LOADBALANCER

DEPLOYMENT BRIEF

Load Balancing Cisco ISE

Version 1.0.0

Table of Contents

1. About this Brief . . . 4
2. Loadbalancer.org Appliances Supported . . . 4
3. Software Versions Supported . . . 4
    3.1. Loadbalancer.org Appliance . . . 4
    3.2. Cisco ISE . . . 4
4. Cisco ISE . . . 4
5. Load Balancing Cisco ISE . . . 4
    5.1. Load Balancing & HA Requirements . . . 4
    5.2. Virtual Service (VIP) Requirements . . . 5
6. Deployment Concept . . . 5
7. Load Balancer Deployment Methods . . . 5
    7.1. Layer 4 NAT Mode . . . 6
    7.2. Layer 4 SNAT Mode . . . 8
    7.3. Layer 7 SNAT Mode . . . 9
8. Configuring Cisco ISE for Load Balancing . . . 10
    8.1. When using Layer 4 SNAT Mode or 7 SNAT Mode . . . 10
    8.2. When using Layer 4 NAT Mode . . . 10
9. Loadbalancer.org Appliance – the Basics . . . 10
    9.1. Virtual Appliance . . . 10
    9.2. Initial Network Configuration . . . 10
    9.3. Accessing the Appliance WebUI . . . 11
        9.3.1. Main Menu Options . . . 12
    9.4. Appliance Software Update . . . 13
        9.4.1. Online Update . . . 13
        9.4.2. Offline Update . . . 13
    9.5. Ports Used by the Appliance . . . 14
    9.6. HA Clustered Pair Configuration . . . 15
10. Appliance Configuration for Cisco ISE . . . 15
    10.1. VIP 1 - ISE_RADIUS_Auth . . . 15
        10.1.1. Virtual Service (VIP) Configuration . . . 15
        10.1.2. Configure the Associated Real Servers (RIPs) . . . 16
    10.2. VIP 2 - ISE_RADIUS_Acct . . . 16
        10.2.1. Virtual Service (VIP) Configuration . . . 16
        10.2.2. Configure the Associated Real Servers (RIPs) . . . 17
    10.3. VIP 3 - RADIUS-COA-SNAT . . . 18
        10.3.1. Virtual Service (VIP) Configuration . . . 18
        10.3.2. Configure the Associated Real Servers (RIPs) . . . 19
    10.4. VIP 4 - ISE_Prof_DHCP . . . 19
        10.4.1. Virtual Service (VIP) Configuration . . . 19
        10.4.2. Configure the Associated Real Servers (RIPs) . . . 20
    10.5. VIP 5 - ISE_Prof_SNMPT . . . 21
        10.5.1. Virtual Service (VIP) Configuration . . . 21
        10.5.2. Configure the Associated Real Servers (RIPs) . . . 22
    10.6. VIP 6 - ISE_HTTPS_8443 . . . 22
        10.6.1. Virtual Service (VIP) Configuration . . . 22
        10.6.2. Configure the Associated Real Servers (RIPs) . . . 23
    10.7. VIP 7 - ISE_HTTPS_Portals . . . 24
        10.7.1. Virtual Service (VIP) Configuration . . . 24

10.7.2. Configure the Associated Real Servers (RIPs) . . . 24
10.8. VIP 8 - ISE_HTTP_Portal . . . 25
10.8.1. Virtual Service (VIP) Configuration . . . 25
10.8.2. Configure the Associated Real Servers (RIPs) . . . 26
10.9. VIP 9 - TACACS . . . 26
10.9.1. Virtual Service (VIP) Configuration . . . 26
10.9.2. Configure the Associated Real Servers (RIPs) . . . 27
10.10. Finalizing the Configuration . . . 27
11. Testing & Verification . . . 28
11.1. Accessing Cisco ISE via the Load Balancer . . . 28
11.2. Using System Overview . . . 28
12. Technical Support . . . 29
13. Further Documentation . . . 29
14. Appendix . . . 30
14.1. Configuring HA - Adding a Secondary Appliance . . . 30
14.1.1. Non-Replicated Settings . . . 30
14.1.2. Configuring the HA Clustered Pair . . . 31
15. Document Revision History . . . 33

1. About this Brief

This brief outlines the steps required to configure a load balanced Cisco ISE environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any Cisco ISE configuration changes that are required to enable load balancing.

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

2. Loadbalancer.org Appliances Supported

All our products can be used with Cisco ISE. For full specifications of available models please refer to https://www.loadbalancer.org/products/enterprise.

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

3. Software Versions Supported

3.1. Loadbalancer.org Appliance

- V8.9.1 and later

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

3.2. Cisco ISE

- All versions

4. Cisco ISE

Cisco ISE is a network administration tool that enables the creation and enforcement of security and access policies for endpoint devices connected to the company's routers and switches. The purpose is to simplify identity management across diverse devices and applications.

5. Load Balancing Cisco ISE

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

5.1. Load Balancing & HA Requirements

Cisco ISE can be installed on multiple servers and load balanced to provide load sharing, HA and resilience.

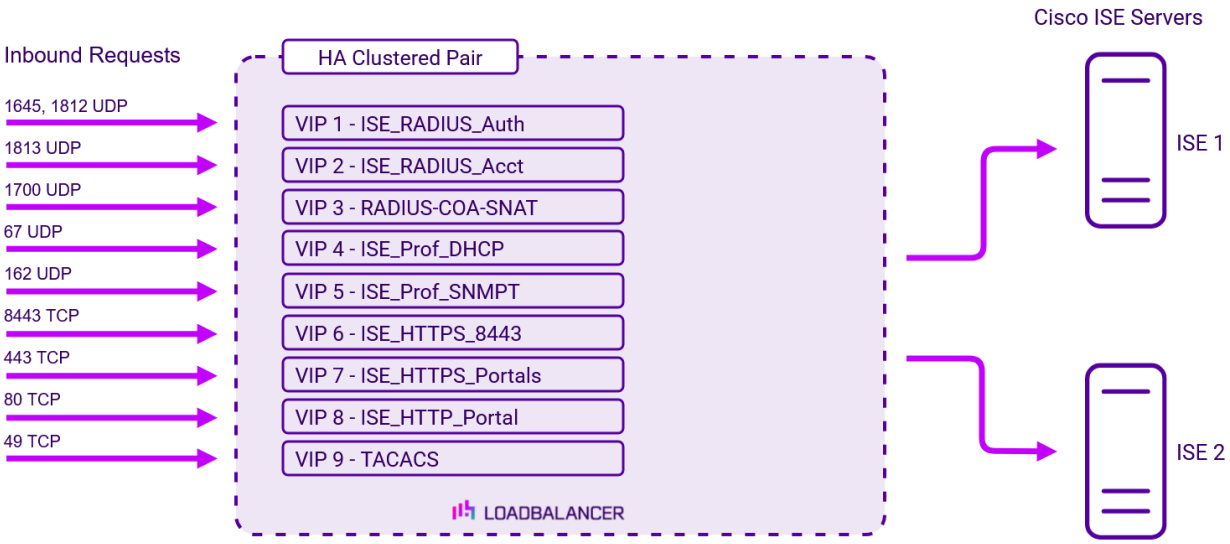
5.2. Virtual Service (VIP) Requirements

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

Ref.	VIP Name	Mode	Port(s)	Persistence Mode	Health Check
VIP 1	ISE_RADIUS_Auth	L4 NAT (UDP)	1645,1812	Source IP	Negotiate RADIUS
VIP 2	ISE_RADIUS_Acct	L4 NAT (UDP)	1813	Source IP	Negotiate RADIUS
VIP 3	RADIUS-COA-SNAT	L4 SNAT (UDP)	1700	Source IP	Ping Server
VIP 4	ISE_Prof_DHCP	L4 NAT (UDP)	67	Source IP	Ping Server
VIP 5	ISE_Prof_SNMPT	L4 NAT (UDP)	162	Source IP	Ping Server
VIP 6	ISE_HTTPS_8443	L7 SNAT (TCP)	8443	Source IP	Negotiate HTTPS GET
VIP 7	ISE_HTTPS_Portals	L7 SNAT (TCP)	443	Source IP	Negotiate HTTPS GET
VIP 8	ISE_HTTP_Portal	L7 SNAT (HTTP)	80	Source IP	Negotiate HTTP GET
VIP 9	TACACS	L7 SNAT (TCP)	49	Source IP	Connect to Port

6. Deployment Concept

Once the load balancer is deployed, clients connect to the Virtual Services (VIPs) rather than connecting directly to one of the Cisco ISE servers. These connections are then load balanced across the Cisco ISE servers to distribute the load according to the load balancing algorithm selected.



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

7. Load Balancer Deployment Methods

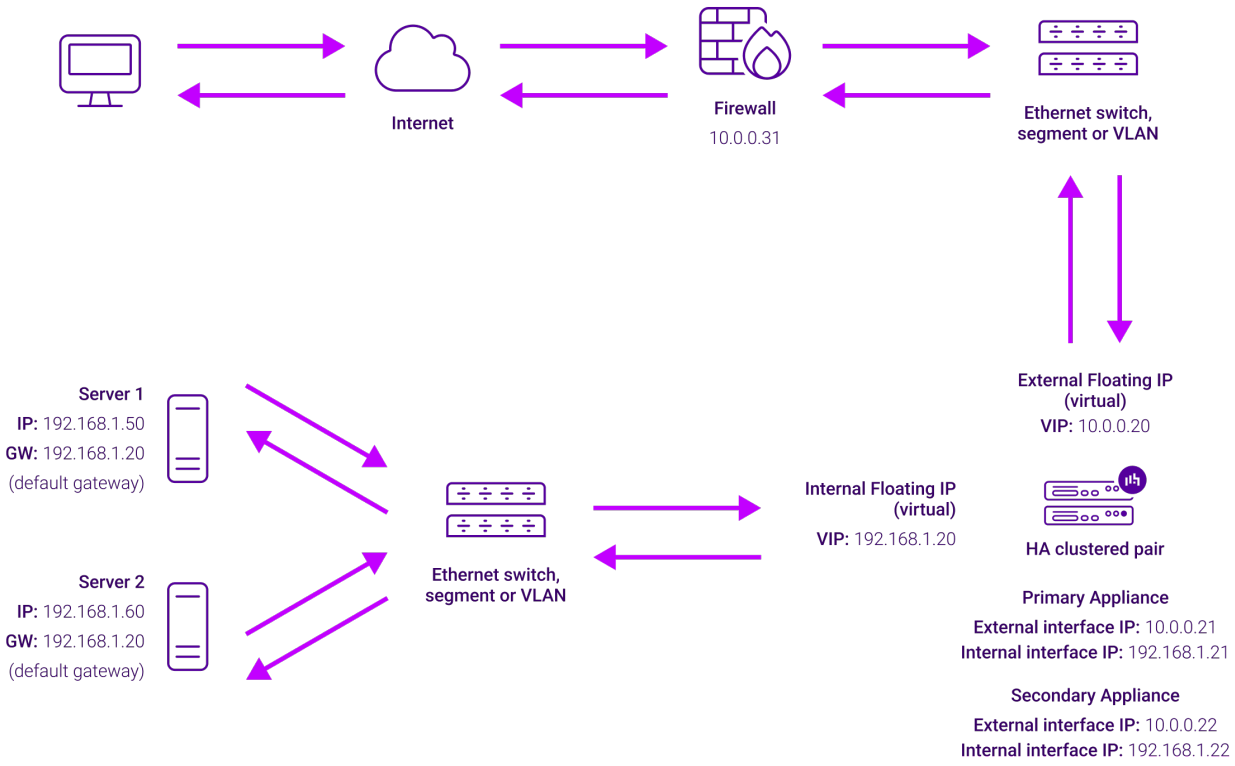
The load balancer can be deployed in 4 fundamental ways: ***Layer 4 DR mode***, ***Layer 4 NAT mode***, ***Layer 4 SNAT***

mode, and *Layer 7 SNAT mode*.

For Cisco ISE, layer 4 NAT mode, layer 4 SNAT mode and layer 7 SNAT mode are used. These modes are described below and are used for the configuration presented in this guide.

7.1. Layer 4 NAT Mode

Layer 4 NAT mode is a high performance solution, although not as fast as layer 4 DR mode. This is because real server responses must flow back to the client via the load balancer rather than directly as with DR mode. The image below shows an example network diagram for this mode.



- The load balancer translates all requests from the Virtual Service to the Real Servers.
- NAT mode can be deployed in the following ways:
  - **Two-arm (using 2 Interfaces)** (as shown above) - 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.

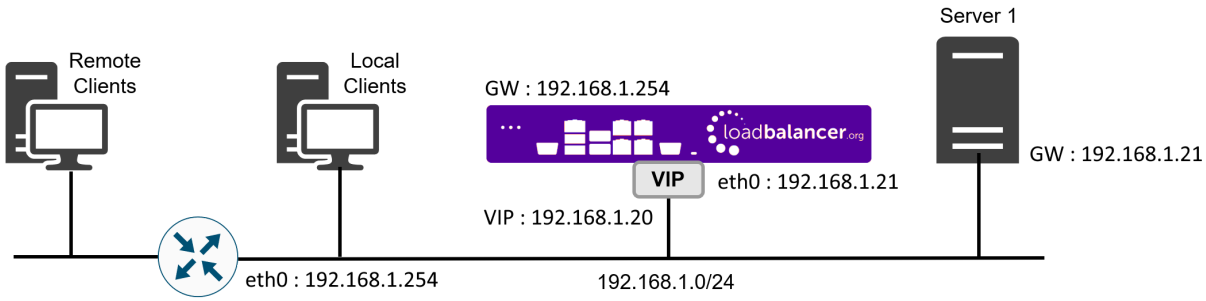
    - Normally **eth0** is used for the internal network and **eth1** is used for the external network, although this is not mandatory since any interface can be used for any purpose.
    - If the Real Servers require Internet access, *Auto-NAT* should be enabled using the WebUI menu option: *Cluster Configuration > Layer 4 - Advanced Configuration*, the external interface should be selected.

- The default gateway on the Real Servers must be set to 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.

- **One-arm (using 1 Interface)** - 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 NAT mode. To address this, the routing table on the Real Servers must be modified to force return traffic to go via the load balancer. For more information please refer to One-Arm (Single Subnet) NAT Mode.

- If you want Real Servers to be accessible on their own IP address for non-load balanced services, e.g. RDP, you will need to setup individual SNAT and DNAT firewall script rules for each Real Server or add additional VIPs for this.
- Port translation is possible with Layer 4 NAT mode, e.g. VIP:80 → RIP:8080 is supported.
- NAT mode is transparent, i.e. the Real Server will see the source IP address of the client.

NAT Mode Packet re-Writing

In NAT mode, the inbound destination IP address is changed by the load balancer from the Virtual Service IP address (VIP) to the Real Server. For outbound replies the load balancer changes the source IP address of the Real Server to be the Virtual Services IP address.

The following table shows an example NAT mode setup:

Protocol	VIP	Port	RIP	Port
TCP	10.0.0.20	80	192.168.1.50	80

In this simple example all traffic destined for IP address 10.0.0.20 on port 80 is load-balanced to the real IP address 192.168.1.50 on port 80.

Packet rewriting works as follows:

1) The incoming packet for the web server has source and destination addresses as:

Source	x.x.x.x:34567	**Destination**	10.0.0.20:80

2) The packet is rewritten and forwarded to the backend server as:

Source	x.x.x.x:34567	**Destination**	192.168.1.50:80

3) Replies return to the load balancer as:

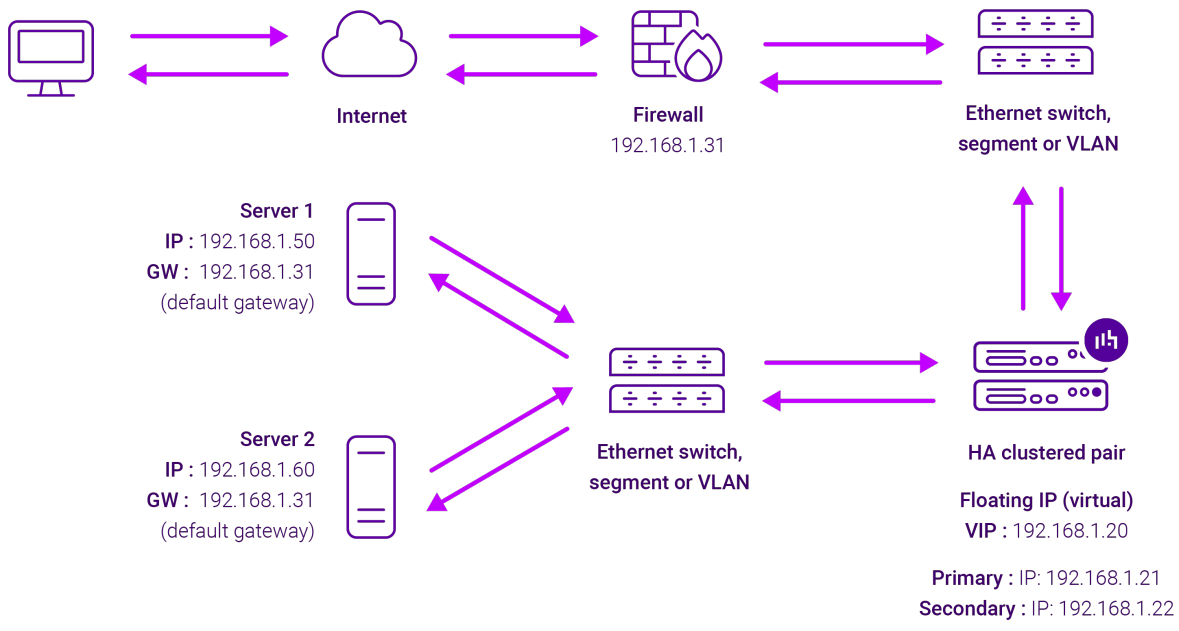
Source	192.168.1.50:80	**Destination**	x.x.x.x:34567

4) The packet is written back to the VIP address and returned to the client as:

Source	10.0.0.20:80	**Destination**	x.x.x.x:34567

7.2. Layer 4 SNAT Mode

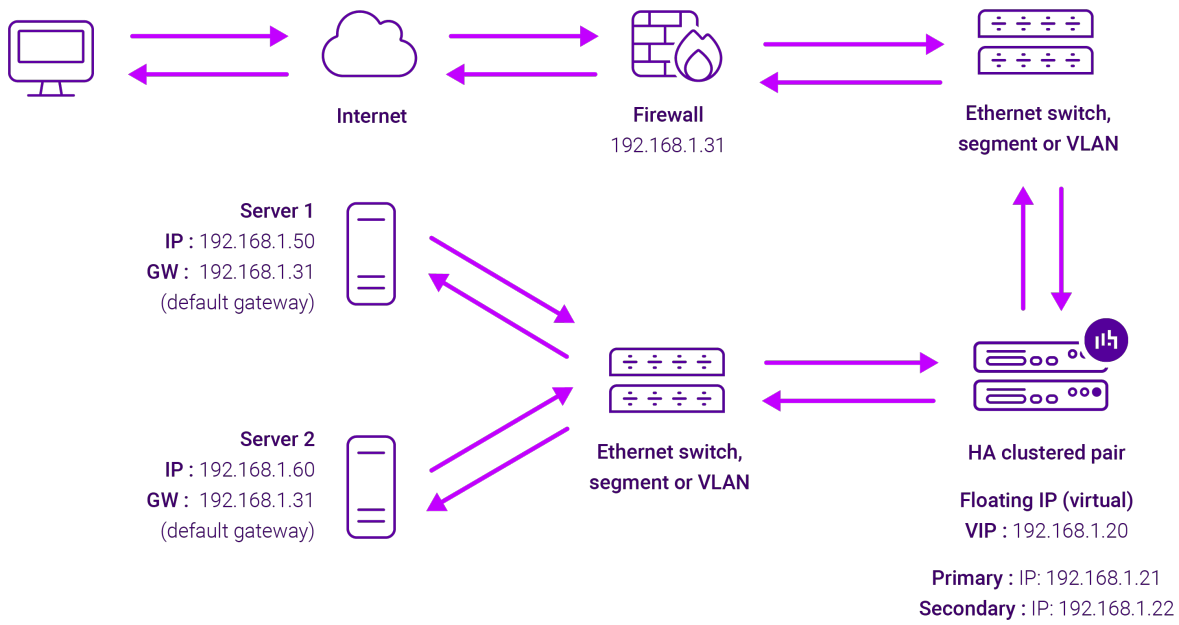
Layer 4 SNAT mode is a high performance solution, although not as fast as Layer 4 NAT mode or Layer 4 DR mode. The image below shows an example network diagram for this mode.



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

7.3. 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 Cisco ISE for Load Balancing

8.1. When using Layer 4 SNAT Mode or 7 SNAT Mode

Layer 4 and later 7 SNAT mode VIPs do not require any mode specific configuration changes to the load balanced Real Servers (ISE servers).

8.2. When using Layer 4 NAT Mode

Layer 4 NAT mode VIPs require the default gateway on the Real Servers to be an IP address on the load balancer. This ensures that return traffic passes back via the load balancer which is required for NAT mode to work.

9. Loadbalancer.org Appliance – the Basics

9.1. Virtual Appliance

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

> **Note** The same download is used for the licensed product, the only difference is that a license key file (supplied by our sales team when the product is purchased) must be applied using the appliance's WebUI.

> **Note** Please refer to Virtual Appliance Installation and the ReadMe.txt text file included in the VA download for additional information on deploying the VA using the various Hypervisors.

> **Note** The VA has 4 network adapters. For VMware only the first adapter (**eth0**) is connected by default. For HyperV, KVM, XEN and Nutanix AHV all adapters are disconnected by default. Use the network configuration screen within the Hypervisor to connect the required adapters.

9.2. Initial Network Configuration

After boot up, follow the instructions on the appliance console to configure the management IP address, subnet

mask, default gateway, DNS servers and other network and administrative settings.

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

9.3. Accessing the Appliance WebUI

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

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

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

   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.

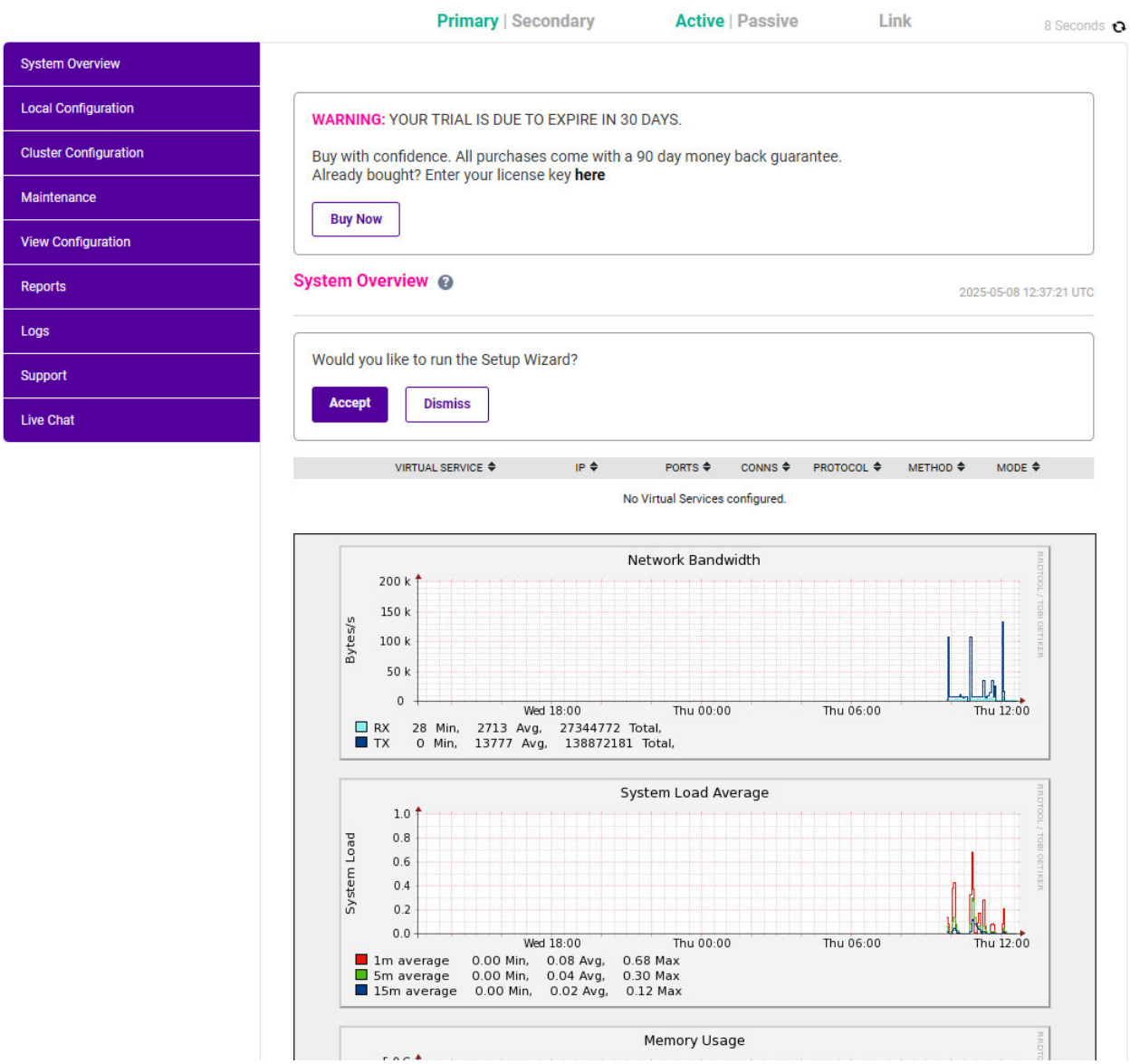
   > **Note** If you need to change the port, IP address or protocol that the WebUI listens on, please refer to Service Socket Addresses.

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:



3. You'll be asked if you want to run the Setup Wizard. Click **Dismiss** if you're following a guide or want to configure the appliance manually. Click **Accept** to start the Setup Wizard.

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

9.3.1. 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

9.4. Appliance Software Update

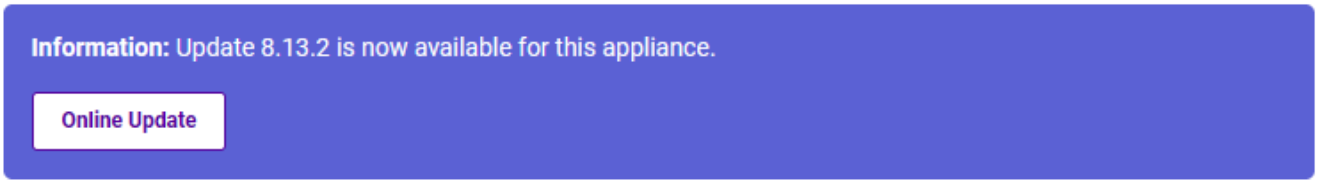
We recommend that the appliance is kept up to date to ensure that you benefit from the latest bug fixes, security updates and feature improvements. Both online and offline update are supported.

> **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.

9.4.1. Online Update

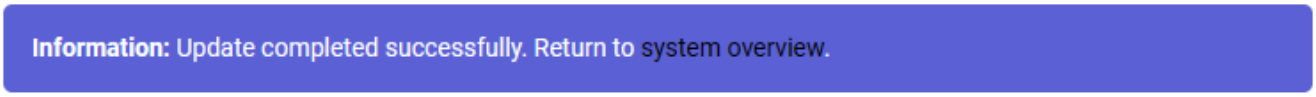
The appliance periodically contacts the Loadbalancer.org update server (**update.loadbalancer.org**) and checks for updates. This is the default behavior and can be disabled if preferred. If an update is found, a notification similar to the example below will be displayed at the top of the WebUI:



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.

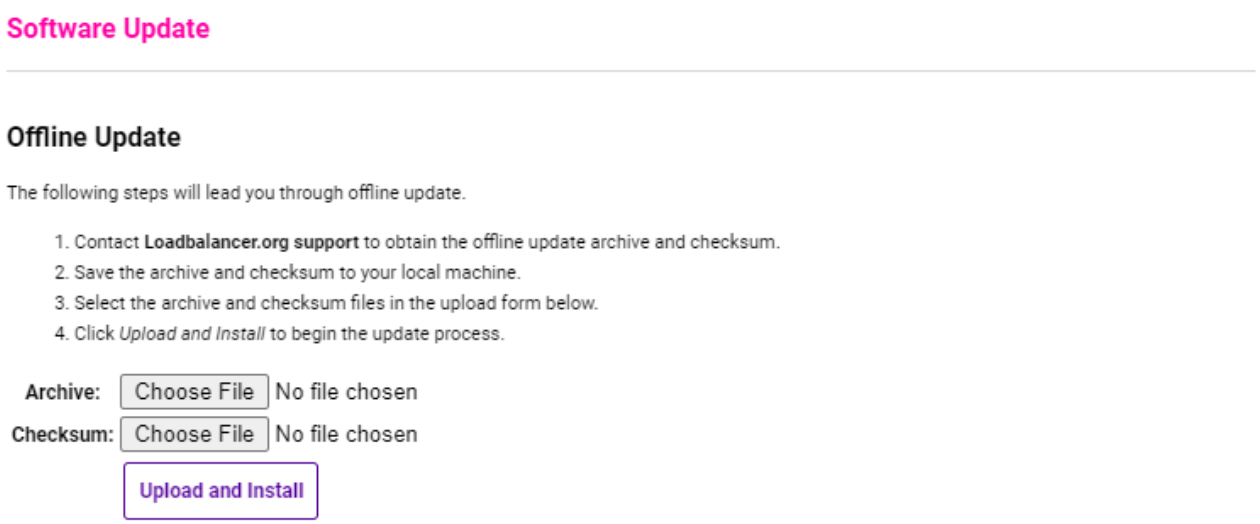
9.4.2. Offline Update

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.

9.5. Ports Used by the Appliance

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

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

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

Addresses.

9.6. HA Clustered Pair Configuration

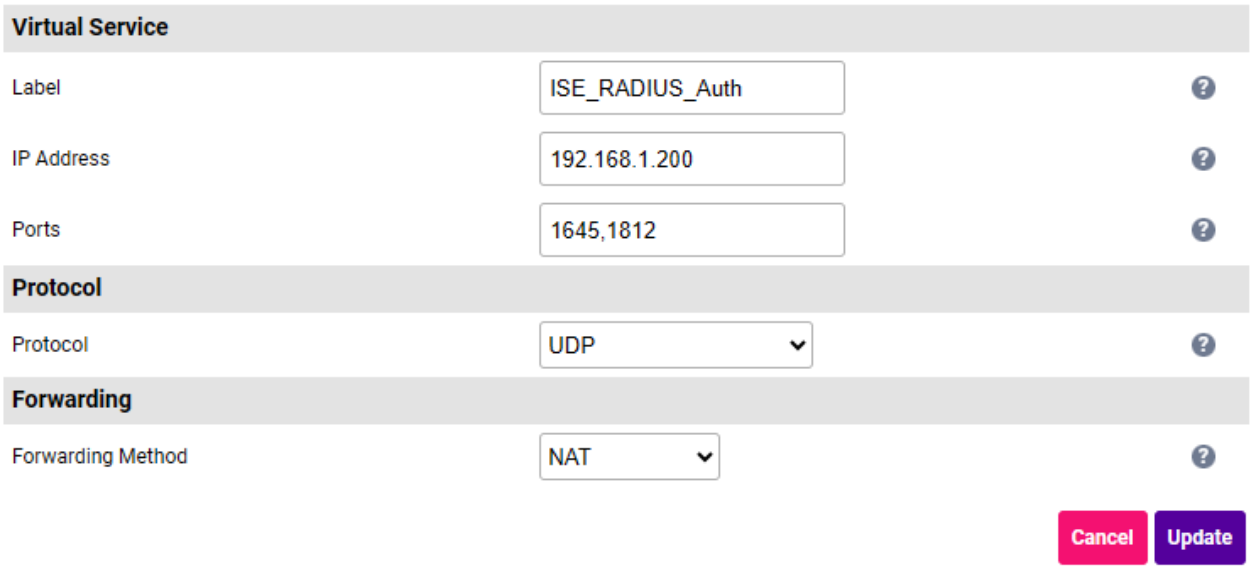
Loadbalancer.org recommend that load balancer appliances are deployed in pairs for high availability. In this guide a single unit is deployed first, adding a secondary unit is covered in the section Configuring HA - Adding a Secondary Appliance of the appendix.

10. Appliance Configuration for Cisco ISE

10.1. VIP 1 - ISE_RADIUS_Auth

10.1.1. Virtual Service (VIP) Configuration

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



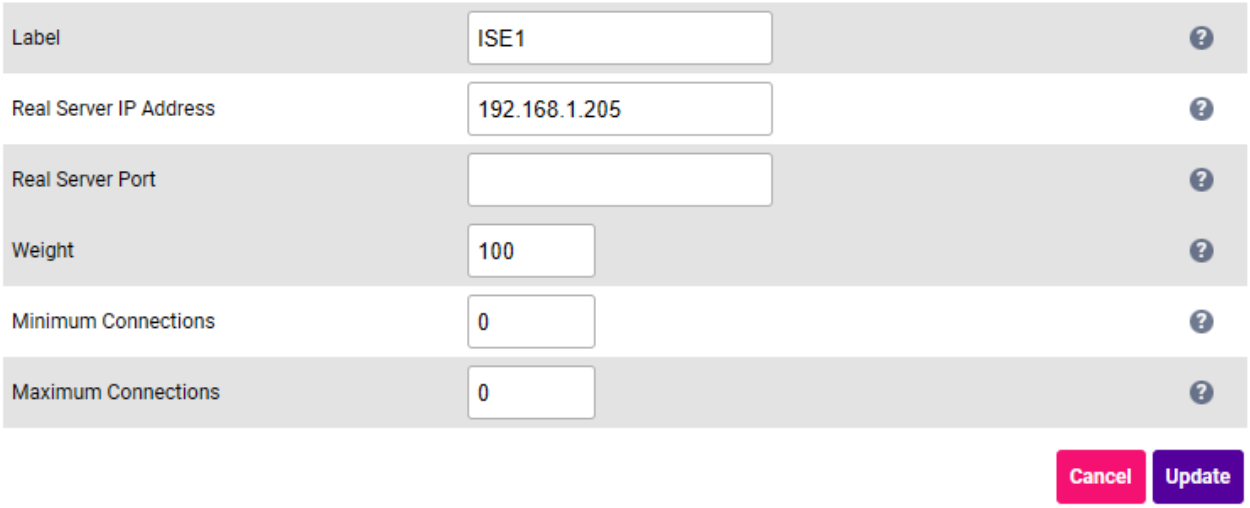
2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **ISE_RADIUS_Auth**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **1645,1812**.
5. Set the *Protocol* to **UDP**.
6. Set the *Forwarding Method* to **NAT**.
7. Click **Update**.
8. Now click **Modify** next to the newly created VIP.
9. Scroll down to the *Persistence* section.
    - Set the *Timeout* to **3600** seconds.
10. Scroll down to the *Health Checks* section.

- Set *Check Type* to **Negotiate**.
- Set *Protocol* to **RADIUS**.
- Enter the relevant *Radius Secret*, *Login* and *Password* for your environment.

11. Click **Update**.

10.1.2. Configure the Associated Real Servers (RIPs)

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



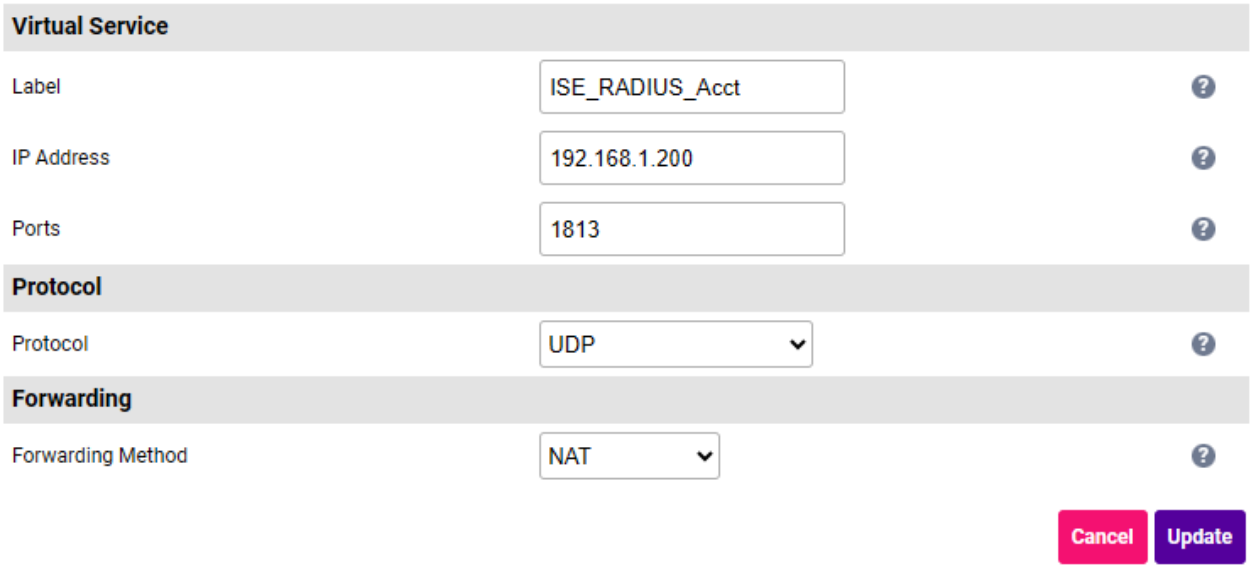
Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.

2. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
3. Click **Update**.
4. Repeat these steps to add additional Real Servers as required.

10.2. VIP 2 - ISE_RADIUS_Acct

10.2.1. Virtual Service (VIP) Configuration

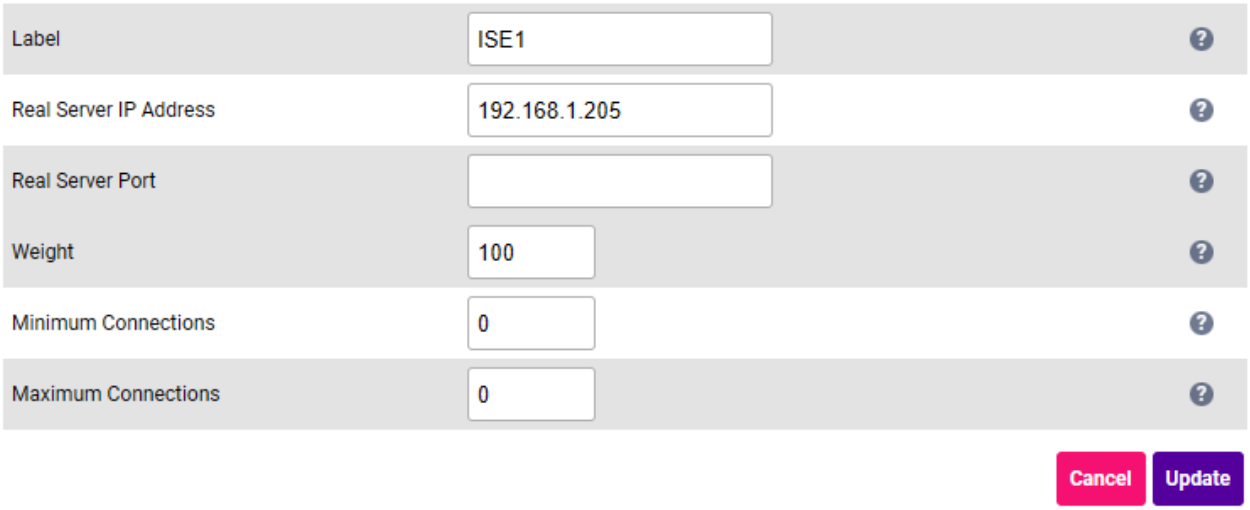
1. Using the WebUI, navigate to *Cluster Configuration > Layer 4 – Virtual Services* and click **Add a new Virtual Service**.



2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **ISE_RADIUS_Acct**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **1813**.
5. Set the *Protocol* to **UDP**.
6. Set the *Forwarding Method* to **NAT**.
7. Click **Update**.
8. Now click **Modify** next to the newly created VIP.
9. Scroll down to the *Persistence* section.
    - Set the *Timeout* to **3600** seconds.
10. Scroll down to the *Health Checks* section.
    - Set *Check Type* to **Negotiate**.
    - Set *Protocol* to **RADIUS**.
    - Enter the relevant *Radius Secret*, *Login* and *Password* for your environment.
11. Click **Update**.

10.2.2. Configure the Associated Real Servers (RIPs)

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



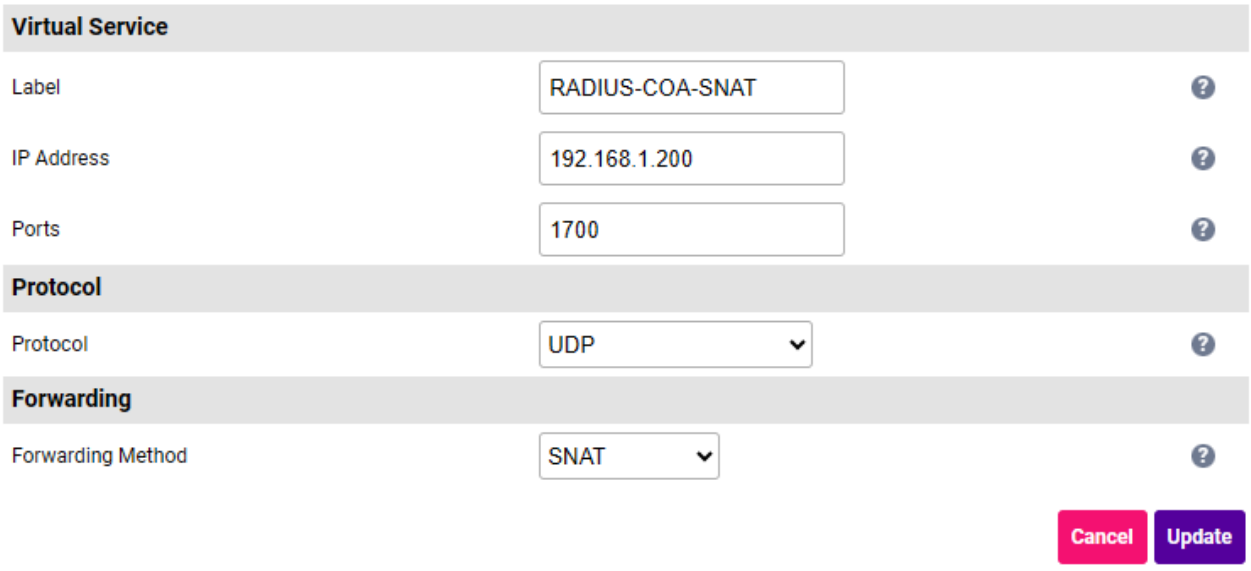
Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.

2. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
3. Click **Update**.
4. Repeat these steps to add additional Real Servers as required.

10.3. VIP 3 - RADIUS-COA-SNAT

10.3.1. Virtual Service (VIP) Configuration

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

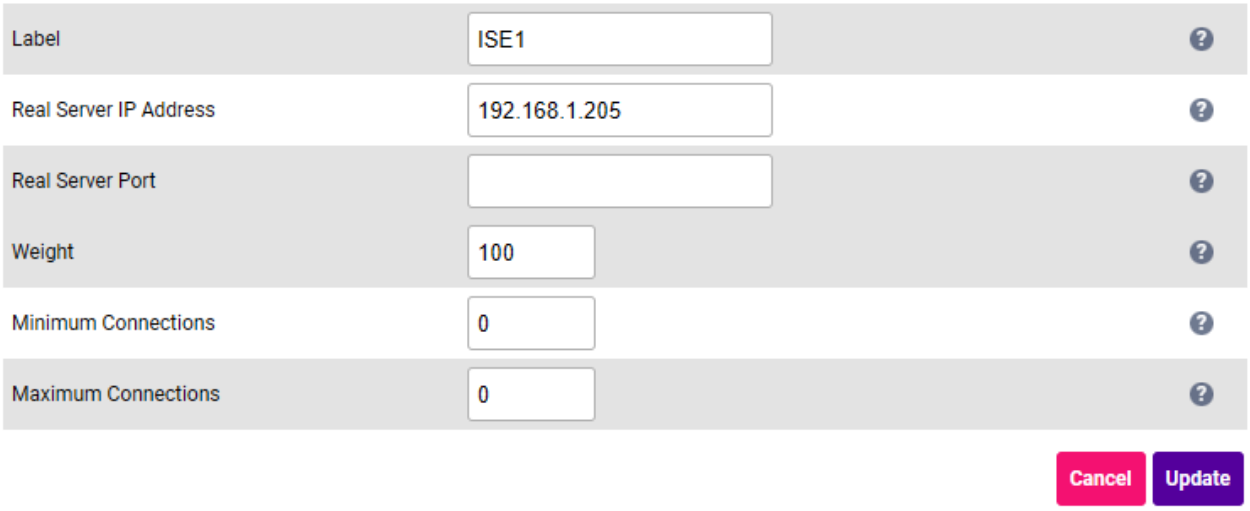


2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **RADIUS-COA-SNAT**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **1700**.

5. Set the *Protocol* to **UDP**.
6. Set the *Forwarding Method* to **SNAT**.
7. Click **Update**.
8. Now click **Modify** next to the newly created VIP.
9. Scroll down to the *Health Checks* section.
    - Set *Check Type* to **Ping Server**.
10. Click **Update**.

10.3.2. Configure the Associated Real Servers (RIPs)

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



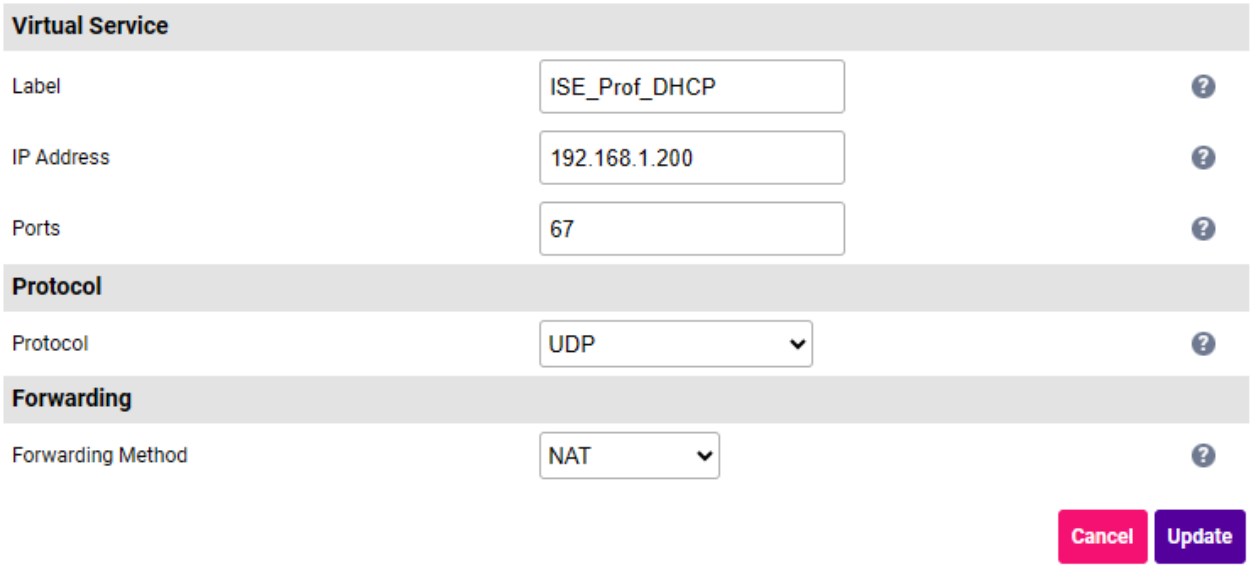
   Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.

2. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
3. Click **Update**.
4. Repeat these steps to add additional Real Servers as required.

10.4. VIP 4 - ISE_Prof_DHCP

10.4.1. Virtual Service (VIP) Configuration

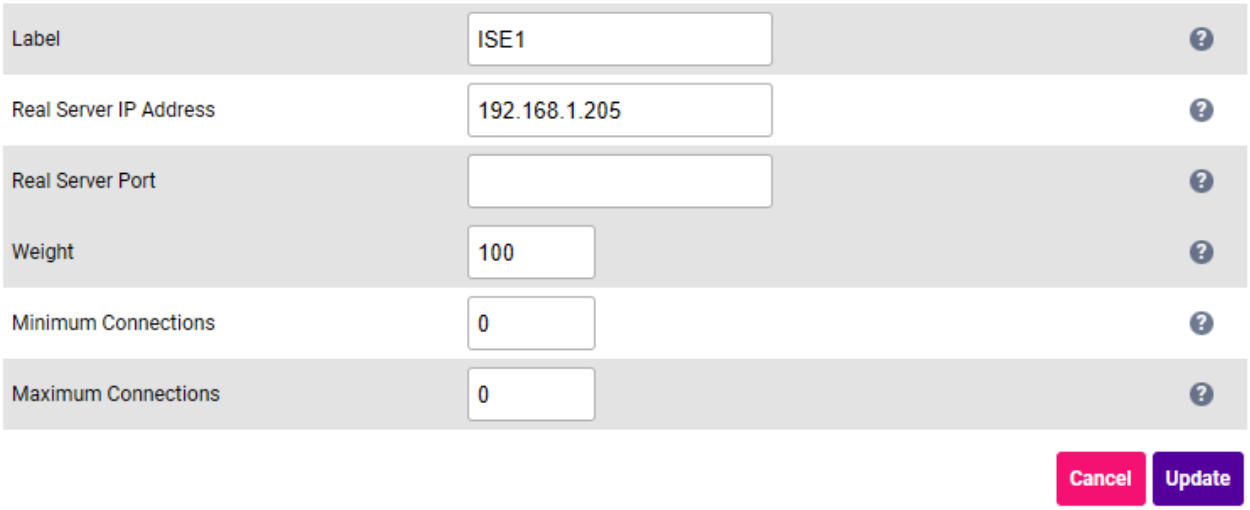
1. Using the WebUI, navigate to *Cluster Configuration > Layer 4 – Virtual Services* and click **Add a new Virtual Service**.



2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **ISE_Prof_DHCP**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **67**.
5. Set the *Protocol* to **UDP**.
6. Set the *Forwarding Method* to **NAT**.
7. Click **Update**.
8. Now click **Modify** next to the newly created VIP.
9. Scroll down to the *Persistence* section.
    - Set the *Timeout* to **7200** seconds.
10. Scroll down to the *Health Checks* section.
    - Set *Check Type* to **Ping Server**.
11. Click **Update**.

10.4.2. Configure the Associated Real Servers (RIPs)

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



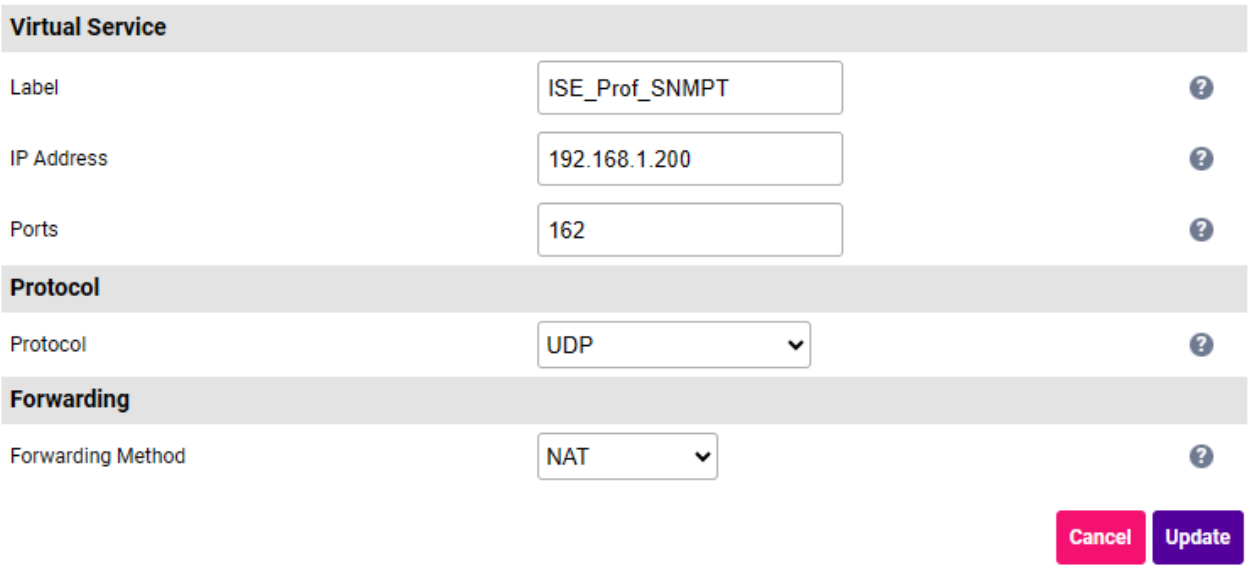
Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.

2. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
3. Click **Update**.
4. Repeat these steps to add additional Real Servers as required.

10.5. VIP 5 - ISE_Prof_SNMPT

10.5.1. Virtual Service (VIP) Configuration

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

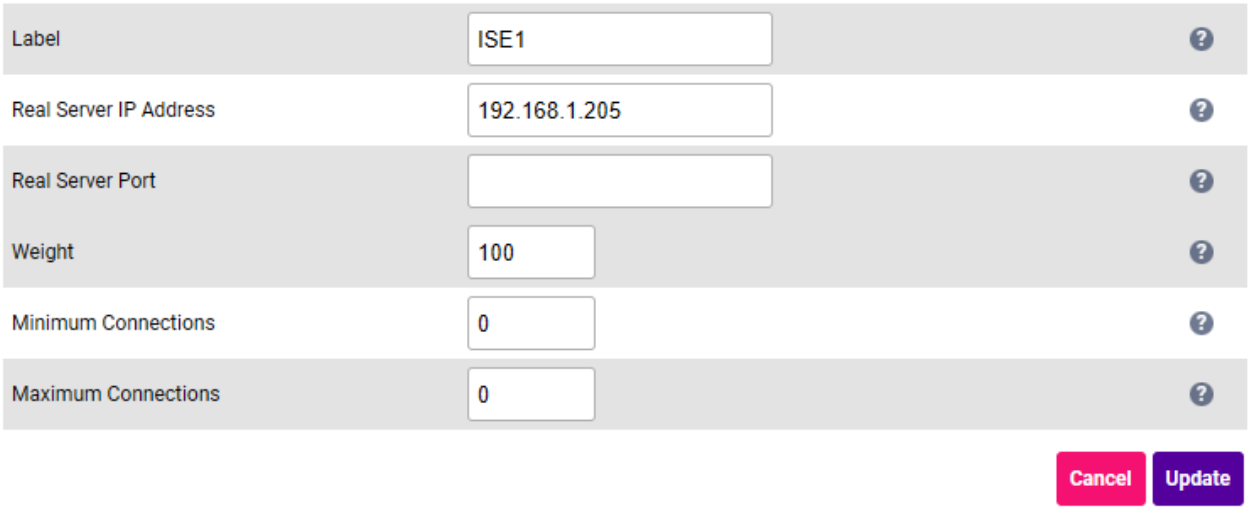


2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **ISE_Prof_SNMPT**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **162**.

5. Set the *Protocol* to **UDP**.
6. Set the *Forwarding Method* to **NAT**.
7. Click **Update**.
8. Now click **Modify** next to the newly created VIP.
9. Scroll down to the *Health Checks* section.
    - Set *Check Type* to **Ping Server**.
10. Click **Update**.

10.5.2. Configure the Associated Real Servers (RIPs)

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



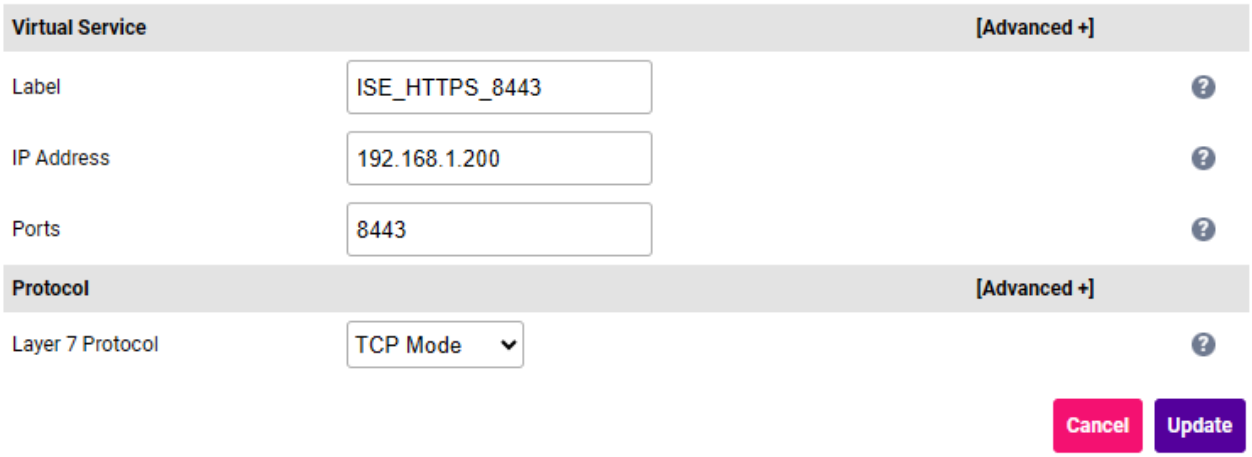
   Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.

2. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
3. Click **Update**.
4. Repeat these steps to add additional Real Servers as required.

10.6. VIP 6 - ISE_HTTPS_8443

10.6.1. Virtual Service (VIP) Configuration

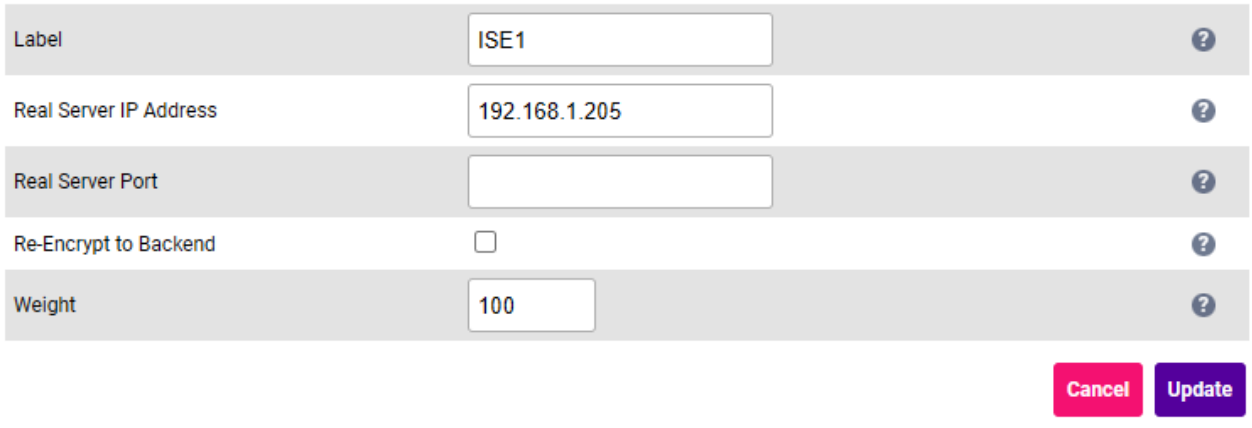
1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.



2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **ISE_HTTPS_8443**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **8443**.
5. Set the *Layer 7 Protocol* to **TCP Mode**.
6. Click **Update**.
7. Now click **Modify** next to the newly created VIP.
8. Scroll down to the *Persistence* section and click **[Advanced]**.
   - Set the *Timeout* to **20** (i.e. 20 minutes).
9. Scroll down to the *Health Checks* section.
   - Set *Health Checks* to **Negotiate HTTPS (GET)**.
   - Set *Request to Send* to **/sponsorportal/PortaLSetup.action?portal=Sponsor%20%Portal%20%28default%29**.
10. Click **Update**.

10.6.2. Configure the Associated Real Servers (RIPs)

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

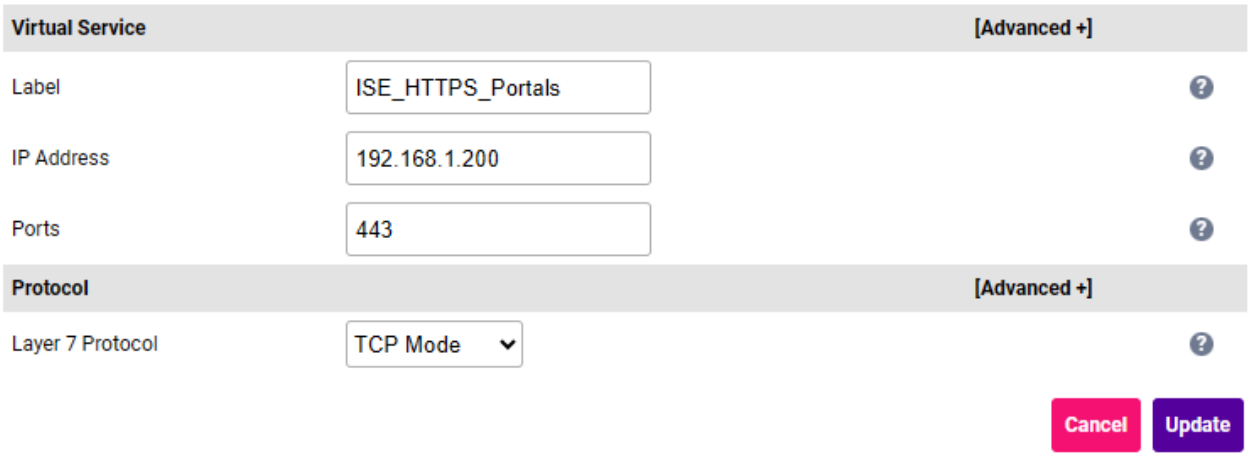


2. Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
4. Leave the *Real Server Port* field blank.
5. Click **Update**.
6. Repeat these steps to add additional Real Servers as required.

10.7. VIP 7 - ISE_HTTPS_Portals

10.7.1. Virtual Service (VIP) Configuration

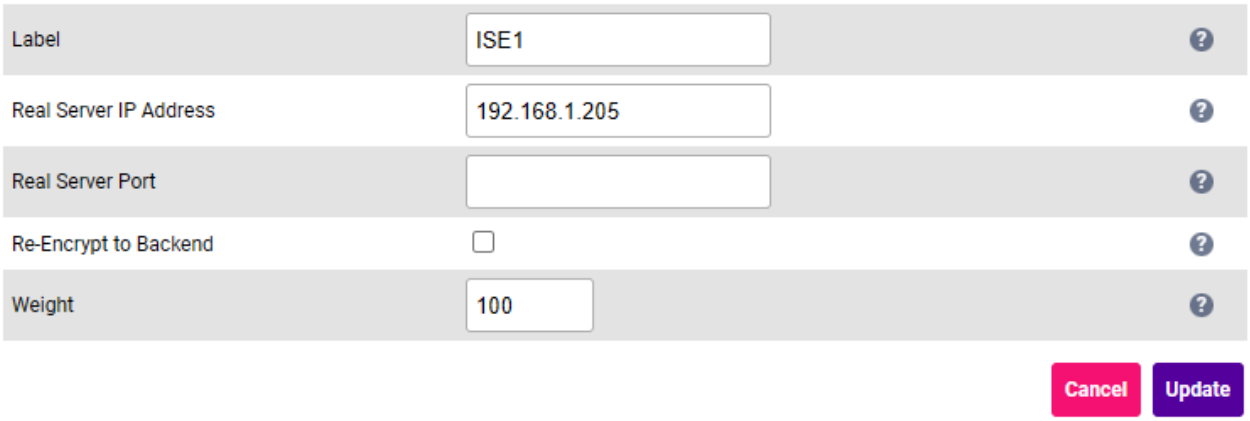
1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.



2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **ISE_HTTPS_Portals**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **443**.
5. Set the *Layer 7 Protocol* to **TCP Mode**.
6. Click **Update**.
7. Now click **Modify** next to the newly created VIP.
8. Scroll down to the *Persistence* section and click **[Advanced]**.
   - Set the *Timeout* to **20** (i.e. 20 minutes).
9. Scroll down to the *Health Checks* section.
   - Set *Health Checks* to **Negotiate HTTPS (GET)**.
   - Set *Request to Send* to **/sponsorportal/PortaLSetup.action?portal=Sponsor%20%Portal%20%28default%29**.
10. Click **Update**.

10.7.2. Configure the Associated Real Servers (RIPs)

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

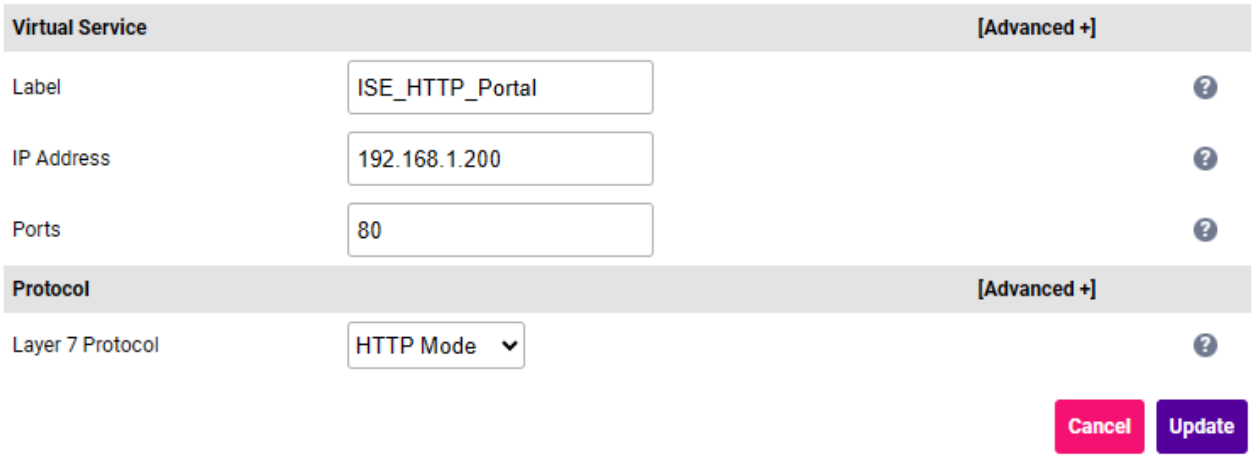


2. Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
4. Leave the *Real Server Port* field blank.
5. Click **Update**.
6. Repeat these steps to add additional Real Servers as required.

10.8. VIP 8 - ISE_HTTP_Portal

10.8.1. Virtual Service (VIP) Configuration

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

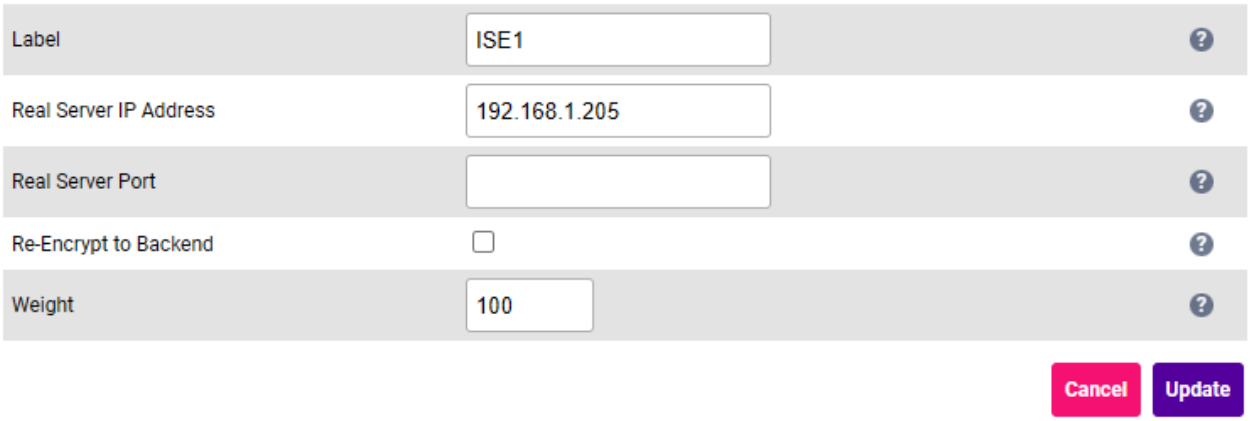


2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **ISE_HTTPS_Portal**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **80**.
5. Set the *Layer 7 Protocol* to **HTTP Mode**.

6. Click **Update**.
7. Now click **Modify** next to the newly created VIP.
8. Scroll down to the *Persistence* section.
   - Set the *Persistence Mode* to **Source IP**.
9. Scroll down to the *Health Checks* section.
   - Set *Health Checks* to **Negotiate HTTPS (GET)**.
   - Set *Request to Send* to **/sponsorportal/PortaLSetup.action?portal=Sponsor%20%Portal%20%28default%29**.
10. Click **Update**.

10.8.2. Configure the Associated Real Servers (RIPs)

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

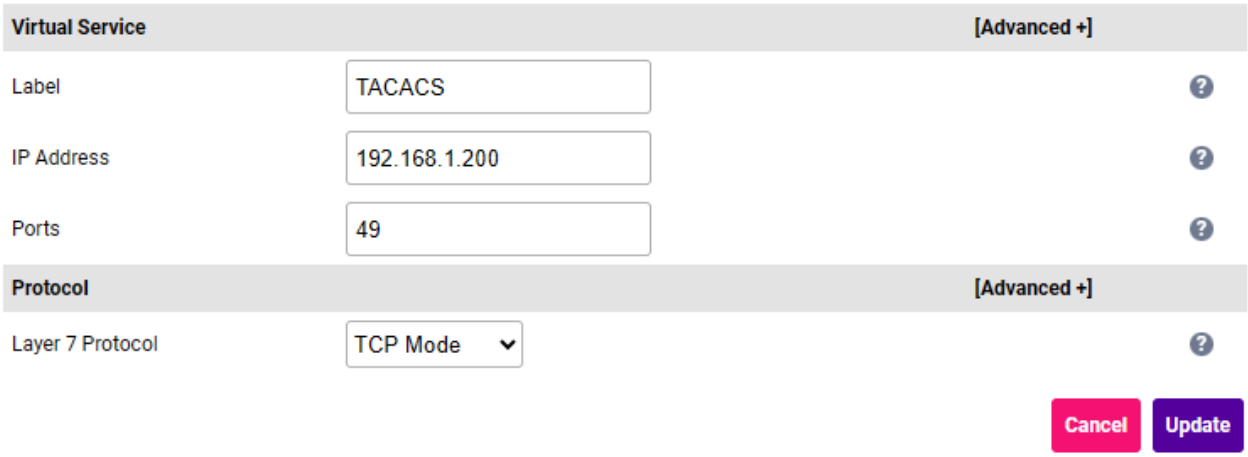


2. Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
4. Leave the *Real Server Port* field blank.
5. Click **Update**.
6. Repeat these steps to add additional Real Servers as required.

10.9. VIP 9 - TACACS

10.9.1. Virtual Service (VIP) Configuration

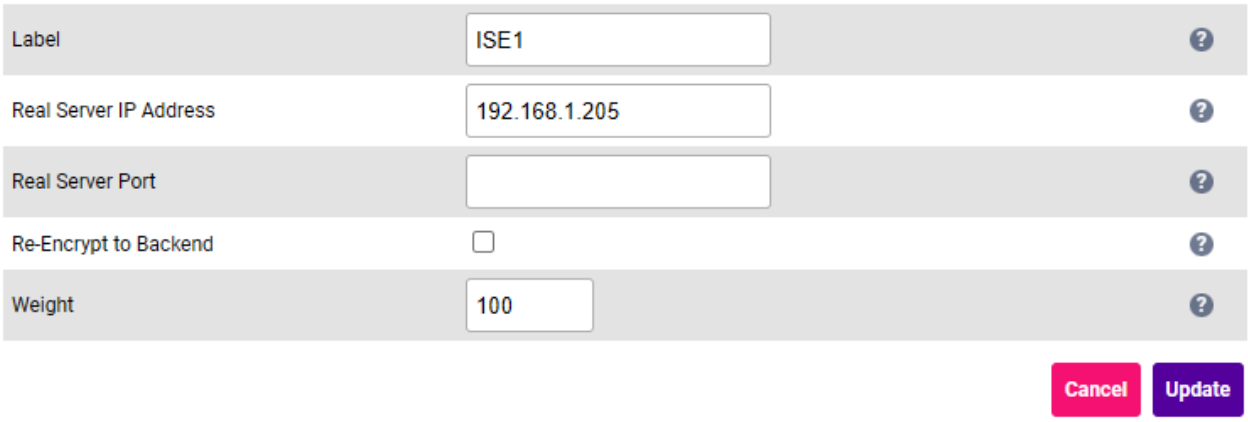
1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.



2. Enter a suitable *Label* (name) for the Virtual Service, e.g. **TACACS**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.1.200**.
4. Set *Ports* to **49**.
5. Set the *Layer 7 Protocol* to **TCP Mode**.
6. Click **Update**.

10.9.2. Configure the Associated Real Servers (RIPs)

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



2. Enter a suitable *Label* (name) for the Real Server, e.g. **ISE1**.
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.1.205**.
4. Leave the *Real Server Port* field blank.
5. Click **Update**.
6. Repeat these steps to add additional Real Servers as required.

10.10. Finalizing the Configuration

To apply the new settings, HAProxy must be reloaded. This can be done using the button in the "Commit

changes" box at the top of the screen or by using the Restart Services menu option:

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

11. Testing & Verification

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

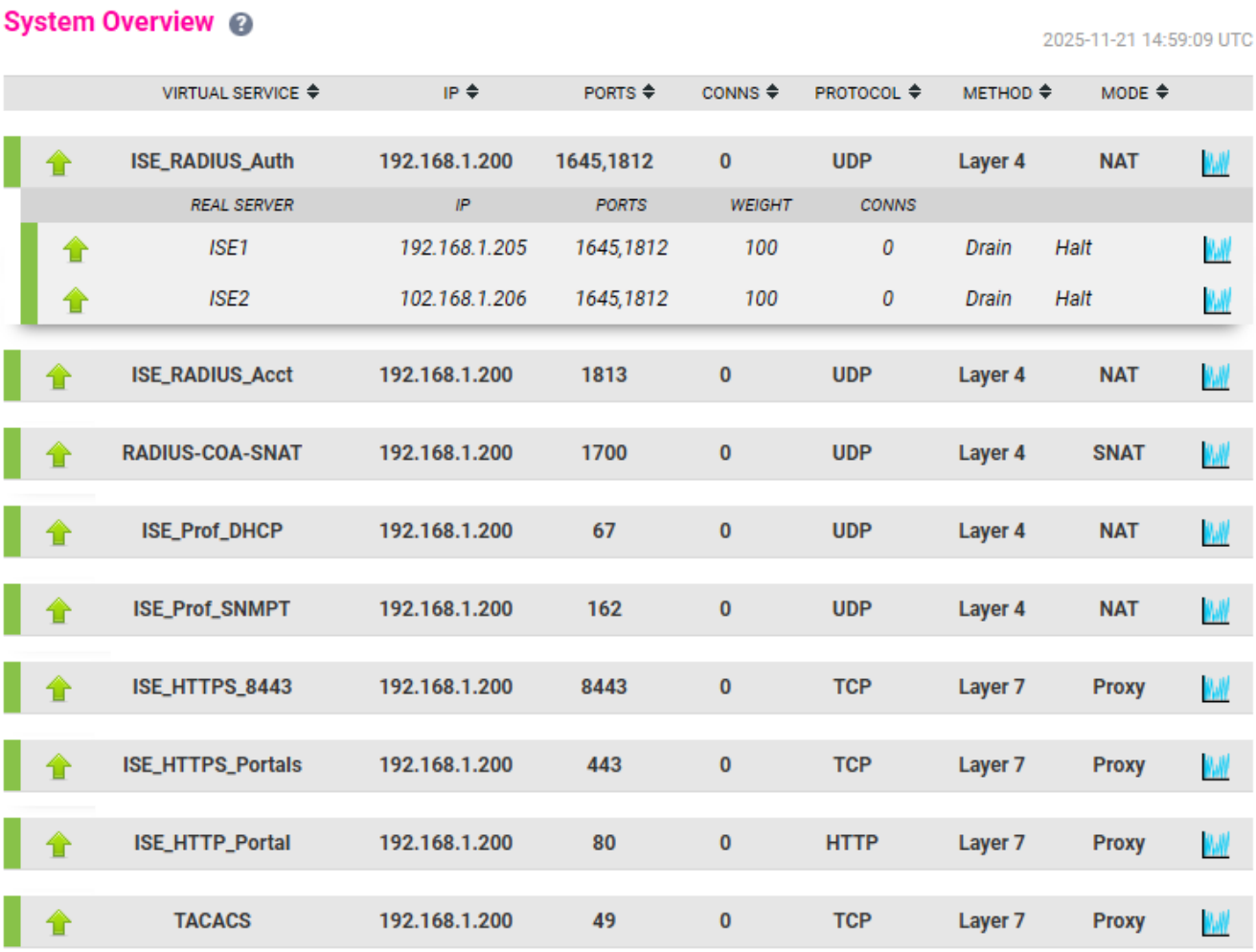
11.1. Accessing Cisco ISE via the Load Balancer

Verify that you're able to successfully access all load balanced applications and services via the Virtual Services on the load balancer.

> **Note** Make sure that DNS is updated so that any FQDNs used point to the VIPs rather than individual servers.

11.2. Using System Overview

The System Overview can be viewed in the WebUI. It shows a graphical view of all Virtual Services & the associated Real Servers (i.e. the FIXME application name servers) and shows the state/health of each server as well as the overall state of each cluster. The example below shows that all servers are healthy (green) and available to accept connections:



12. Technical Support

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

13. Further Documentation

For additional information, please refer to the Administration Manual.

14. Appendix

14.1. Configuring HA - Adding a Secondary Appliance

Our recommended configuration is to use a clustered HA pair of load balancers to provide a highly available and resilient load balancing solution. We recommend that the Primary appliance is fully configured first, then the Secondary appliance can be added to create an HA pair. Once the HA pair is configured, load balanced services must be configured and modified on the Primary appliance. The Secondary appliance will be automatically kept in sync.

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

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

14.1.1. 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:

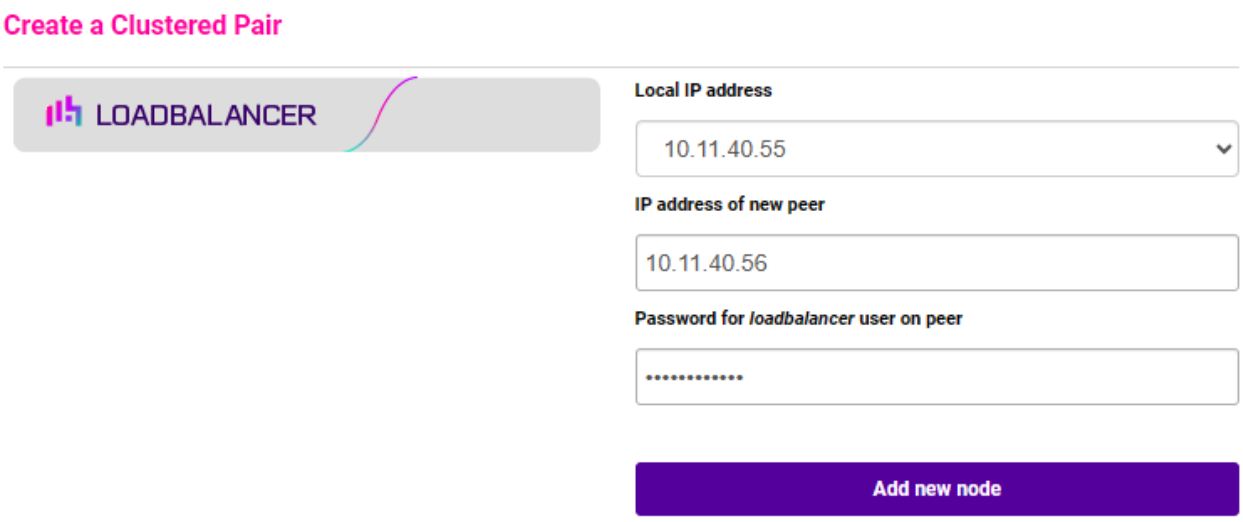
WebUI Main Menu Option	Sub Menu Option	Description
Local Configuration	Hostname & DNS	Hostname and DNS settings
Local Configuration	Network Interface Configuration	Interface IP addresses, bonding configuration and VLANs
Local Configuration	Routing	Default gateways and static routes
Local Configuration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

14.1.2. Configuring the HA Clustered Pair

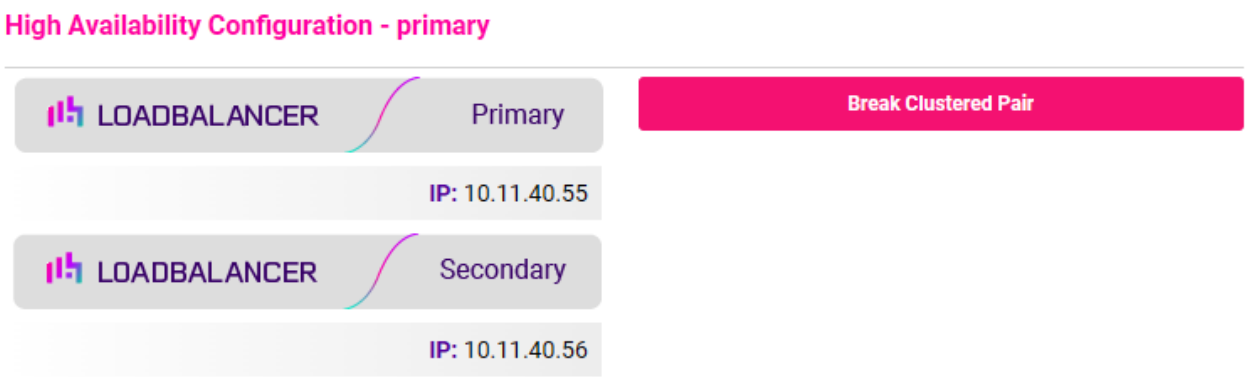
> **Note** If you have already run the firewall lockdown wizard on either appliance, you'll need to ensure that it is temporarily disabled on both appliances whilst performing the pairing process.

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



3. Specify the IP address and the *loadbalancer* user's password for the Secondary (peer) appliance as shown in the example above.
4. Click **Add new node**.
5. The pairing process now commences as shown below:

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



7. To finalize the configuration, restart heartbeat and any other services as prompted in the "Commit changes" message box at the top of the screen.

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

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

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

15. Document Revision History

Version	Date	Change	Reason for Change	Changed By
1.0.0	10 December 2025	Initial version		RJC

LOADBALANCER

Visit us: www.loadbalancer.org

Phone us: +44 (0)330 380 1064

Phone us: +1 833 274 2566

Email us: info@loadbalancer.org

Follow us: @loadbalancer.org

About Loadbalancer.org

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