COVER Book Cover

IBM PC Server 500 System/390

Introduction to the PC Server 500 System/390

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PS/2	Personal System/2
Presentation Manager	SQL/DS
S/370	System/370
S/390	System/390
VM/ESA	Virtual Machine/Enterprise System Architecture
VSE/ESA	Virtual Storage Extended/Enterprise System Architecture
VSE	VSE/POWER
VM/XA	Virtual Machine/Extended Architecture
VTAM	Virtual Telecommunications Access Method
SNA	Systems Network Architecture

PREFACE Preface

This book provides an introduction to the IBM PC Server 500 System/390, a Micro Channel computer which has the ability to run both OS/2-based applications and System/390-based applications on the same system. This book includes information about the hardware features, system configuration, I/O capabilities, and software support of the IBM PC Server 500 System/390. General guidelines on the installation process and performance are also included. Throughout this book, IBM PC Server 500 System/390 will be referred to as PC Server System/390.

Step-by-step instructions for installing and using the PC Server System/390 are included in the:

- *PC Server 500 System/390 Installation, Configuration, and User's Guide for VM/ESA*
- *PC Server 500 System/390 Installation, Configuration, and User's Guide for VSE/ESA*
- *PC Server 500 System/390 Installation, Configuration, and User's Guide for MVS/ESA*

P/390 messages are in the *PC Server 500 System/390 Messages and Codes*.

Subtopics
PREFACE.1 Who This Book Is For
PREFACE.2 How This Book Is Organized

PREFACE.1 Who This Book Is For

This book is intended for data processing professionals and managers who will be evaluating or implementing the PC Server System/390 for use in their information systems environment. It is also intended for anyone interested in knowing about the functions and capabilities of the IBM PC Server 500 System/390. A general understanding of the PC Server 500 and System/390 data processing and teleprocessing techniques is assumed. You should also be generally familiar with VM/ESA, VSE/ESA, or MVS/ESA and OS/2 operating system software.

PREFACE.2 How This Book Is Organized

This book contains the following chapters:

- Chapter 1, "Introduction to the IBM PC Server 500 System/390" in topic 1.0 contains an overview of the PC Server System/390 system.
- Chapter 2, "System Configuration and Support" in topic 2.0 describes the hardware and software options and alternatives available on the PC Server System/390, an overview of configuration and the installation process, and performance considerations.
- Chapter 3, "VM/ESA on the PC Server System/390" in topic 3.0 provides an overview of the capabilities of VM/ESA available on the PC Server System/390, describes the general installation process for VM/ESA and methods for distribution to other PC Server System/390 systems, and how these systems can be managed in an enterprise environment.
- Chapter 4, "VSE/ESA on the PC Server System/390" in topic 4.0 provides an overview of the capabilities of VSE/ESA available on the PC Server System/390, describes the general installation process for VSE/ESA and methods for distribution to other PC Server System/390 systems, and how these systems can be managed in an enterprise environment.
- Chapter 5, "MVS/ESA and OS/390 on the PC Server System/390" in topic 5.0 provides an overview of the capabilities of MVS/ESA available on the PC Server System/390, describes the general installation process for MVS/ESA and methods for distribution to other PC Server System/390 systems, and how these systems can be managed in an enterprise environment.
- Appendix A, "Documentation and Related IBM Manuals" in topic A.0 lists additional publications that describe the PC Server System/390 and the operating systems supported on the PC Server System/390.
- Appendix B, "Supported Facilities" in topic B.0 identifies System/370 and ESA/390 facilities that are supported by the PC Server System/390.

CHANGES Summary of Changes

Subtopics
CHANGES.1 Softcopy Version of Revision GC24-5717-01 (January 1996)
CHANGES.2 Softcopy Revision of GC24-5717-00 (December 1995)

#CHANGES.1 Softcopy Version of Revision GC24-5717-01 (January 1996)

#P/390 supports these additional functions:

#□ Support for OS/390

#□ Device managers to improve connectivity

New device managers

- AWSPBS
- MGR3172
- WAN3172

Enhanced device managers

- LAN3172 (was formerly AWS3172)
- AWSICA

#□ Additional DASD support: 3330, 3350, 3380, 3390, and 9345 DASD

#□ Support for ECKD-capable DASD

#□ Consolidation of P/390 messages in the *PC Server 500 System/390 Messages and Codes*

#Technical changes to this publication are indicated with revision bars.

#CHANGES.2 Softcopy Revision of GC24-5717-00 (December 1995)

#Technical changes to this version are indicated with revision bars.

1.0 Chapter 1. Introduction to the IBM PC Server 500 System/390

The IBM PC Server 500 System/390 brings together two powerful technologies:

- Compact, low-cost Micro Channel-based servers with their broad range of user-friendly interfaces and applications, and
- Enterprise System Architecture/390-based operating systems with their rich tradition of applications and functions supporting interactive and commercial processing.

(Throughout this book, the IBM PC Server 500 System/390 will be referred to as the PC Server System/390).

The PC Server System/390 offers unique and inexpensive solutions to customers who require ESA/390 architecture on a workstation or on a server in a Local Area Network (LAN) environment. The software provided with the PC Server System/390 offer new solutions to customers, for example:

- **Development workbench**:

  The PC Server System/390 provides an environment that helps developers design and maintain System/390 applications while relieving contention between production and development for host system resources. Development tools available with OS/2 can improve programmer productivity in designing and coding System/390 applications.

- **Distributed server**:

  For entry System/390 customers requiring total systems management of multiple remote systems, the PC Server System/390 provides a distributed platform capable of running System/390 and OS/2 applications.

- **LAN client/server**:

  As a LAN server, the PC Server System/390 can provide LAN services and it can integrate S/390 support into the LAN environment. As a LAN client, the PC Server System/390 can run LAN software that co-exists in an already established LAN network.

- **Entry System/390 server**:

  For entry System/390 customers who want new technology but need to reduce costs in their 43X1 and 937X environments, the PC Server System/390 offers substantial savings and outstanding capacity, scalability, and speed.

See "Selected PC Server System/390 Scenarios" in topic 1.7 for an illustration of these examples.

Subtopics

1.1 System Overview

The PC Server System/390 combines the features of PC Servers and an integrated S/390 Microprocessor Complex to produce a Micro Channel computer system that can execute both PC-based and System/390-based applications. (Throughout this book, the S/390 Microprocessor Complex will be referred to as the P/390). The P/390 and the programs supplied with it provide the hardware and software required to run System/390-based applications. The features of the PC Server and OS/2 software enable the P/390 programs to operate in the PC Server environment and to communicate with devices that support System/390 I/O operations.

Figure 1 illustrates the basic structure of the PC Server System/390.

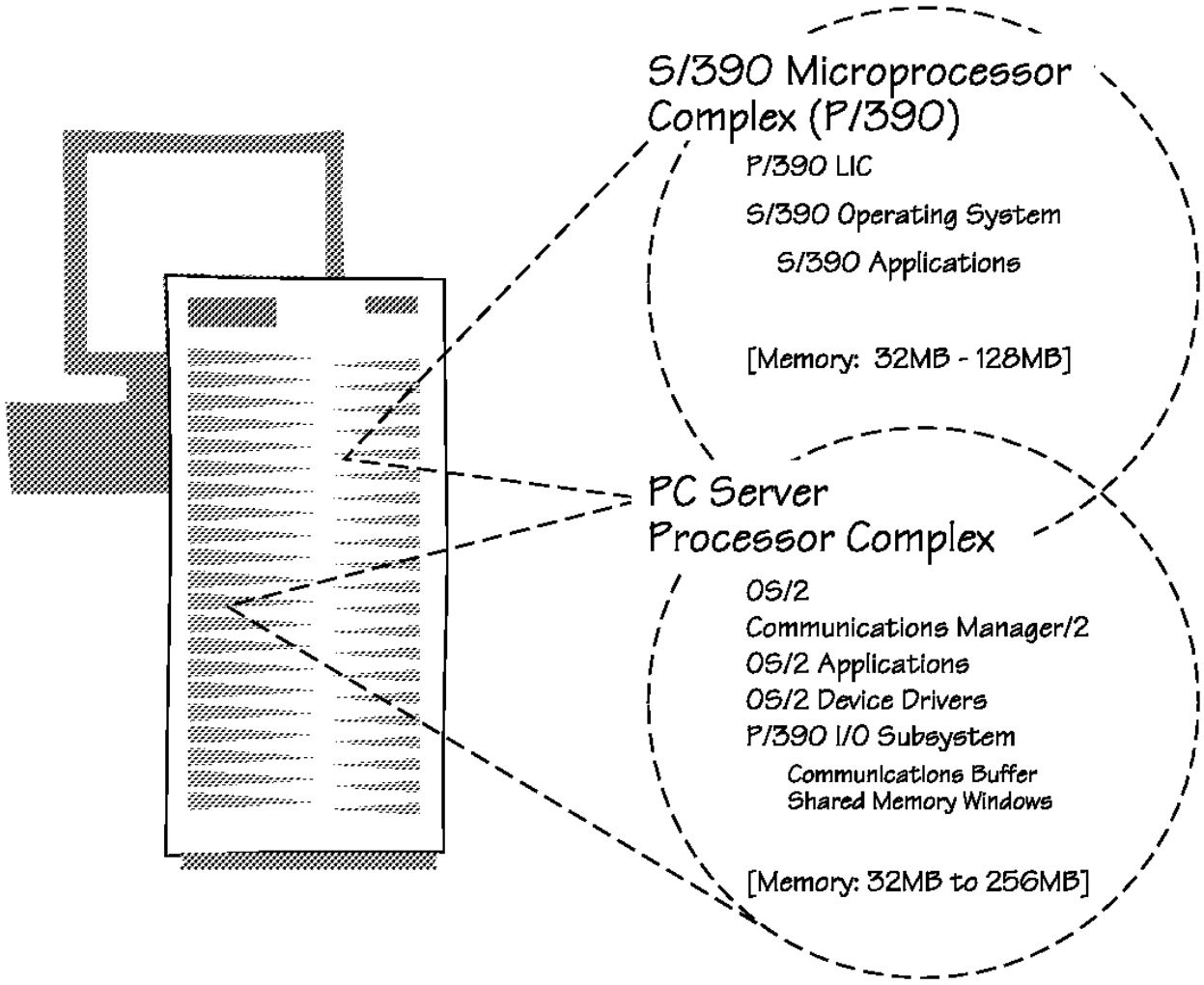

Figure 1. PC Server System/390 System Overview

1.2 PC Server System/390 Hardware Structure

There are two processor complexes in the PC Server System/390 system:

- The S/390 Microprocessor Complex or P/390
- The PC Server Processor Complex

This section describes the roles of these main components.

Subtopics
1.2.1 The S/390 Microprocessor Complex
1.2.2 The PC Server Processor Complex

1.2.1 The S/390 Microprocessor Complex

The S/390 Microprocessor Complex or P/390 provides the functions of an S/390 processor and is best understood when you look at its main parts.

- **The P/390 licensed internal code** is responsible for processor communication with the PC Server processor complex and for implementation of the ESA/390 architecture on the PC Server System/390 system. This code is supplied with the P/390 programs and is installed on the PC Server hard disk. It is loaded from the hard disk when an IPL command is executed.

- **The P/390** with the aid of the licensed internal code, can run the VM/ESA, VSE/ESA, MVS/ESA and OS/390 operating systems along with their applications. (Throughout this book, references to MVS/ESA includes OS/390 unless stated otherwise.) The System/390 microprocessor is implemented via a single 300,000 gate CMOS VLSI module. The P/390 supports the standard ESA/390 instruction set and facilities described in the *ESA/390 Principles of Operations*. In addition, PC Server System/390 can operate in S/370 mode. In S/370 mode, the standard S/370 instruction set and facilities as described in the *IBM System/370 Principles of Operation* are supported. Additional facilities provided by the PC Server System/390 are described in Appendix B, "Supported Facilities" in topic B.0.

  The P/390 takes advantage of the I/O capabilities of the PC Server processor complex to support S/390 I/O operations rather than having its own separate I/O capabilities. It utilizes an S/390 I/O subsystem implemented through device emulation software, device drivers, and PC Server devices controlled by the PC Server Processor Complex to service its I/O requests.

- **Real memory** for the P/390 consists of 32, 64, or 128MB of storage. This memory is part of the P/390 and is completely separate from the PC Server memory that comes with the PC Server System/390. It is dedicated to the P/390 and it is only used to support execution of the ESA/390 operating system and its programs. PC Server memory is used by the P/390 to support S/390 I/O operations only.

A communications buffer and shared memory windows are used for communication between the P/390 and the PC Server processor. The communications buffer resides in the PC Server physical address space. It provides a communication area between the P/390 and the software running on the PC Server processor. It is used to pass control information between the two systems for I/O operations and for other S/390 control functions such as start, stop, and IPL of the P/390.

There are 31 shared memory windows, each 128KB in size. One window is always reserved for control functions such as the communications buffer. The 31 windows are allocated in 4MB of the PC Server physical address space above the 16MB line. The shared memory windows are used mainly to transfer data between the P/390 and the PC Server processor for I/O operations.

1.2.2 The PC Server Processor Complex

Array and non-array models of PC Servers provide the function of the PC Server processor complex. These system units come with several features that facilitate the implementation of ESA/390 operating systems, as well as execution of OS/2 applications on the PC Server System/390. These features are highlighted in Chapter 2, "System Configuration and Support" in topic 2.0.

In addition to providing the support to run OS/2 applications, the PC Server processor provides the I/O support for the P/390 in place of System/390 channel hardware. Because the processor is a PC Server system unit, only PC Server I/O devices can be connected. Thus, the standard S/370 and S/390 I/O devices are emulated by device drivers, device managers, and utilities that come with the P/390 programs and by PC Server devices that are standard features of the system or are added through installation of additional device adapters.

If you have an S/370 Channel Emulator/A adapter installed in the PC Server System/390, you can also connect some S/390 I/O devices by using bus and tag cables.

Chapter 2, "System Configuration and Support" in topic 2.0 describes the I/O capabilities of the system and the S/390 I/O device emulation support.

1.3 P/390 Software Structure

Figure 1 in topic 1.1 also shows the major software components that run in each processor.

You should already be familiar with the software structure of an S/390 processor running VM/ESA, VSE/ESA, or MVS/ESA. If not, see the manuals listed in Appendix A, "Documentation and Related IBM Manuals" in topic A.0.

The new piece in the picture for a system running S/390 software is the PC Server processor complex and the programs running on it. These programs can be divided into three major components as shown in Figure 1 in topic 1.1:

- OS/2 operating system
- Communications Manager/2
- P/390 I/O subsystem

The OS/2 operating system and Communications Manager/2 are provided as standard pieces of PC Server support software. The P/390 I/O subsystem is supplied with the P/390 programs along with several utilities that provide support for the S/390 environment on the PC Server System/390. The PC Server System/390 software also includes programs that support access to VM host minidisks from CMS sessions running on the PC Server System/390. This facility, called Transparent File Access (TFA), is described in "AWSTFA: Transparent File Access" in topic 2.3.10.

Subtopics
1.3.1 OS/2 Operating System
1.3.2 Communications Manager/2
1.3.3 P/390 I/O Subsystem

1.3.1 OS/2 Operating System

OS/2 is required for operation of the PC Server System/390. The PC Server System/390 uses OS/2 facilities to control pieces of the PC Server system, including standard I/O devices, such as the display, keyboard, mouse, disks, and printer. The multitasking capabilities of OS/2 allow concurrent execution of OS/2 applications and the device managers and programs that support the P/390. Installation and operation of the S/390 environment are also integrated into the OS/2 environment.

OS/2 must be properly installed on the PC Server System/390 before the P/390 programs can be installed, because the installation steps use standard OS/2 commands to copy the P/390 to OS/2 formatted disks. This use of unaltered BIOS and OS/2 is an advantage for installation, backup, recovery, and debugging. No special tools are required to manipulate the PC Server disks, which contain standard OS/2 files representing both the P/390 programs and the S/390 disk volumes.

Standard OS/2 facilities are used for operation of the S/390 environment. Figure 2 shows an example of what the PC Server System/390's OS/2 desktop might look like when displayed on a PC Server System/390 running VM/ESA.

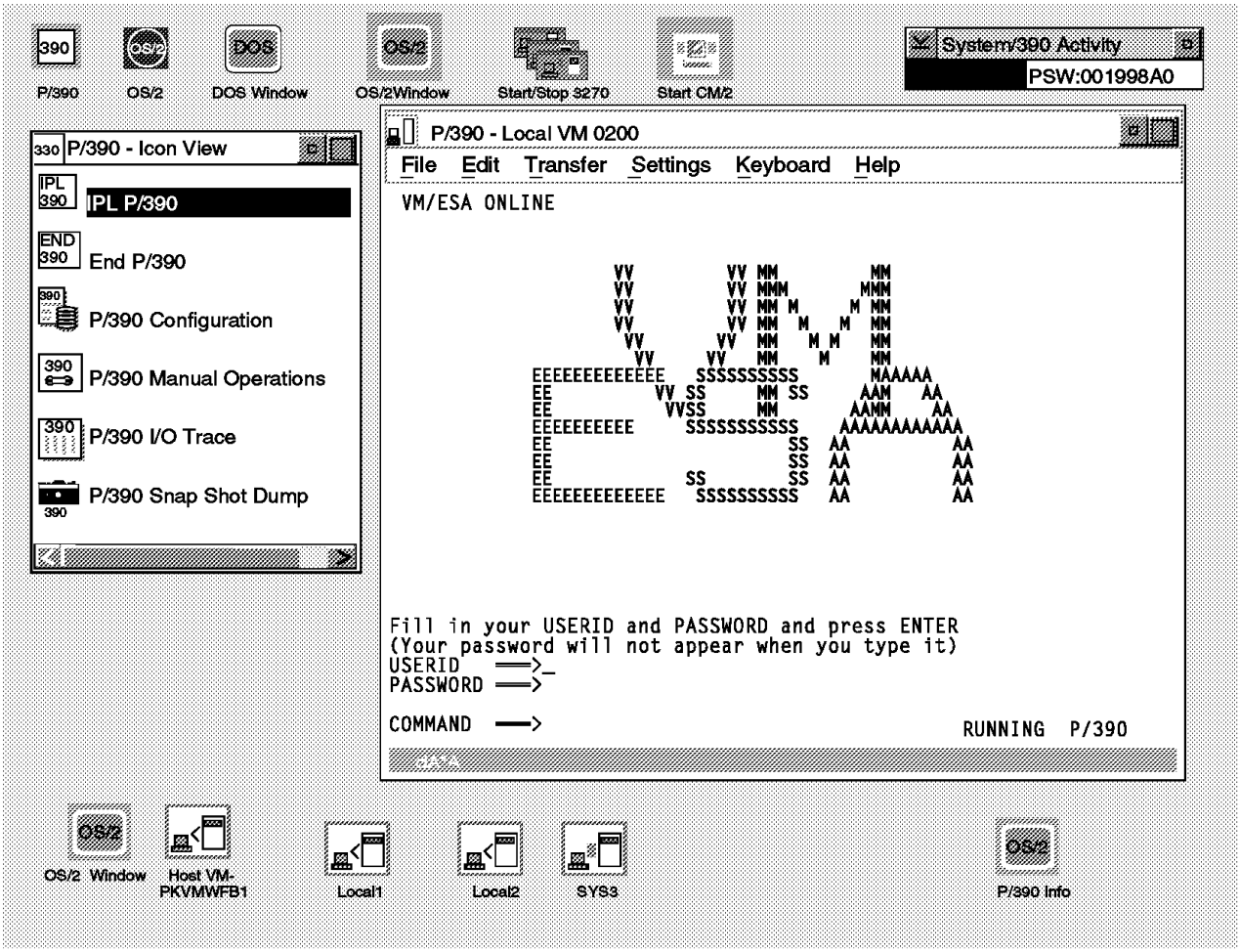

Figure 2. OS/2 Desktop Display of a PC Server System/390 Running VM/ESA

Communications Manager/2 and 3270 emulation sessions are used on the PC Server System/390 to access the ESA/390 operating system. These sessions are displayed in OS/2 windows, as are other functions related to the S/390 environment, such as the S/390 CPU activity window shown in the example. Some of the PC Server System/390 programs use the Presentation Manager interface to display screens that support the S/390 environment. Online help is also available.

P/390 icons are provided for easy access to the functions that are used to operate and support the S/390 environment. Figure 3 shows the icon folder that is displayed when the P/390 icon is selected from the OS/2 desktop.

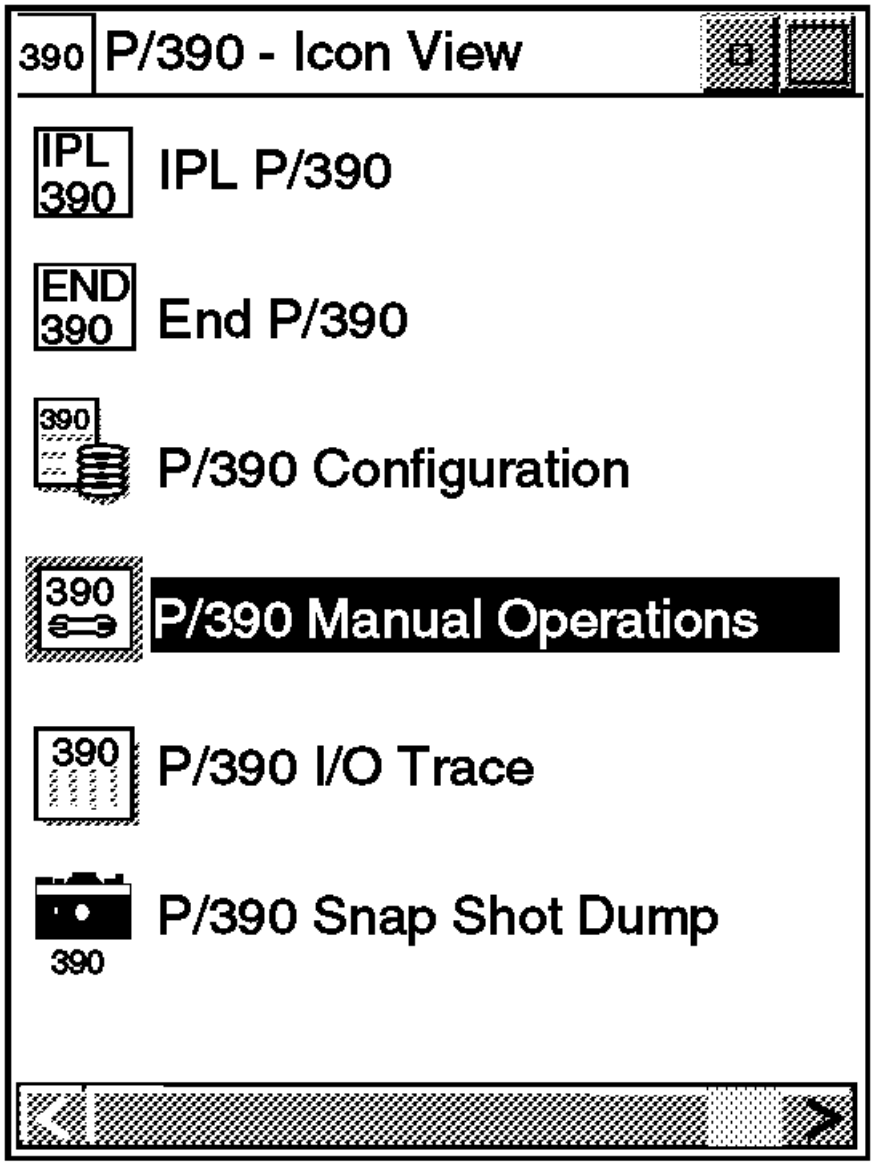

Figure 3. P/390 Icon Folder

The IPL P/390 icon can be included in the OS/2 startup options to automate the startup of the ESA/390 operating system when the PC Server System/390 is turned on.

1.3.2 Communications Manager/2

Communications Manager/2 (CM/2) provides communication support for the PC Server System/390. Installation and operation of the ESA/390 operating systems require 3270 sessions defined on the PC Server System/390 for use as operating system consoles and local 3270 terminals. CM/2 non-SNA DFT coax definitions are used to support these local 3270 emulation sessions that will be used by the PC Server System/390.

Up to five total non-SNA DFT sessions can be defined to CM/2 as 3270 logical terminals (LTs) for use on the PC Server System/390 itself. Any number of these can be allocated as local 3270 sessions. The remainder can be allocated as remote 3270 emulation sessions giving the PC Server System/390 access to 3270 sessions on a host mainframe system or another PC Server System/390 on the LAN.

CM/2 is also used to support connectivity between client workstations and PC Server System/390s on a LAN. Device emulators are provided with the P/390 programs to support access from OS/2, Windows**, and DOS workstations using 3270 emulation on a LAN to the ESA/390 operating system running in the PC Server System/390. Workstations can access the PC Server System/390 on any LAN that supports the IEEE 802.2 standard, such as IBM Token Ring, Ethernet, and Fiber Data Distributed Interface (FDDI). Full TCP/IP connectivity is also supported for PC Server System/390s running VM/ESA and MVS/ESA.

LAN adapter and protocol support (LAPS) is required on the PC Server System/390 for LAN connections. The LAPS function is provided by the Network Transport Services/2 (NTS/2) product that comes with Communications Manager/2.

These and other PC Server System/390 connectivity options are described further in Chapter 2, "System Configuration and Support" in topic 2.0.

1.3.3 P/390 I/O Subsystem

The P/390 I/O subsystem is supplied as part of the P/390 programs. It serves as the interface between the P/390 and PC Server programs and devices. It is made up of OS/2 application programs that emulate an S/390 channel, control units, and devices. The P/390 I/O subsystem consists of:

- P/390 device driver
- I/O control blocks (IOCBs)
- S/390 channel emulator
- Device manager emulators for S/390 I/O devices
- Device map (DEVMAP) for mapping emulated S/390 hardware devices to PC Server devices

Figure 4 illustrates how these components interrelate.

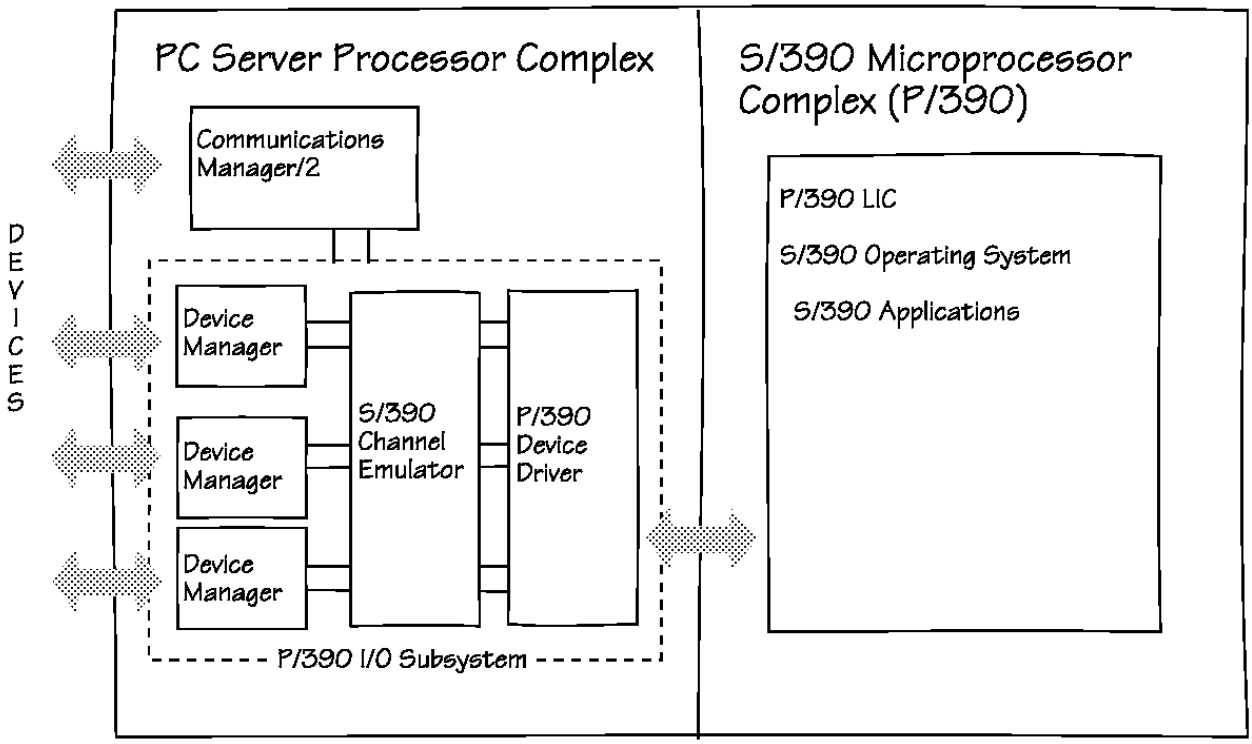

Figure 4. P/390 I/O Subsystem

Subtopics
1.3.3.1 P/390 Device Driver
1.3.3.2 IOCBs
1.3.3.3 S/390 Channel Emulator
1.3.3.4 Device Managers
1.3.3.5 Device Map (DEVMAP)

1.3.3.1 P/390 Device Driver

This device driver provides the interface between the P/390 and the OS/2 application programs that perform channel and device emulation.

Some of the functions it performs include:

- Starting and stopping the P/390
- Initial program load (IPL) of the P/390
- Handling of interrupts from the P/390
- Issuing interrupts to the P/390
- Loading the P/390 licensed internal code from the PC Server hard disk

It is written as a standard OS/2 device driver.

1.3.3.2 IOCBs

An I/O Control Block (IOCB) is created for each emulated device at initialization time. It contains all the status needed to describe the state of the device from the channel's point of view. The IOCB includes:

- CCW (channel command word)
- I/O count
- A pointer to the I/O buffer for the current operation
- Status and internal control indicators

The IOCB is the basis for all I/O activity to and from a device.

1.3.3.3 S/390 Channel Emulator

This program is supplied as an OS/2 application. It performs the S/390 channel emulation and interfaces between the device manager emulators and the P/390 device driver. It is invoked by the device driver when an I/O request is issued by the S/390 processor and passes control to the appropriate PC Server System/390 device managers and Communications Manager to perform the I/O operation. It is given control by the device manager or CM/2 when the S/390 I/O request completes, and passes control to the device driver to issue an I/O interrupt to the P/390 to signal completion and provide status.

1.3.3.4 Device Managers

These programs are also OS/2 applications. They act as control units and emulate S/390 devices using PC Server hardware, OS/2 software, or both. Disk, tape, printer, unit record, and communication devices are emulated. The specific device managers supplied with the PC Server System/390 are described in "Device Managers" in topic 2.3.

1.3.3.5 Device Map (DEVMAP)

The PC Server System/390 is able to emulate host S/390 I/O because it maps S/390 hardware devices to PC Server devices. Device mapping is the process of relating S/390 device definitions to the PC Server device that will emulate it. For example, an S/390 DASD device is mapped to an OS/2 file.

The P/390 I/O subsystem uses resources available on your PC Server System/390 to emulate the devices available on larger S/390 systems. The following table shows some of the device mapping that is used to achieve this emulation:

Host System/390 Device	**PC Server Equivalent Device**
3270 Information Display	Monochrome or color display
FBA, CKD, ECKD-capable DASD	OS/2 file
3215	OS/2 Presentation Manager session
2703	Serial (COM) ports
2540 card reader	OS/2 file
1403 printer	OS/2 print spooler
3088 (CTC)	LAN adapter
3422 Tape Drive	OS/2 file
Special (VM)	Host Transparent File Access
Special (VM)	Import/export PC data
ICA synchronous	SDLC/BSC connection
3172	LAN VTAM connection
3172	LAN TCP/IP connection
9346	3450 Model 1
3420/3480 Tape Drive	DAT (digital audio tape)
3745/NCP	Token Ring

Device mapping is performed by a supplied utility program called the *P/390 Configurator*. The Configurator is menu-driven. Changes to system configuration are easily made by changing the values in data menus. The Configurator also provides menus to simplify creation and maintenance of VM user IDs and minidisks.

Device maps DEVMAP.1VM for VM/ESA and DEVMAP.VSE for VSE/ESA are supplied with the VM/ESA preconfigured system and the VSE/ESA preconfigured system to help you get started.

See "PC Server System/390 Configurator" in topic 2.5 for more information on the Configurator and device maps.

The following example of reading a 3380 DASD device summarizes how the S/390 I/O subsystem emulates I/O operations on the PC Server System/390:

1. The ESA/390 operating system does an SSCH to real device 100.

2. The P/390 licensed internal code passes all I/O instructions to the P/390 I/O subsystem running on the PC Server processor complex.

3. The S/390 channel emulator executes the S/390 channel program and passes the request to the device manager that has claimed that range of devices in DEVMAP. In this example, it would be an CKD device manager.

4. The CKD device manager gets the request for device 100. It looks in the DEVMAP entry for device 100 to find out the OS/2 file name for the 3380 device 100. The device map points to an OS/2 file that emulates the S/390 disk drive, for example, D:\VM\MAINT.191 for a VM/ESA system, D:\VSE\DOSRES.140 for a VSE/ESA system, or D:\MVS\P390R5.120 for an MVS system.

5. A request is issued to OS/2 to read data from the OS/2 file named MAINT.191 in the \VM directory of disk drive D:, from the OS/2 file named DOSRES.140 in the \VSE directory of disk drive D:, or from the OS/2 file named P390R5.120 in the \MVS directory of disk drive D:.

6. OS/2 issues the request for the data to the PC Server device containing disk drive D:.

7. The data is passed back up the line until it is presented to the requesting operating program.

1.4 Commands and Utilities

Several commands and utility programs are used with the PC Server System/390 in addition to those provided by the OS/2, VM/ESA, VSE/ESA, and MVS/ESA operating systems. These are useful when operating P/390 functions on the PC Server System/390.

Subtopics

1.4.1 Commands

CMS commands shipped with the PC Server System/390 complement those provided by the VM/ESA operating system. CMS users can invoke these commands from VM sessions running on the PC Server System/390 to access host VM data and OS/2 files and to interact with the OS/2 environment. These are included with the VM/ESA preconfigured system.

Table 1 lists the commands and their functions:

Table 1. Commands and their functions

Command	**Function**
CACHE	Install and control CMS minidisk cache for TFA in CMS virtual machines using TFA
HDETACH	Detach a host VM minidisk
HLINK	Establish a link from a PC Server System/390 VM session to a host VM minidisk
HQUERY	Display information about host VM minidisks
LTRENAME	Rename the title bar for a 3270 session
MOUNT	Associate an OS/2 file specification with a PC Server System/390 emulated tape drive
OS2	Execute an OS/2 command from a PC Server System/390 virtual machine
PCOPY	Copy (import/export) files between OS/2 and VM
PIPE OS2	Use the OS2FILE stage command in a pipeline running under CMS to read or write an OS/2 file on an associated OS/2 system
PIPE OS2FILE	Read or write OS/2 files from CMS pipelines
TFA	Activate the Transparent File Access functions in a PC Server System/390 virtual machine

See "PC Server System/390 CMS Commands" in topic 3.2 for additional information about these commands and the *PC Server 500 System/390 Installation, Configuration, and User's Guide for VM/ESA* for a detailed description of the commands.

1.4.2 Utilities

Several OS/2 and P/390 utilities are supplied with the P/390 programs to help control and operate the PC Server System/390. The interactive functions invoked by the P/390 icons use some of these utilities to perform their tasks. Because the utilities are OS/2 programs, they can be invoked from an OS/2 command prompt to accomplish these and other tasks without using one of the PC Server System/390 interactive interfaces. Some of the utilities can also be used to implement user-written device managers.

Table 2 lists the commands and their functions:

Table 2. Utilities and their functions

Utility	**Function**
ALC.EXE	Allocate files as FBA DASD, display volume information, and change volume labels
AWSCFG.CMD	Invoke the P/390 Configurator
AWSCMLT.EXE	Configure logical terminal sessions on PC Server System/390s and OS/2 workstations
AWSMOUNT.EXE	Change the DASD or tape configuration dynamically
AWSPROF.EXE	Record the name and location of the DEVMAP to use as the default for the Configurator and IPL
AWSSTART.EXE	Start P/390 device managers
AWSSTAT.EXE	Display or change the status of the P/390 I/O subsystem and device managers
BLDLIST.CMD	Build a file containing a list of SEND/RECEIVE or COPY commands for all the files in a specified subdirectory
CLRIO.EXE	Issue a CLEAR I/O instruction to devices attached to the S/370 Channel Emulator/A
C370TRC.EXE	Take low level trace of the S/370 Channel Emulator/A
DEV2NAME.CMD	Create an ASCII file from a DEVMAP file
IPL.CMD	Start the channel subsystem and IPL the P/390
LTRENAME.EXE	Rename the title bar of a CM/2 3270 session
RDEVMAP.CMD	Reconfigure directory and pathnames in a DEVMAP
SYSOWN.CMD	Avoid rebuilding the VM CP nucleus when you want to add a new volume. Applies only to VM/ESA 370 Feature.
9346CMD.EXE	Issue tape positioning commands to the 1/4-tape drive

1.4.3 VSE/ESA TMOUNT Utility

This utility program called TMOUNT.JCL is also provided for VSE/ESA. This program runs in a VSE/ESA batch partition and performs the same functions for VSE/ESA that the CMS MOUNT command and AWSMOUNT utility provide for VM/ESA and OS/2 respectively.

1.5 Operating Systems Support

The PC Server System/390 comes with the following operating systems and products:

- OS/2 software

  - OS/2 Warp Version 3.0
  - Communications Manager/2 Version 1.11 with NTS/2 Version 2.14
  - NetFinity Version 2.01 (on ServerGuide)

- ESA/390 operating systems

  - VM/ESA ESA Feature (current release)
  - VSE/ESA (current release)
  - MVS/ESA Version 4 (current release) and Version 5 (current release)
  - OS/390 (current release)

To find out the current release level for the operating system that is supported, contact your IBM marketing representative, or IBM authorized dealer, or call 800-IBM-CALL in the U.S. and Canada.

The ESA/390 operating systems are distributed on any currently supported tape, including the new tape media, 4mm digital audio tape (DAT). The VM/ESA and VSE/ESA preconfigured systems are distributed on compact discs. The OS/2 and Communications Manager/2 are also distributed on compact discs. Additional compact discs also contain VM/ESA, VSE/ESA and MVS/ESA publications in softcopy format for use with BookManager Read/2.

See Chapter 3, "VM/ESA on the PC Server System/390" in topic 3.0, Chapter 4, "VSE/ESA on the PC Server System/390" in topic 4.0, and Chapter 5, "MVS/ESA and OS/390 on the PC Server System/390" in topic 5.0 for additional considerations for running VM/ESA, VSE/ESA and MVS/ESA on the PC Server System/390.

1.6 Problem Determination Facilities

The PC Server System/390 has several facilities to assist with hardware and software problems. These consist of:

- Hardware diagnostics
- PC Server System/390 software facilities
- PC Server System/390 messages

Subtopics

1.6.1 Hardware Diagnostics

The PC Server System/390 has two sets of diagnostics to help locate hardware problems:

- PC Server system reference and diagnostics diskettes
- P/390 advanced diagnostics and option diskette

The backup copy of the PC Server system reference and diagnostics diskettes contains the diagnostics to check the PC Server hardware and adapters that have been installed.

The P/390 diagnostics diskette is used to check out the P/390.

A ServerGuide compact disc and hard disk recovery programs are also provided for the RAID controller that comes with the array model of the PC Server System/390.

1.6.2 P/390 Software Facilities

VM/ESA, VSE/ESA and MVS/ESA use the same problem determination tools on the P/390 for debugging ESA/390 operating system and applications problems as they do on S/390 mainframe systems.

Standard OS/2 debugging tools can also be used to assist with problems with the P/390 I/O subsystem on the PC Server System/390 because many of the functions use OS/2 facilities and PC Server devices.

The P/390 also has tools for controlling and debugging the system:

- P/390 Manual Operations session provides the function of the S/390 hardware console as on mainframe systems. This facility is described in "P/390 Manual Operations Session" in topic 1.6.3.

- P/390 status window displays the PSW and current status of the S/390 processor. An example of this window was shown in Figure 2 in topic 1.3.1.

- P/390 I/O trace is used to trace I/O requests between the P/390 and its I/O subsystem. The trace can be selective by device and can be written to an OS/2 file. It can also be displayed in a Presentation Manager window by selecting the P/390 I/O trace icon.

- Kernel Trace is a low-level trace of all interactions between the P/390 and the S/390 channel emulator program.

- Snap Shot Dump provides a dump of the S/390 I/O subsystem and is intended for use by the IBM support center. It is invoked with an icon in the P/390 icon folder.

1.6.3 P/390 Manual Operations Session

The P/390 Manual Operations session is a general-purpose debug facility. It performs functions similar to those of the maintenance console found on many mainframes. These include:

- Start, stop, IPL, and reset the P/390
- Display and modify S/390 memory and registers
- Perform control functions such as address stop, instruction step, store status, and enable TOD clock
- Display and modify S/390 internal control blocks
- Search S/390 real memory

Reference cards ("green cards") for S/370 and ESA/390 are also included as part of the online help facility. Presentation Manager interfaces are used to provide displays consistent with other OS/2 applications.

Knowledge of the ESA/390 architecture is essential to the proper use of these processor control functions. Information about ESA/390 architecture is found in *IBM ESA/390 Principles of Operation*, GA22-7201.

#1.6.4 The 3172 SDLC Gateway

The 3172 SDLC Gateway provides a dynamic display of resource status and traffic throughput in a Presentation Manager-based window. This function supports MVS only. The status monitor displays the following information:

- Adapter information
  - Link station ID
  - Link station address
  - Adapter status
- Link station information
  - Bytes and messages sent and received
  - Number of nonproductive polls
  - Number of times the link station is flow-control blocked in each direction
  - Current status of flow-control blockage
  - Rate of these counters
- Subchannel adapter information
  - Bytes and frames transmitted and received
  - Rate at which bytes and frames are transmitted and received

The status monitor includes commands to collect debugging information and to terminate the 3172 SDLC Gateway operation.

1.6.5 Messages

Messages are produced by different parts of the PC Server System/390 software to aid in operation of the system and resolution of problems.

- The VM/ESA, VSE/ESA, and MVS/ESA operating systems and their component products generate the same messages and error codes when running on the PC Server System/390 as on S/390 mainframe systems. These are explained in the messages and codes manuals and reference manuals distributed with the respective operating systems.

- OS/2 also generates messages and return codes. Explanations of these are documented in the OS/2 manuals distributed with the system.

The P/390 programs generate two kinds of messages:

- Configurator messages, which you see only when you are running the Configurator.

- P/390 LIC program messages, which are identified by the letters *AWS* at the beginning of each message identifier. These are logged to an OS/2 file. These messages are documented in the *PC Server 500 System/390 Messages and Codes*.

1.7 Selected PC Server System/390 Scenarios

The following pages describe sample environments in which the PC Server System/390 can support your business or enterprise. The scenarios are only intended to outline the possibilities. They should not be used as a guide to establish a specific environment.

The following scenarios show the PC Server System/390 as:

- A Development workbench
- A Distributed server
- An Entry S/390 server

Subtopics
1.7.1 Development Workbench
1.7.2 Distributed Server
1.7.3 Entry S/390 Server

1.7.1 Development Workbench

Figure 5 shows an enterprise organized to help programmers develop, test, and maintain mainframe applications. By using the PC Server System/390 as a development workbench, it serves as a dedicated platform for developing, testing, and maintaining mainframe applications resulting in higher productivity.

Constraints on host system capacity can be alleviated by prioritizing application development and system programming functions to PC Server System/390s on the LAN. Systems and applications developers can continue to access the mainframe to move applications, data, and system changes between the mainframe and PC Server System/390s on the LAN.

PC-based tools can help improve programmers' productivity in system analysis, design, re-engineering, and coding of S/370 and S/390 applications. For example, the card reader emulator that is available with the PC Server System/390 improves programmers' productivity by automatically submitting jobs to VM, VSE, or MVS from OS/2 files. New commands and utilities supplied with the PC Server System/390 software can also aid in using the PC Server System/390 facilities.

Applications can be compiled and tested without interrupting host production systems. As applications proceed through their stages of development, client workstations that access the host across the LAN for production applications can access this end-user test machine to validate the applications before they are moved to the mainframe. Applications tested in this native S/390 environment can be uploaded to the host system through connectivity facilities provided by the PC Server System/390 and the ESA/390 operating systems that run on it.

System programmers can benefit from the PC Server System/390 by having an environment for installing and testing system changes that is isolated from production and development systems. Changes to system software can be validated on a PC Server System/390 that is an image of the production system before they are installed on the mainframe.

With the host mainframe connected to the LAN with devices such as the 3172 controller or an integrated mainframe LAN adapter, full SNA connectivity is available between the mainframe and the LAN-attached devices to support these types of environments. PC Server System/390s can communicate peer-to-peer across the LAN with the mainframe and with each other. Workstations can communicate with PC Server System/390s on the LAN, with the mainframe, or both.

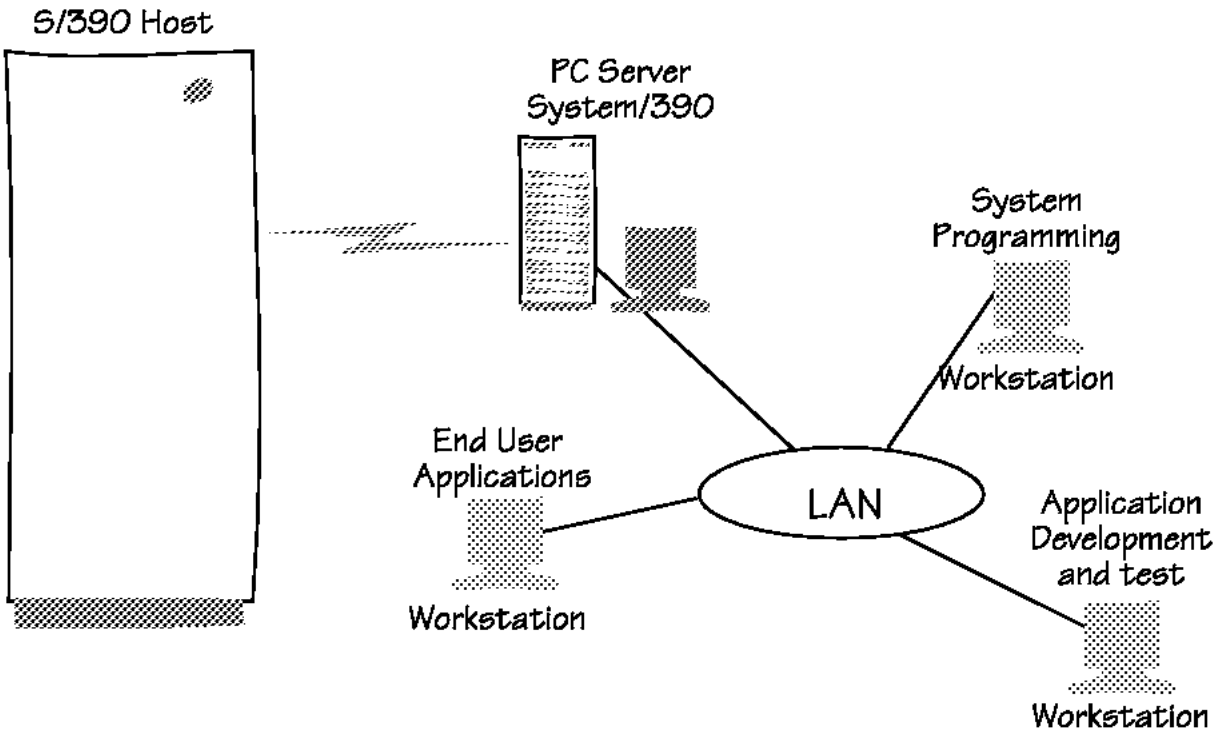

Figure 5. PC Server System/390 as a Development Workbench

1.7.2 Distributed Server

Figure 6 shows an example of the PC Server System/390 participating in multiple local and remote enterprises.

Remote Server: If you have a business or enterprise that needs total systems management of multiple remote systems, the PC Server System/390 provides a distributed platform that is capable of running both ESA/390 and OS/2 applications. Remote locations can run their businesses autonomously while receiving consistent services, such as business applications, regional and corporate data, system skills, and transparent systems management, from the host. Cost savings are achieved by consolidating skills at the host, by eliminating administrative skills at the remote sites, and by reducing telecommunications costs.

Client/Server: Businesses distribute workloads for many reasons, for example, to improve productivity, to increase local control, and to improve workload balancing. The PC Server System/390 can participate fully in a LAN environment as a server or as a client. As a LAN server, it can integrate the S/390 support into the LAN environment with single server management running OS/2 LAN Server. This has a wide variety of uses, for example, as a print server, a file server, and a dedicated batch machine. As a client, the PC Server System/390 can run any LAN requester software that co-exists in an already established LAN network. This co-existence provides flexibility in choice of a LAN environment, the high availability of a S/390 system, drop-in support, and flexible implementation.

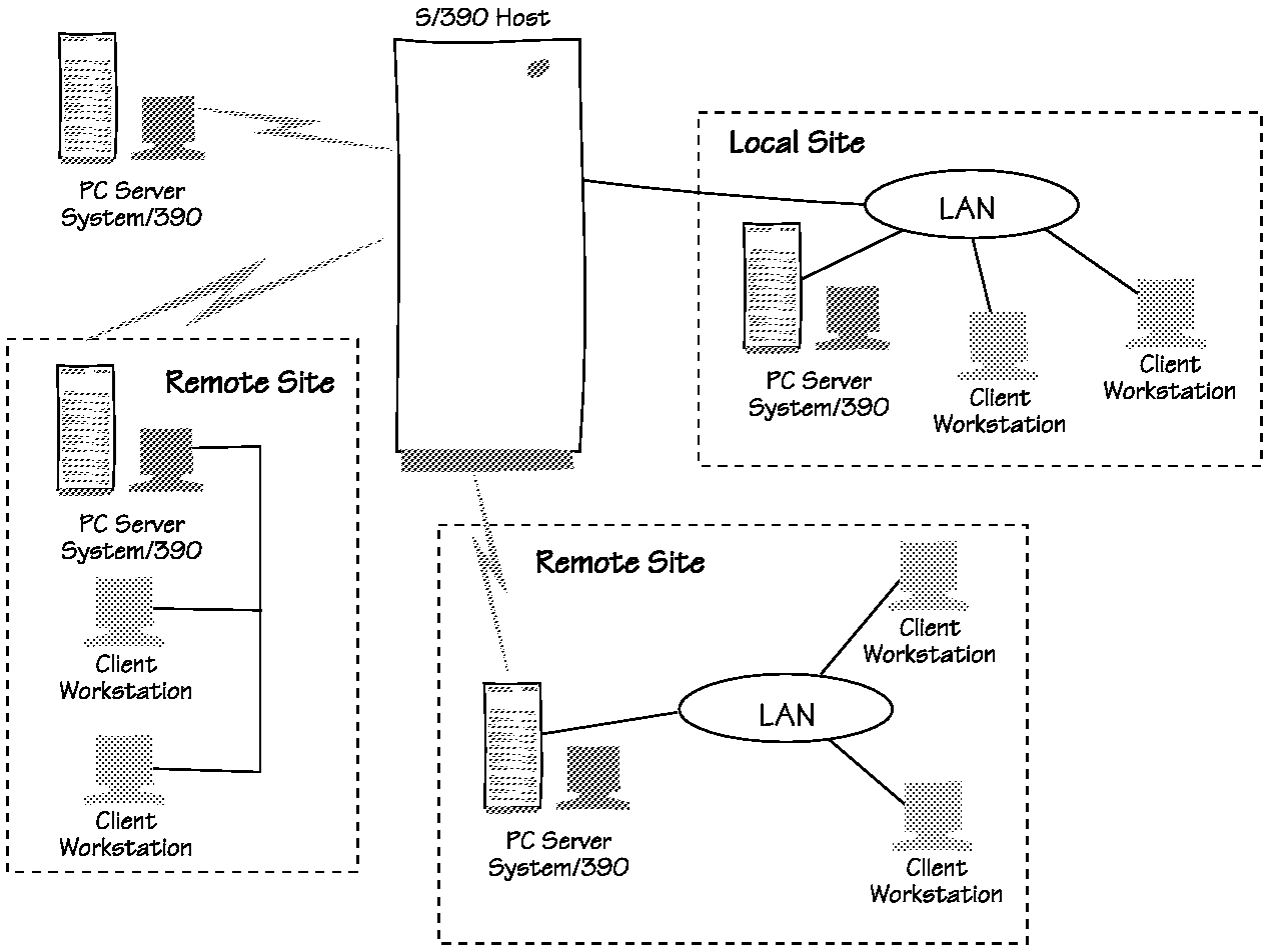

Figure 6. PC Server System/390 in Distributed Environments

#P/390 and its 3172 SNA Communications Programs support NetView (or NetView equivalent) SNA network management.

1.7.3 Entry S/390 Server

Figure 7 shows how you can replace S/370 mainframe systems that are outdated or are at capacity with new technology. Substantial savings can be demonstrated in lower maintenance costs on both the processor and DASD, lower energy costs, lower connectivity costs, and environmental savings. You have the flexibility of configuring the PC Server System/390 as a standalone system or integrating it into a LAN environment. You can also attach tape drives, printers, and communication controllers to the PC Server System/390 by using the S/370 Channel Emulator/A card. There are more savings when you migrate the data to internal, integrated disk storage and use a LAN interface to connect printers, terminals, and workstations.

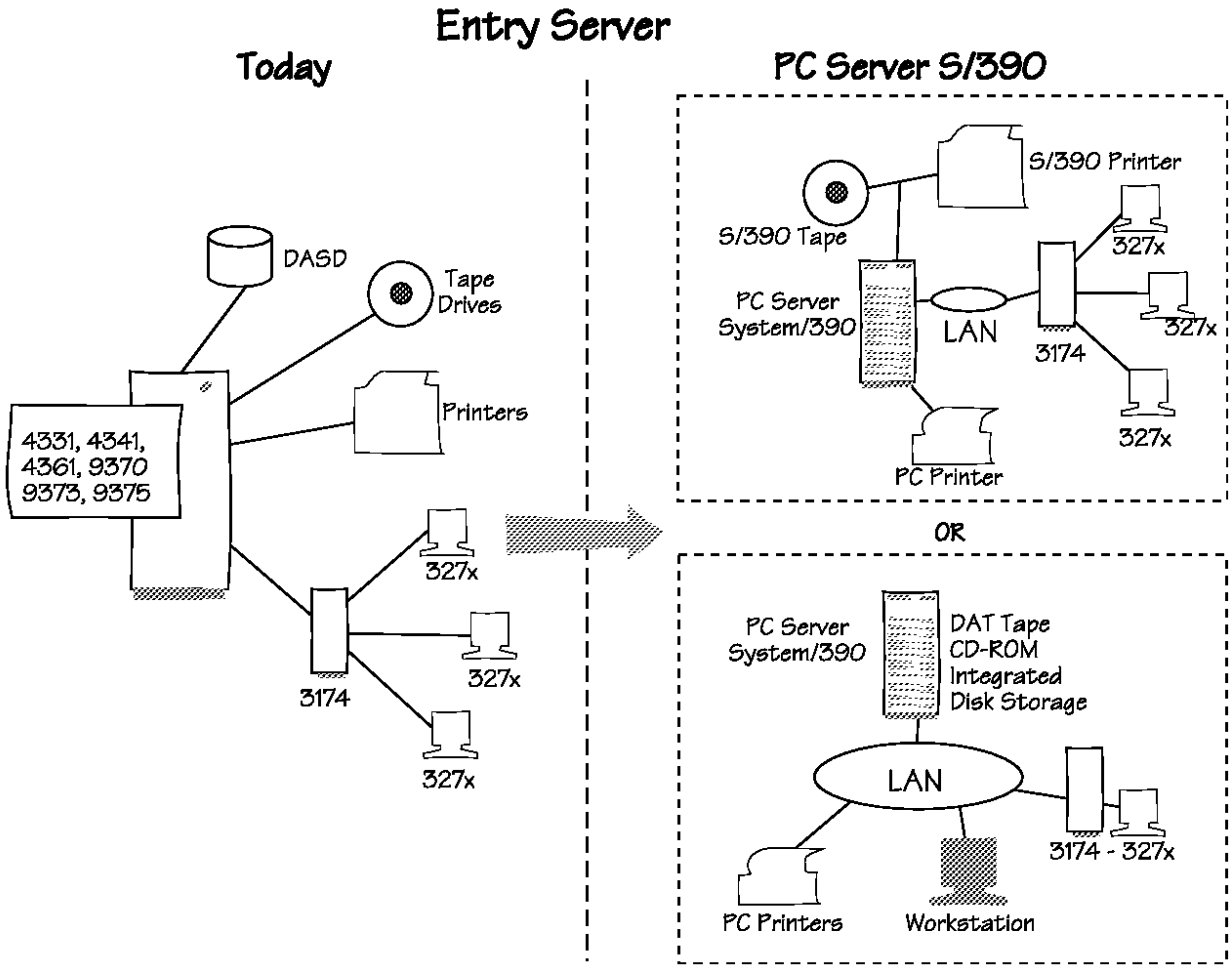

Figure 7. PC Server System/390 as an Entry Server

2.0 Chapter 2. System Configuration and Support

This chapter describes the hardware configuration supplied with the PC Server System/390, additional I/O devices supported by the PC Server System/390 and the S/390 devices that can be emulated on it. It also outlines the basic requirements for the hardware and software and identifies some performance factors to consider when using the system.

Detailed installation instructions are provided in the:

- *PC Server 500 System/390 Installation, Configuration, and User's Guide for VM/ESA*
- *PC Server 500 System/390 Installation, Configuration, and User's Guide for VSE/ESA*
- *PC Server 500 System/390 Installation, Configuration, and User's Guide for MVS/ESA*

and other PC Server System/390 books listed in Appendix A, "Documentation and Related IBM Manuals" in topic A.0.

Subtopics

2.1 Hardware Configuration

Several models of the PC Server System/390 systems are available based on array and non-array PC Servers.

Additional details about the capabilities and features of these components of the PC Server System/390 systems can be found in the *User's Reference* and related publications listed in "PC Server System/390 Booklets and Manuals" in topic A.1.

The following highlights the features that are standard on the PC Server System/390:

- Intel Pentium Microprocessor
- IBM S/390 Microprocessor Complex with 32MB ECC standard memory expandable to 128MB
- IBM Enhanced Keyboard and Mouse
- IBM PC Server Super Video Graphics Array (SVGA) Adapter
- IBM Fast/Wide Streaming RAID Adapter/A (on array systems)
- IBM SCSI-2 Fast/Wide Adapter/A (on non-array systems)
- 40MB Data Streaming Micro Channel
- 32MB-70ns ECC Memory expandable to 256MB
- 2.88 Diskette Drive
- 4mm Digital Audio Tape (DAT)
- IBM SCSI-2 Fast/Wide Hard Disks
- IBM Enhanced Internal CD-ROM II Drive

Subtopics

2.1.1 PC Server Processor Complex

The Pentium processor has two 8KB internal caches and a 256KB dual-ported level 2 cache. The processor complex features 40MB per second streaming data rates on the Micro Channel and SynchoStream technology, a technology that streams data in parallel between system memory, the processor, and the Micro Channel. These features provide processing and data throughput capabilities necessary for support of OS/2 and S/390 operating systems running on the same system.

The PC Server processor memory can be expanded to accommodate the requirements of the OS/2 operating system and the PC Server System/390 programs that run under OS/2. The system comes standard with 32MB of ECC 70 nanoseconds random access memory (RAM) expandable to 256MB. The standard system has adequate memory to support OS/2, Communications Manager/2, and the P/390 programs that run under OS/2 in support of the S/390 operating systems. If you have requirements for additional OS/2 applications on the same machine, refer to the application documentation for additional system resources that may be required.

2.1.2 S/390 Microprocessor Complex

The S/390 Microprocessor Complex (P/390) provides the function of an System/390 processor. Its features were described in "PC Server System/390 Hardware Structure" in topic 1.2. The P/390 is pre-installed on the PC Server System/390.

2.1.3 Drives

One or more 2.25GB SCSI-2 hard disk drives, one internal CD-ROM drive, and one 3.5-inch, 2.88MB diskette drive are installed on the PC Server System/390. Additional hard disks can be installed in the remaining open bays to meet the DASD storage needs of the OS/2 and S/390 operating systems.

2.1.4 Controllers

The array and non-array systems each come with a controller. The array system comes with an IBM SCSI-2 Fast/Wide Streaming RAID Adapter/A. The non-array system comes with a SCSI-2 Fast/Wide Adapter/A. Both controllers transfer data at 40MB per second streaming to the Micro Channel and 20MB per second on the SCSI bus. The RAID (Redundant Array of Inexpensive Disks) technology supports RAID levels 0, 1, and 5. This technology complements the data recovery facilities provided in VM/ESA, VSE/ESA, and MVS/ESA by using hardware data replication and recovery facilities. Both controllers provide improvements in disk performance that are essential to the throughput of S/390 interactive and transaction processing applications.

On array systems, hard disks are grouped into arrays and data is stored across the drives using a process called *striping*.

RAID level 0 Stripes the data across all of the drives of the array. However, data is not replicated and a hard disk failure results in loss of *all* data of the array.

RAID level 1 Stripes the data and duplicates the data across all of the drives of the array with each data stripe on a different drive than its duplicate. Data is recoverable if a hard disk fails, however, the available disk capacity is 50% of the physical capacity of the drives.

RAID level 5 Stripes the data and parity of the data in parallel across all the drives of the array. Data can be recovered if a hard disk fails. The use of parity also provides more available disk capacity than RAID level 1. The system can continue in degraded mode until the failed drive is replaced. This option is recommended because it provides a good balance for performance, recoverability, and disk capacity.

Use of this technology on the PC Server System/390 is transparent to the user.

The IBM Fast/Wide Streaming RAID controller allows you to select the stripe size when you first create an array. It supports stripe sizes of 8K, 16K, 32K and 64K. The default size is 8K. A larger stripe size usually gives better performance for S/390 workloads.

2.1.5 I/O Ports

The display, keyboard and mouse are connected to I/O ports on the back of the PC Server System/390.

One high-speed port and one standard parallel port are provided for attachment of a parallel printer or other parallel device.

Modems or other serial devices can be connected to the two available serial ports.

2.1.6 Expansion Slots

Eight 32-bit Micro Channel I/O expansion slots are provided on the PC Server System/390. One slot is used for the SVGA video adapter, one is for the RAID controller or SCSI-2 adapter (depending on your model) and one is for the P/390.

#The remaining slots are available for additional adapters, such as a network adapter to support connection of client workstations on a #LAN, a synchronous adapter to support connection to a remote mainframe system, or additional SCSI adapters to expand the available disk storage for the operating systems. An additional slot is required if P/390 memory is expanded to 128MB.

2.2 I/O Devices and Adapters

Many adapters and devices are available for PC Server systems that could be installed on the PC Server System/390. However, you need to consider which S/390 I/O devices will be emulated and which PC Server devices and adapters are supported for emulation by the PC Server System/390 software when planning for additional adapters. Disk storage, connectivity to the PC Server System/390, and S/390 device attachment are three areas that should be considered.

Subtopics
2.2.1 Disk Storage
2.2.2 Connectivity
2.2.3 Device Attachment

2.2.1 Disk Storage

The PC Server System/390 software uses OS/2 files to emulate CKD DASD, FBA DASD, 2540 card reader, and 3420 tape devices. These devices can be emulated on hard disks, diskettes, and any device on which OS/2 can write an OS/2 file.

A standard PC Server System/390 array system with at least 2GB of usable storage will accommodate installation of the supplied OS/2 software, PC Server System/390 programs, the VM/ESA preconfigured system, and the VSE/ESA preconfigured system. A restored MVS/ESA system needs a minimum of 4GB of usable storage. Additional disk storage may be required depending on the number and size of devices you will be emulating with OS/2 files.

Disk storage can be expanded significantly with the addition of more internal hard disks. Very large requirements for disk storage can be satisfied with additional SCSI adapters and external SCSI hard disks.

2.2.2 Connectivity

There are several ways to provide connectivity for terminals, workstations, and other systems to the S/390 operating systems running on the PC Server System/390.

Local Area Network (LAN) Connection: A LAN Adapter card provides several options for communicating with the PC Server System/390 on a LAN:

- OS/2 client workstations and other PC Server System/390s on the LAN can communicate with the S/390 operating system in a PC Server System/390 on the LAN using non-SNA DFT 3270 emulation sessions provided by Communications Manager/2.
- OS/2, Windows, and DOS client workstations on the LAN can communicate with the PC Server System/390 from 3270 emulation sessions on the workstation as SNA 3270 devices.
- PC Server System/390s on the LAN can communicate with a host mainframe connected to the LAN from 3270 emulation sessions on the PC Server System/390 using SNA 3270 protocol.
- PC Server System/390s can communicate peer-to- peer across the LAN with each other's S/390 operating system as if they were connected using a channel-to-channel adapter.
- PC Server System/390s can communicate peer-to-peer across the LAN with each other and with other mainframe systems connected to the LAN as if they were connected using a 3172 Interconnect Controller.
- TCP/IP clients connected to the LAN can access an VM/ESA and an MVS/ESA system running on a PC Server System/390 on the LAN.

Any LAN connections such as, the IBM Token Ring, Ethernet, and FDDI that support an NDIS (Network Driver Interface Specification) interface that is compatible with the OS/2 LAPS (LAN adapter and protocol support product) and are supported by CM/2 can be used for 3270 terminal emulation access to the PC Server System/390.

SDLC Connection: The following adapters provide capability for SDLC via ICA connections to the PC Server System/390:

- IBM Asynchronous/SDLC V.32 Model/A
- Multiprotocol Adapter/A
- IBM Wide Area Connector (WAC)
- IBM RealTime Interface Co-Processor Portmaster Adapter/A

The following adapters provide 3172 SNA Interconnect capability for SDLC via VTAM XCA (external communication adapter) major nodes:

- IBM Wide Area Connector (WAC)
- IBM RealTime Interface Co-Processor Portmaster Adapter/A

Without this function, support of the SDLC protocol to MVS VTAM required 37X5 NCP/PEP. Any device or system that uses SDLC protocols, such as remote SNA 3270 control units or systems using LU 6.2 protocols, can communicate to VTAM applications running in the S/390 operating system on the PC Server System/390.

BSC Connection: WAC and Portmaster/A adapters provide the capability for the BSC protocol via ICA connections to the PC Server System/390.

Serial Port: Modems can be attached to the serial (COM) ports on the PC Server System/390 to provide communication for asynchronous devices to the S/390 operating system.

3270 Coax Connection: A 3270 Connection adapter or similar 3270 emulation card installed in the PC Server System/390 provides access to a host mainframe using Communications Manager/2 DFT 3270 emulation sessions on the PC Server System/390.

S/370 Channel Emulator/A: Devices connected to communication controllers and control units can also access the PC Server System/390 using the S/370 Channel Emulator/A, as described in "Device Attachment" in topic 2.2.3.

2.2.3 Device Attachment

The S/370 Channel Emulator/A adapter can be used to attach most S/390 I/O devices or controllers to the PC Server System/390 for use by the S/390 operating system. The only known restriction is DASD, because of performance characteristics of the S/370 Channel Emulator/A.

Some examples of the types of S/390 I/O devices that may be attached to the PC Server System/390 using this card are:

- Line and page printers, such as the IBM 3800 Model 1 and IBM 4248
- Magnetic tape drives, such as the IBM 3420 with an IBM 3803 controller, IBM 3480, and IBM 3490
- Communication controllers, such as the IBM 3720 and IBM 3745
- Display controllers, such as the IBM 3174

Note: Performance of these devices attached using the S/370 Channel Emulator/A will not be as good as the traditional data transmission rates when the devices are attached to an ES/9000 or other mainframe system.

2.3 Device Managers

The PC Server System/390 supplies several device managers to support emulation of S/390 I/O devices. These device managers are OS/2 applications that are started when the PC Server System/390 is IPLed with a device map containing device definitions that use the device managers.

Each device manager is identified by name on the PC Server System/390 Configurator screen that is used to perform device mapping. The following table lists the names of the device managers and the function they perform:

Device Manager Name	**Function**
AWSCKD	Count-key-data (CKD or ECKD-capable) DASD emulator
AWSDEV	General interface for device drive emulation of S/390 devices
AWSFBA	Fixed-block-architecture (FBA) DASD emulator
AWSFEP-See note.	Emulates a type 6 channel adapter attached to an IBM 3745 Communication Controller.
AWSICA	Integrated communication adapter (ICA) support for SDLC protocol using multiprotocol/A and WAC adapters and BSC support using WAC adapters.
AWSOMA	Optical media attach
AWSPBS	Integrated communication adapter (ICA) support for SDLC and BSC protocols using Portmaster/A adapters
AWSPCSRV	Allows communication directly between the P/390 and OS/2
AWSTAPE	9-track tape emulator
AWSTFA	Transparent File Access (VM)
AWS2540	2540 Card Reader emulator
AWS2703	2703 emulator
AWS2821	Printer manager
AWS3215	OS/2 typewriter keyboard emulator
AWS3274	3274 control unit emulator (non-SNA)
AWS9346	SCSI quarter-inch tape drive manager
AWSC370	S/370 channel emulator device manager
LAN3088	3088 emulation over a LAN
LAN3172	3172 LAN Gateway (SNA)
LAN3274	LAN 3270 sessions (non-SNA)
LCS3172	3172 LAN channel station for TCP/IP (VM/ESA and MVS/ESA)
MGR3172	NetView function
SCSI3420	SCSI-attached 9-track tape unit
SCSI3480	SCSI-attached 18-track tape unit
WAN3172	3172 LAN Gateway (SDLC/VTAM)
Note: This device manager is provided on an *as is* basis. We recommend using AWSPBS for VM/ESA or WAN3172 for MVS/ESA.	

The following pages summarize the capabilities and limitations of the device managers. The online help provided with the PC Server System/390 Configurator should always be used to obtain the most current information about a device manager and any new ones that may be added to the system.

Subtopics
2.3.1 AWSCKD: CKD/ECKD-capable DASD Emulator
2.3.2 AWSDEV: General Device Emulator

2.3.3 AWSFBA: FBA DASD Emulator
2.3.4 AWSFEP: Front-End Processor Device Manager for the 3745 Communication Controller
2.3.5 AWSICA: Integrated Communication Adapter (Multiprotocol/WAC Adapter) Support
2.3.6 AWSOMA: Optical Media Emulator
2.3.7 AWSPBS: Integrated Communication Adapter (Portmaster Adapter/A) Support
2.3.8 AWSPCSRV:
2.3.9 AWSTAPE: 9-Track Tape Emulator
2.3.10 AWSTFA: Transparent File Access
2.3.11 AWS2540: Card Reader Emulator
2.3.12 AWS2703: 2703 Emulator
2.3.13 AWS2821: Printer Manager
2.3.14 AWS3215: OS/2 Typewriter Keyboard Emulator
2.3.15 AWS3274: 3274 Control Unit Emulator
2.3.16 AWS9346: SCSI Quarter-Inch Tape Drive Manager
2.3.17 AWSC370: S/370 Channel Emulator Device Manager
2.3.18 LAN3088: 3088 Emulation over a LAN
2.3.19 LAN3274: LAN 3270 Sessions
2.3.20 LCS3172: 3172 LAN Channel Station for TCP/IP support
2.3.21 LAN3172: 3172 LAN Gateway
2.3.22 MGR3172
2.3.23 SCSI3420: SCSI/Tape Support
2.3.24 SCSI3480: SCSI/Tape Support
2.3.25 WAN3172

2.3.1 AWSCKD: CKD/ECKD-capable DASD Emulator

#AWSCKD is designed to emulate 3330, 3350, 3375, 3380, 3390, and 9345 DASD. OS/2 files representing these volumes must be preallocated using the PC Server System/390 Configurator program or the CKDALC.EXE utility program before the PC Server System/390 can use them. The files can be located on either FAT or HPFS volumes and can reside on either the PC Server System/390 or a LAN server.

#AWSCKD supports ECKD commands and 3390 devices. 3380 devices are handled as ECKD-capable.

2.3.2 AWSDEV: General Device Emulator

AWSDEV allows users to write their own device support for S/390 devices.

2.3.3 AWSFBA: FBA DASD Emulator

AWSFBA emulates FBA DASD by mapping a complete CP, CMS, or VSE volume to a single OS/2 file. OS/2 files representing these volumes must be preallocated using the PC Server System/390 Configurator program or the ALC.EXE utility program before the PC Server System/390 can use them. The files can be located on either FAT or HPFS volumes and can reside either in the PC Server with the PC Server System/390 or on a LAN server.

2.3.4 AWSFEP: Front-End Processor Device Manager for the 3745 Communication Controller

AWSFEP emulates a type 6 channel adapter attached to an IBM 3745 Communication Controller. This device manager enables host network processing required by NCP to be performed by VTAM and other mainframe host applications running under VM/ESA and MVS/ESA on the PC Server System/390. It gives better performance than an S/370 Channel Emulator/A attached to the P/390. The NCP #appears to VTAM to be channel-attached, while communication is actually over a Token-Ring. AWSFEP provides the protocol conversion #to support a single 3745/NCP. AWSFEP is provided on an *as is* basis. We recommend using AWSPBS for VM/ESA or WAN3172 for #MVS/ESA.

2.3.5 AWSICA: Integrated Communication Adapter (Multiprotocol/WAC Adapter) Support

AWSICA provides Synchronous Data Link Control (SDLC) integrated communication adapter (ICA) support using Multiprotocol Adapter/A, Asynchronous/SDLC V.32 Modem/A, or Wide Area Connector (WAC) adapters. . In addition, support for BSC is provided when using WAC adapters. MVS/ESA does not support ICAs.

Up to two multiprotocol or SDLC Modem/A adapters are supported, each supporting a single 9221-type SDLC ICA device. Switched and nonswitched RS-232 lines are supported, with a maximum data rate of 19.2 Kbps. The line is defined to VTAM as you would a 9221 SDLC ICA (but note restrictions that follow).

Up to four WAC adapters are supported. Each can have up to two line interfaces installed. The maximum supported configuration is eight 9221-type SDLC/BSC ICA devices. Switched and non-switched RS-232 and V.35 lines and nonswitched X.21 lines are supported (depending on the WAC electrical interface board installed), with a maximum data rate of 500 Kbps (V.35). This is the highest speed tested. Whether eight SDLC lines that are all running at maximum speed are supported depends on the active polling loop used by VTAM. For more information about the 9221 SDLC/BSC ICA, see *ES/9000 Telecommunications Subsystem Description and Reference*, SA24-4198.

Autodial assumes a V.25 bis-capable modem is attached and that a multiprotocol adapter capable of V.25 bis operation is being used (P/N #6451114). The older multiprotocol adapters do *not* support V.25 bis operation. The SDLC Modem/A and WAC adapters do support V.25 #bis.

If connecting to a NCP, an ICA does not support two -way simultaneous SDLC (DATMODE=FULL) or more than 7 outstanding SDLC frames (MAXOUT=7).

Because the AWSICA emulates a 9221 SDLC ICA, PU T2.1 support is supported.

Restrictions and known deviations from the 9221 ICA: Multidropped configurations have not been tested. Link Problem
Determination Aid-level 2 (LPDA-2) protocol support is not provided. The WAC X.21 interface is only supported for leased lines (no
switched line support).

2.3.6 AWSOMA: Optical Media Emulator

AWSOMA reads a CD-ROM in optical media format. IBM uses this format to ship program products, fixes, publications, and so on. AWSOMA reads a tape descriptor file (TDF) which describes the format and location of files on the CD-ROM and the logical organization of the files on the tape.

2.3.7 AWSPBS: Integrated Communication Adapter (Portmaster Adapter/A) Support

AWSPBS allows the P/390 to use the BSC or SDLC protocol to communicate with IBM devices like the 3174 or 3274 Terminal Control Unit, and the 3725 Communication Controller. BSC can transmit EBCDIC or ASCII code. SDLC is code-transparent protocol, but it is used primarily to transmit EBCDIC code in an SNA network. With BSC, the PC Server can act as a control station and as a tributary station. Transmission rates can be half-duplex only. The line can be point-to-point switched, point-to-point nonswitched, or multipoint.

The PC Server with an IBM RealTime Interface Co-Processor Portmaster Adapter/A RS-232 Interface Board installed supports this function. A maximum number of two adapters are allowed in the PC Server. Each adapter can support up to eight 9221-type SDLC or BSC ICA devices.

This device manager supports RS-232-D/CCITT V.24/V.28(EIA RS-232C). Synchronous modes may be individually selected for each of the eight ports. All ports support up to 19.2 Kbps half-duplex running concurrently.

2.3.8 AWSPCSRV:

AWSPCSRV allows the P/390 to directly communicate with the OS/2 environment. This device manager supports VM/ESA commands such as, PCOPY, LTRENAME, OS2, PIPE OS2 and PIPE OS2FILE.

2.3.9 AWSTAPE: 9-Track Tape Emulator

AWSTAPE emulates one or more 3803/3420 tape drives using OS/2 files. The file can reside on either hard disk formatted for either the HPFS or FAT file system, diskettes, or CD-ROM. Unlike PC Server System/390 DASD files, the configurator does not preallocate tape files. The AWSTAPE device manager automatically creates them when the S/390 operating system writes data to the device. Read, write, and repositioning commands are supported.

2.3.10 AWSTFA: Transparent File Access

TFA lets you link and access VM CMS minidisks on host mainframe systems directly from VM CMS users' virtual machines on the PC Server System/390. The Server-Requester Programming Interface (SRPI) that is part of the IBM Enhanced Connectivity Facilities (ECF) for VM/ESA and Communications Manager/2 is used to support this function. A server program called AWSHOST that runs in the host VM system implements the SRPI support in the host. This program is included with the VM software that comes with the PC Server System/390 system.

2.3.11 AWS2540: Card Reader Emulator

AWS2540 emulates a 2540 card reader using OS/2 files. Only one 2540 card reader device is supported. The emulator watches for files to appear in a specified OS/2 subdirectory. Files copied into that subdirectory appear to the emulated 2540 as card decks placed into a stacker. ASCII to EBCDIC translation is supported. The card reader emulator makes it easy for PC LAN clients to submit jobs to a PC Server System/390 VM/ESA, VSE/ESA, and MVS/ESA system.

2.3.12 AWS2703: 2703 Emulator

AWS2703 emulates a 2703 communication controller using the PC Server System/390 serial (COM) ports. When a modem is attached to the asynchronous port, the AWS2703 device manager acts as a 2703 control unit. This allows remote users to connect to the PC Server System/390 using ASCII terminal devices.

2.3.13 AWS2821: Printer Manager

AWS2821 emulates 1403 printers on the PC Server System/390. Printed output can be directed to either a printer port (LPTn) or an OS/2 file.

2.3.14 AWS3215: OS/2 Typewriter Keyboard Emulator

The 3215 sessions are typewriter/keyboard sessions. These sessions are best suited for virtual machines that need a console to monitor them, for example, the VM/ESA 370 Feature operator console. 3215 sessions are more suited to this activity than 3270 sessions are because 3215 sessions automatically scroll off old data and do not require you to press the CLEAR key at the "MORE..." or "HOLDING" indicators that 3270 sessions do. VM/ESA ESA Feature does not support 3215 except as a virtual device. These 3215 sessions can also be used for the VSE console. However, VSE's console support is better suited for use on a 3270 emulation session.

2.3.15 AWS3274: 3274 Control Unit Emulator

AWS3274 allows the PC Server System/390 to emulate a 3274 non-SNA control unit in support of 3270 devices, such as 3277s and 3278s.

AWS3274 uses the Communications Manager/2 (CM/2) to emulate devices. AWS3274 supports non-SNA DFT protocol and uses the CM/2 non-SNA DFT 3270 Emulator. CM/2 supports a maximum of 5 DFT logical terminals. Any one of these can be configured as either a local session or a host session. A local session is a logical terminal active on the PC Server System/390. A host session is a logical terminal active on a host system connected by coax to a 3270 Connection Adapter.

The CM/2 3270 emulator does not distinguish between a local and host logical terminal (LT) session. Both types of LTs can be configured using CM/2's Advanced Configurator. Also, all functions available to a host LT session are also available to a local LT session, for example, GDDM* graphics, font selection, cut and paste, etc.

The only difference between a local and host session is the way 3270 data streams are processed. For a host LT session, the data stream is transmitted between the workstation and control unit over coax. The coax is attached to a 3270 connection card which uses a device driver to interpret the data streams and perform the appropriate inbound or outbound function. For a local LT session, the PC Server System/390 session is physically in the same workstation as CM/2, so no coax, 3270 connection card, or device driver is needed.

2.3.16 AWS9346: SCSI Quarter-Inch Tape Drive Manager

AWS9346 supports emulation of a 9346 tape drive on 3450-001 1/4-inch tape drives installed on the PC Server System/390. This device manager should be used only for reading data from a 9371.

2.3.17 AWSC370: S/370 Channel Emulator Device Manager

The AWSC370 manager allows real S/390 I/O control units to be attached to a PC Server System/390 system using the S/370 Channel Emulator/A card. Device attachment considerations were described in "Device Attachment" in topic 2.2.3.

2.3.18 LAN3088: 3088 Emulation over a LAN

The LAN3088 emulates a channel-to-channel (CTC) or 3088 device connection between PC Server System/390s on a LAN. The LAN3088 emulator lets you use VM/ESA facilities like RSCS and PVM and VSE/ESA facilities like VSE/POWER networking and CICS/VSE Intersystem Communication (ISC) to communicate between PC Server System/390 systems running VM/ESA or VSE/ESA. LAN3088 also supports communications for PC Server System/390s running MVS/ESA. LAN3088 is used only for connecting PC Server System/390 systems. It does not support connections to S/370 or S/390 mainframe systems. CM/2, LAPS, and a LAN adapter card are required on the PC Server System/390s.

2.3.19 LAN3274: LAN 3270 Sessions

The LAN3274 device manager emulates a 3274 non-SNA control unit and provides support for OS/2 workstations on the LAN to access the S/390 operating system on the PC Server System/390 using non-SNA 3270 sessions. CM/2, LAPS, and a LAN adapter are required on the PC Server System/390 and OS/2 workstations. Client software supplied with the P/390 programs is installed on the client workstation to support this emulation. CM/2 provides the same 3270 emulation support for 3270 sessions on client workstations that it does for 3270 sessions on the PC Server System/390 as described in "AWS3274: 3274 Control Unit Emulator" in topic 2.3.15.

2.3.20 LCS3172: 3172 LAN Channel Station for TCP/IP support

The LCS3172 emulator lets TCP/IP running under VM/ESA or MVS/ESA on the PC Server System/390 think it is communicating with a real 3172 LAN Channel Station. This support only requires TCP/IP support in VM/ESA or MVS/ESA and does not require TCP/IP support on OS/2. Since LCS3172 must use the direct interface for the LAN adapter, and because LAPS only allows one application at a time to use this interface, the LAN adapter used by LCS3172 cannot be simultaneously shared with other applications such as OS/2 TCP/IP and Token Ring Monitor (TRMON) that use the direct interface. It is acceptable to install multiple LAN adapters in the PC Server System/390 if there are conflicts with the direct interface. Any adapter that is supported by LAPS can be used, that is, Token Ring, Ethernet, or any other NDIS-supported adapter.

2.3.21 LAN3172: 3172 LAN Gateway

LAN3172 implements 3172 Interconnect Controller function serving as a LAN SNA gateway. This device manager provides support for OS/2, Windows, and DOS client workstations on the LAN to communicate with the S/390 operating system on the PC Server System/390 using SNA 3270 protocols. It also provides peer-to-peer support across the LAN between PC Server System/390s and host mainframe systems connected to the LAN.

Communications Manager/2 and LAPS are required on the PC Server System/390 and the OS/2 workstations for definition of LAN resources (IEEE 802.2). LAN Support for DOS and a 3270 emulator, such as Personal Communications/3270, are required on Windows and DOS workstations. A LAN adapter card is required for the PC Server System/390 and the workstations. Multiple LAN adapters are supported using a single S/390 address for the 3172.

ACF/VTAM External Channel Adapter (XCA) major node definitions and switched major node definitions are used in the S/390 operating system to support connections using this device manager.

#2.3.22 MGR3172

#MGR3172 provides a network manager function for the P/390. This feature allows the P/390 to send network management information to #NetView. Manager 3172 transports SDLC alerts, LAN alerts, alerts due to equipment failures, and responds to Vital Product requests.

2.3.23 SCSI3420: SCSI/Tape Support

This device manager provides 3420 tape support. It can emulate a 3420 tape on an IBM 4/10 4mm DAT tape drive, or it can drive a SCSI-attached 9-track (reel) tape drive to provide access to standard mainframe tapes. It gives better performance than a 3420-attached via the S/370 Channel Emulator/A.

2.3.24 SCSI3480: SCSI/Tape Support

This device manager provides 3480 tape support in two formats. It can emulate a 3480 tape on an IBM 4/10 4mm DAT tape drive, or it can drive a SCSI-attached 3480 or 3490 (cartridge) tape drive. It gives better performance than a 3480 attached via the S/370 channel emulator/A.

Most IBM programs available in standard 3480 cartridge format are now also available in 4mm DAT format, which means you can order and load most IBM software using the 4mm DAT drive included in the PC Server System/390.

#2.3.25 WAN3172

#WAN3172 provides SDLC support to VTAM as a separate XCA PORT. The SDLC lines can be leased, switched, synchronous or #asynchronous. This device manager supports up to 16 lines using either the Portmaster/A or WAC adapters.

2.4 Installing the PC Server System/390

The installation steps for the PC Server System/390 can be categorized into five major areas:

- Install the PC Server System/390 hardware and options.
- Install the OS/2 software.
- Install the P/390 programs.
- Install the S/390 operating system software.
- Configure and activate the S/390 system.

These steps are described in detail in the *PC Server 500 System/390 Installation, Configuration, and User's Guide for VM/ESA*, the *PC Server 500 System/390 Installation, Configuration, and User's Guide for VSE/ESA* and the *PC Server 500 System/390 Installation, Configuration, and User's Guide for MVS/ESA*. This section provides an overview of these steps.

Subtopics
2.4.1 Installing the Hardware
2.4.2 Installing the Software

2.4.1 Installing the Hardware

Installation of the PC Server System/390 hardware uses the same standard procedures as any PC Server system. These are described in *User's Handbook* that is provided with the system. These include:

1. Install the PC Server System/390 system unit following the instructions in the *User's Handbook* manual.

2. Install any additional adapters and devices

3. If the RAID controller is installed, tailor the RAID environment.

The PC Server System/390 is shipped with the P/390, SVGA adapter, an internal CD-ROM, SCSI hard disks, and RAID controller or SCSI-2 Fast/Wide Adapter/A already installed.

2.4.2 Installing the Software

The OS/2 software and P/390 programs must be installed before the S/390 operating system can be installed on the PC Server System/390. The OS/2 software is distributed on a compact disc and PC Server System/390 programs are distributed on 3.5 inch diskettes. README files are also provided to document the most current installation information.

You have a variety of methods to select from when installing S/390 software.

- Because the PC Server System/390 supports either channel-attached or SCSI-attached 3480 and 3420 tape drives, software can be ordered on traditional media and can be installed as it would be on any other S/390 system.

- A 4mm DAT cartridge is available. Software provided with PC Server S/390 enables the DAT to emulate 3420 and 3480 tape drives.

- PC Server System/390 comes with and supports CD-ROMs in Optical Media Attach (OMA) format.

These options, together with the optional S/390 preconfigured system compact disc, allow a person without any S/390 skills to quickly and easily install the base operating system.

2.5 PC Server System/390 Configurator

The PC Server System/390 Configurator is the tool that is used to perform system programmer tasks to interface the S/390 operating system to the PC Server environment. The Configurator performs two main functions:

1. It allows you to describe the mapping between the I/O devices available on the PC Server System/390 and the S/390 I/O devices they emulate.

2. It provides an easy way for VM/ESA users to create and maintain new VM user IDs on the PC Server System/390 and the minidisks associated with those user IDs.

The PC Server System/390 Configurator is menu-driven, and changes to system configuration are easily made by changing the values in data menus.

The specific functions the Configurator performs are:

- Specify and change the configuration of devices on your PC Server System/390

- Modify the number of host and PC Server System/390 3270 sessions on your PC Server System/390

- For VM/ESA users, add and delete VM user IDs and make changes to:

  - User passwords, logon storage, maximum storage, and user class
  - Minidisks (adding, deleting, or changing)
  - Links (adding or deleting)

Subtopics
2.5.1 Structure of the P/390 Configurator

2.5.1 Structure of the P/390 Configurator

Figure 8 shows the hierarchy of menus in the PC Server System/390 Configurator. Some screens are disabled depending on the functions supported by the S/390 operating system. The menus are driven by function key. Online help is available for most of the menus. The Configurator is started using the P/390 CONFIGURATION icon from the PC Server System/390 icon folder.

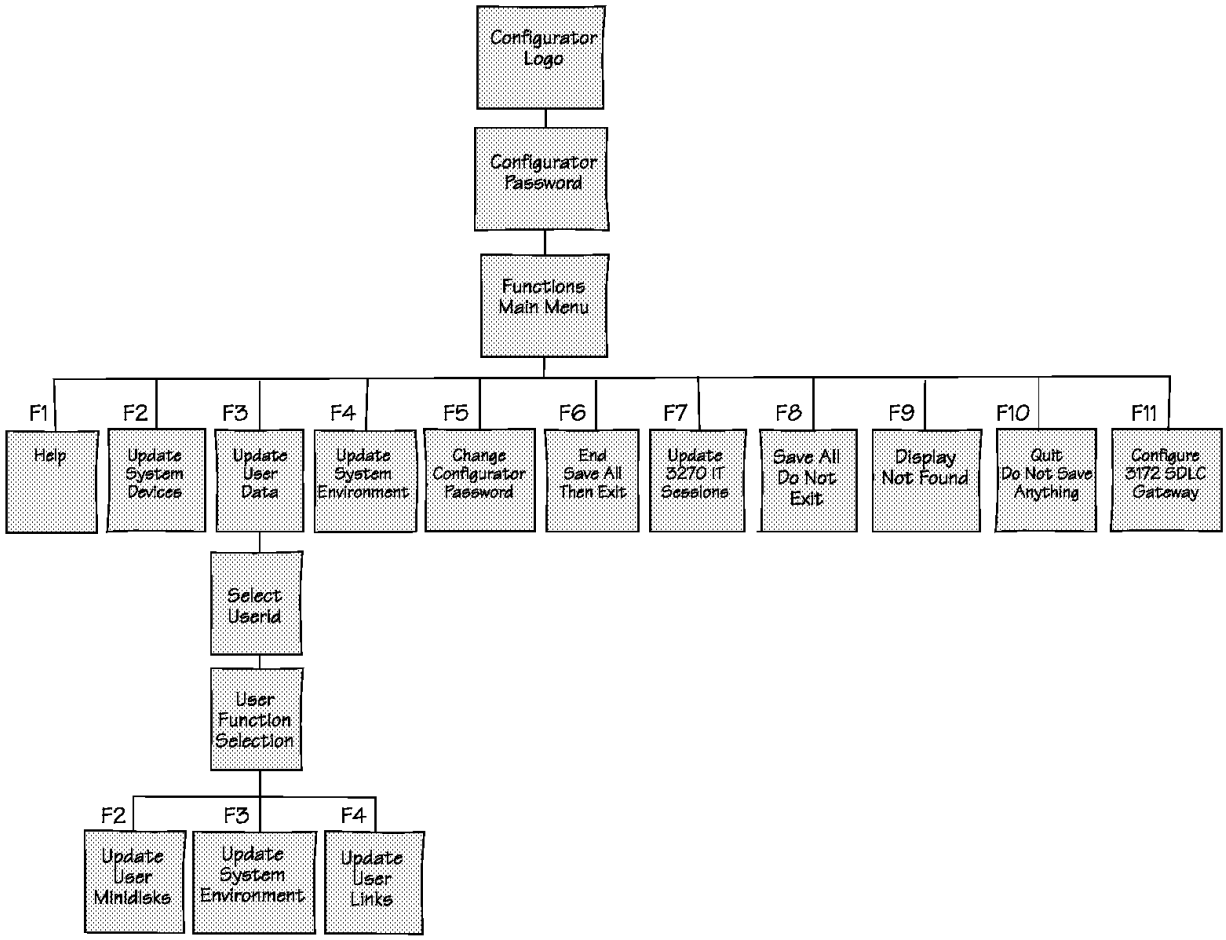

Figure 8. The Structure of the Configurator Menus

2.6 Performance Considerations

The PC Server System/390 is designed to meet the performance, availability, and reliability requirements of servers with a small to medium number of S/390 users in a work group. However, there are performance factors similar to the host mainframe environment and some unique to the PC Server System/390 environment that need to be considered when running S/390 operating systems on the P/390, namely:

- Processor performance
- I/O performance

Subtopics
2.6.1 Processor Performance
2.6.2 I/O Performance

2.6.1 Processor Performance

As described earlier in "System Overview" in topic 1.1, the PC Server System/390 has two completely separate processors, a P/390 and a PC Server processor. The two processors run in parallel, that is, activity in the P/390 overlaps activity in the PC Server processor. The P/390 executes S/390 instructions at the same time the PC Server processor is handling PC Server instruction execution or I/O operations for both S/390 and PC Server applications.

2.6.2 I/O Performance

Because the PC Server processor handles all I/O requests for the P/390, the S/390 I/O performance will be affected by:

- PC Server processor activity
- P/390 I/O activity

Subtopics
2.6.2.1 PC Server Processor Activity
2.6.2.2 P/390 I/O Activity

2.6.2.1 PC Server Processor Activity

The P/390 I/O subsystem executes as OS/2 applications in the PC Server processor. Any other OS/2 applications that are running will contend for the PC Server processor and affect P/390 I/O activity. I/O activity from other OS/2 applications may also affect the amount of PC Server processor resource available for P/390 I/O activity.

2.6.2.2 P/390 I/O Activity

I/O activity from S/390 applications will be affected by I/O activity from OS/2 applications since S/390 I/O operations may be emulated on the same PC Server devices that the OS/2 applications use. You can minimize contention for hard disks by proper placement of files to reduce seek times and by spreading OS/2 files for S/390 emulated devices and OS/2 applications across multiple hard disks. The RAID technology can also improve DASD performance because of its technique of striping data across multiple hard disks.

Additional PC Server memory can also improve system performance and S/390 I/O throughput. Memory can be used for disk caching to reduce activity to I/O devices and adapters. An OS/2 virtual disk can be used for emulated S/390 disk drives containing selected READ-only S/390 operating system files.

3.0 Chapter 3. VM/ESA on the PC Server System/390

VM/ESA is an interactive, multi-access operating system. It is interactive in that there is two-way communication between users and VM/ESA. It is multi-access because multiple users and guest operating systems can use a VM/ESA system at the same time.

VM/ESA consolidates in a single product, functions previously available in the VM/SP, VM/SP HPO, and VM/XA products. VM/ESA provides two features, the ESA Feature and the 370 Feature. The ESA Feature is supported on ESA/370 and ESA/390 processors and exploits the 31-bit architectures on those systems. The 370 Feature is supported on System/370 processors and provides all of the functions that VM/SP Release 6 did for those systems. In addition, the 370 Feature supports 32 channels, more than 16MB of real memory, and other new functions common to the ESA Feature.

Subtopics

3.1 VM/ESA Functions Supported on the PC Server System/390

The P/390 can be IMLed in either 370 or ESA mode. Therefore, it can run either the VM/ESA 370 Feature or the VM/ESA ESA Feature. All of the components that make up the VM/ESA are supported including:

- Control Program (CP)
- Conversational Monitor System (CMS)
- Group Control System(GCS)
- Advanced Program-to-Program Communication/VM (APPC/VM) VTAM support (AVS)
- Transparent Services Access Facility (TSAF)
- Procedures Language VM/REXX
- Virtual Machine Serviceability Enhancements Staged/Extended (VMSES/E).

Subtopics

3.1.1 VM/ESA Support for Devices Attached to the PC Server System/390

VM/ESA device support on the PC Server System/390 is limited to the S/390 devices emulated by the PC Server System/390 device managers and to the S/390 devices that can be attached using the S/370 Channel Emulator/A. The VM/ESA 370 Feature provides support for many devices on S/370 and S/390 mainframes.

Subtopics
3.1.1.1 VM/ESA Support for Emulated Devices
3.1.1.2 Support for S/370 Channel Emulator/A Attached Devices

3.1.1.1 VM/ESA Support for Emulated Devices

The following summarizes the VM/ESA device type (DEVTYPE) used for the S/370 devices emulated by the PC Server System/390 device managers:

Device Manager Name	**Function**	**VM/ESA DEVTYPE**
AWSCKD	CKD or ECKD-capable DASD emulator	3330, 3350, 3375, 3380, 3390, or 9345
AWSFBA	FBA DASD emulator	3370, 0671, 9332, 9335, 9336, or FB-512
AWSFEP-See note	3745 communication controller	3705 (Type 6 channel adapter)
AWSICA	Integrated communications adapter (ICA) support	SDLC/ICA BSCA/ICA
AWSPBS	Integrated communications adapter (ICA) support	SDLC/ICA BSCA/ICA
AWSOMA	Optical Media Attach	3422
AWSPCSRV	Direct communication between OS/2 and the P/390.	3274
AWSTAPE	9-track tape emulator	3422
AWSTFA	Transparent File Access	3088
AWS2540	2540 card reader emulator	2540
AWS2703	2703 emulator	2703, ICA (async)
AWS2821	Printer manager	1403 (2821 Control Unit)
AWS3215	OS/2 Typewriter keyboard emulator	3215
AWS3274	3274 Control unit emulator (non-SNA)	3277, 3278 or 3279
AWS9346	SCSI quarter-inch tape drive manager	9346
LAN3088	3088 emulation over LAN	3088 or CTC
LAN3172	3172 LAN gateway (SNA)	3088
LAN3274	LAN 3270 sessions (non-SNA)	3277, 3278 or 3279
LCS3172	3172 LAN channel station for TCP/IP (VM)	3088 (even/odd address pair)
MGR3172	NetView	3088
SCSI3420	SCSI-attached 9-track tape unit	3420 tape drive
SCSI3480	SCSI-attached 18-track tape unit and 4mm DAT	3480 tape drive

Note: This device manager is provided on an *as is* basis. We recommend using AWSPBS for VM/ESA.

VM/ESA supports the CKD DASD emulator as DEVTYPE 3375 or 3380 on a 3880 control unit. For FBA emulated devices, the specific device type doesn't matter. VM/ESA treats all FBA devices as a generic FB-512 device. For best results, FBA device types should be used. If CKD devices are to be emulated, 3380 devices on 3880-3 control units are recommended over 3375.

A 3420 device definition in VM/ESA cannot be used on a 9346 device on the PC Server System/390. However, it is supported for the VM/ESA 370 Feature. For VM/ESA 370 Feature, a 9346 device requires a 9346 device definition in the DMKRIO file. The 9346 is an unsupported device to VM/ESA ESA Feature and must be defined as TYPE UNSUPPORTED in the SYSTEM CONFIG file.

Local 3270 devices can be defined to VM and supported using the AWS3274 and LAN3274 device managers. These device managers support non-SNA 3270 DFT terminal access to VM/ESA from 3270 emulation sessions on the PC Server System/390 and on OS/2 client workstations. Because VM CP provides the support for these 3270 sessions, VTAM is not required.

#ACF/VTAM support is required on VM/ESA to support devices attached through the AWSICA (SDLC), LAN3172, AWSPBS (SDLC/BSC), #and AWSFEP device managers. The LCS3172 device manager requires VM/ESA TCP/IP support.

3.1.1.2 Support for S/370 Channel Emulator/A Attached Devices

"Device Attachment" in topic 2.2.3 described the considerations for attaching S/390 devices to the PC Server System/390 using the S/370 Channel Emulator/A. The *VM/ESA General Information* manual lists the S/390 devices that are supported by the VM/ESA.

3.1.2 VM/ESA Connectivity and Networking Capabilities

Besides the local 3270 emulation support, users and other systems can be connected to PC Server System/390s running VM/ESA through a variety of facilities provided by VM/ESA, as well as through other program products and the P/390 device managers.

- **Inter-System Facility for Communication (ISFC)**. Multiple PC Server System/390s on a LAN can be connected together with ISFC or as TSAF collections using the 3088 channel-to-channel device manager (LAN3088).

- **Transparent Services Access Facilities (TSAF)**. VM/ESA systems running on the PC Server System/390 can communicate peer-to-peer with VM/ESA systems on other PC Server System/390s and mainframe processors using TSAF and APPC/VM support. With this support resources managed by VM/ESA Shared File System, SQL/DS and other products can be shared among VM/ESA systems.

  Multiple PC Server System/390s on a LAN can be connected together in a TSAF collection using the 3088 channel-to- channel device manager (LAN3088).

- **Remote Spooling Communications Subsystem (RSCS)**. RSCS can be used on the PC Server System/390 to transfer data to other systems, devices, and workstations. RSCS can communicate over a SNA network in conjunction with the Virtual Telecommunications Access Method (VTAM). RSCS supports BSC connections between other network job entry (NJE) nodes. RSCS connections can be established between multiple PC Server System/390s on the LAN using the 3088 (channel-to-channel) device manager.

- **VM/Pass-Through Facility (PVM)**. Using PVM facilities in a VM/ESA system on the PC Server System/390 and the 3088 channel-to-channel device manager, VM users can log on to other VSE/ESA and VM/ESA systems running on PC Server System/390s on the LAN. PVM supports BSC between other PVM-capable systems.

- **Virtual Telecommunications Access Method (VTAM)**. With VTAM and the AWSICA or AWSPBS device managers (using the SDLC protocol and supported adapter), the PC Server System/390 can communicate with other systems in an SNA network. SNA connectivity from a PC Server System/390 to LAN-attached mainframe systems and other PC Server System/390s is also available using the LAN3172 device manager. TSAF, RSCS, and PVM can all use VTAM-controlled links to communicate with other systems in the network.

  OS/2, DOS, and Windows workstations can communicate with the VM/ESA system on the PC Server System/390 as local SNA 3270 terminals using the 3172 LAN gateway device manager. Programs in the VM/ESA system can use the APPC/VM support in VM/ESA and APPC/VM VTAM Support (AVS) to communicate with other APPC programs in the SNA network.

- **Transmission Control Protocol/Internet Protocol (TCP/IP)**. Clients on a TCP/IP network can have full TCP/IP connectivity to a VM/ESA system on the PC Server System/390. The LCS3172 device manager provides emulation support for the 3172 control unit that acts as the gateway for the TCP/IP network. TCP/IP support is only required on VM/ESA to support this capability. OS/2 TCP/IP is not required.

3.2 PC Server System/390 CMS Commands

Several CMS commands are supplied with the PC Server System/390 software to provide additional functions for CMS users running in a PC Server System/390 environment. These commands supplement the standard CMS commands that are provided with the VM operating system. They are included with the VM preconfigured system that comes with the PC Server System/390 software and are installed on the VM system disk (S-disk).

The *PC Server 500 System/390 Installation, Configuration, and User's Guide for VM/ESA* contains a detailed description of these commands. A brief description of each command follows.

Subtopics

3.2.1 CACHE

The CACHE command is used to install and control CMS minidisk cache in virtual machines on the PC Server System/390. The VM/ESA ESA Feature supports only remote (TFA) minidisk caching because VM/ESA has its own real minidisk cache that CP provides. The command has options to suspend and resume cache operations for local and remote minidisks, to query about cache usage and status, and to reset and purge the cache.

3.2.2 HLINK, HDETACH, HQUERY

The HLINK, HDETACH, and HQUERY commands are used to access, detach, and query remote minidisks located on a host mainframe VM system connected to a PC Server System/390 running VM. They provide VM users on the PC Server System/390 with equivalent functions for accessing remote minidisks that the CP LINK, CP DETACH, and CP QUERY commands provide for accessing local minidisks on the PC Server System/390.

These commands rely on the Transparent File Access (TFA) command and the Host Server Program provided with the PC Server System/390 software for access to data on a host VM system.

The HLINK command establishes a link from the PC Server System/390 VM session to a host VM minidisk. The normal CMS ACCESS command is then used to access the remote disk in CMS.

The HDETACH command is used to detach a host VM minidisk.

The HQUERY command displays information about host disks that are currently linked to a PC Server System/390 VM virtual machine with the HLINK command.

3.2.3 LTRENAME

The LTRENAME command is used to rename the title bar for a PC Server System/390 3270 session. It can provide a convenient way of distinguishing between sessions by issuing it in a VM PROFILE EXEC with text that identifies the user. This text replaces the descriptive entry for the session on the OS/2 desktop window list and also the "long name" for the logical terminal session, which is displayed on the title bar at the top of the screen.

3.2.4 MOUNT

The MOUNT command associates an OS/2 file specification with a PC Server System/390 emulated tape drive.

Tape emulation on diskettes allows you to move data easily between PC Server System/390s. Unlike with PCOPY, the data stays in an internal VM format, so it can be recreated exactly on another PC Server System/390 without any special parameters or concern for binary/ASCII translation.

Tape emulation also allows you to use CMS commands such as DDR for backup. The OS/2 file can either be on diskette, on fixed disks, or on remote disks managed by a LAN server.

OS/2 files written by PC Server System/390 tape emulation are suitable for processing only by other PC Server System/390s. The data in them cannot be accessed by other PC programs, or by other 390 processors. PC Server System/390 tape emulation should be used only for temporary storage or transportation of data-for archival.

Tape emulation uses standard OS/2 files.

3.2.5 OS2

The OS2 command is used to execute an OS/2 command from a PC Server System/390 virtual machine and display the results on the terminal. The results can also be stacked for input to a REXX program.

3.2.6 PCOPY

The PCOPY command copies files between the VM/CMS environment and the OS/2 environment on the PC Server System/390. This operation is called the "import/export" function. Files are imported to VM from OS/2, or exported from VM to OS/2. PCOPY can also be used in conjunction with Transparent File Access (TFA) to upload and download files between the PC Server and a host mainframe VM system.

The PCOPY command supports copying of files in ASCII and binary format with fixed or variable length records.

Note: An important difference between PCOPY and the OS/2 SEND and RECEIVE commands is that PCOPY is initiated from CMS on the VM system, and SEND and RECEIVE are issued from the OS/2 command prompt.

3.2.7 PIPE OS2

The PIPE OS2 command executes an OS/2 command from CMS pipelines.

3.2.8 PIPE OS2FILE

The PIPE OS2FILE command reads or writes OS/2 files from CMS from CMS pipelines.

3.2.9 Transparent File Access (TFA)

The TFA command is used to activate Transparent File Access functions used for access to host VM minidisk from VM sessions on the PC Server System/390.

3.3 Installing VM/ESA on the PC Server System/390

A fully functional VM/ESA system is available on compact disc for the PC Server System/390. The compact disc contains a VM/ESA preconfigured system that you can use to familiarize yourself with the PC Server System/390 functions and as a base for installing additional products.

Sample directory system files are supplied with both the VM/ESA preconfigured system and as OS/2 files for use by the PC Server System/390 Configurator. The compact disc supplies a default device map, DEVMAP.1VM, containing device definitions that correspond with the definitions in these files.

Alternatively, you can install the VM/ESA ESA Feature using the same compact disc in Optical-Media-Attach format and the same procedures used for installing VM/ESA on a mainframe processor.

3.4 Migrating VM/ESA Applications to the PC Server System/390

After the VM/ESA system is installed on the PC Server System/390, you can migrate S/390 applications from a VM/ESA host mainframe to the PC Server System/390 for development and testing. CMS applications that run in 370 or ESA mode on host VM mainframe systems should run without change under CMS on the P/390. If the release of CMS you are installing on the P/390 is different from the release you are migrating from, the usual release-to-release migration concerns apply.

Applications can be moved from the host to the PC Server System/390 using any of the following methods:

- For PC Server System/390s that have a 3270 coax or LAN connection to the host:
  - Transparent File Access functions can be invoked to access the host VM system's minidisks. CMS commands can be used to copy application minidisks or selected CMS files from the host to VM minidisks on the PC Server System/390.
  - OS/2 RECEIVE commands or the PCOPY command in conjunction with the TFA functions can be used to copy source members from host VM minidisks to OS/2 files. This method would be used if the application source code is going to be maintained with OS/2 facilities.
  - For P/390s that have APPC VTAM Support (AVS) or Transparent Services Access Facilities (TSAF) connections with the host, it is possible for users on each of the two systems to see Shared File System (SFS) directories on the other system.
- For PC Server System/390s that have an RSCS connection with the host, files can be sent across the RSCS connection to the VM/ESA system on the PC Server System/390.

3.5 Distributing VM/ESA to Other PC Server System/390s

After installing the VM/ESA system on the first PC Server System/390, you may want to install a copy of it on other PC Server System/390s. Because all the files used to support the VM/ESA system are contained in OS/2 files, you can use OS/2 facilities to copy the VM/ESA system to other PC Server System/390s. There are several methods you can use to distribute the VM/ESA system:

- Using a 3270 coax connection or LAN connection to a host VM mainframe system, the OS/2 files used to support the VM/ESA system on the PC Server System/390 can be uploaded to the host VM system and downloaded to other PC Server System/390s connected to it.

- If a LAN file server is available on the same LAN with multiple PC Server System/390s, the OS/2 files can be copied to the file server disk and then copied to other PC Server System/390s. The file server could also be used to share any read-only minidisks, thereby freeing up space on each PC Server System/390.

- A tape device installed on each PC Server System/390 or a portable tape unit that can be temporarily installed is a convenient method for distributing a copy of the VM/ESA system to other PC Server System/390s. This also provides a backup of the system in case it needs to be recovered.

After the VM/ESA system is distributed to other PC Server System/390s, files can be moved between systems using any of these methods or using the VM-to-VM connectivity facilities described in "VM/ESA Connectivity and Networking Capabilities" in topic 3.1.2.

Diskettes can also be used to move selected files from one PC Server System/390 to another. OS/2 commands can be used to copy OS/2 files to diskette or VM/ESA tape commands can be used to copy all or parts of VM/ESA minidisks to emulated S/390 tape files on diskette (see "AWSTAPE: 9-Track Tape Emulator" in topic 2.3.9) for transporting to other systems.

4.0 Chapter 4. VSE/ESA on the PC Server System/390

VSE/ESA is part of the ESA/390 family of operating system. It is designed for high-volume transaction processing and commercial batch processing environments. VSE/ESA is supported on ESA/390, ESA/370, and 370-XA processors. It supplies MODE=ESA and MODE=VMESA (if running under VM/ESA) supervisors to support the 31-bit architecture available on those processors. It also provides MODE=370 and MODE=VM (if running under VM) supervisors that support System/370 processors.

Subtopics

4.1 VSE/ESA Functions Supported on the PC Server System/390

Because the P/390 component of the PC Server System/390 is an S/390 processor, you can run the VSE/ESA supervisor mode in MODE=370 (or MODE=VM) and MODE=ESA. A MODE=370 supervisor supports some of the capabilities of VSE/ESA, including:

- Total virtual size (VSIZE) up to 256MB
- Multiple address spaces, each up to 16MB
- Dynamic partitions
- ACF/VTAM in a private address space

In addition, the following functions are supported if you choose to use a supervisor running with MODE=ESA:

- Real storage greater than 16MB
- 31-bit virtual addressing
- Data spaces
- Virtual disk
- VSE/POWER in a private address space

VSE/ESA is supported as a guest operating system under VM/ESA and can run as a guest of VM/ESA on the PC Server System/390.

Subtopics

4.1.1 VSE/ESA Support for Devices Attached to the PC Server System/390

VSE/ESA supports a wide range of I/O devices and controllers that can be attached to S/370 and S/390 systems. However, it does not support the I/O devices usually attached to PC Server systems. Any devices used by VSE/ESA when running on a PC Server System/390 must either be emulated by the PC Server System/390 device managers or attached using the S/370 Channel Emulator/A.

Subtopics
4.1.1.1 VSE/ESA Support for Emulated Devices
4.1.1.2 Support for S/370 Channel Emulator/A Attached Devices

4.1.1.1 VSE/ESA Support for Emulated Devices

The following summarizes the VSE/ESA device type codes used for the S/390 devices emulated by the PC Server System/390 device managers:

	Device Manager Name	**Function**	**VSE/ESA Device Type**
#	AWSCKD	CKD or ECKD-capable DASD emulator	3330, 3350, 3375, 3380, 3390, or 9345
	AWSFBA	FBA DASD emulator	FBA (0671, 3370, 9332, 9335, or 9336)
#	AWSICA	Integrated communications adapter (ICA) support	SDLC ICA BSCA ICA
	AWSOMA	Optical Media Attach	3422
	AWSPBS	Integrated communications adapter (ICA) support	SDLC ICA BSCA ICA
	AWSTAPE	9-track tape emulator	3422
	AWS2540	2540 card reader emulator	2540R
	AWS2703	2703 emulator	2703
	AWS2821	Printer manager	1403
	LAN3172	3172 LAN Gateway (SNA)	CTCA
	AWS3274	3274 control unit emulator (non-SNA)	3277
	AWS9346	SCSI quarter-inch tape drive manager	9346
	LAN3088	3088 emulation over a LAN	CTCA
	LAN3274	LAN 3270 sessions (non-SNA)	3277
	SCSI3420	SCSI-attached 9-track tape unit	3420T9
	SCSI3480	SCSI-attached 18-track tape unit	3480

The FBA DASD types specifically emulated for VSE are 3370, 0671-4 and 9336-10. A preconfigured VSE/ESA system is supplied in 9336 DASD format. 3370 and 3375 devices can be used by VSE/ESA, but they are not supported for initial installation of VSE/ESA because there are no standard 3370 or 3375 DASD layouts defined.

Local 3270 devices can be defined to VSE/ESA and supported using the AWS3274 and LAN3274 device managers. These device managers support non-SNA 3270 DFT terminal access to VSE/ESA from 3270 emulation sessions on the PC Server System/390 and on OS/2 client workstations. BTAM or VTAM can be used to support these 3270 sessions.

#ACF/VTAM support is required on VSE/ESA to support devices attached through the AWSICA, AWSPBS, and LAN3172 device managers.

4.1.1.2 Support for S/370 Channel Emulator/A Attached Devices

"Device Attachment" in topic 2.2.3 described the considerations for attaching S/370 devices to the PC Server System/390 using the S/370 Channel Emulator/A. The *VSE/ESA General Information* manual lists the S/370 devices that are supported by VSE/ESA.

4.1.2 VSE/ESA File Transfer Support

OS/2 SEND and RECEIVE commands can be used from Communications Manager/2 3270 emulation sessions on the PC Server System/390 to request file transfer functions in the VSE/ESA system running on the PC Server System/390. VSE/ESA file transfer functions can also be invoked from client workstations connected to the PC Server System/390 running VSE/ESA.

4.1.3 VSE/ESA Distributed Workstation Facility

The VSE/ESA Distributed Workstation Facility (DWF) is shipped with the VSE/ESA software and provides support for VSE/ESA application development on OS/2 workstations. By downloading the DWF support to client workstations, DWF can be used in conjunction with VSE/ESA on the PC Server System/390 to provide a development and test environment. See your IBM marketing representative for the product licensing required to run DWF on the workstation.

4.1.4 VSE/ESA Connectivity and Networking Capabilities

The PC Server System/390 offers a number of connectivity options, in addition to the ability of workstation users on a LAN to access the VSE/ESA system using 3270 emulation sessions. Several options are described below.

- **VSE/POWER Networking (PNET)**. If multiple PC Server System/390 systems are connected to the same LAN, the 3088 (Channel-to-Channel) device manager can be used to establish VSE/POWER PNET SNA connections between these systems and with other PC Server System/390s that are using VM/ESA and RSCS. VTAM is required for this support in the VSE/ESA and VM/ESA systems because VSE/POWER does not support a real CTC device. This allows routing of jobs and job output between VSE/ESA and VM/ESA systems.

  If the PC Server System/390 has an SDLC connection with a host, the AWSICA and AWSPBS device managers can be used to establish a full networking connection with MVS/ESA, VM/ESA, or VSE/ESA hosts. Full SNA connectivity is also available using the LAN3172 device manager when the host mainframe is attached to same LAN as the PC Server System/390.

- **CICS/VSE Intersystem Communications (ISC)**. CICS/VSE Intersystem Communications provides support to route transactions between connected CICS systems, and to function ship requests between the systems. This support can be used between PC Server System/390 systems on a LAN using the 3088 device manager, and using the AWSICA or LAN3172 device managers when communicating with host mainframes.

- **ACF/VTAM Cross Domain Access**. ACF/VTAM supports cross-domain access from logical units in one domain to applications in other domains. This capability can be used on the PC Server System/390 to access VTAM applications on other systems in a network, and to allow users on those systems access to applications on the PC Server System/390.

4.2 Installing VSE/ESA on the PC Server System/390

You can install VSE/ESA on the PC Server System/390 using different procedures, depending on your hardware configuration and your need to emulate a specific S/390 DASD type:

- From the compact disc restoring a preconfigured VSE/ESA system
- From another media, such as 4mm digital audio tape (DAT), 3480 magnetic tape, or 6250 BPI tape, by using the VSE/ESA initial install method

Subtopics
4.2.1 VSE/ESA Installation by Restoring a Preconfigured System From the Compact Disc
4.2.2 VSE/ESA Initial Installation from Other Media

4.2.1 VSE/ESA Installation by Restoring a Preconfigured System From the Compact Disc

VSE/ESA is delivered on the VSE/ESA preconfigured system compact disc. This compact disc provides a "load and go" process that allows for an easy and very rapid installation of VSE/ESA It is also useful for verifying the proper operation of the P/390. The preconfigured system compact disc contains backups of the OS/2 files for DOSRES and SYSWK1 as preinstalled by IBM on emulated 9336 DASD. It also contains an initial device map (DEVMAP.VSE) that matches the I/O configuration of the preconfigured VSE/ESA system. Together, these systems are specially tailored to make the best use of the P/390 device managers for most users. The following selections have already been made:

- ACF/VTAM as the TP access method
- 9336 DASD for system residence (cannot be changed).
- Specific S/390 device types at pre-defined S/390 addresses. Additional devices can easily be defined after installation.

4.2.2 VSE/ESA Initial Installation from Other Media

This form of installation is similar to initial installation of VSE/ESA from tape on an ES/9000.

Using the initial install method takes longer and requires more manual intervention than the installation of the preconfigured system. However, you can select the DASD type you wish to emulate and the teleprocessing access method, VTAM or BTAM, to be used.

4.3 Migrating VSE/ESA Applications to the PC Server System/390

After the VSE/ESA system is installed on the PC Server System/390, you can migrate S/390 applications from a VSE/ESA host mainframe to the PC Server System/390 for development and testing. VSE/ESA applications that were S/390-based applications on host VSE mainframe systems should continue to run without change under VSE/ESA on the PC Server System/390.

Applications can be moved from the host to the PC Server System/390 using any of the following methods:

- For PC Server System/390s that have a 3270 coax connection to the host, OS/2 RECEIVE commands can be used to copy source members from host VSE/ESA files or libraries to OS/2 files. This method can be used if the application source code is going to be maintained with OS/2 facilities. The OS/2 files can be edited and VSE/ESA JCL added to submit the files to the VSE/ESA system using the 2540 card reader emulator.

- For PC Server System/390s that have a VSE/POWER PNET connection with the host, files can be sent across the PNET connection to the VSE/ESA system on the PC Server System/390.

4.4 Distributing VSE/ESA to Other PC Server System/390s

After installing the VSE/ESA system on the first PC Server System/390, you may want to install a copy of it on other licensed PC Server System/390s. Since all the files used to support the VSE/ESA system are contained in OS/2 files, OS/2 facilities can be used to copy the VSE/ESA system to other PC Server System/390s. There are several methods you can use to distribute the VSE/ESA system:

- Using a coax connection or LAN connection to a host VSE/ESA mainframe system, the OS/2 files used to support the VSE/ESA system on the PC Server System/390 can be uploaded to the host VSE/ESA system and downloaded to other PC Server System/390s connected to it.

- If a LAN file server is available on the same LAN with multiple PC Server System/390s, the OS/2 files can be copied to the file server disk and then copied to other PC Server System/390s.

- A tape device installed on each PC Server System/390 or a portable unit that can be temporarily installed is a convenient method for distributing a copy of the VSE/ESA system to other PC Server System/390s. This also provides a backup of the system in case it needs to be recovered.

After the VSE/ESA system is distributed to other PC Server System/390s, files can be moved between systems using any of these methods. Diskettes can also be used to move selected files from one PC Server System/390 to another. OS/2 commands can be used to copy OS/2 files to diskette or VSE/ESA utility programs can be used to copy all or parts of VSE/ESA files or libraries to emulated S/390 tape files on diskette (see "AWSTAPE: 9-Track Tape Emulator" in topic 2.3.9) for transporting to other systems.

5.0 Chapter 5. MVS/ESA and OS/390 on the PC Server System/390

MVS/ESA consists of the appropriate related releases of MVS/ESA System Product and MVS/Data Facility Product (MVS/DFP). MVS/DFP is a member of IBM's Data Facility family of products. MVS/DFP works with these products to perform essential storage, data, program, and device management functions in the MVS/ESA operating system environment.

The MVS/ESA environment supports the use of both 24-bit and 31-bit addressing. Many MVS/DFP components have modules or data in extended virtual storage above 16 megabytes, leaving more space below 16 megabytes for user programs.

OS/390 consists of a collection of elements. Some elements are base elements and some elements are optional elements. When you order OS/390, you receive all base elements and they can be used, once you install OS/390.

Note

Information in this section relating to MVS/ESA applies also to OS/390 unless stated otherwise.

Subtopics

5.1 MVS/ESA Functions Supported on the PC Server System/390

PC Server System/390 supports both MVS/ESA and OS/390. Most functions are supported on the S/390 processor that is installed in the PC Server System/390. See Appendix B, "Supported Facilities" in topic B.0 for a list of supported and unsupported functions. Some components include:

- TSO and ISPF/PDF family products
- DFP and DFSMS family products
- ACF/VTAM
- TCP/IP
- Advanced Program-to-Program Communication/MVS (APPC/MVS)
- Procedures languages (REXX/MVS, CLISTs, JCL)
- System Modification Program Extended (SMP/E)

Note: MVS/ESA is supported as a guest operating system under VM/ESA and can run as a guest of VM/ESA on the PC Server System/390.

Subtopics

5.1.1 MVS/ESA Support for Devices Attached to the PC Server System/390

MVS/ESA device support on the PC Server System/390 is limited to the S/390 devices emulated by the PC Server System/390 device managers and to the S/390 devices that can be attached using the S/370 Channel Emulator/A. The MVS/ESA feature provides support for many devices on S/390 mainframes.

Subtopics
5.1.1.1 MVS/ESA Support for Emulated Devices
5.1.1.2 Support for S/370 Channel Emulator/A Attached Devices

5.1.1.1 MVS/ESA Support for Emulated Devices

The following summarizes the MVS/ESA device type (DEVTYPE) used for the S/390 devices emulated by the PC Server System/390 device managers:

Device Manager Name	**Function**	**MVS/ESA DEVTYPE**
AWSCKD	CKD and ECKD-capable DASD emulator	3330, 3350, 3375, 3380, 3390, or 9345
AWSFEP- See note	3745 communication controller	3705 (Type 6 channel adapter)
AWSOMA	Optical Media Attach	3423
AWSTAPE	9-track tape	3422 (3803 Control Unit)
AWS2540	2540 card reader emulator	2540
AWS2821	Printer manager	1403 (2821 Control Unit)
AWS3274	3274 Control unit emulator (non-SNA)	3277, 3278 or 3279
LAN3088	3088 emulation over LAN	3088 or CTC
LAN3172	3172 LAN Gateway (SNA)	3088
LAN3274	LAN 3270 sessions (non-SNA)	3277, 3278 or 3279
LCS3172	3172 LAN channel station for TCP/IP (MVS)	3088 (even/odd address pair)
#MGR3172	NetView	3088
SCSI3420	SCSI-attached 9-track tape unit	3420 tape drive
SCSI3480	SCSI-attached 18-track tape unit	3480 tape drive
#WAN3172	3172 SDLC Gateway	3088

Note: This device manager is provided on an *as is* basis. We recommend WAN3172 for MVS/ESA.

#The CKD DASD emulator, AWSCKD, supports CKD and ECKD commands in the MVS/ESA environment. Device types 3380 and 3390 #are recommended over 3330, 3350 and 3375 (which are no longer supported by DFSMS/MVS).

Local 3270 devices can be defined to MVS and supported using the AWS3274 and LAN3274 device managers. These device managers support non-SNA 3270 DFT terminal access to MVS/ESA from 3270 emulation sessions on the PC Server System/390 and on OS/2 client workstations.

ACF/VTAM support is required on MVS/ESA to support devices attached through the LAN3172 and AWSFEP device managers. The LCS3172 device manager requires MVS/ESA TCP/IP support.

5.1.1.2 Support for S/370 Channel Emulator/A Attached Devices

"Device Attachment" in topic 2.2.3 described the considerations for attaching S/370 devices to the PC Server System/390 using the S/370 Channel Emulator/A. The *MVS/ESA General Information* manual lists the S/370 devices that are supported by the MVS/ESA.

5.1.2 MVS/ESA Connectivity and Networking Capabilities

Besides the local 3270 emulation support, users and other systems can be connected to PC Server System/390s running MVS/ESA through a variety of facilities provided by MVS/ESA, as well as through other program products and the P/390 device managers.

- **Virtual Telecommunications Access Method (VTAM)**. SNA connectivity from a PC Server System/390 to LAN-attached mainframe systems and other PC Server System/390s is also available using the LAN3172 device manager.

  OS/2, DOS, and Windows workstations can communicate with the MVS/ESA system on the PC Server System/390 as local SNA 3270 terminals using the 3172 LAN Gateway device manager.

- **Transmission Control Protocol/Internet Protocol (TCP/IP)**. Clients on a TCP/IP network can have full TCP/IP connectivity to a MVS/ESA system on the PC Server System/390. The LCS3172 device manager provides emulation support for the 3172 control unit that acts as the gateway for the TCP/IP network. TCP/IP support is only required on MVS/ESA to support this capability. OS/2 TCP/IP is not required.

5.2 Installing MVS/ESA on the PC Server System/390

You can install MVS/ESA on the PC Server System/390 using various methods:

- Using 3480 or 4mm tape attached directly to the PC Server System/390
- # Using packages, such as the CustomPac, the CBIPO/CBPDO offerings, and the OS/390 ServerPac
- Restoring any MVS/ESA system that you have backed up on tape
- Transferring an existing MVS/ESA system from DASD to tape, and then restoring that system from tape to the PC Server System/390 using utilities, such as DFDSS

For detailed information about installing MVS/ESA and OS/390 on a PC Server System/390 refer to the *PC Server 500 System/390 Installation, Configuration, and User's Guide for MVS/ESA*.

Subtopics
5.2.1 Servicing MVS/ESA on the PC Server System/390

5.2.1 Servicing MVS/ESA on the PC Server System/390

It is recommended that all MVS/ESA servicing on the PC Server System/390 be accomplished using SMP/E. For further information on the use of SMP/E refer to the SMP/E Program Directory and supporting documentation.

5.3 Migrating MVS/ESA Applications to the PC Server System/390

After the MVS/ESA system is installed on the PC Server System/390, you can migrate S/390 applications from a MVS/ESA host mainframe to the PC Server System/390 for development and testing. MVS/ESA applications that were S/390-based applications on host MVS mainframe systems should run without change under MVS/ESA on the PC Server System/390.

Applications can be moved from the host to the PC Server System/390 using any of the following methods:

- For PC Server System/390s that have a 3270 coax or LAN connection to the host:

  - OS/2 RECEIVE commands can be used to copy source members from host MVS/ESA files into OS/2 files.

  - The TSO XMIT command can be used to send files from host systems directly to a predetermined user ID on a PC Server System/390 MVS system.

5.4 Distributing MVS/ESA to Other PC Server System/390s

After installing the MVS/ESA system on the first PC Server System/390, you may want to install a copy of it on other PC Server System/390s. Because all the files used to support the MVS/ESA system are contained in OS/2 files, you can use OS/2 facilities to copy the MVS/ESA system to other PC Server System/390s. There are several methods you can use to distribute the MVS/ESA system:

- Using a 3270 coax connection or LAN connection to a host MVS mainframe system, the OS/2 files used to support the MVS/ESA system on the PC Server System/390 can be uploaded to the host MVS system and downloaded to other PC Server System/390s connected to it.

- If a LAN file server is available on the same LAN with multiple PC Server System/390s, the OS/2 files can be copied to the file server disk and then copied to other PC Server System/390s.

- A tape device installed on each PC Server System/390 or a portable tape unit that can be temporarily installed is a convenient method for distributing a copy of the MVS/ESA system to other PC Server System/390s. This also provides a backup of the system in case it needs to be recovered.

After the MVS/ESA system is distributed to other PC Server System/390s, files can be moved between systems using any of these methods.

Diskettes can also be used to move selected files from one PC Server System/390 to another. OS/2 commands can be used to copy OS/2 files to diskette or MVS/ESA tape commands can be used to copy all or parts of MVS/ESA datasets to emulated S/390 tape files on diskette. See "AWSTAPE: 9-Track Tape Emulator" in topic 2.3.9 for transporting to other systems.

A.0 Appendix A. Documentation and Related IBM Manuals

This section lists IBM books that can help you plan and install your PC Server System/390 and the operating systems supported on it.

Subtopics

A.1 PC Server System/390 Booklets and Manuals

The following publications along with this book make up the PC Server system library provided to you with your IBM PC Server 500 System/390. These additional books contain more information on installing and using your PC Server System/390.

The *PC Server 500 System Library* (S19H-1252), which contains two manuals:

User's Guide contains the information needed to setup, configure, and troubleshoot the PC Server 500.

User's Reference contains detailed technical information about the PC Server 500 system architecture, input/output connectors, performance considerations, and more.

IBM PC Server 500 System/390 Introduction, GC24-5717

IBM PC Server 500 System/390 Installation, Configuration, and User's Guide for VM/ESA, SC24-5718

IBM PC Server 500 System/390 Installation, Configuration, and User's Guide for VSE/ESA, SC24-5719

IBM PC Server 500 System/390 Installation, Configuration, and User's Guide for MVS/ESA, SA22-7210

PC Server 500 System/390 Messages and Codes, SA22-7227

The following publications are separately orderable:

IBM PC Server 500 System/390...Is It Right for You? Technical Application Brief, GK20-2763

Connectivity on a PC Server System/390 with MVS, SG24-4624

Printing with MVS on the PC Server System/390, SG24-4612

MVS and the PC Server System/390, GG24-2538

A.2 OS/2 Manuals

The following manual is supplied with the OS/2 software that comes with the PC Server System/390. It contains more information on installing and using the OS/2 operating system and Communications Manager/2 software.

User's Guide to OS/2 Warp, 83G8300

A.3 VM/ESA Manuals

#The *Virtual Machine/Enterprise Systems Architecture Library General Information for VM/ESA Version 2 Release 1.0*, GC24-5745, #describes the books in the VM/ESA Version 2 Release 1.0 library. The following manuals are selected manuals from that library that will #help you plan for, install, and use VM/ESA on the PC Server System/390.

Subtopics

#A.3.1 VM/ESA Product Overview

VM/ESA General Information, GC24-5745
VM/ESA Introduction and Features Summary, SC24-5746

#A.3.2 VM/ESA Planning, Administration, Installation and Service

VM/ESA Installation, -Supplied with the VM/ESA product order.
VM/ESA Service Guide, SC24-5749
VM/ESA Introduction and Feature Summary, SC24-5746
VM/ESA Planning and Administration, SC24-5750
VM/ESA CP Command and Utility Reference, SC24-5773
VM/ESA Connectivity Planning, Administration and Operation, SC24-5756
VM/ESA Group Control System, SC24-5757
VM/ESA Running Guest Operating Systems, SC24-5755

#A.3.3 VM/ESA Operation and End Use

VM/ESA System Operation, SC24-5758
VM/ESA CMS User's Guide, SC24-5775
VM/ESA CMS Command Reference, SC24-5776
VM/ESA CP Command and Utility Reference, SC24-5773

#A.3.4 VM/ESA Diagnosis

VM/ESA System Messages and Codes, SC24-5784
VM/ESA Diagnosis Guide, LY24-5255
VM/ESA CP Diagnosis Reference, LY24-5256
VM/ESA Dump Viewing Facility, SC24-5783

A.4 VSE/ESA Manuals

The *VSE/Enterprise Systems Architecture Library Guide*, GC33-6519, describes the manuals available for VSE/ESA, their contents and how to use them. The following manuals from that library will help you plan for, install, and use VSE/ESA on the PC Server System/390.

Subtopics
A.4.1 VSE/ESA Product Overview
A.4.2 VSE/ESA Planning and Installation
A.4.3 VSE/ESA Administration and Operation

A.4.1 VSE/ESA Product Overview

VSE/ESA General Information, GC33-6501

A.4.2 VSE/ESA Planning and Installation

VSE/ESA Planning, SC33-6503
VSE/ESA Installation and Service, SC33-6504
VSE/ESA Unattended Node Support, SC33-6512

A.4.3 VSE/ESA Administration and Operation

VSE/ESA Administration, SC33-6505
VSE/ESA Operation, SC33-6506
VSE/ESA Messages and Codes, SC33-6507
VSE/ESA Networking Support, SC33-6508
VSE/ESA Programming and Workstation Guide, SC33-6509
VSE/ESA Guide for Solving Problems, SC33-6510
VSE/ESA Guide to Systems Functions, SC33-6511
VSE/ESA System Control Statements, SC33-6513
VSE/ESA Diagnosis Tools, SC33-6514
VSE/ESA Systems Utilities, SC33-6517

A.5 MVS Manuals

The library guides in the following list provide information on the contents of the manuals in the MVS/ESA library. The guides also tell about the contents, who the manuals are for, and how the manuals can be used to help you plan for, install, and use MVS/ESA on the PC Server System/390.

One of the following:

MVS/ESA SP V4 Library Guide, GC28-1601
MVS/ESA SP V5 Library Guide with JES2, GC28-1423
MVS/ESA SP V5 Library Guide with JES3, GC28-1424

One of the following:

DFSMS/MVS V1R2 General Information--Library Guide, GC26-4902
MVS/DFP V3R3 Guide and Master Index, GC26-4553

One of the following:

VTAM V3R4.1 for MVS/ESA Release Guide, LY43-0054
VTAM V3R4.2 for MVS/ESA Release Guide, LY43-0062
VTAM V4R1 for MVS/ESA Release Guide, GC31-6441
VTAM V4R2 for MVS/ESA Release Guide, GC31-6492

One of the following:

ISPF and ISPF/PDF V3R5 Getting Started, SC34-4256
ISPF Version 4 Getting Started, SC34-4440

Both of the following:

TSO/E Version 2 Library Guide, GC28-1866
TCP/IP for MVS V3R1 Planning and Migration Guide, SC31-7189

#For OS/390:

OS/390 Up and Running, GC28-1726
OS/390 Information Roadmap, GC28-1727

A.6 Operating System Architecture References

- *IBM System/370 Principles of Operation*, GA22-7000
- *Enterprise Systems Architecture/390 Principles of Operation*, SA22-7201
- *Enterprise Systems Architecture/390 Data Compression*, SA22-7208

A.7 Softcopy

Softcopy documentation for VM/ESA, VSE/ESA and MVS/ESA is available on compact discs that come with the operating system. The compact discs contain online prebuilt books only. Source for the books is not provided on the compact discs. BookManager Read/2 is also provided to access the books.

- The *IBM Online Library Omnibus Edition: VM Collection*, SK2T-2067, contains all of the VM/ESA manuals. In addition, the collection contains:

  - Complete libraries for current releases of VM/ESA and most optional IBM program products.

- The *IBM Online Library Omnibus Edition: VSE Collection*, SK2T-0060, contains all of the VSE/ESA manuals except for the *VSE/ESA Master Index*. In addition, the collection contains:

  - Complete libraries for current releases of VSE/ESA and most optional IBM program products.

- The *IBM Online Library Omnibus Edition: MVS Collection*, SK2T-0710, contains all of the MVS/ESA manuals. In addition, the collection contains:

  - Complete libraries for current releases of MVS/ESA and many optional IBM program products.

- The *IBM Online Library Omnibus Edition: OS/390 Collection*, SK2T-6700, contains all of the OS/390 manuals. In addition, the
collection contains:

- Complete libraries for current releases of IBM program products that run on OS/390.

A.8 Reference Publications

This section lists other publications that may be useful to you.

Ask your IBM representative for information about purchasing the manuals that are not provided with the products they support.

Subtopics

A.8.1 IBM OS/2 Version 2.1 Publications

- *Operating System/2 Extended Edition User's Guide*, provided with the Operating System/2 program
- *Operating System/2 Extended Edition Command Reference*, provided with the OS/2 program
- *Operating System/2 Standard Edition Using the System*, provided with the OS/2 program
- *Operating System/2 Command Reference*, provided with the OS/2 program

A.8.2 IBM SNA Publications

- *SNA Technical Overview*, GC30-3073
- *SNA Management Services References*, SC30-3346

A.8.3 IBM SDLC Publications

- *SDLC Concepts*, GA27-3093

A.8.4 IBM NTS/2 Publications

- *NTS/2 LAN Adapter and Protocol Support*, S96F-8489
- *NTS/2 Messages and Error Recovery*, S96F-8490

A.8.5 IBM VTAM Publications

VTAM Version 4 Release 2

- *Release Guide*
  GC31-6492 (MVS)
  GC31-8089 (VM)
  GC31-8090 (VSE)
- *Network Implementation Guide*, SC31-6494

VTAM Version 4 Release 1

- *VTAM Messages and Codes*, SC31-6418
- *VTAM Operation*, SC31-6420
- *VTAM Operation Quick Reference*, SX75-0201
- *VTAM Resource Definition Reference*, SC31-6427
- *VTAM Resource Definition Samples*, SC31-6428

VTAM Version 3 Release 4

- *VTAM Network Implementation Guide*, SC31-6404
- *VTAM Messages and Codes*, SC31-6405
- *VTAM Operation*, SC31-6408
- *VTAM Programming*, SC31-6409
- *VTAM Programming for LU 6.2*, SC31-6410
- *VTAM Resource Definition Reference*, SC31-6412
- *Planning and Reference for NetView, NCP, and VTAM*, SC31-6092

A.8.6 Miscellaneous Publications

- *Multiprotocol Networking with the 3172 Model 3*, GG24-4252
- *LAN Technical Reference IEEE 802.2 and NetBIOS APIs*, SC30-3587
- BOF for LAN Technical Reference Adapter Interfaces, SBOF-6221
- *Token-Ring Network Problem Determination Guide*, SX27-3710
- *Token-Ring Network: Architecture Reference*, SC30-3374
- *Using the IBM Cabling System with Communication Products*, GA27-3620

B.0 Appendix B. Supported Facilities

This appendix identifies System/370 and ESA/390 facilities that are supported and unsupported by the PC Server System/390.

Subtopics
B.1 System/370 Facilities
B.2 ESA/390 Facilities

B.1 System/370 Facilities

The PC Server System/390 provides all of the System/370 functions defined as standard in Appendix D of the *System/370 Principles of Operation*. In addition, the PC Server System/390 provides the following System/370 facilities:

- Branch and Save
- Conditional Swapping
- CPU Timer and Clock Comparator
- Dual Address Space
- Expanded Storage
- Extended; which includes:
  - Common-segment
  - Low-address protection
  - The instructions IPTE and TPROT
- Extended-Control Program Support
- Extended-Precision Floating Point
- Extended Real Addressing
- Floating Point
- Move inverse
- MVS/370 Assists
  - Add Functional Recovery Routine
  - Fix Page
  - SVC Assist
  - Obtain Local Lock
  - Release Local Lock
  - Obtain CMS Lock
  - Release CMS Lock
  - Trace SVC Interruption
  - Trace Program Interruption
  - Trace Initial SRB Dispatch
  - Trace I/O Interruption
  - Trace Task Dispatch
  - Trace SVC Return
- PSW-Key Handling (the instructions SPKA and IPK)
- Recovery Extensions
- Segment Protection
- Service Signal
- Square root
- Storage-Key-Instruction Extensions (the instructions ISKE, RRBE and SSKE)
- Storage-Key 4K-Byte Block
- Test Block
- TOD-clock-synchronization
- Translation; which includes:
  - Dynamic Address Translation (DAT)
    - 64KB or 1MB Segment Sizes
    - 4KB Page Size only
  - Extended-Control (EC) Mode
  - Program-Event Recording (PER) (with GR alteration events)
  - Reference and change recording
  - SSM Suppression
  - Store Status
  - The instructions LRA, PTLB, RRB, STNSM and STOSM
- Virtual Machine Assists
  - The instructions IPK, ISK, LPSW, RRB, SPKA, SSK, SSM, STCTL, STNSM, STOSM and SVC
  - Common-segment modification
  - Segment-protection modification
  - Extended-storage-key extension

The I/O subsystem provides the following System/370 facilities:

- Channel Indirect Data Addressing
- Clear I/O
- Command Retry
- Fast Release (the instruction SIOF)
- Halt Device
- Recovery Extensions
- 31-Bit IDAWs

B.2 ESA/390 Facilities

The PC Server System/390 provides all ESA/390 functions defined as standard in Appendix D of the *ESA/390 Principles of Operation*. In addition, the PC Server System/390 provides the following ESA/390 facilities:

- Access-List-Controlled Protection
- Address-Limit Checking
- Broadcasted purging
- Cancel I/O
- Subspace Group
- Compare Until Substring Equal
- Compression
- Expanded Storage
- Extended Sorting
- Incorrect-Length-Indication Suppression
- Interpretive Execution
  - Interception format 2
  - PER extensions
  - VM-data-space
  - Storage-Key Function
- Move Inverse
- Move Page (Facility 2)
- MVS assists
  - Add Functional Recovery Routine
  - SVC Assist
  - Obtain Local Lock
  - Release Local Lock
  - Obtain CMS Lock
  - Release CMS Lock
- Program-Event Recording 2 (PER 2)
- PER extensions
- Private Space
- Set Address Space Control Fast
- Square Root
- Storage-Protection Override
- String Instructions
- Suppression on Protection

Subtopics
B.2.1 Unsupported ESA/390 Functions

B.2.1 Unsupported ESA/390 Functions

The following functions are not supported by the PC Server System/390:

- Asynchronous Data Mover Facility
- Asynchronous Pageout Facility
- Channel-Subsystem Call
- Concurrent Sense
- Coupling (Parallel Sysplex, Coupling Links, Integrated Coupling Migration Facility)
- Dynamic Reconfiguration Management
- ESCON
- ICRF (Cryptography)
- PR/SM
- SIE I/O Assist
- Sysplex
- Sysplex Timer (ETR)
- Vector Facility

ABBREVIATIONS List of Abbreviations

APPN Advanced Peer-to-Peer Networking

ARP Address Resolution Protocol

CART channel resource allocation table

CCU communications control unit

CCW channel command word

CDLC Channel Data Link Control

CKD count key data

CLDP controller load and dump program

CMC communication management configuration

CMOS complementary metal oxide semiconductor

CM/2 Communications Manager/2

CMS conversational monitor system

CPU central processing unit

CTC channel-to-channel

CUA Common User Access

DLC data link control

DLL data link library

ECC error correcting code

ECF Enhanced Connectivity Facilities

EDF extended disk format

EIB electrical interface board

EOF end of file

EOL end of line

ESA extended systems architecture

FAT file allocation table

FBA fixed block architecture

FIFO first in, first out

GDDM Graphical Data Display Manager

GPR general purpose register

HPFS high-performance file system

HPOFS High Performance Optical File System

ICA integrated communications adapter

IOCB I/O control blocks

I/O input/output

IP Internet Protocol

IPL initial program load

ISFC ISFC Inter-System Facility for Communication

KB kilobyte

LAN local area network

LAPS LAN adapter and protocol support

LIC licensed internal code

LIFO last in, first out

LIPT link IPL port trace

LLC logical link control

LPDA Link Problem Determination Aid

LRECL logical record length

LSCD Large Scale Computing Division

LT logical terminal

LU logical unit

MAC medium access control

MB megabyte

MHz megahertz

MOSS maintenance and operator subsystem

NCP Network Control Program

NCP MS NCP Multinetwork Server

NTS/2 Network Transport Services/2

OEM original equipment manufacturer

PIU path information unit

PU physical unit

PVM pass-through virtual machine

PC personal computer

P/390 System/390 MicroProcessor Complex

PSW program status word

RECFMS record formatted maintenance statistics

RIP Routing Information Protocol

RTS request to send

SAP service access point

SCSI small computer systems interface

SDLC Synchronous Data Link Control

SIGP Signal processor

SIO start I/O

SIT scanner interface trace

SMMF SSCP monitor mode function

SNA Systems Network Architecture

SRPI Server-Requester Programming Interface

SSCP system services control point

TDF tape descriptor file

TFA transparent file access

TIC token-ring interface coupler

TOD time of day

TSAF transparent services access facility

UCW unit control word

XGA extended graphics adapter

XID exchange identification

VLSI very large scale integration

VM virtual machine

WAC Wide Area Connector

WAN wide area network