

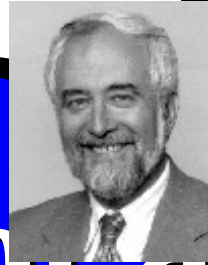
# Internet

# et

**The Electronic  
Superhighway  
Telecommunications  
Reports**

Washington DC

2 December 1993



**Anthony M.  
Rutkowski**

Director, Sprint

Integration

**for a Revolution**  
Vice President, Internet  
Society

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# National Information

## Infrastructure

### **U** *Information infrastructure*

**involves an entire “food chain” of facilities, capabilities and activities**

**Everything from:**

**“bit pipes” at the bottom ...to**

**enabling and incenting valuable collaboration, creativity, and behavior in individuals and institutions at the top**

**The top of the food chain is more important and more difficult to achieve**

**“Strategically significant” sectors (e.g., NREN, Reinventing Government, agile manufacturing, etc.) are separate from and perhaps more important than mass market sectors**

# National Information

## Infrastructure

**U** **Internetworking - of which the Internet is a visible part - is:**

- A suite of technologies and applications on the upper half of the food chain**
- Growing as an electronic communications medium on a speed and ubiquitous global scale at rates beyond human experience**
- Synergetic with today's electronic technology directions, i.e. "the computer is the network."**
- Achieving a massively commercial and user-friendly marketplace**
- Most importantly a new paradigm for reinventing institutions & activities**
- Effecting strategically critical information infrastructure**

# The Electronic Networking Universe

Applications

Manage-  
-ment

Mass  
Media

Voice  
Telephony

Inter-  
networkin  
g

Digital Transport Pipes

# How does it fit together: an information food chain

**What People and Organizations Do**

**Network Management (SNMP)**

**Information "Tools"**  
(FTP, Telnet, SMTP, X400,....)

**Internet "Glue"**  
(TCP,UDP/IP)

**Telecom "Pipes"**  
(leased line, dialup, X.25, ISDN, Ethernet, FDDI, ATM, HIPPI)

# Internetworking : terms of art

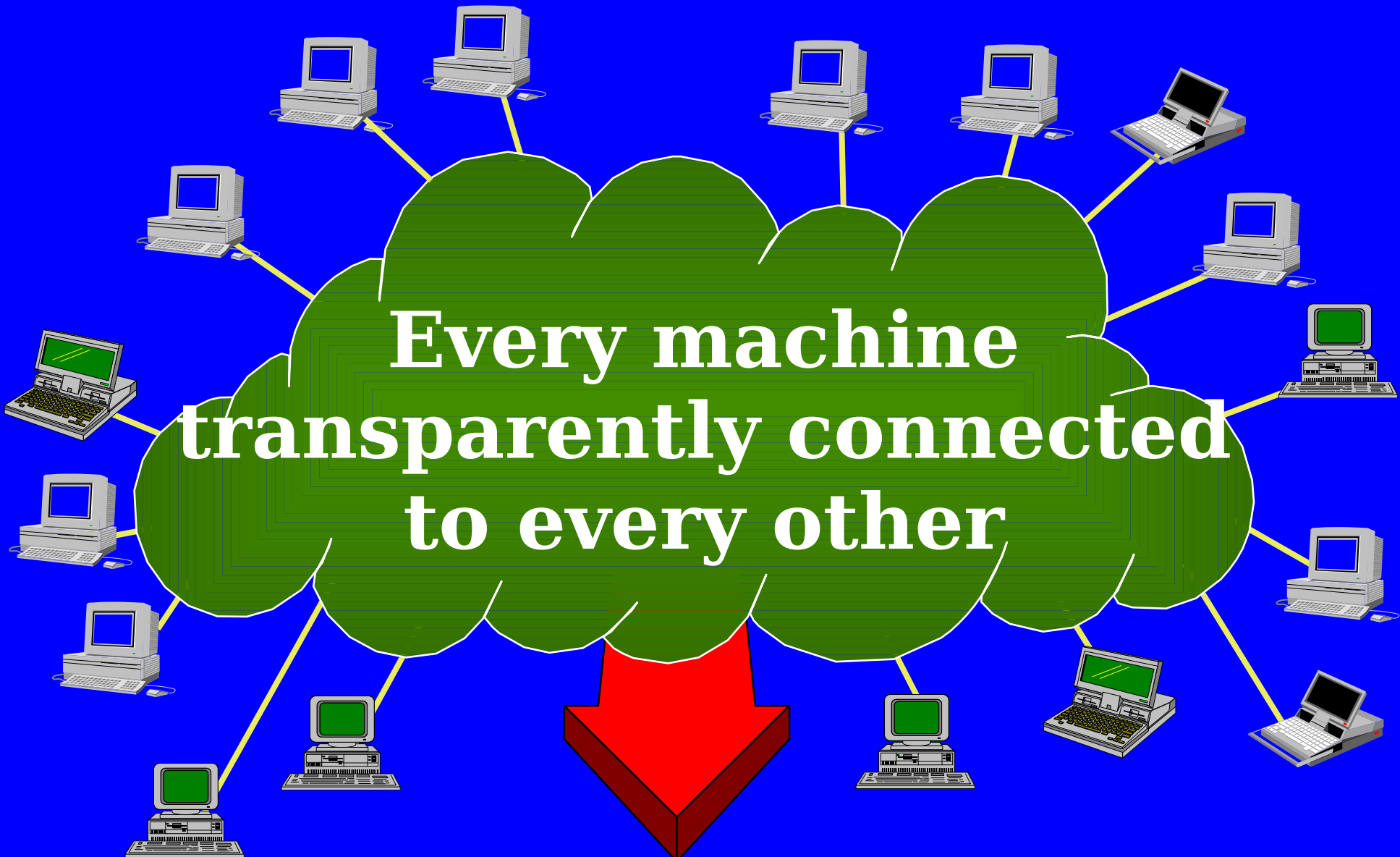
An Internet: A network of networks of computer hosts able to seamlessly communicate - usually through the Internet Protocol (IP) and services

Enterprise Internet:  
An Internet within an organization

Public Data Internet:  
Internet services made available to the public

The Internet:  
More than 21,000 Internets connected together

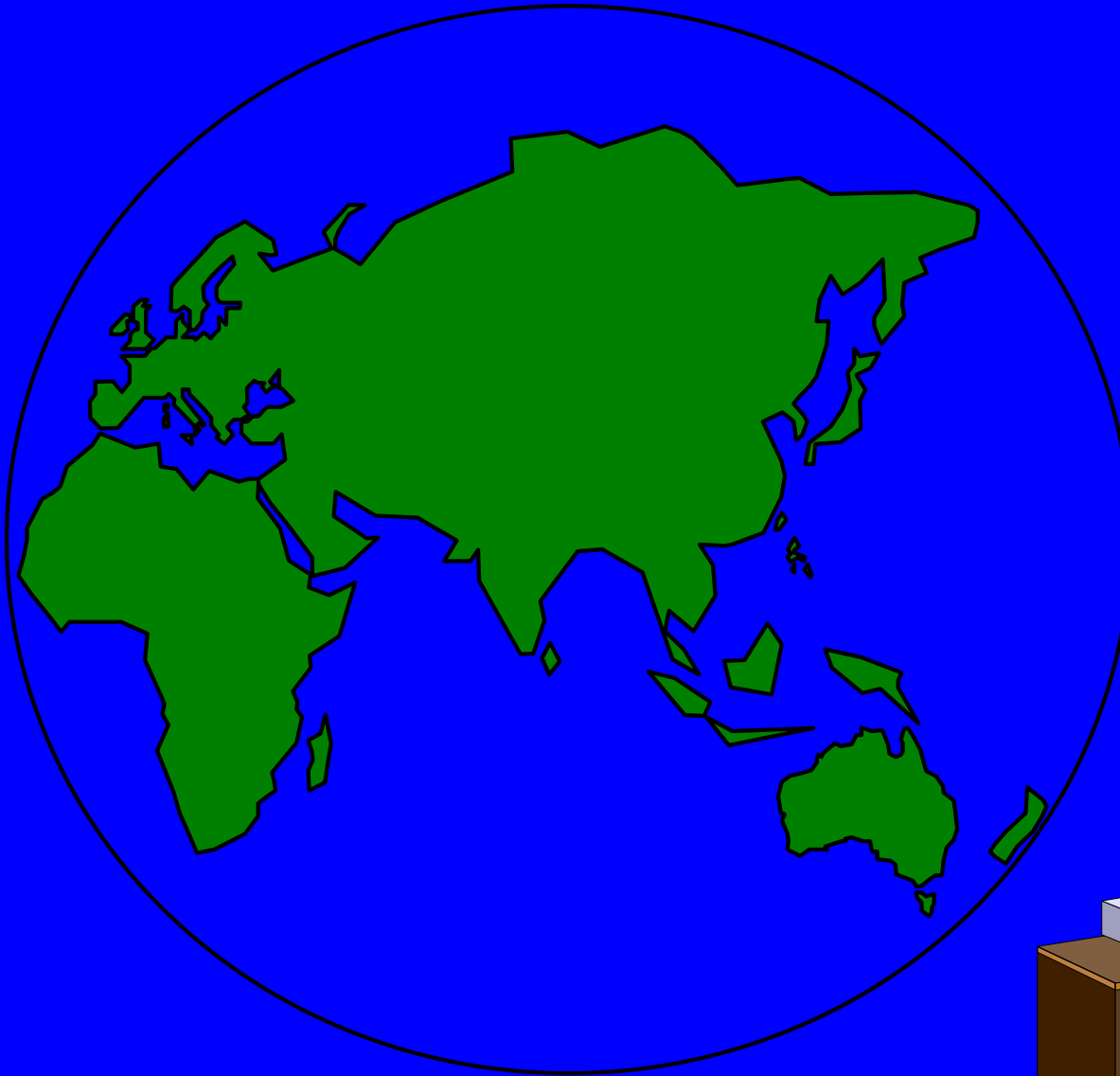
# The Enterprise Internet



Every machine  
transparently connected  
to every other

Outside  
World

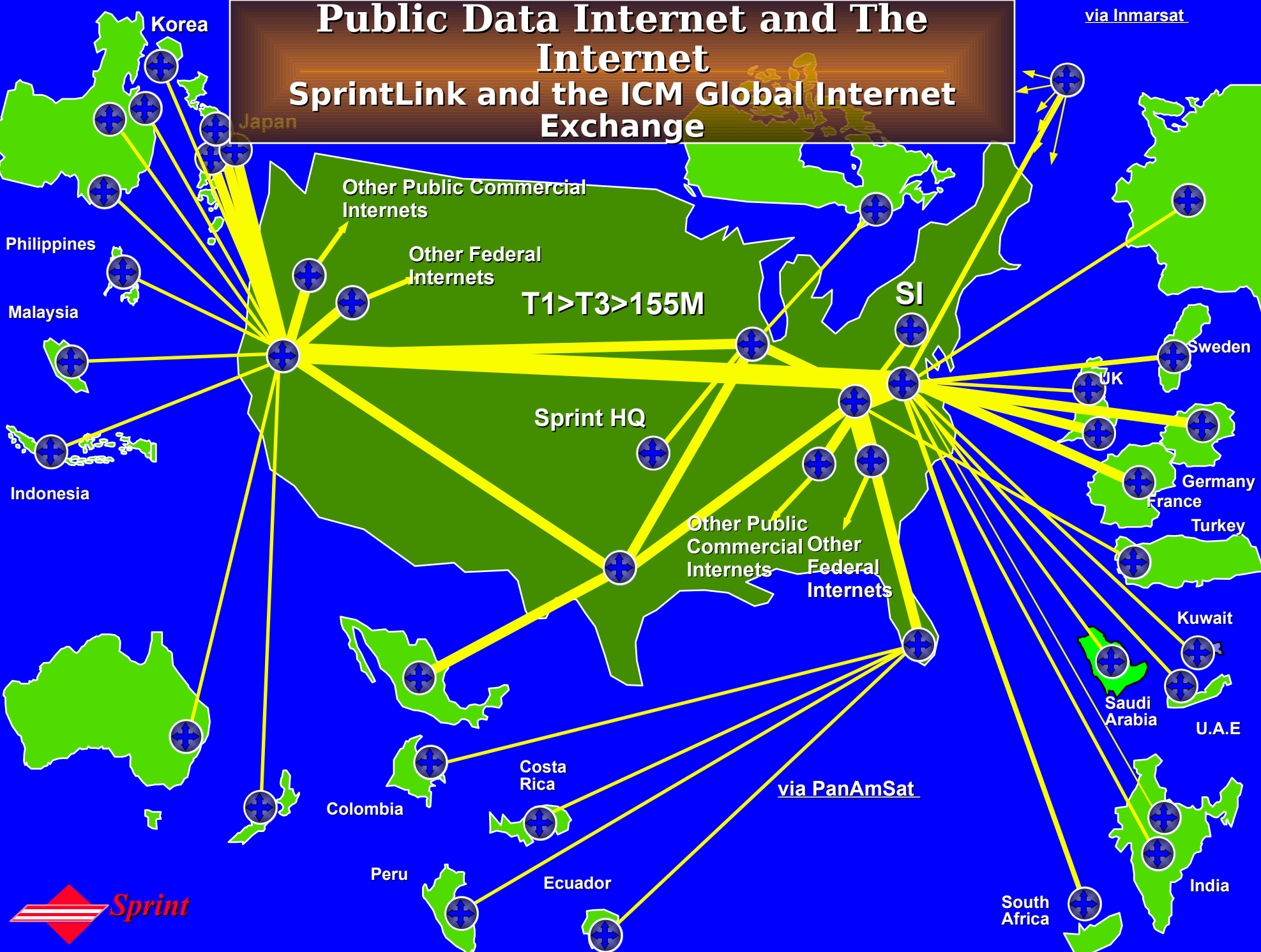
# Internet: Directly Reaching 2,056,000 Computers





# Public Data Internet and The Internet

## SprintLink and the ICM Global Internet Exchange



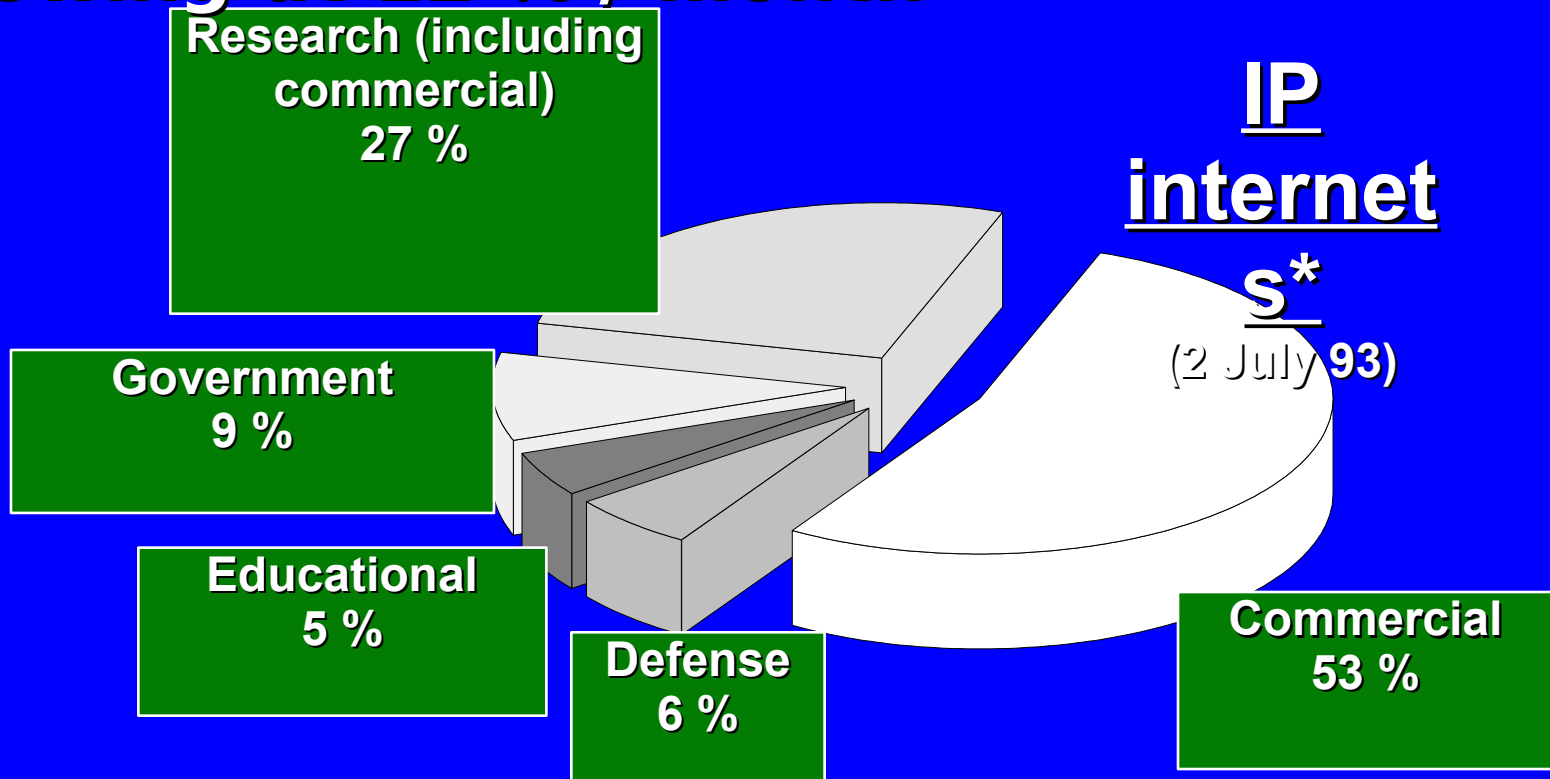
# Internets - Current Dynamics

## IP internets

u49,018 registered (7 Sep 93)

u92 countries (Sep 93)

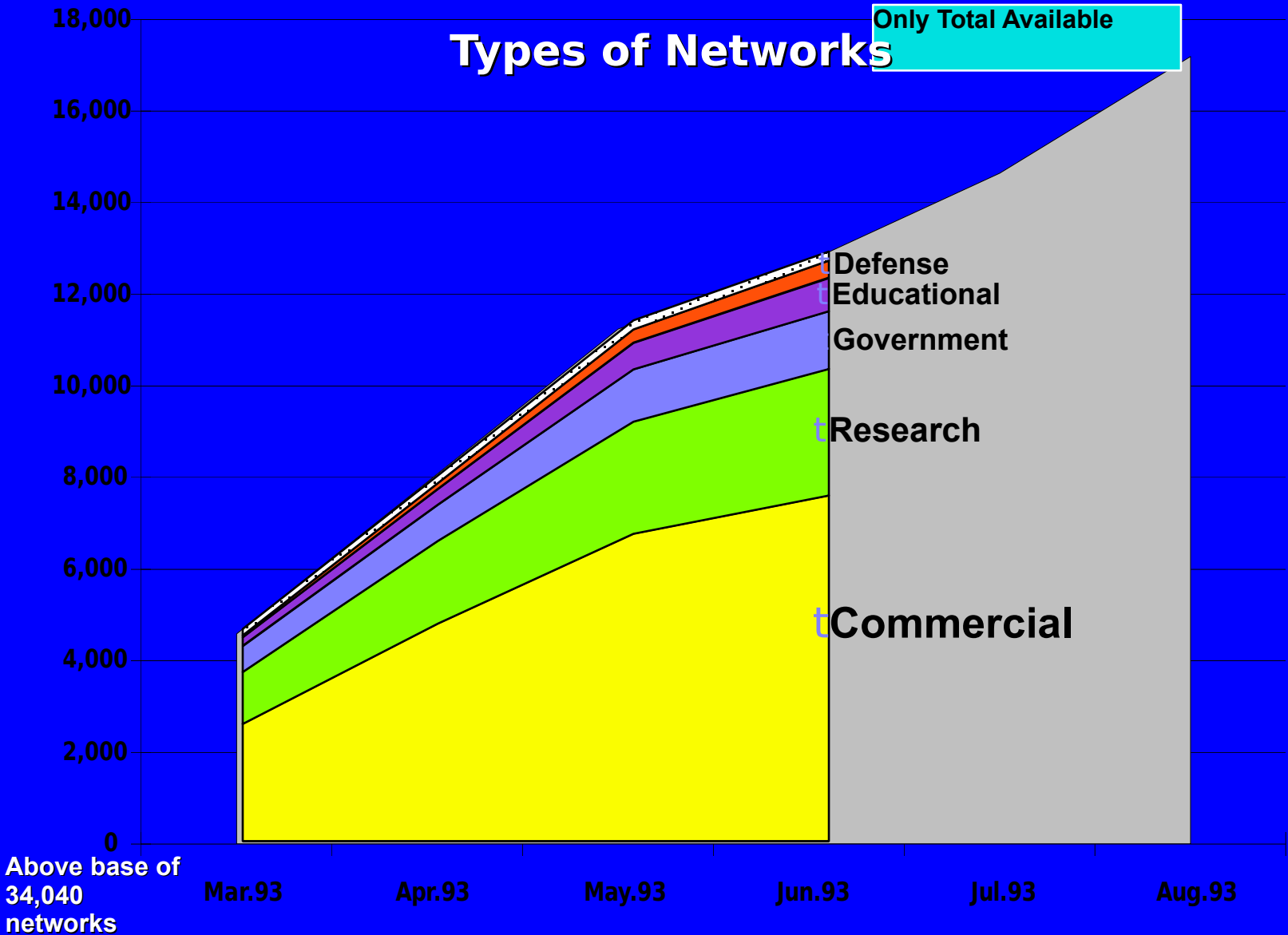
ugrowing at 12 % / month



# Growth in New IP Networks

## 2Q93-3Q93

Number of New Registered Networks



# Current Internet

## Dynamics

### Internet

- u 19,788 (NSFNet 30 Nov 93) plus 10 % ? connected IP internets seen at other backbones
- u 62 IP countries (1 Nov 93)
- u '93 ave growth 7.2% / mo (9.2% /mo non-USA)
- u 2.056 million computer hosts; 28,000 domains (Oct 93)
- u E-mail and other gateways to 137 countries

Government  
7 %

Research (including  
commercial)  
44 %

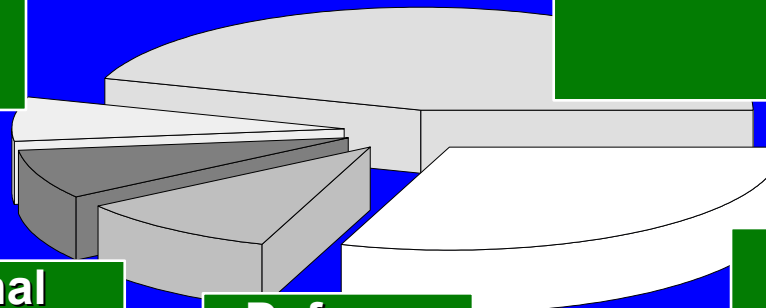
### Internet Networks\*

(2 July 93)

Educational  
8 %

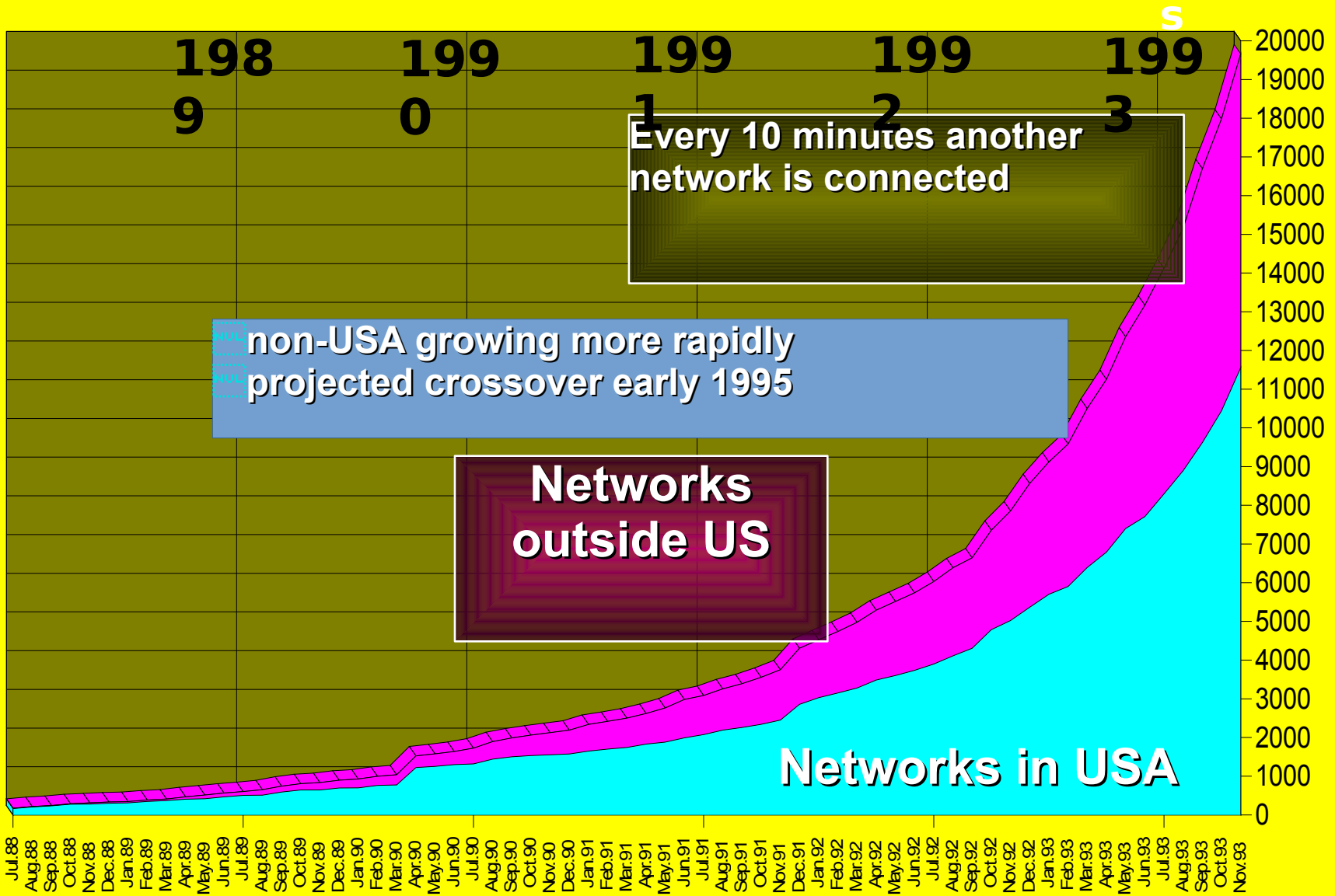
Defense  
10 %

Commercial  
31 %



# Growth of The Internet

Network



1989

1990

1991

1992

1993

Every 10 minutes another network is connected

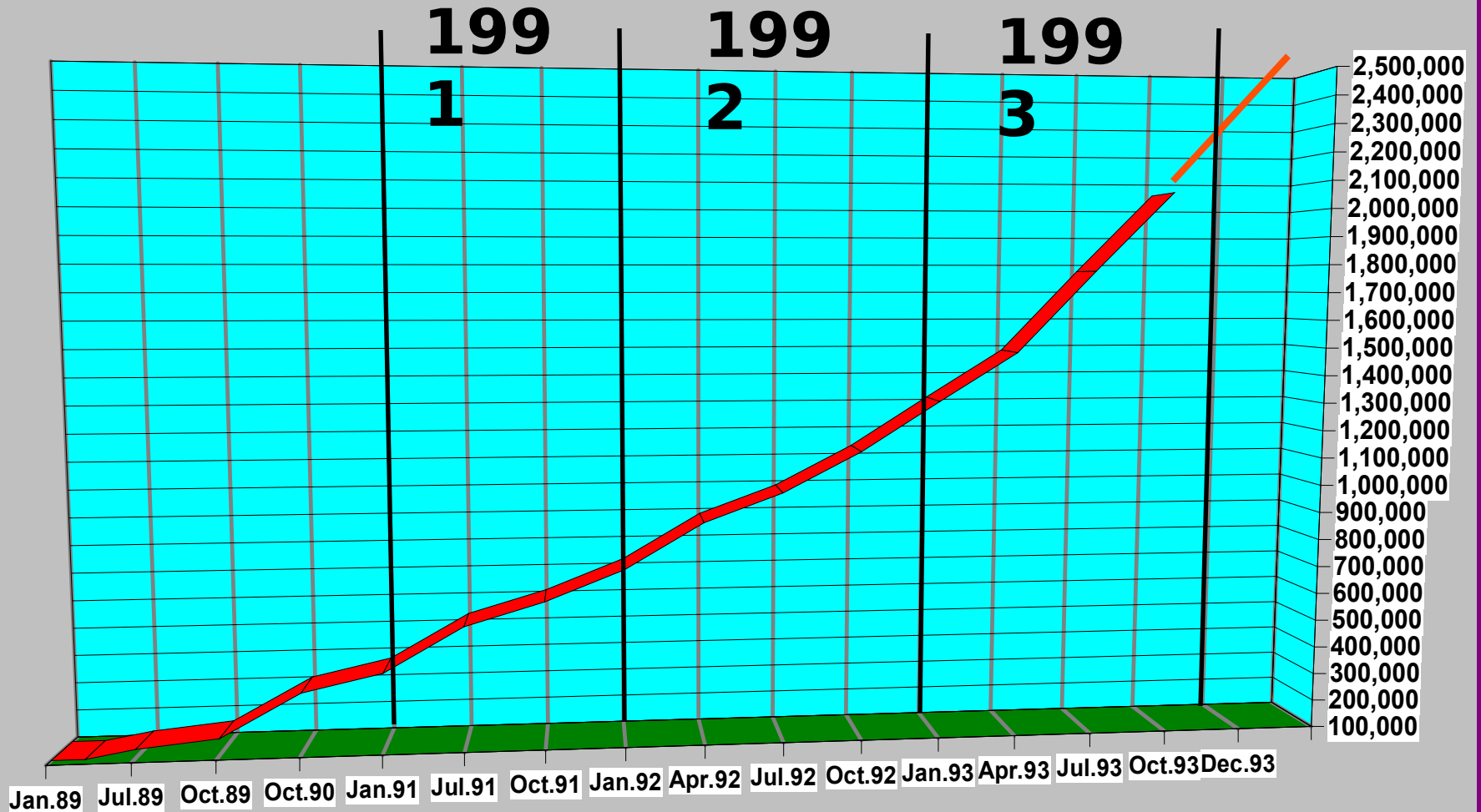
non-USA growing more rapidly  
projected crossover early 1995

Networks outside US

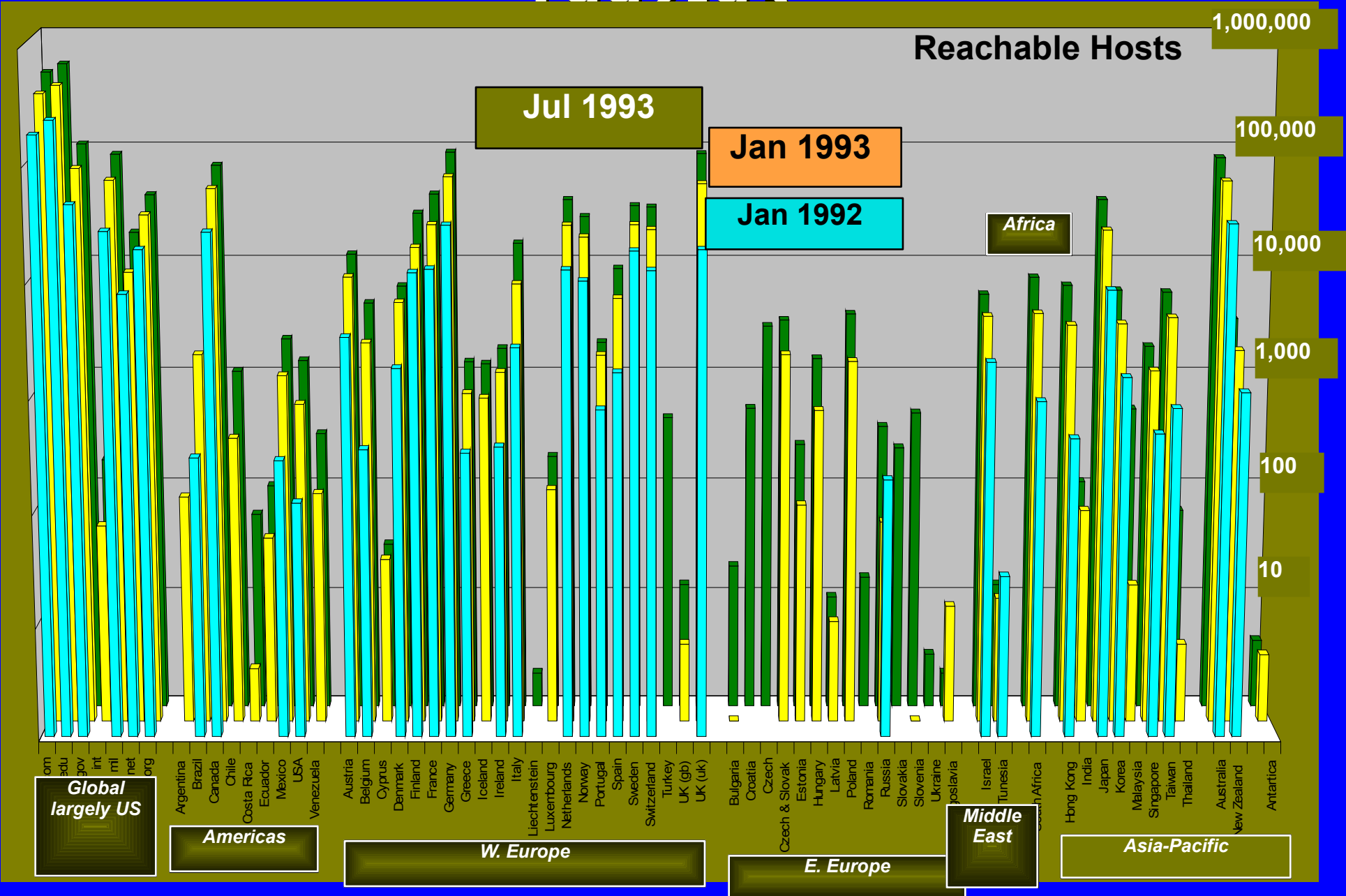
Networks in USA

# Internet Hosts Reachable 1989-1993

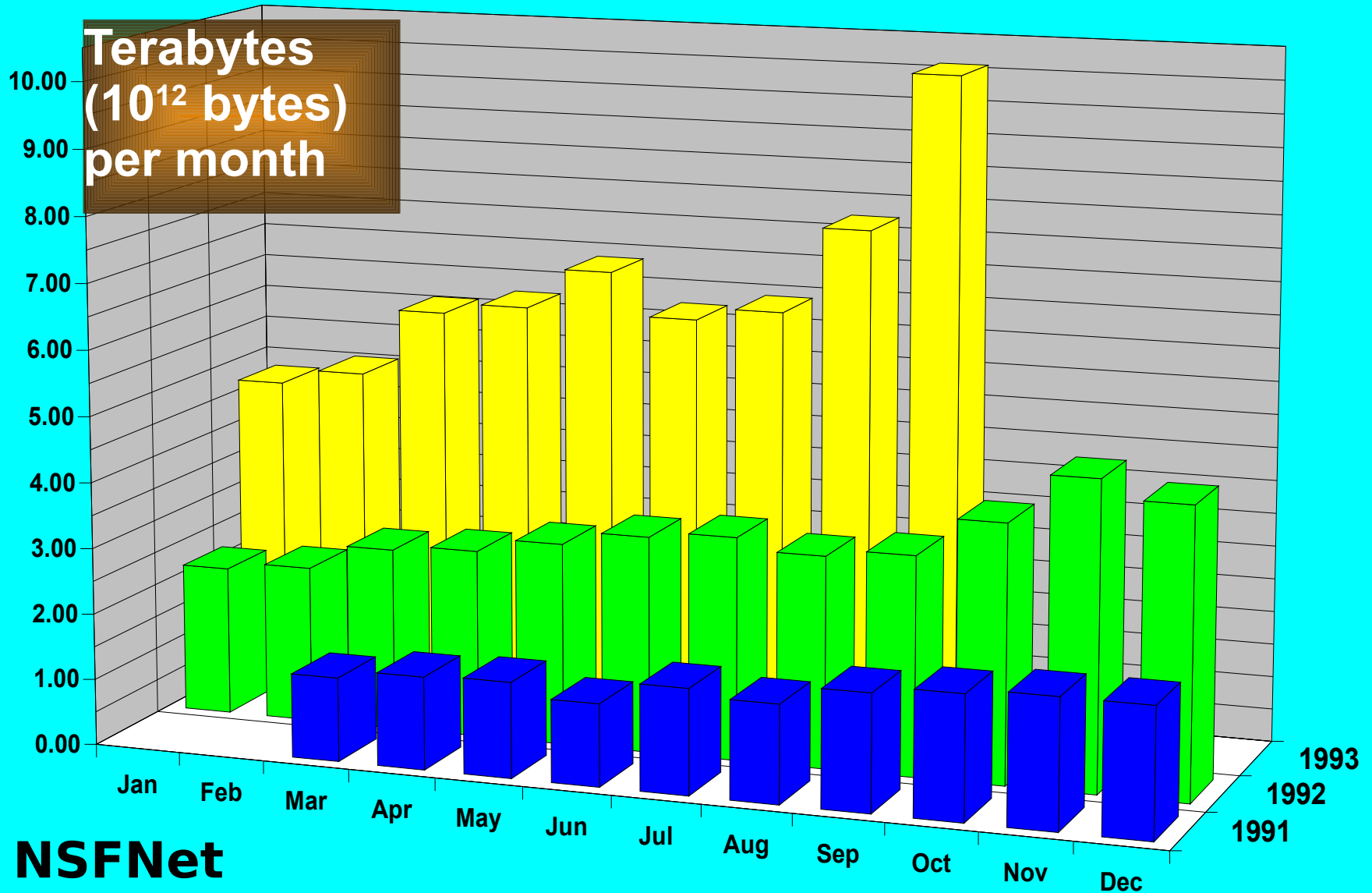
Measured Hosts Reachable



# Global Growth of Internet Hosts in 1992-93



# Traffic on the USA Backbone



**NSFNet  
Statistics**



# Who Uses the Internet ?

**u**Institutions of all kinds - commercial, academic, and government

**u** to allow their staff to collaborate with peers

**u** to rapidly coordinate complex, dispersed worldwide activities

**u** to gather and share information

**u** by interconnecting their enterprise networks via Internet backbone providers

**u**Professional communities of all kinds - especially research and development organizations

**u**Business enterprises which specialize in providing or collecting information

**u**General public via local access providers and gateways to commercial public e-mail carriers and other kinds of networks

# What Is Driving Internet

## Growth?

- u TCP/IP protocols & applications with every workstation - now every computer including PCs
- u Coincided with enterprise internetworking revolution
- u Standards and applications developed by the best standards process in the business
  - Fast
  - User driven and innovative
  - Standards that are proven
  - Rapidly disseminated
- u User costs are very low; but it's not free !
  - "Sender keep all" accounting
  - Inherently low-cost technology
  - Institutional cost sharing
- u Massive global connectivity & professional use
- u Ability to directly reach any computer and process

# Services: Global Information

Allow  
Personal news feeds

## Basic Services

- Remote computer use
- Transferring files
- Email

Allow Personal  
browsing

## Mailing Lists and Bulletin Board Services

- Automated mailing lists
- News distribution

Allow Finding People

## Interactive Information Delivery Services

- Gopher ~ World Wide Web (HTML+)
- Mosaic ~ Cello

Allow Finding  
Information

## Directory Services

- WHOIS ~ Netfind ~ CSO
- X.500 ~ Whois +++

Allow Automated  
Gathering

## Indexing Services

- Archie ~ Veronica
- WAIS ~ online library catalogues

## Active Agents

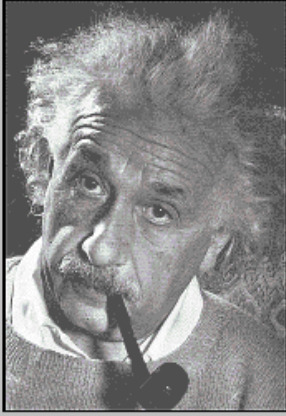
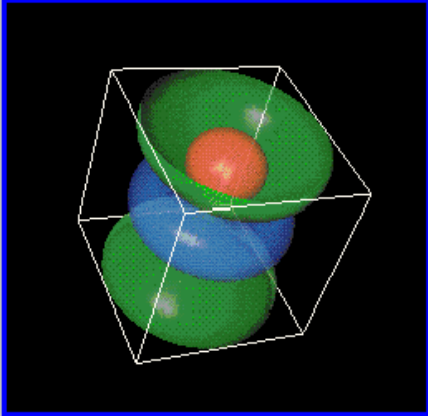
- Knowbots

## Network Management

# Internet "Killer Apps" -

NCSA Mosaic for MS Windows

File Edit Options Navigate Annotate Starting Points Personal Help



## Spacetime Splashes: Catching the Wave in Einstein's Equations

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### Index

- ◆ [The Workbench](#)
  - ◆ [Current setup](#)
  - ◆ [Future](#)
- ◆ [The CAVE Demo](#)
  - ◆ [Physics in a nutshell...](#)
  - ◆ [Inside the CAVE](#)
- ◆ [Credits](#)

### The WorkBench

The Relativity Workbench is a distributed tool for computing solutions to the Einstein Equations through an intuitive [visual user interface](#).

### Current setup

The Workbench is run through (1) a mouse-driven control panel displayed on a workstation that allows the user to select various

NUM

# Emerging: *Mercantilism, Multimedia and Ubiquity*

Allow  
exchange of commercial  
business records

Allow  
property  
transactions

Allow entertainment and  
broadcasting

## Commercial Electronic Data Services

- Bellcore Mercantilism Project
- Educational EDI initiative
- MCC EInet initiative

## Applied Encryption Technology Services

- Signature verification
- "Digicash"
- Copyright protection
- Privacy enhancement

## Multimedia Services

- MIME
- National Public Internet multicasts
- DARTNet Project

## Ubiquitous Connectivity

- Mobile ~ Dialup
- CATV ~ VSAT

# What is the Internet Society?

u The global international organization for open systems internetworking and the *Internet*

u A common mechanism for:

u standards

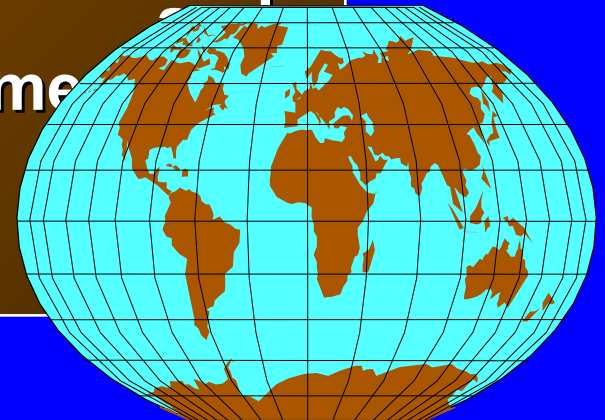
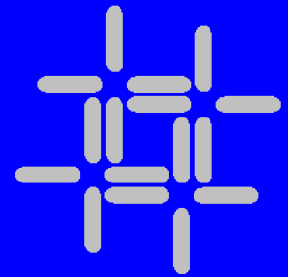
u operational administration

u research coordination

u global cooperation among national, regional, and other international bodies

u An international means for sharing information and encouraging development of internet-related infrastructure and use around the world

u Membership consists of individuals organizations - commercial, government and non-profit



# 2001: Users = Human

## Population?

