Load Balancing Zadara VPSA Object Storage (ZIOS)

v1.0.1

Deployment Guide

loadbalancer.org

Contents

1. About this Guide

This guide details the steps required to configure a highly available Zadara VPSA cluster environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any Zadara VPSA configuration changes that are required.

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

2. Loadbalancer.org Appliances Supported

All our products can be used for load balancing Zadara VPSA Object Storage. The complete list of models is shown below:

Discontinued Models	Current Models *
Enterprise R16	Enterprise R20
Enterprise VA R16	Enterprise MAX
Enterprise VA	Enterprise 10G
Enterprise R320	Enterprise 40G
	Enterprise Ultra
	Enterprise VA R20
	Enterprise VA MAX
	Enterprise AWS **
	Enterprise AZURE **
	Enterprise GCP **

* For full specifications of these models please refer to: http://www.loadbalancer.org/products/hardware

** Some features may not be supported, please check with Loadbalancer.org support

3. Loadbalancer.org Software Versions Supported

- V8.4.1 and later

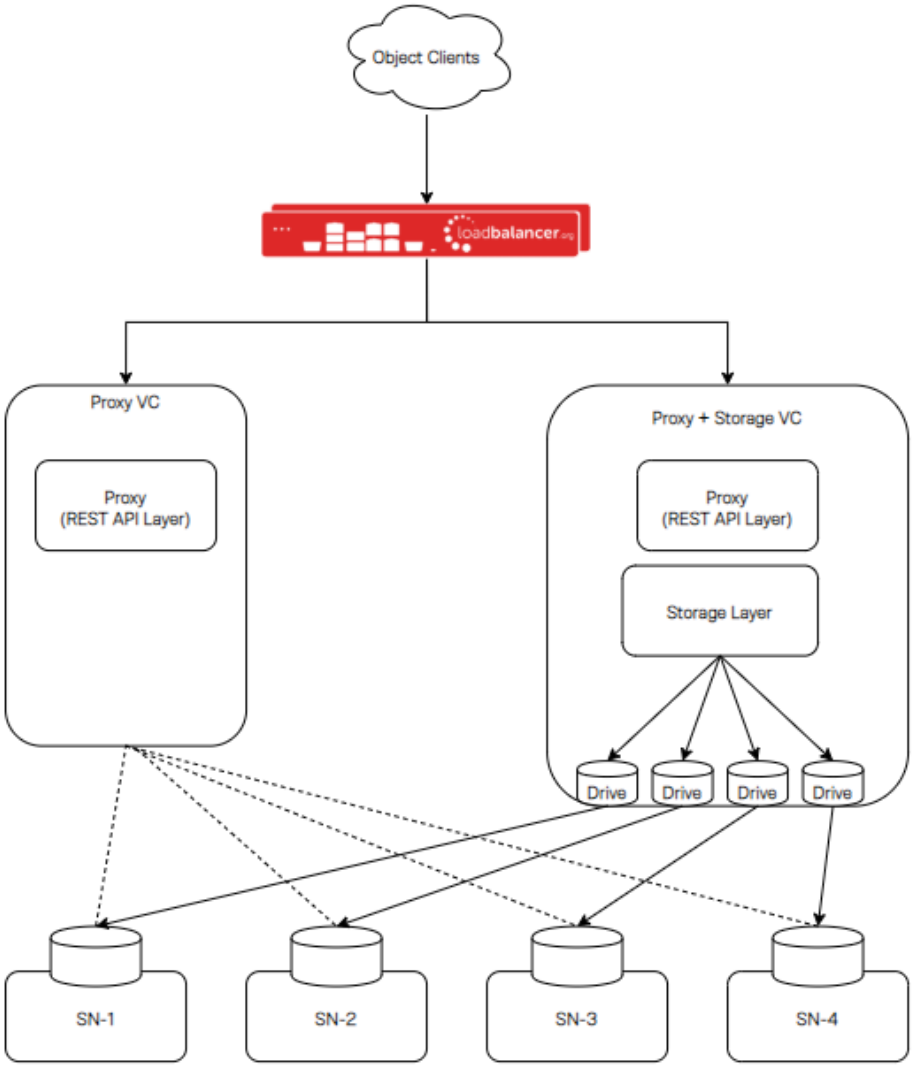
4. Zadara VPSA Object Storage Software Versions Supported

- Zadara VPSA Object Storage – all versions

5. Load Balancing Zadara VPSA Object Storage

VPSA Object Storage (ZIOS) is Zadara's object storage service. It is provided on Zadara clouds, side by side with the VPSA that provides block and file storage services.

VPSA Object Storage (ZIOS) architecture is a scale out cluster of Virtual Controllers that together provide the service. The number Of VC's is automatically determined as needed to serve the capacity and performance of the system.



This figure shows high level logical view of VPSA Object Storage (ZIOS). It is a Virtual Object Store cluster, with two distinct layers:

- "Storage Layer" that manages individual disks
- "Proxy - REST API Layer" that provides a REST API front-end to the Object Storage.

The typical VC runs both functions and is referred to as "Proxy+Storage" VC. It is possible to add VCs with the Proxy layer only. There are referred to as "Proxy" VC.

Each VPSA Object Storage is typically composed of several Proxy+Storage VCs and optionally one or more Proxy VCs with each VC having dedicated CPU / RAM / networking. Proxy+Storage VCs consume raw Physical drives (like SAS / SATA / SSD) exposed from Storage Nodes (SNs). Proxy+Storage and Proxy VCs run the 'Object Storage Stack' which provides Amazon S3 and Swift REST API interfaces.

Capacity & Performance can be independently scaled up/down by adding/removing disks and proxy-VCs respectively. VPSA Object Storage typically has a set of load balancers to distribute REST API traffic across the Proxy REST API Layers. Each VPSA Object Storage natively being multi-tenant allows for the creation of multiple accounts within it, with each account having multiple users who can work with the object interface (GET/PUT objects).

A single Zadara Storage Cloud can host several virtual object stores, making it truly disruptive and unique. Each VPSA Object Store has entirely provisioned resources of CPU / RAM / networking / disks and runs the object stack in isolated Virtual Machines (i.e. there is no sharing of resources anywhere across VPSAs) thereby providing complete performance and fault isolation.

Port Requirements

The following table shows the ports used by the Zadara VPSA nodes. The load balancer must be configured to listen on the same ports.

Port	Protocols	Use
80, 443	TCP / HTTP, HTTPS	Object storage data
8080, 8443	TCP / HTTP, HTTPS	Web interface
5000	TCP	Authentication

Deployment Concept

When the Zadara VPSA nodes are deployed with the load balancer, clients connect to the Virtual Service (VIP) on the load balancer rather than connecting directly to one of the VPSA nodes.

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 section 2 in the appendix on page 24 for more details on configuring a clustered pair.

Virtual Service (VIP) Requirements

To provide load balancing for Zadara VPSA nodes the following VIPs are required

- VIP 1: OBS Data
- VIP 2: VPSA GUI
- VIP 3: VPSA Authentication

Deployment Mode

We recommend using Layer 7 as no network changes are required and SSL termination can be implemented. This mode offers high performance and implementation flexibility, however as Layer 7 is a reverse proxy the client source IP address is not visible at the real server. Instead, the IP address of the load balancer is visible at the real server. In order to retain the client source IP address, the load balancer inserts an *X-Forwarded-For* header into the load balanced traffic, which the VPSA nodes can log for troubleshooting issues while seeing the true source IP address of connecting clients.

6. Loadbalancer.org Appliance – the Basics

Virtual Appliance Download & Deployment

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 and XEN and has been optimized for each Hypervisor. By default, the VA is allocated 1 CPU, 2GB of RAM and has an 8GB 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 the Administration Manual and the ReadMe.txt text file included in the VA download for more detailed information on deploying the VA using various Hypervisors.

Initial Network Configuration

The IP address, subnet mask, default gateway and DNS settings can be configured in several ways as detailed below:

Method 1 - Using the Network Setup Wizard at the console

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

Method 2 - Using the WebUI

Using a browser, connect to the WebUI on the default IP address/port: **https://192.168.2.21:9443**

To set the IP address & subnet mask, use: *Local Configuration > Network Interface Configuration*

To set the default gateway, use: *Local Configuration > Routing*

To configure DNS settings, use: *Local Configuration > Hostname & DNS*

Accessing the Web User Interface (WebUI)

1. Browse to the following URL: **https://192.168.2.21:9443/lbadmin/**

   (replace with your IP address if it's been changed)

   ** Note the port number → 9443*

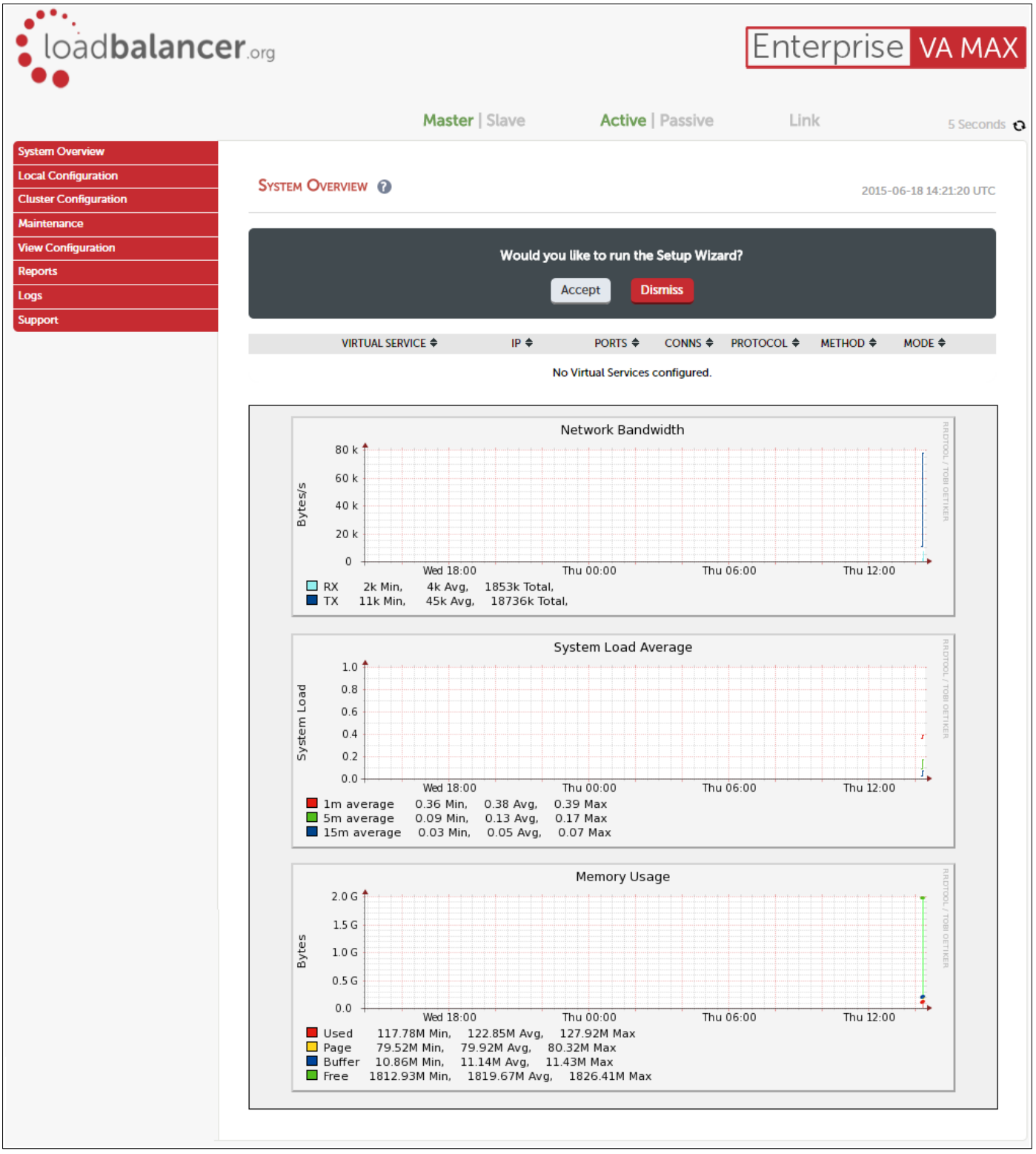
2. Login to the WebUI:

Username: loadbalancer

Password: loadbalancer

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

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



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 slave unit is covered in section 2 of the appendix on page 24.

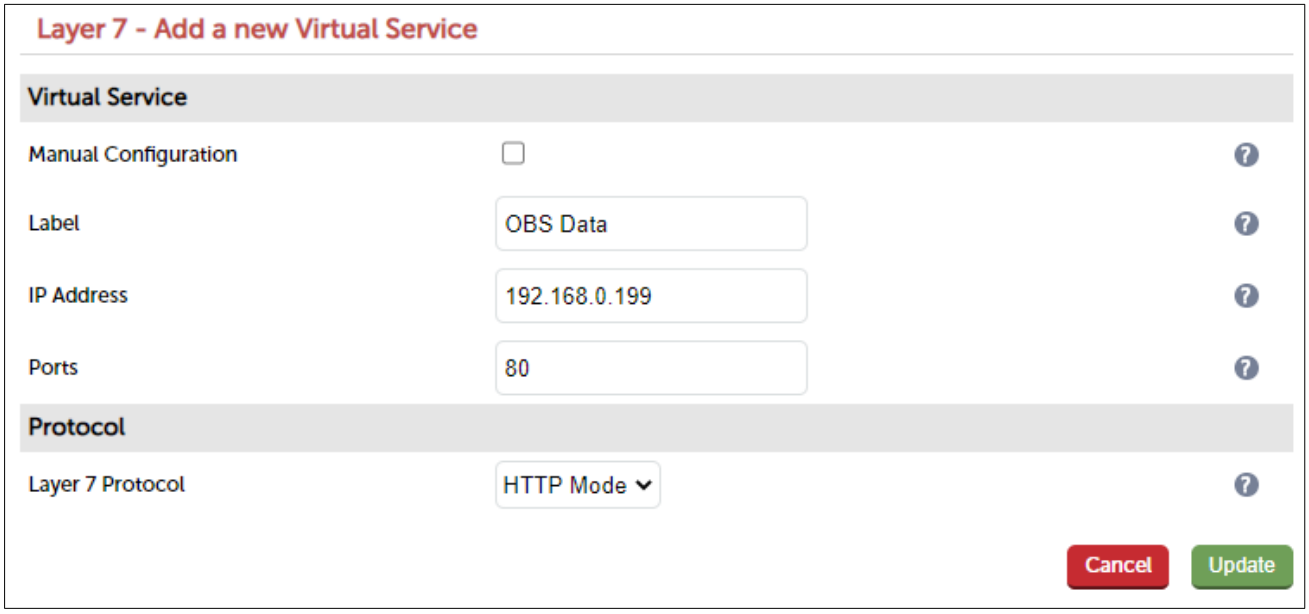
7. Appliance & VPSA Node Configuration

Appliance Configuration

Configuring VIP1 – OBS Data

a) Setting up the Virtual Service (VIP)

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

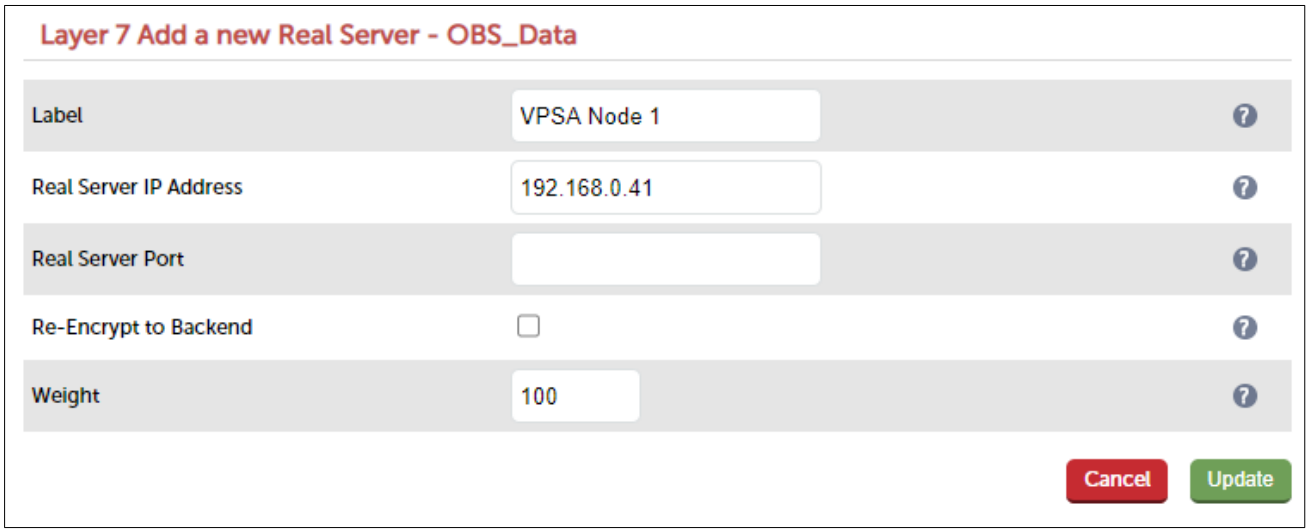


3. Enter an appropriate label (name) for the VIP, e.g. **OBS Data**
4. Set the *Virtual Service IP* address field to the required IP address, e.g. **192.168.0.199**
5. Set the *Virtual Service Ports* field to **80**
6. Set *Protocol* to **HTTP mode**
7. Click **Update**
8. Click **Modify** next to the newly created VIP
9. Set *Persistence Mode* to **None**
10. Set *Health Checks* to **Negotiate HTTP (GET)**
11. Set the *Request to send* to **/healthcheck**
12. Click *Advanced* and set the *Check Port* to **80**
13. Under the *Other* section click ***Advanced***
14. Under *Timeout* check the box
15. Set the *Client Timeout* and *Real Server Timeout* to **50000**

16. Click **Update**

b) Setting up the 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 OBS Data VIP
2. Enter the following details:

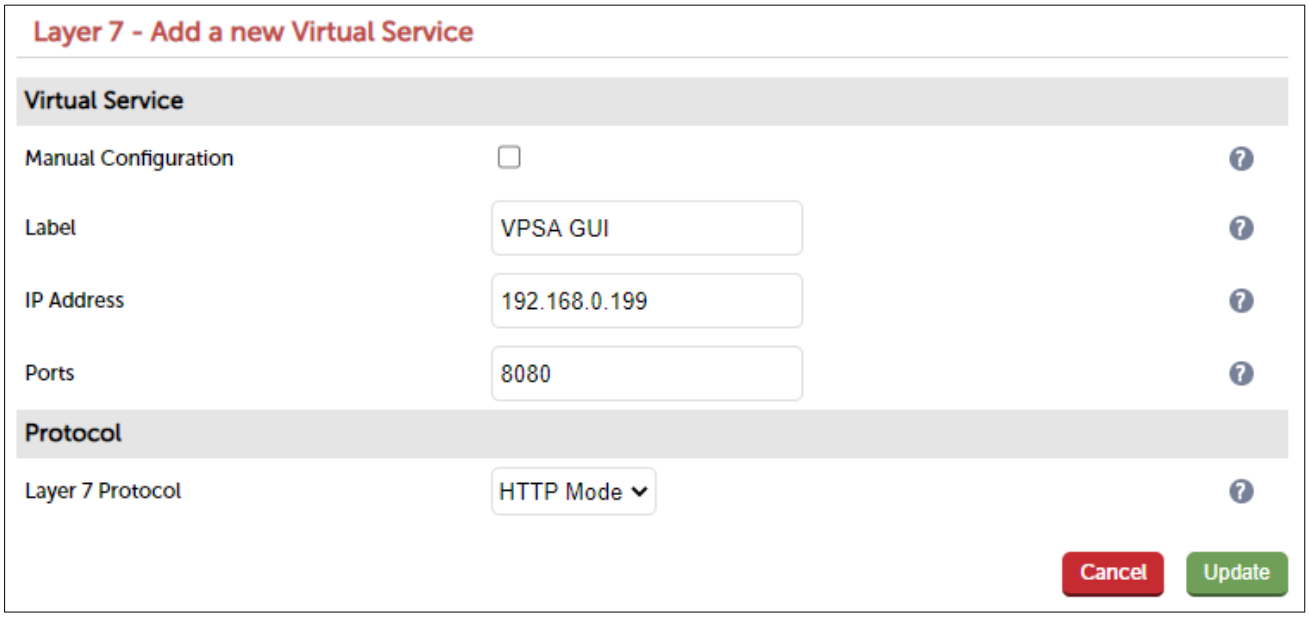


3. Enter an appropriate label (name) for the RIP, e.g. **VPSA Node 1**
4. Set the *Real Server IP Address* field to the IP address of the VPSA node 1
5. Click **Update**
6. Repeat these steps to add additional VPSA nodes as real servers as required

Configuring VIP2 – VPSA GUI

a) Setting up the Virtual Service (VIP)

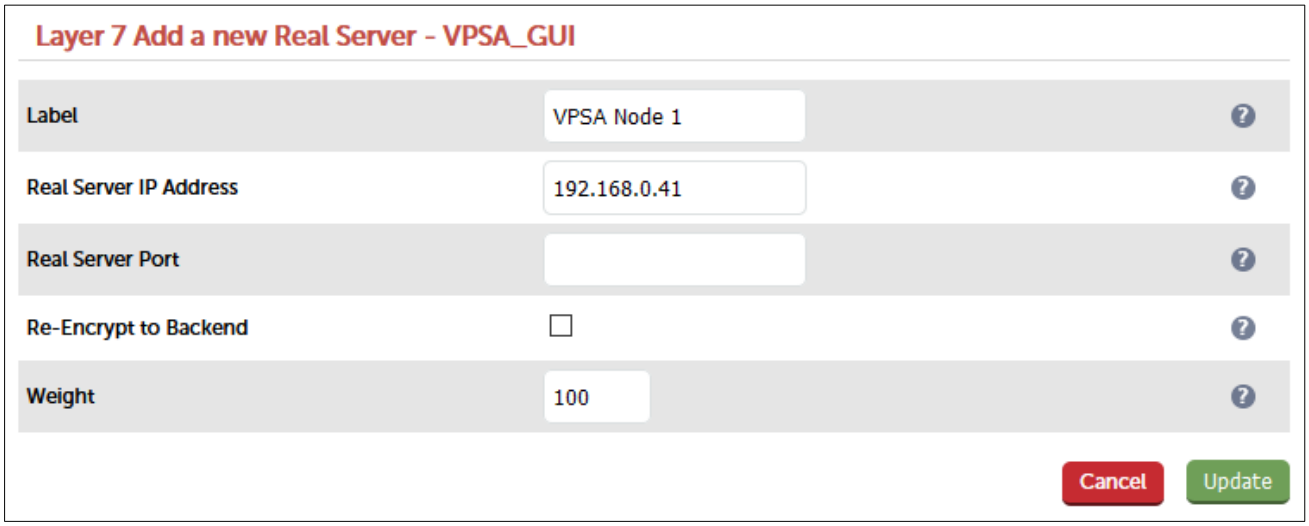
1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**
2. Enter the following details:



3. Enter an appropriate label (name) for the VIP, e.g. **VPSA GUI**
4. Set the *Virtual Service IP* address field to the required IP address, e.g. **192.168.0.199**
5. Set the *Virtual Service Ports* field to **8080**
6. Set *Protocol* to **HTTP Mode**
7. Click **Update**
8. Click **Modify** next to the newly created VIP
9. Set *Persistence Mode* to **None**
10. Set *Health Checks* to **Negotiate HTTP (HEAD)**
11. Set the *Request to send* to **/healthcheck**
12. Click *Advanced* and set the *Check Port* to **8080**
13. Under the *Other* section click ***Advanced***
14. Under *Timeout* check the box
15. Set the *Client Timeout* and *Real Server Timeout* to **50000**
16. Click **Update**

b) Setting up the 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 VPSA Cluster VIP
2. Enter the following details:

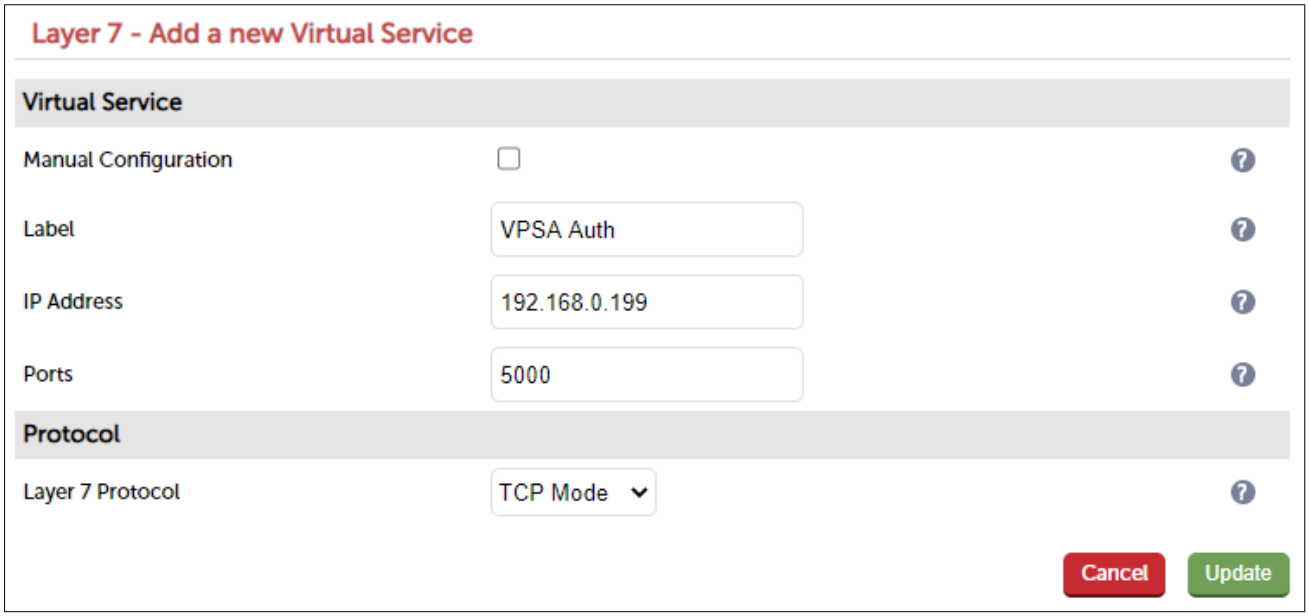


3. Enter an appropriate label (name) for the RIP, e.g. **VPSA Node 1**
4. Set the *Real Server IP Address* field to the IP address of the VPSA node 1
5. Click **Update**
6. Repeat these steps to add additional VPSA nodes as real servers as required

Configuring VIP 3 – VPSA Authentication

a) Setting up the Virtual Service (VIP)

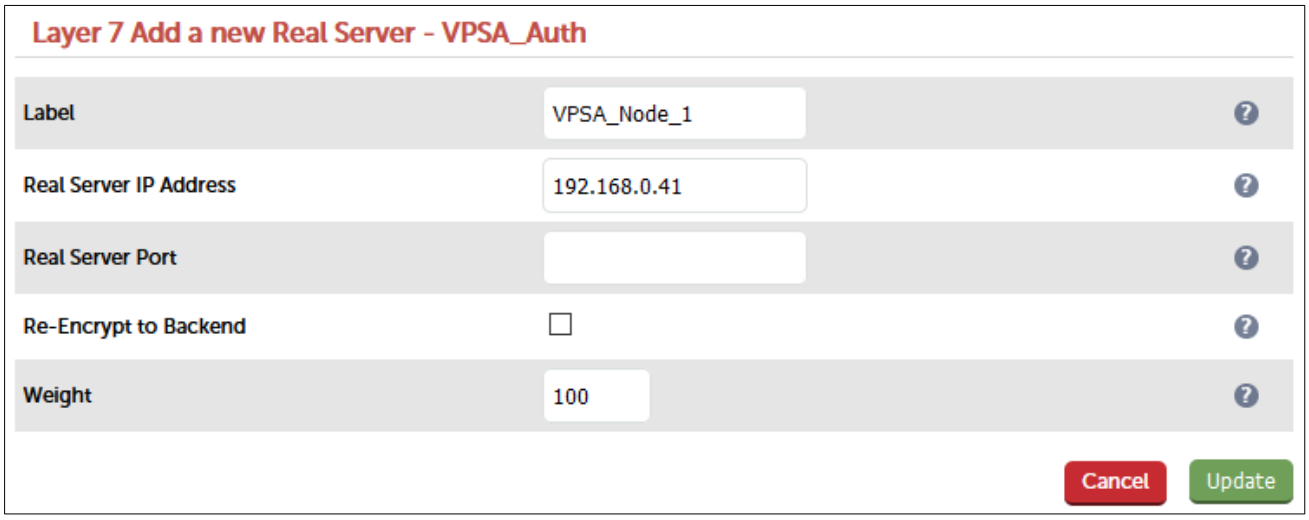
1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**
2. Enter the following details:



3. Enter an appropriate label (name) for the VIP, e.g. **VPSA Auth**
4. Set the *Virtual Service IP* address field to the required IP address, e.g. **192.168.0.199**
5. Set the *Virtual Service Ports* field to **5000**
6. Leave *Protocol* set to **TCP**
7. Click **Update**
8. Click **Modify** next to the newly created VIP
9. Set *Persistence Mode* to **None**
10. Set *Health Checks* to **Connect to Port**
11. Click **Update**

b) Setting up the 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 VPSA Cluster VIP
2. Enter the following details:



3. Enter an appropriate label (name) for the RIP, e.g. **VPSA Node 1**
4. Set the *Real Server IP Address* field to the IP address of the VPSA node 1
5. Click **Update**
6. Repeat these steps to add additional VPSA nodes as real servers as required

8. Additional Configuration Options & Settings

SSL Termination

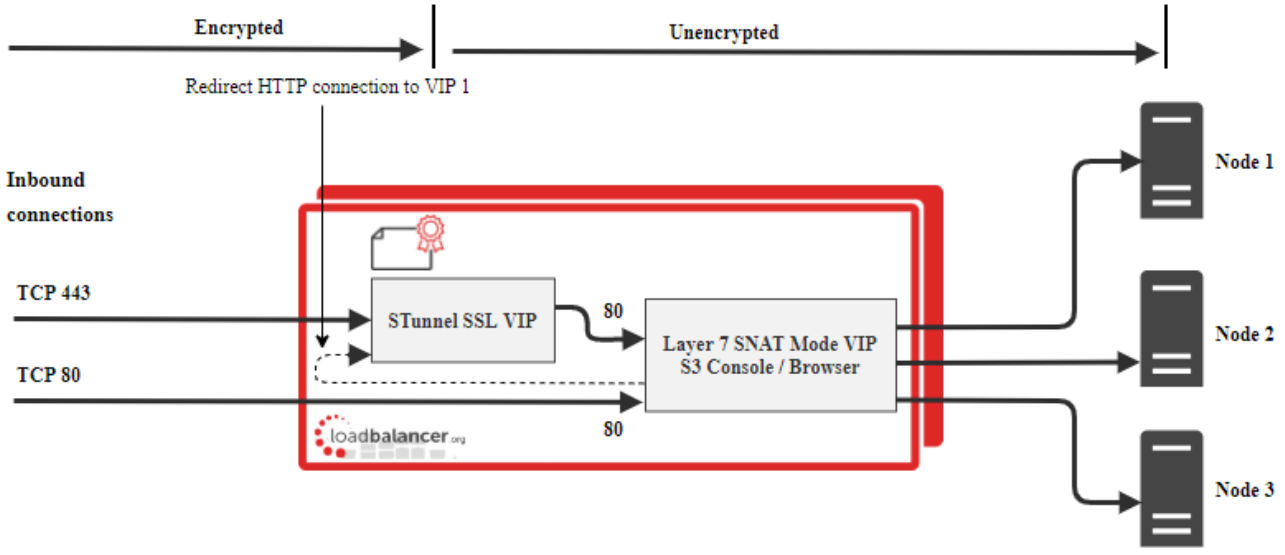
SSL termination can be handled in the following ways:

1. On the Real Servers - aka SSL Pass-through
2. On the load balancer – aka SSL Offloading
3. On the load balancer with re-encryption to the backend servers – aka SSL Bridging

Note:

- SSL termination on the load balancer can be very CPU intensive.
- By default, a self-signed certificate is used for the new SSL VIP. Certificates can be requested on the load balancer or uploaded as described in the section below. The default self-signed certificate can be regenerated if needed using the WebUI menu option: SSL Certificate and clicking the **Regenerate Local SSL Certificate button**.
- The backend for the SSL VIP can be either a Layer 7 SNAT mode VIP or a Layer 4 NAT or SNAT mode VIP. Layer 4 DR mode cannot be used since stunnel acts as a proxy, and the VPSA node servers see requests with a source IP address of the VIP. However, since the VPSA node servers believe that they own the VIP (due to the loopback adapter configured to handle to ARP problem) they are unable to reply to stunnel.

SSL Termination on the load balancer - SSL Offloading



In this case, an SSL VIP utilizing stunnel is configured on the appliance and an SSL certificate is uploaded and associated to the Virtual Service. Data is encrypted from the client to the load balancer, but is un-encrypted from the load balancer to the backend servers as shown above.

Certificates

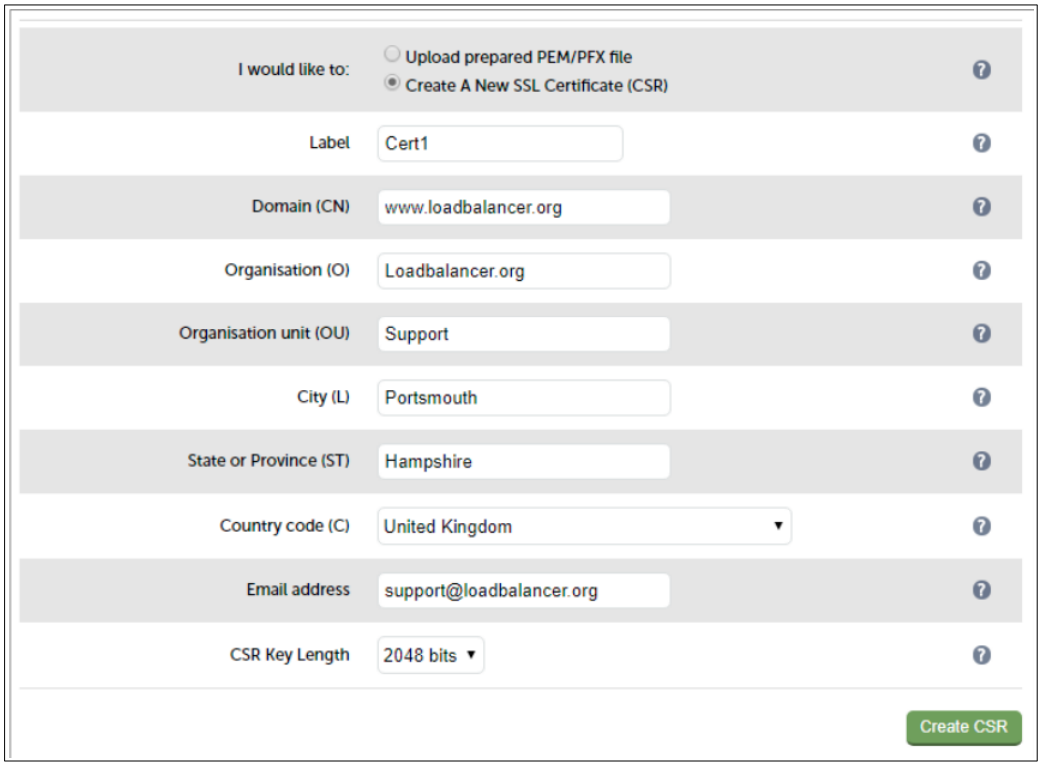
If you already have an SSL certificate in either PFX or PEM file format, this can be uploaded to the Load balancer using the certificate upload option as explained on page 17. Alternatively, you can create a Certificate Signing Request (CSR) and send this to your CA to create a new certificate.

Generating a CSR on the Load Balancer

CSR's can be generated on the load balancer to apply for a certificate from your chosen CA.

To generate a CSR:

1. Using the WebUI, navigate to: Cluster Configuration > SSL Certificates
2. Click **Add a new SSL Certificate** & select Create a New SSL Certificate (CSR)



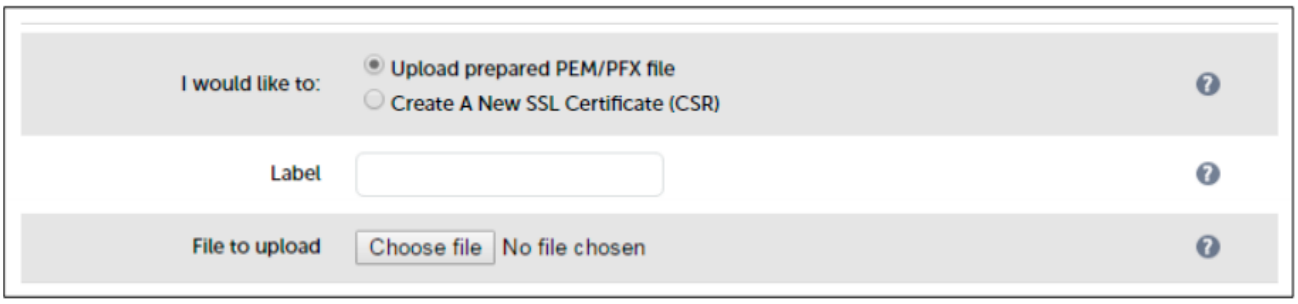
3. Enter a suitable label (name) for the certificate, e.g. **Cert1**
4. Populate the remaining fields according to your requirements
5. Once all fields are complete click **Create CSR**
6. To view the CSR click **Modify** next to the new certificate, then expand the Certificate Signing Request (CSR) section
7. Copy the CSR and send this to your chosen CA
8. Once received, copy/paste your signed certificate into the Your Certificate section
9. Intermediate and root certificates can be copied/pasted into the Intermediate Certificate and Root Certificate sections as required
10. Click **Update** to complete the process

Uploading Certificates

If you already have a certificate in either PEM or PFX format, this can be uploaded to the load balancer.

To upload a Certificate:

1. Using the WebUI, navigate to: Cluster Configuration > SSL Certificates
2. Click **Add a new SSL Certificate** & select Upload prepared PEM/PFX file



3. Enter a suitable Label (name) for the certificate, e.g. **Cert1**
4. Browse to and select the certificate file to upload (PEM or PFX format)
5. Enter the password , if applicable
6. Click **Upload Certificate**, if successful, a message similar to the following will be displayed:

Note: It's important to backup all of your certificates. This can be done via the WebUI from *Maintenance > Backup & Restore > Download SSL Certificates.*

Configuring SSL Termination on the Load Balancer

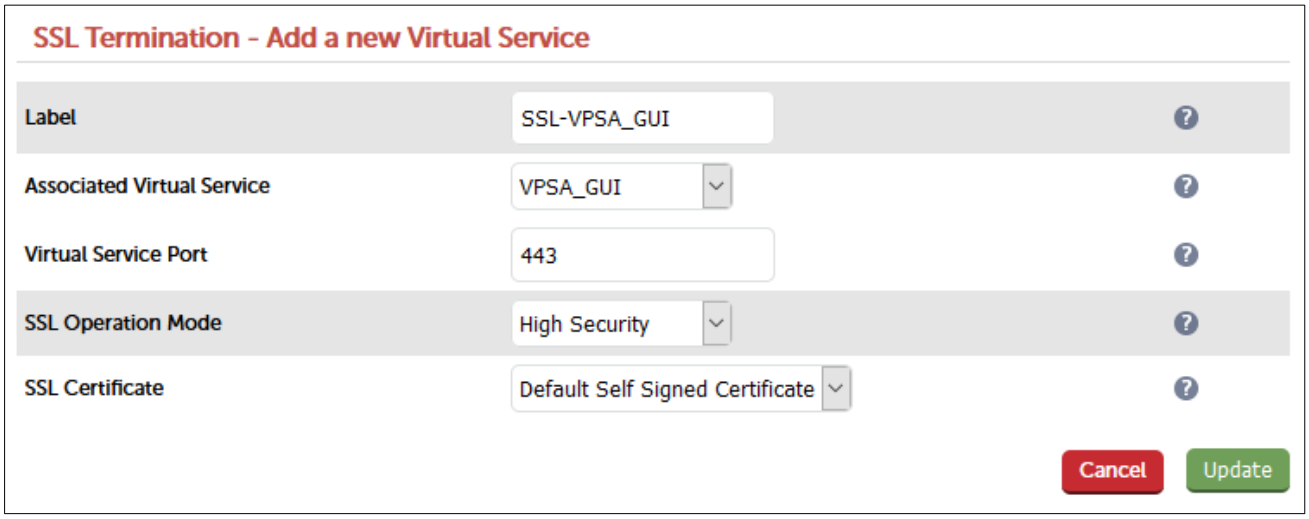
To configure an *SSL VIP* the steps are outlined below:

- Configure SSL termination for the VPSA GUI and OBS Data VIP

Configure SSL Termination

For v8.3.3 and later:

1. Using the WebUI, navigate to *Cluster Configuration > SSL Termination* and click **Add a new Virtual Service**



2. Set *Associated Virtual Service* to the appropriate VIP, e.g. **VPSA_GUI**. This will automatically fill in the label as the VIP name with SSL inserted in front of the VIP name e.g. **SSL-VPSA_GUI**.

> Note: The Associated Virtual Service drop-down is populated with all single port, standard (i.e. non-manual) Layer 7 VIPs available on the load balancer. Using a Layer 7 VIP for the backend is the recommended method although as mentioned earlier, Layer 4 NAT mode and layer 4 SNAT mode VIPs can also be used if required. To forward traffic from the SSL VIP to these type of VIPs, you'll need to set Associated Virtual Service to **Custom**, then configure the IP address & port of the required VIP.

3. Leave *Virtual Service Port* set to **443**
4. Leave *SSL operation Mode* set to **High Security**
5. Select the required certificate from the *SSL Certificate* drop-down
6. Click **Update**
7. For the **OBS Data VIP**, repeat the above steps and Set *Associated Virtual Service* to **OBS Data**
8. Click **Update**
9. Click **Reload STunnel** when prompted to apply the new settings using the button provided in the blue box

Once configured, HTTP traffic will be load balanced by the Layer 7 SNAT mode VIP and HTTPS traffic will be terminated by the SSL VIP, then passed on to the Layer 7 SNAT mode VIP as unencrypted HTTP for load balancing.

Finalizing The Configuration

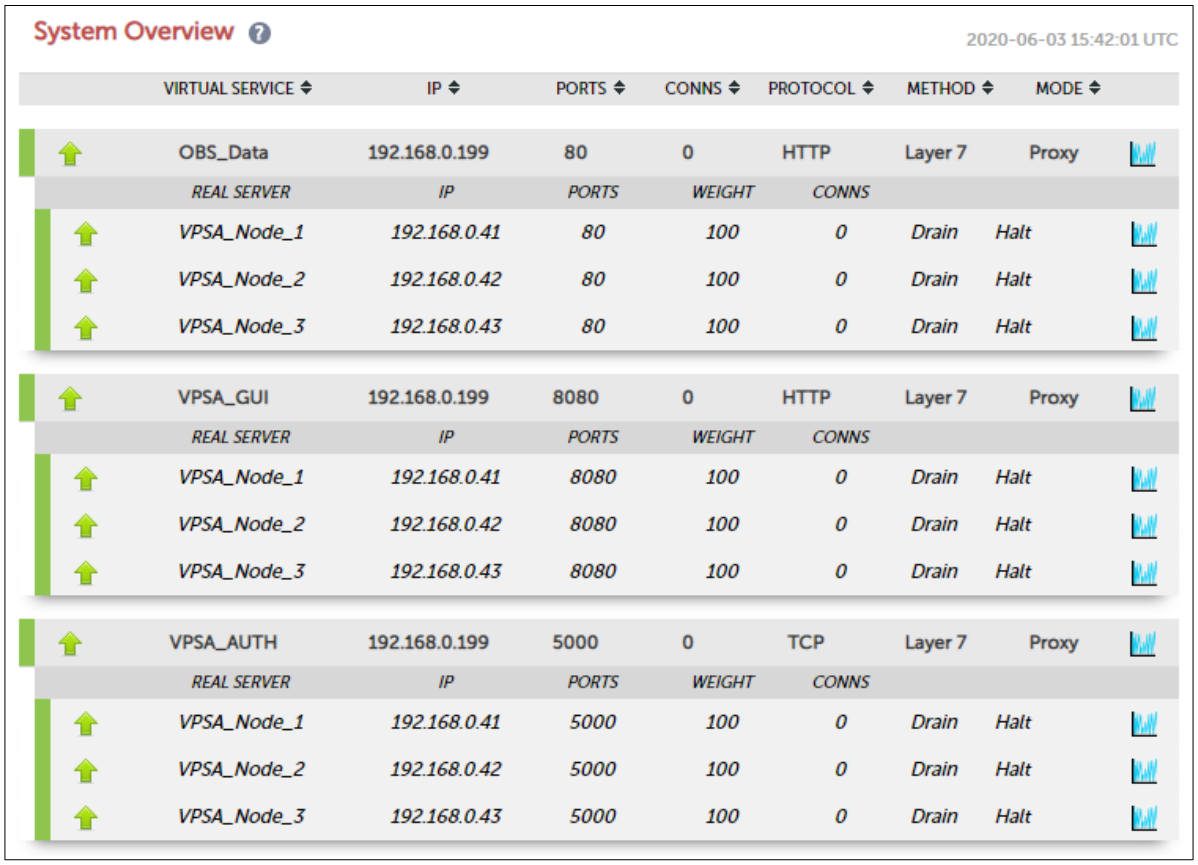
To apply the new settings, HAProxy must be reloaded as follows:

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

9. Testing & Verification

Using System Overview

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



10. Technical Support

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

11. Further Documentation

The Administration Manual contains much more information about configuring and deploying the appliance. It's available here: http://pdfs.loadbalancer.org/loadbalanceradministrationv8.pdf

12. Conclusion

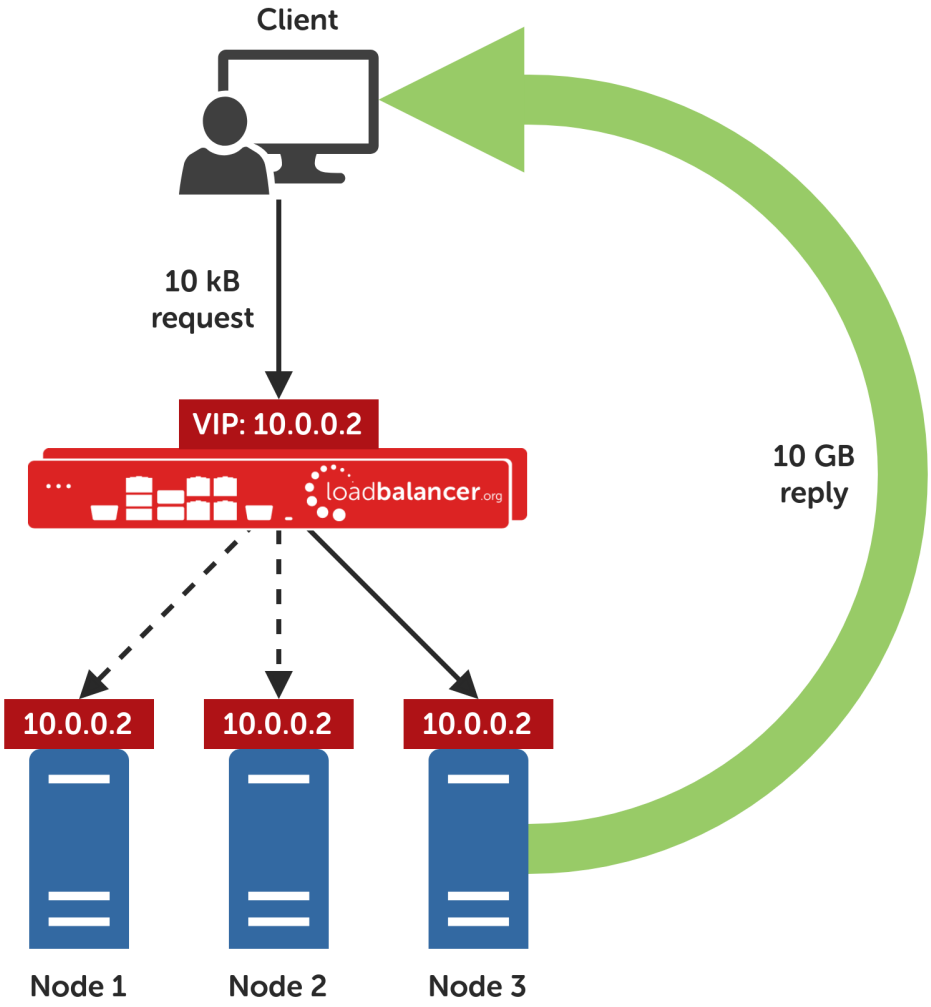
Loadbalancer.org appliances provide a very cost effective solution for highly available load balanced Zadara VPSA Object Storage environments.

13. Appendix

1 – Alternative Load Balancing Method for Read-Intensive Deployments (Direct Routing)

Direct routing, also known as direct server return or DSR, is a method of load balancing. With direct routing, reply traffic flows directly from the back end servers to the clients. In this way, the load balancer is completely bypassed on the return journey for a given connection, thus removing the load balancer as a potential bottleneck for traffic on the return path.

This alternative method of load balancing can benefit read-intensive deployments which feature a large reply traffic to request traffic ratio. For example, consider the scenario where a typical client request is 10 kB in size while a typical reply is 10 GB in size (perhaps file retrieval or video streaming). Direct routing benefits such scenarios: the much larger volume of reply traffic bypasses the load balancer and is *not* limited by the load balancer's network throughput. The reply traffic is instead limited by the total available network bandwidth between the servers and the clients, which is limited only by the underlying infrastructure.



Caveats

There are caveats for using the direct routing load balancing method which should be considered:

- The load balancers must be on the same network segment / switching fabric as the VPSA nodes (due to the fact that this load balancing method works by rewriting MAC addresses, i.e. operates at layer 2 of the OSI model)

- Each VPSA node must own the VIP address so that they can all accept and reply to the load balanced traffic. This address should be assigned to a loopback network adaptor
- Each VPSA node must be configured to not reply to ARP requests for the VIP address or advertise that they own the address

For guidance on configuring the VPSA nodes for direct routing, in the context of the caveats described above, please consult with the Zadara team or Support.

Appliance Configuration For Zadara VPSA Nodes – Using Layer 4 DR Mode (Direct Routing)

Configuring VIP 1 – OBS Data

Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 4 – Virtual Services* and click on **Add a new Virtual Service**
2. Define the *Label* for the virtual service as required, e.g. **OBS_Data**
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.0.167**
4. Set the *Ports* field to **80**
5. Leave the *Protocol* set to **TCP**
6. Leave the *Forwarding Method* set to **Direct Routing**
7. Click **Update** to create the virtual service
8. Click **Modify** next to the newly created VIP
9. Ensure that the *Persistence Enable* checkbox is unchecked
10. Set the *Health Checks Check Type* to **Negotiate**
11. Set the *Check Port* to **80**
12. Set the *Protocol* to **HTTP**
13. Set the *Request to send* to **/healthcheck**
14. Click **Update**

Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 4 – Real Servers* and click on **Add a new Real Server** next to the newly created VIP
2. Define the *Label* for the real server as required, e.g. **VPSA-node1**
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.0.41**
4. Click **Update**
5. Repeat these steps to add additional VPSA nodes as real servers as required

Configuring VIP 2 – VPSA GUI

Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 4 – Virtual Services* and click on **Add a new Virtual Service**
2. Define the *Label* for the virtual service as required, e.g. **VPSA_GUI**
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.0.167**
4. Set the *Ports* field to **8080,**
5. Leave the *Protocol* set to **TCP**
6. Leave the *Forwarding Method* set to **Direct Routing**
7. Click **Update** to create the virtual service
8. Click **Modify** next to the newly created VIP
9. Ensure that the *Persistence Enable* checkbox is unchecked
10. Set the *Health Checks Check Type* to **Negotiate**
11. Set the *Check Port* to **8080**
12. Set the *Protocol* to **HTTP**
13. Set the *Request to send* to **/healthcheck**
14. Click **Update**

Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 4 – Real Servers* and click on **Add a new Real Server** next to the newly created VIP
2. Define the *Label* for the real server as required, e.g. **VPSA-node1**
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.0.41**
4. Click **Update**
5. Repeat these steps to add additional VPSA nodes as real servers as required

Configuring VIP 3 – VPSA Authentication

Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 4 – Virtual Services* and click on **Add a new Virtual Service**
2. Define the *Label* for the virtual service as required, e.g. **VPSA_Auth**
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.0.167**
4. Set the *Ports* field to **5000,**
5. Leave the *Protocol* set to **TCP**
6. Leave the *Forwarding Method* set to **Direct Routing**

7. Click **Update** to create the virtual service
8. Click **Modify** next to the newly created VIP
9. Ensure that the *Persistence Enable* checkbox is unchecked
10. Click **Update**

Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 4 – Real Servers* and click on **Add a new Real Server** next to the newly created VIP
2. Define the *Label* for the real server as required, e.g. **VPSA-node1**
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.0.41**
4. Click **Update**
5. Repeat these steps to add additional VPSA nodes as real servers as required

2 – Clustered Pair Configuration – Adding a Slave Unit

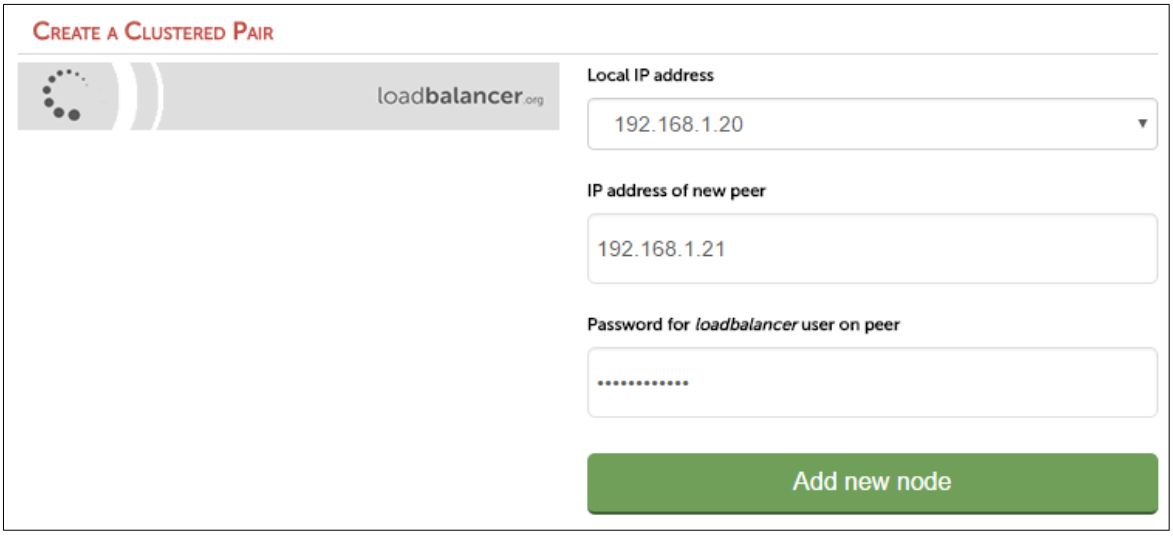
If you initially configured just the master unit and now need to add a slave - our recommended procedure, please refer to the relevant section below for more details:

Note: A number of settings are not replicated as part of the master/slave pairing process and therefore must be manually configured on the slave appliance. These are listed below:

- Hostname & DNS settings
- Network settings including IP addresses, bonding configuration and VLANs
- Routing configuration including default gateways and static routes
- Date & time settings
- Physical – Advanced Configuration settings including Internet Proxy IP address & port, Firewall table size, SMTP relay and Syslog server
- SNMP settings
- Graphing settings
- Firewall Script & Firewall Lockdown Script settings
- Software updates

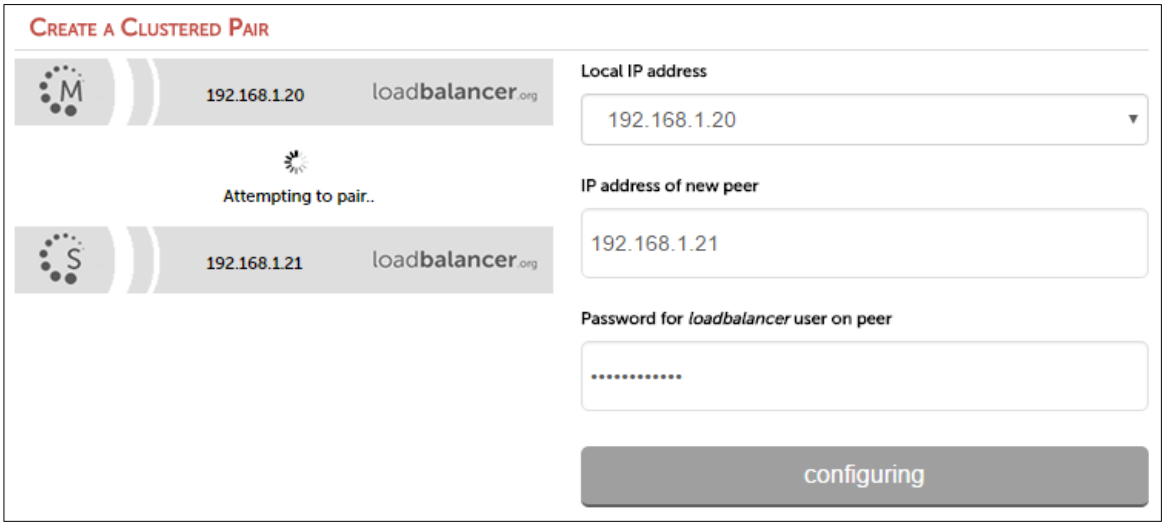
To add a slave node – i.e. create a highly available clustered pair:

- Deploy a second appliance that will be the slave and configure initial network settings
- Using the WebUI, navigate to: *Cluster Configuration > High-Availability Configuration*

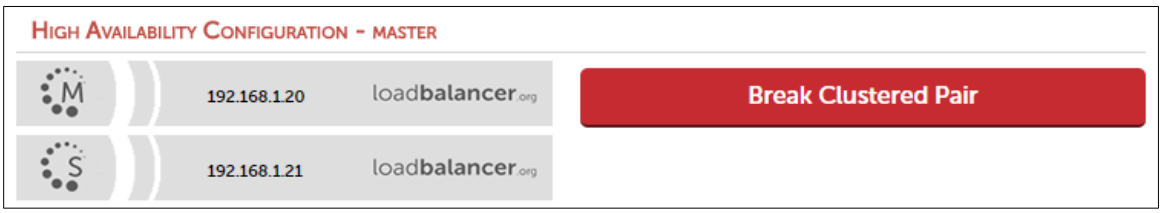


- Specify the IP address and the *loadbalancer* users password (the default is 'loadbalancer') for the slave (peer) appliance as shown above
- Click **Add new node**

- The pairing process now commences as shown below:



- Once complete, the following will be displayed:



- To finalize the configuration, restart heartbeat and any other services as prompted in the blue message box at the top of the screen

Note: Clicking the Restart Heartbeat button on the master appliance will also automatically restart heartbeat on the slave appliance.

Note: Please refer to chapter 9 – Appliance Clustering for HA in the Administration Manual for more detailed information on configuring HA with 2 appliances.

14. Document Revision History

Version	Date	Change	Reason for Change	Changed By
1.0.0	1 April 2020	Initial version		IBG
1.0.1	3 June 2020	VIP Configuration New title page Updated Canadian contact details	Added new OBS data vip and SSL termination Branding update Change to Canadian contact details	IBG, AH

About Loadbalancer.org

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

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