



# NETWORK LOAD BALANCING

Thomas Ayres

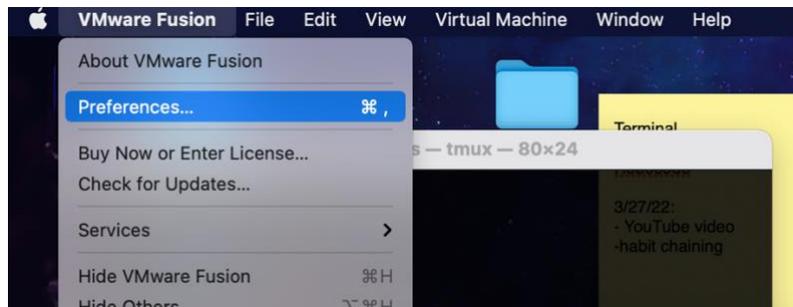
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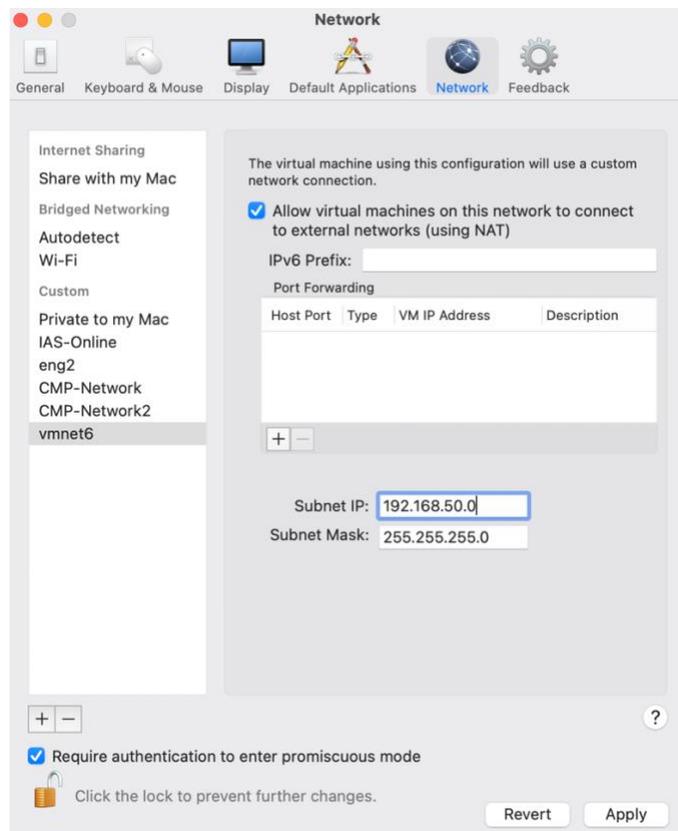
# Installing and Configuring Virtual machines

## Configure a Virtual Network

Before anything else, our first step should be to create a virtual network for use by our virtual machine. We can accomplish this by opening VMware Fusion and navigating to the “Preferences...” tab from the drop-down menu.



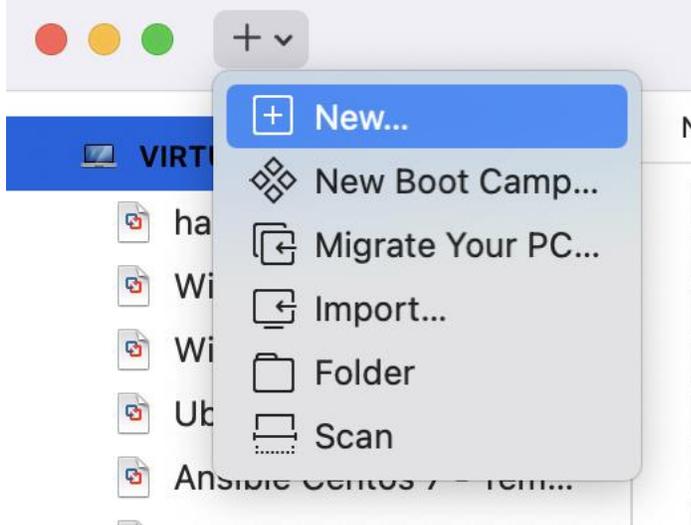
Within Preferences, navigate to the Network tab and click the lock in the bottom-left corner to make changes. Our settings for this network will be a Subnet IP of 192.168.50.0/24 (subnet mask of 255.255.255.0). We will also be ticking “Allow virtual machines on this network to connect to external networks using NAT” (MacOS Big Sur). Correct settings are shown below:



Click “Apply” to save the settings, and then click the lock again to prevent further changes.

## Installing Windows Server 2019 VMs

Open up VMWare Fusion Pro and click the + in the top left corner.



Click “Continue”, and then press the following button to select your Windows Server ISO file.

Use another disc or disc image...

Click continue and enable Easy Install. Put in credentials to use on the Windows Server VMs, as well as a license key if you have one. Select Windows Server 2019 Standard from the dropdown list.

A screenshot of the 'Microsoft Windows Easy Install' configuration window. At the top, it says 'With Easy Install, VMware Fusion will use the information provided here to automatically install Windows Server 2019 from your installation disc and install drivers to optimize your virtual machine.' Below this is a progress bar with three stages: 'Choose Disc or Image' (green dot), 'Configuration' (black dot), and 'Finish' (grey dot). The 'Configuration' stage is active. The main area contains several fields: 'Use Easy Install' is checked; 'Account Name' is 'Thomas Ayres'; 'Account Type' is 'Administrator'; 'Password' and 'Confirm Password' are masked with dots; 'Windows Product Key' is empty; 'Language' is 'English (United States)'; and 'Windows Server 2019 Standard' is selected in a dropdown menu. At the bottom, there is an unchecked checkbox 'Make your home folder accessible to the virtual machine' and a dropdown menu showing 'Read & Write'. At the very bottom are three buttons: 'Cancel', 'Go Back', and 'Continue'.

Continue through until you see a screen with your VM details all on one page. Click the following button, and then save the VM as “NLB-server1”.

Customize Settings

Within the settings, we need to set up a second NIC, so click “Add Device” in the top right of the window.

Add Device...

Click “Network Adapter”.



Network Adapter

Scroll down and select the virtual network that we made earlier.

vmnet6

Now you should have two NICs in the main settings. Click on the pre-configured NIC that was there already and repeat the above step, so that now both NICs are set to the same “vmnet6” network.

#### Removable Devices

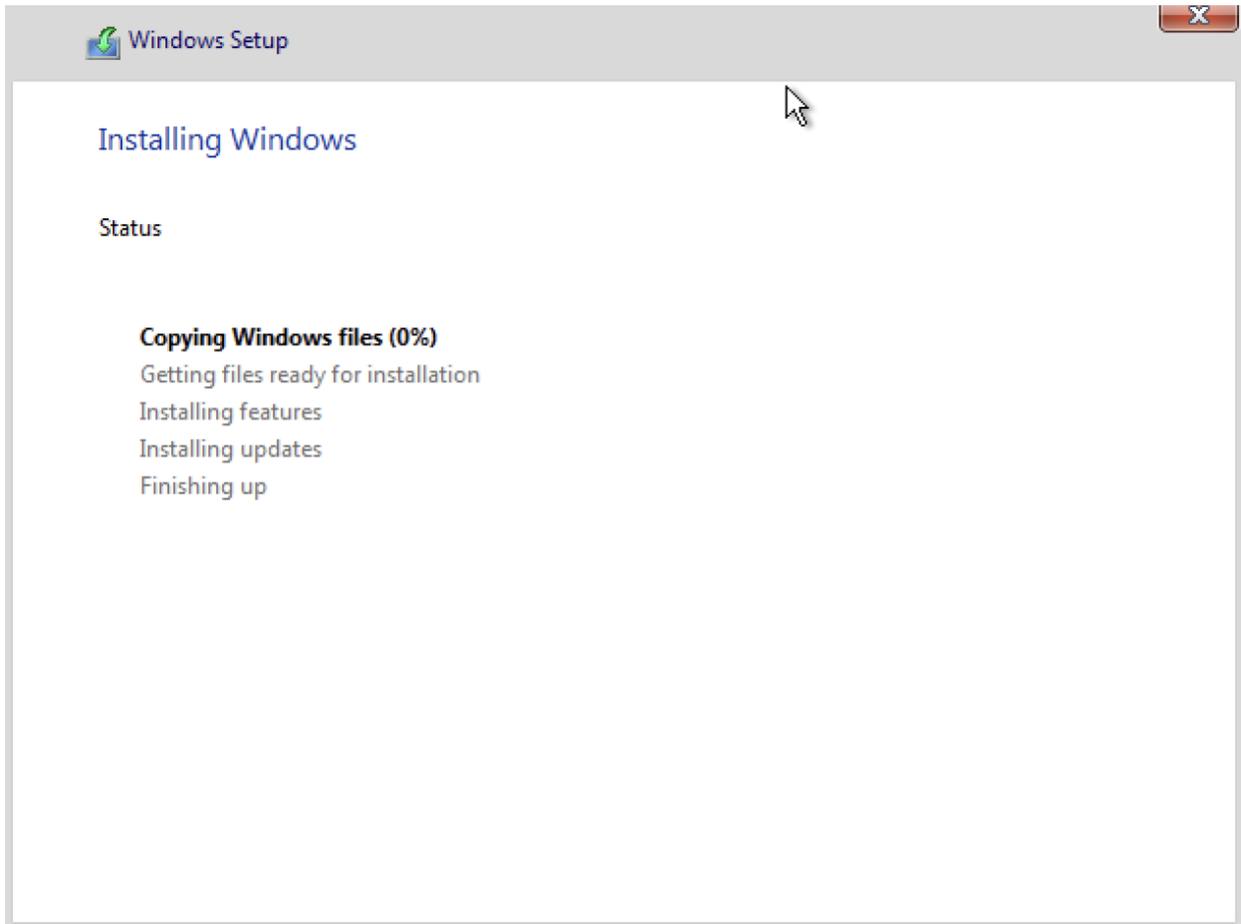


Network Adapter



Network Adapter 2

You may now begin installation of Windows. Boot up the VM and wait for the following window to finish.



**Repeat the same steps to create a second Virtual Machine named NLB-server2.**

## Set up Servers

### Set Hostnames

After your Server 2019 VMs are up and running, log in and Server Manager should pop up. In Server Manager, navigate to Local Server:



Click on the blue text next to “Computer name”. It will bring up properties. Click the following:

To rename this computer or change its domain or workgroup, click Change.

Change...

Enter the respective name for the vm: “NLB-server1” or “NLB-server2”.

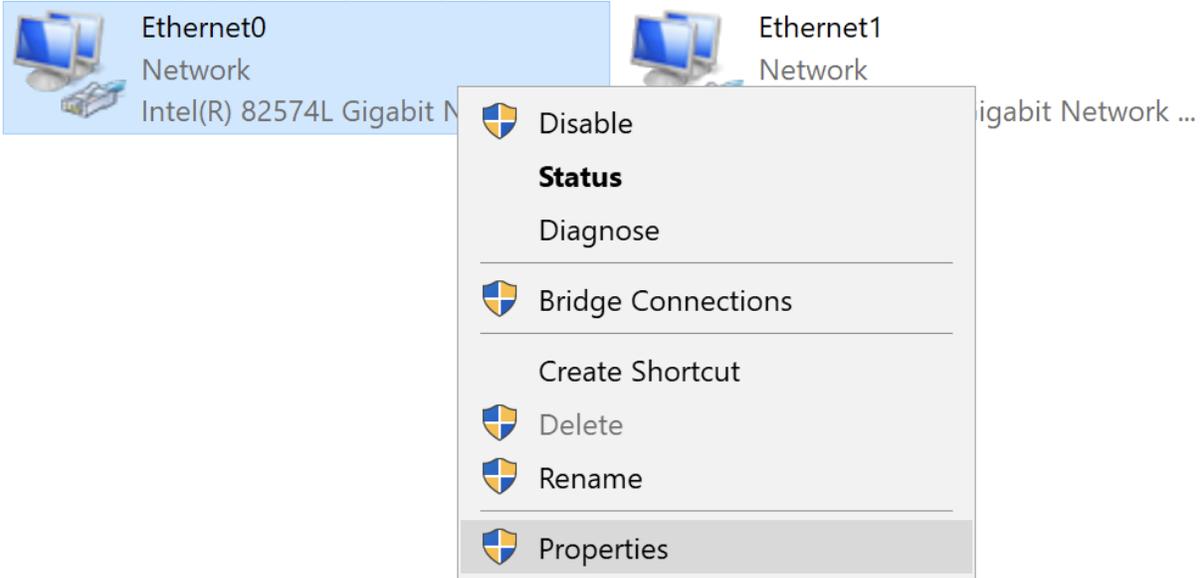
## Set Static IP Addresses

Still under “Local Server”, in the same box as Computer Name, there will be two areas for your NIC cards. Click the blue text next to them to configure.

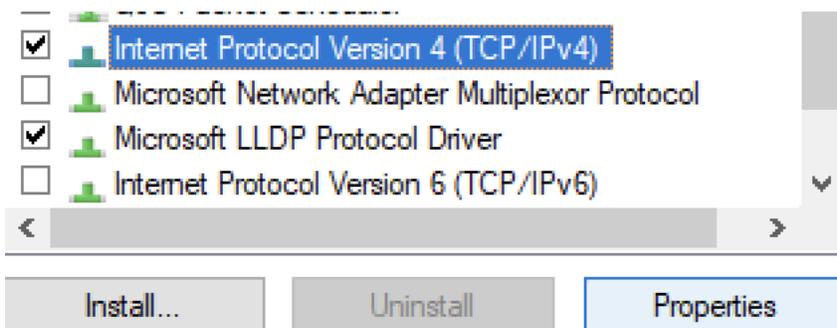
Ethernet0 [IPv4 address assigned by DHCP, IPv6 enabled](#)

Ethernet1 [IPv4 address assigned by DHCP, IPv6 enabled](#)

A window will pop up. Navigate to properties for both, one at a time:



Uncheck the box for IPv6 and click on the text for IPv4. Select properties.



Select the following settings for all NICs on both server1 and server2, changing only the “IP address” field as follows:

NLB-server1 Ethernet0/1: 192.168.50.100/192.168.50.101

NLB-server2 Ethernet0/1: 192.168.50.200/192.168.50.201

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

Obtain an IP address automatically

Use the following IP address:

|                  |                      |
|------------------|----------------------|
| IP address:      | 192 . 168 . 50 . 100 |
| Subnet mask:     | 255 . 255 . 255 . 0  |
| Default gateway: | 192 . 168 . 50 . 1   |

Obtain DNS server address automatically

Use the following DNS server addresses:

|                       |                      |
|-----------------------|----------------------|
| Preferred DNS server: | 192 . 168 . 50 . 100 |
| Alternate DNS server: | 192 . 168 . 50 . 1   |

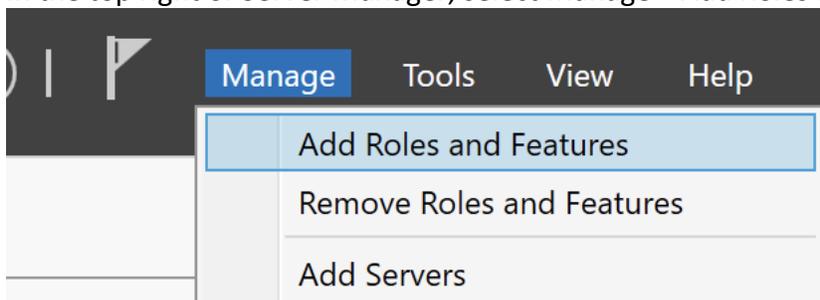
Validate settings upon exit

Advanced...

OK Cancel

### Set up Load Balancer Role

In the top right of Server Manager, select Manage > Add Roles and Features



Click Next, and then select Role-based or feature-based installation. Click Next.

## Select installation type

DESTINATION SERVER  
NLB-server1

- 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.

NLB-server1/NLB-server2 will be the default here. Click next.

## Select destination server

DESTINATION SERVER  
NLB-server1

- 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:

| Name        | IP Address        | Operating System                       |
|-------------|-------------------|--|
| NLB-server1 | 192.168.50.100... | Microsoft Windows Server 2019 Standard |

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

Under the roles, navigate down and select this option:

**Web Server (IIS)**

Click Add Features



### 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.

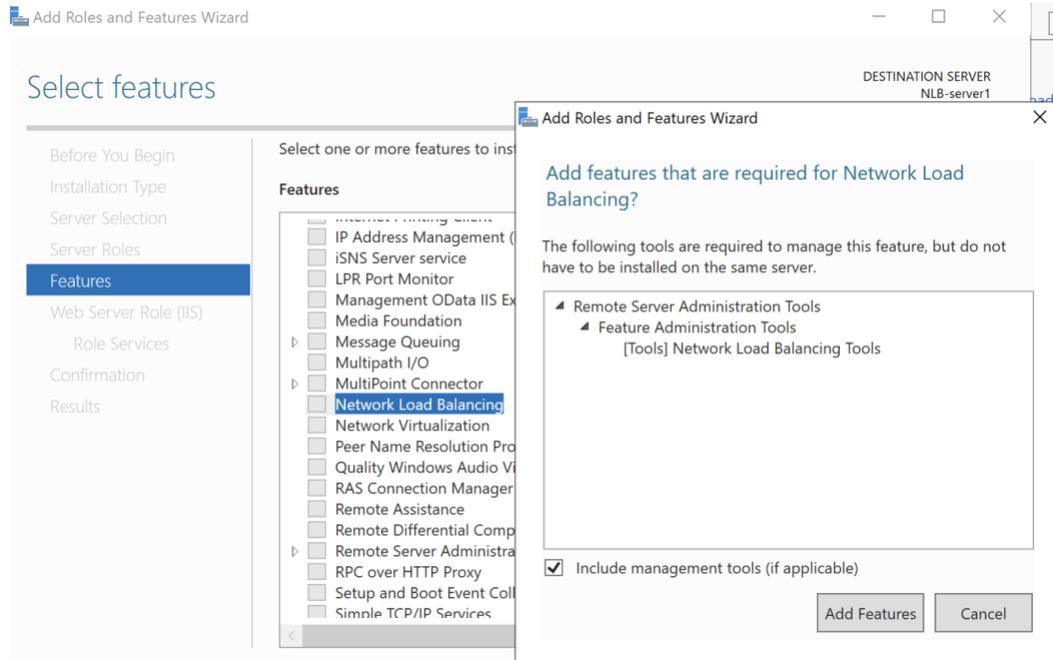
- ▲ Web Server (IIS)
  - ▲ Management Tools
    - [Tools] IIS Management Console

Include management tools (if applicable)

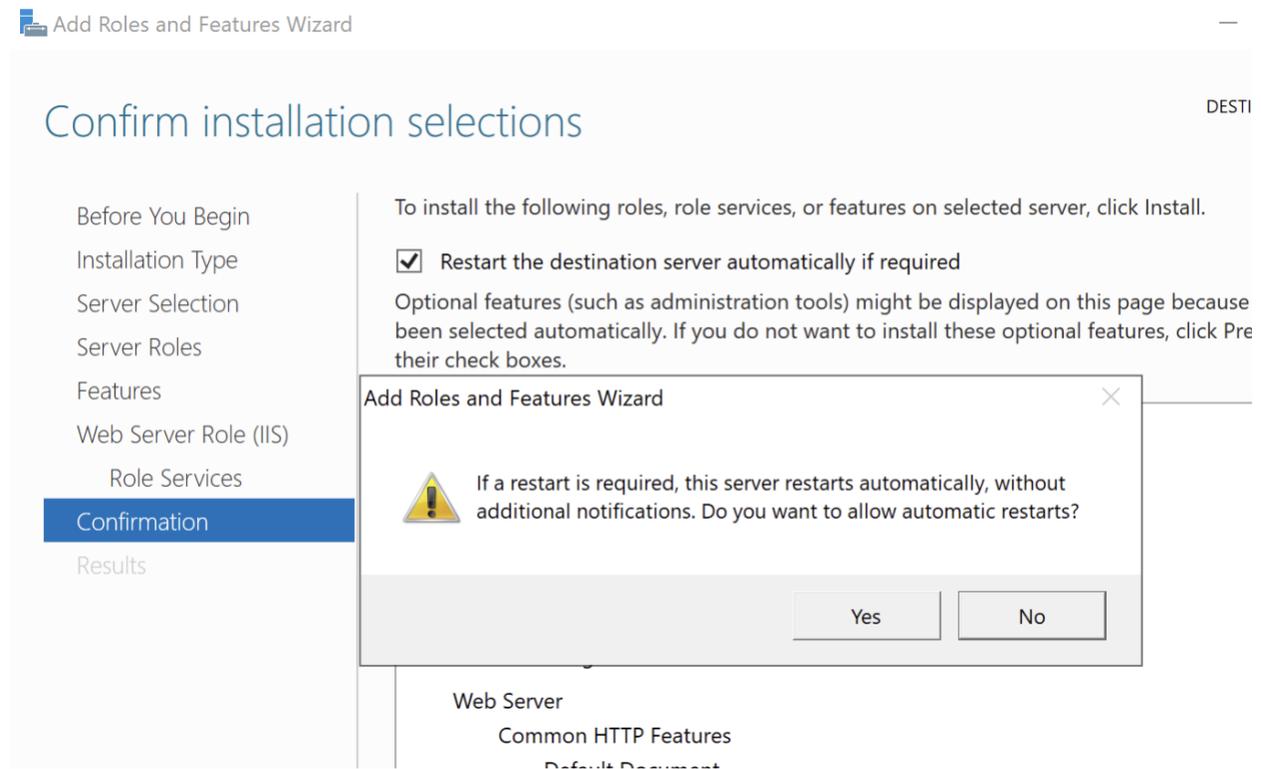
Add Features

Cancel

On the next screen, browse down to find Network Load Balancing and check the box. Click Add Feature.



On the confirmation screen, check the “restart the destination server automatically...” box, and then click yes.



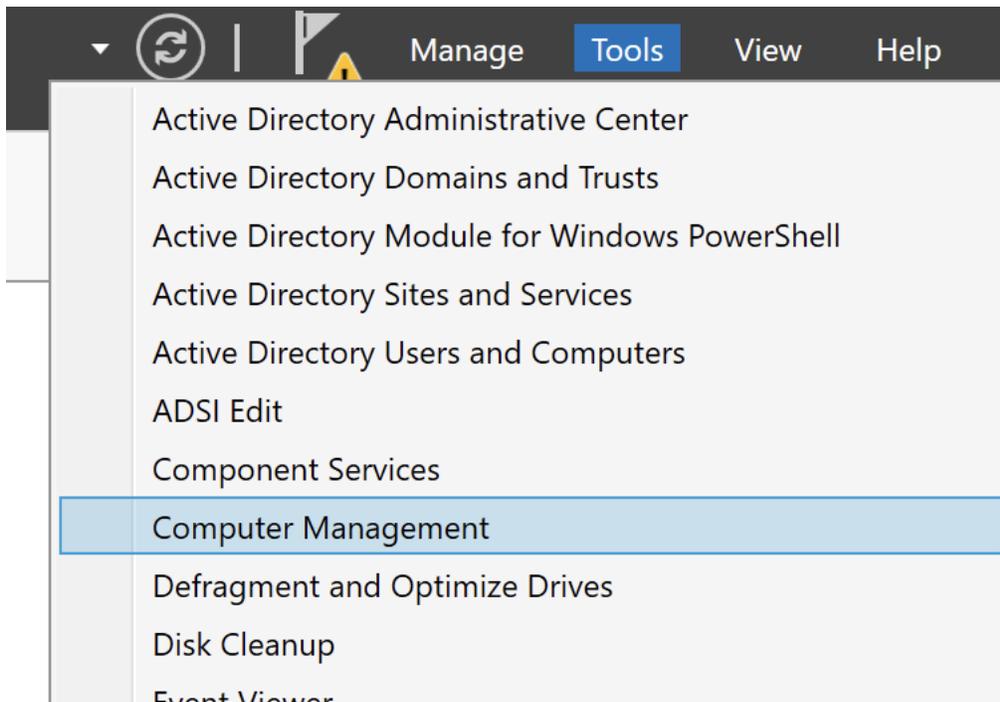
Paydirt. Hit Install and wait.

Install

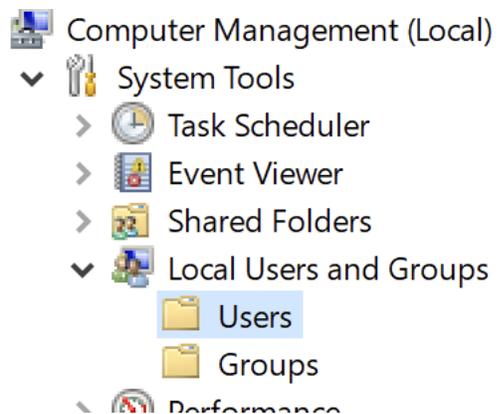
**Repeat this process for both Virtual Machines.**

[Set Admin Password \(NLB-server1\)](#)

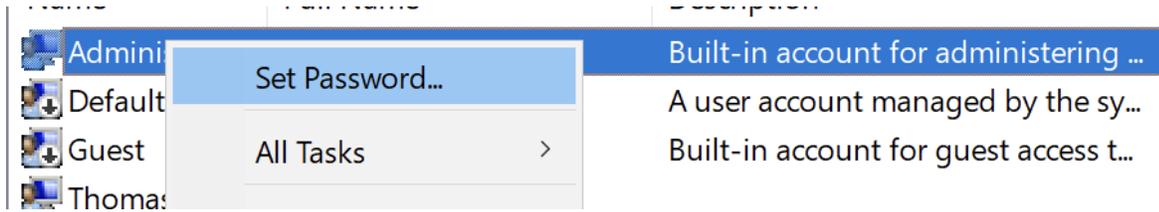
Navigate to the Tools dropdown on the right top side and select computer management.



On the right side, select Users under Local Users and Groups

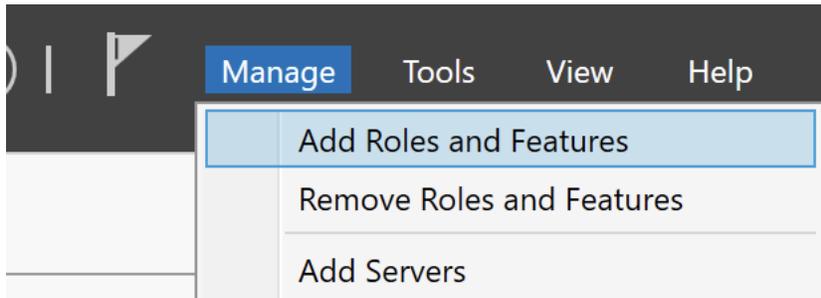


Find the Administrator account in the middle drop down list > right click > Set Password

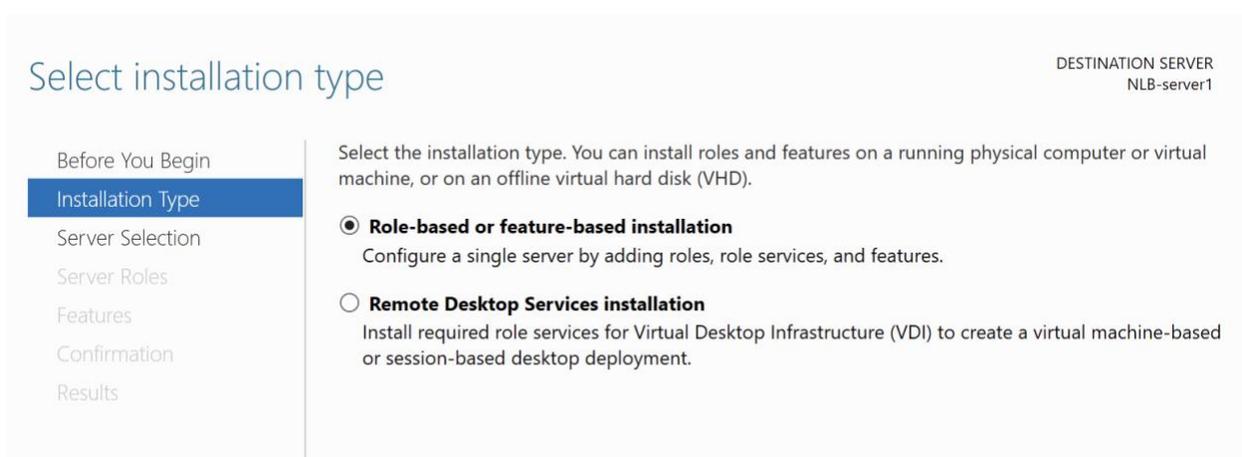


Domain Controller (NLB-server1)

We need to add the Active Directory service. In the top right of Server Manager select Manage > Add roles and features



Click next, then select the default shown below:



Click next and select NLB-server1 (default). Click next.

## Select destination server

DESTINATION SERVER  
NLB-server1

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:

| Name        | IP Address        | Operating System                       |
|-------------|-------------------|--|
| NLB-server1 | 192.168.50.100... | Microsoft Windows Server 2019 Standard |

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

Scroll down and select the Active Directory Domain Services role from the list. Check the box, then select Add Features

Before You Begin  
Installation Type  
Server Selection  
**Server Roles**  
Features  
Confirmation  
Results

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

| Roles  | Description  |
|--|--|
| <input type="checkbox"/> Active Directory Certificate Services           | Active Directory Certificate Services (AD CS) is used to create certification authorities and related role services that allow you to issue and manage certificates used in a variety of applications. |
| <input type="checkbox"/> Active Directory Domain Services                |  |
| <input type="checkbox"/> Active Directory Federation Services            |  |
| <input type="checkbox"/> Active Directory Lightweight Directory Services |  |
| <input type="checkbox"/> Active Directory Rights Management Services     |  |
| <input type="checkbox"/> Device Health Attestation                       |  |

## Add features that are required for Active Directory Domain Services?

You cannot install Active Directory Domain Services unless the following role services or features are also installed.

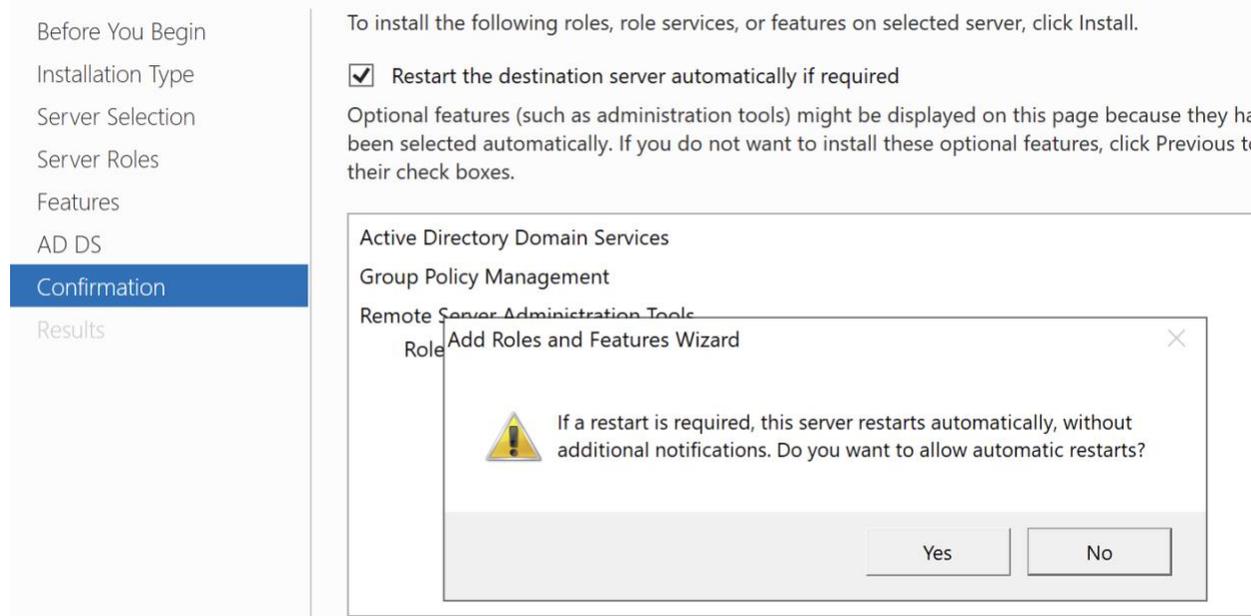
- [Tools] Group Policy Management
  - ▲ Remote Server Administration Tools
    - ▲ Role Administration Tools
      - ▲ AD DS and AD LDS Tools
        - Active Directory module for Windows PowerShell
      - ▲ AD DS Tools
        - [Tools] Active Directory Administrative Center
        - [Tools] AD DS Snap-Ins and Command-Line Tools

Include management tools (if applicable)

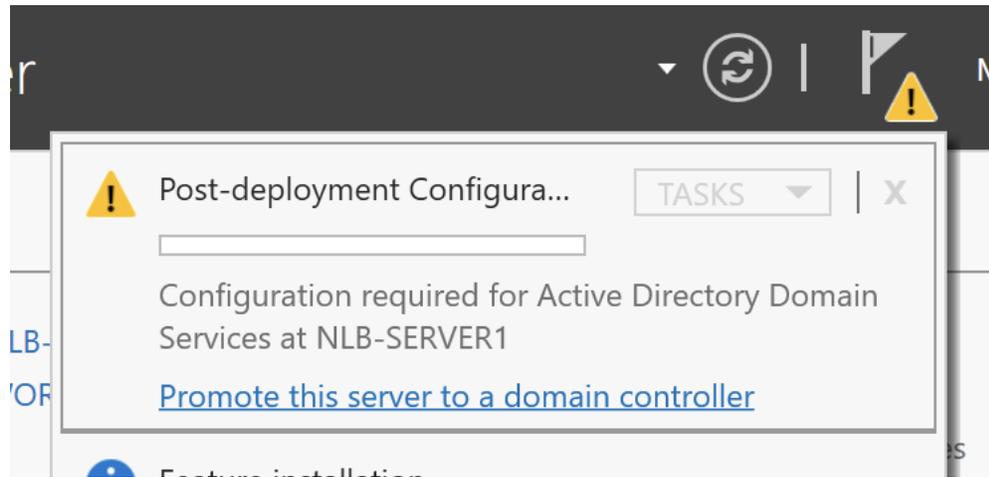
Add Features

Cancel

Click Next all the way through until the Confirmation page. Check the Restart box and then click yes. Click install.



Back on the main interface of Server Manager, you will find a flag with a yellow exclamation symbol right next to the Manage button up top. Click it for a drop-down menu. Click the blue “Promote this server...” text.



In the wizard that pops up, select Add a new Forest. I am going to name this “NLB.local”.

# Deployment Configuration

TARGET S  
NLB-

Deployment Configuration

- Domain Controller Options
- Additional Options
- Paths
- Review Options
- Prerequisites Check
- Installation
- Results

Select the deployment operation

- Add a domain controller to an existing domain
- Add a new domain to an existing forest
- Add a new forest

Specify the domain information for this operation

Root domain name:

On the next screen, set the DSRM password:

# Domain Controller Options

TARGET SERVER  
NLB-server1

Deployment Configuration

- Domain Controller Options
- DNS Options
- Additional Options
- Paths
- Review Options
- Prerequisites Check
- Installation
- Results

Select functional level of the new forest and root domain

Forest functional level:

Domain functional level:

Specify domain controller capabilities

- Domain Name System (DNS) server
- Global Catalog (GC)
- Read only domain controller (RODC)

Type the Directory Services Restore Mode (DSRM) password

Password:

Confirm password:

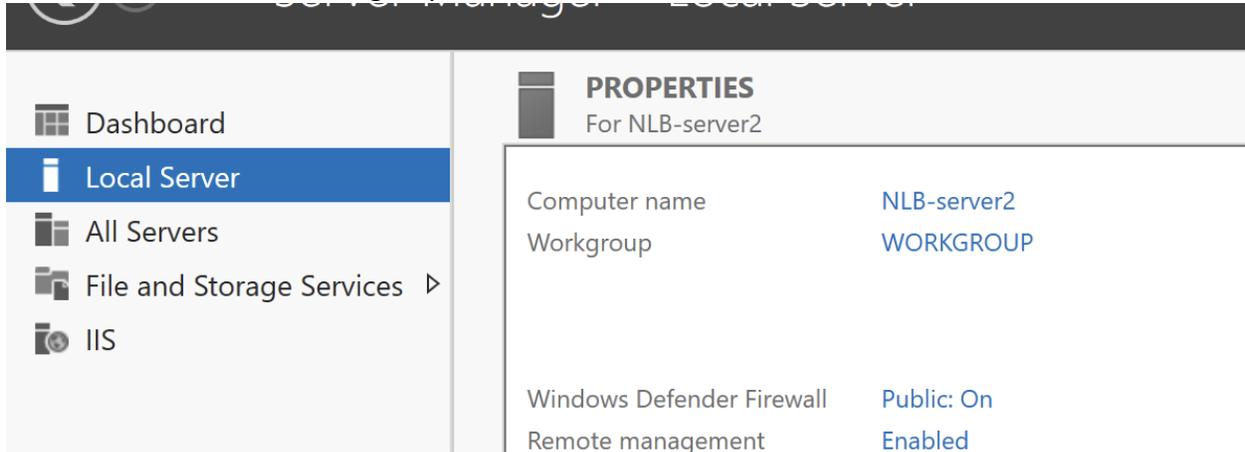
[More about domain controller options](#)

< Previous   Next >   Install   Cancel

Click through the rest of the screens, leaving them default. Install. Computer will restart.

## Add NLB-server2 to domain

Within Server Manager navigate to Local Server, and click on the blue highlighted "WORKGROUP" near "Workgroup":



Click on Change...:

Full computer name: NLB-server2

Workgroup: WORKGROUP

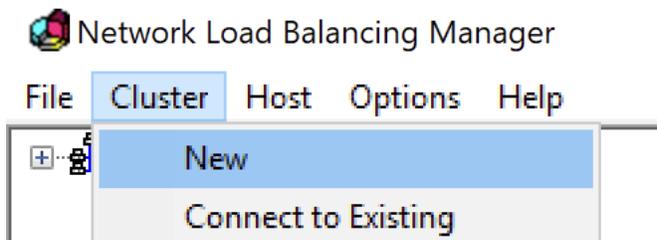
To rename this computer or change its domain or workgroup, click Change.

Change...

server 2

## Create Load Balancer (NLB-server1)

Navigate to the NLB Manager from the Tools menu in the top right of the Server Manager Dashboard. From this new window, select Cluster > New.



Type in the host of NLB-server1 (192.168.50.100), and select the second NIC from the list (192.168.50.101) and click next

Add Host to Cluster : Host Parameters



Priority (unique host identifier):

Dedicated IP addresses

| IP address     | Subnet mask   |
|----------------|---------------|
| 192.168.50.101 | 255.255.255.0 |

Initial host state

Default state:

Retain suspended state after computer restarts

Click next

## Add IP Address



Add IPv4 address:

IPv4 address:

Subnet mask:

Add IPv6 address:

IPv6 address:

Generate IPv6 addresses:

Link-local    Site-local    Global

Click OK. On the Cluster Parameters screen use [www.nlbcluster.com](http://www.nlbcluster.com) for the Full Internet Name. Set the operation mode to Multicast.

Cluster IP configuration

IP address: 192.168.50.5

Subnet mask: 255 . 255 . 255 . 0

Full Internet name: www.nlbcluster.com

Network address: 03-bf-c0-a8-32-05

Cluster operation mode

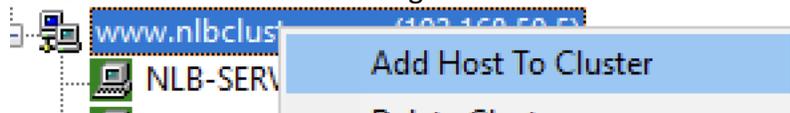
Unicast

Multicast

IGMP multicast

< Back   Next >   Cancel   Help

Finish up and repeat the process by adding in the second NIC card of NLB-server2 by connecting to 192.168.50.200 and selecting the 201 IP.



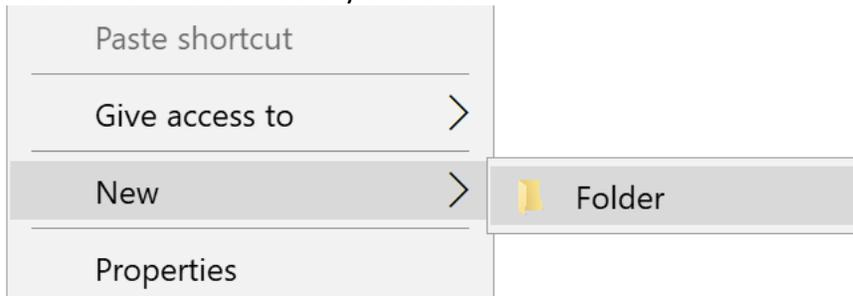
## Set up IIS Site

### HTML

Open up file explorer (folder on the taskbar at the bottom of the screen) and navigate to C: using the bar up top.

➔ C:

Right click within this directory and create a new folder. Name it nlb.



Open up notepad using the search bar on Windows taskbar.



Add `<h1>You have reached NLB-server1</h1>` for server1, or `<h1>You have reached NLB-server2</h1>` for server2.

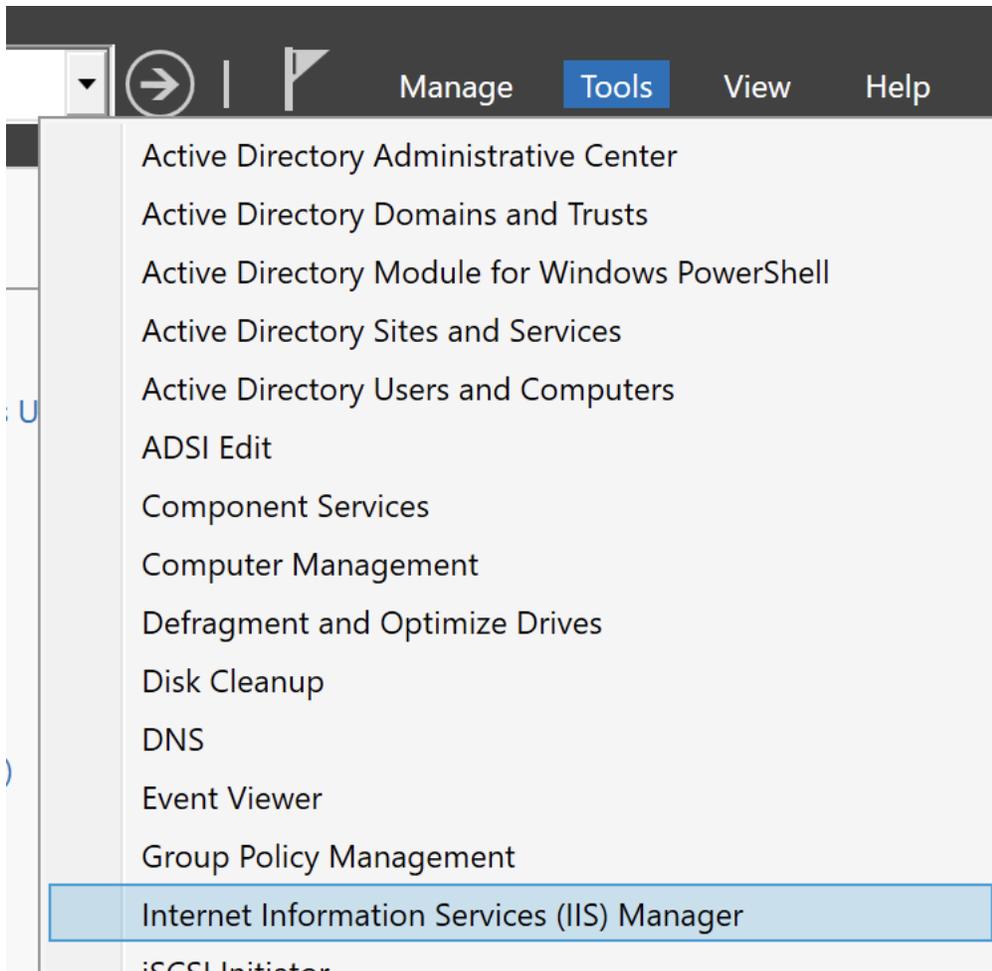


Click File > Save As, then navigate to the nlb folder. Save the file as index.html and set save type to "All files".

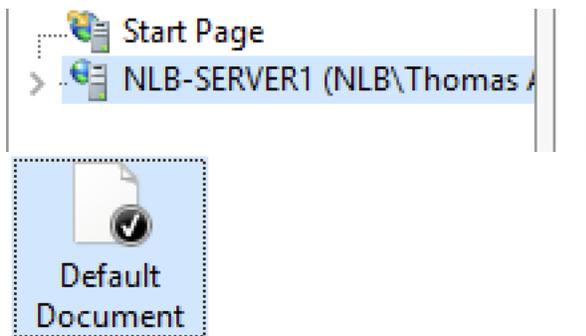
Move the nlb folder to inetpub > wwwroot. Delete anything that is not the nlb folder within the wwwroot directory.

## Set IIS Default

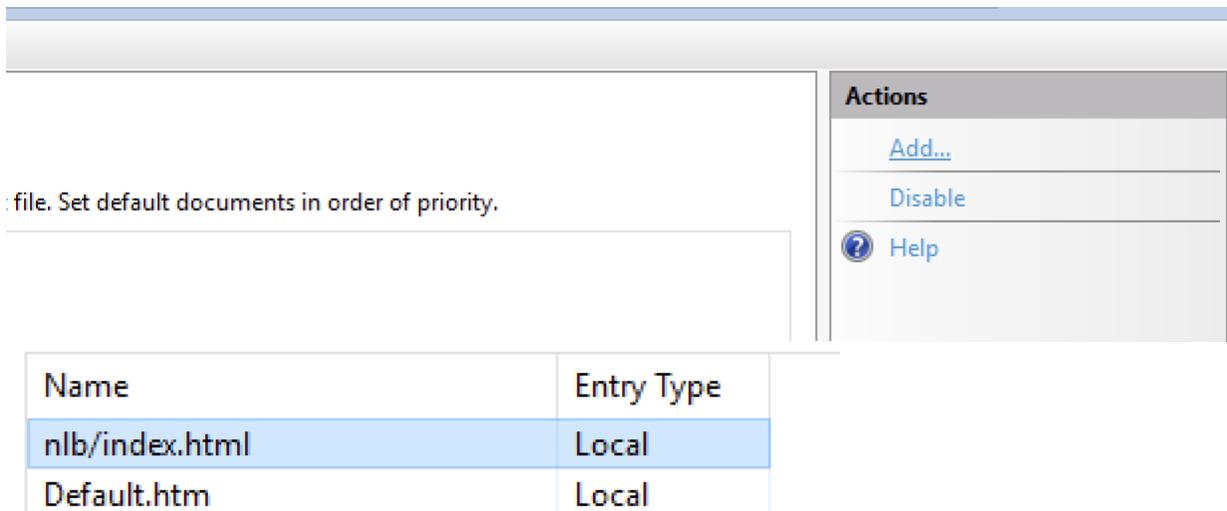
Navigate to the Tools drop down menu from the dashboard and select the IIS Manager.



Select the server from the sidebar, and then double click on Default Document.



Click on Add... on the far right and add nlb/index.html. Repeat this entire process on both servers.



### Change the default Hosts file

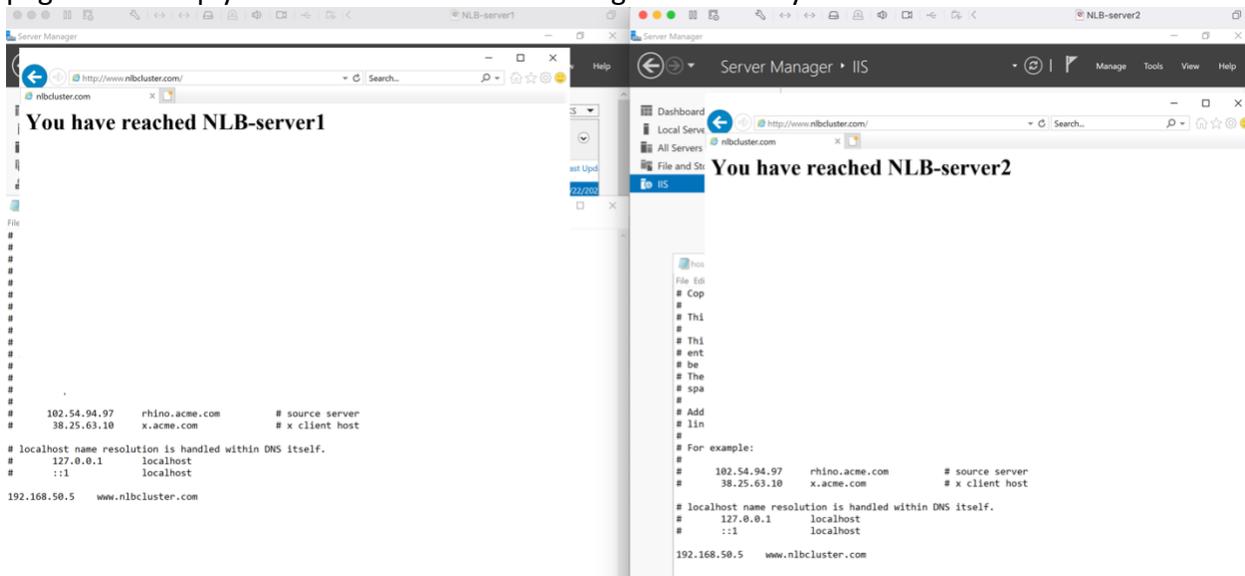
On both servers, open notepad as administrator by right clicking. Within notepad, click File > Open and navigate to **%WinDir%\System32\Drivers\Etc.** Select the hosts file and open.

Add the following line to the bottom of the entire script, and save the document:

192.168.50.5 [www.nlbcluster.com](http://www.nlbcluster.com)

## Conclusion

All things said and done, if you navigate to [www.nlbhosts.com](http://www.nlbhosts.com) on either server, the respective page should reply. Here is a screenshot showing them side-by-side:



## References

- [1.] <https://msftwebcast.com/2020/02/configure-network-load-balancing-in-windows-server-2019.html>