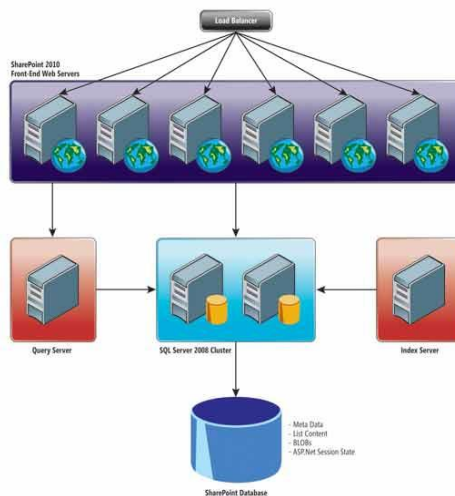
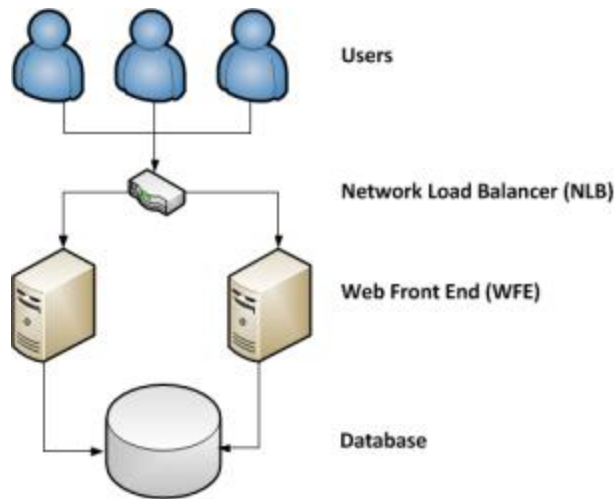


NETWORK LOAD BALANCING and
FAILOVER CLUSTERING IN
WINDOWS SERVER 2008 R2

NETWORK LOAD BALANCING and FAILOVER CLUSTERING IMPLEMENTATION



Generally it is seen that NLB is implemented between the Front End Web Servers and Failover Clustering is implemented for the back end database servers. Please refer to the diagrams on the left side for example.

NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Network Load Balancing overview

The Network Load Balancing (NLB) service **enhances the availability and scalability** of Internet server applications such as those used on Web, FTP, firewall, proxy, virtual private network (VPN), and other mission-critical servers.

What are NLB clusters?

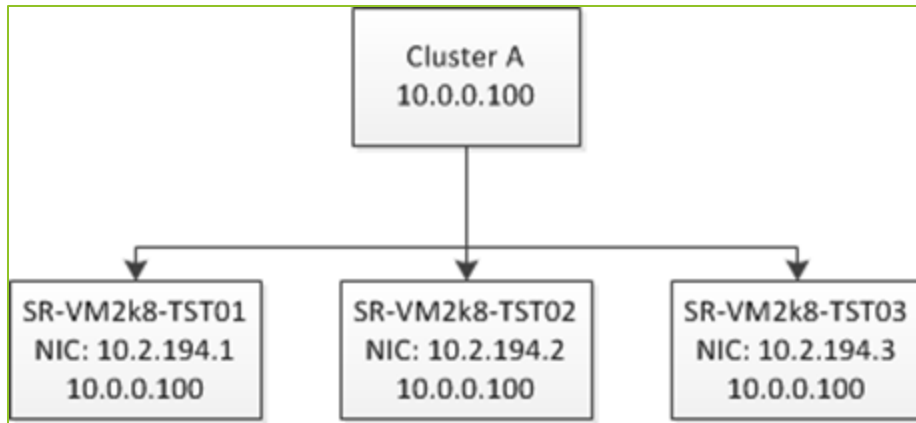
It is important to understand what a network load balanced cluster is and what it does. The cluster is made up of member hosts, and each host is bound to a public IP address (or addresses) which resolve to the cluster itself.

Each host in the cluster must have Network Load Balancing installed, and bound to the network interface(s) of choice.

When you initially install the cluster, you configure both an initial member host, and then the cluster settings.

NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

An example Network Load Balancing Cluster:



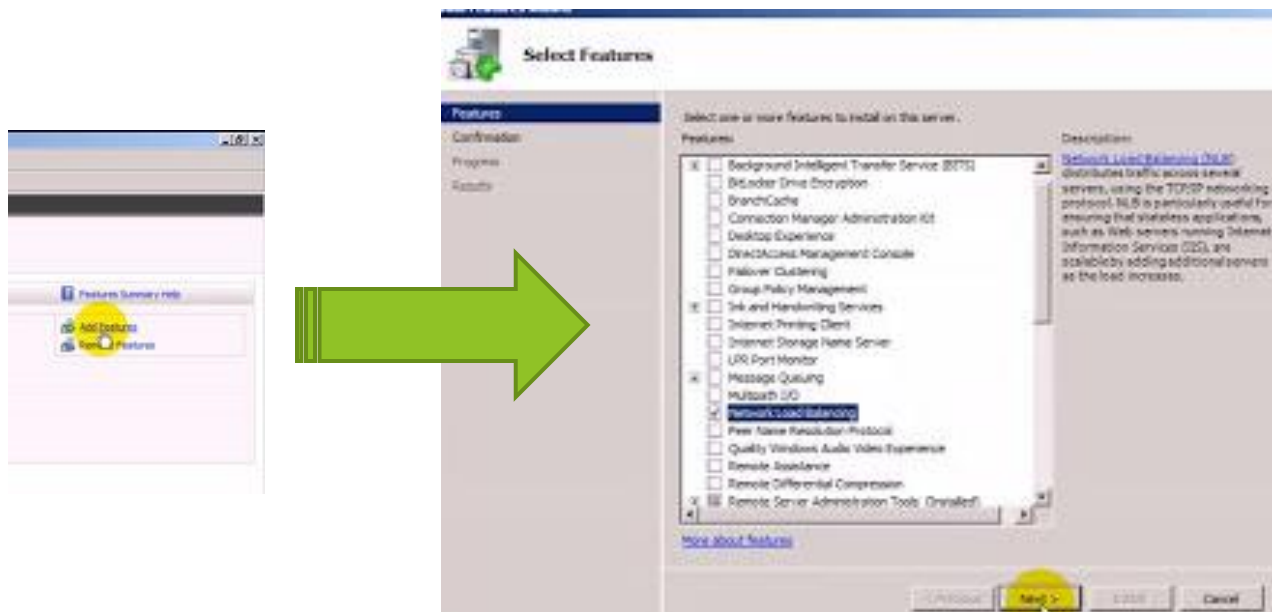
Note how each host in the cluster has a network interface card which is bound to the cluster's IP address (10.0.0.100). So any request coming for Cluster A will turn to the nodes that belongs to the Cluster.

NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

1. Install Network Load Balancing

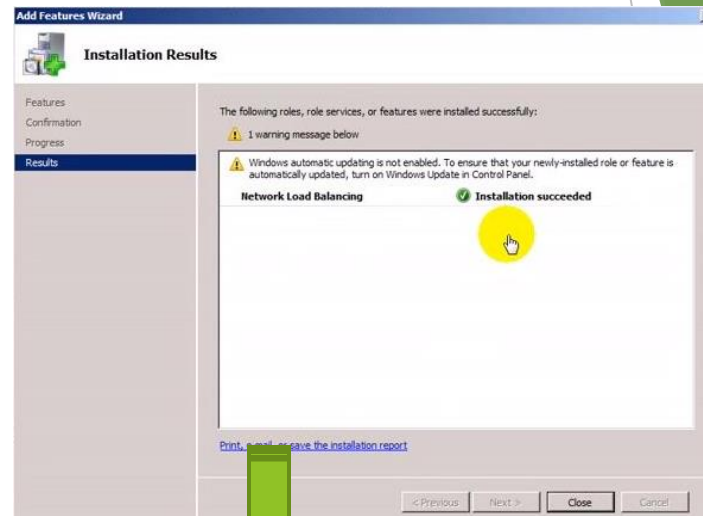
Open Server Manager, click on Features and then click on the Add Features link. In the “Add Features Wizard” scroll to, and select “Network Load Balancing”:



NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

Installation will proceed to install the necessary components

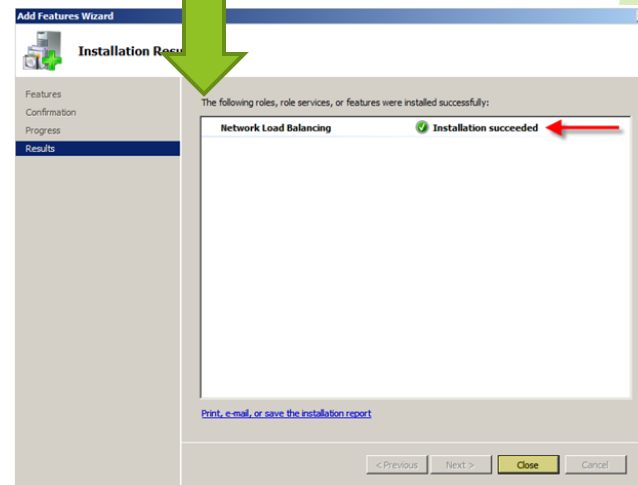


NOTE: Network Load Balancing may also be installed from a command prompt with elevated privileges (right click on the command prompt in the Start menu and select *Run as administrator*) by running the `servermanagercmd -install nlb` command.

For example:

```
C:\Windows\system32>servermanagercmd -install nlb
```

..... Start Installation



NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

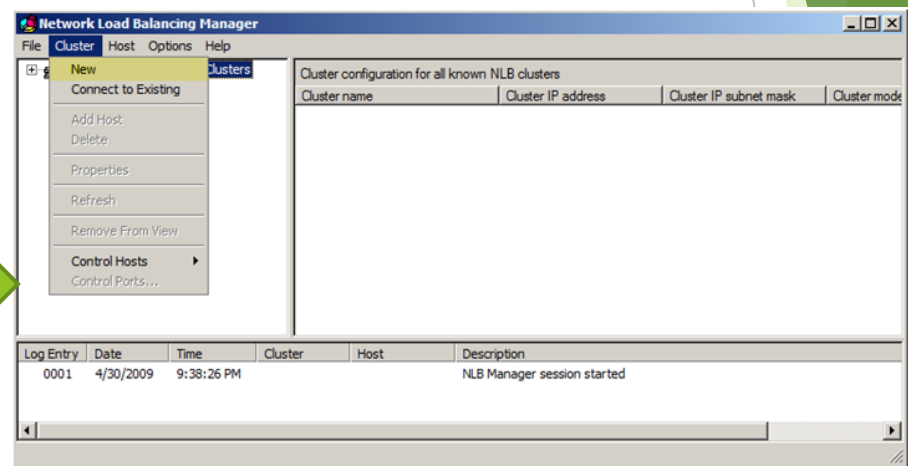
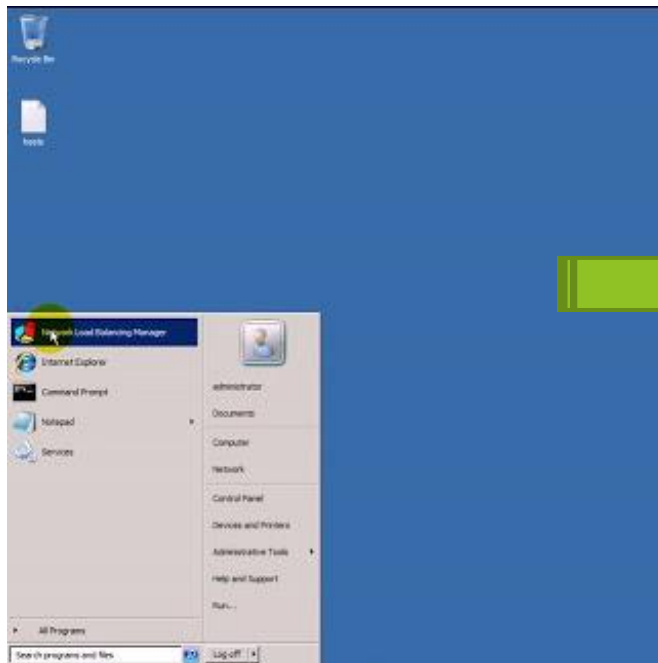
Installation and Configuration

Configuring NLB on NODE 1

Network Load Balanced clusters are built using the *Network Load Balancing Manager* which you can start from

Start -> All Programs -> Administrative Tools menu or from a command prompt by executing `nlbmgr`.

Under the Cluster Menu option select "New"



NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

Enter the first node in the cluster in form of IP Address or Host name

Press "Connect"

Please note that the nodes should be lying under the **same domain of the existing network**. Basically in the same subnet of the Network Adapter.

New Cluster: Connect

Connect to one host that is to be part of the new cluster and select the cluster interface

Host:

Connection status

Interfaces available for configuring a new cluster

Interface name	Interface IP
----------------	--------------

< Back Next > Cancel Help



New Cluster: Connect

Connect to one host that is to be part of the new cluster and select the cluster interface

Host:

Connection status

Connected

Interfaces available for configuring a new cluster

Interface name	Interface IP
Local Area Connection	192.168.1.180

< Back **Next >** Cancel Help

NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

- ▶ Enter the Priority ID as, 1 (each node in the NLB cluster should have a UNIQUE ID)
- ▶ Make sure the correct adapter was selected under "Dedicated IP Address"
- ▶ Select "Started" for the "Initial host state" (this tells NLB whether you want this node to participate in the cluster at startup)
- ▶ Press "Next"
- ▶ Press "Add"
- ▶ Enter the Cluster IP and Subnet mask
- ▶ Press "OK"

New Cluster: Host Parameters

Priority (unique host identifier): 1

IP address	Subnet mask
192.168.1.180	255.255.255.0

Initial host state
Default state: Started

Retain suspended state after computer restarts

< Back **Next >** Cancel Help

New Cluster: Cluster IP Addresses

The cluster IP addresses are shared by all nodes in the cluster. The first IP address listed is considered the primary IP address for heartbeats.

Cluster IP addresses:

IP address

Add IP Address

Add IPv4 address:
IPv4 address: 192.168.1.182
Subnet mask: 255.255.255.0

Add IPv6 address:
IPv6 address:

Generate IPv6 addresses:
 Link-local Site-local Global

OK Cancel

Add... Edit... Remove

< Back Next > Cancel Help

NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

You can add multiple IP Addresses for the cluster, enter as many as you want.

Make sure the "Cluster IP addresses" are correct

Press "Next"

- ▶ Select the IP Address for this cluster
- ▶ Enter the NLB address "PL2008-V.pintolake.net"
- ▶ Enter "Unicast" as the "Cluster operation mode". Well I am not discussing why I chose Unicast here
- ▶ Press "Next"

New Cluster: Cluster IP Addresses

The cluster IP addresses are shared by every member of the cluster for load balancing. The first IP address listed is considered the primary cluster IP address and used for cluster heartbeats.

Cluster IP addresses:

IP address	Subnet mask
192.168.1.182	255.255.255.0

Add... Edit... Remove

< Back Next > Cancel Help

New Cluster: Cluster Parameters

Cluster IP configuration

IP address: 192.168.1.182

Subnet mask: 255 . 255 . 255 . 0

Full Internet name: PL2008-V.pintolake.net

Network address: 02-bf-c0-a8-01-b6

Cluster operation mode

Unicast

Multicast

IGMP multicast

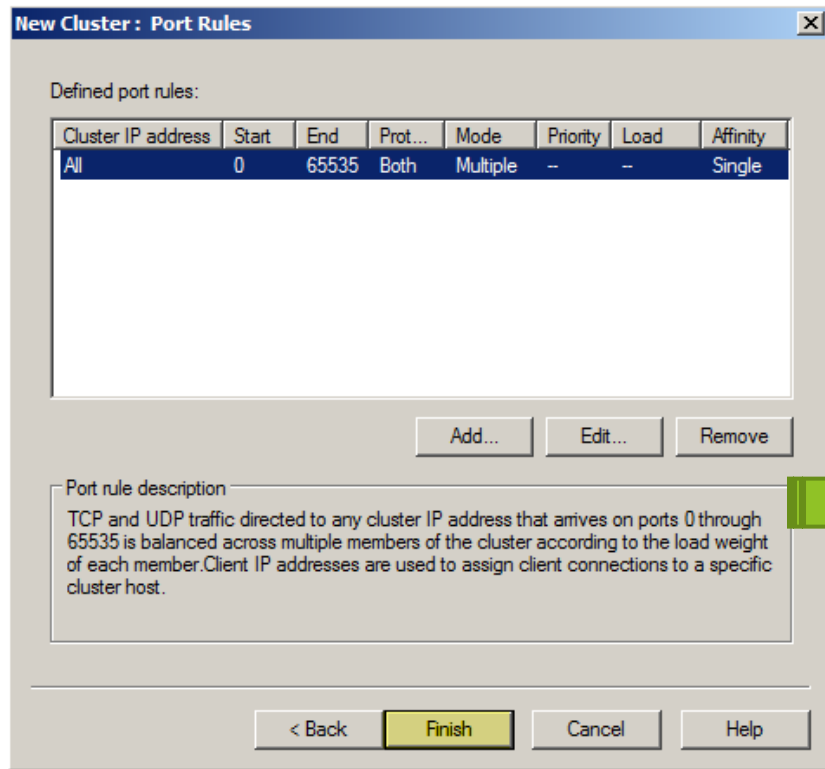
< Back Next > Cancel Help

NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

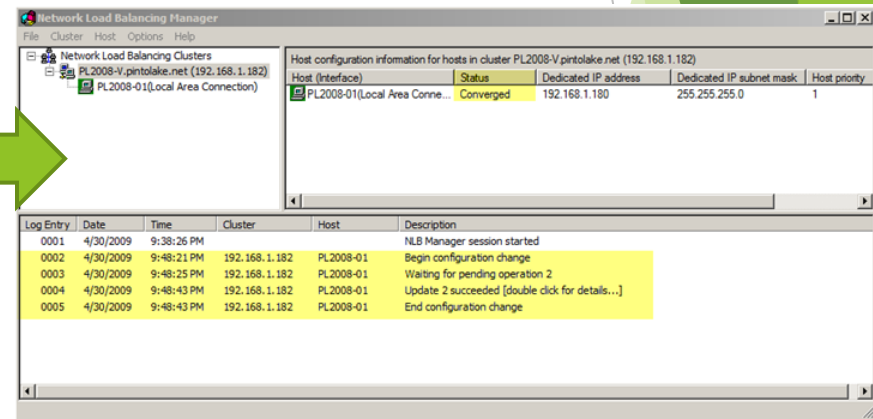
Installation and Configuration

I am leaving all the default for the port rules; by default its set to all ports with Single affinity, which is sticky. For more information on Port Rules, I will discuss it later.

Press "Finish"



You should see a couple of things in the NLB Manager, this will let us know that this node successfully converged on our new PL2008-V.pintolake.net NLB Cluster
Make sure the node's status changes to "Converged"
Make sure you see a "succeeded" message in the log window

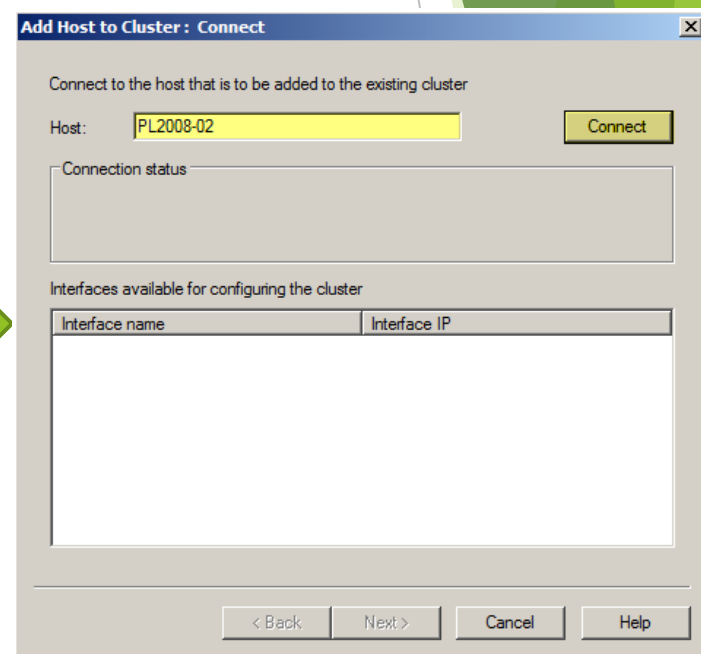
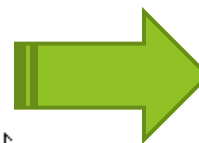
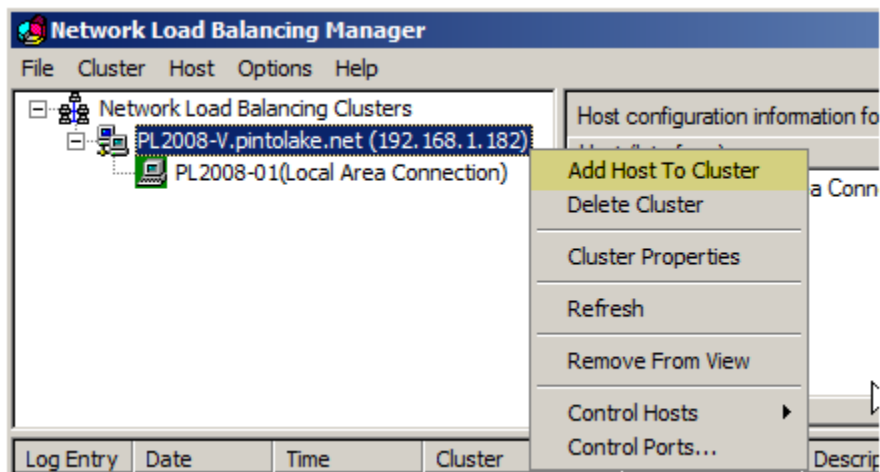


NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

Configuring NLB for NODE 2

- ▶ We will configure PL2008-02 from PL2008-01. If we wanted to configure this from PL2008-02 then we would need to connect to the PL2008-V cluster first then add the host to the cluster.
- ▶ Right click the cluster name "PL2008-V.pintolake.net" and select "Add Host to Cluster"



NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

- ▶ This step is very important; each node in the NLB cluster should have a unique identifier. This identifier is used to identify the node in the cluster.
- ▶ Enter the Priority ID as, 2 (each node in the NLB cluster should have a UNIQUE ID)
- ▶ Make sure the correct adapter was selected under "Dedicated IP Address"
- ▶ Select "Started" for the "Initial host state" (this tells NLB whether you want this node to participate in the cluster at startup)
- ▶ Press "Next"
- ▶ Press "Finish"

Add Host to Cluster : Host Parameters

Priority (unique host identifier): 2

Dedicated IP addresses

IP address	Subnet mask
192.168.1.181	255.255.255.0

Initial host state

Default state: Started

Retain suspended state after computer restarts

< Back Next > Cancel Help

Add Host to Cluster : Port Rules

Defined port rules:

Cluster IP address	Start	End	Prot...	Mode	Priority	Load	Affinity
All	0	65535	Both	Multiple	-	Equal	Single

Port rule description

TCP and UDP traffic directed to any cluster IP address that arrives on ports 0 through 65535 is balanced equally across all members of the cluster. Client IP addresses are used to assign client connections to a specific cluster host.

< Back Finish > Cancel Help

NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

- ▶ You should see a couple of things in the NLB Manager, this will let us know that both nodes successfully converged on our new PL2008-V.pintolake.net NLB Cluster
- ▶ Make sure that both node's status changes to "**Converged**"
- ▶ Make sure each node has a unique "host priority" ID
- ▶ Make sure each node is "started" under "initial host state"
- ▶ Make sure you see a "**succeeded**" message in the log window for the second node

The screenshot displays the Network Load Balancing Manager interface. The left pane shows a tree view of the cluster 'PL2008-V.pintolake.net (192.168.1.182)' with two hosts: 'PL2008-01(Local Area Connection)' and 'PL2008-02(Local Area Connection)'. The right pane shows the host configuration information for the cluster, and the bottom pane shows the log entries.

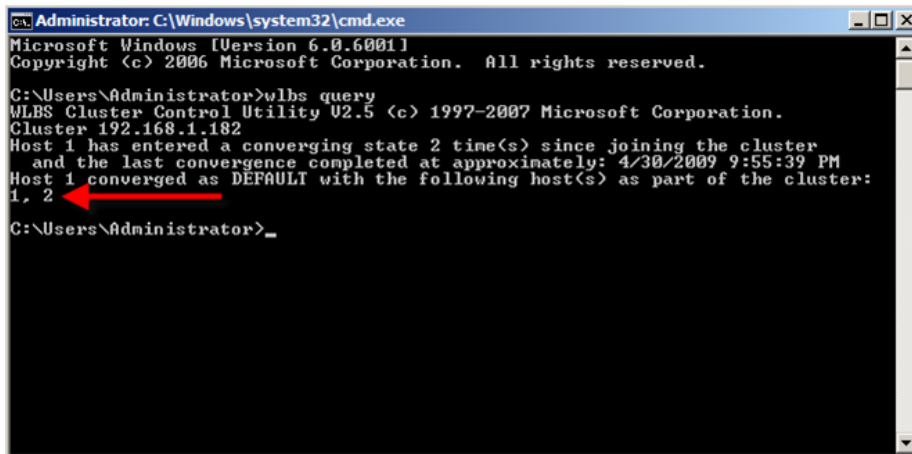
Host (Interface)	Status	Dedicated IP address	Dedicated IP subnet mask	Host priority	Initial host state
PL2008-01(Local Area Connection)	Converged	192.168.1.180	255.255.255.0	1	started
PL2008-02(Local Area Connection)	Converged	192.168.1.181	255.255.255.0	2	started

Log Entry	Date	Time	Cluster	Host	Description
0001	4/30/2009	9:38:26 PM			NLB Manager session started
0002	4/30/2009	9:48:21 PM	192.168.1.182	PL2008-01	Begin configuration change
0003	4/30/2009	9:48:25 PM	192.168.1.182	PL2008-01	Waiting for pending operation 2
0004	4/30/2009	9:48:43 PM	192.168.1.182	PL2008-01	Update 2 succeeded [double click for details...]
0005	4/30/2009	9:48:43 PM	192.168.1.182	PL2008-01	End configuration change
0006	4/30/2009	9:55:21 PM	192.168.1.182	PL2008-02	Begin configuration change
0007	4/30/2009	9:55:21 PM	192.168.1.182	PL2008-02	Waiting for pending operation 2
0008	4/30/2009	9:56:05 PM	192.168.1.182	PL2008-02	Update 2 succeeded [double click for details...]
0009	4/30/2009	9:56:05 PM	192.168.1.182	PL2008-02	End configuration change

NETWORK LOAD BALANCING IN WINDOWS SERVER 2008 R2

Installation and Configuration

- ▶ Testing
- ▶ Go to the command prompt and type "wlbs query", as you can see HOST 1 and HOST 2 converged successfully on the cluster. This means things are working well.
- ▶ Ping each server locally and remotely
- ▶ Ping the virtual IP locally and remotely - you should do this three times from each location. If you cannot ping remotely you may need to add a static ARP entry in your switches and/or routers where the host machines reside
 - ▶ 1 - Both nodes up
 - ▶ 2 - Node 1 down
 - ▶ 3 - Node 2 down



```
Administrator: C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.0.6001]
Copyright (c) 2006 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>wlbs query
WLBS Cluster Control Utility V2.5 (c) 1997-2007 Microsoft Corporation.
Cluster 192.168.1.182
Host 1 has entered a converging state 2 time(s) since joining the cluster
and the last convergence completed at approximately: 4/30/2009 9:55:39 PM
Host 1 converged as DEFAULT with the following host(s) as part of the cluster:
1, 2
C:\Users\Administrator>_
```

FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

Although all editions of Windows Server 2008 include Network Load Balancing, only the Enterprise Edition and the Datacenter Edition include failover clustering capabilities to achieve higher levels of availability. A cluster allows you to establish high availability for general services or for specific applications. The Failover Cluster Management tool included with Windows Server 2008 enables you to create and manage clusters.

You need to take care of the following steps to implement clustering in your environment.

- ▶ Make sure your hardware is compatible with Windows Server 2008 clustering.
- ▶ Configure volumes on your shared storage connected and visible to both servers.
- ▶ Install the Failover Clustering feature on each of your intended cluster nodes.

Once you complete these steps, you can run the Failover Cluster Management console by going to **Start | Administrative Tools | Failover Cluster Management**.

FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

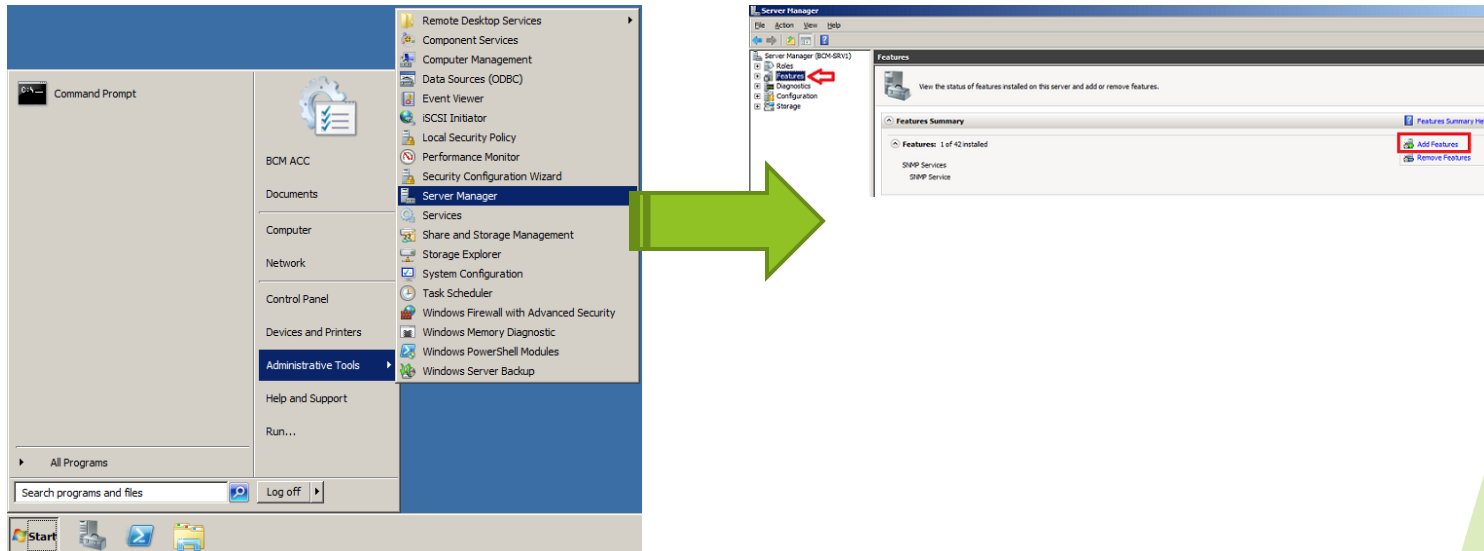
Failover Clustering System Requirement:

- ▶ **Windows Server 2008/R2:** Failover Clustering feature is available with Windows Server 2008/R2 Enterprise/Data Center editions. You don't have this feature with the Standard edition of Windows Server 2008/R2.
- ▶ **Domain role:** All servers in the cluster must be in the same Active Directory domain.
- ▶ **DNS:** The servers in the cluster must be using Domain Name System (DNS) for name resolution.
- ▶ **Account for administering the cluster :** When you create a cluster or add servers to it, you must be logged on to the domain with an account that has administrator rights on all servers in that cluster (if the account is not a Domain Admins account, the account must be given the Create Computer Objects and Read All Properties permissions in the domain).
- ▶ **Servers :** Two identical servers in brand, model and configurations.
- ▶ **Device Controllers (HBA) :** i/SCSI or Fiber , both also to be the identical.
- ▶ **Storage :** You must use shared storage that is compatible with Windows Server 2008 R2.

FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

► Configuration on Server A

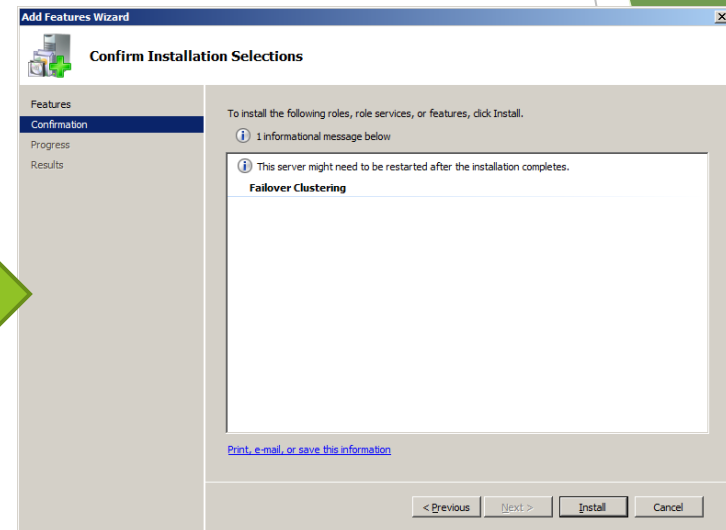
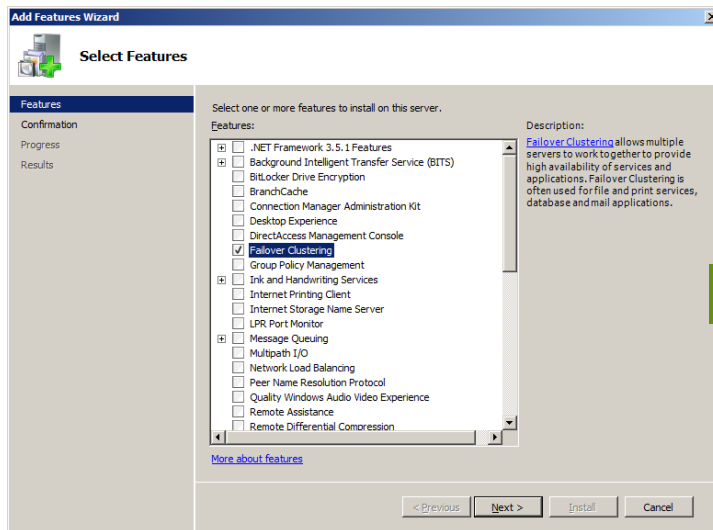
- 1) To install Failover feature, open Server Manager, click on **Start > Administrative Tools > Server Manager**
- 2) Expand **Features**, and then click on **Add Feature**.



FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

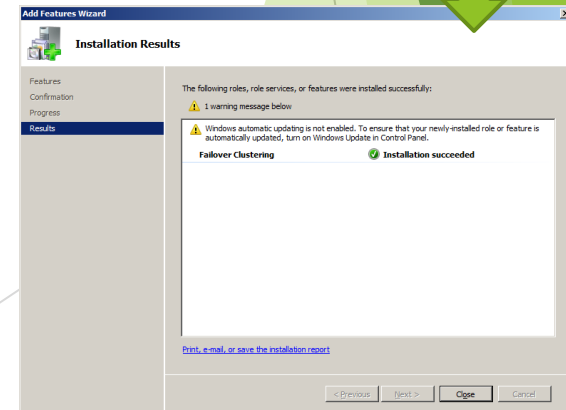
► Configuration on Server A

- 3) The list of available features will be listed, select the Failover Clustering and click on Next



- 4) Click **Install**

- 5) The Failover Clustering feature will be installed. Click Close



FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

► Configuration on Server B

Again on Server B, we will need to install Failover Clustering feature as well. Follow the previously mentioned steps in Server B as well.

Now that both servers have **Failover Clustering feature installed** on them, we can create the cluster on one of these server and join the other one to the cluster.

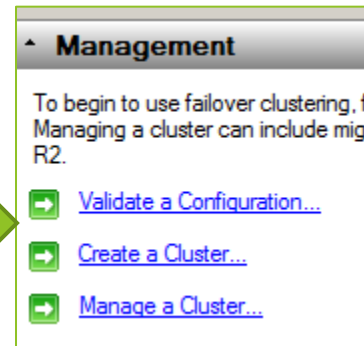
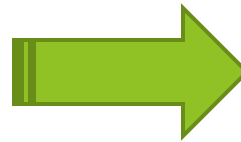
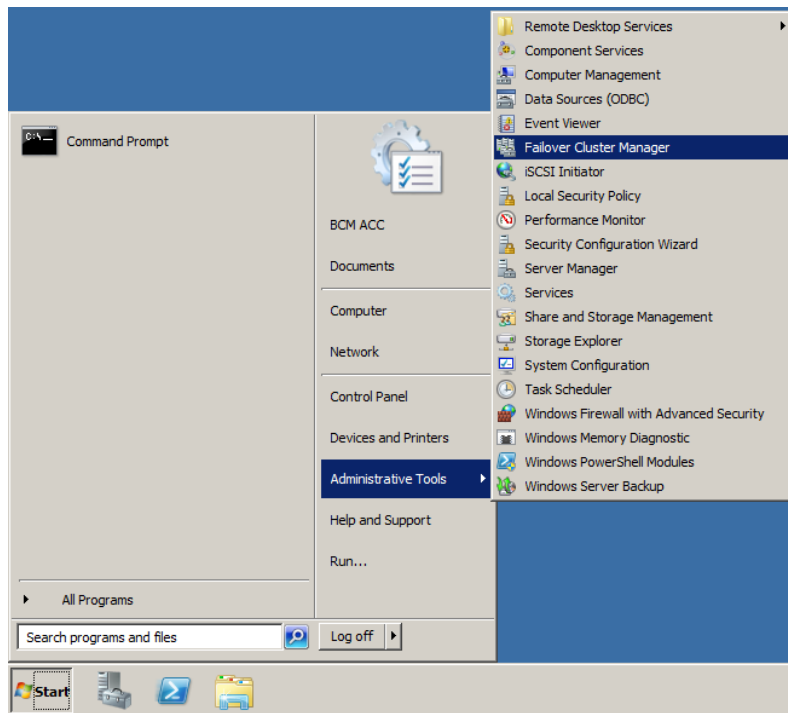
Now, we need to open and configure our cluster name, IP and nodes.

To open Failover Clustering, click on **Start > Administrative Tools > Failover Cluster Manager**

Please Note that This needs to be done on a single server only.

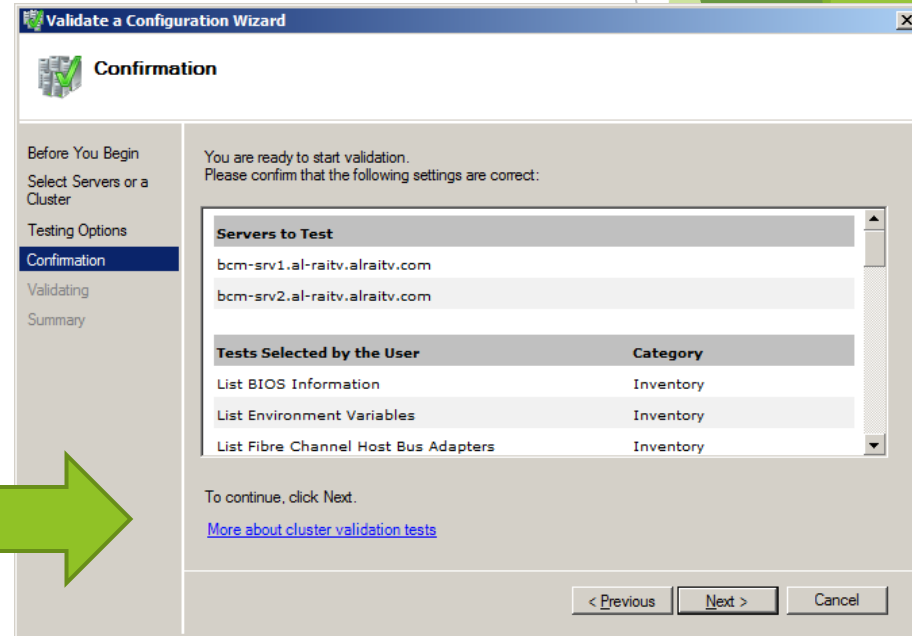
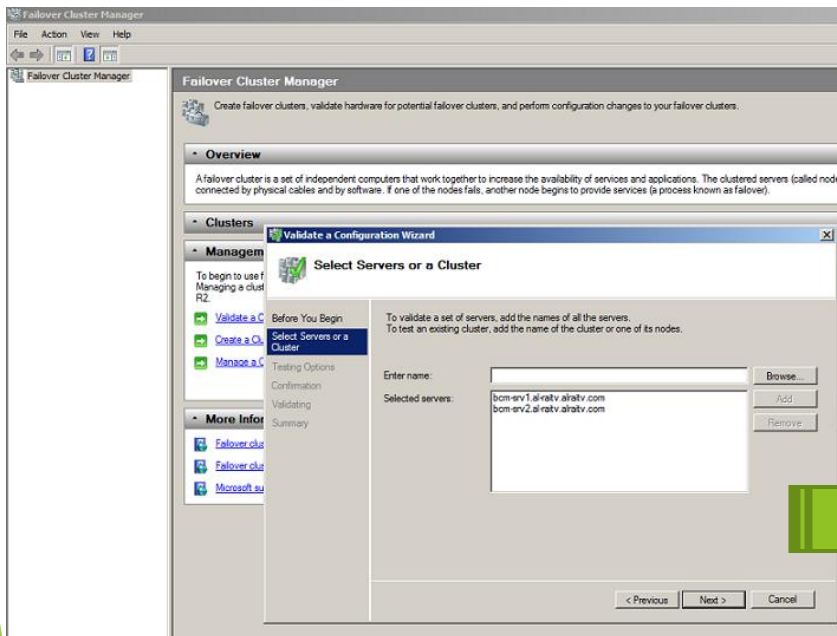
FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

- The first step in creating a successful failover clustering, is by validating the existing systems and shared storage. This is done by selecting the option **Validate a Configuration.**



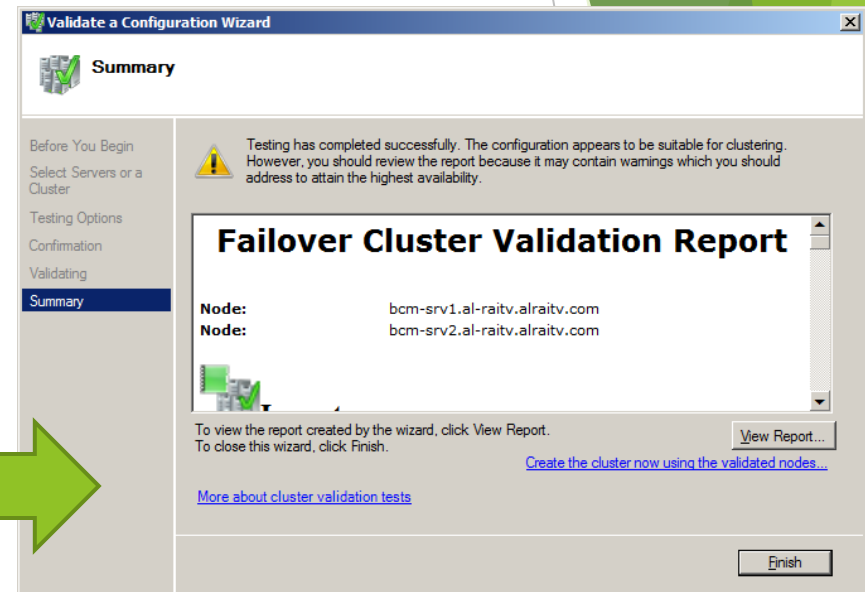
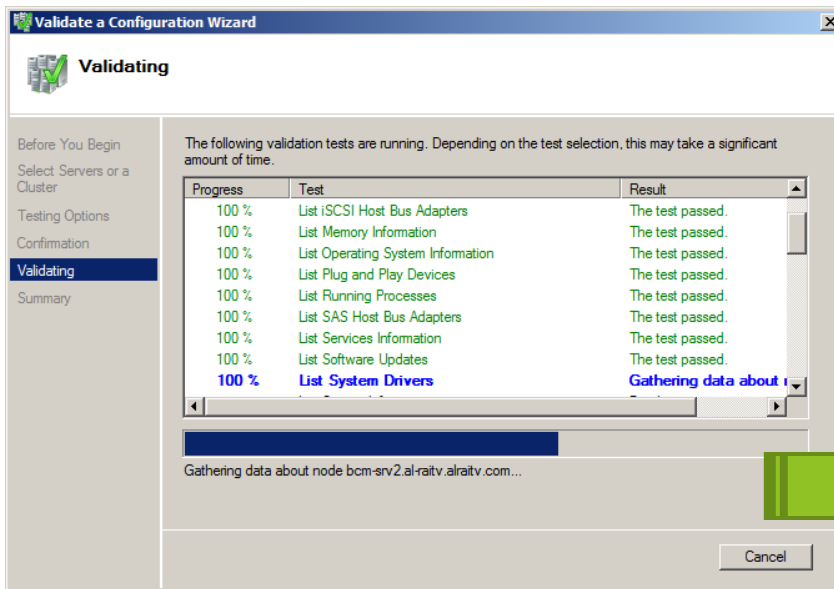
FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

- The first step in creating a successful failover clustering, is by validating the existing systems and shared storage. This is done by selecting the option **Validate a Configuration.**
- When you click on **Validate a Configuration**, you will need to browse and add the Cluster nodes, these are the servers that will be part of the cluster, then click Next
- Choose to **Run all tests** and click **Next**. The available tests will be displayed in the confirmation window, click **Next** to begin validating your cluster.



FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

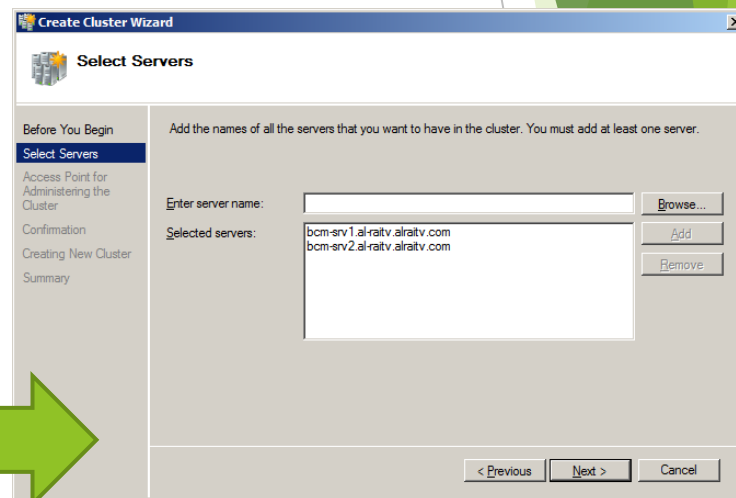
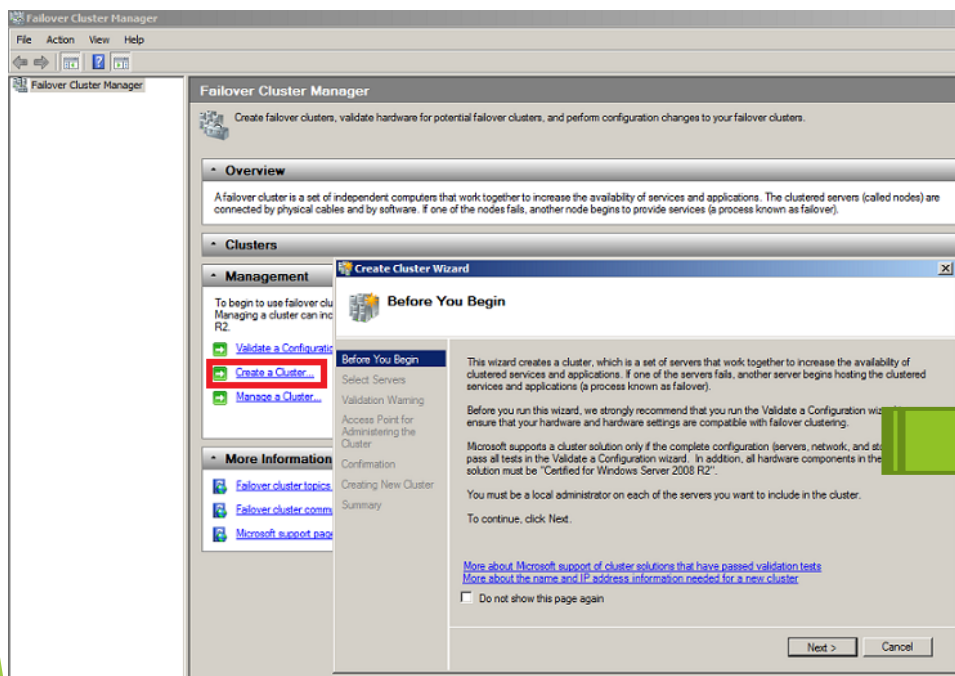
- Review the validation report, as your configuration might have few issues with it and needs to be addressed before setting up your cluster.



FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

- Now that the configuration is validated and you are ready to setup your cluster. Click on the second option, **Create a Cluster**, the wizard will launch, read it and then click Next.
-
- You need to add the names of the servers you want to have in the cluster. You can start creating your cluster with a single server and then add other nodes in the future.

Browse to your servers and then once all the servers (nodes) are listed, click **Next**



FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

- After the servers are selected, you need to type a name and IP for your Cluster.
- On the Confirmation window, review your settings. The following will be displayed in this window: cluster name and IP address, selected servers name. If all info is proper, then click Next. Else click Previous and correct which setting needs to be adjusted.

Create Cluster Wizard

Access Point for Administering the Cluster

Before You Begin
Select Servers
Access Point for Administering the Cluster
Confirmation
Creating New Cluster
Summary

Type the name you want to use when administering the cluster.

Cluster Name:

One or more IPv4 addresses could not be configured automatically. For each network to be used, make sure the network is selected, and then type an address.

	Networks	Address
<input checked="" type="checkbox"/>	192.168.180.0/24	192 . 168 . 180 . 13

[More about the administrative Access Point for a cluster](#)

< Previous Next > Cancel

Create Cluster Wizard

Confirmation

Before You Begin
Select Servers
Access Point for Administering the Cluster
Confirmation
Creating New Cluster
Summary

You are ready to create a cluster.
The wizard will create your cluster with the following settings:

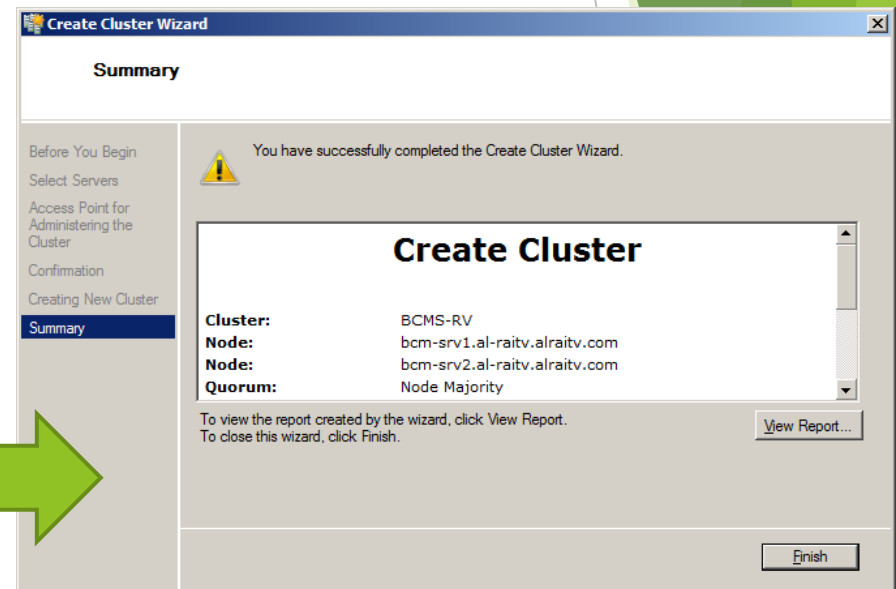
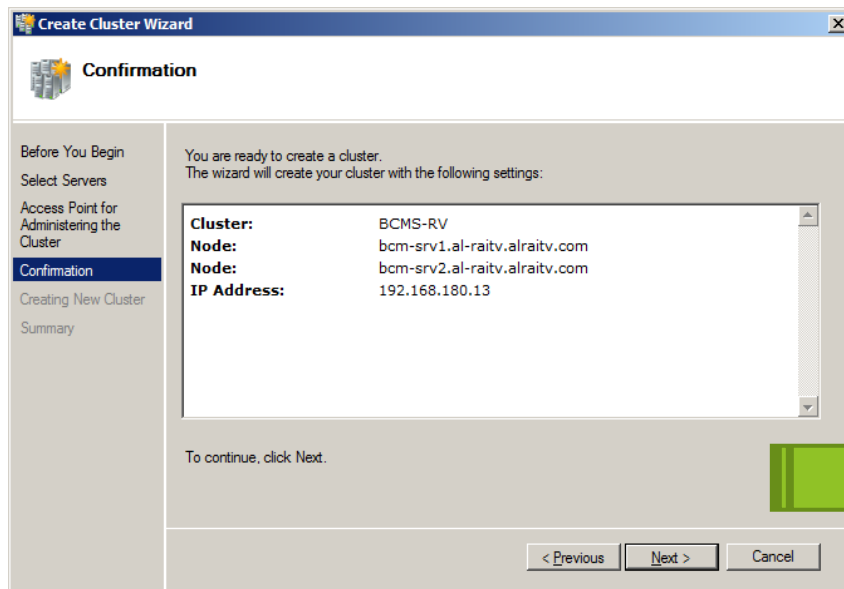
Cluster:	BCMS-RV
Node:	bcm-srv1.al-raitv.alraitv.com
Node:	bcm-srv2.al-raitv.alraitv.com
IP Address:	192.168.180.13

To continue, click Next.

< Previous Next > Cancel

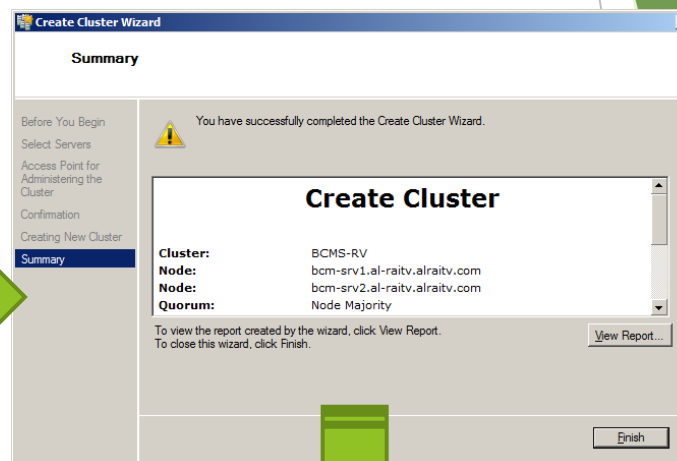
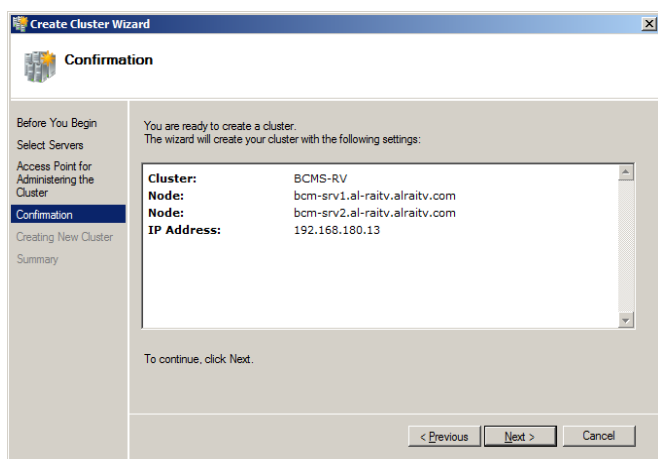
FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

- After you click Next, creating the cluster will begin.
- The summary windows will be displayed after a successful setup of the cluster.

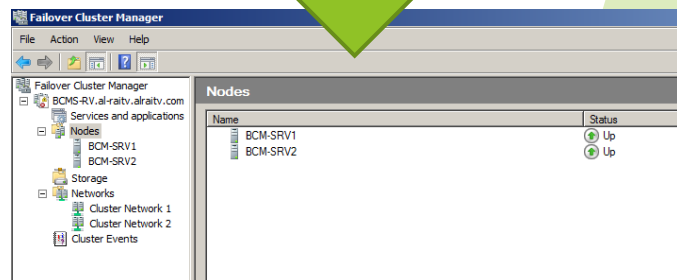


FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

- After you click Next, creating the cluster will begin.
- The summary windows will be displayed after a successful setup of the cluster.



Open Failover Cluster Manager and you will see your nodes and setting inside the MMC. Here you can configure your cluster, add new nodes, remove nodes, add more disk storage and so on.



FAILOVER CLUSTERING IN WINDOWS SERVER 2008 R2

In this article, I have created a two node cluster using both NLB and Failover Clustering feature which is available with Windows Server 2008 R2 Enterprise and Data Center editions. In this case I will be using Windows Server 2008 R2 Enterprise edition.

[Jump over to my Video Tutorial.....](#)

Thanks.....

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