Load Balancing Nutanix Object Storage
Version 1.0.0
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1. About this Brief

This brief outlines the steps required to configure a load balanced Nutanix Object Storage environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any Nutanix Object Storage 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 Nutanix Object Storage. For full specifications of available models please refer to https://www.loadbalancer.org/products.

Some features may not be available or fully supported in all cloud platforms due to platform specific limitations. For more details, please refer to the "Main Differences to our Standard (Non-Cloud) Product" section in the appropriate cloud platform Quick Start Guide or check with Loadbalancer.org support.

3. Software Versions Supported

3.1. Loadbalancer.org Appliance

- V8.9.1 and later

Note: The screenshots used throughout this document aim to track the latest Loadbalancer.org software version. If you’re using an older version, or the very latest, the screenshots presented here may not match your WebUI exactly.

3.2. Nutanix Object Storage

- All Versions

4. Nutanix Object Storage

Nutanix Object Storage is a scalable and distributed storage system offered by Nutanix, designed for storing and managing large volumes of unstructured data, such as documents, images, videos, and backups. It uses an object-based storage architecture and provides features like data replication, data tiering, and data protection to ensure the high availability and durability of data. Nutanix Object Storage is commonly used in enterprises and cloud environments to efficiently manage and access vast amounts of unstructured data while maintaining performance and reliability.

5. Load Balancing Nutanix Object Storage

Note: It’s highly recommended that you have a working Nutanix Object Storage environment first before implementing the load balancer.
5.1. Persistence (aka Server Affinity)
Nutanix Object Storage does not require persistence to be enabled on the load balancer.

5.2. Virtual Service (VIP) Requirements
To provide load balancing and HA for Nutanix Object Storage, 2 VIPs are required, one for HTTP traffic and the other for HTTPS traffic.

5.3. 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>HTTP</td>
<td>HTTP Object Store Service</td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>HTTPS Object Store Service</td>
</tr>
</tbody>
</table>

6. Deployment Concept

VIP = Virtual IP Address

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 the section Configuring HA - Adding a Secondary Appliance in the appendix for more details on configuring a clustered pair.

6.1. Multi-Site Deployments
All loadbalancer.org appliances includes GSLB (Global Server Load Balancing) by default. This can be used to support multi-site Nutanix Object Storage deployments. For more information on GSLB, please refer to Global Server Load Balancing.
7. Load Balancer Deployment Methods

The load balancer can be deployed in 4 fundamental ways: **Layer 4 DR mode**, **Layer 4 NAT mode**, **Layer 4 SNAT mode**, and **Layer 7 SNAT mode**.

For Nutanix Object Storage, layer 7 SNAT mode is recommended since it’s simple to implement and does not require any mode specific changes to the Nutanix Object Storage nodes. This mode is described below and is used for the configurations presented in this guide. For configuring using layer 7 SNAT mode please refer to Section 9, “Appliance Configuration for Nutanix Object Storage”.

7.1. Layer 7 SNAT Mode

Layer 7 SNAT mode uses a proxy (HAProxy) at the application layer. Inbound requests are terminated on the load balancer and HAProxy generates a new corresponding request to the chosen Real Server. As a result, Layer 7 is typically not as fast as the Layer 4 methods. Layer 7 is typically chosen when either enhanced options such as SSL termination, cookie based persistence, URL rewriting, header insertion/deletion etc. are required, or when the network topology prohibits the use of the layer 4 methods.

- Because layer 7 SNAT mode is a full proxy, any server in the cluster can be on any accessible subnet including across the Internet or WAN.
- Layer 7 SNAT mode is not transparent by default, i.e. the Real Servers will not see the source IP address of the client, they will see the load balancer’s own IP address by default, or any other local appliance IP address if preferred (e.g. the VIP address). This can be configured per layer 7 VIP. If required, the load balancer can be configured to provide the actual client IP address to the Real Servers in 2 ways. Either by inserting a header that contains the client’s source IP address, or by modifying the Source Address field of the IP packets and replacing the IP address of the load balancer with the IP address of the client. For more information on these methods please refer to **Transparency at Layer 7**.
- Layer 7 SNAT mode can be deployed using either a one-arm or two-arm configuration. For two-arm deployments, **eth0** is normally used for the internal network and **eth1** is used for the external network.
although this is not mandatory.

- Requires no mode-specific configuration changes to the load balanced Real Servers.
- Port translation is possible with Layer 7 SNAT mode, e.g. VIP:80 → RIP:8080 is supported.
- You should not use the same RIP:PORT combination for layer 7 SNAT mode VIPs and layer 4 SNAT mode VIPs because the required firewall rules conflict.

8. Loadbalancer.org Appliance – the Basics

8.1. Virtual Appliance

A fully featured, fully supported 30 day trial is available if you are conducting a PoC (Proof of Concept) deployment. The VA is currently available for VMware, Virtual Box, Hyper-V, KVM, XEN and Nutanix AHV and has been optimized for each Hypervisor. By default, the VA is allocated 2 vCPUs, 4GB of RAM and has a 20GB virtual disk. The Virtual Appliance can be downloaded here.

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

- Note
  Please refer to Virtual Appliance Installation and the ReadMe.txt text file included in the VA download for additional information on deploying the VA using the various Hypervisors.

- Note
  The VA has 4 network adapters. For VMware only the first adapter (eth0) is connected by default. For HyperV, KVM, XEN and Nutanix AHV all adapters are disconnected by default. Use the network configuration screen within the Hypervisor to connect the required adapters.

8.2. Initial Network Configuration

After boot up, follow the instructions on the appliance console to configure the management IP address, subnet mask, default gateway, DNS servers and other network and administrative settings.

- Important
  Be sure to set a secure password for the load balancer, when prompted during the setup routine.

8.3. Accessing the Appliance WebUI

The WebUI is accessed using a web browser. By default, users are authenticated using Apache authentication. Users can also be authenticated against LDAP, LDAPS, Active Directory or Radius - for more information, please refer to External Authentication.

- Note
  There are certain differences when accessing the WebUI for the cloud appliances. For details, please refer to the relevant Quick Start / Configuration Guide.

1. Using a browser, navigate to the following URL:

Note You’ll receive a warning about the WebUI’s SSL certificate. This is due to the default self-signed certificate that is used. If preferred, you can upload your own certificate - for more information, please refer to Appliance Security Features.

Note If you need to change the port, IP address or protocol that the WebUI listens on, please refer to Service Socket Addresses.

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

   **Username:** loadbalancer  
   **Password:** <configured-during-network-setup-wizard>

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

Once logged in, the WebUI will be displayed as shown below:
3. You’ll be asked if you want to run the Setup Wizard which can be used to configure layer 7 services. Click **Dismiss** if you’re following a guide or want to configure the appliance manually or click **Accept** to start the wizard.

**Main Menu Options**

**System Overview** - Displays a graphical summary of all VIPs, RIPs and key appliance statistics

**Local Configuration** - Configure local host settings such as IP address, DNS, system time etc.

**Cluster Configuration** - Configure load balanced services such as VIPs & RIPs

**Maintenance** - Perform maintenance tasks such as service restarts and taking backups

**View Configuration** - Display the saved appliance configuration settings

**Reports** - View various appliance reports & graphs

**Logs** - View various appliance logs

**Support** - Create a support download, contact the support team & access useful links

**Live Chat** - Start a live chat session with one of our Support Engineers
8.4. Appliance Software Update

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

Determining the Current Software Version

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

Checking for Updates using Online Update

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

   **Information:** Version v8.11.1 is the current release. No updates are available

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

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

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

   **Information:** Update completed successfully.

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

Using Offline Update

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

1. Using the WebUI, navigate to: Maintenance > Software Update.
2. Select Offline Update.
3. The following screen will be displayed:

   **Software Update**

   **Offline Update**

   The following steps will lead you through offline update.

   1. Contact support@loadbalancer.org to obtain the offline update archive and checksum.
   2. Save the archive and checksum to your local machine.
   3. Select the archive and checksum files in the upload form below.
   4. Click Upload and Install to begin the update process.

   ![Upload and Install](image)

   - **Archive:** Choose File
   - **Checksum:** Choose File

   4. Select the Archive and Checksum files.
5. Click Upload and Install.
6. If services need to be reloaded/restarted or the appliance needs a full restart, you'll be prompted accordingly.

### 8.5. Ports Used by the Appliance

By default, the appliance uses the following TCP & UDP ports:

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Port</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP</td>
<td>22 *</td>
<td>SSH</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>53 *</td>
<td>DNS / GSLB</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>123</td>
<td>NTP</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>161 *</td>
<td>SNMP</td>
</tr>
<tr>
<td>UDP</td>
<td>6694</td>
<td>Heartbeat between Primary &amp; Secondary appliances in HA mode</td>
</tr>
<tr>
<td>TCP</td>
<td>7778</td>
<td>HAPProxy persistence table replication</td>
</tr>
<tr>
<td>TCP</td>
<td>9000 *</td>
<td>Gateway service (Centralized/Portal Management)</td>
</tr>
<tr>
<td>TCP</td>
<td>9080 *</td>
<td>WebUI - HTTP (disabled by default)</td>
</tr>
<tr>
<td>TCP</td>
<td>9081 *</td>
<td>Nginx fallback page</td>
</tr>
<tr>
<td>Protocol</td>
<td>Port</td>
<td>Purpose</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>TCP</td>
<td>9443</td>
<td>WebUI - HTTPS</td>
</tr>
<tr>
<td>TCP</td>
<td>25565</td>
<td>Shuttle service (Centralized/Portal Management)</td>
</tr>
</tbody>
</table>

The ports used for SSH, GSLB, SNMP, the WebUI, the fallback page, the gateway service and the shuttle service can be changed if required. For more information, please refer to Service Socket Addresses.

8.6. HA Clustered Pair Configuration
Loadbalancer.org recommend that load balancer appliances are deployed in pairs for high availability. In this guide a single unit is deployed first, adding a secondary unit is covered in the section Configuring HA - Adding a Secondary Appliance of the appendix.

9. Appliance Configuration for Nutanix Object Storage

9.1. Configuring VIP 1 - Nutanix-HTTP
1. Using the WebUI, navigate to Cluster Configuration > Layer 7 – Virtual Services and click on Add a new Virtual Service.
2. Enter the following details:
   - Define the Label for the virtual service as required, e.g. Nutanix-HTTP.
   - Set the Virtual Service IP Address field to the required IP address, e.g. 192.168.110.100.
   - Set the Ports field to 80.
   - Set the Layer 7 Protocol to TCP Mode.
   - Click Update to create the virtual service.
3. Now click Modify next to the newly created VIP.
4. Scroll to the Persistence section.
Set the Persistence Mode to None.

10. Leave all other settings at their default value.

11. Click Update.

9.2. Defining the Real Servers (RIPs)

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

2. Enter the following details:

3. Define the Label for the real server as required, e.g. NutanixObjectStorage-1.

4. Set the Real Server IP Address field to the required IP address, e.g. 192.168.110.110.

5. Set the Real Server Port field to 80.

6. Leave all other settings at their default value.

7. Click Update.

8. Repeat these steps to add the remaining Nutanix Object Storage nodes.

9.3. Configuring VIP 2 - Nutanix-HTTPS

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

2. Enter the following details:
3. Define the **Label** for the virtual service as required, e.g. **Nutanix-HTTPS**.

4. Set the **Virtual Service IP Address** field to the required IP address, e.g. **192.168.110.100**.

5. Set the **Ports** field to **443**.

6. Set the **Layer 7 Protocol** to **TCP Mode**.

7. Click **Update** to create the virtual service.

8. Now click **Modify** next to the newly created VIP.

9. Scroll to the **Persistence** section.
   - Set the **Persistence Mode** to **None**.

10. Leave all other settings at their default value.

11. Click **Update**.

### 9.4. Defining the Real Servers (RIPs)

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

2. Enter the following details:

   3. Define the **Label** for the real server as required, e.g. **NutanixObjectStorage-1**.
4. Set the **Real Server IP Address** field to the required IP address, e.g. **192.168.110.110**.

5. Set the **Real Server Port** field to **443**.

6. Leave all other settings at their default value.

7. Click **Update**.

8. Repeat these steps to add the remaining Nutanix Object Storage nodes.

### 9.5. Finalizing the Configuration

To apply the new settings, HAProxy must be reloaded. This can be done using the button in the "Commit changes" 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**.

### 10. Testing & Verification

#### 10.1. Accessing Nutanix Object Storage

Verify that you can access Nutanix Object Storage by connecting to the VIP address on the load balancer rather than one of the storage nodes. If you connect using a FQDN, first modify DNS to point at the VIP address.

#### 10.2. Using System Overview

The System Overview can be viewed in the WebUI. It shows a graphical view of all VIPs & RIPs (i.e. the Nutanix Object Storage nodes) and shows the state/health of each server as well as the state of the cluster as a whole.

The example below shows that all three Nutanix Object Storage 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

For additional information, please refer to the Administration Manual.
13. Appendix

13.1. Configuring HA - Adding a Secondary Appliance

Our recommended configuration is to use a clustered HA pair of load balancers to provide a highly available and resilient load balancing solution. We recommend that the Primary appliance is fully configured first, then the Secondary appliance can be added to create an HA pair. Once the HA pair is configured, load balanced services must be configured and modified on the Primary appliance. The Secondary appliance will be automatically kept in sync.

For Enterprise Azure, the HA pair should be configured first. For more information, please refer to the Azure Quick Start/Configuration Guide available in the documentation library.

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</td>
<td>Interface IP addresses, bonding configuration and VLANs</td>
</tr>
<tr>
<td></td>
<td>Configuration</td>
<td></td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Routing</td>
<td>Default gateways and static routes</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>System Date &amp; time</td>
<td>Time and date related settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Physical – Advanced</td>
<td>Various appliance settings</td>
</tr>
<tr>
<td></td>
<td>Configuration</td>
<td></td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Portal Management</td>
<td>Portal management settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Security</td>
<td>Security settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>SNMP Configuration</td>
<td>SNMP settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Graphing</td>
<td>Graphing settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>License Key</td>
<td>Appliance licensing</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Backup &amp; Restore</td>
<td>Local XML backups</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Software Updates</td>
<td>Appliance software updates</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Fallback Page</td>
<td>Fallback page configuration</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Firewall Script</td>
<td>Firewall (iptables) configuration</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Firewall Lockdown</td>
<td>Appliance management lockdown settings</td>
</tr>
<tr>
<td></td>
<td>Wizard</td>
<td></td>
</tr>
</tbody>
</table>
Configuring the HA Clustered Pair

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 in the example 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 "Commit changes" message box at the top of the screen.

Note Clicking the Restart Heartbeat button on the Primary appliance will also automatically restart heartbeat on the Secondary appliance.

Note For more details on configuring HA with 2 appliances, please refer to Appliance Clustering for HA.

Note For details on testing and verifying HA, please refer to Clustered Pair Diagnostics.
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>
</tr>
</thead>
<tbody>
<tr>
<td>1.0.0</td>
<td>25 January 2024</td>
<td>Initial version</td>
<td></td>
<td>DS, RJC</td>
</tr>
</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.