Personal Systems

IBM PERSONAL SYSTEMS TECHNICAL SOLUTIONS

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It's Here!

PC DOS 6.1

All DOS is not created equal...

IBM

Contents

ABOUT THE COVER

PC-DOS 6.1 has arrived, and its colorful logo exemplifies its new colorful functionality—including support for PCMCIA and pen, two mobile computing technologies used in IBM's popular ThinkPad series.

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LITTLE SOLUTIONS

Point of View

OS/2: Killer Application or Killer Operating System?

I keep hearing all the comments that OS/2® needs a "killer application" to really make it take off. I say the killer application isn't needed. What people need to know is that OS/2 is the "killer operating system."

The Start of Something Big

I first shared this line of thinking at a meeting just prior to the OS/2 Technical Interchange in Phoenix early this year. The meeting included a number of IBMers and civilians like myself. One of the objectives was for us to voice our concerns about OS/2 support.

An issue brought up repeatedly was the OS/2 sales effort. Most felt that we needed a "killer" OS/2 application to get sales of OS/2 moving. While a good—or great—application can certainly help an operating system like OS/2, I felt a major point was being overlooked: the "killer OS" is already here and it is OS/2. I took the floor and—if you believe others who were present—preached the Sermon of the Killer OS. To this day, some folks on the BBS still call me "the preacher."

My sermon was based on my own experiences with OS/2 and with helping a number of PC users get started with OS/2. I was delighted to learn that we could gain a good deal of productivity by using our existing DOS and DOS/Windows applications on a better operating system.

Getting Involved with OS/2

In my shop, I got involved with OS/2 only because there was a PC sitting on my desk

that I rarely used. After all, I am an old mainframe type and, for the most part, still work in that environment. Our IBM systems engineer had enrolled my company in the OS/2 2.0 Early Experience Program (EEP). When we received our first shipment of OS/2, we needed to find a test machine so we could install OS/2 and learn about it. Someone chose my under-utilized PC as the target system.

By year end, every desktop in the company that has a PC will be running OS/2.

At that time, I used my PC for three primary applications: WordPerfect® for memos and letters, Lotus 1-2-3® for budgets and checkbook balancing, and a terminal emulator to access our mainframe and to access IBMLink™ for support activities.

I didn't particularly like the mainframe connection we were using at the time. We were running straight DOS with PCLP. Also, it seemed that every time I tried to do something in one of the three applications, someone would come by and want me to answer a question. So I'd terminate one task and start another—a-less-than-ideal situation common for DOS users.

One weekend, after an early beta release of OS/2 2.0 was installed on my PC, I was

sitting in my office waiting for some mainframe stuff to finish up. I decided to play around a little and see what this new "animal" was all about. I set up some command files to allow me to start my applications—which were on the network—and started playing with things. I quickly discovered that I could have my spreadsheet, memo, and DOS terminal emulator all open at one time. I did not have to play stop-start every time I wanted to check something in one of the applications.

My boss learned this lesson one day when she came up and asked for something. She saw that I was in the middle of a memo and started to walk away. I just did a quick Ctrl+Esc and got her the budget figures she had requested. She soon asked me for a demonstration of OS/2, and after the demo she asked when we could put OS/2 on her system. Shortly after the final 2.0 beta version was released, I installed OS/2 on her machine.

Initially, she was reluctant to launch into OS/2 without the security of a DOS system, so she used Boot Manager to select a DOS or OS/2 start-up. It didn't take long for her to remove Boot Manager. Once she started using OS/2, she ran her DOS programs there and stopped using real DOS.

Next to try OS/2 was our development group. Most of these folks already had systems capable of running OS/2. At first there was a mixed reaction, which was hardly surprising. After all, some of these people were already proficient computer users and embarking on something

Networking on the OS/2 BBS

Begun a couple of years ago, the OS/2 Bulletin Board Service (OS/2 BBS) that Jack Hiatt invited you to use has become one of the most popular meeting places for OS/2 users—IBMers and customers alike. Those who are familiar with the BBS know Jack is a frequent participant.

The OS/2 BBS is perhaps the best place—outside of a conference—to share information on OS/2. You can meet others with your skill level and with similar responsibilities, talk with support personnel who have similar equipment and applications installed, and share hints, tips, and solutions. All on the OS/2 BBS!

Not only can you get answers from some of the brightest computer users in the world, but your questions and comments are read and responded to by IBMers and other software developers and vendors. Even IBM executives read and respond to notices on the OS/2 BBS.

You can raise issues about required features, pricing, packaging, service, and support. You can read entire presentations or white papers describing IBM's direction in specific product areas. You can even download fixes for IBM software products. The best thing about the OS/2 BBS is that it is not *for* IBM customers, it is *of* customers.

Right now, technical coordinators with IBMLink IDs have free access to the OS/2 BBS by entering OS2BBS on the main menu of IBMLink. If you are not currently registered as a technical coordinator, call (800) 547-1283 to find out more about the Technical Coordinator Program and the OS/2 BBS.

These applications include Lotus 1-2-3 at several different release levels, Word-Perfect 5.1, Harvard Graphics®, and an inexpensive CASE tool. Development has just begun for our first pure PC-based application: an insurance underwriting system.

The reason for the changeover to OS/2 was the increased productivity and ease of use that comes from the operating system itself. Our users were not motivated by a killer application; they were motivated by a killer operating system.

So, I think all you need to do to sell OS/2 is to show just how much the operating system alone can increase productivity. How much time is wasted by having to move from application to application in the workplace today? OS/2 can help eliminate a large amount of this pure waste. Show this to the potential buyers and the product can sell itself.

I Want My OS/2

OBTW (that's bulletin board jargon for Oh, by the way), did I mention that OS/2 is fun? As an old mainframe hacker with 35 years of working with them under my belt, I haven't had this much fun with an operating system since I first played around with VM and ran a couple of different versions of mainframe DOS and VS1.

No doubt in my mind, once you use OS/2, it will be difficult to use anything else. I look forward to hearing from you and sharing opinions on the OS/2 Bulletin Board Service!

unfamiliar created some discomfort. Soon, though, they found advantages to using OS/2 and enjoyed showing the product to the users they worked with on a day-to-day basis.

Preaching to the Converted

It wasn't long before several users were asking what they had to do to get OS/2 on their machines. At the time, many of our users were still on 286 machines, so we began by installing OS/2 on the newer OS/2-compatible systems. We explained to 286 users that their systems could not support OS/2, and there was no money in the computer budget to upgrade all the machines. This started a new trend in our company.

In the past, we had to urge departments to budget funds necessary to upgrade or replace PCs. Now they were coming to us with approved requests for system upgrades. This surprised and delighted me because it made my job easier and improved our overall computing environment.

Today we have OS/2 installed on nearly 100 of the 117 PCs in the company. By year end, every desktop in the company that has a PC will be running OS/2, providing access to our mainframe applications, databases, and Oracle® data, which is exported to a LAN server every evening for ad hoc inquiries.

Now, this is the important part. In general, we are *still* running the same DOS applications we were using before moving to OS/2! We will move to OS/2 apps when we can get the same performance and functions available from the DOS versions.

Jack Hiatt has been involved with IBM equipment for over 35 years in the roles of board wirer, computer operator, repairman, operations manager, and for several years now as technical support manager for two different insurance companies. He is currently technical support manager for a reassurance company in the midst of rightsizing.

Education Courses from Skill Dynamics

Skill Dynamics™, an IBM company, offers many classes for DOS, OS/2, and workstation security. The following courses are held in either Skill Dynamics or IBM classrooms and can also be taught at your location upon request. Over a dozen new courses have been added; they are indicated by an asterisk.

For more information on these courses, or to enroll, call (800) IBM-TEACh (426-8322).

Course Title	Code	Time	Description
DB2/2 Query Manager Workshop	P1046	2 days	Introduces the concepts and purposes of a relational database in building Query Manager applications.
OS/2 Extended Services Database Coding Workshop	P1048	3 days	Teaches IBM relational database programmers how to produce applications that access OS/2 databases in a stand-alone or an RDS environment.
OS/2 Database Performance Workshop	P1054	4 days	Provides software developers with performance tuning tips for the OS/2 Extended Services Database Manager and associated applications.
DATABASE 2 OS/2 Database Administration	P1056	4 days	Teaches DATABASE 2™ OS/2 database administration.
REXX Programming for OS/2	P1066	3 days	Teaches the skills necessary to write, test, and debug REXX programs using OS/2 2.0.
OS/2 2.0 PM Programming Using C++ and ICL:UI*	P1067	4.5 days	Provides basic concepts needed to program OS/2 2.0 Presentation Manager® (PM) applications using the C++ language.
OS/2 2.1 User Workshop*	P1069	1 day	Teaches the basic features of OS/2 2.1 and how to run applications.
Using and Customizing OS/2 2.1*	P1070	2 days	Shows how to install, migrate, and run applications, plus how to customize several OS/2 2.1 parameters.
Installing and Supporting OS/2 2.1*	P1071	3 days	Teaches how to plan an OS/2 installation; addresses hard disk management, memory management, and application support.
OS/2 2.1 Advanced Support Workshop*	P1072	2 days	Teaches how to support OS/2 2.1 end users through hands-on labs designed to teach skills in fixing problems and other support topics.
C Programming for OS/2 Presentation Manager*	P1073	5 days	Prepares application and systems programmers to develop OS/2 and PM applications with ANSI® C.
Secured Workstation Manager Implementation*	P1074	4.5 days	Teaches technical support personnel how to install and support the DOS Secured Workstation Manager.
Introduction to Client/Server*	P1075	1 day	Teaches basic client/server concepts and strategies.
Base OS/2 Programming*	P1076	3 days	Prepares application and systems programmers to develop the OS/2 and PM applications infrastructure with ANSI C.
Introduction to OS/2 Presentation Manager Programming*	P1077	5 days	Shows how to use the OS/2 PM Application Programming Interface (API) to develop C language applications.
OS/2 Presentation Manager Application Development*	P1078	5 days	Teaches advanced topics for developing C language applications, including the Information Presentation Facility, information files, window lists, notebooks, and multi-line entry fields.
OS/2 2.1 Performance and Tuning Workshop*	P1081	2 days	Teaches various tuning parameters and tools available to measure performance in the OS/2 environment.
OS/2 PD/PSI (Hang/Trap Analysis) on Software Problems*	P1082	4.5 days	Teaches problem-solving and diagnostic skills in determining the cause of problems in an OS/2 environment.

Single Sign-On Technology

Most organizations have complex information management systems that often include mainframe data centers, minicomputers, wide-area and local-area networks, stand-alone applications, and many PCs. Although connectivity between such environments provides access to critical information, users must often have multiple IDs and passwords to access different environments. The more environments users must access, the more IDs and passwords they must remember. This proliferation creates a potential security hazard.

Users find multiple IDs and passwords difficult to remember, so they may unintentionally compromise security by posting them on their workstations. Because most environments require users to periodically change their IDs or passwords, users are less able to manage multiple passwords—and thus maintain security.

Products using single sign-on technology simultaneously provide security and convenience. Single sign-on automates multiple security environment logons that require different methods of user authentication, thereby reducing the number of passwords that users must remember. With fewer IDs and passwords to remember, users are less likely to post passwords in obvious places.

What to Look for in a Single Sign-On Product

True single sign-on technology is just becoming available for general use. As this technology moves into mass release, a reliable and useful product should feature the following:

- **Security**. The single sign-on product should be part of an overall security plan.

- **Flexibility**. The method used to implement and administer the single sign-on product should be customizable for multiple security levels.

- **Data encryption**. There should be no way to extract sensitive information for malicious purposes from single sign-on program files on any workstation.

- **Increased productivity**. The technology should increase user productivity and efficiency rather than impede access to data.

Ideally, only network and security administrators should implement and administer a single sign-on product. For another level of security, only designated administrators should be able to customize the product. The customization interface should be intuitive and easy to use by providing high-level services.

Single sign-on program files should be encrypted at the user level so that no one can maliciously retrieve a password from a single sign-on database. The encryption should conform to the highest possible standards so that clever hackers cannot easily decode it.

Once installed on a user's workstation, a single sign-on product should be available to complete connections at all times, yet never interfere with normal CPU operation and common tasks. It should encourage employees to follow proper security procedures while remaining productive and efficient.

SSO/DACS from MERGENT

One product in the "infosecurity" area is Single Sign-On/Data Access Control System (SSO/DACS) from MERGENT International, a leader in PC and LAN information security. SSO/DACS works exclusively with MERGENT's PC Data Access Control System (PC/DACS), which controls access to PC workstations with an ID and password. SSO/DACS allows users to spend less time keying in passwords, and simplifies sign-on and password management procedures (see Figure 1).

Working in concert with PC/DACS-secured workstations, SSO/DACS automates logins to networks, minicomputers, and mainframes.
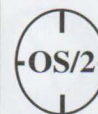
Enterprise Computing before SSO/DACS
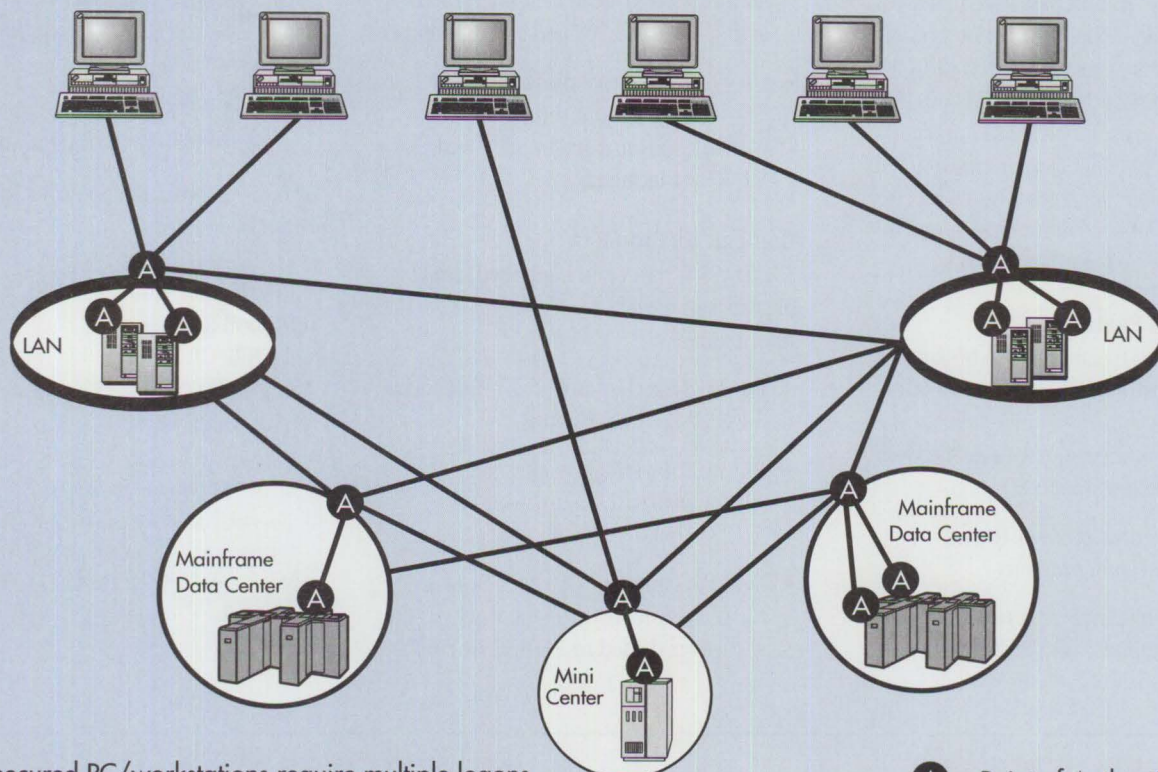
Non-secured PC/workstations require multiple logons.　　　　Ⓐ = Point of Authentication

Enterprise Computing after SSO/DACS
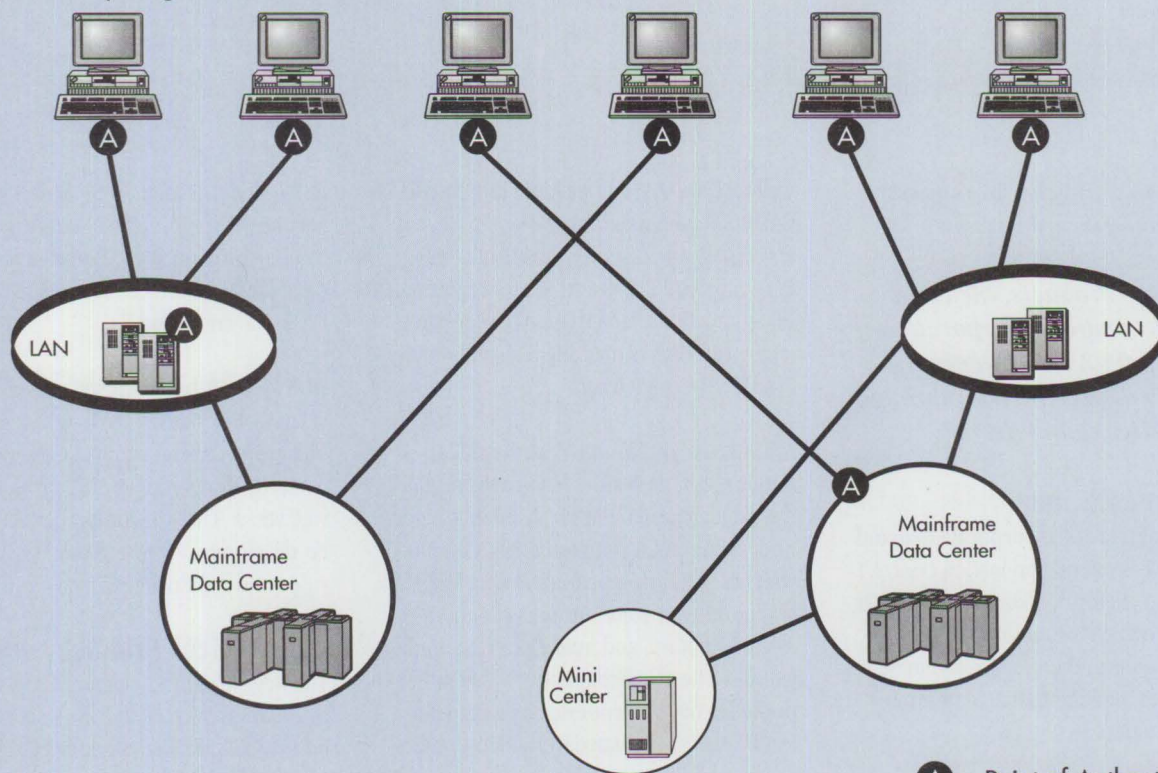
SSO/DACS reduces the number of logons required.　　　　Ⓐ = Point of Authentication

Figure 1.　Enterprise Computing Before and After SSO/DACS

In a standard sign-on procedure, the user enters a user ID and password that are authenticated before the sign-on is complete. Once the user has signed on to the workstation via PC/DACS, SSO/DACS works on the user's behalf to intercept the request to connect to an environment. SSO/DACS then manages all subsequent sign-on activities to other environments with little or no user intervention.

SSO/DACS Features
In addition to enhanced ease-of-use and tighter security, SSO/DACS provides flexible configuration and implementation across an organization. SSO/DACS does this in the following ways:

- Supports multiple user ID and password configurations

- Shares an identification and authentication database with PC/DACS

- Contains an easy-to-use proprietary scripting language to customize interactions between PCs and environments

- Uses default source files for instant sign-on connections through popular network software and to 3270 and 5250 host terminals

Companion Products
SSO/DACS is part of an integrated family of security products from MERGENT International:

- PC/DACS for OS/2 provides infosecurity for OS/2 2.x workstations.

- PC/DACS for DOS provides infosecurity for DOS and Windows-based workstations.

- Net/DACS integrates Novell® NetWare® file server security with the workstation security provided by PC/DACS for DOS.

- Site/DACS provides the tools to create PC/DACS workstation security standards and deploy PC/DACS across thousands of workstations.

- Domain/DACS provides centralized administration of PC/DACS for DOS.

For more information about MERGENT's products, contact:

MERGENT International, Inc.™
70 Inwood Road
Rocky Hill, CT 06067
Phone: (203) 257-4223
Fax: (203) 257-4245

John Worthen joined MERGENT International as president and CEO in 1989, bringing to the company more than 20 years of computer industry management, sales, and systems engineering experience.

Expanded OS/2 Relationships with Industry Giants

IBM recently struck agreements with such hardware industry giants as AST Research®, Inc., Xtend Micro Products, Inc., and Compaq® Computer Corporation to preload OS/2 2.1 on their systems or to distribute OS/2 through their reseller channels.

AST Research, Inc.
As a result of increased corporate demand for OS/2, AST is offering preloaded OS/2 2.1 on their systems for corporate accounts. It is available on AST's Premmia and Bravo desktop systems and on the Premium SE uniprocessor and Manhattan SMP multiprocessor servers.

AST's Premmia features a LocalLink video subsystem, one of the fastest graphic subsystems available for OS/2. The system's accelerated video performance works well with OS/2 2.1 in tackling multimedia, CAD/CAM, engineering, and scientific tasks. AST's price-conscious Bravo 486 PCs with OS/2 2.1 are suited to traditional PC applications such as word processing and spreadsheets, making it a solid entry-level OS/2 workstation.

AST's Premium SE and Manhattan SMP multiprocessor servers feature the scalability and high availability required in mission-critical computing environments. Combined with OS/2 2.1, they provide networking and multi-user solutions for accounting, sales, inventory, and manufacturing applications. The Manhattan SMP is also appropriate for other corporate environments traditionally dominated by minicomputers.

"We at AST believe that OS/2 support on our systems is critical to our success in the corporate market," says Jerry Devlin,

AST's vice president, U.S. sales. "We have very large corporate accounts that have standardized on OS/2, and we can now offer those customers systems with OS/2 2.1 preloaded."

IBM and AST have enjoyed a long-standing relationship. This includes a two-year old bilateral technical support agreement whereby IBM supports AST products and vice versa. The two companies are now co-developing advanced functions such as video and multiprocessing.

Xtend Micro Products, Inc.
The new "Upgrade America Program" from Xtend Micro Products features additions to Xtend's Renaissance Series microcomputer upgrade products. These include the 486/33 and 486/50 processor upgrades and several hard drive options that come preloaded with OS/2 2.1. These

products allow PS/2 users to economically upgrade their systems, increase hard drive capacity, and install OS/2—all in one step.

Xtend's Renaissance system upgrade products offer a unique approach to upgrading older PS/2® computers. The one-slot solution is fully software compatible and includes a memory expansion board with up to 24 MB of memory tightly coupled with a 386 or 486 processor. For PS/2 Models 50, 50Z, and 60, Xtend offers a 386SX/20 or a 486SLC/25 Renaissance system upgrade; Models 70 and 80 can be upgraded to a 486/33 or 486/50. The Renaissance hard drives are of various capacities, each being a Small Computer Systems Interface (SCSI) drive with a Micro Channel® controller. Preloaded with OS/2 2.1 including option files and drivers, it is completely compatible with all existing applications and data files.

"OS/2 is designed to be a world-class, industry-standard operating system," declares John Patrick, vice president of sales and marketing for IBM's Personal Software Products division. "This new upgrade from Xtend enables users of older PS/2s to upgrade their systems to take advantage of OS/2. This is good for customers who purchase new OS/2 systems and would like to extend OS/2's benefits to their installed base."

"Today's economic climate demands cost-effective ways to keep up with hardware advances required by new operating environments such as OS/2," says Mark Rapparport, president of Xtend. "The Upgrade America Program allows users to preserve their investment, avoid the expense of new machines, and migrate easily and economically to OS/2."

Compaq Computer Corporation

As part of its continuing effort to meet the diverse needs of its customers, Compaq Computer Corporation announced an agreement with IBM to distribute OS/2 2.1 through Compaq's traditional reseller channels and to support it on all current Compaq desktop and server products.

"Compaq is committed to addressing the needs of its customers," states Gary Stimac, senior vice president and general manager of Compaq's Systems division. "That commitment is evident in our work with IBM's Personal Software Products division to deliver the hardware and software products Compaq customers depend on. This agreement is driven by the interest we've seen from Compaq customers who are standardizing on OS/2 and look to both companies for an integrated hardware/software solution."

"We are extremely pleased that Compaq is making OS/2 2.1 products available to their customers," says Lee Reiswig, president of IBM's Personal Software Products division. "The power and reliability of OS/2 in stand-alone, networked, and client/server implementations, and the quality of Compaq computers make an excellent customer solution."

IBM TV Broadcasts

IBM TV is an excellent source of technical education for you, your technical staff, and your end users. IBM's technical experts discuss the latest technical topics and new product announcements. Since all broadcasts include a live question-and-answer session, you can ask questions specific to your environment via a toll-free telephone number.

Where to Find IBM TV Schedules

For the most timely and accessible information, we will post announcements of Technical Coordinator Program (TCP) topics, abstracts, times, and dates on CompuServe®, the OS/2 Bulletin Board Service (BBS) on IBMLink, and the IBM PC Company BBS in Atlanta.

Schedules are also available by fax. Call (800) IBM-4FAX and request document number 1967.

How to Download IBM TV Student Materials

Student materials and handouts for most TCP broadcasts can be downloaded from bulletin boards as follows:

To access the OS/2 BBS on IBMLink, follow these steps:

1. Type OS2BBS at the command line on the main IBMLink menu.

2. Select 1, OS/2 Question and Answer Bulletin Boards.

3. Select 3, OS/2 Software Library.

4. Select 3, OS/2 Documents and Information.

Files are named TCPmmdd.EXEBIN (mm is the month and dd is the day of the broadcast).

Access the IBM PC Company BBS by calling (919) 517-0001 (modem settings

How to Receive IBM TV Broadcasts at Your Location

All IBM TV broadcasts sponsored by the TCP are broadcast without encryption. With KU-band satellite equipment, you can receive these programs at the following coordinates:

- Satellite Business Systems 5 (SBS5)
- 123 degrees west longitude
- Horizontal polarity transponder 9
- 12.117 GHz center frequency
- 6.8 MHz audio subchannel

N-8-1). Note that this is a new phone number. First-time callers can register by answering a few questions and assigning themselves a password. After logging on, type D TCPmmdd.EXE (mm is the month and dd is the day of the broadcast).

CHANGE YOUR OPERATING SYSTEM.

PRESENTING WORDPERFECT 5.2 FOR OS/2

Now when you switch to the system of the future, you can get the one word processor that helps bring everyone along. Namely, the new WordPerfect® that's native for OS/2. Right from the start, it runs just like other graphical versions of WordPerfect, so more people already know it than any other. And besides saving you from training all your users, it can also save you from losing all your files. Because not only does every WordPerfect
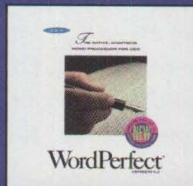
WITHOUT CHANGING THE WAY YOU OPERATE.

DOS, Windows, RS/6000 and VAX file you have remain fully compatible, you can exchange every WordPerfect AS/400, VMS and IBM 370 file as well. All this ease, however, should not be confused with ability. WordPerfect 5.2 comes filled with best-of-breed features and advanced Workplace Shell integration. So if you're stepping forward to OS/2, don't make everyone take two steps back. Get WordPerfect 5.2. For a free brochure or demonstration disk call (800) 526-5225 today.

WordPerfect®

Please circle #5 on reader service card.

IBM PC-DOS 6.1: More Features than MS-DOS 6.0

This article compares the new features of IBM PC-DOS 6.1 and Microsoft's MS-DOS® 6.0. Although they have similarities, IBM PC-DOS 6.1 provides unique features that help users get more from their systems. From award-winning DOS utilities such as disk compression and full-screen backup to PCMCIA and pen support, IBM PC-DOS 6.1 is a "must-have" for all DOS machines—and it takes less memory, too.

When PC users order DOS, many are surprised to find two primary brands of DOS. This naturally raises the question, "Which brand is best for me?" Although all brands of DOS feature the same basic functions, IBM PC-DOS 6.1 provides users with more reliable code, more speed, and more features than MS-DOS 6.0.

Personal Computer Memory Card International Association (PCMCIA) and pen input support—exclusive to PC-DOS 6.1—allow users to integrate exciting new technologies into their personal systems. PC-DOS 6.1 offers enhanced memory management facilities for more control over the system's memory environment, and PC-DOS 6.1 boasts a host of new utilities such as a comprehensive antivirus facility. This makes PC-DOS 6.1 a better value than any other brand of DOS.

PC-DOS 6.1 and MS-DOS 6.0 allow users to back up files modified since the last backup, only PC-DOS 6.1 allows users to make incremental backups; that is, to periodically append changed files to the full backup. This method—much faster than full backups—promotes good habits by allowing users to back up their systems more often. Users can also schedule unattended backups, which makes backing up even easier.

Unlike MS-DOS, IBM PC-DOS 6.1 will back up Novell NetWare's extended attributes from systems on NetWare LANs. Both MS-DOS 6.0 and PC-DOS 6.1 have a Windows™ version of the backup utilities. Both DOS versions can use compression when backing up to diskette. PC-DOS 6.1 is faster.

New Functions in PC-DOS 6.1

The following functions are new in IBM PC-DOS 6.1: a comprehensive backup utility, an IBM antivirus utility, a new easy-to-use editor, and a robust disk compression utility.

René E. Gracia
IBM Corporation
Roanoke, Texas

Figure 1 shows commands for these new functions.

Backup

The backup utility is the full-featured version of PC Tools 8.0 from Central Point Software®, Inc. It supports backup of hard disk, diskette, optical, and tape. Tape backup is a unique feature of PC-DOS 6.1. Although both

The user configures the backup facility by entering `CPBACKUP` at the DOS prompt (or for Windows, double-clicking on the Backup icon located in the IBM Tools program group) and following the program instructions. The `CPBACKUP.CFG` file contains the completed configuration, which is referenced by all `BACKUP`, `RESTORE`, or `COMPARE` commands. The user then selects the appropriate level from the Configure menu:

- **Beginner**—for users not familiar with backup strategies and who want it as simplified as possible

- **Intermediate**—for those wanting limited control over file selection and backup methods

- **Advanced**—for those who want maximum control of all backup aspects

IBM AntiVirus/DOS

The PC-DOS 6.1 AntiVirus/DOS program from IBM is one of the most powerful antivirus tools available. It can detect over 1,500 viruses, including generic lab viruses developed with specific virus creation tools and polymorphic viruses. Because polymorphic viruses transform themselves into new viruses, most antivirus programs cannot detect them. AntiVirus/DOS can also detect stealth viruses, which avoid antivirus detection programs by moving around and hiding.

IBM AntiVirus/DOS detects viruses using two methods. *Integrity checking* detects unknown viruses by using intelligence and fuzzy logic to detect when programs change on the system and whether these changes are from a virus or a legitimate process. *Signature scanning* detects known viruses by looking for specific byte sequences. Together, these two methods reduce false alarms and increase system integrity.

Users can run IBM AntiVirus/DOS as a Terminate-and-Stay-Resident (TSR) program that continually checks for viruses. If the program finds one, it notifies the user and prevents other files from being infected. The MS-DOS 6.0 antivirus TSR uses as much as 44 KB of conventional memory, while IBM AntiVirus/DOS uses only 6 KB.

Command	Purpose
CPBACKUP	Provides a full-screen backup utility for one or more files
CPBDIR	Lists information about a backup diskette created with CPBACKUP
WNBACKUP	Provides backup from Windows 3.1
IBMAVD	Checks the system for computer viruses
IBMAVDR	Starts antivirus scan automatically when the system is booted
IBMAVDW	Starts a Windows antivirus scan
IBMASH	Protects the system against viruses via an antivirus shield program
IBMAVSP	Starts the antivirus program to recover from virus damage
E	Represents a DOS full-screen editor
SSUTIL	Verifies the integrity of and displays information on compressed files

Figure 1. Commands for New Functions in PC-DOS 6.1

Figure 2. The E Editor

Another feature of IBM AntiVirus/DOS is the ability to scan and protect any drive, including network drives, recognized by DOS. You can check for viruses at boot time and continually monitor your system memory for viruses.

E Editor

The E editor is the most powerful and flexible editor ever provided with a version of PC-DOS. Users can select, move, copy, overlay, or delete text. With the E editor, users can edit multiple files simultaneously with a split screen, and cut and paste between files.

Users can set margins and tab stops, reflow paragraphs, and even search and replace words or lines. The Undo function allows lines to revert back to their original state and the Autosave function can be set to save files automatically. The E editor, shown in Figure 2, enables users to draw with the arrow keys and select line widths for drawings, boxes, or columns. It even allows users to perform column sorting and additions.

Disk Compression

PC-DOS 6.1's disk compression utility is based on Addstor®, Incorporated's

Command	Purpose
CPSCHED	Executes DOS programs at a preset date and time; a TSR program
SCHEDULE	Starts the Scheduler program
WNSCHEDL	Starts the Scheduler program for Windows 3.1
PCFORMAT	Formats PCMCIA static memory cards
PCMCS	Loads PCMCIA Card Service 2.0 support
PCMFDD	Emulates diskette drives from PCMCIA cards
PCMINFO	Displays information on PCMCIA cards, sockets, and inserted cards
WPCMINFO	Displays information about PCMCIA cards and sockets in Windows 3.1
PCMINST	Starts the PCMCIA setup utility
PCMMTD	Installs one or more Memory Technology Drivers (MTDs)
PCMSCD	Installs one or more Super Client Drivers (SCDs)
PEN	Starts PenDOS
PENDOS	Initializes PenDOS
VLOAD	Loads the PenDOS handwriting recognition system into expanded memory

Figure 3. Commands for Unique Functions in PC-DOS 6.1

successful SuperStor™ disk compression software. This fast and reliable disk compression utility works with both DOS and Windows. It increases disk capacity up to an average of 50% and provides automatic and transparent data compression; once installed, the user literally forgets it is there.

If you must uncompress a previously compressed disk, you can use the automatic deinstall—an easy task. In contrast, the compression utility in MS-DOS 6.0 requires users to back up the data on the compressed disk, remove the disk compression, and restore the backed up data.

Universal Data Exchange

The universal data exchange feature allows any PC running any version of DOS or Windows to share compressed diskettes. It also works with compressed files created by MS-DOS 6.0. With this feature you can exchange disks compressed with PC-DOS 6.1 with other older versions of DOS, even without running compression. However, disks compressed with MS-DOS can be read only in another MS-DOS 6.0 machine with compression installed. This virtually destroys the portability of compressed disks.

Unique Features in PC-DOS 6.1

IBM PC-DOS 6.1 boasts several features and utilities that are not available in MS-DOS 6.0. These include a scheduler, support for PCMCIA, and pen input. Figure 3 shows commands for these unique functions in PC-DOS 6.1.

Scheduler

A TSR program called Scheduler allows users to schedule any program to run unattended at any time on any date. This is especially useful for lengthy procedures that do not require the user's presence, such as creating backups or performing hard disk compression.

Scheduler is an easy-to-use program with a built-in calendar. Processes are scheduled by pointing and clicking with a mouse. When a scheduled event occurs, Scheduler interrupts whatever program is running with a 15-second warning before it runs the scheduled event (in case the user is using an application). When the event is complete, Scheduler returns to the interrupted application.

Support for New Technologies

Only IBM PC-DOS 6.1 supports two important new technologies: PCMCIA and pen input. These two technologies are featured in many mobile computing platforms, such as the IBM ThinkPad®.

PCMCIA Support. PC-DOS 6.1 provides support for PCMCIA devices whereas MS-DOS 6.0 does not. PCMCIA technology—credit card-sized devices that provide memory, solid state disks, or communications hardware—has been incorporated into several systems from IBM and other manufacturers. The cards are small and use very little power. Users can insert or remove them without powering down their systems.

These cards are inserted into a socket attached to an adapter/controller that is connected to the system bus. Socket Services talks to the adapter at the BIOS level. Above this is Card Services 2.0, supported by PC-DOS 6.1. (See the September/October 1993 issue of the *Personal Systems Technical Solutions* for more information on PCMCIA Socket Services and Card Services.)

PC-DOS 6.1 supports several different PCMCIA drivers. The TSR device driver for Card Services 2.0 (PCMCS.EXE) must be loaded before any driver is loaded, and PCMCS.EXE can be loaded directly from a DOS command prompt, AUTOEXEC.BAT file, or the CONFIG.SYS file.

Pen Support. PC-DOS 6.1 incorporates pen support by Communication Intelligence Corporation™ (CIC) as a subset of IBM's PenDOS™ product. PenDOS provides full mouse emulation so that pen users with a tablet can access any DOS application that allows mouse input—without modifications. With menu-based applications such as Freelance® for DOS, users can select a menu item with a pen rather than a mouse. To display the menu, users touch the menu bar with the pen. For keyboard input, they simply call up the soft keyboard on the tablet and type with the stylus. Likewise, users can call up a soft numeric keypad for calculations.

PenDOS also allows the system to understand *gestures*. Gestures are movements or actions that users make with the pen causing applications to perform functions.

PenDOS features several basic gestures plus gesture macros used by many popular applications. For example, deleting a paragraph with a mouse in WordPerfect requires the user to highlight the text and press the Delete key. With the pen and gesture macros, users simply mark an X at the top of the paragraph and the paragraph is deleted.

Updated Features in PC-DOS 6.1

The following updated PC-DOS 6.1 features are similar to those in MS-DOS 6.0. Figure 4 highlights commands for some additional features in PC-DOS 6.1.

CHOICE. The CHOICE command provides users a convenient way to insert input into batch files. Based on the user response, the batch file can take conditional branches as follows:

```
CHOICE TN,4 Do you want to
    load XYZ driver? [Y,N]
IF ERRORLEVEL 2 GOTO NODRIVER
```

In this case, CHOICE displays the message "Do you want to load XYZ driver? [Y,N]"; then it waits four seconds before taking the "N" default.

DEFRAG. Disk fragmentation—and the poor performance it causes—has plagued DOS users for years. When a file is changed and written to disk, it may not be written back into a contiguous space. This delays access time for data and programs.

DEFRAG reorganizes disk files into contiguous spaces. Users should run CHKDSK /F before running DEFRAG to ensure there are no disk errors. With DEFRAG, users can select which drive to optimize, the sort order, and the optimization method. Users should run this command as often as possible to save valuable processing time and make contiguous disk space available for additional files.

DELTREE. Users can delete a directory and anything in it with DELTREE. This eliminates the time-consuming process of deleting files, stepping through directories, and removing the empty directories. As shown below, one DELTREE command can delete several directories.

```
DELTREE C:\TRASH D:\NOMORE
    C:\NOUSE
```

INTERLNK and INTERSVR. These two programs allow users to transfer information between two machines connected by a serial or parallel cable. For example, a user can copy information from a desktop machine to a notebook by using INTERLNK

PC-DOS 6.1 features improved memory management over MS-DOS 6.0 and DOS 5.0.

---

on the client machine (such as a Think-Pad) and INTERSVR on the desktop system. INTERLNK also allows the client machine to access the server machine's disk drives and printers as if they were local devices.

MOVE. The MOVE command moves both files and directories. It can move a file from one directory to another, or move a whole directory tree and the files contained in it. The following example moves the directory and all files with the .SAM extension in the DOCUMENT directory on drive C: to the LETTERS directory on drive D:. Note that MOVE will replace existing files with the same name without notification.

```
MOVE C:\DOCUMENT\*.SAM
    D:\LETTER
```

Improved Memory Management

PC-DOS 6.1 features improved memory management over MS-DOS 6.0 and DOS 5.0. PC-DOS 6.1 also adds support for Upper Memory Blocks (UMBs) on 8088 and 80286 machines.

The RAMSETUP command allows users to configure RAMBoost. When loaded, RAMBoost automatically checks for the existence of memory managers such as EMM386.EXE and HIMEM.SYS. Using this command on a PS/2 Model 57 multimedia system without EMM386 increased conventional memory from 604 KB to 621 KB. Figure 5 shows the system's CONFIG.SYS file before running RAMSETUP.

Command	Purpose
CHOICE	Prompts the user to make a choice in a batch program
DEFRAG	Reorganizes files on a specified disk
DELTREE	Deletes a directory, all subdirectories, and all files within them
INTERLNK	Represents an exchange transfer program that runs on a client
INTERSVR	Represents an exchange transfer program that runs on a server
MOVE	Moves and renames files and directories
RAMSETUP	Starts and configures RAMBoost to use upper memory blocks

Figure 4. Commands for Additional Features in PC-DOS 6.1

```
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH
DEVICE=C:\DOS\SETVER.EXE
DEVICE=C:\DOS\EMM386.SYS NOEMS
FILES=30
BUFFERS=10
```

Figure 5. CONFIG.SYS before Running RAMSETUP

```
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH
DEVICE=C:\DOS\SETVER.EXE
DEVICE=C:\DOS\EMM386.SYS NOEMS RAM X=A000-B0FF I=B100-B7FF
          X=B800-BFFF I=C000-D7FF X=D800-F7FF H=64 A=7 D=64
FILES=30
BUFFERS=42
DEVICE=C:\DOS\RAMBOOST.EXE LOAD
```

Figure 6. CONFIG.SYS after Running RAMSETUP

RAMBoost scans upper memory to configure itself with the optimal parameters for managing upper memory. RAMBoost checks CONFIG.SYS to identify which TSRs and device drivers exist and arranges them to best fit the machine's high memory blocks. It also tracks AUTOEXEC.BAT and CONFIG.SYS to identify any changes and optimize the system accordingly. It even recognizes when physical adapters have been added or removed, guaranteeing that the maximum amount of memory is always available. IBM calls this "install and forget" memory management.

When the EMM386.SYS line in CONFIG.SYS was remarked out and the system rebooted, the MEM command showed that the system had 604 KB of memory. After running RAMSETUP, there was 621 KB of available memory. The EMM386.SYS line in CONFIG.SYS was given additional parameters indicating which high memory addresses to include and exclude. (Note that the INCLUDE and EXCLUDE statements on the EMM386.SYS line vary, depending on the machine.) The command MEM /C |MORE showed that device drivers were set to run in upper memory. Figure 6 shows the resulting CONFIG.SYS file.

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SystemView Information Warehouse DataHub

IBM SystemView™ Information Warehouse™ DataHub™, known simply as DataHub, provides integrated database management functions for IBM's Systems Application Architecture® RDBMSs. This article provides system administrators with an overview of DataHub's features, benefits, and issues related to multiplatform implementation.

Many information systems evolve from one Relational Database Management System (RDBMS) and mushroom into multiple database management systems from several vendors—often spread over various platforms. Managing such a complex environment requires specialized knowledge of each vendor's system—a task much more difficult and expensive than for single or stand-alone systems. To help organizations meet the challenges presented by complex systems, IBM has developed two key frameworks: the Information Warehouse to help manage data anywhere in an enterprise, and SystemView to facilitate automating and integrating system management products.

The **Information Warehouse** framework enables users to obtain meaningful and timely information from enterprise-wide data. It defines a set of database management systems, interfaces, tools, and facilities that manage and deliver reliable and understandable business information

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to decision-makers. The key concept of the Information Warehouse framework is to provide these services regardless of the system on which the data is stored. For information about the Information Warehouse framework, see *Information Warehouse: An Introduction* (GC26-2876).

SystemView is IBM's business management strategy for planning, coordinating, and operating heterogeneous enterprise-wide information systems. The SystemView structure provides a consistent user interface, shared data, enhanced automation, and tighter integration among system management products. SystemView defines integration levels to manage the evolution of system management applications, resources, tools, and services. Products conforming to the SystemView structure enhance an administrator's ability to manage complex systems.

How DataHub Fits Into IBM's Strategies

The DataHub family of products is designed to help organizations manage complex database environments, increase productivity, and reduce training costs. The DataHub components are shown in Figure 1.
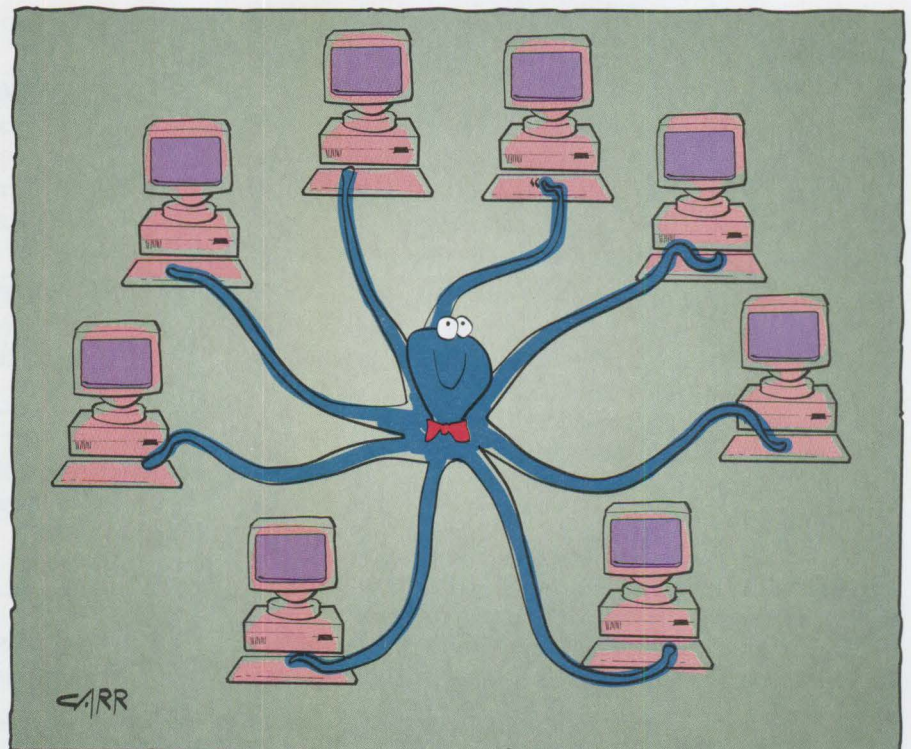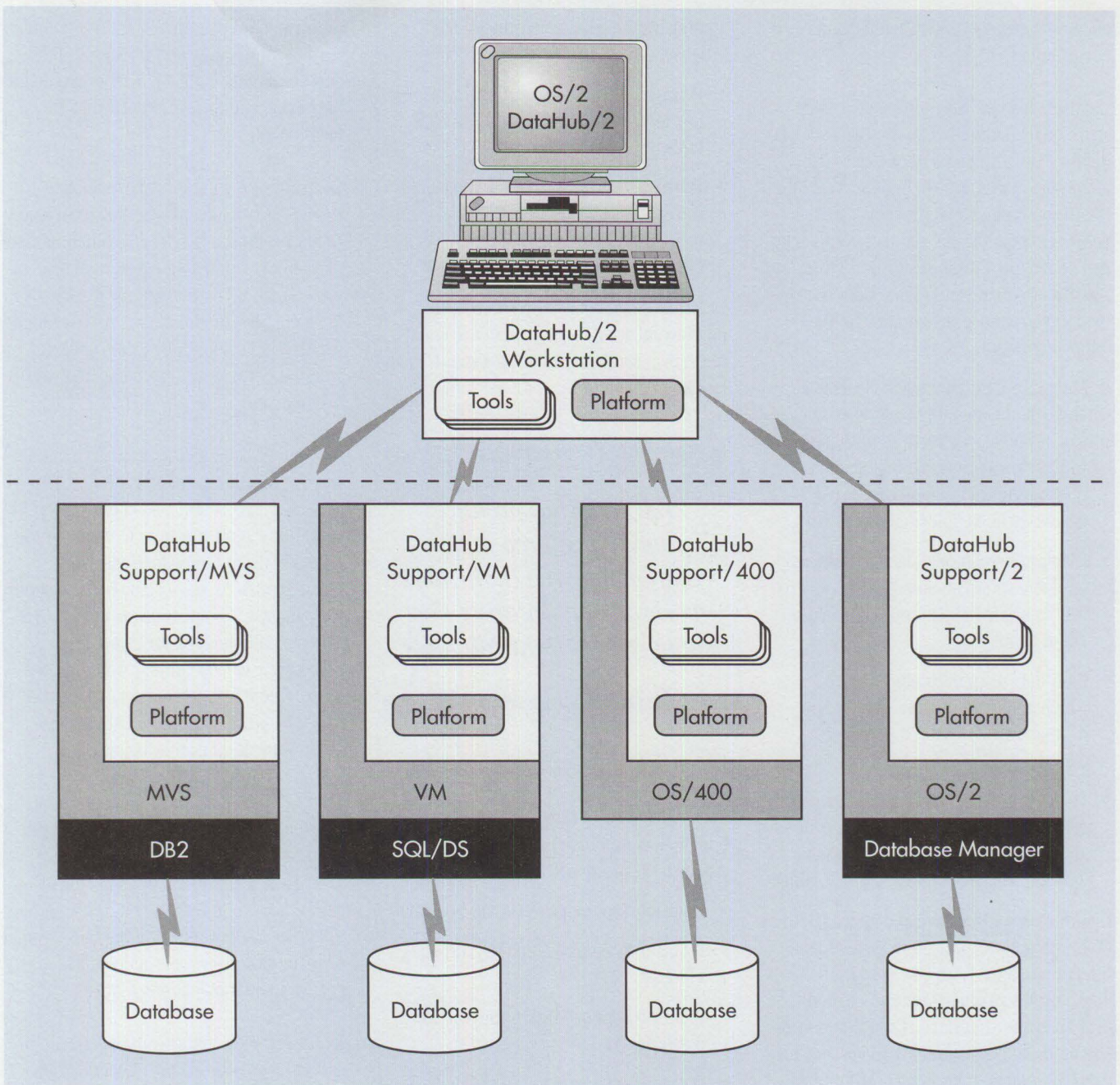
Figure 1. The DataHub Family of Products

DataHub manages data in both distributed and non-distributed environments. With DataHub, system administrators can perform system management tasks on the following IBM Systems Application Architecture (SAA™) relational database management systems from an OS/2 workstation-based control point:

- DATABASE 2 (DB2®) on MVS
- SQL/DS™ on VM/ESA™
- OS/400® database

- Database Manager for OS/2 Extended Services 1.0
- DATABASE 2 OS/2 (DB2/2)

DataHub's tools and functions reduce the training required to manage a complex system, which increases effectiveness and productivity and reduces costs. Applying DataHub to existing information systems will protect an organization's present investment and smooth the integration of additional systems.

DataHub brings the ease-of-use of object management to the Information Warehouse framework. It enhances the productivity of system administrators by simplifying database system management tasks and allowing them to perform more work from a single location. The consistent user interface and task-oriented environment enables administrators to perform operations across platforms and shields them from the different database interfaces. This interface reduces the training required to

effectively manage a distributed database environment.

DataHub ensures data consistency using shared data definitions. Administrators can define a table on one RDBMS, then copy all or part of that table to another RDBMS. DataHub graphically represents data in a consistent manner that reduces complexity and confusion. Administrators can use DataHub to create and manage the Information Warehouse environment in the following ways:

- Manage operational database systems and data throughout the enterprise from a single workstation, providing a window on all the relational database objects and users in the supported databases in the information system

- Display the relational database objects available within an enterprise system as well as related objects and information about them

- Copy data to an information store, which allows administrators to copy database objects from one IBM SAA-compliant RDBMS to another

- Manage and display authorizations and privileges for all objects and users of any relational database in the system, then copy, add, or delete authorizations

DataHub's user interface and approach to tools integration conform to SystemView Integration Level 1. An OS/2 program incorporates an object-action-oriented Graphical User Interface (GUI) that is consistent for all DataHub tools and associates data with function. From a control point, administrators can manage multiple databases either in a homogeneous environment or in multiple environments or locations. For more information on SystemView's levels of conformance, refer to *SAA SystemView: A Guide for Evaluating SystemView Integration* (GC28-1383).

DataHub Components

The DataHub product family has three major components: the DataHub/2 workstation, DataHub host support, and DataHub tools.

DataHub/2 workstation. This control point component performs database

administration tasks consisting of the following:

- **DataHub/2 window**: A GUI for displaying and accessing objects and DBMS tools

- **DataHub/2 Common Services**: Software that provides communication and runtime function between the workstation and the hosts

DataHub/2 can be installed on a LAN so that several administrators can use it at once, or it can be installed as a standalone system.

The DataHub product family has three major components: the DataHub/2 workstation, DataHub host support, and DataHub tools.

DataHub host support. The host support component must be installed at each host managed by a DataHub/2 workstation. This component provides services for the hosts' respective RDBMSs:

- DataHub Support/MVS for DB2 on MVS

- DataHub Support/VM for SQL/DS on VM/ESA

- DataHub Support/400 for the OS/400 database

- DataHub Support/2 for OS/2 Database Manager and DB2/2

DataHub tools feature. Tools components for the DataHub/2 workstations and hosts provide features such as Display Status, Manage Authorizations, Copy Data, and Utilities. DataHub Support/2 does not support the Display Status tool function.

DataHub Functions

DataHub provides a task-oriented GUI that allows administrators to concentrate on the result of the action rather than the specific steps taken to reach that result. The DataHub user selects an object from the window, then selects the action to be

performed on that object. Actions include Display, Add, Copy, Delete, Run, Utilities, and Command. Online help is available for messages, and the system provides steps for recovery.

Display shows both database objects, such as tables and indexes, and occurrences related to those objects. This function displays information about relational units of work (RDBMS work) and database activity. It enables administrators to determine where a logical unit of work originated, where it is currently executing, and who originated it.

Add allows administrators to grant authorizations to database objects on one RDBMS at a time. This action also creates a report that allows administrators to consider the effects of the action before execution. These reports are especially helpful when the database administrator is not familiar with the environment; for example, an administrator who is familiar with the OS/2 environment may not expect some of the side effects that occur in a DB2 environment when adding authorizations.

Copy allows administrators to copy database objects, their definitions, and their contents between and within databases. The Manage Authorizations function also uses Copy to copy authorizations from one object to another object of the same type or to another user. This action also generates an implications report.

Delete revokes authorizations. The implications report shows the effect of cascading deletes. An administrator can specify the level of detail of implications reporting, such as whether or not to report an action's side effects.

Run allows administrators to execute files containing SQL statements, OS/400 authorization statements, and Job Control Language (JCL) statements. The administrator can create the file or save the report created by another utility.

Utilities allows administrators to invoke procedures at a remote database. As shown in Figure 2, not all utilities are supported on each platform.

Command allows experienced administrators to avoid the menus by opening a window from which they can enter Data-Hub commands. Administrators can issue commands without knowing the complexities of each host system or the different methods of obtaining information from each of the databases.

For more information about DataHub/2 commands, see *DataHub/2 Command Reference* (SC26-3044).

Additional Functions

DataHub/2 provides a file pull-down menu that simplifies the administrator's task of working with database objects. Administrators can be more productive by saving displayed objects to a file so they can be redisplayed at any time with just a file name. The file is automatically updated as objects are added and deleted from the database.

DataHub/2 uses a tree structure to display objects, as shown in Figure 3. The tree can be easily expanded and collapsed. To ease system navigation, objects can be removed from view and brought back with the Omit and Refresh actions.

Administrators can manage DataHub/2 workstation functions by selecting Options from the main action bar, including selecting the commit frequency, specifying the initial file to be used each time DataHub starts, controlling tracing, and maintaining DataHub/2 profiles.

The Configure menu allows administrators to customize their workstations by specifying a default report file name, hosts and RDBMSs, and default values for actions. DataHub/2 also provides context-sensitive help for each interface item.

Connectivity

Systems Network Architecture (SNA) is the foundation for IBM's Distributed Relational Database Architecture™ (DRDA™). DRDA streamlines an application's ability to access distributed relational databases. SNA parameters such as Token-Ring address, network name, and the control point name establish the physical and logical connections in the SNA network.

Utility	DB2	SQL/DS	OS/400	OS/2
Load/Unload	Y	Y	Y	Y
Backup/Recover	Y	N	Y	N
Reorganize	Y	Y[1]	Y[2]	Y[2]
Update Statistics	Y	Y	N[3]	Y

[1] Indexes only

[2] Tables only

[3] Update statistics function is automatically provided by the OS/400 database

Figure 2. DataHub Support for Utilities
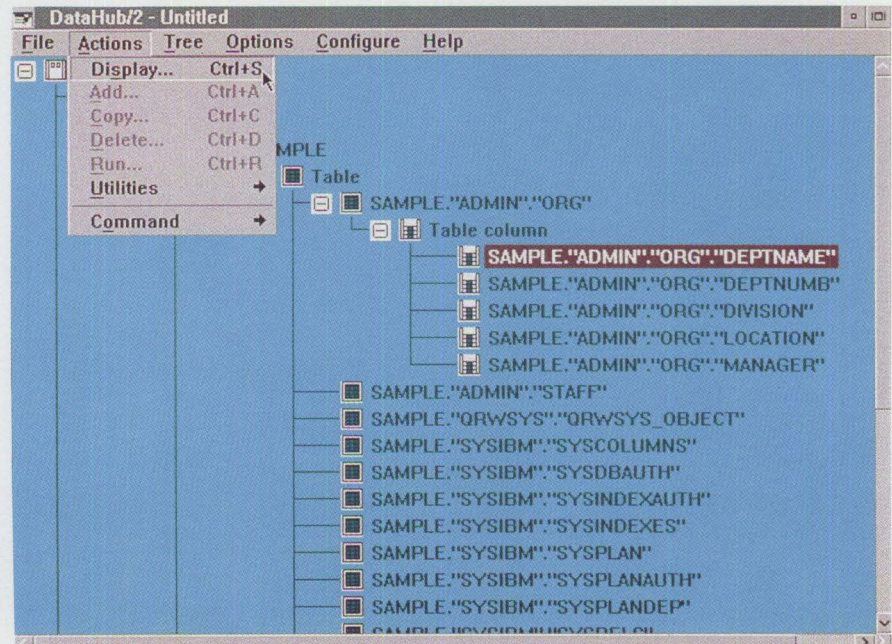
Figure 3. DataHub's Tree Structure

DRDA, the foundation for DataHub, uses LU 6.2 for sessions between non-OS/2 RDBMSs and utilizes parameters such as the RDB_name and the Transaction Program (TP) name. On OS/2, DRDA requires Distributed Database Connection Services/2 (DDCS/2) to be installed.

The Remote Data Services (RDS) subsystem allows OS/2 Database Manager clients to access OS/2 Database Manager servers. The two types of RDS connection protocols are NetBIOS and LU 6.2. DDCS/2 is not required for either type of connection.

Figure 4 shows three different types of information flow between a DataHub/2 workstation and hosts. For MVS, VM, and OS/400 hosts, DRDA flows are used for communication. The tools conversations

between DataHub Support and DataHub/2 use a private protocol that utilizes LU 6.2. All conversations between the DataHub/2 workstation and OS/2 RDBMSs use RDS. Since OS/2 hosts use RDS, DDCS/2 is not required for these conversations. DataHub only works with LU 6.2 when connecting a DataHub/2 workstation to DataHub Support/2.

Security

DataHub must interact with the unique security systems on each IBM mainframe platform. On the DataHub/2 workstation, the choice of communications protocol (DRDA, RDS, or tools conversation) determines the security information to be sent with the request. When using either DRDA or RDS as the communications protocol, User Profile Management (UPM) is the
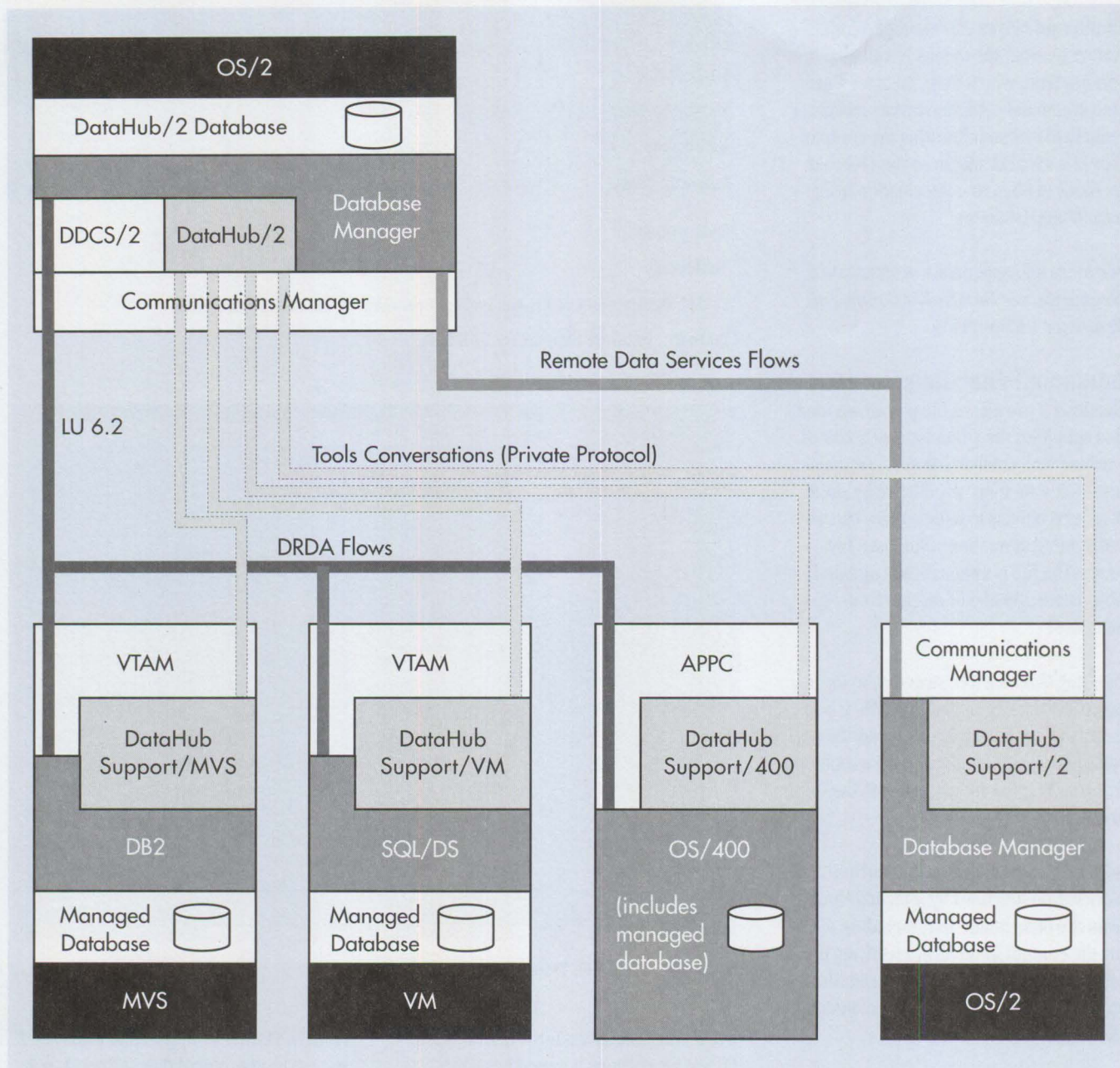
Figure 4. Information Flows between Hosts and a DataHub/2 Workstation

security system; OS/2 Database Manager and OS/2 LAN Server both use UPM as their security system. Because UPM manages both the local environment (OS/2 Database Manager) and the LAN environment, administrators must have the appropriate authority to manage users on either environment.

The DataHub/2 user profile security information is used with the private protocol with host support. Although each user can have multiple profiles defined, a user can have only one profile active at a time. To send a request to a host, an entry must be

associated with that host for the active DataHub/2 user profile.

Database privileges, such as Grant and Revoke, is another method of security. Administrators can use OS/2 UPM to manage user groups and assign privileges to the DataHub/2 package and database tables.

DataHub Support/2 also encrypts user IDs and passwords for tools conversation security. If a user-supplied encryption routine is used at the DataHub/2 workstation, then a matching user-supplied routine that uses the same encryption algorithm must be

installed at the DataHub Support/2 host. Failure to have matching encryption routines will cause the DataHub Support/2 tools functions to fail some authorization checks.

Security in MVS

MVS security validation is a three-step process. First, DB2 must be attached to the network. Second, the Virtual Telecommunications Access Method (VTAM™) and Resource Access Control Facility (RACF) partner LU must be validated. Third, the DB2 requests are checked. Each step may require several actions to be completed.

Security in VM

Security is different in the VM environment. When DataHub/2 sends the user ID and password to a VM host, they are verified as valid at the control point where the service pool machine resides. The DataHub/2 host user ID and password are valid only if the DataHub Support host user ID exists in a VM system running DataHub Support/VM, and the password is a valid password for the DataHub/2 host user ID.

Security validation of inbound processes on VM systems is a four-part process:

1. The LU is verified.

2. Advanced Program-to-Program Communications/VM VTAM Support (AVS) validation is translated.

3. RACF or Control Point (CP) passwords are checked.

4. The connection is authorized.

Each step above may require several actions to be completed. They are intended as a guideline to the basic process.

Security in AS/400

AS/400® security differs from VM and MVS security because there is no external security system. All validation is handled through the OS/400 operating system. The *AS/400 Basic Security Guide* (SC41-0047) and the *AS/400 Security Reference* (SC41-8083) contain detailed information about AS/400 security.

The security level of the AS/400 system is established via the OS/400 QSECURITY system value. The system requires the minimum recommended security level of 30 for user profile and password validation and control access to all system objects.

Security in OS/2

OS/2 UPM validates all RDS and tools conversation requests for OS/2-managed hosts. With RDS, the DataHub/2 user must be defined on the workstation to access local databases. Assigning a group to the DataHub/2 administrator often simplifies the management of Database Manager privileges.

With tools conversation requests, the first level of security is conversation security. The security type field should indicate SAME. DataHub/2 enforces program

security by sending DataHub/2 user profile information along with the tools conversation request. The transaction program definition on the OS/2-managed host indicates that security information is required. The conversation security definition indicates that UPM will validate the incoming request.

DataHub provides tracing, communications, and error-handling capabilities required by several database management tasks.

DataHub Support/2 uses user IDs and passwords sent from the DataHub/2 workstation to log on to the process executing the DataHub Support/2 tools functions. Since these user IDs and passwords are sent in encrypted format, the encryption routine must match at both the DataHub/2 workstation and the DataHub Support/2 workstation. If user-supplied encryption routines do not match, the DataHub Support/2 tool functions will fail various authorization checks.

DataHub Common Services and Tools Integration

DataHub provides tracing, communications, and error-handling capabilities required by several database management tasks. These common capabilities can ease the development and integration of tools.

Any program on the workstation that is enabled to and invoked by DataHub/2 can call Common Services via an Application Programming Interface (API). This allows tools to be written as cooperative processes, which gives the system additional cooperative processing capability not provided by the RDBMSs via SQL and DRDA. Under SAA, *cooperative processing* is the coordinated use of a workstation with one or more systems.

Common Services is also provided with each DataHub support component. User-defined tools can be invoked in the same

manner by selecting an action from the Actions menu, entering a command from an OS/2 prompt, entering a command in the command window and selecting Run, or placing the tool command in an OS/2 window.

Not only can developers create new tools, but they can also define new objects— additional relationships between new and existing objects, actions, and tools. With DataHub, administrators can integrate user-defined tools into the system. Existing tools can be modified to conform to defined standards, then added to DataHub to be used like any other DataHub function.

Although DataHub promotes tool integration, all tools must conform to certain standards. DataHub uses the following architectures and interfaces: SAA Structured Query Language (SQL), Remote Unit of Work (RUW) DRDA capability, SAA Common Programming Interface (CPI) Communications, SAA CPI C language, and SAA Common User Access™ (CUA™).

DataHub can integrate tools from IBM, IBM international alliance members, development partners, and independent software vendors, as well as those from an organization's own Information Systems (IS) staff.

Conclusion

Implementing DataHub in a well-planned manner—considering workstation and machine placement, security requirements, physical communications, and connectivity—can greatly reduce IS costs and increase administrator productivity. New administrators require less training to manage a distributed database environment, and the DataHub tools simplify the database management task. Administrators only need to know what they want; DataHub will do the work.

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Developing DataHub Tools

The DataHub family of products is designed to help organizations manage complex database environments. DataHub tools allow system administrators to perform a variety of tasks on supported databases. This article discusses a DataHub tool called Connection Status Tool, which interrogates and displays the status of tool conversation flow between the DataHub/2 workstation and a DataHub host. This article assumes that users are familiar with the C language, REXX programming, and MAKE files.

The DataHub products allow system administrators to maintain diverse databases from an OS/2 workstation-based control point called DataHub/2. For background on DataHub, see "SystemView Information Warehouse DataHub" in this issue. A good reference for building your own DataHub tools is *IBM SystemView Information Warehouse DataHub Tool Builder's Guide and Reference* (SC26-3046).

In addition to DataHub/2, DataHub contains a support component on each host. DataHub/2 uses the tool conversation flow connection to communicate to its host components. This type of connection uses Advanced Program-to-Program Communications (APPC).

DataHub/2 can directly access databases or it can contact the DataHub support components on the host to handle requested services. Each DataHub component has a "platform" and a "tools" feature. The platform features handle general tasks such as trace, control, and display functions. The tools feature provides functions such as copying database objects to local or remote databases, displaying database activities, performing utility functions, and managing authorizations. The tools feature is optional for DataHub Support/MVS, DataHub Support/2, and DataHub/2.

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DataHub/2 manages the elements such as tool names and hosts in a Database Manager database called DataHub/2 Database (DDB). The DDB includes all the necessary information for DataHub/2 to navigate the system.

In addition to the packaged tools, DataHub can integrate user-developed tools. This article discusses a user-developed tool called Connection Status Tool (XCS) developed by the author. XCS interrogates and displays the status of tool conversation flow between DataHub/2 and a DataHub host component. XCS is particularly useful in testing tool conversation flow connections in new DataHub installations. The tool can be downloaded from the OS/2 Bulletin Board Service (BBS) and the Personal Computer Company BBS. See the box for instructions.

DataHub Objects

DataHub organizes its elements into object types and object occurrences. An *object type* groups and describes a set of object occurrences. An *object*

Downloading DataHub Tools

The XCS executable, a program description, and an OS/2 REXX program that adds the details of XCS to the DDB can be downloaded from the OS/2 BBS and the IBM Personal Computer Company (PCC) BBS.

The OS/2 BBS supports modem speeds from 2,400 to 9,600 baud and handles compression and error checking functions. To retrieve the files, follow these steps:

1. Call one of these numbers: your local OS/2 BBS number, (800) 727-5611, or (800) 284-9280. If you do not subscribe to the OS/2 BBS, call (800) 547-1283.

2. Under the Main Menu, select News and Announcements.

3. Download file DHTEXEC.ZIP.

The PCC BBS supports modem speeds from 2,400 to 14,400 baud. Communications should be set to N-8-1. To retrieve the files, follow these steps:

1. Call the PCC BBS at (919) 517-0001.

2. After logging on, type D DHTEXEC.ZIP.

occurrence is an instance of an object type. When displayed, object types appear immediately above and to the left of the object occurrences they describe.

In addition to tracking object types and occurrences, DataHub/2 maintains details of valid actions that can be performed on each object type. These actions represent the tool that DataHub invokes to perform actions. DataHub relates each tool to at least one object type on which the tool can operate.

DataHub/2 also stores information about the relationships between objects. These relationships define the navigation path used to reach objects. The DataHub/2 Display action navigates the user through such a path. For each Display action, DataHub/2 displays a set of object occurrences for a particular object type. DataHub/2 can display the object occurrences for each newly displayed object until it reaches the end of the path.

DataHub/2 uses object generators to access objects and retrieve object occurrences belonging to particular object types. It allows for three object generator types:

- **Defined generator** is a constant text saved in the DDB that DataHub/2 supplies when the display tool is invoked. This constant text is the actual object occurrence.

- **SQL generator** is an SQL statement that DataHub/2 executes to return a list of object occurrences. DataHub/2 accepts prototypes of SQL statements containing substitution variables and substitutes them to the requested values before it executes the SQL statement.

- **Program generator** is a tool that DataHub/2 invokes as a separate process. DataHub/2 communicates with the program generators through data structures that it builds in the OS/2 shared memory area. This is where DataHub/2 provides the tool with information such as the user selection and details of the DataHub/2 environment. Upon completion, the tool returns the details of the generated object occurrences in the same shared memory area.

XCS Description and Invocation

The XCS program generator tool reports the status of tool conversation flow between the DataHub/2 workstation and DataHub host support components. This tool resides only on DataHub/2. Since it does not contain a host component, it uses the DataHub support platform for its host component.

Once installed, XCS is invoked using these steps:

1. Highlight one or more host names in the DataHub/2 client area.

2. From the Action menu, select the Display menu to see the Related Objects window. This window contains the newly installed XCS tool called Connection Status.

3. Highlight Connection Status and select Display, which will invoke XCS. Upon completion, XCS returns the status of the tool conversation flow connection to DataHub/2 for display.

In the example shown in Figure 1, the user has requested connection status for all four hosts.

DDB Identification of XCS

The administrator can identify XCS to DataHub/2 by adding the details of XCS to the DDB. Figure 2 shows the DDB tables that must be updated.

Figure 3 shows some of the values selected that identify XCS to DataHub/2.

An OS/2 REXX program to add these details of XCS to the DDB is available for downloading (file name is DHTEXEC.ZIP). See the box about BBSs at the beginning of this article for instructions.

CARR
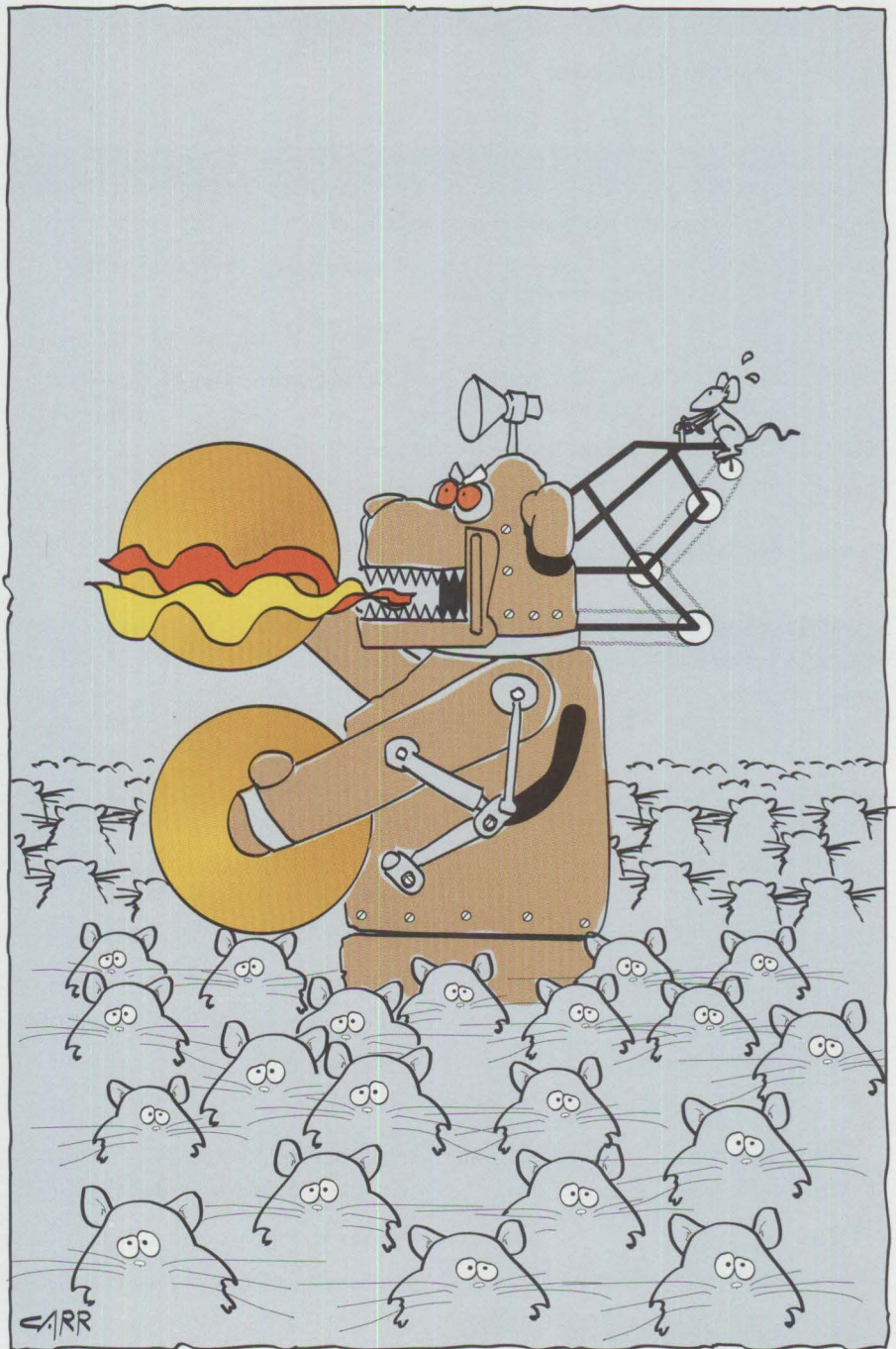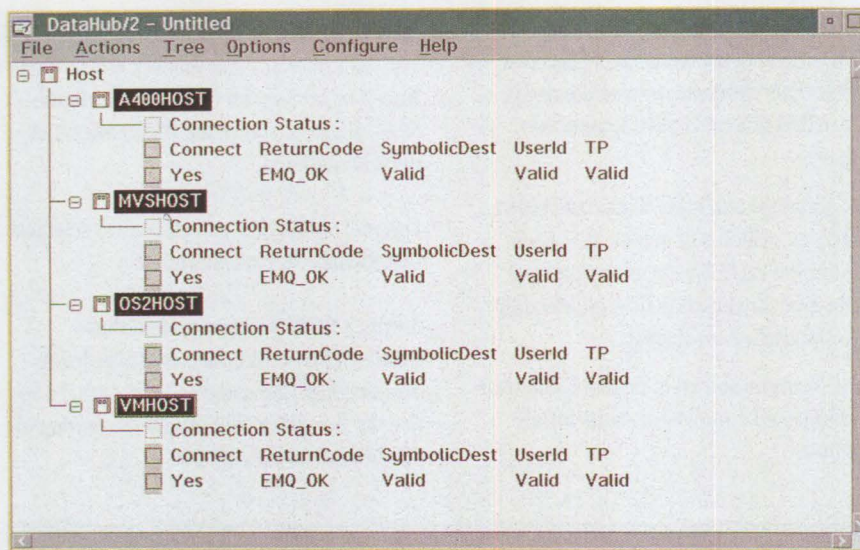
Figure 1. Connection Status Display

Table Name	Description
EMQOBJ_TYP	Contains information about object types.
EMQROT_QUA	Lists relationships of objects and related objects. DataHub/2 uses this information for navigation.
EMQNLS_OT	Contains the National Language Support (NLS) information for the tool.
EMQNLS_QUA	Contains object type NLS qualifier names. Qualifiers can filter the selection of object occurrences.
EMQOBJ_GEN	Contains details of object generators.
EMQOBJ_ACT	Contains details of the object-action pairs.

Figure 2. DDB Tables to Be Updated

Column Name	XCS Value	Description
PROD_ID	XCS	Product (tool) identifier that must be unique throughout the system. For publicly used tools, the product identifier must be registered through IBM to ensure its uniqueness. DataHub sets aside product identifiers starting with the letter 'X' for privately used tools.
OBJ_TYPEID	32512	Object type identifier that must also be unique and must be registered with IBM for publicly used tools. For privately used tools, object type identifier must be in the range of 32512 to 32767.
OBJ_TYPEID	14	In the EMQROT_QUA table, OBJ_TYPEID is the object type on which XCS can operate. The identifier for the object type host is 14.
ENG_OTNAME	CNCT_STAT	Object type name; must be in uppercase English.
DB_TYPE	SQL, DSN, ARI, QSQ	All four Relational Database Management System (RDBMS) types supported by XCS.
LANG_CODE	ENU	Language code of the XCS; values include ENU and JPN for English and Japanese.
NLS_OTNAME	Connection Status	NLS name of XCS.
LOC_NAME	AS/400, VM, MVS, OS/2	All four host types supported by XCS.
GENER_TYPE	P	Indication that XCS is a program generator.
GENER_SPEC	XCS.EXE	The name of the program that executes XCS.
ACTION_ID	1	The identification for the Display action; XCS invokes through the Display action.
PROGRAM_NAME	EMQSGTIN.EXE	DataHub-supplied program that invokes XCS as a separate process.

Figure 3. Selected Values for XCS

DataHub/2 Relationship with XCS

Administrators can invoke tools through DataHub/2 windows or commands. Each tool that executes through DataHub commands must supply a command that follows the DataHub guidelines. XCS can be invoked only through DataHub/2 windows.

When an administrator starts a tool (from either a DataHub/2 command or window), DataHub/2 builds and initializes data structures in an OS/2 shared memory area, invokes the tool as a separate process, and waits for the tool's results. DataHub/2 builds the following data structures in the shared memory area:

- **Tool input area** (EmqToolIn): Contains the details of the selected object types and the user-selected action to be performed on those objects.

- **Tool output area** (EmqToolOut): Represents a base structure that the tool expands to house the results of the selected action. One variable in usReturnCode contains the return code from the tool. During initialization, DataHub/2 sets this variable to EMQ_ERROR to ensure a proper action if a tool terminates prematurely.

- **Public parameter block** (EmqPublicParams): Contains

details of the DataHub/2 environment at the time of tool invocation.

DataHub also makes some Common Services functions available that provide the majority of services needed by a tool. XCS uses the following Common Services functions during its execution:

- `EmqInitialize`: Enables access to the shared memory area created by DataHub/2. It also allows access to the other Common Services functions. For this reason, `EmqInitialize` must be the first Common Services function that a tool executes. A nonzero return code from `EmqInitialize` is severe and XCS cannot continue.

- `EmqConnect`: Establishes a tool conversation flow between DataHub/2 and a DataHub host support component.

- `EmqMemMgr`: Provides memory management functions for the tool.

- `EmqDealloc`: Deallocates the tool conversation flow established by `EmqConnect`.

- `EmqTerminate`: Terminates access to the Common Services functions; the final Common Services function executed.

XCS Messages

DataHub/2 displays messages in message or status boxes or in the client area. It accesses the message text using the message identifier, substitutes any specified message parameters, and displays the messages.

DataHub/2 retrieves the identifiers for messages displayed in the client area from `EmqToolOut`. There are two types of `EmqToolOut` messages: status and detail. *Status messages* appear immediately to the right of the object occurrences. *Detail messages* display below the object occurrences. In Figure 1, the colon to the right of Connection Status is a status message; the two message lines below Connection Status are detail messages.

DataHub/2 uses the OS/2 message facility to access messages. It forms a message file name by concatenating the three-character tool identifier, the first digit of the message number, and the NLS code for the tool.

```
XCS
XCS5000I: XCS5000I :
XCS5001I: XCS5001I Connect\tReturnCode\tSymbolicDest\tUserId\tTP
XCS5002I: XCS5002I &01\t&02\t&03\t&04\t&05
```

Figure 4. Message File (XCS5ENU.TXT) that Produces XCS5ENU.MSG

```
NAME                WINDOWAPI NEWFILES
DESCRIPTION         'XCS Connection Status Tool'
PROTMODE
HEAPSIZE            16384
STACKSIZE           16384
EXPORTS
```

Figure 5. Definition File (XCS.DEF) Used to Build the XCS Tool

```
ALL:  XCS5ENU.MSG XCS.EXE

XCS5ENU.MSG: XCS5ENU.TXT
    MKMSGF XCS5ENU.TXT XCS5ENU.MSG

XCS.EXE:  XCS.OBJ XCS.DEF
    LINK386 /DE/NOLOGO XCS.OBJ,,, EMQS.LIB, XCS.DEF

XCS.OBJ: XCS.C
    ICC /Kb+ /C+ /W3 /Gs- /Gm+ /Gd- /Q+ /O- /Ti+ /DES32TO16 \
    /DEMQC_PWS XCS.C
```

Figure 6. MAKE File (XCS.MAK) Used to Build the XCS Tool

The message file extension is `.MSG`. For example, the message file for XCS that uses message number 5000 series is `XCS5ENU.MSG`. Figure 4 shows a file listing that produces `XCS5ENU.MSG`.

In `XCS5ENU.TXT`, the first line is the product identifier 'XCS'; the following lines contain the actual messages. The first column in each message line is the OS/2 message identifier followed by a colon. The next column is the tool's product identifier concatenated with a message number and a one-letter message severity identifier. The message text follows the message identifier. In Figure 4, the last ":" in message 5000 is the actual message text. Message text can contain substitution variables, which must be specified as two-digit numbers from 01 through 99 and must be preceded by "&". Message text can also contain tab characters denoted by "\t".

Building XCS

Figures 5 and 6 show a definition file and a MAKE file used to build XCS. Administrators enter the command `NMAKE /f`

`XCS.MAK` on an OS/2 command prompt to start the build process. The `MAKE` file produces the `XCS.EXE` executable file and the `XCS5ENU.MSG` message file.

XCS Installation

Once `XCS.EXE` and `XCS5ENU.MSG` files are created, copy them to the DataHub/2 directory. Download the REXX program, issue the command `XCSINST` at an OS/2 command prompt to add XCS details to the DDB, then start DataHub and invoke XCS.

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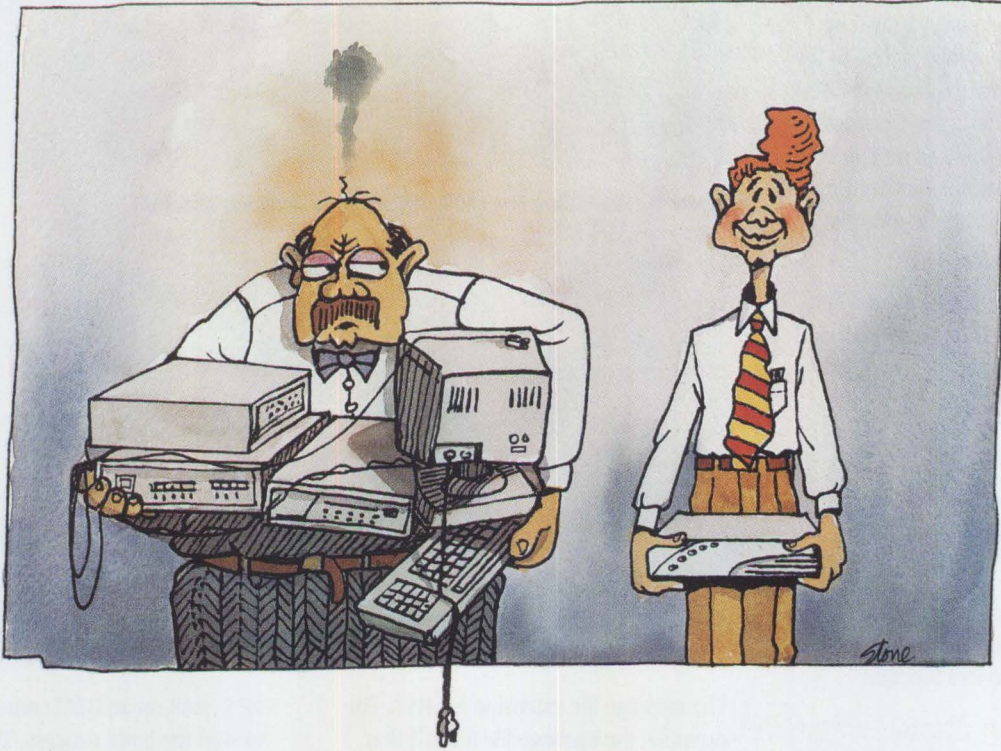
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Using MMPM/2 to Create Multimedia Applications

Application developers can now integrate multimedia features into their OS/2 2.1 applications using Multimedia Presentation Manager/2 (MMPM/2). This article provides a review of MMPM/2 basics and the MMPM/2 setup application, as well as tips on integrating multimedia into existing applications.

MMPM/2 is a set of device-independent programming interfaces enabling an OS/2 application to use digital audio, Musical Instrument Digital Interface (MIDI), digital video, image, and compact disc functions. MMPM/2 also contains a set of easy-to-use applets for configuring and accessing these capabilities.

OS/2 application developers should use MMPM/2 functions to ensure that their multimedia applications can share multimedia devices. MMPM/2 is now a standard feature of OS/2 2.1. The toolkit necessary for MMPM/2 programming is included in the CD-ROM version of the OS/2 2.1 toolkit.

Getting Started with MMPM/2

MMPM/2 provides both string and procedural interfaces for issuing commands to multimedia devices. An application can use either interface; both interfaces can be mixed and matched within an application, depending on the task to be performed. Some commands are not supported by the string interface. For example, the `mciGetDeviceID()` function can return the device ID for a device that was opened using the string interface; the procedural `MCI_OPEN` command supports assigning an alias name to the device.

The string interface provides an additional layer of device independence. For example, two devices can have a similar command set, but if one has additional features, it may use different data structures for a particular command. By using the string interface, the application does not allocate or initialize the data structures sent to the device driver. The command string parser—with the aid of a command table provided by the Media Control Interface (MCI) driver—constructs the appropriate command structures and issues the command with the correct data structures. The command tables are set up to provide string command compatibility across device types.

Understanding Device Names

Occasionally, an application needs to build a list of the multimedia devices available in the system. To do this, the developer must understand how MCI devices are named within MMPM/2. Each device has three names: logical device name, installation name, and alias name.

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The *logical device name* is built from the device type name and the device's ordinal position within that device class. This name, such as `WAVEAUDIO01` or `AMPMIX02`, is assigned when the system is booted.

The *installation name* is assigned to a particular device when it is installed. Because the installation name is persistent, it can refer to that device across system reboots. This name should be used when storing settings in an application's OS/2 profile.

The *alias name,* given to the device that is displayed to the user, is typically less cryptic than the other names. This differs from the one assigned to an open MCI device when using the `OPEN` command through the string interface. That name, equivalent to a handle to the device, is assigned by the application, not by the system. The

CARR

```
              MCI_SYSINFO_PARMS Sysinfo;
              CHAR szNumber[10];
              ULONG ulTotalDevices;
              PCHAR pszDevices, pszLogicalDevice;

              memset ((PCH)&Sysinfo, 0, sizeof(MCI_SYSINFO_PARMS));
              Sysinfo.pszReturn = (PSZ) szNumber;
              Sysinfo.ulRetSize = sizeof(szNumber);

              rc = (LONG) mciSendCommand (       // Determine number of devices
                        (USHORT) MCI_ALL_DEVICE_ID,    // System Device ID
                        (USHORT) MCI_SYSINFO,          // Command
                        (ULONG)  MCI_SYSINFO_QUANTITY, // Command Subfunction Flag
                        (ULONG)  &Sysinfo,             // Command Structure
                        (USHORT) NULL );               // Notify
              ulTotalDevices = atoi((PSZ)Sysinfo.pszReturn);
              memset ((PCH)&Sysinfo, 0, sizeof(MCI_SYSINFO_PARMS));
              ulDeviceBufSize = ulTotalDevices * MAX_DEVICE_NAME;
              Sysinfo.pszReturn = malloc (ulDeviceBufSize + 1);
              Sysinfo.ulRetSize = ulDeviceBufSize;

              rc = (LONG) mciSendCommand (    // Return list of Logical Device Names
                        (USHORT) MCI_ALL_DEVICE_ID, // System Device ID
                        (USHORT) MCI_SYSINFO,       // Command
                        (ULONG)  MCI_SYSINFO_NAME,  // Command Subfunction Flag
                        (ULONG)  &Sysinfo,          // Command Structure Address
                        (USHORT) NULL);             // Notify
              pszDevices = Sysinfo.pszReturn;          // blank delimited list
              pszDevices[strlen(pszDevices)+1] = 0;  // Double Null terminate

              for (pszLogicalDevice = strchr (pszDevices, ' '); // Null byte delimit list
                  pszLogicalDevice && *pszLogicalDevice;
                  pszLogicalDevice = strchr (pszLogicalDevice+1, ' ')) {
                if (*pszLogicalDevice == ' ') *pszLogicalDevice = 0;
              }

              for (i=0, pszLogicalDevice = pszDevices;
                  i<usTotalDevices && pszLogicalDevice;
                  i++, pszLogicalDevice+=strlen(pszLogicalDevice)+1) {

                  // Do something with each device name
              }
              free (pszDevices);
```

Figure 1. The MCI_SYSINFO Command

alias name also provides the opportunity for translation.

Developers can build a list of logical device names in the system by calling the MCI_SYSINFO command, as shown in Figure 1.

After an application has built a list of all devices in the system, it may need one of the device's other names to perform a task. MMPM/2 uses the MCI_SYSINFO_QUERY_NAMES subfunction, shown in Figure 2, to return all three names associated with a device if any one of the names is given.

Since the installation name is persistent, it is generally used for other MCI_SYSINFO calls.

Opening a Device

At some point, an application will open the MCI device. One important issue involved with opening a device is how long it takes to open it. Some devices, such as video-discs and CD-audio devices, take a reasonable amount of time to open. To avoid locking up the OS/2 user interface, the application must continue processing the message queue during an OPEN. So it makes sense to issue an OPEN NOTIFY, which performs the OPEN operation asynchronously on a thread. The call is immediately returned, notifying the application when the operation is complete.

The application should also open the device as shareable to allow other applications in the system to use it. An application can open a multimedia device either as *exclusive* so only that application can use it, or as *shareable* so other applications can use the device. OPEN SHAREABLE NOTIFYs, however, can cause a problem. Because OPEN is done asynchronously, the implicit ACQUIRE of the device is also done asynchronously. When the application is notified that OPEN is complete, it may not have access to the device. So the application must wait for the MCI_GAINING_USE notification as well. These notifications can arrive in any order. Once the application has received both notifications, the programmer can continue to set up the device.

```
        MCI_SYSINFO_PARMS Sysinfo;
        MCI_SYSINFO_QUERY_NAMES_PARMS SysNames;

        memset ((PCH)&Sysinfo, 0, sizeof(MCI_SYSINFO_PARMS));
        memset ((PCH)&SysNames, 0, sizeof(MCI_SYSINFO_QUERY_NAME));
        Sysinfo.ulItem = MCI_SYSINFO_QUERY_NAMES;
        Sysinfo.pSysInfoParm = &SysNames;
        strcpy (SysNames.szLogicalName, pszLogicalDevice);

        rc = (LONG) mciSendCommand (
                        (USHORT) NULL,               // System Device ID
                        (USHORT) MCI_SYSINFO,        // Command
                        (ULONG)  MCI_SYSINFO_ITEM,   // Command Subfunction Flag
                        (ULONG)  &Sysinfo,           // Command Structure
                        (USHORT) NULL );             // notify

        strcpy (pszInstallName, SysNames.szInstallName);  // Installation Name
```

Figure 2. The MCI_SYSINFO_QUERY_NAMES Subfunction

```
    open bell.wav alias WaveAlias shareable wait
    connection WaveAlias query type wave alias AmpAlias wait
    set AmpAlias audio gain 100 wait
    record WaveAlias notify
    ...
    stop WaveAlias wait
    close WaveAlias wait
```

Figure 3. Setting the Microphone Gain for Recording

To ensure that the application can use the device when the user needs it, the application issues the MCI_ACQUIRE command during the WM_ACTIVATE window message. The MCI_ACQUIRE command should be done as a NOTIFY command, ensuring that the application acquires the device sometime in the future. If MCI_ACQUIRE is issued as a wait during the WM_ACTIVATE message and it fails because another application has exclusive use of the device, the application will not know when to reissue the MCI_ACQUIRE command.

It is important to note which commands should be issued as NOTIFY commands and which should be sent as WAIT commands. Although developers must ultimately understand the pros and cons of each type of command for their particular applications, NOTIFY commands should generally be used for MCI_OPEN, MCI_ACQUIRE, MCI_PLAY, MCI_RECORD, MCI_SEEK, MCI_CAPTURE, and MCI_RESTORE. All other commands can be issued as WAIT commands, assuming the Presentation Manager (PM) application is single threaded.

If an application is using a device that has audio support (such as WAVEAUDIO, SEQUENCER, or DIGITALVIDEO), it is important to know how to access the AMPMIX device that is connected to the selected device (the following example uses WAVEAUDIO). This refers to the stereo component metaphor from which the system is modeled. The WAVEAUDIO device is connected to the AMPMIX device in the same way a tape player is connected to an amplifier.

The AMPMIX device is implicitly opened when the WAVEAUDIO is opened. This AMPMIX device controls all audio-related settings beyond basic volume. The main purpose is to query the device ID of the AMPMIX device connected to the WAVEAUDIO device on its WAVE STREAM connector. The developer should assign an alias name to an application that uses the string interface so it can also be referenced through the string interface. It is necessary to "talk" to the AMPMIX device to select the input level or the microphone gain for recording, as shown in Figure 3.

Response Time

Response time, the time delay between an application event occurring and the user hearing the sound or seeing the video, is an important consideration. If the application only needs to play some audio but the timing is not critical, the MCI driver can open and play the file using a very simple command set. If an application includes audio requiring critical synchronization, the developer should consider using either Multimedia Input/Output (MMIO) memory files or play lists.

MMIO memory files are MMPM/2's standard for handling multimedia file and memory objects. They provide the necessary performance for critical timing between applications and device drivers, yet they keep the programming simple. Although play lists involve more work for the application, they can provide flexibility in how data is sent to the device.

The MMIO memory file is simple to create and operates like other MMIO files stored on the file system. Since the MCI drivers typically use MMIO functions to manipulate their file elements, their use of memory files is completely transparent. The memory file can remain open while the MCI device is closed, and it can be loaded into the device only when needed. Most MCI drivers that use files can load a file already opened by the application. Figure 4 outlines this procedure.

```
MMIOINFO mmioinfo;
MCI_LOAD_PARMS WaveLoad;
PBYTE    pBuf;

/* Allocate memory for the memory file and read data into it*/
DosAllocMem ((PPVOID)&pBuf, cbFile, fALLOC);
ReadFileIntoBuffer (pszFile, pBuf, cbFile);

memset (&mmioinfo, 0, sizeof(mmioinfo));

mmioinfo.fccIOProc = mmioFOURCC('W','A','V','E'); // File Format IOPROC
mmioinfo.fccChildIOProc = FOURCC_MEM;             // Storage System IOPROC
mmioinfo.pchBuffer = pBuf;                        // Buffer Pointer
mmioinfo.cchBuffer= cbFile;                       // Buffer Size
mmioinfo.ulTranslate = MMIO_TRANSLATEHEADER;      // Translate Headers

hmmio = mmioOpen (NULL,                           // File Name
                  &mmioinfo,                      // mmioinfo
                  MMIO_READ | MMIO_DENYNONE);     // Flags

// Now load the file that is already open into the MCI device

memset (&WaveLoad, 0, sizeof(WaveLoad));
WaveLoad.ulCallback = 0;
WaveLoad.pszElementName = (PSZ) hmmio;

lrc = mciSendCommand ((USHORT)ulDeviceID,      // Open Wave Audio Device
                      (USHORT)MCI_LOAD,        // Command
                      (ULONG)(MCI_WAIT | MCI_OPEN_MMIO | MCI_READONLY),
                      (ULONG)&WaveLoad,        // Command Structure
                      (USHORT) NULL);          // Notify
```

Figure 4. Opening an Audio Memory File

The Multimedia Setup Application

The Multimedia Setup program is part of MMPM/2. As shown in Figure 5, it provides a user interface for viewing and configuring the properties of multimedia devices and multimedia system settings.

Most MCI drivers that support multimedia functions have some configuration information that can be modified by the developer. These settings are presented as pages in a notebook. Each section of the notebook refers to devices that are registered with MMPM/2's Media Device Manager.

When the Multimedia Setup application starts, it configures the notebook by inserting a set of standard settings pages. Then it allows each MCI driver and subsystem to insert custom settings pages, providing an extensible interface to configure MMPM/2.

Inserting Custom Pages

There are two ways to insert a custom page into the settings notebook. Although each method has advantages and disadvantages,
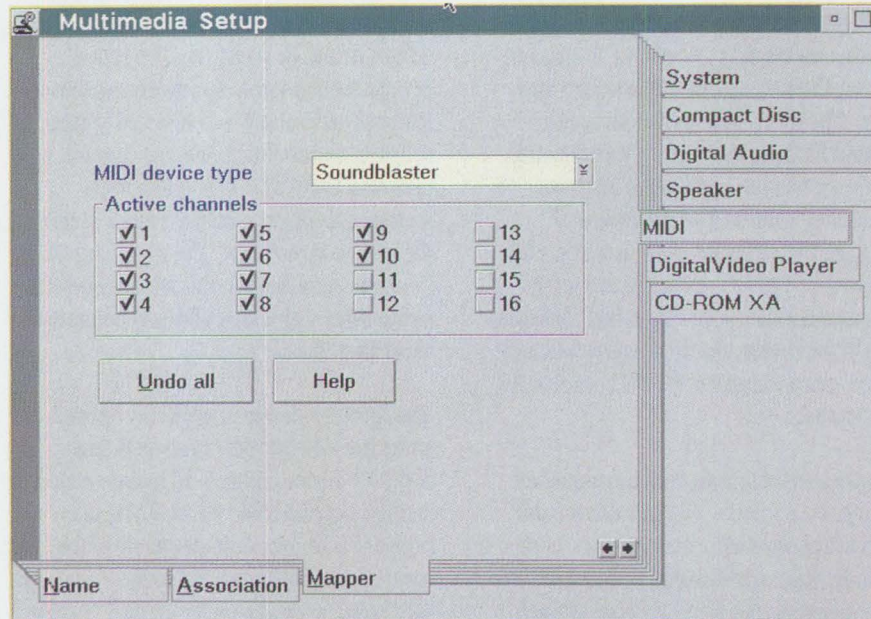

Figure 5. Multimedia Setup

the settings page itself works the same regardless of the method used.

The first method, used by the MCI drivers, provides an object-oriented way

to manage the device-specific parameters of the driver. The MCI driver notifies the Media Device Manager that it has custom settings pages by setting the MCI_SYSINFO_DEVICESETTINGS bit

```
typedef struct _MCI_DEVICESETTINGS_PARMS {
    HWND      hwndCallback;    // PM window handle for MCI notify
    HWND      hwndNotebook;    // Hwnd to notebook window
    USHORT    usDeviceType;    // Device type
    PSZ       pszDeviceName;   // Device name
} MCI_DEVICESETTINGS_PARMS;
typedef MCI_DEVICESETTINGS_PARMS    *PMCI_DEVICESETTINGS_PARMS;
```

Figure 6. MCI_DEVICESETTINGS Parameter Structure

```
HWND InsertPage( PMCI_DEVICESETTINGS_PARMS pMCIDevSettings)
```

Figure 7. Prototype of Insert Page Function

in the `ulDeviceFlag` field of the `MCI_SYSINFO_LOGDEVICE` structure when the device is installed. When the Multimedia Setup program configures the pages for that device and this `MCI_SYSINFO_DEVICESETTINGS` bit is set, it then sends the device an `MCI_DEVICESETTINGS` command and passes the `MCI_DEVICE-SETTINGS_PARMS` data structure, shown in Figure 6.

When the MCI driver receives this command, it calls a function that creates a settings page window and inserts it into the notebook. The MCI driver passes this command to any supported vendor-specific drivers so the driver can insert custom settings pages. Some settings parameters can be related to device type, while others may be related to specific device hardware.

The second method of creating a custom settings page is by writing a registration record in the \MMOS2\MMPM.INI file. When settings pages are registered in this way, they are not associated with a particular MCI driver, but are related to a class of MCI devices. This allows developers to provide a settings page for all devices of a particular type, just one device in that class, or the entire system.

The application name for the record is `STPM_SettingsPage:#` where # refers to the MCI device type number for the device supported by the page. Zero refers to a system settings page, and the key name can be any unique name for the settings page. The value of the registration record is a string that contains the name

of the Dynamic Link Library (DLL) and the name of the function that creates the settings page, such as `Modulename, Entrypointname`. The module and entry-point names are comma-delimited. The drive on which MMPM/2 is installed can be located by referencing the `MMBASE` environment variable.

Figure 7 shows a prototype of the function referred to by the `Entrypointname`.

The `MCI_DEVICESETTINGS_PARMS` is the same structure as used in the first method, shown in Figure 6.

The registration record can be written to the initialization file by using the `PrfWriteProfileData` Application Programming Interface (API) or by using the `ProfileData` command supported by the Multimedia Installation program.

To create the settings page, the `Insert-Page` function creates a Settings Dialog window as shown in Figure 8, and inserts that page (or pages) into the Common User Access (CUA) Notebook window handle provided in the `MCI_DEVICESET-TINGS_PARMS` data structure. This data structure also provides the settings page with the device name for which it should provide settings; the `InsertPage` function verifies that this is an appropriate device.

Although the settings page is a secondary window, it must do several simple things to be well behaved. Figure 9 shows what a Multimedia Setup settings page should do and the minimum tasks a settings page must do to be well behaved.

Creating a Settings Page Help Panel

When `Help` is invoked, the Multimedia Setup application allows each page to provide specific help for its tab by sending an `MM_TABHELP` message to the page. The page displays a general help panel for the settings page, a description of its purpose, and how to use it.

The recommended way to handle help for an external settings page is to create a secondary help instance and handle the `WM_HELP` and `MM_TABHELP` messages explicitly. This avoids problems with sharing the application's primary help instance, such as the system looking in the wrong help table or finding the wrong help panel when help is invoked.

Settings pages can use the device-specific, keyword-oriented settings parameters of the MCI device. If the settings page is parsing and setting these keyword values, it must preserve the keyword values that it does not recognize. This is because other settings pages may be providing settings for that device.

Integrating Multimedia with Existing Applications

Integrating multimedia features into existing applications can be as easy as writing a few API calls. Some simple multimedia elements can enhance the user's experience and provide more interaction with an application.

When thinking about integrating multimedia technology into an application, a key consideration is what kind of multimedia to use. Games, for example, frequently use digitized audio or music to provide the user with audible feedback and make the game more fun. Instructional software, helps, and tutorials with a voice explaining certain concepts can enhance the user's understanding of an

```
HWND InsertPage( PMCI_DEVICESETTINGS_PARMS pMCIDevSettings)
{
    HWND    hwndPage;                    // Page window handle
    CHAR    szTabText[CCHMAXPATH];       // Buffer for tab string
    ULONG   ulPageId;                    // Page identifier

    hwndPage      = WinLoadSecondaryWindow(
                         pMCIDevSettings->hwndNotebook,
                         pMCIDevSettings->hwndNotebook,
                         ExamplePageDlgProc,
                         vhmodMRI,
                         ID_EXAMPLE,
                         (PVOID)pMCIDevSettings);

    if (!hwndPage) return (NULL);

    ulPageId = (ULONG)WinSendMsg( pMCIDevSettings->hwndNotebook,
                         BKM_INSERTPAGE,
                         (ULONG)NULL,
                         MPFROM2SHORT( BKA_AUTOPAGESIZE |
                              BKA_MINOR, BKA_LAST ) );

    WinSendMsg(pMCIDevSettings->hwndNotebook, BKM_SETPAGEWINDOWHWND,
           MPFROMP( ulPageId ), MPFROMLONG( hwndPage ) );
    WinLoadString(WinQueryAnchorBlock( HWND_DESKTOP ),  // Get Tab Text
         vhmodMRI, (USHORT)IDB_EXAMPLE, CCHMAXPATH, szTabText );
    WinSendMsg( pMCIDevSettings->hwndNotebook,          // Set Tab Text
        BKM_SETTABTEXT, MPFROMP( ulPageId ), szTabText );
    return( hwndPage );
}
```

Figure 8. Creating a Settings Dialog Window

application. Digital video adds another dimension to an application's ability to communicate information.

MMPM/2 provides new APIs to simplify the tasks of integrating audio and video into an application. The 16- and 32-bit APIs help developers enhance older applications as well as new 32-bit applications. The mciPlayFile(), mciPlayResource(), and mciRecordAudioFile() APIs allow applications to play and record a media object using a single API call.

The mciPlayFile() API can play any multimedia file understood by the Media Device Manager. Developers can provide titles for media that display a window, such as video. The API does not provide a control panel, but plays the object from beginning to end. Play can be stopped by subsequent calls to mciPlayFile(). The PM message queue is processed while playing, so the user interface remains responsive.

The mciPlayResource() API has the same function as mciPlayFile() except that it allows the application to combine multimedia objects into a program's resource, which reduces the number of objects on the file system. These resources are typically placed into a resource DLL associated with an application. These DLLs can also segregate an application's translatable information so that a new resource DLL can support other languages. As with text, spoken audio must also be translated.

The mciRecordAudioFile() API provides a simple recorder window that allows an application to easily record audio from the user via a standard interface. The audio is recorded using the microphone of the default audio driver and placed into a file, as shown in Figure 10. These APIs handle all multimedia application responsibilities including device sharing, making it easy for an application to include multimedia support.

Creating Multimedia Help Panels

Audio-supplemented help panels and online reference manuals provide a convenient way to include multimedia support in an application. Multimedia can improve an application's usefulness as well as a user's perception of the application.

Developers create these by providing an Information Processing Facility (IPF) viewport DLL and a new help (.HLP) file that easily supplement existing applications.

The IPF compiler provides special kinds of hyperlinks called *inform links* that send notification messages to the viewport DLL, as demonstrated in Figure 11. When the viewport DLL receives a notification, it can associate the event with a particular multimedia object, such as an audio or digital video segment. Typically, these media objects are played by using the mciPlayFile() or mciPlayResource() API. Since multimedia is currently an optional installation, the software should handle error conditions appropriately.

Extending Multimedia

Many applications provide a macro language that allows users to customize the application. The new MMPM/2 APIs allow audio to be incorporated into an application by using its macro language. For example, with macros for Microsoft Excel 3.0 and the Lotus 1-2-3/G® 2.0, audio can be included in a spreadsheet. These macros use the mciPlayFile() and

```
typedef struct {                    // Page instance data structure
   HWND hwndHelpInstance;
   // Page instance data
} MMPAGEINFO;
typedef MMPAGEINFO * PMMPAGEINFO;
MRESULT EXPENTRY ExamplePageDlgProc (HWND hwnd, USHORT msg,
                                     MPARAM mp1, MPARAM mp2)
{
    PMMPAGEINFO pMMPageInfo =
                (PMMPAGEINFO) WinQueryWindowPtr (hwnd, QWL_USER);
    switch (msg) {
       case WM_INITDLG:
          /* Initialize the page */
          pMMPageInfo = (PMMPAGEINFO) malloc(sizeof(MMPAGEINFO));
          WinSetWindowPtr (hwnd, QWL_USER, pMMPageInfo);

          /* Create a help instance */
          pMMPageInfo->hwndHelpInstance = WinCreateHelpInstance(...);
          break;

       case WM_DESTROY:
          /* Clean up page window resources */
          WinDestroyHelpInstance (pMMPageInfo->hwndHelpInstance);
          free (pMMPageInfo);
          break;

      case WM_COMMAND:
          /* Process all commands by returning; unprocessed commands */
          /* will translate into a WinDismissDlg of only this page   */
          return ((MRESULT) FALSE);
          break;

      case MM_TABHELP:
          /* Display help for a tab */
          if (pMMPageInfo->hwndHelpInstance) {
              WinSendMsg(
                   pMMPageInfo->hwndHelpInstance,
                   HM_DISPLAY_HELP,
                   MPFROMSHORT( WinQueryWindowUShort( hwnd, QWS_ID ) ),
                   HM_RESOURCEID );
          }
          break;

       case WM_CLOSE:
          return ((MRESULT) FALSE);
          break;

       case WM_HELP:
          if (pMMPageInfo->hwndHelpInstance) {
              WinSendMsg(
                   pMMPageInfo->hwndHelpInstance,
                   HM_DISPLAY_HELP,
                   (MPARAM) mp1,
                   HM_RESOURCEID );
          }
          return ((MRESULT)TRUE);
          break;

       case WM_TRANSLATEACCEL:
          /* Handle TranslateAccel so that menus and help still work */
          return (WinDefWindowProc (hwnd, msg, mp1, mp2));
          break;

      case HM_QUERY_KEYS_HELP:
          return((MRESULT) IDH_HELPFORKEYS);
          break;
    }
    return (WinDefSecondaryWindowProc(hwnd, msg, mp1, mp2));
}
```

Figure 9. Settings Dialog Window Procedure

```
ULONG EXPENTRY mciPlayFile (HWND hwndOwner,          // Owner
                            PSZ  pszFile,            // File
                            ULONG ulFlags,           // Flags
                            PSZ  pszTitle,           // Title
                            HWND hwndViewport);      // Viewport

ULONG EXPENTRY mciPlayResource (HWND hwndOwner,      // Owner Window
                            HMODULE hmod,            // Module Handle
                            ULONG resType,           // Resource Type
                            ULONG resID,             // Resource ID
                            ULONG ulFlags,           // Flags
                            PSZ  pszTitle,           // Title
                            HWND hwndViewport);//     Viewport

ULONG EXPENTRY mciRecordAudioFile (HWND hwndOwner,   // Owner Window
                            PSZ pszFile,             // File
                            PSZ pszTitle,            // Title
                            ULONG ulFlags);          // Flags
```

Figure 10.   New High-Level Programming Interfaces

```
case HM_INFORM:

    pEvent = LookupFile ((ULONG)mp1);  // Locate associated media element

    rc = mciPlayFile (WinQueryActiveWindow(HWND_DESKTOP),   // hwndOwner
                    pEvent->pszVideoFile,              // file
                    OL,                                // flags
                    pEvent->pszVideoTitle,             // title
                    OL);                               // viewport
    if (rc) WinMessageBox(...);
    break;
```

Figure 11.   Multimedia IPF Hyperlinks

```
open info.wav alias WaveAlias shareable wait
set WaveAlias volume to 90 wait
play WaveAlias notify
....
stop WaveAlias wait
close WaveAlias wait
```

Figure 12.   Commands for Playing Audio

mciRecordAudioFile() APIs, plus another feature of MMPM/2 called *bundled files* that combines groups of media elements (such as audio) into a single file. This allows the macro to group the audio annotations associated with a single spreadsheet into a single audio bundle file.

A REXX command file provides another method for accessing the audio subsystem to produce and coordinate digital audio and MIDI (digital video can be used with PMREXX). REXX provides a flexible and easy-to-use programming interface to the multimedia system by allowing access to the string commands of the MCI system.

In addition, MMPM/2 provides a string-oriented programming interface that can also simplify programming tasks. It is easy to program a multimedia device by sending simple command strings directly from an application. These command strings are the same as those supported through the REXX interface. For example, commands shown in Figure 12 are used to play a segment of audio.

Additional Multimedia Tools

A variety of applications are available to create multimedia content. The Ultimedia™ Tool Series is a collection of media authoring tools for video, image, audio, MIDI, and other forms of multimedia content. For information about the Ultimedia Tool Series, call the MediaSourcery at 800-228-ULTI. The digital audio recorder provided in OS/2 2.1 is good for authoring audio content. For MMPM/2 video content, use Video IN for OS/2.

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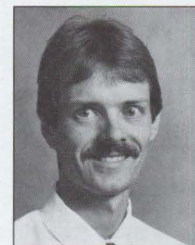
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frugal (froo'gəl) *adj.* Economical, thrifty.

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Advanced Client/Server Computing Using the IBM ThinkPad

This article describes advanced techniques for configuring the IBM Think-Pad Models 720 and 720C for use with OS/2 2.1 client/server applications. The basic techniques for using OS/2 2.1 and the IBM ThinkPad were discussed in the July/August 1993 issue of **Personal Systems Technical Solutions.**

I n today's environment of downsized computer systems, many server applications are being moved from mainframes to platforms such as the AS/400, RISC System/6000®, and high-end PS/2s. In these configurations, intelligent workstations that execute client applications are typically connected to the server applications via Local Area Networks (LANs). In most cases, access to the LAN requires a physical connection such as Token Ring or twinax cable. For productive mobile computing, these connectivity options must extend to the dial-up environment.

The IBM ThinkPad family of portable laptop computers is rapidly setting the standard for portable computing by providing a wide range of portable computing power for today's mobile business professional. In particular, the ThinkPad Models 720 and 720C give mobile users the maximum system capacity for advanced OS/2-based client/server applications.

Some capabilities described in this article can run separately over asynchronous communications lines; however, only Synchronous Data Link Communications (SDLC) allows users to

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take full advantage of this technology. This article will be limited to the IBM Think-Pads that support SDLC adapters: Models 720 and 720C, and their predecessors, Models 700 and 700C.

Communications Basics

The following advanced client/server techniques are based on the Systems Network Architecture (SNA) protocols for connecting the ThinkPad to the host using a

dial-up telephone line. As a fully archi-
tected protocol, SNA incorporates functions
that allow multiple activities over a single
communications line, which exploits the
multitasking capabilities of OS/2. For typi-
cal asynchronous protocols, the SNA multi-
session functions must be added for each
application.

Today, dial-up SNA typically runs over
SDLC protocols. Although SDLC normally
requires more hardware than asynchro-
nous communications, it optimizes the
available bandwidth and offloads some
communication processing from the Think-
Pad. There are implementations of SNA
over asynchronous lines; however, they
typically suffer from functional and per-
formance limitations when compared to
SNA/SDLC.

Implementing the SDLC Connection

The SDLC connection requires users to in-
stall a combination SDLC adapter/modem
in the optional expansion cartridge of the
ThinkPad 720 and 720C and their pre-
decessor Models 700 and 700C. In addi-
tion, the user must install and configure
OS/2 2.1 and Communications Manager/2
(CM/2). (See "Using the IBM ThinkPad
with OS/2 and CM/2" in the July/August
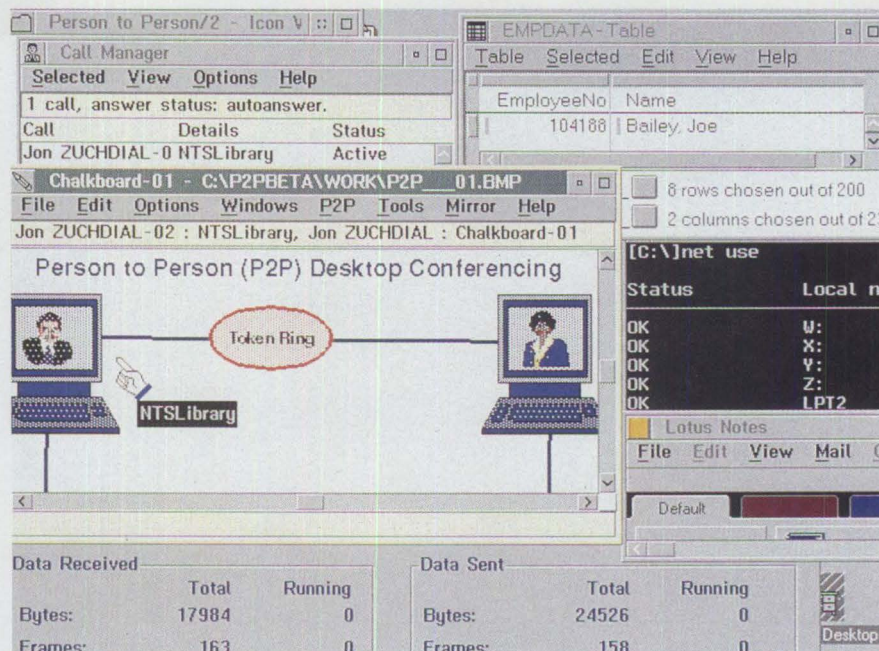
Figure 1.   Personal Application System/2

1993 issue of *Personal Systems Technical
Solutions* for details on configuring this
connection.)

The basic SDLC connection is a 3270-type
emulation that configures the ThinkPad to
emulate a non-programmable workstation
for connection to a host system running
VM or MVS. This provides limited client/
server functions using the Server-Requester

Programming Interface (SRPI), and auto-
mated response control using Emulator
High-Level Language API (EHLLAPI) to
implement functions such as connecting
and disconnecting the host.

Enabling Advanced Client/Server Applications

The real power of the SNA/SDLC connec-
tion is its ability to provide an LU 6.2 host
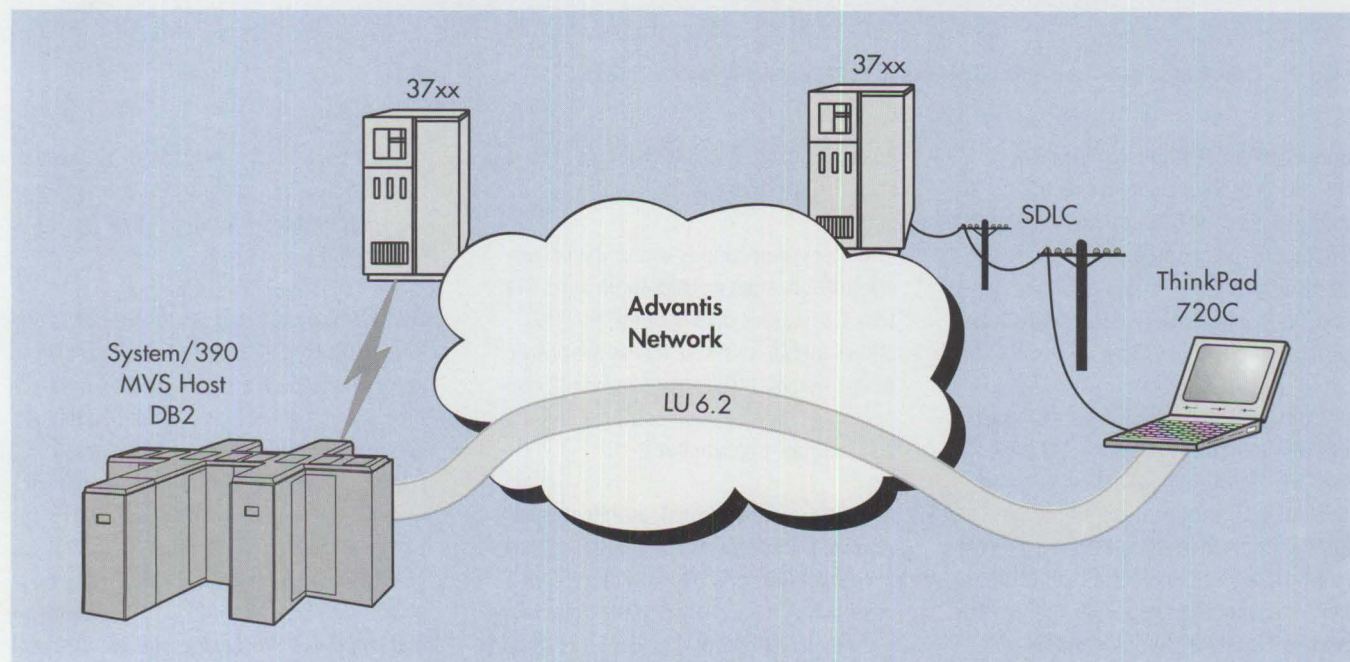
Figure 2.   PAS/2 ThinkPad to DB2 on MVS via LU 6.2
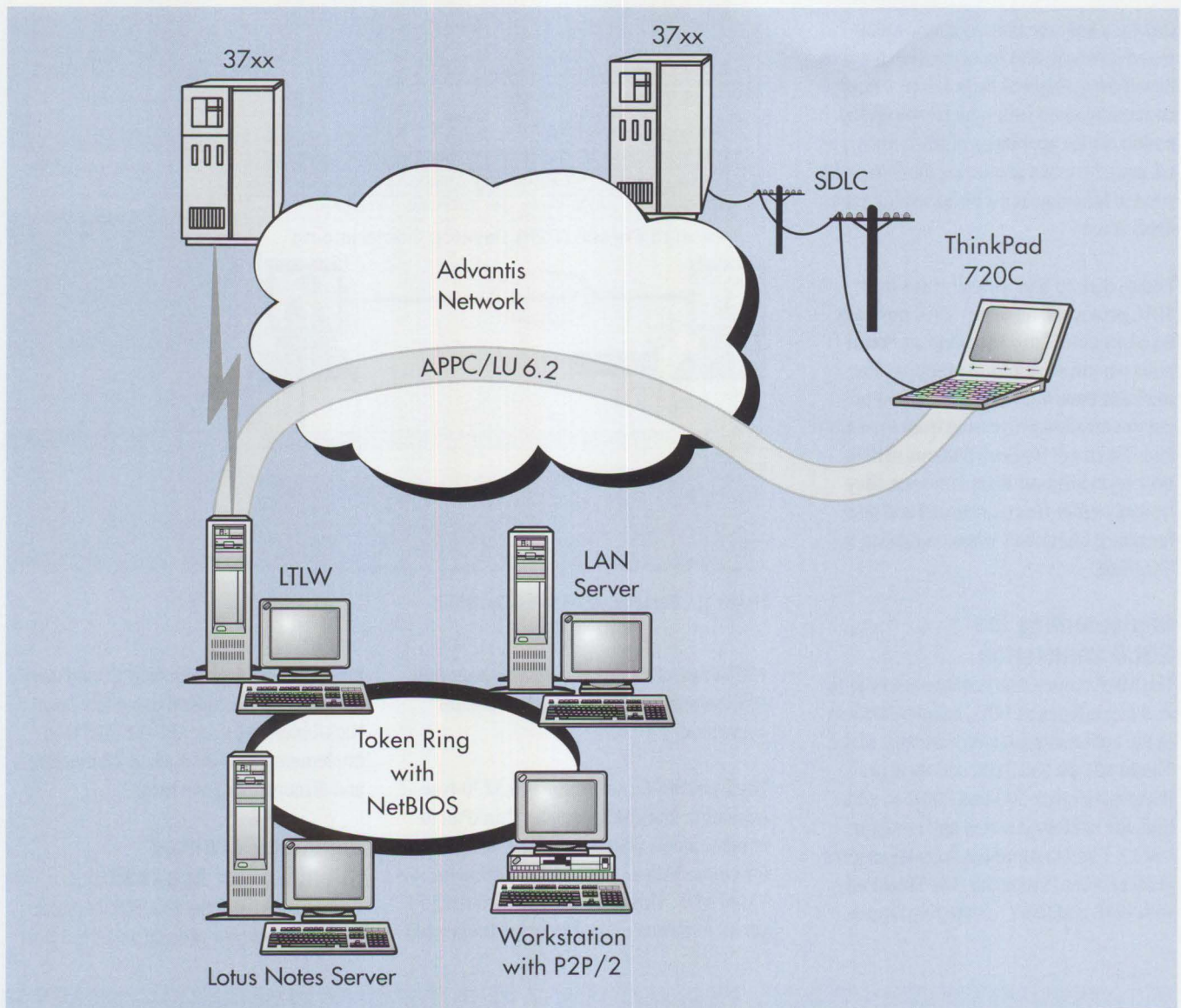
Figure 3. ThinkPad Clients Accessing a LAN-Based Server Using APPC

connection via dial-up telephone lines. This allows mobile users to execute advanced client/server applications, such as database query and multimedia. It also significantly increases the breadth of the application and makes remote individuals more productive.

For example, Figure 1 shows IBM Personal Application System/2 (PAS/2), a 32-bit OS/2 2.1 client application executing on the ThinkPad, connected to a host System/390® server running MVS. The server is performing a remote relational database query and returning the results to the workstation for analysis. In this example, the connection is made via an IBM 3745 communications controller that is

channel-attached to the System/390 host, as shown in Figure 2.

The best connection is where the server application, such as IBM Application System 3.2, resides on a System/390. This allows mobile users to access the power of the System/390 host via an LU 6.2 connection and to perform complex functions such as statistical analyses.

As previously mentioned, mobile workers require remote access to LAN-based client/server applications. The key ingredient in remote LAN access is the appropriate supporting dial protocol. The protocol should traverse the dial, leased line, and LAN environments; optimize performance over the

dial connection; and provide rich management capabilities. It should also function as a support base for other LAN-based protocols.

IBM's Advanced Program-to-Program Communications (APPC) over a wide area SNA network includes these capabilities. Figures 3 and 4 show how a ThinkPad client accesses multiple hosts and LAN-based server applications over dial-up lines with APPC as the underlying protocol. IBM's LAN-to-LAN over Wide Area Network (LTLW) product enables IBM's NetBIOS protocol to flow over APPC. Applications that run over NetBIOS include the IBM LAN Server, Person-to-Person/2 (P2P/2), and Lotus Notes®. In addition to NetBIOS

support, IBM is beta testing support for TCP/IP and Novell IPX protocols using LTLW. This support will provide for additional LAN-based client applications over the same dial connection.

As shown on the bottom of the screen in Figure 4, LTLW has a continuous update mode indicating the NetBIOS traffic transferred during the last five seconds. Because LAN dial access is about 400 times slower than local LAN access, this update provides users with continuous feedback on the progress of their applications.

Figure 5 shows how CM/2 ties everything together for the ThinkPad client. CM/2's current beta-code session-level compression maximizes performance across the dial line. Applying dynamic compression algorithms on a session-by-session basis improves effectiveness over modem-based compression that treats the line as one data stream.

Making the Connection via Cellular Phone

The ultimate goal of mobile client-server computing is to make the dial-up connection via the cellular telephone network using standard SDLC or asynchronous modems and voice-grade cellular telephone handsets. This can be done by adding an industry-standard RJ-11 jack to the handset. These RJ-11 adapters, available from most major cellular telephone manufacturers—including AT&T®, OKI®, and Motorola™—can in most cases be used on today's analog cellular telephone networks with no changes in the cellular service. Such adapters, along with standard modems and cellular handsets, eliminate the need for special-purpose Radio Frequency (RF) cellular modems.

Since the cellular telephone network was designed to switch much more slowly than the public-switched network, it will not operate in data mode at speeds higher than 2,400 bits per second.

The Future of This Technology

Advances in mobile computing technology are coming "fast and furious." Manufacturers are producing low-power-consumption CPUs and larger capacity hard disks that

Figure 4.   Host and LAN Applications on a ThinkPad Client
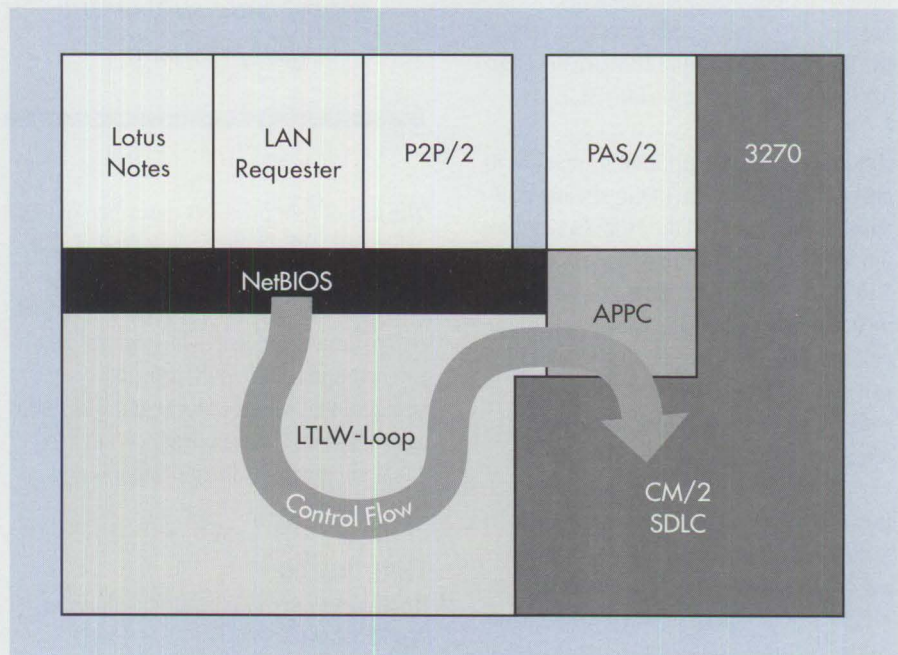
Figure 5.   ThinkPad Software Components

exceed the capacity of many desktop workstations. The result is high-powered portable workstations that can execute complex client/server applications from a remote site.

The Personal Computer Memory Card International Association (PCMCIA) standard allows modems the size of credit cards to be installed in laptop systems. The

ThinkPad Models 720 and 720C support PCMCIA Type I, II, and III adapters.

The cellular telephone industry is also rapidly gearing up for data transmission using the cellular network. Digital cellular networks, Cellular Digital Packet Data (CDPD), and Personal Digital Assistant (PDA) technologies transmit data at speeds comparable to land lines. The recently

announced ThinkPad Model 750 will support a CDPD modem when that modem becomes available.

The most notable development in communications software is the Hayes® AutoSync technology that enables SDLC emulation using standard asynchronous communications ports. Since this eliminates the need for special-purpose SDLC modems, Advantis™ (a value-added network owned by IBM and Sears®) and IBM are developing it as companion code for CM/2.

Hayes AutoSync is supported by many asynchronous modems, including the internal data/fax modems and the PCMCIA data/fax modems for the ThinkPad Models 720 and 720C. Its recent proliferation is due to its inclusion in some widely used modem chipsets. As a standard, Hayes AutoSync will quickly enable the use of SNA/SDLC with the new generation of higher speed modems.

In terms of portability, this new modem technology eliminates the need for external power and takes advantage of the ThinkPad's Advanced Power Management (APM) features. A user can leave OS/2 2.1 and CM/2 enabled during a suspend operation, then resume and quickly redial the target server applications.

For environments without a wide area network, IBM is developing a LAN dial solution called LAN Distance. With this software, an OS/2 machine can support a bank of modems on a LAN, allowing client machines to gain LAN access by dialing that machine.

Summary

Advances in the ThinkPad portable personal computer have produced high-powered workstations that can be used in remote client/server applications. When configured with SNA and SDLC communications equipment, these portable workstations can process client/server applications as efficiently as desktop workstations.

The key ingredient in remote LAN access is the appropriate supporting dial protocol.

The mix of IBM products described in this article provides multiple functions over a single dial connection. CM/2 optimizes communication to multiple hosts—regardless of target platform—through session-level compression. APPC provides a peer protocol that traverses local and wide area networks. APPC-based products such as LTLW support additional protocols and applications.

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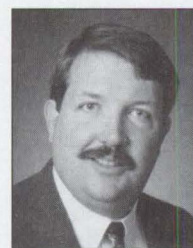
William G. King, Jr. is an IBM decision-support specialist based in Tampa, Florida. Bill currently works for the IBM Software Development Laboratory located in Warwick, England. Bill joined IBM in 1979 and has worked with IBM's Federal Systems division on NASA's space shuttle program. Currently, Bill is responsible for the Warwick Lab's U.S. product awareness campaign, which includes advertising, technical publications, and business shows. He has a BS in computer and information science from the University of Florida.

Jon Zuch is a senior advisory communications analyst based in Tampa, Florida. Jon joined IBM in 1981 and has since worked in IBM's Information Network and now Advantis, the valued-added network owned by IBM and Sears. Jon's current responsibilities include expanding Advantis dial connectivity, providing technical support for customer opportunities, and presenting network designs at customer briefings. Jon graduated from Cornell University with a BS in electrical engineering.

Communications Manager/2: A New Look

IBM's Communications Manager/2 (CM/2) offers significant improvements over earlier versions. Among these improvements are a rich set of emulators and Application Programming Interfaces (APIs), a much wider array of connectivity options, and a complete set of functions for security, system management, and problem solving. Perhaps the greatest difference is CM/2's new "look and feel," making it much easier to install, configure, and use.

CM/2 has evolved from OS/2 Extended Edition (EE) 1.0 through OS/2 Extended Services/2 (ES/2). It is now the richest product of its kind for network communications and application development including the following:

- 3270 and 5250 emulators

- LU 6.2 Advanced Program-to-Program Communications (APPC)

- Common Programming Interface-C (CPI-C) APIs

- LUA (LU0,1,2,3) APIs

- Emulator High-Level Language API (EHLLAPI)

- Server-Requester Programming Interface (SRPI)

- Asynchronous Communications Device Interface (ACDI)

- X.25 APIs

CM/2 also provides numerous connectivity options: coaxial, Synchronous Data Link Control (SDLC), asynchronous, Token Ring, Ethernet™, PC Network, Fiber-Optic Data Distribution Interface (FDDI), twinax, and Integrated Services Digital Network (ISDN).

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The greatest difference between CM/2 and its predecessors is its new "look and feel," making it the easiest communications product to install, configure, and use. In fact, everything within CM/2 is self-guiding; users should not become lost during installation or configuration.

Discrete Functions

CM/2 comprises discrete object-type functions that are grouped into manageable components for flexible user preferences. Users no longer need to navigate a maze of selections. They can choose from functions such as Setup, Keylock, Replace, Start, Stop, Manage 3270/5250 Sessions, Subsystem Management, Problem Determination—Dump, and Problem Determination—Trace Services. Users go to the CM/2 Folder, as shown in Figure 1, and select the function with which they want to work.

To conserve disk space, CM/2 only installs the runtime code based on a user's configuration and allows the user to install optional functions depending on the disk space requirements.

CM/2 features guided paths to keep users from getting lost. The guided paths incorporate fuzzy logic, so with minimal information, CM/2 knows the next step and leads users through a successful setup. Verification (checking that all the right parameters are specified and the configuration is complete) is performed implicitly and in real time. There is no more guessing about which step is next in the process. This eliminates the need for users to backtrack to find out what was done incorrectly.

CM/2 allows users who are comfortable with manual configuration to select the Configure Any list and navigate functions without the guided paths.

CM/2's runtime emulator screens allow users to configure keyboard and color specifications dynamically. For example, to change colors on a 3270 session, users only enter the color configuration from the running 3270 session and update the colors; the changes then appear on the screen. Keyboard remapping is done the same way. Users simply remap keys during a 3270 session and the keys are dynamically updated.

Easy Configuration File Modification

With CM/2, users can modify and create new configurations more easily than in previous versions. To modify a configuration on a LAN or a diskette, users only need to specify the configuration file name, then CM/2 performs all tasks necessary for the user to complete the configuration. In addition, users can interactively upgrade old versions (OS/2 EE 1.30.1 or OS/2 ES 1.0).

The CMRECORD function will create an ASCII printout of the values and keywords associated with more than 700 parameters in CM/2 binary configuration files. This ASCII file can also be used as input to create or modify a configuration file via simple OS/2 commands.

CM/2 Setup combines installation and configuration. Users without an existing configuration can select Setup from the main CM/2 Setup panel and configure their connectivity. They then have the option to install the code required to run the new configuration file.

If a configuration file exists (from a previous release or one just created), the user should select Installation. This installs the files required to support the connectivity options in the configuration file. Since the guided path shows the user what to expect, there are no surprises when the system boots.

Security and System Management Functions

Keylock has been a well-kept secret, but with the functions broken out, it is now easily accessible. Keylock allows a configuration file to be locked with either a Service password or a Master password. The system administrator uses the Master Pass Key to access all configuration files. The Service Pass Key allows users to access their workstations' configuration files. Unauthorized users can only display profiles for a locked configuration file.

Replacing the Default Configuration File

Replace Default Configuration allows users to specify which default configuration file CM/2 uses at startup. As users' communications and configuration requirements
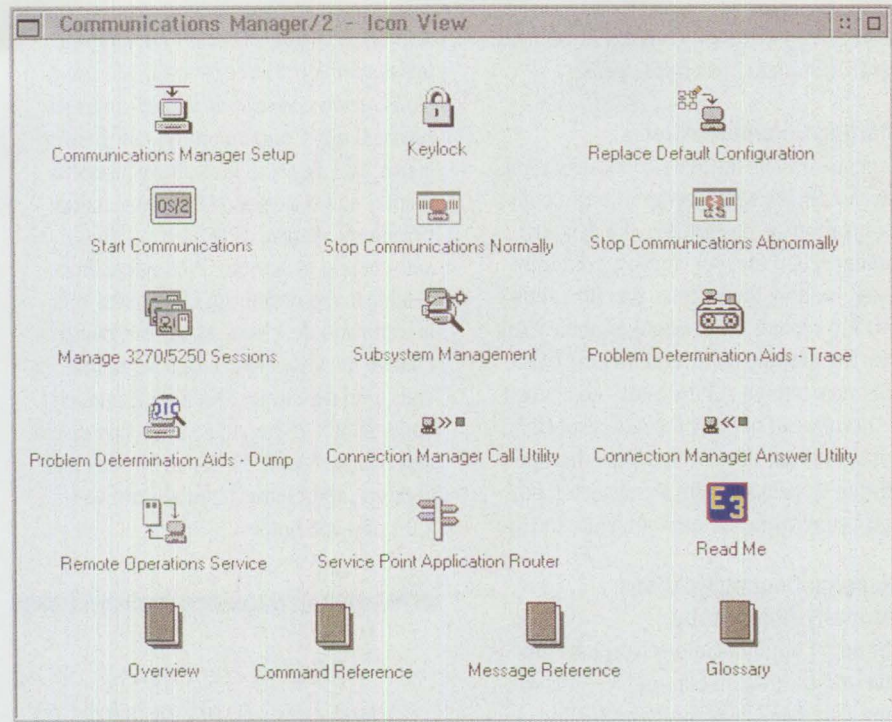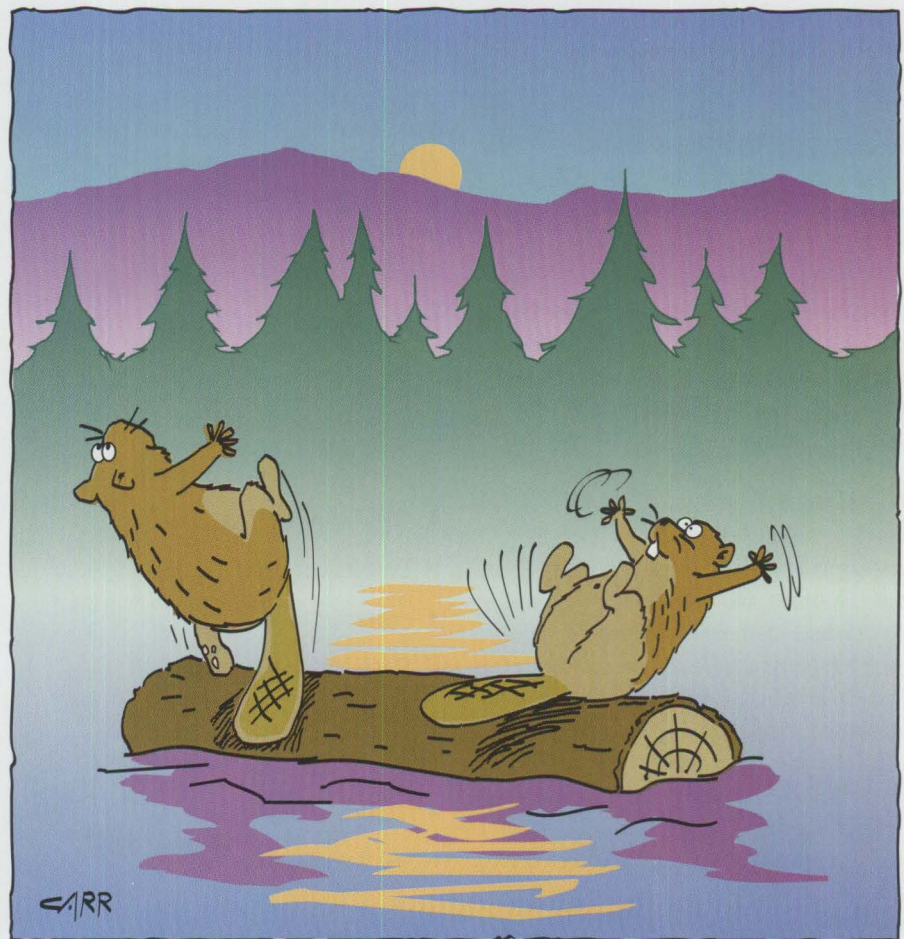

Figure 1. CM/2 Folder

change, they can easily replace the default configuration to meet their needs.

Starting Communications

Users can select the Start Communications function in the CM/2 folder to begin communications as specified in the default configuration file. For starting a different configuration, the Replace function allows users to replace the configuration file name with the new file name and then restart communications. All necessary code must be installed to operate the newly specified configuration. If it is not, users must specify the installation path via the Setup function before using the new configuration file.

Stopping Communications Normally/Abnormally

The Stop Communications Normally function brings down all communications running with the default configuration file. A normal stop means that appropriate time-outs are respected to bring the communications down in an orderly fashion. The Stop Communications Abnormally function brings down all communications when users need to "kill" the communications in the shortest amount of time.

Managing 3270/5250 Sessions

A window interface allows users to stop and start (both normally and abnormally) either individual or a combination of 3270/5250 emulation sessions—without affecting other active sessions. Depending on the number of resources being used on a system at a given time, system administrators can monitor and manage 3270/5250 sessions appropriately.

Managing Subsystems

Subsystem Management allows users to display and control the running status of links, sessions, and transaction programs. To fine-tune their networks, users can display the status of these resources and use Subsystem Management functions to alter communication session operations. Subsystem Management displays the status for the APPC attach manager, CM/2 kernel, Systems Network Architecture (SNA) subsystem, X.25 physical links, and SNA X.25 virtual circuits. Subsystem Management also allows users to start and stop the APPC attach manager, CM/2 kernel, and the SNA subsystem.

SNA Services allows users to display the active configuration of non-LU 6.2 sessions, gateway sessions, signed-on users, physical units, and incoming-call answer status. SNA Services also allows users to display and deactivate APPC transaction programs, change APPC session limits, activate and deactivate SNA logical links, establish and deactivate LU 6.2 sessions, activate and deactivate Data Link Controls, change the answering mode for incoming calls, and deactivate SNA X.25 virtual circuits. With X.25 Services, users can display and control SNA X.25 virtual circuits and connect, autoconnect, and disconnect X.25 physical links.

CM/2 is the easiest communications product to install, configure, and use.

Some Subsystem Management windows automatically refresh at intervals ranging from zero (no refresh) to 999 seconds. This ensures that the windows are always displaying the most current information. The following windows can take advantage of this:

- CM/2 subsystem management
- Transaction programs
- LU 6.2 sessions
- Non-LU 6.2 sessions
- Gateway sessions
- Logical links
- Data-link controls
- Signed-on users
- Signed-on user details
- Physical units
- Incoming-call answer status
- X.25 physical links
- SNA X.25 virtual circuits

Problem Determination

CM/2 includes a powerful diagnostic tool called First Failure Support Technology/2

(FFST/2). This tool automatically captures data about each error at the time the error occurs. In addition to FFST/2, the CM/2 Problem Determination Program provides the Dump Services and Trace Services user tools.

Dump Services helps users identify the source of certain types of communication problems by first making a copy of the data stored in memory by a communication component. A customized dump facility contains detailed information about the error and the environment in which the error occurred. CM/2 uses this to supply detailed alert information.

In addition to Dump Services, the CM/2 Problem Determination Program provides Trace Services. Trace Services helps users diagnose communications problems by allowing them to record or trace a sequence of events.
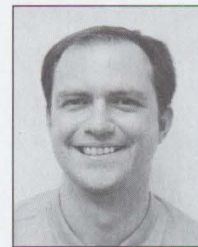
Steve Kipisz is a member of the Network Access area of IBM's Networking Systems division in Research Triangle Park, North Carolina. He led the configuration team for CM/2 and was instrumental in integrating the installation and configuration process of CM/2 into CMSETUP. Steve has a BS in computer science from Wayne State University in Detroit.

Deborah Pharr is a member of the Network Access area of IBM's Networking Systems division in Research Triangle Park, North Carolina. She helped with the transition of Communications Manager from Austin, Texas, where it was originally developed, to Research Triangle Park. Deborah has a BS in computer science from the University of Texas in Austin.

Ly Sauer is a member of the Network Access area of IBM's Networking Systems division in Research Triangle Park, North Carolina. After working on the base OS/2 2.0 operating system, she worked on the Configurator of Extended Services 1.0 and then brought her knowledge of configuration to CM/2 1.0. Ly has a BS in computer science from Arizona State University in Tempe.

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Overview of IBM NetWare 4.01

NetWare 4.01 is a complex and powerful operating system that provides useful functions in large internetworking environments as well as small LANs. It is not an upgrade to Novell NetWare 3.11, yet there are many similarities between the two. This article discusses what is new in NetWare 4.01 and how it compares to previous versions of NetWare.

IBM and Novell have a distribution agreement whereby IBM sells NetWare in a "blue box." Although the packaging may be different, the code and rich functions are the same as the Novell product. IBM also offers comprehensive NetWare support. NetWare 4.01, the most powerful and robust network operating system to date, is already making an impact in organizations worldwide.

New in NetWare 4.01

NetWare 4.01 features NetWare Directory Services (NDS), the functions of previous NetWare versions, plus several new features.

NetWare Directory Services

NDS is a global database that replaces the bindery-based database of previous NetWare versions. The NetWare bindery database contains objects, properties, and values, such as user accounts and passwords used by the operating system. NDS, however, can store information about available network resources such as printers, network file servers, volumes, users, groups, and computers. NDS allows supervisors to add more information about network resources (such as a user's telephone number, fax number, and job title) than they can include in NetWare binderies. With NDS, NetWare users log into a network, not a specific server. Supervisors can duplicate the global database and copy it to multiple servers, eliminating the single point of failure inherent in NetWare binderies.

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If necessary, NetWare 4.01 can emulate bindery capabilities. For example, users can still log in using NETX, and bindery emulation can use NDS information.

NetWare 3.x has six memory pools; NetWare 4.01 manages only one, which significantly increases performance. NetWare 3.x's multiple pools cause problems because the memory manager will not release some of the memory allocated for certain memory routines or NetWare Loadable Modules (NLMs). An NLM program is loaded, linked, or unloaded to NetWare 3.x and 4.01 while the operating system is running. NetWare NLMs include drivers for LAN adapters and disk adapters as well as NetWare server utilities.

Memory Protection

NetWare 4.01 has a memory protection scheme, OS-PROTECTED domain, designed for unstable NLMs. In previous NetWare versions, NLMs share RING 0 with the operating system; if the NLM fails, the operating system crashes. With NetWare 4.01, the NLM can be in an alternate ring—RING 3—and run from there. Once the NLM is stable, it is moved from RING 3 to RING 0 to run with the operating system.

Improved LAN Performance

NetWare 4.01 improves LAN performance in two ways: Burst Mode Protocol (BMP) and Large Internet Packet (LIP) exchange. BMP and LIP are available for NetWare 3.11 separately from Novell, but both are included in NetWare 4.01. BMP sends requests between a workstation and file server. In standard packet request delivery, each packet sent typically returns a reply. With BMP, several packets are sent, but only one reply returns to inform the receiver that all packets were received. This reduces LAN traffic.

LIP is for configurations that have internal or external routers. A NetWare *internal router* is a NetWare file server with two or more LAN cards connected to different LAN segments. A NetWare *external router* is a PC with a minimum of two LAN cards connecting multiple segments. A router typically routes specific protocols such as IPX, TCP/IP, and AppleTalk®. The Novell routers negotiate the size of packets going through the LAN; without LIP, larger packets are reduced to 512 bytes. Even if the workstation and server are set for 4 KB packets, the NetWare router reduces the packet to multiple 512-byte packets. LIP maintains the original packet size, improving overall LAN performance.

Block Suballocation

When creating a NetWare volume, the block size is adjustable to 8 KB, 16 KB, or 64 KB. In NetWare 3.11, if the data block size is set to 4 KB and a user saves a 9 KB file, the file will occupy three 4 KB blocks.

In the third block, 3 KB remains unused; even a 512-byte file will occupy an entire 4 KB block. Because this occurs with multiple files, much disk space is wasted.

In NetWare 4.01, suballocation utilizes the additional space in a 4 KB block. For example, a 9 KB file with suballocation will still occupy three 4 KB blocks, but the unused 3 KB of the third block will be suballocated into 512-byte blocks that can be used by other files. Although block suballocation in NetWare 4.01 is an optional function, it is active by default.

Data Compression

Data compression, another new feature in NetWare 4.01, can provide as much as 63% additional hard disk storage on a standard drive. This function is similar to many DOS data compression programs available today. As data is stored in the NetWare volume, the files, directories, or the volume itself are automatically compressed when server activity is light. If necessary, a user can flag files or directories to be compressed immediately. Compressed files are automatically decompressed when accessed. Data compression is active by default.

Data Migration

NetWare 4.01 also provides data migration, a useful feature when users run out of disk space while copying data. Normally the server broadcasts that it has no more disk space and locks up. NetWare 4.01's data migration automatically transfers unused files to an offline storage system such

---

Data compression can provide as much as 63% additional hard disk storage on a standard drive.

---

as a tape backup, Write Once Read Many (WORM) drive, or High-Capacity Storage System (HCSS). Although this is not a default function, it can be activated if necessary.

Enhanced Security

NetWare 4.01 maintains security capability from previous NetWare versions as well as NDS-based security. NDS provides an

additional layer of security by authenticating the user login and password at the network level. Then, when a user asks the network for resources such as files, directories, or volumes, NDS transparently determines if that user has proper rights to that resource. The result is that users do not have to log in to multiple servers with multiple security schemes to access resources—and administrators have a centralized security scheme across multiple volumes.

Enhanced Client Services

A new shell called VLM.EXE replaces NETX.EXE, breaking down the functions of NETX.EXE into smaller components with the Virtual Loadable Modules (.VLM) extension. The VLM NetWare shell enables connections to NDS as well as attachments to bindery-based servers such as NetWare 3.11.

The new NetWare Requester for OS/2 is for use with OS/2 2.1. This new requester allows users to log in to NetWare 4.01 NDS as well as bindery-based servers.

NetWare Utilities

Another new feature is the NDS configuration utility called NetWare Administrator. NetWare 4.01 comes with Windows-,
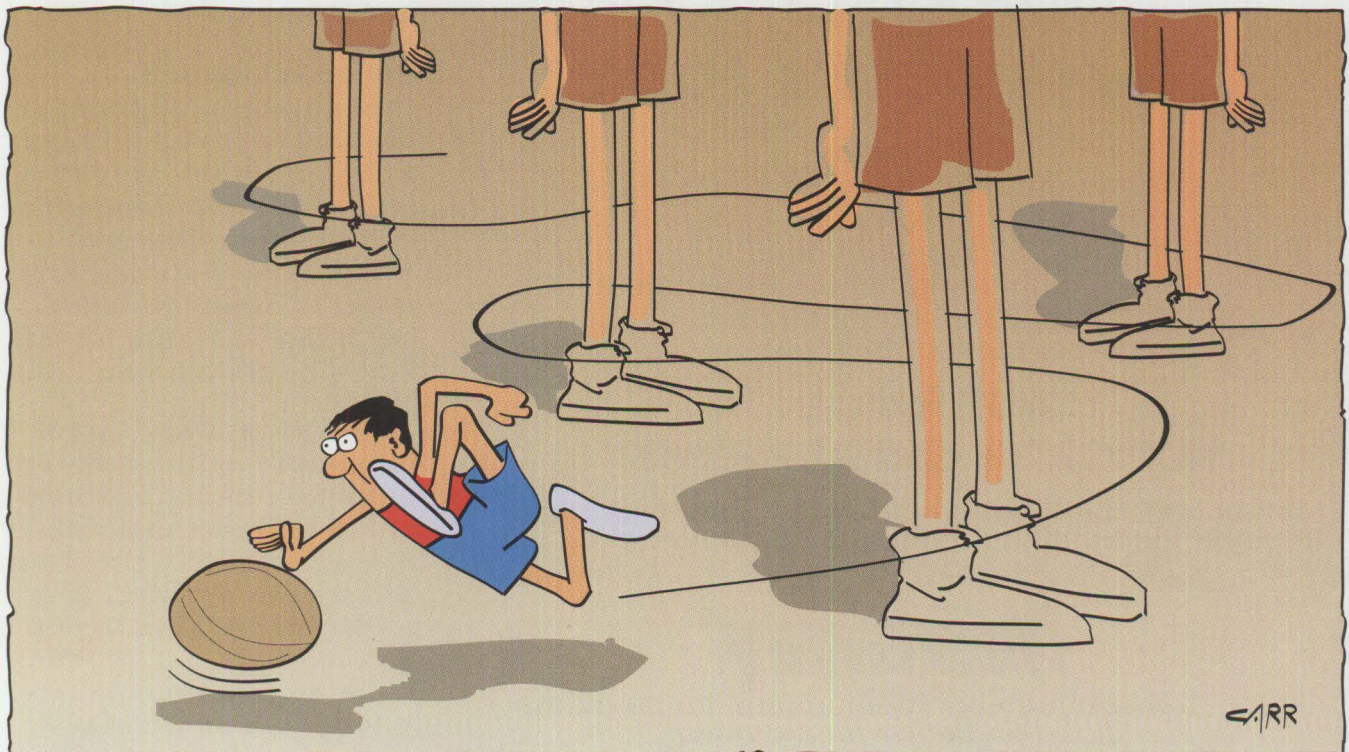
Feature	NetWare 3.11	NetWare 4.01	Comments
Data Compression	No	Yes	Frees additional disk space on a NetWare volume.
Suballocation	No	Yes	Allows unused portions of data blocks in a NetWare volume to be used as additional 512-byte blocks. Makes better use of the volume's space.
Memory Pool	Six	One	Improves file server performance. NetWare 3.11 can rob certain processes of available memory.
Logins	Multiple	Single	Enables users to log in once for all the servers. User logs in to a single network that is not location dependent. NDS provides user with all resources from each server.
CD-ROM	No	Yes	Enables NetWare 4.01 to be loaded from a CD-ROM attached to the NetWare server. With NetWare 4.0x, users can mount High Sierra and ISO® 9660-compliant CD-ROMs as NetWare read-only volumes that can be accessed by NetWare workstations.
Languages	English Only	Multiple Languages	Provides help and menus in multiple languages.

Figure 1. Features of NetWare 4.01 versus NetWare 3.11

OS/2-, and DOS-based utilities that allow administrators to change, delete, and create objects in NDS. The OS/2 NetWare Administrator utility is included in the NetWare 4.01 update, but not in NetWare 4.0.

Users as well as administrators can do the following: audit network transactions, logins, and logouts; create, delete, read, and write files, directories, and NDS objects; request to manipulate queues; and handle events directly related to users. A supervisor can grant rights for specified auditors to use this capability.

Improved Print Services
In the earlier versions, print servers and print queues were the only objects defined in the NetWare bindery. The configuration files in the server SYS: volume contain information about printer configurations and which printers service which queues. With NDS, all print services information is part of the NDS database, giving users better control of objects for print services.

Internationalization
NetWare 4.01 is designed to use language components for the operating system, utilities, and NLMs. Although the English component is the default, NetWare 4.01 includes Spanish, German, Italian, and French modules that can be set as defaults. For example, to use menu utilities in Spanish, the supervisor sets NetWare to use the Spanish language module.

Enhanced Documentation
Online documentation is a special feature of NetWare 4.0; all NetWare 4.01 manuals are stored on disk. A Windows-based application called ElectroText is used to retrieve information from the online manuals. NetWare 4.01 also has a Computer-Based Training (CBT) program to familiarize users with NetWare 4.01. The CBT uses the Windows Toolbook application.

Updating from NetWare 4.0 to 4.01
The NetWare 4.01 update to NetWare 4.0 was announced on July 13, 1993. In addition to the new features described above, the release includes the OS/2 Presentation Manager-based NetWare utilities plus a new VLM version for DOS and Microsoft Windows.

Anyone who has purchased NetWare 4.0 should return their registration card to

```
Total Server RAM = 6 + A + T + (H x .008) + B
```

Variables:

6: 6 MB minimum RAM for loading operating system, NDS, disk and LAN drivers, and the `INSTALL.NLM`.

A: 0 or 2 MB. If you load either of the following, add 2 MB:

- NetWare for Macintosh® or Network File System (NFS®)

- `PSERVER.NLM`, `STREAMS.NLM`, `CLIB.NLM`, or `BTRIEVE.NLM`

T: RAM in megabytes required for any other NLM or third-party applications

H: Amount of file server disk space in megabytes

B: 1 MB to 4 MB RAM of additional cache buffer memory increases performance

A detailed formula can be found in Appendix B, page 204 of *NetWare 4.0 Installation and Upgrade*, shipped with NetWare 4.01.

Figure 2.   Formula for Estimating RAM Requirements

Program	Disk Space
DOS/Windows Client Software and Installation	5 MB [1]
OS/2 Client Software and Installation	5 MB [1]
Login Utilities (`SYS:LOGIN` directory)	2 MB
NetWare Utilities (`SYS:PUBLIC` directory)	24 MB
NetWare System Programs (`SYS:SYSTEM` directory)	6 MB
Online Help Software (Novell ElectroText)	25 MB [1]

[1] Optionally loaded during installation

Figure 3.   NetWare 4.01 Disk Space Requirements

receive a CD-ROM update for 4.01. NDS improvements in NetWare 4.01 are not backward-compatible with NetWare 4.0 NDS; both versions cannot be on the same directory tree.

Differences between NetWare 4.01 and 3.11

Although NetWare 4.01 is designed to use NDS, it can perform bindery emulation. This is useful for those still using the `NETX.EXE` shell that works with bindery logins. The drawback is that NetWare binderies cannot be duplicated or partitioned like NDS; binderies are specific to the server on which they are located. As a result, the bindery on one server is a single point of failure. NDS eliminates this because supervisors can duplicate the NDS on different servers. If the server having

the original NDS database should fail, then the second copy (on another server) is used. Users can also improve performance by partitioning the NDS database; this is particularly helpful when working remotely.

Figure 1 shows some major differences between NetWare 4.01 and 3.11.

When to Use NetWare 4.01 and NetWare 3.11

Many factors can dictate which version of NetWare is best for organizations. Existing NetWare 3.11 networks that provide good performance usually do not need an upgrade unless they are projected to grow substantially. Networks ranging from 5 to 250 nodes can run NetWare 3.11 and still have the functions and performance of a robust network operating system.

NetWare 4.01 may be the best choice for high-performance networks or a multiple server network. NetWare 4.01 allows access to multiple servers with just one login and password, making network management easier than with NetWare 3.11. If an organization has plans for a new network or to expand its current network to more than 1,000 users over time, then NetWare 4.01 has superior performance and ease of administration.

Hardware Requirements for NetWare 4.01

The minimum server hardware required for NetWare 4.01 is an Intel® 386-based system. For larger networks, users should have at least a 25 MHz 486-based system. The file server must have at least one LAN adapter that complies with NetWare 4.0 Open Data-Link Interface (ODI). Administrators can also install a tape backup and a CD-ROM on a Small Computer Systems Interface- (SCSI-) based file server, preferably on a separate controller. The file server must have at least 8 MB of RAM and 57 MB of hard disk space. Figure 2 shows a formula for estimating RAM requirements.

Administrators should partition the first drive with a minimum 5 MB DOS partition and use the rest for the NetWare partition. Figure 3 shows NetWare 4.01 disk space requirements.

NetWare for OS/2 Version 4.01

NetWare for OS/2 Version 4.01 is not a full operating system, but a component used with IBM OS/2 2.1 and NetWare 4.01. NetWare for OS/2 4.01 allows NetWare 4.01 to run with IBM's OS/2 2.1. It contains drivers that enable both environments to share the same LAN adapter and disk controller.

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OS/2 2.1 Performance Tuning Tips

No matter how powerful OS/2 systems are today, most users look for information sources on improving hardware and software performance. Unfortunately, much of this information is either scattered or must be painstakingly discovered. This two-part article provides OS/2 2.1 users with a comprehensive, easy-to-use performance tuning reference.

Most users want to maximize the performance of their OS/2 2.1 systems. This article provides tips and techniques for tuning your system during installation, including file system and partition tuning, general performance enhancements, and swap file tuning. Part 2 will include tips on tuning applications, the CONFIG.SYS and AUTOEXEC.BAT files, printing, and communications.

Hardware Requirements

It is no secret that the faster the machine and the more memory it has, the better OS/2 2.1 performs. Although it is not always economically feasible to purchase the "ultimate" system, the minimum hardware requirements for OS/2 2.x are as follows:

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- Intel or compatible 386SX microprocessor

- 4 MB of memory

- 60 MB hard disk with 15 MB to 30 MB of free space for OS/2 2.0, or 20 MB to 40 MB of free disk space for OS/2 2.1

- Two-button mouse or other pointing device

With OS/2 2.1, you can install Microsoft® Windows support (WIN-OS/2) on a different partition from OS/2. Although you still need the same total disk space, this allows you to install OS/2 on a smaller partition. Because of its 32-bit addressing power, OS/2 2.x requires a 386SX or higher processor. If you use undemanding applications such as word processing, a 386SX will provide fair performance. If you use multiple, concurrent processes or frequently switch between many concurrent tasks, you probably will want the horsepower of a 486 processor.

The minimum amount of memory needed to run OS/2 2.1 is 4 MB. Some computers use up to 128 KB for ROM-to-RAM remapping; some use even more for other

And so, sweet Lady Jane
Her hard disk did Partition.
With a Hey Nonny Nonny
and a C: (Primary) 50 MB formatted FAT
  D: (Logical) 80 MB formatted FAT
  E: (Logical) 269 MB formatted HPFS
  (Boot Manager) 1 MB

CARR

hardware purposes. This results in a 4 MB system without the entire 4 MB available for OS/2; therefore, the memory should be increased by at least 1 MB over the 4 MB minimum. OS/2 2.x and its shell typically require 1 MB to 2 MB more memory to run at the same level as OS/2 1.3. Considering this, a minimum of 6 MB is better for good performance.

Getting Started

The first place to tune OS/2 2.1 performance is perhaps the least obvious: during installation. Several software and hardware considerations are often overlooked in the rush to install the operating system.

The first interactive screen during installation asks you to accept the install partition (based on your system configuration) or to select another partition. If you choose the default partition, OS/2 is installed on the C: primary partition. For a new hard disk, the installation program will, as a default, create one primary partition the size of the entire disk. You can choose to customize your new hard disk's partitioning during installation (see the section "Partitioning Your Hard Disk").

For a system that has already been partitioned, you can—during this step of installation—select any existing partition to install OS/2, or change the existing partitions and then install OS/2 in a newly created one. With either choice, the installation program moves into FDISK so you can make the necessary changes. Several issues arise here, including Boot Manager, partition size, and choice of file system.

Boot Manager

OS/2 2.1's Boot Manager facility allows you to install multiple operating systems on your workstation and then select one from which to boot. This is useful when migrating from one operating system to another, such as from DOS/Windows to OS/2, or when upgrading to new versions of the same operating system, such as from OS/2 1.3 to OS/2 2.0 or 2.1. You can test the new system while maintaining your old one.

To use Boot Manager, the system needs enough disk space for the operating systems plus 1 MB for the Boot Manager

itself. The disk space used by Boot Manager cannot be allocated to any partition and must be located at the beginning or end of a physical drive. By placing the Boot Manager partition at the end of the drive, the system does not have to seek over it. Since the system uses the Boot Manager partition only when it boots or when changing Boot Manager options, putting it at the end of the drive does not impact performance. If there is not enough free space to use Boot Manager, see the next section, "Partitioning Your Hard Disk," for suggestions.

The first place to tune OS/2 2.1 performance is perhaps the least obvious: during installation.

To install Boot Manager at any time, use the OS/2 2.x FDISK utility located on installation Diskette 1, following the steps below. It can be run from OS/2 1.3 or 2.x, but not from a DOS session. FDISK automatically runs during installation if you choose to install a partition other than the default C:. At that time you can leave the existing partitioning. Simply mark an

existing partition as bootable and add it to the Boot Manager menu.

1. Start FDISK, which will display the partitions defined on the first disk.

2. With the Tab key, go to the top of the screen. If you have more than one hard disk, they will all display as icons at the top of the screen. Use the arrow key to select which disk to use. The partitions on the selected hard disk will be displayed.

3. Press the Tab key again to get to the Partition Information portion of the screen. On a new system, the only partition type available will be Free Space, which will be highlighted when you tab to the Partition Information.

4. Press Enter to display the Options menu, shown in Figure 1.

5. Use the arrow key to select Create. A pop-up menu will display showing the maximum amount of free space available. Enter the size of the new partition, in megabytes. Press Enter. You will be prompted to select the Type of Partition: Primary or Extended Logical. Use the arrow key to select which type. Although OS/2 can be installed in either type, a logical partition is recommended. Press Enter and the system will allocate the partition.
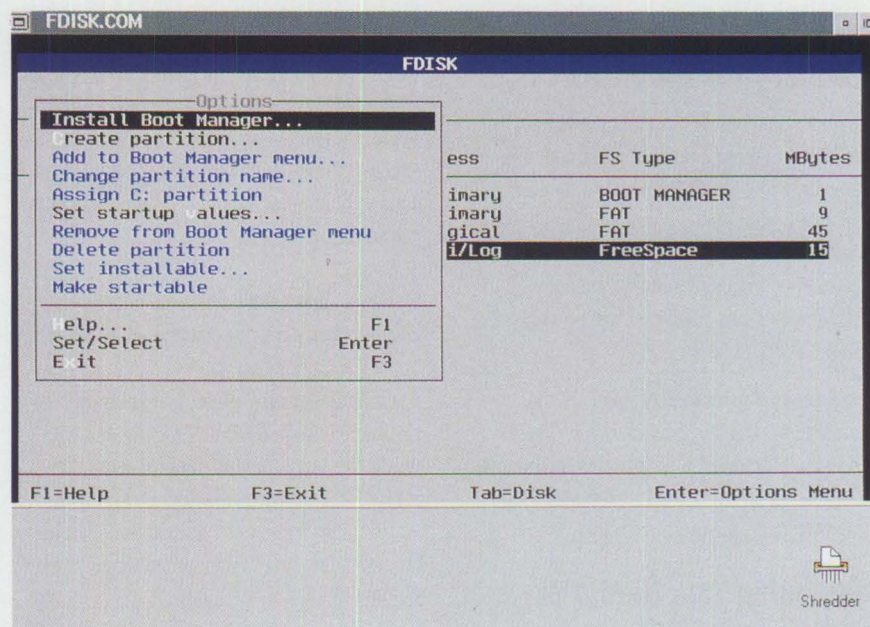

Figure 1.   FDISK with Options Menu

Logical Drive	Size	File System	Use
C: (Primary Partition)	50 MB	FAT	OS/2 2.0
D: (Logical Partition)	80 MB	FAT	OS/2 2.1
E: (Logical Partition)	269 MB	HPFS	OS/2 applications and swap file
(Boot Manager)	1 MB		

Figure 2. Partitioning Example 1: Jane's Office System

Logical Drive	Size	File System	Use
C: (Primary Partition)	30 MB	FAT	DOS 4.0 and Windows 3.1
D: (Logical Partition)	50 MB	FAT	OS/2.0
E: (Logical Partition)	140 MB	HPFS	OS/2 applications, data, and swap file
F: (Logical Partition)	100 MB	FAT	OS/2 2.1 and Windows applications
G: (Logical Partition)	79 MB	FAT	Games (OS/2 and DOS)
(Boot Manager)	1 MB		

Figure 3. Partitioning Example 2: Jane's Home System

6. Continue repeating the above step until your hard disk is partitioned as you like. To change the sizes, use Delete, then Create, from the Options menu.

7. Highlight the partition where you want to install OS/2. Press Enter to display the Options menu. Select Add to Boot Manager menu. You will be prompted for a name, which will display on the Boot Manager menu when you boot the system. It can be any name up to eight characters.

8. Display the Options menu again. Select Installable and press Enter. This tells OS/2 to install on that partition.

9. Press F3 to exit from FDISK. If new partitions were created, a reboot will be required to set those partitions. If you only marked a partition Installable, installation will continue using the new partition. You will see that the new drive letter has replaced C: on the installation screen.

For additional information on FDISK, consult the *OS/2 2.1 Installation Guide* (S61G-0905), which is shipped with the system, or refer to the FDISK and SETBOOT options in the online help facility.

Partitioning Your Hard Disk

Partitioning a system is a matter of personal preference, with as many ways to partition a hard drive as to select background screen colors. How you decide to partition your system depends both on the size of the hard drive and how you will use the system. As an example, consider Jane and her home and office systems. Her office system is connected to a LAN and a host, whereas her home system is a stand-alone.

Her office system has a 400 MB hard drive partitioned as shown in Figure 2.

The smaller partitions are formatted for the File Allocation Table (FAT) file system; the large E: partition is formatted for the High-Performance File System (HPFS) for better performance. The C: partition has OS/2 2.0 installed and the D: partition has OS/2 2.1 installed. This enables Jane to switch between OS/2 versions for development and testing.

Figure 3 shows the partitions in Jane's home system, also equipped with a 400 MB drive.

For better performance, the smaller partitions are formatted as FAT file systems, while the large partition is formatted as HPFS. The C: partition has DOS 4.0 installed with Microsoft Windows 3.1. The D: partition has OS/2 2.0 installed while F: has OS/2 2.1 installed.

Jane would have installed OS/2 2.1 on D:, but disk space on D: was limited. Many Windows applications install themselves on the same drive as the Windows code. Windows applications that she installed using OS/2 had placed files on that partition; therefore, there would not be enough disk space available for the OS/2 2.1 installation and the application files.

The F: partition is formatted for the FAT file system because it contains Windows applications that Jane sometimes runs when she boots DOS. Windows applications can also be executed when OS/2 is booted. Since DOS does not understand HPFS, partitions to be accessed by DOS (or Windows from DOS) must be formatted for the FAT file system.

The E: partition contains her OS/2 applications, data, and the OS/2 swap file. The G: partition holds games that her children can run from either OS/2 or DOS.

Originally, Jane did not install Boot Manager on her home system because it was a DOS system only. When she installed OS/2, she found that she needed a 1 MB partition at one end of her hard drive. She backed up the G: partition, ran FDISK and removed G:, then created G: and installed Boot Manager. Because this did not interfere with the other partitions, Jane did not have to back up the entire system.

FDISK allows four entries, where each entry is a primary partition (including Boot Manager), or a series of logical drives. Although you can have multiple primary partitions, you can only access one primary partition at a time. If you boot from a logical drive using Boot Manager, you can access the primary partition from which you last booted (marked active). In both of Jane's systems, there are three FDISK entries.

FDISK or FDISKPM shows the column Access. You can count the number of entries your hard disk currently has using the Access column. This column also shows the primary partition that you can access. If you have more than one primary partition on a hard disk, only one will be listed with a drive letter. That is the one you can currently access. It changes only

when the system is rebooted and another primary partition is selected to boot.

File System Considerations

OS/2 2.1 supports the FAT and HPFS file systems that are functionally equivalent to earlier releases of OS/2. Although both work on the same hard drives and partitions, there are performance considerations for choosing one over the other.

Generally, if a partition is less than 100 MB, choose the FAT file system because it provides excellent performance and reserves less disk space than HPFS for partition management. If the partition is over 100 MB, HPFS—designed for large disk drives — generally performs better than FAT. HPFS uses B-trees to locate file and directory data, providing better performance on partitions over 100 MB. The B-tree is lexically sorted. To locate a file, HPFS looks at the center of the B-tree and scans in the direction needed to locate the file or directory. HPFS also uses multiple B-trees, one per directory, so it also has smaller trees to search. HPFS also manages disk space at the sector level instead of the cluster level, meaning less disk space lost per file or directory. On average, HPFS would waste half a sector (256 bytes) compared to half a cluster on FAT (1,024 bytes and higher).

The FAT file system manages the partition using clusters, a measure of space on a disk. Clusters, which are groups of sectors, are established at format time. Partition size determines the number of sectors in a cluster.

Sectors are addressable subdivisions of a track. Tracks (disk units of space) are established by the hardware, whereas sectors can be established by either software or hardware. A sector on IBM PC systems is 512 bytes.

Because FAT uses only 64 KB to manage the entire partition, the cluster size varies with the partition size; larger partitions have larger clusters than do smaller partitions. Since a file or directory always takes n number of clusters, large FAT partitions use disk space inefficiently. For example, a one-byte file takes an entire cluster, even if the cluster is 8 KB. As shown in Figure 4, large disks formatted with FAT can have

cluster sizes up to 64 sectors (typically 32 KB), resulting in poor disk management.

HPFS manages all partitions at the sector level, regardless of the partition size. For example, a one-byte file takes one sector (generally 512 bytes) for data and one sector to manage the file (Fnode). Because of differences in partition management, no versions of DOS can access HPFS formatted partitions.

File System Features

Both FAT and HPFS file systems feature disk caching, lazy writing, and read-ahead.

Disk caching places frequently accessed data into a special memory buffer, reducing access time and improving performance of applications that rely heavily on disk I/O.

Lazy writing, also known as *write behind*, writes file updates to disk while the system is idle. It also writes to disk when the updated block has reached the maximum allowable age or when the cache is 30% full of updated blocks. The file system tracks when a cache block is touched to determine the age of the cache block. The least-used blocks are selected using the cache block age, with the oldest (least-accessed) blocks written first.

The lazy-write parameters for both file systems will write the data to disk when the disk is idle or the data is five seconds old; the system may then take one or two seconds to make the physical write. If there is a power failure, for example, the amount of data "in transit" is small—at the most, the last seven seconds of updates or about 50% of the cache.

Read-ahead enables the file system to detect sequential read requests and extends the read, or reads ahead and places the data in the file system cache for improved performance. Since this file system function increases performance, it is always enabled in OS/2 2.x. The parameters for these functions can be changed during or after installation; the default values are good for average systems.

For applications that require absolute data integrity, open the files with WriteThru enabled. In direct contrast to lazy writing,

Partition Size	Cluster Size
Diskettes	1 sector
< 16 MB	8 sectors
16–128 MB	4 sectors
128–256 MB	8 sectors
256–512 MB	16 sectors
512–1024 MB	32 sectors
1024–2048 MB	64 sectors

Figure 4. FAT Cluster Size

WriteThru ensures that disk-write operations commit to disk before the application continues. If lazy writing is disabled, you will not have the same data integrity as with WriteThru. Disabling lazy writing also decreases system performance.

Default File System Cache Sizes

Although the disk cache installation defaults (shown in Figure 5) are generic, these values can be easily tuned after installation. For FAT file systems, the default sizes appear in the DISKCACHE= statement in CONFIG.SYS. For HPFS partitions, the default size appears in the IFS=HPFS statement in CONFIG.SYS (on HPFS-only systems, the FAT DISKCACHE= is set at 64 KB). If the system uses both FAT and HPFS, the OS/2 2.x installation program changes the cache size for both to the values in the Two File Systems column.

With I/O-intensive applications and applications with large program or data files, the choice of file systems, cache sizes, and cache options influence application load and runtimes. File system performance rarely affects the performance of CPU-bound or interactive programs.

File Systems and Memory Performance

Even on an HPFS system, the FAT file system is always active in OS/2 because HPFS does not handle diskettes. HPFS is enabled in the CONFIG.SYS file as shown:

```
IFS=C:\OS2\SYSTEM\HPFS.IFS /c:64
```

In a memory-constrained system, if HPFS is not used, remove this line from the CONFIG.SYS file to reduce the memory requirements up to 500 KB and improve general performance. If the system is not

Memory Size (MB)	One File System	Two File Systems[1]
4	128	128/64
5	128	128/64
6	256	256/64
7	256	256/128
8	512	256/256
9	512	256/256
10 to 16	1024	512/512
17 to 32	2048	1024/1024

[1] The file system with the largest total disk space or sum of partitions is allocated the first value and the other file system is allocated the second.

Figure 5. Disk Cache Installation Defaults

Cache Parameters		FAT	HPFS
Cache size	Range	64 KB–14 MB	64 KB–2 MB
Threshold	Default	2 KB	4 KB
	Range	2 KB–64 KB	2 KB–64 KB
Read-Ahead Value[1]		8 KB	8 KB
MaxAge	Default	5,000 ms	5,000 ms
	Range	Fixed	1–99,999 ms
DiskIdle	Default	1,000 ms	1,000 ms
	Range	Fixed	1–99,999 ms
BufferIdle	Default	500 ms	500 ms
	Range	Fixed	1–99,999 ms

[1] Fixed value that cannot be changed

Figure 6. Cache and Lazy Writing Parameters

memory constrained, removing this line will not affect performance.

Setting File System Cache and Lazy Writing Parameters

Regardless of the file system used, tuning the file system cache improves performance in heavy I/O applications. Figure 6 shows the various cache sizes and threshold parameters for both file systems.

Cache parameters determine when data in the cache is lazy written to disk. Although changing these values rarely impacts system performance, the threshold value *will* affect how I/O-intensive applications perform. This value determines when the file system stops caching I/O requests. Increasing this value increases performance for applications that issue large I/O requests

because more data is available in the cache. This is particularly useful if the application repeatedly accesses the same data or accesses data sequentially. The threshold value depends on your disk cache size because the file system will not cache an I/O request that is greater than 25% of the total cache size. This prevents continuous overwriting of data in the cache. If you increase the threshold value, be sure that the file system cache can use that value with the set cache size. OS/2 will ignore unacceptable threshold values and use the default threshold value if it is too large for the cache size.

Experiment with various values to determine the best setting for your applications. If both file systems are enabled, each file system will have its own cache. Increase

the cache on the file system that supports the I/O-intensive applications. If the applications are not I/O intensive, decrease the file system caches to free up memory. For more information on the file system cache, consult the *OS/2 Command Reference*.

Figure 7 shows examples that suggest changes for systems that are not memory constrained. Use these examples only as guides to tune your system to your unique needs.

Installation Options

There are three options for installing OS/2:

Install Preselected Features installs most—but not all—OS/2 features and takes approximately 27 MB of disk space, plus the swap file. Any features not installed at this time can be installed later with the Selective Install feature, located in the OS/2 System Setup folder. Install Preselected Features provides a generic installation that is useful if there is not enough space for a full installation. It provides all required OS/2 files and automatically installs an optimal subset of OS/2 features.

Install All Features installs all required OS/2 files and features and takes approximately 40 MB of disk space including the swap file. For partitions less than 50 MB, move the swap file to another partition.

Select Features and Install allows you to select needed items from several menus for a custom installation. This takes from 17 MB (minimum installation) to 40 MB of disk space including the swap file. Do not waste disk space by installing features, such as CD-ROM or PCMCIA, that your system cannot support.

This installation is best if you understand all the available features or if you have limited disk space. OS/2 2.1—with the enhanced WIN-OS/2 support—is larger than previous versions, so Select Features and Install provides a full range of control. For example, the more entries in a folder, the more slowly that folder opens. If you select all the productivity aids and games, opening the productivity folder will be slower than if you installed only the aids that you use. To add features later, simply use the Selective Install in the System Setup folder.

System Configuration Menu

A System Configuration Menu displays the hardware configuration after you select an installation path, but before you select features in the Select Features and Install. Since some non-IBM hardware may not appear correctly, check the screen carefully to verify that the installation program has recognized all the hardware. If the configuration shown is incorrect, correct the errors on the screen shown in Figure 8.

Display Selection

The System Configuration menu lets you select the appropriate display driver for your hardware: VGA, Super VGA (SVGA), 8514, or XGA™. Generally, system performance decreases as screen resolution increases. To maximize display performance, select the minimum resolution acceptable for your tasks.

The OS/2 Setup and Installation Menu

The OS/2 Setup and Installation menu, shown in Figure 9, appears when you choose Select Features and Install. This function allows you to install specific features. As each feature is selected, the system displays a running total of the amount of disk space needed. The only item from the list that can affect performance is font support.

Figure 10 lists the fonts supplied with OS/2. To save disk space, install only the fonts that you will use (you can always add fonts later). More importantly, this improves performance when loading applications that use fonts. Each installed font uses a minimum of 2 KB of memory—even if it is not being used—and this number increases significantly when you actually use the font in an application.

Outline fonts are more efficient than bitmapped fonts because the characters are cached into memory. With bitmapped fonts, the entire character rendering is loaded into memory. Bitmapped fonts are defined for a specific screen resolution and device, whereas outline fonts are scalable and tailored to the specific device installed on the system.

Bitmapped fonts must be generated for a particular screen resolution and display type; otherwise, what looks good on one

CPU-Intensive Application # 1

This example system setup with a 160 MB hard disk will be used primarily to run a desktop publishing application and a graphical application. The following shows the layout of the hard disk and the file system for each partition.

| System Setup: | C: is the system partition, 60 MB, FAT |
| | D: is the application partition, 100 MB, HPFS |

| Application: | Desktop publishing and graphics |

A general recommendation is to decrease the size of the file system caches. Try 64 KB for FAT and 128 KB for HPFS; no changes to either threshold. This is because these applications are memory intensive. The file system cache will probably not provide as great an advantage as the additional memory. Since file system caches are not pageable, reducing cache sizes will free memory for the applications.

CPU-Intensive Application #2

This is a variation on Application #1. This example has a smaller hard disk and uses only the FAT file system.

| System Setup: | C: is the system partition, 60 MB, FAT |
| | D: is the application partition, 60 MB, FAT |

| Application: | Desktop publishing and graphics |

The first recommendation is to REM out the IFS line for HPFS in the CONFIG.SYS file. Since HPFS is not used, you will gain the memory that would be allocated to HPFS and its cache. Next, decrease the FAT cache; no changes to the FAT threshold. These applications will probably gain more from the additional memory than from the file system cache.

I/O-Intensive Application #1

This system setup has a 160 MB hard disk. This system will be used primarily to run I/O-intensive applications such as databases and spreadsheets, or to copy large or many smaller files. If the application frequently accesses the hard disk, it is I/O intensive. The following shows the layout of the hard disk and the file system for each partition.

| System Setup: | C: is the system partition, 60 MB, FAT |
| | D: is the application partition, 100 MB, HPFS |

| Application: | Spreadsheet and database |

The first recommendation is to increase the size of the HPFS cache and increase the threshold to 64 KB, if possible. Since the applications and data are located on the HPFS partition, this will allow the system to assist in handling the I/O requests. Also, decrease the size of the FAT cache; no changes to threshold. This frees some memory, offsetting the increase in the HPFS cache. Since the FAT partition contains only the system, most disk accesses will be from the application partition.

I/O-Intensive Application #2

This example assumes a fairly large system. It contains two hard disks, the second being 1 GB (1,000 MB) in size. It may be used for a bulletin board or to hold large amounts of database and spreadsheet data for a small business.

System Setup:	Disk #1	C: is the system partition, 100 MB, FAT
		D: is the application partition, 210 MB, HPFS
	Disk #2	E: is an application partition, 700 MB, HPFS
		F: is an application partition, 300 MB, HPFS

| Application: | Large spreadsheet and database with frequent accesses to files |

Increase the size of the HPFS disk cache to 2,000 KB and increase the threshold to 64 KB. Decrease the size of the FAT disk cache; no changes to threshold. The primary work being done on the system is through access to the HPFS partitions. Increasing the HPFS cache to the maximum will allow the best performance. Accesses to databases and to copy files are generally sequential, so the read-ahead ability of the file system will also improve overall performance. The FAT cache can be decreased because there will be few disk accesses to that partition.

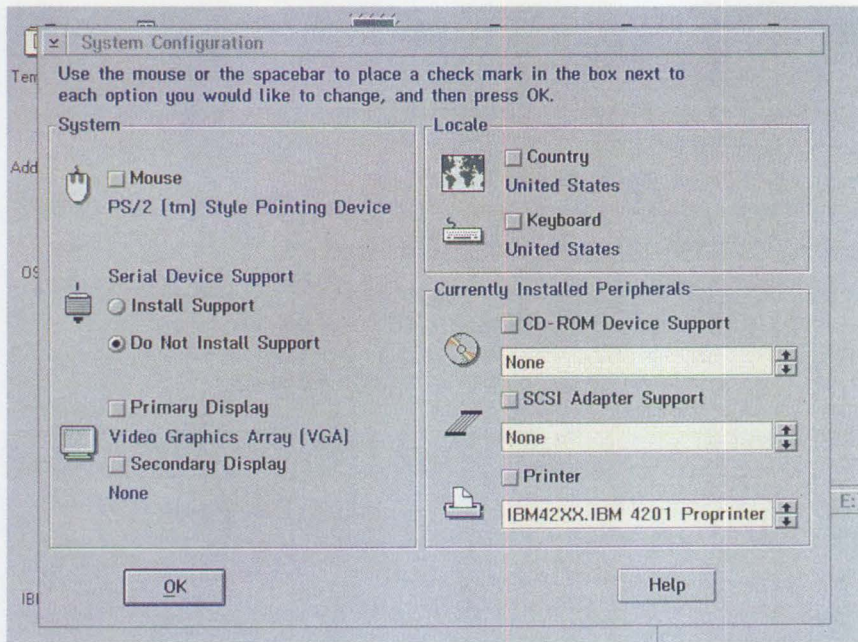**Figure 7. Examples of Tuning the Disk Cache Parameters**

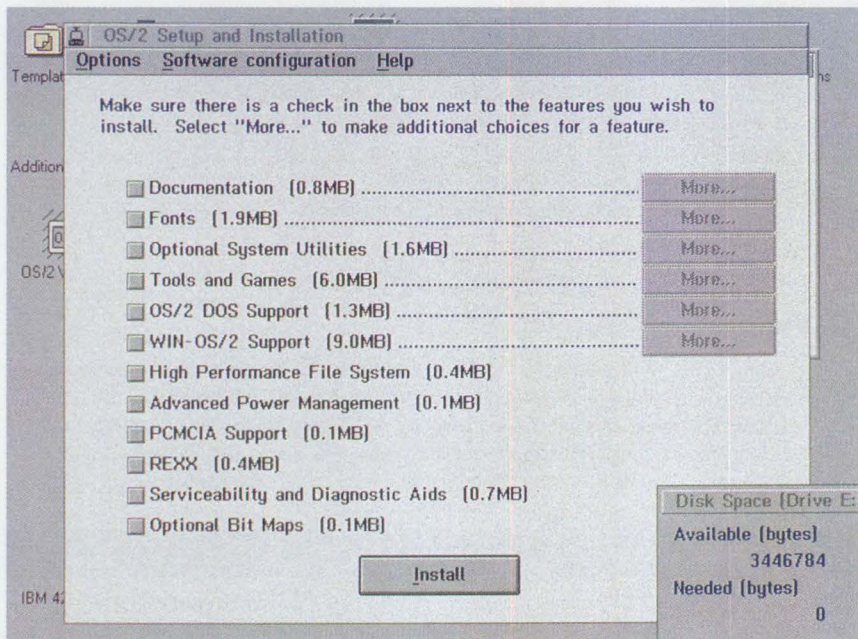Figure 8. System Configuration Menu

Figure 9. OS/2 Setup and Installation Menu

display would be too large, too small, or not clear on another display.

You can also download outline fonts to many kinds of printers, further increasing performance. In this case, the printer assists in creating the correct character.

Installing WIN-OS/2

Installing OS/2 2.1 over a prior version of OS/2 2.x deletes the WIN-OS/2 support of the older version. This is true even if you installed the beta version of WIN-OS/2 and placed WIN-OS/2 on another partition. To defer the installation of WIN-OS/2 3.1, do not select it during installation.

For WIN-OS/2 3.1, you can install a new Windows desktop or preserve the current desktop. There is also an option to install WIN-OS/2 3.1 on a partition other than the one where OS/2 is installed. This provides

flexibility for systems without enough room on the installation partition for the features selected.

General System Tuning
You can make several simple changes that can affect the performance of your entire system. The following details their impact to help you tune your system as needed.

Animation
Disabling animation can improve performance on low-end systems. When opening folders or starting sessions, animation draws boxes on the screen that grow into an open folder or session. Although good looking, animation can slow down a 386SX system that is overcommitted on memory.

To disable desktop animation, open the System Startup icon in the OS/2 System folder. Select the System icon and go to the page with the window bookmark. Click on the Disable button in the Animation portion of the page. Animation is then disabled.

Minimize Applications and Folders
Accessing a minimized application is much faster than starting it. If you use an application frequently, keep it minimized rather than starting it each time. Do the same for folders. If certain applications or folders are used frequently, leave them open at shutdown or place them in the Startup folder so they are loaded at boot time.

Starting Applications
If the system is memory-constrained or has a slow disk, applications may not start quickly. To improve performance, start applications from their own subdirectories or call the application with a fully qualified path. This reduces the time necessary for OS/2 to search for files. Alternatively, use the icon to start the application because it

Courier
Helvetica®
System Monospaced
Times Roman
Courier Outline
Helvetica Outline
Times New Roman® Outline

Figure 10. OS/2-Supplied Fonts

has the exact path for the executable and data files, if correctly migrated. Be certain that the `PATH`, `LIBPATH`, and `DPATH` statements in `CONFIG.SYS` are arranged with the most frequently accessed subdirectories listed first.

Use the Startup Folder

There are several ways to open applications and folders. If you leave them open at shutdown, they reopen at boot time. You can also place applications in the Startup folder (or edit the `STARTUP.CMD` file) that is also processed at boot time. This takes advantage of OS/2's multitasking capabilities because the processing of the Startup folder overlaps the startup of the Workplace Shell.

Multitasking Considerations

OS/2, a true multitasking operating system, manages multiple processes concurrently by *timeslicing*—sharing the system CPU. If the system has enough processing power, performance will not degrade when the system executes multiple applications. If the system is constrained by memory or the processor, performance will be slower.

To help minimize the effect, verify that you are running only necessary programs. Close any processes such as Pulse, Cat and Mouse, and the clock.

Verify that the application's settings are correct—especially for DOS applications that might poll when they are waiting for input. This is good behavior in the DOS environment, but presents a problem for multitasking environments such as OS/2.

Since background applications can slow down foreground tasks, limit background processing to improve foreground performance on memory-constrained and 386SX systems. This also applies for running memory- and file I/O-intensive applications concurrently, such as printing from an application, reflowing a large document, and processing a large database. Although many applications can run simultaneously on OS/2, 386SX machines may be too slow for your needs.

Migrating Applications

The Migrate Applications utility uses a migration database to specify user settings

for DOS and WIN-OS/2 sessions, as well as for OS/2, DOS, and Windows applications. The database, called `DATABASE.DAT`, is located in the `\OS2\INSTALL` subdirectory; a text version called `DATABASE.TXT` exists in the same subdirectory. You can edit this text file to change application settings or add new applications to the database. Migrate Applications can be run during the installation process or from the System Startup folder.

Use Migrate Applications to set up an application and place its icon into the appropriate folder. An application's initial settings in the migration database are good general defaults.

OS/2 manages multiple processes concurrently by timeslicing—sharing the system CPU.

Swap File Tuning

Today's hardware allows operating systems to assign virtual address space to applications. The address space consists of either real memory or disk space. When programs use more memory than the system can offer, OS/2 moves some information stored in memory to a file on the hard drive called `SWAPPER.DAT`. Moving this information is called swapping (associated with segmented memory) or paging (referring to pageable memory, as in applications that are linked with LINK386 or on systems that have paging enabled in the hardware).

Because of functional changes in OS/2, the swap file parameters in OS/2 2.1 have changed from previous releases. These changes make it easier to tune the swap file for performance.

There are two `SWAPPER.DAT` parameters: MinFree Value and Initial Swap File Size. Both, expressed in kilobytes, are rounded to megabytes by the system at boot time.

MinFree Value

The MinFree Value determines when the message that you are out of disk space will

be displayed. When the swap file grows, the system checks the remaining disk space on the partition where the swap file is located. After the swap file extension, a warning message is displayed if the remaining free space is less than the amount specified by the MinFree Value.

When the warning occurs, you can do one of the following:

- End the program, command, or operation
- Ignore the error message and continue
- Display Help

If you ignore the warning and the system tries to extend the swap file without sufficient disk space, the system halts and data will be lost. If you let the system end the program that requested the additional memory, it may even end the Workplace Shell. The best solution is to exit applications you are not using. Do not ignore the warning message. When this message is displayed, you are running short on free disk space.

The MinFree Value should be set so that you can take action before other swap file extensions run out of disk space. If you are running uncomplicated applications, the best MinFree Value for your system is typically 4,096 KB. If your system runs large databases, spreadsheets, or text files, increase the MinFree Value to 6,144 KB or larger to ensure that you receive the disk space warning with enough time to take action.

Initial Swap File Size

The Initial Swap File Size is preallocated to a minimum size during system boot-up, depending on the amount of physical memory installed in the system. This prevents the swap file from growing incrementally during paging and causing excessive overhead. You can change the size of the preallocated swap file using the `SWAPPATH` directive in `CONFIG.SYS`.

If the system needs more swap file space than has been preallocated, the swap file is expanded in 1 MB increments. The swap file expands only when page faults are processed, requiring more swap space. When one or more pages must be

swapped from memory, the kernel determines if swap space has been allocated in the swap file. If so, the swap manager writes them into the allocated swap space. If not, the swap file grows, if needed, and the swap manager writes the pages to their new swap space. Note that swap space in the swap file is not normally freed until the corresponding memory is deallocated.

The system must manage the swap file when it grows beyond its initial size to determine when it can compact the file. This additional overhead exacts a performance penalty. To optimize the system's performance, make sure the initial swap file size is correct. To determine the correct size for your swap file, occasionally check the size of the SWAPPER.DAT file. The size specified in CONFIG.SYS should be at least the size of this file or 1 MB to 2 MB larger, if disk space permits.

The swap file can contain both code and data. The stored data can be either backing an overcommitted system (running programs whose working set is larger than your system's real memory) or 16-bit OS/2 application code and resources, or both. This is because some 16-bit OS/2 application code and resources are backed in the swap file to reduce the working set and increase performance.

Applications that are 32-bit are already pageable—when the code is accessed, only the needed page is brought into system memory. This is very different compared to accessing 16-bit segmented applications.

Segmented 16-bit applications require that an entire code segment be brought into system memory, even if the system needs only a page of that segment. In this case, when a reference is made to a discarded page, the entire code segment is loaded into memory.

When OS/2 initially loads a 16-bit OS/2 application, it packs some segments into pages and copies them to the swap file for faster recovery. To disable this if you have limited disk space, use the NOPACK option on the MEMMAN= line in CONFIG.SYS. The resulting slower performance and larger working set rarely offset the disk space savings of a smaller swap file.

The swap file shrinks when several conditions are met. When the amount of free swap space in the swap file exceeds 1.5 MB, the swap file is compacted while the system is idle. During compaction, free swap space is moved to the end of the swap file. When the amount of free space at the end of the swap file is greater than 1 MB, the swap file is decreased in 1 MB increments. The swap file compacts only when it grows larger than the size set in CONFIG.SYS; it also grows and shrinks only in 1 MB increments.

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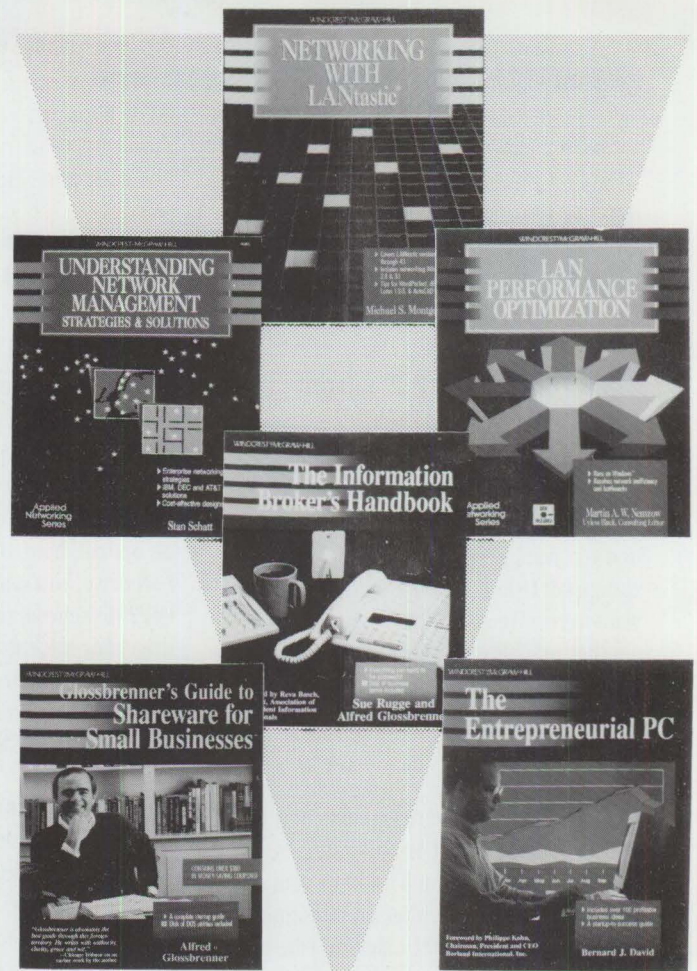
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Little Solutions

Transferring OS/2 2.x from One Drive to Another

Why would you transfer your OS/2 operating system to a different partition? Perhaps because OS/2 2.x is installed on C: drive, and you want to move it to D: drive so you can install DOS on C:. Or maybe you want to restore an OS/2 C: partition to another machine's D: partition because that machine's C: partition is either too small or is being used for another operating system.

The following procedure explains how to transfer the OS/2 2.x base operating system from one partition to another with a different drive letter, either on the same machine or on a similar machine (the hardware configuration on both machines, such as model number and display adapter, must be identical).

What You Need to Get Started

You will need the BACKUP.EXE and RESTORE.EXE commands found either on the OS/2 2.00.1 Preload Utility diskettes or in the \OS2\INSTALL\PRELOAD subdirectory on an OS/2 2.00.1 system. These are the only files that work properly. The sizes and dates of these files are as follows:

File Name	Size	Date and Time
BACKUP.EXE	29712	10-01-92, 6:12p
RESTORE.EXE	32014	10-01-92, 6:13p

These commands allow you to back up and restore the entire operating system. Unfortunately, you cannot completely back up an OS/2 partition with the BACKUP and RESTORE commands from OS/2 2.0 and OS/2 2.1.

You need one partition on which to create the new bootable OS/2 image. You also need a place to temporarily store the original OS/2 partition's backup image—another hard drive partition, a LAN drive, an optical drive, or tape. To back up to a LAN drive, you must first create bootable OS/2 diskettes that connect to the LAN drive. For information on backing up to LAN drives, see *Network Transport Services/2 Redirected Installation and Configuration Guide* (S96F-8488).

Back Up and Restore from One Drive to Another

If OS/2 2.x is installed on C: drive, use D: and E: as the two free partitions; the OS/2 partition is backed up to E: and restored to D:. Follow these steps.

1. Boot from the OS/2 2.x Installation diskettes, then Escape to a command prompt.

2. Type BACKUP C: E: /S.

3. Type RESTORE E: D: /S.

4. Edit D:\CONFIG.SYS, D:\AUTO-EXEC.BAT, D:\OS2\INI.RC, and D:\OS2\INISYS.RC, replacing every occurrence of C: with D:.

5. Type MAKEINI D:\OS2\OS2.INI D:\OS2\INI.RC, using the MAKEINI.EXE from OS/2 2.x.

6. Type MAKEINI D:\OS2\OS2SYS.INI D:\OS2\INISYS.RC.

7. Run FDISK at the command prompt and either add the D: partition to the Boot Manager menu or make the D: partition "startable" if Boot Manager is not installed.

8. Press Ctrl+Alt+Del.

9. Boot OS/2 2.x from the D: partition.

By following these steps carefully, you can successfully transfer the OS/2 2.x operating system from one partition to another.

—Derek Howell, IBM Corporation, Roanoke, Texas

LAN Server Entry 2.0 Support for OS/2 2.1

Although LAN Server Entry 2.0 runs on OS/2 2.1, an error message is displayed during installation. This "little solution" explains the error message and provides a workaround so that the error message is not displayed.

When LAN Server 2.0 is installed onto OS/2 2.1 systems, a pop-up window appears with a message saying Incompatible Version, as shown in Figure 1.

If you select Yes, LAN Server 2.0 installs correctly.

To prevent the message from appearing, you must edit the IBMLVL.ASC file found on both the LAN Server 2.0 Server1 or Requester1 Installation diskettes. In both the Server and Requester sections, the ENTOS= field should currently read ENTOS2=1.30,2.00. Edit this field to read ENTOS2=1.30,2.00,2.10. Save the edited IBMLVL.ASC file to disk.

—Rodney Johnson and Richard Potts, IBM Corporation, Roanoke, Texas

Installing Printers on an OS/2 2.1 RIPL Workstation

Users have concerns about how to install their printers on OS/2 2.1 Remote Initial Program Load (RIPL) workstations. The following "little solution" provides a clearer, more concise process than the documentation.
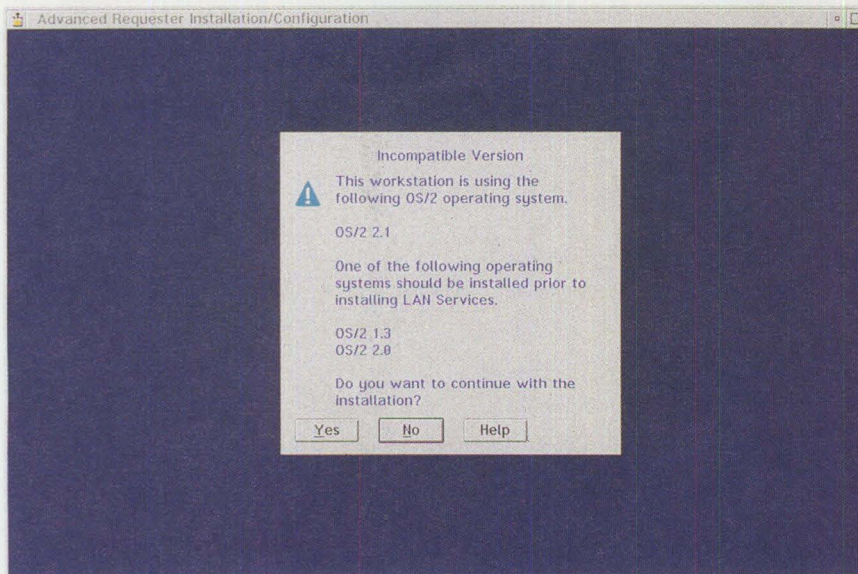
Figure 1. LAN Server 2.0 Pop-up Window

```
{Windows}
Device=descriptive_name,windows_driver_name,port
```

For example:

```
{Windows}
Device=IBM Laser Printer 4019,ibm4019,LPT1.OS2
```

Figure 2. A Device= Line

```
{PrinterPorts}
descriptive_name=windows_driver_name,port,device_timeout,
    retry_timeout
```

For example:

```
{PrinterPorts}
IBM Laser Printer 4019=ibm4019,LPT1.OS2,45,15
```

Figure 3. Printer Driver Line for Printer Ports

```
{Devices}
descriptive_name=windows_driver_name,port
```

For example:

```
{Devices}
IBM Laser Printer 4019=ibm4019,LPT1.OS2
```

Figure 4. Printer Driver Line for Devices

Installing an OS/2 Printer

Use the following steps to install an OS/2 printer on an OS/2 2.1 RIPL workstation:

1. Open the Templates folder.

2. Click the right mouse button to select the Printer icon.

3. Select Install from the Printer icon menu.

4. Select Install New Printer Driver on the Create a Printer panel.

5. Choose the desired printer model from the Printer driver list, then select Install on the Install New Printer Driver panel.

6. Enter the drive and directory name on the RIPL server where the appropriate printer driver is located.

   Note: All OS/2 2.1 printer drivers are installed on the RIPL server under the directory tree `D:/IBMLAN/RPL/OS2.21/OS2/DLL`. For example, to install the IBM Proprinter® III driver (`IBM42XX.DRV`), enter the directory name `z:/OS2/DLL/IBM42XX`, where `z:` is the RIPL client boot drive letter.

7. Select Create on the Create a Printer panel.

The OS/2 printer driver is now installed.

Installing a WIN-OS/2 Printer

To install a WIN-OS/2 printer on an OS/2 2.1 RIPL workstation, complete the following steps:

1. On the RIPL server, edit the `WIN.INI` file:

   ```
   d:/IBMLAN/RPLUSER/
       ripl_client_name
   /OS2/MDOS/WINOS2/WIN.INI
   ```

   Note: All OS/2 2.1 WIN-OS/2 printer drivers are installed on the RIPL server in the following directory: `D:/IBMLAN/RPL/OS2.21/OS2/MDOS/WINOS2/SYSTEM`.

2. Add a `Device=` line in the Windows section as shown in Figure 2.

3. Create a PrinterPorts section and add a printer driver line as shown in Figure 3.

4. Create a Devices section and add a printer driver line as shown in Figure 4.

5. Save the changes to the file.

The WIN-OS/2 printer driver is now installed. Restart WIN-OS/2 to activate the driver.

—Rodney Johnson and Richard Potts,
IBM Corporation, Roanoke, Texas

Fast DOS Soft Boot

The beauty of the DOS programming environment is its simplicity and openness. Programs that run in real mode can do almost anything if they know where and how. For example, they can hook the interrupt, peek and poke the DOS system variables, and replace the system services with private routines.

This open relationship makes DOS a hacker's heaven and spawns thousands of applications and system extensions. Unfortunately, there is a price to pay for this: mistakes in running programs can hang the system. In real life, this occurs often, especially in the software development environment. This is often frustrating because rebooting the system is time-consuming. This article provides a solution to system hangs and allows users to restore a system instantly.

System Integrated Solution

The solution assumes programs that hang the system do not change or destroy the saved system image in extended memory. This assumption is reasonable because DOS programs run in real mode; extended memory is normally accessed through the Extended Memory Services (XMS) protect-mode gateway and DOS Extender Services such as the DOS Protected-Mode Interface (DPMI). Mostly bug-free, these provide well-protected memory regions.

The solution includes the following:

- A utility program to compress the DOS system memory image from memory location 0:0 to the starting address of the utility program, then save it in extended memory. The following information must be saved to ensure that the image is correct:

  — Checksum of the image

  — Length of the image

  — Resumed instruction address and the register's state

  — Starting extended memory address of the image and information, such as signature

All this information can be saved in a fixed location of base memory, such as the BIOS or DOS communication area located at address 50:00.

- **BIOS.** When the user presses the Fast Soft Boot key, for example Ctrl+Alt+Home, the real-mode BIOS—CBIOS—reads

the saved system image information and uses checksum to verify its data integrity. If the verification fails, CBIOS boots the system from the hard disk or diskette. If the verification succeeds (the system image is still intact), CBIOS decompresses and restores the system image and status, then jumps to the resumed instruction address. Figure 1 shows the memory layout and the relationship of image save and restore.
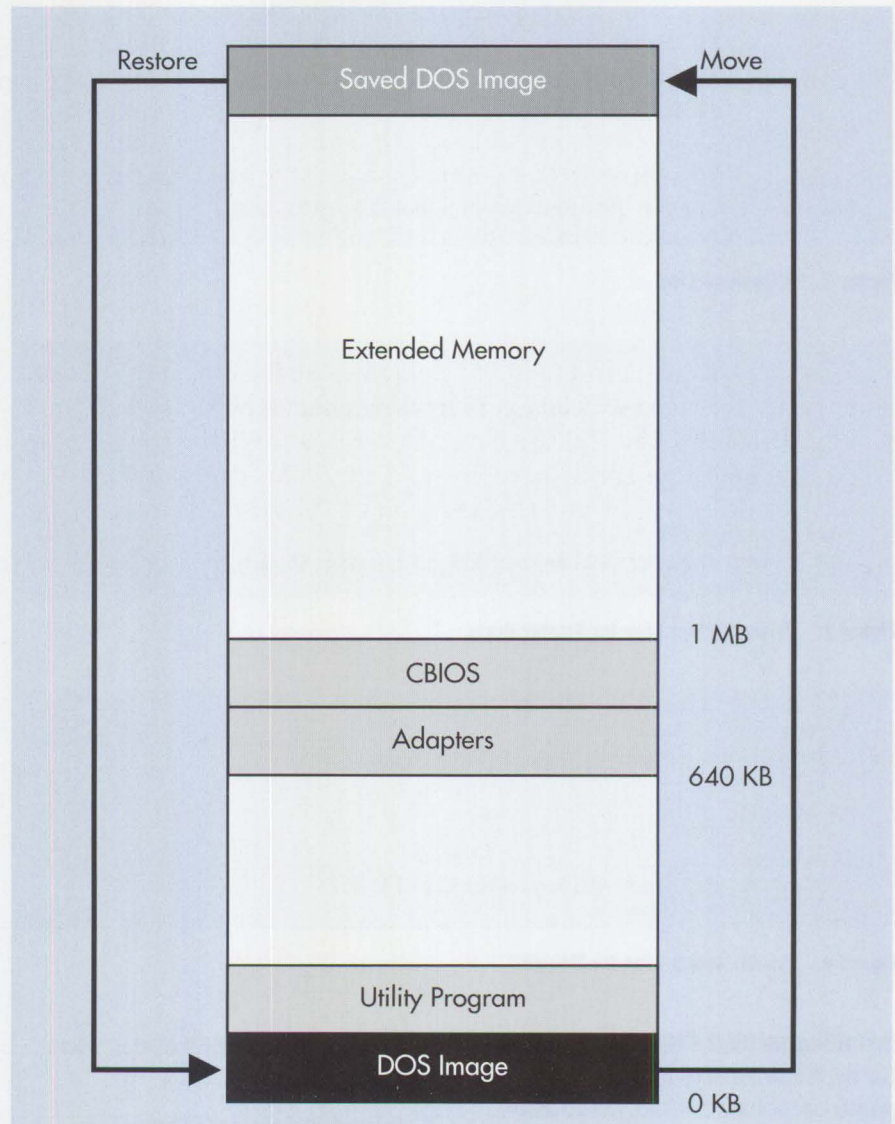

Figure 1.   System Image Save and Restore

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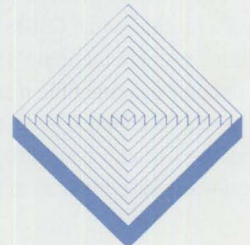
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CHARGE TO: ☐ VISA ☐ MC ☐ AMEX ☐ P.O. #_____

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IBM Green As We Can Be

Downloading SOFTBOOT

The assembler program SOFT-BOOT can be downloaded from the OS/2 BBS and the IBM Personal Computer Company (PCC) BBS.

The OS/2 BBS supports modem speeds from 2,400 to 9,600 baud and handles compression and error checking functions. To retrieve the file, follow these steps:

1. Call one of these numbers: your local OS/2 BBS number, (800) 727-5611, or (800) 284-9280. If you do not subscribe to the OS/2 BBS, call (800) 547-1283.

2. Under the Main Menu, select News and Announcements.

3. Download file SOFTBOOT.ZIP.

The PCC BBS supports modem speeds from 2,400 to 14,400 baud. Communications should be set to N-8-1. To retrieve the file, follow these steps:

1. Call the PC Company BBS at (919) 517-0001.

2. After you log on, type D SOFTBOOT.ZIP.

- **A hardware reset.** If the hung program disables the keyboard interrupt, the Fast Soft Boot key (Ctrl+Alt+Home) will have no effect. To solve this, a hardware interface such as a button must be provided to generate a Non-Maskable Interrupt (NMI) signal that notifies the CBIOS to invoke the Fast Soft Boot logic. The old IBM Professional Debugger (RDT) used to be packaged with a card for this purpose.

Approximated Solution

To approximate this solution, implement the Fast Soft Boot utility as a Terminate-and-Stay-Resident (TSR) program that supports the additional CBIOS functions. This allows users to implement the Fast Soft Boot on PC-compatible machines with extended memory. The disadvantage is that the TSR may be destroyed because it resides in base memory and will not work.

An assembler program called SOFTBOOT that demonstrates the essential logic can be downloaded from a Bulletin Board Service (BBS) (see the box for detailed instructions). This source code conveys the idea of image save and restore. For clarity, the code does not include either image compression and decompression or checksum verification. The CBIOS INT 15h service transfers data between base memory and extended memory. To make it more robust, the user can include XMS or DPMI services in various environments.

The program starts at main. Before it terminates and stays resident, it does the following:

1. Calculates the size of the system image starting from 0:0 to the beginning address of the TSR

2. Issues the INT 21h (AH=0DH) DOS system call to flush the system buffers, ensuring that all changed data is written to disk

3. Issues INT 15h to allocate extended memory and move the system image to it

4. Hooks the INT 15h handler to reflect the available extended memory

5. Hooks the INT 9h handler to intercept the Ctrl+Alt+Home and Ctrl+Alt+End keys (Pressing Ctrl+Alt+Home restores the system image. The difference between Ctrl+Alt+Home and Ctrl+Alt+End is that Ctrl+Alt+End removes the SOFTBOOT TSR after the system image is restored, whereas Ctrl+Alt+Home does not.)

6. Hooks the INT 2h handler to handle the NMI interrupt (Because not all machines have the easy-access button to generate the NMI interrupt, the only source is from the hardware adapter.)

7. Terminates and stays resident; ends at main since the code following the main can be discarded

Finally, the source code restores the first 2 KB of the system. This area contains critical system data including interrupt vectors and the BIOS and DOS communication areas. It must be transferred at the last moment with the interrupt disabled. The data is first moved to base memory using INT 15h, then quickly restored through repeated moves.

Summary

The Fast Soft Boot method increases the possibility of instantaneously restoring the running environment after a program becomes hung. Using this method, programmers can achieve higher productivity during project development.

—Fetchi Chen, IBM Corporation, Boca Raton, Florida

We invite you to share your "little solutions" in this column. Send them to us in care of the editor.

Questions and Answers

Questions and Answers is a regular feature of *Personal Systems*. This issue highlights questions about DOS, the IBM ThinkPad, and OS/2 LAN Server.

DOS

Is the Emulator High-Level Language Application Programming Interface (EHLLAPI) the same in both the Windows and DOS versions of Personal Communications/3270 (PC/3270)? If not, what are the differences?

Although the EHLLAPI for PC/3270 3.0 full-function DOS mode is basically the same as the EHLLAPI for Windows mode, there are differences to consider when migrating EHLLAPI applications from DOS to Windows. You must make changes to programs written for DOS-mode EHLLAPI so that they run in the Windows environment. Most changes are limited to code rather than the design.

When migrating EHLLAPI applications from DOS to Windows, you will find these differences:

- All Windows EHLLAPI applications must be compiled and linked to run in the Windows protect mode.

- Absolute addressing is not allowed, so any application using absolute addressing must be modified.

- Requests for EHLLAPI services are changed from an interrupt system (DOS) to a call-return interface (Windows).

- Windows-mode EHLLAPI includes several new return codes that are not part of DOS-mode EHLLAPI. Error handling in existing applications can be improved by adding checks for these new return codes.

- Customized Language Interface Modules (LIMs) are not supported in either DOS or Windows mode of PC/3270.

For more information about PC/3270's EHLLAPI, see *PC/3270 Version 3 Programmer's Guide for Full-Function DOS and Windows Mode* (S42G-0461).

While we were installing PC/3270 for Windows on an industry-standard 486/66 with an AT® bus and enhanced 101 keyboard, we received the error message, `PCS222 - Invalid Keyboard Attached`. Does this mean that PC/3270 for Windows works only on IBM machines? Will it work on compatible clones?

Yes, PC/3270 works on clones. Sometimes Windows cannot detect the correct type of keyboard, so it uses a different keyboard driver. Then when you install PC/3270, that application queries the keyboard. If it does not match the Windows Setup configuration, you get an error message. To resolve the problem, verify that you have installed the correct keyboard driver when installing Windows 3.1.

Is there a limit to how much disk space DOS will recognize? I have DOS 5.0 loaded on a PS/2 Model 95 with Novell NetWare 3.11. The machine has a total of 4 GB, yet DOS recognizes only about 2 GB, even though 3 GB is available. When the server has under 2 GB available, DOS shows the correct amount of unused disk space. Is this a limitation with IBM PC-DOS or DOS in general?

DOS 5.0 will recognize up to 2 GB of disk space; this is a parameter of DOS in general, not just IBM PC-DOS. The reason is the 16-bit addressing capability of the DOS File Allocation Table (FAT), which contains each block's physical location on the disk. Each block is identified by a set of chained clusters containing a number of sectors determined by disk capacity. The number of sectors per cluster doubles until it reaches the maximum value of 128 (80 hex) sectors per cluster at 2 GB.

Can we run BASICA under DOS 5.0? We have an application that runs on DOS 3.3 using BASICA. We are trying to move it to another machine running DOS 5.0. Since QBASIC will not read the files, we cannot make it run using QBASIC. When we try to run BASICA, the machine hangs and only powering off will free the system. We have also tried to bring up the application under DOS 3.3 on the original machine, but even this does not work.

Yes, you can run BASICA under DOS 5.0, but you must modify each BASICA program. Here are some tips:

- Save the BASICA program in ASCII format. QBASIC cannot use programs saved in BASICA's binary format.

- Use the `/MBF` command option when you start QBASIC. The `/MBF` option enables QBASIC to read and write BASICA data files.

- Change the `CALL` statements in BASICA programs to QBASIC's equivalent, `CALLABSOLUTE`.

A DOS 5.0 program called `REMLINE.BAS` will remove the line numbers from BASICA and GW-BASIC programs. For further assistance on QBASIC, call up its *Survival Guide* by typing `QBASIC` and pressing Enter twice. It provides all the information outlined here plus much more.

Does DOS produce unique volume serial numbers for media formatted

on separate machines? We would like to use the volume serial number for tracking and identifying removable media. Does DOS assign the volume serial number by an algorithm that always produces unique numbers? Will the serial numbers produced on separate machines always be unique?

DOS assigns volume serial numbers based on the current time in milliseconds, although it appears that it assigns these numbers from a random-selection algorithm. The FORMAT command seems to produce a unique number, but this is not guaranteed.

If you are trying to track your media, remember that if you reformat a diskette, it will have a different volume serial number. This means that you could lose track of any reformatted disks.

Perhaps you could devise your own media tracking system and implement it through the volume label, for example, and write-protect your media. This would make it more difficult to format the diskette and write to it—very handy if you are only going to read information from the diskette.

How can I execute DOS COPY commands from a .BAT file? I need a way to avoid the Abort/Retry/Ignore message that can appear if a COPY command fails. Instead of getting a failure message, can I have ERROR-LEVEL set to handle the failures programmatically? Can I do this in DOS 4.0 or 5.0?

You should be able to handle failure messages by setting DOS 5.0's ERRORLEVEL.

You can use the ERRORLEVEL parameter on the IF command line in a batch program to process exit codes returned by XCOPY. The IF ERRORLEVEL form of the IF command returns "true" if the exit code from the most recently executed program is equal to or higher than "exit-code"—the IF-NOT-ERRORLEVEL (exitcode) command. You can use the NOT qualifier to test for the inverse of the condition, and the command parameter can be any valid DOS command.

Exit Code	Description
0	Files were copied without error.
1	No files were found to copy.
2	The user pressed Ctrl+C to terminate XCOPY.
4	An initialization error occurred. Either there is insufficient memory or disk space, or an invalid drive name or invalid syntax was entered on the command line.
5	A disk write error occurred.

Figure 1. XCOPY Exit Codes

XCOPY copies all files (except system and hidden files) and directories (including subdirectories). Figure 1 describes each XCOPY exit code.

For a complete example of XCOPY IF ERRORLEVEL operations, see pages 630–631 of the *IBM Disk Operating System User's Guide and Reference, Version 5.0* (84F9779).

Note: The DISKCOPY command returns an Abort/Retry/Ignore message, while the COPY or XCOPY commands return either an Insufficient Disk Space message (if the receiving diskette does not have enough space) or a File Not Found message (if DOS cannot find the specified file).

IBM ThinkPad

When I remove the Token-Ring 16/4 expansion cartridge from my Think-Pad 700C, the system hangs the next time I boot it. It goes through CONFIG.SYS, displays the background of the Workplace Shell™, then stops accessing the hard drive. Is there something in the hardware or software configuration that I need to change?

During boot, the ThinkPad is trying to load the device driver for the adapter. Use REM to deactivate device drivers when the adapters are not attached.

How long is the "sleeping" battery life on the ThinkPad 710T? If the system goes into suspend mode in Pen-Point™, but the Shutdown option is disabled, how long can the battery maintain the System Ready For

Resume before the battery is discharged?

The battery life while in suspend mode will vary according to many factors. The type of computer (ThinkPad or hard disk model), the amount of battery life remaining when suspend is entered, and the battery's condition (age, whether or not it has been well conditioned) all affect the life. A fully charged and conditioned battery should last at least 48 hours in suspend mode.

When we purchase computer displays, we receive only units that meet the Swedish standard's Very Low Magnetic Field (VLMF) for low emissions. What are the emission levels on the ThinkPad series and with what standards (U.S. or Swedish) do they comply?

The Swedish emissions standards to which you refer apply only to Cathode Ray Tube (CRT) displays. Since ThinkPads have Liquid Crystal Displays (LCDs) and Thin-Film-Transistor (TFT) displays, these standards do not apply. We are not aware of any measurable emissions from the ThinkPad displays.

Is there a way to lock a ThinkPad to a desk?

IBM has a security base that screws onto a desk and has openings in the back to allow access to the ports. The ThinkPad has a slide switch on the left-front bottom corner with a hole that matches one in the security base when the switch is opened. This enables you to attach a lock to secure the unit.

When booting my ThinkPad 700C, I get this message: `00187, system id error, serial number is corrupted.` **What does this message mean?**

This is a configuration error. Run the Automatic Configuration by accessing the system partition. Cold boot the system and watch for the cursor to move to the upper-right side of the screen (the cursor moves almost immediately after the memory count). Then do the following:

1. Press Ctrl+Alt+Insert simultaneously. The computer will display an IBM logo screen followed by the Main menu.

2. Choose Set Configuration.

3. Select Run Automatic Configuration.

If this does not correct the problem, access the system partition again as in Step 1, then do the following:

1. Choose More Utilities.

2. Select Set System Identification.

3. Select Set System Identification again from the next menu.

4. Type in the serial number of the system and press Enter.

Type `exit` until you are prompted to restart the system. These steps should correct the problem.

How can I put 16 MB of memory on my ThinkPad 720C?

The 720C has 4 MB on the system board. To achieve the maximum of 16 MB, obtain one 4 MB card and one 8 MB card.

How do I set up my ThinkPad 700C to work with the 8516 touch-screen color display?

To use the 8516 touch-screen color display, you must disable the TrackPoint™ II before connecting it to the external display connector. To disable the TrackPoint II, cold boot the system, then access the system partition:

1. Press Ctrl+Alt+Insert simultaneously. The computer will display an IBM logo screen followed by the Main menu.

2. Select Set Configuration.

3. Choose Change Configuration.

4. Change the Pointing Stick from `ENABLE` to `DISABLE` and save the changes.

Does the IBM PCMCIA Adapter card for Ethernet provide a standard RJ-45 connector that allows a cable to be attached to the card? Is the PCMCIA-to-MiniDIN cable packaged with the IBM high-speed PCMCIA Data/Fax model? What features should be ordered for use in the U.S.?

A media attachment module with cable, shipped with the IBM PCMCIA Adapter for Ethernet, connects to existing Ethernet cabling, such as thin coaxial and Unshielded Twisted Pair (UTP). It consists of a cable approximately 100 mm long with an adapter connector on one end and either a female RJ-45 connector for the 10BaseT or a female BNC connector for the 10Base2 on the other end. The user must supply the cable to attach to the Ethernet network.

PCMCIA modems bought in the United States have everything required to run. You need the Data Access Arrangement (DAA) and MiniDIN cable only if you run the modem outside the country in which you bought it. If you bought a modem outside the U.S., you need an optional part for the DAA to use the modem in the U.S.

The files `VESA.EXE` and `POWER.EXE` are installed and shipped with Think-Pads. What are they used for? How do you set the display for the 132 columns provided by `VESA.EXE`?

The `VESA.EXE` command is set or executed by the particular software that you are running. To work with 132 columns, you must connect an external monitor that can display 132 columns, and you must have the display set as `CRT Enhanced`. The following steps will enable you to change the display setting:

1. After cold booting the system, access the system partition. Press Ctrl+Alt+Insert simultaneously. The computer will display an IBM logo screen followed by the Main menu.

2. Select Set Features.

3. Choose Set Advanced Features.

4. Change Set Display and Audio Features.

The purpose of `POWER.EXE` is to allow Advanced Power Management while using DOS.

OS/2 LAN Server

We want to install the Remote Initial Program Load (RIPL) service for DOS 5.0 during the installation of OS/2 LAN Server 3.0. When we insert Diskette 1 from the IBM DOS 5.0.2 system into the drive, we get an error message that it is the wrong diskette. How can we load DOS onto the server?

When installing DOS RIPL with DOS 5.0 on LAN Server 3.0, you will be prompted for four DOS 5.0 diskettes rather than the original three diskettes. Use the DOS 5.0 Install utility to install DOS 5.0 to diskette to obtain these four diskettes. To do this, change the "Install to:" field on the second panel of the DOS 5.0 Install program to read "floppy disks." This will create four diskettes named Startup/Support, Shell/Help, Basic/Edit/Utility, and Supplemental.

See Chapter 3 of the *OS/2 LAN Server 3.0 Network Administrator Reference Volume 1: Planning and Installation* (S96F-8428) for additional information about installing DOS RIPL.

We have installed MS-DOS 6.0 on a Compaq. When we attempt to load DOS LAN Requester (DLR) 2.0, we get the message "wrong version of DOS installed." How do we get around this problem?

DOS LAN Requester is not officially supported to run on MS-DOS 6.0. For a workaround, use the `SETVER` command in `CONFIG.SYS` as follows:

`DEVICE=C:\DOS\SETVER.EXE`

After the system starts, type `SETVER CIP_MAIN.EXE 5.00` at the command prompt. This makes `CIP_MAIN.EXE` believe that the operating system is DOS 5.0. After that you should have no problems installing the DLR code.

I want to load a DOS application from a LAN Server 3.0 server and run it on OS/2 2.0 with LAN Requester 3.0 in a DOS window. How do I set up the requester to do this?

Page 7-14 of *OS/2 LAN Server Version 3 Network Administrator Reference Volume 3: Network Administrator Tasks* (S96F-8430) describes how to set up DOS network applications for OS/2 2.0 requesters.

The process is the same as setting up a public OS/2 application. OS/2 2.0 can sense if an application is OS/2-, DOS-, or Windows-based. For example, if you start a DOS application from the OS/2 command line, OS/2 will start the application in a DOS session.

You must create a .CMD file to start the application. For example, to set up Word-Perfect 5.1 for DOS for all your OS/2 requesters, use the following steps:

1. Make an alias for the directory where WordPerfect is installed.

2. Create the access control profile.

3. Create an OS/2 public application. Complete the relevant information and type WP.CMD for the command-line information.

4. Start the editor and create a file called WP.CMD with WP.EXE as a single line of text. Save this file to the directory where WordPerfect is installed.

5. Set up the working directory to point to the WordPerfect directory so WP.EXE can find all the secondary files that are part of the application.

We are using OS/2 LAN Server 3.0 on a ValuePoint client with an Intel Ethernet network adapter card. I need to understand more about the redirector module.

The redirector is the heart of the client. This module redirects all requests to the server and handles files, mail slots, Named Pipes, APIs, printing, and so on.

With LAN Server 3.0, you have three options for optimizing memory usage: /HIM, /EMS, and /UMB. The /HIM

parameter loads part of the redirector into the HIMEM area. With DOS 5.0, you are probably loading DOS= HIGH, so you cannot use /HIM. The /EMS parameter loads part of the redirector into EMS. Use this if you have other programs that also use /EMS. The /UMB parameter loads the redirector into Upper Memory Blocks (UMBs).

Note that all or part of the redirector can be loaded into UMBs.

If the above parameters are not enough to optimize memory, you can reduce buffers by using /BBC, /BBS, /NBC, /NBS, /PPC, or /PPS.

Can you provide me with a functional comparison between LAN Server 1.3, 2.0, and 3.0 from the perspective of DOS LAN Requester?

The following features were introduced with DOS LAN Requester 2.0:

- DOS 5.0 UMB support

- Windows 3.0 support

- Support for multiple logons, allowing a user to be logged on at several workstations in the same domain at the same time (In DOS LAN Requester, this is enabled through the /MLO parameter of the DOSLAN.INI file.)

DOS LAN Requester 3.0 adds the following enhancements:

- Improved performance

- DOS 5.0 task-switching support

- Windows 3.1 support

- Use of the DXMJ0 device driver of LAN Support Program 1.31, which is shipped with OS/2 LAN Server 3.0

I have several general questions regarding RIPL servers:

1. **Is there any advantage to using LAN Server 3.0–Advanced instead of LAN Server 3.0–Entry?**

2. **Is there any advantage to using the High-Performance File System (HPFS) versus FAT?**

3. **Would a machine with lots of RAM (such as 32 MB) and a large cache help improve the speed with which the workstations are RIPLed?**

4. **Would 32-bit busmaster cards improve performance over regular Token-Ring busmaster cards?**

5. **Is there a rule of thumb on how many machines can be connected to a server?**

The following are answers to your questions:

1. You can significantly enhance performance by using LAN Server 3.0–Advanced over Entry, regardless of the server's function. Advanced uses the HPFS-386 installable file system, which installs over preexisting HPFS drives. The HPFS-386 file system allows much faster access to file resources, including the RIPL images—if they are installed on an HPFS-386 drive. Also, HPFS-386 can handle more concurrent file openings than plain HPFS and FAT. This boosts the number of concurrently RIPLed OS/2 machines because an OS/2 RIPLed machine opens many files at one time.

2. Without HPFS, you cannot install the HPFS-386 file system.

3. A server with a lot of RAM and a large cache will improve the speed with which workstations are RIPLed. Large memory and cache improves performance because it decreases the number of disk accesses.

4. A 32-bit busmaster card would significantly enhance performance if you are using a PS/2 Model 95 OMT or OMF. The new adapter streams data directly to the processor and only the Model 95 OMT and OMF processors can handle this function. This adapter can also address more memory than the old adapters, which can address only 16 MB of memory.

5. With the old adapter, up to 64 OS/2 RIPLed machines could be brought up at the same time. This number should increase with the new adapter. DLR RIPLed machines do not require nearly as many resources as OS/2 RIPLed

machines, and thus the capacity for concurrently RIPLed DLR machines should be substantially greater than that for OS/2 RIPLed machines. The absolute limit of machines per adapter is 254.

Also see "Improving Remote Initial Program Load Performance" in the September/October 1993 issue of *Personal Systems Technical Solutions*.

I have some questions about NET.ACC:

1. What is the difference between the NET.ACC file on the server and the NET.ACC file on the workstation?

2. What would happen if I replaced the NET.ACC file on the workstation with the NET.ACC file from the server?

3. What must be done to make the workstation see the entire listing of users that is on the server?

4. Is the answer peer services? If so, how much resource does this use on the workstation?

In answer to your questions:

1. The format is the same, although the actual contents may be different. When first installed, NET.ACC on all machines contains the default user ID and password.

On requesters, you normally do not change the information in the NET.ACC file. You can, however, enter UPM and select the domain to be used. If you choose local, you can then add and delete user IDs to the local user accounts file (NET.ACC) in the same way you do for LAN Server. Then you can log on locally to that workstation using the IDs that you created. This is routine when you have OS/2 Extended Services with Database Manager. If you have a local database, you can add users to your local NET.ACC. Those users can then log on to your machine and access your database. If you are going to use peer services with user level security, you must add users to your local NET.ACC so you can control who accesses your machine.

On a server, the NET.ACC file contains much more information, including details on aliases and access control, user IDs, and passwords. The portion of the NET.ACC that contains user ID and password information is kept identically on all servers within a domain. The access control information stored in NET.ACC is unique for each server.

2. The effect of replacing the NET.ACC file on the workstation with the NET.ACC file on the server would be the same as if you started only the requester (NET START REQ) at the server machine. If you tried to log on locally at your workstation, you would need a user ID and password contained in that NET.ACC file. Although relatively harmless, we do not recommend that you do this.

3. You will need to log on to the domain with an ID that has administrator authority, then issue the NET ADMIN command to access the server in question. Following is a sample command syntax to get a listing of all user IDs defined on the server named MAINSERV:

```
NETADMIN \\MAINSERV /C NET
USERS
```

For more information on how to use the NET ADMIN command, see the *OS/2 LAN Server Version 3 Command Reference* (S96F-8439).

4. Peer services is not the answer. You would still be looking at the local NET.ACC file unless you issue the NET ADMIN command.

Tips and Techniques

OS/2 2.1 Installation Hangs

If OS/2 2.1 hangs on the installation diskette or on Diskette 1 during installation, you must copy the packed file BUNDLE to another location on the diskette. If you have two diskette drives, use the following procedure:

1. Insert a DOS bootable diskette in drive A: and start the computer (if the computer is already running, restart it by pressing Ctrl+Alt+Del).

2. Place a blank diskette in drive B:. This diskette will become the replacement copy of Diskette 1.

3. Type FORMAT B: /v at the DOS A:> prompt.

4. Type DISK 1 when asked for a volume label.

5. After the format is complete, remove the formatted diskette from drive B: and insert the original OS/2 Diskette 1. Type XCOPY B: A: /p at the DOS A:> prompt.

6. At the first (Y/N)? prompt, remove the DOS diskette from drive A: and insert the newly formatted replacement copy of Diskette 1 in drive A:.

7. Type N at the B:BUNDLE(Y/N)? prompt.

8. Type Y for all other (Y/N)? prompts.

9. When the DOS A:> prompt appears, type COPY B:BUNDLE A:.

If you have only one diskette drive, use the following procedure:

1. Insert a DOS bootable diskette into drive A: and start the computer (if the computer is already running, restart it by pressing Ctrl+Alt+Del).

2. Type FORMAT B:/v at the DOS A:> prompt.

3. When prompted, insert a blank diskette in the diskette drive. This will become the replacement copy of Diskette 1.

4. Type DISK 1 when asked for a volume label.

5. After the format is complete, remove the formatted diskette from drive A: and insert the DOS diskette in the diskette drive.

6. Type DISKCOPY A: B: at the DOS A:> prompt.

7. When prompted to insert the SOURCE diskette in drive A:, insert the original OS/2 Diskette 1 in the diskette drive. When prompted to insert the TARGET diskette in drive B:, insert the blank formatted diskette. This diskette will become the replacement copy of Diskette 1.

8. Type N when asked if you want to copy another diskette.

9. Insert the DOS diskette when prompted to insert the diskette with COMMAND.COM in drive A:.

10. Type ERASE B:BUNDLE at the DOS A:> prompt.

11. Insert the replacement copy of Diskette 1 when prompted to insert the diskette for drive B:.

12. Insert the DOS diskette when prompted to insert the diskette with COMMAND.COM in drive A:

13. Type XCOPY B:*.BIO A: at the DOS A:> prompt.

14. Insert the OS/2 Installation diskette when prompted to insert the diskette for drive B:.

15. Insert the replacement copy of Diskette 1 when prompted to insert the diskette in drive A:.

16. Type XCOPY B:BUNDLE A: when the DOS A:> prompt appears.

17. Insert the original OS/2 Diskette 1 in the diskette drive when prompted to insert the diskette for drive B:.

18. Insert the replacement copy of Diskette 1 when prompted to insert

the diskette for drive A:. If there is not enough space on the diskette, remove some of the .BIO files and repeat Steps 13 through 18.

OS/2 2.1 Installation Reboots

On some systems with more than 16 MB of RAM, the OS/2 2.1 Installation diskette will continually reboot itself. This has occurred on PS/2 Models 9577 and 80, plus some Compaq and Dell® machines. Although there is currently no fix for this problem, the solution is to temporarily remove memory so the system has 16 MB or less, or swap the RAM. Ensure that the RAM is all the same type, speed, and manufacturer. Once the system is successfully installed, you can reinstall the RAM you previously removed.

This problem does not occur in OS/2 2.0.

SWAPPER.DAT is Larger in OS/2 2.1 than OS/2 2.0

OS/2 2.1 is a larger operating system than OS/2 2.0. As such, it requires more memory than OS/2 2.0 and demands a greater amount of virtual RAM. This can result in a larger SWAPPER.DAT file.

The OS/2 2.x memory management scheme swaps pages of memory from physical RAM into virtual RAM, which makes up most of the SWAPPER.DAT file. The rest of the file consists of free space to allow for new memory allocations. This free space is to avoid running the SWAPPER.DAT file growth code too often, which can affect overall system performance.

A normal SWAPPER.DAT file can run from 2 MB to 30 MB or more, depending on the system load at any time. Terminating some applications that expanded the SWAPPER.DAT file may shrink the file, which is also normal.

If the actual swapped RAM in use is not reduced by a major amount, the SWAPPER.DAT may remain the same size. Subsequent memory allocations will use the current SWAPPER.DAT file free space before further growth takes place.

When designing the swapper algorithm, a primary consideration is to minimize the dynamic sizing of the SWAPPER.DAT file to improve overall system performance.

Problems occur only when the size of SWAPPER.DAT does not stabilize, even though the system is used in a consistent manner and no additional applications are started.

FDISK Error or Failure to Boot

On systems with hard drives larger than 1 GB, the installation process may report FDISK errors or may be unable to boot. Although OS/2 can support partitions larger than 1,024 cylinders, these cannot be bootable partitions. This is a hardware limitation for DOS and OS/2 as well as the High-Performance File System (HPFS) and File Allocation Table (FAT).

Consult the documentation for the hard drive to identify the number of megabytes within the first 1,024 cylinders. Ensure that any bootable partitions are created at the beginning of free space and within the 1,024 cylinder limit.

Video Problems on a PS/1

If you installed OS/2 2.1 on a PS/1® system over a previous version of OS/2, you may have video problems, such as out of synch, a blank screen, or only 16 colors on a Super VGA (SVGA).

The following process, which addresses the SVGA problem, will restore a PS/1's SVGA support if it has a supported chipset.

1. Open a DOS full-screen session, change the directory to \OS2, type DEL SVGADATA.PMI, then press Enter.

2. Type SVGA ON, then press Enter. Exit the DOS session.

3. Open an OS/2 full-screen session, type DSPINSTL, then press Enter.

4. Select the default for the monitor type and load the drivers from the OS/2 2.1 display driver diskettes. Exit the OS/2 session.

5. Open a DOS full-screen session and delete the SVGADATA.PMI file again (as described in Step 1).

6. Shut down, then restart the system.

—David Reich, IBM Corporation, Boca Raton, Florida

Corrective Service Information

Figure 1 shows maintenance release levels for the listed products. This information is effective as of September 9, 1993. To order all service packages —except for the OS/2 2.0 and OS/2 2.0 Toolkit ServicePaks™—call IBM Software Solution Services at (800) 992-4777. For the OS/2 2.0 ServicePak (XR06100) or the IBM Developer's Toolkit for OS/2 2.0 ServicePak (XR06110) on diskettes or CD-ROM, call (800) 494-3044. Most OS/2 service packages are also available electronically from the following sources:

- **OS/2 Bulletin Board Service (BBS)**: Once connected, select Option 2. (Corrective services are also listed under the General category on the IBMLink BBS.) To subscribe to the OS/2 BBS, call (800) 547-1283.

- **IBM Personal Computer Company (PCC) BBS**: Call (919) 517-0001. Service packages are located in Directory 4.

- **CompuServe**: Download service packages from the IBM OS2 FORUM library (GO IBMSERV).

- **Internet**: Do an anonymous FTP from software.watson.ibm.com. Service packages are located in the /PUB/OS2 directory.

IBM OS/2 2.0 ServicePak

The OS/2 2.0 ServicePak, Level XR06100, is now available. This ServicePak contains fixes to problems reported by customers using OS/2 2.0. The ServicePak is designed to update the following systems:

- OS/2 2.0 GA Level

- OS/2 2.0 preloaded systems

- OS/2 2.0 systems with ServicePak XR06055

The ServicePak XR06100 includes the following:

- Addressing-problem fixes in all areas of the system since OS/2 2.0 ServicePak XR06055 with emphasis on hardware, printing, applications, LAN, restoration, install, DEBUG/RAS, NLV-specific problems, plus miscellaneous traps and hangs

- Latest version of the OS/2 Printer Driver diskettes

- The following video drivers:

  — TSENG Labs ET 4000

  — ATI® Technologies ATI 28800

  — Headland® Technology HT208

  — Trident Microsystems TVGA 8900 B & C

  — Western Digital® Imaging WD 90C11, C30, C31 (C30 Mode)

  — Cirrus Logic® CL-GD5422, 5424

  — IBM VGA256C

- APAR cross-reference list

- National Language Support (NLS) translations (same languages as OS/2)

You can install the ServicePak using IBM's Configuration, Installation, and Distribution (CID) architecture.

For a Remote Initial Program Load (RIPL) installation, obtain a special utility package called the "LAN Server RIPL Package for XR06100" from the IBM Service and Support Center. You can order it by calling (800) 992-4777.

The diskette version of the OS/2 2.0 ServicePak consists of seventeen 3½-inch diskettes or nineteen 5¼-inch diskettes. The cost is $25 plus tax for either diskettes or the CD-ROM version.

IBM Developer's Toolkit for OS/2 2.0 ServicePak

The IBM Developer's Toolkit for OS/2 2.0 ServicePak, Level XR06110, is now available. It includes fixes to problems customers have reported since the IBM Developer's Toolkit for OS/2 2.0 was released in March 1992. Before installing this Toolkit ServicePak, you must install the OS/2 2.0 base ServicePak (Level XR06100).

The Toolkit ServicePak includes two diskettes containing the debug version of the OS/2 kernel and Presentation Manager shipped with OS/2 2.0 ServicePak XR06100. The installation information for the kernel debugger is found in the Installation document located on Debug Diskette 1. You will also receive a new online Debug Kernel Reference with an object that is automatically installed to the Toolkit Information folder.

The diskette version of the IBM Developer's Toolkit for OS/2 2.0 ServicePak has six 3½-inch diskettes or seven 5¼-inch diskettes; the cost is $16 plus tax.

Product/Component	Release	CSD Level	PTF Number	Change Date	Comments
OS/2 Standard Edition	1.3	XR05150	XR05150	2-10-93	
OS/2 Extended Edition 　Operating System 　Presentation Manager 　REXX 　User Profile Management 　Communications Manager 　Database Manager 　LAN Requester 　LAN Server	1.3	WR05200	WR05200	5-12-93	WR05200 replaces WR05050, which can no longer be ordered on diskette.
OS/2 Extended Edition 　User Profile Management 　Communications Manager 　Database Manager 　LAN Requester 　LAN Server	1.3	WR05100	WR05100	11-2-92	WR05050 is a prerequisite for WR05100. It includes APARs and fixes for Database Manager, Communications Manager, LAN Server, and LAN Requester. It does not include the OS/2 base operating system fixes.
OS/2 Extended Edition 　Operating System 　Presentation Manager 　REXX	1.3	WR05150	WR05150	3-15-93	WR05100 is a prerequisite for WR05150. Apply the WR05200 cumulative ServicePak to an OS/2 Extended Edition 1.3 that is not at a WR05050 service level or above.
OS/2	2.0	XR06100	XR06100	9-1-93	XR06100 replaces XR06055.
OS/2 Toolkit	2.0	XR06110	XR06110	9-1-93	
	1.3	XR05053	XR05053	3-23-92	
OS/2 LAN Server/Requester ServicePak 　Service/Requester	2.0	IP06030	IP06030	4-25-93	
Fault Tolerance 　User Profile Management (UPM)	3.0	IP07001	IP07001	8-10-93	
OS/2 DOS LAN Requester SelectPak	3.0	IP07003	IP07003	7-28-93	Diskettes not available. Download from one of the BBSs.
NTS/2 LAPS Service Refresh SelectPak	2.14	WR07008	WR07008	9-9-93	
OS/2 Extended Services Database Manager SelectPaks	1.0				
• Kernel, SQLR, SQLZ, SQLQ, and SQLN		WR06001	WR06001	2-4-93	Diskettes not available. Download from one of the BBSs.
• Database Manager Precompiler		WR06002	WR06002	2-4-93	
• Database Manager Group Utilities		WR06003	WR06003	2-4-93	
• Database Manager Distributed Data Services		WR06004	WR06004	2-4-93	
• Database Manager Query Manager		WR06014	WR06014	2-4-93	
• Database Manager PC DOS Requester		WR06015	WR06015	2-4-93	
• Database Manager Engine DB2/2	1.0	WR07010	WR07010	8-23-93	
• Database Manager DB2/2 Query Manager	1.0	WR07012	WR07012	8-23-93	
• DDCS/2	2.0	WR07011	WR07011	8-23-93	
Communications Manager/2 Version 1.01 ServicePak	1.00	WR06050	WR06050	6-11-93	Available only on diskette.
DOS	4.0, 4.01	UR35284	UR35284	9-26-91	
	5.0	UR37387	UR37387	9-22-92	
PC/3270	1.01	2012	IP00832	11-21-91	

Figure 1.　Maintenance Release Levels (Continued)

Product/Component	Release	CSD Level	PTF Number	Change Date	Comments
PC/3270 (DOS)	2.0	3005	IP00874	3-29-93	
	3.0	7001	IP00891	4-9-93	
PC/3270 (Windows)	2.0	4002	IP00841	4-17-92	
	3.0	6003	IP00897	5-5-93	
PC/3270 Emulation, Entry	1.22		UR29500	3-16-90	
	2.0		N/A	N/A	
PC LAN Program	1.33		IP00249	5-15-90	
	1.34		IP00755	6-26-91	
C Set/2 Compiler	1.0		XR06150	6-29-93	
Workstation Program (WSP)	1.12		UR23217	1-4-89	

Figure 1. Maintenance Release Levels

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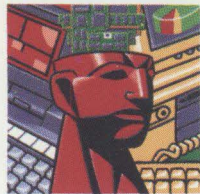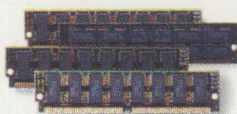An Electronic Bulletin Board for PC Users

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The newest version of QEMM, version 7, pioneers new ways of using the critical area between 640K and 1024K. It optimizes this area, taking into account the many drivers that need more memory at start-up than when running; instantly calculating millions of possible memory configurations to find still more memory for your applications, TSRs and utilities to use.

Instant Riches

What does more memory mean in a practical sense? Simply that your DOS and MS Windows programs run faster, smoother and more reliably. It means you can continue to add valuable utilities, drivers, TSRs and new capabilities to your PC. Whether it's workhorse drivers like LAN utilities and fax drivers; productivity-enhancers like disk caches and disk compressors; or fun and exciting capabilities like sound boards, CD ROM drivers, graphics tablets, etc. The better your memory is managed, the more versatility and flexibility your PC will have. QEMM 7 lets you have it all without fear of 'out of memory' messages or crashes.

DOS 6 Giveth; DOS 6 Taketh Away

The best feature of new DOS 6 is the stable of utilities it includes. Trouble is, they all eat up memory. DoubleSpace file compression needs 43K, Vsafe anti-virus needs 7-45K, Smartdrv disk cache needs 28K and even Undelete takes 10-14K as a resident program. Using MemMaker, you could easily lose—not gain—available 'conventional' memory in DOS 6.

New QEMM 7 takes the best of the new

How to Look a Gift Horse in the Mouth

DOS 6 w/o MemMaker						
DOS 6 with MemMaker						
QEMM-386 v6 Optimize						
New QEMM version 7 Optimize						
0K	100K	200K	300K	400K	500K	600K

We tested DOS 6 with and without MemMaker and with QEMM 6 and our new QEMM 7 runs away from all of them. See details of test conditions listed below.

DOS 6 features into account, finding ways to cut memory demands for these utilities by up to 80%, ensuring that the all-important memory below 640K is free for your programs. And QEMM 7's seemingly small feature of supporting DOS 6's

multiple configurations gives you the flexibility and ease of setup that you expect. (MemMaker doesn't work well with this important DOS 6 feature.)

Page Frame: the Key to Your Future

There's been a lot of jealous talk about our patent-pending Stealth technology. Nobody else can duplicate its 48-115K gains.

The key to Stealth is its use of a 64K reserved area above 640K called the page frame. Besides being used by Stealth, the page frame lets Lotus 1-2-3 r2.x run larger spreadsheets and WordPerfect 5.x larger documents. It's also used by DESQview for multitasking, Novell NetWare, IBM LAN Server and DECnet for reducing the network driver 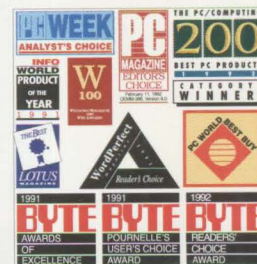memory footprint, plus games for fast action. You sacrifice all this when other memory managers turn off the page frame.

Prior versions of QEMM won just about every competition in sight, as well as remaining the #1 best-selling memory manager 5 years straight.

Stealth saves you room to set up your PC with a mouse, CD ROM, sound board, a network such as Novell NetWare, create 8-24K of extra memory for optimal MS Windows performance, use all of DOS 6's memory-hungry utilities and still have more than 630K to run applications smoothly and safely.

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How we got the chart numbers CPU—486/33 ALR Power/business VEISA machine equipped with 16 megs of RAM and running MS-DOS 6. Comparisons were done using the following memory managers: QEMM 7, QEMM 6.02, MS-DOS 6 MemMaker. In addition to the driver (or drivers) required by each memory manager, the following drivers, DOS resources and programs were loaded for all comparisons: in the CONFIG.SYS file: SETVER.EXE, DOS=HIGH, FILES=20, BUFFERS=10, STACKS=0,0, MVSOUND.SYS, SNDBK12.SYS, SLCD.SYS, DOS SHELL=statement, in the AUTOEXEC.BAT file: VSAFE, MSCDEX, UNDELETE, LSL.COM, NE2000.COM, IPXODI.COM, NETX OR EMSNETX, MOUSE.COM, SMARTDRV.COM, PRTSCCAP.COM. ©1993 Quarterdeck Office Systems. Trademarks are property of their respective owners.

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