



# **Scalability Research**

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**Presidential Advisory Committee on  
High Performance Computing and Communications,  
Information Technology,  
and the Next Generation Internet**

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# Applications Scalability

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- Compute-intensive applications
  - Foster development of tools and systems software scalable logarithmic or better to 1 TFLOP by 2002
  - Highly scalable operating system kernel scalable to 300 K processors by 2007
- Network-intensive applications
  - End-to-end performance (10 sites at 1000x; 100 sites at 100x)
  - Medicine, Crises Management, Basic Sciences, Education, Environment, Manufacturing and Federal Services
  - NASA Specific: EOS Image Spreadsheet, Pathfinder/Nomad Rovers, Remote Echocardiology, Aeronautics Design and Test Environment and Synthetic Aperature Radar
  - Mixed voice, data, mixed-media, and virtual reality



# Distributed Heterogenous Computing

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- **Toward an National Computational Grid**
  - Globus (DOE)
  - Computational grid (NSF-PACI)
  - Information power grid (NASA)
  - Transparent common framework and infrastructure
- **Interoperable networks (DOE, NSF, NASA)**
  - ES Net, NREN, DREN, and vBNS (ATM and/or IP based) thru JET
  - QoS provisions for applications



# Network Engineering

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- Planning and simulation language/tools for 1000x (speed, size, complexity) network management (DARPA, NSF)
- Monitoring (NSF, DOE)
- Integration tools (NASA,DOE)
- Data delivery (DOE, NSF, NASA)
- Managing Lead User Infrastructure (DOE)



# Next Generation Network Technologies

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- IPv4 enhancements and IPv6
- Scaling QoS
  - Multicast
  - RSVP
  - ATM and other services to enable VPNs
  - Admission, accounting/costing, scheduling, and prioritization tools for IP and ATM



# Security

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- Collaborations in Internet Security (CIS) Testbed
  - Kerberos, Authentication, Encryption, Certificates
  - [www.fnc.gov/cis\\_page.html](http://www.fnc.gov/cis_page.html)
- End-to-End OC-12 hardware encryption (NSA/Sandia)
- Modular encryption technologies (NSA)
- Pilot on computer-based patient records (AHCPR)
- Role-based authentication (DOE2000)
- PKI pilot (NASA, GSA)
- Remote facility operation (DOE, NSF, NASA)