Load Balancing
Microsoft 2012 DirectAccess

Deployment Guide
v1.2.0
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1. About this Guide

This guide details the steps required to configure a load balanced Microsoft DirectAccess environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any Microsoft DirectAccess 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 relevant Administration Manual:

• v7 Administration Manual
• v8 Administration Manual

2. Loadbalancer.org Appliances Supported

All our products can be used with DirectAccess. The complete list of models is shown below:

<table>
<thead>
<tr>
<th>Discontinued Models</th>
<th>Current Models *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise R16</td>
<td>Enterprise R20</td>
</tr>
<tr>
<td>Enterprise VA R16</td>
<td>Enterprise MAX</td>
</tr>
<tr>
<td>Enterprise VA</td>
<td>Enterprise 10G</td>
</tr>
<tr>
<td>Enterprise R320</td>
<td>Enterprise 40G</td>
</tr>
<tr>
<td></td>
<td>Enterprise Ultra</td>
</tr>
<tr>
<td></td>
<td>Enterprise VA R20</td>
</tr>
<tr>
<td></td>
<td>Enterprise VA MAX</td>
</tr>
<tr>
<td></td>
<td>Enterprise AWS</td>
</tr>
<tr>
<td></td>
<td>Enterprise AZURE **</td>
</tr>
</tbody>
</table>

* For full specifications of these models please refer to: [http://www.loadbalancer.org/products/hardware](http://www.loadbalancer.org/products/hardware)

** Some features may not be supported, please check with Loadbalancer.org support

3. Loadbalancer.org Software Versions Supported

• V7.6.4 & later

4. Microsoft Windows Versions Supported

• Windows 2012 and later
5. Microsoft 2012 DirectAccess

Introduction
DirectAccess is a feature of Windows that allows connectivity to organization network resources without the need for traditional Virtual Private Network (VPN) connections. With DirectAccess, client computers are always connected to your organization – there is no need for remote users to start and stop connections as is required with traditional VPN connections.

From a user’s perspective DirectAccess is a completely automatic VPN connection that simplifies accessing corporate LAN services from wherever they are located.

DirectAccess Components
DirectAccess is part of the Remote Access server role. The table below details the key components that must be available for DirectAccess to work.

These are the components that are made highly available using the load balancer:

<table>
<thead>
<tr>
<th>Component</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>DirectAccess Server</td>
<td>This is the server that clients establish a tunnel with in order to access the corporate network. Client and server settings are configured via Group Policy to enable the IPsec tunnels to be established.</td>
</tr>
<tr>
<td>Network Location Server</td>
<td>The network location server is used to detect whether computers configured as DirectAccess clients are located in the corporate network. When clients are on the corporate network, DirectAccess is not used to reach internal resources. Instead, clients connect to these resources directly. If the client cannot reach the network location server, the client is considered to be outside the corporate network and a connection is established via the DirectAccess server.</td>
</tr>
<tr>
<td>Connectivity Verifier (Web Probe)</td>
<td>This is part of the Network Connectivity Assistant. It is used by clients to verify connectivity to the internal network.</td>
</tr>
</tbody>
</table>

How it Works
DirectAccess clients communicate with the corporate network using Internet Protocol version 6 (IPv6) and IPsec. To enable this to work over the IPv4 based Internet, IPv4 transition technologies (6to4, Teredo, or IP-HTTPS) are used to encapsulate the IPv6 packets in IPv4 packets.

6to4 and Teredo have various pre-requisites that can make deployment more complex. IP-HTTPS is much simpler to deploy and is the only protocol that can be used when the DirectAccess server is deployed behind a NAT firewall.

Network Location Server is used by the client to determine when it's outside the corporate LAN and automatically activates the connection when it is.

DirectAccess uses the Name Resolution Policy Table (NRPT) to identify which hosts should be accessed via the DirectAccess tunnel (i.e. internal servers) and those which should be accessed directly (i.e. Internet based servers). See page 7 for more information on the NRPT.
IPv6 Transition Protocols

Windows 2012 supports the following transition protocols for client to DirectAccess server communication:

<table>
<thead>
<tr>
<th>Client Transition Protocol</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 6to4                        | - Uses protocol 41 to encapsulate IPv6 packets in IPv4 packets  
                              - Does NOT work when the client or the server are behind a NAT device  
                              - Both client and server must be assigned public IPv4 addresses |
| Teredo                     | - Uses UDP on port 3544 to encapsulate IPv6 packets in IPv4 packets  
                              - Supports client behind a NAT device but not server behind NAT  
                              - Server must be configured with 2 consecutive public IPv4 addresses |
| IP-HTTPS *                | - Uses standard port and protocol  
                              - Earlier clients/servers caused double encryption (IPsec & SSL/TLS)  
                              - Windows 8 and later use null encryption to solve the double encryption |

* IP-HTTPS is the transition protocol used in this deployment guide

Note: Additional protocols (NAT64 & DNS64) are used to provide external DirectAccess clients inbound access to IPv4 servers on the corporate LAN. When "mange-out" outbound access from IPv4 servers to DirectAccess clients is needed, ISATAP must be used. These protocols are not covered in this deployment guide.

Network Topology Options

DirectAccess supports several topology options including dual/single NIC and supports various connectivity options including directly connected (requires public IP addresses) and behind a NAT device.

Note: When DirectAccess servers are deployed behind a NAT device, the only IPv6 transition protocol that is supported is IP-HTTPS.

Network Location Server (NLS)

NLS is a critical component of DirectAccess and is used by clients to determine if they are inside or outside the corporate LAN. The NLS should only be resolvable/reachable internally, and NOT externally. It is possible to use the DirectAccess server as the location server but this is strongly discouraged by Microsoft. Instead, alternative servers should be selected.
These servers require that IIS is installed with HTTPS bindings configured with a certificate that has the FQDN of the network location server. In this guide, this is `directaccess-nls.robstest.com`. Please refer to the following link for more details:


### Client Connectivity Verifier (Web Probe)

The connectivity verifier is used by the Network Connectivity Assistant (NCA) on the DirectAccess clients to check that it can successfully connect to the internal resource. A successful connection indicates that the client is connected. This is not a critical component of DirectAccess, it is only a reporting mechanism and if the the NCA can't connect, DirectAccess functionality is not effected. Typically, the DirectAccess servers are used for this purpose. It's not possible to use Location Servers since by design they are only available when connected to the internal network, and therefore the client would not be able to connect when on the Internet. By default the FQDN for the probe is `directaccess-webprobehost.domain.com`. Note that DNS entries are auto created by the setup wizard.

### Windows 7 DirectAccess Connectivity Assistant

Windows 7 clients require the DirectAccess connectivity assistant to be manually installed so they can connect to the web probe DNS address. Windows 8 clients have this installed by default.


### Name Resolution Policy Table (NRPT)

Some technologies (including DirectAccess) require special handling for name queries for specific portions of the DNS namespace. If the DNS name being searched matches specified portions of the namespace, apply the special handling. If the DNS name does not match the specified portions of the namespace, perform a normal DNS query using the interface-configured DNS servers. To address this need, the Name Resolution Policy Table (NRPT) is used.

When a DirectAccess client is on the Internet, the Name Resolution Policy Table (NRPT) causes DNS name queries for internal resources to be sent to internal DNS servers. In some cases this is not desirable, e.g. for the location servers. In these cases a NRPT exception can be added. This tells the DNS client to resolve the name using its normal interface-configured DNS server instead of sending the query to the internal DNS server.

An NRPT exception consists of a fully-qualified DNS name that has no associated DirectAccess DNS Server address (see page 14 for more details).

### Certificate Requirements

For this guide, an internal CA was used to generate these certificates, and the same certificate/private key was installed on each DirectAccess/Network Location server. Certificates are required for the following:

1. IP-HTTPS, e.g. `https://directaccess.robstest.com`
2. Network Location Server, e.g. `https://directaccess-nls.robstest.com`

For DirectAccess in Windows Server 2012 and later, the DirectAccess server can act as a Kerberos proxy to perform IPsec authentication without requiring certificates. If the Kerberos protocol is used, it works over SSL, and the Kerberos proxy uses the certificate that is configured for IP-HTTPS for this purpose.

Windows7 clients do not support the Kerberos proxy and require computer certificates for IPSec. In this case, the DirectAccess server and clients are required to obtain a computer certificate. The simplest way to install the certificates is to configure Group Policy-based automatic enrollment for computer certificates. This ensures that all domain members obtain a certificate from the enterprise CA.
6. Load Balancing DirectAccess

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

**Basic Concepts**
To provide resilience and high availability for your DirectAccess infrastructure, multiple DirectAccess servers should be deployed with a load balancer. This helps ensure that users can always connect to the corporate network by constantly checking the health of the DirectAccess servers and only forwarding connections to functional servers.

**Load Balancer Deployment**
The following diagram shows a typical load balanced DirectAccess deployment.

Notes:
- Load balancers can be deployed as single units or as a clustered pair. Loadbalancer.org recommends deploying a clustered pair for HA and resilience.
Load Balancer Deployment Mode
Layer 7 SNAT mode (HAProxy) is recommended for DirectAccess and is used for the configuration presented in this guide. This mode offers good performance and is simple to configure since it requires no configuration changes to the DirectAccess servers.

Layer 4 DR mode, NAT mode and SNAT mode can also be used if preferred. For DR mode you'll need to solve the ARP problem on each DirectAccess server (please see the Administration Manual and search for “DR mode considerations”), for NAT mode the default gateway of the DirectAccess servers must be the load balancer.

Load Balanced Ports & Services
For IP-HTTPS, the following ports/protocols must be load balanced:

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>User</th>
</tr>
</thead>
<tbody>
<tr>
<td>443</td>
<td>TCP/IP-HTTPS</td>
<td>All DirectAccess client to server communication</td>
</tr>
</tbody>
</table>

Persistence (Server Affinity)
Source IP address persistence is used for the DirectAccess servers. This ensures that a particular client will connect to the same DirectAccess server for the duration of the session.

Server Health Checking
To constantly check and verify the health of the DirectAccess servers, the load balancer is configured to perform an HTTPS negotiate check. This check verifies that each server responds with 200 OK.

The health check for the Network Location Servers and Connectivity Verifier (web probe) servers uses a TCP port connect to verify server health.

Load Balanced DNS Requirements

Internal

The following resources must be resolvable internally:

- The load balanced network location servers, e.g. directaccess-nls.robtest.com
- The load balanced web probe server, e.g. directaccess-webprobehost.robtest.com

External

The following resources must be resolvable externally:

- The load balanced DirectAccess servers, e.g. directaccess.robtest.com
- The load balanced connectivity web probe server, e.g. directaccess-webprobehost.robtest.com
Note: The Network Location Server should NOT be resolvable/reachable from outside the corporate network as mentioned on page 6.

SSL Offloading
As already mentioned, when IP-HTTPS is used double encryption occurs (IPsec & SSL/TLS). This is mitigated with Win8/Win2012 by using a NULL cipher which solves the performance issue. Windows 7 clients are unable to use the NULL cipher so the double encryption performance issue remains.

It’s not possible to enable SSL offload on the load balancer in this case because the load balancer would need to emulate Windows 8 DirectAccess client behavior which is not currently possible.

7. DirectAccess Configuration for Load Balancing

Introduction
DirectAccess is part of the Remote Access role. Once installed, there are 2 wizard options to configure the system:

- **Run the Getting Started Wizard**
  Use this wizard to configure DirectAccess and VPN quickly, with default recommended settings.

- **Run the Remote Access Setup Wizard**
  Use this wizard to configure DirectAccess and VPN with custom settings.

The first option (Getting Started Wizard) is the simplest as it configures most settings automatically although some of the defaults used are not necessarily desirable – e.g. the DirectAccess servers are set as the Network Location Servers which is not recommended by Microsoft.

The second option (Remote Access Setup Wizard) requires each part of the system to be configured manually. Whichever option is used, the resulting configuration can easily be changed using the Remote Access Setup console to edit the configuration.
Install & Configure the first DirectAccess & NLS Server

This section lists the key configuration steps that were performed in relation to the test environment used in this guide.

- Using the internal CA, create SSL certs for `directaccess.robstest.com` and `directaccess-nls.robstest.com` and place these in the Personal Certificate Store on the DirectAccess server/Network Location Server (NLS).
- Install IIS on the NLS and ensure that the HTTPS binding is configured to use the `directaccess-nls.robstest.com` certificate.
- Add an internal DNS record for `directaccess-nls.robstest.com`.
- Install DirectAccess on the first server.
- Now run the Remote Access Setup Wizard.

Remote Access Setup Step 1 – Remote Clients

- Create/select the computer group that will use DirectAccess.
Remote Access Setup Step 2 – Remote Access Server

- For the RAS server network topology, select **Behind an edge device**:
- Enter the FQDN for DirectAccess:
• Browse to and select the certificate created earlier:

Select the network topology of the server.

- Edge
- Behind an edge device (with two network adapters)
- Behind an edge device (with a single network adapter)

In this topology, the Remote Access server is deployed with a single network adapter that is connected to the internal network.

Type the public name or IPv4 address used by clients to connect to the Remote Access server:
directaccess.robtest.com

Remote Access Setup Step 3 – Infrastructure Server Setup

• Specify & validate the Network Location Server:
Specify settings for the network location server, used to determine the location of DirectAccess client computers. A client computer connecting successfully to the site is assumed to be on the internal network, and DirectAccess is not used.

- The network location server is deployed on a remote web server (recommended)
  - Type in the URL of the network location server:
    - https://directaccess-nls.robtest.com/
    - Validate

- The network location server is deployed on the Remote Access server
  - Select the certificate used to authenticate the network location server:
    - Use a self-signed certificate
    - Browse...

- Connectivity to URL https://directaccess-nls.robtest.com/ was validated successfully.

• Configure DNS suffixes and servers. The direct access and location servers were both entered as exceptions, i.e. no DNS server address is specified, this causes these names to be resolved using locally defined DNS servers rather than forwarding them to internal DNS servers:

Enter DNS suffixes and internal DNS servers. DirectAccess client queries that match a suffix use the specified DNS server for name resolution. Name suffixes that do not have corresponding DNS servers are treated as exemptions, and DNS settings on client computers are used for name resolution.

<table>
<thead>
<tr>
<th>Name Suffix</th>
<th>DNS Server Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>robtest.com</td>
<td>192.168.110.242</td>
</tr>
<tr>
<td>directaccess-nls.robtest.com</td>
<td></td>
</tr>
<tr>
<td>directaccess.robtest.com</td>
<td></td>
</tr>
</tbody>
</table>

Select a local name resolution option:
- Use local name resolution if the name does not exist in DNS (most restrictive)
- Use local name resolution if the name does not exist in DNS or DNS servers are unreachable when the client computer is on a private network (recommended)
- Use local name resolution for any kind of DNS resolution error (least restrictive)
• Once the wizard is complete, verify that DNS records for the Connectivity Verifiers have been auto-created. These are:
  
directaccess-copconnectivityhost.robstest.com
  and
  directaccess-webprobehost.robstest.com

Add Additional DirectAccess Servers & Configure Load Balancing

• Install DirectAccess on the second server but don’t run the configuration wizard

• Export the SSL certs (and private key) used for directaccess.robstest.com and directaccess-nls.robstest.com from the existing servers, then import into the Personal Certificate Store on the additional DirectAccess server(s)/NL server(s)

• On the additional NL server(s), install IIS and ensure that the HTTPS binding is configured to use the directaccess-nls.robstest.com certificate

• On the first DirectAccess server, enable load balancing, define a new IP address to be used for the interface (the existing IP will be used as the VIP address on the load balancer as explained during configuration)

• Confirm the configuration:

  ![Load balancing was configured successfully.]

<table>
<thead>
<tr>
<th>Load balancing method</th>
<th>External load balancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIPs:</td>
<td>192.168.111.242/255.255.192.0</td>
</tr>
<tr>
<td>VIPs:</td>
<td>192.168.110.242/255.255.192.0</td>
</tr>
</tbody>
</table>

• Now add the second DirectAccess server. Once configured, both are listed as part of the load balanced cluster:

  ![Load Balanced Cluster]

Client Configuration

Client configuration settings are deployed via Group Policy. The auto-created GPO is called DirectAccess Client Settings. To force a test client to immediately apply these settings, run the following command:

  gpupdate /force
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].

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 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](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 29.
9. Appliance Configuration for DirectAccess

Configuring load balancing for DirectAccess is done in 4 steps:

A) Configuring load balancing for DirectAccess Servers
B) Configuring load balancing for Network Location Servers
C) Configuring load balancing for Connectivity Verifier (Web Probe) Servers
D) Finalizing Appliance settings

A – Configuring for DirectAccess Servers

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 name (Label) for the Virtual Service, e.g. DirectAccess
4. Set the Virtual Service IP address field to the required IP address, e.g. 192.168.110.242
5. Set the Virtual Service Ports field to 443
6. Set the Layer 7 Protocol to TCP Mode
7. Click Update
8. Now click Modify next to the newly created Virtual Service
9. Ensure Persistence Mode is set to Source IP
10. Change Health Checks to Negotiate HTTPS as shown below
11. Set Check Port to **443**
12. Set Request to Send to **IPHTTPS**
13. Leave Response Expected blank
14. Set Host Header as appropriate for your environment, e.g. `directaccess.robtest.com`
15. Click Update

**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 Virtual Service
2. Enter the following details:

   ![Real Server Configuration](image)

   3. Enter an appropriate name (Label) for the first DirectAccess server, e.g. DA1
   4. Change the Real Server IP Address field to the required IP address, e.g. `192.168.111.242`
   5. Set the Real Server Port field to **443**
   6. Click Update
   7. Now repeat for your remaining DirectAccess server(s)

**DNS Configuration**

1. Ensure that the external DNS record points at the correct external IP and that the firewall NAT's this to the load balanced VIP address.
B - Configuring for Network Location Servers

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:
   - Enter an appropriate name (Label) for the Virtual Service, e.g. DirectAccess-NLS
   - Set the Virtual Service IP address field to the required IP address, e.g. 192.168.110.244
   - Set the Virtual Service Ports field to 443
   - Set the Layer 7 Protocol to TCP Mode
   - Click Update
3. Now click Modify next to the newly created Virtual Service
4. Change Persistence Mode to None
5. Ensure Health Checks is set to Connect to Port
6. Click Update

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 Virtual Service
2. Enter the following details:
3. Enter an appropriate name (Label) for the first NLS server, e.g. NLS1
4. Change the Real Server IP Address field to the required IP address, e.g. 192.168.110.240
5. Set the Real Server Port field to 443
6. Click Update
7. Now repeat for your remaining NLS server(s)

DNS Configuration

1. Modify the internal DNS entry for the Network Location Server so it points at the load balanced VIP address rather than the IP address of the first NL server.
   i.e. directaccess-nls.robstest.com → 192.168.110.244

C - Configuring for Connectivity Verifier (Web Probe) Servers

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:
   - Enter an appropriate name (Label) for the Virtual Service, e.g. DirectAccess-WP
   - Set the Virtual Service IP address field to the required IP address, e.g. 192.168.110.242
5. Set the Virtual Service Ports field to **80**
6. Set the Layer 7 Protocol to **TCP Mode**
7. Click **Update**
8. Now click **Modify** next to the newly created Virtual Service
9. Change Persistence Mode to **None**
10. Ensure Health Checks is to **Connect to Port**
11. Click **Update**

**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 Virtual Service
2. Enter the following details:

```
<table>
<thead>
<tr>
<th>Label</th>
<th>WP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Server IP Address</td>
<td>102.168.111.242</td>
</tr>
<tr>
<td>Real Server Port</td>
<td>80</td>
</tr>
<tr>
<td>Weight</td>
<td>100</td>
</tr>
</tbody>
</table>
```
3. Enter an appropriate name (Label) for the first Web Probe server, e.g. **WP1**
4. Change the Real Server IP Address field to the required IP address, e.g. **192.168.111.242**
5. Set the Real Server Port field to **80**
6. Click **Update**
7. Now repeat for your remaining Web Probe server(s)

**DNS Configuration**

1. The internal DNS entry for the load balanced Connectivity Verifier (web probe) Servers should already exist and refer to the VIP address.
   i.e. **directaccess-webprobehostrobstest.com → 192.168.110.242**

**D – Finalizing Appliance Settings**

**Configure Layer 7 Timeouts**

1. Using the WebUI, navigate to: **Cluster Configuration > Layer 7 – Advanced Configuration**
2. Change **Client Timeout** to **30m** as shown above (i.e. 30 minutes)
3. Change **Real Server Timeout** to **30m** as shown above (i.e. 30 minutes)
4. Click the **Update** button to save the settings

**Restart HAProxy**
1. To apply the new settings restart HAProxy using the WebUI option: Maintenance > Restart Services and clicking **Restart HAProxy**

**10. Testing & Verification**

Note: Make sure that the firewall on the clients and servers is enabled. This is a requirement for DirectAccess to work successfully.

**Using The System Overview**
Verify that all VIPs & associated RIPS are reported as up (green) as shown below:
If certain servers are down, i.e. failing their health check, they will be highlighted red as shown below:

Verify Client Location

Using `netsh dns show state`

When inside the corporate network it should show:

When outside the corporate network it should show:
Verify Domain Connectivity

1) using `nltest /dsgetdc`

When run internally or externally this command should be able to connect and retrieve domain information:

```
C:\Users\administrator>nltest /dsgetdc:

DC: \robstest.com

DOM Guid: e8b06100-3d88-44ad-90fd-84d11730684c

Dom Name: robstest.com

Flag: MDC GC DS LDAP KDC TIMESERV GTIMESERV WRITABLE DNS_DC DNS_DOMAIN DNS_FOREST CLOSE_SITE FULL_SECRET

The command completed successfully.
```

2) browsing to `\domain-name`, e.g. `\robstest.com`

When run internally or externally this should show the list of default shares:
Verify Network Connection

Using `ipconfig /all`

When run externally should show that the IPHTTPS interface is active:

When run internally, it should show that the client is connected using the standard NIC card and that the IPHTTPS interface is no longer active.
DirectAccess Client Troubleshooting Tool
This Microsoft tool is very useful when diagnosing client connection issues. It can be downloaded from the following URL: https://www.microsoft.com/en-us/download/details.aspx?id=41938.

11. 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. Further Documentation

13. Conclusion
Loadbalancer.org appliances provide a very cost effective and flexible solution for highly available load balanced DirectAccess Server 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:

• Once complete, the following will be displayed:
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.

2 – Useful Microsoft Resources & References

Microsoft Windows DirectAccess Client Troubleshooting Tool:

DirectAccess in Windows Server:

Troubleshooting DirectAccess:

Client diagnostic log information:

What’s new in DirectAccess 2012:
15. Document Revision History

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<td>12.0</td>
<td>26 November 2019</td>
<td>Styling and layout</td>
<td>General styling updates</td>
<td>AH</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.

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