GENI: Global Environment for Networking Innovations

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January 30, 2006

Directorate for Computer & Information Science & Engineering

NSF Activities

- Basic scientific research and research fundamental to the engineering process
- Programs to strengthen scientific and engineering research potential
- Education programs at all levels and in all fields of science and engineering
- A knowledge base for science and engineering appropriate for development of national and international policy

The CISE Directorate has three goals

- Enable the United States to lead in computing, communications, and information science and engineering
- Promote understanding of the principles and uses of advanced computing, communications, and information systems in service to society
- Contribute to universal, transparent, and affordable participation in an information-based society

GENI Vision & Implementation

- To enable the discovery and evaluation of *revolutionary* new ideas, paradigms, and technologies that will serve as the basis for the Internet of the 21st century
- To build a facility that will support exploration and evaluation of new network architectures *at scale*

The Future Internet must

- Be worthy of our society's trust
- Enable innovations in S&E
- Support the incorporation of new technologies
- Support pervasive computing
- Bridge physical and virtual worlds
- Enable exciting new services and applications

Limitations of the Internet

- Security mechanisms not included in protocol suite
- Robustness end-to-end cannot be assumed or assured
- Scaling limitations exist in a number of areas
- Innovation at the network layer is difficult
- Quality of service mechanisms have not succeeded

Transportation

Critical Infrastructure

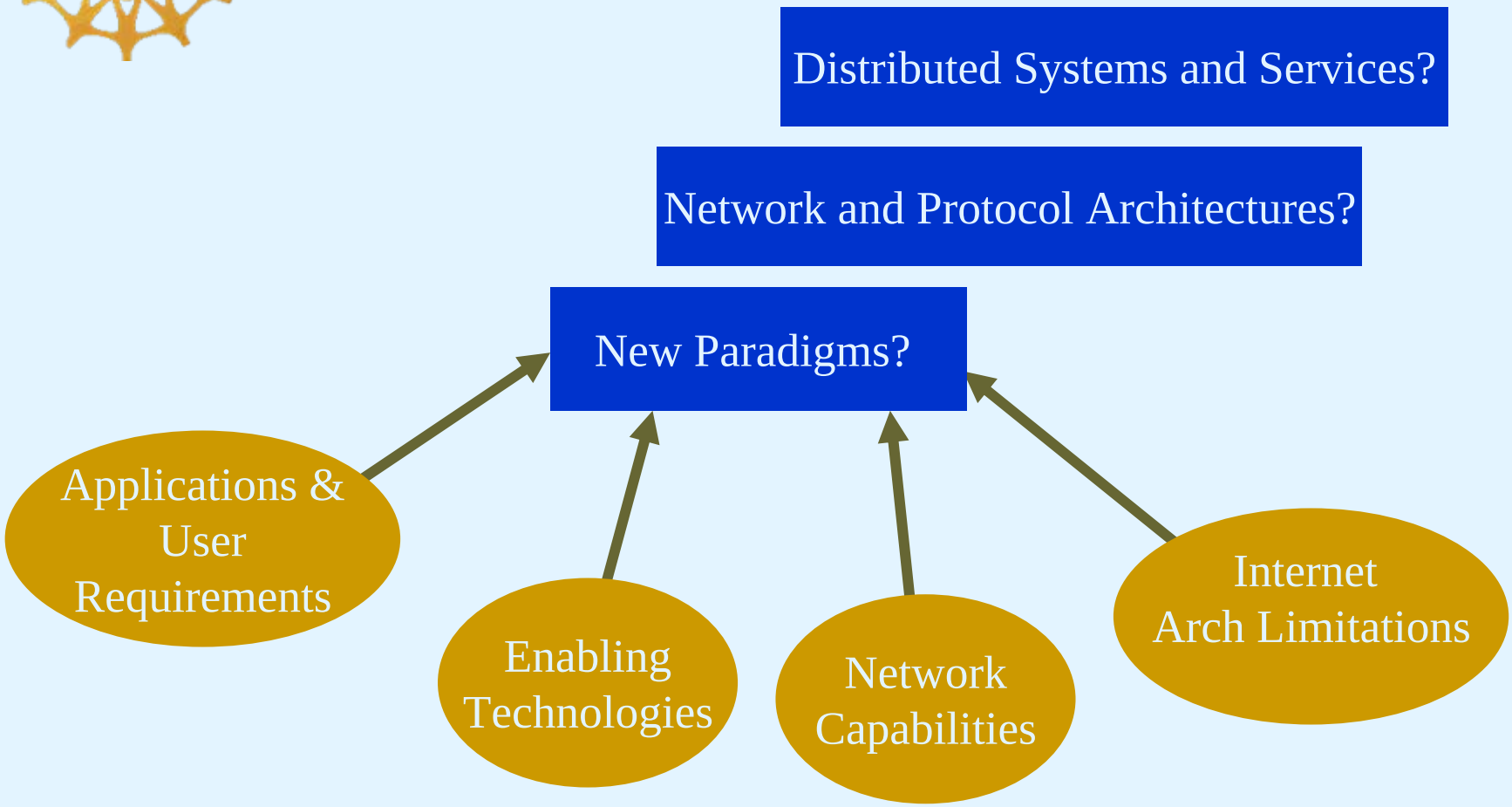
Internet Not Ready for Its Future Roles

Telecommunications
Banking & Finance

Technology Opportunities

- Sensors
- Mobile and wireless
- Optical integration
- System on a chip
- High-end computation
- Massive databases and data mining
- New algorithm approaches
- Virtual environments
- Pervasive computing

Future Internet?

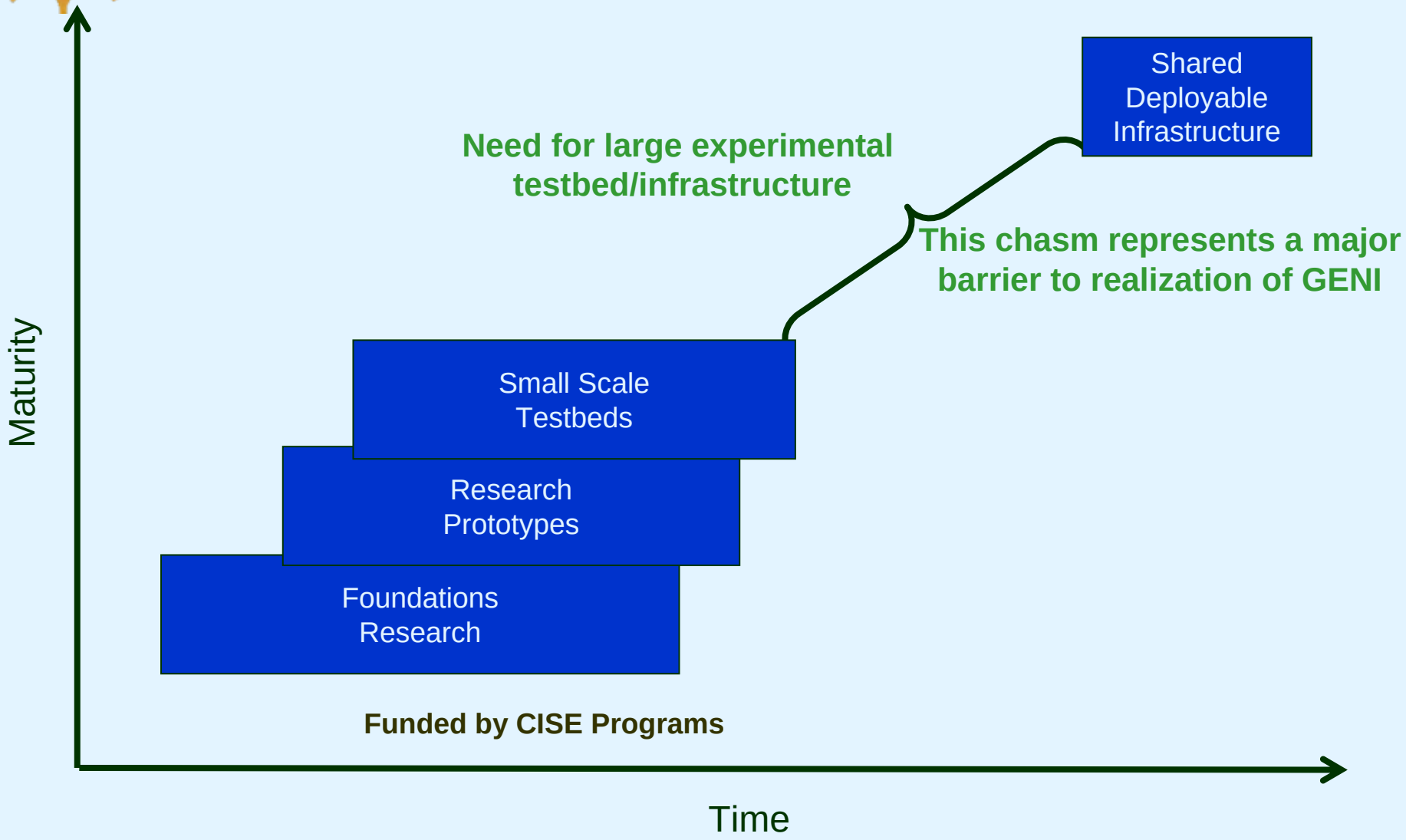


Need a *clean-slate* approach

GENI

- CISE will continue to support long-term basic research and experimentation in networking and related topics
- GENI will be a state-of-the-art, experimental facility to evaluate new networking architectures and services (at scale)
- *Status*: A planning effort initiated by the CISE Directorate in FY 04; aiming for construction readiness in 18-24 months

Case for GENI



GENI History and Timeline

YEAR	Activity
1970s-today	Funding of networking research and infrastructure
2002	Network Research Testbeds Program Experimental Infrastructure Networks Program
2003	Network simulation, emulation, and experimentation facilities funded (~$20M)
2004	Consolidation of networking research programs into a larger new program NeTS with emphasis on next generation networks that go beyond Internet (~$40M/yr)
2005	CISE GENI Team Formed GENI added to the MREFC Horizon List Five GENI facility planning grants
2006	Facility Conceptual Design Creation of the Computing Community Consortium (CCC)
2007	Facility Final Design / Specification GENI Project Management Office
Late 2008	Beginning of Construction

Outcomes as GENI Moves Ahead

- A stock of experimentally validated concepts to address the networking needs of the 21st century
- New platforms that enable the continued growth and innovation of the Internet
- Demonstration of new networking paradigms and services
- Technology transfer to support a new generation of commercial products
- Results that can be applied to enhance the security of the Nation

Industrial Partnering Opportunities

- Industry participation through
  - Refinement of objectives
  - Membership in the GENI consortium (to be formed)
  - Providing leading-edge technology for use in GENI
  - Contracts/subcontracts (to build the facility)
  - Sponsorship of collaborative research with universities
- Benefits to partnering
  - Accelerate the transfer of academic research results to commercial products
  - Enable a national/international "proving ground" for new technology

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Visit the GENI web site at:
http://www.nsf.gov/cise/geni/

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