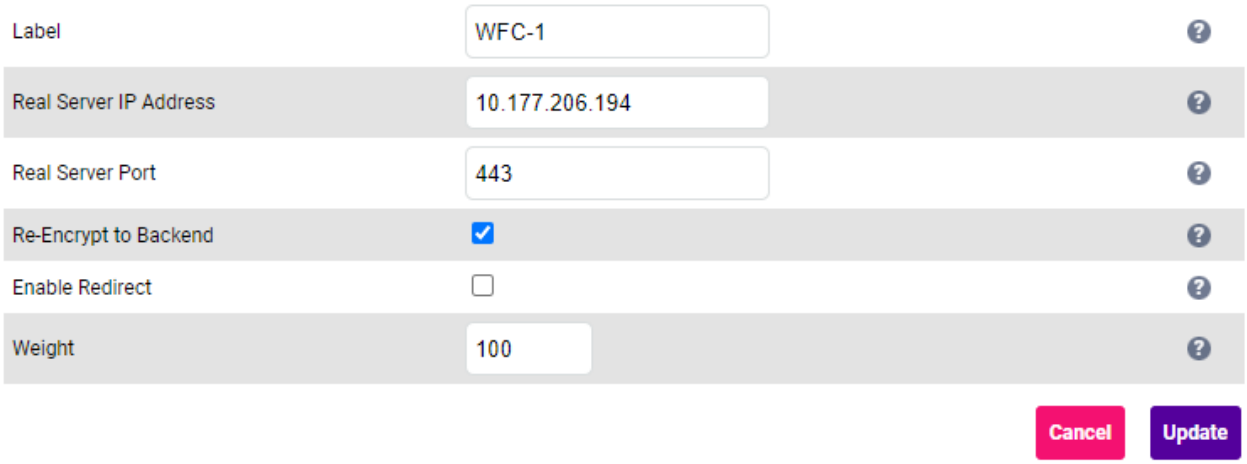
   - Select (Check) **Create Backend Only**.
   - Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_inference_443**.
   - Set the *Layer 7 Protocol* to **HTTP Mode**.
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/inference/health/tenant/<tenantid>**.

> **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.4.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:

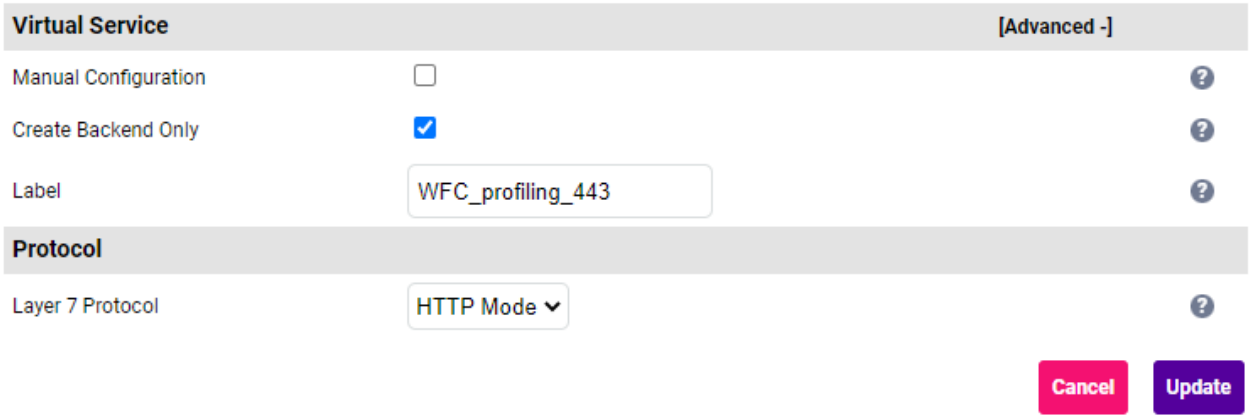


   - Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
   - Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
   - Set the *Real Server Port* field to **443**.
   - Ensure that *Re-Encrypt to Backend* is enabled (checked).
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.5. VIP 2-B2 - WFC_profiling_443

9.8.5.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_profiling_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

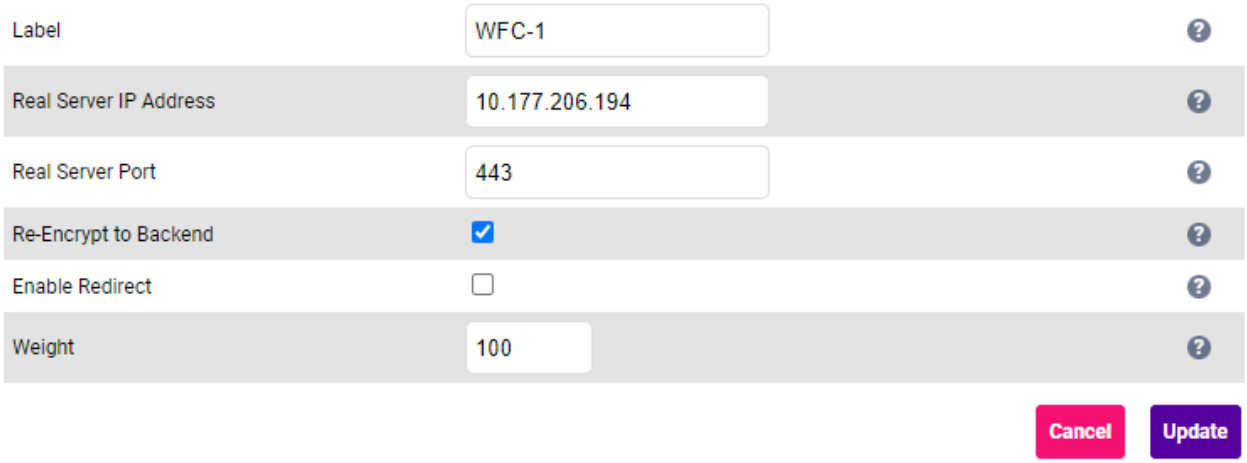
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/profiling/health/tenant/<tenantid>**.

> **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.5.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



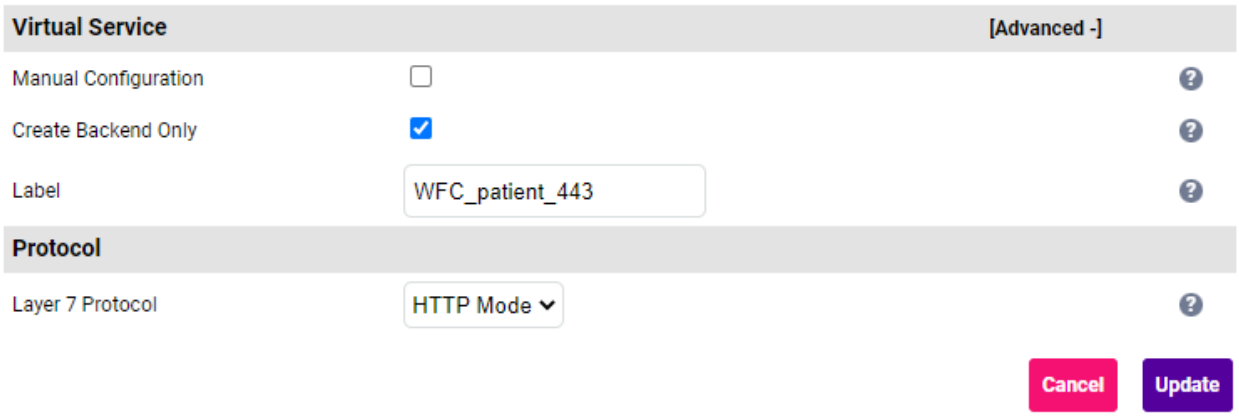
- Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **443**.
- Ensure that *Re-Encrypt to Backend* is enabled (checked).

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.6. VIP 2-B3 - WFC_patient_443

9.8.6.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_patient_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

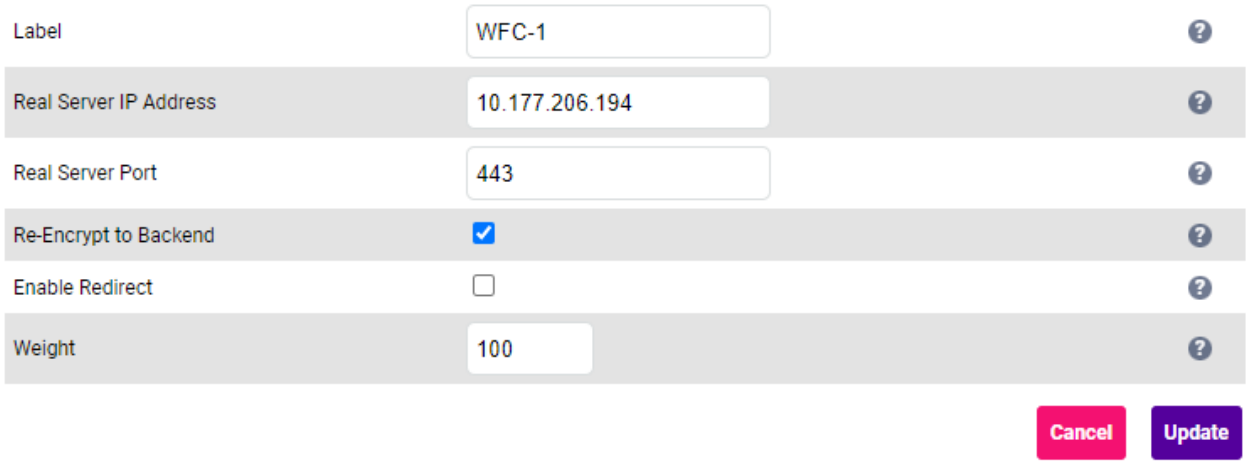
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/patient/health/tenant/<tenantid>**.

> **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.6.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



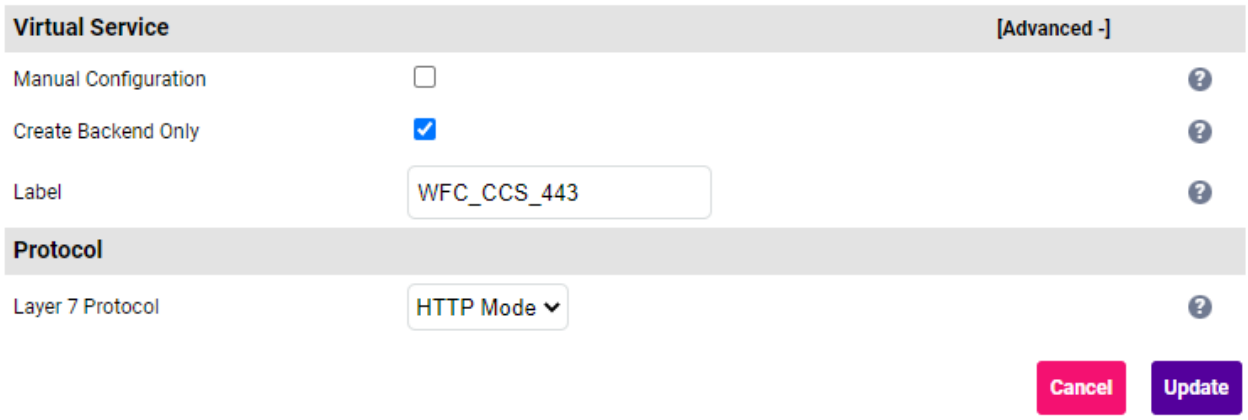
- Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **443**.
- Ensure that *Re-Encrypt to Backend* is enabled (checked).

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.7. VIP 2-B4 - WFC_CCS_443

9.8.7.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_CCS_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

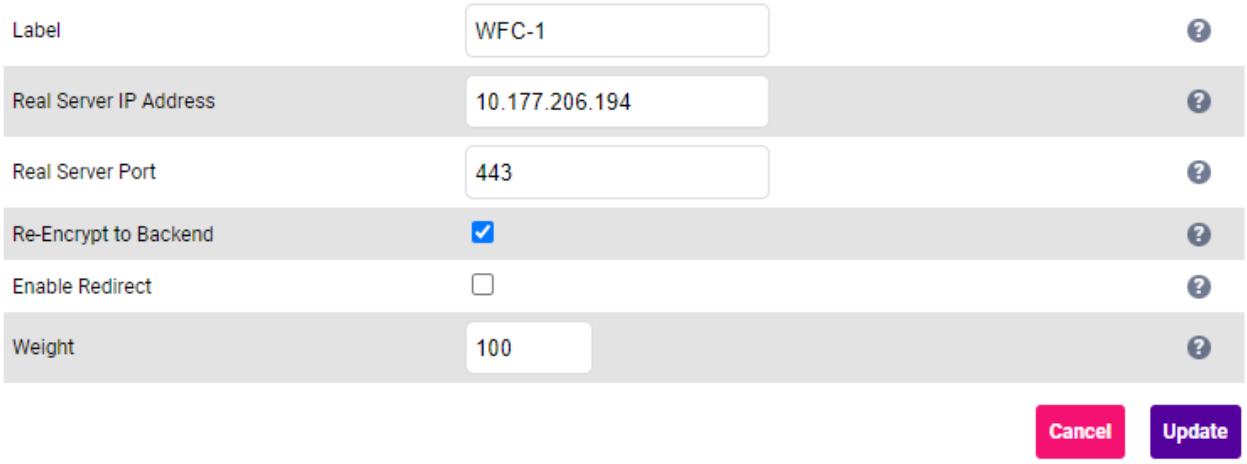
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.

- Ensure that the *Persistence Mode* is set to **None**.

8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/configstore/health/admin/serviceconfig**.
   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.7.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:

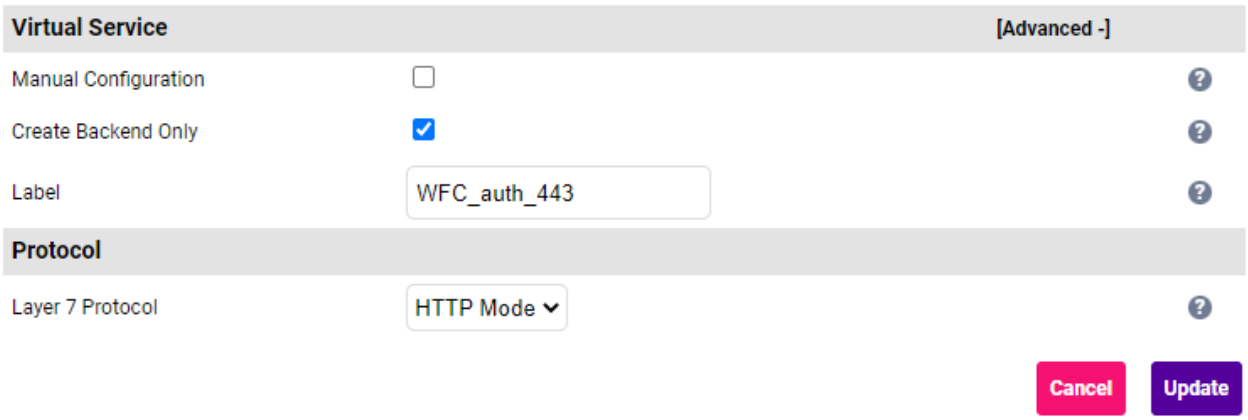


   - Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
   - Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
   - Set the *Real Server Port* field to **443**.
   - Ensure that *Re-Encrypt to Backend* is enabled (checked).
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.8. VIP 2-B5 - WFC_auth_443

9.8.8.1. Virtual Service (VIP) Configuration

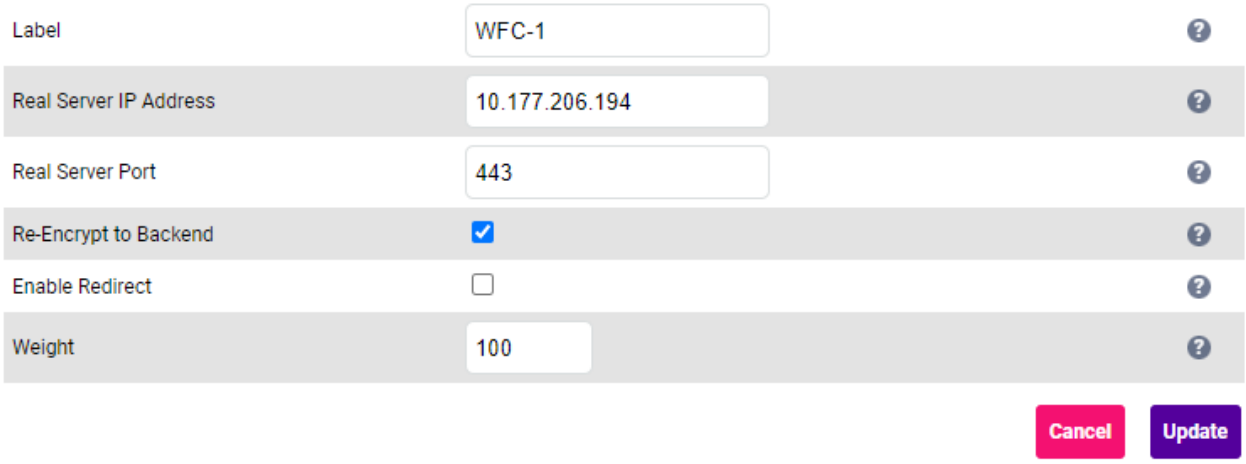
1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



   - Select (Check) **Create Backend Only**.
   - Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_auth_443**.
   - Set the *Layer 7 Protocol* to **HTTP Mode**.
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set *Request to Send* to **/api/v1/auth/health**.
   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.8.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:

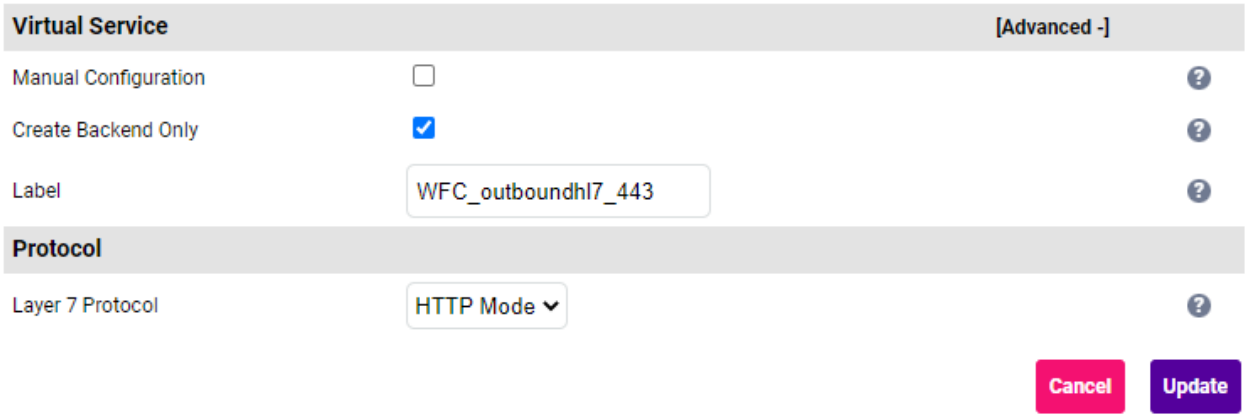


   - Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
   - Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
   - Set the *Real Server Port* field to **443**.
   - Ensure that *Re-Encrypt to Backend* is enabled (checked).
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.9. VIP 2-B6 - WFC_outboundhl7_443

9.8.9.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_outboundhl7_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

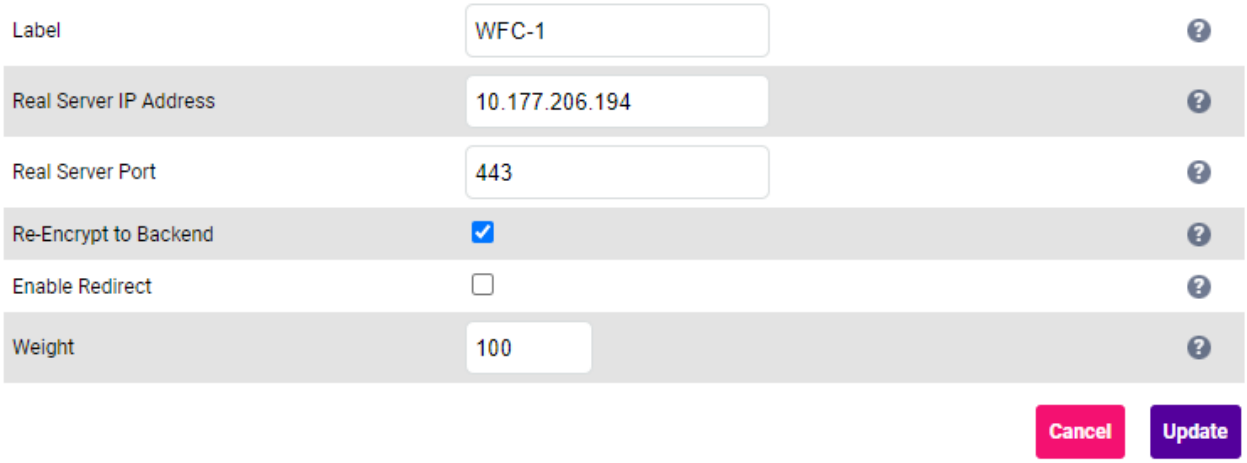
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/outboundhl7/health/tenant/<tenantid>**.

> **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.9.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



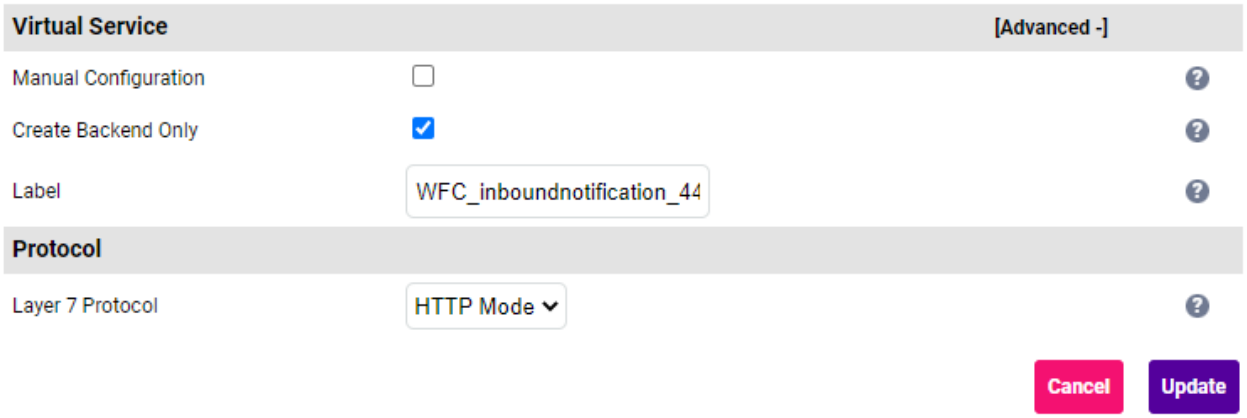
- Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **443**.
- Ensure that *Re-Encrypt to Backend* is enabled (checked).

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.10. VIP 2-B7 - WFC_inboundnotification_443

9.8.10.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_inboundnotification_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

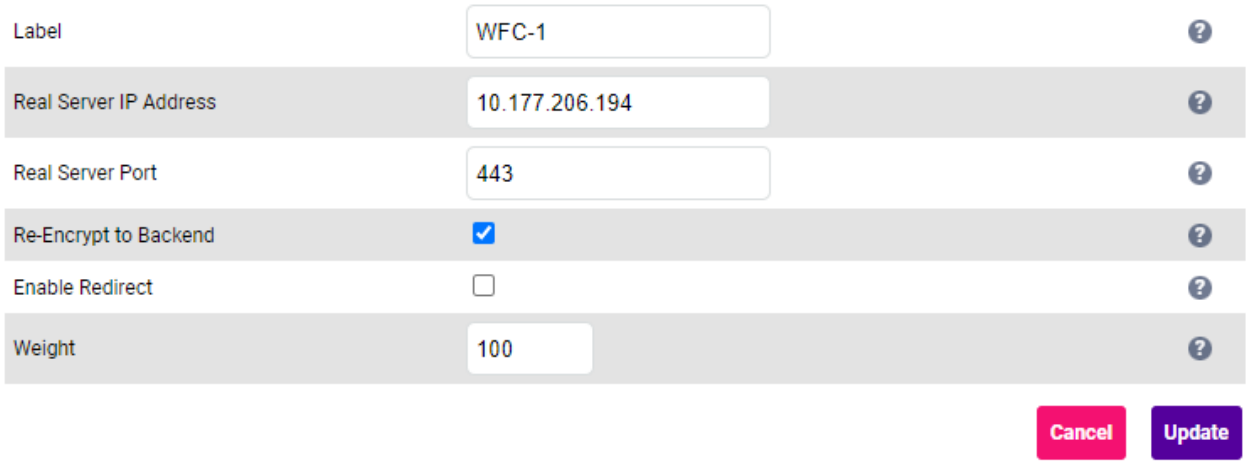
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/inboundnotification/health/tenant/<tenantid>**.

> **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.10.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



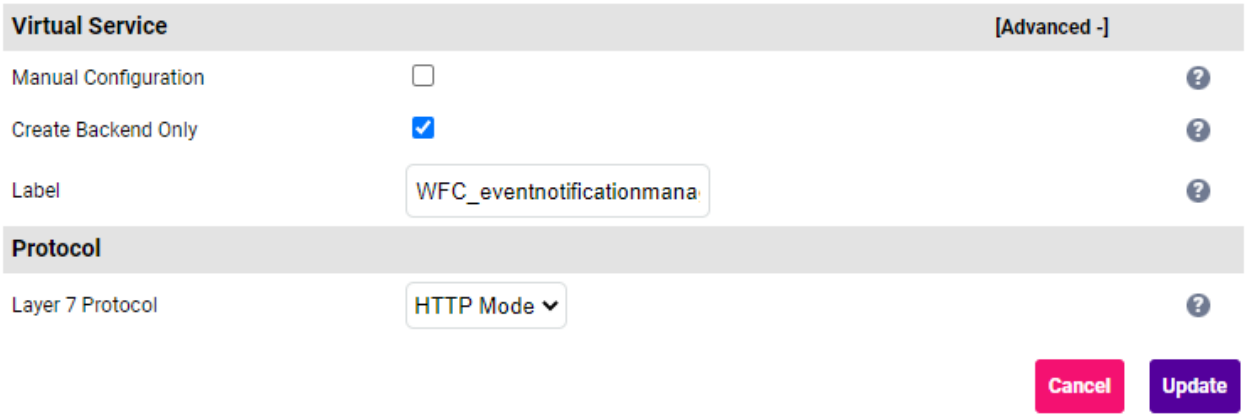
- Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **443**.
- Ensure that *Re-Encrypt to Backend* is enabled (checked).

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.11. VIP 2-B8 - WFC_eventnotificationmanager_443

9.8.11.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_eventnotificationmanager_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

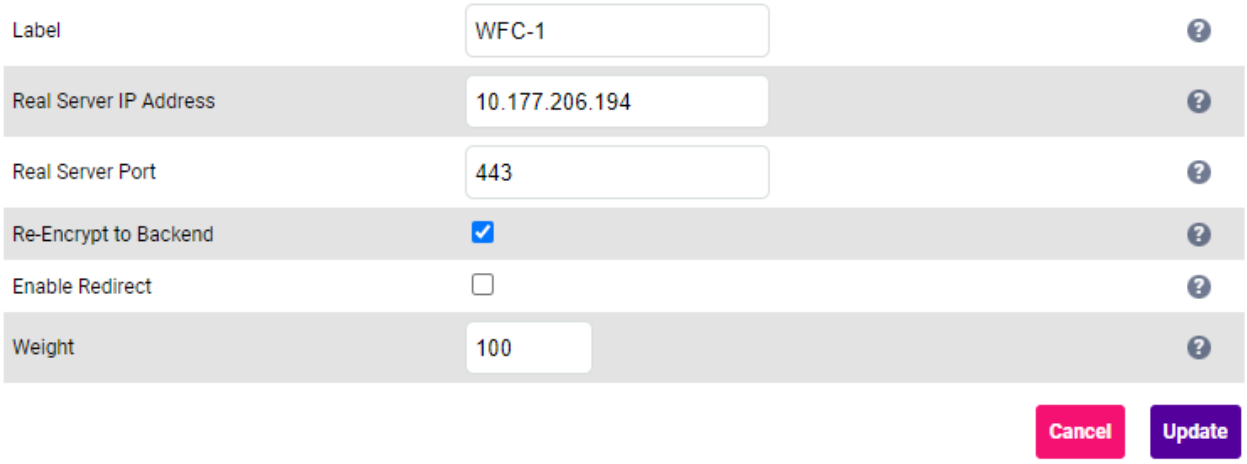
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.

- Ensure that the *Persistence Mode* is set to **None**.

8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/eventnotificationmanager/health**.
   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.11.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:

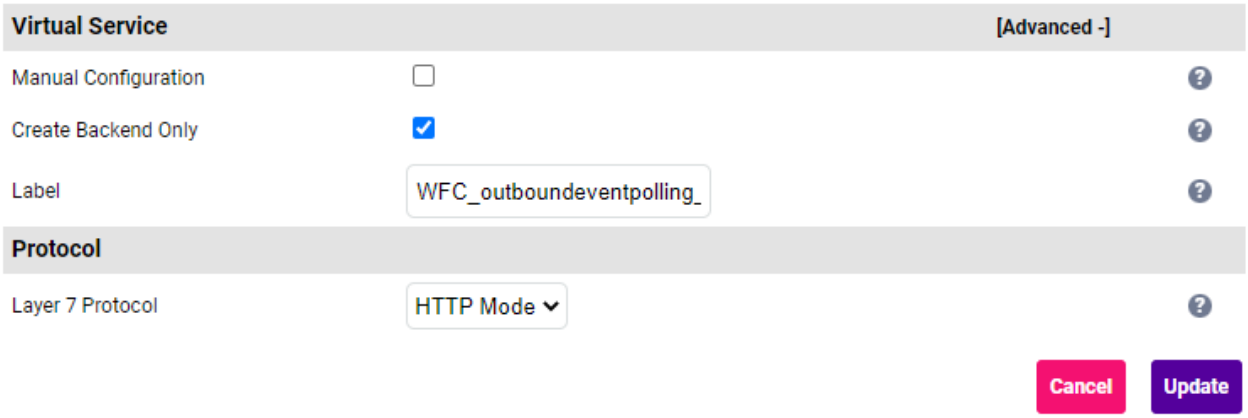


   - Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
   - Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
   - Set the *Real Server Port* field to **443**.
   - Ensure that *Re-Encrypt to Backend* is enabled (checked).
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.12. VIP 2-B9 - WFC_outboundeventpolling_443

9.8.12.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



   - Select (Check) **Create Backend Only**.
   - Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_outboundeventpolling_443**.
   - Set the *Layer 7 Protocol* to **HTTP Mode**.
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/outboundeventpolling/health/tenant/<tenantid>**.

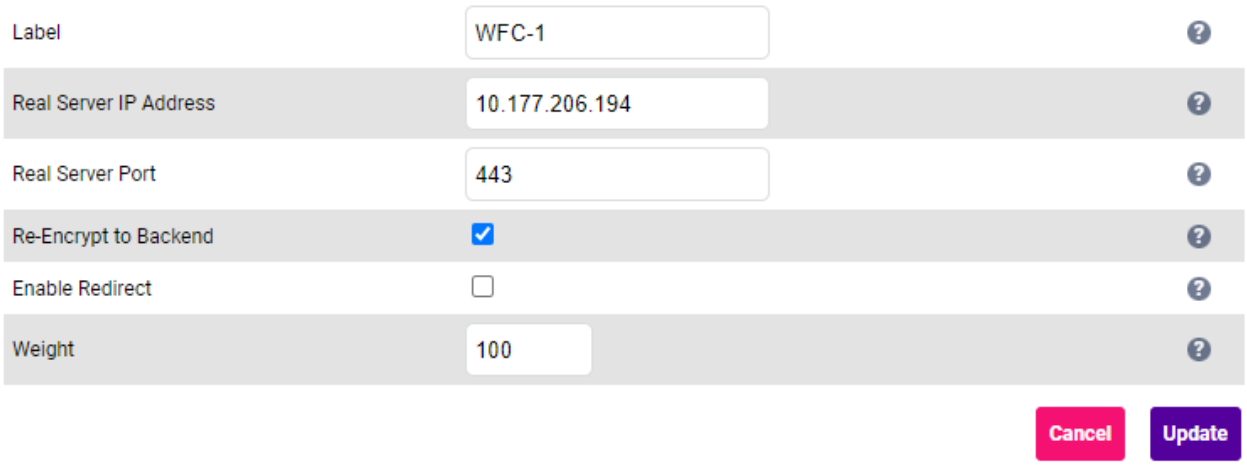
     > **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.

11. Click **Update**.

9.8.12.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:

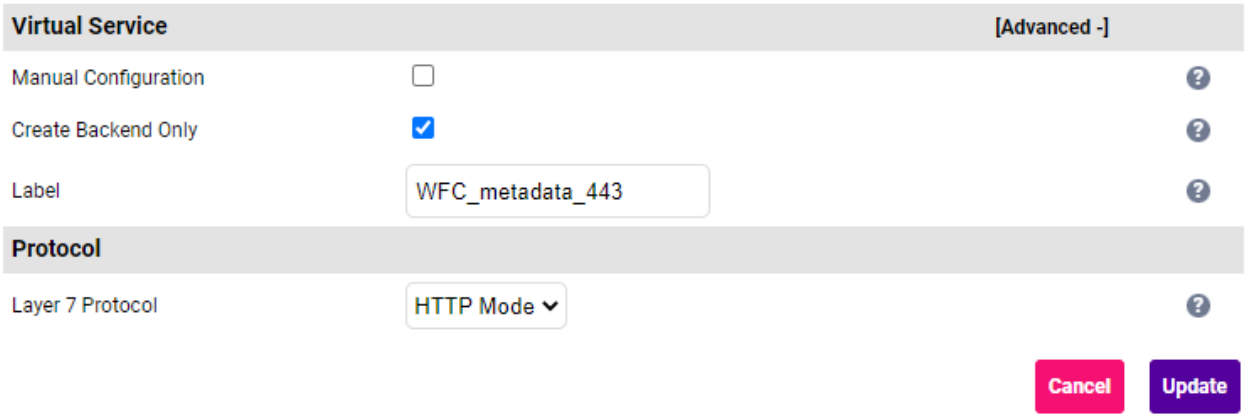


   - Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
   - Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
   - Set the *Real Server Port* field to **443**.
   - Ensure that *Re-Encrypt to Backend* is enabled (checked).
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.13. VIP 2-B10 - WFC_metadata_443

9.8.13.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_metadata_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

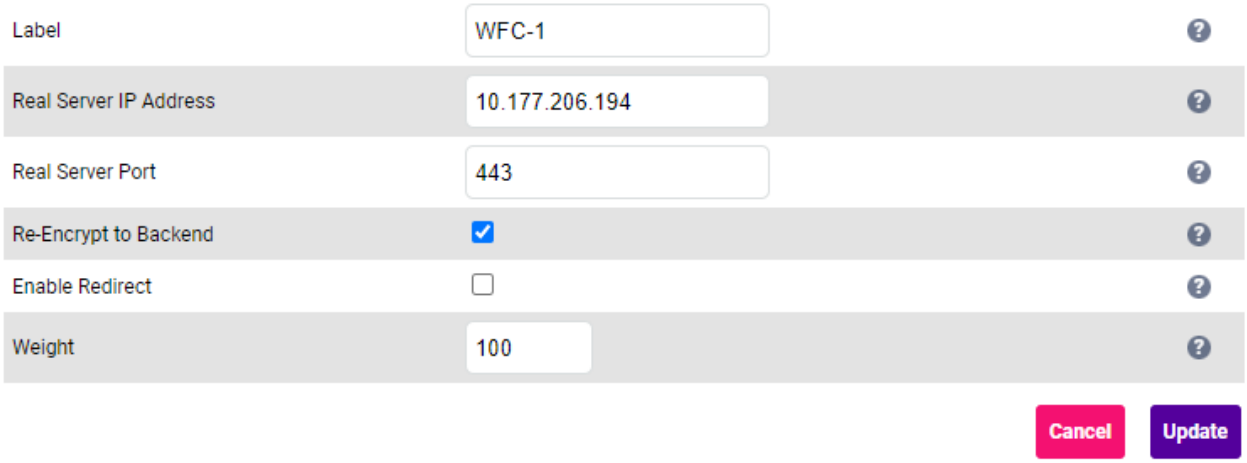
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/metadata/health/tenant/<tenantid>**.

> **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.13.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



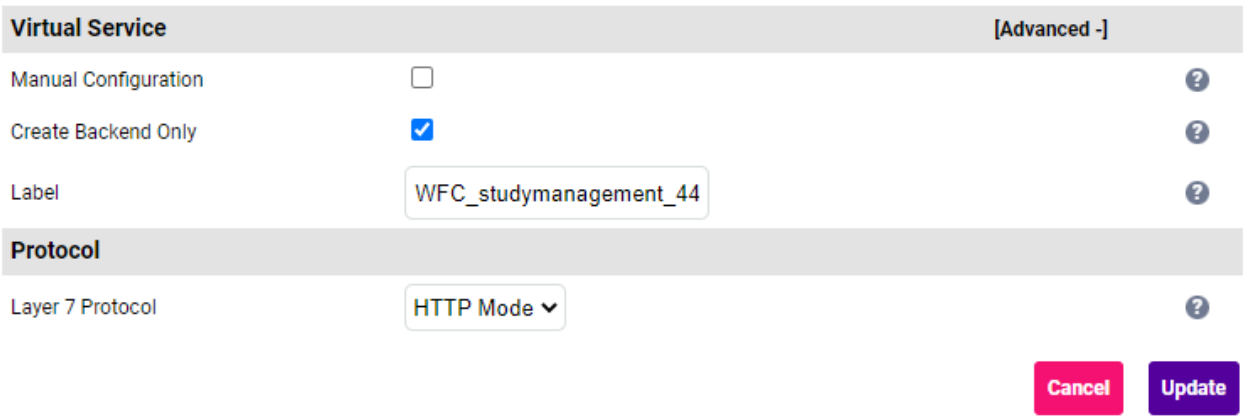
- Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **443**.
- Ensure that *Re-Encrypt to Backend* is enabled (checked).

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.14. VIP 2-B11 - WFC_studymanagement_443

9.8.14.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_studymanagement_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

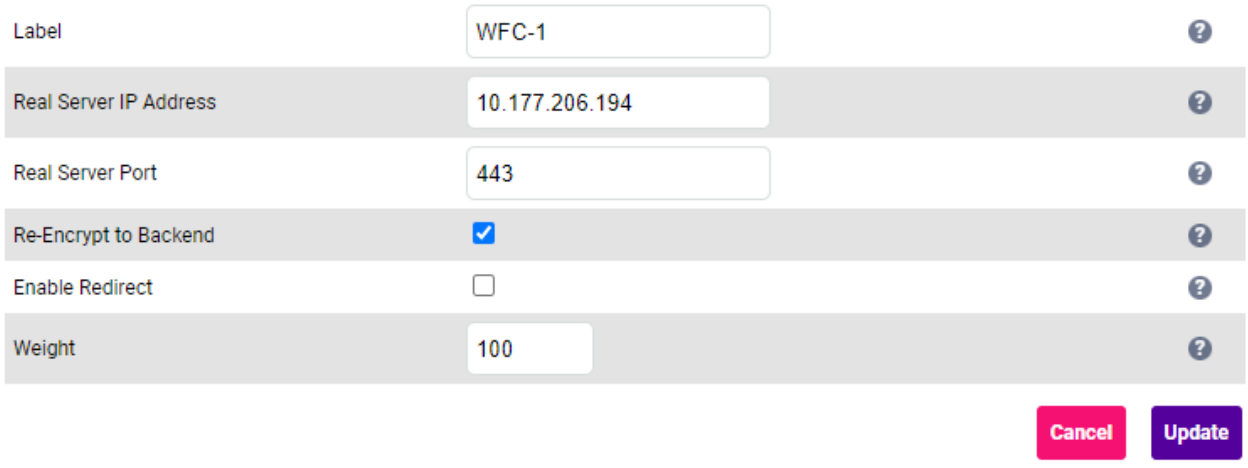
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/studymanagement/health/tenant/<tenantid>**.

> **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.14.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – 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. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **443**.
- Ensure that *Re-Encrypt to Backend* is enabled (checked).

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.15. VIP 2-B12 - WFC_xe_443

9.8.15.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:

- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_xe_443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

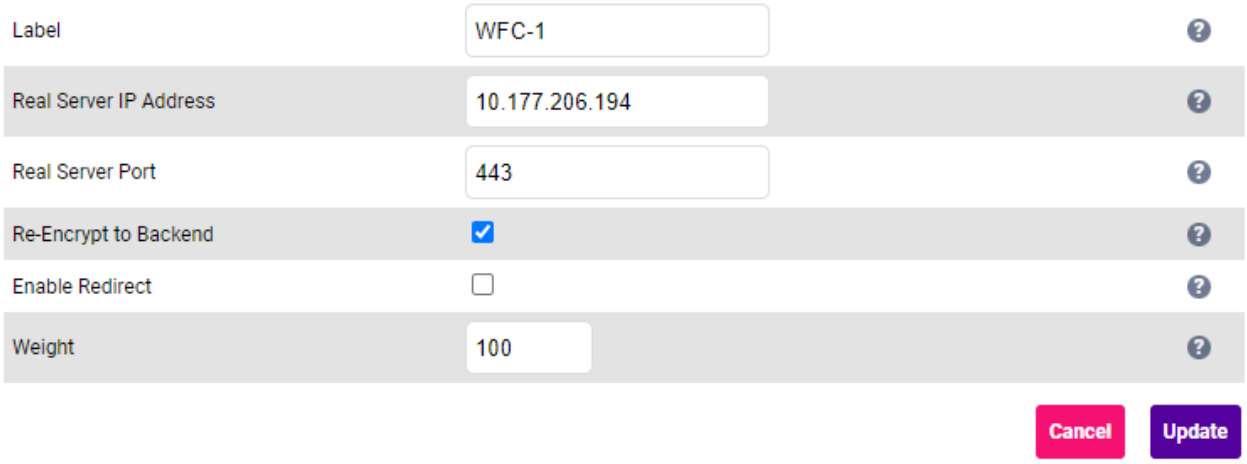
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.

- Ensure that the *Persistence Mode* is set to **None**.

8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/XERService/health**.
   - Set the *Response expected* drop-down to **Equals** and the value to **allServicesOperative**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.15.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



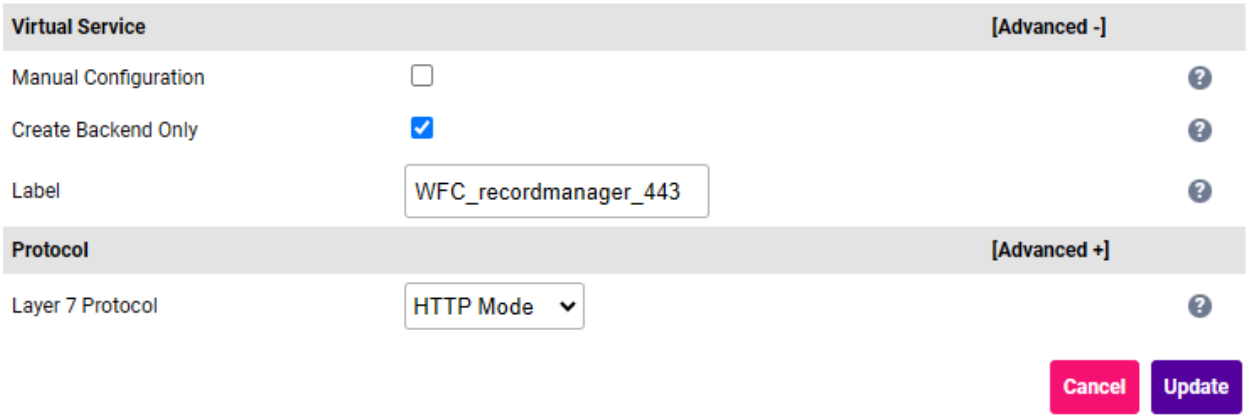
   - Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
   - Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
   - Set the *Real Server Port* field to **443**.
   - Ensure that *Re-Encrypt to Backend* is enabled (checked).
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.16. VIP 2-B13 - WFC_recordmanager_443

> **Note** This VIP is only required for SP2.

9.8.16.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



   - Select (Check) **Create Backend Only**.
   - Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_recordmanager_443**.
   - Set the *Layer 7 Protocol* to **HTTP Mode**.
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/recordmanager/health/tenant/<tenantid>**.

     > **Note** **tenantid** is a site specific setting, please check with the GE Healthcare engineers for this setting at the appropriate site.

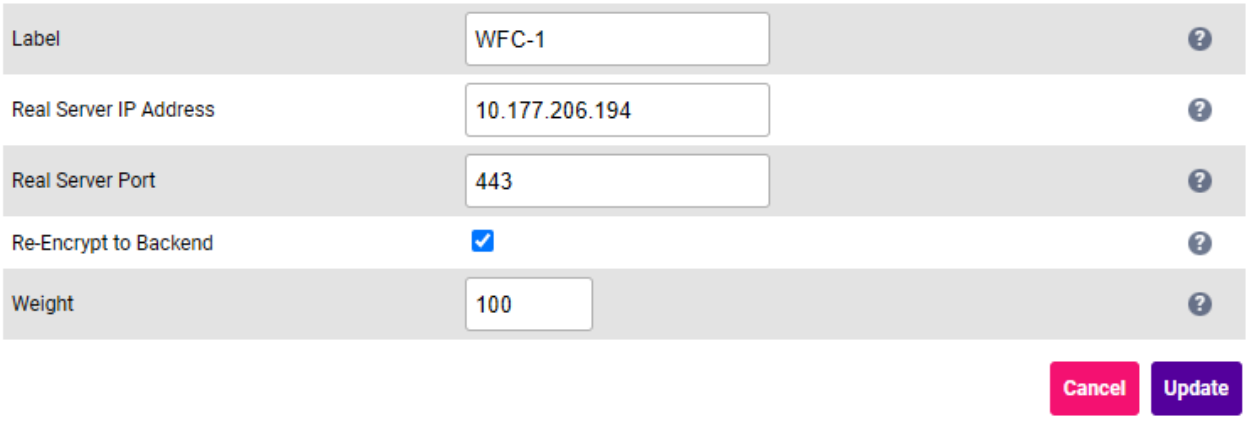
   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.

- Ensure that *Enable Backend Encryption* is enabled (checked).

10. Leave all other settings at their default value.
11. Click **Update**.

9.8.16.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – 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. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **443**.
- Ensure that *Re-Encrypt to Backend* is enabled (checked).

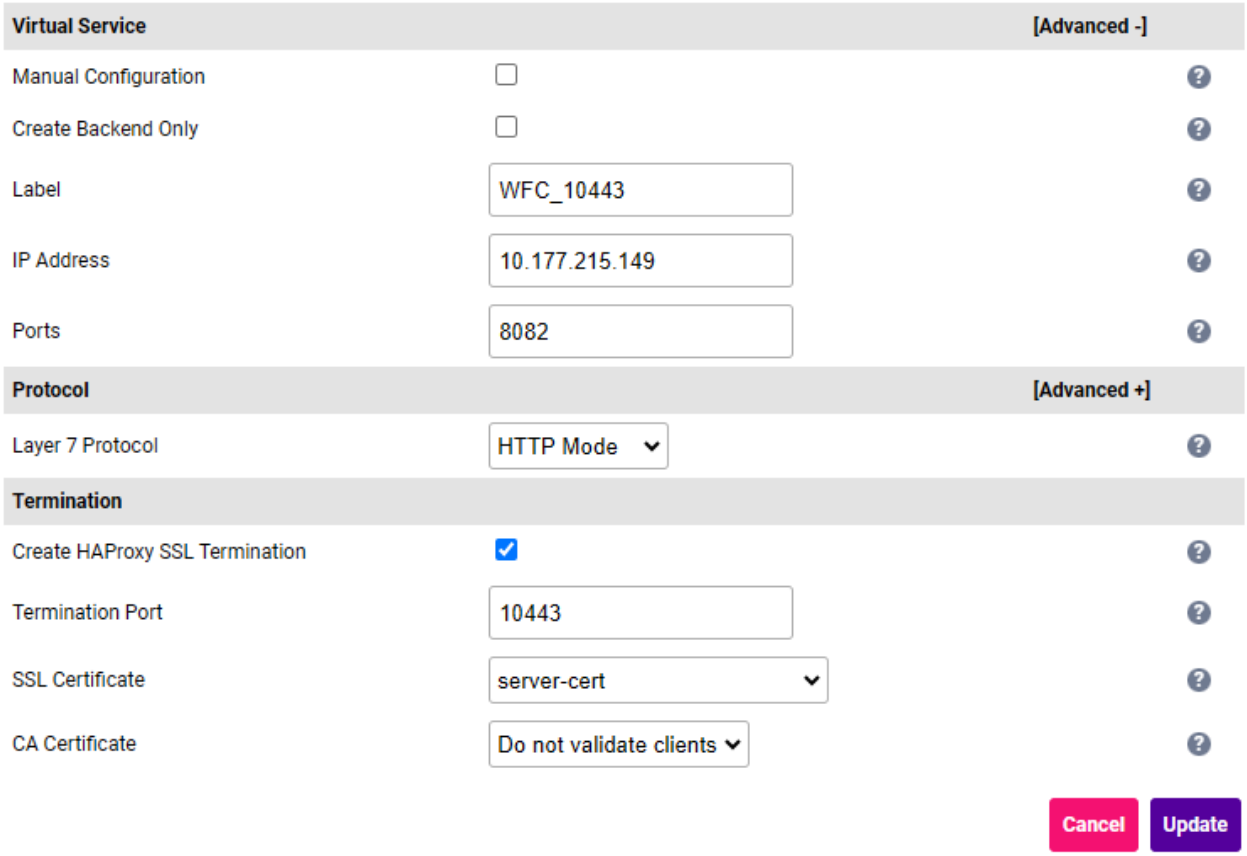
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.17. VIP 3 - WFC_10443_No_Auth

9.8.17.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]** in the *Virtual Service* heading bar.
3. Scroll to the *Termination* section.
   - Enable (check) the *Create HAProxy SSL Termination* checkbox.

4. Enter the following details:



   - Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_10443**.
   - Set the *Virtual Service IP Address* field to the required IP address, e.g. **10.177.215.149**.
   - Set the *Ports* field to **8082**.
   - Set the *Layer 7 Protocol* to **HTTP Mode**.
   - Set the *Termination Port* to **10443**.
   - Set the *SSL Certificate* to the appropriate certificate, e.g. **server-cert**.
5. Click **Update** to create the Virtual Service.
6. Now click **Modify** next to the newly created VIP.
7. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
8. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
9. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **No Checks, Always On**.
10. Scroll to the *ACL Rules* section.
11. Using the **Add Rule** button, add the following ACL rules:

- **Rule 1**

```
Type:            path_reg
Bool:            Equals
URL/Text:        /api/v[0-9]*/masterfiledata
Action:          Use Backend
Location/Value:  WFC_masterfiledata_10443
```

- **Rule 2**

```
Type:            path_reg
Bool:            Equals
URL/Text:        /api/v[0-9]*/masterfileapp
Action:          Use Backend
Location/Value:  WFC_masterfileapp_10443
```

- **Rule 3**

```
Type:            path_beg
Bool:            Equals
URL/Text:        /xeui
Action:          Use Backend
Location/Value:  WFC_xeui_10443
```

> **Note** The following rules (rules 4 to 7) are only required for sites which use ***External IDP with MFA (Multi-Factor Authentication)***.

- **Rule 4**

```
Type:            path_beg
Bool:            Equals
URL/Text:        /oauth2
Action:          Use Backend
Location/Value:  WSO2_oauth2_10443
```

- **Rule 5**

```
Type:            path_beg
Bool:            Equals
URL/Text:        /authenticationendpoint
Action:          Use Backend
Location/Value:  WSO2_oauth2_10443
```

- **Rule 6**

```
Type:            path_beg
Bool:            Equals
```

```
URL/Text:         /logincontext
Action:           Use Backend
Location/Value:   WSO2_oauth2_10443
```

- **Rule 7**

```
Type:             path_beg
Bool:             Equals
URL/Text:         /commonauth
Action:           Use Backend
Location/Value:   WSO2_oauth2_10443
```

12. Scroll to the *Other* section.
    - Set *Force to HTTPS* to **Yes**.
    - Set the *HTTPS Redirect Code* to **301 (Moved Permanently)**.
    - Set the *HTTPS Redirect Port* to **10443**.
13. Leave all other settings at their default value.
14. Click **Update**.

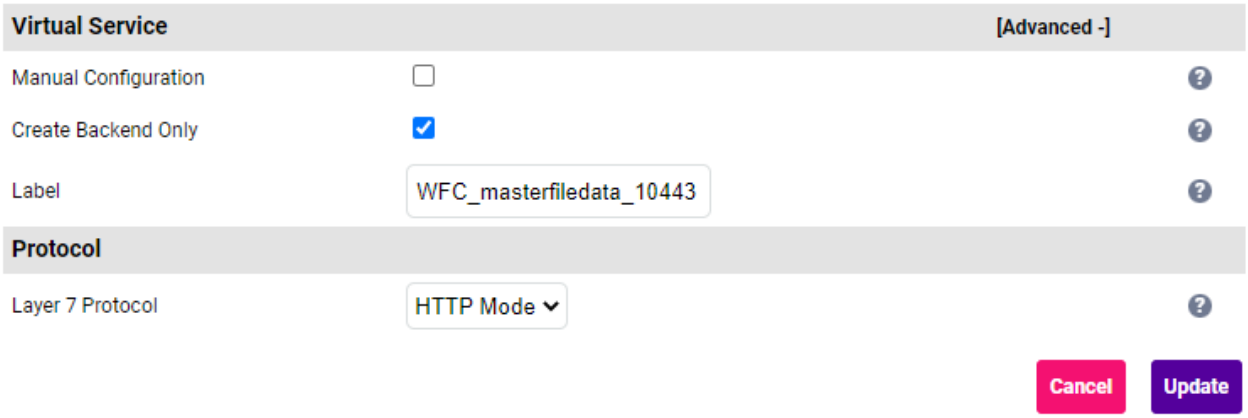
9.8.17.2. Define the Associated Real Servers (RIPs)

This VIP has no associated Real Servers. Instead, the ACLs defined above are used to route traffic to the appropriate Backend Only Virtual Service.

9.8.18. VIP 3-B1 - WFC_masterfiledata_10443

9.8.18.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



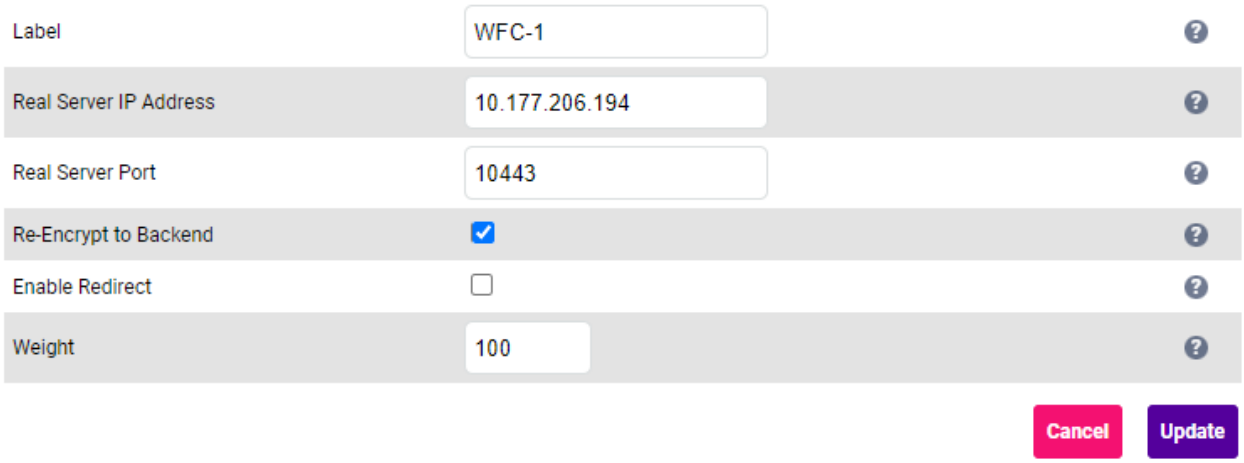
- Select (Check) **Create Backend Only**.

- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_masterfiledata_10443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/masterfiledata/health**.
   - Set the *Response expected* drop-down to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.18.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – 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. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **10443**.

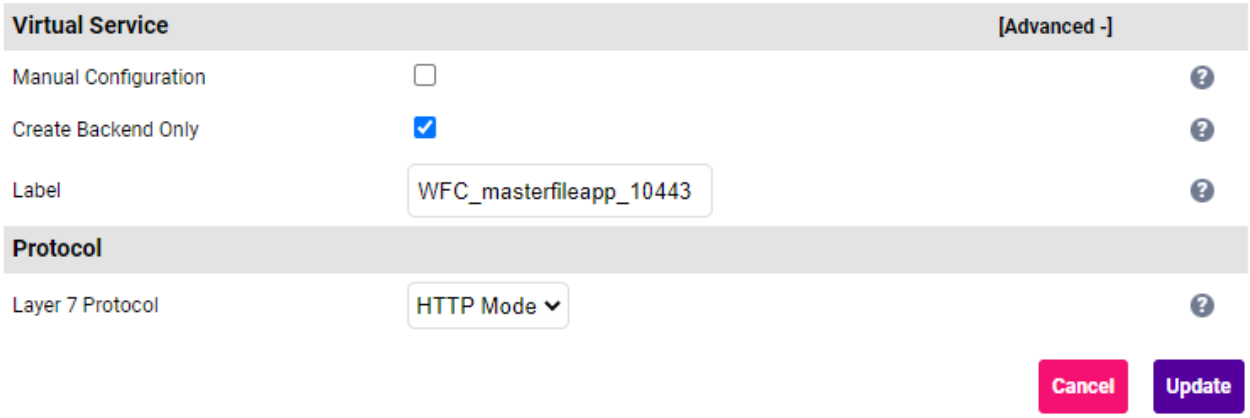
- Enable (check) *Re-Encrypt to Backend*.

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.19. VIP 3-B2 - WFC_masterfileapp_10443

9.8.19.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:



- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_masterfileapp_10443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

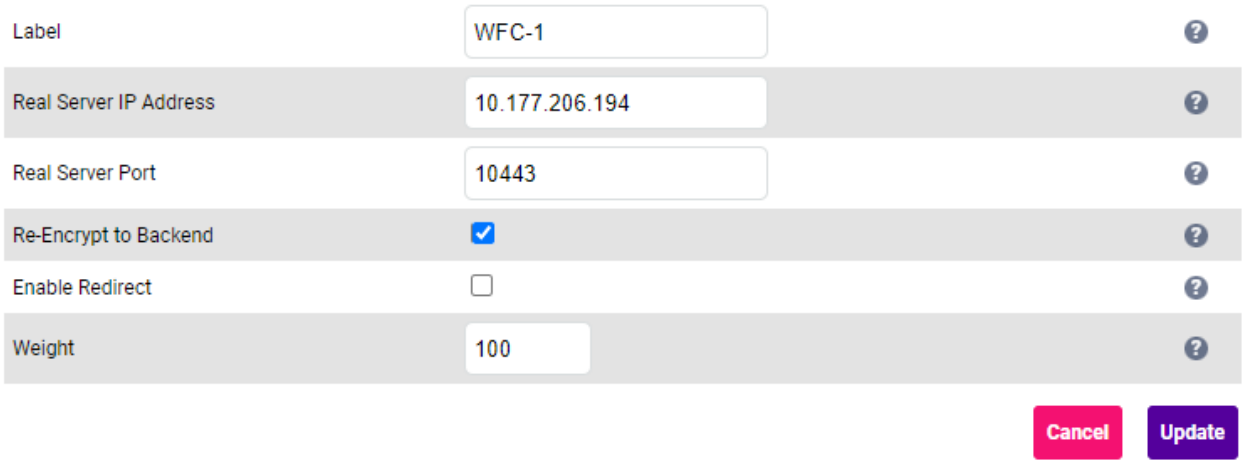
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.

- Set the *Request to Send* to **/api/v1/masterfileapp/health**.
- Set the *Response expected* drop-down to **Equals** and the value to **UP**.

9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.19.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created VIP.
2. Enter the following details:



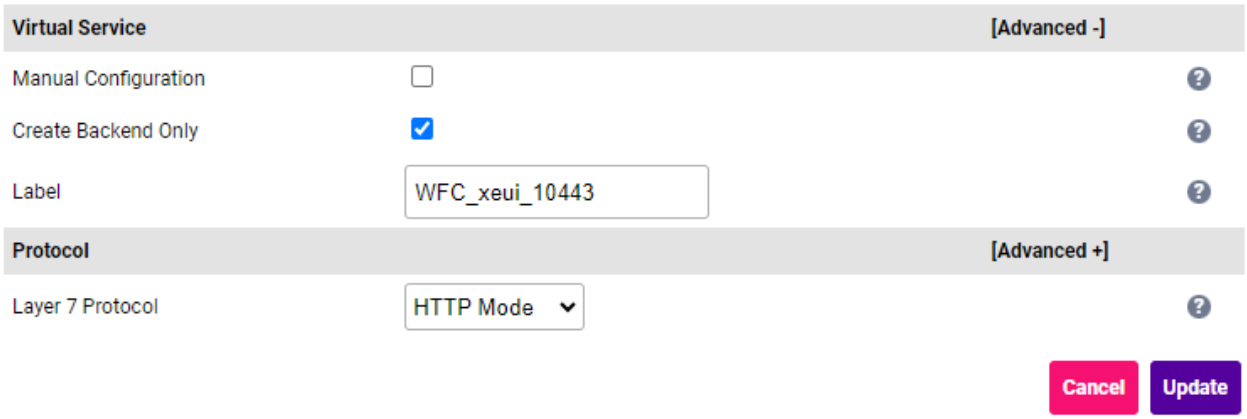
   - Specify an appropriate *Label* for the RIP, e.g. **WFC-1**.
   - Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
   - Set the *Real Server Port* field to **10443**.
   - Enable (check) *Re-Encrypt to Backend*.
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.20. VIP 3-B3 - WFC_xeui_10443

9.8.20.1. Virtual Service (VIP) Configuration

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

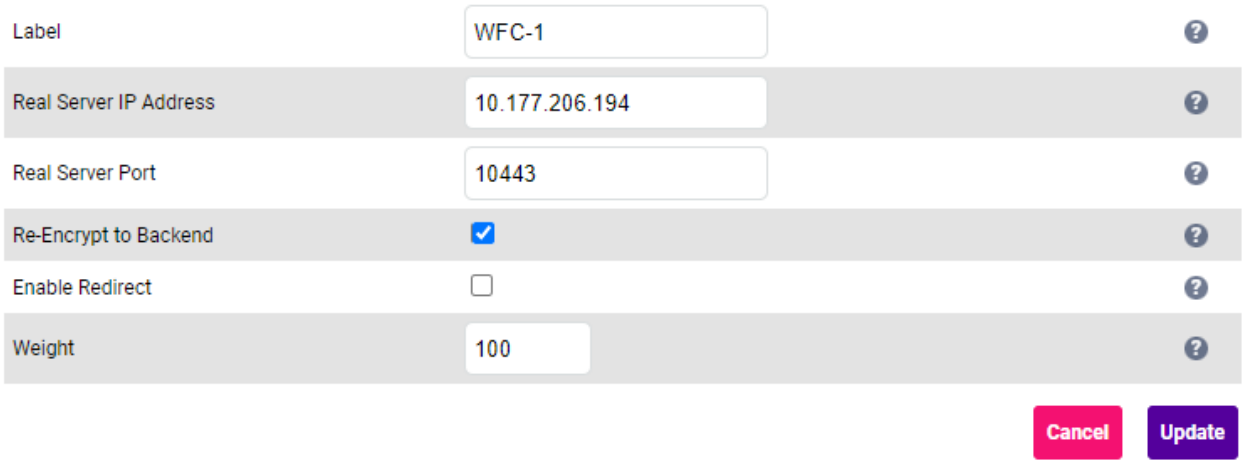
2. Click **[Advanced]**.
3. Enter the following details:



   - Select (Check) **Create Backend Only**.
   - Specify an appropriate *Label* for the Virtual Service, e.g. **WFC_xeui_10443**.
   - Set the *Layer 7 Protocol* to **HTTP Mode**.
4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/xeui/api/admin/health**.
   - Set the *Response expected* to **Equals** and the value to **allServicesOperative**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.20.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – 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. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **10443**.
- Enable (check) *Re-Encrypt to Backend*.

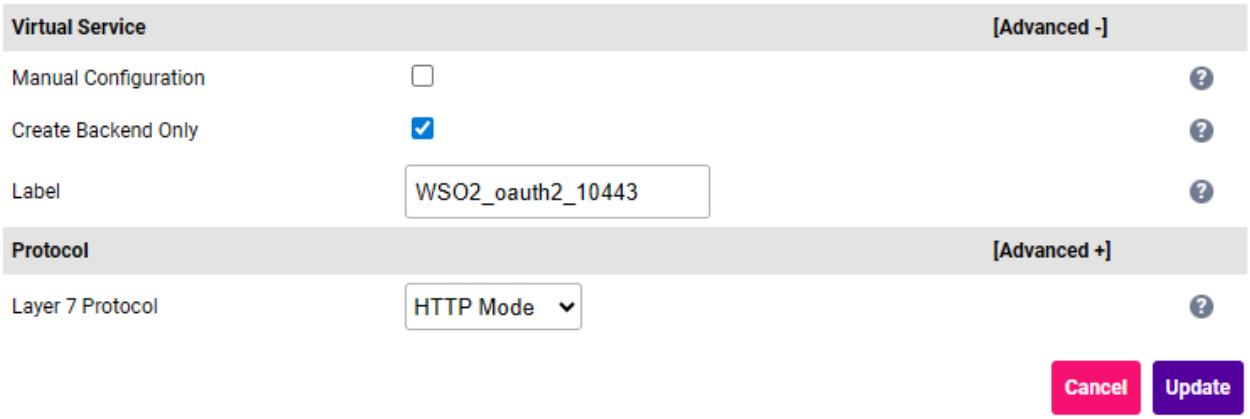
3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.21. VIP 3-B4 - WFC_WSO2_oauth2_10443

> **Note** This VIP is optional. It's only required if the site uses External IDP with MFA (Multi Factor Authentication).

9.8.21.1. Virtual Service (VIP) Configuration

1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Click **[Advanced]**.
3. Enter the following details:

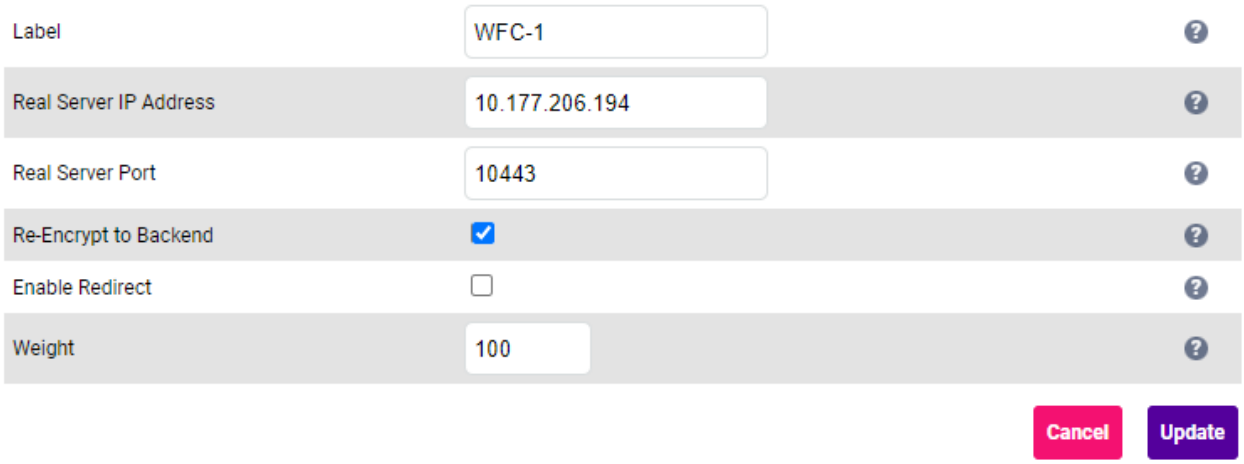


- Select (Check) **Create Backend Only**.
- Specify an appropriate *Label* for the Virtual Service, e.g. **WSO2_oauth2_10443**.
- Set the *Layer 7 Protocol* to **HTTP Mode**.

4. Click **Update** to create the Virtual Service.
5. Now click **Modify** next to the newly created VIP.
6. Scroll to the *Connection Distribution Method* section.
   - Set *Balance Mode* to **Weighted Round Robin**.
7. Scroll to the *Persistence* section.
   - Ensure that the *Persistence Mode* is set to **None**.
8. Scroll to the *Health Checks* section.
   - Set the *Check Type* to **Negotiate HTTPS (GET)**.
   - Set the *Request to Send* to **/api/v1/auth/health**.
   - Set the *Response expected* to **Equals** and the value to **UP**.
9. Scroll to the *SSL* section.
   - Ensure that *Enable Backend Encryption* is enabled (checked).
10. Leave all other settings at their default value.
11. Click **Update**.

9.8.21.2. Define the Associated Real Servers (RIPs)

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 – 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. **WFC-1**.
- Set the *Real Server IP Address* field to the required IP address, e.g. **10.177.206.194**.
- Set the *Real Server Port* field to **10443**.
- Enable (check) *Re-Encrypt to Backend*.

3. Leave all other settings at their default value.
4. Click **Update**.
5. Now click **Modify** next to the newly created Real Server.
6. Set the *Send Client Certificate* dropdown to the required certificate, e.g. **client-cert**.
7. Click **Update**.
8. Repeat these steps to add additional Real Server(s).

9.8.22. 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**.

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 accessed via the WebUI. It shows a graphical view of all VIPs & RIPs (i.e. the TP 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 TP servers are healthy (green) and available to accept connections:

System Overview

2025-08-20 14:31:58 UTC

VIRTUAL SERVICE	IP	PORTS	CONNS	PROTOCOL	METHOD	MODE
WFC_RMQAMQP	10.177.215.149	8080	0	TCP	Layer 7	Proxy
WFC_443_Mutual_A...	10.177.215.149	8081	0	HTTP	Layer 7	Proxy
WFC_inference_443	-	-	0	HTTP	Layer 7	Proxy
WFC_profiling_443	-	-	0	HTTP	Layer 7	Proxy
WFC_patient_443	-	-	0	HTTP	Layer 7	Proxy
WFC_CCS_443	-	-	0	HTTP	Layer 7	Proxy
WFC_auth_443	-	-	0	HTTP	Layer 7	Proxy
WFC_outboundhl7_443	-	-	0	HTTP	Layer 7	Proxy
WFC_inboundnotificati...	-	-	0	HTTP	Layer 7	Proxy
WFC_eventnotification...	-	-	0	HTTP	Layer 7	Proxy
WFC_outboundeventpo...	-	-	0	HTTP	Layer 7	Proxy
WFC_metadata_443	-	-	0	HTTP	Layer 7	Proxy
WFC_studymanageme...	-	-	0	HTTP	Layer 7	Proxy
WFC_xe_443	-	-	0	HTTP	Layer 7	Proxy
WFC_recordmanager_...	-	-	0	HTTP	Layer 7	Proxy
WFC_10443_No_Auth	10.177.215.149	8082	0	HTTP	Layer 7	Proxy
WFC_masterfiledata_1...	-	-	0	HTTP	Layer 7	Proxy

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:

WFC_RMQAMQP	10.177.215.149	5672	0	TCP	Layer 7	Proxy	
REAL SERVER	*IP*	*PORTS*	*WEIGHT*	*CONNS*			
WFC-1	*10.177.206.194*	*5672*	*100*	*0*	*Drain*	*Halt*	
WFC-2	*10.12.28.114*	*5672*	*100*	*0*	*Drain*	*Halt*	

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 VIPs 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
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

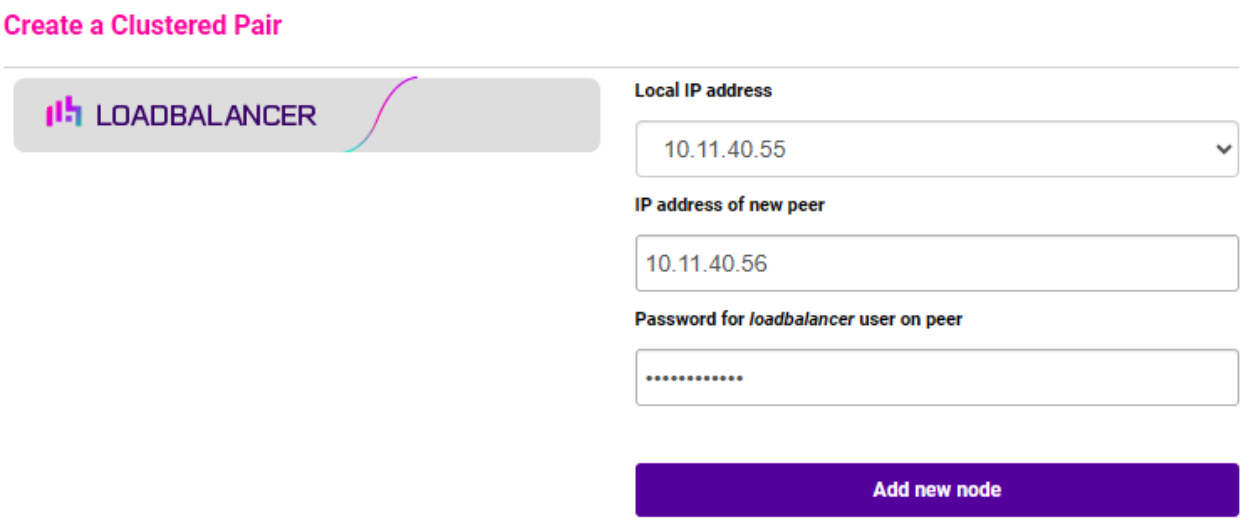
WebUI Main Menu Option	Sub Menu Option	Description
Maintenance	Firewall Lockdown Wizard	Appliance management lockdown settings

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

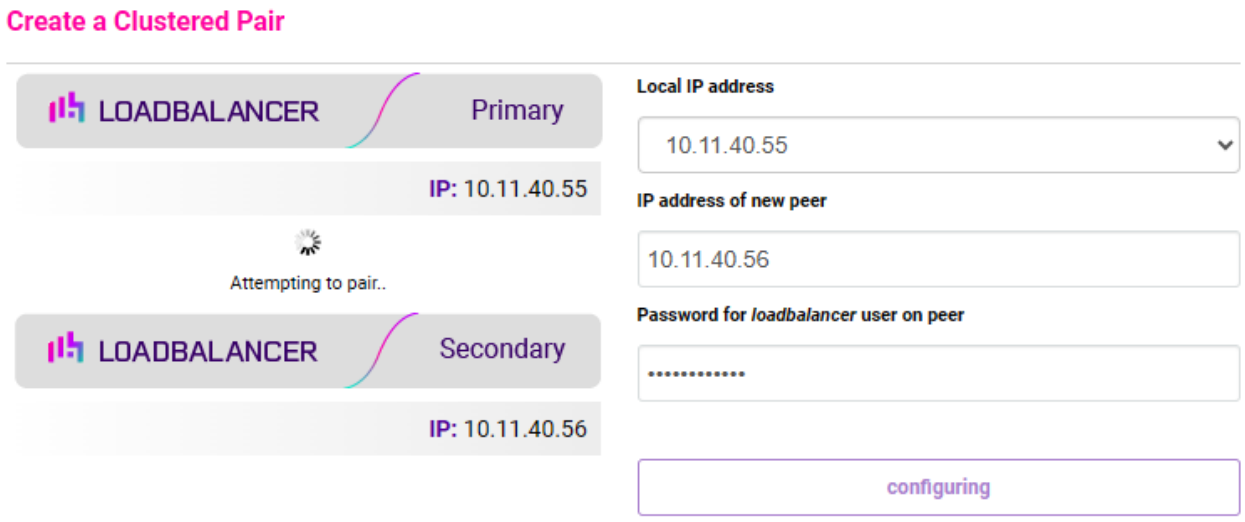
11.2. Configuring the HA Clustered Pair

> **Important** During HA pairing, all WebUI users and passwords are synchronized from the Primary to the Secondary. After clustering completes (you will be logged out of the Secondary when this occurs), the Primary's credentials should be used to login to both nodes.

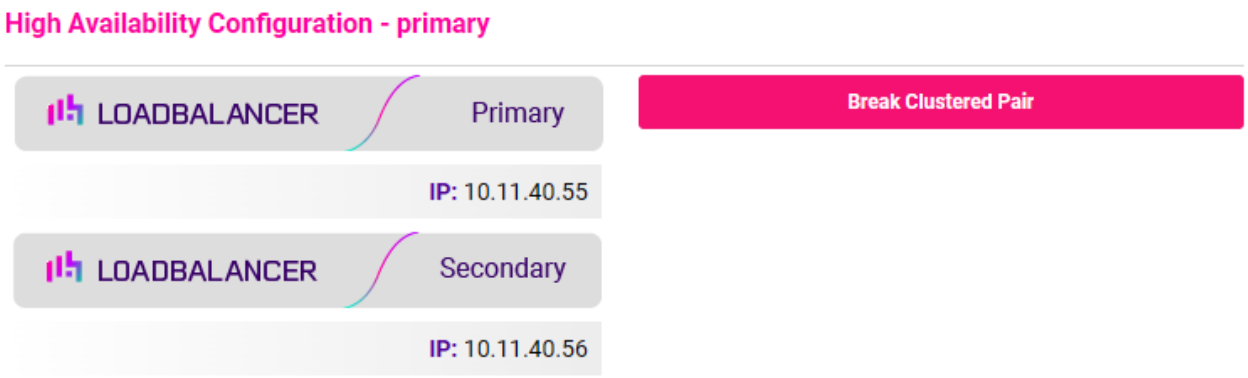
1. Deploy a second appliance that will be the Secondary and configure initial network settings.
2. Using the WebUI on the Primary appliance, navigate to: *Cluster Configuration > High-Availability Configuration*.



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 Configuring High Availability.

> **Note** For details on testing and verifying HA, please refer to Clustered Pair Diagnostics.

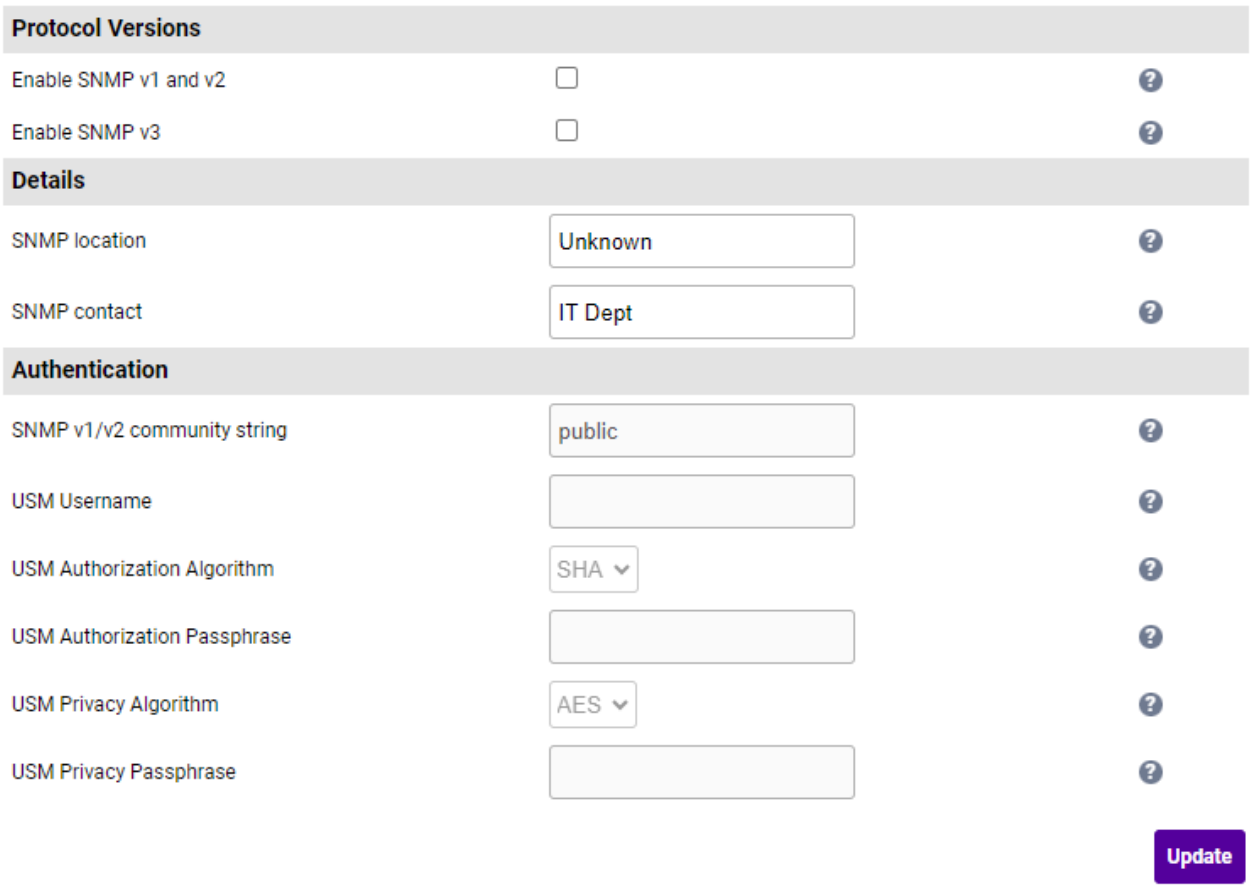
12. Optional Appliance Configuration

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

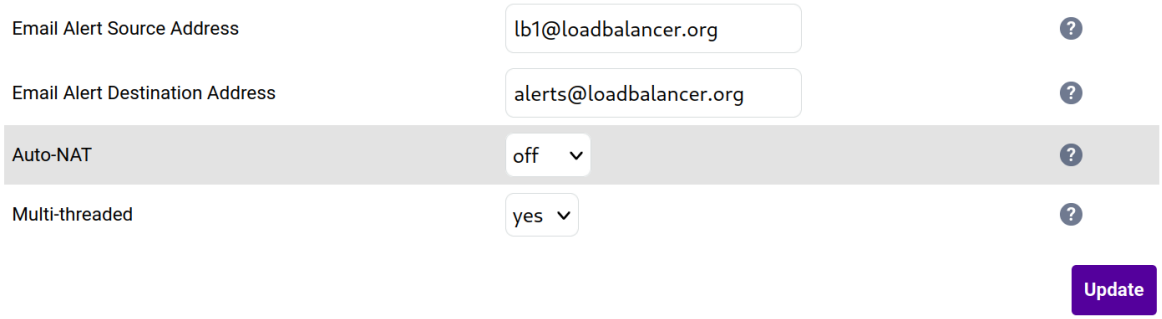
For layer 4 Virtual Services, settings can be configured globally for all VIPs or individually per VIP.

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**.

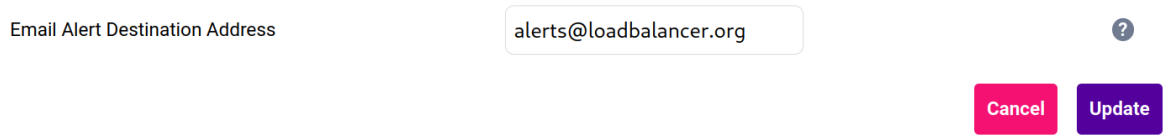
12.2.1.2. VIP Level Settings

> **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**.

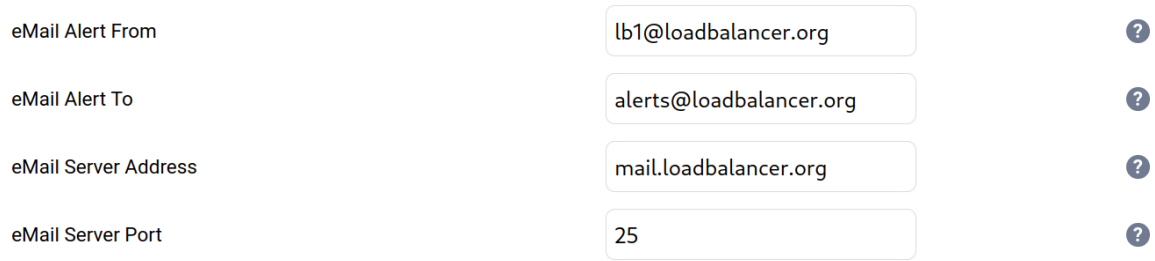
> **Note** You can set the *Email Alert Source Address* field as explained above if required to configure a default source address.

12.2.2. Layer 7

For layer 7 services, email settings are configured globally for all VIPs.

To configure global email alert settings for layer 7 services:

1. Using the WebUI, navigate to: *Cluster Configuration > Layer 7 Advanced Configuration*.



2. Enter an appropriate email address in the *eMail Alert From* field.

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

3. Enter an appropriate email address in the *eMail Alert To* field.

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

4. Enter an appropriate IP address/FQDN in the *eMail Server Address* field.

```
e.g. mail.loadbalancer.org
```

5. Enter an appropriate port in the *eMail Server Port* field.

```
e.g. 25
```

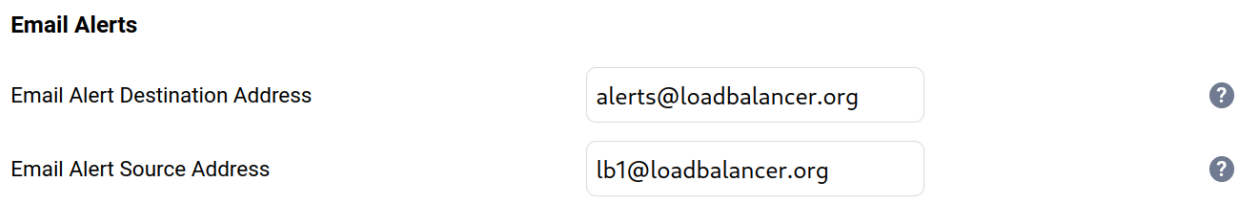
6. Click **Update**.

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

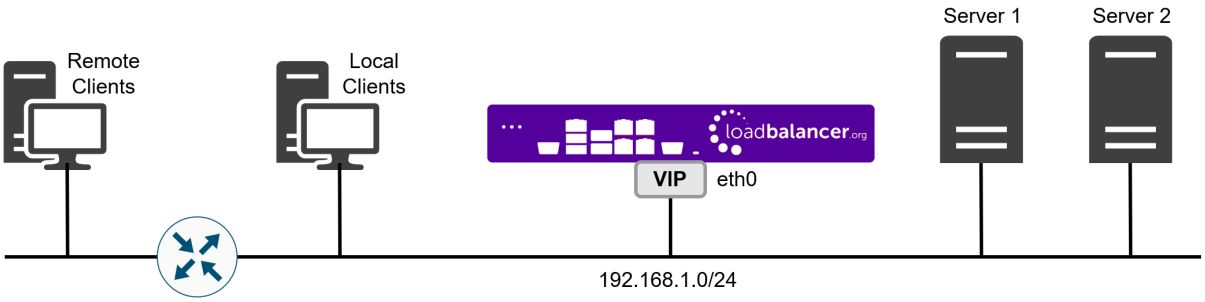
For additional information, please refer to the Administration Manual.

15. Appendix

15.1. Enabling Layer 7 Transparency

If you require the source IP address of the client to be seen by the True PACS servers, TProxy must be enabled. When TProxy is enabled, it's important to be aware of the topology requirements for TProxy to operate correctly. Both one-arm and two-arm topologies are supported:

15.1.1. TProxy Topology Requirements - One-arm Deployments

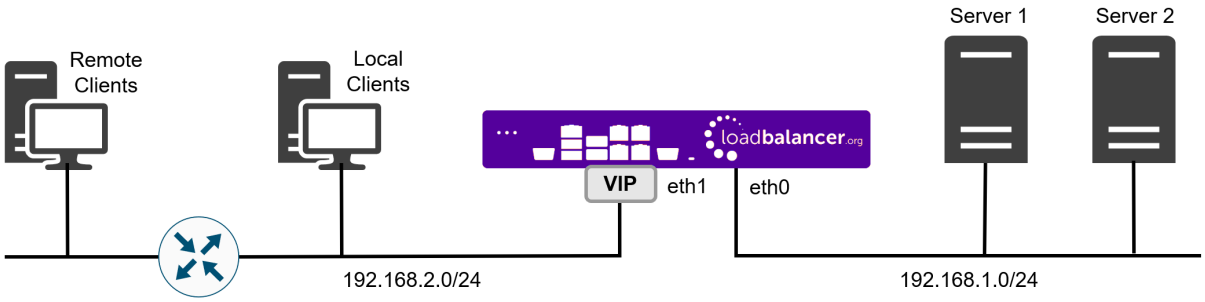


- Here, the VIP is brought up in the same subnet as the Real Servers.
- To support remote clients, the default gateway on the Real Servers must be an IP address on the load balancer and routing on the load balancer must be configured so that return traffic is routed back via the router.

> **Note** For an HA clustered pair, a floating IP should be added to the load balancer and used as the Real Server's default gateway. This ensures that the IP address can "float" (move) between Primary and Secondary appliances.

- To support local clients, return traffic would normally be sent directly to the client bypassing the load balancer which would break TProxy. To address this, the routing table on the Real Servers must be modified to force return traffic to go via the load balancer in the same way as one-arm NAT mode. For more information please refer to One-Arm (Single Subnet) NAT Mode.

15.1.2. TProxy Topology Requirements - Two-arm Deployments



- Here, 2 subnets are used. The VIP is located in one subnet and the load balanced Real Servers are located in the other. The load balancer requires 2 interfaces, one in each subnet.

> **Note** This can be achieved by using two network adapters, or by creating VLANs on a single adapter.

- The default gateway on the Real Servers must be an IP address on the load balancer.

> **Note** For an HA clustered pair, a floating IP should be added to the load balancer and used as the Real Server's default gateway. This ensures that the IP address can "float" (move) between Primary and Secondary appliances.

- Clients can be located in the same subnet as the VIP or any remote subnet provided they can route to the VIP.

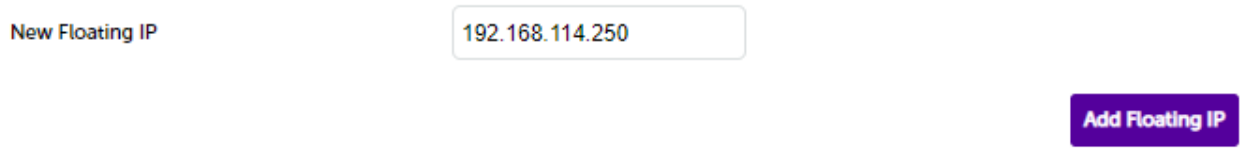
To enable TProxy for a particular layer 7 VIP:

- Click **Modify** next to the HAProxy VIP.
- Scroll down to the **Other** section and click **[Advanced]**.
- Enable (check) *Transparent Proxy*.
- Click **Update**.

15.1.3. Configuring a floating IP Address for the True PACS Servers' Default Gateway

For layer 7 SNAT mode with transparency, a floating IP address is used as the default gateway for the Real Servers.

1. Using the Appliance WebUI, navigate to: *Cluster Configuration > Floating IPs*.
2. Enter the required address in the *New Floating IP* field, e.g. **192.168.114.250**.



3. Click **Add Floating IP**.

> **Important** The default gateway of each True PACS Server should be set to use this address.

16. Document Revision History

Version	Date	Change	Reason for Change	Changed By
1.0	30 June 2026	Initial version		RJC

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