IBM Netfinity

# Cluster Enabler
# Hardware and Software Installation Guide
# for Oracle Parallel Server

**IBM**

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Hardware and Software Installation Guide
for Oracle Parallel Server**

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> **Note**
>
> Before using this information and the product it supports, be sure to read the general information under Appendix B, "Product Notices" on page 38.

# Contents

# About This Book

This book contains instructions to assist you with the setup of your IBM Netfinity Cluster Enabler hardware and with the installation of the IBM Netfinity Cluster Enabler Operating System Dependent (OSD) software that is used to build an IBM Netfinity server cluster. The OSD software is required for the proper operation of the Oracle Parallel Server (OPS).

The hardware setup consists of two, four, or six IBM Netfinity 7000 M10 servers (nodes) with a fibre-channel external storage system as the shared hard disk device.

The software setup consists of the Microsoft Windows NT operating system, Oracle Enterprise Edition for Windows NT, IBM Netfinity clustering software (also know as Operating System Dependent (OSD) software), and IBM Netfinity SYMplicity Storage Manager.

This book is intended for the following audience:

- Network administrator—the individual responsible for configuring, managing, maintaining, and troubleshooting a network or LAN.

- Hardware administrator—the individual responsible for configuring, maintaining, and supporting an IBM Netfinity Server.

- Database administrator—the individual responsible for configuring and maintaining the Oracle Parallel Server software and database.

- Customer project administrator—the individual who is the focal point for all IBM communications related to the cluster project.

## How This Book Is Organized

This book has the following major sections:

- "Introduction" on page 1 contains a description of the IBM Netfinity Cluster Enabler.

- "Installing the Hardware" on page 5 contains procedures for installing and cabling the hardware in a rack. This section also contains information about cable management and cable labeling for the IBM Netfinity Cluster Enabler.

- "Installing the Software" on page 15 contains procedures for installing the necessary software to configure the cluster.

- "Troubleshooting IBM Netfinity Cluster Enabler Configuration" on page 28 contains information on how to isolate and recover from some potential problems that might occur.

- "Getting Help, Service, and Information" on page 34 contains instructions on how and where to obtain service.

- Appendix A, "Supplementary Instructions for Installing a Six Node Oracle Parallel Server Configuration" on page 35 contains instructions on how to set up a sixth node in the cluster.

- Appendix B, "Product Notices" on page 38 contains notices and trademarks.

# Publications Required for the Installation

During the installation of the IBM Netfinity Cluster Enabler, you might need to refer to one or more of the following publications.

## Hardware Publications

- *8271 Ethernet LAN Switch Model 712 User's Guide.* This book contains information for installing and configuring an 8271-712 switch.

- *APC Smart-UPS Uninterruptible Power Supply Model 1400/3000.* This book contains information that can help you optimize the performance and service life from your UPS; it also contains a description of the inner workings of the UPS.

- *IBM Netfinity Rack Console Server Selector Switch Installation Instructions.* This book contains detailed instructions for installing and using the selector switch.

- *IBM 9306 Model 900 Netfinity Rack Enclosure Unpacking Instruction.* This book contains detailed instructions for unpacking the PC Server Rack Enclosure.

- *IBM 9306 Model 900 Netfinity Rack Planning and Installation Guide.* This book contains information about the IBM 9306 Model 900 Netfinity Rack. It also contains a product description, a list of available options, option and equipment installation guidelines, and a description of the IBM Netfinity Rack Configurator program.

- *IBM Netfinity 7000 M10 Server Library.* This book contains detailed instructions for installing and setting up your IBM Netfinity 7000 M10 servers.

- *IBM Netfinity EXP15 Installation and User's Handbook.* This book provides instructions for installing and replacing options and provides information on troubleshooting the IBM Netfinity EXP15 Storage Expansion Unit.

- *IBM Netfinity Fibre Channel PCI Adapter Hardware Installation Handbook.* This book contains detailed instructions for installing the IBM Netfinity Fibre Channel PCI Host Adapter.

- *IBM Netfinity Fibre Channel RAID Controller Unit User's Handbook.* This book contains detailed instructions for installing a rack-mounted IBM Netfinity Fibre Channel RAID Controller Unit.

- *IBM Netfinity Fixed Shelf Installation Instructions.* This book contains detailed instructions for installing fixed shelves in the rack.

- *IBM Netfinity Rack Attachment Kit Installation Instructions.* This book contains detailed instructions for connecting two or more racks together to form a suite of racks.

- *IBM Netfinity Rack Monitor Compartment Installation Instructions.* This book contains detailed instructions for installing the monitor compartment in a rack.

- *IBM Netfinity ServeRAID-3H and ServeRAID-3L Ultra2 SCSI Adapters Installation and User's Guide.* This book contains information and detailed instructions for using the IBM ServeRAID-3H and the IBM ServeRAID-3L Adapters.

- *IBM PC Server 10/100 EtherJet Adapter User's Manual.* This book contains detailed instructions for installing the IBM 10/100 PCI EtherJet adapter in the server.

## Software Publications

- *IBM Netfinity Networked SYMplicity Storage Manager Installation and User's Handbook.* This book contains installation and setup information for the SYMplicity Storage Manager software in a networked Microsoft Windows NT environment.

- *IBM Netfinity SYMplicity Storage Manager for Windows NT Installation and User's Handbook.* This book contains detailed instructions for installing the SYMplicity Storage Manager software with the Windows NT operating system.

- *IBM Netfinity SYMplicity Storage Manager User's Handbook.* This book contains complete instructions for installing the SYMplicity Storage Manager software to perform various storage-management tasks.

- *Microsoft Windows NT Installation and User's Guide.* This book contains instructions for installing and using Microsoft Windows NT.

- *Oracle Parallel Server Getting Started for Windows NT Version 8.0.5.1.* This book contains operating system-specific information on using Oracle Parallel Server for Windows NT.

- *Oracle Parallel Server Getting Started Guide.* This book contains instructions for setting up servers (nodes) in a cluster.

# Introduction

Welcome to the *IBM Netfinity Cluster Enabler Hardware and Software Installation Guide for Oracle Parallel Server*. This book will provide a high level overview of the process of assembling the IBM Netfinity Cluster Server hardware and installing your software for the proper operation of the Oracle Parallel Server (OPS) Version 8.0.5.n. The IBM Netfinity Cluster Enabler has been certified by Oracle to fulfill the Oracle Parallel Server (OPS) requirements for vendor-supplied Operating System Dependent (OSD) software.

```
┌─────────────────────────┐
│      Interconnect       │
└─────────────────────────┘
        Ethernet Hub
```

| Server node | Server node | Server node | Server node | Server node | Server node |
|-------------|-------------|-------------|-------------|-------------|-------------|
| IBM Netfinity 7000 M10 | IBM Netfinity 7000 M10 | IBM Netfinity 7000 M10 | IBM Netfinity 7000 M10 | IBM Netfinity 7000 M10 | IBM Netfinity 7000 M10 |

```
┌─────────────────────────┐
│      Fibre Channel      │
└─────────────────────────┘
```
IBM Netfinity Fibre Channel RAID Controller Unit and Hubs

| Data | Data | Data | Data | Data | Data |
|------|------|------|------|------|------|
| IBM Netfinity EXP 15 | IBM Netfinity EXP 15 | IBM Netfinity EXP 15 | IBM Netfinity EXP 15 | IBM Netfinity EXP 15 | IBM Netfinity EXP 15 |

Six-Node Cluster Configuration

The IBM Netfinity Cluster Enabler hardware consists of two, four, or six IBM Netfinity 7000 M10 servers configured with various hardware components to form a system capable of delivering a single database to a maximum number of clients for high availability and scalability. The system can be configured according to the demands of the operating environment, whether to maximize the number of clients or to configure the system with storage redundancy to safeguard the information contained within the database.

# Hardware Installation Requirements

The following items are required to complete a typical two, four, or six server (node) hardware configuration.  However, hardware requirements might vary depending on your configuration.

| Hardware Requirements | 2 Node | 4 Node | 6 Node |
|---|---|---|---|
| IBM Netfinity Racks | 2 | 2-3 | 3-4 |
| IBM Netfinity 7000 M10 Servers | 2 | 4 | 6 |
| IBM Console Server Selector Switch | 1 | 1 | 1 |
| IBM ServeRAID-3L Adapters (1 per server) | 2 | 4 | 6 |
| IBM 10/100 EtherJet PCI Adapters (for interconnect only) | 2 | 4 | 6 |
| IBM Console Cable Sets | 2 | 4 | 6 |
| IBM 8271-712 Ethernet LAN Switch | 1 | 1 | 1 |
| Hard disk drives for the server (2 per server) | 4 | 8 | 12 |
| IBM Netfinity Fibre Channel RAID Controller Unit | 1 | 1 | 1 |
| IBM Netfinity Fibre Channel RAID Controller for the IBM Netfinity Fibre Channel RAID Controller Unit | 1 | 1 | 1 |
| IBM Netfinity Fibre Channel Failsafe RAID Controller for the IBM Netfinity Fibre Channel RAID Controller Unit | 1 | 1 | 1 |
| Rack mounts for the IBM Netfinity Fibre Channel RAID Controller Unit | 1 | 1 | 1 |
| IBM Netfinity EXP15 Storage Expansion Units | 1-6 | 1-6 | 1-6 |
| Hard disk drives for the IBM Netfinity EXP15 Storage Expansion Unit (per expansion unit) | 1-10 | 1-10 | 1-10 |
| Rack mounts for the IBM Netfinity EXP15 Storage Expansion Unit (1 per EXP15) | 1-6 | 1-6 | 1-6 |
| IBM Netfinity Fibre Channel Hub | 2 | 2 | 2 |
| IBM Netfinity Fibre Channel PCI Adapters (2 per server) | 4 | 8 | 12 |
| Microprocessor Upgrades (3 per server) | 6 | 12 | 18 |
| 1 GB Memory Option Kit (1 per server; refer to the documentation that comes with your server for memory configuration.) | 2 | 4 | 6 |
| APC Smart-UPS Model 3000 | 2 | 4 | 6 |
| Standard Category-5 Ethernet cables with RJ45 connectors | 2 | 4 | 6 |
| Shortwave Fibre Optic cables | 6 | 10 | 14 |
| Fibre Optic Gigabit Interface Converters (each IBM Netfinity Fibre Channel Hub comes with 4 GBICs, table lists total needed) | 6 | 10 | 14 |
| Display monitor, keyboard, and mouse (one of each) | 1 | 1 | 1 |
| Monitor compartment for the IBM Netfinity Enclosure | 1 | 1 | 1 |
| Fixed shelf for the IBM Netfinity Rack | 1 | 1 | 1 |
| Keyboard tray for the IBM Netfinity Enclosure | 1 | 1 | 1 |

## Software Installation Requirements

The following software is required to complete the IBM Netfinity Cluster Enabler:

- Microsoft Windows NT Server, Version 4.0, Enterprise Edition with Service Pack 4

- IBM Netfinity Fibre Channel RAID Support, Version 6.2 or later

  You can obtain the latest Fibre Channel device drivers on the World Wide Web at http://www.pc.ibm.com/support

  1. Under **select family**, click **Fibre Channel Solutions**.

  2. Download the device drivers.

- IBM Netfinity Rack Configurator Program

  **Note:** The IBM Netfinity Rack Configurator Program might be needed for you to accurately configure your hardware.

  You can obtain the latest version of the Rack Configurator Program on the World Wide Web at http://www.pc.ibm.com/support

  1. Click **IBM Server Support**.

  2. Under **Technical Information** click **Downloadable files**.

  3. Click **Other**.

  4. Click **Servers - IBM Netfinity Rack Configurator v1.8B.**

  5. **Download the executable file to your server.**

- Oracle Enterprise Edition Version 8.0.5.n for Windows NT

- IBM Netfinity Cluster Enabler, Version 1.1;

  you can download the software from the World Wide Web at http://www.pc.ibm.com/us/netfinity/parallel_server.html

  1. Click **Download the Netfinity Cluster Enabler version 1.1 here**

  2. Complete the *Netfinity Cluster Enabler Download Registration form*

  3. Click **Submit**

## Tool Requirements

The following tools are required for the installation of this kit:

- Small flat-blade screwdriver
- Phillips-head screwdriver
- 3/16-inch socket wrench and nut driver
- 5-mm Allen wrench
- 8-mm socket wrench
- 9-mm socket wrench
- 10-mm socket wrench

# Cable Management and Labeling

Cable management and labeling are increasingly important. Cable management and labeling needs have expanded from the traditional labeling of network connections to labeling most cable connections between your servers, disk subsystems, multiple network connections, power configurations and video subsystems. Examples include fibre channel configurations, server clusters, multiple unique clusters located in the same rack or across multiple racks, and clusters where components might not be physically located in the same room, building, or site.

The necessity for detailed cable management and labeling is due to the complexity of today's configurations and the potential distances between components. Benefits from more detailed cable management and labeling include:

- Ease of installation
- Ongoing cluster and systems management
- Increased serviceability

Be sure to label your cables. Refer to the IBM support Web site at:

http://www.pc.ibm.com/support

1. Click **IBM Server Support** on the left side of the Web page

2. Click **Hints and Tips** on the right side of the Web page

3. Click **Configuration** on the right side of the Web page

4. Click **Servers - Cable management and labeling for solutions utilizing racks, n-node Clustering or Fiber Channel** for detailed instructions on how to label your IBM Netfinity Cluster

# Installing the Hardware

This section guides you through installing a six server (node) configuration in three racks.

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┌─────────────────────────────────────────────┐
│                   Step 1                    │
│            Unpack and set up the racks      │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 2                    │
│      Install the memory and processor upgrades │
│         into each Netfinity 7000 M10 server │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 3                    │
│        Install the ServeRAID, EtherJet PCI and Fibre │
│      Channel Adapters into each Netfinity 7000 M10 server │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 4                    │
│   Install the hardware (UPS units, servers, keyboard, hubs, │
│      monitor, and Console Selector Switch) into rack #1 │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 5                    │
│         Install the hardware (UPS units, servers, │
│          EXP 15 Storage Units) into rack #2 │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 6                    │
│  Install the hardware (UPS units, servers, RAID Controller Unit │
│         and EXP 15 Storage Units) into rack #3 │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 7                    │
│      Connect the monitor, keyboard, and mouse cables to │
│        the Console Server Selector Switch and each Server │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 8                    │
│     Connect the IBM 100/10 EtherJet PCI Adapter in each │
│           server to the EtherJet LAN Switch │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 9                    │
│ Connect the Fibre Channel cables from the Netfinity Fibre Channel │
│   PCI Adapter in each server to the Netfinity Fibre Channel Hub │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 10                   │
│      Connect the SCSI cables from the Netfinity EXP 15 │
│        to the Netfinity Fibre Channel RAID Controller Unit │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 11                   │
│      Connect the power cables from all components │
│                to the APC Smart-UPS         │
└─────────────────────────────────────────────┘
                       │
┌─────────────────────────────────────────────┐
│                   Step 12                   │
│        Power-up the hardware according to the │
│        prescribed sequence in this document │
└─────────────────────────────────────────────┘
                       │
           ╭─────────────────────────────────╮
           │            Step 13              │
           │     Your hardware installation and │
           │        cabling is complete      │
           ╰─────────────────────────────────╯
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# Front and Back View of the Hardware

These illustrations contain detailed front and rear views of the hardware components illustrated in this overview. The illustrations in this overview might look slightly different from your hardware.

**Front View**                                        **Back View**
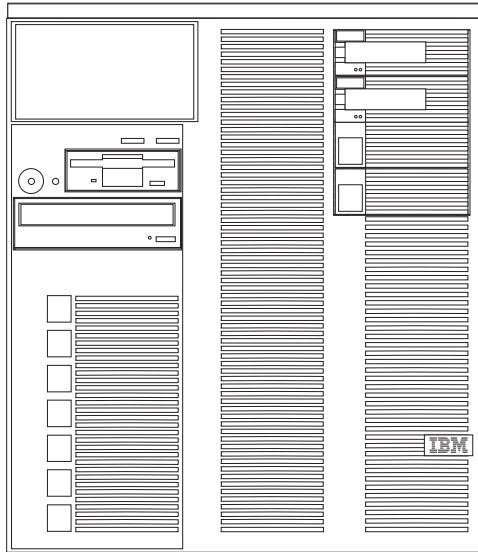
IBM Netfinity 7000 M10 Server
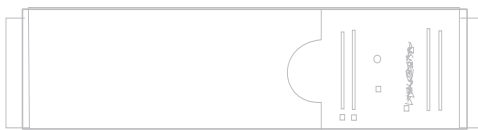
APC Smart-UPS

IBM Netfinity Fibre Channel Hub

IBM Console Server Selector Switch

IBM Netfinity EXP15 Storage Expansion Unit



IBM Netfinity Fibre Channel RAID Controller Unit



IBM 8271-712 Ethernet LAN Switch

# Step 1:  Unpack and Set Up the Racks

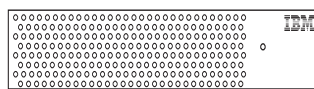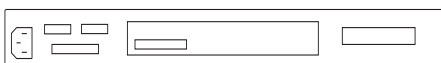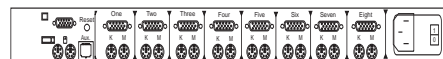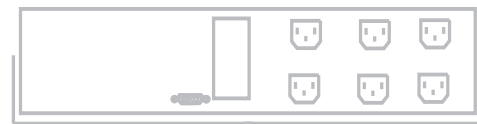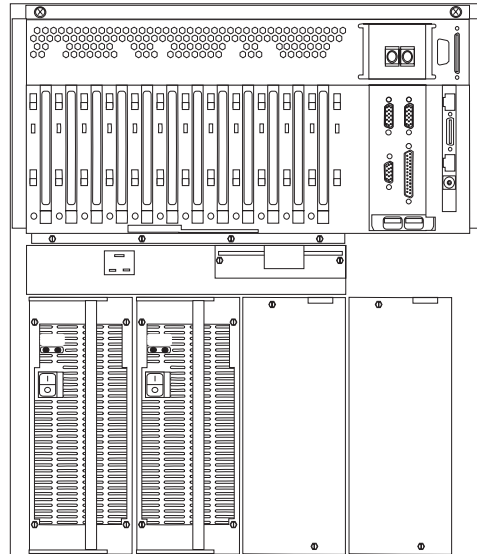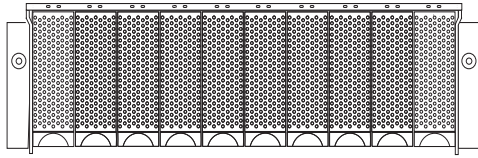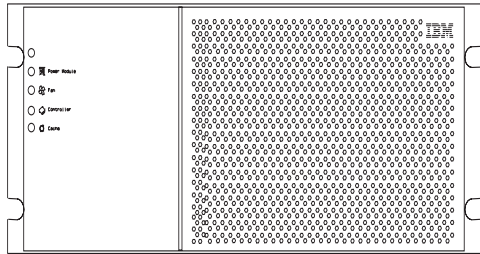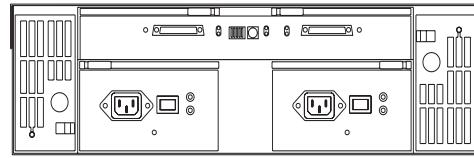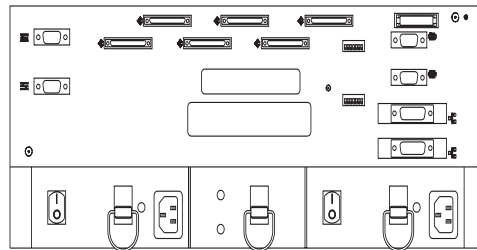Unpack and set up each rack. Refer to the *IBM 9306 Model 900 PC Server Rack Enclosure Caution and Danger Information* safety booklet to ensure the safe installation of your rack.

**Notes:**

1. For individual racks, be sure to install the stabilizer brackets.

2. Refer to the IBM Netfinity Rack Configurator Program and the *IBM 9306 Model 900 Netfinity Rack Planning and Installation Guide* for detailed installation instructions.

3. Do not install the monitor, keyboard, and mouse at this time.

# Step 2:  Install the Required Upgrades into each IBM Netfinity 7000 M10 Server

1. Refer to the *IBM Netfinity 7000 M10 Server Library* documentation *Legal and Safety Information* section for safety concerns while installing these options.

2. Install additional memory (for a total of 1 GB) in each IBM Netfinity 7000 M10 server.

   Refer to the documentation that comes with the memory for detailed installation instructions and then proceed with installing the microprocessors.

3. Install the microprocessors (for a total of 4) in each IBM Netfinity 7000 M10 server.

   Refer to the documentation that comes with the microprocessor for detailed installation instructions and then proceed with Step 3.

# Step 3:  Install the ServeRAID-3L, EtherJet PCI, and Fibre Channel Adapters into each IBM Netfinity 7000 M10 Server

1. Refer to the *IBM Netfinity 7000 M10 Server Library* documentation *Legal and Safety Information* section for safety concerns while installing these options.

2. Install a ServeRAID-3L Adapter that will control your startup drives in slot 1 of each IBM Netfinity 7000 M10 server.

   Refer to *IBM Netfinity ServeRAID-3H and ServeRAID-3L Ultra2 SCSI Adapters Installation and User's Guide* for detailed installation instructions and then proceed with cabling the adapter.

3. Cable the ServeRAID-3L Adapter in each IBM Netfinity 7000 M10 server.

   Refer to the "Working with Adapters" section in the *IBM Netfinity 7000 M10 Server Library* for detailed installation instructions and then proceed to install the EtherJet Adapter.

4. Install the EtherJet PCI Adapter in each IBM Netfinity 7000 M10 server (install the EtherJet PCI Adapter in PCI slot number two of each server).

Refer to the documentation that comes with the IBM 10/100 EtherJet PCI Adapter for detailed installation instructions and then proceed to install the Fibre Channel Adapter.

**Important:**

    a. Install the EtherJet PCI Adapter card for the interconnect in PCI slot number two in each server.

    b. If you add a LAN network card to each server, install it in PCI slot number three next to the EtherJet PCI Adapter.

5. Install the IBM Netfinity Fibre Channel PCI Adapter in each IBM Netfinity 7000 M10 server.

   Refer to *IBM Netfinity Fibre Channel PCI Adapter Hardware Installation Handbook* for detailed installation instructions and then proceed to install the hardware into the first rack.

The following instructions describe the installation procedures and layout for a typical hardware set-up using three racks, one ServeRAID Controller Unit and six EXP15 Storage Expansion Units. Refer to the IBM Netfinity Rack Configurator Program for assistance in configuring the hardware that you selected.

## Step 4:  Install the Hardware into Rack #1

**Important:**  Install the APC Smart-UPS and the servers in the bottom of the rack because they are heavy.

1. Refer to the *IBM 9306 Model 900 PC Server Rack Enclosure Caution and Danger Information* safety booklet to ensure the safe installation of devices into the rack.

2. Install two APC Smart-UPS in the bottom of the first rack.

   Refer to the IBM Netfinity Rack Configurator program and *IBM 9306 Model 900 Netfinity Rack Planning and Installation Guide* for detailed installation instructions and then proceed to installing the first server.

3. Install the first IBM Netfinity 7000 M10 server into the rack.

   Refer to *IBM Netfinity 7000 M10 Server Library* for detailed installation instructions and then proceed to installing the keyboard tray.

4. Install the keyboard tray into the rack.

   Refer to *IBM Netfinity Rack Keyboard Tray Installation Instructions* for detailed installation instructions and then proceed to install the second server.

5. Install the second IBM Netfinity 7000 M10 server into the rack.

   Refer to the *IBM Netfinity 7000 M10 Server Library* for detailed installation instructions and then proceed to install the Ethernet LAN Switch.

6. Install the bracket and IBM 8271-712 Ethernet LAN Switch into the rack.

   Refer to the *8271 Ethernet LAN Switch Model 712 User's Guide* for detailed installation instructions and then proceed to install the Fibre Channel Hubs.

> **Note:** Leave at least 1 U of open air space between the fixed shelf and the IBM Netfinity Fibre Channel Hubs.

7. Install a rack fixed shelf over the IBM 8271-712 Ethernet Switch and place the two IBM Netfinity Fibre Channel Hubs (side-by-side) on top of the shelf.

   Refer to the *IBM Netfinity Fixed Shelf Installation Instructions* for detailed installation instructions and then proceed to install the monitor.

8. Install the monitor compartment and monitor into the rack.

   Refer to the *IBM Netfinity Rack Monitor Compartment Guide* for detailed installation instructions and then proceed to install the Console Selector Switch.

9. Install the IBM 9306 Model 900 Netfinity Rack Console Server Selector Switch into the rack.

   Refer to the *IBM Netfinity Rack Console Server Selector Switch Installation Instructions* for detailed installation instructions and then proceed to Step 5.

## Step 5:  Install the Hardware into Rack #2

> **Important:** Install the APC Smart-UPS and the servers in the bottom of the rack because they are heavy.

1. Refer to the *IBM 9306 Model 900 PC Server Rack Enclosure Caution and Danger Information* safety booklet to ensure the safe installation of devices into the rack.

2. Install two APC Smart-UPS in the bottom of the second rack.

   Refer to the *IBM 9306 Model 900 Netfinity Rack Planning and Installation Guide* for detailed instructions and then proceed to install the third server.

3. Install the third IBM Netfinity 7000 M10 server into the rack.

   Refer to the *IBM Netfinity 7000 M10 Server Library* for detailed installation instructions and then proceed to install the fourth server.

4. Install the fourth IBM Netfinity 7000 M10 server into the rack.

   Refer to the *IBM Netfinity 7000 M10 Server Library* for detailed installation instructions and then proceed to install three EXP15 Storage Units.

5. Install the brackets and the three IBM Netfinity EXP15 Storage Expansion Units into the rack.

   Refer to *IBM Netfinity EXP15 Installation and User's Handbook* for detailed installation instructions and then proceed to Step 6.

## Step 6:  Install the Hardware into Rack #3

> **Important:** Install the APC Smart-UPS and the servers in the bottom of the rack because they are heavy.

1. Refer to the *IBM 9306 Model 900 PC Server Rack Enclosure Caution and Danger Information* safety booklet to ensure the safe installation of devices into the rack.

2. Install two APC Smart-UPS in the bottom of the third rack.

   Refer to *IBM 9306 Model 900 Netfinity Rack Planning and Installation Guide* for detailed instructions and then proceed to install the fifth server.

3. Install the fifth IBM Netfinity 7000 M10 server into the rack.

   Refer to *IBM Netfinity 7000 M10 Server Library* for detailed instructions and then proceed to install the sixth server.

4. Install the sixth IBM Netfinity 7000 M10 server into the rack.

   Refer to *IBM Netfinity 7000 M10 Server Library* for detailed instructions and then proceed to install the RAID Controller Unit.

5. Install the bracket and the IBM Netfinity Fibre Channel RAID Controller Unit into the rack.

   Refer to *IBM Netfinity Fibre Channel RAID Controller Unit User's Handbook* for detailed installation instructions and then proceed to install three EXP15 Units.

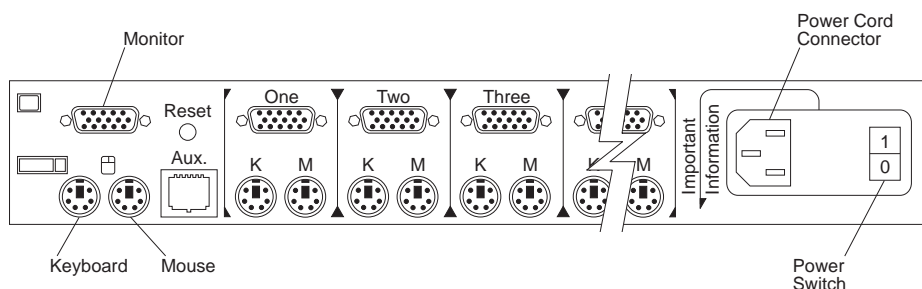6. Install the brackets and the three IBM Netfinity EXP15 Storage Expansion Units into the rack.

   Refer to *IBM Netfinity EXP15 Installation and User's Handbook* for detailed instructions and then proceed to Step 7.

# Step 7: Connect the Monitor, Keyboard, and Mouse Cables to the Console Server Selector Switch



1. Connect the monitor cable to the selector switch monitor connector.

2. Connect the keyboard cable to the selector switch keyboard connector.

3. Connect the mouse cable to the selector switch mouse connector.

4. Using the Console Server Selector Switch Cable Sets (one set for each server), connect one end of the monitor, keyboard, and mouse cable to the monitor, keyboard, and mouse ports on the first server installed in rack number one.

5. Looking below the label marked **One,** on the rear of the Console Server Selector Switch, connect the other end of the Console Server Selector Switch Cable Set keyboard and mouse cable to the Console Server Selector Switch connectors marked **K** and **M** respectively.

6. Connect the Console Server Selector Switch Cable Set monitor cable to the Console Server Selector Switch connector marked **One**.

7. Repeat steps 4 through steps 6, connecting one end of each of the cables in the Console Server Selector Switch Cable Set to its respective port at the rear of each server and the other end to the appropriate port on the rear of the Console Server Selector Switch.

Refer to *IBM Netfinity Rack Console Server Selector Switch Installation Instructions* for safety information and instructions on how to use the selector switch.

# Step 8: Connect the IBM 10/100 EtherJet PCI Adapters to the IBM 8271-712 Ethernet LAN Switch

> **Note:** Label the cables from the Ethernet LAN Switch to the EtherJet PCI Adapter for future reference.

1. For each server in your configuration, connect one end of the Category-5 Ethernet cable to the IBM 10/100 EtherJet PCI Adapter.

2. Connect the other end of the Category-5 Ethernet cable to any port on the front of the IBM 8271-712 Ethernet LAN Switch.

## Step 9:  Connect the Fibre Channel Cables to the IBM Netfinity Fibre Channel Hub

**Notes:**

1. The ports on the back of the IBM Netfinity Fibre Channel Hub are labeled 0 through 6, and can receive fibre channel cables from any of the installed server Fibre Channel PCI Adapters.

2. Label all Fibre Channel cables for future reference.

3. Do not bend, crimp, or coil the fibre channel cables smaller than a 4-inch diameter. Doing so could cause data loss.

4. Extra GBICs may have to be added to the Fibre Channel Hubs depending upon your configuration.

5. The RAID Controller and Failsafe RAID Controller are each sold with one Media Interface Adapter (MIA).

1. For each server in your configuration, connect one end of the fibre channel cable to a IBM Netfinity Fibre Channel PCI Adapter that is installed in the server.

2. Connect the other end of the IBM fibre channel cable to one of the GBICs on the back of one of the IBM Netfinity Fibre Channel Hubs.

3. Connect the second fibre channel cable to the second IBM Netfinity Fibre Channel PCI Adapter that is installed in each server.

4. Connect the other end of the second IBM fibre channel cable to one of the GBICs on the back of the second IBM Netfinity Fibre Channel Hub.

5. Connect an IBM fibre channel cable to the media adapter attached on the IBM Netfinity Fibre Channel RAID Controller Unit.  Refer to the *IBM Netfinity Fibre Channel RAID Controller Unit User's Handbook* for specific instructions when connecting the cable to the front connector.

6. Connect the other end of the IBM fibre channel cable to one of the GBICs on the back of the IBM Netfinity Fibre Channel Hub.

## Step 10:  Connect the IBM Netfinity EXP15 Drive Module Cables to the IBM Netfinity Fibre Channel RAID Controller Unit

Refer to the *IBM Netfinity Fibre Channel RAID Controller Unit User's Handbook* for detailed cabling instructions for your configuration and then proceed to Step 11.

## Step 11:  Connect the Power Cords to the APC Smart-UPS Power Supply Units

Refer to *APC Smart-UPS Uninterruptible Power Supply* for power requirements. Do not power on the servers at this time.

Connect the power cords for the IBM Console Selector Switch, IBM 8271-712 Ethernet LAN Switch, and the IBM Netfinity EXP15 Drive Module to one available APC Smart-UPS.

Connect the power cords for the IBM Netfinity Fibre Channel RAID Controller Unit and the display monitor to another available APC Smart-UPS power supply.

Connect the power cords from each server to an available APC Smart-UPS Power Supply.

**Important:** To ensure high availability between the clusters, distribute the power cords from the servers equally among the UPS units.

## Step 12: Power On the Hardware

Be sure to follow the power on sequence outlined in this section to ensure that all hardware units are recognized by the servers and other controller units.

1. Ensure that the APC Smart-UPS power supplies have charged for 2.5 hours before use. Refer to *APC Smart-UPS Uninterruptible Power Supply* for more information.

2. Power on each APC Smart-UPS power supply by pushing the test button. Refer to *APC Smart-UPS Uninterruptible Power Supply* for more information.

3. Power on the Ethernet LAN Switch, IBM Netfinity Fibre Channel Hubs, and Console Selector Switch.

4. Power on the IBM Netfinity Fibre Channel RAID Controller Unit and IBM Netfinity EXP15 Drive Modules simultaneously.

5. Power on each server, one at a time, and wait until each server is fully operational before powering on the next server.

**Important:**

a. Ensure that the IBM Netfinity Fibre Channel RAID Controller Unit and IBM Netfinity EXP15 drive modules have powered on and started successfully (wait approximately one minute after the disk appears to be idle before continuing to the next step).

b. Do not start or stop the servers (nodes) in rapid succession. Wait a minimum of 30 seconds between starting or stopping the servers (nodes) in a cluster.

# Installing the Software

This section guides you through the tasks for installing the software.

```
┌─────────────────────────────────────────────┐
│                  Step 1                       │
│         Configure the ServeRAID Adapters      │
│               (on all servers)                │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 2                       │
│  Install Microsoft Windows NT Server Enterprise Edition │
│        with Service Pack 4 (on all servers)   │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 3                       │
│  Install the device drivers and verify firmware levels for the │
│        Fibre Channel adapters (on all servers) │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 4                       │
│  Install the IBM Netfinity SYMplicity Storage Manager │
│               (on all servers)                │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 5                       │
│  Test and verify connectivity of the interconnect │
│               (on all servers)                │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 6                       │
│  Install Oracle Parallel Server (OPS) Ver. 8.0.5.n │
│               (on all servers)                │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 7                       │
│  Install the IBM Netfinity Cluster Enabler files │
│        (OSD software) Ver. 1.1 (on all servers) │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 8                       │
│  Create a 2MB extended partition on the shared storage for the │
│        Heartbeat Disk (perform only once)     │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 9                       │
│  Assign symbolic links for the IBM Netfinity Cluster Enabler │
│        Heartbeat Disk (on all servers)        │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 10                      │
│     Configure the IBM Netfinity Cluster Enabler │
│             (perform only once)               │
└─────────────────────────────────────────────┘
                      │
┌─────────────────────────────────────────────┐
│                  Step 11                      │
│  Set port numbers in Microsoft Windows NT Services file │
│               (on all servers)                │
└─────────────────────────────────────────────┘
                      │
         ╭───────────────────────────────────╮
         │              Step 12               │
         │  Your cluster is now ready for Oracle configuration │
         ╰───────────────────────────────────╯
```

# Step 1: Configure the ServeRAID-3L Adapter

**Note:** Oracle Parallel Server (OPS) requires that the operating system and the Oracle program files reside on nonshared storage on each server.

Create a RAID-Level 1 array and a logical drive in each server, using the ServeRAID configuration utility.  Refer to the *IBM Netfinity ServeRAID-3H and ServeRAID-3L Ultra2 SCSI Adapters Installation and User's Guide* that comes with the adapter for detailed installation instructions and then proceed to Step 2.

# Step 2: Install Microsoft Windows NT Server, Version 4.0, Enterprise Edition

Install Microsoft Windows NT Server, Version 4.0, Enterprise Edition with Service Pack 4 on each server.  Refer to the documentation that comes with Windows NT Version 4.0 for detailed installation instructions and then proceed to Step 3.

# Step 3: Install the IBM Netfinity Fibre Channel Adapter Device Drivers

1. Install the IBM Netfinity Fibre Channel Adapter device drivers in each server. Refer to the documentation that comes with the IBM Netfinity Fibre Channel Device Drivers for detailed installation instructions and then proceed to add the driver.

2. Click **Start** → **Settings** → **Control Panel**.

3. Click **SCSI Adapters**.

4. Click **Drivers**.

5. Add the Fibre Channel Device Drivers.

6. When Prompted, shut down and restart the server.

## Step 4: Install IBM Netfinity SYMplicity Storage Manager

IBM Netfinity SYMplicity Storage Manager configures, monitors, and controls the state of the RAID controllers and disk arrays.  It also provides RAID controller failover; therefore, it is necessary to install IBM Netfinity SYMplicity Storage Manager on each server (node).

---

**Important:**   IBM Cluster Enabler supports active/active mode for the RAID controller.  Refer to the *IBM Networked SYMplicity Storage Manager Installation and User's Handbook* for detailed information on how to set up active/active mode.

---

Install IBM Netfinity SYMplicity Storage Manager on each server (node).

## Step 5: Verify and Test Interprocess Communication Connectivity

---

**Important:**   This TCP/IP connectivity is the EtherJet to Ethernet interconnect **Not** a LAN connection.

---

Before you configure the IBM Netfinity Cluster Enabler files, you must verify and test the interconnect connectivity.  To verify and test the connectivity, ping each server by host name and verify the resolution of the IP addresses to the proper host names.

If your cluster is connected to a LAN, verify and test the network connectivity on each server.

## Step 6: Install Oracle Parallel Server (OPS)

Install the Oracle Parallel Server (OPS).  Refer to *Oracle Parallel Server Getting Started for Windows NT* Handbook for detailed installation instructions.

## Step 7: Install the IBM Netfinity Cluster Enabler (OSD Software)

You must install the IBM Netfinity Cluster Enabler Operating System Dependent (OSD) software on each server to provide low-level cluster functions for the Oracle Parallel Server.  To install the IBM Netfinity Cluster Enabler OSD, do the following:

1. Copy the IBM Netfinity Cluster Enabler (OSD) Software to each server that was downloaded from the World Wide Web in "Software Installation Requirements" on page 3.

2. Run SETUP.

    a. Click **Start** → **Run**.

    b. In the **Open** box, type the full directory path and NCES.EXE.

    c. Click **OK**.

    A Welcome screen appears.
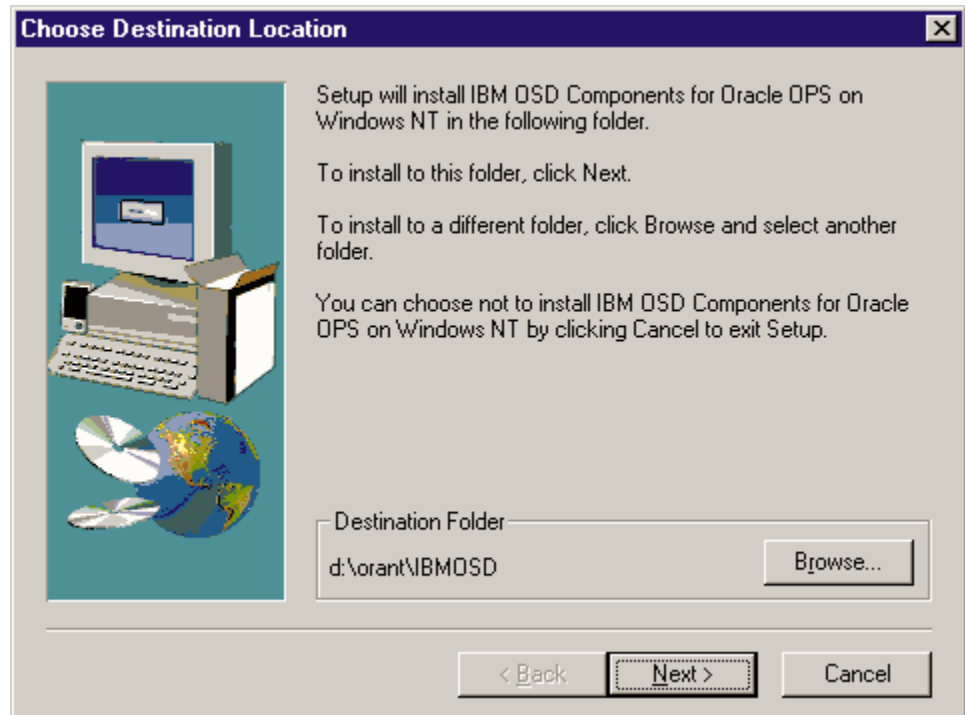
3. Click **Next**.

If you are installing the IBM Netfinity Cluster Enabler software for the first time, continue with step 4.

If you are not installing the IBM Netfinity Cluster Enabler software for the first time, continue here.

**Note:** You must stop the IBM Core Cluster Service if you have installed the IBM Netfinity Cluster Enabler software and are running its services.

    a. Click **Start** → **Settings** → **Control Panel** to stop the service.

    b. Double-click **Services**.

    c. Highlight **IBMCoreClusterService**; then, click **Stop**.

    d. Close the Services window.

4. Click **Next**.

5. Select a Destination Folder to install the IBM Netfinity Cluster Enabler software.

**Choose Destination Location** ✕

Setup will install IBM OSD Components for Oracle OPS on Windows NT in the following folder.

To install to this folder, click Next.

To install to a different folder, click Browse and select another folder.

You can choose not to install IBM OSD Components for Oracle OPS on Windows NT by clicking Cancel to exit Setup.

Destination Folder
d:\orant\IBMOSD                                    Browse...

< Back        Next >        Cancel

a. To accept the default path, click **Next**.

b. To select a different directory, click **Browse** and select the desired directory name.

**Important:** Be sure to use the same fully qualified directory path for each server.

c. Click **OK**.

d. Click **Next**.

Setup verifies all the necessary information before copying the IBM Netfinity Cluster Enabler files to the desired directory.

6. Click **Next**.

When the IBM Netfinity Cluster Enabler finishes copying the files into the desired directory, the **README.TXT** file will appear. When you close the **README.TXT**, the following screen appears.
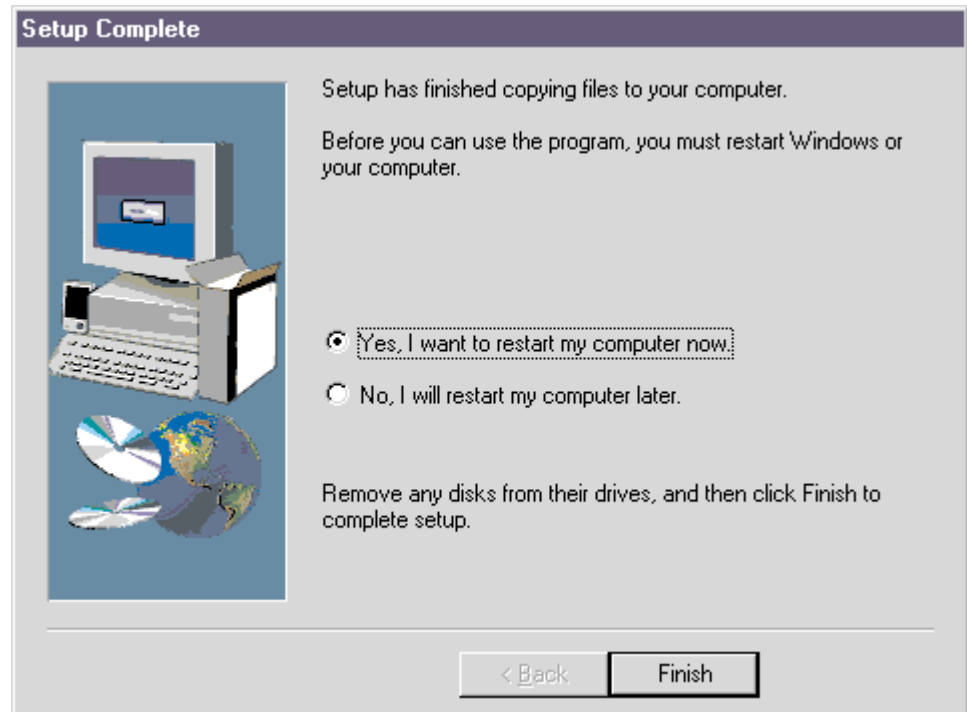


7. Select **Yes, I want to restart my computer now**.

8. Click **Finish**.

**Note:** The server must be restarted for the settings to take effect.

9. Repeat steps 2 on page 18 through step 8 and install the IBM Netfinity Cluster Enabler files on each server.

## Step 8: Create a Shared Partition for the IBM Cluster Enabler Heartbeat Disk

The IBM Netfinity Cluster Enabler software uses a special logical partition on a shared disk for communication in the event of a failure. From a disk subsystem, the information in this logical partition, referred to as the *heartbeat disk*, is used by all servers to determine the correct configuration for continued operation. Therefore, the IBM Netfinity Cluster Enabler heartbeat disk must be configured as a logical drive on a shared disk partition.

1. Shutdown all servers except one and then create your logical unit under the IBM Netfinity SYMplicity Storage Manager. Refer to the *IBM Netfinity Storage Manager User's Handbook* and *Oracle Parallel Server Getting Started* documentation for more information and then proceed to powering on the servers.

2. Power on all servers one at a time. Allow each server to fully start before powering on another server.

---

**Note:** Record the disk and partition numbers created in "Step 8: Create a Shared Partition for the IBM Cluster Enabler Heartbeat Disk" on page 21, and used by the OPS for later reference during the Oracle software installation.

---

Refer to the "Performing the Pre-Installation Tasks" section in the *Oracle Parallel Server Getting Started* documentation for detailed instructions for creating the shared disk partition and setting up symbolic links.

## Step 9: Assign Symbolic Links for the IBM Netfinity Cluster Enabler Heartbeat Disk

To assign a symbolic link for the heartbeat disk that was created in Step 8:

1. First create the ORALINK*n*.TBL file (where n is the number of nodes in the cluster).

2. Edit the ORALINK*n*.TBL file to add the following:

   OPS_CMDISK \Device\Harddisk*X*\Partition*Y*

   where:  OPS_CMDISK is the symbolic link name
   $X$     is the physical drive number
   $Y$     is the partition number of the partition
          you created for the heartbeat disk for the
          IBM Netfinity Cluster Enabler.

---

**Notes:**

a. The symbolic link name *must* be OPS_CMDISK.

b. The IBM Netfinity Cluster Enabler uses raw disk I/O routines to access the **OPS_CMDISK** drive, so the disk drive does not need to be formatted.

c. Do not run the SETLINKS utility until after you have defined symbolic links for the Oracle Parallel Server.

---

3. Run the SETLINKS utility.

4. Refer to *Oracle Parallel Server Getting Started* documentation for information about the SETLINKS utility.

## Step 10: Configure the IBM Netfinity Cluster Enabler OSD Software

**Important:**

1. IBM Netfinity Cluster Enabler OSD Software does not support fully qualified domain names (FQDN). Use **NodeA** not **NodeA.X.Y.Z**.

2. You must edit the ORALINK*n*.TBL file to add any other nodes when you have determined the architecture of your database.

3. When configuring the IBM Netfinity Cluster Enabler OSD Software, at least one

free drive letter must exist on the server (node) from which the
**IBMGSCFG.EXE** configuration utility is run.

Perform the following steps only once since the data is propagated to all servers in
the configuration.

To configure the IBM Netfinity Cluster Enabler, do the following:

1. Ensure that all servers are up and running and network connectivity has been
   verified.

2. To ensure that proper network connectivity has been established, perform the
   following:

   a. Ping each server by host name and verify the resolution of the IP
      addresses to the host names.

   b. Click **Start** → **Settings** → **Control Panel**.

   c. Click **Services** and scroll down the selection list until you see **Server** under
      the **Service** heading.

   d. Under the **Startup** heading, the category should read **Automatic**.

   e. Close the **Services** window.

3. Click **Start** → **Run**.

4. In the **Open** box, type:

   ```
   Your_Installation_Dir\BIN\IBMGSCFG.EXE
   ```

5. Click **OK**.  The IBM OSD Configuration (IBM Netfinity Cluster Enabler) window
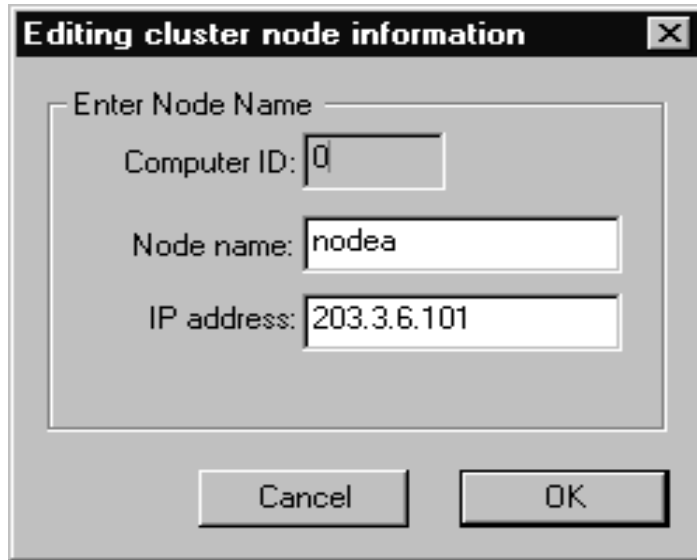   appears.
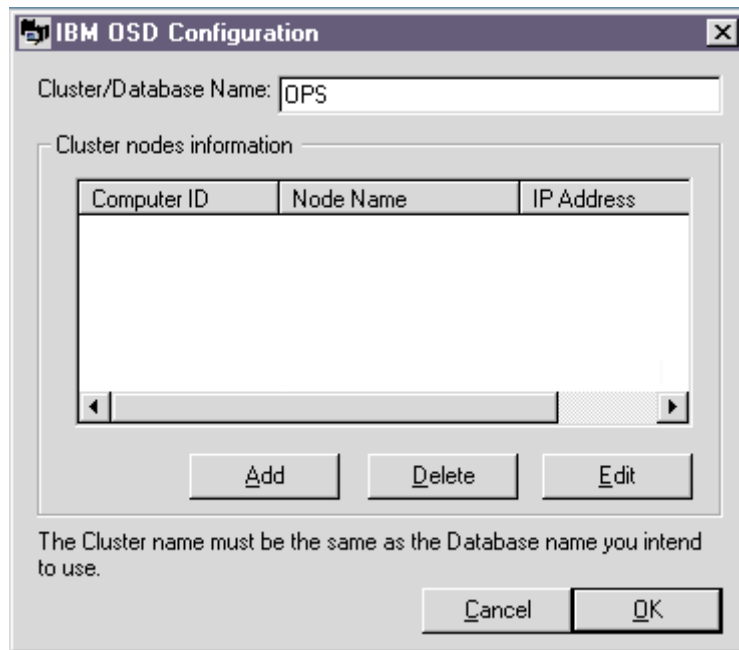


6. Type the OPS cluster or database name in the this panel. This is the name of
   the database you will use when configuring the OPS. For the Oracle Parallel
   Server, the cluster name and the database name are the same. The default

name as it appears on this panel is **OPS**. Make sure that you use the same database name when configuring the Oracle Parallel Server.

7. Click **Add**.

The Editing cluster node information screen appears.

**Editing cluster node information**

Enter Node Name

Computer ID: 0

Node name: nodea
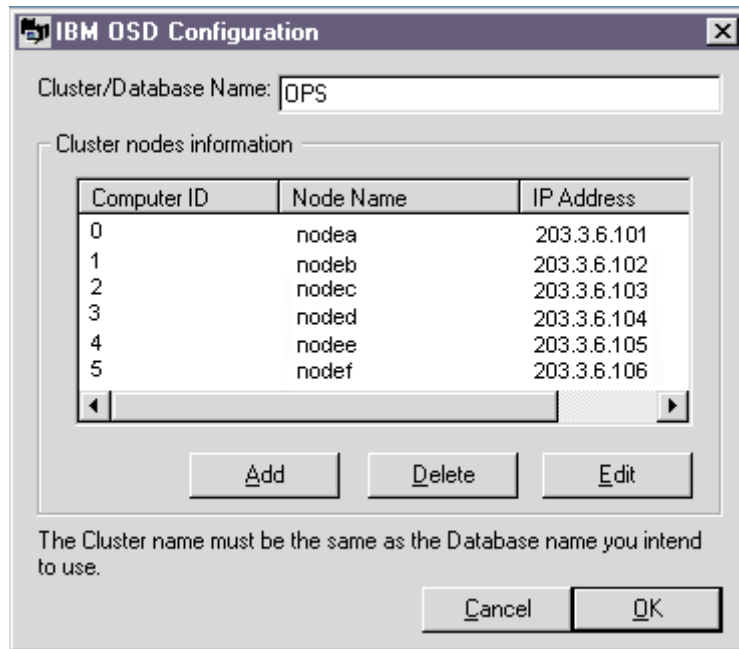
IP address: 203.3.6.101

Cancel    OK

8. Type the server (node) name and the IP address for the server you want to add to the cluster.

   **Note:** You must verify the IP address used for each server (node) for the cluster to interconnect.

9. Click **OK**.

   You are returned to the IBM OSD Configuration (IBM Netfinity Cluster Enabler) window.

**IBM OSD Configuration**

Cluster/Database Name: OPS

Cluster nodes information

| Computer ID | Node Name | IP Address |
|---|---|---|
| 0 | nodea | 203.3.6.101 |
| 1 | nodeb | 203.3.6.102 |
| 2 | nodec | 203.3.6.103 |
| 3 | noded | 203.3.6.104 |
| 4 | nodee | 203.3.6.105 |
| 5 | nodef | 203.3.6.106 |

Add    Delete    Edit

The Cluster name must be the same as the Database name you intend to use.

Cancel    OK

10. Repeat steps 7 on page 24 through 9 until all server (node) names and IP addresses are entered in the cluster.

11. Click **OK**.

> **Note:** This screen can also be used to **Edit** the nodes in the cluster list or to **Delete** items from the cluster list by clicking the list items wanted and then clicking the respective button.

The IBM Netfinity Cluster Enabler configuration program creates CSCLUSTER.CFG and CSCOMPUTER.CFG configuration files, copies these files to each server listed in the IBM OSD Configuration window, and updates the Windows NT Registry for each server. The IBM Netfinity Cluster Enabler configuration files are located in subdirectory *Your_Installation_Dir\CONFIG*.

# Step 11: Set Port Numbers in Windows NT Services File

As part of the configuration process for the IBM Netfinity Cluster Enabler software, four new services and their respective port numbers must be added to the Windows NT SERVICES file in each server. The IBM Netfinity Cluster Enabler software in each server uses these files to communicate with the software in the other servers. The port numbers are used to direct IP messages to the correct program in each server.

**Notes:**

1. Certain editors (such as Notepad) will corrupt the network SERVICES file. Use Edit that is shipped with Windows NT to change your network SERVICES file.

2. The above port numbers are examples only.

3. The protocol for **csgsr** is **udp** while the protocol for the other services is **tcp**.

Any port number that complies with the following rules can be used.

1. Each of the four services must have a different port number.

2. Each port number can be any 4-digit number that is not already used in the SERVICES list and that is not already being used by any other program.

3. The port numbers for a particular service *must* be the same on all servers (nodes) in the cluster.

To add port numbers in the SERVICES file in each server, do the following:

1. Open a command prompt window.

2. Type edit *%SYSTEMROOT%\SYSTEM32\DRIVERS\ETC\SERVICES*

3. Add the five new services and their port numbers.

```
    Services      Port#/Protocol

      cstsl          1234/tcp
      cstsr          1235/tcp
      csgsl          1236/tcp
      csqll          1237/tcp
      csgsr          1238/udp
```

4. Repeat steps 2 and 3 for each server.

The IBM Netfinity Cluster Enabler OSD software installation is now complete and Oracle Parallel Server is now ready to be configured.

# Troubleshooting IBM Netfinity Cluster Enabler Configuration

The following table lists some problems that might occur.  The first column contains a description of the problem. The second column contains a brief explanation of the problem.  The last column provides a course of action to resolve the problem.

| Problem | Explanation | Action |
|---|---|---|
| IBM Core Cluster Service error appears after the first restart. | When you first restart a server after installing the IBM Netfinity Cluster Enabler, you might get an error message indicating that the services have failed to start.  This message is not truly an error.  Once all configuration steps are complete, the services will start correctly. | Restart the IBM Core Cluster Service. |
| The command,<br><br>`Net Start OraclePGMSService`<br><br>fails with a System Error 1067, and the process is terminated. | Fully qualified domain names (FQDN) are not supported. | Rerun IBM Netfinity Cluster Enabler configuration using non-fully qualified host names. |
| IBM Core Cluster Service appears to hang while in a `started` state. | When the IBM Core Cluster Service is started from the Windows NT Services menu, a set of processes is initiated.  If any of these processes fail, a recovery action occurs that automatically restarts all the processes.  During the restart period, which could last from 2 to 3 minutes, the IBM Core Cluster Service is still in the `started` state, but some of the processes might not be fully restarted and running. | None. The server will restart the services automatically. |
| IBM Netfinity Cluster Enabler OSD files cannot be uninstalled. | If the installation of the IBM Netfinity Cluster Enabler OSD software is interrupted (for example, by a power failure) you will not be able to uninstall the files. | Delete the UNINST.ISU file located in the installation directory and reinstall the IBM Netfinity Cluster Enabler OSD software. |
| Shared drives show up first under Microsoft Disk Administrator instead of the local drives. | To implement failover capability with dual IBM Netfinity Fibre Channel RAID Controller Units for Windows NT 4.0, an IBM Netfinity Fibre Channel Class device driver must be loaded prior to loading the Windows NT SCSI Class device driver. This implementation will cause the shared disks to be assigned prior to the local disks with Windows NT Disk Administrator.  If a RAID controller fails, the class device driver is required for the shared disks to failover to the alternate RAID Controller. | If a shared disk has failed, correct the failed shared disks and recover the LUN disks before running SETLINKS, or edit the ORA*nnn*.TBL file to reflect the current disk configuration. |

| Problem | Explanation | Action |
|---|---|---|
| The command<br><br>  `Net Stop`<br>    `IBMCoreClusterService`<br><br>does not successfully complete if other Oracle services are running. | The IBM Core Cluster Service and other Oracle services are interdependent due to timing considerations. If you stop IBM Core Cluster Service while OraclePGMSService and OracleServiceOPSn are running, you will be prompted to confirm that you want to stop these other services. The Oracle services might be stopped, but the IBM Core Cluster Service might not. | When the Oracle services have stopped, issue:<br><br>  `Net Stop`<br>    `IBMCoreClusterService`<br><br>a second time.<br><br>Or perform one of the following:<br><br>Stop each service in the correct order:<br><br>1. OracleServiceOPSn<br>2. OraclePGMSService<br>3. IBMCoreClusterService<br><br>Use the Windows NT Services window to stop IBMCoreClusterService. |

# Isolating Problems

The following section is designed to help you isolate problems if they occur.  To expedite problem resolution, use the following problem determination sequence.  It can help you resolve problems and help identify to whom you should go for support.

These steps can assist you with the isolation and resolution of problems with the hardware, the IBM Cluster Enabler OSD software, and the Oracle Parallel Server OPS software.  The error you receive might be application-generated or application-related.  If you determine that an error is application-generated or application-related, contact the appropriate vendor for that application.

**Step   1.  Validating Device Drivers and Microcode**

Verify that the server (node) in the cluster is operating with the appropriate version of the controller microcode, adapter microcode, system BIOS, and device drivers.  A list of supported versions can be found at the Web site:

http://www.pc.ibm.com/support

**Step   2.  Isolating the Disk Subsystem**

The following is a list of problems related to the disk subsystem:

- Cannot recognize the RAID controllers
- Cannot recognize shared-storage disk drives from the Windows NT Disk Administrator
- Errors from IBM Netfinity SYMplicity Storage Manager
- Amber lights on hard disk drives
- SYMArray messages in the system event log of the Windows NT event log

If any of the above conditions or messages occur, do the following:

a. Use the recovery steps in the IBM Netfinity SYMplicity Storage Manager to correct the condition or message.

b. Refer to *IBM Netfinity SYMplicity Storage Manager for Windows NT Installation and User's Handbook* for further problem analysis.

c. Contact IBM support.

If none of the conditions or messages occur, continue with step 3.

**Step   3.  Isolating the IBM Netfinity Server Hardware**

IBM Netfinity Server hardware problems appear as one of the following:

- POST error messages
- Error messages in the Windows NT event log
- Trap errors before you are prompted to log on

If any of these conditions or messages occur, do the following:

a. Consult the hardware documentation for the component that appears to be failing.

b. Check the IBM online technical tips at:

http://www.pc.ibm.com/support

c. Contact IBM support.

**Note:**  Search for text relating to the component that appears to be failing.

### Step 4. Isolating Start-Up and Software Errors

Check the following items in the order shown:

a. Validate that the critical Windows NT services are running to ensure the OPS solution is functioning.

b. Close and restart Windows NT services if it is already open.

c. Validate that the following four services are present and in a started state:

> IBMCoreClusterService
> OracleTNSListener80
> OraclePGMSService
> OracleService*SID*

> (where the number digit in the *SID* is one number higher than the node number)

If any of the above services are not in a running state, then restart that service and all subsequent services in the order shown in the list above.

**Note:** Each service might take from 1 to 2 minutes to start.

d. Validate that all servers (nodes) are using the same port number assigned in "Step 11: Set Port Numbers in Windows NT Services File" on page 27.

e. Verify that the following three files are located in

> *your_installation_dir*\IBMOSD\CONFIG

If any of these files are not present, reinstall the OSD software on that specific server (node) and reconfigure the OSD software on that cluster.

> CSMETA.CFG
> CSCLUSTER.CFG
> CSCOMPUTER.CFG.

f. Verify that the environment variable CS_Install_Dir is present and its path points to the OSD directory and to the same path on each node. If this environment variable is not present, or does not show the correct path, **do not** attempt to change the environment variable; reinstall the IBM Cluster Enabler software on that node and reconfigure the IBM Cluster Enabler Software on the cluster.

g. Validate that the server (node) IDs and IP addresses are filled in and correct in the CSCLUSTER.CFG file.

h. Validate that the second line of file CSCOMPUTER.CFG identifies the ID number of the server (node) this file came from.

i. Check the Windows NT event log for hardware errors and correct any hardware errors as necessary.

j. Restart the server (node).

k. If you determine that you must reinstall or reconfigure the IBM Cluster Enabler Software, follow these steps:

> 1) Stop the above listed four services on all nodes.

> 2) Install the IBM Cluster Enabler Software on the required nodes.

> 3) Configure the IBM Cluster Enabler Software on the required nodes.

If none of the previous actions corrects the problem, do the following:

> 1) Reinstall the IBM Cluster Enabler software.

2) If the problems are ORA-xxxxx or Oracle Database errors, continue with step 5 on page 32 *Oracle Support*.

3) Continue with step 5.

**Step 5. Contacting Support**

To assist with problem resolution, have the following information ready before contacting support.

- IBM Support:

    a. Machine type, model, and serial numbers of the servers in the cluster

    b. Operating system, service pack, and IBM Cluster Enabler OSD software level

    c. BIOS, microcode, and device driver levels for the server and IBM Netfinity EXP15 Fibre Channel disk subsystem, and all adapter cards

    d. Configuration of IBM Netfinity EXP15 Fibre Channel disk subsystem

    e. Number of servers (nodes) in the cluster showing similar symptoms

    f. Oracle version and service patch level

    g. Name and version of IBM Netfinity SYMplicity Storage Manager software

    h. Model number of RAID Controller Unit and serial number on the IBM Netfinity EXP15 Fibre Channel Drive Module

- Oracle Support:

    a. Oracle customer number

    b. Operating system version number

    c. Oracle DataBase version number

    d. ORA-xxxxx error information, if any

    e. Error or log file information resulting from the problem

    **Notes:**

    1) The *Oracle Guide to Customer Support* publication included with your Oracle software will provide the most current information on customer support.

    2) Refer to the Oracle web site at:

    http://www.oracle.com/support

**Step 6. Advanced Software Problem Isolation**

This section describes steps to isolate problems where a service appears to start correctly and then aborts shortly thereafter or where a service appears to start correctly and then hangs.

- IBMCoreClusterService

    a. From the Windows NT Task Manager, click **Processes**.

    b. Double click **Image Name** to order the processes alphabetically.

    c. Click **Start** → **Settings** → **Control Panel**.

    d. Click **Services** and scroll down the selection list until you see **IBMCoreClusterService** under the **Service** heading and highlight the service.

    e. Click **Start** to start the service.

    f. After **IBMCoreClusterService** has started, a list of started processes should be under the **Task Manager Process List**.

g. If those started processes whose names begin with *CS* begin to fail and disappear from the **Task Manager Process List**, refer to 5 and then contact IBM Support.

- OraclePGMSService

  a. From the Windows NT Task Manager, click **Processes**.

  b. Double click **Image Name** to order the processes alphabetically.

  c. Click **Start** → **Settings** → **Control Panel**.

  d. Click **Services** and scroll down the selection list until you see **OraclePGMSService** under the **Service** heading and highlight the service.

  e. Click **Start** to start the service.

  f. From the **Task Manager Process List**, a process named **CMSRVR.EXE** should be listed after the **OraclePGMSService** has started.

  g. If this service is not started, ping this node by host name to ensure network connectivity and verify that this server (node) can access shared DASD.

- Reinstalling or Reconfiguring the IBM Netfinity Cluster Enabler Software

  If you must reinstall or reconfigure the IBM Netfinity Cluster Enabler Software, then you are generally required to stop the Oracle database and its associated services on all servers (nodes). If this is the first time that you are bringing up the OPS, or if you are running the OPS on a test configuration and not a production configuration, then reinstall and reconfigure the IBM Netfinity Cluster Enabler Software using the steps beginning at "Step 7: Install the IBM Netfinity Cluster Enabler (OSD Software)" on page 18 in this publication.

  If the server (node) exhibiting the problem has been successfully running in a production mode or the OPS has been successfully running elsewhere on this cluster, then you might be able to resolve the problem without shutting down the entire cluster. For this situation, refer to 5 on page 32 in this publication and then contact IBM Support.

# Getting Help, Service, and Information

If you need help, service, technical assistance, or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

For example, IBM maintains pages on the World Wide Web where you can get information about IBM products and services, find the latest technical information, and download device drivers and updates. Some of these pages are:

| | |
|---|---|
| `http://www.ibm.com` | Main IBM home page |
| `http://www.pc.ibm.com` | IBM Personal Computing |
| `http://www.pc.ibm.com/support` | IBM Personal Computing Support |
| `http://www.pc.ibm.com/us/desktop/` | IBM Commercial Desktop (U.S.) |
| `http://www.pc.ibm.com/us/intellistation/` | IBM IntelliStation (U.S.) |
| `http://www.pc.ibm.com/us/netfinity/` | IBM Netfinity and PC Servers (U.S.) |
| `http://www.pc.ibm.com/us/options/` | IBM Options (U.S.) |

Help is also available from bulletin boards and online services, as well as by fax and telephone.

Services available and telephone numbers listed are subject to change without notice.

## Solving Problems

Many computer problems can be solved without outside assistance, by using the online help or by looking in the online or printed documentation that comes with your computer or software. Also, be sure to read the information in any README files that come with your software.

Most computers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. The documentation that comes with your computer also contains information about the diagnostic tests you can perform.

# Appendix A. Supplementary Instructions for Installing a Six Node Oracle Parallel Server Configuration

The *Oracle Parallel Server Getting Started Guide* provides instructions on how to set up the first four servers (nodes) of the cluster. If you want to set up a six server (node) cluster, use the instructions in this section along with the instructions in the *Oracle Parallel Server Getting Started Guide*. These supplementary instructions are in addition to and are supplementary to the instructions in the *Oracle Parallel Server Getting Started Guide*.

The following files and additional information provide instructions on how to set up a six node Oracle Parallel Server configuration. The files are not provided by Oracle on the *Oracle8 Enterprise Edition for Windows NT* Cd. You can find the files needed to complete this task in the *Your_Installation_Dir*\CONFIG directory provided with the IBM Cluster Enabler OSD software.

Copy the following files to the ORACLE_HOME/OPS directory from the *Your_Installation_Dir*\CONFIG directory.

- Database initialization files

    INITOPS5.ORA
    INITOPS6.ORA

- SETLINKS input files

    ORALINK4.TBL
    ORALINK5.TBL

- Database creation files

    C_RBS5.SQL
    C_THR5.SQL
    C_RBS6.SQL
    C_THR6.SQL

---

## Step 1: Assign Symbolic Links to Each Logical Drive

If you are setting up a sixth node in the cluster, input files are created for SETLINKS that contain information for each node. These files are:

    ORALINK4.TBL (for fifth node)
    ORALINK5.TBL (for sixth node)

1. Ensure that you have copied the ORALINK4.TBL and ORALINK5.TBL files to the ORACLE_HOME\OPS directory. from the *Your_Installation_Dir*\CONFIG directory to all servers.

2. Edit each ORALINKn.TBL file
    (where n is one less than the number of the node).

3. Refer to the *Oracle Parallel Server Getting Started Guide* for instructions regarding updating each ORALINKn.TBL file and then proceed to run the SETLINKS application.

4. Run the ASCII input file for each ORALINKn.TBL through the SETLINKS application as shown below:

```
C:\>CD ORACLE_HOME\OPS
C:\ORACLE_HOME\OPS> SETLINKS /F:ORALINKn.TBL

(where x is one less than the number of the node)
(where F: is the drive where the ORALINKn.TBL file exists)
```

Refer to the instructions in the *Oracle Parallel Getting Started Guide* for more information and then proceed to Step 2.

## Step 2: Configure the IBM Netfinity Cluster Enabler OSD Software

Refer to "Step 10: Configure the IBM Netfinity Cluster Enabler OSD Software" on page 22 for instructions and then proceed to Step 3.

## Step 3: Create Services

Refer to the instructions in the *Oracle Parallel Server Getting Started Guide* and then proceed to Step 4.

## Step 4: Add the ORACLE_SID Entry to the Registry

Refer to the instructions in the *Oracle Parallel Server Getting Started Guide* and then proceed to Step 5.

## Step 5: Configure the Network

Refer to the instructions in the *Oracle Parallel Server Getting Started Guide* and then proceed to Step 6.

## Step 6: Create an Oracle Parallel Server Database

1. Ensure that you have copied the following files to the ORACLE_HOME\OPS directory.

   C_RBS5.SQL
   C_THR5.SQL
   C_RBS6.SQL
   C_THR6.SQL

2. To connect to the instance and run the OPSALL.SQL script to create the database, type the following:

```
C:\> CD ORACLE_HOME\OPS
C:\ORACLE_HOME\OPS>  SVRMGR30
SVRMGR> @OPSALL.SQL
```

   **Note:** If you are setting-up a 3rd, 4th, 5th, or 6th server (node) in the cluster, type the following for each node:

```
C:\> CD ORACLE_HOME\OPS
C:\ORACLE_HOME\OPS>  SVRMGR30
SURMGR> CONNECT INTERNAL/ORACLE
SVRMGR> STARTUP

SVRMGR> @C_THRn.SQL
SVRMGR> @C_RBSn.SQL
```

(where n equals the number of the node)

3. Refer to the *Oracle Parallel Getting Started Guide* and the **README.TXT** file in the *C:\IBMOSD\CONFIG* for further details to enable the cluster.

# Appendix B. Product Notices

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