

PREFACE

This chapter provides the following information:

- How This Manual is Organized
- Operating System Commands
- Typographic Conventions
- Online Technical Services

How This Manual is Organized

This manual describes how to install and use your Gigabit Ethernet adapter in a Microsoft Windows 2000, Windows NT, or Novell NetWare operating environment. The procedures in this manual assume that you are a system administrator experienced in installing similar hardware.

This manual is organized as follows:

"Introduction" describes the features of the Gigabit Ethernet adapter. This chapter also describes the adapter faceplate and LED indicators.

"Installing the Hardware" lists the hardware and software requirements for adapter installation and use, and provides instructions for physically installing the adapter in your system.

"Windows 2000 Driver Software" explains how to install the Gigabit Ethernet adapter software, and describes adapter teaming and VLANs under Microsoft Windows 2000.

"Windows NT Driver Software" explains how to install the Gigabit Ethernet adapter software under Microsoft Windows NT.

"NetWare Driver Software" explains how to install the Gigabit Ethernet adapter software, and describes adapter teaming and VLANs under Novell Netware.

"Linux Driver Software" describes the Linux driver for the Gigabit Ethernet adapter, including its limitations, installation, and module parameters.

"PXE Driver Software" describes the PXE driver for the Gigabit Ethernet adapter, including its client and server setups.

"Advanced Server Control Suite " explains how to install the Advanced Server Control Suite software, how to view vital adapter information, how to perform diagnostics, how to detect various cable conditions, and how to configure Teams and VLANs.

"Key Protocols and Interfaces" provides an overview of Adapter Teaming, Failover Teaming, and VLAN configuration.

"Specifications" provides adapter hardware specifications.

"Regulatory" provides information on product regulatory compliance.

"Troubleshooting" provides information for troubleshooting the Gigabit Ethernet Adapter hardware.

Operating System Commands

This manual may not include all necessary hardware procedures or software commands. Instead, it may name specific tasks and refer you to operating system documentation or the hardware handbook that was shipped with your system.

You might need to use supplemental documentation for the following types of information:

- Shutting down the system
- Getting access to system PCI slots
- Booting the system
- Configuring devices
- Other basic software procedures

Typographic Conventions

The following table describes the typographic styles used in this manual.

Table 1 Typographic Conventions

| Typeface or Symbol | Meaning | Example |
|--------------------|---|--|
| AaBbCc123 | This type is used for names of commands, files, and directories used within the text. | View the <code>readme.txt</code> file. |
| AaBbCc123 | It also depicts on-screen computer output and prompts. | Main# |
| AaBbCc123 | This bold type appears in command examples. It shows text that must be typed in exactly as shown. | Main# sys |
| AaBbCc123 | This italicized type appears in command examples as a parameter placeholder. Replace the indicated text with the appropriate real name or value when using the command. | To establish a Telnet session, enter: host# telnet <i>IP-address</i> |
| [] | This also shows book titles, special terms, or words to be emphasized. | Read your <i>user's guide</i> thoroughly. |
| [] | Command items shown inside brackets are optional and can be used or excluded as the situation demands. Do not type the brackets. | host# ls [-a] |

Online Technical Services

3Com offers worldwide product support 24 hours a day, 7 days a week, through the following online systems:

- 3Com Web site
- 3Com FTP site
- 3Com Knowledgebase

3Com Web Site Access the latest networking information on the 3Com Corporation Web site by entering the URL into your Internet browser:

<http://www.3Com.com/>

This service provides access to online support information such as technical documentation and software library, as well as support options ranging from technical education to maintenance and professional services.

3Com FTP Site Download drivers, patches, software, and MIBs across the Internet from the 3Com public FTP site. This service is available 24 hours a day, 7 days a week.

To connect to the 3Com FTP site, enter the following information into your FTP client:

- Hostname: **ftp.3Com.com** (or **192.156.136.12**)
- Username: **anonymous**
- Password: **<your Internet e-mail address>**



A user name and password are not needed with Web browser software such as Netscape Navigator and Internet Explorer.

3Com Knowledgebase Knowledgebase is a self-service database of technical information provided to help you diagnose and solve installation, configuration, and upgrade issues you might have. You can access knowledgebase at

<http://knowledgebase.3Com.com/>

Support from Your Network Supplier

If you require additional assistance, contact your network supplier. Many suppliers are authorized 3Com service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services.

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
- Diagnostics error messages
- Details about recent configuration changes, if applicable





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INTRODUCTION

This chapter provides the following information:

- Functional Description
- Features
- Physical Description
- Advanced Server Program Overview
- Advanced Server Program for Windows 2000
- Advanced Server Program for Windows NT
- Advanced Server Program for Novell Netware
- Advanced Server Control Suite
- Software for Linux
- Creating a Driver Disk

Functional Description

The Gigabit Ethernet Adapter connects a PCI-compliant server or workstation to a Gigabit Ethernet network. This adapter incorporates a technology that transfers data at a maximum rate of one gigabit per second—10 times the rate of Fast Ethernet adapters.

The Gigabit Ethernet Adapter targets the increased congestion experienced at the backbone and server in networks, and provides an upgrade path for high-end workstations that require more bandwidth than Fast Ethernet can provide.

Contents of Your Shipment

Included with your adapter are the following:

- Anti-static bag (protects the adapter when being stored or shipped). Keep the adapter in its package until ready for installation.
- CD-ROM with Gigabit Ethernet driver software and documentation.

Inform your network supplier of any missing or damaged items. If you need to return the adapter, you must pack it in the original (or equivalent) packing material.

Features

The following Gigabit Ethernet Adapter features are available for all supported operating systems:

- Gigabit Ethernet (IEEE 802.3-1999)
- Logical Link Control (IEEE 802.2)
- Flow Control (IEEE 802.3X)

- Standard Ethernet frame size (1518 bytes) and Jumbo frame (9KB)
- MII/GMII and TBI (SERDES style) transceiver interfaces
- Layer 2 priority encoding (802.1P)
- Dual high-speed on-chip RISC processors
- Adaptive interrupt frequency
- Programmable rule checking and frame classification
- Up to 16 classes of service (CoS) (4 if no external memory)
- Up to 16 distribution rings (4 if no external memory)
- Integrated 96KB frame buffer memory
- GMI/MII management interface
- 16M external SSRAM address space
- Selectable memory protection for external (on-board) memory
- Statistics for SNMP MIB II, Ethernet like MIB, and Ethernet MIB (802.3z, clause 30)
- 4 unique MAC unicast addresses
- Support for multicast addresses via 128-bit hashing hardware function
- Serial EEPROM
- Boot ROM (embedded or optional boot ROM with PXE support available.)
- JTAG support
- PCI v2.2 32/64-bit, 33/66 MHz bus interface
- PCI-X v1.0 64-bit 133 MHz bus interface
- PCI Power Management Interface (v1.1)
- PCI Hot Plug (IBM, Compaq, Microsoft)
- ACPI Support
- 64-bit BAR support
- 3.3 V/1.8 V CMOS with 5V tolerant I/Os

Physical Description

The faceplate on the 10/100/1000Base-T adapter provides an RJ-45 connector for connecting the adapter to another network device.

The adapter has four LEDs, one for each port speed option (10 Mbps, 100 Mbps, and 1 Gbps), and one for Active. The three port speed LEDs indicate active links, and the data LED indicates data transfer status. When the driver is loaded and the cables are connected properly, the appropriate speed LED is lit and the data LED is on if data traffic is present.

After the adapter hardware and its driver software have been properly installed on your system, the LEDs indicate the following adapter states:

Table 2 Gigabit Ethernet Port LED Status

| LED | State | Description |
|------|----------|--|
| 1000 | On | Good Gigabit Ethernet link. |
| | Off | No 1000 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch. |
| 100 | On | Good 100 Mbps Fast Ethernet link. |
| | Off | No 100 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch. |
| 10 | On | Good 10 Mbps Fast Ethernet link. |
| | Off | No 10 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch. |
| ACT | Blinking | Brief bursts of data detected on the port. |
| | On | Streams of data detected on the port. |
| | Off | No data detected on the port. |

Advanced Server Program Overview

Introduction

The Advanced Server Program is an intermediate software driver for Windows 2000, Windows NT, and Netware, that provides Load-balancing, fault-tolerance, and VLAN features. These features are provided by creating teams (virtual adapters) that consist of multiple NIC interfaces. A team can consist of one to eight NIC interfaces, and each interface can be designated primary or standby*. All primary interfaces in a team will participate in Load-balancing operations by sending and receiving a portion of the total traffic. Standby interfaces will take over in the event that all primary interfaces have lost their links. VLANs can be added to a team to allow multiple VLANs with different VLAN IDs. A virtual adapter is created for each VLAN added. Load-balancing and fault-tolerance features will work with any third-party NIC adapters. VLANs work only with 3Com, Broadcom, or Alteon NIC adapters.



Standby can be used only in Smart Load-Balance mode (See below)

Limitations

Smart Load-balance (SLB) is a protocol-specific scheme. The levels of support for IP, IPX, and other protocols are listed below.

| | Load-balancing | Fault-tolerance |
|-----------------|----------------|-----------------|
| IP | Yes | Yes |
| IPX | Yes* | Yes** |
| Other protocols | No | Yes** |

*Only outbound load-balancing for IPX (on Netware only).

**Only for 3com, Broadcom, and Alteon NICs.

Smart Load-balance (SLB) mode works with all Ethernet switches without configuring the switch ports to any special trunking mode. Only IP traffic will be load-balanced in both inbound and outbound directions. IPX traffic will be load-balanced in the outbound direction only. Other protocol packets will be sent and received through one primary NIC only. Fault-tolerance for non-IP traffic is

supported using only 3com, Broadcom, or Alteon NICs. The Generic Trunking mode requires the Ethernet switch to support some form of port trunking mode (e.g., Cisco Systems Gigabit EtherChannel or other switch vendors' link aggregation mode). This mode is protocol-independent and all traffic should be load-balanced and fault-tolerant.

Broadcom Advanced Server Program for Windows 2000

The following options are supported under Windows 2000. Refer to "Windows 2000 Driver Software" for additional information.

Fail-over and Load Balance

- Adapter teaming for fail-over (heterogeneous support for 3Com 10/100 server adapters, Alteon AceNIC, released Intel 10/100 server adapters, released Intel 1000BaseSX server adapters, and Intel 82559 LAN on Motherboard (LOM))
- Smart Load Balance™
- Generic Link Aggregation (GEC/FEC, open trunk)
- Link aggregation (IEEE 802.3ad). (Static implementation only)

Virtual LAN (VLANs)

- Up to 64 VLANs per adapter using IEEE 802.1Q-1988 tagging

Offloading

- IP, TCP/UDP checksum
- Support for segmentation of large TCP packets
- Jumbo frames (9KB)

Power Management

- Wake on LAN (magic packet, specific pattern)

PCI Hot plug

- Microsoft

Broadcom Advanced Server Program for Windows NT

The following options are supported under Windows NT. Refer to "Windows NT Driver Software" for additional information.

Fail-over and Load Balance

- Adapter teaming for fail-over (heterogeneous support for 3Com 10/100 server adapters, released Alteon AceNIC, Intel 82559 LAN on Motherboard (LOM), released Intel 10/100 server adapters, and released Intel 1000BaseSX server adapters).
- Smart Load Balance™
- Generic Link Aggregation (GEC/FEC, Open trunk)
- Link aggregation (IEEE 802.3ad). Static implementation only.

Virtual LAN (VLANs)

- Up to 64 VLANs per adapter using IEEE 802.1Q-1988 tagging.

Offloading

- Jumbo frames (9KB)

PCI Hot plug

- Support IBM

Broadcom Advanced Server Program for Novell Netware

The following options are supported under Novell Netware. Refer to "NetWare Driver Software" for additional information.

Fail-over and Load Balance

- Adapter teaming for fail-over (heterogeneous support for 3Com 10/100 server adapters, Alteon Tigon2/3, Intel 82559 LAN on Motherboard (LOM), Intel 10/100 server adapters, and Intel 1000BaseSX server adapters).
- Smart Load Balance™
- Generic Link Aggregation (GEC/FEC, open trunk)
- Link aggregation (IEEE 802.3ad)—*not currently supported*

NESL Compliance

For optimal fault tolerance and recovery operations, **BASP.LAN** relies on the NIC drivers to generate NESL (Netware Event Service Layer) events during link changes and other failure events. NESL is an optional feature in the ODI driver specification and not all drivers support it. For NESL events to propagate properly to **BASP.LAN**, ODINEB.NLM must be loaded before the NESL compliant ODI drivers.

Do the following to determine if a NIC driver supports NESL events:

Load **BASP.LAN** and create a team by binding the NIC adapter to the virtual slot (see instructions and examples below). In the Virtual Adapter X Team Members screen of the **BASP.LAN** menu interface, the Link status of all bound NIC adapters are shown. Disconnect or connect the NIC adapter cable. The link status shown on the screen should change immediately if the NIC driver supports NESL events.

Virtual LAN (VLANs)

- Up to 64 VLANs per adapter using IEEE 802.1Q-1988 tagging (64 is the maximum configurable, although 32 is the maximum operable).

Offloading

- IP, TCP/UDP checksum—Netware 5.0 or greater only

PCI Hot plug

- Supports Dell

Advanced Server Control Suite

The Advanced Server Control Suite is a graphical user interface with the following functions. Refer to "Advanced Server Control Suite" for additional information.

- Vital Sign—The Vital Sign screen allows you to view vital adapter information, network status, and network connectivity. Active Adapters are listed.
- Diagnostics—The Diagnostics screen allows you to view information for 3Com-only adapters. This function is used to test the network interface card or LOM.

- Cable Analysis—From the Cable Analysis screen the user can monitor conditions of an Ethernet CAT5 cable connection within a cable plant in an Ethernet network. The software detects various cable conditions such as cable lengths between two given nodes, cable pair breakage, cable pair polarity, and data skew between cable pairs.
- Load Balance/Virtual LANs—The Load Balance/Virtual LANs screen allows you to configure advanced features. Any available adapter can be configured as part of a team.
- Statistics—The Statistics screen allows you view traffic statistics for both most adapters. Statistical values and coverage are more comprehensive for some adapters than for others.

Software for Linux

The Gigabit Ethernet Adapter supports the Linux driver (see "Linux Driver Software" for additional information).

- Limitations—The driver has been tested only on Redhat 6.2 and 7 Linux distributions.
- Packaging—The driver has been released in two packaging formats: source RPM and compressed tar formats.
- Module Parameters—Optional parameters for the driver can be supplied as command-line arguments to the insmod command.

Creating a Driver Disk

Create driver disks using the MakeDisk utility (setup.exe file). This utility will allow you to create disks with the following drivers:

- Windows 2000 Driver
- Windows NT Driver
- Netware Driver
- Advanced Server Program—Windows 2000 Driver
- Advanced Server Program—Windows NT Driver
- Advanced Server Program—Netware Driver

To create a driver disk:

- 1 Insert a 3.5" disk into floppy drive A (default) or B.
- 2 Run the makedisk setup.exe file.
- 3 Follow the menu commands to the Driver Selection screen.
- 4 Select (check) the driver or drivers of choice. Note that selecting multiple drivers will result in creating multiple disks.
- 5 Click Next. The Setup Needs the Next Disk screen will appear.
- 6 Ensure that a disk is in the disk drive and click OK. The selected driver will be installed.
- 7 If more than one driver was selected, the Setup Needs the Next Disk screen will appear again. Insert another diskette and click OK.
- 8 When all driver diskettes have been created, the information screen will appear, confirming that the drivers were successfully created. Click OK.

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INSTALLING THE HARDWARE

This chapter provides the following information:

- System Requirements
- Safety Precautions
- Pre-Installation Checklist
- Adapter Installation Process
- Connecting the Network Cables

System Requirements

Before installing the Gigabit Ethernet adapter, be sure your system meets the requirements listed for your operating system:

Windows 2000 Requirements

- Pentium-based computer that meets Windows 2000 software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128MB RAM (minimum)
- Microsoft Windows 2000 (server), or Microsoft Windows 2000 Advanced Server
- Gigabit Ethernet adapter driver software for Windows 2000:
 - b57w2k.sys (network device driver file)
 - b57w2k.cat (network device catalog file)
 - b57w2k.inf (information used by installation program)

The Advanced Server Program software for Windows 2000:

- **Bas**pinst.exe (installation program)
- **Bas**p2k.dll (configuration utility program)
- **Bas**p2k.sys (an intermediate driver)
- net**bas**m.inf (information used by the installation program)
- net**bas**p.inf (information used by the installation program)

Windows NT Requirements

- Pentium-based computer that meets Windows NT 4.0 software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128MB RAM (minimum)
- Microsoft Windows NT 4.0 (server) with Service Pack 4 or later

- Gigabit Ethernet adapter driver software for Windows NT:
 - B57NT4.sys (network device driver file)
 - oemsetup.inf (intermediate device driver file)
 - B57nt4.hlp (help file)

The Advanced Server Program software for Windows NT 4.0:

- Baspnt4.sys (intermediate device driver)
- Baspnt4.dll (information used by the installation and configuration program)
- Oemsetnt.int (information used by the installation program)

NetWare Requirements

- Pentium-based computer that meets Novell NetWare 4.2/5.x software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 64MB RAM (minimum)
- One of the following versions of Novell NetWare:
 - Novell NetWare 5.0 or higher, with Support Pack 3 or the most recent NetWare 5 Support Pack
 - Novell NetWare 4.2 with Support Pack 7 or the most recent Support Pack, including the optional ODI v3.31 LAN drivers (MISC/ODI331).

You can get the appropriate updates from the Novell support website

- Gigabit Ethernet adapter driver software for Novell NetWare. (Note that the server ODI driver can be found at the \netware\driver directory).
 - B57.lan (network device driver file)
 - B57.lidi (information used by the installation program)

The Advanced Server Program software for Netware 4.11 or 5.0:

- Basp.lan (an intermediate driver for 5.0 and above)
- Basp.lidi (information used by the installation program)
- Basp.lan (an intermediate driver for 4.x and above)
- Basp.lidi (information used by the the installation program)
- ALT.lan (modified Alteon driver to support Broadcom intermediate drivers)
- ALT.lidi (information used by the installation program)

Safety Precautions



WARNING: *The adapter is being installed in a system that operates with voltages that can be lethal. Before you remove the cover of your system, you must observe the following precautions to protect yourself and to prevent damage to the system components.*

- Remove any metallic objects or jewelry from your hands and wrists.
- Use only insulated or nonconducting tools.
- Verify that the system is powered OFF and unplugged before accessing internal components.
- Install or remove adapters only in a static-free environment. The use of a properly grounded wrist strap (or other personal anti-static device) and an anti-static mat is strongly recommended.

Pre-Installation Checklist

- 1 Check that your server meets the hardware and software requirements listed under "System Requirements."
- 2 Verify that your system is using the latest BIOS.
- 3 Review the information in the release.txt file on the CD-ROM for important information not available at the time this manual was created.



If you acquired the adapter software on a floppy disk or from a third-party support website, please check the appropriate source for the most recent information.

- 4 If your system is active, shut it down.
 - Under Windows 2000
If Windows 2000 is currently running, close all applications and select Start | Shut Down. In the resulting dialog window, select Shut Down from the pull-down options, and click OK.
 - Under Windows NT
If Windows NT is currently running, close all applications and select Start | Shut Down | Shut down the computer.
 - Under NetWare
If Novell NetWare is currently and running, use the down command (NetWare 5) or the down and exit commands (NetWare 4) at the server_name prompt to gracefully shut down the server functions and reach the DOS prompt:

server_name: down
server_name: exit
- 5 When system shut down is complete, turn the power OFF and unplug your system.
- 6 Holding the adapter card by the edges, remove it from its shipping package and place it on an anti-static surface.
- 7 Check the adapter for visible signs of damage, particularly on the edge connector. Never attempt to install any damaged adapter. If the adapter is damaged, report it to your supplier.

Adapter Installation Process

The following instructions apply to installing the Gigabit Ethernet adapter in most systems. Refer to the manuals that were supplied with your system for details about performing these tasks on your particular system.

- 1 Review the precautions and pre-installation Instructions. Before installing the adapter, ensure the system power is OFF, the system is unplugged from the power outlet, and that proper electrical grounding procedures have been followed.
- 2 Remove the system cover, and select any empty PCI slot. If you do not know how to identify a PCI slot, refer to your system documentation.
- 3 Remove the blank cover plate from the slot that you selected.
- 4 Holding the PCI card by the edges, align the adapter's connector edge with the PCI connector dock.



The connector dock in a 32-bit PCI slot is shorter than in a 64-bit PCI slot. Although the adapter is designed to fit in either slot type, when installed in a 32-bit PCI slot, part of the adapter's connector edge will remain undocked. This is perfectly normal.

- 5 Applying even pressure at both corners of the card, push the adapter card until it is firmly seated in the PCI slot. When properly seated, the adapter's port connectors will be aligned with the slot opening, and its faceplate will be flush against the system chassis.



CAUTION: Do not use excessive force when seating the card, as this may damage the system or the adapter. If the card resists seating, remove it from the system, realign it, and try again.

- 6 Secure the adapter with the adapter clip.
- 7 Replace the system cover and disconnect any personal anti-static devices.
- 8 Turn the system power ON.

After the system returns to normal operation, the adapter hardware is fully installed. The next step is to connect the network cables.

Connecting the Network Cables

The adapter has one RJ-45 connector, for attaching the system to an Ethernet copper-wire segment. When automatic link negotiation is disabled, the port can be configured for 10 Mbps, 100 Mbps, or 1000 Mbps signaling and either half-duplex or full-duplex operation.

Follow this procedure for connecting a network cable to the Gigabit Ethernet adapter:

- 1 Prepare an appropriate cable. The following table lists the cable characteristics for connecting to 10/100/1000Base-T ports:

Table 3 10/100/1000Base-T Cable Specifications

| Port Type | Connector | Media | Maximum Distance |
|----------------|-----------|--------------------|-----------------------|
| 10Base-T | RJ-45 | CAT 3, 4, or 5 UTP | 100 meters (325 feet) |
| 100/1000Base-T | RJ-45 | CAT 5 UTP | 100 meters (325 feet) |



1000Base-T signaling requires four twisted pairs of Category 5 balanced cabling, as specified in ISO/IEC 11801:1995 and EIA/TIA-568-A (1995) and tested using procedures defined in TIA/EIA TSB95.

- 2 Connect one end of the cable to the Gigabit Ethernet adapter.
- 3 Connect the other end of the cable to an RJ-45 Ethernet network port.



when the cable is properly connected at both ends, the adapter port LEDs should be functional. See the table in Introduction for a description of adapter port LED operation. For driver installation and configuration instructions, refer to the software configuration for that specific driver.

4

WINDOWS 2000 DRIVER SOFTWARE

This chapter provides the following information:

- Installing the Driver Software
- Modifying Configuration Parameters
- Removing the Driver Software
- Installing Advanced Server Program
- Configuring Teaming
- Configuring VLANs

Installing the Driver Software



The Gigabit Ethernet adapter must be physically installed in your system before installing the driver software. See [Installing the Hardware](#) for details.

When the Windows 2000 system first boots up after installing a new hardware device such as a Gigabit Ethernet adapter, the system detects the new hardware automatically and prompts you to install the driver software for that device.

A network device driver must be installed before the Gigabit Ethernet adapter can be used with your Windows 2000 system.

To install the adapter software for Windows 2000, do the following:



Before beginning this procedure, verify that the Windows 2000 system has been upgraded to the latest version with the latest service pack applied.

- 1 Start your Windows 2000 system and log in. You must have Network Administrator privileges to install the driver software.

When you boot the Windows 2000 system after installing the adapter card, a series of Found New Hardware Wizard windows is displayed.

- 2 In the Install Hardware Device Drivers window, click Search for a suitable driver for my device (recommended), then click Next.
- 3 In the Locate Driver Files window, select the CD-ROM drive and Specify a location check boxes.
- 4 When prompted, insert the enclosed CD-ROM into your system CD-ROM drive, type the path to the driver, and select OK.

Example: e:\W2K

Where "e:" is the letter name designation of the CD-ROM drive on your system.

- 5 In the Driver Files Search Results window, verify that the correct path to the driver software is shown, then click Next.
- 6 If asked to continue installation without the Microsoft digital signature, click Yes.



*If the Insert Disk window appears, **do not insert the Windows 2000 disk**:*

Some early versions of Windows 2000 may display a spurious message requesting you to insert the Windows 2000 disk. If this occurs, leave the enclosed CD-ROM in the drive and click OK. If asked to specify the location of the Windows 2000 CD-ROM instead, click Browse (don't use the text entry field) and locate the path to the Gigabit Ethernet drivers that was specified above.

After installation of the driver software is complete, you are ready to configure adapter properties.

Modifying Configuration Parameters

Although the default values should be appropriate in most cases, you may change any of the available options to meet the requirements of your specific system. After the adapter driver software has been installed, you can use this procedure to verify or change the following adapter properties:

- Link selection
- Checksum offload
- Wake-up capabilities
- Flow control
- 802.1p QOS

- 1 On the Desktop, right-click the My Computer icon and select the Properties option from the pop-up menu. The System Properties window displays.
- 2 Click the Hardware tab and then click Device Manager. The Device Manager window displays.
- 3 Scroll down the list of hardware devices to Network Adapters. Click the plus (+) to the left of the icon to display the list of adapters currently configured.
- 4 Double-click the Gigabit Ethernet adapter you want to configure. The Gigabit Ethernet Properties window displays, showing the General tab.
- 5 Click the Advanced tab. A window showing the list of configurable properties (and default values) for the adapter displays.
- 6 Change the operating parameters as desired. To change adapter operating parameters listed under the Advanced tab, click on the options listed under Properties and then use the pull-down window under Value to change the default or assigned value.



When link negotiation is enabled, the user-configured link speed, flow control, and duplex settings are ignored in favor of automatically determined settings.

The following options are available:

- 802.1p QOS
- Disable (default)

- Enable
 - Checksum Offload
 - None (default)
 - Rx TCP/IP Checksum
 - Tx TCP/IP Checksum
 - Tx/Rx TCP/IP Checksum
 - Flow Control
 - Disable (default)
 - Enable
 - Link Selection
 - Auto (default)
 - UTP 10 Mbps
 - UTP 10 Mbps Full Duplex
 - UTP 100 Mbps TX
 - UTP 100 Mbps TX Full Duplex
 - UTP 1000 Mbps Half Duplex
 - UTP 1000 Mbps Full Duplex
 - RxMtu
 - Disable (default)
 - Enable
 - Wake Up Capabilities
 - None (default)
 - Magic Packet
 - Wake Up Frame
 - Both
- 7 When all desired configuration is complete, click OK to accept the settings.
 - 8 If prompted to restart your computer, click Yes. Although it is not necessary to reboot the system for new adapter properties to take effect, rebooting is recommended to reinitialize all registers.
 - 9 Verify that the adapter port LEDs operate as described in Table 1 in the Introduction.

Removing the Driver Software

Under Windows 2000, the driver software is uninstalled automatically when its hardware is removed. To remove an adapter, do the following:

- 1 Shut down the system and remove the adapter card from the PCI slot.
 - 2 When the system is powered on, the driver is uninstalled automatically.
- Note that the driver and adapter can be removed via Hot Plug, if supported.

Installing Advanced Server Program

To install the Advanced Server Program Driver Properties (ASP), do the following:

- 1 Insert the enclosed CD into the CD-ROM drive.
- 2 Select Windows 2000\BcmServ and double-click on **baspinst.exe**. This will install the **Advanced Server Program** software and display the following window.

From this menu, you can create a team (see Creating a Team and Assigning Adapters), or click OK to complete the installation.

Configuring Teaming



Optionally, all teaming configurations can be performed using the Advanced Server Control Suite (ASCS). Refer to "[Advanced Server Control Suite](#)" for additional information.

Any available adapter can be configured as part of a team. Teaming is a method of grouping multiple adapters to a virtual adapter (bundling multiple adapters to look like a single adapter). The benefit of this approach is load balancing.

By selecting each of the available adapters, move each of them over to the Load Balance Members column. This "team" now appears as one adapter. Each member in the Load Balance Member list shares the traffic burden of all its members.

The Standby Member field is used to permit the selection of one team member to handle traffic, if all other members in the Load Balance Member list fail (fail-over). The selected Standby Member will not handle any traffic unless all Load Balance Members fail. When one Load Balance Member (or more) is restored (fail-back), traffic will then be resumed by the restored team member(s).

Teaming configuration is optional. Before configuring Teaming, see the Teaming Overview.

Configuring Teaming consists of the following tasks:

- Accessing the Advanced Server Program Driver Properties interface
- Creating teams
- Adding adapters to the teams
- Assigning IP addresses to the teams

Each of these tasks is described below, along with procedures describing how to delete adapters from a fail-over team and how to delete a team.

Accessing the Advanced Server Program Driver Interface

Use this procedure to access the adapter properties for Teaming Configuration:

- 1 Right-click on the My Network Places icon and select Properties.
- 2 When the Network and Dial-up Connections window opens, right-click on any network adapter. This displays the Adapter Properties window.
- 3 Select Advanced Server Program Driver and click the Properties button. The **BASP** window is displayed.

Interface components of the Advanced Server Program driver properties window are described below:

- Select or enter a team name
This entry field is used to select or enter a team name.
 - Unassigned adapters
This list displays all of the Ethernet adapters that are available to be added to a team. Because each adapter can be added to only one team, the adapter is removed from this list after it has been assigned to a team.
- Team Type
Smart Load Balance and Fail-Over: Load balancing
FEC/GEC: Also known as general trunking. No standby adapter is allowed when this option is selected.
- Team members
This list displays all adapters that belong to a selected team.
- Standby Adapter
This list displays the standby adapter selected for fail-over for a selected team.
- VLAN List
This list displays all the VLANs that have been created for the selected team.

Creating a Team and Assigning Adapters

A fail-over team comprises at least one primary adapter (a standby adapter is optional). Each adapter can belong to only one team. To configure a new fail-over team, access the Advanced Server Program Driver Properties window and perform the following steps:

- 1 Enter a team name in the "Select or enter a team name" entry field.
- 2 Click Create Team.



The newly created team inherits all the basic configuration properties (Flow Control setting, Link Negotiation, Port Speed, and VLANs, when assigned). All other adapters added to the team are reconfigured automatically to match the team configuration. When the basic configuration properties of a team are changed, this changes the configuration of all adapters in the team. However, when an adapter is removed from any fail-over teams, it will operate according to the parameters set for it before becoming a member of a fail-over team

- 3 Place an adapter into the team.
 - In the Unassigned adapters list, select the adapter(s) that you want to add to the team created in the previous step. Move the selected adapters to the Team Members list box using the double arrows.
 - When you have finished configuring fail-over teams, click OK to accept the changes.



At least one adapter must be displayed in the Team Members list box

- 4 If a team has no adapters assigned, you will be prompted to add an adapter or delete the team.

Click OK. When team has been correctly configured, one Virtual Team adapter driver will be created for each configured team and will appear along with the other adapters in the Network and Dial-up Connections window.

- 5 Configure the team IP address if necessary. If other adapters in your system use TCP/IP bindings, the TCP/IP Properties window will open. Configure the IP address and any other necessary TCP/IP configuration for the team. Click OK when finished.

Removing Adapters from a Team

To remove an adapter from its assigned team, select the adapter in the Team Members list and press the Delete key or the double left arrow. The adapter will be removed from the team list and will reappear in the Unassigned adapters list.

Deleting a Team

To delete a configured fail-over team and release its assigned adapters, select the team in the team list and click Delete Team. The team and all its assigned adapters will be removed from the team list. The released adapters will reappear in the Unassigned adapters list.



Adapters that are part of a team inherit all the basic configuration properties of the team, including VLANs associated with the team. If you delete a team, any VLANs configured for that team will also be deleted.

Configuring VLANs

VLAN Configuration is optional. Before configuring VLANs, see the VLAN Overview.



Adapters that are members of a team can also be configured to support VLANs; however, VLANs cannot be configured for an Intel stand-alone LAN on Motherboard (LOM) or a team that includes a LOM.

When configuring VLANs for team adapters, note that any adapter or LOM that is a member of a team inherits the configuration of the primary adapter. When an adapter or LOM is removed from the team, however, its original configuration parameters are used.

By default, Ethernet adapters are configured with VLAN support disabled. Up to 64 VLANs can be defined for each team on your server. Configuring VLANs consists of the following tasks:

- Accessing the VLAN configuration interface.
- Adding VLAN(s) to the team(s). This includes assigning a unique identifier and name to each new VLAN.

Each of these tasks is described below, along with procedures describing how to delete VLANs or modify the properties of a configured VLAN.

Accessing the Adapter VLAN Configuration Interface

Use this procedure to access the adapter properties for VLAN Configuration:

- 1 Open the system Control Panel and double-click Network and Dial-up Connections.
- 2 Select any adapter and click **BASP** properties.

The **BASP** configuration window is displayed:

The **BASP** configuration window lists the installed adapters and the VLANs configured for each team. Each VLAN is identified with a unique identifier number and name that will appear only in this window. Interface components of the VLAN Configuration window are described in detail below:

- **VLAN List**

This list displays all VLANs that have been configured.

- **Control Buttons**

There are two control buttons: Create VLAN, and Delete VLAN. These buttons are used for creating and deleting VLANs.

Adding a VLAN

You can define up to 64 VLANs per team. To configure a new VLAN, follow these steps:

- 1 From the **BASP** window, select the team to which you want to add a VLAN.
- 2 Enter a VLAN Name and VLAN ID, then click Create VLAN.
- 3 When you have finished adding VLANs to this team, click OK. A new virtual adapter is created for each VLAN.



To maintain optimal adapter performance, your system should have 64 MB of system memory for each eight VLANs.

When adding VLANs to a single adapter, a one-adapter team must be created.

Deleting a VLAN

To delete a configured VLAN, follow these steps:

- 1 From the **BASP** window, select the VLAN you want to delete, and click Delete VLAN. The selected VLAN will be deleted from the VLAN list window.
- 2 When you have finished deleting VLANs, click OK to accept the changes.

5

WINDOWS NT DRIVER SOFTWARE

This chapter provides the following information:

- Installing the Driver Software
- Modifying Configuration Parameters
- Updating the Driver Software
- Removing the Driver Software
- Configuring Teaming
- Configuring VLANs

Installing the Driver Software

The Gigabit Ethernet adapter must be physically installed in your system before installing the driver software. See "Installing the Hardware" for details.



A network device driver must be installed before the Gigabit Ethernet adapter can be used with your Windows NT system.

Install the adapter software for Windows NT as follows:

- 1 Verify that the Windows NT system is upgraded with Service Pack 4 or later.
- 2 Start your Windows NT system and log in. You must have Network Administrator privileges to install the driver software.
- 3 Open the Control Panel.
- 4 In the Control Panel, double-click the Network icon.
- 5 When the Network window opens, select the Adapters tab.
All previously installed drivers are listed under Network Adapters.
- 6 To install the driver software for a Gigabit Ethernet adapter, click the Add button.



For Windows NT Server Enterprise, be sure to use the Add button, not the Search button.

- 7 When the Select Network Adapter window opens, click Have Disk.
- 8 When prompted, insert the included CD-ROM into your system CD-ROM drive, type the path to the driver, and click OK.
- 9 To install the adapter driver software for Windows NT, type e:\ in the Insert Disk location box (where "e:" is the letter name of the CD-ROM drive).



If you acquired the adapter software on floppy disk or from a third-party support website, enter the path to where the adapter driver files reside on your system.

- 10** With the Gigabit Ethernet Adapter Software Release highlighted in the Select OEM Option window, click OK.

The Gigabit Ethernet Driver Media Type window opens.

The possible Media Type parameters are:

- Auto
 - UTP 10 Mbps
 - UTP 10 Mbps Full Duplex
 - UTP 100 Mbps TX
 - UTP 100 Mbps TX Full Duplex
 - UTP 1000 Mbps Half Duplex
 - UTP 1000 Mbps Full Duplex
- 11** When the media type window appears, choose the proper cable type for your network adapter and click Continue.



When you disable automatic link negotiation, the driver properties window will allow you to select 10 Mbps, 100 Mbps, or 1 Gbps port speed and either half-duplex or full-duplex operation.

- 12** When configuration is complete, click Close in the Driver Properties window.
- 13** In the Network window, click Close.



If other adapters in your system use TCP/IP bindings, the TCP/IP Properties window opens. Perform any necessary TCP/IP configuration and click OK when finished. For help configuring TCP/IP protocol, consult your Microsoft Windows NT 4.0 documentation.

- 14** When prompted to restart your computer, click Yes.

The system restarts, using the new configuration settings.

- 15** When the system returns to normal operation, verify that the adapter port LEDs operate as described in Table 1 in the Introduction.

Modifying Configuration Parameters

After the adapter driver software has been installed, you can examine and change the configuration options at any time. The following adapter parameters are user-configurable:

- Basic properties: Tx and Rx Flow Control, Link Negotiation, Duplex Mode, and Port Speed
- Optional properties: Fail-over Team Configuration and VLAN Configuration.



Adapters configured as part of a fail-over share basic configuration properties. Changing the configuration of one adapter in a specific team changes the properties of all the adapters in that team.

To access the adapter properties:

- 1** Open the Control Panel and double-click the Network icon.
- 2** When the Network window opens, select the Adapters tab.

The bus and slot number of the highlighted adapter are listed in the lower part of the window.

- 3 Select the desired adapter from the Network Adapters window and click on Properties.

The Gigabit Ethernet Driver Media Type window opens.

The possible Media Type parameters are:

- Auto
 - UTP 10 Mbps
 - UTP 10 Mbps Full Duplex
 - UTP 100 Mbps TX
 - UTP 100 Mbps TX Full Duplex
 - UTP 1000 Mbps Half Duplex
 - UTP 1000 Mbps Full Duplex
- 4 When the Media Type field appears in the window, choose the proper cable type for your network adapter and click Continue.
 - 5 When prompted to restart your computer, click Yes.

The system restarts, using the new configuration settings.



If no configuration changes have been made, you can click No to close the configuration session without restarting your system.

Updating the Driver Software

To replace version 4.0 adapter driver software with newer versions as they become available:

- 1 Start your Windows NT system and log in. You must have Network Administrator privileges to install the driver software.
- 2 Open the Control Panel and double-click the Network icon.
- 3 When the Network window opens, select the Adapters tab.
Any previously installed Gigabit Ethernet driver software is listed under Network Adapters.
- 4 Select a Gigabit Ethernet adapter and click Update.
- 5 When the Select Network Adapter window opens, click Have Disk....
- 6 When prompted, insert the enclosed CD-ROM into your system CD-ROM drive, type the root path to the drive, and click Continue.

For example, type e:\

(Where "e:" is the letter name of the CD-ROM drive).

The system then copies the appropriate adapter files from the CD-ROM.



If you acquired the adapter software on floppy disk or from a third-party support website, enter the path where the adapter driver files reside on your system.

- 7 When the copying process is complete, click Close in the Network window.

- 8 When prompted to restart your computer, click Yes. The system restarts using the new configuration settings.

Removing the Driver Software

Before physically removing an adapter from your system, first remove the adapter driver software.

- 1 Start your Windows NT system and log in. You must have Network Administrator privileges to remove the driver software.
- 2 Open the Control Panel and double-click the Network icon.
- 3 When the Network window opens, select the Adapters tab.
Any previously installed Gigabit Ethernet adapters are listed under Network Adapters.
- 4 Select each Gigabit Ethernet adapter you want to remove and click Remove.
- 5 After the appropriate adapters have been removed, click Close.
- 6 When prompted to restart your computer, click Yes.

Configuring Teaming

Teaming configuration is optional. Before configuring Fail-over Teaming, see the "Teaming Overview."

Configuring Teaming consists of the following tasks:

- Accessing the Advanced Server Program Driver Properties.
- Creating teams
- Adding adapters to the teams
- Assigning an IP address to the teams
- Rebooting the system

Each of these tasks is described below, along with how to delete adapters from a fail-over team and how to delete a team.

Accessing the BASP Driver Interface

Use this procedure to access the adapter properties for Teaming Configuration:

- 1 Open the Control Panel and double-click the Network icon.
- 2 When the Network window opens, select the Adapters tab.
- 3 Select any Gigabit Ethernet Adapter and click the Properties button. The BASP window is displayed.

Interface components of the BASP window are described below:

- Select or enter a team name
(The entry field is used to select or enter a team name.)

Unassigned adapters

- This list displays all of the Ethernet adapters that are available to be added to a team. Because each adapter can be added to only one team, the adapter is removed from this list after it has been assigned to a team.
- Team Type

Smart Load Balance and Fail Over: Load balancing
 FEC/GEC: Also known as general trunking. No standby adapter is allowed when this option is selected.

- Team members

This list displays all adapters that belong to a selected team.

- Standby Adapter

This list displays the standby adapter selected for fail-over belonging to a selected team.

- VLAN List

This list displays all the VLANs that have been created for the selected team.

Creating a Team and Assigning Adapters

A fail-over team comprises at least one primary adapter and one standby adapter. Each adapter can belong to only one team. To configure a new team, access the Advanced Server Program Driver Properties window and do the following:

- 1 Enter a team name in the "Select or enter a team name" entry field.
- 2 Click the Create Team button.



The newly created team inherits all the basic configuration properties (Flow Control setting, Link Negotiation, Port Speed, and VLANs, when assigned). All other adapters added to the team are reconfigured automatically to match the team configuration. When a basic team configuration properties are changed, this changes the configuration of all adapters in the team. However, after an adapter has been removed from any team, it will operate according to the parameters set for it before becoming a member of a team.

- 3 Add an adapter to the team.
 - In the Unassigned adapters list, select the adapter(s) that you want to add to the team (created in the previous step). Move the selected adapter(s) to the Team members list box using the double arrows.
 - When you have finished configuring fail-over teams, click OK to accept the changes.



At least one adapter must be displayed in the Team Members list box.

- 4 If a team has no adapters assigned, you will be prompted to add another adapter or delete the team.

Click OK. When team has been correctly configured, one Virtual Team adapter driver will be created for each configured team and will appear along with the other adapters in the Network and Dial-up Connections window.

- 5 Configure the Team IP address if necessary. If other adapters in your system use TCP/IP bindings, the TCP/IP Properties window will open. Configure the IP address and any other necessary TCP/IP configuration for the team and click OK when finished.

Removing Adapters from a Team

To remove an adapter from its assigned team, select the adapter in the Team Members list and press the Delete key or the double left arrow. The adapter will be removed from the team list and will reappear in the Unassigned adapters list.

Deleting a Team

To delete a configured fail-over team and release its assigned adapters, select the team in the team list and click the Delete Team button. The team and all its assigned adapters will be removed from the team list. The released adapters will reappear in the Unassigned adapters list.



Adapters that are part of a team inherit all the basic configuration properties of the team, including VLANs associated with the team. If you delete a team, any VLANs configured for that team will also be deleted.

When you close the properties window, if there are no teams or VLANs currently configured for the selected adapter, a dialog box is displayed:

[Describe dialog box]

If the dialog box is displayed, you must click the Yes or No button before the system will allow you to complete adapter configuration.

Configuring VLANs

VLANs Configuration is optional. Before configuring VLANs, see the "VLANs Overview."



Adapters that are members of a team can also be configured to support VLANs. However, VLANs cannot be configured for an Intel stand-alone LAN-on-motherboard (LOM) or a team that includes a LOM.

When configuring VLANs for team adapters, note that any adapter or LAN-on-motherboard (LOM) that is a member of a team inherits the configuration of the primary adapter. However, when an adapter or LOM is removed from the team, its original configuration parameters are used.

By default, Gigabit Ethernet adapters are configured with VLAN support disabled. As many as 64 VLANs can be defined for each Gigabit Ethernet adapter on your server. Configuring VLANs consists of the following tasks:

- Accessing the VLAN configuration interface.
- Adding VLAN(s) to the adapter(s). This includes assigning a unique identifier and (optional) name to each new VLAN.
- Rebooting the system.

Each of these tasks is described below, along with how to delete VLANs or modify the properties of a configured VLAN.

Accessing the Adapter VLAN Configuration Interface

Use this procedure to access the adapter properties for VLAN Configuration:

- 1 Open your system Control Panel and double-click the Network icon.
- 2 When the Network window opens, select the Adapters tab.
- 3 Select any Gigabit Ethernet Adapter and click the Properties button. The **BASP** window is displayed, from which you can configure VLANs.

The **BASP** configuration window lists the installed adapters and the VLANs configured for each team, if any. Each VLAN is identified with a unique identifier number and name that will appear only in this window. Interface components of the VLAN Configuration window are described in detail below:

- **VLAN List**

This list displays all VLANs that have been configured.

- **Control Buttons**

There are two control buttons: Create VLAN, and Delete VLAN. These buttons are used for creating and deleting VLANs.

Adding a VLAN

You can define as many as 64 VLANs per team. To configure a new VLAN, do the following:

- 1 From the **BASP** window, select the team to which you want to add a VLAN.
- 2 Enter a VLAN Name and VLAN ID, then click Create VLAN.
- 3 When you have finished adding VLANs to this team, click OK . A new virtual adapter will be created for each VLAN.



To maintain optimal adapter performance, your system should have 64 MB of system memory for each eight VLANs created.

Deleting a VLAN



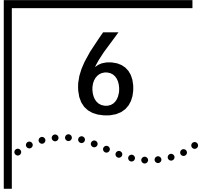
Adapters that are part of a team inherit all the basic configuration properties of the team, including VLANs associated with the team. If you delete a team, any VLANs configured for that team will also be deleted.

To delete a configured VLAN, do the following:

- 1 From the **BASP** window, select the VLAN you want to delete and click the Delete VLAN button. The selected VLAN will be deleted from the VLAN list window.
- 2 When you have finished deleting VLANs, click OK to accept the changes.



When VLANs are created and then deleted, the original team name and adapter assignments [Primary/Standby] are still present, but the IP address for the team is deleted.



NETWARE DRIVER SOFTWARE

This chapter provides the following information:

- Driver Installation
- Pre-Installation Requirements
- Installing Novell NetWare Server 4.x
- Installing Novell NetWare Server 5.x
- Verifying or Modifying Adapter Parameters
- Installing Advanced Server Features
- Load Balance Mode Selection
- Loading Frame Types
- Hot Standby
- Configuring VLANs
- Additional Command Line Keywords
- Editing the AUTOEXEC.NCF File

Driver Installation

This section describes how to perform the following tasks:

- Verify that the required OS support files are installed on the server and the NetWare pre-installation parameters are correctly set.
- Install the driver software in the Novell NetWare environment.
- Reconfigure the driver software, if necessary, after installation.

Note: NWCONFIG is commonly used to install a driver on a NetWare server.

Pre-Installation Requirements

A network device driver must be installed before the Gigabit Ethernet adapter can be used with your Novell NetWare system.

Before you can successfully install the adapter driver for Novell NetWare, the adapter card must be physically installed in the server and, typically, NetWare OS software must already be running on the server. Make sure that your server meets the hardware and operating system software requirements described in "Installing the Hardware."

To enable the Gigabit Ethernet adapter to function correctly, you must first install the latest support pack files. The netware support pack or patch file(s) needed for your server operating system are indicated below:

Table 4 NetWare Support Files

| NetWare OS | Support Pack or Patch | Files to be Installed |
|-------------|---|---|
| NetWare 5.1 | NetWare 5.1 Support Pack (or latest support pack) | The latest support packs can be found at: http://support.novell.com/misc/patlst.htm |
| NetWare 4.2 | Support Pack 7.0 or later | |



NetWare 5.x: If you are installing NetWare 5.x for the first time, you will need to install the adapter driver during the OS installation procedure. Install the NetWare 5 support pack after you have successfully installed the operating system on the server.

To obtain the latest support pack files, go to the Novell support website and click on the Minimum Patch List option in the navigation bar. Scroll down the page and, using Table 1 above as a guide, select and download the latest support pack or patch file(s) for the operating system running on your server.



NetWare 4.2: The latest ODI LAN drivers are not installed automatically with the NetWare 4.2 Support Pack. Follow the support pack instructions for including the ODI LAN drivers during installation.

Installing Novell NetWare Server 4.x

- 1 Installing Novell From the NetWare console, type Load Install, and press Enter.
- 2 Follow the steps under Novell NetWare Server 5.x beginning with step 2.

Note that in NetWare 4.x/5.x you may need to edit the startup.ncf file. To ensure optimal adapter performance, add at least 1500 packet receive buffers for each adapter in the system. Depending on your system configuration, the number of supported clients, and other requirements, more than the minimum 1500 packet receive buffers may be required for each adapter.

Example: The default maximum number of receive buffers for the system is 500; the default minimum is 128. Edit the startup.ncf file to have the following entries:

```
set maximum packet receive buffers = 10000
set minimum packet receive buffers = 2000
```



You may want to change the autoexec.ncf file to add or delete keywords. The startup.ncf and autoexec.ncf files can be edited by invoking NWCONFIG from the NetWare 5.x server console, and by invoking LOAD INSTALL from the NetWare 4.x server console.

Example of a typical autoexec.ncf file:

```
file server name NOVELLSERVER41
# WARNING!!
# If you change the name of this server, you must update
# all the licenses that are assigned to this server. Using
# NWAdmin, double-click on a license object and click on
# the Certificate Assignments button. If the old name of
# this server appears, you must delete it and then add the
```

```
# new server name. Do this for all license objects.
ServerID 1C8EE2C
LOAD ODINEB.NLM
LOAD TCPIP
LOAD B57 SLOT=2 FRAME=Ethernet_802.2 NAME=B57_1_E82
BIND IPX B57_1_E82 NET=FAFD3D25
LOAD B57 SLOT=2 FRAME=Ethernet_802.3 NAME=B57_1_E83
BIND IPX B57_1_E83 NET=5A2D8D6D
LOAD B57 SLOT=2 FRAME=Ethernet_SNAP NAME=B57_1_ESP
BIND IPX B57_1_ESP NET=477A35BD
LOAD B57 SLOT=2 FRAME=Ethernet_II NAME=B57_1_EII
BIND IPX B57_1_EII NET=C3C8F2E4
BIND IP B57_1_EII ADDR=172.16.1.1 MASK=ff.ff.ff.0
mount all
```

Configure driver parameters, referring to the parameter descriptions found in [Table 2](#), below.

Table 5 Adapter Configuration Parameters

| Parameter | Options | Descriptions |
|------------------|--|--|
| Checksum* = | Selections are: Default = OFF ON | This is to enable or disable the transmit and receive checksum off-loading feature. Note that checksum is supported under NetWare 5.x only. |
| Frame* = type | Valid types are: Ethernet_802.2 _ Ethernet_802.3 _ Ethernet_II _ Ethernet_SNAP | Defines the frame type being used by this load instance. Ethernet_802.2 and Ethernet_II are the default values. |
| name* = text | | The name assigned to this adapter |
| Node Address* = | | To override the default Media Access Controller (MAC) address (also known as the Locally Administered Address), specify a node address in this field. The expected range is 0060CF000000 through 0060CFFFFFFF. |
| RxBuffers = | Default = 200 Min = 32 Max = 1000 | This is to pre-allocate ECB resources on the adapter for receiving packets. |
| TxDescriptors* = | Default = 120 Min = 100 Max = 400 | This is to pre-allocate ECB resources on the adapter for transmitting packets. |
| RxFlow* = | Selections are: Default = ON OFF | This keyword allows enabling/disabling of RxFlow control. |
| TxFlow = | Selections are: Default = ON OFF | This keyword allows enabling/disabling of TxFlow control. |
| Slot = n | | Identifies the slot number for the specific BCM5700 adapter currently being configured. This parameter is not necessary if only a single adapter is installed. |
| Speed = n | | If link negotiation has been disabled, you can select port speed to be either Auto, 10HD or 10FD, 100HD or 100FD. |

*Command line options

Installing Novell NetWare Server 5.x

Be sure that the server has the latest support pack available installed. The latest support packs can be found at: <http://support.novell.com/misc/patlst.htm>. You may want to create an archive disk by copying all the files from the CDROM\Netware\Driver directory onto a floppy disk. If you choose to use the CD-ROM directly, ensure that the CDROM.NLM is loaded and that you are aware of the NetWare Volume name for the CD-ROM that you just installed.

- 1 From the NetWare Server console, type NWCONFIG (or LOAD NWCONFIG) and press Enter.
- 2 From the Configuration Options screen, select Driver options and press Enter.
- 3 Select the Configure network drivers option and press Enter.
- 4 Choose the Load an additional driver option and press Enter.
- 5 Insert the CD or driver disk created using the enclosed MakeDisk utility, and select the Install an unlisted driver option, by pressing Insert.
- 6 If you are using the archive disk that you created, insert the disk into drive A: and press Enter. If you have the CD-ROM mounted as a NetWare volume, press F3 and enter <Volume Name>: Netware\Driver as the source path. Where <Volume Name> is the name of the NetWare volume for the CD-ROM and Netware\Driver is the directory of the specific files on the CD-ROM needed for this installation.
- 7 The name of the driver displays.
- 8 Press Enter to select the highlighted driver.
- 9 A copy the driver prompt appears.
- 10 Select Yes and press Enter.
- 11 To copy the .LDI file, select Yes and press Enter. This is the installation script for the driver.
- 12 Follow the instructions for the installation.
- 13 Select Save parameters and load driver to continue.
- 14 Choose Exit to return to the server console prompt.



If you are performing an initial installation of NetWare 5.x and have more than two adapters installed, the install program will allow you to allocate the actual number of packet receive buffers needed by the adapter. During installation, the `RxBuffers` value should be set to 32, the minimum number of buffers the driver requires for each adapter. Although this setting affects adapter performance, it allows installation of the operating system and up to eight adapters during initial install. When installation is complete, you must increase the number of buffers allocated to the driver, as described in [Table 2](#).

- 15 After NetWare 5.x has been successfully installed, set the packet receive buffers parameter in the startup.ncf file to 1500 for each adapter in the system. For more information, see [Table 2](#).
- 16 In the startup.ncf file, delete the packet receive buffers parameter (`RxBuffers=32`) in the load statement for this adapter. Deleting the receive buffers phrase from the load statement resets the receive buffers parameter to the default value of 200 for this adapter.



The server must be restarted for the new configuration.

Example: The default maximum number of receive buffers for the system is 500; the default minimum is 128. Edit the startup.ncf file to have the following entries:

```
set maximum packet receive buffers = 30000
set minimum packet receive buffers = 10000
```

Verifying or Modifying Adapter Parameters

When an adapter configuration is saved, the NetWare install program adds load and bind statements to the autoexec.ncf file. By accessing this file, you can verify the parameters configured for each adapter, modify them, or enter additional parameters.



The Novell monitor program and the config command are also useful for verifying driver configuration. For information on how to use these programs, see the Utilities Reference in your Novell NetWare online documentation.

The parameters that can be defined in the load statements are described in [Table 2](#). A valid autoexec.ncf file is shown below. One set of load and bind commands is shown for each frame type the adapter is configured to support.

```
set Time Zone = PST8PDT
set Daylight Savings Time Offset = 1
set Start Of Daylight Savings Time = (APRIL SUNDAY FIRST 2:00:00 AM)
set End Of Daylight Savings Time = (OCTOBER SUNDAY LAST 2:00:00 AM)
set Default Time Server Type = SINGLE
set Bindery Context = O=LAN
```

```
# WARNING!!
file server name NOVELLSERVER51
# WARNING!!
# If you change the name of this server, you must update
# all the licenses that are assigned to this server. Using
# NWAdmin, double-click on a license object and click on
# the Certificate Assignments button. If the old name of
# this server appears, you must delete it and then add the
# new server name. Do this for all license objects.
```

```
ServerID 1C8EE2C
LOAD ODINEB.NLM
LOAD TCPIP
LOAD B57 SLOT=2 FRAME=Ethernet_802.2 NAME=B57_1_E82
BIND IPX B57_1_E82 NET=FAFD3D25
LOAD B57 SLOT=2 FRAME=Ethernet_802.3 NAME=B57_1_E83
BIND IPX B57_1_E83 NET=5A2D8D6D
LOAD B57 SLOT=2 FRAME=Ethernet_SNAP NAME=B57_1_ESP
BIND IPX B57_1_ESP NET=477A35BD
LOAD B57 SLOT=2 FRAME=Ethernet_II NAME=B57_1_EII
BIND IPX B57_1_EII NET=C3C8F2E4
BIND IP B57_1_EII ADDR=172.16.1.1 MASK=ff.ff.ff.0
```

mount all

```
SEARCH ADD SYS:\JAVA\BIN
SEARCH ADD SYS:\JAVA\NWGFX
```



If you modify any adapter parameters, you must reboot the system before the changes will take effect. If you make changes and do not reboot, you may experience configuration problems.

Installing Advanced Server Program

- 1 Load the network drivers for the NIC adapters that will be part of the team. The frame types loaded should be the same for all adapters in the team. Do not bind protocols directly to these adapters.

Example:

```
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_EII SLOT=3
```

- 2 Load **BASP.LAN** just like a standard LAN driver with the same frame types loaded for the NIC adapters in the team. **BASP.LAN** requires a special VSLOT parameter to specify the virtual slot. The virtual slot can be viewed as a team number.

Example:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1
```

After **BASP.LAN** is successfully loaded, a new screen similar to the one below appears. This screen displays all virtual adapter settings and statistics. Press Alt+Esc to switch back to the console and continue with step 3.

- 3 Bind **BASP.LAN** to the NIC adapters in the team by using a custom **BASP BIND** command at the console.

Example:

```
BASP BIND BASP_1_EII B57_1_EII
BASP BIND BASP_1_EII B57_2_EII
```

Note that if there are multiple frame types loaded on the virtual and the physical adapters, it is necessary to bind only one frame type on the virtual adapter to the same frame type on the physical adapter. The other frame types will be bound automatically.

- 4 Bind protocols to **BASP.LAN**.

Example:

```
BIND IP BASP_1_EII ADDR=x.x.x.x MASK=x.x.x.x
```



*Configuration of **BASP.LAN** should be performed manually by editing the AUTOEXEC.NCF file. NWCONFIG.NLM (or INSTALL.NLM) cannot completely configure **BASP.LAN**.*

Load Balance and Trunk Mode Selection

Use "MODE=SLB" for Smart Load-Balance mode or "MODE=TRUNK" for Generic Trunking mode. The default is SLB.

Example:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1
MODE=TRUNK
```



*Load Balance occurs only on the Tx send side with IPX protocol. It will not Load Balance on the receive side when running Netware **BASP**.*

Hot Standby In Smart Load-Balance (SLB) mode, one or more NIC adapters can be designated as hot standby adapters. Use the keyword "STANDBY" in the **BASP BIND** command to indicate binding a NIC adapter as a hot standby.

Example:

```
BASP BIND BASP_1_EII B57_1_EII
```

```
BASP BIND BASP_1_EII B57_2_EII STANDBY
```

In the above example, B57_1_EII and B57_2_EII are bound as primary and hot standby adapters respectively. Note that standby is valid only for Smart Load-Balance mode.

Configuring VLANs



VLANs are not supported on all adapters. If a non-3Com adapter is a member of a fail-over team, VLANs may not be supported for that team.

To add VLANs to a team, do the following:

- 1 Load the network drivers for the NIC adapters in the team with the frame types and VLANs specified. Only **3Com NIC adapters can be used**. (ALT.LAN must be version 2.05b or later and must include the keyword FORVLANS.)

Example: (Broadcom Adapters)

```
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
```

```
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_EII SLOT=2
```

Example: (Alteon Adapters)

```
LOAD ALT.LAN FRAME=ETHERNET_II NAME=ALT_1_EII SLOT=1 FORVLANS
```

```
LOAD ALT.LAN FRAME=ETHERNET_II NAME=ALT_2_EII SLOT=2 FORVLANS
```

- 2 Load **BASP.LAN** with the same frame types as the NIC adapters and specify one or more VLAN IDs. You can specify a maximum of 64 VLAN IDs.

Example: (VLAN ID 2)

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V2_EII VSLOT=1 VLAN=2
```

Note that when VLAN is set to 0 (which is not a valid number) it will disable the VLAN feature.

The valid range is 1–4094.

- 3 Bind **BASP.LAN** to the NIC adapters in the team for each protocol.

Example:

```
BASP BIND BASP_1_V2_EII B57_1_EII
```

```
BASP BIND BASP_1_V2_EII B57_2_EII
```

Note that if there are multiple VLANs (each with one or more frame types) loaded on the virtual adapter, it is necessary to bind only one frame type on one VLAN on the virtual adapter to the same frame type on the physical adapter. The other VLANs will be bound automatically.

- 4 Bind protocols to **BASP.LAN**.

Example:

```
BIND IP BASP_1_V2_EII ADDR=x.x.x.x MASK=x.x.x.x
```

This example creates a team with 2 adapters using VLAN ID 2. Outbound packets will be tagged with VLAN ID 2; only similarly tagged packets will be received by

the NIC adapters in the team. Additional VLANs with different VLAN IDs can be created in the same team. The maximum number of VLANs per virtual slot is 64. The valid range of VLAN IDs is 1–4094. VLAN=0 indicates the VLAN is untagged and is the default. Use decimal numbers to specify the VLAN ID.

Additional Command Line Keywords

CHECKSUM=ON

This enables **BASP.LAN** to offload TCP/UDP and IP checksums to the bound NIC adapters if supported. This will improve performance if some or all NIC adapters in the team support hardware checksums. Be sure to load the NIC drivers with hardware checksums enabled.

Example:

A team of two **BCM5700 NICs with hardware checksums enabled**.

```
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII CHECKSUM=ON
SLOT=1
```

```
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_EII CHECKSUM=ON
SLOT=2
```

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=B57_1_EII
CHECKSUM=ON VSLOT=1
```

```
BASP BIND BASP_1_EII B57_1_EII
```

```
BASP BIND BASP_1_EII B57_2_EII
```

NOSCREEN

Disables the menu-driven screen when **BASP.LAN** is loaded for the first time.

Example:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1 NOSCREEN
```

GVRP

This enables GVRP (Garp VLAN Registration Protocol) for the VLAN that is loaded. An untagged 802.2 frame type must be loaded in the virtual adapter and all bound physical adapters for GVRP to take effect. This is necessary because GVRP uses untagged 802.2 frames to advertise VLAN memberships. Use VLAN=0 FRAME=ETHERNET_802.2 in the LOAD command to specify untagged 802.2 frame type.

Example:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V2_EII VSLOT=1
VLAN=2 GVRP
```



```
LOAD BASP.LAN FRAME=ETHERNET_802.2 NAME=BASP_1_V2_EII VSLOT=1
VLAN=0
```

Editing the AUTOEXEC.NCF File

When an adapter configuration is saved, the NetWare install program adds load and bind statements to the autoexec.ncf file. By accessing this file, you can verify the parameters configured for each adapter, add or delete parameters, or modify parameters.

Example:

A valid autoexec.ncf file is shown below. It includes one set of load and bind commands for each VLAN the adapter is configured to support. One load command is entered for each adapter you want to add to a fail-over team.

```
set Time Zone = PST8PDT
set Daylight Savings Time Offset = 1:00:00
set Start Of Daylight Savings Time = (APRIL SUNDAY FIRST 2:00:00 AM)
set End Of Daylight Savings Time = (OCTOBER SUNDAY LAST 2:00:00
AM)
set Default Time Server Type = SINGLE
```

```
# Note: The Time zone information mentioned above
# should always precede the SERVER name.
set Bindery Context = 3COM
```

```
file server name SERVER
ipx internal net 1234ABCD
```

```
load conlog maximum=100
; Network driver LOADs and BINDs are initiated via
; INITSYS.NCF. The actual LOAD and BIND commands
; are contained in INITSYS.NCF and NETINFO.CFG.
; These files are in SYS:ETC.
#sys:etc\initsys.ncf
```

```
# Team of 2 NIC adapters with frame type Ethernet_II and one VLAN,
number 2
```

```
# Load the network drivers for the NIC adapters in the team with the frame
# types and VLANs specified.
```

```
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_V2_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_V2_EII SLOT=2
```

```
#Load BASP.LAN with the same frame types and VLAN ID(s) specified.
```

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V2_EII
VSLOT=1 VLAN=2
```

```
# Bind BASP.LAN to the NIC adapters in the team for each protocol
```

```

BASP BIND BASP_1_V2_EII B57_1_V2_EII
BASP BIND BASP_1_V2_EII B57_2_V2_EII

#Bind protocols to BASP.LAN.

BIND IP BASP_1_V2_EII ADDR=192.168.2.200 MASK=255.255.255.0

#####

# Team of 2 NIC adapters with frame type Ethernet_II and three VLANs,
number 2,3,4.

# Load the network drivers for the NIC adapters in the team with the frame
# types and VLANs specified.

LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_V_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_V_EII SLOT=2

#Load BASP.LAN with the same frame types and VLAN ID(s) specified.

LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V2_EII
VSLOT=1 VLAN=2
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V3_EII
VSLOT=1 VLAN=3
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V4_EII
VSLOT=1 VLAN=4

# Bind BASP.LAN to the NIC adapters in the team for each protocol
# Note: BASP BIND is only used for the first VLAN all other VLANs are
automatically # bound to the virtual adapter (VSLOT=1).

BASP BIND BASP_1_V2_EII B57_1_V_EII
BASP BIND BASP_1_V2_EII B57_2_V_EII

#Bind protocols to BASP.LAN.

BIND IP BASP_1_V2_EII ADDR=192.168.2.200 MASK=255.255.255.0
BIND IP BASP_1_V3_EII ADDR=192.168.3.200 MASK=255.255.255.0
BIND IP BASP_1_V4_EII ADDR=192.168.4.200 MASK=255.255.255.0

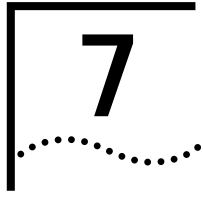
mount all

set immediate purge of deleted files = on
set upgrade low priority threads = on
set display spurious interrupt alerts = on
set display lost interrupt alerts = on

```



NOTE: If you modify any adapter parameters, you must reboot the system before the changes take effect. If you make changes and do not reboot, you may experience configuration problems.



LINUX DRIVER SOFTWARE

This section describes the Linux driver for the 10/100/1000 Mbps Ethernet Adapter, and provides the following details:

- Limitations
- Packaging
- Module Parameters
- Advanced Server Program

Limitations The current version of the driver has been tested only on Redhat 6.2 and 7 Linux distributions for i386 (kernel version 2.2.14 and 2.2.16). The driver has been tested only as a loadable module.

Packaging The driver is released in two packaging formats—source RPM and compressed tar formats. The file names for the two packages are `bcm5700-<version><version>.src.rpm` and `bcm5700-<version><version>.tar.gz` respectively. Identical files to build the driver are included in both packages.

Installing Source RPM Package

- 5 Install the source RPM package:

```
rpm -i bcm5700-<version><version>.src.rpm
```

- 6 CD to the RPM path and build the binary driver for your kernel:

```
cd /usr/src/{redhat,OpenLinux,turbo, ..}  
rpm -bb SPECS/bcm5700.spec
```

Note that the RPM path is different for different Linux distributions.

- 7 Install the newly built package:

```
rpm -i RPMS/i386/bcm5700-<version><version>.i386.rpm
```

The driver should be installed in `/lib/modules/<kernel_version>/net/bcm5700.o`.

- 8 Load the driver:

```
insmod bcm5700
```

Building Driver From TAR File

- 1 Create a directory and extract the files:

```
tar xvzf bcm5700-<version><version>.tar.gz
```

- 2 Build the driver `bcm5700.o` as a loadable module for both uniprocessor and multiprocessor systems:

```
make
```

- 3 Test the driver by loading it:

```
insmod bcm5700.o
```

Module Parameters

Optional parameters for the driver can be supplied as command line arguments to the `insmod` command. These parameters take the form:

```
<parameter>=value[,value,...]
```

where multiple values for the same parameter for multiple NICs are installed in the system.

All the parameters are listed below.

- `line_speed`

Selects the line speed of the link. This parameter is used together with `full_duplex` to select the speed and duplex characteristics of the link. Valid values include:

- 0 = Autonegotiate (default)
- 10 = 10 Mbps
- 100 = 100 Mbps

Note that selecting 1000 Mbps manually is invalid. 1000 Mbps can be achieved only through autonegotiation.

- `full_duplex`

Selects the duplex characteristics of the link. This parameter is used together with `line_speed` to select the speed and duplex characteristics of the link. Note that this parameter is ignored if `line_speed` is 0. Valid values include:

- 0 = half duplex
- 1 = full duplex (default)

- `rx_flow_control`

Enables or disables receiving flow control (pause) frames. This parameter is used together with `auto_flow_control`. Valid values include:

- 0 = pause receive disabled (default)
- 1 = pause receive enabled if `auto_flow_control` is set to 0, or pause receive advertised if `auto_flow_control` is set to 1

- `tx_flow_control`

Enables or disables transmitting flow control (pause) frames. This parameter is used together with `auto_flow_control`. Valid values include:

- 0 = pause transmit disabled (default)
- 1 = pause transmit enabled if `auto_flow_control` is set to 0, or pause transmit advertised if `auto_flow_control` is set to 1

- `auto_flow_control`

Enables or disables autonegotiation of flow control. This parameter is used together with `rx_flow_control` and `tx_flow_control` to determine the advertised flow control capability. Valid values include:

- 0 = flow control autonegotiation disabled (default)

- 1 = flow control autonegotiation enabled with capability specified in `rx_flow_control` and `tx_flow_control` (only valid if `line_speed` is set to 0)
- `mtu`
Enables Jumbo frames up to the specified MTU size. The valid range is 1500–8184.

Advanced Server Program

Overview

The Advanced Server Program is a kernel module designed for Linux 2.2 kernel that provides load-balancing, fault-tolerance, and VLAN features. These features are provided by creating teams that consist of multiple NIC interfaces. A team can consist of between 1 and 8 NIC interfaces, and each interface can be designated primary or standby. All primary NICs in a team will participate in load-balancing operations by sending and receiving a portion of the total traffic. Standby interfaces will take over in the event that all primary interfaces have lost their links. VLANs can be added to a team to allow multiple VLANs with different VLAN IDs. A virtual device is created for each VLAN added.

The Advanced Server Program supports Smart Load-balance, SLB, and Generic trunking. In SLB mode, all the NIC drivers must support **NIC Extension (NICE)**. In this distribution, several NIC drivers patched with **NICE** are included. SLB mode works with all Ethernet switches without configuring the switch ports to any special trunking mode. Only IP traffic will be load-balanced in both inbound and outbound directions. The Generic trunking mode does not require **NICE** and can work with any NIC, however, it requires the Ethernet switch to support and be properly configured. This mode is protocol-independent; all traffic should be load-balanced and fault-tolerant.

Installing Advanced Server Program

The **Advanced Server Program** for Linux is shipped in mixed forms, where the platform and kernel specific files are in source code and the core file is in object form. The installation process involves:

- 1 Configuring the make option to match the kernel. There are two configurable options:
 - a `MODVERSION`—use if the kernel uses module versioning.
 - b `SMP`—use if the module will run on SMP kernel.
- 2 Running the make option to build the kernel module (`basplnx.o`) and utility program (`baspcfg`).
Installing the driver by running `insmod basplnx.o`.
- 3 create management device `/dev/blf` by `mknod /dev/blf c 254 0`.
Note: This is a character device file with major device number 254. If this device number is taken by other drivers, change the constant `BLF_DEVICE_MAJOR` in `blf.h` and re-compile both `basplnx.o` and `baspcfg`.
- 4 configure the team by running `baspcfg` utility.

Files

| | |
|------------------------|--|
| Makefile | makefile |
| <code>baspcfg.c</code> | source file of the configuration utility |

| | |
|-------------|---|
| bcmtype.h | commonly use type header file |
| blf.c | kernel module entries |
| blf.h | ioctl interface |
| blfcore.h | core interface |
| blfcore.o | pre-compiled core object |
| blfver.h | version header file |
| nicext.h | NICE header file |
| pal.c | platform abstraction implementation |
| pal.h | header for paltform abstraction |
| release.txt | this file |
| nice-2.2.16 | contains NICE-enabled driver sources code |
| ADD | sample script to create a team of 3 NICs |
| DEL | sample script to delete a team of 3 NICs |

BASPCFG

baspcfg is a command line tool to configure the **BASP** teams, add/remove NICs, and add/remove virtual device. Following is the usage of this tool.

```
baspcfg v1.1.3 Copyright (c) 2000 Broadcom Corporation
usage: baspcfg <commands><commands>
```

Commands

```
addteam <tid><tname><tid> <type> <tname> -- create a team
delteam <tid> -- delete a team
addva <tid> <vlan_id> <vname> <tid><vlan_id> <vname>[macaddr] -- add a
virtual adapter to a team
delva <tid> <vlan_id> -- delete a virtual adapter from a team bind
bind <tid> <role> <device> -- bind a physical adapter to a team
unbind <tid> >device> -- unbind a physical adapter from a team
```

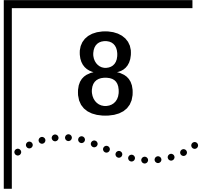
where

```
tid -- A unique ID for each team, starting from 0
type -- Team type: 0=SLB, 1=FEC/GEC
tname -- ASCII string name of the team
vlan_id -- VLAN ID: from 1 to 4094, 0=untagged or no VLAN
vname -- ASCII string name of the virtual device
macaddr -- MAC address (optional), e.g., 00:10:18:00:11:44
role -- Role of the physical device: 0=primary, 1=hot-standby
device -- ASCII string name of the physical device, e.g., eth0
```

Sample Scripts

Two samples scripts are provided in the distribution to demonstrate the configuration of the team.

- **ADD** is a script that creates an SLB team with 3 NICs: eth0, eth1, and eth2, with the team name "Team1." All 3 NICs are primary. One virtual device is also created for this team, and the name of the virtual device is "sw0." The sw0 is the device where ifconfig should be run to set up the IP address. No VLAN is enabled in the script.
- **DEL** is a script that deletes the team created, "ADD." After all the teams are deleted, the **BASP** module can be unloaded by entering `rmmmod basplnx`.



PXE DRIVER SOFTWARE

This section describes the PXE driver for the 10/100/1000 Mbps Ethernet adapter, and describes the following information:

- PXE Overview
- Client Setup
- Server Setup

PXE Overview

The Gigabit Ethernet adapter has PXE (Preboot Execution Environment) support. PXE is a software module that allows your networked client PC to boot with the images provided by remote servers across the network. This PXE complies to PXE-2.1 specification and is released with both monolithic and split binary images. This provides flexibility to users in different environments where the motherboard may or may not have built-in base code.

PXE operates in a client/server environment. A network consists of one or more boot servers that provide boot images to multiple PC clients throughout the network. This PXE implementation has been tested successfully in the following environments:

- Linux RedHat PXE server—PXE clients are able to remotely boot and utilize network resources (NFS mount, etc.) and to install under Linux. In the case of remote boot, Linux universal driver binds seamlessly with (???) **Broadcom UNDI** and provides a network interface in the Linux remote-booted client environment.
- Microsoft Windows 2000 Remote Installation Services (RIS)—PXE clients are able to install Windows 2000 O/S from the network.
- Intel APITEST—PXE passes all API compliance test suites.
- DOS UNDI. Universal NDIS binds seamlessly with **Broadcom UNDI** to provide NDIS2 interface to upper layer protocol stack. This allows PC clients to connect to network resources in a DOS environment.
- **3Com boot server.**

Client Setup

Setting up the PXE client for the Gigabit Ethernet adapter involves the following steps:

- Select/program proper PXE image.
- Enable/disable PXE with provided DOS utility.
- Setup BIOS for boot order.

Select/program proper PXE image.

PXE is released with three different images. They are described as follows:

- **B57pxe.bin**—This is a monolithic image consisting of PXE base-code (BC) and (Universal Network Driver Interface) code. This image should be used on the adapter for installations in which the motherboard does not have built-in BC. However, an adapter programmed with this image is still operational in the motherboard BIOS with built-in BC; the BC on the adapter will not be used.
- **B57undi.bin**—This is an UNDI image that consists of UNDI code only (split implementation). This module should be programmed on the adapter for installations in which the motherboard BIOS has built-in BC.
- **B57base.bin**—This is a BC image that consists of BC code only (split implementation). This module should be programmed on the motherboard BIOS.

This image can be programmed to the adapter serial EEPROM or the motherboard BIOS (LOM). The DOS utility included (**b57diag**) can be used to program this image to the serial EEPROM. For example, to program a monolithic image to the adapter, do the following (assume that the software CD is in drive D):

- d:
- cd \dos\userdiags\
- **b57diag** -e
- upgfrm -p -f=d:\pxe\b57pxe.bin

This process takes from 5 to 10 minutes, depending on the image you choose.

If a **Broadcom** adapter is on the motherboard (LOM), the PXE must be installed as a part of a motherboard BIOS code upgrade. Contact the motherboard manufacturer for flashing/programming PXE images to the motherboard BIOS.

Enable/Disable

PXE is disabled by default. If you want to enable PXE, do the following (assume that the software CD is in drive D):

- d:
- cd \dos\userdiags\
- **b57diag** -t ABCD -x

If you want to disable PXE, do the following:

- d:
- cd \dos\userdiags\
- **b57diag** -t ABCD

Note that option -t ABCD is specified to skip adapter diagnostics.

Setup BIOS

To boot from the network with PXE, you have to make PXE the first bootable device under BIOS. This procedure depends on the PC BIOS implementation. Please refer to the PC user's manual.

Server Setup **Windows 2000**

(???) The current version of Windows 2000 does not include a network driver for the Broadcom Gigabit Ethernet Adapter. To install remotely using PXE, the network driver for Broadcom Gigabit Ethernet Adapter must be included as a part of client installation image on the server. Refer to Microsoft Article ID Q246184: "How to Add Third-Party OEM Network Adapters to RIS Installations."

DOS UNDI/APITEST

To boot DOS and connect to a network for DOS environment, download the Intel PXE PDK from the Intel Web site. This PXE PDK comes with TFTP/ProxyDHCP/Boot server. PXE PDK can be downloaded from Intel at <http://developer.intel.com/ial/WfM/tools/pxe/>

RedHat Linux

RedHat Linux 6.2 (or higher) distribution has PXE server support. It allows users to complete Linux installation over the network. Distribution also comes with boot images —boot kernel (vmlinuz) and initial ram disk (initrd). These two images can be found on the CD disk#1:

- /misc/src/trees/boot/vmlinuz
- /misc/src/trees/initrd-network.img

Refer to RedHat documentation for installation instructions for PXE server on Linux.

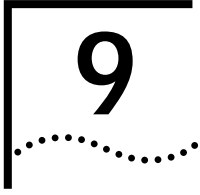
Initrd.img distributed with RedHat 6.2 does not have a Linux network driver for (???) **Broadcom Gigabit Ethernet Adapter. Broadcom has created initrd.img which includes the Linux network driver for the Broadcom Gigabit Ethernet Adapter. Use initrd.img distributed with Broadcom Software CD instead of initrd-network.img provided with standard RedHat distribution. Similarly, RedHat 7.0 is also distributed with boot images. They can be found in CD disk#1:**

- /images/pxeboot/vmlinuz
- /images/pxeboot/initrd.img

This version prompts for inserting a driver disk for drivers that are not part of the standard distribution. You can create driver disk for Broadcom Gigabit Ethernet Adapter from the image distributed with Broadcom Software CD.

Intel has also created patches to Linux PXE server code to allow clients to boot remotely. Download these patches from: <http://developer.intel.com/ial/WfM/tools/pxesdk20linux/>

Remote boot does not require a standard Linux network driver for the Gigabit Ethernet Adapter. (???) **After PXE client downloading Linux kernel and initial ram disk, Linux universal driver came with Linux distribution will bind with UNDI code of PXE to form a Linux network driver. (???)**



ADVANCED SERVER CONTROL SUITE

This chapter provides the following information:

- Overview
- Installing the Advanced Server Control Suite
- Removing the Advanced Server Control Suite
- Initializing the Advanced Server Control Suite
- Vital Sign
- Diagnostics
- Cable Analysis
- Load Balance/Virtual LAN
- Statistics

Overview The Advanced Control Suite is an integrated graphical user interface application that provides status reports for all LAN adapters/controllers in your system ("Vital Sign"); a comprehensive diagnostics tool for Gigabit Ethernet controllers ("Diagnostics"); an in-depth analysis of physical cable transceiver conditions ("Cable Analysis"); an easy way to configure the load balance and fail-over by grouping multiple adapters/controllers ("Load Balance/Virtual LAN"); and detailed performance statistics for each selected adapter/controller ("Statistics").

Installing the Advanced Server Control Suite To install the Advanced Server Control Suite software, do the following:

- 1 Insert the enclosed CD-ROM into your system CD-ROM drive.
- 2 Open the Control Suite folder on the CD and double-click setup.exe.



If the SNMP or DMI service is not installed on your system, you will get the following error message. [Include error message]

- 3 Follow the instructions on the screen to complete the software installation.
- 4 When installation is complete, the following message appears:
[Include message]

Removing the Advanced Server Control Suite To remove the Advanced Server Control Suite software, do the following:

- 1 From the Windows Control Panel, double-click Add/Remove Programs.
- 2 Select the **Broadcom Advanced Server Control Suite** and click Change/Remove.

Initializing the Advanced Server Control Suite

To initialize the Advanced Server Control Suite software, do the following:

- 1 Click Start, click Settings, then click Control Panel.
- 2 Double click the **Broadcom Gigabit Ethernet icon**.

Vital Sign

The Vital Sign screen allows you to view vital adapter information, network status, and network connectivity. Active adapters are listed. Select one of the listed adapters to view its vital sign information.



nformation for some adapters is less comprehensive than for others.

Interface components of the Vital Sign window are described below:

IP Address: This is a network address that is associated with the selected adapter. An all-zeroed value of this parameter indicates the associated driver has not been bound with Internet Protocol (IP).

Physical Address: This is a physical MAC (Media Access Control) address that is assigned to the selected adapter by the adapter's vendor. This parameter will never be zeroed.

Driver Status: This parameter indicates the status of the driver that is associated with the selected adapter. The possible values for this parameter are:

Driver Loaded (normal operating mode)—The driver associated with the selected adapter was loaded by the Windows operating system and is functioning.

Driver Not Loaded—The driver associated with the selected adapter has not been loaded by the Windows operating system.

Information Not Available—The value is not obtainable from the driver that is associated with the selected adapter.

Driver Version: This parameter indicates the current version of the software driver that is associated with the selected adapter.

Device Number: This parameter indicates the PCI bus number and the device number for the selected adapter.

Example: [0] 14 indicates the adapter resides in PCI bus 0, device 14.

Operating Mode: This parameter indicates the current operating mode of the adapter. The possible values are:

10 Mbps Half Duplex
10 Mbps Full Duplex
100 Mbps Half Duplex
100 Mbps Full Duplex
1000 Mbps Full Duplex

Interrupt: This parameter indicates the interrupt line number that is associated with the selected adapter. Valid numbers range from 2 to 25.

Memory Address: This parameter indicates the memory mapped address that is assigned to the selected adapter. This value can never be zero.

PCI Bus Mode: This parameter indicates the type and mode of PCI bus slot that is occupied by the selected adapter. The possible values of this parameter are:

PCI 33MHz 32-bit bus
 PCI 33MHz 64-bit bus
 PCI 66MHz 64-bit bus
 PCI-X 100 MHz 64-bit bus
 PCI-X 133MHz 64-bit bus
 Unknown Clock Speed

Network Status: This parameter provides overall status of the following:

Link Status OK—When GREEN, it indicates the 1000 bps link is established. This parameter does not apply on 10/100 link speed. RED indicates the link is either not applicable (10/100) or link 1000 is not established.

Receive OK—Indicates the selected adapter is able to receive data.

Transmit OK—Indicates the selected adapter is able to transmit data.



Only adapters with a 1000Mbps link will light the Local Receiver/Remote receiver LEDs.



Parameters (3 thru 10) are not applicable on other vendors' adapters and these values are displayed as: Information Not Available.

Diagnostics The Diagnostics screen allows you to view information for 3Com adapters. This function is used to test the physical adapter components.



Network connection will be lost when running these tests.

Interface components of the Diagnostics window are described below:

Control Register Test: This test verifies the read and write capabilities of the network controller registers by writing various values to the registers and verifying the result. The device driver uses these registers to perform network functions such as sending and receiving information. If the test fails, the network adapter may not work properly.

MII Register Test: This test verifies the read and write capabilities of the physical layer chip registers. The physical layer chip is used to control the electrical signals on the wire and for configuring network speed, such as 1000Mbps.

EEPROM Test: This test verifies the content of the EEPROM by reading a portion of the EEPROM and computing the checksum. The test fails if the computed checksum differs from the checksum stored in the EEPROM.

Internal Memory Test: This test verifies that the network controller internal memory is functioning properly. The test writes patterned values to the memory and reads back the results. The test fails if an erroneous value is read back. The network controller will not function without its internal memory.

On Chip CPU Test: This test verifies the operation of the two internal CPUs in the network controller.

Interrupt Test: This test verifies that the NDIS driver is able to receive interrupts from the network controller.

MAC and PHY Loopback Test: This test verifies that the NDIS driver is able to send packets and receive packets from the network controller.

Cable Analysis

From the Cable Analysis screen, the user can monitor conditions of an Ethernet CAT5 cable connection within a cable plant in an Ethernet network. The software detects various cable conditions such as the cable length between two given nodes, cable pair breakage, cable pair polarity, and data skew between cable pairs. Given a graphical environment, it can also display the frequency response characteristics in each cable pair. The Cable Analysis screen allows you to display the following features:

Length
Channel Pairs
Frequency



Network connection will be lost when running these tests.

Length: The Length tab allows you to verify cable length and determine whether your configuration has the appropriate cable (calculated by cable loss and return loss algorithms). This utility allows you to determine whether the problem is with the adapter or in the cable plant.

Interface components of the Cable Analysis/Channel Pairs window are described below:

Cable Length Field: This field presents the estimated cable length (in meters) for each individual channel, using two different algorithms.

Margin: Margin yields the minimum distance between the measured cable pair and the maximum IEEE 802.3ab limits (in dB).

Frequency Margin: This measures the minimum distance between the measured cable pair and the maximum IEEE 802.3ab limits (in MHz) in the frequency domain.

Channel Pairs: Channel pair information reveals the CAT5 cable twisted-pair characteristics in a given connection between the Cable Management software node and the remote connection node. The information is displayed on a per-channel basis. This allows you to verify whether the wiring is cross-connected.

Pair Mapping: This information displays the individual pair termination with respect to the end cable connectors. IEEE 802.3ab specifies legal pair swapping on a CAT5 cable such that pair 0 can be swapped only with pair 1, and pair 2 can be swapped only with pair 3. Any other combinations are illegal and would not allow the cable to make Gigabit Ethernet connection. This field displays the pair order at the far end node connector.

Pair Polarity: Pair polarity reveals each cable pair polarity with respect to the end cable connectors. The pair has either a straight connection or reversed (crossed) connection at the far end connector.

Pair Skew: Gigabit Ethernet data is transmitted and received on all four twisted pairs on the CAT5 cable. Although data symbols are transmitted simultaneously across all four pairs, data symbols may not arrive at the same time at the far end node due to the different propagation delay in each twisted pair. The differences in propagation delays among the different pairs arise as a result of the different physical length of the pairs, resulting from their different twist rates. The pair skew value on each channel represents the relative delay with respect to its neighboring pairs.

The value here is the multiple of 8 nanoseconds representing the delay with respect to the four individual twisted pairs.

Frequency: The frequency response of each channel is displayed, based on the computation of cable algorithms. The two graphs represent the values calculated by the Cable Loss and Return Loss algorithms. The vertical axis represents the gain (in dB) and the horizontal axis represents the operating frequency. The blue graph is the IEEE 802.3ab limit and the red graph is the actual computed values for a particular twisted pair. The Minimum Margin and Frequency Margin fields in the Cable Length display are derived from these graphs.



Network connection will be lost when running this test.

Load Balance/Virtual LANs

The Load Balance/Virtual LANs screen allows you to configure advanced features. Any available adapter can be configured as part of a team. Teaming is a method of grouping multiple adapters to a virtual adapter (bundling multiple adapters to appear as a single adapter). The benefit of this approach is load balancing.

For an example of this usage, [the graphic provided below](#) shows three available adapters on the primary side. By selecting each of the available adapters, and moving it to the Load Balance Members column, this appears as one adapter. Each member in the Load Balance Member list shares the traffic burden of all three members.

The Standby Member field is used to permit the selection of one of the team members to handle traffic, should all other members in the Load Balance Member list fail (fail-over). The selected Standby Member will not handle any traffic unless all Load Balance Members fail. When one Load Balance Member (or more) is restored (fail-back), traffic will then be handled by the restored team member(s).

Creating a New Team

- 1 From the Load Balance/Virtual LAN window, click Create Team. This displays the Add New Team window.
- 2 Enter a team name in the "Name" entry field, then select the Team Type and click OK.
- 3 Add an available adapter to the team:
 - In the Available Adapters list, select the adapter(s) that you want to add to the team you created in the previous step. Move the selected adapter(s) to the Team Members list box using the double arrows.
 - When you have finished configuring fail-over teams, click OK or Apply to accept the changes.



At least one adapter must be displayed in the Team Members list box

The minimum number of characters that can be used in a team name is one. The maximum number of characters that can be used in a team name is 39. A team name cannot begin with spaces. If you attempt to use an identical team name, an error message displays indicating that the entered name already exists. The maximum number of members in a team is eight.

- 4 Click OK. When a team has been correctly configured, one Virtual Team adapter driver will be created for each configured team.

When you create a generic trunking team, you cannot select a Standby Member. Standby Members work only with Smart Load Balance and Fail-over Teams.

The following windows show an example of a team configuration:

- 5 Configure the Team IP address if necessary. If other adapters in your system use TCP/IP bindings, the TCP/IP Properties window will open.
- 6 To access the Internet Protocol Properties window, right-click on the My Network Places icon and select Properties.
- 7 When the Network and Dial-up Connections window opens, right-click on any network adapter. This displays the Internet Protocol (TCP/IP) Properties window.
- 8 Configure the IP address and any other necessary TCP/IP configuration for the team and click OK when finished.

Adding a VLAN

You can add VLANs to a team. The concept behind this is that you are adding multiple virtual adapters that are on different subnets. The benefit of this is that your server can have one NIC that can belong to multiple subnets. With a VLAN you can couple the functionality of load balancing for the Load Balance Members and you can employ a fail-over adapter.

You can define as many as 64 VLANs per team. *VLANs can be created only when all members are 3Com adapters. If you try to create a VLAN with a non-3Com adapter, an error message displays.*

To configure a new VLAN, follow these steps:

- 1 From the Load Balance/Virtual LAN window, select the team to which you want to add a VLAN.
- 2 Enter a VLAN Name and VLAN ID, then click Create VLAN.

If you enter a VLAN name or ID and the name already exists, an Input Error message is displayed.

- 3 When you have finished adding VLANs to this team, click OK. A new virtual adapter is created for each VLAN.



To maintain optimal adapter performance, your system should have 64 MB of system memory for each eight VLANs created.

Deleting a VLAN



Adapters that are part of a fail-over team inherit all the basic configuration properties of the team, including VLANs associated with the team. If you delete a Team, any VLANs configured for that team will also be deleted.

To delete a configured VLAN, follow these steps:

- 1 From the Load Balance/Virtual LAN window, select the VLAN you want to delete, and click Delete VLAN . The selected VLAN will be deleted from the Load Balance/Virtual Lan Configuration window.
- 2 When you have finished deleting VLANs, click OK to accept the changes.

Load Balance/Virtual LAN Statistics

Statistics The Statistics screen allows you view traffic statistics. Statistical values and coverage is more comprehensive for some adapters than for others.

General

Interface components of the Statistics/General window are described below:

- Frames Tx OK: A count of frames that are successfully transmitted. This counter is incremented when the TransmitStatus is reported as transmitOK.
- Frame Rx Error: A count of frames that are received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer errors.
- Frame Rx OK: A count of frames that are successfully received (receiveOK). This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented when the ReceiveStatus is reported as receiveOK.
- Directed Frames Tx: A count of directed data frames that are successfully transmitted.
- Multicast Frames Tx: A count of frames that are successfully transmitted, as indicated by the status value transmitOK, to a group destination address other than broadcast.
- Broadcast Frames Tx: A count of the frames that were successfully transmitted as indicated by the TransmitStatus transmitOK, to the broadcast address.

Frames transmitted to multicast addresses are not broadcast frames and are excluded.

- Directed Frames Rx: A count of directed data frames that are successfully received.
- Multicast Frames Rx: A count of frames that are successfully received and are directed to an active nonbroadcast group address. This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented as indicated by the receiveOK status, and the value in the Destination field.
- Broadcast Frames Rx: A count of frames that are successfully received and are directed to the broadcast group address. This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented as indicated by the receiveOK status, and the value in the Destination field.
- Frame Tx Error: A count of frames that could not be transmitted because of errors.
- Frame Rx with CRC Error: A count of received frames that have failed the cyclic redundancy check (CRC).
- Frame Rx failed due to No Buffer Space: A count of frames that would otherwise have been received by the station, but could not be accepted due to an internal MAC sublayer receive error (no buffer space).

IEEE 802.3

Interface components of the Statistics/IEEE 802.3 window are described below:

- Frames Rx with Alignment Error: A count of frames that are not an integral number of octets in length and do not pass the FCS check. This counter is incremented when the ReceiveStatus is reported as alignmentError.
- Frames Tx with one Collision: A count of frames that are involved in a single collision, and are subsequently transmitted successfully. This counter is incremented when the result of a transmission is reported as transmitOK and the attempt value is 2.
- Frames Tx with more than one Collision: A count of frames that are involved in more than one collision, and are subsequently transmitted successfully. This counter is incremented when the TransmitStatus is reported as transmitOK and the value of the attempts variable is greater than 2 and less than (or equal to) attemptLimit.
- Frames Tx after Deferral: A count of frames whose transmission was delayed on its first attempt because the medium was busy. Frames involved in any collision are not counted.
- Frames not Tx due to Collisions: A count of frames which, due to excessive collisions, have not been transmitted successfully. This counter is incremented when the value of the attempts (variable) equal attemptLimit during a transmission.
- Frames not Rx due to Overrun: A count of frames that would otherwise have been received by the station, but could not be accepted due to an internal MAC sublayer receive error overrun.

- Frames not Tx due to Underrun: A count of frames that would otherwise have been transmitted by the station, but could not be sent due to an internal MAC sublayer transmit error. If this counter is incremented, then none of the other counters in this section are incremented.
- Frames Tx with Heartbeat Failure: This counter is not currently supported and is not applicable for 10/100/1000-BaseT.
- Times Carrier Sense Signal Lost during Tx: A count of times that the carrierSense variable was not asserted or was de-asserted during the transmission of a frame without collision.
- Late Collisions Detected: A count of the times that a collision has been detected later than 512 BT into the transmitted packet. A late collision is counted twice, i.e., both as a collision and as a lateCollision. This counter is incremented when the lateCollisionCount variable is nonzero.

KEY PROTOCOLS AND INTERFACES

This section provides an overview of the following:

- Adapter Teaming
- Fail-over Teaming
- VLAN Overview

Adapter Teaming

Teaming provides traffic load balancing and redundant adapter operation in the event that a network connection fails. When multiple Gigabit Ethernet adapters are installed in the same server, they can be grouped into teams. Each team, with up to 8 ports or 8 adapters, can be configured on the server. If traffic is not identified on any of the adapter team member connections due to failure of the adapter, cable, switch port, or switch (where the teamed adapters are attached to separate switches), the load distribution is re-evaluated and re-assigned among the remaining team members. In the event all the primary adapters are down, the hot stand-by adapter becomes active. Existing sessions are maintained, causing no user impact.

The **Advanced Server Program** supports three schemes of load balancing: Smart Load Balancing, Link Aggregation (802.3ad), and Generic Link Aggregation (Trunking).



Gigabit Ethernet adapters can be grouped into fail-over teams with an Intel 82559 LOM.

Smart Load Balancing (SLB)[™]

- Implementation of load balancing is based on IP flow. This feature supports balancing IP traffic across multiple adapters (i.e., team members) in a bi-directional mode. Each adapter in the team has a separate MAC address. It provides automatic fault detection and dynamic fail-over to another team member or to a hot stand-by member; this is done independently of layer 3 protocol (IP, IPX, Net Beui). It works with existing layer 2 and 3 switches.

Link Aggregation (802.3ad)

- This mode supports Link Aggregation Control Protocol (LACP) and conforms to the IEEE 802.3ad specification. Configuration software allows you to statically configure which adapters are to participate in a given team. Because this mode supports LACP, a valid link aggregation group should be negotiated with the link partner. The negotiated group must satisfy the terms established by the configuration SW (physical adapters are not able to move dynamically from one team to another team). If the link partner is not correctly configured for 802.3ad link configuration, errors are detected and noted. With this mode, all adapters in the team are configured to receive packets for the same MAC

address. The outbound load-balancing scheme is determined by the **Advanced Server Program** driver. The team's link partner determines the load-balancing scheme for inbound packets.

Generic Link Aggregation (Trunking)

This mode is very similar to 802.3ad in that all adapters in the team must be configured to receive packets for the same MAC address. However, this mode does not provide LACP or marker protocol support. This mode supports a variety of environments where a NIC's link partners are statically configured to support a proprietary trunking mechanism. For instance, this mode could be used to support the (Lucent) "OpenTrunk" or the (Cisco Systems) Fast EtherChannel (FEC). This mode is a "light" version of the 802.3ad link aggregation. This approach is much simpler, in that there is not a formal link aggregation control protocol. As with the other modes, the creation of teams, and the allocation of physical adapters to various teams, is done statically via user configuration software.

Fail-over Teaming

Fail-over Teaming provides redundant adapter operation in the event that a network connection fails. When multiple Gigabit Ethernet adapters are installed in the same server, they can be grouped into teams. Each team must have at least one adapter, but can support up to eight adapters. The number of teams is limited by the number of adapters that are installed.

If the primary adapter in a team is disconnect because of failure of the adapter, cable, or switch port, the secondary team member becomes active, redirecting both inbound and outbound traffic originally assigned to the primary adapter. Sessions will be maintained, causing no impact to the user.

VLANs Overview

VLANs allow you to split your physical LAN into logical subparts, to create logical segmentation of workgroups and to enforce security policies among each logical segment. Each defined VLAN behaves as its own separate network, with its traffic and broadcasts isolated from the others, increasing bandwidth efficiency within each logical group. As many as 64 VLANs can be defined for each adapter on your server, depending on the amount of memory available in your system.

Although VLANs are commonly used to create individual broadcast domains and/or separate IP subnets, it is sometimes useful for a server to have a presence on more than one VLAN simultaneously. Gigabit Ethernet adapters support multiple VLANs on a per-port or per-interface basis, allowing flexible network configurations.

Figure 1 Example of Servers Supporting Multiple VLANs with Tagging

The figure above shows an example network using VLANs. In this example, the physical LAN consists of a switch, two servers, and five clients. The LAN is logically organized into three VLANs, each representing a different IP subnet. The features of this network are described in the following table:

| Component | Description |
|-------------------|---|
| VLAN #1 | An IP subnet consisting of the Main Server, PC #3, and PC #5. This subnet represents an engineering group. |
| VLAN #2 | Includes the Main Server, PCs #1 and #2 via shared media segment, and PC #5. This VLAN is a software development group. |
| VLAN #3 | Includes the Main Server, the Accounting Server and PC #4. This VLAN is an accounting group. |
| Main Server | A high-use server that must be accessed from all VLANs and IP subnets. The Main Server has a 3Com adapter installed. All three IP subnets are accessed via the single physical adapter interface. The server is attached to one of the switch ports, which is configured for VLANs #1, #2, and #3. Both the adapter and the connected switch port have tagging turned on. Because of the tagging VLAN capabilities of both devices, the server is able to communicate on all three IP subnets in this network, but continues to maintain broadcast separation among all of them. |
| Accounting Server | Available to VLAN #3 only. The Accounting Server is isolated from all traffic on VLANs #1 and #2. The switch port connected to the server has tagging turned off. |
| PCs #1 and #2 | Attached to a shared media hub that is then connected to the switch. PCs #1 and #2 belong to VLAN #2 only, and are logically in the same IP subnet as the Main Server and PC #5. The switch port connected to this segment has tagging turned off. |
| PC #3 | A member of VLAN #1, PC #3 can communicate only with the Main Server and PC #5. Tagging is not enabled on the PC #3 switch port. |
| PC #4 | A member of VLAN #3, PC #4 can communicate only with the servers. Tagging is not enabled on the PC #4 switch port. |
| PC #5 | A member of both VLANs #1 and #2, PC #5 has a 3Com adapter installed. It is connected to switch port #10. Both the adapter and the switch port are configured for VLANs #1 and #2 and have tagging enabled. |



VLAN tagging is required to be enabled only on switch ports that create trunk links to other switches, or on ports connected to tag-capable end-stations, such as servers or workstations with Broadcom adapters.

VLAN Support

Virtual Local Area Networks (VLANs) are commonly used to split up groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among logical segments.

Each Team supports up to 64 VLANs. Note that **only Broadcom adapters and Alteon AceNIC adapters can be part of a team with VLANs.** With multiple VLANs on an adapter, a server with a single adapter can have a logical presence on multiple IP subnets. With multiple VLANs in a team, a server can have a logical presence on multiple IP subnets and benefit from load balancing and failover.



Adapters that are members of a fail-over team can also be configured to support VLANs. Because VLANs are not supported for an Intel LOM if a LOM is a member of a fail-over team, VLANs cannot be configured for that team.

Adaptive Interrupt Frequency

The adapter driver intelligently adjusts host interrupt frequency based on traffic conditions, to increase overall application throughput. When traffic is light, the adapter driver interrupts the host for each received packet, minimizing latency. When traffic is heavy, the adapter issues one host interrupt for multiple, back-to-back incoming packets, preserving host CPU cycles.

Dual DMA Channels

The PCI interface on the Gigabit Ethernet adapter contains two independent DMA channels for simultaneous read and write operations.

32-bit or 64-bit PCI Bus Master

Compliant with PCI Local Bus Rev 2.2, the PCI interface on the Gigabit Ethernet adapter is compatible with both 32-bit and 64-bit PCI buses. As a bus master, the adapter requests access to the PCI bus, instead of waiting to be polled.

ASIC with Embedded RISC Processor

The core control for the Gigabit Ethernet adapter resides in a tightly integrated, high-performance ASIC. The ASIC includes dual RISC processors. This provides the flexibility to add new features to the card and adapt it to future network requirements via software download. This also enables the adapter drivers to exploit the built-in host off-load functions on the adapter as host operating systems are enhanced to take advantage of these functions.

SPECIFICATIONS

This chapter provides the following information:

- 10/100/1000Base-T Cable Specifications
- Performance Specifications
- Physical Characteristics
- Power Requirements
- Environmental Specifications

Table 6 10/100/1000Base-T Cable Specifications

| Port Type | Connector | Media | Maximum Distance |
|----------------|-----------|---------------------|-----------------------|
| 10Base-T | RJ-45 | Cat. 3, 4, or 5 UTP | 100 meters (325 feet) |
| 100/1000Base-T | RJ-45 | Cat. 5 UTP | 100 meters (325 feet) |



1000Base-T signaling requires four twisted pairs of Category 5 balanced cabling, as specified in ISO/IEC 11801:1995 and ANSI/EIA/TIA-568-A (1995) and tested for additional performance using testing procedures defined in TIA/EIA TSB95.

Performance Specifications

| Feature | Specification |
|------------------------------|---|
| PCI clock | 66 MHz max |
| PCI Data/Address | 32-bit and 64-bit |
| PCI data burst transfer rate | 132 Mbps (32-bit bus) 264 Mbps (64-bit bus) 528 Mbps (64-bit bus at 66 MHz) |
| PCI modes | Master/slave |
| 10/100/1000Base-T | 10/100/1000 Mbps (full duplex) |

Physical Characteristics

| Dimension | Measurement |
|-----------|-------------------|
| Length | 17.3 cm (6.8 in.) |
| Width | 10.7 cm (4.2 in.) |

Power Requirements

| Specification | Measurement |
|-------------------|------------------------|
| Operating voltage | +5 V \pm 5% |
| Power consumption | 15 Watts 3A @ +5VDC |

Table 7 Environmental Specifications

| Condition | Operating Specification | Storage Specification |
|--------------------------------------|--|---|
| Temperature | 0°C to 55°C (+32°F to +131°F) | -40°C to +85°C (-40°F to +185°F) |
| Relative humidity | 5% to 85% (non-condensing) 40°C, 16 hour dwells at extremes | 5% to 95% (non-condensing) 10°C/hour |
| Altitude | Up to 10,000 ft. | Up to 35,000 ft. |
| Shock | 10g, 1/2 sine wave, 11 msec | 60g, 1/2 sine wave, 11 msec |
| Vibration, peak to peak displacement | 0.005 in. max (5 to 32 Hz) | 0.1 in. max (5 to 17 Hz) |
| Vibration, peak acceleration | 0.25g (5 to 500 Hz) (Sweep Rate = 1 octave/min.) | 0.25g (5 to 500 Hz) (Sweep Rate = 1 octave/min.) |

REGULATORY

This chapter provides the following information:

- FCC Class B Notice
- VCCI Class B Notice
- CE Notice

FCC Class B Notice

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

The equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. The equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for assistance.

Do not make mechanical or electrical modifications to the equipment.

VCCI Class B Notice

The equipment is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

CE Notice

The CE mark on this equipment indicates that this equipment meets or exceeds the following technical standards: EN50082-1, EN55022, EN60555-2, EN61000-4-1, EN61000-4-2, EN61000-4-3, EN61000-4-4, and EN61000-4-5.

This chapter provides the following information:

- Hardware Diagnostics
- Checking Port LEDs
- Troubleshooting Checklist
- Troubleshooting

Hardware Diagnostics

Loopback diagnostic tests are available for testing the adapter hardware under Windows. These tests provide access to adapter internal/external diagnostics, where packet information is transmitted across the physical link (refer to "Diagnostics" in the Advanced Server Control Suite chapter).

Checking Port LEDs

The adapter has four LEDs, one for each port speed option (10 Mbps, 100 Mbps, and 1 Gbps), and one for Active. The three port speed LEDs indicate active links, and the data LED indicates data transfer status. When the driver has been loaded and the cables are connected properly, the appropriate speed LED is lit and the data LED is on if data traffic is present.

Before the port LEDs can provide troubleshooting information, the adapter must be connected to the network (see "Installing the Hardware"), and the network drivers for your particular operating system must be installed.

- 1 Verify that the adapter driver software has been installed and that the adapter is connected to a network.
- 2 Check to see that the adapter status LEDs operate as described in the following table:

Table 8 Gigabit Ethernet Port LED Activity

| LED | State | Description |
|------|----------|--|
| 1000 | On | Good Gigabit Ethernet link. |
| | Off | No 1000 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch. |
| 100 | On | Good 100 Mbps Fast Ethernet link. |
| | Off | No 100 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch. |
| 10 | On | Good 10 Mbps Fast Ethernet link. |
| | Off | No 10 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch. |
| ACT | Blinking | Brief bursts of data detected on the port. |
| | On | Streams of data detected on the port. |

Table 8 Gigabit Ethernet Port LED Activity

| | |
|-----|-------------------------------|
| Off | No data detected on the port. |
|-----|-------------------------------|

Troubleshooting Checklist



WARNING: Before opening the cabinet of your system for removing or inserting the adapter, please review all precautions outlined under "Safety Precautions."

The following checklist provides recommended actions to take to resolve problems installing the Gigabit Ethernet adapter or running it in your system.

- Inspect all cables and connections. Verify that the cable connections at the Gigabit Ethernet adapter and the switch are attached properly. Make sure that the cable length and rating are compliant with the requirements listed in "Connecting the Network Cables."
- Check the adapter installation by reviewing "Installing the Hardware." Make sure that the adapter board is properly seated in a PCI slot. Check for specific hardware problems, such as obvious damage to board components or the PCI edge connector.
- Check the configuration settings and change them if they are in conflict with another device.
- Make sure that your system is using the latest BIOS.
- Try inserting the adapter in another slot. If the new position works, the original slot in your system may be defective.
- Replace the failed adapter with one that is known to work properly. If the second adapter works in the slot where the first one failed, the failed adapter is probably defective.
- Install the adapter in another functioning system and run the tests again. If the adapter passed the tests in the new system, the system may be defective.
- Remove all other adapters from the system and run the tests again. If the adapter passes the tests, other adapters may be causing contention.

Troubleshooting

This section provides a list of known software problems and solutions for the operating systems below.

Windows 2000

The following table lists known problems and solutions using Windows 2000:

Table 9

Problem: Able to create Broadcom LAC connections icons having same name under network properties menu.

Solution: In Windows 2000, each network adapter installed properly will have an icon in the Network Properties window. The name of the icon is usually in the form of "Local Area Connection ##" where ## is a number starting from 1. The names of icons can be changed by right-clicking the icon and selecting rename. The names of icons are meaningful only in the Network Properties window. Sometimes the system administrator will rename these icons to easily differentiate the network connections. When **BASP** is configured, **BASP** will create additional adapter icons and rename the icons. The naming convention is to allow end users quickly identify the adapter with corresponding team and VLAN. The names of the icons created by **BASP** therefore are not recommended to be changed.

Table 9

Problem: Uninstalling the BASP software and user is prompted to reboot early.

Description: When uninstalling the BASP from the system, the user is sometimes prompted for a reboot too early. For example: A team of 3 tigon cards with 10 VLANs configured. Without removing the teams or VLANs, the user uninstalls the BASP software. The system will sometimes prompt the user for a reboot immediately. When the user clicks YES on the reboot sequence, at next boot-up the team still exists. If the user clicks NO on the reboot sequence, the system will continue to delete all teams and prompt the user for another reboot a few moments later.

Problem: Cannot enable VLAN after it is disabled.

Description: VLANs can be created using BASP. A virtual adapter is created for every VLAN in the "Network and Dialup Connections" screen. In Windows 2000, when a virtual adapter is disabled, it cannot be re-enabled. It is a known problem with Windows 2000 that once a virtual adapter is disabled, the next enable will not bring the virtual adapter back to normal working mode. This is usually accompanied by an error message indicating "Connection Failed." This problem has been linked to the limitations of Windows 2000.

Problem: Able to configure Internet Connection Sharing (ICS) when there are no unassigned adapters.

Description: When all network adapters are configured as members of teams, the Microsoft Internet Connection Sharing (ICS) configuration component allows the user to select the adapters as "available" adapters for ICS, resulting in an error. ICS Local Area Network can only be configured using a network adapter which is not a member of a team. "Entry Type" has been changed to "Documentation Change."

Problem: Team configuration is not retained when user goes back to edit.

Solution: Software does not capture the team configuration unless the user clicks OK to all the network properties window to fully exit from the network configuration tab. User may inadvertently return to team configuration window, losing previous configuration.

Linux

The following table lists known problems and solutions using Linux:

Figure 2

Problem: Enabling the Flow-control on the network adapter does not function.

Solution: The enabling Flow-control feature does not work as expected. When the flow control is enabled on the switch and enabled on the network adapter, it seems to function correctly. But when the Flow-control is enabled on the network adapter and disabled on the switch, it does not function correctly.

Problem: The Linux driver can not be installed on Red Hat version 7.0.

Solution: For some reason, the kernel installed by Red Hat 7 does not match the kernel symbols in the source. Rebuild the kernel and it will work.