

OS/2 Forums Schedule

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Systems Software

by Steve Ballmer

I want to start with a little bit of perspective on what's gone on over the last year, and then roll into the future. I'm going to break things down from a somewhat parochial standpoint into a few major events, starting in August of last year with the announcement of the Lotus/Intel/Microsoft Expanded Memory Specification Version 4. The LIM spec has certainly become something very important for our business. This is the bank switch memory scheme that was introduced a couple of years ago for MS-DOS. We upgraded that fairly substantially in August of last year, in a way that really made it possible for us to unify the so-called EMS specification from AST, and the Lotus/ Intel/ Microsoft spec, and do some very nice multi-tasking and rich memory management on DOS. That specification actually won the PC Magazine Technical Excellence Award, and from our standpoint it was the key milestone in our ongoing investment to keep DOS a healthy, longlife system. We've had DOS around now for 7 years. We certainly see a future for DOS that stretches

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easily another 3 or 4 years and possibly much longer, and that will involve us putting a lot of creativity into things like the EMS specification in order to extract all of the mileage, if you will, that we can, you can, and our customers can, out of their DOS systems.

In September we introduced Windows 386, a key piece of software from our standpoint, since it was the first piece of software that we introduced that exploited the virtual machine capabilities of the 386. We had been shipping a version of XENIX, that takes advantage of some of the 386 capabilities, but Windows 386 really pushed that forward, and in a way, frankly, that's been very very appealing to customers. Windows 386 now ranks among the top 1 or 2 best-selling retail products from Microsoft on the IBM PCs and compatibles through our retail channel. It's become incredibly popular as an option for OEM customers to sell with their machines. Customers really understand and appreciate the benefit of running multiple DOS applications--which is what you get with Windows 386--in addition to the nice graphical user interface of Windows.

In October/November we shipped Microsoft Excel and Version 2.0 of Windows. Version 2.0 of Windows was considerably faster, most significantly, versus Version 1. The combination of the shipment of Excel, in addition to the shipment of Windows 2, and the prior shipment of Pagemaker from Aldus, really marked a key milestone, I think, in the

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industry. It was the arrival of the graphical user interface. We've been preaching, certainly for a number of years now, on the importance of graphical user interface, and I think it was really in the fall and early winter of last year, that we can fairly say that graphical user interface arrived.

In December, OS/2 shipped initially from IBM and very quickly on the heels from Zenith, and some other computer manufacturers. That was great, that was a quarter early, that was a foundation piece. I'll talk more later about how I expect OS/2 sales to wrap up. It was very very important, in order to prove the credibility of this next-generation platform, that we drive a stake in the ground and ship something. So I was super enthusiastic that we shipped OS/2. We shipped it a quarter early, and that was exciting.

In January we introduced the SQL Server product, and we said that we would do retail distribution of that product through Ashton-Tate. That was an important milestone in two ways. Number one, I think you'll see a shift from us, actually. We've been preaching graphical user interface, graphical user interface. I think people are finally beginning to accept that message from us. And I think you'll see us move into an era where the key banner that we carry forward is this notion of distributed computing. The SQL Server was really the first client-server application from Microsoft. It was also significant in that we and Ashton-Tate agreed to

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work together on that product, so we really could set something up that has a credible chance of becoming a standard for the ways databases get managed on PC-local-area-networks.

In March, we shipped the first prerelease of OS/2 1.1, including the Presentation Manager. At this stage, you all, and some 3500 software developers across the world, have copies of the Presentation Manager and are creating Presentation Manager applications. The reaction to that prerelease has been good. People have been pleasantly surprised by the stability of the code. People have been pleasantly surprised by the performance, though it's not perfect. I almost wish you were giving us more feedback, pointing out more things for us to work on. Because I'm sure we have a long way to go yet, and it's certainly an incredibly important product I think for us and really will be the thing that ushers in, in full force, the next exciting generation of applications.

It was a good year for us, it was a good year for you. I thought it would actually be interesting to give you a summary of what Microsoft's estimates are, which are pretty reliable, of machine sales, in our fiscal year '87, which ended a year ago, and our fiscal year '88. The first thing that stands out is, the growth has been very dramatic. We think there are about 6.5 million machine shipments a year ago, and it rose to 8.2 million in the year which is ending

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this month. There has been a dramatic shift on a percentage basis from 8088 systems to so-called OS/2 capable systems, the 286 and 386 class machines. The 8086/8088 market was essentially flat, actually down slightly year to year, and all of that 1.7 million units of growth came in 286 and 386 systems. That's very important for the success of graphic user interface in general, and for Windows specifically. I think it's also interesting to note that the business was strong worldwide. There was good healthy growth in the US and every bit as healthy growth internationally. I think those are probably the most important things to note.

As we move forward, Microsoft continues to believe in the open-system philosophy. This is sort of a funny part of this talk, in the sense that we've been talking in our way about open systems for a number of years. Our competition has been talking about open systems for a number of years. Now we're in an era where everybody talks about open systems. In fact, we even have a new company that's called the Open Software Foundation. So it might be important for me to say again what we mean by open systems, and reaffirm our commitment to them. Because OSF, the so-called Open Software Foundation, which was announced roughly two weeks ago to promote an open UNIX platform, that was what was done by the group of HP and DAC, IBM, Siemens, Bull, Apollo, and Nixdorf, and that's an important thing for the UNIX community where people are looking for an open source-level standard which can be ported to multiple microprocessors. When we say open

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systems, we're talking about something that's just a little different. We're talking about software products that are open in the sense that we document all of the programmatic interfaces. All of the programmatic interfaces of DOS and OS/2 are documented interfaces. Development tools are widely available from Microsoft and from third parties. We work aggressively with our competitors in the application business to support these platforms. I think it's sort of funny in some senses, that AT&T had this problem with UNIX that caused the Open Software Foundation to form. In that case, people were questioning the motives of AT&T, the hardware vendor, and their use of system software. For years Microsoft has walked the line with our competitors in the applications business who ask the question, Are you being really open? Is there really a separation between your systems work and your applications work? Will we get equal access, etc. And because of the way I think we have supported those people, and because of the way we've made the software broadly available through all of you, people have accepted the fact that this really is an open platform and that all third-party application developers have an equal opportunity to do real exciting great applications. And I think that's very important. We plan to continue this phenomenon, and we do it with binary code. This stuff runs on a given architecture--in this case, DOS and OS/2 have run on the Intel architecture. We created binary standards that people can count on--taking a disk out of a box and putting

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it into a machine that comes from any one of your companies, and running the same application software across the entire breadth of machines. That's an incredibly reassuring, and incredibly valuable, phenomenon, I think, for all of us. All of us get to see the advantage of this huge growth in the market because our customers and the application developers move forward with great confidence of a large marketbase into which they can sell and the customer knows there's a large base of machines and software from which they can choose. It also allows people to do what they do best. People who focus in on third-party peripheral cards can do that, and add value to all of your machines. There are standard device driver interfaces so they can plug in their hardware cards and requisite software into the system. The whole system has worked very very effectively, and not one thing has changed as we move into this world of OS/2 if you will. We put an incredible amount of time as I said into our work with people like Lotus and Ashton-Tate and WordPerfect and Borlin and Software Publishing etc., etc. And that will certainly continue. People are sometimes surprised. Frankly, I think I probably spend more time working with the development groups of some of our competitors than I do with our own applications group. That may say something about our own applications group's overwhelming confidence, but we certainly spend a lot of time with our competitors. I'm responsible for the piece of the business that owns the system software.

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In the context of what I just said, I don't own the application software, and there really is this separation of church and state. So I have all of the research and development, marketing, test, and publications activities for our systems products. That includes protected-mode operating systems, which really means OS/2 and XENIX; real-mode operating systems--DOS and its extensions, Windows and Windows 386; our languages and compiler tools, what we call our distributive processing products which really means XENIX, the LAN Manager, the SQL Server; and some other things I'll talk about in a second, and I have responsibility for publishing the Systems Journal which is the technical newsletter which I hope at this stage all of you get--it comes out every other month, runs about 80 pages, and really has a number of very valuable hints for people who are trying to understand our system software platforms or to write applications that sit on top of those, so I encourage you all to read that.

The number of people it takes to build Microsoft products has increased dramatically over time. Our current staff levels are shown up on the chart; that's a big group. Over the next year we anticipate a lot of growth. Our languages group is scheduled to grow to about 130-140 people over the year. The networking group is our number one area of investment. It will grow from 80 people to about 140 people, and that's up from essentially zero two years ago. So if you go back to 1986 we had 1 or 2 people. Today we have 80. A 12026542

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year from now we'll have 140. That is dramatic growth. That's primarily R&D people, and it reflects our commitment and interest in really pushing forward this notion of client-server computing that we'll talk to you about today. Our DOS and Windows group is about 50 people, and it will grow to about 70. OS/2 and Advanced Development, perhaps not surprisingly, is the largest group. It's about 150 people today and will grow to about 200 people a year from now. These numbers to me are fairly staggering actually. We still believe very much in small groups--doing things in teams of 6-7-8 people. The problem is, a product of the scope of OS/2 is really about 6 or 7 subsystems that all get rolled into one product. If you have 6 or 7 teams of 7 or 8 or 9 people, the group gets to grow fairly quickly. Then if you're trying to do multiple releases, and whatever... I think we've been able to manage this so far fairly well, and we look forward to doing that in the future.

I'm going to touch very briefly on the key things in each product area. What I'll try to do is highlight what I think the key points are. In the languages area I think there's really two things I want to do. If you look back over the last year and ask what were the important things that happened in the languages business as a whole and in our languages business I think you'd focus in on two things. Number one, you'd focus in on the improvements in the programming environments that we're making available--in the debugging, in the way we tie interpreters and compilers

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together to get superfast turnaround for the programmers. I think you'd focus in on the quality of the editors, the integration of editor, debugger, linker, compiler, and that phenomenon will continue over the next year. And there's the very rich integrated environment that we'll expose in future versions of our C compiler, our Basic product, and I think that will be very very important. If you look back even over the last year, you see our QuickBasic 4 product, which is a very very fast interpreter/compiler bundle that allows you to super-easily stop, change a variable, go ahead, see what's happened, etc. So the evolution there is really in the quality of the environment and the quickness of turnaround for the programmer. The other key thing I think you see if you look back over the last year is the improvement in the quality of code generation. We've gone from our C Release 3, to 4, to 5, over the last couple of years. Release 5 shipped the end of last year and 5.1 shipped the beginning of this calendar year. The quality of code that we're generating is really at this stage pretty phenomenal. We still have a lot we can do; we'll move forward. We do very good local optimization; we'll move forward though over the next year or year and a half to do full global optimization. I think you'll continue to be impressed by the kinds of advances we can make in code generation. If you look forward over the next year, what will we do? Well we'll continue those two phenomena, improvements in the environment and quality of code

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generation, but there is another key challenge that we are in the process of tackling, and you'll start to see products come out from us. And that's really in the whole area of making it easy to write these graphical user interface applications. We are as quick to admit as the software vendors who try to write them--it is not easy today to write a Windows application; it is not easy today to write a Presentation Manager application. We have some very clever ideas of things we can do to simplify the interface for people who don't need low-level control. We have some very nice ideas about things we can do to enhance the prototyping and dialogue management facilities that come with OS/2 and with Windows. And I think you'll see over the next year, fairly dramatic advances in terms of making it easier to write Windows and OS/2 applications. The first embodiment of those concepts from Microsoft will actually come in a version of our Basic for the Presentation Manager and you'll see those propagated to our C compiler, to our new Cobol product, etc., further on in the future. The other thing we're putting some investment in from a tool standpoint this year is to really take the tools that we've been using to create our own CD-ROM application--for browsing, text retrievals, hyper-media tools--and enriching those; we'll make those available to people like you then to build your own applications.

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In the distributive processing area, the XENIX area, there are a number of phenomena. This is a loaded chart that I'll

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spend a few minutes on. Firstly, if we look back and say what was important, well, certainly the introduction of the LAN Manager is very important. We expect to ship the LAN Manager on schedule to you in the 3rd quarter and we expect to see OEM shipments begin the end of 3rd quarter or 4th quarter of this year. I am incredibly excited about how well we're doing with the LAN Manager. There are over 40 OEM customers who have signed up for the LAN Manager. We have some 35 independent software vendors committed to writing for the LAN Manager. The feedback we're getting from a feature standpoint on the LAN Manager is great. People are very impressed. Some things people would like we'll address fairly quickly, like fault tolerance. The people are very very excited. From a performance standpoint, I'm confident that the LAN Manager will be viewed as a highly competitive offering. I think we also have, with the investment we're making in R&D, some fairly aggressive plans to provide name service to do high-performance 386-specific servers in the future; so I am incredibly bullish, incredibly optimistic today, about the future of the LAN Manager. We also have, as I said, some work going on in the name and mail service area. We'll certainly follow the key leads that get set by the OSI committee with the x.400, x.500, x.ds set of protocols, but we think it's incredibly important, if PC networks are to grow to be very large, that we make an investment in this area now.

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The next thing I'd like to talk about is connectivity. We often get asked, what are you going to do about OSI communications; what are you going to do about SNA communications; and our answer has traditionally been that we would leave those markets to third party companies and Microsoft would not have an offering. We've certainly been aggressive, working with companies like DCA, to encourage them to build communications-server products on top of OS/2 and the LAN Manager. We have made a decision that we too will enter into this communications market, and that we will have a product that supports the important communications protocols such as OSI and SNA. We have begun the process of developing some of that technology and licensing some of the rest of that technology. And, over the next six months or so, we'd be very interested in hearing from you, getting your feedback about what you think is really important in this communications area so that we can factor that in properly to our plans. But we will certainly have a communications product. Why, you might ask, did we become convinced we need a communications product? Well, one of the most often-asked questions I get from hardware vendor customers is, Is Microsoft going to do an extended edition? Since Microsoft and IBM worked together on the standard edition and the extended edition has database and communications facilities, will Microsoft do an extended edition? My answer has been and continues to be, I don't think so. We'll see. IBM will release the extended edition

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and we'll see what it looks like, but we fundamentally have a different view of database and communications software. IBM is packaging that into a single-user, work-station operating system, and making you run all of that code. We'll know next month exactly how much code that is, but all of that code on every work station. Let's say for a second that it requires a 5 or 6 megabyte machine. I don't think that people are going to want to do that. We see a world instead, where the communications and database functions run centrally up on a server on the network, and it's through that server that you get access to share data, and you get access to host systems--be they IBM host systems or others. So we're putting our investment into building a great database server product--the SQL Server--and a great communications server product. And that's the product that we're in the process of specifying today and that's the product that I want to tell you about. If this concept of extended edition really catches on and takes the world by fire, and there's enough RAM available for people to run it in any kind of volume; we might change our view, and that will be great. We'll own the technology. It'll be available to us through our server products. And yes, we would then put together an extended edition equivalent product. But our current belief is, the way we think our customers want to put together their offices, is not to direct-connect a bunch of PC workstations directly to a host, but rather to attach them to PC servers, which then can get access to these

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shared resources. So that's the tack that we're going to take. We're going to build the key technology assets today. I would be curious to get feedback and comments from you. But I just don't think every end user is going to want to have to learn how to configure PUs on their machine. I just don't see it.

In the XENIX area, we announced over a year ago that we were working with AT&T to merge our XENIX product with their standard UNIX 386 product to create something which has come to known as the merge product. The merge product completes development and tests this month. AT&T will release it, and we will release it in the 3rd quarter of this year. We're in final acceptance stage now with AT&T and the question is, what next? It used to be simple. We're leaders in the DOS and the OS/2 markets. We're leaders from a sales standpoint in the UNIX market. But we weren't going to be the setter of new standards; we were going to try to track AT&T in X/OPEN. Well, with the creation of the OSF group, it's now not clear what the emerging standards will be in the UNIX market. Will they be set by OSF? Will they be set by AT&T and Sun with Release 5? Will they be set by X/OPEN? Will they be set by you people, buying the product and selling it and letting the market decide? We are at the moment in a wait-and-see posture, vis-a-vis OSF. We think that the key standards will really get defined by X/OPEN, so it's really to the X/OPEN body that we look to for leadership, and I would expect to see both AT&T and the OSF group very closely follow the

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X/OPEN recommendations. We don't want to blaze new trails, we want to keep in sync, and over time I'm sure we will sync up more or less with either AT&T and Sun, with release 5.4, or with the OSF group. But really the key, I think, on this one will come through the directions that get set by X/OPEN.

The other key thing that we want to do as a participant in the UNIX world is to provide products that help bridge from the DOS and OS/2 world to the UNIX world. The first of those products we announced at UNIFORM this year, that's the product we call LMX, or Lan Manager for UNIX. What this allows you to do is to set up UNIX machines as servers to DOS and OS/2 workstations running the Lan Manager protocols. It's a product we're doing in conjunction with Hewlett-Packard, and I think it will be a very important product for customers who have mixed installations of DOS, OS/2, and some powerful UNIX workstations that they may want to use as servers, in addition to their OS/2 servers. The other product, which we haven't announced and which I won't announce today, but which we will do, is a thing that we call PMX, or Presentation Manager on UNIX. Many of you have probably wondered whether we would do this product, since it's in my view a no-brainer to go do it. We've talked to a number of you about it, and the question is, why not? Well, we'd worked very hard for a while to encourage Sun and AT&T to support Presentation Manager on UNIX and a standard look and feel. They made an independent decision that what the

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world needed was yet another look and feel, and they announced OpenLook a few months ago.

We still believe in the Presentation Manager on UNIX concept. When I go out and see large corporate customers, both here and in Europe, the number one piece of feedback I get is, we want to have common application suites running on our DOS and OS/2 workstations and our UNIX technical workstations. We want to run the same spreadsheets, the same word processors, we don't want to have to retrain our users. To me that points to me to having a common interface, a common look and feel on UNIX and on DOS and OS/2. And that's what the Presentation Manager on UNIX is--same look and feel as OS/2 and Windows, and similar or the same programmatic interfaces as OS/2 Presentation Manager.

I think over the next couple of months our strategy and development plans on this will become more concrete and we'll unfold them publicly and go through them in detail with each and every one of you with an interest in the UNIX market. But I'm telling you today that you can count on this thing happening, that I think it's important, and we'll certainly work aggressively with the X/OPEN group and OSF to encourage them to adopt Presentation Manager on UNIX as the standard look and feel. It would also make our decision about whether to follow OSF or AT&T and Sun a lot easier, because we think this Presentation Manager on UNIX will be

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very important; if it becomes a part of the OSF standard, I think that's very interesting.

DOS and Windows.

DOS will have a long life as I said. I expect DOS and Windows to live with us for another 3-4-5 years, something like that, and always have a place, even beyond that--to have an evolution of DOS and Windows to have a place on low-end home computers. But over the next 5 years, I expect DOS and Windows to have a role in the office. And that role will be on lower-end machines from a hardware standpoint where probably the user is only using a single application, and wouldn't want to pay the cost in memory etc. for OS/2. I also think it will be important as an upgrade path--DOS to Windows--for people who own DOS workstations. Because as offices get configured in networks with OS/2 workstations and DOS workstations, people will want to be able to run the same applications on their OS/2 workstations and their DOS workstations. And that means a movement on DOS to DOS Plus Windows combinations, so that you can run Windows applications which look like their OS/2 counterparts. Remember, the look and feel, the user interface of both OS/2 and Windows are identical, and applications in the two environments will be identical--both conform, actually, to the so-called common user access piece of the SAA specification from IBM, which we actually worked very hard with IBM to make sure that it was really right and something

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we wanted to support in Windows and OS/2 and our applications.

The next release of DOS will be called DOS 4.0. We will make it available to you in the 3rd quarter of this year. Its key feature will be a new user shell or user interface that replaces COMMAND.COM. Now the old A> prompt will still be there for people who want it, but for people who don't, there will be a full-screen user interface that allows you to copy files, start programs, etc. Not surprisingly, what will that thing look like? It will look like the user interface to the Presentation Manager which is also the direction over time that we'll take the user interface for Windows. So that if you learn any of these systems--how their menus work, their dialogue boxes, how to copy files, delete files, etc.--it'll work the same across DOS, OS/2, and Windows. And we actually view this DOS shell as being a low cost, low-entry alternative to actually using Windows. So some people will choose to ship DOS in the shell. Others, I think most, will choose to ship DOS plus the Windows alternative. Over time with DOS, I think there are two other key things that we will do. Number one, we will make DOS smaller. We, at least for 286 and 386 systems, have come up with some fairly clever ways to hide DOS out of the address space of applications. We've used some of those techniques in our Windows product that I'll talk about in a minute, but over time we'll do more of that under DOS, and give back some of the precious 640K to applications. The other thing

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that we will teach DOS to do is use the EMS 4.0 specification to make DOS itself bank-switchable.

## Windows

Later this month we'll announce a new version of Windows called the 2.1 Release. The 2.1 Release focuses in on Windows on the 286 and the 386. It's smaller, it's about 64K smaller in fact than Windows 2, which is super nice. It means Windows applications are a lot faster. There are people who sell like Sell for example, configured for PC networks, who were dancing in the aisles over this 64K. It's a really great thing that has improved the speed. We've also put a lot of work into the setup to make it a lot easier to set up; particularly to set up the expanded memory. And we've added a slew of new device drivers. That release is actually shipped as a retail product and the OEM binary adaptation kit is also available. The next release of Windows we target out 9 months or so and call that Windows 3.0. Its focus is to be sexy, sexy, sexy. Great new shell. It will not only look like the Presentation Manager shell; we will take it further. It will be very nice, user-configurable, really quite a nice piece of work. The desktop applications will be dramatically enhanced. We'll do some more work on performance and on the bundle tools. The real focus of that 3.0 release will be to provide additional sex appeal for end users as opposed to application developers.

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Just a reminder, since I remind everybody at least once a speech, OS/2 is the result of our joint development with IBM, and that the IBM OS/2 standard edition has the same programmatic interfaces and the same user interface as the Microsoft OS/2 product. The same applications will run; the same user interface applies, etc. The same, the same, the same. From an OS/2 future standpoint I'm going to go into a lot of more esoteric things in a minute, but there are a couple of things I want to stress. OS/2 1.1 which will become available in the 4th quarter of this year, our next follow-on release of OS/2, will focus in on providing an extensible interface to the file system. So the file system can both be richer and so that third parties can create network add-ons, CD-ROM add-ons, etc, themselves, through documented interface to the operating system. And of course we're working on a version of OS/2 that explicitly exploits the 386. That means three things. Number one, we get rid of the 64K segment limitation. Number two, we turn on the paging-memory management facilities of the 386. And number three, it means we enable the user to run multiple DOS applications. Those won't all necessarily come in our first 386 release, but those things will come fairly quickly. The important thing, we think, is to make sure that we can get the independent software vendors who have applications that run today on large linear address space like 68000s and VAXs, to move over to OS/2. We think getting our 386 version done is key to that.

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How is OS/2 doing, is a reasonable question to ask. Well, as I've said, we've sold over 3500 toolkits. We had a major ISV party at the COMDEC show. There are some 50 applications that have already been shipped. There are some 400 applications that have been announced, and I think we're doing okay, about as well as we would have expected. I think we're on target to have about 1000 applications announced and close to shipment by the end of this year. But OS/2 will be a slow burn. I think the software vendor community has lock, stock, and barrel agreed that the center for their creativity, their innovation, their great ideas, is going to be OS/2 version 1.1, with the Presentation Manager. They're going to move their attention to some extent from DOS. They're going to shift their attention from the Mac. And it really will focus in on OS/2 1.1. So there are a bunch of new applications being created today for OS/2 1.1. There's a slew of applications that will be ported from Windows, in a very straightforward fashion, to OS/2 1.1.

We've been out to see many of the leading Mac independent software vendors. They're very enthused about OS/2 1.1. I am optimistic that in the first 6 months of 1989 we will have very compelling applications, and suites of applications, that will cause people to say yes, it is absolutely the time for me to move to OS/2 on a large number of my workstations. Will it be next year that OS/2 outsells DOS? No. Will it be the year after? Maybe. Will it be in 1991? Absolutely. No question. Without a doubt. Now I'm not unbiased, but that

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would be my judgment. That's about how things will unfold. And we'll start to see the compelling suites of applications in the first half of next year and those will be Presentation Manager-based. With a little bit of luck, D-RAM prices will be down by the first half of next year as well, and the combination could be irresistible for some people to run out and really standardize on OS/2.

So I think, I feel very very good. People are making progress and they're getting on with business. I think over the course of this year and the first half of next, you will see a standardization on OS/2, at the server level. People will move off of having just proprietary operating systems or running DOS on their network servers; they'll move to OS/2. And the center for future work on servers will be either on OS/2 or to some extent on UNIX. Where else do we go in the future with OS/2?

Well I've talked to you about a few immediate, important things, Presentation Manager, etc., but there's a lot of other exciting things I think we need to do. We really need to build a file system into OS/2 that supports long names. This 8.3 is ridiculous as a naming convention, we agree. The file system should allow for rich attributes: author, date of last edit, date of last review, etc. We see a world where the command language gets much richer. People have been beating us up for a number of years that COMMAND.COM is not rich enough. I agree, and we really need to take two steps.

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We need to make it a richer language, and we really need to tie it in to the fact that OS/2 is a multi-tasking system that supports the graphical user interface. So the central command language should support graphical user interface, and it should allow people to integrate the work of multiple applications. We sometimes refer to a concept that is sort of a research project inside Microsoft called MacroBasic, which really becomes this next-generation, central command language. There are a number of networking features, which we think ought to be integrated into OS/2, so that you really do get local remote transparency as a standard feature of the operating system. OS/2 will need to be extended to support multiple microprocessor configurations, to be very effective on network servers. We certainly need to embody some of the concepts of object management and object-oriented programming. That'll affect the file system. That'll add a new subsystem for object management. The programming languages will need to change to support these objects. And last but not least, applications themselves will begin to structure themselves as a bunch of objects so it really begins to be easy to have multiple applications work together.

The other thing that we see that is more concrete and more immediate in OS/2's future is the need to do an add-on extension of OS/2 that is POSIX-compliant. As more and more bids, both in the United States and Europe and Japan for that matter, get spec'd that require POSIX-compliance, we

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want you to be able to bid OS/2 systems. You can also bid UNIX but we want you to be able to bid OS/2 systems on those bids. We've done the exploration work and we are funding a development project to go ahead and build an extension to OS/2 that would be POSIX-compliant and run POSIX applications. I think that will be super-important to all of us in this environment in which more and more bids, particularly government bids, are requiring POSIX-compliance.

To summarize then, the key product releases for this year: Windows 2.1, OS/2 1.1 with Presentation Manager, the LAN Manager, SQL Server in the second half of the year, and the merge product, and, of course, DOS 4.0. In the future, OS/2 for the 386, Windows Version 3, the LAN Manager version 2, which includes the name service and the integrated networking. And the strategy is really to focus in on a 3-tier operating system strategy: the workstation, where we think DOS and OS/2 will both be very important, the server, where we think OS/2 with LAN Manager and UNIX with LMX will be very important, and the multi-user system, where UNIX-XENIX continues to be our strategy.

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