<table>
<thead>
<tr>
<th>COMPANY NAME</th>
<th>NAME</th>
<th>CONFIRMED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adobe</td>
<td>Tom Malloy</td>
<td>Y</td>
</tr>
<tr>
<td>Aldus</td>
<td>Ted Johnson</td>
<td>Y</td>
</tr>
<tr>
<td>Ashton-Tate</td>
<td>Kevin Piette</td>
<td>Y</td>
</tr>
<tr>
<td>Ashton-Tate</td>
<td>Mike Donegan</td>
<td>Y</td>
</tr>
<tr>
<td>Asymetrix</td>
<td>Steve Wood</td>
<td>Y</td>
</tr>
<tr>
<td>AutoDesk</td>
<td>Ron McElhaney</td>
<td>Y</td>
</tr>
<tr>
<td>AutoDesk</td>
<td>John Forbes</td>
<td>Y</td>
</tr>
<tr>
<td>AutoDesk</td>
<td>Kern Sibbald</td>
<td>Y</td>
</tr>
<tr>
<td>Borland</td>
<td>Brad Silverberg</td>
<td>Y</td>
</tr>
<tr>
<td>Borland</td>
<td>Richard Schwartz</td>
<td>Y</td>
</tr>
<tr>
<td>Borland</td>
<td>Ken Einstein</td>
<td>Y</td>
</tr>
<tr>
<td>Central Point</td>
<td>Tim Pettibone</td>
<td>Y</td>
</tr>
<tr>
<td>Computer Associates</td>
<td>Chris Frew</td>
<td>Y</td>
</tr>
<tr>
<td>Corel Systems</td>
<td>Patrick Boies</td>
<td>Y</td>
</tr>
<tr>
<td>DataEase</td>
<td>Shelly Altman</td>
<td>Y</td>
</tr>
<tr>
<td>DCA</td>
<td>Chuck Rudolph</td>
<td>Y</td>
</tr>
<tr>
<td>DCA</td>
<td>John Beall</td>
<td>Y</td>
</tr>
<tr>
<td>Fifth Generation</td>
<td>Mark Graybill</td>
<td>Y</td>
</tr>
<tr>
<td>Frame Technology</td>
<td>Kerry Champion</td>
<td>Y</td>
</tr>
<tr>
<td>Index Technology</td>
<td>Burt Rubinstein</td>
<td>Y</td>
</tr>
<tr>
<td>Information Builders</td>
<td>Keith Toleman</td>
<td>Y</td>
</tr>
<tr>
<td>Informix</td>
<td>Doug Edwards</td>
<td>Y</td>
</tr>
<tr>
<td>Lotus</td>
<td>Marty Fahey</td>
<td>Y</td>
</tr>
<tr>
<td>Lotus</td>
<td>Dave Gilmour</td>
<td>Y</td>
</tr>
<tr>
<td>Micrografx</td>
<td>George Grayson Lyle Griffin</td>
<td>Y</td>
</tr>
<tr>
<td>Microrim</td>
<td>Dennis Comfort</td>
<td>Y</td>
</tr>
<tr>
<td>Microsoft</td>
<td>Tandy Trower</td>
<td>Y</td>
</tr>
<tr>
<td>Microsoft</td>
<td>Dave Moore</td>
<td>Y</td>
</tr>
<tr>
<td>Company</td>
<td>Name</td>
<td>Invite?</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Microsoft</td>
<td>Jabe Blumenthal</td>
<td>Y</td>
</tr>
<tr>
<td>Novell</td>
<td>Kyle Powell</td>
<td>Y</td>
</tr>
<tr>
<td>Novell</td>
<td>Drew Majors</td>
<td>Y</td>
</tr>
<tr>
<td>Oracle</td>
<td>Mark Benioff</td>
<td>Y</td>
</tr>
<tr>
<td>Oracle</td>
<td>John Kish</td>
<td>Y</td>
</tr>
<tr>
<td>Samna</td>
<td>Said Mohammadioun</td>
<td>Y</td>
</tr>
<tr>
<td>Software Publishing</td>
<td>Don Sweet</td>
<td>Y</td>
</tr>
<tr>
<td>Symantec</td>
<td>Gary Hendricks</td>
<td>Y</td>
</tr>
<tr>
<td>VersaCad</td>
<td>John Bennett</td>
<td>Y</td>
</tr>
<tr>
<td>WordPerfect</td>
<td>Layne Cannon</td>
<td>Y</td>
</tr>
<tr>
<td>Z-Soft</td>
<td>Marc Zachmann</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Charles Petzold</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Ray Duncan</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Adrian King</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alistair Banks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bill Gates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bob Muglia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bob Taniguchi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cameron Myhrvold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Darryl Rubin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dave Cutler</td>
<td></td>
</tr>
<tr>
<td></td>
<td>David Wood</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Doug Rosencrans</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fred Gray</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Greg Goff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jonathan Lazarus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kent Diamond</td>
<td></td>
</tr>
</tbody>
</table>
Jonathan Lazarus
Director, Systems Strategy
Microsoft Systems Software

**PC Attributes**
- workgroup computing
- sharing data
- standard GUI
- ease of use
- flexibility
- price/perf.

**Mini/Mainframe Attributes**
- multitasking
- multi-user security
- transaction processing

*Microsoft Confidential*
Microsoft Systems Software

DOS 4.0

Windows

OS/2 1.2

3.0

Portable OS/2

LAN Mgr

2.0

Today's focus
Systems Design Review
December 15, 1989

Microsoft Systems Strategy
- OS/2
- Windows
- Applications Integration
Systems Design Review
December 15, 1989

SYSTEMS DESIGN REVIEW

Agenda

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

Microsoft Confidential
Personal Computer Market 1988-90

Source: IDC Estimates
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
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
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.
Systems Design Review

December 15, 1989

Microsoft

SYSTEMS DESIGN REVIEW

OS/2 has had limited success to date

- Memory prices
- Limited applications software
- Confusion
- Too many releases
- OS/2 functionality
  - Device drivers
  - 80386/486 support
  - DOS compatibility box
- OS/2 not easily available - few dealers/channel

Microsoft Confidential
## OS/2 Inhibitors

- Cost of one megabyte of RAM:

<table>
<thead>
<tr>
<th></th>
<th>Mid '88</th>
<th>July '89</th>
<th>Oct '89</th>
<th>Decline since July</th>
</tr>
</thead>
<tbody>
<tr>
<td>256K Chips</td>
<td>$396</td>
<td>$185</td>
<td>$126</td>
<td>32%</td>
</tr>
<tr>
<td>1 MB Chips</td>
<td>$306</td>
<td>$124</td>
<td>$92</td>
<td>26%</td>
</tr>
</tbody>
</table>

*Street prices: 100ns RAM*
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)
SYSTEMS DESIGN REVIEW

Microsoft Systems Software

- User
- ISV APPLICATION
- Shell
- Admin
- Test
- UPE
- Operating System
- Hardware
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
SYSTEMS DESIGN REVIEW

Peter Neupert
Senior General Manager, OS/2

Microsoft Confidential
Operating System/2

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

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
API Road Map

<table>
<thead>
<tr>
<th></th>
<th>DOS</th>
<th>Win 2.x</th>
<th>Win 3.x</th>
<th>OS/2 1.x</th>
<th>OS/2 2.x</th>
<th>Portable OS/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addressing</td>
<td></td>
<td></td>
<td></td>
<td>1Mb</td>
<td>16Mb</td>
<td>512Mb</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>64Kb Segments</td>
<td>Linear</td>
<td></td>
</tr>
<tr>
<td>Win APIs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PM APIs</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>OS/2 APIs</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Threads, HPFS</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Microsoft Confidential
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
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
### OS/2 2.0

#### Features

- **System limits raised:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>OS/2 1.1</th>
<th>OS/2 1.2</th>
<th>OS/2 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threads</td>
<td>255</td>
<td>511</td>
<td>4096</td>
</tr>
<tr>
<td>Processes</td>
<td>255</td>
<td>255</td>
<td>4096</td>
</tr>
<tr>
<td>Named pipes</td>
<td>255</td>
<td>255</td>
<td>3192</td>
</tr>
<tr>
<td>Open files</td>
<td>1K</td>
<td>1K</td>
<td>&gt;32K</td>
</tr>
<tr>
<td>Extended attributes</td>
<td>-</td>
<td>64K</td>
<td>&gt;64K</td>
</tr>
<tr>
<td>Real Memory</td>
<td>16Mb</td>
<td>16Mb</td>
<td>512Mb</td>
</tr>
</tbody>
</table>
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
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)
OS/2 2.0

Compatibility

- MVDM - Better DOS than DOS
  - Up to 16 DOS sessions
  - Up to 620Kb real memory for appl per session
  - LiM 4.0 emulation, up to 8Mb per DOS session
  - DOS sessions demand paged
  - Background/windowed execution (even in graphics mode)
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
OS/2 FONTS

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)
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
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!
### Windjammer (Sizzle) Project

- User Interface
- System Usability
- Key Features
- Performance
- Misc
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
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
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
OS/2 2.0

Windjammer: Misc
(features under consideration)

- Applets
  - Calendar
  - Clipboard Viewer
  - Paint
  - Write
- Card File
- Calculator
- Terminal
- Games
- PM-based Hard Error handler
- System Editor - add print function
- Shell fixes for 1.2 bugs

Microsoft Confidential
OS/2 2.0

Windjammer: Performance

- Slow program load
- Slow user focus switch
- Slow/jerky repaint
- Slow file manager startup
- Slow/difficult printing
- Large disk space consumption
SYSTEMS DESIGN REVIEW

Lou Perazzoli
Development Manager
Portable OS/2
PORTABLE OS/2

Overview

- Implementation Plan
  - Written in C
  - Initially targeted for the 860
  - 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
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
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
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
PORTABLE OS/2

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
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
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
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
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
  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
OS/2 - PORTHOLE

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
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
SYSTEMS DESIGN REVIEW
Microsoft DOS & Windows

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

Future Directions - 1991

- Performance improvements
- Modular design
- Further reductions of lower 640Kb occupied by DOS
- Battery power management
- Utility enhancements
- Usability improvements
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
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
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
MICROSOFT WINDOWS 3.0

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
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.
MICROSOFT WINDOWS 3.0

Introduction/Timing

1990

- Target is late Q4 1989 for retail product
- Windows is entering extensive beta test
- Significant introduction planned with heavy emphasis/participation by ISVs
Phil Barrett
Windows Development Manager
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
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
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
  - Palette manager
MICROSOFT WINDOWS 3.0

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
MICROSOFT WINDOWS 3.0

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
MICROSOFT WINDOWS 3.0

**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
MICROSOFT WINDOWS 3.0

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
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
SYSTEMS DESIGN REVIEW

Martin Dunsmuir
Director
OS/2 PM Development
The OS/2 User Interface

- Ease of use
- Consistency
- Extensibility
- Aesthetics
- Ease of learning
THE OS/2 USER INTERFACE

Components

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

Interaction Model

- **OS/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
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
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
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
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
  - Specifies behavior, independent of implementation
  - Sets criteria for conformance
  - Indicates future direction
THE OS/2 USER INTERFACE

Standard Controls

- OS/2 1.1
  - Window Controls
    - Title Bar
    - Pull-down Menus
    - Sizing Borders
  - Min/Max Button
  - Scroll Bars
  - Layout and Dialog Support
    - Buttons & Check Boxes
    - List Boxes
    - Single-line Entry Fields
    - Static Controls
  - Standard pointers, cursors, and items
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
  - Print
  - Color Palette
  - Drag & Drop
THE OS/2 USER INTERFACE

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
Applications Integration

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

Dynamic Data Exchange

- Protocol to exchange data between applications
  - Based on Windows/PM messaging IPC
  - 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
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
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
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
APPLICATIONS INTEGRATION

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
APPLICATIONS INTEGRATION

DDE Protocol Extensions

- Support integration of applications
- Format independent data links
- Data containment
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
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
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
Object Oriented Systems Technology

- Infrastructure
- Programming Support
- User Interface
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
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")
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
OBJECT ORIENTED SYSTEMS TECHNOLOGY

Infrastructure

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

Programming Support

- Make writing PM programs easier
- More common code between applications
- Better application integration
- Evolutionary approach
OBJECT ORIENTED SYSTEMS TECHNOLOGY

Programming Support

- Phase 1:
  - 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
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
OBJECT ORIENTED SYSTEMS TECHNOLOGY

User Interface Editor

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

Manny Vellon
Group Program Manager
Languages
MICROSOFT LANGUAGES

Future Directions

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

- Code generation/optimization
- Debugging
- Hosting environments
- Language design
MICROSOFT LANGUAGES

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
MICROSOFT LANGUAGES

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
MICROSOFT LANGUAGES

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
MICROSOFT LANGUAGES

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()
Microsoft LANGUAGES

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
MICROSOFT LANGUAGES

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
MICROSOFT LANGUAGES

Language Design

In C 6.0, the language evolves:
- Full ANSI C except for DBCS
- Based pointers
- Long double
- Nameless structs & unions
- Integrated in-line assembler
MICROSOFT LANGUAGES

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
MICROSOFT LANGUAGES

Evolution of Tools

16-bit -> 32-bit -> RISC

PWB -> PM

C 6.0 -> C++ 2.0

CV 3.n -> Win/PM

Win 3.0
MICROSOFT LANGUAGES

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
SYSTEMS DESIGN REVIEW

Cameron Myhrvold
Strategic Marketing Manager

Microsoft Confidential
# International Support

<table>
<thead>
<tr>
<th></th>
<th>MS OS/2 1.1 BAK</th>
<th></th>
<th>MS OS/2 1.2 BAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>French</td>
<td>3/89</td>
<td>French</td>
<td>2/90</td>
</tr>
<tr>
<td>German</td>
<td>3/89</td>
<td>German</td>
<td>2/90</td>
</tr>
<tr>
<td>Swedish</td>
<td>5/89</td>
<td>Swedish</td>
<td>2/90</td>
</tr>
<tr>
<td>Italian</td>
<td>6/89</td>
<td>Spanish</td>
<td>2/90</td>
</tr>
<tr>
<td>Spanish</td>
<td>6/89</td>
<td>Italian</td>
<td>3/90</td>
</tr>
<tr>
<td>Dutch</td>
<td>9/89</td>
<td>Japanese</td>
<td>2.2/90</td>
</tr>
<tr>
<td>Japanese</td>
<td>3/90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

### NLS System Services

<table>
<thead>
<tr>
<th>Arab States</th>
<th>Hungary *</th>
<th>Portugal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian English</td>
<td>Iceland *</td>
<td>Slovak *</td>
</tr>
<tr>
<td>Belgium</td>
<td>Israel</td>
<td>Spain</td>
</tr>
<tr>
<td>China</td>
<td>Italy</td>
<td>Sweden</td>
</tr>
<tr>
<td>Czechoslovakia *</td>
<td>Japan</td>
<td>Switzerland</td>
</tr>
<tr>
<td>Denmark</td>
<td>Korea</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Finland</td>
<td>Latin America</td>
<td>Turkey *</td>
</tr>
<tr>
<td>France</td>
<td>Netherlands</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>French Canada</td>
<td>Norway</td>
<td>United States</td>
</tr>
<tr>
<td>Germany</td>
<td>Poland *</td>
<td>Yugoslavia *</td>
</tr>
</tbody>
</table>

*Note: * = New support in OS/2 1.2*
INTERNATIONAL SUPPORT

Code Pages

- Code pages are character set definitions that support one or 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
### 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
- 437 - United States
- 1004 - Same as 850 (ANSI code page 8859/1)
INTERNATIONAL SUPPORT

Double Byte Code Pages

932 - Japan
934 - Korea
936 - Taiwan
938 - Peoples Republic of China
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)
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
INTERNATIONAL SUPPORT

Localization - Translation

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

Microsoft OnLine

- Microsoft OnLine, 1450 active accounts
  - 28 of the 31 companies attending this meeting
- Average monthly activity levels:
  
<table>
<thead>
<tr>
<th></th>
<th>1988</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS/2 base service requests</td>
<td>226</td>
<td>232</td>
</tr>
<tr>
<td>Presentation Manager</td>
<td>244</td>
<td>334</td>
</tr>
<tr>
<td>Windows</td>
<td>489</td>
<td>789</td>
</tr>
<tr>
<td>LAN Manager/SQL Server</td>
<td>99</td>
<td>104</td>
</tr>
</tbody>
</table>
ISV SUPPORT

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
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
ISV SUPPORT

Microsoft OS/2 ISV Group

- Evangelism, and account management of key ISVs
- Special OS/2 support activities
  - Escalation of technical problems
- OS/2 Design Workshops (bi-monthly)
  - Individual design/style reviews
  - Early code drops
- ISV programs:
  - International program
  - 32-bit ISV program
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
- Goals:
  - Disclose new features and technology
  - Solve real-world appl. development problems
  - Gather feedback to improve OS/2
  - Distribute early code, docs, and internal tools
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
LAN Manager

- LAN Manager 2.0
- Directory Services
Evolution of Office Systems

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

Distributed Client-Server Model

Distributed applications accessing a single network service
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
LAN MANAGER

Distributed Client-Server Model

Making It Work:

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

Microsoft Confidential
LAN MANAGER

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
LAN MANAGER

Distributed Filing System

Server 1
- Databases
- Payroll
- Exempt
- Nonexempt

Server 2

Server 3
- Documents
- Letters
- Training
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
LAN MANAGER

Directory Service

USA

Microsoft

ADDS

Systems

Users

Printers

Servers

Fred

Laser 1

Joe

Laser 2

Msft Confidential
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
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
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
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

Marketing Domain  |  Sales Domain

Microsoft Confidential
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

Ring 0  Ring 3
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 API 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
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
Adrian King
General Manager
Workgroup Services
Network Services

- Ashton-Tate/Microsoft SQL Server
- DCA/Microsoft Comm Server
- Mail Server
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
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
ASHTON-TATE/MICROSOFT SQL SERVER

Heterogeneous Connectivity

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

Microsoft Confidential
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
ASHTON-TATE/MICROSOFT SQL SERVER

SQL Server - Beyond 2.0

- Cursor support
  - In DB-Library
  - Within Transact SQL
- Distributed query/transparent 2-phase commit

Microsoft Confidential
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
DCA/MICROSOFT COMM SERVER

Comm Server Dynamic Routing

Microsoft Confidential
Comm Server Dynamic Routing

- Client automatically re-routed
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
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
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
MULTIMEDIA SYSTEMS

What is Multimedia?

- Integration of:
  - Digital audio
  - Photo quality images
  - Animation
  - Motion video
  - Optical media,
  and traditional PC capabilities
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
- Used only in specialized applications
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)
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)
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
Levels of Multimedia

- Level I:
  - Processor: 286 or higher
  - Memory: 1MB or higher
  - Audio: CD-XA (ADPCM)
  - Video: VGA
  - Storage: CD Rom
  - OS: DOS+Windows+Extensions
  - When: 1990 (has started already!)
MULTIMEDIA SYSTEMS

Levels of Multimedia

- Level II:
  - Processor: 386sx or higher
  - Memory 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
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
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
## Multimedia Data Formats

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

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Runtime Support</th>
<th>Supported via Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio</td>
<td>PCM, ADPCM, MIDI</td>
<td>AIFF</td>
</tr>
<tr>
<td>Stills</td>
<td>DIBs, Win Metafile</td>
<td>PCX, PICT, TIFF, etc</td>
</tr>
<tr>
<td>Animation</td>
<td>Frame, Cast</td>
<td></td>
</tr>
<tr>
<td>Motion Video</td>
<td>MPEG (when done)</td>
<td></td>
</tr>
<tr>
<td>Text</td>
<td>RTF, ASCII</td>
<td>SGML</td>
</tr>
<tr>
<td>Interleave</td>
<td>CD ROM-XA</td>
<td></td>
</tr>
</tbody>
</table>
MULTIMEDIA SYSTEMS

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/Early '91**  Pre-Release MM OS/2 software to early ISVs