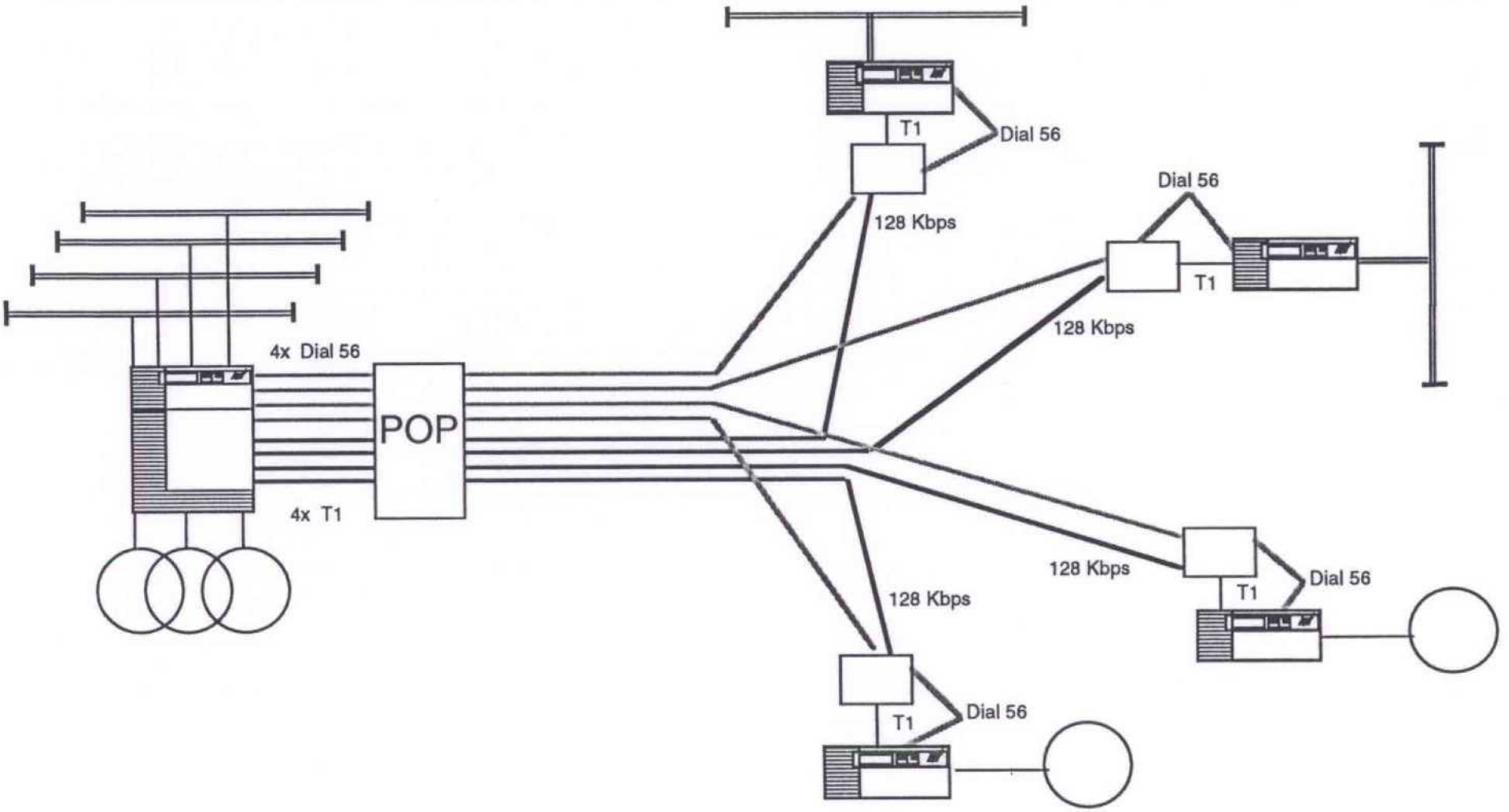
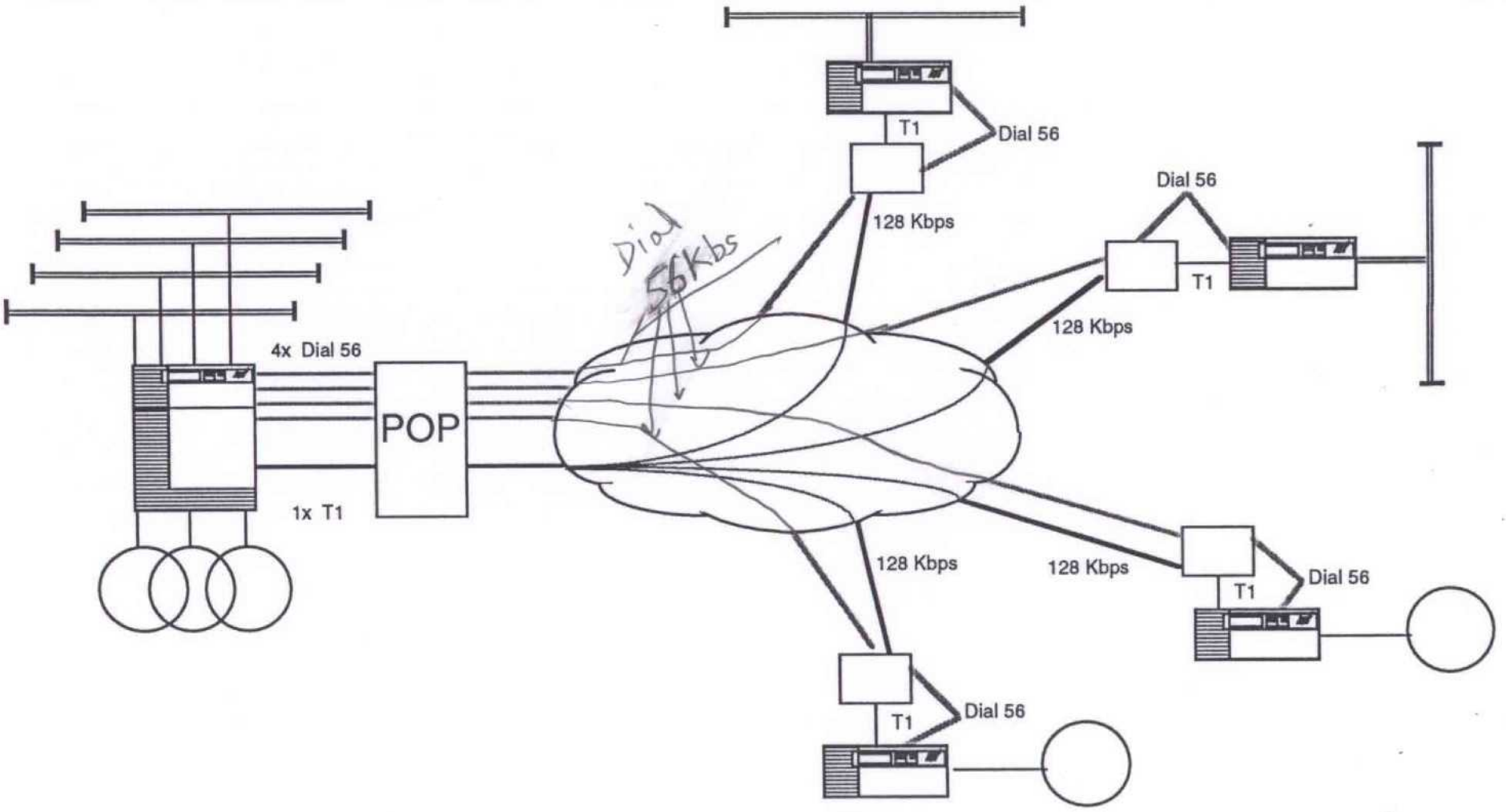
# Banking - Point to Point



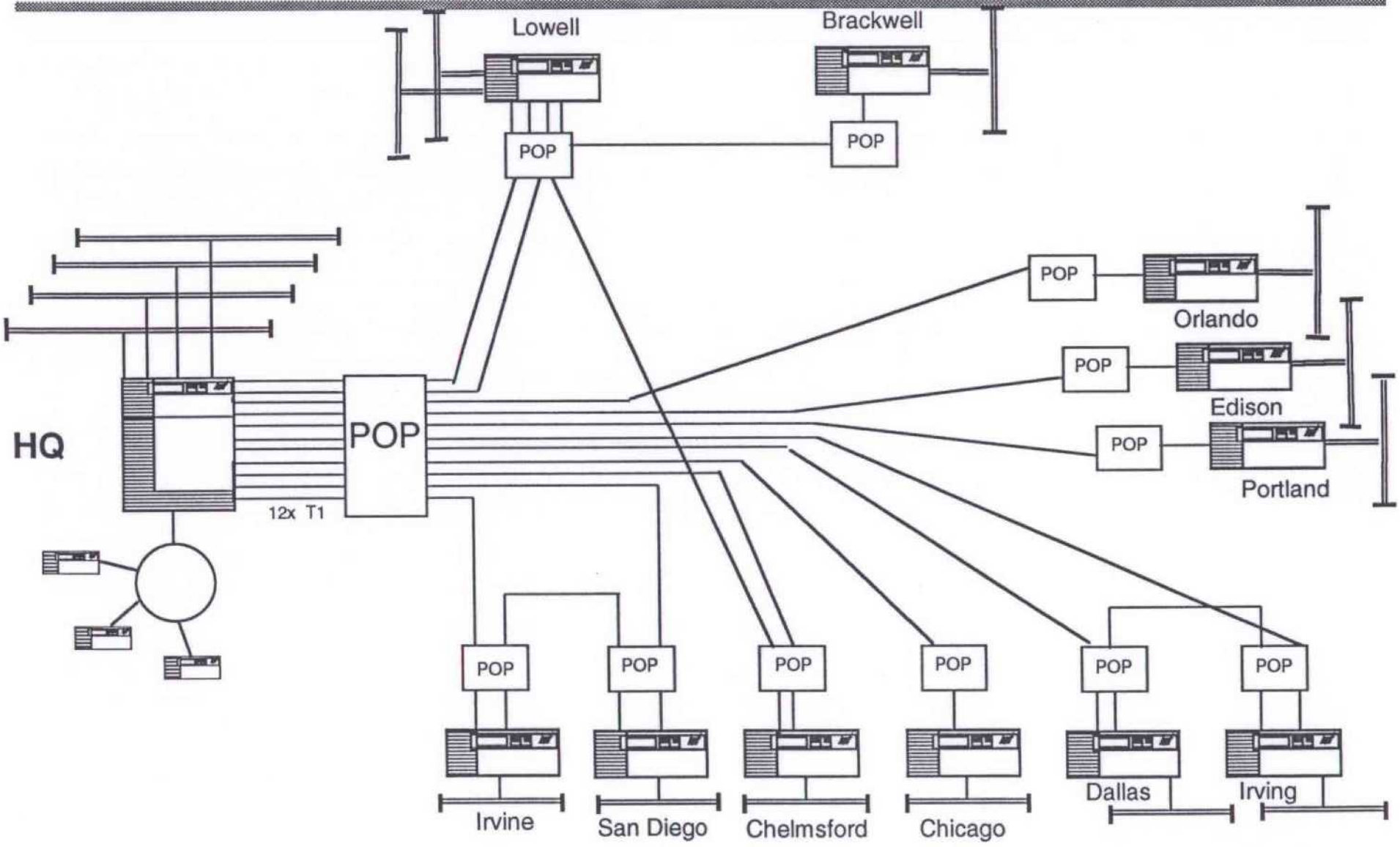
# Banking - Point to Point

# Banking - With Frame Relay

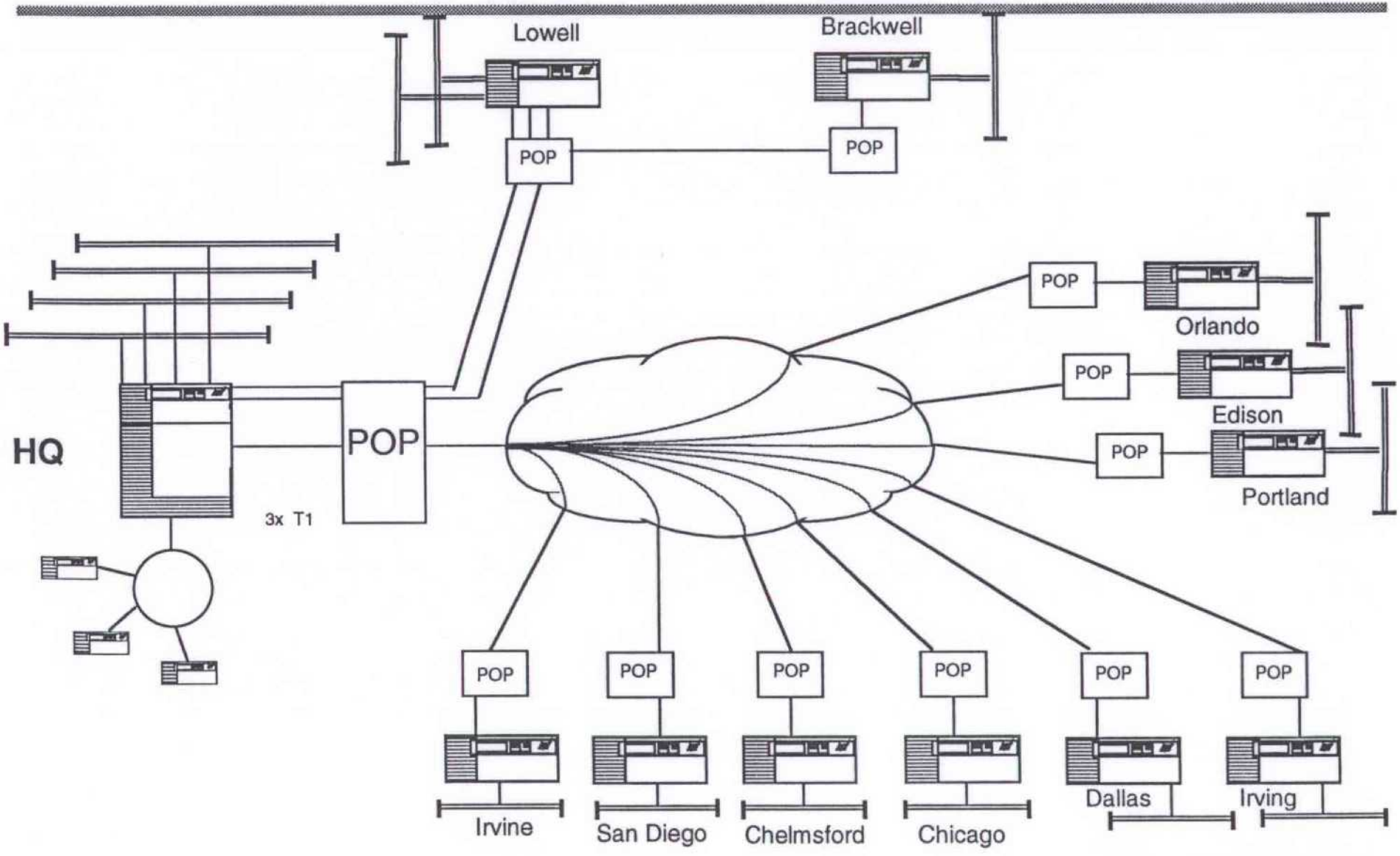


# Banking - With Frame Relay

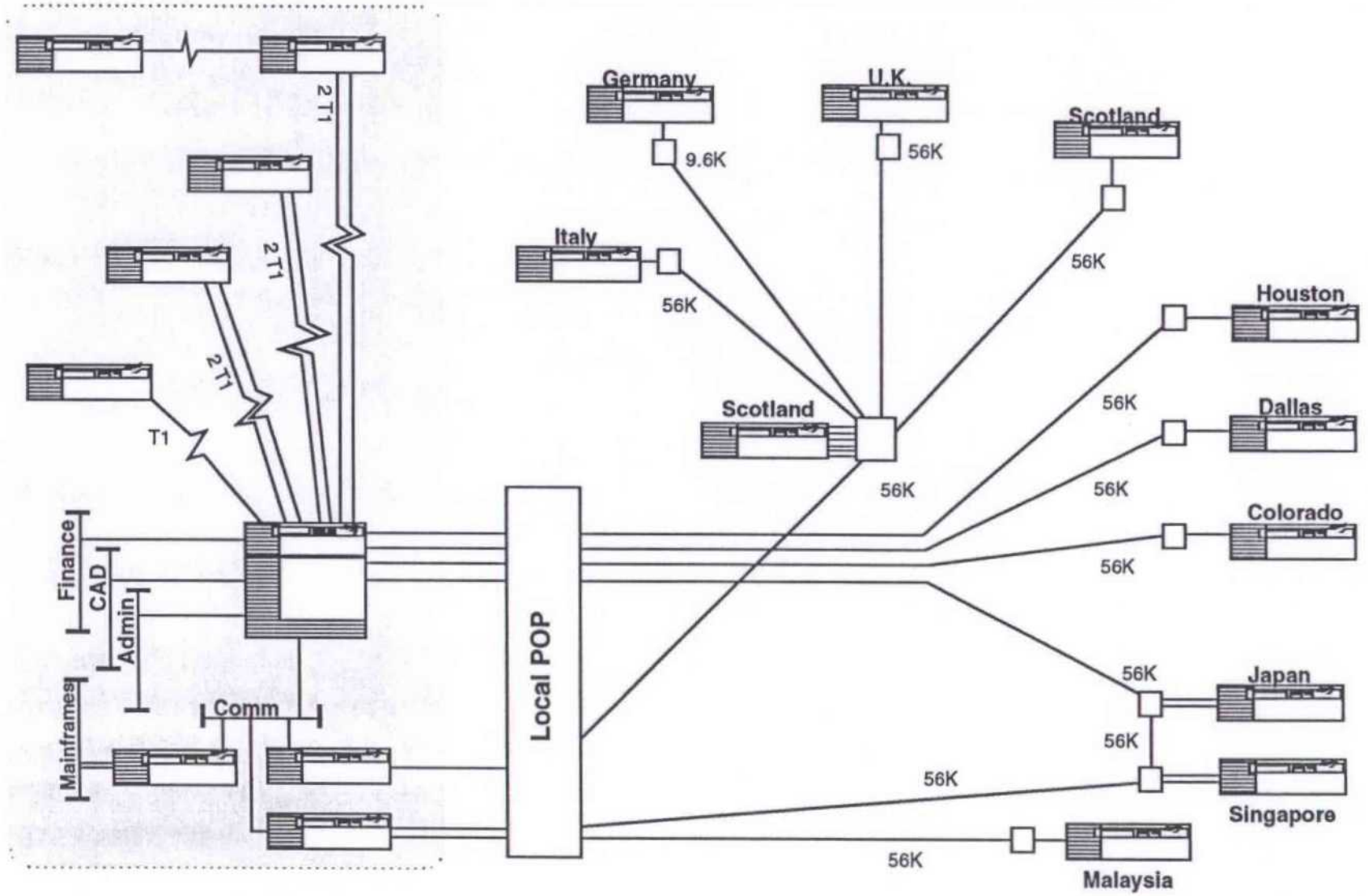
# Software Company - Dedicated & SW56



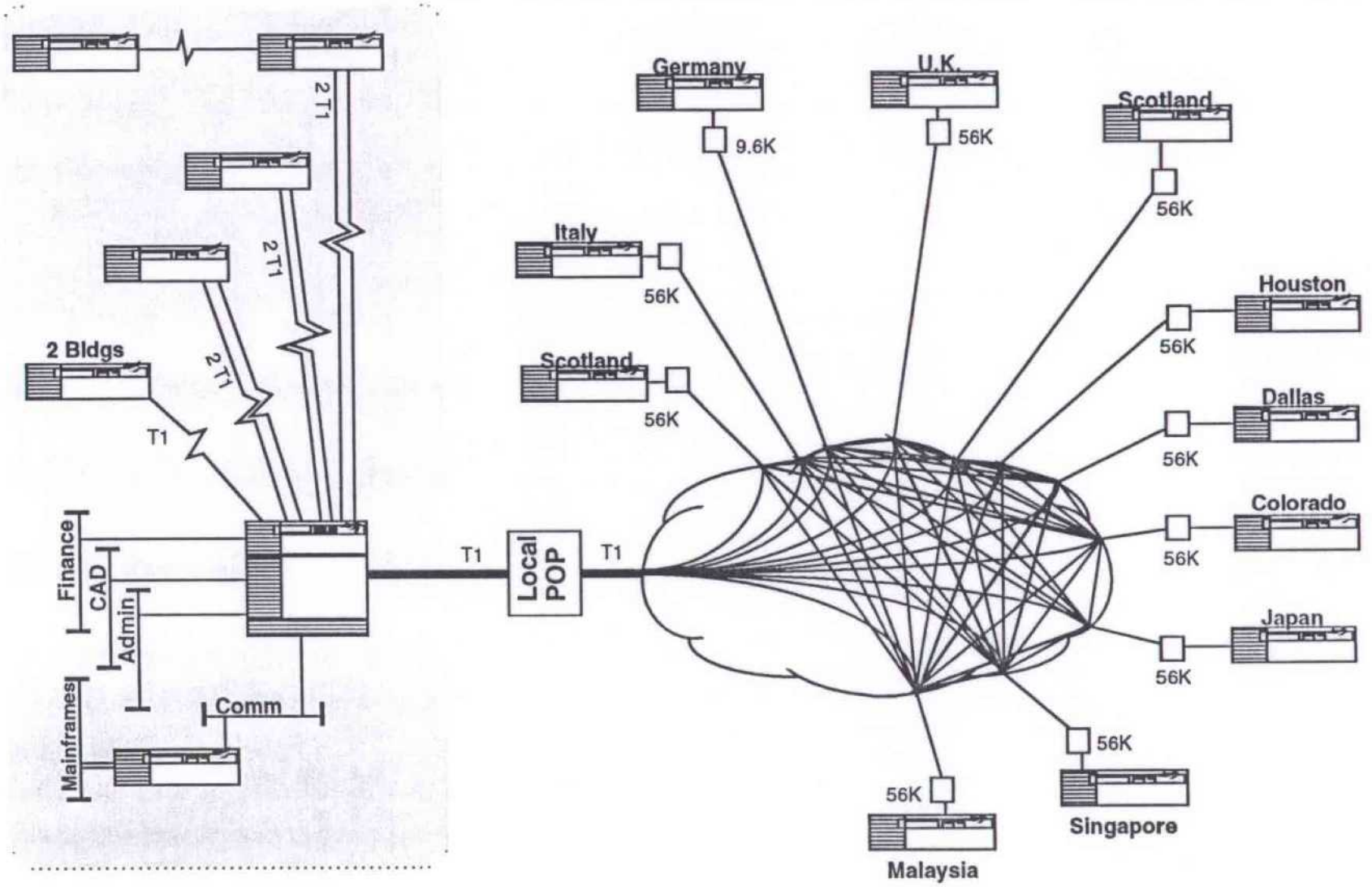
# Software Company - With Frame Relay

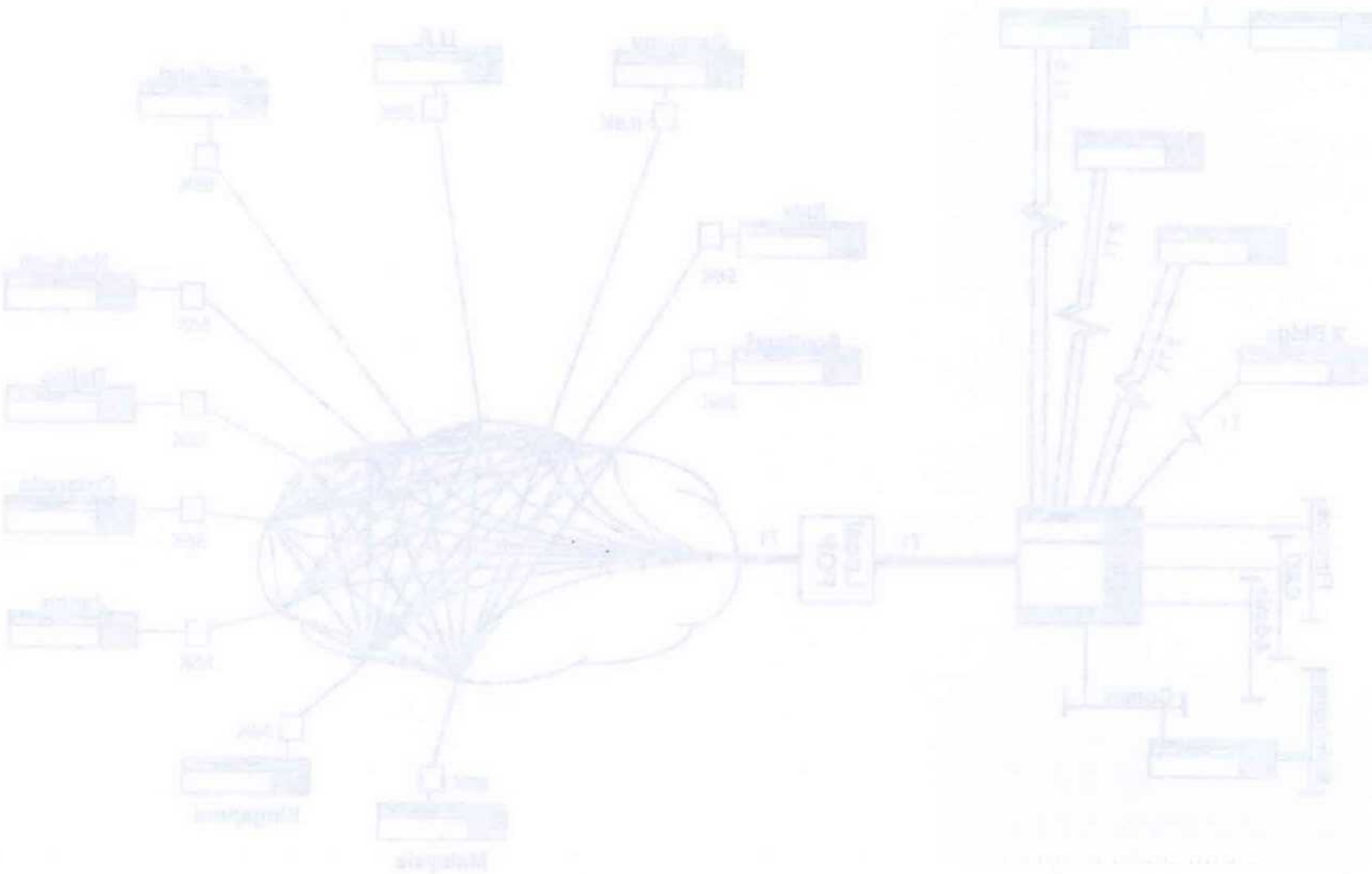


# Peripherals Co. - Dedicated Circuits

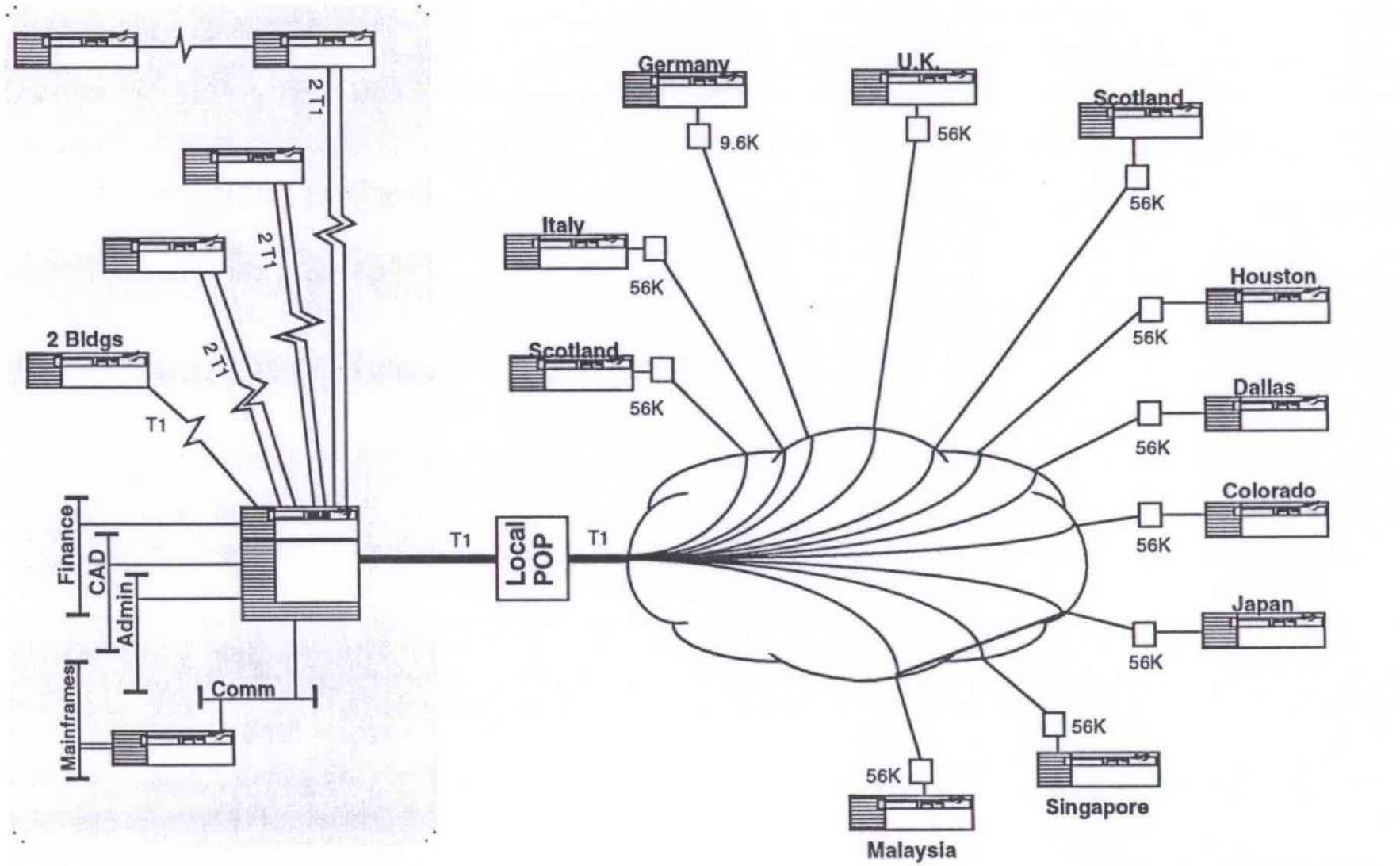


# Peripherals Co. - Frame Service Desired



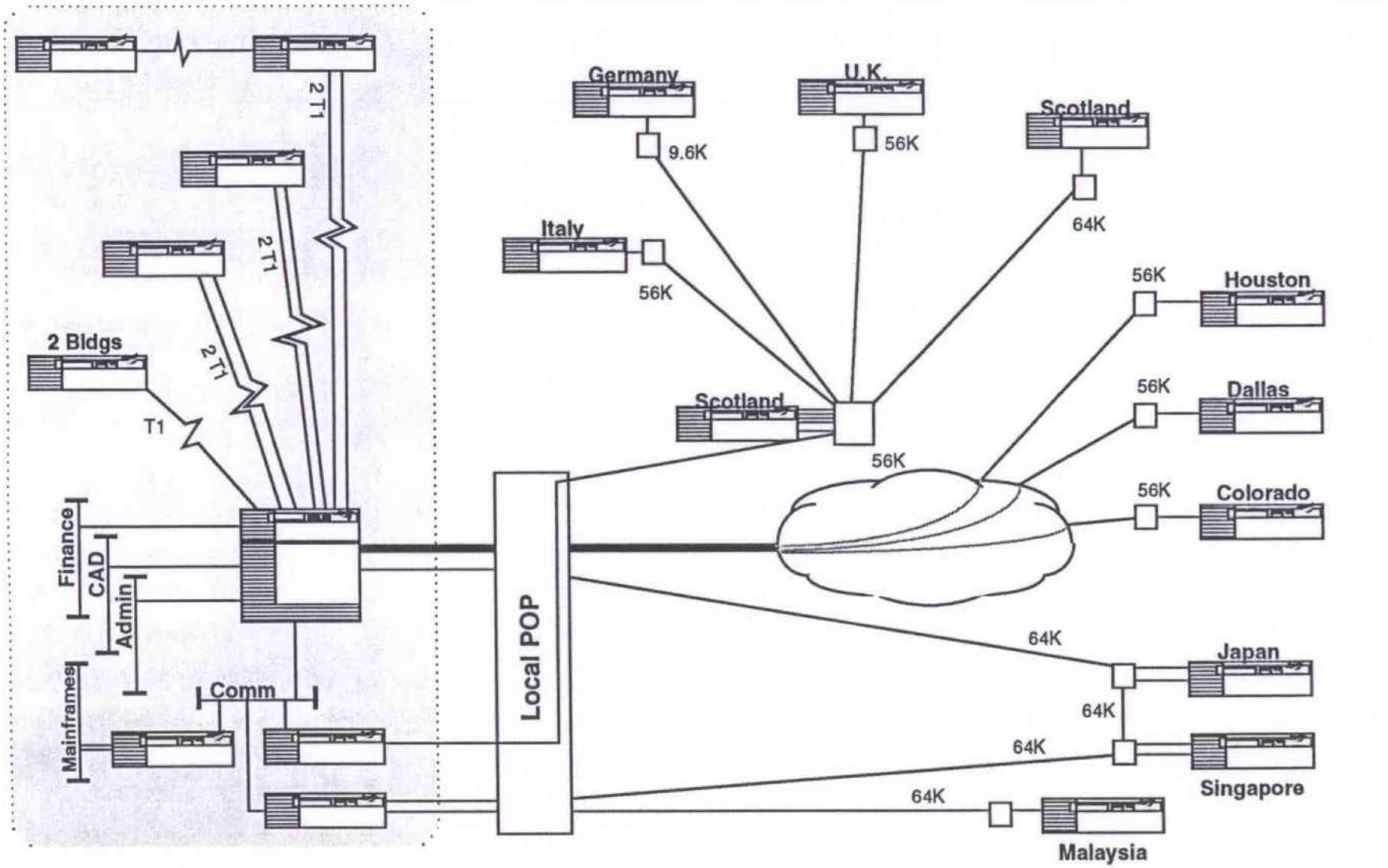


# Peripherals Co. - Frame Cost Justified

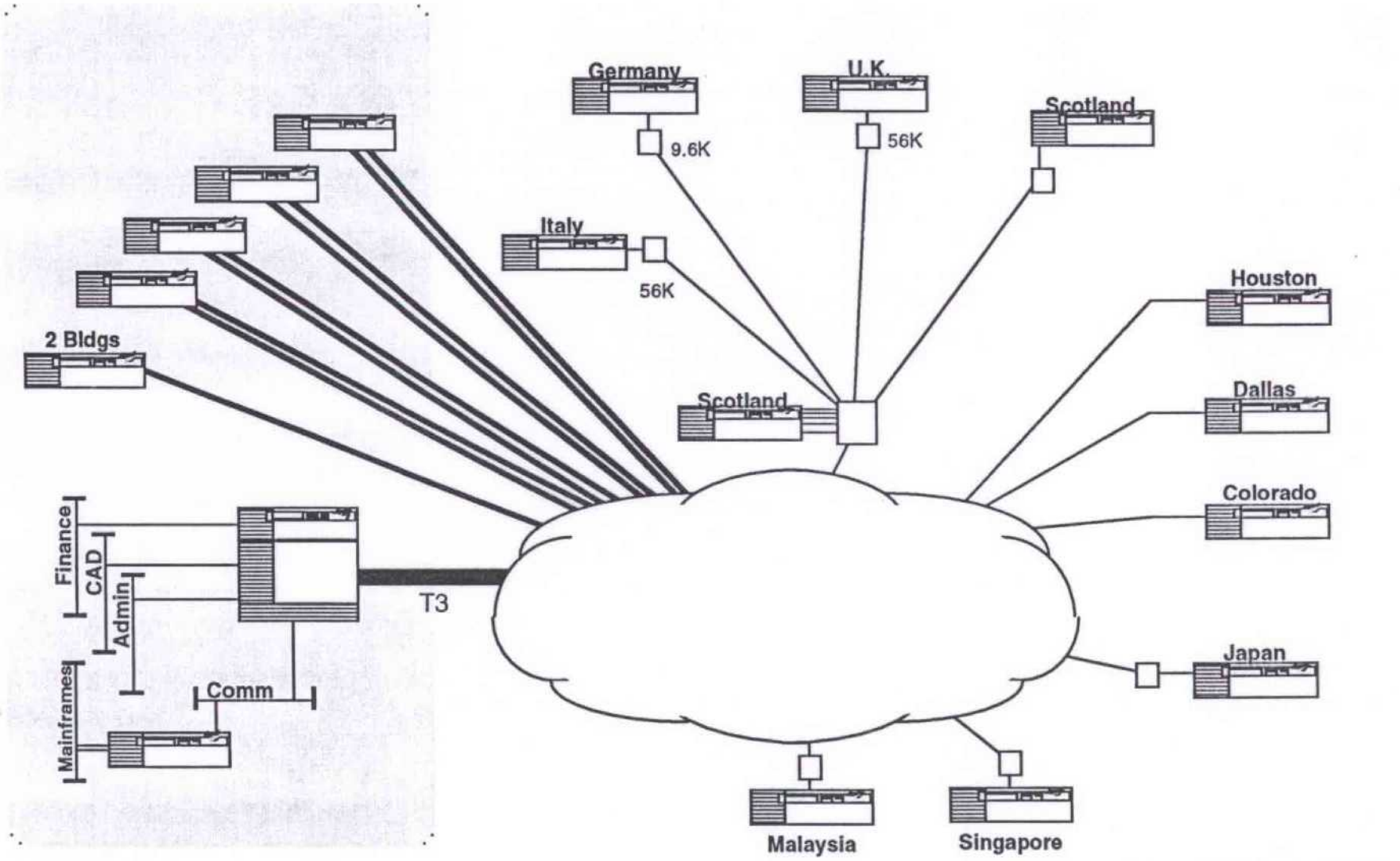


Patentable Co. - Equus Cost Manual

# Peripherals Co. - Frame Relay Offered



# Peripherals Co. - Frame Alternative?



# Peripherals Co. - Frame Alternative?

MES DATANET

# Frame Relay Overview

NCC Training
Wednesday June 16, 1993
By: Ted Rozolis, Pete Langton,
B.J. Chang, and
Dale Scott (WellFleet)

MES DATANET

# Frame Relay Overview
## *Agenda of Topics*

- Why are we talking about Frame Relay?
- History and Opportunities — Dale Scott
- Market Research
- Competition — Pete Langton
- Pricing
- How is HLI Different?
- How is Datanet utilizing Frame Relay? — B.J. Chang
- What Should We Do to Win?
- Q and A Discussion

## Why are we talking about Frame Relay?

- It is our Competition for < T1 Speeds
- It is Everywhere in Market Research

## Frame Relay -- History and Opportunities

- What is it? -- Research Paper handout — DALE S.
- When did it happen --> still Hot Today — DALE S.
- Why do people buy it? — DALE S.
- How do they use it? — DALE S.
- Challenges of using Frame Relay
  - Where is it? -- Domestic and International! — DALE S.
- Why WellFleet? — DALE S.
- Who is buying it -- Applications — DALE S.

# Frame Relay

## Competitive Comparison

May 1993
*Research Paper*
Theodore J. Rozolis
Product Marketing

**FRAME RELAY: The Hype, the Reality, and the MFS Competitive Edge**

### Frame Relay Defined

Frame Relay is a fast packet switching protocol designed to increase data transmission through lowering packet overhead and network processing. The technology takes advantage of today's higher quality telco lines by leaving error checking to the end devices of the connection. With its streamlined processing, Frame Relay can support data circuits ranging in speed from 56 Kbps to 1.544 Mbps. A number of Frame Relay vendors claim an upper bound of 2 Mbps, 4 Mbps, or even 6 Mbps with support of different chip sets.

### Appealing Characteristics

Four attributes make Frame Relay attractive: small overhead, ability to allow data bursts, connectivity economies, and greater speeds. Less overhead differentiates Frame Relay from its packet switching predecessor -- X.25. Processing of flow control and error correction have been moved from network nodes to the two communicating processes at the customer's ends of the circuit, thus yielding lower overhead for the Frame Relay network which leads to improved performance. The second factor is support of traffic bursts beyond a pre-defined Committed Information Rate (CIR). This dynamic allocation of bandwidth cannot be offered with standard leased lines, and is an improvement for LAN-to-LAN data applications that require excess bandwidth on an as-needed basis. Regarding increased connectivity, Frame Relay is designed to route traffic for multiple connections over one physical link. With the use of less lines, both network telco and port equipment costs are lower than a leased line solution. Finally, greater packet throughput, faster than X.25, is available with Frame Relay.

So it seems that a wise network manager should be satisfied with the Frame Relay technology offering cheaper, better, and faster services in place of traditional X.25 and private leased line networks. Moving the curtain of technology to the side, what then are the limitations of Frame Relay?

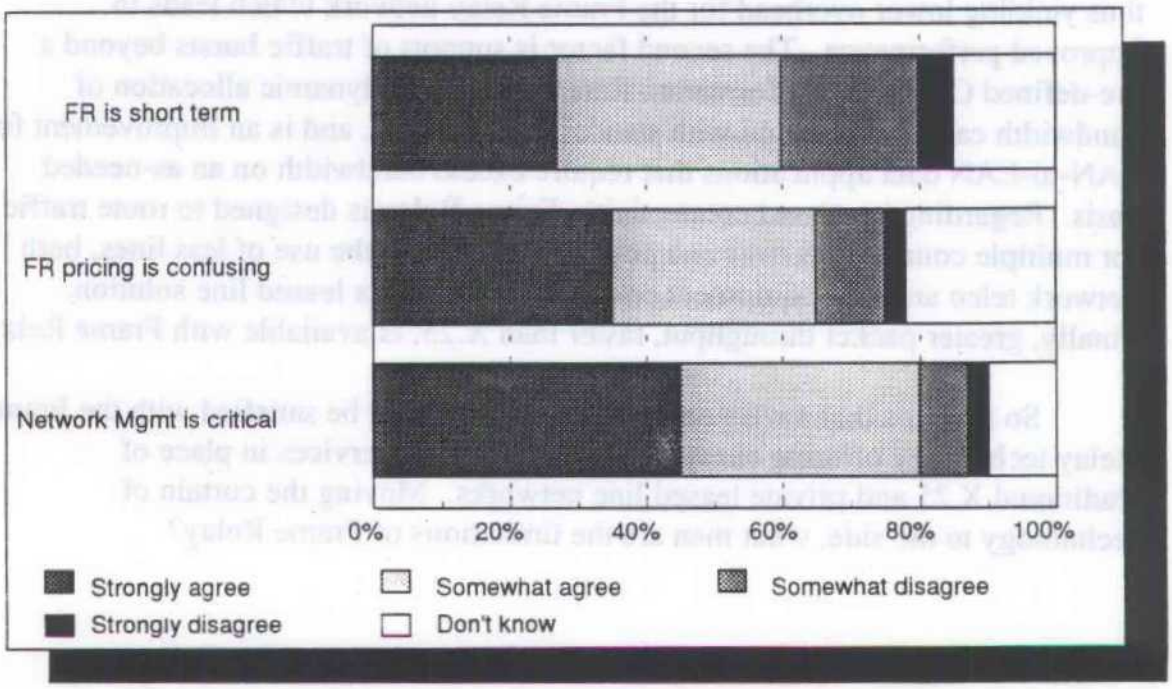
## The Reality

Frame Relay performance improvements over X.25 are too little too late. The advantage of a data-only technology will be a disadvantage in the long run. Frame Relay is not flexible enough to grow with future complex traffic. More sooner than later, a combination of data, voice, video, and imaging services will be traversing business networks. Also, network growth of both flexibility in network addressing and growth in switching capacity will be limited. Ultimately, as the needs of the network increase, so will the need for increasing user speeds.

Another issue with Frame Relay is the importance of careful network design. Many key areas have several choices to choose from which lead to various decisions regarding: CPE, local access speed, frame relay circuit bandwidth (CIR), and equipment certification. Furthermore, analysis of traffic patterns in addition to application testing and adjusting for optimal throughput are extra efforts that are necessary to define CIR requirements or to realize even the promised performance of Frame Relay. Requirements of customer pre-defined PVCs for Frame Relay traffic create additional network investigation.

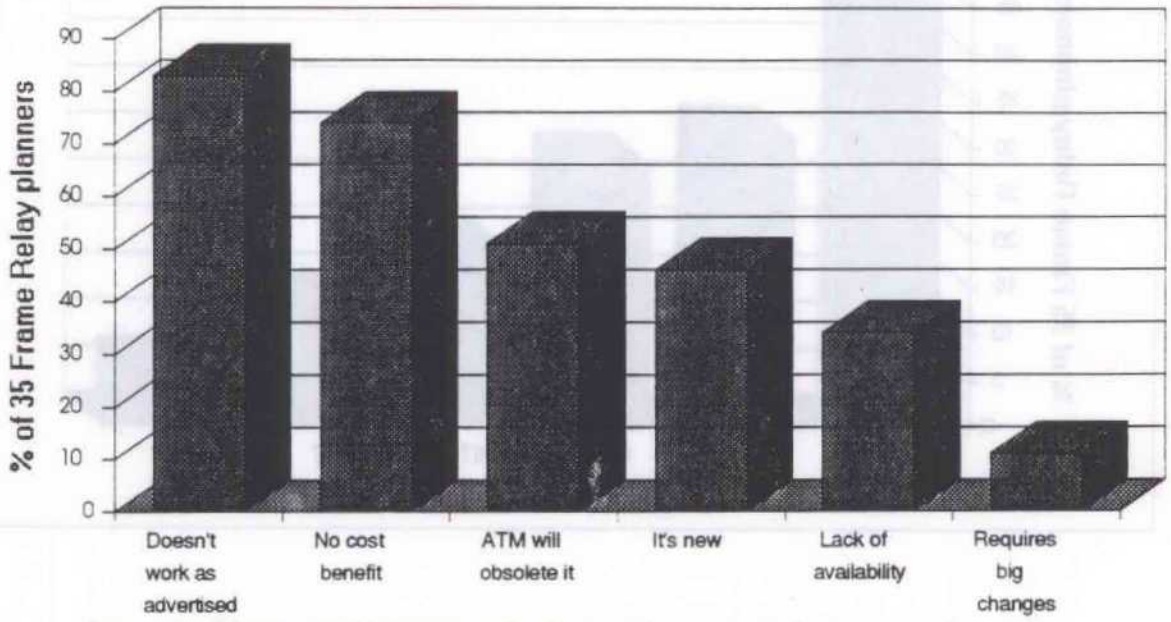
Early users have found that Latency and Delay of Frame Relay services necessitate careful tuning of LAN based applications. Even though it is faster than X.25, it is still not fast enough.

Frame Relay user perception is illustrated in the following table from a December, 1992 market analysis report by International Data Corporation (IDC):



As you can see, the user community is somewhat skeptical about the longevity of the Frame Relay technology, perplexed by the pricing, and concerned with the precarious nature of the Network Management and maintenance.

Forrester Research, Inc. declares the concerns of Frame Relay users in an April, 1993 study:

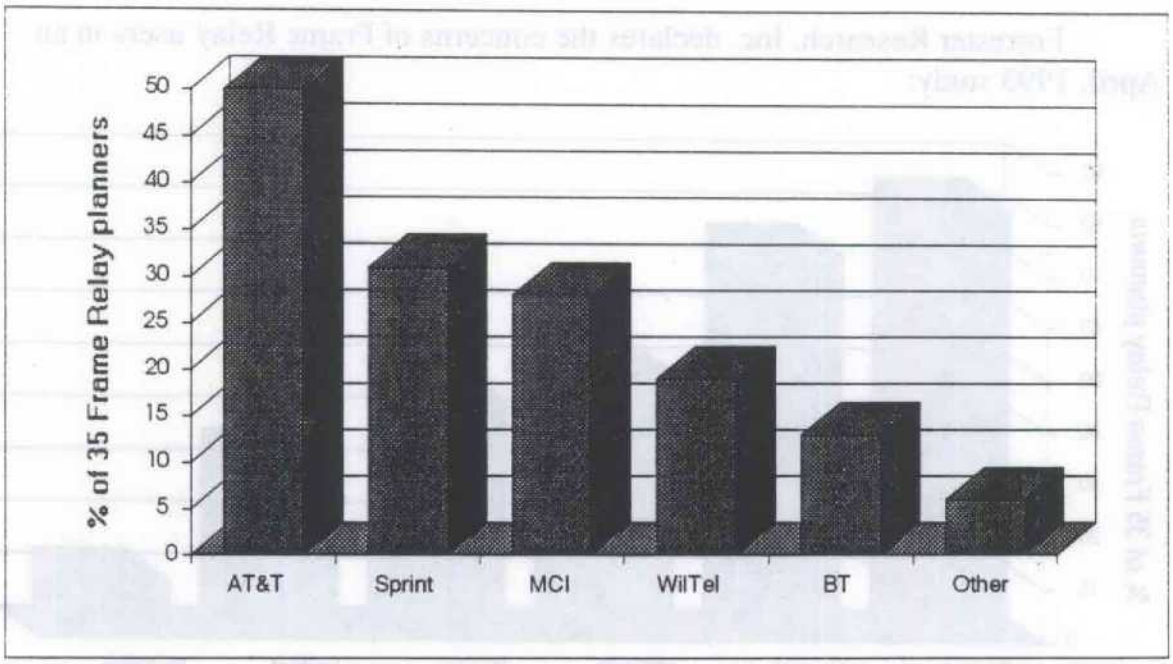



What the above graph concludes is a disbelief in the touted benefits of Frame Relay, a problem with delay of LAN traffic, a perception of limited service distribution, and relative high pricing compared to leased line alternatives.

From a Gartner Group Research Note for Enterprise Network Strategies in February, 1993, MCI Communications Corp. discovered six significant conversion barriers in moving to Frame Relay:

- Poor burst capability, low network throughput and high latency
- Uncertain financial/technological migration path
- Little vendor support of customers' network termination/routing gear
- Lack of user-oriented network management support
- Lack of international service reach
- Lack of compelling economics

Forrester Research, Inc. in the April, 1993 study quoted above, also asked the following question: "Which carriers are you considering for public frame relay services?" The response is shown in the following graph.




Altogether, several sources cite particular perceptions, problems, and concerns with regard to Frame Relay which create questions about the viability of the technology. Has Frame Relay already led users astray? It appears that the reality has caught up with the hype and the excitement is beginning to fade away.

## The MFS Competitive Edge

MFS Datanet pioneered and launched the first commercially available nationwide offering of High-speed LAN Interconnect (HLI) services. MFS Datanet's high-speed solutions, operating at rates as high as 100 megabits per second, are designed to allow businesses and institutions to connect their LANs and high-speed computers throughout major metropolitan areas or across the nation at native speeds. HLI services provide interconnectivity between multiple Ethernet, Token Ring and Fiber Distributed Data Interface (FDDI) LANs, in addition to connections between high-speed performance computer systems. The services are available for both **metropolitan area** (in city) and **wide area** (between cities) high-speed networking. In the LAN Interconnect market, MFS Datanet offers "A National service with Local Focus."

Think about how a customer would interconnect two LANs within an office building. That's how MFS Datanet works. Now suppose the customer set up a new technology that included additional hardware and resource considerations to connect the LANs within their office building. (e.g. frame relay routers). That's the basis of the difference -- the **standard LAN connector** cable is the only requirement for HLI services. On top of that, having no requirement for purchasing hardware allows protection from technological obsolescence. Imagine MFS Datanet as your National LAN.

The "promise" of Frame Relay's higher performance was a solution to LAN interconnect. Unfortunately, the performance of Frame Relay services have been dropping. While it is better than X.25 for LAN connectivity, compared to HLI, Frame Relay is too little too late.

The four appealing characteristics of Frame Relay all add up to one thing: faster data transmission with economy of connections. This does give the technology an advantage over X.25 and leased line solutions; yet, compared to HLI services, Frame Relay cannot support data rates above 1.544 Mbps (as marketed at the present time). In addition, fiber-based transmission lines are not used at the end connections for Frame Relay (or may not be fiber anywhere). With HLI however, fiber is provisioned right to the customer site. Therefore, a one-to-one comparison, for example, of Frame Relay to native Ethernet (10 Mbps) HLI service is not feasible. Frame Relay and HLI are alike in a few ways, yet the differences are even more important.

## HLI vs. FR (Similarities)

- Moves traffic from multiple LAN sites over Wide Area
- Allows economies of connectivity
- Combines different types of networks into one
- Offers major geographic locations for access
- Both are new

Besides having a competitive edge with native LAN speeds, MFS Datanet distinguishes itself as a leader in LAN Interconnection through the following list of features.

## HLI vs. FR (MFS Datanet Advantages)

- Native Data Rates
- Predictable Costs
- Simple Pricing
- Trust in Long Term Success
- Transparent Service using State-of-the-Art Technology
- High Network Throughput
- Flexible to Grow with Future Type of Network Traffic
- No Traffic Analysis Needed
- Customer Pre-Defined PVCs are Not Required
- Simply connect like two LANs within a building
- No need for Additional CPE (No stranded Investment)
- Ease of Implementation to Add New Locations
- Less Complexity and Time to Provision Connections
- No New Technology Learning Curve
- Route Diversity (Reliability)
- Digital -- 100% Fiber Backbone
- Low Latency / Rich Burst Capability

Beyond these features, MFS Datanet offers a key competitive advantage: **Asynchronous Transfer Mode** (ATM). ATM is based on the CCITT standard for broadband communications and is rapidly being accepted as the new technology of voice, video, and data communications. The wide industry acceptance of ATM is based on its ability to be adapted for a broad variety of current technologies and services while being well suited to newer, optical transmission systems such as SONET and true multimedia applications. ATM's uniform cell structure is ideal for LAN-based traffic with its inherent bursty nature and extensive range of data sizes. ATM also has an extremely **low switching delay** which allows end users to experience greater throughput performance on ATM-based networks, and even more important, allows LAN based applications to be bridged across the WAN without extensive tuning. ATM's network management capabilities extend across a wide variety of technologies from very small (LAN) to very large (LAN-MAN-WAN) network infrastructures. As mentioned above, ATM has extremely wide acceptance with over 200 companies as members of the ATM Forum -- the governing body behind the emerging ATM standards. The ATM Forum members include service providers, LAN equipment manufacturers, WAN equipment manufacturers, computer equipment manufacturers, plus a comprehensive variety of end users.

MFS Datanet is committed to providing superior value to end users through the deployment of our **national ATM backbone network** which will be used to provision leading quality High-speed LAN Interconnection (HLI) services on a ubiquitous basis. Currently, MFS Datanet has deployed operational ATM switches which are carrying commercial customer traffic, and as far as it is known, no other company can make this statement.

The real deliverables of High-speed LAN Interconnect simply surpass the hype of Frame Relay while raising network capabilities to allow new levels of LAN productivity. MFS Datanet offers a full range of HLI solutions to meet your LAN needs today, provide a migration path for tomorrow, and exceed your service expectations along the way.

# Features and Benefits

| FEATURE: | BENEFIT: |
|---|---|
| *National LAN* | *National Service with Local Focus* |
| High-speed LAN Interconnect at Native data rates | Significant Advantage over RBOCs and IXCs |
| Faster response time and throughput | Reduced Overhead Cost |
| Ease of handling additional traffic | True End-to-End Service |
| Fit for advanced applications | Permits Full LAN Efficiency for High Bandwidth Applications |
| *National Network* | *Optimal Use of Purchased Speed* |
| Digital -- 100% Fiber ATM Backbone | Transparent Service using State-of-the-Art Technology |
| Clear, Error-free Transmission | Lower Maintenance Costs |
| High Quality and Reliability | Economies of Scale allow Faster Provisioning than Private Solution |
| Secure Fiber Optics | Long Term Success Strategies will lead to Accelerated Implementation of Distributed Applications and Multimedia |
| National Network designed for LAN Interconnectivity | |
| *Network Availability and Disaster Recovery* | *Less Worry and Headache* |
| Electronic Redundancy and Route Diversity | Reduced Downtime Risk from Component Failure |
| Meshed Backbone for Multiple Sites | Connection of Widely Dispersed LANs as easy as if they were Local |
| Optimized Configuration | No Need for Complex Routing Analysis |
| On-net and Off-net provisioning | Reduced Management Network Infrastructure |
| *Ease of Use* | *Simplicity with Reduced Risk* |
| Easy to Understand | No Need for Additional CPE |
| Logically and Physically Functions as an Extended LAN Cable | Protection from Depreciation of Capital Equipment |
| Standard LAN Interfaces (AUI / MAU / MIC) | No Need to Learn New Technologies |
| Standard Service Protocol Choices (Ethernet, Token Ring, FDDI) | Low Risk to Technological Obsolescence and Evolving Standards |
| Can use existing Cable Configurations | During the Contract Term, Upgrades are Allowed as Traffic Volumes and Business Needs Increase |
| Scalable to Allow Swaps and Upgrades of Equipment | New Sites are Connected without Complex Network Reconfiguration |
| Protocol Independent Data Link Transports | |

# Features and Benefits

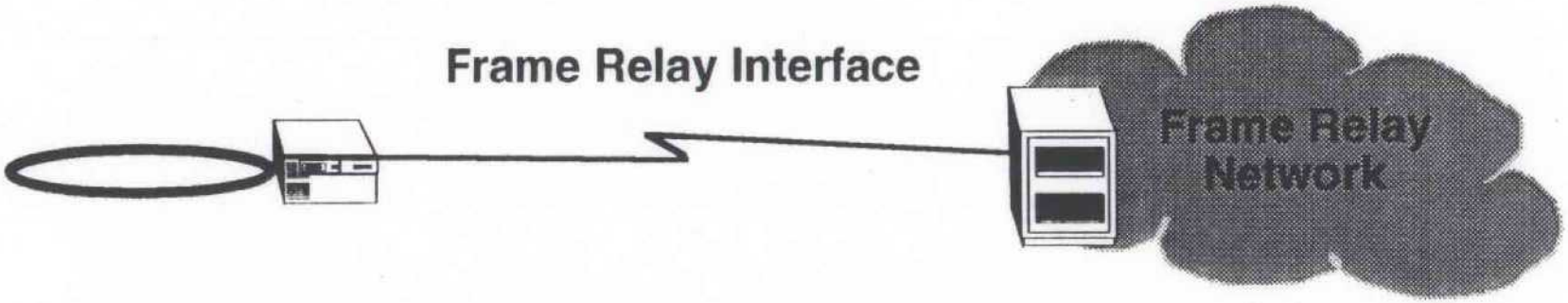
| FEATURE: | BENEFIT: |
|---|---|
| *Customer Service* | *Focus on Core Competencies* |
| Our Business is High-Speed LAN Interconnectivity | Outsourcing Leads to More Effective Use of Staff |
| Fast Installation | Greater Time to Concentrate on Strategic Network Applications Instead of Daily Operational Concerns |
| Quick Circuit Repair | Team of Experienced Engineers is Provided to Match Networking Requirements with a Best Solution |
| Experienced Field Engineers (CNE Certified) | |
| Single Source Provisioning | |
| Responsiveness -- Fast Turnaround Time | |
| *Network Management* | *Safe and Secure Management* |
| Nationwide Monitoring and Maintenance | Reduced Maintenance Cost |
| Single Point of Contact (1-800-MFS-4USA) | Complements Existing Resources of the Customer |
| Physically Secure Points of Presence (POPs) | High Level of Security for Customer Data |
| 24 x 7 Service and Support | |
| *Service Portfolio* | *Complete Solution Family* |
| Full Range of Solutions -- Ethernet, Token Ring, FDDI | Choice for Today |
| Variety of Configurations -- Point-to-Point, Mesh, Ring | Migration Path for Tomorrow |
| Metropolitan and National Solutions | |
| *Cost / Benefit Analysis* | *MFS Datanet Advantage* |
| Nationwide High Performance at Economical Price | Closer to the Commercially Viable Technology Curve |
| Clear and Simple Pricing | Leverage of Developing Market Conditions |
| Match User's Needs without the High Cost of a Private Network | Changing User Expectations |
| Focus on Data | |
| Break the Cost Barrier of Distance x Speed | |

# Research Brief 2nd Quarter

| FEATURE: | BENEFIT: |
| --- | --- |
| Customer Service | Customer Care Commitment |
| Can Develop a High-Speed | Networking Look to Most |
| LAN Interconnectivity | Discover Use of Skill |
| Fast Installation | Create Time to Concentrate on Strategic |
| Quick Client Report | Network Applications Instead of Daily |
| Experienced Field Engineers | Operational Concerns |
| ICSE Certified | Team of Experienced Engineers is Provided |
| Single Source Point of Entry | to Match Networking Requirements |
| Responsiveness — Fast Turnaround Time | with a Best Solution |
| Service Maintenance | Value and Low-Cost Maintenance |
| Can provide Monitoring and Telecommu- | Protected Maintenance Fee |
| Single Point of Contact (1-800-MPS-4USA) | Comprehensive Existing Hardware |
| Physically Secure Points of Presence (POPs) | of the Customer |
| 24 x 7 Service and Support | High Level of Security for Customer Data |
| Service Continuity | Complete Solution Center |
| Fail Ready of Solutions — | Choice for Today |
| Options: Three Ring, POTS | Migration Path for Tomorrow |
| Variety of Configurations — | |
| Point-to-Point, Multi-Ring | |
| Interoperation and Protocol Solutions | |
| Cost - Specific Analysis | MPS Express Advantage |
| Maximum High Performance | Closer to the Customer by Virtually |
| — Economical Price | Technology Curve |
| Close and Simple Pricing | Leverage of Developing Market Conditions |
| Multi Layer Device Options | Changing User Expectations |
| the High Cost of a Private Network | |
| Focus on Data | |
| Break the Cost Barrier of Dataline x Speed | |

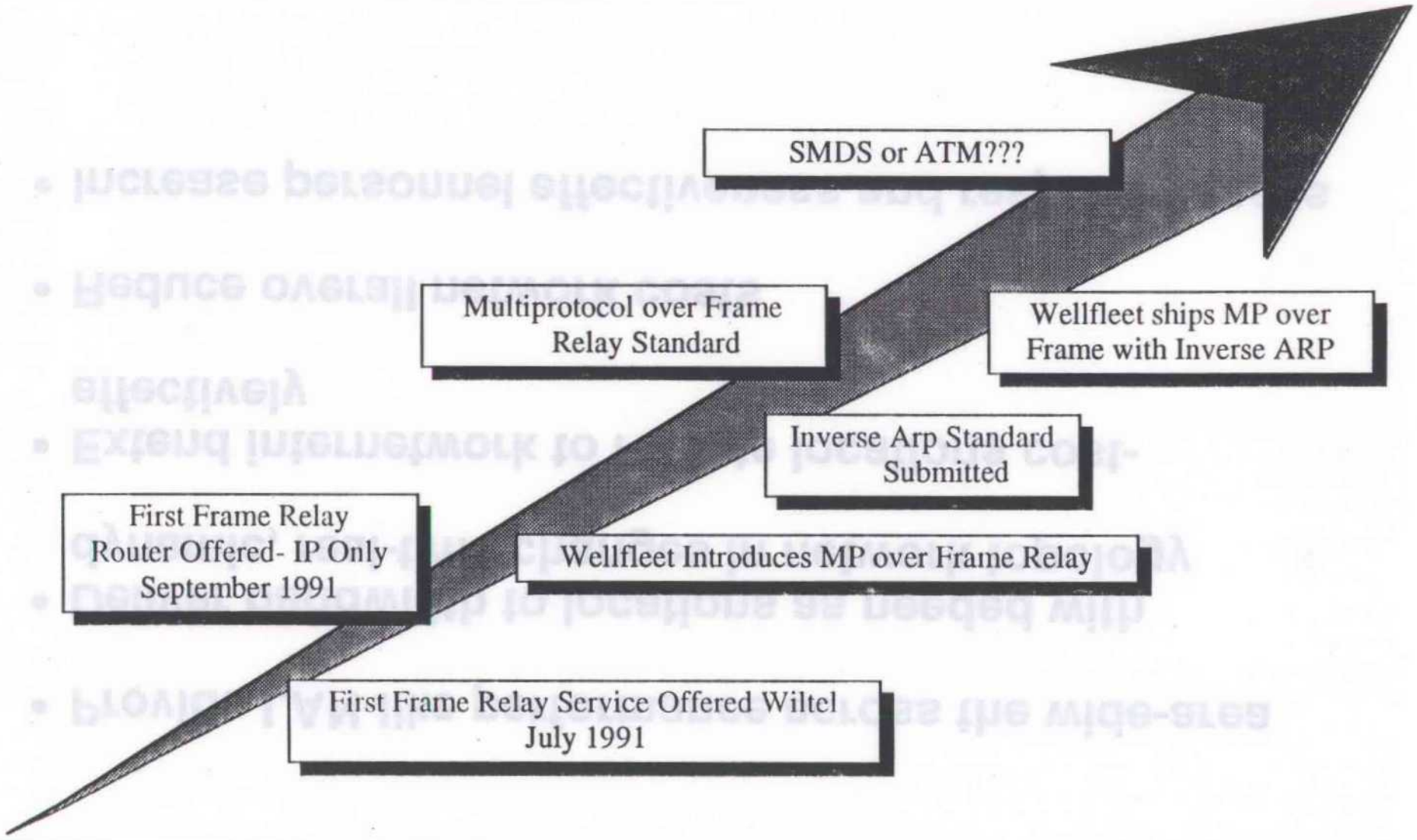
# Frame Relay
# The Panacea of WAN

# Frame Relay Overview




- Connection-oriented data transfer protocol defining standard interface between routers (DTE) and packet switches (DCE)
- Access speeds up to T1/E1, up to T3 possible
- Error recovery performed by end stations
- Protocol for public services and private networks

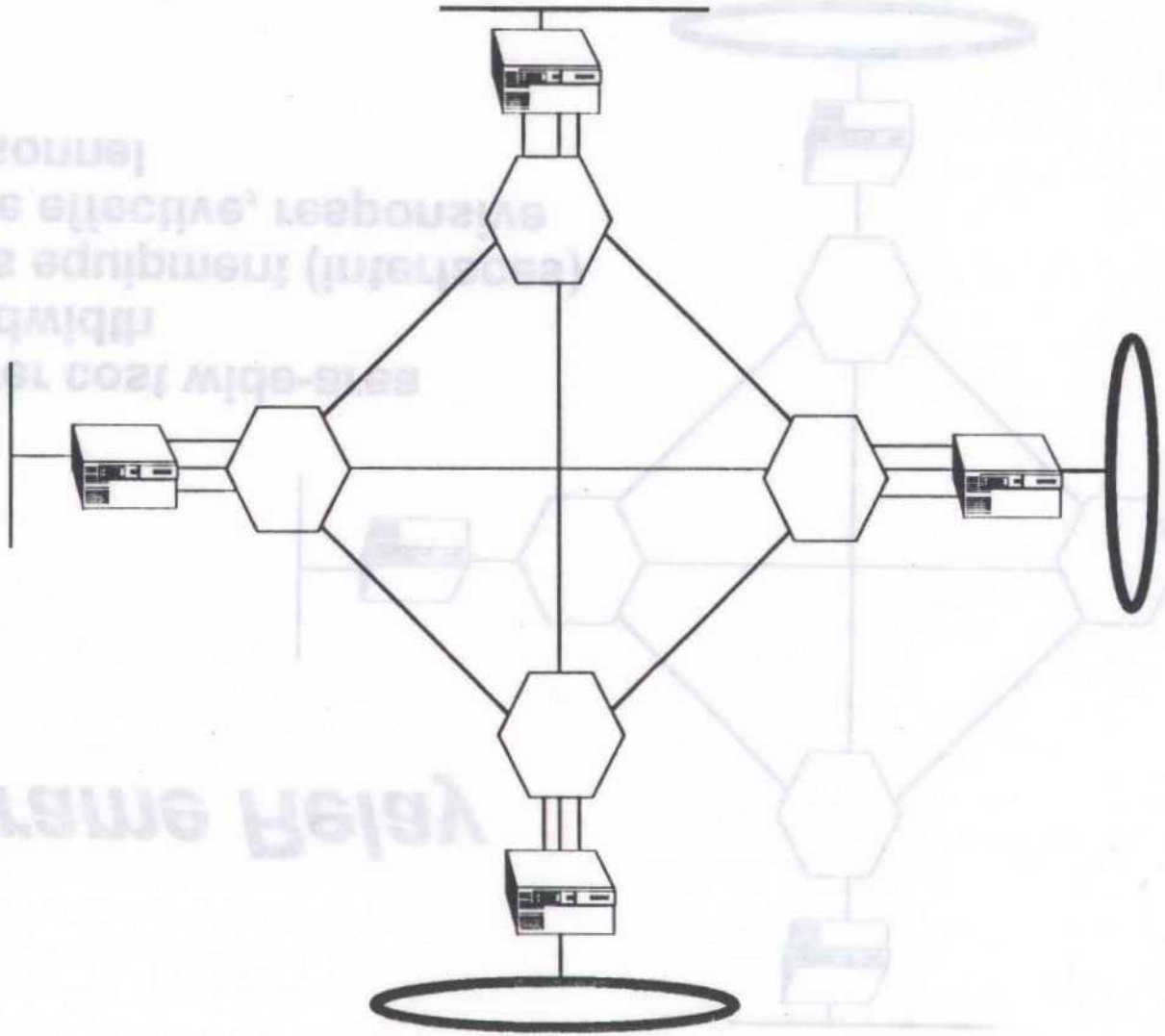
# Frame Relay - When did it happen?



# The Challenges - Why Use It?

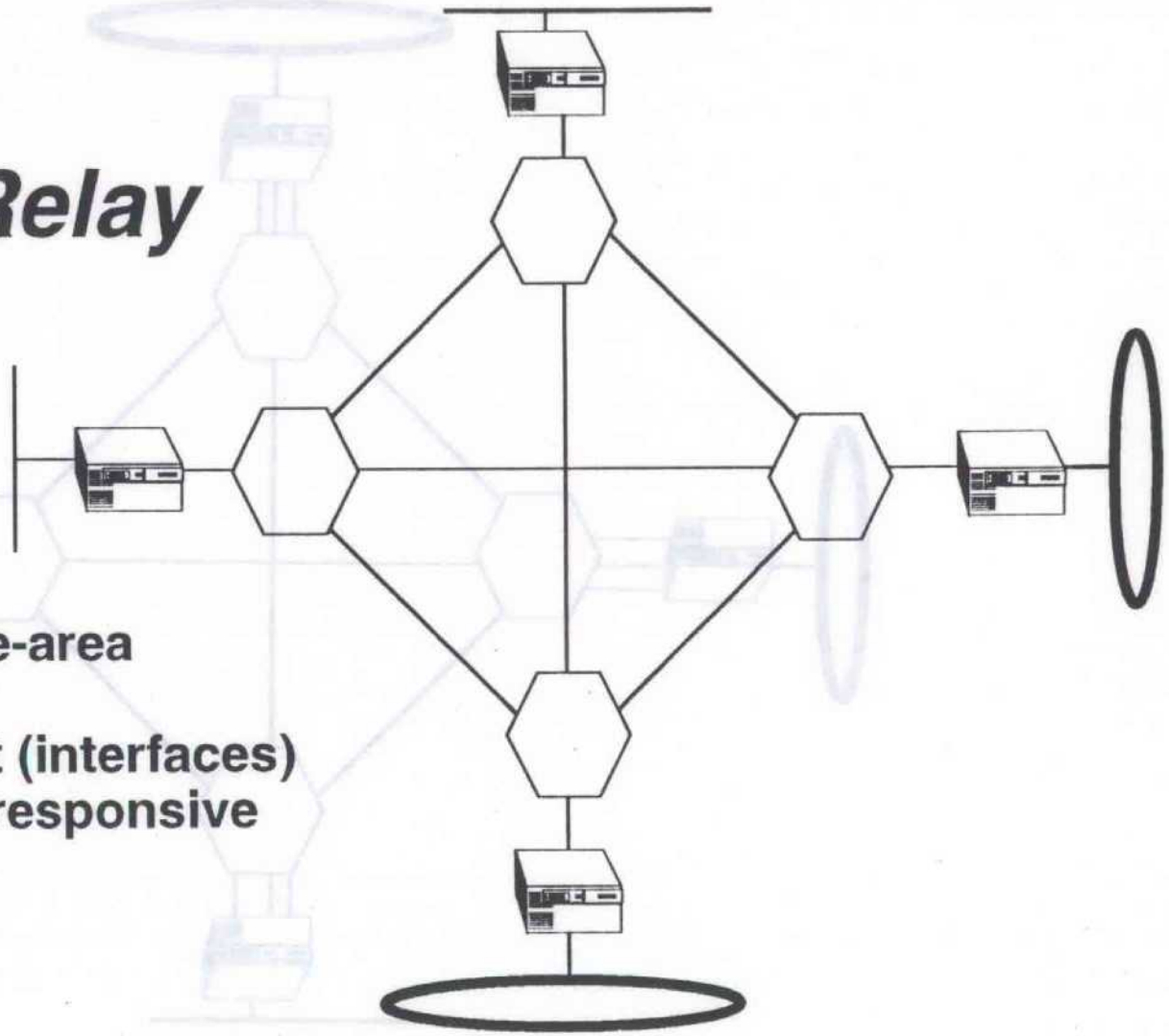
- Provide LAN-like performance across the wide-area
- Deliver bandwidth to locations as needed with dynamic, real-time changes in network topology
- Extend internetwork to remote locations cost-effectively
- Reduce overall network costs
- Increase personnel effectiveness and responsiveness

# The Opportunity - Point to Point



# The Answer

## Frame Relay



- Lower cost wide-area bandwidth
- Less equipment (interfaces)
- More effective, responsive personnel

# *Frame Relay Benefits*

- Delivers low delay and high throughput

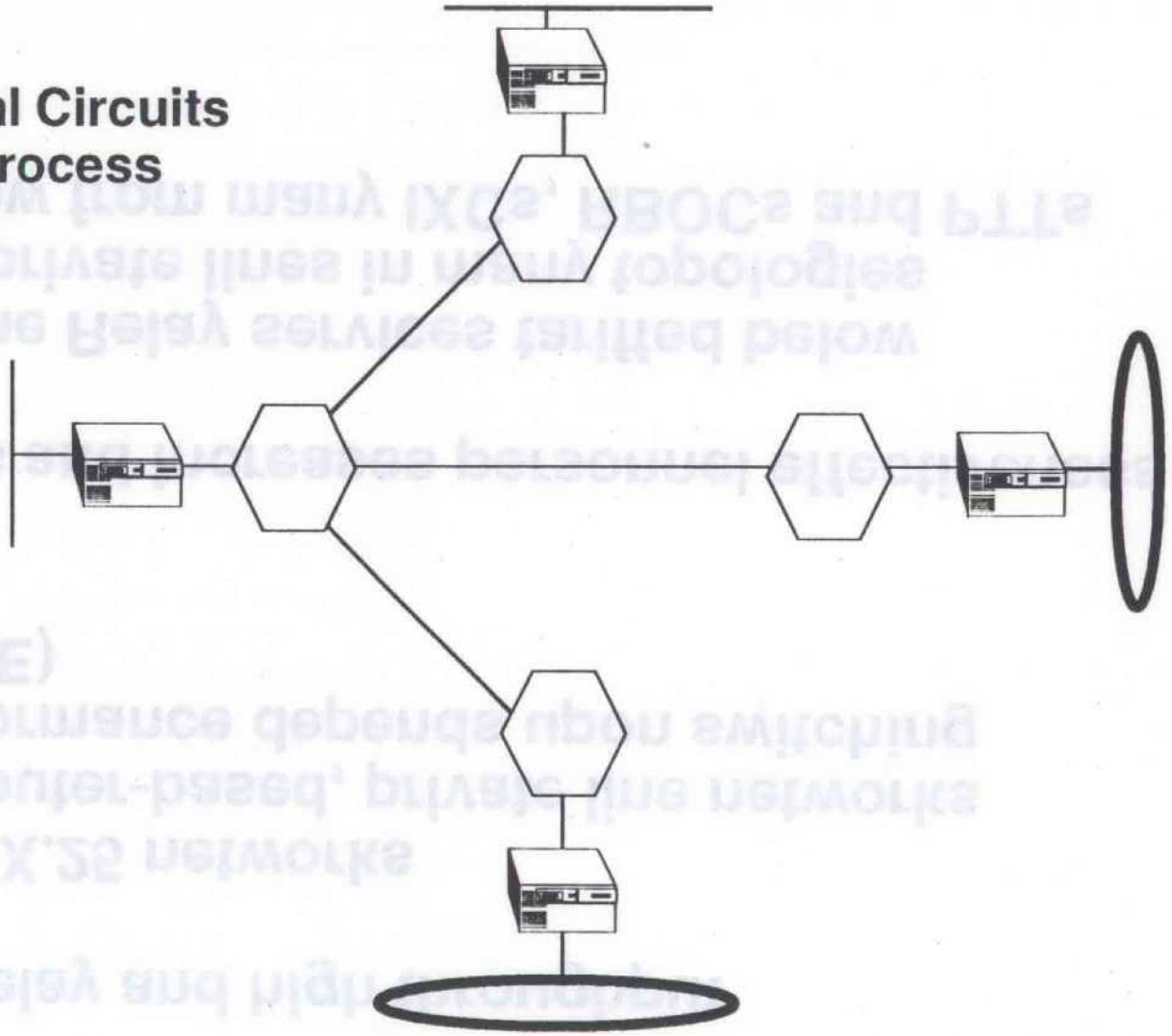
  - Superior to X.25 networks
  - Similar to router-based, private line networks
  - Actual performance depends upon switching platform (DCE)

- Reduces costs and increases personnel effectiveness

  - Public Frame Relay services tariffed below equivalent private lines in many topologies
  - Available now from many IXCs, RBOCs and PTTs

# Frame Relay - How is it used?

- NonFull Mesh
- No Switched Virtual Circuits
- Managed Design Process

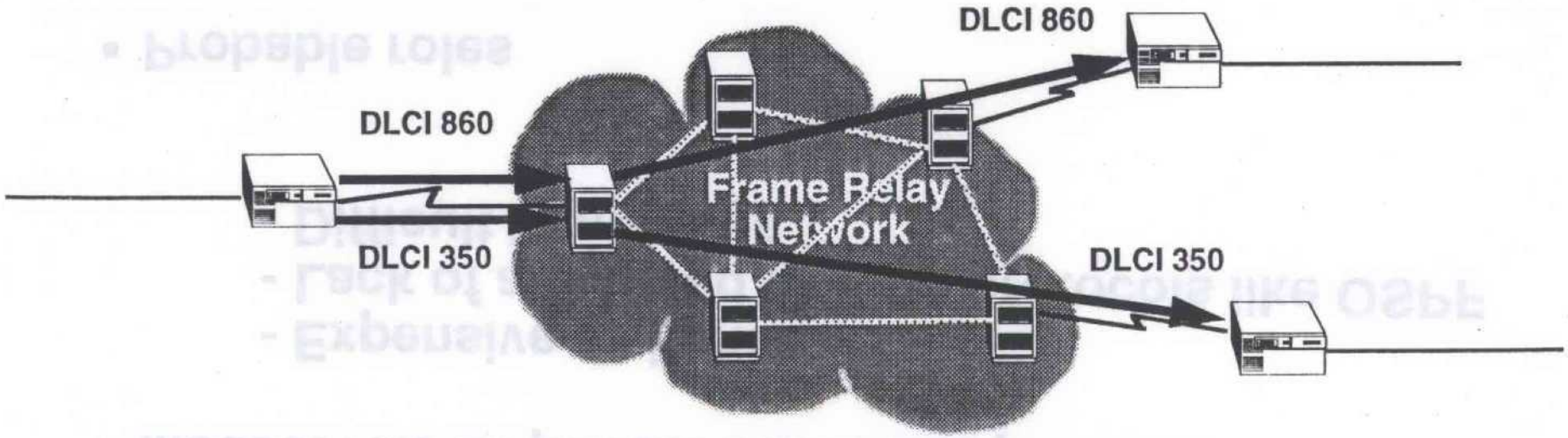


# Frame Relay in Private Networks

- Modest role as private backbone protocol
  - Expensive switches
  - Lack of advanced routing protocols like OSPF
  - Difficult to manage
- Probable roles
  - Switches to feed traffic to public networks
  - Concentrators to consolidate traffic from LAN and non-LAN sources

# Data Link Connection Identifier (DLCI)

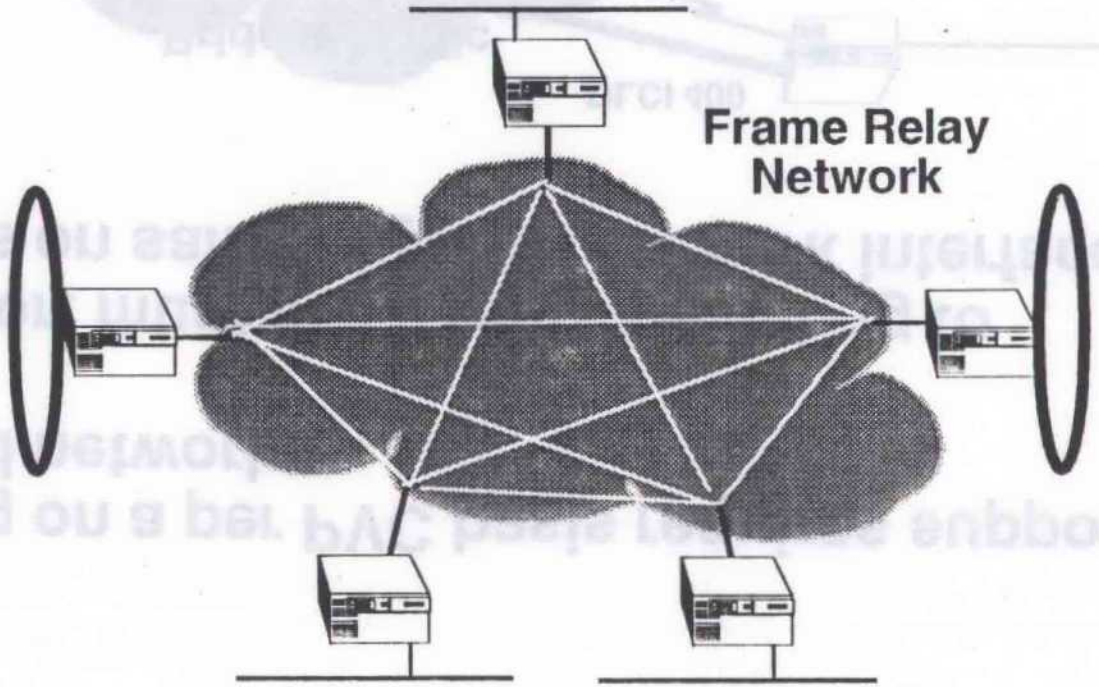
- Defines independent Permanent Virtual Circuits (PVCs) (uni-directional) available through single physical interface



# Dynamic Configuration

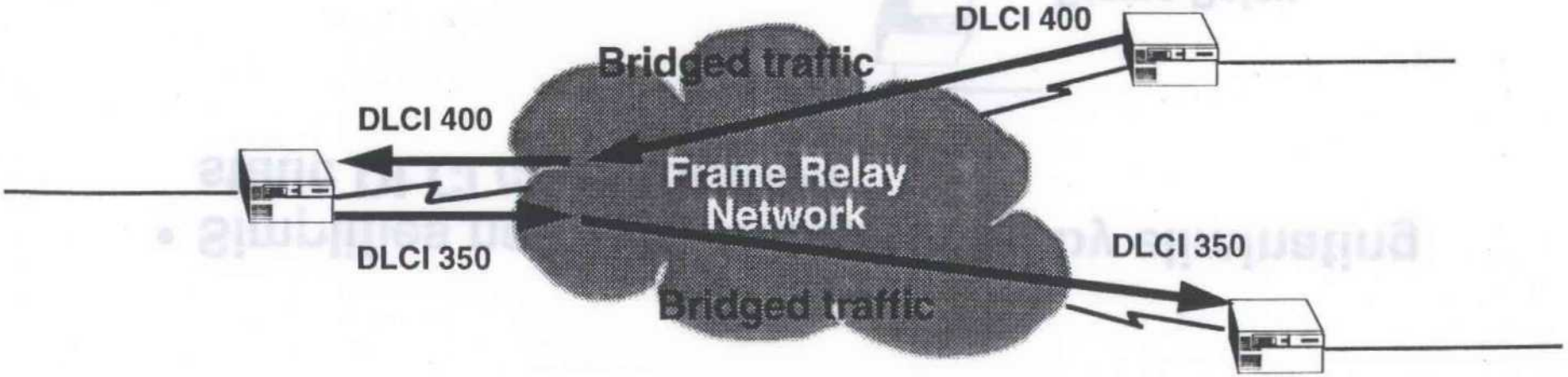
- Simplifies network configuration by eliminating static DLCI configuration

5 IP address entries
vs.
45 entries =
4 DLCIs and
5 IP address
entries per router



# Non-Meshed Network Support

- Service pricing on a per PVC basis requires support of non-meshed networks
- Bridging support must allow rebroadcasting to different DLCIs on same physical network interface



# Frame Relay
# Where Is It Today?

# Wellfleet Frame Relay Interoperability

**Switches**

AT&T
Netrix
Northern Telecom
Sprint
StrataCom
Telematics

**Services**

AT&T
BT Tymnet
CompuServe*
Dutch PTT
MCI*
NYNEX
Pacific Bell
Southwestern Bell*
US Sprint*
US West
WilTel*

*Certified

# Public Frame Relay Service

## Considerations

- Tariffs — Flat rate vs. usage based
- Maximum number of PVCs
- Committed Information Rates (CIR)
- Burst rates
- Access speeds
- Geographic availability
- Price bundling (access lines, DSU/CSU, routers)


# "America's Fastest-Growing Company"

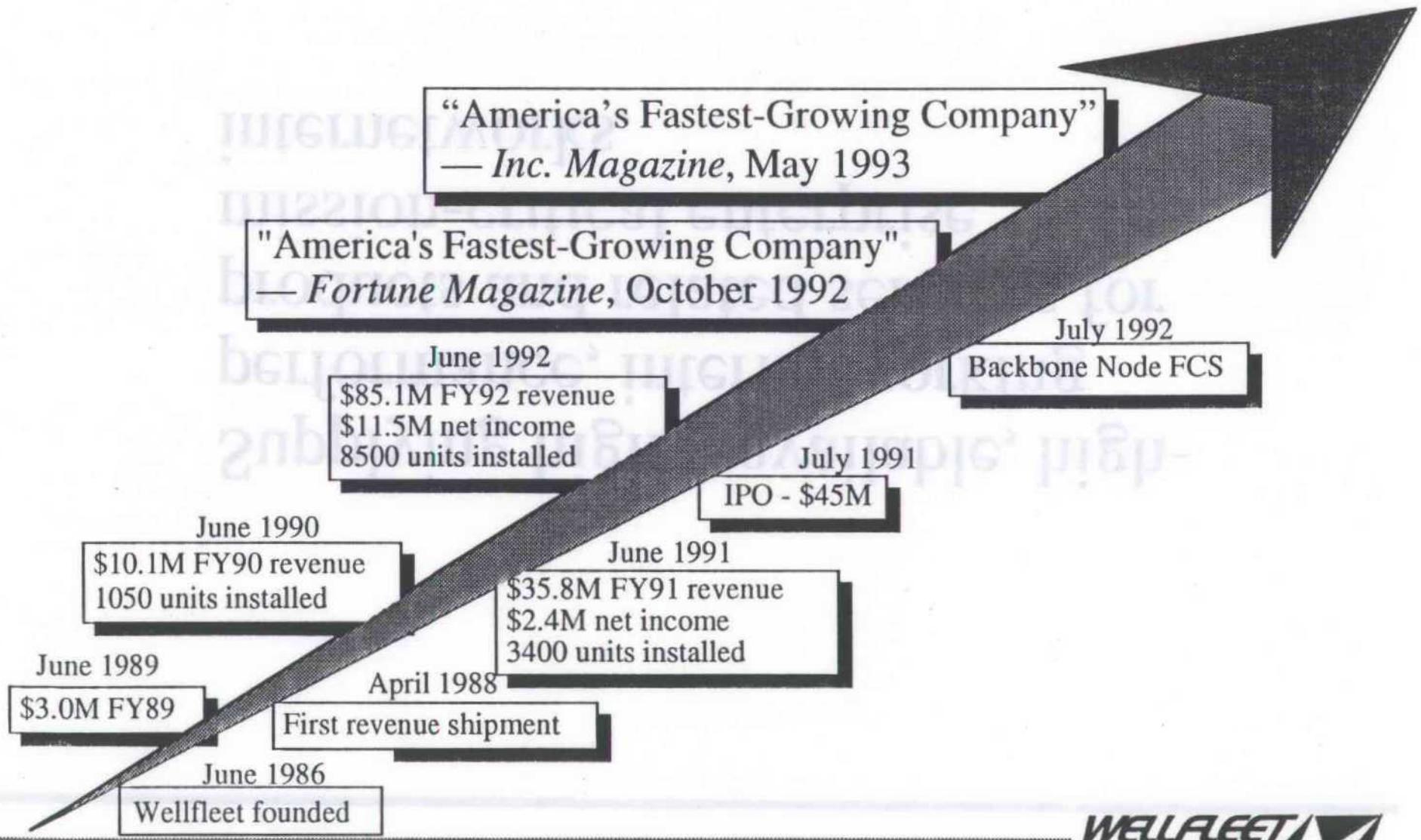
*-- Fortune Magazine, October 5, 1992*

*-- Inc. Magazine, May 5, 1993*

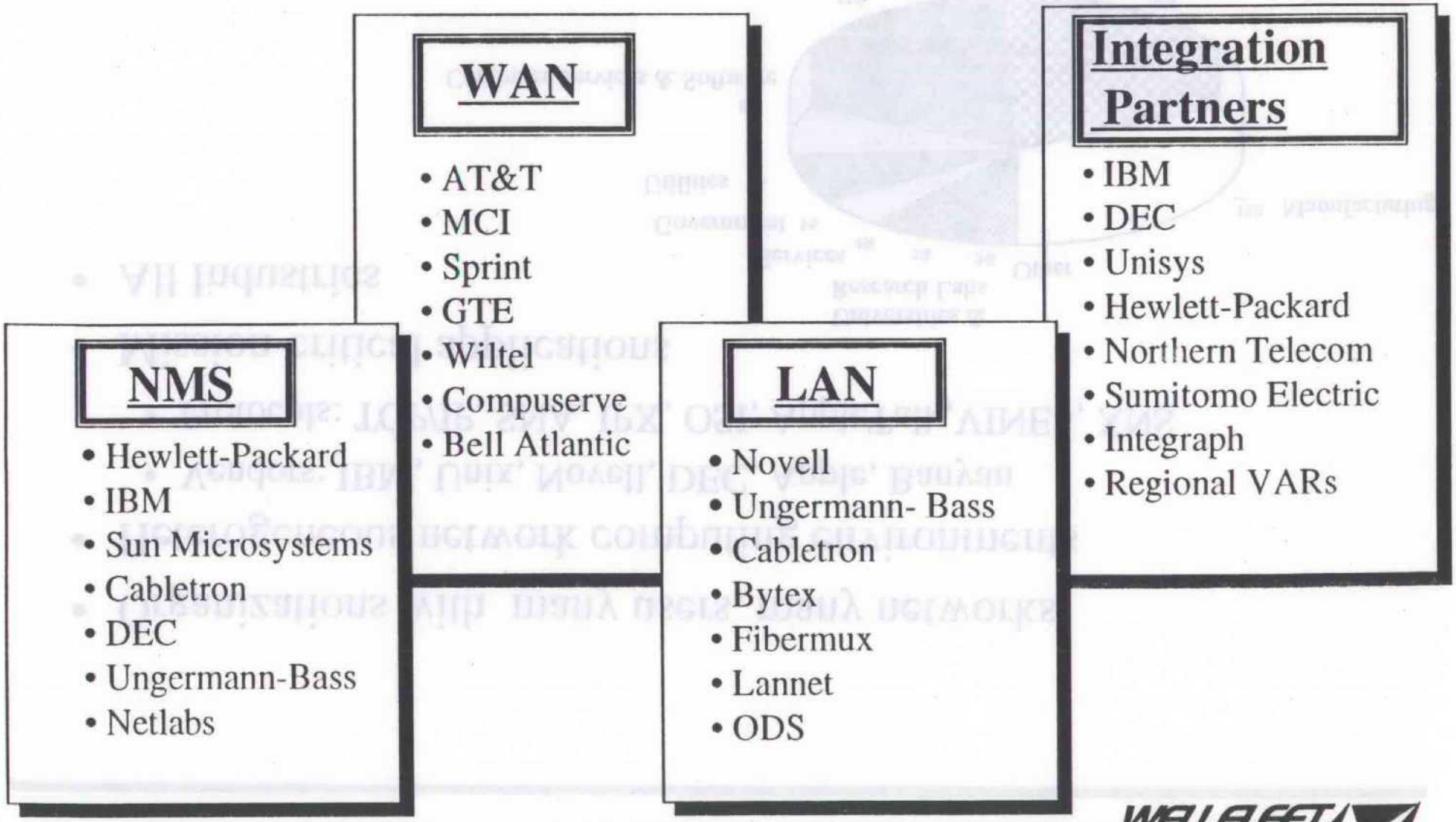
# Our Business

Supplying highly available, high-performance, internetworking products and related services for mission-critical enterprise internetworks.

# Wellfleet History

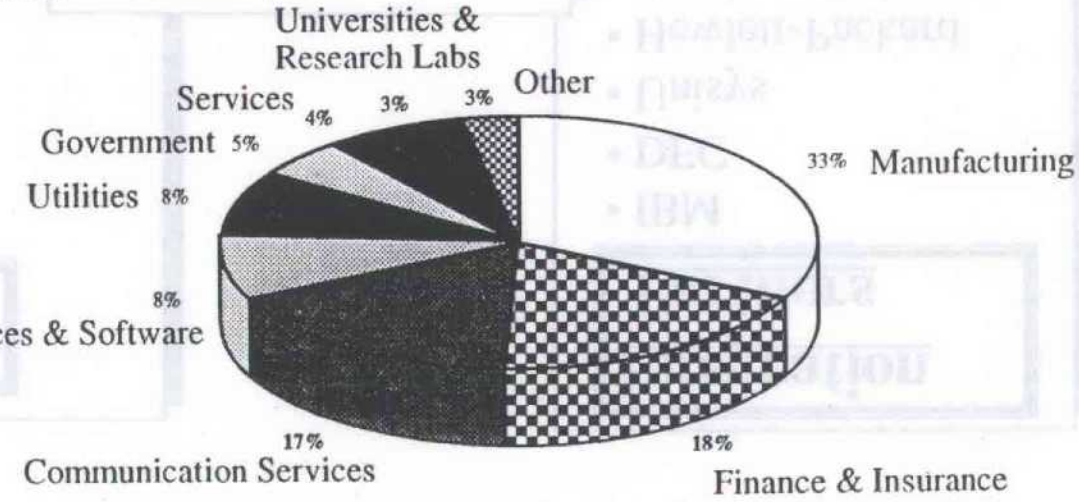


# Strategic Relationships

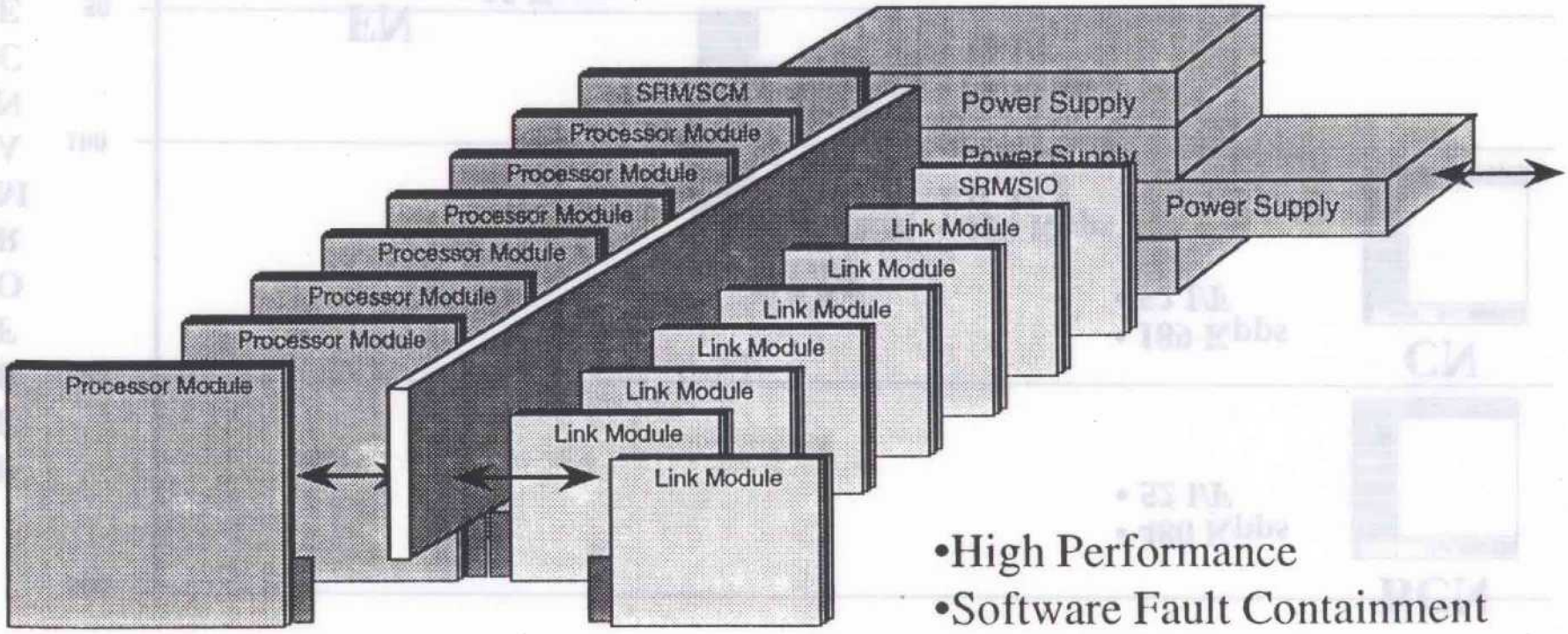


# Market Focus

- Organizations with many users, many networks
- Heterogeneous network computing environments
  - Vendors: IBM, Unix, Novell, DEC, Apple, Banyan
  - Protocols: TCP/IP, SNA, IPX, OSI, AppleTalk,VINES, XNS
- Mission-critical applications
- All Industries

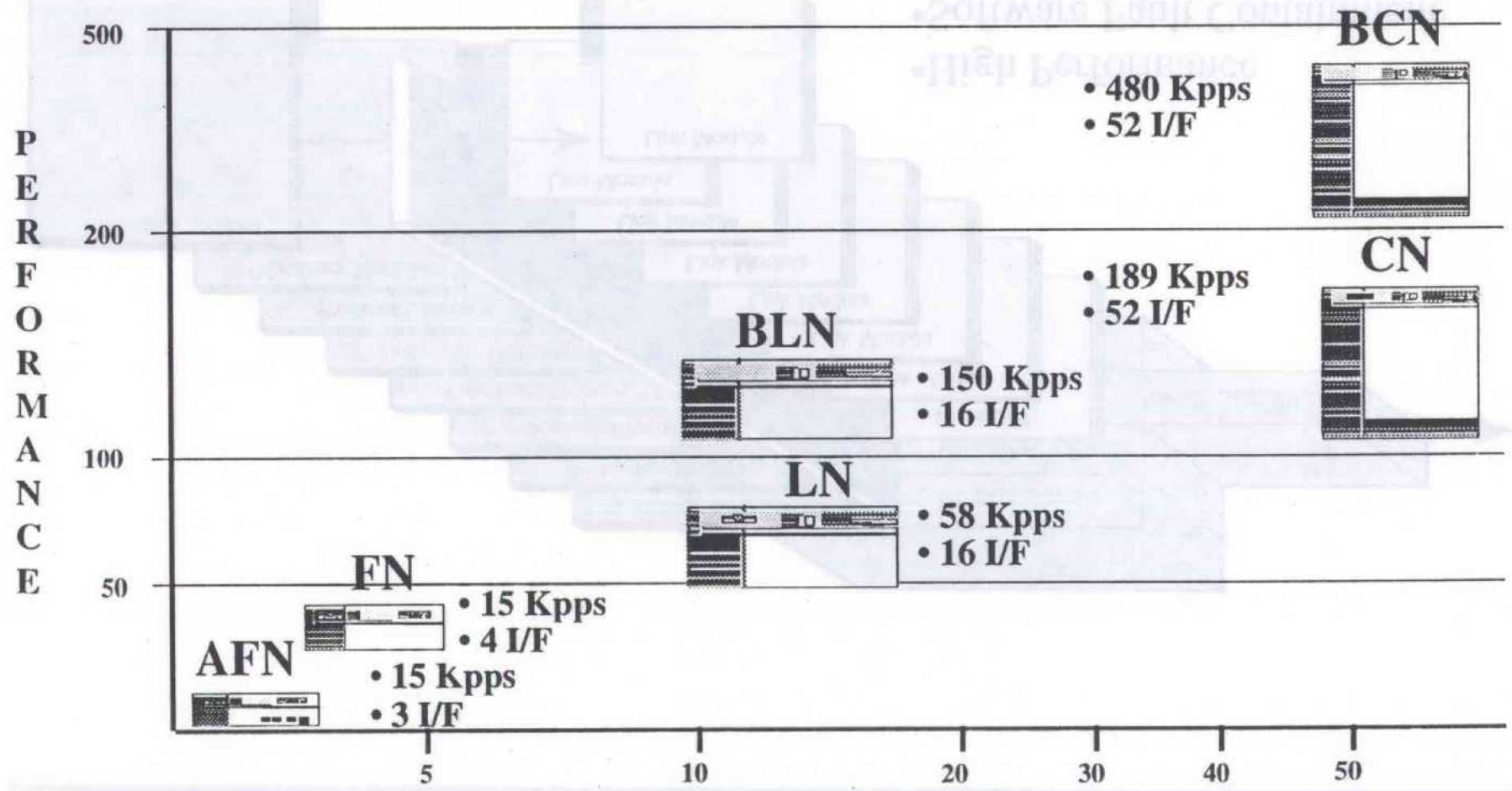


# System Architecture




- High Performance
- Software Fault Containment
- Scalable Expansion
- High Availability

# *Wellfleet Product Family*



# Customer Applications

See Handouts

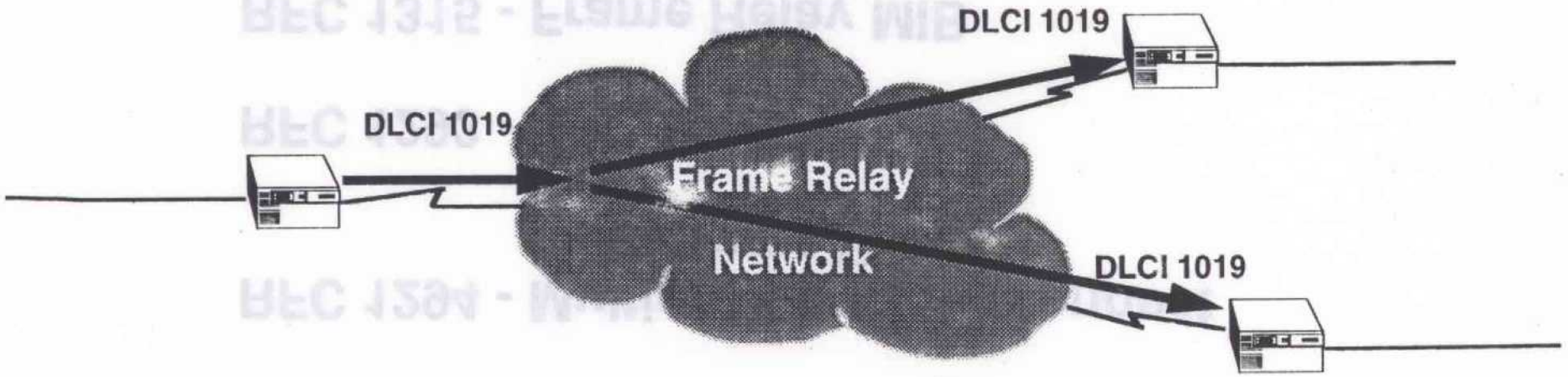
MS DATANET

# Frame Relay and Wellfleet

## Reference Materials

# Multicast Addressing

- Multiple addresses mapped to single DLCI



# Frame Relay IETF RFCs

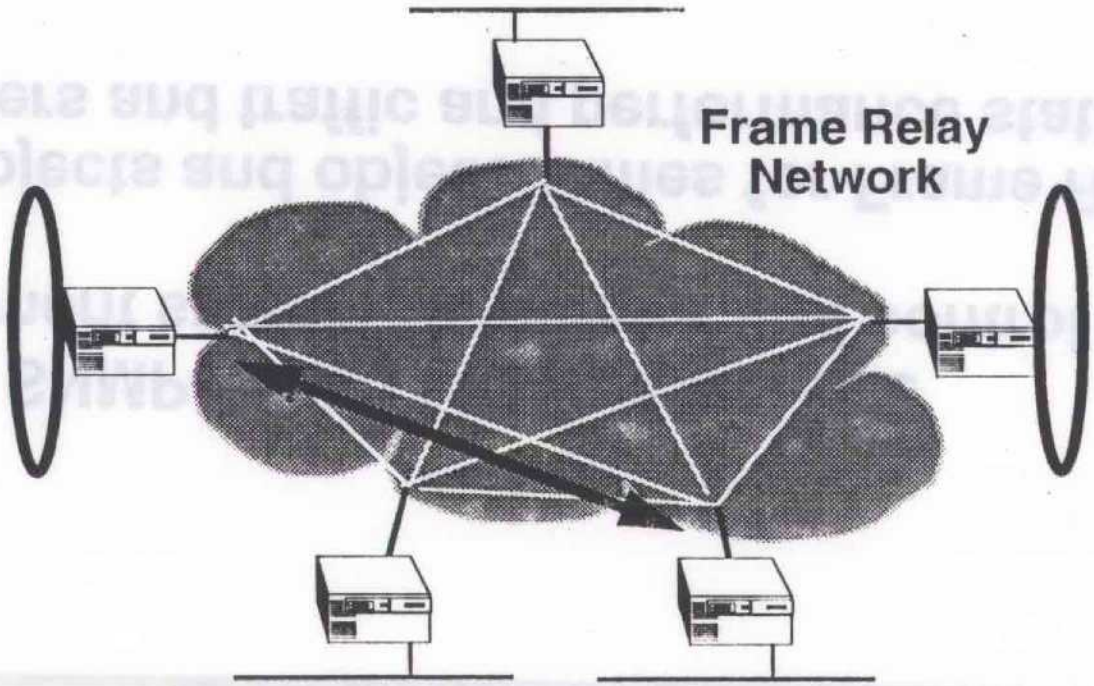
**RFC 1294 - Multiprotocol Interconnect over Frame Relay**

**RFC 1293 - Inverse ARP**

**RFC 1315 - Frame Relay MIB**

# Inverse ARP (RFC 1293)

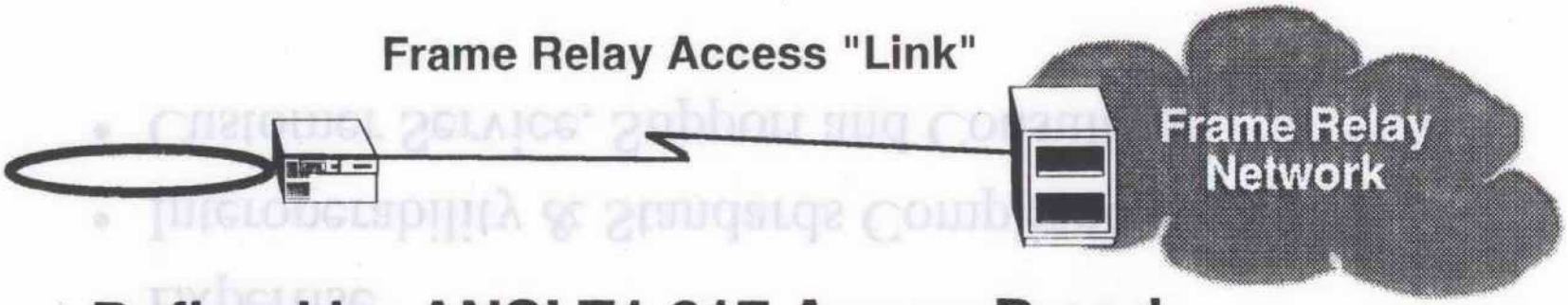
- Minimizes bandwidth utilization
- Frame relay interface directs non-broadcasted packet to newly advertised DLCI to obtain protocol address



# Frame Relay MIB (RFC 1315)

- Enables SNMP-based network or node management system to monitor and control router
- Set of objects and object names for Frame Relay parameters and traffic and performance statistics

# Link Management




- **Defined by ANSI T1.617 Annex D and Link Management Interface (LMI) R1.0**
- **The router and network exchange keep alive messages with network communicating DLCI status:**

| Status | ANSI | LMI |
|---|---|---|
| New | √ | √ |
| Present and active | √ | √ |
| Present and inactive | √ | √ |
| PVC deleted | | √ |
| PVC reserved as multicast | | √ |
| X-on/X-off for flow control | | √ |

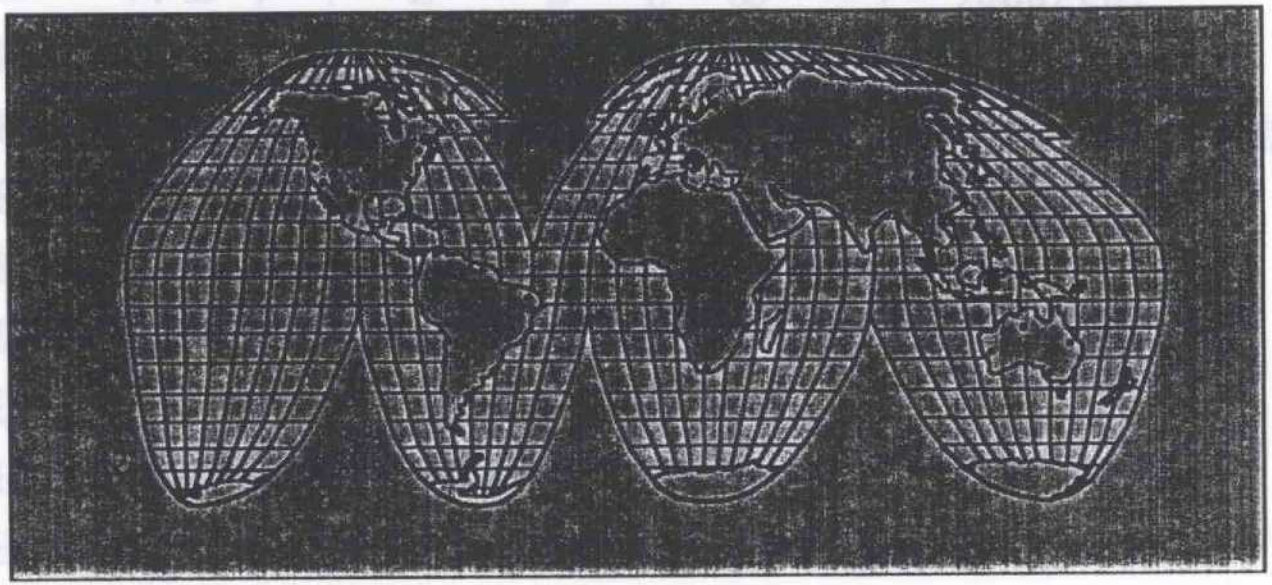
# Core Competencies

- Highly Available System Design
  - Hardware Redundancy
  - Non-disruptive Network Expansion and Growth
  - Fault Containment Operating System
- High Performance & Scalable Architecture
- Complex Network Design & Implementation Expertise
- Interoperability & Standards Compliance
- Customer Service, Support and Consulting

# Wellfleet Technology Firsts

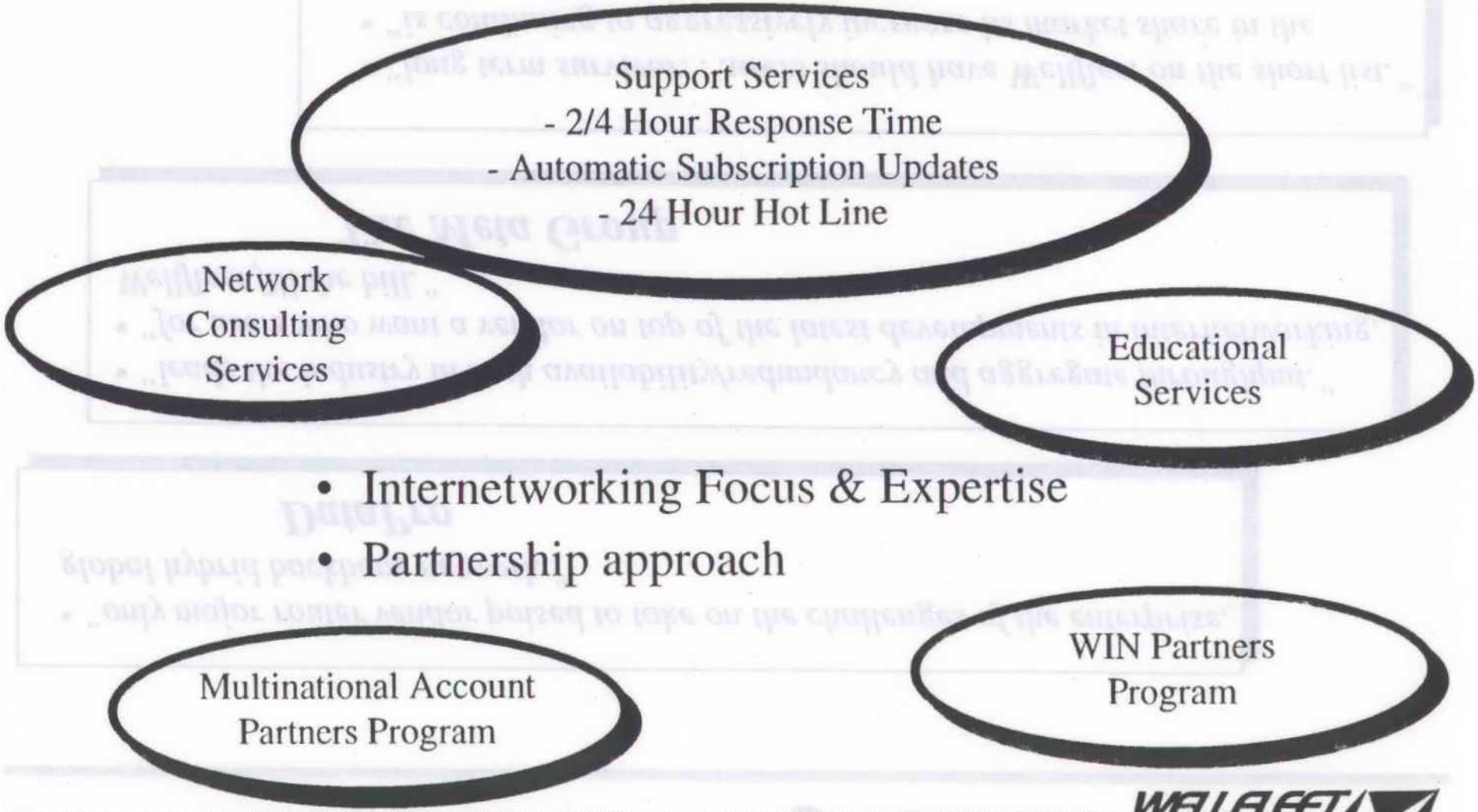
- First to Support and Demonstrate 460,000 pps (April 1993) BCN
- First to Demonstrate Non-Disruptive Hot Swap -VME (January 1993)
- First Support ATM at T3 Speeds (August 1992)
- First to Support 1 Gbps Interconnect (July 1992)
- First Non-Disruptive Hot Swap (July 1992)
- First to Hit 150,000 pps (July 1992) BLN
- First to Support Software Fault Management (July 1992)
- First Entirely SNMP-based Management (July 1992)
- First with Graphical Dynamic Configuration Editor (July 1992)
- First to Support Open Network Management Strategy (August 1991)
- First to Support 52 LAN/WANs in a Node (December 1988) CN
- First with Redundant Power Supplies (December 1988) CN
- First Symmetrical Multiprocessing Architecture (April 1988) LN
- First Multiprotocol Router/Bridge (April 1988) LN

# Global Distribution



- Worldwide Distribution & Support Services
- Customized Multinational Account Program
- Consistent Product, Services and Support Across Boundaries
- Direct Wellfleet Support to Distributors, VARs, Integrators

# Support & Services



# Wellfleet Market Recognition

- *"only major router vendor poised to take on the challenges of the enterprise, global hybrid backbone network."*

***DataPro***

- *"leads the industry in both availability/redundancy and aggregate throughput."*
- *"for users who want a vendor on top of the latest developments in internetworking, Wellfleet fill the bill."*

***The Meta Group***

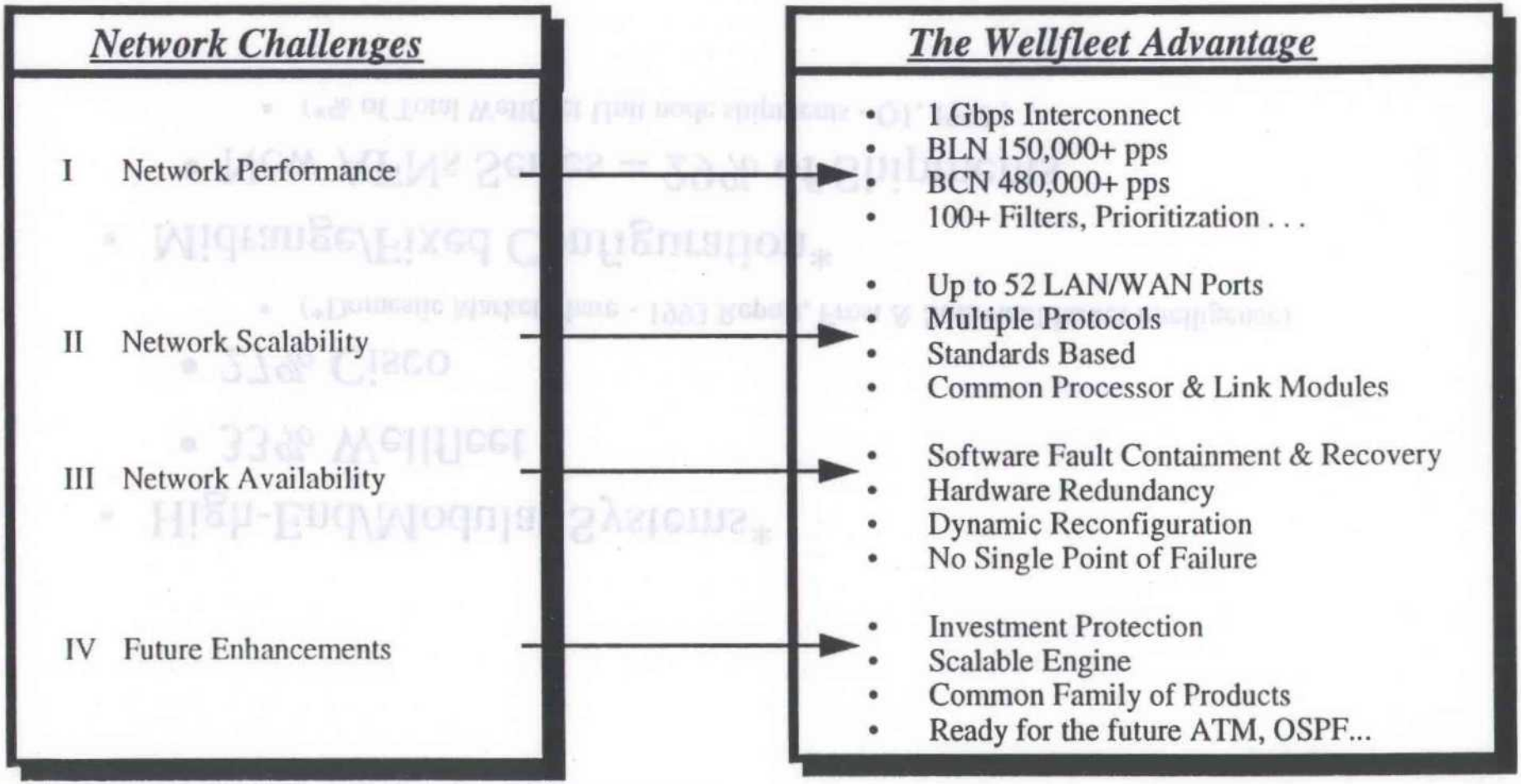
- *"long term survivor. . .users should have Wellfleet on the short list."*
- *"is continuing to aggressively increase its market share in the exploding internetworking market."*

***The Gartner Group***

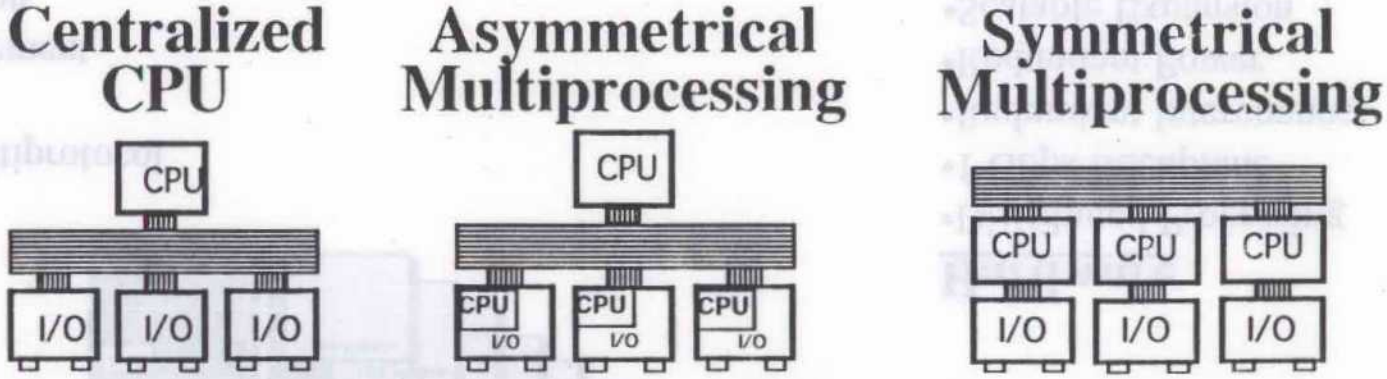
# Market Leadership Position

- High-End/Modular Systems*
  - 33% Wellfleet
  - 27% Cisco
    - (*Domestic Market Share - 1993 Report, Frost & Sullivan/Market Intelligence)
- Midrange/Fixed Configuration*
  - New AFNs Series = 29% of Shipments
    - (*% of Total Wellfleet Unit node shipments - Q1, 1993 )

# Market Leading Solutions

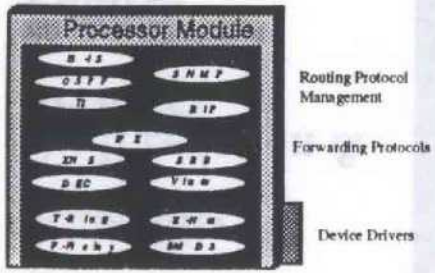


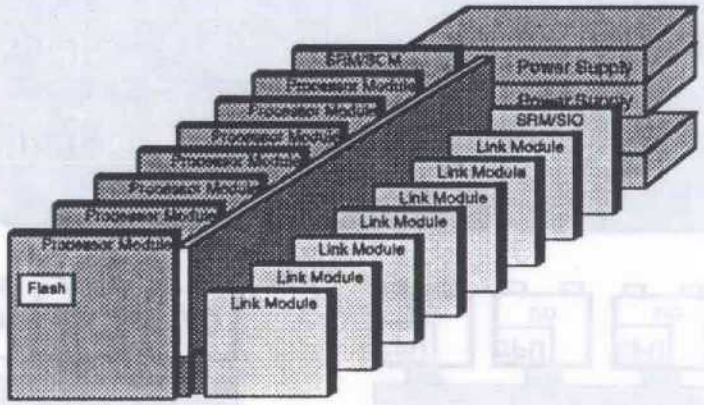
# *Selecting an Architecture*

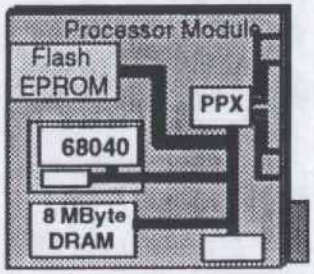



| | Centralized CPU | Asymmetrical Multiprocessing | Symmetrical Multiprocessing |
|---|---|---|---|
| **Performance** | Up to 50,000 pps | Up to 100,000 pps | Up to 480,000 pps |
| **Scalability** | POOR | FAIR | OPTIMUM |
| **Fault Isolation & Recovery** | NO | NO | YES |
| **Futures** | INVESMENT RISK | INVESTMENT RISK | INVESTMENT PROTECTION |

# *Technology Leadership*



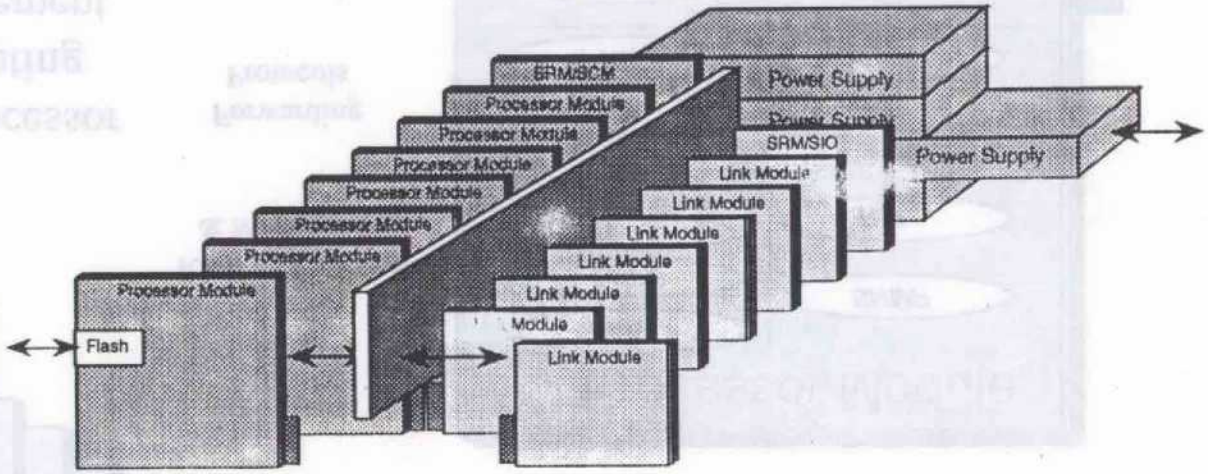

## Software

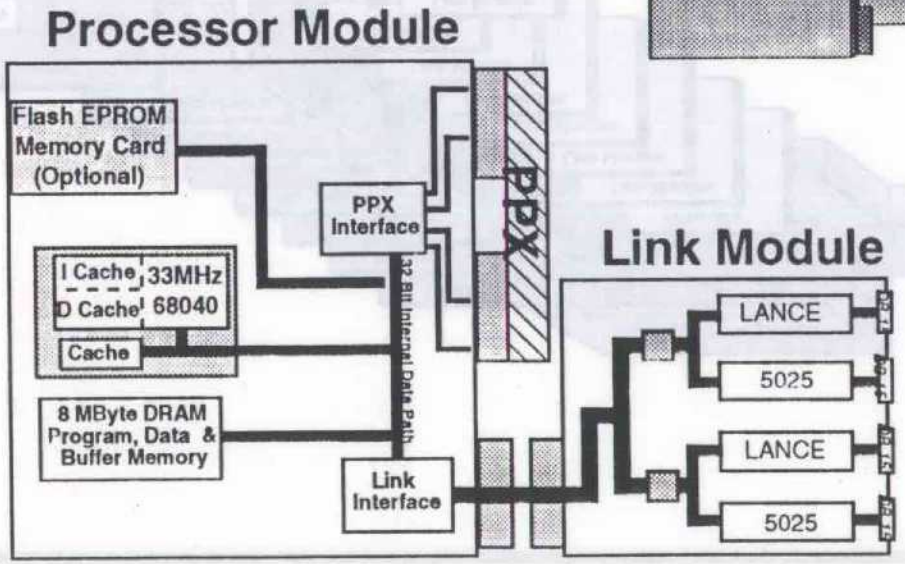
- Distributed OS
- High Performance Multiprotocol Routing
- Software Fault Management
  - Fault Identification
  - Fault Containment
  - Fault Recovery
- Non-Dissruptive Hot Swap

## Hardware

- Distributed Processing
- 1 Gbps Backplane
- Redundant Interconnect
- Redundant Power
- Scalable Expansion

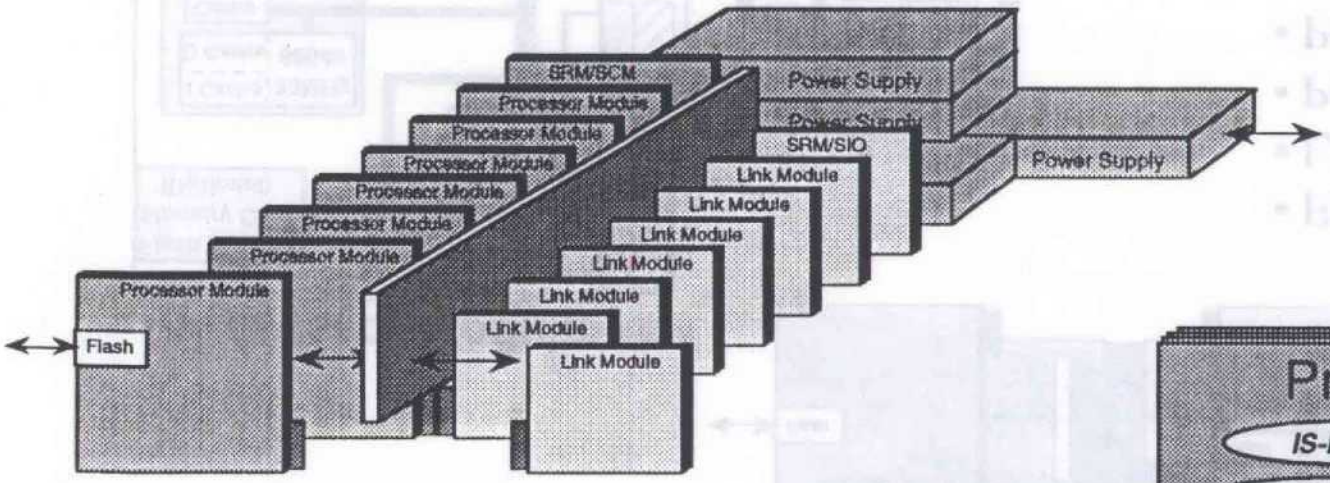
# System Architecture -- Hardware




- FRE / ACE
- Link Module
- Processor Interconnect (Bus)
- Processor
- Midplane Design
- Power Supplies
- Flash Memory

# System Architecture -- Software

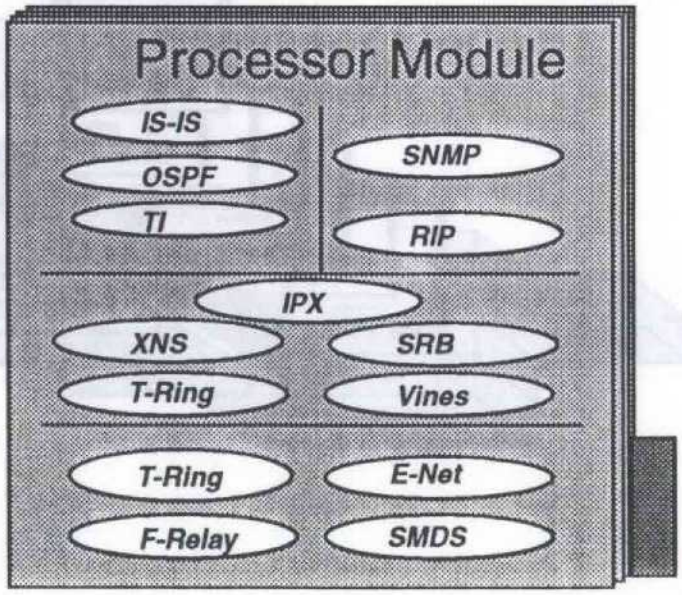



- Entire OS Image on Every Processor
- High Speed Multiprotocol Routing
- Robust Software Fault Management

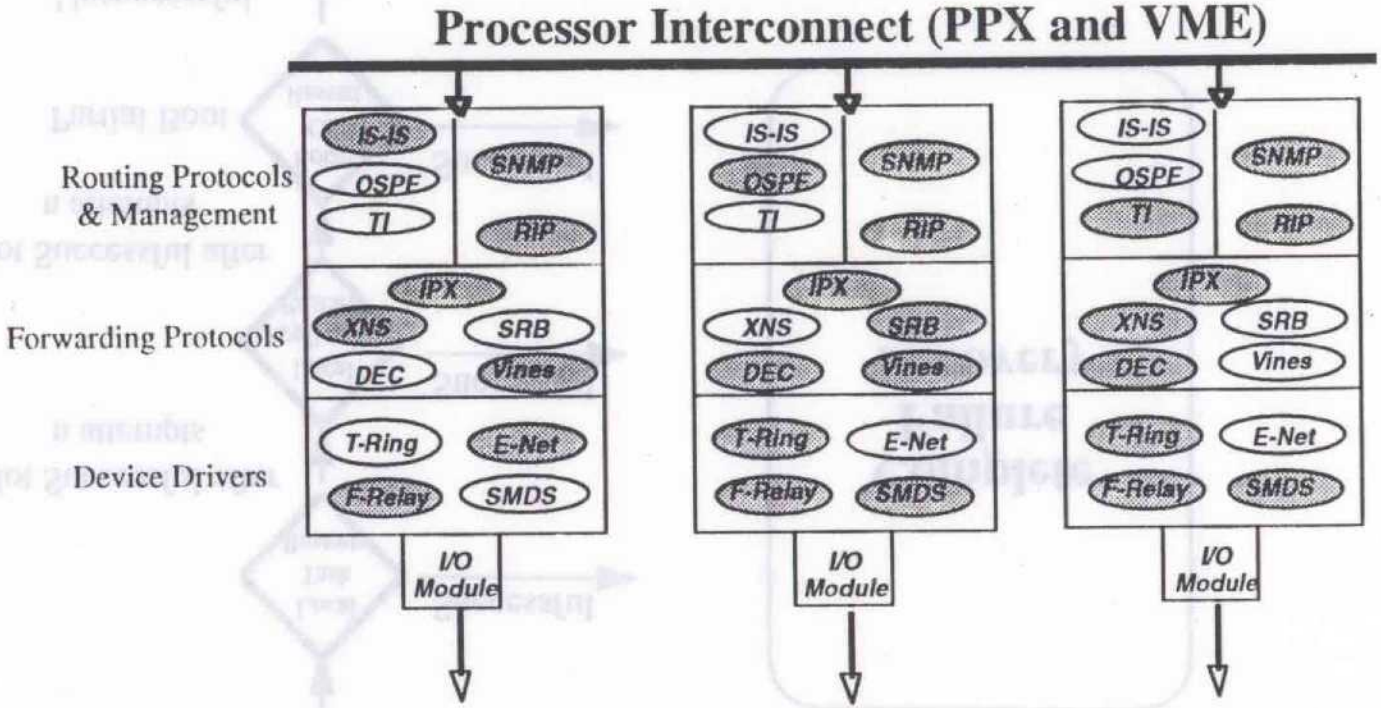
Routing Protocols & Management

Forwarding Protocols

Device Drivers

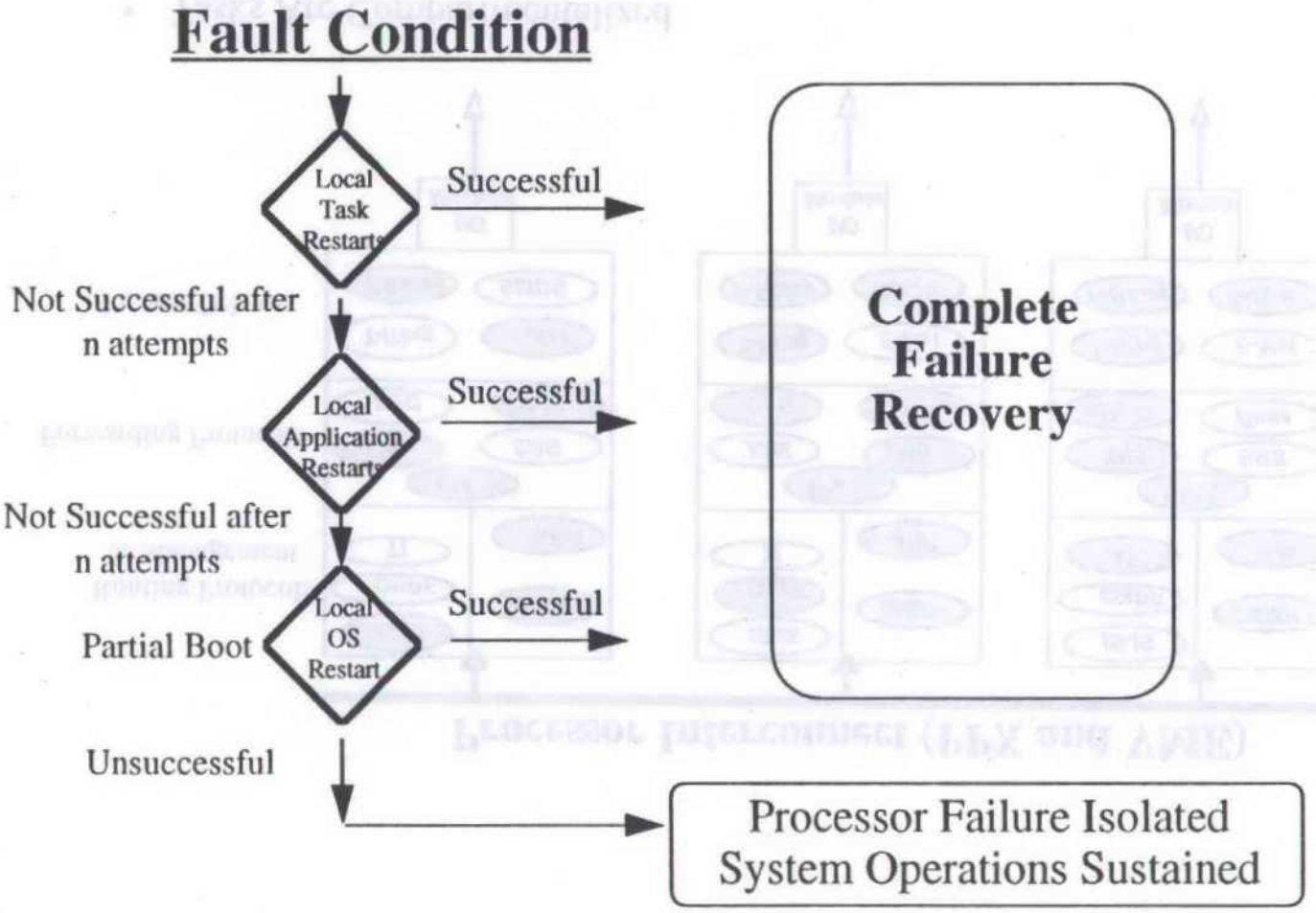


# Software Architecture




- Tasks Are Compartmentalized
- Only Necessary Tasks Are Activated (Active Task)
- Fault Containment & Recovery Mechanisms Sustain Operations

# Robust Fault Isolation & Recovery



# *Comprehensive Fault Management*

- Faults are automatically detected and isolated
- Multiple subsystem restart attempts are made
- Log entries provide audit trail for troubleshooters
- All fault management activities are localized to the problem area
- On-line system operations are not disrupted

# Performance Leadership

## Industry's Fastest Product Family...

*Interlab (4/8/93)- BLN 2 FDDI Streams*

- 171,250 pps Bridging (64 byte IP)
- 146,750 pps Routing (64 byte IP)

*Bradner (4/15/93)- BCN 12 E-net Streams*

- 172,000+ pps Routing (64 byte IP, IPX, Bridge, DECnet)

*Interlab (5/5/93)- BCN 12 FDDI Streams*

- 459,000 pps Bridging (64 byte IP)
- 395,000 pps Routing (64 byte IP)

# *Router Performance Considerations*

## Lab Environment

- Packet Forwarding Rates
- Small or Large Packets
- Individual Protocols
- Consistent Input

## Network Environment

- Multiple Protocols Simultaneously
- Multiple Media Simultaneously
- Filters/Access Lists
- Priority Queing
- Broadcast Explorers/Broadcast Flooding
- Unpredictable Inputs

**Symmetrical Multiprocessing Makes a Difference**

# Wellfleet High Performance Platform

- Symmetric Multiprocessing Architecture
- Fast Routing Engine 75,000 pps
- 1 Gbps Interconnect
- High Performance Software
- Software Fault Management
- Flash Memory
- BLN 150,000 + pps
- BCN 480,000 pps

MES DATANET

# Frame Relay Market Research

- Sales Volume by Carrier
- It's a Bust! (article) ---FR Dead?
- Still Hopeful! (article) ---FR Alive?
- Graph of other services (LL/FR/SMDS/ATM)

MES DATANET

# Who is the Competition?

- Value-Added Networks
  - WilTel
  - Sprint
  - Compuserve
  - BT/MCI
- DIY Frame Relay

# Wiltel "Wilpak"

- Service:
  - Flat rate pricing, not distance sensitive, based on aggregate speed per port and port size - no PVC specific charges
  - 3 port speeds (56,256,1024Kbps) and "PVC" speeds from 64Kbps to 512Kbps
  - 65 access locations
- Key Issues:
  - All circuits are "as available" (like Sprint's Standard Service)
  - Highest access speed (and throughput) is 1.024Mbps
  - Limited experience in network service environment (LL mainly)
  - No pricing flexibility

# Sprint "Frame Relay"

- Service:
  - Standard or Reserved types of service
  - Usage pricing is either Flat Fee or Variable with Cap
  - All-Digital Network
  - Network Service Experience
- Key Issues:
  - Top Access Speed (actual throughput) is 1.5 Mbps

## Compuserve "Frame-Net"

- Service:
  - Access speeds of 56Kbps, 256Kbps, and T1
  - Flat rate pricing (latest indications)
  - Committed Information Rate (CIR) from 4Kbps to 512Kbps
- Key Issues:
  - "Standard" service means limited access speed options
  - No pricing flexibility
  - Networking is not Compuserve's primary business

## BT / MCI "ExpressLANE"

- Service:
  - Access speeds from 56/64Kbps to T1
  - Flat rate and Variable pricing
  - Available in 160 US Cities
  - International Sites too
- Key Issues:
  - BT North America has been newly acquired by MCI
  - Not an all-digital network
  - Also evaluating SMDS and ATM switching
  - Relationship with Infonet (and InfoLAN)

MFS DATANET

# DIY Frame Relay

- Service:
  - Do-It-Yourself (DIY) means "closer" control of your network
  - Buy your own routers and leased lines
  - Staff your own Networking department
- Key Issues:
  - Expensive
  - Need to hire experienced personnel
  - Distracts from the core business of a company

MFS DATANET

# How is it Priced?

| | *Pricing Strategy for Frame Relay Carriers* |
|---|---|
| ▪ Access Line (local loop= distance and speed) | ▪ *SAME* |
| ▪ Port (by speed) | ▪ *SAME* |
| ▪ Usage (Flat / Variable) | ▪ *DIFFERENT* |

## Two Types of Usage Pricing

- "Standard" -- customers buy this often
- "Reserved" -- we sell against this, it includes:
  - Bandwidth Guarantee (Premium)
- *example*: MCI is billing by distance ("standard")
  - good for regional configs
  - similar to Leased Line pricing

## How is HLI Different?

- Brief from Research Paper
- Who we talk to (in the org chart),
  Who we should talk to &
  Who likes to hear what....
  - MIS people like to keep their jobs
  - CEOs like to look good
  - Managers like to save costs

## How is Datanet utilizing Frame Relay?

- Provisioning ONLY B.J.
  - for Network Management
  - for providing Fractional Services
- Our company sells HLI **Services**, not Frame Relay

## What Should We Do to Win?

- Realize when HLI is Economical
- Leverage our Key Differentiators
- Do not sell on Price Alone
- Use HLI Features & Benefits

MES DATANET

# Q and A Discussion

- Will we have Connections to other Public FR networks?
  - No, unless the market demand is there
- Will we sell Frame Relay?
  - No, not at this time; we are still in the Service Business
- Can we steal away current customers of Frame Relay?
  - Yes, let's talk about it....