

# IBM Ethernet Networking Solutions



**Jeff Huxtable**

Networking Consultant  
Networking Hardware Division  
International Business Machines  
Corporation

1001 Winstead Drive  
Cary, NC 27513  
919-301-4309  
Fax: 919-301-3794  
Internet: [huxtable@us.ibm.com](mailto:huxtable@us.ibm.com)



**e-business**



---

# Movement to e-business solutions

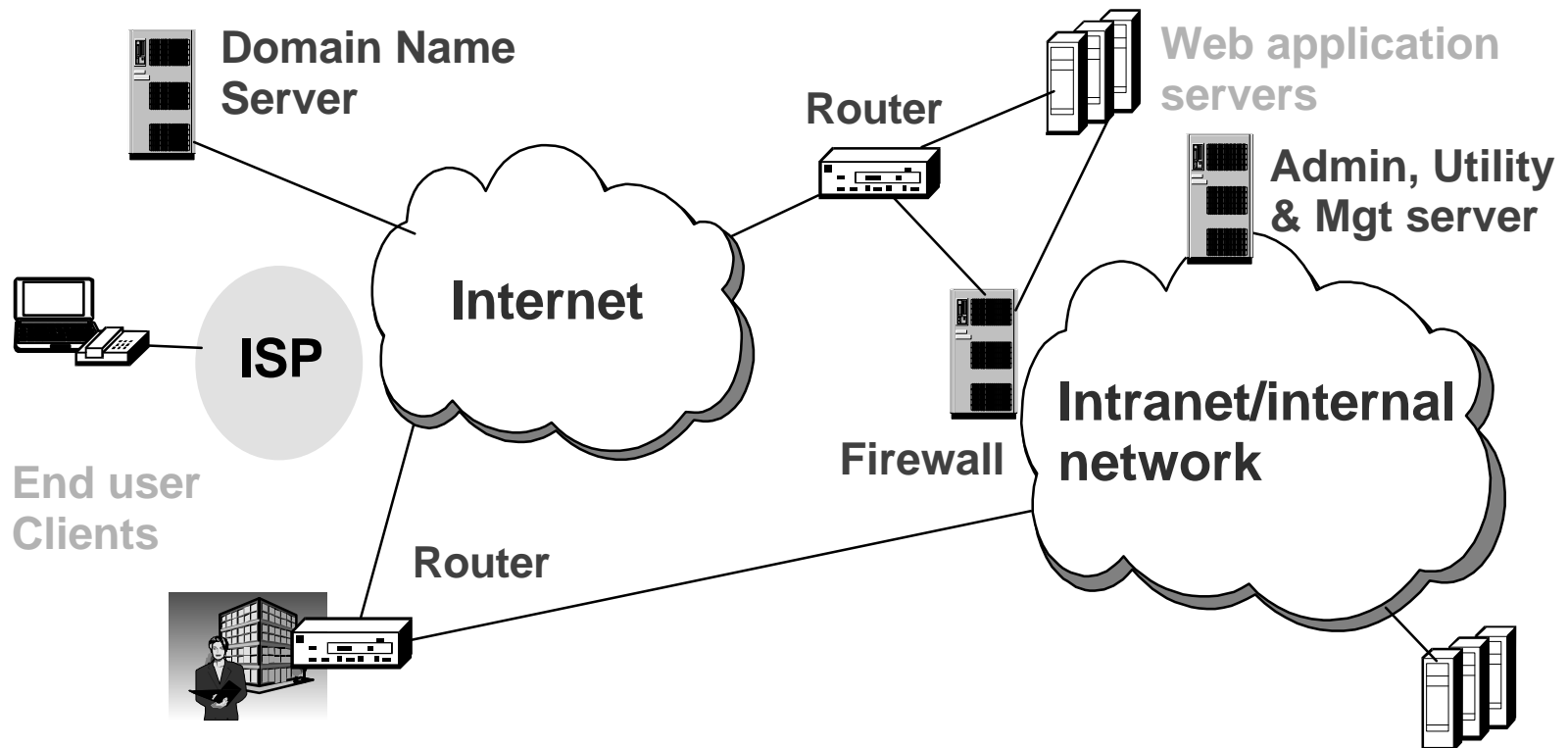
- Web-enable existing applications
- Utilize Internet, Intranets, and Extranets
- Extending reach to new customers
- Implement New Business Applications
- Accommodate growth
- Streamline operations and supply chain



e-business

- Start simple and grow fast
- Secure, scalable and reliable connectivity
- Solutions designed for e-business
- Increased bandwidth
- Investment protection
- Voice, data, and fax integration
- Management options

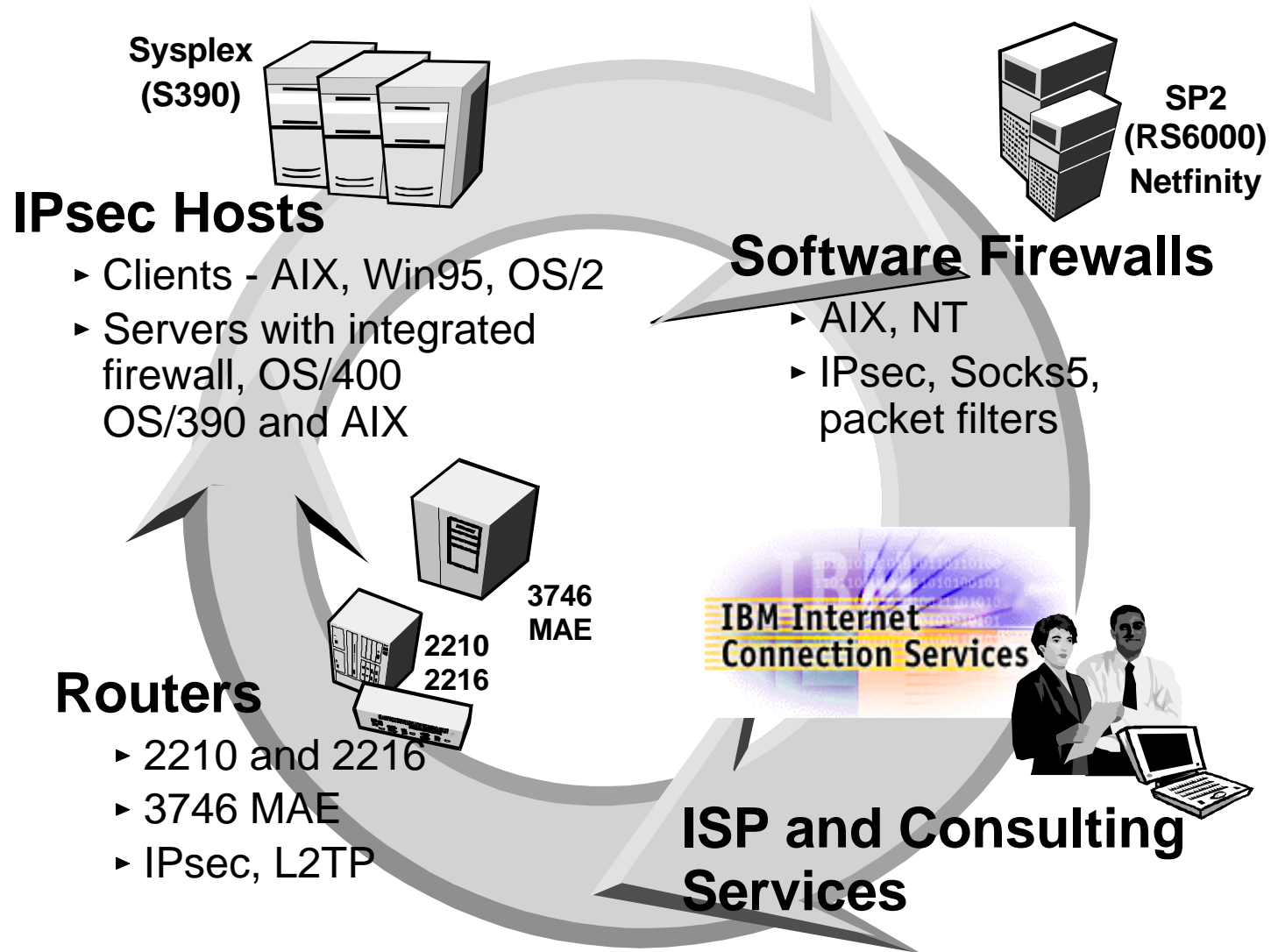
# Key e-business Network Components



## Key e-business Network Components

- Router
- Firewall
- Admin, utility and management server

# Everything You Need For e-business

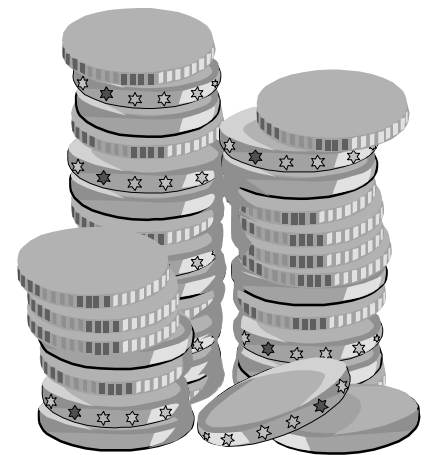


# IBM Networking Strategy: Emphasis on Switching

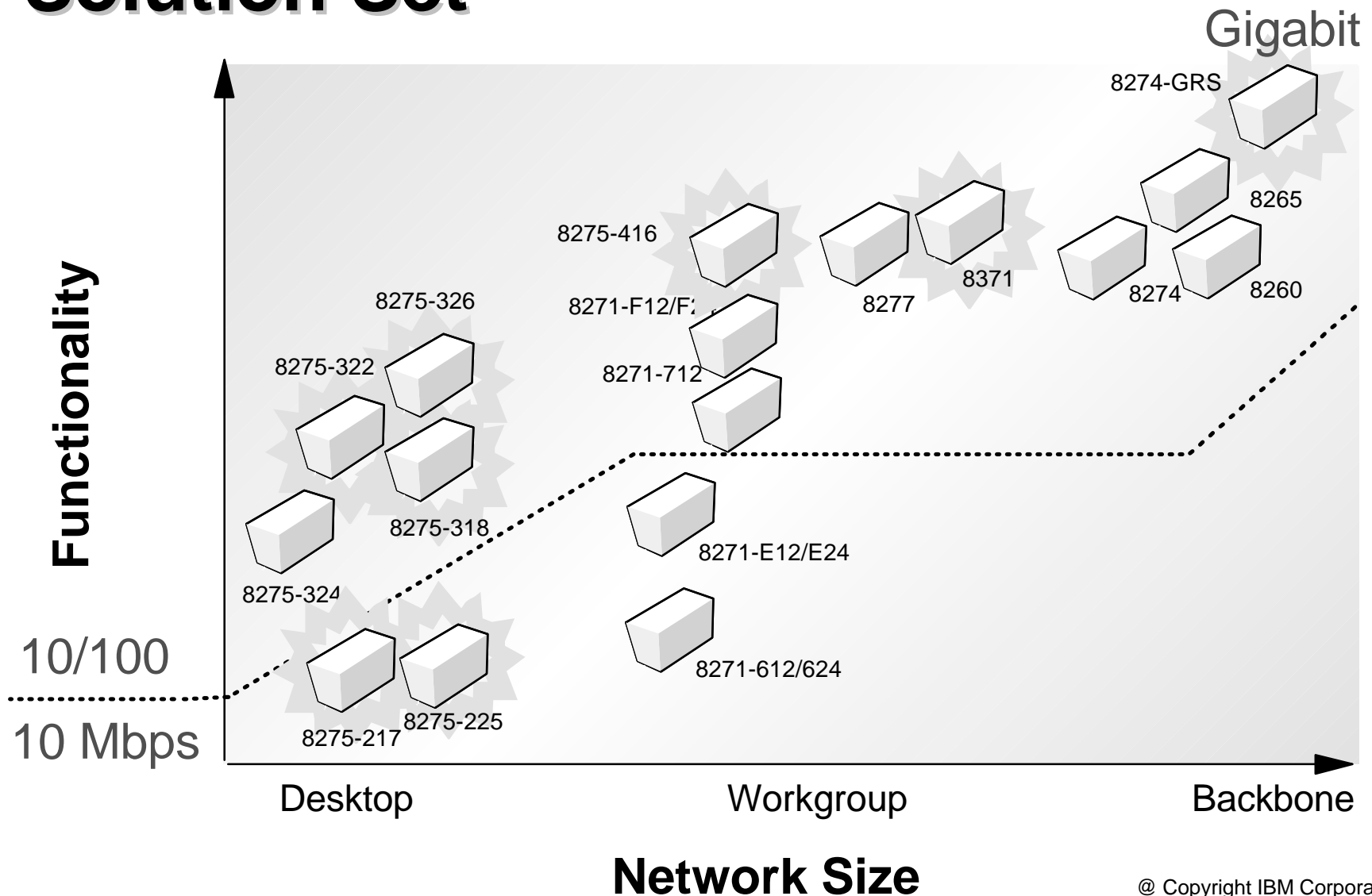
Switching provides a significant increase in bandwidth:

- Using existing wiring infrastructure
- Facilitates the migration to a segmented network for broadcast reduction
- Provides dedicated bandwidth to
  - Power user's
  - Servers and
  - Switch to Switch
- Minimizes disruption to the network.....

*And you save a fistful of dollars !!!!!*



# Rapidly Expanding Ethernet Solution Set



# 8275 10BaseT Switches

## New Models



### 8275 Model 217

- ♦ **16 (or 24) MDI-X 10BaseT ports**
  - One MDI port is available to connect the 8275 to other switches. The MDI port is used in place of port 8 (or 12).
- ♦ **One 10BaseT/100BaseTX port**
- ♦ **Two expansion slots that can accept the following features:**
  - 1-port 10BaseT/100BaseTX module
  - 1-port 100BaseFX module
- ♦ **EIA-232 port for local management**



### 8275 Model 225



---

## 8275 Models 217 and 225

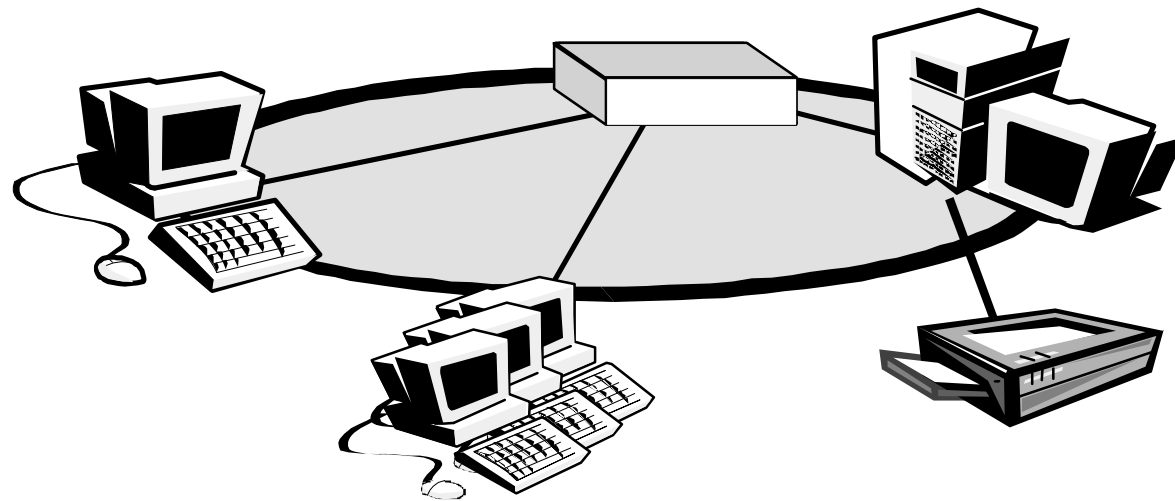
### Features:

- All 10BaseT and 100BaseTX ports support half- or full-duplex connections
- Supports 2000 MAC addresses
- Port mirroring
- Supports Cut-through and Store-and-Forward (default) switching
- Port trunking available on 100 Mbps ports
- Rack-mountable or place on desktop
- 802.1Q VLAN tagging
- Port-based VLANs
- Static multicast address configuration
- Illuminated Control Panel for easy configuration and status updates



# "Shared to Switched Ethernet Migration"

**10Mb Ethernet Hub  
8242-008 or 016**

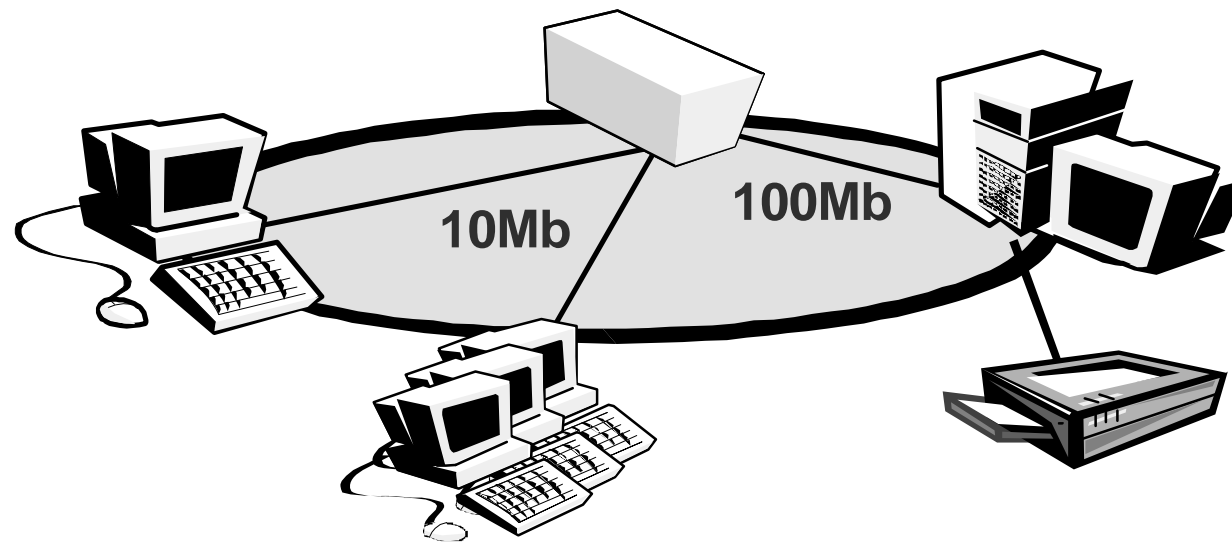


**Shared Environment Using 10Mb Hub**

- All Users Share 10Mb Bandwidth
- Performance Can Suffer as Traffic Increases

# "Shared to Switched Ethernet Migration"

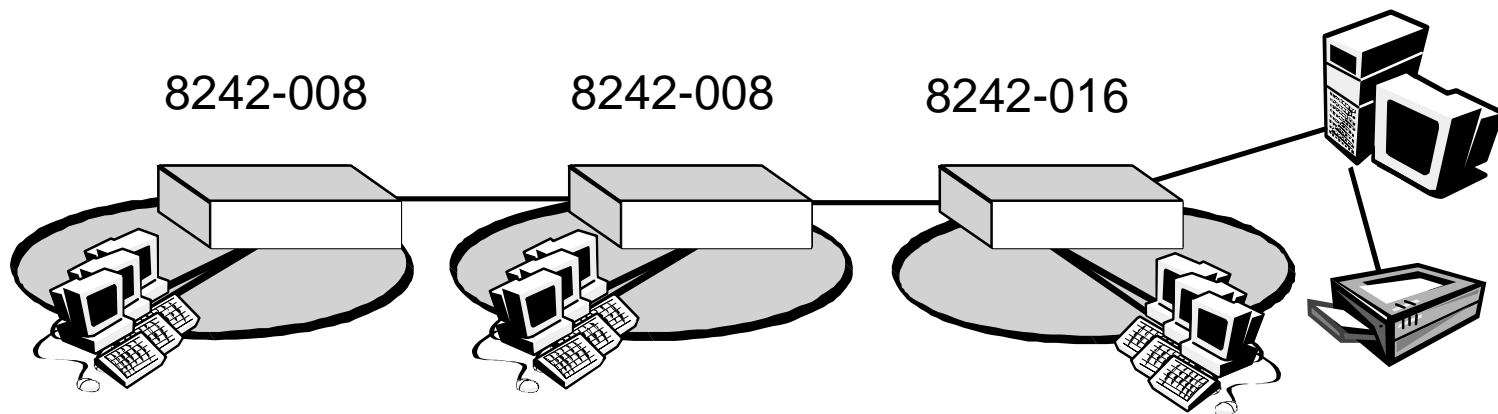
**10Mb Ethernet Switch  
8275-217 or 225**



## **Switched Environment**

- **All Users Have 10Mb to the Desktop**
- **Increase Bandwidth Per User**
- **Server, Printer or Super User Connected via 100Mb Uplink Port**

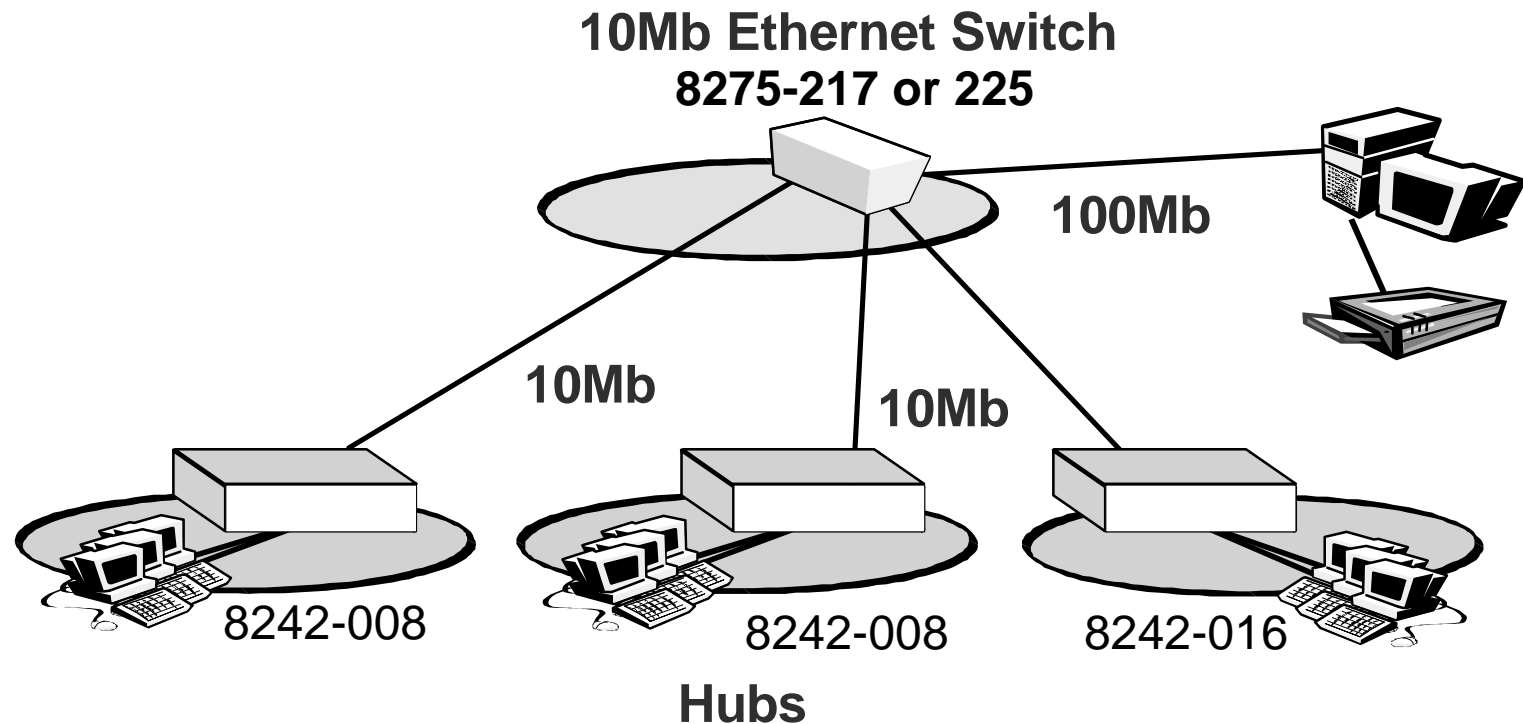
## "Segment Departmental LANs with 10Mb Switch"



### Shared Environment Using Hubs

- All Users Share 10Mb Bandwidth
- Performance Can Suffer as Traffic Increases
- All Users on Same Segment

# "Segment Departmental LANs with 10Mb Switch"



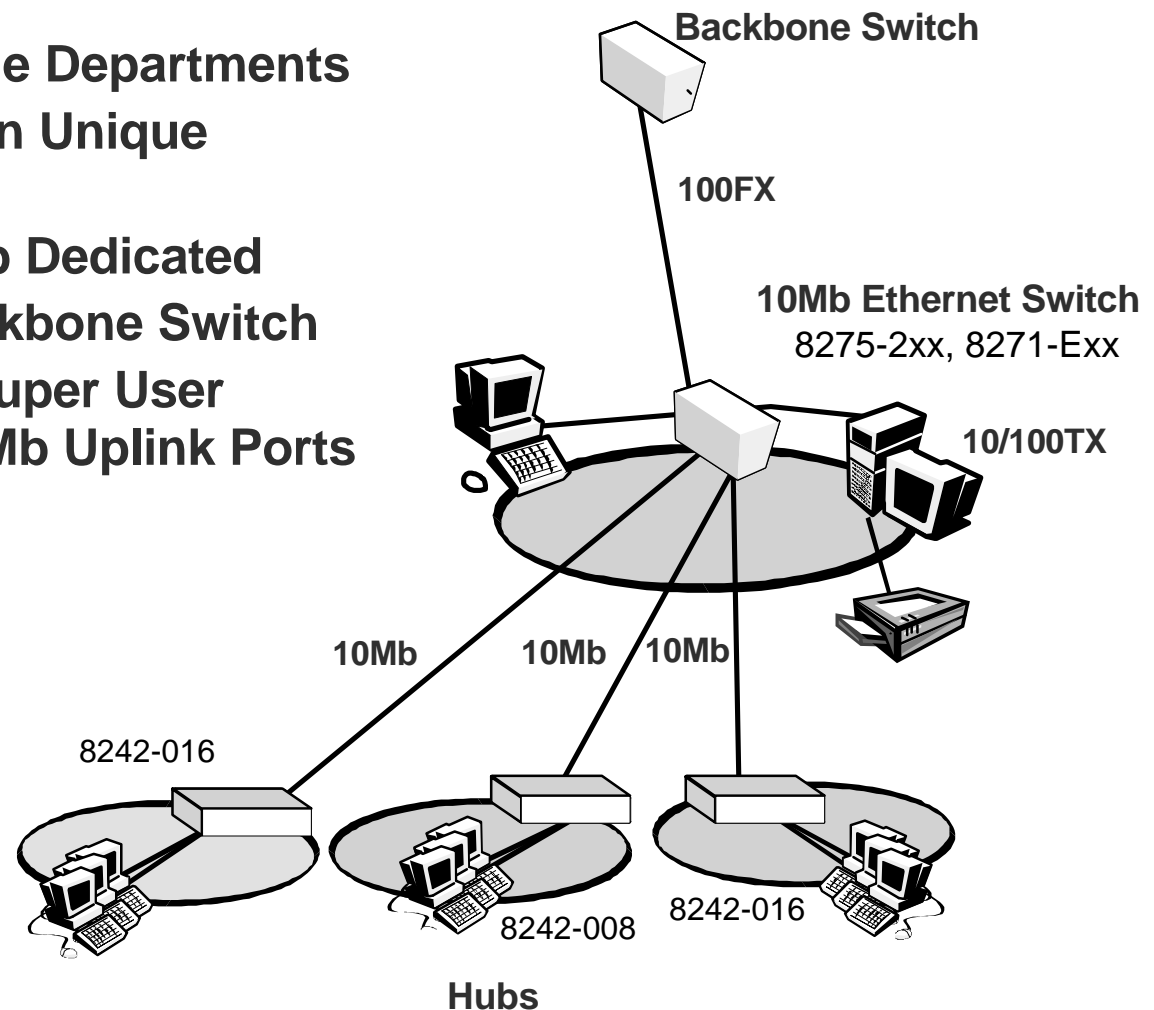
## Segmented LANs

- Ethernet Switch Used to Segment LANs
- Each Hub has 10Mb Dedicated Connection from Switch
- Provides Increased Bandwidth to Each Segment
- Server, Printer or Super User Connected via 100Mb Uplink Port

# Enterprise Scenario: "Segmented Departmental LANs with High Speed Uplink"

## Enterprise with Multiple Departments

- Each Department on Unique Segment
- Each Hub has 10Mb Dedicated
- Fiber Uplink to Backbone Switch
- Server, Printer or Super User Connected via 100Mb Uplink Ports (10/100TX or Fiber)



# 8275 10/100 Switches New Models



## Model 322

- ♦ 8 100BaseFX ports
- ♦ 12 10BaseT/100BaseTX ports
- ♦ 2 Expansion slots
  - 1-port gigabit ethernet (1000BaseSX) module\*
  - 2-port 100BaseFX module
- ♦ EIA-232 port for local management



## Model 318

- ♦ 16 100BaseFX ports
- ♦ 2 Expansion slots
  - 1-port gigabit ethernet (1000BaseSX) module\*
  - 2-port 100BaseFX module
- ♦ EIA-232 port for local management



## Model 326

- ♦ 24 10BaseT/100BaseTX ports
- ♦ 2 Expansion slots
  - 1-port gigabit ethernet (1000BaseSX) module\*
  - 2-port 100BaseFX module
- ♦ EIA-232 port for local management

\* Release 2 May 28, 1999



---

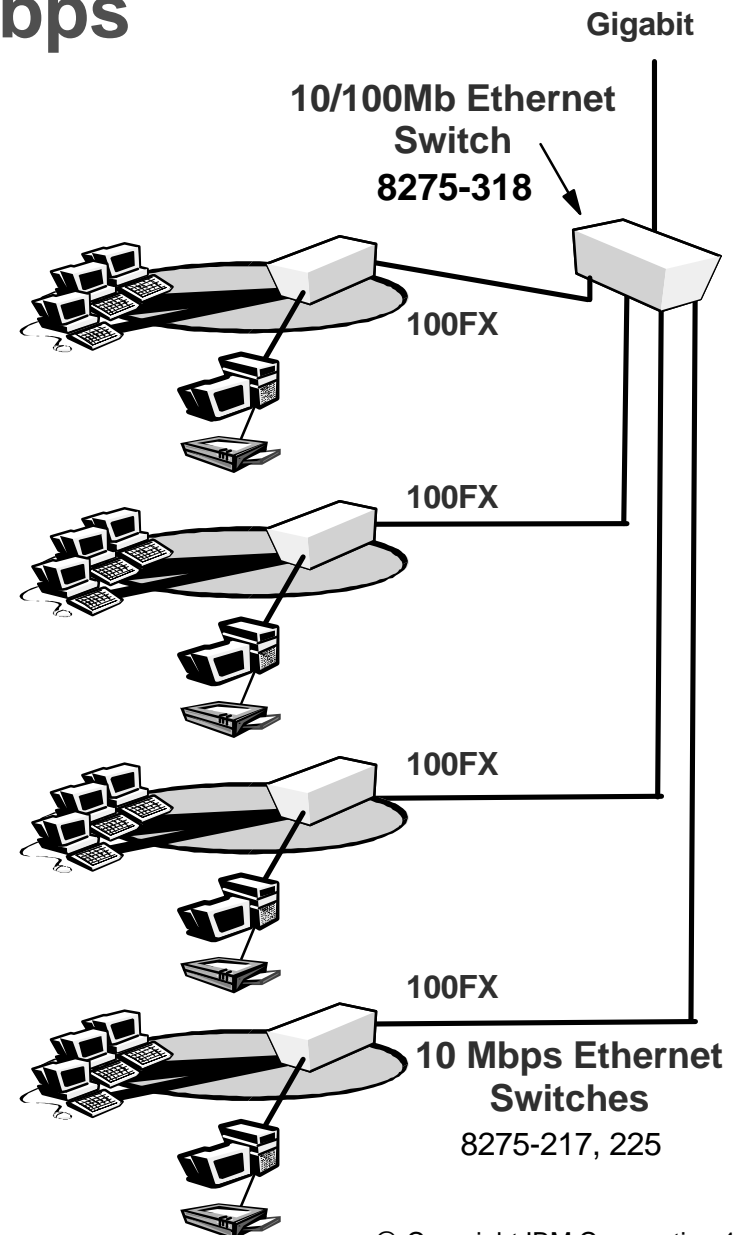
# 8275-300 Series

## Features:

- All 10BaseT/100BaseTX ports autonegotiate speed and duplex connectivity
- All ports support full- or half-duplex operation
- Supports 8192 MAC addresses
  - Automatic MAC address aging
- Supports Cut-through and Store-and-Forward (default) switching
- Trunking for high-bandwidth connections between switches
- Port Mirroring (due 1Q99 for 8275-324)
- Rack-mountable or place on desktop
- 2MB switching buffers (1 MB for Models 318 and 322)
  - Dynamically allocated
- Port-based VLANs
- Supports UTP and STP cabling
- LEDs for at-a-glance switch management

# "Aggregation Point for 100 Mbps Fiber Uplinks"

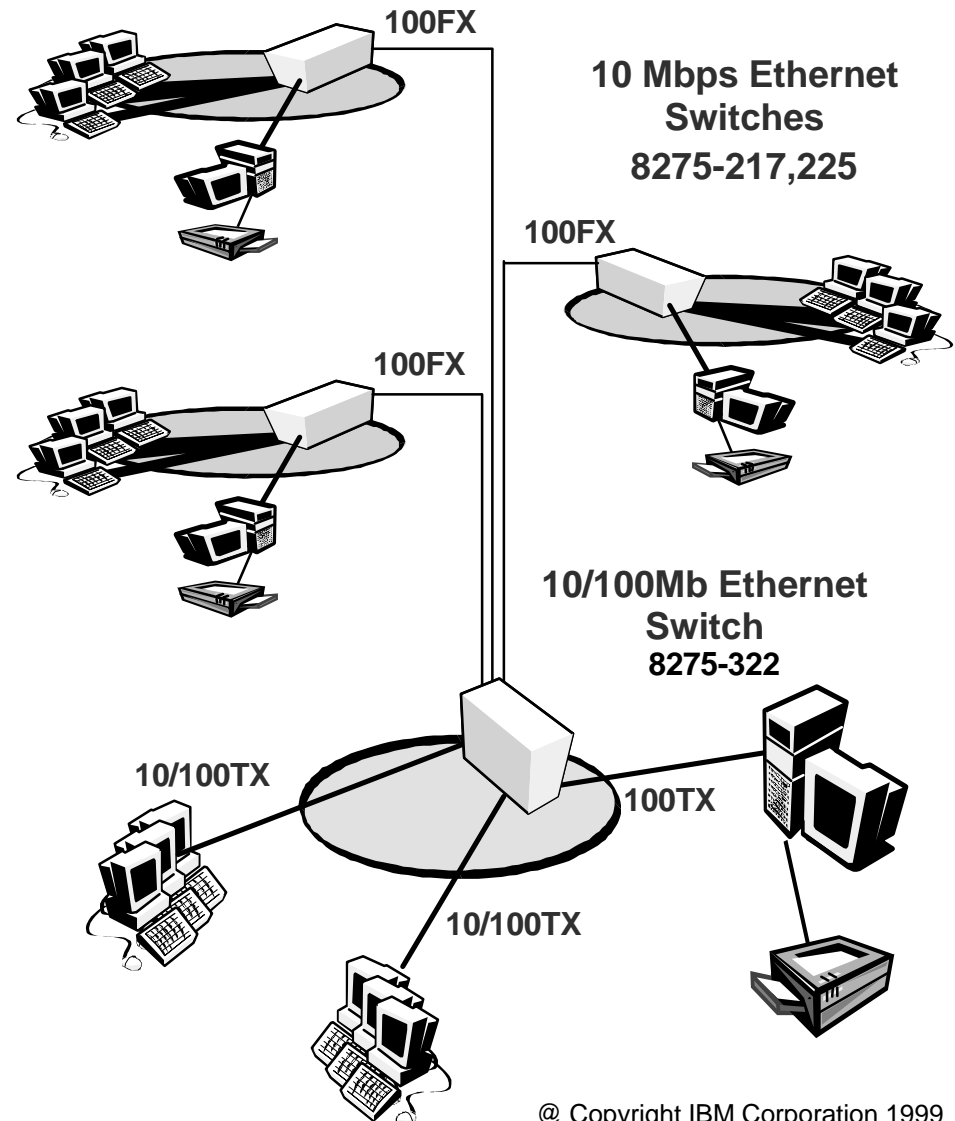
- 16 100FX Fiber Ports for Aggregation of Hubs & Switches (Fiber Catcher)
- Gigabit Uplinks for Connection to Enterprise Backbone Switch
- Campus Solution with Fiber Connections for Distance or Noisy Environments
- Removes Bottlenecks in Hub & Switches by Segmenting LANs
- High Speed Connections for Servers & Super Users Requiring Fiber
- Industry Leading Fiber Port Density





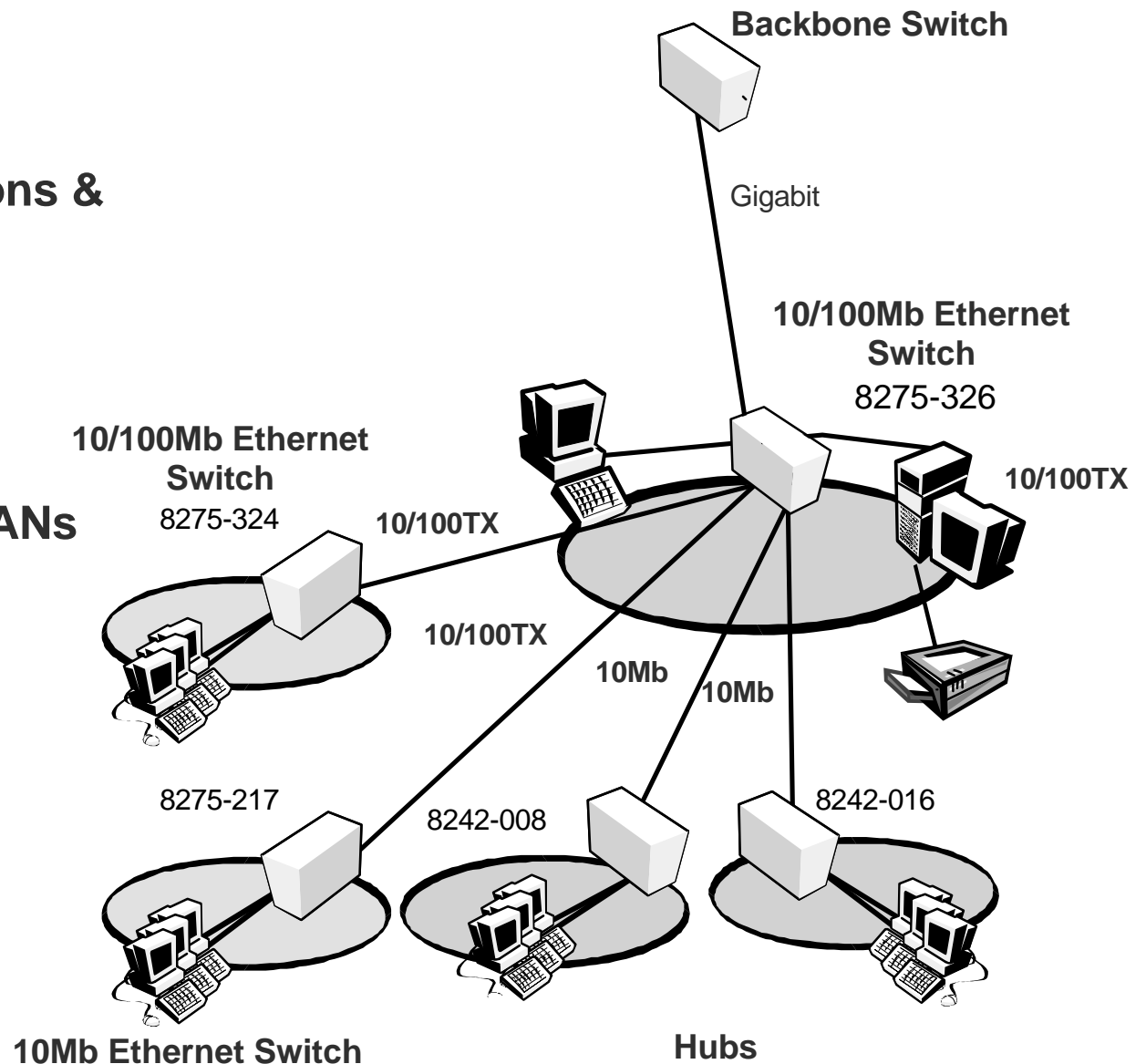
# "Mixed Environment (Copper & Fiber) Fast Ethernet Backbone"

- High speed Copper and Fiber Connections to Desktops or Servers
- 10/100TX & 100FX Aggregation of Hubs & Switches
- High Performance Backbone for Medium Business
- Flexible Configuration for Mixed Cable Environments
- Segmentation of LANs for Increased Performance



# "High Density Desktop and Server Connections"

- 24 10/100 Ports for Desktop Connections & Aggregation of Hubs/Switches
- 2 Gigabit Ports for Uplink or Server Connection
- Segmentation of LANs for Increased Performance



# 8275 Model 416



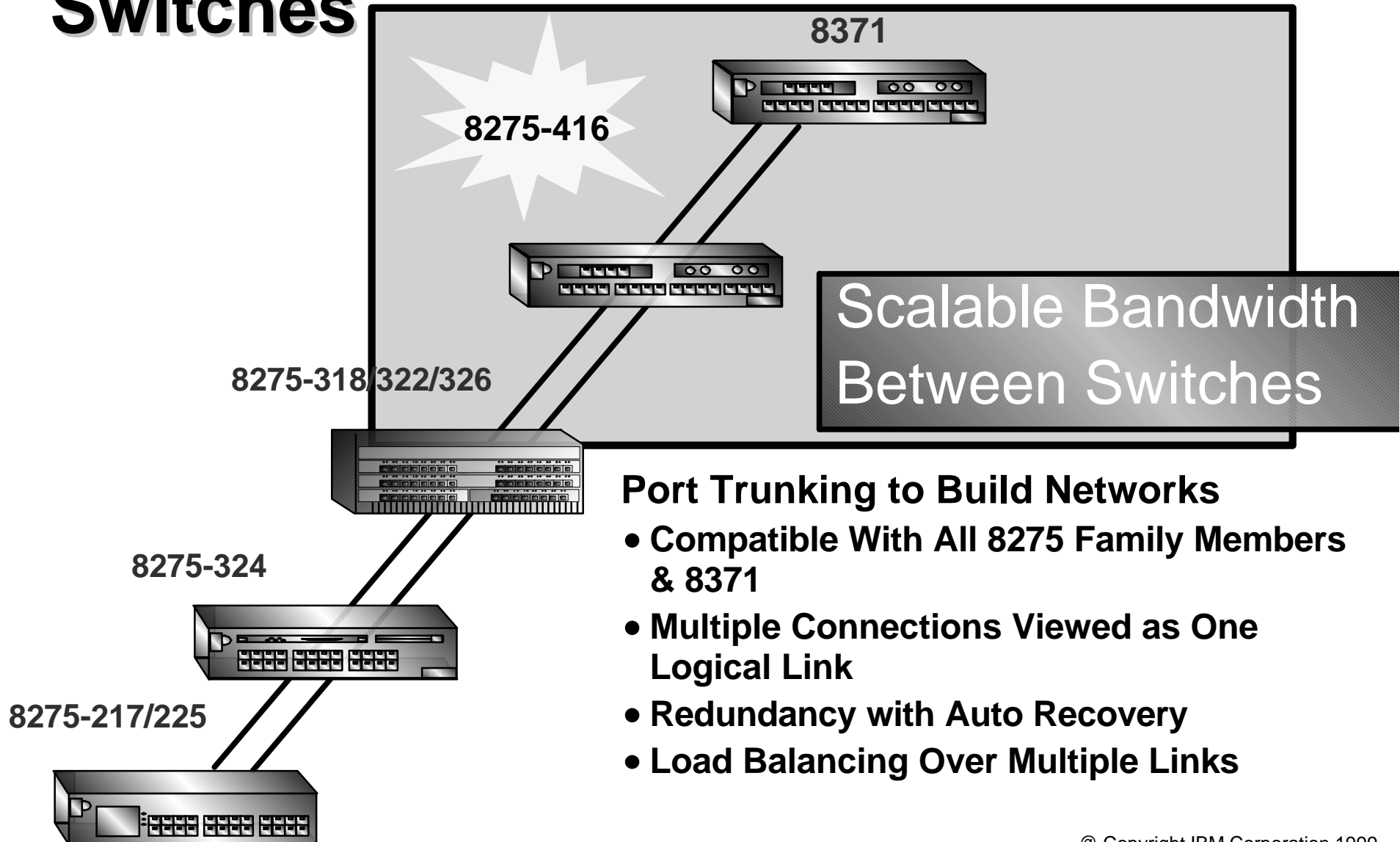
- 16 ports 10BaseT/100BaseTX
  - All ports support full- or half-duplex operation
  - All ports autonegotiate speed and duplex connectivity
- Two optional feature slots
  - 8-port 100BaseFX module
  - 8-port 10/100 module
- 9.5 Mpps high-performance frame backplane
- 802.1Q VLAN and GVRP for Dynamic VLAN Registration
- Port mirroring
- Supports 16000 MAC addresses
- Supports Store-and-Forward switching
- Rack-mountable or place on desktop

# 8275 Model 416



- Port-based VLANs
  - 32 per switch
- Management
  - SNMP
  - RMON (4 groups - Events, Alarms, History and Statistics)
  - Telnet
  - Web-based (Java/HTML)
  - VT/100 terminal emulation
- Spanning Tree
- Store and Forward switching
- LEDs for at-a-glance switch management

# Trunking Compatibility Among IBM Switches





---

# 8275-416 Rollout Schedule

**General Availability Date: 06/18/99**

- **8275-416 16 port 10/100 TX base model**
- **8 Port 10/100TX Module**
- **8 Port 100FX Module**

**08/30/99\***

- **802.1p&q support**
- **4 Port 100FX Module**

**10/15/99\***

- **2 Port Gigabit Module (1000SX)**
- **Port Trunking (Sun trunking & Etherchannel)**

**12/17/99\***

- **Layer 3 Switching (Self-Learning IP)**
- **Stacking (up to 4 units/stack)**
- **SNMP v3 support**
- **Additional RMON groups (Host, Hostopn, Matrix)**

\* Software to be available via web download

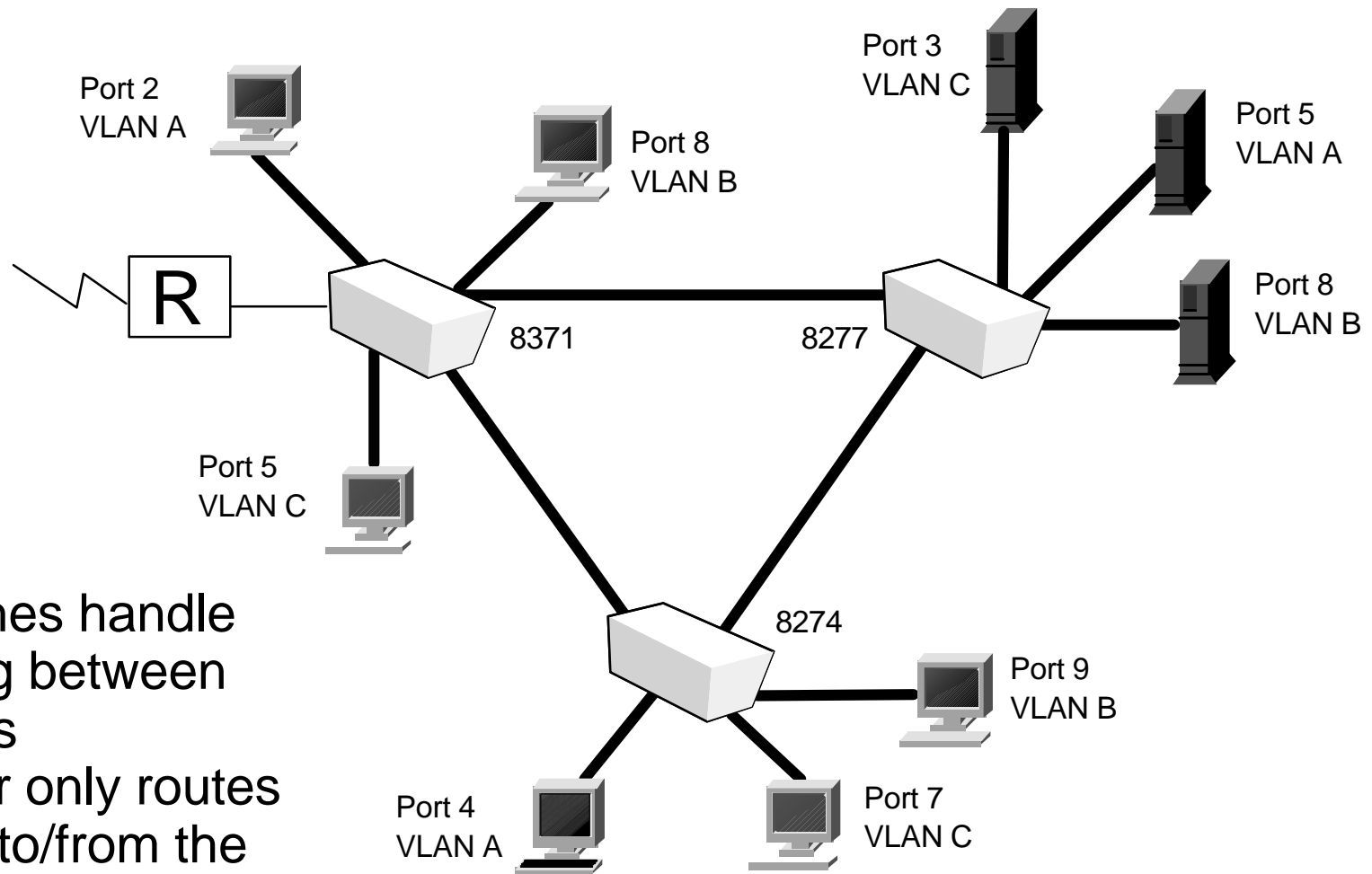


---

# Layer 3 Switches

- Layer 3 switches have hardware routing capability
- Best of both worlds
  - High-speed switching for traffic within subnets
  - Routing for traffic between subnets
- Offload routing function from WAN routers

# Layer 3 Switching



- Switches handle routing between VLANs
- Router only routes traffic to/from the WAN



# 8371 Model A16

**New!**



- 16 10BaseT/100BaseTX ports
- Two optional feature slots for the following hot-swappable feature cards:
  - 8-port 10BaseT/100BaseTX
  - 8-port 100BaseFX
  - 2-port 155 Mbps ATM
    - Maximum one per switch



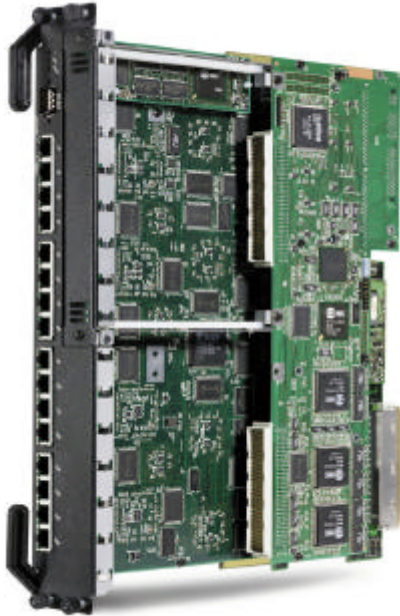
---

# 8371 Switching Functions

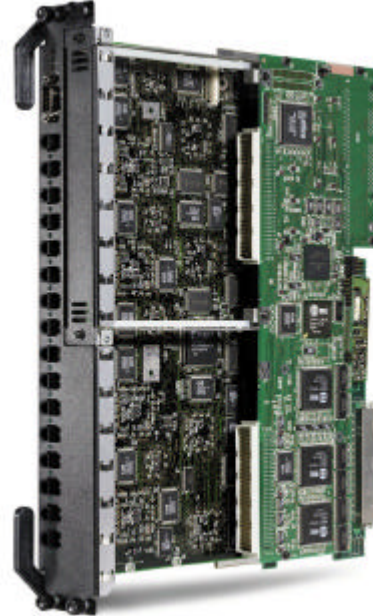
- ♦ All UTP ports can operate at 10 Mbps or 100 Mbps
  - Auto-negotiated or configurable
- ♦ All ports can be half- or full-duplex
  - Auto-negotiated or configurable
- ♦ 10 Gbps, non-blocking switch fabric
- ♦ Layer 2/Layer 3 switching
- ♦ SNMP/RMON management
- ♦ 64,000 MAC Addresses supported
- ♦ Extensive VLAN capability
- ♦ Broadcast/multicast firewalls
- ♦ Contains sufficient flash memory to store two operational code images and two configuration files
- ♦ Built-in auto-ranging power supply

# 8371 MLS Blades

**New!**



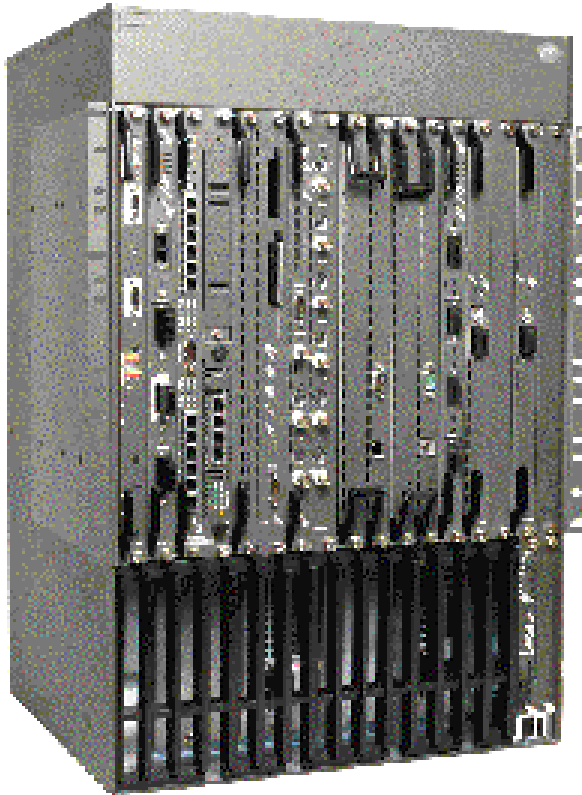
16 port 10/100 TX Blade



16 port 100FX Blade

- Two versions:
  - **16-port 10BaseT/100BaseTX UTP ports with one feature slot**
  - **16-port 100BaseFX fiber ports with one feature slot**

# 8371 MLS Blades in an 8265



- Each 8371 blade is equivalent to a standalone 8371
- Add additional blades for more ports/switches
- With 8371 blades, up to 128 Fast Ethernet ports can be installed in an 8265
- Blades can be installed in slots 1, 3, 5, 7, 12, 14, and 16
- Mix and match with other ATM 8265 modules
- Will need MSS blade in backbone for MPOA solution



---

# 8371 Software

- **Based on Nways Common Code:**

- Already shipped in MSS Server, MSS Client, and 2210, 2212, and 2216 router products

- **New functions for 8371 Switches:**

- Self-Learning IP
- MPOA Client support for multiple ATM adapters (standalone version only)
- RMON

- **Re-used and adapted functions:**

- ATM Signalling, Ethernet LANE and ILM
- Transparent bridging and Spanning Tree
- Protocol Virtual LANs for IP, IPX and NetBIOS
- IP Multicast VLANs
- MPOA Client for IP and IPX
- IP Host functions - TELNET and PING
- Command line and web browser interfaces
- SNMP support and MIBs
- Box services support for functions such as code image and configuration management



---

# 8371 Router Accelerator

- **What is a Router accelerator?**
  - Network device placed between a router and it's associated LAN interfaces
  - Distributes layer-3 forwarding functions out to LAN switches
  - Similar to MPOA but it's for Ethernet - not based on LANE
  - Learns topology information by snooping on contents of selected packets - uses ***Self-Learning IP***
- **Identifies routers attached to ports on switch**
  - Builds IP forwarding table
  - Offloads the IP forwarding functions from the attached routers
- **Realizes same benefits in LAN environment as MPOA does in ATM environment - router offload**

# Gigabit Ethernet

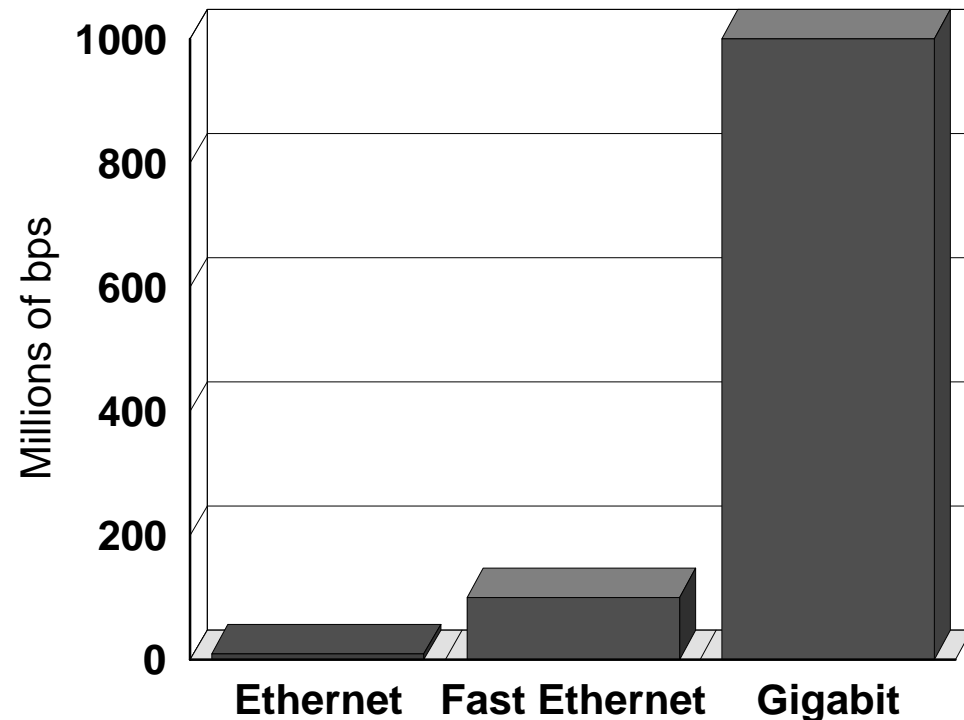
Standard for Ethernet at 1 gigabit per second over fiber cabling is 802.3z

Standard for Gigabit Ethernet over copper cabling is 802.3ab

Same IEEE 802.3 frame format as Ethernet  
- Variable length 64-1518 bytes

Fiber Channel PHY

Full and Half Duplex





---

# Gigabit Ethernet over Fiber

Two types:

## **1000BaseLX**

- Single-mode fiber to 5 km
- 50u/62.5u multi-mode fiber to 550 m
- 1300 nm optics
- Standard ratified March 1999

## **1000BaseSX**

- 50 u multi-mode fiber to 550 m
- 62.5 u multi-mode fiber to 275 m
- 850 nm optics
- Standard ratified March 1999





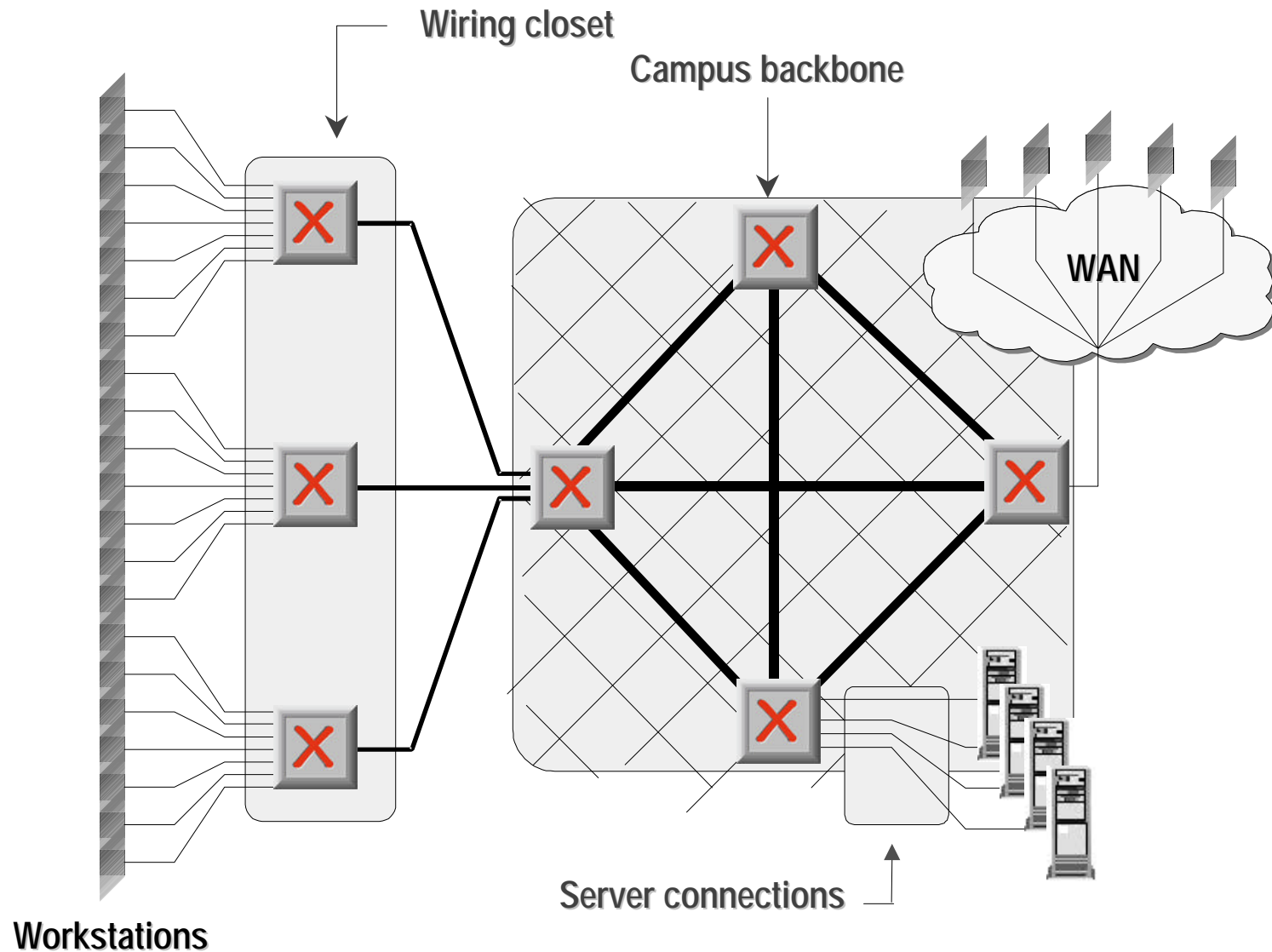
---

# Gigabit Ethernet over Copper

## 1000BaseT

- Operates over a 4-pair Category 5 balanced cabling system
  - Each of the four pairs supports an effective data rate of 250 Mbps in each direction simultaneously
- 100 m distance from workstation to switch
- Auto-negotiation supported
- Full-duplex supported
- Expect standard ratification September 1999

# Where does gigabit go?





---

# Gigabit Ethernet Product Rollout

## Netfinity Server Adapter

- 1000BaseSX support - *Shipping!*

## 8271 Switch

- Gigabit uplink (SX) for E and F Series - *Shipping!*

## 8275 Switch

- Gigabit uplink (SX) on Models 318, 322, and 326 - *Shipping!*
- Gigabit uplink (SX) on Model 416 - *Available October 15!*

## 8277 Switch

- 2-port Gigabit uplinks (LX and SX) - *Available Soon!*

## 8274 Switch

- New 22 Gbps Gigabit backbone switch - *Shipping!*
- Gigabit modules for all 8274 switches - *Shipping!*

## 8265 Switch

- Gigabit Ethernet I/O cards due 4Q99

## Gigabit Backbone Switches

- 16-port - Announce 9/21, Available 4Q99
- 60-port - Announce and GA 1H00

# 8274 GRS Product Family

## Common equipment

- 9-slot chassis (similar to 8274), plans for 5-slot version
- 650W power supply
- management module - MPX
- Layer-3 routing engine - HRE-X
- high-speed backplane - 22Gbps
- Redundant power supply support
- hot-swap module support





---

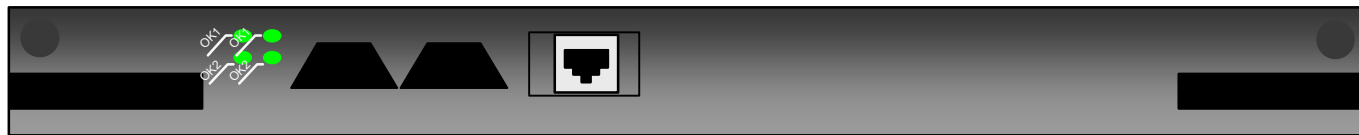
# 8274 GRS product family

## Modules in first release:

- 2-port backbone Gigabit Ethernet (MMF or SMF)
- 4-port Gigabit Ethernet (MMF)
- 12-port backbone 10/100BaseTX Ethernet
- 32-port desktop 10/100BaseTX Ethernet
- 12-port backbone 100Base-FX
- 16-port desktop or MAU 4/16 token ring
- 32-port desktop 4/16 token ring
- 1-port ATM OC-3
- 2-port ATM dual PHY OC-3

# MPX

## Management Processor Module for GRS



### Features:

- standard 32M DRAM & option for up to 128M
- standard 8M flash & option for up to 32M
- supports redundancy mode
- layer-3 switching capable through optional daughter card (HRE-X)
- high-speed processing with optional co-processor

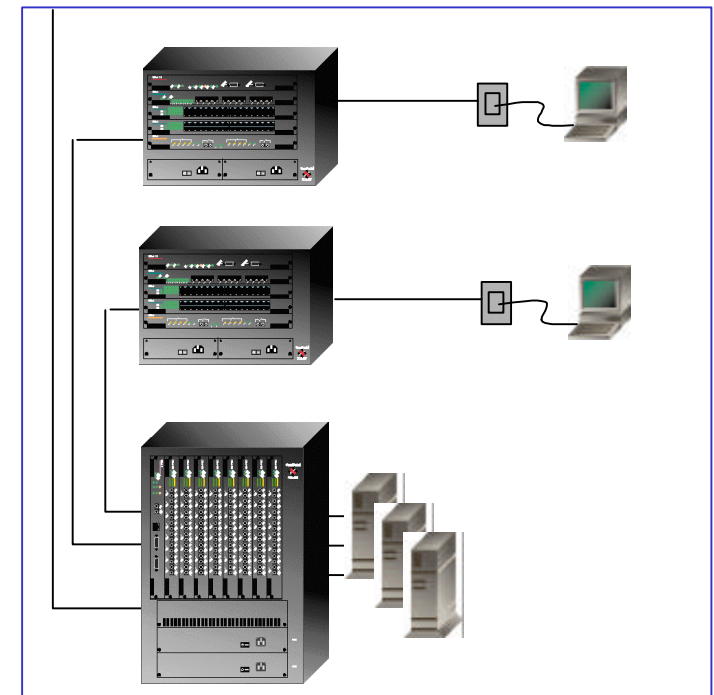
# HRE-X

## Hardware Routing Engine for GRS

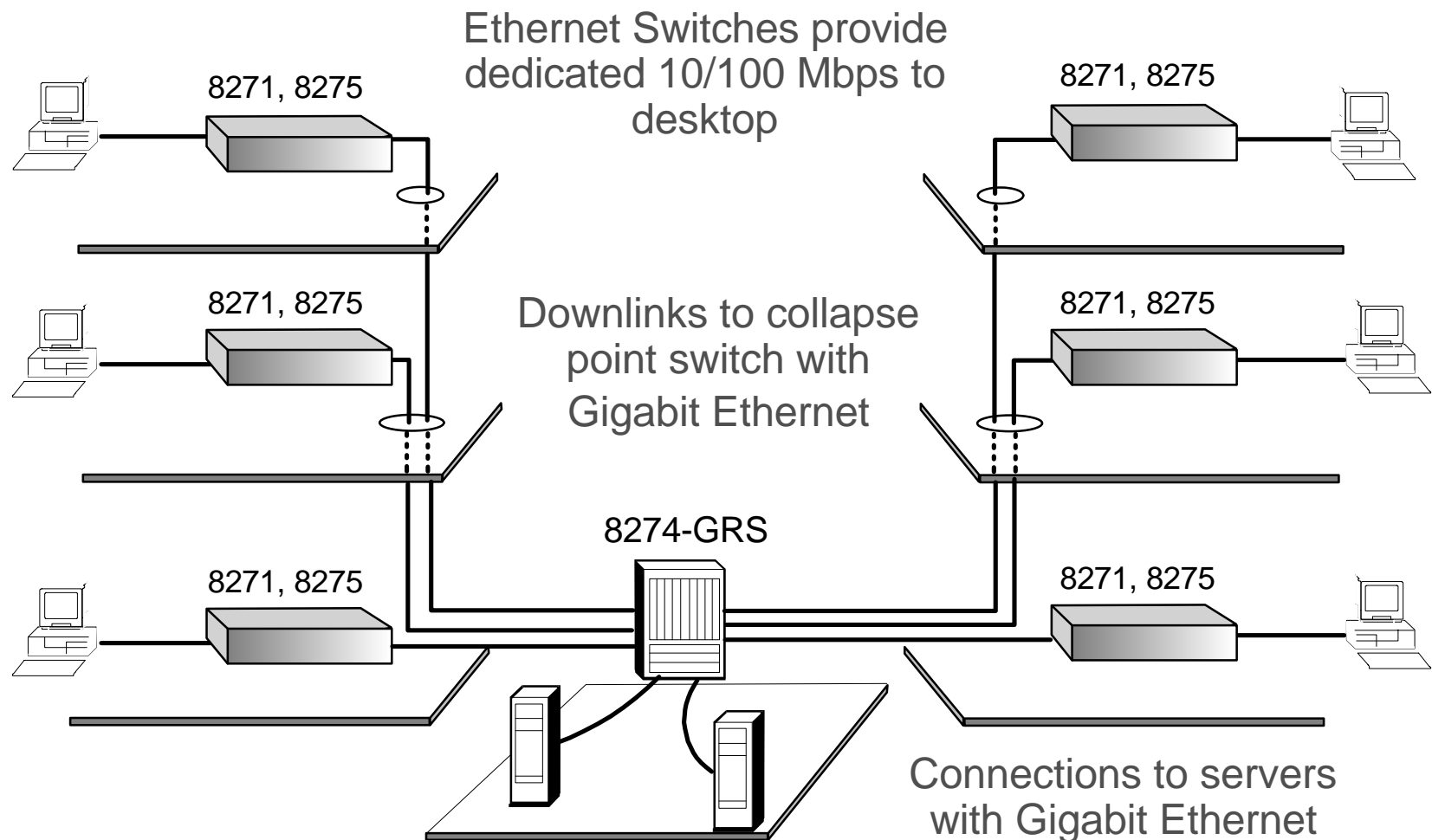
### Features:

- IP and IPX, RIP, RIP II, OSPF, IP Multicast, DHCP Relay support
- 1.5M to 12 Million Packets Per Second
- One HRE-X on MPX, or one HRE-X per module
- ISP-class table size
  - 256,000 route entries
  - 64,000 next-hop destinations

### Application

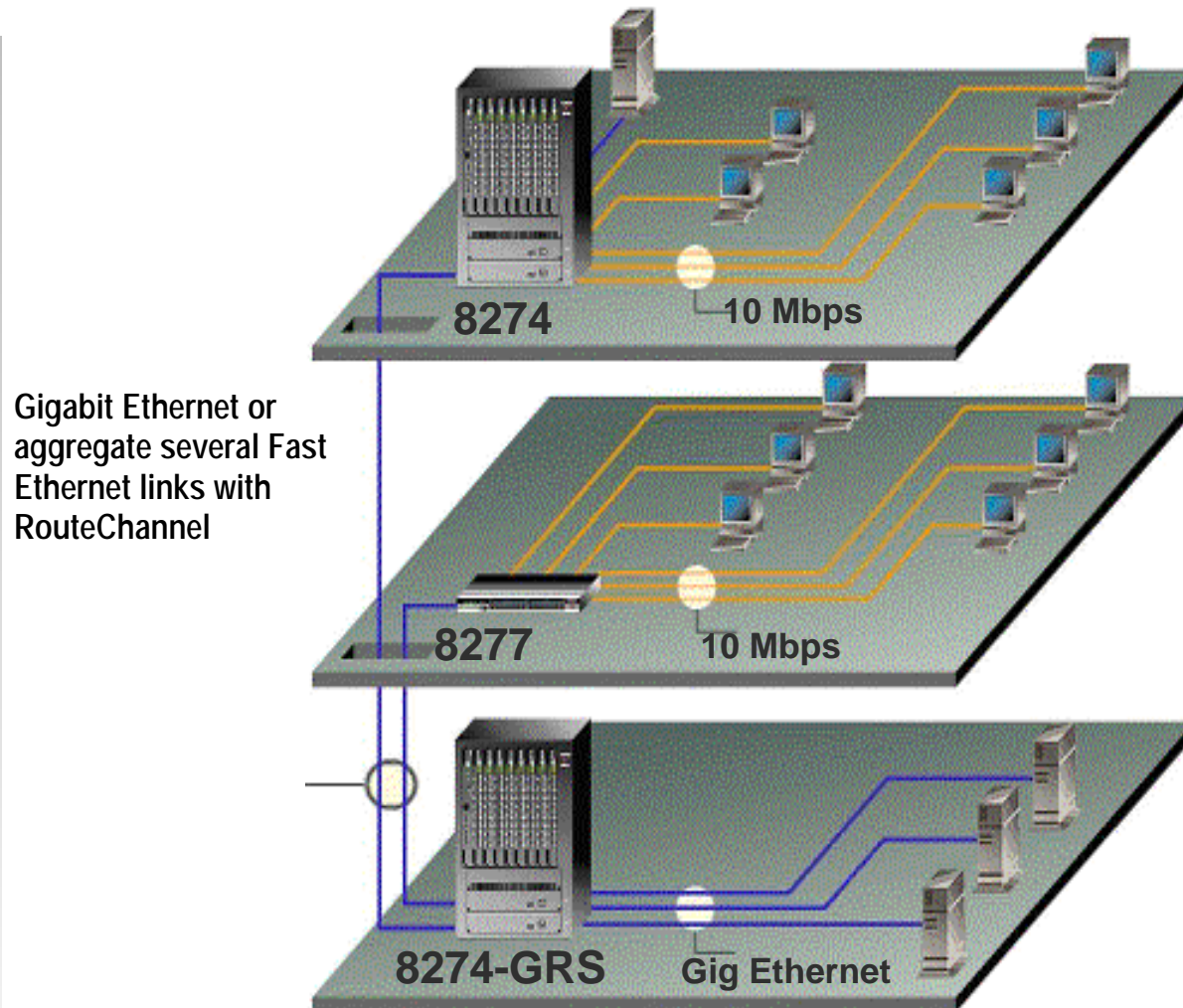


# Gigabit Backbone Solution





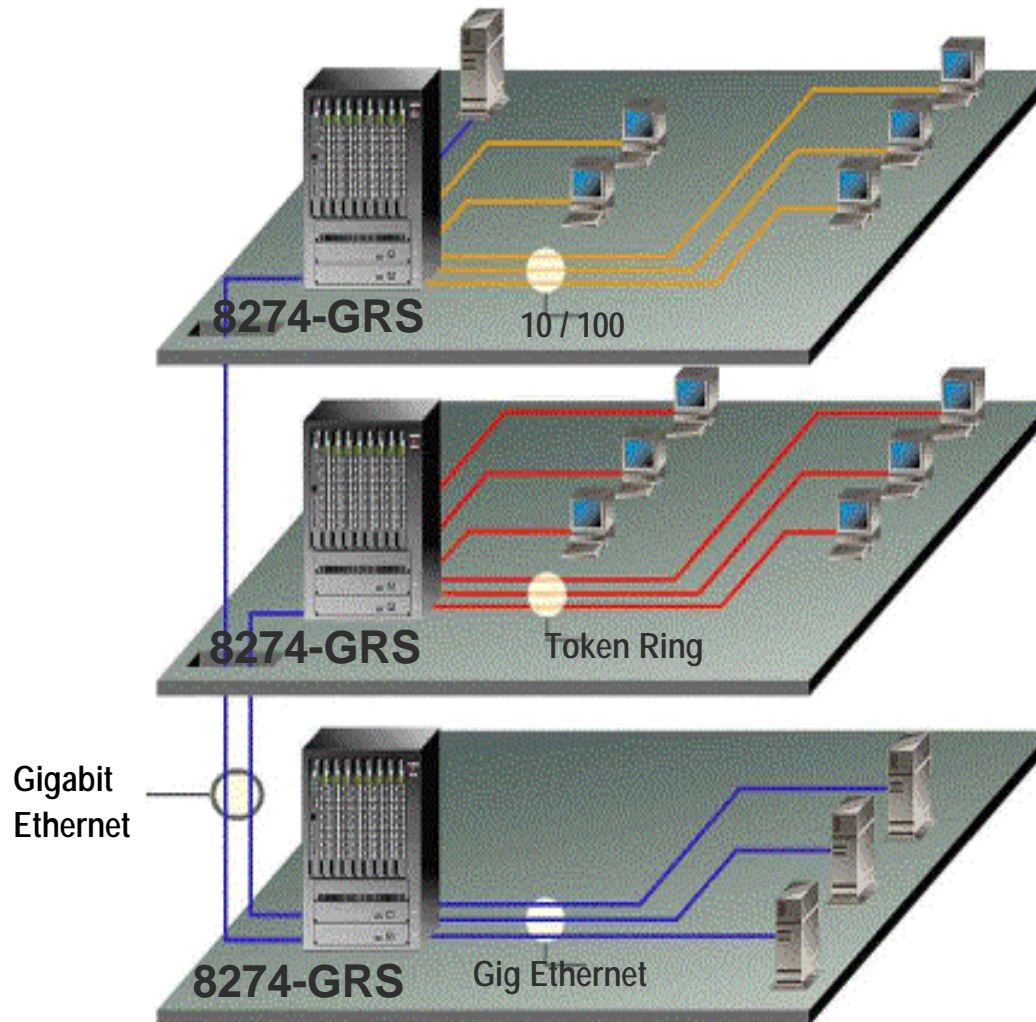
# Gigabit Backbone Solution



## Features

- high switching capacity
- extensive routing capabilities
- Backbone Network Services
  - DHCP, DNS, etc.

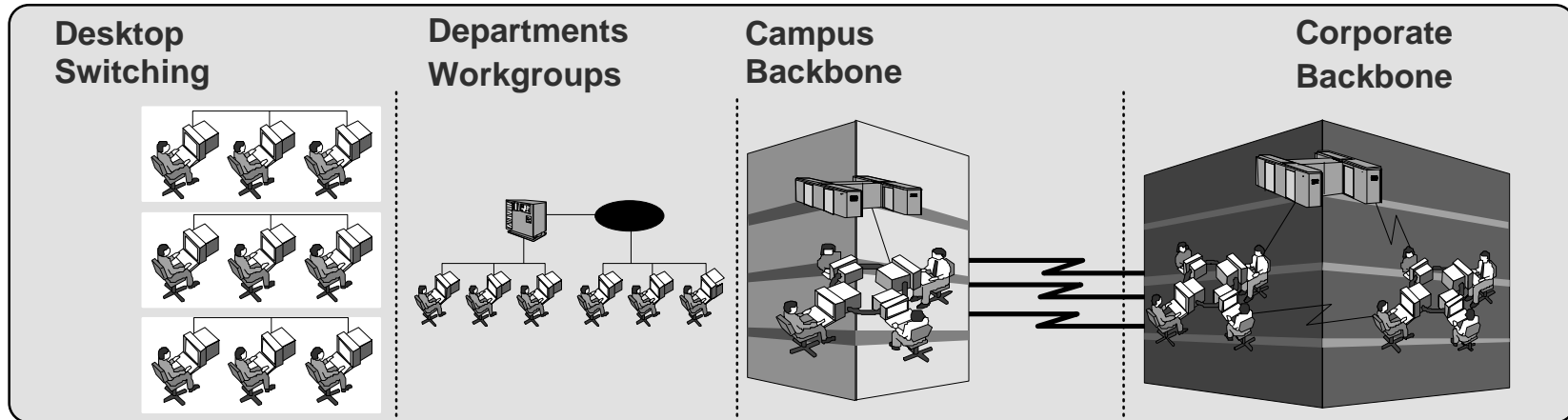
# High-Density Wiring Closet



## Features

- low cost
- high-speed switching fabric
- flexibility
- Desktop Network Services
  - QoS, Multicast, VLANs

# IBM Ethernet Switching Products



8265	
8274 - GRS	
8260 Switching Modules Series	
8274- W33, W53, W93	
8371 - A16	<b>local backbone capabilities</b> <ul style="list-style-type: none"><li>▪ Fast Ethernet</li><li>▪ Gigabit Ethernet</li><li>▪ FDDI</li><li>▪ ATM LAN</li></ul>
8277 - 524	
8275 - 416	
8271 - 712, F12, F24	
8271 - 612, 624, E12, E24	
8275 - 318, 322, 326	<b>more capacity</b> <ul style="list-style-type: none"><li>▪ switching</li><li>▪ ATM uplinks</li><li>▪ stacking</li></ul>
8275 - 324	
8275 - 217, 225	
<b>extended campus capabilities</b> <ul style="list-style-type: none"><li>▪ High speed backplanes</li><li>▪ V.24 , V.35, X.21</li><li>▪ ATM WAN</li></ul>	

@ Copyright IBM Co