

Load Balancing IBM Watson Health iConnect Enterprise Archive by Merative

Version 1.4.0



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1. About this Guide

This guide details the steps required to configure a highly available IBM Watson Health iConnect Enterprise Archive by Merative environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any iConnect Enterprise Archive 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 with IBM Watson Health iConnect Enterprise Archive by Merative. For full specifications of available models please refer to <https://www.loadbalancer.org/products>. Some features may not be supported in all cloud platforms due to platform specific limitations, please check with Loadbalancer.org support for further details.

3. Software Versions Supported

3.1. Loadbalancer.org Appliance

- V8.3.8 and later

Note

The screenshots used throughout this document aim to track the latest Loadbalancer.org software version. If using an older software version, note that the screenshots presented here may not match the WebUI exactly.

3.2. IBM Watson Health iConnect Enterprise Archive by Merative

- All versions

4. Load Balancing iConnect Enterprise Archive

For high availability, IBM Watson Health recommend that a load balancer is used to enable rapid failover to the secondary iConnect Enterprise Cluster should the Primary Cluster become unavailable.

4.1. Port Requirements

The following table shows the ports used by iConnect Enterprise Archive. The load balancer must be configured to listen on the same ports.

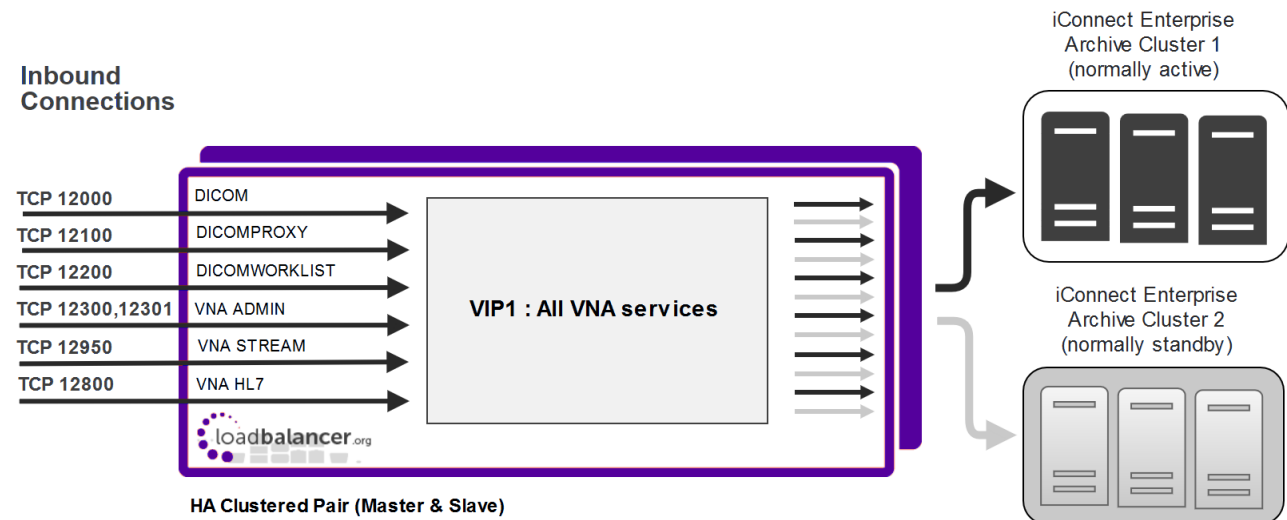
| Port | Protocols | Use |
|---------------|-----------|-----------------|
| 12000 | TCP | DICOM |
| 12100 | TCP | DICOM Proxy |
| 12200 | TCP | DICOM Work List |
| 12300 & 12301 | TCP | VNA Admin |



| Port | Protocols | Use |
|-------|-----------|------------|
| 12950 | TCP | VNA Stream |
| 12800 | TCP | VNA HL7 |

4.2. Deployment Concept

When iConnect Enterprise Archive is deployed with the load balancer, clients connect to the Virtual Service (VIP) on the load balancer rather than connecting directly to one of the iConnect Enterprise Archive Clusters. Under normal conditions, these connections are then forwarded to the Primary Cluster.



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.

Should the Primary Cluster become unavailable, failover to the Secondary Cluster can be handled in either of the following ways:

- **Automatically** – In this case, health checks are configured at 30 second intervals. Should there be 10 consecutive health check failures, failover to the Secondary Cluster occurs.
- **Manually** – In this case, failover to the Secondary Cluster must be triggered manually using the 'Halt' feature in the load balancer's WebUI. Please refer to [Manual Failover](#) for more details.

Note

The way the Virtual Service's health check is configured determines which of these failover methods is used.

4.3. Virtual Service (VIP) Requirements

A single multi-port VIP is used that listens on all required ports. The VIP is configured as follows:

- Deployment mode: Layer 4 NAT (Network Address Translation) mode



- Listens on a total of 7 ports as described on the table and diagram in [Port Requirements](#)
- The health-check configuration depends on whether automatic or manual failover is required:
 - for **automatic** failover an external script is used, the script checks that **all** 7 ports are available and runs every 30 seconds, if connection to one or more of the ports fails, the health check is deemed to have failed, if there are 10 consecutive health check failures, cluster failover occurs
 - for **manual** failover the health check is set to: **No checks, always On**
- The associated Real Server is configured to be the cluster IP address of the Primary Cluster
- The fallback server is configured to be the cluster IP address of the Secondary Cluster

4.4. Deployment Mode

As mentioned above, the VIP is configured using Layer 4 NAT mode. With this mode, return traffic must pass via the load balancer. To achieve this, the default gateway of each cluster must be set to be the load balancer. For a clustered pair (our recommended configuration), an additional floating IP address must be used for this purpose. This allows the same IP address to be brought up on the Secondary appliance should an appliance failover occur.

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 Server and other network 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](#).

Note

A number of compatibility issues have been found with various versions of Microsoft Internet Explorer and Edge. The WebUI has been tested and verified using both Chrome & Firefox.

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 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](#).

2. Log in to the WebUI using the following credentials:

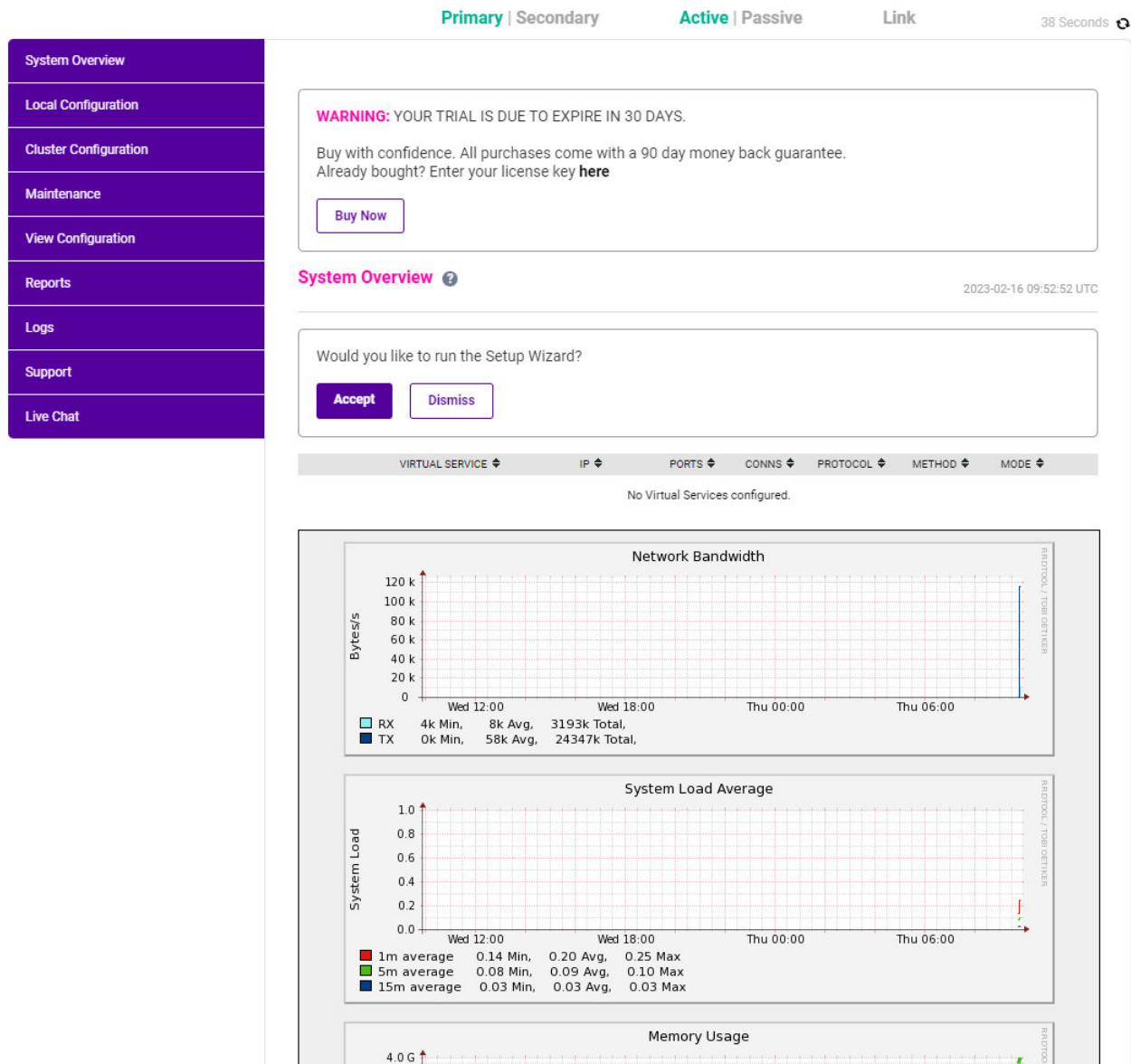
Username: loadbalancer

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.

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 taking 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

5.4. Appliance Software Update

To ensure that the appliance(s) are running the latest software version, we recommend a software update check is performed.

Determining the Current Software Version

The software version is displayed at the bottom of the WebUI as shown in the example below:

Copyright © Loadbalancer.org Inc. 2002 – 2023
ENTERPRISE VA Max - v8.9.0

English ▼

Checking for Updates using Online Update

Note

By default, the appliance periodically contacts the Loadbalancer.org update server and checks for updates. An update check can also be manually triggered as detailed below.

1. Using the WebUI, navigate to: **Maintenance > Software Update**.
2. Select **Online Update**.
3. If the latest version is already installed, a message similar to the following will be displayed:

Information: Version v8.9.0 is the current release. No updates are available

4. If an update is available, you'll be presented with a list of new features, improvements, bug fixes and security related updates.
5. Click **Online Update** to start the update process.

Note

Do not navigate away whilst the update is ongoing, this may cause the update to fail.

6. Once complete (the update can take several minutes depending on download speed and upgrade version) the following message will be displayed:

Information: Update completed successfully.

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

Using Offline Update

If the load balancer does not have access to the Internet, offline update can be used.





Note

Please contact support@loadbalancer.org to check if an update is available and obtain the latest offline update files.

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

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 |
| 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 | 9080 | WebUI - HTTP (disabled by default) |
| TCP | 9081 | Nginx fallback page |
| TCP | 9443 | WebUI - HTTPS |



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 & iConnect Enterprise Archive Configuration

6.1. Appliance Configuration


Network Configuration


Layer 4 NAT mode is typically used in a 2-arm configuration where the VIP is located in one subnet and the load balanced Real Servers are located in another. This can be achieved by using two network adapters, or by creating VLAN's on a single adapter. Single arm configuration is also supported under certain conditions - for more information please refer to [Layer 4 NAT Mode](#).


To configure an additional network interface for a 2-arm configuration:


1. Using the WebUI, navigate to *Local Configuration > Network Interface Configuration*.
2. Scroll to the *IP Address Assignment* section.

IP Address Assignment


eth0
1 GB/s


eth1
1 GB/s


eth2


eth3

eth0

192.168.100.1/24

MTU 1500 bytes

eth1

192.168.200.1/24

MTU 1500 bytes

3. Specify an appropriate IP address for **eth1** in CIDR format as shown above.
4. Click **Configure Interfaces**.

Note

There are no restrictions on which interface is used for each requirement.

Floating IP Configuration (For The Cluster's Default Gateway)

As mentioned in [Deployment Mode](#), when using Layer 4 NAT mode and a clustered pair of load balancers, a floating IP address must be configured on the load balancer for use as the iConnect Enterprise Archive server's default gateway.



1. Using the WebUI, navigate to: *Cluster Configuration > Floating IP's*.

New Floating IP

192.168.100.254

Add Floating IP

2. Enter the IP address you'd like to use as the default gateway. e.g. **192.168.100.254**.
3. Click **Add Floating IP**.

Configuring VIP1 – All VNA Services

a) Configure the External Health Check Script (used for automatic failover)

1. Using the WebUI, navigate to *Cluster Configuration > Health Check Scripts* and click **Add New Health Check**.

| Health Check Details | | |
|----------------------|---------------------------------------|---|
| Name: | IBM-WHI-iConnect-Enterpris | ? |
| Type: | Virtual Service ▼ | ? |
| Template: | IBM-WHI-iConnect-Enterprise-Archive ▼ | ? |

| Primary Node Health Check Contents | |
|------------------------------------|--|
|------------------------------------|--|

2. Specify an appropriate *Name* for the health check, e.g. **IBM-WHI-iConnect-Enterprise-Archive**.
3. Set *Type* to **Virtual Service**.
4. Set *Template* to **IBM-WHI-iConnect-Enterprise-Archive**.
5. Click **Update**.

b) Setting up the Virtual Service (VIP)

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



| | | |
|------------------------|---------------------------|---|
| Label | VNA | ? |
| Virtual Service | | |
| IP Address | 192.168.200.100 | ? |
| Ports | 12000,12100,12200,12300,1 | ? |
| Protocol | | |
| Protocol | TCP | ? |
| Forwarding | | |
| Forwarding Method | NAT | ? |
| | | <input type="button" value="Cancel"/> <input type="button" value="Update"/> |

3. Enter an appropriate label (name) for the VIP, e.g. **VNA**.
4. Set the *Virtual Service IP* address field to the required IP address, e.g. **192.168.200.100**.
5. Set the *Virtual Service Ports* field to **12000,12100,12200,12300,12301,12950,12800**.
6. Leave *Protocol* set to **TCP**.
7. Set the *Forwarding Method* to **NAT**.
8. Click **Update**.
9. Now click **Modify** next to the newly created VIP.
10. Scroll to the *Health Checks* section.

For **automatic** failover:

- a. Set *Check Type* to **External Script**.
- b. Set *External Script* to **IBM-WHI-iConnect-Enterprise-Archive**.

For **manual** failover:

- a. Set the *Check Type* to **No checks, Always On**.

11. Scroll to the *Fallback Server* section.
 - a. Set the *IP Address* field to the IP address of the Secondary iConnect Enterprise Archive Cluster.
 - b. Set the *Port* to **0** (numerical zero) , this ensures that the fallback server (i.e. the Secondary Cluster) can receive connections on all required ports.
 - c. Enable (check) the *MASQ Fallback* checkbox.
12. Click **Update**.

c) Setting up the Real Server (RIP)



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

| | | |
|------------------------|--|---|
| Label | <input type="text" value="PrimaryCluster"/> | ? |
| Real Server IP Address | <input type="text" value="192.168.100.110"/> | ? |
| Real Server Port | <input type="text"/> | ? |
| Weight | <input type="text" value="100"/> | ? |
| Minimum Connections | <input type="text" value="0"/> | ? |
| Maximum Connections | <input type="text" value="0"/> | ? |

3. Enter an appropriate label (name) for the RIP, e.g. **PrimaryCluster**.
4. Set the *Real Server IP Address* field to the IP address of the Primary iConnect Enterprise Archive Cluster.
5. Leave the *Real Server Port* field blank.
6. Click **Update**.

6.2. iConnect Enterprise Archive Server Configuration

As mentioned in [Deployment Mode](#), when using Layer 4 NAT mode and a clustered pair of load balancers, a floating IP address must be configured for use as the default gateway. Set the default gateway of each iConnect Enterprise Archive to be this IP address.

7. Testing & Verification

Note

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

Under normal circumstances the Primary Cluster handles all connections. Failover to the Secondary Cluster is handled automatically or manually depending on how the VIP is configured (see [Virtual Service \(VIP\) Requirements](#)).



7.1. Automatic Failover

Automatic failover occurs after 5 minutes. To trigger a failover, the Primary Cluster must be continuously unavailable for this time.

7.2. Manual Failover

To trigger a failover to the Secondary Cluster, the 'Halt' option in the System Overview is used:







| | REAL SERVER | IP | PORTS | WEIGHT | CONNS | | |
|---|----------------|-----------------|--------------|--------|-------|-------|---|
|  | PrimaryCluster | 192.168.100.110 | 5.12000,12.. | 100 | 0 | Drain | Halt  |



Once Halted, the VIP & RIP will be shown colored blue, connections will then be forwarded to the fallback server, i.e the Secondary Cluster:

System Overview

2019-05-29 14:42:14 UTC

| | VIRTUAL SERVICE | IP | PORTS | CONNS | PROTOCOL | METHOD | MODE | |
|---|-----------------|-----------------|--------------|--------|----------|---------------|------|---|
|  | VNA | 192.168.200.100 | 5.12000,1.. | 0 | TCP | Layer 4 | NAT |  |
| | REAL SERVER | IP | PORTS | WEIGHT | CONNS | | | |
|  | PrimaryCluster | 192.168.100.110 | 5.12000,12.. | halt | 0 | Online (halt) | |  |

To return to the Primary Cluster, the 'Online' option is used:

| | REAL SERVER | IP | PORTS | WEIGHT | CONNS | | |
|---|----------------|-----------------|--------------|--------|-------|----------------------|---|
|  | PrimaryCluster | 192.168.100.110 | 5.12000,12.. | halt | 0 | Online (halt) |  |

7.3. Client Connection Tests

Ensure that clients can connect via the load balancer to the iConnect Enterprise Archive Cluster / MergePACS cluster. You'll probably need to create new DNS records or modify your existing DNS records, replacing the IP addresses of individual servers or the cluster with the IP address of the Virtual Service on the load balancer.

8. 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.

9. Additional Documentation

For additional information, please refer to the [Administration Manual](#).



10. Appendix

10.1. 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 configured first and then the Secondary should be added. Once the Primary and Secondary are paired, all load balanced services configured on the Primary are automatically replicated to the Secondary over the network using SSH/SCP.

Note

For Enterprise Azure, the HA pair should be configured first. In Azure, when creating a VIP using an HA pair, 2 private IPs must be specified – one for the VIP when it's active on the Primary and one for the VIP when it's active on the Secondary. Configuring the HA pair first, enables both IPs to be specified when the VIP is created.

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.

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 | All network settings including IP address(es), bonding configuration and VLANs |
| Local Configuration | Routing | Routing configuration including default gateways and static routes |
| Local Configuration | System Date & time | All time and date related settings |
| Local Configuration | Physical – Advanced Configuration | Various settings including Internet Proxy, Management Gateway, Firewall connection tracking table size, NIC offloading, SMTP relay, logging and Syslog Server |
| Local Configuration | Security | Appliance security settings |
| Local Configuration | SNMP Configuration | Appliance SNMP settings |
| Local Configuration | Graphing | Appliance graphing settings |
| Local Configuration | License Key | Appliance licensing |
| Maintenance | Software Updates | Appliance software update management |
| Maintenance | Firewall Script | Appliance firewall (iptables) configuration |
| Maintenance | Firewall Lockdown Wizard | Appliance management lockdown settings |

⚠ Important

Make sure that if these settings/updates have been configured on the Primary appliance, they're also configured on the Secondary appliance.


Adding a Secondary Appliance - Create an 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**.

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

Local IP address

192.168.110.40

IP address of new peer

192.168.110.41

Password for *loadbalancer* user on peer





••••••••••

configuring

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



High Availability Configuration - primary

| | |
|--|-----------------------------|
|  LOADBALANCER  Primary | Break Clustered Pair |
| IP: 192.168.110.40 | Make Active |
|  LOADBALANCER  Secondary | |
| IP: 192.168.110.41 | |

- 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](#).

11. Document Revision History

| Version | Date | Change | Reason for Change | Changed By |
|---------|------------------|--|---|--------------|
| 1.1.0 | 2 August 2019 | Styling and layout | General styling updates | RJC |
| 1.1.1 | 20 August 2020 | New title page Updated Canadian contact details | Branding update Change to Canadian contact details | AH |
| 1.2.0 | 1 October 2021 | Converted the document to AsciiDoc | Move to new documentation system | AH, RJC, ZAC |
| 1.2.1 | 11 May 2022 | Updated external health check related content to reflect latest software version | New software release | RJC |
| 1.3.0 | 6 September 2022 | Renamed document and amended references to the product | Product acquisition | AH |
| 1.3.1 | 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 | Housekeeping across all documentation | AH |
| 1.3.2 | 2 February 2023 | Updated screenshots | Branding update | AH |
| 1.3.3 | 7 March 2023 | Removed conclusion section | Updates across all documentation | AH |
| 1.4.0 | 24 March 2023 | New document theme Modified diagram colours | Branding update | AH |



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