Next Generation Internet Overview

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NGI Overview

Goals:
- Promote experimentation with the next generation of network technologies
- Develop a next generation network testbed to connect universities and federal research institutions at rates that are sufficient to demonstrate new technologies and support future research
- Demonstrate new applications that meet important national goals and missions

Next Generation Internet Architecture

Legend:
- DREN - Defense Research & Engineering Network
- NREN - NASA Research and Education Network
- vBNS - Very High Speed Backbone Network Service (NSF)
- SuperNet - Terabit Research Network (DARPA)
- vBNS partner
- NREN Application Partner
- Next Generation Internet Exchange

https://ntrs.nasa.gov/search.jsp?R=19980227016 2019-05-19T02:15:38+00:00Z
Advanced Networking: NASA’s Relationships with Other Agencies

Advanced Networking Science & Technology R&D

DARPA ($40 M)  Basic technology research; technology delivery to research universities; Internet2

NSF ($23 M)  Connectivity & technology delivery to research universities; Internet2

NASA ($10 M)  Applied research for end-to-end systems development and deployment

NIST ($5 M)  Standards development; industry

NIH ($5 M)  Advanced medical application demos; medical research; health care applications

Advanced networking services delivered to users

NGI/I2 Comparison

Next Generation Internet

- Federal funding
- Agency mission driven
- R&D in advanced networking technologies, and demonstrations on a wide-area scalable testbed which connects to academic (including some Internet 2 universities) and industry networks
- Develop general-purpose and agency-specific applications

Internet2

- Funded by research universities and communications and computing companies
- Education and research driven
- State-of-the-practice connectivity deployed at universities and GigaPOPs and interconnected using NSF’s vBNS as the backbone
- Deploy networking technologies and develop a wide range of applications (many funded by Federal initiatives such as NGI)

Mid Atlantic GigaPOP for Internet2
Capability

Today
- "Best Effort"
- Unicast (point-to-point networking)
- Lots of human intervention required to manage
- Security handled by host
- Router-to-router performance monitoring

Tomorrow
- Differentiated services
- Intelligent network (scalability)
- End-to-end performance management policies and tools
- Security as part of the network
- End-to-end performance measurement
- Qualities of service
- Multicast
- End-to-end service guarantees

Capacity

Today
- Internet exchange points are bottlenecks
- Newer applications don't have enough bandwidth
- Available bandwidth is poorly utilized
- Duplicate traffic slows growth of advanced applications

Tomorrow
- Robust internetworking exchanges move the traffic
- New technologies provide wide-open bandwidth
- Networks are unclogged by high-speed applications running over high-speed networks
- Multicast reduces traffic exponentially
Revolutionary Applications

Today
- Electronic mail
- File transfer
- World Wide Web
- Remote login
- Travel to meetings
- Isolated design systems

Tomorrow
- Collaboratories
- Metacomputing
- Distance learning
- Telemedicine
- Integrated design systems
- Remote operation

NASA Mission Application Partners

Accelerate network technology development to meet NASA unique mission requirements today.

- Astrophysics
- Earth Sciences: Advanced Earth Sciences Investigations
- Astrobiology Institute Collaboratories, Virtual Aerospace Environment
- Advanced Aerospace Design Information Power Grid, Wind Tunnels on-line, Virtual Flight Simulation Laboratories
- Space Exploration
- Telemedicine, Interactive Consultations, Remote Protocols and Procedures
Systems Engineering

Today
• Isolated research
• Many autonomous systems with different architectures and policies
• Uncoordinated, duplicate technology development efforts

Tomorrow
• Collaborative research
• True end-to-end systems technology integration across heterogeneous networks
• Partnerships allow collaboration on large-scale testbeds
• Technology scalable across wide area networks

More Information

• National Coordination Office for Computing, Information and Communications
  – http://www.ccic.gov/

• Internet 2 (university consortium)
  – http://www.internet2.edu

• NASA Research and Education Network
  – http://www.nren.nasa.gov

• DOE
  – http://www.es.net

• DARPA

• NSF’s Connections
  – http://www.vbns.net

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http://www.ngi.gov