

Info Tech Futures and Policies

http://www.umich.edu/~jmm/

http://www.spp.umich.edu/

From specialized nets to The Net

Telex

- 300 bps character

Video

- analog, 20-30 Mbps
- radio, cable, satellite
- one-way real time
- unswitched

Phone

- mostly analog, 64 Kbps
- copper, fiber, microwave, satellite
- two-way real-time
- circuit-switched

Electric

- every home connected
- high-bandwidth telecom available

Data

- 2.4 Kbps -- 300 Mbps
- two-way, store-and-forward
- packet-switched

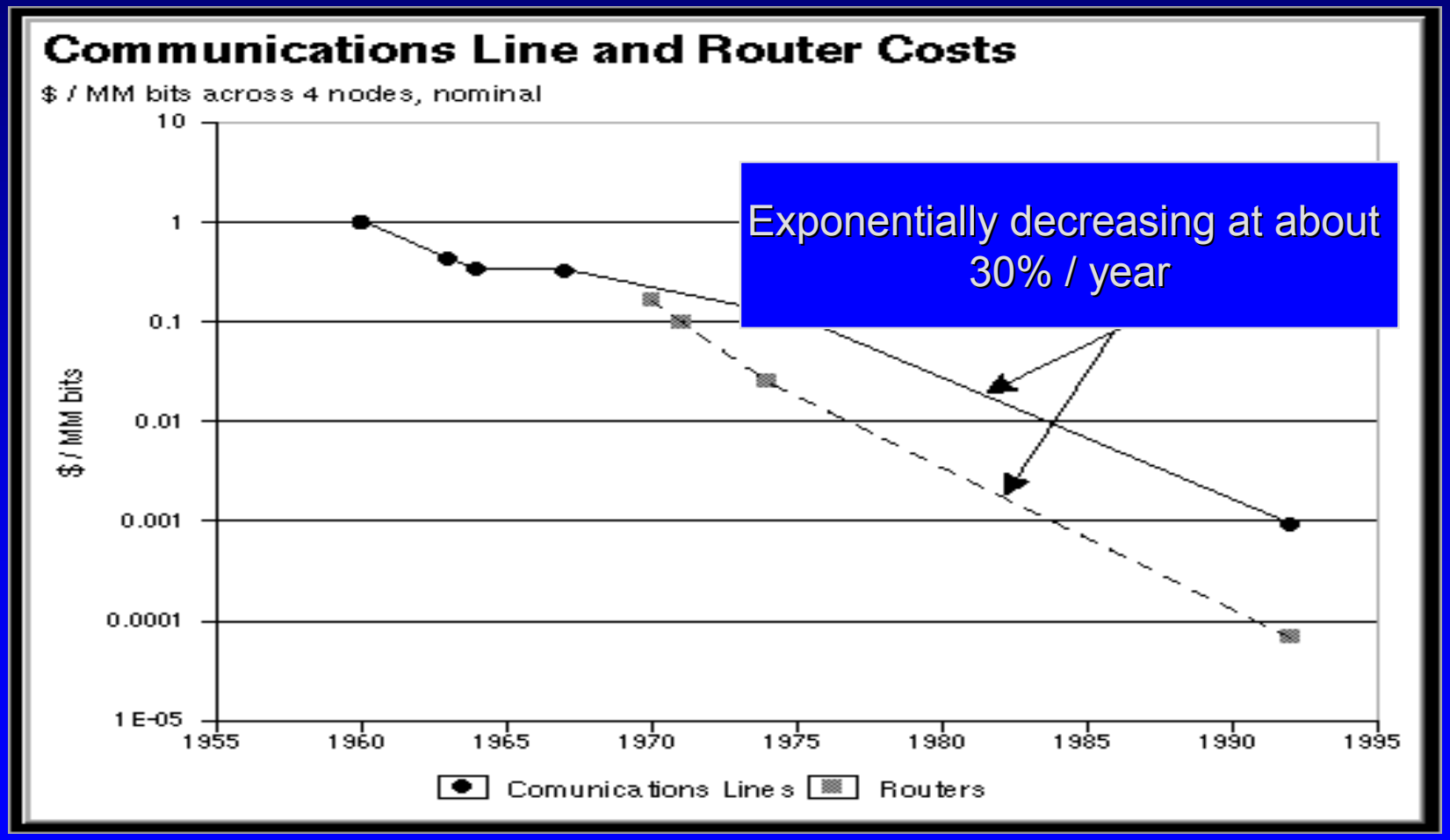
An "information outlet"?

- Multimedia mail (text, graphics, voice, video
- Gigabit file transfer (textbooks on demand)
- Video-on-demand
- Real-time videoconferencing
- PCS (mobile telephony, fax, paging, email)

Why Bother?

- Need *flexible infrastructure and interoperability*
- Need *vastly higher bandwidth*
  - phone: 64 Kbps
  - HDTV: 100,000 Kbps
- Different net for each service costly
  - global dialtone (Gates/McCaw): $9 billion
  - MCI local phone facilities: $20 billion for 20 cities

Drivers: Telecom Cost-Performance



Drivers: fiber capacity

- Current Internet backbone: 155 Mbps
- Single thread of fiber:
  - 75,000,000 Mbps
  - equiv. 4-5 billion AM radio stations
  - more than all current airwave transmission of radio + TV + microwave + satellite comm

Drivers: computing cost-performance

- Moore's Law: chip density doubling every 18 months
  - 1971: 2300 transistors, 1K DRAMs
  - 1995: 35,000,000 transistors, 64,000K DRAMs
- 1995 Pentium about 4X power of 1985 IBM 3090 mainframe



Drivers: digital everything

- homogeneous: bits are bits
- efficient: CDMA: 20:1 gain over analog cellular phone

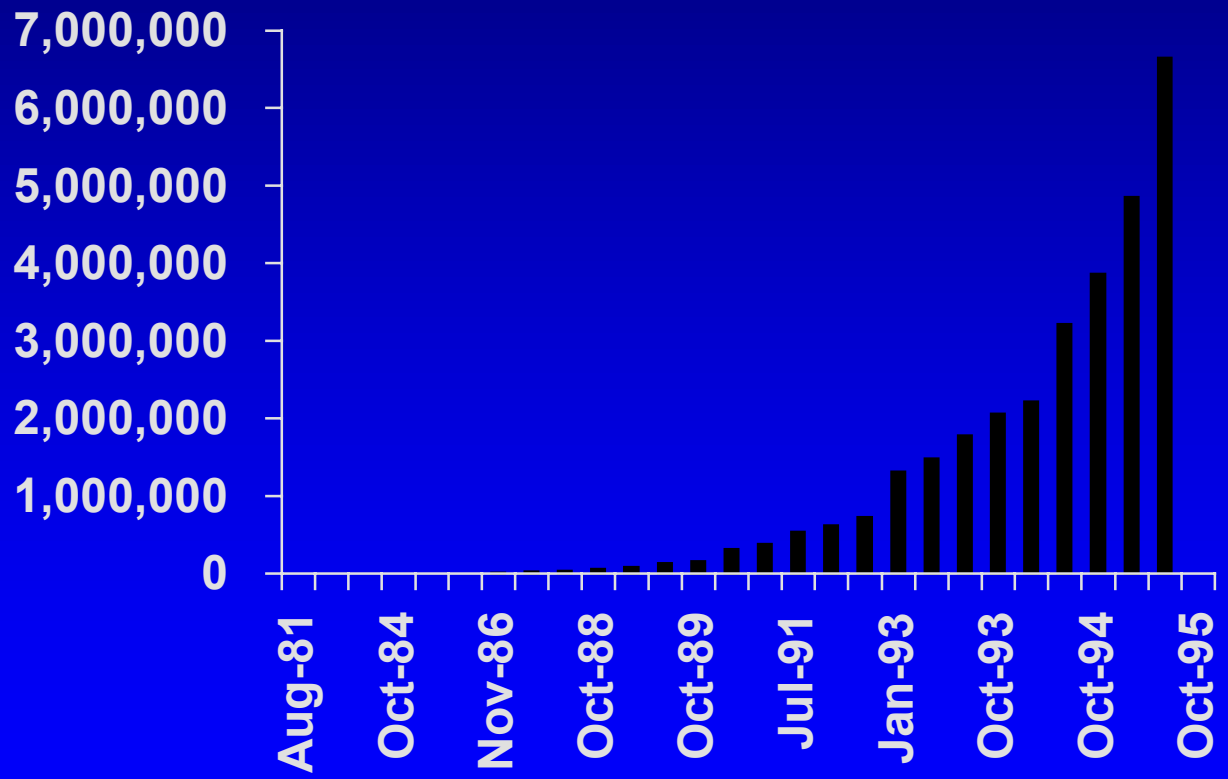
Opportunities

- info access anytime, anywhere
- a competitive telecom industry
- politics:
  - direct democracy (immediate, low-cost access to bills, data; virtual interest communities)
  - hot polling
- technology-supported organizations can simultaneously be:
  - big and small
  - centralized and decentralized
  - local and global
- education: the virtual campus
  - shared learning
  - distance learning

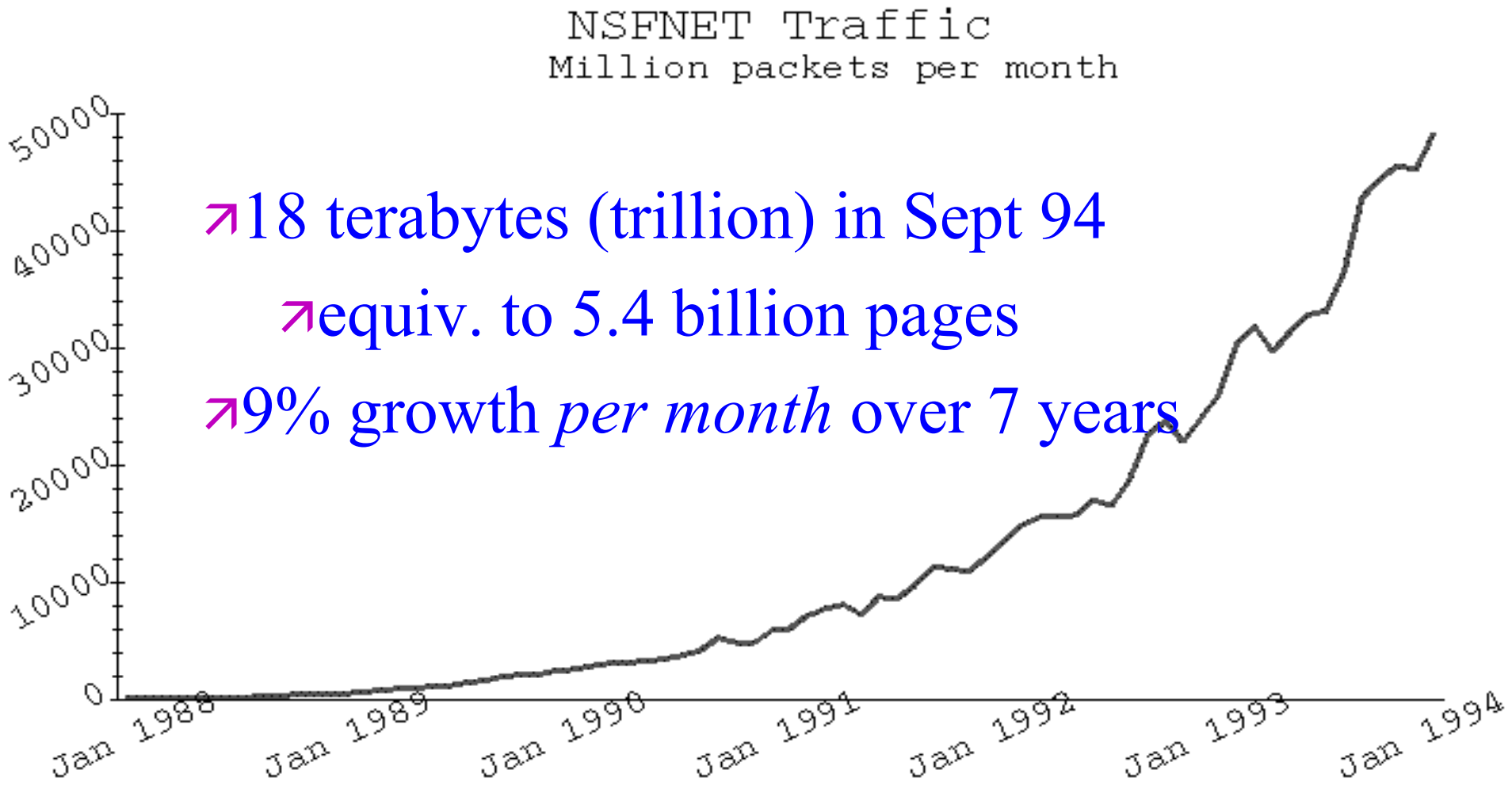
What can we learn from Internet?

- model for competitive telecom (layered architecture)
- model for content innovation and provision (blind service)
- extraordinary growth rates

Internet Hosts: 1981-95

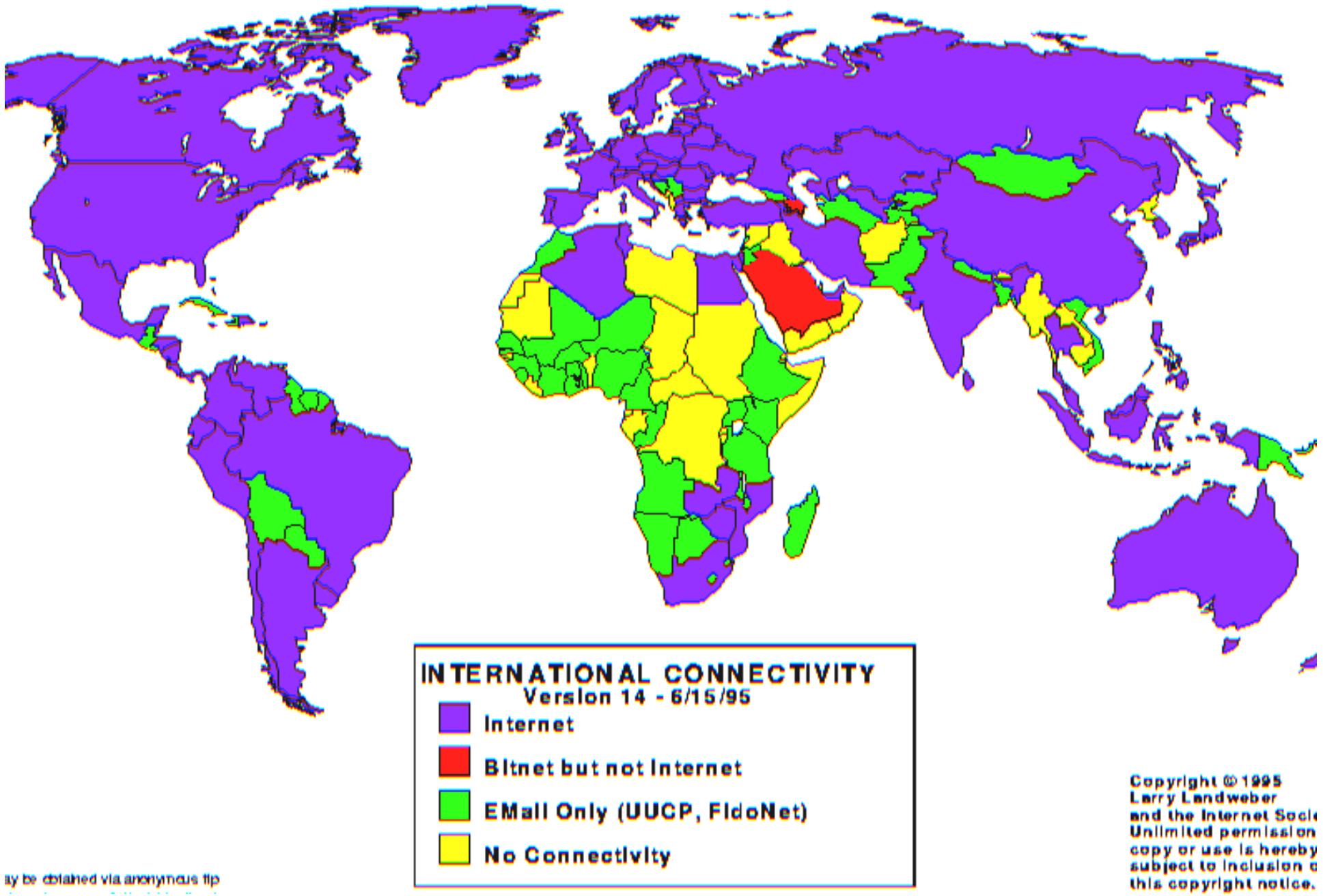


Traffic Growth

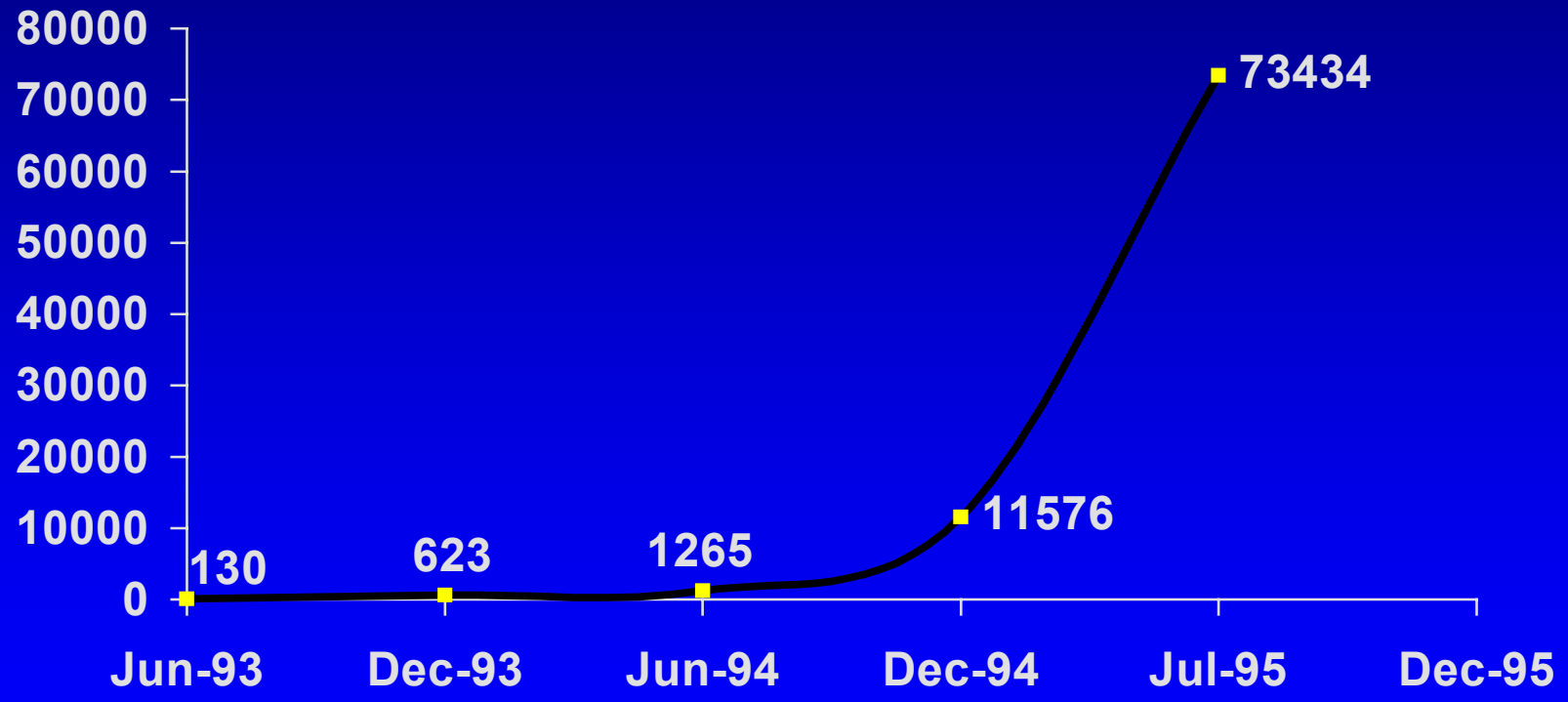


- ↗18 terabytes (trillion) in Sept 94
  - ↗equiv. to 5.4 billion pages
- ↗9% growth *per month* over 7 years

93 Internet countries



Number of Web Servers: 1993 - 1995

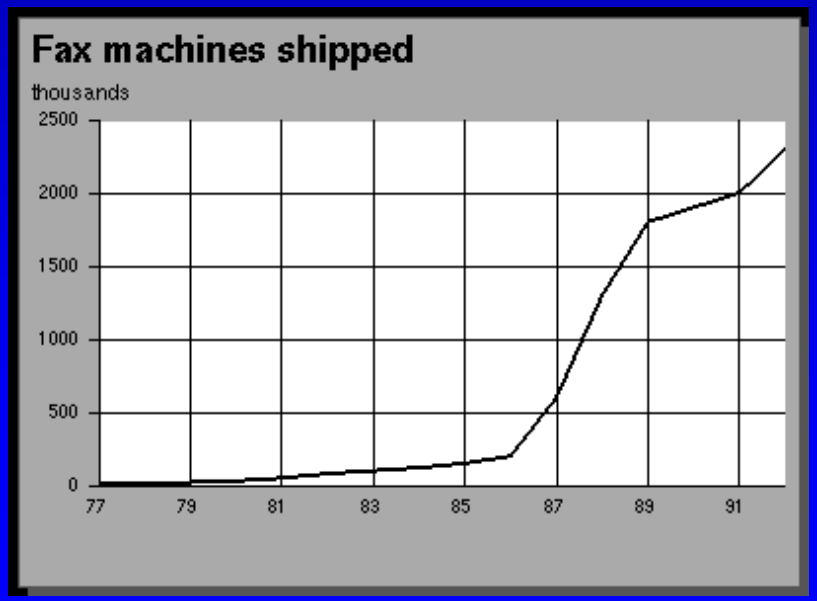


Why economic and policy research?

- shared resources
  - packet switching vs. circuit switching -> ATM adopted by phone industry
- infrastructure investment (high fixed cost)
- innovation investment (transport; content creation)
- social issues (universal access, copyright, crime, security)

Critical mass and standardization

- VHS vs. Beta
- who wants a fax?
- Microsoft über alles





Achieving *critical mass* is essential

Network transport policy issues

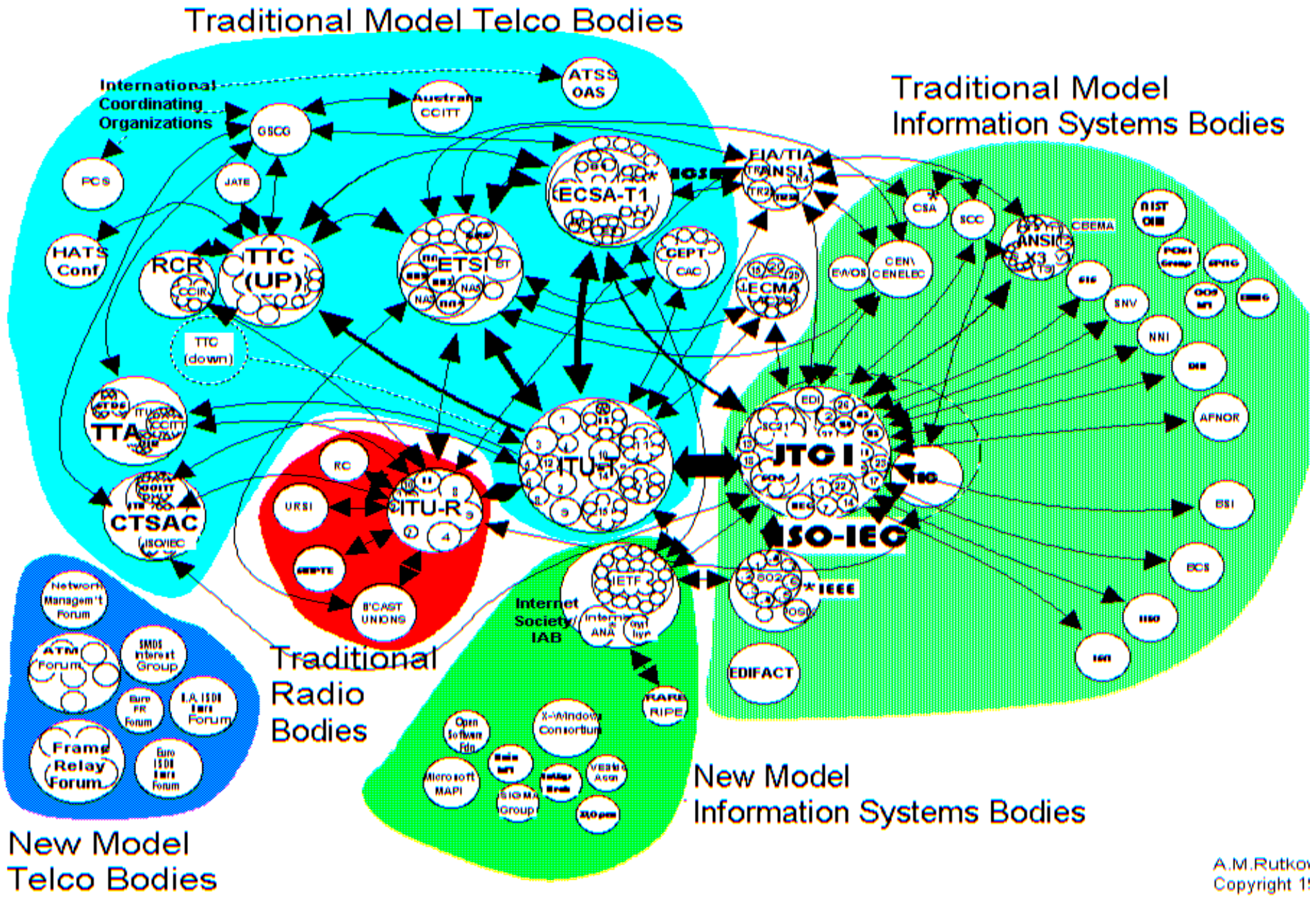
- congestion
- multiple qualities of service
- universal access
- vertical integration
- standard-setting
- service architecture
- accounting architecture
- dark fiber



Congestion

- “tragedy of the commons”
- on highway: one person adds one car
- on info net, one person can add
  - 2-3 Kbps (email)
  - 10,000 Kbps (video)
  - 1 car vs. 5000 cars!

The Standards Making Universe



A.M.Rutkov
Copyright 1

Information goods

- info brokers
- search agents
- personal newspapers
- traditional:
  - journals
  - movies
  - databases
  - software

Information Goods Issues

- *intellectual property protection*
  - Web browsing violates copyright under MAI v. Peak
- *pricing*: how to recover fixed costs?
- *electronic currency*
- *privacy* (Clipper, medical/work/credit records, etc.)
- *crime*: pornography, gambling, money laundering

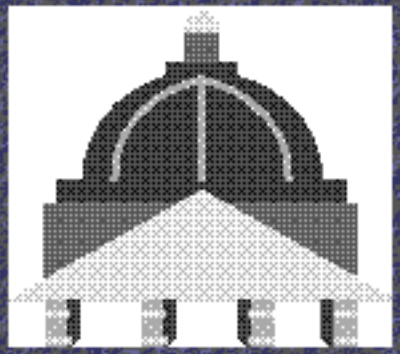


Information economies

- digital currency
  - Microsoft, Visa, Mastercard, IBM, etc., etc.
  - anonymous cash, checks, money orders, etc.
- artificial agents (e.g., UMDL, travel agent)
- spontaneous commerce

Courses at SPP

- Information Networks Policy
- Telecommunications Policy
- Computers in Organizations
- Information Technology and Organizational Learning
- Systems Problem Solving
- Ethics and Values in the Use of Information Technology



School of Public Policy



School Information

- Information about this server
- Announcements
- Computer Information
- Courses
- Faculty
- Recent Conferences and Seminars
- Policy Notes and Research Papers
- Other Servers

Telecom Server Usage

`http://www.spp.umich.edu/telecom-info.html`

Maintained by Jeff MacKie-Mason

- 2500 “visits” per day
- over 800,000 visits during first year
- 280 MB of data transferred in Sept 95
- from over 58 countries:
  - Bahrain
  - Costa Rica
  - Estonia
  - Croatia
  - Iceland
  - Ukraine
  - South Africa

research projects

- 3 year NSF grant: *Economics of the Internet* (joint with Xerox PARC)
- *Infrastructure Cost Project* (joint w/Harvard, Wisconsin, Stanford)
- *ATM Pricing* (joint with Auburn, University College -- Dublin)
- *Pricing Information* (prepared for Infonautics, Inc.)
- *UM Digital Library*