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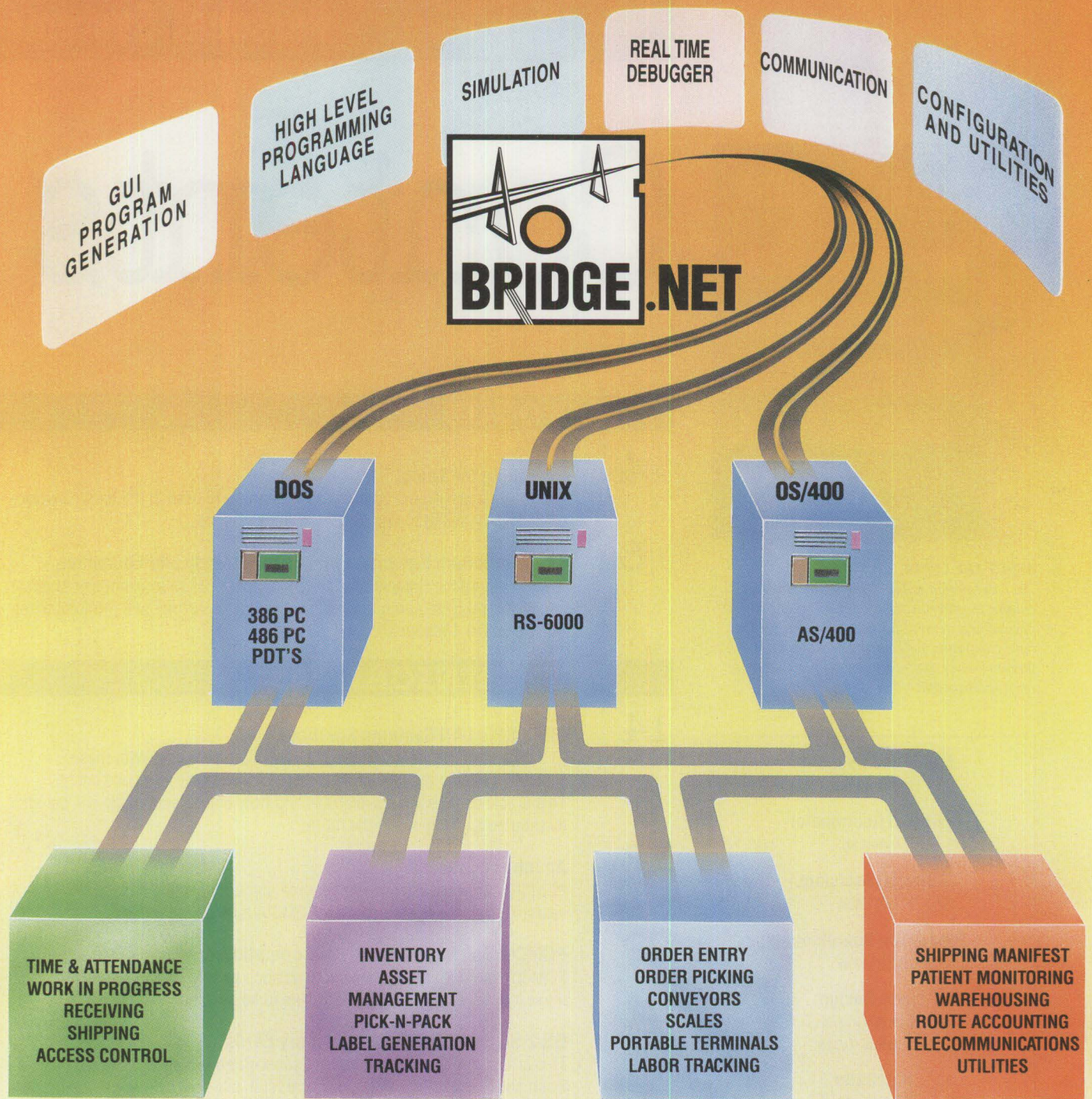
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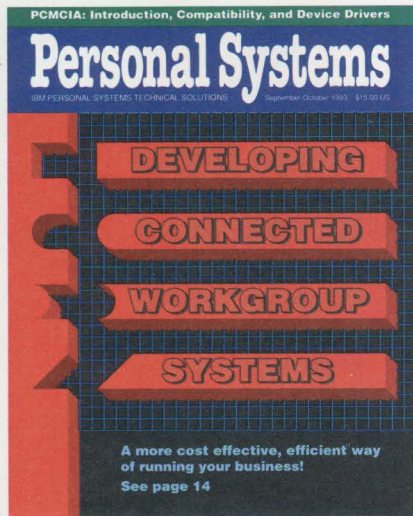
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Searching for Speed

IBM ThinkPads now aid Indy drivers in their quest for safety and speed.

Emerson Fittipaldi won the 1993 Indianapolis 500®—the safest and most competitive Indy 500 in more than two decades—driving a car that used an IBM ThinkPad® mobile laptop computer to download and display critical data.

In fact, 24 of the 33 drivers who made this year's Indy field chose IBM ThinkPads to analyze their cars' data in practice, qualification, and the race itself. That list of drivers includes 1992 Indy 500 winner Al Unser, Jr.; 1992 Indy 500 Rookie of the Year Lyn St. James; four-time Indy 500 winner Al Unser, Sr.; 1990 winner Arie Luyendyk; 1985 winner Danny Sullivan; and Scott Goodyear, winner of last year's Michigan 500-Mile race.

When the race was over, 15 of the top 20 finishers had used IBM ThinkPads. Of those 15, 7 drivers were in the top 10, including Fittipaldi and runner-up Arie Luyendyk.

The Importance of Setup

Today's Indy car—a Lola, Penske, or Rahal/Hogan® chassis powered by a Chevy®, Ford®-Cosworth®, or Buick® engine—is a finely balanced machine that seems more closely related to an F-15 jet aircraft than to an ordinary car.

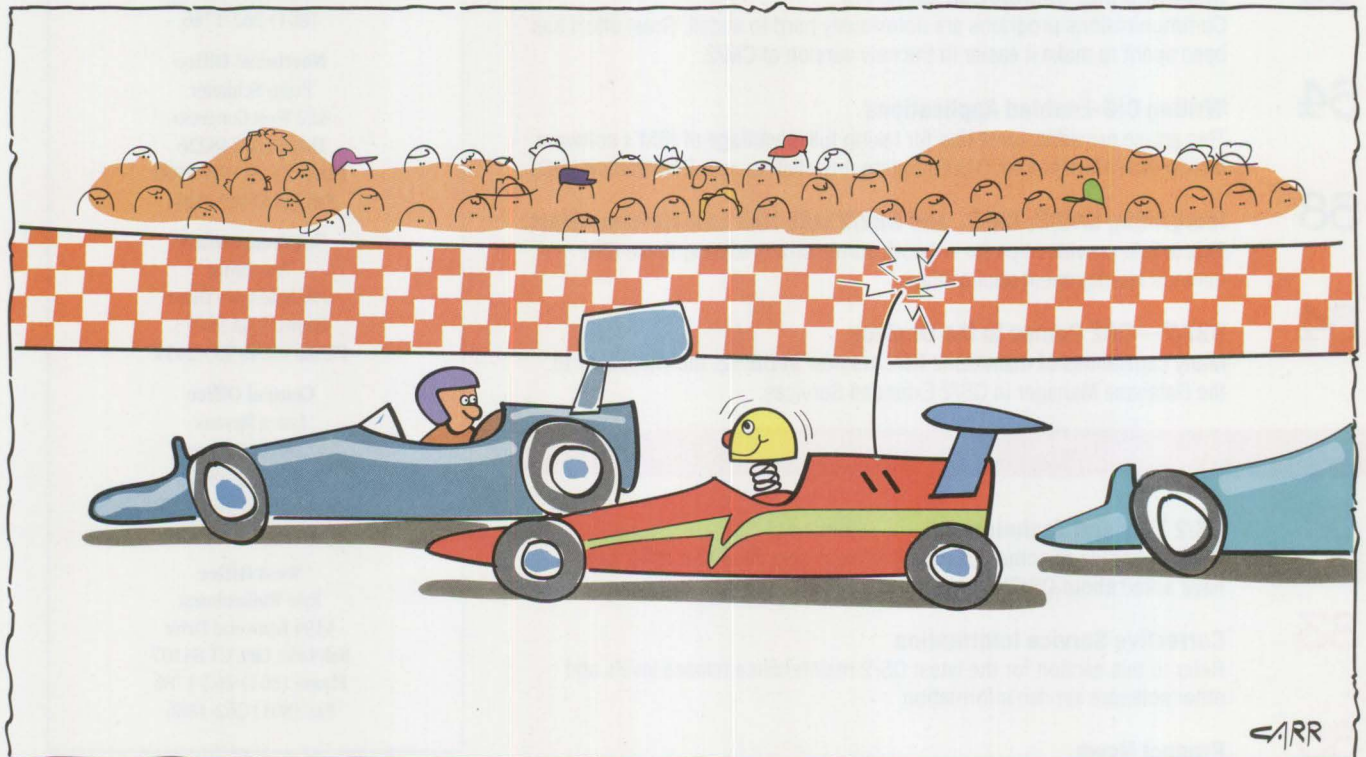
To make an Indy car competitive, a mechanic needs to find the point of perfect balance between horsepower and aerodynamics, understeer and oversteer, and all the other factors that help the driver go fast and turn left (the Indy speedway is a left-turning oval). Achieving a winning combination of speed and finesse requires

any number of infinitesimal adjustments to the car's myriad components to make it run consistent 2.5-mile laps at approximately 40 seconds per lap.

During setup, even the smallest margin of error can be costly. To adjust a front wing ever so slightly the wrong way might add $\frac{1}{10}$ of a second to a driver's lap time. At the end of a 200-lap race, that adds up to 20 seconds—and 20 seconds at Indy can cost a driver several positions and hundreds of thousands of dollars in prize money. As a result, computer-assisted testing has become a high priority for Indy car teams.

Searching for Speed

Indy car teams spend much of the short off-season—November to February—testing engine and chassis setup. They also devote most of May to finding the right



setup for the Indianapolis Motor Speedway® (IMS). Indy car people call this process "searching for speed."

In the old days, searching for speed involved seat-of-the-pants driver-mechanic experience, gut feeling, and handheld stop-watches. Race cars were set up through trial and error, and for many drivers, the race ended abruptly at the wall.

Within the last few years, all Indy car teams have begun using information from on-board data acquisition systems. These systems provide data downloading for display and analysis on laptop or desktop computers. One source estimates that at least nine Original Equipment Manufacturer (OEM) data acquisition systems are available for Indy cars. The racers' edge may now lie in the choice of a data acquisition system and their crew's expertise at interpreting the data.

Using ThinkPads During Setup

This year, 7 of the 10 fastest Indy qualifiers used IBM ThinkPads to help them set up their cars. These qualifiers included two front-row cars: pole-sitter (inside front position on the starting line) Arie Luyendyk, who clocked the fastest speed at 223.967 mph, and Raul Boesel, who started on the outside of row one with a speed of 222.379 mph and led the first 17 laps of the race.

Although IBM is not directly involved with the makers of the race car data acquisition system, the ThinkPad's ability to store and retrieve data helped Luyendyk win his first Indy 500 pole on Saturday, May 8, 1993.

Although Luyendyk had been running the fastest times on the Friday before qualification, a minor change to his Lola/Cosworth setup on Saturday morning caused the car to lose about 10 mph in early morning practice. After waving off his first pole attempt, Luyendyk's crew retrieved data stored on diskettes from Friday's practice laps. Over a six-hour period, they returned the car to its earlier setup, with modifications for current track conditions. Luyendyk then turned a four-lap qualifying run late Saturday, winning the pole from 1969 Indy



Photo by Tom Murphy

Indy car teams choose IBM ThinkPad mobile laptop computers for data acquisition downloading, display, and analysis. The ThinkPad is fast, lightweight, and reliable in the hostile environment of auto racing.

500 champion Mario Andretti by more than half a mile per hour.

Data Acquisition and Display

Each Indy car is equipped with a small OEM "black box" data acquisition system developed by Pi Research of Noblesville, Indiana. The system simultaneously monitors and records up to 40 discrete mechanical functions, including forward and lateral G-forces, oil pressure and temperatures, fuel mix, throttle, braking, suspension travel and stresses, miles per hour, and engine RPMs. The resulting data is

then relayed by Radio Frequency (RF) signal from the moving cars back to the laptop computers in the pits, a process known as radio telemetry.

As the Indy car passes its pit at well over 200 mph, the data acquisition system transmits its data on a unique RF signal to a small antenna located on the team's timing stand. The antenna feeds the RF signal into a receiver that converts it to a digital signal and sends it to the IBM ThinkPad mobile laptop computer running the Pi Research analysis software. The analysis software



Photo by Greg Papadimitriou

Data is downloaded from the data acquisition system on Fittipaldi's Indy car via a data cable to the IBM ThinkPad for display and analysis.

processes the data and displays it graphically on the IBM ThinkPad's thin-film transistor display. Crew members read and interpret this display to make adjustments to the car.

During testing and practice, crews can also bring the cars in and download the data directly from the acquisition controller to the IBM ThinkPad via a data cable and the laptop computer's RS-232 port.

Even though the acquired data is extremely precise, adjustments to the car are not based solely on the evidence of that data.

Input from an experienced driver is still critical to achieving a setup. No matter how much data the on-board systems acquire—and some data acquisition systems can monitor up to 128 analog inputs and store up to 16 MB of information—the driver is still the only human being who knows exactly how the car is handling on the track.

Ron Ruzewski, data acquisition manager for Walker Motorsport, said his crew usually talks to the driver about the car's performance. Crew members then use the

computer data to help analyze what the driver has noted.

Analyzing Acquired Data

Analysis software provides several methods of data analysis, including plotting parameters, bar charts, and math functions that enable crews to perform algebraic, geometric, or trigonometric calculations for aerodynamics, suspension, or acceleration ratios.

Running the software on the IBM ThinkPad allows drivers to replay and study their performance anywhere—on a plane or in a hotel—using an advanced computer-animation feature that displays the acquired data as an animated track map. The software can generate maps of the Indianapolis Motor Speedway or other race-tracks on the 1993 PPG Indy Car World Series® tour. The cursor simulates the car traveling around the course, while the screen concurrently displays important values such as speed, throttle, engine RPMs, G-forces, and braking—showing how the car performed on various laps. Drivers can speed up, slow down, or even stop the cursor to study the car's performance at any point on the track map.

Computers as Safety Tools

Because data acquisition display and analysis enables teams to develop successful setups with less trial and error, computers have also become valuable safety tools. For example, if a car's data acquisition system communicates water temperature over 100° Celsius or subnormal oil pressure, the crew chief can radio the driver to bring the car in before the engine overheats and fails. Prompt action in such a case can prevent more severe problems, such as engine failure, which often throws oil or water on the track and can cause accidents.

Putting the ThinkPad on the Line

From start to finish, Indy car racing is an extremely high-tech sport. It depends upon computer equipment not only to make the cars perform better, but also to handle all the regular business tasks involved in supporting an Indy car team.

At the 1992 Indianapolis 500, several teams asked IBM to supply laptop and desktop computers for all the applications they were running. IBM saw a great opportunity to create a more direct link to Indy car racing, gain ThinkPad visibility, and prove the ThinkPad's performance in one of the harshest computing environments.

In the pits at Indy, ThinkPads were dropped, stepped on, and exposed to both rain and sun. At the 1993 Indy car race in Phoenix, ThinkPads were exposed to both desert sun and heat. They were left on the timing stands during a sandstorm—and they survived with their data intact. "Use it wherever you think best" is not just a marketing slogan for these Indy car ThinkPads.

66 Years of IBM Indy Performance

The IBM ThinkPad mobile laptop computer is just the latest in a long line of IBM machines used at the Indianapolis 500. In fact, 1993 marks 66 years of continuous use of IBM equipment at the IMS—a history that began at the 1927 500-Mile Race when T. J. Watson leased IBM keypunches and tabulators to the Speedway at a special one-day rate to time and score the race.

In those days, the second floor of the Speedway's old pagoda was the site of timing and scoring. The 33 car scorers, including many IBM employees and customers, sat in three rows of 11 seats at long tables. Equipped with their decks of IBM cards and time clocks, they wrote their cars' times on the cards. After each race, keypunch operators punched the time codes into the cards.

The Mainframe Era

The United States Auto Club (USAC®) sanctions the Indy 500. In 1956, they began using a process of mark-sensing to encode the cars' times onto the cards with lead pencils. This led to greater efficiency in timing the Indy 500. Then, in 1964, USAC migrated its race processing scheme from IBM punched-card tabulators to an IBM 705 mainframe computer. This migration

took advantage of the new magnetic tape and stored-program technology. The race-processing programs were adapted to run on IBM System/360™ and System/370™ architectures as the new machines became available.

Enter the Personal Computer

In 1982, IBM personal computers were incorporated into the timing and scoring scheme. They ran programs written in IBM BASIC to calculate qualifying times and speeds and to automate car numbers on the spectator scoring display. In 1989, IMS and USAC installed and tested the Dorian DATA-1 automatic timing system, which was attached to a system of IBM Personal Computer ATs® acting as data managers.

In 1990, IMS and USAC entered into a partnership agreement with IBM making IBM their official supplier of information processing equipment. They named the IBM PS/2® the Official Computer of USAC and the Indianapolis 500. The primary mission of the partnership was to help IMS and USAC develop a transmitter-based timing and scoring system. The system uses RF transmitters in the cars to track times as they pass over a series of antennas buried in the asphalt. This Integrated Race Information System is connected to an IBM OS/2® 2.0 data manager on a Token-Ring LAN. It was developed in 1992 by IBM and USAC programmers to distribute race information to officials, spectators, and the press.

In 1990, IBM donated a "History of Timing and Scoring" exhibit to the IMS Hall of Fame Museum. The permanent multimedia exhibit tells the 80-year story of the men and machines responsible for timing the auto race that awards the world's highest prize money. Also in 1990, IBM instituted the \$10,000 Fastest Lap-of-the-Race Award—possible because the IMS/USAC timing and scoring system could record the lap times and speeds for every car on every lap of the race. Emerson Fittipaldi won the award in 1993, with a speed of 214.807 mph on lap 198.

In 1992, the IBM PS/2 with the OS/2 operating system was the IMS and USAC Computer Choice for the 76th Indianapolis 500—and IBM instituted the Indy Car Support Program.

IBM's Indy Car Support Program

Under the IBM Indy Car Support Program, IBM is supplying the Indy car teams with computer equipment and service for all race-related activities at Indianapolis and the other 15 races in the 1993 PPG Indy Car World Series.

Although IBM is not actually sponsoring Indy cars or race teams, most teams at the Indianapolis 500 and on the circuit use the ThinkPad or various models of the PS/2. IBM will supply equipment to any team that wants to use it. Teams using the IBM Indy Car Support Program include Team Penske, Dick Simon Racing, Walker Motorsport, Galles Racing, Hall/VDS, Pagan Racing, Turley Motorsports, King Racing, and PRO FORMANCE Motorsports.

—Patrick Karle, Robert D. Lohman,
and Tom Murphy

Patrick Karle is managing director of Patrick Karle Associates, a high-tech marketing communications firm in Ann Arbor, Michigan. His specialty is IBM PS/2 solutions for the automotive industry. Patrick also teaches public relations at Eastern Michigan University in Ypsilanti.

Robert D. Lohman is program director of Image Events for the IBM PC Company based in Boca Raton, Florida. Robert has over 34 years of IBM service, including 10 years with IBM PC channel development, marketing, and merchandising. Since 1990, he has managed business shows, special events, and IBM's participation with the Indianapolis 500. In 1992, he created the IBM Indy Car Support Program to demonstrate the reliability of IBM ThinkPad mobile laptop technology in championship auto racing.

Tom Murphy is program manager of the IBM Indy Car support team and president of TDAAT, Inc., Boca Raton, Florida. TDAAT is a full-service company that installs and supports IBM PC Company products. Tom formed TDAAT after 27 years of service in IBM field and development organizations.

The Journalism Network: Linking Technology and Education

Five years ago, IBM and the University of Missouri School of Journalism began one of the largest joint research projects ever undertaken between industry and education. The School of Journalism is using leading-edge technology based on the OS/2 2.0 platform to automate news gathering, reporting, and production for *The Columbia Missourian*, a general circulation newspaper published daily since 1908. OS/2 2.0 workstations also enable news broadcasting for two other School of Journalism media outlets: KBIA-FM, a national public radio station, and KOMU, an NBC-TV affiliate.

The excitement generated by this project has attracted both national and international attention. As a result of this success, IBM and the School of Journalism have decided to extend the project into 1995. IBM originally provided more than \$2 million of equipment—hardware, software, and peripherals—to the project; the

extension includes hardware upgrades and additional licenses of OS/2.

Technology in the Newsroom

The School of Journalism's 300 computers are being upgraded to OS/2 2.1. They run OS/2 programs including WordPerfect®, Lotus 1-2-3®, Excel, and custom newsroom and school applications; DOS programs such as Folio Views®, and Windows™ programs such as PageMaker®, Quark Xpress®, and other imaging and graphics programs.

Student reporters sit at their newsroom workstations making full use of OS/2's multitasking capability. They can compose articles in an onscreen word processor window while monitoring incoming news in an Associated Press® or other news service window. In yet a third window, student journalists can review archived data to establish the historical framework for the article (see Figure 1). The summer of

1993 saw incoming digital news photos routed to requesting workstations and gave expanded access to dial-up databases through the communications server and modem pool.

Faculty and staff not only exploit OS/2's multitasking environment in the newsroom, but they also experiment with multimedia and electronic news delivery. Students in news writing classes at most journalism schools use text-based simulations of news events to learn news writing. University of Missouri students now have both text-based and multimedia simulations. A current multimedia simulation popular with students and instructors uses still-frame clips of a train wreck combined with full-motion, digital video interviews of witnesses and officials at the scene. Students watch an overview of the clips, then determine whom to "interview" from the group of experts and witnesses. Working within a strict time limit, they write their stories based on what they watched.

Another important multimedia application uses OS/2 Audio Visual Connection® (AVC) software in a step-by-step tutorial on editing audio tape. The tutorial uses electronic images of the equipment, animation, and on-screen text and graphics. Students can access the tutorial from workstations near the audio tape equipment, making it easy to learn or review the procedures.

Campus Connections

Linking over 300 PS/2s, plus a few PCs and PS/ValuePoint™ machines, the School of Journalism's 16 Mbit Token-Ring network contains several internal rings and an internal fiber backbone. The entire system bridges to a campus fiber backbone connecting 90 buildings. The network also includes many Macintosh® computers on PhoneNet® twisted-pair AppleTalk®

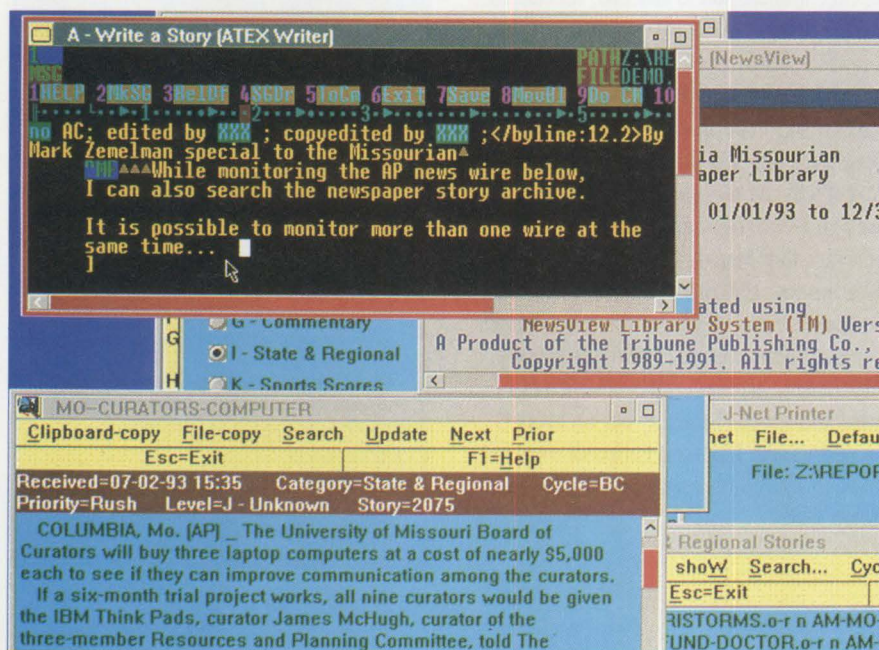


Figure 1. Multiwindowed Screen Used to Produce *The Columbia Missourian*

networks, with some that connect to an IBM computer via Novell® NetWare®. The rest of the IBM computers are attached to one of over 15 LAN Server 3.0 file and print servers that can be accessed from any workstation with the proper ID and password. The school is currently installing LAN Server for Macintosh from IBM and 16 Mbit Token-Ring cards in some Macintoshes to more closely integrate the network and file sharing.

The school has a T1 microwave link with remote bridging between the central campus and the television station located eight miles from the campus. In addition, satellite links bring in digital news photos via T1 optical fiber and copper links at 1.4 Mbits per second. Text services also arrive by satellite at a slower speed. Off-campus sites in the state capital 30 miles away and in Washington, D.C. use modems for electronic mail and will be part of an upcoming remote dial-up bridge project.

Every faculty member and most staff members can access the network using computers on their desks. Several of the school's computerized classrooms have PS/2s at every desk and projection equipment that connects to the teacher workstation and cable TV system. The entire school is tied together with PC-based electronic mail and mainframe 3270 emulation for Internet® and electronic communications such as INFORMU, a mainframe-based bulletin board and information service.

Public Schools Receive Digital News

Computer technology is being used not only to further the education of students at the university, but to educate students in the public classroom as well. Faculty, staff, and students in the School of Journalism produce and deliver news daily to public schools in the community via computer, in addition to making it available on the LAN at the School of Journalism. Every evening during the regular semester, students edit news, electronically prepare photographs and graphics (including cartoons and weather maps), and assemble the graphically based *Digital Missourian* for early-morning, electronic transmission to the public schools' computers (see Figure 2).



Figure 2. The Graphically Based *Digital Missourian*

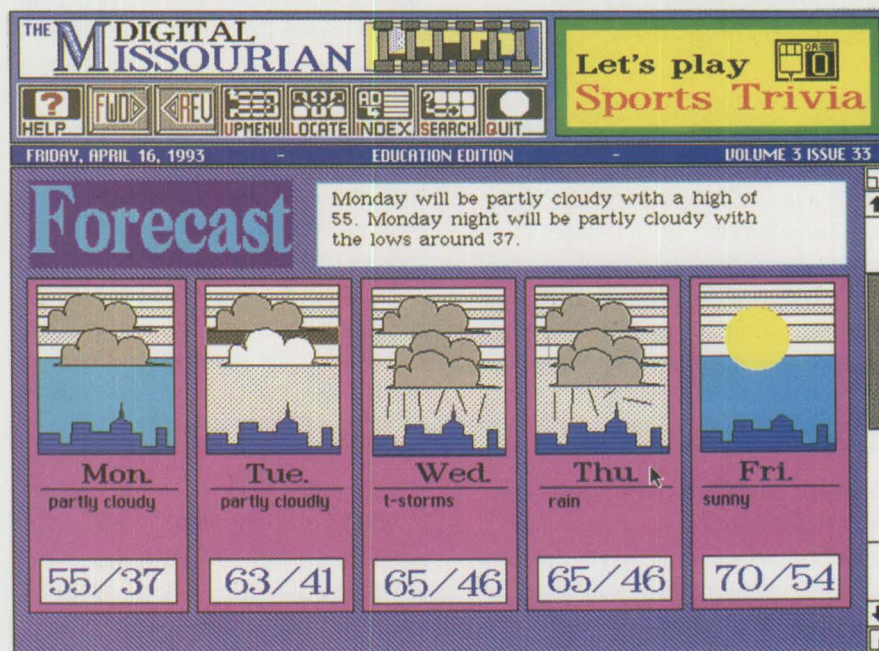


Figure 3. Local Weather Forecast from the *Digital Missourian*

From grade school on up, students and teachers are enthusiastic about this new teaching tool being used for everything from remedial reading to politics, weather, and business lessons. When students turn on the computer, they are greeted by a simple graphical menu of main topic areas. The students can then access information ranging from local, state, national, or international news, to sports, local movie schedules, advice columns, and

local or national weather (see Figure 3). They can even access stories written by their peers. Many stories contain photographs and information graphics. The experimental news delivery software tracks all activity in the *Digital Missourian* for follow-up research and statistical analysis—some of the first of its kind.

In addition to teaching full-time students and producing print, digital, and televised

news, the faculty and staff also provide information and workshops at the university and at sites around the world for the national and international news media. The school presents information on journalism topics as well as on current technology used to gather and deliver news.

While students use state-of-the-art technology to produce and distribute news, hardware and software developers use the school as a "safe" environment in which to test their products. For example, the

school can test software applications on 25 computers simultaneously or focus on using different combinations of circumstances and a variety of user skill levels. While products sometimes cause brief headaches when they do not work as expected, the research and teaching environment allows real-world testing with more flexibility to deal with the concerns that unexpected problems would cause in a corporate or business environment.

—Mark Zelman

Mark Zelman (Internet: jourmark@muccmail.missouri.edu) is the computer projects manager for the University of Missouri School of Journalism. For the last three years he has been responsible for maintaining the Journalism Network (JNET), managing major computer projects, and planning for the use of future technologies. Mark also travels the state and the country giving demonstrations and presentations for groups, organizations, and corporations on topics such as Mac[®] and IBM cross-platform applications, overviews of PC-based image applications, electronic news delivery research, and computer applications for non-technical audiences.

The Imagination System

Now showing on the PS/1—the IBM/Disney connection.

Mickey Mouse is moving into a new Enchanted Kingdom: the family computer. Two new IBM PS/1™ models now come preinstalled with "The Imagination System," which includes 11 Disney software programs (see Figure 1), online services, and Windows 3.1 word processing, database, and spreadsheet programs (see Figure 2). A parents' guide describes how to use the products and includes a useful Q&A section.

The Imagination System provides the entire family with access to a world of information and entertainment. It is designed to entertain and educate children of all ages—up to and including adults—and to grow with a family's computing needs.

An Expandable Family System

The Imagination System is easily upgraded and expanded. Users can add more memory, upgrade the processor, or add a printer, scanner, multimedia card, or other peripheral.

According to Jim Keenan, director of consumer brands and retail channels, IBM Personal Computer Company, "These specially configured PS/1s are designed to meet the current and future education and entertainment needs of even the youngest

member of the family, and can continue to expand to meet their needs as they grow."

Online Services

The Imagination System includes two online services: Prodigy[®] and America Online[®]. Prodigy provides up-to-the-minute news, weather, stock quotes, an online encyclopedia, and more. The PS/1 edition of America Online is a window to over 30,000 software titles that users can download and use. By visiting online "classrooms," users can exchange information with online advisors and other computer users of all ages.

Disney Sound Source and Disney Software Launcher

The PS/1s also include the Disney Sound Source, a stand-alone, battery-powered speaker unit. Its realistic sound effects, speech, and music bring the software to life. The Sound Source also works with Microsoft Windows applications that support digital sound.

The Disney Software Launcher makes it easy for children to access the software programs they should be able to use, while protecting the ones they should not access.

The Disney Software Collection

Hours of educational fun await every member of your family with The Disney Software Collection. Each title in this exciting

and innovative collection is listed below with a description of how it works. Everyone will find something to appeal to them, no matter what their age.

Mickey's ABCs, 1-2-3s, Colors, and Shapes

Using the basic premise of "learning and fun go hand in hand," these preschool titles introduce and motivate youngsters to learn with the familiar faces and voices of popular Disney characters (using Disney's Sound Source or other sound devices). Designed to allow children to work at their own pace, these titles encourage young minds to understand the concepts of letters, words, numbers, colors, and shapes. Figure 3 shows a sample screen from Mickey's ABCs.

Follow the Reader

This reading program, which received the 1993 National Parenting Center's Seal of Approval, takes children into an interactive storybook filled with Mickey and his friends. This talking software adventure (a supported sound device is required for speech) helps children develop and sharpen their reading skills as they create stories, print them, and even read along. Follow the Reader encourages young readers to develop necessary reading skills at their own pace in an entertaining learning environment.

Children build stories by controlling Mickey's actions and deciding what he will do from sunrise to nightfall. Mickey can call friends on the phone, play at the beach, eat pizza for lunch—hundreds of story combinations can be created. Once completed, stories can be saved and printed. Children can then replay the story video-style and follow along with their printed copy.

Mickey's Memory Challenge

This product provides a fun way for youngsters to sharpen their memory skills at their own pace and ability level. Children match images that feature everyday objects, familiar words, or popular Disney characters. Children can play alone or against one of their favorite Disney characters on several skill levels.

Younger children will enjoy the visual play and older children can test their skills with memory and vocabulary building exercises. The difficulty level can be set with 8, 15, or 24 images to match, and there is a "peek" option to help players. In Mickey's Memory Challenge, the amount of time the images are shown can be adjusted depending on the skill level of the child. To track progress, parents can monitor children's development through the scoring option. This feature, along with an optional timer to measure speed, further adds to the choices available for building memory skills.

Mickey's Jigsaw Puzzles

Mickey's Jigsaw Puzzles (shown in Figure 4) provides youngsters with 15 animated puzzles for hours of fun and challenge. Once each puzzle is completed, players are treated to an exciting animated sequence. Mickey, Minnie, Donald, and the whole gang come alive using animation, voice, music, and sound effects with the distinctive Disney touch.

Children can challenge themselves with the jigsaw fun of Mickey's Jigsaw Puzzles, which offers multiple skill levels. Players can choose from 4 to 64 puzzle pieces and can decide whether to use the easy silhouette mode, the puzzle-shaped pieces, or the difficult square-shaped pieces. A special help

Ages 2-5	
Mickey's 1-2-3s	Eleven of Disney's best-loved characters help children recognize numbers and learn to count.
Mickey's ABCs	Preschoolers learn the alphabet, how to recognize upper- and lowercase letters, simple words, and more.
Mickey's Colors and Shapes	Mickey the magician motivates children to learn colors and shapes that they can print and color.
Ages 5-8	
Follow the Reader	This talking adventure sharpens reading skills as children create, print, and read their own stories.
Ages 5 and up	
Disney's Aladdin Print Kit	Using characters from the movie "Aladdin," children can create colorful posters, banners, and greeting cards.
Mickey's Crossword Puzzle Maker	Children and adults can create, solve, and print crossword puzzles using Disney characters and backgrounds. Clues make it easier!
Mickey's Jigsaw Puzzles	Fifteen colorful puzzles come to life when the last piece is put into place. Select from 4- to 64-piece puzzles using square, silhouette, or standard jigsaw shapes.
Mickey's Memory Challenge	Players match words, objects, or Disney characters. The software helps prepare young children to read, and builds older players' vocabulary and memory skills.
Teens and adults	
The Animation Studio	Both teens and adults can learn how to create Disney-style animations with easy-to-follow demonstrations, a library of animations, sound effects, and more.
Coaster	Users can design and build the roller coaster of their dreams, then take it on a stomach-churning ride, keeping track of speed, G-forces, and more.
Stunt Island	A first-rate flight simulator is combined with a movie studio, enabling the user to be pilot, director, and editor while making action-packed films.

Figure 1. The Disney Software Collection

The Imagination System
<ul style="list-style-type: none"> • MS-DOS 6.0 • Microsoft® Windows 3.1 • Microsoft Works for Windows (includes word processing, database, and spreadsheet applications) • Two online services for access to news, weather, airline reservations, downloadable software, educational resources, and exclusive online support: <ul style="list-style-type: none"> — The Prodigy Service — PS/1 Edition of America Online • IBM exclusive software such as the PS/1 Club, PS/1 Connection, PS/1 Fitness, PS/1 Index, and PS/1 Tutorial

Figure 2. Preinstalled Software for Work, School, and Home



Figure 3. Mickey's ABCs

© Disney

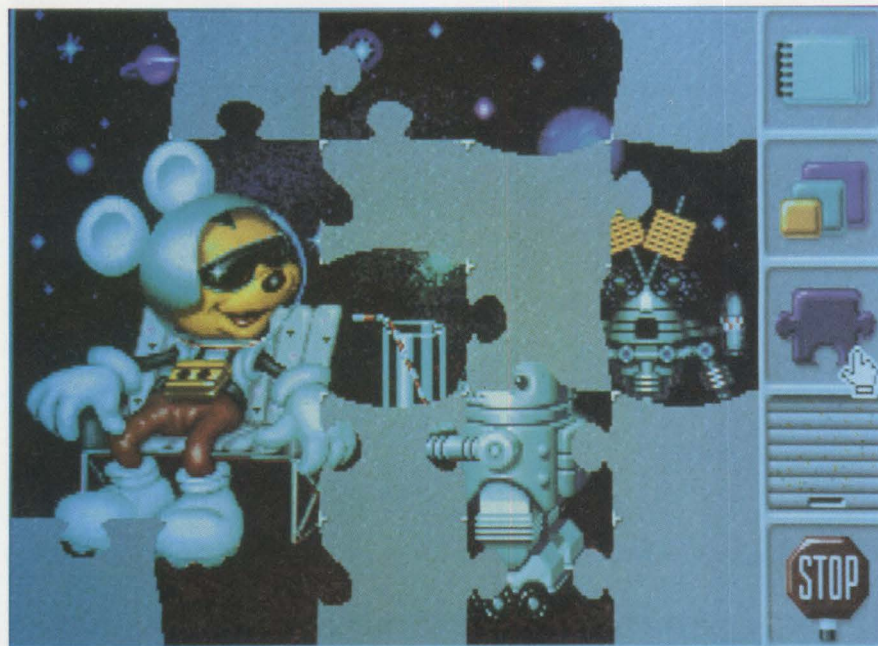


Figure 4. Mickey's Jigsaw Puzzles

© Disney

key and an "oops" option easily guide children through puzzle play.

This colorful software features a print option that allows children to print puzzles as line art, which can then be colored by hand. It supports a wide range of popular printers.

Mickey's Crossword Puzzle Maker

Mickey helps children build reading, spelling, and vocabulary skills while undertak-

ing the challenge of creating and playing crossword puzzle games. Children can play by themselves or with a friend, the computer, Mickey, Goofy, or Donald. This program includes online instructions, an easy-to-use picture menu bar, eight Disney trivia puzzles, and a built-in dictionary of over 500 words and clues. Once created, the puzzles can be printed in color or black and white.

Disney's Aladdin Print Kit

This product allows users to create a variety of printed material, using all the popular characters from the animated Aladdin film, with an easy-to-use point-and-click interface. The fourth in a series of print kits—including Mickey and Minnie's Fun Time Print Kit, Beauty & the Beast® Print Kit, Dick Tracy® Crimestoppers Print Kit, and the Aladdin™ Print Kit—features the ability to cut and paste within the program and music support. Offering over 40 images, Aladdin, Jasmine, the flamboyant genie, and the evil sorcerer come to life for children.

Children can use their imagination to make greeting cards, banners, place mats, character cutouts, calendars, and more. Youngsters can personalize their creations with nine expressive typefaces in a variety of sizes and over 20 exotic borders.

Stunt Island

This combination of flight simulator and movie-making program (shown in Figure 5) is in a class by itself in the crowded field of simulation, and is destined to change every simulator that follows it.

This program combines a top flight simulator with the facilities to create stunt films rich with music, speech, and special effects (appropriate sound board required). Developed with input from top Hollywood talent, Stunt Island allows players to design, fly, film, and edit their own action-packed films in worlds they create.

Players have access to 45 different aircraft—from World War I classics and modern jets to commercial planes and the space shuttle. The set editor allows the player to modify any of the 34 existing sets or create new ones from scratch.

After filming the stunt in full 256-color VGA graphics, players can go to the editing room to work on the film footage. Once edited, the finishing touches of credits, titles, sound effects, music, or voice-over and dialogue (using a Sound Blaster™ and microphone) can be added. Then, it's on to the Stunt Island theater for the film's premiere.

Stunt Island received the Software Publisher's Association (SPA) 1993 Critics Choice award for best consumer software.

The Animation Studio

This product provides beginners and professionals with the canvas on which to create animated scenes—with the only boundary being their imagination. Lauded for its ability to teach beginners the skills of animation, The Animation Studio has also found acceptance among professionals, with television networks using The Animation Studio to create animation.

Using the Ink and Paint tool, animators can color their creations with up to 256 colors from a palette of 256,000 colors. The Animation Studio also allows users to import artwork from other sources. With a built-in converter, The Animation Studio can work with PCX, GIFF, or TIFF files from other paint programs.

For the beginner or novice, the basics of cel animation are taught in an easy-to-learn fashion that will have users creating their own animations in minutes. Sample Disney animation, including some from classic Disney movies, is included in the "library" and "morgue" sections of The Animation Studio. This program also includes an extensive library of sound effects to add audio to animations. The program supports the Sound Source along with the Sound Blaster and Tandy® Sound.

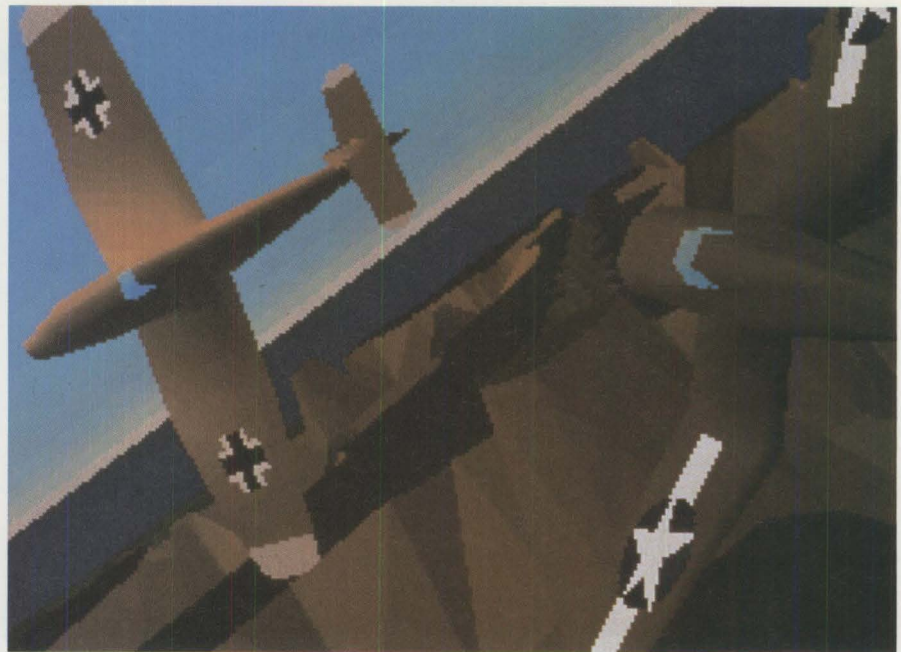


Figure 5. Stunt Island

© Disney

Hardware Specifications

The following hardware is standard with The Imagination System, enabling users to be up and running within minutes of opening the box. Printers and other peripherals are sold separately.

- Intel's® 486SX 25 MHz processor, upgradable to a 486DX2 with the OverDrive chip
- 4 MB of RAM expandable to 32 MB
- 129 MB hard drive with enough room for thousands of files
- 3.5-inch and 5.25-inch diskette drives
- 3 slots/3 bays or 5 slots/5 bays

- 14-inch Super VGA monitor for high-quality color images
- Mouse
- Internal modem to access online services

The new 3-slot, 3-bay systems are covered by IBM's exclusive 12-month warranty on hardware and preloaded software, guaranteeing the integration of both. The 5-slot, 5-bay systems include two years of service from IBM. If a system needs repair, IBM Express Maintenance normally delivers a replacement system to the owner's site within 48 hours.

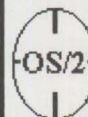
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IBM PSP's LAN Systems Solutions

Connected workgroup solutions can provide a more cost-effective, efficient way of running your business, whatever its size. If you are considering migrating from a host-connected environment or if you want to make better use of your current hardware and software inventory, this article will be of particular interest. It describes IBM Personal Software Product's (PSP's) directions for Local Area Network (LAN) systems: enabling organizations to manage an entire heterogeneous network as a single entity with scalable product levels ranging from small business to workgroup to enterprise.

Since the inception of the Local Area Network (LAN), business systems have been evolving to exploit LAN technology. Some organizations—mostly departments or small businesses—are moving from stand-alone personal computers to a networked environment, using a workgroup LAN to run critical business systems. Other, larger organizations are setting up integrated LANs throughout the enterprise, either to interact with a central host system or to downsize by off-loading applications from the host to a LAN.

As this range of business needs has evolved, so have the capabilities of the LAN environment. Organizations are now using LAN servers not only as file and print servers, but also as specialized database, communications, management, and application servers in increasingly complex heterogeneous environments.

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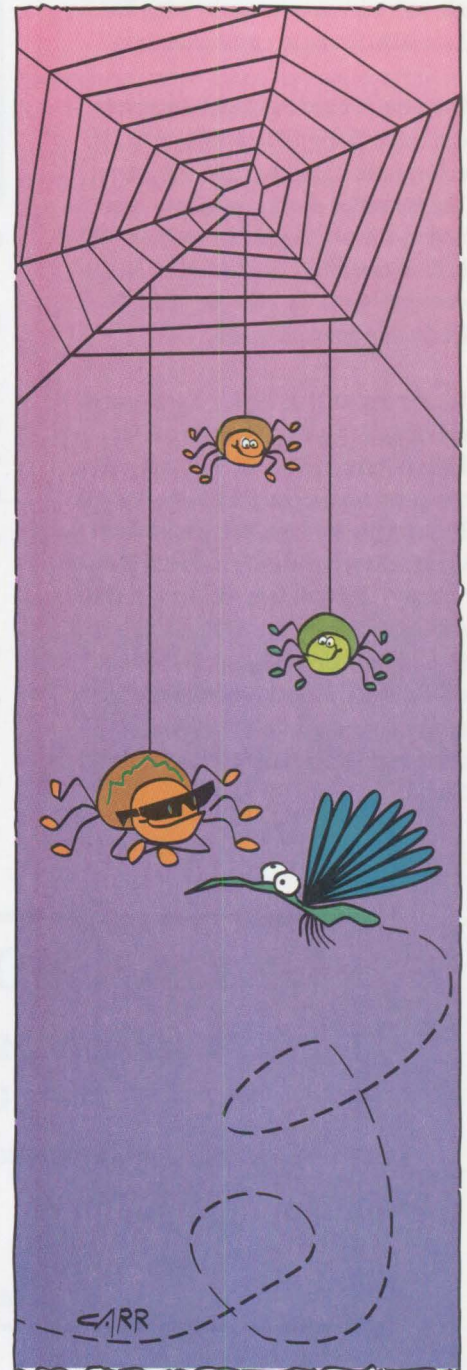
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IBM Personal Software Products (PSP) Division's strategy for LAN systems is to simplify these complex environments from the user's perspective by treating the LAN as a system. This manageable LAN environment will serve as the platform for a new generation of distributed applications. Backing up this strategy is IBM's range of system solutions and hardware/software interoperability—the widest of any company in the industry. This

approach combines the ease of use and flexibility of workstations with the reliability, manageability, and capability found in traditional information systems, giving customers the following benefits:

- Easy access to information anytime, anywhere
- Industrial-strength systems that are reliable, manageable, and secure
- Investment protection through scalable systems that grow with the business

Today's PSP LAN systems products are designed to give users access to the information they need, regardless of where it is located. At the same time, the



products insulate users and administrators from the complexities of the network—including connections, protocols, service providers, and hardware.

The LAN as a System

The LAN provides centralized security, administration, and management functions like the minicomputer and mainframe systems of the last 20 years. Beyond these functions, the LAN has also evolved to allow flexibility and diversity to which users have become accustomed. Treating the LAN as the system means providing a manageable environment with a single-system image. The goal is to ensure that LANs no longer appear as sophisticated, expensive, and complicated products, but are easy to use and manage.

With a single-system image, the end user's Graphical User Interface (GUI) appears to be the first, last, and only interface into the user's entire computing universe. In reality, it may be an integrated piece of a huge worldwide network comprised of thousands of resources. It also means that organizations can manage an entire heterogeneous network as a single entity.

Where It All Begins: The Client

Fundamental to a LAN system of any size is reliable client software that supports multiple hardware and software environments.

For the PC environment, IBM's premier offering is OS/2 running with LAN Server 3.0. For workstations, IBM offers AIX/6000™ with Network File System (NFS®) running on the RISC System/6000® as well as the AIX Distributed Computing Environment (DCE) family. OS/2 and AIX® are both enabled for multiple Network Operating System (NOS) environments to access data across heterogeneous systems including LANs, minicomputers, and mainframe hosts.

OS/2 and AIX both offer the crash-protected, multitasking environments required to support mission-critical applications. With their powerful, highly intuitive GUIs—Presentation Manager® and Workplace Shell™ for OS/2, Motif® and X-Windows for AIX—these strategic platforms are easy

Traditional Business Structures Are Changing

Increased competition, corporate decentralization, and economic pressures are making companies change the way they do business. Filtering decisions through traditional management chains is no longer acceptable. Companies are finding that teams of employees closest to the situation make better, quicker decisions.

Today, empowered teams are replacing the old workplace hierarchy. To make good decisions quickly, these teams need timely, reliable information. To remain competitive, organizations must enable their employees to access and share the ideas, knowledge, and resources they need.

Business Systems Are Also Changing

These changes in the traditional office have resulted in an explosion in the use of LANs and enterprise networks. These networks and a new generation of distributed applications are connecting people to people, workgroups to workgroups, workgroups into the enterprise, and everyone to outside information resources, including small businesses and department workgroups to suppliers and buyers.

With this explosion comes the challenge of determining the best way to enhance or grow your computing environment. Traditional Information Systems (IS) departments still play a major role in the installation of business systems, but end users now have much more influence in defining their computer environments. Companies must consider their existing hardware and software investment. With all the options available in the industry today, choosing the right solution can seem an arduous task.

IBM LAN Systems Can Help

IBM PSP LAN systems bring together the best of the personal computer and mainframe environments to create scalable solutions that are easy to integrate into a business, easy to use, and easy to manage. From the personal computer environment comes the ease of the human/computer interface. And from the mainframe environment comes the ability to deliver products that run mission-critical applications and manage complex tasks and environments.

This approach—along with a commitment to open systems based on industry standards—has enabled IBM to leverage synergy from diversity.

to use and can support highly sophisticated applications.

With OS/2 and AIX, users can continue to use DOS and DOS/Windows applications—but in a crash-protected, multitasking environment.

The LAN is best suited to today's business because it promotes using the best system for each user's needs. IBM supports not only clients that it develops, but all users' clients of choice. Support for DOS and DOS/Windows is outstanding. The LAN

Server for Macintosh extends sharing files and printers to the native-mode Macintosh.

Bringing It All Together

OS/2 LAN Server 3.0 has two versions: Entry and Advanced, with an optional feature that supports Macintosh clients. In addition to the flexibility and scalability offered by this approach, LAN Server provides extremely high performance. In October 1992, LANQuest®—an independent test lab—named LAN Server 3.0 the fastest PC-based LAN server on the market.

LAN Server 3.0 currently supports DOS, DOS/Windows, OS/2, and Macintosh clients, and over 300 types of PCs. In addition, LAN Server and NetWare LANs can now share resources across environments. Combined with the Network Transport Services/2 (NTS/2) enhanced multi-adapter feature, LAN Server 3.0 can support over 1,000 LAN clients on a single LAN server on a single network.

The system composed of LAN Server and its clients can also interoperate with other types of LAN systems. Integrating client requesters, particularly under the transparency of the WorkPlace Shell, allows users to access resources on several LAN systems. This results in a high degree of interoperability between LAN Server and NetWare. In addition, LAN Server and Microsoft LAN Manager systems can interoperate.

Both Entry and Advanced versions of OS/2 LAN Server 3.0 exploit the power of the OS/2 32-bit operating system. Remote installation support provides for the unattended installation of remote requesters and servers. Peer services enables clients to access printers, files, and serial devices on another client on the same LAN. With peer services, users can share directories, printer queues, and communication device queues with other users on the network.

For networks that need higher performance and higher levels of reliability, LAN Server 3.0—Advanced offers High-Performance File System-386 (HPFS-386) support, improved disk fault tolerance (mirroring and duplexing), asymmetrical multiprocessing on the IBM PS/2 Server 295, and local security enhancements.

Network File System is the distributed file system for UNIX[®] supported by AIX/6000. A de facto UNIX standard developed by Sun Microsystems[®], NFS can be used by DOS, DOS/Windows, OS/2, AIX, and VM machines. NFS is widely supported by other vendors.

IBM's High-Availability NFS (HANFS) is a high-availability configuration of RISC System/6000 hardware and software in which one NFS server backs up another server.

Switchovers are transparent to the NFS clients. In addition, the IBM 7051 POWER Network Dataserver system provides industry-leading NFS performance for applications requiring large amounts of online data.

For distributed client file and print support in PC environments, AIX/6000 supports DOS Server/AIX Access for DOS Users (AADU).

LAN Server 3.0 currently supports DOS, DOS/Windows, OS/2, and Macintosh clients, and over 300 types of PCs.

NetWare from IBM is supported on OS/2 and AIX server platforms. It is offered in addition to OS/2 LAN Server and AIX/6000 NFS to fulfill the broadest possible range of user requirements. Although the three products are similar, they are best suited for different situations and remain separate product lines with unique system services, Application Programming Interfaces (APIs), and communication transports.

Connection Flexibility

IBM has designed a blueprint for optimum network flexibility while providing for the most robust connections. The Multi-Protocol Transport Networking (MPTN) architecture provides for communications on almost any network protocol. A variety of network interface cards and cable connection mechanisms that support the Network Device Interface Specification (NDIS) can be used with the MPTN architecture.

IBM provides support for the MPTN blueprint in two product packages:

- **LAN Server with NTS/2:** Provides full support for the MPTN structure. The primary default protocol is NetBIOS. With full support of NDIS, NTS/2 enables LAN Server to support a wide variety of

network interface cards from many suppliers. As a result, users can install and configure adapters without changing their workstations, applications, or networks. This approach provides a future migration path as higher capability, wider bandwidth networks become commonplace for LANs.

- **TCP/IP:** Provides the NFS distributed file mechanism and other classic UNIX connectivity applications. This LAN system provides interoperability between OS/2, DOS, and UNIX-based systems (including AIX) that support open standards such as TCP/IP, NFS, File Transfer Protocol (FTP) TELNET, and X-Windows. TCP/IP is important for users who share data across different software platforms that may, for example, be running on IBM, Hewlett-Packard[®] (HP[®]), or Sun[®] hardware.

Workgroup Computing

Electronic mail and workgroup computing are major elements of any networked PC environment. As the result of a strong partnership with Lotus, IBM's LAN systems and OfficeVision[™] products include Lotus cc:Mail and Lotus Notes[®].

Lotus cc:Mail provides high-end electronic mail capabilities. The cc:Mail product supports DOS, Windows, Macintosh, OS/2 Workplace Shell, and UNIX clients, as well as gateways to PROFS[®], OS/400[®], DEC[®], NetWare's MHS, and many more. This makes cc:Mail the industry's most comprehensive electronic mail and messaging system.

Lotus Notes gives every member of a workgroup—across the hall or across the continent—easy access to information in text, graphics, or images. It also contains a development platform for creating individual and workgroup business applications.

Data You Need, When You Need It

For mobile users, PSP has developed full-function, dial-in/dial-out remote LAN access for LAN Server. IBM LAN Distance enables users with portable systems to connect to a LAN by telephone. This provides transparent access to LAN applications and

services from anywhere in the world. LAN Distance clients supported on both OS/2 and DOS/Windows can access LAN Server, NetWare, and NFS servers. This feature can significantly enhance the efficiency of employees who travel on business and need access to LAN resources and data.

Communicating Among Networks

IBM OS/2 Extended Services, Communications Manager/2, and AIX Systems Network Architecture (SNA) provide connectivity to a variety of IBM and non-IBM host-connected applications. They also support peer-to-peer operations using Advanced Peer-to-Peer Networking (APPN) support.

Easy Access to Host Data

More information is moving to LANs—but valuable information will continue to reside on minicomputers and mainframes. IBM LAN systems products provide access to existing information and applications, whether they reside on a co-worker's desktop, a workgroup server, or a large host system.

For relational data, IBM provides integrated, high-performance multivendor communications and SQL (client and server) database support, while various resource managers provide application enablers. Workstations from LAN Server, AIX, and NetWare environments can create, access, and modify information on LAN or host databases such as DATABASE 2® OS/2 (DB2/2), DATABASE 2/6000 (DB2/6000), DB2®, and third-party databases on workstations and mainframes.

DB2/2 and DB2/6000 are powerful relational database management systems for users in client/server LAN environments. They can run on stand-alone machines or they can be database servers on a LAN. Their newly enhanced DB2 compatibility, remote systems administration, and other features improve both reliability and system management. DB2/2 and DB2/6000 are open database platforms supporting industry standards.

For organizations with databases in both LAN and host environments, IBM offers Distributed Database Connection Services (DDCS). DDCS/2 for OS/2 and DDCS/6000 for the RISC System/6000 support the Distributed Relational Database Architecture™ (DRDA™) used in all IBM relational database products as well as those from several other vendors. DDCS allows developers to write applications that connect to, access, and update host databases from DOS, DOS/Windows, OS/2, and AIX client workstations.

Organizations that use LAN Server or NetWare and want to access data on host systems can take advantage of IBM's LANRES/VM, LAN/MVS, or Workstation LAN File Services (WLFS) for shared file access. For backing up host systems from LAN Server, NetWare, and other systems, Data Facility Distributed Storage Manager (DFDSM) can be used.

System Management

System and network management is one of the biggest challenges in a networked

environment. How can changes be handled efficiently? What is the best way to manage the assets that are distributed in large numbers in locations far and wide? How are the LANs analyzed and supported remotely? How can heterogeneous systems and tools be integrated into a single management environment that makes sense? And finally, how can the needs of both IS departments and end users be satisfied? IS wants reliability, security, and the ability to meet user needs in a planned and controlled way. End users want the freedom to access data anywhere, anytime.

IBM's strategy for distributed system management is to solve the business issues associated with managing changes, configuration problems, software distribution, and assets. As shown in Figure 1, IBM is delivering a distributed systems management family, called LAN NetView®, to address the problems of distributing information and data that will satisfy both IS and end users.

LAN NetView

The LAN NetView family provides industry-standard interfaces to network management protocols such as X/Open™ Management Protocol (XMP), Simple Network Management Protocol (SNMP), and Common Management Information Protocol (CMIP). IBM and other vendors will build on this family with system management applications that support a variety of management functions across different types of clients, servers, operating systems, and hardware platforms.



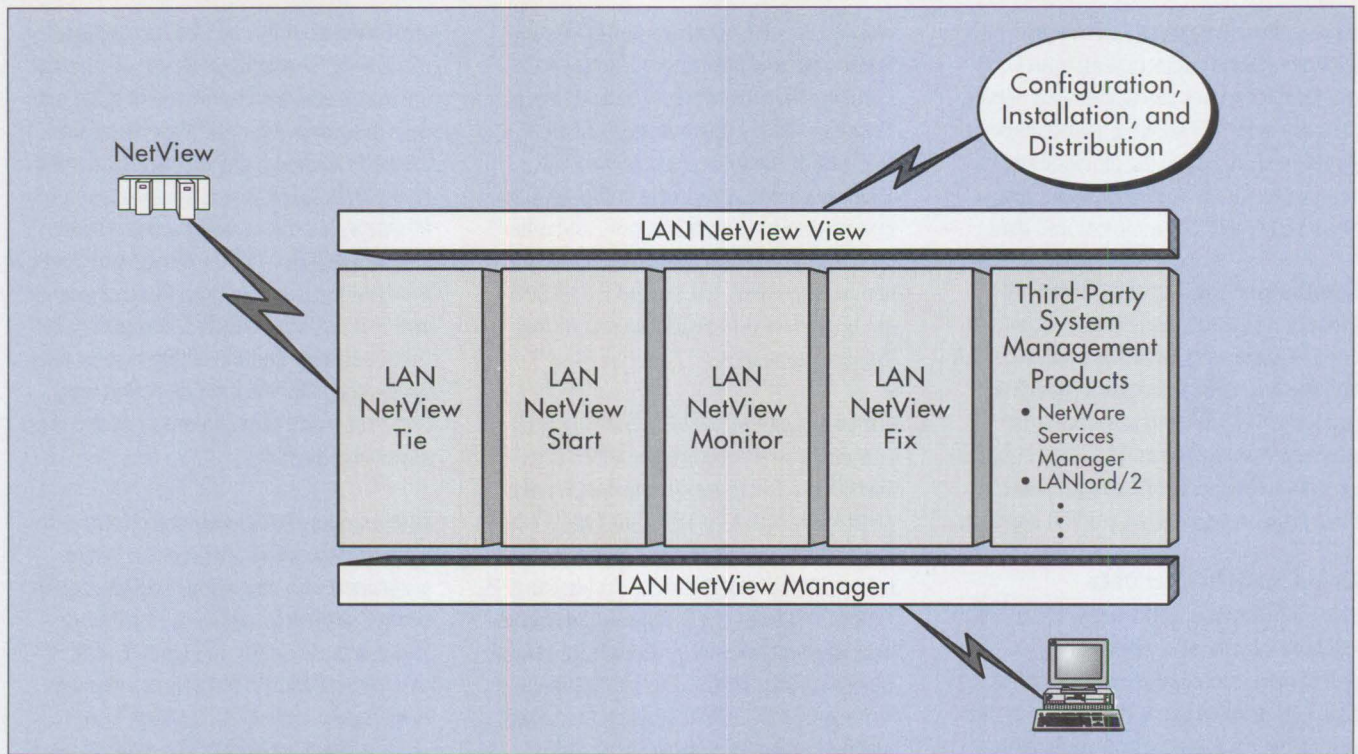


Figure 1. Managing the System

In this environment, customers will be able to easily develop system management applications to address their own unique requirements. Management functions can be centralized, decentralized, or a combination of both. In addition, companies and LAN managers will not need a totally different set of tools for each network component.

LAN NetView View

LAN NetView View is a graphical interface that enables system management tools to be written with a consistent "look and feel," so a company's entire system management application suite can be viewed through this single graphical interface.

Configuration, Installation, and Distribution

To reduce costs and simplify LAN administration, IBM products support automated Configuration, Installation, and Distribution (CID) for clients and servers. Desktop operating systems, communications managers, databases, and the user's choice of applications can be distributed, installed, and managed by the system automatically. Human intervention is eliminated because CID functions are handled over the network.

CID can be further enhanced when the LAN is connected to an IBM MVS host. Using NetView Distribution Manager (NetView DM) on the host, software can be sent to servers on many LANs located worldwide. Using NetView Distribution Manager/2 (NetView DM/2), these remote servers can then customize the installation of both clients and servers on the LAN. They can also quickly distribute code fixes to both vendor- and customer-developed programs.

AIX NetView/6000

AIX NetView/6000 is an open network management platform for multivendor TCP/IP networks. It provides device management including SNMP agent support and Internet Protocol- (IP-) addressable device monitoring. AIX NetView/6000 also provides interfaces to XMP and CMIP, industry-standard network management protocols.

NetView/6000 features a graphical, object-oriented user interface built on Motif and X-Windows that displays the network on top of pictures such as maps, buildings, or devices. It also maintains a dynamic view of the network topology.

Cooperative network management is also available from System/390® NetView. Together, System/390 NetView and NetView/6000 provide hierarchical management for large networks with mixed SNA and TCP/IP protocols.

NetView Entry

NetView Entry, an entry version of NetView/6000, manages TCP/IP networks with a maximum of 32 nodes. In small TCP/IP networks, NetView Entry operates as a stand-alone distributed manager.

Open Systems

In response to customer demand, much of the computer industry has shifted from proprietary technology to open systems. While everyone agrees that this shift is necessary, the definition of "open" is being debated.

IBM PSP's approach to building open systems is based on the following characteristics of open environments:

- Applications and data can be moved from one vendor's computer system to a different vendor's computer system.

- Computing systems and products from different vendors can work together to form an application solution.
- Standards are complied with, whether set by standards-making bodies, de facto industry standards, or common specifications/technology endorsed by the industry.

PSP's approach is to combine industry standards with existing de facto standards. Where standards do not exist, PSP will add its own specifications and technologies, working closely with industry standards bodies and consortia to gain industry acceptance and support.

Distributed Computing

Distributed computing is much more than the simple file and print sharing being done on most LANs today. In a distributed environment, a set of workstations, personal computers, and programs appear to the user as a single system. Individual programs can run on multiple computers simultaneously, thus taking advantage of the different types of processing power available across a network. As shown at the recent "Challenge '93" sponsored by the Open Software Foundation® (OSF®), users can run programs that appear to reside on a local system, but are actually executing on several remote systems.

Imagine writing a distributed application in half the time it takes today—one that is also higher quality, 40% smaller, and significantly less expensive to maintain because the code has already been tested. Too good to be true? No—that is the significance of distributed computing technology and services for application developers. IBM provides the infrastructure (multiple protocol support, gateways to other networks, and so on) required for a distributed environment, so application developers can focus on the application functionality. Applications for databases, mail, system management, and Online Transaction Processing (OLTP) can all be written to take advantage of a distributed environment.

The Distributed Computing Environment

IBM has selected the Distributed Computing Environment (DCE) from OSF as

fundamental technology for common services supporting application development and interoperability. Using DCE technology, application developers can write distributed, network-optimized applications without having to write vendor- or network-specific code—significantly increasing the portability of applications across different vendors' hardware and software platforms.

IBM currently intends to support DCE on AIX/6000, OS/2, OS/400, AIX/ESA, MVS/ESA, and VM.

DCE facilities have key functions such as Remote Procedure Calls (RPC), network time management, security, distributed file system, and distributed directory services. DCE provides a coherent, integrated environment for developing and managing distributed applications in an open enterprise; an application implementing DCE can be distributed across multiple systems composed of both IBM and non-IBM hardware.

To continue our position of providing the broadest coverage in the industry, IBM currently intends to support DCE on AIX/6000, OS/2, OS/400, AIX/ESA®, MVS/ESA®, and VM. Other vendors, such as HP and Digital Equipment Corporation, also offer DCE support within their product lines. Today, IBM's DCE technology is available on AIX, with beta versions available for OS/2 and MVS. Figure 2 depicts IBM's current DCE solutions. Planned enhancements are shown later in Figure 4.

Remote Procedure Call

Application developers using Remote Procedure Call (RPC) can create programs that are portable and interoperable across multiple hardware and software platforms. In a distributed computing environment, RPC enables multiple computers on a network to process the work. Work is handed off from one computer to another by an application program executing a familiar

programming construct—a procedure call. The RPC programming construct extends the call/return mechanism from a single system to network capability.

Distributed Directory Services

Distributed directories enable people and programs to identify the resources (such as files, printers, and programs) they need across a global network. Using accepted industry naming standards (such as the X.500 worldwide directory service and the X/Open directory service programming interface), the OSF DCE Directory Service ensures that resources are known through location-independent names. The DCE Directory Service is accessed via the RPC communications programming interface.

Security Services

Users are placing more valuable information on LANs. This makes security a growing issue for both end users and LAN administrators. Because most LAN systems control password access on a per-server basis, each user can have several passwords. As LANs get larger and users begin to access more resources, securing these simple systems becomes increasingly difficult.

IBM will enhance security through a combination of passwords and privilege assignments that enables a single user logon to access all system resources. This eliminates the need for a user to have multiple passwords for multiple servers—or even for a single system. It also reduces administrator workload and cost, since each user has a single profile on the entire system, not one profile per server.

The technology to ensure security will be the Kerberos® authentication service developed by the Massachusetts Institute of Technology's Project Athena. It is an excellent solution for networks where resources, applications, and user profiles keep changing.

Distributed File System

OSF's Distributed File System (DFS) extends the operating system's file system by taking advantage of DCE's global directory and security services, providing a secure, enterprise-wide view of the file system. File

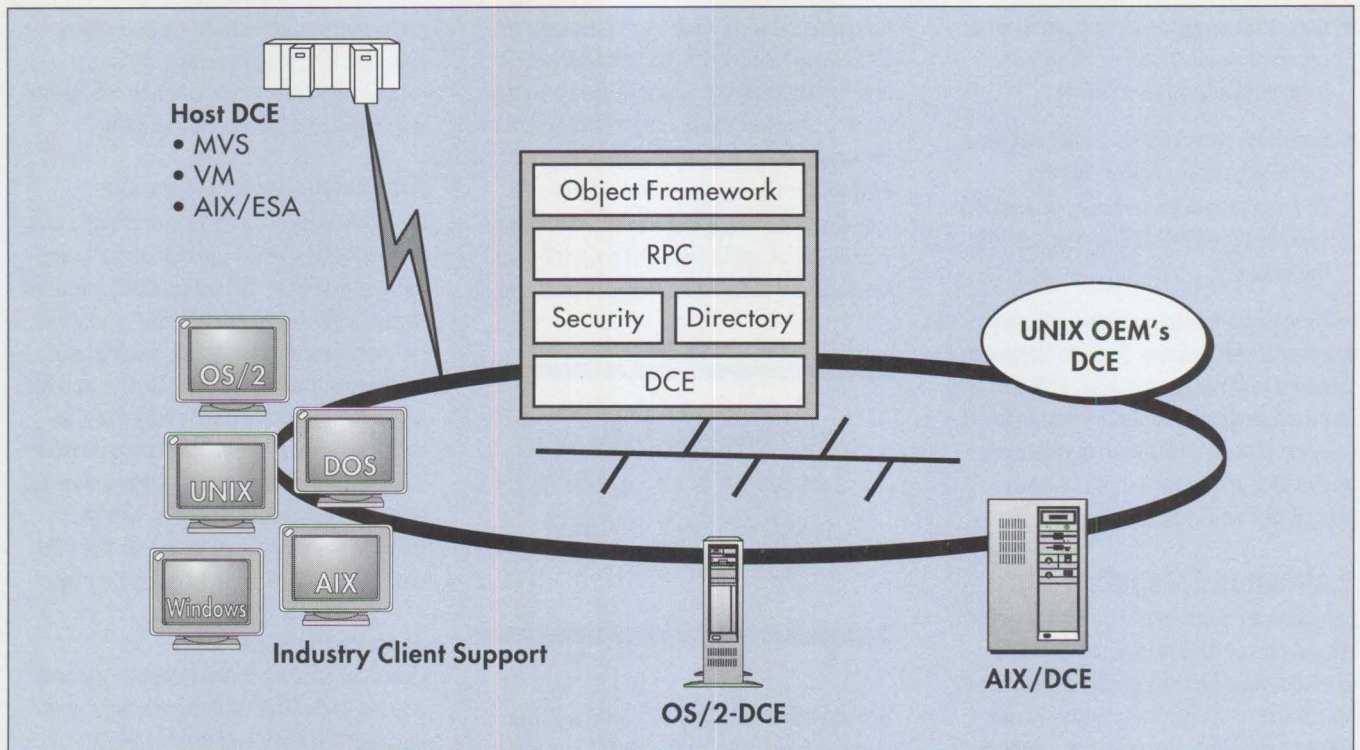


Figure 2. IBM's Current DCE Solutions

replication and cloning maximize timely, usable access to data. DFS also ensures file integrity, thus enabling developers to create data location-independent applications.

Online Transaction Processing

To enhance the core DCE services (RPC, Security, Time, Directory, and DFS), IBM has included additional functions in OLTP. Because the next generation of distributed applications will be used in real-time systems, IBM has incorporated transaction management services into DCE. Both Encina[®] (from Transarc[®] Corporation) and CICS are offered to allow distributed application transactions across a network of heterogeneous systems. They maintain data integrity if a system or network fails at any point during a transaction.

Encina monitors basic distributed transaction processes, including transactional RPC, structured file system for indexed data access, and two-phase commit. With Encina, developers can create distributed transaction processing applications that ensure data is changed only when the complete transaction is successfully processed.

Another option is CICS. CICS-OS/2 and CICS/6000 make it easy to port mainframe

applications to workstations. The CICS family API is supported for both COBOL and C languages. Both mainframe and LAN connections are supported.

Today's Solutions— Breadth and Choice

No one in the computer industry provides the breadth of solutions nor the interoperability across hardware and software boundaries that IBM does. This is important to many organizations that must deal with an installed base of hardware and software. For example, suppose you have one department with a mix of personal computers and software that includes DOS/Windows, Macintosh, and OS/2 computers attached to a NetWare LAN. Another department may perform intensive graphic design using UNIX workstations. You keep data for both departments on a remote server and require the data to be current at all times. Finally, you update the information on a host at a headquarters location every quarter. To support this scenario, you could take advantage of the products shown in Figure 3.

With IBM PSP's approach, if your needs are only a subset of those described, you can choose from these offerings, while

leaving your options open to grow incrementally as your business grows or as your needs change.

Extending Today's Products

While distributed systems technologies are being developed, IBM and others in the industry are already working on new technologies such as objects, distributed objects, multimedia, image, wireless computing, mobile systems, symmetrical multiprocessing, and microkernel-based systems. Using distributed systems as the base, these new technologies are being incorporated into an exciting new computing environment for end users, administrators, and application developers.

IBM PSP's approach to this new environment begins with today's family of distributed LAN system products. IBM is committed to LAN Server and will offer new products built on the current LAN Server 3.0. With IBM's distributed system technology, this family will be extended, as shown in Figure 4, to increasingly insulate end users, administrators, and application developers from the specifics of the network, including connections, protocols, service providers, and hardware. The network will continue to be scalable, enabling users to

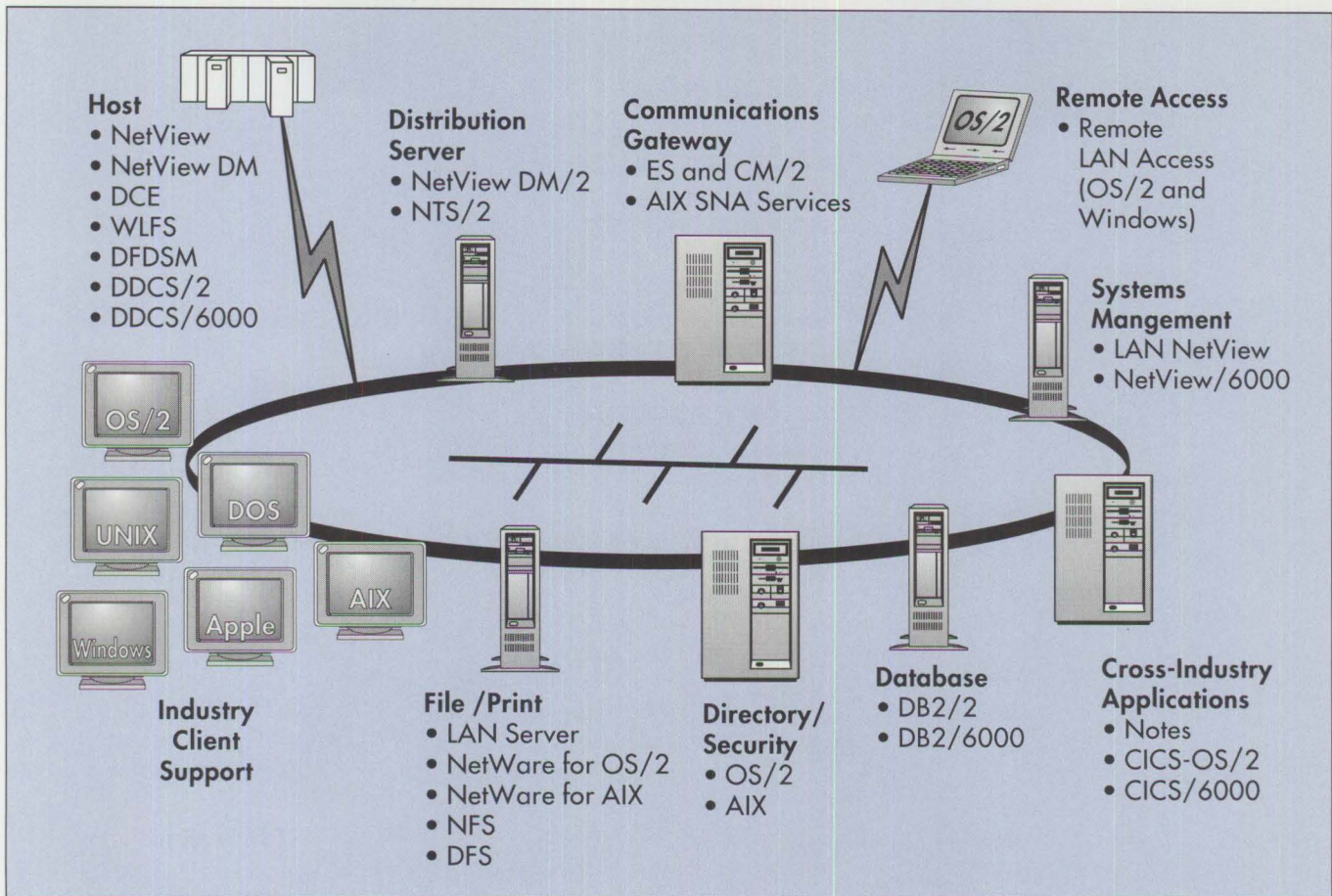


Figure 3. LAN System Solutions

choose product solutions that address current needs while offering the flexibility for system growth. As new technologies, such as objects and distributed objects, are developed and enhanced, PSP will incorporate them into the family to interoperate with current products and provide upward compatibility.

Enhancing Scalability

IBM PSP's approach to scalability enables users to expand their environments by adding—not replacing—products. Each product family member is simply an add-on to the previous level, as shown in Figure 5. The next generation of IBM PSP products will address the requirements of customers of all sizes. At the same time, these products will protect existing investments in hardware, software, and skills, thus enabling growth without the need to migrate or replace.

Entry products will offer a low-cost, load-and-go environment that requires no server

and minimal administration. This product level is designed for organizations that require easy-to-use personal productivity applications. It will support file and print sharing and an electronic mail capability—sometimes called “peer-to-peer” communications—that allows people to collaborate on the same information whether they are in the same room or miles apart.

Workgroup products will offer all the functions of the entry product level plus advanced system management options and additional connectivity. This environment provides a server and is designed for larger organizations needing higher performance, fault-tolerance functions in the server, more rigorous system management capabilities, and more connection choices. It provides a straightforward growth path from the entry product.

Enterprise products will include a set of extensions to the workgroup environment aimed at accessing enterprise data and

integrating workgroups with enterprise applications. This product line will include global directory services, full systems and network management, host information access, and mechanisms to give a single-system image to multiple heterogeneous LAN systems. Global security will be implemented with the OSF DCE Security Service, which specifically addresses the challenges of maintaining security in a distributed environment. In addition to stringent security services, IBM's enterprise products will include a backup/restore capability, access control, and software license management.

Enhancing Application Development

IBM PSP's goal is to make the underlying services of the distributed application environment transparent to end users, administrators, and application developers. We think the best approach to creating this transparency is to develop frameworks incorporating object-oriented technology.

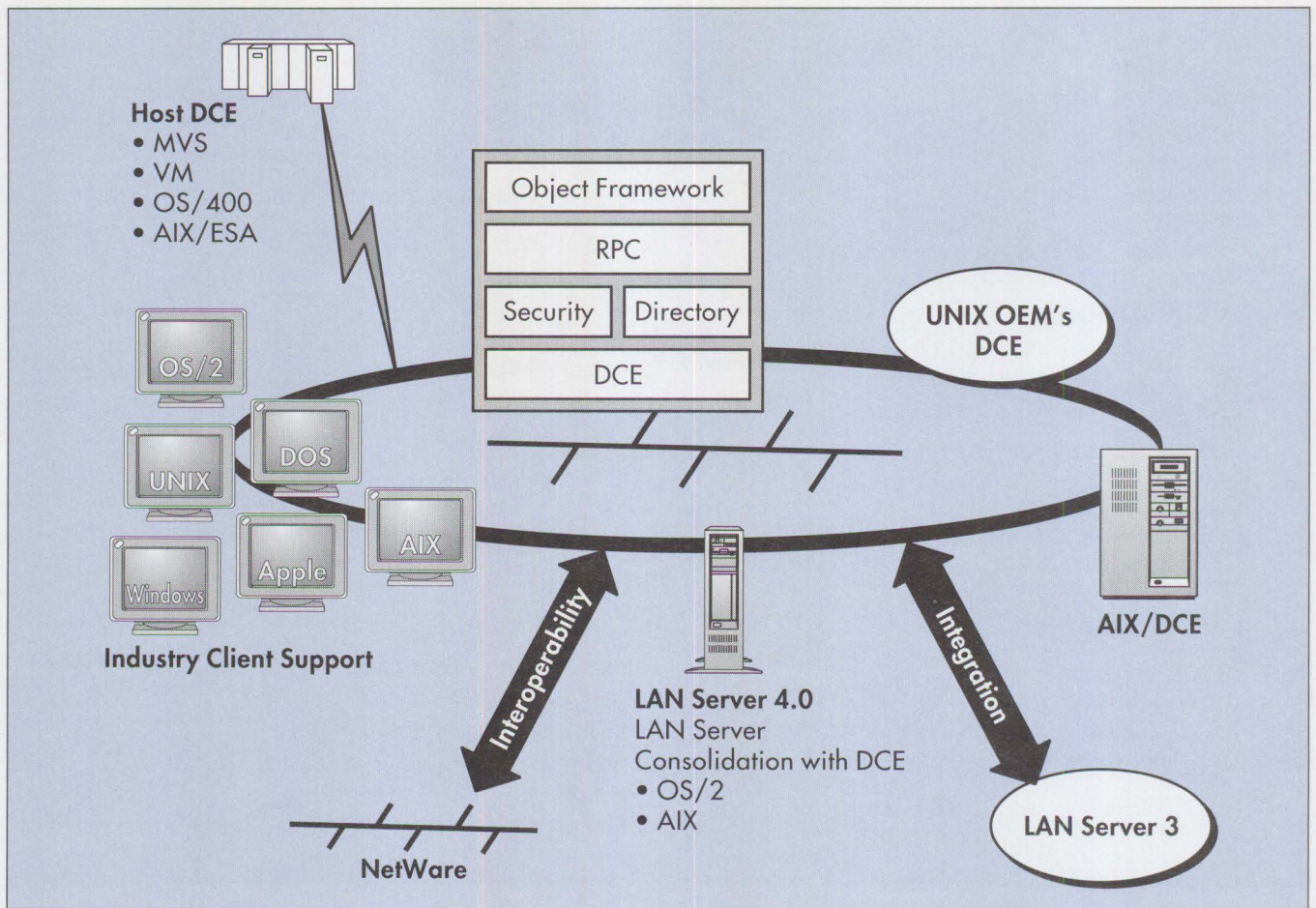


Figure 4. IBM's Planned DCE Enhancements

Object-Oriented Technology

With the magnitude of current industry-wide software backlogs and escalating software maintenance costs, many companies realize that they must shorten their application development cycle to remain competitive. PSP's strategy is to offer products that provide a basis for developing object-oriented distributed programs.

From the end user's perspective, object-oriented technology will make using computers more intuitive. The drag-and-drop capabilities of OS/2 and AIX illustrate how easily end users can manipulate the system in an object-oriented environment. While end users benefit from this easy-to-use, easy-to-learn environment, application developers can work faster because of highly reliable reusable code. Object-oriented technology can significantly benefit an application programmer developing a distributed application because the developer can take advantage of existing

code in the form of objects. An example of an object that could be created for a LAN environment is one that takes a file on a client and prints it on a remotely located printer. As you can see from this simple example, many different types of applications could take advantage of an object that provides this function.

Objects and Object Frameworks

The software industry is expected to evolve rapidly into developing software in modules. Many small, general-purpose software modules will be available as foundations for building larger applications—regardless of hardware platform, operating system, or programming language. This approach will greatly reduce development time, resulting in shorter cycles and lower costs.

Object frameworks are collections of prebuilt objects with established relationships. They offer built-in, easily extendable,

and customizable functions. Object frameworks can be designed for a variety of specific purposes such as system management, transaction processing, compound documents, and graphics. Replication of data across a network is another example. An object framework could contain the objects necessary to create a copy of data, locate the data across the network, and automatically update a file on multiple systems.

Object framework technology has the potential to automate the drudgery of development, lower the bar for entry-level developers, and spark a new cycle of software development creativity as profound as the move from machine languages to high-level languages more than 30 years ago.

Industry Standards for Objects

IBM's object-oriented technology is based on industry-standard Common Object

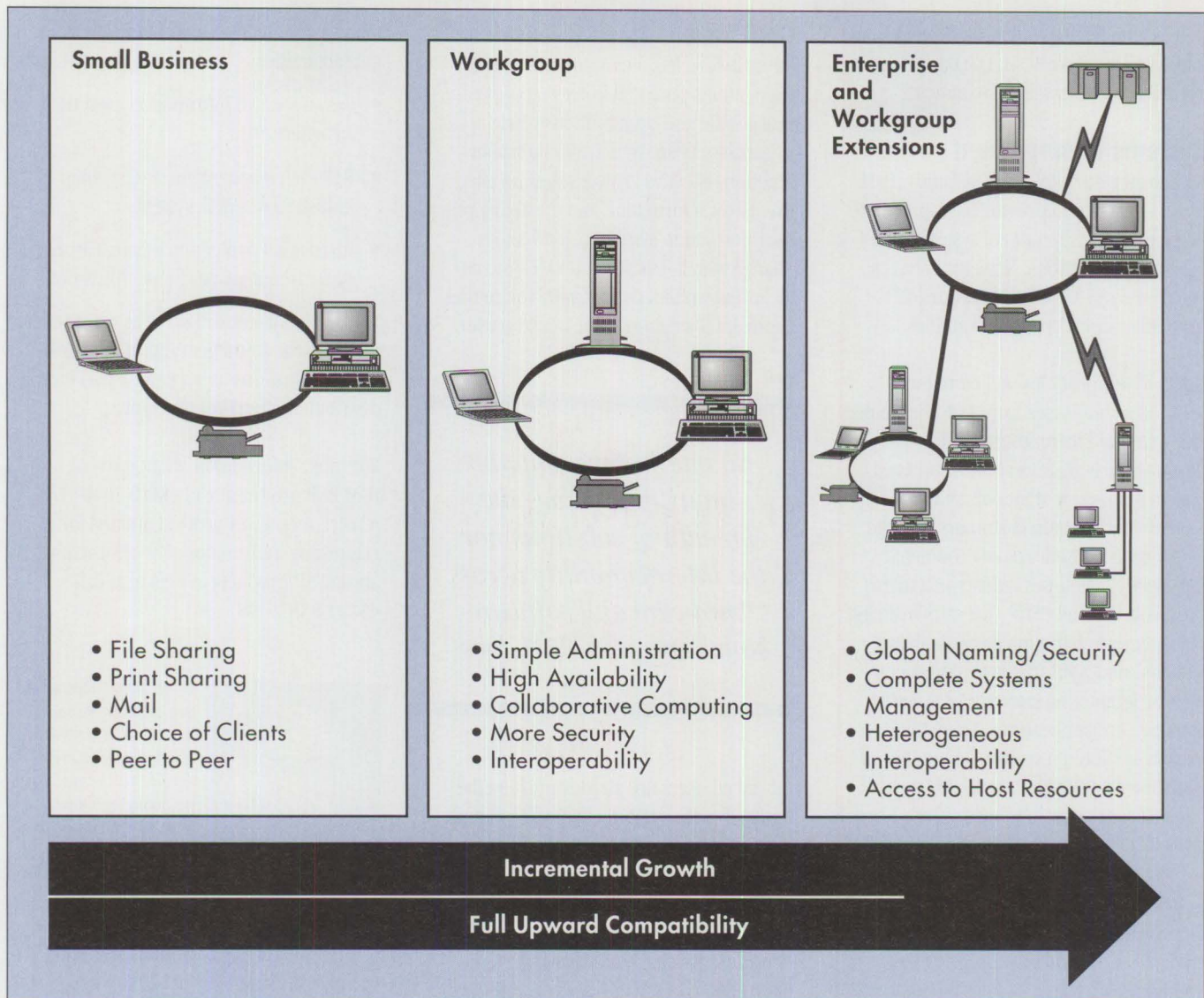


Figure 5. Scalable Solutions

Request Broker Architecture (CORBA) from Object Management Group® (OMG®). The foundation for this technology is IBM's System Object Model (SOM).

System Object Model. IBM's SOM technology for packaging object-oriented class libraries is a language-neutral model for defining object libraries that operate across many computer languages. Many in the industry view SOM as a "universal translator" of applications and objects developed in diverse programming languages. It will be supported on many software platforms, including OS/2, AIX, Windows, MVS, CICS, and AS/400®. SOM technology has broad industry support and is being embraced by OEMs as well as language and tool vendors.

On June 16, 1993, IBM announced the SOMobjects Developer Toolkit, the first complete CORBA-compliant, cross-platform, cross-language object implementation. This object and framework technology will provide flexible, distributed, and portable systems. In addition, IBM, HP, and SunSoft, Inc. announced plans to work together to enable software portability across the companies' object-oriented software platforms using standards set forth by OMG.

The close affinity between the principles of distributed computing and those of objects leads us to believe that the best approach to enhancing application development is based on objects. The significant investment in education and development to produce

truly distributed applications can be reduced by marrying the two technologies. Developers can simply use distributed objects and let the underlying distributed system services manage the communications completely.

Distributed SOM (DSOM). DSOM is planned to support transparent remote access to objects in a distributed environment. DSOM supports the full object-oriented programming paradigm through distributed computing facilities such as Sockets and DCE. It is based on the SOM currently available for OS/2 and provides language-, network-, and platform-independent access to distributed objects. This technology is being developed together with standards organizations as

well as with leading industry language and tools vendors. Like SOM, DSOM will support multiple software environments.

Systems Management

To enhance our LAN NetView family, IBM is working with other industry suppliers to encourage development of systems management applications. NetWare Services Manager from Novell and LANlord/2[®] from Microcom[®] are two examples.

LAN NetView products will combine selected technologies from OSF Distributed Management Environment (DME), X/Open, the Open Systems Interconnection (OSI) System Management Model, and IBM SystemView[®] to help customers manage heterogeneous network environments. LAN NetView includes industry-standard protocols such as CMIP (for standardizing management communications between systems) and XMP (for providing a common programming interface) for system management applications. Using these protocols should increase the number of distributed applications available by making it easier to develop powerful applications that will appeal to a variety of users.

Transport Technology

To provide application transparency, IBM PSP is developing and supporting programming interfaces such as the industry-standard Sockets and X/Open's transport interface.

The Sockets interface, first introduced in UNIX, has become a de facto industry-standard API for communications. With this interface, users and their existing applications can operate consistently and transparently across multiple network environments, including TCP/IP, NetBIOS, IPX, OSI, and SNA. In addition, a single network adapter card can be used with multiple protocols—meaning that with one network adapter, end users can participate in LAN Server, NetWare, and TCP/IP networks simultaneously and transparently. These future developments will be achieved with the MPTN blueprint.

Conclusion

Never before has technology held such tremendous potential for reshaping the way people and organizations work. Regardless of an organization's size or function, effective growth relies on effective use of information and the ability of the information system to grow and change with it. Distributed LAN systems technology offers the potential for getting needed information to the desktop user.

No one in the computer industry provides the breadth of solutions nor the interoperability across hardware and software boundaries that IBM does.

Advanced users are already pushing the limits of today's LAN technologies. Simple resource sharing is giving way to distributed applications. Single LANs connecting multiple users have grown into multiple LANs connecting multiple workgroups. Mission-critical applications that were once locked in the domain of the centralized host/terminal environment are being "rightsized" to LANs. The environment that now accommodates OS/2, NetWare, Macintosh, DOS, DOS/Windows, and AIX will soon stretch to accommodate even greater heterogeneity.

IBM's current set of LAN systems products enables any small business or large organization to develop an effective workgroup computing environment today. IBM is also delivering a stream of new offerings for tomorrow, many of which are now being tested by customers.

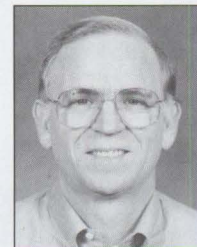
To ensure that LANs are easy to use, manage, and integrate into your business, IBM PSP's strategy is to provide an open,

manageable LAN environment with these characteristics:

- Easy access to information anytime, anywhere
- Reliable, manageable, and secure industrial-strength systems
- Investment protection through scalable systems that grow with your business

This environment will serve as an excellent platform for a new generation of distributed applications and a launch pad for the distributed objects of the future.

For more information about current IBM PSP products, call (800) IBM-4FAX. A voice menu will provide options for requesting information. For information about PSP products in beta test, call (512) 838-2098.



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Fort Lauderdale, Florida.

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An Introduction to PCMCIA

This article provides an overview of the PCMCIA standards for hardware and software. Originally designed as memory cards for portable systems only, PCMCIA cards now offer a wide array of memory and I/O functions on every major manufacturer's mobile system. In 1993, IBM began shipping Socket Services with its PCMCIA systems and Card Services in OS/2 2.1 and DOS 6.1. With the PS/2 E, IBM extended the PCMCIA standards from the mobile arena to the desktop.

Personal Computer Memory Card International Association (PCMCIA) standards encompass everything from card dimensions to system hardware and software—providing compatibility across different vendor systems, operating systems, and PC cards. The standards are designed to provide a level of usability and compatibility that is unsurpassed, opening a new range of computing opportunities.

Initially designed as a memory-card-only architecture, the PCMCIA standard now includes I/O cards for modems, Token Ring, Ethernet™, 3270, and hard drives. For details on the standard, see “PCMCIA PC Cards Provide Expandability and Network Interfacing” in the July/August 1993 issue of *Personal Systems Technical Solutions*.

A Different Kind of PC Card

Although referred to as PC Cards, PCMCIA cards differ from traditional PC adapter cards in many ways—primarily in their light weight and convenience (see Figure 1). Because their diminutive size approximates a credit card, PC Cards are frequently called credit card adapters.

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Another key difference is that PCMCIA specifies a new expansion bus interface, so PCMCIA cards do not plug directly into the Industry Standard Architecture (ISA) or Micro Channel® bus. The system hardware makes this difference virtually invisible to most software.

Finally—given the right system software—the memory and I/O registers of the PC Card can be mapped into any available address space of the host system. The card can be inserted into or ejected from a PCMCIA system even while powered on. Traditional PC adapter cards lack these capabilities.

No Limitations

Perhaps the most exciting feature of PCMCIA computing is the lack of limitations. Gone is the need to power off the system and remove the cover before inserting a new option card adapter. Gone is the worry about whether the machine has an AT® bus (IBM's version of ISA) or Micro Channel bus. And gone are the limitations of slots and bays. Not using your LAN card at the moment? Simply swap the modem card into its place. No need to worry about configuration—the client drivers will figure it out.

Three Types of PC Cards

The PCMCIA standard currently encompasses three types of PC Cards, all of which adhere to stringent mechanical, electrical, and even labeling characteristics. The Type I standard addresses memory cards; Type II and Type III standards address I/O cards.

Although card thickness varies among the PCMCIA Types, backward compatibility is ensured throughout. A PCMCIA system that accepts Type II cards will also accept a Type I card, and a system that can accommodate a Type III card can accept either two Type II or Type I cards or one of each.

A PCMCIA system must have at least one PCMCIA slot (or socket) into which the PC Card is inserted. It is common to see systems with multiple Type II slots. For example, the IBM ThinkPad 720C has two Type II slots, located one on top of the other, so that one Type III PC Card can be inserted into the two slots.

The PCMCIA System

On the system end of the PCMCIA socket is a specialized chip known as an *adapter*. This chip converts PCMCIA bus signals to those of the target system. In the IBM ThinkPad 720C, the chip converts the PCMCIA bus to the Micro Channel bus. Similarly, in the ThinkPad 710T, the chip converts the PCMCIA bus to AT-bus signals.

Socket Services fields interrupts from the adapter chip and provides a generalized programming interface to the adapter. Similar to a BIOS, Socket Services is adapter-specific. For example, while the ThinkPad 720C and the ThinkPad 710T have different implementations of Socket Services, the Application Programming Interface (API) remains the same. One version understands the AT-bus adapter in the IBM ThinkPad 710T; the other understands the

Micro Channel bus adapter in the IBM ThinkPad 720C.

Because of its BIOS nature and the system hardware, Socket Services usually ships with the system. It detects events such as a card being inserted into or ejected from the system, and reports these events to Card Services.

Card Services provides a client/server-model API in which Card Services acts as the server and card drivers act as clients. PC Card drivers register as Card Services clients to configure and manage the PC Card via Card Services. Through Card Services, a PC Card client driver can be notified of events such as a card being inserted or ejected.

Although the Card Services API itself is operating system independent, it is implemented as part of OS/2 2.1 and DOS 6.1 (see Figure 2). OS/2 client drivers, such as those for I/O PC Cards, must be provided by the PC Card manufacturer.

PCMCIA: The Future

PCMCIA standards are still evolving. Subcommittees are currently working on proposals for 32-bit busmaster PC Cards, storing and loading PC Card clients from PC Cards, and even Execute In Place (XIP), in which client drivers execute from PC Card memory instead of system memory.

With operating systems such as OS/2 2.1 providing the critical Card Services function, developers have a powerful platform on which to employ the power of PCMCIA—now and in the future.

Related Reading

PCMCIA Standards. Available from PCMCIA, 1030G East Duane Avenue, Sunnyvale, CA 94086. (408) 720-0107.



Dana L. Beatty is a staff programmer in IBM's Location Independent Subsystems department in Boca Raton, Florida. Dana was the lead programmer on the IBM PCMCIA Data/Fax Modem products, the first IBM products to

ship DOS and OS/2 PCMCIA client drivers. She received a BA in computer science from the University of Texas at Austin.



Figure 1. The IBM PCMCIA High-Speed Data/Fax Modem

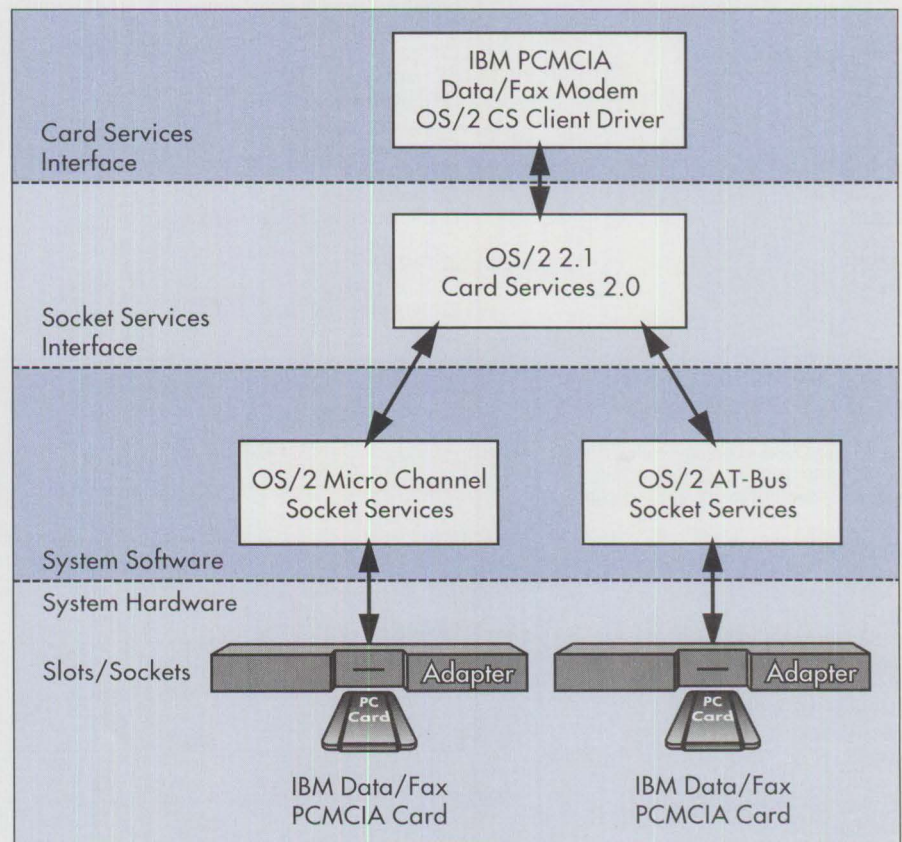


Figure 2. PCMCIA Architectural Standards

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 SCO Unix/Xenix
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 A/UX
 HP/UX
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 PC/MS-DOS
 OS/2
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 Windows
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4. The number of employees at your location:
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 400-999 1,000-1,999 Over 2,000
5. The number of employees company wide:
 1-99 100-199 200-399
 400-999 1,000-1,999 Over 2,000
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PCMCIA Software: The Key to Compatibility

The four software components defined by PCMCIA 2.0 are integral to the specification's usability and compatibility. This article explains these software layers and how they work together. For an introduction to PCMCIA cards and standards, see "An Introduction to PCMCIA" in this issue.

Four key software components are defined in the Personal Computer Memory Card International Association (PCMCIA) standard: Card Services, a resource manager, client drivers, and Socket Services. Each layer performs a specific function, and they all work together to ensure the highest level of compatibility. Figure 1 shows an overview of these architectural layers.

Early Days of PCMCIA

Today, PCMCIA standards include a wide array of memory and I/O cards for every major manufacturer's mobile system. But when the standard first appeared, few systems were capable of accepting PC cards, and the only cards available were memory and data-only modem cards.

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To support these two card types, most system vendors provided a setup utility that statically configured the system's PCMCIA slot.

Unwieldy Usability

This setup utility had several problems. First, the PCMCIA slot could be set to accept only one card type at a time. For example, if the system slot was set for a modem card and the user wanted to insert a memory card, the user had to eject the modem

card, rerun the setup program to configure the slot for the memory card, then reboot the system.

This approach also required *cold insertion*; that is, the PCMCIA card had to be inserted before the system was turned on and ejected only after power was



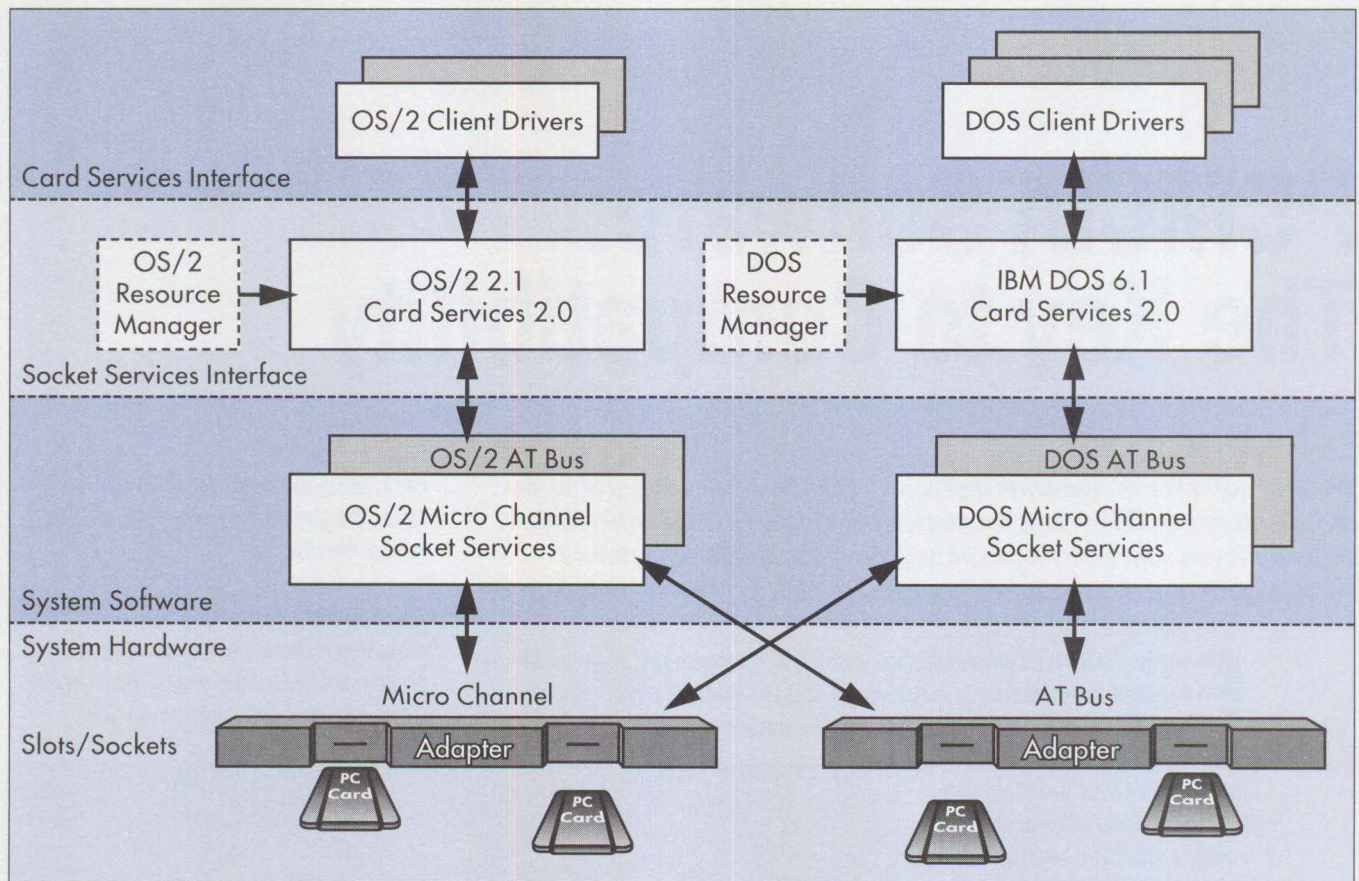


Figure 1. PCMCIA 2.0 Standards Architectural Overview

turned off. (To illustrate just how inconvenient this was, imagine having to power down your PC every time you insert or eject a floppy diskette.) The PCMCIA standard allows *hot insertion*—the PCMCIA card can be plugged into the system while it is running. Because the necessary supporting software for hot insertion was not available at the time, system vendors opted for the unwieldy setup utility approach (the PCMCIA organization was founded in 1989, but the Card Services specification was not approved until September 1992).

This also meant that cards would not readily operate from one system to another. As additional PCMCIA cards (such as Token-Ring, Ethernet, and 3270) became available, the utility became outdated, and the task of supporting new cards on these systems became much more complex. Another problem was that cards would not readily operate from one system to another. To support new cards on older systems, a PCMCIA programmer often had to write a separate client driver for each system

while worrying about the driver coexisting with other client drivers written by other programmers. Maintaining these drivers and keeping up with new systems was a constant chore. The environment was ripe for confusion and disorder.

Enter Card Services

Today, PCMCIA developers must still write a client driver—but Card Services makes this job much easier. It also resolves the problems that existed with the previous approach to PCMCIA support. Card Services eliminates the need for platform-specific client drivers if the target PCMCIA system contains the PCMCIA software components outlined in the Release 2.0 standard. Figure 2 depicts the software evolution toward PCMCIA card compatibility across systems.

Card Services is an Application Programming Interface (API) responsible for coordinating resources among multiple client drivers. It is dependent on the underlying Socket Services layer that interfaces to the system hardware. Although the API is

operating system independent, the actual Card Services implementation is operating system dependent. In fact, Card Services is often provided as a device driver with the operating system. This means that the set of API functions is the same in DOS as it is in OS/2, but DOS and OS/2 each use a different device driver. Because the API is operating system independent, a programmer can design a DOS and OS/2 client driver to reuse the code interfacing to Card Services.

Card Services is implemented in a client/server model. Client drivers make requests for resources such as an Interrupt Request (IRQ) level, and Card Services acts as the server, allocating resources in response to these requests. To track resource availability, Card Services maintains a resource map, sometimes with the help of a resource manager.

Resource Manager

The resource manager's job is to determine the resources already claimed in the

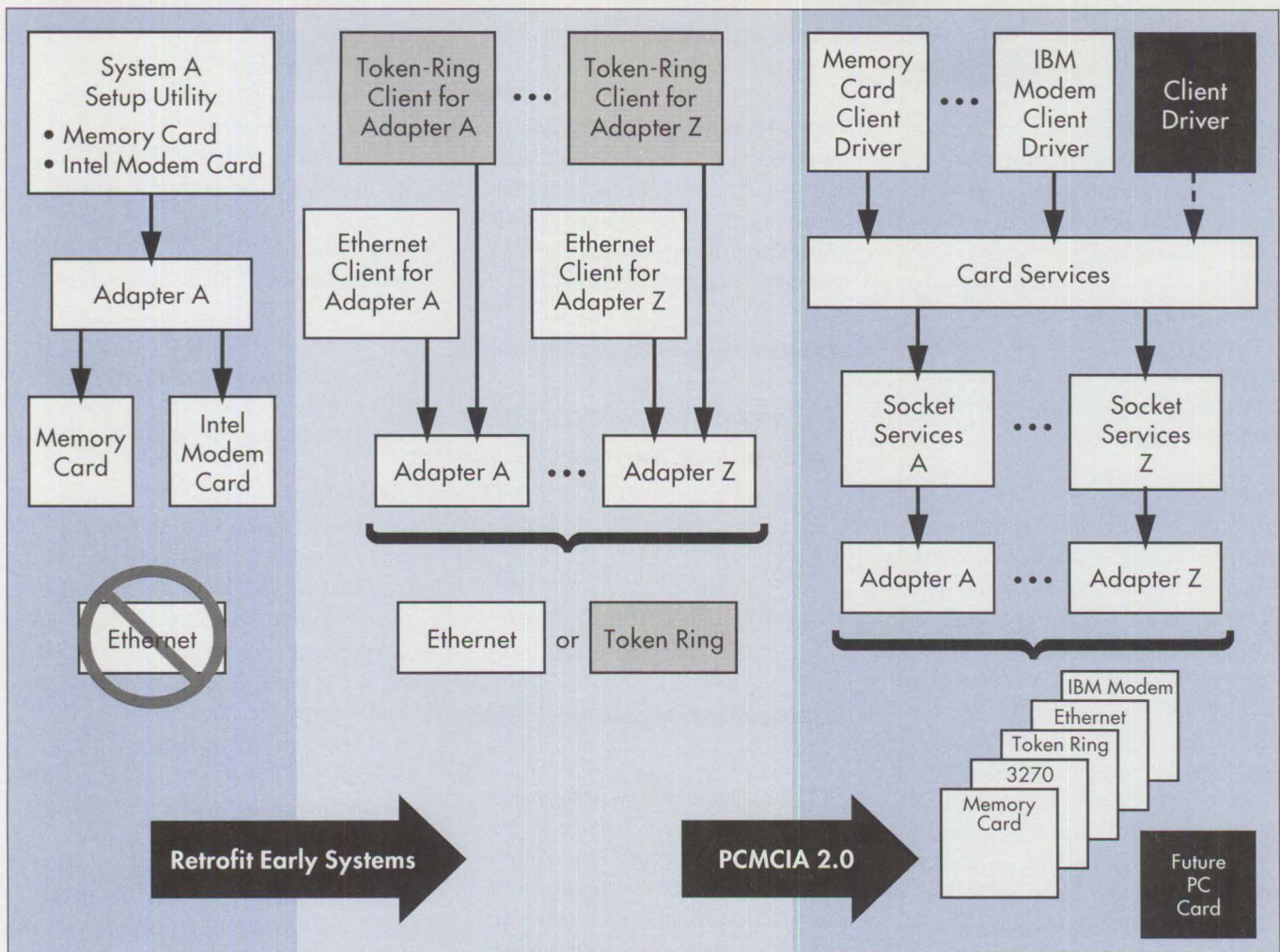


Figure 2. Evolution of PCMCIA Compatibility

system, register those resources (IRQs, system memory, and I/O address space) with Card Services, then de-install itself. Card Services then marks those resources in its resource map as "in use." When a client driver requests a particular resource, Card Services checks the resource map and either grants or rejects the request based on availability.

A resource manager can be implemented in two ways: as a utility entirely within Card Services or as part of the operating system (so that Card Services requests resources from the operating system on behalf of the client). Today, many Card Services providers have chosen to implement the resource manager as a utility or device driver that loads after Card and Socket Services, but before any other Card Services clients.

Resource Allocation: Then and Now

If a system has a planar serial port that has been allocated the resources¹ for COM1, Card Services will reject a client requesting these same resources. This scenario illustrates key Card Services functions: allocating resources among multiple client drivers and dynamically returning resources to the pool.

Previously, setup utilities tied up resources during the entire time the system was powered up, regardless of associated hardware activity. With the planar serial port, the COM1 resources would have been permanently assigned, regardless of whether that port was ever active. Properly designed PCMCIA client drivers will acquire resources only when their card is inserted and release them only when their card is

ejected. This exemplifies a powerful feature of PCMCIA: conservation of resources.

Client Drivers

A *client driver* is a PCMCIA card-specific program that understands how to configure and manage the needs of particular cards or card types. For example, a memory-card client driver can manage memory cards from different manufacturers, while a modem client driver can manage only a specific vendor's PCMCIA modem card.

A PCMCIA card program registers as a client of Card Services. In DOS, client drivers can be implemented as Terminate-and-Stay-Resident (TSR) programs or as device drivers. In OS/2, the client driver must be written as a device driver. Client drivers are event-driven, as described later

¹ On AT-bus systems, these are typically base addresses x'03F8' and IRQ4.

in this article, and they make requests of Card Services based on a chain of events.

When a driver registers as a Card Services client, it specifies a set of events that it will monitor, such as card insertion and card ejection. Socket Services, because of its direct involvement with the hardware, is the first to capture an event. It reports the event to Card Services, which in turn notifies registered clients of the event via its callback handler. Events become the communication mechanism between Card Services and its clients.

An Insertion Event

An interrupt occurs when a PCMCIA card is inserted into the system socket. Socket Services detects this interrupt and notifies Card Services that a PCMCIA card was inserted. Card Services identifies which clients are monitoring this event and notifies them through the callback handler routine. The client then determines which event caused this notification. For a card insertion, each client driver interrogates the card via Card Services to determine if the card belongs to the client driver. If it does, the client driver makes subsequent requests of Card Services to claim the resources necessary to configure that card. A client can either request specific resources or allow Card Services to assign an available resource.

Requesting Resources

A PCMCIA modem client driver requests specific resources to ensure that standard communication and fax applications will operate correctly. For example, the modem client driver can request a base address and an IRQ level that correspond specifically to those currently architected for COM2. As a result, an application looking for COM2 will find the PCMCIA modem mapped there. The application will use

this new modem without modifying its code.

Card Services will allocate the COM2 resources to a client driver only if they are not in use. For example, if the planar serial port has already claimed them, the client driver can then request alternate resources (perhaps COM3 or COM4).

Client drivers are the keys that unlock the doors to the open system. IBM PCMCIA cards, such as the Data/Fax Modem, Token-Ring, and Ethernet, provide client driver support.

Once the client driver has configured the card, it returns to its dormant state and waits for another event. It can receive another insertion event if the system has more than one PCMCIA socket, or it can receive an ejection event, indicating that the user has removed a card from the system. The result is a sequence of events similar to those described earlier; however, the client driver will return the resources it had claimed to Card Services.

Socket Services

Like Card Services, Socket Services is an API. It is the lowest layer of the PCMCIA software standard. Socket Services manages the system hardware that controls the actual PCMCIA slot or socket. It performs tasks such as detecting that a PCMCIA card has been inserted or ejected from the socket.

The hardware that interfaces to a PCMCIA slot has a chip known as an *adapter*. Besides generating an interrupt when a PCMCIA card is inserted, this chip is responsible for mapping the PCMCIA bus to the system's bus (such as an AT bus). Because a Micro Channel system has a different adapter from an AT-bus system, Socket Services on these systems will vary.

Because Socket Services is so closely tied to the system, it can be shipped with the system either as a device driver with the operating system or in the system's BIOS.

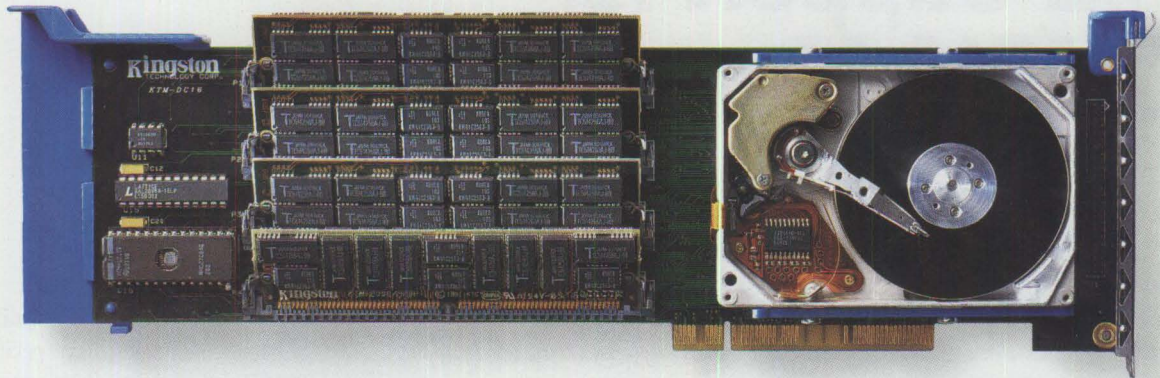
Summary

The PCMCIA Release 2.0 standard is a giant step toward making PCMCIA compatibility a reality and unleashing the full power of this new technology. With operating systems (such as IBM DOS 6.1 and OS/2 2.1) providing Card Services support and major system vendors (such as IBM and NEC®) embracing the standards by shipping Socket Services with their systems, an open system foundation has been laid.

Client drivers are the keys that unlock the doors to the open system. IBM PCMCIA cards, such as the Data/Fax Modem, Token-Ring, and Ethernet, provide client driver support. Now, other PCMCIA card manufacturers must take the next step by writing the required client drivers for their cards.



Dana L. Beatty is a staff programmer in IBM's Location Independent Subsystems department in Boca Raton, Florida. Dana was the lead programmer on the IBM PCMCIA Data/Fax Modem products, the first IBM products to ship with DOS and OS/2 PCMCIA client drivers. She received a BA in computer science from the University of Texas in Austin.



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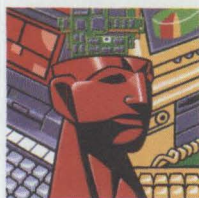
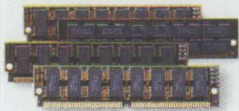


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OS/2 Support for PCMCIA Memory Cards

The OS/2 PCMCIA client device driver supports read, write, and erase operations for all IBM PCMCIA memory cards. This article describes the types of PCMCIA memory cards available from IBM, explains how they work with ICMEM2 device drivers, and provides information on how to obtain these free drivers.

A Personal Computer Memory Card International Association (PCMCIA) memory card, used to store files, is about the size of a credit card and has a 68-pin socket. This memory device is like a floppy diskette that conforms to PCMCIA standards. (For more information about the PCMCIA standard, see "PCMCIA PC Cards Provide Expandability and Network Interfacing" in the July/August 1993 issue of *Personal Systems Technical Solutions*.)

IBM PCMCIA Memory Cards

IBM makes several types of PCMCIA memory cards: Static RAM (SRAM), Flash, and an SRAM/Flash combination. Figure 1 shows the available configurations.

SRAM Cards

SRAM memory supports read and write operations. To retain its data, an SRAM memory card contains a battery and uses ultra-low-power SRAM memory modules that do not require special voltages or algorithms.

Kenneth Ka Wah Ng
IBM Corporation
Toronto, Ontario, Canada

Data retention and reliability for SRAM cards are increased by having primary and secondary batteries. Separate "battery low" and "battery fail" signals indicate the status of the primary battery. The secondary recharge-

able battery allows users to replace the primary battery outside the system without losing data.

Flash Memory Cards

Flash memory cards use low-power, non-volatile Flash memory modules that do not require batteries to maintain the data. Once a byte has been written to a Flash memory location, the location cannot be rewritten without erasing the entire memory chip. The mean time between failures of a Flash memory card can reach 100,000 erase and write cycles.

SRAM/Flash Combination

The Combo memory card uses both non-volatile Flash modules and battery-backed, volatile SRAM memory modules. It is generally used when an application and its data must be on a single card. Since the Combo card uses the same dual-battery design as the SRAM card, this Combo memory can be treated as two partitions of memory on a physical card.

PCMCIA Device Driver Overview

Since PCMCIA Card Services and Socket Services contain machine-specific code, PCMCIA client device drivers are independent of the machine environment. Figure 2 shows an overview of PCMCIA device driver architecture.

Device drivers interface directly with Card Services, which coordinates resources for multiple client drivers. Socket Services manages and controls the actual PCMCIA slot on the system.

Supported PCMCIA Features

Device drivers support the following PCMCIA features:

- **Card insertion and removal events:** When a PCMCIA card is inserted into or removed from a PCMCIA slot, an audible beep notifies the user that a card insertion or removal event has been handled.
- **Write-protect switch:** If a card is protected by a write-protect switch, data cannot be written to the card. Device drivers respond to a write-protect switch if present.
- **GetClientInfo function:** Device drivers support the `GetClientInfo` Application Programming Interface (API) call.

OS/2 ICMEM2 Device Drivers

The OS/2 ICMEM2 device driver package supports read, write, and erase operations for all IBM cards. It includes the `ICMEMCDD.SYS` client device driver and the `ICMEMMTD.SYS` memory technology

driver and supports Industry Standard Architecture (ISA), Extended Industry Standard Architecture (EISA), and Micro Channel bus machines.

ICMEMCDD Client Device Driver

ICMEMCDD.SYS is a standard block device driver supporting the File Allocation Table (FAT) file system on OS/2 2.1. The ICMEMCDD client device driver interfaces with the Card Services PCMCIA.SYS device driver and the OS/2 2.1 kernel. It treats an IBM PCMCIA memory card as if it were an ordinary FAT file diskette.

Device information stored in an IBM PCMCIA memory card must conform to the PCMCIA standard. Currently, the SRAM and Flash device types are accepted; any other value will cause the ICMEMCDD driver to return an error. ICMEMCDD can support up to 16 logical drives.

SRAM	Flash	SRAM/Flash Combo
256 KB	1 MB	512 KB Flash/512 KB SRAM
512 KB	2 MB	1 MB Flash/512 KB SRAM
1 MB	4 MB	1 MB Flash/1 MB SRAM
2 MB		2 MB Flash/1 MB SRAM

Figure 1. IBM PCMCIA Memory Cards

ICMEMCDD.SYS is installed in the same way as any block device driver and can support IBM SRAM, Flash, and SRAM/Flash Combo memory cards under OS/2 2.1. For Flash and Combo cards, the ICMEMMTD.SYS memory technology driver is required to access Flash memory.

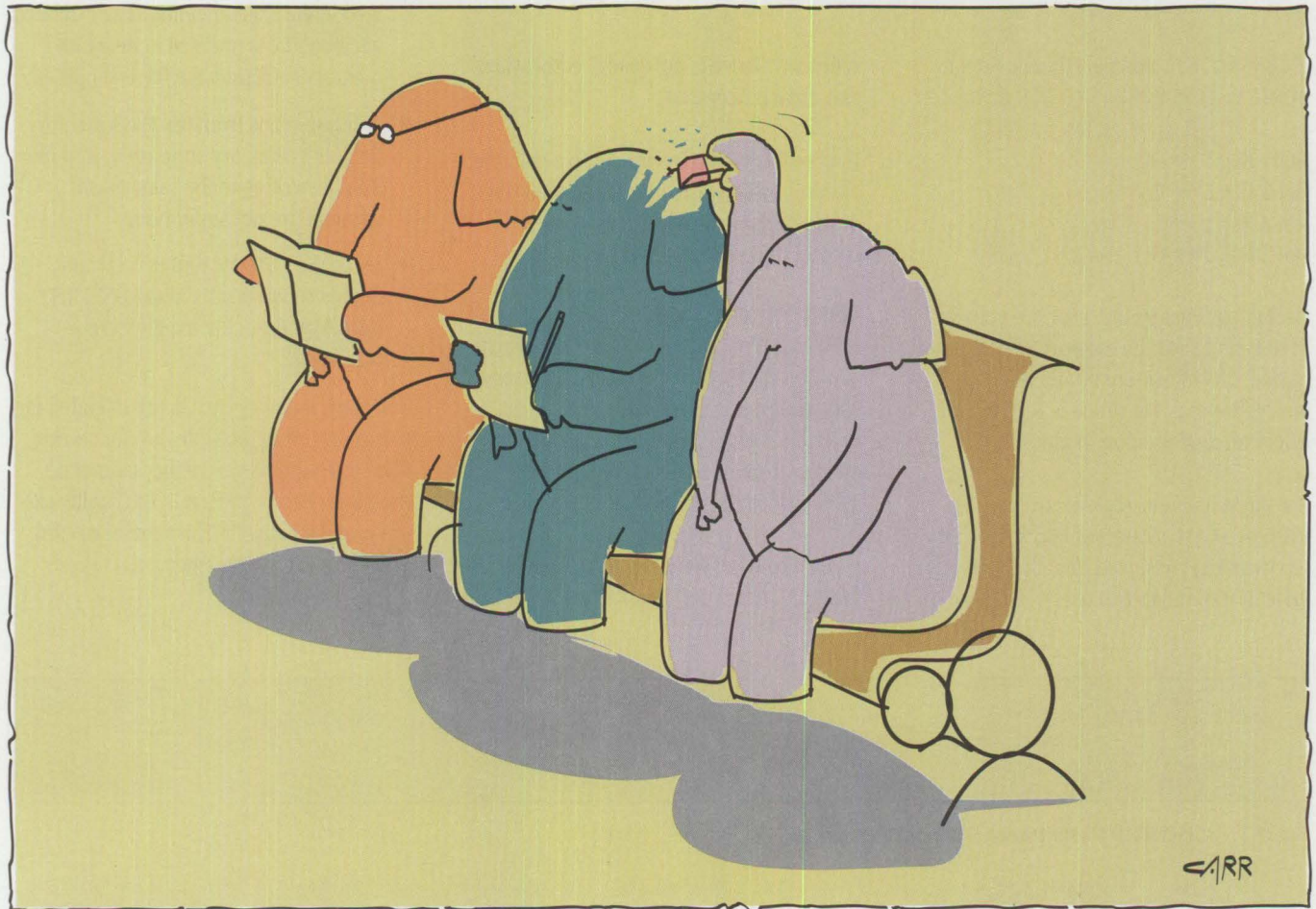
ICMEMCDD Client Device Driver Parameters

ICMEMCDD.SYS takes two arguments: the number of PCMCIA slots and the memory region supported. The number of slots for inserting a PCMCIA card ranges from 1 to 8. Memory region refers to the number of

different common memory regions on the card; the value can be either S for a single region or D for dual regions. Figure 3 illustrates the valid parameters supported by ICMEMCDD.SYS.

After ICMEMCDD is installed, each slot is assigned a drive (two drives for dual memory). For example, assume that D is the first available drive. If CONFIG.SYS contains the statement `DEVICE=ICMEMCDD.SYS 2, S` then:

- slot 1 → D:
- slot 2 → E:



CARR

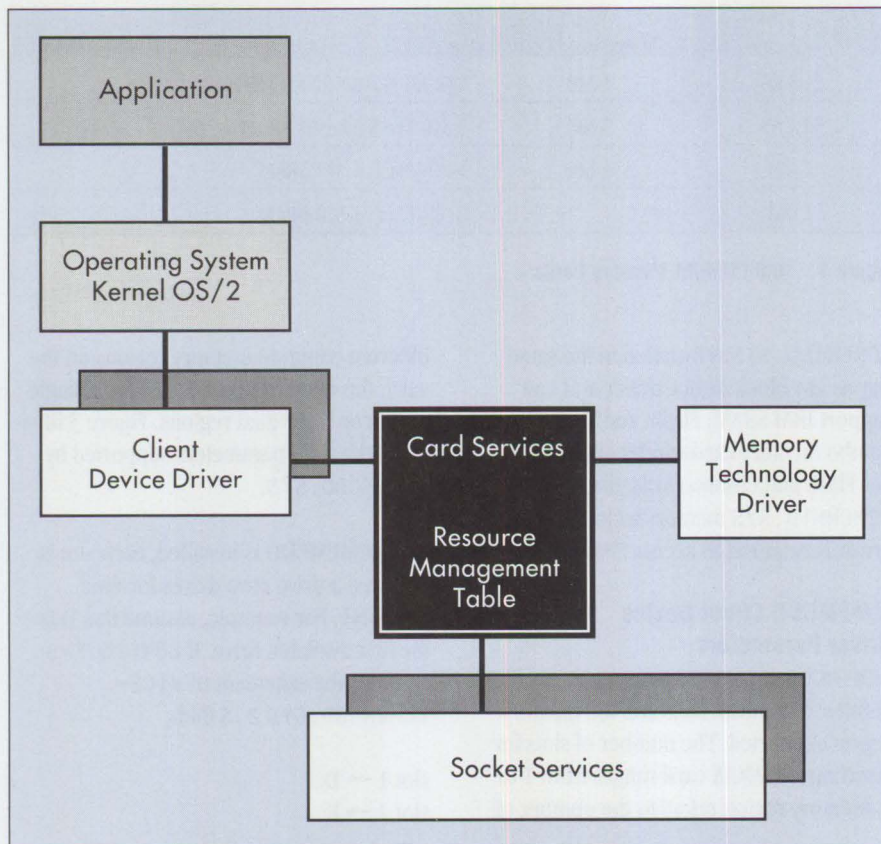


Figure 2. PCMCIA Device Driver Architecture

If CONFIG.SYS contains the statement
DEVICE=ICMEMCDD.SYS 2,D then:

slot 1 Reg 1 → D:
slot 1 Reg 2 → E:
slot 2 Reg 1 → F:
slot 2 Reg 2 → G:

Default parameters are 1 for the number of slots and S for the memory region supported. The maximum number of supported drives is 16, which is 8 PCMCIA slots with dual-memory regions.

If a single memory-region card such as Flash or SRAM is inserted into a slot that has two drives assigned to it, the second drive is not available to users. The kernel

returns a "Drive is not ready" error when that drive is accessed.

If a Combo card is inserted into a slot that has only a single drive assigned to it, only the first memory region is used; the second region is disabled.

Flash Memory Support

ICMEMCDD does not access the Flash memory directly. PCMCIA Card Services uses a special device driver, ICMEMMTD.SYS, to access a Flash memory region. Flash memory cannot be accessed without ICMEMMTD.SYS installed.

When a byte has been written to a memory location in the Flash region, that location

cannot be rewritten without erasing the entire memory chip. Since this limitation makes it difficult to support a true FAT file system in Flash, the following limitations apply:

- When a file is copied, the file manager performs several write operations to the file directory entry. Thus, after the file is copied, the file date and time may differ from the original date and time of file creation. ICMEMCDD will attempt to select the most recent date and time value. Once this information has been written, the file cannot be rewritten.
- No subdirectories are allowed.
- After a label is created, it cannot be re-created.
- Once a file has been written, the Flash card must be reformatted before the file can be erased.
- After a file has been created, its attribute is set to "read only."
- Any file associated with extended attributes cannot be directly copied or created in the Flash memory. The extended attribute file is updated in the Flash memory each time the file is modified.
- Multiple reads from the Flash memory FAT file system are supported; multiple threads writing to the same Flash memory are not supported.
- Using the RENAME and MOVE commands requires a fix in the OS/2 2.1 kernel. Without the fix, the kernel may hang.

The Flash memory card is not intended for use as a working diskette, but for storing files or programs where they cannot be modified. The ICMEMFMT.EXE utility can erase and format the Flash memory card. Then files can be rewritten.

```
icmemcdd_parameters      ::= <number_of_slots> <, memory_region_supported>
number_of_slots          ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8
memory_region_supported ::= S | s | D | d
```

Figure 3. ICMEMCDD Client Device Driver Parameters

The ICMEMMTD Memory Technology Device Driver

The ICMEMMTD driver provides special programming algorithms to write and erase Flash memory. ICMEMMTD is a PCMCIA client device driver installed as a regular OS/2 character device driver and used only for Flash memory.

Release 1.0 of ICMEMMTD supports only IBM cards with Intel Flash Type I memory. It uses the Intel Quick-Erase algorithm for erase operations and the Intel Quick-Pulse algorithm for write operations. Each operation is followed by a byte or word verification to determine when the addressed byte or word has been successfully written.

ICMEMMTD does not use any arguments from the DEVICE= statement in the CONFIG.SYS file.

ICMEMFMT.EXE Memory Card Format Utility

ICMEMFMT is an OS/2 utility for formatting IBM SRAM, Flash, or Combo memory cards. The OS/2 format utility FORMAT.EXE does not currently format memory cards. ICMEMFMT is not supported in OS/2-DOS or DOS/Windows mode.

ICMEMFMT takes the following arguments, where *drive* is the drive unit in which a card is to be formatted, and *label_name* can be up to 11 characters.

```
ICMEMFMT_parameters ::= drive  
</v:label_name>
```

If spaces are used in the label name, *label_name* must be enclosed within double quotes. For example, if the drive unit is G:, type:

```
ICMEMFMT g: /v:"LABEL XMP"
```

After the ICMEMFMT command is invoked, the size of the memory to be formatted is displayed as follows:

- 4 MB memory: 4194304
- 2 MB memory: 2097152

To install the memory technology device driver:

```
DEVICE=<drive&dir>\ICMEMMTD.SYS
```

To install the client device driver:

```
DEVICE=<drive&dir>\ICMEMCDD.SYS 2,s
```

Figure 4. DEVICE Statements

- 1 MB memory: 1048576
- 512 KB memory: 524288

For SRAM memory, the percentage of format completed is displayed on the second line. For Flash memory, two percentage values are shown.

*IBM makes several types
of PCMCIA memory cards:
Static RAM (SRAM),
Flash, and an SRAM/Flash
combination.*

Obtaining the Device Drivers

The ICMEM2 software package ICMEM2.ZIP can be obtained from three sources:

- **OS/2 Bulletin Board Service (BBS):** Subscribers can sign on and select Software Library, select OS/2 Selective Fixes, search for ICMEM2, then download the software.
- **CompuServe:** The ICMEM2.ZIP software will become available through CompuServe® at a future time.
- **IBM Personal Computer Company (PCC) BBS:** Call (919) 517-0001 to access the PCC BBS. Set your modem to use 8 bits, no parity, and 1 stop bit at 1200 to 14.4 K baud rate. The software is stored in the List File 17 directory.

Installing the Device Drivers

After ICMEM2.ZIP is downloaded, use PKUNZIP to retrieve all the files. Copy the ICMEMCDD.SYS and ICMEMMTD.SYS device drivers onto the hard disk. Also copy ICMEMFMT.EXE onto the disk where it can be accessible.

In the CONFIG.SYS file, add two DEVICE= statements (shown in Figure 4) between the IBM OS/2 Card Services driver and IBM OS/2 Socket Services, where <drive&dir> is the disk drive (followed by a colon) and directory path where the files are located. Figure 5 shows a sample CONFIG.SYS file after installation.

Before rebooting the system, be sure the PCMCIA Card Services and Socket Services are installed. For a Micro Channel machine, the PCMCIA.SYS, IBM2SS02.SYS, and ICRMU02.SYS driver files should be specified in the CONFIG.SYS file. PCMCIA.SYS, IBMSS01.SYS, and ICRMU01.SYS are required for the ISA bus.

OS/2 2.1 includes PCMCIA.SYS and VPCMCIA.SYS. Both Socket Services and the Resource Manager are found on the OS/2 System Reference diskette or the IBM PCMCIA Adapter Card option diskette.

Reporting Problems

If you have suggestions, concerns, or problems related to the ICMEM2 package, send them to one of the following addresses:

- **Internet:** ICMEMOS2@torolab2.vnet.ibm.com
- **OS/2 BBS:** ICMEMOS2 CFORUM

```

Rem ----- IBM OS/2 PCMCIA Card Services -----
DEVICE=C:\OS2\PCMCIA.SYS
DEVICE=C:\OS2\MDOS\VPCMCIA.SYS

Rem ----- IBM OS/2 Flash MTD -----
DEVICE=C:\OS2\ICMEMMTD.SYS

Rem ----- IBM OS/2 ICMEM2 CDD -----
DEVICE=C:\OS2\ICMEMCDD.SYS 2,s

Rem Enable only one for either ISA bus system or MCA
Rem bus system.
Rem NOTE:
Rem It cannot be both.
Rem -- for ISA bus system
Rem ----- IBM OS/2 PCMCIA Socket Services -----
Rem DEVICE=C:\OS2\IBM2SS01.SYS
Rem ----- IBM OS/2 PCMCIA Resource Manager -----
Rem DEVICE=C:\OS2\ICRMU01.SYS
Rem -- for MCA bus system
Rem ----- IBM OS/2 PCMCIA Socket Services -----
Rem DEVICE=C:\OS2\IBM2SS02.SYS
Rem ----- IBM OS/2 PCMCIA Resource Manager -----
Rem DEVICE=C:\OS2\ICRMU02.SYS

```

Figure 5. Sample CONFIG.SYS File after Installation

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Provide the following information when reporting problems:

- **Contact:** Person and company to contact, including detailed address, telephone number, and electronic mail address
- **Date:** Date when the problem was found and reported
- **Severity:** Severity of the problem reported, on a scale of 1 to 4, with 1 being a request for an immediate fix and help
- **Description:** Full description of the problem and how to re-create it
- **Machine:** Type of machine on which the problem occurred
- **Hardware:** Any PCMCIA adapter cards used; specifying the number of cards and PCMCIA slots used and any other hardware-specific information
- **OS/2 version:** The version of OS/2 you were running and what OS/2 Service-Pak™ you were using
- **Software:** Any software that could have contributed to the problem you experienced, including version numbers and release dates

Kenneth Ka Wah Ng is a senior development analyst at the PC Card Subsystem Technology Product division at IBM Canada. He is involved in developing PCMCIA-aware device drivers and PCMCIA applications. Kenneth holds an MS degree in computing from the University of London, Imperial College of Science and Technology.



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Improving Remote Initial Program Load Performance

The Remote Initial Program Load (RIPL) feature of IBM's OS/2 LAN Server significantly reduces the disk and memory requirements for LAN clients. These savings, when multiplied by the number of affected workstations, can considerably reduce the total cost of a network. This article presents recommendations, derived from lab tests, on planning a large network of remotely IPLed workstations while providing strategies for maximizing performance.

OS/2 LAN Server allows workstations to share data and programs on the server. The RIPL feature of LAN Server allows workstations to access the operating system and application files needed to boot a DOS or OS/2 workstation—even if the workstation does not have a hard disk.

RIPL servers contain all the loadable modules for the operating system and the applications to be remotely loaded onto clients. This allows each client to be configured individually with different device drivers, configuration files, or code.

RIPL provides a level of workstation security not available through conventional methods. By defining the access rights to specific files, users at dependent workstations can have restricted access to certain files or applications. This is particularly important in financial applications as well as in point-of-sale terminal configurations.

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IBM Corporation
Austin, Texas

RIPL also helps manage clients on a network. By providing a central copy of the operating system and applications, LAN Server helps to distribute code fixes. It also allows administrators to control the configurations of individual user machines.

The Performance Issue

Providing Initial Program Load (IPL) images for large numbers of workstations significantly increases the load on the network. Disk access by other clients may be noticeably slower during the RIPL process. If RIPL is not properly configured, the remote IPL time for workstations may be long.

Since RIPL performance depends on factors such as LAN speed, number of clients, and applications being RIPLed, performance varies considerably by environment. With few clients, the RIPL performance can nearly match the IPL time of a stand-alone workstation. If the number of clients that can IPL concurrently increases, this time can be significantly extended; therefore, it is important to configure the systems properly.

Study Methodology

RIPL performance factors were recently studied in the lab to determine the most important factors that a system administrator can vary to improve the RIPL times. This study examined the factors considered by the researchers to have the greatest effect on RIPL time. Other systems may not be able to achieve the same results unless the configurations are identical, yet the trends uncovered by the study indicate ways to improve performance in many environments.

As shown in Figure 1, the time required to load a client consists of three parts: Power-On Self Test (POST), loading and initializing the operating system, and loading applications. The POST time for a given machine depends primarily on the machine type and memory configuration. Using PS/2 Model 57s with 16 MB of RAM, the POST time is approximately one minute. With less RAM or a faster processor, the POST time will be shorter. On the other hand, a slower processor or more memory (unlikely on a client machine) will increase the POST time.

The time required to load the operating system depends on the operating system. Loading DOS 5.0, which requires transferring about 1 MB of data, can be accomplished quite rapidly. OS/2 2.x, on the other hand, requires transferring over 10 MB of data and takes longer. Since RIPL saves many more resources on OS/2 clients than DOS clients, it is more likely to be used in OS/2 environments.

Because of OS/2's many files and the nature of how Dynamic Link Libraries

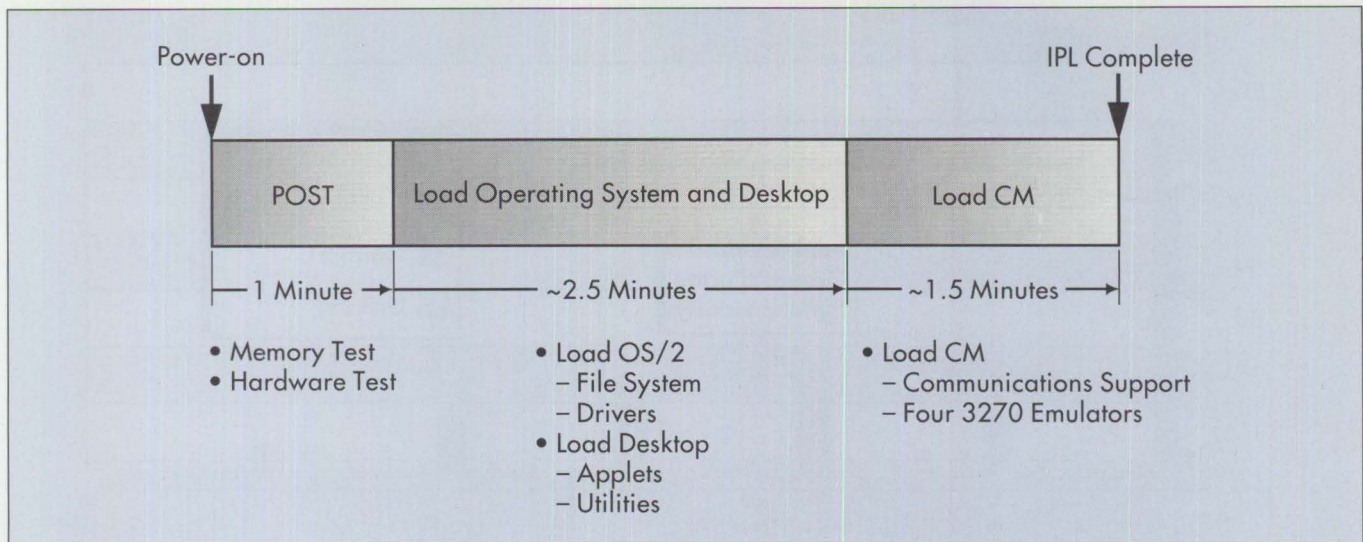


Figure 1. Baseline PS/2 Model 57: IPL Times from a Local Hard Disk

(DLLs) load, studying RIPL's behavior in OS/2 is valuable. In fact, this study was done for an OS/2-based IBM customer who, like many others with large LAN installations, was using the Communications Manager in OS/2 Extended Services.

Activity of Clients

The primary factor affecting RIPL performance is the number of simultaneous users attempting to load their systems. For small numbers of users (one to six), the RIPL time approximates the stand-alone time (time to IPL from a local hard drive). As the number of simultaneous RIPLs increases, the time increases significantly. As the number of workstations increases, contention for network (and server) resources increases dramatically, effectively diminishing the number of those resources available to each workstation. Figure 2 shows an example of simultaneously RIPLing 4 through 60 users.

The number of simultaneous RIPL clients depends on such factors as server and network speed and server configuration. As a rule, network planners should design the LAN using no more than 30 RIPL clients per RIPL server.

Almost as important as the number of users is the rate at which the users initiate RIPL requests (the RIPL arrival rate). Two scenarios were studied: IPLing over a span of several minutes (simulating the start of

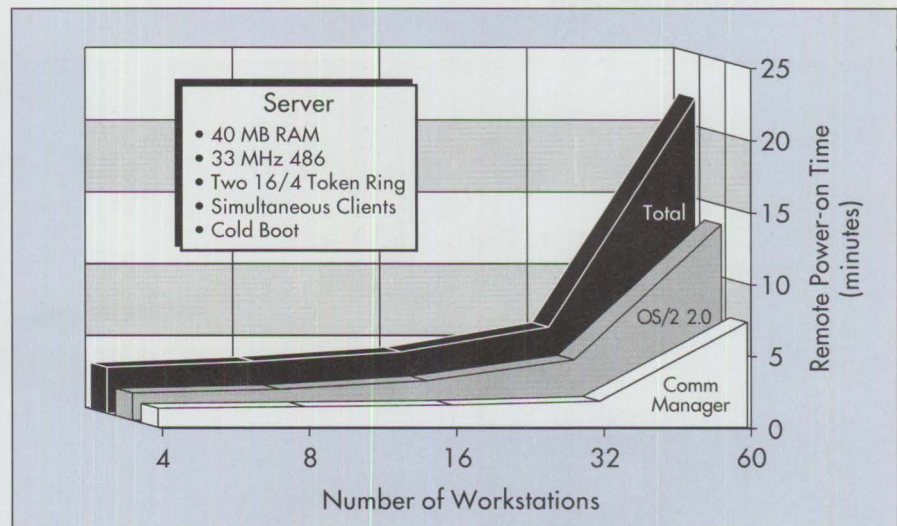


Figure 2. RIPL Sensitivity to Number of Workstations IPLing Simultaneously

the day) and simultaneous IPLs (simulating the aftermath of a power failure).

Figure 3 illustrates three different distributions. The first (uniform distribution) shows 60 users arriving at regular intervals over a 30-minute span. This distribution assumes no influencing factors to weight the arrival time.

Traditionally, users arrive at work near an agreed starting time, so a normal distribution was also applied to this study. In this case, sets of clients were started at 5-minute intervals, over a 30-minute time span, centered around an arbitrary start time.

Finally, the same 60 clients were started simultaneously, as in the case of a power failure. This scenario is not typical, but served as an outside boundary for the study.

Figure 4 shows the base configuration for studying the 60 workstations, including OS/2 2.0 and the Communications Manager. The operating system and network operating system were installed on the C: drive with the RIPL images on a separate physical drive.

The first test explored the effect of client start times. Figure 5 shows a histogram of the IPL completion time for each arrival

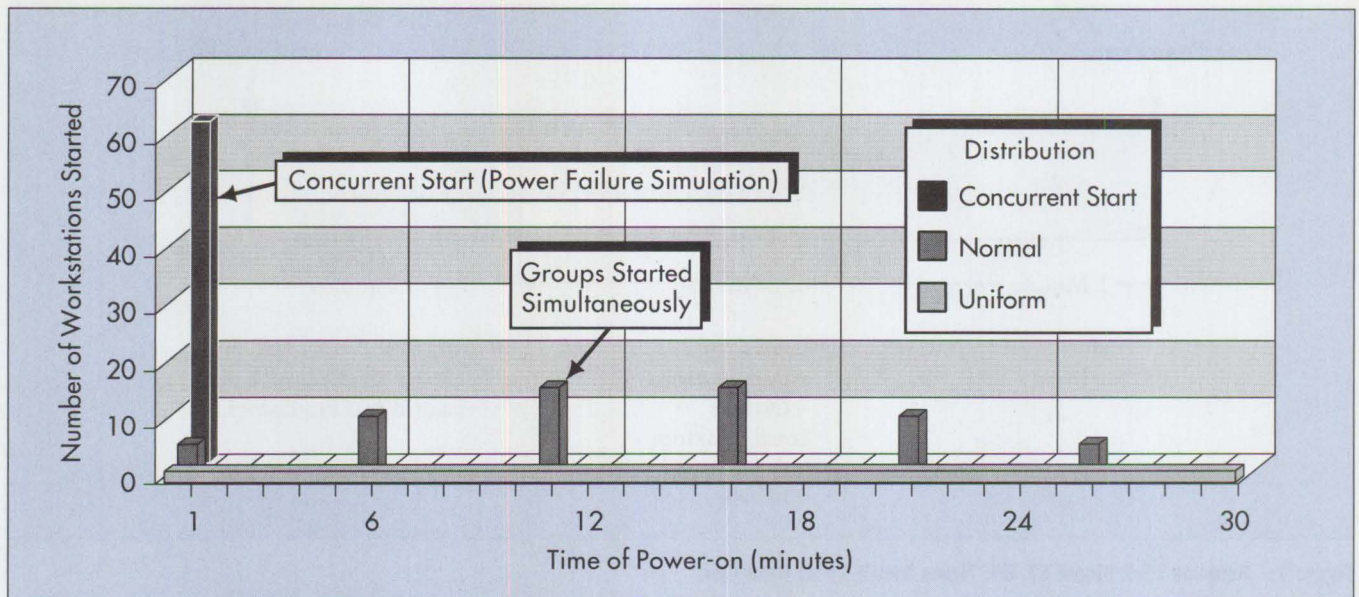


Figure 3. Arrival Rate of RIPL Users

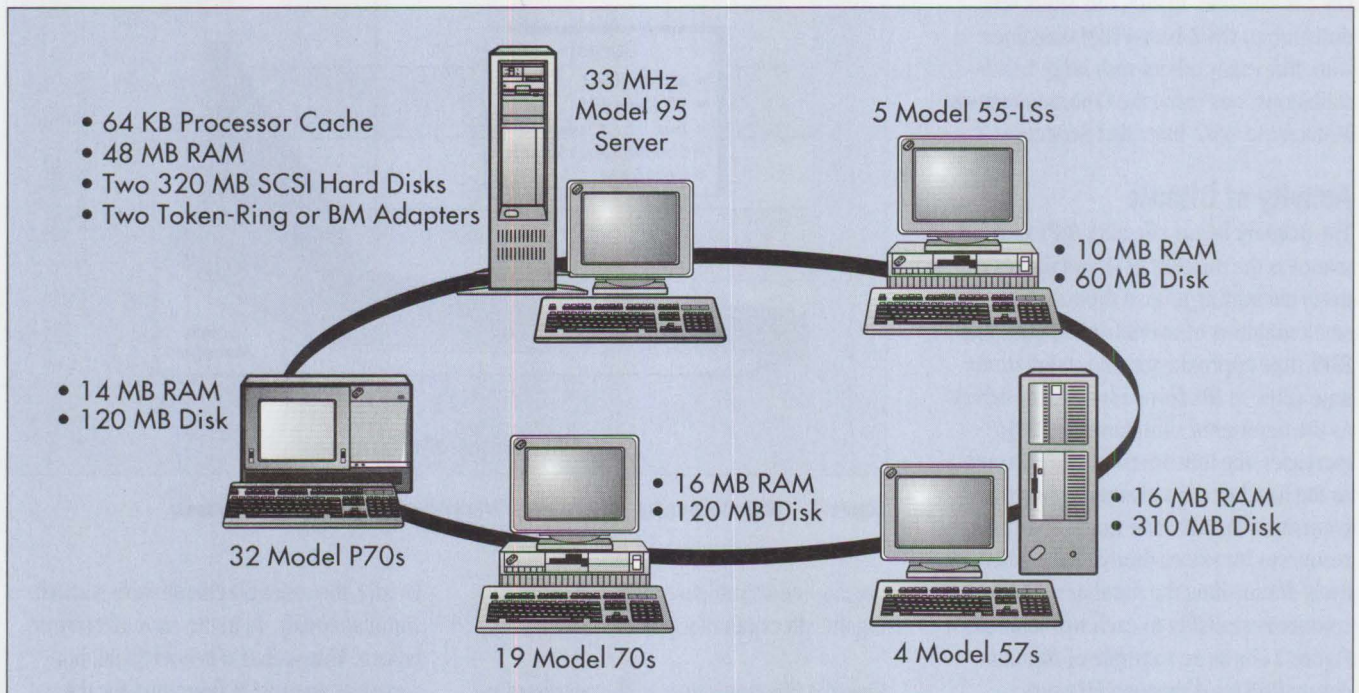


Figure 4. Test Configuration

rate described in Figure 3. This 60-client test was run with the optimal server configuration indicated by the study, as described later in this article.

Figure 5 shows that the completion times for the first two distributions were closely grouped, with the uniform distribution providing faster times. The normal distribution case shows groupings that closely match the overlap in start times. In other

words, approximately 30 workstations took longer than the others because of the high level of network resource contention caused by their concurrent RIPL requests.

The completion times for the power-on case were significantly different. Much more contention was seen on the network. It took over four times as long to IPL, and the completion time was distributed over a much longer period.

Some machines took much longer to RIPL—these were AT-bus systems with slower memory than the Model P70 clients that constituted most systems in the test.

The main conclusion from this test is that increased overlap in RIPL requests increases the time required for any given workstation to boot. Although network administrators and planners have little control over this factor, the results provide

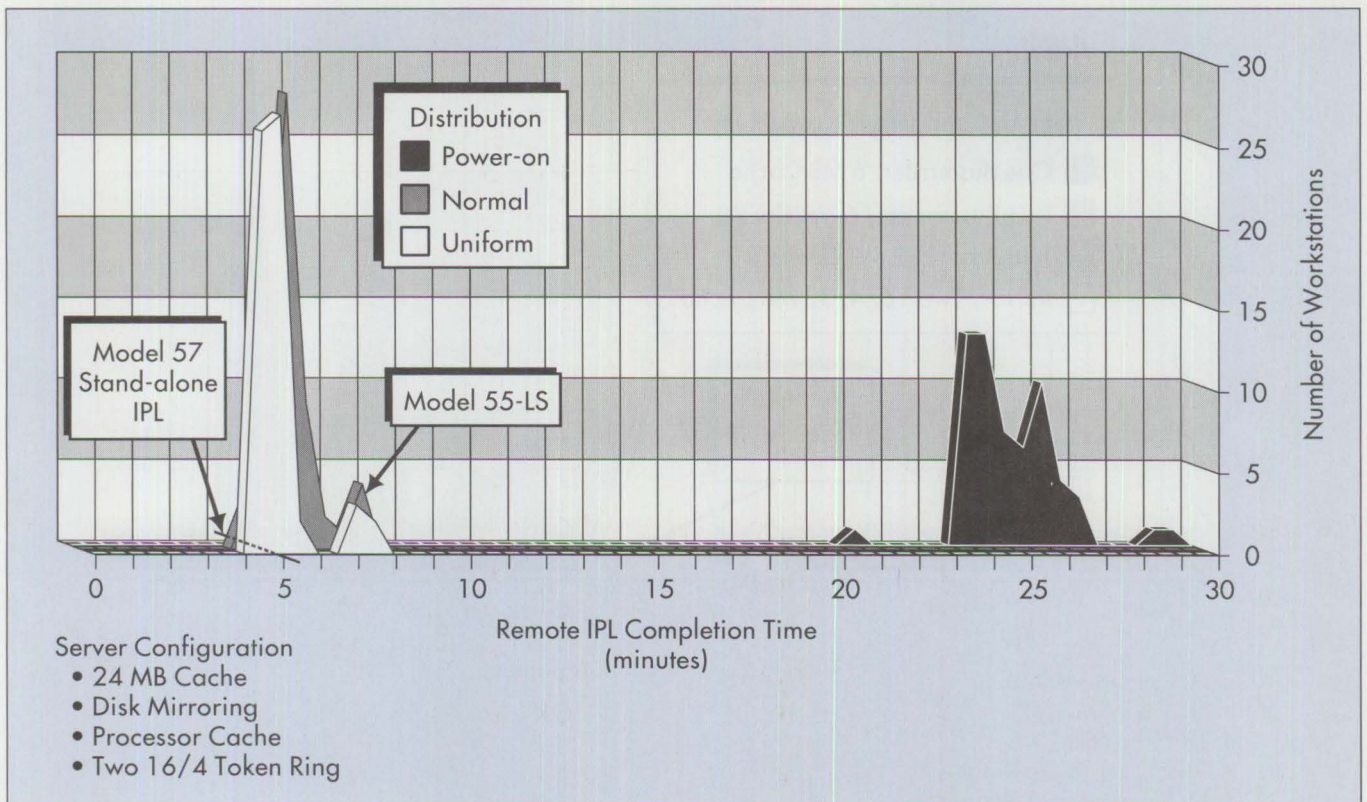


Figure 5. RIPL Times for the 60-Workstation Test

some insights into the behavior of RIPL networks.

Base Server Configuration

Studies of many customer client/server environments showed that supporting a large network requires a more powerful server than previously believed. Additional applications and storage requirements increase demands on the server. But all researchers seem to agree that since LAN servers off-load clients, using more powerful servers is justifiable.

Figure 4 shows the base configuration used in the study. The server ran OS/2 LAN Server 3.0-Advanced and OS/2 2.0. The network adapter was a 16 Mbits-per-second Token Ring driven by IBM 16/4 Token-Ring Adapter/A interface cards. Changes to this basic configuration resulted in noticeably poorer performance. For example, when it was run on a 4 Mbits-per-second Token-Ring network, performance suffered considerably. The benefit of this investment is most dramatically demonstrated in a heavy-load environment such as Remote IPL.

Recently, one of the most significant performance enhancements to LAN Server has been the High-Performance File System-386 (HPFS-386). This is a Ring 0 network file system operating as a privileged application and bypassing most of the operating system calls. It improves performance up

The primary factor affecting RIPL performance is the number of simultaneous users attempting to load their systems.

to 3:1 over File Allocation Table (FAT) file systems. If the LAN Server 3.0-Advanced is configured to take advantage of HPFS-386, it automatically replaces an existing HPFS file system when installed.

Tuning Server Performance

To demonstrate the sensitivity of RIPL performance to various server improvements,

several tests were run while supporting 16 workstations (12 were 33 MHz PS/2 Model 57 clients and 4 were 16 MHz PS/2 Model 70 clients). These tests were made by powering on all 16 clients simultaneously. Figure 6 shows the resulting completion times. The stand-alone IPL time for Model 57 is shown for reference.

The first test represents the baseline for the series. A 6 MB server disk cache was specified in the IFS statement for HPFS-386 in the CONFIG.SYS file. This cache size was selected because of its compatibility with a 16 MB server. One of the many advantages of specifying an HPFS-386 file system is that the disk cache size can be tuned. Unlike the FAT file system, which has a maximum cache size of 14 MB, HPFS-386 can take advantage of memory that exceeds 16 MB. It also allows the disk cache size to be configured up to 56 MB (in a 64 MB machine).

The configuration for the first test included a single Token-Ring Network 16/4 Busmaster Server Adapter/A network interface card. The primary advantage of a busmaster network adapter card is the reduced

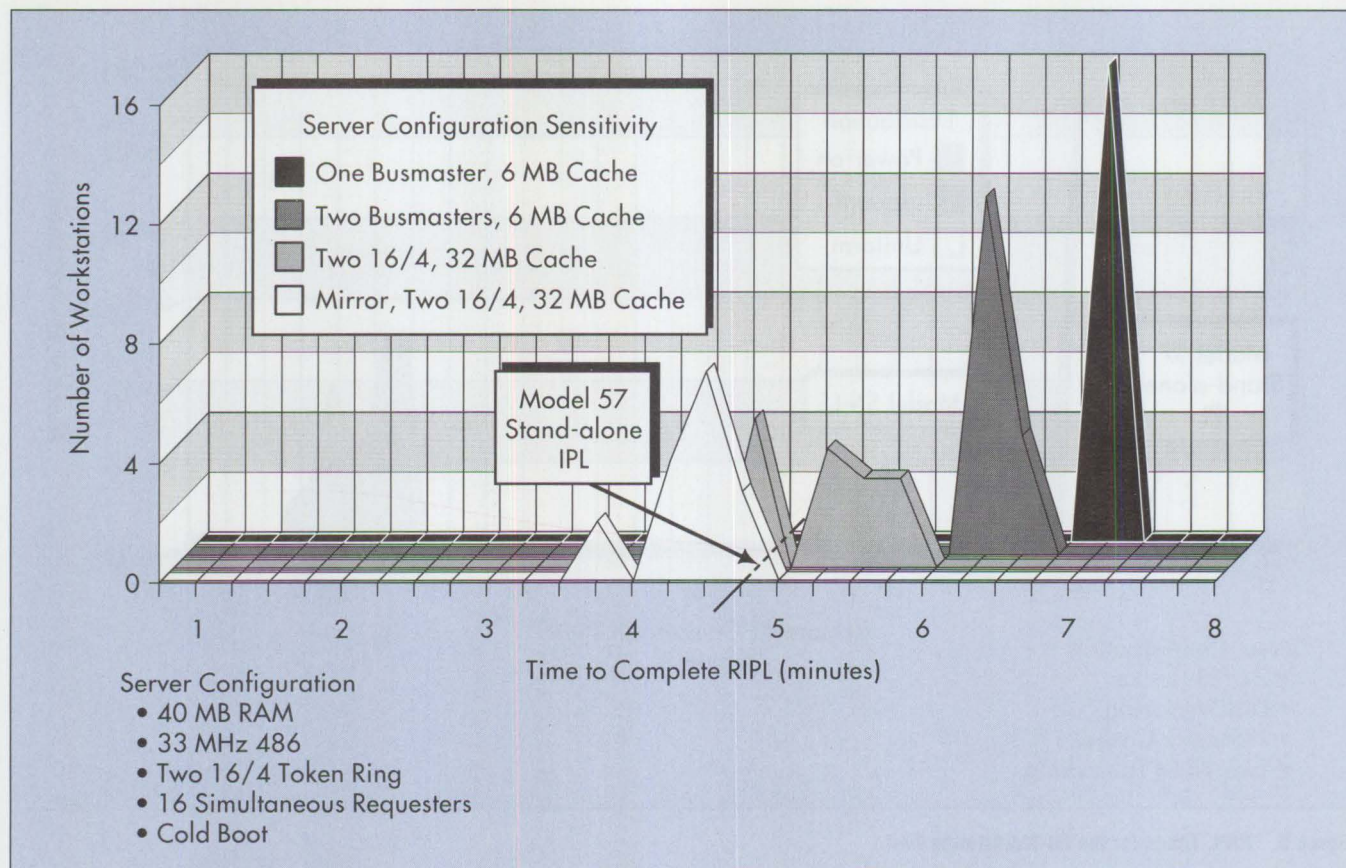


Figure 6. Server Enhancement Sensitivity

CPU utilization compared with a non-busmaster adapter. In this test, all 16 workstations completed RIPL within 8 seconds of 6 minutes and 45 seconds. This tight grouping indicates that each workstation received its fair share of the server resources and stayed closely in sync with the others.

To explore the network adapter as a bottleneck, the second set of tests was run using two busmaster network adapters. LAN Server 3.0 can share up to four adapters on a single network. (Previous releases allowed the use of multiple adapters, but each had to be on a separate network.) This enhancement allows load balancing when initiating sessions. The Network Transport Services code determines which adapter is busier and assigns new sessions to the less busy adapter. The grouping was similar to the previous test but showed an approximate 9.4% improvement in average completion time.

The third set of tests illustrates the effect of increasing the disk cache size on the server. A 32 MB cache was defined. To do this, the Token-Ring Network 16/4 Adapter/A, which is not a busmaster card, was needed. The Busmaster Server Adapter/A is a 24-bit card, which means it cannot address more than 16 MB. The performance of the non-busmaster card closely matches that of the busmaster card in several of IBM's internal benchmarks. Although the CPU load is significantly higher, changing adapter cards alone did not greatly affect the RIPL results.

Note: The IBM LANStreamer™ MC32 Adapter/B, now available, provides busmaster capability and 32-bit addressability.

This test reduced the dependency on disk access time by allowing a larger portion of the data needed by the clients to reside in cache. The cache hit ratio was close to 90% during most of the test. This indicates that disk access time was largely eliminated as a bottleneck because the large

cache allowed all the common loadable modules to be cached.

By minimizing the number of disk requests queued, the grouping of completion times is much broader; however, the average improvement over the previous test was more than 4.8%.

Additional testing using the same configuration examined the effect of disk cache size more closely. The disk cache was controlled by simply changing the cache parameter of the IFS statement in the server's CONFIG.SYS file.

Figure 7 shows the large gain achieved by increasing the cache size from 6 MB to 8 MB. Little additional improvement is seen until the cache size increases to 24 MB. This study shows no additional advantage in increasing the cache beyond 24 MB. This result was expected, since all the shared files required to RIPL a system can be cached in 24 MB.

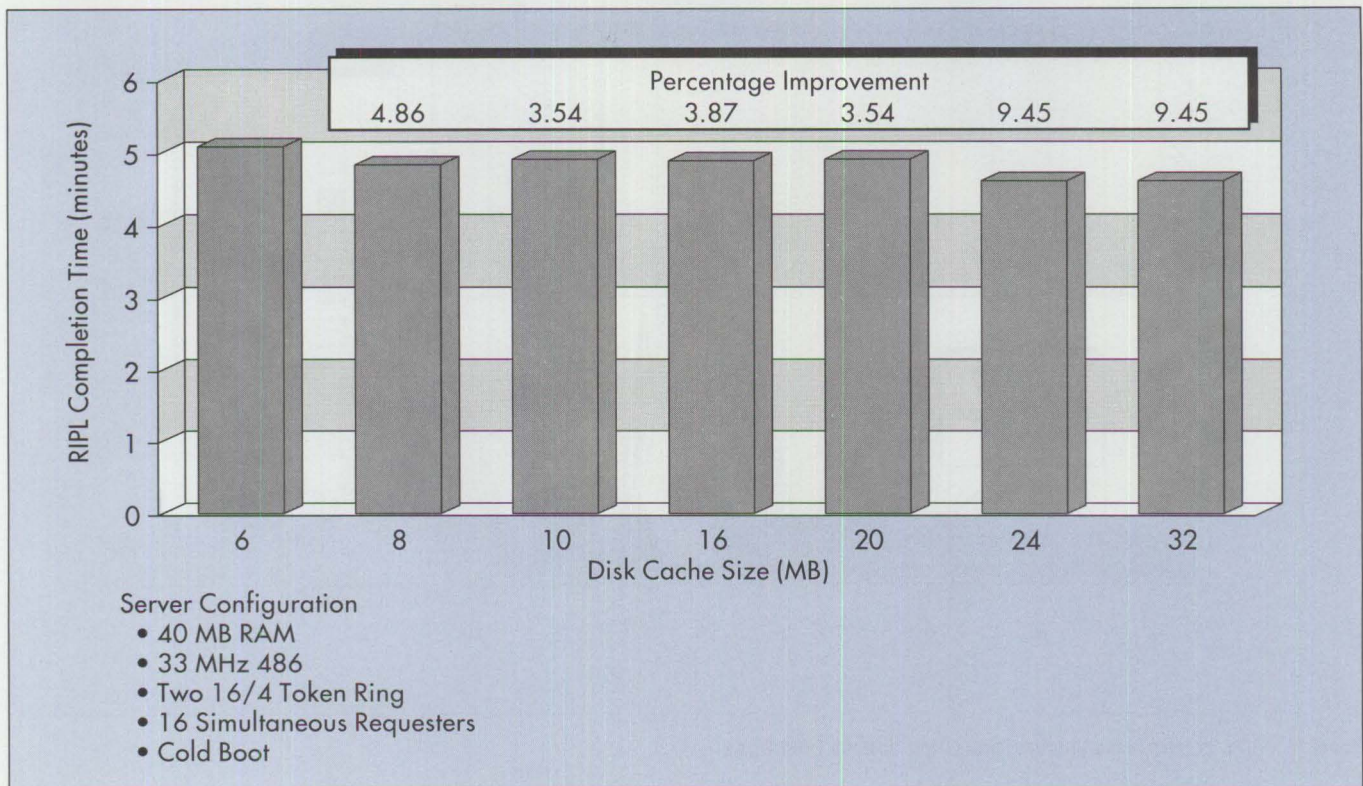


Figure 7. Sensitivity to Server Disk Cache Size

The results of the fourth test, shown in Figure 6, confirmed that the disk is a significant bottleneck in RIPL performance. The test took advantage of the split-read capability offered by the fault tolerant feature of LAN Server 3.0—Advanced. Fault tolerance in the LAN Server is implemented using a technique called *mirroring*, in which a duplicate copy of a disk (or partition) is created.

In this case, the disk that contained the RIPL image files used to IPL the workstations was mirrored. Using this scheme, whenever a read request is issued, it is queued against the copy of the data that is least busy. It was not surprising to see a 13.2% improvement in performance with this single change.

Overall, the server enhancements shown in Figure 6 produced a 25.2% improvement in RIPL performance for the configuration tested. In many cases, this provides performance comparable to the stand-alone IPL time.

Remote Swapping

Finally, a set of tests was done to show the effects of remote swapping. Normally, as OS/2 finds that it needs more memory than is available (such as to load a new executable module), it swaps the contents of a

Increased overlap in RIPL requests increases the time required for any given workstation to boot.

portion of memory to disk. Then the operating system can maintain a much larger addressable memory space than is physically in the machine. This swapper file usually resides on a local hard disk—just as in all previous tests.

If medialess workstations are used, the swapper file is placed on the server since there is no hard disk on the client.

Obviously, this increases the demand on both network and server. Figure 8 shows the impact of reducing the amount of RAM available on the client when simultaneously RIPLing 16 workstations. With 14 MB of RAM available on the client, RIPL takes only slightly longer than stand-alone IPL. As the amount of RAM decreases, swapping occurs more frequently, increasing the contention on the network. Finally, as the RAM approaches the recommended minimum for OS/2 2.0, significant thrashing occurs and completion of RIPL is marginal at best. Client post-RIPL performance will vary with memory size.

Other Variables

LAN Server has many tuning parameters that are used in special situations—probably many more than most administrators will ever use. Several other LAN Server configuration parameters were adjusted with little effect on RIPL times. Parameters such as NetBIOS parameters (number of network control blocks, number of sessions, and number of names) actually cause protocol errors if not properly specified. They have little effect on the overall performance

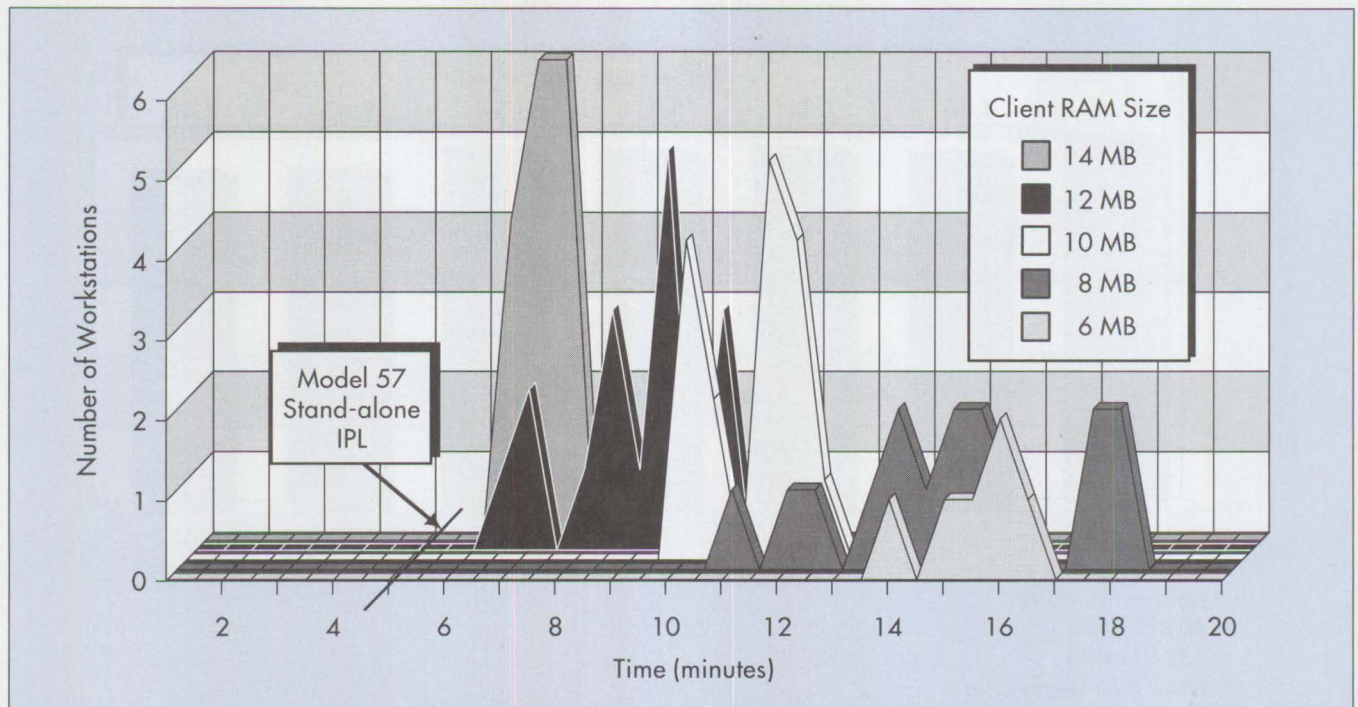


Figure 8. RIPL of Medialess Workstations Using Various RAM Sizes

if specified according to the guidelines in the *OS/2 LAN Server Version 3.0 Network Administrator Reference Volume 2: Performance Tuning* (S96F-8429).

All tests described in this article were run using the default settings for LAN Server parameters, except that the number of sessions and connections was raised to accommodate 60 clients.

Conclusions

Remote IPL requires that large amounts of data be moved between the server and clients, causing significant bottlenecks in various areas of the network and on the server. Several steps can be taken to maximize RIPL performance. Most require a modest investment in enhancements to the server. The following list (starting with the

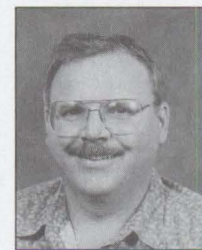
most important) summarizes recommendations for server enhancements.

1. Use LAN Server 3.0—Advanced to take advantage of the HPFS-386 file system.
2. Use a large HPFS-386 disk cache.
3. Use multiple network adapter cards on the server.
4. Enable the fault tolerant feature of LAN Server to reduce the disk bottleneck on the server.

In addition, the following recommendations (starting with the most important) for client configurations will significantly improve overall performance:

1. Use a 16 Mbit Token-Ring network rather than a 4 Mbit network.

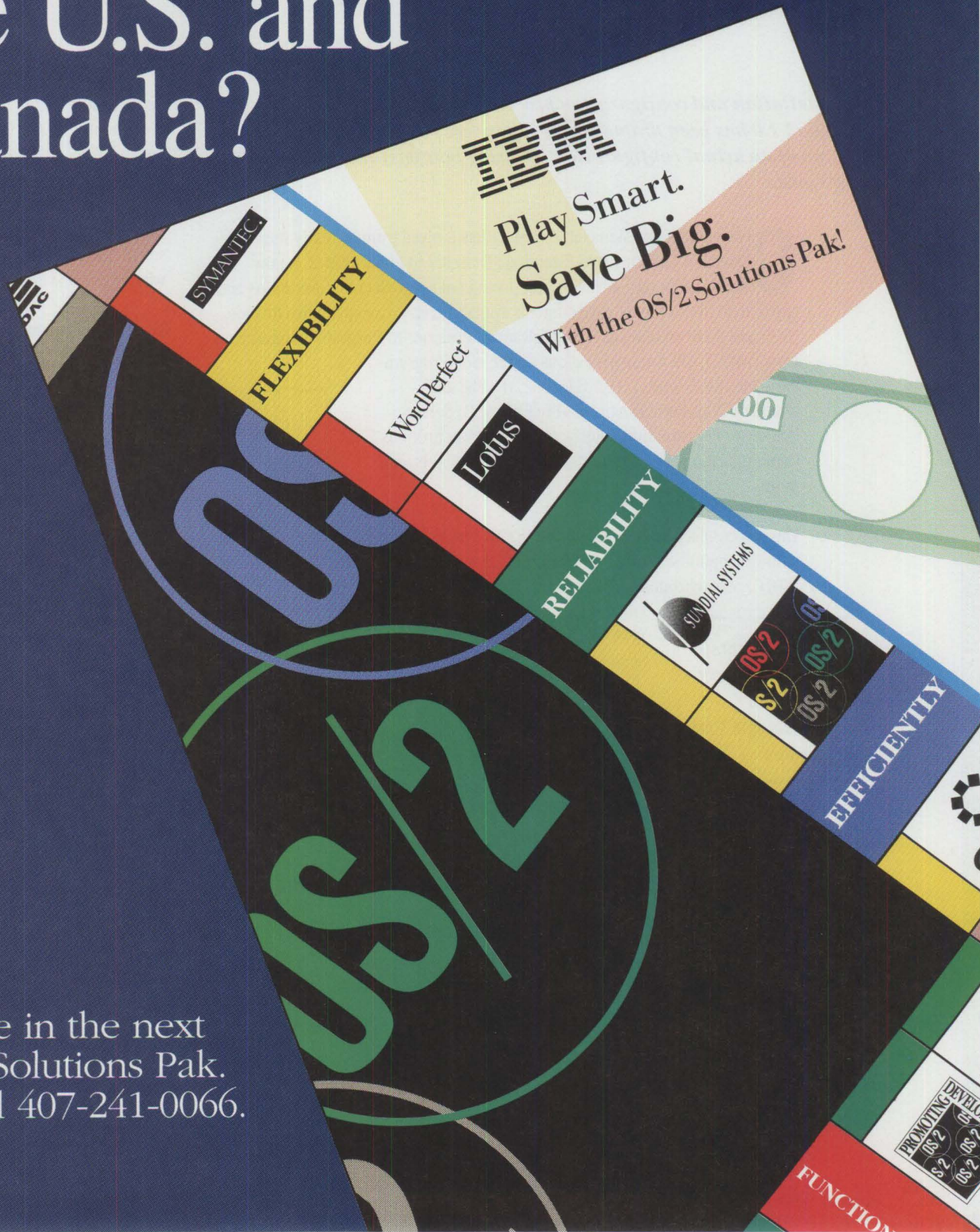
2. Configure the clients for local swapping. This requires each client to have a local hard disk; however, the load on the network is significantly reduced.
3. Configure clients' network adapter cards for at least 16 KB of shared RAM.



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System/6000 and also worked on OS/2 Database Manager. He holds a BS in electrical engineering from the University of Texas in El Paso.

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Installing and Configuring CM/2 1.0

The installation and configuration process for Communications Manager/2 1.0 has been dramatically improved. This article describes the steps of an actual configuration, showing how easy the process has become.

Communications Manager/2 (CM/2) has evolved from the early stages of Extended Edition 1.0 to Extended Services/2 to today's CM/2. It now stands on its own as the richest product of network communications and application development environments available today. Its capabilities include 3270 and 5250 emulation; LU 6.2 Advanced Program-to-Program Communications (APPC); CPI-Communications Application Programming Interfaces (APIs); LUA (LU0,1,2,3) APIs; and Emulator High-Level Language API (EHLAPI), Server-Requester Programming Interface (SRPI), Asynchronous Communications Device Interface (ACDI), X.25 APIs, and more.

The vast connectivity available through CM/2 includes the following options: Coaxial, Synchronous Data Link Control (SDLC), Asynchronous, Token Ring, Ethernet, PC Network, Fiber-optic Data Distribution Interface (FDDI), Twinaxial, and Integrated Services Digital Network (ISDN).

Steve Kipisz, Deborah Pharr, and Ly Sauer
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North Carolina

The greatest difference between CM/2 and its predecessors is the new "look and feel." This new look has made CM/2 the easiest and simplest product

in its category to install, configure, and use. In fact, everything within Communications Manager/2 is self-guiding—you will never become lost in the middle of installation or configuration as in the days of Extended Services/2.

Step 1: Beginning the Installation

Begin with your six Communications Manager/2 installation diskettes. Insert the first diskette into the floppy drive and type `d:CMSETUP`, where `d` represents the floppy drive from which you are installing. You can install from any drive on the workstation.

The first window that appears will contain either a logo or a message indicating that Installation is temporarily copying

product files to the startup drive. Since CM/2 complies with Common User Access™ (CUA™), it respects your system settings for logo display, so you may or may not see the logo window. If you do, you can click the OK button. (You can also select Close from the system menu if you wish to exit Installation.)

The files being temporarily copied to your startup drive are Dynamic Link Libraries



(DLLs) and message (MSG) files required for installation to continue. In general, these files enable installation to log and display errors throughout the installation process. After installation is complete, these files will automatically be moved to their proper subdirectories and removed from the startup drive.

Step 2: Choosing When to Install NTS/2

The next window welcomes you to CM/2 and provides general guidelines for using the upcoming window dialogs. If you are installing for LAN or ISDN configurations, this window also indicates that the LAN Adapter and Protocol Support component of Network Transport Services/2 (NTS/2) must be installed. If you are installing a LAN or ISDN configuration without having NTS/2 installed, you may want to close this window and install NTS/2 first. If you choose not to do this, you can still continue installation; however, you must install NTS/2 before using any configuration.

Step 3: Choosing a Target Drive

Next, choose the target drive. The Target Drive Selection window displays the local hard drives, CM version, workstation type, and available disk space, as shown in Figure 1. This information can help you decide where to install CM/2.

The CM Version column can have any of the following values:

- **Blank:** No version of CM is found on this drive.
- **Unknown:** Some CM files exist, but are not sufficient to determine the version.
- **Extended Edition 1.30.1:** Extended Edition 1.30.1 is found on this drive.
- **Extended Services:** Extended Services is found on this drive.
- **CM 1.0:** Communications Manager/2 is found on this drive.

If CM/2 is on the drive, the Workstation Type column will indicate which CM version was previously on the drive.

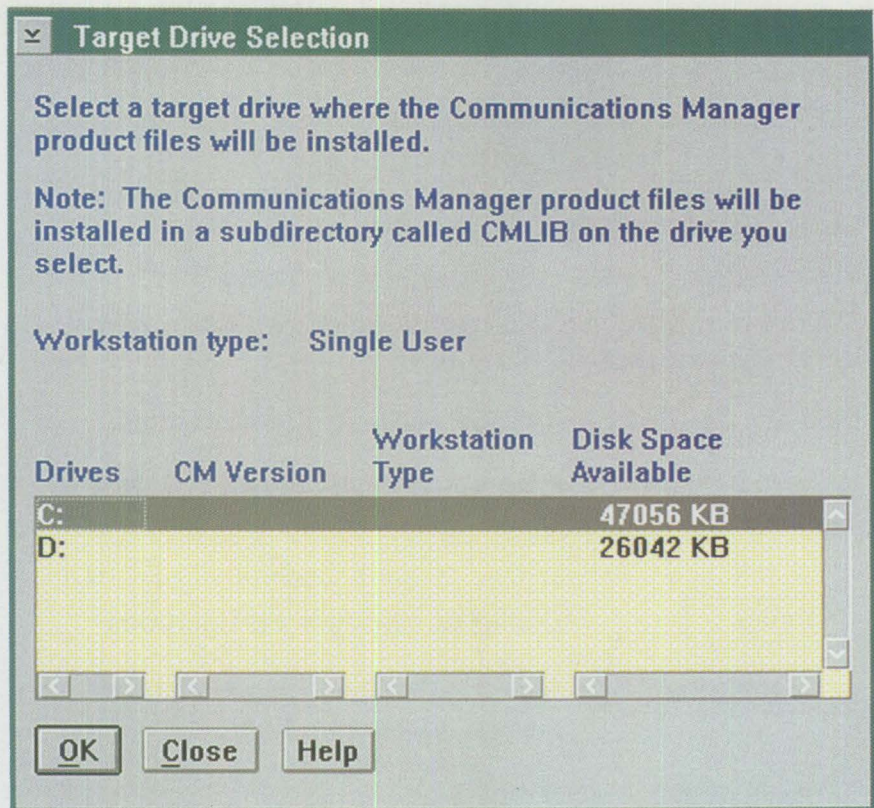


Figure 1. Target Drive Selection Window

For example, assume Extended Services is installed on the D: drive, which has 5 MB of available disk space. That does not sound like much—but since Extended Services 1.0 (currently on the drive) will be removed, there is probably enough space. Or suppose CM/2 is already installed on the F: drive, and the column shows only 3 MB available. Since CM/2 is being reinstalled, there is enough disk space available.

Step 4: Removing Previous Versions

After selecting the target drive, windows may appear saying that previous versions exist and will be removed if you press OK. (Configuration files will remain, however, and you will be given the option of upgrading them later.)

If you do not want to remove the previous version, cancel from this window and return to the target selection window and choose a different target drive.

Step 5: Using the CM/2 Setup Window

The Communications Manager/2 Setup window (shown in Figure 2) is the main window for installation and configuration. You can use any installation or configuration function from this window. The window has two pushbuttons: one button for setup (configuration and, optionally, installation) and the other for installation only. This window also contains pull-down options for various installation functions, including the following:

- Installing additional functions
- Removing additional functions
- Reinstalling
- Removing Communications Manager/2 1.0
- Removing communications features
- Viewing system information
- Viewing audit trail
- Re-creating folders



Figure 2. Communications Manager/2 Setup Window

To complete the CM/2 installation, the configuration file must contain at least one configuration definition.

Step 6: Selecting Setup

To begin configuration, select the Setup button. Since Setup spans two diskettes, you are prompted to insert additional diskettes before seeing the Configuration window.

Step 7: Opening or Specifying a Configuration File

The Configuration window prompts you to specify a configuration file name. You can also specify a configuration description in the entry field.

Below the configuration description field is an output field displaying the configuration path. This is followed by two optional list boxes where you can specify the configuration path and file name.

- **Directories list box:** Contains all drives for the workstation plus any drives—such as LAN or virtual drives—to which the workstation has access; lists all subdirectories under the current configuration path
- **Configurations list box:** Contains all configuration file names in the current configuration path

If a configuration file already exists, you can open it by either typing the name in the entry field or selecting it from the list box.

If the configuration file does not exist, you must specify a file name in the appropriate entry field. CM/2 will then open the necessary files for the configuration definition. For example, if you are configuring for 3270 Emulation Through Token Ring and specify 3270TR as the configuration file name, CM/2 will automatically create the following files: 3270TR.CFG,

3270TR.NDF, 3270TR.BIN, and 3270TR.SEC.

Step 8: Verifying Configuration File Name

After specifying the file name and clicking OK, you are asked to verify that you want to open the specified configuration file. This prevents accidentally creating unwanted configurations.

You are then asked whether this configuration is for the current workstation or another workstation. If you are configuring for another workstation, you must specify the other machine type.

Step 9: Using the Configuration Definition Window

After the configuration file is opened, the Communications Manager Configuration Definition window (shown in Figure 3) is displayed. This window enables you to specify a connection type and associated features or applications for the configuration.

Connection types are listed in the left list box; features and applications are listed in the right list box. The list in the right list box is based on the connection type selected from the left list box. For example, if Coaxial (DFT) is selected from the Workstation Connection Type list box, then 3270 Emulation will appear in the Feature or Application list box.

Workstation Connection Type

This list box is always displayed with a preselected connection. CM/2 looks at the workstation's adapters to determine if any adapter card on the workstation matches any connections supported by CM/2. If it does, that connection type is preselected, and the features and applications supported for that connection are listed in the Feature or Application list box.

If the workstation does not contain any cards, or if none of the cards in the workstation match connections supported by CM/2, then the configuration defaults to a Token-Ring or Other LAN Type connection. This is appropriate if you are trying to configure hardware that is not yet in the

machine. Otherwise, you should install a card supported by CM/2.

Graphical Representation of Configuration

Below the two list boxes in the Configuration Definition window is a group box containing a graphical representation of the configuration definition you have selected. The graphics make it easy to confirm your selection.

Different graphical representations are displayed depending on the configuration definition selected. If the configuration definition is not completed, this box shows the IBM logo.

Step 10: Completing the Configuration Definition

To complete the configuration definition, you must select a connection type and at least one feature or application. For our example—configuring for 3270 Emulation Through Token Ring—just select Token Ring or Other LAN Type from the Workstation Connection Type list box and 3270 Emulation from the Feature or Application list box, then click the Configure button.

When you select Configure, CM/2 automatically determines if Quick Configuration is available. If it is, you are automatically directed into the Quick Configuration path. If it is not, you are guided toward the Advanced Configuration path.

Step 11: Quick Configuration

The next window is the Quick Configuration window for 3270 Emulation Through Token Ring (shown in Figure 4). Configuring through Quick Configuration is as the name implies—easy and quick. The configuration is done through one window where the contents and questions displayed are based on the definition selected in the Configuration Definition window.

In the example, required information includes the network ID, local node name, local node ID, LAN destination address, and number of logical sessions. This information is generally available from the system administrator.

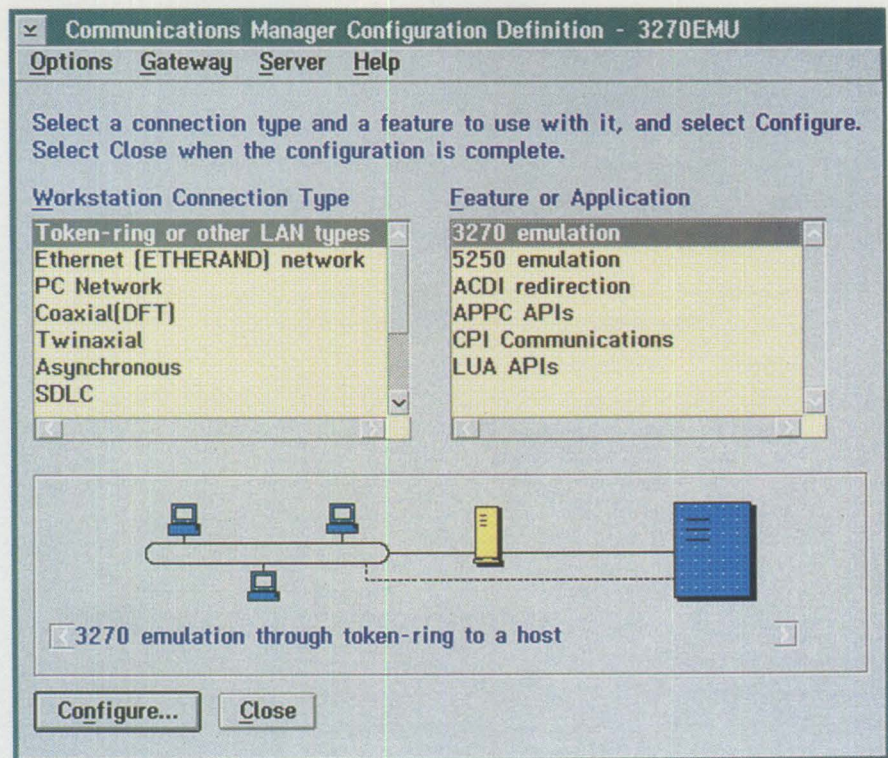


Figure 3. Configuration Definition Window

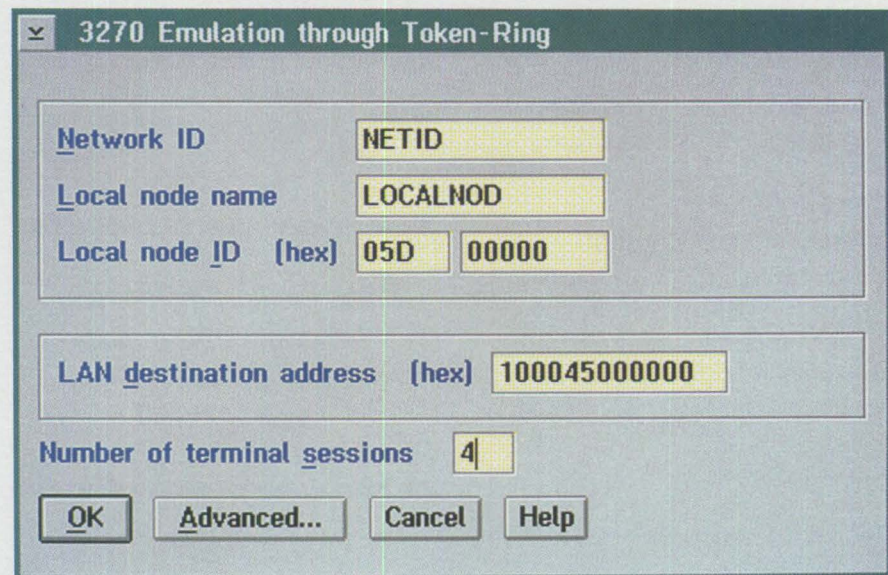


Figure 4. Quick Configuration Window

Step 12: Selecting Options for Advanced Users

The Options pull-down in the Configuration Definition window contains additional options for more advanced users.

- If you prefer to have all your connections, features, and applications listed

under one window (as in previous versions of Communications Manager), select Configure Any Profile or Feature.

- To change or customize the default workstation profile, select Change Workstation Information.

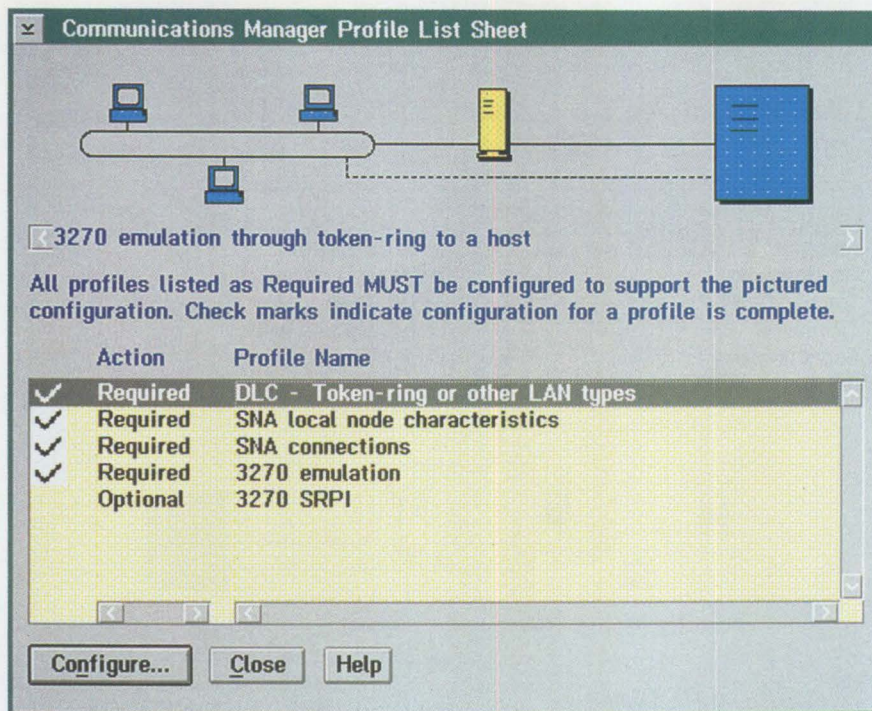


Figure 5. Profile List Sheet Window

- To default to the Advanced Configuration path, bypassing Quick Configuration, select Use Advanced Configuration.
- To override the default verification setting, select Verify Configuration.

Step 13: Creating the Configuration Definition

Selecting OK in the Quick Configuration window creates the configuration definition based on the information specified. It then returns to the CM/2 Configuration Definition window where you can select another configuration definition or close the configuration definition created.

If the Advanced button is selected in the Quick Configuration window, the guided path continues to the Profile List Sheet window and uses advanced options to customize the configuration created by Quick Configuration.

Step 14: Using the Profile List Sheet Window

Previous releases of Communications Manager/2 included hardcopy profile check sheets. The Profile List Sheet window (Figure 5) replaces these sheets. The

top of the window has a graphical representation of the selected configuration definition. The profiles in the list box are not order dependent. If any operation is illegal, a warning message appears.

The greatest difference between CM/2 and its predecessors is the new "look and feel."

The Profile Name column lists all the profiles needed for the selected configuration definition. The Action Status column indicates whether the profile is required or optional. If it is required, the profile must be configured for the selected configuration definition to be successfully verified. The Configuration Status column indicates with a check mark whether the profile has been configured.

Step 15: Ending Configuration

To end configuration, select the Close or Cancel button in each window until you return to the Setup window.

Step 16: Verifying Configuration

At this point, Verify is automatically invoked as needed. Verify ensures no configuration errors exist that might prevent the configuration from working. It also ensures that a functional configuration was successfully built.

Step 17: Beginning the Installation

After verification is successfully completed, the Install dialog appears, displaying the following information:

- Configuration name
- Subdirectory location of the configuration
- Source drive and subdirectory
- Target drive and subdirectory
- Disk space required and available
- An option to install or not install selected additional functions

Available and Required Disk Space

Two important fields in the Install window are Disk Space Required and Disk Space Available. Comparing these two numbers can show whether you have enough disk space to continue installation.

If you do not have enough disk space and choose to continue installation, you will be prompted to specify another target drive for installation. Or, to reduce the amount of disk space required, you can click the Select button and choose not to install some of the optional functions listed below:

- Command reference
- Glossary
- Interactive configuration interface
- Keyboard remap
- Keylock
- Message reference

- Overview
- Problem determination aids
- Remote operations
- Subsystem management

For example, if you know you will never need to remap your keyboard or use the keylock function, you can choose not to install these functions, thereby reducing the disk space requirement.

Step 18: Changing CONFIG.SYS

After pressing OK on the Install panel, you are asked whether you want the changes made to the CONFIG.SYS file or saved in CMLIB\CONFIG.CM1.

If you are an advanced user, you can save the changes in CMLIB\CONFIG.CM1 and later add them to CONFIG.SYS yourself. That allows you to control your CONFIG.SYS changes. Otherwise, you can let CMSETUP make the changes.

Step 19: Finishing the Installation

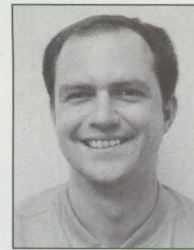
After you have viewed the Change CONFIG.SYS window dialog, finish the

installation process by simply inserting diskettes as prompted and watching the "progress bar" for each diskette.

Verify ensures no configuration errors exist that might prevent the configuration from working. It also ensures that a functional configuration was successfully built.

Step 20: Rebooting Your Workstation

Once installation is complete, a completion window asks you to reboot the workstation. Follow the steps to shut down, then reboot your workstation. After rebooting, CM/2 will be fully functional and ready to run.



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.

where it was originally developed, to Research Triangle Park. Deborah has a BS in computer science from the University of Texas in Austin.

Writing CID-Enabled Applications

This article describes how developers can make applications installable using IBM's Configuration, Installation, and Distribution (CID) architecture. It includes an example of how to design an application for CID distribution and some tips for creating world-class CID-enabled applications.

IBM's software distribution strategy,¹ Configuration, Installation, and Distribution (CID), is continually gaining support from IBM and other companies. IBM can provide you with a monthly updated product list of both IBM and software vendor applications that are currently CID-enabled or are planned to become CID-enabled. The July 1, 1993 list shows 17 IBM applications enabled and over 150 applications from other companies either planned or already enabled. All the applications listed are announced products, and planned availability dates are noted for those not yet available.²

Getting Started with CID

There are several options for getting started with CID. You can use a CID-enabling tool from IBM, build upon IBM sample code, or write your own CID-enabled installation program from scratch based on IBM reference documentation.

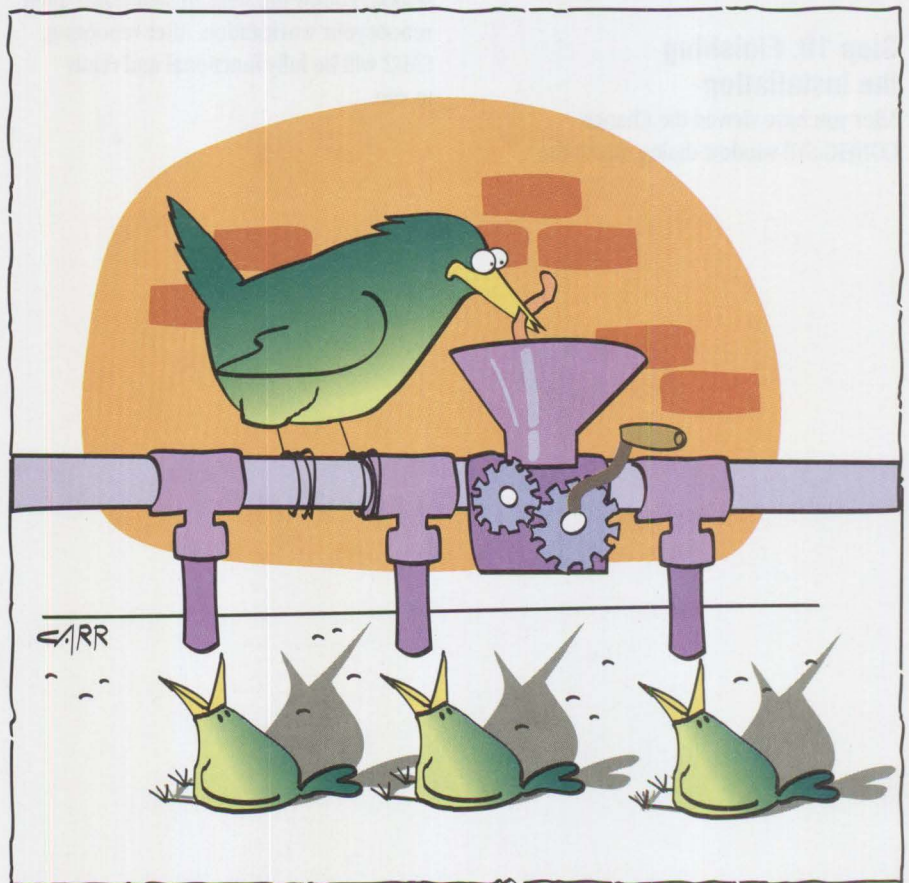
Barry Cunningham
IBM Corporation
Roanoke, Texas

IBM's CID-Enabling Tool

IBM's Software Installer for OS/2 can automate the installation and maintenance of applications. This tool provides services for installing, updating, restoring, and

deleting components of workstation products that are installed from CD-ROMs, diskettes, Local Area Network (LAN) environments, and host systems such as MVS, OS/400, VM, or VSE/ESA™. Software Installer can create a CID-enabled installation for any application.

Software Installer requires OS/2 2.x. There are no extra charges or royalty payments for redistributing the required Software



¹ The January 1993 *Personal Systems Technical Solutions* article, "CID: Remote OS/2 Configuration, Installation, and Distribution of PC Software," describes the benefits of implementing a software distribution strategy.

² The list of CID-enabled applications is located in the IBM OS/2 Developer's 2 forum on CompuServe. Type GO OS2DF2 and look in the library section titled "CID Enablement." The file name is CIDAPPS.ZIP.


```
-MYCIDPRG-> HISTORY LOG: 10/26/93 at 14:37:07
Remote history log file "F:\CID\LOG\MYCIDPRG\MYCIDPRG.HST" created or modified successfully.
Remote error log file "F:\CID\LOG\MYCIDPRG\MYCIDPRG.ERR" created or modified successfully.
```

Figure 1. Local History Log File

```
-MYCIDPRG-> ERROR LOG: 10/26/92 at 14:37:08
ERROR - Device Not Ready(12 04):
Drive F: of the remote history log file specification is inaccessible.
```

Figure 2. Local Error Log File

Installer executable modules in an application. Simply rename them using a command file supplied with Software Installer³.

Sample Code from IBM

To CID-enable the installation program yourself, ask your IBM representative for the sample C program source code that shows a simple way to process CID response files. Illustrating some subtleties of CID-enablement, this public-domain package includes a complete example of a CID-enabled installation program written in REXX. It also includes a set of Application Programming Interfaces (APIs) that can be used by anyone to create their own response-file processing programs⁴.

Writing Your Own Installation Program

To write your own CID-enabled installation program instead of using the IBM Software Installer, consider ordering the latest reference on the CID architecture: *CID Product Enablement Guidelines* (document S96F-8589, available from IBM in December 1993). A text file is available now in the IBM OS/2 Developer's 2 forum on CompuServe. Type GO OS2DF2 and look in the library section titled "CID Enablement." The file name is CIDGUIDE.ZIP). This document supersedes *Automated Installation for CID-Enabled Extended Services, LAN Server Version 3, and Network Transport Services/2* (GG24-3781).

Logical Flow Outline

This section outlines the logical flow for one method of CID-enabling an application. It includes associated pseudo-code

and some practical implementation insights, as well as a brief sample of one way to design a CID-enabled installation program. This is not the only method available, nor is it necessarily the best. Depending on your design choices, functions such as `initialize_local_log_file` and `initialize_remote_log_file` may not be required.

Initialize Local Log Files

Immediately after invocation, a CID program should establish one or more local log files, possibly in the current working directory. These new log files will be either created or appended to existing ones. In either case, a simple way to initialize these files is to write a new single timestamp line to each log file. For example, if you name the CID program MYCIDPRG.EXE and decide to implement separate history and error log files, the first lines of each may look like the first lines in Figures 1 and 2. These log files document the history of all CID processes up to any error condition or to successful completion.

You can also store both history and error information in a single log file. Since history logs are large by design, it is often easier to scan a separate error log file. This not only makes developing your CID program easier, but also benefits the end user.

Using the previous example, the format of the first two entries in the local history log file might be as shown in Figure 1. The first entry in the local error log file is shown in Figure 2.

Figure 1 shows that remote log files were successfully initialized, while Figure 2 indicates that a remote history log file could not be initialized and notes the reason why. This example illustrates the primary purpose of local log files: to log problem determination information that would be unavailable if no remote log files were specified or successfully initialized. Remote log file specification occurs in command-line parameters. Without the presence of local log files, inconsistencies detected in any command-line parameters can only be reported as a generalized return code to the software distribution manager. For the example in Figures 1 and 2, this means the difference between knowing only that a device was not ready and knowing that drive F: associated with the remote history log file specification is inaccessible.

The example in Figure 2 provides the hexadecimal representation of the architected CID return code value and textual description—Device Not Ready(12 04):. It also provides a more detailed explanation of the problem, which assists during the development phase of the CID program. It later benefits the end user by providing a common reference in terminology between the CID program's error log files and those of the software distribution manager.

Parse Command-Line Parameters

The CID architecture does not dictate any particular command-line scheme, but it does require that a CID-enabled installation program be executable from the command line. This suggests that the name of

³ For a more detailed description of Software Installer, call (800) IBM-CARY in the U.S. or (919) 469-7763 outside the U.S.

⁴ The sample code is located in the IBM OS/2 Developer's 2 forum on CompuServe. Type GO OS2DF2 and look in the library section titled "CID Enablement." The package name is "Sample Code to Help CID Enable." The file name is CIDSAMPL.ZIP.

```

-MYCIDPRG-> HISTORY LOG: Remote Entry
-MYCIDPRG-> HISTORY LOG: 10/26/93 at 14:39:45

or

-MYCIDPRG-> ERROR LOG: Remote Entry
-MYCIDPRG-> ERROR LOG: 10/26/93 at 14:39:46

```

Figure 3. History and Error Log Files with Timestamp

the response file should be communicated as a command-line parameter. As the developer, you must decide which conventional CID command-line parameters to implement and how to implement various combinations of them. Whatever the decision, ensure that the product documentation reflects the implementation.

After initializing local log files, a CID program should make an initial pass through all of its command-line arguments to detect missing arguments, validate syntax, and check for duplicates. Any discrepancies should cause an entry in the local error log file and then terminate the CID program with the return code X'16 00'—Incorrect Program Invocation. By convention, all CID command-line parameters are delimited by spaces; the tags begin with a forward slash (/) and end with a colon (:), and any value follows the tag. Building on previous examples, assume the CID program is invoked with the following command:

```

MYCIDPRG.EXE ... /L1:F:\CID\
LOG\MYCIDPRG\MYCIDPRG.HST ...

```

The tag for the remote history log file is /L1:, and the associated value is the remote history log file specification F:\CID\LOG\MYCIDPRG\MYCIDPRG.HST. Validating the syntax of this command-line parameter involves detecting a known tag /L1: and confirming the presence of an associated required value F:\CID\LOG\MYCIDPRG\MYCIDPRG.HST. It also verifies that this value meets the syntax requirements for a fully qualified file specification for the file system associated with drive F:.

Initialize Remote Log Files

Since remote log files are specified as command-line arguments to a CID program,

remote log files cannot be initialized until the command-line arguments are parsed. The history of the installation and error conditions should now be logged into both the local and remote log files. The remote administrator needs as much information as possible, including information that can only be caught in the local log files as well as information in remote log files. Remote log files are initialized as explained above for local log files, with the possible addition of a remote line above the timestamp line shown in Figure 3. This helps to differentiate remote from local log files if they have been moved or copied from their original locations.

Parse Response Files, Keywords, and Values

Users of traditional installation programs interactively choose the product's initial configuration. In CID terminology, these choices consist of installation and configuration *actions* associated with configuration objects. Instead of depending on user interaction, keywords identify the actions or objects associated with the installation or configuration of the product. The developer also defines the valid ranges for any values associated with such actions and objects, and stores them as lines in an ASCII text file called a *response file*. If the standard installation program does not ask many questions, the response file design can be simple—no response file is needed if the standard installation program does not ask the user any questions.

Although the CID architecture does not dictate any particular syntax for response files, tools are available (such as the CIDSAMPL package) to process a conventional form of response file syntax. The simplest form is similar to the following.

```

Action1
Action2=
Object1=SomeValue,AnotherValue
Object2=ThingValue

```

The abbreviation of this simple design is “keyword [= [value]]”, where items enclosed within brackets are optional.

If the standard installation program deals with complex relationships among definitions, then response files can include nested value lists and look more like Figure 4, where value could be another nested value list.

Create Configuration Files

The “C” in CID stands for configuration, which includes tuning and tailoring the program. Now that the CID program has parsed and interpreted “keyword=value” pairs from the response file, the program can create any configuration files it requires—just as it did before CID was introduced. This might include modifying existing shared system configuration files such as CONFIG.SYS. Check for a previous installation of the application and preserve any existing configuration values not already overridden by the response file. The program should log progress in local and remote history files, recording any error conditions in the local and remote error files.

Copy Product Files to Workstation

The “I” in CID—installation—basically involves copying the correct files to the client workstation for the product features desired. Today, most installation programs are not bound to the A: drive as the source. They copy an application's files from any source supported by the operating system on the workstation. CID programs also allow applications to be installed from any accessible drive letter. After creating the configuration files, the CID program knows the source drive and path because of the command-line parameter tag /S: and its value. It also knows the target drive and path from the /T: command-line parameter tag and its value. The application diskette images should already be stored on the source drive, either according to manual instructions or as completed by a utility program designed for that purpose.

Depending on how the images are stored on the source drive, the CID program may need to create new subdirectories under the target directory, /T:, or decompress files after copying them from the source directory, /S:. When installing over a previous version of a product, files and directories associated with new or old features should be added or deleted, respectively. Finally, consider designing your CID program to install code fixes or create a separate CID-enabled maintenance utility.

Complete Other Standard Installation Processes

If you are CID-enabling an existing application, you can plug existing routines from the traditional installation program directly into the CID installation program. The standard install process may include building Workplace Shell folders and icons, detecting previously installed versions of the application, then migrating existing product definitions. CID enablement does not interfere with any of these processes.

Exit with Return Code for Software Distribution Manager

The exit routine must write any history and error information to the local and remote log files, close these log files, then exit with an architected CID return code for the software distribution manager. Through these return codes, the program can tell the software distribution manager to reboot the system to activate any changes made to CONFIG.SYS, and even to call back for the next phase if the application dictates a highly complex installation process. If subsequent steps depend on changes made to the system that require rebooting to take effect, then use the call-back option.

CID Enablement Hints and Tips

Although the following suggestions and guidelines are not required for an application to be considered CID-enabled, you may find them beneficial when creating installation procedures and establishing the administrative setup of an application.

- Check disk space at the beginning of the installation program to prevent having to abort installation. This could eliminate cleanup functions after an aborted product installation. If a new version is installed in a new directory

```
Object4 = (
    Object4.1 = These are
    Object4.2 = keyword
    Object4.3 = values
    Object4.4 = (
        Object4.4.1 = that
        Object4.4.2 = are
        Object4.4.3 = nested
    )
)
Object4 = (
    Object4.1 = There
    Object4.2 = must
    Object4.3 = be
    Object4.4 = (
        Object4.4.1 = two instances of
        Object4.4.2 = those Object4
        Object4.4.3 = keywords defined
    )
)

Note: The abbreviation of this complex design is:

keyword = (
    keyword [ = [value] ]
    [ keyword [ = [value] ] ]
)
```

Figure 4. Nested Value Lists in Response Files

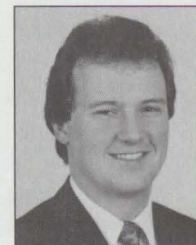
and then the old version is deleted (as opposed to overlaying a prior version of the same product), space must be available during installation for both directories. Data compaction on the target drive may also increase the amount of storage available compared to that reported by the operating system.

- Delete files and directories that are not needed after the program is successfully installed. This preserves disk space and reduces storage fragmentation. This suggestion also applies to aborted installations.
- Update code server log files in real time to capture error or history data during an aborted install.
- Ensure that CID-enabled products can add and delete on a feature-by-feature basis to avoid having to completely remove or re-install a product.
- Ensure CID-enabled products ship their image data in compressed form to reduce both server disk space and LAN transport time.
- Use the INCLUDE keyword in client-unique product response files to eliminate redundant specifications of common parameters for a set of clients.

The INCLUDE keyword can refer to the common response file.

- Use HPFS for code server workstations.
- Ensure that CID-enabled installation programs transfer large rather than small blocks of product images from the code server.
- Consider placing a shared copy of the product on a network server to remove the administrative burden of maintaining the same product image files on each client workstation.

For assistance in implementing a CID program, contact the IBM Personal Systems Competency Center at (800) 547-1283.



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Integrating LAD/2, CM/2, and DB2/2 with IBM LAN NetView Start

This article discusses how IBM's LAN NetView Start Version 1.1 uses information created with IBM's LAD/2. It also describes how Start can be extended to support additional applications such as Communications Manager/2 (CM/2) and DATABASE 2 for OS/2 (DB2/2). The article is primarily for network administrators using Start.

IBM LAN NetView Start configures and tunes software products on workstations. Start supports both applications that are enabled for Configuration, Installation, and Distribution (CID)¹ and those that are not. LAD/2 also supports CID-enabled products but concentrates on installation.

The first section of this article describes how to migrate data created with LAD/2 to Start. This makes Start much easier to use for tuning applications after they are installed.

Start allows network administrators to graphically configure several products on networked workstations (see Figure 1). Start supports the Entry and Advanced versions of LAN Server 3.0, the

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and John L. Bunce**
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Austin, Texas

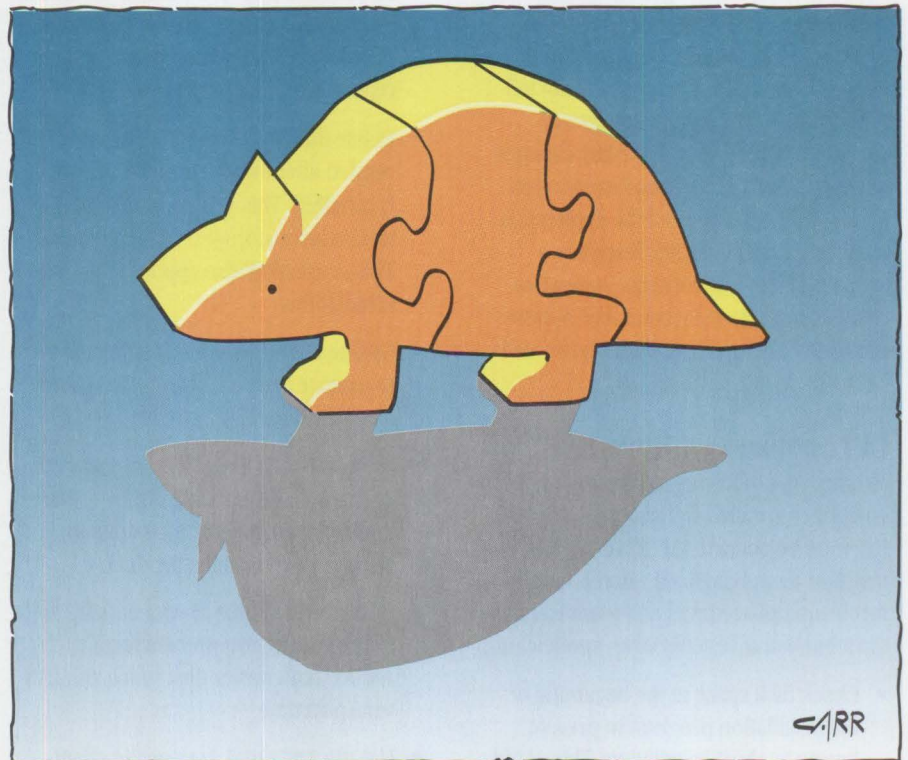
LAN Adapter and Protocol Support (LAPS) component of Network Transport Services/2 (NTS/2), and the Communications

Manager and Database Manager components of OS/2 Extended Services. Administrators can drag and drop workstation icons onto transformer icons, generating the files needed to remotely install or configure applications on workstations.

Although administrators can use Start to configure non-CID applications, the graphics are limited. With no drop-down lists, administrators cannot choose values from custom controls on their node notebooks. The techniques presented in the second half of this article, however, can allow you to add further support to Start for CID- and non-CID-enabled applications.

LAD/2

LAD/2 allows administrators to set the installation parameters of software products.



¹ For an overview of CID, see "CID: Remote OS/2 Configuration, Installation, and Distribution of PC Software" in the January 1993 issue of *Personal Systems Technical Solutions*.

Its distribution mechanism includes response files, LAN CID Utility (LCU) command files, and other files. *Response files* contain a set of keyword=value assignments that eliminates having users manually enter values into a program during installation. *LCU command files* allow users to set the order of product installation, use the CID parameters for the applications, and include additional functions.

Administrators can specify keywords such as installation parameters by stepping through the LAD/2 panels. Start, however, allows users to include installation keywords in their response files by creating supplemental response files.

LAD/2 and Start use much of the same data. After an administrator installs software on a workstation, Start can configure and maintain the applications, using Start's built-in tuning rules and aging abilities. Once transformed into response files, LCU command files, or NetView Distribution Manager/2 (NetView DM/2) change files, Start stores the data for a workstation in a corresponding aged node representation. When the administrator modifies information on a workstation and transforms it again, options permit the output to reflect either the changed information only or the complete configuration information.

For example, products such as Communications Manager have specific keywords indicating whether a 3270 session defined in a response file is new, modified, or should be deleted. By using aged nodes, Start knows if sessions have been added, changed, or deleted since the last time the node was transformed.

Migrating Data from LAD/2 to Start

Start can be used with client data originally created by LAD/2. Administrators must migrate the client data from LAD/2 to Start. If you have been using LAD/2, it can be helpful to examine the terminology used by both products. LAD/2 has a hierarchy of objects (see Figure 2), beginning with customers at the top. Customers can have a collection of workgroups. Within each workgroup, users can define several client workstations as well as the products on these workstations.

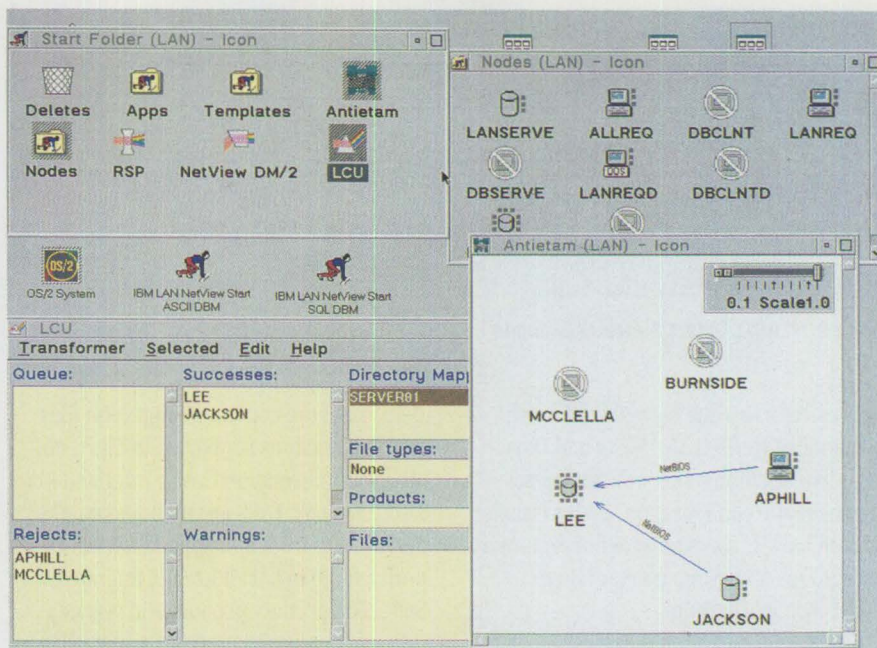


Figure 1. IBM LAN NetView Start in Action

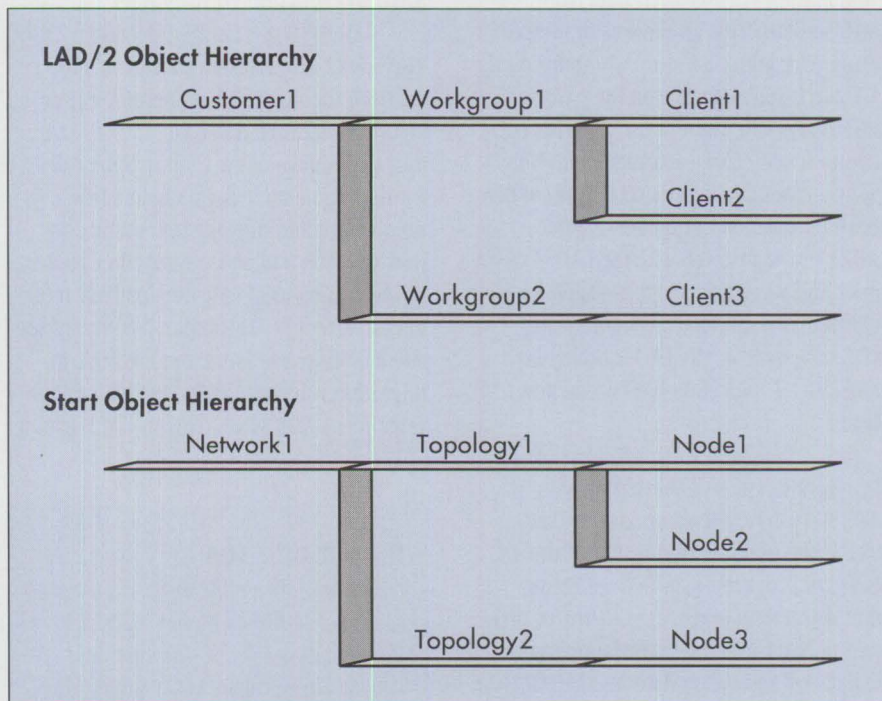


Figure 2. Comparison of the LAD/2 and Start Object Hierarchies

The Start hierarchy (also shown in Figure 2) begins with a network at the top. A network can contain several topologies, with each topology having one or more node workstations and the products on their workstations.

LAD/2 can support multiple customers just as Start can support multiple networks.

But only one customer or network can be loaded concurrently.

The workstations in Start topologies can contain different products. For example, one workstation can contain a Communications Manager Distributed Function Terminal (DFT) definition and connection but have no LAN definition; another workstation can contain the opposite. When

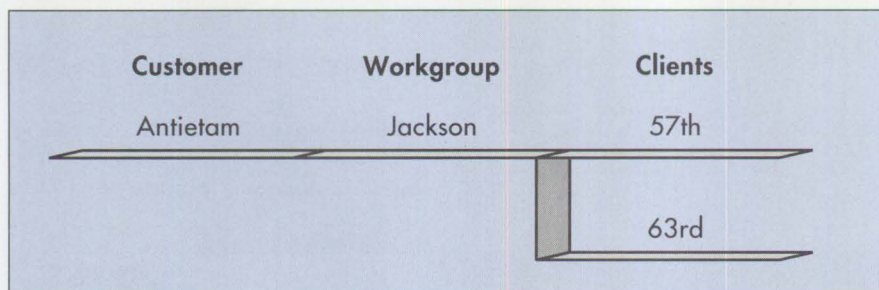


Figure 3. LAD/2 Object Structure Example

administrators switch between different functionality views (LAN, 3270, and Database), workstation icons will change according to the configuration. To have such a mix in LAD/2, users must define separate workgroups and group similar clients within each workgroup.

The LAD2ST11 Applet

The LAD2ST11 applet can help network administrators bridge their data from LAD/2 to Start. This applet was designed for network administrators who have used LAD/2 to install software on their workstations and who want to use Start for configuration and change management. This applet is available in the CID Library of the OS2DF2 forum on CompuServe. After LAD2ST11 is invoked with the LAD/2 customer and workgroup names slated for migration, the applet transfers data for LAD/2 clients from the LAD/2 table files into Start 1.1 migration files—one per client.

The migration files generated by LAD2ST11 have the same format (see box) as the ones created by the OCUNODE discovery program, supplied with Start. Administrators can run the OCUNODE program on their existing workstations to get the data for their workstation, 3270 DFT and non-DFT sessions, and LAN configurations. Whether the migration files were created by OCUNODE or LAD2ST11, administrators can drag and drop them from an OS/2 Directory folder onto a Start Topology container. Start will display objects representing the workstations and software represented by the migration files. Start will also draw connections between the LAN clients and servers to the appropriate LAN domain controllers and draw DFT and non-DFT connections to the host node representations.

Because of the content of migration files and the functions supported by Start, not all client information can be migrated from LAD/2 to Start. LAPS installation data, OS/2 ServicePak, DOS, and application information defined in LAD/2 are not migrated to Start. The primary product and workstation information is migrated, especially in the areas with overlapping installation and configuration definitions, such as with 3270 DFT and non-DFT sessions.

The applet generates migration files for use with topologies in either an ASCII or SQL Start network database. LAD2ST11 takes advantage of the built-in Start rules for migration such as checking name uniqueness and drawing automatic connections. If it had chosen the other route—attempting to modify the database information directly—the applet would migrate a few more parameters, but the built-in migration rules would need to be incorporated into LAD2ST11. This would increase

Migration Files

A migration file can contain up to six sections, as shown below. Each section contains a set of keywords and values. These values in the migration file will be assigned to the corresponding parameters in the workstation or products represented in Start.

- General node information
- DFT sessions
- Non-DFT sessions
- DFT adapter
- Non-DFT adapter
- LAN parameters

the complexity of the applet as well as its size and processing time.

Administrators may want to generate other keyword values for the migration files created by LAD2ST11. The applet allows administrators to use an override file to specify the keywords in the migration file followed by the new values, if any. Specified values will replace the existing keyword values in all the generated migration files. Since a variety of values and formats exist, the migration file should not be modified directly.

The LAD2ST11 applet follows these steps:

1. Processes the command-line invocation parameters.
2. Reads in the override file, if used.
3. Finds the workgroup file and list of client names.
4. Reads in the data rows for the other LAD/2 tables.
5. For each LAD/2 client, creates the keyword and value structure for all the relevant migration sections: node, emdftparms, emnondftparms, dftadapter, adapter, and lansrparms.
6. Processes the override values, if any.
7. Writes out one migration file for each LAD/2 client.

Values that are not processed or that are inferred by the applet are logged. Administrators can use the log file to determine what the applet may have changed during the translation or what parameters were not included in the migration file, even though they are supported by Start.

Example Using the LAD2ST11 Applet

Invoke LAD2ST11 after installing workstations with LAD/2 or having at least used LAD/2 to define the products on the workgroup's clients. LAD2ST11 will create several migration files. Next, run Start, open a topology (new or existing), and drag and drop the migration files onto the Topology container. Migration files can be mixed if they were created from different workgroups and if they conform to Start rules, such as node name uniqueness. Start can then be used to maintain your

workstations. If you need to change a workstation using LAD/2, rerun LAD2ST11 afterwards. Specify that only the changed clients must be migrated. After the applet generates the migration file, open your Start topology, delete the old node, and drag and drop the new migration file definition onto the topology.

To retrieve the LAD/2 client data, the LAD2ST11 applet reads the LAD/2 table files. For example, suppose a network administrator had created the structure shown in Figure 3 for two client workstations. The LAD/2 data files would be stored in the directory structure shown in Figure 4.

The workgroup file stores high-level information about all the customers and workgroups in the \LADCODE subdirectory. The other table files store client workstation and product-specific information (such as information for Extended Services, LAPS, and LAN Server 3.0) in the corresponding customer and workgroup subdirectories. Note that the applet does not change any data in the LAD/2 data files.

For example, the following command would invoke the LAD2ST11 applet to create Start migration files for clients in customer ANTIETAM and workgroup JACKSON.

```
LAD2ST11 /LADPATH=y:\LAD2\
/customer=antietam
/workgroup=jackson
```

Figure 5 shows the migration files generated by LAD2ST11 for this example.

Supporting CM/2 and DB2/2

Start 1.1 supports many configuration parameters for the prior Communications Manager and Database Manager components of OS/2 Extended Services. In 1993, IBM began selling these separately from Extended Services. DB2/2 is an upgrade of Database Manager and CM/2 is an upgrade of Communications Manager. CM/2 and DB2/2 also support Extended Services response files. These older response files can contain a mixture of Database Manager and Communications Manager keywords—the newer response files may not. CM/2 will also generate a CM/2 response file based on an Extended Services response

Workgroup Table:	\LAD2\LADCODE\WORKGRP.TBL
Extended Services Table:	\LAD2\ANTIETAM\JACKSON\EXTD.TBL
LAPS Table:	\LAD2\ANTIETAM\JACKSON\LAPS.TBL
LAN Server Table:	\LAD2\ANTIETAM\JACKSON\LS30.TBL
Receiver Table:	\LAD2\ANTIETAM\JACKSON\RECEIVER.TBL

Figure 4. Paths for the LAD/2 Data Files Example

file, removing Database Manager keywords and upgrading those Communications Manager keywords that changed from the old product to the new.

Since Extended Services response files can be used with the new products, administrators can easily incorporate these files into their generated LCU command files, along with their product installation program and parameters. This can be done by using a two-step process—one before the user invokes Start and the other after the user defines the products and exits Start.

The first step is to create the application representations in Start by asking the user for the installation program parameters for the CM/2 and DB2/2 products. This data is inserted directly into the Start ASCII or SQL database as an application object.

Administrators could implement this step in a utility that exploits the functions and features common to CM/2 and the Communications Manager as well as those common to DB2/2 and the Database Manager. It would establish both the CM/2 and DB2/2 products as Start applications in the Apps folder. This would allow the defini-

tion of information unique to these products as shown in Figure 6.

After creating these application objects outside of Start, administrators can do the following:

1. Invoke Start.
2. Add or modify workstation nodes.
3. Drag and drop the new applications onto the workstations.
4. In the 3270 and Database sections of the node notebook, modify the unique configuration parameter information for each node that will have CM/2 and/or DB2/2.
5. In the Files section of the node notebook, include supplemental response files, if any, for each node that will have CM/2 and/or DB2/2.
6. Transform the nodes to generate the LCU command files (ensuring that the Extended Services response files are generated).
7. Exit Start.

Since the configuration parameter values of the two products are similar, network

```
*NODE*
...
DBType   svr
LANType  req
EMType   dft
...
*ADAPTER*
AdapterNum 0
AdapterType Token Ring 16/4 /a
...
```

Figure 5. Example of Start Migration File Generated by the LAD2ST11 Applet

CM/2 Specific Information
Product image file path General response file path Fully qualified response file installation log file (L1) Fully qualified installation log file (L2)
DB2/2 Specific Information
Product ZIP files path General response or userexit file path Timeout waiting for install Temporary directory

Figure 6. CID Parameters Used by CM/2 and DB2/2

administrators can use the 3270 and Database sections in the node notebook to change the configuration parameters for each workstation. Once the CM/2 and DB2/2 applications are established, using Start is the same as for any other application. Start administrators can use the Start graphical interface to drag and drop the CM/2 and/or DB2/2 application icons on a target workstation icon.

Administrators can generate distribution system output (such as the LCU command file) for a node by invoking the Start transformer. This is done by dragging and dropping the target workstation node icon onto a Start transformer. The LCU transformer then outputs an LCU command file and a response file. Administrators can transform multiple nodes or an entire topology of nodes at one time.

As mentioned earlier, Start supports the most commonly used Extended Services configuration parameters for both Database Manager and the 3270 functions of the Communications Manager. Additional parameters (installation and uncommon configuration parameters) are supported by processing a supplemental response file. If these types of parameters are needed for a node, administrators can specify the product supplemental response files in the corresponding node's notebook and select the Mark for Installation option for the targeted node.

The second step completes the process of adding Start support for CM/2 and DB2/2. This step loops through each generated LCU command file in the target directory, removes the installation entries for Ex-

tended Services, and inserts the new entries for the CM/2 and DB2/2 products. The Extended Services entries exist in two places: the product variable data section that contains the installation program name and parameters; and the installation ordering that indicates the sequence in which Extended Services will be installed. Administrators can then create the boot diskettes and install the target workstations with the modified LCU command files.

Administrators can implement this step as a second utility by assuming that if Extended Services is defined in the LCU command file, they want to install both CM/2 and DB2/2. Alternatively, the utility could scan the Extended Services response file first to locate Communications Manager and Database Manager keywords, since those files exist in the Start directory structure on the same machine. Finding the keywords indicates that the products will be installed on the machine. This utility could also query the Start database to determine if the node corresponding to the LCU command file has 3270 or database functionality defined.

This approach does not support any more CM/2 or DB2/2 keywords than Start supports. Administrators can add those keywords, such as CM/2 installation keywords, through supplemental response files. This approach does not change the functionality in Start 1.1.

Other Applications

Start can support other applications using the same techniques. Although these techniques require administrators to do some additional work in the beginning, they can still rely on Start to generate the LCU

command files. Similar techniques can be used to automate changing the generated LCU command files.

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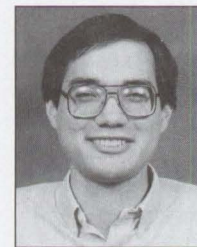
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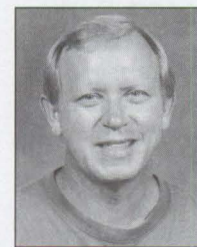
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Theodore Shrader is a senior associate programmer in Austin, Texas. Ted joined IBM in 1989 to work on graphical interfaces to the OS/2 Database Manager. He has worked in graphical application development, most

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John L. Bunce is an advisory system analyst in Austin, Texas. John joined IBM in 1968 and has worked in such areas as product engineering, information systems, manufacturing, and product development. He first began

OS/2-related development while working on OS/2 1.0. He is currently the development lead for Start 1.1.

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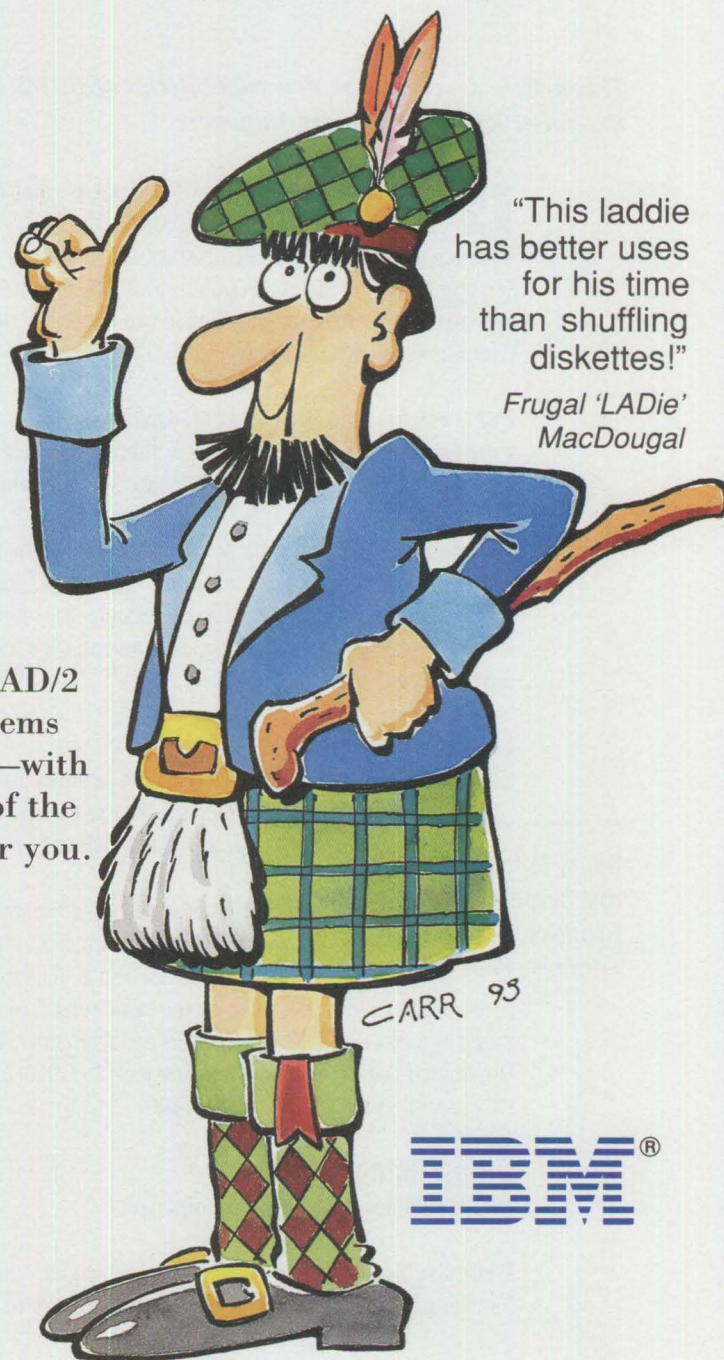
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OS/2 2.0	DBM/2* OS/2
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DB2/2—DB2 Comes to the Desktop

This article describes the new capabilities of DB2/2, the successor to OS/2 Extended Services Database Manager.

In May 1993, a new version of OS/2 Database Manager¹ became available under a new name: DATABASE 2 OS/2 (DB2/2). DB2/2 is a true 32-bit application and a separate product. It is no longer packaged in Extended Services (ES) with the OS/2 Communications Manager. The functions provided by Extended Services are provided in two successor products: DB2/2 and Communications Manager/2.

DB2/2 can function as a robust PC database server, providing data access from a variety of clients, or can serve as a stand-alone database system. It offers all the functions provided by OS/2 Database Manager plus many enhancements.

Why did IBM choose to rename OS/2 Database Manager in this release? As shown in this article, DB2/2 is a more robust OS/2 database product. It is a strong product for a multiplatform environment, a full-fledged member of IBM's family of relational database products, and an excellent development platform for DATABASE 2 (DB2).

Closer Ties to DB2

DB2 is IBM's premier relational database product for MVS mainframes. It is the dominant large systems database in the market today, with many terabytes of data stored throughout the world.

Nancy Miller
IBM Corporation
Roanoke, Texas

Since its inception in 1988, OS/2 Database Manager has shared technology with DB2. DB2/2 incorporates many strengths of DB2, including features that guarantee data integrity, security, and recoverability. Both are based on the same relational model and feature a cost-based optimizer and declarative referential integrity. When implemented with Distributed Database Connection Services/2 (DDCS/2), DB2/2 can be a client to DB2 as well as to SQL/DS™ or AS/400.

DB2/2 Components

DB2/2 includes the following components:

Database Services: This is the database "engine" that provides all the base functions of DB2/2. It creates databases, tables, views, indexes, recovery log

and configuration files, and manages all the data. It generates the "packages" or access plans to access the data and supports Structured Query Language (SQL), which is used to define, manipulate, and control data in a database. Database Services also manages transactions, data integrity, and data protection services.

Remote Data Services (RDS): This facility provides the database server and client functions for LAN environments. Using RDS, an end user or application program can access a database on a remote workstation. If using DDCS/2, the user can access a host relational database. When a request is issued, RDS determines the database location and transmits the request to the relational engine in Database Services.

Application Programming Interfaces (APIs): A group of routines can be incorporated into an application to perform many database functions. Programs can use API calls for such functions as backing up and restoring the database, importing and exporting tables, and updating the database manager configuration file. All APIs are fully documented and can be called through vendor tools or tools supplied with DB2/2. They can also be embedded in programs written in various supported languages.

Database management and administration tools: These management tools include the Configuration Tool, which allows

¹ For information on earlier versions of OS/2 Database Manager, see "Database Manager: Highlights and Directions," *Personal Systems Technical Solutions*, Issue 4, 1991, and "IBM Extended Services Database Manager," *Personal Systems Technical Solutions*, July 1992.

the user to specify the resources to be allocated for DB2/2 and for each database; the Recovery Tool, which allows administrators to perform backup, restore, roll-forward recovery, and restart the database; and the Directory Tool, which provides facilities for administrators to create or drop a database and to catalog or uncatalog either a local or a remote database.

Command-line processor: This facility provides quick access to database functions from the OS/2 command line. In Extended Services Database Manager, this facility was called the Command-Line Interface. It can be used with DDCCS/2 2.0 to access a host database as well as local databases or databases on a LAN.

Query Manager: This Presentation Manager application provides a user-friendly prompted interface to DB2/2. Query Manager can also be used for creating and executing applications. The functions provided by Query Manager are the same as

those in Extended Services Database Manager. Query Manager cannot be used to access host databases.

This is the last release of the product that will include Query Manager. In the future, IBM will offer various products that will provide a broad range of front-end and database interface solutions.

Performance Improvements

DB2/2 performance has been improved in several areas. First, DB2/2 is a 32-bit application. Since it runs on OS/2 2.1, it takes advantage of the OS/2 32-bit enhancements. Second, some users will find improved performance because of increases in the maximum limit for the buffer pool size and the sort heap size—two important tuning parameters for DB2/2. Finally, system administrators can now control when damaged indexes are rebuilt, so they can choose a time that will least impact users.

The 32-Bit Difference

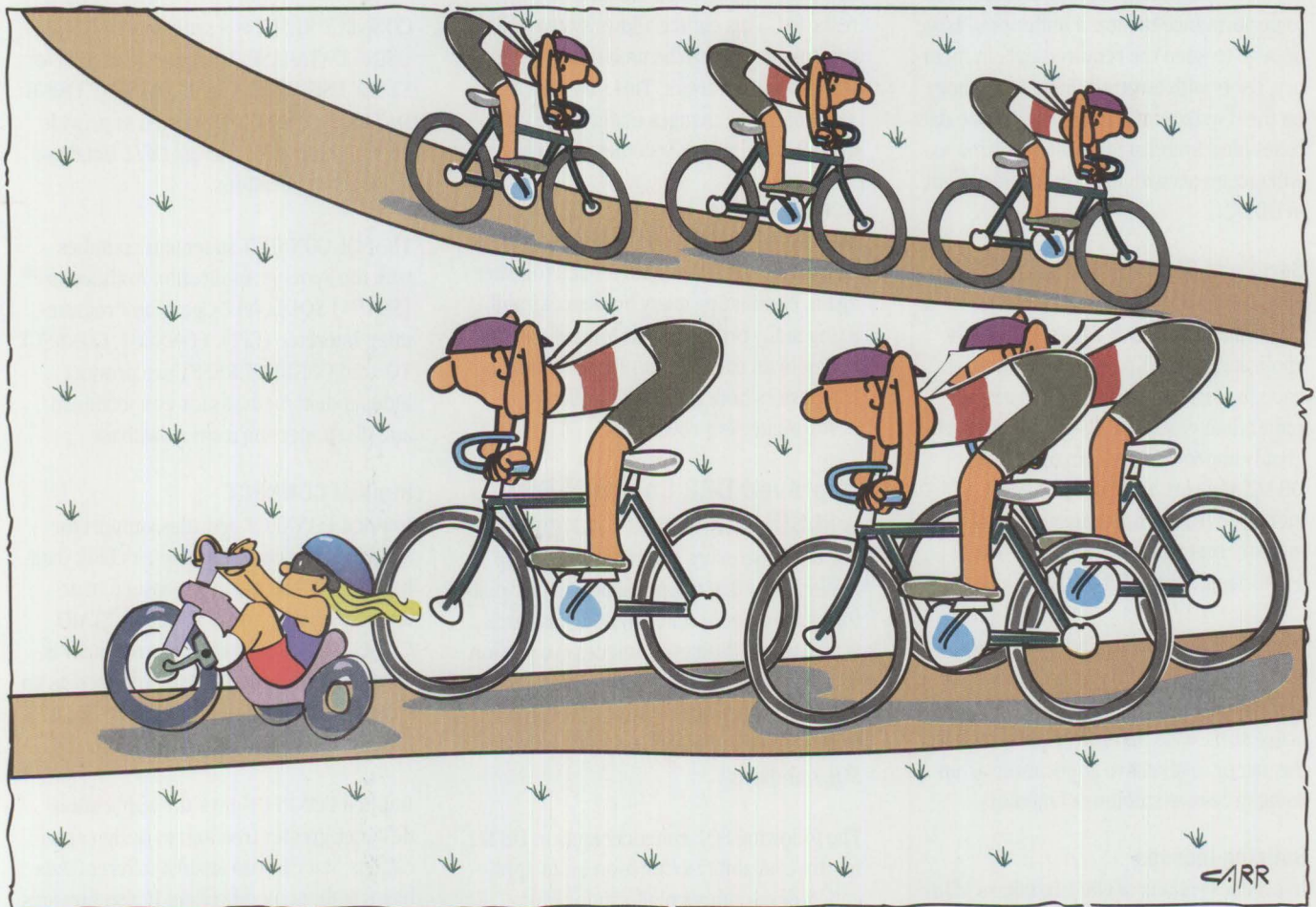
With the 32-bit flat-memory model, all addresses are near addresses. Thus, it is not necessary to have segment registers loaded when accessing data or calls. The result is an average 20% to 30% reduction in instruction path length.

The move to 32-bit is most significant for applications that are CPU-intensive rather than I/O-intensive. Since DDCCS/2 2.0 running with DB2/2 relies heavily on the CPU, it can benefit greatly from this enhancement.

Buffer Pool Size

The buffer pool is a memory area (cache) allocated by DB2/2 for each database in use. It consists of multiples of 4 KB pages. The maximum size has been increased from 1,500 4 KB pages (6 MB) to 32,767 4 KB pages (128 MB).

Database Services uses the buffer pool to store records as they are read and changed. Once data is in the buffer pool, it remains



Data Type	Default Value
Numeric	0
Fixed-length character string	Blanks
Variable-length character string	A string of length 0
Graphic string	Double-byte blanks
Variable-length graphic string	A string of length 0
Date	For existing rows, a date corresponding to January 1, 0001. For added rows, the current date.
Time	For existing rows, a time corresponding to 0 hours, 0 minutes, and 0 seconds. For added rows, the current time.
Timestamp	For existing rows, a date corresponding to January 1, 0001, and a time corresponding to 0 hours, 0 minutes, 0 seconds, and 0 microseconds. For added rows, the current timestamp.

Figure 1. Default Data Types

there until the last active write transaction is committed to the tables, the database is no longer in use, or the space is needed for other transactions.

Since data is accessed much faster in memory than from disk, it can be a great boon to performance to have a buffer pool large enough to keep the required data in memory. Users with large amounts of memory on their systems and with large, active databases have found significant performance enhancements with the larger buffer pool in DB2/2.

Sort Heap Size

The sort heap is a segment of private memory available for each data sort in each application. If this parameter is set high enough, sorts can take place in memory rather than requiring disk access, thereby greatly improving performance. With DB2/2, the sort heap size has been increased from a maximum of 20 64 KB memory segments (1.25 MB) to 1,000 64 KB segments (62.5 MB).

A new DB2/2 configuration parameter, Sort Heap Threshold, has been added to control the amount of memory used for all active sorts. This parameter prevents sorts that occur in all active applications from using excessive amounts of memory.

Building Indexes

In earlier versions of OS/2 Database Manager, the index file (actually a separate file from the table file) was rebuilt when the

index was first used. If the table was large, the process of rebuilding this file could be time consuming and cause locks on data, impacting overall system performance. With DB2/2, there are two times that the index can be rebuilt: when the index is first accessed or when the database is restarted. This choice allows system administrators to choose the time that has the least impact on users. This new option is an example of changes made to the product based solely on customer requirements.

Rebuilt Engine

DB2/2 developers took the Database Manager engine apart and put it back together again, eliminating many bottlenecks and fixing many problems. Customers participating in an early availability program and IBM testers both reported significant performance improvements.

Improved DB2 Compatibility and SQL Standards Compliance

For database users who want to develop applications that are portable to other platforms, close adherence to SQL standards is important. With every successive version of Database Manager and now with DB2/2, IBM has improved the product's compatibility with DB2 and its compliance with SQL standards.

The following SQL enhancements in DB2/2 improve its ability to function as an application development platform for host database applications.

NOT NULL WITH DEFAULT

Column Definitions

This is a parameter for the CREATE TABLE or ALTER TABLE statements. With previous versions of the Database Manager, users could set up a column to be NOT NULL, preventing the column from containing null values. Now, users can define columns to default to a system-defined value based on the column data type when the value is not provided in the INSERT statement. The default data types are shown in Figure 1.

The CONNECT Statement

The CONNECT statement is an SQL statement that connects an application process or a user to an application server. The application server is identified by a database alias that must be listed in the application requester's local directory.

CONNECT TO is a synonym for START USING DATABASE. An example is CONNECT TO SAMPLE, where SAMPLE is the database alias.

CONNECT RESET is a synonym for STOP USING DATABASE. The equivalent APIs for START USING DATABASE and STOP USING DATABASE are still supported to provide compatibility with current OS/2 Database Manager applications.

The SQL CONNECT statement complies with the Systems Application Architecture® (SAA™) SQL Level 2 Common Programming Interface (CPI). CONNECT, CONNECT TO, and CONNECT RESET are product-independent methods for connecting to and disconnecting from a database.

Implicit CONNECT

Implicit CONNECT provides support for automatically connecting to a default database if SQL statements are issued in an application and no CONNECT or START USING DATABASE has been previously issued. The default database is defined as an environment variable in the CONFIG.SYS file.

Implicit CONNECT gives the application designer greater freedom to design applications that can run against different databases without modification. It also provides greater DB2 compatibility since the

database name is not generally used in host applications. This feature is important to those who bring their source code down to OS/2 for off-loading host application development.

CURRENT SERVER Register

CURRENT SERVER is one of several special registers or storage areas within the Database Manager. These registers store special information that can be referenced by SQL statements. The CURRENT SERVER register is a value that identifies the current application server. Since this register is supported by other SAA database products and adheres to the SAA Level 2 CPI, accessing this register provides a product-independent way of determining the name of a database (local, remote across the LAN, or remote host) to which an application is connected. The following is an example of how CURRENT SERVER might be used in an SQL statement:

```
SELECT CURRENT SERVER
INTO :hostvar
FROM tablename
```

RUN as a Synonym for EXECUTE

RUN can now be used as a synonym for EXECUTE when granting or revoking privileges on a package. Again, this is consistent with the way privileges on packages are specified on other SAA platforms. A *package* is an object that contains all the information necessary to execute specific SQL statements. A package is also called an *access plan* or a *plan*.

The following example shows how RUN can be used:

```
GRANT RUN ON PACKAGE pkg_name
TO PUBLIC
```

DECIMAL, INTEGER, and FLOAT Scalar Functions

Each of these three functions takes a number returned from an SQL statement as its input and represents it in the appropriate format for that function. This support is yet another change that brings the product in closer compliance with SAA Level 2 CPI and other industry standards; for example:

```
SELECT INTEGER
(salary/edlevel) FROM employee
```

This example accesses the EMPLOYEE table and divides each value in the Salary column by the corresponding value in the Edlevel column. The resulting decimal number will be converted to an integer, then returned.

Systems Management Support

As more and more data is moved from centralized host systems and spread across an enterprise, managing this data becomes a primary concern for administrators. Security issues previously handled in one place are now much more complex because they must be dealt with across multiple platforms in multiple physical locations.

With every successive version of Database Manager and DB2/2, IBM has improved the product's compatibility with DB2 and its compliance with SQL standards.

With distributed data, problem determination is much more complex than at a single site. At the same time, users require easier ways to distribute and install code and fixes to code.

First Failure Support Technology/2

DB2/2 supports First Failure Support Technology/2 (FFST/2). Packaged with the product, FFST/2 allows application programmers to determine the cause of errors and collect diagnostic information. Because FFST/2 captures diagnostic information at the time of failure, the error does not have to be re-created.

To assist users or programmers with problem determination and error detection, IBM has increased the number of FFST/2 probe points into the DB2/2 code base. Probe points are used to capture diagnostic information when an error occurs.

Configuration, Installation, and Distribution

Both DB2/2 and DDCCS/2 are "CID-enabled;" that is, they can be installed remotely on a LAN using IBM's Configuration, Installation, and Distribution (CID) technology. With the DB2/2 CID feature, a user can remotely install DB2/2, DDCCS/2, the OS/2 distributed feature, or Query Manager on LAN workstations from a central point or code server. Needless to say, this feature has made the installation process much easier and more efficient.

The CID process uses IBM's LAN NetView products and Network Transport Services/2 (NTS/2). A response file directs the installation of the desired code on the target workstation. For more information about CID, see "Writing CID-Enabled Applications" in this issue of *Personal Systems* and "CID: Remote OS/2 Configuration, Installation, and Distribution of PC Software" in the January 1993 issue.

IBM LAN NetView

The IBM LAN NetView family of products will provide further support for managing DB2/2 machines through the LAN NetView Agents Extended product. When this product becomes available by the end of 1993, it will include an agent for the DB2/2 products. An application running on a LAN NetView management station will be able to use the DB2/2 agent to manage DB2/2 and its databases.

Here are some functions that a managing application will be able to provide for DB2/2 using LAN NetView:

- Back up, restore, and perform roll-forward recovery of a database across a LAN
- Remotely catalog and uncatalog databases
- Emit notifications when certain state changes or errors occur
- Collect database status information, such as the number of users connected and the time of last backup
- Retrieve or modify database configuration parameters such as the size of the buffer pool

16-bit Compilers
Microsoft C Compiler Version 6.0 WATCOM FORTRAN F77 Compiler Version 9.01 (Patch Level D) Micro Focus COBOL [®] Compiler Version 3.0
32-bit Compilers
IBM C Set/2 Compiler Version 1.0 WATCOM FORTRAN F77/386 Compiler Version 9.01 (Patch Level D)

Note: Applications for DOS or Windows clients should be written in Microsoft C 6.0 or Micro Focus COBOL 3.0.

Figure 2. Languages Supported by DB2/2 Precompilers

Application Support

Applications access DB2/2 databases either by calling DB2/2 routines (APIs) or by containing embedded SQL statements. Application programs for DB2/2 can be written in a compiled language or in IBM SAA Procedures Language/2 REXX. Because REXX is easy to use, it is excellent for prototyping applications that can later be written in one of the faster and more flexible compiled languages.

Compiled applications can be written in C, COBOL, or FORTRAN. Figure 2 shows the languages supported by DB2/2 precompilers to process the SQL statements.

Existing Applications

Existing applications written for the Extended Services 1.0 Database Manager in C, COBOL, or FORTRAN will run on DB2/2 without recompilation or relinking. Although Extended Services is 16-bit, it does support the development of 32-bit applications using IBM C Set/2. For best performance, these existing applications should be recompiled and relinked so that they

access the new DB2/2 Version 1 interfaces directly. The 32-bit compilers will naturally provide the best performance.

Developing Applications for DB2/MVS

For those who are using DB2/2 as a development platform for DB2/MVS, Micro

DB2/2 is intended for use as a high-performance stand-alone database system, a LAN-based client/server database system, or a cost-effective way to access host data from a workstation client.

Focus[®] provides a supplementary product called Micro Focus Host Compatibility Option for IBM Database Manager 1.0 as

Communications Protocol	Communications Application
OS/2	
NetBIOS	Network Transport Services/2 (NTS/2) IBM LAN Adapter and Protocol Support (LAPS) (comes with LAN Server)
APPC/APPN	Extended Services 1.0 Communications Manager IBM Communications Manager/2
SQLLOO	OS/2 Extended Edition 1.3 Communications Manager
DOS and DOS/Windows	
NetBIOS	LAN Support Program Version 1.2.1 or higher

Figure 3. Communications Protocols Supported for DB2/2 Clients

an option for Micro Focus COBOL. This option provides some DB2-type development tools, including EBCDIC data conversion facilities, a DCLGEN facility, a Data Definition Language (DDL) processor, and an SQLCODE mapping facility. The DCLGEN utility creates a COBOL copy member with a DECLARE TABLE and host variable structure, and can be run interactively from the command line for batch execution. The DDL processor is a tool for executing a group of DDL statements. The SQLCODE mapping facility translates DB2/2 error codes into the equivalent DB2 error code. COBOL programmers accustomed to developing applications on a mainframe will find these tools familiar and useful.

Connectivity

Database client applications can be run from OS/2, DOS, or DOS/Windows 3.x. Each client must have a communications protocol installed as well as the database client-enabling code. Figure 3 shows the supported communications protocols and the products that can be used to provide the support.

As shown in Figure 4, DB2/2 offers new wider connectivity choices. For the first time, down-level server support is available. A DB2/2 client can access an Extended Services server. This allows system administrators to upgrade their clients a few at a time, then upgrade the server. Many system administrators prefer this gradual approach to systems migration.

A DB2/2 server can be accessed using APPC by down-level Extended Edition 1.3 clients or using APPC/APPN or NetBIOS by Extended Services 1.0 clients, as well as by clients running 32-bit OS/2, DOS, and DOS/Windows.

When DDCS/2 is installed with DB2/2, the DB2/2 machine can be a client to host databases. DDCS/2 can be purchased for a single DB2/2 user or for a DB2/2 server. The server version allows all the supported DB2/2 clients to access the host databases. Once the host database has been cataloged on the client, it can be accessed just as if it were an OS/2 database. The database location is transparent to both users and applications.

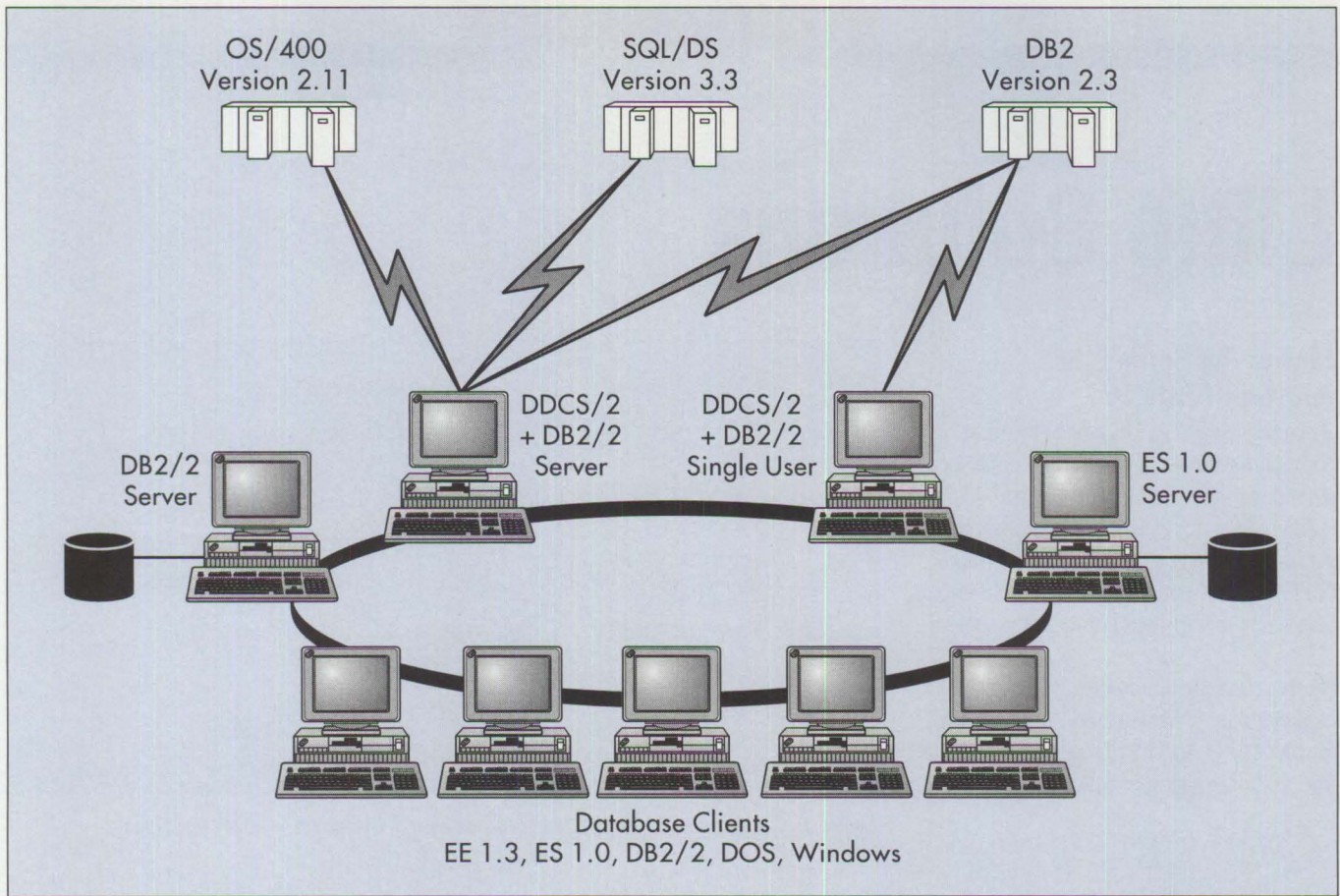


Figure 4. DB2/2 Client/Server Environment

APPC is required for DDCS/2 to communicate to a host. If DDCS/2 is to be installed on the server, either Extended Services Communications Manager or Communications Manager/2 must be installed to provide APPC support.

Conclusion

DB2/2 is IBM's strategic workstation-based database product. It is intended for use as a high-performance stand-alone database system, a LAN-based client/server database system, or a cost-effective way to

access host data from a workstation client. It is also a convenient platform to develop applications for use on one of IBM's mainframe relational host systems. The product will evolve with even more changes in the next release as developers accelerate the pace to meet customer demands and requirements. For online transaction processing, decision support, personal productivity, and mission-critical applications, users will find DB2/2 to be an effective solution.



Nancy Miller joined IBM in 1989 after participating in the IBM cooperative education program. She has provided technical support for the OS/2 Database Manager for four years in the Personal Systems Competency Center. She holds a BS from Oklahoma Baptist University and studied mathematics and computer science at Texas Woman's University.

Little Solutions

How to Put Some Life into Your PROMPT

When working in an OS/2 full-screen or command window, it would be nice to see something other than drab gray type. The following PROMPT command allows you to set some pleasing colors to liven up your OS/2 sessions. You can also add the time/date stamp in the upper corner of the screen.

Figure 1 lists the commands with their explanations. When you add the command to your CONFIG.SYS file, put it on one line, without spaces, as follows:

```
SET PROMPT=$e[s$e[2;53f$e[1;...
```

Use the chart in Figure 2 to choose your own colors.

—Paul Leduc, IBM Canada Ltd.
Markham, Ontario

Changing the Appearance of a Text File Document

Embedding commands within your document can help you change the appearance of a document and implement various features supported by your printer. There are three types of commands for this purpose: control codes, escape sequences, and control sequences.

A *control code* is a single-byte command that specifies functions such as line feed, carriage return, form feed, and escape. The escape code (ESC) indicates the beginning of an escape or control sequence.

Escape sequences begin with a two-byte mnemonic that can have parameters. The first byte is the ESC code; the second byte identifies the particular command to the printer. For example, the ESC Pn command causes an IBM LaserPrinter to begin or end proportional spacing. The value n begins or ends proportional spacing

SET PROMPT=	\$e[s	Save current cursor position
	\$e[2;53f	Move cursor line 2, col 53
	\$e[1;46;33m	Set date/time color: yellow on cyan*
	\$e[K	Erase to end of row
	\$D	Display current date
	\$e[2;70f	Move cursor to line 2, col 70
	\$T	Display current time
	\$h\$h\$h	Delete the hundreds of seconds
	\$e[u	Restore cursor to original position
	\$e[1;41;37m	Set prompt color: white on red*
	\$i[\$p]	Display OS/2 info line and prompt
	\$e[1;40;32m	Set text color: green on black*

*When setting colors, use \$e[x;y;z m where x = attribute
y = background
z = foreground

Figure 1. Setting the PROMPT Colors and Including Time/Date for OS/2 Sessions

Attributes	Background	Foreground (Text)
0 = none	40 = black	30 = black
1 = high intensity	41 = red	31 = red
2 = normal intensity	42 = green	32 = green
4 = underline	43 = yellow	33 = yellow
5 = blinking	44 = blue	34 = blue
7 = reverse video	45 = magenta	35 = magenta
8 = invisible	46 = cyan	36 = cyan
	47 = white	37 = white

Figure 2. Numerical Codes for Setting Screen Colors

mode. A value of n=1 (or any odd number) begins this mode. A value of n=0 (or any even number) ends this mode and restores pitch to the value in effect prior to this command.

A *control sequence* is a three-byte mnemonic followed by a specified number of parameters. The first byte of the mnemonic is the ESC code. For an IBM LaserPrinter, the second byte is always the character "I"; the third byte identifies the specific control sequence. For example, ESC | j saves or restores the cursor X and Y

coordinates of the cursor position. The "j" parameter represents parameters Ln, Hn, and Mode. Ln and Hn represent the length of the command; Mode represents a value to save or restore the coordinates. The printer recognizes that a control sequence is completed when the printer processes the number of bytes specified for the remainder of the command.

These commands are printer codes that control and manipulate the printer (check the technical reference manual for your printer). Many features can be manipulated

by these commands, which vary from printer to printer. Additional features controllable by some printers are as follows:

- Horizontal movement such as space, tabs, and carriage returns
- Vertical movement such as line feeds, vertical tabs, and form feeds
- Page format such as top of form, margins, landscape, and portrait

You must embed printer commands in the text file document to use them. That is because the printer driver will reinitialize the printer between print jobs and allows only the printer commands for that job. Except for data embedded in escape or control sequences, the printer assumes that each byte received is a control code or a character to be printed.

Tables called code pages determine which character or control code each byte represents. Each character and control code is represented by a number between 0 and 255 called a code point. Code pages map characters to code points; for example, the escape control code (ESC) is 27. The code points for ESC I are 27 91.

To embed printer commands in a file, first open the text file in a text editor. Next, hold down the ALT key while entering the code points for the printer command.

Note: Some text editors do not support this function. They require that only "true" printable characters be allowed in the datastream. The OS/2 System Editor and EPM Editor do support embedding printer commands in a document.

REXX, a language provided with OS/2, can help if you frequently add printer commands to a text document. For example, to print a file in landscape mode, create a REXX program that places the escape sequence at the beginning of the file.

Note: If new data is appended to the beginning of an existing stream or file, data at the beginning of the file will be overwritten by the new data. You can circumvent this by opening up a new file, writing the printer commands, then appending the original file.

The REXX program in Figure 3 does the following:

1. Creates a new file called NEWFILE.TXT
2. Appends the escape sequence for landscape to the beginning of NEWFILE.TXT
3. Appends the AUTOEXEC.BAT file to NEWFILE.TXT

—Bryan Stublsatz, IBM Corporation
Roanoke, Texas

Creating a Specific DOS Environment for a Public Application

Users logging on to a LAN Server environment can have a Public Applications folder on their Desktop. This folder can contain DOS, Windows, and OS/2 applications that reside on the server.

When setting up an application to appear in the Public Applications folder, you must specify a *.BAT or *.EXE file in the full-screen LAN Requester interface to start the application. DOS and Windows applications will run with default DOS settings. If the application needs particular DOS settings to execute properly (such as a specific DOS version, more expanded or extended memory than allocated, or specific DOS device drivers), then the default setting can cause problems.

To solve this problem, have the Public Application start a REXX program that creates a specific program object. This custom program object will run the application with the necessary settings.

Figure 4 shows how to create a specific DOS environment for WordPerfect 5.1.

—Bryan Stublsatz, IBM Corporation
Roanoke, Texas

```
infile='C:\autoexec.bat' /* File to be changed into Landscape mode */
outfile='C:\newfile.txt' /* New file, ready to print in Landscape */
call lineout outfile outfile, d2c(27)||d2c(108) /* The characters in quotes are ESC I */
do until lines(infile)=0
    line=linein(infile) /* Loops until all lines appended from infile */
    call lineout outfile, line
end
```

Figure 3. Sample REXX Program to Print NEWFILE.TXT in Landscape Orientation

```
/* ----- */
CALL RxFuncAdd SysLoadFuncs, REXXUtil, SysLoadFuncs
CALL SysLoadFuncs

classname='WPPProgram'
title='WordPerfect'
location='<WP_DESKTOP>'
setup 1='EXENAME=D:\WP.BAT;OBJECTID=<WPerfect>';
setup2='PROGTYPE=WINDOWEDVDM;SET IDLE_SENSITIVITY=90;OPEN=DEFAULT;';
setup3='SET MOUSE_EXCLUSIVE_ACCESS=ON;SET EMS_MEMORY_LIMIT=4096;';
SAY SysCreateObject(classname, title, location, setup1||setup2||setup3)
```

Figure 4. Creating a DOS Environment for WordPerfect

Creating Invisible Text in REXX or C

Users do not always want keyboard input echoed to their displays while they are using an AVIO or VIO window. A color-changing capability within a program can help users achieve a simple level of security or privacy. Users can change the foreground and background colors of their displays by modifying the Set Graphics Rendition (SGR) codes in the ANSI.SYS device driver, thus "hiding" text entered by users. (ANSI.SYS provides the SGR codes as a set of attributes.)

The ANSI.SYS device driver packaged with OS/2 and DOS allows SGR codes to be set using escape sequences. These escape or character sequences, called escape codes, can be used in windowed or full-screen sessions of OS/2 2.0.

Figure 5 shows a sample REXX program to hide the user's password. In this example, the program prompts the user for a logon ID and password (the domain name can be hard-coded or there can be a prompt requesting it). The logon ID is echoed back to the screen, but since the foreground color has been set to match the background color, the password text becomes "invisible" on the screen.

Figure 6 provides a sample C program to hide user passwords. To execute the hidden password function in a Virtual DOS Machine (VDM) session of OS/2 2.0, you could again use the SGR codes (values and parameters of the SGR codes shown in Figure 2) provided by ANSI.SYS. Remember to load the ANSI.SYS device driver in your CONFIG.SYS file as follows:

```
DEVICE = D:\OS2\MDOS\ANSI.SYS
```

Hiding passwords is just one of the simple but effective uses of ANSI.SYS escape codes. Cursor positioning, screen mode commands, and keyboard redefinition commands are also available through ANSI.SYS. Use your imagination to exploit the potential of this convenient device driver.

—Dominic Chiffolo, IBM Corporation
Roanoke, Texas

```
a='1B'X          /* variable for escape character */
say "Please enter your logon id: "
pull id
say "Please enter your password: "
say a'[30;40m'
pull password
cls
'logon ' ||id||' /p:'||password||' /d:Domain_Name'
if RC \=0
  then success = 0
else
  success = 1
cls
say a'[37;40m'
if success = 0 then say "Logon failed."
  else say "Logon Successful."
exit
```

Figure 5. Sample REXX Program to Hide Password

```
#include <stdio.h>
char id[10];
char password[10];

main()
{
  printf("Enter the id: ");
  scanf("%s", &id);
  printf("Enter the password: ");
  printf("%c[30;40m",0x1B);
  scanf("%s", &password);
  printf("%c[37;40m\n",0x1B);
}
```

Figure 6. Sample C Program to Hide Passwords



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

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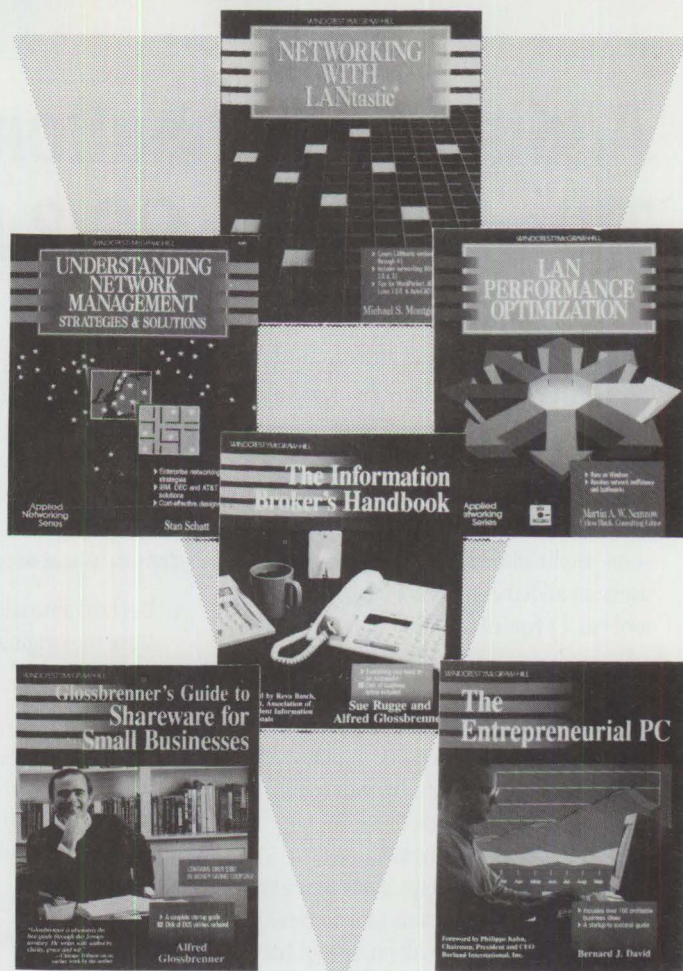
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Adding a Pushbutton to the Title Bar in an OS/2 Application

When customizing OS/2 applications, designers typically want to provide users with a set of program functions (such as Cut, Copy, Paste, and Print) via the menu bar. Although menus are convenient and easy to use, some application designers like to give users an added convenience known as the tool bar (a row of pushbuttons).

A tool bar usually resides between the title bar and the menu bar, giving users ready access to program functions. At times, however, neither a menu bar nor a tool bar is desirable. Perhaps there are not enough functions to warrant an entire menu or tool bar. Perhaps some functions would become significantly less convenient if they were buried in a menu or tool bar already full of functions and submenus. For these cases, a convenient alternative is to place a few pushbuttons on the title bar.

The most common example of pushbuttons on the title bar is the EPM (OS/2 Enhanced Editor). When "Ring-enabled" is selected from the Options menu, two pushbuttons appear on the title bar. These allow the user to toggle between the multiple text files currently being edited. (EPM, a fast, programmable text editor for OS/2, is available on the OS/2 Bulletin Board Service (BBS) in the EPMBBS package.) This "little solution" for OS/2 application developers describes how to add pushbuttons to title bars.

Subclassing a Window

A vital concept in adding a pushbutton to a title bar is subclassing a window, because it is necessary to subclass the frame window that owns the title bar.¹

Each window has a window procedure to process all the messages sent to that window. Subclassing a window allows applications to process the messages first, then as an option, to route them through the original window procedure. Here are the basic steps in subclassing a window:

1. Declare a variable of type `PFNWP` to store the original window procedure's address.
2. Write your own window procedure to process the messages sent to the window you are subclassing. This procedure will have the same format as any client window procedure.
3. Call `WinSubclassWindow()` to replace the window's original window procedure with your own.

The major difference between a subclass window procedure and a client window procedure is that the original window procedure should be called to perform default message processing.

My First Attempt: Progress

To help you understand how to add a pushbutton to the title bar, I will describe my own learning experiences. Although my first attempt was unsuccessful, it laid the foundation for a working solution. First, I created a frame window using `WinCreateStdWindow()`, subclassed the frame window, and intercepted all the `WM_PAINT` and `WM_SIZE` messages sent to it. Upon receiving either message, my window procedure would post my user-defined message (which I called `WM_DRAWBUTTON`) to the frame window.

Whenever the window procedure received the `WM_DRAWBUTTON` message, it would call `WinSetWindowPos()` to draw the

pushbutton on the right side of the title bar (next to the minimize/maximize button). I posted the `WM_DRAWBUTTON` message to give the system enough time to first paint the frame window and title bar. I wanted the pushbutton to be painted on top of the title bar. Unfortunately, it did not work; the title bar was consistently painted after my pushbutton, covering it up.

My Second Attempt: Success

There is a better way to keep the title bar from covering up the pushbutton. From my first attempt, I learned that every time a frame window is redrawn (usually to resize the window), it receives a message called `WM_FORMATFRAME`. After receiving this message, the frame window procedure calculates the new sizes and positions of all the child windows (such as client window, title bar, scroll bars, and so on) with which it was created. This information is returned as an array of `SWP` structures. An `SWP` structure stores a window handle and also has fields for the window's position, size, z-order, and style.

The starting address of the array is stored in the `MP1` parameter of the `WM_FORMATFRAME` message, and the return value of the frame window procedure indicates the number of structures in the array. This information is used to draw the frame window and all of its children. Having discovered this, I drew the pushbutton on the title bar with the following simple steps:

1. Subclass the frame window.
2. Intercept the `WM_FORMATFRAME` message.
3. Send it to the original frame window procedure.

¹ For details on subclassing, see the Little Solutions sections in the January 1992 and April 1992 issues of the *Personal Systems Technical Solutions*. Look for "Subclassing Made Easy" and "Subclassing Made Easy, Part 2." Back issues are available. See page 87 for the Back Issue Order Form.)

```

#define ID_BUTTON 1
#define INCL_DOSPROCESS
#define INCL_WIN
#include <os2.h>

PFNWP OldFrameProc;
MRESULT EXPENTRY NewFrameProc (HWND, ULONG, MPARAM, MPARAM);

int main (void)
{
    HAB hab;
    HMQ hmq;
    QMSG qmsg;
    HWND hwndframe, hwndbutton;
    static ULONG FrameWndFlags = FCF_TITLEBAR      | FCF_SYSMENU |
                                FCF_SIZEORDER    | FCF_MINMAX |
                                FCF_SHELLPOSITION | FCF_TASKLIST;

    hab = WinInitialize (0);
    hmq = WinCreateMsgQueue (hab, 0);

    hwndframe = WinCreateStdWindow (
        HWND_DESKTOP,          /*Parent window handle*/
        0,                    /*Style of frame window*/
        &FrameWndFlags,        /*Pointer to control data*/
        NULL,                  /*Client window class name*/
        "My Window",          /*Title bar text*/
        0,                    /*Style of client window*/
        NULLHANDLE,           /*Module handle for resources*/
        0,                    /*ID of resources*/
        NULL);                /*Pointer to client window handle*/

    hwndbutton = WinCreateWindow (
        hwndframe,            /*Parent window handle*/
        WC_BUTTON,           /*Window class*/
        "p",                  /*Window text*/
        WS_VISIBLE |         /*Window style*/
        BS_PUSHBUTTON,
        0, 0,                /*Window position*/
        0, 0,                /*Window size*/
        hwndframe,           /*Owner window handle*/
        HWND_TOP,            /*Sibling window handle*/
        ID_BUTTON,           /*Window ID*/
        NULL,                 /*Control data*/
        NULL);               /*Presentation parameter*/

    OldFrameProc = WinSubclassWindow (hwndframe, NewFrameProc);
    WinShowWindow (hwndframe, TRUE);

    while (WinGetMsg (hab, &qmsg, NULLHANDLE, 0L, 0L))
        WinDispatchMsg (hab, &qmsg);

    WinDestroyWindow (hwndframe);
    WinDestroyMsgQueue (hmq);
    WinTerminate (hab);

    return (0);
} /*end main*/

/*-----*/
MRESULT EXPENTRY NewFrameProc (HWND hwnd, ULONG msg, MPARAM mp1, MPARAM mp2)
{
    PSWP pswp;
    USHORT ccount;
    ULONG BtnWidth;
    HWND hwndbutton, hwndttlbar;

    switch (msg)
    {

```

Figure 7. First Method for Drawing a Pushbutton (Continued)

```

    case WM_FORMATFRAME:
        ccount = (USHORT)OldFrameProc (hwnd, msg, mp1, mp2);
        hwndttlbar = WinWindowFromID (hwnd, FID_TITLEBAR);
        for (pswp = (PSWP)PVOIDFROMMP(mp1); pswp->hwnd != hwndttlbar; pswp++);
        BtnWidth = pswp->cy;
        pswp->cx -= BtnWidth;
        hwndbutton = WinWindowFromID (hwnd, ID_BUTTON);
        WinSetWindowPos (
            hwndbutton,
            HWND_TOP,
            pswp->x+pswp->cx,
            pswp->y,
            BtnWidth,
            pswp->cy,
            pswp->fl);
        return ((MRESULT)ccount);

    case WM_COMMAND:
        switch (COMMANDMSG(&msg)->cmd)
        {
            case ID_BUTTON:
                DosBeep (261, 50);
                return (0);
        } /*end switch*/

    } /*end switch msg*/

    return (MRESULT)OldFrameProc (hwnd, msg, mp1, mp2);
} /*end NewFrameProc*/

```

Figure 7. First Method for Drawing a Pushbutton

4. Use the returned information to make room beside the title bar for the pushbutton.

After adjusting the size of the title bar, the pushbutton can be drawn using one of two methods: using `WinSetWindowPos()` to draw the pushbutton, or adding a new SWP structure for the pushbutton to the end of the array and incrementing the value returned from the original frame window procedure.

Figure 7 is a short program illustrating the first method. In this approach, the pushbutton is drawn slightly before the rest of the controls in the frame window. This can be seen on some systems when the frame window is resized. Figure 8 is a modified version of `NewFrameProc` (my subclass window procedure) illustrating the second approach to drawing the pushbutton.

Overview of the Program

First, I declared the variable `OldFrameProc` of type `PFNWP` to store the original frame window procedure's address. I declared it as a global variable for the sake of simplicity; I do not necessarily advocate using global variables when subclassing windows. An alternative is to store

`OldFrameProc` in the window words of the frame window using `WinSetWindowPtr()`. See the *OS/2 Programming Guide, Volume II* (S10G-6494) for more information on this procedure. The `main()` function of the program resembles a standard Presentation Manager (PM) application with a few notable differences. I did not create a client window, since it was not necessary for adding a pushbutton to the title bar.

In the `WinCreateWindow()` call to create my pushbutton, I specified the frame window as the owner of the pushbutton. This caused all the `WM_COMMAND` messages from the pushbutton to go to the frame window procedure. Normally this would be pointless, but since I planned to subclass the frame window, I would then be able to process the messages sent to it by the pushbutton. If I had created a client window, I could have specified the client window as the owner of the pushbutton. The call to `WinSubclassWindow()` specifies the frame window as the one being subclassed. `NewFrameProc` is the name of the new window procedure, and the return value of the function is the

address of the original frame window procedure.

One final detail to note in the `main()` function is that in the `WinCreateStdWindow()` call to create the frame window, I did not specify the `WS_VISIBLE` window style flag, so the frame is initially invisible. Immediately after subclassing the frame window, I called `WinShowWindow()` to set its visibility state to `TRUE`. The reason for this is explained at the end of the article.

Method 1

The crucial part of adding a pushbutton to the title bar is in processing the `WM_FORMATFRAME` message. In Figure 7, the first step is to call the original window procedure (`OldFrameProc`) with this message, letting it calculate the sizes and positions of its control windows. `WinWindowFromID()` retrieves the title bar's window handle. The title bar handle is used to search the array of SWP structures returned by the call to `OldFrameProc`, locating the one corresponding to the title bar. The title bar's width is reduced to make room for the pushbutton, then the pushbutton is drawn with a call to

```

MRESULT EXPENTRY NewFrameProc (HWND hwnd, ULONG msg, MPARAM mp1, MPARAM mp2)
{
    PSWP pswp, pswpttlbar;
    USHORT ccount;
    ULONG BtnWidth;
    HWND hwndbutton, hwndttlbar;
    switch (msg)
    {
        case WM_QUERYFRAMECTLCOUNT:
            ccount = (USHORT)OldFrameProc (hwnd, msg, mp1, mp2);
            return ((MRESULT)(ccount+1));
        case WM_FORMATFRAME:
            ccount = (USHORT)OldFrameProc (hwnd, msg, mp1, mp2);
            hwndttlbar = WinWindowFromID (hwnd, FID_TITLEBAR);
            pswp = (PSWP)PVOIDFROMMP(mp1);
            for (pswpttlbar = pswp; pswpttlbar->hwnd != hwndttlbar; pswpttlbar++);
            BtnWidth = pswpttlbar->cy;
            pswpttlbar->cx -= BtnWidth;
            pswp[ccount].hwnd = WinWindowFromID (hwnd, ID_BUTTON);
            pswp[ccount].x = pswpttlbar->x+pswpttlbar->cx;
            pswp[ccount].y = pswpttlbar->y;
            pswp[ccount].cx = BtnWidth;
            pswp[ccount].cy = pswpttlbar->cy;
            pswp[ccount].fl = pswpttlbar->fl;
            pswp[ccount].hwndInsertBehind = pswpttlbar->hwndInsertBehind;
            pswpttlbar->hwndInsertBehind = pswp[ccount].hwnd;
            return ((MRESULT)(ccount+1));
        case WM_COMMAND:
            switch (COMMANDMSG(&msg)->cmd)
            {
                case ID_BUTTON:
                    DosBeep (261, 50);
                    return (0);
            } /*end switch*/
    } /*end switch msg*/
    return (MRESULT)OldFrameProc (hwnd, msg, mp1, mp2);
} /*end NewFrameProc*/

```

Figure 8. Second Method for Drawing the Pushbutton

WinSetWindowPos(). NewFrameProc returns the number of SWP structures in the array pointed to by MP1 just as in the original frame window procedure. In this example, the subclass window procedure also processes the WM_COMMAND message sent by the pushbutton, simply calling DosBeep(). In an actual application, this is a good place to implement the program functions associated with clicking the pushbutton (such as selecting the next file in the ring). Finally, note the call to OldFrameProc, not WinDefWindowProc(), for default message processing.

Method 2

Figure 8 shows the second method for adding a pushbutton to the title bar. This method uses the WM_QUERYFRAMECTLCOUNT message, which the operating system sends to a frame window before sending the WM_FORMATFRAME message. The system does this to determine how much memory

to allocate for the array of SWP structures used while processing WM_FORMATFRAME. Since this method includes adding an additional structure (for the pushbutton) to the end of the array, the application developer must ensure that there is enough space for that structure.

When the frame window procedure receives the WM_QUERYFRAMECTLCOUNT message, it simply returns the number of frame controls. In the example, this count is incremented and returned to the operating system. In processing WM_FORMATFRAME, OldFrameProc is first called to calculate the control window sizes and positions. To decrease the title bar's width, the title bar window handle is retrieved and its SWP structure is located as in the first method. After this, instead of drawing the pushbutton, a new SWP structure for the pushbutton is added to the end of the existing array. The count of SWP structures returned from OldFrameProc is

incremented and returned by NewFrameProc to reflect the additional array structure. This causes the system to redraw the pushbutton with the other frame window controls whenever the frame window is redrawn.

Conclusion

I initially set the frame window to "invisible," then set it to "visible" after subclassing it. This delays drawing the frame window until the mechanism for drawing the pushbutton is in place. If I had not done this, the frame window would have been created and drawn without the pushbutton, and the pushbutton would not have been drawn until the frame window was resized.

This method can also be used for adding a second client window to the frame window or simply changing the sizes and positions of the existing frame window controls.

—Joe McSorley, IBM Corporation
Roanoke, Texas

Questions and Answers

Questions and Answers is a regular feature of *Personal Systems*. This issue features questions about the OS/2 LAN Server and NetWare.

OS/2 LAN Server

We have just migrated from Microsoft LAN Manager to LAN Server 2.0 (soon to be LAN Server 3.0). We were able to enter a command equivalent to the IBMLAN.INI file to set a SRVCOMMENT. When we issued a NET VIEW command, it appeared as a remark beside the server name. This entry does not work in LAN Server. How can we enter a remark for a server that shows when a NET VIEW command is issued?

The Remark field of the NET VIEW command is pulled from the server's description. To enter a description for the server, do the following:

1. Log on as an administrator.
2. Start the LAN Requester full-screen interface.
3. Select Definitions—Machine Parameters.
4. Select the server you want to update, go to the action bar, and choose Actions—Update.
5. Enter the remark you want to appear in the Remark field when a NET VIEW is issued.

When I use a PS/ValuePoint with the new 5120 16/4 Adapter II, I get the following message:

16/4 Adapter II Not Responding or Was Not Found, Error LT0026

If I use the 7367 Adapter II, there is no problem. I am using OS/2 2.0 with LAN Server 2.0. I have changed the

interrupts with no success. Do you have any suggestions or is this a problem with the adapter?

You may be trying to use the Network Driver Interface Specification (NDIS) Media Access Control (MAC) driver for IBM Token-Ring adapters that is provided with Extended Services 1.0 LAN Adapter and Protocol Support (LAPS). This driver, IBMTOK.OS2, will not work with the Adapter II. To load the NDIS MAC driver for the Adapter II (IBM16TR.OS2), follow these steps:

1. Run LAPS from the Communications Manager configuration screen.
2. When the Options window appears, select Copy Additional Network Adapter Drivers.
3. At the Path prompt, enter A:\OS2\ (assuming the driver is being loaded from the A: drive) and put the adapter options diskette for the Adapter II in the drive.
4. When the Options window appears, select Configure Workstation. "IBM Token-Ring Network 16/4 Adapter II (IBM16TR.OS2)" should now be included in the list of network adapters. Select it rather than "IBM Token-Ring Network Adapters."

I have partitioned and mirrored three partitions named C:, D:, and E: on two 400 MB disks. I pointed Boot Manager at C: as OS/2 PRI (primary partition) and at C' (secondary partition) as OS/2 SEC. Mirroring seems to be working fine, but the system will not boot from C'. The LAN Server 3.0—Advanced documentation is very brief—it alludes to mirroring the boot drive but gives no examples. If total disk failure occurs, the Network Administrator Tasks

documentation says to reload OS/2 on a new disk drive. Why do I need to do that if I have it mirrored? When I try to boot from C', the server just locks up.

The README.DOC file on the LAN Requester diskette 1 gives the step-by-step procedure for recovering from a failed boot drive as follows:

Perform steps 1 through 3 after fault tolerance has been configured but before the boot drive has failed. Keep the diskettes created from these steps until needed.

1. Copy the files in the table below from the subdirectories listed to diskettes.

From \OS2\DLL

DISPLAY.DLL
DOSCALL1.DLL
MSG.DLL
NIS.DLL
PMGPI.DLL
PMGRE.DLL
PMSHAPI.DLL
PMSHLTKT.DLL
PMSPL.DLL
PMWIN.DLL
SPLIB.DLL

From \MUGLIB\DLL

NETAPI.DLL
NETOEM.DLL
NETSPOOL.DLL
MAILSLOT.DLL

From \BMLAN\NETPROG

FTREMOTE.EXE

From \BMLAN\NETLIB

FT.DLL

From \OS2

FDISK.COM

2. Create the High-Performance File System-386 (HPFS-386) boot diskettes using the MAKEDISK utility. See Appendix C of *OS/2 LAN Server 3.0 Network Administrator Reference Volume 3: Network Administrator Tasks* (S96F-8430) for information about MAKEDISK.
3. Run FTSETUP or FTREMOTE and note the location of the boot drive's secondary partition. FTREMOTE needs this information during the recovery process.

Complete steps 4 through 10 when the boot disk fails:

4. Replace the failed disk. If necessary, format the disk using the procedure on the reference diskette.
5. Boot the computer using the HPFS-386 boot diskettes created in step 2.
6. Copy all the files stored on diskette in step 1 to an existing drive so FTREMOTE can access the files during the recovery procedure.

7. Create an FTREMOTE response file with the following format:

```
COMMANDS
  recover loc=2:35 secondary
```

Note: The secondary partition's location in this example is for completeness only; the secondary partition of any given boot drive will probably not reside at this location. Also, the storage space at the beginning of the hard disk containing the boot drive must be at least equal to the size of the partition plus 1 MB.

8. Run FTREMOTE using the following syntax (where filename is the name of the response file from step 7):


```
FTREMOTE /r:filename
```
9. Run FDISK. Install the Boot Manager. Add the newly created drive to the Boot Manager list (this will be the first drive on the replaced disk).
10. Exit FDISK and restart the server.

These steps will help you recover from a failed boot drive. The documentation says

to reload OS/2 on a new disk drive because the mirrored drive should be used only until you fix or replace the faulty drive. The mirrored drive is not meant to be a permanent replacement.

What type of NetBIOS frame is generated by the NET WHO query performed by OS/2 LAN Server 2.0? Is this an NCB_STATUS_QUERY? Will using the Remote Name Directory (RND) parameter in the OS/2 2.0 LAPS configuration reduce these broadcasts?

NET WHO generates the NAME_QUERY NetBIOS frame and not an NCB_STATUS_QUERY. The RND parameter reduces the number of frames broadcast to the NetBIOS functional address on the network.

Can LAN Server 3.0 limit the amount of hard disk that a particular user (requester) can access?

The only method provided by OS/2 LAN Server 3.0 to limit the amount of a user's hard disk space involves using home directories. When a user ID has been assigned a home directory, the administrator can issue the NET USER command with the /MAXSTORAGE: parameter to specify the maximum amount of storage (in KB) for a user's home directory. The MAXSTORAGE restriction is not enforced by the user account system but can be checked using the CHKSTOR utility.

For additional information on the NET USER command and its /MAXSTORAGE: parameter, read the online OS/2 LAN Command Reference. The CHKSTOR utility is documented in Appendix C of the *OS/2 LAN Server 3.0 Network Administrator Reference Volume 3: Network Administrator Tasks* (S96F-8430).

I have a question about implementing OS/2 LAN Server 3.0 with requesters using TCP/IP to access the server. Is Configuration, Installation, and Distribution (CID) supported in this environment? We want to install over the network using TCP/IP. This would include both pristine systems

as well as upgrades of existing systems.

You can connect the CID code server and a CID client via TCP/IP; the CID process is supported over a TCP/IP network. For additional information on remote installation over TCP/IP, refer to *OS/2 2.0 Remote Installation and Maintenance* (GG24-3780). The CID installation process does not require the NetBIOS protocol. The CID process, supported over NetBIOS, is also supported over a pure TCP/IP connection.

I installed LAN Server 3.0—Entry, and it's working fine. I'm now going back through the installation to add the Remote Initial Program Load (RIPL) function. The installation function asks for a diskette called "IBM DOS 5.0 Startup/Support Diskette." What is this? Also, what advanced installation options are needed for OS/2 RIPL to work?

By installing the three IBM DOS 5.0 installation diskettes to diskette, the result will be four diskettes with the following names: Startup/Support, Shell/Help, Basic/Edit/Utility, and Supplemental.

You are being prompted for these diskettes. To make OS/2 RIPL work, complete the following steps:

1. Install the OS/2 RIPL service component in addition to what is installed by default.
2. Install the LAN Server.
3. Run the RIPLINST utility to install the OS/2 images.
4. Run the GETRPL utility.
5. Define RIPL workstations through the full-screen interface.
6. RIPL OS/2.

I am trying to get IBM DOS 3.3 to work with NDIS connecting to an IBM LAN Server 3.0 and running PC/3270 3.0. I am using a 16/4/A Token-Ring card on a PS/2 Model 50 and the LAN Support Program from the LAN Server box.

Is NDIS required? Can I use this configuration with the normal DXMA,C,T drivers? Will that give me the 802.2 session that I need for my three PC/3270 sessions?

The IBM Token-Ring 16/4 Adapter/A can use either Adapter Support Interface (ASI) drivers (DXMCOMOD.SYS) or NDIS (DXMEOMOD.SYS and the NDIS MAC driver IBMTOK.DOS) to support the 802.2 protocol used by PC/3270. In either case, you need DXMTOMOD.SYS to provide NetBIOS support required by DOS LAN Requester (DLR). In your scenario, you can use the ASI driver, DXMCOMOD.SYS, to provide the 802.2 support for PC/3270, which will leave more memory available for DOS programs.

There is a trend to use NDIS because it can enable the same protocol drivers to be used with any adapter that has an NDIS MAC driver. For example, DXMEOMOD.SYS, an NDIS 802.2 protocol driver, can be used with Token-Ring, Ethernet, and Fiberoptic Data Distribution Interface (FDDI) adapters that have NDIS MAC drivers. With NDIS drivers, a software package can provide an NDIS protocol driver. This driver will support the protocol required by the software without being concerned about which adapter will be used by the software on the LAN. DXMCOMOD.SYS can only be used with IBM Token-Ring adapters because this driver has to provide 802.2 protocol support and also support the adapter at the MAC level.

The new IBM Token-Ring 16/4 Adapter II for Industry Standard Architecture (ISA-) bus computers cannot use DXMCOMOD.SYS; it must use NDIS. NDIS support for Token-Ring adapters started with LAN Support Program 1.3. Prior to that, the LAN Support Program provided only ASI support for Token-Ring adapters and NDIS support for Ethernet adapters.

When RIPLing an OS/2 workstation, what do I specify to use the local C: hard disk as the swap file disk? Is it possible to store all OS/2.INI files in the local hard disk? I want the

ability to save all .INI files for each workstation when it boots up.

You can locate the swapper file on the local hard disk of a RIPL machine by changing the SWAPPATH statement in the CONFIG.20 file for that workstation to the drive you want. This line should already exist; all you do is remove the REM statement.

To have OS2.INI (OS2INI.20) and OS2SYS.INI (OS2SYINI.20) located on the hard disk, perform the following steps:

1. Make sure the RIPL machine is not booted.
2. Copy the machine's OS2INI.20 and OS2SYINI.20 files from the \IBMLAN\RPLUSER\machine_name\OS2 subdirectory on the server to diskette.
3. Boot the RIPL machine and copy the .INI files from the diskette to the hard disk (any subdirectory) as OS2.INI and OS2SYS.INI, respectively.
4. Shut down the RIPL machine.
5. Change the lines in the .FIT file that reference the .INI files to point to the C: drive on the hard disk; for example:

```
Z:\OS2\OS2.INI      C:\OS2.INI
Z:\OS2\OS2SYS.INI  C:\OS2SYS.INI
```

6. Change the lines in CONFIG.20 to the location of the .INI files; for example:

```
SET USER_INI=C:\OS2.INI
SET SYSTEM_INI=C:\OS2SYS.INI
```

7. Boot the RIPL machine.

NetWare

When installing NetWare for SAA 1.3, we received the following messages at the point where COMMEEXEC.NLM is loaded.

**Loader cannot find public symbol:
dev_register
dev_unregister
mod_register
mod_unregister**

Load file referenced undefined public variable

What's the problem?

Typically, this message indicates CLIB.NLM is not loaded or you are using an incorrect version of CLIB.NLM. Be sure to read the READ.ME file that comes with NetWare for SAA 1.3. You must carefully follow the directions contained in it for the installation to work properly. The READ.ME located on diskette 1 contains the location and purpose of all other information files. The following summarizes what to do.

1. XCOPY the NetWare for SAA Miscellaneous Support Files from diskette 7 and the BTRIEVE subdirectory from diskette 8 to the system subdirectory on your communication server. Using the NetWare FLAG.EXE command utility, flag existing subdirectory files to Shareable Read Write (SRW), then XCOPY to the subdirectory.

Note: SPXFIX2 replaces SPXFIX1, which sometimes caused abends or lockups. SPXFIX2 is available by downloading STRTLI.ZIP from library 9 in the NOVLIB forum on CompuServe or by calling IBM Software Defect Support at (800) 237-5511.

2. The AUTOEXEC.NCF must contain the following statements before loading the LAN drivers and after LOAD CLIB:

```
LOAD LLENH
LOAD SPXFIX2
```

3. To use the Token-Ring or Ethernet drivers supplied in this release of NetWare for SAA 1.3, SERVER.EXE must be patched using the following procedure:

- Copy XLOAD.EXE and LDR001.PTF from diskette 7 to the directory where SERVER.EXE resides in the DOS partition (for example, the C: drive).
- Ensure there is enough disk space on the C: drive for another copy of SERVER.EXE.

- From the DOS command line, type the following: XLOAD LDR001.PTF SERVER.EXE.

The old copy of SERVER.EXE is saved as SERVER.OLD. The patched copy is called SERVER.EXE. Be sure to save SERVER.OLD for future changes.

4. If you are planning to autoload a NetWare for SAA 1.3 profile and the NetWare AS/400 router software, add the following lines to AUTOEXEC.NCF (service_profile_name is the same in both occurrences below):

```
LOAD COMMEEXEC
LOAD DLM
LOAD SMA
LOAD NWSAA
CSLOAD service_profile_name
LOAD MONITOR
LOAD AS400PCS service_
    profile_name
```

This information should enable you to continue with the installation according to the *NetWare for SAA 1.3 Administration Guide*.

We are using NetWare for Systems Application Architecture (SAA) 1.3. Is it possible to load WSLAN in high memory?

Yes, you can load WSLAN into high memory. WSLAN will do this automatically if the Upper Memory Block (UMB) is free. Both HIMEM.SYS and EMM386 must be in the CONFIG.SYS file. Although you can set DOS=HIGH, you cannot put DOS into the UMB by using DOS=UMB. You can also use expanded or extended memory (be sure to use NetWare 3270 LAN Workstation for DOS 3.0).

We are installing NetWare for SAA on top of Novell 3.11. We were told to use two adapters in our heavily used environment. We installed the two adapters, but when binding them,

we are forced to give two unique net numbers. After we bind the second adapter with a unique net number, we get route messages (from ourselves as well as from one other location) saying that net 100 should be 101 and 101 should be 100. What is the solution?

Do not bind IPX to the second adapter. The second adapter's primary function is for the host link—Systems Network Architecture (SNA) traffic only. The first adapter is used for IPX traffic.

When installing NetWare 4.0, I am prompted to choose between two unfamiliar frame formats. I am familiar with TOKEN-RING and TOKEN-RING_SNAP. The frame formats introduced by NetWare 4.0 are TOKEN-RING_MSB and TOKEN-RING_LSB. What is the difference between the MSB and LSB frames and the standard TOKEN-RING? Are there any considerations in choosing a frame type as it relates to Source Route Bridging?

MSB stands for "most significant bit" and LSB stands for "least significant bit." The parameters refer to the bit order. MSB places the most significant bit first; LSB places the least significant bit first. LSB should only be used with Ethernet; therefore, you should always choose MSB when using Token-Ring frame types. TOKEN-RING_MSB is comparable to the standard TOKEN-RING frame type with which you are familiar.

Can NetWare 3.11 send messages to NetView? Most of our LANs are connected to a host by OS/2 gateways.

Yes, NetWare can send messages to NetView on a host if the NetWare server is running NetWare for SAA. NetWare for SAA can either attach directly to a host via a Token-Ring, Ethernet, or Synchronous

Data Link Control (SDLC) link, or it can go through a controller such as the Model 3174. Since the OS/2 gateway acts like a 3174, NetWare for SAA should be able to communicate through it. Host link attachment via Ethernet is only supported in NetWare for SAA 1.3. Another option is to use NetWare Management for NetView (Version 2.0) found in NetWare 3.11.

We are installing PS/2s with 122-key, host-compatible keyboards so the end users see no difference when accessing existing 3270 applications. The PS/2s have DOS 5.0 and 3270 via Novell SAA; the server is running Novell 3.11 and Novell SAA. When the host keyboards were attached, the play and record keys did not work. Is there a way to remap? Or is there a driver for Novell SAA for the 122-key keyboard?

If you are using a 3270 LAN workstation for DOS 2.02, you can include support for the 122-key keyboard in one of two ways:

- Override the defaults at startup time by specifying a command-line parameter:

```
WSLAN WSLAN.CFG /KI
```

- Run the WSCONFIG program to configure the workstation:
 1. Enter WSCONFIG <filename>.CFG (usually WSLAN.CFG).
 2. Press Alt+O to go to the Options screen.
 3. Cursor to Keyboard Options and press Enter.
 4. Choose the correct keyboard (IBM 122-key) and press Ctrl+Enter.
 5. Press F3 to save this configuration.

OS/2 Tips and Techniques

Installing REXX Support for MMPM/2

Multimedia Presentation Manager/2 (MMPM/2) is now a separately installed application packaged with OS/2 2.1 that adds digital audio, digital video, and software motion video to OS/2 2.1. OS/2 Procedures Language 2/REXX must be installed to invoke the following commands associated with MMPM/2:

PLAY	Play a multimedia file
INSTSND	Install system sound support
DINSTSND	Remove system sound support

Use Selective Install to install REXX support:

1. Select OS/2 System, then select System Setup.
2. Click on Selective Install (the System Configuration window appears).
3. Select OK (the OS/2 Setup and Installation window appears).
4. Select REXX (third item from the bottom).
5. Select the Install button, then continue the installation until it is completed.

If the MMPM/2 PLAY.COM file fails when you try to play a digital video clip, run the PLAY command via PMREXX by typing the following at an OS/2 command line (where fn is the file name of a digital video movie):

```
START PMREXX PLAY FILE=fn
```

Installing OS/2 2.1 on a Machine with an AOX/Kingston Upgrade

If you want to install OS/2 2.1 on a machine upgraded to a 386SX with an AOX

upgrade, you should obtain the file AOX282.EXE either from AOX's Bulletin Board Service (BBS) at (617) 890-3393 or their technical support group at (800) 232-1269. You can then perform the following procedure:

1. Boot the machine from DOS or a DOS bootable diskette.
2. Insert the disk containing AOX232.EXE in drive A: and execute the command.
3. Remove the disk from drive A:, insert the OS/2 2.1 Installation diskette, and press Ctrl+Alt+Del to reboot the system and restart the installation.

Setting Up Environment Space for DOS Programs to Run Under OS/2 2.x

To increase the amount of environment space for running a specific DOS application under OS/2 2.1, specify the value with a /E:# parameter in the DOS_SHELL setting for that specific object.

To open the Settings notebook for the Program object:

1. Click on the Program icon with the right mouse button.
2. Click on the arrow next to the Open selection with the left mouse button.
3. Select Settings.

To get into the DOS Settings window:

1. Select the Session tab.
2. Select the DOS Settings box.

To change the DOS_SHELL setting to reflect the requested size:

1. Scroll down the Settings window until DOS_SHELL is highlighted.
2. Click on the Value window.

3. Use the right arrow key to advance to the end of the entry.
4. Add /E:# (where # is the number of bytes needed, between 160 and 32,768 bytes). For example, to specify a 32 KB environment space, the DOS_SHELL command should look like the following (where C: is the drive where OS/2 is installed):

```
C:\OS2\MDOS\COMMAND.COM  
C:\OS2\MDOS /p /E:32768
```

5. Select Save and close the Settings notebook.

Installing OS/2 2.x on a Machine with Video 7 Adapter

If your equipment has a Video 7[®] Adapter, you may have problems synchronizing the Desktop and OS/2 full-screen function. This occurs because the OS/2 installation recognizes the Video 7 Adapter as a high-resolution board and loads the BVHSVGA and VSVGA drivers rather than BVHVGA and VVGA for VGA (640 × 480 × 16) support. You can resolve this issue after installing OS/2.

After installation, edit the CONFIG.SYS file to change the video support statements.

1. Open an OS/2 Command window.
2. Type E CONFIG.SYS at the command prompt and press Enter.
3. Change SET VIO_VGA=DEVICE (BVHSVGA) to SET VIO_VGA=DEVICE(BVHVGA).
4. Change DEVICE=C:\OS2\MDOS\VSVGA.SYS to DEVICE=C:\OS2\MDOS\VVGA.SYS.
5. Save the file and exit the editor.
6. Shut down the system and restart it.

Changing from VGA to Super VGA (SVGA)

OS/2 installs VGA support by default. If your adapter is supported in SVGA, use the following procedure to selectively install SVGA:

1. Open the OS/2 System folder.
2. Open the System Setup folder.
3. Choose Selective Install.
4. Select Primary Display, then click on OK.

5. Select Super VGA and click on OK.
6. Select Install, then follow the instructions.
7. Shut down the system and restart it.

Running Batch Files

To keep a window open after running a batch file, place an asterisk (*) in the Path and File Name field and a /k filename in the parameter field.

1. Open the Settings notebook for the DOS session in which the program is going to run.
2. Edit the Path and File Name field to replace anything currently there with an asterisk.
3. Enter /k filename in the Parameter field.
4. Close the Settings notebook.

—David E. 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 August 2, 1993. To order the corrective service packages, call IBM Software Solution Services at (800) 992-4777. Most OS/2 Program Temporary Fixes (PTFs) are also available electronically from the following sources.

- OS/2 Bulletin Board Service (BBS)

- IBM Personal Computer Company (PCC) BBS at (919) 517-0001
- CompuServe
- Internet

PTFs may also be available from other BBSs. For more information about OS/2 BBSs, refer to "OS/2 2.0 Resources" in the

April 1993 issue of *Personal Systems Technical Solutions*.

To download the OS/2 and C Set/2 corrective service packages from IBMLink™, type OS2BBS on the main IBMLink menu, then select Option 2. (Corrective services are also listed under the General category on the IBMLink BBS.)

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.

Figure 1. Maintenance Release Levels (Continued)

Product/Component	Release	CSD Level	PTF Number	Change Date	Comments
OS/2	2.0	XR06055	XR06055	11-16-92	Available from OS2BBS, Internet, and CompuServe. There is a minimum \$24.95 charge for diskette orders from IBM Software Solution Services.
OS/2 Toolkit	1.3	XR05053	XR05053	4-13-92	
OS/2 LAN Server/Requester ServicePak	2.0	IP06030	IP06030	4-25-93	
	3.0	IP07001	IP07001	8-10-93	
OS/2 DOS LAN Requester 3.0 SelectPak		IP07003	IP07003	7-28-93	Diskettes not available. Download from one of the BBSs.
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	
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	
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

Product News

IBM ValuePoint 6381

IBM expands the very popular ValuePoint family of products by adding six new entry-level models, the ValuePoint 6381 systems. The ValuePoint 6381 systems deliver 486SX-25 and 486DX-33 performance in a three-slot/three-bay (two 3.5-inch, one 5.25-inch) mechanical design to provide additional expansion and investment protection.

Hard disk models include IBM DOS 6.1 and Microsoft Windows 3.1 preinstalled and 4 MB of memory. Operating system publications are packaged with these models.

The ValuePoint 6381 models with 486DX processors can be upgraded with Level 2 (L2) Write Back Cache; 128 KB and 256 KB L2 Write Back Cache options are available for these systems.

Highlights of the Six New Models:

- Choice of 486SX-25 or 486DX-33 processor
- SVGA graphics
- Choice of PS/2 enhanced keyboard or IBM basic keyboard
- Optional external (L2) cache sockets on planar board (Mxx models only)
- Larger capacity hard disk (120 MB or 212 MB)
- IBM DOS 6.1/Microsoft Windows 3.1 preinstalled on hard disk models

Highlights of All ValuePoint Models:

- One 3.5-inch, 1.44 MB diskette drive standard
- 4 MB memory standard (70 ns)
- 512 KB video RAM standard (DRAM)

- VESA local bus technology
- High-performance SVGA local bus video: 640 × 480, 800 × 600, 1024 × 768, 1280 × 1024
- Up to two diskette drives and two IDE hard disks
- MFI modes 2, 3 and 4; MFI mode 5 (132 columns) supported in some graphics modes
- Two serial ports, one parallel port
- Keyboard and pointing device ports
- IBM Mouse

Letter # 193-230, July 29, 1993

IBM 5250 Emulation PCMCIA Adapter

The IBM 5250 Emulation PCMCIA Adapter, when used with a compatible terminal emulation program, enables systems equipped with an expansion slot meeting the Personal Computer Memory Card International Association (PCMCIA) Release 2.0 Type II or Type III standard to be attached to IBM System/36, System/38, and AS/400 hosts. Compatible IBM 5250 terminal emulation programs include the following:

- IBM Enhanced 5250 Emulation Program PCMCIA Support 1.0
- IBM PC Support/400 2.1 Workstation Function and later releases
- IBM Communications Manager-based program products such as Extended Services for OS/2 and Communications Manager/2 1.0 (These products support AS/400 attachment only.)

Letter # 193-216, July 29, 1993

PS/2 Model 95 XP 486 Enhancements

The PS/2 Model 95 XP 486 (9595-0LG and 0MG) systems are enhancements to the popular Intel i486DX2-50 MHz and

i486DX-50 MHz Model 95 server family. The 9595-0LG and 0MG provide 540 MB of data storage and have improved hard disk performance over the 400 MB hard disk included in the PS/2 Model 95 XP 486 (9595-0LF and 0MF). The 540 MB Small Computer Systems Interface (SCSI) hard disk provides 10 ms average access time.

As with all PS/2 Model 95 XP 486 systems, these systems (with Micro Channel architecture and upgradeable processor complex cards) are designed to take advantage of today's technology and future processor enhancements.

The PS/2 Model 9595-0LG can be used as a cost-effective, high-performance network server, multi-user host, or gateway. The 9595-0LG system also makes an outstanding high-performance workstation, especially when users need future expansion. Customers can upgrade the processor complex card with the PS/2 Enhanced 486/50 Processor Upgrade option when required.

The PS/2 Model 9595-0MG is a powerful server—ideal for supporting many clients in either database or file server applications. The 9595-0MG offers higher levels of performance with 256 KB L2 cache, 40 MB per second streaming data, System Control Block (SCB) architecture, plus reliability, availability, and serviceability features such as Error Checking and Correction (ECC) memory, synchronous channel check, and design for additional power-on hour usage.

The premier PS/2 product line, including all 9595 models, carries an on-site, three-year warranty. In addition, an optional one-year warranty is available via special bid.

Letter # 193-206, July 13, 1993

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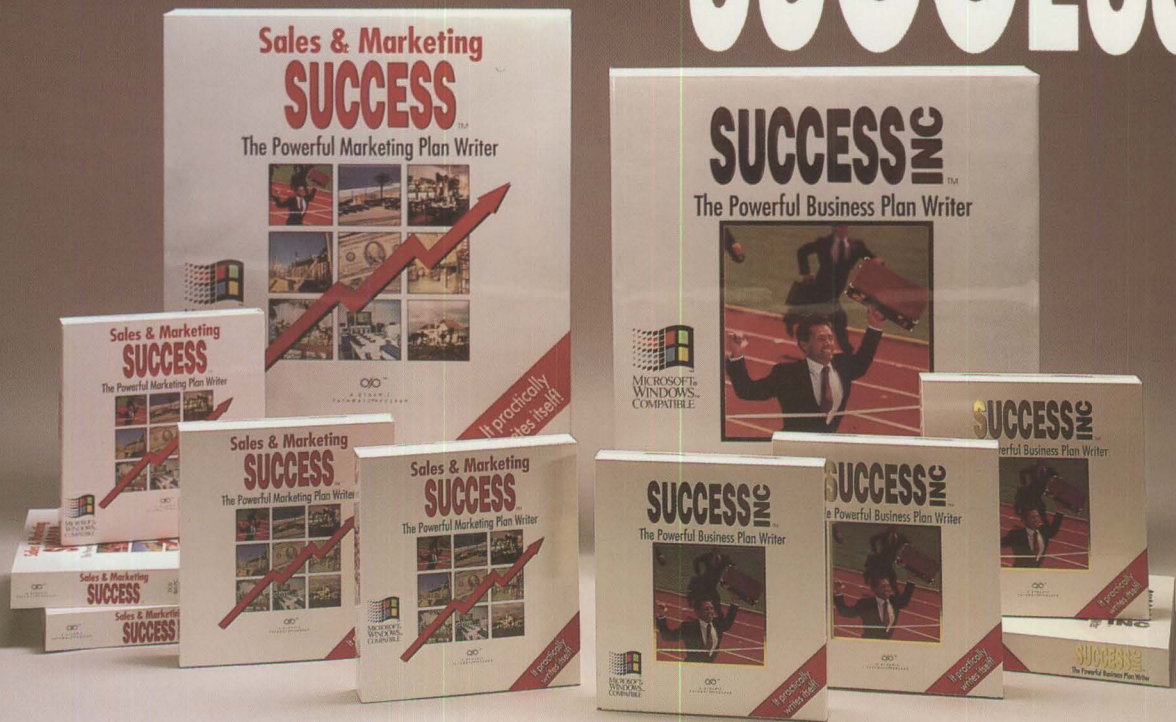
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The unique question & answer presentation develops your plan quickly & confidently. The hundreds of example and street-wise tips show what's expected. Whether you're a novice or expert you'll find it's all you need.

Dynamic Pathways Company, 180 Newport Center Drive, Newport Beach, CA 92660

Even a *free* memory manager may not be a bargain—especially if it can't give you all the memory you need.

Introducing QEMM 7 The Memory Manager Worth Paying For

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.

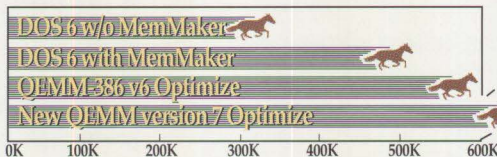
DOS 6 Giveth; DOS 6 Taketh Away

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 745K, 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



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.

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.



Prior versions of QEMM won just about every competition in sight, as well as remaining the #1 best-selling memory manager 5 years straight.

Put Your Money on a Winner—QEMM 7

The new and ever more exciting capabilities coming to your PC will all compete for memory with your favorite applications, TSRs and drivers. And that makes QEMM 7 the most vital utility you can own.

Our seventh-generation memory manager is a thoroughbred that helps you get the most out of your PC today and tomorrow.

Quarterdeck

QEMM Users:
Low-cost upgrades
available from your dealer.

Quarterdeck Office Systems, 150 Pico Boulevard, Santa Monica, CA 90405 (310) 392-9851 Fax (310) 314-4219
Quarterdeck International Ltd., B.I.M. House, Crofton Terrace, Dun Laoghaire Co. Dublin, Ireland Tel. (353) (1) 284-1444 Fax: (353) (1) 284-4380

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, 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, PRNTPC.COM. ©1993 Quarterdeck Office Systems. Trademarks are property of their respective owners.