# Table of Contents

1. About this Guide ......................................................... 3
2. Loadbalancer.org Appliances Supported ............................ 3
3. Software Versions Supported ........................................... 3
   3.1. Loadbalancer.org Appliance ................................... 3
   3.2. Microsoft Windows Server ................................... 3
4. Related Documentation .................................................. 3
5. Load Balanced Ports / Services ....................................... 3
6. Appliance Configuration Overview .................................... 3
   6.1. Operation Mode ................................................... 3
   6.2. Print Server Health-check ..................................... 4
   6.3. Deployment Concept ............................................ 4
7. Deploying & Accessing the Appliance ............................... 4
   7.1. Deployment ...................................................... 4
   7.2. Accessing the Appliance WebUI ............................... 4
   7.2.1. Main Menu Options ....................................... 6
8. Configuration Steps ..................................................... 6
   8.1. Appliance Configuration ......................................... 6
   8.1.1. Using Layer 4 DR Mode .................................... 6
   8.1.2. Using Layer 7 SNAT Mode ................................ 7
   8.2. Print Server Configuration .................................... 9
   8.2.1. Solve the ARP Problem (Layer 4 DR Mode Only) ....... 9
   8.2.2. Enable Microsoft Print Server Load Balancing ....... 14
9. Testing & Verification .................................................. 17
10. Deploying Load Balanced Printers via Group Policy ............. 17
11. Loadbalancer.org Technical Support .................................. 18
12. Document Revision History ........................................... 19
1. About this Guide
This document provides a quick reference guide on how to load balance Microsoft Print Servers using Loadbalancer.org appliances.

2. Loadbalancer.org Appliances Supported
All our products can be used with Microsoft Print Server. 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

3.2. Microsoft Windows Server
- Windows Server 2012 and later

4. Related Documentation
For additional information, please refer to the Administration Manual and the relevant Quick Start / Configuration Guide.

5. Load Balanced Ports / Services

<table>
<thead>
<tr>
<th>Ports</th>
<th>Uses</th>
<th>Transport Layer Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>445</td>
<td>SMB</td>
<td>TCP</td>
</tr>
<tr>
<td>515</td>
<td>LPD</td>
<td>TCP</td>
</tr>
</tbody>
</table>

6. Appliance Configuration Overview

6.1. Operation Mode
Configuration steps are provided for layer 4 DR mode and layer 7 SNAT mode. Layer 4 DR mode requires the "ARP Problem" to be solved on each print server - for more information, please refer to Solve the ARP Problem (Layer 4...
DR Mode Only). Layer 7 SNAT mode does not require any mode specific configuration changes.

6.2. Print Server Health-check
A connect to port health-check on port 445 is used to verify that each Print Server is available.

6.3. Deployment Concept
Once the load balancer is deployed, clients connect to the Virtual Service (VIP) on the load balancer rather than directly to one of the Print Servers.

7. Deploying & Accessing the Appliance

7.1. Deployment
Deploy the Loadbalancer.org appliance as described in the relevant Quick Start / Configuration Guide.

7.2. 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...
2. Log in to the WebUI using the following credentials:

**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:
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.

7.2.1. 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. Configuration Steps

8.1. Appliance Configuration

8.1.1. Using Layer 4 DR Mode

**Configure 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:

   - Specify an appropriate *Label* (name) for the VIP, e.g. *PrintServers*.
   - Set the *IP address* to the required IP address, e.g. *192.168.100.10*.
   - Set the *Ports* to *445,515*.

   *Note* If you only have SMB print queues, port 515 can be omitted.
3. Click **Update**.

4. Now click **Modify** next to the newly created Virtual Service.
   - Scroll to the **Health Checks** section.
     - Ensure the **Health Check** is set to **Connect to Port**.
     - Ensure the **Check Port** is set to **445**.

5. Click **Update**.

### Define the Real Servers

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:

<table>
<thead>
<tr>
<th>Label</th>
<th>PS1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Server IP Address</td>
<td>192.168.100.20</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>

   - Specify an appropriate **label** for the first print server, e.g. **PS1**.
   - Set the **Real Server IP Address** to the address of the first print server, e.g. **192.168.100.20**.

3. Click **Update**.

4. Repeat these steps to add additional print servers.

### 8.1.2. Using Layer 7 SNAT Mode

#### Configure 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:
- Specify an appropriate **Label** (name) for the VIP, e.g. **PrintServers**.
- Set the **IP address** to the required IP address, e.g. **192.168.100.10**.
- Set the **Ports** to **445,515**.

  If you only have SMB print queues, port 515 can be omitted.

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

3. Click **Update**.

4. Now click **Modify** next to the newly created Virtual Service.
   - Scroll to the **Persistence** section.
     - Change the **Persistence Mode** to **None**.
   - Scroll to the **Health Checks** section.
     - Ensure the **Health Check** is set to **Connect to Port**.
     - Click **[Advanced]** and set the **Check Port** to **445**.

5. Click **Update**.

**Define 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:
Specify an appropriate label for the first print server, e.g. PS1.

Set the Real Server IP Address to the address of the first print server, e.g. 192.168.100.20.

Leave the Real Server Port field blank.

3. Click Update.

4. Repeat these steps to add additional print servers.

**Reload HAProxy**

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.

### 8.2. Print Server Configuration

#### 8.2.1. Solve the ARP Problem (Layer 4 DR Mode Only)

**Note** The configuration steps in this section are NOT required when using layer 7 SNAT mode.

Layer 4 DR (Direct Routing) mode works by changing the MAC address of inbound packets to match the Real Server selected by the load balancing algorithm. Steps must taken for each Real Server to enable DR mode to work correctly. This is known as "solving the ARP Problem". The exact steps required depend on the particular operating system in use.

**Note** For more details on the ARP problem, please refer to DR Mode Considerations.

**Windows Server 2012 & Later**

Windows Server 2012 and later support Direct Routing (DR) mode through the use of the Microsoft Loopback Adapter that must be installed and configured on each load balanced (Real) Server. The IP address configured on the Loopback Adapter must be the same as the Virtual Service (VIP) address. This enables the server to receive packets that have their destination set as the VIP address. If a Real Server is included in multiple DR mode VIPs, an IP address for each VIP must be added to the Loopback Adapter.

In addition, the strong/weak host behavior must be configured on each Real Server. The weak host model allows packets with any IP to be sent or received via an interface. The strong host model only allows packets with an IP belonging to the interface to be sent or received.

**Important** The following 3 steps must be completed on all Real Servers associated with the VIP.

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

1. Click Start, then run hdwwiz to start the Hardware Installation Wizard.

2. Once 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**.

   **Note** You can configure IPv4 or IPv6 addresses or both depending on your requirements.

   **Important** When configuring the loopback adapter properties, make sure that **Client for Microsoft Networks** and **File & Printer Sharing for Microsoft Networks** is also checked as shown below.

**IPv4 Addresses**

1. Uncheck all items except **Client for Microsoft Networks**, **File & Printer Sharing for Microsoft Networks** and **Internet Protocol Version 4 (TCP/IPv4)** as shown below:
2. Ensure that **Internet Protocol Version (TCP/IPv4)** is selected, click **Properties** and configure the IP address to be the same as the Virtual Service address (VIP) with a subnet mask of **255.255.255.255**, e.g. **192.168.2.20/255.255.255.255** as shown below:

### Internet Protocol Version 4 (TCP/IPv4) Properties

- **Obtain an IP address automatically**
- **Use the following IP address**:
  - **IP address**: 192.168.2.20
  - **Subnet mask**: 255.255.255.255
  - **Default gateway**: . . .

### Note

192.168.2.20 is an example, make sure you specify the correct VIP address.

### Note

If a Real Server is included in multiple DR mode VIPs, an IP address for each VIP must be
3. Click **OK** then click **Close** to save and apply the new settings.

**IPv6 Addresses**

1. Uncheck all items except **Client for Microsoft Networks**, **File & Printer Sharing for Microsoft Networks** and **Internet Protocol Version 6 (TCP/IPv6)** as shown below:

2. Ensure that **Internet Protocol Version (TCP/IPv6)** is selected, 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:
Note 2001:470:1f09:e72::15/64 is an example, make sure you specify the correct VIP address.

Note If a Real Server is included in multiple DR mode VIPs, an IP address for each VIP must be added to the Loopback Adapter.

3. Click OK then click Close to save and apply the new settings.

Step 3 of 3: Configure the strong/weak host behavior
The strong/weak host behavior can be configured using either of the following 2 methods:

- Option 1 - Using Network Shell (netsh) commands
- Option 2 - Using PowerShell cmdlets

The commands in this section assume that the LAN Adapter is named "net" and the Loopback Adapter is named "loopback" as shown in the example below:

Important Either adjust the commands to use the names allocated to your LAN and loopback adapters, or rename the adapters before running the commands. Names are case sensitive so make sure that the interface names used in the commands match the adapter names exactly.
Option 1 - Using Network Shell (netsh) Commands

To configure the correct strong/weak host behavior run the following commands:

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 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
```

Option 2 - Using PowerShell Cmdlets

For IPv4 addresses:

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

For IPv6 Addresses:

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

8.2.2. Enable Microsoft Print Server Load Balancing

**Pre-Requisites**

1. Each Print Server must be joined to the same domain as the client PCs.

2. Each Print Server must have the **Print and Document Service** role installed.

3. All printers must be installed & shared on each Print Server using exactly the same share names, settings and permissions.

**Note**

A number of issues have been reported when using Type 4 print drivers, so whenever possible we recommend using Type 3 drivers. Type 4 drivers are usually bundled with the operating system or are downloaded from Windows update, whereas Type 3 drivers are typically
Enable access via Hostname

To enable the load balanced Print Servers to be accessed via an appropriate hostname, complete the following steps:

Note: The configuration steps below assume the hostname for the VIP is `printserver-vip` and the domain name is `lbtestdom.com`. Change these to suit your environment.

Windows 2019 & Later

For Windows 2019 & later, local host file entries and a single Registry Key must be added to each Print Server:

1. Add the following host entries to the local hosts file on each Print Server:

   `<Real Server IP address> printserver-vip`
   `<Real Server IP address> printserver-vip.lbtestdom.com`

   For example, if you have 2 Print Servers - 192.168.100.20 and 192.168.100.21, the following entries must be added:

   a. on the 192.168.100.20 server:

      192.168.100.20 printserver-vip
      192.168.100.20 printserver-vip.lbtestdom.com

   b. on the 192.168.100.21 server:

      192.168.100.21 printserver-vip
      192.168.100.21 printserver-vip.lbtestdom.com

2. Add the following Registry Key to each Print Server:

   Key: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\lanmanserver\parameters
   Value: OptionalNames
   Type: REG_MULTI_SZ
   Data: `printserver-vip`

   Note: In the example presented here, `printserver-vip` is the hostname that will be used to access the load balanced Print Servers via the virtual service (VIP) created on the load balancer. This can be set to be any appropriate name, although whatever name is used, it must be the same name that is used for the DNS entry described in the "Configure DNS Name Resolution" section below.

Windows 2012 & 2016
For Windows 2012 & 2016, the following Registry Keys must be added to each Print Server:

- **Key: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Lsa**
  - **Value:** DisableLoopbackCheck
  - **Type:** REG_DWORD
  - **Data:** 1

- **Key: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\lanmanserver\parameters**
  - **Value:** DisableStrictNameChecking
  - **Type:** REG_DWORD
  - **Data:** 1

- **Key: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\lanmanserver\parameters**
  - **Value:** OptionalNames
  - **Type:** REG_MULTI_SZ
  - **Data:** printserver-vip

**Note**

In the example presented here, **printserver-vip** is the hostname that will be used to access the load balanced Print Servers via the virtual service (VIP) created on the load balancer. This can be set to any appropriate name, although whatever name is used, it must be the same name that is used for the DNS entry described in the "Configure DNS Name Resolution" section below.

**Configure DNS Name Resolution**

1. Create a DNS Host (A) record that points to the VIP address. The hostname used must match the value set for the REG_MULTI_SZ **OptionalNames** registry entry, in this example: **printserver-vip** → 192.168.100.10.

**Disable NetBIOS over TCP/IP**

1. On each Print Server, disable NetBIOS over TCP/IP on all interfaces:
Server Reboot
To apply the changes, reboot each Print Server.

9. Testing & Verification
You should now be able to access your printers using either the Virtual Service IP address or the share name. For the example presented in this guide the following UNC paths can be used:

\192.168.100.10

\printserver-vip

\printserver-vip.lbtestdom.com

Any shared printers and shared folders that have been configured on the Print Servers should be visible.

10. Deploying Load Balanced Printers via Group Policy
1. Ensure that the name you’ve used for your load balanced Print Server cluster (e.g. printserver-vip) is resolvable by DNS as explained above.

2. On one of your Print Servers, open: Administrative Tools > Print Management.
   - Right-click Print Servers and click Add/Remove Servers.
• Specify the name you’ve used for your load balanced Print Server cluster, e.g. `printserver-vip` and click OK.

• Expand the Print Servers section then expand the new `printserver-vip` section.

• Select Printers.

• Right click the printer you want to deploy and click Deploy with Group Policy.

• Select the relevant GPO and configure the remaining settings according to your requirements.

11. Loadbalancer.org Technical Support

If you have any questions regarding the appliance or would like assistance designing your deployment, please don’t hesitate to contact our support team: support@loadbalancer.org.
## 12. 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>1.1.0</td>
<td>4 November 2019</td>
<td>Styling and layout</td>
<td>General styling updates</td>
<td>AH</td>
</tr>
<tr>
<td>1.1.1</td>
<td>9 June 2020</td>
<td>New title page</td>
<td>Branding update</td>
<td>AH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Updated Canadian contact details</td>
<td>Change to Canadian contact details</td>
<td></td>
</tr>
<tr>
<td>1.1.2</td>
<td>25 June 2021</td>
<td>Added Print Server load balancing configuration steps for Windows 2019</td>
<td>The steps listed for other versions of Windows do not work for Windows 2019</td>
<td>RJC</td>
</tr>
<tr>
<td>1.2.0</td>
<td>1 September 2022</td>
<td>Converted the document to AsciiDoc</td>
<td>Move to new documentation system</td>
<td>AH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Updated links and instructions where necessary</td>
<td>Required updates</td>
<td></td>
</tr>
<tr>
<td>1.2.1</td>
<td>3 November 2022</td>
<td>Removed configuration sections for Legacy environments</td>
<td>Section no longer needed / updated configuration requirements</td>
<td>RJC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added section covering how to solve the ARP problem for Windows 2012 &amp; Later</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added port 515 to the VIP</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added the OptionalNames Registry key for Windows 2019 &amp; later</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.2</td>
<td>7 November 2022</td>
<td>Added minimum software version sections</td>
<td>Additional information</td>
<td>RJC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Various minor tidy ups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.3</td>
<td>5 January 2023</td>
<td>Combined software version information into one section</td>
<td>Housekeeping across all documentation</td>
<td>AH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added one level of section numbering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.4</td>
<td>2 February 2023</td>
<td>Updated screenshots</td>
<td>Branding update</td>
<td>AH</td>
</tr>
<tr>
<td>1.2.5</td>
<td>8 March 2023</td>
<td>Improved document structure</td>
<td>Document standardization</td>
<td>RJC</td>
</tr>
<tr>
<td>1.3.0</td>
<td>24 March 2023</td>
<td>New document theme</td>
<td>Branding update</td>
<td>AH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modified diagram colours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version</td>
<td>Date</td>
<td>Change</td>
<td>Reason for Change</td>
<td>Changed By</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------</td>
<td>-------------------------------------------------------------</td>
<td>----------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>1.3.1</td>
<td>27 April 2023</td>
<td>Added note to say port 515 can be omitted if only have SMB print queues</td>
<td>Remove unnecessary configuration</td>
<td>RJC</td>
</tr>
<tr>
<td>1.3.2</td>
<td>24 August 2023</td>
<td>Added note to say that type 3 printer drivers are recommended</td>
<td>Type 4 drivers can cause issues</td>
<td>RJC</td>
</tr>
<tr>
<td>1.4.0</td>
<td>22 November 2023</td>
<td>Added layer 7 SNAT mode configuration</td>
<td>Provides additional deployment flexibility</td>
<td>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.