

# CSc 450/550 Computer Networks Overview

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## Communication networks

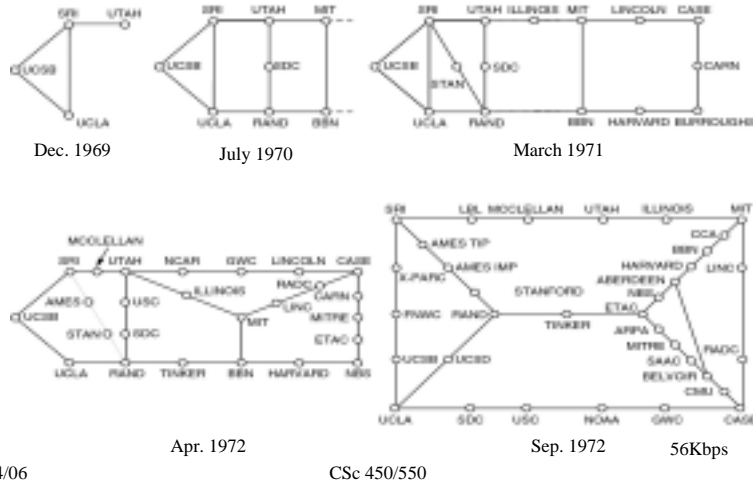
- **Broadcast networks**
  - e.g., cable television (CATV)
- **Switched networks**
  - circuit-switching networks
    - e.g., public switched telephone systems (PSTN)
  - packet-switching networks
    - datagram: e.g., the Internet
    - virtual circuit: asynchronous transfer mode (ATM)

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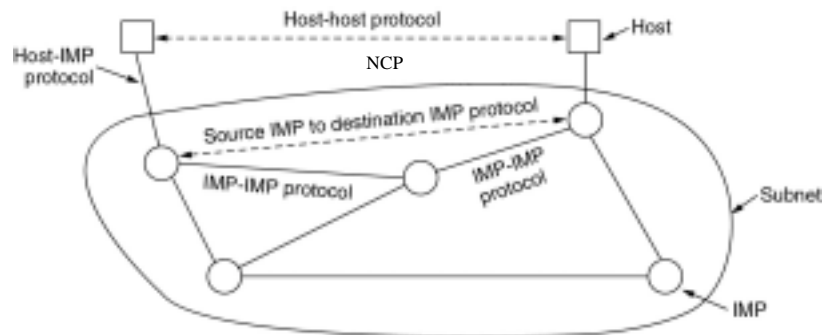
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# Internet history: ARPAnet (70's)



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# ARPAnet architecture



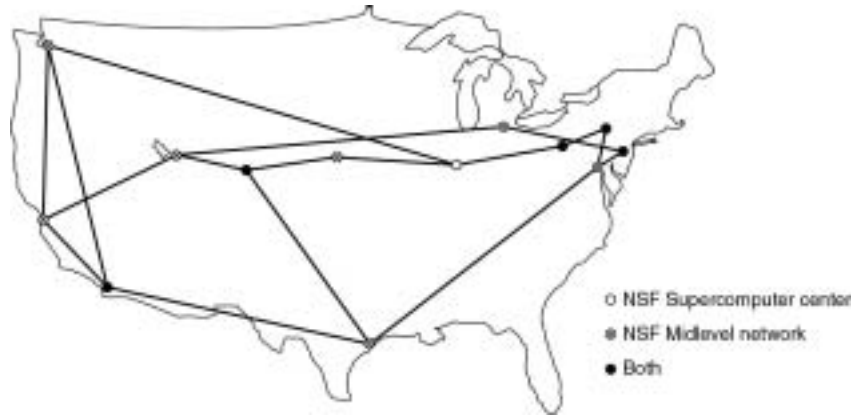
BBN's Interface Message Processor (IMP)

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## Internet history: NSFnet (80's)



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1988

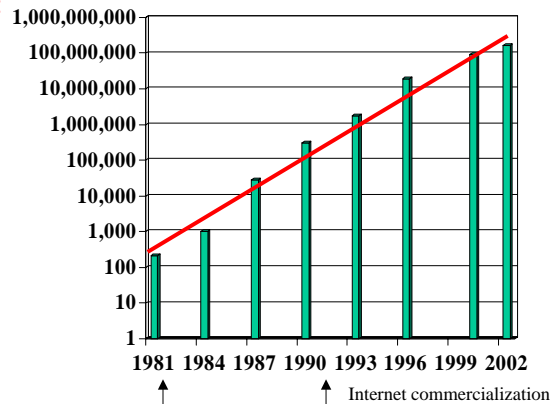
1.5Mbps

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## Internet growth

### # of Hosts on the Internet:

Aug. 1981	213
Oct. 1984	1,024
Dec. 1987	28,174
Oct. 1990	313,000
Jul. 1993	1,776,000
Jul. 1996	19,540,000
Jul. 2000	93,047,000
Jul. 2002	162,128,493



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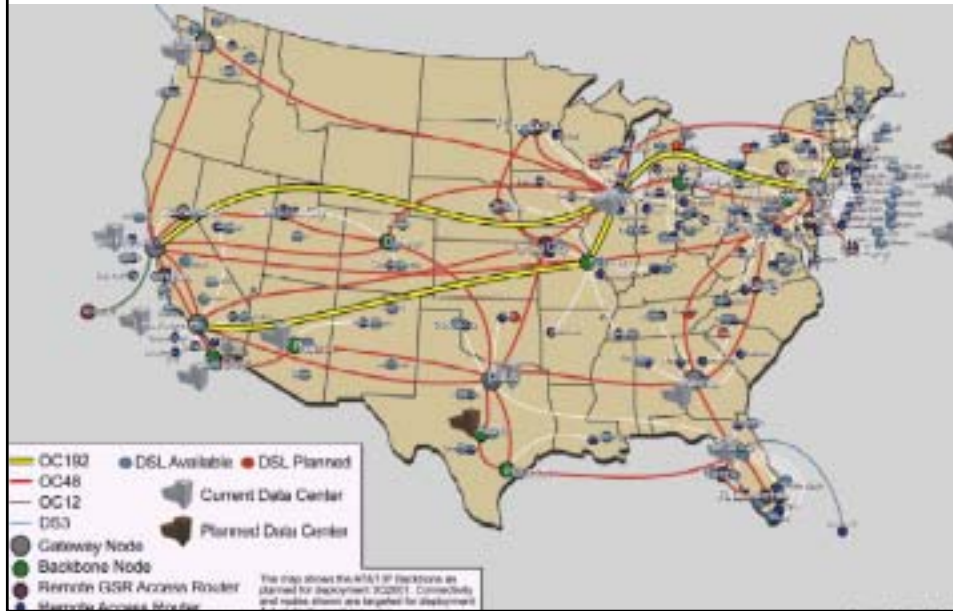
TCP/IP flag day

WWW

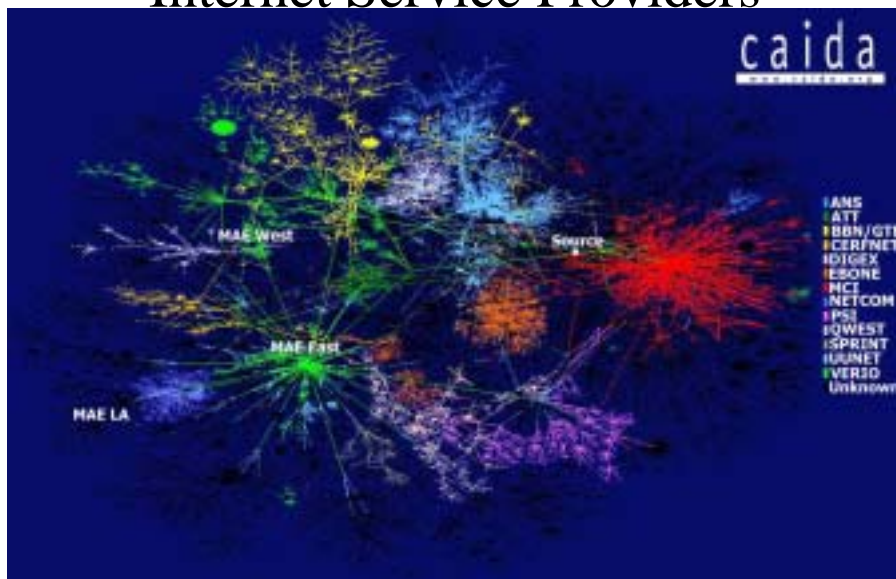
Internet commercialization

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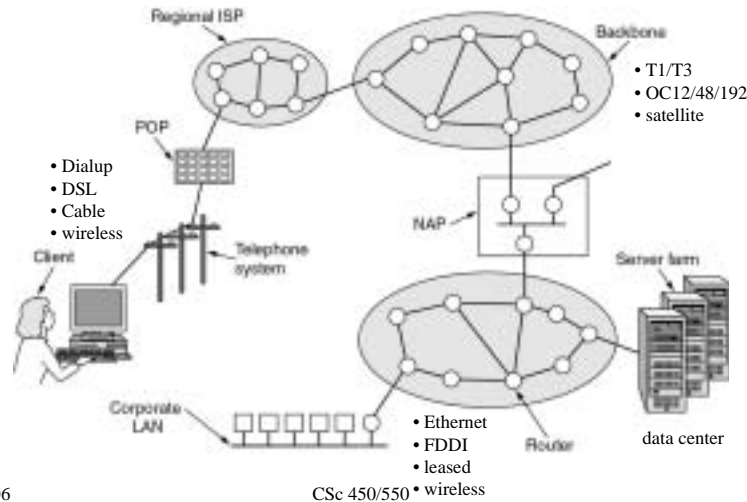
# AT&T US backbone



# Internet Service Providers



## “The Internet”



## Internet in Canada

- CA\*net: 1990-1997; CANARIE: 1993
    - 56Kbps, T1 (1.5Mbps), T3 (45Mbps)
  - CA\*net II: 1995-2000
    - national test network: ATM (155Mbps)
  - CA\*net 3: 1998-2002
    - the world’s first national optical R&E network
  - CA\*net 4: 2002-now
    - high-speed optical network (40Gbps)
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## Internet @ UVic

- UVicNet: Gigabit Ethernet backbone
  - switched 10/100Mbps Ethernet access
  - also, UVic research network
- ResNet: switched 10Mbps Ethernet
- UVic AirNet: 11Mbps wireless LAN
- Upstream providers
  - BCnet ORAN: CA\*net4
  - VicTX: commercial Internet

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## UVic => Google

- # traceroute google.com  
traceroute: Warning: google.com has multiple addresses; using 72.14.207.99  
traceroute to google.com (72.14.207.99), 30 hops max, 38 byte packets  
1 gw.net.engr.UVic.CA (142.104.127.254) 8.686 ms 1.471 ms 5.732 ms  
...  
5 csc1cled050.bb.uvic.ca (142.104.252.21) 1.375 ms 1.244 ms 1.156 ms  
...  
8 UVicB-Policy1.VICTX.BC.net (207.23.241.221) 2.041 ms 1.821 ms 2.795  
9 ra1cv-ge3-2-11.gv.bigpipeinc.com (64.251.72.41) 1.832 ms 1.937 ms  
...  
12 rc1wt-pos2-1.wa.shawcable.net (66.163.77.21) 7.415 ms 196.976 ms  
199.916 ms  
13 six.sea01.google.com (198.32.180.17) 4.779 ms 4.769 ms 4.657 ms  
14 72.14.233.55 (72.14.233.55) 23.586 ms 24.045 ms 23.684 ms  
...  
18 72.14.207.99 (72.14.207.99) 63.148 ms 63.026 ms 63.126 ms

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## Google!

- # wget -d www.google.com  
Connecting to www.google.com:80... Caching www.google.com <-> 66.102.7.104  
Created fd 3.  
connected!  
---request begin---  
GET / HTTP/1.0  
User-Agent: Wget/1.7  
Host: www.google.com  
Accept: \*/\*  
Connection: Keep-Alive  
---request end---  
HTTP request sent, awaiting response...  
HTTP/1.0 302 Found  
Location: http://www.google.ca/  
Cache-Control: private  
Content-Type: text/html  
Server: GWS/2.1  
Content-Length: 218

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## Things involved

- You say “www.google.com”, I say “66.102.7.104”
  - Domain Name System (DNS)
  - User Datagram Protocol (UDP)
- “connected”
  - Transmission Control Protocol (TCP)
  - Internet Protocol (IP)
- “request begin”
  - Hyper Text Transfer Protocol (HTTP)

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## More things involved

- TCP
  - connection management
  - flow, error, and congestion control
- IP
  - Internet addressing and routing
- Link layer
  - Ethernet: IEEE 802.3
  - wireless Ethernet: IEEE 802.11

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## This lecture

- An overview on computer networks
  - particularly the Internet
  - brief Internet history and structure
  - applications, protocols, services, architectures
- Explore further
  - find out your Internet access at home
    - your ISP's ISP, your "traceroute" to google.com
  - try traceroute "server"

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## Next lecture

- A review on communication systems
  - wired/wireless communications
  - read CN Chapter 2

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