

Gigabit Ethernet on the Desktop and Beyond

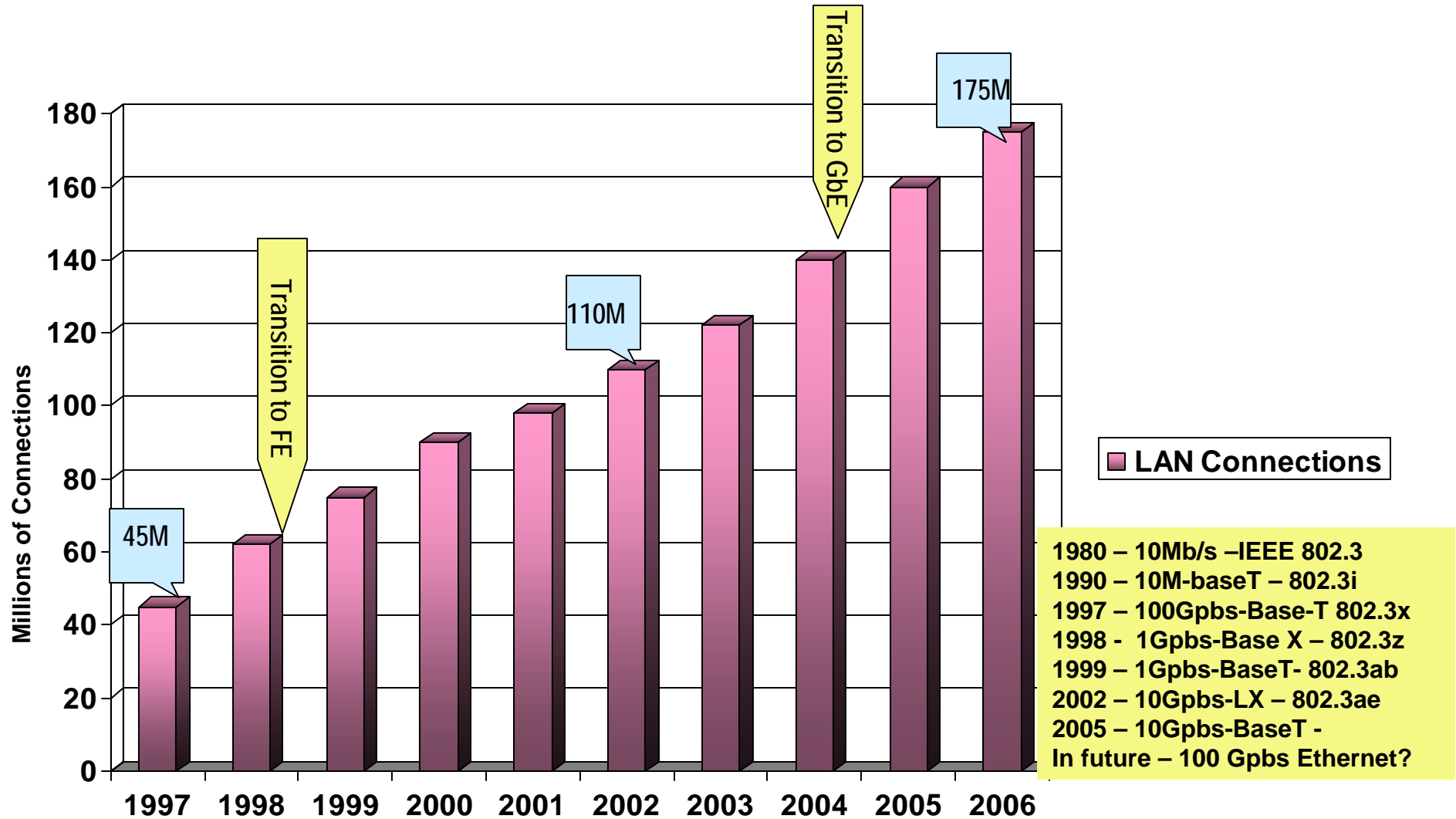
NFOEC/GEC

September 9, 2003

Agenda

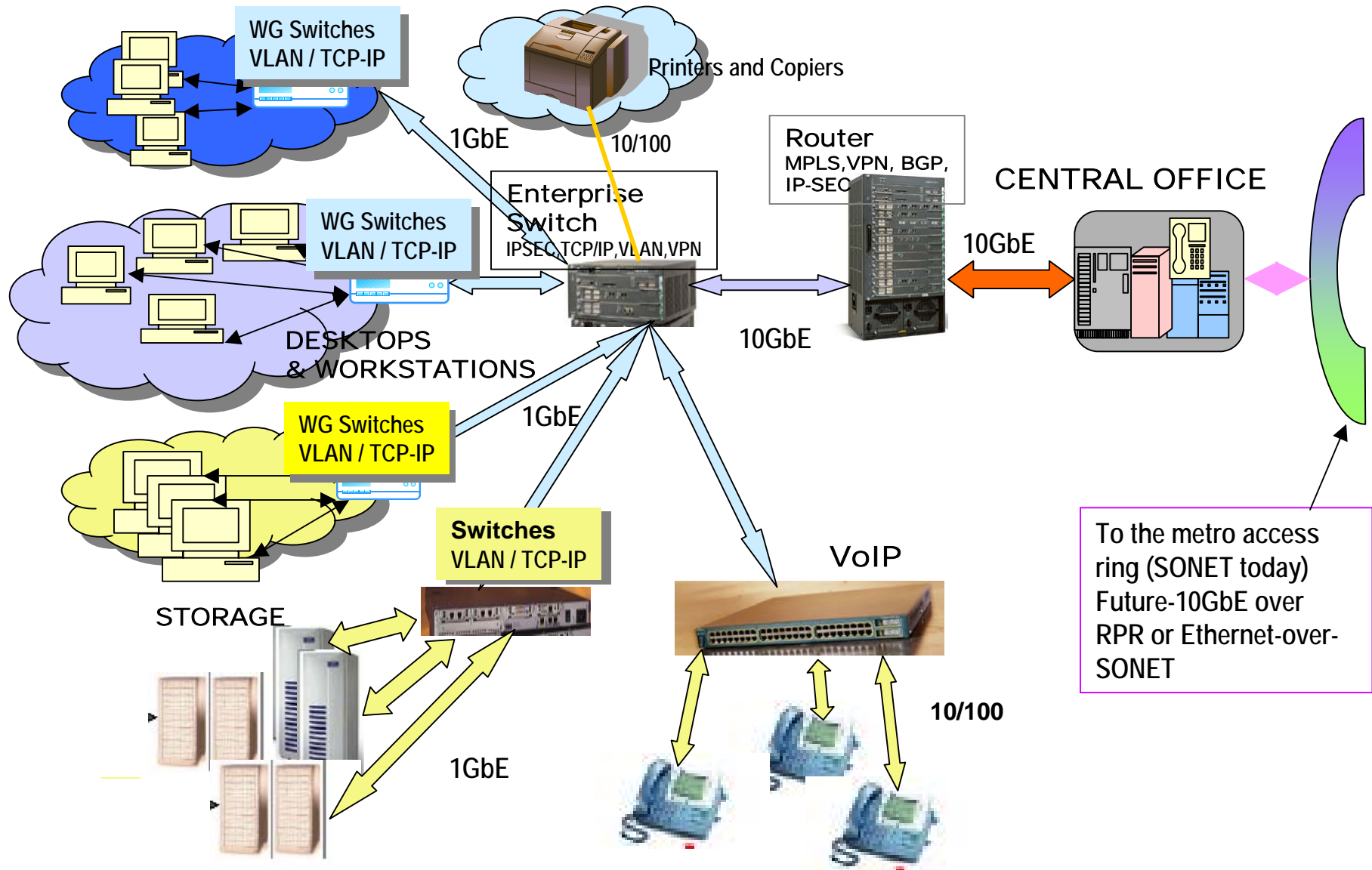
- **The History**
- **The Need**
- **Market Future**
- **10GbE Switch Chip Introduction**
- **Applications**
- **Summary**

Ethernet's Past and the Future



Past and Future of LAN Connections

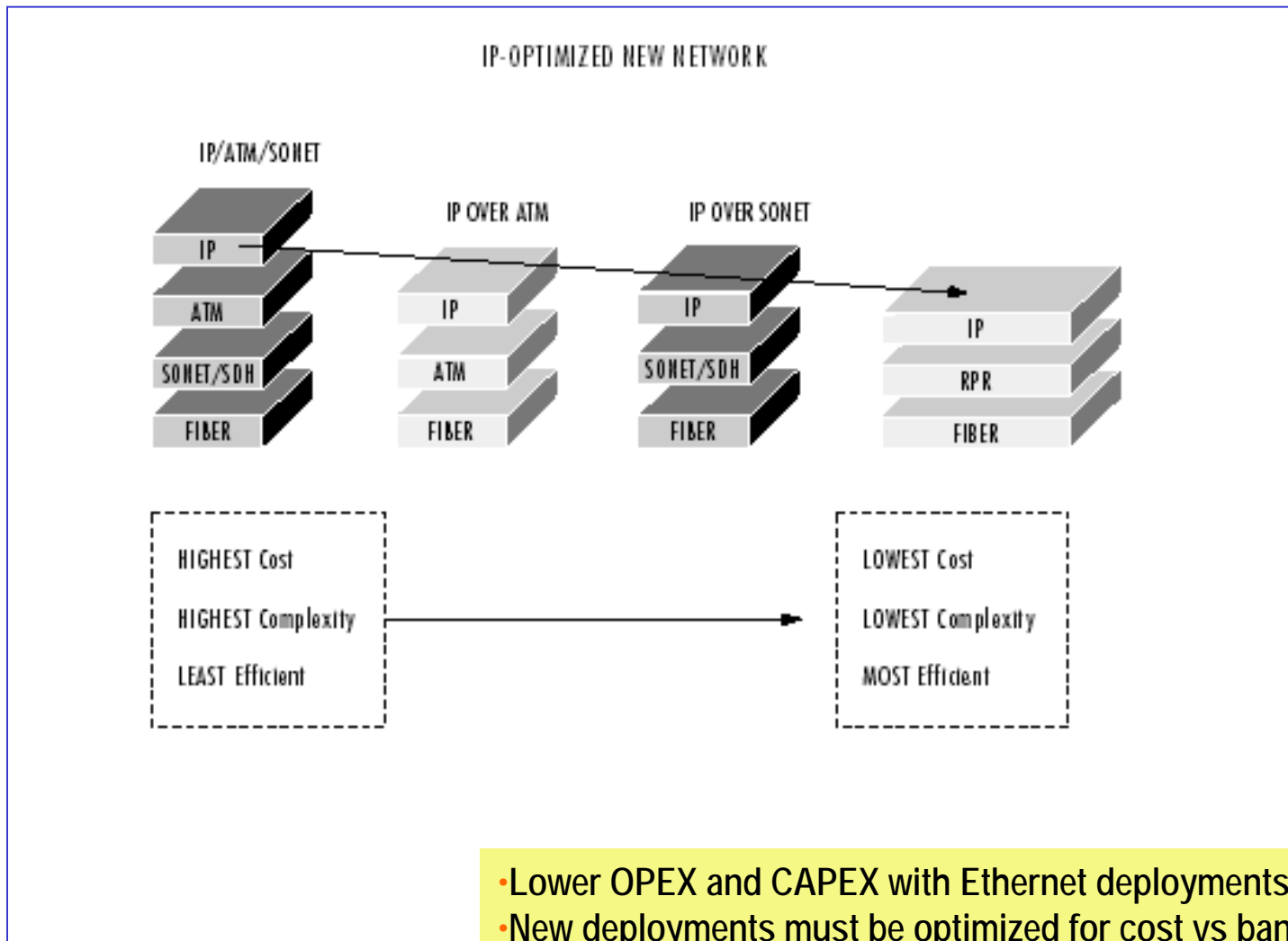
The Network



Market Drivers for Ethernet

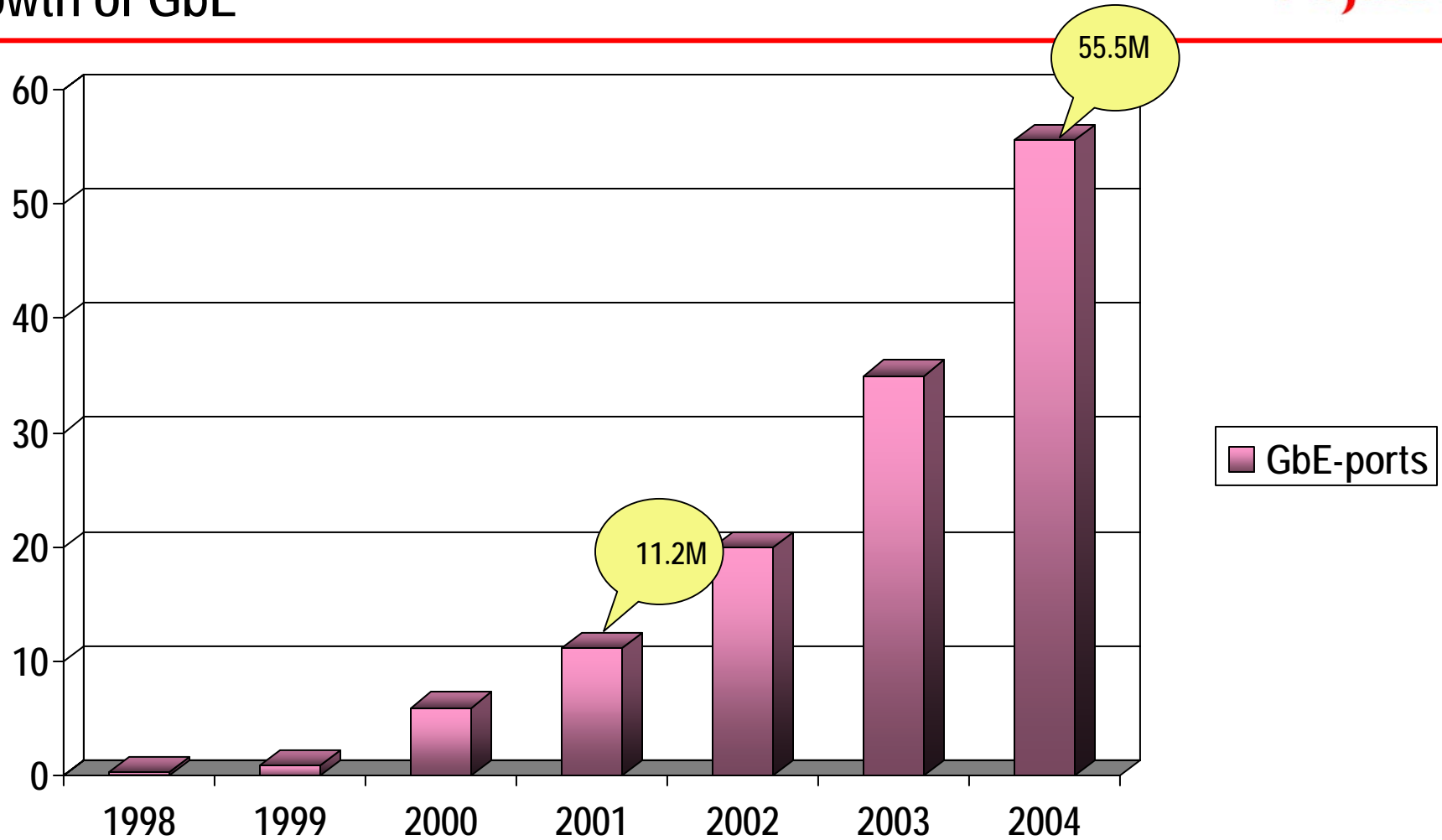
- **The Problem**
 - As Data Traffic Grows at 85% - revenue per bit declines – 53%
 - Growth of High-speed access in U.S. has been anemic
 - 1.3% Q-2-Q (2001-2002), impeded by Access costs and Access itself
 - Telecom industry needs to transform itself into a utility industry
 - Billed and Metered Internet Access - akin to Electric Power
- **Ethernet can optimally provide Voice, Video and Data services at lower costs**
 - Converged Voice, Video and Data Services
 - Capability exists to provide Metering and Billing at lower-order granularity
 - GbE maps easily to higher-order Sonet transport
- **Lower TCO of End-to-End Solutions**
 - Desktops
 - Data-Centers & Storage Networks & Servers
 - Campus and Enterprise Networks
 - Metro Area Networks
 - Residential Units

Ethernet over RPR



- Lower OPEX and CAPEX with Ethernet deployments
- New deployments must be optimized for cost vs bandwidth
- Ethernet provides TLS and QOS mechanism to optimize delivery

Growth of GbE



Worldwide Installed base of Gigabit Ethernet Ports (Copper and Fiber) - IDC 2002

Giga growth: There is no end in sight for the popularity of Gigabit Ethernet products, which originally worked on fiber networks.

Gigabit Ethernet (GbE) Market

- **Declining costs of GbE**

- Critical GbE component prices are falling dramatically
 - ASPs for GbE port dropped by 25% in 2002 over 2001
 - ASPs are expected to drop 15 –20% every year for the next five years
 - Fast Ethernet (FE) and GbE prices will start converging in 2004

- **GbE revenue**

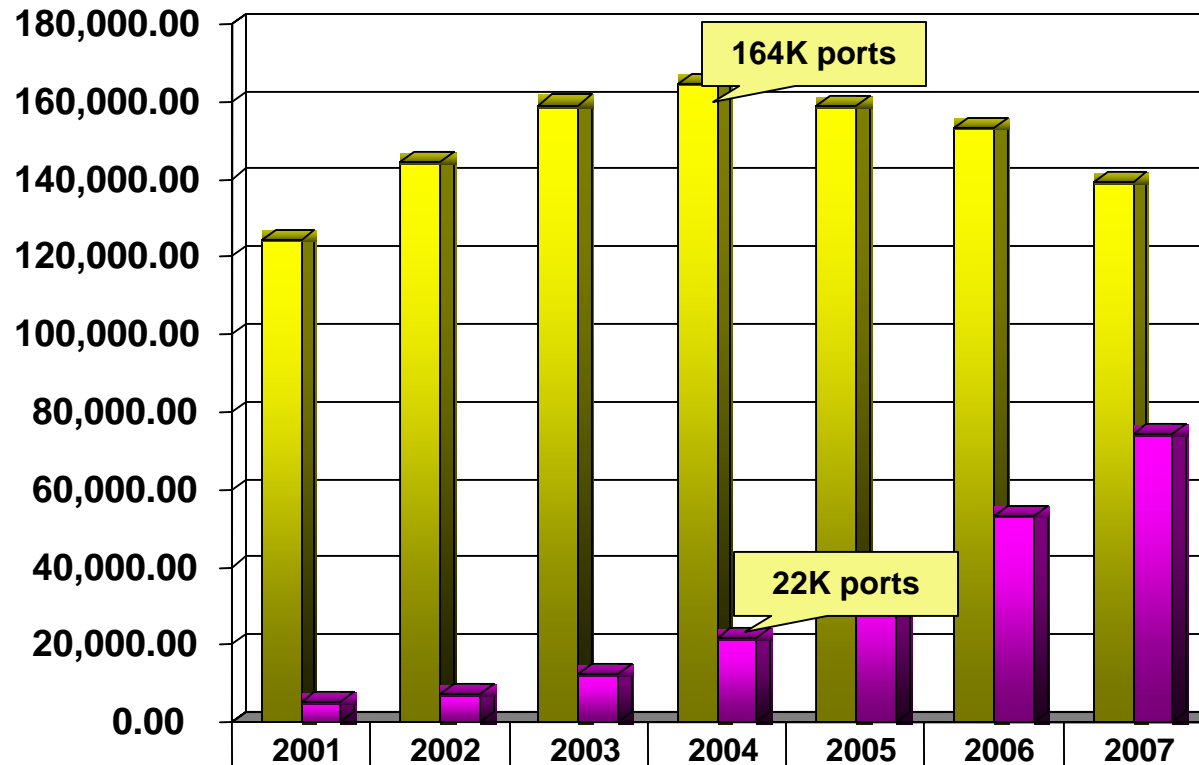
- GbE port shipments -> 10 billion revenue by 2007 (CAGR-20%)
- 2007: GbE -> 35% of ports sold (85% of revenue)

- **Ethernet switch market 2002**

- The worldwide Ethernet switch market => 154 million ports (14% over 2001)
- Gigabit Ethernet ports shipments increased by 42%

Growth of GbE vs Fast Ethernet

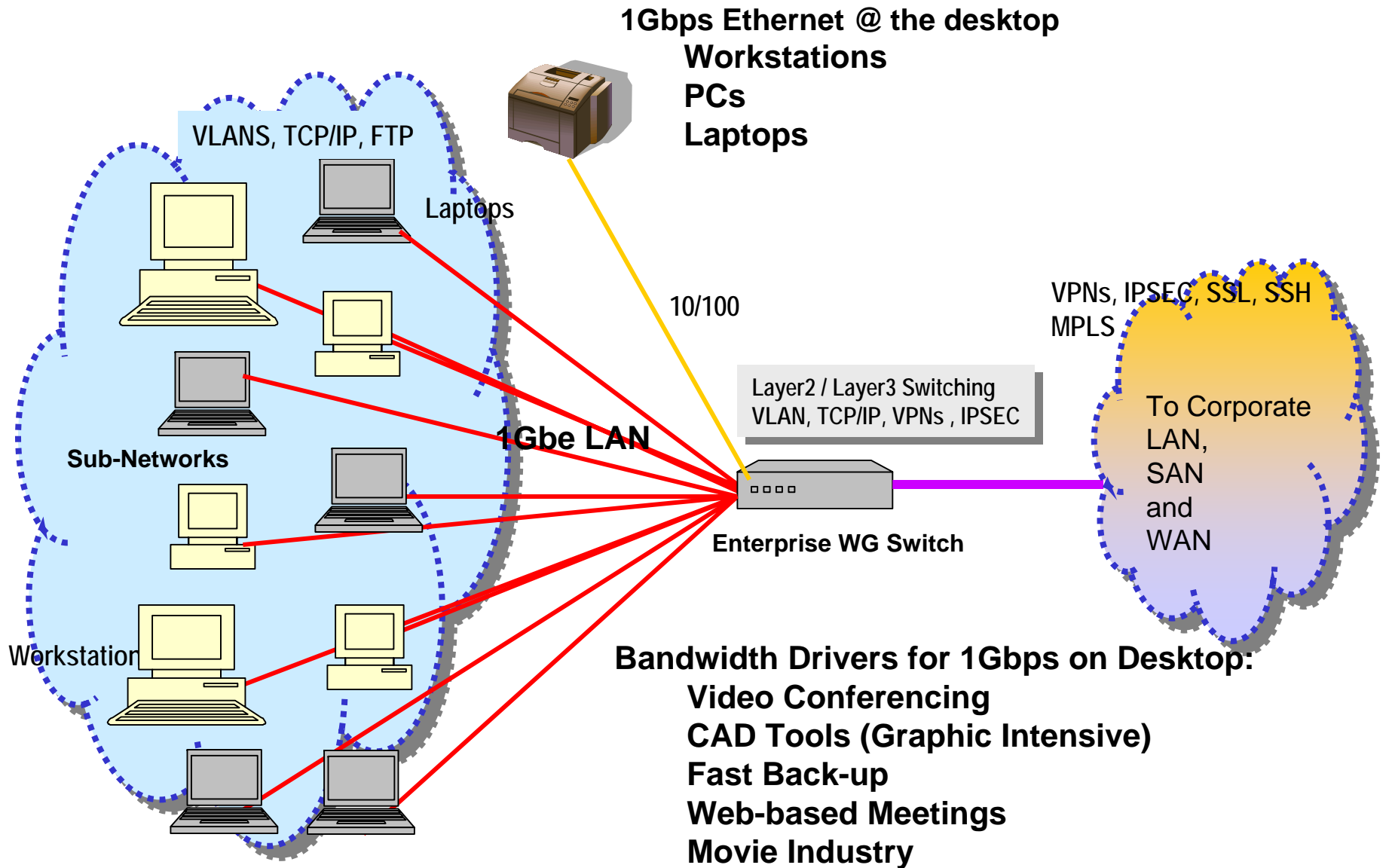
Switch Market



■ 10/100 SwitchesPort (K)
■ 1Gige SwitchesPort (K)

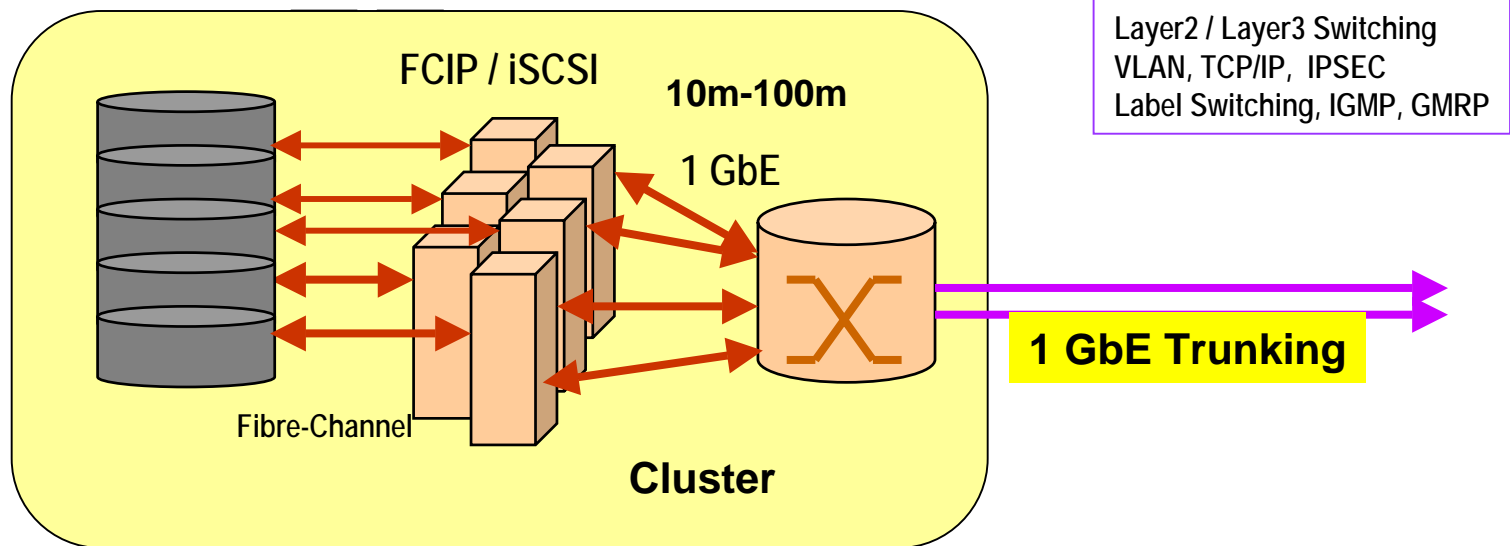
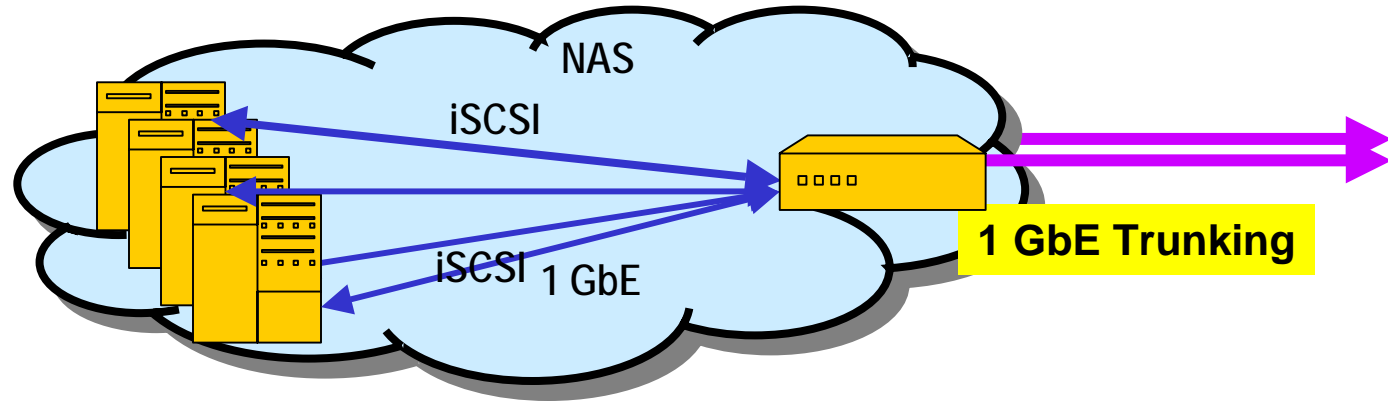
2001: 10/100 => 94%
 2003: GiGe > 10/100
 2004: 10Mbps around 1%
 2006: 10/100 around 10%

1Gbps at the Desktop



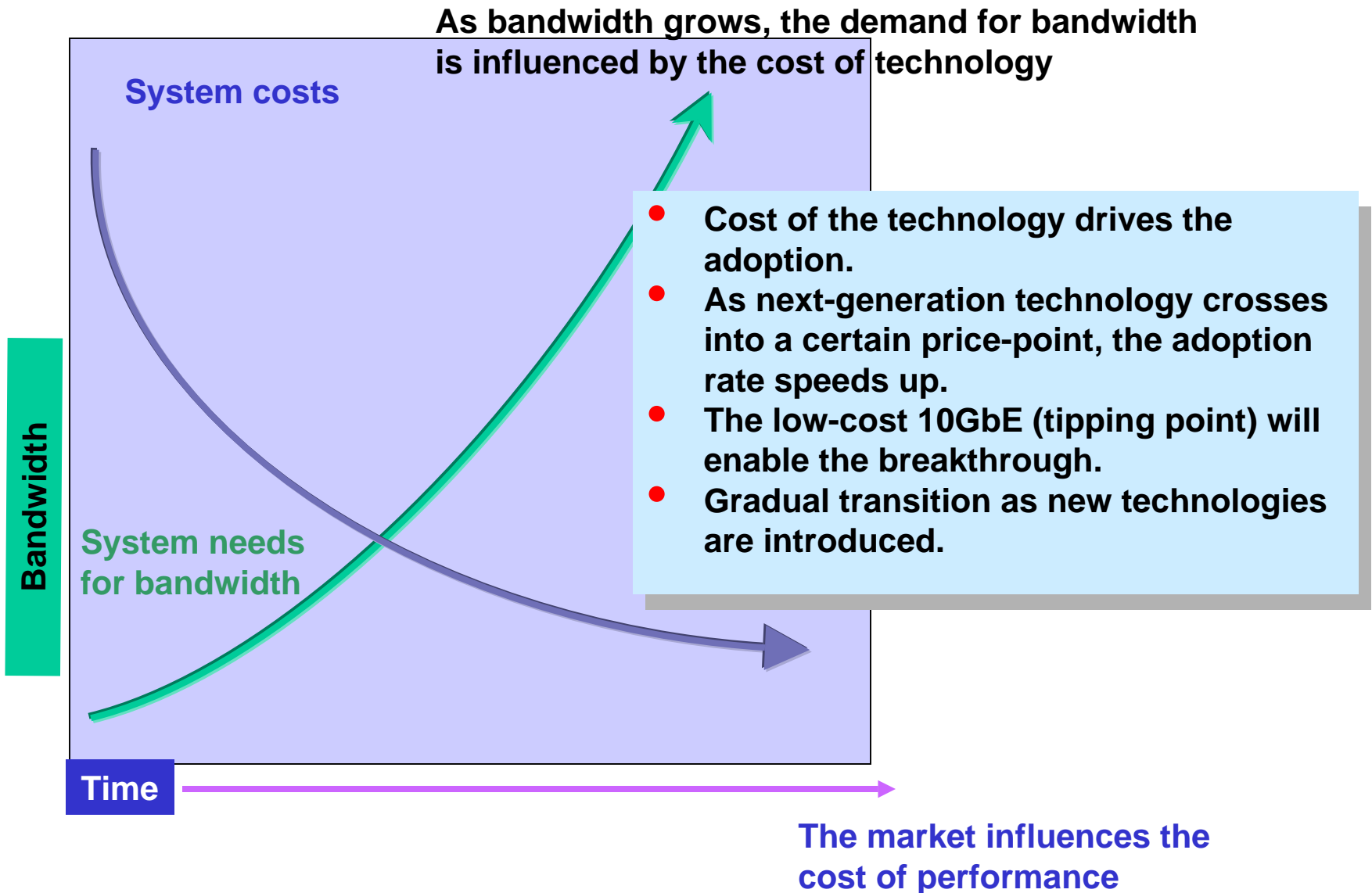
1Gbps Server-to-Switch Connections

Density of storage devices is pushing the need for bandwidth in data centers and enterprise storage networks



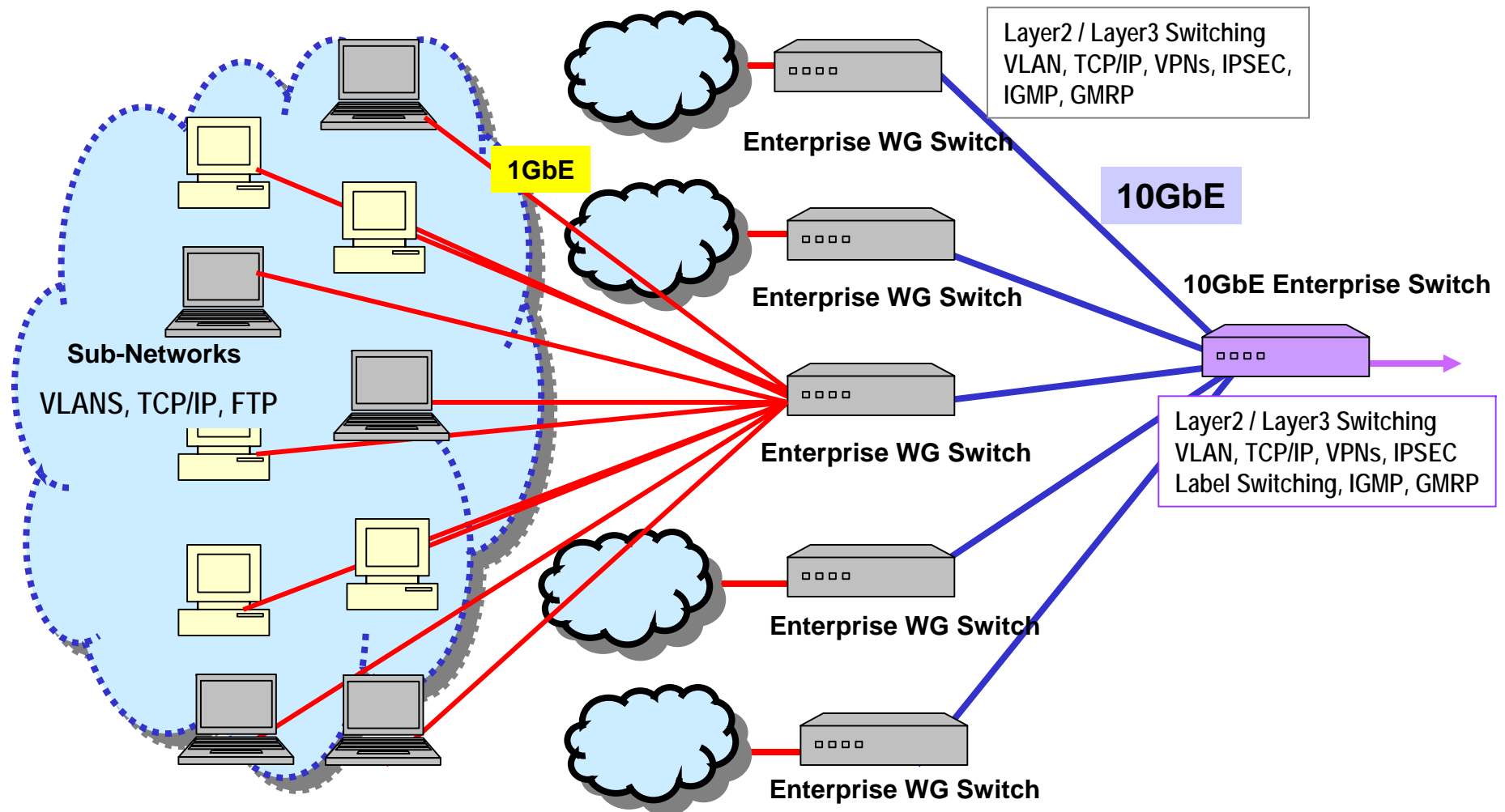
Where does 10GbE fit?

Lower Bandwidth / Cost Ratio

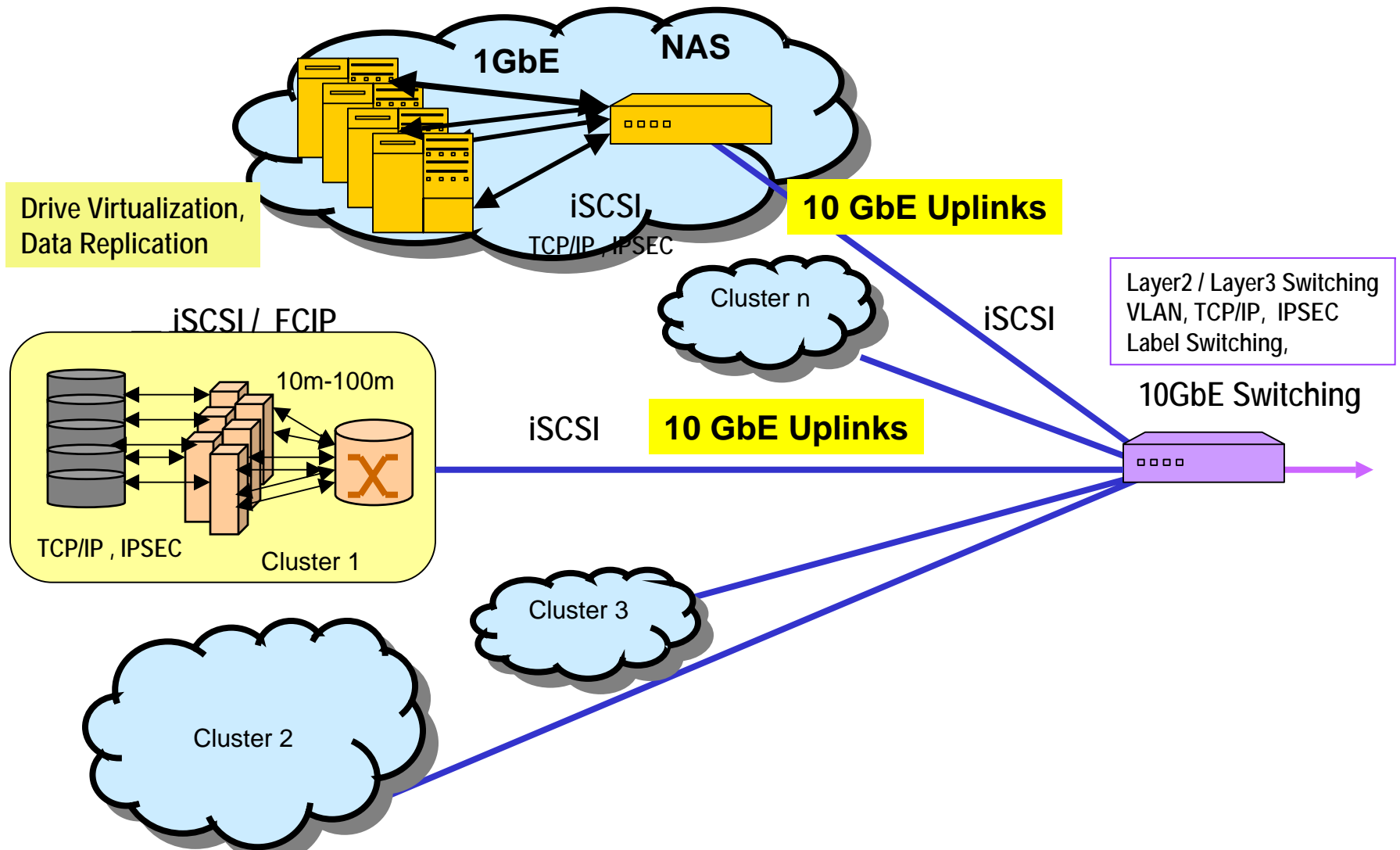


1Gbps-to-10Gbps Migration

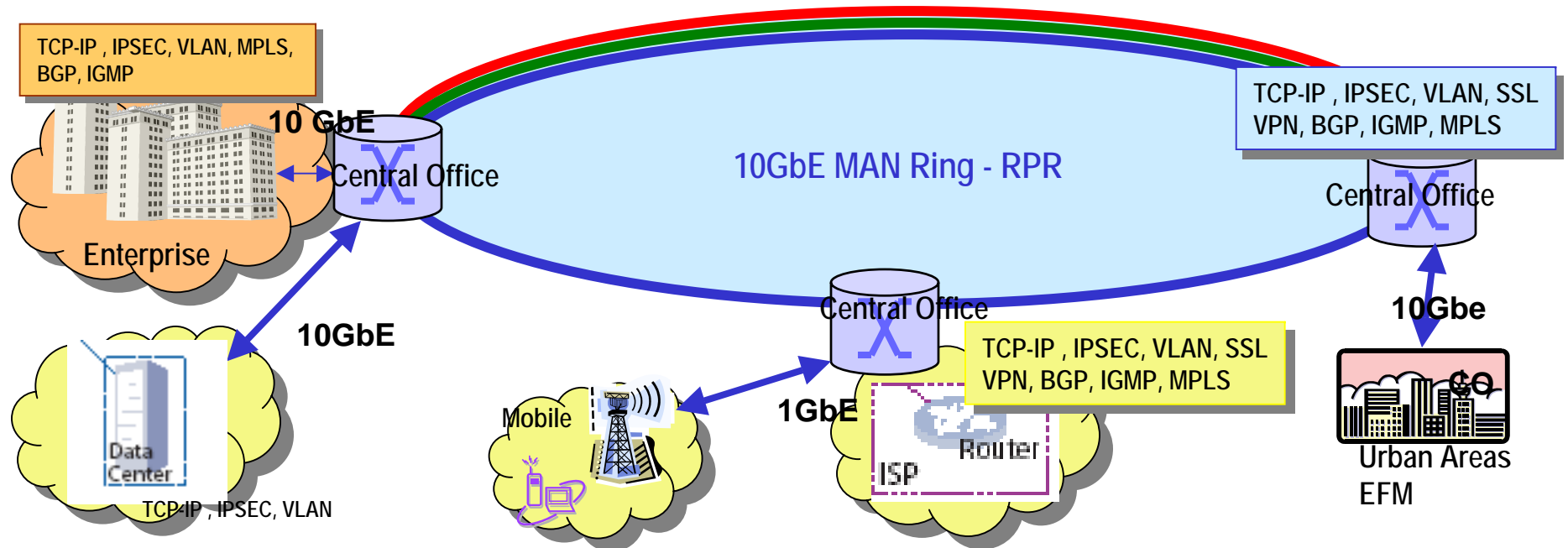
As desktops move to 1Gbps Ethernet, the enterprise interconnects will move to 10GbE switches



10Gbps Switch-to-Switch Connections

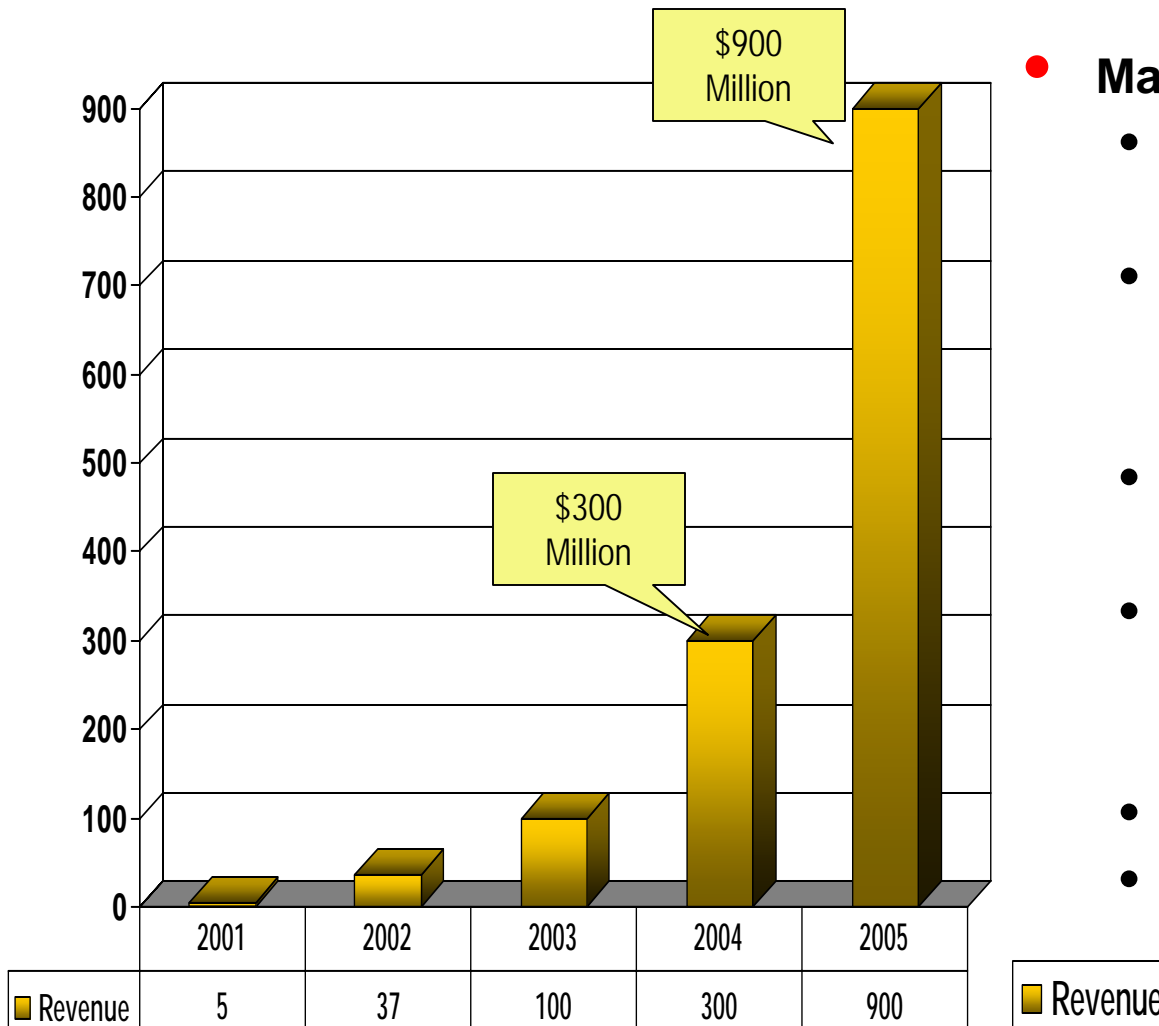


End-to-End Solution of Gigabit Ethernet



- **10GbE as a carrier-class transport**
 - Protocol - RPR (Resilient Packet Rings - 802.17)
- **Carrier-class Ethernet services**
 - Transparent LAN, video, data, voice, TDM
 - VLAN, frame relay emulation
 - Utilizing QOS, MPLS, DiffServ and congestion management
 - Simplified Network Provisioning
 - Delivered with 99.999% reliability

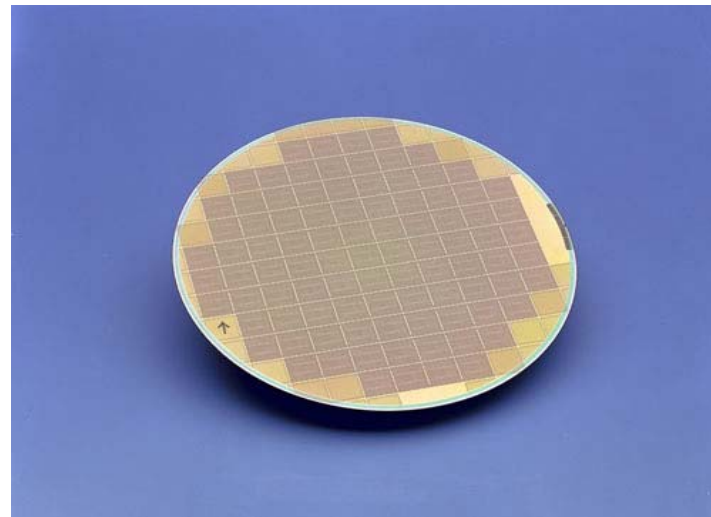
10GbE Port Revenues



Market Drivers for 10GbE

- Enterprise data centers
 - High-density GiGe
- Consolidation of servers
 - GbE-attached servers
 - Server blades
- Campus backbones
 - PCs and workstations w/ GbE
- Metro
 - 10G Ethernet Mesh
 - 10G Ethernet Rings
- Wireless back-haul
- Lower-cost 10GbE over copper
 - CX4 and 10G BaseT

12-port, 10Gbps Ethernet Switching in one!



10Gbps Ethernet Switch Chip

First single-chip solution for 10Gbps Ethernet switches

- **Key features**

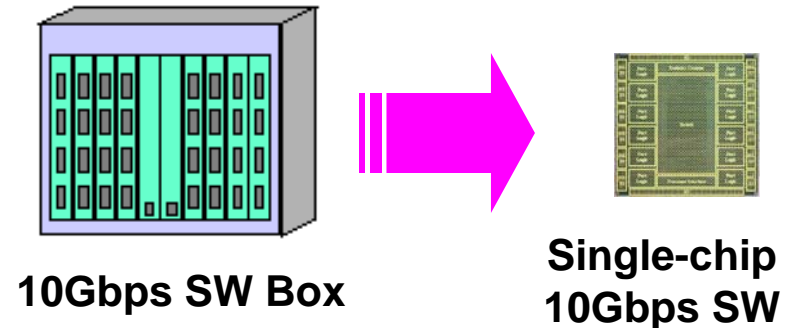
- 12-port 10Gbps Ethernet layer-2 switch chip
- Supports VLAN, QoS, multicast and MSTP
- On-chip high-throughput buffer memory
- Integrated XAUI SERDES
- 802.3ae PAUSE support

- **Benefits**

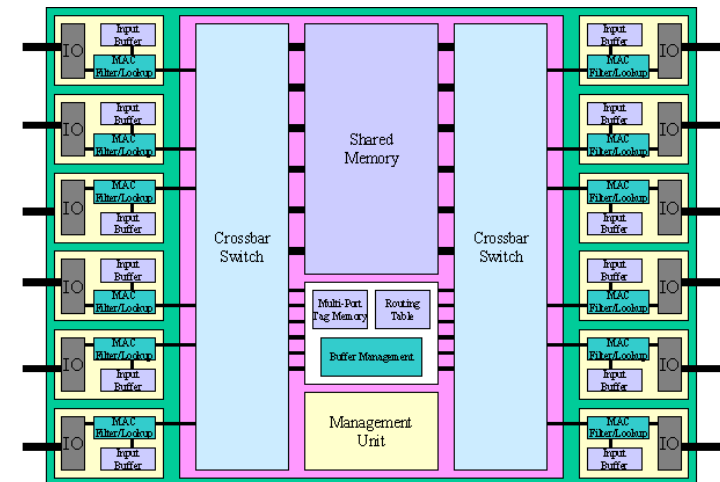
- High density and low cost
- Total aggregate throughput of 240Gbps
- Low latency for cluster applications

- **Enabling technologies**

- High-throughput memory for packet buffering
- Buffer management for low latency
- XAUI and MAC macro integration for low cost

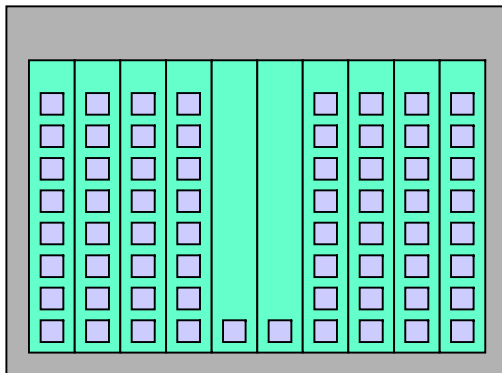


- **Focus on layer 2 and 10GE**
- **High-throughput buffer memory**
- **SERDES integration**



Changing Economics: Price/Port Comparison

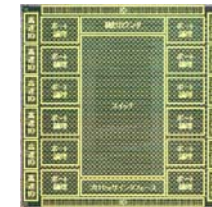
**10Gbps
Switch Box**



\$20K/port

System Price: \$250K

**10Gbps
Switch Chip**



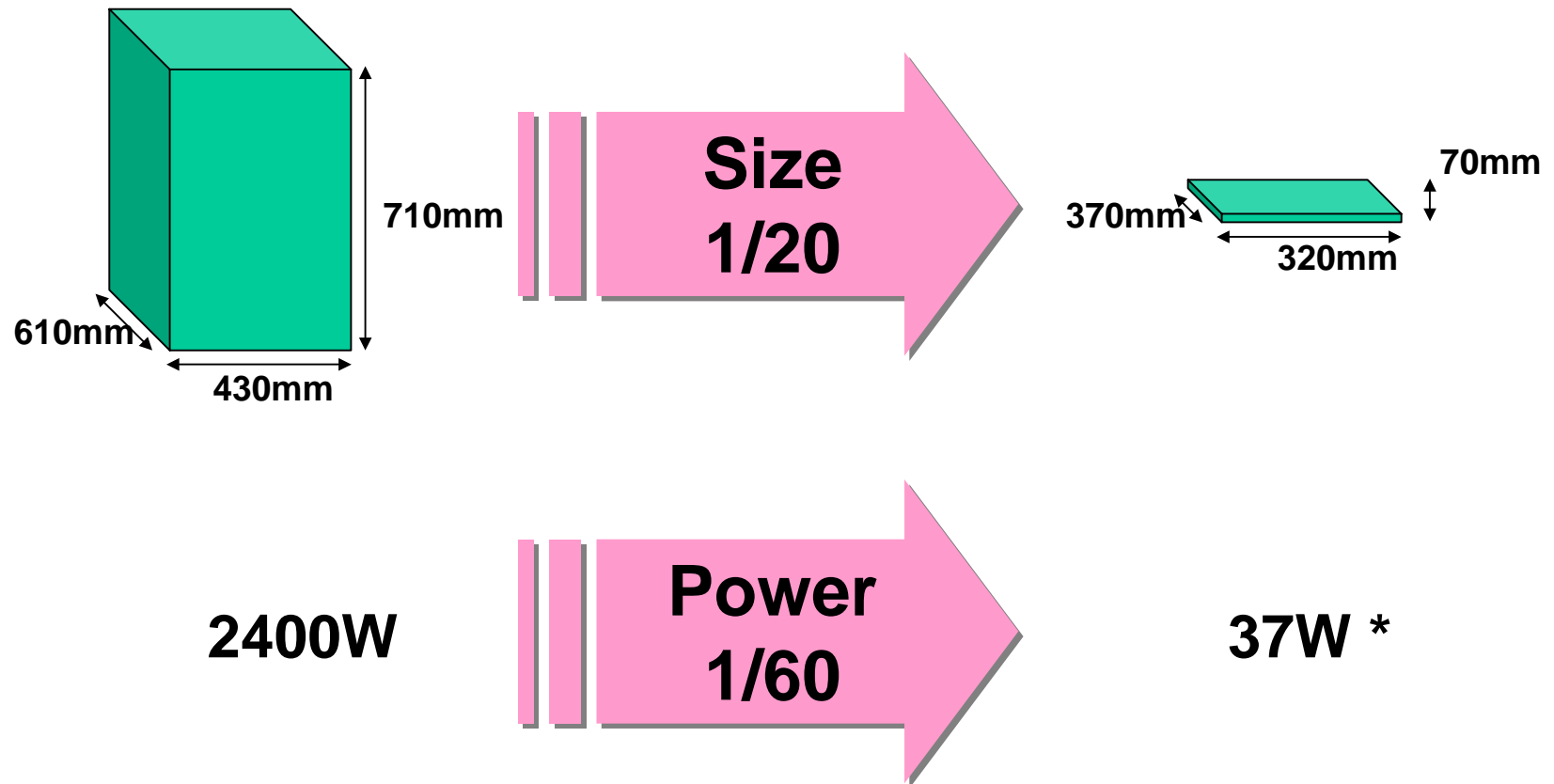
\$200/port

System Price: \$4K

**Port Price
1/100**

Note: price is for a 12-port system

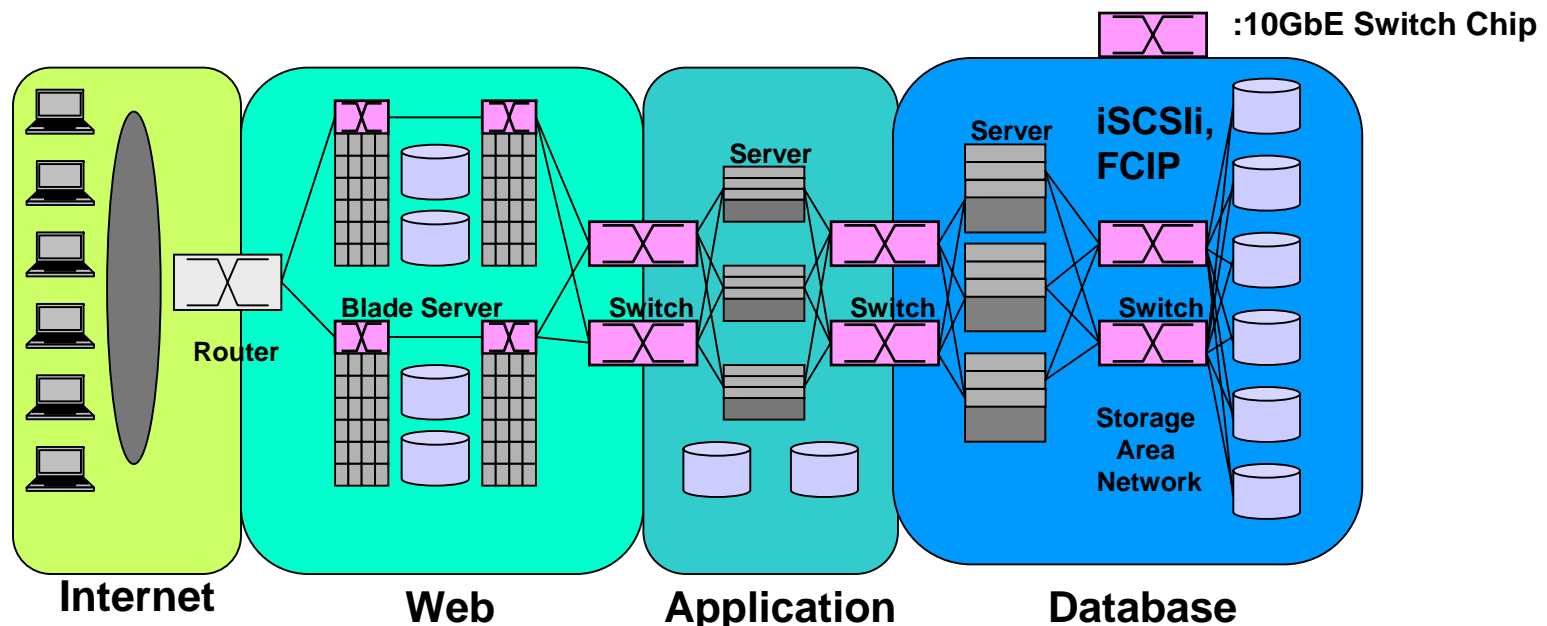
Size & Power Consumption Reduction



* Total Board Power

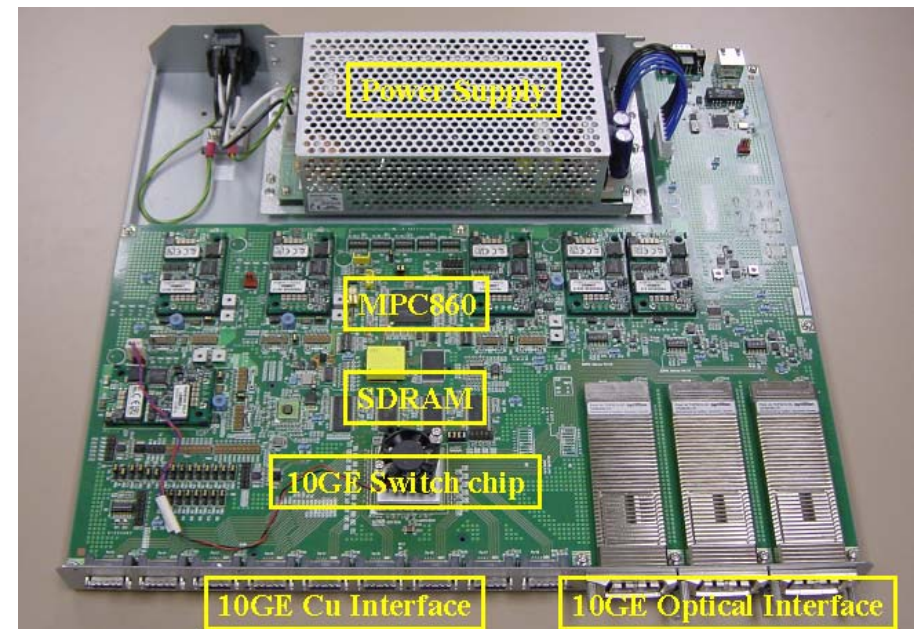
Target Applications

- Cluster, grid, blade, IP storage and aggregation switches are all used in data centers
- It is important to centralize all server farms or data centers into one facility to reduce the total cost of ownership while maintaining network and computing performance
- A 10GbE switch chip can provide the high density, scalable, cost-effective, high-performance solution for data centers, server and the enterprise



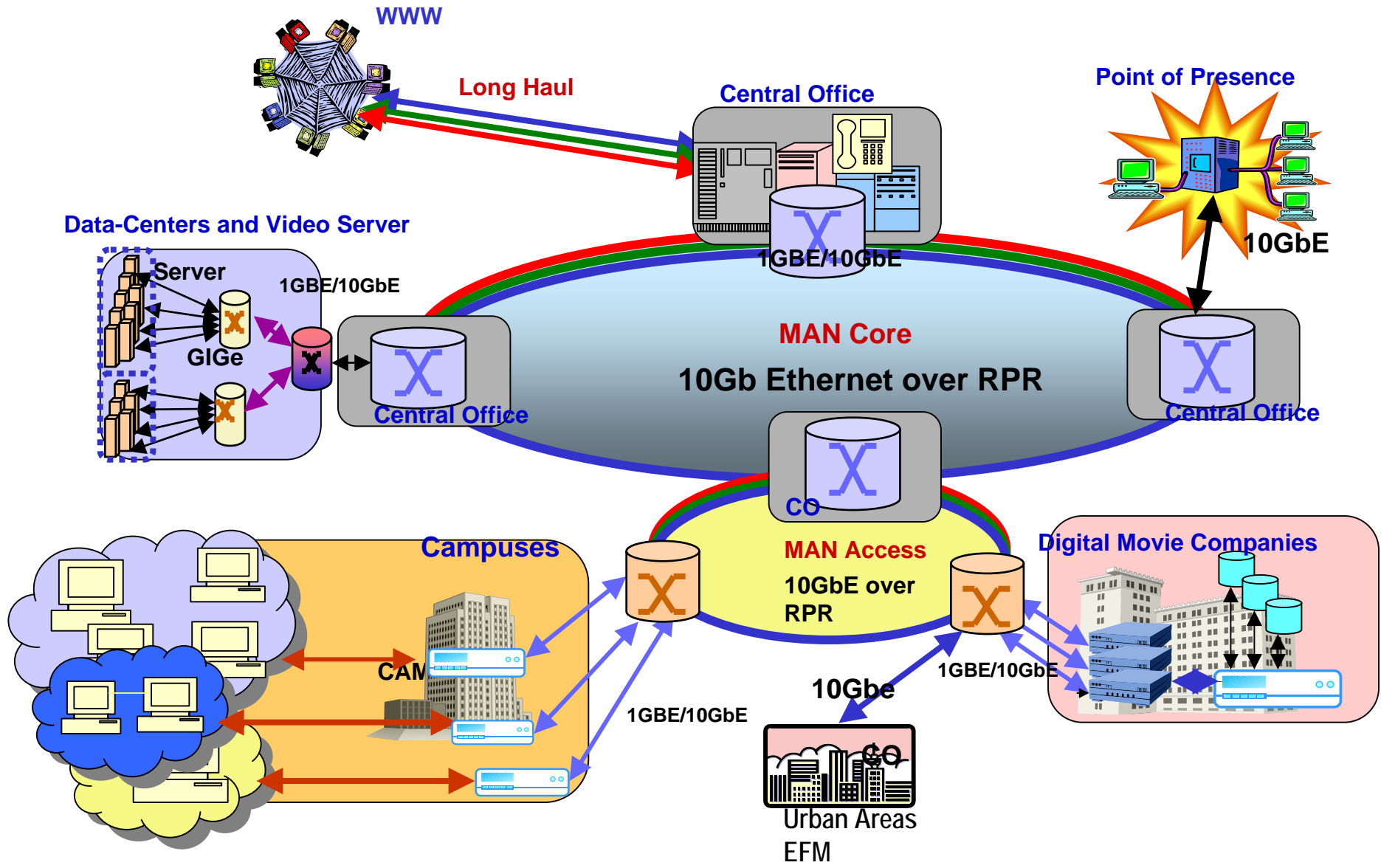
Software & Evaluation Board

- **Layer-2 standard support**
 - 802.1D spanning tree
 - 802.1Q VLAN
 - 802.1p priority queuing
- **Device management support**
 - SNMP
 - Web-based management
 - Console interface
- **Standard MIB support**
 - MIB II
 - Bridge MIB
 - RMON MIB
 - SMON MIB
 - SNMP MIB
- **Hardware diagnostics**
 - Test with random packet generation



Conclusion

Gigabit Ethernet Everywhere!



Summary

- **The Ethernet value proposition**

- Low-cost end-to-end solutions
 - Enterprise
 - Storage networks
 - Desktops
 - MAN
- Capable of delivering carrier-class services with optimal quality of service and carrier-class reliability
- With diverse SLA offerings.

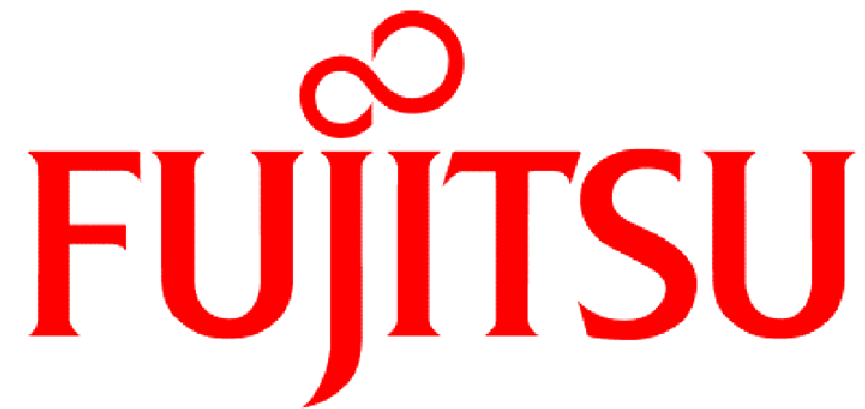
- **Benefits**

- Lower the OPEX and CAPEX for service providers
- Improves SP's revenue per bit
- And we will all make money!

- **The Future**

- Telemedicine
- Tele-schooling
- The possibilities are JUST Infinite!

- **Copies of the presentation will be available on the Web**
www.fma.fujitsu.com
- **Please visit Kiosk 101 in booth 1430 @ GEC Pavilion for demo**



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THE POSSIBILITIES ARE INFINITE