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1. About this Guide

This guide details the steps required to configure a load balanced NextGen Connect 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 Administration Manual.

2. Loadbalancer.org Appliances Supported

All our products can be used for load balancing NextGen Connect. 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

- V8.4.1 and later

4. NextGen Connect Software Versions Supported

- NextGen Connect – all versions

5. Load Balancing NextGen Connect

NextGen Connect, formerly known as Mirth Connect, is a cross-platform interface engine used in the healthcare industry. It enables the management of information using bi-directional sending of many types of messages. Like an interpreter who translates foreign languages into the one you understand, NextGen Connect Integration Engine translates message standards into the one your system understands. Whenever a "foreign" system sends you a message, NextGen Connect Integration Engine’s integration capabilities expedite the following:

- Filtering – NextGen Connect Integration Engine reads message parameters and passes the message to or stops it on its way to the transformation stage
- Transformation – NextGen Connect Integration Engine converts the incoming message standard to another standard (e.g., HL7 to XML)
- Extraction – NextGen Connect Integration Engine can "pull" data from and "push" data to a database
- Routing – NextGen Connect Integration Engine makes sure messages arrive at their assigned destinations

Ports Requirements

The following table shows the ports used by the NextGen Connect nodes. The load balancer must be configured to listen on the same ports.

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocols</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>8080</td>
<td>TCP/HTTP</td>
<td>Web based access to Mirth Connect</td>
</tr>
<tr>
<td>8443</td>
<td>TCP/HTTPS</td>
<td>Secure web based access to the Mirth Connect</td>
</tr>
</tbody>
</table>
Load Balancer Deployment

When the NextGen Connect nodes 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 nodes.

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

To provide load balancing for NextGen Connect nodes one VIP is required:

- VIP 1: NextGen-HTTP(S)

Deployment Mode

We recommend using Layer 7 as no network changes are required and SSL termination with re-encryption can be implemented. This mode offers high performance and implementation flexibility, however as Layer 7 is a reverse proxy the client source IP address is not visible at the real server. Instead, the IP address of the load balancer is visible at the real server. In order to retain the client source IP address, the load balancer inserts an X-Forwarded-For header into the load balanced traffic, which the NextGen Connect nodes can log for troubleshooting issues while seeing the true source IP address of connecting clients.

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.
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.

Please refer to The Virtual Appliance - Hypervisor Deployment and the ReadMe.txt text file included in the VA download for more detailed information on deploying the VA using various Hypervisors.

For the VA, 4 NICs are included but only eth0 is connected by default at power up. If the other NICs are required, these should be connected using the network configuration screen within the Hypervisor.

Initial Network Configuration

After boot up, follow the instructions on the console to configure the IP address, subnet mask, default gateway, DNS 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. Appliance authentication is based on Apache .htaccess files. User admin tasks such as adding users and changing passwords can be performed using the WebUI menu option: Maintenance > Passwords.

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.

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>

   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
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 Configuration for NextGen Connect

Configuring VIP1 – NextGen-HTTPS

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:

   3. Enter an appropriate label (name) for the VIP, e.g. NextGen-HTTPS.
4. Set the Virtual Service IP address field to the required IP address, e.g. 192.168.0.143.
5. Set the Virtual Service Ports field to 8443.
7. Click Update.
8. Click Modify next to the newly created VIP.
9. Set Persistence Mode to Source IP.
10. Set Health Checks to Negotiate HTTPS (HEAD).
11. Under the Other section click Advanced.
12. Under Timeout check the box.
13. Set the Client Timeout and Real Server Timeout to 5m.
14. Click Update.

b) Setting up the Real Servers (RIPs)
1. Using the WebUI, navigate to Cluster Configuration > Layer 7 – Real Servers and click Add a new Real Server next to the newly created NextGen-HTTPS VIP.
2. Enter the following details:

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

3. Enter an appropriate label (name) for the RIP, e.g. NGC1.
4. Set the Real Server IP Address field to the IP address of the NextGen Connect node, e.g. 192.168.0.43.
5. Click Update.
6. Repeat these steps to add additional NextGen Connect nodes as real servers as required.

8. 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 Local SSL 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 NextGen Connect node servers see requests with a source IP address of the VIP. However, since the NextGen Connect 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 the context of a NextGen Connect deployment only SSL Bridging is an accepted configuration. Force to HTTPS is not compatible with NextGen Connect nodes and therefore should be disabled.

SSL Termination on the load balancer - SSL Bridging

In this case an STunnel SSL Virtual Service is defined 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 and is also 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 in Uploading Certificates. Alternatively, you can create a Certificate Signing Request (CSR) and send this to your CA to create a new certificate.

Generating a CSR on the Load Balancer
CSRs can be generated on the load balancer to apply for a certificate from your chosen CA.

To generate a CSR:
1. Using the WebUI, navigate to: Cluster Configuration > SSL Certificates.

2. Click Add a new SSL Certificate & select Create a New SSL Certificate (CSR):

3. Enter a suitable label (name) for the certificate, e.g. Cert1.

4. Populate the remaining fields according to your requirements.

5. Once all fields are complete click Create CSR.

6. To view the CSR click Modify next to the new certificate, then expand the Certificate Signing Request (CSR) section.

7. Copy the CSR and send this to your chosen CA.

8. Once received, copy/paste your signed certificate into the Your Certificate section.

9. Intermediate and root certificates can be copied/pasted into the Intermediate Certificate and Root Certificate sections as required.

10. Click Update to complete the process.

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**.

![Image of SSL Certificate upload interface]

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**
   It’s important to back up all of your certificates. This can be done via the WebUI from Maintenance > Backup & Restore > Download SSL Certificates.

### Configuring SSL Termination on the Load Balancer

To configure an SSL VIP the steps are outlined below:

1. Configure a layer 7 HTTP mode VIP.

2. Configure SSL termination with re-encrypt to the backend.

### 1) Configuring 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:
3. Enter an appropriate label (name) for the VIP, e.g. NextGen-HTTP.

4. Set the Virtual Service IP address field to the required IP address, e.g. 192.168.0.200.

5. Set the Virtual Service Ports field to 8080.


7. Click Update.

8. Click Modify next to the newly created VIP.

9. Set Persistence Mode to HTTP Cookie and Source IP.

10. Set Health Checks to Negotiate HTTPS (HEAD).

11. Click Advanced.

12. Set Check Port to 8443.


14. Under the Other section click Advanced.

15. Under Timeout check the box.

16. Set the Client Timeout and Real Server Timeout to 5m.

17. Click Update.

b) Setting up the Real Servers (RIPs)

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

2. Enter the following details:
3. Enter an appropriate label (name) for the RIP, e.g. **NGC1**.

4. Set the **Real Server IP Address** field to the IP address of the NextGen Connect node.

5. Click **Update**.

6. Repeat these steps to add additional NextGen Connect nodes as real servers as required.

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

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 <strong>Custom</strong>, then configure the IP address &amp; port of the required VIP.</td>
</tr>
</tbody>
</table>

3. Set **Virtual Service Port** to **8443**.
5. Select the required certificate from the SSL Certificate drop-down.
6. Click Update.
7. Click Reload STunnel when prompted to apply the new settings using the button provided in the blue box.

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 the use of the HTTP Cookie and Source IP persistence method. The connection is then re-encrypted and forwarded to the real server.

**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.

9. Testing & Verification
**Using System Overview**
The System Overview can be viewed in the WebUI. It shows a graphical view of all VIPs & RIPS (i.e. NextGen-HTTP) 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 NextGen Connect nodes are healthy and available to accept connections.

![System Overview](image)

10. 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.

11. Further Documentation

12. Conclusion
Loadbalancer.org appliances provide a very cost effective solution for highly available load balanced NextGen Connect environments.
13. 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.

**Note**

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</td>
<td>Appliance management lockdown settings</td>
</tr>
</tbody>
</table>

To add a Secondary node - i.e. create a highly available clustered pair:
1. Deploy a second appliance that will be the Secondary and configure initial network settings.

2. Using the WebUI, 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:
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*. 
## 14. 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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<tr>
<td>1.0.0</td>
<td>24 April 2020</td>
<td>Initial document creation</td>
<td></td>
<td>IBG</td>
</tr>
<tr>
<td>1.0.1</td>
<td>1 September 2020</td>
<td>New title page</td>
<td>Branding update</td>
<td>AH</td>
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<td></td>
<td></td>
<td>Updated Canadian contact details</td>
<td>Change to Canadian contact details</td>
<td></td>
</tr>
<tr>
<td>1.1.0</td>
<td>1 January 2022</td>
<td>Converted the document to AsciiDoc</td>
<td>Move to new documentation system</td>
<td>AH, RJC, ZAC</td>
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</tbody>
</table>
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.