Security Challenges of the NGI

NIH IT Security Conference

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Outline

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- NGI Program Goals
- Goal 1 : Technologies and security challenges
- Goal 2 : Testbeds and security challenges
- Goal 3 : Applications and security challenges
- NIH Application Security Issues
- NIH Security Challenges
- NGI Workshop and identified Security Issues
- Miscellaneous NGI information

NGI CURSE

MAY YOU LIVE IN

INTERESTING TIMES

Points to Remember

- **Nothing is ever fully secure**
- **Really skilled attacks go undetected**
- **Firewalls can be your Maginot Line**
- **More control by the user will mean more security challenges**
- **NGI exacerbates Internet security challenges**
- **SECURITY is HARD to SELL**

NGI Program Goals

- **New technologies and services**: sponsor research and development in new networking technologies and services in support of the high performance applications requirements
- **Testbed(s):** build a high performance network infrastructure in support of both network research and science applications research
- **Applications**: support demonstration of next generation applications requiring advanced networking technologies

GOAL 1: Technologies

- 1) Network Engineering
- 2) QOS
- 3) Security

Goal 1.1 : Network Engineering

- Planning and Simulation
- Monitoring
- Integration
- Data delivery
- Managing Lead User Infrastructure
- Dynamic and Adaptive Networks

Goal 1.2 : QOS (end to end)

- Baseline QOS Architecture
- Admission control and prioritization
- Accounting and costing
- APIs to see and control QOS
- Drill Down Technologies

Goal 1.3 : Security

- secure and fair means for users to access network resources (e.g. Fabric)
- smart network management
- inter-network peering (e.g. surety of routing updates, costing/accounting)
- nomadic/remote access
- Public Key Infrastructure

Summary: Security Issues for Goal 1

- Multiple security policies and domains
- shared control/management of infrastructure
- adaptive and active networks
- drill down technologies
- QOS - enforcement
- Admission control, accounting, costing
- secure multicast and multipath

Summary: Security Issues for Goal 1 ctd

- Reliable and unreliable multicast
- network monitoring and management
- common set of evaluation and testing criteria
- Operating System (OS) bypass and APIs
- OS exposure to QOS and network

GOAL 2 : TESTBEDS

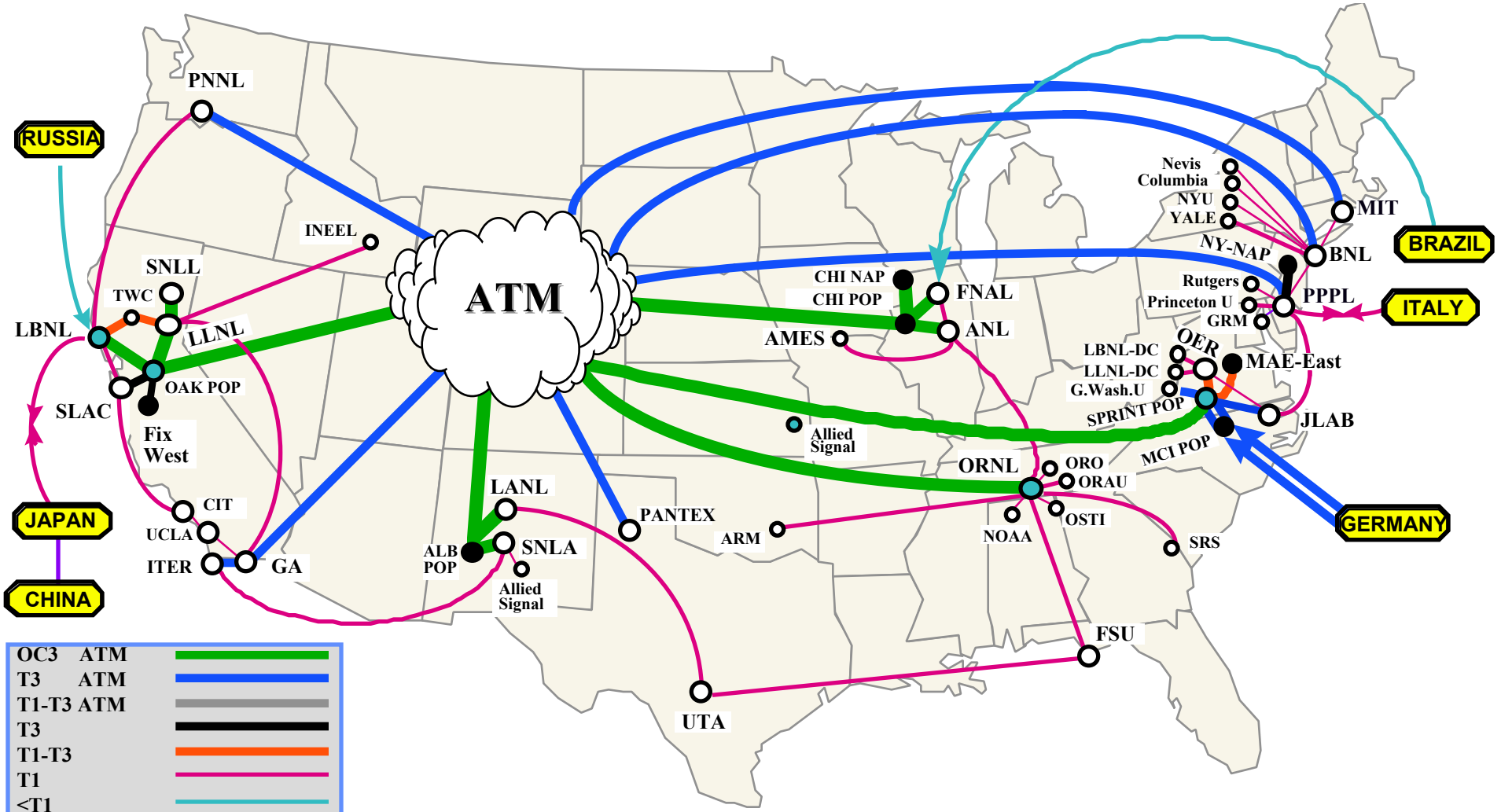
- 1) 10+ sites at 1000x today's Internet speeds and with better capabilities
- 2) 100+ sites at 100x today's Internet speeds and with better capabilities

Today's Internet is approximately T1 speeds of 1.54 mb/s

Goal 2.1 : 10 sites at 1000x

- end-to-end gigabits and terabits
- end system 1000x interfaces (e.g. HIPPI 64)
- WDM at WAN, LAN and Local Loop
- optical, electrical, hybrid hardware
- (de) aggregation of high speed tributaries
- Operating System (OS) and end system architectures
- 1000x network management capabilities

ESnet BACKBONE
Late 1997

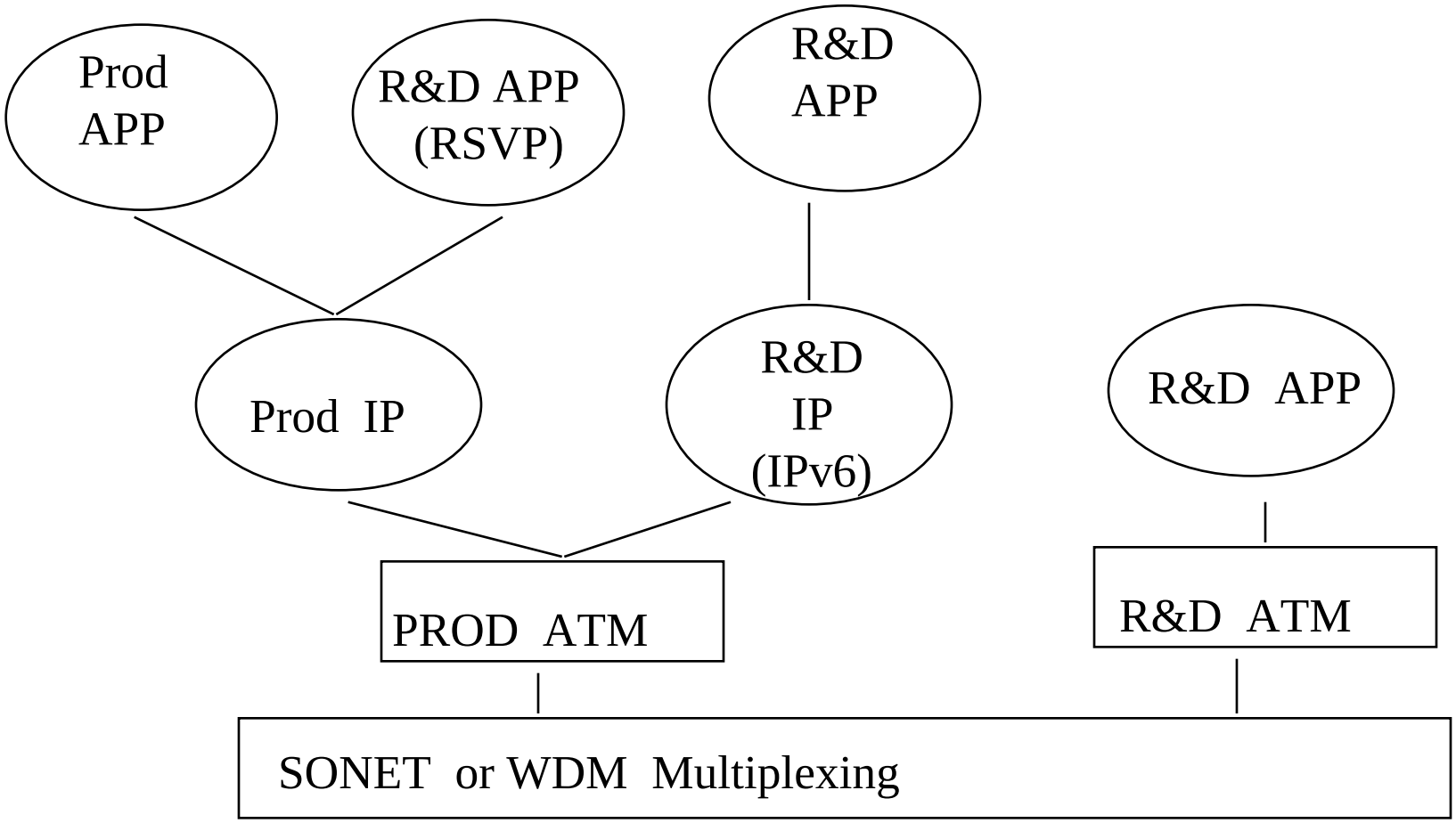


5 August 1997

Goal 2 : 100 sites at 100x

- end-to-end 100 megabits +
- 100+ Universities, Labs, and Federal Centers
- IPv4 minimum bearer service , IPv6 in future
- ATM and other services as required (VPNs)
- Gigapops (aggregation points)
- interconnection and peering (vBNS for I2)
- Large scale and cross domain network mgmt.
- concurrent production and network research

MORPHNET (Virtual Networks)



Summary: Security Issues for Goal 2

- Encryption at Ultra High Speeds
- Network probes for management, monitoring, and validation of services **VS** intrusion detection (traceroutes, pings,…)
- Certificate Authorities and Infrastructure
- Support for dynamic virtual networks
- Secure software updates and patches

Summary: Security Issues for Goal 2 ctd

- interconnection/ peering of Nets
  - privacy of customer list and network performance data
  - secure exchange of routes / peering /accounting data
  - propagation and support of multiple policies
  - dynamic construction of virtual networks
  - cross domain Intrusion detection and tracing
  - accounting / costing
  - large scale inter-connectivity begets vulnerabilities

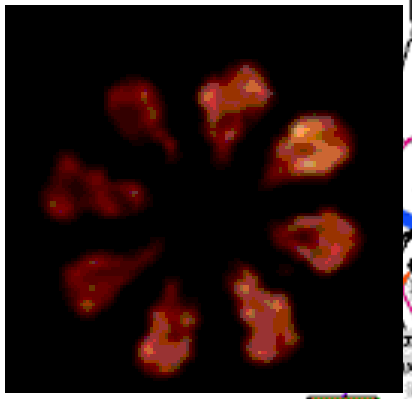
Goal 3 : Applications

- Applications
  - Medicine
  - Crises Management
  - Basic Sciences
  - Education
  - Environment
  - Manufacturing
  - Federal Services
- Characteristics
  - Distributed/Computing
  - Remote Operation
  - Digital Libraries
  - Collaboratories
  - Privacy / Security

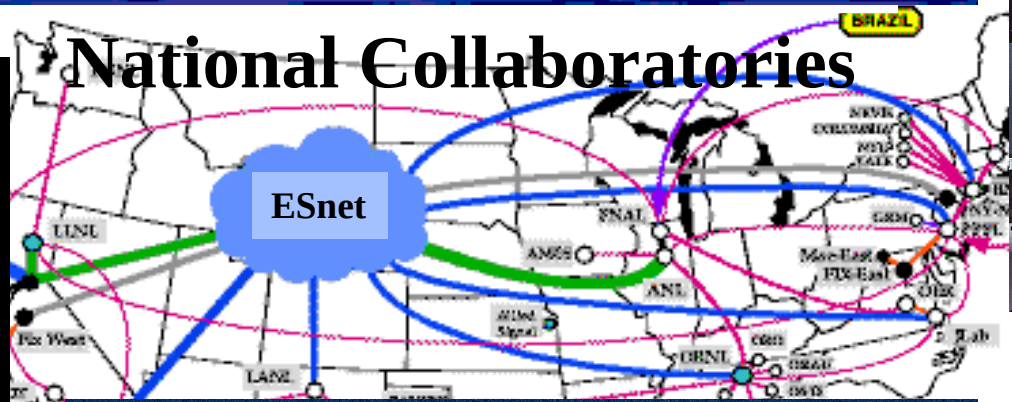
http://www.mcs.anl.gov/DOE2000/index.html

DOE2000

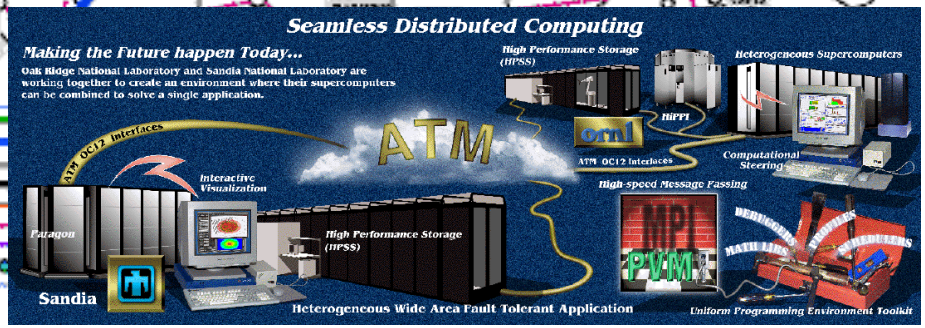
National Collaboratories



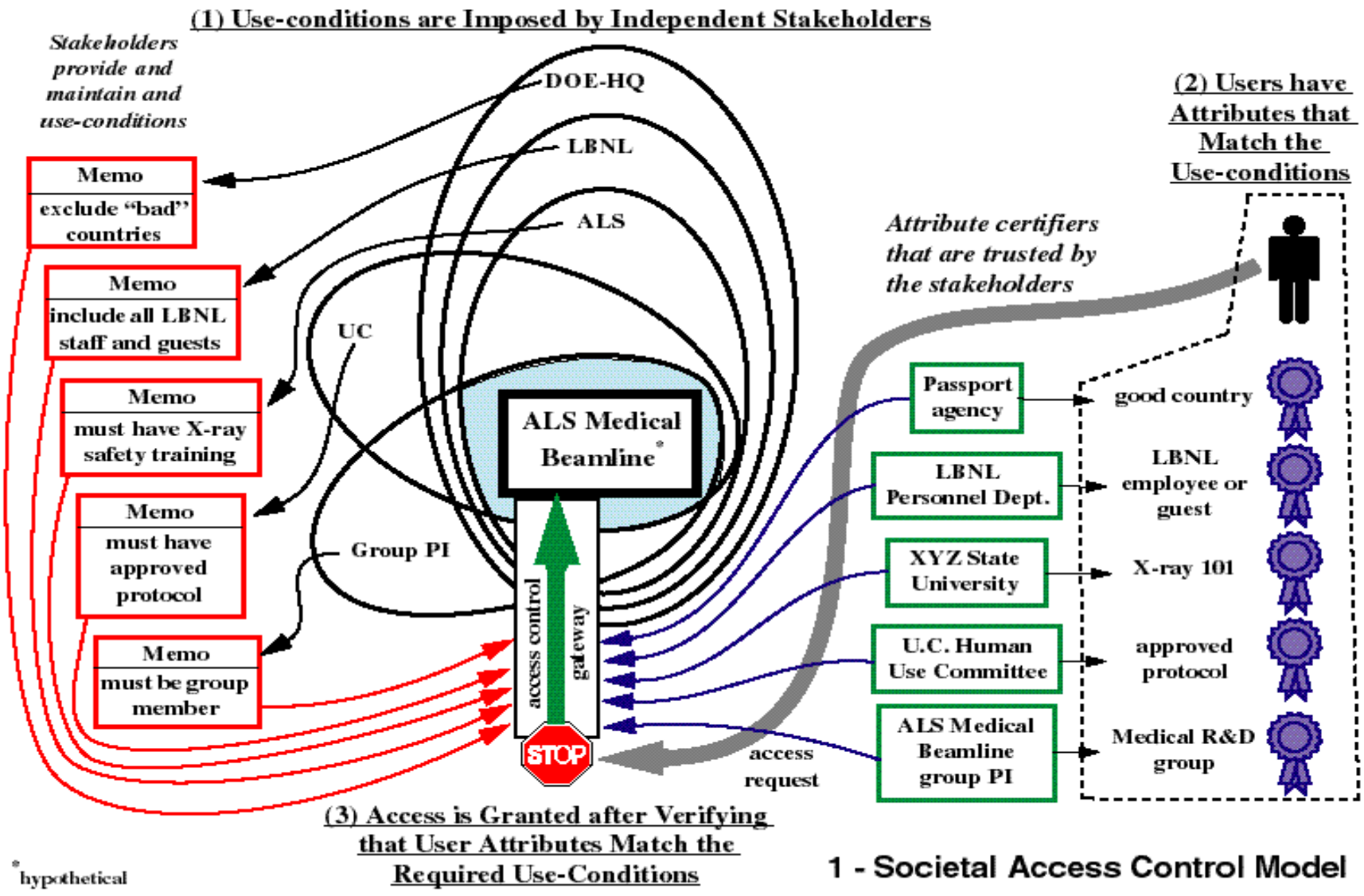
Diesel Combustion Collaboratory



Materials MicroCharacterization Collaboratory



Akenti Access Control System



Summary: Security Issues for Goal 3

- Application controlled dynamic Networks
- Application invoked policies
- Application controlled QOS
- Application management and use of network based resources (i.e. the FABRIC)

NIH Application Security Issues

- Administration vs User QoS / Security Policies
- Denial of Service and Theft of resources
- Application manipulation of resources / fabric
- Filters/ Firewalls vs Access and capabilities
- Secure Software Distribution, Updates, Patches
- Intrusion detection vs Privacy
- Privacy of patient/client information
- reliability and integrity of networks and data
- PKI and cryptography choices

NIH Security Challenges:

- Identify and use the right Tools
- Education of the end user and administrators
- Timely dissemination of relevant information
- Choice of PKI and cryptography

NGI Workshop Security Issues

- Infrastructure robustness
- Security Policies
- Mobile Code
- Intrusion detection
- PKI

NGI Workshop Security Issues ctd

- Security management
- Operating systems
- Cryptography
- Software Engineering
- Network Management

Proposed FY98 and FY99 NGI Budgets

FY 1998 NGI Budget, $ in millions

Goal	DoD/DARPA	NSF	NASA	NIST	NLM/NIH	Total
Goal 1: Experimental Research	20	5	2	3		**30**
Goal 2: Next Generation Network Testbed	20	10	3			**33**
Goal 3: Revolutionary Applications	2	8	5	2	5	**22**
Total	**42**	**23**	**10**	**5**	**5**	**85**

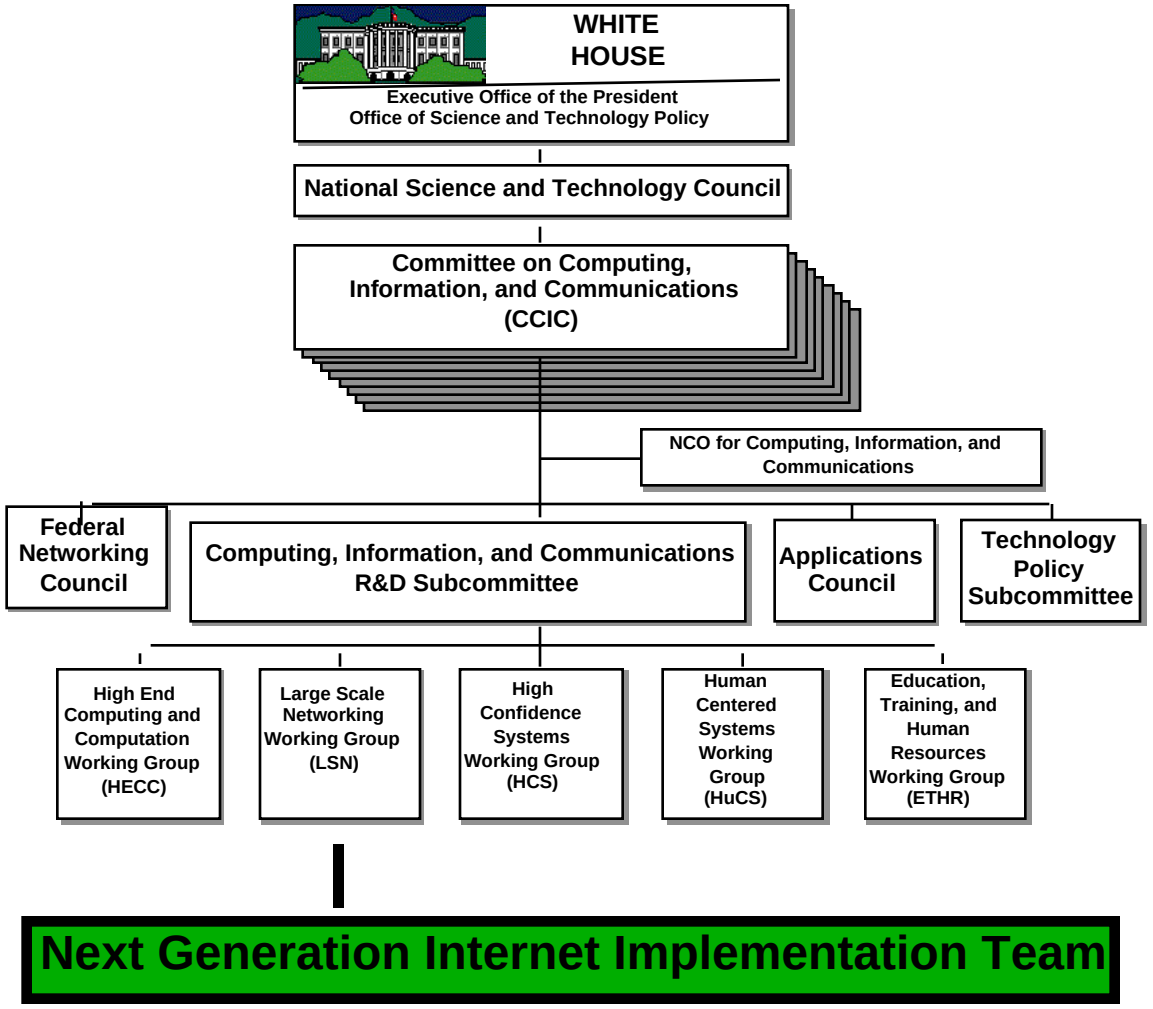
Figure 1. NGI FY 1998 Funding by Goal

Proposed FY 1999 NGI Budget, $ in millions

DoD/DARPA	DoE	NSF	NASA	NIST	NLM/NIH	Total
40	**22**	**25**	**10**	**5**	**5**	**107**

NGI Management Structure

see: http://www.ccic.gov



NGI Implementation Plan : DARPA, DOE, NASA, NIH, NIST, NOAA, NSF

- Michael Ackerman, NIH
- Robert Aiken, DoE
- Debra Bailey, NASA
- Richard desJardins, NASA
- Richard DuBois, NIH
- Phil Dykstra, DoD
- Don Endicott, DoD
- Christine Falsetti, NASA
- Jim Fowler, NIST
- Ken Freeman, NASA
- Bert Hui, DARPA
- Gary Koob, DARPA
- Mark Luker, NSF
- Doug Montgomery, NIST
- Hilarie Orman, DARPA
- Alex Poliakoff, Dept. of Education
- Mary Anne Scott, DoE
- George Seweryniak, DoE
- Carl Stanton, NOAA
- Dave Staudt, NSF
- Bill Turnbull, NOAA

For More Information - URLs

Next Generation Internet

- **http://www.ngi.gov**
- **http://www.cra.org/Policy/NGI/research_chall.pdf**

Internet 2

- **http://www.internet2.edu**

NASA Research and Education Network

http://www.nren.nasa.gov

DOE

- **http://www.es.net**
- http://www.anl.gov/ECT/Public/research/morphnet.html

DARPA

- **http://www.ito.darpa.mil/ResearchAreas.html**

NSF's Connections

- **http://www.vbns.net**