Load Balancing
INFINITT PACS

Deployment Guide
v1.0.0
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1. About this Guide
This guide details the steps required to configure a load balanced INFINITT PACS 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 relevant Administration Manual:

- v7 Administration Manual
- v8 Administration Manual

2. Loadbalancer.org Appliances Supported
The complete list of our products that are supported for load balancing INFINITT PACS is shown below:

<table>
<thead>
<tr>
<th>Discontinued Models</th>
<th>Current Models *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enterprise 10G</td>
</tr>
<tr>
<td></td>
<td>Enterprise 40G</td>
</tr>
<tr>
<td></td>
<td>Enterprise VA MAX</td>
</tr>
</tbody>
</table>

* For full specifications of these models please refer to: http://www.loadbalancer.org/products/hardware
** Some features may not be supported, please check with Loadbalancer.org support

3. Loadbalancer.org Software Versions Supported

- V8.3.6 and later

4. INFINITT PACS Software Versions Supported

- INFINITT PACS – all versions
5. INFINITT PACS

INFINITT PACS is an award-winning, web-based image management system. It provides a streamlined reading work-flow and scalable and expandable architecture, as well as optional virtualized server architecture for highest availability and disaster recovery.

6. Load Balancing INFINITT PACS

Note: It’s highly recommended that you have a working INFINITT PACS environment first before implementing the load balancer.

Load Balancing & HA Requirements

The function of the load balancer is to distribute inbound connections across a cluster of INFINITT PACS nodes, to provide a highly available and scalable service. Four virtual services are used to load balance the different aspects of INFINITT PACS.

Persistence (aka Server Affinity)

All VIPs should be configured to use Source IP persistence in order to function correctly. For the INFINITT PACS Web VIP, HTTP Cookie can be used in combination with Source IP. This means, in the event that the HTTP cookie persistence method fails, persistence will fall back to using Source IP.

Virtual Service (VIP) Requirements

To provide load balancing for INFINITT PACS, the following VIPs are required:

- INFINITT Web
- DICOM
- QUERY
- MWL

Port Requirements

The following table shows the ports that are load balanced:

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocols</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>TCP/HTTP</td>
<td>Web portal access</td>
</tr>
<tr>
<td>104</td>
<td>TCP</td>
<td>DICOM communication</td>
</tr>
<tr>
<td>105</td>
<td>TCP</td>
<td>DICOM Query communication</td>
</tr>
<tr>
<td>204</td>
<td>TCP</td>
<td>Modality Worklist communication</td>
</tr>
</tbody>
</table>
Health Checks
The INFINITT Web service uses the Negotiate HTTP (HEAD) health check to confirm that both the port and website are running and accessible. The remaining virtual services will use the connect to port health check.

7. Deployment Concept

Note: The load balancer can be deployed as a single unit, although Loadbalancer.org recommends a clustered pair for resilience & high availability. Please refer to section 1 in the appendix on page 18 for more details on configuring a clustered pair.
8. Loadbalancer.org Appliance – the Basics

Virtual Appliance Download & Deployment
A fully featured, fully supported 30 day trial is available if you are conducting a PoC (Proof of Concept) deployment. The VA is currently available for VMware, Virtual Box, Hyper-V, KVM and XEN and has been optimized for each Hypervisor. By default, the VA is allocated 1 CPU, 2GB of RAM and has an 8GB virtual disk. The Virtual Appliance can be downloaded [here](https://www.loadbalancer.org).

Note: The same download is used for the licensed product, the only difference is that a license key file (supplied by our sales team when the product is purchased) must be applied using the appliance's WebUI.

Note: Please refer to the [Administration Manual](https://www.loadbalancer.org) and the ReadMe.txt text file included in the VA download for more detailed information on deploying the VA using various Hypervisors.

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

**Method 1 - Using the Network Setup Wizard at the console**
After boot up, follow the instructions on the console to configure the IP address, subnet mask, default gateway and DNS settings.

**Method 2 - Using the WebUI**
Using a browser, connect to the WebUI on the default IP address/port: `https://192.168.2.21:9443`
To set the IP address & subnet mask, use: *Local Configuration > Network Interface Configuration*
To set the default gateway, use: *Local Configuration > Routing*
To configure DNS settings, use: *Local Configuration > Hostname & DNS*
Accessing the Web User Interface (WebUI)
The WebUI can be accessed via HTTPS at the following URL: https://192.168.2.21:9443/lbadmin
* Note the port number → 9443

(replace 192.168.2.21 with the IP address of your load balancer if it’s been changed from the default)

Login using the following credentials:

  **Username:** loadbalancer  
  **Password:** loadbalancer

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

Once logged in, the WebUI will be displayed as shown on the following page:
HA Clustered Pair Configuration

Loadbalancer.org recommend that load balancer appliances are deployed in pairs for high availability. In this guide a single unit is deployed first, adding a secondary slave unit is covered in section 1 of the appendix on page 18.
9. Appliance Configuration for INFINITT PACS

Duplicate Service Function
As of version 8.3.8 of the Loadbalancer.org appliance, the Duplicate Service button can be used to save time during initial configuration. This function duplicates the configuration of a given virtual service along with all of the associated back end real servers which have been defined. This is useful for deployments where multiple, very similar virtual services are used, with only minor changes between them. It saves time as the same settings and real servers do not need to be repeatedly defined.

First, fully create the initial virtual service as directed. Then click the Modify button for the virtual service in question, click the Duplicate Service button near the top, and make the necessary changes for the new, duplicated virtual service.

This feature is available for both layer 4 and layer 7 virtual services.

Configuring VIP 1 – INFINITT PACS

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. INFINITT Web
3. Set the Virtual Service IP Address field to the required IP address, e.g. 192.168.86.87
4. Set the Ports field to 80
5. Set the Layer 7 Protocol to HTTP Mode
6. Click Update to create the virtual service
7. Click **Modify** next to the newly created VIP
8. Set **Persistence Mode** to **HTTP Cookie and Source IP**
9. Set **Health Checks** to **Negotiate HTTP (HEAD)**
10. Leave **Request to send** empty as the load balancer will by default look for a “200 OK” response
11. Click **Update**

**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. **INF_PACS1**
3. Set the **Real Server IP Address** field to the required IP address, e.g. **192.168.86.50**
4. Click **Update**
5. Repeat these steps to add additional INFINITT PACS nodes as real servers as required
Configuring VIP 2 – DICOM

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. DICOM
3. Set the Virtual Service IP Address field to the required IP address, e.g. 192.168.86.87
4. Set the Ports field to 104
5. Set the Layer 7 Protocol to TCP Mode
6. Click Update to create the virtual service
7. Click Modify next to the newly created VIP
8. Set Persistence Mode to Source IP
9. Set Health Checks to Connect to port
10. Click Update

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. INF_PACS1
3. Set the Real Server IP Address field to the required IP address, e.g. 192.168.86.50
4. Click Update
5. Repeat these steps to add additional INFINITT PACS nodes as real servers as required

Configuring VIP 3 – QUERY

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. QUERY
3. Set the Virtual Service IP Address field to the required IP address, e.g. 192.168.86.87
4. Set the Ports field to 105
5. Set the Layer 7 Protocol to TCP Mode
6. Click Update to create the virtual service
7. Click **Modify** next to the newly created VIP
8. Set **Persistence Mode** to **Source IP**
9. Set **Health Checks** to **Connect to port**
10. Click **Update**

**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. **INF_PACS1**
3. Set the **Real Server IP Address** field to the required IP address, e.g. **192.168.86.50**
4. Set the **Real Server Port** field to **104**
5. Click **Update**
6. Repeat these steps to add additional INFINITT PACS nodes as real servers as required
Configuring VIP 4 – MWL

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. MWL
3. Set the Virtual Service IP Address field to the required IP address, e.g. 192.168.86.87
4. Set the Ports field to 204
5. Set the Layer 7 Protocol to TCP Mode
6. Click Update to create the virtual service
7. Click **Modify** next to the newly created VIP
8. Set **Persistence Mode** to **Source IP**
9. Set **Health Checks** to **Connect to port**
10. Click **Update**

### 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. **INF_PACS1**
3. Set the **Real Server IP Address** field to the required IP address, e.g. **192.168.86.50**
4. Click **Update**
5. Repeat these steps to add additional INFINITT PACS nodes as real servers as required

![Layer 7 Add a new Real Server - MWL](image)

### Finalizing the Configuration

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

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

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

11. 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

12. Further Documentation
13. Conclusion
Loadbalancer.org appliances provide a very cost effective solution for highly available load balanced INFINITI PACS environments.
14. Appendix

1 – Clustered Pair Configuration – Adding a Slave Unit

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

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

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

Version 7:
Please refer to Chapter 8 – Appliance Clustering for HA in the v7 Administration Manual.

Version 8:
To add a slave node – i.e. create a highly available clustered pair:

- Deploy a second appliance that will be the slave and configure initial network settings
- Using the WebUI, navigate to: Cluster Configuration > High-Availability Configuration
• Specify the IP address and the loadbalancer users password (the default is 'loadbalancer') for the slave (peer) appliance as shown above
• Click Add new node
• The pairing process now commences as shown below:

![Create a Clustered Pair]

• Once complete, the following will be displayed:

![High Availability Configuration - Master]

• To finalize the configuration, restart heartbeat and any other services as prompted in the blue message box at the top of the screen
Note: Clicking the **Restart Heartbeat** button on the master appliance will also automatically restart heartbeat on the slave appliance.

Note: Please refer to chapter 9 – Appliance Clustering for HA in the [Administration Manual](#) for more detailed information on configuring HA with 2 appliances.
15. Document Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Change</th>
<th>Reason for Change</th>
<th>Changed By</th>
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<tbody>
<tr>
<td>1.0.0</td>
<td>17 December 2019</td>
<td>Initial version</td>
<td></td>
<td>IBG</td>
</tr>
</tbody>
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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.