

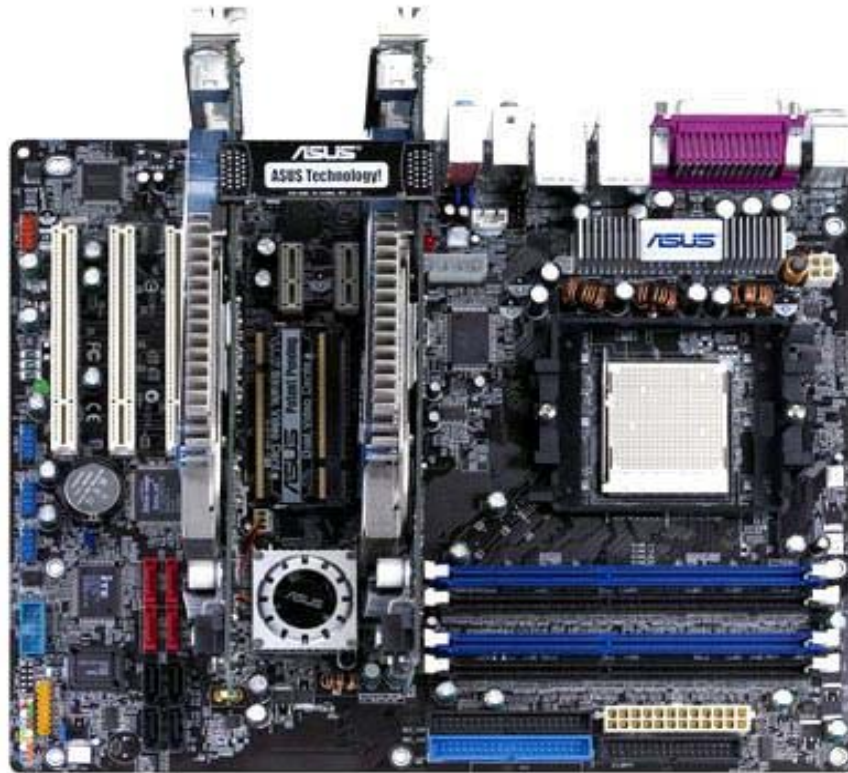
Server Design in a Commodity World

Carl Anderson
IBM

Future Outlook

Commodity Systems

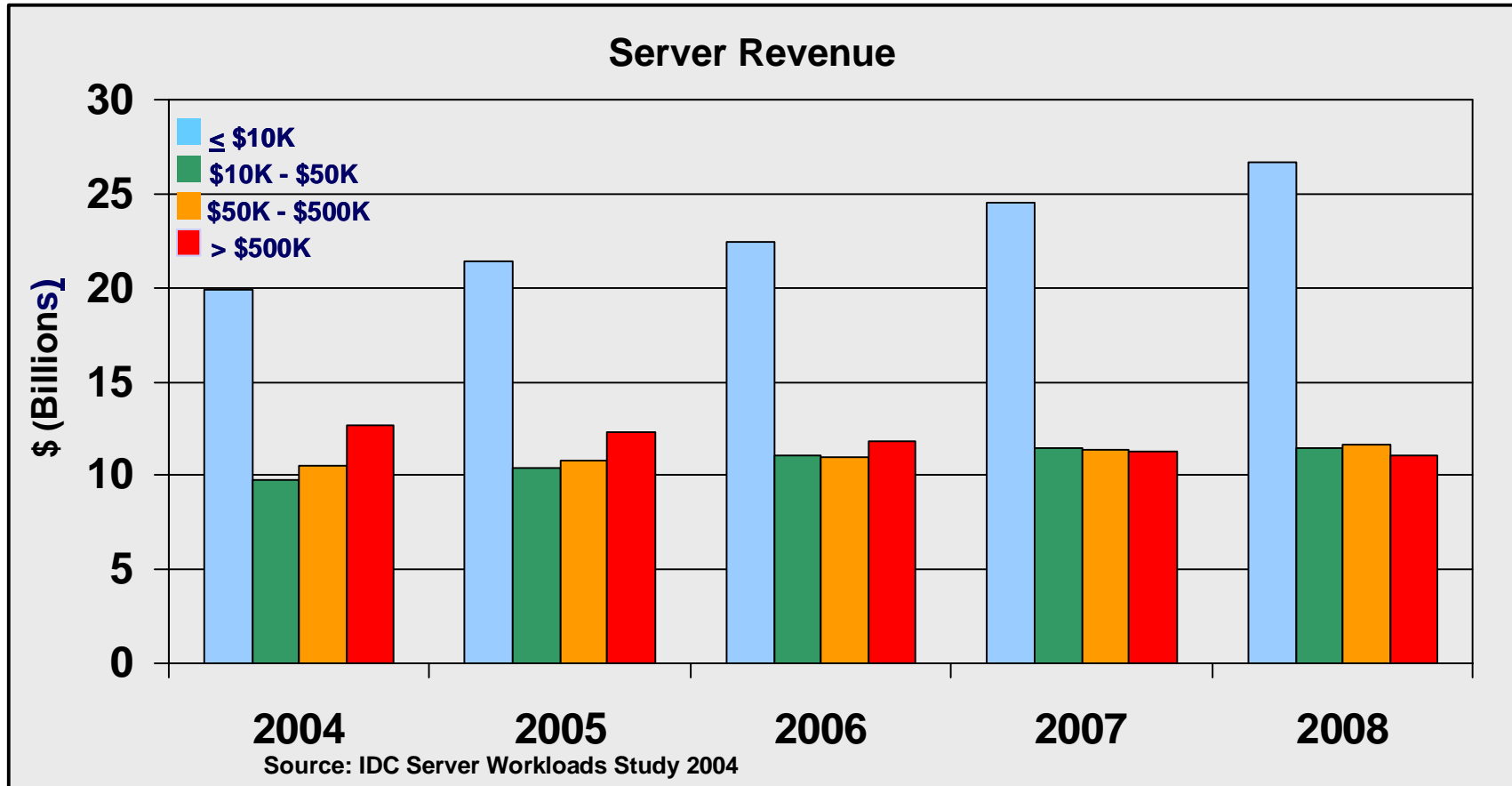
- PC Motherboards \$50-200



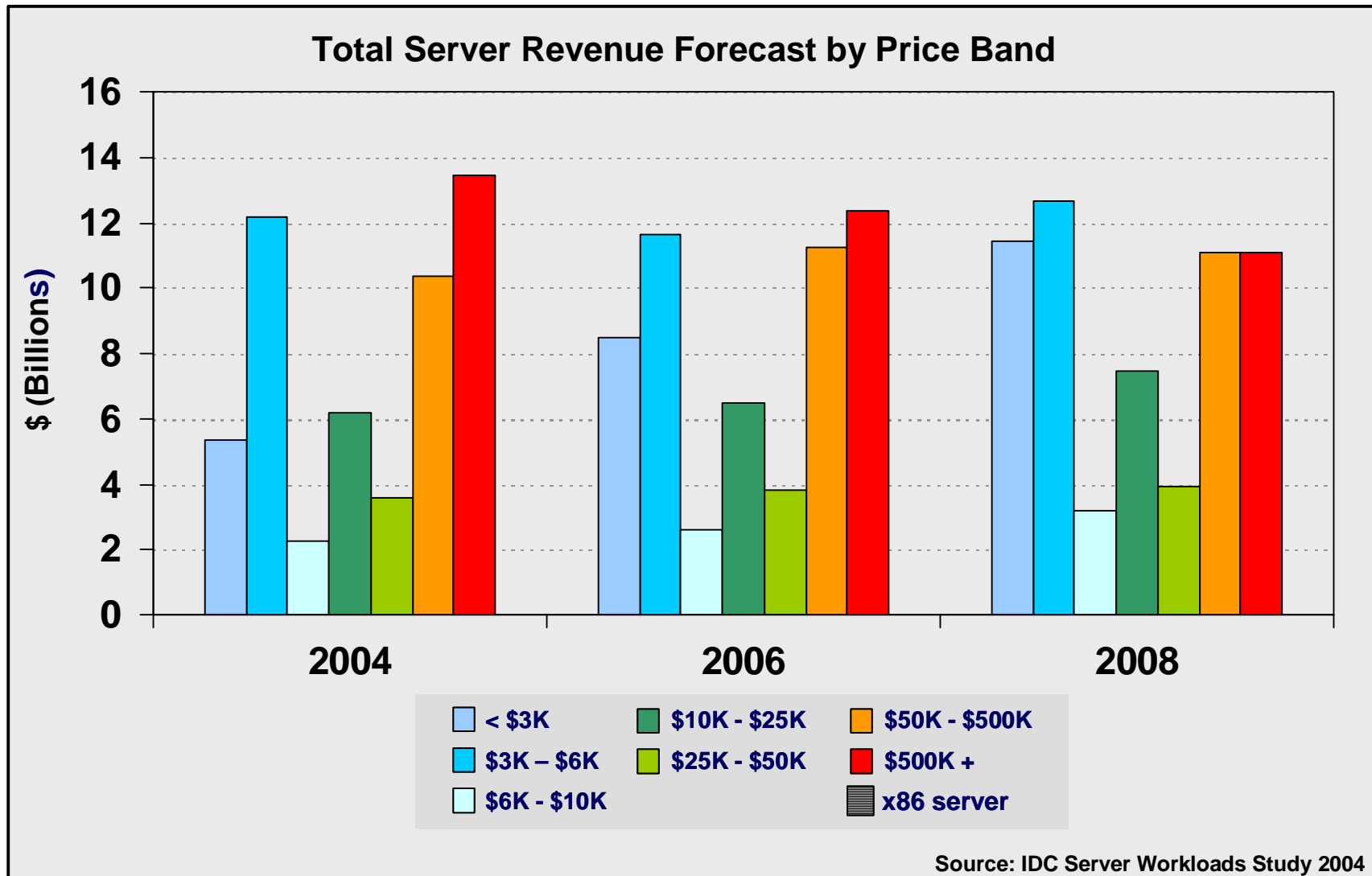
Performance With Low Cost Packaging Not The Low End Any More

- Inexpensive Motherboards Can Support World Class Performance Benchmarks
 - ▶ Spec Int 2000
 - ▶ Spec Flt 2000
 - ▶ Specjbb
 - ▶ Specwebb
- High End Computers Continue SMP Leadership
 - ▶ Largest Single Image TPC-C
 - ▶ Many Classes of High Performance Numerical Applications

Server Revenue



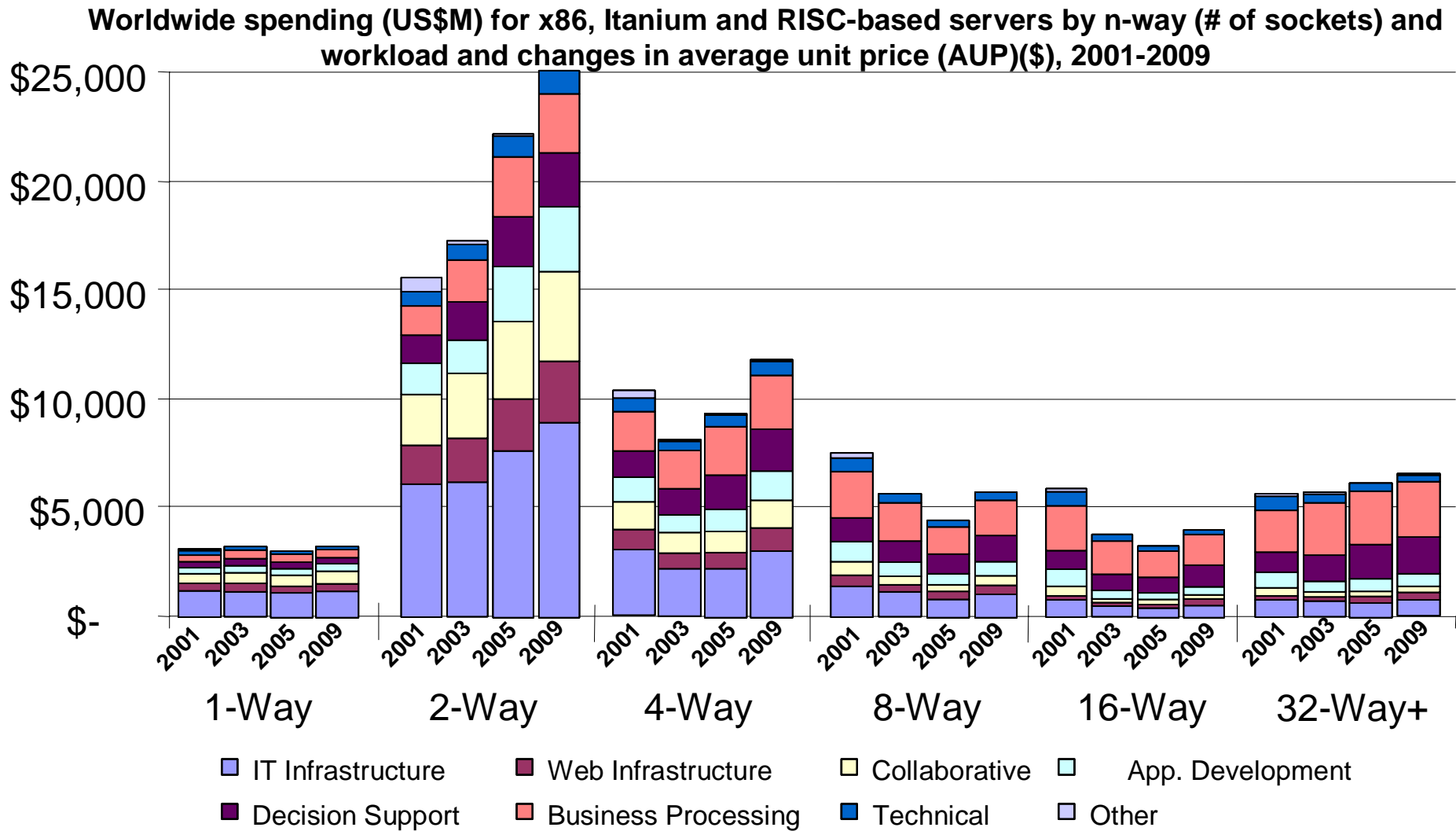
Price Bands



Growth Is In the Comodity Low End

Revenue By Socket

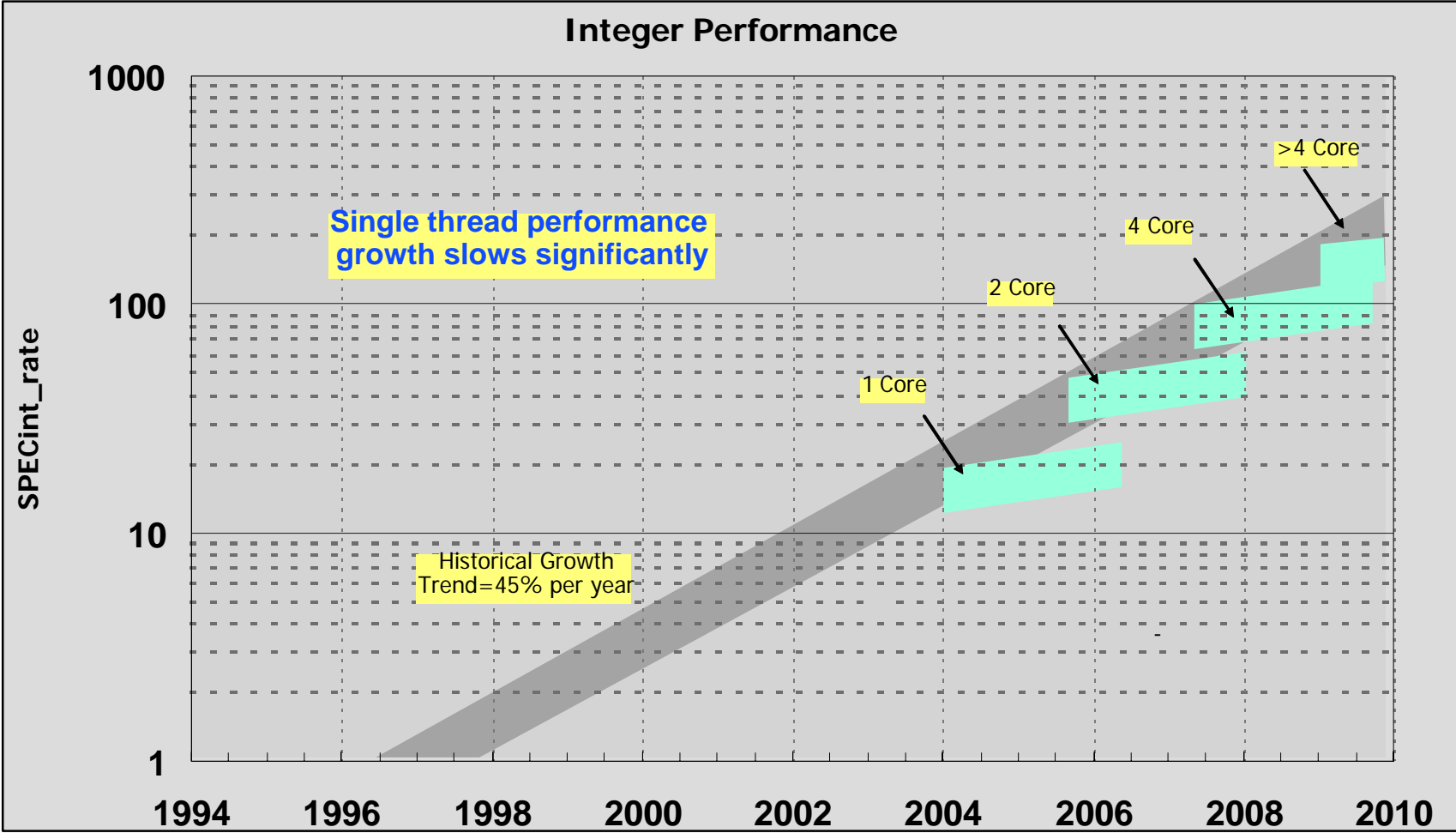
Recent and projected growth in the server market is being driven by 2-socket systems largely dedicated to IT and web infrastructure workloads. Spending for more scalable SMPs of 8-sockets or more is expected to be nearly flat.



Server Processor Trends

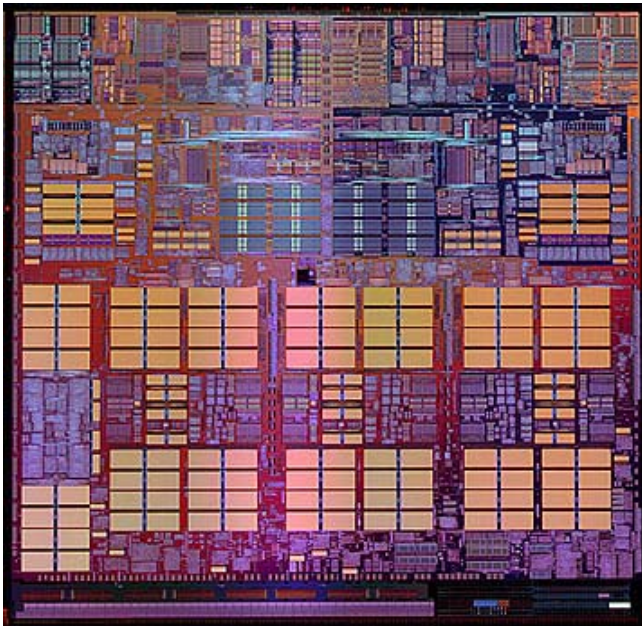
- Multicore Designs per Socket
 - ▶ Less Improvement In Frequency & Single Thread Performance
 - ▶ Both On-Chip and MCM Designs
 - IBM, HP, AMD, Intel & Sun
- More Power Efficient Designs
 - ▶ 2.26 GHz Dothan Better Spec Int 2000 Than 3.8 GHz Pentium4
 - ▶ Need Lower Power Cores For Multicore Designs
- I/O Trends
 - ▶ Standardized I/O
 - ▶ Standard Fully Buffered DIMs, FBD, for Memory
 - ▶ Glueless Multi Socket Fabric (No Switch Chips)
- More Power Supplies / Chip
 - ▶ Optimize Power and Performance of Cores and SRAMs

Chip Performance Trends

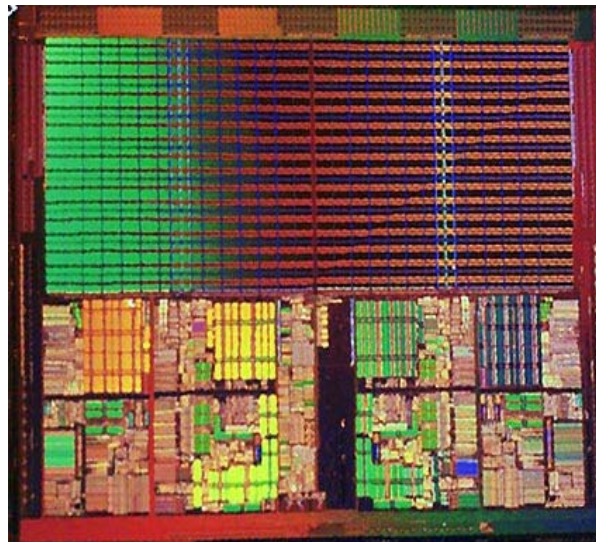


Multi Cores

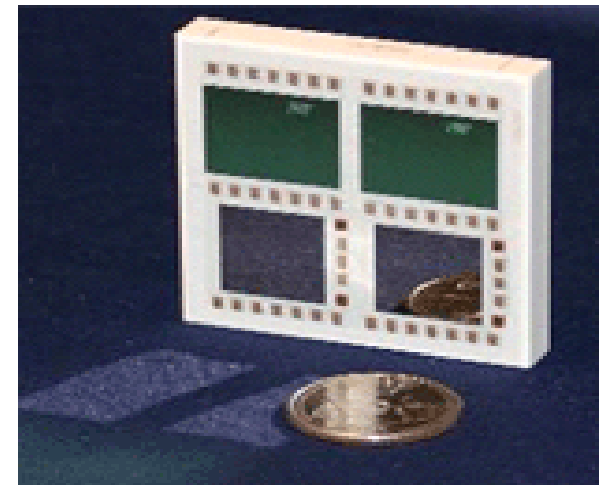
- 2-4 Cores per Socket Available Now
 - ▶ 8+ Cores By 2010



Power 4
1st Dual Core 2001



Dual Core Opteron
1st Desktop Dual Core



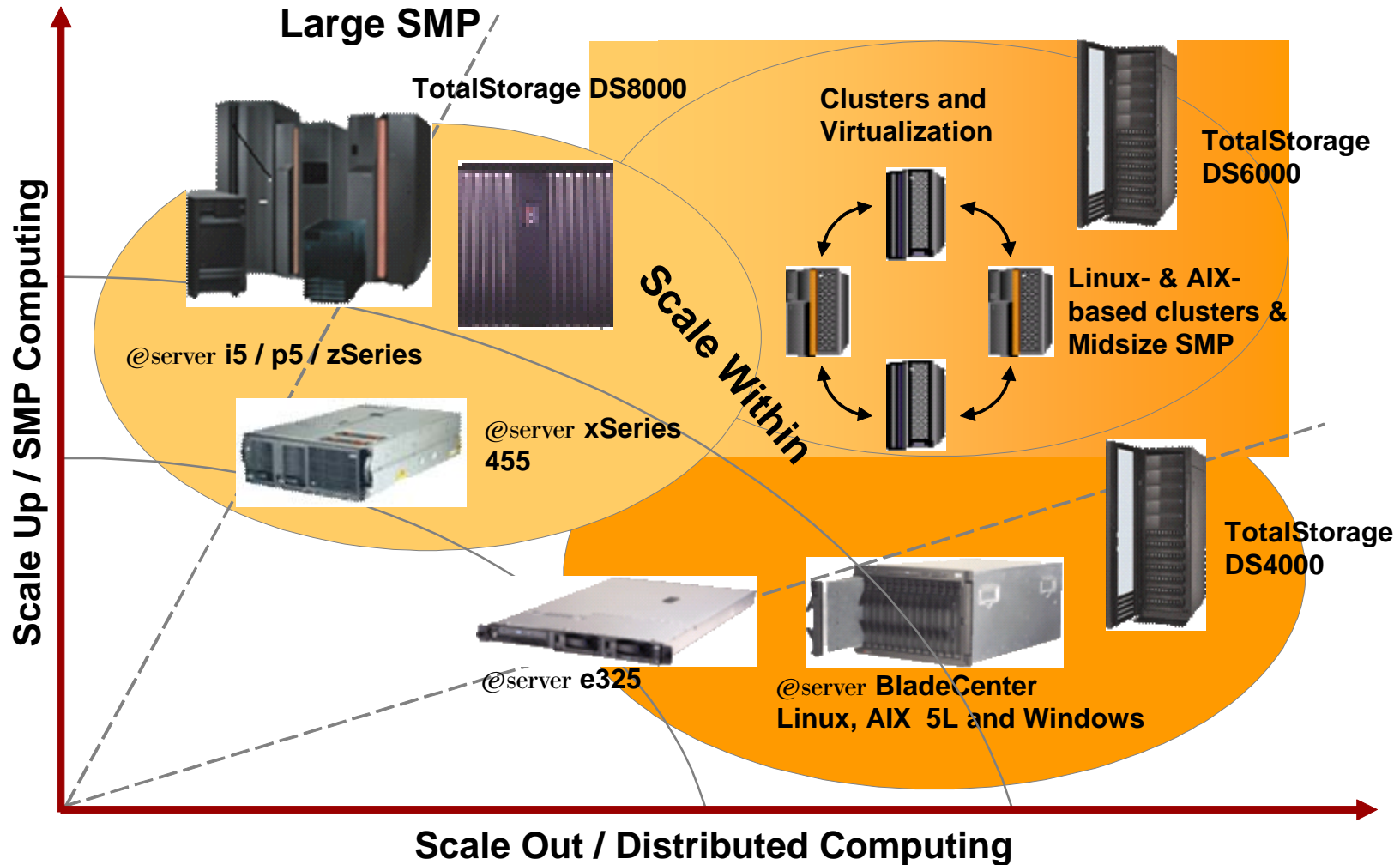
Power 5
Quad Core per Socket

Server Packaging Trends

- Cost, Cost, Cost
 - ▶ Reuse Packaging and Cooling Technology
 - Mobile and Desktop
- Modularity - Blades & 1-4u Rack Systems
 - ▶ Assemble Larger Servers - Weak SMPs
 - ▶ Integration of Storage
- Power per Socket 100W > 150W
- High Speed I/O 2-8? GHz
- More System Level Reliability & Power Management

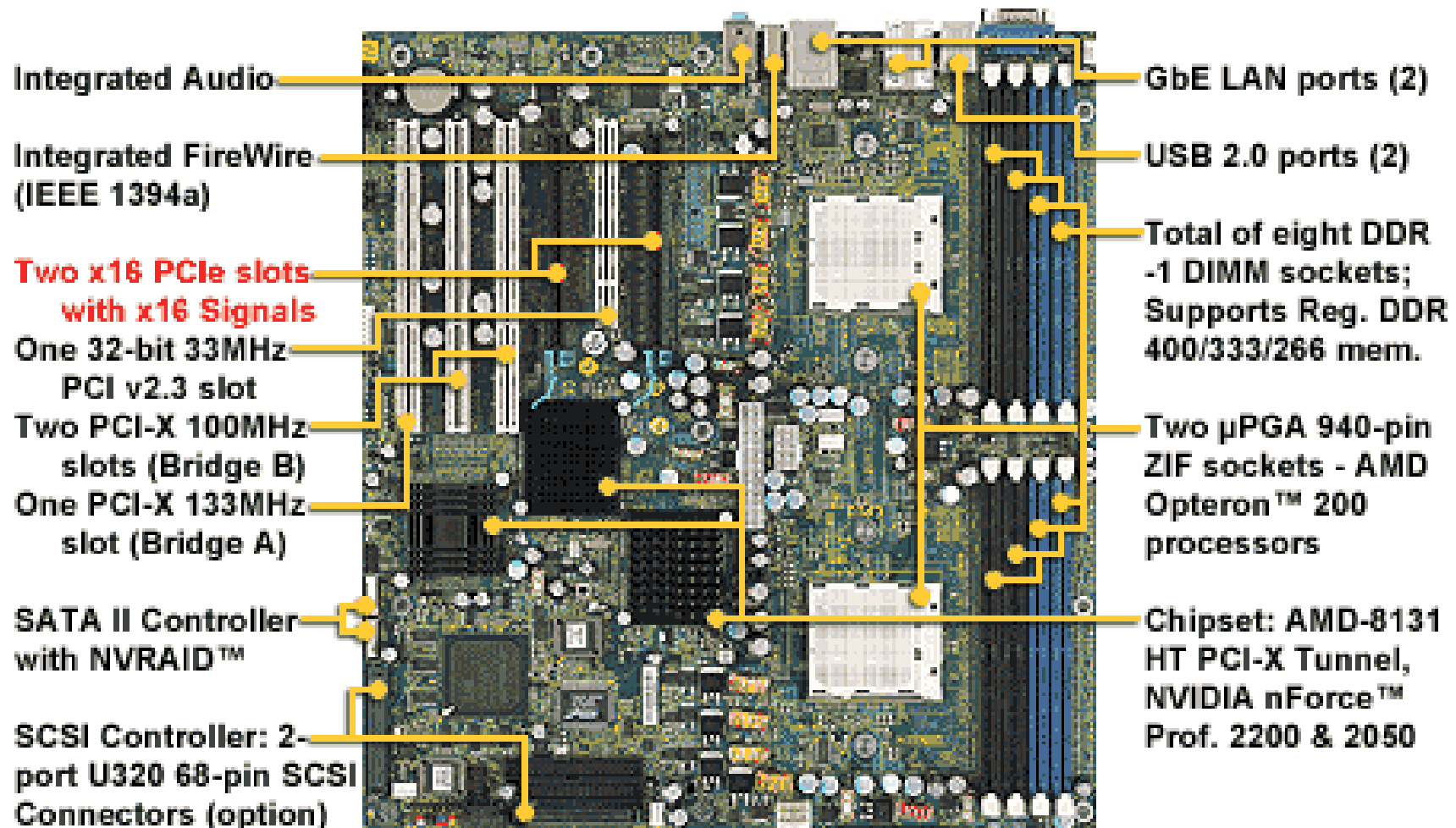
Types of Servers

Scale Up. Scale Out. Scale Within.



Two Socket System

- Opteron 2-Socket Motherboard, 4-Way SMP, < \$500
 - ▶ Tyan Thunder K8WE



Summary

- Server Growth Is In the Low Cost / Commodity Area
 - ▶ New Technologies Will Come From Mobile & Desktop
- Server Designs Have to Leverage Commodity Technologies
- Multicore Processor Designs
 - ▶ Continue Performance Per Socket Growth
 - ▶ Allows Larger SMPs in 2-4 Socket Motherboards
- More Interaction Between Motherboards and Processors
 - ▶ System Power Management
 - ▶ System Reliability Management
- Continued Drive For High Frequency I/O (At Low Cost)