LOADBALANCER

DEPLOYMENT GUIDE

Load Balancing NextGen Connect (Mirth)

Version 1.2.0

Table of Contents

1. About this Guide

This guide details the steps required to configure a load balanced NextGen Connect environment utilizing Loadbalancer.org appliances.

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 NextGen Connect. 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. NextGen Connect

- All versions

4. Load Balancing NextGen Connect

NextGen Connect, formerly known as Mirth Connect, is a cross-platform interface engine used in the healthcare industry. It enables the management of information using bi-directional sending of many types of messages. Like an interpreter who translates foreign languages into the one you understand, NextGen Connect Integration Engine translates message standards into the one your system understands. Whenever a "foreign" system sends you a message, NextGen Connect Integration Engine's integration capabilities expedite the following:

- Filtering – NextGen Connect Integration Engine reads message parameters and passes the message to or stops it on its way to the transformation stage
- Transformation – NextGen Connect Integration Engine converts the incoming message standard to another standard (e.g., HL7 to XML)
- Extraction – NextGen Connect Integration Engine can "pull" data from and "push" data to a database
- Routing – NextGen Connect Integration Engine makes sure messages arrive at their assigned destinations

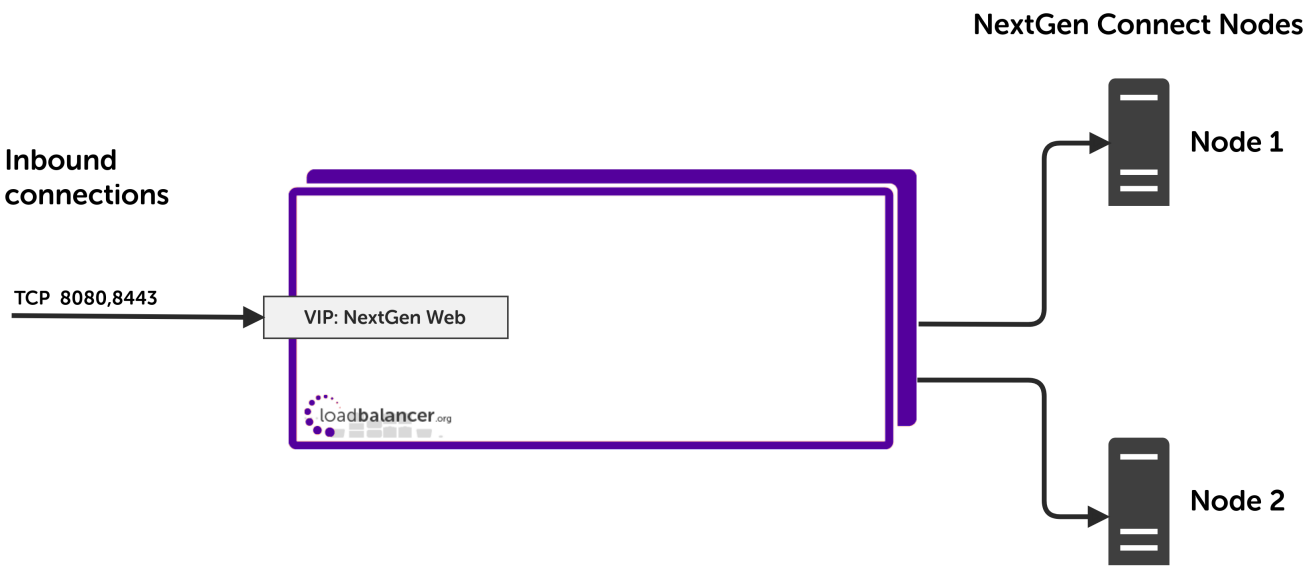
4.1. Ports Requirements

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

Port	Protocols	Use
8080	TCP/HTTP	Web based access to Mirth Connect
8443	TCP/HTTPS	Secure web based access to the Mirth Connect

4.1.1. Load Balancer Deployment

When the NextGen Connect 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 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 Configuring HA - Adding a Secondary Appliance for more details on configuring a clustered pair.

4.2. Virtual Service (VIP) Requirements

To provide load balancing for NextGen Connect nodes one VIP is required:

- **VIP 1:** NextGen-HTTP(S)

4.3. Deployment Mode

We recommend using Layer 7 as no network changes are required and SSL termination with re-encryption 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 NextGen Connect nodes can log for troubleshooting issues while seeing the true source IP address of connecting clients.

5. Loadbalancer.org Appliance – the Basics

5.1. 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.

5.2. 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.

5.3. 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

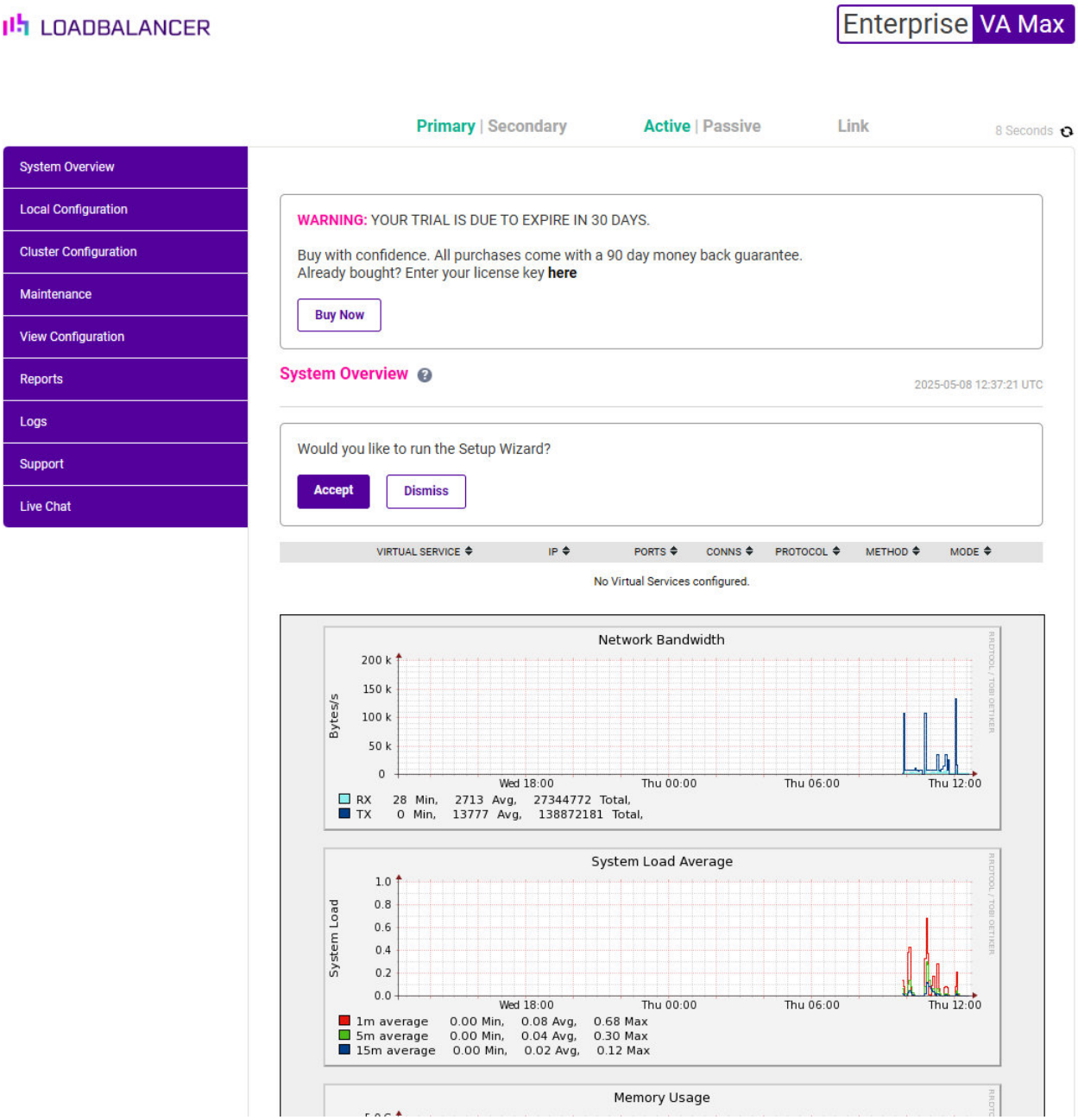
refer to Service Socket Addresses.

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.

5.3.1. 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

5.4. Appliance Software Update

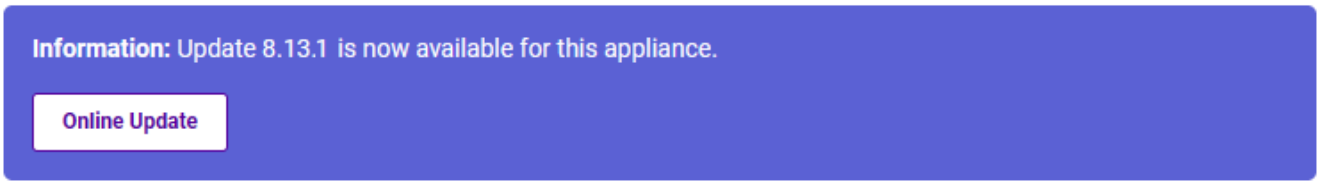
We recommend that the appliance is kept up to date to ensure that you benefit from the latest bug fixes, security updates and feature improvements. Both online and offline update are supported.

> **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.

5.4.1. Online Update

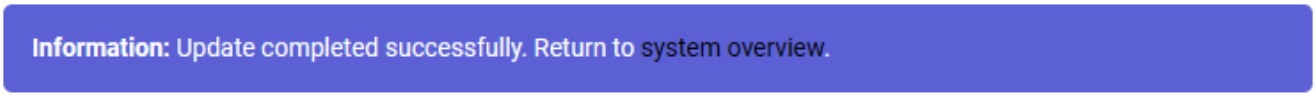
The appliance periodically contacts the Loadbalancer.org update server (**update.loadbalancer.org**) and checks for updates. This is the default behavior and can be disabled if preferred. If an update is found, a notification similar to the example below will be displayed at the top of the WebUI:



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.

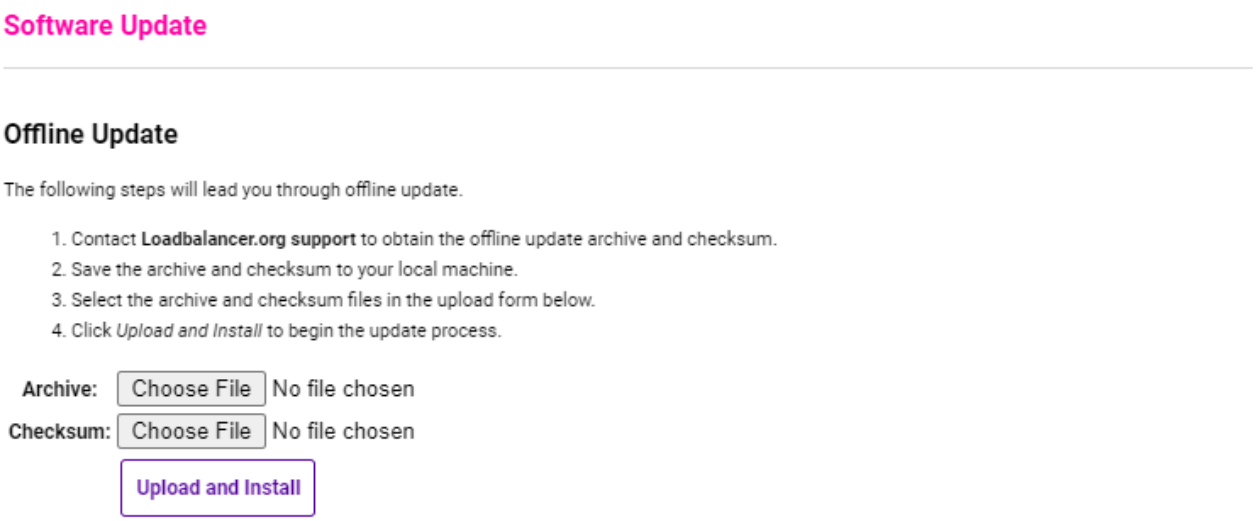
5.4.2. Offline Update

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.

5.5. 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

Protocol	Port	Purpose
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.

5.6. HA Clustered Pair Configuration

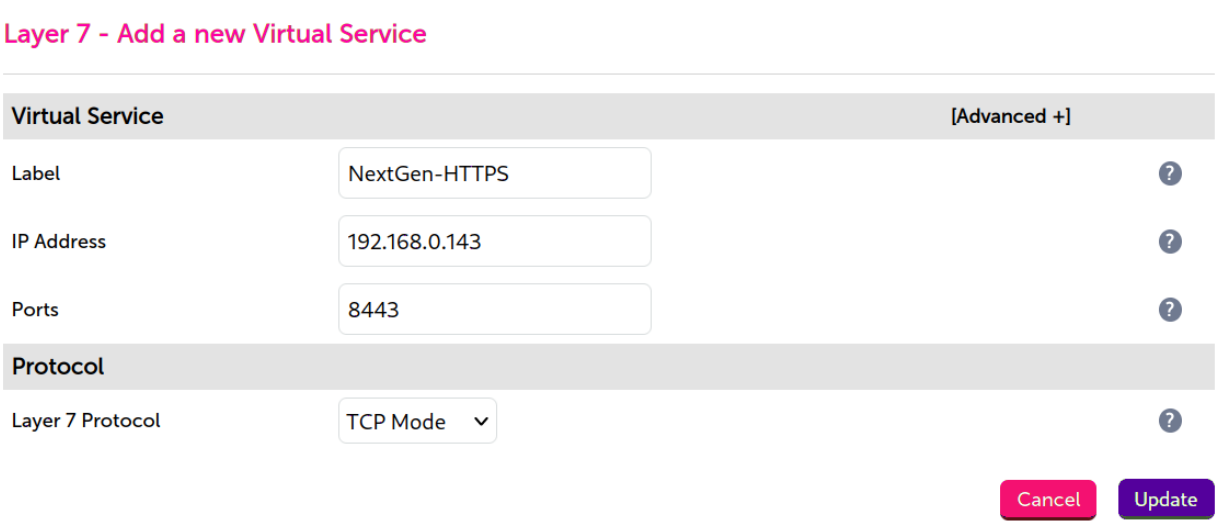
Loadbalancer.org recommend that load balancer appliances are deployed in pairs for high availability. In this guide a single unit is deployed first, adding a secondary unit is covered in Configuring HA - Adding a Secondary Appliance.

6. Appliance Configuration for NextGen Connect

6.1. Configuring VIP1 – NextGen-HTTPS

6.1.1. a) Setting up the Virtual Service (VIP)

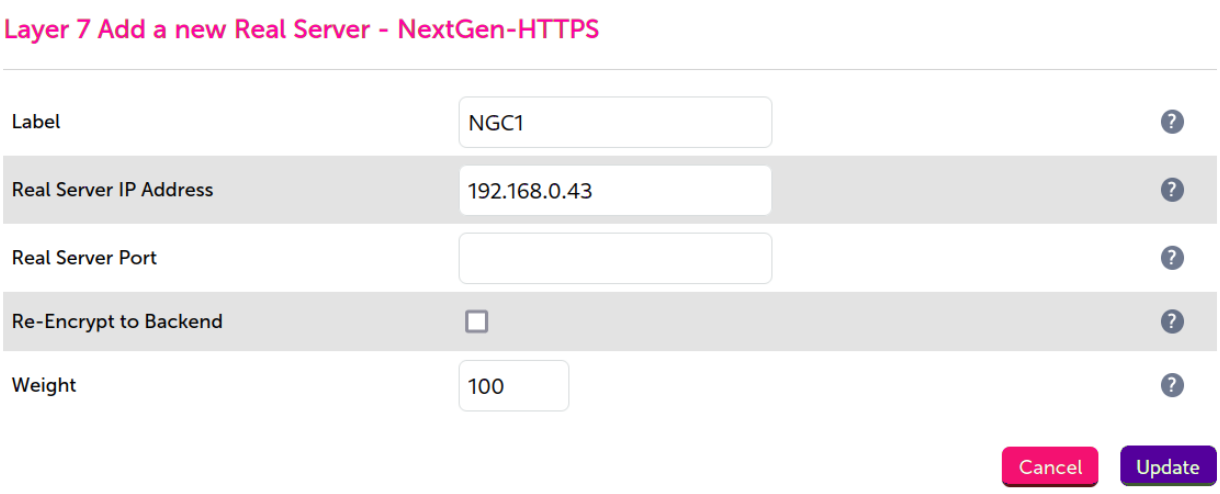
1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click **Add a new Virtual Service**.
2. Enter the following details:



3. Enter an appropriate label (name) for the VIP, e.g. **NextGen-HTTPS**.
4. Set the *Virtual Service IP* address field to the required IP address, e.g. **192.168.0.143**.
5. Set the *Virtual Service Ports* field to **8443**.
6. Set *Protocol* to **TCP Mode**.
7. Click **Update**.
8. Click **Modify** next to the newly created VIP.
9. Set *Persistence Mode* to **Source IP**.
10. Set *Health Checks* to **Negotiate HTTPS (HEAD)**.
11. Under the *Other* section click ***Advanced***.
12. Under *Timeout* check the box.
13. Set the *Client Timeout* and *Real Server Timeout* to **5m**.
14. Click **Update**.

6.1.2. 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 NextGen-HTTPS VIP.
2. Enter the following details:



3. Enter an appropriate label (name) for the RIP, e.g. **NGC1**.
4. Set the *Real Server IP Address* field to the IP address of the NextGen Connect node, e.g. **192.168.0.43**.
5. Click **Update**.
6. Repeat these steps to add additional NextGen Connect nodes as real servers as required.

6.2. 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**.

7. Additional Configuration Options & Settings

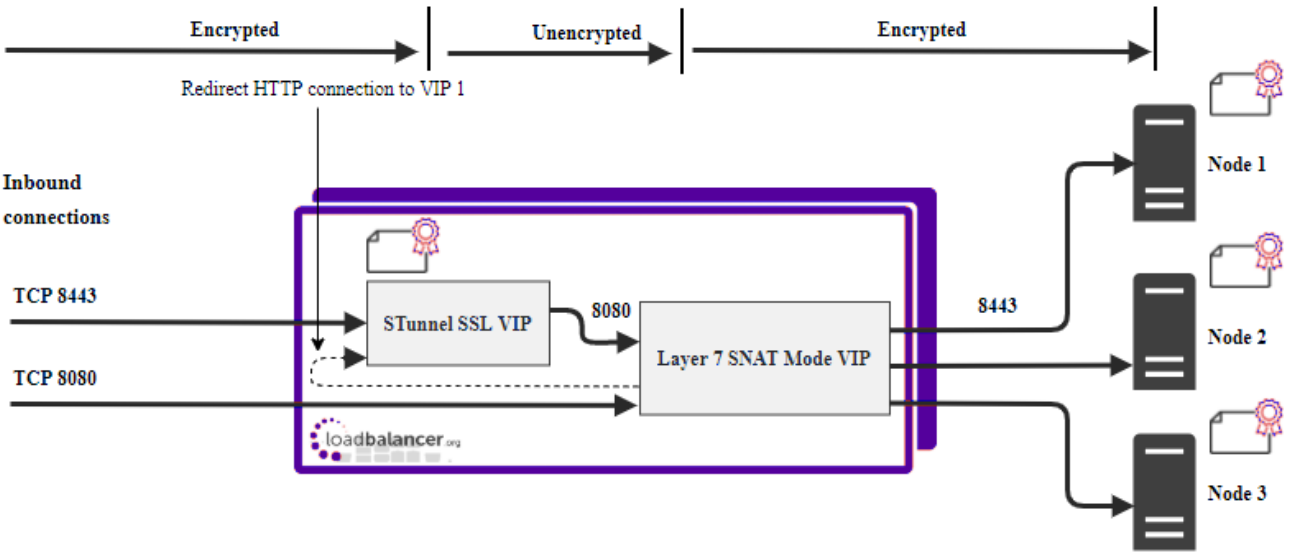
7.1. SSL Termination

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 Default Self Signed 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 NextGen Connect node servers see requests with a source IP address of the VIP. However, since the NextGen Connect 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. In the context of a NextGen Connect deployment *only **SSL Bridging** is an accepted configuration*. ***Force to HTTPS*** is not compatible with NextGen Connect nodes and therefore should be disabled.

7.2. SSL Termination on the load balancer - SSL Bridging



In this case an STunnel SSL Virtual Service is defined 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 and is also encrypted from the load balancer to the backend servers as shown above.

7.2.1. Certificates

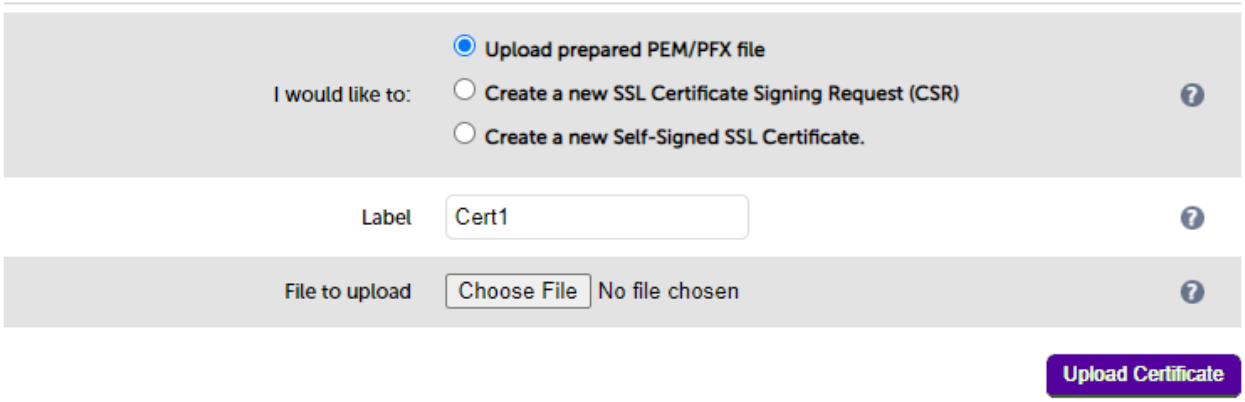
If you already have an SSL certificate in either PFX or PEM file format, this can be uploaded to the Load balancer using the certificate upload option as explained below in Uploading Certificates. Alternatively, you can create a Certificate Signing Request (CSR) on the load balancer and send this to your CA to create a new certificate. For more information please refer to Generating a CSR on the Load Balancer.

7.2.2. 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:.

Information: cert1 SSL Certificate uploaded successfully.

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

7.3. Configuring SSL Termination on the Load Balancer

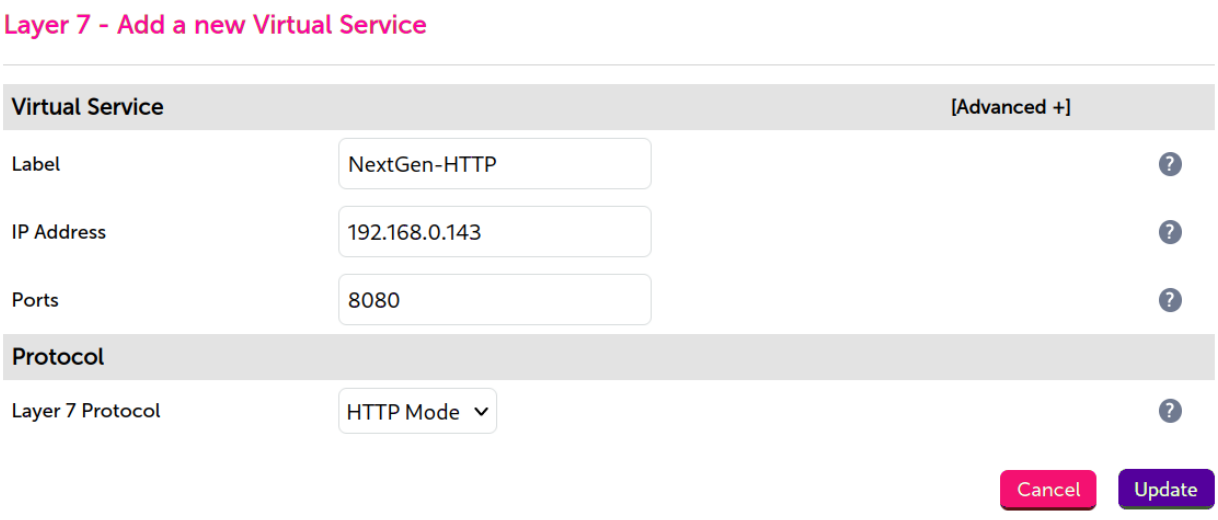
To configure SSL termination for NextGen:

1. Configure a layer 7 HTTP mode VIP to handle HTTP traffic
2. Configure SSL termination to handle HTTPS traffic

7.4. 1) Configuring a Layer 7 HTTP mode VIP

7.4.1. 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:

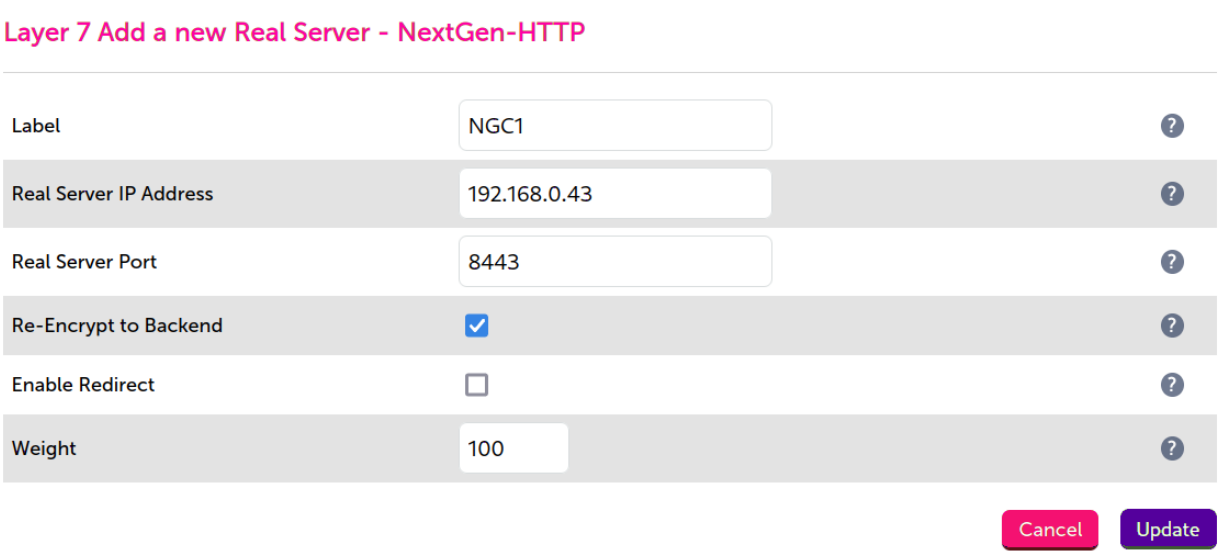


3. Enter an appropriate label (name) for the VIP, e.g. **NextGen-HTTP**.
4. Set the *Virtual Service IP* address field to the required IP address, e.g. **192.168.0.200**.
5. Set the *Virtual Service Ports* field to **8080**.

6. Leave *Protocol* set to **HTTP Mode**.
7. Click **Update**.
8. Click **Modify** next to the newly created VIP.
9. Set *Persistence Mode* to **HTTP Cookie and Source IP**.
10. Set *Health Checks* to **Negotiate HTTPS (HEAD)**.
11. Click **Advanced**.
12. Set *Check Port* to **8443**.
13. Under *SSL* check **Enable Backend Encryption**.
14. Under the *Other* section click ***Advanced***.
15. Under *Timeout* check the box.
16. Set the *Client Timeout* and *Real Server Timeout* to **5m**.
17. Click **Update**.

7.4.2. b) Setting up the Real Servers (RIPs)

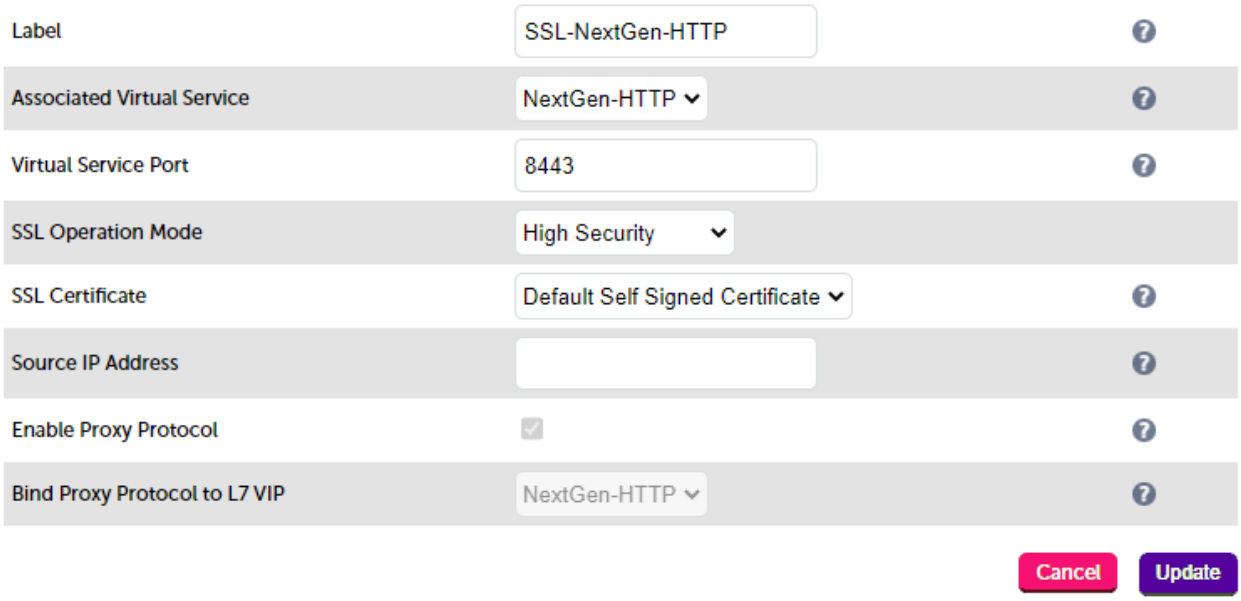
1. Using the WebUI, navigate to *Cluster Configuration > Layer 7 – Real Servers* and click **Add a new Real Server** next to the newly created NextGen-HTTP VIP.
2. Enter the following details:



3. Enter an appropriate label (name) for the RIP, e.g. **NGC1**.
4. Set the *Real Server IP Address* field to the IP address of the NextGen Connect node.
5. Click **Update**.
6. Repeat these steps to add additional NextGen Connect nodes as real servers as required.

7.5. 2) Configure SSL termination

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. **NextGen-HTTP**. This will automatically fill in the label as the VIP name with SSL inserted in front of the VIP name e.g. **SSL-NextGen-HTTP**.

> **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. Set *Virtual Service Port* to **8443**.
4. Leave *SSL operation Mode* set to **High Security**.
5. Select the required certificate from the *SSL Certificate* drop-down.
6. Click **Update**.

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 the use of the HTTP Cookie and Source IP persistence method. The connection is then re-encrypted and forwarded to the real server.

7.6. Finalizing the Configuration

To apply the new settings, HAProxy and STunnel must both be reloaded. This can be done using the buttons 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**.

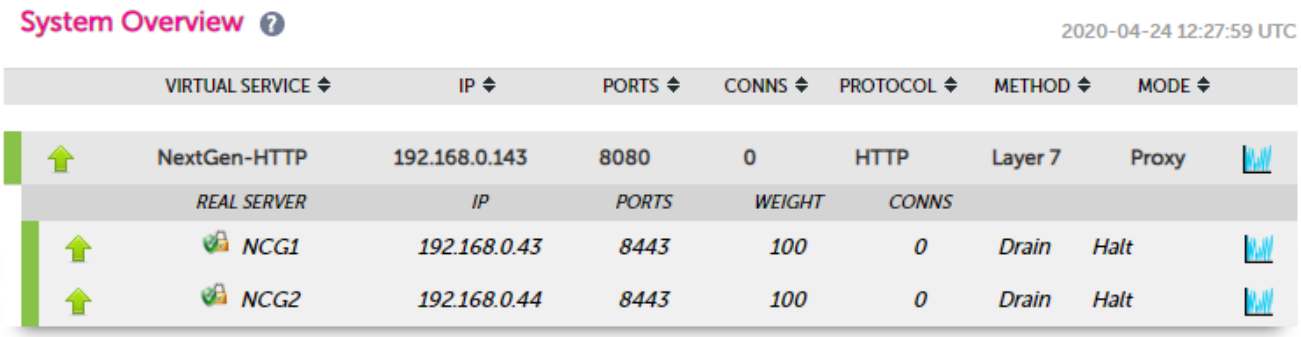
3. Click **Reload STunnel**.

8. Testing & Verification

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

8.1. Using System Overview

The System Overview can be viewed in the WebUI. It shows a graphical view of all VIPs & RIPs (i.e. NextGen-HTTP) 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 NextGen Connect nodes are healthy and available to accept connections.



9. 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.

10. Further Documentation

For additional information, please refer to the Administration Manual.

11. Appendix

11.1. 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.

11.1.1. 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:

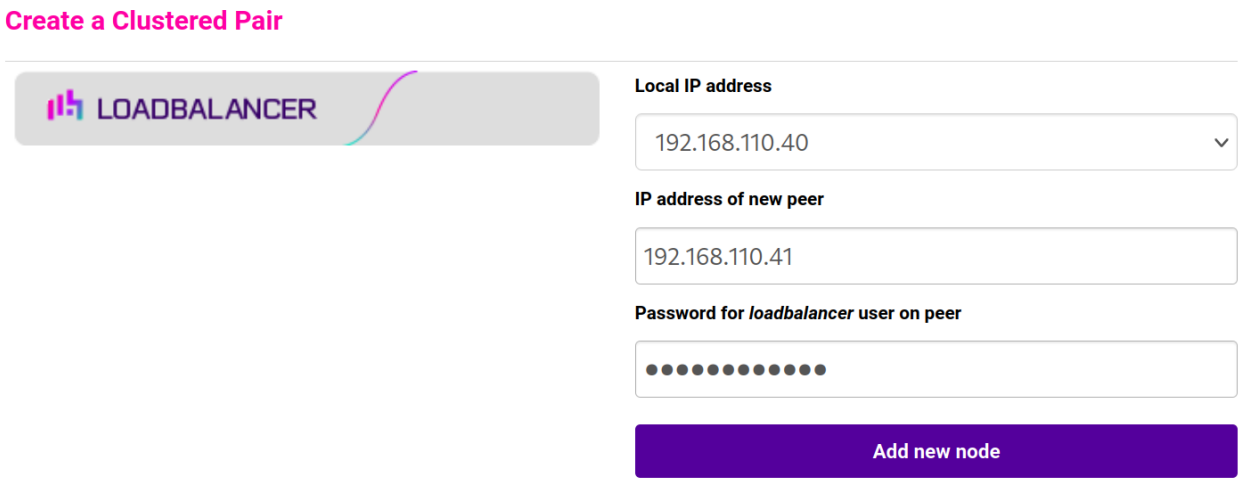
WebUI Main Menu Option	Sub Menu Option	Description
Local Configuration	Hostname & DNS	Hostname and DNS settings
Local Configuration	Network Interface Configuration	Interface IP addresses, bonding configuration and VLANs
Local Configuration	Routing	Default gateways and static routes
Local Configuration	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	Fallback Page	Fallback page configuration
Maintenance	Firewall Script	Firewall (iptables) configuration
Maintenance	Firewall Lockdown Wizard	Appliance management lockdown settings

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

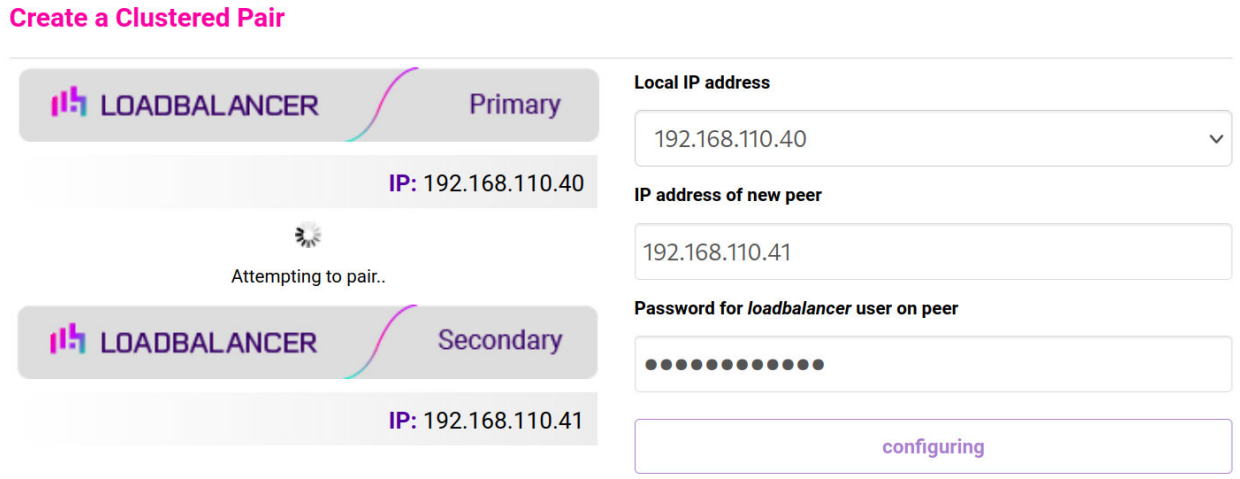
11.1.2. Configuring the HA Clustered Pair

> **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.

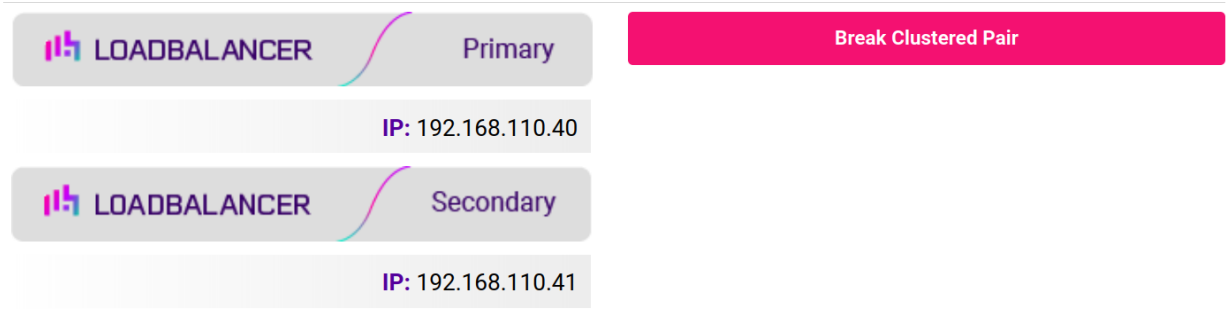
1. Deploy a second appliance that will be the Secondary and configure initial network settings.
2. Using the WebUI on the Primary appliance, navigate to: *Cluster Configuration > High-Availability Configuration*.



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.

12. Document Revision History

Version	Date	Change	Reason for Change	Changed By
1.0.0	24 April 2020	Initial document creation		IBG
1.0.1	1 September 2020	New title page Updated Canadian contact details	Branding update Change to Canadian contact details	AH
1.1.0	1 January 2022	Converted the document to AsciiDoc	Move to new documentation system	AH, RJC, ZAC
1.1.1	26 April 2022	Updated SSL related content to reflect latest software version	New software release	RJC
1.1.2	28 September 2022	Updated layer 7 VIP and RIP creation screenshots	Reflect changes in the web user interface	AH
1.1.3	5 January 2023	Combined software version information into one section Added one level of section numbering Added software update instructions Added table of ports used by the appliance Reworded 'Further Documentation' section Removed references to the colour of certain UI elements	Housekeeping across all documentation	AH
1.1.4	2 February 2023	Updated screenshots	Branding update	AH
1.1.5	7 March 2023	Removed conclusion section	Updates across all documentation	AH
1.2.0	24 March 2023	New document theme Modified diagram colours	Branding update	AH

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.