Trends in Telecommunications Technology

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Outline

- Drivers: Customer expectations
- Drivers: Technology
- Summary of Access Technologies
- Conclusion

Communications Networks

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

Drivers: Customer Expectations

- Sense of always connected
- Instant response
- Ubiquitous connectivity
- Multimedia support
- Mobility support

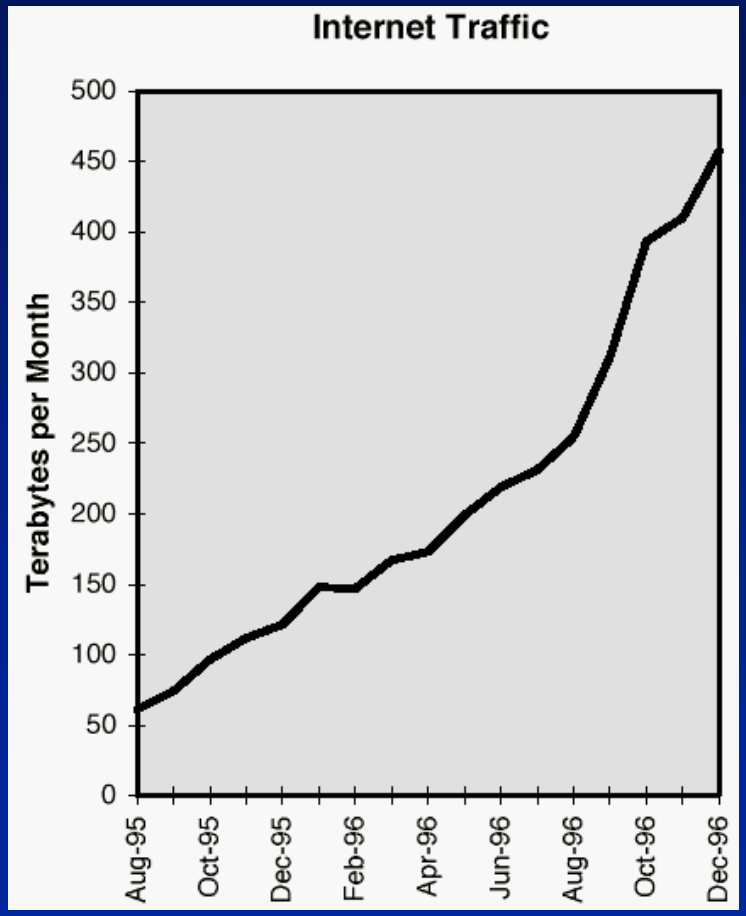
Drivers: Customer Expectations

- Conferencing (simultaneous communications with multiple users)
- Personalized information services
- Context sensitive information services
- Absolutely secure
- Cheap

Drivers: Technology
Value of the Network

- The value of a network increases as the square of:
  - The number of connected users
  - The connection bandwidth
  - The user computer capabilities

Drivers: Traffic Growth



Internet traffic doubles every three months

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

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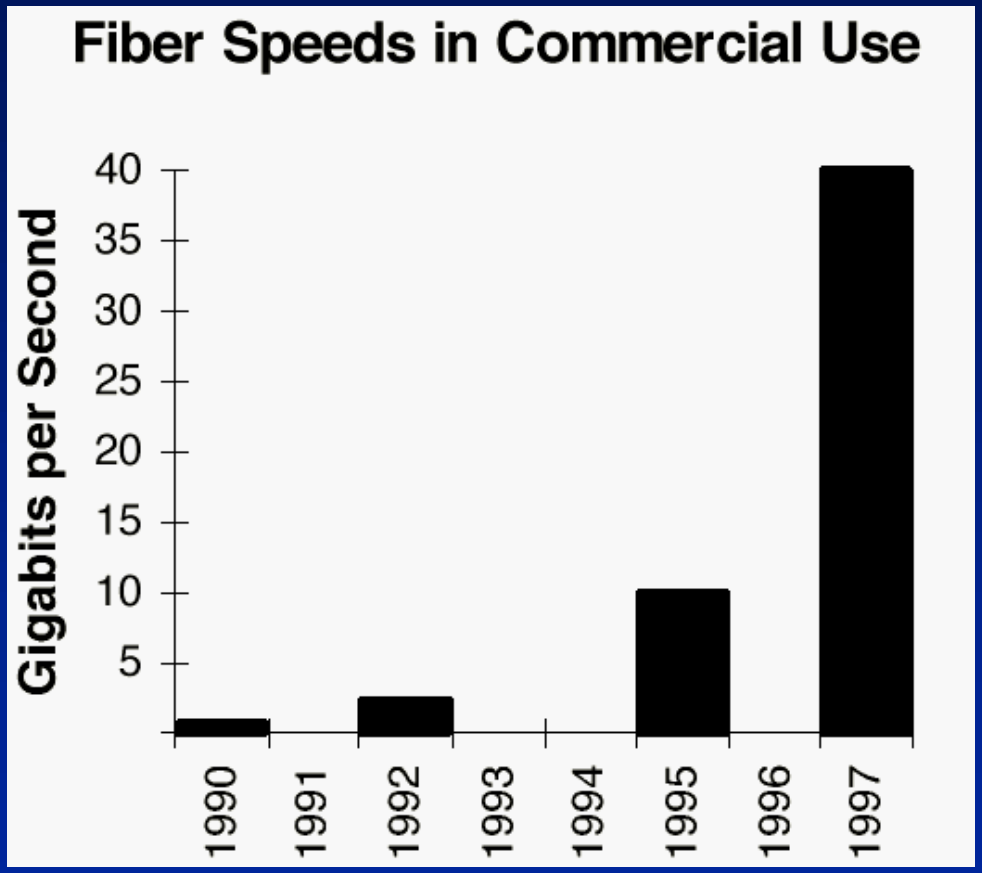
Drivers: Technology

- Processing power doubles every 18 months
- This trend has been true for the past 20 years
- Total telecommunications system capacity (b/s) triples every three years

Drivers: Technology
Available bandwidth



- Capacity of each fiber used to interconnect communications switches
- Projected to reach 1000 Gb/s in next 2-5 years

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

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Drivers: Technology
Ramifications

- Products go obsolete before they wear out
- Terminal cost decreases
- Cost of bandwidth decreases
- Value of the ***network*** increases
- Network devices, capacity and software technologies are ***constantly changing*** to support customer expectations
- Expect the trend to continue for the next 20 years.

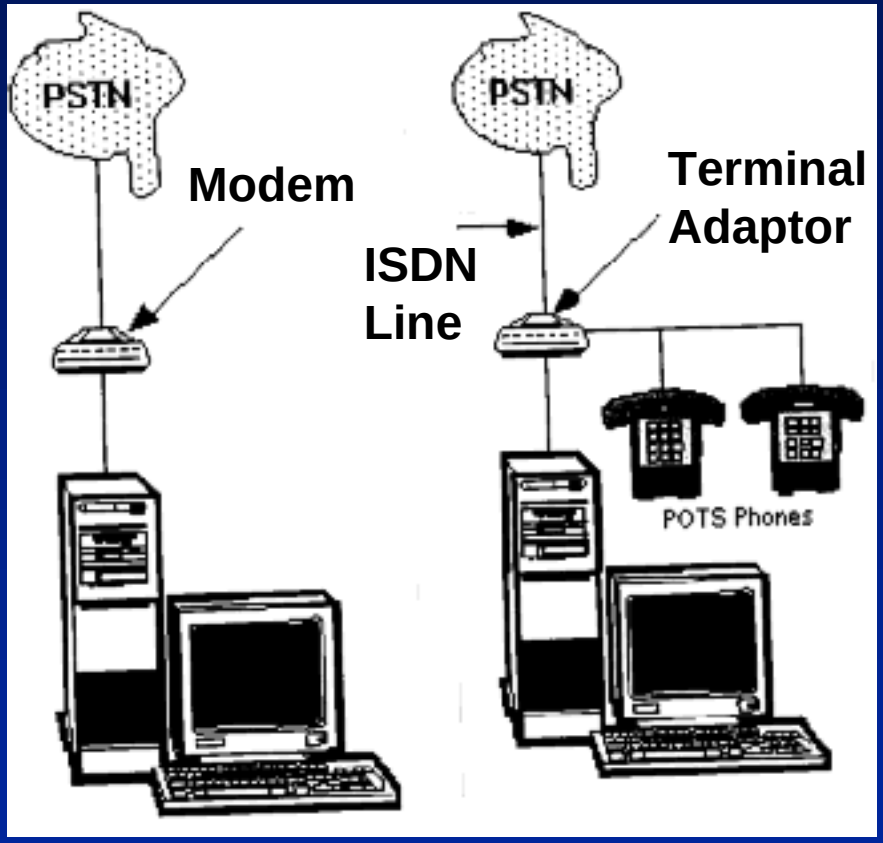
Drivers: Technology
Impact of Speed

Time to transmit a 10 Mbyte file

MODEM SPEED / TYPE	TRANSFER TIME
9.6-Kbps Telephone Modem	2.3 hours
14.4-Kbps Telephone Modem	1.5 hours
28.8-Kbps Telephone Modem	46 minutes
56-Kbps Telephone Modem	24 minutes
128-Kbps ISDN Modem	10 minutes
1.54-Mbps T-1 Connection	52 *seconds*
4-Mbps Cable Modem	20 *seconds*
10-Mbps Cable Modem	8 *seconds*

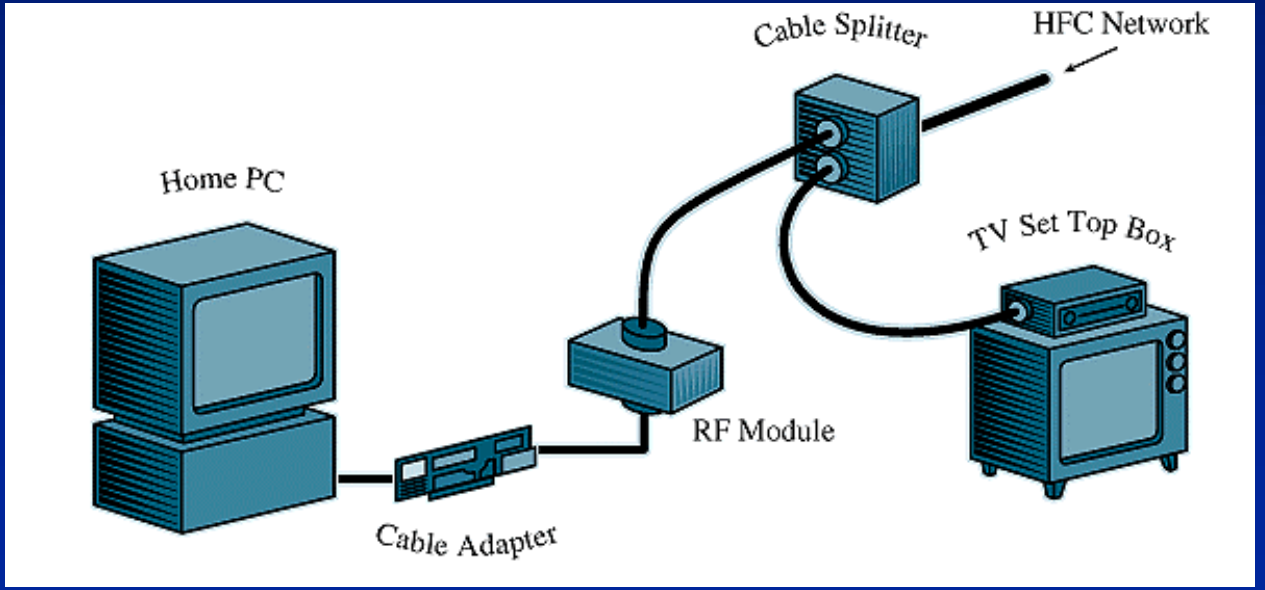
New Modes for Information Distribution to the Home: ISDN

- Integrated Services Digital Network (ISDN)
- What it is
  - » Transmission over standard telephone wires
  - » Peak rate 128 kb/s
  - » 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



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

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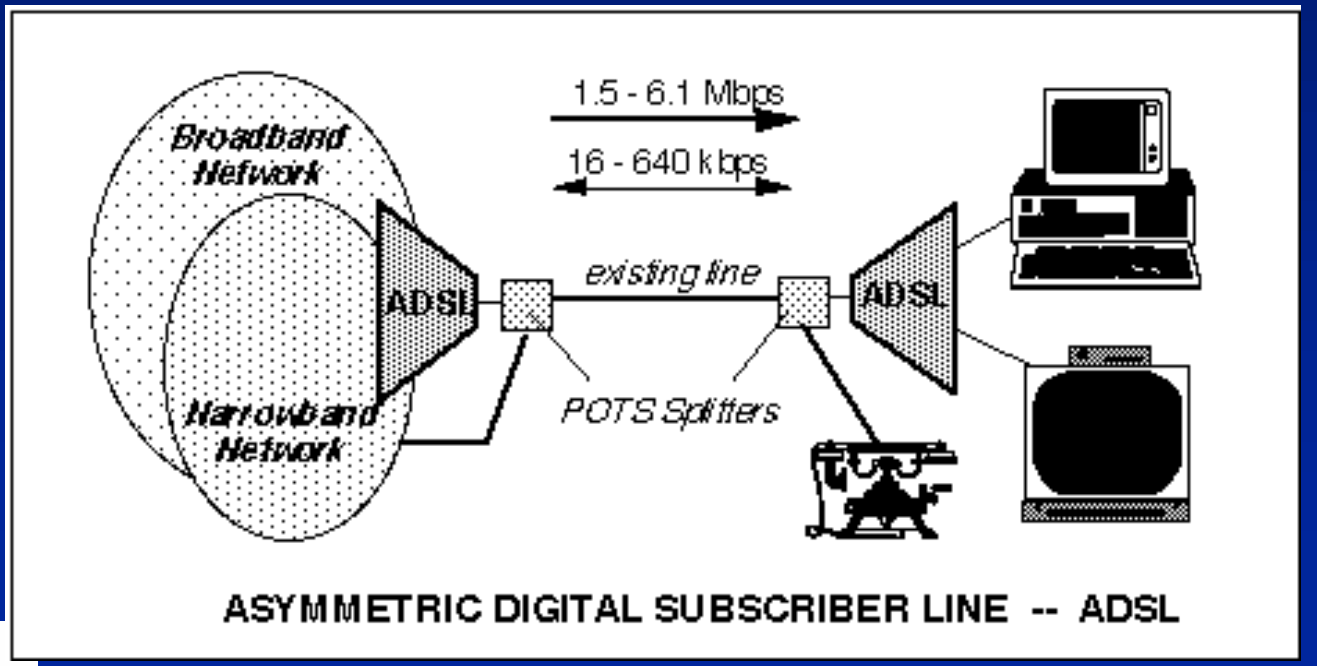
New Modes for Information Distribution to the Home: HDSL

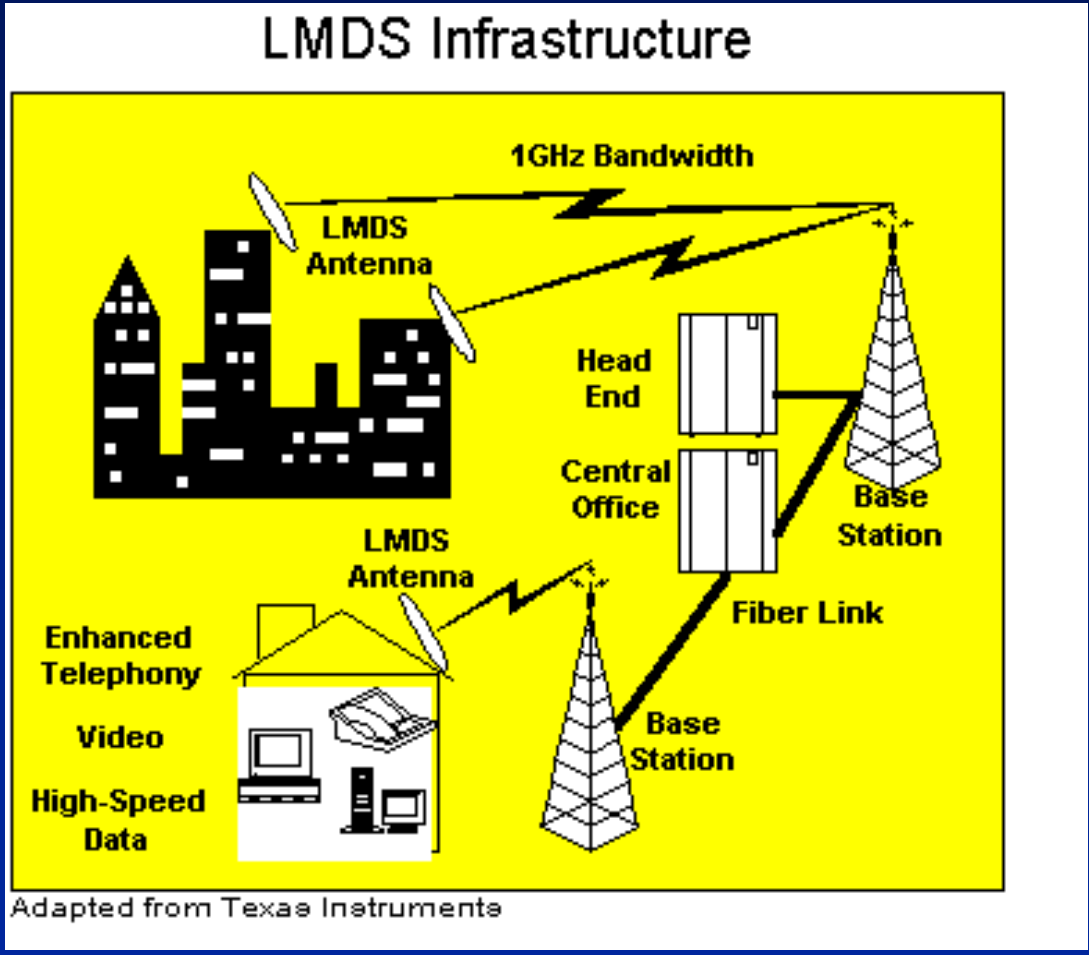
- What it is
  - High-bit-rate digital subscriber line (HDSL)
  - Peak rate ~10's Mb/s
  - Access over standard telephone copper wires
  - In trials and limited deployment



New Modes for Information Distribution to the Home: Wireless

Local Multipoint Distribution System (LMDS)

High Speed Wireless Access for
- Telephone
- Video
- Internet



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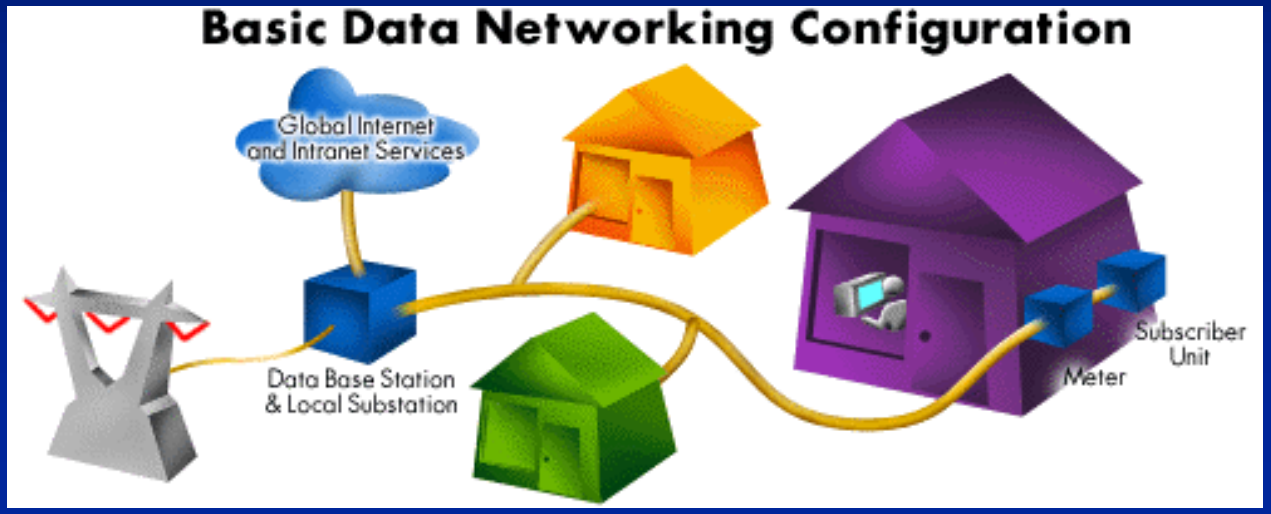
New Modes for Information Distribution to the Home: Wireless

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

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



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)

Conclusions

- Customer expectations are growing
- The value of being *"connected"* is increasing
- Information technology is:
  - » Changing rapidly
  - » Offering many access alternatives
- Trends are expected to continue for many years