4.4.3 NIC Teaming Facts

NIC Teaming allows two or more network adapters to be combined and to work together as a team. NIC teaming can be configured to either increase bandwidth or provide fault tolerance:

- If you aggregate the bandwidth, then all adapters in the team are in an active state and are able to process network frames. As a result, the combined bandwidth of all the adapters in the team is available to the system.
- If you configure failover, some of the adapters in the team are active while others are passive. If an active adapter in the team fails, then a passive adapter is activated and takes over for the failed adapter.

Be aware of the following regarding NIC Teaming:

- Windows Server supports up to 32 network adapters in a team.
- A NIC team appears as a single adapter to the server operating system.
- When using NIC Teaming with Hyper-V:
  - Each external switch can use only one team.
  - An adapter connecting the VM to the network cannot be part of a NIC Team. You must create the NIC Team first and then create the Hyper-V network.
  - Hyper-V is not able to create networks based on individual adapters in a team.
  - Hyper-V supports only two adapters in a team.
- You can use PowerShell or Server Manager to configure and manage NIC Teaming.
  In PowerShell:
  - Use the **New-NetSwitchTeam** cmdlet to create NIC Teams.
  - Use the cmdlet: **Remove-NetLbfoTeam** to break up a NIC Team.

NIC Teaming can be set up in one of two ways:

Mode	Description

Switch-dependent Mode	Switch-dependent mode requires all network adapters to be connected to the same switch:
	▪ All NICs in the team are connected to the same switch using one of the following methods:
	  ▪ *Static* or *generic* teaming requires that the links forming the team be identified on the switch and the computer.
	  ▪ *Dynamic* teaming uses the IEEE 802.1ax Link Aggregation Control Protocol (LACP) to identify the links that form the team.
	  Most switches require that LACP be manually enabled on the port. The LACP protocol is also referred to as IEEE 802.3ad.
	▪ The bandwidth of the adapters is aggregated.
	▪ Traffic distribution should be implemented so that packets associated with a TCP stream are handled by the same network adapter.
	▪ The teams are usually Active/Active, meaning that both network adapters accept traffic.

Switch-independent Mode	In switch-independent mode, each adapter is connected to a different switch. Switch-independent mode provides fault tolerance. In this mode: ▪ Switches are not aware of the NIC team. ▪ The NIC team can be Active/Active or Active/Passive. In an Active/Passive configuration, there is only one standby NIC per team. ▪ NICs in the team can be connected to the switch using either static teaming or dynamic teaming.

The following table describes the *load balancing mode*, also known as *traffic distribution algorithms.*

Method	Description
Hyper-V Switch Port	The MAC address can be used to divide traffic when virtual machines have independent media access control (MAC) addresses. ▪ The advantage to this method is that the switch balances the traffic based on the MAC address for the virtual machine. ▪ A disadvantage is that the virtual machine is limited to the bandwidth of a single adapter.

	▪ Choose Hyper-V switch port if you have multiple virtual network cards in the VM teamed in the guest operating system.

Hashing	The hashing method creates a hash for the packet and sends packets with that hash value to an available network adapter.
	▪ Dynamic redistribution of packets based on hash value is known as *smart load balancing* or *adaptive load balancing*.
	▪ Hashing ensures that all packets from the same stream are sent to the same network adapter.
	▪ Communication between the VM and the network is not interrupted if one of the adapters fails.
	▪ The hash is created using one of the following:
	  ▪ Source and destination MAC addresses.
	  ▪ Source and destination IP addresses.
	  ▪ Source and destination TCP ports and source and destination IP addresses.
	This type of hash cannot be used with IPSec.