NSF’s International Research Network Connections (IRNC) Program: Present and Future

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“NSF expects to make a small number of awards to provide network connections linking U.S. research networks with peer networks in other parts of the world”

“The availability of limited resources means that preference will be given to solutions which provide the best economy of scale and demonstrate the ability to link the largest communities of interest with the broadest services”

Follow-on to “High-Performance International Internet Services” (HPIIS) 1997
Some IRNC Program Objectives

- Economy of scale – linking largest communities-of-interest
- Increase capacity and reach into new and existing regions
- Deploying new networking technologies driven by production needs (such as insertion of layer2 and “hybrid” services)
- Leverage resources (capacity, tools, ideas) where feasible
- Collaborate and cooperate closely with U.S. domestic R&E network providers and leaders (Internet2 and NLR)
- Opportunities to contribute directly to the Network Research community
- Technical emphasis areas – security and measurement
- Strive to understand how these connections and services are used (how? By who? For what purpose?)
- Strive to support to the scientist/engineer/educator/student by targeting an end-to-end approach in appropriate activities
- Finally - Maintain and build strong international relationships with colleagues and partners
IRNC Awards

- 5 year program (2004-2009) and 5 main awards for US $25M total
- GLORIAD (PI Greg Cole, UT)
  - US-Russia-China-Korea-Canada-Netherlands-Nordic
- TRANSPAC2 (PI James Williams, Indiana)
  - US-Japan and TEIN2 Partners
- Translight/Starlight (PI Tom DeFanti, UIC)
  - US-Europe
- Translight/PacificWave (PI John Silvester, USC)
  - US-Australia
- WHREN (PI Julio Ibarra, FIU)
  - US-Latin America
Awards

- **TransPAC2** (U.S. – Japan and beyond)
- **GLORIAD** (U.S. – China – Russia – Korea)
- **Translight/PacificWave** (U.S. – Australia)
- **TransLight/StarLight** (U.S. – Europe)
- **WHREN** (U.S. – Latin America)
Thanks to technology maturation and multiyear efforts by countries, regions, and federations, the global r&e community is relatively well connected today with multi Gbps stable WAN connectivity.

There are exceptions: Africa, and some other areas of the world.

“Smarter” routing for US international traffic, although evidence suggests routing is still not completely coordinated and optimized.

IRNC Principle Investigators maintain strong relationships with peers and colleagues globally.

Other NSF (OCI) investments engaged (PRAGMA, NSRC and others).

Measurement efforts starting to pay dividends.
Current IRNC awards run to 2009 and NSF is in planning stages for a solicitation to compete and fund IRNC activities for 2010 and beyond.

What new types of infrastructure will the program be needed to support? How do we take advantage of emerging technologies? What new scientific collaborations will emerge and how will they drive networking innovation, provisioning, and support? How do we balance the potentially diverse networking needs across the broad science community?....

Planning activities for 2007 included events at: TERENA; CLARA meetings; APAN; Beijing; and an NSF workshop dedicated to the topic.
IRNC Futures Workshop
Findings (October 2007)

- IRNC program is a critical element of U.S. International science policy and a core component of NSF’s support of international cyberinfrastructure
- “...issues around optical exchanges, dynamic circuit provisioning and IPv6 will be important to future international research networks”
- Can the commercial sector provide everything that is needed for the r&e user communities? – NO
  - unique requirement set (hybrid services, low-latency real-time, end-to-end performance mgmt, etc.) not met by services available across arbitrary commercial backbones
- Additional funding needed to maintain and extend impact of the program
  - “leverage factors have multiplied the value of every federal dollar beyond any reasonable expectation”
  - foreign investments leveraged in the 10:1 to 15:1 range
IRNC Workshop Recommendations

- Extend Strategic Position and Leverage
- Programmatic Strategies
  - create flexibility in funding cycle
  - encourage partnerships with other countries’ programs
  - continue dual tract strategy (production and r&d)
- Programmatic Activities (subset below)
  - broaden beyond connectivity (e.g. “people connections”)
  - facilitate cross-domain interactions
  - address end-to-end support and training
  - added focus on major scientific instrument connectivity (e.g. SKA)
  - explicitly address cybersecurity, establish environments of trust
  - extend connections to all countries

- Report available at www.renici.org
Timeline

- Available Funding Permitting....
- New IRNC solicitation under development this year at NSF
- on the street by April 2009
- New Awards made Fall 2009 for award activities 2010 and beyond
IRNC 2009 Themes

- Continue primary goal to connect US researchers with broad communities
  - Multi-Gbps connections
  - Balancing current/projected needs with limited funding availability

- Continue to grow, emphasize, leverage strong partnerships with regional and continental r&e network efforts
  - Opportunities for new connections

- Hybrid networking as production services
  - Shared IP connectivity
  - Dynamic circuit services – DCN interoperability

- More flexible funding cycle and diverse award types
  - Adapt and respond to changing and growing needs
  - Address anticipated/unanticipated opportunities
  - Address outreach and other engagement activities, e.g. NSRC-like “grass roots” efforts, studies, workshops, etc.

- Improving quality of network operations and engineering
  - Best practices in measurement – PerfSonar, RouteViews
  - Best practices in security – Security Plans, REN-ISAC membership
IRNC Themes 2009

- **Experimental networking area**
  - Activities anchored to identified science application drivers
  - Potential support for GENI activities - tbd

- **Integration and End-to-end networking**
  - Scientific Apps and distributed environments - SURFnet competition (integrating use of lightpaths into research projects) as one model
  - Connectivity to unique instruments

- **IPv6**
  - Going beyond IPv6 “compliance” in the core to accelerate real implementation, deployment, and use by scientific community
  - “The world is changing around us and we need to keep pace” – Dale Finkelson
  - How to partner with and leverage international experience in IPv6? Through an NSF international networking program
  - Goal - apps, projects, services running over IPv6 in routine production
In the end...

It’s all about the SCIENCE