



# High Availability

## Installation and Configuration Guide

**CloudShell 7.1 GA**

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## Overview

This document describes the installation and configuration of CloudShell in a High Availability (HA) environment.

This document should be read in conjunction with the *CloudShell High Availability Deployment Guide*.

A failover cluster is a group of independent servers (nodes) that work together to increase the availability and scalability of clustered nodes. The clustered nodes are connected by physical cables and by software. If a disaster occurs and the active cluster node goes down, the clustering solution changes the active node automatically to the standby server and Quali server starts on the new active node.

## Requirements and Prerequisites

This section describes the CloudShell clustering requirements.

The following table lists the requirements for the following infrastructure components: NICs, Switches and host.

Based on the CloudShell High Availability Deployment Guide, the administrator should select the optimal set up for the environment (4/6/8 nodes on physical or virtual machines).

### 4 machines High availability setup

Component	Requirements
Quali Application Server , License server, CloudShell Portal	<ul style="list-style-type: none"><li>• 2 machines running Windows 2012 Server Standard or Datacenter edition and above</li><li>• 2 network adapters (one for cluster use and one for client use)</li><li>• Failover cluster role installed</li><li>• Windows Failover Cluster Manager installed</li><li>• 4 IP addresses free in the client subnet (for Cluster front, and components roles)</li></ul>
SQL cluster	<ul style="list-style-type: none"><li>• According to prerequisites listed in the SQL clustering solution</li></ul>

## 6 machines High availability setup

Component	Requirements
CloudShell HA (Quali Application Server plus License server)	<ul style="list-style-type: none"> <li>• 2 machines running Windows 2012 Server Standard or Datacenter edition and above</li> <li>• 2 network adapters (one for cluster use and one for client use)</li> <li>• Failover cluster role installed</li> <li>• Windows Failover Cluster Manager installed</li> <li>• 3 Available IPs in the client subnet (for Cluster front and components roles)</li> </ul>
CloudShell Portal	<ul style="list-style-type: none"> <li>• 2 machines running Windows 2012 Server Standard or Datacenter edition and above</li> <li>• 2 network adapters (one for cluster use and one for client use)</li> <li>• Failover cluster role installed</li> <li>• Cluster is configured using Windows Failover Cluster Manager</li> <li>• Available IP in the client subnet (for Cluster front)</li> <li>• IIS 8.0 installed</li> <li>• ASP.NET 4.5 enabled on IIS 8.0 web server (see <a href="http://www.iis.net/learn/get-started/whats-new-in-iis-8/iis-80-using-aspnet-35-and-aspnet-45">http://www.iis.net/learn/get-started/whats-new-in-iis-8/iis-80-using-aspnet-35-and-aspnet-45</a>)</li> </ul>
SQL cluster	<ul style="list-style-type: none"> <li>• According to prerequisites listed in the SQL clustering solution</li> </ul>

## 8 machines High availability setup

Component	Requirements
CloudShell HA (Quali Application Server plus License	<ul style="list-style-type: none"> <li>• 2 machines running Windows 2012 Server Standard or Datacenter edition and above</li> <li>• 2 network adapters (one for cluster use and one for client</li> </ul>

server)	use) <ul style="list-style-type: none"><li>• Failover cluster role installed</li><li>• Windows Failover Cluster Manager installed</li><li>• 3 Available IPs in the client subnet (for Cluster front and components roles)</li></ul>
CloudShell Portal (2 Portal servers plus 2 Load Balancing Servers)	2 machines with CloudShell Portal (see <a href="#">6 machines setup</a> ) 2 machines with: <ul style="list-style-type: none"><li>• Windows 2012 Server Standard or Datacenter edition and above</li><li>• 2 network adapters (one for cluster use and one for client use)</li><li>• Network load balancing installed (see <a href="#">Installing Windows Network Load Balancing</a>)</li><li>• IIS 8 and above installed</li><li>• ASP.NET 4.5 enabled on IIS 8.0</li><li>• Server farm installed (for installation procedures, see <a href="#">Configuring the Server Farm</a>)</li></ul>
SQL cluster	<ul style="list-style-type: none"><li>• According to prerequisites listed in the SQL clustering solution</li></ul>

## Software licenses

- Windows server 2012
- SQL Server 2012 Enterprise or SQL Server 2014 Enterprise or SQL Server 2016 Standard Edition
- CloudShell HA license

## Supported versions of MS SQL Server

- SQL Server 2012 Enterprise Edition
- SQL Server 2014 Enterprise Edition



- SQL Server 2016 Standard Edition

To deploy on a virtual environment with VMware vCenter 5.5 or above that has HA clustering configured across two different ESXi hosts, ssee <https://pubs.vmware.com/vsphere-55/index.jsp#com.vmware.vsphere.avail.doc/GUID-E90B8A4A-BAE1-4094-8D92-8C5570FE5D8C.html>.

## Installation procedure

This section describes the installation and configuration procedure. Perform the steps in the following table:

Download and install the latest official CloudShell High Availability Solution Pack	<a href="#">Downloading the CloudShell High Availability Solution Pack</a>
Database configuration	<a href="#">Configuring the database server cluster</a>
Quali server installation	<a href="#">Installing Quali server</a>
Quali server configuration	<a href="#">Configuring Quali server</a>
Configure the AlwaysOn availability Group (for MSSQL AlwaysOn users)	<a href="#">AlwaysOn Availability Groups (SQL Server)</a>
Portal Installation and configuration (not for advanced setup users)	<a href="#">Installing and configuring CloudShell Portal</a>
Install and configure ARR and load balancing	<a href="#">Microsoft Application Request Routing</a>
Configure SSL	<a href="#">Configuring CloudShell Portal to support SSL</a>

## Downloading the CloudShell High Availability Solution Pack

The CloudShell High Availability Solution Pack is available from the [Quali's Download Center](#).

Each folder contains an **.md5** file with a list of files in that folder and their md5 checksum.

Note: Registration to the QualiSystems portal is required, so if you have not already done so, register in advance.

Download the CloudShell High Availability Solution Pack (zip file) and extract all the files under one folder, for example: `C:\Quali`. Ensure files are placed on the exact path on each of the cluster nodes.

The CloudShell High Availability Solution Pack for this version (zip file) contains the following files:

- Quali Server folder: files required to cluster Quali server plus elastic search
- CloudShell Portal folder: files required to cluster CloudShell portal using Windows cluster (basic setup)
- LicenseServer folder: `LicenseServer.vbs` script that is used in a Windows cluster and is triggered by cluster events

- Documentation folder: the CloudShell High Availability Deployment Guide and the CloudShell High Availability Installation and Configuration Guide
- The `HASqlPortal.sql` file

## Install and configure the License Server

The License server component is co-hosted with the application server. A Windows script monitors the license server service.

Use the procedures in this section to install and configure the License Server and apply the license.

### License Server installation

#### To install the License Server:

- Follow the License Server installation procedure in the CloudShell Suite Installation Guide.

### Configuring each node with License Server

#### To configure each node in the system:

1. Install License Server on each node.
2. Configure the License Server.

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**Note:** Use the CloudShell Suite Installation Guide for more information about License Server Installation.

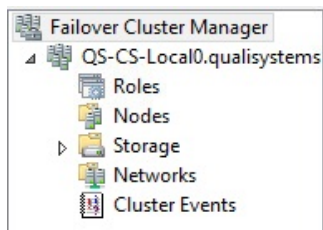
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3. Apply the license.

### Create a Configuration Role for WSFC

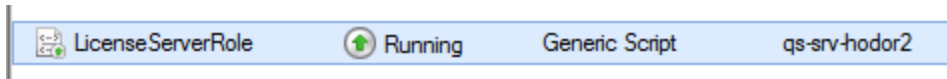
#### To create a configuration role:

1. Open **Windows Failover Cluster Manager**.



2. Right-click **Roles** and select **Configure Role**.
3. Click **Next**, select the **Generic Script** option, then click **Next**.
4. Enter the path to the `LicenseServer.vbs` file.  
(for example: `c:\Quali\LicenseServer.vbs`)
5. Enter a name for the role and click **Next**.
6. Click **Next** to complete the wizard.

This creates a new role that starts to run cluster events.



## Configuring CloudShell components to the License Server Role address

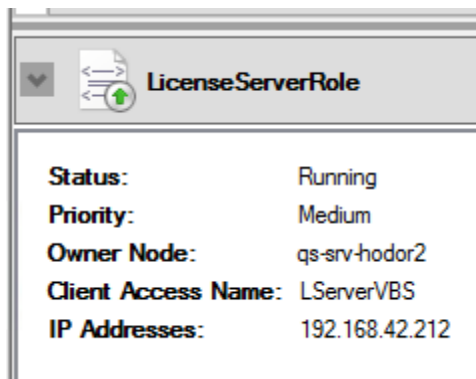
Use the procedures described in this section to configure CloudShell components after completing the High Availability configuration.

All CloudShell components can be configured to the clustered License Server Role address.

### To configure CloudShell components to the License Server Role address:

1. Open the **Windows Failover Cluster Manager**.
2. Click the required **License Server** role.

The role's **IP Address** is displayed in the bottom half of the screen.



**Note:** The CloudShell HA License Server solution requires a dual set of licenses – a license for each of the nodes.

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## Alternative license server solution

An alternative license server solution is to host the license server on a separate machine (VM). Use either MS Clustering or VM Fault Tolerance solution to handle failover.

## Configuring the database server cluster

The SQL server database clustering uses the **AlwaysOn Availability Group** solution.

### AlwaysOn Availability Groups (SQL Server)

The **AlwaysOn Availability Groups** feature is a high-availability and disaster-recovery solution that provides an enterprise-level alternative to database mirroring. AlwaysOn Availability Groups maximizes the availability of a set of user databases for an enterprise. An availability group supports a failover environment for a discrete set of user databases, known as availability databases that fail over together. An availability group supports a set of read-write primary databases and one to four sets of corresponding secondary databases. Optionally, secondary databases can be made available for read-only access and/or some backup operations.

An availability group fails over at the level of an availability replica. Failovers are not caused by database issues, such as, a database becoming suspect due to a loss of a data file, deletion of a database, or corruption of a transaction log. For more information about AlwaysOn Availability Groups, see [https://msdn.microsoft.com/en-us/library/hh510230\(v=sql.110\).aspx](https://msdn.microsoft.com/en-us/library/hh510230(v=sql.110).aspx).

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**Note:** **AlwaysOn Availability Groups** is a Microsoft feature.

---

The supported versions of MS SQL Server are:

- SQL Server 2012 Enterprise Edition
- SQL Server 2014 Enterprise Edition
- SQL Server 2016 Standard Edition

### Setting up and configuring an instance of SQL Server to Support AlwaysOn Availability Groups

For more information about AlwaysOn Availability Groups, see [https://msdn.microsoft.com/en-us/library/gg509118\(v=sql.110\).aspx](https://msdn.microsoft.com/en-us/library/gg509118(v=sql.110).aspx).

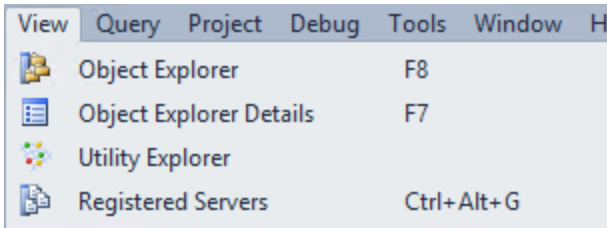
#### Prerequisite

Set-up nodes with Windows Server Failover Clustering (WSFC)

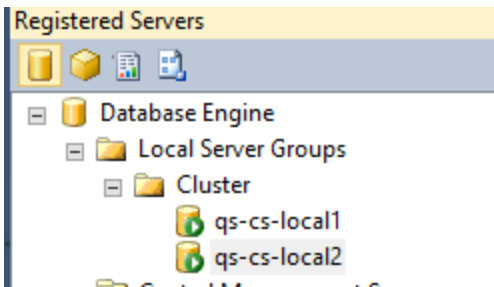
## Configuring SQL Server AlwaysOn availability group

### To configure the SQL Server AlwaysOn availability group:

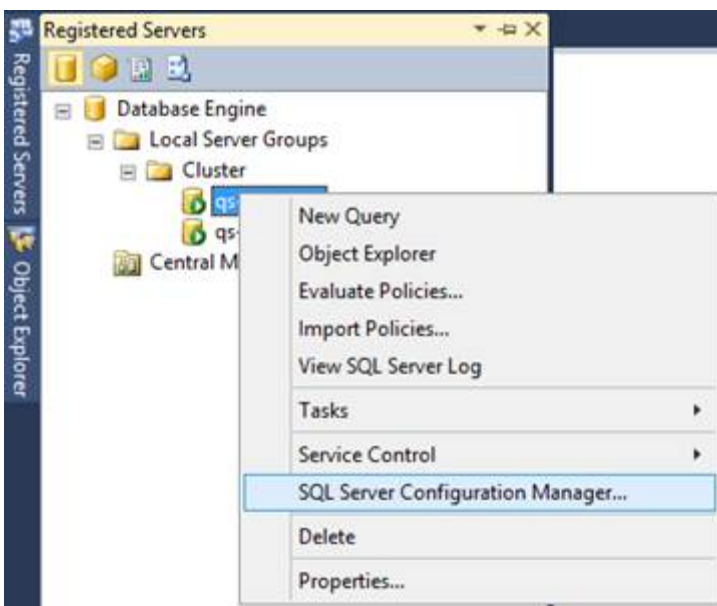
1. Open SQL Server on one of the nodes.
2. Connect to all SQL servers that should be part of the SQL cluster.
3. Choose **View > Registered Servers**.



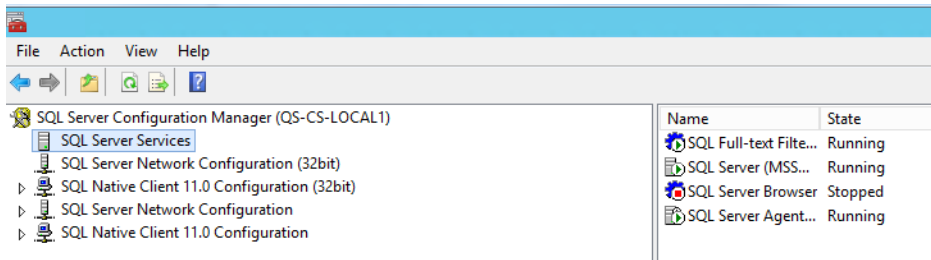
4. Add the required servers to a new group.



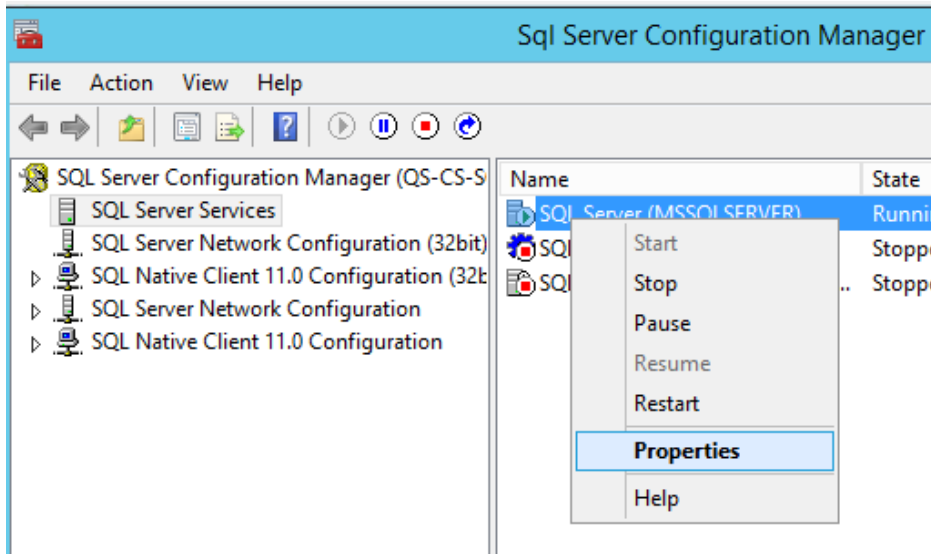
5. Right-click on a server and click **SQL Server Configuration Manager**.



6. Select **SQL Server Services**.

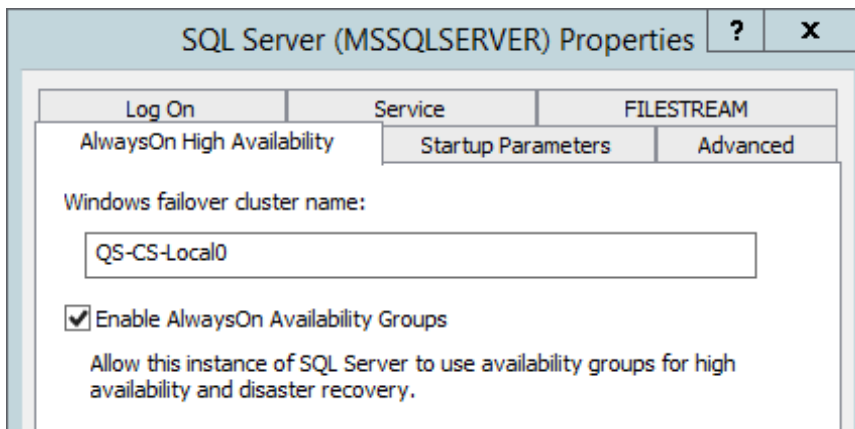


7. Right-click the SQL Server instance and select **Properties**.



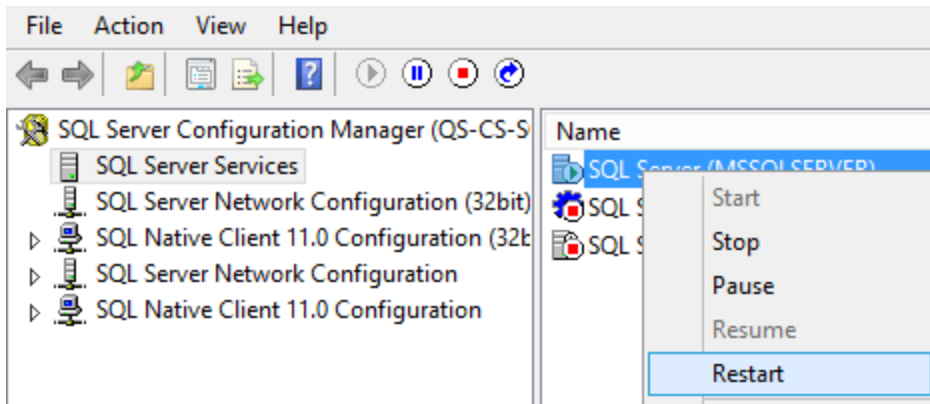
8. Open the **AlwaysOn High Availability** tab.

9. Check the **Enable AlwaysOn Availability Groups** check-box.

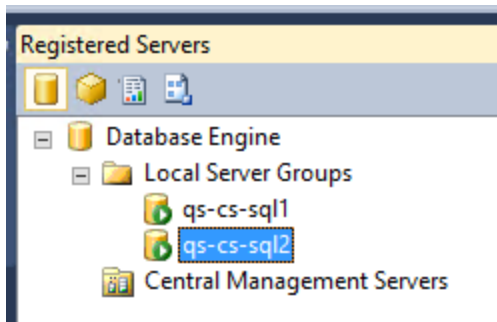


**Note:** If there is no cluster name, make sure to install Windows failover cluster and configure a cluster first.

10. Right-click the SQL Server instance and click **Restart**.



11. Enable **AlwaysOn** for each of the DB cluster nodes.
12. Repeat steps 5-10 for each SQL server presented in the MSSQL registered servers pane.



The cluster is now configured for **AlwaysOn**.

## Configure the Application Server

Quali server works with only one active node in Active-Passive mode. You can change any node in the cluster to be the active node. However, only one Quali server should be up at any time. Elasticsearch (a search engine that achieves fast search responses), is synchronized between nodes to ensure that the latest state is available in all nodes. After a node recovery, the node starts and elasticsearch launches automatically for synchronization with the online node.

Use the following procedures to configure Quali server to work in a cluster environment.

## Modifying the `elasticsearch.yml` configuration file

**To modify the `elasticsearch.yml` configuration file:**



1. Save the extracted elasticsearch.yml file under the name: elasticsearch.yml.old. Keep this file as a backup.
2. Open the elasticsearch.yml file in a text editor.
3. In the cluster section, modify the value of cluster.name to your cluster name. Use a unique name to distinguish between CloudShell environments in your network. For example:

```
##### Cluster
#####

# Cluster name identifies your cluster for auto-discovery. If
# you're running multiple clusters on the same network, make sure
# you're using unique names.

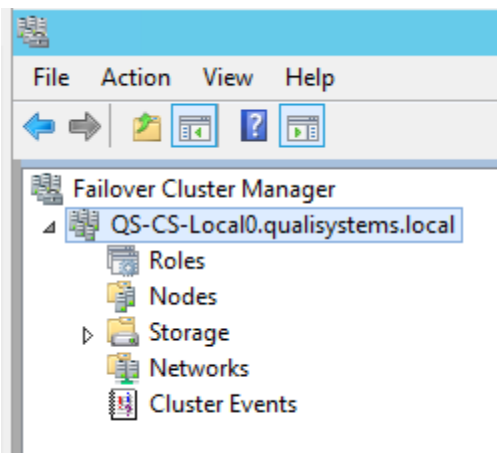
#
cluster.name: QS-CS-Local10.qualisystems.local
```

## Locating the cluster name

Cluster names are displayed in the **Windows Failover Cluster Manager**. After creating a cluster, open the Windows Failover Cluster Manager.

**To display the cluster name:**

- Open the Windows Failover Cluster Manager.



In the explorer tree, the cluster name is displayed under Failover Cluster Manager.

## Modify the Quali.vbs file

**To modify the Quali.vbs file:**

1. Rename the extracted `Quali.vbs` file to: "Quali.vbs.old". Keep this file as a backup.
2. Open the `Quali.vbs` file in a text editor.
3. Modify the following values:
  - `Eventlog` - The values are `$true` or `$false`. If the value is `$true`, all scripts write logs to the Windows event log while running - set to `$true` by default. It's recommended to leave it with the default.
  - `ScriptPath` – The folder which in you store all the PowerShell scripts that are in the downloaded CloudShell High Availability Solution Pack zip file. For example:

```
Const EventLog = "$true"  
Const ScriptPath = "c:\Quali\QualiServer"
```
4. Save the file.

## Installing and configuring Quali server

Use the following procedures to install and then configure Quali server to work in a cluster environment.

### Installing Quali server

#### To install Quali Server:

- Follow the Quali Server installation procedure in the *CloudShell Suite Installation Guide*.

### Configuring Quali server

Configure Quali server to communicate with the computer where the database is installed. You can either create a new database or use an existing QualiSystem database.

**AlwaysOn Users:** Set the Quali server to one of the AlwaysOn nodes. This setting changes after configuring the AlwaysOn listener.

#### To configure Quali server on the first cluster node:

1. Configure Quali server (note that during configuration, when you specify the License server IP or name, ensure that you use the License server role IP that you configured earlier, see the [Configuring License Server](#) section).
2. Run the following command at the command prompt: `services.mcs`
3. Right-click the Quali server service and select **Stop**.
4. When the service has stopped, right-click the Quali server service and select **Properties**.
5. In the Quali server **Properties** window, in the **Startup** type menu, select **Manual**.
6. Using Windows Explorer, navigate to the following directory:  
`[CloudShell Server Directory]\QualiSystems\CloudShell\Server`  
Where `[CloudShell Server Directory]` is the directory where CloudShellServer is installed.
7. Rename the `customer.config` file to: "customer.config.old". Keep this file as a backup.
8. Double-click the `customer.config` file.

9. In the `<appSettings>` section, add the following line:

```
<add key="FtsReplicasShards" value="1"/>
```

10. Using Windows Explorer, navigate to the following directory:

```
[CloudShell Server Directory]\QualiSystems\CloudShell\Server\  
QuickSearch\Config
```

Where `[CloudShell Server Directory]` is the directory where CloudShell Server is installed.

11. Rename the `elasticsearch.yml` file to: "elasticsearch.yml.old". Keep this file as a backup.
12. Copy the `elasticsearch.yml` file that was modified in the procedure [Modifying the elasticsearch.yml configuration file](#) to the `QuickSearch` folder.
13. Start the Quali server service.
14. Stop the Quali Server.

## Setting up AlwaysOn availability groups (only for AlwaysOn users)

---

**Note:** Make sure to perform the steps in the [Configuring Quali server](#) topic in order to work with the Availability group listener step after configuring the **AlwaysOn availability** group.

---

### To cluster the database:

1. Ensure that you create a full back up for all clustered CloudShell databases. For more information, see (<https://msdn.microsoft.com/en-us/library/ms187510.aspx>).
2. Make sure to open port 5022 on all cluster machines firewalls
3. Open the SQL server in which you created the CloudShell DBs, expand **AlwaysOn High Availability** and right-click **Availability Groups**.
4. Click **New Availability Group Wizard**.



5. Specify a group name.

**Specify an availability group name.**

Availability group name:

6. Associate the availability groups to the CloudShell databases (Quali Database, Results Database, Insight Database):
- For **SQL Server Enterprise Edition**, associate all three databases to the availability group.
  - For **SQL Server 2016 Standard Edition**, create two additional **AlwaysOn** availability groups by repeating steps 4-5 (3 groups in total), and associate each database to a different group.
7. Make sure that status in the **Status** column of every database is **Meets prerequisites**. If not, click the database status, follow the error message and resolve the issue.

**Select user databases for the availability group.**

User databases on this instance of SQL Server:

	Name	Size	Status
<input checked="" type="checkbox"/>	Quali	23.9 MB	<a href="#">Meets prerequisites</a>
<input checked="" type="checkbox"/>	QualiInsight	5.3 MB	<a href="#">Meets prerequisites</a>
<input checked="" type="checkbox"/>	QualiResults	5.3 MB	<a href="#">Meets prerequisites</a>

8. Click **Next**.
9. Under the **Replicas** tab, click **Add Replicas** and connect to all of the environment SQL

nodes using SQL or windows authentication.

**Specify an instance of SQL Server to host a secondary replica.**

Replicas | Endpoints | Backup Preferences | Listener

Availability Replicas:

Server Instance	Initial Role	Automatic Failover (Up to 2)	Synchronous Commit (Up to 3)	Readable Secondary
QS-CS-LOCAL1	Primary	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	No
QS-CS-LOCAL2	Secondary	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Read-intent only

Add Replica...   Add Azure Replica...   Remove Replica

**Summary for the replica hosted by QS-CS-LOCAL2**

**Replica mode:** Synchronous commit with automatic failover  
This replica will use synchronous-commit availability mode and support both automatic failover and manual failover.

**Readable secondary:** Read-intent only  
In the secondary role, this availability replica will only allow read-intent connections.

10. Select the **Automatic Failover** checkbox for each of the servers and for each of the servers, select **Read-intent only** from the **Readable Secondary** dropdown list.

**Note:** SQL Server 2016 Standard Edition does not support this feature.

11. Click the **Listener** tab, insert the values for **Listener DNS Name**, **Port** (1433 for MSSQL default) and select **Network Mode**. If you selected **DHCP**, then select **subnet**. If you selected **Static IP**, then specify an available IP in the subnet.

Script Help

Listener DNS Name: QualiDBListner

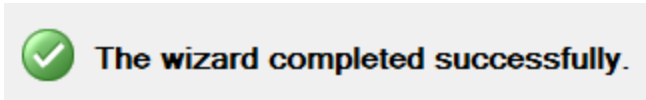
Port: 1433

Network Mode: DHCP

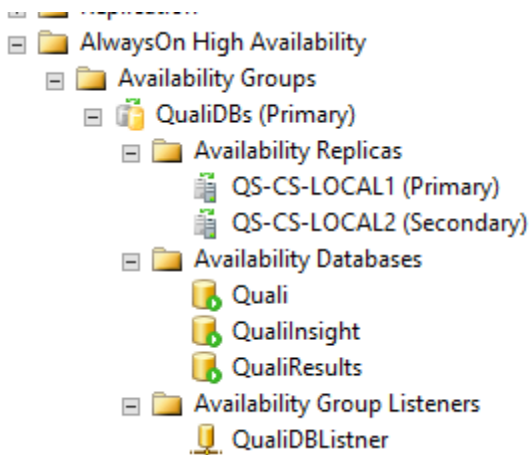
Choose a Subnet: DHCP, Static IP

12. Click **Next**.
13. Select **Full**. Specify the database backup file location on the server and click **Next**.
14. Wait for the validation step to finish.
15. If an error occurs during this process, click on the error, resolve the problem and run the validation step again.

16. When all steps are free of errors, click **Next**.
17. Click **Finished**. The wizard is finalized and the clustering Role dependencies are created.



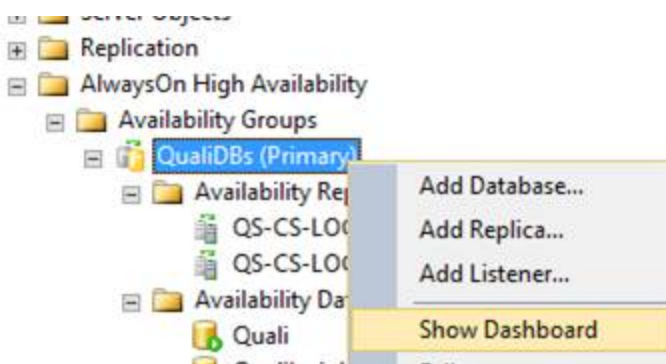
Now, the availability group is set up, and you can see all relevant data for it under the availability group name you specified in early step:



## Displaying cluster health information

To see more information about the cluster health:

1. Right click the availability group name.
2. Click **Show Dashboard**.



Note that a new Role was generated under the Microsoft Clustering manager with type **Other**:

Name	Status	Type	Owner Node	Priority	Information
QualiDBs	Running	Other	QS-CS-Local1	Medium	

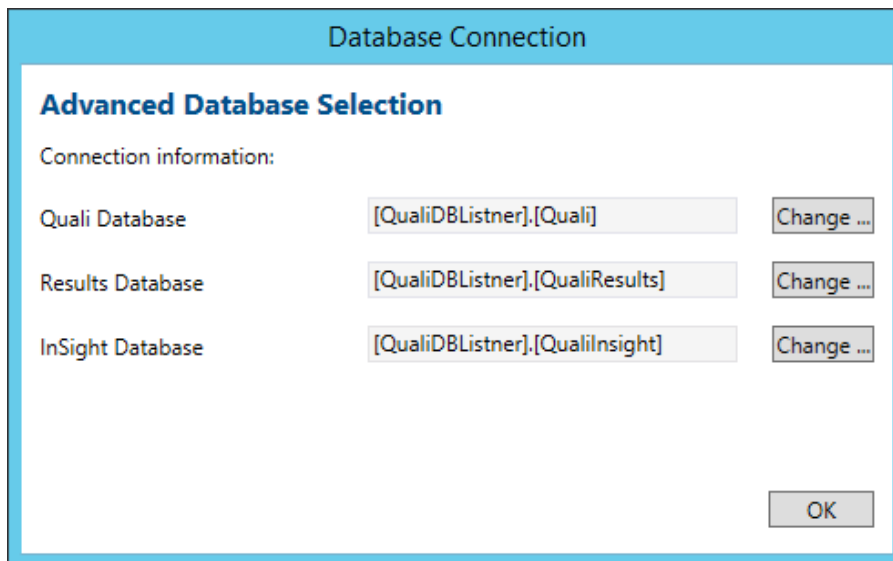
## Configuring Quali server to work with the Availability group listener

### To configure Quali server to work with the Availability group listener

1. Run the **Quali Server Configuration** again on the first node.
2. In the databases section, select the **Availability Group Listener** as the database hostname.

**Note:** In SQL Server 2016 Standard Edition, for each database, specify its specific listener.

---

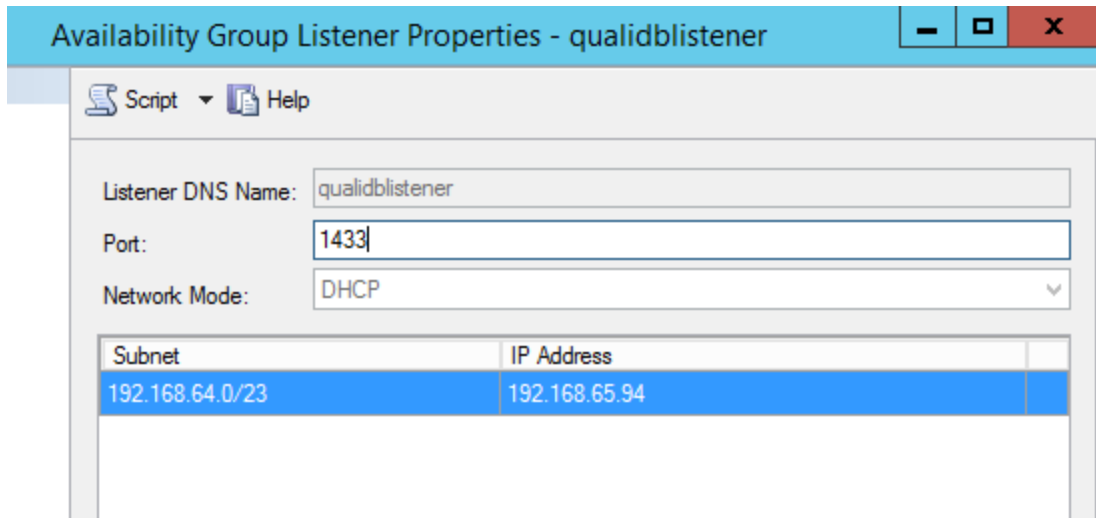
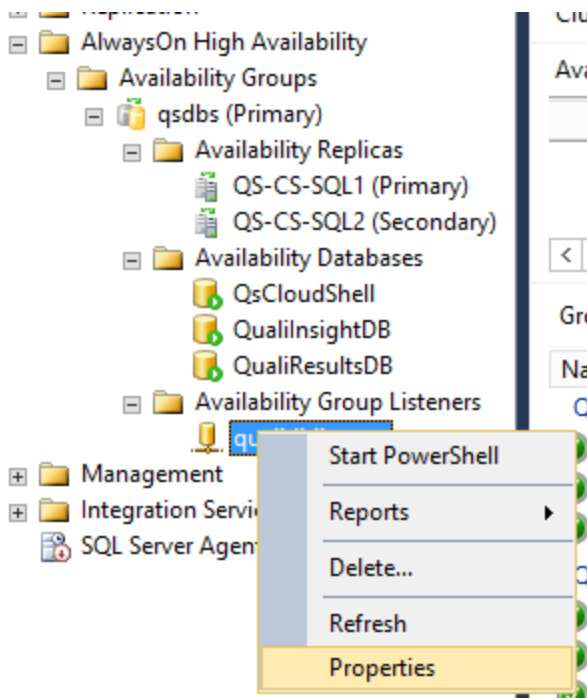


3. Stop the **Quali Server** service.

### To see the AlwaysOn listener properties:



- Right click on the listener and open the properties:



## Configuring the remaining cluster nodes

### To configure the rest of the cluster nodes:

1. For each node in the cluster, except the first one that is already configured, repeat steps 1-13 from the [Configuring Quali server](#) topic.
2. Make sure to use the License server role IP and the AlwaysOn SQL listener IP.

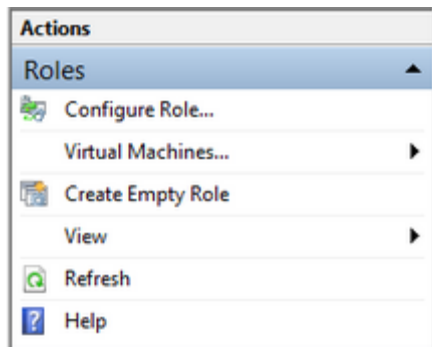
## Creating a Configuration Role in Quali Server

To create a configuration role:

1. Make sure the **Quali Server** service is stopped on all Quali Server nodes.
2. Open **Windows Failover Cluster Manager**.



3. Right-click **Roles**.



4. Select **Configure Role**.
5. Click **Next**, select the **Generic Script** option, then click **Next**.
6. Enter the path to the `Quali.vbs` file (for example: `c:\Quali\QualiServer\Quali.vbs`).
7. Enter a name for the role and click **Next**.
8. Click **Next** to complete the wizard.

This creates a new role that starts to run. This role uses the PS1 files to operate Quali server and elasticsearch during cluster events.

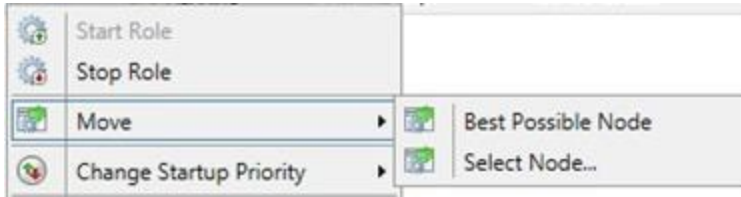


## Activating Quali server setup on all nodes

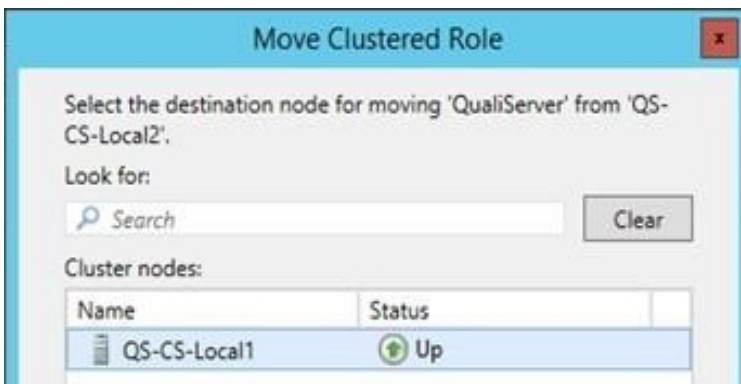
Use Windows Failover Cluster Manager to move between all nodes.

**To activate Quali server setup in all nodes:**

1. Open Windows Failover Cluster Manager.
2. Right-click **Move** and select **Select Node**.



3. Browse to the required node and move the role to it.
4. Repeat steps 2 and 3 for all the nodes in the cluster.



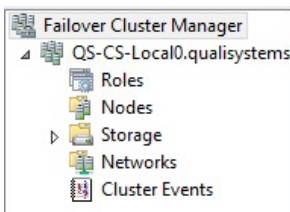
## Configuring CloudShell components to the Quali Server Role address

Use the procedures described in this section to configure all other CloudShell components after completing the High Availability configuration for the Quali Application server.

All CloudShell components must be configured to the Quali Server Role address.

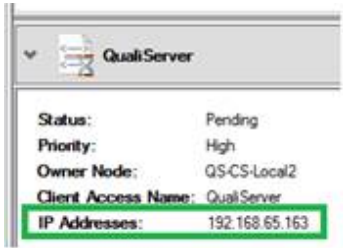
**To configure CloudShell components to the Quali Server Role address:**

1. Open **Windows Failover Cluster Manager**.



2. Select the required Quali Server role.

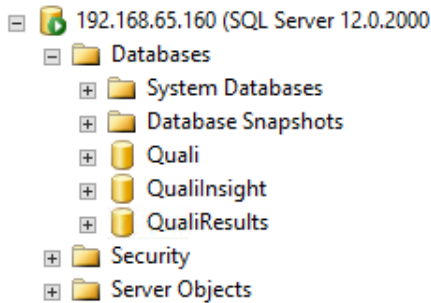
The role IP Address are displayed in the bottom half of the screen.



## In cases where a database is not present

### To activate AlwaysOn where a database is not present:

1. Install Quali server.
2. Run the configuration of the Quali server from one of the nodes and configure the database connection to one of the database cluster nodes (in that way the Quali database is generated in one of the database cluster nodes).



3. Stop the **Quali server** service.
4. Go to the **Clustering the database** section.

## Configuring each node

### To configure each node in the system:

1. Install CloudShell Portal on each node. For more information, see the “Installing CloudShell Portal” section in this document.
2. Configure the CloudShell Portal with IIS.

---

**Note:** Use the *CloudShell Suite Installation Guide* for more information about installing License Server.

---

## Installing and configuring CloudShell Portal

Use the following procedures to install and then configure License Server to work in a cluster environment.

### Installing CloudShell Portal

#### To install CloudShell Portal:

- Follow the CloudShell Portal installation procedure in the *CloudShell Suite Installation Guide*.

**Note:** To use CloudShell Portal in a High Availability environment, make sure to configure it with IIS 8 and above (do not use the default IIS Express). For more information, see the *CloudShell Suite Installation Guide*.

---




### Modify the CloudShellPortal.vbs file

#### To modify the CloudShellPortal.vbs file:

1. Rename the extracted `CloudShellPortal.vbs` file to: "CloudShellPortal.vbs.old". Keep this file as a backup.
2. Open the `CloudShellPortal.vbs` file in a text editor.
3. Modify the following values:
  - `SITE_NAME` = "Default Web Site" - use your site name (can be found in the IIS manager)
  - `APP_POOL_NAME` = "DefaultAppPool" - use your application pool (can be found in the IIS manager)

For example:

```
SITE_NAME = "CloudShell"  
APP_POOL_NAME = "CloudShell"
```

 Classic .NET AppPool	Started	v2.0	Classic
 CloudShell	Started	v4.0	Integrated
 DefaultAppPool	Started	v4.0	Integrated

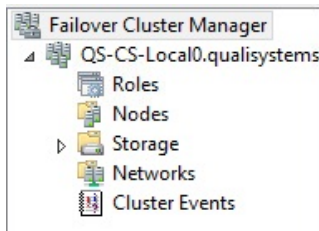


4. Save the file.

## Creating a Configuration Role in Windows Failover Cluster

To create a configuration role:

1. Open **Windows Failover Cluster Manager**.
2. Right-click **Roles** and select **Configure Role**.



3. Click **Next**, select the **Generic Script** option, then click **Next**.
4. Enter the path to the `CloudShell Portal.vbs` file (for example: `c:\Quali\Portal.vbs`).
5. Enter a name for the role and click **Next**.
6. Click **Next** to complete the wizard.

This creates a new role that starts to run.

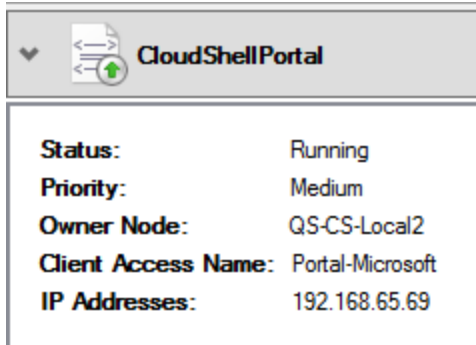
A screenshot of the Failover Cluster Manager console showing a table of roles. The table has five columns: Role Name, Status, Role Type, Cluster Name, and Priority. Two roles are listed: 'CloudShellPortal' and 'License Server'.

Role Name	Status	Role Type	Cluster Name	Priority
CloudShellPortal	Running	Generic Script	QS-CS-Local2	Medium
License Server	Running	Generic Service	QS-CS-Local2	Medium

To configure the portal virtual front with Quali Server:

1. In **Cluster Manager**, open the **Roles** window.
2. Click the portal role.
3. At the bottom of the page, locate the **IP address** of your Portal virtual front.

For example, when using Windows cluster to cluster the CloudShell Portal, the information in the following image is displayed:



The virtual IP for the portal in this example is: 192.168.65.69.

3. Connect to the Quali database using Microsoft SQL Server Management Studio. (if you are using **SQL AlwaysOn** - connect to the AlwaysOn Listener).
4. Copy the SQL statements below and paste them after changing these parameters:

SQL Statement	Parameter details
<code>&lt;&lt;Quali Database&gt;&gt;</code>	Select the Quali Database your system uses
<code>&lt;&lt;CloudShell Portal Ip or Name&gt;&gt;</code>	Select the CloudShell Portal Virtual front IP or DNS name
<code>&lt;&lt;CloudShell Portal Port&gt;&gt;</code>	Select the CloudShell Portal Virtual front port

5. Run the following SQL statement. This SQL statement ensures that Quali server is aware of the portal cluster and does not use the portal cluster nodes for communication (for example, links that are in emails sent from Quali server should redirect you to the CloudShell Portal cluster and not to one of the individual nodes).

```
USE <<Quali Database>>
GO

IF (select count(*) from PortalInfo) > 0
BEGIN

/*Choose your CloudShell Portal Virtual front Ip or name*/
DECLARE @ip NVARCHAR(15) = <<CloudShell Portal Ip or Name>>

/*Choose your CloudShell Portal Virtual front portal port*/
```

```
DECLARE @port INT = <<CloudShell Portal Port>>

UPDATE [dbo].[PortalInfo]
    SET [MachineName] = @ip
        , [Port] = @port
/*If http is in use, change the http to https*/
        , [PortalUri] = 'http://' + @ip + ':' + CONVERT(varchar
(10),@port) + '/'
        , [ModificationDate] = GETDATE()
WHERE Id = (select max(Id) from [dbo].[PortalInfo])
END
ELSE
    PRINT 'No registered CloudShell Portal in the system, please
register the Portal and run this statement again...'
GO
```

---

**Note:** You do not need to restart the server.

---

## Configuring CloudShell Portal to support SSL

Use the procedures in this section in basic (4 machines) and performance (6 machines) setups. For 8 machines setup, SSL off-loading should be set.

For information about setting up TestShell Portal on IIS including HTTPS, see the QualiSystems support article at this link:

<https://support.quali.com/hc/en-us/articles/231607987-Setting-up-Testshell-Portal-on-IIS-including-HTTPS->

## Configuring the Web Server Load Balancing

This step is only needed for the advanced deployment option. For more information, see [Deployment Options](#). For the Basic and Performance options, see to the WSFC role configuration step.

CloudShell Portal load balancing solution is based on Microsoft Application Request Routing (ARR).



## Software requirements:

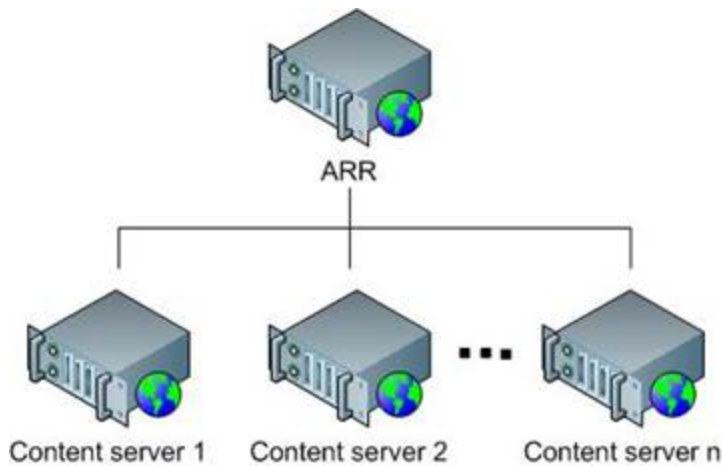
- Windows Server 2012 or Windows Server 2012 R2
- IIS 8

## Hardware requirements

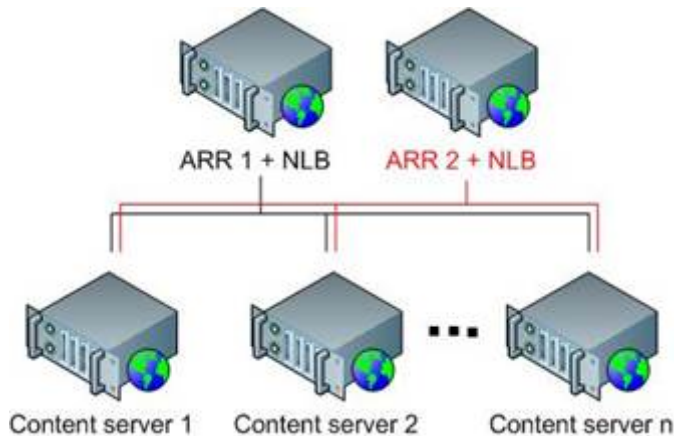
The HA solution may be deployed on physical servers or virtual servers.

## Microsoft Application Request Routing

Microsoft Application Request Routing (ARR) for IIS 7.0 and above is a proxy-based routing module that forwards HTTP requests to content servers based on HTTP headers, server variables, and load balance algorithms. A typical ARR deployment is depicted in the diagram below:



ARR does not provide fault tolerant deployment features for itself and must rely on other complementary technologies and solutions to achieve high availability for the ARR tier.



For more information about Application Request Routing, see [http://www.iis.net/learn/extensions/configuring-application-request-routing-\(arr\)/achieving-high-availability-and-scalability-arr-and-nlb](http://www.iis.net/learn/extensions/configuring-application-request-routing-(arr)/achieving-high-availability-and-scalability-arr-and-nlb).

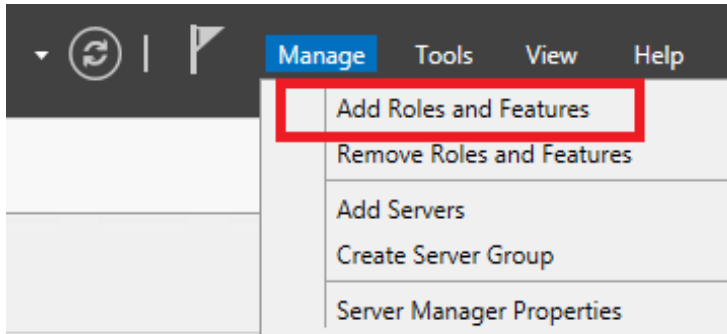
### Installing and configuring Network Load Balancing

This section describes how to install and configure the Network Load Balancing (NLB) Manager and to use it to create and manage NLB clusters from a single computer as well as replicate the cluster configuration to other hosts.

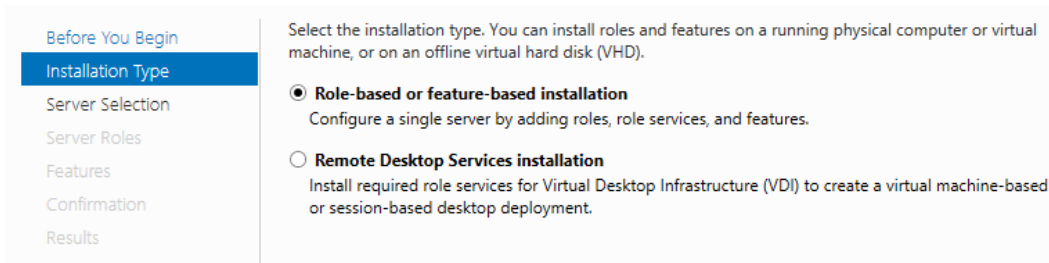
# Installing Windows Network Load Balancing

To install Windows Network Load Balancing:

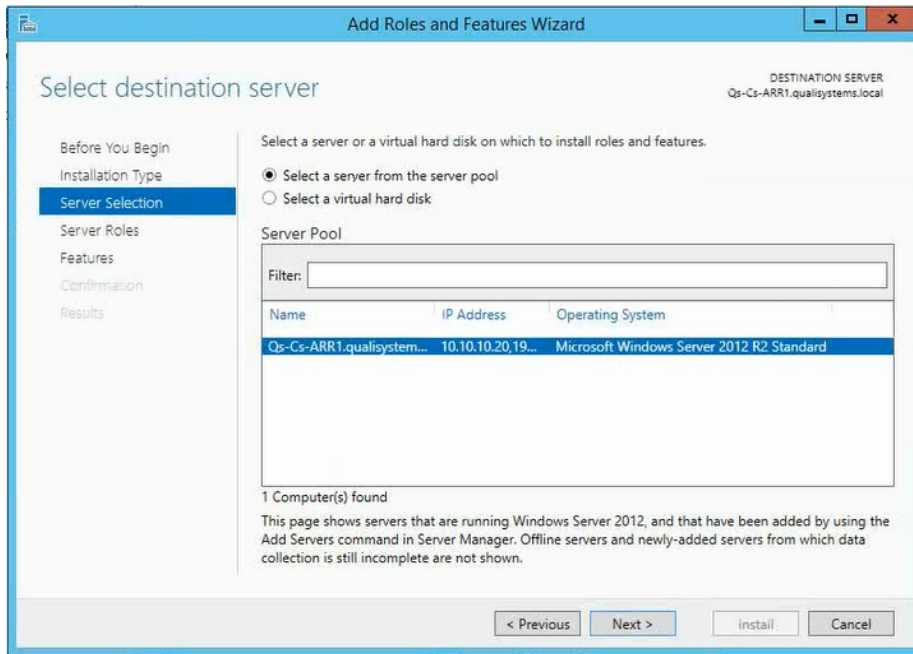
1. Click **Start > Administrative Tools > Server Manager**.
2. Click **Manage** and then select **Add Roles and Features**.



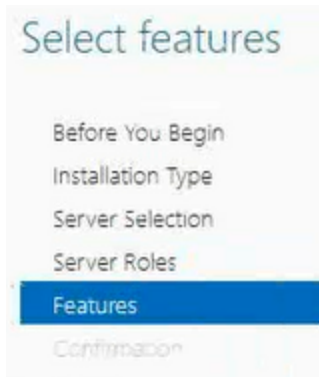
3. Click **Next**.
4. In the **Add Roles and Features Wizard**, select **Installation Type**.



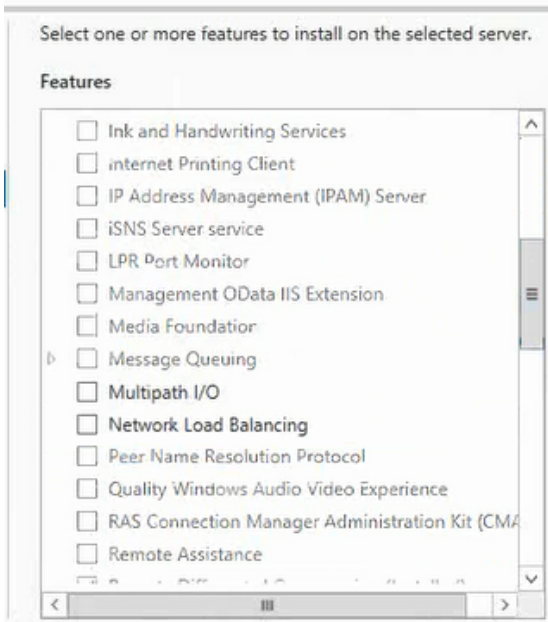
5. Select **Role-based or feature-based installation** and click **Next**.



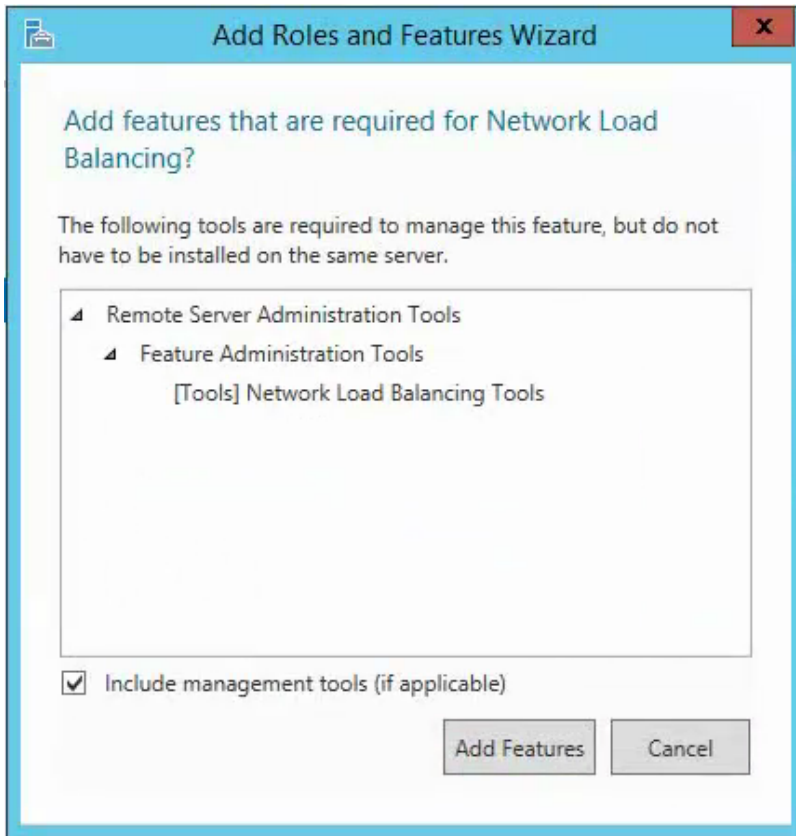
6. Select a server for the installation and click **Next**.



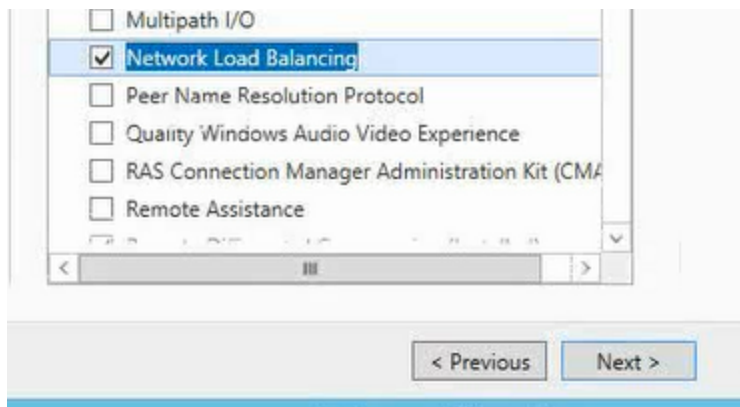
7. In the **Select features** menu, select **Features**.



8. In the **Features selection** pane, select the **Network Load Balancing** option.



9. In the **Add features that are required for Network Load Balancing** dialog box, click **Add Features**.
10. In the **Features selection** pane, click **Next**.



11. In the **Confirm installation selections** window, select the **Restart the destination server automatically if required** option.

Restart the destination server automatically if required

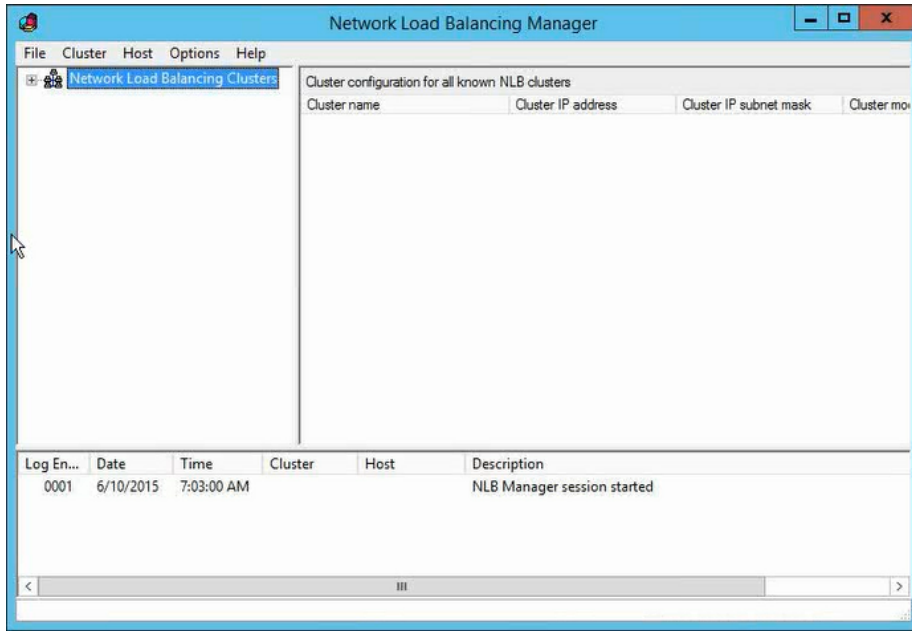
12. Click **Install**.
13. Repeat steps 1-13 in each of the ARR servers (this can be done in parallel).

## Configuring Windows Network Load Balancing

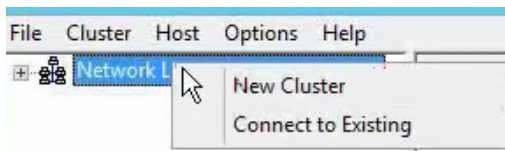
This section describes how to configure Windows Network Load Balancing using the NLB Manager.

### To configure Windows Network Load Balancing:

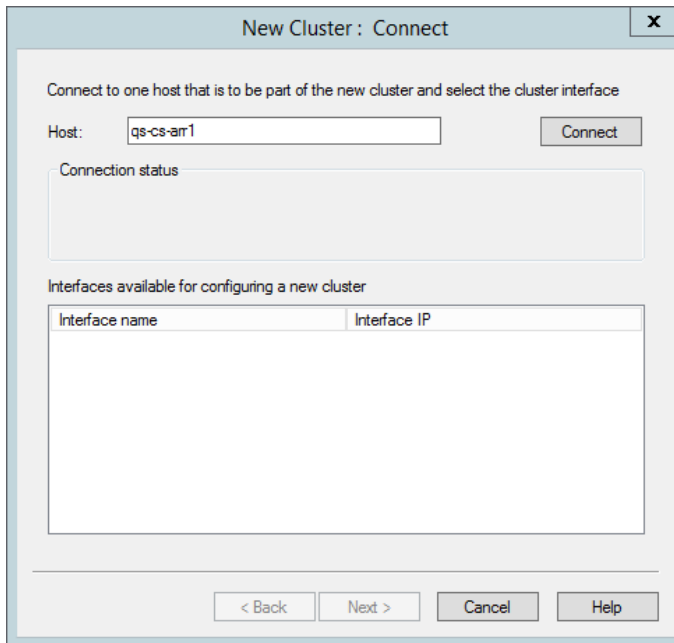
1. Click **Start > Administrative Tools > Network Load Balancing Manager** or from the command prompt, type **NLBMgr** and then press **Enter**).



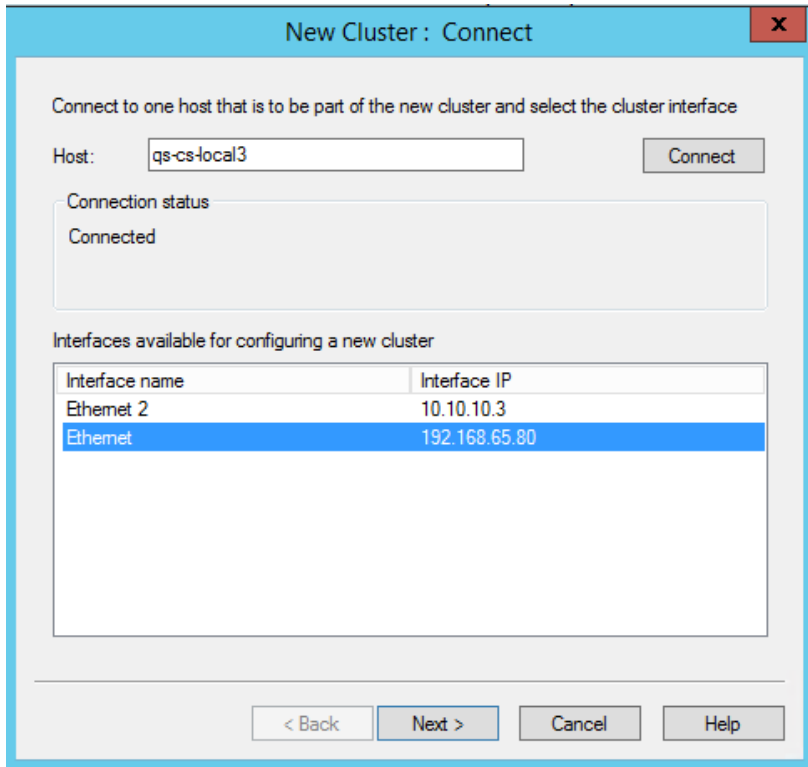
2. Right click **Network Load Balancing Clusters**.



3. Select **New Cluster**.



4. In the **Host** field, enter the details of the ARR servers and then click **Connect**.



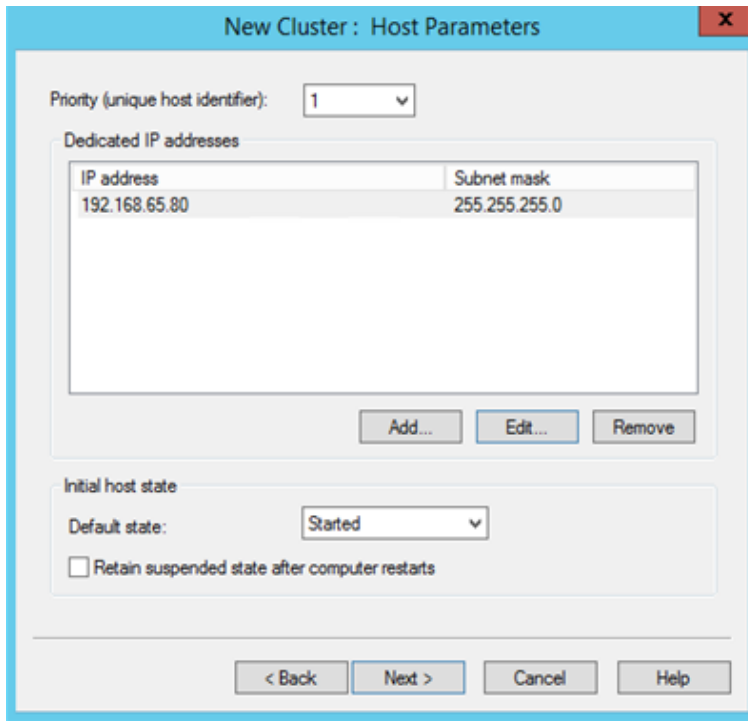
5. Select the client's network and click **Next**.

**Note:** Due to a limitation, the network card must use a static IP address and not DHCP. (see [Known issues and limitations](#)).

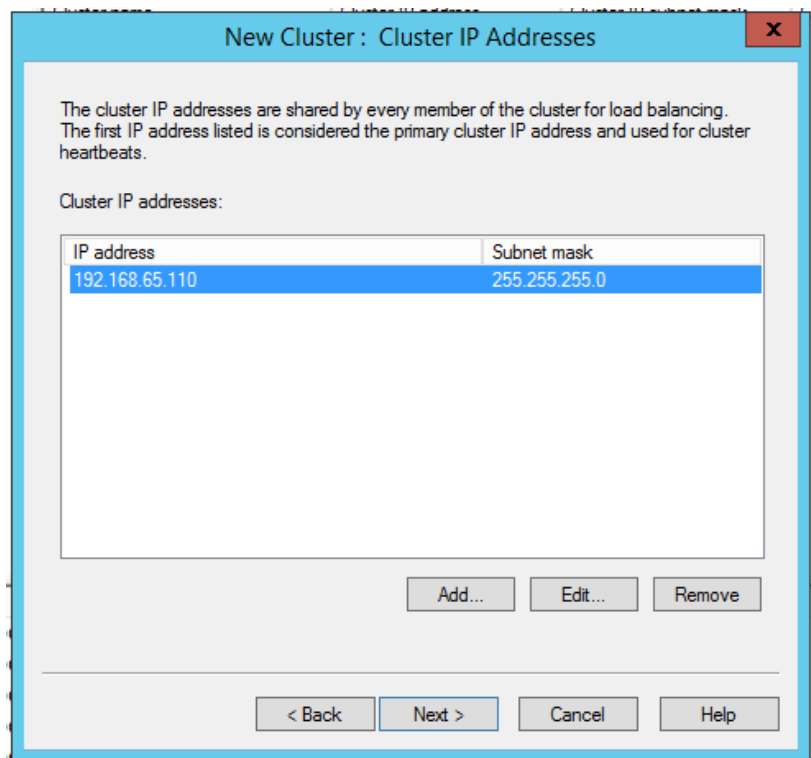
---



6. In the **New Cluster: Host Parameters** window, click **Add**.



7. In the **New Cluster: Cluster IP Addresses** window, click **Add**.

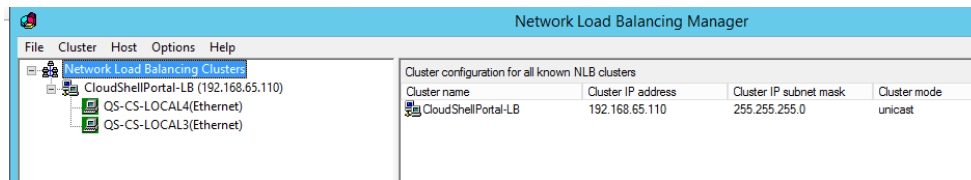


8. In the **Cluster Parameters** section, add the cluster "full Internet name" and click **Next**. This name is used in the DNS as the Virtual front name.
9. In the **Port Rules** section, click **Edit**.
10. Select the port range to use in the cluster. This is the port range that is redirected in the cluster to other hosts.
  - Usually http users use from: 80 to:80
  - Usually SSL users use from:443 to:443
11. Under **Filtering mode**, select **Single host** and click **OK**.
12. Click **Finish**.

## Adding another host to the Network Load balancing cluster

### To add another host to NLB cluster:

1. Open **Network Load Balancing Manager**.



2. Right-click the required cluster name.
3. In the pop-up menu, select **Add Host to Cluster**.
4. In the **Add Host to Cluster** section, enter the host name details and click **Connect**.
5. Select the client network and click **Next**.
6. Click **Next** and then click **Finish**.

## Working with the ARR cluster Virtual front

After configuring the ARR load balancing cluster, you can use the cluster IP or name (for example, 192.162.63.110 or CloudShellPortal-LB) to browse the portal.

### To configure the portal virtual front with Quali Server:

1. Connect to the Quali database using Microsoft SQL Server Management Studio. (if you are using SQL AlwaysOn - connect to the AlwaysOn Listener).

- Copy the SQL statements below and paste them after changing these parameters:

SQL Statement	Parameter details
<code>&lt;&lt;Quali Database&gt;&gt;</code>	Select the Quali Database your system uses
<code>&lt;&lt;CloudShell Portal Ip or Name&gt;&gt;</code>	Select the CloudShell Portal Virtual front IP or DNS name
<code>&lt;&lt;CloudShell Portal Port&gt;&gt;</code>	Select the CloudShell Portal Virtual front port

- Run the following SQL statement. This SQL statement ensures that Quali server is aware of the portal cluster and does not use the portal cluster nodes for communication (for example, links that are in emails sent from Quali server should redirect you to the CloudShell Portal cluster and not to one of the individual nodes).

```
USE <<Quali Database>>
GO

IF (select count(*) from PortalInfo) > 0
BEGIN

/*Choose your CloudShell Portal Virtual front Ip or name*/
DECLARE @ip NVARCHAR(15) = <<CloudShell Portal Ip or Name>>

/*Choose your CloudShell Portal Virtual front portal port*/
DECLARE @port INT = <<CloudShell Portal Port>>

UPDATE [dbo].[PortalInfo]
    SET [MachineName] = @ip
        , [Port] = @port
/*If http is in use, change the http to https*/
        , [PortalUri] = 'http://' + @ip + ':' + CONVERT(varchar
(10),@port) + '/'
        , [ModificationDate] = GETDATE()
WHERE Id = (select max(Id) from [dbo].[PortalInfo])
```

```
END
ELSE
PRINT 'No registered CloudShell Portal in the system, please
register the Portal and run this statement again...'
GO
```

---

**Note:** You do not need to restart the server.

---

## Monitoring the Cluster environment

To monitor the ARR cluster, you can use features of the Network load balancing manager:

- Cluster log in the bottom of the application
- Right click on specific host and click 'host status'

## Working with HTTPS Portal

**To work with HTTP with the CloudShell Portal:**

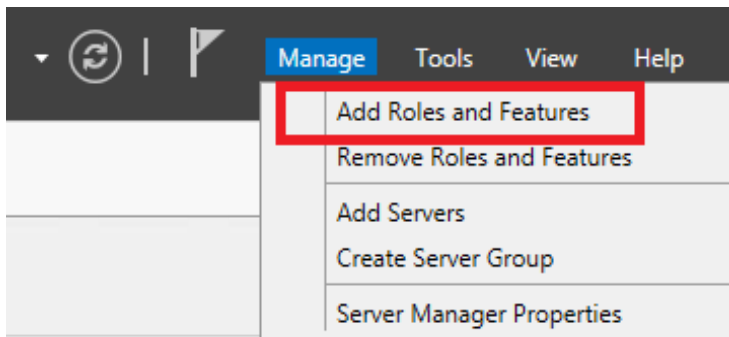
- Configure the port range in the cluster to include SSL port (443). For more information, see [Configuring Windows Network Load Balancing](#).

## Configuring Portal load balancing

To be able to communicate in a load balancing environment, start by configuring all web servers. This section describes how to enable communication between IIS on the load balancing server and it should be configured on load balancing servers using Windows Server Manager.

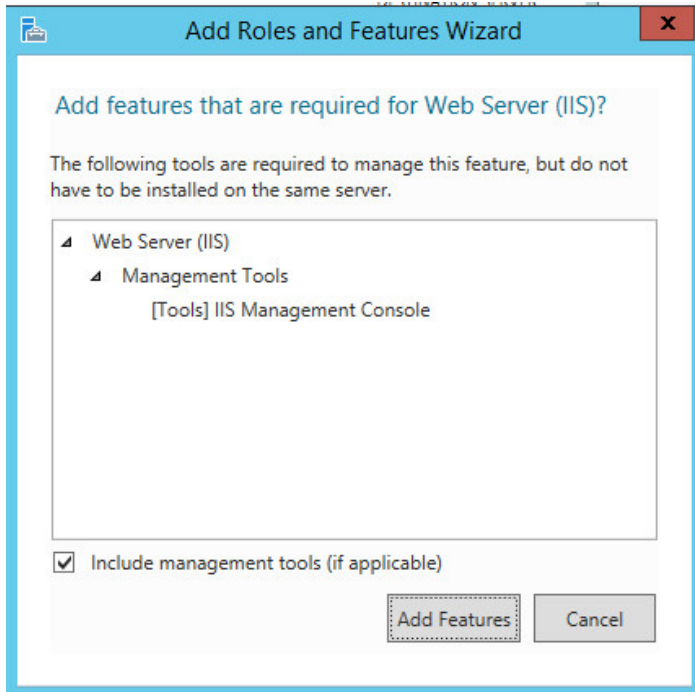
**To configure all web servers to communicate in a load balancing environment:**

1. Click **Start > Administrative Tools > Server Manager**.
2. Click **Manage** and then select **Add Roles and Features**.

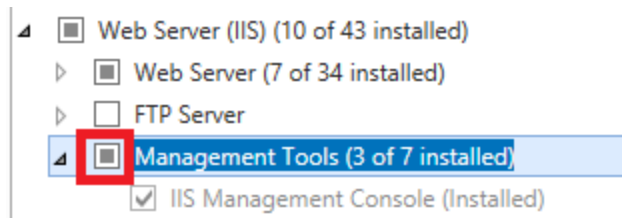


3. In the **Before You Begin** tab, click **Next**.
4. In the **Installation type** tab, select **Role-based or feature-based installation**.
5. In the **Server selection** tab, select the server.
6. In the **Server Roles** tab, select the **Web Server (IIS)** option.

7. In the **Add Roles and Features Wizard**, click **Add Features**.



8. In the **Feature** tab click **Next**.
9. In the **Web Server Role** tab click **Next**.
10. In **Role Services**, expand the **Application Development** section and select the **Management Tools** section.



11. In the window, click **Add Feature**, then click **Next**.
12. Click **Install**.

13. Open IIS and under the IIS server configurations, select **Management Service**.

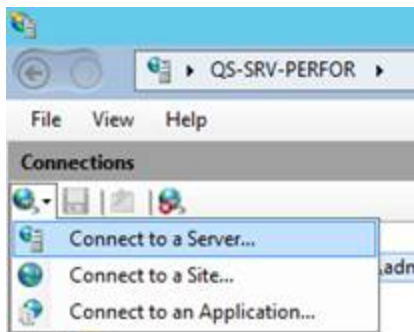


14. Stop the **Management Service**.
15. Select the **Enable remote connection** option and click **Apply**.
16. Start the **Management Service**.
17. Repeat steps 1-16 for each Portal server.

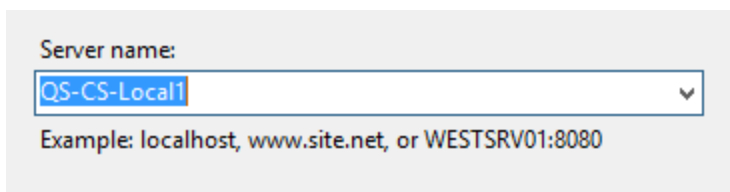
## Adding Servers to the main IIS Manager

To add all Portal servers to the IIS Manager in the ARR machines:

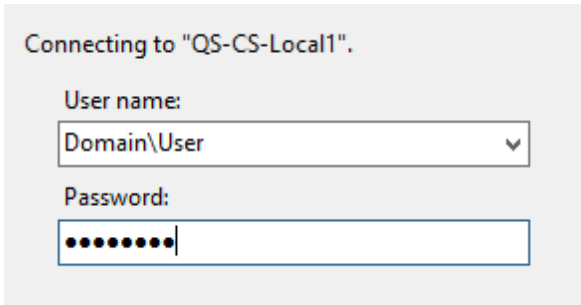
1. Click **Start > Administrative Tools > IIS Manager**.
2. On the left side of the IIS Manager window, click the **Connect** icon.



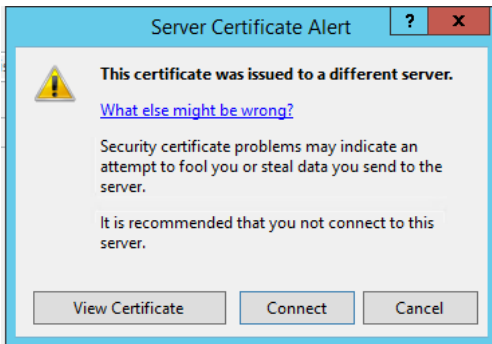
3. Select **Connect to a Server**.



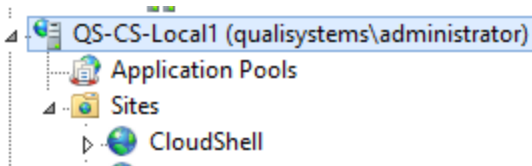
4. In the **Server name** field, specify the remote web server name.



5. If a server certificate alert is displayed, click **Connect**.



6. Specify a name for the server. This name is displayed in the **Start page** tree in the left pane of the IIS Manager.



The server name is now displayed in the **Connection** pane.

7. Repeat steps 1-6 for each of the Portal machines.

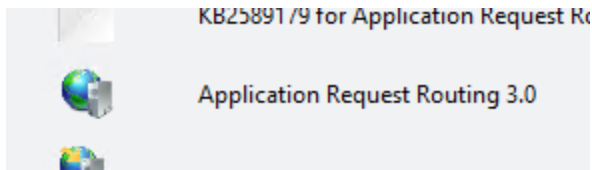
## Configuring the ARR server

### To Configure the ARR server:

1. Download and install Microsoft Web Platform Installer 5.0: <http://www.microsoft.com/web/downloads/platform.aspx>



2. Open the Microsoft web platform installer and search for Application Request Routing 3.0.



For more information, see <http://blogs.iis.net/roman/archive/2013/07/26/application-request-router-arr-3-0-rtm-is-now-available.aspx>

3. Click **Add > Install**.
4. Click **I accept**.

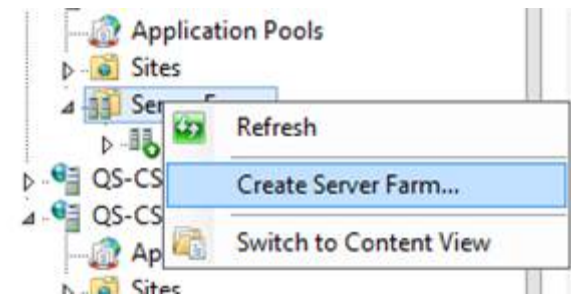
## Configuring the Server Farm

**To configure the server farm:**

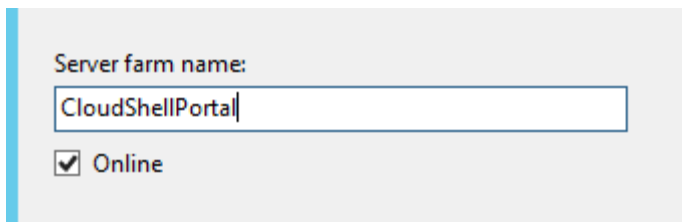
1. Open the IIS manager on the ARR server.



2. Under your local server, right-click **Server Farm**.



3. Click **Create Server Farm**.



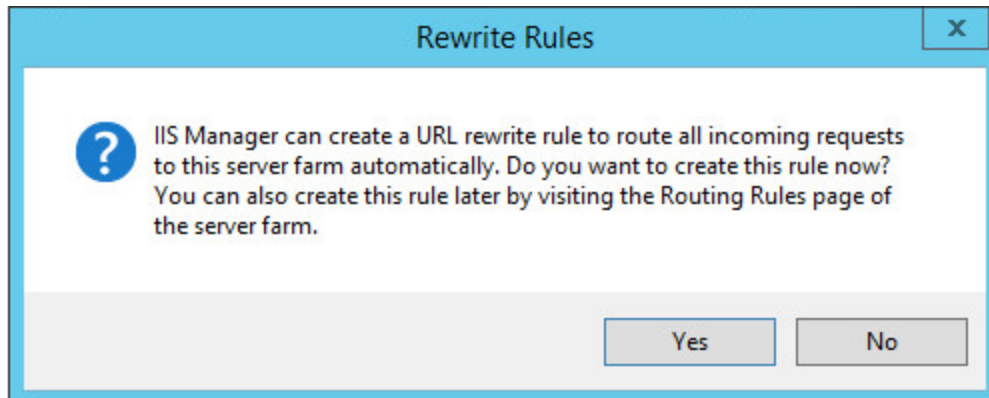
4. In the **Server farm name** text field, enter the Server Farm name, and click **Next**.
5. Add the Portal machines details and click **Finish**.

Server address:

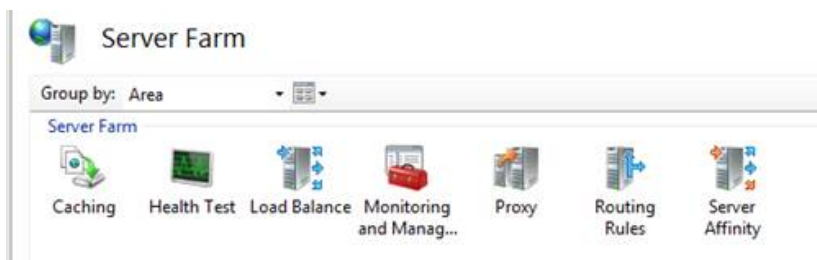
  
  
 Online  
[Advanced settings...](#)  

Server Address	Status
QS-CS-Local2	Online
QS-CS-Local1	Online

6. In the **Rewrite Rules** window, click **Yes**.

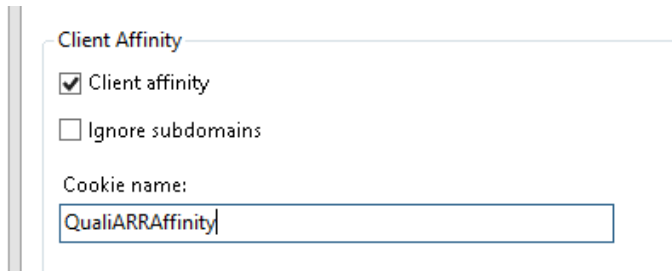


7. To open the **Server Farm** main menu, click on the server farm name.



8. Open the **Server Affinity** section.
9. Select the **Client affinity** option.

10. In the **Cookie name** field, change the name to "QualiARRAffinity" and click **Apply**.



Client Affinity

Client affinity

Ignore subdomains

Cookie name:

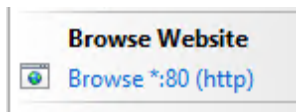
QualiARRAffinity

10. Return to the **Server Farm** main menu and click the **Load Balance** section.

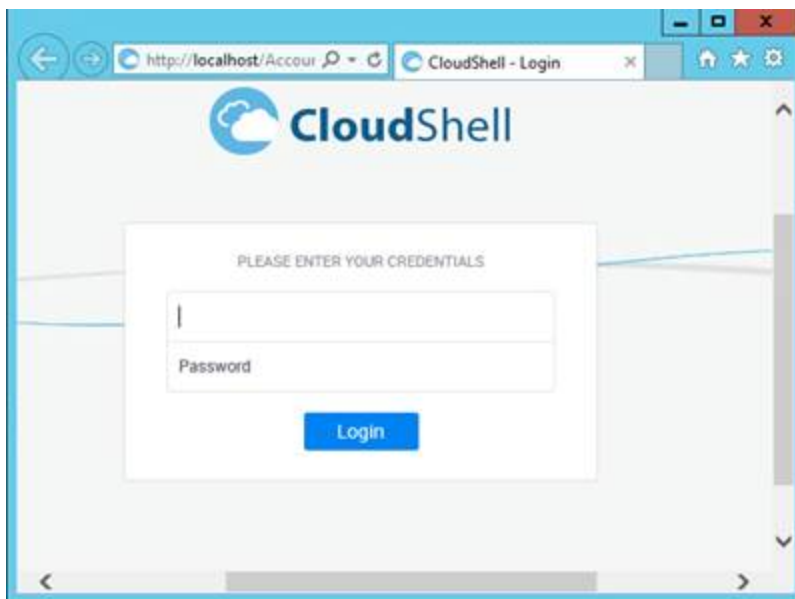
## Verifying that the system is up and working

To verify that the system is up and working:

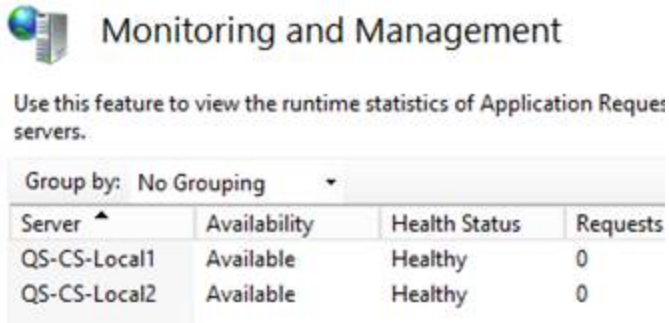
1. Open IIS manager and click **Default Web Site** in the ARR server.
2. Under the management Website section in the Action pane click **Restart**.
3. Under the **Browse Website** menu item, click **Browse \*:80 (http)**.



A browser opens with the CloudShell login screen (there might be a short delay the first time that this is performed).



4. In the **Server Farm Main** menu, go to **Monitoring and Management**.

The image shows a screenshot of the 'Monitoring and Management' section in a web application. It features a globe icon and the title 'Monitoring and Management'. Below the title is a descriptive text: 'Use this feature to view the runtime statistics of Application Request servers.' Underneath is a dropdown menu labeled 'Group by: No Grouping'. A table displays server statistics with columns for 'Server', 'Availability', 'Health Status', and 'Requests'.

Server ^	Availability	Health Status	Requests
QS-CS-Local1	Available	Healthy	0
QS-CS-Local2	Available	Healthy	0

5. Ensure that all servers have the **Available and Healthy** status.

## Alternatives

Load balancing the IIS web servers with MS ARR. There are limitations for using that solution (see [Known issues and limitations](#)).

## Configuring ARR and IIS to support SSL in an HA scenario

The SSL off-loading approach is used to support SSL in Advanced CloudShell Portal setup.

### Before you begin

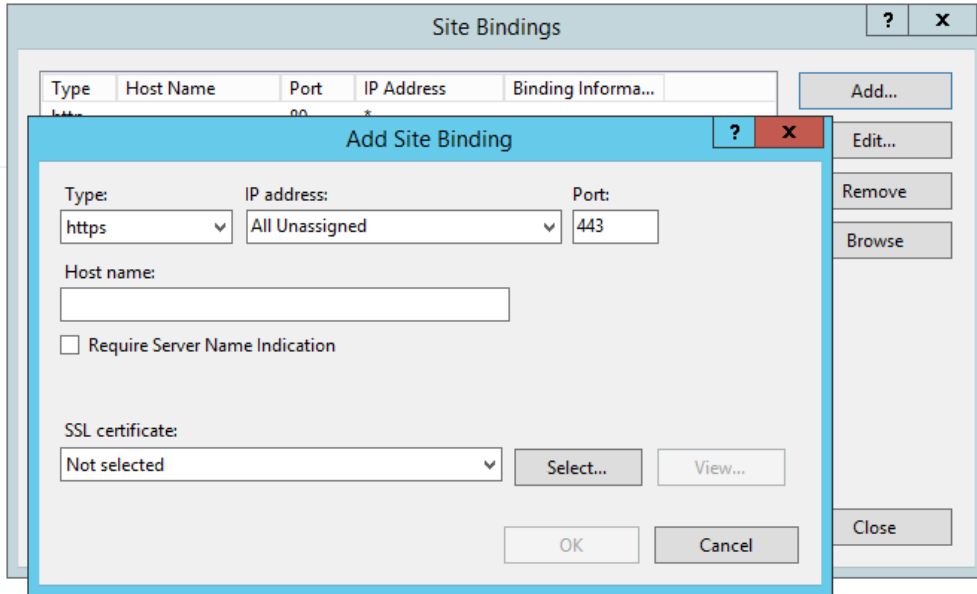
Ensure that:

- ARR is installed and configured on at least two machines
- The ARR machines are configured in a *Load balancing* cluster using Load balancing manager
- Load balancing manager is configured to handle traffic from port 443 (SSL)
- CloudShell Portal machines are configured to be used with http binding

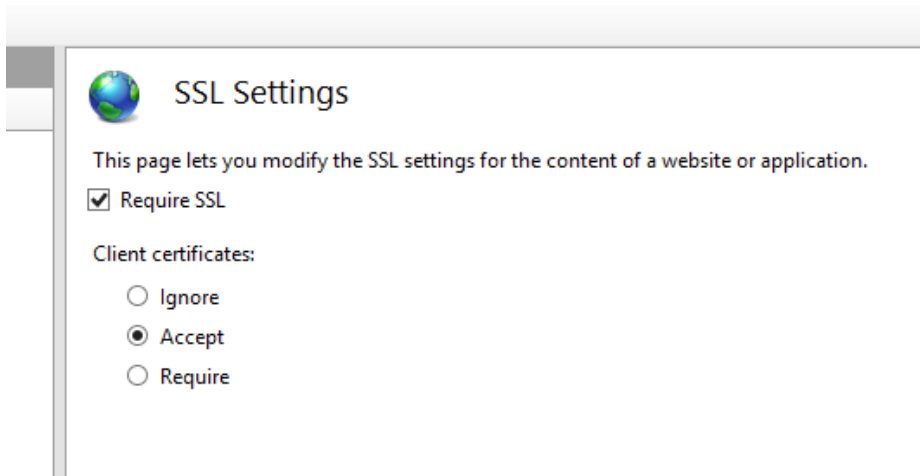
### Configuring ARR to support SSL

**To configure the ARR to support SSL:**

1. Open the IIS Manager on the ARR machine.
2. Go to the Default Web Site configuration and open the **Bindings**.
3. In the **Add Site Binding** window, add a new binding of type **http**, specify the **Host name** and select the relevant **SSL certificate**.



4. Click **OK** and close the bindings menu.
5. Open the **Default Web Site** configuration and select **SSL Settings**.
6. Select the **Require SSL** checkbox and then select the required **Client certificates** setting.



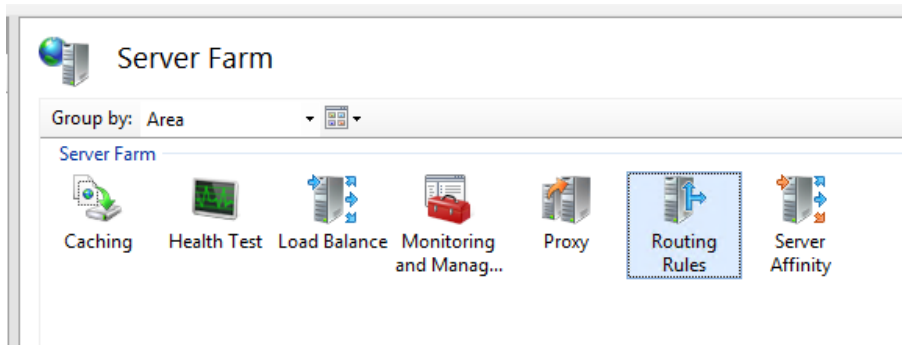
7. Repeat steps 1-6 on all ARR machines.

## Configuring ARR to support SSL offloading

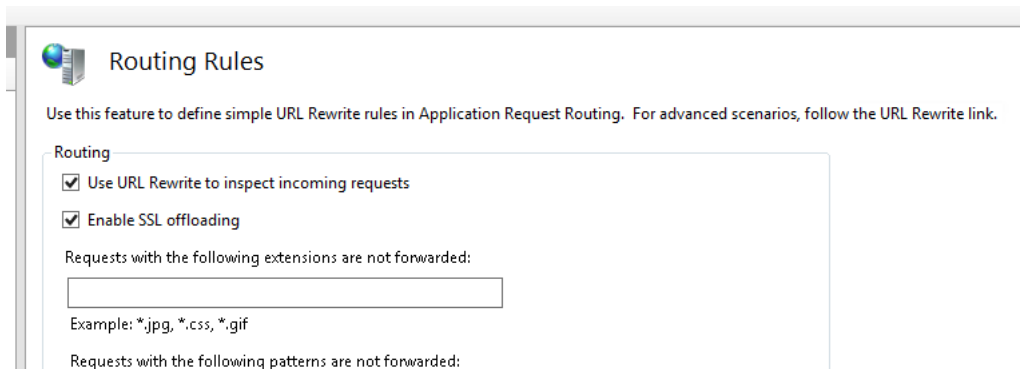
### To configure ARR to support SSL offloading:

1. On the ARR machine, open the IIS manager.

2. Open the ARR server farm and double-click **Routing Rules**.



3. Make sure the **Enable SSL offloading** check box is selected.



4. Repeat steps 1-3 with all the ARR machines.

## Recommendations

- Use **Centralized SSL Certificate** to share the same customer certificate between all ARR machines. For more information, see <http://www.iis.net/learn/get-started/whats-new-in-iis-8/iis-80-centralized-ssl-certificate-support-ssl-scalability-and-manageability>
- Use **IIS Shared Configuration** to share the IIS configuration between the servers. For more information, see [http://www.iis.net/learn/manage/managing-your-configuration-settings/shared-configuration\\_264](http://www.iis.net/learn/manage/managing-your-configuration-settings/shared-configuration_264)
- Use **URL rewrite** to redirect users from http to https. For more information, see <http://www.iis.net/downloads/microsoft/url-rewrite>
- Basic ARR configuration information, see [http://www.iis.net/learn/extensions/configuring-application-request-routing-\(arr\)/define-and-configure-an-application-request-routing-server-farm](http://www.iis.net/learn/extensions/configuring-application-request-routing-(arr)/define-and-configure-an-application-request-routing-server-farm).

# How to create a cluster in Windows failover manager

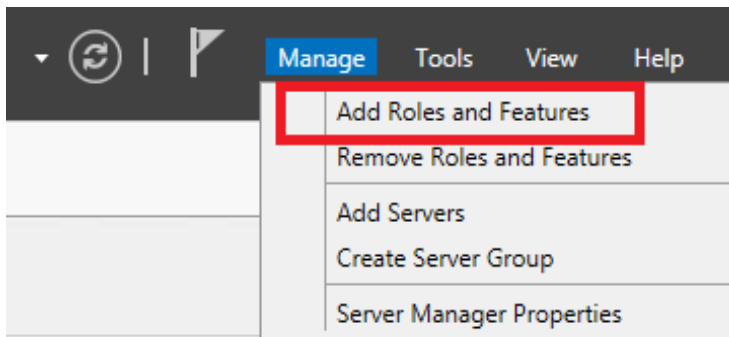
This section provides general instruction on how to configure a cluster with **Failover Cluster Manager**. Creating a cluster is a prerequisite to most of the CloudShell High Availability Solution Pack setups.

## Installing the failover cluster feature

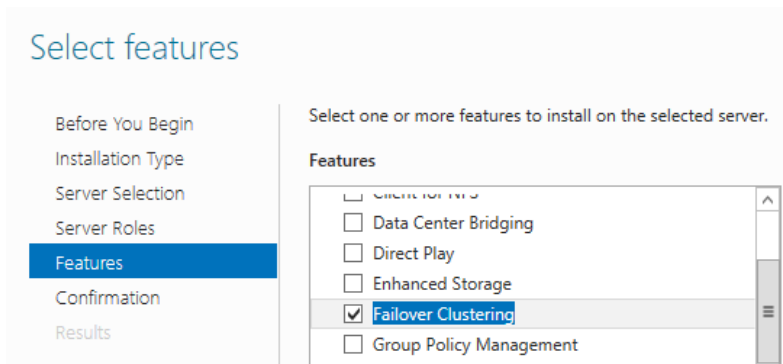
This section describes how to use Windows Server Manager to install a failover cluster.

**To install the failover cluster feature:**

1. Click **Start > Administrative Tools > Server Manager**.
2. Click **Manage** and then select **Add Roles and Features**.

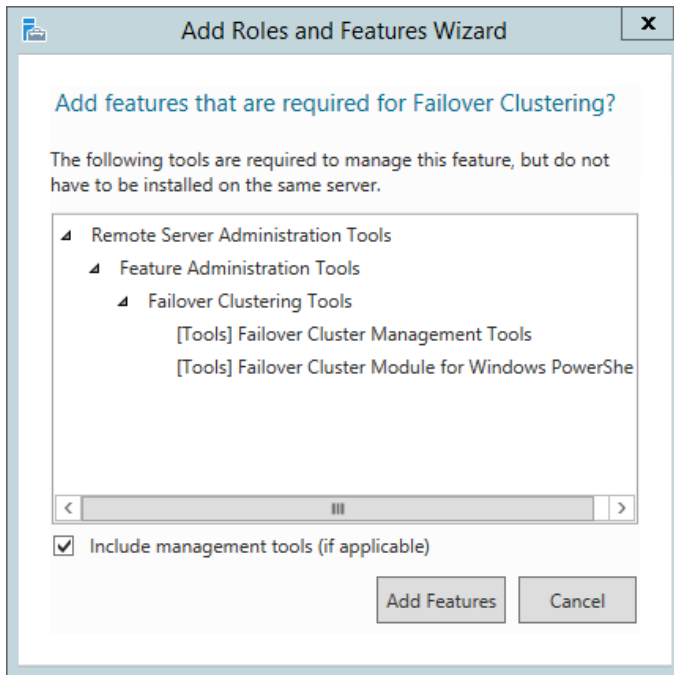


3. Click **Next** until you reach the **Features** tab.





4. Click **Failover Clustering**.



5. Click **Add Features**.

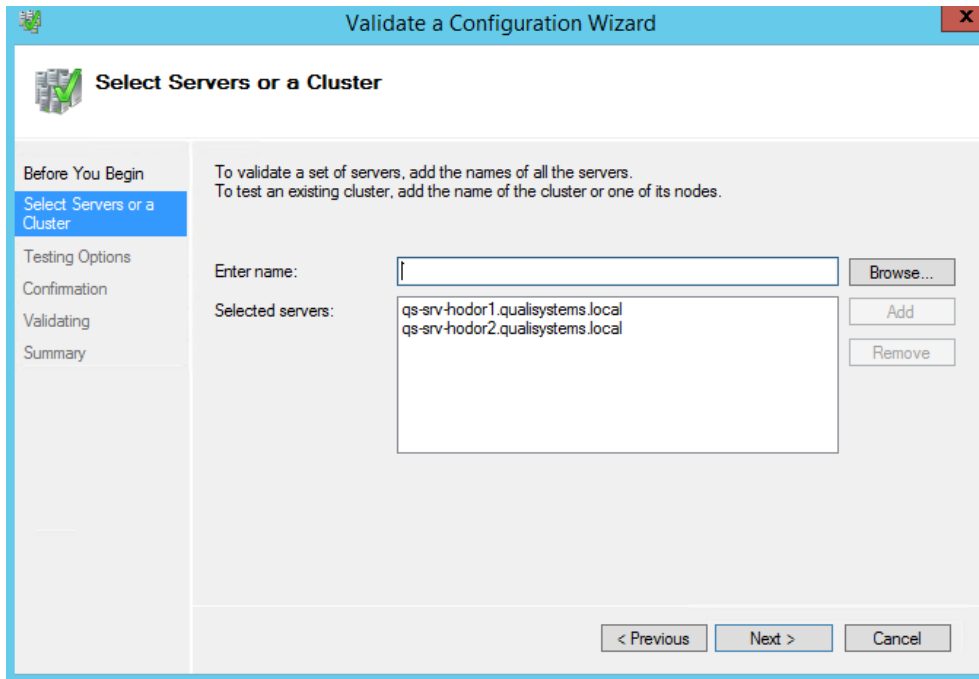
6. Click **Next**, install the feature and close the wizard.

## Configuring a new cluster

**To configure a new cluster:**

1. Open **Windows Failover Cluster Manager**.
2. In the main page, click **Validate configuration**. This opens a wizard that helps testing the cluster configuration and generates a report.
3. In the wizard, click **Next**.

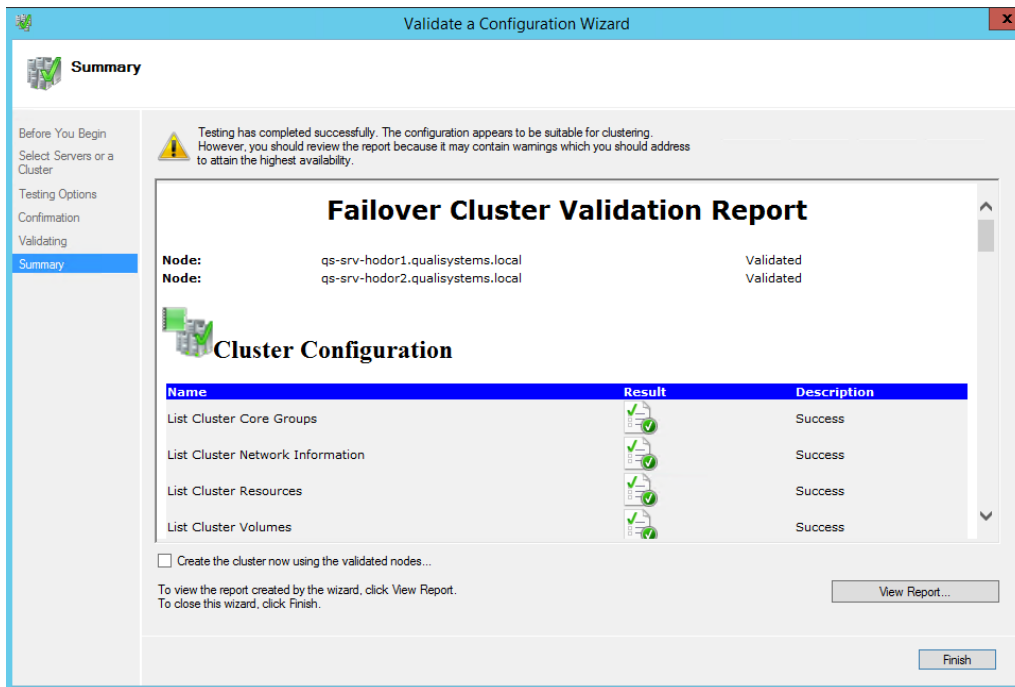
4. Enter the names of the cluster nodes and click **Next**.



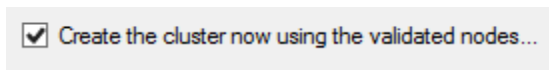
5. Select **Run all tests** and click **Next**.
6. Click **Next** to run the tests. This could take a few minutes.

After the tests have run, inspect the resultant report and see if there are errors. Do not consider errors that relate only to the storage section as the CloudShell High Availability Solution Pack does not use shared storage. To help with the examination of the results, you can open

the html version of the report by clicking **View report** 



7. Select the **Create the cluster now using the validated nodes** check-box and click **Finish**.

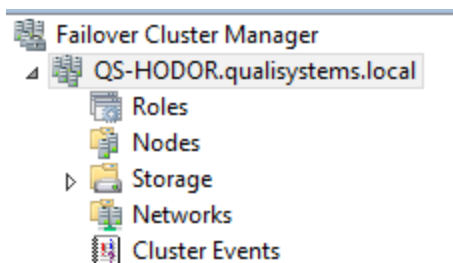


The **Create cluster** wizard opens.

8. In the first page of the wizard, click **Next**.
9. Enter a cluster name. This name is published to the DNS. Click **Next**.
10. In the **Confirmation** page, click **Next**.
11. Click **Next**. The wizard concludes.

The cluster is now configured.

Cluster related information can be seen in the cluster tree in the left pane inside **Failover Cluster Manager**.



## Maintenance of the HA solution

This section explains how to upgrade and manage configuration changes on the cluster.

### Upgrading the CloudShell HA solution

This section describes the required steps to upgrade the Quali server clustering environment to a new version of CloudShell.

Repeat the following procedure for each **Quali Server** node in the Quali server clustering environment.

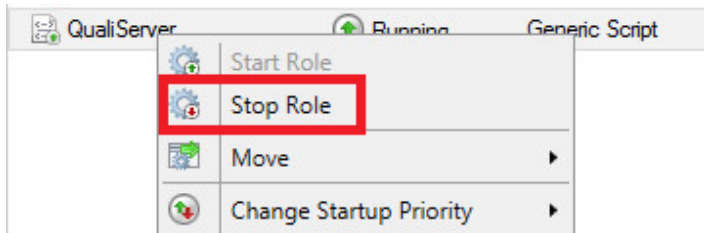
---

**Note:** Do not perform this procedure in parallel. Upgrade each node separately.

---

#### To upgrade CloudShell:

1. Open Windows Failover Cluster Manager.
2. Right-click the **Quali Server** role and select **Stop Role**.



When the role stops, a Java process starts.

3. In **Task Manager**, close the **java.exe** process (do this in all of the nodes in the cluster).  
If more than one Java process is running, the **java.exe** process that is running from the Quali server folder must be closed.
4. Navigate to the following folder:  
`~Qualisystems\CloudShell\Server\Quicksearch\config`
5. Make a backup copy of the `elasticsearch.yml` file and move the backup copy to another folder as this file is overwritten during the upgrade process.
6. Download the latest official CloudShell High Availability Solution Pack from the [Quali's Download Center](#).
7. Copy the Quali server files to the same folder where the files from the earlier version are saved. Replace old files if needed. When upgrading, use the `Quali.vbs` file from the new

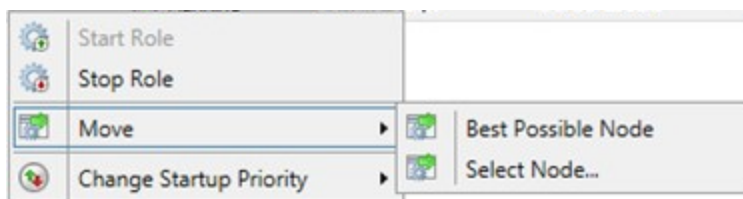
version plus the `Functions.ps1` file provided in the new CloudShell High Availability Solution Pack.

8. Perform the following steps for each node (do not perform this procedure in parallel, upgrade each node separately):
  - a. Install the new version of CloudShell.
  - b. Run the server **Quali Server Configuration** wizard.
9. Stop the **Quali Server** service and then perform the following steps:
  - a. Change the **Quali Server** service to **Manual**.
  - b. Copy the backup `elasticsearch.yml` file to the correct location:  
`~Qualisystems\CloudShell\Server\Quicksearch\config`
10. Start the **Quali Server** service, ensuring that the service starts successfully.
11. Open Windows Failover Cluster Manager.
12. Right-click the **Quali Server** node and in the context menu click **Start Role** to start the Cluster Quali Server Role.
13. Move the role between all nodes - see [Moving a WSFC role between nodes](#).

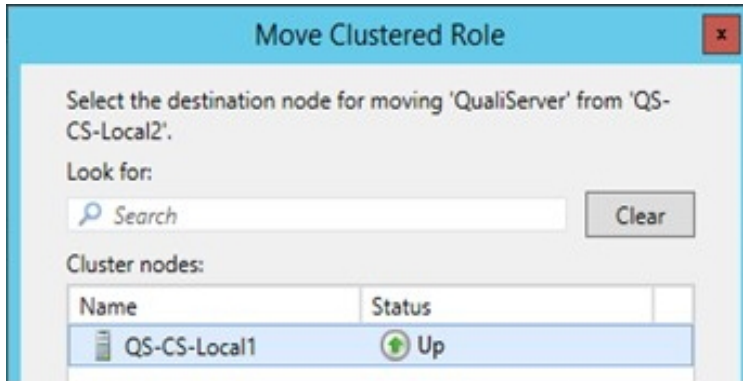
## Moving a WSFC role between nodes

**To move the role between all nodes:**

1. Open Windows Failover Cluster Manager.
2. Right-click **Move** and in the context menu, click **Select Node**.



3. Browse to the required node and move the role to it.
4. Repeat steps 2 and 3 for all the nodes in the cluster.



## Upgrading to a new version of CloudShell (with the latest HA solution pack)

**Note:** prior to performing this upgrade procedure, make sure you are familiar with CloudShells's installation procedure. For more information see CloudShell suite installation guide downloadable [here](#).

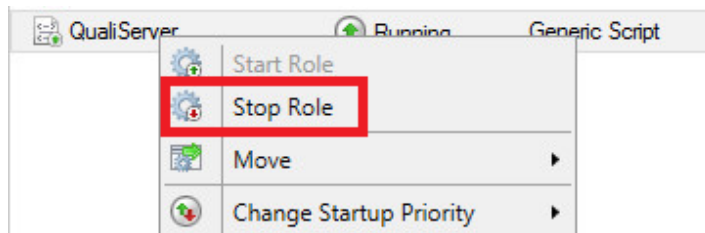
This section describes the required steps to upgrade the Quali server clustering environment to a new version of CloudShell with the latest official HA solution pack.

Repeat the following procedure for each cluster node in the clustered environment.

**Note:** Do not perform this procedure in parallel. Upgrade each node separately.

### To upgrade to a new CloudShell version:

1. Stop Quali Server
  - a. Open Windows Failover Cluster Manager on the Quali Server cluster.
  - b. Right-click the Quali Server Role and select the option **Stop Role**



- c. In **Task Manager**, close the java.exe process (do this in all of the nodes in the cluster). If more than one Java process is running, the java.exe process that is running from the Quali server folder must be closed.

- d. Browse to the folder `Qualisys-tems\CloudShell\Server\Quicksearch\config`.
  - e. Make a backup copy of the `elasticsearch.yml` file and move the backup copy to another folder as this file is overwritten during the upgrade process.
  - f. Repeat steps c-e for each of the Quali server nodes.
2. Stop CloudShell Portal
    - a. Open **Windows Failover Cluster Manager** on the **Portal** cluster.
    - b. Stop the **Portal** role.
  3. Stop the License Server
    - a. Open Windows Failover Cluster Manager on the **License Server** cluster.
    - b. Stop the **License Server** role.

**Make sure to upgrade each node separately. The following steps should not be performed in parallel to the previous ones.**

4. Upgrade the License Server:
  - a. Install the new version of CloudShell.
  - b. Configure the license server by running the Configuration Wizard.
  - c. Close all other configuration wizards (if other products installed on this machine).
  - d. Validate License Server is running under Windows' Services.
5. Repeat step 4 for each of the License Server nodes.
6. Start the **License Server Role** in Windows Cluster.
7. Upgrade Quali Server:
  - a. Install the new version of CloudShell. If the latest version is already installed on all nodes, skip this step.
  - b. Configure the Quali server by running the Configuration Wizard.
  - c. If other products are installed on this machine, close all other configuration wizards.
  - d. Validate Quali Server is running under Windows' Services.
  - e. Stop the Quali Server service and then perform the following steps:
    - i. Change the Quali server service to **Manual**.
    - ii. Move the backup `elasticsearch.yml` file to `Qualisys-tems\CloudShell\Server\Quicksearch\config`.
    - iii. Make sure that the following key exists in the Server's `customer.config` file:

```
<add key="FtsReplicasShards" value="1"/>
```

- f. Start the Quali Server service, ensuring that the service starts successfully.
  - g. Stop the Quali Server service.
8. Repeat step 7 for each of the QualiServer nodes.
9. Start the **Quali Server Role** in Windows Cluster.
10. Move the role between all nodes. For further instructions, see [Moving a WSFC role between nodes](#).
11. Upgrade CloudShell Portal:
  - a. Install the new version of CloudShell. If the latest version is already installed on all nodes, skip this step.
  - b. Configure the CloudShell portal by running the Configuration Wizard.
  - c. If other products are installed on this machine, close all other configuration wizards.
  - d. Validate portal is accessible using “localhost” address.
12. Repeat step 11 for each of the CloudShell Portal nodes.
13. Start the **CloudShell Portal Role** in Windows Cluster.
14. Configure all other products in all clusters' nodes (Execution servers, Runtime, Sandbox API etc.)



## Known issues and limitations

- CloudShell application warm upgrade is currently not supported.
- The CloudShell BI solution is currently not supported in a high availability setup. It is possible to use CloudShell BI with CloudShell High Availability Solution Packs (version 6.3 EA and above).
- Where the NLB Manager is connected through a DHCP IP address, the network card must be connected to a static IP address.

# Troubleshooting

Troubleshooting topics are discussed in this section.

## PowerShell Execution Policy

The Quali High Availability solution uses PowerShell code to manage the cluster. To use the solution, ensure that you have Execution Policy on the machine.

If, after starting the Quali Server Role, the role fails with an ‘incorrect function’ error (this error can be found both in the cluster manager and in the Windows event viewer), run the following steps:

### To make sure that the execution policy is unrestricted on the machine:

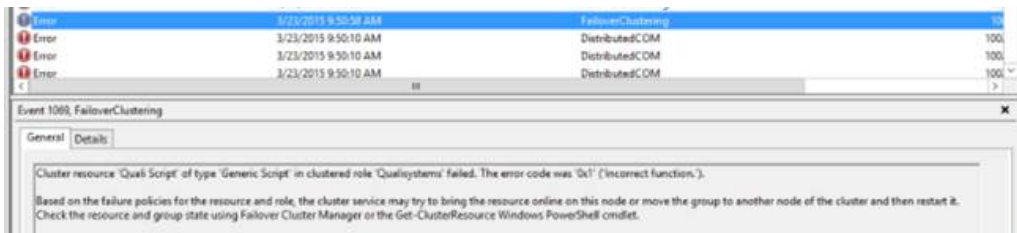
1. Open **PowerShell** using administrator credentials.
2. Run the following command: `Get-ExecutionPolicy`  
The command should return the result: **Unrestricted**.
3. If this result is not received, in **PowerShell**, run the following command: `Set-ExecutionPolicy Unrestricted`
4. In the registry, make sure that the following key value is valid:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\PowerShell\1\ShellIds\Microsoft.PowerShell
```

Name	Type	Data
(Default)	REG_SZ	(value not set)
ExecutionPolicy	REG_SZ	Unrestricted
Path	REG_SZ	C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe

### Example

The following image shows an ‘incorrect function’ error.



## Appendix

This appendix contains reference information and a glossary of terms.

### References

Topic	URL
Application Request Routing Version 2 Overview	<a href="http://www.iis.net/learn/extensions/planning-for-arr/application-request-routing-version-2-overview">http://www.iis.net/learn/extensions/planning-for-arr/application-request-routing-version-2-overview</a>
CloudShell distributed execution server:	<a href="https://support.quali.com/hc/en-us/articles/231623807-Distributed-Provisioning-DisPro-CloudShell-6-2-feature-">https://support.quali.com/hc/en-us/articles/231623807-Distributed-Provisioning-DisPro-CloudShell-6-2-feature-</a>
Create a New Network Load Balancing Cluster	<a href="https://technet.microsoft.com/en-us/library/cc771008.aspx">https://technet.microsoft.com/en-us/library/cc771008.aspx</a>
Create a new Network Load Balancing Port Rule	<a href="https://technet.microsoft.com/en-us/library/cc733056.aspx">https://technet.microsoft.com/en-us/library/cc733056.aspx</a>
Define and Configure an Application Request Routing Server Farm – step-by-step guide	<a href="http://www.iis.net/learn/extensions/configuring-application-request-routing-(arr)/define-and-configure-an-application-request-routing-server-farm">http://www.iis.net/learn/extensions/configuring-application-request-routing-(arr)/define-and-configure-an-application-request-routing-server-farm</a>
Health check	<a href="http://blogs.iis.net/richma/application-request-routing-health-check-features">http://blogs.iis.net/richma/application-request-routing-health-check-features</a>
Setting up TestShell Portal on IIS including HTTPS	<a href="https://support.quali.com/hc/en-us/articles/231607987-Setting-up-Testshell-Portal-on-IIS-including-HTTPS-">https://support.quali.com/hc/en-us/articles/231607987-Setting-up-Testshell-Portal-on-IIS-including-HTTPS-</a>
Virtual environment deployment on VMware vCenter 5.5 or above, with HA clustering configured across two different ESXi hosts.	<a href="https://pubs.vmware.com/vsphere-55/index.jsp#com.vmware.vsphere.avail.doc/GUID-E90B8A4A-BAE1-4094-8D92-8C5570FE5D8C.html">https://pubs.vmware.com/vsphere-55/index.jsp#com.vmware.vsphere.avail.doc/GUID-E90B8A4A-BAE1-4094-8D92-8C5570FE5D8C.html</a>
Windows load balancing manager	<a href="https://technet.microsoft.com/en-us/library/cc776931%28v=ws.10%29.aspx">https://technet.microsoft.com/en-us/library/cc776931%28v=ws.10%29.aspx</a>
Windows Server Manager Step-by-Step Guide	<a href="https://technet.microsoft.com/en-us/library/cc753762(v=ws.10).aspx">https://technet.microsoft.com/en-us/library/cc753762(v=ws.10).aspx</a>

## Documentation

Additional technical documentation is available in the [Quali's Download Center](#).

Operational documentation for all High Availability applications is available by clicking the Help option in any CloudShell application.

For our discussion forums, you can access the [Quali Community Forum](#).

## Glossary

Terms used in this guide are described in the following table.

<b>Term</b>	<b>Description</b>
Active-Active	All nodes in the cluster are active. A load balancing algorithm/policy determines the preferred node for a given session. This is a more scalable architecture. However, it is more complex to manage.
Active-Passive	A fully redundant instance of each node is present. The passive node is brought online when its associated primary node fails.
Active- Standby	One node in the cluster is active. The other node is inactive until failover is triggered (warm standby).
AlwaysOn Availability Groups	A high-availability and disaster-recovery solution that provides an enterprise-level alternative to MSSQL database mirroring.
ARR	Active Request Routing. This is an IIS server native load balancing solution.
ARR Server Farm	A logical group of application servers where HTTP requests are routed based on HTTP inspection rules and load balance algorithm.
Availability databases	A failover environment for a discrete set of user databases (an availability group) that fail over together.
Availability rep- lica	<p>An instantiation of an availability group that is hosted by a specific instance of SQL Server and that maintains a local copy of each availability database that belongs to the availability group.</p> <p>Two types of availability replicas exist: a single primary replica and one to four secondary replicas. The server instances that host the availability replicas for a given availability group must reside on different nodes of a single Windows Server Failover Clustering (WSFC) cluster.</p>

<b>Term</b>	<b>Description</b>
NLB	Network Load Balancing. Use the NLB Manager to create and manage NLB clusters from a single computer.
SAN	Storage area network, dedicated network used to enhance storage devices. It is a high-speed network, providing a direct connection between servers and storage, including shared storage, clusters, and disaster-recovery devices.
SPOF	Single Point of Failure.
Warm Upgrade	An administrator is able to upgrade one node of the cluster to a new version of CloudShell (Quali Server) while the other node is active, then fall back to the new node and upgrade the standby without any down-time for the end user.
Windows load balancing manager	Windows load balancing manager enables you to create and manage Network Load Balancing (NLB) clusters from a single computer. By centralizing NLB administration tasks, many common configuration errors are eliminated.
WSFC	Windows Server Failover Clustering

## Revision History

CloudShell Version	Doc revision number	Description
7.1 EA	4.0	Updated topic: "Upgrading to a new version of CloudShell (with the latest HA solution pack)"
	5.0	Added support of SQL Server 2016 Standard Edition  Topic "Setting up AlwaysOn availability groups" updated for AlwaysOn users only.
	1.0	Terminology correction: Windows cluster manager replaced with Windows Failover Cluster Manager
7.1 GA	2.0	Updated links to download center and support portal  Terminology correction: Generic Service role replaced with Generic Script role