

NIC Teaming Demonstration

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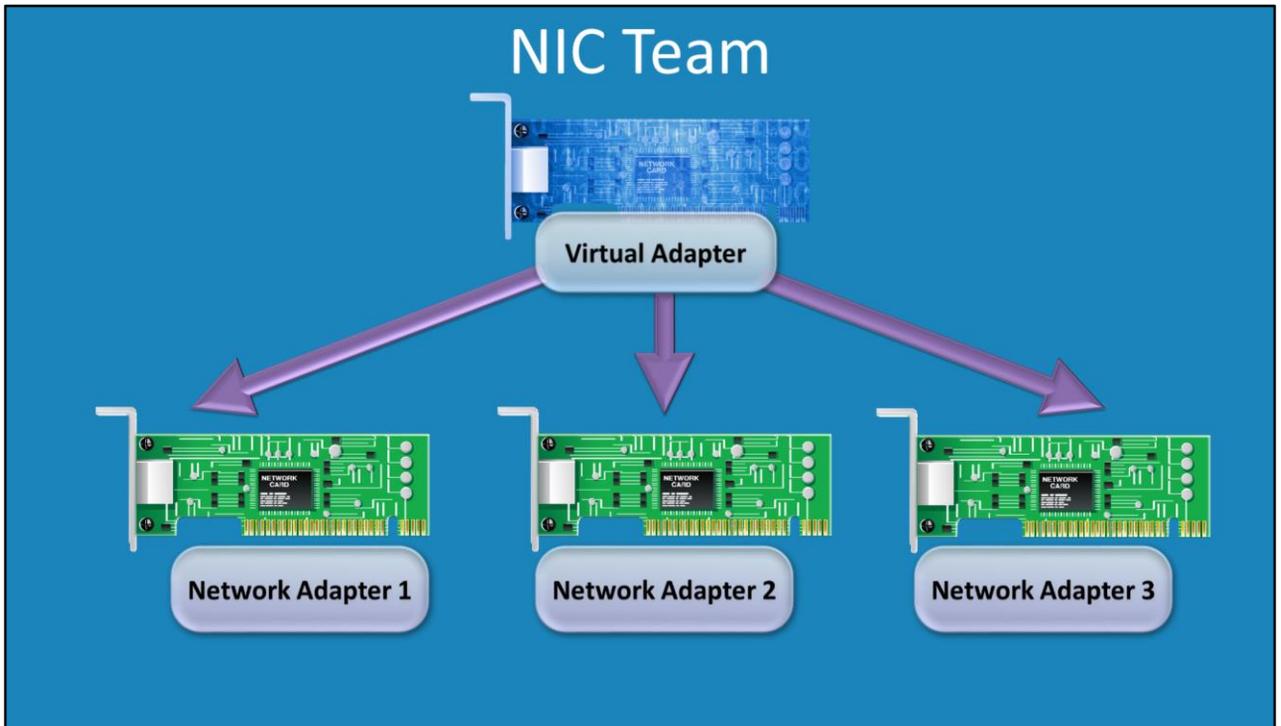
This video will look at using the NIC teaming feature on Windows Server 2012 R2 to combine 3 network cards together. The video will look at using NIC Teaming using software and also network hardware that supports networking combining protocols.

Demonstration

Demonstration

1. To configure NIC teaming, first open Server Manager from the task bar.
2. When a server is selected in server manager, on the properties screen, it will show all the network adapters for that server.
3. In this case, this server has 3 network adapters installed. Each network adapter can have its own configuration. In this example one network adapter has been configured with a static IP Address. The other two network adapters have been configured to use DHCP.
4. If one of the network adapters is selected, this will display a windows with the network connection in it.
5. To display the properties for a network adapter, right click on the network adapter and select the option for properties. When a network adapter is not part of a NIC team, all the items listed will have tick boxes next to them except for one. This one is the "Microsoft Network Adapter Multiplexor Protocol". While the network adapter is not in a NIC team, all the items in here can be configured.
6. To configure NIC teaming, in the properties for the server, select the enabled or disable text next to "NIC Teaming". This will open the configuration for NIC teaming.
7. NIC teaming is divided into 3 windows. The bottom left Window is Teams. Select the Tasks pull down on this window and then select "New Team".
8. From the New Team, it is just a matter of entering in a name for the NIC Team and then ticking which network adapters that you want to use. You can use up to 32 network adapters in the one NIC team.

9. To see additional options that can be configured in the NIC team, select the option at the bottom Additional properties.
10. For the teaming mode, the default option Switch Independent is a software solution. The option Static Teaming requires your network switch to support IEEE 802.3ad and LDAP requires IEEE 802.1ax.
11. The second option that can be configured is load balancing mode which has 3 options. Address Hash uses characteristics of the stream like the IP Address and port to determine which network adapter to use. Hyper-V port works with virtual machines. Each virtual machine will always will use the same network adapter. Dynamic combines both address hash and Hyper-V port together. It also has the ability to move a network stream from one network adapter to another in an attempt to balance the load. It does however required Windows Server 2012 R2.
12. The option "Standby adapter" allows one of the network adapters in the team to be used as a stand by adapter. If a network adapter in the team was to fail, the standby adapter will change from stand by to active and will be used to replace the failed network adapter.
13. Once o.k. is pressed the NIC team will be created. At the bottom right hand of the screen you can see the status on the NIC team. When you first create the NIC team it may take about 30 seconds for the NIC Team to complete and become available.
14. Once the NIC team has been created, if you go in the properties of any of the network adapters, all the items in the properties will be un-ticked except for Microsoft Network Adapter Multiplexor Protocol.
15. When a NIC team is created, a new virtual adapter is created on the server and is visible under network connections. This virtual adapter can be configured just like any other network adapter in the system.



NIC Team

When a NIC team is created, a virtual network adapter is created on the system. This virtual adapter is responsible for transferring traffic to and from the physical network adapters in the system. This means that any software on the server uses the virtual network adapter just like a physical adapter and thus does not require an understanding of how the NIC team works or how it is configured.

Demonstration

If a network card in the system fails or is disconnected, network traffic on the server should not be disrupted or should be very minor. If the network card becomes available again, it may take 20-30 seconds before the network adapter is reported as Active.

Once a NIC team has been created, it is possible to change the name of the NIC team in the properties of the NIC team. When you do this however, this will cause the old NIC team to be deleted and then recreated. When this occurs, the NIC team will temporarily be unavailable. It should be remembered that when changing certain properties in the NIC team, this may cause this to occur.

Demonstration Static Teaming

In order to configure a NIC team to use static teaming. The network switches on your network must support the protocol IEEE 802.3ad. Some network switches on the market will have this configured by default and for others, the protocol will need to

be enabled on the network switches. All the network cards in the NIC team will also need to be plugged into the same switch.

To configure a static team, open the properties for the NIC team and then select at the bottom of the properties the option for the additional properties. From the additional properties select the teaming mode as Static Teaming. Once the teaming mode is set to Static Teaming, the option for the standby adapter will be grayed out as standby adapters are only available for static teaming.

When you configure the NIC team to static teaming, the server will negotiate with the switch. During this process the network adapters will be displayed as connection pending and if everything is working correctly will change to active.

To obtain the status of the NIC Team, you can always look in Server Manager, however if you also look in Network Connections this will show all the network adapters in the system. If a network adapter is not working, it will be listed as disconnected.

NIC Teaming Recap



Incoming Traffic

- Switch Independent
 - Incoming traffic comes through one card
 - Unless virtual machines are in use
 - Need to use Hyper-V Port or dynamic
 - Supports standby adapters
- Static Teaming or LACP
 - Requires hardware support
 - 802.3ad or 802.1ax
 - Incoming traffic controlled by switch

NIC Teaming Recap

Windows has no control over incoming traffic. If the teaming mode switch independent is used, the incoming traffic will always arrive on the same one network card in the NIC team. The only time this changes is when virtual machines are used. Since virtual machines have different MAC addresses, traffic for each virtual machine will always use the same network adapter. Switch independent is also the only teaming mode that supports standby adapters.

In order to have some control over incoming traffic a hardware solution needs to be used. The two hardware solutions that Windows Server 2012 supports is Static teaming (802.3ad) and LACP (802.1x). Incoming Traffic is controlled by the switch so how well incoming traffic is load balanced will depend on the switch.

NIC Teaming Recap



Outgoing Traffic

- Address hash
 - Divides traffic by IP Address, Port etc
- Hyper-V Port
 - Divides traffic based on virtual machine
- Dynamic
 - Includes features of other 2 balancing modes
 - Can move network streams between network cards
 - Windows Server 2012 R2 only

NIC Teaming Recap

Windows Server has complete control over outgoing traffic so all outbound traffic works the same regardless of whether you use a hardware or software only solution. The outgoing traffic is determined by the setting in the NIC team properties called load balancing mode. Address hash divides traffic up based on characteristics of the network adapter like its IP Address and port used. Each combination of these characteristics will always use the same network adapter. Hyper-V Port is used when virtual machines are used. Each virtual machine will always have its traffic directed out the same network adapter. Dynamic combines both characteristics of address hash and Hyper-V port. However it also has the ability to move a network stream from one network adapter to another if the network adapters are not balanced enough; however it is only available on Windows Server 2012 R2. It should be remembered that Windows Server does not load balance traffic at the packet level. For this reason, if you have one network stream that uses a lot of network traffic, it will be directed out to one network adapter and cannot be split between the other network cards.

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References

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