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MS/IBM SYSTEMS SOFTWARE PLAN: 1990-92

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John –
JAS 2-22-90

Here is a copy of the pitch Paul Mintz made to Dick H. and the MS Negotiating Task Force in NYC on 2/5-6. Lee ask me to give you a copy for reference in preparing for the next MS meetings which will include the ES & LAN Plans. This Format was received very favorably by the Task Force, however, the assumed productivity is in question.

[signature]

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DEFENDANT'S EXHIBIT 548

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0. SUMMARY

1. Environment:

Hardware:	Movement to 386
	Emergence of RISC
	Emergence of New Hardware Types
Software:	GUI Accepted
	New Application Types Involve Distributed Operations
	ISV's Seeking Platform Independence
End-Users:	DOS Entrenched
	LAN Usage Rising Strongly
	Large Corporations Flirting with UNIX

2. MS/IBM Product Line:

- Windows Will Be Successful
  - but No Growth Path to New Hardware Types
- OS/2 Is Limping
  - Not Strong Competitor to DOS/Windows, MAC, UNIX, Netware
  - Immature
  - No Compelling Applications Soon
- MS not Timely in Addressing New Platform Types
  - RISC
  - Multi-processors

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3. Plan Proposal:

- Recognize that Windows Must Evolve on x86, But Stay "Personal"
- Position OS/2 as
  - High-End
  - Distributed/Connected
  - Bridge to Future

DO:

- Evolve Windows on x86--
  - Ease of Use, Size, Performance
  - Use DOS Extender Technology to Address Need for Larger Programs
- Make OS/2 2.0 as Good as Possible in 1990
  - "Superset" of DOS/Windows
  - Corporate Market: LAN Enabled
  - Focus on High End (386, 4+ MB): Performance/Capacity/32-bit
- Accelerate NT to Address New Platform Types and to Compete with UNIX
  - Late 1991: RISC, 386 MP (32-bit only)
  - 1992: Replace OS/2 2.0 (16-bit OS/2, Win compatible)

DO NOT DO:

- Further OS/2 16-bit Work (i.e. Try to Compete with Windows at Low End)

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1. THE ENVIRONMENT

1.1 HARDWARE BASE

Key Issues/Implications:

a. Strong Shift in mix from 286 to "386"

	1990	1992
286	50%	25%
386	35%	65%

b. Emergence of RISC on Desktop:

	1990	1992	1995
RISC	<1%	5%	15-20%

c. Growth of new types of "PC" machines at low and high-ends:

Low-end: Notepad, Laptops, Multimedia
High-end: Multiproc. Servers, Workstations

Implications:

- must stay competitive on "386"
- must address new types of platforms with family of consistent products.

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1.2 APPLICATION SOFTWARE

a. **Rapid movement to GUI** - all "new" versions of apps dependent on GUI:
   - application integration desired
   - high quality WYSIWIG (display/print) desired

b. **Certain App categories will move to exploit linear, 32-bit quickly:**
   - CAD, DB, Spreadsheet, Servers

c. ***New application categories*** *will be in:*
   - Email/group information
   - Personal, graphical "4GL" tools

d. **Platform Independence**
   ISV's view market percentages in 1992 to be:

DOS/Windows:	40%
OS/2:	15-20%
Mac:	10-15%
Unix (some flavor):	10-15%

i.e., view Windows as being highest volume, but limited (no 32-bit, no RISC, no "open", no server, etc.), but view no other alternative as being dominant.

Current response by ISV's:
- **wait/see**
- **seek to be platform independent**

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Key Implications:

1. GUI will be accepted/required across product line
2. 32-bit linear on 386 will be important
3. "LAN" enabling will be important to new "group" apps., hence will become tangible issue to end-users.
4. ISV's will:
   - seek to minimize platform specific investment until they can see clear paths/winners.
   - will prefer toolsets that promise to span platforms.

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1.3 KEY CORPORATE FACTORS

Corporations ("Fortune 500"):

1. **DOS still reigns supreme on desktop:**
   - 90% market share
   - large investment in DOS Infrastructure (apps, peripherals, scripts, training, etc.)

2. **GUI accepted as future** - transition will occur over period (90->92):
   - number of apps/PC will increase
   - integration will be demanded

3. **Spread of LAN's** - penetration:
   - 1990 - 20% of PC's
   - 1992 - 35-45% of PC's
   - 1993 - 40-55% of PC's

4. **Usage of PC platforms for MIS Purposes:**
   - running internally developed apps.
   - running off-the-shelf DB and Comm. software (increasingly client/server mode)

6. **Flirtation with UNIX:**
   - some corps. attracted by "open"/standards message.
   - govt. giving leadership to UNIX movement

   Currently limited issue, but could become large scale movement if viable, alternative vision not supplied.

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- KEY IMPLICATIONS:

a. DOS will not go away:

- Corporations will seek to build off their DOS investment; Transition to any significantly different platform will be slow.
- Adding GUI to DOS will be popular strategy for them.
- DOS Client, XXX Server (OS/2 , Netware, or UNIX) will be popular strategy.

b. LAN Environment:

- A server OS (multitasking, high performance file system, secure, MP) is needed for PC platforms.
- Administration of LAN environment will be MAJOR issue.
- A peer enabled client OS will be required over time.

c. UNIX:

- MS/IBM need to sell corporations on a coherent, long-term product plan
  - How they get to new capabilities
  - How they get benefits of multi-vendor world
  - How they build off DOS

  else risk ceding share in large way to UNIX over time

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1.4 COMPETITION:

Key Competitors:

1. UNIX
2. DOS clones & extenders
3. "Environments" (New Wave)
4. Macintosh
5. Network operating systems

Key Implications

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1.4.1 UNIX

a. **Key Players:**

AT&T, SCO, OSF, SUN, NeXT, IBM/AIX

b. **Products:**

AT&T UNIX System V.4
SCO System V/Open DeskTop
SunOS
NeXT OS
AIX
OSF/x

c. **Key Attributes:**

Portable (x86, 68000, RISC, etc)
"32bit"
Secure
Standards Compliant

d. **Positioning/Game Plan**

"Open" (i.e. not under control of single entity, standards compliant)

More amenable to hardware advances (RISC)
More amenable to networking

Benefit from industry "contributions" (via OSF, UI)

Game plan of AT&T USO, SCO, SUN:
- license "binary standard"/shrink wrapped UNIX to achieve "PC phenomenon"

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1.4.1 UNIX (con't.)

e. Key Strengths:

Occupy the "open" (noble) position

Portable product line

Lots of technology to draw on

Well-established VAR /support infrastructure

f. Key Weaknesses:

Lack of Binary standard - no such thing as generic, shrink wrapped "UNIX" software

Lack of large personal productivity base to call on.

Coverage of spectrum of PC hardware

DOS is entrenched.

g. Projected Market Share:

	1990	1992
All PC's	2%	3%
386/RISC PC's	6%	7%

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1.4.4. Apple Macintosh

a. **Product:** System 7.0 (available 3Q90)

b. **Key Attributes:**

Established Macintosh GUI +
Inter-application communication
Outline fonts
Virtual memory/demand paging on 68030-based Macs
32-bit address space

c. **Positioning/Game Plan**

Build more OS features under established GUI

Retain ease of use, user loyalty-- the "Apple Advantage"

Focus on vertical solution selling for entry into corporations

- Design & Modelling
- Information Management
- Desktop Publishing & Presentations

d. **Key Strengths:**

Binary standard-- wide body of applications

Fanatically loyal installed base

Well-defined user interface, consistent across applications

Desktop Publishing standard

Multimedia tools

Strong reputation for user-friendly system

e. **Key Weaknesses:**

Runs only on proprietary hardware

High price points-- no strong low-end machine

Perceived connectivity weakness

Limited Server capability (e.g. security)

"New-age" marketing strategy: the "feel" of a Macintosh

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1.4.4. Apple Macintosh (con't.)

f. Projected Market Share:

	1990	1992
All personal computers	10%	10%

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Competition: Key Implications

1. Competition has key weaknesses (UNIX: divisions, no binary standard; Apple: proprietary hardware) that will limit them if MS/IBM can execute well.

2. Competition has key strengths that will take significant market share if left unaddressed.

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2. CURRENT MS/IBM PRODUCT LINE: MARKET POSITION

2.1 REPORT CARD

1. **DOS is still entrenched, but becoming dated**
   - still 85% market share
   - DOS has not been evolving, exposed to clones
   - Fragmentation occurring as result of lack of evolution and no clear successor OS.

2. **Windows will be successful/high-volume on desktop**
   - meets real market requirement
     (offers access to GUI/multi-app, but retains DOS investment)
   - mature (polish, device support)
   - but limited in growth path
     - 32-bit
     - RISC
   - not good server OS

3. **OS/2 is having mixed/poor acceptance:**

   - OS/2 is not selling onto desktop in volume:
     - not mature (polish/usability, performance, device support)
     - migration not 100% "seamless"
       - runs DOS apps, not DOS
       - does not preserve investment in device drivers, scripts, etc.
     - not differentiated sufficiently from Windows:
       - perceived benefits of OS/2 over Windows do not justify add'l. hardware resources required

   - Reasonable applications support in works, but late. No compelling application.

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3. OS/2 is having mixed/poor acceptance (con't):

- OS/2 is not dominant as a server OS:
  - outsold by Netware
  - outpositioned by UNIX
  - desktop OS/2 applications give no leverage
  - server applications all available on UNIX

- OS/2 is winning some designs in large corporations against UNIX, largely on:
  - faith in IBM/MS,
  - SQL Svr, EE wins
  - lack of confidence in UNIX

Currently OS/2 is "neither fish nor fowl":
- not direct "successor" to DOS:
  (partially but not completely addressed by OS/2 2.0)
- not well differentiated from Windows
- not good server OS
- not "open/portable/hi-tech"

4. IBM/MS does not have clearly visible/timely plan to address all platform types and corporate needs:
- MP, RISC missing
- Migration path not differentiated
  - DOS ---> OS/2 vs. UNIX
  - Windows ---> OS/2 vs. UNIX

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2.2 FORECAST given current "POR"

Summary of Units ('000s)	FY 89 (Jul. -> Jun.)	FY 90	FY 91	FY 92	FY 93	FY 94	Cum Total 90-94	% Total
Total New Shipments(>286)		11,400	12,600	13,500	14,400	15,300	67,200	100%
DOS (inc. 8086 units)								
OEM	8,900	10,300	10,200	10,000	9,200	7,800		
IBM		2,700	2,900	2,700	2,400	2,400		
Total DOS	8,900	13,000	13,100	12,600	11,600	10,200	60,500	
Windows								
OEM	1,900	2,200	4,200	3,900	2,900	1,900		
Retail		800	2,500	3,100	3,900	4,900		
IBM	0	0	0	0	0	0		
Total Windows	1,900	3,000	6,700	7,000	6,800	6,800	30,300	45%
OS/2								
OEM	20	60	600	1,100	2,400	3,200	7,360	
IBM	54	100	250	700	1,200	1,900	4,150	
Total OS/2	74	160	850	1,800	3,600	5,100	11,510	17%
Total OS/2 as a % of New Shipments		1%	7%	13%	25%	33%		
IBM OS/2 units as % of Total IBM units		3%	8%	21%	33%	44%		
Previous MS OS/2 Forecast		500	1,500	3,000	5,000	7,000		

Assumptions:

1. OS/2 2.0 ships in Q490 and is good but not as good as Windows 3.0, 3.1
2. IBM does not bundle Windows with DOS or with hardware
3. IBM OS/2 units based on their forecast with IBM being 50% share
4. No major OEM bundles OS/2 in Cal. 90
5. Unix does not accelerate on desktop in 90,91

See the Environment section of Backup material for derivation of forecast.

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2.3 MAJOR EXPOSURES given "POR"

2.3.1 Principal:

a. **DOS desktop user base does not make switch to GUI on either DOS/WIN or OS/2, goes to UNIX.**

Causes:
- confusion compared to alternatives
- neither DOS/Win nor OS/2 alone are competitive on required range of popular hardware
- OS/2, Windows don't build on each other

Implication:
- above all win Desktop GUI.
  Options:
  1. build plan that leverages best strength today (Windows)
  2. drive OS/2 to high volume very quickly

b. **Lose RISC desktop to UNIX:**

Implication:
- 1. define smoother growth path for GUI user to MS/IBM RISC software products
  2. get RISC offering done early

c. **DOS Clone reaches high-volume**
Lose ability to influence future migration
Loss of funds to invest in future

Implication:
- keep DOS competitive by investing in it

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2.3.2 Secondary (all UNIX!):

a. **Lose the server OS to UNIX**
(UNIX will then push down onto desktop)

Implication: - offer competitive server OS offering
(MP, security, scaleable/portable)

b. **UNIX viewed as more supportive/complete for distributed processing/network administration**

Implication: - make sure PC/GUI is good client
- competitive LAN integration
(DFS, directory, RPC, security, mail, etc)
- release desktop offering that is peer on network

c. **UNIX viewed as more productive for application development (particularly in Corps).**

Implication: - ensure development tools keep pace,
pioneer in personal "4GL" category

d. **UNIX builds critical mass in Govt. markets**

Implication: - meet current rules (POSIX, C2)
- change future rules (make DOS/Win "open")?

e. **UNIX becomes more unified than MS/IBM product line:**
- API's
- Device drivers
- Enhancements (e.g. multimedia)
- Number of releases

Viewed as safer/more manageable platform by ISV's/OEM's/Corps.

Implication: - have to present unifying plan
(i.e reduce current plethora)
for API's and DD's over time.

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2.3.2 Summary of Implications

In order of priority:

- Secure desktop with a personal GUI solution that builds on our strength
  - high-volume applications
  - DOS heritage

- Secure the RISC workstation early:
  - Provide offering early in growth cycle of RISC
  - Compete by offering a clear migration path for high-volume desktop applications

- Secure the server with full-featured server OS (scaleable, portable, secure, high-performance, etc.)

- Compete with and be differentiated from UNIX
  - be LAN enabled (client and server)/LAN friendly (admin.)
  - be portable, secure, etc.
  - have unique features

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3. PRODUCT PLAN

3.1 Key Priorities

1. Windows - keep strong, focus on size/performance/ease-of-use on 1-2 MB systems, provide migration path to OS/2

2. Complete OS/2 2.0:

   - position towards the "high-end," connected user (performance/capacity, LAN enabled)
   - make a "superset" of Windows:
     - runs Windows applications
     - as good as Windows in ease of use, polish, and completeness ("Hydroplane" list)
     - upgrade ease of migration from DOS/Windows
   - get done in 1990
   - get IBM, key H/W vendors to bundle on high-end machines (e.g. 386/33, 486)

3. NT OS/2 - establish as offering for new platform types ASAP:

   - RISC & MP 386
   - initially make 32-bit only to reduce development time
   - later add 16/32 compatibility with Windows and 16-bit OS/2 compatibility
   - focus on features tangible to end user that will continue to differentiate OS/2 as the "high-end": e.g. new file system functions, security, performance/capacity
   - IBM to start RIOS project asap

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3.1 Key Priorities (con't.)

4. Keep DOS protected with size/performance/ease-of-use features– no major function, but timely releases

5. Don't do Cutter

   - 16-bit API's already dead-ended
   - 32-bit API's will be available with Cruiser
   - forecast does not support continued investment in 16-bit OS/2

	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
80286		21%	6%	3%	0%	0%
80386		79%	83%	56%	66%	57%
80486		0%	11%	27%	19%	25%
RISC		0%	0%	14%	15%	17%
Total OS/2 Sales (000s)	74	160	850	1,800	3,600	5,100

6. Don't do Yawl

   - put key ease-of-use functionality into Cruiser
   - then devote development resources to NT base

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3.2 MS Plan Release Summary

3.2.1 Major Release Content Items

1990	1991	1992
DOS 5.0 XMS Driver in BIOS DOS/BIOS from HMA Size reduction Enhanced Utilities **Release to Mfg: 8/90**	**DOS 6.0** Performance/size Control Panel Enhanced Shell NLS **Release to Mfg: 4Q91**	**DOS 7.0**
Windows 3.0 Single version Memory mgmt. Improved Shell **Release to Mfg: 3/90** **Windows 3.1** Multimedia Royal Fonts NLS **Release to Mfg: 11/90**	**Windows 4.0** Scaleable memory/ performance OO shell Connectivity **Release to Mfg: 4Q91**	**Windows 5.0**

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3.2.1 Major Release Content Items (con't.)

1990	1991	1992
OS/2 2.0 "POR" + Performance Fix Printing Improved Install Porthole LAN ready Release to Mfg: 12/90	OS/2 3.0 386 MP Support on 386 Based on NT kernel 32-bit API only Release to Mfg: 1/92	OS/2 3.1 386 16-bit PM MVDM KBD/VIO/MOU Porthole Unattended Ops. Release to Mfg: 11/92
	OS/2 3.0 RISC OS/2 support on selected RISC uni- processors C2 Security POSIX Release to Mfg: 11/91	OS/2 3.1 RISC MP Enabled Release to Mfg: 1/93
	OOPS 1.0 Windows + OS/2 Building Block Frameworks User Interface Frameworks User Interface Editor Release to Mfg: 9/91	OOPS 2.0 Release to Mfg: 4/93

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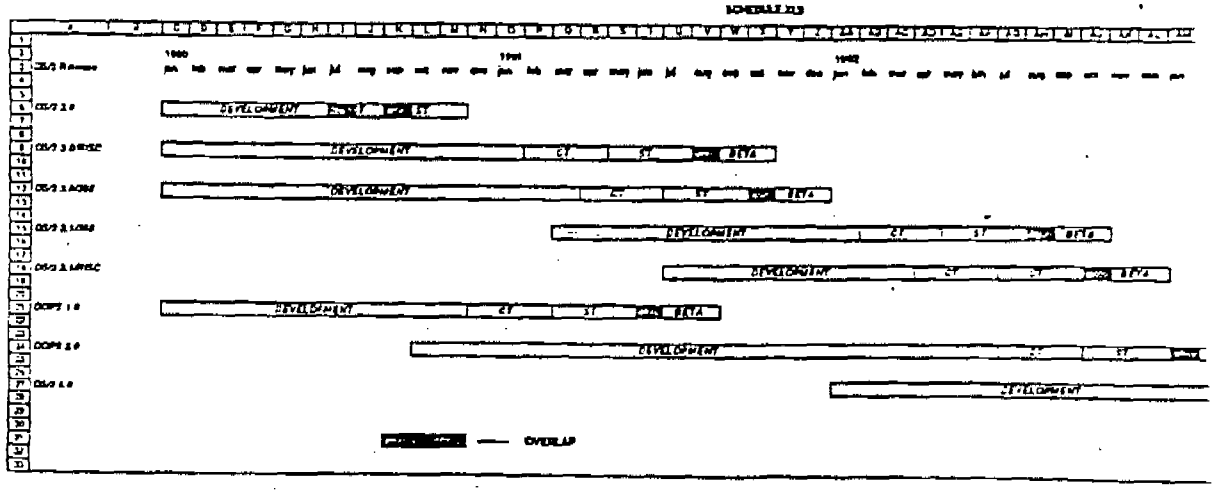
3.2.2 Release Schedule



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3.2.3 Headcount Summary

	90				91				92			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Developers:												
DOS 5.0	12	12	3									
DOS 6.0	3	3	12	15	15	15	15					
DOS 7.0								15	15	15	15	15
Win 3.0	25	3										
Win 3.1		12	12	8								
Win 4.0		10	13	17	25	25	25	25				
Win 5.0									25	25	25	25
OS/2 2.0	81	81	69	27								
NT OS/2 3.0	38	38	50	79	91	77	57	17				
NT OS/2 3.1				8	18	31	55	85	86	74	55	17
OS/2 4.0							0	11	27	39	59	100
OOPS	8	8	8	13	19	19	15	14	14	14	13	10
Total Development	167	167	167	167	167	167	167	167	167	167	167	167
Total Test, Build, & Other	101	110	110	110	110	110	110	110	110	110	110	110
Total User Education	43	49	49	49	49	49	49	49	49	49	49	49
TOTAL HEADCOUNT	311	326	326	326	326	326	326	326	326	326	326	326

6. BACKUP

A. THE ENVIRONMENT:

1. KEY HARDWARE/PLATFORM FACTORS

a. **Processor/Platform Sales Growth (in M's):**

Processor		1989	1990	1991	1992
	actual				
86		4.4	1.8	1.0	0.5
% 86's		34%	14%	7%	4%
286		6.5	6.4	5.0	3.7
% 286's		51%	48%	37%	27%
386SX		0.0	1.7	2.9	3.7
386		1.9	3.0	3.8	4.4
486			0.2	0.6	1.0
% 386's		15%	37%	53%	65%
RISC		0.0	0.1	0.3	0.7
% RISC		0%	1%	2%	5%
TOTAL		12.8	13.2	13.6	14.0
% growth	3%		3%	3%	3%

Notes:
1. Years are MS Fiscal (Jul->Jun)
2. Source: IDC plus MS
3. RISC = RISC machines costing < $50K

IMPLICATIONS:
1. Strong shift to 386, 486 over plan period (28% to 54%)
2. 286 peaks but remains substantial
3. Shift to 386 might be even faster among corporate and institutional buyers, based on survey of planned 1990 purchases
4. RISC starts to grow
5. Industry growth moderates

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b. Change in Platform Types:

Typical "PC" HW Manufacturer Product Line:

1990	1992
Laptop (86/286, 8ty pwr)	Laptop (386LP, VGA, HD, 8ty pwr)
Desktop (286/386, VGA, HD)	Desktop (386SX, 386, Super VGA, HD)
Server (386, large disks)	Server (486, larger disks)
MP Servers	Notebook (small form factor, writing)
	MP Servers (1-8 x 486's, fault tolerant)
	RISC Workstation (RISC, 8MB, 1Kx1K graphics)

IMPLICATIONS:

1. "PC" H/W manufacturers will extend downwards and upwards with product lines.
2. Growth/profit will come from new platform types (Notebook, MP Server, RISC)
3. More important than ever to have system software product line that:
   a. covers low to high end
   b. covers new platform types

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c. Capability growth:

System List Price	$1000		$3000	
	1990	1992	1990	1992
Processor	86/286	386SX	286/386SX	386SX/386
Memory	1MB	2MB	2MB	4MB
Hard Disk	-	30MB	40MB	80MB
Display	VGA	VGA	VGA	Super VGA
Market Share by units	20%	25%	55%	45%

System List Price	$6000		$15000	
	1990	1992	1990	1992
Processor	386/25	386-33,486,RISC	386/33	2x486,RISC
Memory	4MB	8MB	8MB	16MB
Hard Disk	60MB	120MB	360MB	1GB
Display	VGA	Super VGA/1Kx1K	1Kx1K	1Kx1K
Market Share by units	24%	25%	1%	5%

KEY IMPLICATIONS:

1. Bulk of market moves from 286/386SX to 386(SX)/4MB.
2. Growth occurs in low and high end.

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d. Derivation of "POR" Operating System forecast

	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994
Total Shipments	13,200	13,600	14,000	14,400	15,300
IBM Market Share	21%	23%	24%	25%	28%
IBM Shipments	2,772	3,128	3,360	3,600	4,284
Other OEM Shipments	10,428	10,472	10,640	10,800	11,016
DOS shipments on new machines					
8086/8	100%	100%	100%	100%	100%
80286	100%	100%	100%	100%	100%
80386	100%	100%	100%	95%	80%
80486	100%	100%	80%	75%	75%
Windows shipments on new non-IBM machines					
80286	25%	40%	50%	50%	50%
80386	25%	50%	40%	30%	20%
80486	0%	10%	10%	10%	10%
OS/2 shipments bundled with non-IBM hardware					
80286	0%	0%	0%	0%	0%
80386	0%	0%	0%	5%	20%
80486	0%	0%	20%	25%	25%
RISC	0%	0%	10%	25%	25%
OS/2 per-copy shipments by OEM's					
80286	0.25%	1%	1%	1%	0%
80386	1.25%	10%	10%	15%	5%
80486	0%	15%	20%	10%	15%
RISC	0%	0%	20%	15%	20%

Additional sources:

1. Windows retail sales forecasts estimated for FY90 and FY91; 25% annual growth thereafter.

2. IBM OS/2 sales derived from IBM's OS/2 forecast, with IBM's share assumed to be 50% of their total.

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B. PRODUCT PLAN

Planning Assumptions

Development

- Productivity assumptions:

-	new code	0.5 KLOCS/man-month
-	converted code	0.8 KLOCS/man-month
-	ported code	1.5 KLOCS/man-month

- Development resources required to support Component Test phase is 90% of the resources during the development phase.

- Development resources required to support System Test phase is 70% of the resources during the development phase.

Component Test

- CT will require approximately 50% of the development resources.

- CT development starts at mid point of the project development.

- CT resources required to support System Test phase is 50% of the resources during the component test phase.

System Test

- 20 system testers are needed for a major release for 6 month of development and 4 months of system test phase.

- 6 system testers are needed for a minor release for 1 month of development and 3 months of system test phase.

Other Assumptions

- Cruiser development resources are kept constant through 7/90.
- Cruiser will not require any development support after 11/90.
- RISC hardware is available for development and test by 8/90.
- NT 3.0 386 will not support 16-bit PM applications and MVDM.

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RELEASE: DOS 5.0

RELEASE OBJECTIVES:

Get market to single DOS version:

Reduce DOS resident base memory requirements while improving performance
Add/Enhance utilities
MS-DOS Upgrade Package
App/net/3270 compatibility (except Pclp redir)

PROJECT MILESTONES:

Dev Start: underway
Beta Test Entry: 5/90
Release to Manufacturing:8/90

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
XMS Driver in BIOS		
Run DOS/BIOS from HMA		
Size reduction of Resident Dos		
Shell		
Install		
New/Enhanced Utilities		
Disable 4.0 IFS		
Total	41.4 man-months 21 KLOC's	7.0 man-months 3.5 KLOC's

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RELEASE: DOS 6.0

RELEASE OBJECTIVES:

Size, performance, and usability enhancements:

Reduce size while improving performance
Hardware specific versions
Make cloning DOS difficult
Make Dos more human
Consistency with Windows and OS/2 (in that order)
Multi Platform NLS Solution
Modular/Configurable Kernel
App/Net/3270 compatibility

PROJECT MILESTONES:

Dev Start: underway
Beta Test Entry: 2 Q CY '91
Release to Manufacturing: 3 or 4 Q CY '91

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
Performance/size		
Help (On-line)		
Single NLS Strategy		
DOS Control Panel		
Full Screen Editor		
Combined Win/DOS Install		
Enhanced Command.com		
Enhanced/New Utilities		
Rom Issues		
Shell Enhancements		
Long Filenames		
Subtotal	102 man-months 51 KLOC's	101 man-months 51 KLOC's
Other	TBD	TBD
Capacity	174	

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RELEASE: Windows 3.0

RELEASE OBJECTIVES:

Address major problems with 2.x:

More memory for Win apps, networking/3270
Improve performance
Sexy
Significant advances in aesthetics/usability
Enhance connectivity (3270/nets)
Make it is easier to install/configure
Provide additional support for printers, displays, computers
Architecture to support multimedia

PROJECT MILESTONES:

Dev Start: 5/88
Beta Test Entry: 8/89
Release to Manufacturing: 3/90

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
win386/286 issues		
Printer Drivers		
Display Drivers		
Kernel/User/GDI		
Shell		
Net		
Setup		
Desktop Apps		
SDK/DDK		
Control Panel/Spooler, etc		
OEM/ISV support		
WinOldApp		
Total Win 3.0 Dvlp (internal)	450 man-months 225 KLOC's	0 man-months 225 KLOC's
Externally developed	400 man-months	0 man-months

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RELEASE: Windows 3.1

RELEASE OBJECTIVES:

Multimedia
DBCS
Royal font engine
Address/correct urgent product problems as they arise
Begin process of merging DOS and Windows

Constraints:

No major Code restructure
no major metaphor changes
don't break drivers or apps
2 calendar months for development
Win 3.0 app/net/3270 compatibility

PROJECT MILESTONES:

Dev Start: 4/90
Beta Test Entry: 7/90
Release to Manufacturing: 11/90

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
Bug Fixes as needed by Market Fast Disk for 386 mode Multimedia Enabled DBCS Enabled Royal Fonts on the Fly DOS/Win Common Install		
Subtotal	47 man-months 24 KLOC's	47 man-months 24 KLOC's
Other	TBD	TBD

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RELEASE: Windows 4.0

RELEASE OBJECTIVES:

Retain 1 mbyte design goal
Scaleable memory/performance
Consistent personal metaphor (new shell, enhance UI)
Continue to be sexy
Complete environment (with DOS) from power on to power off
- DOS integration (utilities in Windows)
- Network
- 3270

Improved developer environment
Improved end user control of environment (configurable)
Portable/Laptop support (rommable, power management)
Continue to extended supported hardware (printers, displays, computers)
Win 3.0 app/net/3270 compatibility

PROJECT MILESTONES:

Dev Start: 3Q CY '90
Beta Test Entry: 3Q CY 91
Release to Manufacturing: 4Q CY 91

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
Performance/Size Tuning		
Laptop/Portable		
New Shell/Interface/enhance UI		
NLS support		
DPMI support library/loader		
Improve Graphical/Color Services		
Improved Connectivity (3270/NET)		
Improve SDK/DDK		
Other - TBD		
Internal development capacity	600 man-months	600 man-months

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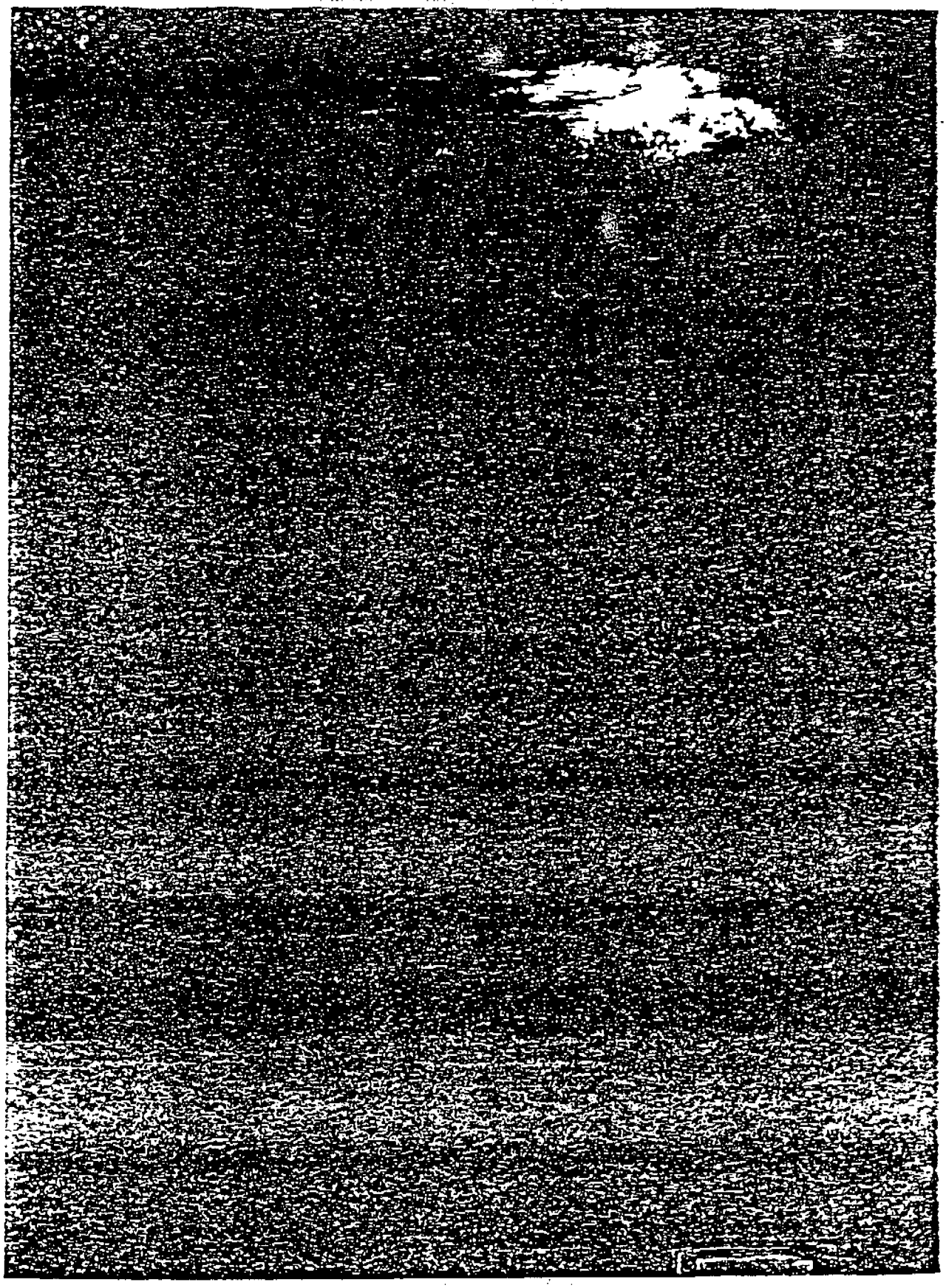

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RELEASE: OS/2 3.0 386

RELEASE OBJECTIVES:

Competitive Server offering to UNIX on MP 386 machines:

32-bit only

PROJECT MILESTONES:

Dev Start: underway
System Test Entry: 7/91
Release to Manufacturing: 1/92

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
Kernel	12	12
Device Drivers	53	53
PM	31	31
TOTAL	96	96

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RELEASE: OS/2 3.1 386

RELEASE OBJECTIVES:

Support Cruiser functionality on NT base

16-bit PM applications
MVDM
KBD/VIO/MOU
Porthole

Enhanced functionality

Unattended ops.

PROJECT MILESTONES:

Dev Start: 3/91
System Test Entry: 5/92
Release to Manufacturing: 11/92

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
MVDM	37	37
KBD/VIO/MOU	39	39
Unattended Ops.	20	20
Other Base	27	27
16-bit PM	5	5
Porthole	25	25
Misc. Improvements/ Contingency	100	100
TOTAL	253	253

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RELEASE: OS/2 3.1 RISC

RELEASE OBJECTIVES:

MP Enabled

PROJECT MILESTONES:

Dev Start: 7/91
System Test Entry: 7/92
Release to Manufacturing: 1/93

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
Performance		
MP enabling		
Contingency		
Total	100	100

40

2/4/90

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RELEASE: OOPS 1.0

RELEASE OBJECTIVES:

Object-oriented development tools under OS/2 and Windows

Competitive with UNIX (Next)

PROJECT MILESTONES:

Dev Start: underway
System Test Entry: 3/91
Release to Manufacturing: 9/91

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
Building Block Framework		
User Interface Framework		
User Interface Editor		
Total	80	50

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RELEASE: OOPS 2.0

RELEASE OBJECTIVES:

Object-oriented development tools under OS/2 and Windows

Competitive with UNIX (Next)

PROJECT MILESTONES:

Dev Start: 10/90
System Test Entry: 9/92
Release to Manufacturing: 4/93

SIZING:

Item:	KLOC /Effort Total	KLOC/Effort to go
Total	50	50

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Bridge from IBM Booked Plan

CRUISER

IBM Plan	KLOC's	MS Plan
BASE OS		
32 BIT DOSCALLS(NO VIO/KBD/MOU)	37K	OS/2 2.0
32 BIT APPL ENABLING	80K	OS/2 2.0
PERFORMANCE TOOL HOOKS	2K	OS/2 2.0
NLS:KBDS - ICELAND,TRKY,LTN2	17K	OS/2 2.0
MVDM	67K	OS/2 2.0
MVDM ENHANCEMENTS	6K	OS/2 2.0
PERFORMANCE/LIMITS	11K	OS/2 2.0
RAS:SA DMP, DYN TRC PTS	22K	OS/2 2.0
HARDWARE:SCB/DASD EXPLOIT	13K	OS/2 2.0
SLOOP DCR ROLLOVER	15K	OS/2 2.0
MEMORY REDUCTION	9K	OS/2 2.0
MULTI LANG SUPPORT	2K	OS/2 2.0
SHELL		
MVDM,LANMAN DCRS	3K	OS/2 2.0
HELP MANAGER		
MISC. ENHANCEMENTS	7K	OS/2 2.0

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CRUISER (con't.)

IBM Plan	KLOC's	MS Plan
PRESENTATION MANAGER		
NLS:KBDS(ICELAND,TRKY,LTN2)	5K	OS/2 2.0
32 BIT API	7K	OS/2 2.0
PERFORMANCE/LIMITS/VISUAL	11K	OS/2 2.0
MVDM	1K	OS/2 2.0
MVDM ENHANCEMENTS	6K	OS/2 2.0
MEMORY REDUCTIONS	8K	OS/2 2.0
LANMAN SPOOLER	7K	OS/2 2.0

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IBM Plan	KLOC's	MS Plan
BASE OS		
UNATTENDED OPS	46K	OS/2 3.1
SPECIAL NEEDS	4K	NIP
HARDWARE SUPPORT	10K	NIP
OOPS HOOKS	1K	OS/2 2.0
FULL SCREEN BIDI	18K	OS/2 3.1
SHELL		
WORKPLACE	30K	OS/2 3.0
TUTORIAL	5K	OS/2 3.0
HELP MANAGER		
WORKPLACE	5K	NIP
PRESENTATION MANAGER		
SHELL DEPENDENCY	6K	OS/2 3.0
NETVIEW/PC HOOKS	2K	OS/2 3.1
IMAGE/IDOCA	5K	OS/2 3.1

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IBM Plan	KLOC's	MS Plan
BASE OS		
NETWORK DCRS	5K	NIP
SHELL		
CRUISER SHELL	1K	NIP
HELP MANAGER		
CRUISER FUNCTION	1K	NIP
PRESENTATION MANAGER		
LANMAN SPOOLER	1K	NIP
PM NETVIEW PC HOOKS	9K	NIP
MEMORY REDUCTION	13K	NIP

2/4/90

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OUTBOARD

IBM Plan	KLOC's	MS Plan
BASE OS		
PORT NT OS/2 TO IBM X86	12K	OS/2 3.0
IBM DEVICE SUPPORT	27K	NIP
X86 COMPATIBILITY	145K	OS/2 3.1
SPECIAL NEEDS	4K	OS/2 2.0
GREEK/CYRILLIC(14K VENDED)	16K	OS/2 3.0
CODE PAGE FILE TAGGING	3K	OS/2 3.1
LOGICAL VOLUME MANAGEMENT	7K	OS/2 3.1
SYSTEM MANAGEMENT	30K	OS/2 3.1
HARDWARE SUPPORT	10K	NIP
C2 SECURITY	?	OS/2 3.0
MULTIMEDIA KERNEL SUPPORT	?	OS/2 3.1
SHELL		
PM BIDI	3	OS/2 3.0

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OUTBOARD (con't.)

PRESENTATION MANAGER

NETVIEW PC HOOKS	2	NIP
PM DEVICE DRIVERS(BOCA)	41K	NIP
16 BIT PM SUPPORT	10K	OS/2 3.1
NLS FONTS(3K VENDED)	5K	OS/2 3.0
PM BIDI(3K VENDED)	18K	OS/2 3.0
IMAGE/IDOCA	1K	OS/2 3.0

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API Path

	1990	1991	1992
DOS 16-bit API	DOS 5.0 WIN 3.0, 3.1 OS/2 2.0	DOS 6.0 WIN 4.0 OS/2 2.1	DOS 6.0 OS/2 3.1 /386
WIN 16-bit API	WIN 3.0, 3.1 OS/2 2.0	WIN 4.0 OS/2 2.1	OS/2 3.1 /386
OS/2 16-bit API	OS/2 1.2 OS/2 2.0	OS/2 2.1	
OS/2 32-bit API	OS/2 2.0	OS/2 2.1 OS/2 3.0 /386 OS/2 3.0 /RISC	OS/2 3.1 /386 OS/2 3.1 /RISC
OO Support		WIN 4.0 OS/2 2.1 OS/2 3.0 /386 OS/2 3.0 /RISC	OS/2 3.1 /386 OS/2 3.1 /RISC
Multimedia	WIN 3.1	WIN 4.0 OS/2 2.1	WIN 5.0 (?) OS/2 3.1 /386 OS/2 3.1 /RISC

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LAN Support

	1990 LanMan 2.x	1991 LanMan 2.x	1992 LanMan 3.x
Clients	DOS/WIN OS/2 1.x OS/2 2.x	DOS/WIN OS/2 1.x OS/2 2.x	DOS/WIN OS/2 1.x OS/2 2.x OS/2 3.x
Servers	OS/2 1.x OS/2 2.x	OS/2 1.x (?) OS/2 2.x	OS/2 3.x

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C. The Competition

A. UNIX COMPETITORS:

1. AT&T:

Product: UNIX System V.4

- Merger of AT&T System V.3.2 and SunOS (Berkeley BSD 4.2)
- X/Windows + AT&T Openlook GUI
- NFS, TCP, ISO

Pricing: OEM license: 1% of hardware list or 10% of software list

X/Windows + Openlook:

Positioning:

- UNIX is scaleable and portable - 1 set of API's up, down, across the line.
- UNIX implements "open standards". (vendor independence, blessed by govt.)
- UNIX is state-of-art (32bit, etc).
- UNIX is better at networking.
- UNIX can run DOS Apps.
- V.4 is the "standard" version of UNIX - all important strains are united (UNIX, XENIX, BSD)

Market Share: Desktops: < 1% (including SunOS)

Servers: 5%

Strengths:

- complete, portable product line
- "open" image

Weaknesses:

- no binary standards, UNIX market is fragmented
- lack of large/personal productivity application base
- coverage of PC h/w spectrum today
- not "personal" (easy to configure, install, etc.)
- V.4 is not "state of art", will need new kernel for MP, etc.

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2. Santa Cruz Operation (SCO):

Products: SCO System V.3.2 - multiuser, packaged UNIX

SCO Open Desktop - above packaged with X/WIN, Motif, NFS/TCP, Ingres DB and packaged for desktop (single install, etc).

Pricing: Base : $695 1-2 users, $895 unlimited users

Open Desktop: $995 1-2 users, $1595 unlimited users (retail prices)

Positioning:

- Combine advantages of UNIX (above) with Binary Standard for PC's.
- Complete ready-to-use product.
- Ease of use, installation.
- Market Share on PC Platforms

Market Share: Desktops: 1%

Servers: 3%

Strengths:

- Good support of reseller channel
- Complete, ready-to-use product

Weaknesses:

- As above for UNIX - lack of application software (particularly graphical), and lack of coverage of h/w spectrum.
- Suffer in wake of AT&T release "churn".

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3. SUN Microsystems:

Product:

SunOS for SUN SPARC Station

Pricing:

$600 per license (retail)

Positioning:

- the "next" PC Platform
- Binary standard platform
- RISC Performance
- UNIX "umbrella" Advantages
- "PC" prices

Market Share:

Desktops: <1% (incl. AT&T)

Servers: 2%

Strengths:

- Complete design - sw and hw available.
- SUN installed base to lever off.

Weaknesses:

- UNIX issues (lack of application software, etc)
- Industry not buying into their strategy -
  SPARC not becoming RISC processor of choice.

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4. NeXT

Product:

NeXTOS for NeXT workstations

Pricing:

Sold bundled with $10K base system

Positioning:

- First complete, affordable, easy to use UNIX machine.
- Binary standard ala Macintosh.
- The "next generation" of everything (sound, disks, etc).
- The platform for "interpersonal computing".
- Easy to develop graphical apps.
- MP-enable kernel

Market Share:

Desktops: negligible

Servers: negligible

Strengths:

- Binary standard
- Strong marketing push
- Image of Hi-Tech
- WYSIWYG with DisplayPostscript

Weaknesses:

- UNIX issues.
- Not radical enough.
- Single sourced.

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B. DOS Clones & Extenders

1. QUARTERDECK

Products: DESQVIEW

QEMM 386

Pricing:

DESQVIEW $129
QEMM $59

Positioning:

- 85% of capabilities of OS/2
- DOS-BASE/Cheap
- Consistent U on all x86 platform
- Great memory management for DOS Systems (VCPI; QEMM)

Current/Future Penetration:

1989 1%
1992 5%

Strengths:

- Provides benefit to DOS-character mode users.
- Leverages market inertia
- Good technical leadership
- VCPI switcher

Weaknesses:

- Going against the GUI/Pmode tide
- Limited resources

Key Implications:

- MS/IBM solutions have to meet market requirements
- MS/IBM solutions need to address entire market

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2. RATIONAL/PHARLAP DOS EXTENDERS

Products: Rational 16-Bit DOS extender

Pharlap 32-Bit DOS extender

Pricing:

Rational: $5000 for developer's kit and license for $200 copies

Pharlap: $495 for developer's kit
$1495 for unlimited distribution license

Positioning:

- Easy/Compatible alternative to solving 640K barrier

Current/Future Penetration:

1989 Rational 2%
Pharlap 4%

1992 Rational 20%
Pharlap 5%

Strengths:

Rational
- Runs on both 286/386
- Lotus 1-2-3 3.0
- Lotus investment

Pharlap
- 32-Bit flat model

Weaknesses:

Both = very limited resources

Pharlap = Borland propping

Key Implications:

- A real market factor to deal with given LOTUS

- MS/IBM position on DOS extenders is soft

- Potential tension of limited outer strategic direction

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3. DIGITAL RESEARCH

Product: DR. DOS 3.41

Pricing:

$69 (packaged product)

Positioning:

- Cheap compatible DOS
- Rommable
- Enhanced usability

Current/Future Penetration:

1989 2%
1992 1%

Strengths:

- Reasonably functional clone
- Rommable
- MS/IBM DOS 4.0 is weak
- Responsive to customers
- Enhancements: outline help; full screen edition

Weaknesses:

- Opportunistic vs. strategic
- Compatibility

Key Implications:

- MS/PC-DOS is vulnerable until DOS 3.x/DOS 4.x replaced by single great version
- DOS market requirements expanded/charged given rommable PC's; low-cost PC's

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4. OTHER DOS CLONES

Products:

- Its HI-DOS
- Datalight ROM DOS
- Wendin DOS (U.S.)
- LZ DOS (Brazil)
- IALCOW DOS (Taiwan)
- DIP DOS
- Pirated DOS Copies

Positioning:

Opportunistic

Current/Future Penetration:

1989 10%
1992 10%

Strengths:

- Innovative
- Cheap
- Responsive

Weaknesses:

- Incompatibilities
- Non-Strategic

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C. "Environments"

HEWLETT-PACKARD

Product: HP New Wave

Positioning:

Alternative to Office Vision not another OS

Current/Future Penetration:

1989 0%
1992 4%

Strengths:

- Taps Object-oriented interest
- HP is credible/committed

Weaknesses:

- Luke-warm ISV interest
- HP is not standard-setter technology upside is united

Key Implications:

- MS/IBM need coherent/real object strategy
- MS/IBM need ISV direction soon

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D. Macintosh

Product: System 7.0

Pricing:

Sold bundled with hardware

Positioning:

- Build more OS features under established GUI
  - Outline fonts for better WYSIWYG
  - Virtual memory/demand paging on 68030
  - 32-bit address space (on high-end machines)
  - Interapplication Communication architecture for
    - live copy/paste
    - network messaging
    - user scripting (not in System 7.0)
  - User Interface enhancements
    - "special" directories (e.g. accessory/font) for ease of use
    - tear-off menus
    - more direct object manipulations
  - Links in file system
  - Bundled with mail/CL1 (DB access)
  - Operates in 2-4 MB
- Retain ease of use, user loyalty-- the "Apple Advantage"
- Focus on vertical solution selling for entry into corporations
  - Design & Modelling
  - Information Management
  - Desktop Publishing & Presentations

Current/Future Penetration:

1989 10%
1992 10%

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D. Macintosh (con't.)

Strengths:

- Binary standard– wide body of applications
- Fanatically loyal installed base
- Desktop Publishing standard
- Multimedia tools
- Strong reputation for user-friendly system

Weaknesses:

- Runs only on proprietary hardware
- High price points– no strong low-end machine
- Perceived connectivity weakness
- "New-age" marketing strategy: the "feel" of a Macintosh
- No true multitasking (no protection or preemption)

Key Implications:

- MS/IBM must maintain dominant position on desktop by presenting a coherent GUI story
- Stress advantages of a multi-vendor world

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E. Network Operating Systems

1. Novell

Product: NetWare 386 v. 3.0

NetWare SFT v. 2.15

Pricing:

$8,000 for NetWare 386

Positioning:

- The "de facto" standard, with greater than 50% market share.
- Supports standards (Will have: TCP, ISO, X.400, X.500)
- Runs everywhere (Portable NetWare)

Market share:

60-70%

Strengths:

- Huge installed base
- Performance
- Good reseller support
- ISV support

Weaknesses:

- Proprietary OS
- No directory service (yet)

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2. OSF

Product: DEcorum (An assortment of Distributed Environment technologies)

Pricing:

???

Positioning:

- An open standard
- Chosen from the "best technologies"
- Highly portable and scaleable

Market share:

None today

Strengths:

- Support of heavyweights (IBM, DEC, HP)
- Implements a standard

Weaknesses:

- OSF moves slowly
- Some players might really be more committed to other technology (e.g. DEC/VMS, IBM/OS/2)
- Political compromises could affect product quality

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3. USO

Product: NFS

Pricing:

$1000

Positioning:

- Highly portable
- Standard technology
- Easier to use

Market share:

4 %

Strengths:

- Excellent at file sharing (cheap, small, fast)
- Big vendor support (AT & T, Sun)
- Good distribution (ships with every box Sun ships)

Weaknesses:

- Only a file sharing system (no security, directory, etc.)

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