



Xframe Adapter Quick Installation and Configuration Guide

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Neterion Proprietary

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REGULATORY DECLARATIONS



Manufacturer's U.S. FCC Part 15 Declaration of Conformity

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Cupertino, CA 95014

"This device complies with the rules of FCC Part 15. Operation is subject to the following two rules: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation."

Statement of compliance with ICES 003

"This Class (A or B) digital apparatus complies with Canadian ICES-003"

I. Revision History

| Revision | Date | Description |
|----------|---------------|---|
| 01 | March 2005 | <ul style="list-style-type: none">• Initial Release |
| 02 | February 2006 | <ul style="list-style-type: none">• Added description of CX-4 installation procedure• Document expanded to cover Xframe II and Xframe E products |

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1. Introduction

Thank you for your purchase of an Xframe adapter, the world's leading 10 Gigabit Ethernet Network Interface Card. This document defines the installation and configuration of the Xframe adapter.

1.1. Products Covered By This Manual

This manual covers the following products:

- **Xframe** PCI-X 1.0 SR/LR adapters
- **Xframe II** PCI-X 2.0 SR/LR/CX-4 adapters
- **Xframe E** PCIe x4 SR/LR adapters

1.2. Supported Operating Systems

The following operating systems are supported:

Microsoft Windows Server 2000 and 2003 (All versions, including Datacenter Edition) for x86, x64 (AMD Opteron), IA2, and x32-64 (Intel EMT) platforms.

Linux 2.4 and 2.6 for PowerPC, x86, x64 (AMD Opteron), IA2, and x32-64 (Intel EMT) platforms. Linux 2.6 driver is included under the GPL in the Linux kernel and major Linux distributions based upon version 2.6.6 and newer.

Support for all major flavors of UNIX is available either natively in the Operating System, or from your Xframe Adapter vendor – please e-mail support@neterion.com for details.

A FreeBSD driver is available with limited support – please e-mail support@neterion.com for details.

1.3. Hardware and System Requirements

The Xframe Adapter is compatible with the following system platforms:

- Power PC (PPC)
- x86 (Intel)
- x64 (AMD Opteron)
- IA2 (Intel Itanium)
- x32-64 (Intel EMT)

Xframe adapters are PCI-X 1.0 compliant and will operate in any 3.3V or 5V tolerant PCI or PCI-X slot.

Xframe II adapters are PCI-X 2.0 compliant and will operate in any 3.3 V tolerant PCI or PCI-X slot (including PCI-X 1.0 slots).

Xframe E adapters are PCIe 1.1 compliant and will operate in any x4 or x8 PCIe slot.

Note: Using PCI-X or PCIe is highly recommended in order to achieve optimal performance.

1.4. Safety Precautions

Optical versions of the Xframe adapter feature a high-powered laser. The laser light is outside of the visible light spectrum. Looking directly into a laser can cause permanent eye damage.

- Never look directly into the adapter's optical port, or into the end of an optical cable.
- Always cap optical ports and cables when not in use.
- The adapter may generate high temperatures during normal course of operation.
- Do not make any internal physical contact with the body of the adapter or adapter components while the device is in operation.
- Do not remove the adapter from the slot while the slot is powered up. The device is not hot pluggable

1.5. Handling

The Xframe adapter contains state-of-the-art technology. With proper care and handling, it should provide years of reliable service. However, the adapter is very susceptible to damage from dirt and debris. As well, some components are sensitive to electro-static discharge (ESD).

- Always ensure you are properly grounded to the system chassis when inserting and removing cards.
- When not in use, always transport and store cards in an anti-static bag.
- When shipping an adapter, ensure that adequate padding is used.

Optical Adapters (SR/LR)

- High-speed optical fibers are very susceptible to dirt and debris. Do not make contact with the end of an optical fiber, and keep a fiber cleaning kit handy. Cards that are not in use should also have the optical port plugged, and the optical cables should be capped off.
- Never remove the optical transceiver from the adapter. The transceivers are not interchangeable.
- When disconnecting the fiber from the adapter, do not pull on the fiber itself; pull on the connectors. Do not apply excess force. In order to ensure that the transceiver is not pulled out of its socket, it may be necessary to apply pressure on the transceiver faceplate while removing the fiber optic cables. Some transceivers may have a "locking bar" which prevents the connector from being dislodged; simply swing the bar in the direction indicated to release the connector from its socket.
- For proper device operation, ensure that the optical cables are not bent or tightly wrapped around obstacles. Observe the manufacturer's minimum bend radius at all times.

CX-4 Adapters

- CX-4 cables are easily damaged. Be careful when handling them and do not bend them tightly around obstacles. Observe the manufacturer's minimum bend radius at all times.
- The installation procedure for CX-4 adapters requires that the CX-4 transponder be removed before the card is inserted. Take ESD precautions when removing and re-inserting the transponder.

2. Installing and Connecting the Adapter

2.1. Procedure for Optical Adapters

STEP 1: Insert the card into the system.

1. Shut down the system.
2. Unplug the power cord from your computer and remove the cover.
3. Insert the adapter into an available PCI or PCI-X slot. Push the adapter into the slot until it is firmly seated.
4. Secure the adapter bracket with a screw if necessary.
5. Replace the cover.

STEP 2: Connect the cable

1. Remove the fiber optic connector cap. Save it for when the cable is unplugged.
2. Insert the fiber optic cable into the ports on the network adapter.
3. Most connectors are keyed for proper orientation. If the cable is not keyed, ensure that the connector is oriented properly (the transmit port should connect to the receive port and vice versa).

STEP 3: Reconnect the power cord and power up the system

2.2. Procedure for CX-4 Adapters

Special procedures are required in order to install Xframe adapters equipped with a CX-4 transponder. The CX-4 transponder unit will not pass through the PCI slot openings at the rear of the computer. For this reason, it is necessary to first install the adapter without the transponder. Then, the transponder may be inserted into the adapter through the slot opening.

STEP 1: Take Electrostatic Discharge Precautions

When handling the CX-4 adapter, or removing or inserting the CX-4 transponder, it is essential that ESD (electro-static discharge) precautions be taken.

- Wear a properly grounded wrist strap if one is available.
- If a wrist strap is not available, be sure to discharge any static electricity you may have accumulated by touching the metal chassis of the computer. When possible, remain in contact with the metal chassis throughout the installation process.

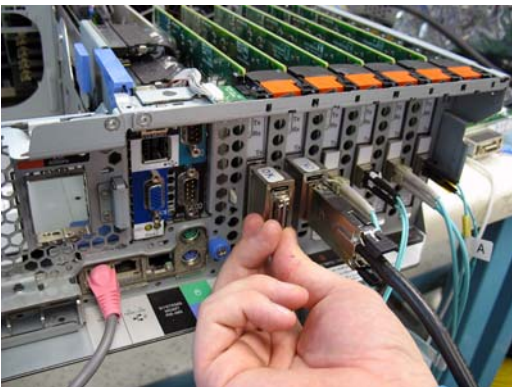
STEP 2: Insert the adapter card into the system

The CX-4 transponder unit is packaged separately. Insert the adapter card into the system *before* inserting the transponder unit.



1. Shut down the system.
2. Unplug the power cord from your computer and remove the cover.
3. Insert the adapter into an available PCI or PCI-X slot. Push the adapter into the slot until it is firmly seated.
4. Secure the adapter bracket with a screw if necessary.
5. Replace the cover.

STEP 3: Insert the CX-4 transponder into the adapter's guide rails



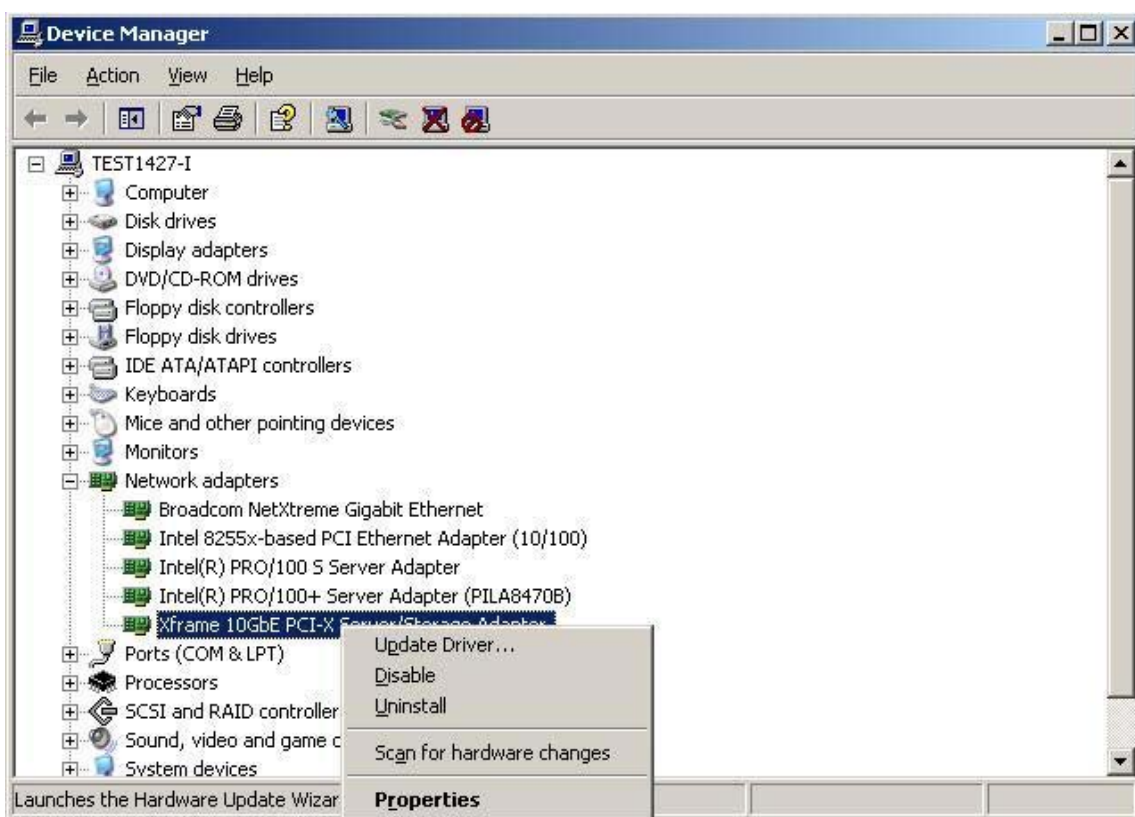
1. Carefully insert the CX-4 transponder unit into the adapter's guide rail.
2. Slide the transponder unit into the rail until a soft "click" is felt.
3. The locking bar should snap into place. It may be necessary to slide the bar into position.
4. The transponder should be secure and should not move even if gently tugged.
5. The transponder is now inserted.

STEP 4: Connect the CX-4 cable, reconnect the power plug, and power up the system.

3. Driver Installation

3.1. Windows Driver Installation/Removal

1. Go to Control Panel -> System -> Device Manager. Select Network Adapters and find the Xframe adapter.
2. Right-click and select "Update Driver."
3. Follow the wizard and select "Continue Anyway" if prompted regarding Windows Logo testing.
(Note: Neterion has obtained windows certification as of 3/27/2003.)

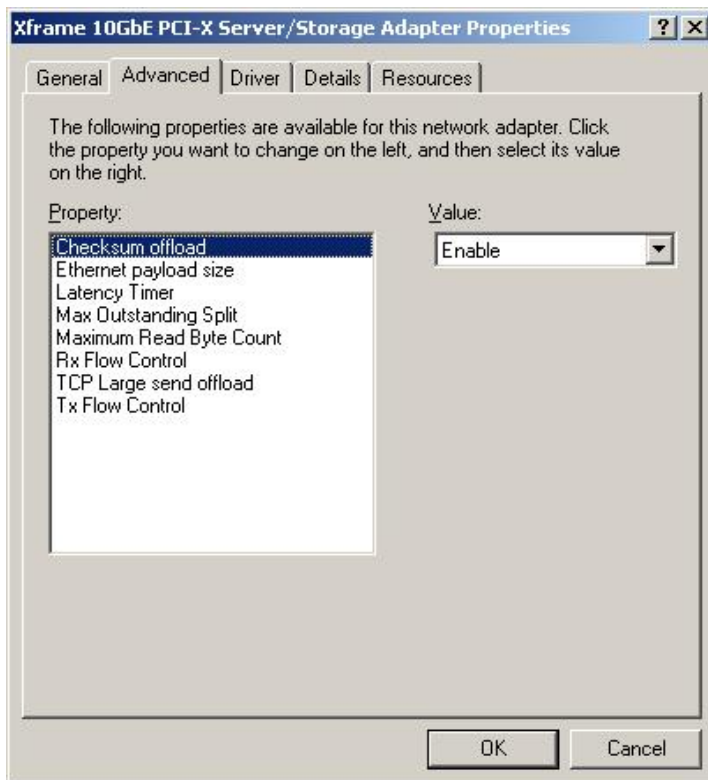


3.1.1. Changing the adapter configuration

There are multiple ways to change adapter configuration under Windows.

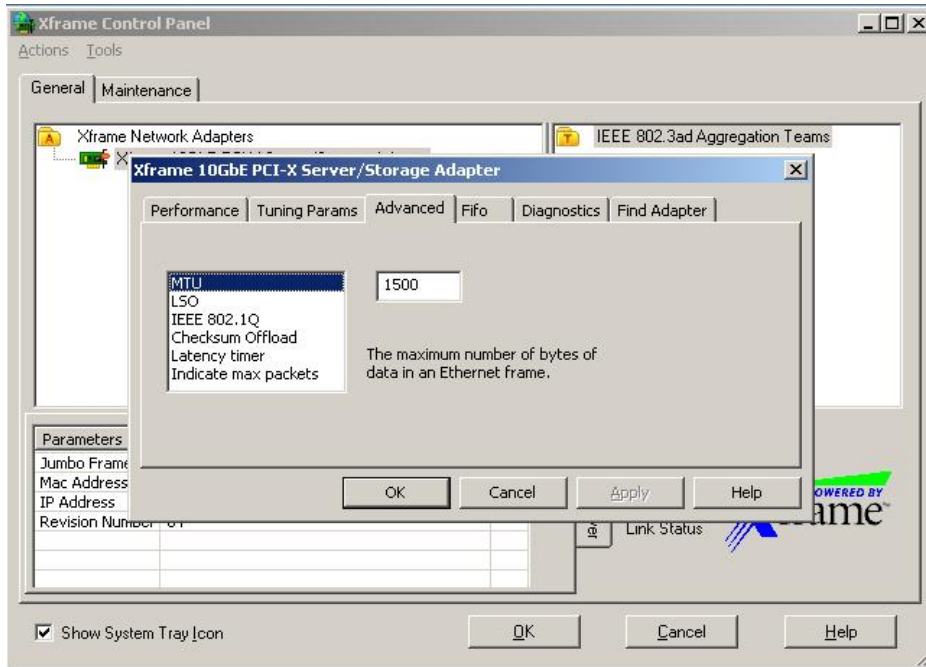
3.1.2. Driver Settings

- Open Network Connections, select target adapter, right click and select properties.
- Select "Configure" and then the "Advanced" tab.



3.1.3. Xframe GUI

- Open the Xframe GUI. Select target adapter, right click and select properties.
- Select "Advanced" tab.



3.1.4. Making Driver Installation Disk

- Insert floppy disk into drive.
- Run `xfdisk.exe` (available on the CD under the `win\makedisk` folder)
- Select appropriate platform, operating system and adapter type.
- Click "Make Disk"

3.2. Linux Driver Installation

3.2.1. Driver Installation/Removal

1. Build the driver.

Before starting the build, ensure that the following symbolic link/directory points to the correct kernel source tree:

```
For 2.4, use /usr/src/linux-2.4
```

```
For 2.6, use /usr/src/linux-2.6
```

Then build the driver sources:

```
# make clean
```

```
# make
```

2. Load the driver:

On 2.4 kernel,

```
# insmod s2io.o
```

On 2.6 kernel,

```
# insmod s2io.ko
```

3. Configure IP address:

```
# ifconfig <ethernet_interface> <IP_address>
```

<ethernet_interface> can be found by executing "ifconfig -a". Neterion cards typically will have a HWaddr (Ethernet address) starting with "00:0C:FC"

3.2.2. Changing the adapter configuration

In Linux, configuration is handled by the tool `ethtool`.

To view a list of possible settings and their current values,

```
# ethtool -k <ethX>
```

where <ethX> is the appropriate device (found by executing `ifconfig`). For example,

```
# ethtool -k eth0
```

To change a setting,

```
# ethtool -K <ethX> <setting> <value>
```

e.g.:

```
# ethtool -K eth0 tso on
```

For more information about `ethtool`, refer to its man page:

```
# man ethtool
```

3.3. UNIX and Other Proprietary Platforms

Support for major flavors of Unix is available either natively in the Operating System, or from your Xframe Adapter vendor - please e-mail support@neterion.com for details.

4. Advanced Software Installation and Configuration

4.1. Windows

4.1.1. Overview of Advanced Features Supported under Windows

The XFrame Network Adapter Configuration Utility allows you to create, delete and configure advanced features of the adapter. It allows you to:

- Create pairs
- Create link aggregation teams
- Create and manage virtual local area networks (VLANs)
- Additionally, the Configuration Utility allows you to:
- View adapter details.
- View adapter event logs.
- Run adapter diagnostics
- Physically locate an adapter in your system.

4.1.2. Installing Windows GUI

Run `xfsetup.exe` (available on the CD under the `win\Protocol` folder.)

Follow the wizard and press "Continue Anyway" if prompted regarding Windows Logo testing for drivers.

4.2. Linux

4.2.1. Overview of Advanced Features Supported under Linux

Advanced Features under Linux include:

- optimized fail over mechanism, link aggregation functionality based on IEEE 802.3 ad standard through bonding driver,
- Increased security through VLANs and a prioritized send and receive based on the IEEE 802.1Q standard.
- SNMP Agent support.

4.2.2. VLAN

A Virtual LAN is a network of computers that behave as if they are connected to the same network even though they may actually be physically located on different segments of a LAN. VLANs are configured through the driver. Use the `vconfig` utility to create and destroy VLANs on interfaces.

To create a VLAN device with VLAN-ID of 5 on the `eth0` device, the command is:

```
vconfig add eth0 5
```

To delete a VLAN, the command is:

```
vconfig rem eth0.5
```

You will also need to give it an ip address:

```
ifconfig -i eth0.5 192.168.2.1
```

and configure it as UP:

```
ifconfig -i eth0.5 up
```

4.2.3. Bonding Driver

The Bonding driver permits grouping of LAN connections to provide link failover, link throughput aggregation, or both. All links in a bond have the same Ethernet and MAC addresses. Link failover refers to the process by which a failure of one component of a redundant link can be transparently masked by having its traffic routed to another link. The bonding driver accomplishes this task by continuously monitoring all links available to it and removing any links from service that are no longer operative. With a compliant ethernet switch, the system can aggregate the links to provide better throughput. The driver offers failover operation with any class of switch.

4.2.4. SNMP Agent:

The Simple Network Management Protocol defines a method by which a remote user can view or change management information for a networked device (a host, gateway, server, etc.). A monitoring or management application on the remote user's system uses the protocol to communicate with an SNMP agent on the device to access the management data.

In order for a device to respond to SNMP requests it must be equipped with the software that enables it to properly interpret the request, perform the action required by that request and return the SNMP reply. The SNMP Agent is the required software to execute this functionality. The SNMP agent is provided as a Dynamically Loadable Linux module.

4.2.4.1. Installing Bonding Software

1. Build the kernel with the bonding driver
 - For the latest version of the bonding driver, use kernel 2.4.12 or above (otherwise you will need to apply a patch).
 - Configure the kernel with `make menuconfig/xconfig/config`
 - Select "Bonding driver support" in the "Network device support" section. It is recommended to configure the driver as a module since it is currently the only way to pass parameters to the driver and configure more than one bonding device.
 - Build and install the new kernel and modules.
2. Get and install the userspace tools

The bonding driver requires an updated `ifenslave` utility. The original one from extreme-linux and beowulf will not work. Kernels 2.4.12 and above include the updated version of `ifenslave.c` in `Documentation/network` directory. For older kernels, please follow the links at the end of this file.

NOTE: If you are running on Redhat 7.1 or greater, you need to be careful because `/usr/include/linux` is no longer a symbolic link to `/usr/src/linux/include/linux`. If you

build ifenslave while this is true, ifenslave will appear to succeed but your bond won't work. The purpose of the `-I` option on the ifenslave compile line is to make sure it uses `/usr/src/linux/include/linux/if_bonding.h` instead of the version from `/usr/include/linux`.

To install ifenslave.c, run the following commands:

```
# gcc -Wall -Wstrict-prototypes -O -I/usr/src/linux/include \  
    ifenslave.c -o ifenslave  
# cp ifenslave /sbin/ifenslave
```

4.2.4.2. Installing SNMP Agent

The agent can be run either with UCD or NET snmp agent. Enable the `SNMP_SUPPORT` macro in the monolith driver and compile it. Install the `neterion.o` module. Check that the following files are created in `proc` directory: `/proc/net/NETERION/BDInfo` and `/proc/net/NETERION/PhyAdap`.

Build instructions

1. Specify the path of the include files in Makefile for `INCLUDEDIR` `/usr/include/net-snmp`
2. Ensure that there exist shared objects or symbolic links for the following shared objects in the `LIBDIR` path for net snmp agent:

```
libnetsnmp.so  
libnetsnmpagent.so  
libnetsnmpmibs.so  
libcrypto.so  
libdl.so  
libb1.so  
libz.so  
libpopt.so  
libm.so  
libelf.so
```

or for UCD SNMP:

```
libsnmp.so  
libucdagent.so  
libucdmibs.so  
libcrypto.so  
libdl.so  
libb1.so  
libz.so  
libpopt.so  
libm.so  
libelf.so
```

3. `make clean`
4. `make` (Generates the `neterion.so` shared object)

Agent Installation

1. Edit the `snmpd.conf` file. Add the following lines:

```
view systemview included .1.3.6.1.4.1.12808  
dlmod neterion path_of_shared_object
```
2. Copy the `XENA_NIC_MIB.txt` file to the general mibs directory `/usr/local/share/snmp/mibs/`

5. Performance

5.1. What to Expect

Performance is highly dependent on system configuration and environment. The test results below are provided only as reference. This performance data is applies to Xframe I in a PCI-X 1.0 environment.

Opteron Platforms (64-bit)

Dual 1.6 GHz AMD Opteron systems running throughput benchmark back-to-back and switch-based against 2 10GbE clients. Cisco Catalyst 6500 used.

| OS | Back-to-back (Gbps) | | Switch-Based (Gbps) | |
|---------|---------------------|-----|---------------------|-----|
| | Tx | Rx | Tx | Rx |
| Windows | 5.6 | 5.8 | 5.6 | 7.1 |
| Linux | 6.7 | 6.8 | 7.0 | 6.9 |

Itanium Platforms (64-bit)

HP Rx2600 Dual Itanium-2 1.5 GHz or Dell PowerEdge 3250 Dual Itanium-2 1.5 GHz system running throughput benchmark back-to-back and switchbased against 2 10GbE clients. Cisco Catalyst 6500 used.

| OS | Back-to-back (Gbps) | | Switch-Based (Gbps) | |
|---------|---------------------|-----|---------------------|-----|
| | Tx | Rx | Tx | Rx |
| Windows | 5.3 | 6.0 | 7.1 | 6.9 |
| Linux | 6.0 | 6.8 | 6.1 | 7.4 |

x86 Platforms

The following table represents a Dell Dual Xeon 2.4 GHz system running throughput benchmark back-to-back and switch-based against 2 10GbE clients. Cisco Catalyst 6500 used.

| OS | Back-to-back (Gbps) | | Switch-Based (Gbps) | |
|---------|---------------------|-----|---------------------|-----|
| | Tx | Rx | Tx | Rx |
| Windows | 2.5 | 2.5 | 4.0 | 4.0 |
| Linux | 3.4 | 3.4 | 3.4 | 4.7 |

5.2. Tools and Methodology for Basic Performance Evaluation

NTTCP, an open source tool, can be used to measure the transfer rate and other parameters on a TCP, UDP, or UDP multicast connection.

NTTCP for Linux (used in Neterion lab) can be found at

<http://freeware.sgi.com/Installable/nttcp-1.47.html>

NTTCP for Windows can be found in Windows DDK.

There are two basic setups for high-stress, high-throughput testing with unidirectional traffic flow:

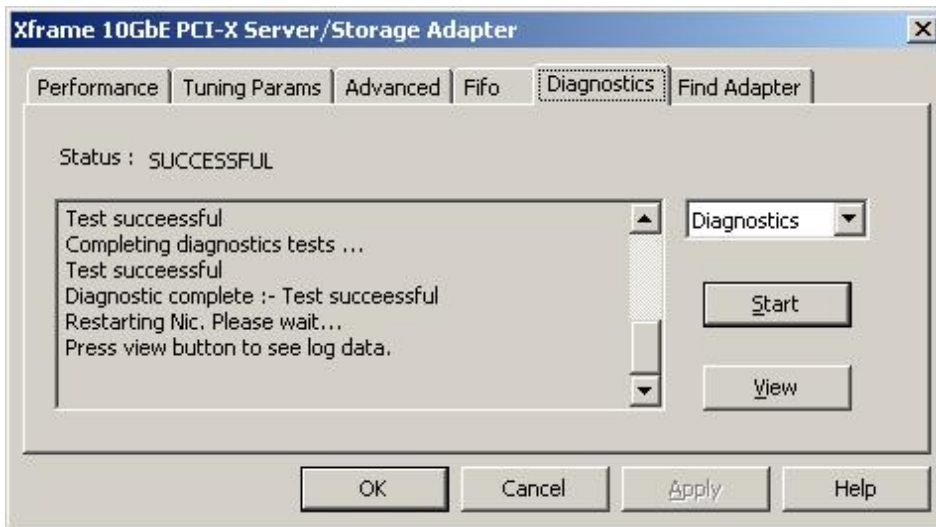
1. Two XFrame adapters connected back-to-back.
2. One Xframe adapter connected to several clients (either 10GbE or GbE) via an Ethernet switch.

6. Troubleshooting

6.1. Diagnostics

6.1.1. Windows Diagnostics

1. Install Neterion Protocol by using Xframe Installation Utilities (See “Installing Windows GUI” in section 4 of this guide)
2. Double click “Xframe Control Panel” on the system tray or from Control Panel
3. Right click on the Xframe 10GbE PCI-X Server/Storage Adapter”, select “Properties”, and click on the “Diagnostics” tab
4. Click “Start” on the “Diagnostics” page to start NIC Diagnostics
5. Check results of the “Diagnostics” by clicking “Statistics” on the “Diagnostics” page.



6.2. Checking Installation

6.2.1. Checking Windows Installation

1. Click on Start -> Settings -> Control Panel -> System -> Hardware -> Device Manager -> Network Adapters
2. The Xframe adapter should be listed, with no red “x” or yellow exclamation mark. If either a red “x” or yellow exclamation mark are present, try the following:

If the Xframe adapter has a red “x,” right click on it and select “Enable”;

If the Xframe adapter has a yellow exclamation mark, right click on it, select “Update Driver” and complete the “Update Driver” wizard, OR

If neither of above suggestions work, right click on the Xframe Adapter, select “Uninstall” and click “OK” to confirm uninstall. Right click on “Network Adapters” and select “Scan for hardware changes” to let system scan for the device. When “Found New Hardware Wizard” appears, follow the Wizard to complete installation.

3. If the Xframe adapter is not found under “Network Adapters” try the following:

Click on the “Other devices” category in Device Manager. If “Ethernet Controller” is listed, right click on it, choose “Update Driver” and follow the “Update Driver” Wizard to complete installation.

If there is no “Ethernet Controller” listed under “Other devices”, right click on “Network Adapters,” and select “Scan for hardware changes” to let system scan for the device. When “Found New Hardware Wizard” appears, follow the Wizard to complete installation.

If neither of above suggestions work, shut down the system and unplug the power cord. Ensure that the Xframe adapter is fully inserted in the PCI-X slot, or try another PCI-X slot. “Found New Hardware Wizard” should appear on the screen after booting up the system. Follow the wizard to complete installation.

6.2.2. Checking Linux Installation

1. Try out the steps mentioned in Checking Connectivity to ensure the card is okay and cable is connected properly.
2. One of the causes for bring-up failure could be lack of memory. In such a case, try to load the driver with a smaller transmit queue and/or receive queue.

6.3. Checking Connectivity

6.3.1. Checking Windows Connectivity

1. Confirm you are using the correct mode cable for your version of Xframe and connection to your switch - multi-mode fiber for SR version of Xframe and singlemode fiber for LR version of Xframe. Contact your cable vendor if you do not have this information.
2. Click on Start -> Settings -> Control Panel, and open Network Connections. You should see Xframe 10GbE PCI-X Server/Storage Adapter as “connected”. If Status does not show “Connected” try the following:

Use a fiber cable cleaner to clean the fiber pairs at both ends of the cable

Swap Tx/Rx of fiber cable either on the switch side or Network Adapter side;

Use a single back to back fiber cable and connect one of the leads to the Tx port and other end of the same lead to the Rx port (external loopback). If link comes up, there might be a problem with your cable.

Check the Network Adapter status in Device Manager (Refer to “Checking Installation” section).

3. Assign proper ip address for the Xframe 10GbE PCI-X Server/Storage Adapter or use DHCP if DHCP server is available:

Open the “Command Prompt” from Start->Programs->Accessories, type “ipconfig /all” to verify the right ip address has been assigned

Verify the network is ready by pinging another client in the network.

6.3.2. Checking Linux Connectivity

1. Check if the adapter has been recognized by the system. This can be checked by executing the command “`lspci | grep 17d5`”. If this command does not display any output, the system did not recognize the Neterion card. Shut down the system and check that the card is seated firmly.

2. Ensure that cable is connected properly (Tx of one side connected to Rx of other side and vice-versa).
3. Each adapter can be individually checked by connecting the card in an external loopback configuration. This can be done by connecting one of the leads of the cable to the Tx port and the same lead on the other end of the cable to the Rx port. If you cannot ping the broadcast address (displayed by executing the command "ifconfig <ethernet_interface>") then no link is present.
4. After loading the driver and bringing up the interface, check if there are any errors reported in the output of "dmesg" command. If any errors are seen, send these to Neterion support team (support@neterion.com) for further analysis. Be sure to include the revision of the card (check the label on the card).

7. Support from your Network Supplier

If you require additional assistance or driver updates, please contact your network supplier or see the support section of the Neterion website at www.neterion.com.

When you contact your network supplier for assistance, have the following information ready:

- Product model name, part number, and serial number
- A list of system hardware and software, including revision levels
- Diagnostic error messages
- Details about recent configuration changes, if applicable

8. Warranty Information

Please contact your network supplier or see the Neterion Limited Warranty on the CD shipped with each adapter.

