

Load Balancing Ellucian Banner

Version 1.1.0

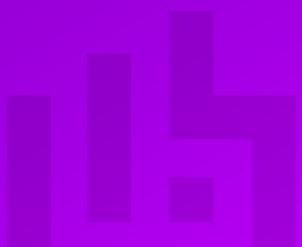


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1. About this Brief

This brief outlines the steps required to configure a load balanced Ellucian Banner environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any Ellucian Banner 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 Ellucian Banner. 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. Ellucian Banner

- All versions

4. Ellucian Banner

Banner from Ellucian is a complete student information system that lets you create an integrated digital campus. Banner makes it easier for all of your users to communicate, get the information they need, and accomplish their everyday tasks.

5. Load Balancing Ellucian Banner

 **Note**

It's highly recommended that you have a working Ellucian Banner environment first before implementing the load balancer.

5.1. Persistence (aka Server Affinity)

Session-based persistence is used via either source IP addresses or application cookies when load balancing an



Ellucian Banner deployment.

5.2. Virtual Service (VIP) Requirements

To provide load balancing and HA for Ellucian Banner, only a single VIP is required:

- HTTP(S) (for all HTTP-based services)

5.3. Port Requirements

The following table shows the ports that are load balanced:

Port	Protocols	Use
443	TCP/HTTPS	Ellucian Banner Web Application Traffic

5.4. TLS/SSL Termination

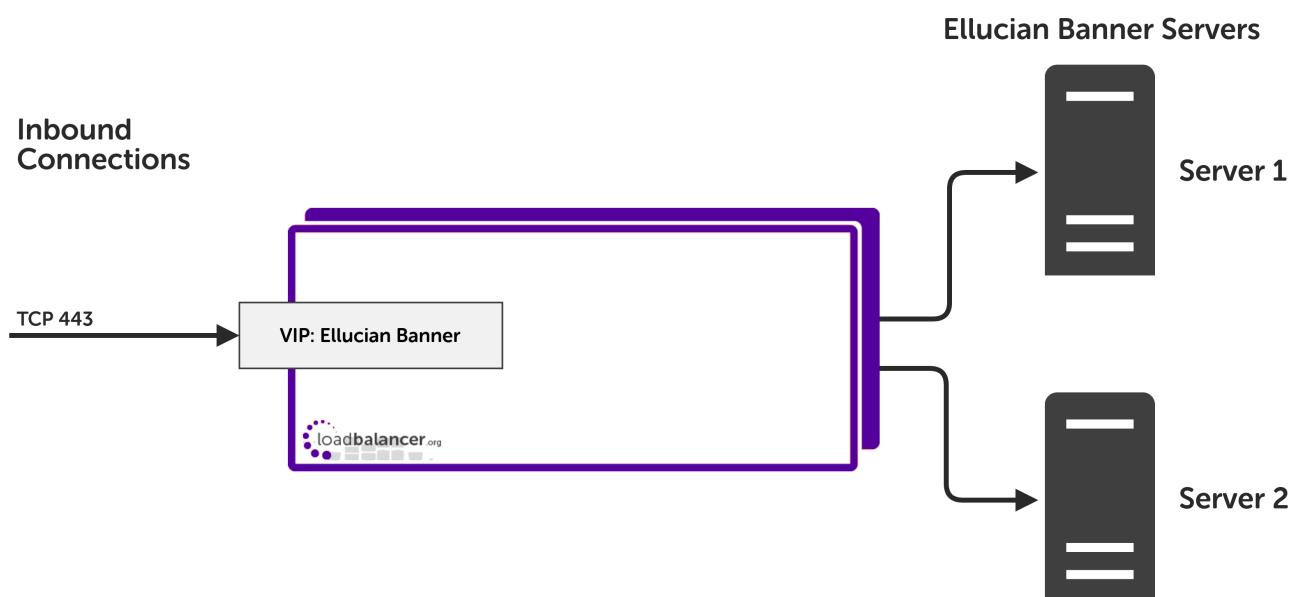
It is possible to terminate TLS connections on the load balancer. Performing TLS termination can add significant CPU overhead. As such, this deployment method should not be used unless the plaintext HTTP traffic must be inspected for some reason.

Unless there is a compelling reason not to do so, the [recommended deployment method without TLS termination](#) should be used.

6. Deployment Concept

Ellucian Banner can be deployed in two different ways:

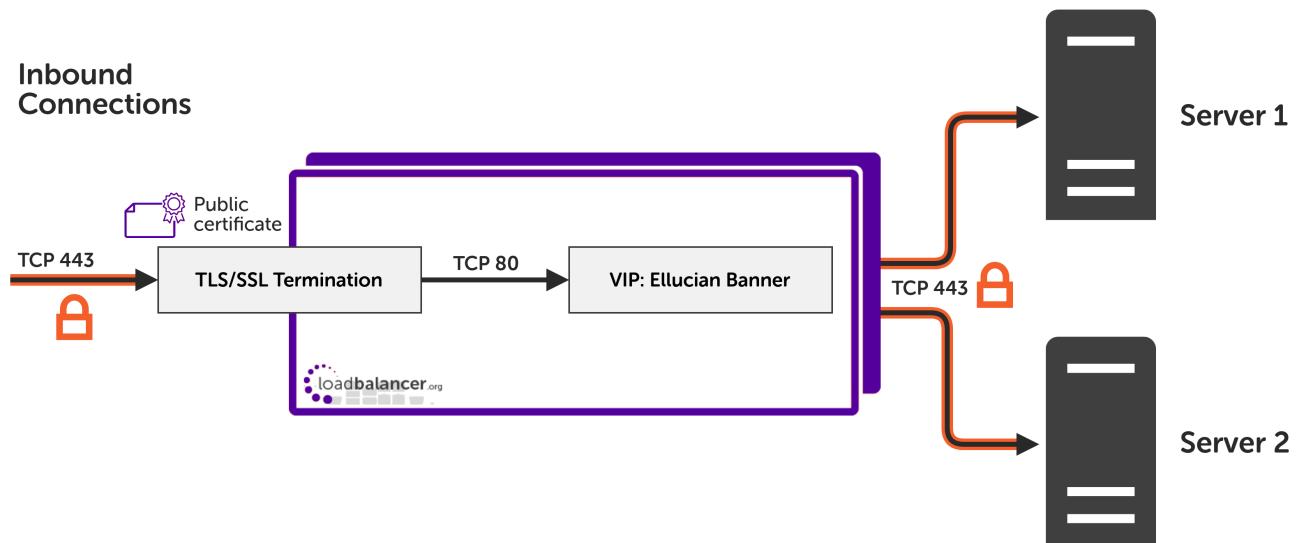
6.1. Recommended Deployment Type (Without TLS Termination)



6.2. Alternative Deployment Type With TLS Termination



Inbound Connections

**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.

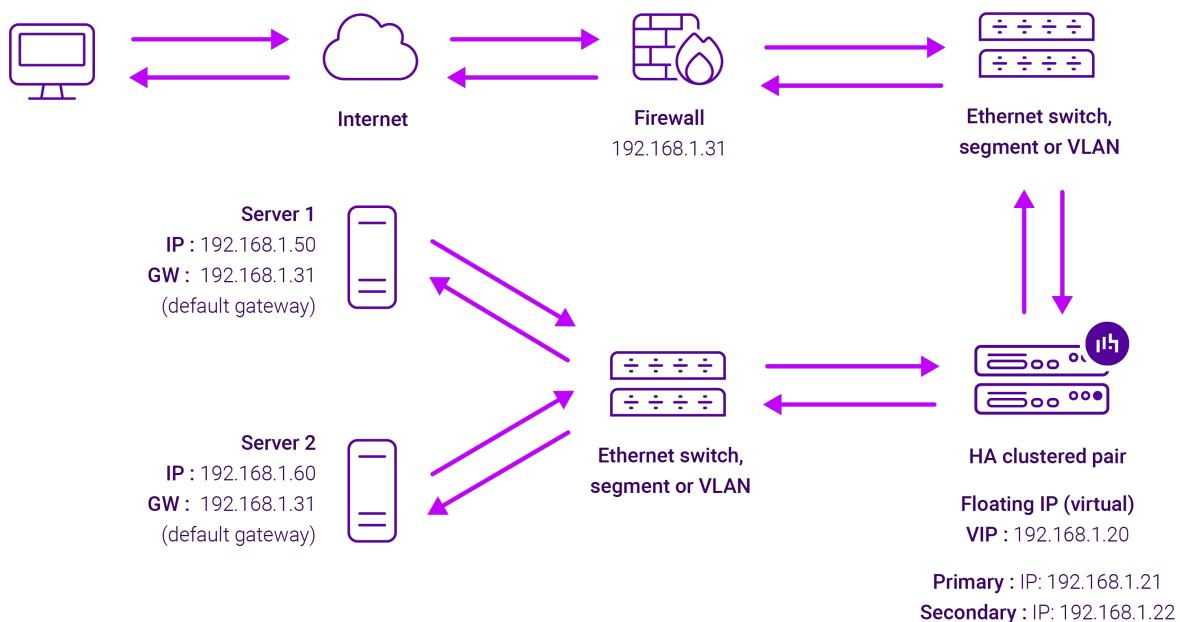
7. Load Balancer Deployment Methods

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 Ellucian Banner, using layer 7 SNAT mode is recommended. This mode is described below and is used for the configurations presented in this guide.

7.1. Layer 7 SNAT Mode

Layer 7 SNAT mode uses a proxy (HAProxy) at the application layer. Inbound requests are terminated on the load balancer and HAProxy generates a new corresponding request to the chosen Real Server. As a result, Layer 7 is typically not as fast as the Layer 4 methods. Layer 7 is typically chosen when either enhanced options such as SSL termination, cookie based persistence, URL rewriting, header insertion/deletion etc. are required, or when the network topology prohibits the use of the layer 4 methods. The image below shows an example network diagram for this mode.



- Because layer 7 SNAT mode is a full proxy, Real Servers in the cluster can be on any accessible network including across the Internet or WAN.
- Layer 7 SNAT mode is not transparent by default, i.e. the Real Servers will not see the source IP address of the client, they will see the load balancer's own IP address by default, or any other local appliance IP address if preferred (e.g. the VIP address). This can be configured per layer 7 VIP. If required, the load balancer can be configured to provide the actual client IP address to the Real Servers in 2 ways. Either by inserting a header that contains the client's source IP address, or by modifying the Source Address field of the IP packets and replacing the IP address of the load balancer with the IP address of the client. For more information on these methods please refer to [Transparency at Layer 7](#).
- Layer 7 SNAT mode can be deployed using either a one-arm or two-arm configuration. For two-arm deployments, **eth1** is typically used for client side connections and **eth0** is used for Real Server connections, although this is not mandatory since any interface can be used for any purpose.
- Requires no mode-specific configuration changes to the load balanced Real Servers.
- Port translation is possible with Layer 7 SNAT mode, e.g. VIP:80 → RIP:8080 is supported.
- You should not use the same RIP:PORT combination for layer 7 SNAT mode VIPs and layer 4 SNAT mode VIPs because the required firewall rules conflict.

8. Loadbalancer.org Appliance – the Basics

8.1. 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.

i 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.

i 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.

8.2. 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.

8.3. 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](#).

i 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/

i 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](#).

i 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>

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



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

Primary | Secondary Active | Passive Link 8 Seconds

System Overview

WARNING: YOUR TRIAL IS DUE TO EXPIRE IN 30 DAYS.

Buy with confidence. All purchases come with a 90 day money back guarantee.
Already bought? Enter your license key [here](#)

Buy Now

System Overview [?](#)

2025-05-08 12:37:21 UTC

Would you like to run the Setup Wizard?

Accept **Dismiss**

Network Bandwidth

Bytes/s

200 k, 150 k, 100 k, 50 k, 0

Wed 18:00, Thu 00:00, Thu 06:00, Thu 12:00

RX 28 Min, 2713 Avg, 27344772 Total,
TX 0 Min, 13777 Avg, 138872181 Total,

System Load Average

System Load

1.0, 0.8, 0.6, 0.4, 0.2, 0.0

Wed 18:00, Thu 00:00, Thu 06:00, Thu 12:00

1m average 0.00 Min, 0.08 Avg, 0.68 Max
5m average 0.00 Min, 0.04 Avg, 0.30 Max
15m average 0.00 Min, 0.02 Avg, 0.12 Max

Memory Usage

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.

8.3.1. 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

8.4. 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.

i **Note**

For full details, please refer to [Appliance Software Update](#) in the Administration Manual.

i **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.

8.4.1. 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:

Information: Update 8.13.2 is now available for this appliance.

Online Update

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.

(i) 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:

Information: Update completed successfully. Return to system overview.

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

8.4.2. 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:

Software Update

Offline Update

The following steps will lead you through offline update.

1. Contact **Loadbalancer.org support** to obtain the offline update archive and checksum.
2. Save the archive and checksum to your local machine.
3. Select the archive and checksum files in the upload form below.
4. Click **Upload and Install** to begin the update process.

Archive: No file chosen

Checksum: No file chosen

Upload and Install

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.

8.5. 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](#).

8.6. 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.

9. Appliance Configuration for Ellucian Banner – Using Layer 7 SNAT Mode (Recommended)

9.1. Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 7 – Virtual Services* and click on **Add a new Virtual Service**.
2. Define the *Label* for the virtual service as required, e.g. **Ellucian Banner**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.85.150**.
4. Set the *Ports* field to **443**.
5. Set the *Layer 7 Protocol* to **TCP Mode**.
6. Click **Update** to create the virtual service.

Layer 7 - Add a new Virtual Service

Virtual Service		[Advanced +]
Label	Ellucian Banner	?
IP Address	192.168.85.150	?
Ports	443	?
Protocol		
Layer 7 Protocol	TCP Mode	?
		Cancel Update

9.2. Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 7 – 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. **Banner Node 1**.
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.85.200**.
4. Click **Update**.



5. Repeat these steps to add the remaining Banner nodes.

Layer 7 Add a new Real Server - Ellucian_Banner

Label	Banner Node 1	?
Real Server IP Address	192.168.85.200	?
Real Server Port		?
Re-Encrypt to Backend	<input type="checkbox"/>	?
Weight	100	?

Cancel **Update**

9.3. Finalizing the Configuration

To apply the new settings, HAProxy must be reloaded. This can be done using the button in the "Commit changes" box at the top of the screen or by using the **Restart Services** menu option:

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

10. Appliance Configuration for Ellucian Banner – Using Layer 7 SNAT Mode With TLS Termination

This deployment method terminates TLS connections on the load balancer. Performing TLS termination can add significant CPU overhead. As such, this deployment method should not be used unless the plaintext HTTP traffic must be inspected for some reason.

Unless there is a compelling reason not to do so, refer to the [recommended deployment method without TLS termination](#) instead.

10.1. Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to **Cluster Configuration > Layer 7 – Virtual Services** and click on **Add a new Virtual Service**.
2. Define the *Label* for the virtual service as required, e.g. **Ellucian Banner**.
3. Set the *Virtual Service IP Address* field to the required IP address, e.g. **192.168.85.150**.
4. Set the *Ports* field to **80**.
5. Set the *Layer 7 Protocol* to **HTTP Mode**.
6. Click **Update** to create the virtual service.



Layer 7 - Add a new Virtual Service

Virtual Service		[Advanced +]
Label	Ellucian Banner	?
IP Address	192.168.85.150	?
Ports	80	?
Protocol		
Layer 7 Protocol	HTTP Mode	?
		<input type="button" value="Cancel"/> <input type="button" value="Update"/>

7. Click **Modify** next to the newly created VIP.
8. Under the **SSL** section, enable the option **Enable Backend Encryption** and then click "OK" in the "enable re-encryption" confirmation box that appears.

SSL
Enable Backend Encryption <input checked="" type="checkbox"/>
?

9. Click **Update**.

10.2. Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to *Cluster Configuration > Layer 7 – 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. **Banner Node 1**.
3. Set the *Real Server IP Address* field to the required IP address, e.g. **192.168.85.200**.
4. Set the *Real Server Port* field to **443**.
5. Ensure that the option **Re-Encrypt to Backend** is enabled.
6. Click **Update**.
7. Repeat these steps to add the remaining Banner nodes.

Layer 7 Add a new Real Server - Ellucian_Banner

Label	Banner Node 1	?
Real Server IP Address	192.168.85.200	?
Real Server Port	443	?
Re-Encrypt to Backend	<input checked="" type="checkbox"/>	?
Enable Redirect	<input type="checkbox"/>	?
Weight	100	?
		<input type="button" value="Cancel"/> <input type="button" value="Update"/>



10.3. Uploading a Certificate

The appropriate certificate for the service in question must be uploaded to the load balancer for TLS/SSL termination to work. The process for doing this is as follows:

1. Using the web user interface, navigate to *Cluster Configuration > SSL Certificate* and click on **Add a new SSL Certificate**.
2. Press the *Upload prepared PEM/PFX file* radio button.
3. Define the *Label* for the certificate as required. It may make sense to use the domain that the certificate is associated to, e.g. **example.com**.
4. Click on **Browse** and select the appropriate PEM or PFX style certificate.
5. If uploading a PFX certificate, enter the certificate's password in the *PFX File Password* field.
6. Click **Upload certificate**.

For more information on creating PEM certificate files and converting between certificate formats please refer to [Creating a PEM File](#).

10.4. Creating the TLS/SSL Termination

1. Using the web user interface, navigate to *Cluster Configuration > SSL Termination* and click on **Add a new Virtual Service**.
2. From the *Associated Virtual Service* drop-down list, select the associated WAF gateway that was created previously, e.g. **Ellucian_Banner**.
3. Set the *Virtual Service Port* field to **443**.
4. From the *SSL Certificate* drop-down list, select the certificate for the service in question, which in this example is **example.com**.
5. Click **Update** to create the TLS/SSL termination service.

SSL Termination - Add a new Virtual Service

Label	SSL_Ellucian_Banner	?
Associated Virtual Service	Ellucian_Banner	?
Virtual Service Port	443	?
SSL Operation Mode	High Security	?
SSL Certificate	example.com	?
Source IP Address		?
Enable Proxy Protocol	<input checked="" type="checkbox"/>	?
Bind Proxy Protocol to L7 VIP	Ellucian_Banner	?
		Cancel Update

10.5. Finalizing the Configuration



To apply the new settings, HAProxy and stunnel must 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**.

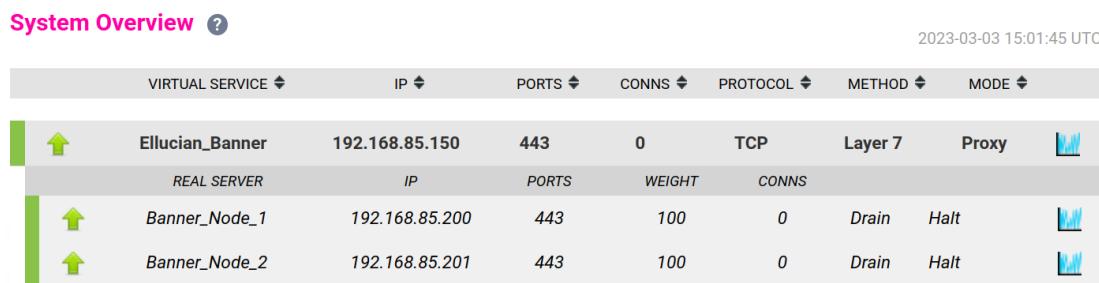
11. Testing & Verification

Note

For additional guidance on diagnosing and resolving any issues you may have, please also refer to [Diagnostics & Troubleshooting](#).

11.1. Using System Overview

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



System Overview 								2023-03-03 15:01:45 UTC
VIRTUAL SERVICE	IP	POR	CONN	PROT	METH	MODE		
 Ellucian_Banner	192.168.85.150	443	0	TCP	Layer 7	Proxy		
REAL SERVER								
 Banner_Node_1	IP	PORTS	WEIGHT	CONN				
 Banner_Node_2	192.168.85.200	443	100	0	Drain	Halt		
 Banner_Node_2	192.168.85.201	443	100	0	Drain	Halt		

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



① Important

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

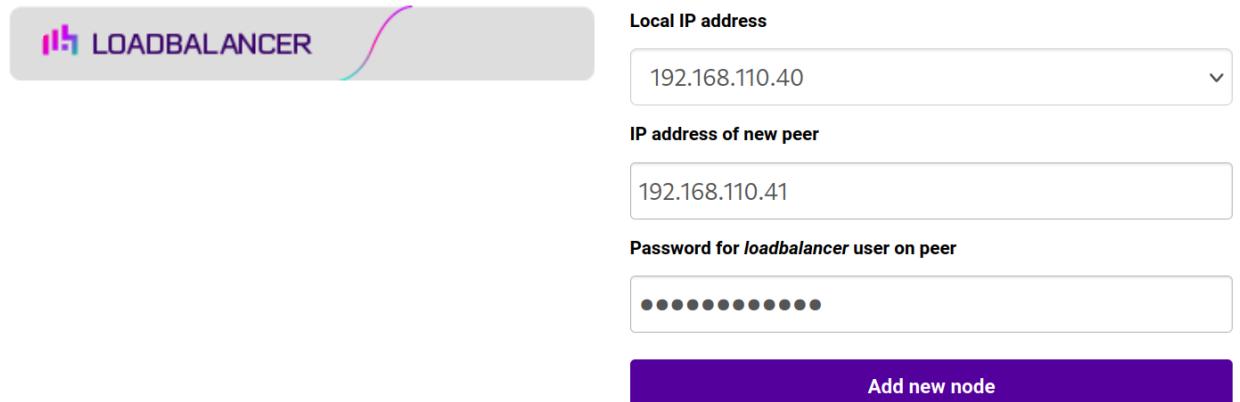
14.1.2. Configuring the HA Clustered Pair

ℹ 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*.

Create a Clustered Pair



LOADBALANCER

Local IP address
192.168.110.40

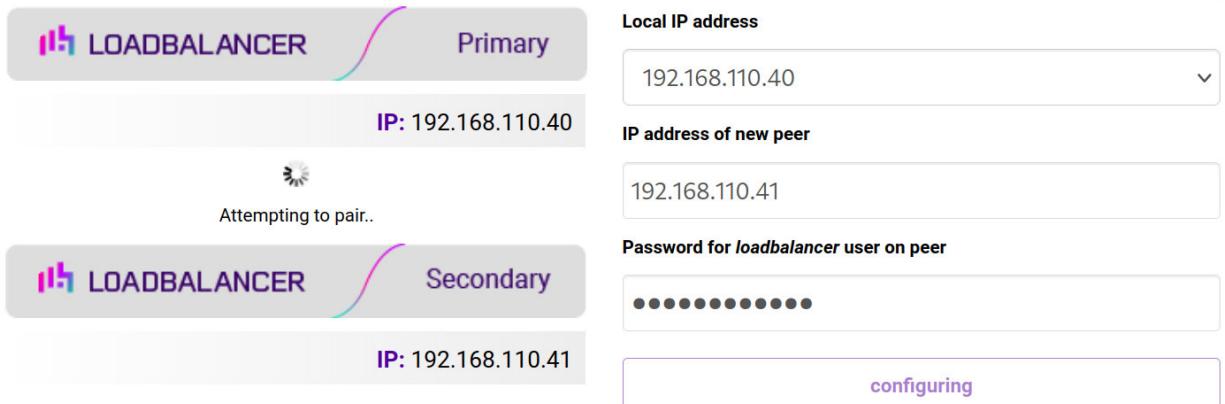
IP address of new peer
192.168.110.41

Password for *loadbalancer* user on peer
••••••••••••

Add new node

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:

Create a Clustered Pair



LOADBALANCER Primary

IP: 192.168.110.40

Attempting to pair..

LOADBALANCER Secondary

IP: 192.168.110.41

configuring

Local IP address
192.168.110.40

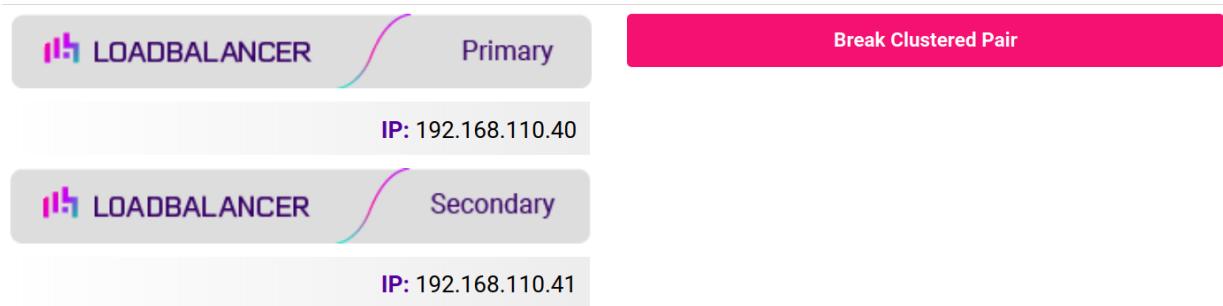
IP address of new peer
192.168.110.41

Password for *loadbalancer* user on peer
••••••••••••

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



High Availability Configuration - primary



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	3 March 2023	Initial version		VM, AH
1.0.1	7 March 2023	Removed conclusion section	Updates across all documentation	AH
1.1.0	24 March 2023	New document theme Modified diagram colours	Branding update	AH





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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.

