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October 4, 1989

Mr. James Cannavino
IBM Vice President and General Manager
of Personal Systems
Route 100, Building 3
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Dear Jim:

Thanks for meeting with me last week. I believe the bandwidth of communications between IBM and Microsoft is too low in a number of areas. This is hurting our relationship and causing us to miss significant opportunities.

Windows: Unfortunately, I think Windows is delaying resolution of many important MS/IBM issues. We are in a position to establish OS/2 as the "default" operating system for new 386 machines. Our OEMs are enthusiastic about this. The positioning of OS/2 for 386 platforms, and of Windows for 286 and low-end platforms, will be well accepted and will yield best short and long term results for IBM and MS. Please find attached a draft of a MS positioning document that might be useful in shaping our joint positioning.

Anti-Windows thinking comes from either being overly pessimistic or overly optimistic about OS/2. Pessimists believe that even 4 Mb 386 owners won't use OS/2 if there is a Windows alternative. The optimists believe that everyone will upgrade to 4 Mb and larger disks. The pessimists and the optimists are extreme, and they are wrong.

Recent Windows developments include:

1. We will combine Windows/286 and Windows/386 into a single box called "Windows." This will help clarify that Windows does not have a 386 API. There will be no product called "Windows/386," although if Windows is installed on a 386, it optimizes running old applications and memory management. Neither the paging nor VDM are nearly as good as OS/2 2.0. The single SKU will list for $149.

2. IBM Japan is licensing Windows for its machines.

3. IBM Publishing Systems Business Unit has shipped an excellent 3270 emulator for Windows.

4. IBM Desktop will announce its first Windows applications this month.

5. We believe Lotus will announce its first Windows application ("Notes") before Comdex.

6. Twenty-five other new Windows applications will ship in the next four months.

Developers are complaining due to uncertainty. They want a clear picture of what features Windows will never have and how it fits, i.e., Windows will not have 32-bit APIs. If we determine this jointly and say it jointly, Windows will become a significant asset. Unlike mainframes, the key audience for PCs is users - not developers. The fact that Windows and PM have different APIs is not an insurmountable problem. The key is we're providing a consistent user interface across both platforms. There are 1000 times as many users as programmers, and keeping users happy is a major win. Our Windows-OS/2 strategy is similar to Apple's System 7 and System 8 strategy. The low-end is single tasking, requires less memory and runs on older processors.

Networking: Our LAN product can exploit multiple processors and disk arrays. We want to connect our LAN directory to IBM's SAA directory. We believe IBM can gain share by marketing and supporting networks aggressively. Very little is happening on the hardware/software, SAA connect, or marketing side. Compaq sells a significant number of its machines as servers and Netware is well-entrenched.

Portable OS/2: As indicated in my other letter, we have been told to wait five weeks. Microsoft is moving ahead aggressively to implement portable OS/2. We are able to demonstrate an initial version of OS/2 running on the 860. Machines using RISC chips like the 860 and MIPS will be able to ship by late '90/early '91. We have been very impressed with the MIPS chips and are seeing a lot of interest in it.

Is IBM interested in OS/2 for its new RT hardware? We raised the subject in the past and received upper management interest. Having SAA and OS/2 on the RT would help both the RT and OS/2. Perhaps we should find a third party to port and support RT-OS/2. Recent OSF politics should increase the importance of RT-OS/2.

Staffing efficiency: The potential savings from eliminating duplicate work like translation and streamlining is almost $100M/year. Difficult decisions will be required to implement this plan. I am curious to know if IBM wants to make these changes and if so, in what timeframe? This will require significant joint work.

Handwriting: We would like to evaluate licensing IBM software in this area. Although you indicated you are making policy decisions, I wonder if we need to prevent technical meetings. We have designed a set of simple extensions to Windows and OS/2 for handwriting machines.

Multimedia: Since the IBM press release in March, Microsoft and IBM have talked to about 30 developers who are now building Windows Multimedia applications. Unfortunately, this is not enough to justify the machine. We need an aggressive ISV push, DSP licensing and Sony involvement to have a successful launch within the next year. Apple has a significant lead with their built-in sound and 8-bit per pixel video. CDI is gaining momentum. Microsoft has been investing in working with IBM because of your public commitment to the project as an open machine. The latest development is that even the few ISV visits taking place have been cancelled because of a lack of decisions.

OS/2 Extended Services: Decoupling the Standard Edition schedules from communications and database will be helpful for both groups. You and I should talk about how MS can help you meet your goals with Extended Services.

I am flying to the east coast from Europe on October 8th. If we want to use Comdex effectively, we should meet that week. The latest I've heard is that IBM is not inviting ISVs to a Gates/Cannavino meeting, although our last ISV event (Comdex) was excellent. I am free the afternoon of October 8th, and all day October 9th. I would be happy to drive up to your home to meet the afternoon or evening of October 8th. I understand you are busy on the 10th when we announce the U.S. shipment of PM Excel with Tony Mondello. IBM is announcing promotional packaging of PM Excel with OS/2 with me in France and Germany this week.

Every meeting we have had has been valuable. Now that you have two very challenging jobs, I can understand how busy you are. I am willing to be quite flexible on our meeting time and place. I hope to see you next week.

Best regards,

(dictated by)
William H. Gates
Chairman

WHG/sav

Enclosures

From DOS to Windows and OS/2
The Graphical User Interface

The debate over the value of a graphical user interface is over. The issue for users and software developers alike is no longer if, but when, to make the move to the graphical environment, and how to manage the transition from the old world of character-based applications.

Many factors precipitated this change: the increasing power and video capabilities of standard PC hardware; the push toward more feature-laden applications, which simultaneously must be easier to learn; and the growing use of PCs for explicitly graphical tasks, such as publishing, CAD, and business presentations.

Finally, but not least, Microsoft Windows and OS/2 Presentation Manager, have established the SAA interface as the PC standard, and it is rapidly becoming the most familiar user interface in the world.

For most businesses, the advantages of a *common* user interface for all of their applications -- and in some cases, across systems -- is sufficient to justify replacing old familiar programs with a new generation of software.

And the best is yet to come: twenty-eight of the top thirty software developers are writing applications for OS/2 Presentation Manager; and two of every three new PC applications are being written for PM or Windows.

Windows Completes DOS

The success of Microsoft Windows over the past two years indicates that many users want a simple, low-cost entry point for trying a graphical interface -- without burning their bridges to the familiar DOS world.

With the announcement of Windows 3.0, DOS takes a major step forward. Windows 3.0 not only brings to DOS users an advanced graphical shell -- surpassing the Macintosh in functionality -- but it also provides a transparent solution to DOS memory constraints which have stymied users and software developers alike.

Windows 3.0 enhances DOS in three critical ways:

- It provides a graphical user interface, for consistency and ease of use
- It uses protected-mode memory, breaking the 640K barrier for Windows applications
- It can multitask Windows applications; and on the 386, DOS applications as well

Windows 3.0 requires one M-byte of memory to run on a 286 PC, and 2 M-bytes on a 386 (with 386-specific support for multiple DOS sessions), providing an economical track for corporations to move their installed base of PCs to the industry-standard graphical user interface.

OS/2, the successor to DOS

OS/2 is also coming on strong. Now in it's third release, OS/2 1.2 also offers an more powerful user shell as well as the High Performance File System, and improved DOS support.

Several major PM applications are shipping, including Microsoft Excel, Aldus PageMaker, Micrografx Designer, and Describe Inc.'s Describe, as well as hundreds of character-based applications including Lotus 1-2-3 3.0, Information Builders PC Focus, Microsoft Word and WordPerfect 5.0. Within a few months, every major applications category will be supported under Presentation Manager.

More importantly, even among the early applications, many are taking advantage of OS/2-specific features to provide functionality beyond what is possible on DOS and Windows. PageMaker, as mentioned earlier, uses OS/2 threads to increase performance, allowing users to load a large document while editing another. There is no hourglass (an indicator that Presentation Manager pops up to signal that the system is busy) in PageMaker, either. The user interface remains active--responsive to the user--even when another task is running. The use of threads allowed Aldus to make the user interface extremely responsive to the user.

While OS/2 carries forward DOS user conventions to facilitate the transition, OS/2 is a new operating system from the ground up, intended to replace DOS and serve as the platform for a new class of applications. OS/2 also enables a high degree of applications integration on the workstation, and via the network.

Features that set OS/2 apart include:

Threads

The real advantage of threads is system throughput, more than the apparent utility to the end user of multiple simultaneous tasks within a single application.

Under Windows, DOS controls the file system, basic file management, and I/O. DOS limits the system throughput. OS/2 can overlap operations (keyboard/mouse and CPU, disk and CPU) -- resulting in better performance for the user and more efficient use of memory. All of the recent reviews of PM PageMaker attest to the enormous performance and productivity gains afforded by the use of threads in an application otherwise undifferentiated from its Windows version.

Threads also allow the system to respond quickly to asynchronous events -- critical for communications (3270) and server applications.

Better development environment

- Simpler due to larger address space and more memory.

  OS/2 extends this advantage in release 2.0 for the 386, where applications will have access to a 32-bit wide flat address space. This means applications can have access to up to 4GB of memory and are free from the restrictions of a segmented architecture (i.e., having to break applications up into <64K chunks.)

- System provides more information about program bugs, and resists program misbehavior.

- Async notification and support for priorities simplifies communications and control applications.

- Presentation Manager offers a richer, and at the same time more consistent, graphics programming interface than Windows.

Microsoft recommends that all corporations starting mission critical PC development work write for OS/2, as it is a better programming environment and the strategic platform for the long term.

Customers have a choice

Windows 3.0 offers a subset of OS/2 functionality, but it is an important subset and therefore presents customers with a choice: to move directly from DOS to OS/2, or to migrate some or all of their systems to OS/2 through Windows.

In order to make this decision wisely, a technical understanding of the two products is helpful, as well as a view of Microsoft's long term perspective on Windows and OS/2.

Windows and OS/2 are a family, covering a broad range of user needs and PC configurations under a single user interface.

OS/2 is aimed at more powerful machines: 386 and 486 PCs where users require a high performance, multitasking graphical workstation.

Windows is targeted at the low end: the installed base of 286 machines configured with an EGA and 1 MB of memory. Windows is also intended for those new users who purchase 286 or 386sx with machines with 1 or 2 MB of memory that will be sold into the home, small business, single user, or single application user on a network.

Today, Windows and OS/2 offer similar functionality in key areas, such as the graphical user interface and protected mode memory. Over time, the differentiation between Windows and OS/2 will become more pronounced as OS/2 is enhanced for high-end hardware and applications take advantage of OS/2-specific features.

Because Windows is targeted at the huge DOS installed base and runs well on a broader range of low-end hardware, Microsoft expects Windows sales to accelerate over the next couple of years. For this reason, even as OS/2 quickly becomes the corporate standard for 386 and 486 workstations, unit Windows sales and installed base will be greater than OS/2 installations in the early 1990's.

Windows completes DOS

Windows and OS/2 may look a lot alike, but Windows is still a DOS-based system, and inherits many of the limitations of DOS. Windows, for example, retains the DOS FAT file system. The new High Performance File System gives OS/2 the edge in file system response time, plus offers support for huge drive partitions, and usability features such as long file names and extended attributes.

Moreover, since Windows is intended to complete DOS, Microsoft will continue to optimize it for good performance on 1M-byte 286 PCs. (On a 386, because of the multiple virtual DOS machines, the recommended minimum is 2M-bytes.) The criteria for enhancing Windows over time hinge on keeping the system within the 1M-byte ceiling so that it can be supported across the broadest range of DOS systems.

Protected-mode Windows 3.0 does not change Microsoft's positioning of Windows, but it raises the acceptable minimum level of functionality for a graphical user interface on DOS. Windows 3.0 is essentially a DOS extender for Windows applications, allowing them to access memory beyond 640K while still running on DOS. Windows will be the catalyst to move large numbers of installed PCs to the graphical user interface, and as such, is one step toward replacing DOS with a graphical user interface.

OS/2 Moves Beyond DOS

Where Windows is optimized to work well within 1M-byte, OS/2 is optimized for performance and functionality. Although OS/2 offers compatibility with DOS applications, and a nearly identical command syntax, it is not based on DOS or constrained by DOS I/O. OS/2's enables new kinds of applications which fully exploit the hardware and the network.

A typical OS/2 configuration requires 4M-bytes of memory to run well. (IBM's application extensions to OS/2, the Extended Edition Database Manager and Communications Manager, and Office Vision, can add another 4 to 6 megabytes to the base system, but these are not requirements of OS/2.) Working within this higher minimum memory requirement, the role of OS/2 is to provide a platform for new kinds of high performance, high reliability applications, which exploit the power of the 386/486 platform and advance the strategic utility of corporate networks.

Where OS/2 Shines

The earliest examples of the unique kinds of applications which OS/2 makes possible can be broken into three broad categories: advanced network servers (LAN Manager) and server applications (such as SQL Server); high performance dedicated graphics workstations for CAD or publishing; and corporate development efforts for "mission critical" applications or process control.

A LAN Manager server uses OS/2 protected mode multitasking and large memory support to excel as a high performance network operating system. LAN Manager also derives the greatest immediate benefit from the two to ten times faster response time of the High Performance File System. Most significantly, LAN Manager can function as an applications server, running the network and simultaneously supporting multiuser back-end applications -- such as SQL Server -- for front-end DOS, Windows or OS/2 clients. Saros FileShare is a good example of the kind of workgroup application enabled by LAN Manager and OS/2.

For dedicated graphics workstations, OS/2 provides very high system throughput and sophisticated graphics processing capabilities that translate directly into greater productivity for the user. PageMaker's use of threads not only allow it to provide an instantaneously responsive user interface, but also to run time-consuming tasks, such as placing of documents from a word processor or autoflowing, in the background. An OS/2-based editorial system from CText Inc. is being installed this year at the Chicago Tribune, which also chose OS/2 because of its multitasking and good response time.

CAD programs such as AutoCAD and VersaCAD are also being extensively rewritten to provide new features and better processing under OS/2. PM's advanced features such as presentation fonts (which can be blown up to arbitrary point sizes), and ability to do transformations (tweak and rotate entire coordinate systems or fonts), paths and clipping, give developers a much richer set of graphics functions than exist in either Windows or on the Macintosh. OS/2's more sophisticated metafiles also enable drawing and presentation packages to share highly complex graphical images.

Finally, OS/2 is being applied to a wide range of corporate applications that require large memory, pre-emptive multitasking, an integrated graphical user interface, and communication links to IBM large systems. A major domestic airline is using OS/2 for its internal reservation system. Ford

is building its automotive diagnostic system on OS/2 and PM; and companies such as TRW Technar and Ralston-Purina are building factory floor process control systems using OS/2. A major New York financial services firm is converting all of its trading workstations from Windows to OS/2 because of OS/2's superior performance for multitasking applications, and it's greater protection against data corruption and system crashes.

Travellers Insurance is developing a network management system using PM; and Delta Airlines has implemented a mailbag sorting system based on OS/2. Fireman's Fund, Merrill Lynch, Amoco, Kentucky Fried Chicken, the list of companies that have adopted OS/2 early to build unique solutions, is growing rapidly. In environments where coexistence with an installed base of shrink-wrapped applications is not key, OS/2 is winning the day over Unix because of it's robustness, it's superior programming model, it's standard graphical interface, and it's role within SAA.

Many of OS/2 strengths -- pre-emptive multitasking, multithreaded architecture, hardware-enforced protection between applications -- are invisible to the end user. But they are critical to building the kinds of communications-oriented applications these business require. On networks, OS/2 will be necessary for network management, remote processing, and for peer and distributed services. Again, OS/2 enables new kinds of applications.

The Future

With the 386/486 release of OS/2 next year, the case for OS/2 gets stronger. The following features will afford users significantly better performance, high reliability, greater ease of use and functionality.

- The flat memory model and 32-bit APIs (application programming interfaces) will offer much better performance and simplify the development of new applications
- Demand paging improves the performance of all applications (including 16-bit and DOS applications) and offers more efficient use of system memory
- Increased system limits (threads, processes, pipes, file attributes, open files)
- Support for multiple simultaneous DOS sessions; and protection for the rest of the system from DOS application failures (also in Windows/386)
- Better network support, including peer services, fault tolerance, and automatic electronic distribution (with LAN Manager 2.0)

Windows and OS/2 will track each other over time with regard to user interface. Some features introduced in OS/2 may eventually be migrated to Windows, as minimum memory requirements allow. To facilitate the transition to OS/2, Microsoft is working on technology which could allow Windows applications to run natively on OS/2 2.0. Microsoft cannot commit to this feature, but it recognizes the customer need and is aggressively pursuing this possibility.

Other advances, which will be specific to OS/2 include:

- intelligent fonts, for scalability and device independence
- object oriented enhancements and programming support
- Posix compliance
- support for advanced hardware architectures, and multiprocessor systems

- better system security

- distributed processing

Managing the Transition

Sooner or later you will be running OS/2.

It makes sense that for most organizations the transition will be gradual. In many cases, OS/2 will be phased in with new hardware purchases. Corporations should identify applications and/or specific groups of users which stand to benefit from OS/2, and begin implementation where the return is most immediate. In some instances, these applications will be executive information systems providing graphic representations of daily sales information to corporate officers; in other situations it will be the clerical support staff who most need multitasking and the ability to produce high-quality output.

Since OS/2 is the strategic platform for the long term, we recommend to companies that are developing their own applications in-house, that they begin developing now for OS/2.

Microsoft strongly encourages all organizations to standardize on 386-based machines, and to buy those machines with at least 2, and ideally, 4 M-bytes of memory installed. For most companies the cost of buying the memory up front is substantially less that retrofitting the hardware later. The benefit of the 386 is not only increased processing speed, but the ability to run 386-specific software over the life of the machine. Moreover, experience has shown that the cost of investing in a graphical user interface is more than offset over time by reduced training and support costs.

OS/2 will be introduced into many organizations on the network server, providing database and other back-end application services to DOS, DOS/Windows and eventually, OS/2 client workstations. In this way, the network serves as a tool for migrating to OS/2, and for integrating DOS/Windows and OS/2 workstations.

Microsoft anticipates that DOS/Windows and OS/2 will coexist in many organizations for a long time. For organizations keen on moving to OS/2 as soon as possible, DOS/Windows can provide coherency with their installed base of non-OS/2-capable PCs. Not only can users run common applications on both platforms, DOS/Windows and OS/2 workstations have data and file compatibility, and can talk to common services on a network.

For installed 386 machines, the option to adopt DOS/Windows or move directly to OS/2, will depend upon the cost effectiveness of adding memory to older hardware, if that is necessary, and an organization's timetable for implementing OS/2.