High Performance PC Directions

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December 1, 1995

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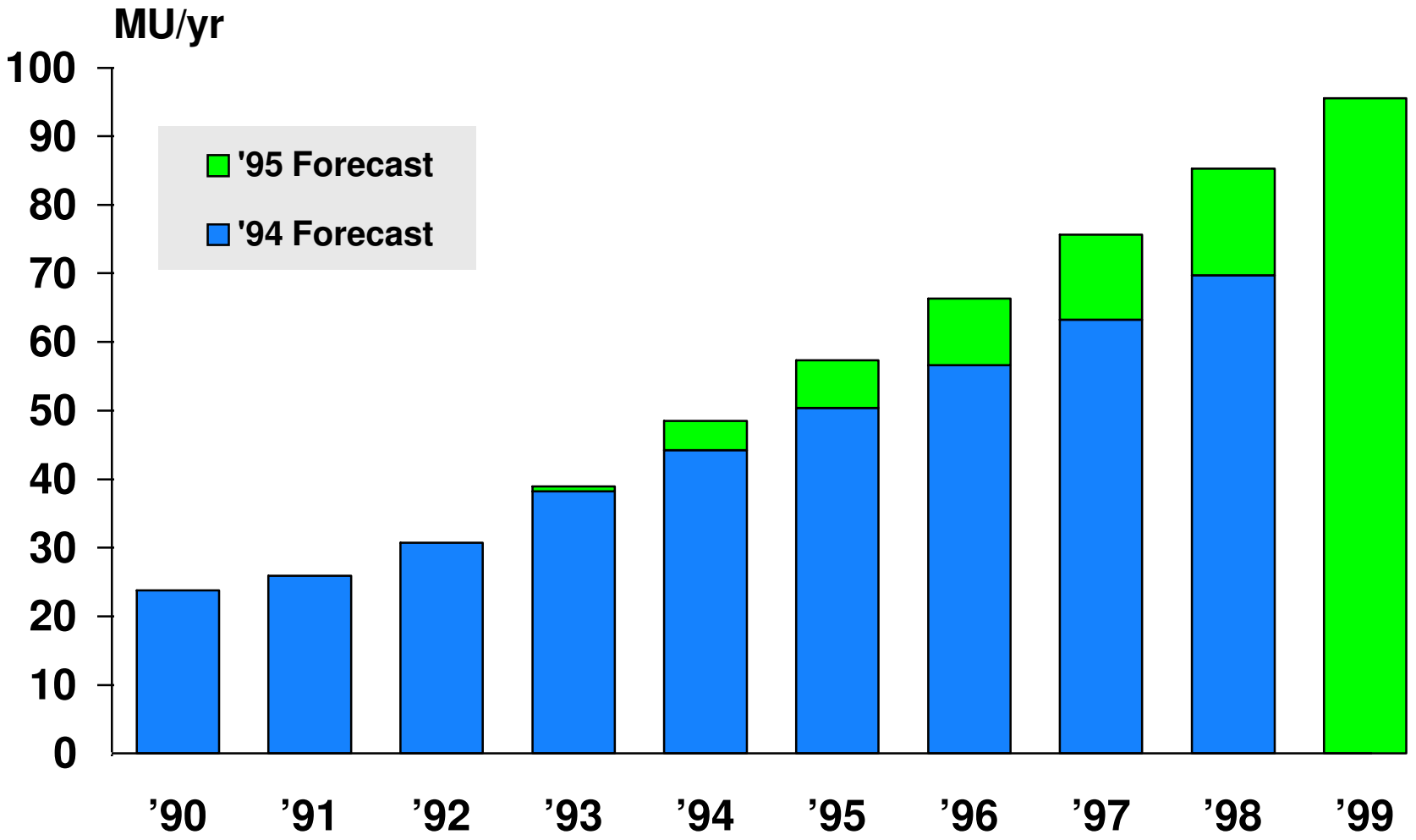
Agenda

- Current Industry Megatrends
- Short-Term Evolution of PC
- Historical View of the Growth in Computing Performance
- Current Microprocessor Performance
- RISC vs CISC - A Postmortem

#1: PC Market Growth



Continued Market Growth Worldwide

Source: IDC

PC Market Trends

World-Wide

	1993	1994	1995est
Apple PC Market Share	11.1%	8.1%	8.0%

But What About 1996?

® Data Source: IDC, 1995

MacWEEK (on Pentium® Pro Announcement)

“The Pentium Pro's SPECmark integer and floating-point numbers leave PowerPC's equivalent values in the dust. . . . Intel has done it again, and like it or not, the Mac will be hard pressed to claim the performance advantages over Windows machines it held for a brief time.” *Mark Hall, editor in chief at MacWEEK*

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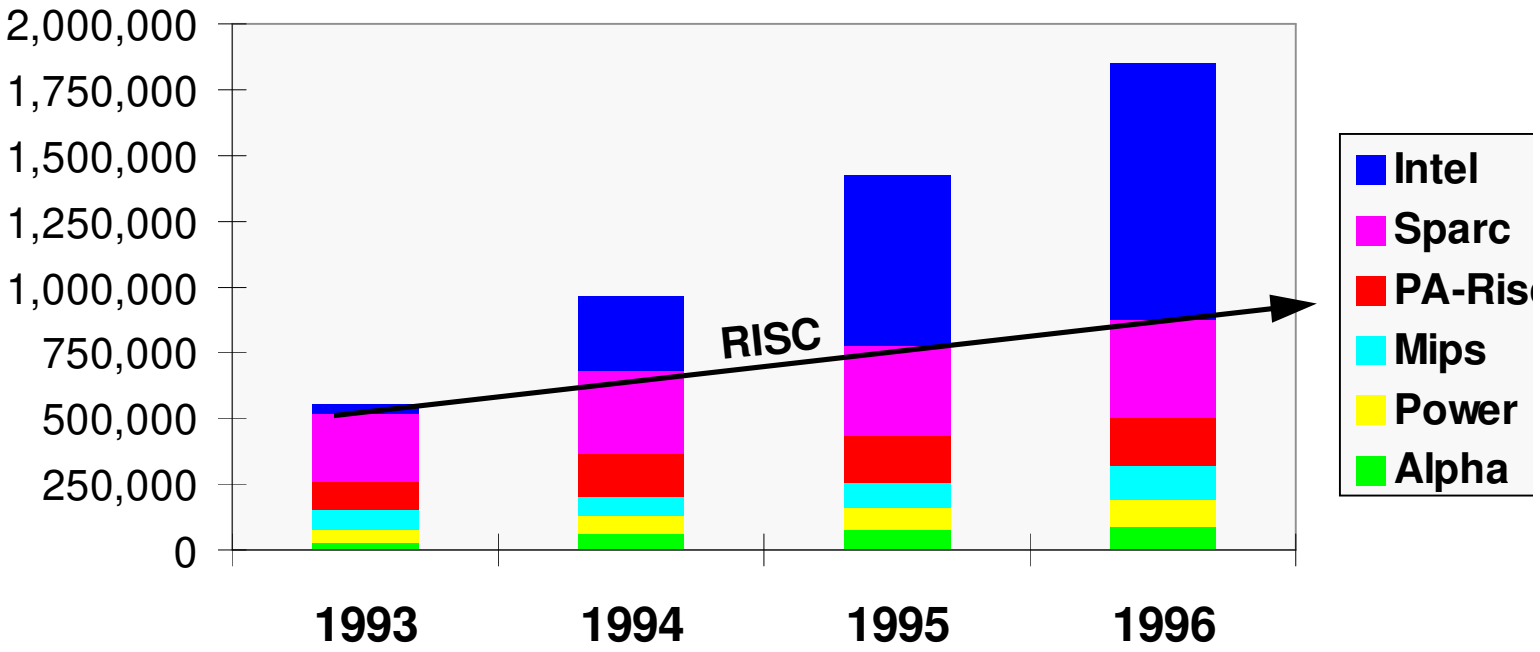
Growth in Workstation Segment 1993-1996

Units/year



- **Modest Growth in RISC Workstations**
- **IA Workstation is now Leader in Segment Share**

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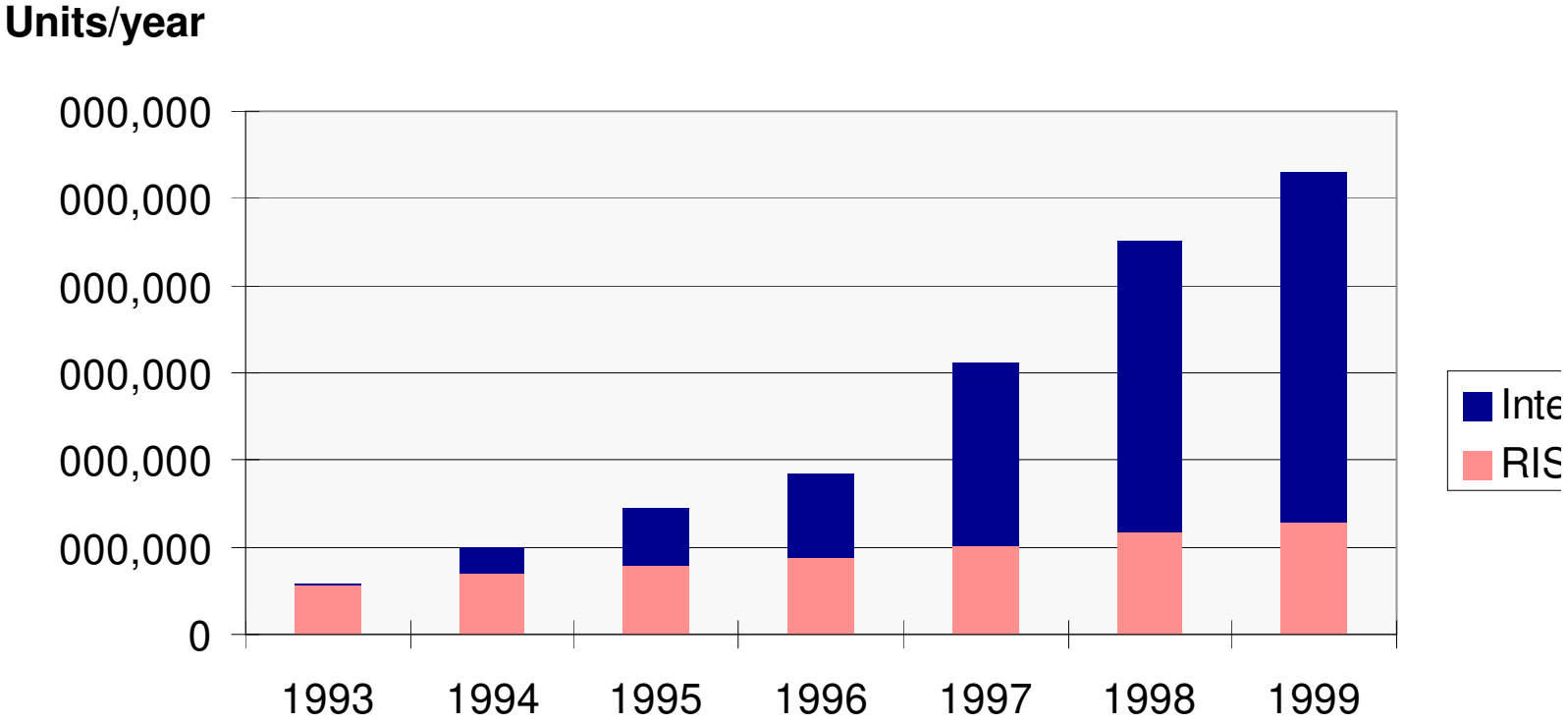
Source: IDC, Octorber 1995

Growth in Workstation Segment 1993-1999: RISC vs. IA



- Continued Modest Growth for RISC Workstations
- IA Workstation Growth Spurts in 1997 due to Completion of Software Ports to IA/NT in 1996

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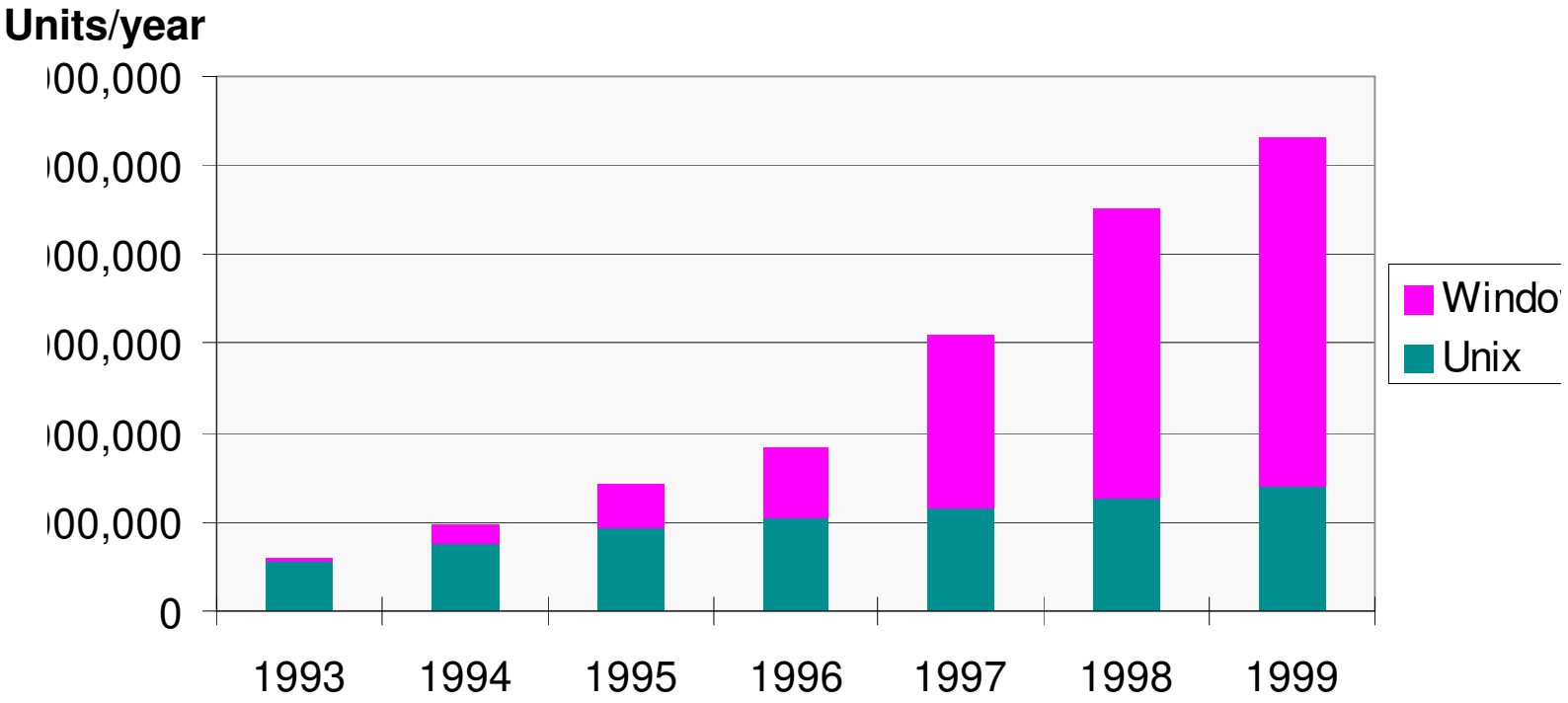
Source: IDC, Octorber 1995

Growth in Workstation Segment 1993-1999: UNIX vs. NT



- NT Becomes the Leading Workstation OS in 1997
- To be Successful, Workstation ISVs will Target IA/NT as Platform of Choice

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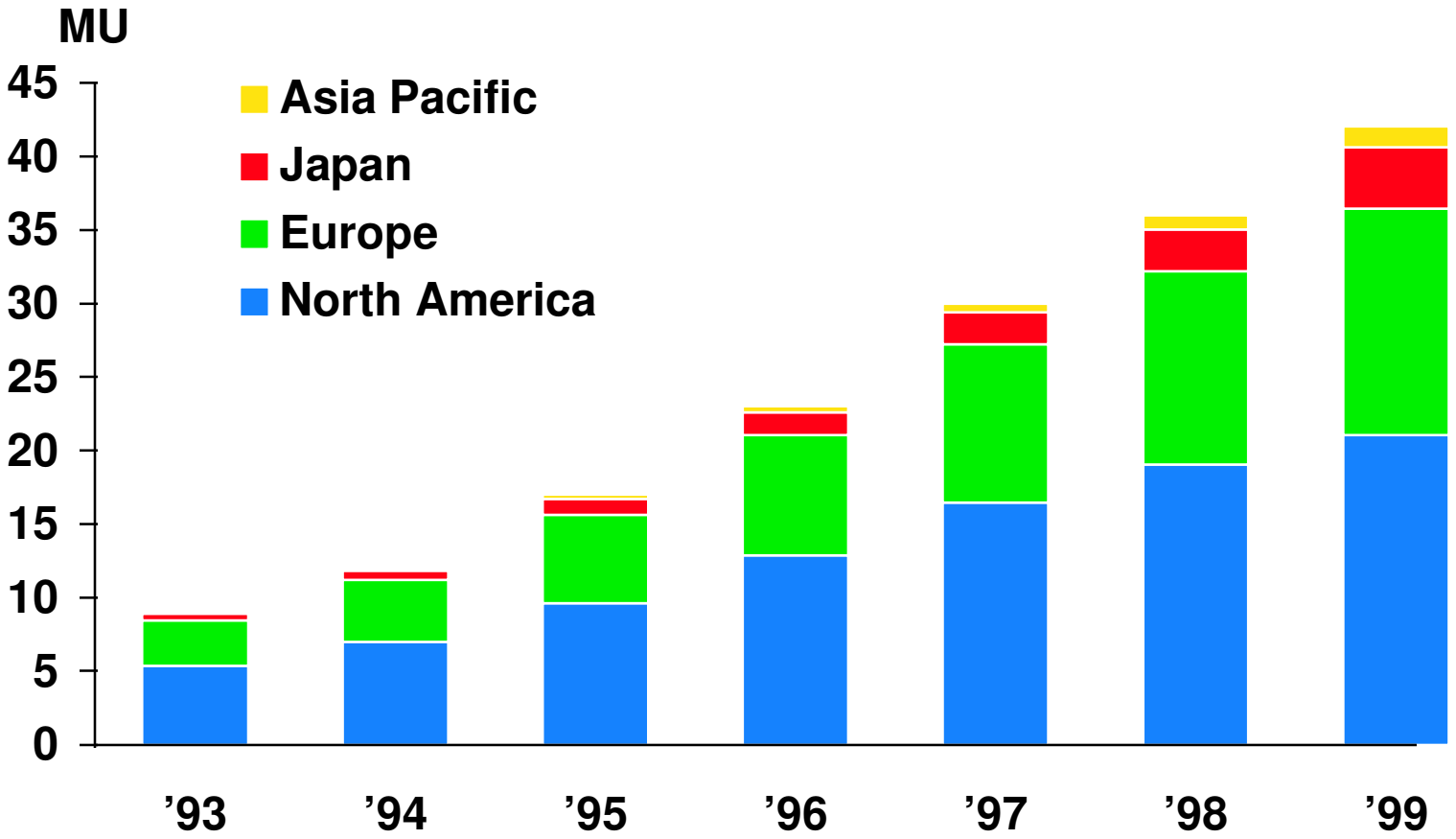
Source: IDC, Octorber 1995

#2: Rapid Increase in PC Shipments to the Home



Source: In-Stat '95

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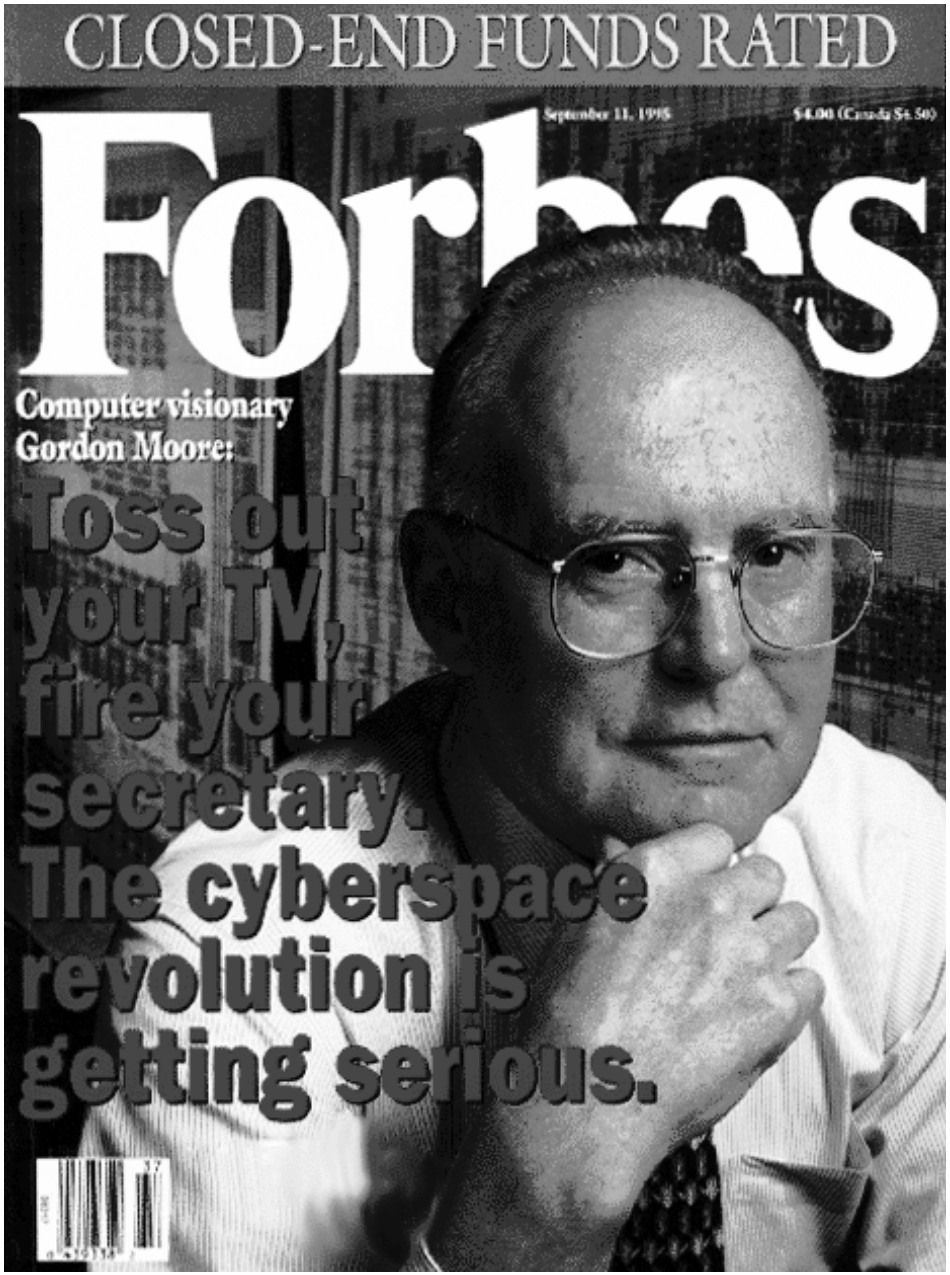

Forbes,
September, 1995

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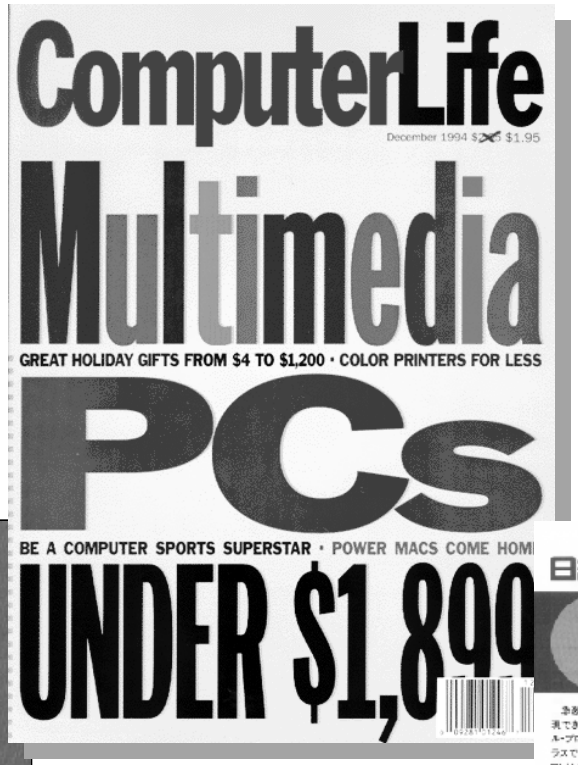
Multimedia Everywhere



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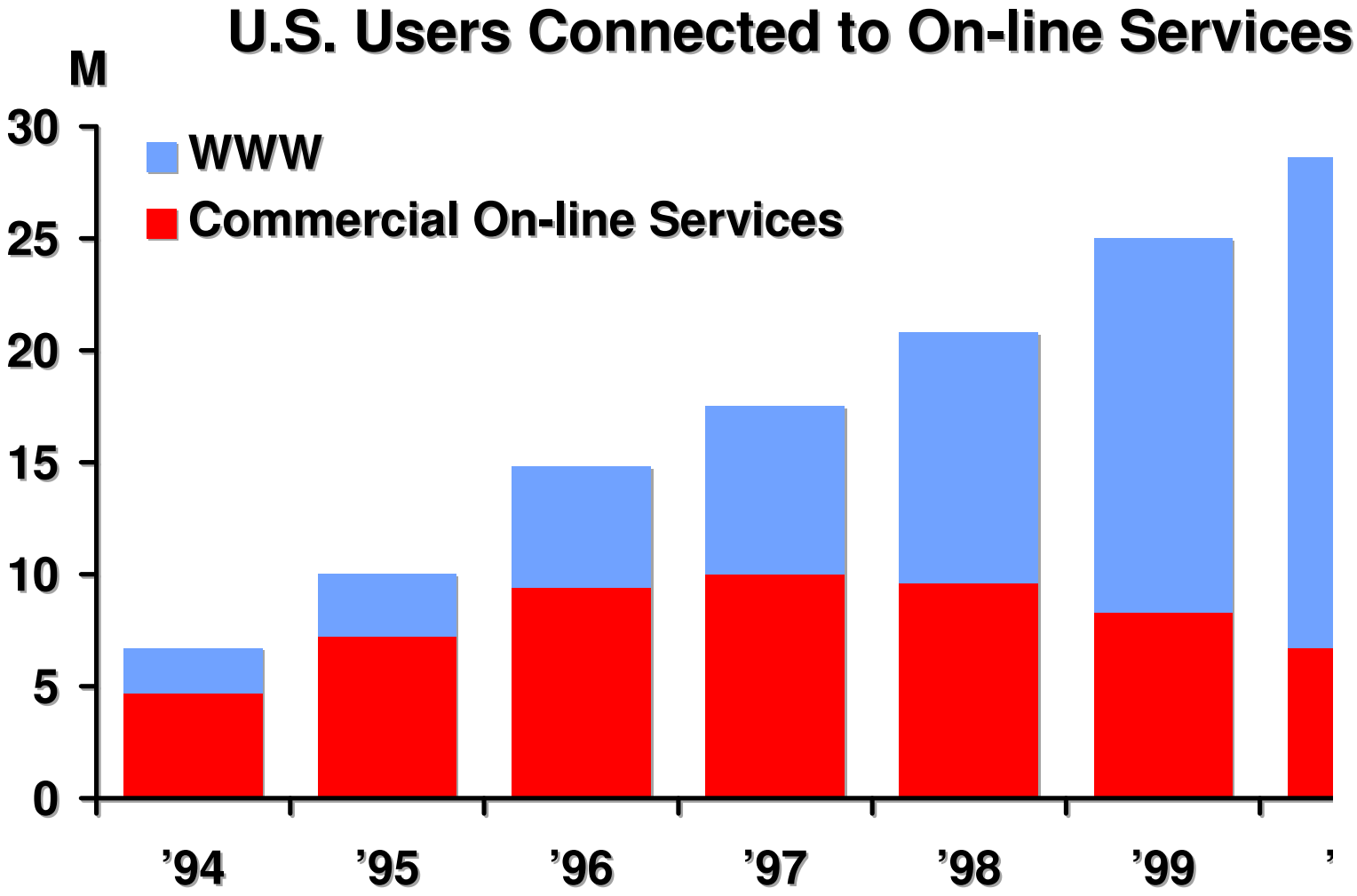
#3: PCs are Connected



Source: Forrester Research

Q1-Q3 Press Coverage

	Stories
Internet	~39,000
OJ	~24,000

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Internet

- Fundamentally Changes to the Way
  - We communicate
  - Do business
  - Get information
  - Are Entertained
- The Pull of the Internet will Accelerate the Deployment of a High-Bandwidth Communication Infrastructure
- The PC is at the Center of This Trend

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Current Industry Megatrends

- Continued High Growth: 100MU/yr by the year 2000
- Home computer = Multimedia: 40MU/yr to homes by 2000
- PCs are connected ➡ PC: the communicating device

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Darwinian Theory

Survival requires adaptation to environmental change

The PC Adapts and Evolves

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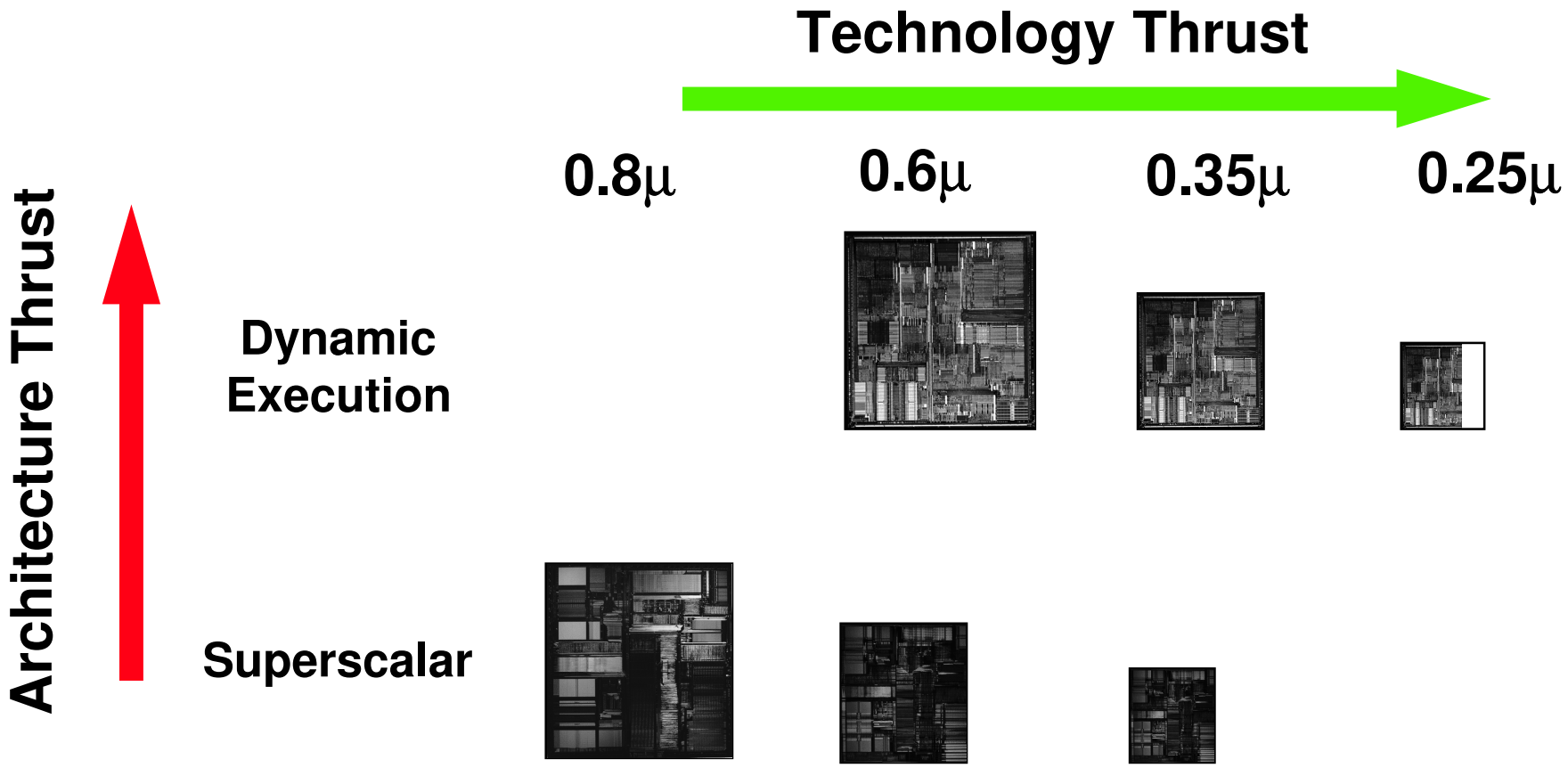
Microprocessor Evolution



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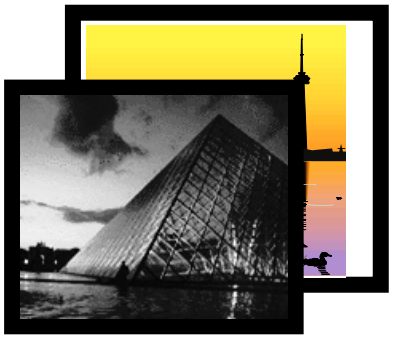
High Performance PC = More Capabilities

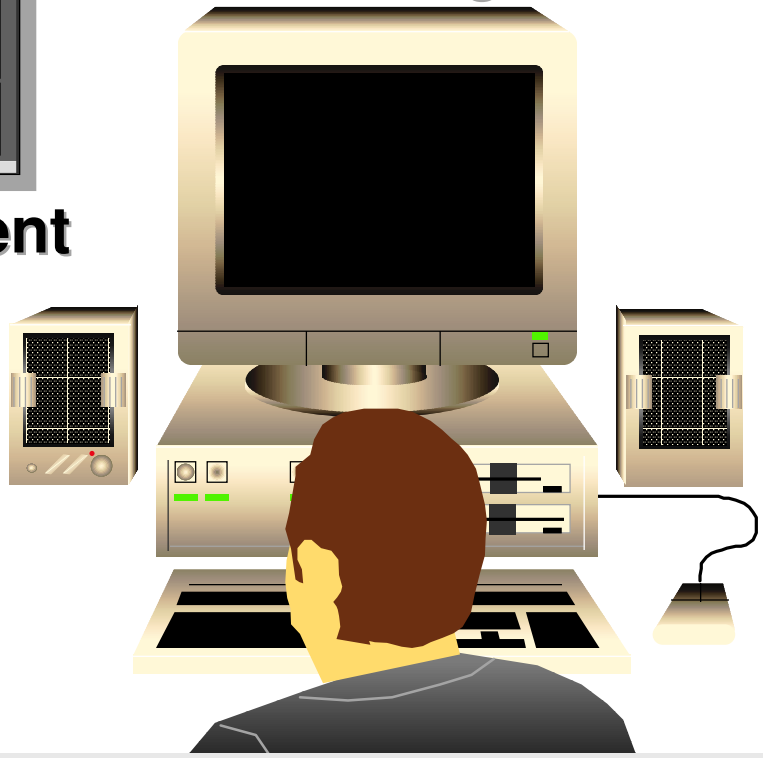
Real-time Content

PC Communication/ Technologies



Pictures

Videos



Music

Robust Multimedia PC Communications is Here

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Desktop Evolution
Features and Capabilities

1995

- 100 MHz Pentium® processor
- PCI
- 8 MB RAM
- 16 bit Audio
- 4X CD-ROM/Speakers
- Windows* 3.11
- 14.4K Fax/Modem

Enables Audio/Video Capabilities on the Desktop

®

Desktop Evolution
Features and Capabilities

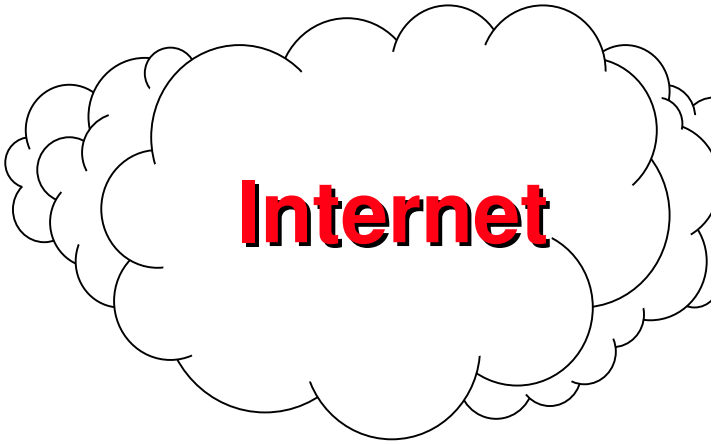
1996

- 150 MHz Pentium® processor
- PCI
- 16 MB RAM
- 16 bit Audio
- 6X CD-ROM/Speakers
- Windows* 95
- Serial Bus
- TV Tuner
- 28.8K Fax/Modem
- POTS video conferencing
- 3D accelerated graphics

Enables Realtime 3D Graphics &
Better Communication Capabilities

®

+


Internet

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Byte
July 1995

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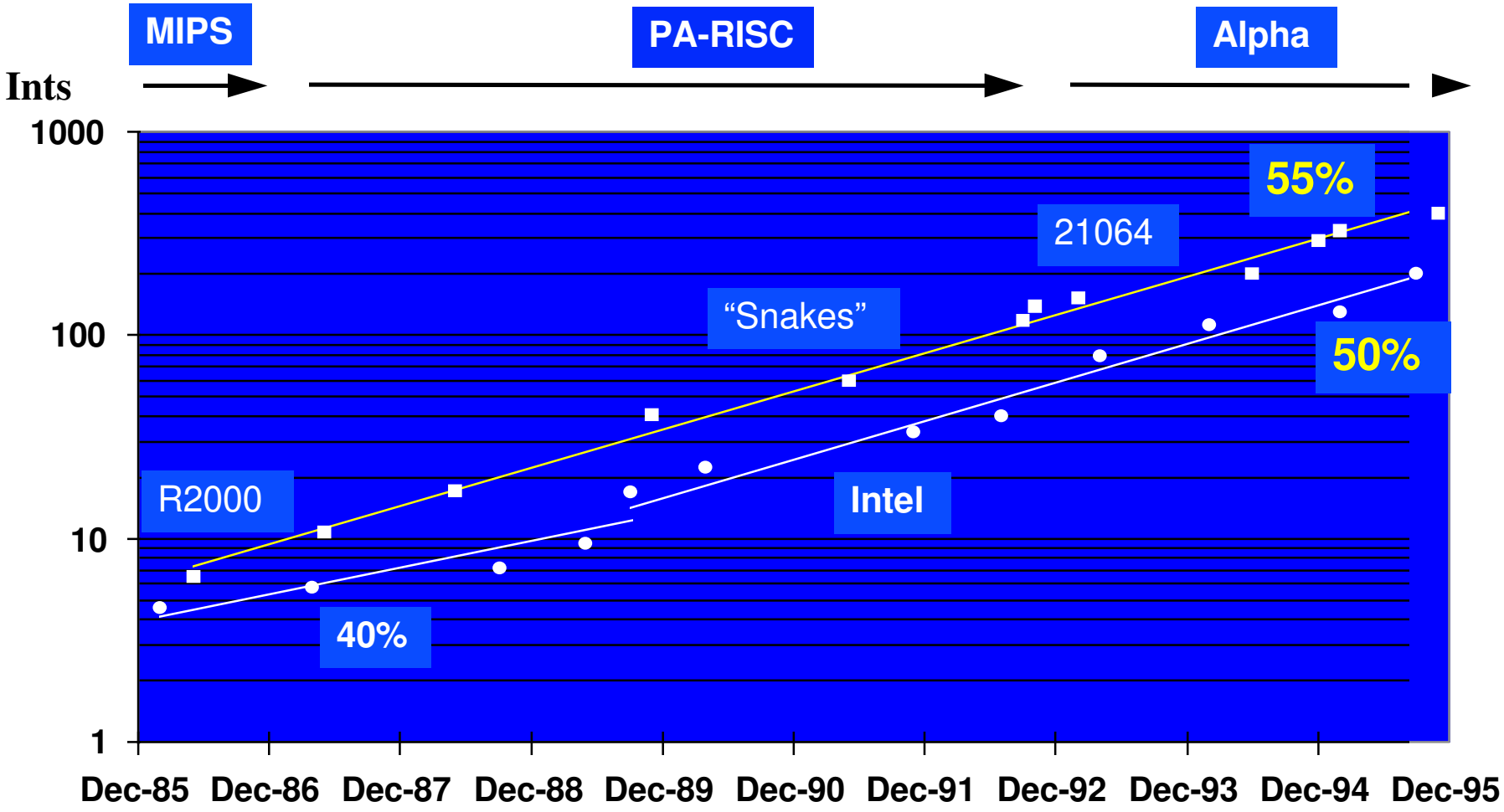
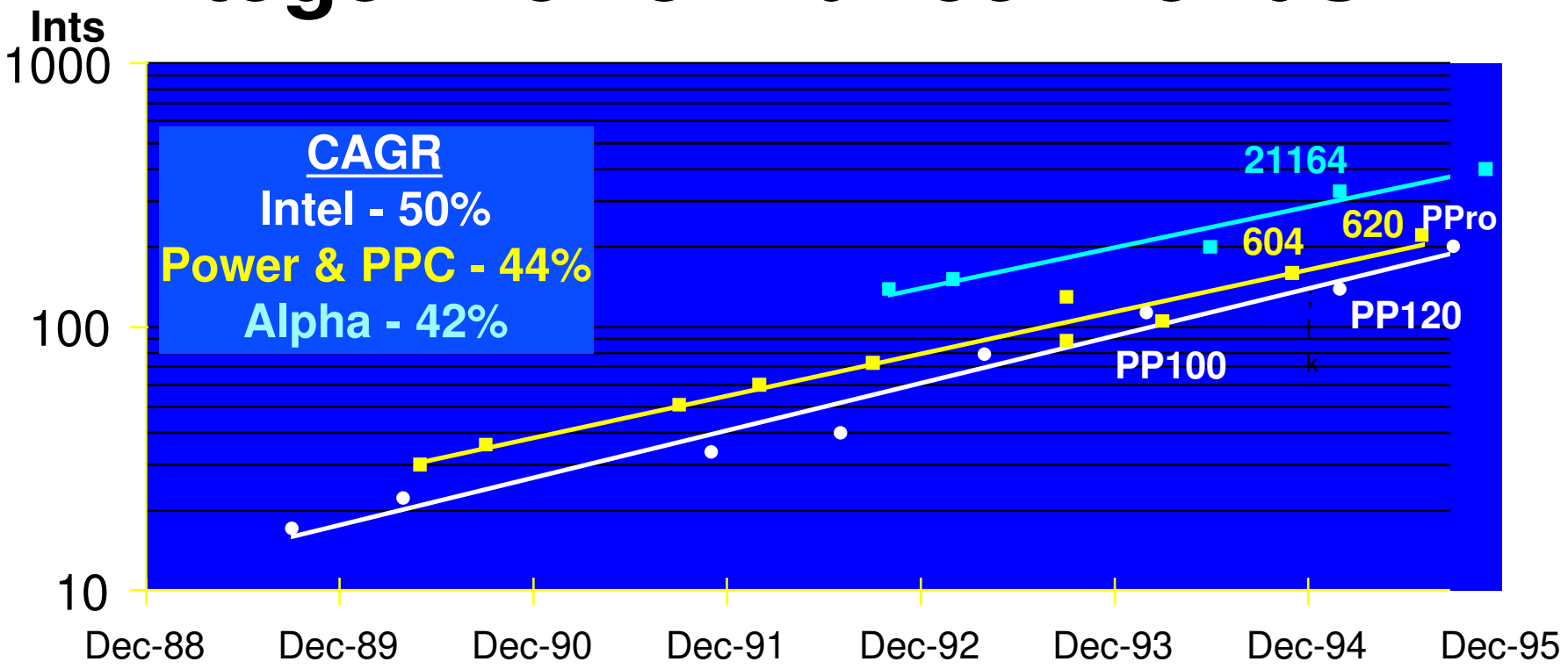
All RISC vs Intel

Per MPR, 1/23/95



Integer Performance Trends

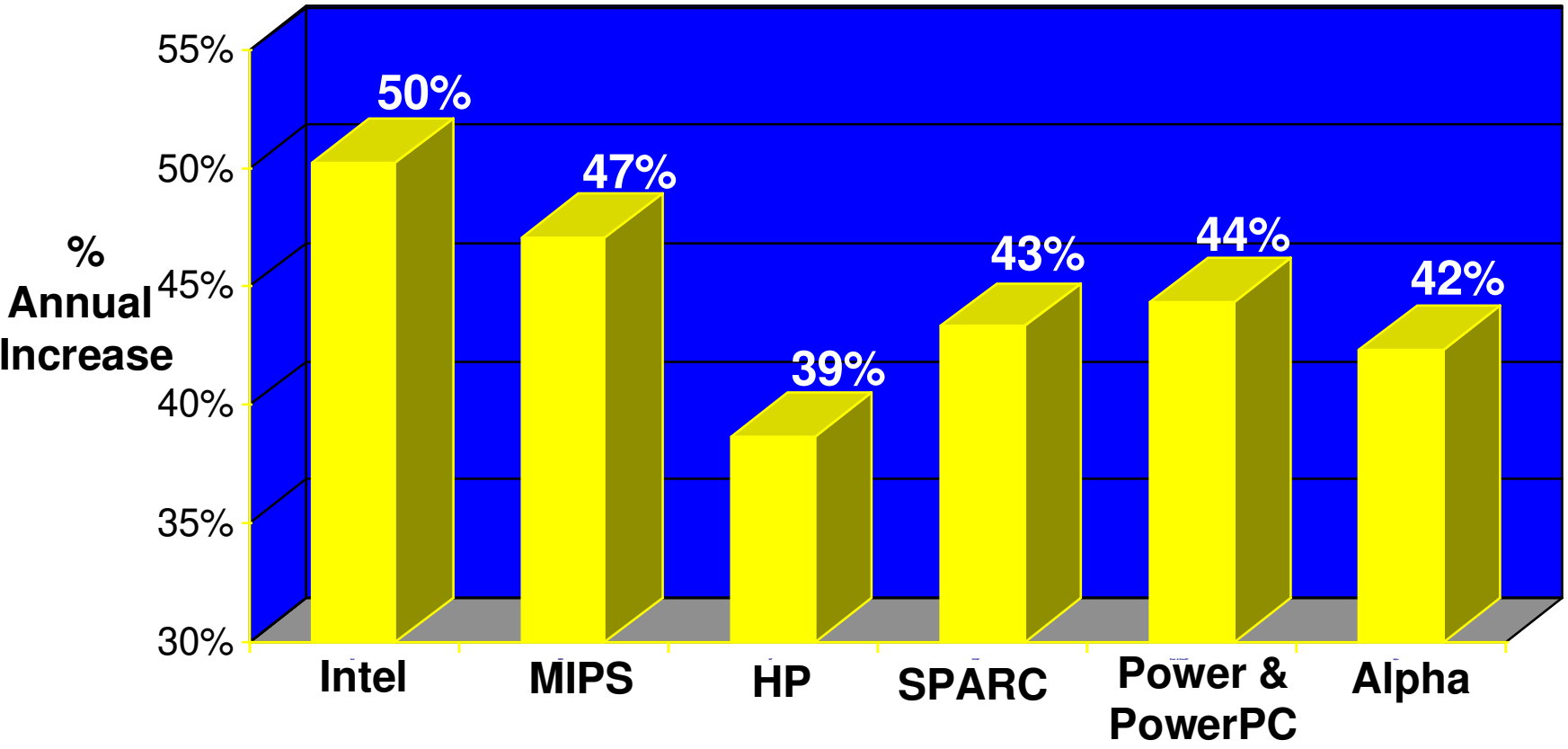


- **Pentium® Pro processor is at 366 SPECint92 vs 200 on chart**
- **No PPC-620 in 1995. PPC604 in 6/95 vs 11/94**

® CAGR Calculations: Intel ; Data Source: 1/23/95 Microprocessor Report (MPR)
"Ints" is a MPR measure of integer performance = (SPECint92 - adjustment to negate "compiler" optimizations ")

Annual Performance Growth

1989-1995



Intel Performance:
Yearly Growth Exceeds All RISCs

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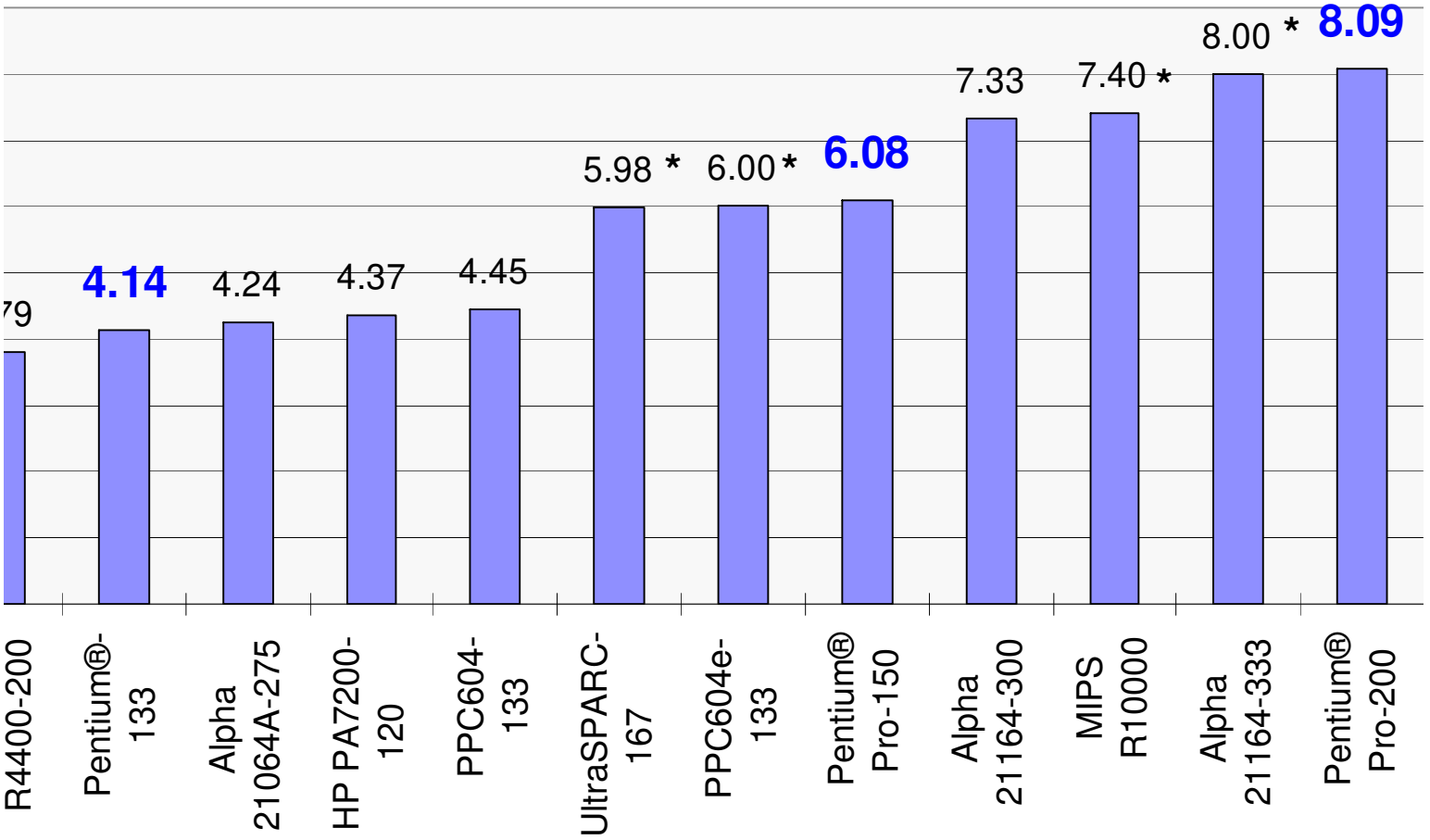
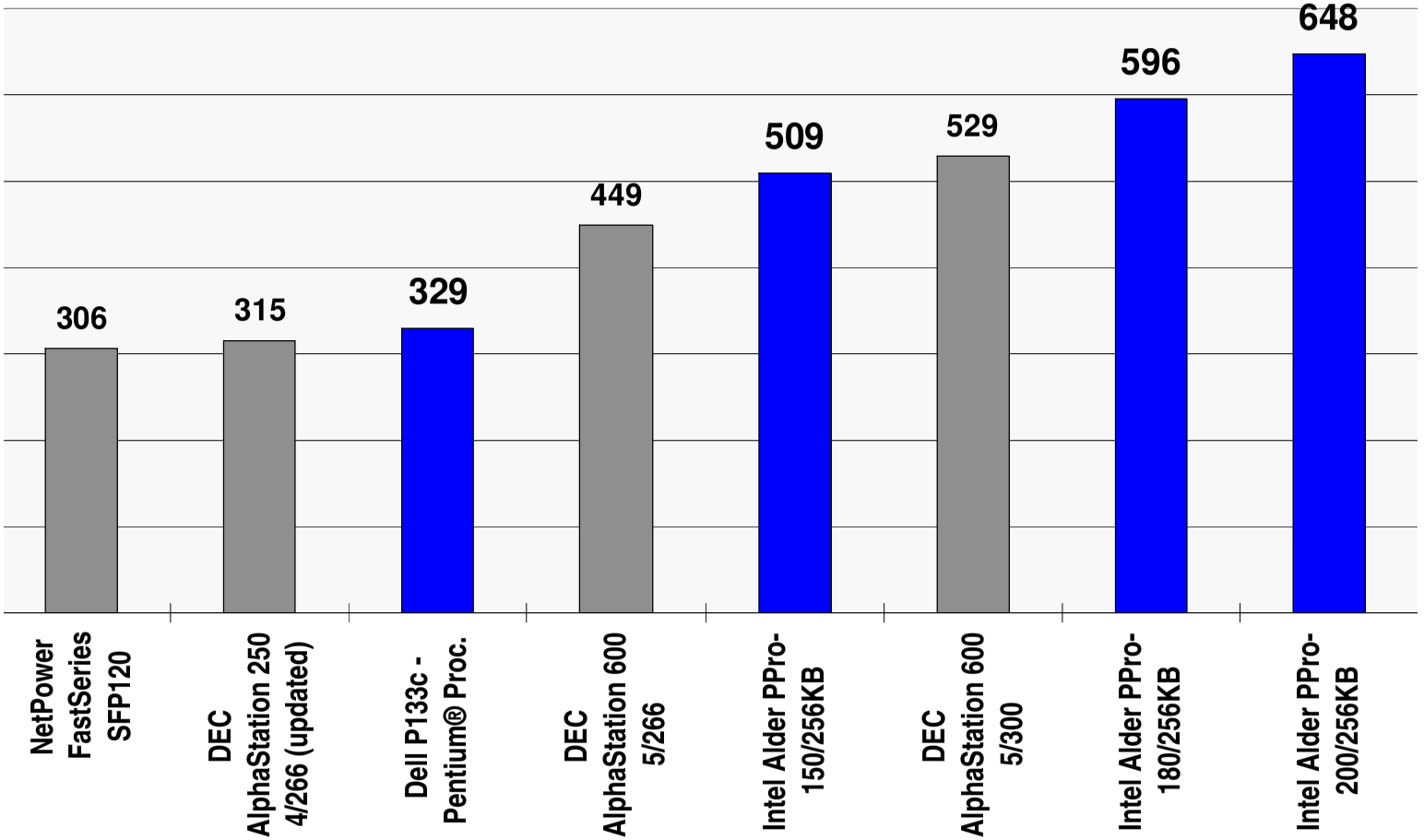
SPECint_base95 of Systems Expected to Ship in Next 6 months



- Micron Pro Magnum Plus: Pentium Pro Processor 200MHz, 256KB cache, 64MB DRAM, 4GB SCSI-2 HD, 6XCDROM, PCI 64-bit Graphics, Sound, 17" Monitor, Windows/NT, MS Office Pro 95, etc. **$7,399**

® * Estimated. Various Sources. Some projected.

NT Performance



- **Application Benchmark consisting of Excel, Word, PowerPoint, MaxEDA, and Texim**

® Source: BAPCo

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RISC vs CISC Issue

“Is RISC is Better than CISC?”

Not the Issue

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Real Issue

"Is RISC is Enough Better than CISC to Compensate for All the Other Factors that Make an ISA Successful"

It Isn't!

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Popular Myths

- RISC will result in cheaper and much faster microprocessors
- These cheaper RISC microprocessors will power PCs that will offer a 2X price/performance advantage over Intel PCs

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Reality

- The microprocessor price is typically less than 5-15% of a PC's price
- Manufacturing, Volume, Channels, Competition, and Compatibility are the key success factors
- Evolution is a Stronger Force than Revolution
- The PC continues to offer the best price/performance

Summary

- By 2000, PC Market will be 100mu/yr - 40m into homes
- "High-Performace Processors + Internet + High-Bandwidth Comm + Multimedia Platforms with 3D Graphics Accelerators" Provide the Growth Medium for the Next Generation of PC Software
- Compatible Processor Performance will Continue to Increase at 50+% per year for the forseeable future
- The Pentium® Pro Processor 200MHz - Highest SPECint95 of any 1995 System
- RISC vs CISC Issue is Dead

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