National Research & Education Network

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NASA

High Performance Computing & Communications

GOALS: STRATEGIC PRIORITIES

- Extend U.S. technological leadership in high performance computing and computer communications
- Provide wide dissemination and applicatin of the technologies both to speed the pace of innovation and to serve the national economy, national security, education, and the global environment.
- Spur gains in U.S. productivity and industrial competitiveness by making high performance computing and networking technologies an integral part of the design and production process.

High Performance Computing & Communications

STRATEGY: INTEGRATING PRIORITIES

Support solutions to important scientific and technical challenges through a vigorous R & D effort

Reduce the uncertainties to industry for R&D and use of this technology through increased cooperation between government, industry, and universities and by the continued use of government and government-funded facilities as a prototype user for early commercial HPCC products.

Support the underlying research, network, and computational infrastructures on which UI.S. high performance computing technology is based.

Support the U.S. human resource base to meet the needs of industry, universities, and government.

High Performance Computing & Communications

PROGRAM COMPONENTS

High Performance Computing Systems (HPCS)

- 1000-fold increase in computing power

Advanced Software Technology and Algorithms (ASTA)

- Grand Challanges applications

National Research and Education Network (NREN)

- R&D and wide-area gigabit communications

Basic Research and Human Resources (BRHR)

- Infrastructure, training, education

High Performance Computing & Communications

NREN 5-YEAR IMPLEMENTATION

- Interconnect Agency networks with 1.5 mbps backbone
- Upgrade multi-Agency backbone to 45 mbps
- Perform R&D to achieve 3 gbps networking capability

MULTI-AGENCY PROGRAM

- NSF, DARPA, DOE, NASA; also NIST, HHS, NOAA & EPA

NREN Program Relationships

The HPCC agencies (NSF, DARPA, DOE & NASA) have demonstrated close collaboration in their networking activities, and they are developing more formal structures for the close coordination needed to ensure success of the NREN.

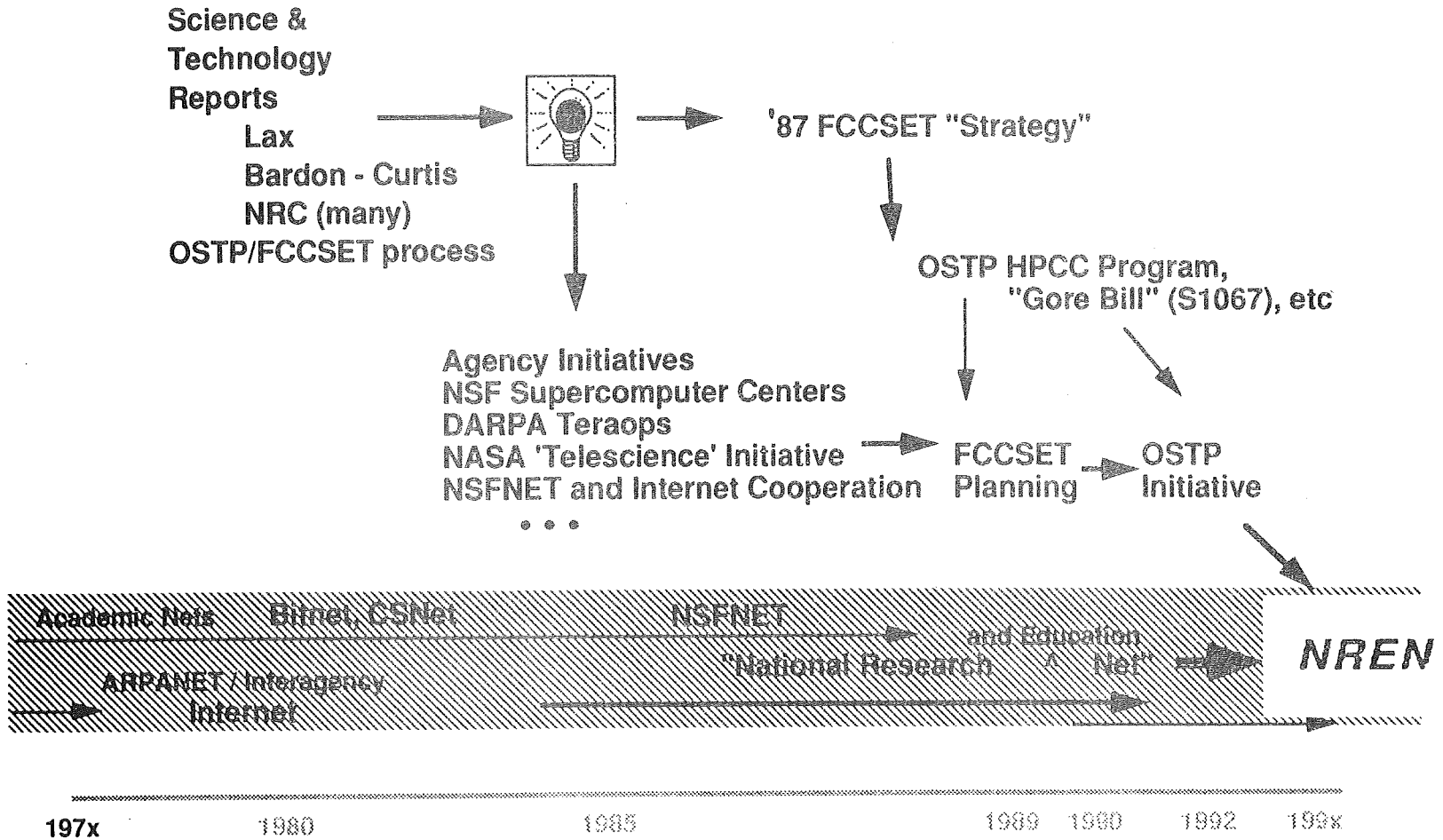
- **DARPA will coordinate gigabit network technology research and development activities in which DARPA, DOE, NASA, NIST, and NSF will participate.**
- **NSF will coordinate the broad deployment of the NREN by working with all participating HPCC agencies through formal structures, such as the FCCSET subcommittees and the Federal Network Council.**
- **In conjunction with the other HPCC agencies, NIST will identify and develop network and security standards.**

The HPCC Program

OSTP-FCCSET 1989

1. High Performance Computers	research on future generations system design tools advanced prototype development evaluation of early systems
2. Software and Algorithms	grand challenge problems SW components and tools computational techniques HPC research centers
3. National Research and Education Network	interim NREN gigabit networking research & deployment transition to commercial service
4. Basic Research and Human Resources	instrumentation and lab improvement education and training basic CS & CE research

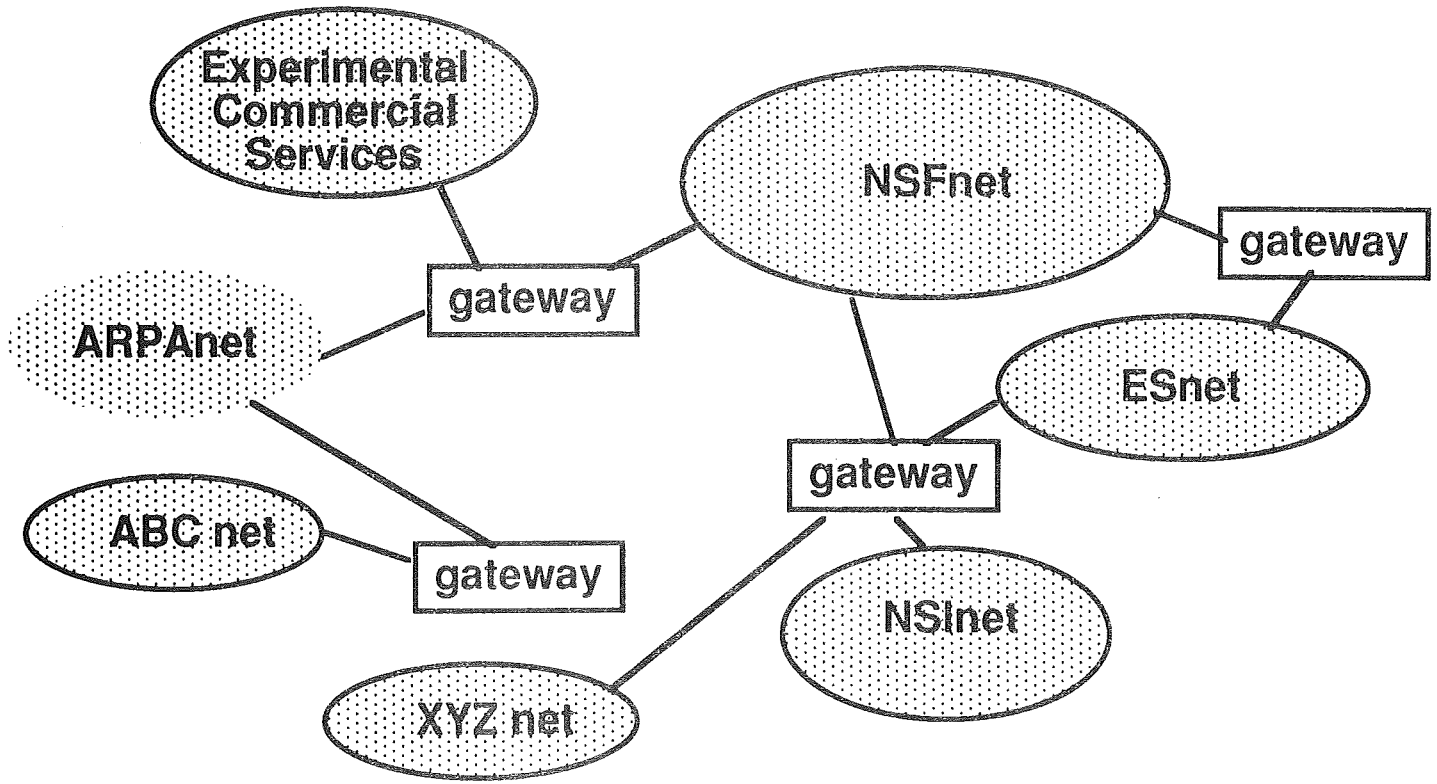
A Brief History of HPCC

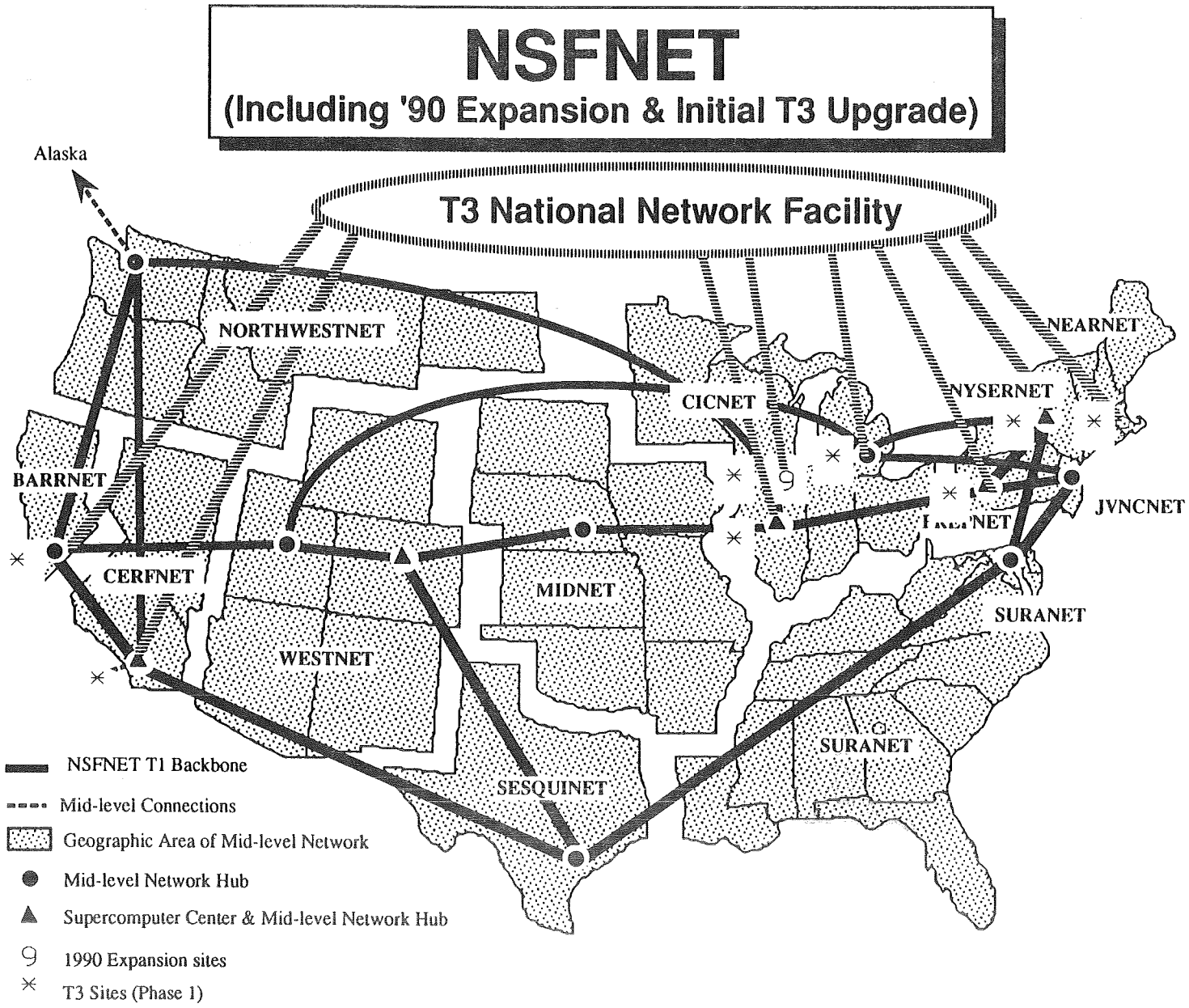


HPCC Agency Leads

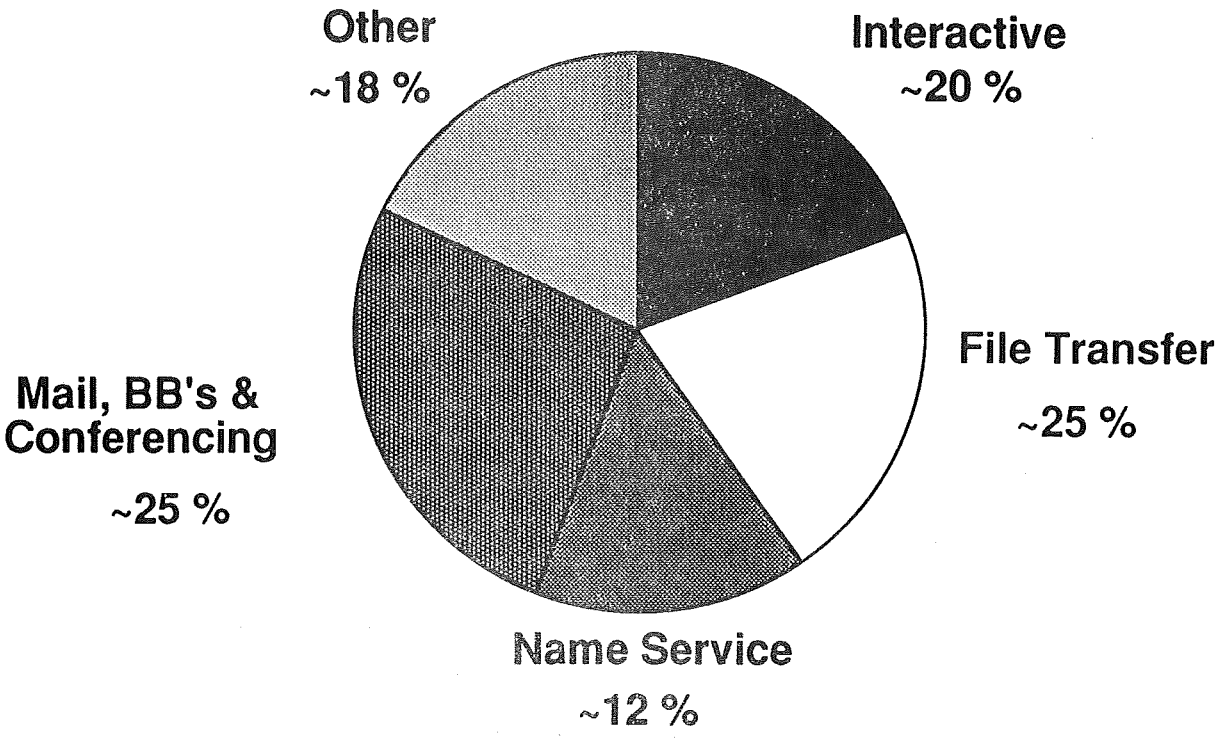
Activity \ Agency	DARPA	DOE	NASA	NSF
HPC Systems	Parallel Systems; Systems Software Microsystems	Application Testbeds; Systems Evaluation	Application Testbeds; Systems Evaluation	Basic Architecture Research
Advanced Software and Algorithms	Software Tools; Parallel Algorithms	Software Tools; Parallel Algorithms; Access Centers	Software Coordination Visualization Data Management	Software Tools; Database Research Access Centers
National Research & Education Network	Gigabit Research	Network Interconnect	Network Interconnect	Interim , NREN Deployment
Basic Research & EHR	Universities; Industry	Universities; National Labs	Universities; Institutes & Centers	Universities; Research Centers

The Present Internet



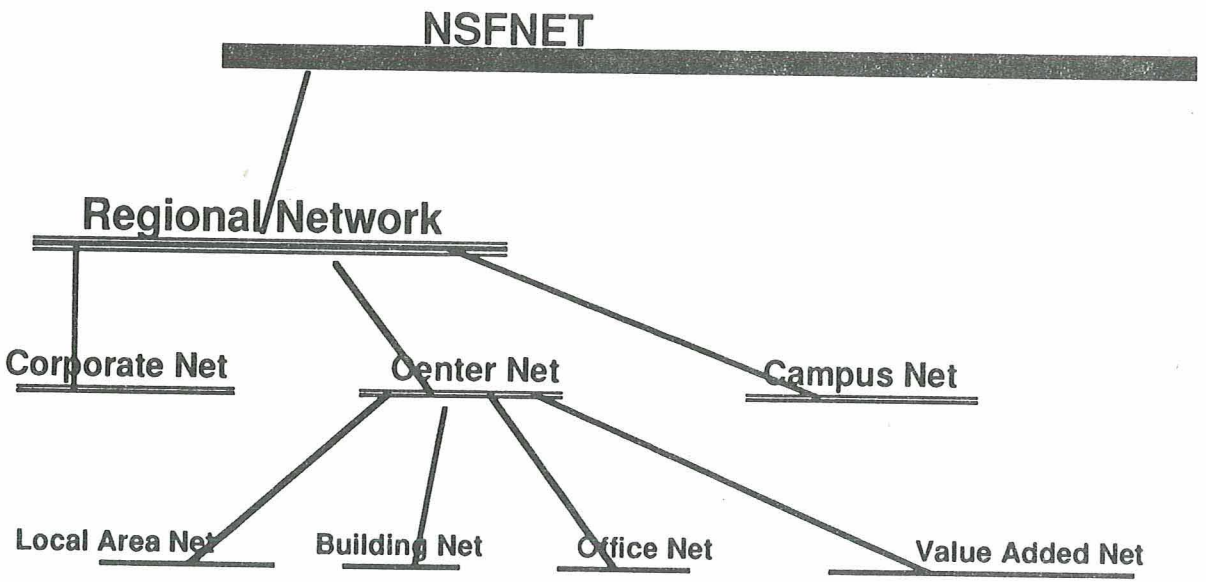

NSFNET
(Including '90 Expansion & Initial T3 Upgrade)
Alaska
T3 National Network Facility
NORTHWESTNET
NEARNET
CICNET
NYSERNET
BARRNET
JVNCNET
CERFNET
MIDNET
SURANET
WESTNET
SURANET
SESQUINET
NSFNET T1 Backbone
Mid-level Connections
Geographic Area of Mid-level Network
Mid-level Network Hub
Supercomputer Center & Mid-level Network Hub
1990 Expansion sites
T3 Sites (Phase 1)

NSFNET Traffic Mix*



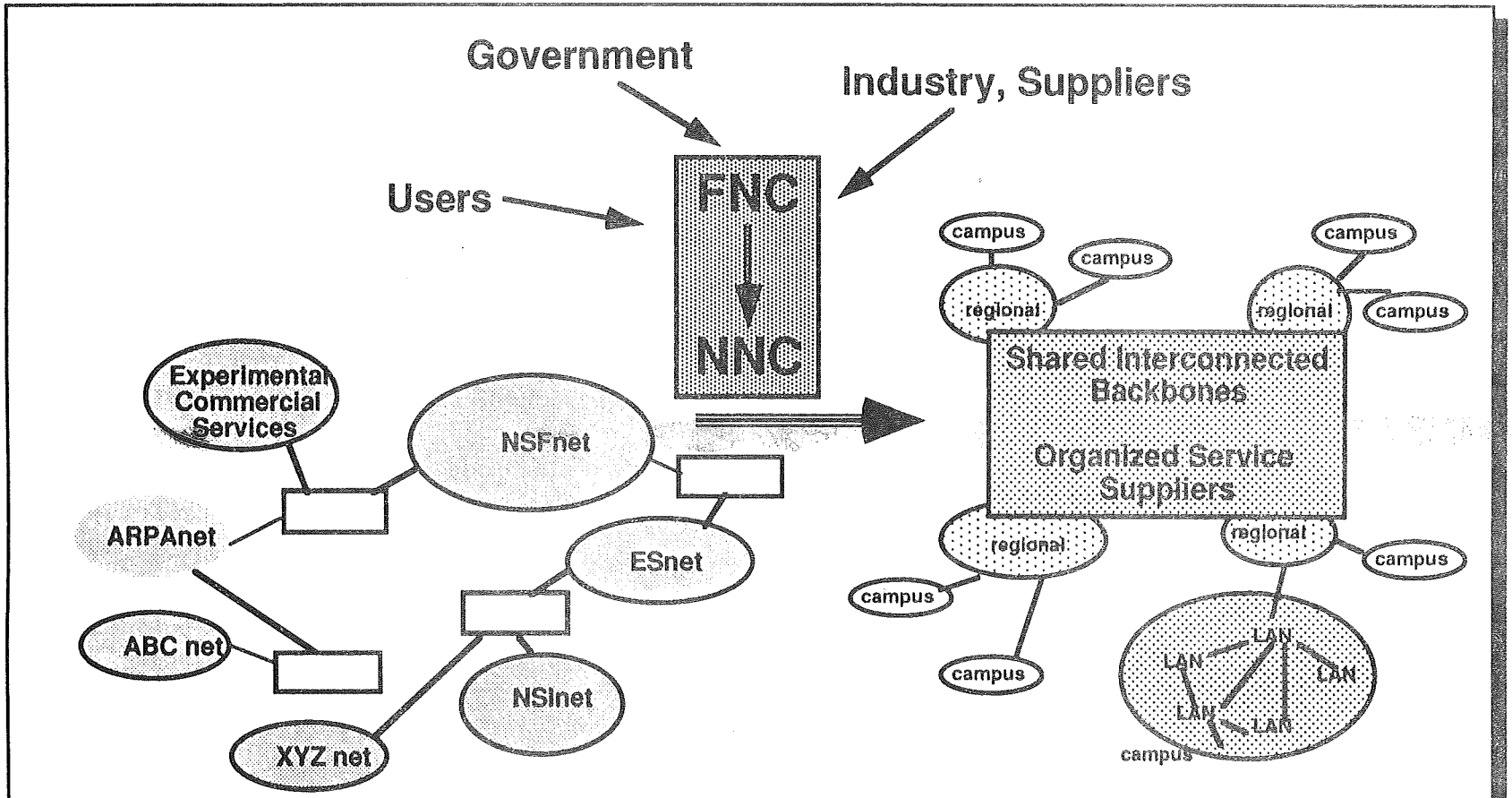
* All estimates ± ~2%

National Network Hierarchy



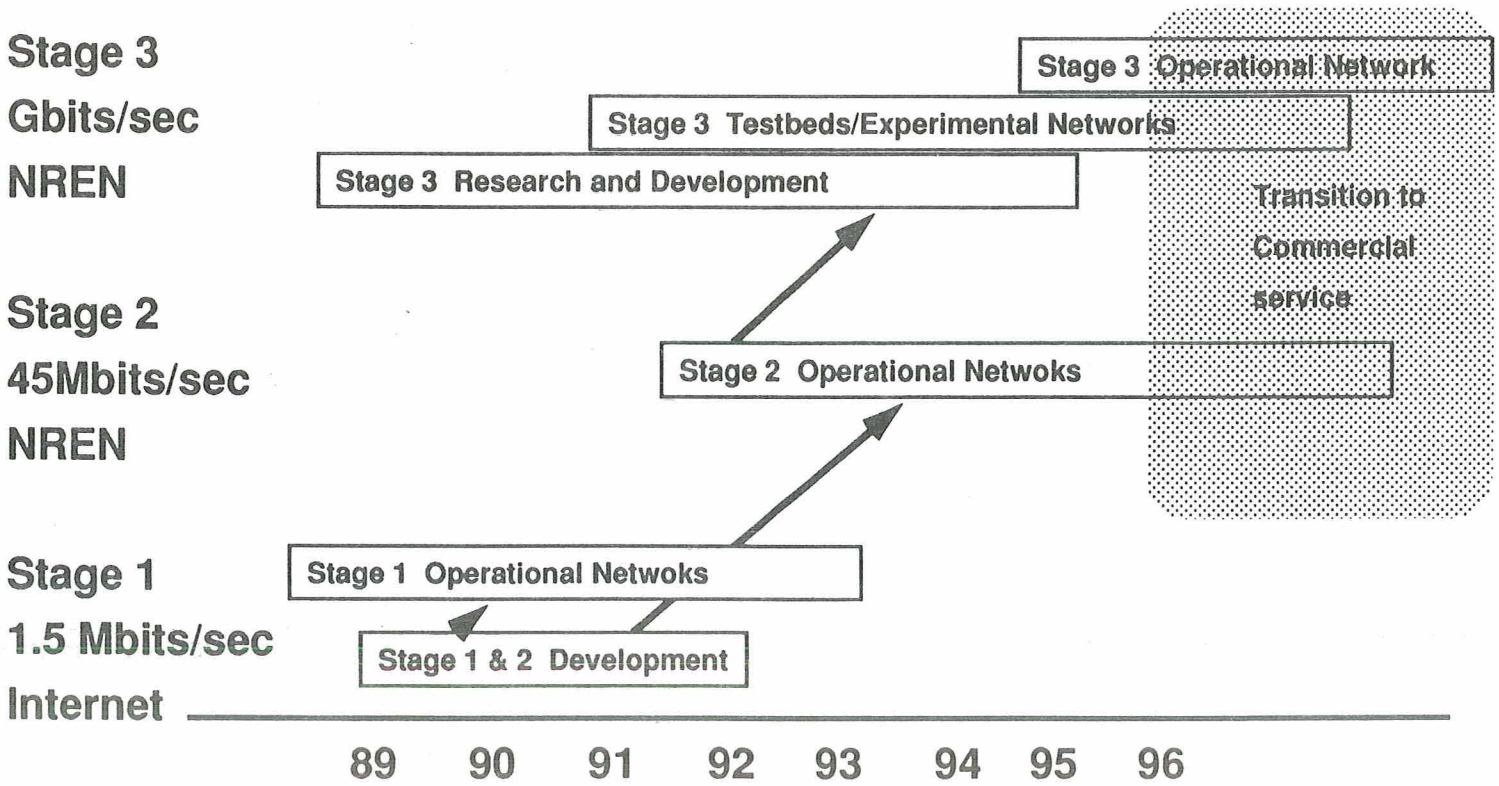
USERS
(electronic mail, file transfer, logon, etc.)

Technical Approach to NREN

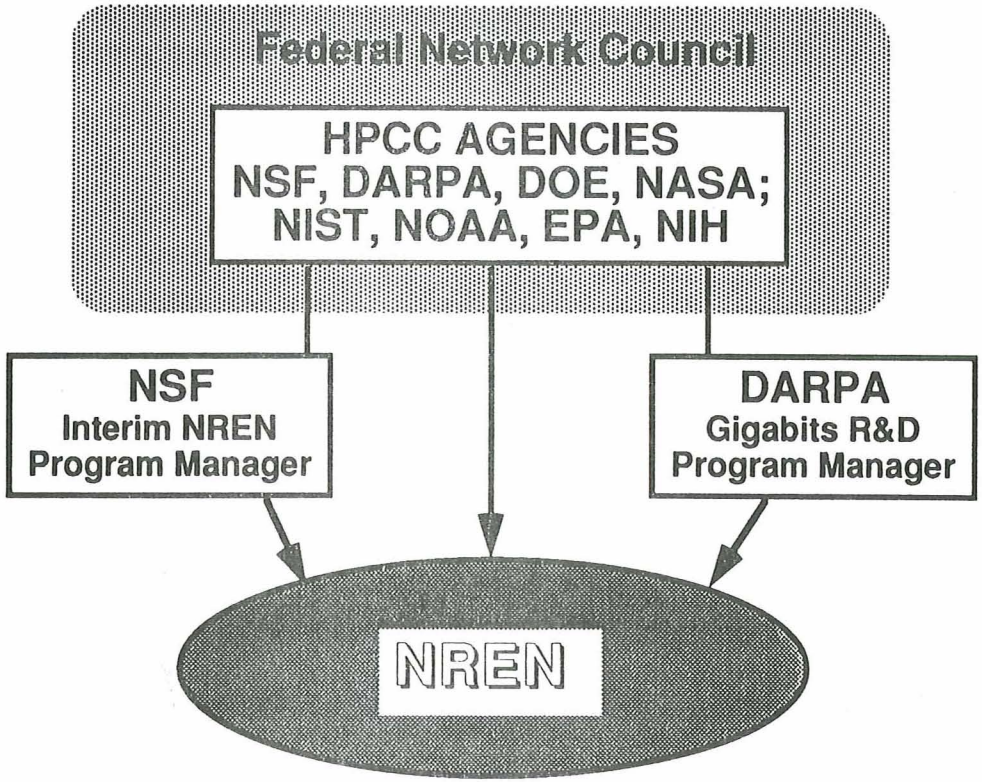


IF NREN IS FUNDED, THE INTERNET WILL EVOLVE TO NREN

Initial NREN Implementation Plan



Management Approach to NREN

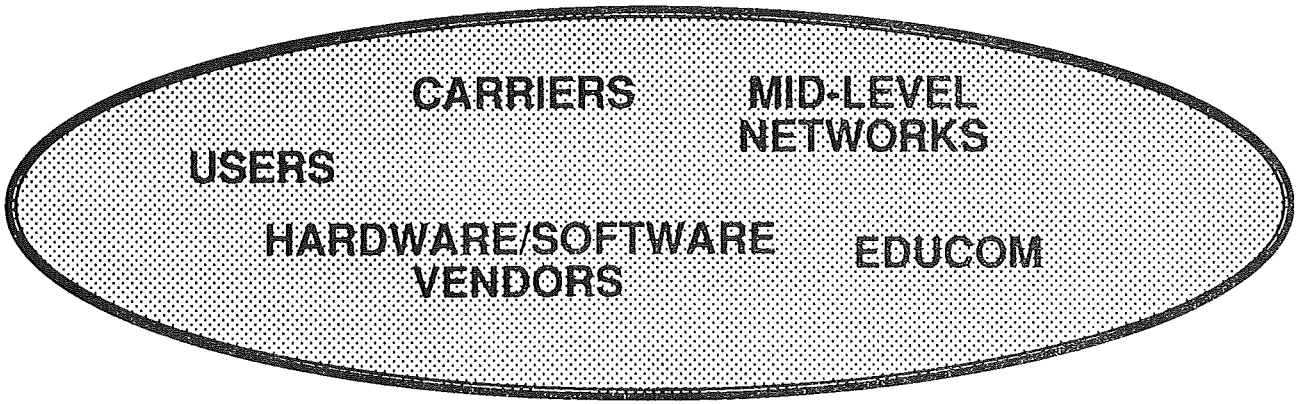


FEDERAL NETWORK COUNCIL
(Charter)

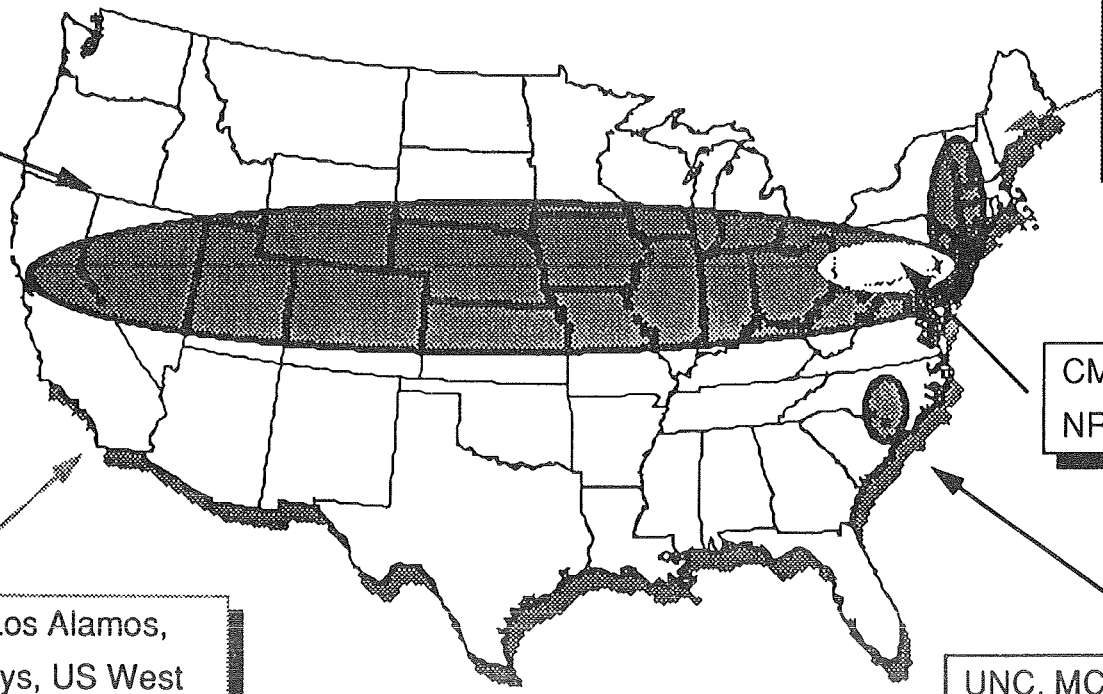
- FORMED by FCCSET Network SubCommittee Chair (Jan, 1990)
- PURPOSE: to establish an effective interagency forum and long-term strategy to oversee the operation and evolution of the Internet and other national computer networks in support of research and education.
- FNC will coordinate with FCCSET to ensure national alignment.
- WORKING GROUPS will be established to support the FNC; members will be limited to Federal employees, Government contractors/grantees, or members of Federal advisory groups.
- FNC will meet at least 4 times per year.

FNC Advisory Committee

FNC, coordinating with OSTP, will establish a charter and formal Advisory Committee representing industry and academia and the national user community; this Advisory Committee will work closely with the FNC to provide guidance in developing the NREN.



Industry-University-Government High Speed Network Research Testbeds



UC Berkeley,
LBL, U Wisc,
NCSA,
ATT Bell Labs,
Ameritech,
Bell Atlantic,
ATT, Pac Tel,
US West

MIT, U Penn,
Bellcore, IBM,
Bell Atlantic,
MCI, NYNEX

CMU, PSC,
NRL, Bell Atlantic

SDSC, Cal Tech,Los Alamos,
MCI, Pacific Telesys, US West

UNC, MCNC,
Bell South, GTE

Note: see special report on "GIGABIT NETWORK TESTBEDS",COMPUTER, V.23 N.9, September, 1990, IEEE Computer Society, Los Alamitos CA 90720