Load Balancing IBM Watson Health iConnect Access
Version 1.2.0
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1. About this Guide

This guide details the steps required to configure a load balanced IBM Watson Heath iConnect Access environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any iConnect Access 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 IBM Watson Health iConnect Access. 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. IBM Watson Health iConnect Access Software Versions Supported

- IBM Watson Health iConnect Access – all versions

5. Load Balancing iConnect Access

For high availability and scalability, IBM Watson Health recommend that multiple iConnect Access Servers are deployed in a load balanced cluster.

**Note**
It’s highly recommended that you have a working iConnect Access environment first before implementing the load balancer.

Load Balanced Ports

The following table shows the ports/services that are load balanced:

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocols</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 &amp; 443</td>
<td>TCP</td>
<td>HTTP &amp; HTTPS</td>
</tr>
<tr>
<td>4444</td>
<td>TCP</td>
<td>DICOM</td>
</tr>
</tbody>
</table>

Deployment Concept

When iConnect Access is deployed with the load balancer, clients connect to the Virtual Services (VIPs) on the load balancer rather than connecting directly to one of the iConnect Access Servers. These connections are then load balanced across the iConnect Access Servers to distribute the load according to the load balancing algorithm selected.
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.

VIP Requirements

To provide load balancing and HA for iConnect Access, 2 VIPS are required as depicted in the diagram above, these are:

- VIP1: ICA_WEB
- VIP2: ICA_DICOM

Deployment Mode

The Virtual Services (VIPS) are configured using Layer 4 DR (Direct Return) mode. This mode offers the best possible performance since replies go directly from the iConnect Access Servers to the client, and not via the load balancer. To use this mode, the "ARP Problem" must be solved as explained in Solve the ARP Problem.

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, RIPv 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 & RIPv
- **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. Appliance & iConnect Access Configuration

Appliance Configuration

Configuring VIP1 – ICA_WEB

a) 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:

<table>
<thead>
<tr>
<th>Label</th>
<th>ICA_WEB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Service IP Address</td>
<td>192.168.100.100</td>
</tr>
<tr>
<td>Ports</td>
<td>80,443</td>
</tr>
<tr>
<td>Protocol</td>
<td>TCP</td>
</tr>
<tr>
<td>Forwarding Method</td>
<td>Direct Routing</td>
</tr>
</tbody>
</table>

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

4. Set the Virtual Service IP address field to the required IP address, e.g. 192.168.100.100.

5. Set the Virtual Service Ports field to 80,443.

6. Leave Protocol set to TCP.

7. Leave Forwarding Method set to Direct Routing.

8. Click Update.

9. Now click Modify next to the newly created VIP.

10. Scroll down to the Health Checks section.

11. Set the Check Port to 443.

12. Click Update.

b) Setting up the Real Servers (RIPs)

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

<table>
<thead>
<tr>
<th>Label</th>
<th>ICA_WEB1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Server IP Address</td>
<td>192.168.100.110</td>
</tr>
<tr>
<td>Weight</td>
<td>100</td>
</tr>
<tr>
<td>Minimum Connections</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Connections</td>
<td>0</td>
</tr>
</tbody>
</table>

3. Enter an appropriate label (name) for the RIP, e.g. ICA_WEB1.
4. Change the Real Server IP Address field to the required IP address, e.g. 192.168.100.110.
5. Click Update.
6. Repeat these steps to add your other iConnect Access Server(s).

Configuring VIP2 – ICA_DICOM

a) 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:

<table>
<thead>
<tr>
<th>Label</th>
<th>ICA_DICOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Service IP Address</td>
<td>192.168.100.100</td>
</tr>
<tr>
<td>Ports</td>
<td>4444</td>
</tr>
<tr>
<td>Protocol</td>
<td>TCP</td>
</tr>
<tr>
<td>Forwarding Method</td>
<td>Direct Routing</td>
</tr>
</tbody>
</table>

3. Enter an appropriate label (name) for the VIP, e.g. ICA_DICOM.
4. Set the Virtual Service IP address field to the required IP address, e.g. 192.168.100.100.
5. Set the Virtual Service Ports field to 4444.
6. Leave Protocol set to TCP.
7. Leave Forwarding Method set to Direct Routing.
8. Click Update.

b) Setting up the Real Servers (RIPs)
1. Using the WebUI, navigate to **Cluster Configuration > Layer 4 – Real Servers** and click **Add a new Real Server** next to the newly created ICA_DICOM VIP.

2. Enter the following details:

   ![Real Server Configuration Table]

   - **Label**: ICA_DICOM1
   - **Real Server IP Address**: 192.168.100.110
   - **Weight**: 100
   - **Minimum Connections**: 0
   - **Maximum Connections**: 0

3. Enter an appropriate label (name) for the RIP, e.g. **ICA_DICOM1**.

4. Change the **Real Server IP Address** field to the required IP address, e.g. **192.168.100.110**.

5. Click **Update**.

6. Repeat these steps to add your other iConnect Access Server(s).

**iConnect Access Configuration**

As mentioned earlier, when using Layer 4 DR mode, the ARP problem must be solved. This involves configuring each iConnect Access Server to be able to receive traffic destined for the VIP and ensuring that each iConnect Access Server does not respond to ARP requests for the VIP address – only the load balancer should do this.

**Solve the ARP Problem**

**Note**

The steps below are for IPv4 addresses on Windows 2012 & later. For other versions of Windows & IPv6 configuration steps, please refer to **DR Mode Considerations**

**Note**

The following steps must be performed on all iConnect Access Servers.

**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:
Note | Leaving both checked ensures that both IPv4 and IPv6 are supported. Select one if preferred.

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:**

```
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 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:

```
netsh interface ipv4 set interface "LAN" weakhostreceive=enabled
netsh interface ipv4 set interface "LOOPBACK" weakhostreceive=enabled
netsh interface ipv4 set interface "LOOPBACK" weakhostsend=enabled
```

**For IPv6 addresses:**

```
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:

```
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:

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

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

To configure just IPv4:

```
Set-NetIpInterface -InterfaceAlias loopback -WeakHostReceive enabled -WeakHostSend enabled
```
8. Testing & Verification

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

Checking the Status Using the System Overview
The System Overview in the WebUI shows a graphical view of all VIPs & RIPv (i.e. the iConnect Access Servers) and shows the state/health of each server as well as the state of the cluster as a whole. This can be used to ensure all servers are up and available.

Client Connection Tests
Ensure that clients can connect via the load balancer to the iConnect Access Servers. For this, you'll probably need to create new DNS records or modify your existing DNS records, replacing the IP addresses of individual servers with the IP address of the relevant Virtual Service on the load balancer.

9. Technical Support
For more details about configuring the appliance and assistance with designing your deployment please don't hesitate to contact the support team using the following email address: support@loadbalancer.org.

10. Additional Documentation

11. Conclusion
Loadbalancer.org appliances provide a very cost effective solution for highly available load balanced IBM Watson Health iConnect Access environments.
12. 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>
</tr>
<tr>
<td>Maintenance</td>
<td>Software Updates</td>
<td>Appliance software update management</td>
</tr>
<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:
Note: If you have already run the firewall lockdown wizard on either appliance, you'll need to ensure that it is temporarily disabled on both appliances whilst performing the pairing process.

1. Deploy a second appliance that will be the Secondary and configure initial network settings.

2. Using the WebUI on the Primary appliance, navigate to: Cluster Configuration > High-Availability Configuration.

3. Specify the IP address and the loadbalancer user's password for the Secondary (peer) appliance as shown 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](#).
## 13. 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>1.1.0</td>
<td>2 August 2019</td>
<td>Styling and layout</td>
<td>General styling updates</td>
<td>RJC</td>
</tr>
<tr>
<td>1.1.1</td>
<td>24 August 2020</td>
<td>New title page</td>
<td>Branding update</td>
<td>AH</td>
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<td></td>
<td>Updated Canadian contact details</td>
<td>Change to Canadian contact details</td>
<td></td>
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<tr>
<td>1.2.0</td>
<td>1 October 2021</td>
<td>Converted the document to AsciiDoc</td>
<td>Move to new documentation system</td>
<td>AH,RJC,ZAC</td>
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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.