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December 15, 2000

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, SW, Room TWB-204
Washington, DC 20554

Re: In the Matter of Inquiry Concerning High Speed Access to the Internet Over Cable and Other Facilities, GN Docket No. 00-185

Dear Ms. Salas:

On December 14, 2000, Joy Johnson and the undersigned gave a Technology Presentation at AT&T's Technology Center, a copy of which is attached to this letter. The following individuals attended the presentation: Michelle Carey, Johanna Mikes and Chris Libertelli of the Commission's Common Carrier Bureau; Robert Pepper of the Commission's Office of Plans and Policy; John Norton, William Johnson and Anne Levine of the Commission's Cable Services Bureau; Jerry Stanshine of the Commission's Office of Engineering and Technology; and Jon Nuechterlein of the Commission's Office of the General Counsel.

The following persons were also present at the meeting: Howard Symons, Catherine Carroll, Diane Burstein, Loretta Polk and David Nicoll.

Two copies of this Notice are being submitted to the Secretary of the FCC in accordance with Section 1.1206 of the Commission's rules.

Sincerely,

Attachment

cc: Johanna Mikes

No. of Copies rec'd 0+1
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Recycled Paper

The Building Blocks of the Internet

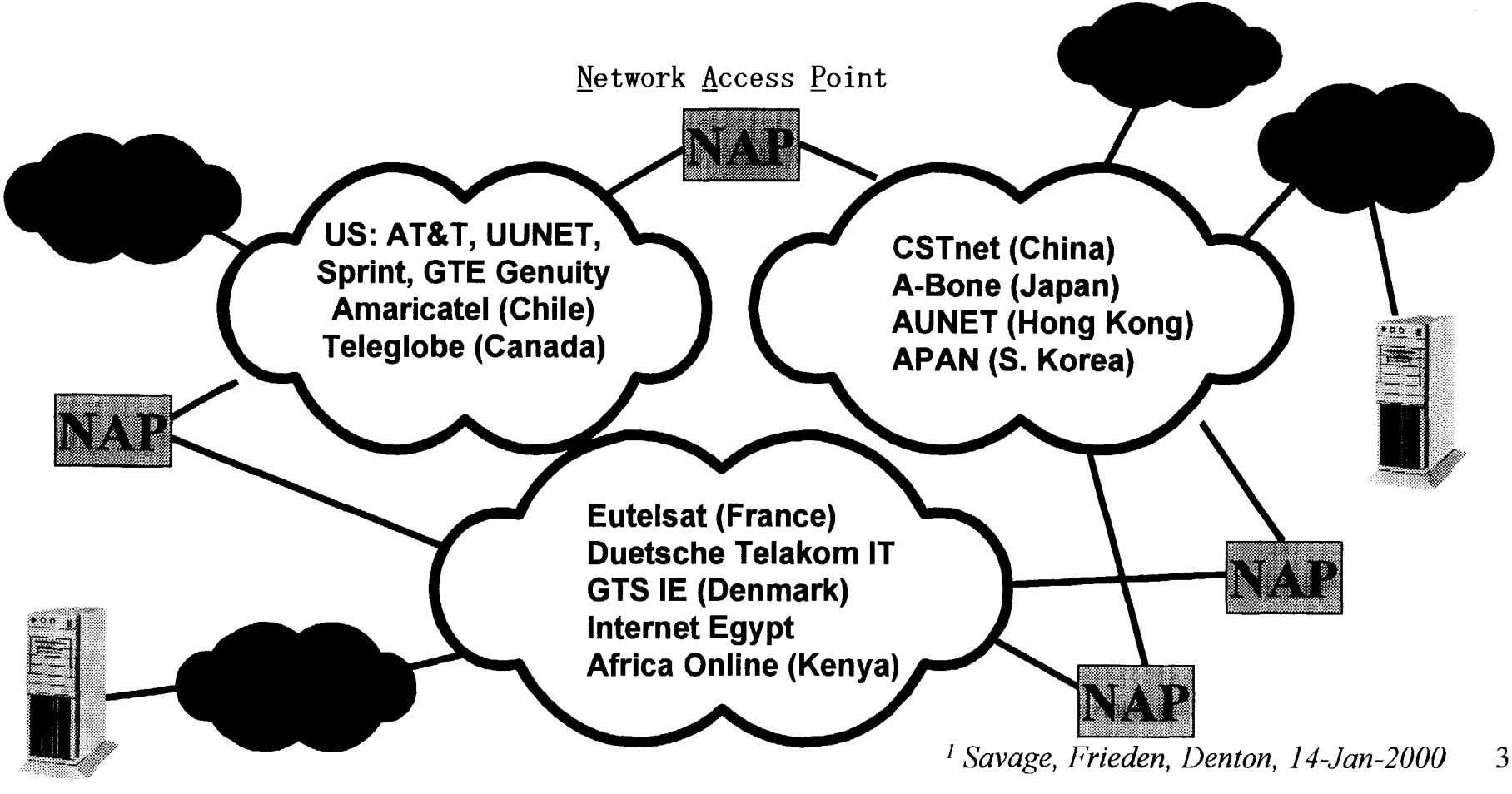
A Technology Discussion

Today's Topics

- The Internet
- The Internet Backbone Market
- The Internet Access Market
- High Speed Access Technologies
- Competition is Driving the High Speed Marketplace

What Is The Internet?

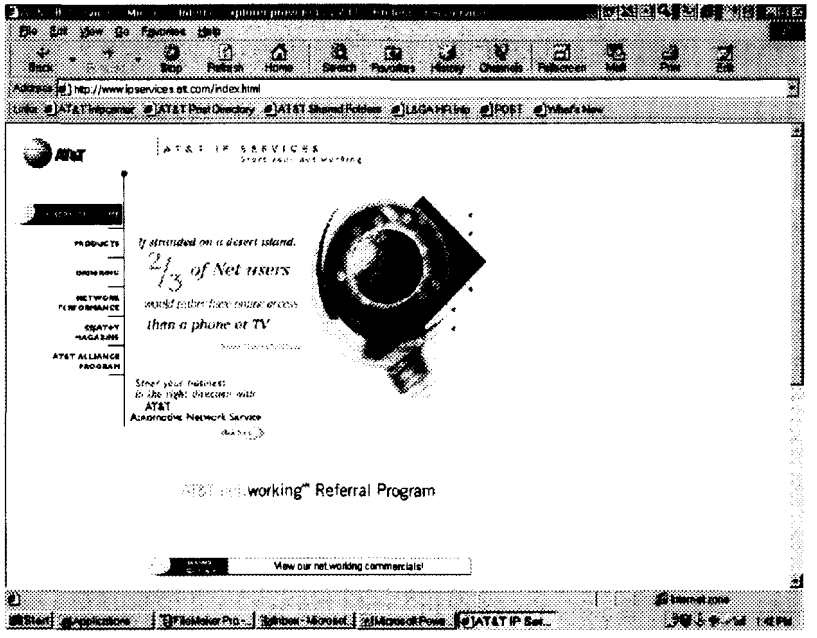
- The global Internet is comprised of about 70,000 networks[1]
- This "network of networks" enables:
  - » any computer to talk to any other computer
  - » a common applications platform for the delivery of services



[1] *Savage, Frieden, Denton, 14-Jan-2000*

The World Wide Web

- Subset of the Internet
- Uses Hypertext Mark-up Language (HTML) and URLs to:
  - Organize information into easy-to-understand pages
  - Cross-reference documents through a process known as <u>hyperlinking</u>
- Web browsers provide user interface



»The WWW doubles in size every 45 days

»There are over 320M WWW pages

»A new home page appears every minute

Internet Growth

Then

1969
4 HOST COMPUTERS

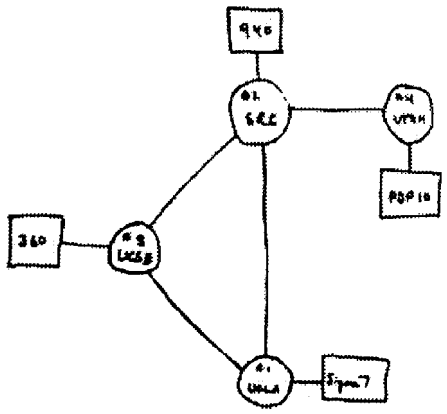


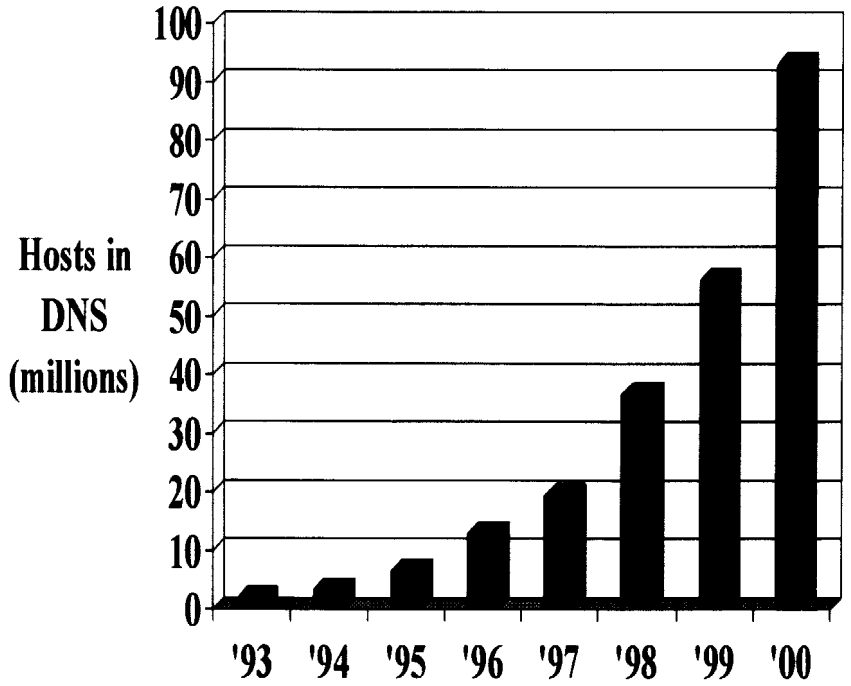
FIGURE 6.2 Drawing of 4 Node Network (Courtesy of Alex McKenzie)

First 4 hosts:

University of California Los Angeles (UCLA)
University of California Santa Barbara (UCSB)
University of Utah
Stanford Research Institute (SRI)

Now

HOST COMPUTERS



Source: Internet Software Consortium (http://www.isc.org/) July data

Worldwide Internet Users

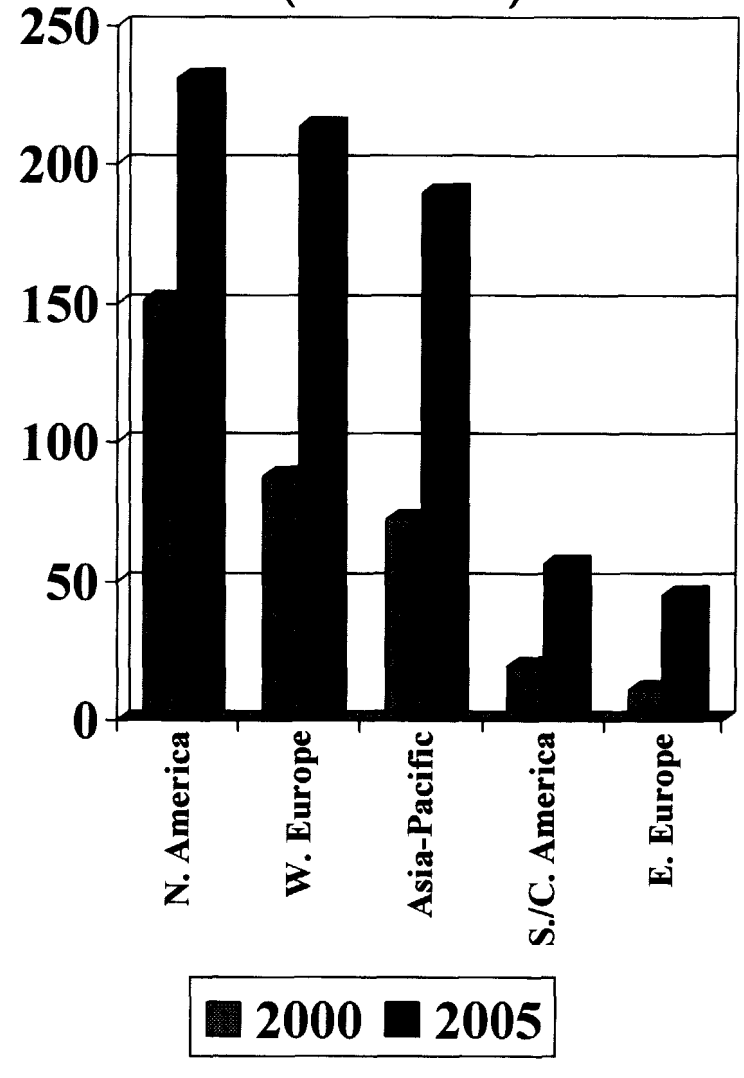
Top 15 Nations (YE00)

NATION	Internet Users (millions)
United States	135.7
Japan	26.9
Germany	19.1
UK	17.9
China	15.8
Canada	15.2
South Korea	14.8
Italy	11.6
Brazil	10.6
France	9.0
Australia	8.1
Russia	6.6
Taiwan	6.5
Netherlands	5.4
Spain	5.2

source: ETForecasts

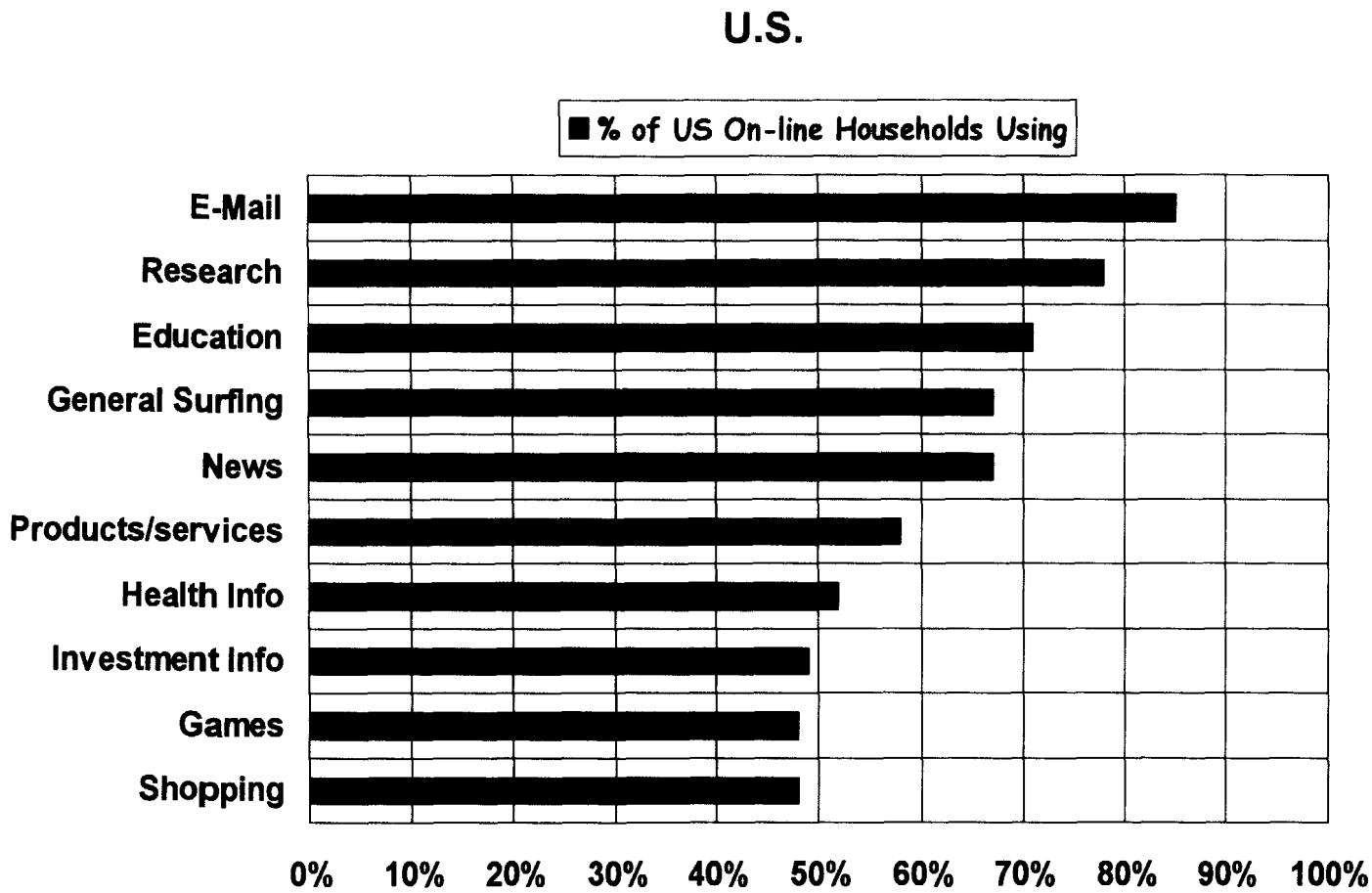
Internet Users by Region

(in millions)



source: Computer Industry Almanac

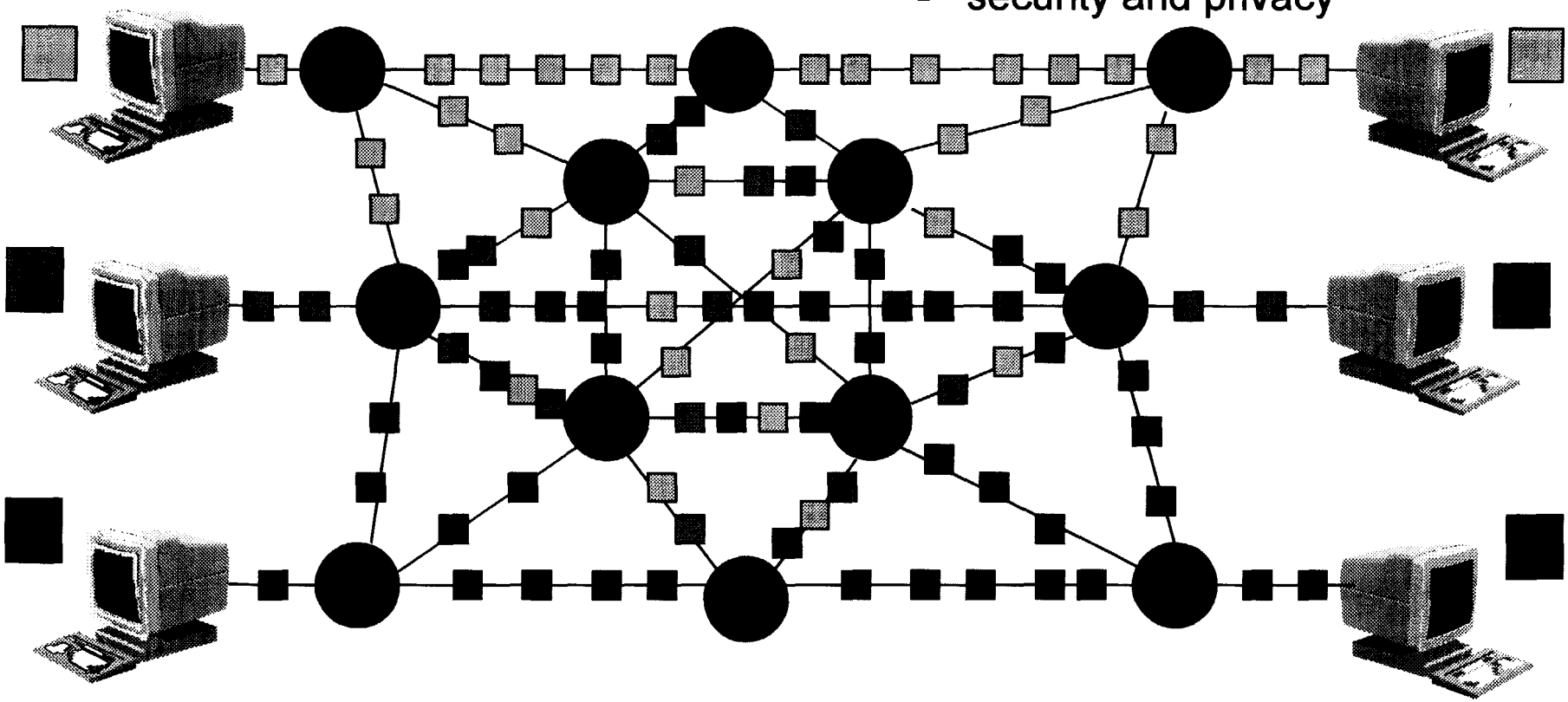
Consumer Internet Activities



Source: Odyssey, L.P. 10/99

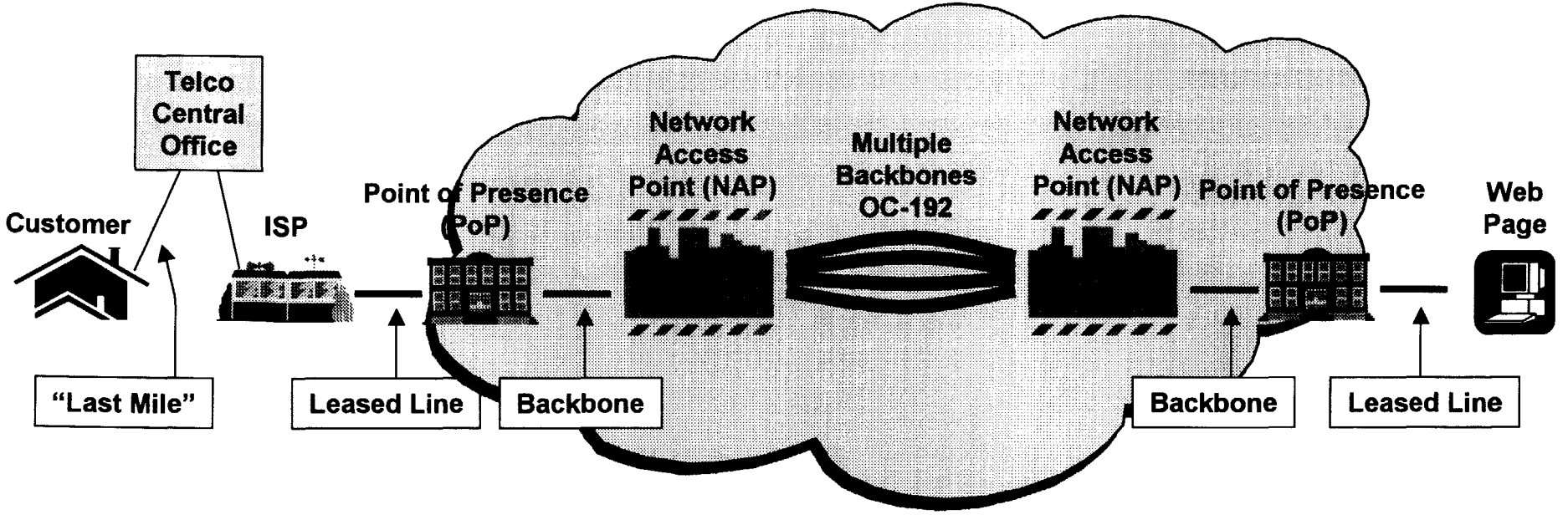
Technical Characteristics

- Shared transport medium
- No bandwidth reservation or fixed routing
- No Guarantees regarding
  - order or timing of delivery
  - integrity of delivery
  - security and privacy



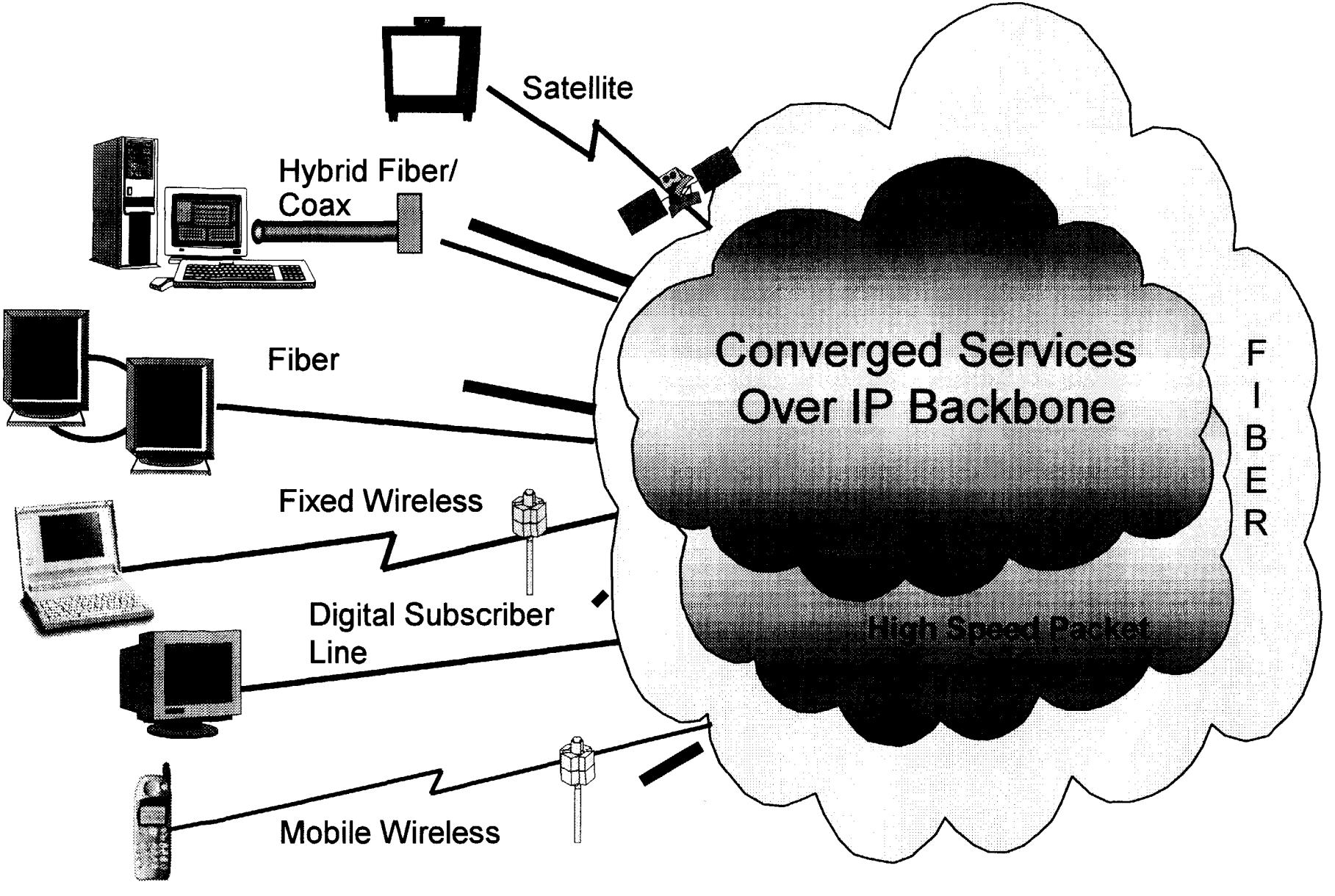
Parts of the Physical Internet

Dialing up an Internet Service Provider is just the beginning...



1. **Customer** places a call to the ISP modem pool
2. **ISP** aggregates traffic, carries it via leased line to a backbone Point of Presence (POP)
3. **Point of Presence** is where local traffic joins an Internet backbone
4. **Network Access Point** (NAP) is where ***multiple backbones*** exchange traffic
5. **Point of Presence,** again, is a handoff point to the local infrastructure
6. **Web Page** resides at a Web-hosting facility

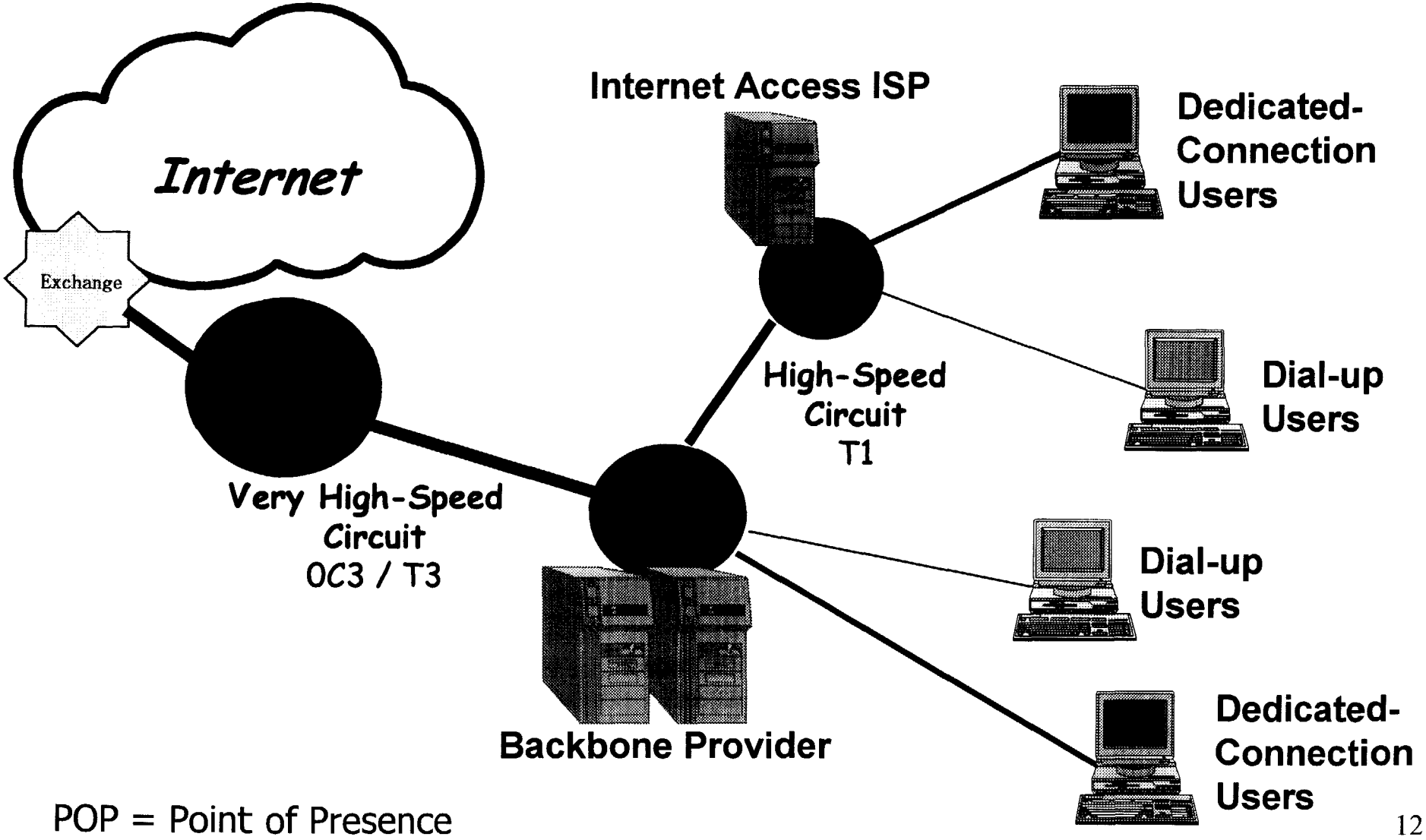
Internet Evolution



The Internet Backbone Market

Development of the Backbone

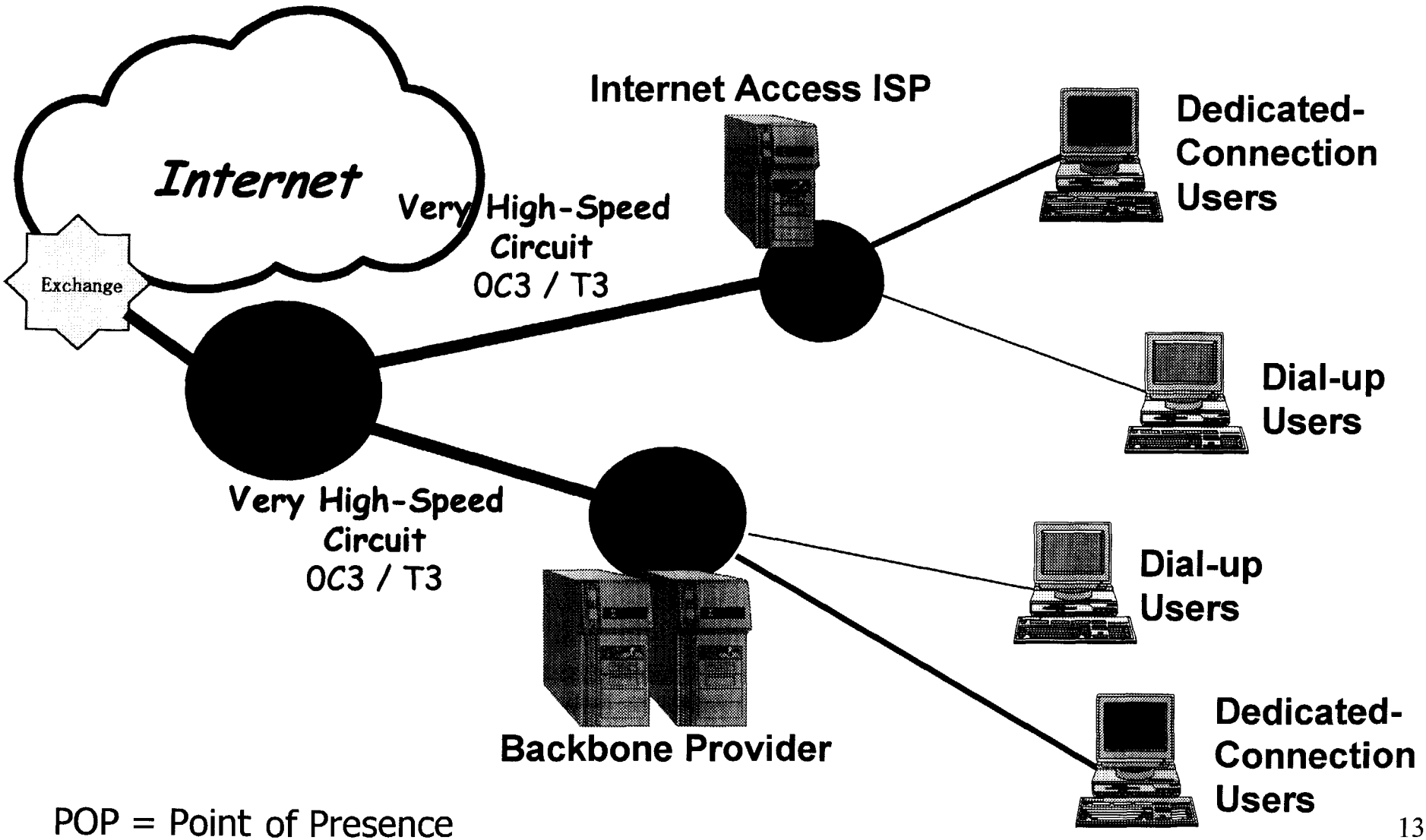
ISPs transit traffic through National/Regional/Global Backbone Providers



POP = Point of Presence

Development of the Backbone

When the subscriber base is large enough, the ISP connects to the T3 POP

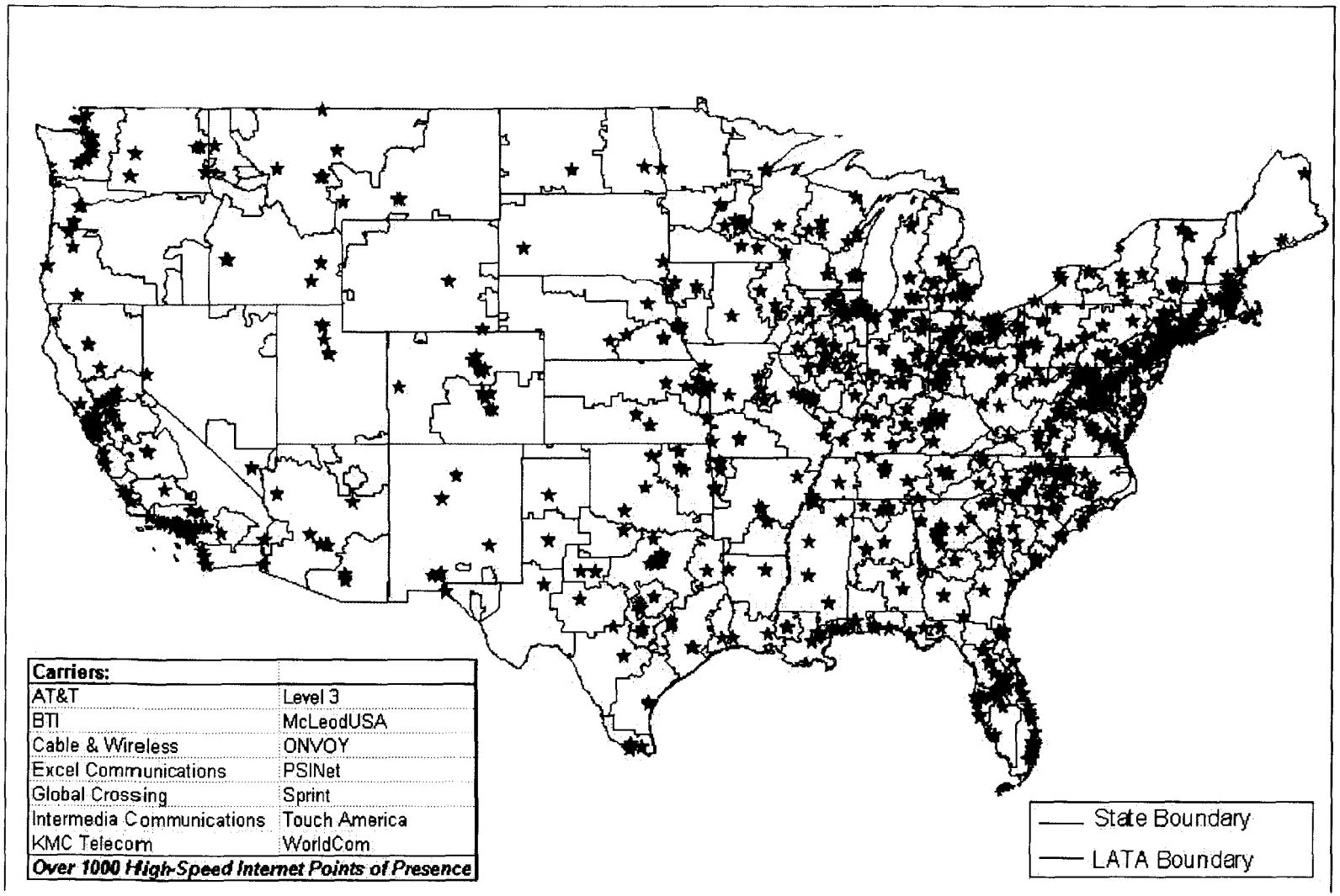


POP = Point of Presence

U.S. Points of Presence (POPs)

High Speed*On-Ramps to the Internet

94.4% of Americans live within 50 miles of a High-Speed Internet Point of Presence

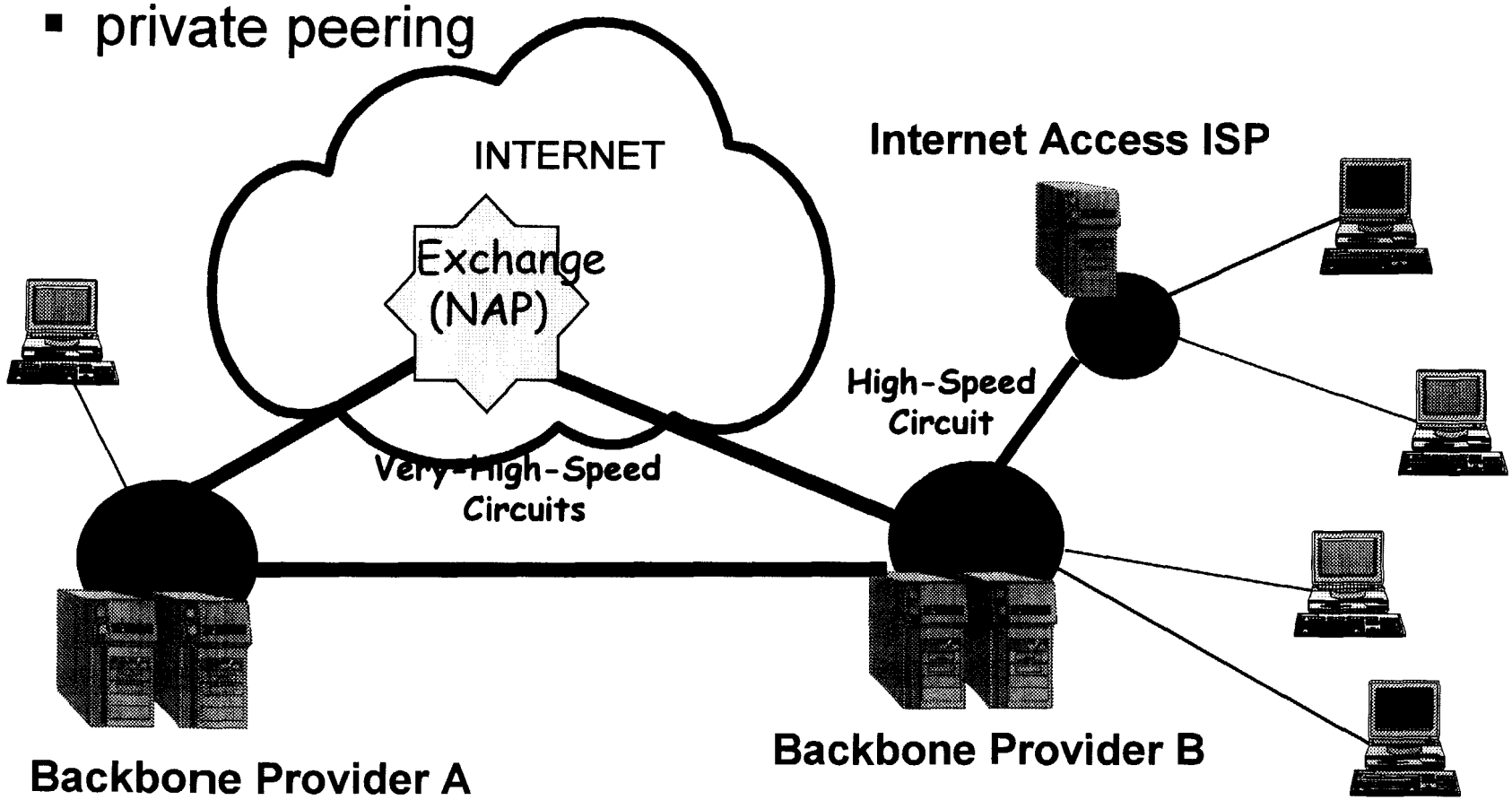


Carriers:	
AT&T	Level 3
BTI	McLeodUSA
Cable & Wireless	ONVOY
Excel Communications	PSINet
Global Crossing	Sprint
Intermedia Communications	Touch America
KMC Telecom	WorldCom
Over 1000 High-Speed Internet Points of Presence	

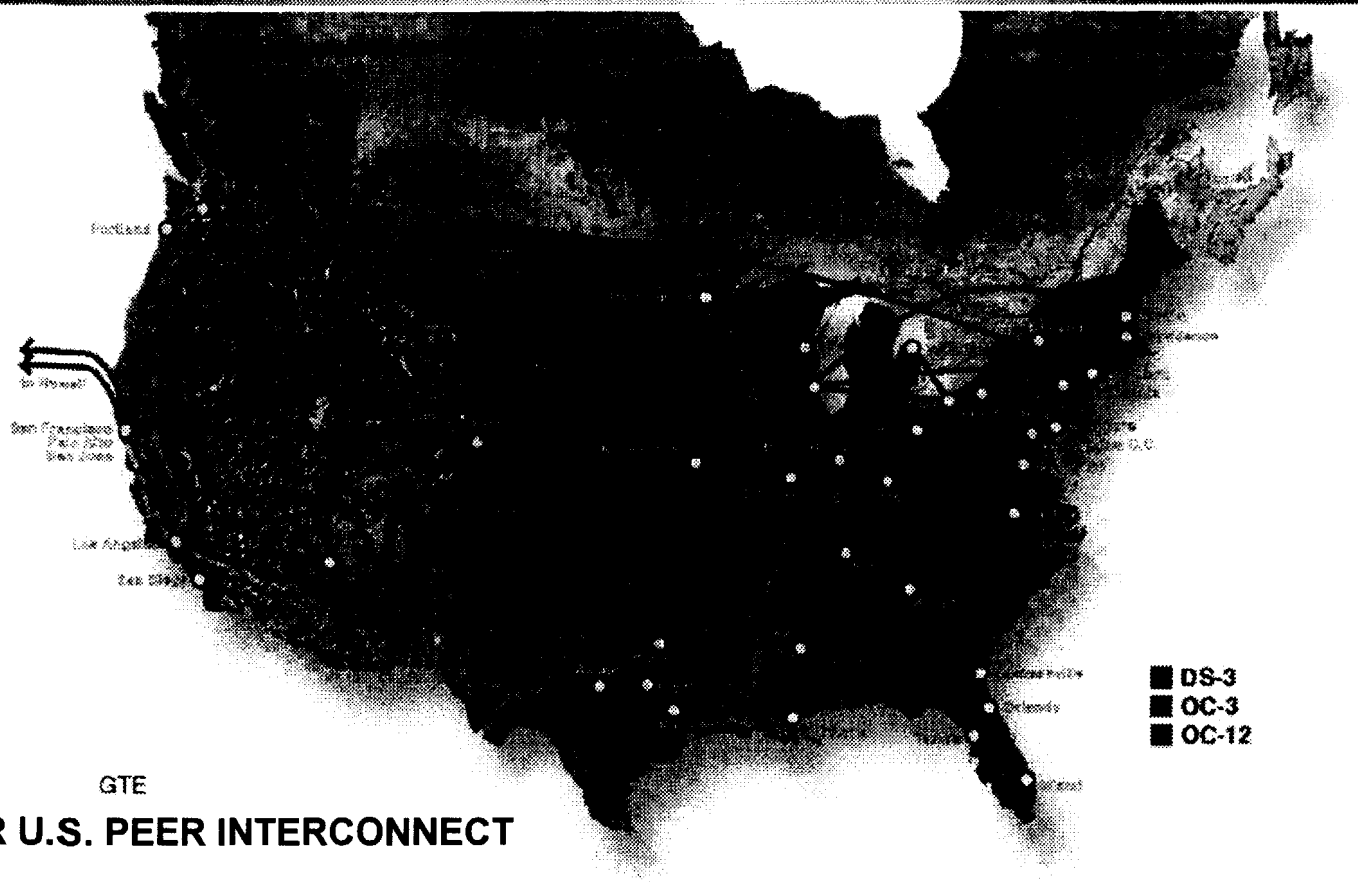
*DS3 (T3) data pops

Mechanisms For Exchanging Traffic

- Commercial agreements govern interconnection for:
  - transit
  - public peering
  - private peering



GTE Genuity Backbone



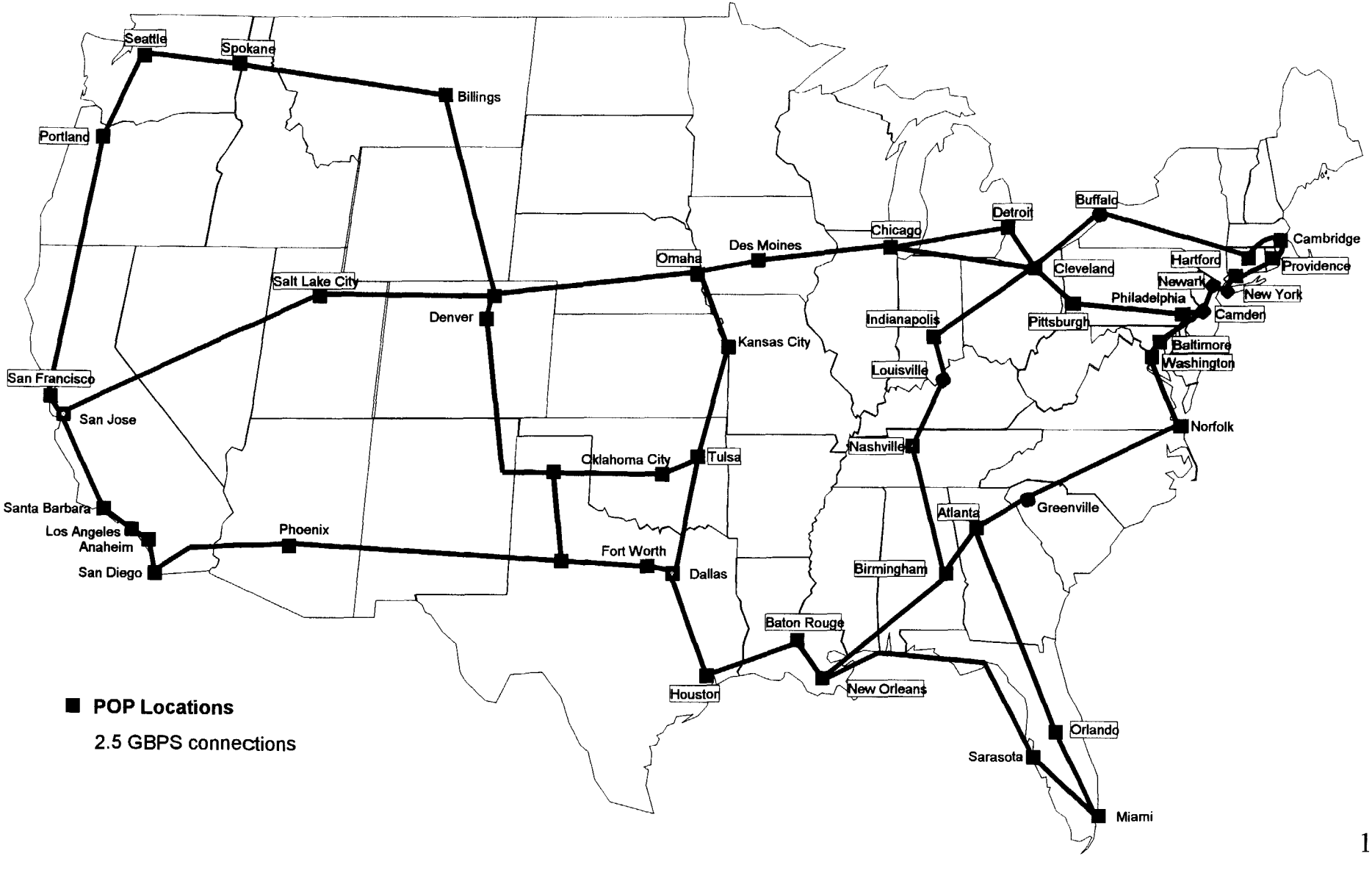
- **4 MAJOR U.S. PEER INTERCONNECT POINTS**
  - MAE East - Washington, D.C.
  - MAE West - Palo Alto, Calif.
  - PAIX - Palo Alto, Calif.
  - Sprint New York NAP, Pennsauken, N.J.

- **7 MAJOR INTERNATIONAL PEER INTERCONNECT POINTS**

TOTAL POPs: 600

Source: http://www.ispworld.com/isp/bb/Genuity.htm

@Home National Backbone

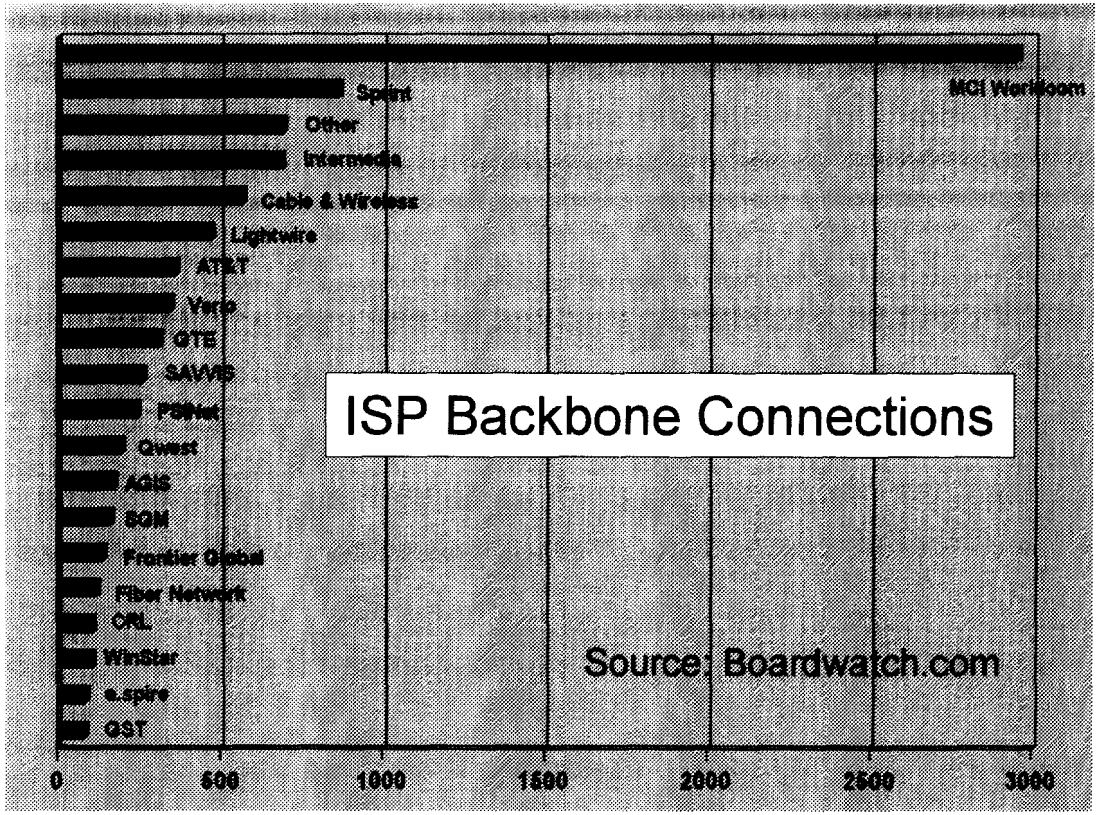


■ **POP Locations**

2.5 GBPS connections

Internet Backbone Connectivity

- 43 National Backbones[1]
- Largest Tier-1 IBPs[2]
  - UUNet Technologies (Worldcom)
  - Sprint
  - Cable & Wireless
  - AT&T
  - Genuity (GTE)
  - PSINet Inc.



National Backbone Provider: "Maintaining a hub city in at least 5 different states, spanning both coasts, and peering at the major NAPS" [1]

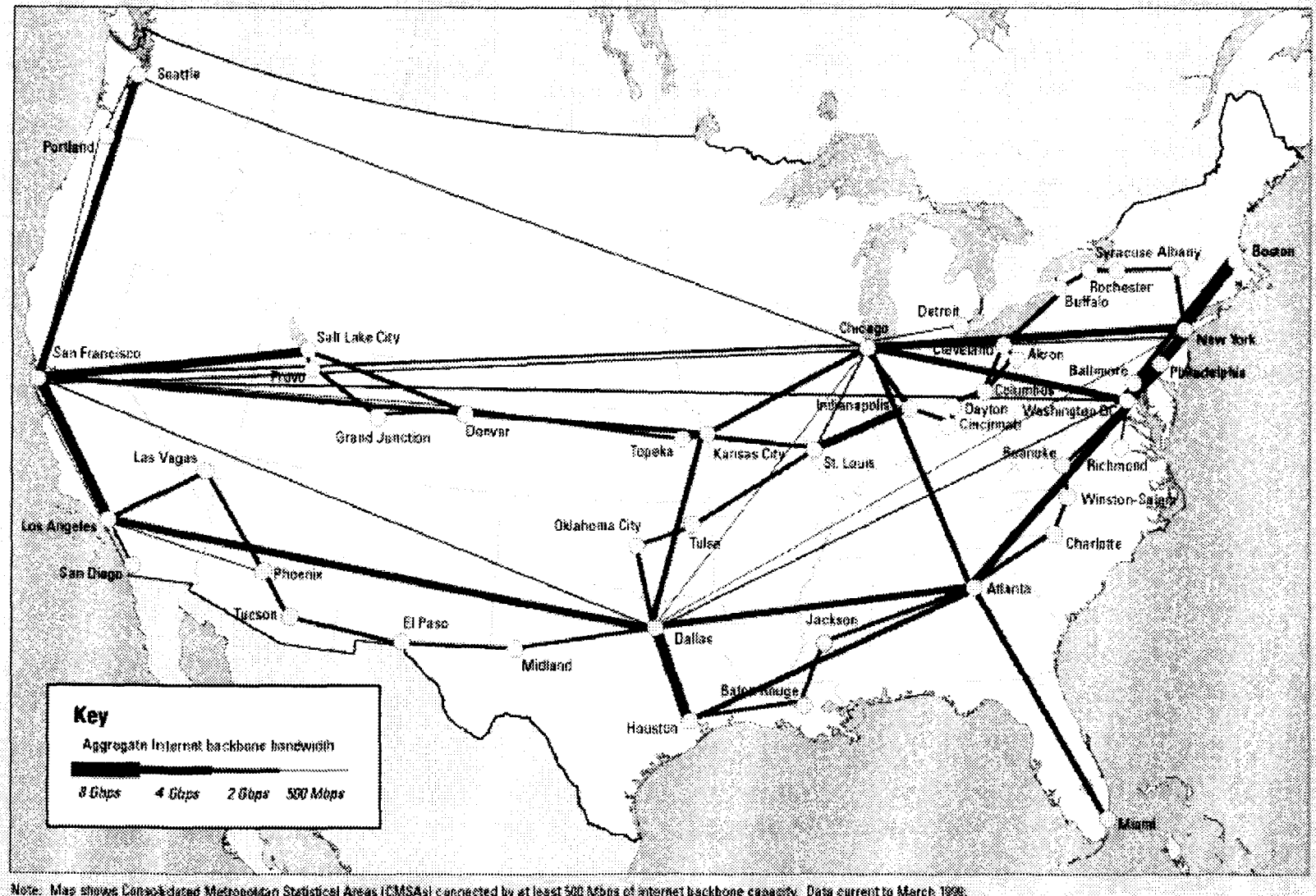
Top Tier Backbone: "interconnect solely by peering and do not need to purchase transit from other backbones" [3]

Tier 1 Provider: "the small group of global Internet transit operators at the top of the Internet"[4]

1 Boardwatch Magazine's Directory of ISPs, 1999
2 Savage, Frieden, Denton, 14-Jan-2000
3 FCC, OPP Working Paper No. 32, Sept. 2000
4 Internet Society (ISOC)

U.S. Backbone Connectivity

Figure 12. Map of Major U.S. Domestic Backbone Routes, 1999

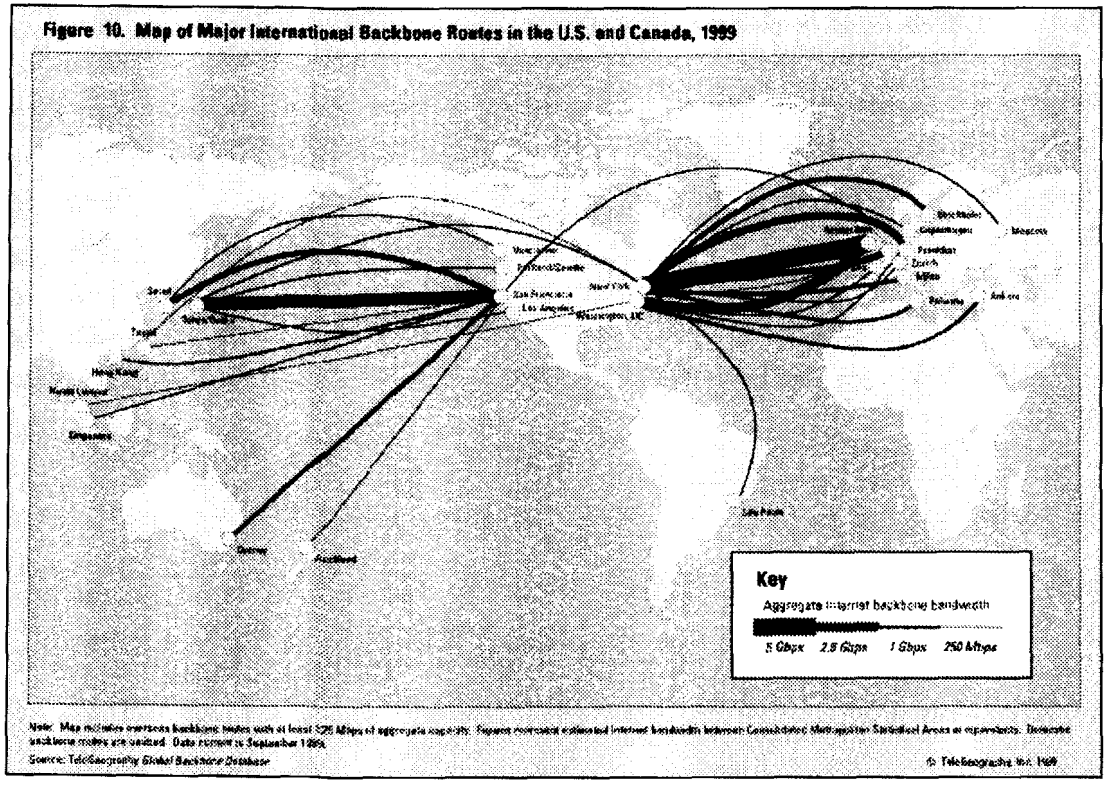


Note: Map shows Consolidated Metropolitan Statistical Areas (CMSAs) connected by at least 500 Mbps of internet backbone capacity. Data current to March 1999.

Source: Anthony Townsend, Global Network Analysis (www.networkanalysis.com)

Design © TeleGeography, Inc. 1999

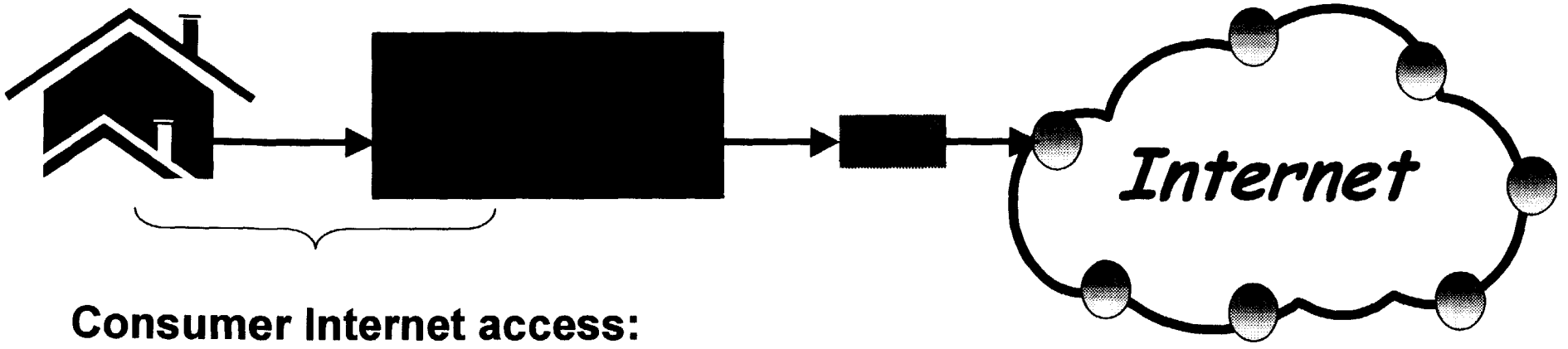
Global Backbone Connectivity Trans



- Hands off regulatory approach in US
- Competitively priced US long distance telecommunications market
- Lower cost for transit through US versus direct cross-border and cross-continent connections

Internet Access Market

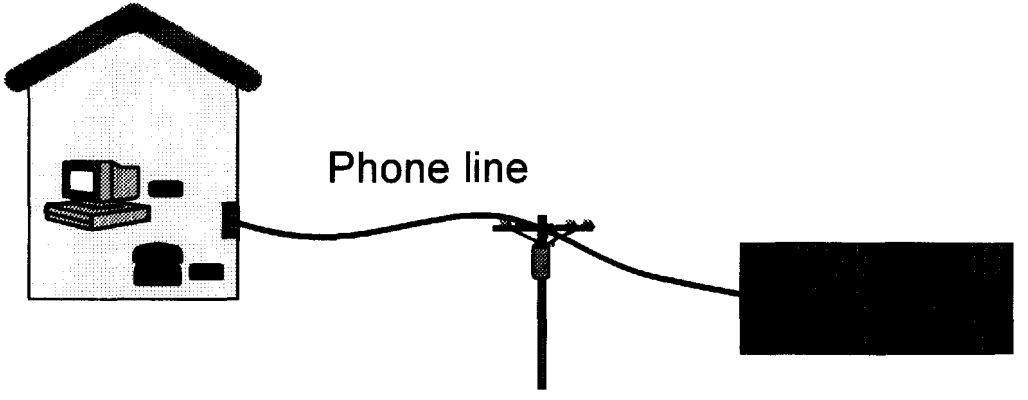
Consumer Internet Access



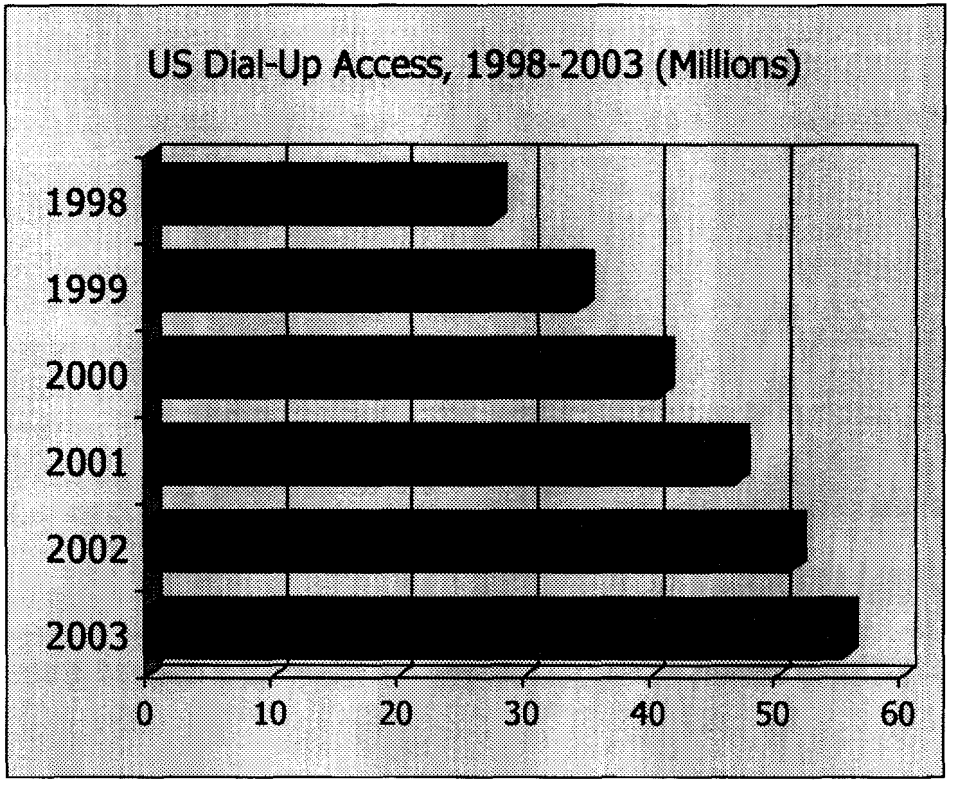
Consumer Internet access:
"Last mile"

- Internet access is how you connect to the Internet
- "Narrowband" & "Broadband" refer to different access speeds, not different markets

Dial-Up Access



- 90% of subscribers dial-up today. Dial-up subscribers will continue represent a vast majority (73%) of all users through 2003. *eMarketer,00*
- The Bell Companies still control 95% of the [local] phone lines today. *Reuters, 2/00*

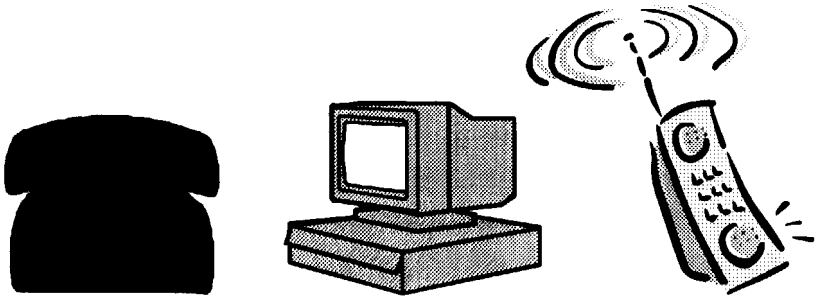


Source: eMarketer, 2000

Dial-up Access Will Continue to be Popular

PRICE

- Free dial-up Internet service readily available
- Free computer with a premium dial-up service
- Competitively priced local phone service for dial-up (in limited areas)



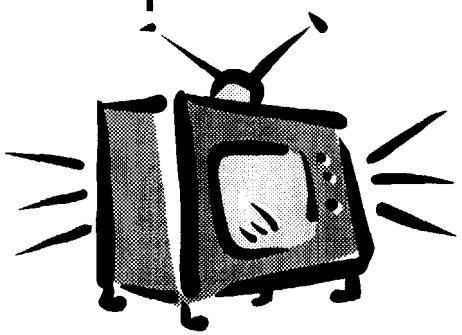
PERFORMANCE

- Popular applications do not require high speed (email, general web searches)
- Increasing demand for mobile applications & hand-held devices
- Migration to web-based software
- Improvements in compression technology such as MPEG-3

High Speed Access Will Become More

PRICE

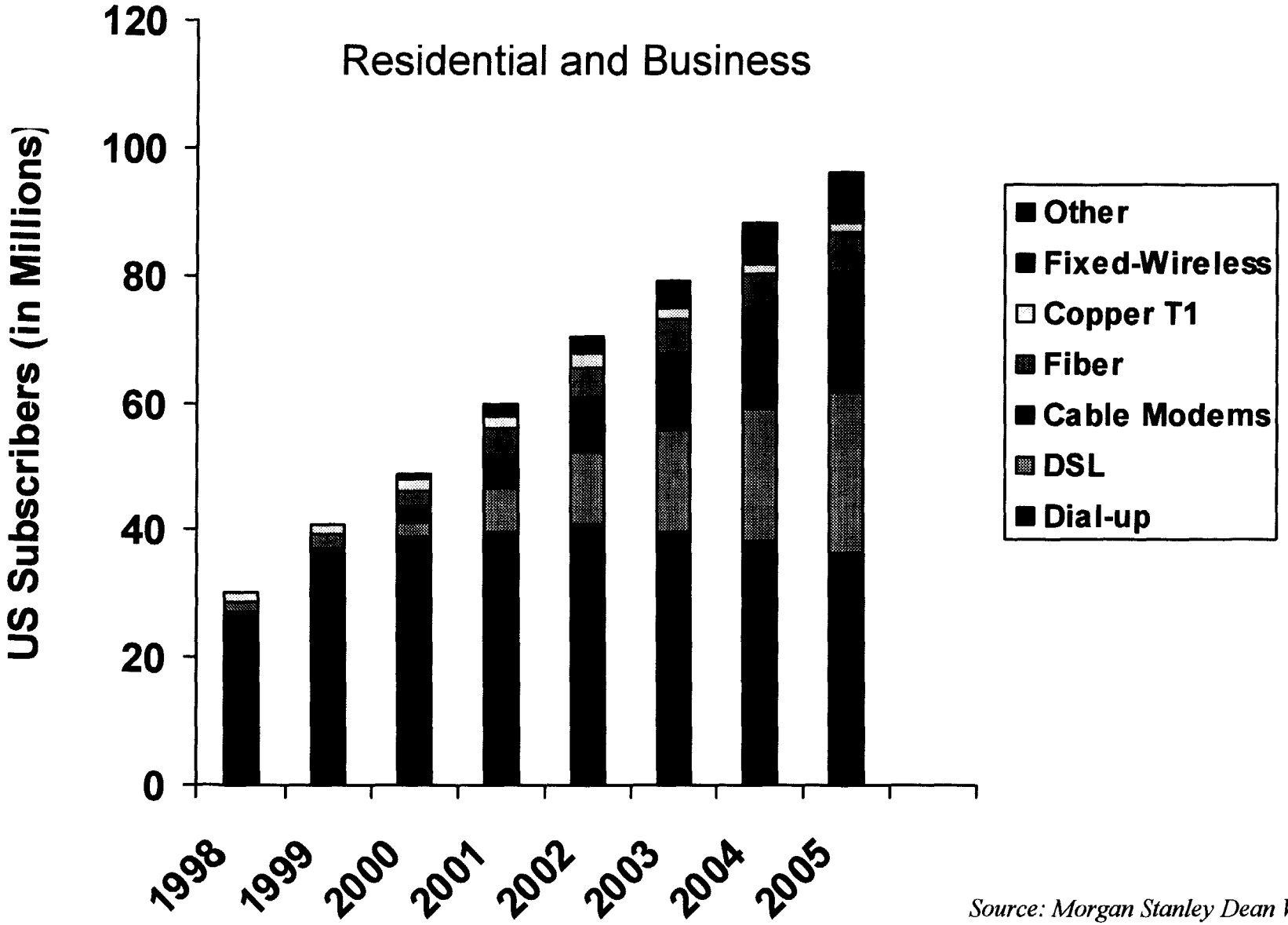
- Now comparable to cost of a second phone line and unlimited Internet access (~$40/mo.)
- Next generation set-top TV boxes can complement or substitute for a computer



PERFORMANCE

- 10 to 100 times faster
- No busy signals - always on
- Video applications
  - "Choose Your News"
  - Movies
  - Telemedicine
  - Distance Learning
- Work from home and access your work network at high speed

Growth of Different Access Te



Source: Morgan Stanley Dean Witter, The Broadband Report, 5/1/00