

Approved: January 21, 1999
Date

MINUTES OF THE SENATE COMMERCE COMMITTEE.

The meeting was called to order by Chairperson Alicia Salisbury at 8:00 a.m. on January 20, 1999 in Room 123-S of the Capitol.

All members were present except: Senators Feleciano and Umbarger

Committee staff present: Lynne Holt, Legislative Research Department
Jerry Donaldson, Legislative Research Department
Bob Nugent, Revisor of Statutes
Betty Bomar, Committee Secretary

Conferees appearing before the committee:

Victor Frost, Don F. Servey Distinguished Professor,
University of Kansas

Others attending: See attached list

Senator Ben Vidricksen and Douglas Jernigan, DVM, representing the Kansas Historic Theatres Association, requested a bill be introduced granting sales tax increment status to historic theaters. To qualify for such status, a theater must have been built before 1940 as a movie theatre, vaudeville or opera house; converted or being converted to a performing arts facility, qualified for recognition by the state as a historic building, and owned and operated by a tax-exempt non-profit 501(c)3 corporation. Dr. Jernigan advised there are presently 9 cities restoring theaters for multi-purpose uses.

Senator Jordan moved, seconded by Senator Steffes that a bill extending the sales tax increment status to include certain historic theaters be introduced. The voice vote was unanimous in favor of the motion.

Victor Frost, Dan F. Servey Distinguished Professor, Electrical Engineering and Computer Science, Acting Director, Information and Telecommunications Technology Center, University of Kansas, presented a slide-program explaining the growth of internet technology. Professor Frost stated the more people connected to the internet, the more the value increases to users. The technology has increased dramatically in the last few years due to the explosive growth of the infrastructure. The burying of the fiberoptic cable is a large initial investment, however, the potential use has barely been tapped. Professor Frost stated the modes for information distribution to homes are: Integrated Services Digital Network (ISDN); Cable, Satellite, Asymmetric Digital Subscriber Line (ADSL), Wireless and Powerline Communications. In response to a question, Professor Frost stated the cost of ISDN is higher in Kansas than other parts of the country. Professor Frost stated all the above named distribution systems are available to homes in the United States with the exception of Powerline Communications which is in the experimental stage in Europe. Cable is the most economical of the systems. (Attachment 1)

Professor Frost stated digitized voice over the internet uses the same infrastructure as world wide web (www), e-mail and other internet traffic. The benefits are: a phone call can be placed to any other internet telephony user anywhere in the world at no additional cost; simplified voice/data conferencing; and the integration offers potential administrative cost reduction. The rapid advance in networking technology continually changes the way we learn, work and play. The development of the information infrastructure can be viewed as "The Unpredictable Certainty", and as a result public policy should not be technology specific.

Upon motion by Senator Steineger, seconded by Senator Brownlee, the Minutes of the January 15, 1999 meeting were unanimously approved.

The meeting adjourned at 9:00 a.m.

The next meeting is scheduled for January 21, 1999.

Unless specifically noted, the individual remarks recorded herein have not been transcribed verbatim. Individual remarks as reported herein have not been submitted to the individuals appearing before the committee for editing or corrections.

**Information Technology:
"The Unpredictable Certainty"**

Victor S. Frost

**Dan F. Servey Distinguished Professor
Electrical Engineering and Computer Science**

Acting Director

Information and Telecommunications Technology Center

University of Kansas

2291 Irving Hill Dr.

Lawrence, Kansas 66045

Phone: (785) 864-4833 FAX: (785) 864-7789

e-mail: frost@eecs.ukans.edu

<http://www.ittc.ukans.edu/>

Choices... 1

Senate Commerce Committee

Date 1-20-99

Attachment # 1-1 thru 1-37

Outline

- Drivers: Customer expectations
- Drivers: Technology
- The Essence of Networking Science
- Alternatives in Access Technologies
- Voice over the Internet
- Conclusion

Choices... 2

Communications Networks

- Voice
- Data
 - > E-mail
 - > Web
 - > Network based applications
- Video
 - > Broadcast
 - > Video on Demand
- Today => Separate networks
- Future => An integrated network

Choices... 3

Drivers: Customer Uses

■ Work

- > 80% corporate computers are connected
- > E-mail
- > Telecommuting

■ Learning

- > Web based courses
- > Access to vast repositories of **multimedia** information

Choices... 4

Drivers: Customer Uses

■ Financial and commercial uses

- On-line browsing
- Retrieval of product information
- On-line purchasing
- On-line customer service

■ Entertainment

- Chat rooms
- Video (TV)
- Network based games

Choices... 5

Drivers: Customer Expectations

- Sense of always connected
- Instant response
- Ubiquitous connectivity
- Multimedia support
- Conferencing (simultaneous communications with multiple users)

Drivers: Customer expectations

- Mobility support
- Personalized information services
- Context sensitive information services
- Absolutely secure
- Cheap

Choices... 7

Drivers: Technology

Value of a Network

- Number of Connections: Metcalf's Law
 - The value of a network increases as the square of the number of connected users
- Access Bandwidth
 - The value of a network increases as the square of the access bandwidth
- Host capabilities
 - The value of a network increases as the square of the host capabilities

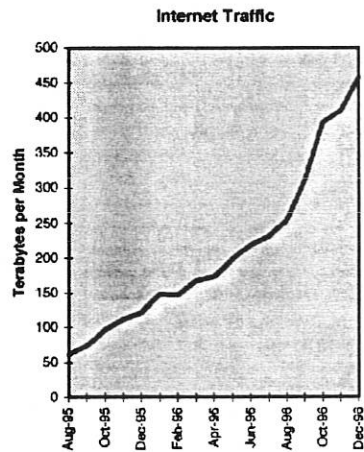
Choices... 8

Drivers: Technology

Traffic Growth

- Sidgemore's Law
- Internet traffic doubles every three months

From: "The Dark Fiber Paradigm",
Gilder Technology Report,
Vol. II, No 2, Feb. 1997



Choices... 9

Drivers: Technology

Processors and network capacity

■ Moore's Law

- Processing power doubles every 18 months
- Moore's Law has been true for the past 20 years

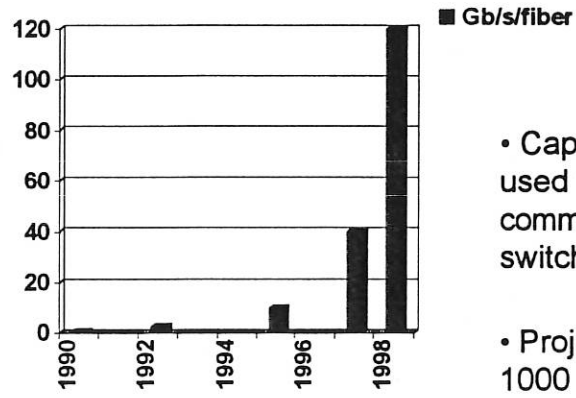
■ Gilder's Law (The Law of Telecoms)

- Total telecommunications system capacity (b/s) triples every three years

Choices... 10

Drivers: Technology

Available bandwidth



- Capacity of each fiber used to interconnect communications switches

- Projected to reach 1000 Gb/s soon

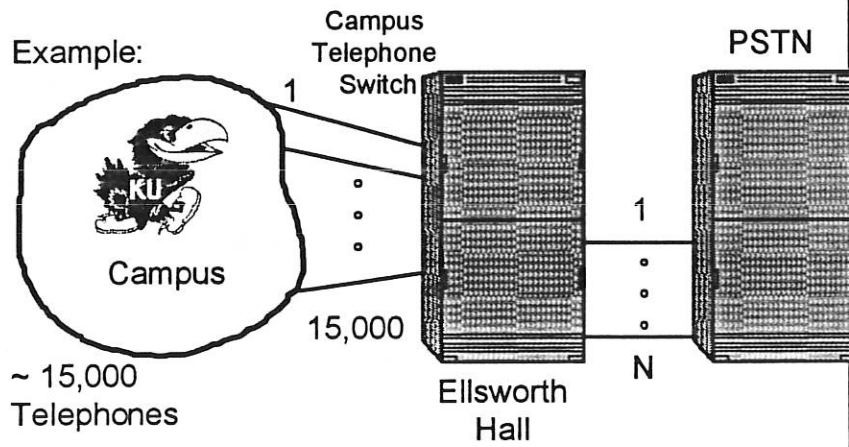
Choices... 11

Drivers: Technology Ramifications

- Rapid change in enabling technologies
- Products go obsolete before they wear out
- Terminal cost decreases
- Cost of bandwidth decreases
- Value of the *network* increases
- Network capacity and software technologies will be there to support the customer expectations
- Expect the trend to continue for the next 20 years.

Choices... 12

Essence of Networking Science



Essence of Networking Science

- How many lines do you lease?
- To guarantee every campus phone can always get an outside line:
N=15,000
- Too expensive: lines cost per month

Choices... 14

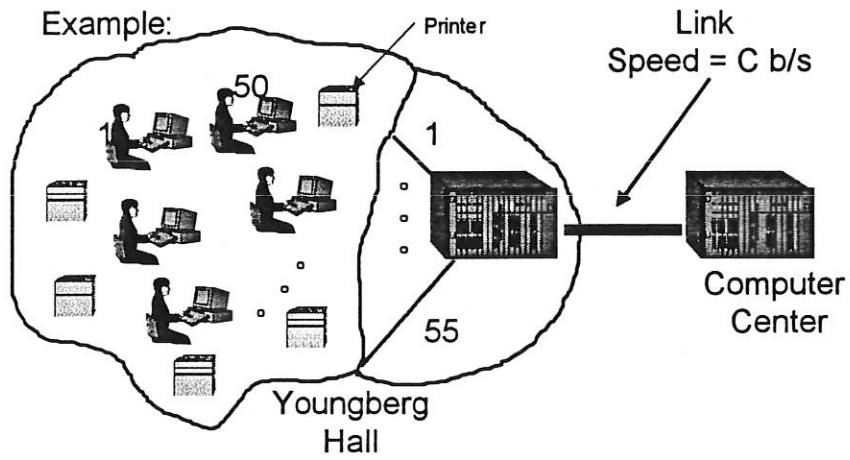
Essence of Networking Science

- Solution: Gamble
- Make “reasonable” assumptions about the call patterns (traffic)
- Apply network engineering
- Result: N reduces to 160 from 15,000

Choices... 15

Essence of Networking Science

Example:



Choices... 16

Essence of Networking Science

- Assume each customer and printer is connected using Ethernet, i.e. at 10 Mb/s
- How fast does the link between Youngberg and the computer center have to be to **guarantee** all the customers can use the 10 Mb/s.
- $C = 550 \text{ Mb/s}$
- Too expensive

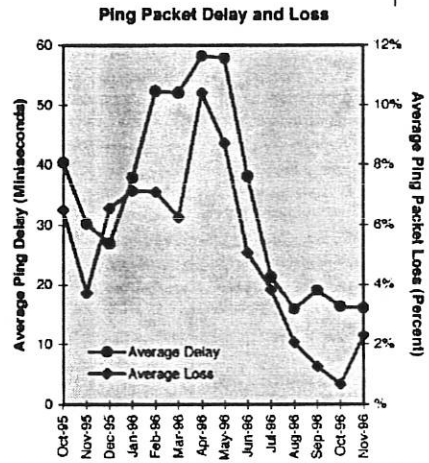
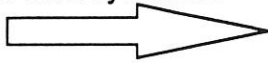
Essence of Networking Science

- Solution: Gamble
- Assume:
 - > Break up messages into 'smallish' units called *packets*
 - > Packets from each customer are sent to a waiting line, buffer, to wait their turn to use the link
 - > Packets arriving to a full buffer are discarded
- Customer information now experiences:
 - > Delay, e.g., 0.1 sec
 - > Loss, e.g., 1 in 100
- Make "reasonable" assumptions about the call patterns (traffic)
- Apply network engineering
- Result: C reduces to 16 Mb/s from 550 Mb/s

Choices... 18

Essence of Networking Science

What happens when you lose
your gamble



From: "The Dark Fiber
Paradigm",
Gilder Technology Report,
Vol. II, No 2, Feb. 1997

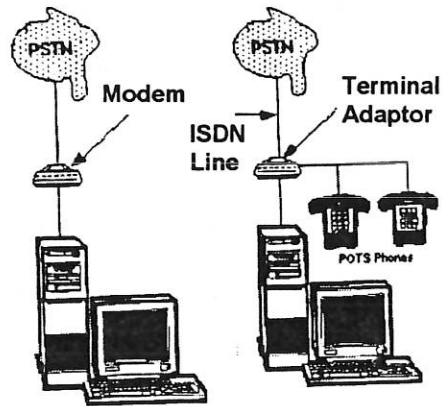
Choices... 19

New Modes for Information Distribution to the Home: ISDN

■ Integrated Services Digital Network (ISDN)

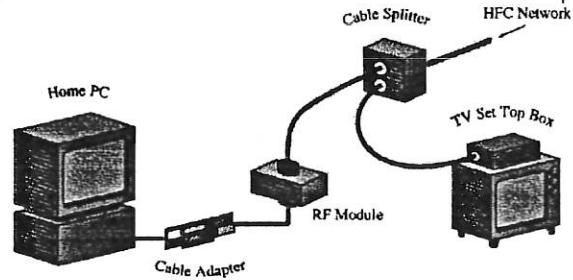
■ What it is

- > Transmission over standard telephone wires
- > Peak rate 128 kb/s
- > Max Length ~18,000ft
- > Available now



New Modes for Information Distribution to the Home: Cable

- What it is: Simultaneous transmission over cable TV coax facilities
 - > Current technology - Cable modems @ Peak rate = 500 kb/s
 - > Available now
 - > Future technology: Digital TV + 10's Mb/s



For more information see:
<http://cabledatcomnews.com/cm1c1.htm>

New Modes for Information Distribution to the Home: Satellite

- What it is: Satellite access
 - Asymmetric
 - Requests are sent via modems
 - Responses sent via satellite at 400 kb/s
 - Available now



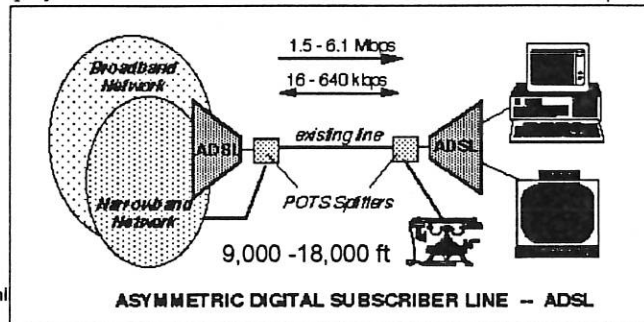
Choices... 22

New Modes for Information Distribution to the Home: HDSL

- What it is
 - > High-bit-rate digital subscriber line (HDSL)
 - > Peak rate ~10's Mb/s
 - > Access over standard telephone copper wires
 - > In trials and limited deployment

Maximum distance
1,000 to 18,000 ft
depending on the
data rate

For more information see:
http://www.adsl.com/tech_info.html

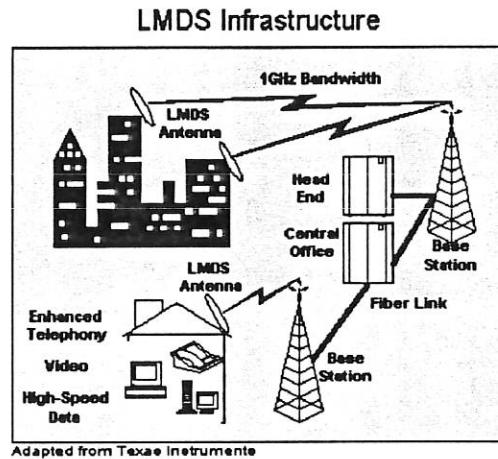


New Modes for Information Distribution to the Home: Wireless

Local Multipoint
Distribution System
(LMDS)

High Speed Wireless
Access for

- Telephone
- Video
- Internet



New Modes for Information Distribution to the Home: Wireless

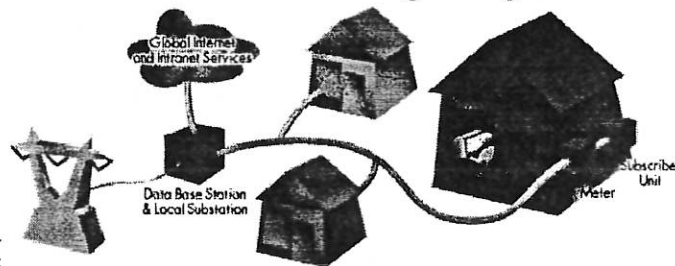
- What it is
 - Symmetric Access ~ 10's Mb/s
 - Asymmetric wireless access
 - Over 100 Mb/s to home
 - 1.5 Mb/s from home
 - Line of sight communications
 - In trials
 - A future technology

Choices... 25

New Modes for Information Distribution to the Home: Powerline Communications

- What is it:
 - > It is a data communication technology that operates over the electricity supply.
 - > Rates range up to 1 Mb/s
 - > In trials
 - > Future technology
 - > Coverage anywhere on one side of a transformer

Basic Data Networking Configuration



For more information see:
<http://www.adaptivenetworks.com/>

New Modes for Information Distribution to the Home: Costs (Estimated as of 2/98)

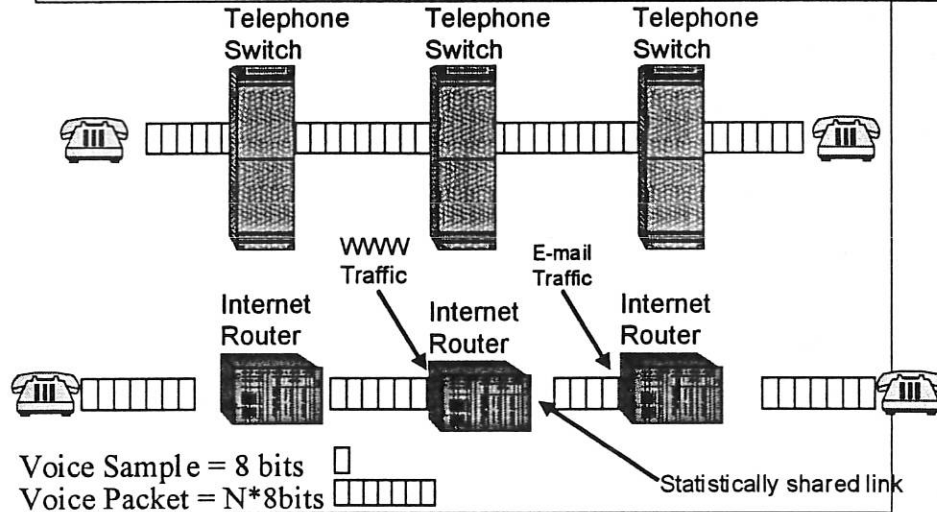
- Cable modem cost
 - > Installation ~ \$25
 - > ~ \$30/mo
- ISDN
 - > Installation ~ \$200.00
 - > ~ \$50 - \$100/mo
- ADSL
 - > ~ \$95/mo (for 1.5 Mb/s)
 - > SOURCE: http://www.3com.com/xdsl/05_30_97b.html
- Satellite
 - > Hardware ~ \$400
 - > ~ 24.95/month up to 64MB(approximately 25 hours online)

Choices... 27

Voice over the Internet: What is it?

- A digitized voice signal is *sliced* into packets and sent in using the same infrastructure and protocols as www, e-mail and other internet traffic
 - Private/campus infrastructure--intranet
 - Public internet

Voice over the Internet



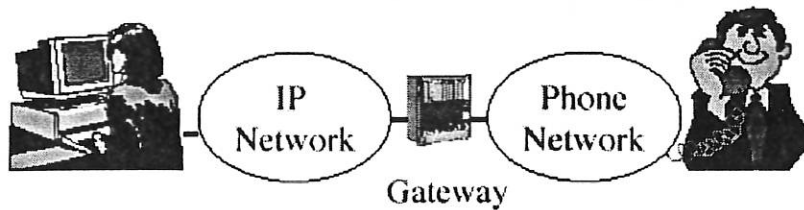
Voice over the Internet: Common Operational Modes



■ PC-to-PC

- Requires connection to "Internet"
- Requires PC sound card
- Requires internet voice software

Voice over the Internet: Common Operational Modes

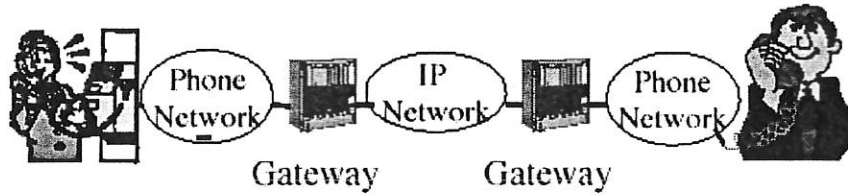


■ PC-to-Phone

- Requires connection to "Internet"
- Requires PC sound card
- Requires internet voice software
- Requires an internet-to-telephone gateway (switch-to-router)

Choices... 31

Voice over the Internet: Common Operational Modes



■ Phone-to-Phone

- Requires connection to "Internet"
- Requires PC sound card
- Requires internet voice software
- Requires an internet-to-telephone gateway (switch-to-router)

Choices... 32

Voice over the Internet: Benefits

- Can place a phone call to any other internet telephony user anywhere in the world and only pay for call to local ISP
- Simplifies voice/data conferencing
- Enhanced helpdesks
- Enhanced on-line order placement
- Integration offers potential to reduce administrative cost

Voice over the Internet: Problems

- Quality of Service
 - The internet is currently *"best effort"*
 - The internet is unreliable
- Lack of standards
 - ~~> plethora of proprietary solutions
 - Lack of **Interoperability**
- Lack of high volume call processing capability

Voice over the Internet: Projections

- International Data Corporation predicts that the Internet telephony market will grow from US\$3.5 million in 1995 to US\$560 million 1999.
- Frost & Sullivan estimates that Internet telephony will be a \$1.8 billion market by 2001.
- Forrester predicts that Internet telephone calls will take 4% of U.S. telephone company revenues by 2004.
- International Data Corp. predicts that packet-switched networks will account for about 1% of global long distance traffic by 2001 (about 12.5 billion minutes).

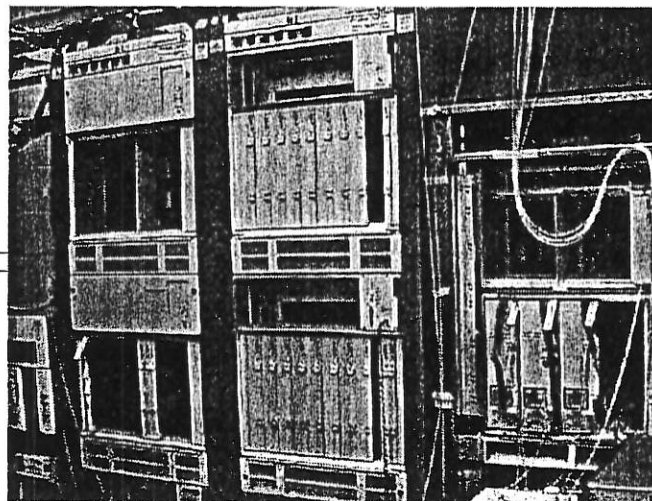
Conclusions

- Rapid advance in networking technology will continually changing the way we learn, work, and play
- Past experience indicates that change will continue for many years
- View the development of the information infrastructure as “The Unpredictable Certainty”

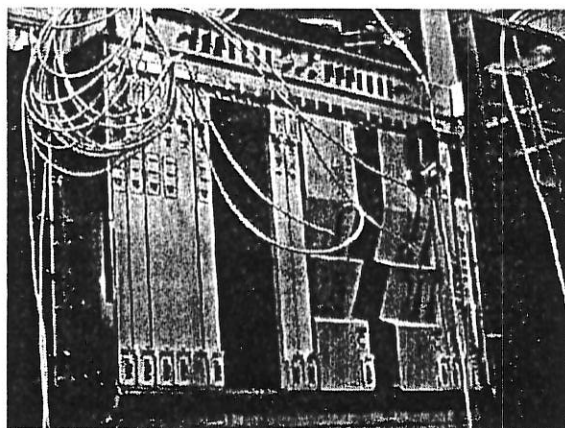
“The Unpredictable Certainty: Information Infrastructure through 2000” Computer Science and Telecommunications Board National Research Council, 1996

Research Networking Facilities at the
University of Kansas
Information and Telecommunications
Technology Center

1-37

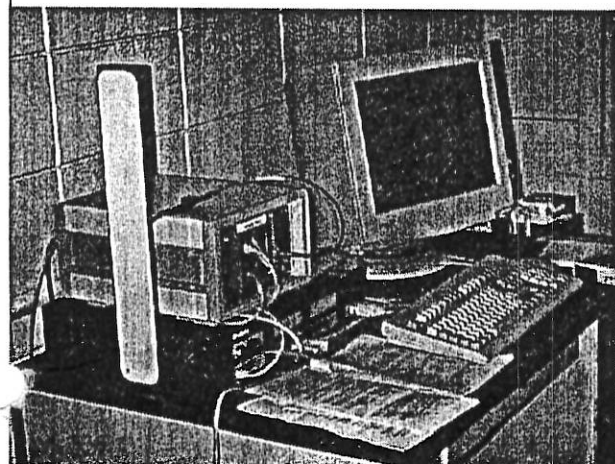


20 Gb/s
WDM →
Lightwave System

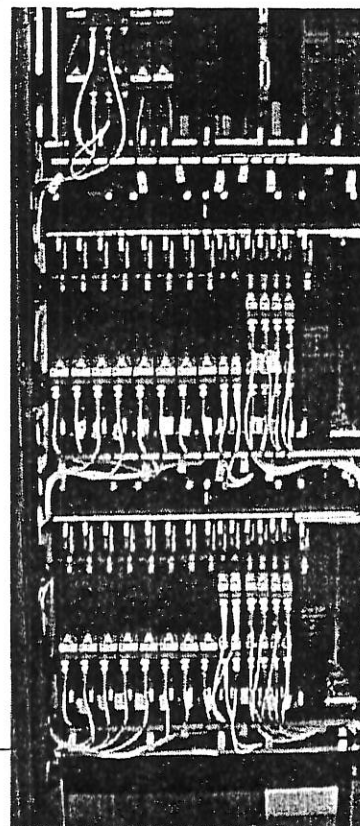


↑
2.4 Gb/s Fiber Terminal

25 Mb/s Wireless System



←
40 Gb/s
WDM →
Lightwave
System



IP Router

