Installation and User's Guide

ACEnic™ Adapter

For Solaris

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Regulatory Compliance

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

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Do not make mechanical or electrical modifications to the equipment.

VCCI Class 1: The equipment is Type 1 Data Processing Equipment and is intended for use in commercial and industrial districts. It has been tested and found to comply with VCCI technical requirements for the purpose of protection against electronic interference. When used in residential districts or their peripheral areas, radio, and TV receiver units may be subject to radio interference. The operation should be done in accordance with 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.

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Preface

This guide describes how to install and use the following Alteon WebSystems ACEnic™ adapters in the Solaris™ operating environment:

- PCI (Peripheral Component Interconnect) ACEnic adapter
- SBus ACEnic adapter

The procedures in this guide assume that you are a system or network administrator experienced in installing similar hardware in the Solaris environment.

How This Book Is Organized

This book is organized as follows:

Chapter 1, "About the ACEnic Adapter," describes the features of the ACEnic adapter, and lists the hardware and software requirements for its installation and use.

Chapter 2, "Installing the ACEnic Hardware," tells you how to physically install the adapter in your system.

Chapter 3, "The ACEnic Driver Software," explains how to install and configure the Gigabit Ethernet adapter software in the Solaris environment.

Chapter 4, "Optional Configuration," explains how to configure the adapter for use with VLANs, Jumbo Frames, and Dual Homing.

Appendix A, "Specifications," provides adapter hardware specifications.

UNIX Commands

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

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

- Shutting down the system
- Booting the system
- Configuring devices
- Other basic software procedures

Typographic Conventions

The following table describes the meanings of the various typographic styles used in this book.The following table describes the typographic styles used in this book.

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 `readme.txt` file.
	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` *IP-address*
	This also shows book titles, special terms, or words to be emphasized.	Read your *User's Guide* 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]`

Shell Prompts

Table 1 Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Contacting Alteon WebSystems

Use the following information to access Alteon WebSystems support and sales.

- URL for Alteon WebSystems Online:

  `http://www.alteon.com`

  This website includes product information, software updates, release notes, and white papers. The website also includes access to Alteon WebSystems Customer Support for accounts under warranty or that are covered by a maintenance contract.

- E-mail access:

  `support@alteon.com`

  E-mail access to Alteon WebSystems Customer Support is available to accounts that are under warranty or covered by a maintenance contract.

- Telephone access to Alteon WebSystems Customer Support:

  1-888-Alteon0 (or 1-888-258-3660)
  1-408-360-5695

  Telephone access to Alteon WebSystems Customer Support is available to accounts that are under warranty or covered by a maintenance contract. Normal business hours are 8 a.m. to 6 p.m. Pacific Standard Time.

- Telephone access to Alteon WebSystems Sales:

  1-888-Alteon2 (or 1-888-258-3662), and press 2 for Sales
  1-408-360-5600, and press 2 for Sales

  Telephone access is available for information regarding product sales and upgrades.

CHAPTER 1

About the ACEnic Adapter

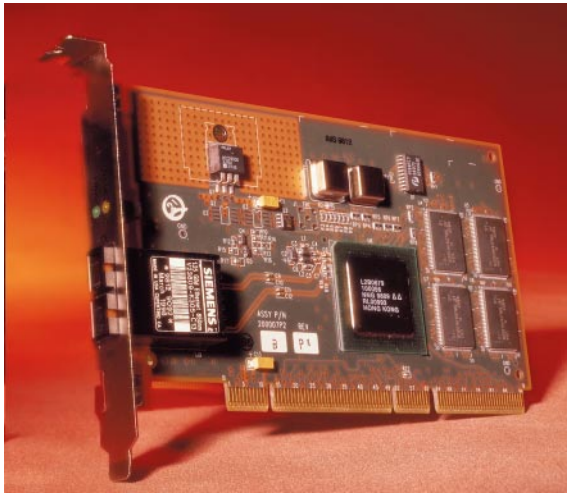

Figure 1 Alteon WebSystems ACEnic Gigibit Ethernet Adapter

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

The ACEnic adapter targets the increased congestion experienced at the backbone and server by today's networks, while providing a future upgrade path for high-end workstations that require more bandwidth than Fast Ethernet can provide.

Included with your adapter is the following:

- Anti-static bag (used for protecting the adapter when stored or shipped). Keep the adapter in its packaging until ready for installation.
- ACEnic Gigibit Ethernet Adapter CD-ROM with ACEnic adapter 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 or the warranty will be voided.

Features

Following is a list of the Gigabit Ethernet PCI adapter features:

- Full-duplex Gigabit Ethernet interface (IEEE P802.3z)
- Standard Ethernet frame size (up to 1518 bytes)
- Jumbo Frame support (optional 9,000 byte frames for server-to-server traffic)
- Dual Homing for automatic failover if a port, switch, or adapter is down
- VLANs: up to 64 VLANs per adapter using IEEE 802.1Q-1998 tagging
- Dual DMA channels
- Adaptive interrupt frequency (maximizes network throughput; adapts to traffic load)
- ASIC with on-chip MAC and dual RISC processors
- Duplex SC fiber-optic connector

PCI Models

The following features are available on the PCI adapter (Model 710012):

- 33/66 MHz, 32-bit or 64-bit PCI bus master with adaptive DMA
- Universal dual voltage signaling (3.3V and 5V)
- PCI Local Bus Rev 2.1 compliant (6.8"x 4.2")

SBus Models

The following features are available on the SBus adapter (Model 710003):

- 25 MHz, 64-bit bus master with adaptive DMA
- 5.75" x 3.25" card

Key Protocols and Interfaces

ACEnic adapters are interoperable with existing Ethernet equipment assuming standard Ethernet minimum and maximum frame size (64 to 1518 bytes), frame format, and compliance with the following standards and protocols:

- Logical Link Control (IEEE 802.2)
- Flow Control (IEEE 802.3x)
- SNMP
- Gigabit Ethernet (IEEE P802.3z)

VLANs 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 ACEnic adapter supports up to 64 VLANs. With multiple VLANs on an adapter, a server with a single adapter can have a logical presence on multiple IP subnets.

Refer to "Configuring VLANs" on page 36 for configuration information. For details about planning networks with VLANs, refer to the *ACElerate Software User's Guide*.

Jumbo Frames Support

To reduce host frame processing overhead, Alteon WebSystems switches and the ACEnic adapter, both running operating software version 2.0 or greater, can receive and transmit frames that are larger than the maximum frame size allowed on normal Ethernet.

VLANs can be configured on the same Alteon WebSystems adapters and switches to separate regular and Jumbo Frame traffic. End-stations with an ACEnic adapter installed and attached to Alteon WebSystems switches can communicate across both the Jumbo Frame VLANs and regular frame VLANs at the same time.

Dual Homing

Server switching networks require the capability to employ resiliency and redundancy similar to FDDI network environments. The combination of ACEnic adapters and Alteon WebSystems switches provide the Ethernet user with this capability.

For dual homing support, you must install two ACEnics in the same host system. The adapters are configured to provide a hot-standby failover service. The switches must be configured to support Spanning Tree on both Gigabit Ethernet ports to support the ACEnic Dual Homing capability.

Adaptive Interrupt Frequency

The adapter driver intelligently adjusts host interrupt frequency based on traffic conditions, in order to increase overall application throughput. In light traffic, 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 ACEnic adapter contains two independent DMA channels for simultaneous read and write operations.

ASIC with Embedded RISC Processor

The core control for the ACEnic 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.

Diagnostic Support

An ACEnic adapter RISC CPU runs on-board diagnostics at power-up.

Physical Description

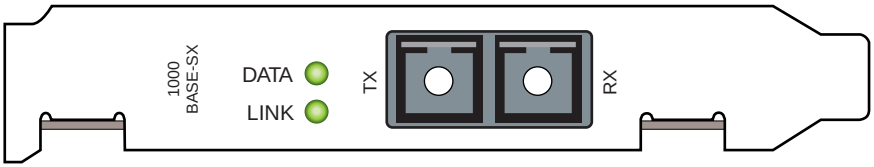

Figure 2 ACEnic adapter faceplate

The faceplate of the ACEnic adapter has one 1000Base-SX fiber-optic connector for connecting the adapter to a Gigabit Ethernet segment. There are also two LEDs: one to indicate link status and one for data transfer status.

Once the adapter hardware and its driver software have been properly installed on your system, the LEDs will signal the following adapter states:

Table 2 ACEnic Port LED Activity

LED	State	Description
Data	Blinking	Data detected on the port.
	On	Data detected on the port.
	Off	No data detected on the port.
Link	Blinking slowly	Port has been disabled by software.
	On	Good link.
	Off	No link; possible bad cable, bad connector, missing or improperly installed driver software, or configuration mismatch.

CHAPTER 2

Installing the ACEnic Hardware

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

System Requirements

Before installing the ACEnic adapter, make sure your system meets the requirements listed in the following table:

Table 3 Hardware and Software Requirements

Category	Requirements
Hardware	
PCI	Sun™ Ultra30™ and Ultra™ Enterprise™ 450, 3000, 3500, 4000, 4500, 5000, 5500, 6000, and 6500 systems with an available PCI I/O card slot. (Up to four ACEnic adapters are supported per Ultra Enterprise Server.)
SBus	Sun Ultra™ 2 and Ultra Enterprise 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500, and 10000 systems with an available SBus I/O card slot. (Up to 4 ACEnic adapters are supported per Ultra Enterprise Server.)
Firmware	OpenBoot™ PROM version 3.0 or greater.
Software	
Operating System	Solaris 2.5.1 (4/97 release, or later) and 2.6.
Adapter Software	ACEnic adapter driver software, version 2.0 (or higher) for Solaris.

Safety Precautions

CAUTION—The adapter is being installed in a server that operates with voltages that can be lethal. Before you remove the cover of your server, 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.
- Make sure to use only insulated or nonconducting tools.
- Installation or removal of adapters must be performed in a static-free environment. The use of a properly grounded wrist strap or other personal anti-static devices and an anti-static mat is strongly recommended.
- Verify that the server is powered OFF before accessing internal components.

Pre-Installation Checklist

1. **Check that your server meets the hardware and software requirements listed in Table 3 on page 15.**
2. **Verify that your system is using the latest firmware.**
3. **Review the information in the `readme` file on the ACEnic CD-ROM for important information not available at the time this manual was printed.**

   NOTE – If you acquired the adapter software on a floppy disk or from the Alteon WebSystems support website, please check the appropriate source for the most recent information.

4. **If your system is active, shut it down gracefully.**
5. **When system shutdown is complete, power OFF your system.**
6. **Holding the adapter card by the edges, remove it from its shipping package it and place it on an anti-static surface.**
7. **Check the adapter for visible signs of damage, particularly on the card's edge connector. Never attempt to install any damaged adapter.**

   If the adapter is damaged, report it to your Alteon WebSystems Customer Support Representative. For more information, see "Contacting Alteon WebSystems" on page 7.

PCI Adapter Installation

To install a PCI ACEnic adapter in your system, perform the following procedure.
If you are installing an SBus ACEnic adapter, see the instructions on page 18.

1. **Observe all precautions and pre-installation instructions on page 16.**

   Before installing the adapter, ensure the system power is OFF, and proper electrical grounding procedures have been followed.

2. **Remove the server cover, and select any empty PCI slot.**

   If you do not know how to identify a PCI slot, refer to your server documentation.

3. **Remove the blank cover-plate from the slot that you selected. Retain the screw so that it can be replaced later.**

4. **Holding the PCI card by the edges, align the adapter's connector edge with the PCI connector dock in the server.**

NOTE – 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.**

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

When properly seated, the adapter's port connectors will be aligned with the slot opening, and its faceplate will be flush against the server chassis.

6. **Use the screw removed above (in Step 3) to secure the adapter in the PCI card cage.**

7. **Replace the server cover and disconnect any personal anti-static devices.**

8. **Power the server on.**

   Once the server returns to proper operation, the adapter hardware is fully installed. You must next connect the network cables (see page 19) and install the adapter driver software (see Chapter 3, “).

SBus Adapter Installation

To install an SBus ACEnic adapter in your system, perform the following procedure.

1. **Observe all precautions and pre-installation instructions on page 16.**

   Before installing the adapter, ensure the system power is *OFF*, and proper electrical grounding procedures have been followed.

2. **Remove the server cover, and select any empty SBus slot.**

   If you do not know how to identify an SBus slot, refer to your server documentation or ask your system administrator.

3. **Remove the blank cover-plate from the slot that you selected.**

4. **If necessary, remove the ACEnic adapter's faceplate extension clip.**

   For servers with narrow slot openings (such as the Sun Ultra 2), it will be necessary to remove the extension clip from the top of the card's faceplate. As indicated in the following diagram, loosen and remove the two screws that hold the extension clip in place:

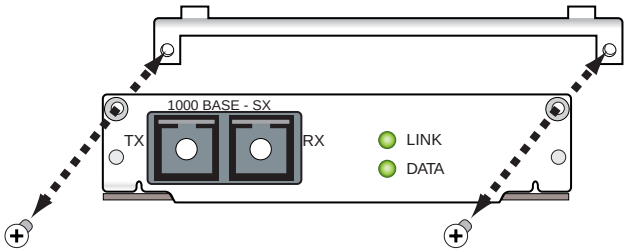

Figure 3 Removing the faceplate extension clip

5. **Holding the SBus card by the edges, slide the card faceplate into the small slot at the end of the SBus opening and align the card with the SBus connector.**

6. **Applying even pressure at both corners of the card, push the SBus card until it is firmly seated in the connector.**

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

When properly seated, the adapter's port connectors will be aligned with the slot opening, and its faceplate will be flush against the server chassis.

7. **Replace the server cover and disconnect any personal anti-static devices.**

8. **Power the server on.**

   Once the server returns to proper operation, the adapter hardware is fully installed. You must next connect the network cables (see next section) and install the adapter driver software, as described in Chapter 3.

Connecting the Network Cables

The adapter has one SC-type connector used for attaching the server to a Gigabit Ethernet fiber-optic segment. The port is auto-negotiating and supports full-duplex operation.

1. **Prepare an appropriate cable.**

   The following table lists cable characteristics required for connecting to 1000Base-SX ports:

Table 4 1000BASE-SX Link Characteristics

Description	62.5 Micron	50 Micron
	Shortwave (850 nanometer multimode fiber)	
Operating Range	2 to 260 meters	2 to 550 meters (in compliance with IEEE 802.3z)

2. **As shown in the following diagram, connect one end of the cable to the ACEnic adapter.**

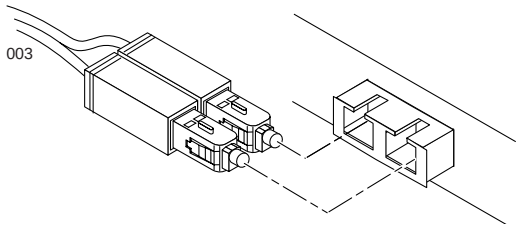

Figure 4 Connecting the network cable to the adapter

3. **Connect the other end of the cable to a Gigabit Ethernet network port.**

   Attach the cable connector so that the TX (transmit) port on the ACEnic adapter is connected to the RX (receive) port of the device at the other end of the cable.

NOTE – The adapter port LEDs are not functional until the adapter driver software is installed. See Table 2 on page 13 for a description of adapter port LED operation. See Chapter 3, "The ACEnic Driver Software," for driver installation and configuration instructions.

CHAPTER 3

The ACEnic Driver Software

A network device driver must be installed before the ACEnic adapter can be used with your system. This chapter describes how to perform the following tasks:

- Install the driver software in the Solaris environment
- Configure the host files
- Configure driver parameters using the `ndd` utility

Installing the Driver Software

NOTE – The ACEnic adapter must be physically installed in your server prior to installing the driver software. See Chapter 2, "Installing the ACEnic Hardware," for details.

To install the adapter software for Solaris, perform the following procedure:

1. **Become superuser (`root`).**
2. **Note the revision level of the CD-ROM included with your Alteon WebSystems adapter.**

   The revision level is stamped on the CD-ROM label and is used in the commands below.
3. **Place the CD-ROM into the CD-ROM drive.**
4. **Mount the CD-ROM on a local directory.**

   - If the Volume Manager (`vold`) is running on your machine, when the ACEnic CD-ROM is loaded into the drive, it is mounted automatically under `/cdrom/acenic_rev_`*x*, where *x* is the current revision level as stamped on the CD-ROM label.

- If the Volume Manager (`vold`) is not running on your machine, create a directory called `/cdrom/acenic_rev_`*x* (where *x* is the revision level stamped on the CD-ROM label) and mount the CD-ROM manually:

```
# mkdir /cdrom/acenic_rev_x
# mount -F hsfs -r /dev/sr0 /cdrom/acenic_rev_x
```

5. **Access the package directory by entering the following:**

```
# cd /cdrom/acenic_rev_x
```

Where *x* is the revision level stamped on the CD-ROM label.

6. **At the prompt, type the `pkgadd` command:**

```
# pkgadd -d .
```

The screen displays a list of packages available for installation:

```
The following packages are available:
1 ALTNalt   Alteon Networks ACEnic Adapter
            (sparc) 2.x.x
2 ALTN   Alteon Networks ACEnic Adapter
            (i386) 2.x.x

Select package(s) you wish to process (or 'all' to process all pack-
ages). (default: all) [?, ??, q]
```

7. **Type the number for the `ALTNalt` driver and press Return.**

The `pkgadd` command starts the installation script.

NOTE – Do not select the `default: all` option to install "all" drivers. Install only the driver appropriate for your system: `ALTNalt`.

---

8. **Respond to prompts in the script.**

NOTE – `pkgadd` keeps cycling through its script once it has started. Therefore you must quit (**q**) the program the second time the list of packages is displayed.

---

9. **When you have finished loading the software, eject the CD-ROM by entering the following commands:**

```
# cd /
# unmount /cdrom/acenic_rev_x
# eject cdrom
```

Where *x* is the revision level stamped on the CD-ROM label.

Troubleshooting: If the Driver Fails to Attach

If the adapter is not installed, you will see the following message when you run `pkgadd`:

```
drvconfig: Driver (alt) failed to attach
Warning: Driver (alt) successfully added to system but failed to
attach
pkgadd: ERROR: postinstall script did not complete successfully
```

If this happens, halt your machine using the following commands:

```
# sync
# sync
# halt
```

Then, at the `ok` prompt, use the following command to list the system devices:

```
ok show-devs
```

ACEnic adapter output will be displayed. Sample PCI and SBus examples are shown on the next page.

For PCI systems, “`pci12ae,1@1`” identifies the PCI ACEnic adapter:

```
/SUNW,ffb@1e,0
/SUNW,UltraSPARC-II@0,0
/pci@1f,2000
/pci@1f,4000
/counter-timer@1f,1c00
/virtual-memory
/memory@0,60000000
/aliases
/options
/openprom
/chosen
/packages
/pci@1f,2000/pci12ae,1@1
/pci@1f,4000/scsi@3
/pci@1f,4000/network@1,1
/pci@1f,4000/ebus@1
/pci@1f,4000/scsi@3/tape
/pci@1f,4000/scsi@3/disk
/pci@1f,4000/ebus@1/SUNW,CS4231@14,200000
....
```

For SBus systems, “`alt@0,100000`” identifies the SBus ACEnic Adapter:

```
/SUNW,UltraSPARC@0,0
/sbus@1f,0
/counter-timer@1f,3c00
/virtual-memory
/memory@0,0
/aliases
/options
/openprom
/chosen
/packages
/sbus@1f,0/alt@0,10000
/sbus@1f,0/SUNW,bpp@e,c800000
/sbus@1f,0/SUNW,hme@e,8c00000
/sbus@1f,0/sc@f,1300000
/sbus@1f,0/eeprom@f,1200000
/sbus@1f,0/flashprom@f,0
....
```

If the appropriate ACEnic device is not listed, check that the adapter is installed and properly seated. Then restart the system and re-install the adapter software.

Configuring the Host Files

Once the ACEnic adapter software is installed on your system, it must be configured. To ensure proper adapter performance, configure the host files and driver parameters as described in the following sections.

NOTE – If any adapter card is moved from one slot to another, the `alt` instance values in the `/etc/path_to_inst` file will be incorrect. Correct the instance values before making any adapter configuration changes. See your Solaris manuals for details on setting instance values.

- Each adapter must be assigned a host name and an IP address. If you are not using multiple VLANs, perform the steps below when configuring the host name and IP address for your adapter.
- If VLANs are to be used, any specific adapter may have one host name and IP address for each VLAN. If you will be using VLANs on the network, see "Configuring VLANs" on page 36.

1. **Create the `/etc/hostname.alt`<*num*> file(s) on the server.**

   There can be up to four adapters per server. Create one `/etc/hostname.alt`<*num*> file for each adapter. The number <*num*> in the filename is determined as follows:

   Table 5 hostname Numbering

Adapter	Hostname
First	`/etc/hostname.alt0`
Second	`/etc/hostname.alt1`
Third	`/etc/hostname.alt2`
Fourth	`/etc/hostname.alt3`

   For example, the first adapter in the server requires a file named `/etc/hostname.alt0` and the second adapter requires a file named `/etc/hostname.alt1`.

2. **Place the appropriate adapter host name into the `hostname.alt`<*num*> file(s).**

   The `/etc/hostname.alt`<*num*> file must contain the appropriate host name for the adapter. The host name should be different from that of any other interface. For example, `/etc/hostname.alt0` and `/etc/hostname.alt1` cannot share the same host name.

   The following example depicts the host name files required for a machine called `ace`, with ACEnic adapters known as `ace-1`, `ace-2`, `ace-3`, and `ace-4` on the networks created for `alt0`, `alt1`, `alt2`, and `alt3`.

```
ace # cat /etc/hostname.alt0
ace-1
ace # cat /etc/hostname.alt1
ace-2
ace # cat /etc/hostname.alt2
ace-3
ace # cat /etc/hostname.alt3
ace-4
```

3. **For each host name, enter the appropriate IP address in the `/etc/hosts` file.**

4. **Reboot the system.**

   If you make changes and put the system into service before rebooting, you may experience configuration problems.

   Perform this command to reboot the system:

```
# reboot -- -r
```

Configuring Driver Parameters with ndd

The ndd (1M) utility is useful for changing configuration parameters for the adapter. Alternately, adapter parameters can be changed by manually editing the configuration files. This section describes the ndd utility in detail.

NOTE – Any changes made with ndd are temporary and will be lost when you reboot the system. To make configuration changes survive the reboot process, you will need to store driver settings in the `/etc/rc2.d/S99alteon` file (see "Saving Driver Parameters Beyond Reboot" on page 31).

Available Parameters

To view parameters that you can set using the ndd command, type:

```
# ndd /dev/alt '?'
```

The system returns the following:

```
stat_ticks                      (read and write)
send_max_coalesced_bds          (read and write)
recv_max_coalesced_bds          (read and write)
nic_tracing                     (read and write)
link_negotiation                (read and write)
dump_nic                        (read and write)
jumbo                           (read and write)
vlan?                           (read and write)
vlan_tag                        (read and write)
vlan_tag_id                     (read and write)
redund?                         (read and write)
redund                          (read and write)
fdr_filter                      (read and write)
rx_flow_control                 (read and write)
tx_flow_control                 (read and write)
instance                        (read and write)
```

The following table describes the driver parameters available through `ndd`.

Table 6 Adapter Driver Parameters

Parameter	Meaning
`stat_ticks`	Minimum number of 1 µsec ticks between statistics updates. 0 (off) is the minimum, and 100,000 is the default. There is no maximum.
`send_max_coalesced_bds`	Number of sends before a send complete event is set. 1 is the minimum, 127 is the maximum, and 60 is the default. WARNING: Setting this to an improper value can result in driver performance degradation or failure.
`recv_max_coalesced_bds`	Maximum number of receives that can be bundled into an event. 1 is the minimum, 511 is the maximum, and 6 is the default. WARNING: Setting this to an improper value can result in degraded performance.
`nic_tracing`	(Not currently used)
`link_negotiation`	Used to set IEEE 802.3z Link Negotiation to auto or off. Use a value of 0 for off, or 1 for auto. The default is 1 (auto).
`dump_nic`	Takes a dump of adapter memory so that a system core dump will then include adapter information. Use a value of 0 to clear adapter dump memory and return it to the system, or 1 to dump current adapter information. The default is 0 (clear).
`jumbo`	(Do not use; value is set by startup file)
`vlan?`	(Do not use; value is set by startup file)
`vlan_tag`	(Do not use; value is set by startup file)
`vlan_tag_id`	(Do not use; value is set by startup file)
`redund?`	(Do not use; value is set by startup file)
`redund`	(Do not use; value is set by startup file)
`fdr_filter`	Full-Duplex Repeater Filter. For older adapters (Model 710002), turn this on if the adapter is attached to a Full-Duplex Repeater. Use a value of 0 for off, or 1 for on. The default is 0 (off).
`rx_flow_control`	If link negotiation is on, a value of 1 allows the adapter to negotiate 802.3x receive flow control with the device at the other end of the link. If 802.3x flow control is supported by the other device, receive pause packets will be respected. A value of 0 disables receive flow control. The default is 1 (on).

Table 6 Adapter Driver Parameters

Parameter	Meaning
`tx_flow_control`	If link negotiation is on, a value of 1 allows the adapter to negotiate 802.3x transmit flow control with the device at the other end of the link. If 802.3x flow control is supported by the other device, transmit pause packets will be respected. A value of 0 disables transmit flow control. The default is 0 (off).
`instance`	Used to set the device number from which the previous data is extracted. This value can range from 0 to the number of adapters installed in the system. The default is 0.

Checking Parameter Settings

To check a current parameter setting, use the following command:

```
# ndd /dev/alt <parameter_name>
```

Setting Parameters

Follow this procedure to set parameters using the `ndd` utility:

1. **Check the `/etc/path_to_inst` file for the instance associated with particular devices.**
2. **Specify the instance for the adapter you wish to configure:**

```
# ndd -set /dev/alt instance <instance#>
```

Any subsequent `ndd` configuration commands will act on the adapter with the selected instance. The adapter remains selected until you specify a different instance.

3. **Specify the configuration command using the following format:**

```
# ndd -set /dev/alt <parameter> <value>
```

A list of valid parameters and values can be found in Table 6 on page 28.

NOTE – Any changes made with `ndd` will be lost when you reboot the system. To make configuration changes survive reboot, store driver settings in the `/etc/rc2.d/S99alteon` file (see "Saving Driver Parameters Beyond Reboot" on page 31).

Link Negotiation

The default configuration for link negotiation of the Gigabit Ethernet link is `auto`. With this setting the ACEnic adapter will use IEEE 802.3-1998 auto negotiation. All ACEnic adapters and Alteon WebSystems switches have link negotiation set to `auto` as the default configuration.

If you are connecting the adapter to Gigabit Ethernet equipment that does not support auto negotiation, or if there is a problem establishing a link between the two devices, auto negotiation can be turned off (see Table 6 on page 28).

Increasing TCP/IP Performance

The TCP/IP performance of the ACEnic PCI adapter can be increased by changing the TCP/IP `ndd` values. This can be done with the `ndd` (1M) utility, as described below.

Enter the following `ndd` commands to increase TCP/IP performance:

```
# ndd -set /dev/tcp tcp_recv_hiwat 65535
# ndd -set /dev/tcp tcp_xmit_hiwat 65535
# ndd -set /dev/udp udp_recv_hiwat 65535
# ndd -set /dev/udp udp_xmit_hiwat 65535
```

To avoid losing these settings when reboot occurs, add your `ndd` parameter settings to the start-up file as described in the following section, “Saving Driver Parameters Beyond Reboot” on page 31.

Saving Driver Parameters Beyond Reboot

Any parameter changes made using `ndd` will be lost the next time your system is rebooted. To keep changes through reboot, parameter settings must be placed in a start-up file with the following filename:

```
/etc/rc2.d/S99alteon
```

Example: If you need to adjust adapter 2 to turn Link Negotiation off and increase the TCP/IP values, you could place the following lines in the `/etc/rc2.d/S99alteon` start-up file:

```
#!/sbin/sh
# local kernel modification

#


case "$1" in
'start')

        echo "Setting local kernel parameters...\c"
        ndd -set /dev/alt instance 2
        ndd -set /dev/alt link_negotiation 0
        ndd -set /dev/tcp tcp_recv_hiwat 65535
        ndd -set /dev/tcp tcp_xmit_hiwat 65535
        ndd -set /dev/udp udp_xmit_hiwat 65535
        ndd -set /dev/udp udp_recv_hiwat 65535
        echo " "
        ;;

'stop')
        echo "$0: No parameters changed."
        ;;

*)
        echo "Usage: $0 {start|stop}"
        ;;

esac
```

Capturing Dump Information

The `dump_nic` command should be used if an adapter stops operating for any reason. The dump contains internal NIC state information which can be used to troubleshoot problems.

To take a dump of an adapter's state information, once the adapter has stopped operating, perform the following steps:

1. **Select the proper adapter instance.**

```
# ndd -set /dev/alt instance <value>
```

2. **Set the adapter to dump state information in the case of a system core dump.**

```
# ndd -set /dev/alt dump_nic 1
```

3. **Force the system to produce a core dump.**

At the `ok` prompt, enter the following command:

```
ok sync
```

CHAPTER 4

Optional Configuration

Your Alteon WebSystems ACEnic adapter can be configured to support the following options:

- VLANs: 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 each logical segment. Up to 64 VLANs can be defined for each ACEnic adapter on your server.
- Jumbo Frames: Standard Ethernet frames are 1,500 bytes long. When sending Ethernet traffic at Gigabit speeds, a considerable portion of the bandwidth is consumed by the overhead of handling a multitude of small packets. ACEnic adapters and Alteon WebSystems switches support Ethernet frames of 9,000 bytes. Host CPU utilization is significantly reduced and network throughput is enhanced when enabling Jumbo Frames between servers that have ACEnic adapters.
- Dual Homing: Two ACEnic adapters on a server can be paired for redundant operation through the use of the Dual Homing feature. If traffic on a primary connection is lost due to the failure of the adapter, cable, switch port, or switch (when the dual adapters are attached to separate switches), the secondary adapter becomes active and assumes the MAC and IP address of the primary adapter. Network sessions should be maintained after the switch-over, causing minimum impact to network traffic.

This chapter describes these options in detail, with configuration instructions and examples. If your network does not require multiple VLANs, Jumbo Frames, or Dual Homing, you need only configure the adapter to support the default configuration, as described in Chapter 3, “The ACEnic Driver Software.

NOTE – If you modify any of the optional configuration parameters (VLAN, Jumbo Frame, or Dual Homing), you must reboot the system before the changes will take effect. If you make changes and do not reboot, you may experience configuration problems.

VLANs

VLANs allow you to split your physical LAN into logical subparts, providing an essential tool for increasing the efficiency and flexibility of your network.

Overview

Each defined VLAN behaves as its own separate network, with its traffic and broadcasts isolated from the other VLANs to increase bandwidth efficiency within each logical group. One example of how VLANs can be used to segment a LAN is when isolating different types of network traffic. If you wanted to utilize Jumbo Frames on a portion of your LAN, you could configure one VLAN for devices that support Jumbo Frames, and a separate VLAN for devices supporting only standard frames. By implementing VLANs, you could segregate the different frame types from each other without reorganizing your LAN into separate physical subnets.

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. Alteon WebSystems switches and ACEnic adapters support multiple VLANs on a per-port or per-interface basis, allowing very flexible network configurations.

Figure 5 shows an example network that uses VLANs.

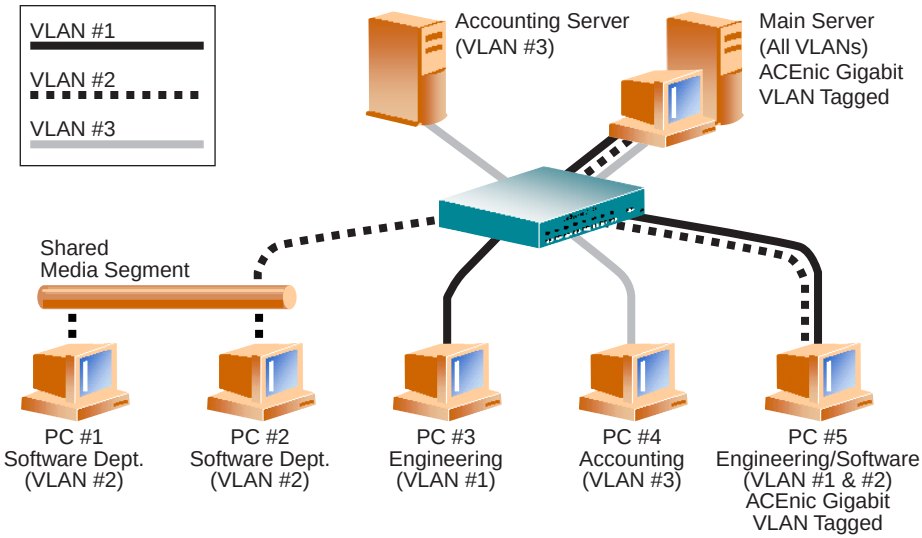

Figure 5 Example of Servers Supporting Multiple VLANs with Tagging

In the example network shown on page 34, the physical LAN consists of a switch, two servers, and five clients. The LAN is logically organized into three different VLANs, each representing a different IP subnet. The features of this network are described in the following table.

Table 7 Example VLAN Network Topology

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 needs to be accessed from all VLANs and IP subnets. The Main Server has an ACEnic adapter installed. All three IP subnets are accessed via the single physical adapter interface. The server is attached to one of the Alteon WebSystems switch Gigabit Ethernet 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 between 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 PC #3's switch port.
PC #4	A member of VLAN #3, PC #4 can only communicate with the servers. Tagging is not enabled on PC #4's switch port.
PC #5	A member of both VLANs #1 and #2, PC #5 has an ACEnic 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.

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

Configuring VLANs

By default, Alteon WebSystems switches have a single VLAN configured for every port, which groups all ports into the same broadcast domain, just as if there were no VLANs at all. This default VLAN has an 802.1Q-1998 VLAN identification number of [1], with VLAN tagging for the switch port turned off.

To configure VLANs, perform the following procedure:

NOTE – If you configure a VLAN for an adapter, all traffic sent or received by that adapter must be in VLANs.

---

1. **Create the `/etc/hostname.alt` file(s) on the server.**

   There can be up to four adapters per server, and up to 64 VLANs defined per adapter.

   One `/etc/hostname.alt`<*num*> file must be created for each VLAN that will be configured for each adapter on the server. Create files using the following naming format:

   ```
   /etc/hostname.alt<num>
   ```

   For each file, the number <*num*> in the filename is determined according to the table below. For example, the first adapter in the server requires a file named `/etc/hostname.alt0` for its first VLAN, and a file named `/etc/hostname.alt100` for its second VLAN.

Table 8 `hostname` Numbering

Up to 64 VLANs	First Adapter	Second Adapter	Third Adapter	Fourth Adapter
1	`/etc/hostname.alt0`	`/etc/hostname.alt1`	`/etc/hostname.alt2`	`/etc/hostname.alt3`
2	`/etc/hostname.alt100`	`/etc/hostname.alt101`	`/etc/hostname.alt102`	`/etc/hostname.alt103`
3	`/etc/hostname.alt200`	`/etc/hostname.alt201`	`/etc/hostname.alt202`	`/etc/hostname.alt203`
...				
64	`/etc/hostname.alt6300`	`/etc/hostname.alt6301`	`/etc/hostname.alt6302`	`/etc/hostname.alt6303`

2. **Place the appropriate adapter host name into the `/etc/hostname.alt` file(s).**

   The `/etc/hostname.alt`<*num*> file must contain the appropriate adapter host name.

   The host name should be different from the host name of any other interface. For example, `/etc/hostname.alt0` and `/etc/hostname.alt100` cannot share the same host name.

   The following example depicts the host name files required for a machine called `ace`, with one ACEnic adapter with four VLANs:

```
ace # cat /etc/hostname.alt0
ace-1
ace # cat /etc/hostname.alt100
ace-1100
ace # cat /etc/hostname.alt200
ace-1200
ace # cat /etc/hostname.alt300
ace-1300
```

3. **For each host name, enter the appropriate IP address in the `/etc/hosts` file.**

4. **Create the `/etc/vlan.alt`<*num*> file(s).**

   One corresponding `/etc/vlan.alt`<*num*> file is needed for each `/etc/hostname.alt`<*num*> file created in the previous steps (one for each VLAN being configured for each adapter on the server). Create files using the following naming format:

```
/etc/vlan.alt<num>
```

   For each file, the number <*num*> in the filename is determined according to the table below. For example, the first adapter requires a file named `/etc/vlan.alt0` for its first VLAN, and a file named `/etc/vlan.alt100` for its second VLAN.

Table 9 VLAN Numbering

Up to 64 VLANs	First Adapter	Second Adapter	Third Adapter	Fourth Adapter
1	/etc/vlan.alt0	/etc/vlan.alt1	/etc/vlan.alt2	/etc/vlan.alt3
2	/etc/vlan.alt100	/etc/vlan.alt101	/etc/vlan.alt102	/etc/vlan.alt103
3	/etc/vlan.alt200	/etc/vlan.alt201	/etc/vlan.alt202	/etc/vlan.alt203
...				
64	/etc/vlan.alt6300	/etc/vlan.alt6301	/etc/vlan.alt6302	/etc/vlan.alt6303

5. **Place the appropriate VLAN ID tag into the `vlan.alt`<*num*> file(s).**

   Each VLAN must be assigned a unique identification number. Even though the maximum number of VLANs that can be configured on each adapter is 64, any particular VLAN can be assigned an identification number between 1 and 4094. The VLAN tagging format follows the guidance provided in IEEE 802.1Q-1998.

   The VLAN identifier numbers must be placed into each appropriate `vlan.alt`<*num*> file to which the adapter is a member.

   Example: Consider a server with a single adapter. The server is a member of two VLANs, with VLAN identifiers 383 and 777. The contents of the first file, `/etc/vlan.alt0`, would be “383” and the contents of the second file, `/etc/vlan.alt100`, would be “777”.

   Use your regular text editor to put the VLAN identifier number into the appropriate `vlan.alt`<*num*> file. Be certain that there are no spaces, blank lines, or extra characters. The identifier can be entered in decimal (e.g. 383), octal (e.g. 0577), or hexadecimal (e.g. 0x17F) format.

6. **If you are finished with all optional configuration, reboot the system.**

   Changes to the optional configuration parameters (VLAN, Jumbo Frame, or Dual Homing) do not take effect until you reboot the system. If you will be making changes to the other optional parameters during your configuration session, you should wait to reboot until those changes are complete.

NOTE – If you modify parameters and put the system into service before rebooting, you may experience configuration problems.

Perform this command to reboot the system:

```
# reboot -- -r
```

7. **Verify the configuration changes.**

   Enter the following command and verify that the appropriate VLANs are present:

```
# ifconfig -a
```

Jumbo Frames Support

ACEnic adapters and Alteon WebSystems switches support Jumbo Frames—frames of up to 9,000 bytes that are sent between servers that have ACEnic adapters. Host CPU utilization is significantly reduced and network throughput is enhanced by sending 9,000 byte frames rather than the standard 1,500 byte Ethernet frames.

Overview

A single ACEnic adapter on a server can support standard Ethernet frames as well as Jumbo Frames. Jumbo Frames are only sent between servers that have ACEnic adapters. Standard Ethernet frames are used between servers that have ACEnic Adapters and all other Ethernet devices.

VLANs are used to create logical subnets that separate Jumbo Frame traffic from standard Ethernet frames. The VLAN with the VLAN ID of “383”, for example, could be used by a number of servers that have ACEnic adapters with Jumbo Frame support. The VLAN with the VLAN ID of “777” could include these same servers where the maximum frame size is 1,500 bytes.

In the example on page 38, VLAN ID “383” is configured in vlan.alt0. A `jumbo.alt0` file can be configured to enable Jumbo Frame support for this VLAN. VLAN ID “777” is configured in `vlan.alt100`. There will be no `jumbo.alt100` file since this is not a Jumbo Frame VLAN.

Table 10 shows the possible sequence of numbers for `jumbo.alt`<*num*> files.

Table 10 Jumbo Frame VLAN Numbering

Up to 64 VLANs	First Adapter	Second Adapter	Third Adapter	Fourth Adapter
1	/etc/jumbo.alt0	/etc/jumbo.alt1	/etc/jumbo.alt2	/etc/jumbo.alt3
2	/etc/jumbo.alt100	/etc/jumbo.alt101	/etc/jumbo.alt102	/etc/jumbo.alt103
3	/etc/jumbo.alt200	/etc/jumbo.alt201	/etc/jumbo.alt202	/etc/jumbo.alt203
...				
64	/etc/jumbo.alt6300	/etc/jumbo.alt6301	/etc/jumbo.alt6302	/etc/jumbo.alt6303

Configuring Jumbo Frames Support

To configure Jumbo Frame support, perform the following procedure:

1. **Create the `/etc/jumbo.alt`<*num*> file.**

2. **Use your regular text editor to put the "`9000`" into the `/etc/jumbo.alt`<*num*> file.**

   Put the number "**`9000`**" in the file, without spaces or blank lines.

3. **If you are finished with all optional configuration, reboot the system.**

   Changes to the optional configuration parameters (VLAN, Jumbo Frame, or Dual Homing) do not take effect until you reboot the system. If you will be making changes to the other optional parameters during your configuration session, you should wait to reboot until those changes are complete.

NOTE – If you modify parameters and put the system into service before rebooting, you may experience configuration problems.

Perform this command to reboot the system:

```
# reboot -- -r
```

4. **Verify the configuration changes.**

   Enter the following command and verify that the MTU size is set to 9000:

```
# ifconfig -a
```

Dual Homing

When two ACEnic adapters are installed in the same server, they can be paired in a Dual Homing configuration. If traffic is not seen over the primary adapter connection due to loss of the adapter, cable, switch port, or switch (where the two adapters are attached to separate switches), the secondary adapter becomes active. When it becomes active, the secondary adapter uses the MAC and IP address originally assigned to the primary adapter. Sessions should be maintained, with minimum impact to network traffic.

Overview

The Dual Homing feature relies on the Spanning Tree Protocol. Adapters configured for Dual Homing allow Spanning Tree Protocol packets to pass between them. This causes the Spanning Tree Protocol to detect a loop in the network, forcing the switch port connected to one of the adapters to go into blocking mode. The blocked adapter becomes the secondary.

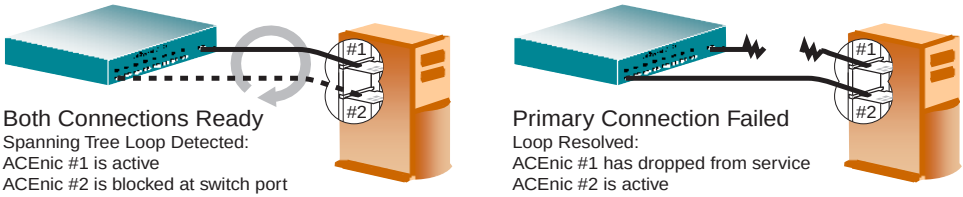

Figure 6 Dual Homing with Spanning Tree

If the primary connection becomes disabled for any reason, the Spanning Tree Protocol will detect the loss of the loop, and will change the switch port connecting the secondary adapter from blocking mode to forwarding mode.

Configuring Dual Homing

To configure Dual Homing in a system with two adapters, where `/etc/hostname.alt0` is the primary adapter, perform the following procedure:

NOTE – Do not configure an `/etc/hostname.alt`<*num*> entry for the *redundant* adapter. Also, do not configure VLAN or Jumbo Frame support files for the redundant adapter. If the primary adapter fails, the secondary adapter takes on the configuration of the primary adapter. Serious configuration problems will occur if there are hostname, Jumbo Frame, or VLAN configuration files for the secondary adapter.

---

1. **Enable Spanning Tree Protocol on the switch connected to your ACEnic adapters.**

2. **The port to which the secondary adapter is connected must be the port that blocks.**

   If there is more than one switch in the spanning tree, be certain that the secondary adapter is not attached to the root switch of the spanning tree. Also, be sure that the port path cost of the switch port connected to the secondary adapter is higher than the other ports in the loop.

   Example: In the following redundant switch configuration, the switch port connected to adapter #2 must have the highest port path cost of any of the four ports in the loop:

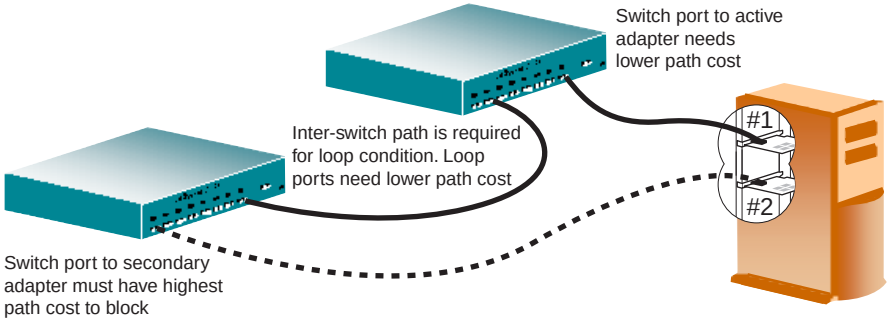

Figure 7 Dual Homing Path Costs

3. **Create the `/etc/redund.alt1` file.**

4. **Use your regular text editor to put the number "`0`", the instance number of the primary adapter, into the file `/etc/redund.alt1`.**

   Put the number "**`0`**" in the file, without spaces or blank lines.

5. **If you are finished with all optional configuration, reboot the system.**

   Changes to the optional configuration parameters (VLAN, Jumbo Frame, or Dual Homing) do not take effect until you reboot the system. If you will be making changes to the other optional parameters during your configuration session, you should wait to reboot until those changes are complete.

NOTE – If you modify parameters and put the system into service before rebooting, you may experience configuration problems.

Perform this command to reboot the system:

```
# reboot -- -r
```

APPENDIX A

Specifications

1000BASE-SX Link Characteristics

Description	62.5 Micron	50 Micron
	Shortwave (850 nanometer multimode fiber)	
Operating Range	2 to 260 meters	2 to 550 meters (in compliance with IEEE 802.3-1998)

Performance Specifications

Feature	Specification
PCI clock	66 MHz max
PCI Data/Address	32- and 64-bit
PCI data burst transfer rate	132 MB/second (32-bit bus) 264 MB/second (64-bit bus) 528 MB/second (64-bit bus at 66 MHz)
PCI modes	Master/slave
SBus	25 MHz, 64-bit bus master with adaptive DMA

Physical Characteristics

Dimension	Measurement
PCI Length x Width	17.27 cm x 10.67 cm (6.8" x 4.2"
SBus Length x Width	14.61 cm x 8.26 cm (5.75" x 3.25")

Power Requirements

Specification	Measurement
PCI operating voltage	+5 V ± 5%
PCI power consumption	7.5 Watts 1.5A @ +5VDC
SBus operating voltage	+5 V ± 5%
SBus power consumption	10 Watts 2A @ +5VDC

Environmental Specifications

Condition	Operating Specification	Storage Specification
Temperature	0° to 55° C (+32 to +131 F)	-40° to +85° C
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 feet	Up to 35,000 feet
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.)