SYSTEMS DESIGN REVIEW INVITEES

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Microsoft®

Systems Design Review

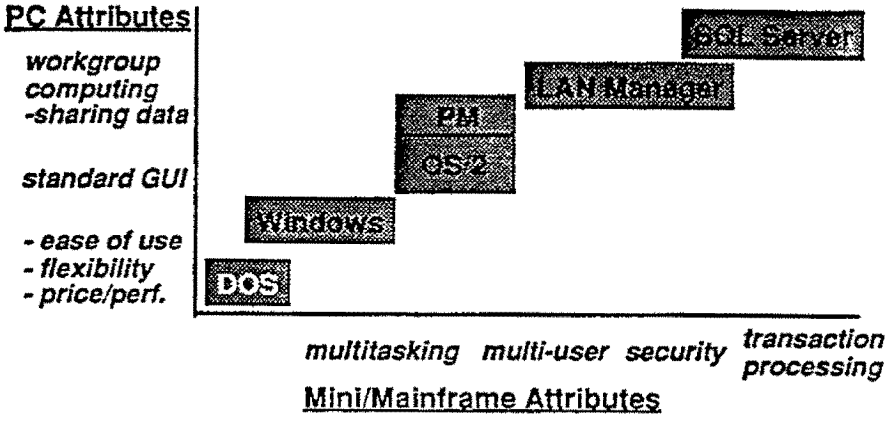
December 15, 1989

SYSTEMS DESIGN REVIEW

Jonathan Lazarus
Director, Systems Strategy

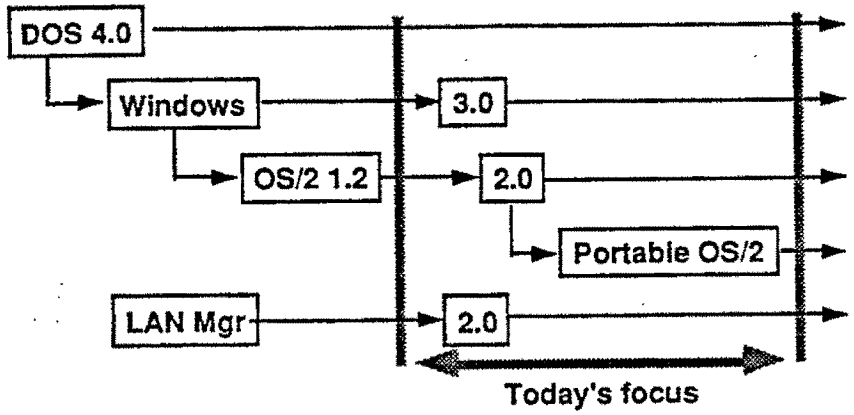
SYSTEMS DESIGN REVIEW

Microsoft Systems Software



SYSTEMS DESIGN REVIEW

Microsoft Systems Software



SYSTEMS DESIGN REVIEW

Agenda

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

SYSTEMS DESIGN REVIEW

Agenda

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

SYSTEMS DESIGN REVIEW

Steve Ballmer
Senior Vice President
Systems Software

SYSTEMS DESIGN REVIEW

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

SYSTEMS DESIGN REVIEW

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

SYSTEMS DESIGN REVIEW

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

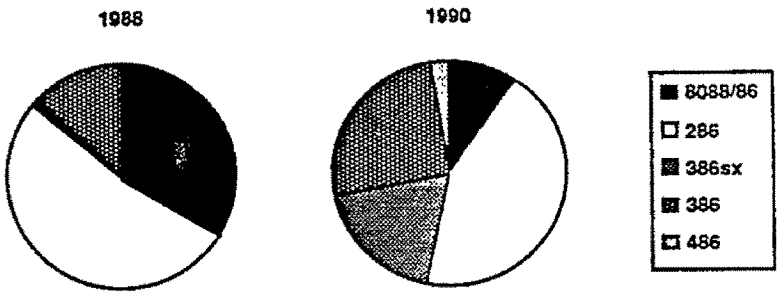
SYSTEMS DESIGN REVIEW

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

SYSTEMS DESIGN REVIEW

Personal Computer Market 1988-90



Source: IDC Estimates

SYSTEMS DESIGN REVIEW

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

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

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

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

SYSTEMS DESIGN REVIEW

OS/2 Inhibitors

- Cost of one megabyte of RAM:

	Mid '88	July '89	Oct '89	Decline since July
256K Chips	$396	$185	$126	32%
1 MB Chips	$306	$124	$92	26%

Street prices: 100ns RAM

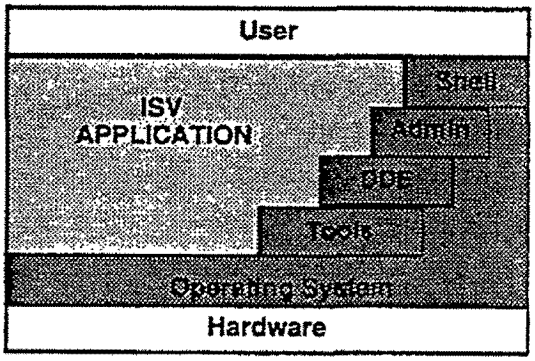
SYSTEMS DESIGN REVIEW

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



SYSTEMS DESIGN REVIEW

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

SYSTEMS DESIGN REVIEW

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

SYSTEMS DESIGN REVIEW

API Road Map

	DOS	Win 2.x	Win 3.x	OS/2 1.x	OS/2 2.x	Portable OS/2
Addressing	1Mb		16Mb		512Mb	4Gb
	64Kb Segments				Linear	
Win APIs		✓	✓	Porthole	✓	
PM APIs				✓	✓	✓
OS/2 APIs Threads,HPFS				✓	✓	✓

SYSTEMS DESIGN REVIEW

Mark Zbikowski
Lead Designer, OS/2

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:

	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

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!

OS/2 2.0

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

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 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

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

SYSTEMS DESIGN REVIEW

Scott Ludwig
Senior Software Engineer

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

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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

SYSTEMS DESIGN REVIEW

Russ Werner
General Manager
DOS/Windows Business Unit

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SYSTEMS DESIGN REVIEW

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

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

- Target is late Q1 1989 (1990) for retail product
- Windows is entering extensive beta test
- Significant introduction planned with heavy emphasis/participation by ISVs

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SYSTEMS DESIGN REVIEW

Phil Barrett
Windows Development Manager

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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

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

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

DPMI Dos Protect Mode Interface - Int31.
"Puppets under protection of OS/2"

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SYSTEMS DESIGN REVIEW

Martin Dunsmuir
Director
OS/2 PM Development

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SYSTEMS DESIGN REVIEW

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
    - Single-line Entry Fields
    - List Boxes
    - 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
    - Print
    - Color Palette
  - More Controls
    - Mini-Icon
    - Spin-Button
    - 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

SYSTEMS DESIGN REVIEW

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

SYSTEMS DESIGN REVIEW

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

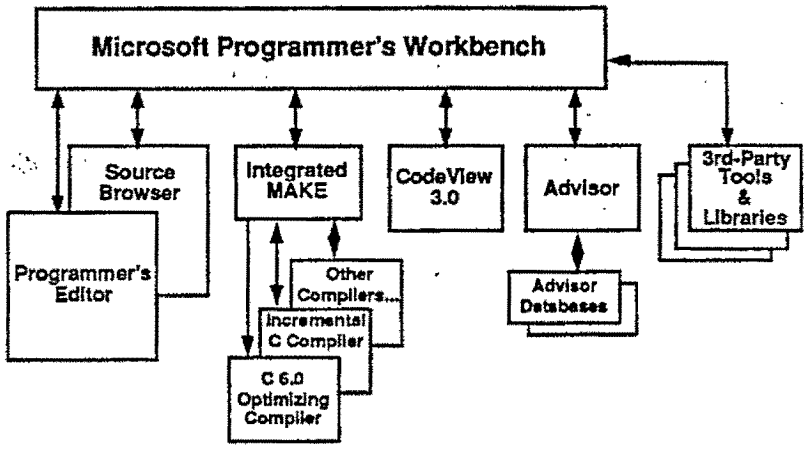
MICROSOFT LANGUAGES

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

C6 Professional Development System



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

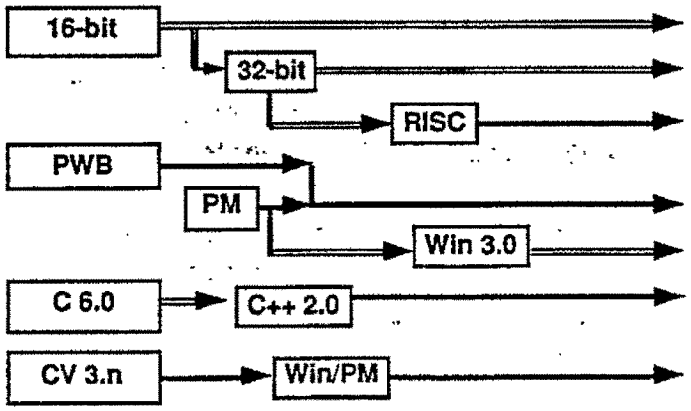
Language Design

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



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:

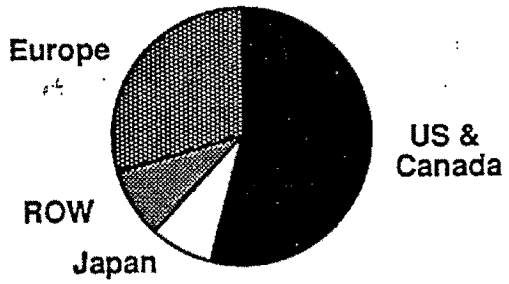
- Complete on C6, including Win 3.0
- Functionality/design input on Redwood PM host

SYSTEMS DESIGN REVIEW

Cameron Myhrvold
Strategic Marketing Manager

SYSTEMS DESIGN REVIEW

International OS/2 Market 1990-91



SYSTEMS DESIGN REVIEW

International Support

MS OS/2 1.1 BAK	
French	3/89
German	3/89
Swedish	5/89
Italian	6/89
Spanish	6/89
Dutch	9/89
Japanese	3/90

MS OS/2 1.2 BAK	
French	2/90
German	2/90
Swedish	2/90
Spanish	2/90
Italian	3/90

Japanese Q3/90

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

INTERNATIONAL SUPPORT

NLS System Services

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

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

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

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

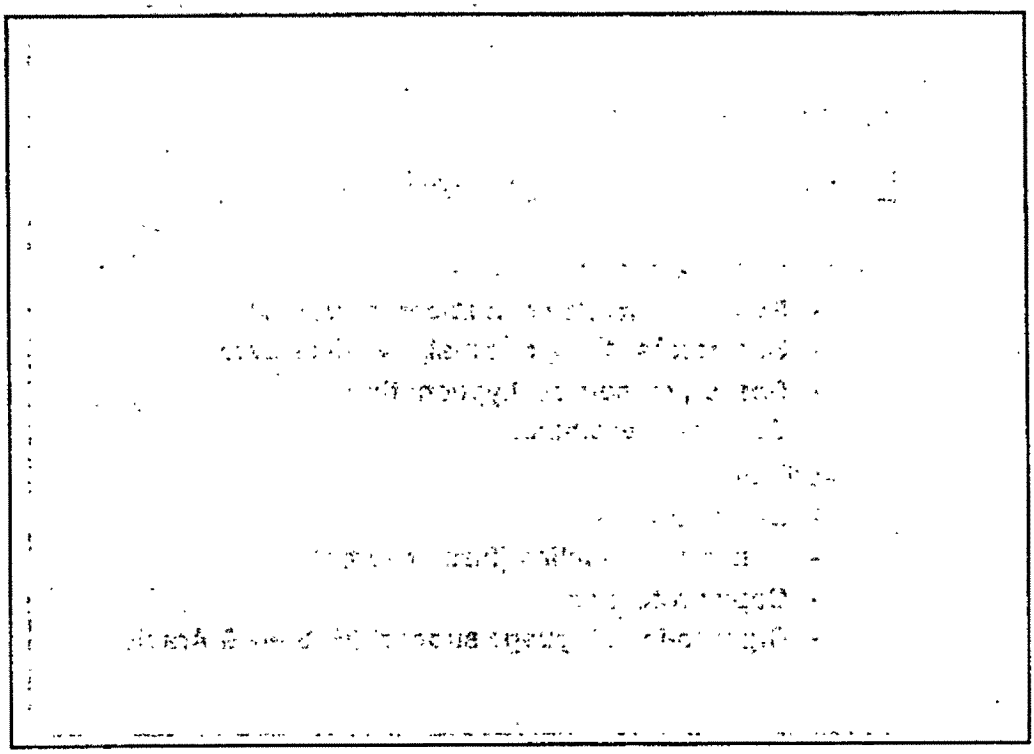
Localization - Translation

- 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)



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

ISV SUPPORT

Microsoft OnLine

- Microsoft OnLine, 1450 active accounts
  - 28 of the 31 companies attending this meeting
- Average monthly activity levels:

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

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

SYSTEMS DESIGN REVIEW

Darryl Rubin
Director, Network Development

SYSTEMS DESIGN REVIEW

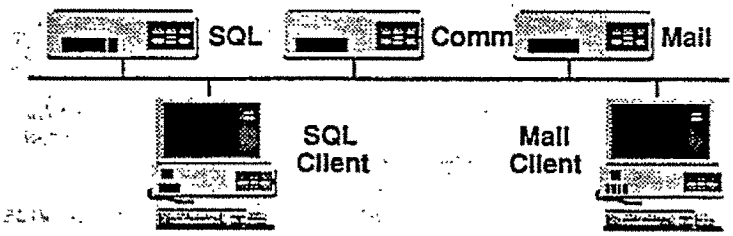
LAN Manager

- LAN Manager 2.0
- Directory Services

LAN MANAGER

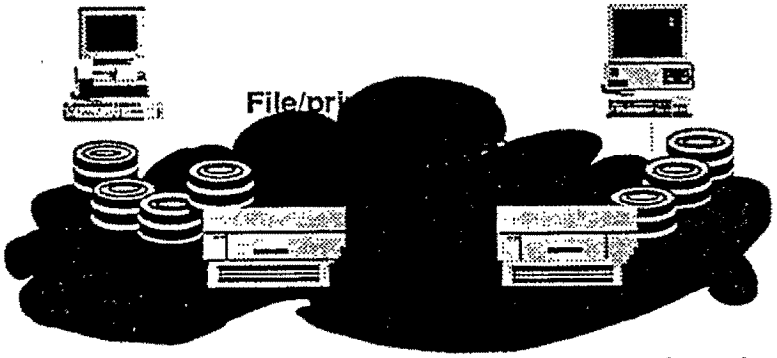
Evolution of Office Systems

- 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

LAN MANAGER

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

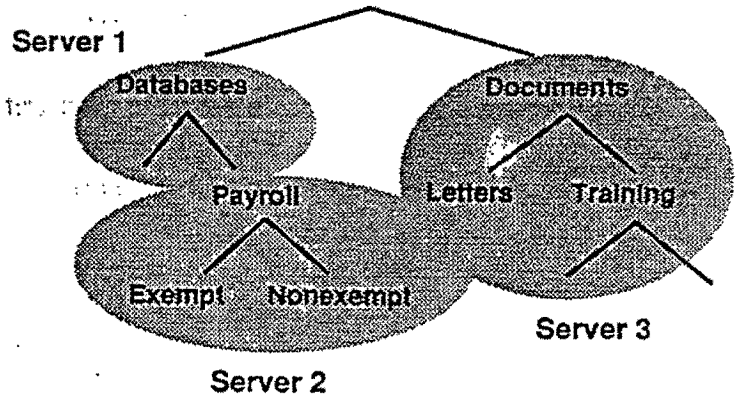
LAN MANAGER

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



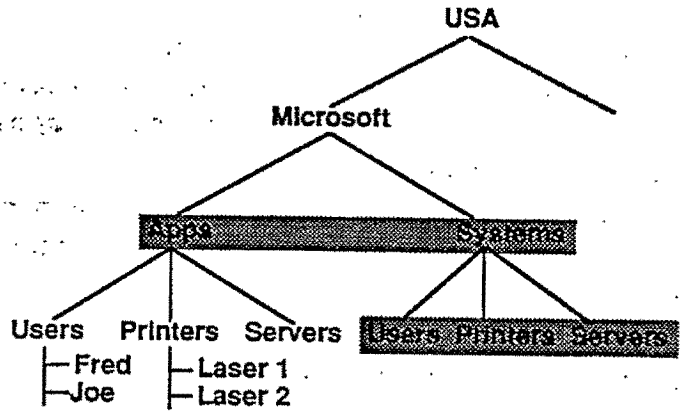
LAN MANAGER

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

LAN MANAGER

Directory Service



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

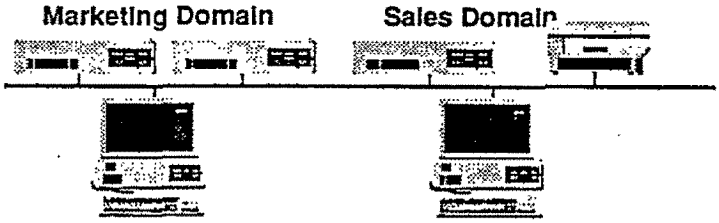
Distributed Administration

- 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

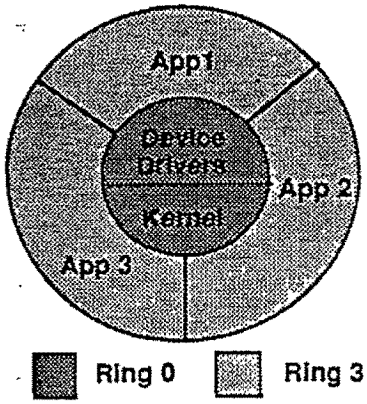
Distributed Client-Server Model

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



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

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

SYSTEMS DESIGN REVIEW

Adrian King
General Manager
Workgroup Services

SYSTEMS DESIGN REVIEW

Network Services

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

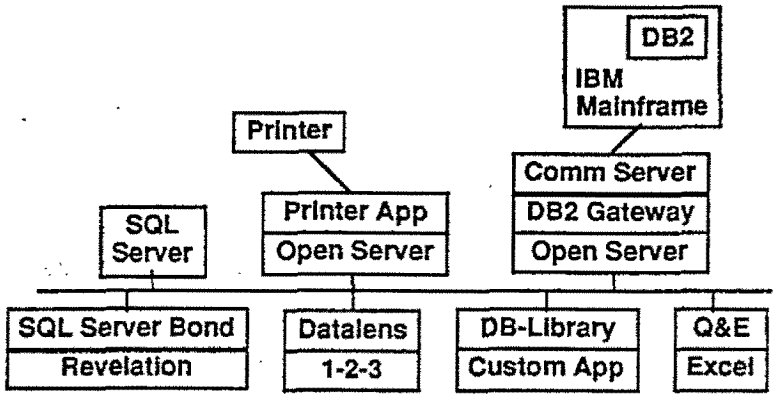
ASHTON-TATE/MICROSOFT SQL SERVER

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

SQL Server Environment



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

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

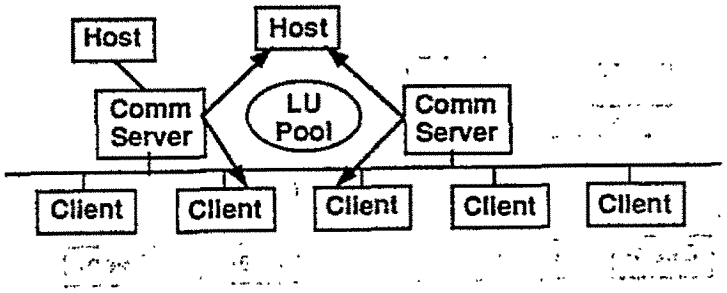
DCA/MICROSOFT COMM SERVER

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

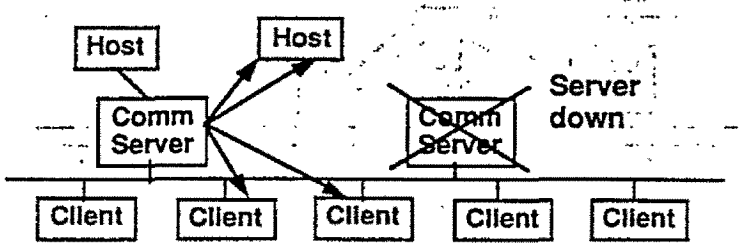
Comm Server Dynamic Routing



DCA/MICROSOFT COMM SERVER

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

SYSTEMS DESIGN REVIEW

Rob Glaser
General Manager
Multimedia Systems Group

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

MULTIMEDIA SYSTEMS

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 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	

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