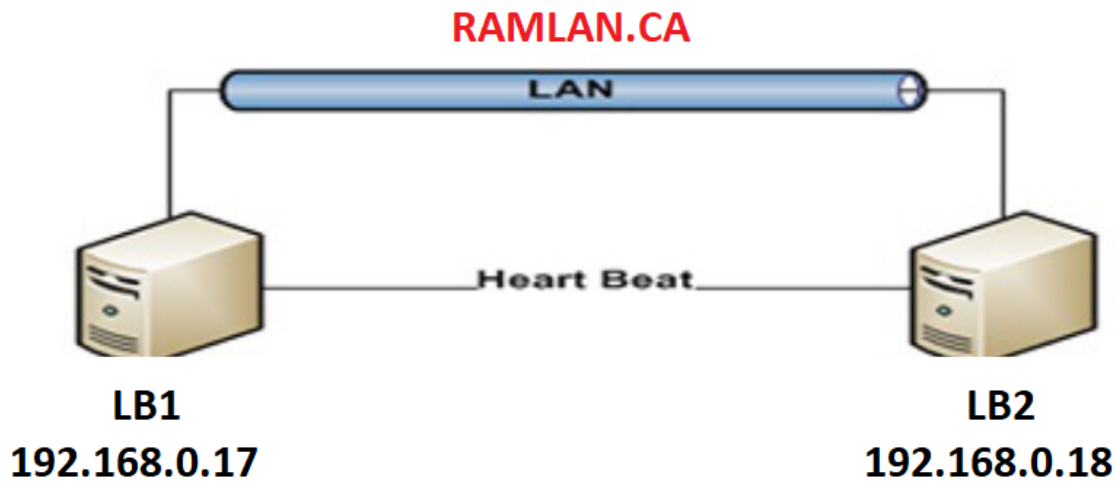


How to setup Windows Load Balancer on Server 2019

In this post, I will show you the steps for setting up Server 2019 load balancer. My lab setup will be as follows:



Load balancing is defined as the methodical and efficient distribution of network or application traffic across multiple servers in a server farm. Each load balancer sits between client devices and backend servers, receiving and then distributing incoming requests to any available server capable of fulfilling them.

What are load balancers and how do they work?

A load balancer may be:

- A physical device, a virtualized instance running on specialized hardware or a software process.
- Incorporated into application delivery controllers (ADCs) designed to more broadly improve the performance and security of three-tier web and microservices-based applications, regardless of where they're hosted.
- Able to leverage many possible load balancing algorithms, including round robin, server response time and the least connection method to distribute traffic in line with current requirements.

Regardless of whether it's hardware or software, or what algorithm(s) it uses, a load balancer disburses traffic to different web servers in the resource pool to ensure that no single server becomes overworked and subsequently unreliable. Load balancers effectively minimize server response time and maximize throughput.

Indeed, the role of a load balancer is sometimes likened to that of a traffic cop, as it is meant to systematically route requests to the right locations at any given moment, thereby preventing costly bottlenecks and unforeseen incidents. Load balancers should ultimately deliver the performance and security necessary for sustaining complex IT environments, as well as the intricate workflows occurring within them.

Load balancing is the most scalable methodology for handling the multitude of requests from modern multi-application, multi-device workflows. In tandem with platforms that enable seamless access to the numerous different applications, files and desktops within today's digital workspaces, load balancing supports a more consistent and dependable end-user experience for employees.

Hardware-vs software-based load balancers

Hardware-based load balancers work as follows:

- They are typically high-performance appliances, capable of securely processing multiple gigabits of traffic from various types of applications.
- These appliances may also contain built-in virtualization capabilities, which consolidate numerous virtual load balancer instances on the same hardware.
- That allows for more flexible multi-tenant architectures and full isolation of tenants, among other benefits.

In contrast, software-based load balancers:

- Can fully replace load balancing hardware while delivering analogous functionality and superior flexibility.
- May run on common hypervisors, in containers or as Linux processes with minimal overhead on bare-metal servers and are highly configurable depending on the use cases and technical requirements in question.
- Can save space and reduce hardware expenditures.

What are some of the common load balancing algorithms?

A load balancer, or the ADC that includes it, will follow an algorithm to determine how requests are distributed across the server farm. There are plenty of options in this regard, ranging from the very simple to the very complex.

Round Robin

Round robin is a simple technique for making sure that a virtual server forwards each client request to a different server based on a rotating list. It is easy for load balancers to implement, but does not take into account the load already on a server. There is a danger that a server may receive a lot of processor-intensive requests and become overloaded.

Least Connection Method

Whereas round robin does not account for the current load on a server (only its place in the rotation), the least connection method does make this evaluation and, as a result, it usually delivers superior performance. Virtual servers following the least connection method will seek to send requests to the server with the least number of active connections.

Least Response Time Method

More sophisticated than the least connection method, the least response time method relies on the time taken by a server to respond to a health monitoring request. The speed of the response is an indicator of how loaded the server is and the overall expected user experience. Some load balancers will take into account the number of active connections on each server as well.

Least Bandwidth Method

A relatively simple algorithm, the least bandwidth method looks for the server currently serving the least amount of traffic as measured in megabits per second (Mbps).

Least Packets Method

The least packets method selects the service that has received the fewest packets in a given time period.

Hashing Methods

Methods in this category make decisions based on a hash of various data from the incoming packet. This includes connection or header information, such as source/destination IP address, port number, URL or domain name, from the incoming packet.

Custom Load Method

The custom load method enables the load balancer to query the load on individual servers via SNMP. The administrator can define the server load of interest to query – CPU usage, memory and response time – and then combine them to suit their requests.

For lab setup, I have created 2 virtual servers (**LB1 & LB2**). Installed all the updates and restarted the servers. The servers have 4GB memory and 250GB hard disk. Just bare minimum for testing.

```
Administrator: Windows PowerShell

Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\Users\administrator.RAMLAN> ipconfig /all

Windows IP Configuration

    Host Name . . . . . : LB1
    Primary Dns Suffix . . . . . :
    Node Type . . . . . :
    IP Routing Enabled. . . . . :
    WINS Proxy Enabled. . . . . :
    DNS Suffix Search List. . . . . :

Ethernet adapter Ethernet0:

    Connection-specific DNS Suffix . :
    Description . . . . . :
    Physical Address. . . . . :
    DHCP Enabled. . . . . :
    Autoconfiguration Enabled . . . . :
    IPv4 Address. . . . . : 192.168.0.17(Preferred)
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :
    DNS Servers . . . . . :
    NetBIOS over Tcpi. . . . . :

PS C:\Users\administrator.RAMLAN>
```

```
Administrator: Windows PowerShell

Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\Users\administrator.RAMLAN> ipconfig /all

Windows IP Configuration

    Host Name . . . . . : LB2
    Primary Dns Suffix . . . . . :
    Node Type . . . . . :
    IP Routing Enabled. . . . . :
    WINS Proxy Enabled. . . . . :
    DNS Suffix Search List. . . . . :

Ethernet adapter Ethernet0:

    Connection-specific DNS Suffix . :
    Description . . . . . :
    Physical Address. . . . . :
    DHCP Enabled. . . . . :
    Autoconfiguration Enabled . . . . :
    IPv4 Address. . . . . : 192.168.0.18(Preferred)
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :
    DNS Servers . . . . . :
    NetBIOS over Tcpi. . . . . :

PS C:\Users\administrator.RAMLAN>
```

INSTALLING THE FEATURE:

I will install Load Balance feature using PowerShell on **LB1**.

Install-windowsfeature NLB,RSAT-NLB

Install-WindowsFeature -name Web-Server -IncludeManagementTools

```
Administrator: Windows PowerShell
PS C:\Users\administrator.RAMLAN> Install-windowsfeature NLB,RSAT-NLB

Success Restart Needed Exit Code      Feature Result
-----
True     No                Success      {Network Load Balancing, Remote Server Adm...

PS C:\Users\administrator.RAMLAN> Install-WindowsFeature -name Web-Server -IncludeManagementTools

Success Restart Needed Exit Code      Feature Result
-----
True     No                Success      {Common HTTP Features, Default Document, D...

PS C:\Users\administrator.RAMLAN>
```

I will install Load Balance feature using GUI on **LB2**.

The image shows the Windows Server Manager interface. The 'Manage' menu is open, displaying options: 'Add Roles and Features', 'Remove Roles and Features', 'Add Servers', 'Create Server Group', and 'Server Manager Properties'. Below this, the 'Add Roles and Features Wizard' window is open. The window title is 'Add Roles and Features Wizard'. The 'Before you begin' step is selected in the left-hand navigation pane. The main content area displays instructions for the wizard, including prerequisites like a strong password, network settings, and security updates. At the bottom, there are buttons for '< Previous', 'Next >', 'Install', and 'Cancel'. A checkbox labeled 'Skip this page by default' is checked.

Select installation type

DESTINATION SERVER
LB2.RAMLAN.CA

Before You Begin

Installation Type

Server Selection

Server Roles

Features

Confirmation

Results

Select the installation type. You can install roles and features on a running physical computer or virtual machine, or on an offline virtual hard disk (VHD).

☒ **Role-based or feature-based installation**

Configure a single server by adding roles, role services, and features.

☐ **Remote Desktop Services installation**

Install required role services for Virtual Desktop Infrastructure (VDI) to create a virtual machine-based or session-based desktop deployment.

< Previous

Next >

Install

Cancel

Select destination server

DESTINATION SERVER
LB2.RAMLAN.CA

Before You Begin

Installation Type

Server Selection

Server Roles

Features

Confirmation

Results

Select a server or a virtual hard disk on which to install roles and features.

☒ **Select a server from the server pool**☐ **Select a virtual hard disk**

Server Pool

Filter: <input type="text"/>			
Name	IP Address	Operating System	
LB2.RAMLAN.CA	192.168.0.18	Microsoft Windows Server 2019 Datacenter	

1 Computer(s) found

This page shows servers that are running Windows Server 2012 or a newer release of Windows Server, and that have been added by using the Add Servers command in Server Manager. Offline servers and newly-added servers from which data collection is still incomplete are not shown.

< Previous

Next >

Install

Cancel

Add Roles and Features Wizard

Select server roles

DESTINATION SERVER
LB2.RAMLAN.CA

Before You Begin

Installation Type

Server Selection

Server Roles

Features

Web Server Role (IIS)

Role Services

Confirmation

Results

Select one or more roles to install on the selected server.

Roles

☐ Active Directory Certificate Services

☐ Active Directory Domain Services

☐ Active Directory Federation Services

☐ Active Directory Lightweight Directory Services

☐ Active Directory Rights Management Services

☐ Device Health Attestation

☐ DHCP Server

☐ DNS Server

☐ Fax Server

☒ File and Storage Services (1 of 12 installed)

☐ Host Guardian Service

☐ Hyper-V

☐ Network Controller

☐ Network Policy and Access Services

☐ Print and Document Services

☐ Remote Access

☐ Remote Desktop Services

☐ Volume Activation Services

☒ **Web Server (IIS)**

☐ Windows Deployment Services

Description

Web Server (IIS) provides a reliable, manageable, and scalable Web application infrastructure.

< Previous

Next >

Install

Cancel

Add Roles and Features Wizard

✕

Add features that are required for Web Server (IIS)?

The following tools are required to manage this feature, but do not have to be installed on the same server.

- ▲ Web Server (IIS)
 - ▲ Management Tools
 - [Tools] IIS Management Console

☒ Include management tools (if applicable)

Add Features

Cancel

Select features

DESTINATION SERVER
LB2.RAMLAN.CA

Before You Begin

Installation Type

Server Selection

Server Roles

Features

Web Server Role (IIS)

Role Services

Confirmation

Results

Select one or more features to install on the selected server.

Features

- ☐ Group Policy Management
- ☐ Host Guardian Hyper-V Support
- ☐ I/O Quality of Service
- ☐ IIS Hostable Web Core
- ☐ Internet Printing Client
- ☐ IP Address Management (IPAM) Server
- ☐ iSNS Server service
- ☐ LPR Port Monitor
- ☐ Management OData IIS Extension
- ☐ Media Foundation
- ☐ Message Queuing
- ☐ Multipath I/O
- ☐ MultiPoint Connector
- ☒ **Network Load Balancing**
- ☐ Network Virtualization
- ☐ Peer Name Resolution Protocol
- ☐ Quality Windows Audio Video Experience
- ☐ RAS Connection Manager Administration Kit (CMA)
- ☐ Remote Assistance

Description

Network Load Balancing (NLB) distributes traffic across several servers, using the TCP/IP networking protocol. NLB is particularly useful for ensuring that stateless applications, such as Web servers running Internet Information Services (IIS), are scalable by adding additional servers as the load increases.

< Previous

Next >

Install

Cancel

Add features that are required for Network Load Balancing?

The following tools are required to manage this feature, but do not have to be installed on the same server.

- ▾ Remote Server Administration Tools
 - ▾ Feature Administration Tools
 - [Tools] Network Load Balancing Tools

☒ Include management tools (if applicable)

Add Features

Cancel

Web Server Role (IIS)

DESTINATION SERVER
LB2.RAMLAN.CA[Before You Begin](#)[Installation Type](#)[Server Selection](#)[Server Roles](#)[Features](#)**Web Server Role (IIS)**[Role Services](#)[Confirmation](#)[Results](#)

Web servers are computers that let you share information over the Internet, or through intranets and extranets. The Web Server role includes Internet Information Services (IIS) 10.0 with enhanced security, diagnostic and administration, a unified Web platform that integrates IIS 10.0, ASP.NET, and Windows Communication Foundation.

- The default installation for the Web Server (IIS) role includes the installation of role services that enable you to serve static content, make minor customizations (such as default documents and HTTP errors), monitor and log server activity, and configure static content compression.

[More information about Web Server IIS](#)

< Previous

Next >

Install

Cancel

Select role services

DESTINATION SERVER
LB2.RAMLAN.CA[Before You Begin](#)[Installation Type](#)[Server Selection](#)[Server Roles](#)[Features](#)[Web Server Role \(IIS\)](#)**Role Services**[Confirmation](#)[Results](#)

Select the role services to install for Web Server (IIS)

Role services

- ☒ Web Server
 - ☒ Common HTTP Features
 - ☒ Default Document
 - ☒ Directory Browsing
 - ☒ HTTP Errors
 - ☒ Static Content
 - ☐ HTTP Redirection
 - ☐ WebDAV Publishing
 - ☒ Health and Diagnostics
 - ☒ HTTP Logging
 - ☐ Custom Logging
 - ☐ Logging Tools
 - ☐ ODBC Logging
 - ☐ Request Monitor
 - ☐ Tracing
 - ☒ Performance
 - ☒ Static Content Compression
 - ☐ Dynamic Content Compression
 - ☒ Security

Description

Web Server provides support for HTML Web sites and optional support for ASP.NET, ASP, and Web server extensions. You can use the Web Server to host an internal or external Web site or to provide an environment for developers to create Web-based applications.

< Previous

Next >

Install

Cancel

Confirm installation selections

DESTINATION SERVER
LB2.RAMLAN.CA

Before You Begin

Installation Type

Server Selection

Server Roles

Features

Web Server Role (IIS)

Role Services

Confirmation

Results

To install the following roles, role services, or features on selected server, click Install.

☐ Restart the destination server automatically if required

Optional features (such as administration tools) might be displayed on this page because they have been selected automatically. If you do not want to install these optional features, click Previous to clear their check boxes.

- Network Load Balancing
- Remote Server Administration Tools
 - Feature Administration Tools
 - Network Load Balancing Tools
- Web Server (IIS)
 - Management Tools
 - IIS Management Console
- Web Server
 - Common HTTP Features
 - Default Document
 - Directory Browsing

[Export configuration settings](#)[Specify an alternate source path](#)

< Previous

Next >

Install

Cancel

Installation progress

DESTINATION SERVER
LB2.RAMLAN.CA

Before You Begin

Installation Type

Server Selection

Server Roles

Features

Web Server Role (IIS)

Role Services

Confirmation

Results

View installation progress



Feature installation

Installation succeeded on LB2.RAMLAN.CA.

- Network Load Balancing
- Remote Server Administration Tools
 - Feature Administration Tools
 - Network Load Balancing Tools
- Web Server (IIS)
 - Management Tools
 - IIS Management Console
- Web Server
 - Common HTTP Features
 - Default Document
 - Directory Browsing



You can close this wizard without interrupting running tasks. View task progress or open this page again by clicking Notifications in the command bar, and then Task Details.

[Export configuration settings](#)

< Previous

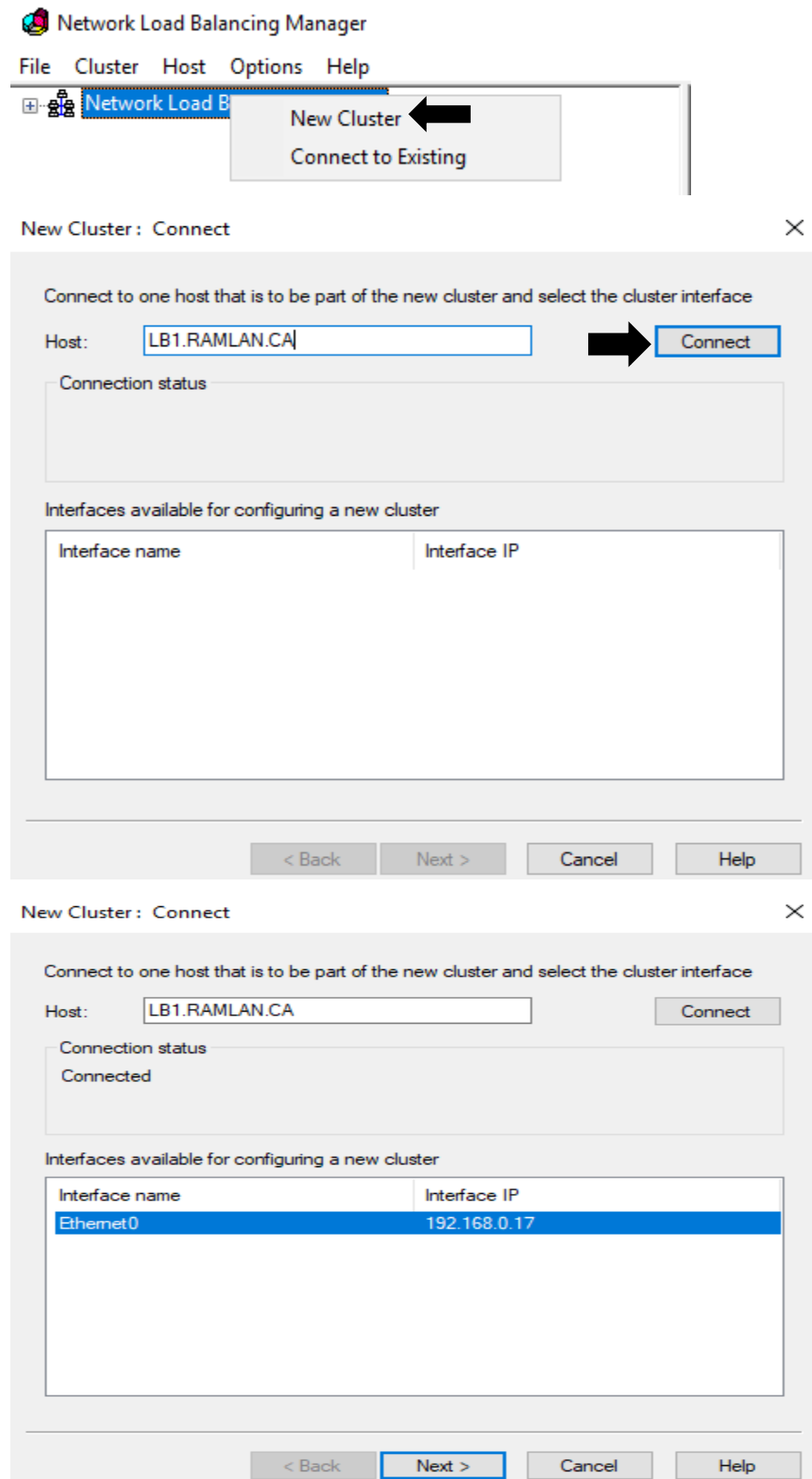
Next >

Close

Cancel

Configuring Network Load Balancing – Creating a Cluster

On **LB1** – Open Network Load Balancing Manager from Windows Administrative Tools



New Cluster : Host Parameters

Priority (unique host identifier): 1

Dedicated IP addresses

IP address	Subnet mask
192.168.0.17	255.255.255.0

Add... Edit... Remove

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 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
------------	-------------

Add... Edit... Remove

< Back Next > Cancel Help

Add IP Address

☒ Add IPv4 address:

IPv4 address: 192 . 168 . 0 . 19

Subnet mask: 255 . 255 . 255 . 0

☐ Add IPv6 address:

IPv6 address:

☐ Generate IPv6 addresses:

☐ Link-local ☐ Site-local ☐ Global

OK Cancel

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
192.168.0.19	255.255.255.0

Add...

Edit...

Remove

< Back

Next >

Cancel

Help

New Cluster : Cluster Parameters



Cluster IP configuration

IP address:	192.168.0.19
Subnet mask:	255 . 255 . 255 . 0
Full Internet name:	
Network address:	02-bf-c0-a8-00-13

Cluster operation mode

- ☒ Unicast
- ☐ Multicast
- ☐ IGMP multicast



< Back

Next >

Cancel

Help

New Cluster : Port Rules
✕

Defined port rules:

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

Add...
Edit...
Remove

Port rule description

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

< Back

Finish

Cancel

Help

Wait for **LB1** to turn GREEN after the configuration

Network Load Balancing Manager
—
□
✕

File Cluster Host Options Help

Network Load Balancing Clusters

- (192.168.0.19)
 - LB1(Ethernet0)

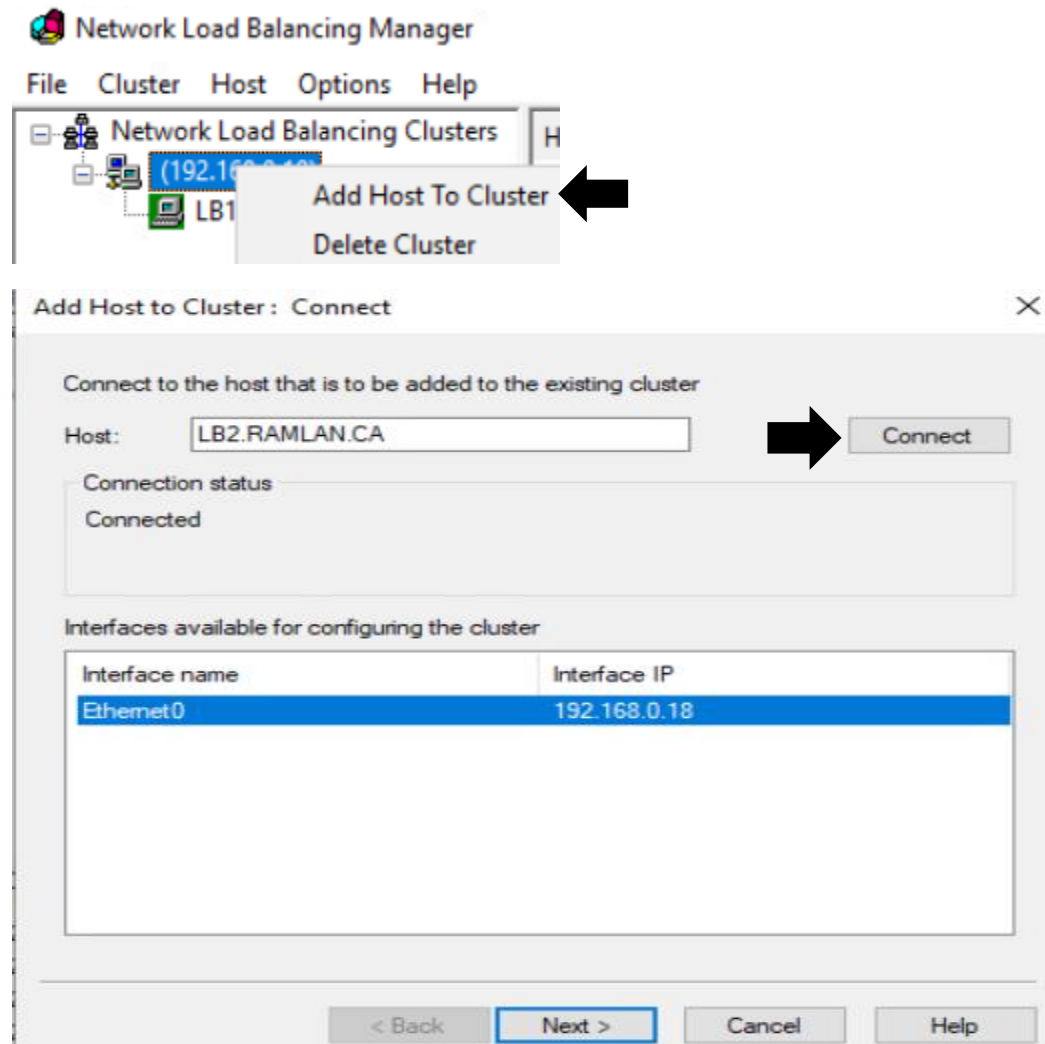
Port rules configured on LB1 (Ethernet0)

Cluster IP address	Status	Start	End	Protocol	Mode	Priority	Load	Affinity	Timeout
All	Enabled	0	65535	Both	Multiple	--	Equal	Single	N/A

Log En...	Date	Time	Cluster	Host	Description
0001	13-Nov-...	1:53:14 PM			NLB Manager session started
0002	13-Nov-...	1:58:33 PM	192.168.0.19	LB1	Begin configuration change
0003	13-Nov-...	1:58:33 PM	192.168.0.19	LB1	Waiting for pending operation 2
0004	13-Nov-...	1:58:44 PM	192.168.0.19	LB1	Update 2 succeeded [double click for details...]
0005	13-Nov-...	1:58:44 PM	192.168.0.19	LB1	End configuration change

Start

Now it is time to add **LB2**.



The screenshot shows the Network Load Balancing Manager application. The 'Network Load Balancing Clusters' tree on the left has a context menu open with 'Add Host To Cluster' selected. Below, the 'Add Host to Cluster : Connect' dialog is displayed. It contains a 'Host' field with 'LB2.RAMLAN.CA' and a 'Connect' button. The 'Connection status' is 'Connected'. A table lists available interfaces for configuration, with 'Ethernet0' and IP '192.168.0.18' selected. Navigation buttons at the bottom include '< Back', 'Next >', 'Cancel', and 'Help'.

Network Load Balancing Manager

File Cluster Host Options Help

Network Load Balancing Clusters

(192.168.0.18) LB1

Add Host To Cluster

Delete Cluster

Add Host to Cluster : Connect

Connect to the host that is to be added to the existing cluster

Host: LB2.RAMLAN.CA

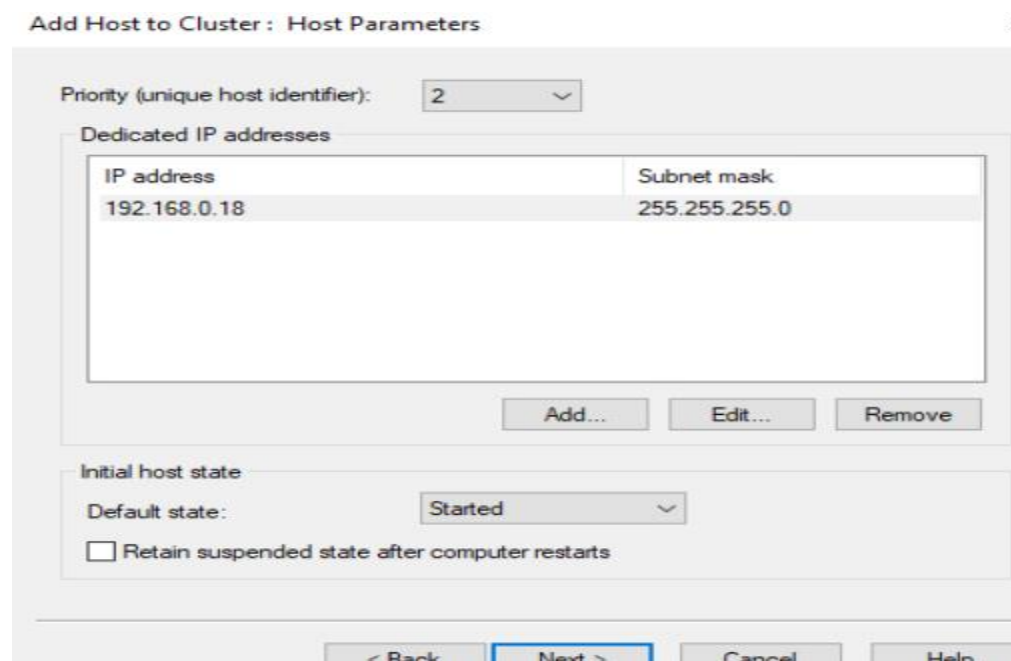
Connection status

Connected

Interfaces available for configuring the cluster

Interface name	Interface IP
Ethernet0	192.168.0.18

< Back Next > Cancel Help



The screenshot shows the 'Add Host to Cluster : Host Parameters' dialog. It features a 'Priority (unique host identifier)' dropdown set to '2'. Below is a table for 'Dedicated IP addresses' with one entry: IP address '192.168.0.18' and Subnet mask '255.255.255.0'. Buttons for 'Add...', 'Edit...', and 'Remove' are at the bottom of the table. The 'Initial host state' section has a 'Default state' dropdown set to 'Started' and an unchecked checkbox for 'Retain suspended state after computer restarts'. Navigation buttons at the bottom include '< Back', 'Next >', 'Cancel', and 'Help'.

Add Host to Cluster : Host Parameters

Priority (unique host identifier): 2

Dedicated IP addresses

IP address	Subnet mask
192.168.0.18	255.255.255.0

Add... Edit... Remove

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

Add...

Edit...

Remove

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 Manager



File Cluster Host Options Help

Network Load Balancing Clusters

(192.168.0.19)

LB1(Ethernet0)

LB2(Ethernet0)



Host configuration information for hosts in cluster (192.168.0.19)

Host (Interface)	Status	Dedicated IP address	Dedicated IP subnet mask	Host priority	Initial state
LB1(Ethernet0)	Converged	192.168.0.17	255.255.255.0	1	start
LB2(Ethernet0)	Converged	192.168.0.18	255.255.255.0	2	start

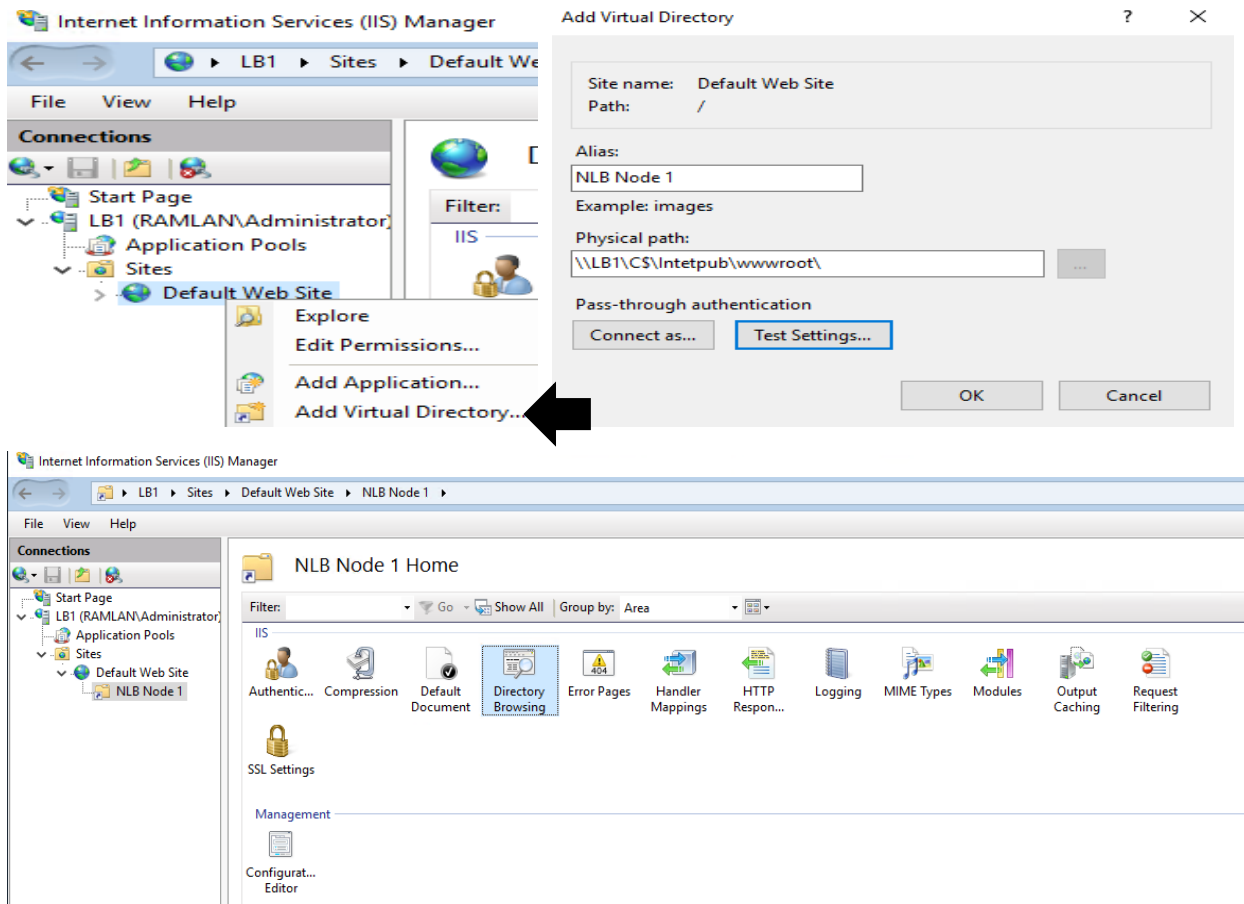
Log En...	Date	Time	Cluster	Host	Description
0001	13-Nov-...	2:12:32 PM			NLB Manager session started
0002	13-Nov-...	2:12:32 PM			Loading configuration information from host "LB1.RAMLAN.CA" for cluster 192.168.0.19
0003	13-Nov-...	2:13:15 PM	192.168.0.19	LB1	Begin configuration change
0004	13-Nov-...	2:13:15 PM	192.168.0.19	LB1	Waiting for pending operation 2
0005	13-Nov-...	2:13:20 PM	192.168.0.19	LB1	Update 2 succeeded [double click for details...]
0006	13-Nov-...	2:13:20 PM	192.168.0.19	LB1	End configuration change
0007	13-Nov-...	2:13:21 PM	192.168.0.19	LB1	Begin configuration change
0008	13-Nov-...	2:13:21 PM	192.168.0.19	LB1	Waiting for pending operation 3
0009	13-Nov-...	2:13:22 PM	192.168.0.19	LB1	Update 3 succeeded [double click for details...]
0010	13-Nov-...	2:13:22 PM	192.168.0.19	LB1	End configuration change
0011	13-Nov-...	2:14:53 PM	192.168.0.19	LB2	Begin configuration change
0012	13-Nov-...	2:14:53 PM	192.168.0.19	LB2	Waiting for pending operation 2
0013	13-Nov-...	2:15:04 PM	192.168.0.19	LB2	Update 2 succeeded [double click for details...]
0014	13-Nov-...	2:15:04 PM	192.168.0.19	LB2	End configuration change

The load balancing configuration is complete.

Testing Load Balance with IIS site:

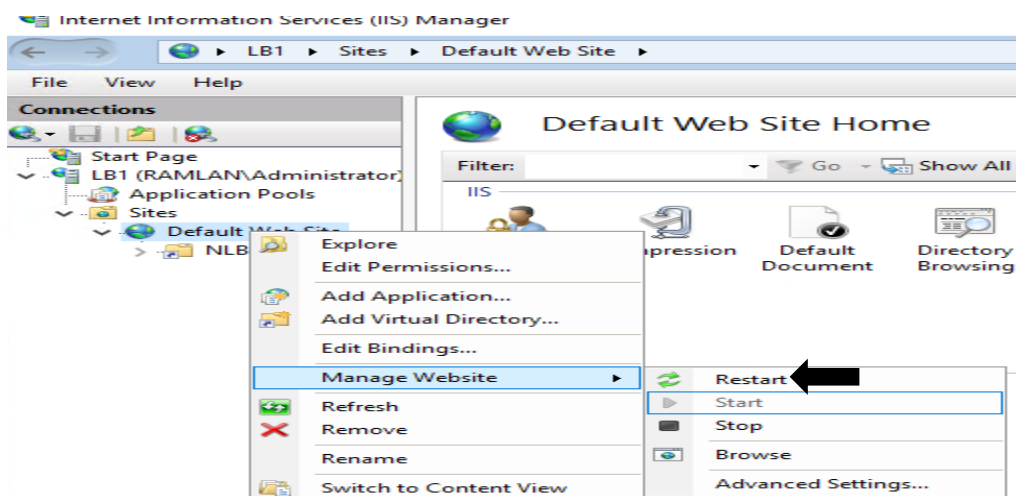
With the load balancer ready, we can handover the configuration to app or developer team to configure IIS site. Since this is home lab, I will create default IIS site and test load balancer is functioning properly.

OnLB1 - Open IIS Manager from Windows Administrative Tools

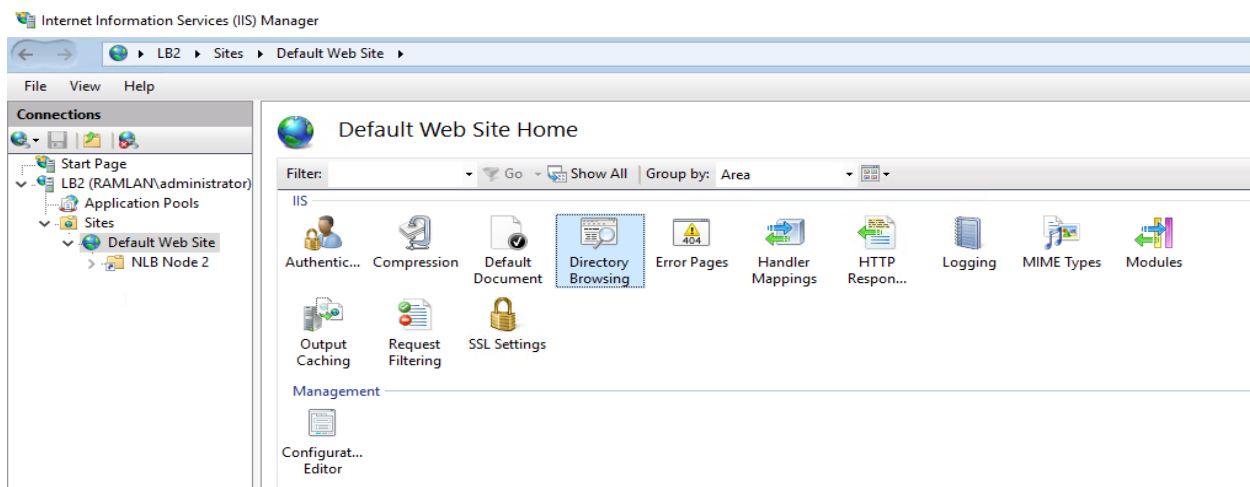
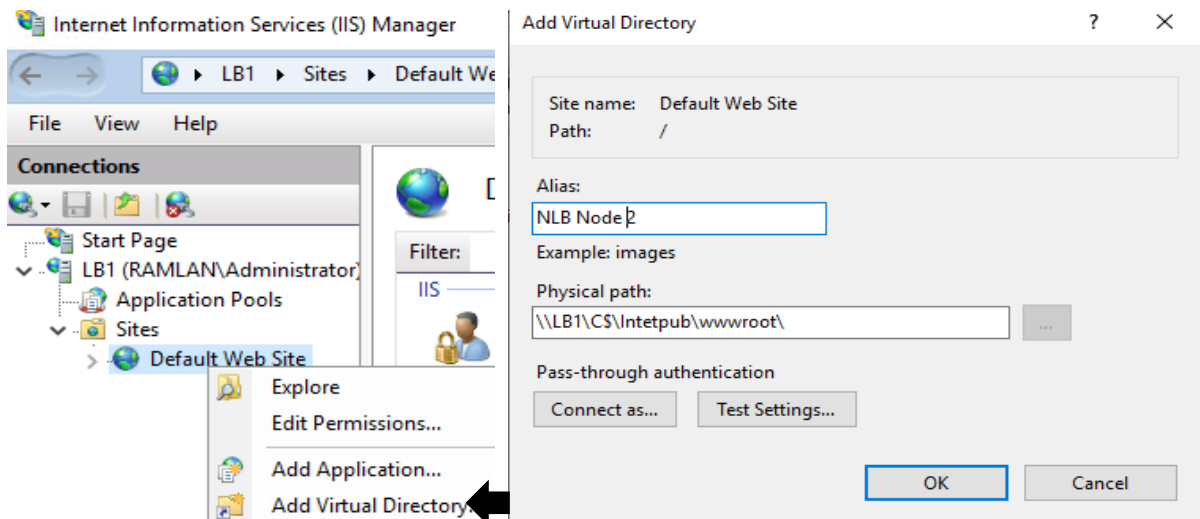


Double click Directory Browsing – Click Enable

Now restart IIS Service

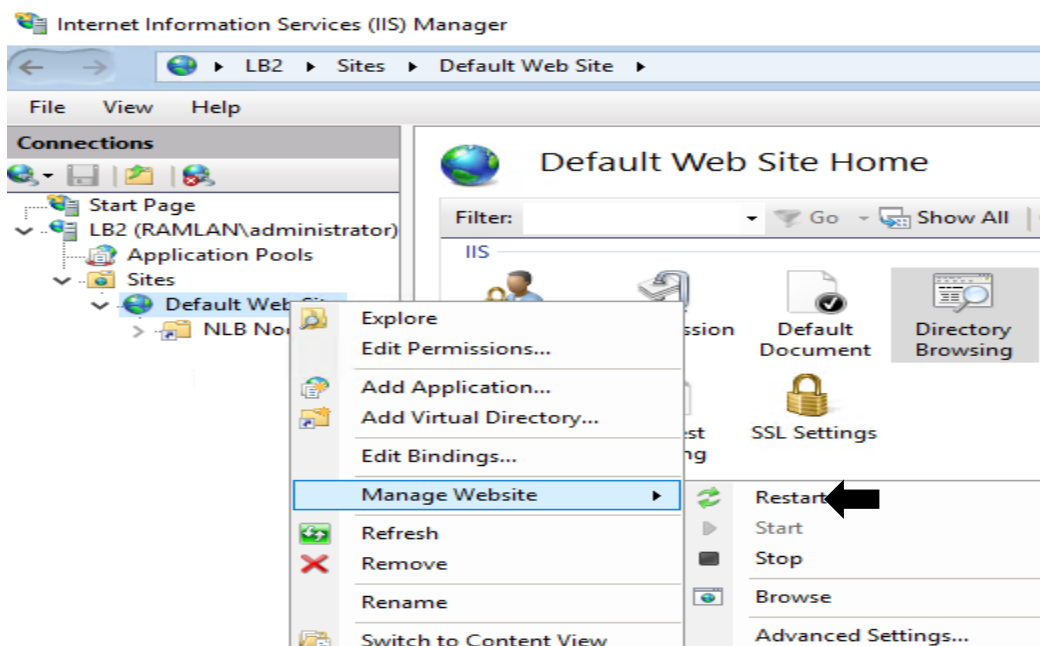


Repeat the same on **LB2**



Double click Directory Browsing – Click Enable

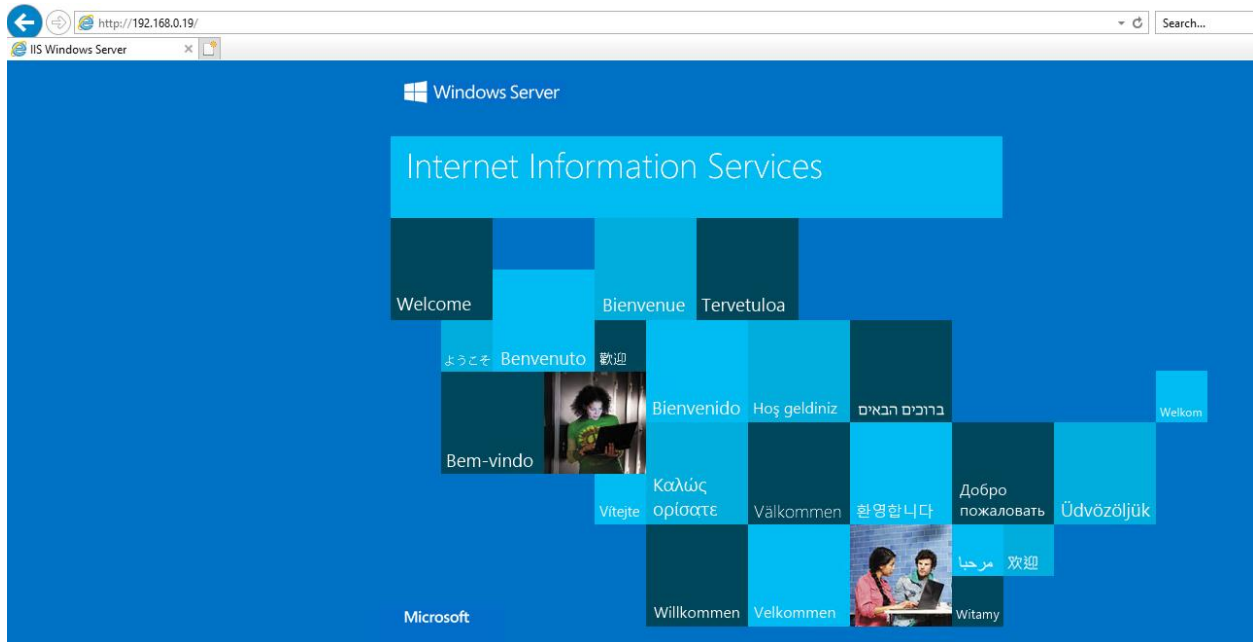
Now restart IIS Service



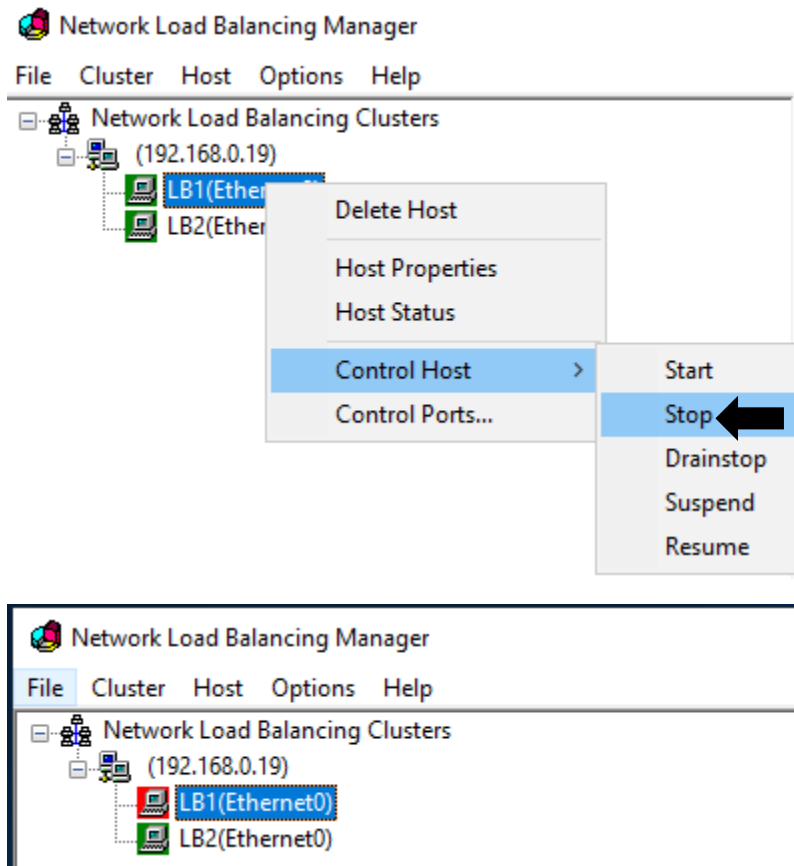
Verifying Network Load Balancing Configuration

On **LB1** – Open Internet Explorer

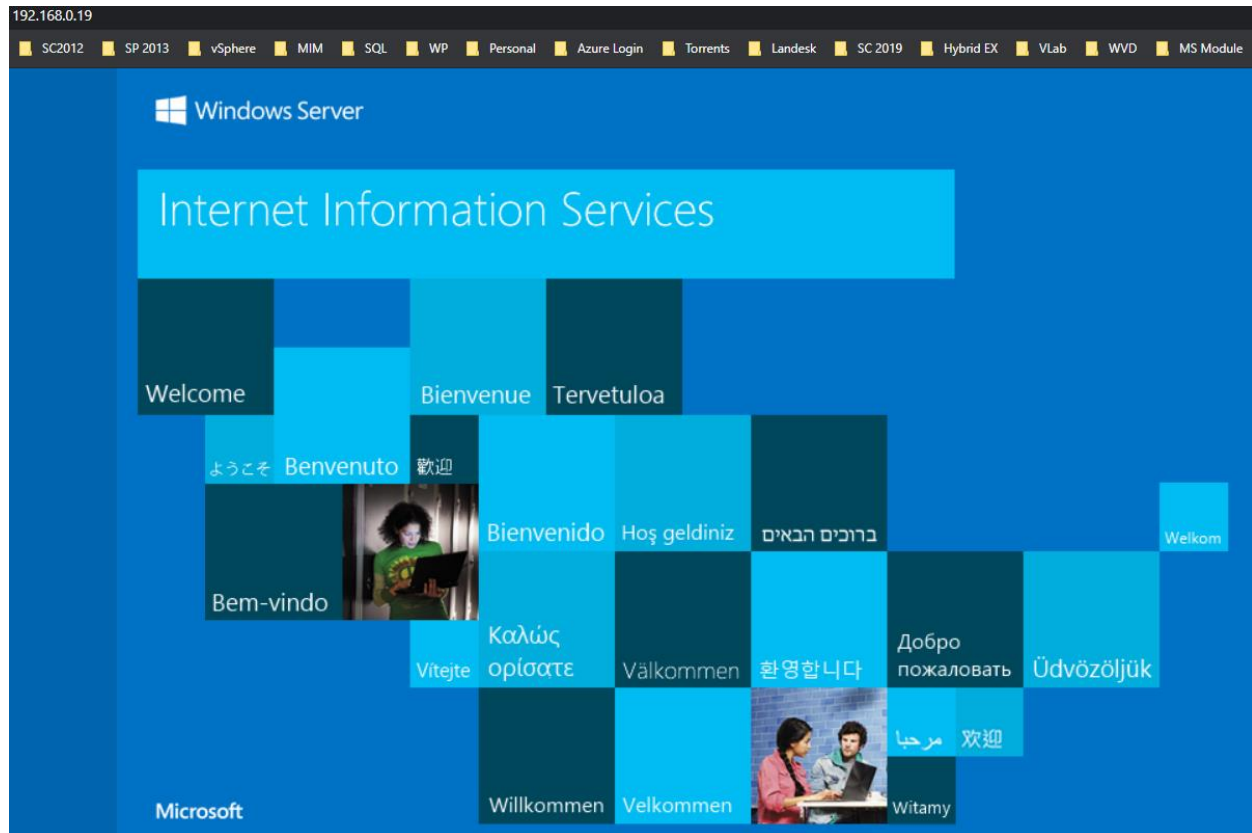
Type 192.168.0.19 – This is our **Cluster IP**



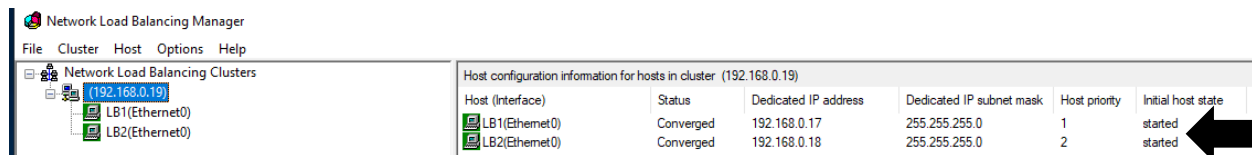
The IIS site is responding. We will stop LB1 and see what happens when we try to access IIS site from another workstation using Internet Explorer.



The IIS site is responding and it is being serviced by LB2. This is how you can configure your application to load balance and available **24/7 365 days**.



Now we can restart **LB1**



We have completed Load Balancer configuration on Server 2019 for default IIS site.

Thanks

Ram Lan
13th Nov 2020