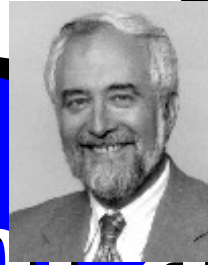


Internet

et

**The Electronic
Superhighway
Telecommunications
Reports**
Washington DC
2 December 1993



**Anthony M.
Rutkowski**

Director, Sprint
Incorporation

For a Revolution
Vice President, Internet
Society

Copyright 1993 A.M. Rutkowski

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

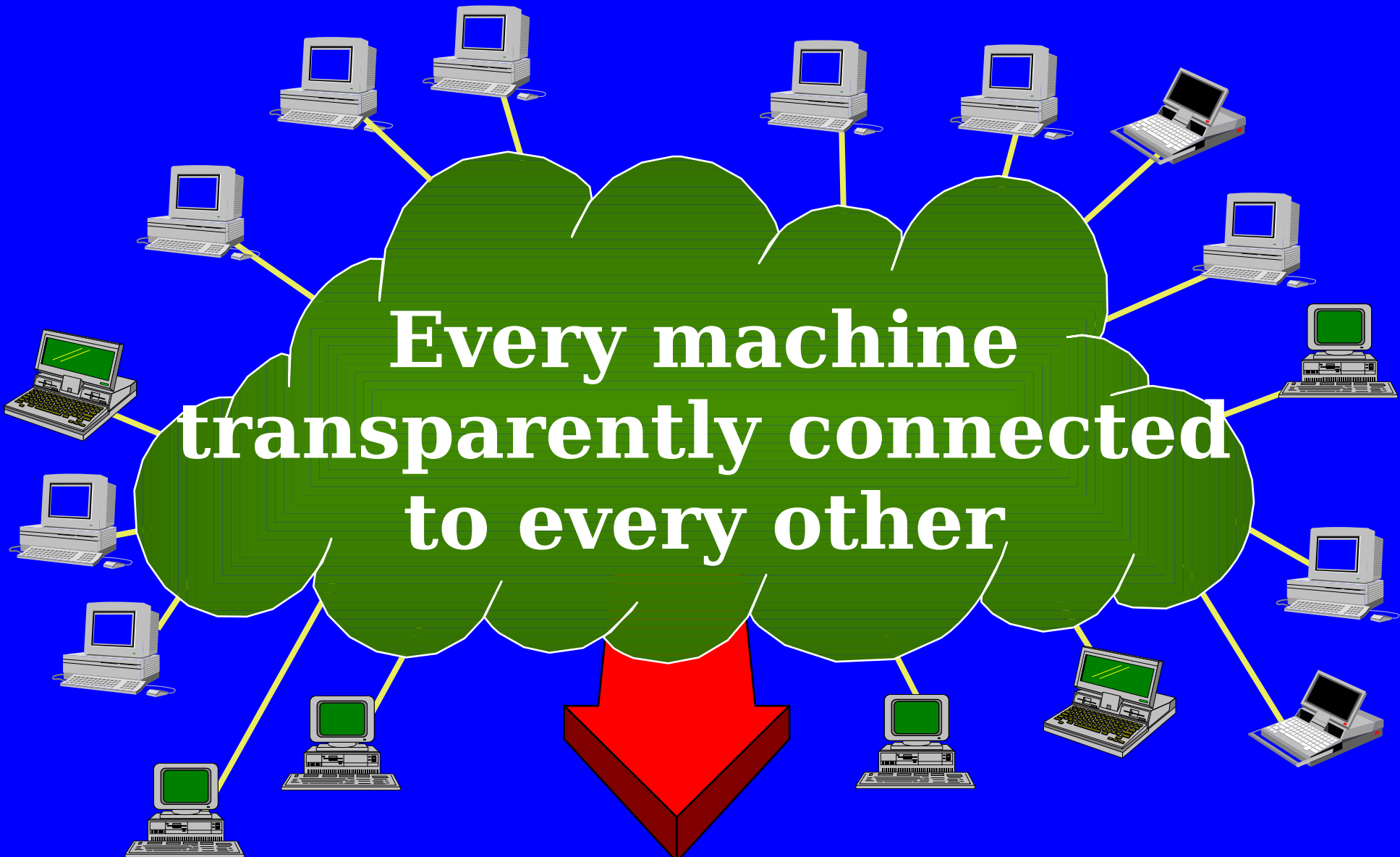
An Internet: A network of networks of computer hosts able to seamlessly communicate - usually through the Internet Protocol (IP) and services

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

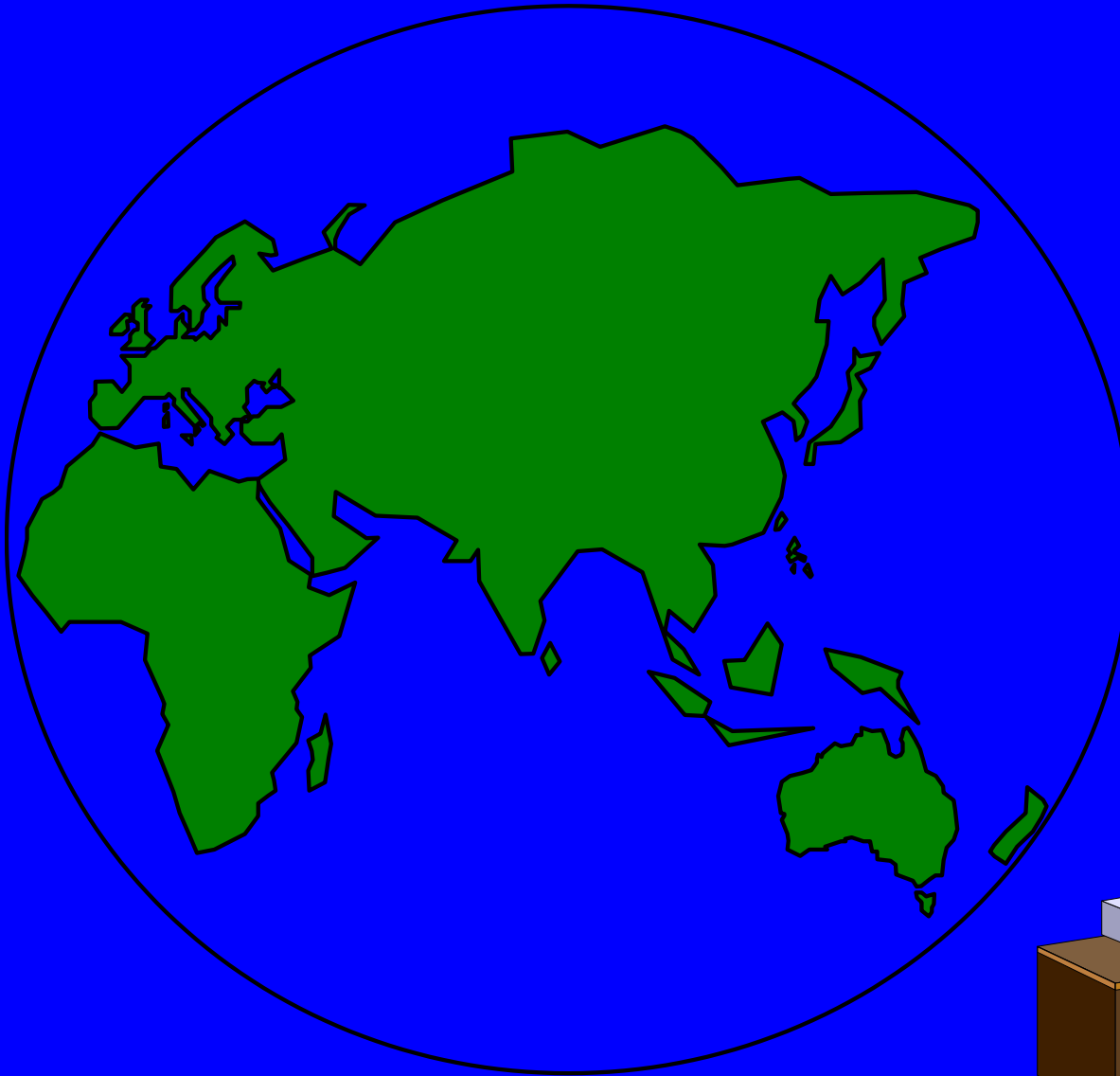
The Enterprise Internet



Every machine
transparently connected
to every other

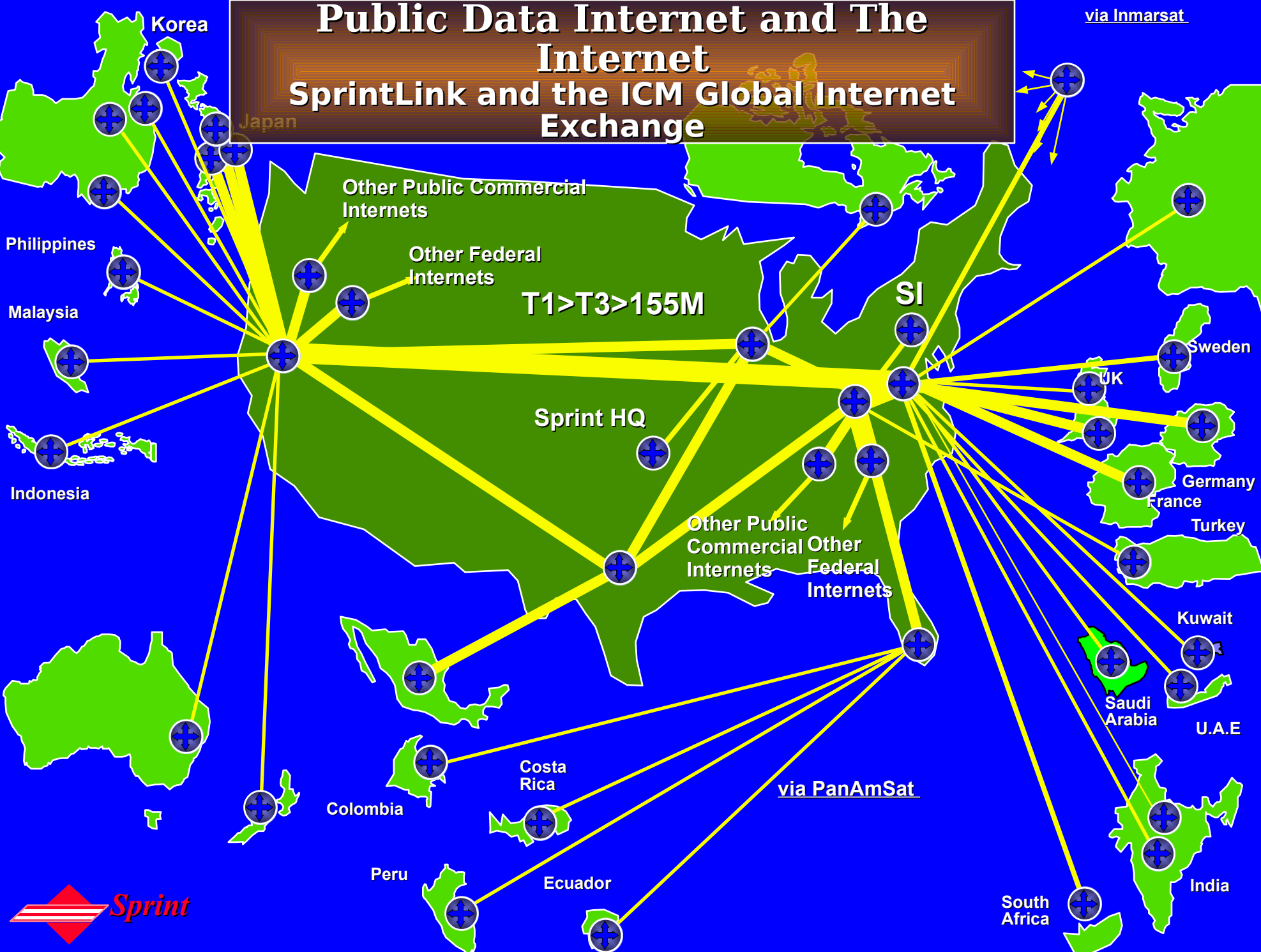
Outside
World

Internet: Directly Reaching 2,056,000 Computers



Public Data Internet and The Internet

SprintLink and the ICM Global Internet Exchange



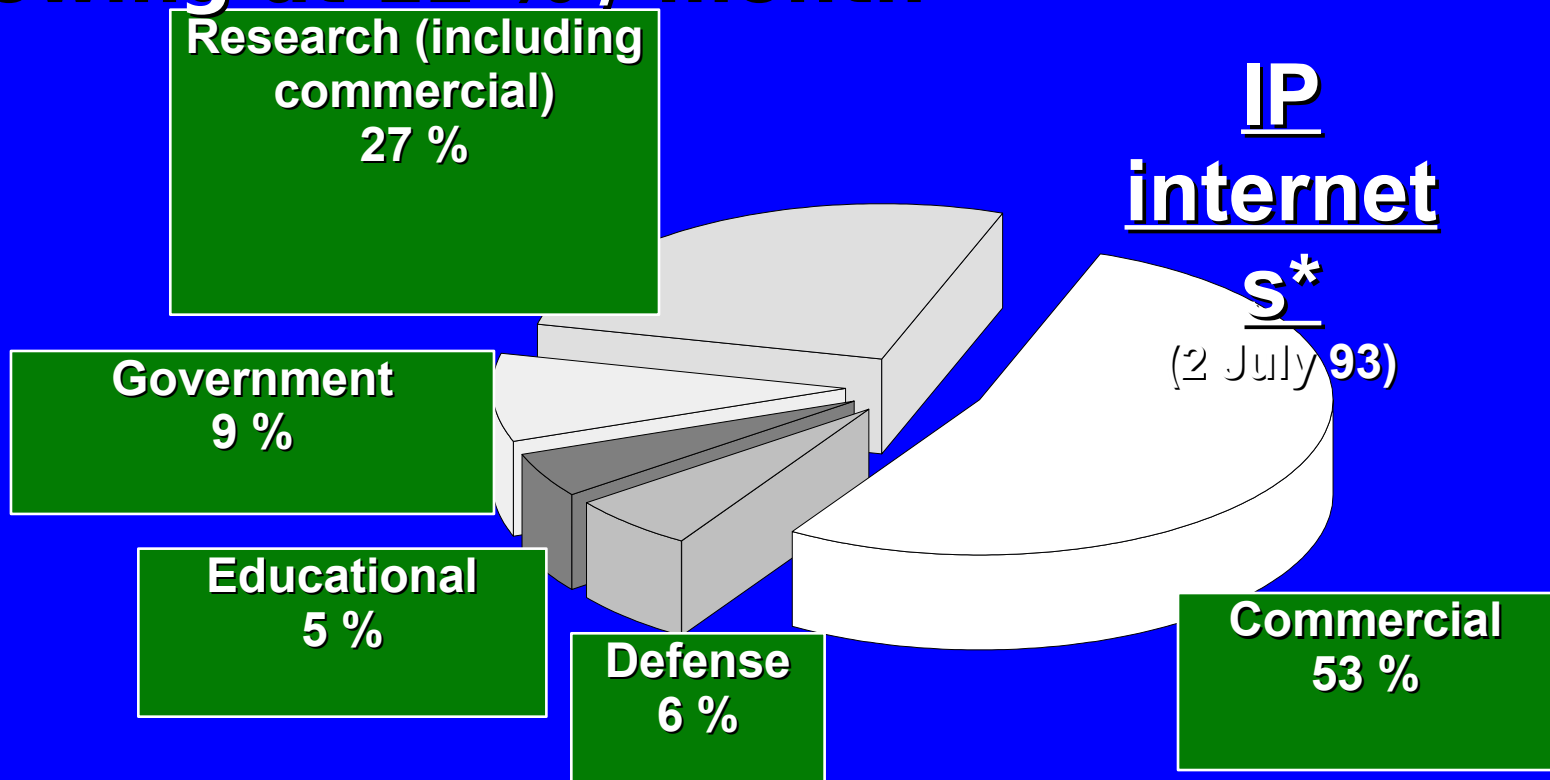
Internets - Current Dynamics

IP internets

u49,018 registered (7 Sep 93)

u92 countries (Sep 93)

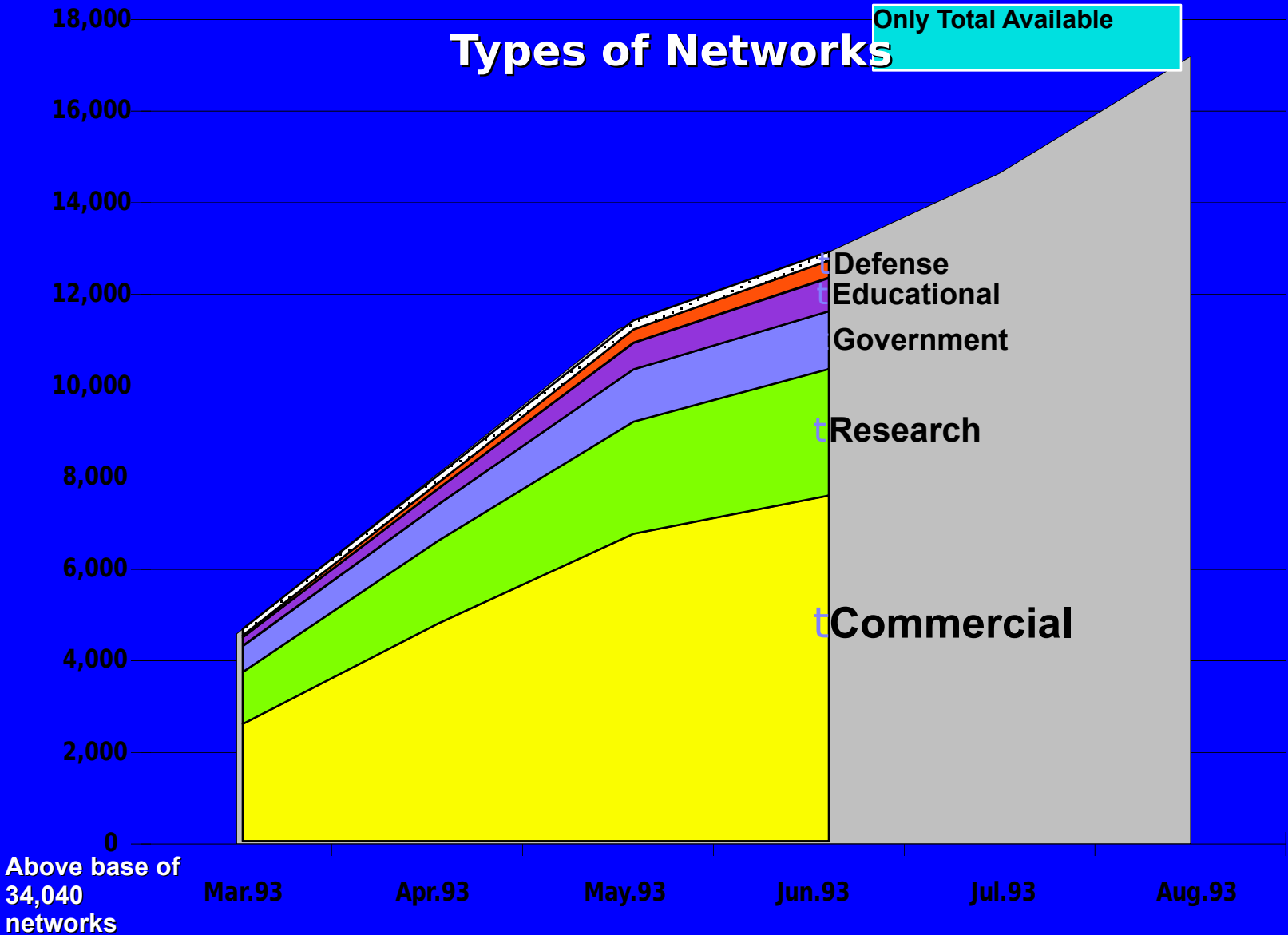
ugrowing at 12 % / month



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 %

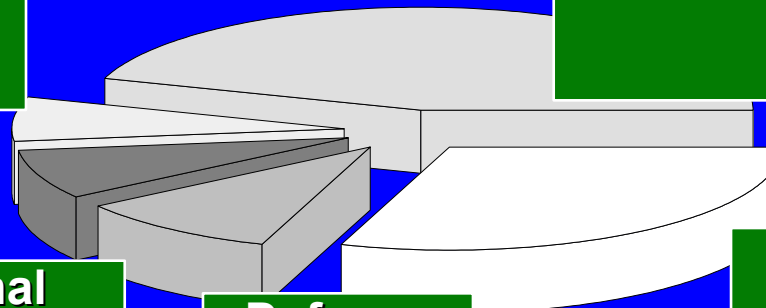
Internet Networks*

(2 July 93)

Educational
8 %

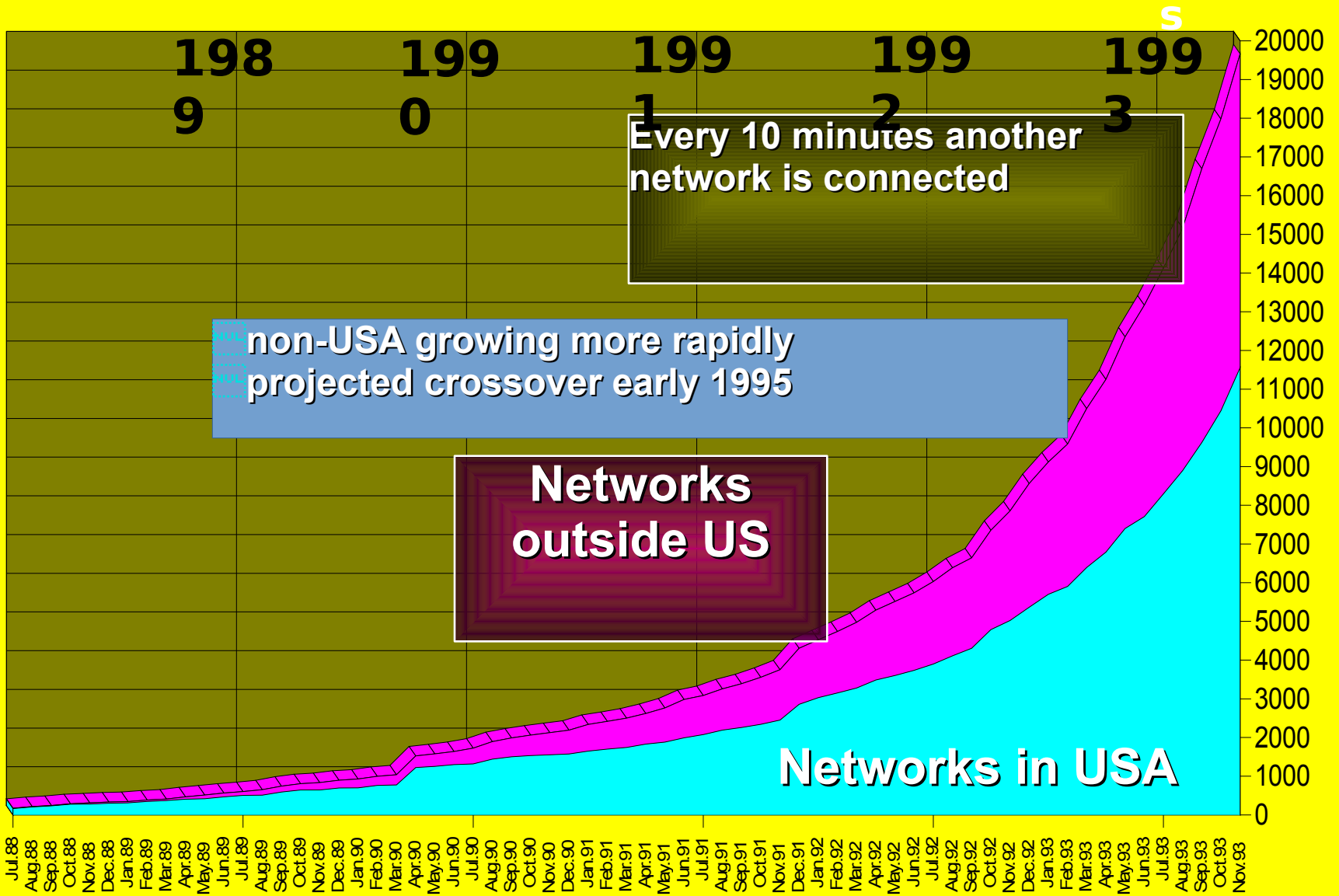
Defense
10 %

Commercial
31 %



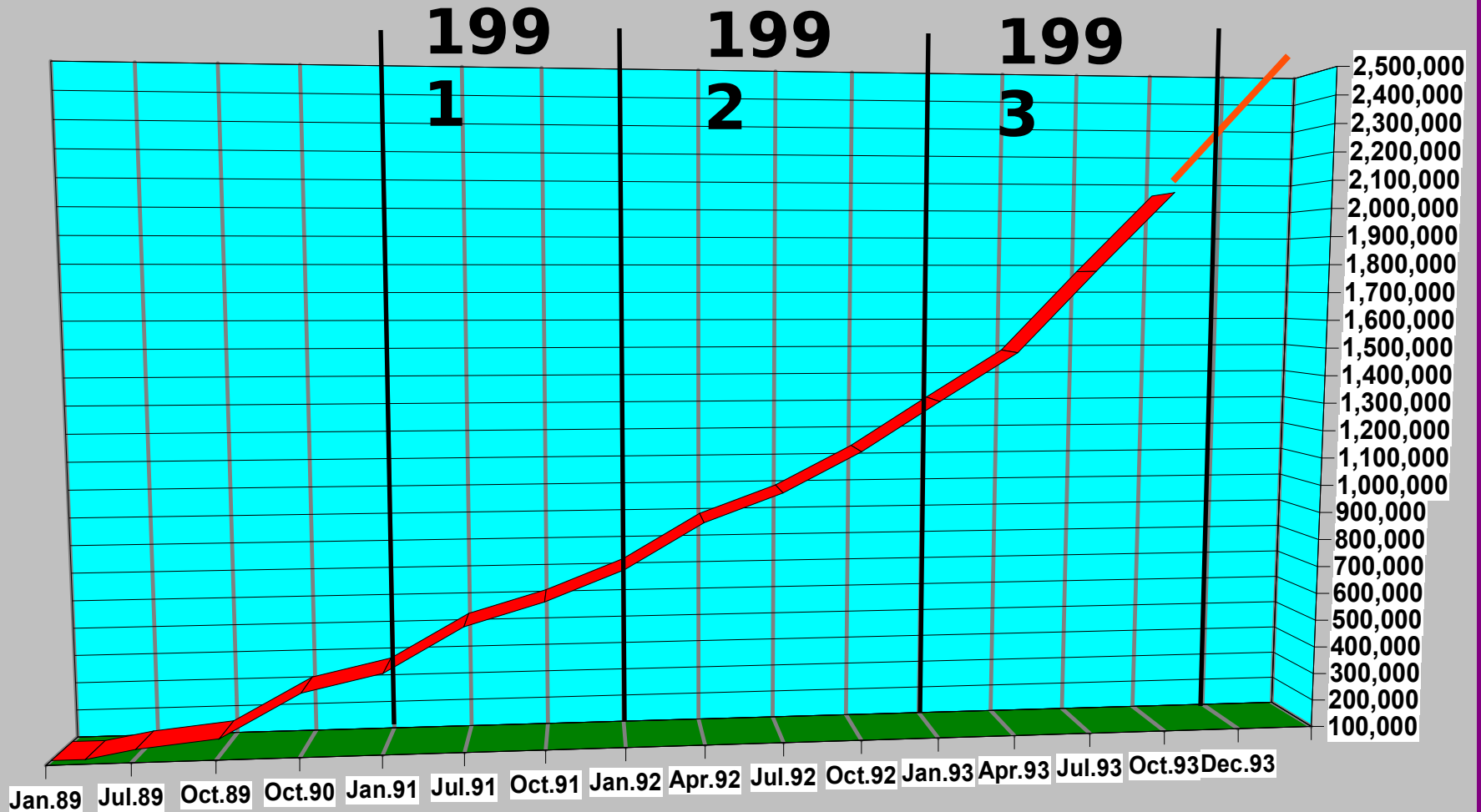
Growth of The Internet

Network

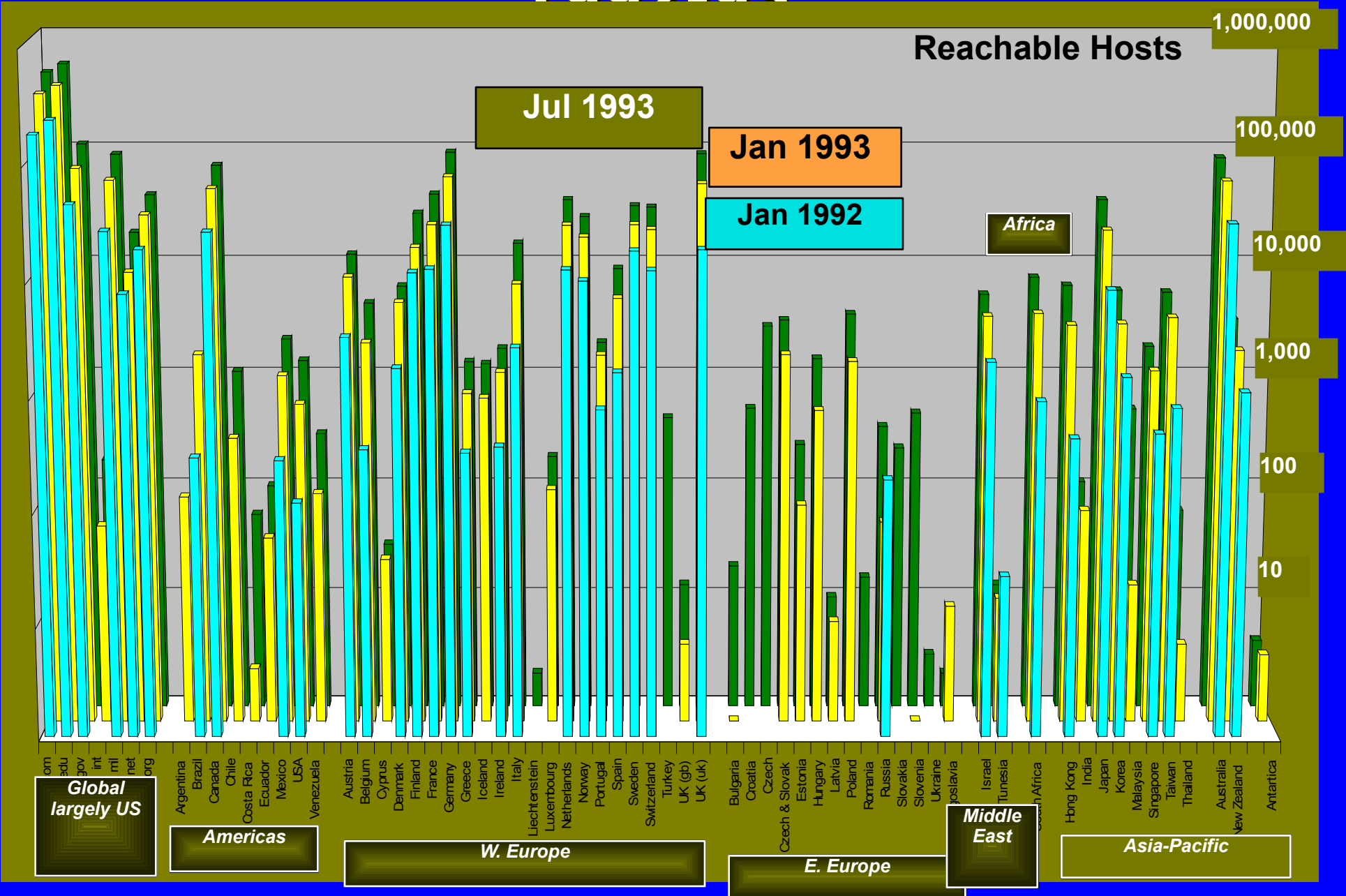


Internet Hosts Reachable 1989-1993

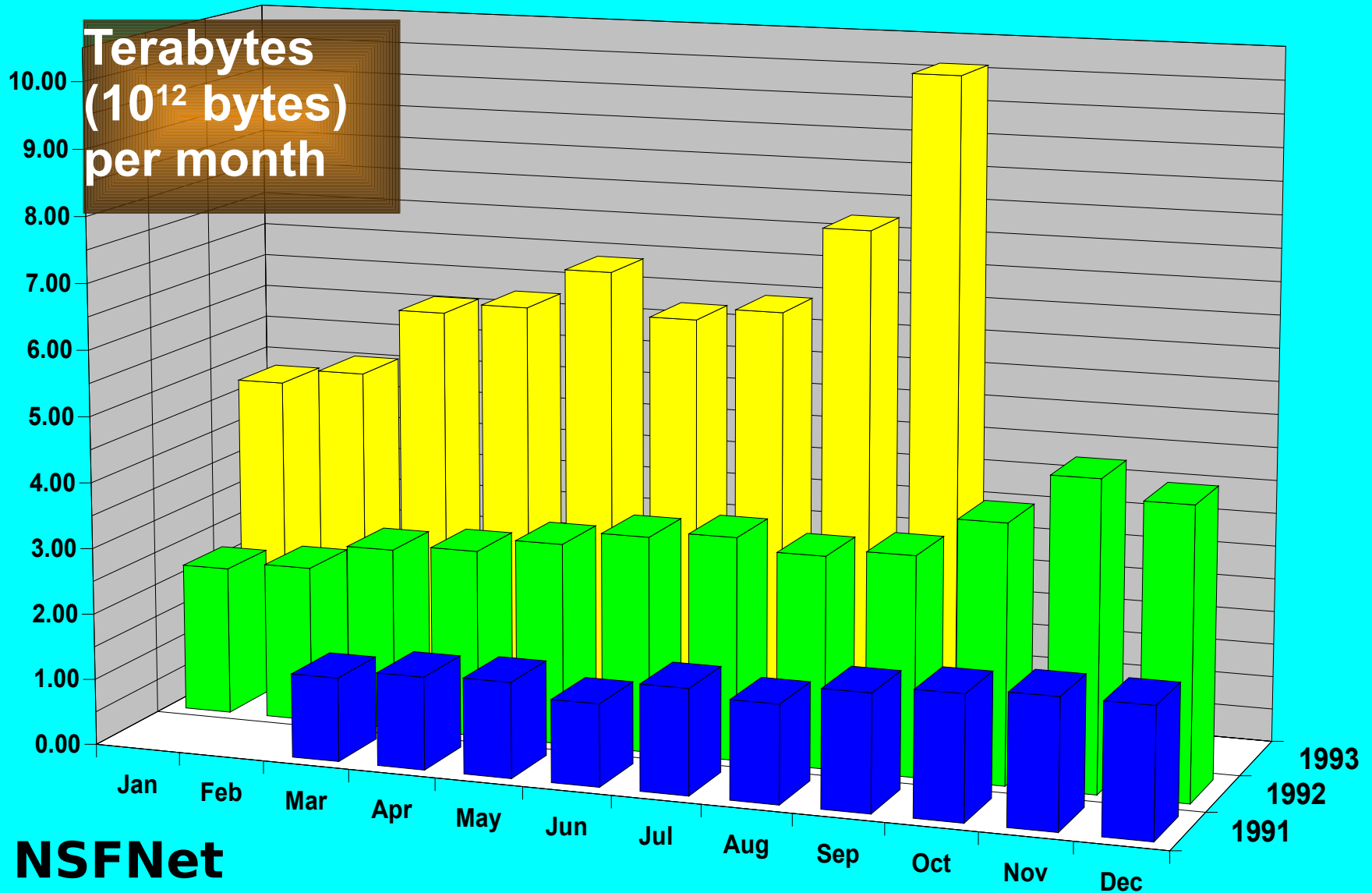
Measured Hosts Reachable



Global Growth of Internet Hosts in 1992-93



Traffic on the USA Backbone



**NSFNet
Statistics**

Who Uses the Internet ?

uInstitutions 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

uProfessional communities of all kinds - especially research and development organizations

uBusiness enterprises which specialize in providing or collecting information

uGeneral 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

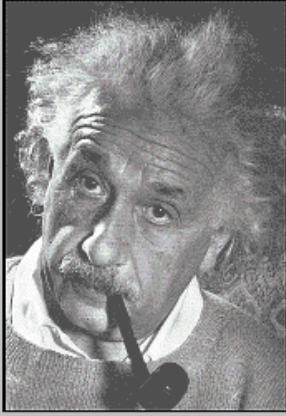
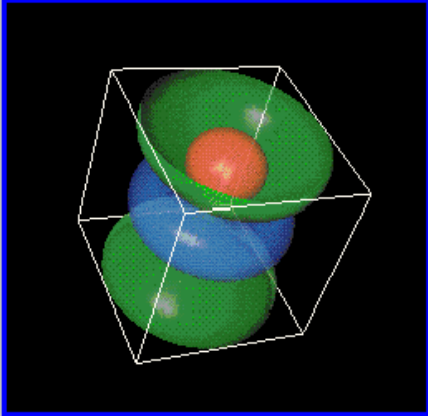
- Knowbots

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

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

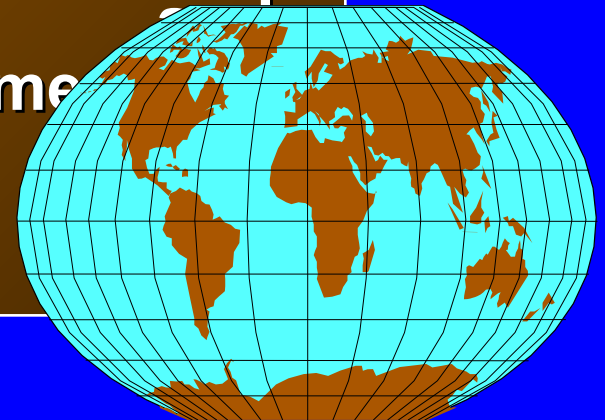
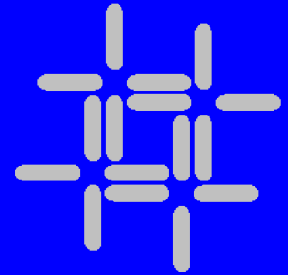
u operational administration

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?

