SYSTEMS DESIGN REVIEW INVITEES

PLAINTIFF'S EXHIBIT

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COMPANY NAME	NAME:		Come
	erun E	CONFIRMED	3
Adobe	Tom Malloy	Y	
Aldus	Ted Johnson	Y	
Ashton-Tate	Kevin Piette	Y	
Ashton-Tate	Mike Donegan	Y	
Asymetrix	Steve Wood	Y	اريا
AutoDesk	Ron McElhaney	Y	سيا
AutoDesk 、	John Forbes	Y	
AutoDesk	Kern Sibbald	Y	
Borland	Brad Silverberg	Y	
Borland	Richard Schwartz	Y	
Borland	Ken Einstein	Y	
Central Point	Tim Pettibone	Y	
Computer Associate	es Chris Frew	Y	
Corel Systems	Patrick Beisee Beisne	Y	
DataEase	Shelly Altman	Y	
DÇA	Chuck Rudolph	Y	
DCA	John Beall	Y	
Fifth Generation	Mark Graybill	Υ	
Frame Technology	Kerry Champion	Y	
ndex Technology	Burt Rubinstein	Y	
nformation Builders	Keith Toleman	Y	
nformix	Doug Edwards	Y	
otus	Marty Fahey	Y	·
otus	Dave Gilmour	Y	
Micrografx	Goorgo Grayson Lyle Griffin	Y	
Microrim	Dennis Comfort	Y	
licrosoft	Tandy Trower	Y	
licrosoft	Dave Moore	- Y	

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Microsoft	Jabe Blumenthal	Υ	
Novell	Kyle Powell	Y	7
Novell	Drew Majors	Y	1
Oracle	Mark Benioff	Υ	7
Oracle	John Kish	Y	1
Samna	Said Mohammadioun	Y	
Software Publishing	Don Sweet	Y	1
Symantec	Gary Hendricks	Y	سا
VersaCad	John Bennett	Y	۱,
WordPerfect	Layne Cannon	Y	1
Z-Soft	Marc Zachmann	Y	
<u> </u>	Charles Petzold		_
	Ray Duncan	Y Y	1
	Adrian King		
	Alistair Banks		1
	Bill Gates		
	Bob Muglia		
	Bob Taniguchi		
	Cameron Myhrvold		
	Darryl Rubin		
	Dave Cutler		
	David Wood		
	Doug Rosencrans		
	Fred Gray		
	Greg Goff		
	Jonathan Lazarus		
	Kent Diamond		

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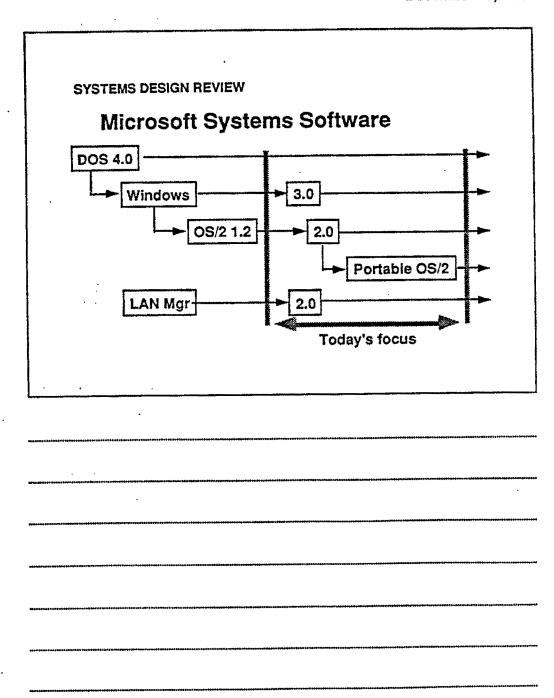
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Micro	soft Systems Software
workgroup computing -sharing data standard GUI - ease of use - flexibility - price/perf.	Pili OS 2 Windows DOS multitasking multi-user security transaction processing Mini/Mainframe Attributes

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Agenda

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- Microsoft Systems Strategy
 - OS/2
 - Windows
 - Applications Integration

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Agenda

- Developer Support
 - Tools
 - International Considerations
 - Product Support
- Networking
- Multimedia

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Steve Bailmer Senior Vice President Systems Software

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IBM & Microsoft Statement of Direction

- Broadened the scope of the joint development partnership between IBM and Microsoft
- OS/2 is recommended for machines with 3Mb or more of memory and 30Mb of hard disk
 - A new feature, a swappable DOS environment reduces memory requirements by 512K
 - IBM and Microsoft will make a concerted effort to reduce the memory requirements of OS/2
- · Windows is recommended for 1-2Mb machines

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IBM & Microsoft Statement of Direction

- OS/2 for the 386 and 486 to be available in 1990
 - Enables 32-bit linear addressability
 - SDK for 32-bit OS/2 before the end of 1989
- OS/2 development underway for RISC architectures
- Will work together to make IBM Extended Edition services available for other vendors' OS/2
- LAN Server and LAN Manager APIs to be identical over time

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Microsoft's System Software Business

- 1982-1989 The "DOS" decade, an industry is born:
 Over 30 million copies sold!
 - Platform for Individual productivity
 - Wide choice of system hardware
 - Broadest choice of applications

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Microsoft's System Software Business

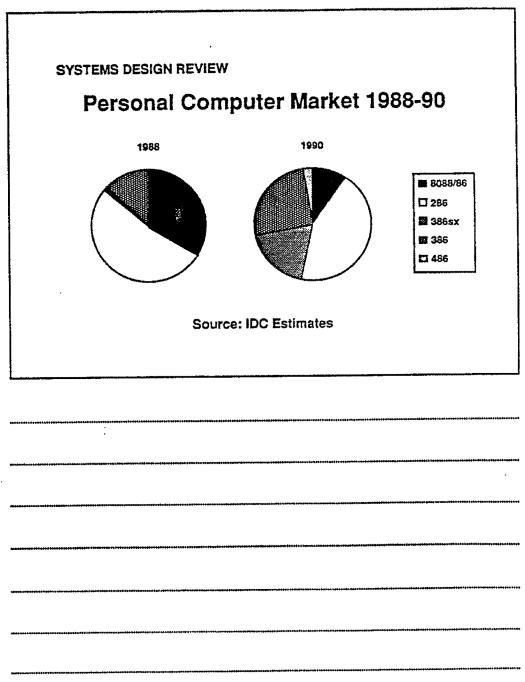
- 1990-2000 The Challenge:
 - 1. Popularize Graphical User Interface
 - 2. Facilitate Application integration
 - 3. Simplify set-up and administration
 - 4. Enable workgroup computing
 - 5. Access to enterprise information
 - 6. Offer solution building tools

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Personal Computer Market - 1990

- · Hardware
 - Strong shift to 386 based machines -
 - 286 machines still predominate
 - 286 & 386SX machines good for GUI, but limited in RAM
- · Implications
 - OS/2 market penetration limited by hardware
 - Windows is vehicle for bringing GUI to these low RAM systems

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SYSTEMS DESIGN REVIEW

OS/2 and Windows Positioning

- · Windows
 - Enhanced to exploit installed base of 1-2 Mb machines
 - Target market is low-end (286, 386sx)
 - Will continue to be enhanced Win 4, 5, 6

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SYSTEMS DESIGN REVIEW

OS/2 and Windows Positioning

- OS/2
 - Better application integration
 - Connected/networked environments business **installations**
 - OS/2 will dominate the 386/486 market
 - Platform for new technology

 - HPFS RISC Multiprocessor
 - POSIX etc.

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SYSTEMS DESIGN REVIEW

OS/2 has had limited success to date

- Memory prices
- · Limited applications software
- Confusion

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- Too many releases
- OS/2 functionality
 - Device drivers
 - 80386/486 support
 - DOS compatibility box
- OS/2 not easily available few dealers/channel

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OS/2 Inhibitors

· Cost of one megabyte of RAM:

	Mid '88	July '89	Oct '89	<u>Decune</u> since July
256K Chips	\$396	\$ 185	\$126	32%
1 MB Chips	\$ 306	\$124	\$92	26%

Street prices: 100ns RAM

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OS/2 Inhibitors

- · Product Functionality
 - Shipping PostScript driver
 - H-P PCL driver in beta-test
 - OS/2 2.0 exploits 386/486
 - 40Kb added to DOS compatibility box in 1.2, MVDM added in 2.0
 - Extensive OS/2 2.0 Sizzle effort
- Confusion
 - IBM/MS Comdex OS/2 announcement (OS/2 2.0, Windows, LAN, EE)

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We want your input!

- ISVs are the best source of feedback for improving our products - we need your help
- Application software support is crucial to our success - we need your support
- We are committed to creating a strategy with which you can be successful
- · Our success is linked

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SYSTEMS DESIGN REVIEW	
Peter Neupert Senior General Manager, OS/2	
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Operating System/2

- OS/2 Current Status
- OS/2 2.0
- Portable OS/2
- Porthole

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OS/2 CURRENT STATUS .

OS/2 1.2 Status

- IBM shipped 1.2.129 build in September
- IBM shipped 1.2.161 CSD in November
 - Long file names
 - Swappable DOS box
 - Extended DTP glyphs
- Microsoft shipped 1.2.166 to our OEMs
- · Additional 1.2 CSD releases may be required

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Printer Drivers

- PostScript and Epson drivers shipped in September with 1.2.129, updated in later releases
- Work underway for downloadable font support in PostScript driver
- H-P PCL now in beta, written as generic driver
- H-P DeskJet and PaintJet next planned devices
- PostScript and PCL driver sources available in DDK

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SYSTEMS DESIGN REVIEW

API Road Map

	DOS	Win 2.x	Win 3.x	0021	09223	Portable OS/2
Addressing	1	МБ	16	Mb	512Mb	4Gb
Addressing		64Kb	Segment	8	Line	ar
Win APIs		1	1	Porthole		
PM APIS				1	7	1
OS/2 APIS Threads, HPFS					1	1

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Mark Zbikowski Lead Designer, OS/2	
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OS/2 2.0

Overview

- Customer availability targeted for second half 1990
- Software Development Kit available end of December 1989
- Exploits the 386 and 486 architecture, enables 32-bit OS/2 applications
- Full compatibility with 16-bit OS/2 (all current apps)
- Improved DOS & Windows compatibility provides ability to leverage larger software and end-user base

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OS/2 2.0

Features

- Large, flat memory address space (0:32 memory model)
 - Supports demand paging (4K page size)
 - No 64K segment limitation
 - 512Mb addressability
- 32-bit application program interfaces (APIs)
 - Larger programs and large data manipulation capabilities
 - Major API changes are in OS/2 base (memory management) not PM

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OS/2 2.0				
OS/2 2.0		,	-	-
Features		•		
System limits raised:				
	1.1	1.2	2.0	
- Threads	255	511	4096	
- Processes	255	255	4096	
- Named pipes	255	255	3192	
- Open files	. 1K	1K	> 32K	
- Extended attributes	***	64K	> 64K	
- Real Memory	16Mb	16Mb	512Mb	
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OS/2 2.0

Features

- Floating point emulation (80387 emulation)
- · New spooler
 - Smaller and faster
 - Improved LAN support
- DDE extensions
- Pallette Manager API application control

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OS/2 2.0

Compatibility

- Runs all OS/2 1.0, 1.1, 1.2 applications unmodified
- Multiple Virtual DOS Machines (MVDM)
- · Runs all Windows 3.0 binaries
 - Using system DLLs that map Win calls to PM
 - Supports all Win 3.0 API and DOS calls (except sound APIs)

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OS/2 2.0

Compatibility

- MVDM Better DOS than DOS
 - Up to 16 DOS sessions
 - Up to 620Kb real memory for appl per session
- ्र LIM 4.0 emulation, up to 8Mb per DOS session
 - DOS sessions demand paged
 - Background/windowed execution (even in graphics mode)

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OS/2 2.0

Compatibility

- MVDM Better DOS than DOS
 - 9600 BPS communications
 - DOS 4.0 compatible
 - OS/2 applications protected from ill-behaved DOS apps
 - OS/2 applications can spawn DOS sessions
 - Cut and paste between DOS apps using PM Clipboard

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Objectives

- · Best technology available, Open format
- · WYSIWYG on smart and dumb printers
 - Fonts rasterized for dumb printers
 - Fonts will be available that replicate popular proprietary font metrics
- Availability
 - Targeted for OS/2 2.0, may not make first release
 - Microsoft will license Royal font technology to ISVs for inclusion with their applications (on any and all platforms)

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OS/2 FONTS

ROYAL Fonts

- · APIs
 - Uses same APIs as existing GPI outline fonts
 - New APIs to access font outlines
- · Availability of fonts
 - Many font vendors to offer ROYAL format fonts
 - Developers have announced tools
- Size
 - Rasterizer less than 50Kb
 - Font files in 30-45Kb range

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OS/2 2.0

Windjammer (Sizzle) Project

- Objective: Make OS/2 2.0 the platform of choice
 - Superset of Windows 3.0
 - Beating the Macintosh
- · Focus on:
- Matching competitor's advantages
 - Leveraging OS/2 Strengths
- The following slides show items under consideration
- We want your feedback and suggestions!

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OS/2 2.0

Windjammer (Sizzle) Project

- User Interface
- System Usability
- Key Features
- Performance
- Misc

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OS/2 2.0

Windjammer: User Interface

(features under consideration)

- · Icon view
- Action feedback "widgets" (expanding windows)
- Associative printing (print by dragging)
- Graphical Control Panel
- Improve icons, colors; enhance 3-d look (use 3 bits)
- Graphic buttons (buttons with Icons instead of text)
- Revise/remove cryptic messages
- Trash compactor/black hole

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OS/2 2.0

Windjammer: System Usability (features under consideration)

- Automatic, GUI diskette format
- Drag (install) file to Desktop Manager
- Implement drag/drop protocol
- · LAN connect from Shell
- · Paste into VIO windows
- · Simplify printer setup
- Simplify Print Manager interface

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OS/2 2.0

Windjammer: Key Features (features under consideration)

- DDE Enhancements DDE Function Library
- High quality scalable fonts
- MVDM "Advanced DOS Properties"
- MVDM windowed graphics (run DOS graphics apps in a window)
- Standard Dialogs (Open, Save, Print, Font, Color)
- True font mapping

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Windjammer: Misc (features under consideration)

- Applets
 - Calendar
- Card File
- Clipboard Viewer
- Calculator

- Paint

- Terminal

- Write
- Games
- PM-based Hard Error handler
- · System Editor add print function
- · Shell fixes for 1.2 bugs

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Windjammer: Performance

- Slow program load
- · Slow user focus switch
- · Slow/jerky repaint

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- Slow file manager startup
- Slow/difficult printing
- Large disk space consumption

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	Lou Perazzoli Development Manager Portable OS/2	

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Systems Design Review December 15,1989

PORTABLE OS/2

Overview

- · Implementation Plan
 - Written in C
 - Initially targeted for the i860
 - Also targeted for the 386/486
- · Compatible:
 - Application interfaces -- OS/2 2.0 32-bit APIs
 - User interface
 Presentation Manager
 - Interconnect strategy -- LAN Manager
 - File systems -- FAT, HPFS

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PORTABLE OS/2

Architecture

- · Kernel-based architecture
 - Multi-processor synchronization
 - Low-level machine-dependent functions
- · Large virtual address space
 - 3Gb addressability
 - Fully demand paging
- · Executive pre-emptible at any time
- · Extensible system functions
 - Secure and protected subsystems
- · Object-oriented architecture

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PORTABLE OS/2

Architecture

- · Uniform treatment of security
 - Planned C2 certification
 - Design goal of B1 and B2
- POSIX compliant
- · Symmetric multi-processor support
 - Scalable performance
 - Concurrent application execution

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PORTABLE OS/2

Architecture

- Promotes transparent, easy distribution and controlled sharing of resources, via:
 - Networks
 - Remote procedure call capability
- Standard interrupt model
- · Structured error handling
- 32-bit device driver model
- · 32-bit installable file systems

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32-bit OS/2 2.0 APIs are the Path!

- OS/2 reaches new: functionality, platforms, markets
- · Common 32-bit implementation on all platforms
 - Source-level compatibility for OS/2 32-bit APIs
 - · Simple recompile to move to new platforms
- Single development investment, single API, lets ISVs address new platforms:
 - · RISC
 - · Multi-processors
 - 386/486 market

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Scott Ludwig	
Senior Software Engineer	
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OS/2 - PORTHOLE

Overview

- Porthole: a Windows API mapping layer for OS/2; Implemented in two ways:
 - 1. Under 2.0; runs Windows binaries unmodified
 - 2. As a set of libraries ISVs can link with their Windows apps to run under OS/2 1.2 & 2.0
- Helps ISVs get Windows applications to PM faster
 - Works with OS/2 versions 1.2 and 2.0
 - Much easier than a full PM port

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OS/2 - PORTHOLE

Features

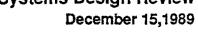
- Supports all of Windows 3.0 API, except for Sound management
- Supports cut and paste with PM apps via PM Clipboard
 - Win-to-PM metafile conversion in first release
 - PM-to-Win metafile conversion Q3 1990
- Anticipated performance degradation of 5-10%
- Approximately 160Kb on disk, 100-150Kb RAM

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OS/2 - PORTHOLE

Benefits

- Windows applications can benefit from OS/2:
 - Transparent support for ROYAL fonts
 - Automatic performance advantages of HPFS
 - Applications can make OS/2 specific calls
- · More applications for PM more quickly than traditional ports

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OS/2 - PORTHOLE

Mixing Windows and OS/2 APIs

- Limited mixing of Windows and OS/2 API supported
 - 16-bit OS/2 API only, no 32-bit API mixing
 - Recommended primarily for OS/2 base calls, not PM
 - Multiple threads, IPC, extended attributes, long filenames, etc.
 - Restrictions

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- Runtime dynamic linking only, if single binary desired for both Windows and PM
- Possible conflict with Win/PM include file constant names and Win/PM handle conflicts

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OS/2 - PORTHOLE

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Using Porthole SDK

- · Application re-linked with special Porthole libraries
- Programs that modify WIN.INI directly (not using Win API) need to be converted to work with OS2.INI
- Porthole SDK available in February 1990

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OS/2 - PORTHOLE

Windows Application Strategies

- 1. Do nothing (Win3 apps will run on OS/2 2.0)
- 2. Simple port using Porthole
 - Support OS/2 1.x and 2.x releases
 - Fastest path to OS/2
 - Exploit selected OS/2 APIs
- 3. Convert application to OS/2 APIs
 - Take full advantage of OS/2

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Russ Werner General Manager DOS/Windows Business Unit	
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Microsoft DOS & Windows

- MS-DOS Future Directions
- · Current Windows Product Line
- Windows 3.0 Overview
- Windows 3.0 Features and SDK

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MS-DOS

Future Directions - 1990

- · Memory reductions
 - DOS 3.3 kernel size in 640Kb systems
 - 15K kernel resident in 1Mb systems
- · Improvements to DOS shell .
- · Enhanced utility set
- ROM executable

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MS-DOS

Future Directions - 1991

- · Performance improvements
- Modular design
- Further reductions of lower 640Kb occupied by DOS
- Battery power management
- · Utility enhancements
- · Usability improvements

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MICROSOFT WINDOWS

Current Product Line

- · Windows 286 2.11: \$99
 - All Windows apps share one 640K session
 - Context switch to single DOS session
- Windows 386 2.11: \$195
 - All Windows apps share one 640K session
 - VMM provides true multitasking of VM's
- Windows SDK: \$495

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MICROSOFT WINDOWS

Current Market Status

- · Distributed via retail and OEM channels
 - Packaged product sales at 50-70K units/month
 - Total sales at 2.5M per year run rate
- · 50% of Windows sales are international
- Big shift to Windows/386 in second half CY 1989

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MICROSOFT WINDOWS

Windows 3.0 Product Goals

- Sufficient functionality in 1 Mb for entry-Level professional workstations
- Significantly enhance ease of use, aesthetics, installation, on-line help, etc.
- · Enable multimedia

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Planned Product Line

- Single package for Windows: \$149
- · Modes of operation:
 - Real mode:

640Kb minimum configuration

- Standard mode:

286 or 386 with 1Mb minimum

- 386 enhanced mode:

386 with 2Mb minimum

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MICROSOFT WINDOWS 3.0

Runtime Policy

- Runtime: Version of Windows limited to run single application. Licensed free to Windows ISV's, to let their applications run "out of the box".
 - All existing runtime licenses (for version 2.1) have been extended to be perpetual.
 - There will not be a runtime version of Windows 3.0.

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Introduction/Timing

- Target is late Q1 1989 for retail product
- Windows is entering extensive beta test
- Significant introduction planned with heavy emphasis/participation by ISVs

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MICROSOFT WINDOWS 3.0

Features/Benefits - More Memory

- New memory manager fully utilizes extended memory
 - Better performance for multiple Windows apps
- 386 enhanced mode uses paged virtual memory
 - Overcommit of physical memory to 4X
- 386 enhanced mode DOS VM's now paged to disk
 - Reduces physical RAM requirements for DOS apps

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MICROSOFT WINDOWS 3.0

Memory Model

- Real mode Default with < 256K extended memory
 - Memory situation same as Windows today
- Standard Mode Default on all 286
 - Default when 256K ≤ extended memory < 1 MB
 - Uses 286 protect mode
 - Non-Win apps run full screen and suspended when in background and swapped to disk
 - · 386 enhanced mode Requires 386 and 2MB RAM
 - Non-Win apps multitask and may be windowed
 - Virtual memory

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MICROSOFT WINDOWS 3.0

Enhanced User Interface & Peripherals

- · New shell, control panel & print manager
 - 🖫 Eliminates user need to edit "win.ini"
 - Improved speed and network print job support
- Enhanced display and printer support
 - Speed optimization, new devices
 - Device initialization
 - · Other enhancements
 - Device independent bitmaps
 - Pallette manager

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MICROSOFT WINDOWS 3.0

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Improved Network and 3270 Support

- Windows network driver provides consistent interface between Windows and net transport
- Connect and disconnect to net services from within Windows
- Architectural changes plus cooperation with ISVs to solve Windows 3270 problems

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MICROSOFT WINDOWS 3.0

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Application Compatibility

- · Win 2 applications could perform segment arithmetic
- Under Win 3.0 violating memory management rules causes general protection faults.
- To run properly, Win apps need to be:
 - clean (not break the rules)
 - marked (as Win 3 compatible)
- All Win 2.1 apps can run under Win 3 in real mode

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Improved SDK

- Documentation
- · Source code examples
- CodeView for Windows (CVW)
- · Resource editing tools
- · Help system support
- Two new analysis tools
- · C Runtime Library support
- SDK installation

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DOS Extended App Support

- · Real and standard modes
 - XMS using apps supported e.g. Lotus 1-2-3 3.0
 - INT31 interface (Standard Mode Only)
- 386 enhanced mode
 - Requires extender support via INT31 interface
- To be supported in a future version of OS/2

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MICROSOFT WINDOWS 3.0

DOS Extended App Support - INT31

- Simple protected mode interface
- · Features:

- GDT, LDT, IDT
- Page tables
- Translate real <-> protected modes
- Switch to protected mode
- Allocate memory
- Used by DOS extenders to provide services to extended apps
- Available in standard and 386 enhanced modes

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SYSTEMS DESIGN REVIEW

The OS/2 User Interface

- · Ease of use
- Consistency
- Extensibility
- Aesthetics

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· Ease of learning

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	Components			
·	 Visual Appearance Aesthetics Ease of use User Interaction Model Consistency Ease of use Extensibility API (controls, dialogs etc.) Consistency Extensibility 	• 3	•	
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THE OS/2 USER INTERFACE

Visual Appearance

- · OS/2 1.1
 - Two dimensional appearance
 - Limited Use of Icons
- · OS/2 1.2
 - Three dimensional appearance
 - Object specific icons are stored in EAs
- OS/2 2.0
 - Three dimensional controls
 - "State of the Art" iconic visuals
 - Iconic interface to control panel
 - Enhanced color model

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THE OS/2 USER INTERFACE

Interaction Model

- DS/2 1.1
 - Limited task management
 - Limited active program groups
 - Many operations require CMD.EXE
- · OS/2 1.2
 - Multiple active program groups
 - Application specific iconic representations
 - More direct manipulations
 - Enhanced Profile and Help support
 - Support long filename and extended attributes

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THE OS/2 USER INTERFACE

Interaction Model - contd.

- OS/2 2.0
 - More direct manipulation (Drag & Drop)
 - Removal of constraints on iconic view
 - Better integration with applications (e.g. drag & drop to/from Office Vision)
 - LAN connection support

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THE OS/2 USER INTERFACE

The Work Place Model

- Object oriented desktop paradigm
- Consistent visual representations of system entities
 - Files
 - Printers
 - "Waste Basket"
 - System resources etc...
- Disappearance of distinction between applications and data

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THE OS/2 USER INTERFACE

The Work Place Model - contd.

- · Seamless applications integration
- · Direct manipulation of objects
 - · Customization and extensibility
 - · Context related property sheets & menus
- · Rich environmental control

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THE OS/2 USER INTERFACE

Applications Components

- Standard Controls
 - Offer consistent interface to end-user
 - Allow ISV's to concentrate on added-value
 - Implement window management interface
- Style Guide

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- Specifies behavior, independent of implementation
- Sets criteria for conformance
- Indicates future direction

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> Min/Max Button Scroll Bars

THE OS/2 USER INTERFACE

Standard Controls

- · OS/2 1.1
 - Window Controls
 - Title Bar
 - Pull-down Menus
 - Sizing Borders
 - Layout and Dialog Support
 - Buttons & Check Boxes List Boxes
 - Single-line Entry Fields Static Controls
 - · Standard pointers, cursors, and items

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THE OS/2 USER INTERFACE

Standard Controls - contd.

- · OS/2 1.2
 - Combination Boxes
 - Multiple-Line Entry Fields
- · OS/2 2.0
 - Standard Dialog Boxes
 - File
 - Font
 - More Controls
 - Mini-Icon
 - Spin-Button
- Prin
- Color Palette
- Drag & Drop

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THE OS/2 USER INTERFACE

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Standard Controls - Futures

- · New controls planned
 - Context (Popup) menus
 - List control (standard container window)
 - Dynamic information line
- Move to Object oriented model and tools
 - Focus on extensible building blocks
 - Support high-level abstractions
 - Provide interactive UI building tools

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SYSTEMS DESIGN REVIEW

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Applications Integration

- Dynamic Data Exchange Protocol
- DDE Manager Library
- DDE Extensions for Linked and Imbedded Objects

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APPLICATIONS INTEGRATION

Dynamic Data Exchange

- · Protocol to exchange data between applications
 - Based on Windows/PM messaging IPC
- See Uses shared memory
 - Implemented in both OS/2 and Windows
 - · More sophisticated than Clipboard
 - Automatic no specific user action
 - Data format negotiation
 - Flexible user interface

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APPLICATIONS INTEGRATION

DDE Components

- · API
 - OS/2 supports DDE API in OS/2 1.1 and 1.2
- Message protocol
 - Paper specification
- •: Data formats
 - Defined and agreed upon by applications

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APPLICATIONS INTEGRATION

DDE Limitations

- · Relatively difficult to implement
 - Application must manage conversations
 - Application must manage Advises, Requests
- · No standardized data format
 - Applications must know each other's formats
- No standardized EXECUTE protocols
 - Applications must know EXEC protocol of the other application
- · Conversations not persistent
 - Links not easily preserved between sessions

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APPLICATIONS INTEGRATION

DDE Manager Library

- DLL to implement high-level access to DDE
 - Performs conversation, transaction management
 - Call back based vs. message based
 - Support for debugging and monitoring
 - Server registration support
 - Support for basic security
 - Compatible with all DDE applications at the back-end

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APPLICATIONS INTEGRATION

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DDE Manager Library

- Included in OS/2 1.2 Programmers Toolkit
 - DDEMGR sources
 - Simple monitor application
 - DDE message spy program
 - Documentation (included in DDEMGR.C)
- · Planned for inclusion in system for 2.0

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APPLICATIONS INTEGRATION

DDE Protocol Extensions

- Support integration of applications
- · Format independent data links
- · Data containment

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APPLICATIONS INTEGRATION

DDE Protocol Extensions

- · Linked/Imbedded documents
 - Host/Server relationship between applications
 - Host controls the server
 - Startup
 - Focus
 - Data transfer
 - Shutdown
 - Links or data contained in host document
 - Single application appearance to end-user

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APPLICATIONS INTEGRATION

DDE Protocol Extensions

- Standard EXECUTE protocol
 - For saving and loading documents
 - For specifying target output device
 - For focus and shutdown control
- Standard DDE data format definitions
 - CF_LINK, CF_NATIVE
- · Extended Advise protocol
 - Advise on saving or closing
- · Standard itemname definitions

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APPLICATIONS INTEGRATION

DDE Futures

- · Definition of additional protocols
- Implementation of protocols at higher level using standard libraries
- Implementation of more efficient IPC/RPCs at low level
- · Cross-platform consistency for OS/2 and Windows

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SYSTEMS DESIGN REVIEW

Object Oriented Systems Technology

- Infrastructure
- Programming Support
- User Interface

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

Infrastructure

Objects

- Language independent public data model for Persistent and in memory objects
- · Standard repository for "public" objects
- Standard protocols (APIs) for interacting with public

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

Infrastructure

- · "Public" object model
 - Based on C++ conventions
 - Defines layout of object instance in memory
- ... -. Versioning support
 - Standard methods for interrogation ("type-tagging -protocol")

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

Infrastructure

- Type Database
 - Repository for class, type and executable specific data
 - Communication medium for objects, debuggers and language tools
 - Accessed via standard API

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

Infrastructure

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- Dynamic Class Manager
 - Manages "public" classes (install/delete)
 - Dynamically loads object code for public objects
 - Manages type-tagging and type database API services

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

Infrastructure

- · Type-Tagging Protocol
 - Optionally supported by public objects
 - Allows programs to find out about an object when only its address is known
- Features:
 - Type identification and dynamic casting
 - Dynamic binding and subclassing
 - Type negotiation
 - Runtime object creation
 - Runtime pointer checking

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

Programming Support

- · Make writing PM programs easier
- More common code between applications
- · Better application integration
- Evolutionary approach

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

Programming Support

· Phase 1:

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- Develop library of visual objects
- Provide tools to interactively construct UI objects from the library of parts
- Interface to UI objects from current PM programming model

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OBJECT ORIENTED SYSTEMS TECHNOLOGY Programming Support

- · Phase 2:
 - Provide C++ library to programmers
 - Visual objects
 - Object oriented file system
 - Wrappers for existing OS functions
 - Allow ISVs to extend library
 - Extend the UI Editor to allow construction of arbitrary objects

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

User Interface Editor

- Replaces Dialog Editor
 - Allows interactive construction of UI components
 - Allows specification of:
 - U
 - API
 - Internal behavior
- Saves UI objects in file system (persistent objects)
- Generates complete classes for calling by PM programs

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OBJECT ORIENTED SYSTEMS TECHNOLOGY

Object Oriented User Interface

- Object oriented replacement for OS/2 Shell
- · Implement CUA workplace model + more
- · Intuitive, end-user oriented object model
- · Allow extensions and modifications
 - Installation of new objects
 - Modification of existing object behavior
 - External control language

						
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Future Directions

We're advancing our tools technology on several tracks in parallel:

- Code generation/optimization
- Hosting environments
- · Language design

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Microsoft C for OS/2 2.0 SDK

- C 5.1 optimization
- · Runs as a 16-bit app, generates 32-bit '386 code
- 32-bit runtimes
- Codeview/386 able to debug mixed 16 and 32-bit code
- M Editor, other utilities

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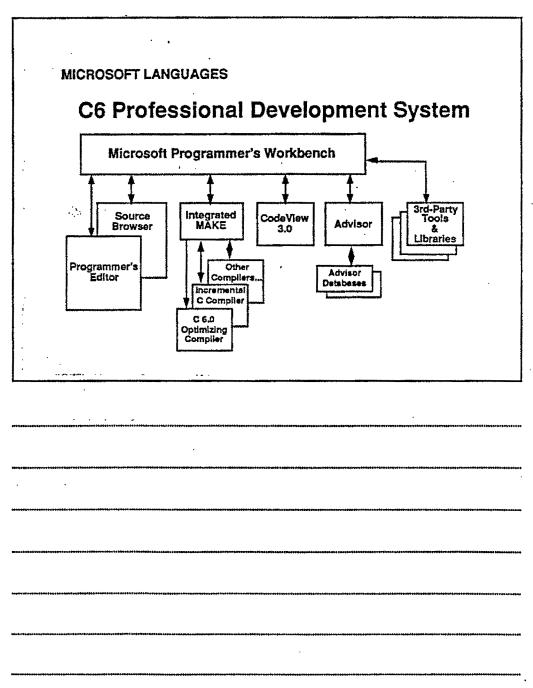
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Code Generation & Optimization

Parallel efforts here on 16-, 32-bit efforts

- OS/2 2.0 SDK compiler: C 5.1+ technology
- ... C 6.0: new generator, optimizer in 16-bit

Obvious next step:

 32-bit code generation with C6 level of optimization for OS/2 2.0 SDK developers

Also planned: p-code option

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Debugging

In Codeview 3.0:

- · Revamped user interface
- · Better browsing through arrays and structures
- · Redesigned breakpointing more flexible
- Dynamic replay/undo
- Resolved DOS capacity issues

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Debugging for PM/Windows

In Codeview 3.0:

- · Support for child processes
- Better UI for thread debugging
 - Better Dynamic Link Library support
 - View names of DLL routines
 - Debug DLLs loaded with LoadModule()

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Debugging for PM/Windows

Codeview for Windows [CVW]:

- Debug Windows app in protected mode
- Increased capacity for larger apps, symbol tables
- Set trace and breakpoints on Windows msgs
- Dump local and global heap commands
- Dereferencing of local and global memory handles

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Host Environments

The development platform is evolving in three phases:

- Programmer's Work Bench: character-based windows, both DOS & OS/2 host
- · Redwood: PM 2.0 host
- · Redwood/Win: Windows 3.0 host

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Language Design

In C 6.0, the language evolves:

- Full ANSI C except for DBCS
- based pointers 💡 👵
 - Long double park is a property and
 - · Nameless structs & unions
 - · Integrated in-line assembler

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Language Design

Next stop, C++:

- Full implementation of C++, Version 2.0
- Both 16- and 32-bit compilers
 - Optimization enhancements
 - Object browser
 - · Tools will support mixed-language (C, C++ and MASM) development

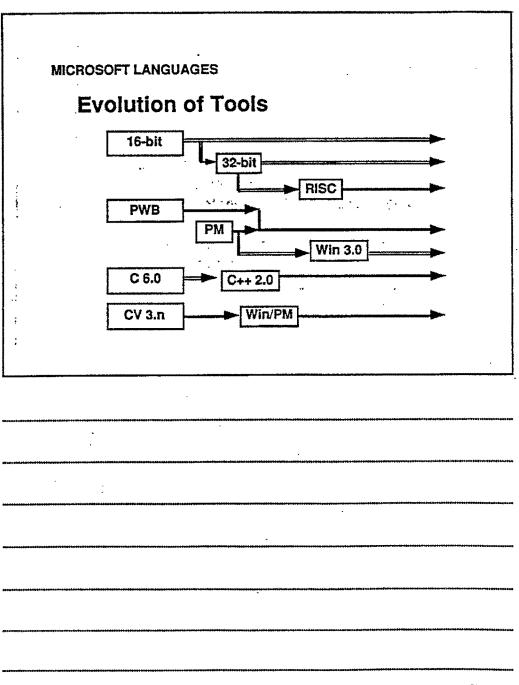
 • Support for public object model

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ISV Involvement

More direct relationship between Microsoft Languages and key ISVs has started to pay off:

- Direct contact between our program managers, developers and yours
- · Impact on C6 usability, testing

Two next steps:

- · Complete on C6, including Win 3.0
- Functionality/design input on Redwood PM host

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SYSTEMS DESIGN REVIEW

Cameron Myhrvold Strategic Marketing Manager

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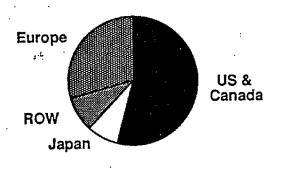
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SYSTEMS DESIGN REVIEW

International OS/2 Market 1990-91



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SYSTEMS DESIGN REVIEW

International Support

MS OS/2 1.1 BAK		MS 0S/2 1.2 BAK		
French 3/89		French	2/90	
German	3/89	German	2/90	
Swedish	5/89	Swedish	2/90	
Italian	6/89	Spanish	2/90	
Spanish	6/89	Italian	3/90	
Dutch	9/89	. •		
Japanese	3/90	Japanese	03/90	

Windows 2.11 - French, German, Italian, Japanese, Korean, Swedish, Dutch, Spanish, Finnish, Portuguese, Norwegian

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INTERNATIONAL SUPPORT

NLS System Services

Portugal Hungary * **Arab States** iceland * Slovak * Asian English Spain Israel Belgium Sweden Italy China Switzerland Czechoslovakia * Japan Taiwan Korea Denmark Turkey * Latin America **Finland United Kingdom** Netherlands France **United States** Norway French Canada Poland * Yugoslavia * Germany

Note: * = New support in OS/2 1.2

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INTERNATIONAL SUPPORT

Code Pages

- Code pages are character set definitions that support one of more countries
- OS/2 supports single and double byte code pages
- OS/2 also supports EBCDIC code pages under PM
- First 128 characters of ASCII pages are identical
- Default PM code page is 850
- Default base code page depends upon PC's ROM

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INTERNATIONAL SUPPORT

Single Byte Code Pages

- 850 Multilingual (Western Europe, North/South America)
- 852 Multilingual 2 (Eastern Europe)
- 857 Turkey
- 860 Portugal
- / > 861 Iceland
 - 862 Israel (Hebrew)
 - 863 French Canada
 - 864 Area South (Arab States)
 - 865 Nordic
 - 7437 United States
 - 1004 Same as 850 (ANSI code page 8859/1)

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INTERNATIONAL SUPPORT

Double Byte Code Pages

932 - Japan 934 - Korea 936 - Taiwan

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1. 3 938 - Peoples Republic of China

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INTERNATIONAL SUPPORT

Programming Conventions - General

- Set country-dependent values dynamically during start-up, using NLS system services
- All sorting, searching and case mapping/conversion routines should be based upon NLS system services
- · Use unsigned char instead of char
- All text handling routines should support extended characters (characters above 127)
- All I/O should support extended characters (no filtering or masking of the high bit)

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INTERNATIONAL SUPPORT

Programming Conventions - DBCS

Double Bytes Character Set (Far East Countries)

- Applications should be designed from day one to handle both Single and Double byte characters
- All string manipulation functions have potential DBCS impact:
 - Private search, compare, truncation and sorting routines need to all be DBCS enabled
 - DBCS enabling means providing built-in DBCS awareness into applications

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INTERNATIONAL SUPPORT

Localization - Translation

- Application
 - User interface (menus and dialog boxes)
 - Messages, prompts, bitmaps
- 😹 Help files
- Computer-based tutorials and demos
- Documentation manuals
- Packaging

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INTERNATIONAL SUPPORT

Localization - Modifications

- · International requirements
 - Formats (time, date, number, currency)
 - Separators (1000, decimal, list, time, date)
 - Speller, thesaurus, hyphenation
 - Document examples
- Additions
 - Device drivers
 - Conversion utilities (files, macros)
 - Copy protection
 - Right-to-left language support (Hebrew & Arabic)

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SYSTEMS DESIGN REVIEW

Microsoft ISV Support

- Microsoft OnLine electronic technical support
- Microsoft University classes
 - One week long hands-on technical training for developers
 - Seven courses on OS/2 for developers and support staff
 - OS/2 ISV group activities

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Microsoft OnLine

- Microsoft OnLine, 1450 active accounts
 - 28 of the 31 companies attending this meeting

ാര • Average monthly activity levels:

· ·	<u> 1988</u>	<u> 1989</u>
- OS/2 base service requests	226	232
- Presentation Manager	244	334
- Windows	489	789
- LAN Manager/SQL Server	99	104

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Microsoft OnLine Response Times

· Average response time:

- OS/2-base	4.1 days
- Presentation Manager	2.5 days
-`Windows	5.3 days
- LAN Manager/SQL Server	3.7 days

· We are committed to making it better

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ISV SUPPORT

Microsoft OnLine futures

- End-user tools rewritten to run under PM and Windows
- Internal back-end tools rewritten for client/server model using OS/2, LAN Manager and SQL Server
- Internal front-end support tools rewritten for OS/2 and Windows
- · Working to explore alternative support mechanisms
 - CD/ROM
 - High-end service

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ISV SUPPORT

Microsoft OS/2 ISV Group

- Evangelism, and account management of key ISVs
- Special OS/2 support activities
 - *** Escalation of technical problems *** *
- ಶನ್ನಡಿಂದ ≠ OS/2 Design Workshops (bi-monthly) -
 - Individual design/style reviews
 - Early code drops
 - : ISV programs:
 - International program
 - ುಂದ್ ≥ 32-bit ISV program

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ISV SUPPORT

OS/2 ISV Design Workshops

- OS/2 Design Workshops:
 - Very technical event for experienced developers
 - Speakers from OS/2 development, not support
 - Scheduled for two days once every two months
- Gnale
 - Disclose new features and technology
 - Solve real-world appl. development problems
 - Gather feedback to improve OS/2
 - Distribute early code, docs, and internal tools

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ISV SUPPORT

OS/2 Design Workshops

- · Five Workshops held to date
- Attendance: over 300 people, more than 75 firms
- Future Workshops:
 - OS/2 2.0
 - Porthole
 - Internationalization
 - Device drivers

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SYSTEMS DESIGN REVIEW

LAN Manager

- LAN Manager 2.0
- Directory Services

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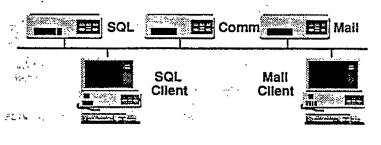
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LAN MANAGER

Evolution of Office Systems

- 1990s: Client-Server Model
 - Treating both the client and the server as intelligent, programmable devices



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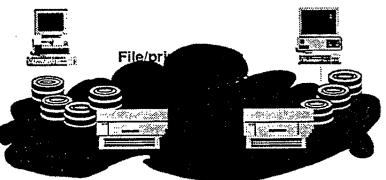
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Distributed Client-Server Model



Distributed applications accessing a single network service

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LAN MANAGER

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Distributed Client-Server Model

What It Means

- "The enterprise network looks like a single computer system that can be administratively subdivided for autonomous control"
- Location transparency
- · Distributed log-on
- Distributed administration

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LAN MANAGER

Distributed Client-Server Model

Making It Work:

- Two key distributed services
 - War Distributed filing system
 - Directory service

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LAN MANAGER

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Distributed Filing System

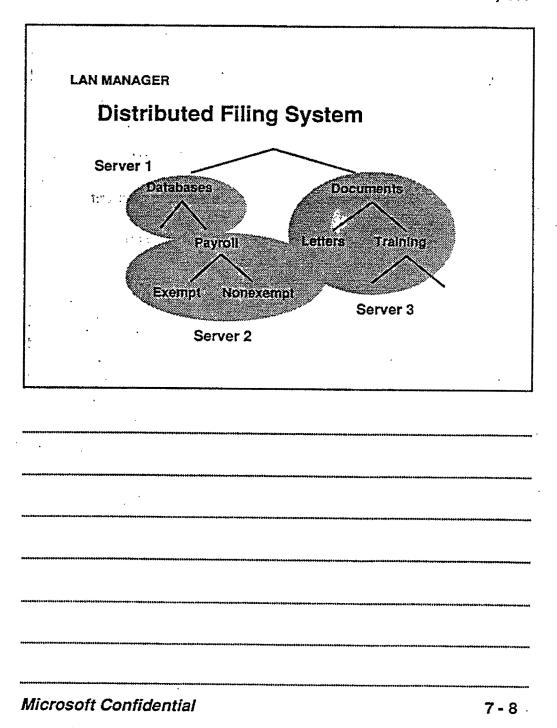
- · Extension of LAN Manager file sharing model
- · Globally consistent file naming
- Files named and accessed in location-transparent manner
- · Files can be relocated without affecting users
- · Built-in replication / fault tolerance

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LAN MANAGER

Directory Service

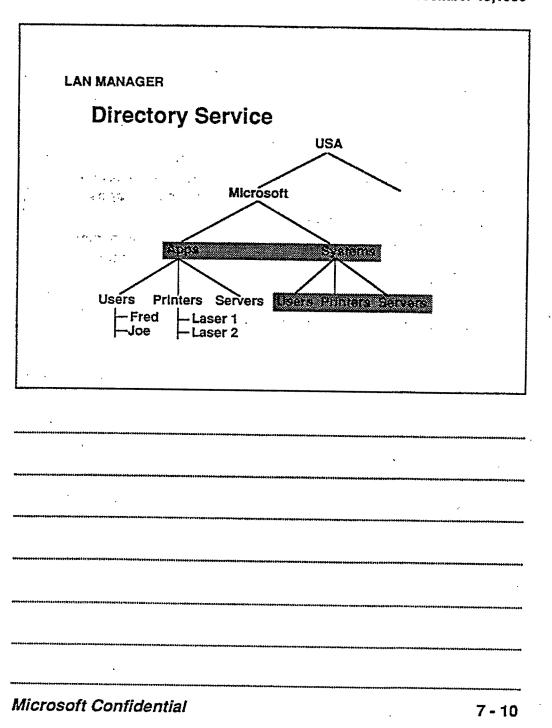
- · White and yellow pages view of the network
 - Lists & describes all users, machines, resources
 - Queried and browsed by users, admins, apps
- · Globally consistent naming
 - All entities given unique, non-conflicting names
 - Hierarchical delegation of name assignment
- · Single point of administration
- Entities configured and administered by manipulating directory contents

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LAN MANAGER 2.0

Power for Client-Server Computing

- · Support for 386/486 processors
 - LAN Manager 2.0 high-performance server
 - Networking subsystem
 - HPFS-386
 - Extended interfaces
- · Multiple processor support

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LAN MANAGER 2.0

Power for Client-Server Computing

- OS/2 1.2 HPFS
 - Supports huge files (2 Gb)
 - Fast access and efficient allocation
 - Long file names, extended attributes, "Hot Fix"
- JetBEUI

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LAN MANAGER 2.0

Distributed Administration

- · Domain service group services logically
- · Log-on service logon validation
- · Replication service update servers
- Administrative accounts operators
- · Remote boot service
 - Supports diskless workstations

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LAN MANAGER 2.0

Distributed Client-Server Model

- · File replication
- Distributed domain service for location independence of user/group accounts
- · Distributed administration for a domain

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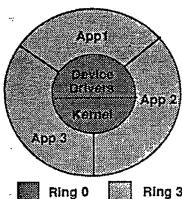
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LAN MANAGER 2.0

OS/2 Memory Protection



- · OS/2 uses built-in hardware protection of the Intel processors
- Applications are protected from each other
- · The kernel is protected from applications

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Systems Design Review **December 15,1989**

LAN MANAGER

Central Role of the File System API

Unifying principle for distributed client/server design

- Becoming object oriented Extended attributes

 - Class concept with Inheritance
 - Class specific file apl semantics and methods
- All resources unified into file name space
 - Files, printers, pipes, users, organizations... Single global name space

 - Location and type transparency
- Richer semantics
 - Attribute-based query
 - Linking

Directory service and DFS implement the first steps

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LAN MANAGER

Why Develop for LAN Manager

- · Distributed Client/Server computing
- · LAN Manager is the right choice
 - Right architecture
 - Performance
 - Security
- LAN Manager is the natural extension of OS/2
 - Same operating system on client and server
 - One development environment

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SYSTEMS DESIGN REVIEW

Adrian King General Manager Workgroup Services

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- · Ashton-Tate/Microsoft SQL Server
- . DCA/Microsoft Comm Server
 - Mail Server

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ASHTON-TATE/MICROSOFT SQL SERVER

SQL Server 1.1 (Q1 '90)

- DB-Library API rewrite
 - Much smaller and faster
 - Network independent API
 - Simple open, read, write, close structure
 - Implemented as small TSR under DOS, DLL under under Windows and OS/2
 - Support for Sybase Server on Unix, VAX
- Full IBM support under Lan Server 1.2
- · Bug fixes

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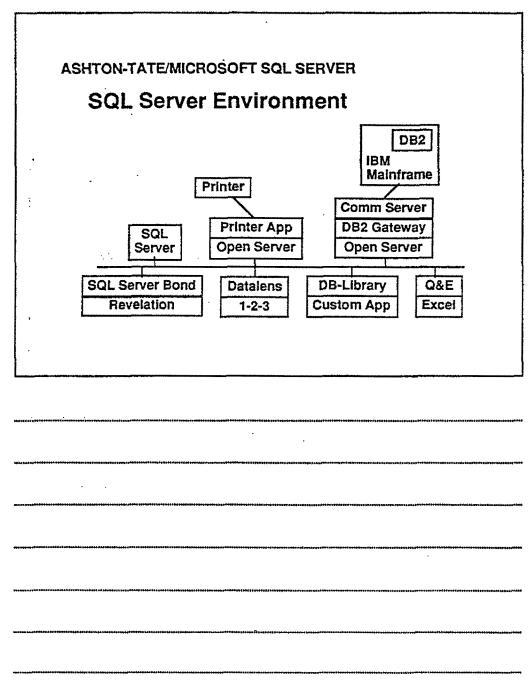
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ASHTON-TATE/MICROSOFT SQL SERVER

Heterogeneous Connectivity

- OS/2 Open Server
 - Server API for heterogeneous connectivity
 - API compatible with Sybase Open Server
 - Multi-threaded event handler
 - Includes data conversion routines
 - Data returned to client in tabular format
 - Supports connectivity to external data stores and other applications

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ASHTON-TATE/MICROSOFT SQL SERVER

Heterogeneous Connectivity

· Generalized Client API

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- One call level API for all SQL databases
- Based on installable drivers.
- Oriented to SQL text

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ASHTON-TATE/MICROSOFT SQL SERVER

SQL Server Release 2.0 (Fall 1990)

- · Sybase 4.0 features
 - Remote stored procedure calls
 - Stored procedure return parameters
 - Disk mirroring
 - Cascading triggers
 - Table space
- · 8-bit international support
- · Network independent API on the server

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ASHTON-TATE/MICROSOFT SQL SERVER

SQL Server - Beyond 2.0

- Cursor support
 - In DB-Library
- Within Transact SQL Transact SQL

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DCA/MICROSOFT COMM SERVER

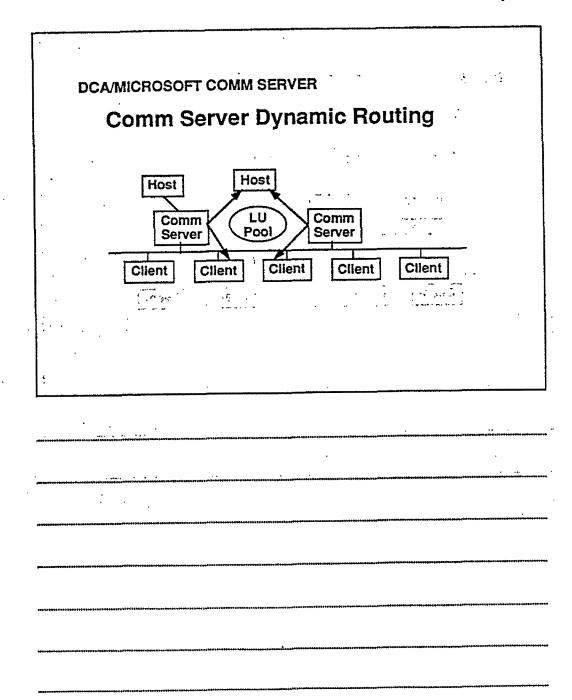
Comm Server Version 1.0

- Tightly integrated with LAN Manager 2.0
 - LAN Manager 2.0 security
 - Domain-wide communications configuration
 - File replication used for configuration
 - Mailslots for dynamic 3270 and APPC routing
- DOS 3270 based on DCA IRMALAN technology

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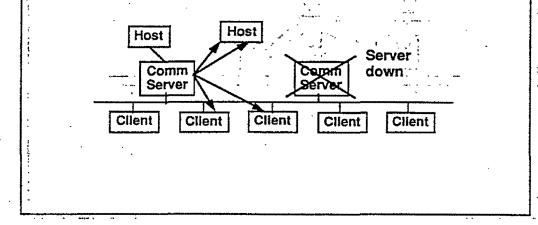
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DCA/MICROSOFT COMM SERVER

Comm Server Dynamic Routing

· Client automatically re-routed



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DCA/MICROSOFT COMM SERVER

Comm Server version 1.1

- DB2 Gateway
 - Based on Open Server technology
 - Brings DB2 connectivity to any SQL Server application
 - Supports data upload/download between DB2
- PM interfaces for 3270 and configuration .
- · Client/server async support
- Full Windows 3.0 support

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MAIL SERVER

Standards

- 1988 X.400 Mail Transfer Agent
 - LAN Message Format is 1988 X.400
 - Perceived as either '84 or '88 on WAN
- X.400 APIA Conformance
 - Microsoft has joined APIA
 - Industry standard mail object API
 - Microsoft is focusing on API efficiency
 - Standard gateway and user agent API

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MAIL SERVER

Mail Server Plans

- Fully 1988 X.400 conforming MTA
- · Store and Forward Fault Tolerance
- WAN support using X.25
- · LAN support using network independent API
 - Named pipes
 - ASN.1 is messaging protocol
- · > 100 active users per MTA
 - Microsoft will encourage ISV's to develop gateways
- · Availability: 1991

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SYSTEMS DESIGN REVIEW
Rob Glaser General Manager Multimedia Systems Group
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MULTIMEDIA SYSTEMS

What is Multimedia?

- Integration of:
 - Digital audio
 - Photo quality images
 - Animation
 - Motion video
 - Optical media,

and traditional PC capabilities

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MULTIMEDIA SYSTEMS

Multimedia -- State of the Market

- · Very much "build your own"
 - 3rd party add-in hardware required
 - No standard system software
 - No standard data formats
 - No standard development tools
- Expensive

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· Used only in specialized applications

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MULTIMEDIA SYSTEMS

Multimedia for Business/Productivity?

- · New capabilities for existing applications
- Easier to learn, more engaging (multimedia tutorial for Lotus 1-2-3
- Enables new kinds of applications
- Multimedia presentations (Multimedia Powerpoint)
- Communications applications
 (Fax, answering machine, annotated e-mail)
- Business information products (financial analysis)

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MULTIMEDIA SYSTEMS

Multimedia for the Home/Consumer?

- New information products
 (Chilton's Car Repair Manual, Life Magazine,
 Interactive Vacation Planner)
- New/Enhanced entertainment products
 (realistic driving simulator, interactive novels)
- New personal creativity products (home audio/video editing system)
- New education products (interactive chess tutorial, language tutor)

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MULTIMEDIA SYSTEMS

Microsoft's Approach to Multimedia

- Work with OEMs to integrate Multimedia
 capabilities into Hardware
- · Build on Standard Systems Software
 - DOS/Windows, with multimedia extensions
- OS/2 support to closely follow
- Work with industry to create standard data formats and tools

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Levels of Multimedia

· Level I:

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Processor
Memory
Audio
286 or higher
1MB or higher
CD-XA (ADPCM)

-> Video VGA - Storage CD Rom

- OS DOS+Windows+Extensions
- When 1990 (has started already!)

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MULTIMEDIA SYSTEMS

Levels of Multimedia

Processor:Memory

386sx or higher 2 MB or higher

- Audio

Integrated DSP

- Video

Enhanced VGA (2 planes,

blitter, YUV)

- Storage

CD Rom

- OS

DOS+Win for low end,

OS/2 for high end

- When

1991

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MULTIMEDIA SYSTEMS

Multimedia Extensions to Windows

- · Streaming data transfer
 - pass lots of information through small amounts of memory
 - pass data from M sources to N destinations
- Synchronization
- · Audio Device support
- Libraries
 - animation
 - sprites
 - special effects

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MULTIMEDIA SYSTEMS

Multimedia Development Tools

- · Ensure creation of robust tools that create and manipulate:
 - Audio (Recording, ADPCM encoding)
 - Photo-realistic stills (Scanning, Drawing, Painting, Palette Normalization)

 - Animation (Creating, Editing)
 Motion Video (Digitizing, Frame Capturing, Editing)
 - Rich Text with Links (Word Processors, Hypertext tools, Full Text Indexing and Searching)

PLUS cataloging, interleaving, and pre-mastering of the above

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MULTIMEDIA SYSTEMS

Multimedia Data Formats

 Our system software and tools will support the following data types and formats:

Data Type Runtime Support Supported via Conversion

Audio PCM, ADPCM, MIDI . .. AIFF

Stills DIBs, Win Metafile PCX, PICT, TIFF, etc

Animation Frame, Cast

Motion Video MPEG (when done)

Text RTF, ASCII SGML

Interleave CD ROM-XA

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Timetable/Next Steps

1Q '90 Discuss tool and file format efforts

with interested ISVs . .

• 1H '90 Pre-Release MM Windows Software

to early ISVs

• End '90/ Pre-Release MM OS/2 software

Early '91 to early ISVs

130 pg.

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