OneCommand™ NIC Teaming and VLAN Manager Version 2.8 User Manual

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1. Overview

The Emulex® OneCommand™ Network Interface Card (NIC) Teaming and Virtual Local Area Network (VLAN) Manager allows you to group multiple NICs as a single virtual device and provides the ability to team two or more NIC/vNIC ports. It also enables you to add one or more VLANs over a team or over a NIC/vNIC.

A VLAN is a network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a Local Area Network (LAN). VLANs are configured through software rather than hardware, which make them extremely flexible. One advantage of a VLAN is that when a computer is physically moved to another location, it can stay on the same VLAN without any hardware reconfiguration.

To increase throughput and bandwidth, and to increase link availability, you can configure multiple network interfaces on one or more ethernet ports to appear to the network as a single interface. This is referred to as Network Interface Card (NIC) teaming, or multi-link trunking.

NIC teaming has several advantages.

- Increased bandwidth – Two or more network interfaces are combined to share the load, thus increasing bandwidth.
- Load balancing – Link aggregation enables distribution of processing and communication across multiple links.
- Higher link availability – Prevents a single link failure from disturbing traffic flow.

The Windows NIC Teaming and VLAN Manager supports:

- vNIC teaming
- Reactivation delay – Ensures that the primary team adapter is ready to carry traffic before a failback occurs. For more information, see "Changing the General Settings" on page 32.
- The auto-refresh setting specifies how often the OneCommand NIC Teaming and VLAN Manager refreshes itself. For more information, see "Changing the General Settings" on page 32.
- Switch independent teaming types
  - Failover (FO) – If configured for fault tolerance, the system provides only failover. For more information, see "Failover (FO)" on page 10.
  - Auto Failback
  - Smart load balancing (SLB) – If configured for load balancing, failover is included. For more information, see "Smart Load Balancing" on page 10.
    - TX/RX load balancing
    - TCP/IP load balancing
    - Non-TCP/IP TX load balancing
    - Media Access Control (MAC) address load balancing
- Switch dependent teaming types

  - Link Aggregation Control Protocol (LACP) – Also known as dynamic link aggregation. For more information, see "IEEE 802.3ad and LACP Team Types" on page 12.
  - IEEE 802.3ad static – For more information, see "IEEE 802.3ad and LACP Team Types" on page 12.
- Hashing
  - Perceived Port Load
  - Destination IP hashing
  - Destination MAC hashing
- Backup/Restore of teaming configurations
- Dynamically reprogramming VLAN IDs allows you to change the VLAN ID of a VLAN without recreating the VLAN with the new ID. The IP addresses assigned to the VLAN remain intact through the change.
- Change the primary adapter of a team
- Optional deletion of native VLANs

Restrictions

- Virtual Machine Queue (VMQ) is not supported.
- The Windows NIC Teaming and VLAN Manager does not support Single Root I/O Virtualization (SR-IOV).
- You cannot run LACP when multichannel (UMC) is enabled.
- There are restrictions when using VLANs and UMC together. See the *Emulex Universal Multichannel Reference Guide* and the *Emulex Windows Driver Manual* for more information.
- The NIC Teaming driver does not allow TCP Offload sessions on 802.3ad and LACP teams.
- Smart Load Balancing teams are not recommended when using clustering software.

Supported Operating Systems

The Windows NIC Teaming and VLAN Manager supports the following Windows Server operating systems:

- Windows Server 2012
- Windows Server 2008 R2
- Windows Server 2008

(All versions supported with Hyper-V, Enterprise and Core editions, on x64 platforms only).

Terminology

- Team – A group of available adapters working together and presented as a single adapter to applications.
- VLAN – A Virtual LAN allows computers or virtual machines (hypervisor guests) to act as if they are connected by a private, directly connected network. You can assign VLANs to teams or individual adapters.
- VLAN Bound adapter – A single adapter to which you assigned VLANs. This adapter cannot be part of a team. These are also called VLAN adapters.
- Available adapter – An adapter that is not a member of a team and has no assigned VLANs. This adapter is also called a free or unbound adapter.
- Reactivation delay – The amount of time that an adapter must be ready to carry traffic before it is allowed to rejoin its team.

Failover (FO)

A failover team consists of at least two and at the most three members; a primary and the remaining secondary members. When a team is created, the primary member is active and the remaining secondary members are passive. When the primary team member disconnects (due to link down, link disabled or any other reason) the failover mechanism selects one of the secondary team members (which is in a link up state) at random and traffic continues.

When a previously failed primary team member reports a link up state, failback to the primary member occurs only if the team was created with auto failback enabled. For teams created with auto failback disabled, traffic will continue on one of the secondary adapters. By default all the failover team members use the same MAC address, the MAC address of the primary team member.

Load Balancing

Smart Load Balancing

Team load balancing provides both load balancing and fault tolerance. Team load balancing works with any Ethernet switch and does not require any switch configuration. The team advertises multiple MAC addresses and one or more IP addresses. The virtual team adapter selects the team MAC address from the list of load balancing members. When the server receives an address resolution protocol (ARP) request, the software-networking stack always sends an ARP reply with the team MAC address. To begin the load balancing process, the intermediate teaming driver modifies this ARP reply by changing the source MAC address to match one of the physical adapters.

Load balancing enables both transmit and receive load balancing based on load balancing function to maintain in-order delivery of frames.

Transmit load balancing is achieved by creating a hashing table using the hashing algorithm based on load distribution type. When the virtual teaming adapter selects a physical adapter (or port) to carry all the frames to the destination, the unique MAC address of the physical adapter is included in the frame, and not the team MAC address. This is required to comply with the IEEE 802.3 standard. If two adapters transmit using the same MAC address, a duplicate MAC address situation would occur that the switch could not handle.

Receive load balancing attempts to load balance incoming traffic for client machines across physical ports in the team. It uses a modified gratuitous ARP to advertise a different MAC address for the team IP address in the sender physical and protocol address. The gratuitous ARP is unicast with the MAC and IP address of a client machine in the target physical and protocol address respectively. This causes the target client to update its ARP cache with a new MAC address map to the team IP address. This has the potential to direct the received traffic to a different adapter than learned from the transmission. Gratuitous ARPs are not broadcast because this would cause all clients to send their traffic to the same port. As a result, the benefits achieved through client load balancing would be eliminated, and could cause out of order frame delivery. This receive load balancing scheme works as long as all clients and the teamed server are on the same subnet or broadcast domain.

When the clients and the server are on different subnets, and incoming traffic has to traverse a router, the received traffic destined for the server is not load balanced. The physical adapter that the intermediate driver has selected to carry the IP flow carries all of the traffic. When the router needs to send a frame to the team IP address, it broadcasts an ARP request (if not in the ARP cache). The server software stack generates an ARP reply with the team MAC address, but the intermediate driver modifies the ARP reply and sends it over a particular physical adapter, establishing the flow for that session over the particular physical adapter. The reason is that ARP is not a routable protocol. It does not have an IP header and therefore is not sent to the router or default gateway. ARP is only a local subnet protocol. In addition, since the gratuitous ARP is not a broadcast packet, the router does not process it and does not update its own ARP cache.

The only way that the router would process an ARP intended for another network device is if the router has proxy ARP enabled and the host has no default gateway. This is very rare and not recommended for most applications.

Transmitted traffic through a router is load balanced and is based on the source and destination IP address and TCP/UDP port number. Since routers do not alter the source and destination IP address, the load balancing algorithm works as intended.

Receive-Side Scaling

Receive-side scaling (RSS) improves the received traffic performance by distributing multiple incoming traffic sessions to multiple processors.

On the OCe10102 UCNA, receive-side scaling (RSS) works only on incoming packets that match the MAC address programmed into the NIC port. This limitation applies to secondary members of the Failover, LACP and 802.3ad team types.

For Hyper-V virtual machines that use the Failover, LACP and 802.3ad team types, both the primary and secondary adapters do not have RSS support.

The OCe11102 UCNA does not have this limitation and is fully supported.

IEEE 802.3ad and LACP Team Types

IEEE 802.3ad and Switch-Controlled Teaming (LACP) are similar to link aggregation static mode except that it uses the LACP to negotiate the ports that make up the team. The LACP must be enabled at both the server and the switch for the team to operate. If LACP is not available at both ends of the link, 802.3ad provides a static aggregation that only requires both ends of the link to be in a link up state.

Note: You cannot disable an adapter port that is part of an 802.3ad static team. If you do, I/O will fail because an 802.3ad team is switch dependent. When using 802.3ad static teams, you must disable links by disabling the switch port.

Because static aggregation provides for the activation of a member link without performing the LACP message exchanges, it is not as reliable and robust as an LACP negotiated link. LACP automatically determines which member links can be aggregated and then aggregates them. It provides for the controlled addition and removal of physical links for the link aggregation so that no frames are lost or duplicated. The removal of aggregate link members is provided by the marker protocol that can be optionally enabled for LACP-enabled aggregate links.

The link aggregation group advertises a single MAC address for all the ports in the team. The MAC address of the team/aggregator can be the MAC addresses of one of the NICs in the group.

The link aggregation control function determines which links may be aggregated. It then binds the ports to an aggregator function in the system and monitors conditions to determine if a change in the aggregation group is required. Link aggregation combines the individual capacity of multiple links to form a high performance virtual link. The failure or replacement of a link in an LACP trunk does not cause loss of connectivity. The traffic fails over to the remaining links in the trunk.

2. Installing, Updating, and Uninstalling

There are two ways to install the OneCommand NIC Teaming driver, and the NIC Teaming and VLAN Manager:

- Attended installation using the GUI
- Unattended installation using the command line

Installing the Driver and the NIC Teaming and VLAN Manager

Prerequisites

See Table 2-1 for Microsoft.NET Framework version requirements for your supported operating system.

Depending upon your operating system, the Microsoft.NET Frameworks version 4.0 and/or version 3.5 SP1 must be installed before you can install the OneCommand NIC Teaming driver, and the NIC Teaming and VLAN Manager.

Table 2-1 Supported Operating Systems and Microsoft.NET Frameworks Requirements

Operating System	.NET Framework Required
Windows Server 2012	3.5 SP1 and 4.0
Windows Server 2012 Server Core	3.5 SP1
Windows Server 2008 x64 SP2	3.5 SP1 and 4.0
Windows Server 2008 x64 R2	4.0
Windows Server 2008 x64 R2 Server Core	3.5 SP1
Windows Server 2008 x64 R2 with Hyper-V	4.0
Windows Server 2008 x64 R2 SP1	4.0
Windows Server 2008 x64 R2 SP1 Server Core	3.5 SP1
Windows Server 2008 x64 R2 SP1 with Hyper-V	4.0

Note: For Windows Server 2012 Server Core, you must enable the 3.5 .NET Framework. See the Microsoft website for more information.

Note: Use the latest available drivers for third party adapters; otherwise, unpredictable results may occur.

Attended Installation

Procedure

To perform an attended installation:

1. From the Emulex website, download the **elxdrvr-nic-teaming-<version>.exe** to your system. The installer is an executable file that self-extracts and copies the following software onto your system:
   - NIC Teaming driver
   - NIC Teaming and VLAN Manager
   - NIC Teaming and VLAN Manager utilities
2. Navigate to the system directory to which you downloaded the file and double-click the **elxdrvr-nic-teaming-<version>.exe** file.

Unattended Installation

An unattended driver installation (a quiet or silent installation) requires no user input. This is useful for performing an installation remotely from a command script, or when you want to make sure a custom configuration is not changed by a user during installation.

Procedure

To perform an unattended installation:

1. From the Emulex website, download the **elxdrvr-nic-teaming-<*version*>.exe** file to your system.

   The kit is activated with the optional switch /q or /q2. The /q switch displays progress reports.

   The /q2 switch does not display progress report.
2. Run the driver kit installer with the optional switch.

   For example, use the following command:

   ```
   elxdrvr-nic-teaming-<version>.exe /q2
   ```

Note: If unattended installation fails, it may be because the operating system prerequisites have not been met. To ascertain if this is the reason, run the installation interactively. If you encounter error messages when you run the installation interactively, the same error messages apply to an unattended installation. See Table 2-1 on page 13 for a complete list of prerequisites.

Exit Codes

The Installer's Setup program returns an exit code that indicates the result of its actions. This result code is useful if you run Setup in unattended installation in a batch file, where it can be tested through the %ERRORLEVEL% variable (Windows NT4 and later only), or by using an IF ERRORLEVEL statement. An exit code of zero indicates success. A non-zero exit code indicates a failure.

If you run Setup from a batch file or from a command line prompt, the default Windows behavior is to continue with the next command as soon as Setup starts; it does not wait until Setup has finished. As a result, the value of %ERRORLEVEL% does not necessarily reflect an accurate exit code.

To remedy this, run Setup as follows:

```
c:\share>START /wait elxdrvr-nic-teaming-<version>.exe /q
c:\share>echo %ERRORLEVEL%
```

This ensures that the command does not return until Setup has exited.

Updating the Driver and the NIC Teaming and VLAN Manager

Caution: Use the Emulex-provided kit to update the NIC Teaming and VLAN Manager. Do not use a previous version of the driver utilities to update the OneCommand NIC Teaming driver and NIC Teaming and VLAN Manager. If you do, unpredictable results will occur.

Caution: Do not update the NIC Teaming driver and NIC Teaming and VLAN Manager while I/O traffic is running. If you do, unpredictable results will occur.

To update the NIC Teaming driver and the NIC Teaming and VLAN Manager while preserving the existing configuration (including the IP address):

1. From the Emulex website, download the latest file named **elxdrvr-nic-teaming-<version>.exe** to your system.
2. Double click the **elxdrvr-nic-teaming-<version>.exe** and follow the prompts.
3. Reboot when prompted to do so.

Uninstalling the Driver and the NIC Teaming and VLAN Manager

WARNING: Use the Emulex-provided kit to uninstall the driver. Do not use a previous version of the driver utilities to uninstall the OneCommand NIC Teaming driver and NIC Teaming and VLAN Manager. Do not use Device Manager to uninstall the OneCommand NIC Teaming driver and NIC Teaming and VLAN Manager. If you use a previous version of the driver utility or Device Manager, unpredictable results will occur.

Caution: Uninstalling the NIC Teaming package will remove all existing teams and VLANs.

To uninstall the NIC Teaming package:

- For Windows Server 2008 and Windows Server 2008 R2, select **Start>Control Panel>Programs>Uninstall a Program**.
- For a Windows 2008 Server Core operating system, use the following file (because there is no GUI to view the Programs and Features Control Panel):

  `C:\Program Files\Emulex\NIC Teaming\uninstall_nic_teaming.bat`

- For Windows Server 2012, select **Start>Control Panel>Programs>Uninstall a Program**.
  a. Select Emulex NIC Teaming Driver Kit-2.xx.xxx in the program list and click the Uninstall icon in the tool bar above the program list. If you have User Access Control enabled, click **Continue** when asked for permission.
  b. Click **Yes**. The application is removed from the system. You are prompted to reboot.
  c. Click **OK**.

3. Using the OneCommand NIC Teaming and VLAN Manager

Starting the OneCommand NIC Teaming and VLAN Manager

To start the OneCommand NIC Teaming and VLAN Manager, click **OneCommand NIC Teaming and VLAN Manager** from your Windows Start menu.

OneCommand NIC Teaming and VLAN Manager Element Definitions

Note: To properly view the OneCommand NIC Teaming and VLAN Manager, your display resolution must be set to 800 by 600 or higher.

The OneCommand NIC Teaming and VLAN Manager application window contains four basic components: the menu bar, the toolbar, the discovery-tree, and property tabs.

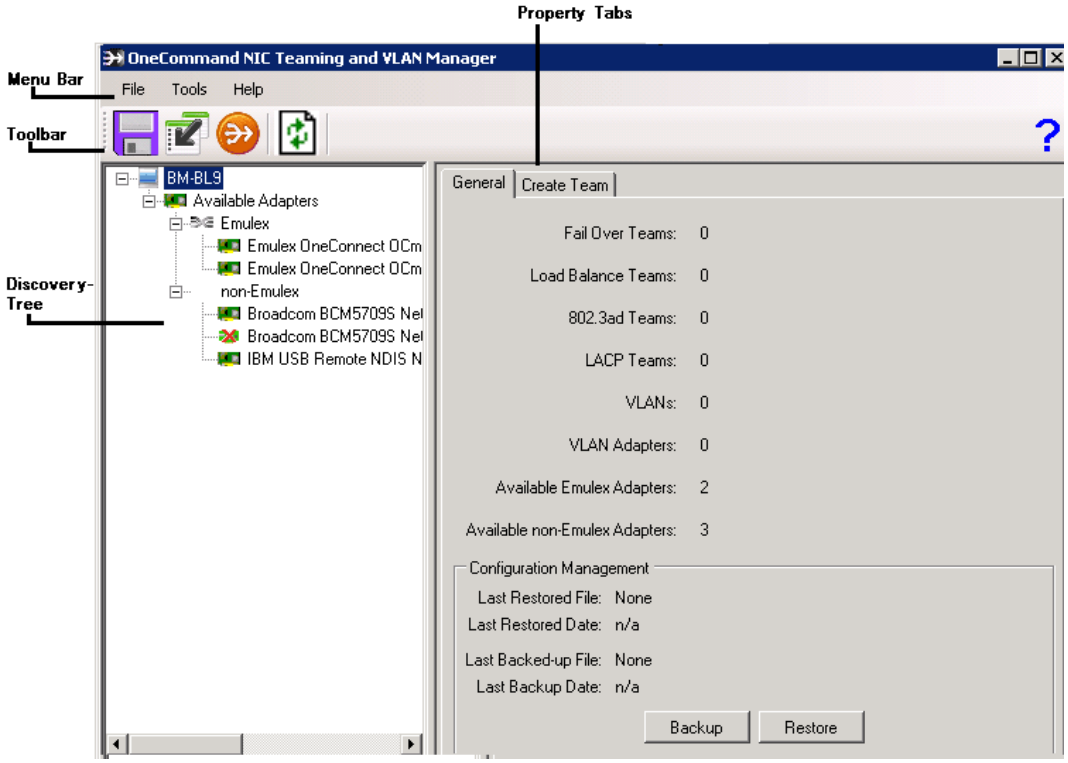

Figure 3-1 OneCommand NIC Teaming and VLAN Manager Element Definitions

Menu Bar

File

- Exit – Exits the application.

Tools

- Backup Current Configuration – Saves the current teaming configuration on the system. Use the Save As browser dialog box to specify a location for backing up the configuration and click **Save**.
- Restore Saved Configuration – Restores from a saved configuration. Use the browse dialog box to select a saved configuration and click **Open**. A Confirmation Restoration message warns you that the current teaming configuration will be erased. Click **Yes** on the message to proceed.
- General Settings – The General Settings dialog box displays the global reactivation delay and auto-refresh settings. A reactivation delay value while creating a team (on the Create Team tab) overrides any default global reactivation delay value set or changed in the General Settings dialog box. The auto-refresh setting specifies how often the OneCommand NIC Teaming and VLAN Manager refreshes itself. By default, auto-refresh is set to 90 seconds.

Help

- Contents – Displays OneCommand NIC Teaming and VLAN Manager online help.
- About OneCommand NIC Teaming and VLAN Manager – Displays OneCommand NIC Teaming and VLAN Manager version information.

Toolbar Buttons

The toolbar buttons perform the following tasks:

 **Backup button**

- Saves the current configuration. Use the Save As browser dialog box to specify a location for backing up the configuration and click **Save.**

 **Restore button**

- Restores from a saved configuration. Use the browse dialog box to select a saved configuration and click **Open**. A Confirmation Restoration message warns you that the current teaming configuration will be erased. Click **Yes** on the message to proceed.

 **Create Team button**

- Creates a team. See “Creating a Team” on page 28 for more information.

 **Discovery Refresh button**

- Initiates a discovery refresh cycle.

Help button

- Displays OneCommand NIC Teaming and VLAN Manager online help.

Discovery-Tree

The discovery-tree (left pane) has icons that represent the host machine, teams, and adapters.

Figure 3-2 The Discovery-Tree

Host Computer

Team Icon — This icon can represent one of the following:

- A list of team adapters
- An individual team

Adapter Icon — This icon can represent one of the following:

- A list of available adapters.
- An individual available adapter
- An individual adapter that is part of a team.

Emulex Adapter Icon — This icon can represent one of the following:

- A list of available Emulex adapters
- An individual Emulex adapter

VLANs Icon — This icon can represent one of the following:

- A list of VLANs
- An individual VLAN

Viewing General Information

Information is displayed in two ways on a General tab.

- If you have a team group, adapter group, or VLAN group selected in the discovery-tree, a General tab shows a listing of that item.
- If you double-click on an item in the General tab's listing, the General Information for that item is displayed in its General tab.

For example, select the Available Adapters icon to show an adapter listing on the General tab. Double-click an adapter in this list to show another General tab with port properties and connection properties, as well as IP addresses.

Viewing General Information for the Host Computer

Click **OneCommand NIC Teaming and VLAN Manager** from the Windows start menu.

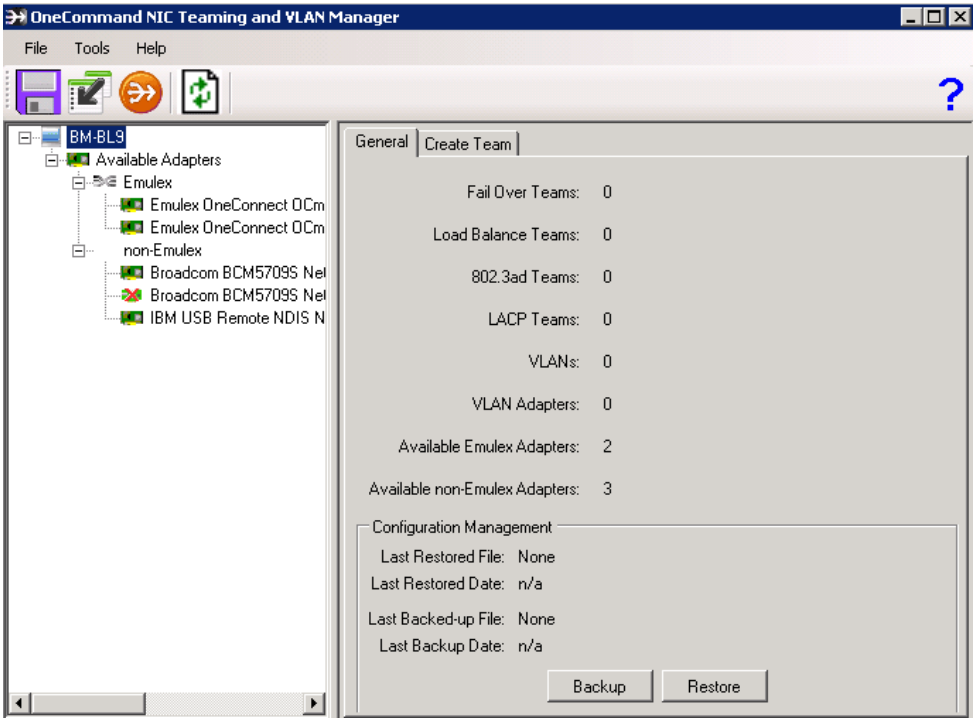

Figure 3-3 General Tab Information for a Host Computer

General Tab for the Host Computer - Field Definitions

- The number of teams for each team type.
- The number of VLAN adapters.
- The number of VLANs.
- The number of available adapters, both Emulex and non-Emulex.

Configuration Management Area

- Last Restored File: The file that was used to restore the configuration last.
- Last Restored Date: The date and time when the last restoration was done.
- Last Backed-up File: The file to which the configuration was backed up last.
- Last Backup Date: The date and time when the last backup was made.

Configuration Management buttons

- Backup – Click to back up a configuration in a .txt file format. For more information, see "Saving a Configuration" on page 34.
- Restore – Click to restore a configuration from a saved configuration. For more information, see "Restoring a Configuration" on page 36.

Viewing General Information for an Adapter

1. From the Start menu, click **All Programs>Emulex>OneCommand Teaming and VLAN Manager** to start the application. The General tab for the host computer is displayed.
2. Select an adapter from the available adapter list in the discovery-tree. The General tab for the adapter is displayed. This tab is read-only.

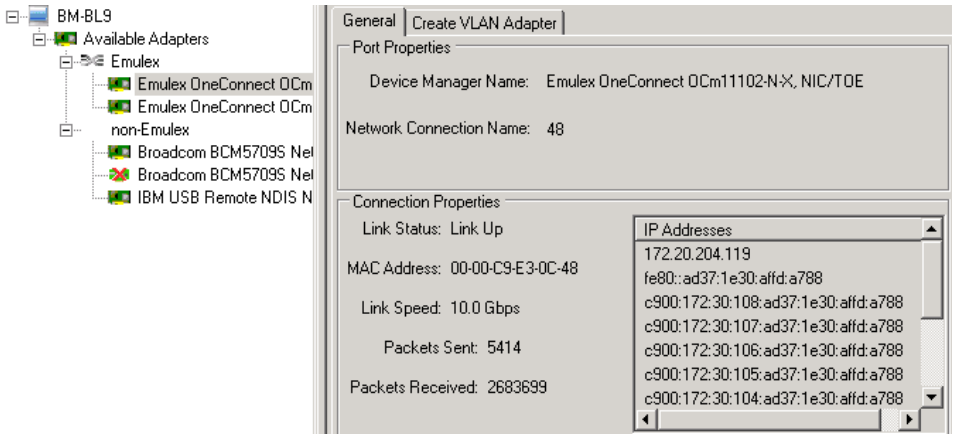

Figure 3-4 General tab Information for an Emulex Adapter

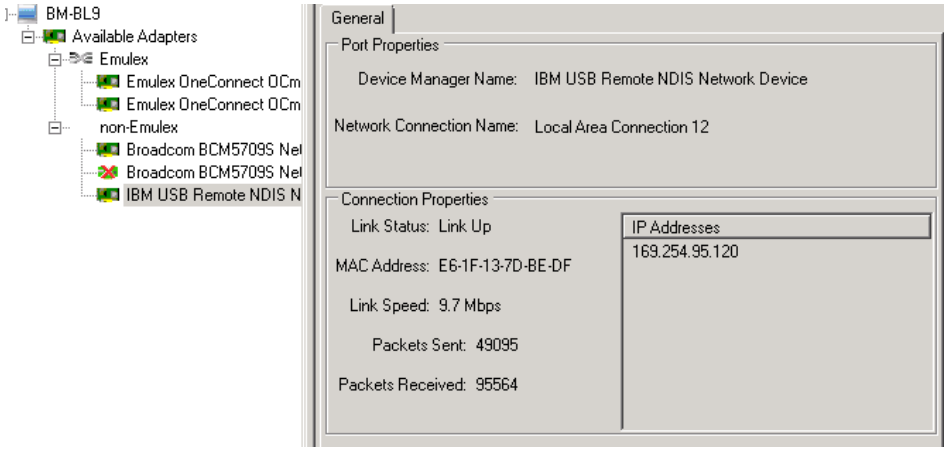

Figure 3-5 General tab Information for a non-Emulex Adapter

General Tab for an Adapter - Field Definitions

Port Properties Area

- Device Manager Name – The device manager name
- Network Connection Name – The network connection friendly name

Connection Properties Area

- Link Status – The status of the link on the selected adapter port
- Link Speed – The link speed
- MAC Address – The NIC MAC address currently assigned to the selected adapter port
- Packets Sent – The number of packets sent
- Packets Received – The number of packets received
- IP Address table – IP addresses for the adapter

Viewing General Information for a Team

1. From the Start menu, click **All Programs>Emulex>OneCommand Teaming and VLAN Manager** to start the application. The General tab for the host computer is displayed.

2. Select a team in the discovery-tree. The General tab for the team is displayed.

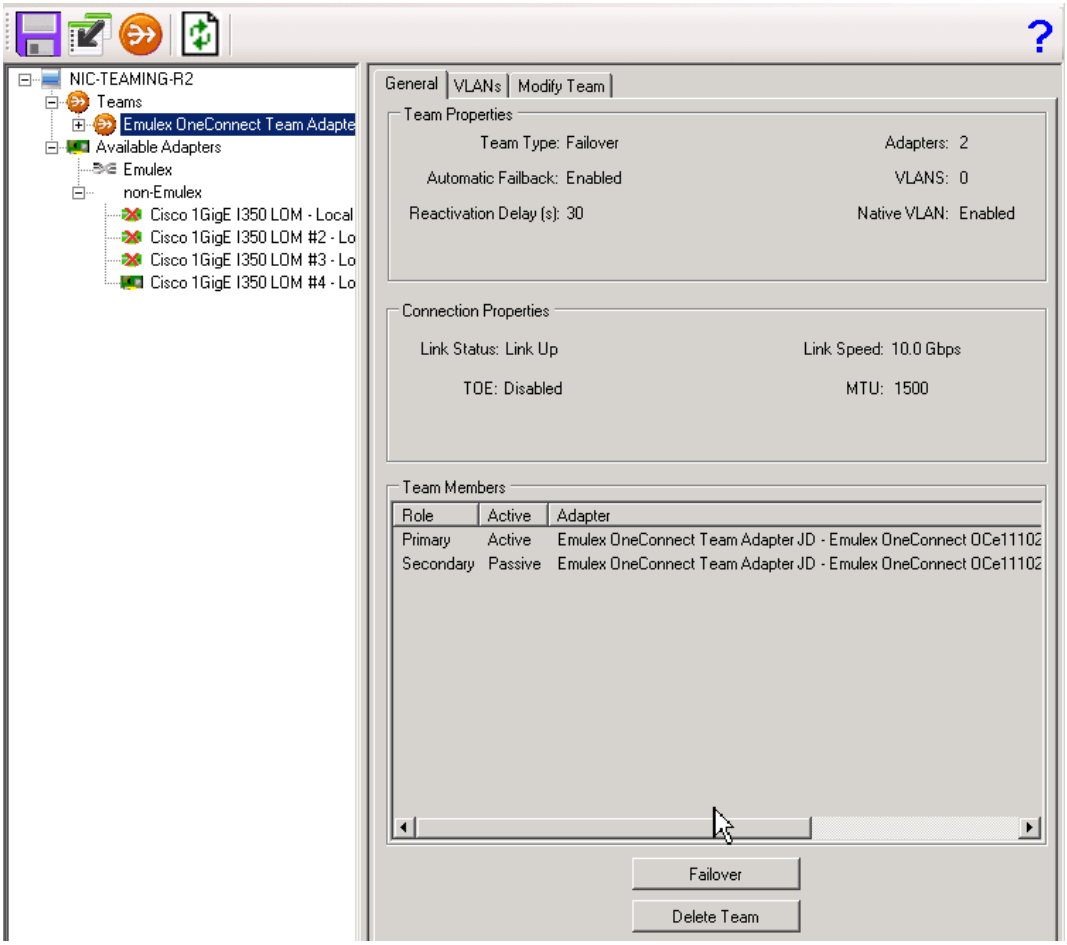

Figure 3-6 General Tab Information for a Team

General Tab for a Team - Field Definitions

Team Properties Area

- Team Type – The team type
- For a failover team, this area shows the Automatic Failback field. This field shows whether automatic failback is enabled.
- For a non-failover team (LACP, 802.3ad or load balancing), this area shows the Load Balance Hash field. This field shows the hash algorithm that is used for the load balancing. For a LACP team, this area also shows the Short Timeout field. This field shows whether short timeout is enabled for the LACP team.
- Reactivation Delay(s) – The default reactivation delay value, in seconds, for the team.
- Adapters – The number of tagged adapters for the team
- VLANs – The number of VLANs assigned to the team

- Native VLAN – Shows whether native VLAN is enabled.

Connection Properties Area

- Link Status – This field shows whether the team is functional. A link up status indicates that at least one team member is functional. A link down status indicates that no team members are functional.
- Link Speed – The current link speed of the team. In failover teams, the link speed is the same as the link speed of the active member. In load balancing, 802.3ad, and Link Aggregation Control Protocol (LACP) teams, the link speed is the sum of the link speed of the active members in the team.
- TOE – Displays whether TOE is enabled or disabled for the team.
- MTU – Displays the MTU (Maximum Transmit Unit) value of the team. This value is the same as the MTU of the team's adapters.
- Team Members table – This table shows the following team member information: primary or secondary role, active or passive status, and team member name.

Note: In the event of a mismatch between the MTU values of the team adapters, the least MTU of the team adapters is used by the team. TOE is disabled for the team and an "MTU mismatch detected" message is displayed below each MTU field.

General Tab Buttons

- Failover – This button is only available for failover teams. Click to manually cause the current team to failover.
- Delete Team – Click to delete the team. A Confirm Team Deletion message is displayed. Click **Yes** to proceed.

Viewing General Information for a VLAN

1. From the Start menu, click **All Programs>Emulex>OneCommand Teaming and VLAN Manager** to start the application. The General tab for the host computer is displayed.

2. Select a VLAN in the discovery-tree. The General tab for the VLAN is displayed. This tab is read-only.

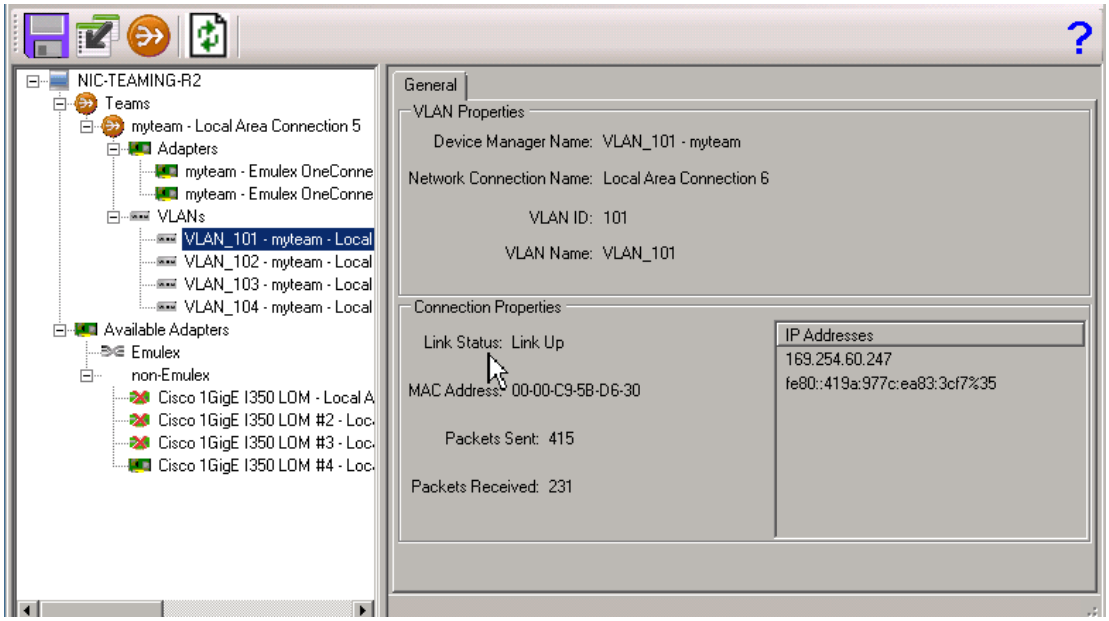

Figure 3-7 General Tab Information for a VLAN

General Tab for a VLAN - Field Definitions

VLAN Properties Area

- Device Manager Name – The device manager name
- Network Connection Name – The network manager name
- VLAN ID – The VLAN ID
- VLAN Name – The VLAN name

Connection Properties Area

- Link Status – The status of the link on the selected VLAN
- MAC Address – The NIC MAC address currently assigned to the VLAN
- Packets Sent – The number of packets sent using the VLAN
- Packets Received – The number of packets received using the VLAN
- IP Addresses table – A list of the IP addresses for the VLAN

Viewing General Information for a VLAN Adapter

1. From the Start menu, click **All Programs>Emulex>OneCommand Teaming and VLAN Manager** to start the application. The General tab for the host computer is displayed.

2. Select an adapter listed under "VLAN Adapters" in the discovery-tree. The General tab for the VLAN adapter is displayed.

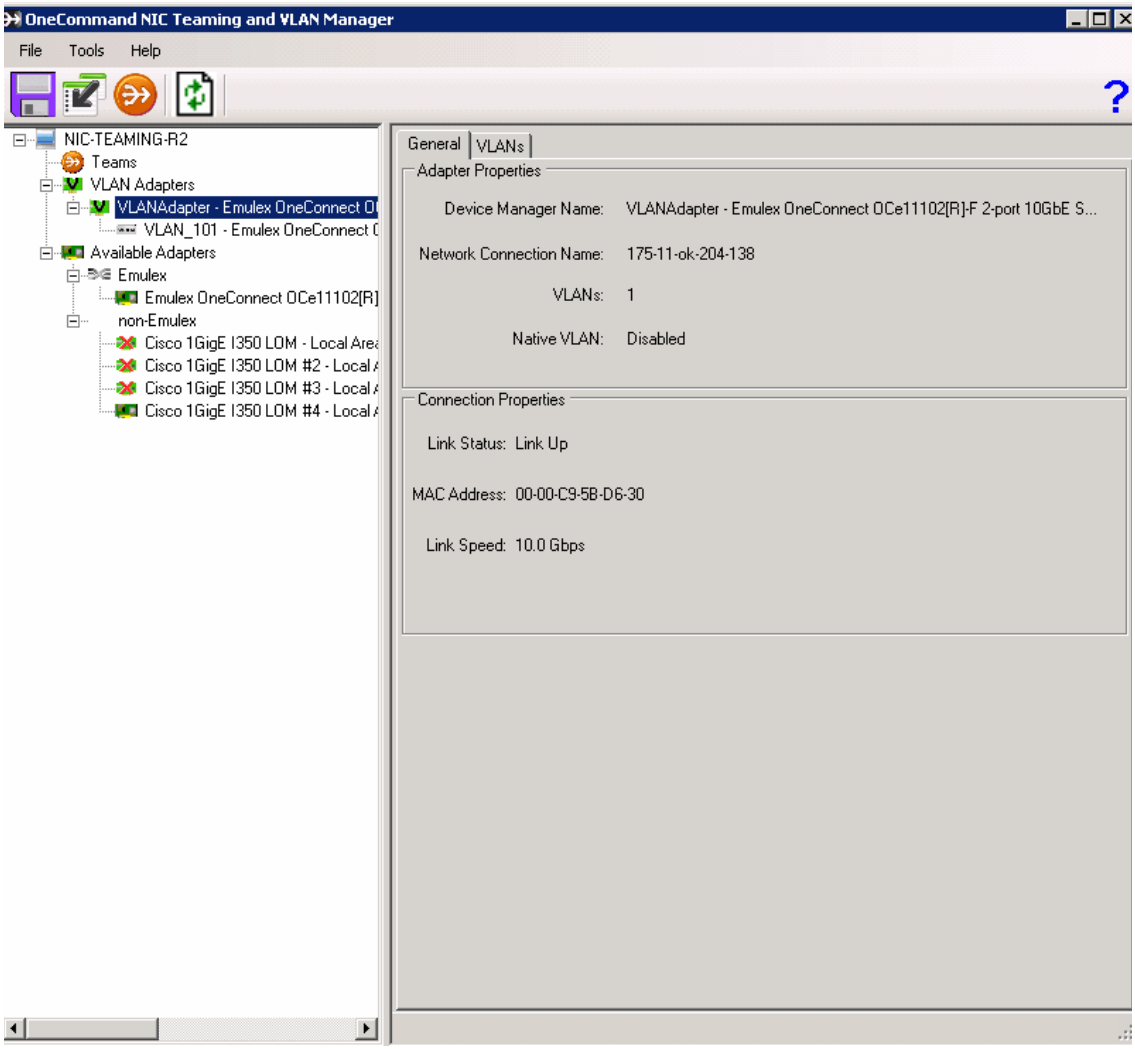

Figure 3-8 General Tab Information for a VLAN Adapter

General Tab for a VLAN Adapter - Field Definitions

Adapter Properties Area

- Device Manager Name – The device manager name
- Network Connection Name – The network connection friendly name
- VLANs – The number of VLANs
- Native VLAN – Indicates whether native VLAN is enabled or disabled.

Connection Properties Area

- Link Status – The status of the link on the selected adapter port
- Link Speed – The link speed

- MAC Address – The NIC MAC address currently assigned to the selected adapter port

Creating, Configuring, and Removing Teams

A team of adapters functions as a single virtual network interface and appears the same as non-teamed adapters to other network devices. A protocol address such as an IP address is usually assigned to the physical adapter. However, when the OneCommand NIC Teaming and VLAN Manager is installed, the protocol address is assigned to the native VLAN adapter and not to the physical adapters that make up the team.

Note: The following notes apply to creating and configuring teams with the CLI and with the OneCommand NIC Teaming and VLAN Manager:

- When teams are created, the proper bindings for the team and its adapters are set up in the Network Connections CPA. The adapters are bound to the Emulex driver, and the team's Native VLAN is bound to IPv4/IPv6. Changing the bindings of teams, teamed adapters, or their VLANs can result in non-functional teams and hung applications.
- If you use static IP addresses when creating a team (non-DHCP), you must assign IP addresses to the VLANs of the team that you create. Adapters that have been disabled in either Network Connections or Device Manager cannot be managed by the NIC Teaming Manager and may not be visible to the Manager. Make sure that any affected adapters, teams and VLANs are enabled before making any NIC Teaming configuration changes.
- Do not change a team member's advanced properties (in network, adapter's properties). You must delete the team, change the desired values and recreate the team.
- The NIC Teaming and VLAN Manager supports multi-vendor teams. Each team in a multi-vendor environment must include at least one Emulex adapter and this Emulex adapter has to be the primary adapter of the team.
- Emulex has tested the NIC Teaming and VLAN Manager with Intel (x520) and Broadcom (Netextreme II) adapters.
- NICs shown as members of the same port by OneCommand Manager should not be included on the same team.
- LACP and 802.3ad teams do not support TCP offload. Disable these setting before creating teams.
- On the OCe10102 UCNA, receive-side scaling (RSS) works only on incoming packets that match the MAC address programmed into the NIC port. This limitation applies to secondary members of the Failover, LACP, and 802.3ad team types.
- When creating or modifying teams and VLANs, changes to adapter names may not completely propagate through the system until the system has been restarted. Before the system is restarted, the teams and VLANs will function properly, however some operating system facilities may continue to use the adapter names before the change was made.

- It is possible for the IPv6 configuration information to be retained when a team or VLAN is deleted. If a new team or VLAN is created, it is possible this IPv6 configuration information, such as static IPv6 address, may be used with the new team or VLAN. If this behavior is observed, use the network properties dialog for the team or VLAN to correct the configuration.

Creating a Team

Every team must include at least one Emulex adapter and the primary adapter should be an Emulex adapter.

Caution: Creating a team may take several seconds. Prematurely cancelling this operation may result in the partial creation or deletion of a team or VLAN. Such an act may also lead to future teaming issues or even system instability.

To create and configure a team:

1. From the Start menu, click **All Programs>Emulex>OneCommand Teaming and VLAN Manager** to start the application. The General tab shows information for the host computer (Figure 3-3).
2. Do one of the following to select the Create Team tab:
   - Select the host computer in the discovery-tree.
   - Select the Teams node in the discovery-tree.
   - Select Available Adapters in the discovery-tree.
   - Click  **Create Team** on the toolbar.

The Create Team tab is displayed.

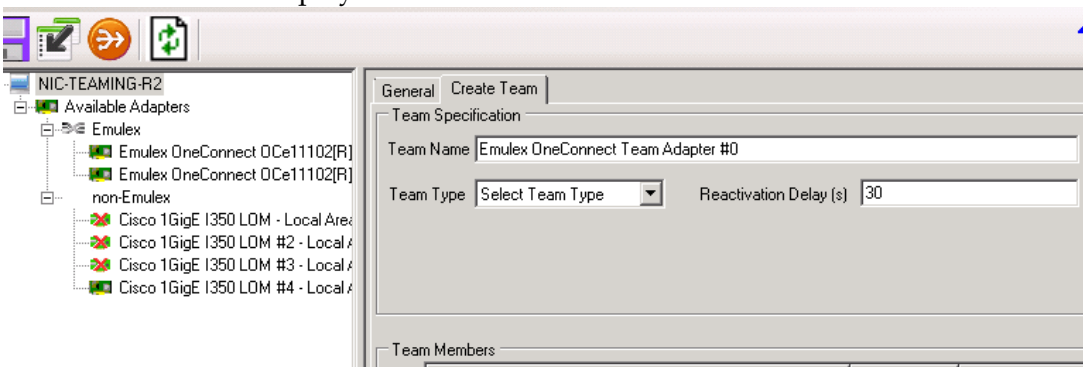

Figure 3-9 Create Team Tab

3. Enter a unique team name using up to 79 characters.

Note: When creating a team, keep in mind that the team name will be prepended to the Device Manager Friendly Name of all adapters included in the team. If the addition of the team name causes the adapter's Friendly Name to exceed 169 character on x64 systems, then event log messages for the adapter may be affected. When these limits are exceeded, the adapter's

GUID is be used in event log messages instead of the adapter's Friendly Name. Exceeding these limits has no other known consequences.

4. Choose a team type. Valid options:
   - Failover – A type of switch-independent teaming. If Failover is selected, the Automatic Failback Enabled check box is available. Check "Automatic Failback Enabled" if you want the traffic to failback to the primary team member when the primary member recovers from a failure. Clear this check box if you want traffic to continue on a secondary adapter. For more information, see "Failover (FO)" on page 10.
   - Load balancing – A type of switch independent teaming. Load balancing enables both transmit and receive load balancing to maintain in-order delivery of frames. For more information, see "Smart Load Balancing" on page 10.
   - LACP– A type of switch-dependent teaming. For more information, see "IEEE 802.3ad and LACP Team Types" on page 12.
   - 802.3ad – A type of switch-dependent teaming. For more information, see "IEEE 802.3ad and LACP Team Types" on page 12.
5. For team types other than failover, select the Load Distributed By list and select from the following:
   - Perceived Port Load – Selects the port with the least traffic load for the session.
   - Destination MAC Address – Performs an XOR on the destination MAC address to determine which port should carry the load.
   - Destination IP Address – Performs an XOR on the destination and source IP address to determine which port should carry the load.
6. When the team type selected is LACP, the "Short Timeout" check box is available. Select this check box to use short timeout for LACP operations. If this check box is not checked, the standard long timeout is used.
7. Change the reactivation delay value, if desired. The reactivation delay is the number of seconds the adapter waits to bring a port back online within a team. The delay ensures that the port is stable and reduces any port jitter that might occur. Setting a reactivation delay value on this tab overrides the default global reactivation delay value for the team.
8. In the discovery-tree, select one or more adapters in the Available Adapter list and click  in the Team Members area of the **Create Team** tab. The adapter is moved from the discovery-tree to the Team Members area. A minimum of two adapters must be selected to create a team of any type. At least one Emulex adapter must be selected, and it must be made the Primary adapter.

   Note: The number of maximum adapters for a team depends upon the team type. The maximum number of adapters per type of team are

   - Failover teams - 3
   - Load balance teams - 8
   - IEEE 802.3ad and LACP - 4
9. Select the primary adapter and create the team.

- The primary adapter is labeled "Marked as Primary" and is at the top of the list in the Team Members area. If this is the adapter that you want to be primary, click **Create Team**.
- To change the primary adapter, select the adapter in the Team Members area and click **Set Primary**. The new primary adapter will display at the top of the adapter list and be marked as primary. Click **Create Team**.

An Operation in Progress message is displayed.

Note: You can change the primary adapter after a team is created. See "Modifying a Team" on page 30.

Note: Use the latest available drivers for third party adapters; otherwise, unpredictable results may occur.

Modifying a Team

1. From the Start menu, click **All Programs>Emulex>OneCommand Teaming and VLAN Manager** to start the application.
2. Select the team in the discovery-tree.
3. Select the **Modify Team** tab.

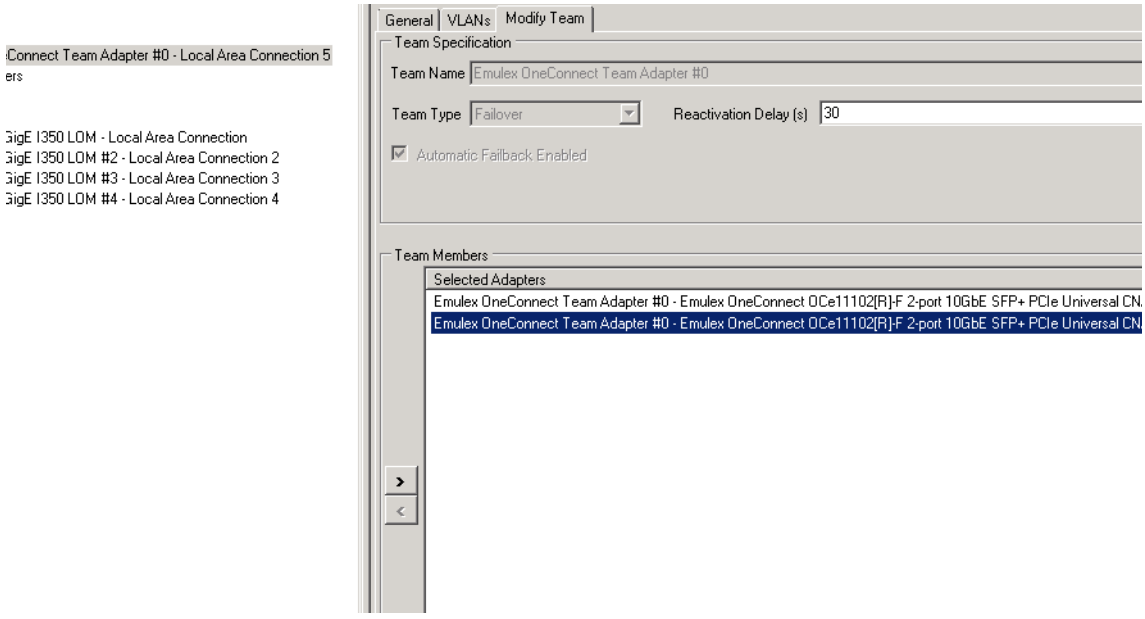

Figure 3-10 Modify Team Tab

4. Make changes to the team:
   - To add a secondary adapter from the discovery-tree, select one or more adapters and click > . If this button is not active, you cannot add the adapter. This could be due to the team type you have selected.
   - To remove an adapter, in the Team Members area, select one or more adapters. The < button is active. Click this button to mark the adapter for

deletion from the team. If this button is not active, the secondary adapter cannot be removed.

- The primary adapter is labeled "primary". To choose a different primary adapter, select the adapter in the Team Members area and click Set Primary. The new primary adapter will be marked as “primary" and the previous primary adapter will be marked as “non-primary".

The Modify Team button is available.

5. Click **Modify Team**. The Confirm Team Modification dialog box is displayed.
6. Click **Yes** on the confirmation dialog box to make the changes. An Operation in Progress status window is displayed.

Removing One or More Teams

To remove a single team:

1. In the discovery-tree, select the team node that you want to remove.
2. On the **General** tab, click **Delete Team**. The Confirm Team Deletion dialog box is displayed.
3. Click **Yes** on the confirmation dialog box to make the changes. An Operation in Progress status window is displayed. Once the removal is complete, the discovery tree is automatically updated to display the latest configuration.

To remove multiple teams:

1. In the discovery-tree, click the Teams tree node.
2. Select one or more teams listed on the General tab.
3. Click **Delete** on the General tab.

Note: A progress indicator displays the status of deletion of each of the selected teams. When all the teams are deleted, click **Close** and the page automatically refreshes.

Changing the General Settings

The default global reactivation delay is the amount of seconds that an adapter must wait to carry traffic before it is allowed to rejoin its team. The reactivation delay defaults to 30 seconds and prevents jittering while the adapter stabilizes.

If you change the default global reactivation delay value using the General Settings dialog box, all new teams that you create will use the new value. Teams created with non-default reactivation delay values are not affected.

Note: Setting a reactivation delay value while creating a team (on the Create Team tab) overrides any default global reactivation delay value set or changed in the General Settings dialog box.

To change the global reactivation delay for future teams:

1. From the menu bar, select **Tools>General Setting**s. The General Settings dialog box is displayed.

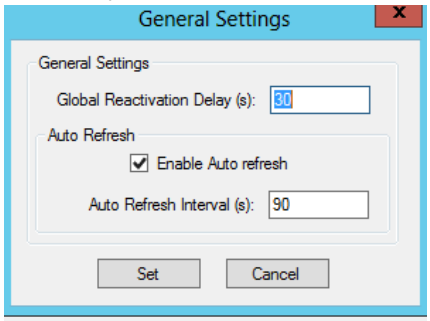

Figure 3-11 General Settings Dialog Box

2. Change the global reactivation delay value. The acceptable range is 1–200.
3. Choose to enable or disable auto-refresh. Clear Enable Auto refresh to disable it. If Auto refresh is selected, the OneCommand NIC Teaming and VLAN Manager refreshes itself. By default, auto-refresh is enabled and set to 90 seconds. The acceptable range is 30–300.
4. Click **Set**.

Replacing a Team Adapter

Note: Adapters that have been disabled in either Network Connections or device Manager cannot be managed by the OneCommand NIC Teaming and VLAN Manager and may not be visible to the OneCommand NIC Teaming and VLAN Manager. Make sure that any affected adapters are enabled before making any NIC Teaming configuration changes.

Note: You should not disable an adapter port that is part of an 802.3ad static team. If you do, I/O will fail because an 802.3ad team is switch dependent. When using 802.3ad static teams, you must disable links by disabling the switch port.

Replacing a Primary Adapter

To remove a team's primary adapter, you must first set a secondary adapter as the primary adapter. Afterwards, you can replace the old primary adapter. Using this method, you avoid having to rebuild the team.

Replacing a malfunctioning primary adapter will cause the team to assume the new adapter's MAC address. To prevent the team's network identity from changing, program the new adapter with the old adapter's MAC address.To change primary and secondary adapters:

1. From the OneCommand NIC Teaming and VLAN Manager window, select the team that you want to modify.
2. Click the **Modify Team** tab.
3. Select the team member that you want to make primary.
4. Click the **Set Primary** button.

To replace a team's primary adapter with one of the same model:

1. Turn off the machine.
2. Replace the adapter.
3. Turn on the machine.
4. Update the ports on the new adapter to use the MAC addresses from the old ports.

To replace a team's primary adapter with one of a different model:

1. Turn off the machine.
2. Replace the adapter.
3. Turn on the machine.
4. Update the ports on the new adapter to use the MAC addresses from the old ports.

Replacing a Secondary Adapter

To replace a secondary adapter with one of the same model:

1. Turn off the machine.
2. Replace the adapter.
3. Turn on the machine.

To replace a secondary adapter with one of a different model:

1. Turn off the machine.
2. Replace the adapter.
3. Turn on the machine.
4. Remove the old adapter from the team.

   Note: If removing the old adapter from the team will result in only one adapter, add the new adapter first, then remove the old adapter.

5. Add the new adapter to the team.

Saving a Configuration

To save a configuration in a text file format:

1. Access the Save As browse dialog box one of these ways:

   - From the toolbar, click **Backup**.
   - From the menu bar, select **Tools>Backup Current Configuration**.
   - With the host computer selected in the discovery-tree, click **Backup** on the **General** tab.

   The Save As browse dialog box is displayed.

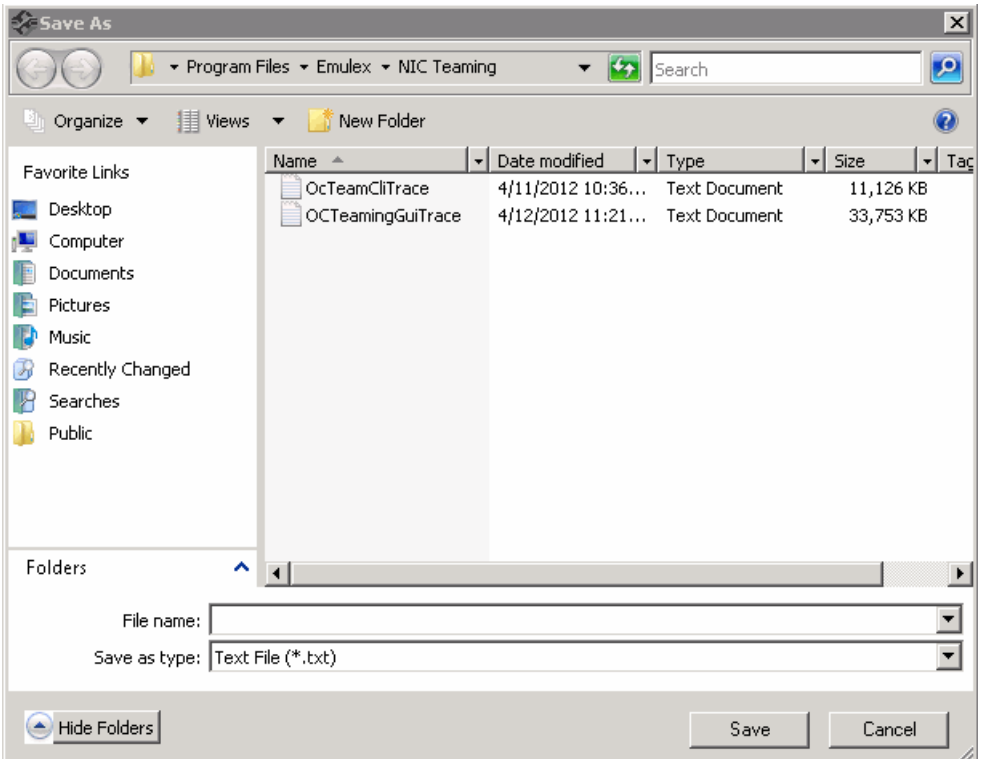

Figure 3-12 Browse Dialog Box to Save a Configuration

2. Use the Save As browse dialog box to specify a location for the configuration and click **Save**. The Backup in Progress status window is displayed. Once the

configuration is saved, a confirmation message is displayed. This message shows the path and file name of the saved configuration. Click **OK** on this message to close it.

Restoring a Configuration

Restores from a saved configuration. Use the browse dialog box to select a saved configuration and click **Open**. A Confirmation Restoration message warns you that the current teaming configuration will be erased. Click **Yes** on the message to proceed.

To restore a configuration from a saved configuration

1. Access the Confirm Restoration dialog box one of these ways:
   - From the toolbar, click  **Restore**.
   - From the menu bar, select **Tools>Restore Current Configuration**.
   - With the host computer selected in the discovery-tree, click **Restore** on the **General** tab.
2. The Confirm Restoration dialog box is displayed. Click **Yes** to proceed. The Open browse dialog box is displayed.

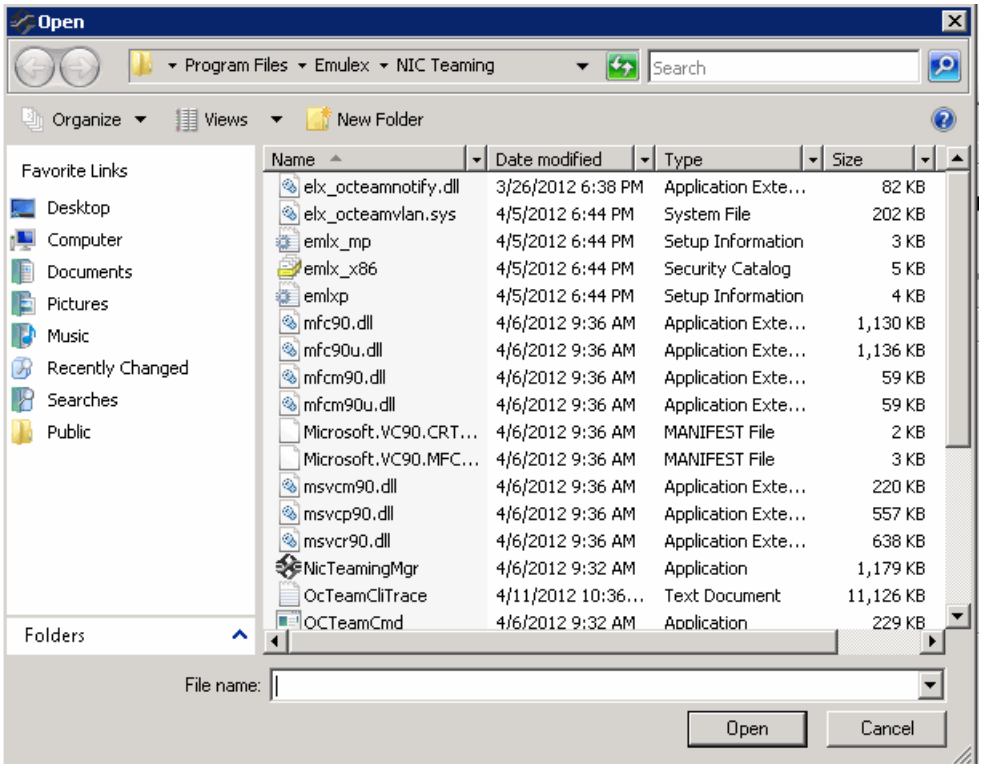

Figure 3-13 Browse Dialog Box to Restore a Configuration

3. Use the Open browse dialog box to locate a configuration and click **Open**.

Configuring a VLAN

Note: The following notes apply to configuring a VLAN for an adapter and team.

- Configuring the VLAN at both the physical and team level is not supported.

- If you use static IP addresses (non-DHCP), you must assign IP addresses to any native VLANs and VLANs that you create.
- VLANs that have been disabled in either Network Connections or device Manager cannot be managed by the OneCommand NIC Teaming and VLAN Manager and may not be visible to the OneCommand NIC Teaming and VLAN Manager. Make sure that any affected VLANs are enabled before making any NIC Teaming configuration changes.
- When the first VLAN is added to a team, you have the option to keep the team's Native VLAN or remove it. The Native VLAN can be added later, if desired. If the Native VLAN is added again, adding additional VLANs will not affect its state.
- When VLANs are created, they are bound to IPv4 and IPv6. It is preferable to have IP addresses assigned automatically using DHCP. If the VLANs are to have statically assigned IP addresses, it is preferable to assign IP addresses to each VLAN as it is created. Without DHCP support, creating a large number of VLANs and then manually assigning IP addresses to them can lead to high CPU utilization and occasional instability while Windows tries to resolve the IP addresses.
- When VLANs are created over an adapter, the adapter is bound to the Emulex driver and the VLANs are bound to IPv4/IPv6. Changing these bindings will cause the VLANs to become non-functional.
- The maximum VLAN count is 48 per team and 48 per system. These limits apply to VLANs that are created by the NIC teaming driver and do not apply to VLANs created by Microsoft Virtual Network Manager in Hyper-v configurations.
- VLANs created over teams containing non-Emulex team members are not supported by Emulex. However this configuration may work if the non-Emulex team members are well-known to your system.

Configuring a VLAN for a Team

To configure a VLAN for a team:

1. From the Start menu click **All Programs>Emulex>OneCommand Teaming and VLAN Manager** to start the application. The General tab is displayed.
2. In the discovery-tree, open up the list of teams. Select the team you want to modify.

3. Select the **VLANs** tab. The VLANs tab is displayed.

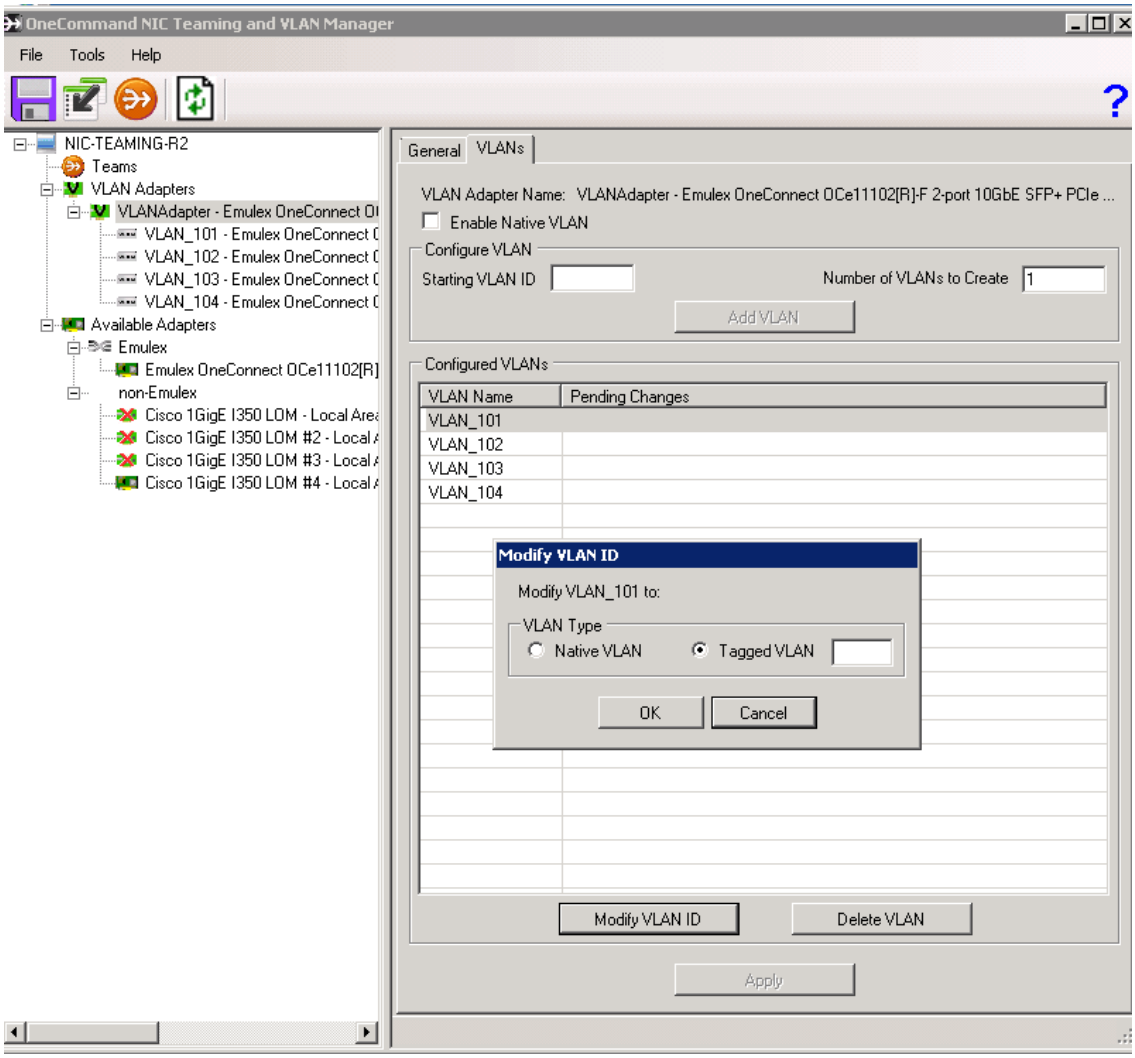

Figure 3-14 VLANs Tab

4. Enter a Starting VLAN ID. Valid tag values are from 1—4094.
5. Enter the number of VLANs to create.
6. Click **Add VLAN** to add the VLAN to the team. You can create up to 48 VLANs for a team. The Configured VLANs area shows the list of VLANs configured for the team.

   The VLAN Name shows the VLAN Name in the format VLAN_<VLAN ID>.
7. Click **Apply**. The VLAN is added to the selected team.

Configuring a VLAN Adapter

To configure a VLAN adapter:

1. From the Start menu click **All Programs>Emulex>OneCommand Teaming and VLAN Manager** to start the application. The General tab is displayed.
2. Select an Emulex adapter from the available adapter list in the discovery-tree.
3. Select the **Create VLAN Adapter** tab. The Create VLAN **Adapter** tab is displayed.

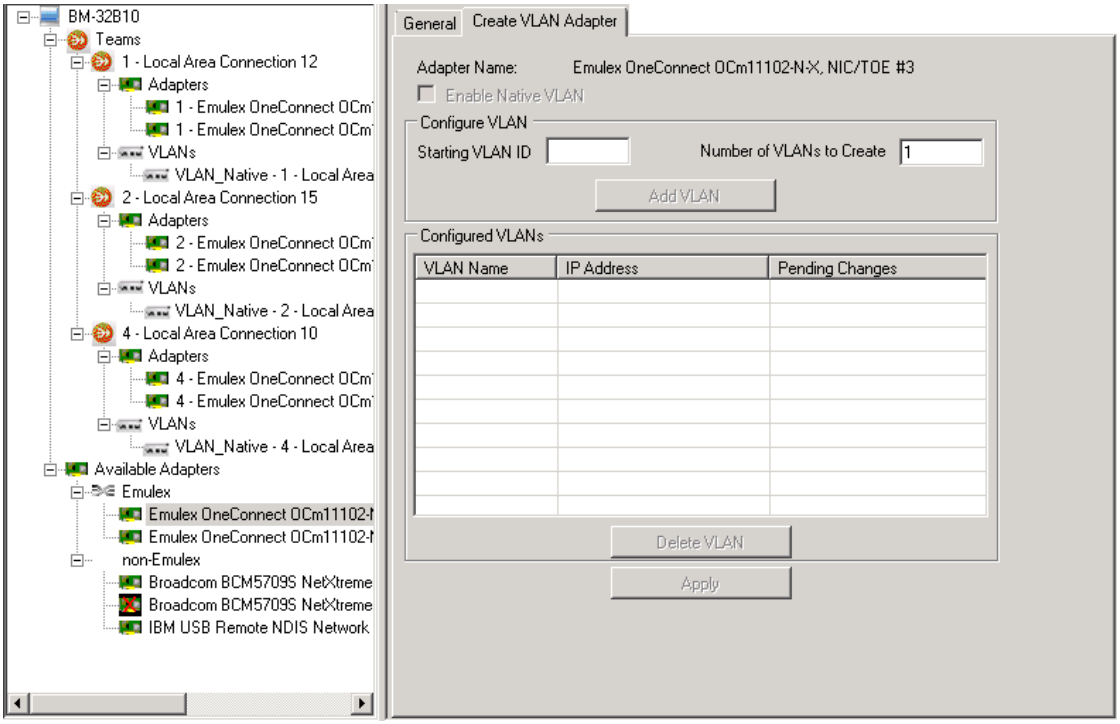

Figure 3-15 Create VLAN Adapter Tab

4. Enter a starting VLAN ID. Valid tag values are from 1—4094. The VLAN Name shows the VLAN Name in the format VLAN_<VLAN ID>.
5. Enter the number of VLANs to create.
6. Click **Add VLAN** to add the VLAN to the adapter. You can create up to 48 VLANs for an adapter. The Configured VLANs area shows the list of VLANs configured for the adapter. The VLAN Name shows the VLAN Name in the format VLAN_<VLAN ID>.
7. Click **Apply**. The VLAN is added to the selected adapter.

Modifying a VLAN ID of a VLAN Adapter

You may want to reprogram the VLAN that is added to a team or VLAN adapter. You can change the VLAN ID without having to delete and recreate the VLAN with a new VLAN ID. The IP Addresses assigned to the VLAN remain attached to the VLAN regardless of the ID change.

Native VLANs

Once a VLAN has been placed over a team or an adapter, you can still access a team or adapter directly, without going through a VLAN, if you desire. This means that the VLAN tag is 0 and this is the native VLAN.

The native VLAN is disabled by default when you create the first VLAN on a team. However, you can specify whether or not to enable or disable the native VLAN.

When all the VLANs on a device are deleted, the native VLAN is automatically enabled in case of a team, and the VLAN adapter becomes a free adapter in case of a VLAN adapter.

You can enable or disable the native VLAN on any team or adapter that already contains VLANs.

To modify VLAN IDs:

1. In the discovery-tree, select the team for which you want to modify the VLAN ID. The General tab is displayed.
2. Select the **VLANs** tab.
3. Select the VLAN in the Configured VLANs area that you want to modify.
4. Click **Add VLAN.** The Modify VLAN ID dialog box is displayed.

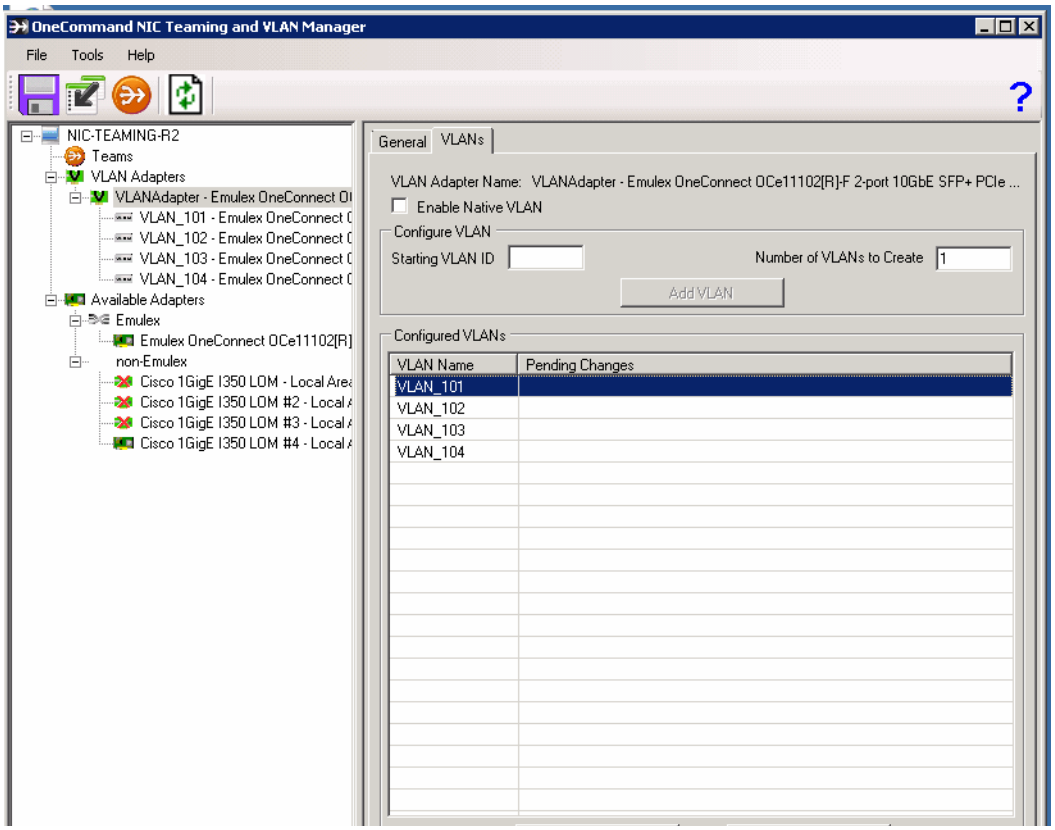

Figure 3-16 Modify VLAN ID Dialog Box

5. Modify the selected VLAN to be a native VLAN (a non-tagged VLAN, this is the d or enter an ID in the Tagged VLAN field.

6. On the Modify VLAN ID dialog box, click **OK**. The changes that you have specified appear in the **Pending Changes** list.
7. Click **Apply**.
8. Click **Yes**. The VLAN list is automatically updated with the changes.

Removing a VLAN during VLAN Configuration

To remove a VLAN (for a team or VLAN adapter, selected in the discovery-tree) during VLAN configuration:

1. Click the **VLANs** tab.
2. Select the VLAN in the Configured VLANs table on the VLANs tab.

   Note: Do not remove a team or VLAN while they are carrying traffic; unpredictable results may occur.

3. Click **Delete VLAN**. The VLAN is marked for deletion.
4. Click **Apply** to delete the VLANs.
5. Click **OK**.

4. Using Teamed Adapters in Hyper-V

Exporting a team to a virtual machine allows for isolation of virtual machine traffic and allows the virtual machine to be moved to other machines without having to modify the virtual machine.

Note: The use of VLANs is not supported under Hyper-V. In Hyper-V environments only NIC Teaming's Native VLAN should be used. To provide VLANs to Virtual Machines (VMs), define them within the Hyper-V Manager and within each adapter's driver.

Note: The following notes apply to using teamed adapters in Hyper-V.

- NIC Teaming may be used in the Hyper-V host. Its use within VMs is not supported.
- Use of the Hyper-V Virtual Network Manager is recommended for using VLANs withe virtual machines. Virtual networks should be created using the adapter instance or the Native VLAN instance of a team and the VLAN tag should be added when adding a virtual machine to the virtual network.
- Hyper-V must be installed to use Emulex teamed adapters in Hyper-V.
- TCP Offload does not occur in virtual machines.
- When configuring a Smart Load Balancing (SLB) team with Hyper-V, the SLB team requires a static IP address assigned in the network connection properties. All virtual machines that use this SLB team type will also be required to use static IP addresses.
- DHCP is not supported in an SLB team running in Hyper-V mode.
- On the OCe10102 UCNA for Hyper-V virtual machines that use the Failover, LACP and 802.3ad team types, both the primary and secondary adapters do not have RSS support. The OCe11102 UCNA does not have this limitation and is fully supported.

Note: For complete instructions on creating virtual networks, see the appropriate Microsoft Hyper-V documentation.

Deleting Hyper-V Teams

When deleting a team that was configured in a virtual machine, you must complete the following procedures:

1. Use the Virtual Machine Settings to remove the adapter from the virtual machine.
2. Use Hyper-V Manager to remove the team from the Virtual Network Manager.

   Note: For complete instructions on removing the adapter from the virtual machine and removing the team from the Virtual Network Manager, see the appropriate Microsoft Hyper-V documentation.

3. Use the OneConnect NIC Teaming and VLAN Manager to remove the team. See "Configuring a VLAN" on page 36.

5. OneCommand NIC Teaming Manager Command Line Interface

Introduction

The OneCommand™ NIC Teaming Manager Command Line Interface (OCTeamCmd) is a companion to the OneCommand NIC Teaming and VLAN Manager. Use the OCTeamCmd in scripted operations from within shell scripts or batch files.

Each time you run this application from the command line, a single operation is performed. The first parameter of this command is the requested operation. When the specified operation is completed, the command prompt is displayed. Some of the OCTeamCmd commands require one or more additional parameters that specify the nature of the command.

When creating or modifying teams and VLANs, changes to adapter names may not completely propagate through the system until the system has been restarted. Before the systems is restarted, the teams and VLANs will function properly, however some operating system facilities may continue to use the adapter names before the change was made.

Note: Do not configure VLANs on adapters used with NIC teaming.

Note: On Server Core systems, utilities such as SCONFIG and SYSTEMINFO identify a network object with the Device Manager friendly name the object had at boot time or when the object was created, whichever is most recent. As a result, newly created teams and VLANs are identified generically until the system is rebooted. Until a reboot, these utilities do not identify teams with their team names nor do these utilities identify VLANs with their VLAN IDs. Likewise, when deleting teams or removing adapters from teams, these utilities continue to show such an adapter with its team member name until a reboot occurs. The OCTeamCmd does show the correct name, even though these Server Core utilities do not. Rebooting is not necessary for proper system operation. However, if you manually assign IP addresses to teams and VLANs, you may want to reboot as the IP address assignment is easier when the network objects are properly identified.

Adapter Aliases and Team Identification

Adapters are identified within Windows by using the adapter name.

The OCTeamCmd also uses aliases to identify physical adapters. Adapter aliases are assigned by the OCTeamCmd as adapters are discovered and take the form of “nicX” where “X” is a unique integer. Adapter aliases, once assigned, exist for as long as the adapter's GUID does not change. Any events that cause Windows to treat an existing adapter as if it is newly installed, causes a new alias to be assigned to that adapter the next time a OCTeamCmd command is run.

Network Connection Names

Windows assigns each adapter, team and VLAN a Network Connection Name. In most versions of Windows the name defaults to the form of "Local Area Connection N".

To view the Network Connection Name from the desktop:

1. Select: **All Programs>My Network Places**.
2. Right-click the adapter and click **Properties**. The Network Connection Name is labeled by the operating system in a format similar to Local Area Connection #N.
3. You can rename these network connections with the tools provided by the operating system. You can also use the Network Connection Name as an alias when identifying adapters or teams in OCTeamCmd commands. If the name contains spaces, enclose the entire name in double quotes.

   Note: Network Connection Names are not stored by the OCTeamCmd. They are maintained by Windows.

Syntax Rules

- Key words – Key words determine which command to run, but do not specify any command parameters. Keywords are shown in plain text.
- Mandatory items – Angle brackets represent mandatory, but variable items. For example, <filename> is a place in a command where you must supply a filename.
- Optional items – Curly brackets represent optional items. For example, "octeamcmd help {command name}" shows that the help command can accept a command name as an optional parameter.
- List of choices – If a command parameter may be one of several items, those items are separated by a vertical bar "|". For example, "blue | green | red" indicates that you may use "blue", "green" or "red". When selection from a list is mandatory, the entire list is enclosed in angle brackets. A list of optional items would be enclosed in curly brackets.
- Team-id – Where a team name is placed in a command.
- Adapter-id – Where an adapter alias is placed in a command.
- Adapter-list – Where a list of adapter aliases are placed in a command. Aliases in a list are separated by one or more spaces.
- Network Manager – Also known as the Network Connection Name.
- Hash – Shows where a hashing algorithm is specified in a command. For a list of supported hashing algorithms, see Table 5-2, Hash Algorithms, on page 62.
- VLAN-id – This number represents the VLAN tag.
- VLAN alias – The name that represents a VLAN that is automatically generated when a VLAN is created. The name takes the form of "VLAN_n" where n is the VLAN's VLAN-id.

Error Codes

Table 5-1 OneCommand NIC Teaming Driver and Command Line Utility Error Codes

Hexadecimal Error Code	Signed Decimal Value	Unsigned Decimal Value	Description
0x00000000		0	No errors.
0x8F000001	-1895825407	2399141889	The OneCommand NIC Teaming and VLAN Manager is running. The OneCommand NIC Teaming and VLAN Manager and the OCTeamCmd utility cannot run at the same time.
0x8F000002	-1895825406	2399141890	The OneCommand NIC Teaming and VLAN Manager Uninstaller is running. The OneCommand NIC Teaming and VLAN Manager Uninstaller and the OCTeamCmd utility cannot run at the same time.
0x8F000003	-1895825405	2399141891	The OneCommand NIC Teaming and VLAN Manager Update utility is running. The OneCommand NIC Teaming and VLAN Manager Update utility and the OCTeamCmd utility cannot run at the same time.
0x8F000004	-1895825404	2399141892	Another copy of the OCTeamCmd utility is running, only one can run at a time.
0x8F000005	-1895825403	2399141893	Initialization of Windows Common Controls failed.
0x8F000006	-1895825402	2399141894	The OneCommand NIC Teaming and VLAN Manager is not installed. Presence of the driver is required for OCTeamCmd utility operation.
0x8F000007	-1895825401	2399141895	A file with this name already exists. Backup files must have unique names.
0x8F000008	-1895825400	2399141896	The file cannot be found.
0x8F000009	-1895825399	2399141897	There are too many arguments specified on the command line.
0x8F00000A	-1895825398	2399141898	The command is not recognized.
0x8F00000B	-1895825397	2399141899	The specified directory cannot be found.
0x8F00000C	-1895825396	2399141900	Windows does not allow the file to open.
0x8F00000D	-1895825395	2399141901	The backup file has been corrupted.
0x8F00000E	-1895825394	2399141902	The number of NICs has changed since the backup was made.
0x8F00000F	-1895825393	2399141903	A different and unexpected NIC is found in the PCI slot.
0x8F000010	-1895825392	2399141904	A PCI slot does not contain the expected NIC.
0x8F000011	-1895825391	2399141905	Backup file creation failed.
0x8F000012	-1895825390	2399141906	Restoration failed.

Table 5-1 OneCommand NIC Teaming Driver and Command Line Utility Error Codes (Continued)

Hexadecimal Error Code	Signed Decimal Value	Unsigned Decimal Value	Description
0x8F000013	-1895825389	2399141907	No teams exist on the system.
0x8F000014	-1895825388	2399141908	There is an invalid number of command arguments.
0x8F000015	-1895825387	2399141909	Required data is not found on the command line.
0x8F000016	-1895825386	2399141910	The team type is not provided.
0x8F000017	-1895825385	2399141911	An invalid hash value is specified.
0x8F000018	-1895825384	2399141912	The provided number of members did not fall in the required range for the requested team type.
0x8F000019	-1895825383	2399141913	The adapter ID is invalid.
0x8F00001A	-1895825382	2399141914	The team-ID is either missing or invalid.
0x8F00001B	-1895825381	2399141915	The team-ID exceeds the maximum string length of 39 characters.
0x8F00001C	-1895825380	2399141916	The team-ID/adapter-ID is invalid or missing.
0x8F00001D	-1895825379	2399141917	The team-ID/adapter-ID is not found.
0x8F00001E	-1895825378	2399141918	The VLAN value or ID is invalid.
0x8F00001F	-1895825377	2399141919	The hash value may be invalid or the internal structure may need to be updated.
0x8F000020	-1895825376	2399141920	The team type may be invalid or the internal structure may need to be updated.
0x8F000021	-1895825375	2399141921	Failure to retrieve the list of free adapters on the system.
0x8F000022	-1895825374	2399141922	Failure to retrieve the list of bound adapters on the system.
0x8F000023	-1895825373	2399141923	Failed to retrieve the adapter alias list from the system.
0x8F000024	-1895825372	2399141924	Failed to create alias for one of the adapters.
0x8F000025	-1895825371	2399141925	Failed to create a team alias.
0x8F000026	-1895825370	2399141926	Failed to retrieve a team alias list.
0x8F000027	-1895825369	2399141927	Failed to read alias information from the registry.
0x8F000028	-1895825368	2399141928	The team name is not unique. There is already a team or adapter with this name or alias.
0x8F000029	-1895825367	2399141929	<Code Error> The primary team is not set by the calling function.
0x8F00002A	-1895825366	2399141930	One of the team members does not exist or does not have link.

Table 5-1 OneCommand NIC Teaming Driver and Command Line Utility Error Codes (Continued)

Hexadecimal Error Code	Signed Decimal Value	Unsigned Decimal Value	Description
0x8F00002B	-1895825365	2399141931	The primary adapter is not an Emulex adapter. A non-Emulex adapter was set as the primary adapter.
0x8F00002C	-1895825364	2399141932	The adapter's link is not enabled by the calling function.
0x8F00002D	-1895825363	2399141933	One of the team members is already bound and is not available for use by another team.
0x8F00002E	-1895825362	2399141934	The primary adapter is not set to active by the calling function.
0x8F00002F	-1895825361	2399141935	The secondary adapter in failover mode is not set to passive by the calling function.
0x8F000030	-1895825360	2399141936	The wrong number of members is set by the calling function.
0x8F000031	-1895825359	2399141937	The failover type provided to the create command is unknown.
0x8F000032	-1895825358	2399141938	Unable to determine whether an adapter is enabled or disabled.
0x8F000033	-1895825357	2399141939	An adapter is disabled.
0x8F000034	-1895825356	2399141940	An internal error is detected. Check the debug log.
0x8F000035	-1895825355	2399141941	A timeout occurred while waiting for Windows to delete a team. The deletion may have completed, but it did not complete within five minutes.
0x8F000036	-1895825354	2399141942	A timeout occurred while waiting for Windows to delete a VLAN. The deletion may have completed, but it did not complete within five minutes.
0x8F000037	-1895825353	2399141943	A reboot is needed for just made changes to take effect.
0x8F000038	-1895825352	2399141944	A reboot request is pending. It is not safe to make NIC teaming configuration changes while the Windows operating system is in this state.
0x8F000039	-1895825351	2399141945	The OneCommand NIC Teaming and VLAN Manager cannot be uninstalled while teams or VLANs are defined. The teams or VLANs must be deleted first.
0x8F00003A	-1895825350	2399141946	The team name is not unique.
0x8F00003B	-1895825349	2399141947	The command line interface cannot be found.
0x8F00003C	-1895825348	2399141948	The application is invoked without administrator privileges.

Table 5-1 OneCommand NIC Teaming Driver and Command Line Utility Error Codes (Continued)

Hexadecimal Error Code	Signed Decimal Value	Unsigned Decimal Value	Description
0x8F00003D	-1895825347	2399141949	The number of teams configured is already at the maximum allowed.
0x8F00003E	-1895825346	2399141950	The number of VLANs configured is already at the maximum allowed.
0x8F00003F	-1895825345	2399141951	A value on the command line cannot be converted to a numeric value. Verify that values are correct.
0x8F000040	-1895825344	2399141952	VLANs cannot be assigned to this adapter because the adapter is a team member, disabled or cannot be found.
0x8F000041	-1895825343	2399141953	One or more of the VLAN IDs are already in use by this adapter or team.
0x8F000042	-1895825342	2399141954	The adapter or team has no VLANs assigned to it.
0x8F000043	-1895825341	2399141955	No VLAN bound adapters are defined.
0x8F000044	-1895825340	2399141956	VLANs cannot be added to team members.
0x8F000045	-1895825339	2399141957	An error occurred during application initialization.
0x8F000046	-1895825338	2399141958	An error occurred while cleaning the registry.
0x8F000047	-1895825337	2399141959	The adapter ID specified is invalid or already bound.
0x8F000048	-1895825336	2399141960	There are no teams or VLANs defined, therefore a backup of the configuration cannot be made.
0x8F000049	-1895825335	2399141961	An application has locked Windows networking, therefore teaming configuration changes cannot be made.
0x8F00004A	-1895825334	2399141962	Exceeds the number of VLANs allowed.
0x8F00004B	-1895825333	2399141963	Failed to find the alias for the required adapter.
0x8F00004C	-1895825332	2399141964	The same adapter was specified multiple times on the command line.
0x8F00004D	-1895825331	2399141965	Reboot the system after creating a failover team unless it is the first one on the system.
0x8F00004E	-1895825330	2399141966	Windows reports that some device configuration activity (install, uninstall, enable, disable) is in progress. NIC Teaming configuration changes cannot be made until that activity has completed.
0x8F00004F	-1895825329	2399141967	A timeout occurred while waiting for Windows to complete the creation of a team. The creation may have happened, but it did not happen within 5 minutes.

Table 5-1 OneCommand NIC Teaming Driver and Command Line Utility Error Codes (Continued)

Hexadecimal Error Code	Signed Decimal Value	Unsigned Decimal Value	Description
0x8F000050	-1895825328	2399141968	A timeout occurred while waiting for Windows to complete the creation of a VLAN. The creation may have happened, but it did not happen within 5 minutes.
0x8F000051	-18958225327	2399141969	An adapter specified in a backup file could not be found on the system.
0x8F000052	-18958225326	2399141970	A team member is disabled. Backups cannot be made while members are disabled.
0x8F000053	-1895825325	2399141971	The maximum number of VLANs on a system has been reached.
0x8F000054	-1895825324	2399141972	The adapter you are attempting to bind to is not an Emulex adapter.
0x8F000055	-1895825323	2399141973	The adapter or team provided was not found. The team name is not valid.
0x8F000056	-1895825322	2399141974	Failed to obtain a device's MAC address.
0x8F000057	-1895825321	2399141975	Attempting to delete more VLANs than are supported on any team or adapter.
0x8F000058	-1895825320	2399141976	Only one non-Emulex adapter is allowed in a failover team.
0x8F000059	-1895825319	2399141977	Failed to get the handle to the NIC Teaming management DLL.
0x8F00005A	-1895825318	2399141978	Invalid value for fbdelay.
0x8F00005B	-1895825317	2399141979	Failed to enable a native VLAN during a VLAN creation.
0x8F00005C	-1895825316	2399141980	An enable or disable operation not permitted on an unbound adapter.
0x8F00005D	-1895825315	2399141981	Attempting to disable the native VLAN on an adapter with native VLAN disabled.
0x8F00005E	-1895825314	2399141982	Attempting to enable the native VLAN on an adapter with native VLAN enabled.
0x8F00005F	-1895825313	2399141983	Attempting to set the native VLAN state on a team member.
0x8F000060	-1895825312	2399141984	The VLAN was created but a reboot is required before the native VLAN can be enabled.
0x8F000061	-1895825311	2399141985	Invalid value for the state parameter.
0x8F000062	-1895825310	2399141986	Invalid LACP timeout type while creating a team.
0x8F000063	-1895825309	2399141987	Cannot get the unavailable adapters list.
0x8F000064	-1895825308	2399141988	Unable to fetch the adapter list.

Table 5-1 OneCommand NIC Teaming Driver and Command Line Utility Error Codes (Continued)

Hexadecimal Error Code	Signed Decimal Value	Unsigned Decimal Value	Description
0x8F000065	-1895825307	2399141989	The adapter is not bound to team or the adapter is not a bound adapter.
0x8F000066	-1895825306	2399141990	The adapter is not a member of a team or the adapter is not a member of the team and it set as the primary member.
0x8F000067	-1895825305	2399141991	The adapter cannot be deleted as it is the primary adapter.
0x8F000068	-1895825304	2399141992	You attempted to add more adapters than the maximum number supported.
0x8F000069	-1895825303	2399141993	The specified adapter is already bound to an Emulex driver.
0x8F00006A	-1895825302	2399141994	The specified adapter is not bound to an Emulex driver.
0x8F00006B	-1895825301	2399141995	The specified adapter is part of a team or VLAN.
0x8F00006C	-1895825300	2399141996	You attempted to remove a NVLAN from a team that does not have any VLANS.
0x8F00006D	-1895825299	2399141997	Failed to set the native VLAN state for the specified device.
0x8F00006E	-1895825298	2399141998	Failed to retrieve the native VLAN for the specified device.
0x8F00006F	-1895825297	2399141999	Failed to retrieve the VLAN list to determine the need for a native VLAN to be created.
0x8F000070	-1895825296	2399142000	Failed to delete the native VLAN on the device.
0x8F000071	-1895825295	2399142001	An attempt to update the registry from a previous installation failed.
0x8F000072	-1895825294	2399142002	Failed to open the NIC Teaming package registry key.
0x8F000073	-1895825293	2399142003	No help is available for the specified command.
0x8F000074	-1895825292	2399142004	The team name conflicts with an alias name.
0x8F000075	-1895825291	2399142005	The team name conflicts with a NIC teaming command.
0x8F000076	-1895825290	2399142006	The team name conflicts with an adapter description (adapter name or friendly name).
0x8F000077	-1895825289	2399142007	The team name may conflict with an adapter alias.
0x8F000078	-1895825288	2399142008	No active adapter on which to failover.
0x8F000079	-1895825287	2399142009	The adapter cannot be bound to the Emulex Teaming driver.

Table 5-1 OneCommand NIC Teaming Driver and Command Line Utility Error Codes (Continued)

Hexadecimal Error Code	Signed Decimal Value	Unsigned Decimal Value	Description
0x8F00007A	-1895825286	2399142010	Device Manager reports that the team is disabled or cannot be found.
0x8F00007B	-1895825285	2399142011	The driver failed to start.
0x8F00007C	-1895825286	2399142012	Unable to obtain a handle to NDIS.
0x8F00007D	-1895825287	2399142013	Timed out waiting for driver to bind to adapter.
0x8F00007E	-1895825288	2399142014	The adapter or team is disabled or missing.
0x8F00007F	-1895825289	2399142015	The specified VLAN interface is disabled or missing.
0x8F000080	-1895825290	2399142016	The team or VLAN adapter already has a VLAN with the specified new VLAN ID.
0x8F000081	-1895825291	2399142017	The team or VLAN adapter doesn't have the VLAN with the specified old VLAN ID.
0x8F000082	-1895825292	2399142018	The old and the new VLAN IDs are the same.
0x8F000083	-1895825293	2399142019	An invalid VLAN ID was specified for VLAN modification.
0x8F000084	-1895825294	2399142020	VLAN adapters cannot have just the Native VLAN.
0x8F000085	-1895825295	2399142021	An adapter which is already a primary adapter for a particular team is re-specified as primary.
0x8F000086	-1895825296	2399142022	MTU mismatch between primary and secondary adapters.
0x8F000087	-1895825297	2399142023	When a VLAN is added to a team which does not have a Native VLAN and the `keepnvlan` parameter has been specified.
0x8F000088	-1895825298	2399142024	The team name specified contains an unsupported character.

The Command Reference

Help

Syntax

`OCTeamCmd.exe help {`*`command`*`}`

Parameters

`command` An optional parameter that specifies the name of the CLI command. Use this argument to show help for a specific command.

Description

The OCTeamCmd.exe help command without any parameters or with the command line options of "help", "/h" or "/?" lists the utility's version and all OCTeamCmd commands.

Example of Help With No Optional Command

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe help
OCTeamCMD: version  <version number>
Usage:  octeamcmd <command> <parameters>
   Help commands:
      /h - displays this text
      /? - displays this text
      ? - displays this text
      help - displays this text
      help <command> - displays help for the requested command
   Backup/Restore Commands:
      backup <filename> - creates a file containing the current
      configuration
      restore <filename> - replaces the current configuration with th
      one in the file
   Show Commands:
      show - displays the number of teams, VLAN bound adapters and free
      adapters
      show <team-id | adapter-id | network-connection-name> <vlan_id>
      - displays detailed information about an adapter, team or VLAN
      show aliases - displays each adapter's alias, Network Connection
      Manager's device name, and Device Manager's name
      show freeadapters - displays a listing of the adapters that are
      not assigned to any teams and do not have VLANs assigned
      show reactdelay - Displays the default reactivation delay that
      will be used when creating teams.  The delay value is shown in
      seconds.
      show teams - displays a listing of the current teams and their
      details
      show versions - displays the versions of the various components
      show vlandadapters - displays a listing of the VLAN bound
      adapters and the VLANS assigned to them
      show vlans <team-id | adapter-id> - displays the assigned and
      available VLAND ids for a team or an adapter
   Team Management Commands:
```

```
    create team <team type> <team name> <adapter list> - creates a
    team
    delete team <team-id> - removes a team from the system
    add adapter <team-id> <adapter-id> - adds an adapter to an
    existing team
    delete adapter <team-id> <adapter-id> - deletes an adapter from
    an existing team
    set reactdelay <delay-value> - sets the default reactivation
    delay
    set reactdelay <delay-value> <team-id> - sets reactivation delay
    for a team
    set nvlan <team-id ¦ adapter-id> <enabled ¦ disabled> - sets
    native VLAN on a VLAN bound team or adapter
    set primary <team-id> <adapter-id> –sets the specified adapter as
    the primary member of the team
    failover <team-id> - causes the specified failover team to change
    which adapter is the active adapter.
  VLAN Management Commands:
    add vlan <team-id ¦ adapter-id> <vlan-id> <number> - adds one or
    more VLANs to a team or an adapter
    delete vlan <team-id ¦ adapter-id> <vlan-id> <number>> ¦ <vlan
    alias> > - removes one or more VLANs to a team or an adapter
    modify vlan <team-id ¦ adapter-id> <old-id> <new-id>- Modifies
    the VLAN ID of the specified team or adapter.
```

Example of Help With an Optional Command

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe help backup

  Usage: octeamcmd backup <filename>
  Creates a backup of the current NIC Teaming configuration in the
  specified file. The specified file cannot already exist.  The file
  specification can include a directory path in addition to the
  filename. If no directory path is specified, the backup file will be
  placed in the current working directory. Any specified directory
  path must exist and must be absolute or relative to the current
  working directory.  If either the directory path name or the
  filename contains spaces, then the entire file specification must be
  enclosed in double quotes.
```

Backing Up the NIC Teaming Configuration

Syntax

```
OCTeamCmd.exe backup <filename>
```

Parameters

`filename` The name of the backup file that is created.

Description

This command stores a backup of the current NIC teaming configuration in the specified file. If the specified file exists, the command returns an error. You can include a directory path in addition to the filename. If no directory path is specified, the backup file is placed in the current working directory. Any directory path that you specify must exist and must be absolute or relative to the current working directory. If the directory path name or the file name contains spaces, then you must enclose the entire file specification in quotes or double quotes.

In addition to the configuration information, the server name of the machine that created the backup and the list of NIC adapters present are included in the backup data. Backup files are saved as simple text files.

Note: Backup files should not be edited or altered.

Use the backup option after a teaming configuration is complete or has changed. Use the restore option when you want to:

- Replicate a server
- Rebuild a server
- Replace a failed adapter
- Change a current configuration to a previous one

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe backup backup.txt
Configuration backed up to file: backup.txt
```

Restoring the NIC Teaming Configuration

Syntax

```
OCTeamCmd.exe restore <filename>
```

Parameters

`filename` The NIC Teaming and VLAN configuration is restored from this file that was created using the backup option.

Description

This command replaces current NIC teaming configuration with the configuration found in the specified backup file. By replacing the current NIC teaming configuration with a backed up version, you can:

- Undo changes to the NIC configuration that you no longer want.
- Facilitate disaster recovery by restoring a NIC teaming configuration after reloading an operating system.
- Duplicate NIC teaming configurations on identical servers.

Note: The Restore command does not restore assigned IP addresses.

To restore the NIC teaming configuration on the same or a duplicated server, the server's current physical NIC configuration must be identical to the NIC configuration in the backup file. If this condition is violated, the restoration is terminated.

The file specification can include a directory path in addition to the filename. If you do not specify a directory path, the backup file is assumed to be located in the current working directory. Any directory path that you specify must be absolute or relative to the current working directory. If the directory path name or the file name contains spaces, then you must enclose the entire file specification in quotes or double quotes.

Note: When restoring a NIC Teaming configuration, the system must have the same adapter models in the same PCI slots as the backed up system.

Note: When using the Restore command on Hyper-V systems, you must first delete any existing Hyper-V virtual adapters that represent teams or VLANs. See “Deleting Hyper-V Teams” on page 42 for more information. Once the restore process is complete, you can re-create the virtual adapters.

Once the restore operation is complete, a restore report is generated.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe restore backup.txt
The NIC Teaming and VLAN configuration has been restored from file
backup.txt created 1/20/2012 1:49:36 PM. Please check c:\Program
Files\Emulex\NIC Teaming\RestoreReport_20120120-135023.txt for more
details.
```

Showing NIC Teaming and VLAN Configurations

Syntax

```
OCTeamCmd.exe show
```

Parameters

None.

Description

This command shows a summary of the overall NIC teaming and VLAN configurations.

Note: Network adapters are considered "bound" when they are part of the network team or VLAN adapter. Adapters that are not part of your network team or not part of a VLAN adapter are considered "unbound".

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe show

Number of teams: 0
VLAN Bound Adapters: 0
Available Adapters: 6
```

Showing Aliases

Syntax

```
OCTeamCmd.exe show aliases
```

Parameters

None.

Description

This command shows each adapters' alias, device manager name and network connection device name. The aliases that are returned are used with CLI commands that use "adapter-id" as a parameter.

Note: Network adapters are considered "bound" when they are part of the network team or VLAN adapter. Adapters that are not part of your network team or not part of a VLAN adapter are considered "unbound".

Example

```
Alias:  nic1 (unbound)
  Device Manager Name: <AdapterName> #1
```

```
  Network Connection Name: J_ETH3
Alias:  nic2 (unbound)
  Device Manager Name: <AdapterName> #2
  Network Connection Name: J_ETH1
Alias:  nic3 (unbound)
  Device Manager Name: <AdapterName> #3
  Network Connection Name: J_ETH2
Alias:  nic4 (unbound)
  Device Manager Name: <AdapterName> #4
  Network Connection Name: J_ETH4
Alias:  nic5 (unbound)
  Device Manager Name: Emulex OneConnect OCe11102[R]-I 2-port 10GbE SFP+ PCIe iS
CSI CNA
  Network Connection Name: SLOT 2
Alias:  nic6 (unbound)
  Device Manager Name: Emulex OneConnect OCe11102[R]-I 2-port 10GbE SFP+ PCIe iS
CSI CNA #2
  Network Connection Name: SLOT 2 2
```

Showing Teams

Note: If team members have different MTU sizes, a warning will appear. The MTU warning will not affect the creation of the team.

Syntax

```
OCTeamCmd.exe show teams
```

Parameters

None.

Description

This command lists all teams including their team type, team members and assigned VLANs. Teams are identified using the team name and network manager (network connection name). If you get a warning about differing MTU sizes, your team is still created. However, it is strongly recommended that you delete the team, correct the MTU disparity, and then recreate the team.

Example

```
C:\Program Files\Emulex\NIC Teaming>OCTeamCmd.exe show teams

Device Manager Name: myteam
Network Connection Name: Ethernet 9
Connection Status: connected
Team type: Failover                         Automatic Failback: enabled
Reactivation delay: 30 seconds              MTU: 1500
Link Speed: 10.0 Gbps
```

```
TOE: disabled
Members:
  Emulex OneConnect OCe11102-N-X, NIC/TOE - Ethernet 3 (Primary)
        MTU: 1500
  Emulex OneConnect OCe11102-N-X, NIC/TOE #2 - Ethernet 4 (Secondary)
        MTU: 1500
VLANs:
  VLAN_Native
    IPV4: 172.20.205.101
    IPV6: fe80::ada4:acb8:46d8:f4e8%71
    IPV6: c900:172:20:204:ada4:acb8:46d8:f4e8
    Packet Sent: 318              Packets Received: 18219
```

Showing VLAN Adapters

Syntax

```
OCTeamCmd.exe show vlanadapters
```

Parameters

None.

Description

This command shows all VLAN bound adapters and the VLANs assigned to them. Adapters are identified using their name, network manager (network connection name) and alias.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe show vlanadapters
Alias: nic5
Device Manager Name: VLANAdapter - Emulex OneConnect OCe11102[R]-I
2-port 10GbE SFP+ PCIe iSCSI CNA
Network Conn. Device Name: SLOT 2
Connection Status: connected
Adapter type: VLAN Bound
MAC Address: 00:00:C9:AD:AD:C4              Link Speed: 10.0 Gpbs
Packet Sent: 4578                           Packets Received: 295851
VLANs:
   VLAN_100
   1PV4: 169.254.132.28
   iPV6: fe80::5d5d:e07d:a9ae:841c
   Packet Sent: 126             Packets Received: 0
   VLAN_101
   IPV4: 172.30.101.179
```

```
   IPV6: fe80::4c32:804c:90c6:2754
   IPV6: c900:172:30:101:4c32:804c:90c6:2754
Packet Sent: 237              Packets Received: 42
```

Showing Free Adapters

Syntax

```
OCTeamCmd.exe show freeadapters
```

Parameters

None.

Description

This command shows a listing of adapters that are not assigned to a team and do not have any assigned VLANs. Adapters are identified using their name, network manager (network connection name) and alias.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe show freeadapters
Alias:  nic8
   Device Manager Name: Emulex OneConnect OCe11102[R]-I 2-port 10GbE
   SFP+ PCIe iSCSI CNA
   Network Connection Name: Local Area Connection
   Connection Status: connected
```

Showing Team or Adapter Details

Syntax

show <*team-id* |*adapter-id* | *network-connection-name*> {*vlan-id*}

Parameters

`team-id`	Team name.
`adapter-id`	Adapter alias assigned by OCTeamCMD.
`network-connection-name`	This name is not stored by OCTeamCMD. This name is maintained by Windows.
`vlan-id`	An optional parameter that specifies the number used as the VLAN tag.

Description

This command shows details about a team or an adapter. Optionally, to show information about a VLAN, you must first specify an adapter or team, and then specify the VLAN ID. You may use a numeric value or a string to identify the VLAN.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe show "SLOT 2"
Device Manager Name: Emulex OneConnect OCe11102[R]-I 2-port 10GbE SFP+
PCIe iSCSI CNA
Network Conn. Device Name: SLOT 2
Connection Status: connected
IPv4: 172.20.204.114
IPv6: fe80::40fa:fb7b:777e:100f
Adapter type: Adapter Unbound
MAC Address:                          Link Speed: 10.0 Gbps
Packet Sent: 4592                     Packets Received: 39229154
```

Showing VLAN IDs

Syntax

`show vlans <team-id>`

Parameters

`adapter id`	Adapter alias assigned by OCTeamCMD.
`team-id`	The name assigned to a team when it is created.

Description

This command shows a listing of VLAN IDs that are currently in use and those that are available for use.

Example

```
C:\Program Files\Emulex\NIC Teaming>OCTeamCmd.exe show vlans myteam
```

```
Used VLAN IDs:
    101, 102, 103

Available VLAN IDs:
  VLAN_Native, 1-100, 104-4094
```

Showing the Global Reactivation Delay Default

Syntax

```
show reactdelay
```

Parameters

None.

Description

This command shows the global default reactivation delay that is used when creating teams. The default delay value is 30 seconds and is shown in milliseconds.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe show reactdelay
Default reactivation delay: 30 seconds
```

Creating a Team

Caution: Creating a team may take several seconds. Large configurations make take several minutes. Prematurely cancelling this operation may result in partial removal of a team or VLAN, which may lead to future teaming issues including system instability.

Note: Adapters, teams and VLANs that have been disabled in Network Connections or Device Manager cannot be managed by the NIC Teaming Manager and may not be visible to the NIC Teaming Manager. Make sure that any affected adapters, teams and VLANs are enabled before making any NIC Teaming configuration changes.

Note: For a complete list of notes for creating a team, see "Creating, Configuring, and Removing Teams" on page 27.

Syntax

```
create team  <failover:<auto-failback-setting> |  loadbalance:<hash> |
802.3ad:<hash> |  LACP:<hash> {:shortTO}> team-name adapter-list
```

Parameters

`auto-failback-setting` fbenabled or fbdisabled

`hash` Hash algorithm

Description

This command creates a team. The team-name is the name for the team that is to be created. The name cannot exceed 79 characters and must be unique. The adapters listed as part of the team must not be part of another team and must not have VLANs assigned to them. The first adapter listed becomes the primary adapter; this must be an Emulex adapter.

Note: When creating a team name, keep in mind that the team name will be prepended to the Device Manager Friendly Name of all adapters included in the team. If the addition of the team name causes the adapter's Friendly Name to exceed 52 character on x86 systems or 169 character on x64 systems, then event log messages for the adapter may be affected. When these limits are exceeded, the adapter's GUID may be used in event log messages instead of the adapter's Friendly Name. Exceeding these limits has no other known consequences.

Note: You cannot disable an adapter port that is part of an 802.3ad static team. If you do, I/O will fail because an 802.3ad team or a LACP team is switch dependent. When using an 802.3ad static team or a LACP team, you must disable links by disabling the switch port.

The number of allowable team members varies with team type. Failover teams must have at least 2 members and may have up to 3. Load balancing teams must have from 2 to 8 members. LACP and 802.3ad teams must have from 2 to 4 members.

The auto-failback-setting is only used for failover teams. This setting specifies whether the team should automatically resume using the primary adapter once it becomes available again after the team has failed over to the secondary adapter.

A maximum of 16 teams can be created. Use the abbreviated names from Table 5-2 when specifying the team type on Load Balancing, LACP and 802.3ad teams from the command line.

When the team is created, MTU information is collected. If there is an MTU discrepancy between members, a warning is displayed. This warning does not affect the creation of the team.

For LACP teams there is an optional argument, shortTO, which specifies that the protocol's short timeout is to be used. If this is not specified, the standard long timeout is used.

Table 5-2 Hash Algorithms

Hash Algorithm	Abbreviation
Perceived adapter load	percload
Destination MAC	destmac
Destination IP	destip

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe create team failover
                :fbenabled myteam nic5 nic6
Successfully created team: myteam
WARNING: The MTU sizes of some of the team member adapters are not
matching. As a result, the team will use the least MTU. Also, TOE will
be disabled.
```

Deleting a Team

Caution: Removing a team may take several minutes. Prematurely cancelling this operation may result in partial removal of a team or VLAN, which may lead to future teaming issues including system instability.

Note: Do not remove a team or VLAN while they are carrying traffic. If you do, unpredictable results will occur.

Note: Adapters, teams and VLANs that have been disabled in Network Connections or Device Manager cannot be managed by the NIC Teaming Manager and may not be visible to the NIC Teaming Manager. Make sure that any affected adapters, teams and VLANs are enabled before making any NIC Teaming configuration changes.

Note: For a complete list of notes for deleting a team, see "Creating, Configuring, and Removing Teams" on page 27.

Syntax

```
delete team <team-id>
```

Parameters

`team-id` Team to be deleted.

Description

This command deletes a team from the system and deletes any VLANs assigned to the team.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe delete team mylbteam
Successfully deleted team: mylbteam
```

Adding an Adapter to a Team

Syntax

```
add adapter <team-id> <Adapter-id>
```

Parameters

`team-id` Team from which an adapter is to be added.

`adapter-id` Adapter to be added.

Description

This command adds a specified adapter from the specified team. The adapter can only be added if the team currently has less than the maximum number of adapters for that team type. For more information about adding an adapter, see "Replacing a Team Adapter" on page 33.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe add adapter myteam nic14
Adapter nic14 has been successfully added to team myteam
```

Setting an Adapter as Primary

The following command lets you set an adapter as primary.

Note: The primary adapter must be an Emulex-branded adapter.

Note: You cannot set an adapter as primary if it is not a member of the team.

Syntax

```
# OCTeamCmd.exe set primary <teamID> <adapterID>
```

Example

```
c:\Program Files\Emulex\NIC Teaming>octeamcmd.exe set primary myteam nic5
Adapter nic6 has been successfully set as primary adapter for the team myteam
```

Removing an Adapter from a Team

Note: Do not remove an adapter while it is carrying traffic. If you do, unpredictable results will occur.

Note: Adapters that have been disabled in either Network Connections or device Manager cannot be managed by the OneCommand NIC Teaming and VLAN Manager and may not be visible to the OneCommand NIC Teaming and VLAN Manager. Make sure that any affected adapters are enabled before making any NIC Teaming configuration changes.

Note:

Syntax

```
delete adapter <team-id> <Adapter-id>
```

Parameters

`team-id` Team from which an adapter is to be removed.

`adapter-id` Adapter to be removed.

Description

This command removes the specified adapter from the specified team. The adapter can only be removed if the team will be left with the minimum number of adapters for that team type.

Example

```
c:\Program Files\Emulex\NIC Teaming>octeamcmd.exe delete adapter myteam nic5
Adapter nic5 has been successfully deleted from team FOTeam
```

Adding a VLAN

The following notes apply to adding a VLAN:

- Adapters, teams and VLANs that have been disabled in Network Connections or Device Manager cannot be managed by the NIC Teaming Manager and may not be visible to the NIC Teaming Manager. Make sure that any affected adapters, teams and VLANs are enabled before making any NIC Teaming configuration changes.
- If you use static IP addresses (non-DHCP), you must assign IP addresses to any native VLANs and VLANs that you create.
- When the first VLAN is added to a team, the team's Native VLAN is removed. The Native VLAN can be added later, if desired. If the Native VLAN is added again, adding additional VLANs will not affect its state. For more information about Native VLAN, see “Native VLANs” on page 40.
- VLANs created over teams containing non-Emulex team members are not supported by Emulex. However this configuration may work if the non-Emulex team members are well-known to your system. Discretion is advised.

Syntax

`add vlan <team-id |adapter-id> < vlan-id> {number}`

Parameters

`team-id`	If a VLAN is to be assigned to a team, this is the team name.
`adapter-id`	If a VLAN is to be assigned to an adapter, this is the adapter alias.
`vlan-id`	The number to be used as the VLAN tag. Valid values range from 1 to 64.
`number`	An optional parameter that specifies the total number of VLANs to be assigned. Valid values range from 1 to 4. If there are already VLANs assigned to a team, then the maximum valid value of the number of VLANs to be assigned is reduced by the number of existing teams. If an invalid value is specified the command is rejected without any other action being taken.
`["keepnvlan"]`	An optional parameter that lets you keep the native VLAN on an adapter.

Description

This command assigns one or more VLANs to a team or an adapter. You can only assign a VLAN to teams and Emulex adapters. A VLAN is specified using the number to be assigned as the VLAN ID, valid values range from 1 to 4094. If you specify a duplicate VLAN ID, no VLANs that you request in the command are created. You may assign a single team or adapter no more than 64 VLANs. You can assign more than 1 VLAN by including the optional 'number' parameter. The parameter specifies the total number of VLANs you wish to assign. Valid values range from 1 to 64. If there are already VLANs assigned to a team, the maximum valid value of the number of VLANs to be assigned is reduced by the number of existing teams. If you specify an invalid value, the command is rejected without any other action being taken.

When you assign multiple VLANs, the specified VLAN ID is used as the VLAN ID of the first VLAN. That VLAN ID is then incremented to generate the VLAN ID for the next VLAN. This process applies to each additional VLAN being assigned. If any of the generated VLAN IDs are already in use, or are outside the range of valid values, the command is rejected without any action being taken.

Example

Adding VLAN to team

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe add vlan mylbteam 3 4
VLAN 3 added to mylbteam
VLAN 4 added to mylbteam
VLAN 5 added to mylbteam
VLAN 6 added to mylbteam
```

Adding VLAN to adapter

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe add vlan nic6 100 2

VLAN 100 added to mylbteam
VLAN 101 added to mylbteam
```

Modifying a VLAN ID

Syntax

```
# OcTeamCmd.exe modify vlan <VLAN name> <original ID> <new ID>
```

Successful condition

```
Successfully modified the VLAN ID from <original ID> to <new ID>
```

Error Conditions

```
VLAN ID <new ID> is already assigned to <VLAN name>.
Invalid VLAN value specified.
```

Example

```
# OCTeamcmd.exe modify vlan LACPTeam 333 444
```

Deleting a VLAN

Note: Do not remove a team or VLAN while they are carrying traffic. Doing so may produce unpredictable results.

Note: Adapters, teams and VLANs that have been disabled in Network Connections or Device Manager cannot be managed by the NIC Teaming Manager and may not be visible to the NIC Teaming Manager. Make sure that any affected adapters, teams and VLANs are enabled before making any NIC Teaming configuration changes.

Syntax

```
delete vlan <team-id|adapter-id> < vlan-id> {number}>
```

Parameters

`team-id`	Team to which a VLAN to be deleted belongs.
`adapter-id`	Adapter alias of the VLAN to be deleted from an adapter.
`vlan-id`	VLAN tag.
`number`	An optional parameter specifies the total number of VLANs to be deleted. Valid values range from 1 to 64.

Description

This command deletes one or more VLANs from a team or an adapter. You must specify the VLAN with its VLAN ID. Additionally, if the VLAN to be deleted belongs to a team, you must specify the team, and if the VLAN is assigned to an adapter, you must specify the adapter id. Optionally, you can delete multiple VLANs by following the VLAN ID with the number of VLANs to be deleted.

If you are deleting multiple VLANs, the specified VLAN ID is used as the VLAN ID of the first VLAN to delete. The VLAN IDs of the other VLANs to be deleted must sequentially follow the VLAN ID of the first VLAN. If any of these VLANs do not exist, then no VLANs specified in the command are deleted.

Single VLANs may also be deleted by specifying their VLAN ID without the optional number of VLANs to delete.

Example

Delete from team

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe delete vlan myteam 3 4
VLAN 3 deleted from mylbteam
VLAN 4 deleted from mylbteam
VLAN 5 deleted from mylbteam
VLAN 6 deleted from mylbteam

Delete from VLAN adapters
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd..exe delete vlan nic6 100 2
VLAN 100 deleted from nic6
VLAN 101 deleted from nic6

Delete two VLANS
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd..exe delete vlan nic5 3 2
VLAN 3 deleted from nic5
VLAN 2 deleted from nic5
```

Setting the Default Global Reactivation Delay

Syntax

`set reactdelay <delay value>`

Parameters

`delay value` Delay value in seconds. Valid values range from 1 to 200.

Description

The default global reactivation delay is the amount of seconds that an adapter must wait to carry traffic before it is allowed to rejoin its team. The reactivation delay defaults to 30 seconds and prevents thrashing while the adapter stabilizes.

This command sets the default global reactivation delay value to be used when creating teams. Changing the default value does not affect the value used by teams already defined. The new value affects only teams created after the value is set.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe set reactdelay 45
Default reactivation delay of 45 seconds is successfully set
c:\Program Files\Emulex\NIC Teaming>
```

Setting the Reactivation Delay of an Existing Team

Syntax

`set reactdelay <delay value> <team-id>`

Parameters

`delay value`	Delay value in seconds. Valid values range from 1 to 200.
`team-id`	The name of the team that will use the global reactivation delay value.

Description

This command changes the global reactivation delay value used by the specified team.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe set reactdelay 45
FOTeam
Default reactivation delay of 45 seconds is successfully set for team
FOTeam
c:\Program Files\Emulex\NIC Teaming>
```

Forcing a Team to Failover

Syntax

`failover <team-id>`

Parameters

`team-id`	The name of the team that is to change the active adapter.

Description

This command forces the specified failover team to change the active adapter. If there is more than one available adapter, the driver selects which adapter is to become the active adapter.

Example

```
c:\Program Files\Emulex\NIC Teaming>OcTeamCmd.exe set failover FOTeam
Manual failover successful on team FOTeam
c:\Program Files\Emulex\NIC Teaming>
```

Appendix A. Load Balancing Use Cases

Perceived Port Load

This method automatically distributes TCP/IP traffic across team member channels by examining traffic load history patterns.

When to Use

Favorable types of traffic patterns for this balancing method include web traffic (HTTP, HTTPS) and e-mail traffic (SMTP, POP3). New TCP/IP connections are assigned to the more lightly loaded member channel links to balance traffic loading across all members over time. Only TCP/IP traffic is balanced and distributed (other non-connection oriented traffic, such as UDP/IP), and non-IP traffic (such as IPX/SPX and others) is assigned to a single default team member and is not balanced. Once a connection is opened and assigned to a member link, that TCP/IP connection's traffic is never moved to a new link without regard to the out-of-balance level the overall team might be experiencing. There must be a consistent stream of new TCP/IP connections (and typically a consistent stream of terminated TCP/IP connections which have finished work) for this traffic balancing method to perform well. This type of process works well for servers that process a lot of small transactional operations that start and then end individual TCP/IP connections for each transaction. Some database protocols involve new connections for each query and these also work well with this method.

When Not to Use

Connections that are very long lived or which are not TCP/IP based are a poor fit with this choice of balancing technique. Examples of long-lived connections are most TCP/IP storage traffic such as NFS (Unix/Linux, others), CIFS (Windows), and iSCSI (widespread usage).

Destination MAC

This method is team member channel selection (hashing) based on the destination MAC address.

When to Use

Use this method when the local system is the server and the server communicates through a NIC team to a switch, and then to many other systems on the local subnet (typically many client, laptop or desktop systems). To be effective, the remote systems must be located on the same IP address subnet as the server team is located. Use this method only when the server system communicates with many clients (or other servers) on the local subnet. Only systems that are on the local subnet have highly variant destination MAC addresses in Ethernet frames sent from the server system NIC team to those systems.

When Not to Use

If the client, laptop or desktop systems are located on different IP subnets and IP routing is required to reach them (from the server), this method is typically not a good fit. When the Ethernet frames sent from the server system's NIC team to the IP router (often a single gateway) all have the same constant destination MAC address (that of the IP router), this method does not distribute traffic well. When all of the packets in all of the TCP/IP have the same destination MAC address (of the IP router), they all hash to the same member (individual link) of the NIC team, and all of the traffic has to travel on one link instead of being distributed to across many links.

Destination IP

This method is team member channel selection (hashing) based on the destination IP address.

When to Use

Use this method in these two situations:

- When a server communicates with many client systems (or peer servers) that are on the local IP subnet (they have the same subnet as the server). In this case, the destination IP address varies for each client, and a good distribution of load based on varying IP addresses results between the server and the network switch.
- When the local server communicates with many client systems (or peer servers) that are located on different IP subnets. Non-local (different subnet) or local IP addresses give a good distribution with this method when the IP addresses have good variation across the group. IP address assignments are often not in the control of the administrator setting up a NIC team, therefore the best way to guarantee a good distribution is when the group of client systems is large, and there is good random variation in their IP address assignments.

When Not to Use

This method is a poor fit when you have communication between only a few clients (or peer servers) and the server, as there is insufficient variation in the set of destination IP addresses because there are few partners for IP traffic.

Appendix B. NIC Teaming Driver Event Log

The event log is a standard feature of Windows Server software.

1. Click **Start>Run**. The Run dialog box is displayed. In the Run dialog box, type:
   `eventvwr`
2. Click **OK**.
3. Click **Windows Log**.
4. Click **System**.
5. Click the EMLX error under System Events to show the event details. Table 5-3 shows event log entry detail.

Table 5-3 Event Log Entries

Message ID Hexadecimal/ Decimal	Severity	Message	**Recommended Resolution**
1	Informational	Failover team active connection on primary adapter <adapter_name>	No resolution required.
2	Informational	Failover team active connection on secondary adapter <adapter_name>	No resolution required.
3	Informational	Failover team primary adapter <adapter_name> link is down.	No resolution required.
4	Informational	Failover team secondary adapter <adapter_name> link is down.	No resolution required.
5	Informational	Failover team primary adapter <adapter_name> link is up.	No resolution required.
6	Informational	Failover team secondary adapter <adapter_name> link is up.	No resolution required.
7	Informational	<adapter_name> link is up and it will be activated after reactivation timer for team <team_name> expires.	No resolution required.
8	Informational	<team_name> team adapter <adapter_name> link is down.	No resolution required.
9	Informational	<adapter_name> link is activated on team <team_name>.	No resolution required.
10	Informational	Adapter <adapter_name> MTU size is different than team <team_name> MTU size.	The NIC Teaming manager or the NIC Teaming CLI should be utilized to determine which team members have the undesired MTU settings.