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1. About this Guide
This guide details the steps required to configure a load balanced Fujifilm Synapse environment utilizing Loadbalancer.org appliances. It covers Synapse PACS, Synapse VNA, Synapse Mobility and Synapse CWM and details the configuration of the load balancers and also any Synapse server 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 Fujifilm Synapse. 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. Loadbalancer.org Software Versions Supported
- 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.

4. Fujifilm Synapse Software Versions Supported
- Fujifilm Synapse PACS – All versions
- Fujifilm Synapse VNA – All versions
- Fujifilm Synapse Mobility – All versions
- Fujifilm Synapse CWM – All versions

5. Load Balancing Fujifilm Synapse
For high availability and scalability, Fujifilm recommend that multiple Synapse Servers are deployed in a load balanced cluster.

Port Requirements
The following table shows the ports used by the various Synapse systems. The load balancer must be configured to listen on the same ports.

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocols</th>
<th>System</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>TCP</td>
<td>PACS</td>
<td>HTTP</td>
</tr>
<tr>
<td>104</td>
<td>TCP</td>
<td>PACS</td>
<td>DICOM</td>
</tr>
<tr>
<td>80</td>
<td>TCP</td>
<td>VNA</td>
<td>HTTP</td>
</tr>
<tr>
<td>104</td>
<td>TCP</td>
<td>VNA</td>
<td>DICOM</td>
</tr>
</tbody>
</table>
## Deployment Concept

When Fujifilm systems 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 Fujifilm servers. The load balancer then distributes these connection to the load balanced servers according to the algorithm selected.

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### 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.

---

## Virtual Service (VIP) Requirements

The following tables summarize the VIPs required for each Synapse system and how they are configured.

### Synapse PACS

2 VIPs are required:

<table>
<thead>
<tr>
<th>Ref.</th>
<th>VIP Name</th>
<th>Operating Mode</th>
<th>Protocol</th>
<th>Port(s)</th>
<th>Persistence</th>
<th>Health check Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIP1</td>
<td>SynapsePacsHTTP</td>
<td>Layer 7 SNAT mode</td>
<td>TCP</td>
<td>80</td>
<td>Source IP</td>
<td>Connect to Port</td>
</tr>
<tr>
<td>VIP2</td>
<td>SynapsePacsDICOM</td>
<td>Layer 4 DR mode</td>
<td>TCP</td>
<td>104</td>
<td>Source IP</td>
<td>External Script – DICOM-C-ECHO</td>
</tr>
</tbody>
</table>

### Synapse VNA

2 VIPs are required:

<table>
<thead>
<tr>
<th>Ref.</th>
<th>VIP Name</th>
<th>Operating Mode</th>
<th>Protocol</th>
<th>Port(s)</th>
<th>Persistence</th>
<th>Health check Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIP1</td>
<td>SynapseVnaHTTP</td>
<td>Layer 7 SNAT mode</td>
<td>TCP</td>
<td>80</td>
<td>Source IP</td>
<td>Connect to Port</td>
</tr>
<tr>
<td>Ref.</td>
<td>VIP Name</td>
<td>Operating Mode</td>
<td>Protocol</td>
<td>Port(s)</td>
<td>Persistence</td>
<td>Health check Type</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------</td>
<td>---------</td>
<td>-------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>VIP2</td>
<td>SynapseVnaDICOM</td>
<td>Layer 4 DR mode</td>
<td>TCP</td>
<td>104</td>
<td>Source IP</td>
<td>External Script – DICOM-C-ECHO</td>
</tr>
</tbody>
</table>

**Synapse Mobility**

1 VIP is required:

<table>
<thead>
<tr>
<th>Ref.</th>
<th>VIP Name</th>
<th>Operating Mode</th>
<th>Protocol</th>
<th>Port(s)</th>
<th>Persistence</th>
<th>Health check Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIP1</td>
<td>SynapseMobility</td>
<td>Layer 7 SNAT mode</td>
<td>TCP</td>
<td>8080</td>
<td>Source IP</td>
<td>Negotiate HTTP (GET)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref.</th>
<th>VIP Name</th>
<th>Operating Mode</th>
<th>Protocol</th>
<th>Port(s)</th>
<th>Persistence</th>
<th>Health check Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIP1</td>
<td>SynapseCwm</td>
<td>Layer 7 SNAT mode</td>
<td>HTTP</td>
<td>80</td>
<td>HTTP Cookie</td>
<td>Connect to Port</td>
</tr>
</tbody>
</table>

**Synapse Server Configuration Requirements**

As mentioned in the tables above, Layer 7 SNAT mode and Layer 4 DR mode are used when load balancing Fujifilm Synapse.

**SNAT Mode**

When using Layer 7 SNAT mode, no additional Synapse server configuration changes are required.

**DR Mode**

When using DR mode, the 'ARP problem' must be solved on each Synapse server for DR mode to work. For detailed steps on solving the ARP problem, please refer to [DR Mode Server Configuration](#) for more information.

**6. Loadbalancer.org Appliance – the Basics**

**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.

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.

Accessing the WebUI
The WebUI is accessed using a web browser. By default, user authentication is based on local Apache .htaccess files. User administration tasks such as adding users and changing passwords can be performed using the WebUI menu option: Maintenance > Passwords.

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

Note | If required, users can also be authenticated against LDAP, LDAPS, Active Directory or Radius. For more information please refer to External Authentication.

1. Using a browser, access the WebUI using the following URL:
   

2. Log in to the WebUI:

   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:
Note: The WebUI for the VA is shown, the hardware and cloud appliances are very similar. The yellow licensing related message is platform & model dependent.

3. You’ll be asked if you want to run the Setup Wizard. If you click Accept the Layer 7 Virtual Service configuration wizard will start. If you want to configure the appliance manually, simple click Dismiss.

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
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.

7. Load Balancing Fujifilm Synapse PACS

Appliance Configuration

Configuring VIP1 - synapsePacsHTTP

a) Setting up the Virtual Service

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

   - Label: SynapsPacsHTTP
   - IP Address: 10.50.20.10
   - Ports: 80
   - Layer 7 Protocol: TCP Mode

3. Enter an appropriate label for the VIP, e.g. SynapsPacsHTTP.
4. Set the Virtual Service IP address field to the required IP address, e.g. 10.50.20.10.
5. Set the Virtual Service Ports field to 80.
7. Click Update.

b) Setting up the Real Servers

1. Using the WebUI, navigate to: Cluster Configuration > Layer 7 – Real Servers and click Add a new Real Server next to the newly created VIP.
2. Enter the following details:
3. Enter an appropriate label for the RIP, e.g. Server1.

4. Set the Real Server IP Address field to the required IP address, e.g. 10.50.20.20.

5. Set the Real Server Port field to 80.

6. Click Update.

7. Repeat the above steps to add your other server(s).

Configuring VIP2 - synapsePacsDICOM

a) Configure the DICOM health check

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

2. Specify an appropriate Name for the health check, e.g. DICOM-Check.

3. Set Type to Virtual Service.

4. Set Template to DICOM-C-ECHO.

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:
3. Enter an appropriate label (name) for the VIP, e.g. SynapsePacsDICOM.

4. Set the Virtual Service IP address field to the required IP address, e.g. 10.50.20.11.

5. Set the Virtual Service Ports field to 104.

   **Note** For layer 4 DR mode a star ( * ) can be specified instead of 104 to mean "all ports" if required.

6. Leave Protocol set to TCP.

7. Leave the Forwarding Method to Direct Return.

8. Click Update.

9. Now click Modify next to the newly created Virtual Service.

10. Scroll down to the Health Checks section.

    a. Set Check Type to External script.

    b. Set External Script to DICOM-Check.

11. 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:
3. Enter an appropriate label (name) for the RIP, e.g. Server1.
4. Change the Real Server IP Address field to the required IP address, e.g. 10.50.20.21.
5. Click Update.
6. Repeat the above steps to add your other server(s).

Synapse PACS Configuration
Since VIP2 is configured using layer 4 DR (Direct Return) mode, the "ARP Problem" must be solved on each Synapse server as mentioned in DR Mode. For full details on how this is done, please refer to DR Mode Server Configuration.

8. Load Balancing Fujifilm Synapse VNA

Appliance Configuration
Configuring VIP1 - synapseVnaHTTP

a) Setting up the Virtual Service
1. Using the WebUI, navigate to: Cluster Configuration > Layer 7 – Virtual Service and click Add a New Virtual Service.
2. Enter the following details:

3. Enter an appropriate label for the VIP, e.g. SynapseVnaHTTP.
4. Set the Virtual Service IP address field to the required IP address, e.g. 10.50.20.12.
5. Set the Virtual Service Ports field to 80.
7. Click Update.

b) Setting up the Real Servers
1. Using the WebUI, navigate to: Cluster Configuration > Layer 7 – Real Servers and click Add a new Real Server next to the newly created VIP.
2. Enter the following details:
3. Enter an appropriate label for the RIP, e.g. Server1.
4. Set the Real Server IP Address field to the required IP address, e.g. 10.50.20.22.
5. Set the Real Server Port field to 80.
6. Click Update.
7. Repeat the above steps to add your other server(s).

Configuring VIP2 - synapseVnaDICOM

a) Configure the DICOM health check
   Note | Skip this step if you have already configured a DICOM health check for PACS.
1. Using the WebUI, navigate to Cluster Configuration > Health Check Scripts and click Add New Health Check.

   Health Check Details
   Name: DICOM-Check
   Type: Virtual Service
   Template: DICOM-C-ECHO

   Primary Node Health Check Contents

2. Specify an appropriate Name for the health check, e.g. DICOM-Check.
3. Set Type to Virtual Service.
4. Set Template to DICOM-C-ECHO.
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:
3. Enter an appropriate label (name) for the VIP, e.g. **SynapseVnaDICOM**.
4. Set the *Virtual Service IP* address field to the required IP address, e.g. **10.50.20.13**.
5. Set the *Virtual Service Ports* field to **104**.
   
   **Note**  
   For layer 4 DR mode a star ( * ) can be specified instead of **104** to mean "all ports" if required.

6. Leave *Protocol* set to **TCP**.
7. Leave the *Forwarding Method* to **Direct Return**.
8. Click **Update**.
9. Now click **Modify** next to the newly created Virtual Service.
10. Scroll down to the *Health Checks* section.
    a. Set *Check Type* to **External script**.
    b. Set *External Script* to **DICOM-Check**.
11. 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:
3. Enter an appropriate label (name) for the RIP, e.g. Server1.

4. Change the Real Server IP Address field to the required IP address, e.g. 10.50.20.23.

5. Click Update.

6. Repeat the above steps to add your other server(s).

**Synapse VNA Configuration**

Since VIP2 is configured using layer 4 DR (Direct Return) mode, the "ARP Problem" must be solved on each Synapse server as mentioned in DR Mode. For full details on how this is done, please refer to DR Mode Server Configuration.

9. Load Balancing Fujifilm Synapse Mobility

**Appliance Configuration**

Configuring VIP1 - synapseMobility

a) Setting up the Virtual Service

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

2. Enter the following details:

3. Enter an appropriate label for the VIP, e.g. SynapseMobility.

4. Set the Virtual Service IP address field to the required IP address, e.g. 10.50.20.14.

5. Set the Virtual Service Ports field to 8080,8443.


7. Click Update.

8. Scroll down to the Health Checks section and set the Health Check to Negotiate HTTP (GET).


10. Leave Response Expected blank (this will configure the load balancer to look for a 200 OK response).
b) Setting up the Real Servers

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

2. Enter the following details:

<table>
<thead>
<tr>
<th>Label</th>
<th>Server1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Server IP Address</td>
<td>10.50.20.24</td>
</tr>
<tr>
<td>Real Server Port</td>
<td></td>
</tr>
<tr>
<td>Re-Encrypt to Backend</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>100</td>
</tr>
</tbody>
</table>

3. Enter an appropriate label for the RIP, e.g. Server1.

4. Set the Real Server IP Address field to the required IP address, e.g. 10.50.20.24.

5. Leave the Real Server Port field blank.

6. Click Update.

7. Repeat the above steps to add your other server(s).

Synapse Mobility Configuration

As mentioned in SNAT Mode, when using Layer 7 SNAT mode no additional Synapse server configuration changes are required.

10. Load Balancing Fujifilm Synapse CWM

Appliance Configuration

Configuring VIP1 - SynapseCwm

a) Setting up the Virtual Service

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

2. Enter the following details:
3. Enter an appropriate label for the VIP, e.g. **SynapseCwm**.

4. Set the **Virtual Service IP address** field to the required IP address, e.g. **10.50.20.15**.

5. Set the **Virtual Service Ports** field to **80**.

6. Set **Layer 7 Protocol** set to **HTTP Mode**.

7. Click **Update**.

b) Setting up the Real Servers

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

2. Enter the following details:

3. Enter an appropriate label for the RIP, e.g. **Server1**.

4. Set the **Real Server IP Address** field to the required IP address, e.g. **10.50.20.25**.

5. Set the **Real Server Port** field to **80**.

6. Click **Update**.

7. Repeat the above steps to add your other server(s).

**Synapse CWM Configuration**

As mentioned in **SNAT Mode**, when using Layer 7 SNAT mode no additional Synapse server configuration changes are required.
11. Finalizing the Configuration

Once all the VIPs have been configured, HAProxy must be reloaded to apply the new settings (for Layer 7 VIPs). This can be done using the button in the blue 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**.

12. 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**

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 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.
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 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.

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: To backup your certificates use the WebUI menu option: Maintenance > Backup & Restore > Download SSL Certificates.

Configuring SSL Termination on the Load Balancer
To configure SSL termination for Synapse Mobility:

1. Configure a layer 7 HTTP mode VIP to handle HTTP traffic
2. Configure SSL termination to handle HTTPS traffic
1) Configuring SSL Offloading for Synapse Mobility using a Layer 7 HTTP mode VIP

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:

   ![Layer 7 - Add a new Virtual Service](image)

   3. Enter an appropriate label for the VIP, e.g. SynapseMobility.

   4. Set the Virtual Service IP address field to the required IP address, e.g. 10.50.20.14.

   5. Set the Virtual Service Ports field to 8080.


   7. Click Update.

   8. Click Modify.

   9. Scroll down to the Health Checks section and set the Health Check to Negotiate HTTP (GET).


   11. Leave Response Expected blank (this will configure the load balancer to look for a 200 OK response).

b) Setting up the Real Servers

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

2. Enter the following details:
3. Enter an appropriate label for the RIP, e.g. Server1.

4. Set the Real Server IP Address field to the required IP address, e.g. 10.50.20.24.

5. Leave the Real Server Port field blank.

6. Click Update.

7. Repeat the above steps to add your other server(s).

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

**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.


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 load balancing.

Finalizing the Configuration
To apply the new settings, HAProxy and STunnel must both be reloaded. This can be done using the buttons in the blue 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.

13. Testing & Verification

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

Using the System Overview
The System Overview shows a graphical view of all VIPs & RIPs (i.e. the Synapse servers) 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 Synapse servers are healthy and available to accept connections:

Client Connection Tests
Ensure that clients can connect via the load balancer to the Synapse servers. 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.
14. 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.

15. Additional Documentation

16. Conclusion
Loadbalancer.org appliances provide a very cost effective solution for a highly available load balanced Fujifilm Synapse environments.
17. Appendix

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 should be configured first, 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:

<table>
<thead>
<tr>
<th>WebUI Main Menu Option</th>
<th>Sub Menu Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Configuration</td>
<td>Hostname &amp; DNS</td>
<td>Hostname and DNS settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Network Interface Configuration</td>
<td>All network settings including IP address(es), bonding configuration and VLANs</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Routing</td>
<td>Routing configuration including default gateways and static routes</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>System Date &amp; time</td>
<td>All time and date related settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Physical – Advanced Configuration</td>
<td>Various settings including Internet Proxy, Management Gateway, Firewall connection tracking table size, NIC offloading, SMTP relay, logging and Syslog Server</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Security</td>
<td>Appliance security settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>SNMP Configuration</td>
<td>Appliance SNMP settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Graphing</td>
<td>Appliance graphing settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>License Key</td>
<td>Appliance licensing</td>
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<tr>
<td>Maintenance</td>
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<td>Appliance software update management</td>
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<tr>
<td>Maintenance</td>
<td>Firewall Script</td>
<td>Appliance firewall (iptables) configuration</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Firewall Lockdown Wizard</td>
<td>Appliance management lockdown settings</td>
</tr>
</tbody>
</table>

Important

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

To add a Secondary node - i.e. create a highly available clustered pair:
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 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 blue 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**.

### DR Mode Server Configuration

When using Layer 4 DR mode the ARP problem must be solved. This involves configuring each Synapse Server to accept traffic destined for the VIP in addition to it’s own IP address, and ensuring that each server does not respond to ARP requests for the VIP address – only the load balancer should do this. The following section covers Windows 2012 and later, for earlier versions of Windows please refer to the **Administration Manual**.

#### Windows Server 2012 & Later

Windows Server 2012 and later support Direct Routing (DR) mode through the use of the Microsoft Loopback Adapter. The IP address allocated to the Loopback Adapter must be the same as the Virtual Service (VIP) address. If the Real Server is included in multiple DR mode VIPs, additional IP addresses can be added to the Loopback Adapter that correspond to each VIP. In addition, steps must be taken to set the strong/weak host behavior which is used to either block or allow interfaces to receive packets destined for a different interface on the same server.

#### Step 1 of 3: Install the Microsoft Loopback Adapter

1. Click **Start**, then run `hdwwiz` to start the Hardware Installation Wizard.
2. When the Wizard has started, click **Next**.
3. Select **Install the hardware that I manually select from a list (Advanced)**, click **Next**.
4. Select **Network adapters**, click **Next**.
5. Select **Microsoft & Microsoft KM-Test Loopback Adapter**, click **Next**.
6. Click **Next** to start the installation, when complete click **Finish**.

**Step 2 of 3: Configure the Loopback Adapter**

1. Open Control Panel and click **Network and Sharing Center**.
2. Click **Change adapter settings**.
3. Right-click the new Loopback Adapter and select **Properties**.
4. Uncheck all items except **Internet Protocol Version 4 (TCP/IPv4)** and **Internet Protocol Version 6 (TCP/IPv6)** as shown below:
5. If configuring IPv4 addresses select **Internet Protocol Version (TCP/IPv4)**, click **Properties** and configure the IP address to be the same as the Virtual Service (VIP) with a subnet mask of 255.255.255.255, e.g. 192.168.2.20/255.255.255.255 as shown below:

6. If configuring IPv6 addresses select **Internet Protocol Version (TCP/IPv6)**, click **Properties** and configure the IP address to be the same as the Virtual Service (VIP) and set the **Subnet Prefix Length** to be the same as your network setting, e.g. 2001:470:1f09:e72::15/64 as shown below:
7. Click **OK** on TCP/IP Properties, then click **Close** on Ethernet Properties to save and apply the new settings.

**Note**
For Windows 2012/2016/2019, it's not necessary to modify the interface metric on the advanced tab and should be left set to Automatic.

**Step 3 of 3: Configure the strong/weak host behavior**

To configure the correct strong/weak host behavior for Windows 2012/2016/2019, the following commands must be run on each Real Server:

**For IPv4 addresses:**

```bash
netsh interface ipv4 set interface "net" weakhostreceive=enabled
netsh interface ipv4 set interface "loopback" weakhostreceive=enabled
netsh interface ipv4 set interface "loopback" weakhostsend=enabled
```

For IPv6 addresses:

```bash
netsh interface ipv6 set interface "net" weakhostreceive=enabled
netsh interface ipv6 set interface "loopback" weakhostreceive=enabled
netsh interface ipv6 set interface "loopback" weakhostsend=enabled
```

**For IPv6 addresses:**

```bash
netsh interface ipv6 set interface "net" weakhostreceive=enabled
netsh interface ipv6 set interface "loopback" weakhostreceive=enabled
netsh interface ipv6 set interface "loopback" weakhostsend=enabled
netsh interface ipv6 set interface "loopback" dadtransmits=0
```
For these commands to work, the LAN connection NIC must be named "net" and the loopback NIC must be named "loopback" as shown below. If you prefer to leave your current NIC names, then the commands above must be modified accordingly. For example, if your network adapters are named "LAN" and "LOOPBACK", the commands required would be:

```plaintext
netsh interface ipv6 set interface "LAN" weakhostreceive=enabled
netsh interface ipv6 set interface "LOOPBACK" weakhostreceive=enabled
netsh interface ipv6 set interface "LOOPBACK" weakhostsend=enabled
netsh interface ipv6 set interface "LOOPBACK" dadtransmits=0
```

Note: The names for the NICs are case sensitive, so make sure that the name used for the interface and the name used in the commands match exactly.

- Start PowerShell or use a command window to run the appropriate netsh commands as shown in the example below:

```
Note: This shows an IPv6 example, use the IPv4 commands if you’re using IPv4 addresses.
```

Repeat steps 1 - 3 on all remaining Windows 2012/2016/2019 Real Server(s).

If preferred you can also use the following PowerShell Cmdlets:

The following example configures both IPv4 and IPv6 at the same time:

```powershell
Set-NetIpInterface -InterfaceAlias loopback -WeakHostReceive enabled -WeakHostSend enabled -DadTransmits 0
```

```powershell
Set-NetIpInterface -InterfaceAlias net -WeakHostReceive enabled
```

To configure just IPv4:

```powershell
Set-NetIpInterface -InterfaceAlias loopback -WeakHostReceive enabled -WeakHostSend enabled
```
-DadTransmits 0 -AddressFamily IPv4

Set-NetIpInterface -InterfaceAlias net -WeakHostReceive enabled -AddressFamily IPv4

To configure just IPv6:

Set-NetIpInterface -InterfaceAlias loopback -WeakHostReceive enabled -WeakHostSend enabled -DadTransmits 0 -AddressFamily IPv6

Set-NetIpInterface -InterfaceAlias net -WeakHostReceive enabled -AddressFamily IPv6
### 18. Document Revision History

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<th>Reason for Change</th>
<th>Changed By</th>
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<td>17 April 2018</td>
<td>Initial version</td>
<td></td>
<td>AH</td>
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<td>1.0.1</td>
<td>6 December 2018</td>
<td>Added the new &quot;Company Contact Information&quot; page</td>
<td>Required updates</td>
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<td>18 September 2019</td>
<td>Multiple updates</td>
<td>Revised load balancing design</td>
<td>RJC</td>
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<td>Updated the health check settings for the Synapse Mobility VIP</td>
<td>To improve the accuracy of the health check</td>
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<td>Revised load balancing design</td>
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<td>27 July 2020</td>
<td>New title page</td>
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<td>Converted the document to AsciiDoc</td>
<td>Move to new documentation system</td>
<td>AH, RJC, ZAC</td>
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<td>1.3.1</td>
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