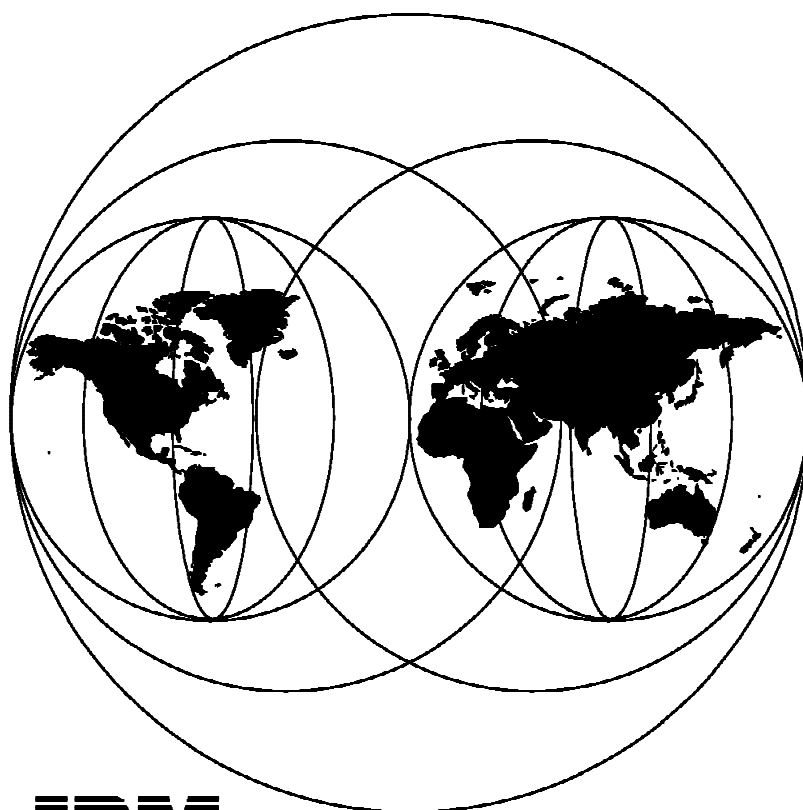


# OS/2 Warp Server Integration Guide for IBM Netfinity and IBM PC Servers

September 1997



**IBM**

**International Technical Support Organization  
Raleigh Center**





International Technical Support Organization

SG24-2125-00

**OS/2 Warp Server Integration Guide for  
IBM Netfinity and IBM PC Servers**

September 1997

**Take Note!**

Before using this information and the product it supports, be sure to read the general information in Appendix F, "Special Notices" on page 293.

**First Edition (September 1997)**

This edition applies to Version 4.0 of OS/2 Warp Server Advanced and OS/2 Warp Server Advanced SMP.

Comments may be addressed to:  
IBM Corporation, International Technical Support Organization  
Dept. HZ8 Building 678  
P.O. Box 12195  
Research Triangle Park, NC 27709-2195

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## Preface

This redbook provides a resource for implementing the OS/2 Warp Server on the IBM Netfinity and IBM PC Servers for large enterprises and small businesses. This book provides detailed instructions on how to configure your IBM hardware technology such as the SCSI-2 Fast/Wide PCI RAID and Streaming RAID Adapter, the PC ServeRAID SCSI Adapter, and the IBM SSA RAID Adapter. This redbook provides instructions for customers and businesses seeking to implement OS/2 Warp Server Advanced on OS/2 Warp Version 4.0.

OS/2 Warp Server supports clients running a variety of desktop operating systems. This redbook will help you to implement the client software and provide worry-free network connectivity, as well as identification to the network. These products include:

- OS/2 Warp 4.0 client
- IBM Networks Client for Windows 95
- IBM Networks Primary Logon Client for Windows NT
- IBM Networks Coordinated Logon Client for Windows NT
- Linux connection to OS/2 Warp Server
- IBM Neighborhood Browser Enabler

Performance monitoring is covered in detail complete with examples of IBM's NetFinity 5.0. NetFinity helps to determine the performance bottlenecks that may exist in your hardware and software configurations.

Some knowledge of PC Servers, OS/2 Warp Server Advanced, OS/2 Warp, Linux, Windows 95, and Windows NT is assumed.

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## The Team That Wrote This Redbook

This redbook was produced by a team of specialists from around the world working at the Systems Management and Networking ITSO Center, Raleigh.

**John Schult** is an Independent Network Operating System Consultant from Fort Wayne, Indiana. He has seven years of experience in the field of network operating systems and network management. He is IBM certified as both an OS/2 Warp Engineer and Warp Server Engineer. He has developed several VX-REXX applications for OS/2 LAN Server, as well as managed and administered OS/2 LAN Server networking environments. His areas of expertise include TCP/IP, REXX, OS/2, and TME 10 NetFinity.

**Rainer Kubesch** is an OS/2 Software Engineer at the Global Services, Berlin. He worked on several OS/2 service projects in the last five years. His areas of expertise in the spectrum of OS/2 include hardware, software and networking all around.

**Rufus Credle** is an Advisory Software Engineer for PC Servers at the Systems Management and Networking ITSO Center, Raleigh. He conducts residencies and writes redbooks about IBM PC Servers and network operating systems. Rufus's various positions during his IBM career included assignments in administration

and asset management, system engineering, marketing and services. He holds a BS degree in Business Management from Saint Augustine's College.

**David Watts** is an Advisory ITSO Specialist for PC Servers at the ITSO Center in Raleigh. He conducts residencies and writes redbooks on IBM PC Servers and network operating systems. He has been working with PCs for the past 14 years, most recently as a server specialist for the IBM PC Company in Australia. He has a Bachelor of Engineering degree from the University of Queensland and has worked for IBM Australia for nine years.

Thanks to the following people for their invaluable contributions to this project:

Ronnie Winick  
IBM PC Server Technology Center, Research Triangle Park.

Eric Lund  
IBM IBM Personal Software Products, Austin.

Ken Whitfield  
IBM PC Server Technology Center, Research Triangle Park.

Kathryn Casamento  
Linda Robinson  
Systems Management and Networking ITSO Center, Raleigh.

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## Comments Welcome

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## Chapter 1. Introduction

OS/2 Warp Server is one of the major network operating systems (NOS) available on the market today. OS/2 Warp Server has as its foundation the 32-bit, multitasking, multithreaded, OS/2 Warp operating system for departmental application platforms and IBM's LAN Server 5.0 NOS for its enhanced file and print services.

OS/2 Warp Server supports clients running a variety of desktop operating systems, including OS/2 Warp, DOS, Windows 3.x, Windows 95, Windows NT, AIX and Macintosh. OS/2 Warp Server also delivers protocol independence by concurrently supporting NetBIOS, TCP/IP, IPX, and 802.2.

Some of the significant enhancements to OS/2 Warp Server from LAN Server 4.0 include the following:

- Sophisticated systems management tools
- Worry-free backup and recovery
- A full set of remote connectivity facilities
- Advanced printer functionality
- Support for up to 1000 users on a single server (advanced version)
- Higher performance for file and print sharing and Lotus Notes (advanced version)
- Seamless, secure Internet access, providing high-speed connections to the Web

In this redbook, we aim to demonstrate how easily and quickly OS/2 Warp Server can be installed on the range of IBM PC Servers from the IBM PC Server 310 right up to the IBM PC Server 704.

This redbook is not designed to teach you how to use OS/2 Warp Server or OS/2 Warp; it is assumed that you are already familiar with the operating system. Rather, this book is designed to aid you in installing and tuning OS/2 Warp Server on your new IBM PC Server. We have tested the installations on a variety of current and recent servers and adapters so as to provide as much insight as possible into using the hardware that you, are likely to have.

---

### 1.1 What's Ahead for OS/2 Warp Server

Since the release of OS/2 Warp Server, significant enhancements have been made to both OS/2 Warp Server and OS/2 Warp. In the past, these enhancements have been made available to you via Corrective Service Diskettes (CSDs), or by Fix Packs. To provide you with the enhancements that you need, when you need them, IBM has launched Software Choice.

IBM Software Choice is available via the World Wide Web (WWW). With Software Choice, you can now get early, immediate access to new features and updates to OS/2 Warp Server in advance of regular product updates. These new features and updates, with a focus on network computing, are made available over the Internet and on periodic update CDs.

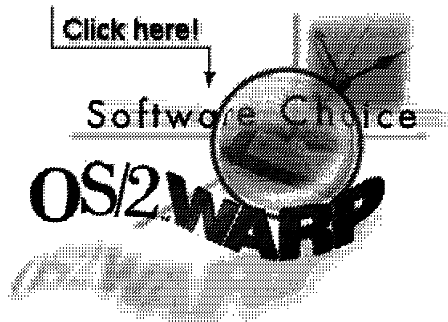


Figure 1. The Software Choice Web Site

Features and updates available today include:

- Java 1.0.2 for OS/2
- Netscape Navigator 2.02 for OS/2
- Netscape Navigator for OS/2 Plug-in Pack
- Neighborhood Browser Enabler for OS/2 OS/2 Warp Server
- Networks Client for Windows 95
- Networks Coordinated Logon Client for Windows NT
- Networks Primary Logon Client for Windows NT
- Enhanced Remote Access Connection Server for OS/2 Warp Server (PPP support)

To assist you in planning, IBM informs you of additional features and updates planned to be made available in the coming months. They include:

- Java Development Kit 1.1 for OS/2
- TCP/IP enhancements
- IBM Network Station support
- Lightweight Directory Access Protocol (LDAP) support

**World Wide Web**

More information and access to IBM Software Choice can be found at URL:

<http://www.software.ibm.com/os/warp/swchoice/>

---

## 1.2 IBM PC Server and OS/2 Warp Server Integration Guide

This redbook helps you to install OS/2 Warp Server on your IBM PC Server and provides assistance with the monitoring of its performance in your production environment and tune it to maximize the potential of your IT investment.

The following chapter discusses the configuration of the hardware itself, through the use of SCSI and RAID utilities, CMOS and EISA configuration, and references partition maintenance.

Chapter 3 through Chapter 6 describe and step through the following procedures:

- OS/2 Warp Server Installation using Warp 4.0 Base
- OS/2 Warp Server SMP Installation
- OS/2 Warp Server Client Installations

Finally, performance tuning and IBM NetFinity 5.0 are discussed. We describe how to use the OS/2 Warp Server Tuning Assistant and IBM NetFinity to monitor and tune the performance of your IBM PC Server.





---

## Chapter 2. Hardware Configuration

This chapter focuses on the setup and configuration of your IBM PC Server hardware. The most common tasks are presented here. For more information about these tasks, please see the user guides that came with your system.

The different technologies used to implement the PC Server family require different methods for configuration. Unfortunately, there is no one common configuration program that is run on a machine to completely configure it. In most cases, multiple programs will need to run in order to complete this process.

This chapter gives instructions on using the various configuration programs and when to use each one. There are some model dependencies, however. If you see differences between what you see on your machine and what is documented here, consult the user guides that comes with the system.

The configuration programs and a brief explanation of each are listed below:

- BIOS setup  
This program is used to configure system options on PCI/EISA/ISA machines. The system options include such things as diskette and hard disk options, video subsystem, and system memory.
- EISA configuration utility  
This utility is used to configure I/O adapters on machines with an EISA bus.
- SCSISelect utility  
This utility allows you to configure the SCSI subsystem on PCI/EISA/ISA machines. RAID subsystems are usually handled separately.
- System partition programs  
These programs allow you to configure system options, I/O adapters, and the SCSI subsystem on Micro Channel machines. They are either on the reference partition of the server's hard disk, or on a reference diskette, or a combination of both.
- RAID utility  
This utility allows you to configure the RAID subsystem on machines equipped with a RAID adapter.

These configuration programs are updated from time to time. The latest versions are found on IBM PC Company's Web site. Refer to Appendix C, "Sources of Drivers and Information" on page 259 for more information.

---

### 2.1 The BIOS Setup Program

The setup program is used to configure system options on ISA and EISA machines. The system options include such things as diskette and hard disk options, video subsystem, and system memory. These parameters are controlled by system BIOS and, hence, need to be modified before the operating system boots.

For this redbook, we have used the PC Server 330 for the screen shots and descriptions. The BIOS in this machine is indicative of the current range of PC servers from IBM.

To access the setup program:

1. Turn on the server and watch the screen for the blue IBM logo to appear.
2. When prompted, press the F1 key.
3. Follow the instructions on the panel to view or change the configuration as described below.
4. To exit the setup program, select **Exit Setup** from the main menu.

When you successfully enter the BIOS setup program, the main menu appears, shown in Figure 2 for the PC Server 330:

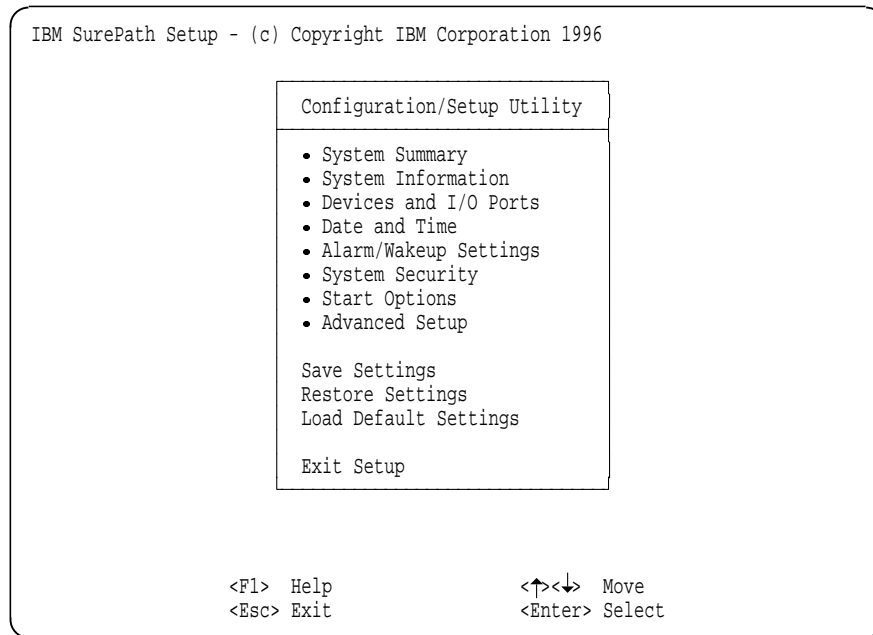


Figure 2. BIOS Setup Program - Main Menu (PC Server 330)

Each menu option is described below.

## 2.1.1 System Summary

Selecting this option shows you a read-only summary of your server. Some of these line items are changeable using other main menu options.

System Summary	
Processor	Pentium Pro (sA1)
Processor Speed	200 Mhz
Math Coprocessor	Internal
System Memory	640 KB
Extended Memory	31 MB
Cache Size	256 KB
Shadow RAM	384 KB
System ROM	E0000h - FFFFh
PCI Data Parity	NMI [Enabled]
Diskette Drive A:	[1.44 MB 3.5"]
Diskette Drive B:	[Not installed]
Mouse	[Installed]

## 2.1.2 System Information

This choice also shows read-only summaries of your server, divided into two sections:

- Product Data
- PCI Routing

Selecting **Product Data** shows you the following information (as per our test Server 330):

Product Data	
Machine Type/Model	8640ESS
Flash EEPROM Revision Level	RAET27AUS
System Board Identifier	J113965H38X
System Serial Number	23LG592
BIOS Date	11/18/96

On our test server, we see it is a Server 330 (machine type/model 8640-ESS) with a serial number 23LG592, and a BIOS level RAET27AUS dated 11/18/96. This information is required by IBM Service if you need to place a service call on your machine. The machine type/model and serial number should match the numbers printed on the bottom of the front of your server.

Selecting **PCI Routing** shows you the following information.

PCI Routing	
Planar SCSI INT_A	is Routed to IRQ11
Planar Ethernet INT_A	is Routed to IRQ10
PCI Slot 1 INT_A	is not Routed
PCI Slot 1 INT_B	is not Routed
PCI Slot 1 INT_C	is not Routed
PCI Slot 1 INT_D	is not Routed
PCI Slot 2 INT_A	is not Routed
PCI Slot 2 INT_B	is not Routed
PCI Slot 2 INT_C	is not Routed
PCI Slot 2 INT_D	is not Routed
PCI Slot 3 INT_A	is not Routed
PCI Slot 3 INT_B	is not Routed
PCI Slot 3 INT_C	is not Routed
PCI Slot 3 INT_D	is not Routed
PCI Slot 4 INT_A	is not Routed
PCI Slot 4 INT_B	is not Routed
PCI Slot 4 INT_C	is not Routed

This window indicates the IRQs to which the PCI interrupts are routed to. It is a scrollable window.

## 2.1.3 Devices and I/O Ports

This option from the main menu gives you the ability to change the details of your ports and diskette drives.

Devices and I/O Ports	
Serial Port A Address	[3F8h-IRQ 4]
Serial Port B Address	[2F8h-IRQ 3]
Infrared	[Disabled]
Infrared DMA	[Disabled]
Parallel Port	[3BCh-IRQ 7]
Parallel Port Mode	[Standard]
Parallel Port Extended Mode	[ ]
Mouse	[Installed ]
Diskette Drive A:	[1.44 MB 3.5" ]
Diskette Drive B:	[Not installed]

You can specify the I/O address and IRQ for the two COM ports on your server, the I/O address of the infrared port (if your PC Server has one, such as the Server 330) and the address and type of parallel port (standard, bidirectional, EPP/ECP).

## 2.1.4 Alarm/Wakeup Settings

With this option, you can configure your server to automatically start at a set time up to one month in advance.

Alarm/Wakeup Settings	
Warning:	
If you enable a choice on this menu and save the settings, the server will be halted and must be powered off. The Wakeup choices are disabled when the server is restarted.	
Wakeup Timer	[Disabled ]
Wakeup Date	[10]
Wakeup Time	[00:00:00]
Wakeup on Ring	[Disabled]

**Note:** This setting is to start the server one time only. You cannot use it to start multiple times. Once you set this option, you must power off the server. If you manually power the server back on, the wakeup options will be disabled, and you will need to reset them.

## 2.1.5 System Security

From here, you can specify a power-on password (POP) and an administrator password.

Selecting **Power-on Password** lets you set, change or delete the POP. You can also specify if a prompt for the POP (if it is set) will appear at boot time.

If the POP is set and you specify On for Password Prompt, the server will not boot until you enter the password. If you specify Off, the system will boot with the keyboard locked and user input will be ignored until the POP is entered.

Power-on Password	
Enter your new power-on password twice.	
Enter Power-on Password	[       ]
Enter Power-on Password Again	[       ]
Set or Change Power-on Password	
Delete Power-on Password	
Password Prompt	[On ]

The administrator password, if set, restricts access to the BIOS setup program to authorized users only.

Administrator Password	
Enter your new administrator password twice.	
Enter Administrator Password	[       ]
Enter Administrator Password Again	[       ]
Set or Change Administrator Password	
Delete Administrator Password	
Power-on password changeable by user	[No ]

## 2.1.6 Start Options

Selecting this option shows the following window:

Start Options	
Keyboard NumLock State	[Off]
Keyboard Speed	[Fast ]
Keyboardless Operation Mode	[Disabled]
First Startup Device	[Diskette Drive 0]
Second Startup Device	[Hard Disk 0 ]
Third Startup Device	[Disabled ]
Fourth Startup Device	[Disabled ]
Power On Self Test	[Quick ]
Virus Detection	[Disabled]

You can specify the state of NumLock at boot time, and the repeat rate of the keyboard. You can also specify whether the server can be started with or without a keyboard.

This window also lets you specify the order in which devices in your system are checked for bootable media. You can specify diskette drives, hard drives or the network adapter (some systems also allow the CD-ROM to be bootable).

You can also specify if built-in virus detection is enabled at boot time, and if you want Quick or Enhanced POST.

## 2.1.7 Advanced Setup

Selecting **Advanced Setup** menu choice shows you this window:

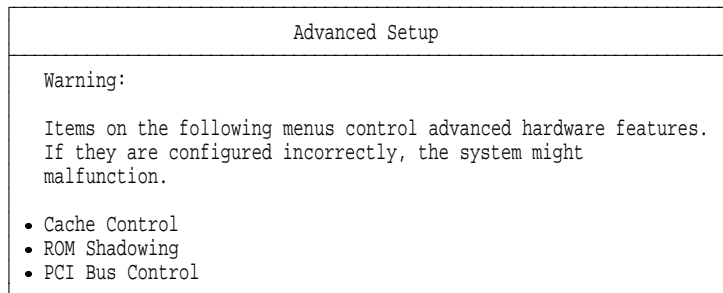
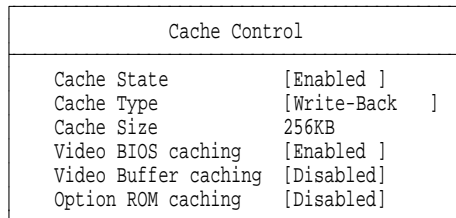


Figure 3. BIOS Advanced Setup

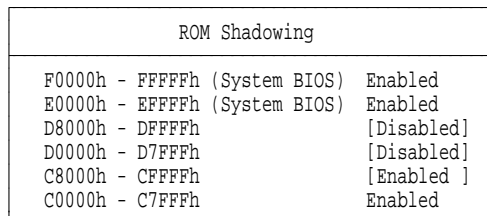
Selecting **Cache Control** gives you the following window:



Here, you can enable or disable the L2 cache, specify whether the cache is write-back or write-through, and view the amount of cache that is installed in your server.

You can also specify if Video BIOS (C0000h - C7000h) and Video Buffer (B0000h - BFFFFh) are cached into main memory. You can also enable whether or not you can cache (shadow) ROM areas. If you enable this, you can specify which components of ROM you wish to shadow in ROM Shadowing on the Advanced Setup menu (Figure 3). Doing so enhances system performance.

The ROM Shadowing option gives you the following choices:



Here, you can specify which components of ROM you wish to cache in main memory.

**Note:** If the address range is used for an adapter card buffer, do not enable shadowing.

Selecting **PCI Bus Control** shows you the following panel.

PCI Bus Control	
PCI Data Parity NMI	[Enabled ]
CPU-PCI Write Buffers	[Disabled]
SCSI ROM Address	[C8000 ]
PCI Primary Bus MLT	[30h]
PCI Secondary Bus MLT	[90h]
• PCI Interrupt Requests	

PCI Data Parity NMI enables the generation of a non-maskable interrupt when a PCI data parity error occurs. CPU-PCI Write Buffers enables the CPU to PCI write posting. SCSI ROM Address lets you specify the I/O address of the server's imbedded SCSI controller. The PCI Master Latency Timer values can be set for both the primary and secondary buses.

## 2.1.8 BIOS Updates

The BIOS of PCI/EISA servers are located in a flash ROM on the motherboard. If necessary, it can be updated with a new version that can be obtained from the Web.

For more information on how to obtain BIOS updates, please refer to Appendix C, "Sources of Drivers and Information" on page 259.

---

## 2.2 EISA Configuration Utility

This utility is used when you add or remove an ISA or EISA adapter. We use an example to illustrate the process. In our example, we add an Auto Token-Ring 16/4 ISA adapter in slot 3 of a PC Server 320. The steps to complete the process are as follows:

1. Boot with the EISA configuration utility diskette.
2. Answer Y to the following question:

Do you want to configure your system now [Y,N]?

3. The welcome panel will appear. Press Enter to continue. A panel similar to the one in Figure 4 on page 12 will then appear.

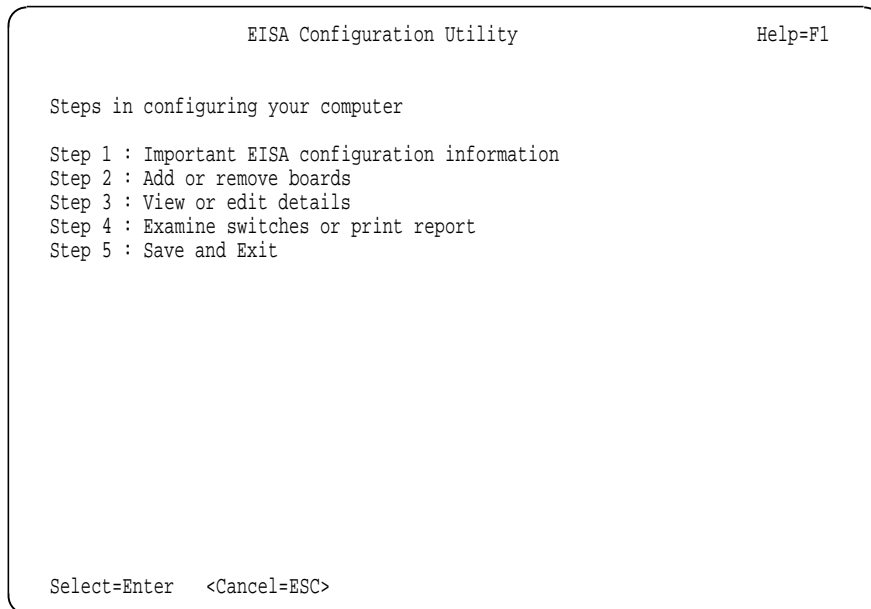


Figure 4. EISA Configuration Utility - Steps

If you are not familiar with the ISA and EISA cards, you can read the information in step 1; otherwise, you can skip to step 2.

A panel similar to the one in Figure 5 will appear.

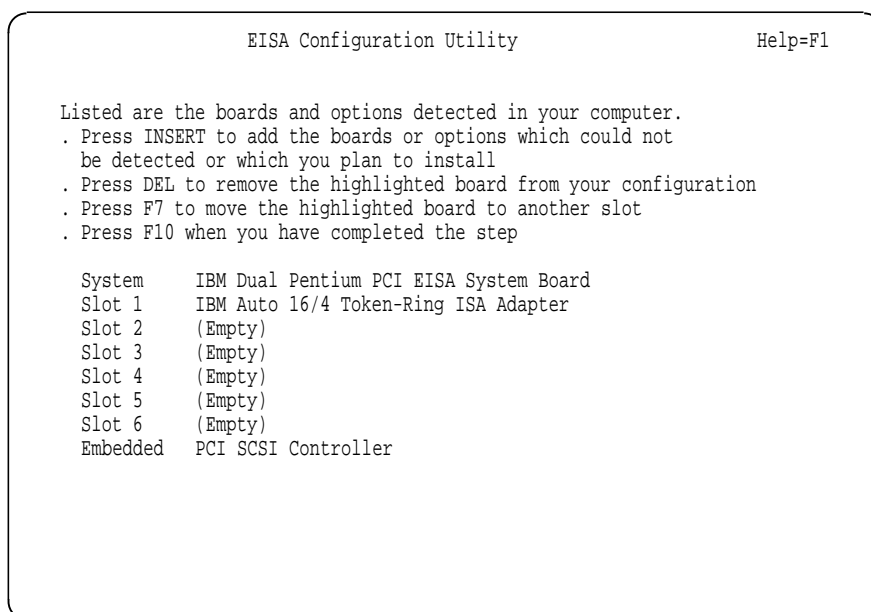


Figure 5. EISA Configuration Utility - Adding or Removing Boards



### EISA Configuration Diskettes

EISA adapters are shipped with a diskette that contains a configuration file (a .CFG file) that the EISA configuration utility needs so that it knows what parameters are available for the adapter. This .CFG file should be copied to the EISA configuration diskette. If the file has been copied to the diskette, the EISA adapter is added automatically.

If you have not copied the .CFG file, you will be prompted to insert the adapter's configuration diskette into the diskette drive during this process and the .CFG file will be copied to your diskette.

Our token-ring adapter is recognized but not in the correct slot. This is because it is not possible for EISA systems to determine what slot ISA adapters are in. So we must tell the system what slot it is in by *moving* the adapter to the correct slot.

4. To move the ISA adapter to the correct slot:
  - a. With the arrow key, select the desired adapter.
  - b. Press F7. A Move Confirmation panel appears:

```
----- Move Confirmation -----
Board Name:   IBM Auto 16/4 Token-Ring ISA Adapter
OK=ENTER    <Cancel=ESC>
```

- c. Select **OK**.
  - d. With the arrow key, select the destination slot and press Enter.
  - e. Press F10 to return to the EISA Configuration menu.

5. View or edit details.

After adding EISA or ISA adapters, you will often need to view and edit the settings for the adapter. To view or edit an adapter's details:

- a. From the main menu, select **Step 3: View or edit details** with the arrow key.
- b. Press Enter to view configuration details. You will see a panel similar to that shown in Figure 6.

```
----- Step 3: View or edit details -----
Press Enter to edit the functions of the highlighted item.
Press F6 to edit its resources (IRQs, DMAs, I/O ports, or memory).
Press F10 when you have finished this step.

System - IBM Dual Pentium PCI-EISA System Board
SYSTEM BOARD MEMORY
System Base Memory..... 640K Base Memory
Total System Memory..... 16MB Total Memory
Memory Gap between 15-16Megs..... Memory Gap Enabled

System Board I/O Resource allocation
Serial Port A..... COM1 or COM3 - Enabled
Serial Port B..... COM2 or COM4 - Enabled
Parallel Port..... Parallel Port LPT1 - Enabled
Floppy Controller..... Floppy Controller - Enabled
ISA IDE Controller..... Secondary IDE IRQ 15 - Enabled
Reserved System Resources..... Reserved System Resources
```

Figure 6. EISA Configuration Utility - View/Edit Details

Use the Edit Resources option to change interrupt request levels, I/O addresses and other parameters whose settings may need to be changed to avoid conflicts with other devices.

**Note**

Sometimes changing a setting during this step requires you to change a switch or jumper setting on the system board or on an adapter.

When finished, press F10 to exit and return to the EISA Configuration menu.

6. Examine switches or print report.

You can use this option to display the correct switch and jumper settings for the installed devices that have switches and jumpers. You can also choose to print a system configuration report. To do this:

- a. Use the arrow key to select **Step 4** and press Enter.
- b. Select the board(s) marked with an arrow and press Enter.
- c. The necessary switch/jumpers settings are displayed in a panel similar to the one shown in Figure 7.

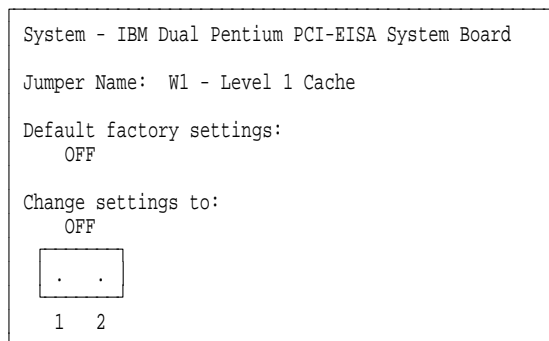


Figure 7. EISA Configuration Utility - Jumper Settings

- d. Press F7 if you want to print configuration settings. You can print:
  - Settings for selected board or option
  - Settings for selected board or option to a file
  - All configuration settings
  - All configuration settings to a file
- e. When finished, press F10 to return to the Configuration menu.

7. Select **Step 5** and press Enter to save your configuration.

---

## 2.3 SCSISelect Utility Program

This utility is used on PCI/EISA models of the IBM PC Server line and lets you configure the non-RAID SCSI controller. For instructions on how to configure the RAID controller see 2.4, "RAID Adapter Utilities" on page 19.

Specifically, SCSISelect allows you to do the following:

- View and modify parameters for the SCSI controller
- View and modify parameters of SCSI devices
- Perform low-level formatting of attached SCSI hard disks

To access the SCSISelect Utility Program, do the following:

1. Turn on the server and watch the screen.
2. When the message Press <Ctrl><A> appears, press Ctrl and A simultaneously.

A panel similar to the one in Figure 8 will appear.

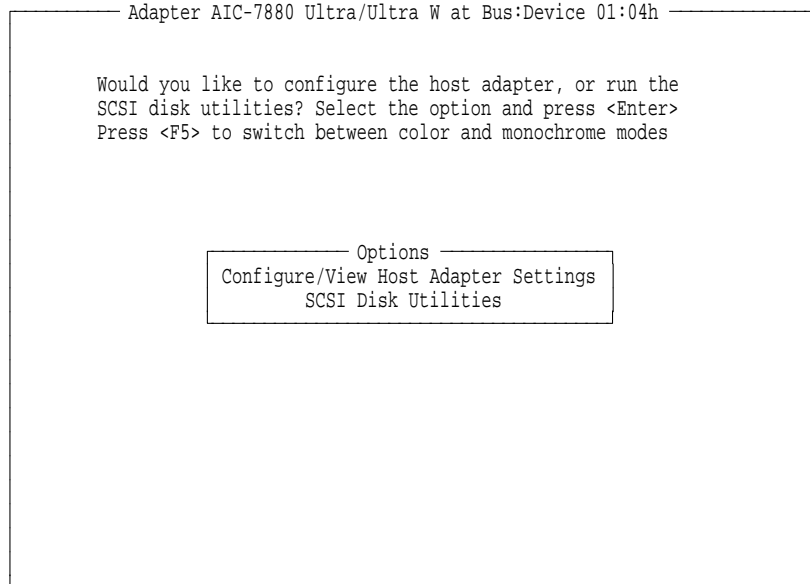


Figure 8. IBM PC Server SCSISelect Utility Program - Main Menu

Press Enter to go to the Configure/View Host Adapter Settings option.

A panel similar to the one in Figure 9 will appear.

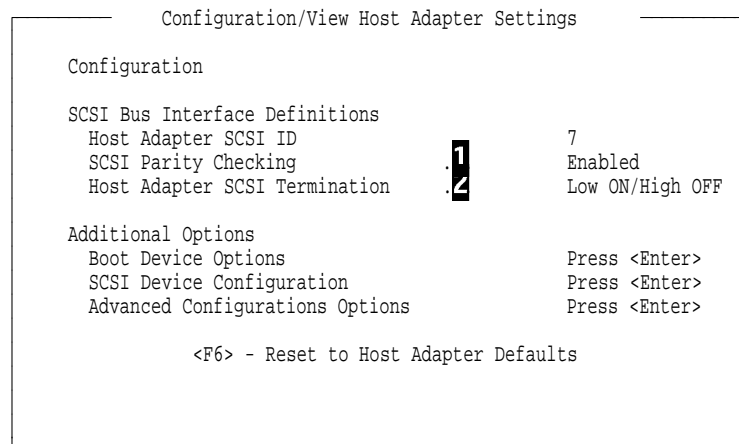


Figure 9. IBM PC Server SCSISelect Utility Program - Host Adapter Settings

The fields on this panel are described as follows:

**.1.** SCSI Parity Checking

Select this option to enable or disable SCSI Parity Checking on the host adapter. If enabled, the host adapter will check parity when reading from the SCSI bus to verify the correct transmission of data from your SCSI devices. SCSI Parity Checking should be disabled if any attached SCSI device does not support SCSI parity. Most currently available SCSI devices support SCSI parity.

## 2. Host Adapter SCSI Termination

All SCSI interfaces use daisy-chained cabling. The cable starts at the adapter and goes to the first device, and then out of that device to the next device and so on until it reaches the last device in the chain. The last device has an incoming cable and a *terminator*. The terminators are used to absorb potential signal reflections on the SCSI bus that would cause interference. The last device on the bus must always be terminated.

The SCSI-2 Fast/Wide PCI adapter that came with the PCI/EISA server has three connectors that are the starting points for a daisy-chained cable: one 8-bit, 50-pin (SCSI-I) internal connector, one 16-bit, 68-pin (SCSI-II Wide) internal cable connector, plus another 16-bit, 68-pin external connector. The adapter has built-in terminators on these connectors.

The setting for the Host Adapter SCSI termination needs to be configured depending on which connectors are used. This option is comprised of two entries, a low and a high. You can think of them as software jumpers. Each entry, low and high, can take on either an on or off value, thereby giving four possible different combinations of the two entries. The chart below shows the proper values of these entries depending upon which connectors have been used.

### Note

Only two of the three connectors are used, either the two internal or one internal and one external.

Table 1. Host Adapter SCSI Termination Parameter

16-bit (68-pin) internal connector	8-bit (50-pin) internal connector	16-bit (68-pin) external connector	Low value	High value
Yes			On	On
		Yes	On	On
	Yes		On	On
Yes		Yes	Off	Off
Yes	Yes		Off	On
	Yes	Yes	Off	On

After configuring the host adapter, you need to configure the SCSI devices. To do this, from the panel shown in Figure 9 on page 15 use the arrow keys to select **SCSI Device Configuration** and press Enter.

A panel similar to the one in Figure 10 on page 17 will appear.

SCSI Device Configuration									
SCSI Device ID	#0	#1	#2	#3	#4	#5	#6	#7	
Initiate Sync Negotiation	. 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Max Sync Transfer Rate	. 2	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Enable disconnection	. 3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Initiate Wide negotiation	. 4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Options listed below have NO EFFECT if the BIOS is disabled									
Send start unit command	. 5	No	No	No	No	No	No	No	No
Include in BIOS Scan	. 6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SCSI Device ID	#8	#9	#10	#11	#12	#13	#14	#15	
Initiate Sync Negotiation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Max Sync Transfer Rate	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Enable disconnection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Initiate Wide negotiation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Options listed below have NO EFFECT if the BIOS is disabled									
Send start unit command	No	No	No	No	No	No	No	No	No
Include in BIOS Scan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Figure 10. PC Server 320 SCSISelect Utility Program - SCSI Device Configuration

To modify settings on this panel:

1. Use the arrow keys to select the parameter to modify.
2. Press Enter to edit the value.
3. Use the arrow keys to select the new value or press Esc to quit.
4. Press Enter to validate the new value.

The fields in this panel are described below:

**.1.** Initiate Sync Negotiation

The host adapter always responds to synchronous negotiation if the SCSI device initiates it. However, when this field is set to Yes, the host adapter will initiate synchronous negotiation with the SCSI device.

Some older SCSI-1 devices do not support synchronous negotiation. Set Initiate Sync Negotiation for these devices to avoid malfunction.

**.2.** Maximum Sync Transfer Rate

The default value is 10.0 MBps for SCSI-II Fast devices. If you are using SCSI-II Fast/Wide devices, the effective maximum transfer rate is 20.0 MBps.

Older SCSI-1 devices do not support fast data transfer rates. If the transfer rate is set too high, this may cause your server to operate erratically or even hang. Select 5.0 Mbps for any SCSI-I devices.

**.3.** Enable Disconnection

This option determines whether the host adapter allows an SCSI device to disconnect from the SCSI bus (also known as the Disconnect/Reconnect function).

You should leave the option set to Yes if two or more SCSI devices are connected to optimize bus performance. If only one SCSI device is connected, set Enable Disconnection to No to achieve better performance.

**.4.** Send Start Unit Command

Enabling this option reduces the load on your server's power supply by allowing the SCSI devices to power up one at a time when you boot the server. Otherwise, the devices all power up at the same time.

The SCSI-2 Fast and Wide Adapters issue the start unit command to each drive one at a time. The SCSI-2 Fast/Wide Streaming RAID adapter issues the start unit command to two drives at a time.

**Note**

In order to take advantage of this option, verify that the autostart jumpers have been removed on hard drives. Otherwise, the drives will spin up twice: once at Power on Reset (POR) time and again when the adapter sends the start unit command.

**5. Include in BIOS SCAN**

This option determines whether the host adapter BIOS supports devices attached to the SCSI bus without the need for device driver software. When set to Yes, the host adapter BIOS controls the SCSI device. When set to No, the host adapter BIOS does not search the SCSI ID.

**Notes:**

1. The Send start unit and Include in BIOS Scan options have no effect if BIOS is disabled in the Advanced Configuration Options panel (see Figure 11).
2. Disabling the host adapter BIOS frees up 8-10 KB memory address space and can shorten boot-up time, but you should only disable this option if the peripherals on the SCSI bus are all controlled by device drivers and do not need the BIOS (for example, a CD-ROM).

After completing the device configuration, there are a few more parameters that need to be configured. To do this:

1. Press ESC to quit the SCSI Device Configuration menu.
2. Use the arrow keys to select the **Advanced Configuration Options** menu.
3. Press Enter.

A panel similar to the one in Figure 11 will appear.

Advanced Configuration Options	
Reset SCSI Bus at IC Initialization	Enabled
Options listed below have NO EFFECT if the BIOS is disabled	
Host Adapter BIOS (configuration utility reserves BIOS space)	Enabled
Support Removable disks under BIOS as Fixed Disks	Boot only
Extended BIOS translation for DOS drives > 1 GByte	Enabled
Display <Ctrl-A> message during BIOS initialization	Enabled
Multiple LUN support	Disabled
BIOS support for bootable CD-ROM	Enabled
BIOS support for Int13 Extensions	Enabled
Support for Ultra SCSI speed	Enabled

Figure 11. PC Server 320 SCSISelect Utility Program - Advanced Configuration

To modify the settings on this panel:

1. Use the arrow keys to select the parameter to modify.
2. Press Enter to edit the parameter.
3. Use the arrow keys to select the new value or press Esc to quit.
4. Press Enter to validate the new value.

When you have finished:

1. Press Esc to quit the SCSI Advanced Configuration options menu.
2. Press Esc to quit the Configuration menu.
3. Use the arrow keys to select the **SCSI Disk Utilities**.
4. Press Enter.

A panel similar to the one in Figure 12 will appear.

```
----- Select SCSI ID Disk and Press <Enter> -----  
SCSI ID #0 : IBM      DPES-31080  
SCSI ID #1 : No device  
SCSI ID #2 : No device  
SCSI ID #3 : IBM      CDRM 00203  
SCSI ID #4 : No device  
SCSI ID #5 : No device  
SCSI ID #6 : No device  
SCSI ID #7 : AHA-2940/AHA-2940W  
SCSI ID #8 : No device  
SCSI ID #9 : No device  
SCSI ID #10 : No device  
SCSI ID #11 : No device  
SCSI ID #12 : No device  
SCSI ID #13 : No device  
SCSI ID #14 : No device  
SCSI ID #15 : No device
```

Figure 12. PC Server 320 SCSISelect Utility Program - DASD Information

This panel shows the devices that are attached to the adapter and their SCSI IDs. It will also allow you to perform a low-level format of the disk or to scan it for media defects if desired. To do this use the arrow keys to select the DASD to format and follow the directions on the panel.

When you have finished: press Esc to quit the SCSI disk utility and select **Yes** to confirm.

You have now completed the SCSI subsystem configuration. Do not forget to save changes before you exit.

---

## 2.4 RAID Adapter Utilities

On PC servers with SCSI RAID and IBM SSA RAID adapters, the RAID utility is used to configure the attached SCSI and SSA devices. This section describes three of the utilities used on IBM PC Servers:

1. The utility for the IBM SCSI-2 Fast/Wide Streaming RAID Adapter/A and the IBM SCSI-2 Fast/Wide PCI RAID adapters (see 2.4.1, “SCSI-2 F/W PCI RAID and Streaming RAID Adapter” on page 20).
2. The utility for the PC ServeRAID SCSI Adapter (refer to 2.4.2, “PC ServeRAID SCSI Adapter” on page 33).

3. The utility for the IBM SSA RAID Adapter (see 2.4.3, “IBM SSA RAID Adapter” on page 43).

## 2.4.1 SCSI-2 F/W PCI RAID and Streaming RAID Adapter

This utility comes on a bootable diskette that is shipped with every RAID server. Also, it is rebuilt if necessary with the Diskette Factory option from the ServerGuide.

The IBM RAID utility allows you to configure disk arrays as well as view the status of the arrays already defined. It provides a graphical display of the defined arrays and provides diagnostic information to assist you if a hard disk within the array malfunctions.

The common configuration tasks that are described here are as follows:

1. Verifying the configuration
2. Low-level format of the disks
3. Defining a hot-spare drive
4. Creating a disk array
5. Defining logical drives
6. Looking at the drives information
7. Backing up/restoring the configuration

After booting with the RAID Controller program diskette, if more than one RAID adapter is installed, it will prompt you to select the adapter you want to work with (see Figure 13). Otherwise, a panel similar to the one in Figure 14 on page 21 will appear.

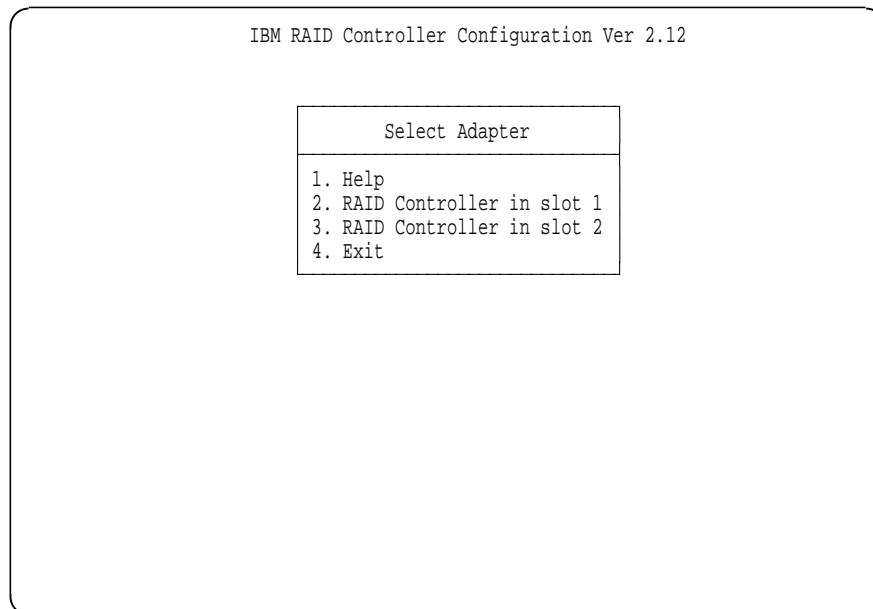


Figure 13. RAID Configuration Program - Adapter Selection

Use the arrow keys to select the adapter you want to configure and press Enter.

A panel similar to the one in Figure 14 on page 21 will appear.



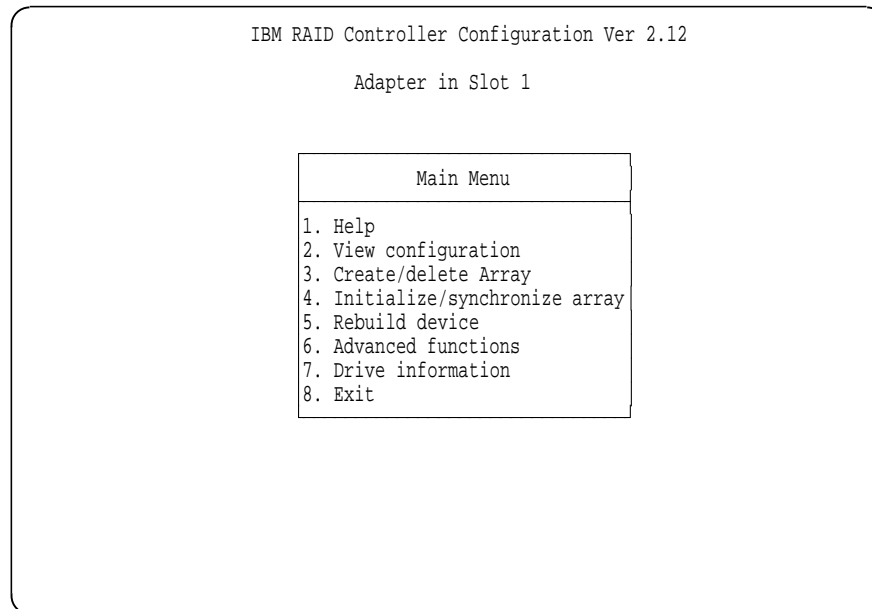


Figure 14. RAID Configuration Program - Main Menu

### 2.4.1.1 Drive Information

During this first step, we verify that all the installed units are recognized and available for future use.

Select **Drive Information** on the main menu.

The following panel appears:

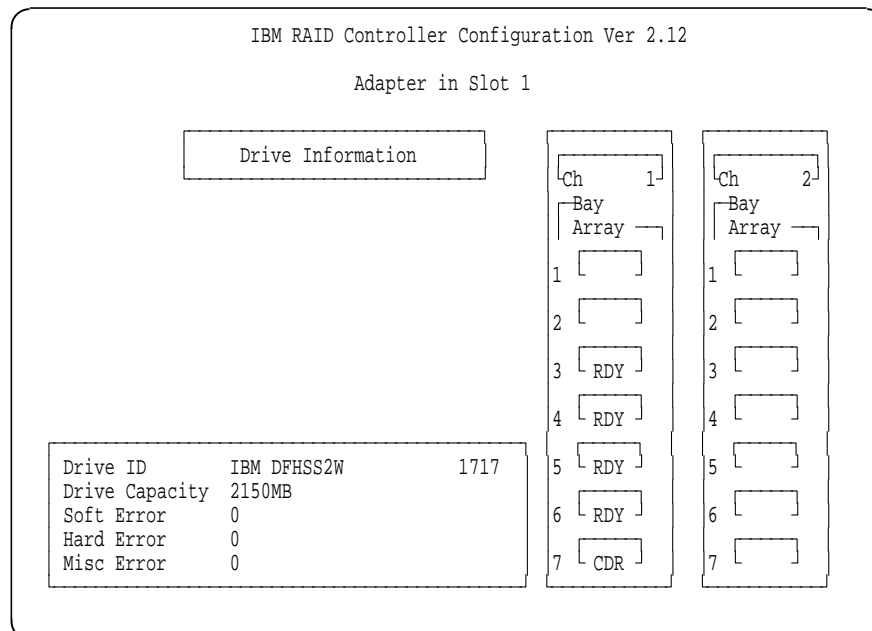


Figure 15. RAID Configuration Program - Drive Information

The columns on the right show any devices attached to each channel on the adapter. The box on the left shows information about a specific device. The unit whose information is displayed is highlighted on the right.

Use the up and down arrow keys to display the information for other devices.

The RAID Utility shows the device type and status for each device that it recognizes. The devices may take on several states that you may encounter when running the utility.

Here is a list of indicators we used along with a description of each:

- CDR = A CD-ROM device.
- DDD = A hard disk that is defunct.
- FMT = A hard disk that is being formatted.
- HSP = A hard disk that has been defined as hot-spare drive.
- OFL = A hard disk that is being used to rebuild a defunct drive. This is an intermediate state between DDD and ONL.
- ONL = A hard disk that has been assigned to an array.
- RDY = A hard disk that is ready to use but not assigned to an array or defined as hot-spare drive.
- TAP = A tape drive.
- UFM = A hard disk that is unformatted. The drive requires a low-level format before it is used.

#### **2.4.1.2 Formatting the Disks**

If your DASD devices appear as UNF, or if you have experienced some problems with them, you can low-level format the disks.

If your disks appear as RDY, and you don't want to reformat, then you can skip over this section.

To format a device:

1. From the main menu, select **Advanced Functions**. The following menu appears:

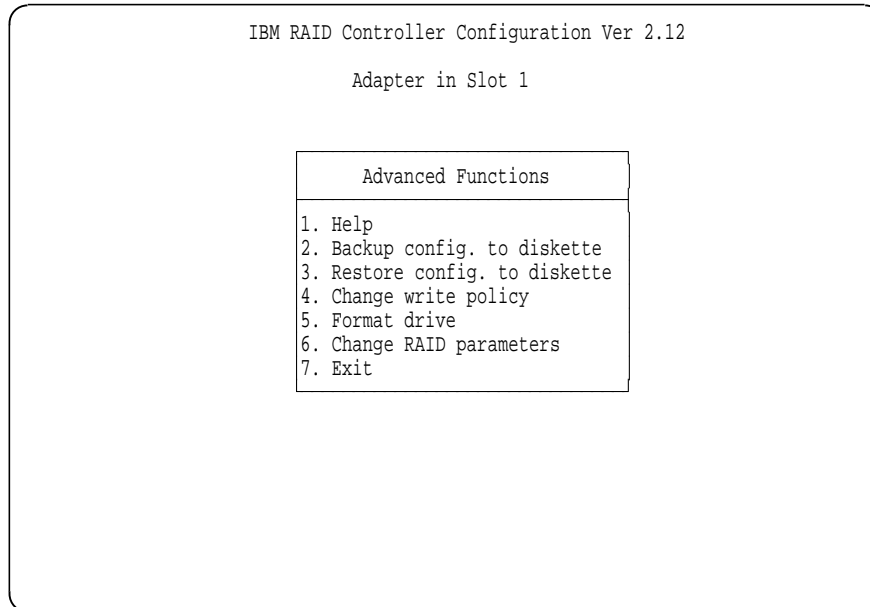


Figure 16. RAID Configuration Program - Advanced Functions Menu

2. Select **Format drive**.
3. With the Spacebar, select the devices to format. They appear as FMT.
4. Press Enter to format the selected drives.

**Notes**

All the desired devices may be selected and formatted together to reduce the time necessary for formatting.

The operation is time consuming. It takes approximately 20 minutes to format six 2-GB disks attached to the same adapter.

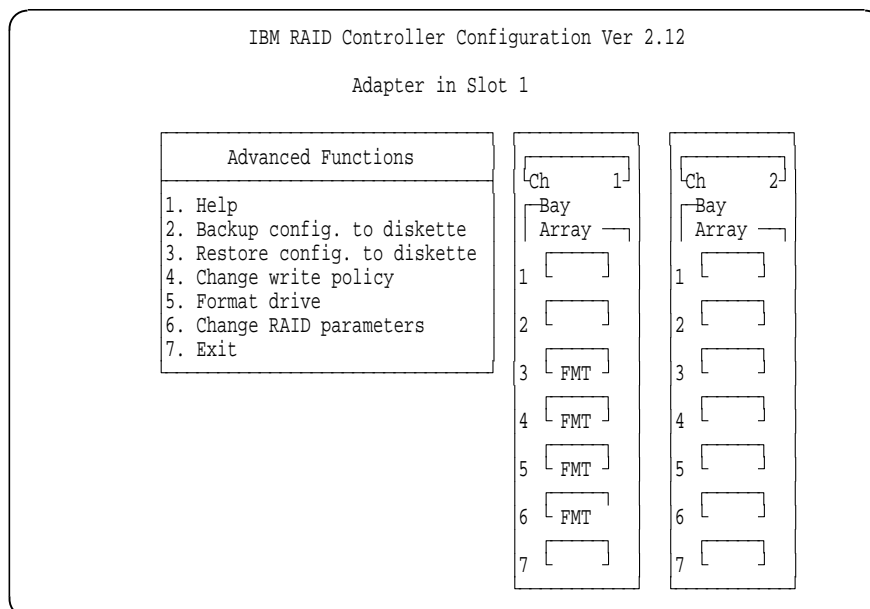


Figure 17. RAID Configuration Program - DASD Formatting

**Change RAID Parameters:** The panel for changing RAID parameters is shown in Figure 18 on page 24.

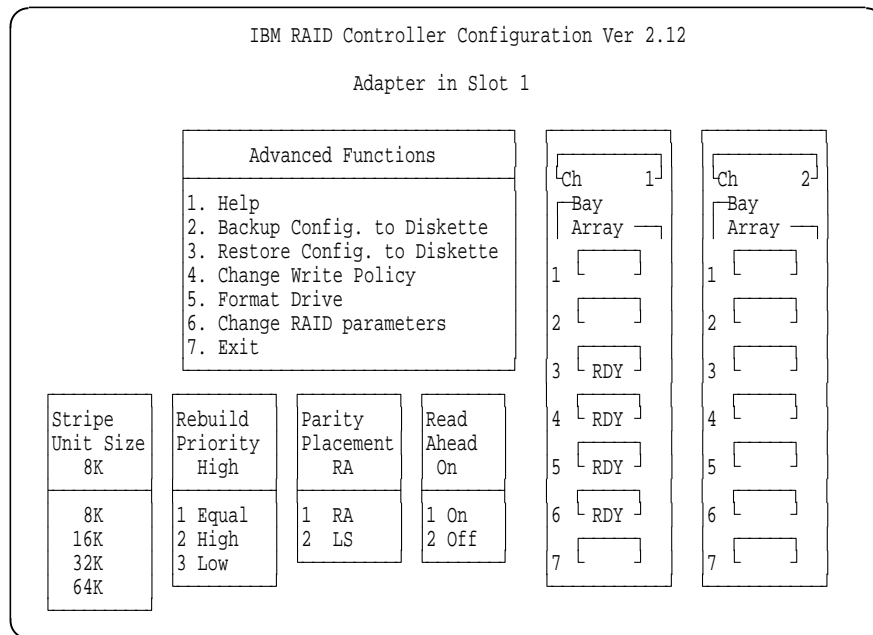


Figure 18. RAID Configuration Program - Change RAID Parameters

The following fields are configurable:

- Stripe Unit Size

This parameter should be chosen such that the stripe unit size is close to the size of the system I/O requests. The default is set to 8 KB.

**Note:** Once data is stored in the logical drive, the stripe unit cannot be changed without destroying data in the logical drives.

- Rebuild Priority

This parameter sets the priority of the execution order of the rebuild I/O requests with respect to the system I/O requests. The rebuild priority is changed without affecting data in the logical drive.

- Parity Placement

Parity Placement defines how parity is placed in the disk array with respect to the data. Figure 19 on page 25 shows the differences between left symmetric and right asymmetric parity placement.

AAA-LLL are the data stripe units; PP0-PP3 are the corresponding parity units.

Right Asymmetric (RA)				Left Symmetric (LS)			
Disk	Disk	Disk	Disk	Disk	Disk	Disk	Disk
1	2	3	4	1	2	3	4
PP0	AAA	BBB	CCC	AAA	BBB	CCC	PP0
DDD	PP1	EEE	FFF	EEE	FFF	PP1	DDD
GGG	HHH	PP2	III	III	PP2	GGG	HHH
JJJ	KKK	LLL	PP3	PP3	JJJ	KKK	LLL

Figure 19. Parity Placement in a RAID Subsystem

The default value is right asymmetric. In some situations, you may want to try left symmetric to improve performance.

**Note:** Once a parity placement scheme is chosen and data is stored in the logical drives, it cannot be changed without destroying data in the logical drives.

- Read-Ahead

Normally the IBM SCSI-2 Fast/Wide Streaming RAID adapter transfers data from a disk to its local cache in steps of stripe unit size. This provides excellent overall performance when workloads tend to be sequential. However, if the workload is random and system I/O requests are smaller than stripe unit size, reading ahead to the end of the stripe unit will result in a wasted SCSI bus bandwidth and wasted disk utilization.

When Read-Ahead is set to Off, the size of data transfer from the disk to the local cache is equal to the system I/O request size, and no read-ahead to the end of the stripe unit size is performed.

**Note:** The Read-Ahead setting can be modified without destroying data in a logical unit.

### 2.4.1.3 Defining a Hot-Spare Disk

After selecting **Create/Delete Array** from the main menu of the IBM RAID Configuration program, the following panel appears:

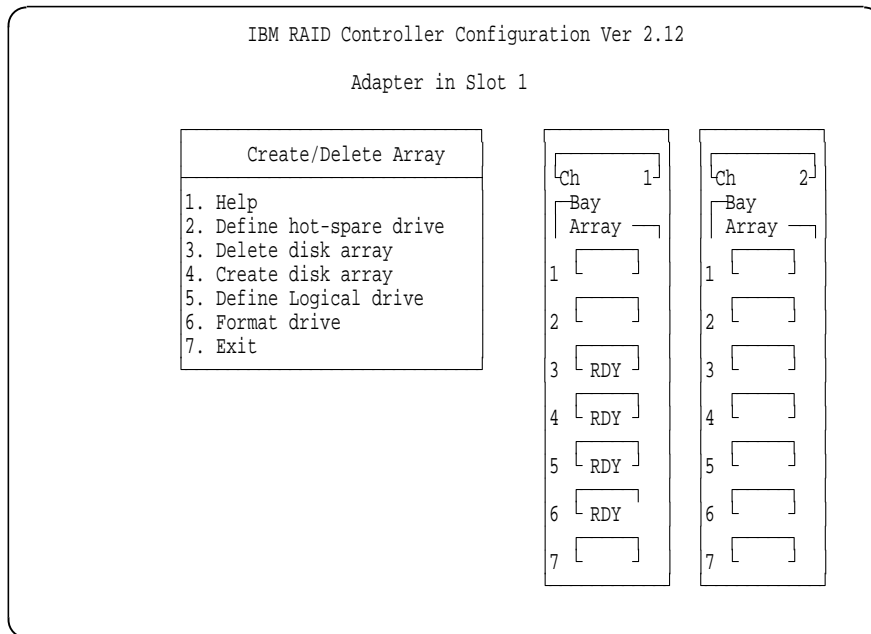


Figure 20. RAID Configuration Program - Create/Delete Array Menu

1. Select **Define hot-spare drive**. The cursor becomes active in the Bay/Array selection list.
2. Use the up and down arrow keys to select the RDY (ready) drive to be used as a hot-spare and press Enter. The RDY status changes to HSP (hot-spare). Figure 21 on page 27 shows an example where a hot-spare disk has been defined.
3. Press Esc to validate.

**Notes:**

1. The hot-spare drive is not associated with any array. If more than one array is defined, you need only one hot-spare drive for all the arrays.
2. If the disks have different sizes, the hot-spare drive must be the largest.

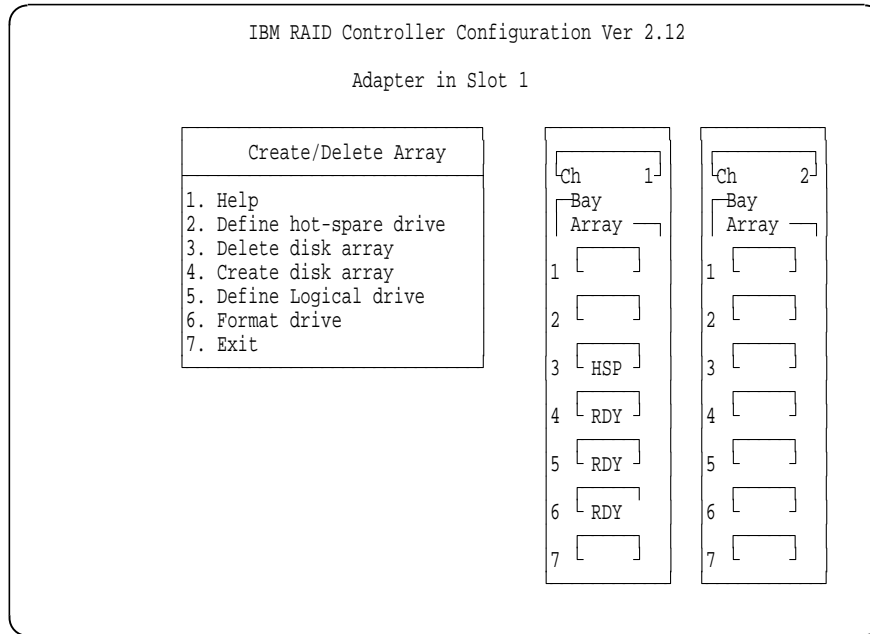


Figure 21. RAID Configuration Program - Hot-Spare Disk Definition

#### 2.4.1.4 Creating a Disk Array

1. Select **Create/Delete Array** from the main menu.
2. Select **Create Disk Array** from the Create/Delete Array menu and press Enter.
3. Using the Enter key, select each drive you want included in the array you are now defining. The devices will be highlighted as they are selected and the status changes from RDY to ONL (online). Also, the array ID (A for the first one, then B and so on) appears behind the drives that make up the array.
4. Press Esc to validate.

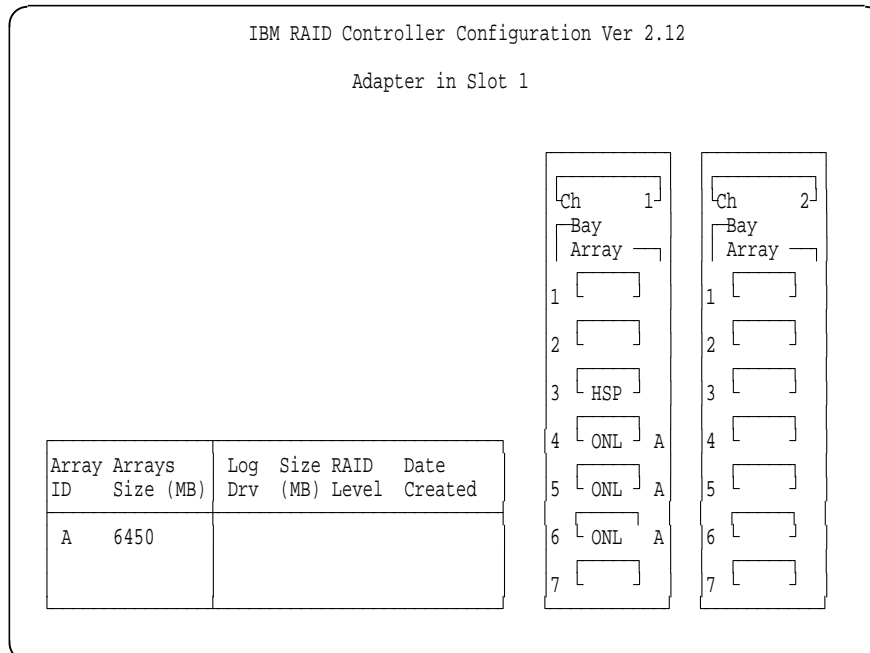


Figure 22. RAID Configuration Program - Disk Array Creation

5. Press any key to return.

Now that an array has been defined, it is necessary to create the logical drives on this array. Logical drive definitions for created arrays must be done before exiting the Create/Delete Array menu.

**Notes:**

1. Up to four arrays can be defined per controller.
2. An array can be defined across the two channels of one controller.
3. You cannot define an array across two controllers.
4. For maximum performance and configuration flexibility, all installed drives should be configured into a single-disk array. Where data separation is desired, use separate logical drives on the same disk array. Each of these logical drives will appear as a separate physical disk to software programs such as FDISK, and may be further divided into logical partitions. With this approach, if additional physical drives are added at a later date, they are easily added as a second array without reconfiguring the original drives.

### 2.4.1.5 Defining Logical Drives

The following steps will guide you through defining the logical drives:

1. Select **Define Logical drive** from the Create/Delete Array menu. The following panel appears:

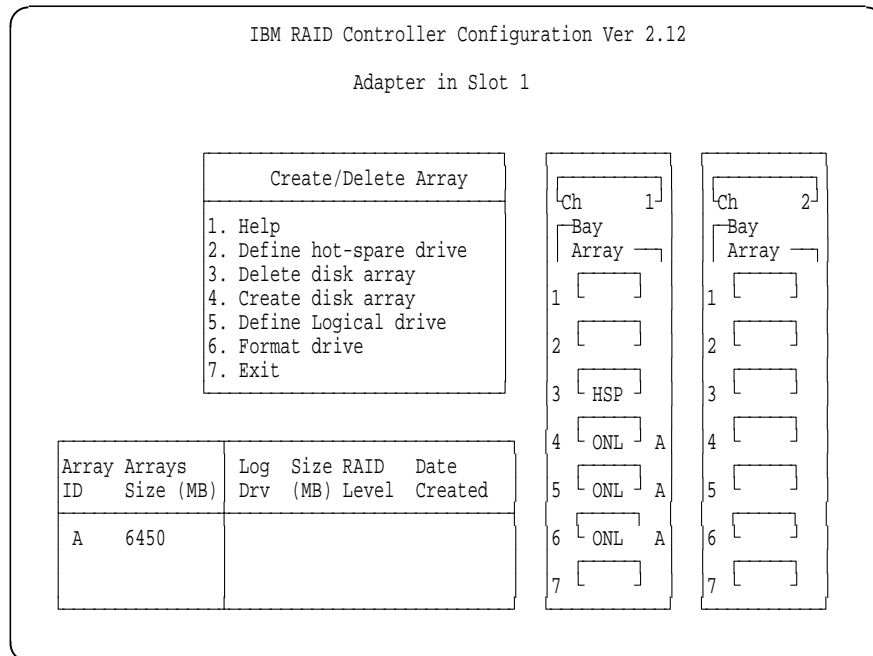


Figure 23. RAID Configuration Program - Logical Drive Definition

2. Highlight the array to be defined and press Enter. The define logical drive pop-up window appears.



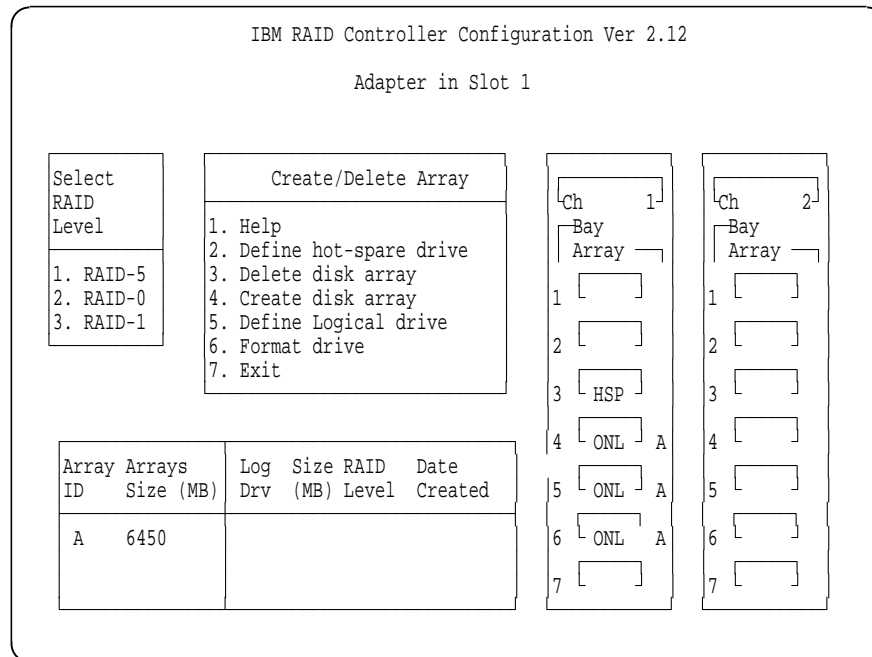


Figure 24. RAID Configuration Program - Logical Drive Definition - Array Selection

**Notes:**

- a. If only one hard disk has been assigned to the array, RAID level 0 will be automatically assigned and the pop-up menu does not appear.
  - b. If only two hard disks are assigned to the array, RAID-5 is not selectable, since at least three hard disk drives in an array are necessary to assign RAID level 5 to one of the logical drives.
  - c. Define any RAID-5 logical drives first. This is because the first logical drive seen will be the first RAID-5 drive created and will be assigned drive letter C. In this way, the operating system will be installed on a RAID-5 drive.
  - d. The three RAID levels (0, 1 and 5) can be mixed in the same array allowing the user to chose the optimum RAID level for each data type.
  - e. It is, however, not recommended to mix RAID-0 with the others levels if a hot-spare drive is defined, since an automatic rebuild would not be possible.
3. Assign the RAID level wanted and press Enter.

The logical drive size pop-up menu shows the space available in this array for logical drives.

RAID-5 has been chosen in this example.

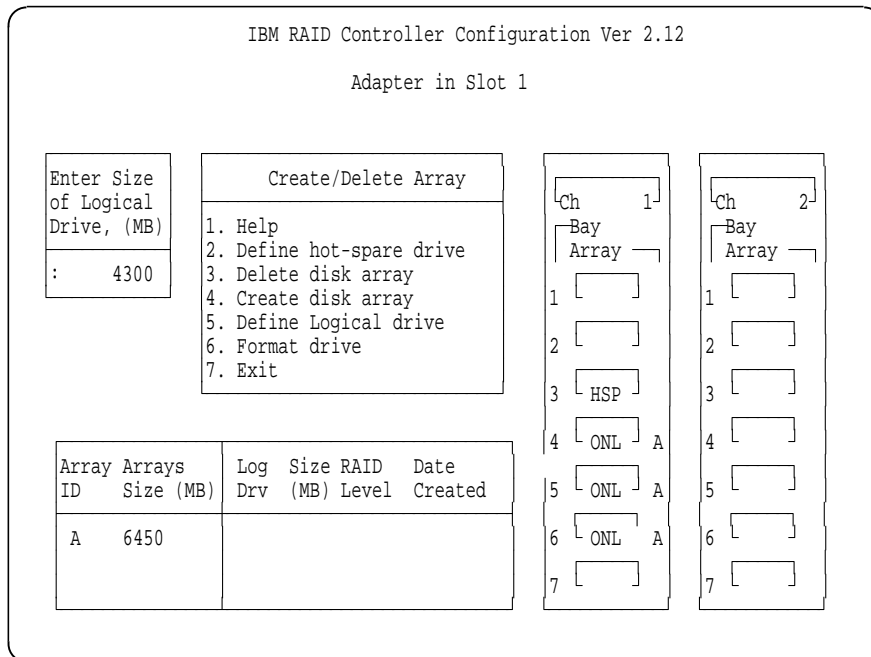


Figure 25. RAID Configuration Program - RAID Level Selection

4. Enter the size needed, within the limitation (for example, 400).
5. Press Enter to confirm.
6. As shown in Figure 26, information about the new logical drive appears in the logical drive list.

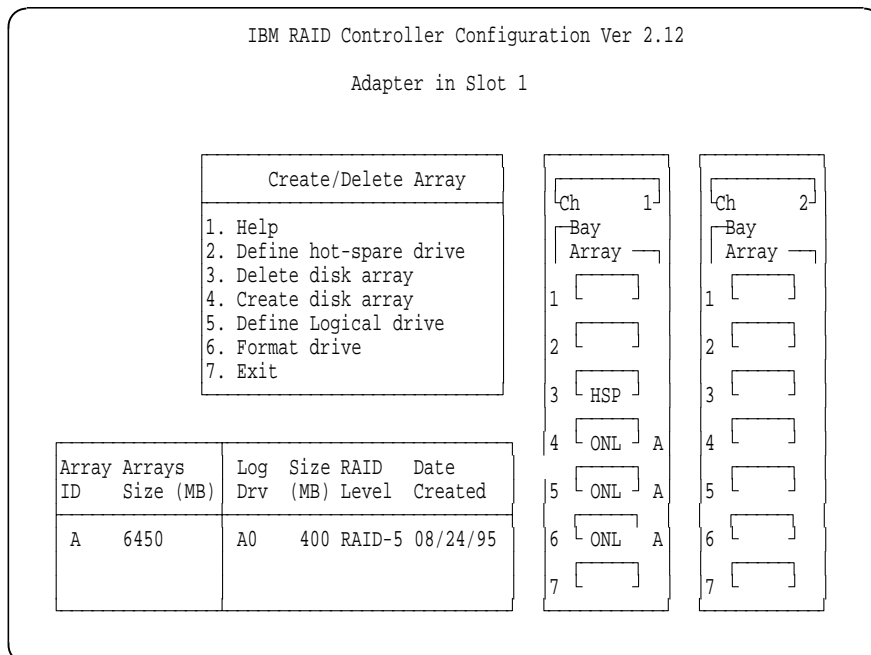


Figure 26. RAID Configuration Program - Size Definition

7. Repeat the procedures for the other logical drives and arrays.

**Note**

It is not necessary to define multiple logical drives of the same RAID level. You can partition these logical drives the same way you partition a real disk when you install the operating system.

8. Select **Exit** to leave this menu.
9. Select **Yes** to save the changes.

Figure 27 shows an example of a completed array definition that includes two logical drives: one 400 MB RAID-5 array and one 2925 MB RAID-1 array.

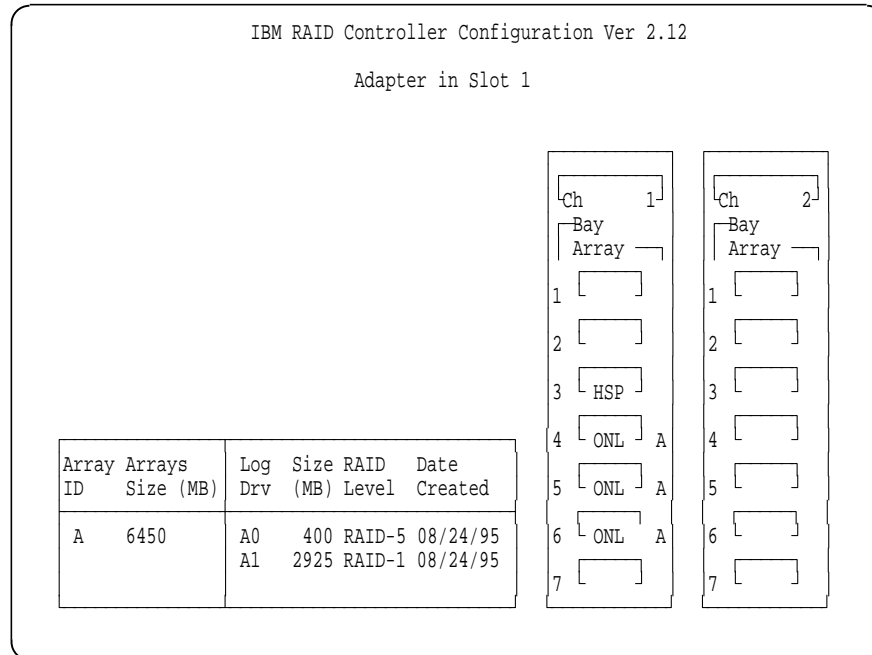


Figure 27. RAID Configuration Program - Result

### 2.4.1.6 Setting the Write Policy

Now that the logical drives have been created, you may wish to change the write policy for these drives.

If you want to change the write policy:

1. Select **Advanced functions** from the main menu.
2. Select **Change write policy**.
3. Use the up and down arrow keys to select the logical drive.
4. Press Enter to toggle the write policy.

The different options are as follows:

- WB for Write-Back

In the write-back mode, the completion status is sent before the data is actually written to the drives. While this mode will yield higher performance, it is critical to protect the DASD power to ensure the write operations actually complete, since the processor thinks the operation has been completed.

- WT for Write-Through

In write-through mode, the data is written directly to the disk and no acknowledgement is sent until the operation is complete. This is the default.

#### 2.4.1.7 Initializing the Array

If you are using RAID level 1 or 5, you must select **Initialize logical drives** for proper operation. This sets the drive to a predetermined state. Any data existing on the drive is overwritten with zeros, and the corresponding parity is initialized to the correct value.

Complete the following procedure:

1. Select **Initialize/synchronize array** from the main menu.
2. Select **Initialize logical drive**.
3. Select the logical drive you want to initialize by pressing the Spacebar.
4. Press Enter to start the initialization.
5. Select **Yes** to confirm.

#### 2.4.1.8 Backup/Restoring the Configuration

The array configuration is stored on EEPROM on the adapter. It is very important to back up this configuration on a diskette. If the adapter ever needs to be replaced, the configuration can be restored to the new adapter without the need to reconfigure the array. Otherwise, the array would need to be redefined and your data would be lost.

This is important not only at installation time but whenever the array configuration changes. For example, if a hot-spare drive is defined and subsequently, a drive fails and the hot-spare is enabled, the array configuration is updated. If you are unable to restore the configuration *exactly* as it was before, it would have the same effect as re-initializing the arrays: all data would be lost.

#### Backup Recommended

We *strongly* recommend that the configuration be backed up.

To back up the configuration:

1. Select **Advanced functions** from the main menu.
2. Select **Backup config. to diskette**.
3. Press Enter.
4. Enter the file name you want for backup. (CONFIG is the default.)
5. Insert a diskette to hold the backup file.
6. Press Enter.

To restore the configuration:

1. Select **Advanced functions** from the main menu.
2. Select **Restore config. from diskette**.
3. Press Enter.
4. Enter the file name you used for backup.
5. Insert the diskette used for backup.
6. Press Enter.

A panel similar to the one in Figure 28 on page 33 will appear. This shows you the date when the backup was performed.

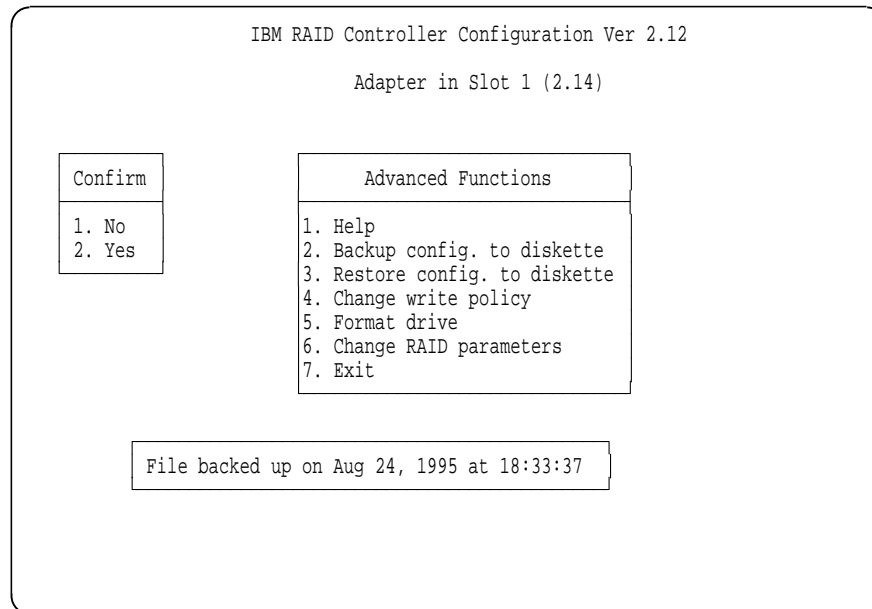


Figure 28. RAID Configuration Program - Advanced Functions Menu

7. Select **Yes** to confirm.

## 2.4.2 PC ServeRAID SCSI Adapter

The ServeRAID Adapter is a high-performance, three-channel PCI RAID adapter. This technologically advanced RAID controller supports up to 45 SCSI-2 Fast/Wide or UltraSCSI hard drives to satisfy mission critical applications that require protection for large amounts of data.

The ServeRAID Adapter achieves outstanding performance through the use of a RISC processor, 4 MB of cache, and a dual PCI bus architecture with a local PCI bus. These attributes significantly improve system performance by reducing traffic on the system local bus and by rapidly processing complex RAID algorithms with a high-speed processor.

IBM incorporates logical drive migration with the ServeRAID Adapter. This new technology allows changes to be made to the RAID configuration while the PC Server is up and running. Using online utilities, new RAID arrays can be added and RAID levels modified without deleting the original array, or requiring the data to be restored from a backup source.

For added security, the ServeRAID Adapter stores critical RAID configuration information in multiple locations on the adapter and hard disk making disaster recovery or migrating hard drives from one server to another quick and easy. This means hard drives can now be removed from your server and installed in another server or external enclosure in any order. The ServeRAID Adapter takes care of getting the configurations from the hard drives and remapping them as necessary.

This adapter contains three internal connectors, one for each channel, and one external connector. Three of the four connectors can be used for attachment of SCSI devices.

### 2.4.2.1 ServeRAID Adapter Support Diskettes

Prior to publication, IBM released Version 2.0 of the support diskettes for the ServeRAID Adapter. The two major functional enhancements that this new version provides are:

#### 1. Internal Hot-Swap Drive Support for the IBM PC Server 704

The IBM PC ServeRAID SCSI Adapter is now supported on the IBM PC Server 704, for both internal hot-swap disk drives and externally attached hot-swap disk drives. This enhances the already robust PC Server 704 and adds flexibility to its RAID configurations.

To use the IBM PC ServeRAID SCSI adapter in the PC Server 704, the server must be at BIOS Level 7 or higher and the PC ServeRAID SCSI Adapter firmware and BIOS must be at Level 2.

#### 2. Logical Drive Migration Capabilities

Logical Drive Migration (LDM) for the IBM PC ServeRAID SCSI Adapter is now available, extending the power and control of your IBM PC Server RAID implementations.

The primary LDM functions allow you to add capacity to your RAID arrays by increasing the size of the logical drives, or by creating additional free space to create new logical drives.

The new LDM code provides the following functions:

- Expand the array by adding up to three physical drives at a time. While expanding the array, the logical drive size can be increased or kept unchanged. While the logical drive size remains unchanged, the increased space can be used to define additional logical drives.
- Change the RAID level on-the-fly from RAID-0 to RAID-5 by adding a drive and from RAID-5 to RAID-0 by removing a drive. All logical drives in the array must be at the same RAID level.
- Change RAID level on-the-fly from two-drive RAID-1 to RAID-5 by adding one physical drive.
- Concurrent I/O support: During the LDM process logical drives can be accessed by users.
- Degraded Mode support: While LDM is in progress and the logical drive goes to critical mode due to physical drive failure, LDM will continue to run normally. LDM will not start if the logical drive is already in critical mode.
- Power Failure Recovery: Should a power failure occur during LDM, the operation restarts from the point of interruption when power is restored.

Logical Drive Migration functions are controlled from the ServeRAID Administration and Monitoring Utility. Refer to 2.4.2.5, "Administration and Monitoring Utility" on page 41 for information about this utility.

At the time of publication, the current levels of the ServeRAID Adapter software are:

- ServeRAID Adapter Configuration Disk V2.00
- ServeRAID Adapter Driver and Utility Disk V2.00
- ServeRAID Adapter SCO BTLN Disk V2.00
- ServeRAID Adapter Administration and Monitoring Utility V2.00
- ServeRAID Adapter BIOS/Firmware V2.00

Images of these diskettes plus an online (HTML) version of the *ServeRAID Adapter Installation and User's Guide* are available from IBM's PC Server Web site. Refer to Appendix C, "Sources of Drivers and Information" on page 259 for details.

### 2.4.2.2 IBM PC Server Support

To support the ServeRAID firmware, you should update the BIOS level of your IBM PC Servers to the latest level. Refer to Appendix C, "Sources of Drivers and Information" on page 259 for information on where to get the latest BIOS code. As a minimum, the BIOS must be at the following BIOS levels:

Server	BIOS Level Required
PC Server 310	Not Supported
PC Server 320 PCI/MCA	19A
PC Server 320 PCI/EISA	M54PE-15T3
PC Server 325	All
PC Server 330	All
PC Server 520 PCI/MCA	19A
PC Server 520 PCI/EISA	M54PE-15T3
PC Server 720	07
PC Server 704	7

**PC Server 704 Considerations:** The 704's internal drive bays are managed directly over the SCSI bus (rather than through a separate DASD status cable) via an intelligent SCSI processor device embedded in each internal hot-swappable backplane.

All devices on a single SCSI channel must be assigned a unique ID. Since the 704's internal backplanes are themselves SCSI devices, one of the SCSI IDs on each of the ServeRAID adapter's internal channels will be assigned to each backplane. The PC Server 704 assigns each internal hot-swappable backplane to SCSI ID 6 (which corresponds to bay 7).

To view the ServeRAID's current SCSI device ID assignments, please use one of the ServeRAID utilities (such as the Configuration Diskette, the Monitor Utility, or the BIOS-based Mini-Config Utility). The bay/ID assigned to the backplane will appear as an SBY (standby) or PRC (processor) device.

### 2.4.2.3 ServeRAID Configuration Utility

The configuration utility allows you to do maintenance on your ServeRAID configuration. Boot from the diskette to run the utility. The main menu will appear (Figure 29 on page 36):

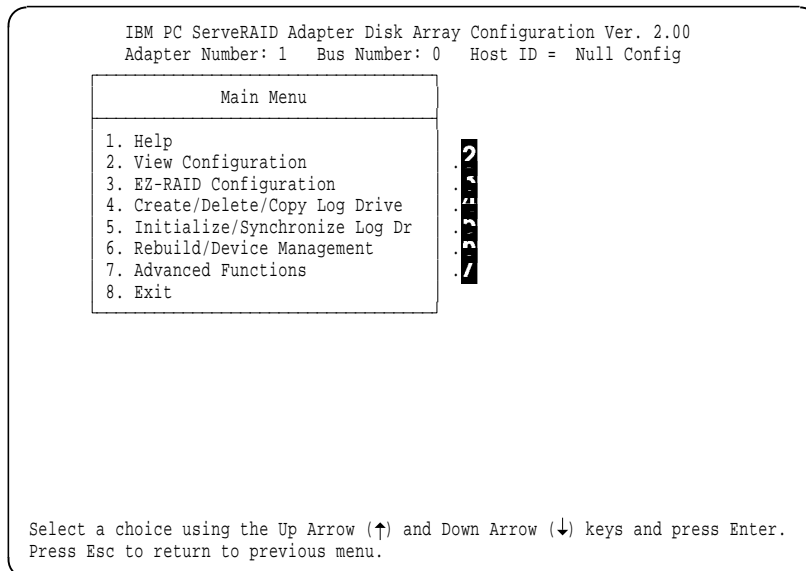


Figure 29. ServeRAID Adapter Main Menu

Your choices from the main menu are:

**2.** View Configuration

This option lets you see how your system is presently configured. The physical drives will present the following states:

- CDR** Device is a CD-ROM.
- DDD** The drive has become defunct; it does not respond to commands.
- DHS** The drive is defined as a hot-spare, but is now defunct.
- EMP** The drive was present but has now been removed and the slot is empty.
- HSP** The drive is a hot-spare for use when a similar drive fails.
- INI** The device is the ServeRAID controller itself (initiator).
- ONL** The drive is online and part of an array. (The array letter A,B, etc. is listed to the right of the status in the View Configuration panel.)
- PRC** Reserved. In use by a component of the system (for example, the backplane).
- RBL** The drive is being rebuilt.
- RDY** The drive is available but not in use.
- SBY** The drive has been spun down by the adapter and is in standby mode.
- SHS** The drive is a standby hot-spare.
- TAP** The device is a tape drive.

The status of the logical drives can be:

- CRT** The logical drive is in a critical state, although it is still functioning despite the failure of one of its physical devices.
- FRE** The logical drive is not defined.
- LDM** The logical drive is undergoing a RAID level change using Logical Drive Migration functions.
- OKY** The logical drive is functioning correctly.
- OFL** The logical drive is offline and not accessible. This occurs when more physical drives fail that the RAID level can cope with (that is, 1 for RAID-0 and 2 for RAID-1 and RAID-5).
- SYS** Reserved state.



### 3. EZ-RAID Configuration

This option give you an automatic method to create an IBM PC ServeRAID configuration based on the number of physical drives that are in the ready (RDY) state. The bays are scanned for the physical drives in the RDY state. A maximum of nine drives will be selected on a first-found, first-selected basis. The following configurations will be created based on the number of RDY physical drives:

*Table 3. Configurations that EZ-RAID Creates Based on Drives Available*

Physical Drives Available	RAID Level Created	Hot-Spare Defined
1	0	no
2	1	no
3	5	no
4-9	5	yes

Upon defining this configuration, EZ-RAID will automatically initialize and synchronize your logical array.

**Note:** If you require a configuration other than these, you will need to manually configure your arrays using Create/Delete/Copy.

### 4. Create/Delete/Copy

Select this option if you are configuring your system for the first time or if you have added or removed a disk drive. More panels will be provided for you to accomplish your task.

### 5. Initialize/Synchronize

Select Initialize/Synchronize logical drive if you want to prepare a freshly created logical drive for use or if you want the system to recompute the parity data in the drive.

### 6. Rebuild/Device Management

This choice is used when you replace a defunct drive or reconstruct the data on a failed drive. You can also select Drive information to view SCSI devices connected to the RAID Adapter. You can view drive IDs, capacities, and error records. The Device Error Table can also be erased.

### 7. Advanced Functions

This choice shows you a menu as shown in Figure 30 on page 38 and gives you access to a number of advanced functions:

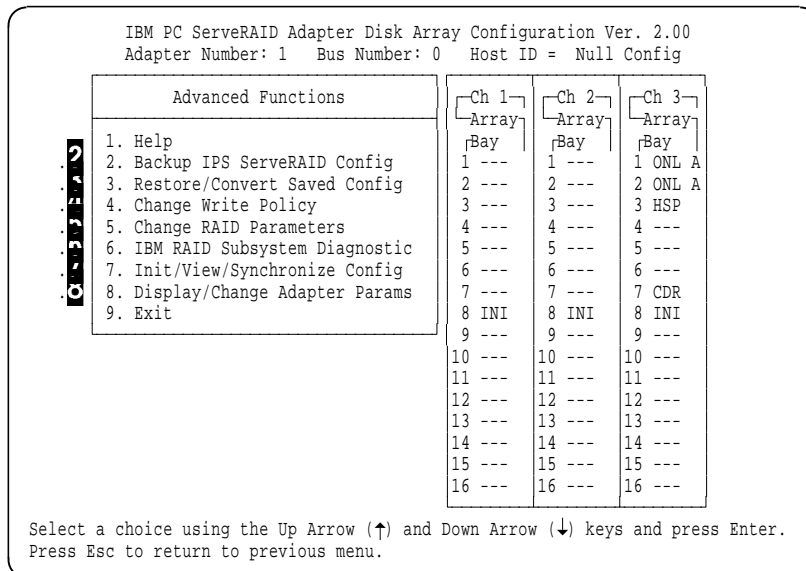


Figure 30. ServeRAID Adapter Advanced Functions Menu

2. Backup IPS ServeRAID Config and
3. Restore/Convert Saved Config

These two options let you back up or restore the disk array configuration to or from a diskette. This should be done when ever the configuration changes (either manually by you, or automatically when a hot-spare is used to replace a defunct drive).

#### Back Up to Diskette

We strongly recommend you back up your ServeRAID configuration to diskette whenever a change is made.

The Restore/Convert option also helps you upgrade from a PCI RAID or Streaming RAID adapter by converting your previous configuration.

**Note:** There are some limitations to this conversion option. See the *ServeRAID User's Guide* for more information.

4. Change Write Policy

Select **Change Write Policy** to configure a logical drive of an array to work in either the write-through mode or the write-back mode. In the write-back mode, the completion status is sent before the data is actually written to the drives. Write-back mode generally provides higher performance with increased risk of data loss in the event of power failure. In write-through mode completion status is sent after the data is written to the drives.

5. Change RAID Parameters

Change RAID Parameters allows you fine tune the RAID subsystem:

- Stripe unit size - Should be set to the size of I/O requests
- Rebuild priority - Specify which has higher priority: rebuild I/O or system I/O.
- Auto rearrange - Allows the adapter to resolve configuration-related conflicts automatically.
- Read ahead - Toggles the cache read ahead up to the end of stripe unit.

**.6.** IBM RAID Subsystem Diagnostic

Select this option to run the ServeRAID Adapter self test. Low-level formatting of drives is provided as well as a drive media test.

**.7.** Init/View/Synchronize Config

This option lets you initialize the configuration of the adapter back to the factory defaults. The ServeRAID Adapter stores critical configuration information in a number of locations to ensure the data is not lost:

- NVRAM on the adapter
- EEPROM on the adapter
- On each online (ONL) or rebuilt (RBL) drive
- On diskette (upon request)

This option lets you view each of these stored configurations, and when a discrepancy exists, you can select which one to use as a basis for synchronization.

The RAID adapter also maintains a list of all changes to its RAID configuration. A power-on change list, wrong SCSI ID list, and an unidentified drive list are updated when devices are added or moved. Changes to the devices' state also affect these lists. This option allows the user to view all of this information.

**.8.** Display/Change Adapter Params

Select **Display/Change Adapter Params** to display the adapter's status or to write a new adapter configuration host ID. The adapter's SCSI channel ID and speed may also be changed.

#### **2.4.2.4 Mini-Configuration Utility**

The mini-configuration program is a quick way to display the adapter settings and to perform a limited set of configuration functions without using the configuration utility on diskette.

Upon booting the server with the ServeRAID controller installed, you will see:

Press <Ctrl+I> for MiniConfig Utility

If you have more than one adapter installed, you can select which adapter to work with. The main menu now appears (Figure 31 on page 40):

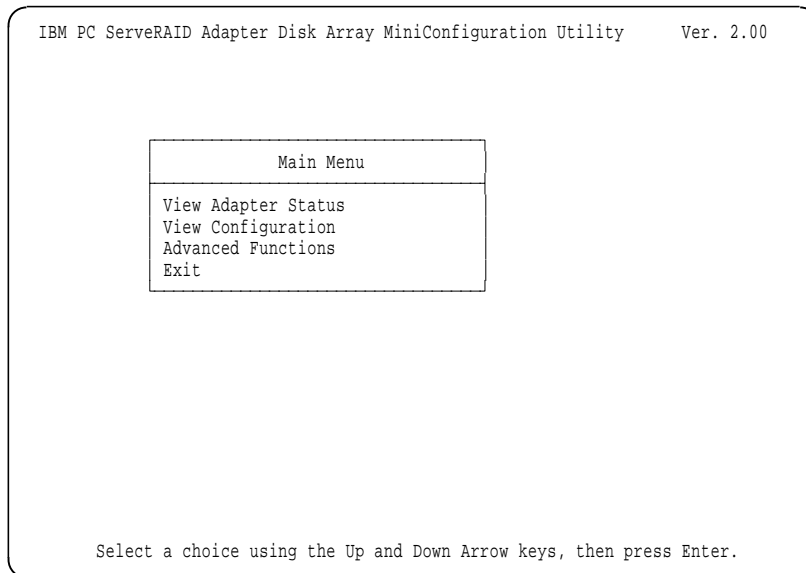
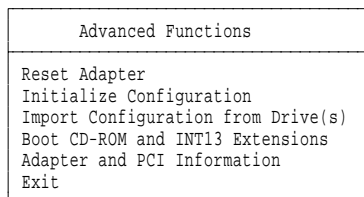


Figure 31. ServeRAID Adapter Mini-Configuration Utility

As well as viewing both the adapter status and the logical drive configuration, you can perform a subset of administrative functions that you can do with the configuration utility. Selecting **Advanced Functions** from the menu gives you a window:



The options you can select here are:

- **Reset Adapter**  
This option resets the adapter and runs all internal diagnostics. This does not affect the data on the drives.
- **Initialize Configuration**  
This option resets the adapter configuration to factory defaults, and places all drives in the ready (RDY) state.  
**Note:** All configuration data will be lost.
- **Import Configuration from Drive(s)**  
This option reads the configuration from the drives and copies it to NVRAM and EEPROM on the adapter.  
**Note:** Configurations stored in the adapter will be lost.
- **Boot CD-ROM and INT13 Extensions**  
Figure 32 on page 41 appears to allow you to configure the CD-ROM boot options.
- **Adapter and PCI Information**  
This displays data about the adapter hardware and the PCI registers.

- Boot CD-ROM Configuration

This menu choice gives you options to support bootable CD-ROMs. If you wish to boot from CD-ROM, set each option to Yes and then save the configuration to the adapter.

Boot CD-ROM Configuration	
BIOS Support for Bootable CD-ROM	No
Display Boot CD-ROM Menu	No
BIOS Support for Int13 Extensions	No
Save Configuration in Adapter	
Exit	

Figure 32. ServeRAID Adapter Boot CD-ROM Configuration

### 2.4.2.5 Administration and Monitoring Utility

The administration and monitoring utility provides a superset of the functions provided by the configuration utility discussed in 2.4.2.3, “ServeRAID Configuration Utility” on page 35, including Logical Drive Migration. It is installed by inserting the Administration and Monitoring Utility diskette and typing:

A:\SETUP

The administration utility can also be installed on another Windows NT or Windows 95 workstation to manage the ServeRAID subsystem remotely. Figure 33 shows the main window of the administration utility.

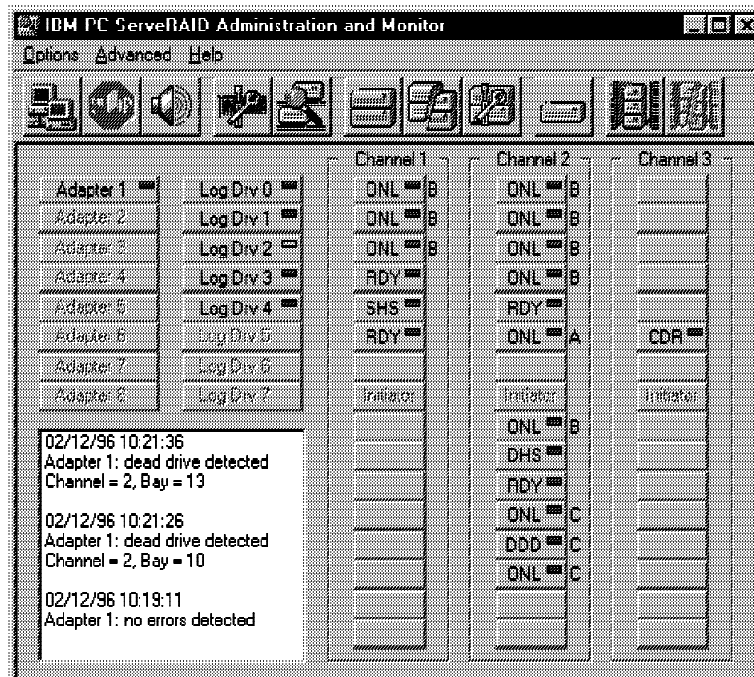


Figure 33. ServeRAID Administration and Monitoring Utility

Refer to the user's guide for more information.

### 2.4.2.6 Possible POST Errors

During POST, the ServeRAID adapter compares the stored configuration information to the configuration that is actually present. If a discrepancy exists, one or more status messages appear after POST completes, but before the operating system loads. You will be given a list of choice to select from. Possible messages are included in the following sections.

***New Drives Installed:*** You will see:

```
Following new drives found
(old state: new state: ch:bay)
[...a list of drives...]
```

This is an informational message only.

***Configured Drives Are Missing:*** You will see:

```
Following drives not responding
(old state: new state: ch:bay)
[...a list of drives...]
```

Possible choices here are:

- F4**        Retry. You would select this, for example, if you forgot to turn on an external enclosure.
- F5**        Accept the new state that the adapter will assign to the drives. You might press F5 when in a RAID-5 or RAID-1 configuration a drive has started in DDD (defunct) mode. In this instance, you can continue to boot the server in critical mode to enable you to replace the faulty drive while the server is running.

***Configured Drives Are Not in the Configured Location:*** When the adapter detects that a previously configured drive is present, but the drive is in a new location, the following message appears:

```
Following drives found in new location
(old ch: old bay: > new ch: new bay)
[...a list of drives...]
```

Here you can select:

- F4**        Retry. You might press F4 once you have moved the drives back to their original locations.
- F6**        Accept the drives in their new locations.

***New Adapter or Imported Drives:*** Unlike the New drives installed message, here the adapter has detected that the drives installed in the server are new to this machine, but were part of a different ServeRAID adapter configuration. You will see:

```
Following new drives found
("host id": old ch:old bay: new ch:new bay)
[...a list of drives...]
```

or

```
Identifiers for the following drives do not match configuration
("host id": channel:bay > channel:bay)
[...a list of drives...]
```

Included in the message is the identifier (Host ID) of the other ServeRAID Adapter. From here, you have the following choices:

**F4** Retry.

**F7** Restore the configuration from diskette. Press F7 when you replace a faulty adapter or when you move an entire disk array from one system to another without also moving the adapter.

#### **New Adapter**

There may be situations (for example, using a factory-fresh adapter as the replacement) where the F7 option does not appear. If you need to restore a configuration from diskette, do the following:

1. Restart the server.
2. When prompted during POST, press Ctrl+I to enter the MiniConfiguration Utility.
3. Select **Advanced Functions**.
4. Select **Import Configuration from Drives to Adapter**.
5. Follow the instructions on the panel.

### **2.4.3 IBM SSA RAID Adapter**

The IBM SSA RAID Adapter is a PCI bus master adapter that serves as the interface between systems using the Peripheral Component Interconnect (PCI) architecture and devices using the Serial Storage Architecture (SSA). The adapter provides high-performance implementation of RAID-0, RAID-1 and RAID-5. It can also provide storage in a non-RAID configuration if required, for maximum storage space.

SSA includes SCSI-2 commands, queuing model, status, and sense bytes. It is an industry-standard interface.

The adapter provides four SSA ports for attachment of storage devices. Each port (or connector) operates at 20 MB full-duplex using point-to-point copper cables. SSA allows 25 meters (82 feet) between nodes over copper and a maximum of 2.4 Km distance using fiber optic cable, where supported. Ports are normally used in pairs to form SSA loops.

Each SSA port pair on the adapter can attach up to 48 dual-ported hard disks in a closed loop. This would allow for 96 disks per SSA adapter.

Up to three SSA RAID Adapters can be installed in some IBM PC Servers. This means that up to 288 disks can be connected to one server. With 9.1 GB disks, this equates to 2.6 terabytes of online storage. Refer to Table 4 on page 45 for supported IBM PC Servers.

SSA has link error recovery procedures and an automatic path selection for alternative paths. Therefore, there is no single point of path failure on an SSA loop. If a loop is broken, the two connectors continue to access the devices using the remaining connections as a string. When the faulty cable is replaced the loop will automatically reconnect. The server need not be brought offline, as all SSA cables and disk drives are hot swappable.

SSA technology allows you to have huge amounts of disk storage housed in external disk storage units. The IBM PC Server range of SSA devices currently includes the IBM 7133 and the IBM 3527 external disk storage units.

The 3527 mini-tower enclosure is used for smaller SSA configurations and can hold up to five 2.2 GB or 4.5 GB disk drives, allowing for a maximum configuration of 22.5 GB per external unit. Up to 24 external 3527 units can populate one loop (up to a maximum of 48 drives per loop) giving you a maximum of 48 external 3527 units on one SSA adapter, using two loops, one on each port of the adapter. Due to disk technology, the current maximum for disk storage on a single SSA adapter using 3527 units is approximately 432 GB.

The 7133 comes in either a tower or rack mount form and can hold 16 2.2 GB, 4.5 GB or 9.1 GB SSA disk drives, allowing for a maximum configuration of 144 GB per external unit. Up to six 7133s can be connected to one SSA adapter. Due to disk technology, the current maximum for disk storage on a single SSA adapter using 7133 units is approximately 864 GB. The 7133 has three power and cooling supplies for full redundancy. The 7133 can continue to operate if one fan or power supply fails, and it can be replaced while the 7133 is still operating. It also has a fiber optic extender on particular models, allowing you to have connectivity up to 2.4 km. The 7133 and the 3527 external units can be mixed together on an SSA loop.

Due to the nature of SSA, disk arrays may be spanned over different external disk drive units and different loops on the same SSA adapter.

The SSA RAID Adapter supports the following operating systems:

- OS/2 Warp Server Version 4
- OS/2 Warp Server SMP
- OS/2 2.11 SMP
- Novell NetWare 4.1 and 4.11
- Novell NetWare 4.1 SMP
- Windows NT 3.51 and NT 4.0

The configuration utility allows you to configure and administer your SSA configuration online from the OS/2 workplace shell. There is also a DOS-based configuration that allows you to configure SSA configurations offline. Refer to 2.4.3.2, "SSA Configurator Utility" on page 45 for details on the configurators.

#### More Information

If you need more information about the technology and the hardware that's available behind the SSA product, please refer the redbook *Implementing PC ServeRAID SCSI and SSA RAID Disk Subsystem*, SG24-2098-00.

### 2.4.3.1 SSA Installation and Configuration Considerations

Before installing an SSA RAID Adapter in your PC server, it may be a good idea to consider the installation options. You have the choice of installing your network operating system (NOS) on an SSA disk and therefore booting from the SSA RAID Adapter only, or installing your NOS on an SCSI disk, possibly already installed in your server and using your SSA RAID Adapter to control SSA hard disk drives attached to your server, in addition to your existing SCSI drives.

See 2.4.3.4, "Install an OS/2 Warp Server on an SSA RAID Device" on page 57 and 2.4.3.3, "Expand an OS/2 Warp Server with an SSA RAID Device" on page 55 for more information about the different installations.

The SSA RAID Adapter is supported in the following IBM PC Servers (see Table 4 on page 45):



<i>Table 4. SSA RAID Adapter Supported Servers</i>	
<b>Server</b>	<b>Maximum Number of Adapters Supported</b>
PC Server 320	1
PC Server 325	3
PC Server 330	3
PC Server 520	1
PC Server 704	3
PC Server 720	2

The maximum number of adapters supported is based on how many full-sized PCI adapters will physically fit in each server and what number have been officially tested by IBM. Larger numbers than those listed may function correctly but may not be supported.

### **2.4.3.2 SSA Configurator Utility**

The SSA RAID Configurator utility is the program you will need to use to set up arrays controlled by your IBM SSA RAID Adapter. It is available for DOS, OS/2 and NT and NetWare and is supplied on diskettes with your SSA RAID adapter. Instructions for use are included in the README.TXT file on each NOS-specific diskette.

#### **World Wide Web**

Download the latest SSA RAID utilities and device drivers from the following IBM PC Company Web site:

<http://www.us.pc.ibm.com/>

The following figure shows the SSA RAID Configurator for OS/2. However, the configurators for the other supported operating systems look almost identical.

**Note:** The DOS version is an offline configuration tool, and the DOS diskette is bootable. The OS/2, NT and NetWare versions are used online.

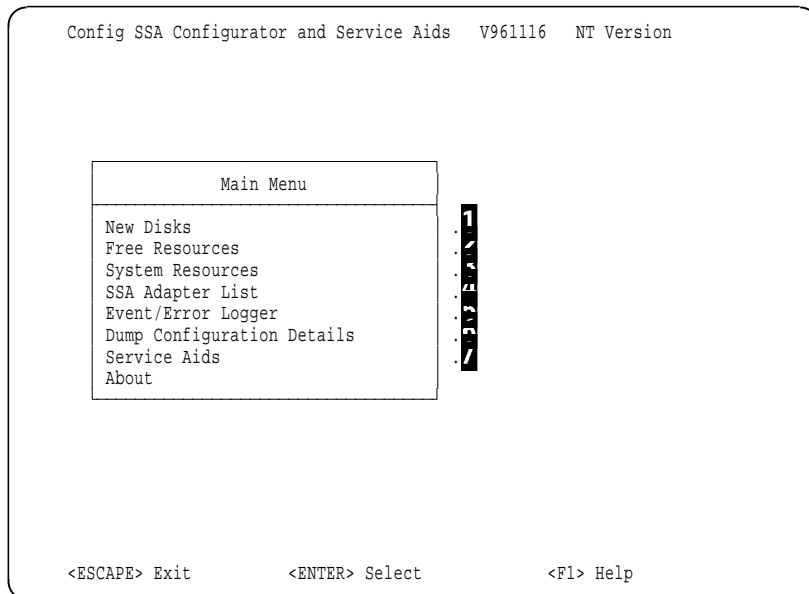


Figure 34. SSA Configurator Main Menu (OS/2 Version)

#### Definition: Resources

A *resource* is a disk drive that can be accessed individually, or it can be an array. When disks are seen by an SSA adapter for the first time, they are considered *new*. They then must be moved into the *free resources* category to be used in an array or as individual disks. Resources are then *attached* to the operating system, which means that they can then be used by the operating system and ultimately accessed by users.

Your choices from the main menu are:

**1.** New Disks

This lists all the hard disk drives that have been added to the system, in other words the *new* disks. These disks have not been used yet. Each disk is listed with its unique SSA identifier, which is a hexadecimal number such as AC7E6173.

**2.** Free Resources

This is a hard disk drive which is available for:

- Attaching to the operating system
- A hot spare
- Becoming part of an array
- An array member exchange (swapping with a failed disk in an array)

**3.** System Resources

A disk can be attached or detached from the operating system from this option.

**Note:** OS/2 requires a reboot when disks are attached or detached.

**4.** SSA Adapter List

This is a list of installed SSA adapters. By selecting an adapter you can create/modify/delete arrays from this option. Functions such as running diagnostics and looking at NVRAM can also be run from here.

## .5. Event/Error Logger

This option lets you view the SSA error logs. The event logs are formatted and saved to a text file of your choice, which can be read using any text editor. A portion of an example error log is shown in Figure 35 on page 47.

You can analyze event logs on systems running NetWare, OS/2 and NT, but not from the offline DOS utility.

**Note:** The error log specifies any errors that have occurred as SRNs, or *service request numbers*. Refer to Appendix B of *SSA RAID Adapter Installation and User's Guide*, S32H-3816 for a listing of these numbers and what they mean.

```
Date and time: 10:40:13 16-04-97
SSA unique ID: g6902110
Error type: Adapter
Template: SSA_ARRAY_ERROR
SRN: 49500
Flag: Current
Array SN: 1_____K
```

Figure 35. A Portion of an SSA Error Log

## .6. Dump Configuration Details

This option allows you to send the configuration details of your SSA subsystem to a text file of your choice. Output includes detailed information on resources managed by:

- New Disks
- Free Resources
- System Resources
- Adapter VPD
- RAID 0 Arrays
- RAID 1 Arrays
- RAID 5 Arrays
- Rejected Disks
- Non-Volatile RAM
- Hot-spare Disks
- Physical Disks

Sample output from the log file is shown in Figure 36 on page 48.

```

>>> Resources managed by RAID 5 Arrays

  Displayed Resource Name : 1
    Full Resource Name : 1_____K
      Status1 : Online (Good)
        Node Number : 11
          Status2 : Online (Good)
            Capacity : 8807134 blocks (4.5G)
  List of Components :
                                0004AC7C0C3000D
                                0004AC7C0BC500D
                                0004AC7C0C2600D

      Blocksize : 512 bytes
      Strip Size : 128
      Stretch Size : 4
  ReadOnly when Exposed : Off
    Hot Spare Enabled : On
      Hot Spare Exact : Off
  Page Aligned Splits : On
    Read Ahead Enable : Off
  Lazy Parity Update : On
  Read Cache Disable : Off
    Rebuild Priority : 50 %
  Unbuilt Parity Strips : 0
  Unbuilt Data Strips : 0
  Invalid Array Strips : 0

```

Figure 36. Portion of the SSA Configuration Dump File

## 7. Service Aids

This menu choice simply provides information on how to access service aids.

To actually access the service aids, select **SSA Adapter List** from the main menu, press Enter, then Enter again when the adapter list is displayed. Use the down arrow key to navigate to the **Disk Service Aids** selection, then press Enter. A list of the disks in the system is displayed. From here it is possible to do the following on a selected SSA physical disk drive:

- Format
- Certify (verifies all data on a disk can be read correctly)
- Set Service Mode (enables you to determine location of a drive)
- Run diagnostics

**Creating an Array:** The SSA RAID Adapter supports RAID 0, 1 and 5 arrays (not RAID 1 enhanced). The following table describes the minimum and maximum number of drives support for each type of array.

RAID Level	Minimum Number of Drives	Maximum Number of Drives
0	2	16
1	2	2
5	3	16

Use the following steps to create an array:

1. Start the SSA RAID Configurator by double-clicking on the appropriate icon on your desktop.
2. As this is the first time you will have run this utility, all of the SSA hard disk drives in your system will be in the New Disks category. Once a disk drive is used in an array it will never return to the New Disk list, but rather it will be viewable in the Free Resources list.

If you have used the disks in a previous PC SSA RAID configuration, they will appear in the Free Resources list rather than the New Disks list.

To view the disks available, use the up and down arrow keys to navigate to the New Disk menu item and press Enter.

Figure 37 appears.

List of New Disk			
SSA UID/Array Name	Status	Adapter	
1. AC7E6173	Online	25	
2. AC7E8F8A	Online	25	
3. AC7E719F	Online	25	
4. AC7E7274	Online	25	
5. AC7E793D	Online	25	
6. AC7DFD22	Online	25	
7. AC7E9D2D	Online	25	
8. AC7E8FA5	Online	25	

Figure 37. List of New Disks Window

The hexadecimal numbers listed in the second column of Figure 37 are the unique numbers each SSA hard disk drive has burnt into it when it is manufactured. Each drive will only have one number. Figure 37 shows eight disks, therefore eight unique numbers.

The numbers listed in the fourth column of Figure 37 (all 25) under the heading Adapter are the node numbers that are assigned to the adapter by the software. The node number is internally derived.

3. Before you are able to create arrays, you must move the SSA hard disk drives in the New Disk category to the Free Resource category. To do this, select the drive you wish to move and press Enter. Press Esc and repeat the process until you have selected all of the drives you want (probably all of them). Press Esc twice to return to the main menu.

Select the **Free Resources** menu item and press Enter. Figure 38 will be displayed.

List of Free Resource			
SSA UID/Array Name	Status	Adapter	
1. AC7E6173	Online	25	
2. AC7E8F8A	Online	25	
3. AC7E719F	Online	25	
4. AC7E7274	Online	25	
5. AC7E793D	Online	25	
6. AC7DFD22	Online	25	
7. AC7E9D2D	Online	25	
8. AC7E8FA5	Online	25	

Figure 38. List of Free Resources Window. All the disks listed here can be used in new arrays.

4. Go back to the main menu by pressing the Esc key.
5. Select **SSA Adapter List** from the main menu and press Enter.

The following window is displayed:

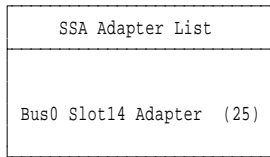


Figure 39. SSA Adapter List Window

Bus0 means the adapter is inserted in PCI bus number 0. Slot14 means the SSA RAID Adapter is in PCI slot 14. 25 means that the adapter node number is 25. These are internally derived numbers.

6. Press Enter to view the adapter details.

The following window is displayed:

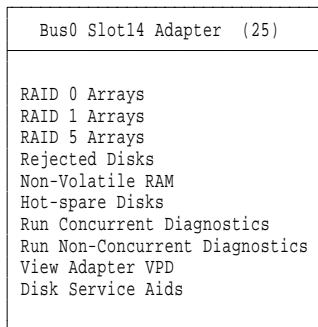


Figure 40. Adapter Details Window

7. To create an array, select the RAID configuration from this menu. For this example we are creating a RAID 5 array, so select **RAID 5 Arrays** from the menu and press Enter.

The following window is displayed:

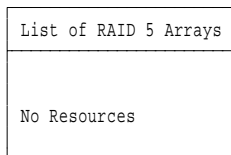


Figure 41. Creating a RAID 5 Array

8. Press the Ins key to create an array.

The following window is displayed:

Filter Attributes for RAID 5 Arrays	
SSA UID/Array Name	: ARRAY1
Blocksize	: 512
Strip Size	: 128
Stretch Size	: 4
Hot Spare Enabled	: 1
Hot Spare Exact	: 0
Rebuild Priority	: 50

Figure 42. Attributes for the RAID 5 Array

9. Type in the array name you wish. In this example the array has been named ARRAY1. An array name must be unique and can be a maximum of 14 characters long. It can contain alphanumerics, underscores and blanks only.

Modify any of the other parameters listed in Figure 42. To get help on any of the parameters, press F1. The parameters are listed alphabetically in the help window.

**Note:** The list of parameters varies depending on which RAID level you choose (RAID 0, 1 or 5).

Once you have entered the array name and modified any other parameters, use the down arrow key to navigate to the last selection in the list, then press Enter.

The following window is displayed:

Members of RAID 5 Arrays
No Members

Figure 43. Selecting the Members of a New RAID 5 Array

10. Press the Ins key to display a list of drives available for inclusion in your array.

The following window is displayed:

Candidates for RAID 5 Arrays			
	SSA UID	Status	Size
1.	AC7E8FA5	Online	2.3G
2.	AC7E9D2D	Online	2.3G
3.	AC7DFD22	Online	2.3G
4.	AC7E793D	Online	2.3G
5.	AC7E7274	Online	2.3G
6.	AC7E719F	Online	2.3G
7.	AC7E8F8A	Online	2.3G
8.	AC7E6173	Online	2.3G

Figure 44. Potential Drives for Use in a New RAID 5 Array

11. Use the up and down arrow keys to navigate to the drive you wish to select and press the Enter key.

**Hint**

To determine which of the physical disks match those listed in Figure 44, use the function keys F9 and F10 to *flash* each of the drives. Pressing F9 makes the *in use* LED blink, while F10 turns it back off again.

The following window is displayed after selecting the first drive:

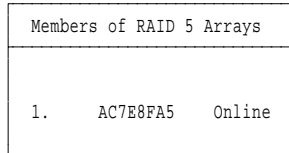


Figure 45. Selecting the First Member of a RAID 5 Array

12. Repeat steps 10 and 11 until you have selected all the drives you want to be part of your array.
13. Press the Esc key when you are ready to create your array.

The following window will be displayed:

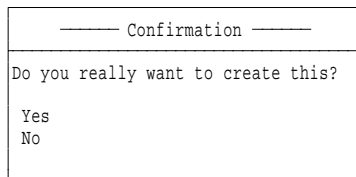


Figure 46. Confirming the Creation of an Array

**Note:** If you do not have enough disks selected to create the desired RAID configuration, a warning message will be displayed:

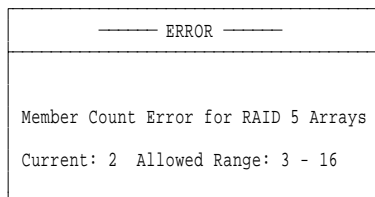


Figure 47. Not Enough or Too Many Drives Selected

This particular message is saying that only two disks have been selected to make a RAID 5 array. The system needs a minimum of three disks to make a RAID 5 array. Refer to Table 5 on page 48 for the minimum and maximum number of drives supported for each RAID level.

To rectify this situation, simply press the Esc key to clear the error message box and press the Ins key to display the list of available drives again. Select another drive to add to the array and continue.

14. Select **Yes** to create the array.

The following window will be displayed:



List of RAID 5 Arrays	
1. ARRAY1	Online (ReBuilding - 7%)

Figure 48. Array Initialization in Progress

15. The system will initialize your array automatically.

The array may take some time to initialize, depending on the amount of disks you have added to it and the RAID level used; that is, the greater amount of disks, the longer time taken. Also, RAID 5 takes longer to initialize than RAID 0.

**Note:** The % complete counter does not automatically update. To view the percentage completion of the initialization, you will need to press Esc and then press Enter to return to the progress window.

When your array is completely initialized, the following window will be displayed when you press Esc and then Enter again:

List of RAID 5 Arrays	
1. Array1	Online (Good)

Figure 49. Array Initialization Complete

16. If you press Enter now, you will be able to look at the array details and the drives that the array contains.

The following window will be displayed.

View RAID 5 Arrays	
SSA UID/Array Name	: Array1
Status	: Online (Good)
Number Of Members	: 3
Capacity	: 8807134 blocks (4.5G)
Blocksize	: 512 bytes
Strip Size	: 128
Stretch Size	: 4
Hot Spare Enabled	: On
Hot Spare Exact	: Off
Rebuild Priority	: 50 %
V	

Figure 50. Array Status Window. Note the window is scrollable.

If you press the down arrow key to navigate the menu list to the **View Members** selection and press Enter, a list of the drives in your array will be shown, as below:

Members of RAID 5 Arrays		
1.	AC7E8FA5	Present
2.	AC7E9D2D	Present
3.	AC7DFD22	Present

Figure 51. Members of an Array

Selecting a drive by using the up and down arrow keys to navigate, then pressing Enter will display details about each individual drive in the array.

- Now the array must be made available to the operating system. For the SSA Configurator, the array must be placed in the System Resources list. To do this press the Esc key three times until you are back at the main menu window. Select **System Resources** and press Enter.

The following window will be displayed:

List of System Resource		
SSA UID/Array Name	Status	Adapter Disk
No Resources		

Figure 52. System Resources Window

Press the Ins key to display your new array.

The following window will be displayed:

Candidates for System Resource			
SSA UID	Status	Size	
1. Array1	Online	4.5G	
2. AC7E734B	Online	2.3G	

Figure 53. Adding an Array to the List of System Resources. Notice you can make single drives as well as arrays into system resources. This means you use individual hard disks without first having to put them into arrays.

Select **Array1** and press Enter.

The following window will be displayed:

List of System Resource		
SSA UID/Array Name	Status	Adapter Disk
1. Array1	Online	25 14h

Figure 54. List of System Resources Window

Your array is now created.

### Logical Drives

SSA RAID does not use the logical drive concept, which is familiar to users of SCSI RAID adapters. In SSA you create an array, then go directly to your NOS and create partitions in your array space. The actual array appears to your NOS as a logical drive and can then be partitioned as required, using your NOS disk tools.

**Other Configuration Functions:** The standard compliment of RAID array administration functions are available for the SSA RAID Adapter. These include:

- Defining hot-spares
- Changing array attributes
- Deleting arrays

- Forcing a rebuild of a drive onto another drive

For information on these functions, consult the *Installation and User's Guide* for the SSA RAID Adapter.

### 2.4.3.3 Expand an OS/2 Warp Server with an SSA RAID Device

If you want to expand your IBM PC Server by adding the SSA RAID Adapter to an existing SCSI adapter with a running OS/2 Warp Server, use the SSA RAID installation program for installing the OS/2 SSA RAID device and the SSA RAID configurator.

To install the SSA RAID device drivers on a running system perform the following steps:

1. Insert the PC Server SSA RAID OS/2 Drivers diskette in drive A.
2. At an OS/2 window, type:

```
A:\INSTALL
```

The install program will copy all necessary device drivers to the appropriate directory and modify your system's CONFIG.SYS file so that the device drivers are loaded at the next boot time.

The install program will also copy the utility software to the directory \SSA on your boot drive and create an SSA RAID folder on your desktop with icons for the following programs:

- SSA Configurator
- SSA Event Logger
- SSA Topology Application

3. Shut down and reboot your server.

To run the SSA Configurator, double-click on the **SSA Configurator** icon (see Figure 55). Create arrays as per "Creating an Array" on page 48.

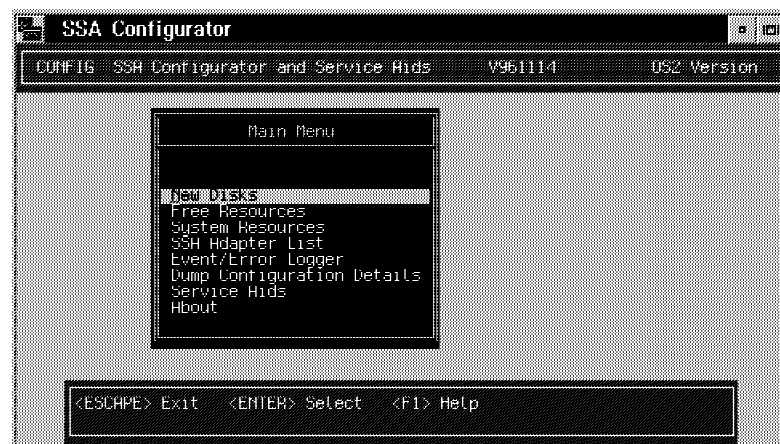


Figure 55. Running OS/2 SSA Configurator

To use the space that you create in your new array, you will need to run the OS/2 FDISK program, to create OS/2 partitions. Remember you'll need to format the partitions before you can access them.

**Error Logging:** The error logging capability under OS/2 is automatically installed when you install the SSA RAID OS/2 device drivers and utilities. A shadow of the SSA Event Logger is placed in your system startup folder.

To view error logs, run the SSA Configurator and select **Event/Error Logger**. You can either view any log entries that have occurred or you can dump the log to a text file. If you choose to dump the log, you will be asked to provide a path name and file to dump the error log to. You can then view the log with any text editor.

An example of the log is:

```
Date and time: 12:15:32 06-06-97
SSA unique ID: g6902110
Error type: Adapter
Template: SSA_LINK_OPEN
SRN: 45002
Flag: Current
```

The error logger should always be running as a background task. In the event of an error, the following window appears on the screen:



Figure 56. Pop-Up Message When an Error Occurs

The error log specifies any errors that have occurred as SRNs, or *service request numbers*. Refer to Appendix B of *SSA RAID Adapter Installation and User's Guide*, S32H-3816 for a listing of these numbers and what they mean.

**SSA Topology Application:** This program shows a graphical representation of the SSA network, showing for instance what happens when a disk is removed or added to the network. It is updated in real time.

Figure 57 on page 57 shows an example of the topology program showing four hard disks connected to one port of an SSA adapter. The four drives are installed in a 3527 enclosure.

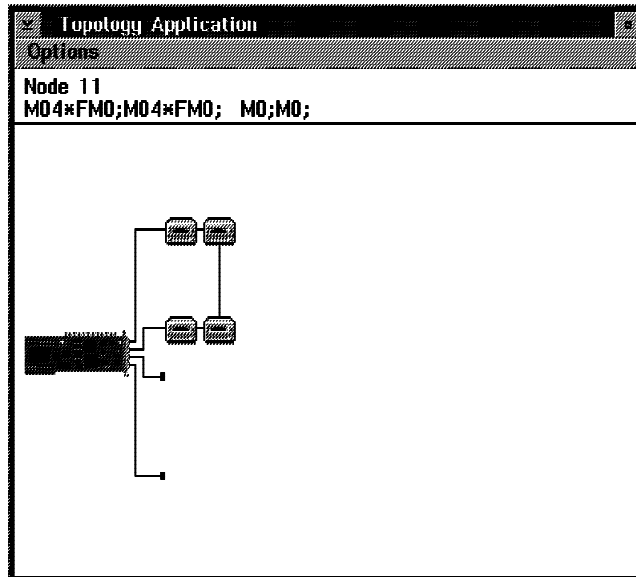


Figure 57. SSA Topology Application

#### 2.4.3.4 Install an OS/2 Warp Server on an SSA RAID Device

If you want to use the SSA RAID device as your primary boot device, perform the following steps to install OS/2 Warp Server onto an SSA disk:

1. Boot from the DOS Configurator and Utilities diskette to configure and attach an SSA resource to your PC Server.

##### Configuration with the DOS Configurator Utilities Diskette

To configure your SSA resource:

1. Insert the SSA RAID DOS Configurator and Utilities diskette in your disk drive.
2. Press Ctrl+Alt+Del to reboot your system.
3. Verify the time and date or just press Enter twice to bypass them. At the DOS prompt type:

```
A:\ISSACFG
```

Then press Enter.

4. Follow the instructions in your *SSA Installation and User's Guide* and see 2.4.3.2, "SSA Configurator Utility" on page 45 for further installation and configuration information.

2. Modify the second installation disk:

- a. Edit the config.sys and add the following statements:

```
BASEDEV=ISSAPCI.ADD
BASEDEV=ISSADSK.ADD
SET COPYFROMFLOPPY=1
```

Add them before the first BASEDEV= statement in the config.sys file. This causes the SSA device drivers to load first.

- b. Copy ISSAPCI.ADD and ISSADSK.ADD from the OS/2 Device Driver and Utilities diskette onto the second installation diskette.

You will need approximately 196000 bytes of free space and depending on your system configuration you may be able to delete some of the following files in order to provide room for the SSA device drivers:

IBM2FLPY.ADD Supports disk drives on Micro Channel computers.

IBM2SCSI.ADD Supports SCSI hard drives on Micro Channel systems.

**Note**

The two device drivers listed above can only be deleted from an installation diskette associated with an EISA/PCI PC Server. The MCA/PCI PC Server (for example PC Server 720) requires all of the above.

You can also delete vendor options (for example, CD-ROM drivers) depending on which hardware is installed on your server.

3. Before you start the installation read also the README.TXT file on OS/2 Device Driver and Utilities diskette for further information.
4. After the successful installation of the OS/2 Warp Server remember to install the SSA Configurator, the SSA Event Logger and the SSA Topology Application as described in step 2 on page 55 in 2.4.3.3, "Expand an OS/2 Warp Server with an SSA RAID Device" on page 55.

---

## Chapter 3. Pre-Installation Considerations

The purpose of this chapter is to provide you with a set of hardware, software, and capacity planning guidelines to help you on your way to a trouble-free installation of OS/2 Warp Server.

---

### 3.1 Hardware Requirements

To install OS/2 Warp Server on your IBM PC Server you must meet the following minimum hardware requirements:

- A minimum of 32 MB of random access memory (RAM). The amount depends upon which services you install.
- A minimum of 120 MB of available hard disk space is required for the installation of File and Print Services. For the installation requirements of additional services, please refer to 3.1.1, "OS/2 Warp Server Hard Disk Space Requirements."
- A 1.44-MB 3.5-inch diskette drive, configured as drive A.
- VGA or higher video support.
- An OS/2 compatible CD-ROM.
- A LAN adapter card that is supported by Adapters and Protocol Services.

With the exception of the LAN adapter, IBM PC Servers are shipped with the above minimum hardware configuration. Insure that you select a LAN adapter that will meet the above specifications prior to installing OS/2 Warp Server.

**Note:** You may need additional CPU speed, hard disk space, or RAM if you want to install additional software. Check the requirements of the software you want to install prior to installation of Warp Server.

#### Supported Hardware

You can find the most current information on OS/2 Warp Server supported hardware at the following URL:

<http://www.software.ibm.com/warp-server>

#### 3.1.1 OS/2 Warp Server Hard Disk Space Requirements

The information in the following table provides the hard disk space requirements for implementing a new OS/2 Warp Server.

Service	Server Hard Disk Requirements (MB)
OS/2 Warp base operating system	71.5
Adapters and Protocols Services (MPTS)	9.5
OS/2 Warp Server Files	13.0
SWAPPER.DAT (recommended)	40.0
File and Print Sharing Services	20.0
Remote Access Services	5.5

Service	Server Hard Disk Requirements (MB)
System Management Services	45.5
Backup and Recovery Services	3.5
Advanced Print Services	54.0
TCP/IP Services	22.5
On-line References	10.0

### 3.1.2 OS/2 Warp Server Memory Requirements

OS/2 Warp Server, in addition to including the base OS/2 Warp operating system, offers the ability to run many services, of which all or any combination may be installed and active on a system.

Since memory is a limited and expensive resource that can dramatically affect performance, you must understand the various services' memory requirements to properly size the system. Table 7 shows the memory requirements for an operational system. The memory values are *working-set* numbers, meaning that the specified amount of memory was touched (used) during a defined time period. For each service, the memory values were measured when only that service was active and performing its typical functions.

When you estimate memory requirements, it is essential that you make a provision for all services that might reside on OS/2 Warp Server at any one time in order to obtain optimal performance. However, most programs require more memory during startup than normal operation; by sizing those peaks you can achieve very good performance but at a high cost. The performance reserve number is sized to remove most, but not all, startup peak memory requirements, trading off memory for startup time.

You can choose to accept slower startup times, for smaller performance reserves memory requirements if desired. The numbers in Table 7 reflect the memory requirements for normal operations for a minimum configuration system and estimates for a multi-client configuration when the two significantly differ. Add the memory requirements for the services you want to run concurrently to estimate your total OS/2 Warp Server memory requirements.

Service	Minimum Configuration (MB)	Multi-client Configuration (MB)
OS/2 Warp base operating system	6.0	-
Remote Access Services	3.3	-
System Management Services	6.7	Up to 44.0 <b>.1</b>
Backup and Recovery Services	1.9	-
Advanced Print Services	1.8	-
File and Print Services - Entry	6.1	-
Diskcache	1.0 <b>.2</b>	Up to 14.0 <b>.2</b>
HPFS cache	1.0 <b>.2</b>	Up to 2.0 <b>.2</b>
File and Print Services - Advanced	7.1	12.0
386HPFS cache	3.0 <b>.2</b>	All available memory <b>.2</b>



Table 7 (Page 2 of 2). OS/2 Warp Server Memory Requirements		
Service	Minimum Configuration (MB)	Multi-client Configuration (MB)
Performance reserve	6.0	12.0

**Notes:**

1. For more detailed information regarding multi-client memory configuration requirements, refer to *NetFinity Server Up and Running*.
2. File system cache size affects the performance of File and Print Services. The more memory assigned to file system cache for a file and print server, the better the performance will be.

You should size your system memory requirements by adding the memory requirements for the base operating system plus each service that will be concurrently active. A generous allowance for file-system cache is important for good file and print sharing (LAN Server) performance. (See the document titled *IBM OS/2 Warp Server Up and Running: Planning Overview*, which accompanies the OS/2 Warp Server product, for more information about system memory sizing.)

---

## 3.2 Software Considerations

Observe the following restrictions when installing or migrating OS/2 Warp Server and OS/2 Warp Server Clients:

- IBM LAN Requester 5.0 cannot be installed over IBM Peer for OS/2 from Warp Connect. IBM Peer for OS/2 must be removed before installing LAN Requester.
- NetWare File and Print Gateway Service Version 2.11 for OS/2 cannot be installed over previous versions of the NetWare Client. Previous versions of NetWare Client must be removed before this NetWare File and Print Gateway Service 2.11 can be installed.
- The NetWare File and Print Gateway Service is the same level of code as in previous versions of Warp Server (uni-processor version). Therefore, if during installation you receive a message stating that the gateway service is already installed, you do not need to remove the existing version of the gateway service; nor do you need to install the gateway service, as it is already present on the server.

Each service included in OS/2 Warp Server can be installed over the same or previous versions of that service, except for the following restrictions:

- OS/2 Warp Server software cannot be installed over a previously installed LAN Distance Connection Server or LAN Distance Remote. Run LDREMOVE to remove LAN Distance Connection Server before installing any OS/2 Warp Server software.
- The HPFS386 file system must be removed before migrating the operating system. If 386HPFS is on your system, see the "Migrating or Installing on 386HPFS" section in the online book, *Planning, Installation, and Configuration Guide*. To view this book type the following command at an OS/2 command prompt and press Enter:

```
VIEW d:\CID\SERVER\BOOKS\A3A61M02.INF
```

where d is your CD-ROM drive.

---

### 3.3 Disk Partitioning

We recommend the following partitioning guidelines when preparing your hard disk partitions using FDISK:

- Always install Boot Manager as the first and *only* primary partition on the first hard disk of your server. Doing so will provide you with the means to boot from the Maintenance Partition as well as give you the ability to use SETBOOT from the command line to reboot your server in a pinch.

Refer to the *OS/2 Command Reference* for documentation of the SETBOOT command.

- Create and install a maintenance partition as outlined in Appendix B, "Preparing a Maintenance Partition" on page 253.
- Always define a 400 MB or larger system partition. Make this a *logical* drive.
- Always define a separate logical drive for data. We recommend using separate logical drives for shared programs and data. For example, define logical drive E: as 500 MB for programs, and define logical drive F: as 4000 MB for data.

This type of division of data can save you many headaches when trying to re-install or recover data. If you have to boot from your maintenance partition, you will be able to access all of your drives.

---

### 3.4 Creating OS/2 Warp Server Installation Diskettes

You must create two installation diskettes if you do not have the diskettes that were supplied with the OS/2 Warp Server package. Use the following procedure to create installation diskettes. These two diskettes are used to boot your IBM PC Server such that the OS/2 base operating system can be installed as well as the networking parts of OS/2 Warp Server.

1. Insert the OS/2 Warp Server CD-ROM 1 in the CD-ROM drive.
2. Choose the appropriate procedure:
  - OS/2**            Open an OS/2 Window.
  - DOS**             Start from a command prompt.
  - Windows 3.x/95** Open an MS-DOS prompt.
3. From the command prompt, type the following and press Enter:  
d:  
where d is your CD-ROM drive.
4. At the command prompt, type the following and press Enter:  
CDINST
5. When prompted to do so, insert a blank formatted 1.44 MB 3.5" diskette in drive A. Then press Enter.
6. When the copy is finished, remove the diskette from drive A, and label it OS/2 Diskette 1 for CD-ROM.

7. Insert another blank formatted 1.44 MB 3.5" diskette in drive A. Then press Enter.
8. When the copy is finished, you can remove the diskette from drive A, and label it Installation Diskette for CD-ROM.

You can now use the diskettes you have created to start the OS/2 Warp Server installation.

---

## 3.5 Changes from LAN Server 4.0 to Warp Server

The following sections contain information about enhanced features of LAN Server 4.0 contained in OS/2 Warp Server.

### 3.5.1 New 386 HPFS Default Cache Size

The calculation to determine the default value for the 386 HPFS cache (cachesize) has been changed. Previously, if less than 20 MB of memory was available after OS/2 Warp and LAN Server were loaded, then 20 percent of the available memory would be assigned to cache size. But if more than 20 MB of memory was available, then 60 percent of that memory would be assigned to cache size.

To provide a more consistent increase in cachesize with increases in system memory, the default cachesize parameter is determined as shown in Table 8.

<i>Table 8. OS/2 Warp Server Advanced Default 386 HPFS Cache Size</i>	
<b>Available Memory</b>	<b>386 HPFS Cache Size</b>
0 MB- (4 MB-1B)	256 KB
4 MB- (6 MB-1B)	506 KB
7 MB- (8 MB-1B)	838 KB
9 MB- (10 MB-1B)	1222 KB
11 MB- (12 MB-1B)	1652 KB
15 MB- (16 MB-1B)	2630 KB
19 MB- (20 MB-1B)	3748 KB
23 MB- (24 MB-1B)	4992 KB
27 MB- (28 MB-1B)	6350 KB
31 MB- (32 MB-1B)	7812 KB
32 MB- (96 MB-1B)	(Available Memory - 24 MB)
96 M +	(Available Memory * 0.75)

Available memory is determined by the 386 HPFS file system software at initialization and is the total system memory minus OS/2 Warp memory requirements (about 4 MB) and LAN Server-Advanced 5.0 memory requirements (about 7 MB).

#### Hint

This default 386 HPFS cache size will be replaced at the completion of the installation process by the value that Tuning Assistant calculated for the cachesize parameter. To obtain the values given in Table 8, you must remove the cachesize parameter from the HPFS386.INI file.

### 3.5.2 Eliminating the 24-Bit DMA Question

The LAN Server 4.0 (Advanced only) installation procedures included two panels that asked the user to indicate if the system contained only network adapter cards (busmaster type) and disk adapter cards that supported 24-bit direct memory addressing (DMA). If you were unsure and accepted the default response, then performance would not be optimum in a system that had the required 24-bit DMA adapters.

**Note:** The likelihood of your system having either a busmaster type network adapter or a disk adapter that does not support 24-bit DMA is very small.

The IBM OS/2 Warp Server installation procedure does not ask these questions, but instead automatically detects known network adapters of this type and during the installation process posts an error message warning of the reduced performance. A disk adapter that does not support 24-bit DMA cannot be detected during the installation process, but will be detected and reported when LAN Server 5.0 Advanced is started. Instructions for remedial actions are provided in the error message.

### 3.5.3 Updated Tuning Assistant Command Line Options

Changes to the command line options of the OS/2 Warp Server Tuning Assistant have been made. For a complete discussion of the OS/2 Warp Server Tuning Assistant and the changes, please refer to 7.8.1, "Updated Tuning Assistant Command Line Options" on page 208.

---

## 3.6 Potential Installation Problems and Their Solutions

This section discusses potential problems a system administrator could incur during the installation of OS/2 Warp Server

### 3.6.1 Problems That Are Caused by Improper Hard Disk Format

The following are indications that a hard disk is improperly formatted and requires a long format, as described in 3.6.1.1, "Performing a Long Hard Disk Format" on page 65:

- During installation, a red screen is displayed with an XCOPY error message that says the OS/2 Warp Server installation failed.  
If the installation runs without errors, the following symptoms might still occur.
- If you use the DIR command, it displays the message:  
`SYS0278: The system cannot find the extended attribute.`
- The volume label has strange symbols and characters in it.

- When you run CHKDSK, FDISK, or FDISKPM, the file system displayed for a partition is FAT, even though you formatted the partition as HPFS.
- When you run CHKDSK, it displays either of the following errors:
  - C:\ <drive label> attempted to claim an extended attribute that does not exist.
  - The first cluster number of C:\<drive label> is incorrect.
  - The entry has been truncated.
- If you try to boot up from installation disks and run CHKDSK /F, the following error is displayed:

```
The current hard disk drive is: C: The type of file system for the disk
is FAT SYS0108: The disk is in use or locked by another process.
```

### 3.6.1.1 Performing a Long Hard Disk Format

If a hard disk exhibits any of the symptoms described in 3.6.1, “Problems That Are Caused by Improper Hard Disk Format” on page 64, you can use the following steps to perform a long format of the drive:

1. Reboot with the Installation Diskette and Install Diskette 1.
2. At the blue Welcome screen, press F3 to get to an OS2 command line.
3. At an OS/2 command prompt, type the following command and press Enter:

```
g:\OS2IMAGE\DISK_2\FORMAT c: /FS:HPFS /L
```

where g: is the CD-ROM drive and d: is the partition you are installing OS/2 Warp Server on.



---

## Chapter 4. Installing Warp Server Using ServerGuide 3.1

ServerGuide is a set of CD-ROMs containing installation tools and code designed to aid users in installing their operating systems with a minimum of effort. It is included with all new IBM PC Servers.

The current version, ServerGuide 3.1, aids the installation of all major operating systems. The difference to former versions of ServerGuide is that there are no more encrypted versions of any operating system included in the ServerGuide 3.1 package. You need your own copy of the operating system you want to install.

ServerGuide 3.1 includes seven CDs:

- ServerGuide 3.1 Main CD
- CoPilot CD 1
- CoPilot CD 2
- CoPilot CD 3
- Diskette Factory
- Book Factory
- Fixes CD (Windows NT 4.0 Service Pack 2 and IntranetWare Support Pack 2)

ServerGuide 3.1 provides aids in the installation of the following operating systems:

- OS/2 Warp Server Entry Version 4.0
- OS/2 Warp Server Advanced Version 4.0
- OS/2 Warp Server SMP Version 4.0
- Novell IntranetWare
- SCO Open Server Release 5.0.4
- Windows NT Server 4.0

In addition, ServerGuide 3.1 provides the following products and installation tools at no additional charge:

- Lotus Domino 4.51
- IBM PC Server Rack Configurator 1.0
- IBM AntiVirus 2.52
- APC PowerChute plus
- TME 10 NetFinity 5.0
- AutoPilot
- Book Factory
- Diskette Factory
- System Information Tool
- RAID Manager

This redbook discusses the installation of OS/2 Warp Server Advanced Version 4.0 and also OS/2 Warp Server SMP Version 4.0

---

### 4.1 General ServerGuide Comments

On a 16-MB system, ServerGuide creates a 20-MB partition on the hard disk, which is used as a swapper. ServerGuide requires this space to successfully restart.

There are two solutions:

- Allocate ServerGuide some space on the hard disk so that it can create the needed 20-MB partition.
- Add an additional 16 MB of memory (for a total of 32 MB of memory) to the PC Server.

---

## 4.2 ServerGuide 3.1 and OS/2 Warp Server

For the purposes of this redbook, this chapter concentrates on the aspects of ServerGuide 3.1 as it pertains to the installation of OS/2 Warp Server.

For the installation of OS/2 Warp Server and OS/2 Warp Server SMP, ServerGuide provides assistance building driver diskettes for the various IBM products and the installation diskettes for OS/2 Warp Server and OS/2 Warp Server SMP. However, you will have to make sure that the drivers that you create from the ServerGuide CD-ROM are newer than those provided with the product. You can do this by checking their time and date stamps.

### World Wide Web

For the latest device drivers, software patches, product information, general ServerGuide notes or specific information about your server model and your operating system visit the ServerGuide home page at:

<http://www.us.pc.ibm.com/server/sguide/index.html>

---

## 4.3 Starting ServerGuide

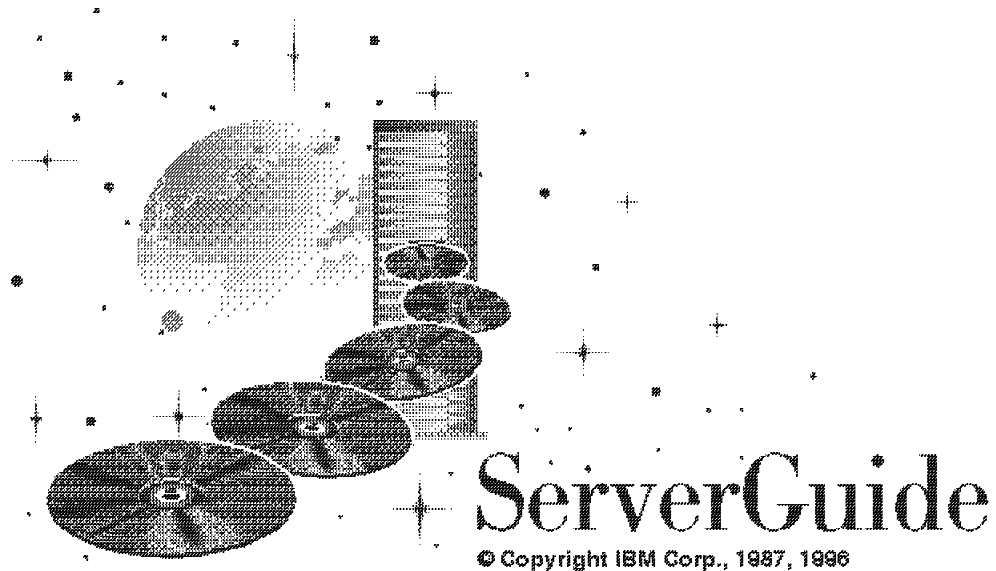


Figure 58. ServerGuide 3.1



Make sure that the write protect tab of the ServerGuide boot diskette is set to write enable. ServerGuide needs to write to the diskette from time to time to store information about your configuration and choices across reboots.

#### Write Protect Tab

If the write protect tab on the ServerGuide startup diskette is set to the write protect position, the server will continuously reboot and ServerGuide will not start. Ensure the diskette is write enabled.

To start ServerGuide, perform the following steps:

1. Insert the ServerGuide boot diskette.
2. Place the CD-ROM marked Main in the CD-ROM drive.
3. Power up or reboot the server.

#### Server Reboots

During this initial phase of ServerGuide, your server may reboot once or twice. This is normal. These reboots are necessary as ServerGuide adds a partition to your drive to accommodate the code it temporarily installs to control the process.

4. Choose a language.

The first panels to be displayed after the booting process completes are the ones to select the language of ServerGuide and the other to select your keyboard and your country code, as shown in Figure 59.

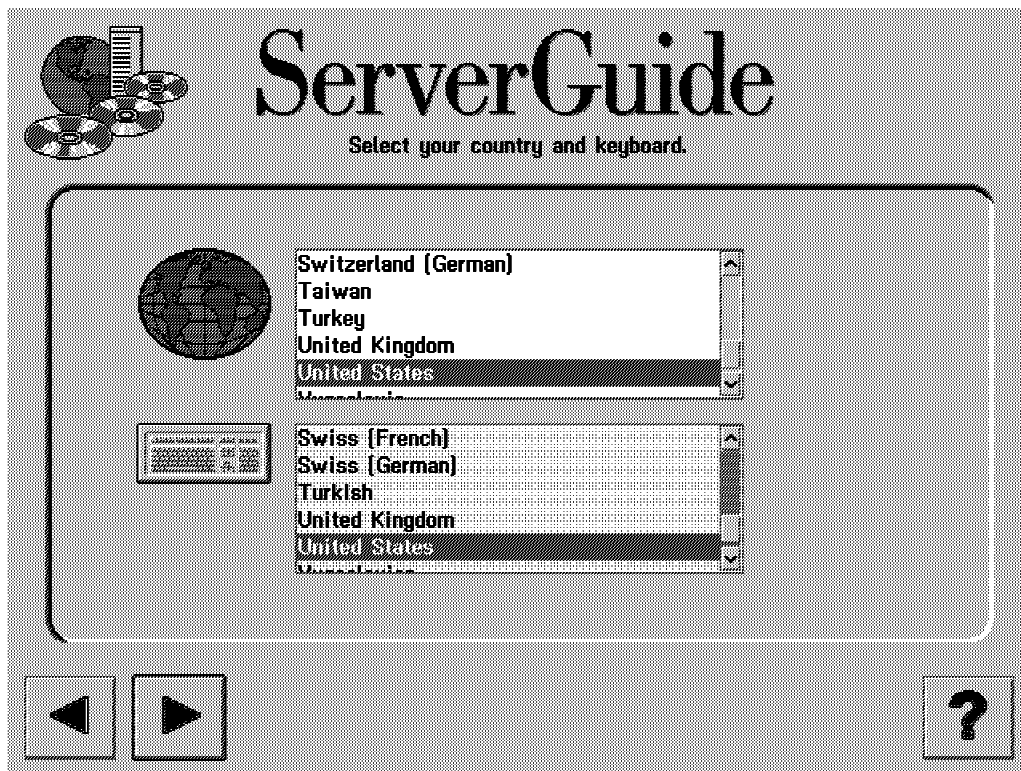


Figure 59. ServerGuide 3.1 Country and Keyboard Selections

Select your country and keyboard; then on the following panel, confirm these choices.

**Note:** ServerGuide will now perform a hardware detection function to determine which IBM components are installed in the server.

The next panel provide you with the option of using AutoPilot or working through the Main Menu.

1. Now you have the choice between the AutoPilot or the Main Menu. If you need to configure your hardware, for example your RAID or Micro Channel configuration, click the **AutoPilot** icon and see 4.4.2, "AutoPilot" on page 73.
2. If you don't need any further hardware configuration, you should click the **Main Menu** icon and the Main Menu is displayed (Figure 61 on page 71). You can also start the AutoPilot through **Utility Programs** from the Main Menu.

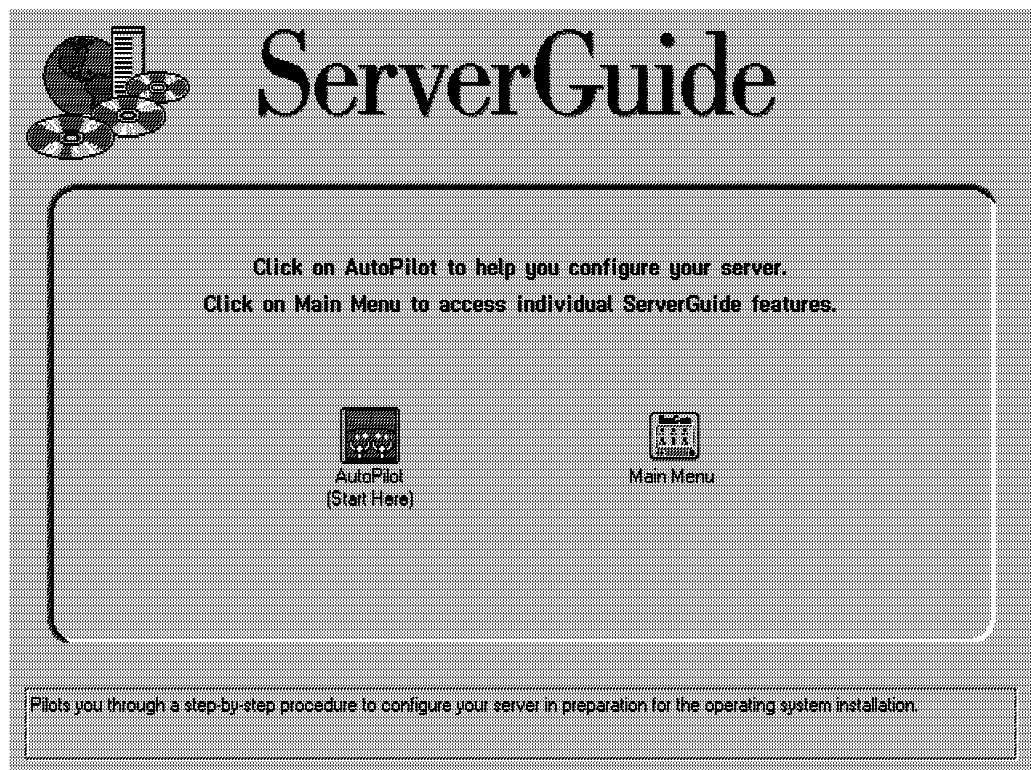


Figure 60. ServerGuide 3.1 AutoPilot or Main Menu Selection Screen

## 4.4 ServerGuide Main Menu

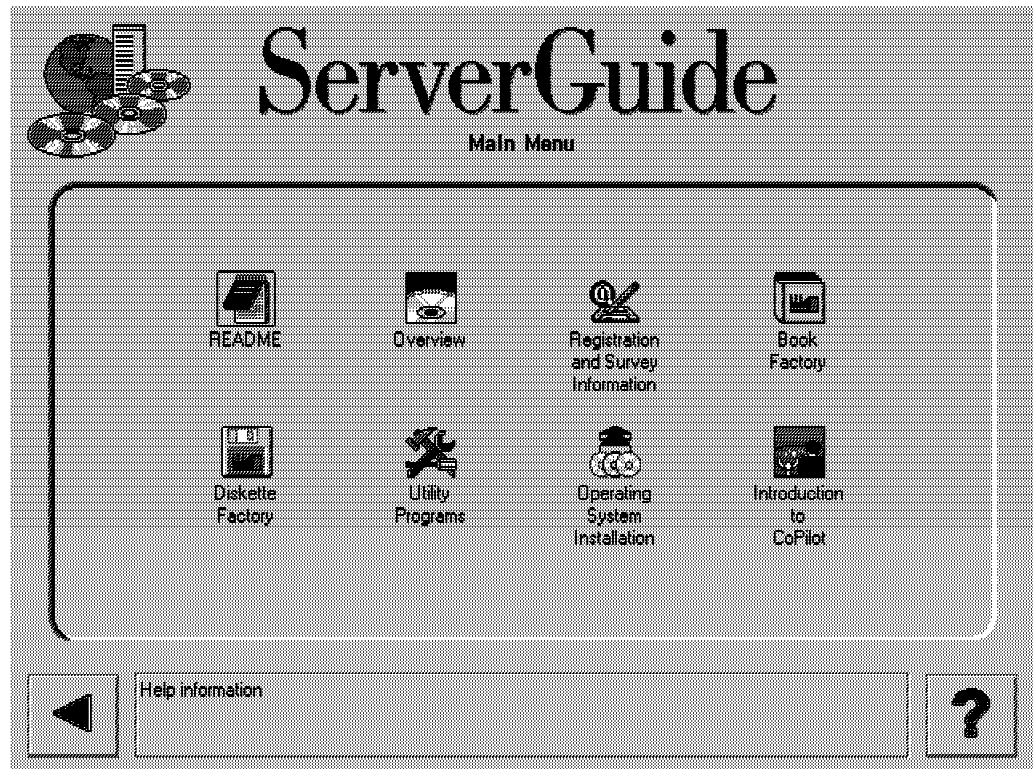


Figure 61. ServerGuide 3.1 Main Menu

From the Main Menu (Figure 61), you can select a number of different options:

- Read Me

This displays some further information about ServerGuide 3.1. It describes how to recreate your ServerGuide diskette should it be damaged, machine requirements for installation using ServerGuide, and any particular restrictions for each operating system including unsupported IBM adapters. It is recommended that you review the README file before you start.

**Note:** The README file can be viewed on a separate OS/2 machine directly from the main CD-ROM by issuing the command (where x: is your CD-ROM drive):

```
view x:\mri\en\readme.inf
```

- Overview

This option introduces you to ServerGuide, and explains what functions it can perform to help you install your operating systems.

- Registration and Survey Information

Here you get information about registering your IBM PC Server with IBM.

- Book Factory

From here, you can view online or print (in PostScript format) any of the following:

- Manuals that came with your IBM PC Server
- The IBM NetFinity publications

- The various integration guides, including the previous version of this book
- The PC Server Selection Guide
- Diskette Factory
 

This lets you create reference, driver, diagnostic and utility diskettes for your hardware and operating system. You can select diskettes suitable for your PC Server (which ServerGuide automatically detects), diskettes for IBM and some non-IBM adapters, and diskettes to install IBM AntiVirus, and IBM NetFinity.
- Utility Programs
 

From here, you can:

  - View your hardware configuration using the System Information Tool.
  - Perform RAID administration on your SCSI RAID subsystem using IBM NetFinity's RAID Administration.
  - Start AutoPilot to guide you through the process of configuring your server in preparation for operating system installation. AutoPilot is discussed in more detail in 4.4.2, "AutoPilot" on page 73.
- Operating System Installation
 

Here you can install any of the supported operating systems using your own license CD.

For OS/2 Warp Server or OS/2 Warp Server SMP installation, ServerGuide will create your OS/2 Warp Server Server boot diskettes direct from the ServerGuide Main CD. Blank diskettes are provided for this use.
- Introducing to CoPilot
 

This option displays an overview and additional information about the CoPilot CDs.

## 4.4.1 CoPilot

ServerGuide CoPilot is a facility to install the additional software that is provided in the ServerGuide package. CoPilot can be started by running `\SCOS2.COMD` from the CoPilot CD-ROM #1, #2 and #3. CD-ROM #1 includes IBM NetFinity 5.0, IBM Anti Virus 2.52, APC PowerChute plus and the Rack Configurator 1.0. CD-ROM #2 includes Lotus Domino 4.51 (English and French version) and CD-ROM #3 includes Lotus Domino 4.51 (Spanish, German and Italian version)

### — Installing TME 10 NetFinity —

Before you install TME 10 NetFinity from the CoPilot CD, you must have a LAN adapter installed and connected to the LAN; otherwise, the installation process will not complete. Although you can install TME 10 NetFinity, you cannot configure for remote LAN operations.

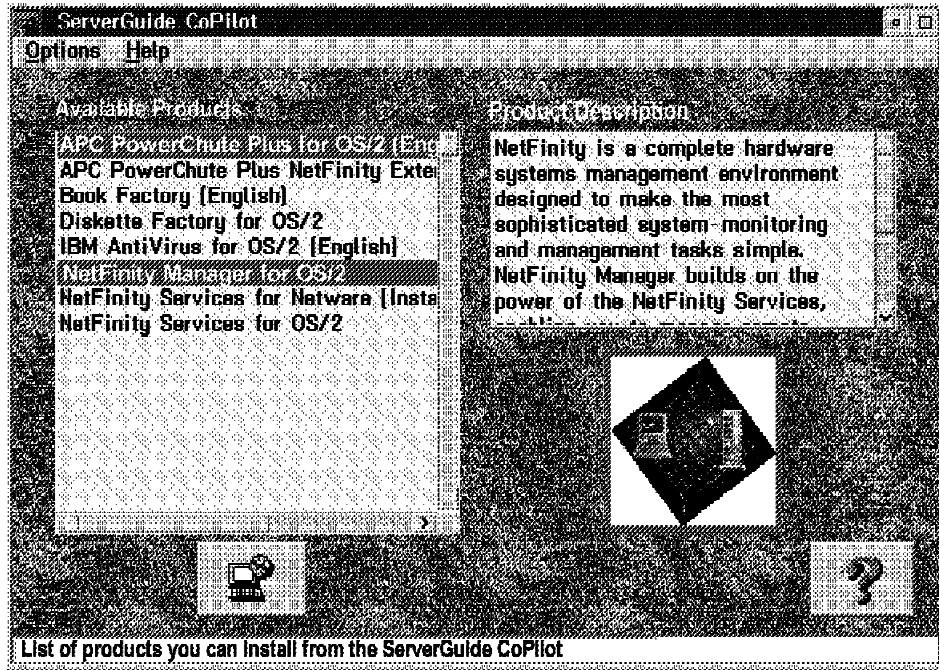



Figure 62. ServerGuide 3.1 Started CoPilot from CD-ROM #1

The CoPilot utility is shown in Figure 62. By selecting the appropriate product you wish to install on this machine, and clicking on the install button  , the install utility for that product will start.

## 4.4.2 AutoPilot

AutoPilot lets you learn about ServerGuide and then be guided step-by-step through the hardware configuration of the server. It includes checking (and if necessary updating) the BIOS level, configuring the adapters, and configuring the disk arrays. At each stage, the server online documentation is available for reference.

AutoPilot will display some of the following choices. An example of this is shown in Figure 63 on page 74.

- ServerGuide overview
- RAID configuration (when a RAID adapter is detected in your system)
- Micro Channel configuration (when detected)
- EISA configuration (when detected)
- Flash BIOS update (when the update is available)

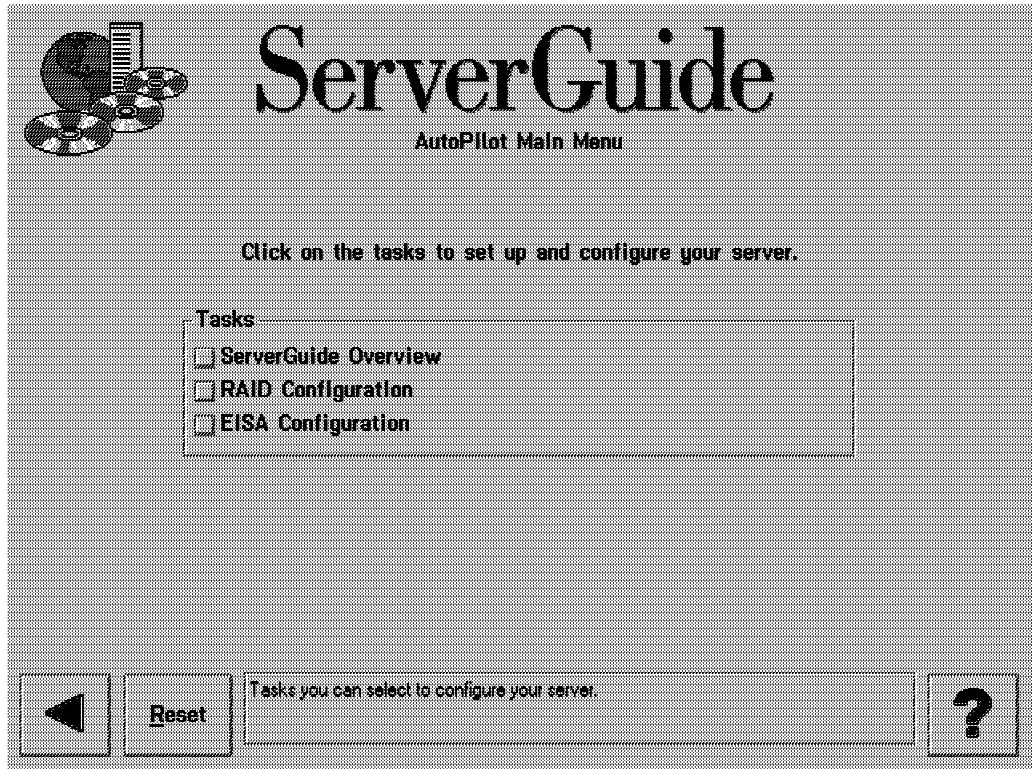


Figure 63. ServerGuide 3.1 AutoPilot Main Menu

Many of the options will help you create the appropriate diskettes and then request that you reboot the server to perform the action.

---

## 4.5 Installing OS/2 Warp Server Using ServerGuide

ServerGuide aids your installation by helping you build the necessary diskettes for use during the installation process. To install OS/2 Warp Server using ServerGuide 3.1, perform the following steps:

1. From the main menu, select **Operating System Installation**.
2. The list of supported operating systems is shown. Click on **IBM OS/2** (see Figure 64 on page 75).

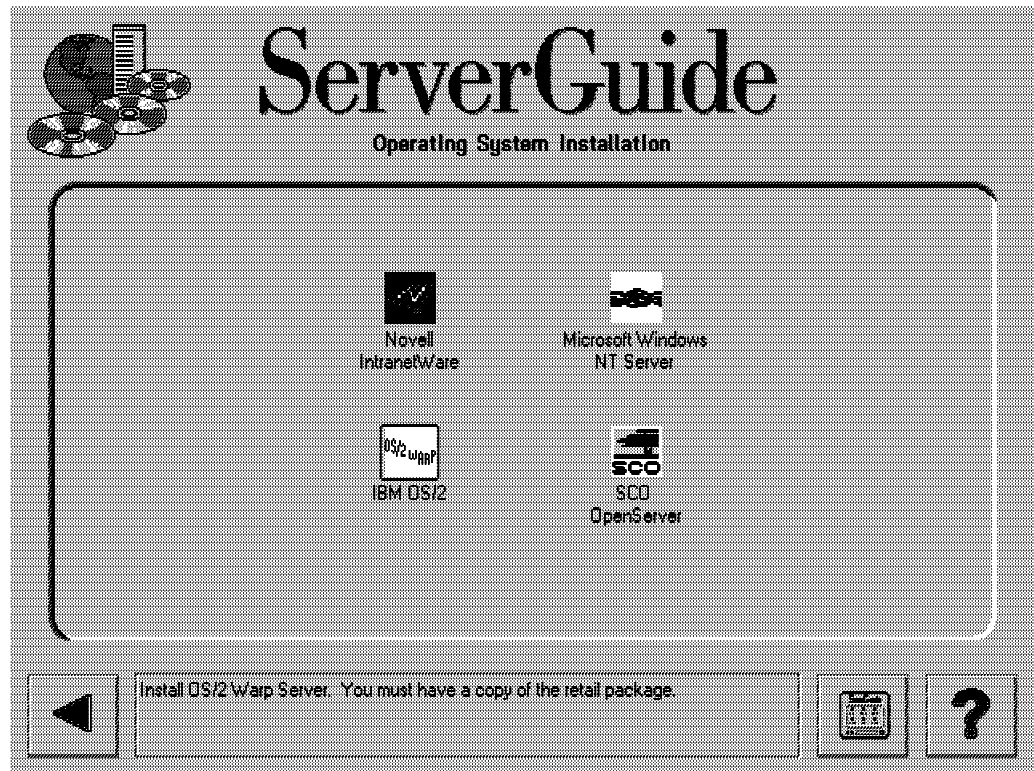



Figure 64. ServerGuide 3.1 Operating System Installation

3. The panel shown in Figure 65 on page 76 appears. Select **OS/2 Warp Server Advanced Version 4.0** from the versions and under Method for OS/2 Warp Server CD installation, select **With diskettes for OS/2 "advanced installation" path** and click the forward button .

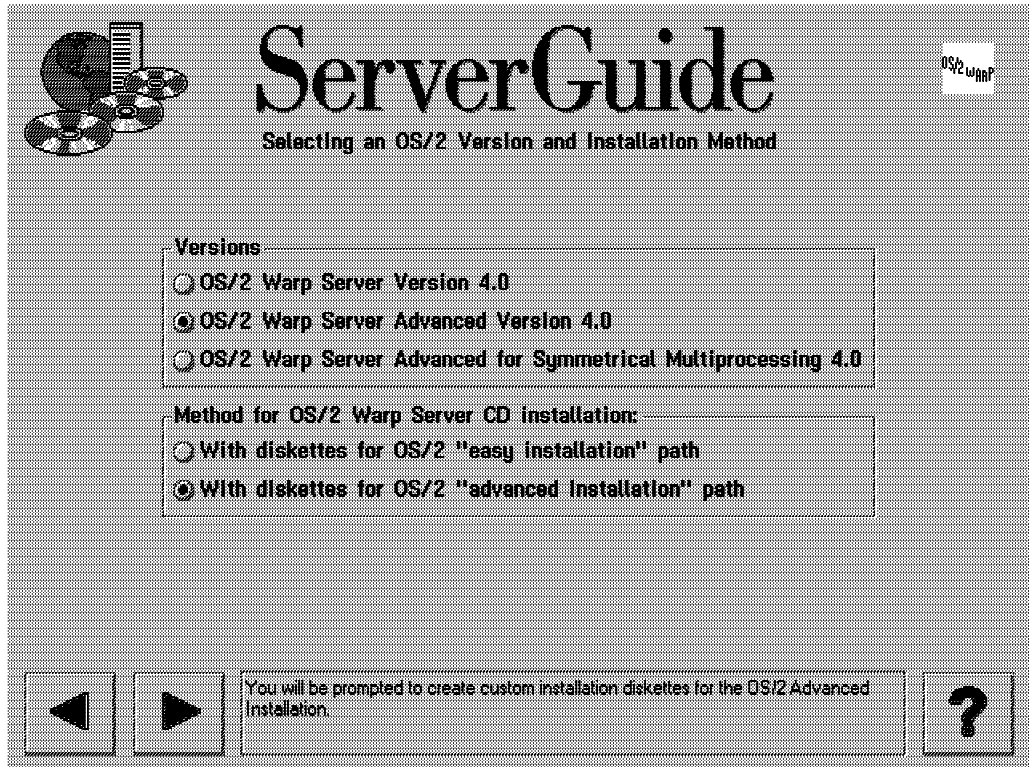


Figure 65. Selecting OS/2 Warp Server from ServerGuide 3.1

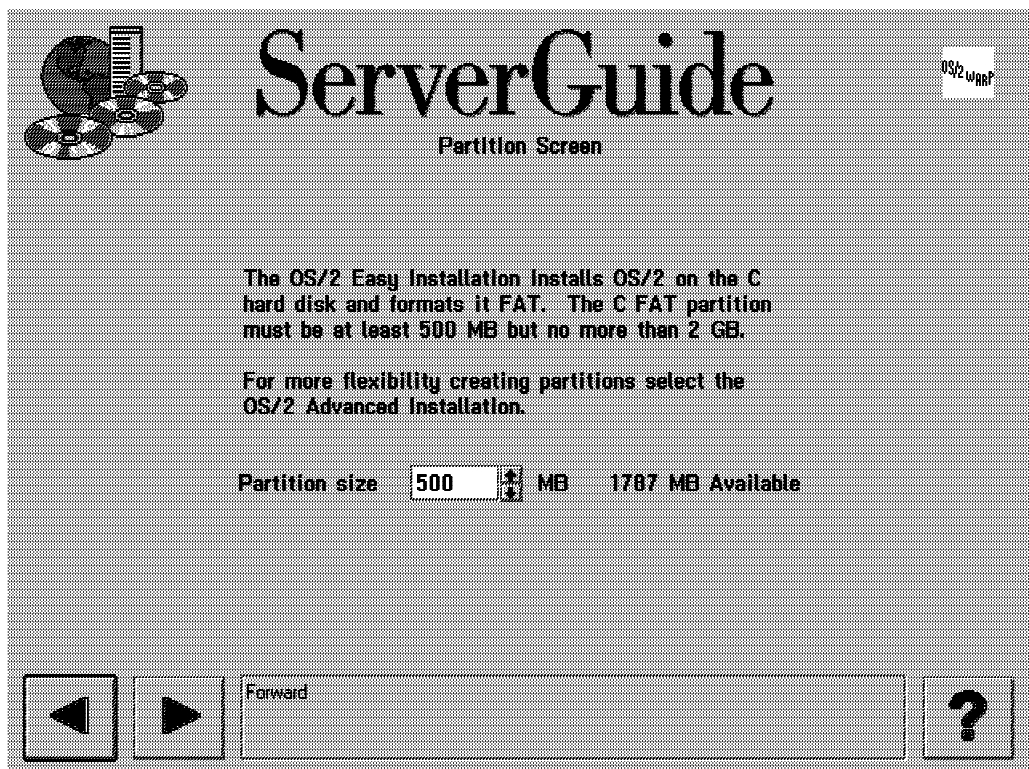


Figure 66. ServerGuide 3.1 Partition Screen



**Note**

If you select the easy installation path, the ServerGuide partition screen appears to prepare the partitioning (see Figure 66). You should accept the default size of a 500-MB partition or change it to a more desirable size. ServerGuide will do the partitioning and reboots your server.

4. The panel Installed Adapters comes up. ServerGuide 3.1 automatically detects what hardware you have installed in your server. For this example, the IBM PC Server 704 in Figure 67 is displayed.

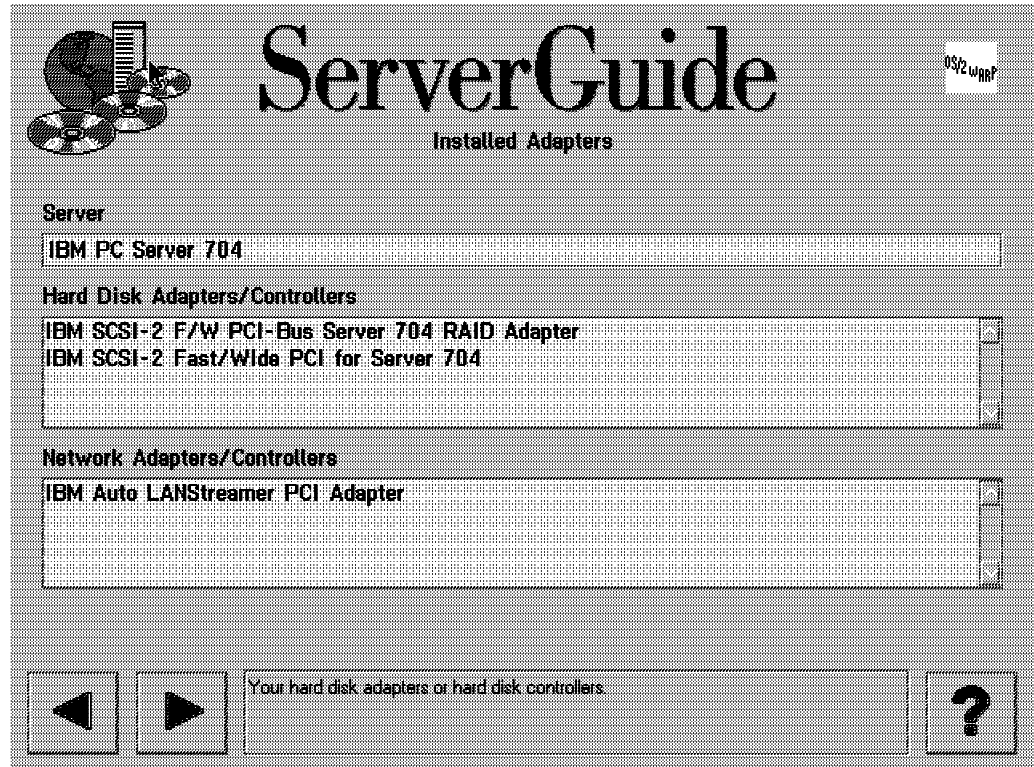



Figure 67. ServerGuide 3.1 Installed Adapters/Controllers

Once you are satisfied with this panel, click on the forward button  to continue with the installation.

5. A list box now appears showing recommended diskette packages and optional diskette packages. Select the ones you want to build.

Our IBM PC Server 704 in Figure 68 on page 78 is displayed. The optional diskette packages may include drivers that are at a later level than those supplied on the OS/2 Warp Server CD-ROM.

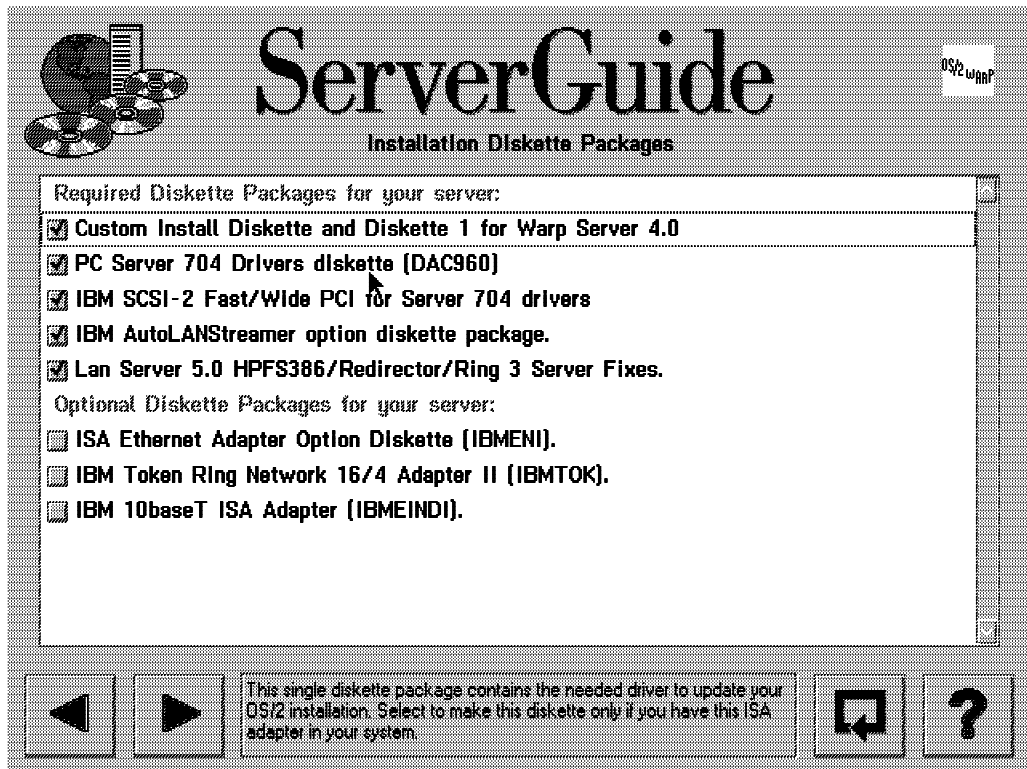




Figure 68. ServerGuide 3.1 Installation Diskette Packages

6. If you wish to build any of the packages, ensure they are selected. Mark the check boxes of the following diskette packages for the server:
  - Custom Install Diskette and Diskette 1 for Warp Server 4.0
  - PC Server 704 Drivers diskette (DAC960)
  - IBM SCSI-2 Fast/Wide PCI for Server 704 drivers
  - IBM AutoLANStreamer option diskette package
  - LAN Server 5.0 HPFS386/Redirector/Ring 3 Server Fixes

Then click the forward button  to continue.

You will then be given the opportunity to de-select any specific diskettes within the packages. After clicking on the forward button, you will be prompted to insert appropriate CD-ROMs and insert successive blank diskettes into your diskette drive to create the diskettes. Write the appropriate label information on each diskette for future reference.

**Note:** Some diskette packages require that the diskettes be blank as well as formatted prior to being used in the process. You may need to use another computer to prepare the diskettes you wish to use.

7. After you have built all diskettes you need, click the forward button  and you will be prompted to insert the OS/2 Installation disk.
8. Insert the OS/2 Installation disk and click on the **OK** button.
9. Now you will be prompted to insert the OS/2 Warp Server Advanced Product CD (see Figure 69 on page 79). Insert the CD and click the **OK** button.

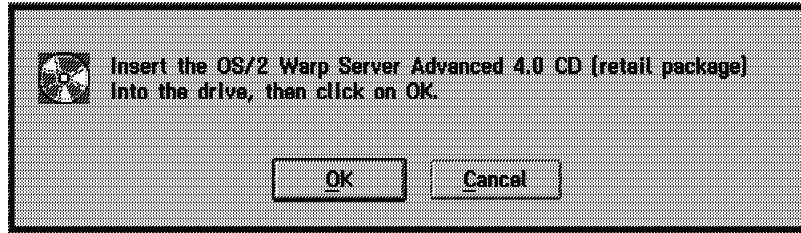


Figure 69. ServerGuide 3.1 Prompt for the Product CD

10. After ServerGuide has checked the CD, your server is ready to reboot and a final prompt window appears on your screen (see Figure 70).



Figure 70. ServerGuide 3.1 Final Prompt to Begin the Installation

By clicking the **OK** button the work of ServerGuide is done. The normal installation process of OS/2 Warp Server begins. See 5.2, "Installation of OS/2 Warp Server with Base OS/2 Warp 3.0" on page 82 to guide you through the installation of OS/2 Warp Server and OS/2 Warp Server SMP.



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## Chapter 5. Installing OS/2 Warp Server on an IBM PC Server



Figure 71. The OS/2 Warp Server

This chapter covers the steps required to install the generally available (GA) OS/2 Warp Server code as well as describes the steps needed to install OS/2 Warp Server with an OS/2 Warp 4.0 base on your IBM PC Server.

**Note:** If you followed the ServerGuide path in Chapter 4, "Installing Warp Server Using ServerGuide 3.1" on page 67, then you should continue with 5.2, "Installation of OS/2 Warp Server with Base OS/2 Warp 3.0" on page 82.

The first section of this chapter walks you through an advanced installation of OS/2 Warp Server with File and Print Sharing Services only. If you need additional services, please refer to *Inside OS/2 Warp Server, Volume 1: Exploring the Core Components*, SG24-4602-00.

We performed this installation on both an IBM PC Server 330 and an IBM PC Server 704. Although the IBM PC Server 704 is a Symmetric Multiprocessing (SMP) server, the install methods only differ slightly from the installation on the IBM PC Server 330. We let you know where the installation steps differ from one another.

---

### 5.1 Installation Checklist

Below is a list of the software items used in the following installations. Your needs will vary depending on the installation path that you follow.

- OS/2 Warp Server Advanced CD-ROM 1
- OS/2 Warp Server Advanced SMP CD-ROM
- OS/2 Warp Family FixPak 26 XR\_W026
- OS/2 Warp Server: LAN Server Advanced V500 IP08265
- OS/2 Warp 4.0 CD-ROM
- OS/2 Warp 4.0 CSF Kicker Diskettes (CSFBOOT.1DK and CSFBOOT.2DK)
- OS/2 Warp 4.0 Family FixPak XR\_M001 Diskettes (XR\_M001.1DK thru XR\_M001.9DK)

#### Additional Information

For additional information on where to obtain IBM software and Fix Packs, be sure to look at Appendix C, "Sources of Drivers and Information" on page 259.

## 5.2 Installation of OS/2 Warp Server with Base OS/2 Warp 3.0

The base operating system shipped with OS/2 Warp Server Advanced, OS/2 Warp Server Entry and OS/2 Warp Server SMP is OS/2 Warp 3.0. It's a proofed, powerful and integrated combination that builds this NOS.

#### Installation Assumptions

The following installation procedures assume that you are installing on a new hard drive, with no partitions defined.

### 5.2.1 Installation of OS/2 Warp Server and OS/2 Warp Server SMP

In this section, we show you a base installation of OS/2 Warp Server Advanced 4.0 and OS/2 Warp Server Advanced SMP. The installation of Warp Server Advanced SMP is so similar to the installation of Warp Server Advanced 4.0 that we put them both together in one section. We let you know where there are differences. This section is the smooth continuation of the ServerGuide installation in Chapter 4, "Installing Warp Server Using ServerGuide 3.1" on page 67.

#### World Wide Web

IBM's WWW site contains a wealth of information about OS/2 Warp Server. For the latest information on OS/2 Warp Server refer to URL:

<http://www.software.ibm.com/os/warp-server/>

To install OS/2 Warp Server or OS/2 Warp Server SMP:

1. Insert the Installation diskette for CD-ROM into drive A.
2. Insert the OS/2 Warp 4.0 CD-ROM into the CD-ROM drive.
3. If your server is already on, press Ctrl+Alt+Del to restart it, otherwise, turn on the server.
4. When prompted to do so, remove the Installation diskette for CD-ROM from drive A and insert the OS/2 Warp 3.0 Diskette 1 for CD-ROM. Then press Enter.
5. When the Welcome screen is displayed, read the information and press Enter to continue (see also Figure 72 on page 83).

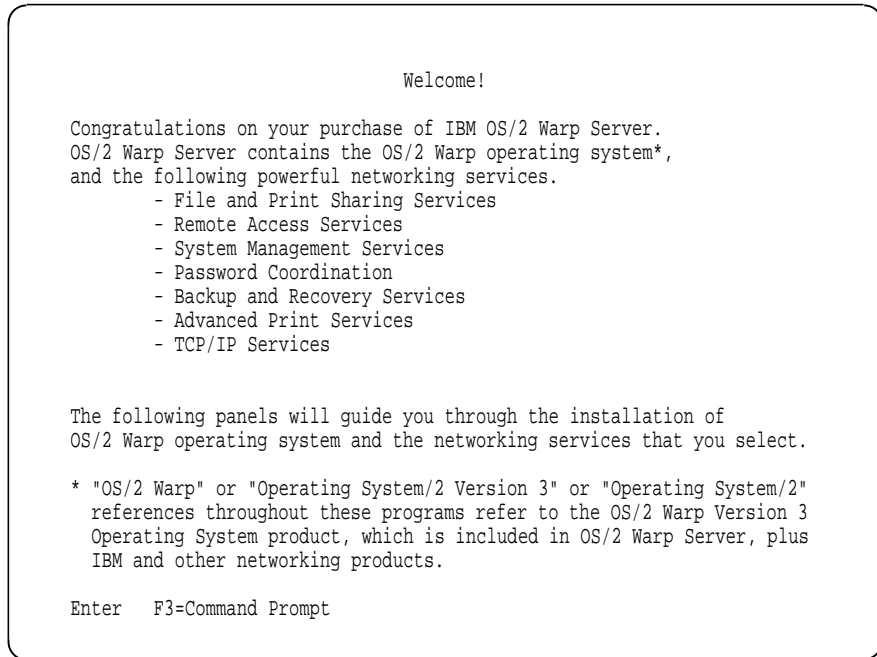


Figure 72. OS/2 Warp 3.0 Welcome Screen

6. At the (easy and advanced) Installation screen, select **Advanced** and press Enter (see Figure 73).

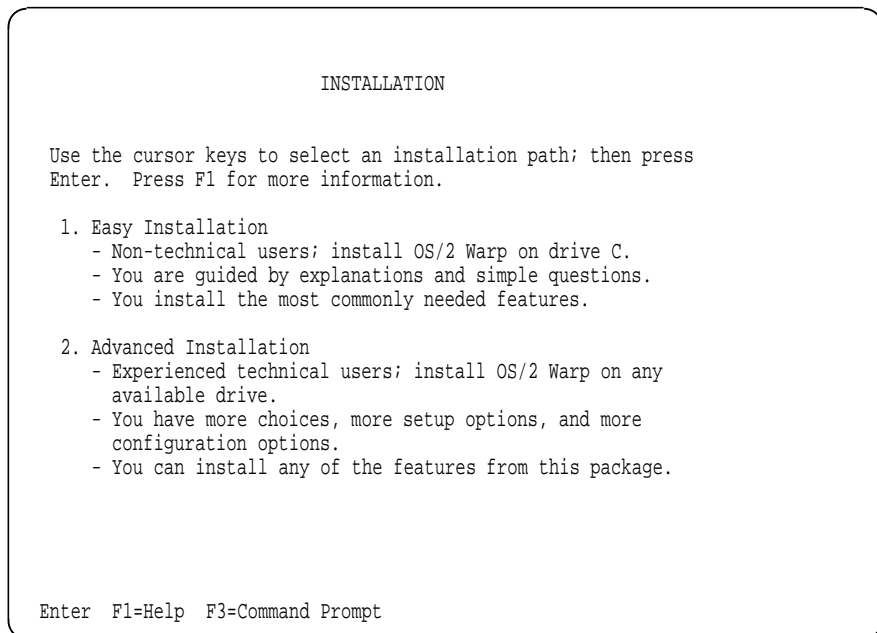


Figure 73. Installation Screen

7. When the Installation Drive Selection screen is displayed, you will have the option to Accept the drive or Specify a different drive or partition. If you followed the instructions in Chapter 4, "Installing Warp Server Using ServerGuide 3.1" on page 67, accept the drive and continue. Otherwise, use the arrow keys on your keyboard to select **Specify a different drive or partition**. Then press Enter.

8. A message window is displayed. Read the message and press Enter. The FDISK screen is displayed.

Prior to using FDISK, you should determine the number of partitions that will exist on this server. In this example, you should create a primary partition at least 500 MB in size to install Warp Server. Create additional partitions as necessary. Then save your settings and exit FDISK.

If you need to install Boot Manager then you can press F1 in FDISK to get help, which includes more information about creating a primary partition on which to run Boot Manager. You might need to delete and re-create an existing partition.

**Important Note**

If you plan to create a maintenance partition (see Appendix B, "Preparing a Maintenance Partition" on page 253), you will want to set up those partitions at this time. Refer to 3.3, "Disk Partitioning" on page 62 for recommended hard disk partition geometry and creation methods.

After you change partitions in FDISK and save the changes, the server must be restarted so that the partitions can be recognized during installation. Follow the instructions on the screen and restart the installation with step 4 on page 82.

9. The Formatting the installation partition screen is displayed. Select **Format the partition** and press Enter to continue.
10. The Select the File System window is displayed. Select **High Performance File System** and press Enter.
11. A message window is displayed. Read the message and press Enter to continue.
12. The Installing OS/2 Warp 3.0 progress screen is displayed. When prompted to do so, remove the diskette from drive A. Then press Enter. The server restarts.
13. The System Configuration window is displayed as seen in Figure 74 on page 85. Check the country configuration and hardware device types to insure that they are correct for your server. If you are unsure about the hardware you are using, refer to your *IBM PC Server User's Guide*.



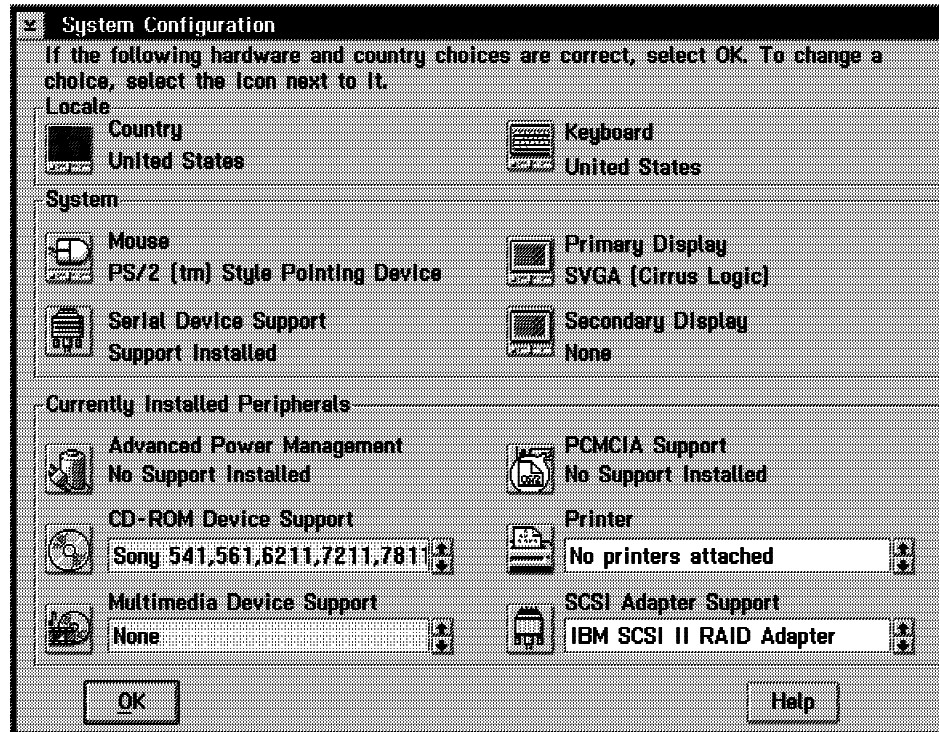


Figure 74. System Configuration Window

14. Select the icon next to **Primary Display** to show the Display Driver Install window. Select **Video Graphics Array (VGA)**, as seen in Figure 75 and click on **OK**.

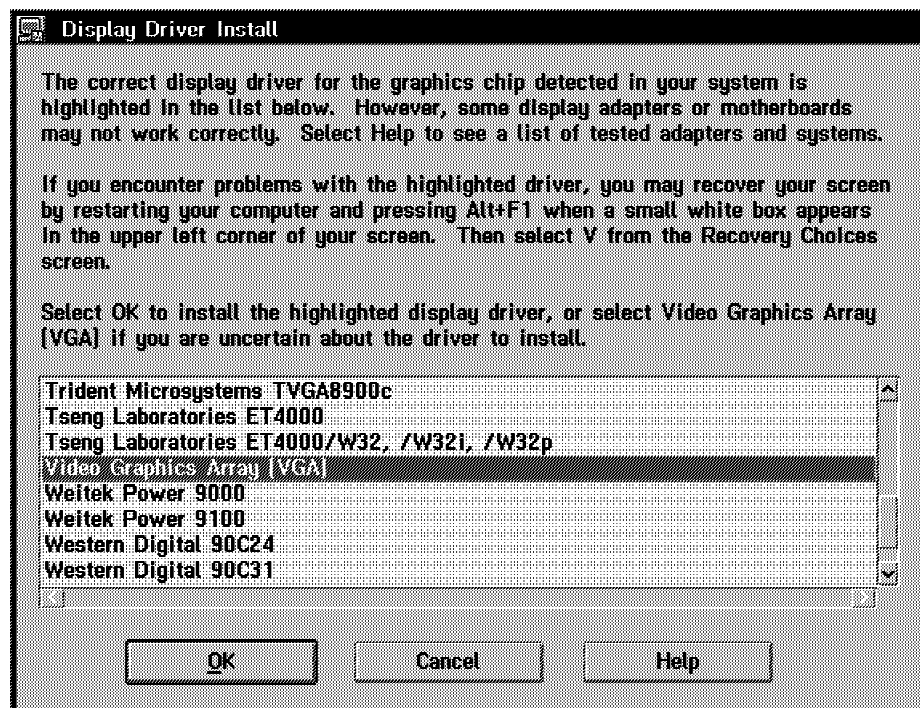


Figure 75. Display Driver Install Window

### VGA Selection

We recommend using VGA for your servers' display mode. Certain problems can be traced to video selections other than VGA. It will also give you optimal performance both locally, and remotely. (In the case of Remote Workstation Control, see Chapter 8, "Using IBM NetFinity 5.0 with OS/2 Warp Server" on page 219.)

15. Select the icon next to **Printer** to display the Select System Default Printer window as pictured in Figure 76.

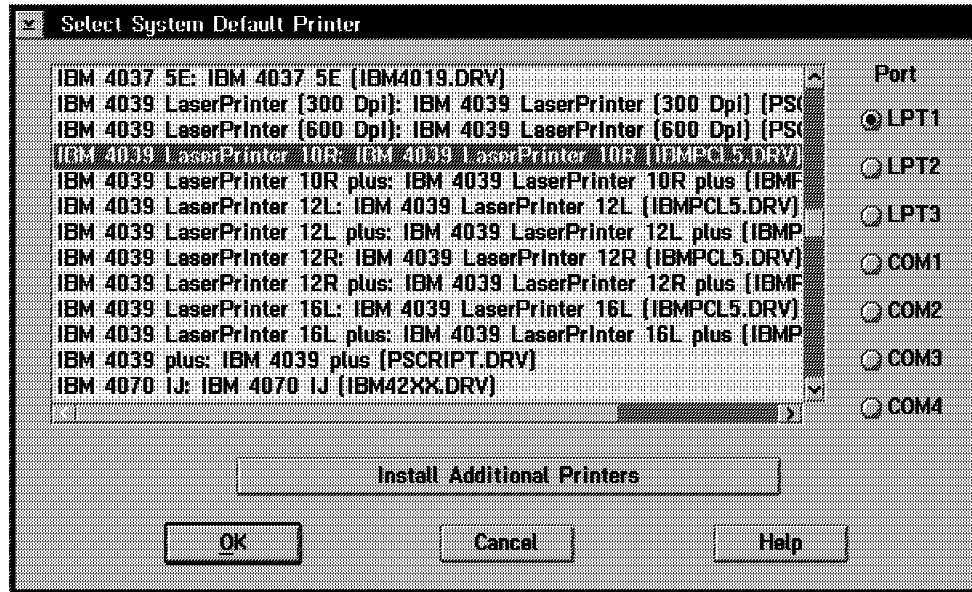


Figure 76. Select System Default Printer Window

16. Select the proper printer(s) for your server. If you do not have any printers attached, or plan to use LAN-attached printers, then leave the default selection. Click **OK**.
17. You will now be presented with the System Configuration window again as in Figure 74 on page 85. Click **OK** to display the OS/2 Setup and Configuration window (see Figure 77 on page 87). Select the **Software configuration** menu item and select **Change OS/2 parameters....**

### Note

Figure 77 on page 87 shows the setup screen of the OS/2 Warp Server SMP Version. You can see it at the additional check box Symmetric Multiprocessor Support.

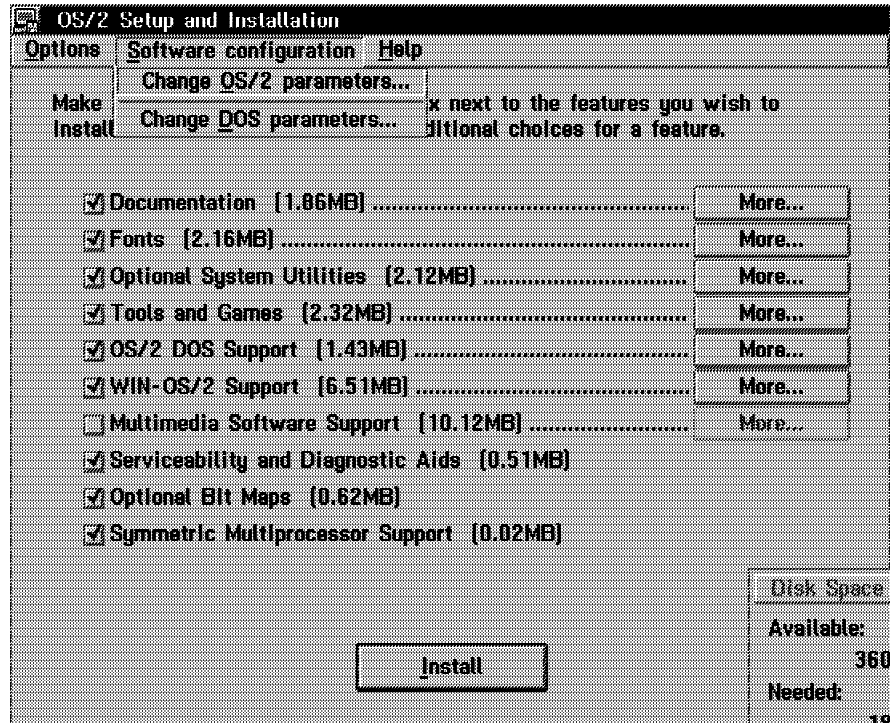


Figure 77. OS/2 Setup and Configuration Window (SMP Version)

18. The OS/2 Configuration window is now displayed (refer to Figure 78). We recommend changing the Swap Minfree value to 20480, as the default value of 2 MB is far too small for a server. It is also a good idea to increase the number of threads to a value of 1024. Click **OK** to save these values and return to Figure 77.

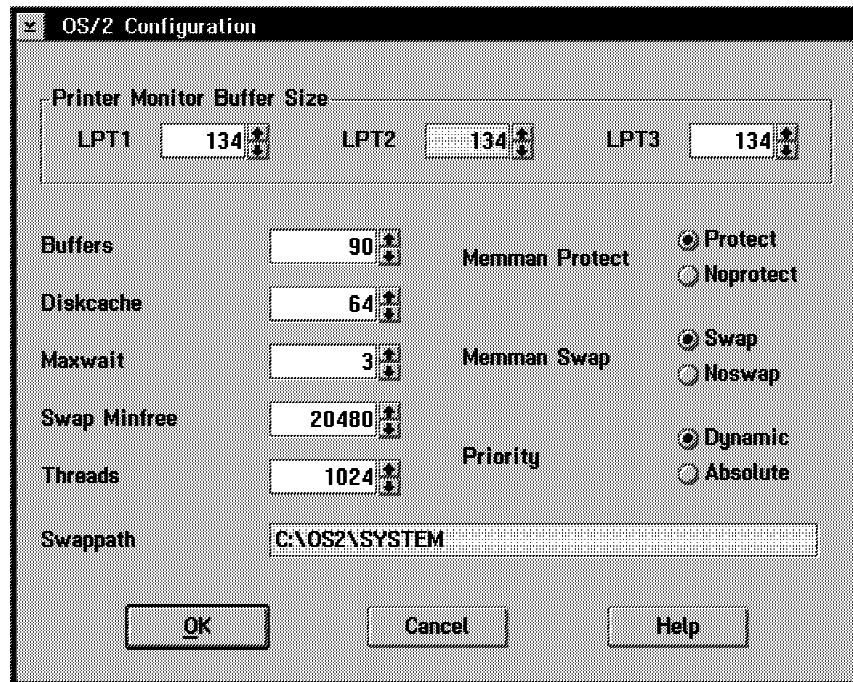


Figure 78. OS/2 Configuration Window

19. There are several items that can be de-selected to save space on your system partition. To deselect click the **More...** button to the right of for example, Documentation or Tools and Games, and uncheck the selected check boxes.
20. To conserve space as well as reduce the amount of memory used by OS/2, we also recommend unchecking **Multimedia Software Support**, as shown in Figure 77 on page 87. Multimedia support is seldom needed on a server.
21. You are now ready to continue. Select **Next** to display the window in Figure 79. Uncheck the **Add existing programs to your Desktop** check box, as you have no existing programs. This will reduce the amount of clutter on your desktop after installation completes. Click **OK** to continue.

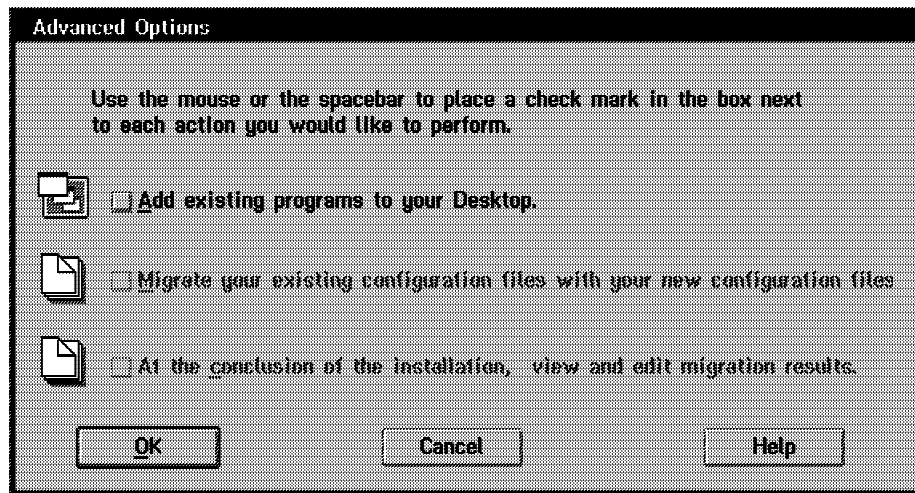


Figure 79. Advanced Options

22. The information window (see Figure 80) is now displayed. Fill in the fields on this screen with the information that is requested and click **OK**.

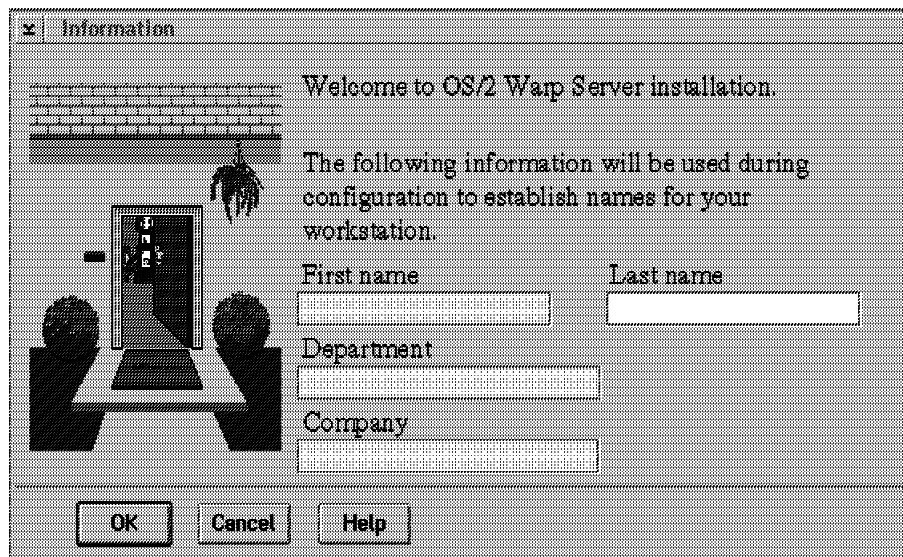


Figure 80. Information Window

23. You will now be presented with the OS/2 Warp Server Setup and Installation window, as pictured in Figure 81 on page 89. Select the **File and Print**

Sharing Services check box, as seen in Figure 81 on page 89 and click the OK button to continue.

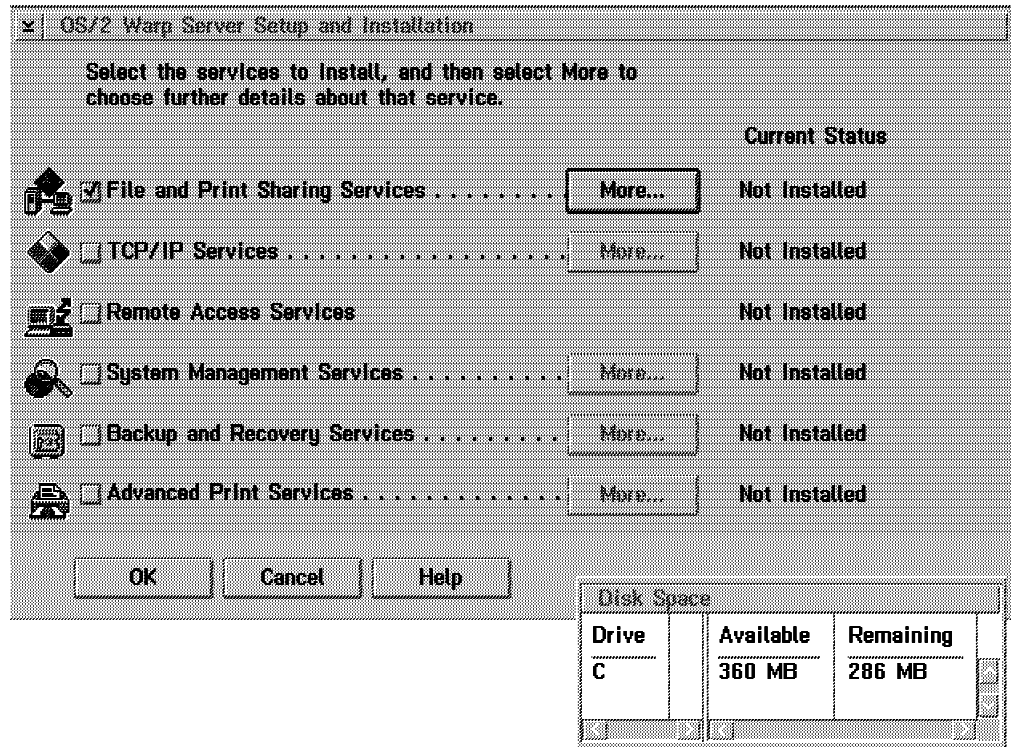


Figure 81. OS/2 Warp Setup and Installation Window

24. The Configuration window is now displayed as seen in Figure 82 on page 90. Notice the key in the right panel of the window. To begin the installation you must correctly configure each list item in the left panel of the Configuration window.

We will start with the File and Print Sharing Services. Select the **File and Print Sharing Services** and the right panel resembles that of Figure 83 on page 90.

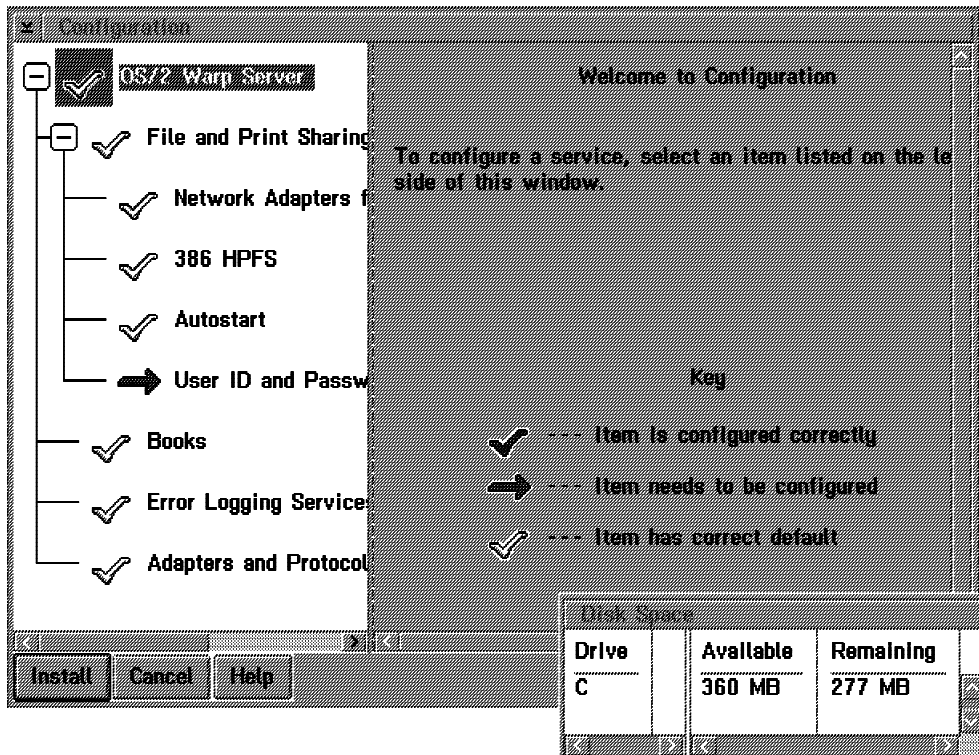


Figure 82. Configuration Window - Welcome to Configuration

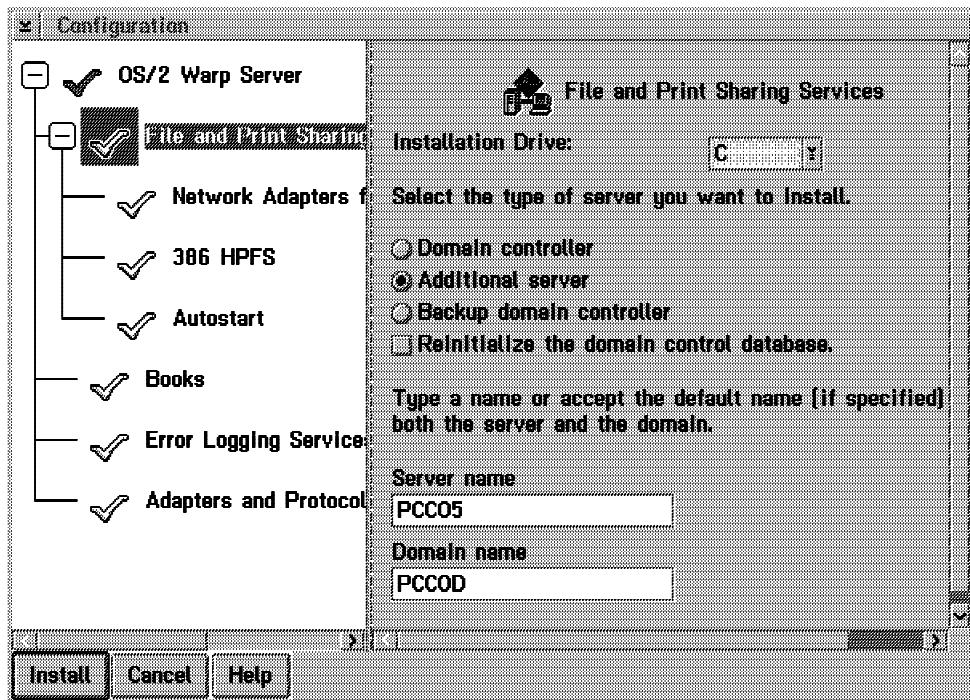


Figure 83. Configuration Window - File and Print Sharing Services

25. The only values that will need to be supplied on this screen are the Server Name and the Domain Name values. The names used here are up to you to provide and should be unique within your network. Our installation is an example of an additional server that will work in the existing domain PCCOD.

26. Enter the names you will use and then select the **Network Adapters** item under File and Print Sharing Services. The window pictured in Figure 84 on page 91 will be displayed.

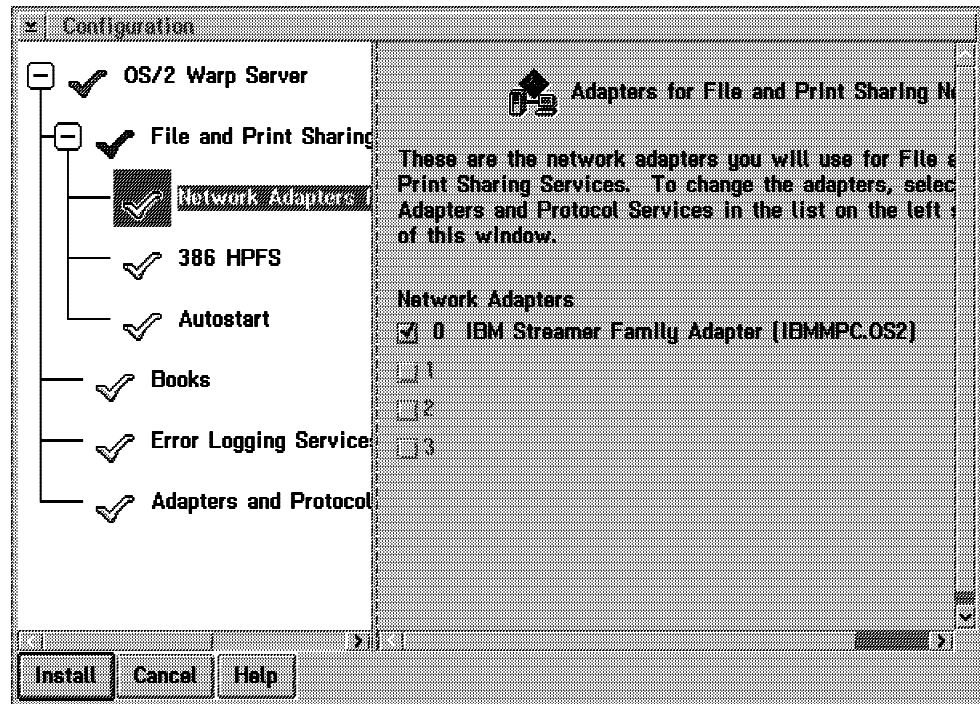


Figure 84. Configuration Window - Adapters for File and Print Sharing Network

27. This panel displays the network adapter(s) that will be used for File and Print Sharing Services. Select the **386 HPFS** item under File and Print Sharing Services. The window pictured in Figure 85 on page 92 contains parameters that affect the 386 HPFS file system. You can accept the default values. More information detailing these parameters and their usage is contained in *Inside OS/2 Warp Server, Volume 1: Exploring the Core Components*, SG24-4602-00. You may also want to look at Chapter 7, "Performance Highlights" on page 199 for additional information on tuning your OS/2 Warp Server.

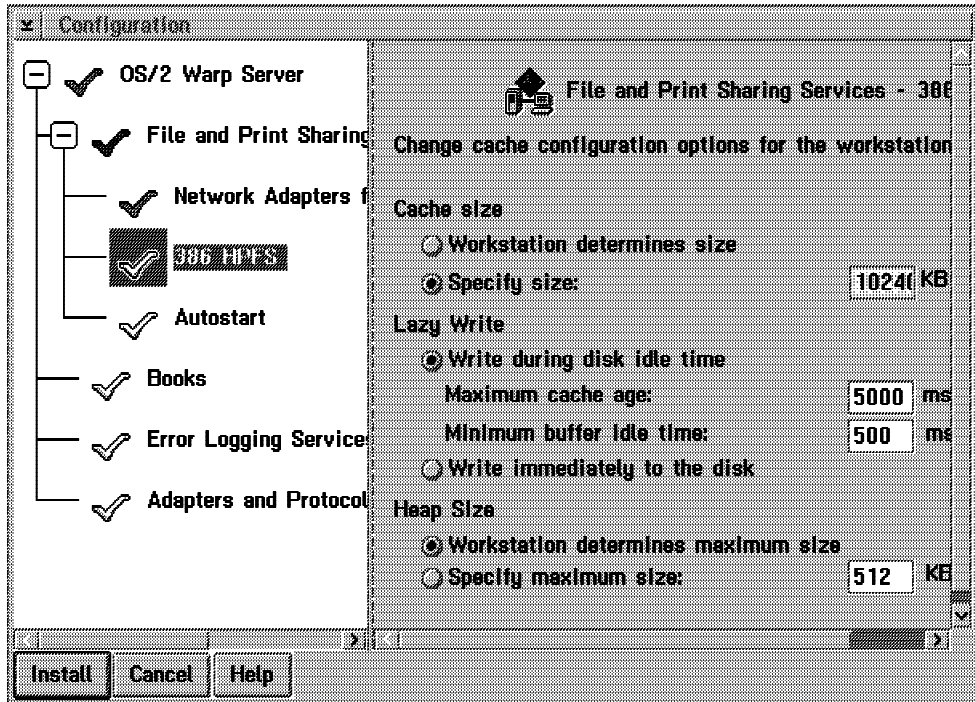


Figure 85. Configuration Window - 386 HPFS

28. Click **OK** to display Figure 86. This window configures the services that will start automatically every time the NET START command is issued without any parameters. Again, we will accept the defaults. For the next three selections Books, Error Logging Services, Adapters and Protocol Services we also accept the defaults under OS/2 Warp Server.

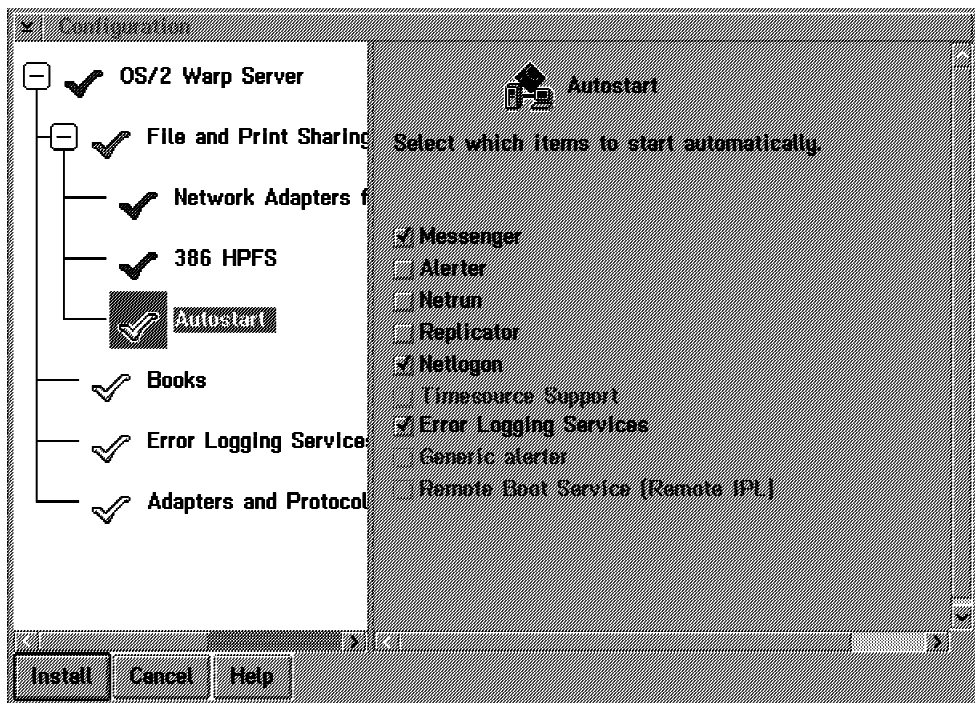


Figure 86. Configuration Window - Autostart



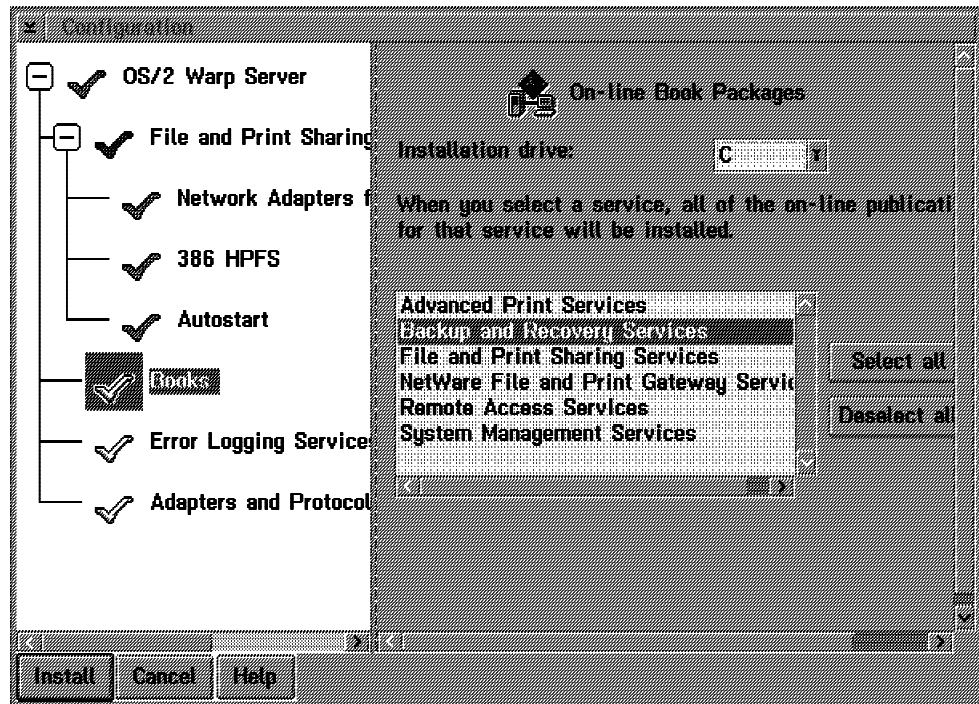


Figure 87. Configuration Window - Books

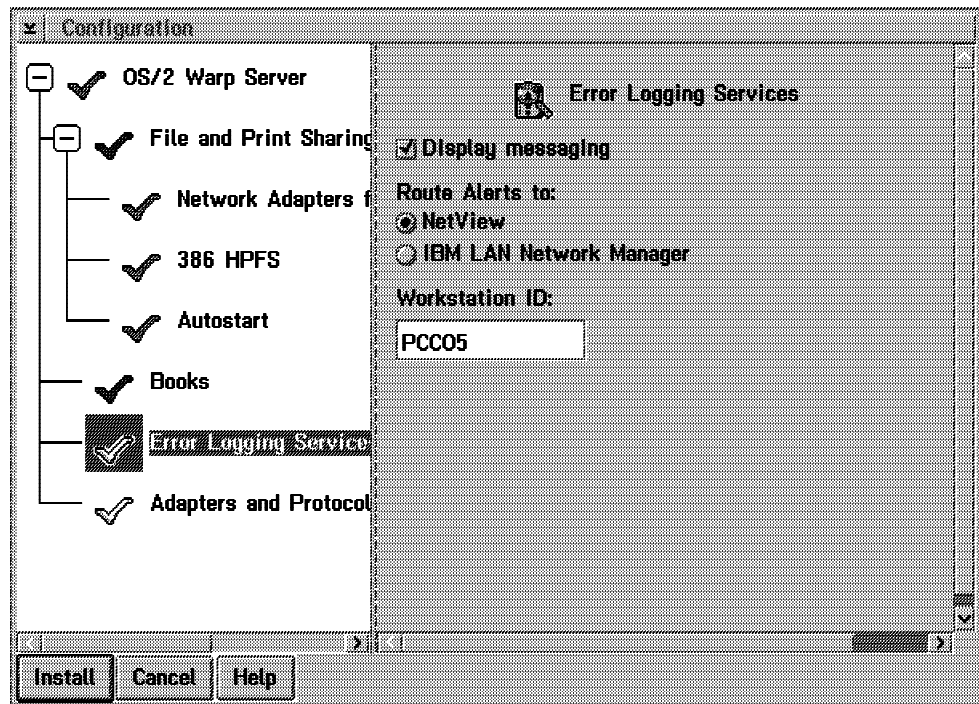


Figure 88. Configuration Window - Error Logging Services

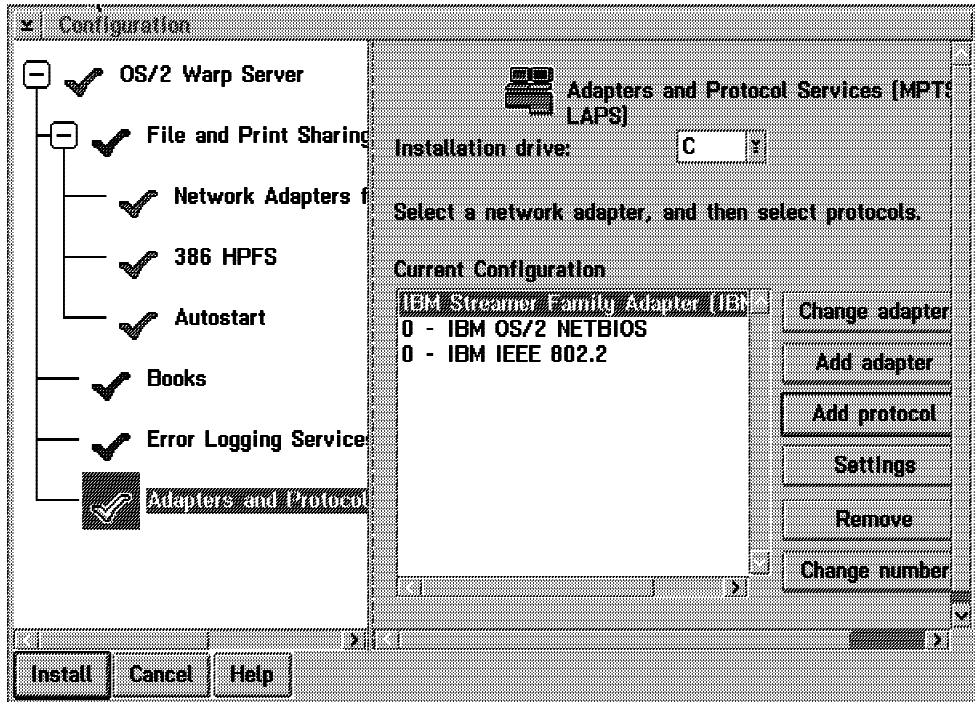


Figure 89. Configuration Window - Adapter and Protocol Services

29. When you have checked the three configuration windows, select **Install** and you will then be prompted by the Configuration dialog as viewed in Figure 90. Click **OK** to continue.

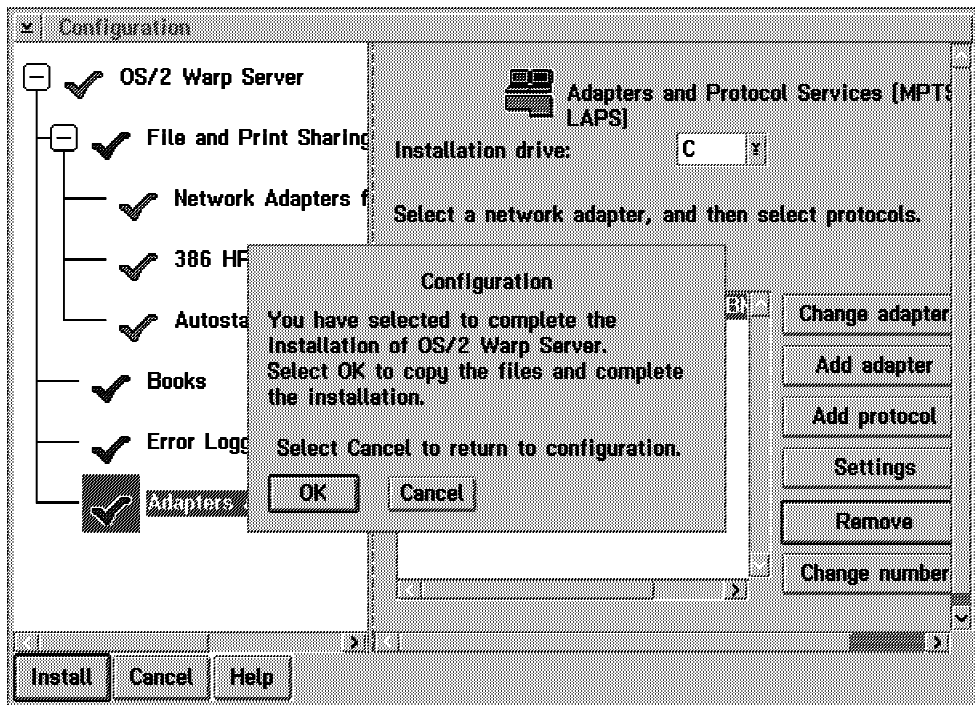


Figure 90. Configuration Dialog

30. The OS/2 Warp Server Installation will now begin. First, the progress of the second part of the OS/2 installation is displayed (see Figure 91 on page 95) and after that the installation progress of the OS/2 Warp Server installation

(see Figure 92 on page 95) is shown. Your server will restart as necessary during the installation.

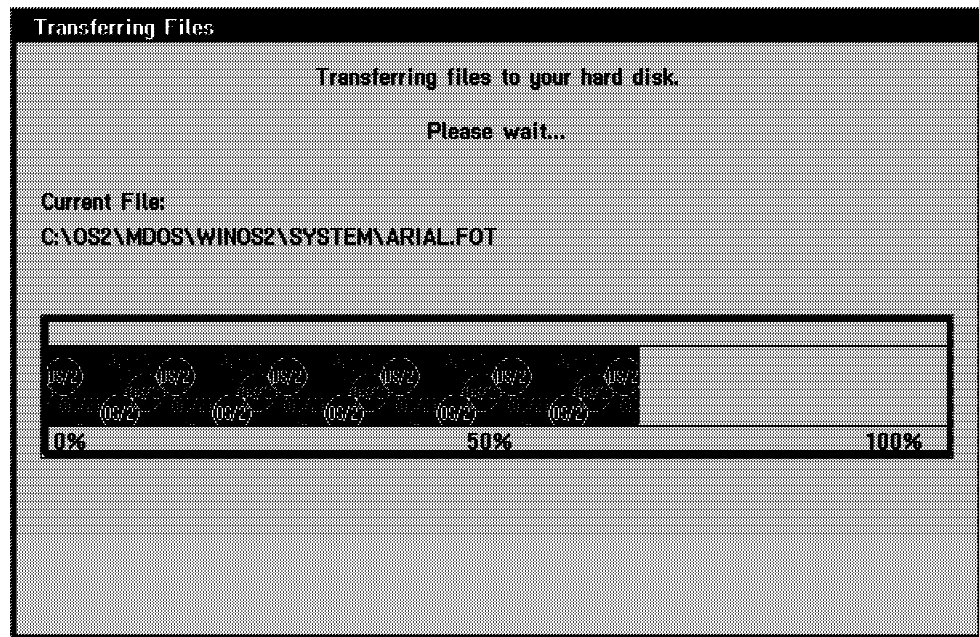


Figure 91. OS/2 Warp 3 Installation Progress Window

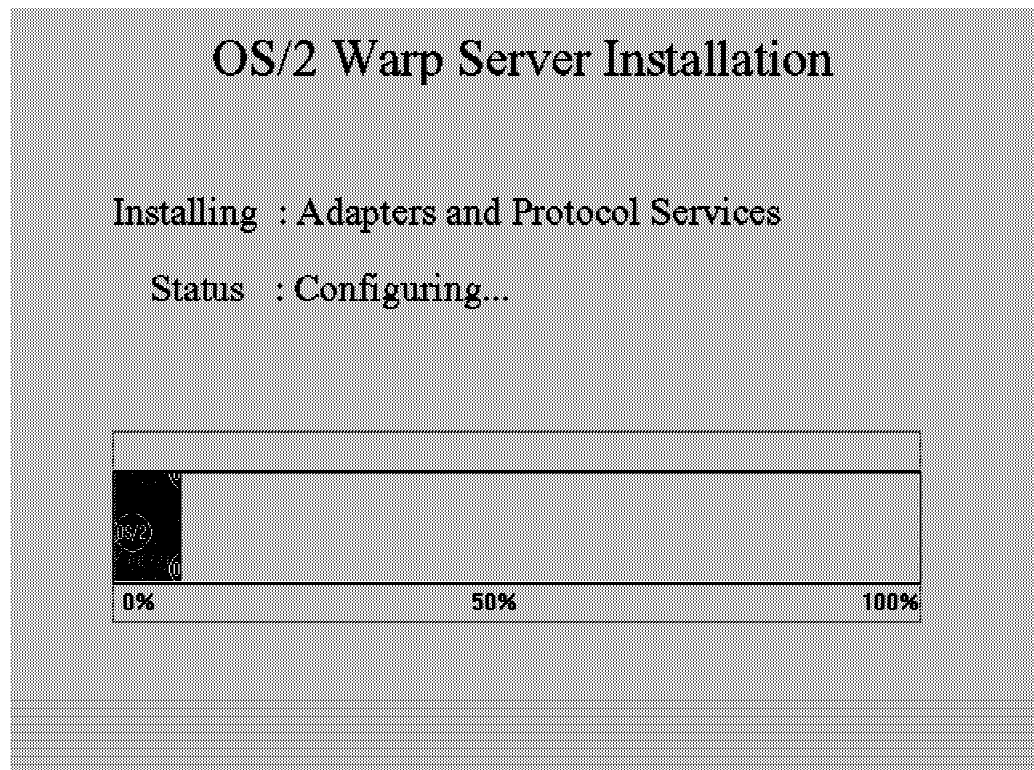


Figure 92. Warp Server Installation Progress Window

31. When the installation is complete, you will be prompted by two windows shown in Figure 93 on page 96 and Figure 94 on page 96. Read the information provided.

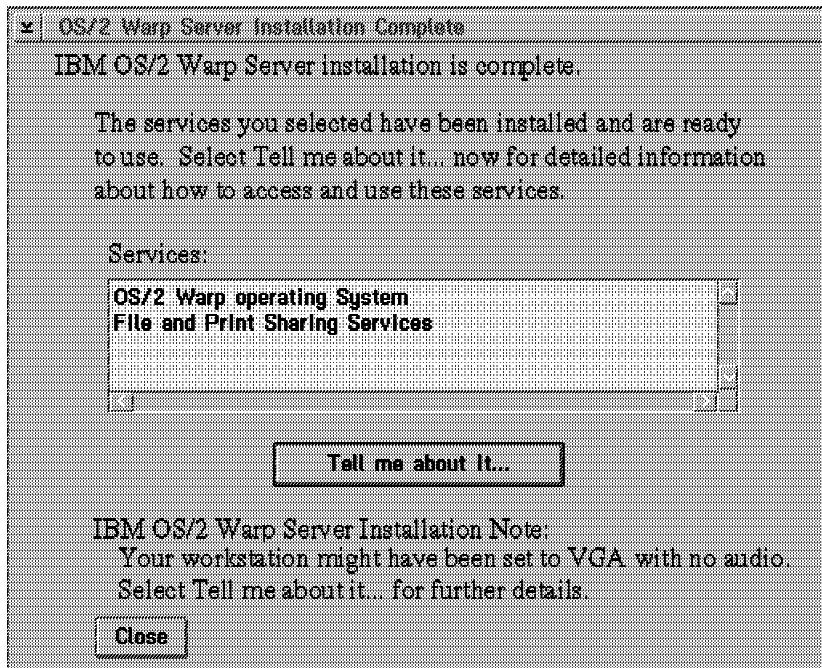


Figure 93. OS/2 Warp Server Installation Complete Window

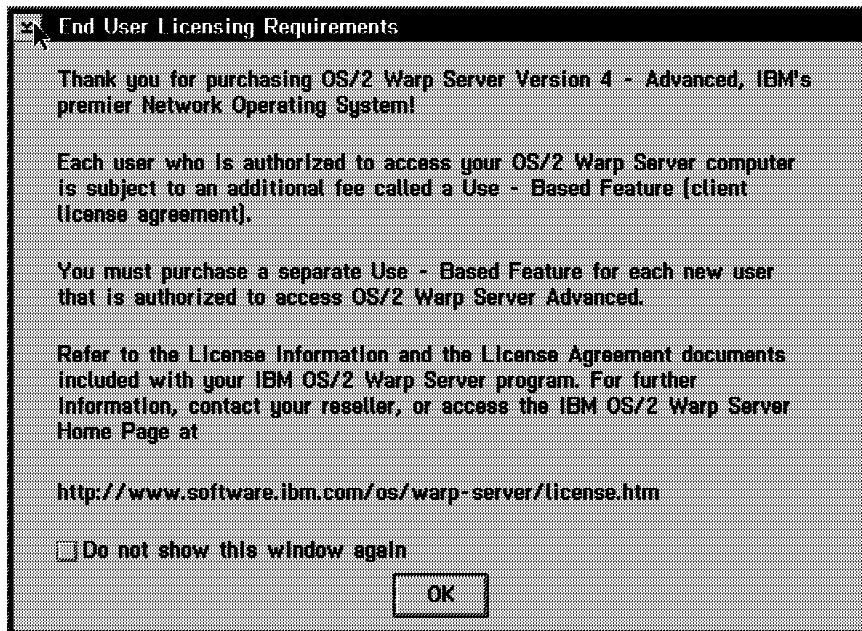


Figure 94. End User Licensing Requirements

That completes the installation of OS/2 Warp Server. Your server is now ready to perform File and Print Sharing Services. Remember to add the servername in your domain definition otherwise your server netlogon services will not start. We recommend that you obtain both *Inside OS/2 Warp Server, Volume 1: Exploring the Core Components*, SG24-4602-00 and *Inside OS/2 Warp Server, Volume 2: System Management Backup/Recovery and Advanced Print Services*, SG24-4702-00 for further information pertaining to the detailed usage, customization, and optimization of your Warp Server so that you get the best performance and satisfaction from your IBM PC Server.

## 5.2.2 OS/2 Warp Server SMP Additional

After the installation of Warp Server SMP there is an additional program available to monitor the load of each processor (see Figure 95).

You can start it from an OS/2 command prompt by typing: `MPCPUMON`. If you want to deactivate a processor, select **Status** and change the processor status to offline (see Figure 96).

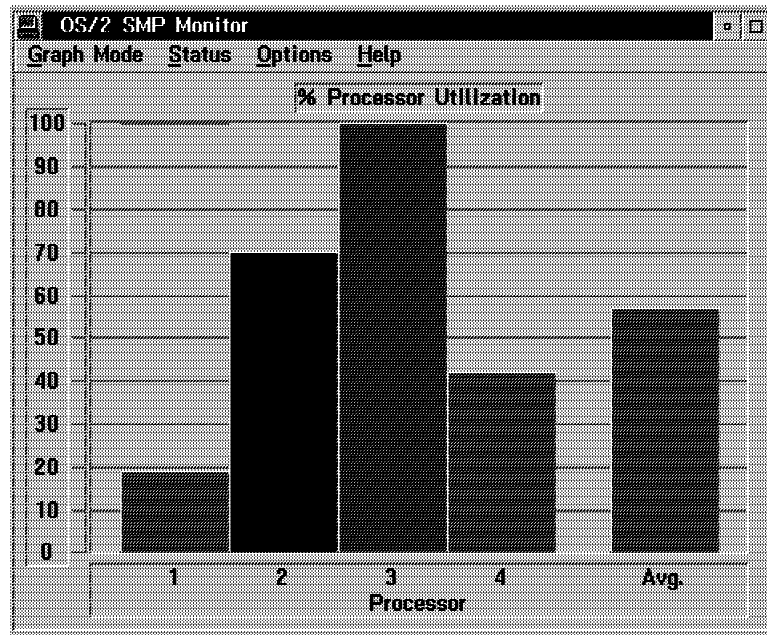


Figure 95. OS/2 SMP Monitor

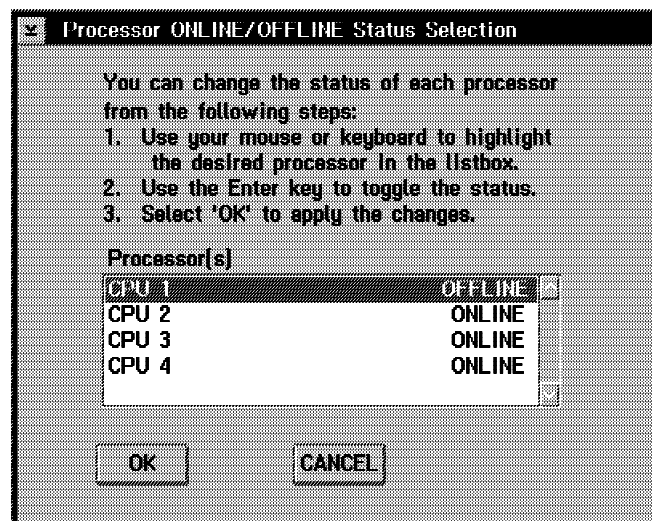


Figure 96. Processor ONLINE/OFFLINE Status Selection

**World Wide Web**

Currently licensed users of the OS/2 Warp Server Advanced can order the SMP Feature for no charge. For further information refer to URL:

<http://www.software.ibm.com/os/warp-server/html/getsmp2.htm/>

### 5.2.3 OS/2 Warp Server Version 4 Additional

After the installation of Warp Server Advanced, we recommend you install the following FixPaks:

- OS/2 Warp Version 3.0 Family FixPak 26 XR\_W026
- OS/2 Warp Server: LAN Server Advanced V500 IP08265
- OS/2 Warp Server: MPTS V500 WR08210

You should install all the FixPaks if you want to manage intelligent network printers over HP Jet Admin for OS/2 by Hewlett Packard (HP) or Mark Vision for OS/2 by Lexmark International. You also need the FixPak 26 for OS/2 Warp 3.0 when you want to install the automatic installation of printer drivers.

**World Wide Web**

For further FixPak information refer to URL:

<http://service2.boulder.ibm.com/pspfixpk/>

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## 5.3 Installation of OS/2 Warp Server with OS/2 Warp 4.0

OS/2 Warp Server can be installed on an OS/2 Warp 4.0 base with only a few minor modifications. By following this procedure you will be able to enjoy the advantages of the latest version of OS/2 Warp on your OS/2 Warp Server.

**Installation Assumptions**

The following installation procedures assume that you are installing on a new hard drive, with no partitions defined. If you are installing on a drive that contains partitions or data, then please refer to *OS/2 Warp 4.0, Up and Running!*, S84H-3098-00.

## 5.3.1 Installing OS/2 Warp 4.0

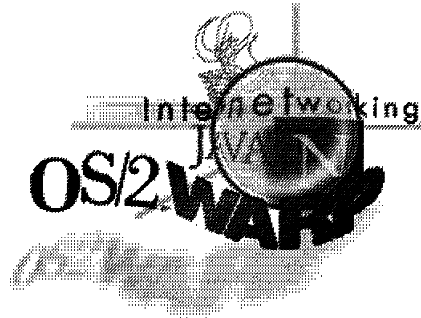


Figure 97. The OS/2 Warp 4.0 Client

This section guides you step by step through an installation of OS/2 Warp 4.0 on your IBM PC Server. Enhancements to OS/2 Warp 4.0 make it an ideal upgrade to OS/2 Warp 3.0 as a Warp Server base platform.

### World Wide Web

IBM's WWW site contains a wealth of information about OS/2 Warp 4.0. For the latest information on OS/2 Warp 4.0 refer to URL:

<http://www.software.ibm.com/warp/>

To install OS/2 Warp 4.0:

1. Insert the Installation diskette for CD-ROM into drive A.
2. Insert the OS/2 Warp 4.0 CD-ROM into the CD-ROM drive.
3. If your server is already on, press Ctrl+Alt+Del to restart it, otherwise, turn on the server.
4. When prompted to do so, remove the Installation diskette for CD-ROM from drive A and insert the OS/2 Warp 4.0 Diskette 1 for CD-ROM. Then press Enter.
5. When prompted to do so, remove the OS/2 Warp 4.0 Diskette 1 for CD-ROM from drive A and insert the OS/2 Warp 4.0 Diskette 2 for CD-ROM. Then press Enter.
6. When the Welcome screen is displayed, read the information and press Enter.
7. If the Important Licensing information screen appears, read it and press Enter.
8. At the Easy and Advanced Installation screen, select **Advanced** and press Enter.
9. When the Installation Drive Selection screen is displayed, use the arrow keys on your keyboard to select **Specify a different drive or partition**. Then press Enter.
10. A message window is displayed. Read the message and press Enter. The FDISK screen is displayed. In order to install OS/2 Warp 4.0 to a drive other than C, you must have Boot Manager installed.

If Boot Manager is listed on the FDISK screen, you can set a drive other than C to Installable. Then exit and save from FDISK.

If you need to install Boot Manager, then you can press F1 in FDISK to get help, which includes more information about creating a primary partition on which to run Boot Manager. You might need to delete and re-create an existing partition.

**Important Note**

If you plan to create a maintenance partition (see Appendix B, "Preparing a Maintenance Partition" on page 253), you will want to set up those partitions at this time. Refer to 3.3, "Disk Partitioning" on page 62 for hard disk partitioning recommendations.

After you change partitions in FDISK and save the changes, the server must be restarted so that the partitions can be recognized during installation. Follow the instructions on the screen and restart the installation with step 4 on page 99.

11. The Formatting the installation partition screen is displayed. Select **Format the partition** and press Enter to continue.
12. The Select the File System window is displayed. Select **High Performance File System** and press Enter.
13. A message window is displayed. Read the message and press Enter to continue.
14. The Installing OS/2 Warp 4.0 progress screen is displayed. When prompted to do so, remove the diskette from drive A. Then press Enter. The server restarts.
15. The System Configuration window is displayed as seen in Figure 98 on page 101. Check the country configuration and hardware device types to insure that they are correct for your server. If you are unsure about the hardware you are using, refer to your *IBM PC Server User's Reference and Handbook*.



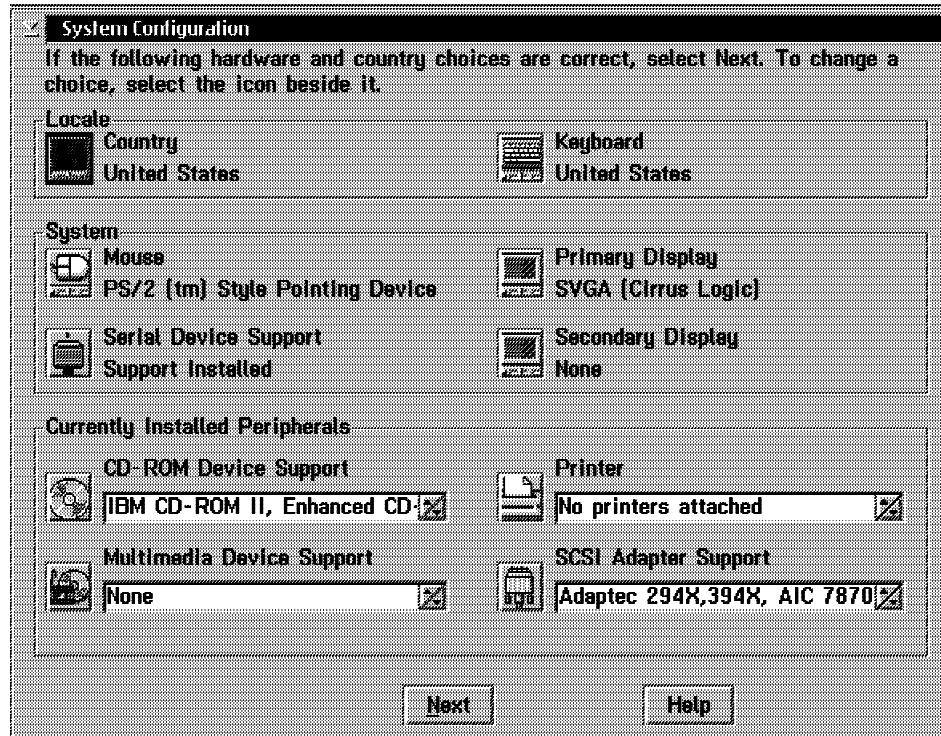


Figure 98. System Configuration Window

16. Select the icon next to **Primary Display** to show the Display Driver Install window. Select **Video Graphics Array (VGA)**, as seen in Figure 99 and click **OK**.

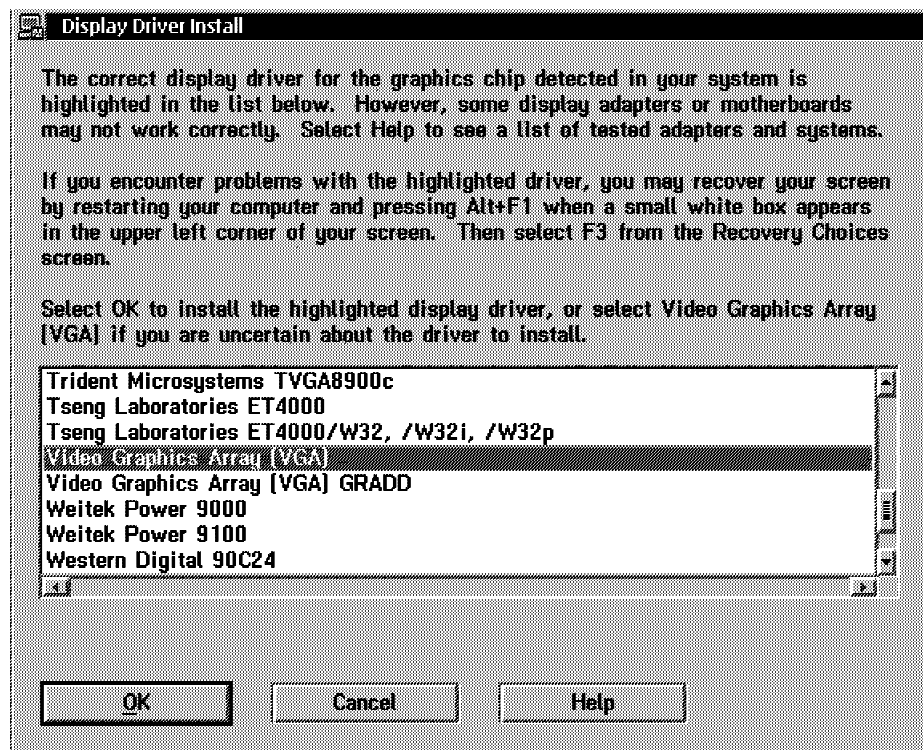


Figure 99. Display Drive Install Window

### VGA Selection

We recommend using VGA for your servers' display mode. Certain problems can be traced to video selections other than VGA. It will also give you optimal performance both locally, and remotely. (In the case of Remote Workstation Control, see Chapter 8, "Using IBM NetFinity 5.0 with OS/2 Warp Server" on page 219.)

17. Select the icon next to **Printer** to display the Select System Default Printer window as pictured in Figure 100.

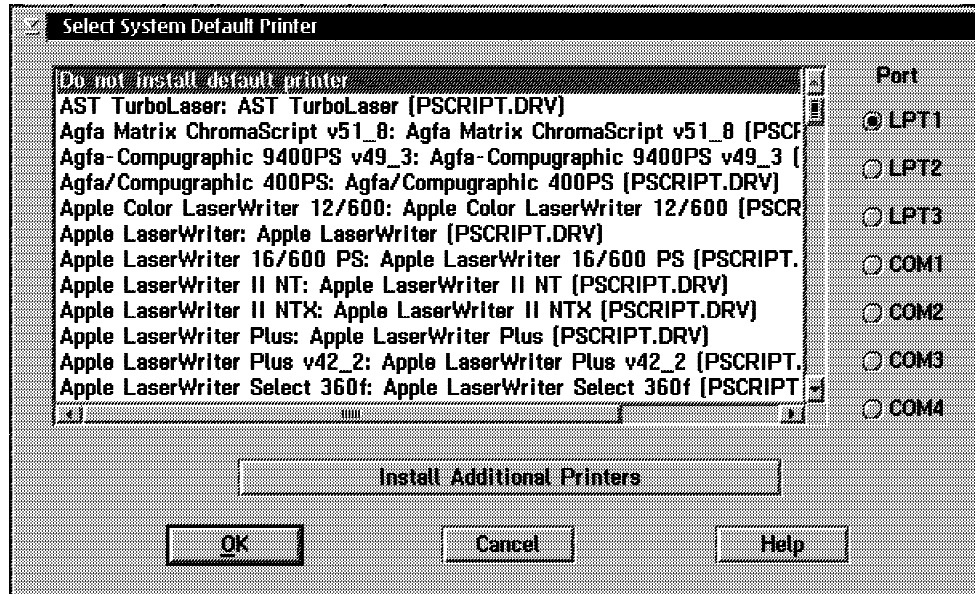


Figure 100. Select System Default Printer Window

18. Select the proper printer(s) for your server. If you do not have any printers attached, or plan to use LAN-attached printers, then leave the default selection. Click **OK**.
19. You will now be presented with the System Configuration window again as in Figure 98 on page 101. You will note, however, that the changes you have made will now be visible. Select **Next** to display the System Configuration (cont.) window as seen in Figure 101 on page 103.

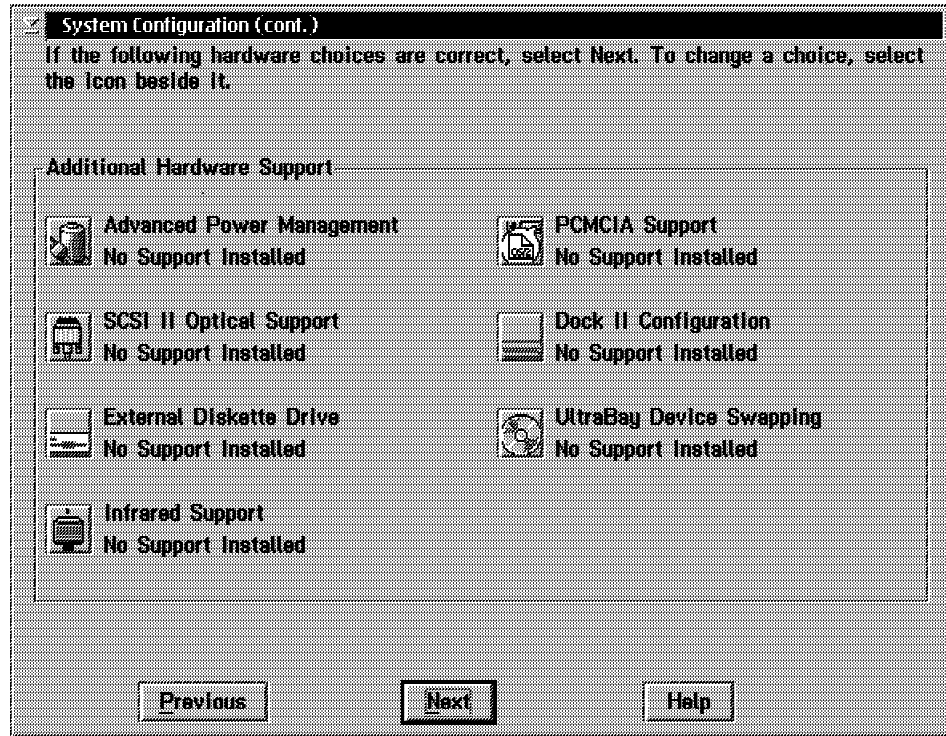


Figure 101. System Configuration (cont.) Window

20. Select **Next** to display the OS/2 Setup and Configuration window (see Figure 102). Select the **Software configuration** menu item and select **Change OS/2 parameters...**

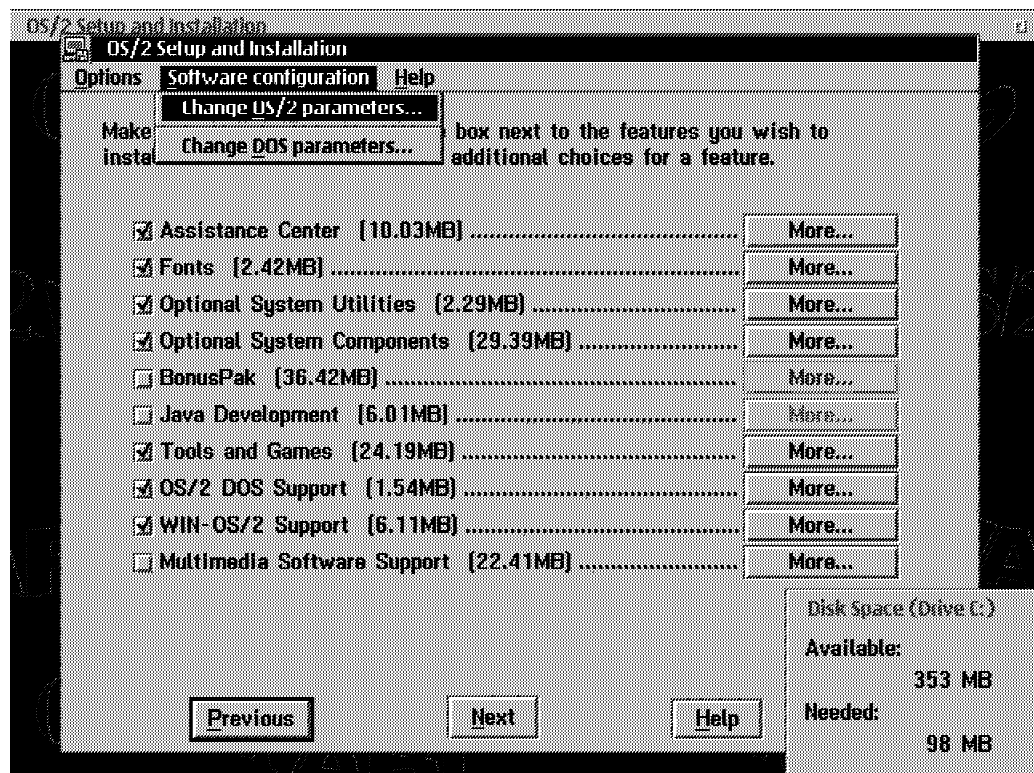


Figure 102. OS/2 Setup and Configuration Window

21. The OS/2 Configuration window is now displayed (refer to Figure 103 on page 104). We recommend changing the Swap Minfree value to 20480, as the default value of 2 MB is far too small for a server. It is also a good idea to increase the number of threads to a value of 1024. Click **OK** to save these values and return to Figure 102 on page 103.

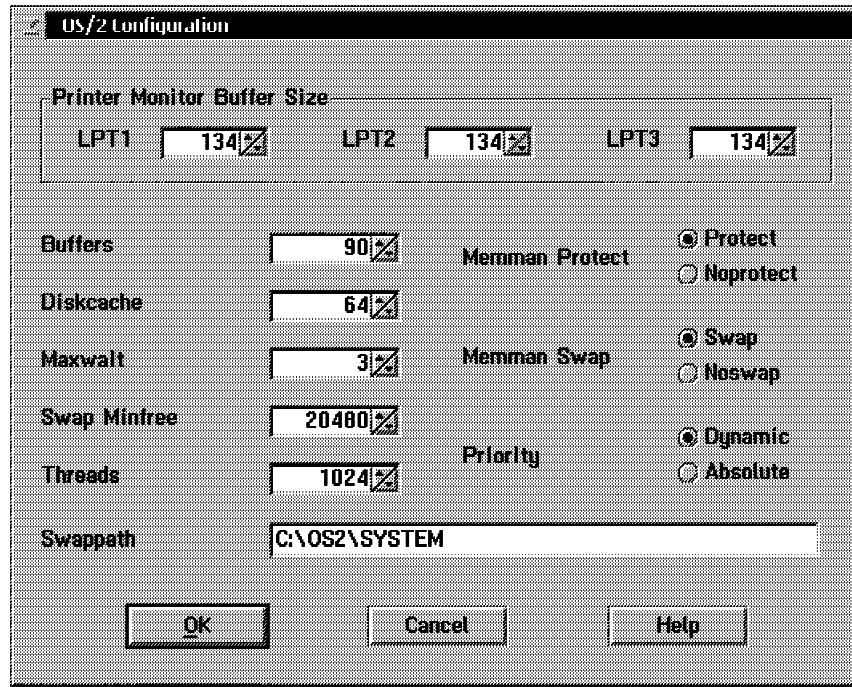


Figure 103. OS/2 Configuration Window

22. There are several items that can be de-selected to save space on your system partition. If you are concerned about saving space, then follow this step; otherwise continue with step 24 on page 105.

Select the **More...** button to the right of **Assistance Center** to display the dialog in Figure 104. Uncheck the check boxes as shown and click **OK** to return to Figure 102 on page 103.

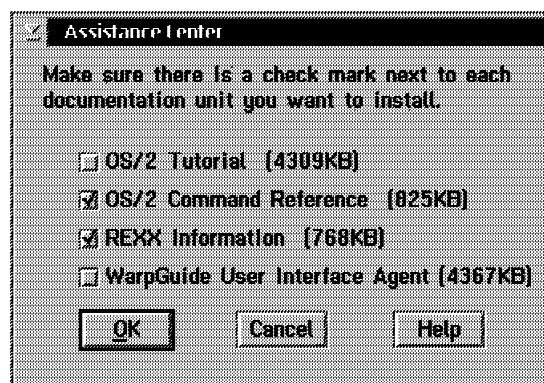


Figure 104. Assistance Center Dialog

23. Select the **More...** button to the right of **Tools and Games** to display the dialog in Figure 105 on page 105. Uncheck the check boxes as shown and click **OK** to return to Figure 102 on page 103.

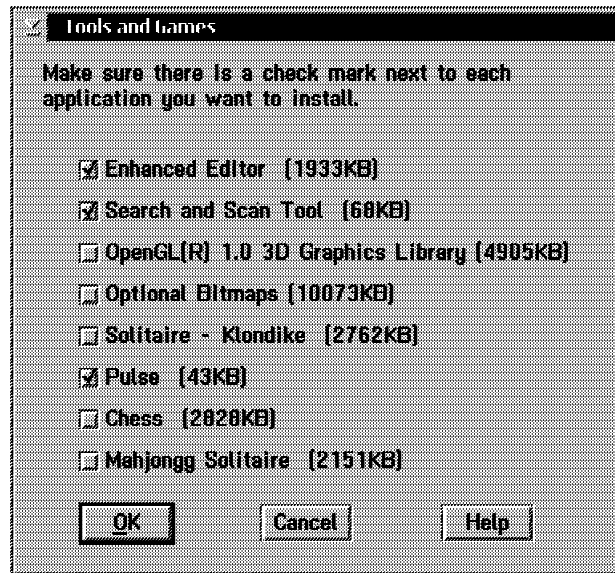


Figure 105. Tools and Games

24. To conserve space as well as reduce the amount of memory used by OS/2, we also recommend unchecking the Multimedia Software Support, as shown in Figure 102 on page 103. Multimedia support is seldom needed on a server.
25. You are now ready to continue. Select **Next** to display the window in Figure 106. Uncheck the **Add existing programs to your Desktop** check box, as you have no existing programs. This will reduce the amount of clutter on your desktop after installation completes. Click **OK** to continue.

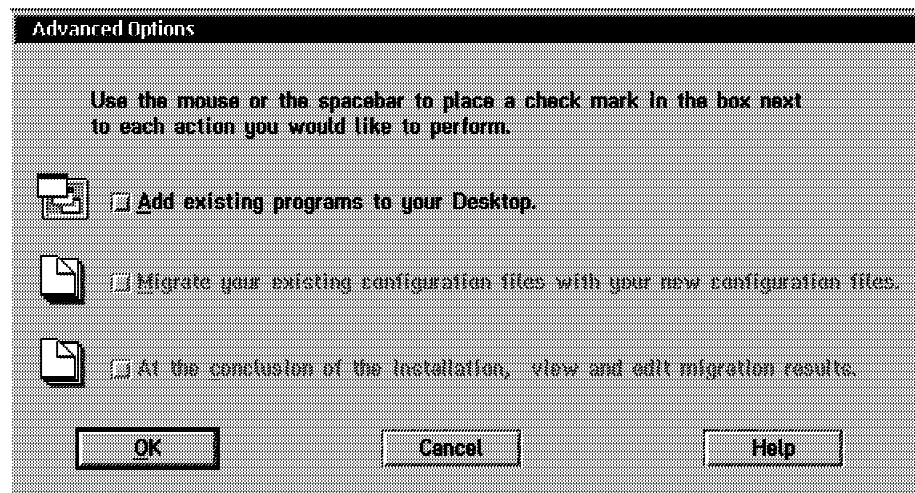


Figure 106. Advanced Options

26. You will now be presented with the OS/2 Warp Setup and Installation window, as pictured in Figure 107 on page 106. De-select *all* check boxes and select **Next** to continue.

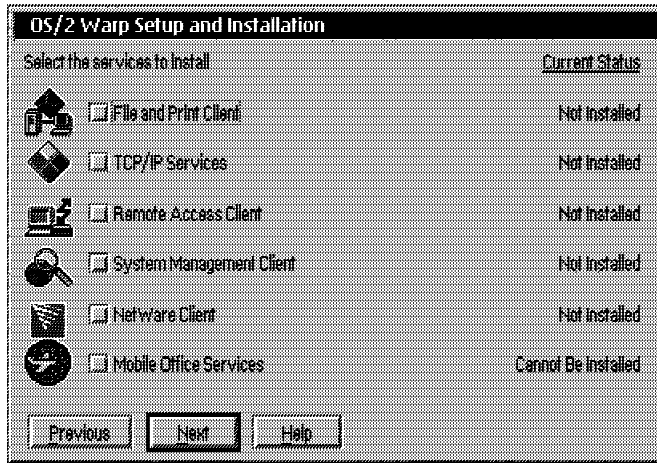


Figure 107. OS/2 Warp Setup and Installation Window

27. The dialog in Figure 108 will be displayed. Click **OK**.

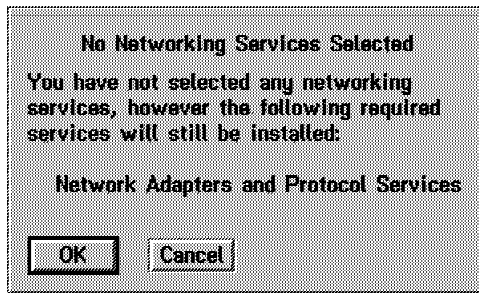


Figure 108. No Networking Services Selected Dialog

28. The Configuration window is now displayed (as seen in Figure 109). Note the symbol key in the right panel of the window.



Figure 109. Configuration Window

29. Select **Network Adapters and Protocol Services** as seen in Figure 110 on page 107. The token-ring or Ethernet adapter in your server should be displayed under Current Configuration. If it is not, then select **Change Adapter...** or **Add Adapter...** and install your network adapter.

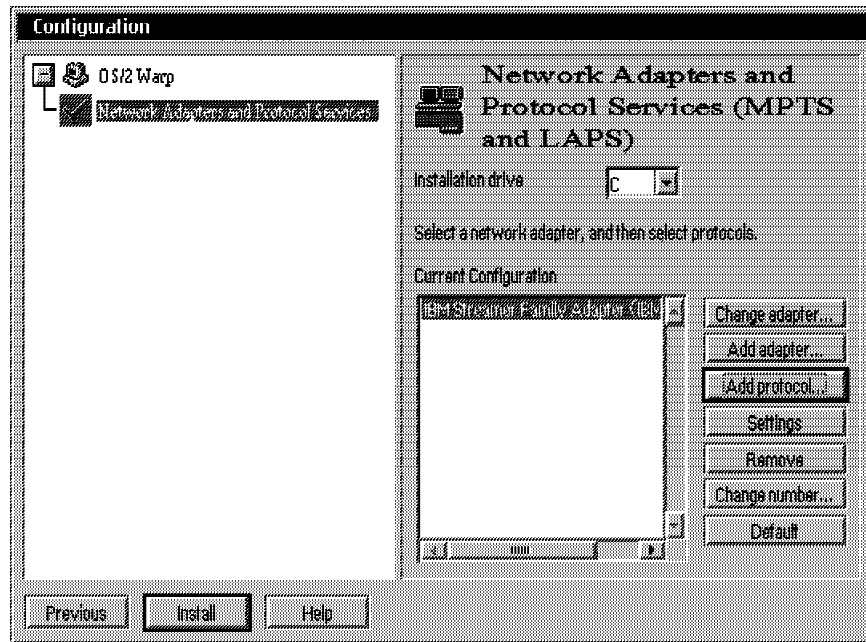


Figure 110. Configuration Window

**World Wide Web**

For more information on MPTS, please refer to URL:  
<http://www.software.ibm.com/warp/performance/mpts.html>

30. Click on **Add Protocol...** to display the Add Protocol dialog (see Figure 111), select **IBM OS/2 NETBIOS**, and then click **OK**.

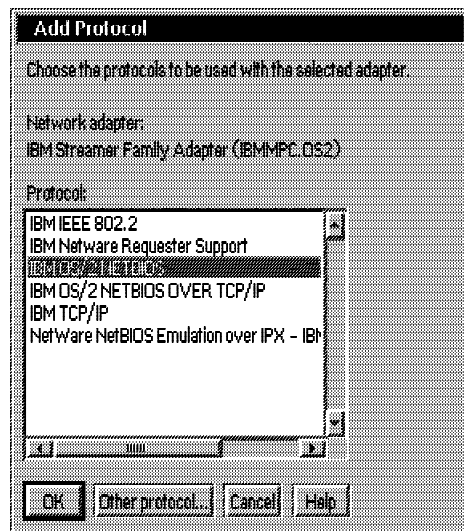


Figure 111. Add Protocol Dialog

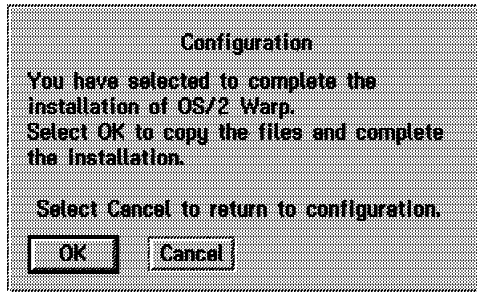


Figure 112. Confirmation

31. Click on **Next** in the Configuration window. A confirmation window, as seen in Figure 112, is displayed. Click **OK** to begin the installation of OS/2 Warp 4.0.



Figure 113. Installing Software Window

A progress window (see Figure 113) shows the status of your installation. When the installation completes, the OS/2 Warp Setup and Installation window (see Figure 114 on page 109) will inform you that your installation is complete.

32. Read the instructions and click **OK** to start a reboot of your server.



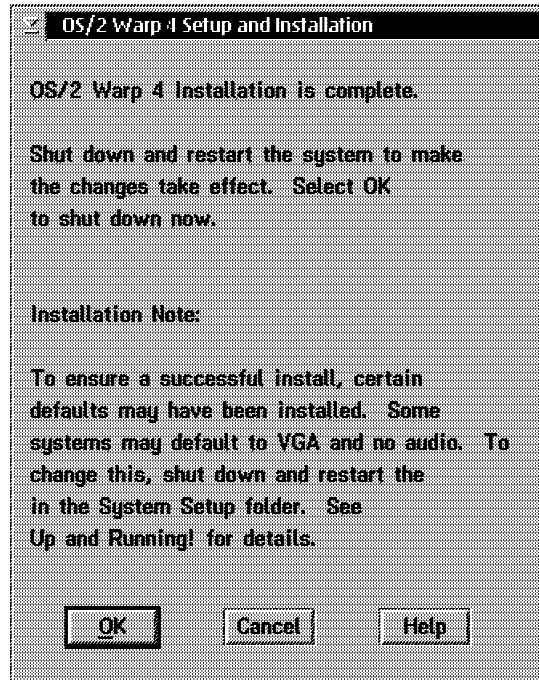


Figure 114. OS/2 Warp Setup and Installation Window

## 5.3.2 Preparing OS/2 Warp 4.0 for OS/2 Warp Server

Several steps need to be taken to prepare your newly installed OS/2 Warp 4.0 system for an installation of OS/2 Warp Server. The OS/2 Warp Server Installation program expects OS/2 Warp 3.0 to be installed, and as such will fail without these modifications.

First, we show you a few tips to make your OS/2 Warp 4.0 Server a little leaner and less memory hungry. Second, we guide you through a little trickery we use in convincing OS/2 Warp Server into installing over OS/2 Warp 4.0. Next, we perform corrective service on OS/2 Warp 4.0 to bring it to the proper service level. Additionally, we also provide you with a method to perform this service from the server's hard disk as opposed to a floppy operation.

**Note:** Applying Corrective Service Diskettes (CSD) can become quite cumbersome. This method will save you time as well as provide you with a uniform way of applying CSDs for other products.

### 5.3.2.1 CONFIG.SYS Changes

There are many changes to the CONFIG.SYS that you can make to optimize your system. We only cover a couple of changes in this document.

**Note:** If you are interested in more information about the CONFIG.SYS and the changes that you can make to optimize your server, then please refer to 7.9.1, "OS/2 Warp CONFIG.SYS File Insights" on page 210.

To begin preparing your server:

1. Open an OS/2 Window from the Command Prompts folder on your WarpCenter. Type the following command and press Enter:

```
e config.sys
```

2. In the E Editor window, locate the following line:

```
SET AUTOSTART=PROGRAMS, TASKLIST, FOLDERS, CONNECTIONS, WARPCENTER
```

After the above line insert the following:

```
RESTARTOBJECTS=STARTUPFOLDERONLY
```

This will eliminate numerous boot problems caused by misbehaved programs that will not close. Otherwise OS/2 starts them again. This action also reduces swapping when the system is first booted up.

3. Locate the following line:

```
DISKCACHE=D, LW
```

and REMark it out. This setting is used *only* for the FAT file system. It is highly unlikely that you will be using the FAT file system on your server, and this will free up some memory resources. Do *not* REMark this out if you do plan on using a FAT file system.

4. Add the following lines to your CONFIG.SYS:

```
SET PM_ASYNC_FOCUS_CHANGE=ON
```

```
PAUSEONERROR=NO
```

The first line will fix the single input queue problem. The OS/2 solution detects misbehaved applications that cause system hangs in what is often incorrectly attributed to OS/2 as the Single Input Queue (SIQ) problem. This fix is implemented at the system level as a separate OS/2 thread that monitors the status of the input queue. No modifications of applications is necessary.

The second line allows your server to continue booting even if there is a problem or mistake in the CONFIG.SYS. This is always a good idea for an unattended server.

### 5.3.2.2 Preparing the CSD Structure

As stated earlier, installing FixPaks and CSDs from diskette can get very boring, very fast. If you have more than a few servers, this task can be tedious to say the least. Without getting into too much detail, we show you how to create the proper directory structure on your hard drive, copy the images for the OS/2 Warp 4.0 FixPak 1 (XR\_M001) to the hard drive, and how to perform service to your server using this newly created Configuration, Installation, and Distribution (CID) structure.

#### Sharing Your CSDs

To complement this CID structure by enabling your server to share this structure across the network, see *OS/2 Installation Techniques: The CID Guide*, SG24-4295-01.

To begin:

1. After your server has rebooted, open an OS/2 Full-Screen session. At the OS/2 prompt, enter the following commands:

```
md x:\cid
```

```
md x:\cid\csd
```

```
md x:\cid\exe
```

```
md x:\cid\log
md x:\cid\rsp
md x:\cid\csd\xr_m001
```

Where *x* is the hard disk on which you want to install this structure. We recommend that you do *not* install this on your system partition.

2. Insert the CSF Kicker Disk 2 into drive A and enter the following commands:

```
xcopy a:. x:\cid\exe /v /s /e /h
move x:\cid\exe\response.fil x:\cid\rsp\xr_m001.rsp
```

Where *x* is the drive that you have created the above structure on.

3. When the XCOPY is complete, insert Disk 1 of XR\_M001, type the following command, and press Enter:

```
xcopy a:. x:\cid\csd\xr_m001 /v /s /e /h
```

4. Repeat step 3 for each disk in the XR\_M001 set.

### 5.3.2.3 Applying Service to OS/2 Warp 4.0

You are now ready to apply service to your OS/2 Warp 4.0 Server. It is important that any time service diskettes or FixPaks become available, you should make arrangements to have them installed. We begin the installation of OS/2 Warp 4.0 with the following steps:

1. At the OS/2 prompt, type the following command, and press Enter:

```
x:\cid\exe\fservice /s:x:\cid\csd\xr_m001 /r:x:\cid\rsp\xr_m001.rsp
```

#### Syntax

For an explanation of the FSERVICE utility syntax, simply type FSERVICE with no parameters in an OS/2 Full-Screen session.

The FSERVICE utility will start as pictured in Figure 115.

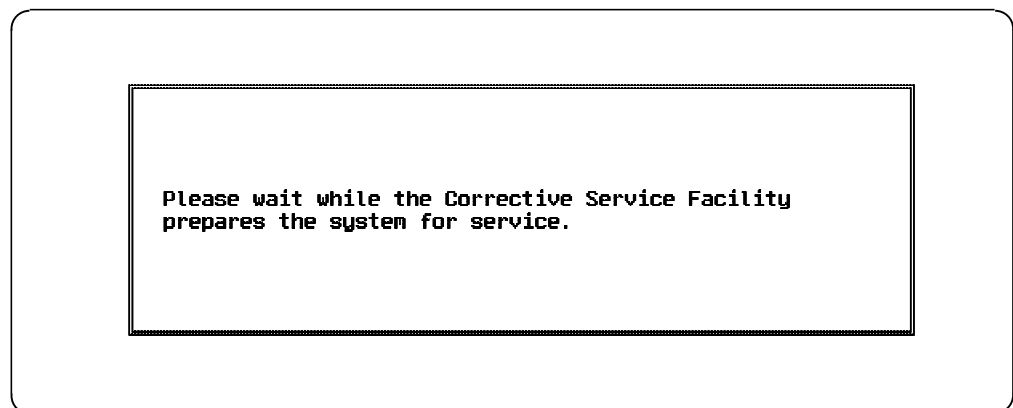


Figure 115. FSERVICE Utility - Initiating

FSERVICE will then begin updating files on your server (see Figure 116 on page 112). This process will take a few minutes. Do not do *anything* else while FSERVICE is running. When FSERVICE has been completed, you will be notified by the screen in Figure 117 on page 112.

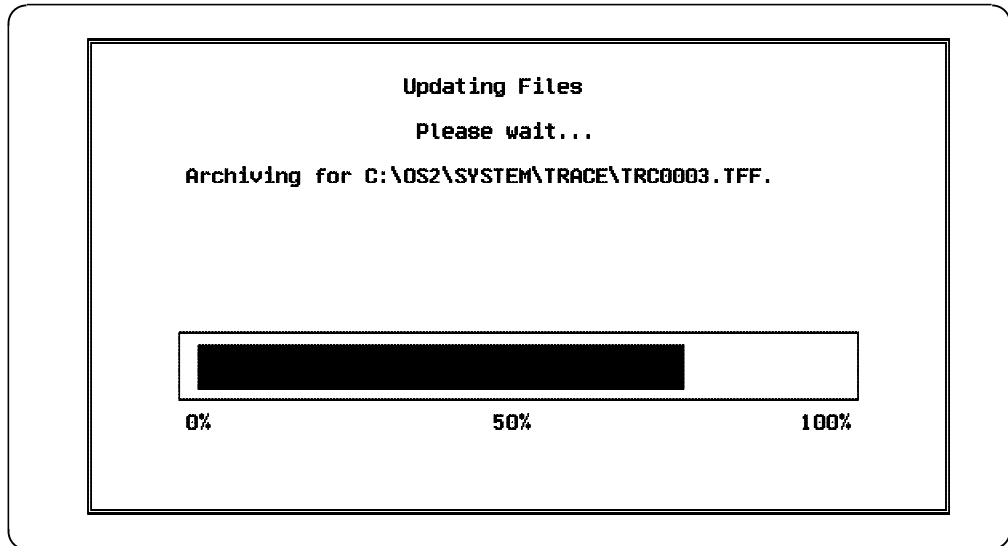


Figure 116. FSERVICE Utility - Updating Files

2. Remove the diskette from the floppy drive as instructed, but do *not* Ctrl+Alt+Del your server. Simply press Ctrl+C to break out of the FSERVICE Utility, type exit, and press Enter to return to your OS/2 Warp 4.0 Desktop.

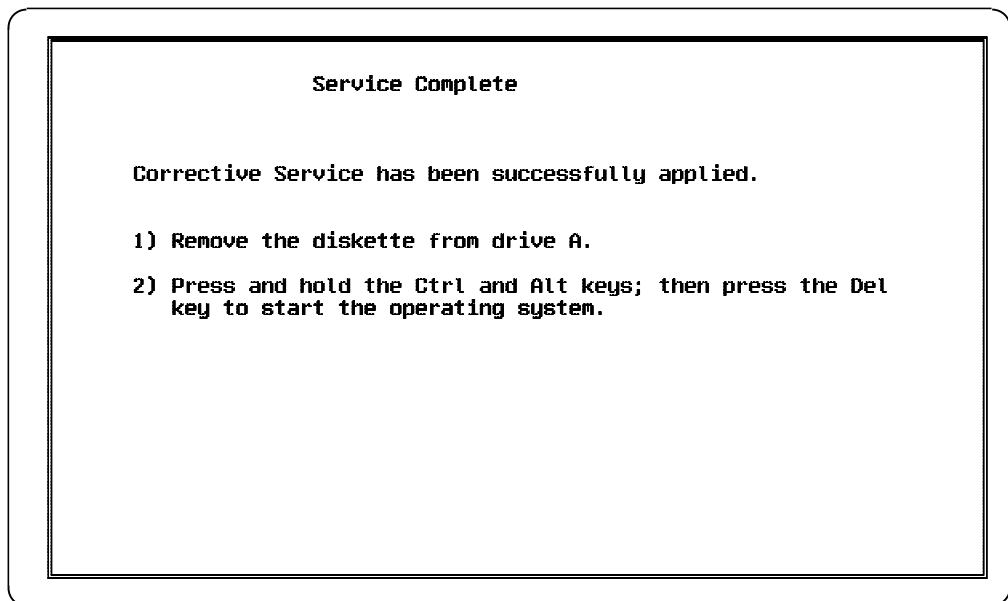


Figure 117. FSERVICE Utility - Complete

#### 5.3.2.4 Preparing the OS/2 Warp Server Installation Utility

As we mentioned earlier, installing OS/2 Warp Server with an OS/2 Warp 4.0 base involves a small amount of trickery. If you attempt to run the OS/2 Warp Server installer from the CD-ROM, you will receive a message stating that you must have Warp installed on your system to install OS/2 Warp Server. This has to do with the version of your system that gets reported back to the WSINST.EXE program (which is called by the INSTALL.CMD found on the root of the CD-ROM). Although, we now have Warp installed, the version level is not compatible with WSINST.EXE.

To circumvent this problem, perform the following:

1. Open an OS/2 Window from your WarpCenter.
2. Insert the Warp Server Advanced CD-ROM 1 into your CD-ROM drive.
3. At the OS/2 prompt, enter the following commands:

```
md x:\warpsrv
```

```
xcopy y:\warpsrv\*. * x:\warpsrv /v /s /e /h
```

where x is your OS/2 boot partition and y is the letter of your CD-ROM drive.

After the XCOPY operation is complete, you are ready to begin installing OS/2 Warp Server.

### 5.3.3 Installing OS/2 Warp Server on OS/2 Warp 4.0



Figure 118. The OS/2 Warp Server

Now that you have installed OS/2 Warp 4.0, brought your system to the desired service level, and prepared your system, we are ready to begin installing OS/2 Warp Server. This section describes the steps you will need to take to successfully install OS/2 Warp Server on a system that has OS/2 Warp 4.0 installed as the base operating system. We guide you through an installation of OS/2 Warp Server with File and Print Sharing services only, as explained previously. Remember, if you need to install additional services, then *please* refer to *OS/2 Warp Server Advanced, Up and Running!*, S28H-0152-00.

To install OS/2 Warp Server:

1. Open an OS/2 Window, type the following command, and press Enter.

```
d:\warpsrv\wsconfig.exe
```

where d is the system partition of your server.

The Warp Server Installer will start and you will be prompted by the Installing IBM OS/2 Warp Server window as seen in Figure 119 on page 114. Select **Advanced Installation** as pictured and click **OK**.



Figure 119. Installing IBM OS/2 Warp Server Window

2. The Information window (see Figure 120) is now displayed. Fill in the fields on this screen with the information that is requested and click **OK**.



Figure 120. Information Window

3. When the OS/2 Warp Server Setup and installation window is displayed, select the **File and Print Sharing Services** check box, as seen in Figure 121 on page 115.

**Note:** If you will be installing additional services, please refer to the proper documentation for detailed installation procedures for each product.

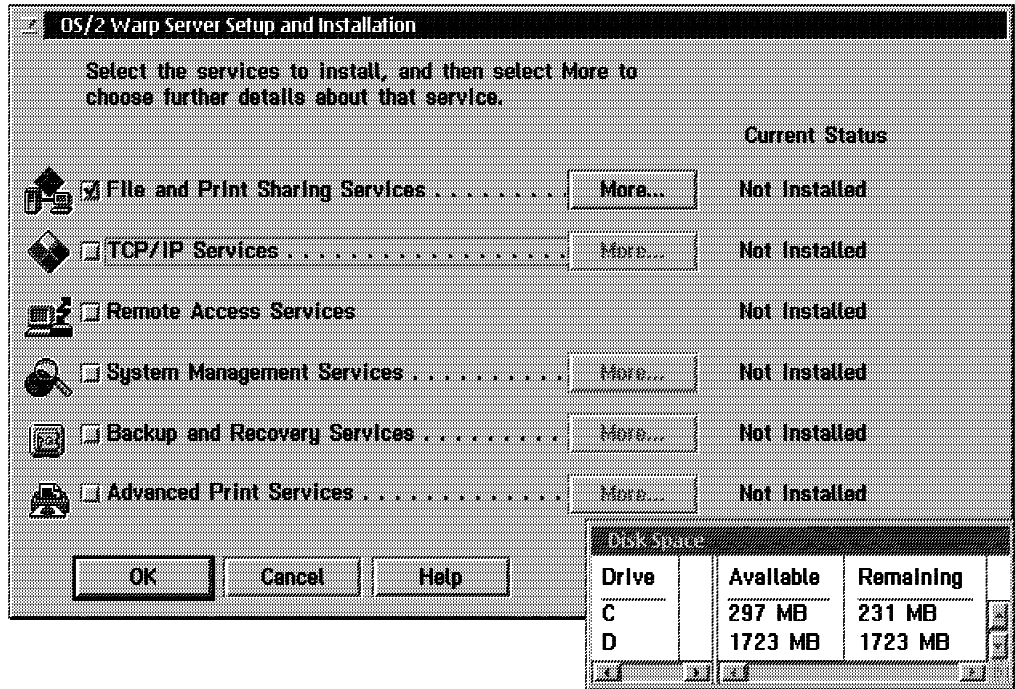


Figure 121. OS/2 Warp Server Setup and Installation Window

- The Configuration window is now displayed as seen in Figure 122 on page 116. Notice the key in the right panel of the window. To begin the installation you must correctly configure each list item in the left panel of the Configuration window.

Let us begin with the top-most item, File and Print Sharing Services. Select the **File and Print Sharing Services** and click **OK**. The right panel will resemble that of Figure 123 on page 116.

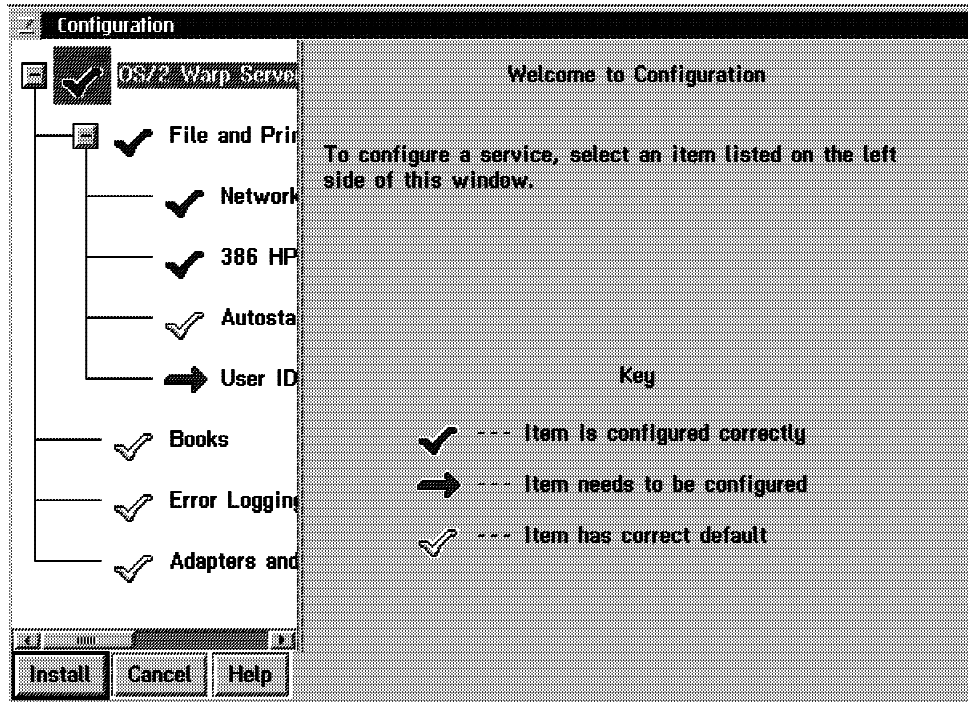


Figure 122. Configuration Window - Welcome to Configuration

5. Double-click on **File and Print Sharing Services** to select the type of server. You will see a screen similar to the Figure 123.

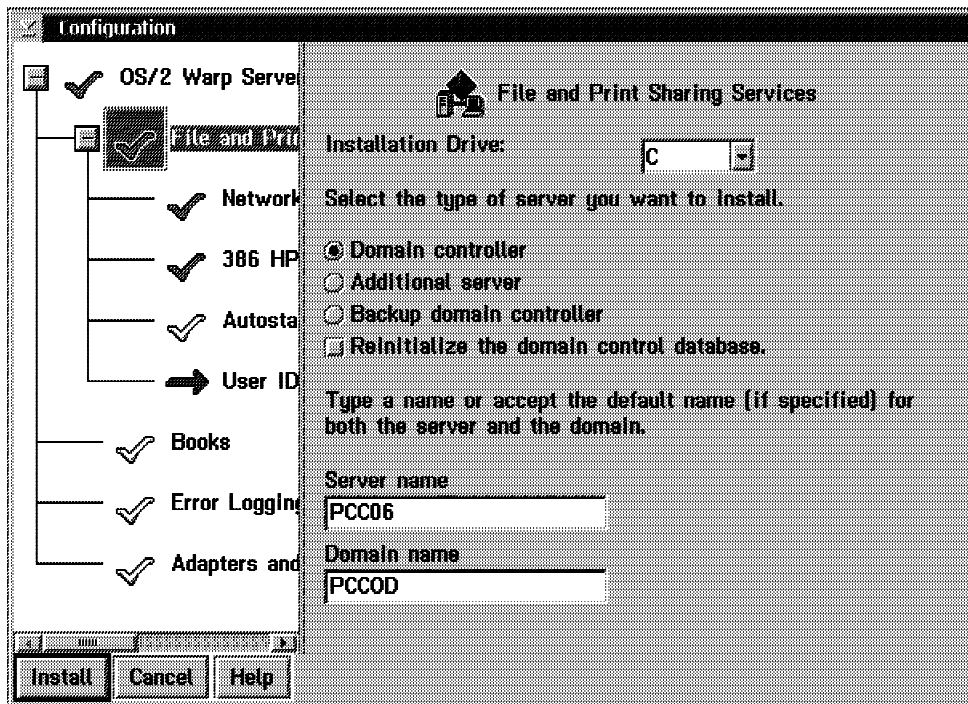


Figure 123. Configuration Window - File and Print Sharing Services

The only values that will need to be supplied on this screen are the Server Name and the Domain Name values. The names used here are up to you to provide and should be unique within your network. Our installation is of a new server that will function as a domain controller. If you are installing an



additional server or migrating an existing server to OS/2 Warp Server, then you should refer to *Appendix C of OS/2 Warp Server Advanced, Up and Running!*, S28H-0152-00.

6. Enter the names you will use and then select the **Network Adapters** item under File and Print Sharing Services. The window pictured in Figure 124 will be displayed.

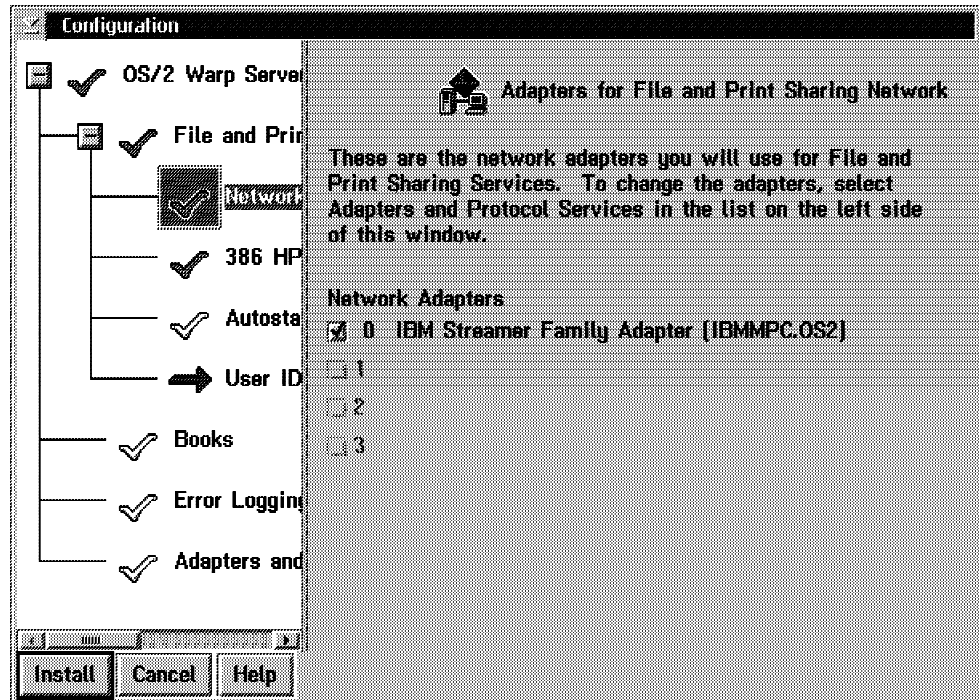


Figure 124. Configuration Window - Adapters for File and Print Sharing Network

7. This panel displays the network adapter(s) that will be used for File and Print Sharing Services. Select the **386 HPFS** item under File and Print Sharing Services. The window pictured in Figure 125 on page 118 contains parameters that affect the 386 HPFS file system. We will accept the default values. More information detailing these parameters and their usage is contained in *Inside OS/2 Warp Server, Volume 1: Exploring the Core Components*, SG24-4602-00. You should also look at Chapter 7, "Performance Highlights" on page 199 for additional information on tuning your OS/2 Warp Server.

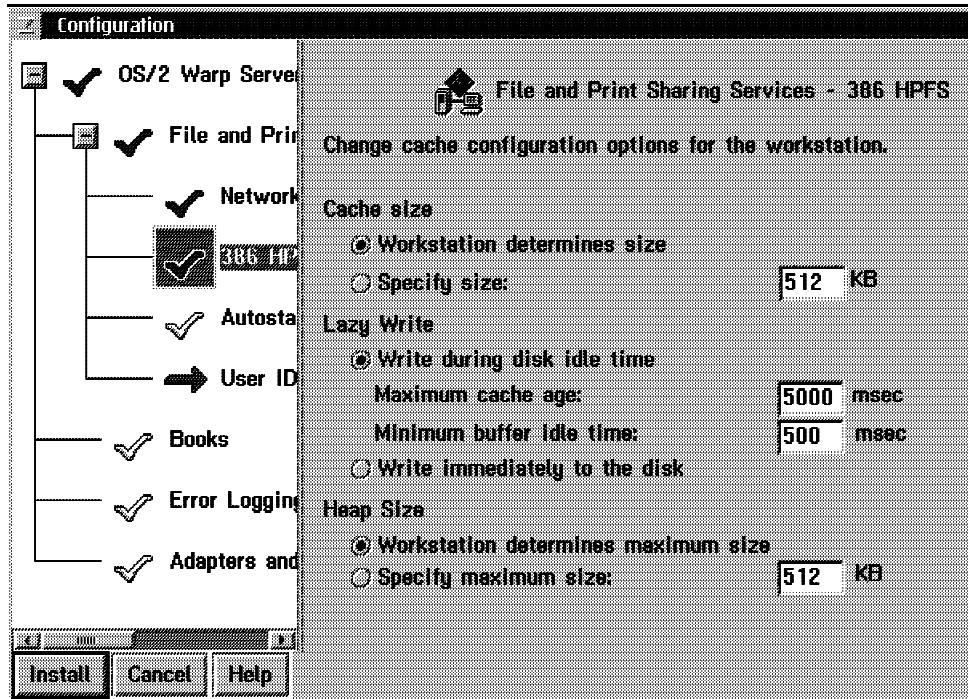


Figure 125. Configuration Window - 386 HPFS

8. Select **Autostart** to display Figure 126. This window configures the services that will start automatically every time the NET START command is issued without any parameters. Again, we will accept the defaults.

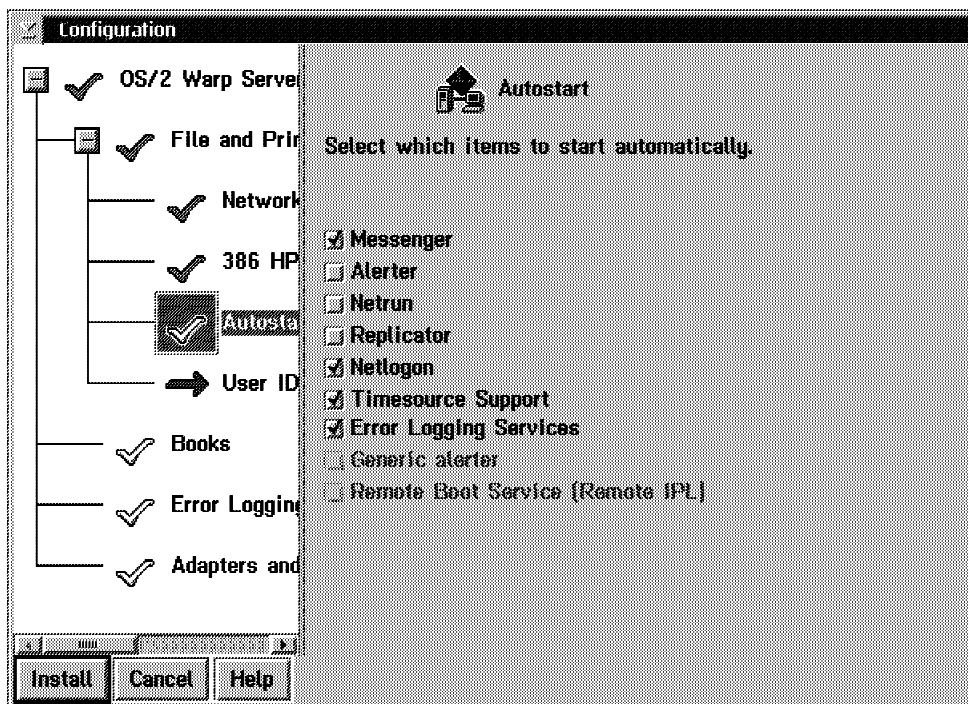


Figure 126. Configuration Window - Autostart

9. Select **User ID and Password** under File and Print Sharing Services.

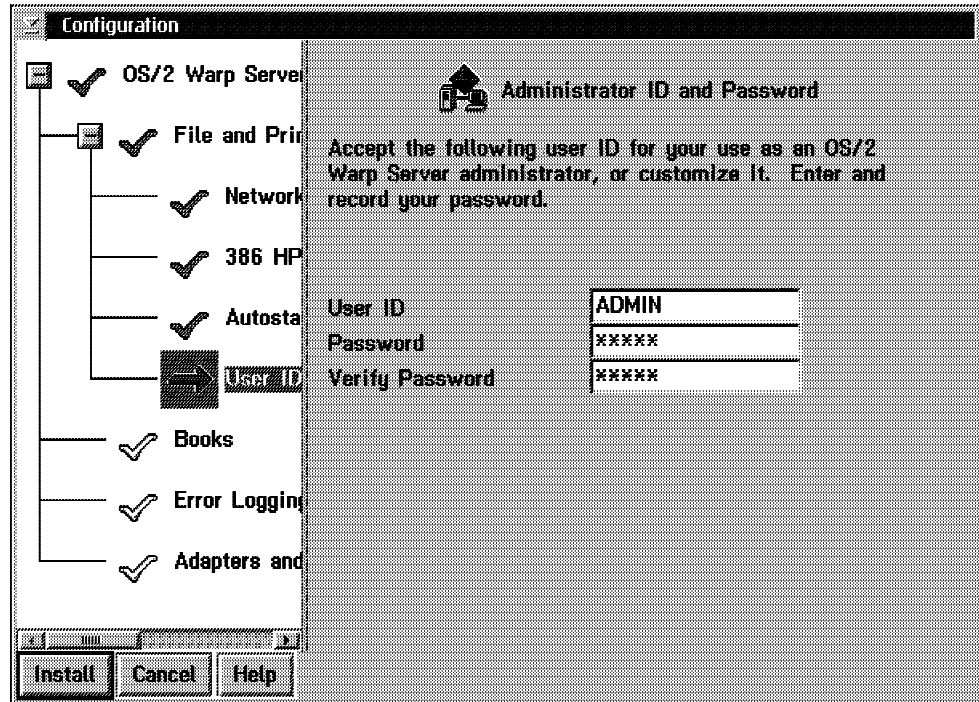


Figure 127. Configuration Window - Administrator ID and Password

10. The Administrator ID and Password screen is now displayed in the left panel of the Configuration window (see Figure 127). Previously, LAN Server always set up a default administrator's ID of USERID. This is now the responsibility of the end user. If you already have an administrative user ID in another domain, then it would certainly be appropriate to use it here as well. Otherwise, use any valid user ID/password combination you wish. Click on Help if you are unsure of the validity of your choices.

When you have entered the values for all three fields, select **Install**. You will then be prompted by the Configuration dialog as viewed in Figure 128. Click **OK** to continue.

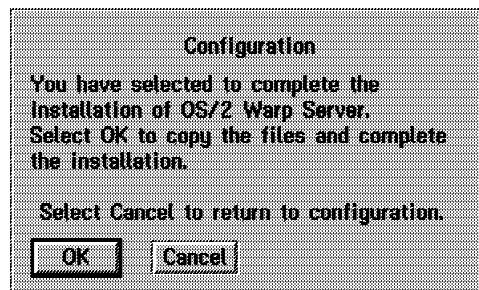


Figure 128. Configuration Dialog

11. The OS/2 Warp Server Tuning Assistant dialog appears (see Figure 129 on page 120).

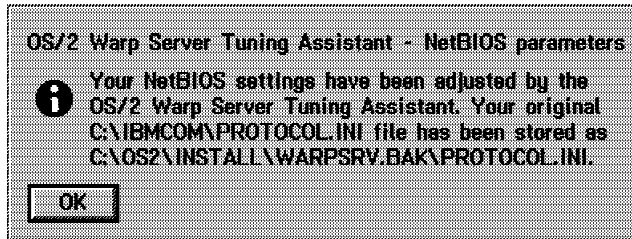


Figure 129. OS/2 Warp Server Tuning Assistant Dialog Box

12. Read the information presented and then click **OK**. The Warp Server Installation will now begin. The installation progress is displayed throughout the Warp Server installation (see Figure 130). Your server will restart as necessary during the installation.

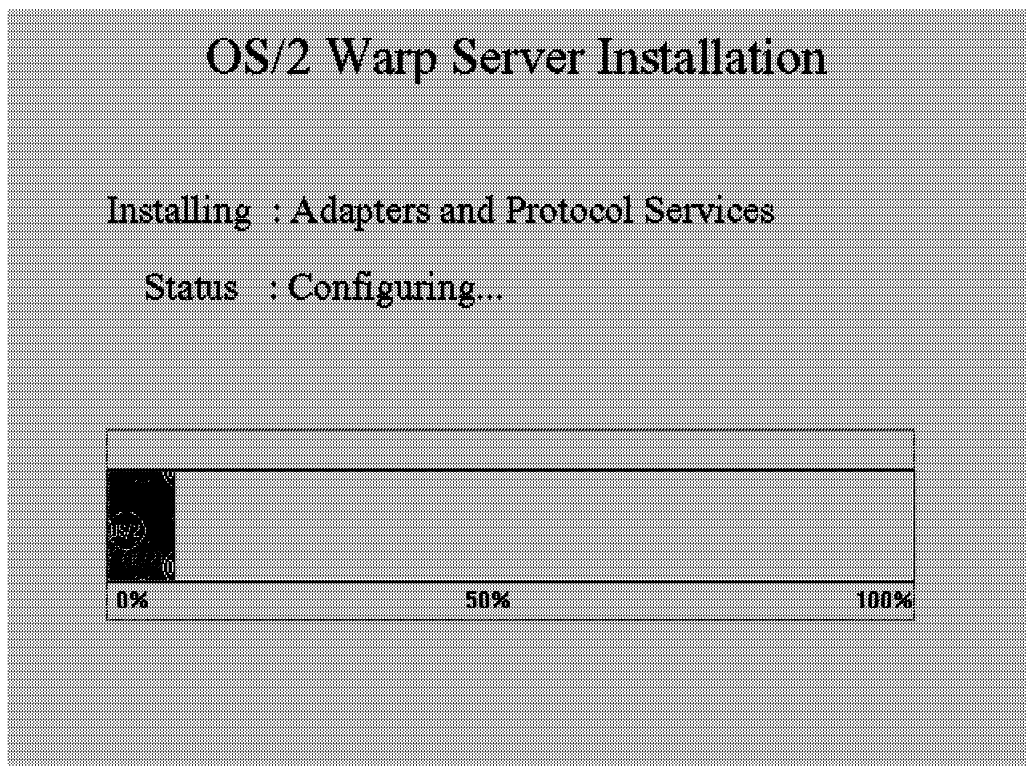


Figure 130. Warp Server Installation Progress Window

13. When the installation is complete, you will be prompted by the window shown in Figure 131 on page 121. Read the information provided, and if you wish to know more, select **Tell me about it...** for the product selected in the list.



Figure 131. OS/2 Warp Server Installation Complete Window

That completes the installation of OS/2 Warp Server over OS/2 Warp 4.0. Your server is now ready to perform File and Print Services. We recommend that you obtain both *Inside OS/2 Warp Server, Volume 1: Exploring the Core Components*, SG24-4602-00 and *Inside OS/2 Warp Server, Volume 2: System Management Backup/Recovery and Advanced Print Services*, SG24-4702-00 for further information pertaining to the detailed usage, customization, and optimization of your Warp Server so that you get the best performance and satisfaction from your IBM PC Server.



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## Chapter 6. Connecting to an OS/2 Warp Server

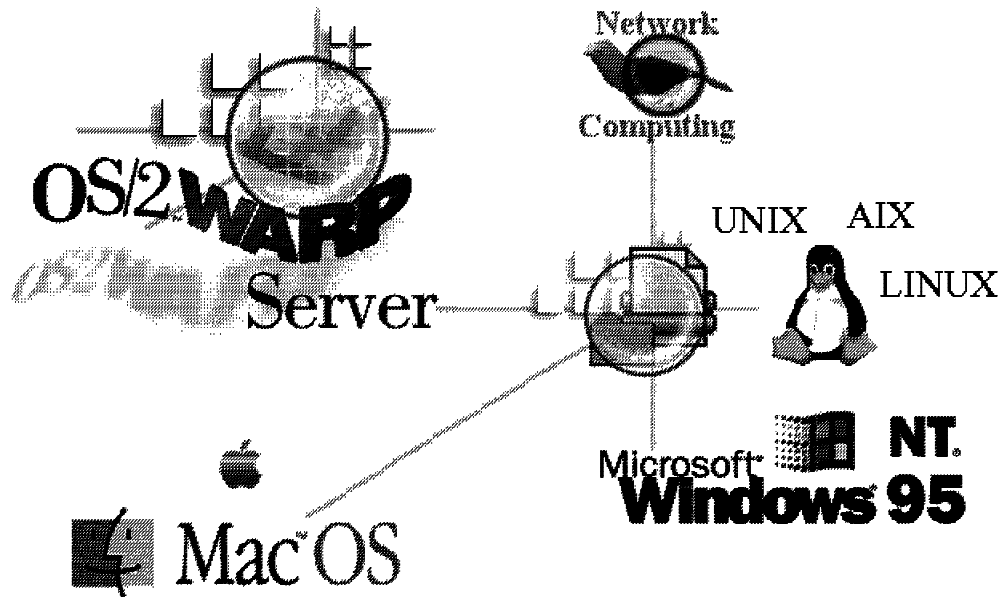


Figure 132. The Supported Warp Server Clients

Whether you run a large enterprise or a small business, OS/2 Warp Server offers you a strategic network platform, for today and for the future. With OS/2 Warp Server, you gain a complete, fully functional application server, a highly reliable network operating system, a systems management server, backup and recovery services, and more. OS/2 Warp Server supports clients running a variety of desktop operating systems, including OS/2 Warp, DOS, Windows 3.x, Windows 95, Windows NT, AIX and Macintosh. Plus, OS/2 Warp Server delivers the protocol independence you've asked for, concurrently supporting NetBIOS, IPX, TCP/IP and 802.2. In this chapter, we focus on some of the new server and client programs and add ons you can get at the IBM Software Choice from the Internet (refer to 1.1, "What's Ahead for OS/2 Warp Server" on page 1).

---

### 6.1 Our Environment

First of all, we introduce you to our environment used to make our tests and examples. We present the hardware, operating systems, and network protocols that were used.

#### 6.1.1 Overview

Figure 133 on page 124 gives you a fast overview of the topology we used. Our servers and clients were set up on the production network of the IBM ITSO Raleigh, USA as a part of the IBM worldwide network. For example, to test the OS/2 Warp Server network application function we ran several Lotus Notes clients for OS/2, Windows 95, and Windows NT, shared from an OS/2 Warp Server to connect to a Lotus Notes Server in Germany.

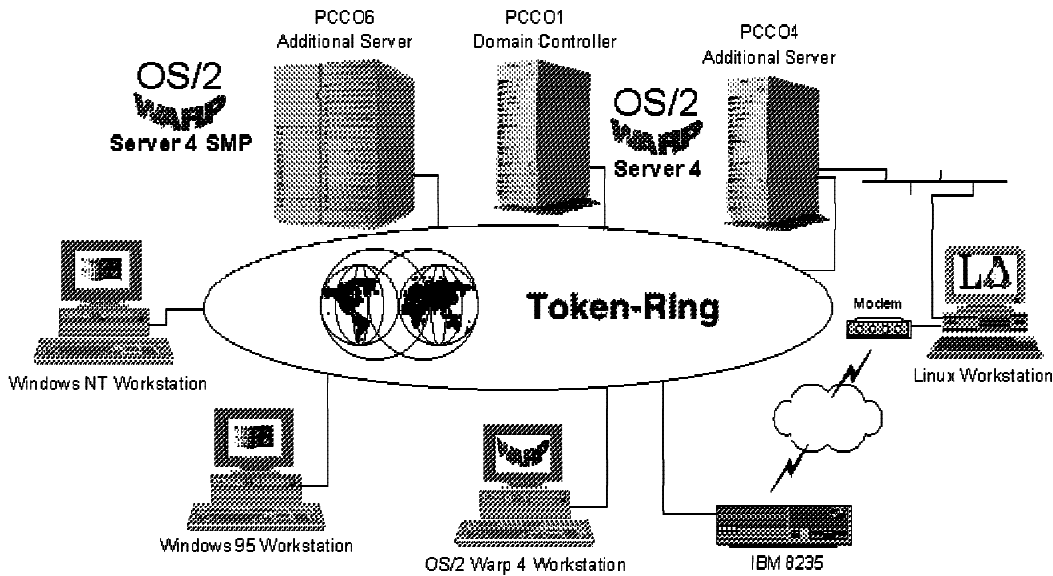
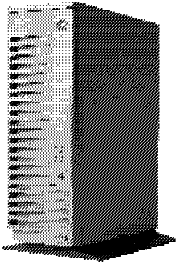
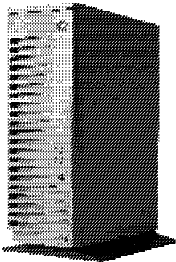


Figure 133. Overview

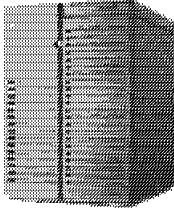
## 6.1.2 Server Systems

The following tables should give you an overview of the server systems we used:

<b>OS/2 Warp Server 1</b> 	Model	IBM PC Server 320
	NetBIOS Name	PCC01
	Domain	PCCOD
	Server Role	Primary (Domain controller)
	Function	File, Print and Application Server
	Network Adapter	MCA Token-Ring 16/4
	SCSI Adapter	PCI Adaptec SCSI-2 Fast/Wide (on planar)
	Operating System	OS/2 Warp 4 (XR04000)
	NOS	OS/2 Warp Server 4 Advanced (IP08265)
	File system	386HPFS

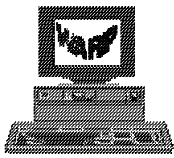
<b>OS/2 Warp Server 2</b> 	Model	IBM PC Server 330
	NetBIOS Name	PCC04
	Domain	PCCOD
	Server Role	Member
	Function	File, Print and Application Server
	Network Adapter 1	IBM PCI Auto LANStreamer Token-Ring Adapter
	Network Adapter 2	IBM Etherjet 100/10 PCI Adapter
	SCSI Adapter	IBM PCI ServeRaid Adapter
	Operating System	OS/2 Warp 3 (XR04000)
	NOS	OS/2 Warp Server Version 4 Advanced (IP08265)
File system	386HPFS	

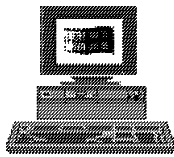



<b>OS/2 Warp Server 3</b> 	Model	IBM PC Server 704
	Number of Processors	4
	NetBIOS Name	PCCO6
	Domain	PCCOD
	Server Role	Member
	Function	File, Print and Application Server
	Network Adapter	IBM PCI Auto LANStreamer Token-Ring Adapter
	SCSI Adapter	IBM PCI ServeRaid Adapter
	Operating System	OS/2 Warp 3 SMP
	NOS	OS/2 Warp Server 4 Advanced SMP
	File system	386HPFS


### 6.1.3 Client Systems

To connect to the OS/2 Warp Servers we worked with the following client workstations:

<b>OS/2 Warp4 Workstation</b> 	Model	IBM PS/2 Model 77
	NetBIOS Name	WARPCIENT
	Domain	PCCOD
	Function	Warp 4 Workstation
	Network Adapter	MCA Token-Ring 16/4
	Operating System	OS/2 Warp 4 (XR04000)
	File system	HPFS

<b>Windows NT Workstation</b> 	Model	IBM PS/2 Model 77
	NetBIOS Name	NTCLIENT
	Workgroup	WORKGROUP / PCCOD / ALONE2
	NT Domain	(Not selectable without an NT Server)
	Function	Windows NT Workstation
	Network Adapter	MCA Token-Ring 16/4
	Operating System	Windows NT 4.0 Workstation
	File system	FAT

<b>Windows 95 Workstation</b> 	Model	IBM PS/2 Model 77
	NetBIOS Name	NTCLIENT
	Workgroup	WORKGROUP / PCCOD / ALONE
	NT Domain	PCCOD (only activated by testing the logon scripts)
	Function	Windows 95 Workstation
	Network Adapter	MCA Token-Ring 16/4
	Operating System	Windows 95
	File system	FAT

<b>Linux Workstation</b> 	Model	OEM
	NetBIOS Name	APOLLO
	Workgroup	PCCOD
	Function	Linux Samba Workstation
	Network Adapter	OEM Ethernet
	Operating System	Red Hat Linux 4.2
	File system	FAT

#### 6.1.4 Network Protocols

On each server and each workstation we configured the NetBIOS and the TCP/IP protocols. Generally, we used NetBIOS to communicate between the OS/2 Warp Servers and several workstations. We used the TCP/IP protocol for Internet, international Lotus Notes and NetFinity connections. On the server PCCO4, we configured NetBIOS over TCP/IP on both network adapters (Ethernet and token-ring) to make the LAN connection between the Linux workstation and the OS/2 Warp Server. A Windows 95 workstation was configured using only TCP/IP.

**Note**

When Microsoft workstations are configured to use only the TCP/IP protocol, they use NetBIOS over TCP/IP to make the server or workgroup connections. If you want to connect an OS/2 Warp Server with these machines add the NetBIOS over TCP/IP protocol and reconfigure the IBMLAN.INI to use the new logical adapter.

## 6.2 OS/2 Warp and OS/2 Warp Server

OS/2 Warp and OS/2 Warp Server provides a solid base for network computing with fundamentals such as TCP/IP, Netscape, and Java already in place. Both provide the connectivity for today's networked world and the stability and compatibility you need to run your business.

In this section, we demonstrate the installation of OS/2 Warp 4.0 and the latest OS/2 Warp Server solution WorkSpace On-Demand.

## 6.2.1 Installing OS/2 Warp 4.0 File and Print Client

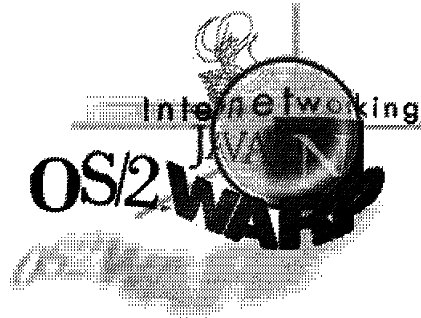


Figure 134. OS/2 Warp 4.0

OS/2 Warp 4.0 is the premiere network client operating system solution for companies of all sizes and for people who want to stay connected from anywhere. You can standardize on one operating environment and meet the wide range of networking requirements throughout your organization. OS/2 Warp 4.0 has unmatched connectivity, improved systems management, easier-than-ever Internet access and an enhanced user interface.

This section guides you step by step through an installation of OS/2 Warp 4.0. Enhancements to OS/2 Warp 4.0 make it an ideal upgrade to OS/2 Warp 3.0 as a Warp Server client and operating system.

### World Wide Web

IBM's WWW site contains a wealth of information about OS/2 Warp 4.0. For the latest information on OS/2 Warp 4.0 refer to URL:

<http://www.software.ibm.com/warp/>

To install OS/2 Warp 4.0:

1. Insert the Installation Diskette for CD-ROM into drive A.
2. Insert the OS/2 Warp 4.0 CD-ROM into the CD-ROM drive.
3. If your server is already on, press Ctrl+Alt+Del to restart it, otherwise, turn on the server.
4. When prompted to do so, remove the Installation Diskette for CD-ROM from drive A and insert the OS/2 Warp 4.0 Diskette 1 for CD-ROM. Then press Enter.
5. When prompted to do so, remove the OS/2 Warp 4.0 Diskette 1 for CD-ROM from drive A and insert the OS/2 Warp 4.0 Diskette 2 for CD-ROM. Then press Enter.
6. When the Welcome screen is displayed, read the information and press Enter.
7. If the Important Licensing information screen appears, read it and press Enter.
8. At the Easy and Advanced Installation screen, select **Advanced** and press Enter.

9. When the Installation Drive Selection screen is displayed, use the arrow keys on your keyboard to select **Specify a different drive or partition**. Then press Enter.
10. A message window is displayed. Read the message and Enter. The FDISK screen is displayed. For this example, our client workstation has a 1-GB hard drive installed. We create a 300-MB C: primary partition and a D: logical partition with the remaining space.
  - a. Select **Options - Create Partition** from the pull-down menu.
  - b. In the maximum size entry field, type 300. Ensure the type of partition is marked Primary.
  - c. Click **Create**.
  - d. The remaining free space is highlighted. Select **Options - Create Partition** from the pull-down menu.
  - e. Select **Logical** as the partition type and click **Create** to accept the remaining space as your D: drive.
  - f. Press F3 and click **Save** to save and exit FDISK.

After you change partitions in FDISK and save the changes, the server must be restarted so that the partitions can be recognized during installation. Follow the instructions on the screen and restart the installation with step 4 on page 127.

11. The Formatting the installation partition screen is displayed. Select **Format the partition** and press Enter to continue.
12. The Select the File System window is displayed. Select **High Performance File System** and press Enter.
13. A message window is displayed. Read the message and press Enter to continue.
14. The Installing OS/2 Warp 4.0 progress screen is displayed. When prompted to do so, remove the diskette from drive A. Then press Enter. The server restarts.
15. The System Configuration window is displayed as seen in Figure 135 on page 129. Check the country configuration and hardware device types to ensure that they are correct for your workstation.

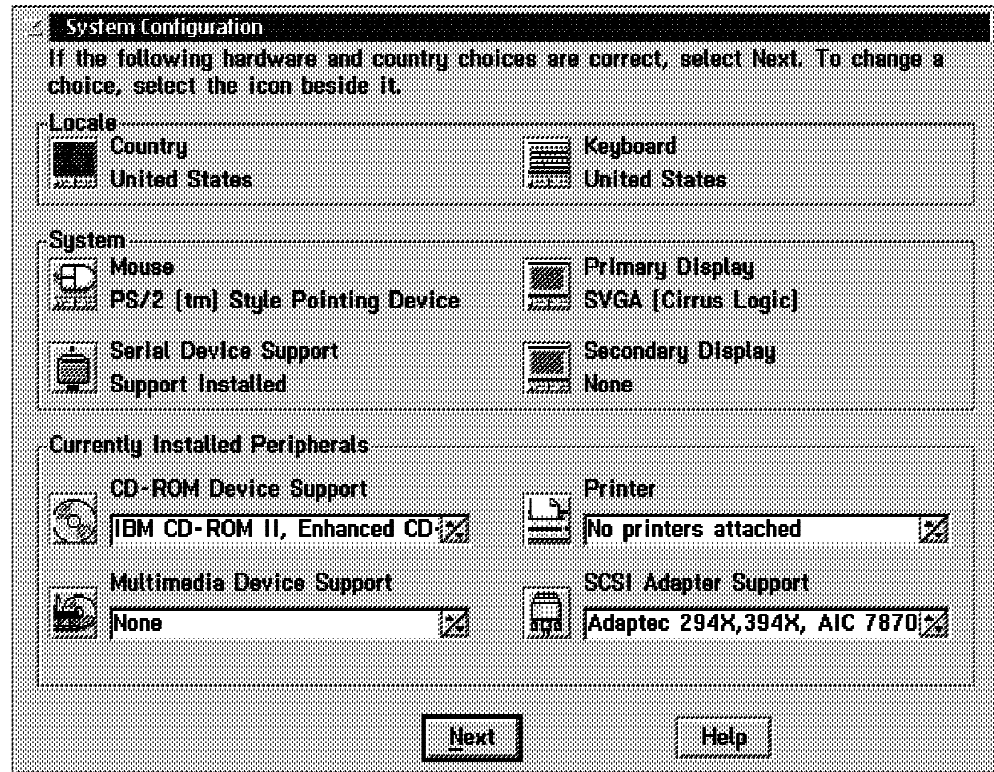


Figure 135. System Configuration Window

16. Select the icon next to **Printer** to display the Select System Default Printer window as pictured in Figure 136.

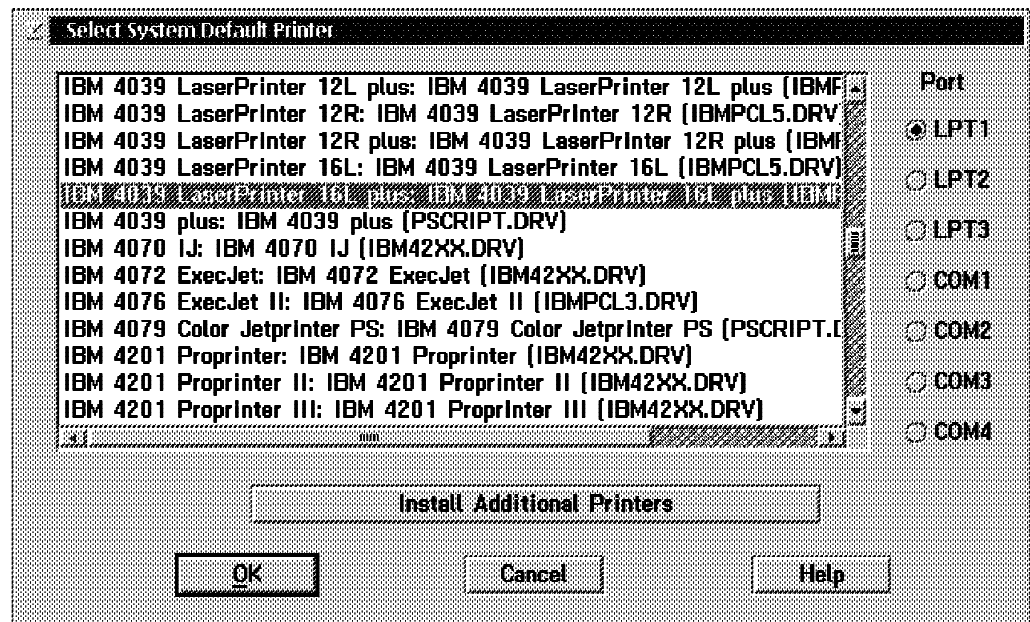


Figure 136. Select System Default Printer Window

17. Select the proper printer(s) for your server. If you do not have any printers attached, or plan to use LAN-attached printers, then leave the default selection. Click **OK**.

18. You will now be presented with the System Configuration window again as in Figure 135. You will note, however, that the changes you have made will now be visible. Select **Next** to display the System Configuration (cont.) window as seen in Figure 137 on page 130.

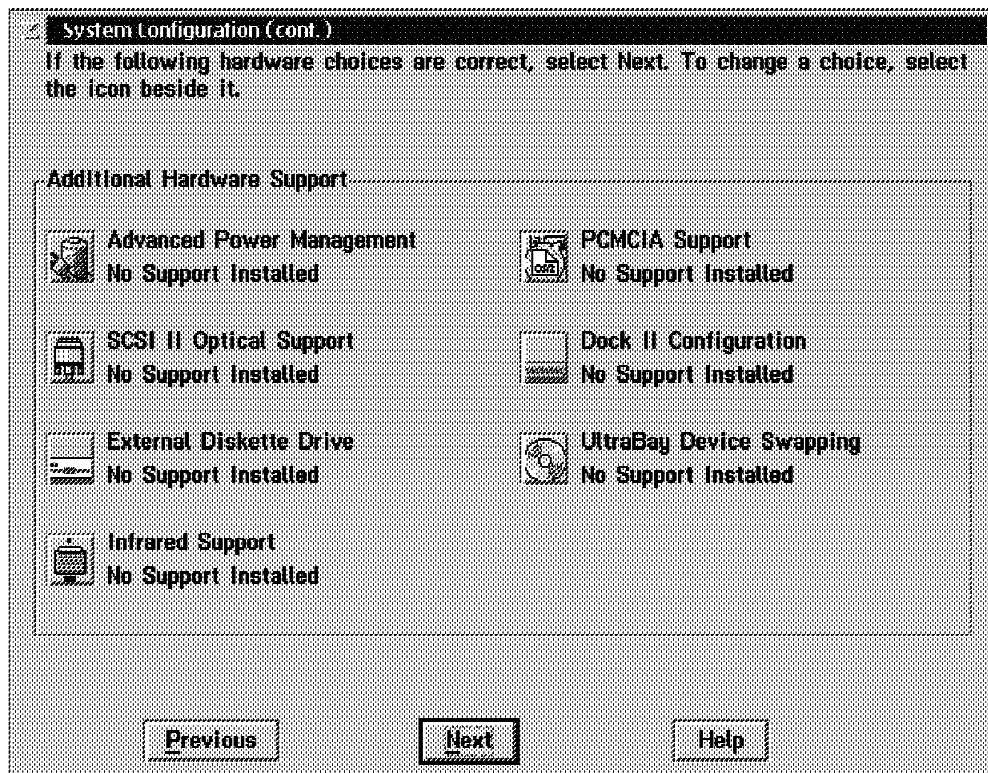


Figure 137. System Configuration (cont.) Window

19. Select **Next** to display the Display Driver Install window (see Figure 138 on page 131).

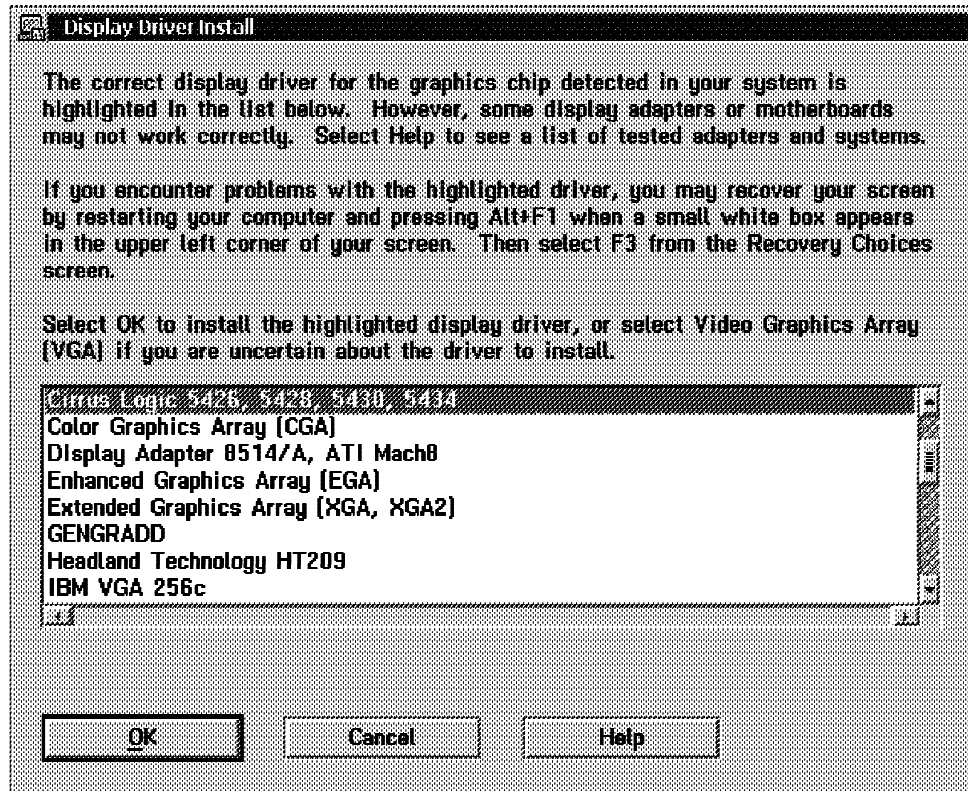


Figure 138. Display Driver Install

OS/2 Warp 4.0 automatically detects the graphics chip in your system. This screen appears to allow you to confirm the display driver to be loaded.

20. Select **OK** to install the highlighted display driver. Afterwards, the OS/2 Setup and Configuration window will be displayed as in Figure 139 on page 132.

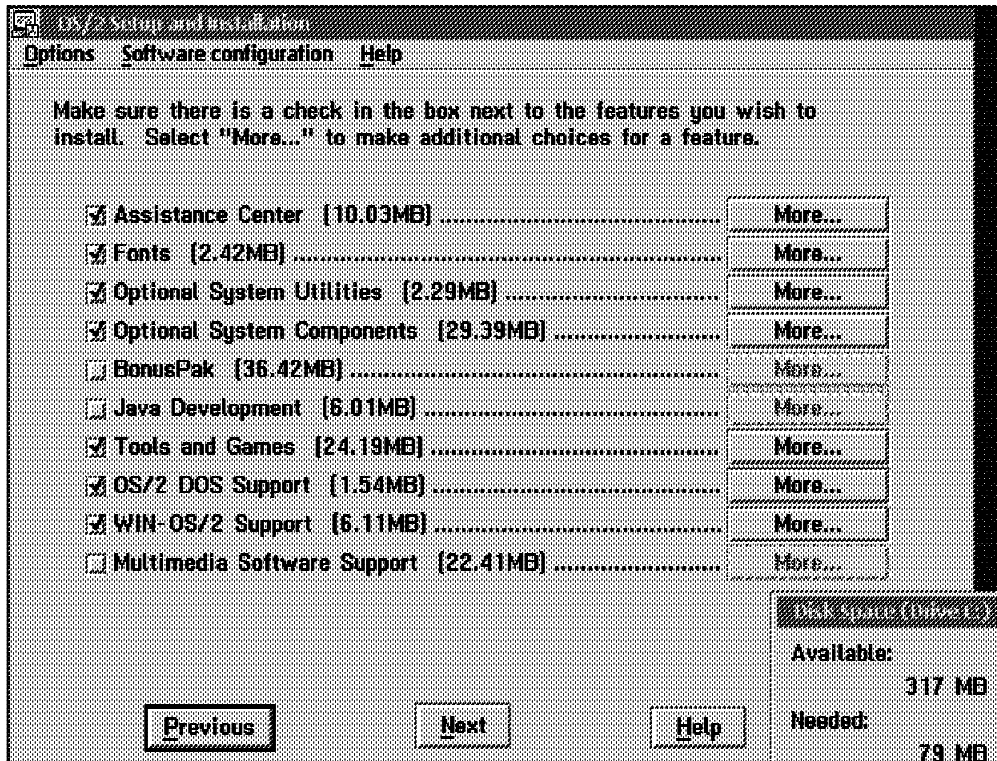


Figure 139. OS/2 Setup and Installation Window

21. Unless you have certain hardware devices to support the multimedia feature of OS/2 Warp 4.0, we recommend that you uncheck **Multimedia Software Support**, as shown in Figure 139 to conserve space as well as reduce the amount of memory used by OS/2.
22. Select **Next** to display the window in Figure 140.

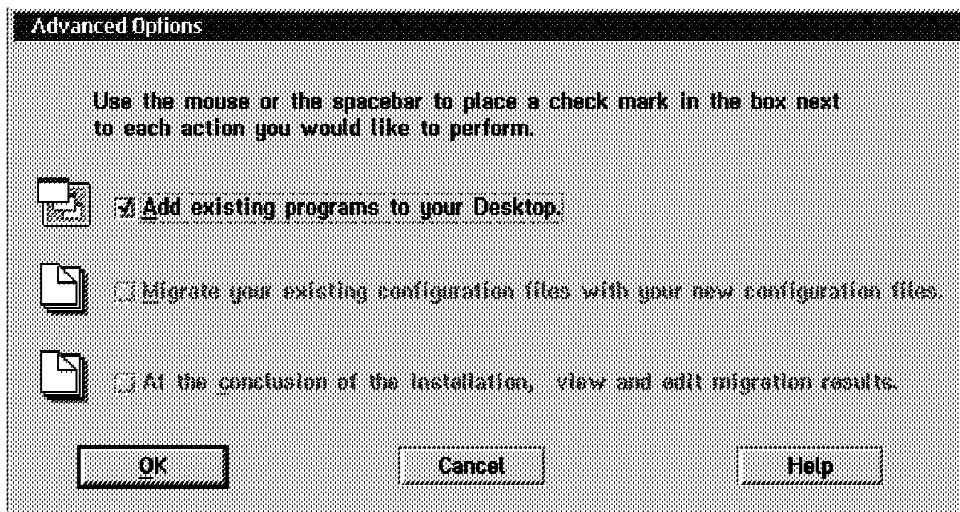


Figure 140. Advanced Options Windows.

23. Leave the **Add existing programs to your Desktop** check box checked. Click **OK** to continue.



24. You will now be presented with the OS/2 Warp Setup and Installation window, as pictured in Figure 141 on page 133. Mark the File and Print Client check box only and select **Next** to continue.

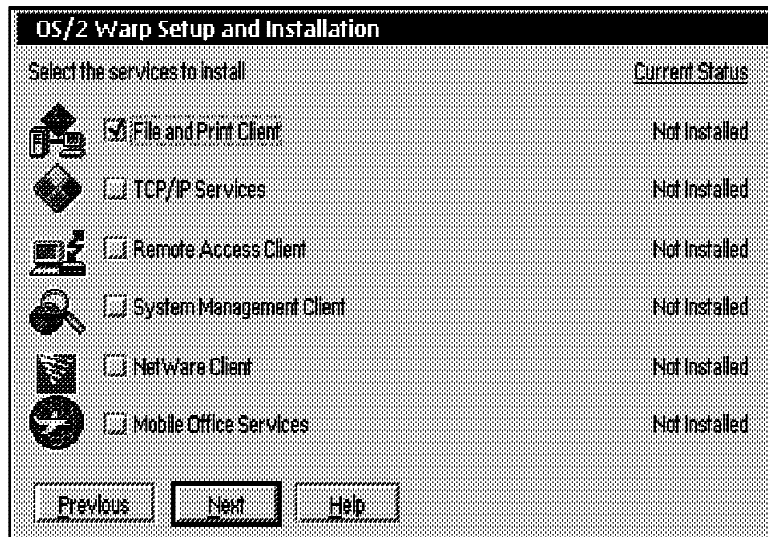


Figure 141. OS/2 Warp Setup and Installation Window

25. The Configuration window is now displayed (as seen in Figure 142). Note the symbol key in the right panel of the window.



Figure 142. Configuration Window

The symbol key in the left panel indicates that OS/2 Warp 4.0 has several items listed that require configuration or acceptable defaults. We will select each listed item to configure or make changes.

26. Select **File and Print Sharing Services**. The File and Print Client window is displayed in Figure 143 on page 134.

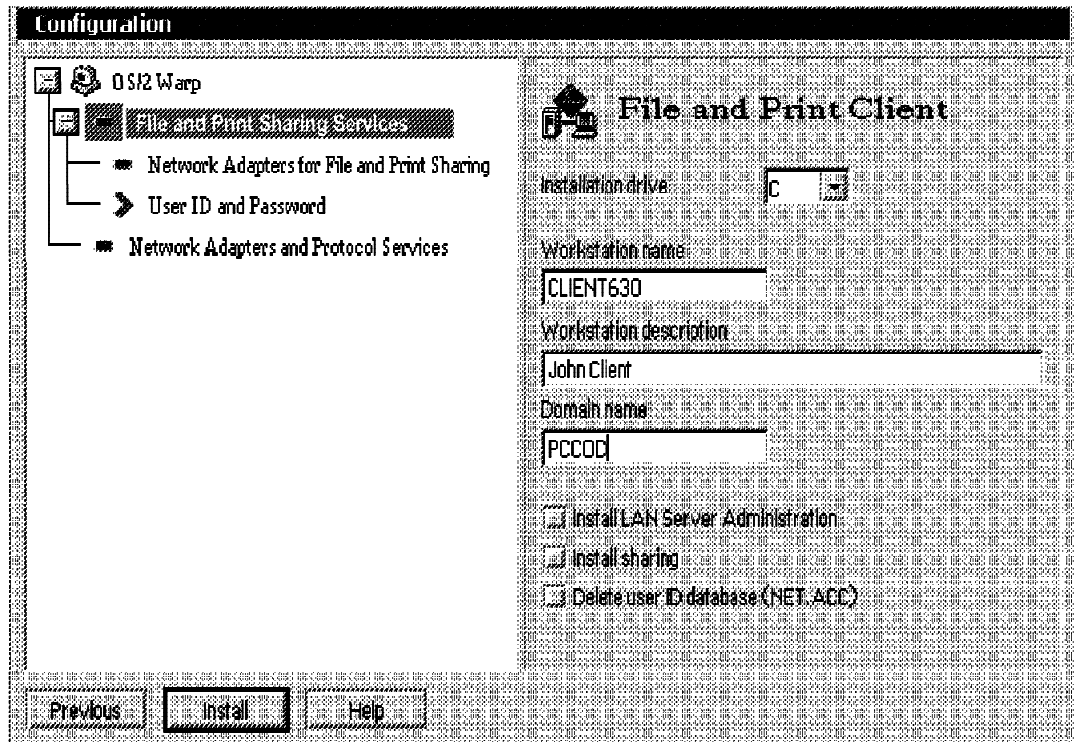


Figure 143. File and Print Client Window

27. The Installation drive entry field should indicate the drive you intend to install the OS/2 Warp 4.0 operating system.
28. In the Workstation name field, type the name of your workstation or a name to identify the workstation. For example, type CLIENT630.
29. In the Workstation description field, type a description to identify the workstation. For example, type John Client.
30. In the Domain name field, type the name of your domain controller. For example, type PCCOD.

**Note:** You should mark the Install LAN Server Administration check box if this workstation will be used to administer your Warp Server domain. In addition, you should mark the Install sharing check box if you plan to use this workstation as a peer station enabling it to share applications and resources.

31. In the left panel of File and Print Client window, select **Network Adapters for File and Print Sharing** as seen in Figure 144 on page 135. The token-ring or Ethernet adapter in your server should be displayed under Current Configuration. If it is not, then select **Change Adapter...** or **Add Adapter...** and install your network adapter.

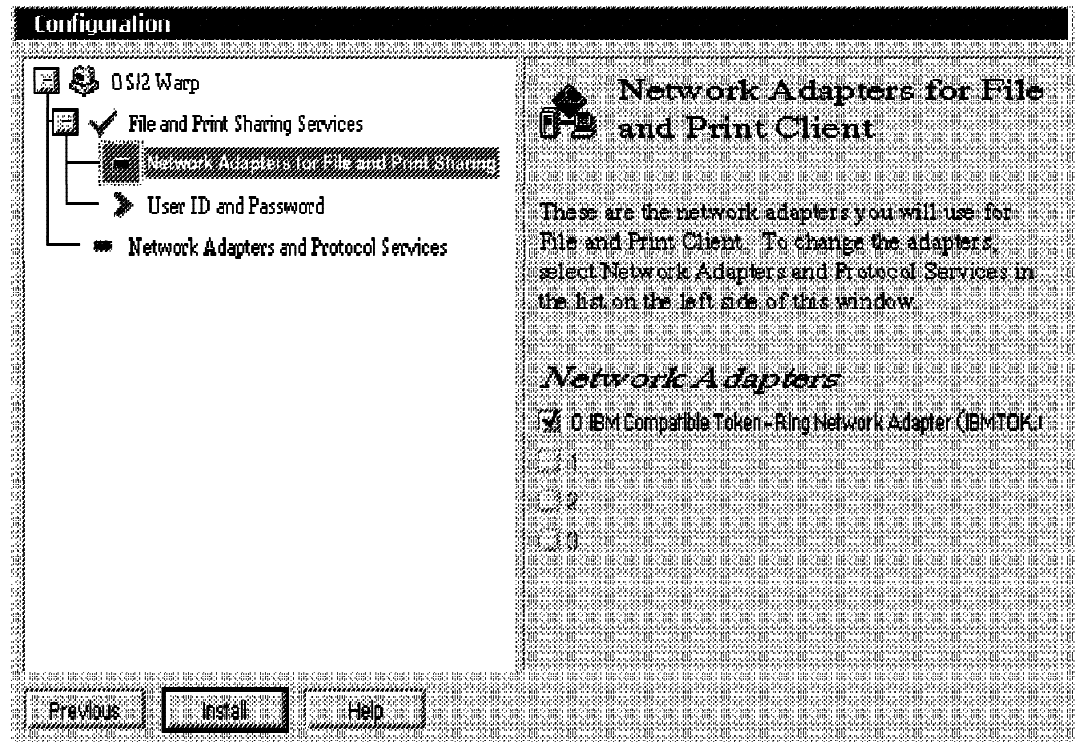


Figure 144. Network Adapters for File and Print Client Window

OS/2 Warp 4.0 has detected that an IBM token-ring network adapter has been installed and will use the driver listed to initialize this system.

32. In the left panel of the Network Adapters for File and Print Client window, select **User ID and Password** as seen in Figure 145 on page 136.

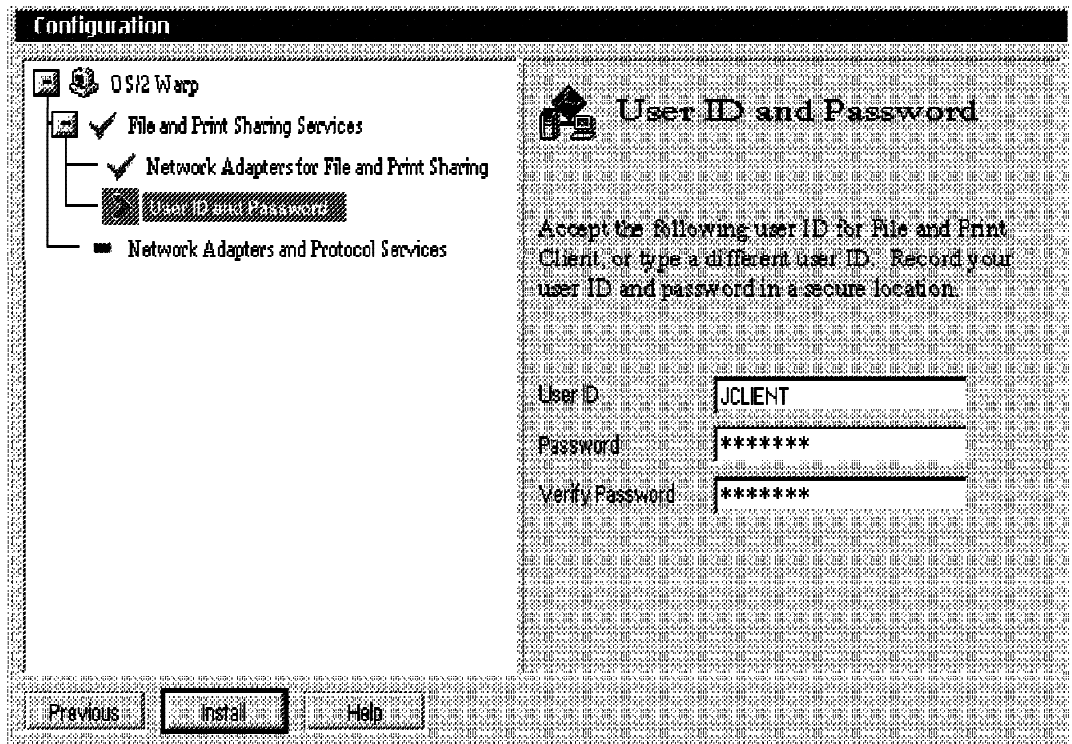


Figure 145. User ID and Password Window

33. In the User ID field, type a user ID for the file and print client. For example, type JCLIENT.
34. In the Password and Verify Password field, type the password to be used with the user ID.
35. In the left panel of the User ID and Password window, select **Network Adapters and Protocol Services** as seen in Figure 146 on page 137.

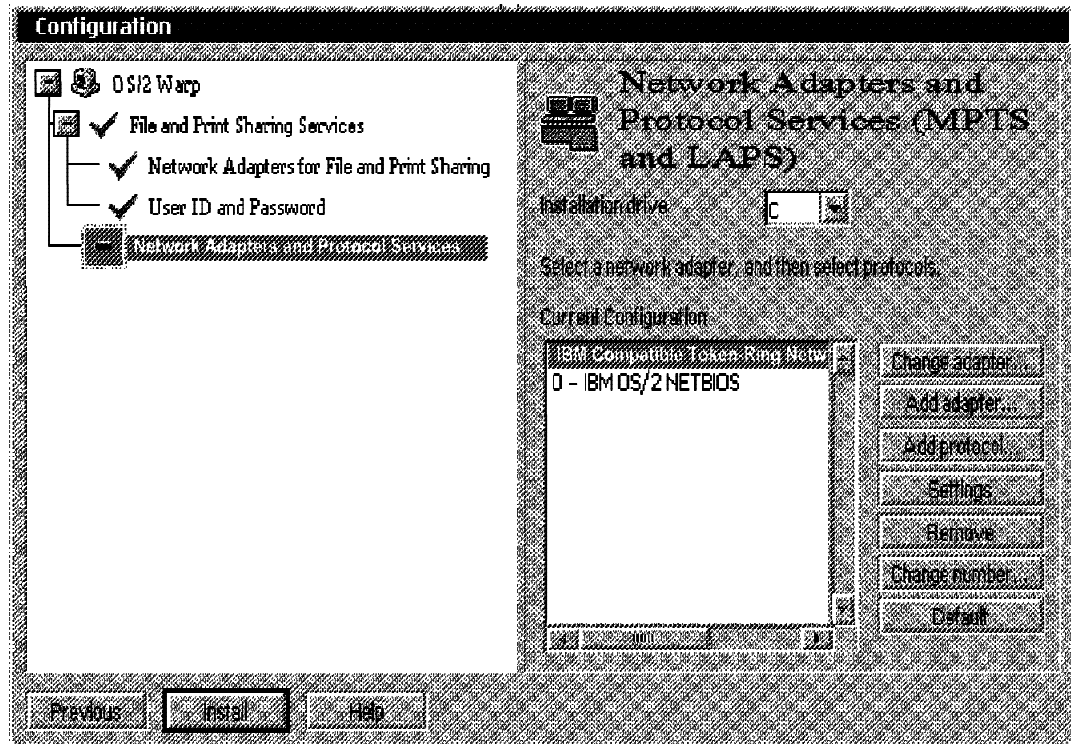


Figure 146. Network Adapters and Protocol Services Window

36. Ensure the token-ring adapter card is highlighted and click **Settings**. The screen with the token-ring adapter settings will appear as in Figure 147.

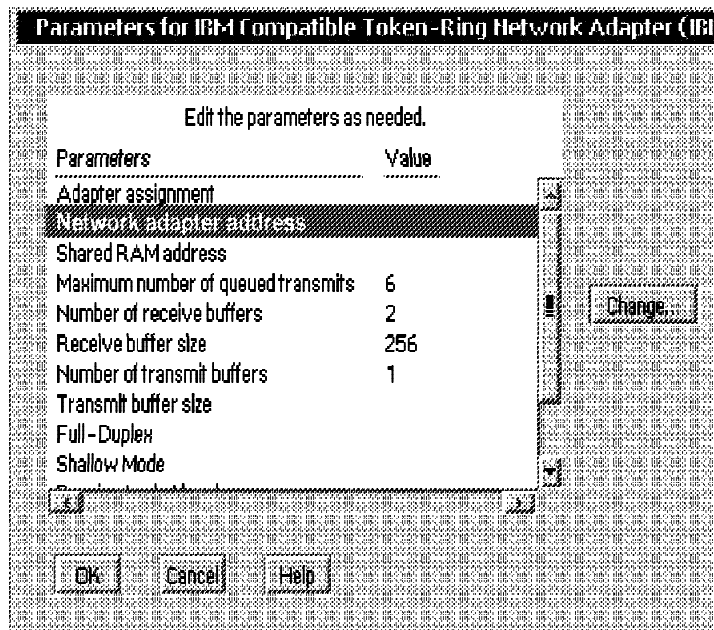


Figure 147. Parameters for IBM Compatible Token-Ring Network Adapter Window

37. Select **OK**. You will see the Change Configuration screen for the token-ring adapter as in Figure 148 on page 138.

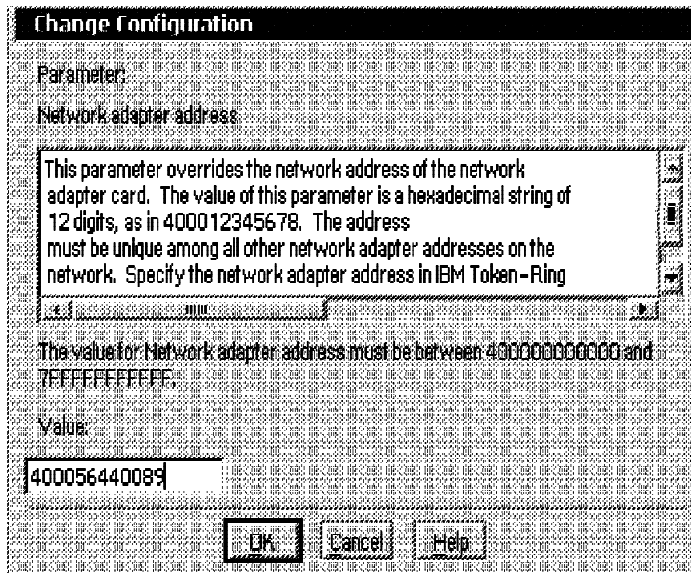


Figure 148. Change Configuration Window

38. In the Value field, type the unique (Local Administered Address) LAA that has been assigned to this workstation. For example, type 400056440089.
39. Click **OK** twice, and then click **Install** to continue with the installation.

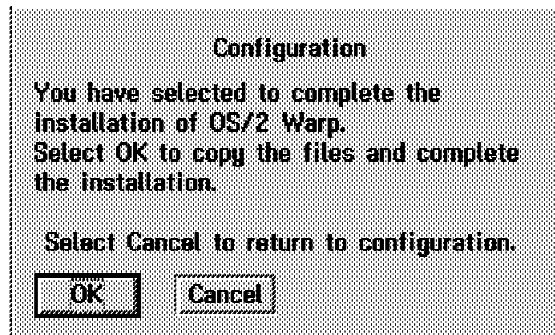


Figure 149. Confirmation Window

40. A confirmation window, as seen in Figure 149, is displayed. Click **OK** to begin the installation of OS/2 Warp 4.0  
 A progress window shows the status of your installation. During the installation, a screen will appear regarding the selection of your attached monitor as seen in Figure 150 on page 139.

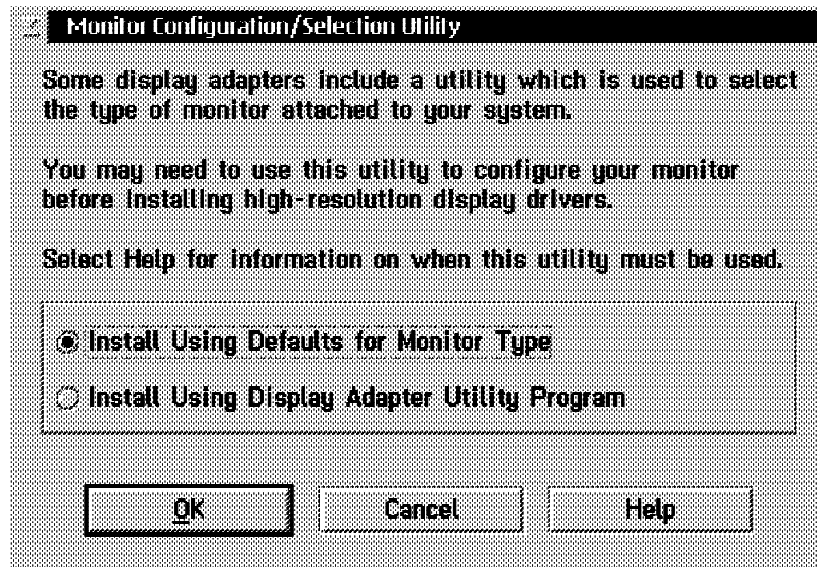


Figure 150. Monitor Configuration/Selection Utility Window

41. Ensure that **Install Using Defaults for Monitor Type** is highlighted and click **OK** to continue.

When the installation completes, the OS/2 Warp Setup and Installation window will inform you that your installation is complete.

42. Read the instructions and click **OK** to start a reboot of your server.

Once your OS/2 Warp 4.0 operating system has been properly installed and configured you can begin accessing network resources immediately. For more details on connecting to network resources from OS/2 Warp 4.0, we recommend that you obtain *Inside OS/2 Warp Server, Volume 1: Exploring the Core Components*, SG24-4602-00.

## 6.2.2 WorkSpace On-Demand

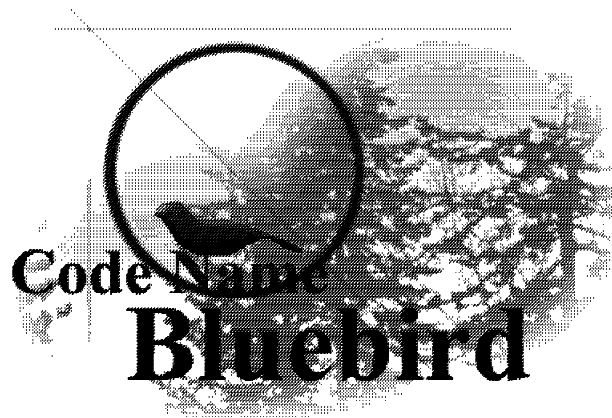


Figure 151. Code Name Bluebird Now Known As WorkSpace On-Demand

WorkSpace On-Demand (formerly known as Code Name Bluebird) is mentioned in this section because it offers IBM customers an alternative from a traditional

client/server model to a network computing environment optimized for 100% Pure Java, the Internet, and corporate intranets. In addition, this solution is for customers who seek to reduce their cost of ownership of PCs in a network environment. They prefer a thin client or managed PC solution capable of handling today's dynamic office changes better with little or no administrative actions. This solution may save customers millions of dollars in the right end user environment (task-oriented users such as order entry or customer support representatives) deploying network computers. One key thing to remember is that network computers are not for everyone. If many end users in your organization are considered true power users (informal surveys estimate that only 30% of the end users in an average company are truly power users), then today's fat client model may be the right solution.

WorkSpace On-Demand consolidates applications and data on the server, reducing complexity and overall costs by allowing IS managers and system administrators to more easily manage user applications fulfilling one of the promises of network computing. With WorkSpace On-Demand administrators add applications or make updates to many client systems at a single server rather than at multiple client machines.

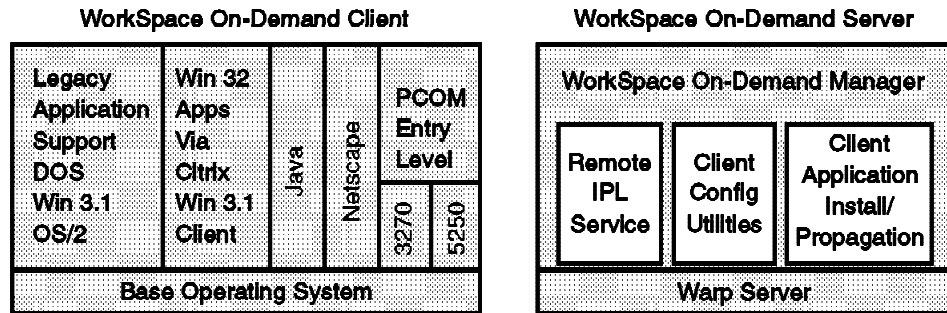
### **6.2.2.1 What Is WorkSpace On-Demand**

WorkSpace On-Demand is IBM's Intel-based managed client operating system for enterprise customers who want the potential to reduce operational costs using optimized network computing technology. WorkSpace On-Demand is based on proven technology and is capable of managing many clients from a single server, simplifying software administration and maintenance, reducing associated costs, allowing more efficient use of critical IS skills. WorkSpace On-Demand extends customers' investment by supporting current hardware platforms, DOS, Windows 3.1 and OS/2 applications while providing a Year 2000 Ready environment. WorkSpace On-Demand allows the customer to migrate easily to network computing with concurrent 100% Pure Java capability to let users benefit from centrally controlled applications without losing the flexibility and power of traditional PCs. This network computing environment consist of three components:

1. WorkSpace On-Demand Client - A client operating environment that consists of the operating system and software that runs on a network computer or client machine. The client provides end user logon capability and a simplified desktop consisting of program objects, or icons, to run client applications.
2. WorkSpace On-Demand Manager - A set of utilities to manage the client environment, and a service offering setup and rollout. The manager includes RIPL server enhancements.
3. WorkSpace On-Demand Server - The WorkSpace On-Demand manager functions run on an OS/2 Warp Server making it a WorkSpace On-Demand server. The server enhancements include improved RIPL function and usability. The administrator functions add a set of utilities to the existing Warp Server functions to install the client software on the server, configure client hardware, configure the software for a particular client machine and end user, and administer end users and applications.

All WorkSpace On-Demand Client code (operating system) and WorkSpace On-Demand Manager software reside on the server, simplifying system management.





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Figure 152. The WorkSpace On-Demand Client and the WorkSpace On-Demand Server

### 6.2.2.2 WorkSpace On-Demand Client

The WorkSpace On-Demand client consists of an operating system and a simplified desktop to run applications. The client operating system image, all applications, and end user data reside on the server. When the client is powered on, its operating system is loaded from the WorkSpace On-Demand server by the remote initial program load (RIPL) service. The end user is prompted to log on. The end user access authority is checked and only those applications assigned to the end user are available. The end user Desktop then displays the program objects for each application the end user has access to. When the end user selects an application to run, the application is downloaded from the server and runs on the client. When the end user terminates the application, the end user data is stored back onto the server. The client does not have local nonvolatile storage, storage that persists from one logon session to another. If an optional hard disk is present on the client machine, it is used only for temporary swapping space.

### 6.2.2.3 WorkSpace On-Demand Manager

The WorkSpace On-Demand manager, which runs on the WorkSpace On-Demand server, consists of enhancements to the domain controller, RIPL service, and additional administrator functions to configure and manage the WorkSpace On-Demand client. The system administrator can install the WorkSpace On-Demand client image on the server, build an image for a specific WorkSpace On-Demand client machine, install applications, and manage service and upgrades. A server with the WorkSpace On-Demand manager function installed is referred to as the WorkSpace On-Demand server. A WorkSpace On-Demand server may have other functions enabled on it, for example, HTTP server, DB/2 server, Lotus Notes server and other similar functions.

The administrator functions are available to an administrator at the server or at a client machine when the administrator logs on as an administrator. Only the administrator can install and configure client applications and provide access to them by adding them to the client desktop.

### 6.2.2.4 Network Structure in Which WorkSpace On-Demand Operates

In the simplest case, the WorkSpace On-Demand network environment consists of the WorkSpace On-Demand server, on which the WorkSpace On-Demand manager runs, and the WorkSpace On-Demand clients. The WorkSpace On-Demand server exists in a domain (as shown in Figure 153 on page 142) defined by the domain controller and an optional backup domain controller. The

WorkSpace On-Demand server itself can be the domain controller or a separate server. The domain controller provides user ID and password authentication based on the user account subsystem and provides the end user with access to resources in that domain. The domain controller also maintains information on the list of applications that each end user is given access to. An optional backup domain controller contains a backup copy of the DCDB and can provide services in the case of a failure on the primary domain controller. Additional servers may also exist as application servers.

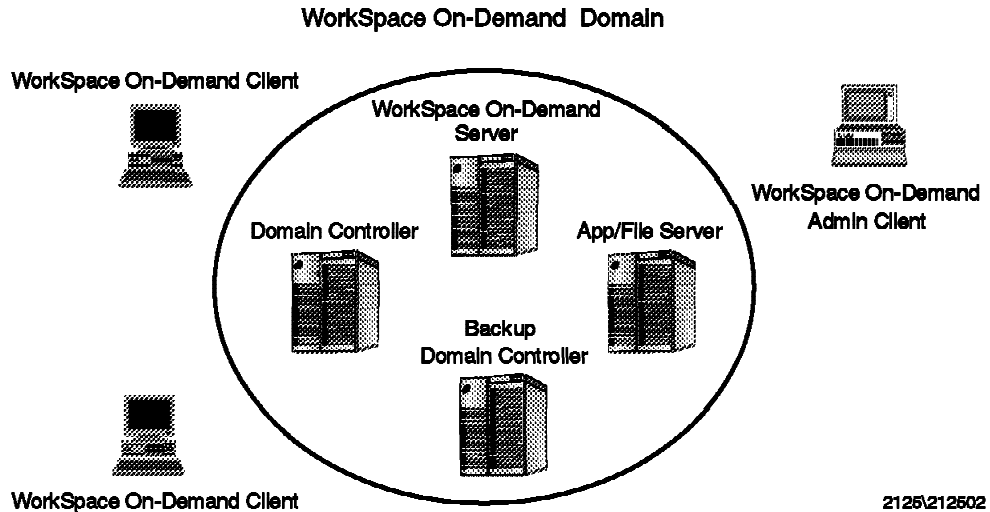
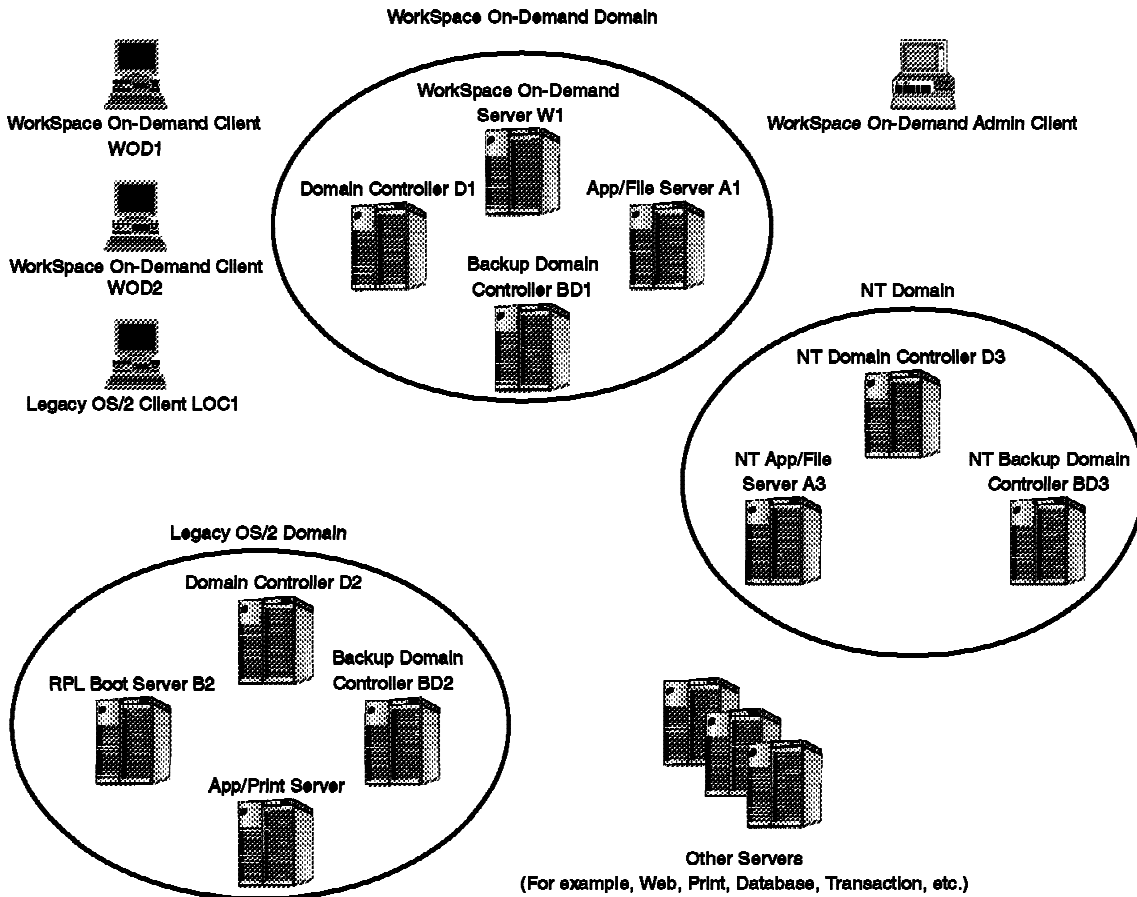


Figure 153. The WorkSpace On-Demand Domain

In a heterogeneous network environment (see Figure 154 on page 143), the WorkSpace On-Demand client and server can interact with other WorkSpace On-Demand clients and servers, as well as existing clients and servers. For example, a WorkSpace On-Demand client (WOD1, WOD2) can log on to some other domain (D2) to access its resources, for example, Web, print, database, and transaction servers, running on platforms including AIX, AS/400, and S/390. A WorkSpace On-Demand server (W1) provides services to existing legacy clients (LOC1) as well as WorkSpace On-Demand clients (WOD1).

The administration of WorkSpace On-Demand can be performed only from a WorkSpace On-Demand server (W1) or remotely from a WorkSpace On-Demand administration client (ADM1).



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Figure 154. Heterogeneous WorkSpace On-Demand Domain

### 6.2.2.5 LAN Server Administration GUI

The LAN Server Administration GUI allows the WorkSpace On-Demand administrator to control the WorkSpace On-Demand clients, as well as existing DOS and OS/2 RIPL clients. Each WorkSpace On-Demand client has specific hardware information, for example, the type of communications card installed, the printers attached, and the type of terminal display it has. This information is kept on the WorkSpace On-Demand server and is provided to the WorkSpace On-Demand client to allow the client to initialize correctly. The administrator has the ability to display, set, and modify the client machine hardware configuration data, as well as controlling applications the end user has access to.

The WorkSpace On-Demand manager functions enhance the existing OS/2 Warp Server LAN Server Administration GUI in three functional areas to support the WorkSpace On-Demand clients. These areas are:

- RIPL requesters
- Applications
- User accounts

**RIPL Requesters:** After installing WorkSpace On-Demand, a new WorkSpace On-Demand RIPL requester object is displayed in the Remote RIPL Requester folder. The WorkSpace On-Demand RIPL requester object allows the

administrator to create and update specific WorkSpace On-Demand client data. The WorkSpace On-Demand RIPL requester object is similar to the existing OS/2 Warp Server Remote IPL object, but allows for more specific data to be entered to handle the WorkSpace On-Demand client information. You can perform the following tasks from the WorkSpace On-Demand RIPL Requester object:

- Create a WorkSpace On-Demand RIPL requester
- Modify a WorkSpace On-Demand RIPL requester
- Delete a WorkSpace On-Demand RIPL requester
- Display a WorkSpace On-Demand RIPL requester

A new WorkSpace On-Demand machine class has been added to the LAN Server Administration GUI. Each machine class contains the hardware-specific information for each hardware client machine. This hardware-specific information is stored with more generic information on the RIPL server for the RIPL requester.

**Applications:** Every DOS and OS/2 network application can run on a WorkSpace On-Demand client. All applications that run on WorkSpace On-Demand clients need specific environment information stored and must be able to change the environment on a per-application basis. The environment information is used by the application launcher to make sure the application runs correctly on the WorkSpace On-Demand client. This application parameter environment information is added to the existing application objects for public applications. These application parameters are needed to allow applications to run on a WorkSpace On-Demand client. You can perform the following tasks from the applications objects:

- Add application parameters
- Modify application parameters
- Delete application parameters
- Display application parameters

**User Accounts:** Besides application parameters, there are some user-specific parameters that can be set to support the running of applications on a WorkSpace On-Demand client. The user-specific parameters per application are modified from the User Accounts notebook and are maintained on a per-user basis.

The OS/2 Warp Server User Accounts objects use existing fields for additional information specific to the WorkSpace On-Demand clients. These fields include a home directory for storing WorkSpace On-Demand user-specific information, and an application list, which stores all the applications an end user can access during logon to a WorkSpace On-Demand client.

#### 6.2.2.6 Machine Class

A *machine class* is a description of the hardware environment and the data files to support a particular hardware platform or client machine. One machine class is defined for each hardware configuration or client machine. The hardware environment information includes:

- Serial support
- Parallel support

- Bus type, for example ISA/PCI or Micro Channel
- Video subsystem

The machine class information maintains several files including a WorkSpace On-Demand .INI file, OS2.INI, OS2SYS.INI, and CONFIG.SYS. When a particular instance of a client machine or RIPL requester is created, the hardware information is obtained from these files to define an RIPL requester.

### 6.2.2.7 Roaming Application Access

*Client roaming* allows an end user to move to and use different client machines of the same hardware configuration to access their desktop and applications. The end user accesses the exact same set of applications and environment after logging on any of these machines.

### 6.2.2.8 Legacy Clients Logging onto a WorkSpace On-Demand Domain

End-users on a legacy OS/2 client can log on to a WorkSpace On-Demand domain and experience no change in the services they receive.

### 6.2.2.9 Key Points about WorkSpace On-Demand Technology

Here are the key points that pertain to the WorkSpace On-Demand technology and why it can lower the cost of administration by streamlining management processes in these key areas:

- Administrators make changes to applications on one server, rather than on multiple clients.
- Simplifies the process of making new applications or updates accessible to clients.
- Gives administrators the ability to prevent users from accessing hard drive or other resources.
- Reduces the costs of software distribution and control.
- WorkSpace On-Demand consolidates highly reliable (available today) systems management functions into the server for key services such as backup and recovery of end user data.

From an end user's perspective, WorkSpace On-Demand's ability to provide roaming application access is greatly appreciated. This lets end users access their applications from any client system in the network. Administrators can offer end users a choice of user interfaces (UI) depending on their needs, including:

- Restricted graphical interface (default)
- A simple mini shell interface
- Customizable applications menu on Navigator browser interface
- Customizable Lotus Notes or Domino interface
- Java desktop interface (such as Lotus Kona)
- Other third-party or customer-developed interface

**Note:** Some manual changes may be required.

### 6.2.2.10 WorkSpace On-Demand Requirements

WorkSpace On-Demand supports existing and new IBM PC Servers, as well as the existing and new Intel hardware, extending the life of traditional PC and PC server hardware. It supports traditional PC workstations acting as *thin clients* (diskless PCs) and also runs on new NetPCs or Networked PCs (typically lower-cost, Pentium class systems with built-in network adapters and features).

Prior to installing WorkSpace On-Demand onto a particular machine, there are software prerequisites that must be adhered to:

On the target WorkSpace On-Demand server:

- IBM OS/2 Warp Server 4.0 or IBM OS/2 Warp Server SMP, with the following options:
  - File and Print sharing (required)
  - LAN Server Administration Tool upgrade (optional). Required if you want to install WorkSpace On-Demand LAN Server Administration Tool upgrade for the LAN Server Administration GUI functions.
  - RIPL services upgrade (optional). Required if you want to install the WorkSpace On-Demand RIPL services upgrade to be able to RIPL client images to WorkSpace On-Demand clients.
- FixPak 22 or later (for base OS/2 fixes)

On the target administrator client:

- IBM OS/2 Warp 4.0
- File and Print client
- LAN Server Administration Tool (optional). Required if you want to install WorkSpace On-Demand LAN Server Administration tool upgrade.

---

## 6.3 Windows 95 and OS/2 Warp Server

In this section, we discuss the ways to communicate between a Windows 95 workstation and an OS/2 Warp Server. We show the use of the basic Windows 95 functions and also the advanced and additional functions of the IBM Networks Client for Windows 95.

### 6.3.1 Using Native Windows 95 Network Functions

The basic NetBIOS network functions (connecting to a LAN drive or using a network printer) at Windows 95 are based on standard NetBIOS SMBs. The NetBIOS SMBs are also used by several other products such as OS/2 Warp Server, Windows NT, Windows for Workgroup, OS/2 LAN Requester, and OS/2 Peer. The following sections of this chapter (6.3.1.2, “Using the Windows 95 NET Commands” on page 147 and 6.3.1.3, “Using the Graphical Interface without Neighborhood Access” on page 150) describe how you can connect to OS/2 Warp Server LAN resources by using the standard SMBs without any additional software to install.

### 6.3.1.1 Prerequisites

You must have the following prerequisite components installed on your system before you can connect to OS/2 Warp Server:

- The Client for Microsoft Networks.
- An appropriate network adapter device driver.
- A supported protocol (either NetBEUI or TCP/IP).
- A valid user ID must exist on the OS/2 Warp Server domain you want to connect.
- The logon validation to Windows NT Domain is enabled and configured if you want to use logon scripts.

To verify that you have the prerequisite components installed:

1. Click on the **Start** button, point to Settings, and then click **Control Panel**.
2. Double-click **Network**.
3. From the Configuration tab you can view the components that are currently installed.
4. Check the properties of the Client for Microsoft Networks to use logon scripts.
5. Contact your LAN administrator for a valid user ID.

#### Note

If you only use the TCP/IP protocol on your Windows 95 workstation, you must run and activate NetBIOS over TCP/IP on the OS/2 Warp Servers you want to connect to.

### 6.3.1.2 Using the Windows 95 NET Commands

The NET Commands are an easy and fast way to connect to any OS/2 Warp Server or OS/2 LAN Server resources. If you are familiar with using UNC names, there are many ways to get connected. There are several NET commands available in Windows 95. To get information about the available NET commands type `NET HELP` at an MS DOS command prompt and you get the following output on the screen:

```

For more information about a specific Microsoft NET
command, type the command name followed by /?
(for example, NET VIEW /?).

NET CONFIG  Displays your current workgroup settings.
NET DIAG    Runs the Microsoft Network Diagnostics program to
            display diagnostic information about your network.
NET HELP    Provides information about commands and
            error messages.
NET INIT    Loads protocol and network-adapter drivers without
            binding them to Protocol Manager.
NET LOGOFF  Breaks the connection between your computer and
            the shared resources to which it is connected.
NET LOGON   Identifies you as a member of a workgroup.
NET PASSWORD Changes your logon password.
NET PRINT   Displays information about print queues
            and controls print jobs.
NET START   Starts services.
NET STOP    Stops services.
NET TIME    Displays the time on or synchronizes your computer's
            clock with the clock on a Microsoft Windows for
            Workgroups, Windows NT, Windows 95, or NetWare time server.
NET USE     Connects to or disconnects from a shared
            resource or displays information about
            connections.
NET VER     Displays the type and version number of the
            workgroup redirector you are using.
NET VIEW    Displays a list of computers that share
            resources or a list of shared resources
            on a specific computer.

C:\WINDOWS

```

Figure 155. Microsoft NET Command Overview

Most of the NET commands will not run in the MS DOS command prompt but the commands to view and connect to an OS/2 Warp Server (NET USE and NET VIEW) will work fine. All you have to know to make any connections are the NetBIOS names of the servers you want to connect to. For example to get the resources shared by an OS/2 Warp Server with the server name PCC01, type the following command at the MS DOS command prompt: NET VIEW \\PCC01 and you get a screen like Figure 156:

```

Shared resources at \\PCC01

Sharename  Type      Comment
-----
CDROM      Disk      CDROM Drive
DWORK     Disk      David's work files
LANPRT01   Print     IBM LAN Drucker
NETLOGON   Disk      Domain controller share
RB2125     Disk      Redbook SG242125
WINHOME    Disk      Windows user homedirectories
The command was completed successfully.

```

Figure 156. Using the NET VIEW Command



In this environment, the server PCCO1 gets five disk sharenames and also one printer sharename. The sharenames of disk resources corresponds with the alias names of the OS/2 Warp Server but the sharename of the printer is the spooler name. If you want to use the the CD-ROM drive of the server as drive x: type: NET USE X: \\PCCO1\CDROM or for the LAN printer on port LPT3 type: NET USE LPT3 \\PCCO1\LANPRT01. If you are logged on as an administrator, you can also use the administrator sharenames for root drives such as NET USE Z: \\PCCO1\C\$ to get the root directory of the servers drive C:.

To get a list of all available sharenames on an OS/2 Warp Server type NET SHARE in an OS/2 window on the server and you will get an output like Figure 157.

Netname	Resource	Remark
IPC\$		Remote IPC
ADMIN\$	C:\IBMLAN	Remote Admin
A\$	A:\	Drive Share for Admin Use
B\$	B:\	Drive Share for Admin Use
C\$	C:\	Drive Share for Admin Use
D\$	D:\	Drive Share for Admin Use
E\$	E:\	Drive Share for Admin Use
F\$	F:\	Drive Share for Admin Use
IBMLAN\$	C:\IBMLAN	OS/2 LAN Server root
CDROM	F:\	CDROM Drive
DWORK	D:\DWORKS-BACKUP	David's work files
NETLOGON	C:\IBMLAN\REPL\IMPORT\SCRIPTS	Domain controller share
RB2125	E:\RPCREDL\SG242125	Redbook SG242125
RPCREDL	E:\RPCREDL	RPCREDL - Home directory
WINHOME	E:\USERDIR\WINUSER	Windows user homedirectories
LANPRT01	LPT1	Spooled IBM LAN Drucker
The command completed successfully.		

Figure 157. All Shared Resources on Our PCCO1 Server

If you compare this with the output of the NET ALIAS command, you will see the difference especially for printer resources.

Alias definitions for \\PCCO1		
Name	Type	Description
CDROM	Files	CDROM Drive
DWORK	Files	David's work files
LANPRT	Printer	IBM LAN Drucker
RB2125	Files	Redbook SG242125
WINHOME	Files	Windows user homedirectories
The command completed successfully.		

Figure 158. Alias Names on Our PCCO1 Server

**Note**

Connections made via the NET USE Command will not be automatically restored every time you log on. If you want an automatic connection using the logon script function, you should review section 6.3.1.4, "Using Logon Scripts" on page 156 or use the possible connections via the graphical interface in 6.3.1.3, "Using the Graphical Interface without Neighborhood Access" on page 150.

### 6.3.1.3 Using the Graphical Interface without Neighborhood Access

Windows 95 does not recognize any OS/2 Warp Server when there is no master browser within the OS/2 Warp Server domain. In this section, we will describe how you can still connect to an OS/2 Warp Server without changing an existing configuration. For this section, our Windows 95 workstation is running as the only member of the workgroup ALONE without a master browser in it. When you double-click the network neighborhood icon you will see only the **Entire Network** icon entry at the neighborhood browser. (See Figure 159).

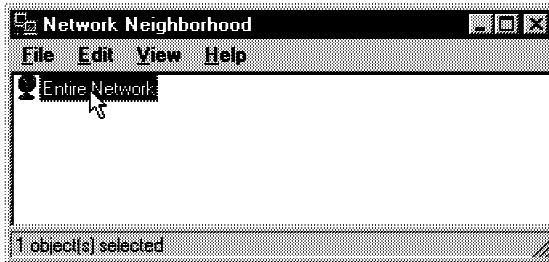


Figure 159. Empty Microsoft Network Neighborhood Browser

If you double-click the Entire Network entry, you will get an error message as in Figure 160.

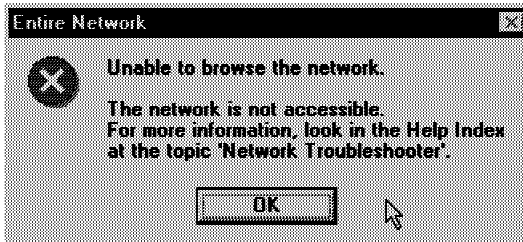


Figure 160. Neighborhood Browser Error Message

But nevertheless, it is possible to establish a connection through the neighborhood browser or the Windows 95 Explorer. All you need is the NetBIOS name of any OS/2 Warp Server you have access to and the same user ID and password at the OS/2 Warp Server domain as you use to log on at Windows 95. With the following procedure, you can connect to an OS/2 Warp Server disk resource:

1. Right mouse-click on the neighborhood browser.
2. Select **Find Computer...** (see also Figure 161 on page 151).

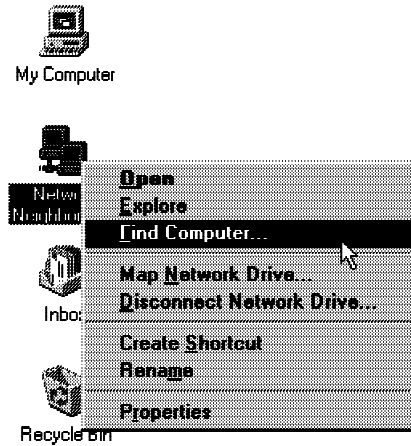


Figure 161. Neighborhood Browser Find Computer Selection

3. Write the NetBIOS name of the server in the Named field.
4. Click the **Find Now** button.
5. After a short time the server appears in the list field (see Figure 162).

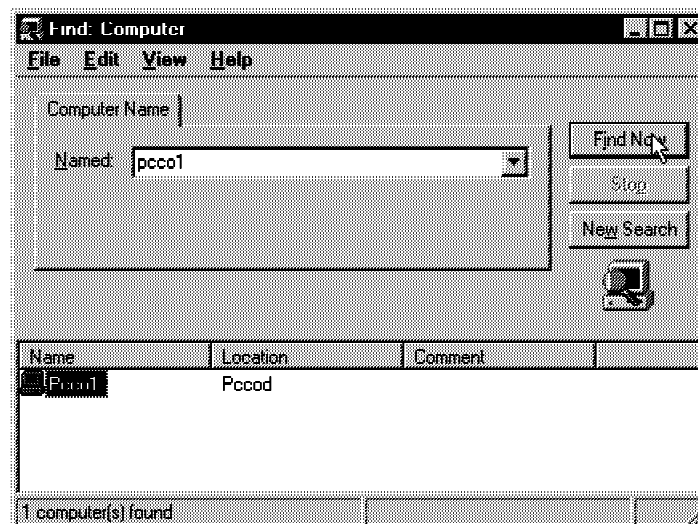


Figure 162. Find Computer Dialog Window

6. You can double-click the server name entry, or hold the right mouse button on it to make a shortcut per drag and drop on the desktop (see Figure 163 on page 152).

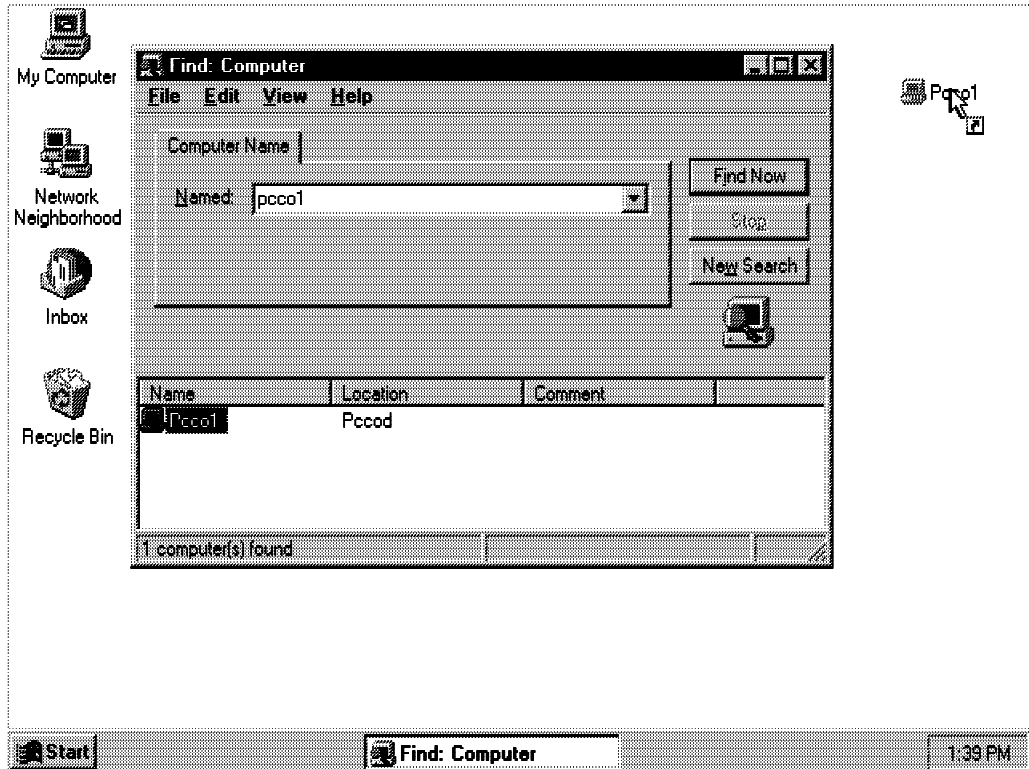


Figure 163. Making a Shortcut of an OS/2 Warp Server

7. After double-clicking the server name or the shortcut on your desktop you get a new window with the available sharenames of the selected server (see Figure 164).

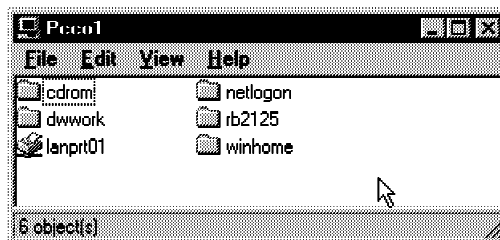


Figure 164. Available Sharenames of an OS/2 Warp Server on Windows 95

8. To force a reconnection of a disk sharename at logon time, click the right mouse button on the icon and select **Map Network drive...** (see also Figure 165).

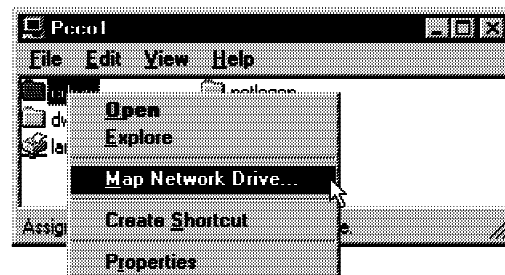


Figure 165. Mapping a Network Drive

- To enable the reconnection, mark the check box **Reconnect at logon** (see Figure 166 on page 153).

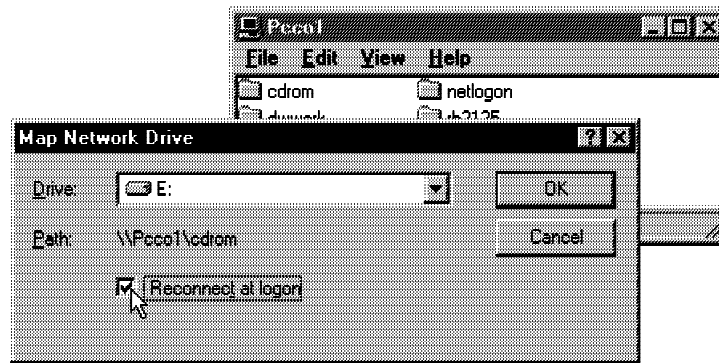


Figure 166. Enable the Reconnection

Besides the neighborhood browser, you can use the Windows Explorer too, to make any drive connections. To make a drive connection, perform the following steps:

- Open the Windows Explorer.
- Click the pull-down menu **Tools**.
- Select **Map Network drive**.
- Type the UNC name of the resource you want to connect in the Path input field (see also Figure 167).

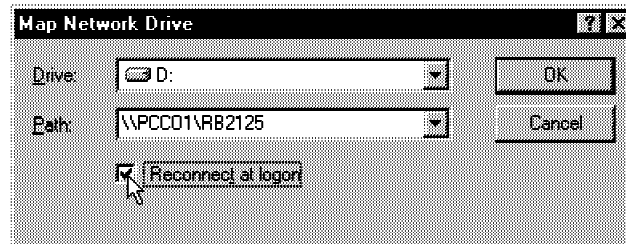


Figure 167. Mapping a Sharename Using the Windows Explorer

After mapping the sharename, the explorer adds a new LAN drive symbol with the name of the resource and the server (see Figure 168 on page 154).

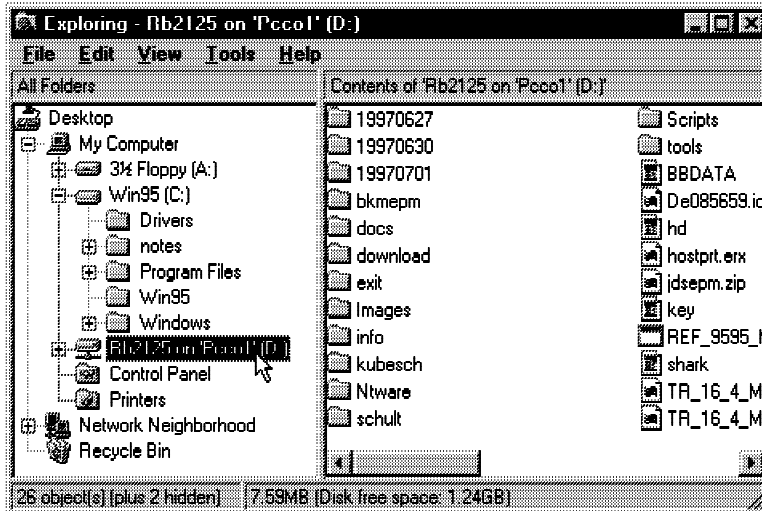


Figure 168. Windows 95 Explorer with an Additional OS/2 Warp Server LAN Drive

In the last part of this section, we make a printer connection with the graphical interface. The following steps describe the way to get connected with a LAN printer:

1. Double-click **My Computer**.
2. Double-click **Printers** (see Figure 169).
3. Double-click **Add Printer**.

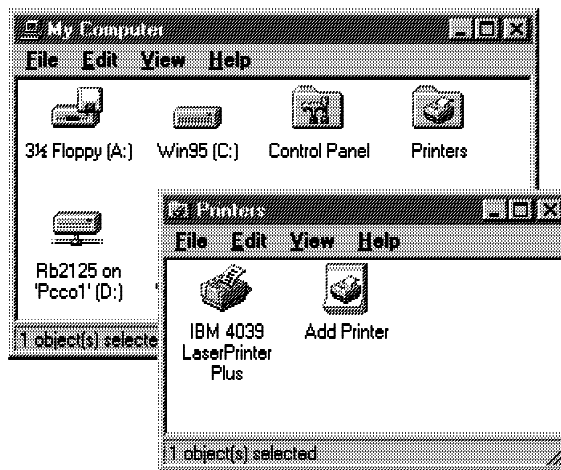


Figure 169. Adding a New Printer

4. Select **Network Printer** and click the **Next** button (see Figure 170 on page 155).



Figure 170. Type of Printer

5. Type the UNC name of the printer resource in the Network path or queue name input field (see Figure 171) and click **Next**.

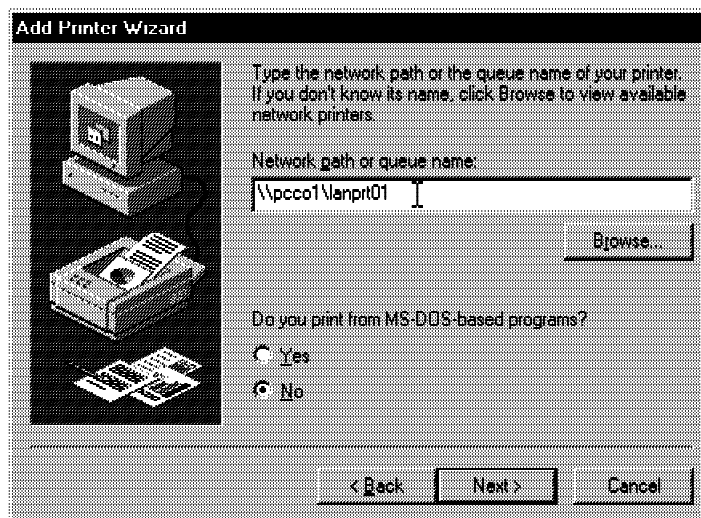


Figure 171. Type the UNC Printer Name

6. Type a name for the printer as you will know it on your PC and click **Next**.
7. Choose the printer model and if necessary install the printer driver. A new network printer icon will appear in the printer folder (see Figure 172 on page 156).

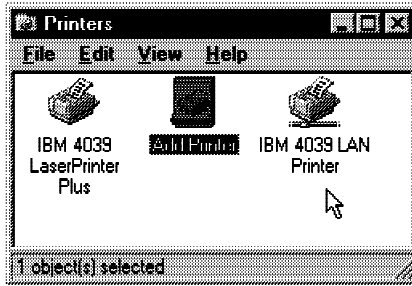


Figure 172. New Network Printer in the Printers Folder

8. Additionally, you can define an automatic printer port reconnection at logon time, for example, DOS applications that use a port name to print. To define the port connection open the properties of the network printer (right mouse button on the icon and select **Properties**) and select **Capture Printer Port...** (see Figure 173).

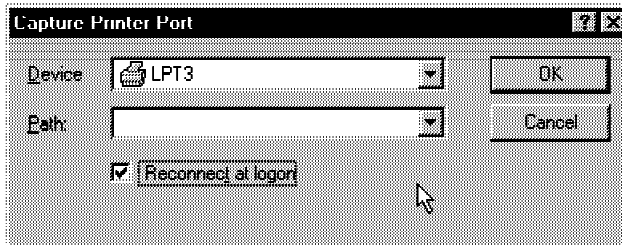


Figure 173. LAN Printer Properties

9. Select a device, type the UNC name of the printer resource in the path field, mark **Reconnect at logon**, and click the **OK** button (see Figure 174).

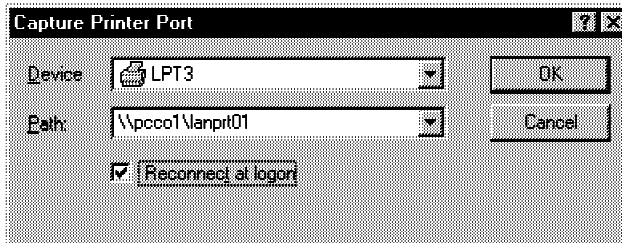


Figure 174. Capture a Printer Port

#### 6.3.1.4 Using Logon Scripts

If you want to assign resources to users every time they log on to the server, you can use the logon script mechanism of the OS/2 Warp Server. To use a logon script, two prerequisites must be fulfilled. First, you have to add a script file for the user in the OS/2 Warp Server domain by typing the following command:

```
NET USER user ID /SCRIPT:script_filename
```

The NET USER command is the only available way to add a logon script to an OS/2 Warp Server user profile. To view the settings of the user profile type the following command: NET USER user ID and you will get a screen like Figure 175 on page 157.



```

User ID                                KUBESCH
Full Name
Comment
User's comment                          Rainer Kubesch
Parameters
Country code                            000 ( System Default)
Privilege level                          USER
Operator privileges                      SERVER
Account active                           Yes
Account expires                          Never

Password last set                        06-19-97 04:49pm
Password expires                          Never
Password changeable                      06-19-97 04:49pm
Password required                         Yes
User may change password                  Yes

Requesters allowed                       All
Maximum disk space                       Unlimited
Preferred logon server                   Domain controller
Logon script                             KUBESCH.BAT
Home directory
Last logon                               07-07-97 03:18pm

Logon hours allowed                      All

Group memberships                        *USERS

Logon assignments for KUBESCH:
None
Applications assigned to KUBESCH:
NTNOTES PUBLIC
NTNOTESI PUBLIC
The command completed successfully.

```

Figure 175. Controlling the User Settings on the OS/2 LAN Server

The second prerequisite is that the NT logon validation of the Client for Microsoft Networks must be enabled and the domain name is set to the OS/2 Warp Server domain. To do this, double-click **Network** in the Control Panel folder, open the properties for the Client for Microsoft Networks and make the changes (see Figure 176 on page 158). If you have successfully configured the Windows 95 Network Client and the user ID profile at the OS/2 Warp Server domain, during the network logon two additional windows (Windows NT Logon Script and Windows NT Logon Script Command) will appear for a short time on the screen.

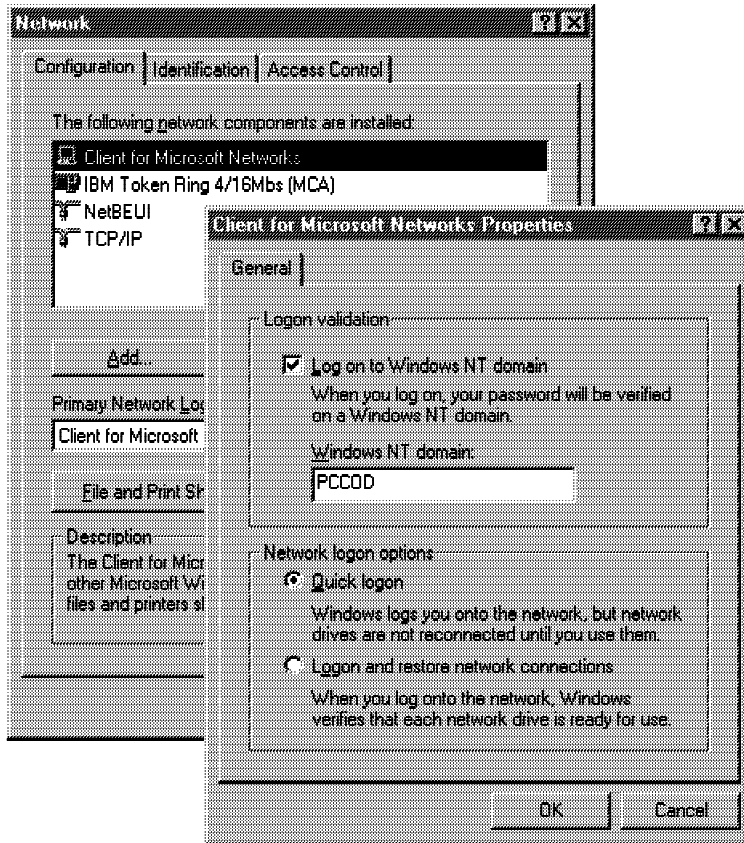


Figure 176. Client Settings to Use the Logon Script

**Note**

The script file (for example `userid.BAT` or `PROFILE.BAT`) must be located in the path pointed to by the `NETLOGON` resource. The `NETLOGON` resource is automatically shared (by netname only, not by alias) on each server when the `NETLOGON` starts. By default the `NETLOGON` netname points to `\BMLAN\REPL\IMPORT\SCRIPTS`. If you want to change this location, edit the domain controller `IBMLAN.INI` file, and change the `script=` parameter in the `[netlogon]` section to point to another path.

The following screen shows an example of a user script file, that is using a `NET` command to connect several LAN resources.

```

REM **** GET SERVER CDROM DRIVE
NET USE X: \\PCC01\CDROM
REM ****
REM **** GET LAN PRINTER
NET USE LPT3 \\PCC01\LANPRT01
REM ****
REM **** GET HOME DIRECTORY
NET USE H: \\PCC01\WINHOME
REM ****
REM **** SYNCHRONIZE CLIENT TIME WITH SERVER TIME
NET TIME \\PCC01 /SET /YES

```

Figure 177. Example of a Logon Script File

## 6.3.2 Using Windows 95 with IBM Networks Client for Windows 95

The IBM Networks Client for Windows 95 is an add on to the Microsoft Windows 95 Network function. The functions in this new product allows companies using Windows 95 clients to effectively utilize the IBM OS/2 Warp and LAN Server functions. When you use IBM Networks Client as the primary network logon and you start your Windows 95 system, your network logon is validated and your home directory and logon assignments are automatically connected.

### Note

You can obtain the IBM Networks Client software from the IBM Software Choice Web site at:

<http://www.software.ibm.com/os/warp/swchoice>

### 6.3.2.1 Prerequisites

You must have the following prerequisite components installed on your system before you can install IBM Networks Client:

- The Client for Microsoft Networks
- An appropriate network adapter device driver
- A supported protocol (either NetBEUI or TCP/IP)

To verify that you have the prerequisite components installed:

1. Click the **Start** button, point to Settings, and then click **Control Panel**.
2. Double-click **Network**.
3. From the Configuration tab, you can view the components that are currently installed.

### Note

If you only use the TCP/IP protocol on your Windows 95 workstation, you must run and activate NetBIOS over TCP/IP on the OS/2 Warp Servers you want to connect to and on the server(s) that validate the logon (including the domain controller).

### 6.3.2.2 Installing the IBM Network Client for Windows 95

We begin the installation of the IBM Network Client for Windows 95 by completing the following procedure:

1. Click the **Start** button, point to Settings, and then click **Control Panel**.
2. Double-click **Network**. The Network notebook is displayed.
3. Click the **Add...** button. The Select Network Component Type window is displayed (see Figure 178 on page 160).
4. Click **Client**, and then click the **Add...** button as shown in Figure 178 on page 160. The Select Network Client window is displayed.

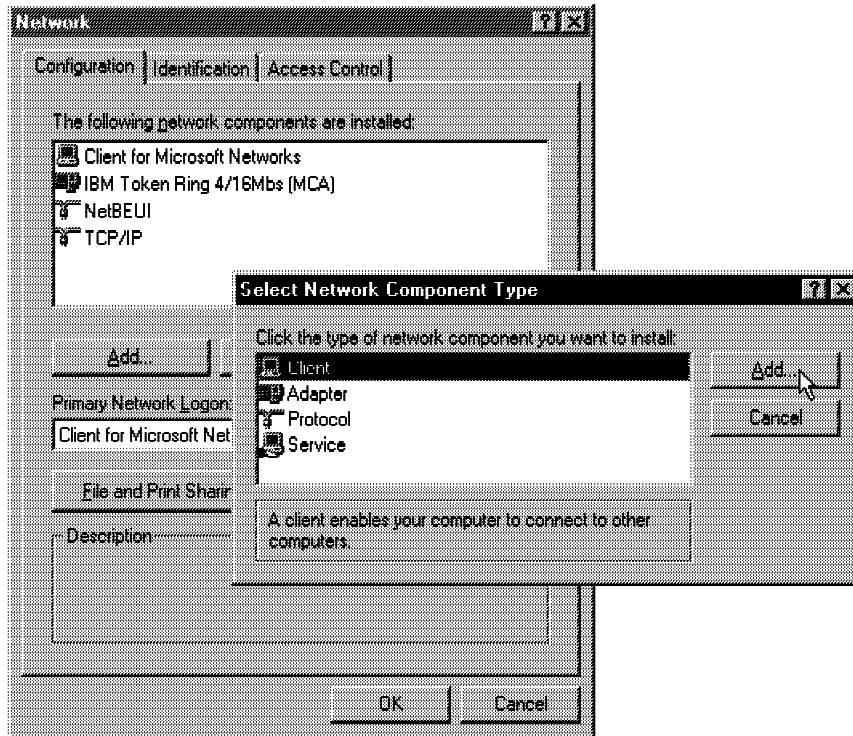


Figure 178. Add a Network Client

5. Click the **Have Disk...** button. The Install From Disk window is displayed.
6. Insert the IBM Networks Client for Windows 95 diskette into the A: drive, and then click **OK**.
7. From the Select Network Client window, select **IBM Networks Client for Windows 95** and then click **OK** (see Figure 179).

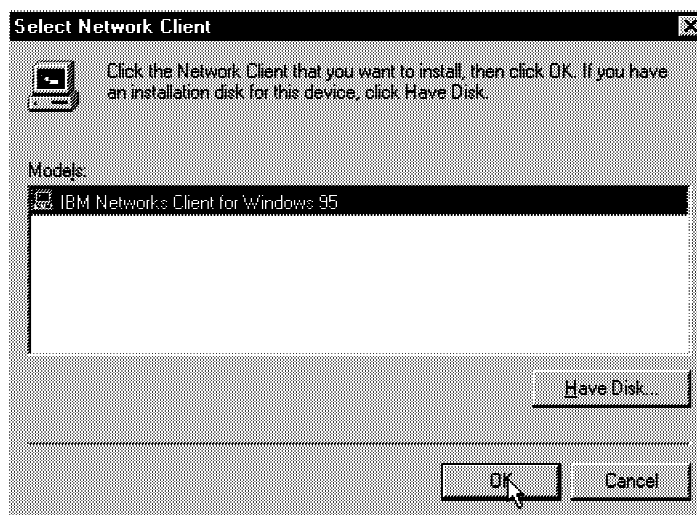


Figure 179. Select the IBM Networks Client for Windows 95

8. Depending upon the service level of Windows 95 on your system, you may be prompted to insert your Windows 95 disk. If prompted, insert your Windows 95 disk and then click **OK**. After the files are copied, the Network window is displayed.

9. From the Primary Network Logon list, click **IBM Networks Client for Windows 95**.

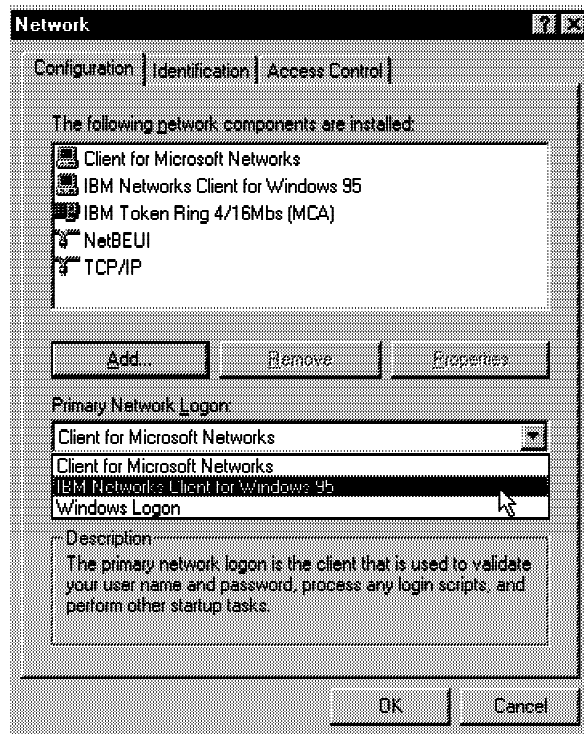


Figure 180. Select the IBM Networks Client As the Primary Network Logon

10. From The following network components are installed list, click **IBM Networks Client for Windows 95**.
11. Click the **Properties...** button. The IBM Networks Client Properties notebook is displayed.
12. Click **General** tab.
13. Type the name of the default logon IBM OS/2 Warp Server domain (see Figure 181 on page 162).

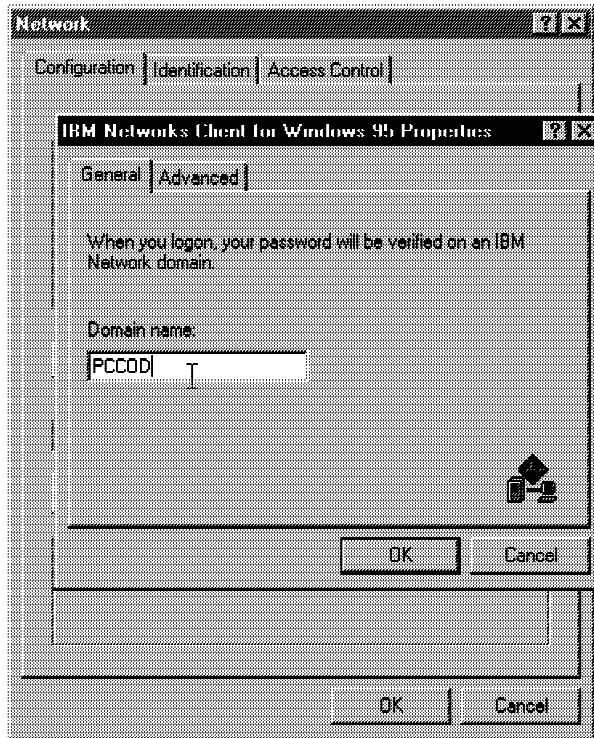


Figure 181. Default IBM Network Domain

14. Click the **Advanced** tab.
15. Select the System Policy settings you want to use.
16. Click **OK**. The Network notebook is displayed.
17. Click **OK**. The System Settings Change window is displayed.
18. Click **Yes** to restart your system.

Instead of installing from a diskette, you can also use an OS/2 Warp Server LAN drive. The installation program expects all files in a root drive; therefore, we recommend you create a new sharename on the OS/2 Warp Server which points direct to the installation files. The following steps show you how to prepare your OS/2 Warp Server:

1. Create a directory named d:\IBMWIN95.
2. Copy all of the files from the IBM Networks Client for Windows 95 diskette into the d:\IBMWIN95 directory.
3. Create a shared resource by typing: `NET SHARE IBMWIN95=d:\IBMWIN95.`
4. Set access controls by typing: `NET ACCESS d:\IBMWIN95 /ADD GUESTS:RX USERS:RX.`

On the Windows 95 workstation open an MS DOS command prompt and type `NET USE X: \\servername\IBMWIN95` or use the explorer to connect to the sharename. Instead of installing from drive A: in step 5, you can now install from the LAN drive X:.

### 6.3.2.3 Up and Running - IBM Network Client for Windows 95

After the installation of the IBM Networks Client for Windows 95 there is a new entry in the Programs folder where you can start the IBM Networks Client application (see Figure 182).

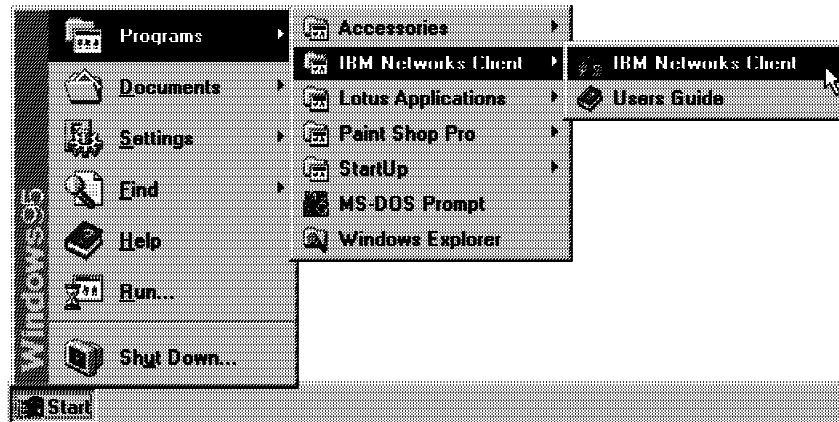


Figure 182. New Program Entry

With the IBM Networks Client for Windows 95 you can do user, applications, drives, printers, and message operations from the IBM Networks Client task bar.

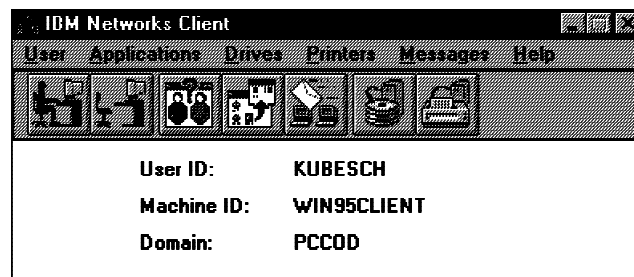


Figure 183. IBM Networks Client for Windows 95 Application

These following functions are available:

- Change user comment
- Change user domain password
- User logoff/logon
- List logged on users
- Run shared applications
- Add shared applications to local program groups
- Create new program groups for shared applications

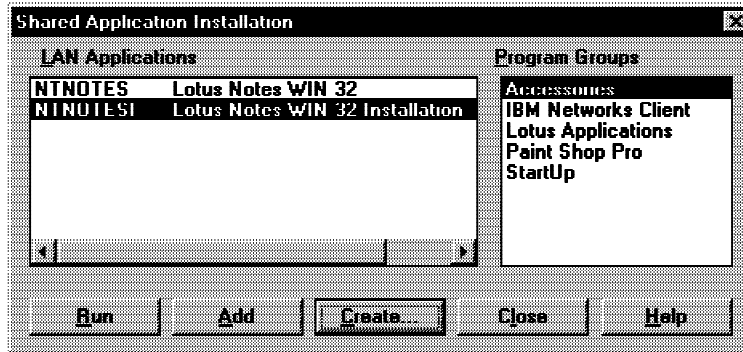


Figure 184. Shared Application Functions

- Connect/disconnect LAN drives
- Configure automatically reconnections of LAN drives at logon time
- Add/delete LAN drive logon assignments
- Check DASD limits
- Connect/disconnect LAN printers
- Configure automatically reconnections of LAN printers at logon time
- Add/delete LAN printer logon assignments
- Send messages to a single user or whole domain
- Home directory support
- Logon script support

For more additional information and how you can customize the IBM Networks Client for Windows 95 see 6.4.2.3, “Up and Running - IBM Networks Primary Logon Client” on page 176.

---

## 6.4 Windows NT and OS/2 Warp Server

In this section, we demonstrate three possibilities to get connected to an OS/2 Warp Server with a Windows NT workstation. We show the native compatibilities between Windows NT and OS/2 Warp Server, the new way of the IBM Networks Coordinated Logon Client for NT and the IBM Networks Primary Logon Client for NT to communicate with the OS/2 Warp Server.

### 6.4.1 Using Native Windows NT Network Functions

As with the native Windows 95 network function, the Windows NT network function operates very similar. The difference is, you can not redirect the authentication of the logon to an OS/2 Warp Server domain like in 6.3.1.4, “Using Logon Scripts” on page 156. The NT workstation does not accept an OS/2 Warp Server domain controller. If you try to change the network identification to an OS/2 Warp Server domain, you get an error message like in Figure 185 on page 165:



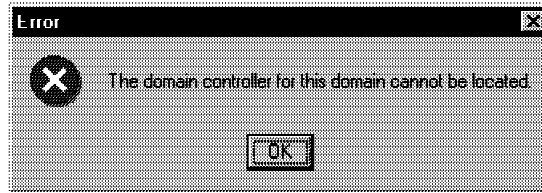


Figure 185. NT Error Message Window

#### 6.4.1.1 Prerequisites

You must have the following prerequisite components installed on your system to connect an OS/2 Warp Server with the native functions:

- The Microsoft Workstation service
- An appropriate network adapter device driver
- A supported protocol (either NetBEUI or TCP/IP)
- Synchronized user ID and password account between the NT workstation (domain) and the OS/2 Warp Server domain

To verify that you have the prerequisite components installed:

1. Click the **Start** button, point to Settings, and then click **Control Panel**.
2. Double-click **Network**.
3. From the Services and Protocols tabs you can view the components that are currently installed.

#### Note

You must use NetBIOS to connect to an OS/2 Warp Server. If you only use the TCP/IP protocol on your Windows NT workstation, you must run and activate NetBIOS over TCP/IP on the OS/2 Warp Servers you want to connect to.

#### 6.4.1.2 Using the Windows NT NET Commands

As in Windows 95 or the OS/2 LAN Requester there are also NET commands for Windows NT. Windows NT has the same UNC rules to connect to any OS/2 Warp Server resources as Windows 95. To get information about the available NET commands type `NET HELP` in an MS DOS command prompt and you will get a screen like in (Figure 186 on page 166).

The syntax of this command is:

```
NET HELP command
-or-
NET command /HELP
```

Commands available are:

NET ACCOUNTS	NET HELP	NET SHARE
NET COMPUTER	NET HELPMMSG	NET START
NET CONFIG	NET LOCALGROUP	NET STATISTICS
NET CONFIG SERVER	NET NAME	NET STOP
NET CONFIG WORKSTATION	NET PAUSE	NET TIME
NET CONTINUE	NET PRINT	NET USE
NET FILE	NET SEND	NET USER
NET GROUP	NET SESSION	NET VIEW

NET HELP SERVICES lists the network services you can start.  
NET HELP SYNTAX explains how to read NET HELP syntax lines.  
NET HELP command | MORE displays Help one screen at a time.

Figure 186. Windows NT NET Commands

Most of the commands are to configure and to control the NT workstation and they are similar to the NET commands of the OS/2 Warp Server. The commands you can use in conjunction with an OS/2 Warp Server are:

NET USE, NET VIEW, NET SEND, NET TIME.

The syntax of the NET USE command to connect a LAN drive is:

```
NET USE x: \\servername\drivesharename
(where x: is the name of the logical LAN drive)
```

The syntax of the NET USE command to connect to the administrative drive share of an OS/2 Warp Server is (user ID must have administrator privileges):

```
NET USE x: \\servername\c$
(where x: is the name of the logical LAN drive and c is the drive you want to connect to.)
```

The syntax to connect a printer port is:

```
NET USE lptx \\servername\printersharename
(where lptx is the logical LAN printer portname such as lpt3)
```

The syntax to disconnect a LAN resource is:

```
NET USE x:|lptx /D
(where x: is a logical LAN drive and lptx is a logical LAN printer portname)
```

The syntax of the NET VIEW command to get the sharenames of an OS/2 Warp Server is:

```
NET VIEW \\servername
```

The syntax of the NET TIME command to get the server time from an OS/2 Warp Server is:

```
NET TIME \\servername /SET /YES
```

To get more information about the NT NET commands type `NET HELP netcommand` in an MS DOS command prompt and see also 6.3.1.2, “Using the Windows 95 NET Commands” on page 147 for some examples.

### 6.4.1.3 Using the Graphical Interface without Neighborhood Access

Using the graphical interface to connect to an OS/2 Warp Server from an NT workstation is similar to a Windows 95 workstation. To make a connection over the network neighborhood or with the NT Explorer see 6.3.1.3, “Using the Graphical Interface without Neighborhood Access” on page 150. The way to connect to an OS/2 Warp Server LAN printer is different on an NT workstation compared to a Windows 95 workstation. The following steps show how to connect to an OS/2 Warp Server LAN resource:

1. Double-click on **My Computer**.
2. Double-click on **Printers**.
3. Double-click on **Add Printer**.
4. The Add Printer Wizard window appears. Select **Network printer Server** and click the **Next** button (see Figure 187).

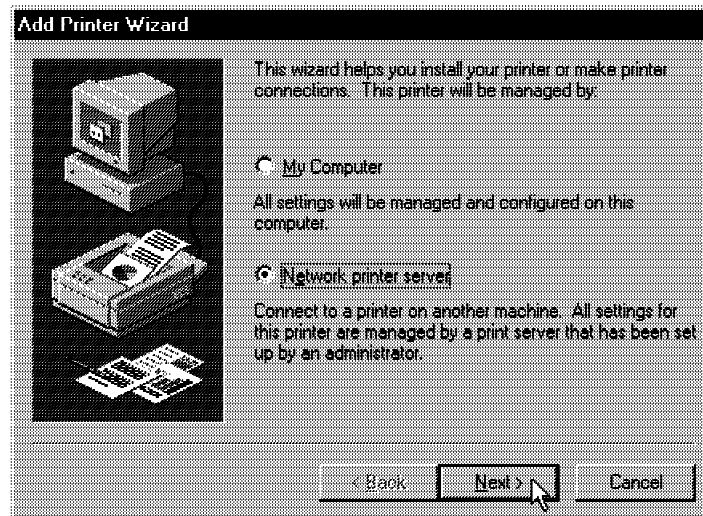


Figure 187. Add Printer Wizard Window

5. Type the UNC name of the printer resource in the input field at the Connect to Printer window as shown in Figure 188 on page 168 and click the **OK** button.

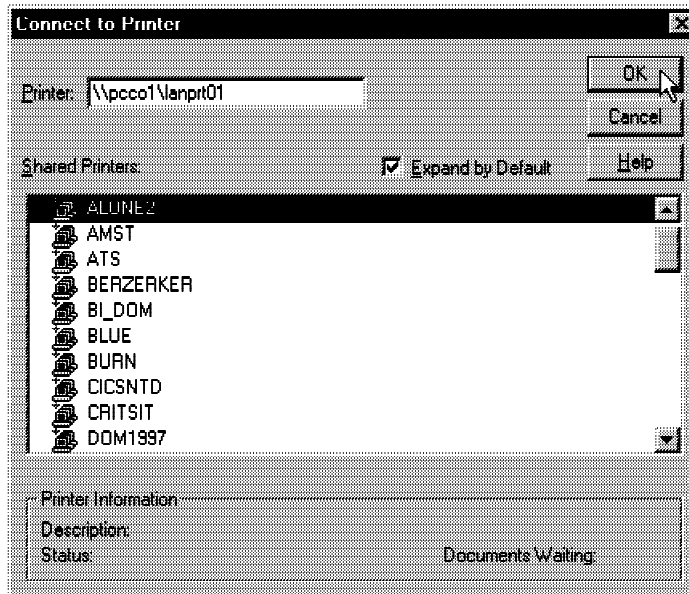


Figure 188. Connect to Printer Window

6. Click **OK** at the following Connect to Printer message (see Figure 189).

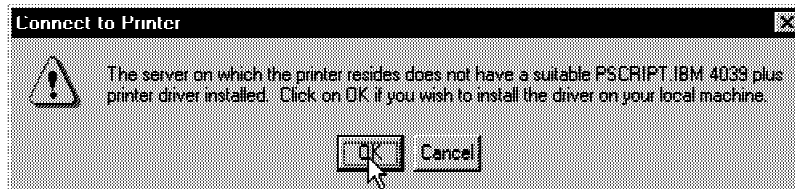


Figure 189. Connect to Printer Message

7. Choose the printer model and if necessary install the printer driver.
8. Select **Yes** or **No** to choose the LAN printer as your default printer (see Figure 190) at the default printer selection. You only get this message if you already have a printer set up.



Figure 190. Default Printer Selection

9. Click the **Finish** button at the follow message window (see Figure 191 on page 169).



Figure 191. Installation Message Window

10. The LAN printer is now available at the Printers folder and ready to use (see Figure 192).

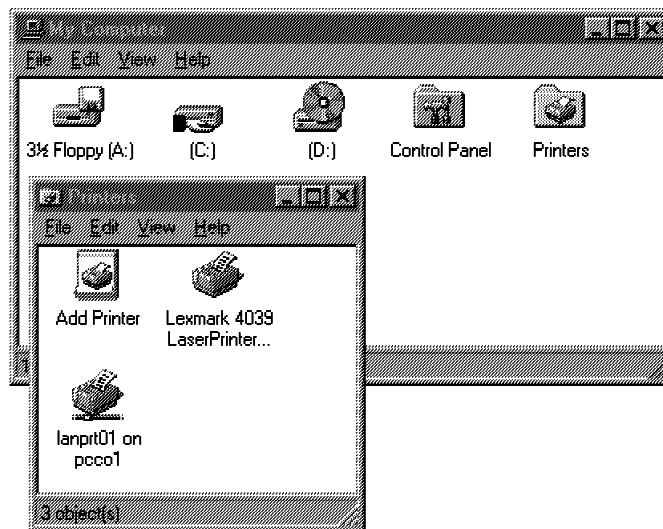


Figure 192. Available LAN Printer

#### 6.4.1.4 Store and Retrieve a User Profile

Most users want their own custom environment. This is achieved by providing user profiles. User profiles contain desktop settings, logon information and network resources. In this section, we describe how you can store and retrieve a Windows NT user profile from an OS/2 Warp or an OS/2 LAN Server. We store a modified Windows NT user profile on an OS/2 Warp Server or an OS/2 LAN Server subdirectory and make it available for a Windows NT user. To make the profile available for a user do the following:

1. Log on as a local administrator and design the user profile you want to make available.

2. To save the profile on the LAN drive:
  - a. Click the **Start** button, point to Settings, click **Control Panel** and double-click **Systems**.
  - b. Click the **User profiles** tab.
  - c. Select the profile you want to save and click the **Copy To...** button as shown in Figure 193.

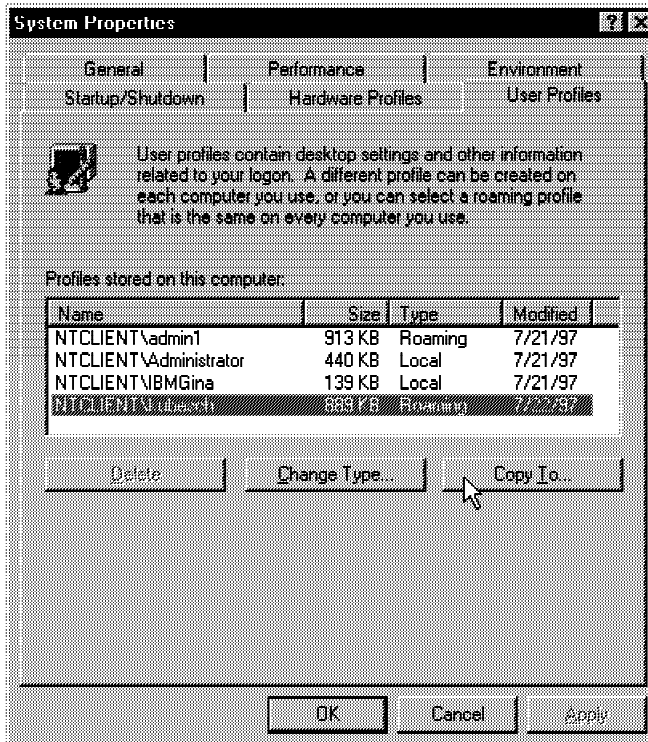


Figure 193. Copy a User System Profile

- d. The Copy To windows appears. Type in the network path you want to copy the profile and change Permitted to use to Everyone (see Figure 194). Click the **OK** button.

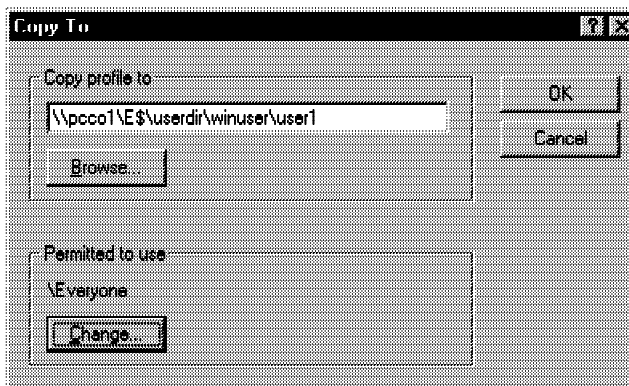


Figure 194. Copy To Window

3. Change at the local workstation(s) the user properties to load the profile from an OS/2 Warp Server. Perform the following to do this:
  - a. Log on as a local administrator.

- b. Click **Start**, point to Programs, point to Administrative Tools (Common) and select **User Management**.
- c. The User Manager window opens (see Figure 195).

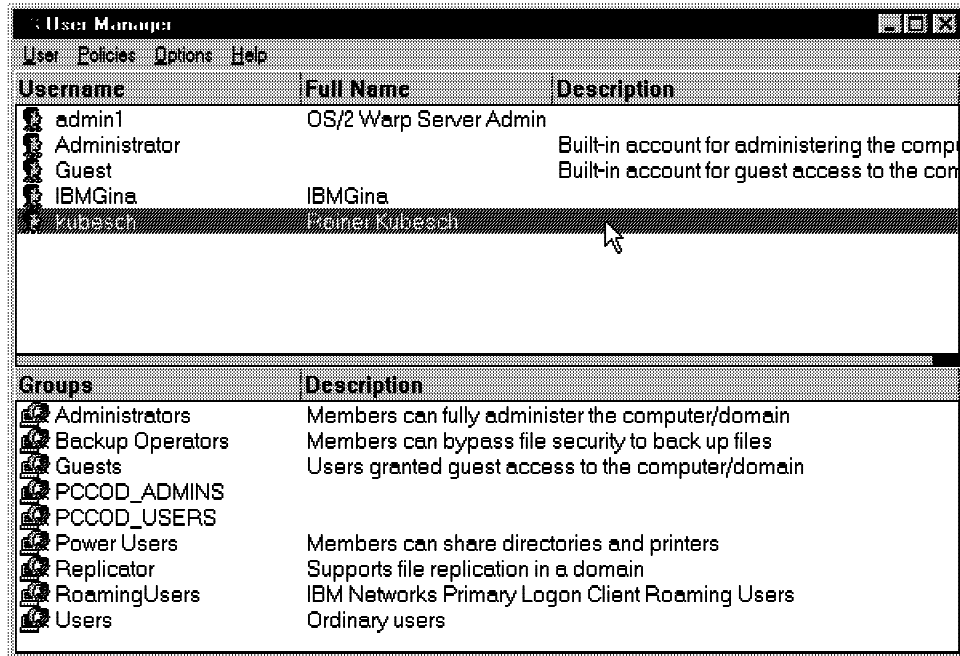


Figure 195. User Manager Window

- d. Double-click the user you want to change.
- e. The User Properties window appears (see Figure 196).
- f. Click the **Profile** button as shown in Figure 196.

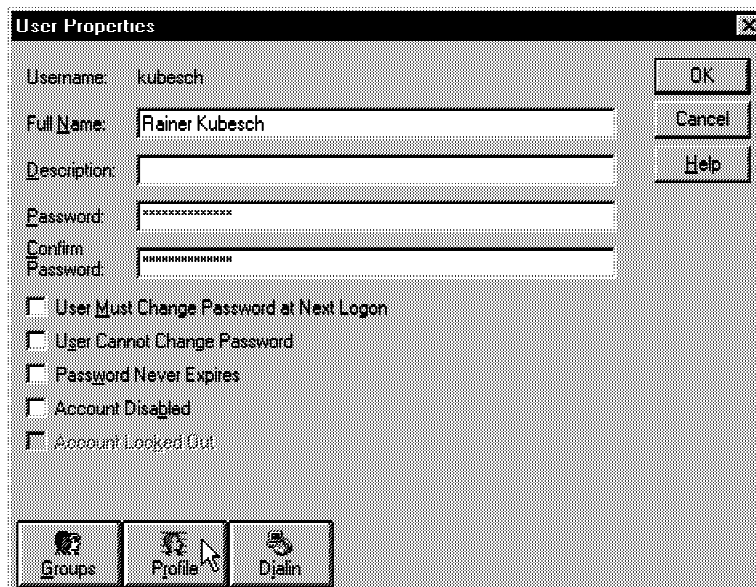


Figure 196. User Properties Window

- g. Type the LAN drive path where the user profile is stored in the User Profile Path: input field (refer to Figure 197 on page 172) and click the **OK** button to complete.

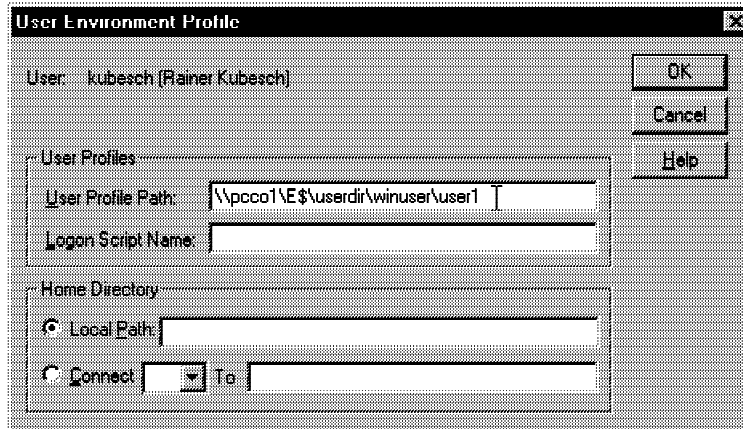
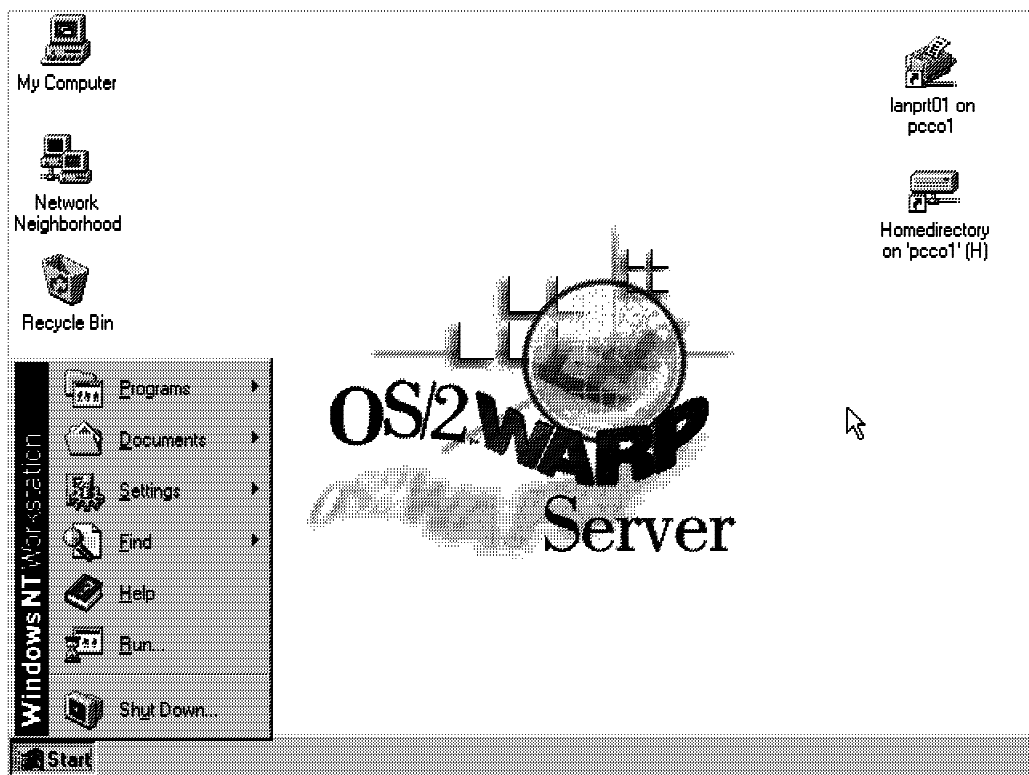


Figure 197. User Environment Profile Window

4. Close the User Management window.

To test your configuration use the shutdown option **Close all programs and logon as a different user?**, log on again with a changed user ID and you might get a lovely screen like this from an OS/2 Warp Server:



**Note**

If you are working with a Windows NT domain, you have to log on at the domain server as a user having administrator privileges and use the User Manager for Domains to change the user profile path.



## 6.4.2 Using Windows NT with IBM Networks Primary Logon Client

If you need a centralized user definition and administration environment, the IBM Networks Primary Logon Client for Windows NT enables OS/2 Warp Server to be the central system. OS/2 Warp Servers are equivalent to NT servers in domain level support of Windows NT clients. With this domain level support, users are defined at one location and all authentication requests from clients are executed at the OS/2 Warp Server domain. If there are established user domains on OS/2 Warp Servers, there is no reason to move to NT servers to support NT client users, since OS/2 Warp Server equals any NT server capability. With the IBM Networks Primary Logon Client for Windows NT product, OS/2 Warp Servers and OS/2 LAN Servers equal Microsoft Windows NT Servers for all core functions frequently cited by Microsoft as Windows client advantages, for example:

- Windows User Profile support - Users can store and retrieve their profiles upon logon from an OS/2 Warp or OS/2 LAN Server.
- Windows System Policy support - The Windows NT system enables a server to define what client functions the server can execute. Both OS/2 Warp Server and OS/2 LAN Server now deliver this capability.

This is the recommended approach versus the IBM Networks Coordinated Client for Windows NT.

### Note

You can obtain the IBM Networks Client software from the IBM Software Choice Web site at:

<http://www.software.ibm.com/os/warp/swchoice>

### 6.4.2.1 Prerequisites

You must have the following prerequisite components installed on your system before you can install the IBM Networks Primary Logon Client for NT:

- The Microsoft Workstation service
- An appropriate network adapter device driver
- A supported protocol (either NetBEUI or TCP/IP)

To verify that you have the prerequisite components installed:

1. Click the **Start** button, point to Settings, and then click **Control Panel**.
2. Double-click **Network**.
3. From the Services and Protocols tabs you can view the components that are currently installed.

### Note

You must use NetBIOS to connect to an OS/2 Warp Server. If you only use the TCP/IP protocol on your Windows NT workstation, you must run and activate NetBIOS over TCP/IP on the OS/2 Warp Servers you want to connect to and also on the server(s) that validate the logon (including the domain controller).

### 6.4.2.2 Installing IBM Networks Primary Logon Client

The following steps show you the way to install the IBM Networks Primary Logon Client:

1. Log on to the system as a user with administrator privilege.
2. Click the **Start** button, point to Settings, and then click **Control Panel**.
3. Double-click **Network**. The Network notebook is displayed.
4. Click the **Services** tab.
5. Click the **Add...** button. The Select Network Service window is displayed.
6. Click the **Have Disk...** button. The Insert Disk window is displayed.
7. Type the directory path to the IBM Networks Primary Logon Client installation files, and then click **OK**. The OEM Option window is displayed.

#### Note

You can install the IBM Networks Primary Logon Client from a local or shared network drive (for example, A:\: or d:\IBMNT), or from a UNC network path (for example, \\servername\IBMNT).

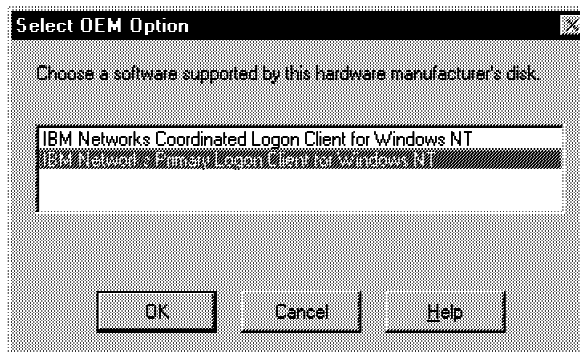


Figure 198. The OEM Option Window

8. Click **IBM Networks Primary Logon Client for Windows NT**, and then click **OK**. After the files are copied, the IBM Networks Client Properties notebook is displayed.
9. Click the **General** tab. All of the domain servers that were located by the network are listed in the Domain/Cell name list. DCE cells will not be included in this list.

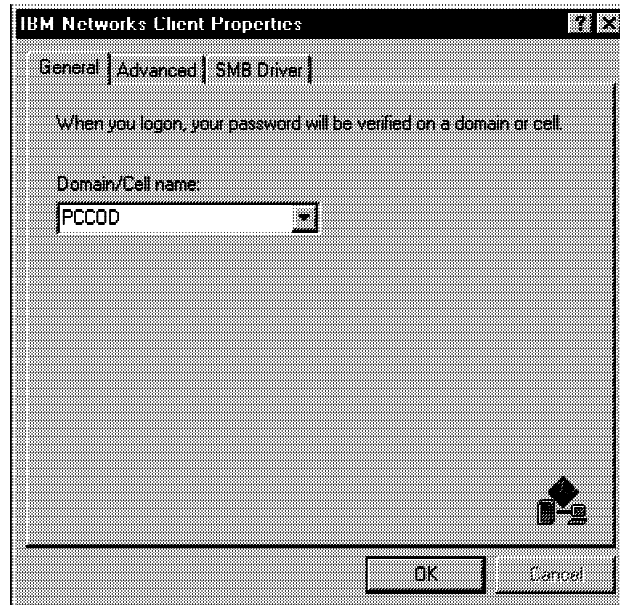


Figure 199. Default Logon Domain

10. From the Domain/Cell name box, do one of the following:

- Click the down arrow to display a list of the locations, and then select one.
- Type the name of the default logon location. This could be an IBM OS/2 Warp Server or OS/2 LAN Server domain, DCE cell, Windows NT Server domain, or standard SMB domain.

11. Click the **Advanced** tab.

12. Here you can customize the appearance of the Logon window. You can add other domains or cells that will be available.

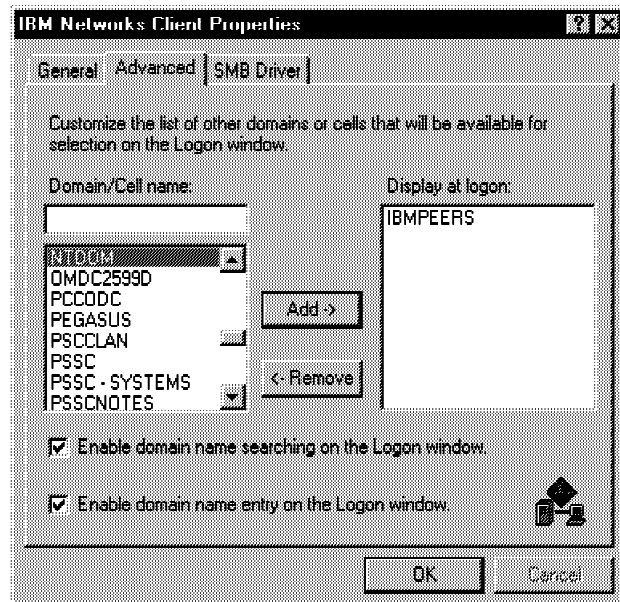


Figure 200. Advanced IBM Networks Client Properties

13. Click the **SMB Driver** tab (see Figure 201 on page 176).

14. You can select a secondary authentication on an other domain.
15. If you select the button to allow the domain to determine which server will validate your logon, you may change the Logon Broadcast Attempts and Logon Broadcast Wait settings.
16. If you select the button to specify the name of your logon server, you must enter the name of the logon server.

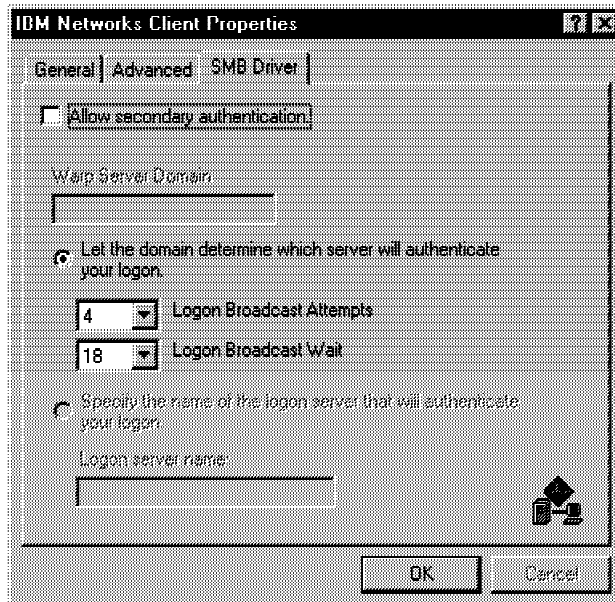


Figure 201. SMB Driver Settings

17. Click **OK**. The Network notebook is displayed.
18. Click **Close**. The Network Settings Change window is displayed.
19. Click **Yes** to restart your system.

**Note**

Before you install a Windows NT service pack on top of a workstation that has the IBM Networks Client currently installed, do the following:

1. Uninstall the IBM Networks Client.
2. Install the service pack on Windows NT.
3. Install the IBM Networks Client.

### 6.4.2.3 Up and Running - IBM Networks Primary Logon Client

After the reboot of the workstation a new logon window will appear on your screen (see Figure 202 on page 177).

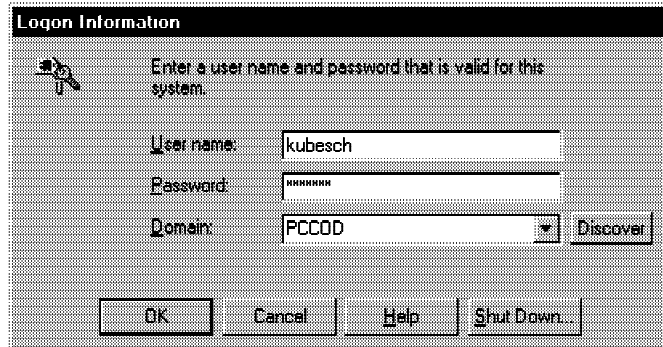


Figure 202. IBM Primary Logon Client - Logon Window

To log on:

1. Type the user ID that you want to use to log on in the User name box.
2. Type the password for this workstation in the Password box.
3. In the Domain box, you can do one of the following:
  - Nothing - Accept the default domain.
  - Select the arrow to display a list of domains, and then select one. If the list is empty or the domain that you want to use to log on is not listed, click **Discover**. The network is searched for available domains and the list is updated with all the Windows NT and OS/2 Warp Server domains that the network finds.
  - Type the name of the location where you want to log on to.
4. Click **OK** to start the authentication of your IBM Networks Client user ID and password.

To start the IBM Networks Client, click the **Start** button, point to Programs, point to IBM Networks Client (Common) and then Click **IBM Networks Client** as shown in Figure 203. The IBM Networks Client window will appear on your screen (see Figure 204 on page 178).

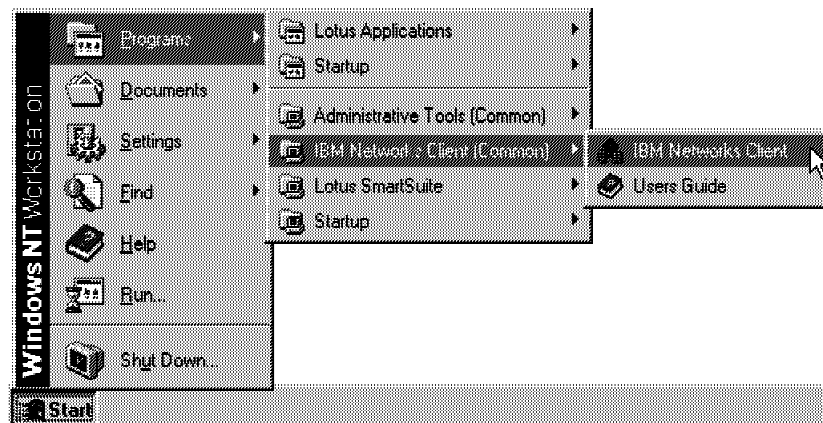


Figure 203. Starting the IBM Networks Client for NT

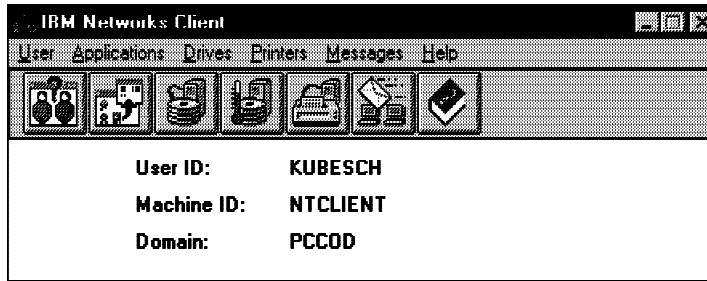


Figure 204. IBM Networks Client

These functions are available from the IBM Primary Networks Logon Client application:

- Change user comment
- List logged on users
- Run shared applications
- Add shared applications to local program groups
- Create new program groups for shared applications

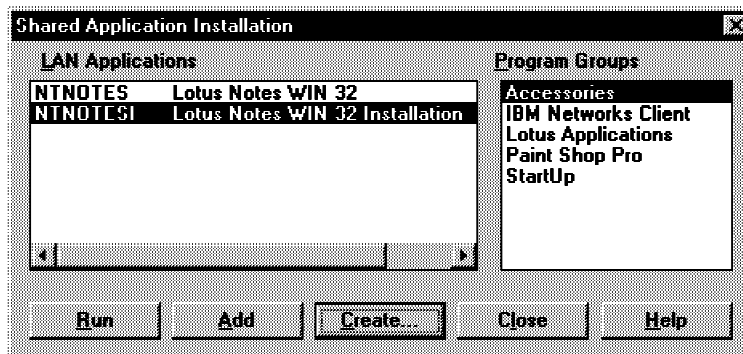


Figure 205. Shared Application Functions

- Connect/disconnect LAN drives

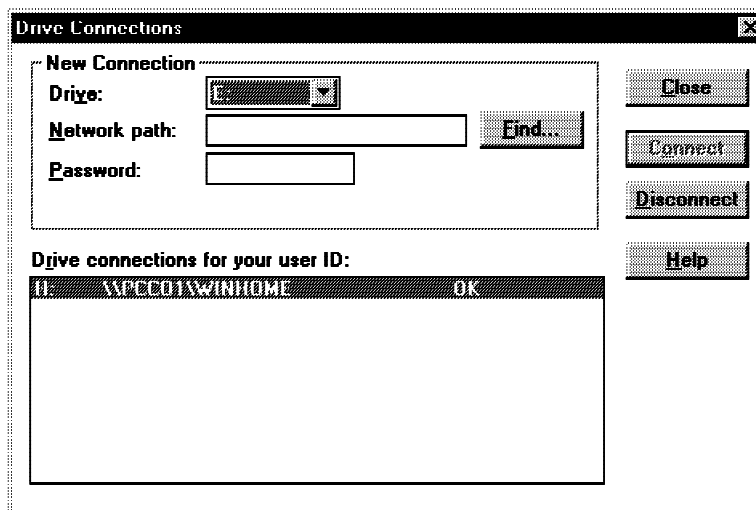


Figure 206. Drive Connections Window

- Automatically configure reconnections of LAN drives at logon time
- Add/delete LAN drive logon assignments

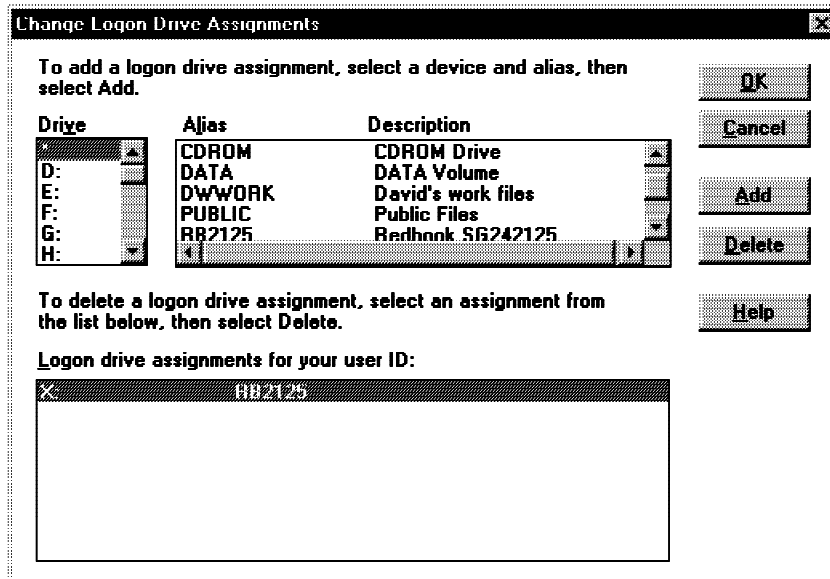


Figure 207. Change Logon Drive Assignments Window

- Check DASD limits
- Connect/disconnect LAN printers
- Automatically configure reconnections of LAN printers at logon time
- Add/delete LAN printer logon assignments
- Send messages to a single user or whole domain

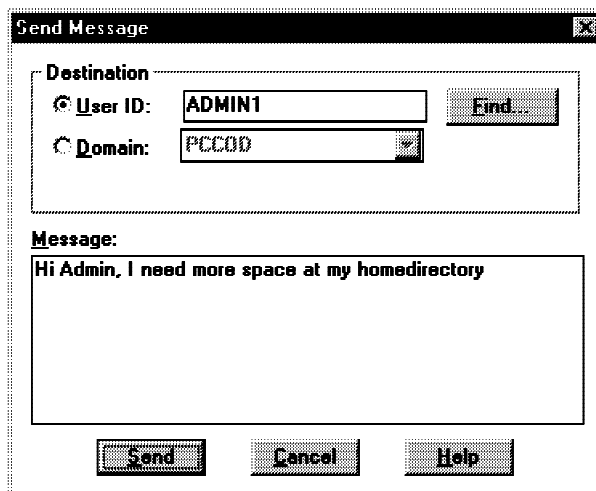


Figure 208. Send Message Window

As the network administrator, you can customize the appearance of the graphical user interface (GUI), restrict user access to menu bar items, or even hide the GUI. You will find this useful when you want to provide a standard workstation configuration tailored to enable users to perform their jobs while preventing them from modifying their logon assignments or connections.

To customize the GUI do the following:

1. Use an editor to create a file named WDLS.INI (located in d:\WINNT\SYSTEM32 directory).
2. In the WDLS.INI file, include only the section headings with the entries you want to change. The following is a sample of a WDLS.INI file containing all available headings and entries.

```
[MenuBar]
User=1
UserComment=1
Applications=1
Drives=1
DriveAssignments=1
Printers=1
PrinterAssignments=1
Messages=1
Help=1

[MainWindow]
HideMainWindow=0
ShowNormalAtStartup=1
Toolbar=1
```

In the WDLS.INI file 0 disables the item and 1 enables the item and is the default. The [MenuBar] section controls the menu bar items on the main window. The [MainWindow] section has the following controls:

#### **HideMainWindow**

Hides the main window completely. This enables you to provide only logon and logoff functions by creating program icons that call the WDLS.EXE file with the appropriate command line parameters.

#### **ShowNormalAtStartup**

Controls how the main window behaves when the user starts Windows 95. The default behavior (=1) causes the main window to display centered on the desktop. The (=0) setting causes the main window to be displayed as a minimized icon until the user selects the icon. Then, the main window is displayed centered on the desktop.

#### **Toolbar**

Controls the tool bar on the main window. The (=0) setting suppresses the tool bar from being displayed.

In the following example, we want to disable the toolbar, the whole drives and printer functions. The WDLS.INI file contain the following entries:

```
[MenuBar]
Drives=0
DriveAssignments=0
Printers=0
PrinterAssignments=0

[MainWindow]
Toolbar=0
```

The result of WDLS.INI you can see in Figure 209 on page 181.



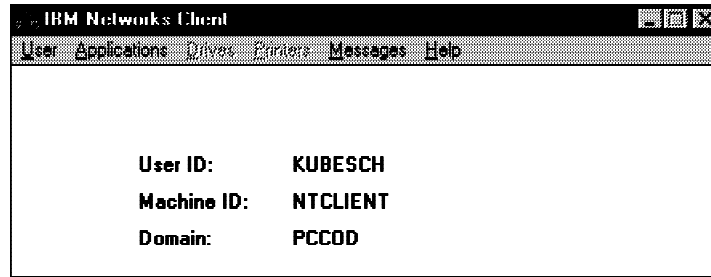


Figure 209. Customized IBM Networks Client GUI

3. Optionally, you can use the ATTRIB command to hide the WDLS.INI file, thereby reducing the possibility that a user can make changes to the file.

**Note**

These customizing options are also available for the IBM Networks Coordinated Logon Client for NT and the IBM Networks Client for Windows 95.

You can also start the IBM Networks Client GUI directly from a command line and you can control how the graphical user interface is displayed. For example, if you want to start the IBM Networks Client GUI and immediately display the Shared Application window, type at the command line `WDLS 3`.

The following command line parameters are available:

Parameter	Functions
3	Displays the Shared Applications window.
4	Displays the Change user comment window.
5	Manages drive connections.
6	Manages printer connections.
9	Displays the Send Message window.

With the installation of the IBM Primary Networks Logon Client there are some new Windows NT NET commands for the command prompt available. If you type `NET HELP`, you will get an overview of all available NET commands (see also Figure 210 on page 182).

The syntax of this command is:

```
NET HELP command
  -or-
NET command /HELP
```

Commands available are:

NET ACCOUNTS	NET HELP	NET SHARE
NET COMPUTER	NET HELPMMSG	NET START
NET CONFIG	NET LOCALGROUP	NET STATISTICS
NET CONFIG SERVER	NET NAME	NET STOP
NET CONFIG WORKSTATION	NET PAUSE	NET TIME
NET CONTINUE	NET PRINT	NET USE
NET FILE	NET SEND	NET USER
NET GROUP	NET SESSION	NET VIEW

NET HELP SERVICES lists the network services you can start.  
NET HELP SYNTAX explains how to read NET HELP syntax lines.  
NET HELP command | MORE displays Help one screen at a time.

Additional available commands are:

NET ADMIN	Runs a command or starts a command processor on a server from a workstation. You must have administrative privilege at the server to use this command.
NET ALIAS	Displays a list of aliases on a specified domain or information on a specific alias.
NET DASD	Displays directory limits for the maximum usable disk space for a remote HPFS386 logical drive.
NET WHO	Lists usernames logged on in a domain or a server, and displays information about individual users.

Figure 210. Windows NT Net Commands Overview

#### 6.4.2.4 Additional Information

There is a new group, RoamingUsers, that has been created to allow the Primary Logon Client to control how user accounts are handled during logon.

For accounts that are in the RoamingUsers group (accounts created dynamically by the Primary Logon Client are automatically added to this group):

- They will be removed from any groups they are a member of prior to logon (except for the RoamingUsers group).
- They will be added to their domain or cell groups.
- Their password may be automatically synchronized with their network password during the logon process (if necessary).

For accounts that are not in the RoamingUsers group:

- The Primary Logon Client will not modify their group membership.
- Their passwords will not be synchronized with their network password if it becomes unsynchronized.

Installation of the Primary Logon Client does not migrate user accounts to become roaming user accounts. If resource access is based on local group membership, access rights should be changed to include domain or cell groups that the user is a member of.

The local account is not marked as a roaming user if you got an error message like:

The system could not log you on. Your network account and password are correct, but your local account password is out of sync. Contact your system administrator to synchronize your passwords.

This message will occur if the local password is not the same as the network password, if the local account has expired or been disabled, or if the local password has expired.

To correct the problem, the local administrator must either:

- Make the account a roaming user.
- Synchronize the network and local password for the user, or re-enable the account.

#### **6.4.2.5 Windows NT User Profile Support**

The IBM Networks Primary Logon Client loads and stores Microsoft Windows NT User Profiles in the home directory under the \PROFILES subdirectory that is defined for the OS/2 Warp Server you are using. If you do not have a home directory defined or you cannot access the home directory, the user profile is loaded and stored on your local workstation.

If you want to define another path instead of the \PROFILES subdirectory or the default local workstation, use the Windows NT User Manager tool to define the specific path that you want to use. This will override the roaming or local profile on this workstation.

#### **Note**

User profiles are not supported on FAT partitions.

#### **6.4.2.6 Windows NT System Policy Support**

The following steps describe how to store system policies on an OS/2 Warp Server:

1. Log on to a Windows NT workstation as a user having administrator privileges.
2. Start the System Policy Editor. The System Policy Editor window is displayed. (The System Policy Editor's POLEDIT.EXE file must be run on the local workstation.)
3. From the File menu, click **Open Registry**. The Local Computer and Local User icons are displayed.
4. Double-click **Local Computer**. The Local Computer Properties page is displayed.
5. Expand the Network branch. The System Policies Update branch is displayed.

6. Expand the System Policies Update branch. The Remote Update check box is displayed.
7. Select the **Remote Update** check box. The Settings for remote update are displayed.
8. From the Update Mode drop list, click on **Manual**.
9. In the Path for Manual Update box, type the UNC path and file name. For example:  
\\servername\NETLOGON\ntconfig.pol  
where:  
servername The name of the server.  
NETLOGON The NETLOGON share.  
ntconfig.pol The name of the system policy you want to load during logon.
10. Click **OK**.
11. From the File menu, click **Save**.
12. Close the System Policy Editor.

**Note**

When multiple logon servers are used, the system policy file must be present on each server.

### 6.4.3 Using Windows NT with IBM Networks Coordinated Logon Client

The IBM Networks Coordinated Logon Client for Windows NT provides a product that will plug into the standard Microsoft architecture for network providers. That standard architecture employs an NT user account for initial authentication and then calls all network providers that have been installed and configured at the workstation. The IBM Networks Coordinated Client performs a secondary logon validation to an IBM OS/2 Warp Server domain after Windows NT successfully logs on.

**Note**

You can obtain the IBM Networks Client software from the IBM Software Choice Web site at:

<http://www.software.ibm.com/os/warp/swchoice>

#### 6.4.3.1 Prerequisites

You must have the following prerequisite components installed on your system before you can install IBM Networks Client:

- The Microsoft Workstation service
- An appropriate network adapter device driver
- A supported protocol (either NetBEUI or TCP/IP)

To verify that you have the prerequisite components installed:

1. Click the **Start** button, point to Settings, and then click **Control Panel**.
2. Double-click **Network**.

3. From the Services and Protocols tabs you can view the components that are currently installed.

**Note**

If you only use the TCP/IP protocol on your Windows NT workstation, you must run and activate NetBIOS over TCP/IP on the OS/2 Warp Servers you want to connect to and also on the server(s) that validate the logon (including the domain controller).

### 6.4.3.2 Installing IBM Networks Coordinated Logon Client

To install the IBM Networks Coordinated Client do the following steps:

1. Log on to the system as a user with the administrator privilege.
2. Click the **Start** button, point to Settings, and then click **Control Panel**.
3. Double-click **Network**. The Network notebook is displayed.
4. Click the **Services** tab.
5. Click the **Add...** button. The Select Network Service window is displayed.
6. Click the **Have Disk...** button. The Insert Disk window is displayed.
7. Insert the IBM Networks Coordinated Logon Client for Windows NT diskette into the A: drive, and then click **OK**. The OEM Option window is displayed (see Figure 211).

**Note**

You can also install the IBM Networks Coordinated Logon Client from a shared network drive (for example, d:\IBMNT), or from a UNC network path (for example, \\servername\IBMNT).

8. Select IBM Networks Coordinated Logon Client for Windows NT, and then click **OK**. The IBM Networks Client Properties notebook is displayed, after the files are copied (see Figure 212 on page 186).

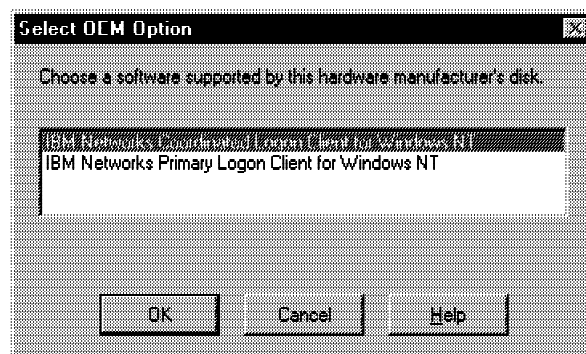


Figure 211. OEM Product Selection

9. Click the **General** tab.
10. In the Domain name box, type the name of the default logon IBM OS/2 Warp Server domain.
11. In the Alternate domain name box, if you want to use an alternate domain, type the name of the alternate domain (see Figure 212 on page 186).

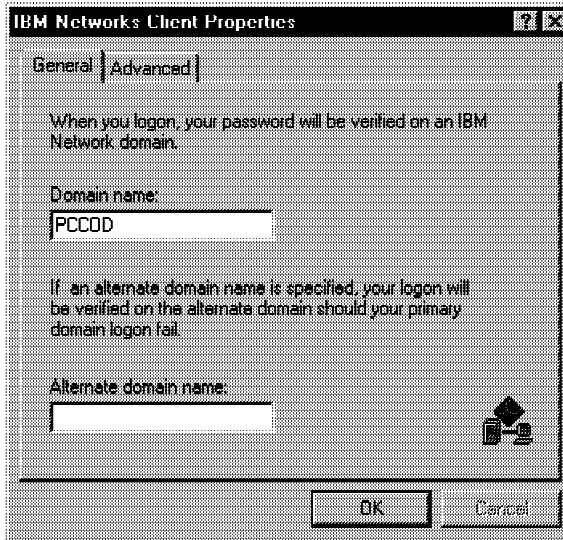


Figure 212. IBM Networks Coordinated Logon Client General Properties

12. Click the **Advanced** tab.
13. If you select the button to allow the domain to determine which server will validate your logon, you may change the Logon Broadcast Attempts and Logon Broadcast Wait settings.
14. If you select the button to specify the name of your logon server, you must enter the name of the logon server (see Figure 213).

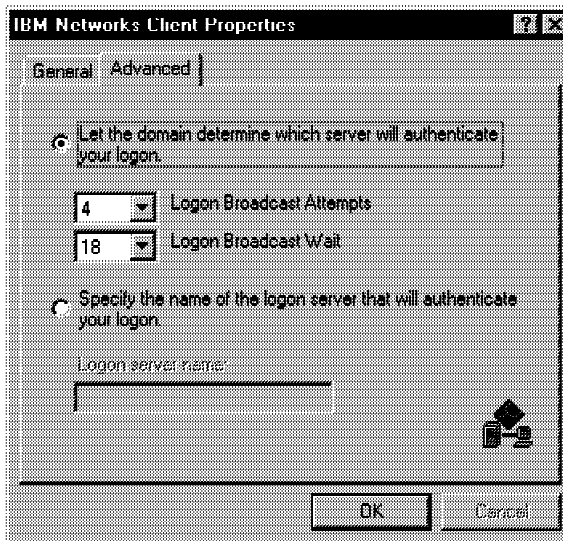


Figure 213. IBM Networks Coordinated Logon Client Advanced Properties

15. Click **OK**. The Network notebook is displayed.
16. Click **Close**. The Network Settings Change window is displayed.
17. Click **Yes** to restart your system.

**Note**

Before you install a Windows NT service pack on top of a workstation that has the IBM Networks Client currently installed, do the following:

1. Uninstall the IBM Networks Client.
2. Install the service pack on Windows NT.
3. Install the IBM Networks Client.

### 6.4.3.3 Up and Running - IBM Networks Coordinated Logon Client

For successful running of the IBM Networks Coordinated Logon Client, your Windows NT user account and your IBM OS/2 Warp Server domain user account must be synchronized. You must have a Windows NT user account whose user name and password also exist in an IBM OS/2 Warp Server domain. To coordinate the user accounts do one of the following:

- If you have a Windows NT user account with a user name that is the same as your IBM OS/2 Warp Server domain account user name, then you must change the password on your Windows NT account to be the same as your password on the IBM OS/2 Warp Server domain user account.
- If you do not have a Windows NT user account with a user name that is the same as your IBM OS/2 Warp Server domain account user name, then you must create one. Use the Windows NT User Manager utility to create your Windows NT account.

When you start the Windows NT workstation you get the normal logon screen you had before the installation of the IBM Networks Client. But during the logon process, independent if a local or a Windows NT domain verified logon, an information window will appear and give you a message telling if your second logon at the OS/2 Warp Server was successful or not (see Figure 214).

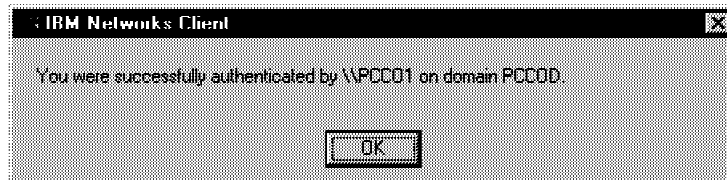


Figure 214. IBM Networks Logon Client - Logon Information Window

With the installation of the IBM Networks Coordinated Logon Client you have the same function described in 6.4.2.3, "Up and Running - IBM Networks Primary Logon Client" on page 176 of the IBM Networks Primary Logon Client; see this section for detailed information.

### 6.4.3.4 Windows NT User Profile Support

A typical use of the IBM Networks Coordinated Logon Client is if you have a OS/2 Warp Server domain beside a Windows NT domain. If you want to store the user profile at the OS/2 Warp Server, do the following steps:

1. Log on to the Windows NT domain server, as a user having administrator privileges.
2. Bring up the User Manager for domains.
3. Double-click on the user whose profile location you want to change. The user's Property: page is displayed.

4. Click **Profiles**. The User Environment Profile window is displayed.
5. In the User Profile Path box, type the UNC path.
6. Click **OK**.
7. From the User Properties page, click **OK**.
8. Close the User Manager Program.

See also 6.4.1.4, "Store and Retrieve a User Profile" on page 169 for more details and screens.

---

## 6.5 Using Network Neighborhood

In this chapter, we show three different ways of how you can make your OS/2 Warp Server file and print sharing services fully functional and available in the network neighborhood for Windows 95 and Windows NT workstations. Which one you will use depends on your environment and on your requirements.

### 6.5.1 Using a Windows 95 Workstation As a Master Browser

In the first solution, we make a Windows 95 workstation work as our master browser. It is one of the possible and the most complicated of the three master browser solutions shown in this chapter.

#### 6.5.1.1 Prerequisite

There are three prerequisites for a Windows 95 workstation to work as a master browser for an OS/2 Warp Server:

1. In the Windows 95 workstation network identification, the workgroup must be the OS/2 Warp Server domain (see Figure 215).

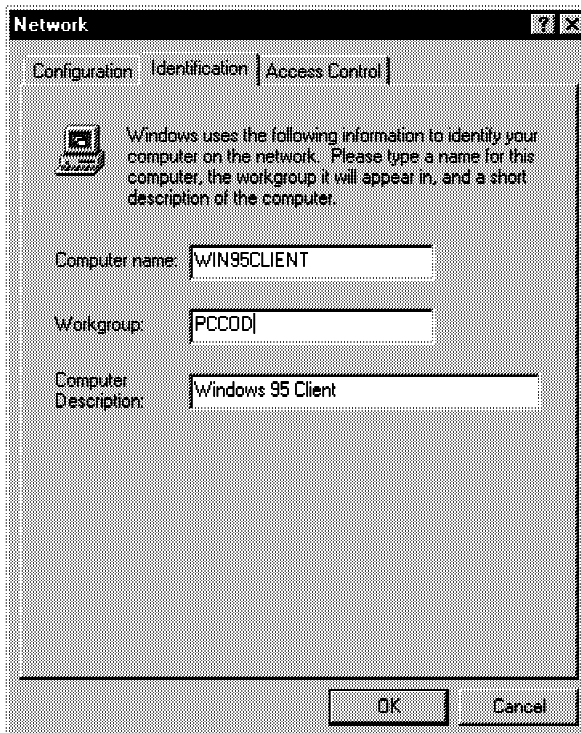


Figure 215. Windows 95 Workstation Network Identification



2. The File and Printer Sharing for Microsoft Networks must be enabled.
3. The browser function must be activated.

### 6.5.1.2 Installation

The Windows 95 workstation should be modified in the following way:

1. Select **Control Panel** from the task bar (Start).
2. Select **Network**.
3. If necessary, first activate and then highlight **File and Printer Sharing for Microsoft Network**.
4. Click the **Properties** button.
5. Set Property Browse Master to the value **Enabled** (see Figure 216).
6. Set Property LM Announce to the value **Yes**.
7. Select the **OK** button on the Network panel.
8. Reboot your system if required.

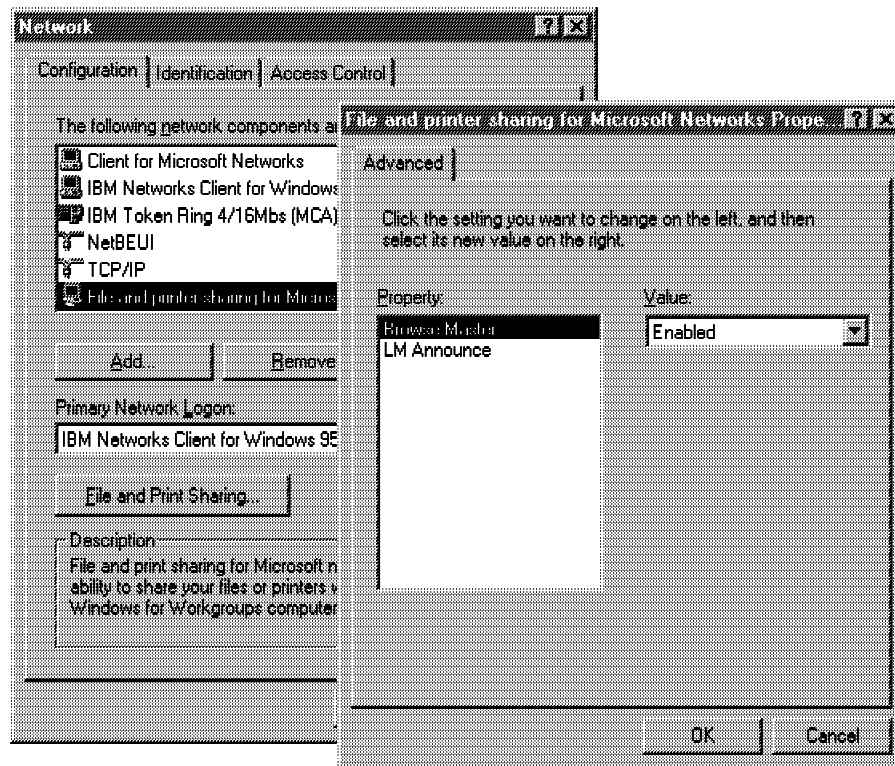


Figure 216. Enabled Browse Master Function

### 6.5.1.3 Recommendations

When you use a Windows 95 workstation as a master browser in the OS/2 Warp Server domain, the domain will only appear in the network neighborhood as long as the Windows 95 workstation is running. For higher availability you can use more than one Windows 95 workstation or a mix of Windows 95 and Windows NT workstations. The additional workstations automatically work as a backup browser.

**Note**

If you have no OS/2 Warp Server in your domain to install the IBM Neighborhood Browser Enabler, you can use this solution to make your OS/2 LAN Server 3.0 or OS/2 LAN Server 4.0 available in the network neighborhood.

## 6.5.2 Using a Windows NT Workstation As a Master Browser

Instead of using a Windows 95 client, you can also use a Windows NT workstation to make your OS/2 Warp Server domain available at the network neighborhood. A Windows NT workstation works much better at providing the browser service.

### 6.5.2.1 Prerequisite

There are two prerequisites to the configuration of the Windows NT workstation. First, the workgroup of the Windows NT workstation must be the OS/2 Warp Server domain and second, the master browser service must be active on this workstation. By default the browser service is running. To check the running NT services you can activate the **Services** application in the Control Panel (see also Figure 218 on page 191) or open an MS DOS command prompt and type: `NET START` and you will get a screen output like Figure 217. You can start and stop the services also from the command prompt with the commands `NET START BROWSER` or `NET STOP BROWSER`.

These Windows NT services are started:

```
Computer Browser
EventLog
Messenger
Plug and Play
Remote Procedure Call (RPC) Service
Server
Spooler
Workstation
```

The command completed successfully.

Figure 217. Active NT Services

### 6.5.2.2 Installation

To prepare a Windows NT as a master browser do the following:

1. Select **Control Panel** from the task bar (Start).
2. Select **Network**.
3. At the identification tab click the **Change** button to change the workgroup name to the OS/2 Warp Server domain name.
4. Select the **OK** button on the Network panel.
5. Reboot your system.
6. Make sure that Computer Browser has the status Started and the Startup value is Automatic as shown in Figure 218 on page 191.

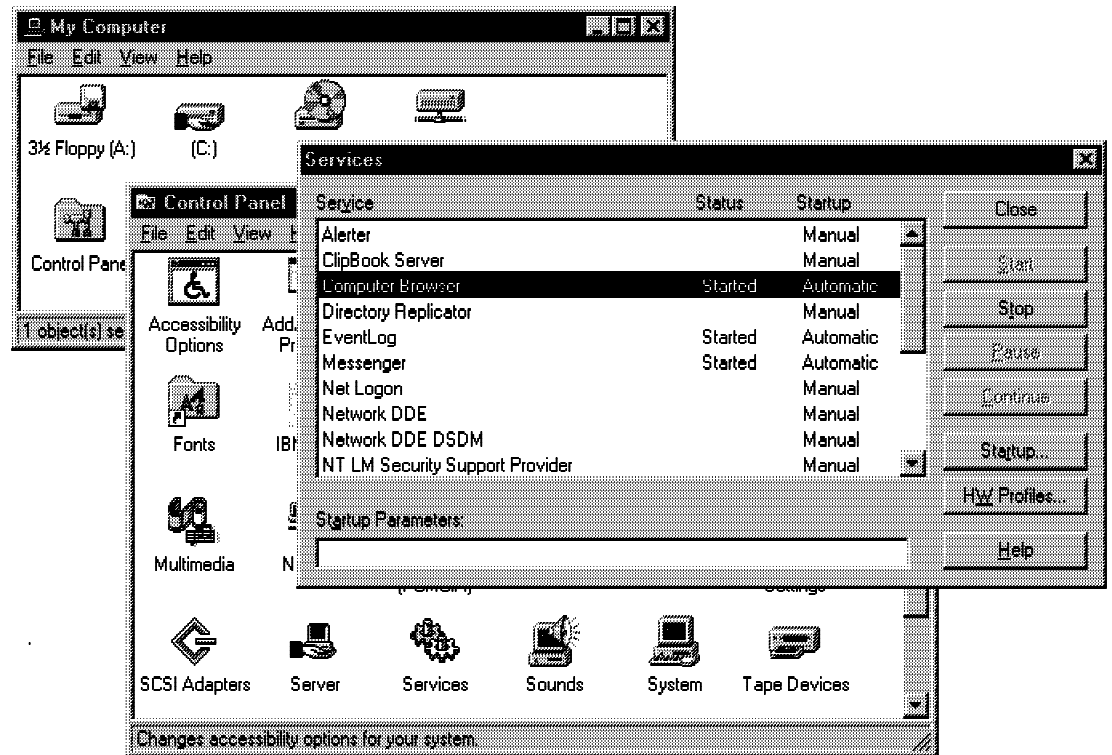


Figure 218. Services Application to Control the NT Services

### 6.5.2.3 Recommendations

When you use an NT workstation as a master browser in the OS/2 Warp Server domain, the domain will only appear in the network neighborhood as long as the NT workstation is running with the active browser service. For higher availability you can use more than one NT workstation or a mix of NT and Windows 95 workstations they will automatically work as a backup browser.

**Note**

If you have no OS/2 Warp Server in your domain to install the IBM Neighborhood Browser Enabler, you can use this solution to make your LAN Server 3.0 or OS/2 LAN Server 4.0 available in the network neighborhood.

### 6.5.3 Using IBM Neighborhood Browser Enabler

The easiest, fastest and best way to provide Windows 95 and Windows NT workstations the ability to view the domain's OS/2 Warp / LAN Server machines and their resources via the network neighborhood object is to use the IBM Neighborhood Browser Enabler for OS/2 Warp Server. This add-on to your OS/2 Warp Server services enables the network neighborhood access to starting your server. After the installation of the IBM Neighborhood Browser Enabler the OS/2 Warp Server offers a new service called browser (see Figure 219 on page 192) and you can use it like other server services. You can start or stop this service with NET START BROWSER or NET STOP BROWSER. The IBM Neighborhood Browser is online and available from IBM Software Choice.

## World Wide Web

To get the IBM Neighborhood Browser Enabler for OS/2 Warp Server visit the IBM software choice Web page at the URL:

<http://www.software.ibm.com/os/warp/swchoice/>

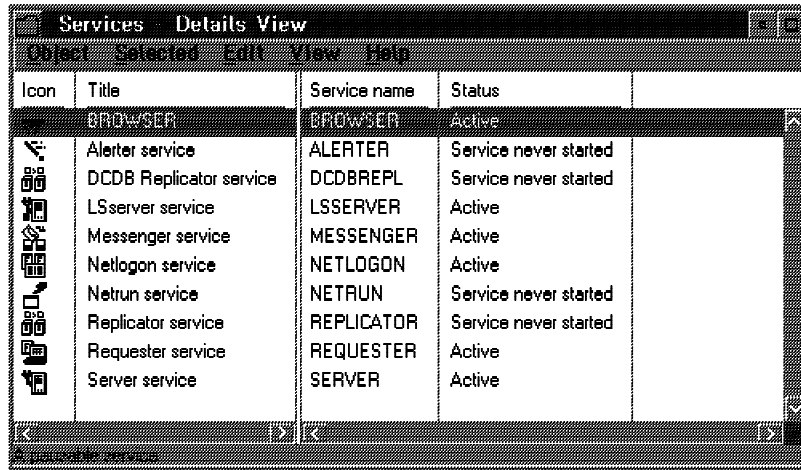


Figure 219. Available OS/2 Warp Server Service after Installing NBE

### 6.5.3.1 Prerequisite

You must have at least CSD IP08260 installed on your OS/2 Warp Server before you can install the IBM Neighborhood Browser Enabler. If you have Warp Server SMP installed, no CSD is required.

### 6.5.3.2 Installing the IBM Neighborhood Browser Enabler

1. Make sure you have the following files and that they reside in the same drive and directory:

```
BRINST.COMD  
BROWSER.EXE  
BROWSE32.DLL  
BROWSE16.DLL  
NETSERVR.EXE  
NETSVINI.EXE  
NETWKSTA.200  
HPFS386.IFS
```

2. Stop the OS/2 Warp Server if it is running by typing: `NET STOP SERVER.`
3. From the drive and directory where the files reside, type: `BRINST.`
4. If your OS/2 Warp Server CSD level is IP08260, shut down and restart your computer before you start the server.
5. Restart the server by typing: `NET START SERVER.`

After a short time, you can see all the OS/2 Warp Servers in the network neighborhood window. If your Windows workstation workgroup is not equal to the OS/2 domain, you can only see the domain in the Entire Network folder (see also Figure 220 on page 193).

**Note**

See also the readme.1st in the IBM Neighborhood Browser Enabler package for further installation information especially for OS/2 Warp Server SMP.

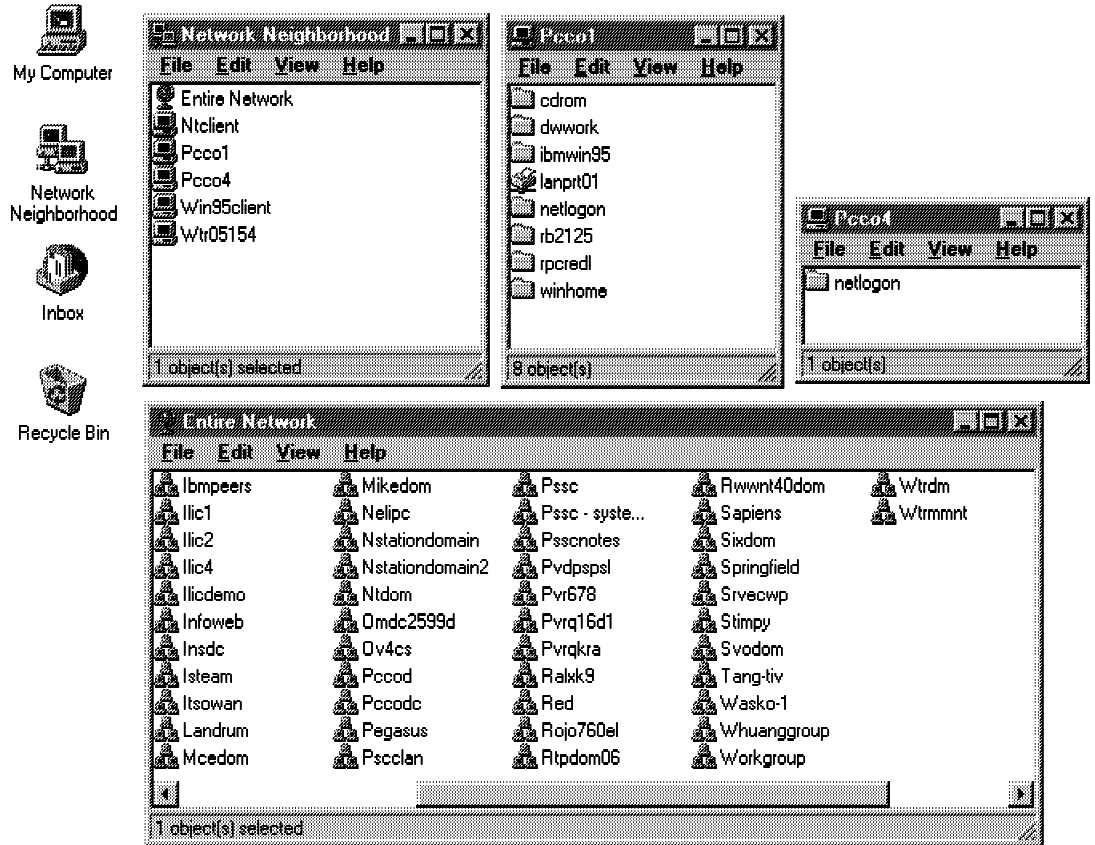


Figure 220. Available OS/2 Warp Servers in the Network Neighborhood

### 6.5.3.3 Recommendations

To ensure that the IBM Neighborhood Browser Enabler becomes your master browser, install it on the domain controller. If the IBM Neighborhood Browser Enabler is installed on a server other than the domain controller, it can become a master browser or a backup browser, depending on how the other machines in the domain are configured. When the IBM Neighborhood Browser Enabler is installed on more than one server in the domain, one server will become the master browser and other servers can become the backup browsers. Backup browsers reduce the number of network requests to the master browser. For performance considerations you might want to install an IBM Neighborhood Browser Enabler for every 20 servers in the domain. If you are installing in a TCPBEUI environment, IBM Neighborhood Browser Enabler supports Windows clients within a single subnet. Windows clients will be able to browse OS/2 Warp Server domains only in their own subnet.

---

## 6.6 Using UNIX to Connect to OS/2 Warp Server

In this section, we demonstrate connectivity to OS/2 Warp Server using UNIX, specifically Linux. We use an application called Samba to accomplish this.

First, we give you a brief introduction to both Linux and Samba. Then, we describe the environment we used in our lab. We tell you why Samba is a good choice for UNIX to OS/2 Warp Server file transfers, and finally we perform a simple example of connecting to OS/2 Warp Server from Linux utilizing Samba.

This section is intended for system administrators and assumes knowledge of UNIX, TCP/IP, PPP, and DNS.

### 6.6.1 What Is Linux?

Linux is a member of the UNIX family. Originally, Linux was a hobby project of Linus Torvalds at the University of Helsinki in Finland. He based the project loosely on the small MINIX operating system. The first official version of Linux was Version 0.02 (Linux is now on release version 2.0) which ran on the 80386 platform. Although the system could only run bash and gcc, it marked a major step in creating a multiuser, multitasking and highly stable OS for PCs. Linux reached Version 1.0 in 1994 and Version 2.0 was officially released recently.

An important aspect of Linux is that it was programmed completely by UNIX experts and programmers around the Internet and much of the discussion took place on newsgroups. Today, a lot of the application development is done by the GNU (GNU's not UNIX) project at the Free Software Foundation in Cambridge, Massachusetts. Much thanks and appreciation should be extended to the numerous programmers who have worked hard to make Linux what it is today.

#### World Wide Web

Linux Now! is an excellent Linux resource on the World Wide Web. Their URL is:

<http://linuxnow.com/>

### 6.6.2 What Is Samba?

Samba is a suite of programs that work together to allow clients access to a server's file space and printers via the Server Message Block (SMB) protocol. Initially written for UNIX, Samba now also runs on NetWare, OS/2 and VMS.

In practice, this means that you can redirect disks and printers to UNIX disks and printers from OS/2 Warp Server clients, Windows 95 clients, Windows NT clients, Linux clients, and other SMB clients. There is also a generic UNIX client program supplied as part of the suite which allows UNIX users to use an ftp-like interface to access file space and printers on any other SMB servers. This gives the capability for these operating systems to behave much like an OS/2 Warp Server or Windows NT Server machine, only with added functionality and flexibility designed to make life easier for administrators.

Samba consists of the following components:

- `smbd` - This daemon provides the file and print services to SMB clients, such as OS/2 Warp Server, Windows NT or Windows 95.

- nmbd - This daemon provides NetBIOS name serving and browsing support. It can also be run interactively to query other name service daemons.
- smbclient - This program implements a simple ftp-like client. This is useful for accessing SMB shares on other compatible servers (such as OS/2 Warp Server), and can also be used to allow a UNIX box to print to a printer attached to any SMB server.
- smbstatus - This utility allows you to tell who is currently using the smbserver.

As this chapter deals primarily with client connectivity to OS/2 Warp Server, do not discuss smbserver, nmbd, or smbstatus. Those components are used to connect to UNIX and are discussed in great detail by persons who know a great deal more about Samba than we do.

#### World Wide Web

The main author of the Samba suite is Andrew Tridgell. He may be contacted via e-mail at [samba-bugs@samba.anu.edu.au](mailto:samba-bugs@samba.anu.edu.au).

To find out more about Samba, and where to get Samba, browse to the Samba Web pages at URL:

<http://lake.canberra.edu.au/pub/samba/>

### 6.6.3 Our Environment

To demonstrate using Samba to connect to OS/2 Warp Server, we set up the following environment:

- APOLLO - Pentium Workstation running RedHat Linux 4.2, TCP/IP, and Samba. Apollo was dialed into the LAN and connected using PPP.
- PCCO4 - IBM PC Server running OS/2 Warp Server. PCCO4 implemented TCPBEUI for TCP/IP connectivity to OS/2 Warp Server.

You will note that PCCO4 had TCPBEUI implemented in MPTS. This must be used to allow Samba to connect to OS/2 Warp Server. For more information on implementing TCPBEUI on OS/2 Warp Server, refer to *Inside OS/2 Warp Server, Volume 1: Exploring the Core Components*, SG24-4602-00.

### 6.6.4 Why Use Samba?

As mentioned above in 6.6.2, "What Is Samba?" on page 194, Samba can provide connectivity to UNIX disks and printers from OS/2 Warp Server clients, but it can also allow you to connect to file resources on OS/2 Warp Server from UNIX as well. Unfortunately, you can not redirect drives from UNIX, but you can use the SMBCLIENT to transfer files from OS/2 Warp Server.

At first glance, this may seem somewhat like using FTP to connect to an OS/2 Warp Server utilizing the TCP/IP suite of applications, and you would be correct in that line of thinking. The very big difference is that Samba uses OS/2 Warp Server's security database for authentication. Unlike many other server applications that run on OS/2, the IBM TCP/IP suite for OS/2 uses its own security model for authentication. We know that this can be problematic for an administrator as you cannot synchronize OS/2 Warp Server security database with an external one.

Enter Samba. By utilizing the facilities in the SMBCLIENT you can both transfer files to and from OS/2 Warp Server as well as print to OS/2 Warp Server using the same authentication that is used for native OS/2 Warp Server clients. We consider this to be a huge advantage over using standard FTP implementations for file transfers, or using LPD to print to OS/2 Warp Server from UNIX.

## 6.6.5 Using Samba to Transfer Files

We now step through the procedure of connecting to OS/2 Warp Server using SMBCLIENT to transfer files. We use the interactive method, but note that you may also use a command line method of file transfer that would be especially useful in scripts. See the Samba documentation for more details.

The output of smbclient is seen in Figure 221 and shows the syntax for SMBCLIENT.

```
Usage: smbclient service <password> [-p port]
      [-d debuglevel] [-l log]
Version 1.9.16p11
  -p port                listen on the specified port
  -d debuglevel          set the debuglevel
  -l log basename.       Basename for log/debug files
  -n netbios name.       Use this name as my NetBIOS name
  -N                     don't ask for a password
  -P                     connect to service as a printer
  -M host                send a winpopup message to the host
  -m max protocol        set the max protocol level
  -L host                get a list of shares available on a host
  -I dest IP             use this IP to connect to
  -E                     write messages to stderr instead of stdout
  -U username            set the network username
  -W workgroup           set the workgroup name
  -c command string      execute semicolon separated commands
  -T<c|x>IXgbNa          command line tar
  -D directory           start from directory
```

Figure 221. SMBCLIENT Syntax

For a more detailed discussion of these parameters and their usage, please refer to the Samba documentation.

To connect to OS/2 Warp Server open an xterm and type the following command followed by pressing Enter:

```
smbclient '\\SERVER\SHARE' XXX -U USERID -n USERID
```

where SERVER is the name of your server, SHARE is the name of the share or alias, and USERID is a valid domain user ID with rights to share. A connection is made as seen in Figure 222 on page 197.



```

rxvt@apollo.rocketship.com
[Schult@apollo /]#
[Schult@apollo /]# smbclient '\\PCC04\DATA' START -U ADMIN1 -n ADMIN1
Added interface ip=127.0.0.1 bcast=127.255.255.255 nmask=255.0.0.0
Server time is Tue Jul 22 08:37:52 1997
Timezone is UTC+0,0
smb: \>
smb: \> help
ls          dir          lcd          cd           pwd
get         nget        put          mput        rename
more        mask        del          rm           mkdir
nd          rmdir       rd           prompt      recurse
translate  lowercase  print       printmode   queue
qinfo      cancel      stat        quit        q
exit        newer       archive     tar         blocksize
tarmode    setmode    help        ?           !
smb: \>
smb: \> █

```

Figure 222. Samba Connection Example Window

To get a file listing of the OS/2 Warp Server connection from the smb: \> prompt enter the following command:

```
dir
```

You will see a standard file listing as seen in Figure 223.

**Note:** You can use wildcard modifiers to filter the output of the dir command.

```

rxvt@apollo.rocketship.com
smb: \warp4fix\> dir
.          D          0 Sat Jul 19 17:34:58 1997
..         D          0 Mon Jul 21 19:14:46 1997
CSFBOOT.1DK A 1066441 Mon Nov 18 09:20:48 1996
CSFBOOT.2DK A 978968 Mon Nov 18 09:27:36 1996
LOADDSKF.EXE A 14168 Thu Jan 14 15:40:38 1993
WKICKR.TXT A 6035 Mon Nov 18 09:40:20 1996
WKICKR.ZIP A 2057201 Thu Feb 27 19:58:10 1997
XR_M001.1DK A 1475063 Thu Feb 27 19:13:14 1997
XR_M001.2DK A 1473527 Thu Feb 27 19:16:22 1997
XR_M001.3DK A 1473527 Thu Feb 27 19:20:06 1997
XR_M001.4DK A 1473527 Thu Feb 27 19:24:28 1997
XR_M001.5DK A 1473527 Thu Feb 27 19:30:30 1997
XR_M001.6DK A 1473527 Thu Feb 27 19:35:12 1997
XR_M001.7DK A 1473527 Thu Feb 27 19:38:32 1997
XR_M001.8DK A 1473527 Thu Feb 27 19:43:50 1997
XR_M001.9DK A 584183 Thu Feb 27 19:48:00 1997
40004 blocks of size 131072. 35628 blocks available
smb: \warp4fix\> █

```

Figure 223. SMBCLIENT Output Example Window

To send a file from the smb: \> prompt enter the following commands:

```
bin
```

```
put <filename>
```

where <filename> is the name of the local file you wish to send to OS/2 Warp Server.

**Note:** We used the bin command to set the transfer mode to binary. If you send text files, be sure to use the asc command instead, as it will set the mode to ASCII.

The file is transferred to OS/2 Warp Server. To get a file from the smb: \> prompt enter the following commands:

```
bin
```

```
get <filename>
```

where <filename> is the name of the remote file you wish to get from OS/2 Warp Server.

**Note:** We used the bin command to set the transfer mode to binary. If you send text files, be sure to use the asc command instead, as it will set the mode to ASCII.

The file is transferred to your workstation.

#### SMBCLIENT Commands

For more help on SMBCLIENT commands enter `help` or `?` at the `smb: \>` prompt. See Figure 222 on page 197 for the output of this command. Help on individual commands can be obtained by entering `help <command>`.

## 6.6.6 Summary

This chapter was in no way designed to be a guide to Samba or UNIX, but it is our hope that the topics we touched on will inform you of the facilities available for connectivity between UNIX and OS/2 Warp Server.

Samba is a very robust suite, but its abilities and their specific usage are beyond the scope of this document. If you find that you want to know more about Samba and what it can do, then please refer to the Samba Web pages pointed out in 6.6.2, "What Is Samba?" on page 194.

---

## Chapter 7. Performance Highlights

This chapter updates the performance capabilities of LAN Server 5.0, a key component of OS/2 Warp Server. This chapter features the OS/2 Tuning Assistant, a utility that assists a LAN administrator in configuring and tuning a system for optimum performance when several OS/2 Warp Server services (applications that come with OS/2 Warp Server) will coexist in that system.

OS/2 Warp Server integrates several key IBM networking products into a single package. These products include file and print sharing services, system management services, remote access services, backup and recovery services, advanced print services, and Internet networking connectivity. OS/2 Warp Server will extend OS/2's industry-leading market share of application server installations with these additional functions.

The file and print sharing services, also known as LAN Server 5.0, are the cornerstone of OS/2 Warp Server; they provide the basic file and print sharing services needed in practically all network environments.

As a starting point in discussing LAN Server 5.0's performance capability, you might want to read the LanQuest Lab report, dated October 1994, in which LanQuest compared, evaluated, and reported its findings on LAN Server 4.0, Windows NT Server 3.5, and NetWare 4.02. LanQuest found that IBM LAN Server 4.0 was faster than the other two products in running a set of tests with industry-standard applications and scripts. For a copy of this report, call 1-800-IBM-4FAX and request document 2014.

IBM employed these same tests while developing and testing OS/2 Warp Server. The hardware that IBM used was not identical to the hardware used in the LanQuest Labs report, so LAN Server 4.0 was run on the new hardware to provide an accurate basis for comparison.

These new tests showed that LAN Server 5.0 is faster than LAN Server 4.0 by 14 percent at the 400 equivalent client load, and by 13 percent at the 800 equivalent client load. This improvement is attributed to better integration with OS/2 and additional improvements in OS/2 Warp print performance.

---

### 7.1 The DOS TCPBEUI Protocol Stack

In addition to LAN Server 5.0's improvement in file and print performance, a major improvement was made to the DOS LAN Services (DLS) client's TCP/IP performance. A completely new DOS TCPBEUI protocol stack is included with the DLS client shipped with OS/2 Warp Server. It is integrated in the installation procedure and is as easy to install as NetBEUI of LAN Support Program (LSP).

TCPBEUI is software that intercepts NetBEUI protocol functions and maps them into TCP/IP protocol functions. This enables LAN Server and its clients to use TCP/IP wide area connectivity, even though both server and client normally use the NetBEUI protocol to control data flow over the network. The disadvantage to this technique is the additional overhead and the resulting performance impact of mapping from NetBEUI protocol to TCP/IP protocol, and vice versa.

The TCPBEUI protocol stack shipped with the DLS client in LAN Server 5.0 is dramatically improved over the one in LAN Server 4.0. Whereas LAN Server 4.0

was able to support only 40 equivalent clients running the DLS 4.0 client TCPBEUI protocol stack, LAN Server 5.0 has been tested up to a load of 800 equivalent clients with no functional problems.

The performance of the new DLS client TCPBEUI protocol stack is extremely good. When running the file and print application test used in LanQuest Labs' report, DLS clients running the new TCPBEUI protocol stack can run as much as four times faster than the DOS TCPBEUI protocol stack shipped with LAN Server 4.0. Under a moderately heavy server load, DOS TCPBEUI is approximately 25 percent slower than NetBEUI.

LAN Server must also be running the TCPBEUI protocol to communicate with DLS TCPBEUI clients. Although some additional CPU workload is placed upon LAN Server when compared with running the NetBEUI protocol, this workload is usually insignificant, because file and print servers normally underutilize the CPU resource. Because file and print servers are usually underutilized, in most cases you won't be able to distinguish TCPBEUI performance from that of NetBEUI. This means that dual protocol stacks are not necessary to maintain good local performance along with wide area connectivity, so valuable memory can be saved in DOS machines.

Another significant addition to the DLS client for LAN Server 5.0 is a TCP/IP protect mode stack that runs under Windows 3.1 or Windows 95. Like TCPBEUI, it provides TCP/IP wide area connectivity, but with the additional benefit of requiring no conventional memory.

---

## 7.2 IBM OS/2 Warp Server Tuning Assistant

The OS/2 Warp Server Tuning Assistant is an extension of the LAN Server 4.0 Tuning Assistant. (See the article "LAN Server 4.0 Performance, Capacity Enhancements, and Tuning Tips" in *Personal Systems* magazine, May/June 1995, for a description of the LAN Server 4.0 Tuning Assistant.) In LAN Server 5.0, the Tuning Assistant is extended to allow system configuration and tuning when additional OS/2 Warp Server services will coexist with the LAN Server 5.0 file and print services.

**Note:** The Tuning Assistant is installed and available only if the file and print services are installed.

The Tuning Assistant can assist you in two important tasks. It can allocate NetBIOS resources among the various installed services as well as among other installed OS/2 applications. It can also efficiently allocate system memory between the various services and other applications to provide good overall system performance. The Tuning Assistant is executed without user input when the install process completes, and it automatically configures the system's NetBIOS resources and memory. When you install OS/2 Warp Server, the system is configured to provide good performance in most environments, but it may not be optimal for your particular needs.

### Hint

Launching the Tuning Assistant enables you to define the requirements for services and applications running on the system, including NetBIOS and memory resources for applications not included in OS/2 Warp Server. Custom tuning your system this way provides the best system performance.

Additional information, such as the number of clients to be supported by certain services, provides even more detail to aid configuration and tuning. When Tuning Assistant knows this information, it can calculate new values for key parameters, then update the system's configuration files when you are satisfied with the results. The system always makes backup copies of all configuration file changes. The changes that Tuning Assistant makes to system configuration files improve system-wide performance most of the time. To obtain the best results, however, you must be prepared to provide accurate memory and NetBIOS data for the various installed applications.

## 7.3 Solving NetBIOS Restrictions with Tuning Assistant

NetBIOS has existed since the earliest PC networking days. Its architecture did not anticipate some of the changes that occurred when networks expanded into enterprise and global geographical entities. For example, NetBIOS' limits a system to only two network interface cards (NICs) with a maximum of 254 sessions per NIC. These limits were extended to four NICs and 1,016 sessions with the advent of busmaster NICs, which allow up to four NICs per system using LAN Server for file and print sharing. This section discusses some additional NetBIOS restrictions and how they are handled in OS/2 Warp Server. A clarification of terminology will help in understanding the following material.

NetBIOS is an application programming interface (API), not a protocol. Along with this API, an underlying network protocol is required, for example, implementations include NetBEUI, LAN Support Program (DXMJ0MOD), and NetBIOS over TCPIP. Unless otherwise stated, NetBIOS in this chapter refers to both the API and the protocol. Reference is also made to the NetBEUI protocol to discuss specific data structure considerations.

### 7.3.1 Constraints of the NetBEUI Data Segment

One NetBIOS restriction that must be addressed is that the size of a certain set of parameter data structures cannot exceed 64-KB, since some of the NetBIOS code uses 64-KB memory segments. The NetBEUI 64-KB segment can cause problems if the combination of these parameters exceeds 64-KB, which results in a configuration where NetBIOS will not start until the values of some of the parameters are reduced. The NetBEUI data segment's content and default values in OS/2 Warp Server are shown in Table 9.

*Table 9. NetBEUI 64-KB Data Segment*

NetBEUI Parameter	Value (bytes)	Data Size (bytes)	Total Size (bytes)
Commands (NCBS)	254	64	16256
Names	42	76	3192
Packets	330	108	35640
Selectors	15	10	150
Datagrampackets	10	124	1240
Looppackets	8	148	1184
Overhead			7620
Total			65282
>Maximum Size			65535

Some of the NetBIOS code has been rewritten to eliminate some 64 KB segment restrictions. For example, during NetBIOS initialization, a message may appear saying that a 32-bit data segment is being used. The NetBEUI parameters *sessions* and *namecache* have been moved from 64 KB data segments to larger data segments.

Because several OS/2 Warp Server services use NetBIOS resources, you might expect that NetBIOS configuration could be problematic. The design approach for NetBIOS configuration was to set the critical NetBEUI parameters to their maximum values within the constraints of the 64 KB data segment size. The NetBIOS resources are allocated to the various services as shown in Table 10.

<i>Table 10. Default NetBIOS Resource Allocations</i>			
<b>Service</b>	<b>Sessions</b>	<b>Commands</b>	<b>Names</b>
Remote Access	9	27	1
System Management (Software Dist. Server option)	5	51	7
System Management (Software Dist. Server option)	29	94	8
File and Print Services	32	50	18
+ Network SignON Coordinator	8	8	2
File and Print Services (Advanced)	100	220	18
+ Network SignON Coordinator	8	8	2

Table 10 mentions LAN Server Advanced. OS/2 Warp Server is also available as OS/2 Warp Server Advanced, which includes LAN Server Advanced. LAN Server Advanced's additional functions include:

- High Performance File System (HPFS386)
- Improved file and print performance and capacity
- Fault tolerance via disk mirroring
- Per-user disk limit management capability

Readers experienced with NetBIOS might observe that the installation of LAN Server Advanced and either version of System Management Services requires more NetBIOS commands than are available on a single NIC (254). This is where Tuning Assistant comes into play.

When you start the Tuning Assistant, it examines a configuration file, WSCONFIG.CFG, looking for the keyboard AllProducts, then it parses that line to identify the services installed in the system where Tuning Assistant is being executed. It then reduces the LAN Server Advanced NetBIOS resource requests

in the net1 line of the IBMLAN.INI net1 line from the total available NetBIOS resources, which are defined in the PROTOCOL.INI file. Consequently, the total NetBIOS resources available for other NetBIOS applications can be restricted by the LAN Requester's resource specifications.

### 7.3.2 Constraints of the NetBIOS Data Segment

A second data segment restriction specific to the NetBIOS API must be addressed if the system configures NetBIOS to more than two NICs. This 64-KB data segment is used to keep information about commands, also referred to as network control blocks (NCBs). The formula in Table 11 shows the condition to be satisfied to ensure that the total amount of data to be kept in the 64-KB NetBIOS data segment does not exceed its capacity of 65,535 bytes.

#### Formula to Ensure No Data Overflow

$$\begin{aligned}
 & (\text{Total NetBIOS NCBs} - \text{Total Requester NCBs}) * 95 \\
 & + (\text{Total NetBIOS NCBs} - \text{Total Rquester NCBs}-15) * 15 \\
 & + (\text{NetBIOS Bindings}) * 990 \\
 & - (\text{Requester Bindings}) * 990 \\
 & + 11310
 \end{aligned}$$

Must be less than or equal to 65535

Where:

- Total NetBIOS NCBs is the value of NCBS in the PROTOCOL.INI file times the number of NetBIOS bindings to NICs (also called network adapter cards).
- Total Requester NCBs is the sum of the x2 parameters on the net1 and net2 lines, for example, in the IBMLAN.INI file.
- NetBIOS Bindings is the number of bindings of NetBIOS to NICs and is equal to the number of drivers specified in the Bindings=line, NetBEUI section of the PROTOCOL.INI file. The LAN Distance driver PDFH\_nif, the TCPBEUI\_nif driver and also the IPXNB\_nif driver count as bindings in this parameter.
- Requester Bindings is the number of LAN Requester bindings to NICs and is equal to the number of net1 and net2 lines, for example, in the IBMLAN.INI file.

Table 11. Examples of 64-KB NetBIOS Data Segment Calculations

Total NetBIOS NCBs	Total Requester NCBs	NetBIOS Bindings to NICs	Requester Bindings to NICs	Total (Using Formula Above)
254 x 1 NIC	100 x 1 NIC	1	1	29015
254 x 2 NICs	100 x 1 NIC	2	1	57211
254 x 3 NICs	100 x 1 NIC	3	1	86875*
254 x 3 NICs	100 x 2 NICs	3	2	73895*
254 x 3 NICs	100 x 3 NICs	3	3	61905
191 x 3 NICs	100 x 1 NIC	3	1	65095

**Note:** Exceeds 64-KB limit and would prevent NetBIOS from initializing.

The Tuning Assistant incorporates routines that check both the NetBEUI and NetBIOS 64-KB data segments. If the parameter settings for the NetBEUI data segment exceed the 64-KB boundary, the parameter's packets and names will be reduced until the limit is no longer exceeded. Packets was chosen to be reduced because it is the biggest overall contributor, and the resulting performance impact is negligible. Names was chosen to be reduced because most NetBIOS applications use very little of this resource.

If the combination of NetBIOS NCBs, Requester NCBs, NETBIOS Bindings, and Requester Bindings causes the NetBIOS data segment to exceed the 64-KB boundary, Tuning Assistant increases the values of the x2 parameters in the net1 and net2 lines, for example, of the IBMLAN.INI file. Increasing the number of Requester Bindings, as shown in lines 4 and 5 of Table 11 on page 203 produces the same effect as increasing the value of x2. That is, it increases the Total Requester NCBs, which then reduces the amount of data to be contained in the NetBIOS 64-KB data segment (see the formula in table Table 11 on page 203). Approximately 456 NCB data structures can be stored in this data segment when NetBIOS has bindings to four adapters; you may use this value for estimation purposes.

Configuring the 64-KB NetBIOS data segment can become quite complex, because there are many combinations of services that may be installed, possibly using different NICs as well as different ways of binding LAN Distance Connection Server to LAN Server. Tuning Assistant addresses these situations and configures NetBIOS resources for proper operation and good performance.

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## 7.4 OS/2 Warp Server Memory Allocation

OS/2 Warp Server, in addition to including the base OS/2 Warp operating system, offers the ability to run many services, of which all or any combination may be installed and active on a system. Since memory is a limited and expensive resource that can dramatically affect performance, you must understand the various services' memory requirements to properly size the system. Table 12 on page 205 shows the memory requirements for an operational system. The memory values are *working-set* numbers, meaning that the specified amount of memory was touched (used) during a defined time period. For each service, the memory values were measured when only that service was active and performing its typical functions. The memory requirements in Table 12 on page 205 should be considered minimum requirements, because the number of active clients was not large.



<i>Table 12. IBM OS/2 Warp Server Memory Requirements</i>	
<b>Operating System</b>	<b>Memory Requirement MB</b>
Base Operating System	4.0
<b>Services</b>	<b>Memory Requirement MB</b>
Remote Access (LAN Distance Connection Server)	3.3
System Management (SystemView)	6.7
Backup and Recovery (Personally Safe and Sound)	1.9
Advanced Print (Print Services Facility)	1.8
File and Print Sharing	6.1
File and Print Sharing-Advanced	7.1

You should size your system memory requirements by adding the memory requirements for the base operating system plus each service that will be concurrently active. A generous allowance for file system cache is important for good file and print sharing (LAN Server) performance. (See the document titled *IBM OS/2 Warp Server Up and Running: Planning Overview*, which accompanies the OS/2 Warp Server product, for more information about system memory sizing.)

Another important Tuning Assistant function allocates as much memory as possible to the file system cache LAN Server is using. Recall that when the Tuning Assistant starts, it determines the amount of memory in the system, examines the configuration file (WCONFIG.CFG) for the keyword AllProducts, and parses that line to identify the services installed on that system. Tuning Assistant conservatively assumes that all installed services will be active concurrently and sets aside the memory specified in Table 12 for the identified services. Most of the remaining system memory is then assigned to the file system cache.

Tuning Assistant changes the appropriate configuration files to set the cache size. This approach should provide enough memory for all installed services to run well (assuming that the system memory is properly sized), with LAN Server performance only minimally affected by a reduced file system cache size. Tuning Assistant issues a warning message if the installed system memory is insufficient.

**Note:** If you intend to run additional applications on your system, or will be providing services for a substantial number of clients, you must provide application memory information to the Tuning Assistant to avoid too much memory being assigned to the file system cache. You will know this has occurred if your system slows down when loading and executing applications as a result of memory being swapped out to disk (see 7.7, “Using Tuning Assistant to Reserve Memory for Applications” on page 208 later in this chapter).

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## 7.5 Customizing Your System Memory Allocation

It is likely that many OS/2 Warp Server installations will not run all the installed services concurrently. If this is your situation, you can improve your system's file and print sharing performance by increasing the size of the file system cache. Tuning Assistant's flexibility helps you accomplish this.

Start Tuning Assistant and click on the new **Services** tab. There, you see check boxes for LAN Distance Connection Server and for Administrator Console. Tuning Assistant places a check in these check boxes when it determines that these services are installed on the system. You can tell Tuning Assistant not to reserve memory for these services by removing the check in either or both check boxes as appropriate for your system. To verify that memory is no longer reserved for this service(s), click on the **Test Data** tab and watch the APP RAM memory value change. The result is an increased file system cache size and better file and print sharing performance.

The backup and recovery services and the advanced print services are not externalized in Tuning Assistant. If these services will not be concurrently active on the OS/2 Warp Server system, you can manually edit the file system cache configuration files to increase the cache size by increasing the appropriate memory value(s) shown in Table 8 on page 63.

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## 7.6 Reserving NetBIOS Resource for Applications

You can use Tuning Assistant to reserve NetBIOS resource and memory for other applications that you want to run on your OS/2 Warp Server system. Click on the Tuning Assistant **Services** tab, then click on the right arrow to turn pages to view the names of other applications that you may have installed. Reserving NetBIOS resources is the only effect of clicking on these application check boxes. Clicking on the **Lotus Notes on Server** check box causes Tuning Assistant to increase both x1 and x2 in the net1 line in the IBMLAN.INI file by the amount specified in the Maximum Concurrent Users entry field. The total is evenly divided if there are multiple net lines (bindings to NICs). Prior to the release of Lotus Domino<sup>1</sup>, the default protocol for Lotus Notes was NetBIOS, which actually uses LAN Requester's resources instead of going directly to NetBIOS; consequently, LAN Requester's resources are increased to accommodate Lotus Notes. It is possible that Lotus Notes is configured to use actual NetBIOS resources; Lotus Notes calls that protocol EENB. If that is your situation, you should use the Other NetBIOS Applications check box instead of the Lotus Notes on Server check box.

The LAN Server Ultimedia check box added to this release of Tuning Assistant enables that product to be easily configured. Clicking on its check box affects only parameters in a LAN Server 5.0 Advanced file, HPFS386.INI. The changes made to the HPFS386.INI file specify how many big buffers to allocate when the file system is started. You can use the Maximum Concurrent Users entry field to increase the value for the fsprealloc parameter in the HPFS386.INI file from its minimum of two big buffers at start time to the minimum plus the value entered in the Maximum Concurrent Users entry field.

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<sup>1</sup> Lotus Domino is the new name and the latest release of the Lotus Notes server. The default protocol for Lotus Domino is TCP/IP.

If the Dedicated Ultimedia Server push button is on, the 386 HPFS cache size is set to its minimum value to make all memory available for multimedia file transfer. If your system will be supporting normal file and print sharing functions, the Ultimedia and File Server push button must be on to avoid severe performance degradation caused by the minimum file system cache.

**Note:** For more information about the `fsprealloc` and `srvprealloc` parameters, use a text editor to view the comments in the `HPFS386.INI` file.

Clicking on the LAN Network Manager on Server check box, or clicking on the Communications Manager/2 check box, causes parameter changes only in the `LANDD_nif` section of the `PROTOCOL.INI` file. This has no effect on Tuning Assistant's NetBIOS or memory allocation algorithms.

Clicking on the DB2/2 on Server check box causes Tuning Assistant to set aside 45 NCBs, plus the total number of sessions specified in the two entry fields for Number of DOS and OS/2 Requesters, for the DB2/2 product to use. As a result, you will probably observe a decrease in the `x1` and `x2` parameters in the `net1`, `net2`, etc. lines of the `IBMLAN.INI` file. This decrease is intended to reduce the NetBIOS resources claimed by LAN Requester at initialization, so that a sufficient amount will be available when DB2 is started. This scheme is based upon an older version of DB2 than is now available, and it may not be the best way to configure your system for DB2. The following section outlines another method that should yield better results.

From the DB2/2 on Server check box, one more right arrow click brings up a panel with a check box labeled Other NetBIOS applications. Under this check box are the entry fields: Number of Sessions and Number of Names. We strongly recommend that these entry fields be used to identify to Tuning Assistant any NetBIOS requirements for products or applications that are not OS/2 Warp Server services. (Those requirements should be available in the products' or applications' specifications.) Tuning Assistant uses the values given for commands, sessions, and names in its calculations, and makes adjustments accordingly.

Since sessions and NCBs (commands) are already set at their maximum value of 254, additional requirements must be satisfied by reduction in the LAN Requester's NetBIOS resources, for example, a decrease in the `x1` and `x2` parameters in the `net1` line of the `IBMLAN.INI` file. If more than 254 session or commands are needed to satisfy the new requirements and to maintain reasonable performance for LAN Server, Tuning Assistant displays a warning message that says additional adapters are recommended. Most NetBIOS applications use very few of the names resources. If your product or application specification requires a lot of names, you should be aware of the following detail.

Earlier in this chapter, we described the NetBEUI 64-KB data segment constraint. Table 9 on page 201 shows that Names is one of the parameters that must be stored in this data segment. An increase in names must be accompanied by a decrease in one of the other parameters. Tuning Assistant uses an algorithm that takes the initial values of packets and names and alternately reduces one, then the other, until the 64-KB limit is satisfied. This means that you must specify a larger value for names than you actually need. Tuning Assistant's trial calculations provide an easy way to zero in on the right number.

Configuring NetBIOS resources for additional applications is more complicated when multiple NICs are used in the system. Tuning Assistant can determine how

the OS/2 Warp Server services are configured to the NICs, but has no provision to obtain this information about additional applications. Consequently, it configures the NICs as though the applications were using all of them.

Tuning Assistant must also ensure that the NetBIOS 64-KB data segment constraint is strained. For this reason, you may see unexpected values for x1 and x2 in the net1, net2, etc. lines of the IBMLAN.INI file. To improve LAN Server 5.0 performance or capacity, you can modify the net1, net2, etc. lines in the IBMLAN.INI file, after Tuning Assistant has been run, with values that satisfy the formula given in Table 11 on page 203.

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## 7.7 Using Tuning Assistant to Reserve Memory for Applications

Clicking on the **Server** major tab, then clicking twice on the right brings up a panel that enables you to reserve memory in your system for applications not in OS/2 Warp Server. Click on the Support user logged on to the server check box. After determining (by consulting the specifications) how much application memory is needed, you can enter the amount of memory into the Application Reserve Memory entry field. Tuning Assistant adds this value into its calculations to determine how much of the system memory is available to assign to file system cache. We strongly recommend that you use this entry field to identify to Tuning Assistant the memory requirements for the additional applications that will be running on an OS/2 Warp Server system. You should also use the Application Reserve Memory entry field when any of the OS/2 Warp Server services will be running in a multi-client configuration that requires more memory than that specified in Table 12 on page 205.

### A Final Point about Application Memory Specifications

Often, the numbers are given as a total system size rather than working set size. If this is your situation, the memory specification may be reduced by 4 MB, the size of the base operating system, to approximate the working set. The working set number will give Tuning Assistant a more appropriate value for properly tuning and configuring the system.

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## 7.8 Additional Tips about OS/2 Warp Server

The following section contains information about an enhanced feature of LAN Server 4.0 contained in OS/2 Warp Server.

### 7.8.1 Updated Tuning Assistant Command Line Options

This section includes a list of parameters you can use when executing the Tuning Assistant program (WSTUNE.EXE) from the OS/2 command line in the \IBMLAN subdirectory.

#### Tuning Assistant Parameters:

/D:Domain name

/S:Server name

/T:Server type

/P:package type

/M:xxx

/A:x

/U

**Example:**

WSTUNE /D:DOMNAME /S:SRVNAME /T:DC /P:ADVANCED /M:32 /A:2 /U

Domain name is used only to display a domain name on the first panel.

Server name is used only to display a server name on the first panel.

Server type is either AS for additional server or DC for domain controller.

Package type is either Entry or Advanced.

/M:xxx is the memory in MB.

/A:x is the number of adapters begin used by LAN Server (1 to 4 only).

/U specifies to use user-supplied files. The possible user-supplied files are:

- CONFIG.SYS - Cache settings (x:\boot drive)
- IBMLAN.INI - LS settings (x:\ibmlan directory)
- PROTOCOL.INI - MPTS settings (x:\ibmcom directory)
- HPFS386.INI - HPFS386 settings (x:\ibm386fs directory)
- WCLLOCAL.INI - LAN Distance settings (x:\wal directory)
- WSCONFIG.CFG - OS/2 Warp Server install settings (x:\os2\install directory)
- SYSVIEW.CFG - SystemView settings (x:\os2\install directory)

If /U is used on a system with no LAN Server installed, then the /T parameter must also be used. This is because the Tuning Assistant uses a net API call to determine server type, and if no server is installed, the API fails.

User-supplied files must be in the same directory as WSTUNE.EXE. If the Apply push button is selected, these files are changed and no backups are created.

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## 7.9 Additional Tips about OS/2 Warp 4

The following section contains information about the tuning and modification of parameters within the OS/2 Warp 4 CONFIG.SYS file.

### 7.9.1 OS/2 Warp CONFIG.SYS File Insights

If you feel comfortable with OS/2 Warp 4 internal operations, you can make the following changes to the CONFIG.SYS file to make it leaner and with less memory demand:

LIBPATH, PATH, and DPATH

SWAP file

DOS=LOW,NOUMB

BUFFERS

MAXWAIT

PRIORITY\_DISK\_IO

TIMESLICE

RESTARTOBJECTS=STARTFOLDERONLY

AUTOREFRESHFOLDERS

PM\_ASYNC\_FOCUS\_CHANGE=ON

DISKCACHE

DISKCACHE Threshold

LAZYWRITE

HPFS CACHE

THREADS

VDISK

PRIORITY=DYNAMIC

COM and VCOM

CDROM and VCDROM

PMCMCIA

BASEDEV=IBM2FLPY.ADD

BASEDEV=IBM1FLPY.ADD

BASEDEV=IBM1S506.ADD

BASEDEV=IBM2ADSK.ADD

BASEDEV=IBM2SCSI.ADD

BASEDEV=OS2SCSI.DMD

BASEDEV=PRINT01.SYS

BASEDEV=PRINT02.SYS

APM.SYS and VAPM.SYS

EGA.SYS

EXTDISKDD.SYS

TOUCH.SYS

VXMS.SYS

BREAK=ON to OFF

FCBS=16,8 to 4,4

LIBPATH, PATH, and DPATH

Re-order the LIBPATH, PATH, and DPATH parameters. Directory names should be placed in the order of usage. The most accessed directory should be listed first and the least accessed listed last.

There are two other environmental variables that the system uses when an application is looking for a DLL (dynamic link library). They are:

SET BEGINLIBPATH=path

SET ENDLIBPATH=path

where path is the location of the DLLs. They are searched in the following order:

BEGINLIBPATH (environmental variable)

LIBPATH (CONFIG.SYS)

ENDLIBPATH (environmental variable)

SWAP file

Relocate the SWAP file to the root directory of the most used partition and set its initial size to a value slightly larger than it typically grows. This makes it large enough so that it does not have to grow in size while running applications. In systems using the FAT file system, this technique also minimizes fragmentation of the SWAP file on the hard drive. If more than one physical disk drive is present, relocate the SWAP file to the least-used drive and place it in the root directory of the most used partition.

Initial Swapper File Size. Change the third parameter (second number) to 20480 or 30920 so the swapper starts out at 20 or 30 MB. This is especially important on a FAT partition, since FAT has a tendency to fragment files that impact performance when the swapper file fragments. As a result, at startup, OS/2 will find a contiguous 20 MB area and reuse it each time. You can also use the following rule of thumb: initial swap file size = total physical memory size + 8 MB.

#### DOS=LOW,NOUMB

Ensure DOS=LOW,NOUMB. If a DOS application needs DOS to be loaded high or device drivers to be loaded in upper memory, they should be set from that applications settings notebook. Setting them in the CONFIG.SYS file forces them to be set for all DOS applications whether they need it or not.

#### BUFFERS

Set BUFFERS greater than or equal to 60 if using FAT, otherwise set to 30. Buffers are physical memory used to support partial sector reads and writes in a FAT file system environment. They are also used to cache FAT directory entries and for swap file disk I/O. Because they are used to cache FAT directory entries, they should not be reduced below 60, unless you are not using the FAT file system on any of your disks. Reducing this number will increase the number of disk reads that are done to the FAT directory entries and therefore slow down your system.

#### MAXWAIT

MAXWAIT=3. This statement specifies the number of seconds a task must wait before getting a priority boost. If your system is under a heavy load, a program may have to wait for execution time. Receiving a priority boost will put a program ahead of others that are also waiting for the processor. Decreasing this number will help programs get execution time faster, but the overall performance may suffer. Increasing this number will allow the OS/2 Scheduler to resolve requests for system time based on the true priority of the programs.

#### PRIORITY\_DISK\_IO

Set PRIORITY\_DISK\_IO=YES. This allows the application that has screen focus to receive a priority boost when its disk operation is complete. This applies to the first time slice given to the thread after the disk operation is complete. After the time slice, the state is reset for the thread and the priority boost removed.

#### TIMESLICE

TIMESLICE=X,Y. This statement is not found in the CONFIG.SYS file after you install OS/2 but is sometimes recommended to be added. This was all right to add for OS/2 2.0, 2.1 or 2.11 systems, but not for OS/2 Warp. In OS/2 Warp, we dynamically modify a threads time slice based on actions that have occurred. For instance, if a thread took a page fault during its time slice, we gave it an extra time slice to process what is contained in the faulted page. We also give applications doing disk I/O extra time slices if the data they are reading is in the diskcache. When the TIMESLICE= parameter is used, none of these actions will occur. Instead, each thread will be given the minimum time slice of X, and its time slice will not be allowed to go beyond value Y.



## RESTARTOBJECTS=STARTUPFOLDERONLY

Add SET RESTARTOBJECTS=STARTUPFOLDERONLY after the SET AUTOSTART statement. This eliminates numerous boot problems caused by misbehaved programs that won't close. Otherwise OS/2 starts them again. This action also decreases swapping when the system is first booted up.

## AUTOREFRESHFOLDERS

To reduce memory and CPU usage, change the SET AUTOREFRESHFOLDERS statement to NO. When SET AUTOREFRESHFOLDERS=NO, the system will not automatically update changes you make to the folders and objects in OS/2. For example, if you delete an object from a folder after you make this change, you will have to either close the folder and reopen it or select **View** and then **Refresh Now** from the pop-up menu to observe the changes you have made. This change is recommended for computers that are used as servers not as workstations.

## PM\_ASYNC\_FOCUS\_CHANGE=ON

SET PM\_ASYNC\_FOCUS\_CHANGE=ON in the CONFIG.SYS file to fix the single input queue problem. The OS/2 solution detects misbehaved applications that cause system hangs in what is often incorrectly attributed to OS/2 as the Single Input Queue (SIQ) problem. The fix is implemented at the system level as a separate OS/2 thread that monitors the status of the input queue. No modifications of applications are necessary.

## DISKCACHE

Optimize the DISKCACHE statement on systems using the FAT file system or REMark it out if the system does not use the FAT file system. Disk caching allows a certain amount of (RAM) memory to serve as a cache for disk I/O. A cache improves performance when a particular disk file is accessed frequently. Keeping it in memory will avoid real I/O and thereby improve I/O response time when accessing that file. In memory constrained systems, the recommendation is to decrease caching. This is not obvious but the rationale is that the benefit of using memory for disk caching is lower than the benefit of having the memory available for other processes when they are referenced. Experimenting with various DISKCACHE settings to achieve the best performance is the most effective way to determine the correct value.

### DISKCACHE Threshold

Optimize the DISKCACHE Threshold value. It is recommended that the threshold be set to 32 unless the software product you are using is disk-intensive and the manufacturer supplies information on the block size required. Otherwise, experiment with different threshold values and monitor the DISKCACHE utilization with (IBM System Performance Monitor/2) SPM/2 to achieve the most effective value.

## LAZYWRITE

Enable LAZYWRITE (LW) whenever possible. This allows disk writes to be temporarily held in memory to increase throughput. Without LW, disk writes are done immediately. LW will increase disk performance, but an unexpected power outage may cause data loss.

## HPFS CACHE

Optimize the HPFS CACHE setting on systems using the HPFS file system or REMark it out if the system does not use this file system. Optimize the CRECL value by experimenting with different threshold values while monitoring the HPFS cache utilization with SPM/2. This will ensure the optimum value is determined.

REMark the HPFS statement. This system does not use the HPFS file system. The HPFS code and data space requirement is 200 KB of memory plus the cache requirement (minimum cache size is 64 KB). Removing this statement will save at least 264 KB and as much as 2312 KB.

## THREADS

Set THREADS to a value 50% larger than the actual number of threads expected to be used. Threads consume resident memory so determining the optimum value for this parameter will affect the amount of memory that is available for applications to use. One page of resident memory is needed for approximately every 32 threads that are defined. As a minimum, you will need 80 threads to support the base OS/2 Warp system and three or four OS/2, DOS and or Windows applications. The system will support up to 64000 threads, but typically you will not have enough memory in your system to support more than 300 to 500 threads. 18 threads are required for LAN Server 4.0, and 12 for Personal Communications/3270. You will need an additional two threads for each Personal Communications/3270 session that is started. To calculate the number of threads that you will need in your system, use the formula  $54+(2 \times N)+10$  where N is the number of programs that you will run together. If the program requires more than two threads, add in the additional threads.

## VDISK

Remove any VDISK parameters. A VDISK is a virtual disk made in the computers physical memory to provide quick access to often-used files and programs. These systems don't have enough memory to support using a VDISK.

## PRIORITY=DYNAMIC

Ensure PRIORITY=DYNAMIC. This allows OS/2 to adjust thread priorities based on its display status (foreground or background), recent input and output activity, and frequency of processor use. DYNAMIC allows this calculation of priorities to support a system boost for foreground applications. This is the default. ABSOLUTE performs no calculation. There is no system-applied boost for foreground applications when this parameter is specified.

## COM and VCOM

REMark the COM and VCOM device driver statements. These statements load support for serial ports. These drivers should only be removed if there are no immediate intentions to use such devices in this system.

## CDROM and VCDROM

REMark the CDROM and VCDROM device driver statements. These statements load support for CD ROM devices. These drivers should only be removed if there are no immediate intentions to use such devices in this system.

## PCMCIA

REMark the PCMCIA device driver statements. This statement provides support for PCMCIA devices. This driver should only be removed if there are no immediate intentions to use such a device in this system.

### BASEDEV=IBM2FLPY.ADD

REMark the BASEDEV=IBM2FLPY.ADD device driver statement. This driver supports diskette drives on Micro Channel computers. This driver should only be removed if there are no immediate intentions to use such a device in this system.

### BASEDEV=IBM1FLPY.ADD

REMark the BASEDEV=IBM1FLPY.ADD device driver statement. This driver supports diskette drives on non-Micro Channel computers. This driver should only be removed if there are no immediate intentions to use such a device in this system.

### BASEDEV=IBM1S506.ADD

REMark the BASEDEV=IBM1S506.ADD device driver statement. This driver supports MFM, RLL, and IDE disk controllers. This driver should only be removed if there are no immediate intentions to use such a device in this system.

### BASEDEV=IBM2ADSK.ADD

REMark the BASEDEV=IBM2ADSK.ADD device driver statement. This driver supports BIOS-based disk devices. This driver should only be removed if there are no immediate intentions to use such a device in this system.

### BASEDEV=IBM2SCSI.ADD

REMark the BASEDEV=IBM2SCSI.ADD device driver statement. This driver supports SCSI controllers on Micro Channel computers. This driver should only be removed if there are no immediate intentions to use such a device in this system.

### BASEDEV=OS2SCSI.DMD

REMark the BASEDEV=OS2SCSI.DMD device driver statement. This is the SCSI device driver manager. This driver should only be removed if there are no immediate intentions to use such a device in this system.

### BASEDEV=PRINT01.SYS

REMark the BASEDEV=PRINT01.SYS statement. This statement supports printer ports on non-Micro Channel computers.

### BASEDEV=PRINT02.SYS

REMark the BASEDEV=PRINT02.SYS statement. This statement supports printer ports on Micro Channel computers.

### BASEDEV=IBM1S506.ADD

Your system uses the IBMINT13.I13 driver, which causes your system performance to suffer. RMVIEW /IRQ shows one of the IRQ levels being controlled by IBT13BIOS Int 13 BIOS support. If you have an IDE hard drive, make sure the statement BASEDEV=IBM1S506.ADD is in the CONFIG.SYS. Adding it should change the IRQ owner to ST506 / IDE Controller. If it does not, you may need a third-party device driver to get a performance improvement.

#### APM.SYS and VAPM.SYS

REMark the APM.SYS and VAPM.SYS statement. This statement supports Advanced Power Management (APM) but your computer doesn't use this feature.

#### EGA.SYS

REMark the EGA.SYS statement. This statement loads support for DOS applications that use EGA display registers. You only need this driver if you use DOS graphics programs that expect EGA compatibility.

#### EXTDISKDD.SYS

REMark the EXTDISKDD.SYS statement. This statement allows access to external floppy disks using a logical drive letter. This driver should only be removed if there are no immediate intentions to use such a device in this system.

#### TOUCH.SYS

REMark the TOUCH.SYS statement. This statement loads a device driver that provides support for touch screen displays.

#### VEMM.SYS

Change the DEVICE=\OS2\MDOS\VEMM.SYS statement to VEMM.SYS 0. This statement loads a driver that provides Expanded Memory Support (EMS) for DOS sessions. Adding a 0 variable causes OS/2 to not allocate EMS to a DOS session unless you override the setting in that session's DOS Settings. Most programs do not require EMS, so disabling EMS by default will save RAM.

#### VXMS.SYS

Change the DEVICE=\OS2\MDOS\VXMS.SYS statement to DEVICE =\OS2\MDOS\VXMS.SYS /XMMLIMIT=4096,0 /UMB. This will allocate a maximum of 4 MB of SMS for the entire system, but it will not give any XMS memory to a DOS session unless you override the setting in an individual sessions's DOS Settings. DOS sessions won't get XMS by default, which will save memory (since most DOS programs can run without XMS). If you replace /UMB with /NOUMB, no DOS session will be able to use upper memory blocks. If you want DOS=HIGH to be the default, use /XMMLIMIT=4096,64 /UMB instead. Each session will need at least 64 KB of XMS.

#### BREAK=ON to OFF

Change BREAK=ON to OFF. This statement instructs DOS sessions to check for Ctrl+Break key presses. If set to ON, Control-Break checking is more frequent, but DOS programs may run slower.

FCBS=16,8 to 4,4

Change FCBS=16,8 to 4,4. This statement allows you to allocate File Control Blocks (FCBs) for DOS sessions. Most new DOS programs do not use FCBs so these values can be lowered to save RAM.



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## Chapter 8. Using IBM NetFinity 5.0 with OS/2 Warp Server

This chapter provides an overview of the IBM NetFinity 5.0 product. It also shows how to install and configure IBM NetFinity 5.0 on the OS/2 Warp Server platform (including hardware and software requirements). Additionally we introduce you to some of the tools within IBM NetFinity 5.0 that will assist you in monitoring and managing your IBM PC Server.

IBM NetFinity 5.0 also includes the ability to monitor and manage your IBM NetFinity 5.0 environment with a Web browser. This can be referred to IBM NetFinity 5.0's Webability. Although we do not demonstrate this in this chapter, we provide you with a method to customize the Webability of IBM NetFinity 5.0 using the Hyper Text Markup Language (HTML).

If you plan to use IBM NetFinity 5.0 you should obtain *NetFinity V5.0 Command Line and LMU Support*, SG24-4925. This redbook is the reference of choice for IBM NetFinity 5.0. It covers installation, usage, and new functionality of IBM NetFinity 5.0. For a review of the functions already implemented in TME 10 NetFinity 4.0, please see the following redbooks:

- *LAN Management Processes (Alerts/Monitoring) Using NetFinity*, SG24-4517
- *Systems Management from an NT Server Point of View*, SG24-4723
- *NetFinity V5.0 Database Support*, SG24-4808

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### 8.1 What Is IBM NetFinity 5.0?

IBM NetFinity 5.0 is a set of applications used for systems management and monitoring capabilities. Due to its product structure, it is very flexible and allows updating of existing product components and new features without having to re-install the product.

IBM NetFinity 5.0 enables you to monitor and manage systems locally and remotely without any interruptions to your users. It helps keep you informed about actual problems within your network as well as helping you to fix them. It is also very flexible when it comes to connecting to its clients.

From a functional perspective, the transport protocol used for connectivity does not determine which services are available. When connecting to its clients, it uses just the network device drivers, which makes it very convenient if you want to change the network adapters. If you change transport protocols, you don't have to make any changes within IBM NetFinity 5.0, just the operating system device drivers.

IBM NetFinity 5.0 is designed to help solve problems for your clients whether their workstations are notebooks, desktops, or servers, as long as the workstations are systems that are running under an operating system supported by IBM NetFinity 5.0.

IBM NetFinity 5.0 is part of the TME 10 product family, which also means that it will cooperate with all the other systems management products on the MVS, AIX and OS/400 platforms, as well as with other TME 10 products.

### World Wide Web

For an overview of the TME 10 product family, go to the following URL:

[http://www.tivoli.com/sol\\_pres/TME10\\_Overview.html](http://www.tivoli.com/sol_pres/TME10_Overview.html)

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## 8.2 Connectivity Options

There are different ways to connect your IBM NetFinity 5.0 manager to your workstations. Several operating systems and communication protocols are supported as well.

- LAN Connection

You can use any hardware connection to your clients and servers as long as you provide a supported network device driver. This may be a connection on a LAN such as a token-ring or Ethernet or a WAN connection using LAN distance or bridges and routers, depending on the protocols that are used.

- Serial Connection

You also may use a modem connection for your access. Here you can dial in from one IBM NetFinity 5.0 manager to another and thereby interconnect otherwise separate networks.

- Internet/Intranet

Another way to connect to your remote workstations is to use the Internet or your company's intranet. IBM NetFinity 5.0 provides an easy-to-use interface to manage remote clients over the WWW using any Java-enabled Web browser.

For more information about IBM NetFinity 5.0 you can also read *NetFinity V5.0 Command Line and LMU Support*, SG24-4925.

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## 8.3 Installing IBM NetFinity 5.0

In this section, we describe how to install IBM NetFinity 5.0 under OS/2 Warp Server as a manager and as a client.

There are two components of IBM NetFinity 5.0, Manager and Services:

1. On each server and workstation where you plan to manage your network, you should install IBM NetFinity 5.0 Manager.
2. On every other workstation or server that you need to manage but don't plan to do the managing from, you should install IBM NetFinity 5.0 Services.

For server installation, you can install the code directly from CD-ROM using ServerGuide 3.1's CoPilot (see 4.4.1, "CoPilot" on page 72) or you may use the CD-ROM to do a manual installation. Additionally, you may use ServerGuide 3.1's Diskette Factory to build diskettes and perform the installation with diskettes.

**Note:** Ensure you do not violate the licensing conditions of IBM NetFinity 5.0 by installing it on more than one machine.



### 8.3.1 Installing IBM NetFinity 5.0 Services

To install IBM NetFinity on a workstation or server that requires managing or will manage other stations, perform the following steps:

1. Insert the ServerGuide CoPilot CD-ROM.
2. Go to an OS/2 command prompt and type:

```
X:\NETFIN\YY\SERVICES\INSTALL
```

where X is your CD-ROM drive and YY is the language you wish to use. See the following definition list for language choices available and their abbreviations.

<b>DE</b>	German
<b>EN</b>	English
<b>ES</b>	Spanish
<b>FR</b>	French
<b>IT</b>	Italian

This results in execution of the installation program for IBM NetFinity 5.0.

3. A window will pop up indicating a default drive and directory where you will install the code. You can override the defaults by typing in a new location (see Figure 224). The installation can be from a diskette, CD or a LAN drive. The same applies to the target drive. You should also define the subdirectory where the code will be installed.
4. After you have defined the source and target drives, define the type of IBM NetFinity 5.0 client you want to install. There are different types of clients that can be installed.

Figure 225 on page 222 shows the installation options.

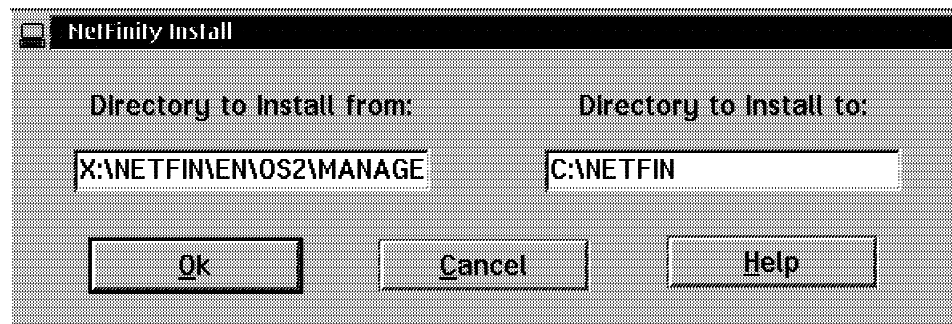


Figure 224. NetFinity Install Window

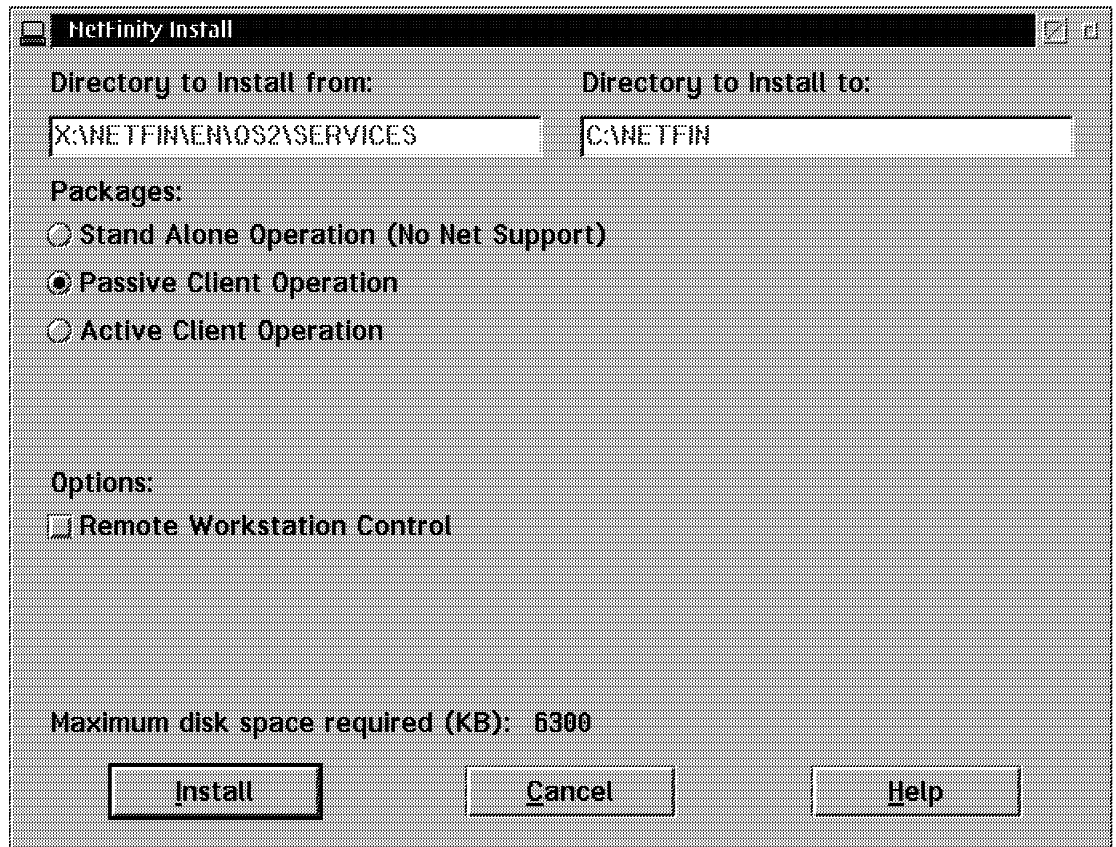


Figure 225. NetFinity Install Window

5. The following are the different types of clients that you can install. Figure 225 shows the available client types.

- Stand-alone client

The stand-alone client can only perform IBM NetFinity 5.0 functions locally and has no network interface support installed. This means that the network administrator has no access to this workstation over the LAN using IBM NetFinity 5.0.

- Passive client

The passive client can not perform most of the IBM NetFinity 5.0 functions locally. Only the IBM NetFinity 5.0 services for the alert, security manager and for the serial control are available. For the other services, it can only respond and react to requests from an IBM NetFinity 5.0 manager.

- Active client

The active client can perform all IBM NetFinity 5.0 services locally. It also can react to requests from an IBM NetFinity 5.0 manager over the LAN.

If you are installing IBM NetFinity 5.0 services on your server, you would normally install the active client code. This will allow you to perform NetFinity functions on the server directly. You may choose to install IBM NetFinity 5.0 Manager instead.

**Note on Server**

We recommend that management functions be performed on a dedicated workstation and not on the server itself. For this reason, you will not need to install the manager on your server.

6. You will see a window that shows you the actual status of the installation in progress (see Figure 226). If you are installing from diskette, you will be prompted to insert the additional diskettes.
7. If you are installing either an active or passive client, you are prompted to configure the IBM NetFinity 5.0 client. This process is described in detail in 8.4, "Network Driver Configuration" on page 226.

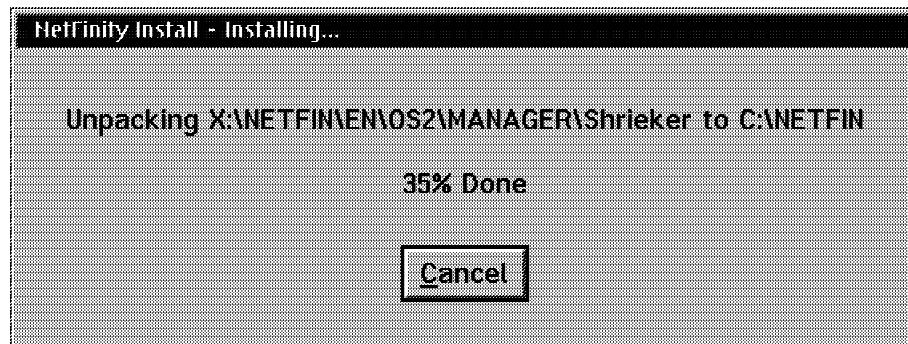


Figure 226. NetFinity Install - Installing... Window

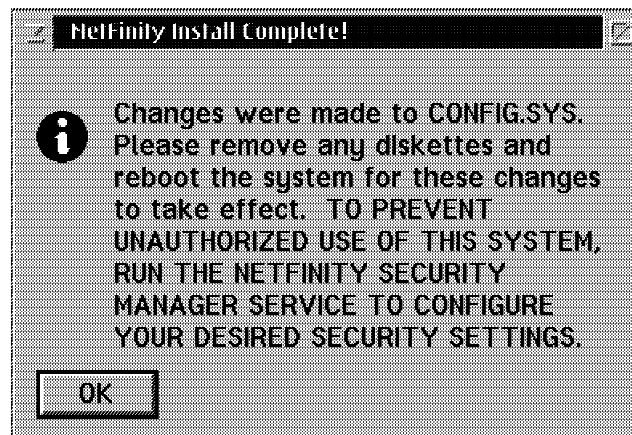


Figure 227. NetFinity Install Complete! Window

Figure 227 shows the end of the installation process. In this dialog box you are reminded to run the security manager in order to prevent unauthorized users from gaining access to your server.

8. Reboot the server. Failure to do so may cause unpredictable results.

### 8.3.2 Installing IBM NetFinity 5.0 Manager

You would normally install either the active client or the manager code on your server. We recommend installing the active client on the server (as performed in 8.3.1, "Installing IBM NetFinity 5.0 Services" on page 221) and using a dedicated OS/2 Warp workstation for performing management functions. To install the IBM NetFinity 5.0 Manager code on your workstation, use ServerGuide 3.1's CoPilot to install the code from CD-ROM. See 4.4.1, "CoPilot" on page 72 for more information.

Alternatively, build the diskettes from ServerGuide 3.1's Diskette Factory, then run NETFINST from this first diskette. See 4.4, "ServerGuide Main Menu" on page 71 for more information about Diskette Factory.

The installation of the IBM NetFinity 5.0 Manager is similar to the services installation, except that instead of being asked for the type of client, you are asked whether you want to use your manager with or without Web Enhancement support and whether or not you want Remote Workstation Control enabled (refer to Figure 228).

The Web Enhancement function enables you to access your IBM NetFinity 5.0 Manager from any Web browser. Remote Workstation Control allows you graphical control of workstations from your IBM NetFinity 5.0 Manager.

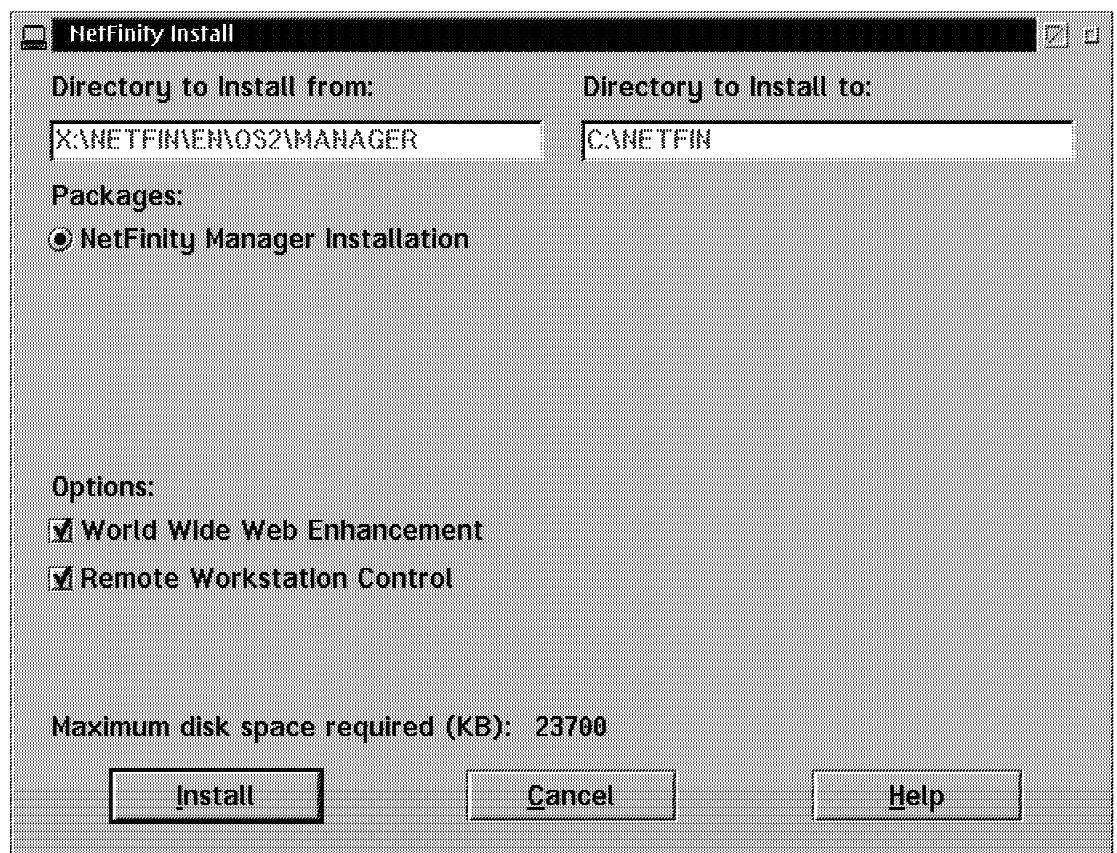


Figure 228. NetFinity Install Window

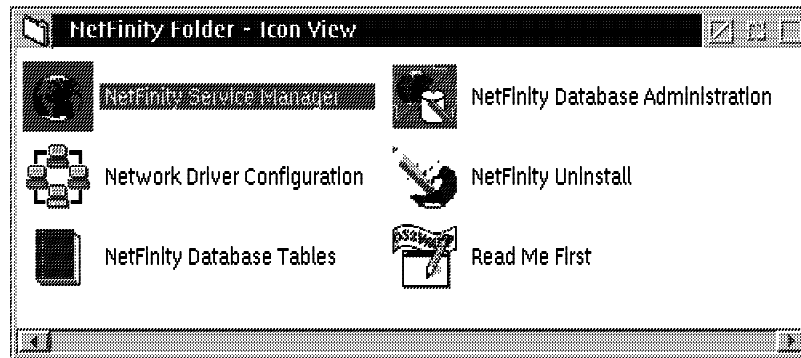


Figure 229. NetFinity Folder - Icon View

The IBM NetFinity 5.0 folder for managers, as seen in Figure 229, includes the following services:

- NetFinity Service Manager

The IBM NetFinity 5.0 Manager gives you the management functions provided by IBM NetFinity 5.0. When started, it provides the graphical user interface for the IBM NetFinity 5.0 services. The detailed description of the functions can be found in Chapter 2 of *System Management from an NT Server Point of View*, SG24-4723-00.

- Network Driver Configuration

It is important to be careful with the configuration done in the network driver configuration because it is used to define the possible connections for the IBM NetFinity 5.0 workstations. See 8.4, “Network Driver Configuration” on page 226 for more information.

- NetFinity Database Tables

If you select this function, you will get detailed information on how the database tables created by IBM NetFinity 5.0 are structured. This might be very useful if you create your own databases and want to include the IBM NetFinity 5.0 information in that database. More details about the databases and their structure can be found in Chapter 5 of *System Management from an NT Server Point of View*, SG24-4723-00.

- NetFinity Database Administration

The administration functions are used to define the kind of database being used. You may select IBM DB2 using ODBC or Microsoft SQL Server using ODBC.

- NetFinity Uninstall

If you select this option, you will be guided through the uninstall process.

- Read Me First

This is a typical README file that provides some hints and tips as well as some general information on IBM NetFinity 5.0.

## 8.4 Network Driver Configuration

In this section, we describe how the network configuration of IBM NetFinity 5.0 Services and Manager is done and also explain the contents of the fields that are in Figure 230.

**Note:** This does not apply to the stand-alone client.

The main configuration menu within the IBM NetFinity 5.0 configuration is the Network Driver Configuration window, which is shown in Figure 230.

The network configuration menu will automatically show up at the end of the installation process, so you are able to check and correct your network support definitions for IBM NetFinity 5.0. You can also change them later by opening your IBM NetFinity 5.0 folder and clicking on Network Driver Configuration.

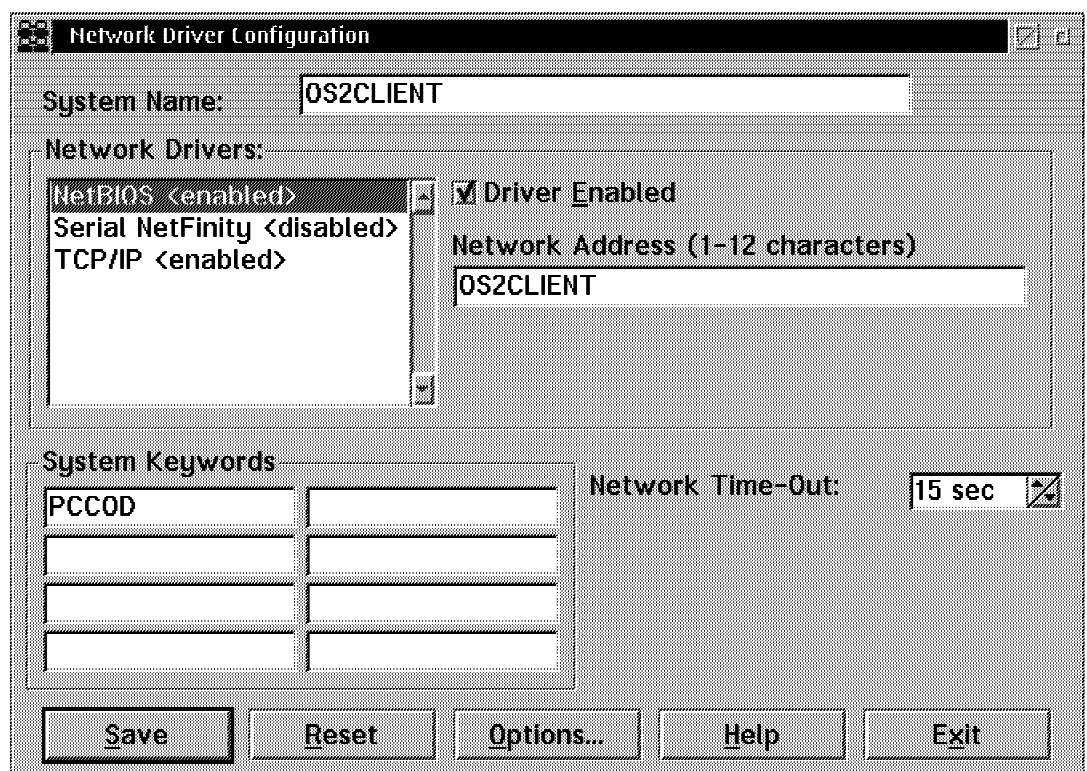


Figure 230. Network Driver Configuration Window

The main purpose of the network driver configuration is to define the connections to and from other workstations using IBM NetFinity 5.0. The following are the definition fields within this menu and their meanings:

- System Name  
The System Name field can be any combination of alphanumeric characters including blanks. It shows the name of the workstation. This name can be seen later in the management process when monitoring the client groups. It is used to easily identify your workstations.
- Network Drivers  
The Network Drivers field automatically shows you all the installed network device drivers such as NetBIOS, IPX, TCP/IP and serial support. In parentheses you can find the status of this driver, which means whether or

not this driver has been activated for IBM NetFinity 5.0 usage. You can easily activate or deactivate any of the drivers by selecting it with the mouse and marking the check box Driver Enabled. If IBM NetFinity 5.0 is already running, you will need to restart it to add the additional protocols.

In Figure 230 on page 226, you can see that the NetBIOS and TCP/IP drivers are enabled, which means they can be used by IBM NetFinity 5.0. In this example, we selected the NetBIOS driver (highlighted) and marked the Driver Enabled check box. The Network Address field shown in this figure shows some additional required information depending on the device driver. For NetBIOS, this will default to the NetBIOS name that is currently in use on the workstation or server.

We also selected the TCP/IP driver and marked its check box enabled. Note that no additional configuration is needed for TCP/IP. All configuration is obtained from OS/2's TCP/IP configuration.

- System Keywords

The system keywords are not required for IBM NetFinity 5.0, but it makes life easier for the network administrators. They are used to identify and group the workstations and servers within the network. The keywords are used within a network environment to identify and define groups among the workstations.

**Case-Sensitive**

Note that the keywords you supply are *case-sensitive*. Unless you need to do otherwise, we recommend you use either all caps or all lowercase when choosing your system keywords.

- Network Time-Outs

This defines the timeout interval before you get an error message when you try to use one of the remote functions of IBM NetFinity 5.0.

If you click on the **Options...** button, the NetFinity Options window appears (Figure 231).

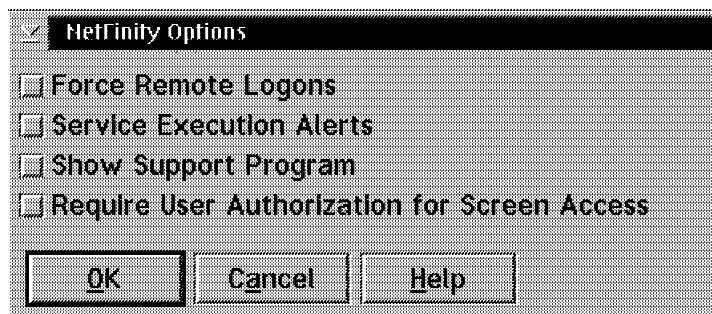


Figure 231. NetFinity Options Window

The options here are:

- Force Remote Logons

If you are accessing remote workstations, such as an IBM NetFinity 5.0 Manager, you can choose to save a user ID and a password for the different workstations. The next time you access the same workstation, IBM NetFinity 5.0 will automatically provide the same user ID and password that was specified on your first connection.

This might be risky, because if somebody else gets access to your managing workstation, they can access your clients without providing a user ID and password.

If you enable the Force Remote Logons option, your system will not be able to save the user ID/password combinations that you use when accessing remote systems. This will force you to manually log on to any remote system that you want to access each time you access that system.

- Service Execution Alerts

With this selected, whenever an IBM NetFinity 5.0 manager accesses your workstation, IBM NetFinity 5.0 will send an alert. This is true for every access of the IBM NetFinity 5.0 services. An alert will be created with the information about who is using one of the IBM NetFinity 5.0 services on your workstation. You can then decide what you want to do about it. This can be done using an EXEC to take some specific action by using the alert editor, or by something as simple as providing a pop-up window.

- Show Support Program

If you enable the Show Support Program option, the NetFinity Network Interface will be visible as a minimized icon at the bottom of the display (Windows 3.1, Windows for Workgroups, or Windows NT only) or as a minimized process in the Windows 95 task bar. This enables the user to shut down the NetFinity Network Interface. If you want the NetFinity Network Interface to remain invisible to the user, do not enable this option. This option is applicable only on systems that are running Windows 3.1, Windows for Workgroups, Windows 95, or Windows NT.

- Require User Authentication for Screen Access

If you enable the Require User Authorization for Screen Access option, a message will be displayed requesting approval when a remote user attempts to access the Screen View or Remote Workstation Control services on your system.

---

## 8.5 Installation Hints and Tips

We did not experience any problems during the installation and configuration of this product. However, the following hints might be of interest to you:

1. After you have installed IBM NetFinity 5.0, make sure you reboot your server before starting it. Not doing so may produce unpredictable results.
2. Make sure that the network drivers have been installed before installing IBM NetFinity 5.0; otherwise, you will not be able to define the appropriate network connection during the installation process and you will have to do it later.
3. Set the option Force Remote Logon in the Driver Configuration Options menu. This will ensure that only authorized people can access other workstations.
4. Make sure that you do not leave the PUBLIC user ID with access to any services that you want to restrict (see Figure 232 on page 229). Typically, people disable the PUBLIC ID after they have added other IDs. You will find a detailed description on how to do this in Chapter 2 of *Systems Management from an NT Server Point of View*, SG24-4723.



### New Feature

The Service Configuration Manager in IBM NetFinity 5.0 now allows mass administration of configuration files for the Security manager as well as numerous other services. For more information please refer to Chapter 3 of *NetFinity V5.0 Command Line and LMU Support*, SG24-4925.

5. It might also be useful to define Show Execution Alerts within the Network Driver Configuration Options menu. This enables your users to monitor the network administrator actions when accessing the user's workstation. The information from these actions may also be logged in the alert log. If any problem occurs later, then there is a chance that you can tell who accessed the workstation, what services they tried to use and what the problem might be.

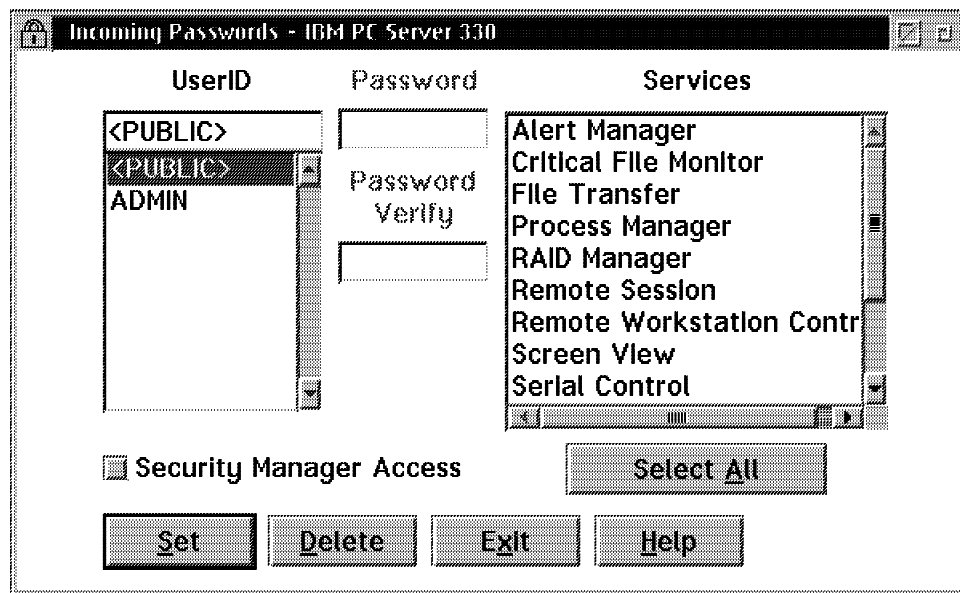


Figure 232. Incoming Passwords - IBM PC Server 330 Window

## 8.6 Using NetFinity Service Manager

For the purposes of this demonstration, we have created a group named Lab, which contains the clients discussed in Chapter 6, "Connecting to an OS/2 Warp Server" on page 123.

We start the NetFinity Service Manager and select **Remote System Manager**. The Lab group can be seen in Figure 233 on page 230.

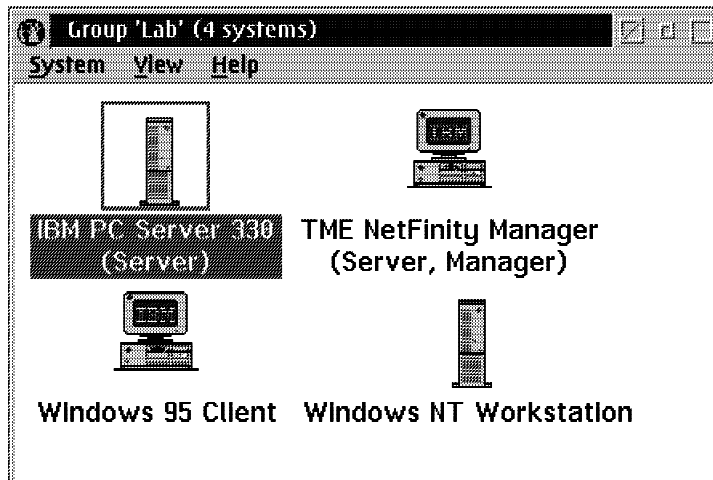


Figure 233. IBM NetFinity 5.0 Group Window

The IBM PC Server 330 icon is opened and the NetFinity Service Manager window is displayed (see Figure 234).

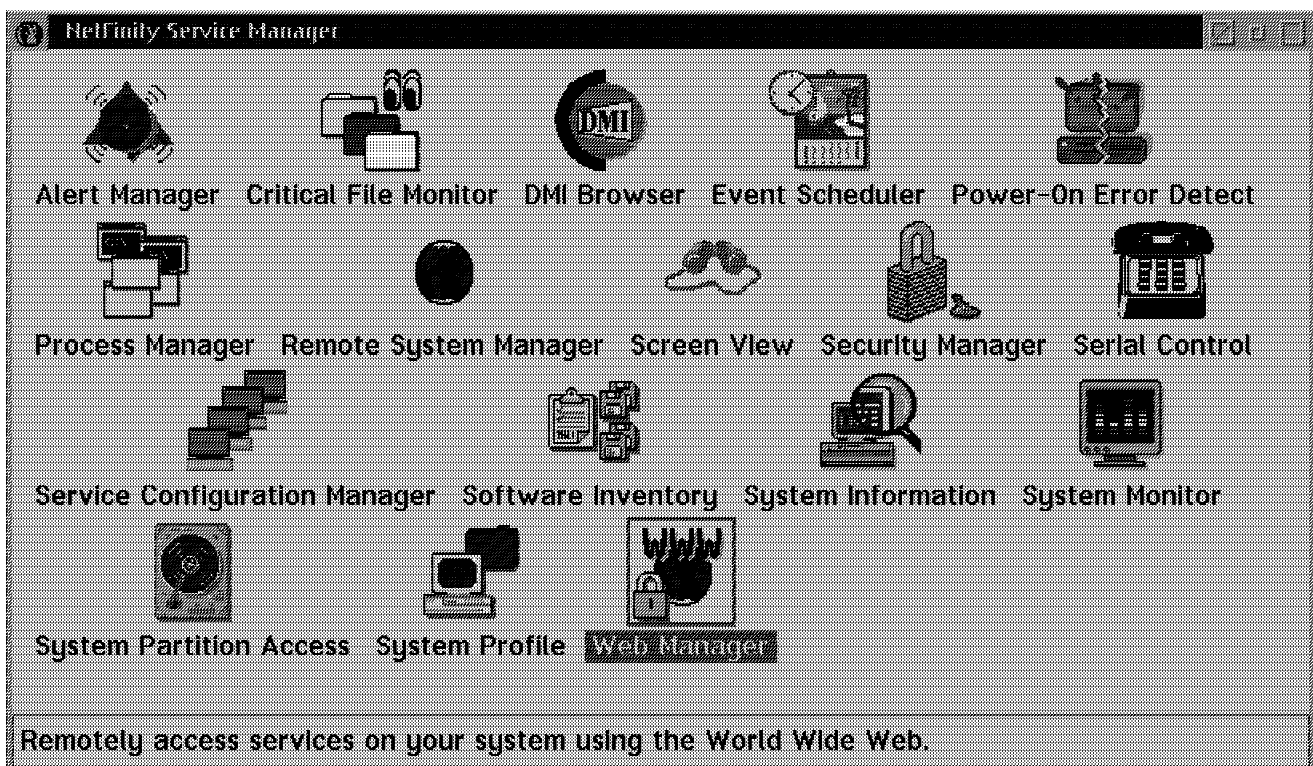


Figure 234. NetFinity Service Manager - IBM PC Server 330

The icons in the NetFinity Service Manager provide access to the following functions:

- Alert Manager - Allows you to set up monitors to alert you or another system of a predefined event or threshold. Alerts can be actioned or forwarded to others via a number of methods.

**Note:** For a detailed discussion of the Alert manager, please refer to *LAN Management Processes (Alerts/Monitoring) Using NetFinity*, SG24-4517.

- Critical File Monitor - Monitors specific files on your server and alerts you when they have been modified.
- File Transfer - Allows you to send, receive, and remove files.
- Process Manager - Allows you to examine, start and terminate processes on your server.
- RAID Manager - Allows you to maintain your RAID subsystem.
- Remote Session - Opens an OS/2 Window on your server. Note that you need to be using a Java-enabled Web browser for this function.
- Remote Workstation Control - Gives you graphical control of the server. You control the keyboard and mouse of the remote server.
- Screen View - Shows a snapshot of your screen (useful from another system).
- Security Manager - Lets you set who can access your system and what functions they can perform.
- Serial Control - Configures the ability to dial into and out of this system.
- Software Inventory - Shows what software you have installed on your system (useful when collecting this data from many machines in your network).
- System Information - Shows the hardware and software configuration of your system.
- System Monitor - Allows you to monitor the performance of your system.
- System Partition Access - Allows for greatly simplified system partition file handling on PS/2 computers, both locally and remotely.
- System Profile - Lets you enter information about this system to enable network and user records to be maintained.

Figure 235 on page 232 shows the System Monitor Service. This service can be customized to show any of number of available real-time statistics from your server. Both graphical, textual, and historical representations can be used in System Monitor Service windows. Thresholds can be set to generate alerts and trigger events (see Figure 236 on page 233). For more information on using alerts and events, please refer to *LAN Management Processes (Alerts/Monitoring) Using NetFinity*, SG24-4517.

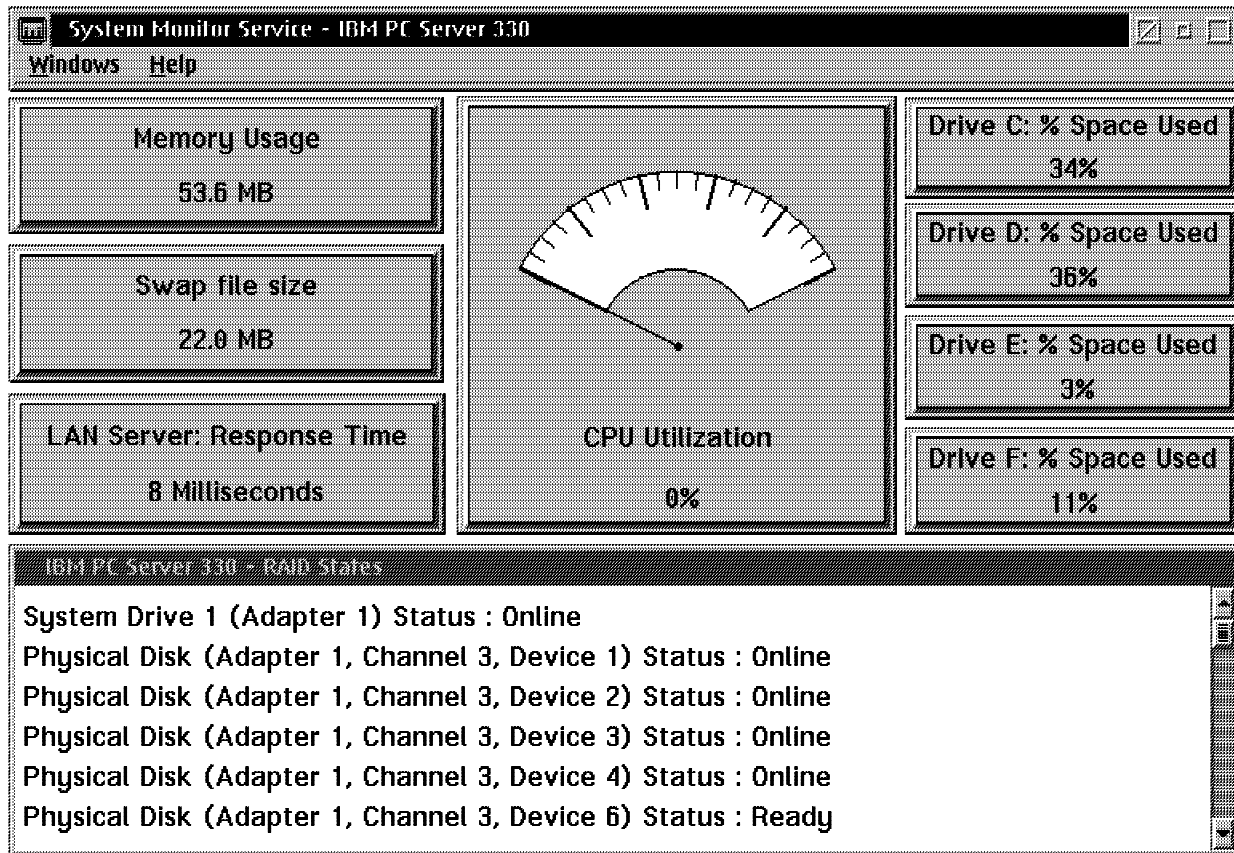


Figure 235. System Monitor Service - IBM PC Server 330 Window

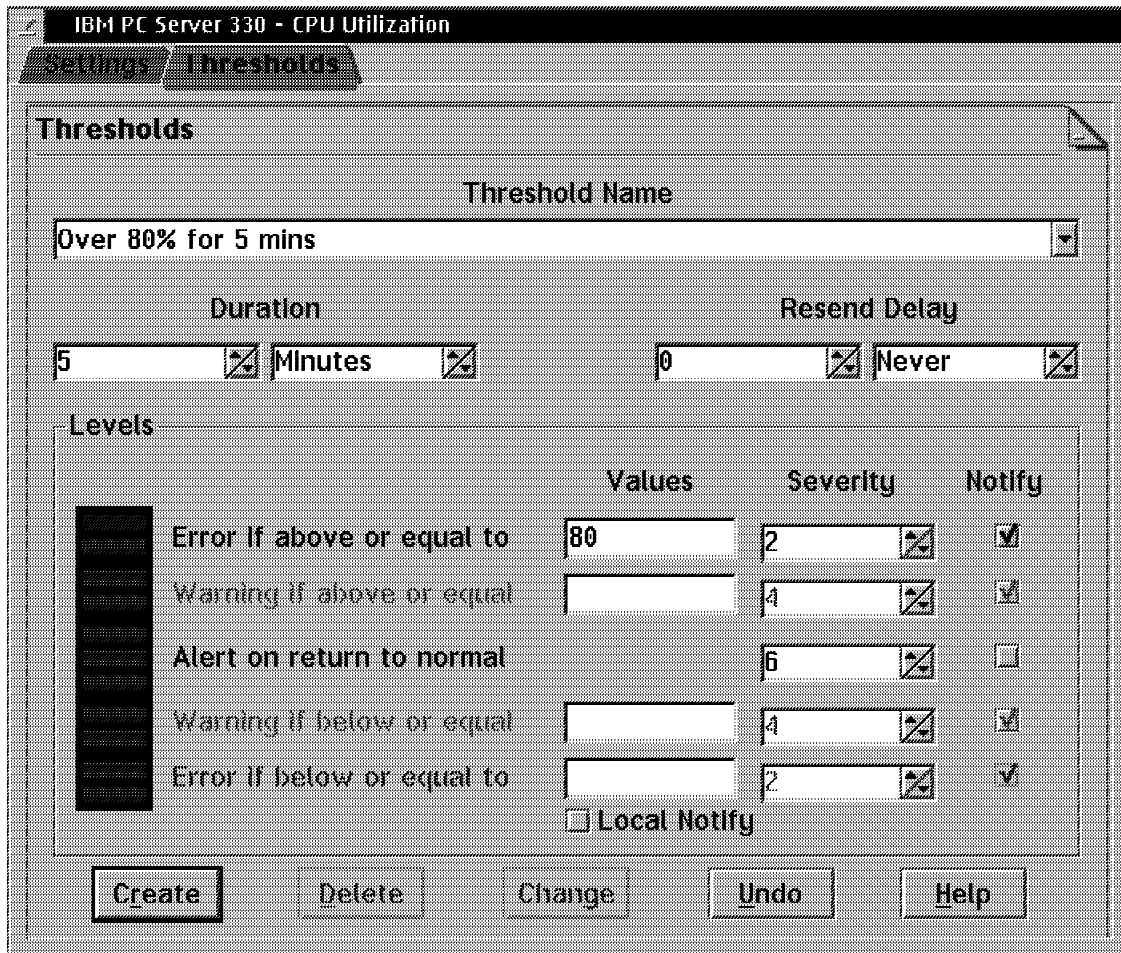


Figure 236. IBM PC Server 330 - CPU Utilization Window

By utilizing the Event Scheduler in your NetFinity Service Manager, you can schedule System Monitor Events on groups of servers (or workstations), gather the data, and export it to Lotus Notes or ODBC database. This information can then be used for capacity planning, resource monitoring, network utilization, and other models.

The NetFinity Process manager is seen in Figure 237 on page 234. This function is used to monitor and administer system processes on IBM PC Server. As in the System Monitor, you can also monitor specific processes and take action based on their state. For example, a process that should always be running can be monitored and restarted in the case of a failure.

Process	System	Help	
Program Name	Process ID	Parent Process ID	Session ID
D:\IBMCOM\LANMSGEX.EXE	0006h	0000h	0000h
D:\IBMCOM\PROTOCOL\LANDLL.EXE	0015h	0000h	0000h
D:\IBMCOM\PROTOCOL\NBTCP.EXE	0014h	0000h	0000h
D:\IBMLAN\NETPROG\LSDAEMON.EXE	0016h	0000h	0000h
D:\IBMLAN\NETPROG\NETGUI.EXE	00B6h	001Bh	0019h
D:\IBMLAN\NETPROG\NETMSG.EXE	0028h	001Bh	0013h
D:\IBMLAN\NETPROG\IRNS1.EXE	003Ah	0000h	0011h
D:\IBMLAN\SERVICES\BROWSER.EXE	003Bh	0000h	0011h
D:\IBMLAN\SERVICES\MSRV.EXE	0033h	0000h	0011h
D:\IBMLAN\SERVICES\NETLOGON.EXE	0038h	0000h	0011h
D:\IBMLAN\SERVICES\NETSERVR.EXE	0036h	0000h	0011h
D:\IBMLAN\SERVICES\NETSERVR.EXE	0037h	0000h	0011h

Figure 237. NetFinity Process Manager - IBM PC Server 330 Window

File Transfer, as seen in Figure 238 on page 235 gives you the means to copy and move files and directories both to and from your IBM PC Server. You can synchronize directories, delete files, and show detailed file information about remote and local files. This function is also available from the Event Scheduler, and allows you to schedule remote file transfers to systems or groups of systems.

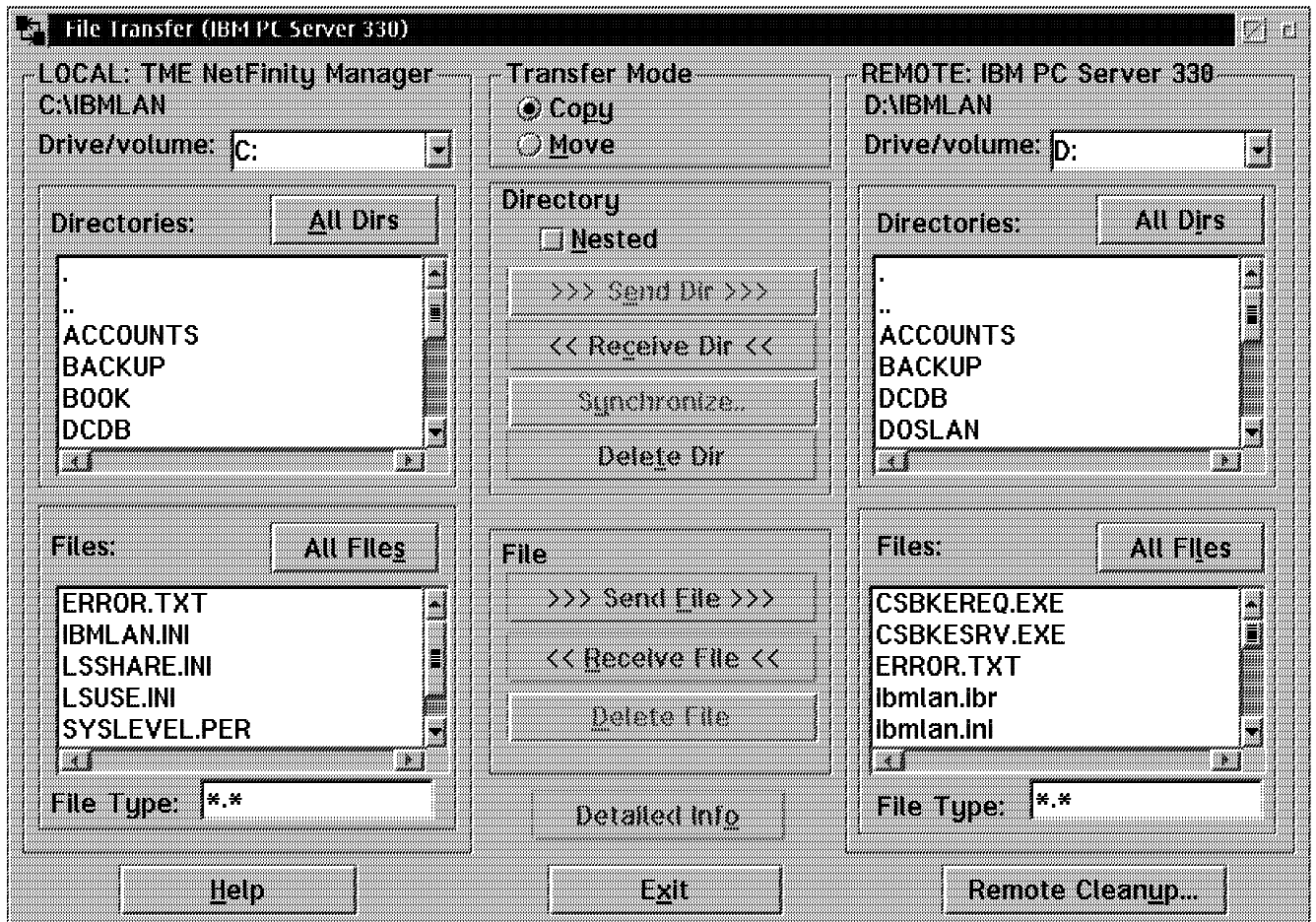


Figure 238. File Transfer (IBM PC Server 330) Window

The System Information Tool gives you a representation of the hardware installed in your IBM PC Server as well as Operating System Information. Detailed information about adapters, installed options, system BIOS, memory, DASD, and other hardware can be obtained and exported to a database using the Event Scheduler with this service. This can be instrumental in tracking assets as well as system changes over time. The System information Tool is pictured in Figure 239 on page 236.

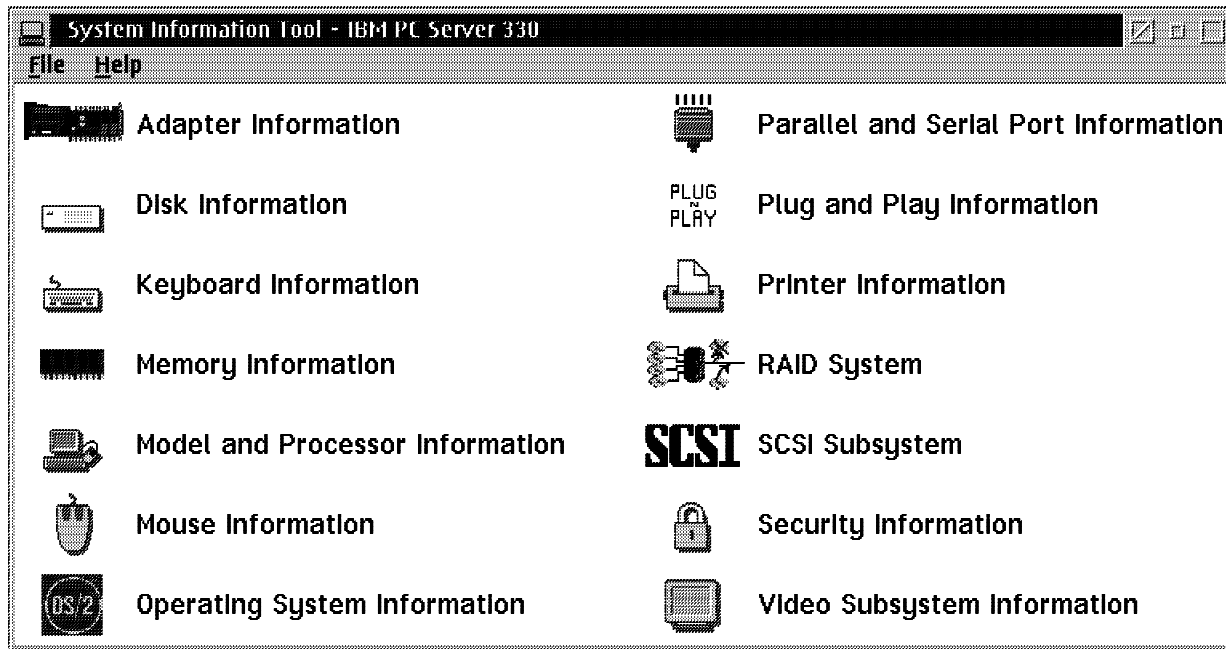


Figure 239. System Information Tool - IBM PC Server 330 Window

## 8.7 HTML Coding Tip for IBM NetFinity 5.0

The Web Enhancements to IBM NetFinity 5.0 allow you to use a Java-enabled Web browser and utilize most of the functions in the NetFinity Service Manager. We have found that using the standard Web browser can get somewhat cumbersome, especially when using only a small portion of the browser's window real estate to display information. You can very simply write HTML code and integrate it into existing Web pages to make opening NetFinity very much like an application window.

The code example in Figure 240 on page 237 is very simple and will create a button on the page it is inserted on and open an IBM NetFinity 5.0 window for the specified managing workstation with none of the standard browser widgets. You will be able to specify its size, and restrict the browser widgets to your liking.

Generating complex HTML is beyond the scope of this document. You should refer to specific HTML references for syntax and instruction on HTML.

### World Wide Web

Many HTML references are available, but a good place to start is the following URL:

[http://home.netscape.com/assist/net\\_sites/](http://home.netscape.com/assist/net_sites/)

We refer to the following HTML code:



```

<FORM>
<INPUT TYPE="BUTTON" NAME="Button1" VALUE="TME 10 NetFinity"
  OnClick="window.open('http://wtr05145:411/main', 'newWin', \
    'scrollbars=yes,toolbar=no,location=no,\
    status=no,menubar=no,directories=no,\
    width=474,height=643')"
>
</FORM>

```

1  
2  
3  
3  
4

Figure 240. HTML Code Example

**Notes:**

- 1. The VALUE parameter is what will be displayed in the button. Set this value to the text that you want to appear on the button.
- 2. In this example, wtr05145:411 is used for the hostname of the IBM NetFinity 5.0 Manager. This is sure to be different in your environment. Set this value to the hostname of your IBM NetFinity 5.0 Manager. Simply entering hostname in an OS/2 Window will supply you with this value.
- 3. The various parameters in these lines determine which widgets are displayed in the browser window. The values we used will give you a nice window with no controls on it. Note that the default pop up menu is still available. These values can be changed to suit your preferences.
- 4. The values on this line are used to set the browser window size. The size values are in pixels. You can adjust the height and width to suit your preferences.

If you used the HTML code example in Figure 240, the results would resemble the button on the Web page seen in Figure 241.

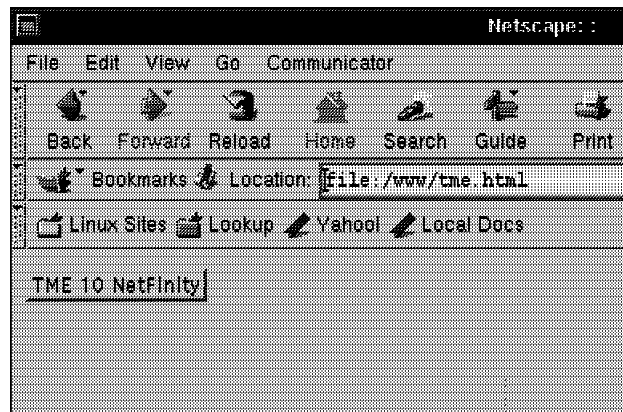


Figure 241. Web Page Example

Figure 242 on page 238 shows the browser window created by selecting the TME 10 NetFinity button in Figure 241.



Figure 242. NetFinity Services Manager Web Page

## 8.8 Summary

In this chapter you were shown how to install both IBM NetFinity 5.0 Services and Manager. You were given a brief description of the services available and examples shown. IBM NetFinity 5.0 is well suited for IBM PC Server management and is an integral piece in the overall Tivoli TME 10 management scheme.

To fully exploit IBM NetFinity 5.0 please refer to the books cited in Chapter 8, "Using IBM NetFinity 5.0 with OS/2 Warp Server" on page 219.

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## Appendix A. Adding a New Hard Drive to an Existing RAID Array

In this appendix, we discuss how to add a new hard drive in an existing RAID 5 Array at an OS/2 Server environment. We provide two examples using an earlier RAID adapter such as the IBM Streaming RAID Adapter and the latest IBM PC ServeRAID Adapter.

---

### A.1 Increasing the RAID Array with an IBM Streaming RAID Adapter

In this section, we describe a procedure to expand a RAID 5 Array at an OS/2 Server. We assume the server has a local tape drive to backup the data.

#### 1. Preparations

- a. Prepare OS/2 boot diskettes for accessing 386HPFS drives and the tape drive to restore your data. This step also depends on the software you use to back up your data. Use the *Disaster Recovery Guide* when you run the Backup and Recovery Services of OS/2 Warp Server or use Sytos Rebound if you work with Sytos Plus or Sytos Premium from Seagate Inc.. Remember to copy the IBMRAID.ADD driver to diskette 1 and add the BASEDEV=IBMRAID.ADD statement to the CONFIG.SYS.

#### Note

For more information about the Backup and Recovery Services and how to create disaster recovery diskettes see the redbook *Inside OS/2 Warp Server, Volume 2: System Management, Backup/Recovery and Advanced Print Service* (SG24-4702-00).

- b. Test the created boot diskettes for access to the tape and to the hard drives.
  - c. Prepare a tool diskette that contains the following files: fdisk.com, format.com, uhpfs.dll, nls.dll, chkdsk.com and tedit.exe to configure and format the new created array.
  - d. Write down your current hard drive partitioning and also the labels of each logical drive. You can use the FDISK /QUERY command to get some of the information.
- #### 2. Back up your data
- a. If you are using 386HPFS, first run BACKACC d:\ /S on all your drives to back up the ACLs.
  - b. Check the created backup files (file size greater than zero).
  - c. Stop all running applications on the server to avoid busy files.
  - d. Run your backup program to save all data on all disks and partitions.
  - e. Check the data on your tape and view the log file for not saved files or other errors.
  - f. Shut down the server.
- #### 3. RAID configuration
- a. Insert the new RAID hard drive in a free slot.
  - b. Insert the RAID configuration diskette in drive A: for your RAID adapter.

- c. Restart your server and boot it with your RAID configuration diskette.
  - d. Delete the existing RAID array.
  - e. Define the new array and the logical drives including the new disk.
  - f. Initialize and synchronize the new RAID 5 drive.
  - g. Save your RAID configuration.
  - h. Exit the RAID configuration utility.
4. Restore your data
- a. Boot your server with the OS/2 boot diskettes you created in step 1 on page 239.
  - b. If you have an OS/2 prompt, insert the tool diskette you created in step 1 on page 239 and partitioning the hard drive with FDISK using the same partition structure you had before.
  - c. After the partitioning you have to reboot your server again with the OS/2 boot diskettes.
  - d. Insert again the tool diskette and format each partition. We recommend to use the long format option by typing `FORMAT d: /L`. Label the logical drives with the same names you used before.

**Note**

If you don't use the same partition names the next time you use the BACKACC program, it will not work because it compares the label name of the partitions with the name stored in the backup files (ACLBKx.BKP) of BACKACC. If you still want to use other label names, make sure that you rename or delete the ACLBKx.BKP files before you run BACKACC.

- e. After formatting all logical drives insert the diskette containing the restore program. Start the program and restore all data from the tape.
- f. When the restore process is finished remove the diskette from drive A: and reboot the server by starting OS/2.

**Note**

In some cases, it is possible that your server will not reboot. If this happens you have to rebuild the OS/2 boot blocks and/or the master boot record. The following procedure shows you how to do that:

- Boot your server with your OS/2 boot diskettes.
- When you have an OS/2 prompt change to the `d:\OS2\DLL` subdirectory on your system partition.
- Insert the OS/2 installation disk containing `SYSINSTX.COM` in drive A:.
- Run the `A:\SYSINSTX d:` command from `d:\OS2\DLL` directory to write the OS/2 boot blocks and the OS/2 loader on your system partition (where `d:` is your system partition).
- To rebuild the master boot record insert the tool diskette you created in step 1 on page 239 in drive A: and run the command `FDISK /NEWMBR` from the diskette.

- g. Run RESTACC d:\ /S on all your partitions to restore the ACLs.

After these very time consuming and disruptive operations, you can use the disk space of your new hard disk. To handle a data volume of 1.5 GB with the procedure just described, your wait time will range from 10 - 12 hours.

---

## A.2 Increasing the RAID Array with an IBM PC ServeRAID Adapter

In this section, we use the IBM PC ServeRAID Adapter to increase the disk space of a RAID 5 Array. In our environment, we are using an IBM PC 320 Server with three 2-GB hard drives in the RAID Array A and we add a 2-GB hard drive. OS/2 Warp Server 4.0 Advanced is installed on this server system. We show how the new free space is handled by OS/2 and what you can do with the new free space. The following partition table shows the status of the partitioning before we started the increasing process:

Drive Name	Partition	Vtype	FStype	Status	Start	Size
1 0000003F	:	1	0a	2	0	7
1 MAINT	C:	2	04	5	7	31
1 OS2 WARP	D:	2	07	1	39	406
1 000deb31	E:	2	07	0	445	406
1 001a9d99	F:	2	07	0	851	3445

We use a Windows 95 workstation with the IBM PC ServeRAID Administration and Monitor utility to configure the IBM PC ServeRAID Adapter remote over TCP/IP. To increase the RAID Array we execute the Logical Drive Migration function of the IBM ServeRAID Administration and Monitoring utility. You must use a Windows NT or a Windows 95 workstation and TCP/IP connection to configure your OS/2 Server because the administration utility is only available for Windows NT or Windows 95. The following shows how to increase the hard disk space on an IBM PC Server with OS/2:

### 1. Preparations

- a. Start the IBM PC ServeRAID Adapter Administration/Monitor Server for OS/2 (IPSADM.EXE) on the server. This server program enables the remote connection to the IBM PC ServeRAID Adapter over TCP/IP.

**Note**

You can find the IBM PC ServeRAID Adapter Administration/Monitor Server on the ServeRAID Driver Utility Disk in the subdirectory A:\REMOTE\SERVERS\OS2.

- b. Insert the new hard drive in a free RAID slot.
- c. Start the IBM PC ServeRAID Adapter Administration/Monitor utility on the Windows 95 workstation.
- d. To connect to the server, click the **Network Settings** smart icon as shown in Figure 243 on page 242.

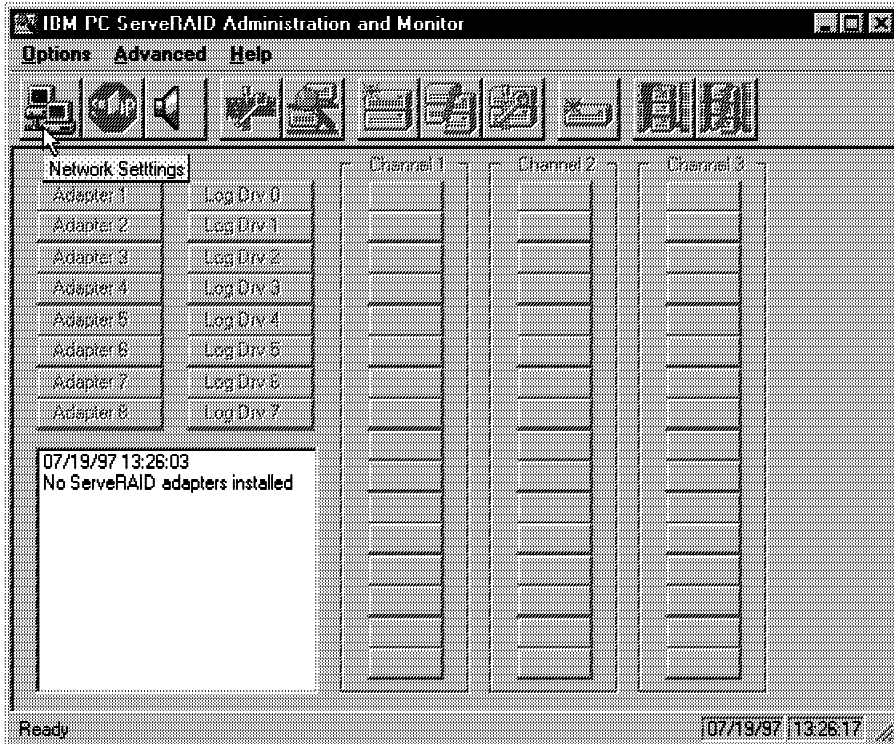


Figure 243. IBM PC ServeRAID Administration and Monitor Utility

- e. The Network Settings window appears. Click on **Client/Server** and add the TCP/IP address of the server followed by the port number :1087. Click the **Connect** button to establish the connection (see Figure 244).

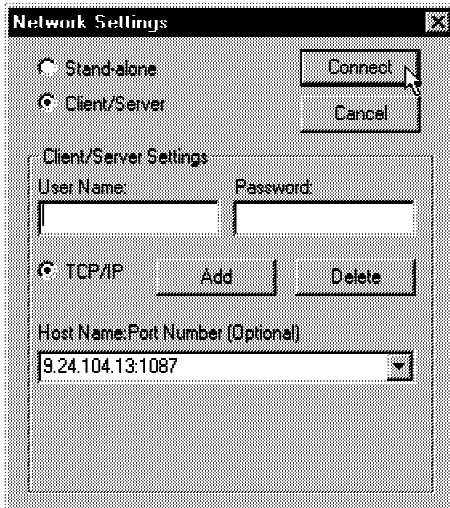


Figure 244. Network Settings

- f. After the successful connection you can see the current configuration of the IBM PC ServeRAID Adapter at the Administration and Monitor utility (see Figure 245 on page 243).

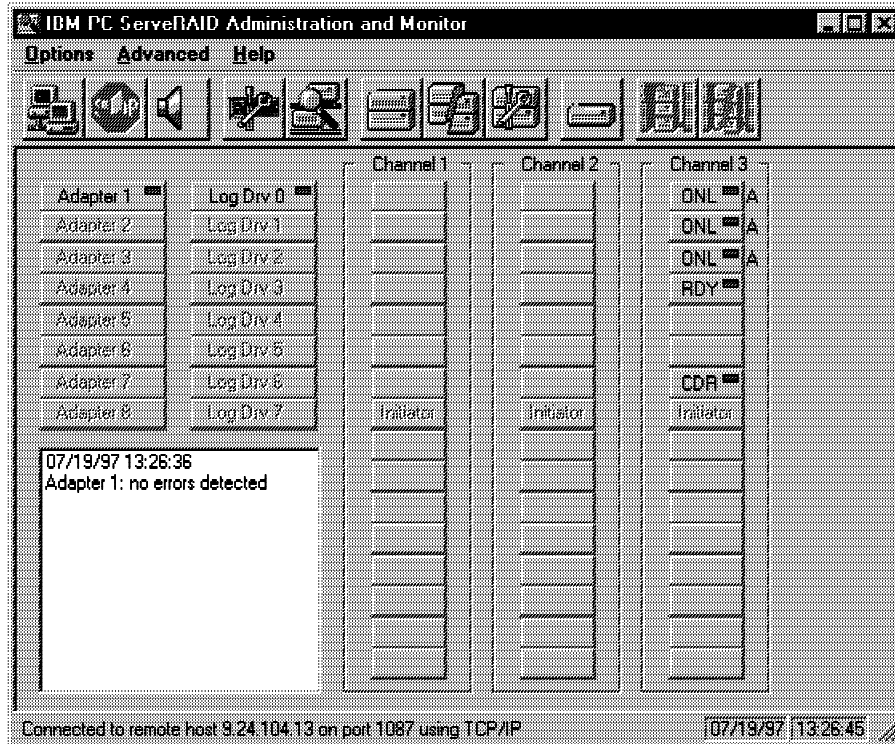


Figure 245. Current RAID Configuration

## 2. RAID configuration

- a. Select **Logical Drive Migration...** as shown in Figure 246 in the Advanced pull-down menu.

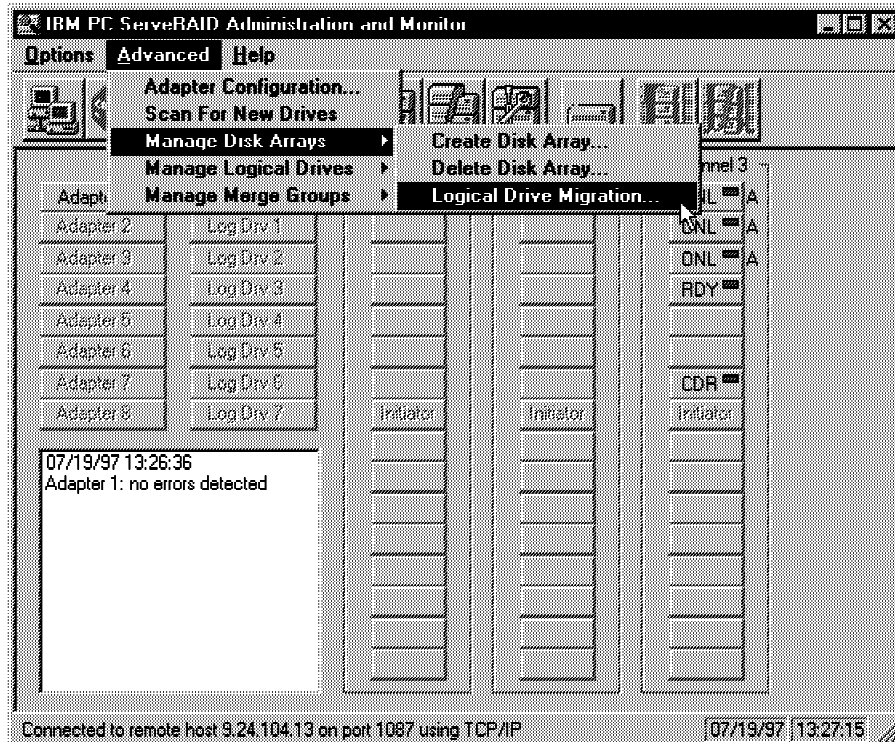


Figure 246. Select Logical Drive Migration

- b. At the Logical Drive Migration window select **Add Physical Drive(s)** and click **OK**.

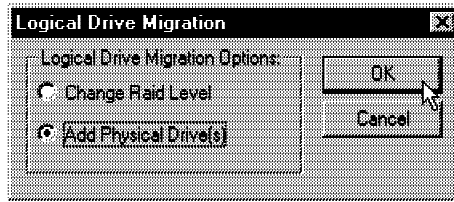


Figure 247. Logical Drive Migration Window

- c. Click on the new **RDY** drive to mark it with an X and then click on **OK** at the Select Ready Drive(s) window as shown in Figure 248.

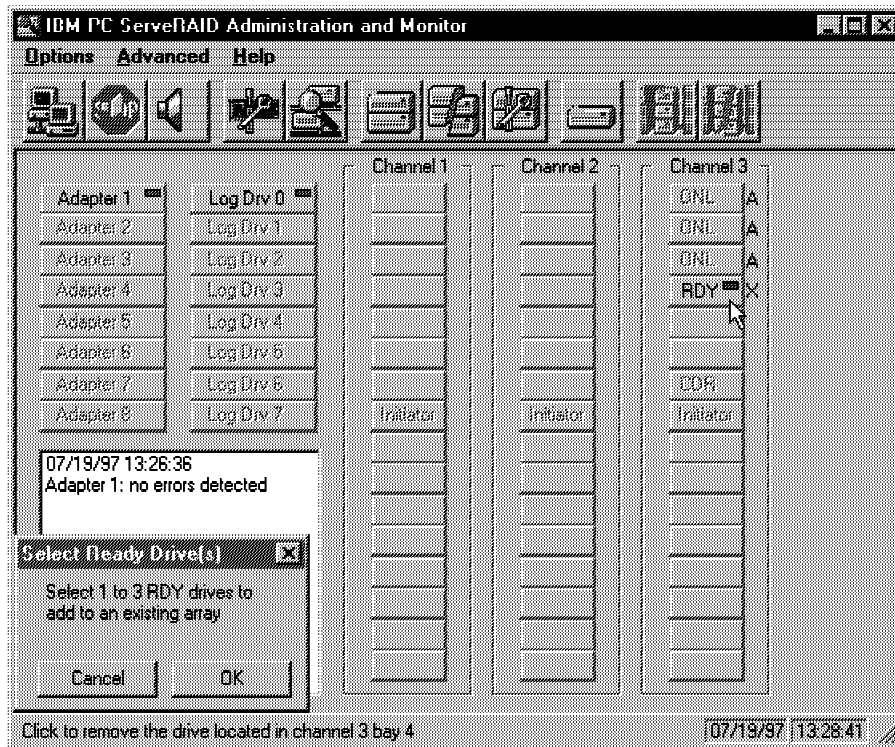


Figure 248. Select the New Drive to Add

- d. A new window appears to add physical drives (see Figure 249 on page 245). Select the **Increase the capacity of all logical drives in array A** option and click the **OK** button.



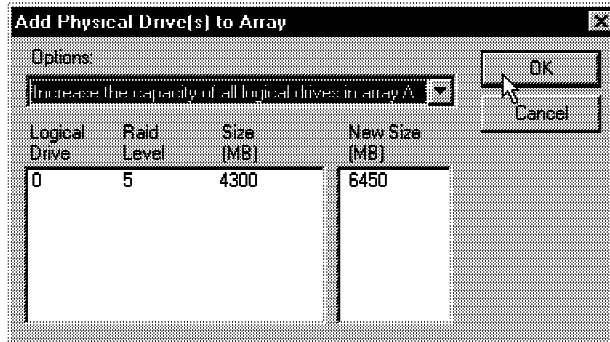


Figure 249. Add Physical Drive(s) to Array Window

- e. Click **OK** again on the following confirmation window to start the increase process.
- f. The Drive Migration Progress window shows the status of the Migration (see Figure 250).

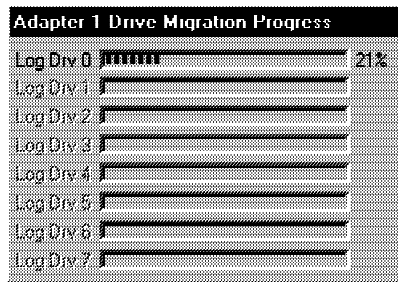


Figure 250. Drive Migration Progress Window

- g. After the migration the synchronization process starts the progress of the synchronization is shown in an extra window (see Figure 251).

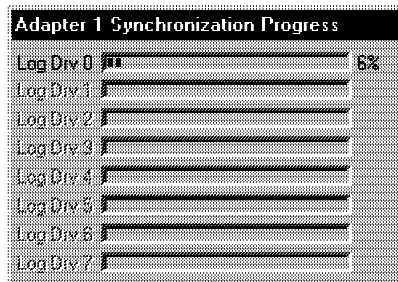


Figure 251. Adapter Synchronization Window

- h. After less than 45 minutes we have added the new drive to our RAID array. During the whole time the server was up and running and always ready to do the work. The Administration and Monitor utility shows the new drive in the RAID array A (see Figure 252 on page 246).

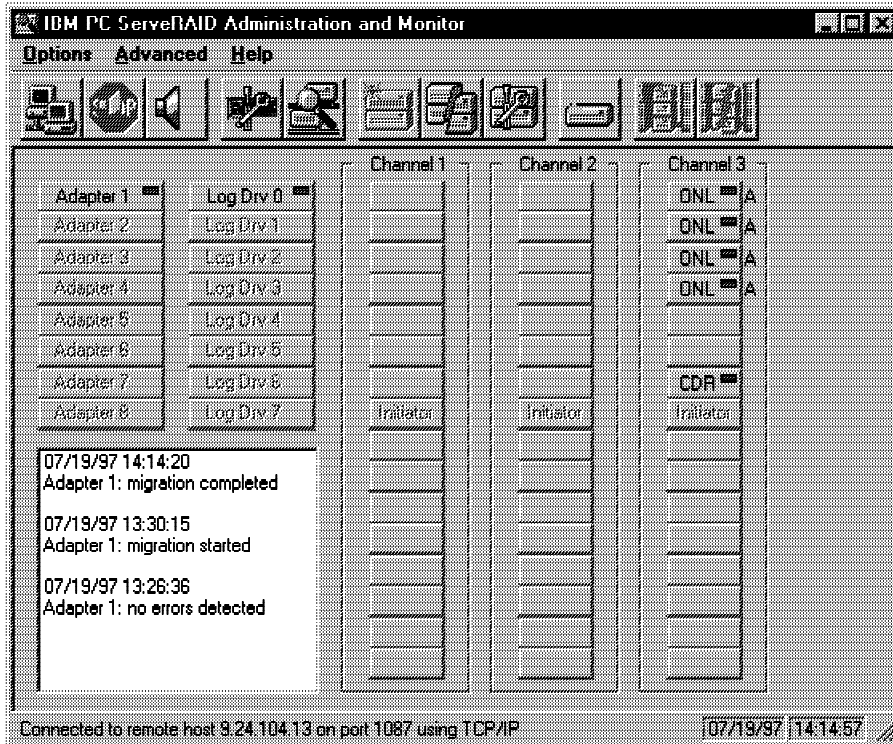


Figure 252. IBM PC ServeRAID Adapter Status after the Migration

- i. To make the new disk space available for OS/2 you have to reboot the server.

3. Using the new disk space

After the reboot, OS/2 recognizes the new disk space. In the following actual partition table you can see that the completely added disk space is available at the end as free disk space (FStype=00).

Drive Name	Partition	Vtype	FStype	Status	Start	Size
1 0000003F	:	1	0a	2	0	7
1 MAINT	C:	2	07	1	7	31
1 OS2 WARP	D:	2	07	1	39	406
1 000deb31	E:	2	07	0	445	406
1 001a9d99	F:	2	07	0	851	3445
1 00864b4c	:	3	00	0	4297	2148

You can use the disk space to add a new partition by using FDISK but usually you need the new disk space to add them to existing partitions, for example to add free space for LAN user home directories or Lotus Notes or DB/2 database drives. In our example all LAN data located on partition F:. That's the partition we want to increase. To do this, we show you two ways to go:

- **First (conventional) way:**
  - a. Back up the ACLs using BACKACC F:\ /S.
  - b. Back up the data from partition F: to a tape or a LAN drive.
  - c. Delete the F: partition with FDISK.
  - d. Create a new partition F: with added space you need.

- e. Reboot your server.
- f. Format partition F:.
- g. Restore the data back to partition F: from the tape or LAN drive.
- h. Restore the ACLs using RESTACC F:\ /S.

In our case we only had to delete partition F: but if you want to increase the space of a middle partition, you also have to back up, delete and restore all partitions coming behind the partition you want to increase. For example if we want to increase partition E:, we have to delete partition E: and F: to increase partition E:.

- **Second way - Using PowerQuest's PartitionMagic for OS/2**

- a. Start PartitionMagic. (We are using the PM program of Version 2.02.)
- b. Mark partition F: and click **Resize** as shown in Figure 253.

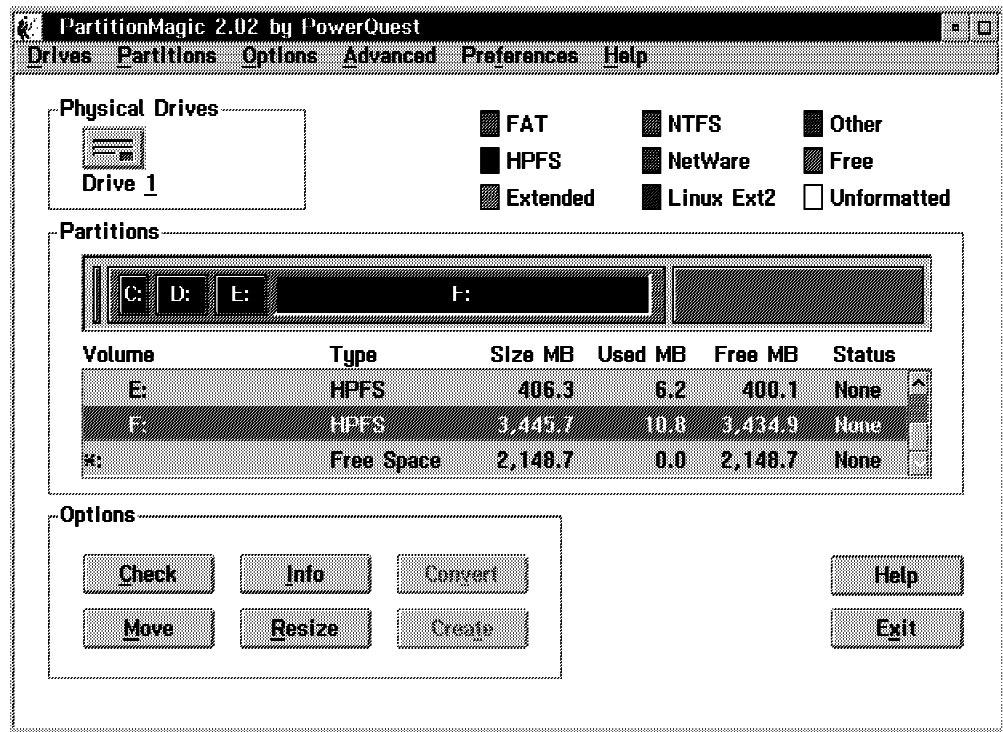



Figure 253. PartitionMagic

- c. Increase the space you want by clicking the forward button  at the Resize Partition window and click **OK** to start the resize process (see Figure 254 on page 248).

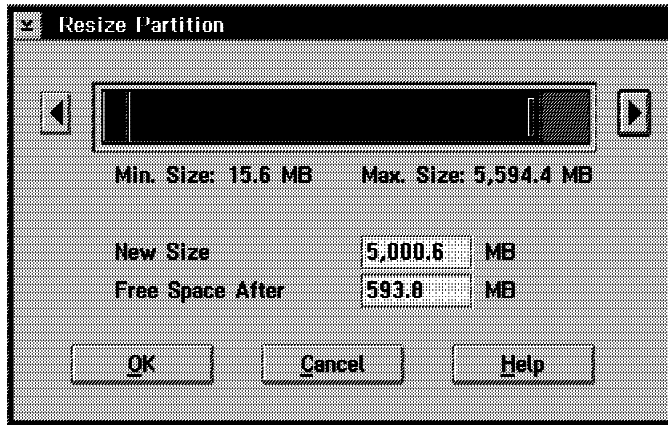


Figure 254. PartitionMagic Resize Partition

- d. The resize progress window appears as in Figure 255. After successfully completing the resize operation you get a message as shown in Figure 256. Click the **OK** button to go back to the main window. The operation time for resizing from 3.4 GB to 5.0 GB was about ten minutes in our environment.

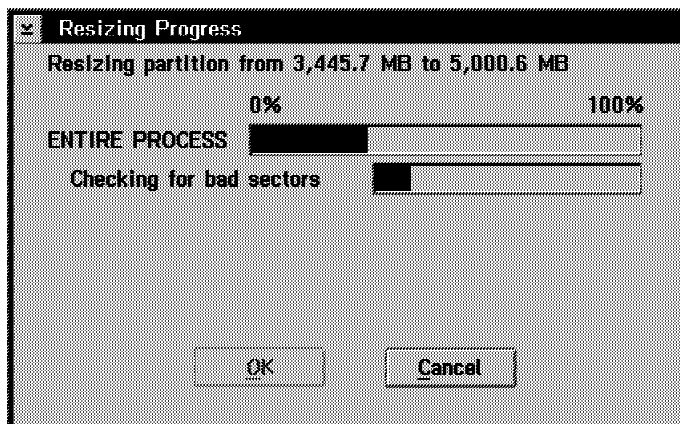


Figure 255. Resizing Progress Window

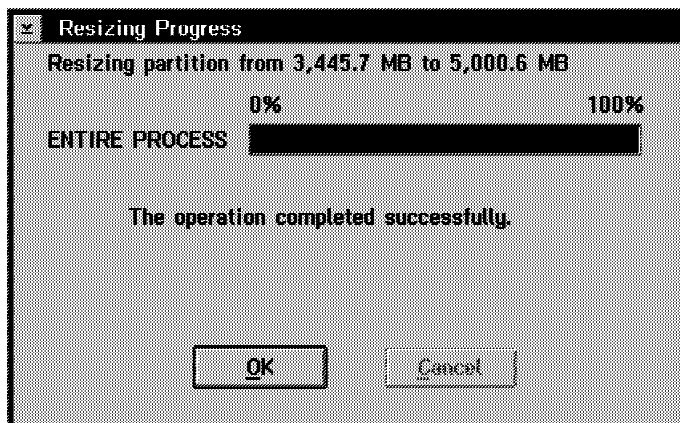


Figure 256. Final Resizing Progress Window

- e. After finishing the resizing we move partition F: to the end of the disk space to create free space behind the E: partition. So we get the possibility to enlarge partition E:. Make sure that partition F: is marked at the PartitionMagic main window and click on **Move**. The Move Partition window is displayed (see Figure 257).
- f. Click and hold down the left mouse button on the colored block and move them to the right end as shown in Figure 257.

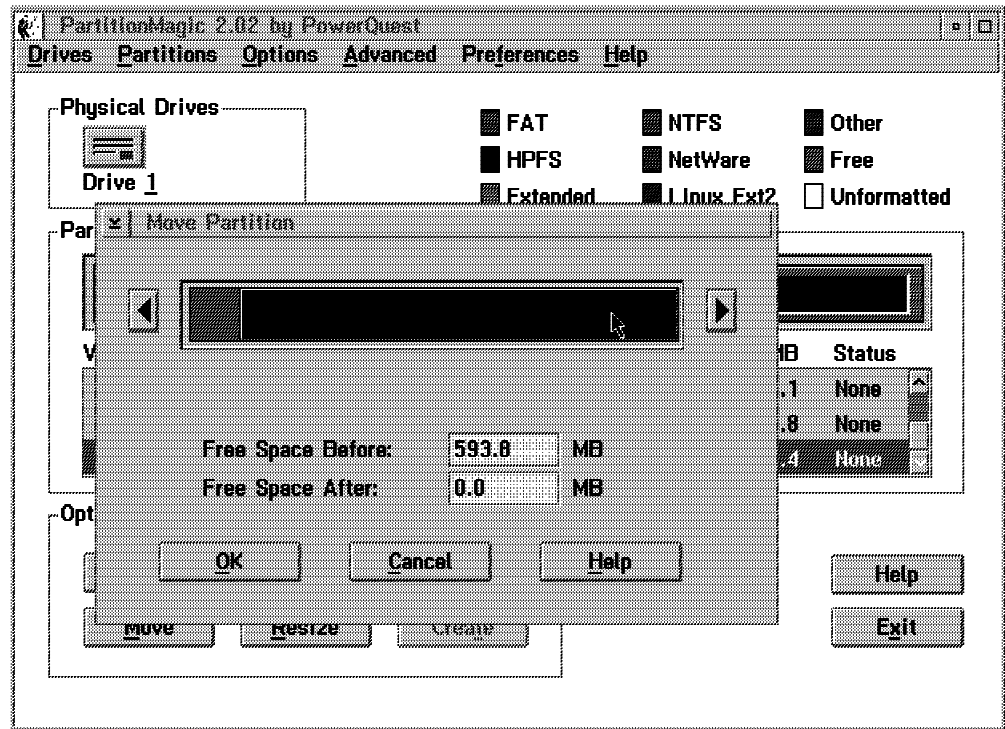


Figure 257. Moving the Partition

- g. Click the **OK** to start the move process and the Moving Progress window is displayed (see Figure 258).

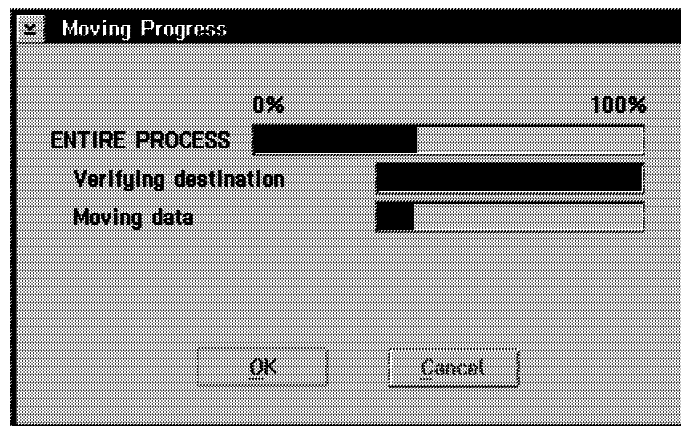


Figure 258. Moving Progress Window

- h. To move our 5-GB partition to the right end it took about 2 hours. After finishing the move process you come back to the main

PartitionMagic window. You can see in Figure 259 on page 250 the new created free space between partition E: and F:.

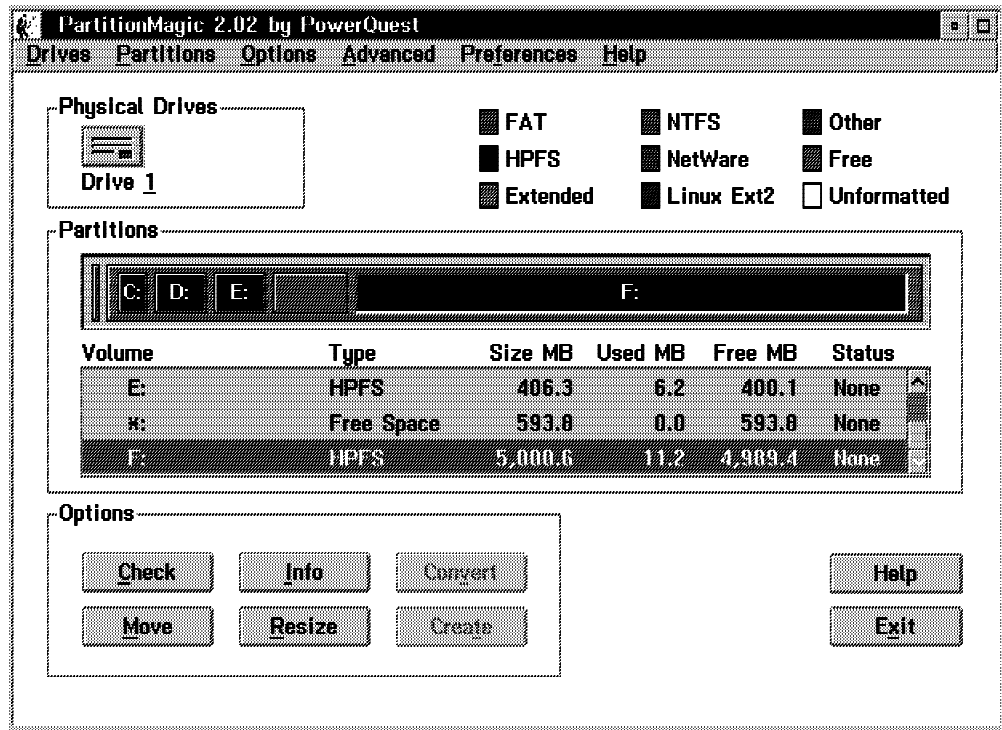


Figure 259. PartitionMagic Main Window after the Move Process

- i. Close PartitionMagic by clicking the **Exit** button and the Reboot window appears. Close all running applications on the server and click the **Reboot** button to restart the server.

**Note**

You don't need to reboot the server if you only resize a partition.

- j. After the reboot the partition table has the following status:

Drive Name	Partition	Vtype	FStype	Status	Start	Size
1	0000003E	:	1	0a	2	7
1	MAINT	C:	2	07	1	31
1	OS2 WARP	D:	2	07	1	406
1	000deb31	E:	2	07	0	406
1	001a9d99	:	2	00	0	593
1	001a9d99	F:	2	07	0	5000

**World Wide Web**

For further information about PowerQuest's PartitionMagic, go to the following URL:

<http://www.powerquest.com/>

**Note**

You can only work with PartitionMagic on a partition as shown before, if no programs are running on it and no files are accessed. To increase the size of the system partition you have to run PartitionMagic from a maintenance partition or from a diskette booted system by running the full-screen version of PartitionMagic.

**Error 1027** caused by 386HPFS

If you run the resize function from PartitionMagic on a 386HPFS partition it will not work unless the ACLs information is removed from the partition. Do the following steps to resize a 386HPFS partition:

1. Save the ACLs of the partition by using `BACKACC d:\ /S` (where d: is the drive you want to resize).
2. Remove the ACLs from the partition with `PREPACL /P /N /D:d:\`.
3. Resize the partition.
4. Restore the ACLs by using `RESTACC d:\ /S`.

On heavily used partitions run `CHKDSK /F:2` before you start working with PartitionMagic.





---

## Appendix B. Preparing a Maintenance Partition

To adequately prepare yourself in the case of an emergency on your IBM PC Server, we *strongly* recommend that you install a maintenance partition on your server. By doing so, you will save hours of headaches while trying to recover a drive, or simply applying FixPaks.

While OS/2 Warp Server provides the ability to create boot disks (MAKEDISK), the following method is much faster, easier to use, more robust, and many times more functional than the diskette method. Your maintenance partition can provide you with the means to:

- Run CHKDSK on your system partition
- Apply CSDs to your system partition
- Use recovery utilities to repair data structures
- Resize hard drive partitions

Remember that this section merely provides you with the steps taken to create the maintenance partition. It will be up to you to tailor it to your specific needs.

---

### B.1 Preparations

The preparations begin before you install your server system. Take a minute or two to think about what you will cover with the maintenance partition. Think about the tools you will need especially for your server system and your configuration. Check the restrictions of your configuration for example using a maintenance partition with a raid adapter.

To figure out what type and what size your maintenance partition should be, write down the tools and programs you will need. The following list should give you something to start thinking about:

- Do I need LAN access?
- Do I need the ability to run Presentation Manager (PM) programs?
- Do I need REXX support?
- What hardware restrictions might I have?
- Which file system(s) do I need?
- Which tools do I need?
- How much place I need for diskette file images of special system diskettes (386HPFS boot diskettes, RAID Configuration diskettes, etc.)?

One thing you should not miss on your maintenance partition is the installation of THINLAPS, THINIFS and the SERVICE.EXE as part of the CID utilities. These tools give you the possibility to connect to or work like a CID server when you are working with the maintenance system.

Also put diskette image files of important system diskettes for your server system on it, such as:

- Reference diskettes
- EISA configuration diskette

- OS/2 386HPFS boot diskettes
- RAID configuration diskette
- BIOS update diskettes
- Driver diskettes
- Data recovery boot diskettes

**Note**

There are many utilities to create diskette image files of diskettes, you can also use the XDFCOPY command of OS/2 Warp but if you use XDFCOPY do not forget to copy the XDFCOPY.EXE and the XDFLOPPY.FLT to the maintenance partition and add the BASEDEV=XDFLOPPY.FLT line to the CONFIG.SYS.

Our recommendation for the size of a maintenance partition is at least 30 MB. Thus you can put the workplace shell on it and you have room to grow. Before we started the installation of the OS/2 Warp Server we did the following disk partitioning (output of FDISK /QUERY):

Drive Name	Partition	Vtype	FStype	Status	Start	Size
1	0000003f	:	1	0a	2	0 7
1	MAINT	C:	2	07	1	7 31
1	OS2 WARP	D:	2	07	1	39 400
1	000dba77	E:	2	07	0	439 400
1	001a3aea	F:	2	07	0	839 1310

The first partition is the BootManager. It's the only primary partition in our configuration; all following partitions are logical partitions. The second partition (C:) will be the maintenance partition. We put the maintenance partition at the beginning to avoid boot problems with large hard disk drives caused by the 1024 cylinder boot limitations of the BootManager. The D: partition will contain the operating system, OS/2 Warp Server and all other system tools and programs we intend to install such as NetFinity, ADSM client and NVDM/2 client. The last two partitions E: and F: we will use for LAN applications (E:) and LAN data (F:).

## B.2 Installing Using BOOTOS2

After the complete installation of Warp Server we start the installation of the maintenance partition by using the BOOTOS2 tool. BOOTOS2 is a powerful utility that allows you to build a bootable OS/2 V2, V3 or V4 system using an existing OS/2 system. The boot system can be installed on either floppy disks or a hard disk partition. You have the choice between three types of boot systems:

- Minimal - Supports one or more OS/2 Full-Screen sessions.
- PM - Supports one or more OS/2 Full-Screen or PM sessions.
- WPS - Supports one or more OS/2 Full-Screen or PM sessions and also the availability of the OS/2 Workplace Shell.

```

OS/2 V4.00 BOOT System Create Utility
Version 0800
Copyright IBM Corp. (C) 1992,1996
Program Property of IBM

```

```

Usage : BOOTOS2 <SOURCE=drive:\path\> <TARGET=drive> <TYPE=PM|WPS>
<NLS(Country,KBD,CodePage)> <2DISK<=drive>> <REXX>
<SWAP=drive:\path\> <TRACE=<drive:\path\>> <VDM>
<HELP> <SYSED> <QUIET> <FORMAT<:FAT|HPFS|NONE>> <VGA>

```

```

Where : <SOURCE> = OS/2 CID Redirected Install directory structure
<TARGET> = Target Drive (A .. Z) for Installed BOOT System
<TYPE=PM> = BOOT System supports PM via a single OS/2 Window
<TYPE=WPS> = BOOT System supports the OS/2 WPS
NLS = Defines the NLS Environment - Hard Disk Install Only
REXX = Add REXX support
2DISK = Create a 2-Disk BOOT System (optional 2nd target)
HELP = Add Basic OS/2 HELP Support
SYSED = Add support for OS/2 System Editor (PM or WPS only)
SWAP = Alternate SWAP File Destination
TRACE = Output Install record to BOOTOS2.LOG (optional path)
QUIET = Suppress all output to STDOUT
FORMAT = Force a format of the Target Drive
VDM = Add support for Virtual DOS Machines
VGA = Force Install of VGA video support (PM or WPS only)

```

Figure 260. The Syntax of BOOTOS2

#### World Wide Web

The Author of BOOTOS2 is Kenneth A. Kahn. It is an IBM employee-written software and available over the Internet. Check the following ftp site:

<ftp://service.boulder.ibm.com/ps/ews/bootos2/>

A big advantage of the BOOTOS2 program is that it will analyze your system and create a boot system that is specific for it. For example, it will determine if your system supports features such as HPFS, 386HPFS, SCSI, RAID and add the appropriate support for it. At our servers, we used the OS/2 Warp Server CD as source for the installation of the maintenance partition by BOOTOS2, the THINLAPS command and the THINIFS command. The following steps guide you through the installation of a WPS maintenance partition:

1. Format the maintenance partition:

```
FORMAT C: /HPFS /L
```

2. Start the BOOTOS2 command from the running server system at an OS/2 window:

```
BOOTOS2 source=d:\OS2IMAGE target=C: type=WPS REXX SYSED
```

3. Add THINLAPS support:

```
d:\CID\SERVER\MPTS\THINLAPS d:\CID\SERVER\MPTS C: IBMTOK.NIF
```

4. Add THINIFS support to connect LAN drives:

```
d:\CID\SRVIFS\THINIFS /s:d:\CID\SRVIFS /t:C: /req:* /d:X:
```

5. REMark out the SRVATTCH statement in the CONFIG.SYS to avoid the opening of the LAN adapter if you are not connected to the LAN.
6. Copy SERVICE.EXE on the maintenance partition to share the server drives over the LAN.
7. Prepare a SERVICE.INI file for your server to share all drives as in the following example:

```

;
!
@
#
Adapter      = 0
MaxClients   = 5
MaxFiles     = 102
Name         = PCC04
Groupname    = No
ClientWorkers = 6
;Authlist    = C:\service.lst
;
Path         = C:\
perclient    = No
PermitWrite  = Yes
;
alias= readwrite,single,C,C:\
alias= readwrite,single,D,D:\
alias= readwrite,single,E,E:\
alias= readwrite,single,F,F:\
alias= readonly,single,CDROM,G:\

```

To start the service program type `SERVICE /INI=SERVICE.INI`. If you need detailed information about SERVICE.EXE, the INI file parameters and the using them, see *OS/2 Installation Techniques: The CID Guide*, SG24-4295-01.

**Note**

If you want to share the CD-ROM drive, make sure that a CD is inserted when you run the service program. The service program checks the availability of all shared drives before it starts.

The following lines are from the CONFIG.SYS file created for our server by BOOTOS2 with the additions by THINLAPS and THINIFS:

```

PROTSHELL=\OS2\PMSHELL.EXE
SET USER_INI=\OS2\BOS2USER.INI
SET SYSTEM_INI=\OS2\BOS2SYS.INI
SET OS2_SHELL=\OS2\CMD.EXE
SET COMSPEC=\OS2\CMD.EXE
SET AUTOSTART=TASKLIST,FOLDERS,LAUNCHPAD
SET RUNWORKPLACE=\OS2\PMSHELL.EXE
DEVICE=\OS2\PMDD.SYS
MEMMAN=SWAP,PROTECT
SWAPPATH=C:\ 512
LIBPATH=.;C:\OS2\DLL;C:\OS2\MDOS;
SET PATH=C:\OS2;C:\OS2\MDOS;C;;
SET DPATH=C:\OS2;C:\OS2\MDOS;C;;
SET PROMPT=[ $p ]
BUFFERS=30
IOPL=YES
SET KEYS=ON

```

```

DISKCACHE=D,LW
SET HELP=C:\OS2\HELP
BASEDEV=IPSRAID.ADD
BASEDEV=IBMRAID.ADD
BASEDEV=DETNE2.SYS
BASEDEV=IBMKBD.SYS
BASEDEV=IBM1FLPY.ADD
BASEDEV=OS2DASD.DMD
IFS=\OS2\HPFS386.IFS
COUNTRY=001,\COUNTRY.SYS
DEVICE=\OS2\OS2CDROM.DMD /Q
IFS=\OS2\CDFS.IFS /Q
DEVICE=\OS2\POINTDD.SYS
DEVICE=\OS2\MOUSE.SYS
CODEPAGE=437,850
DEVINFO=KBD,US,\OS2\KEYBOARD.DCP
DEVINFO=SCR,VGA,\OS2\VIOTBL.DCP
SET VIDEO_DEVICES=VIO_SVGA
SET VIO_SVGA=DEVICE(BVHVGGA,BVHSVGA)
RUN=\OS2\BOS2REXX.EXE

rem *** Start of ThinLAPS additions ***
device = lanmsgdd.os2
device = protman.os2
device = netbeui.os2
device = netbios.os2
device = IBMTOK.OS2
call = netbind.exe
run = lanmsgex.exe
rem *** End of ThinLAPS additions ***
DEVICE=C:\SRVIFS.SYS
IFS=C:\SRVIFSC.IFS *
REM CALL=C:\SRVATTCH.EXE x: CIDSRV

```

BOOTOS2 is an easy and fast way to create a maintenance partition. You don't have to take care about the main device drivers when you start it from a right configured system. It saves time.



---

## Appendix C. Sources of Drivers and Information

One of the challenges that LAN administrators face is ensuring that the adapters they want to use are supported and then finding the latest level of device drivers for these adapters. Another problem they face is trying to find information about known software bugs and their corresponding fixes. This appendix is included to help readers solve these problems.

For a general source of information and support for IBM PC servers, go to the World Wide Web (WWW) at the following URLs:

<http://www.pc.ibm.com/servers>

<http://www.pc.ibm.com/techlink/tcsrvsp1.html>

The latter URL is part of IBM TechConnect program. Refer to Appendix D, "IBM TechConnect Program" on page 263 for more information.

---

### C.1 Compatibility Information

IBM does extensive testing on each new system before it is introduced to ensure that it is compatible with the wide variety of IBM and non-IBM hardware and software. Compatibility information is available from the following Web site:

<http://www.pc.ibm.com/compat/compat.html>

This site has a wealth of valuable information. It contains the following:

- A comprehensive listing of products that have been tested for compatibility with these servers and a technical description of each server.
- Compatibility reports and information about network and workstation operating systems, showing detailed information on hardware configurations, adapters, device drivers, and code levels used in the testing.
- Direct access to device drivers, flash BIOS updates, and other server code.
- An overview of how IBM conducts compatibility and certification tests.

This is an excellent source of information to ensure your hardware and software are supported by IBM servers. It is updated regularly with the latest NOS certifications and driver updates.

---

### C.2 Device Drivers

The IBM PC Company home page has a very good file repository containing drivers and BIOS updates, as well as other documentation and drivers, including the new ServeRAID software:

<http://www.pc.ibm.com/servers/#files>

In addition to this Web site, IBM has another site that contains a file that has LAN adapter device driver information. This file is a matrix of adapters and drivers and version levels. It is updated frequently as new drivers become available. The file is named DRVRLIST.EXE and is a self-extracting ZIP file containing a Word 6.0 document. It can be obtained from the PC Company BBS at either:

<ftp://ftp.pcco.ibm.com/pub/pccbbs/network>

or via modem at (919) 517-0001 in Raleigh, North Carolina, USA. There are also IBM bulletin boards in other countries where IBM operates.

If it is an IBM adapter, the driver itself can be obtained from the same site. In addition, the IBM Networking Hardware Division maintains an FTP site at URL:

<ftp://lansupport.raleigh.ibm.com/pub/products/lanprods>

For OEM adapters, many manufacturers have Web and FTP sites. Examples include:

<http://www.adaptec.com>

<http://www.mylex.com>

<http://www.madge.com>

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

There are also useful Web sites run by people not necessarily related to hardware or software vendors. One such site is the LAN Drivers page at:

<http://sunsite.unc.edu/~towfiq/lan-drivers.html>

---

## C.3 IBM World Wide Web Resources

IBM has many World Wide Web sites for OS/2. They make software information, device drivers, FixPaks, and other useful items available from your Web browser.

### C.3.1 OS/2 Software Sites

The following sites contain information about OS/2 Warp and OS/2 Warp Server and are always a good place to start.

<http://www.software.ibm.com/warp>

<http://www.software.ibm.com/warp-server>

<http://www.software.ibm.com/warp/warpfm>

### C.3.2 OS/2 Device Drivers

The OS/2 Device Driver Pak OnLine's URL is:

<http://service.software.ibm.com/os2ddpak/index.htm>

The IBM OS/2 Device Driver Repository is at:

<http://www.europe.ibm.com/getdoc/psmemea/progserv/device/>

### C.3.3 FixPaks and CSDs

This is a database of IBM Personal Systems Products that have fix packages available for you to download from the FTP server. You can view or search the database by APAR number, or by fix packages per product. If you search by APAR number, you may be presented with multiple fix packages which contain the APAR. Determine which one is appropriate for your environment. The hyperlinks in the documents will take you to the location of the fix package on the FTP server. The URL is:

<http://service2.boulder.ibm.com/pspfixpk/>



Also provided in this database is a cross reference between the FixPak name and the Build Level for many of the OS/2 and LAN products. The URL is:

<http://service2.boulder.ibm.com/pspfixpk/crossreference.html>

Software Updates is a tool to install OS/2 service packages directly from the Web. Check out this site to see what Software Updates is and what packages are available for you to install. Check the site often, as they frequently add new packages.

<http://ps.boulder.ibm.com/softupd.html>

### **C.3.4 OS/2 Warp Migration Guide**

An excellent page for planning migration to Warp from OS/2 2.x is found at:

<http://pscc.dfw.ibm.com/warpmi/>

---

## **C.4 Other World Wide Web Resources**

There are many more resources for OS/2 on the World Wide Web and most of them are run by individuals or universities. Although they are not sponsored by IBM, you will find a wealth of information, software, drivers, etc. on these sites that isn't available anywhere else.

Team OS/2 Online is a group of OS/2 users worldwide who are committed to OS/2 as their operating system of choice, who wish to promote OS/2 to the general public, and who are willing to assist other users by providing resources and support. Their Web site address is:

<http://www.teamos2.org/>

Team OS/2 Austria has a WWW site at:

<http://www.os2forum.or.at/TeamOS2/>

The OS/2 Software Site on the Internet, affectionately known as Hobbes is an FTP site dedicated to providing a global home to the many OS/2 applications, drivers, and utilities that have been written for OS/2. Free shareware and commercial applications are available, as well as a mirror of the Employee Written Software (EWS) from IBM for OS/2.

An HTML version of Hobbes called Hobbes Virtual Mirror can be found at:

<http://www.columbia.edu/.chs11/hvm.html>

Many other sites are on the Web. Here are just a few of them:

<http://www.secant.com/sipples/>

<http://www.zeta.org.au/.jon/WarpPharmacy.html>

<http://www.os2ss.com/>

<http://www.warpcity.com/>

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## C.5 Other Internet Resources

There are many other resources for information on the Internet besides the World Wide Web. They include USENET and the IRC. We supply you with a number of them in the following section. This is not a comprehensive list of resources by any means, as it would be both redundant, and most likely out of date if it were.

To obtain an up-to-date and comprehensive list of OS/2 Internet resources go to:

<http://www.yahoo.com/>

and search for OS/2.

### Internet Users Guide

For an excellent beginner's guide to the Internet including FTP, WWW, IRC and USENET browse to this URL:

<http://www.newbies-netguide.com/netguide.html>

### C.5.1 OS/2 USENET Resources

Following is a list of the OS/2 USENET newsgroups on the Internet:

```
bit.listserv.os2-1
comp.binaries.os2
comp.os.os2.advocacy
comp.os.os2.announce
comp.os.os2.apps
comp.os.os2.beta
comp.os.os2.bugs
comp.os.os2.comm
comp.os.os2.games
comp.os.os2.mail-news
comp.os.os2.marketplace
comp.os.os2.misc
comp.os.os2.multimedia
comp.os.os2.networking.misc
comp.os.os2.networking.tcp-ip
comp.os.os2.networking.www
comp.os.os2.programmer.misc
comp.os.os2.programmer.oop
comp.os.os2.programmer.porting
comp.os.os2.programmer.tools
comp.os.os2.setup.misc
comp.os.os2.setup.storage
comp.os.os2.setup.video
comp.os.os2.utilities
```

### C.5.2 Internet Relay Chat (IRC)

Real-time feedback from OS/2 professionals, students, and others can invariably be obtained from the IRC during most hours of the day. The EFFNET #os/2 channel is probably the oldest and most visited OS/2 IRC channel on the Internet, but similar channels can also be found on one of the alternative IRC networks such as UNDERNET, DALNET, CHATNET, and others.

As with other Internet resources, the IRC can be helpful if you know how to use it properly. Always use proper etiquette when surfing the net.

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## Appendix D. IBM TechConnect Program

The IBM TechConnect program is a server training, certification and information resource program. It is designed to help network specialists increase their technical skills and proficiency on IBM servers as well as networking and open computing solutions.

IBM TechConnect will offer server technical specialists value-added capabilities by offering state of the industry hands-on PC Server training and certification as well as:

- Industry-leading PC Server products and technical field support
- Technical specialist peer networking opportunities
- Unique incentives and rewards in recognition of re-seller and individual's technical achievements

In today's competitive environment, business customers of every size are relying on increasingly sophisticated PC Server networks to support, run and profitably manage their businesses. In addition to requiring advanced, fault-tolerant PC Servers, customers require highly skilled, qualified technical professionals to design, install and support their growing networks. The IBM TechConnect program is designed to meet these customer challenges. TechConnect focuses on informing, training, educating, and developing highly skilled people to fully support IBM PC Server customers from a total networking solutions perspective.

The program works at two levels:

1. The *Associate path* is an information connection, a quarterly mailing of our TechConnect CD that contains technical information designed specifically for networking specialists.
2. The *Certification path* includes hands-on lab training with real-life problem solving opportunities on IBM PC Server products. Course content will focus on underlying technology, in addition to specific products, to maximize value and provide transferable skills.

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### D.1 Certification

By attending the technical training being run through the IBM PC institute, individuals are working towards certification as an IBM Professional Server Specialist (PSS) or an IBM Professional Server Expert (PSE), which provides unique incentives and rewards in recognition of re-seller and individual's technical achievements.

The courses descriptions and codes are:

- IBM Server Technical Training (V5051): PSS and PSE designation
- IBM Server/Novell NetWare Installation and Performance (V5052): PSE designation
- IBM Server/IBM LAN Server Installation and Performance (V5053): PSE designation
- IBM Server/Microsoft Windows NT (V5055): PSE designation

The professional roles being certified by IBM are:

- IBM Professional Server Specialist (PSS)

- IBM Professional Server Expert (PSE) - Novell NetWare
- IBM Professional Server Expert (PSE) - IBM LAN Server
- IBM Professional Server Expert (PSE) - Microsoft Windows NT
- IBM Professional Server Enterprise Expert (PSEE)

The Professional Server Enterprise Expert (PSEE) curriculum, open to those holding PSE designations, will include client/server-mainframe connectivity specialization paths with course work covering LAN, WAN, network management, backup/recovery and security.

To certify as a Professional Server Specialist (PSS) individuals must complete the IBM Server Technical Training course and gain a pass mark in the certification test. The PSS will receive a TechConnect PSE Priority mailing that includes the TechLink plus audio and video tapes and CDs.

To certify as a Professional Server Expert (PSE) individuals must complete the IBM server technical training course and one of the three IBM server/network operating system installation and performance courses. Individuals may choose more than one IBM server/network operating system installation and performance course.

In addition, two certification tests must be passed covering topics from the IBM server technical training course and one of the IBM server/network operating system installation and performance courses.

IBM will provide support to Professional Server Experts (PSEs) by offering the following benefits:

- Priority access to the IBM network and server support center via Internet to enable support of networks and effective problem determination and resolution of server/LAN issues.
- TechConnect PSE Priority mailing
- PSEs working for IBM business partners will enable their employer to take advantage of additional incentives on the purchase of IBM server product.
- Recognition programs will be run to recognize technical excellence in our IBM PSEs.

As a prerequisite to certifying as a Professional Server Expert, an individual must show proof of one of the following network operating systems certifications:

- Novell Certified NetWare Engineer (CNE)
- Certified OS/2 LAN Server Engineer
- Microsoft Certified Systems Engineer (MCSE)

For more information on TechConnect on the Web, go to the TechConnect home page:

<http://www.pc.ibm.com/techlink>

For information about OS/2 LAN Server certification, go to URL:

<http://www.austin.ibm.com/pspinfo/proroad.htm>

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## Appendix E. Key tuning parameters

This appendix gives the key parameters for which the tuning assistant calculates values and also gives the inputs which influence the setting of these parameters.

### **Netx X1**

Indicates the number of NetBIOS sessions the server allocates. This parameter must be set to a value less than or equal to the sessions parameter value in PROTOCOL.INI.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 32

Minimum = 2

Maximum = 254

Input used to calculate this parameter is:

Number of DOS RIPL requesters

Number of OS/2 RIPL requesters

Number of Additional Servers

Number of DOS requesters

Number of OS/2 requesters

User logged on at server

Lotus Notes on server

Number of concurrent users of Lotus Notes

**Netx X2**

Indicates the number of NetBIOS commands (network control blocks) the server can post. This parameter must be set to a value less than or equal to the commands (ncbs) parameter value in PROTOCOL.INI.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 50

Minimum = 16

Maximum = 255

Input used to calculate this parameter is:

Lotus Notes on server

Number of concurrent users of Lotus Notes

Maxusers

numreqbuf

numbigbuf

srvpipes

**Netx X3**

Indicates the number of NetBIOS names the requester allocates. This parameter must be set to a value less than or equal to the names parameter value in PROTOCOL.INI.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 14

Minimum = 5

Maximum = 254

Input used to calculate this parameter is:

Lotus Notes on server

Default value

**MAXUSERS**

Sets the maximum number of users who can use the server simultaneously. This parameter cannot exceed the maxconnections parameter value.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 45

Minimum = 1

Maximum = 1000 (250 per adapter specified in the IBMLAN.INI file)

Input used to calculate this parameter is:

Domain Controller or Additional Server

Number of Additional Servers

Number of DOS Requesters

Number of OS/2 Requesters



**MAXSHARES**

Specifies the maximum number of resources the server can share with the network.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 16

Minimum = 2

Maximum = 500

Input used to calculate this parameter is:

Number of shared applications

Number of home directories

Number of file and printer aliases

**MAXLOCKS**

Specifies the number of locks the server can have on non-386 HPFS files. The number of locks permitted on 386 HPFS files is bounded by the amount of heap space the 386 HPFS has available. This applies only to Entry servers.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 64

Minimum = 1

Maximum = 8000

Input used to calculate this parameter is:

maxopens

Entry or Advanced server

File system type

Maxlocks as a fraction of maxopens (specified in the assumptions)

## **MAXOPENS**

Specifies the maximum number of files, pipes and devices the server can have open at one time. The 386 HPFS servers ignore this parameter and allocate handles dynamically.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 250

Minimum = 1

Maximum = 8000

Input used to calculate this parameter is:

maxopens

Entry or Advanced server

File system type

Number of DOS Requesters

Number of DOS Requesters w/ Windows

Number of OS/2 Requesters

maxopens per DOS user (specified in the assumptions)

maxopens per DOS w/Windows user (specified in the assumptions)

maxopens per OS/2 user (specified in the assumptions)

maxlocks as a fraction of maxopens (specified in the assumptions)

Number of workstations using G/W (specified in assumptions)

Number using distributed feature (specified in assumptions)

## **MAXCONNECTIONS**

Specifies the maximum number of connections that requesters can have to the server. The maxconnections parameter must be greater than or equal to the maxusers parameter value. This parameter does not count connections to 386 HPFS server shares. There can be up to 2048 connections to 386 HPFS server shares, in addition to the maxconnections parameter value.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 128

Minimum = 1

Maximum = 2000

Input used to calculate this parameter is:

maxopens

Entry or Advanced server

File system type

Number of DOS Requesters

Number of DOS Requesters w/ Windows

Number of OS/2 Requesters

maxusers

IBMLAN.INI maxconnections for DOS users (specified in the assumptions)

IBMLAN.INI maxconnections for Windows users (specified in the assumptions)

IBMLAN.INI maxconnections for OS/2 users (specified in the assumptions)

**NUMREQBUF**

Specifies the number of buffers (with a size determined by sizreqbuf) the server uses to take requests from requesters.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 36

Minimum = 5

Recommended Maximum = 300

Input used to calculate this parameter is:

maxusers

Entry or Advanced server

numreqbufs per LS50/A user (specified in the assumptions)

numreqbufs per LS50/E user (specified in the assumptions)

**NUMBIGBUF**

Specifies the number of 64 KB buffers the server uses for moving large files containing large amounts of data.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 12

Minimum = 0

Maximum = 80

Input used to calculate this parameter is:

maxusers

Entry or Advanced server

File system type

Applications loaded from server

File access mode(sequential or random)

Maximum numbigbufs to generate (specified in the assumptions)

**MAXSEARCHES**

Specifies the maximum number of directory searches the server can perform simultaneously. This parameter is ignored on 386 HPFS servers.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 50

Minimum = 1

Maximum = 1927

Inputs used to calculate this parameter is:

maxusers

Number of DOS Requesters

Maxsearches per user (specified in the assumptions)

**SRVPIPES**

Specifies the maximum number of pipes that the server uses.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 3

Minimum = 1

Maximum = 20

Input used to calculate this parameter is:

maxusers

**NUMSERVICES**

Sets the size of the internal service table.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 12

Minimum = 4

Maximum = 256

Input used to calculate this parameter is:

Tuning Assistant sets this to 18.



**NUMDGRAMBUF**

Sets the number of buffers for processing datagrams.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 14

Minimum = 8

Maximum = 112

Input used to calculate this parameter is:

Number of Additional Servers

**MAX\_SAPS**

Specifies the maximum number of SAPs that can be open concurrently.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 3

Minimum = 1

Maximum = 126

Input used to calculate this parameter is:

Number of DOS RIPL requesters

Number of OS/2 RIPL requesters

Number of Additional Servers

Number of LAN attached printers

Number of OS/2 requesters

SNA gateway on server

APPC used on server

DB/2 on server

Number of DB/2 OS/2 requesters

LAN Network Manager on server

Number of other 802.2 applications

## **LINKS**

Specifies the maximum number of link stations that can exist for all service access points (SAPs) concurrently.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 8

Minimum = 1

Maximum = 155

Input used to calculate this parameter is:

Number of LAN adapters

Number of DOS RIPL requesters

Number of OS/2 RIPL requesters

Number of OS/2 requesters

LAN Network Manager on server

Number of bridges

SNA gateway on server

Number of workstations using gateway

APPC on server

Number of workstations for APPC applications

DB/2 on server

DB/2 DOS requesters

DB/2 OS/2 requesters

## **USERS**

Specifies the maximum number of applications that can use IEEE 802.2 protocol driver concurrently.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 3

Minimum = 1

Maximum = 12

Input used to calculate this parameter is:

Number of DOS RIPL requesters

Number of OS/2 RIPL requesters

Number of LAN attached printers

Number of OS/2 requesters

SNA gateway on server

Number of workstations using gateway

LAN Network Manager on server

**ELEMENTS**

Specifies the amount of queue space in memory.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 800

Minimum = 200

Maximum = 1400

Input used to calculate this parameter is:

USERS

## **GDTS**

Specifies the number of internal data descriptors to allocate for global descriptor table (GDT) selectors.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 30

Minimum = 10

Maximum = 30

Input used to calculate this parameter is:

Tuning Assistant sets this value to 30.

## **SESSIONS**

Specifies the maximum number of NetBIOS sessions that can be open simultaneously. Each session uses about 300 bytes.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 40

Minimum = 1

Maximum = 254

Input used to calculate this parameter is:

NETx X1 parameter

Are there other NetBIOS applications (Yes or No)

Number of NetBIOS sessions

Number of OS/2 requesters

DB/2 on server

Number of DB/2 OS/2 requesters

Number of DB/2 DOS requesters

## **COMMANDS**

Specifies the maximum number of network control block (NCB) descriptors to allocate for managing NCBs submitted to the NetBIOS protocol driver over any single network adapter.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 40

Minimum = 1

Maximum = 254

Input used to calculate this parameter is:

NETx X2 parameter

Number of LAN adapters

Number of NetBIOS commands

Are there other NetBIOS applications (Yes or No)

DB/2 on server



**NAMES**

Specifies the maximum number of NetBIOS names that can be defined over any single network adapter.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 21

Minimum = 2

Maximum = 254

Input used to calculate this parameter is:

Other NetBIOS applications

DB/2 on server

NETx X3 parameter

Number of LAN adapters

Number of NetBIOS names

**SELECTORS**

Specifies the number of internal data descriptors to allocate for global descriptor table (GDT) selectors.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 5

Minimum = 2

Maximum = 100

Input used to calculate this parameter is:

Number of LAN adapters

maxusers

**LOOPPACKETS**

Specifies the number of internal loopback packet descriptors.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 1

Minimum = 1

Maximum = 1000

Input used to calculate this parameter is:

Number of LAN adapters

**NAMECACHE**

Specifies the number of remote names that the workstation contacts.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 0

Minimum = 0

Maximum = 255

Input used to calculate this parameter is:

Number of LAN adapters

maxsessions

**NETBIOSRETRIES**

Specifies the number of times the NetBIOS protocol driver attempts transmissions at the NetBIOS level before assuming that the receiver is not present.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 8

Minimum = 1

Maximum = 50

Input used to calculate this parameter is:

Number of LAN adapters

maxusers

**PACKETS**

Specifies the number of I-frame packet descriptors that NetBIOS protocol driver can use to build data link control (DLC) frames from NetBIOS messages.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 350

Minimum = 1

Maximum = 1000

Input used to calculate this parameter is:

Number of LAN adapters

maxsessions

**DATAGRAMPACKETS**

Specifies the number of data descriptors to allocate for packeting NetBIOS datagrams into UI-frames.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 2

Minimum = 2

Maximum = 1000

Input used to calculate this parameter is:

Number of LAN attached printers

Number of LAN adapters

**MAXDATARCV**

Specifies the maximum size of the user data field (in bytes) in any frame that this node receives on a session.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 4168

Minimum = 512

Maximum = 16438

Input used to calculate this parameter is:

Number of LAN adapters

**ADAPTRATE**

Specifies the time, in milliseconds, between runs of the adaptive window algorithm.

The default used by Tuning Assistant and the minimum and maximum values are as follows:

Default = 1000

Minimum = 0

Maximum = 65535

Input used to calculate this parameter is:

Number of LAN adapters



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## Appendix F. Special Notices

This publication is intended to help IBM customers, resellers, I/T specialists, services specialists, system engineers and consultants to implement OS/2 Warp 4.0 and OS/2 Warp Server on an IBM PC Server platform. The information in this publication is not intended as the specification of any programming interfaces that are provided by IBM. See the PUBLICATIONS section of the IBM Programming Announcement for OS/2 Warp 4.0 and OS/2 Warp Server for more information about what publications are considered to be product documentation.

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## Appendix G. Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

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### G.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see "How to Get ITSO Redbooks" on page 297.

- *Inside OS/2 Warp Server, Volume 1*; SG24-4602-00
- *OS/2 Installation Techniques: The CID Guide*, SG24-4295-01

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### G.2 Redbooks on CD-ROMs

Redbooks are also available on CD-ROMs. **Order a subscription** and receive updates 2-4 times a year at significant savings.

CD-ROM Title	Subscription Number	Collection Kit Number
System/390 Redbooks Collection	SBOF-7201	SK2T-2177
Networking and Systems Management Redbooks Collection	SBOF-7370	SK2T-6022
Transaction Processing and Data Management Redbook	SBOF-7240	SK2T-8038
AS/400 Redbooks Collection	SBOF-7270	SK2T-2849
RS/6000 Redbooks Collection (HTML, BkMgr)	SBOF-7230	SK2T-8040
RS/6000 Redbooks Collection (PostScript)	SBOF-7205	SK2T-8041
Application Development Redbooks Collection	SBOF-7290	SK2T-8037
Personal Systems Redbooks Collection	SBOF-7250	SK2T-8042

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### G.3 Other Publications

These publications are also relevant as further information sources:

- *OS/2 Warp Server Advanced, Up and Running!*, S28H-0152-00



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## How to Get ITSO Redbooks

This section explains how both customers and IBM employees can find out about ITSO redbooks, CD-ROMs, workshops, and residencies. A form for ordering books and CD-ROMs is also provided.

This information was current at the time of publication, but is continually subject to change. The latest information may be found at <http://www.redbooks.ibm.com>.

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## How IBM Employees Can Get ITSO Redbooks

Employees may request ITSO deliverables (redbooks, BookManager BOOKs, and CD-ROMs) and information about redbooks, workshops, and residencies in the following ways:

- **PUBORDER** —to order hardcopies in United States
- **GOPHER link to the Internet** - type `GOPHER.WTSCPOK.ITSO.IBM.COM`
- **Tools disks**

To get LIST3820s of redbooks, type one of the following commands:

```
TOOLS SENDTO EHONE4 TOOLS2 REDPRINT GET SG24xxxx PACKAGE
TOOLS SENDTO CANVM2 TOOLS REDPRINT GET SG24xxxx PACKAGE (Canadian users only)
```

To get BookManager BOOKs of redbooks, type the following command:

```
TOOLCAT REDBOOKS
```

To get lists of redbooks, type one of the following commands:

```
TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET ITSOCAT TXT
TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET LISTSERV PACKAGE
```

To register for information on workshops, residencies, and redbooks, type the following command:

```
TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ITSOREGI 1996
```

For a list of product area specialists in the ITSO: type the following command:

```
TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ORGCARD PACKAGE
```

- **Redbooks Web Site on the World Wide Web**

<http://w3.itso.ibm.com/redbooks>

- **IBM Direct Publications Catalog on the World Wide Web**

<http://www.elink.ibm.com/pbl/pbl>

IBM employees may obtain LIST3820s of redbooks from this page.

- **REDBOOKS category on INEWS**
- **Online** —send orders to: USIB6FPL at IBMMAIL or DKIBMBSH at IBMMAIL
- **Internet Listserver**

With an Internet e-mail address, anyone can subscribe to an IBM Announcement Listserver. To initiate the service, send an e-mail note to [announce@webster.ibm.com](mailto:announce@webster.ibm.com) with the keyword `subscribe` in the body of the note (leave the subject line blank). A category form and detailed instructions will be sent to you.

### Redpieces

For information so current it is still in the process of being written, look at "Redpieces" on the Redbooks Web Site (<http://www.redbooks.ibm.com/redpieces.htm>). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

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## How Customers Can Get ITSO Redbooks

Customers may request ITSO deliverables (redbooks, BookManager BOOKs, and CD-ROMs) and information about redbooks, workshops, and residencies in the following ways:

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