NIC Teaming (LBFO) in Windows Server "8" Beta

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Abstract

This paper contains beginner through expert deployment and management information for Windows Server "8" Beta NIC Teaming, also known as Load Balancing/Failover (LBFO).

This version of this document is based on the Windows Server “8” Beta release. There are changes from previous releases and there will be changes in future releases. For best results make sure the user guide matches the release you are running.
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1 NIC Teaming

NIC teaming, also known as Load Balancing/Failover (LBFO), allows multiple network interfaces to be placed into a team for the purposes of

- bandwidth aggregation, and/or
- traffic failover to prevent connectivity loss in the event of a network component failure.

This feature has long been available from NIC vendors but until now NIC teaming has not been included with Windows Server.

The following sections address:

- NIC teaming architecture
- Bandwidth aggregation (also known as load balancing) mechanisms
- Failover algorithms
- NIC feature support – stateless task offloads and more complex NIC functionality
- A detailed walkthrough how to use the NIC Teaming management tools

NIC teaming is available in Windows Server 8 in all SKUs, both ServerCore and full Server versions. NIC teaming is not available in Windows 8 Client SKUs.
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3  Technical Overview
One of the biggest challenges to describing a NIC teaming solution is the many parts and options within the umbrella of NIC teaming technology.

3.1 Existing architectures for NIC teaming
Today virtually all NIC teaming solutions on the market have a similar architecture, as shown in Figure 1.

![Figure 1 - Standard NIC teaming solution architecture and Microsoft vocabulary](image)

Two or more physical NICs are connected into the NIC teaming solution multiplexing unit, which then presents one or more virtual adapters (team NICs [tNICs] or team interfaces) to the operating system. There are a variety of algorithms that distribute outbound traffic between the NICs.

The only reason for multiple tNICs is to logically divide inbound traffic by virtual LAN (VLAN). This allows a host to be connected to different VLANs at the same time. Arguably this upper-side separation of traffic is not part of NIC Teaming. As every other existing implementation of NIC Teaming includes this capability the Windows Server 8 implementation also includes it.

*When NIC teaming is connected to a Hyper-V switch all VLAN segregation should be done in the Hyper-V switch instead of in the NIC Teaming software.*

3.2 Configurations for NIC Teaming
There are two basic configurations for NIC Teaming.

- A configuration that does not require the switch to participate in the teaming. This is referred to as switch-independent teaming. Since in switch-independent mode the
switch does not know that the interface is part of a team in the host, the team interfaces may be connected to different switches. Switch independent modes of operation do not require that the team members connect to different switches, they merely make it possible.

- A configuration that requires the switch to participate in the teaming. This mode is referred to as switch-dependent teaming. Switch dependent teaming requires all the interfaces of the team to be connected to the same physical switch.¹

There are two modes of operation for switch-dependent teaming:

- **Generic or static teaming (IEEE 802.3ad draft v1).** This mode requires configuration on both the switch and the host to identify which links form the team. Since this is a statically configured solution there is no additional protocol to assist the switch and the host to identify incorrectly plugged cables or other errors that could cause the team to fail to perform. This mode is typically supported by server-class switches.

- **Dynamic teaming (IEEE 802.1ax, LACP).** This mode is also commonly referred to as IEEE 802.3ad as it was developed in the IEEE 802.3ad committee before being published as IEEE 802.1ax.² IEEE 802.1ax works by using the Link Aggregation Control Protocol (LACP) to dynamically identify links that are connected between the host and a given switch. This enables the automatic creation of a team and, in theory but rarely in practice, the expansion and reduction of a team simply by the transmission or receipt of LACP from the peer entity. Typical server-class switches support IEEE 802.1ax but most require administration to enable LACP on the port.³

Both of these modes should result in both inbound and outbound traffic approaching the practical limits of the aggregated bandwidth because the pool of interfaces in the team is seen as a single pipe.

### 3.3 Algorithms for traffic distribution

Outbound traffic can be distributed among the available links in many ways. One rule that should be followed by any distribution algorithm is to try to keep all packets associated with a single flow (TCP-stream) on a single interface. This rule is needed to minimize out-of-order packet arrival scenarios.

---

¹ Some vendors have multi-box switches that report all the aggregate interfaces as being from the same switch. This configuration is supported as long as the switch vendor’s management allows all the interfaces to be placed in the same LACP team.

² See [http://en.wikipedia.org/wiki/Link_aggregation](http://en.wikipedia.org/wiki/Link_aggregation) for the history behind this change in identification of this standard.

³ There are security challenges to allowing completely dynamic IEEE 802.1ax operation on a switch. As a result, switches today still require the switch administrator to configure the switch ports that are allowed to be members of such a team.
NIC teaming in Windows Server 8 supports the following traffic distribution algorithms:

- **Hyper-V switch port.** Since VMs have independent MAC addresses the VM’s MAC address or the port it’s connected to on the Hyper-V switch can be the basis for dividing traffic. There is an advantage in using this scheme in virtualization. Because the adjacent switch always sees a particular MAC address on one and only one connected interface, the switch will "balance" the ingress load (the traffic from the switch to the host) on multiple links based on the destination MAC (VM MAC) address. This is particularly useful when Virtual Machine Queues (VMQs) is used as a queue can be placed on the specific NIC where the traffic is expected to arrive. However, if the host has only a few VMs this mode may not be granular enough to get a well-balanced distribution. This mode will also always limit a single VM (i.e., the traffic from a single switch port) to the bandwidth available on a single interface. *Windows Server uses the Hyper-V Switch Port as the identifier rather than the source MAC address as, in some instances, a VM may be using more than one MAC address on a switch port.*

- **Address Hashing.** This algorithm creates a hash based on address components of the packet and then assigns packets that have that hash value to one of the available interfaces. Usually this mechanism alone is sufficient to create a reasonable balance across the available interfaces.

The components that can be specified as inputs to the hashing function include the following:

- Source and destination MAC addresses
- Source and destination IP addresses (2-tuple hash)
- Source and destination TCP ports, usually used along with the IP addresses (4-tuple hash)

The 4-tuple hash creates the most granular distribution of traffic streams resulting in smaller streams that can be independently moved between interfaces. However, it cannot be used for traffic that is not TCP or UDP-based or where the TCP and UDP ports are hidden from the stack, such as IPsec-protected traffic. In these cases, the hash falls back to a 2-tuple hash or, if the traffic is not IP traffic, to the MAC address hash.

### 3.4 Interactions between Configurations and Load distribution algorithms
### Table 1 - Interactions between configurations and load distribution algorithms

<table>
<thead>
<tr>
<th></th>
<th>All Address hash modes</th>
<th>Hyper-V Port mode</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switch Independent</strong></td>
<td>• Outbound traffic is spread across all active members.</td>
<td>• Outbound traffic is tagged with the port on the Hyper-V switch where it originated. All traffic with that port tag is sent on the same team member.</td>
</tr>
<tr>
<td></td>
<td>• Inbound traffic (from beyond the subnet) arrives on only one interface (primary member). If primary member fails another team member is selected as primary and all inbound traffic moves to that team member.</td>
<td>• Inbound traffic destined for a specific Hyper-V port will arrive on the same team member that the traffic from that port is sent out on.</td>
</tr>
<tr>
<td><strong>Switch Dependent (Static and LACP)</strong></td>
<td>• Outbound traffic is spread across all active members.</td>
<td>• Outbound traffic is tagged with the port on the Hyper-V switch where it originated. All traffic with that port tag is sent on the same team member.</td>
</tr>
<tr>
<td></td>
<td>• Inbound traffic will be distributed by the switch’s load distribution algorithm.</td>
<td>• Inbound traffic will be distributed by the switch’s load distribution algorithm.</td>
</tr>
</tbody>
</table>

### 3.5 NIC teaming inside of Virtual Machines (VMs)

NIC teaming in Windows Server 8 may also be turned on in a VM. This allows a VM to have virtual NICs connected to more than one Hyper-V switch and still have connectivity even if the NIC under that switch gets disconnected. This is particularly important when working with Single Root I/O Virtualization (SR-IOV) because SR-IOV traffic doesn’t go through the Hyper-V switch and thus cannot be protected by a team in the host that is under a Hyper-V switch. With the VM-teaming option an administrator can set up two Hyper-V switches, each connected to its own SR-IOV-capable NIC.

- Each VM can have a virtual function (VF) from one or both SR-IOV NICs and, in the event of a NIC disconnect, fail-over from the primary VF to the back-up interface.
- Alternately, the VM may have a VF from one NIC and a non-VF interface to the other switch. If the NIC associated with the VF gets disconnected, the traffic can fail-over to the other switch without loss of connectivity.

---

4 If a team is put in the Hyper-V switch port distribution mode but is not connected to a Hyper-V switch all outbound traffic will be sent on a single team member.
**Note** Because fail-over between NICs in a VM might result in traffic being sent with the MAC address of the other interface, each Hyper-V switch port associated with a VM that is using NIC Teaming must be set to allow teaming. More specifically, if the team is being created in a VM, you **MUST** run the following PowerShell command in the host (parent partition) with Administrator permission:

```
Set-VMNetworkAdapter -VMName <VMname> -AllowTeaming
```

Teams created in a VM can only run in Switch Independent configuration, Address Hash distribution mode. Only teams where each of the team members is connected to a different Hyper-V switch are supported.

### 3.6 Feature compatibilities

NIC teaming is compatible with all networking capabilities in Windows Server 8 with three exceptions: SR-IOV, RDMA, and TCP Chimney. For SR-IOV and RDMA, data is delivered directly to the NIC without passing it through the networking stack (in the host OS in the case of virtualization). Therefore, it is not possible for the team to look at or redirect the data to another path in the team. TCP Chimney is not supported with NIC teaming in Windows Server 8 since TCP Chimney has the entire networking stack offloaded to the NIC.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Datacenter bridging (DCB)</td>
<td>Works independent of NIC Teaming so is supported if the team members support it.</td>
</tr>
<tr>
<td>IPsec Task Offload (IPsecTO)</td>
<td>Supported if all team members support it.</td>
</tr>
<tr>
<td>Large Send Offload (LSO)</td>
<td>Supported if all team members support it.</td>
</tr>
<tr>
<td>Receive side coalescing (RSC)</td>
<td>Supported in hosts if any of the team members support it. Not supported through Hyper-V switches.</td>
</tr>
<tr>
<td>Receive side scaling (RSS)</td>
<td>NIC teaming supports RSS in the host. The Windows Server 8 TCP/IP stack programs the RSS information directly to the Team members.</td>
</tr>
<tr>
<td>Receive-side Checksum offloads (IPv4, IPv6, TCP)</td>
<td>Supported if any of the team members support it.</td>
</tr>
<tr>
<td>Remote Direct Memory Access (RDMA)</td>
<td>Since RDMA data bypasses the Windows Server 8 protocol stack team members will not also support RDMA.</td>
</tr>
<tr>
<td>Single root I/O virtualization</td>
<td>Since SR-IOV data bypasses the host OS stack, NICs exposing the SR-IOV feature will no longer expose the feature while a member of a team. Teams can be created in VMs to team SR-IOV virtual functions (VFs).</td>
</tr>
<tr>
<td>TCP Chimney Offload</td>
<td>Not supported through a Windows Server 8 team</td>
</tr>
<tr>
<td>Transmit-side Checksum offloads (IPv4, IPv6, TCP)</td>
<td>Supported if all team members support it.</td>
</tr>
<tr>
<td>Virtual Machine Queues (VMQ)</td>
<td>Supported when teaming is installed under the Hyper-V switch</td>
</tr>
</tbody>
</table>
3.7 No teaming of Hyper-V ports in the Parent Partition

Hyper-V virtual NICs exposed in the parent partition (vNICs) must not be placed in a team. Teaming of virtual NIC’s (vNICs) inside of the parent partition is not supported in any configuration or combination. Attempts to team vNICs may result in a complete loss of communication in the event that network failures occur.

3.8 NIC Requirements

NIC teaming requires the presence of at least one Ethernet NIC. A team of one NIC may be used for separation of traffic using VLANs. Obviously a team with only one team member has no failure protection. All modes that provide fault protection through failover require a minimum of two Ethernet NICs in the team. The Windows Server 8 implementation supports up to 32 NICs in a team.

Any Ethernet NIC that has passed the Windows Hardware Qualification and Logo test (WHQL tests) may be used in a Windows Server 8 team.

3.9 Teaming of different speed NICs

Teaming of NICs capable of operating at different speeds but presently operating at the same speed is supported.

Teaming of NICs with different speed connections is not supported. The teaming software will allow you to build such a team; however the traffic distribution algorithms in this release do not base the distribution on the speeds of the connections. A team consisting of a 10Gbps NIC and a 100Mbps NIC will send approximately half of the traffic to each NIC.

If you are creating a team for active/standby operation a lower speed NIC can be used as the standby NIC so that connectivity is maintained. It is not recommended or supported for active/active configurations.

3.10 Teams of teams

Some teaming solutions today allow an administrator to create a team of teams, i.e., a team where the team members are actually team interfaces from other teams. This capability is not supported in Windows Server “8” NIC Teaming solution. Furthermore, attempting to place the team interface from a 3rd-party teaming solution into a Microsoft team may result in an unstable system that may lose connectivity to the network. DO NOT mix elements of 3rd-party teaming solutions with elements of Microsoft’s NIC Teaming solution.

3.11 Interactions with other teaming solutions

Some users will want to use other NIC teaming solutions for a variety of reasons. This can be done but there are some risks that the system administrator should be aware of.
1. If the system administrator attempts to put a NIC into a 3rd party team that is presently part of a Microsoft NIC Teaming team the system will become unstable and communications may be lost completely.
2. If the system administrator attempts to put a NIC into a Microsoft NIC Teaming team that is presently part of a 3rd party teaming solution team the system will become unstable and communications may be lost completely.

As a result it is STRONGLY RECOMMENDED that no system administrator ever run two teaming solutions at the same time on the same server. The teaming solutions are unaware of each other’s existence resulting in potentially serious problems.

In the event that an administrator accidently violates these cautions and gets into the situation described above the following steps may solve the problem.

1. Reboot the server. Forcibly power-off the server if necessary to get it to reboot.
2. When the server has rebooted run this PowerShell cmdlet:

   Get-NetLbfoTeam | Remove-NetLbfoTeam

3. Use the 3rd party teaming solution’s administration tools and remove all instances of the 3rd party teams.
4. Reboot the server again.

If the above steps do not restore the server to full functionality the server may need to have the operating system reinstalled.

Microsoft continues its longstanding policy of not supporting 3rd party teaming solutions. If a user chooses to run a 3rd party teaming solution and then encounters networking problems the customer should call their teaming solution provider for support. If the issue is reproducible without the 3rd party teaming solution in place please report the problem to Microsoft.

4 Managing NIC Teaming in Windows Server 8

Windows Server 8 has two inbox management tools for managing NIC Teaming. Other Microsoft management products may, in future releases, also provide the ability to manage Windows Server 8 NIC teaming. Windows 8 client SKUs that allow the installation of the Remote Server Administration Tools (RSAT)\(^5\) are also able to manage NIC teaming on Windows Server 8 hosts.

\(^5\) RSAT tools for Windows 8 Consumer Preview are available at http://go.microsoft.com/fwlink/?LinkId=242077.
This section provides a detailed presentation of the NIC Teaming management UI. For each operation the equivalent PowerShell cmdlets will be provided. The NIC Teaming management UI operates exclusively through the use of PowerShell underneath. Everything the UI does can be done with PowerShell.

For a full understanding of the PowerShell commands for NIC Teaming,

```
Get-Help NetLbfo
```

will return a list of all the LBFO PowerShell commands as shown in Figure 2.

Executing the PowerShell command `Get-Help <command>` will provide a full syntax and all the options available.

```
Get-Help New-NetLbfoTeam
```

is also shown in Figure 2.

![Figure 2 - LBFO PowerShell Cmdlets](image)
4.1 Invoking the Management UI for NIC Teaming

There are three common ways to start the NIC Teaming Management UI tool.

- From the Server Manager Local Server window (click on “Disabled” or “Enabled”)

![Image of Server Manager Local Server window with network adapter teaming option highlighted]

**Figure 3 - Invoking the UI from Server Manager Local Server screen**

- From the Server Manager All Servers window right-click on the server to be managed and select the Configure Network Adapter Teaming action.
From a command prompt or PowerShell prompt: execute “lbfoadmin”. If run with no arguments it will attempt to manage NIC teaming on the local host. If the “/servers” flag is present then all the servers in the list of servers that follows will be included in the servers to be managed.

4.2 The components of the NIC Teaming Management UI

The NIC Teaming management UI consists of 3 primary windows (tiles):

- The Servers tile
• The Teams tile
• The Adapters and Interfaces tile

![Figure 7 - the NIC Teaming Management UI tiles](image)

The Adapters and Interfaces tile is shared by two tabs:

• The Network Adapters tab
• The Team Interfaces tab

Each tile or tab has a set of columns that can be shown or hidden. The column chooser menus are made visible by right-clicking on any column header. (For illustration purposes the screenshot in Figure 8 shows a column chooser in every tile. Only one column chooser can be active at a time.)

Contents of any tile may be sorted by any column. To sort by a particular column left click on the column title. In Figure 8 the Servers tile is sorted by Server Name; the indication is the little triangle in the Name column title in the Servers tile.
Each tile also has a Tasks dropdown menu and a right-click action menu. The Tasks dropdowns can be opened by clicking on the TASKS box at the top right corner of the tile and then any available task in the list can be selected. The right-click action menus are activated by right-clicking in the tile. The menu options will vary based on context. (For illustration purposes the screen shot in Figure 9 shows all the TASKS items selected and a right-click action list in every tile. Only one action list or TASKS list can be active at any time.)
4.3 Adding a server to be managed
To add a server to the list of servers to be managed, i.e., the list of servers in the Servers tile, select the Servers Tile TASKS list. Selecting the Add Servers action will pop-up the Add Server window. The Add Server window for the NIC Teaming UI is the same as the Add Server window for Server Manager.

4.4 Removing a server from the managed servers list
To remove a server from the list of managed servers right click on the server to be deleted and then select the Remove Server action.

4.5 Creating a team
There are two ways to invoke the New Team UI:

- Select the TASKS action list in the Teams tile and then select New Team, or
- Right click on an available adapter in the Network Adapters tab and select the Add to New Team item.

Both of these will cause the New Team dialog to pop-up.
When the New Team dialog pops-up there are two actions that MUST be taken before the team can be created:

- A Team name must be provided, and
- One or more adapters must be selected to be members of the team
Optionally, the administrator may select the Additional Properties item and configure the Teaming mode, load distribution mode, and the name of the primary team interface.
In the Additional properties the Load distribution mode drop-down provides only two options: Address Hash and Hyper-V Port. The Address Hash option in the UI is the equivalent of the TransportPorts option in PowerShell. To select additional Address hashing algorithms use PowerShell as described below and in Section 4.6.2.3.

When the team name, the team members, and optionally any additional properties (including the Primary team interface name) have been set to the administrator’s choices, the administrator will click on the OK button and the team will be created. Team creation may take several seconds and the NICs that are becoming team members will lose communication for a very short time.

Teams can also be created through PowerShell. The PowerShell to do exactly what these figures have shown is

```
New-NetLbfoTeam Team1 NIC1,NIC2
```

Teams can be created with the additional properties modified. See Sections 4.6.2.2 and 4.6.2.3 for more information about these flags.
New-NetLbfoTeam Team1 NIC1,NIC2 -TeamingMode LACP -LoadBalancingAlgorithm
HyperVPorts

If the team is being created in a VM, you **MUST** run the following PowerShell command in the host (parent partition) with Administrator permission:

```
Set-VMNetworkAdapter -VMName <VMname> -AllowTeaming
```

### 4.6 Modifying a team

#### 4.6.1 Modifying a team through the UI

Within the UI modifications to the team can be done by selecting a team in the Team tile, right-clicking on the team, and selecting the Modify Team action. Selecting Modify Team will pop-up the Team properties dialog. This dialog is very similar to the New Team dialog described in Section 4.5.

In the Team properties dialog the following actions can be accomplished:

- Rename the team: Select the team name and edit it.
- Add team members: Select additional adapters from the Member Adapters tile
- Remove team members: De-select adapters from the Member Adapters tile. At least one adapter must be selected.

![Team properties dialog](image)

*Figure 13 – Modifying Team Properties*
If the Additional properties drop-down item is selected then the Teaming mode and Load distribution mode may also be modified.

![Team properties window](image)

**Figure 14 - Modifying a team's Teaming mode and Load distribution mode**

### 4.6.2 Modifying a team through PowerShell

#### 4.6.2.1 Renaming a team

To rename Team1 and give it the name TeamA, the PowerShell is:

```
Rename-NetLbfoTeam Team1 TeamA
```

#### 4.6.2.2 Changing the teaming mode

The PowerShell options for teaming mode are:

- SwitchIndependent
- Static
- LACP

These options are described further in Section 3.2.

To change Team1 to an 802.1ax LACP team, the PowerShell is:
Set-NetLbfoTeam Team1 -TeamingMode LACP

The “-TeamingMode” flag can be abbreviated “-TM”, as in

Set-NetLbfoTeam Team1 -TM LACP

**Note:** For security reasons teams created in VMs may only operate in SwitchIndependent mode.

### 4.6.2.3 Changing the load distribution algorithm

The PowerShell options for load distribution algorithm are:

- TransportPorts
- IPAddresses
- MacAddresses
- HyperVPort

TransportPorts is the 4-tuple hashing described in Section 3.3. IPAddresses is the 2-tuple hashing described in Section 3.3. MacAddresses is the MAC Address hashing described in Section 3.3. HyperVPort is the distribution method based on Hyper-V switch ports as described in Section 3.3.

To change Team1’s Load balancing algorithm to Hyper-V Ports, the PowerShell is:

Set-NetLbfoTeam Team1 -LoadBalancingAlgorithm HyperVPorts

The “-LoadBalancingAlgorithm” flag can be abbreviated “-LBA”, as in

Set-NetLbfoTeam Team1 -LBA HyperVPorts

To change the Teaming mode and Load balancing algorithm at the same time,

Set-NetLbfoTeam Team1 -TM LACP -LBA HyperVPorts

**Note:** Teams created in VMs may not use the HyperVPort load distribution algorithm.

### 4.6.2.4 Adding new members to the team

To add NIC1 to Team1 the PowerShell command is:

Add-NetLbfoTeamMember NIC1 Team1

### 4.6.2.5 Removing members from the team

To remove NIC1 from Team1 the PowerShell command is:

Remove-NetLbfoTeamMember NIC1 Team1
4.6.3 Adding new interfaces to the team

To add a new interface to the team select the Team in the Teams Tile and the Team Interfaces tab in the Adapters and Interfaces tile. Select the TASKS drop-down in the Adapters and Interfaces tile, then select Add Interface.

![Adding new interfaces to the team](image)

**Figure 15 - Selecting Add Interface**

Selecting the Add Interface action item pops-up the New team interface dialog.

![New team interface](image)

**Figure 16 - New team interface dialog**

Since only one team interface, the primary team interface, can be in Default mode, the new team interface must have a specific VLAN value. As the specific VLAN value is entered the name of the interface will be modified to be the team name followed by the VLAN value of this team interface. The interface name can be modified to any other name (duplicates are not allowed) if the administrator chooses to do so.
Selecting OK will create the new team interface.

![Figure 17 - Team Interface tab after creating new team interface](image)

The PowerShell to add a team interface with VLAN 42 to Team1 is

```
Add-NetLbfoTeamNIC Team1 42
```

### 4.6.4 Modifying team member roles

Some administrators like to operate a team with standby (passive) members. To modify the role of a team member to be a standby member of the team, select the team member in the Adapters and Interfaces tile, right-click, and select Properties.

![Figure 18 - Modifying a Team Member Role](image)

When the Properties action item is selected the Network Adapter Properties dialog will pop-up. In this dialog the Configured Role can be changed from its default, Active, to either Standby or Disabled. The Disabled role will be removed as an option before Windows Server 8 is released to market.
other member of the team fails. Disabled role means that the team member remains part of the team but can’t be used by the team for any reason.

![Network Adapter Properties Dialog for team members](image)

**Figure 19 - Network Adapter Properties Dialog for team members**

The team member role can also be modified through PowerShell

```
Set-NetLbfoTeamMember NIC4 -AdministrativeMode Standby
```

4.6.5 **Modifying team interfaces**

There are only two modifications that can be done to a team interface:

- change the team interface name and/or
- change the VLAN ID.

To modify the team interface VLAN ID select and then right-click the team interface in the Team Interfaces tab. Select the Modify Team Interface action item.
This pops-up the Network Adapter Properties dialog. This dialog has some useful information about the team interface. It also has the box where the new VLAN ID can be entered. If a new VLAN ID is entered and the team name is the one the system provided when the team interface was created the team interface name will be changed to reflect the new VLAN ID. If the team interface name has been previously changed then the team name will not be changed when the new VLAN ID is entered.
To modify a team interface’s VLAN ID in PowerShell

Set-NetLbfoTeamNIC “Team1 – VLAN 42” -VlanID 15

Just as in the UI, changing the VLAN ID will cause the team interface name to change if the team interface name is still the same as the one the system created when the team interface was created. I.e., if the team interface name is <teamName – VLAN xx> where xx is the VLAN ID of the team interface, then the VLAN ID portion of the team interface name will be modified to reflect the new VLAN ID.

4.6.6 Removing interfaces from the team
To delete a team interface select and then right-click the team interface in the Team Interfaces tab. Select the Delete team interface action item. (See Figure 20.) A confirmation dialog will pop-up. Once confirmed the team interface is deleted.

To delete a team interface in PowerShell

Remove-NetLbfoTeamNIC “Team1 – VLAN 42”

4.7 Deleting a team
To delete a team from the server select the team in the Teams tile. Right-click the team and select the Delete team action item.

A confirmation dialog will be displayed. Once confirmed the team will be deleted.

To delete a team in PowerShell

Remove-NetLbfoTeam Team1

To remove all teams from the server in PowerShell (i.e., to clean up the server),

Get-NetLbfoTeam | Remove-NetLbfoTeam
4.8  Viewing statistics for a team or team member

If the UI window is sufficiently tall a statistics tile appears at the bottom of the Team tile and the Adapters and Interfaces tile. These statistics windows reflect the traffic of the selected team and selected team member.

![NIC Teaming](image)

**Figure 23- Statistics information for teams and team members**

4.8.1  Viewing statistics for a team interface

If the Team Interfaces tab is selected in the Adapters and Interfaces tile the statistics at the bottom of the Adapters and Interfaces tile will be those of the selected team interface.
Figure 24- Statistics information for teams and team interfaces

4.8.2 Setting frequency of Statistics updates
In the TASKS drop-down menu for the Servers tile one action item is Settings. Selecting this item brings up the General Settings dialog.
The two drop-down lists in this dialog allow the user to change how often the UI components get refreshed. The settings apply equally to all servers in the servers list.
5 Frequently asked questions (FAQs)

Q1: Is Active/Standby (Active/Passive) mode supported?

Yes. Create a team with two members (Section 4.5). Set one to be in Standby role (Section 4.6.4). Teams with more two members may be created such that e.g., a team of 5 members could be configured with four active members and one standby member. The standby member will be activated any time that one of the active members is faulted.

Q2: What is the recommended configuration for Hyper-V?

See section 3.4.

- If the administrator wants the team to be connected to different switches then the teaming mode must be Switch Independent.
  - If the administrator wants inbound traffic spread across the team members, use Hyper-V Port load balancing.
  - If the administrator accepts all inbound traffic arriving on one team member and wants outbound traffic from each VM to be limited by the bandwidth of the team, use Address Hash (TransportPorts).
- If the administrator wants all team members to be connected to the same switch and is willing to administer the switch, select Static or LACP\(^7\) configuration.
  - If the administrator wants to ensure that no VM can send enough traffic to block other VMs from communicating user Hyper-V Port load balancing.
  - If the administrator wants to allow a VM to send more data than one team member can handle or the load between VMs fluctuates considerably, use Address Hash (TransportPorts).

Q3: Why does a NIC failure cause my VM to lose connectivity?

If the VM is running NIC teaming you MUST first run this PowerShell command in the host (parent partition):

```
Set-VMNetworkAdapter -VMName <VMname> -AllowTeaming
```

\(^7\) In day-to-day operation there is little effective difference between Static and LACP configurations. LACP provides some misconfiguration detection at a price of an extremely small amount of traffic it generates on each team member. If both are available LACP should be considered the better choice.
6  **Known bugs in the Windows Server 8 Beta version of NIC Teaming**

a. The UI will start from a command prompt without administrator privileges. It will show the local host as Host Unmanageable. *Work around:* cancel the UI and restart with administrator privileges or start the UI from Server Manager.

b. There are a number of fit-and-finish items for the UI that are known and will be resolved before the final Windows 8 Server version is released to market. Please feel free to submit any feedback in this area.