What Can 64-Bit Computing Do for You?

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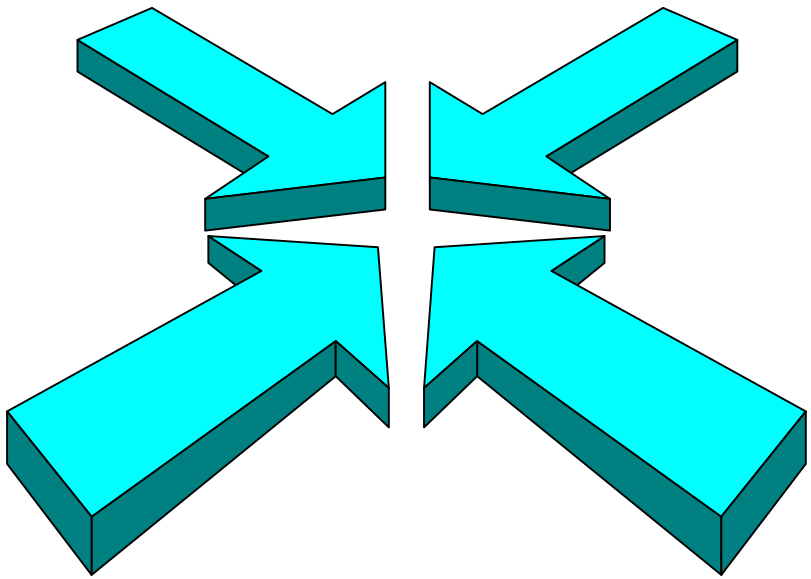
Drivers for 64-Bit Convergence



- 64-bit addressing capability for >4GB
- Larger computing tasks for commercial, scientific/technical
- Faster processors, more memory and data storage
- Internet workloads drive multimedia data

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What's Important About 64-Bit Computing?

- It unlocks lots of computing power
- Larger address space allows users to process larger "chunks" of data
- Early adopters, early benefits
  - Scientific/technical engineering
  - Database/data warehouse/data mining
  - Writing to storage, SANs

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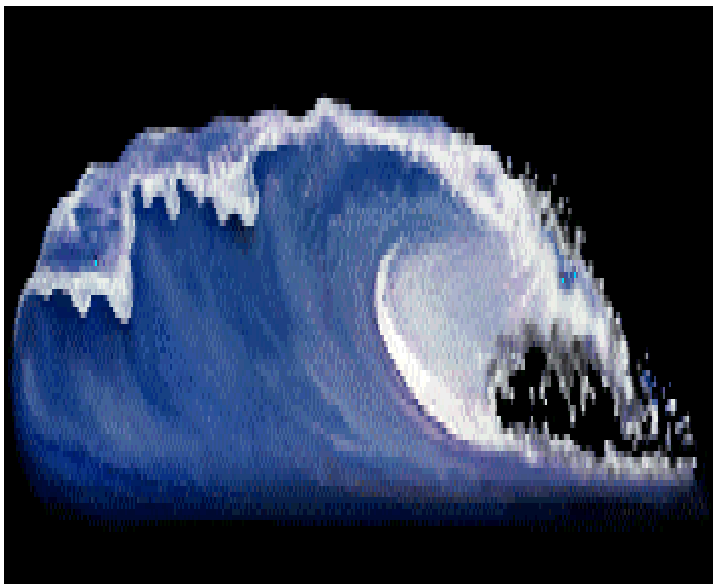
What's 64-Bit All About?



- It's the next "wave" of computing
- It's "2 to the 64th power"
  - Overcoming the 4 GB limit
- It will coexist with, and eventually overtake, 32-bit computing
- It processes larger "chunks" of data at one time

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What's the History of 64-Bit?

- Widespread use in the Unix/RISC world
- 64-bit hardware came first . . .
- . . . Followed by 64-bit operating systems
- . . . And 64-bit applications
- First areas to benefit were:
  - Scientific/engineering simulation (CFD)
  - Data Mining, fast scans of large databases

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The 64-Bit Environment

- **Today, most applications are 32-bit**
- **Most RISC chips are 64-bit**
  - **PA-RISC, SPARC, POWER, ALPHA, MIPS**
- **Soon, Intel's IA64 will bring 64-bit computing to the Standard Intel Architecture Server (SIAS) marketplace**
  - **64-bit operating systems will support both 64-bit and 32-bit applications**

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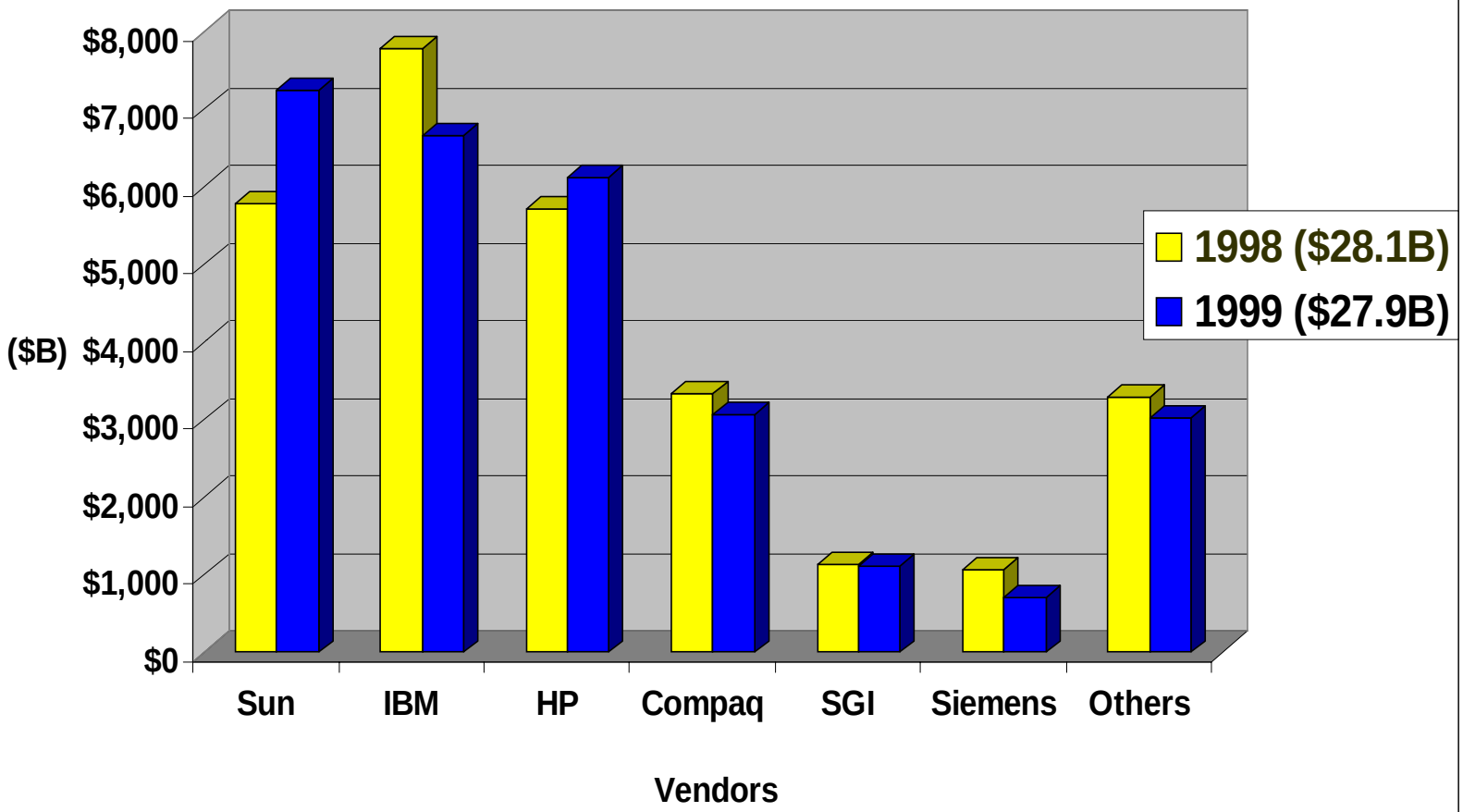
Worldwide RISC Market, Unix and Non-Unix



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What's the Impact of IA64?

- **Will it change enterprise computing?**
- **And if so, how?**
- **How will it be different from IA32 computing?**
- **How does it change the dynamics of the Windows 2000, Unix and Linux markets?**
- **What is the roadmap for IA64 adoption?**

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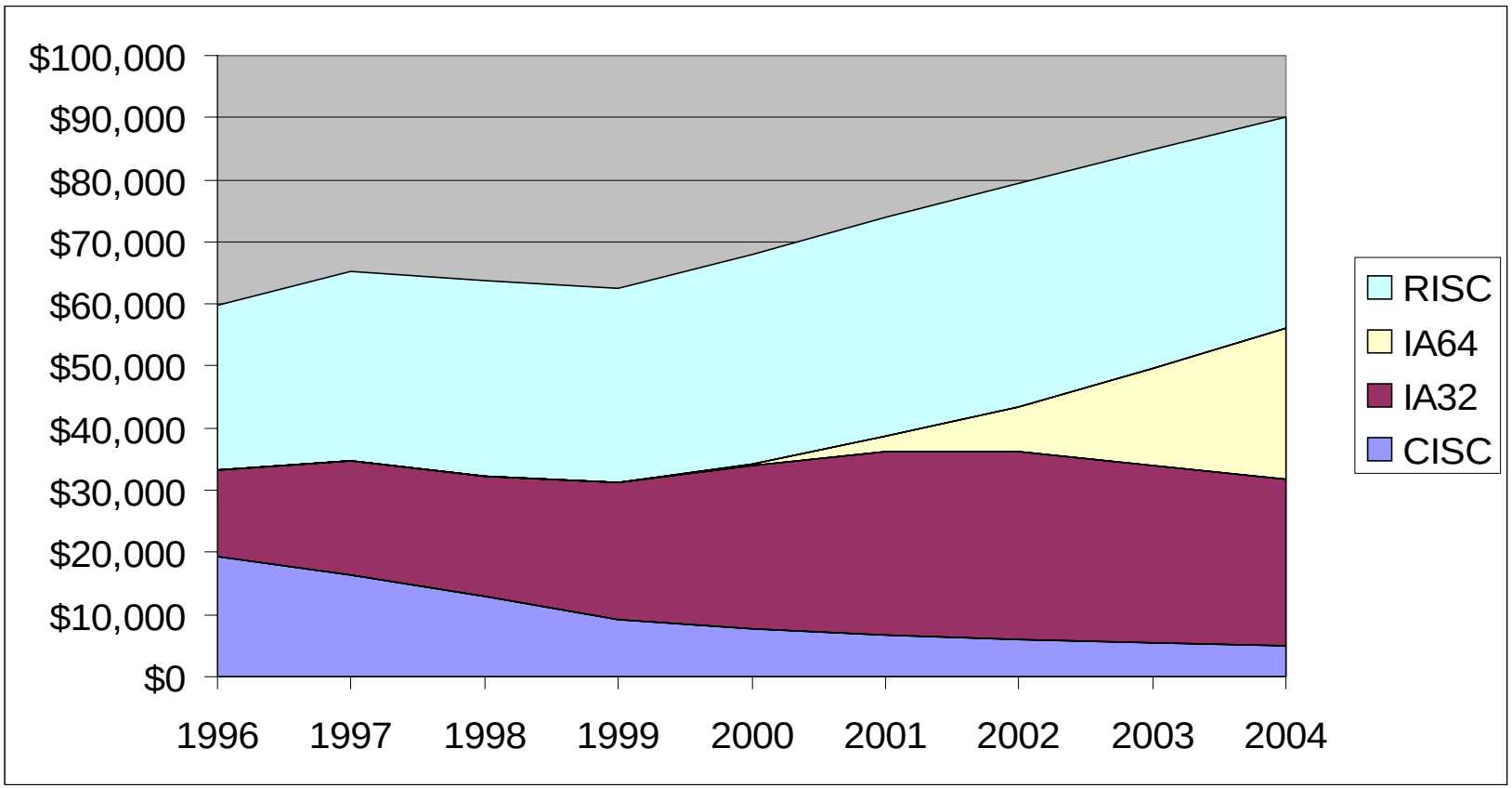
IA64 Server Adoption, Forecast 1999-2004, by Server Revenues ($B)



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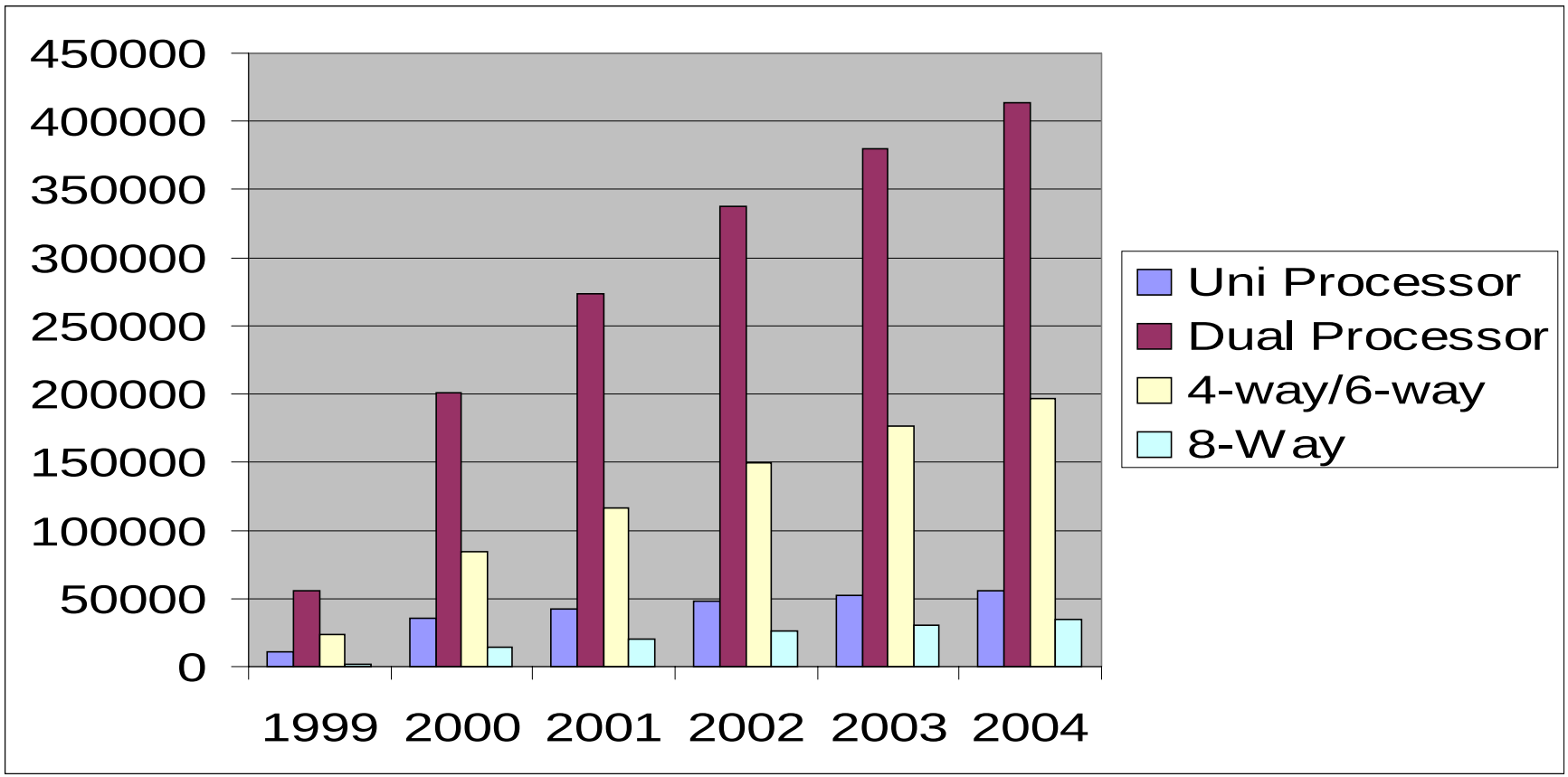
U.S. Rack-Optimized SIAS Server Unit Forecast by CPU Capacity, 1999-2004



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How Will IA64 Change Things?

- **Unix on IA64, particularly HP-UX, Monterey and Solaris, will take on important roles as database platforms, especially on midrange servers**
- **Windows 2000/IA64 servers will likely move into midrange server price-bands**
- **Linux/IA64 will "surprise" users with its power, level of ISV support for 64-bit**

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How Will IA64 Change Things?

- Has the potential to improve price/performance of midrange servers
- Ushers in an era of " modular" computing: partitions in midrange servers and clusters/arrays of IA32/RISC entry servers
- Support for multiple operating systems will allow IT to promote server consolidation

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Windows 2000/IA64 Servers

- 64-bit Windows 2000 will run on IA64, supporting scalable database workloads
- Controlled release of 64-bit Windows 2000 is intended to “smooth” the user adoption of IA64 technology for Microsoft apps
- Microsoft works with specific OEMs on 64-bit Windows 2000/IA64 midrange servers
- Key workloads may shift to IA64/W2K

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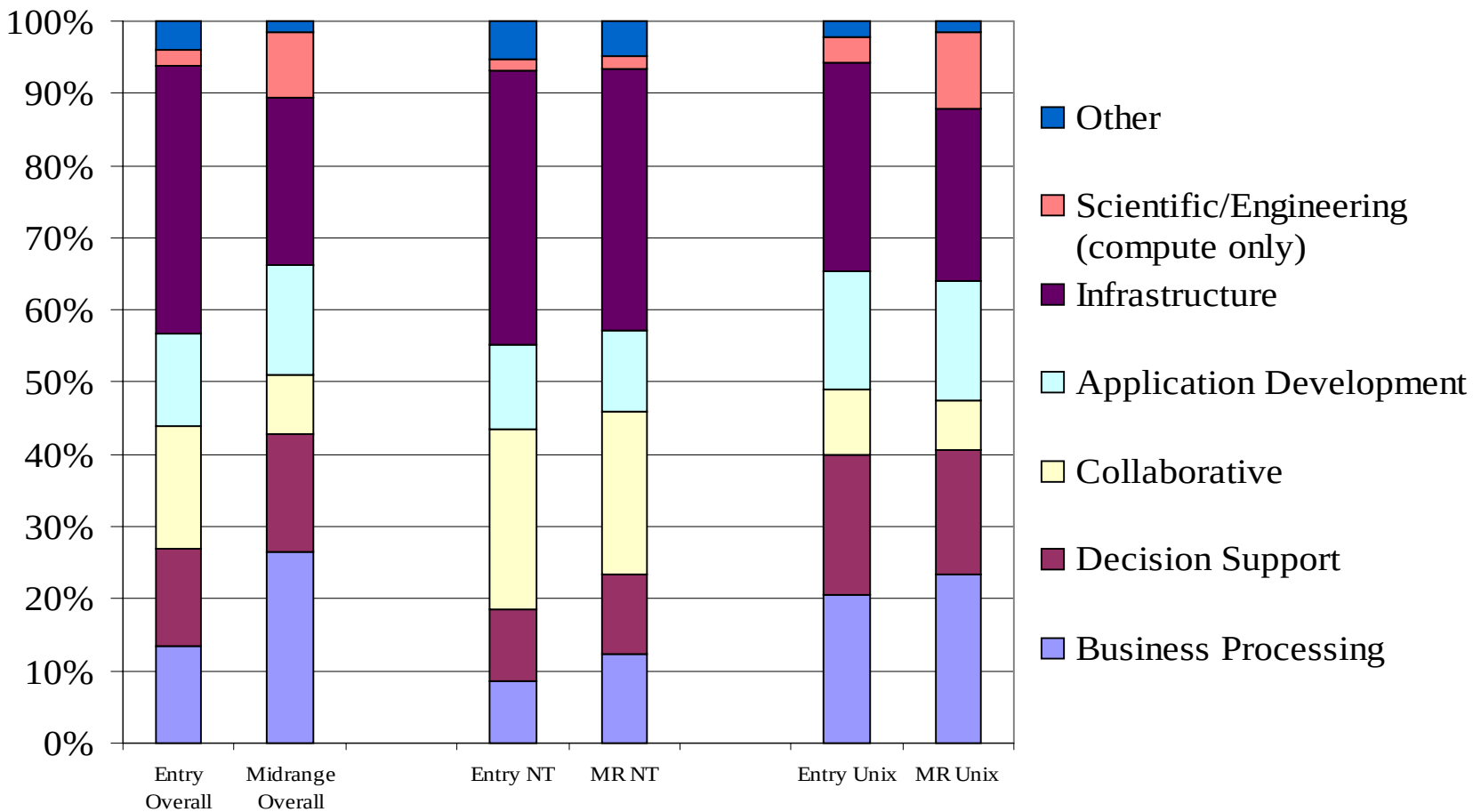
Example of NT and Unix Workloads in CY1999: Server Workloads Customer Revenue by Segment, 1999



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What IA64 Won't Change . . .

- Vast majority of all applications will still be 32-bit applications, even under 64-bit O/S
- Skill-sets in the commercial space will be slow to "change-over" to 64-bit computing
  - Technical/scientific users will embrace IA64 computing more quickly
  - Users from the '80s-era LAN world may rely on ASPS, ISPs to make the transition for them

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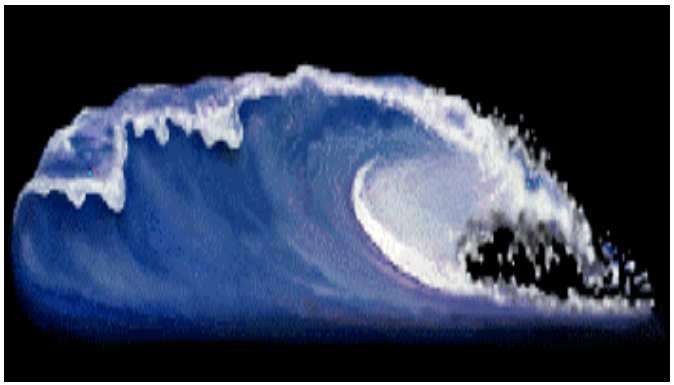
The First “Wave” of IA64



- Uniprocessor desktops, servers
- Quad-processor IA64 boards
- Building servers from IA64 quad “blocks”
- OEMs “balance” the multi-quad IA64-based systems
- InfiniBand plays a new role in redefining I/O subsystems, access to storage

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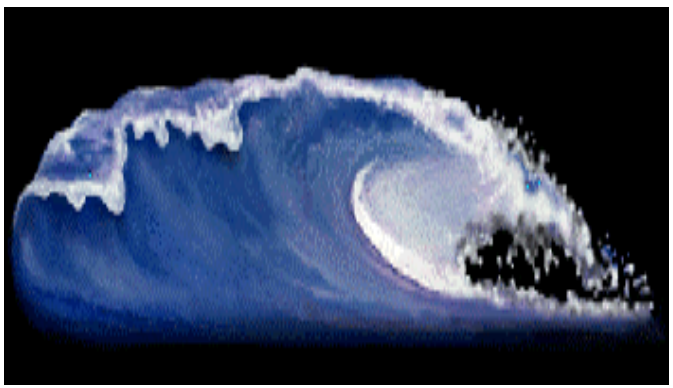
Second “Wave” of IA64



- Uniprocessors and quad-processor servers dominate
- Few dual-processor IA64 systems; IA32 is strong there
- Focus on “scaling up” IA64 servers through
  - Larger SMP (>8 CPUs)
  - Partitionable systems
  - Clustered servers

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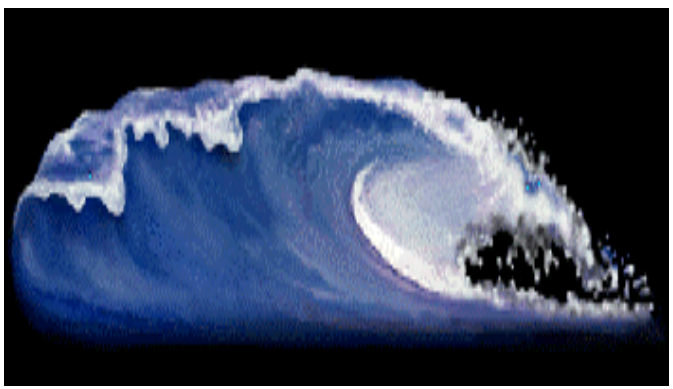
Third “Wave” of IA64

- Wide range of offerings
- Begins to cannibalize IA32
- Wide ISV support for 64-bit applications
- Broad multi-operating-system support: Windows 2000, Unix, Linux and Novell NetWare
- Prices for servers begin to fall, based on volume shipments



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Early Adoption Environment

- As in the Unix/RISC world, 64-bit adoption is likely to be among technically "sophisticated" user communities
- Relatively few 64-bit ISV applications
- IA64 computers just beginning to ship
- Scientific/technical: fast floating point
- Custom applications for commercial use

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Early Adoption Scenarios: Scientific/Technical/Engineering

- Workgroup servers
  - Workgroup servers with 1 or 4 processors
- Linux clusters for Internet applications
  - Clusters of small server nodes
- Porting of 64-bit Unix applications
  - Thousands already exist
  - Can be run on Unix or Linux right away
  - Emergence of 64-bit Windows 2000

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Early Adoption Scenarios: Commercial Users

- **Leading-edge commercial adopters**
  - **Custom applications from financial institutions, Wall Street sites would benefit**
  - **Technically adept IT staffers have experience with 64-bit Unix computing**
  - **It will take several years to create a big inventory of 64-bit commercial applications**
  - **Windows 2000 adoption will happen first with ports of 64-bit ISV packages**

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Early Adoption Scenarios: Software Developers

- Work has already begun on 64-bit application, database development
- Originally, the IA64 Simulator was used for operating-system development (HP-UX, Solaris, Monterey, Linux, MS W2K)
- Database packages are being adapted, since multi-GB database scans will be much faster with 64-bit computing

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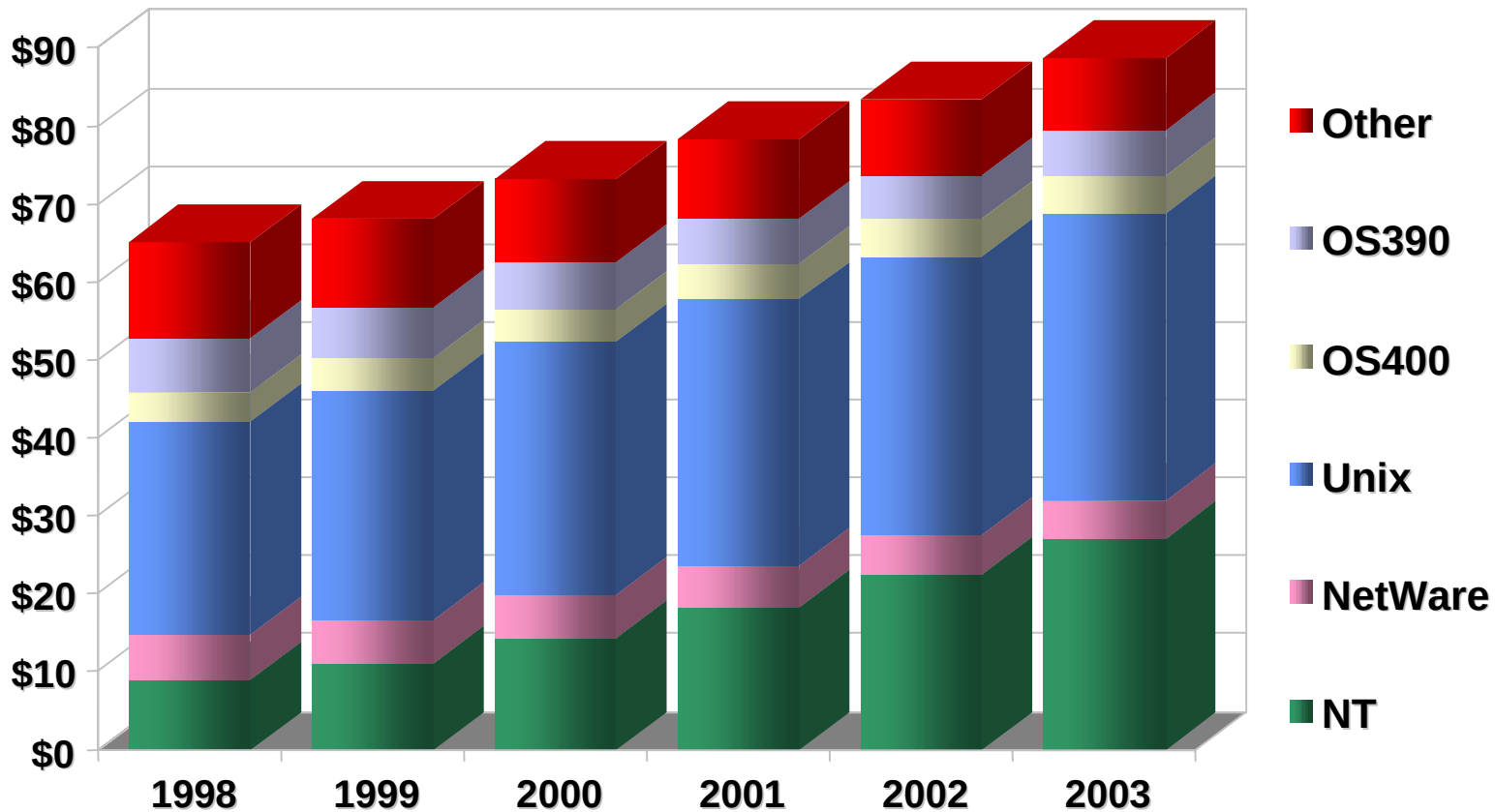
1999 Forecast of Worldwide Server Customer Spending by OS, 1999–2003, ($B)



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What's a Vendor To Do?

- **Identify specific market segments that will adopt IA64 and 64-bit RISC early on . . .**
- **Develop plans for volume 64-bit rollouts**
- **Work with ISVs to make sure key commercial applications "go 64-bit"**
- **Work on scalability, balancing of 64-bit computing systems, whether IA64 or RISC**

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What's an IT Manager To Do?

- **Identify specific computing workloads that will benefit from 64-bit server capabilities . . .**
- **. . . and which ones will remain 32-bit**
- **Develop plans for deployment of IA64 servers, particularly for large databases**
- **Analyze your company's "buy" or "build" decision for 64-bit application deployment**

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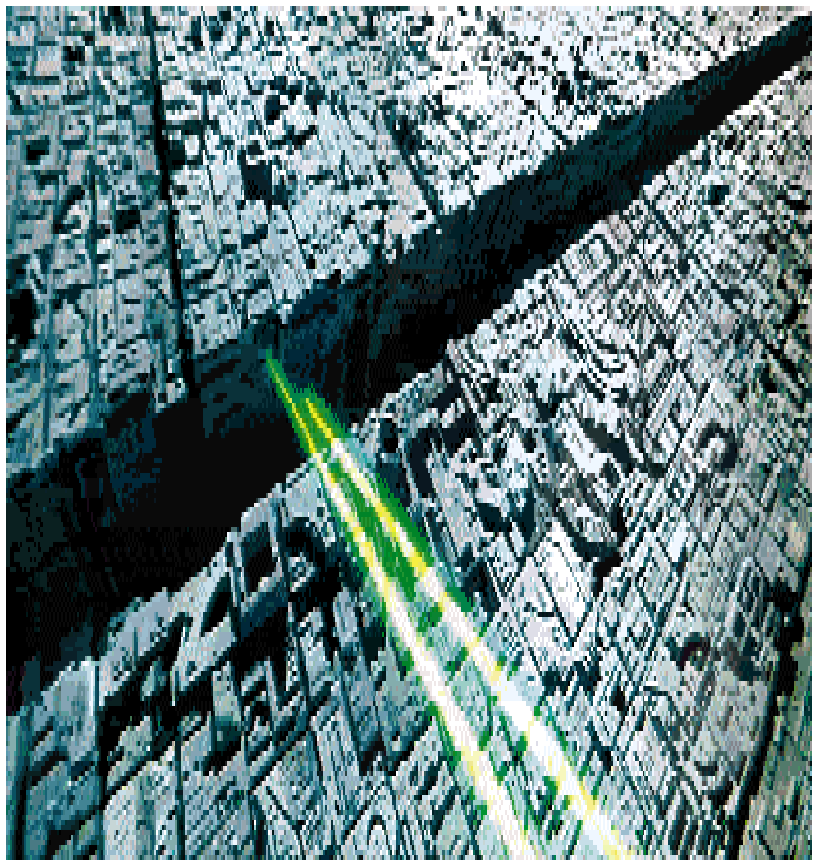
Focus = “Stay on Target!”



- **Just as in Star Wars . . .**
- **Focus on the target is everything!**
- **Finding the right server focus for IA64 . . .**
- **Will promote early adoption in CY02 and CY03; volume by CY04**

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