Higher Education members

- Internet2 was formed by 34 universities in 1996
- Now over 200 member universities and colleges
- Higher Education members are at core of Internet2
- Membership levels based on Carnegie Foundation Basic Classifications
The New Internet2 Network

**by the numbers**

- **10** Juniper T1600 routers
- **7** Juniper MX960 nodes for TR-CPS
- **49** custom colocation facilities
- **250+** amplification racks
- **15,500** miles of newly acquired dark fiber
- **2,400** miles of partnered capacity with NTNC
- **8.8** Tbps of optical capacity
- **100** Gbps of IP capacity
- **300+** Ciena ActiveFlex 6500 network elements

**Internet2 Network platform architecture**

Building blocks for end-to-end environment between campuses to introduce

- Massive amounts of bandwidth
- Avoidance of traditional bottlenecks
- Software-defined networking capabilities to enable new applications
- Performance monitoring nodes to assure performance verification
Domestic and International connectivity

- Peer networks extend domestic and international reach
- U.S.-based open exchange points provide key facilities and capabilities
- Peering agreements extend Internet2 members’ reach to more than 100 research and education networks around the world
Fall 2012 Updates

- Committed to a growing partnership between UCAID and CUDI
- Creation of new VLANs:
  - 1) to Internet2 traffic (ID 3065)
  - 2) to Starlight and CERN in Chicago (ID 3067)
  - 3) to U of Maryland (ID 3066).
- Potential for future move to Brocade switch in El Paso; discussions already underway
- Pursuing joint support for increased connectivity to Latin America
What an NREN is not—what it must become

- specialized regional ISP—essential global platform
- afraid to take risks and experiment—innovation incubator
- supply-side market player—demand-side market maker
- contract broker—market aggregator
- knowledge carrier—knowledge multiplier
- provider of shrink-wrapped solutions—economic development engine
- business-as-usual partner—transformation vehicle
- neutral collaboration connection—collaboration enabler
- disinterested community service—community developer
- political tool—political stabilizer
Essential *global platform* for R&E institutions

- Essential global representation and leadership
- Innovation platform encourages the development of new technologies
- Transparent operations mean easier solutions, avoidance of problems
  - Supporting ‘end-to-end’ domain science and education
- Collaborative environment for solving common challenges, developing common solutions
Innovation incubator

• Facilitates development of advanced applications supporting global R&E
  – Distributed lab environments
  – Remote access to rare scientific instruments
  – Large-scale computation and data access
  – Medical and biological research
  – Teaching and learning
• Delivers abundant bandwidth, setting stage for next generation of innovation
• Provides testing “playground” for new technologies that hold enormous value for current (and future) constituents
Many companies have been created or re-invented through R&E community innovations

Students capitalize on network-rich platform to create new technologies

In the U.S., this has created fast-growing economic impact

Now contributes over $8 trillion dollars annually to the global economy
Market aggregator

- Research and Education is a large market but not large enough to gain leverage over suppliers.
- R&E network aggregation enabled access to advanced services for lower cost, enabling R&E to benefit from the most advanced capabilities.
- Efforts are now being launched to apply network aggregation success to services above the network.
  - Internet2 ‘Net+’
  - Surfnet ‘SurfConnects’
  - JANET ‘Brokerage’
Knowledge multiplier

- NRENs don’t just enable access to knowledge, their services increase the pace of knowledge development.
- Knowledge enables economic, social and cultural development.
- Technology, networks and the explosion of knowledge spur development.
  - The Roman Road System.
  - 18th – 20th Centuries
    - Canals, railroads, telephone & telegraph
  - 20th & 21st centuries
    - The Internet
Economic development engine

• **Buying power:** NREN uniquely positioned to bring advanced ICT service

• **Innovation engine:** Does not take shrink-wrapped solutions for granted

• **New market creator:** Creates new markets

• **Market pull creator:** Students exposed to high-end ICT demand the same afterward

• **Trusted party:** As member of the family, can act in joint buying role
Transformational vehicle

- Enables big changes across the spectrum
- Empowers R&E responses to challenges in funding, pedagogy and online resources, technology, “consumerization”
- Refactors fundamental business operations and productivity across entire supply chain
- Equips constituents to accomplish their missions to serve and transform global communities
Collaboration enabler

- Provides key enabling technologies, like global video services
- Provides broad range of participatory opportunities, including training
- Provides expertise to help solve technology challenges
- Provides transparent, favorable environment for cooperation
  - Identity Federations like InCommon
Community developer

• Provide connectivity to satisfy growing needs
• Change the way content, applications, and services are delivered
• Foster regional and international anchor collaboration
• Ultimately, transform communities
Political stabilizer

- NRENs create collaborative relationships in the international R&E communities that transcend cultures and outlast political regimes
- Open, reliable avenues of communication foster a safe haven for political dialogue and intellectual freedom
Education Market Historically Underserved by Commercial IT Providers

- Research Institutions demanded unique implementations of hardware and software solutions
- State schools, small liberal arts and community colleges, IT spending dominated by administration
- K-12 technology investment a very small percentage of their total spend during two decades of reductions
- For all three groups, very long procurement cycles, low margins, low turnover (repeat business)
- Too much of the resource went to sales and marketing and not enough to the classrooms and labs
Internet2 NET+ Cloud Services
Higher Education Opportunity

- Major investments (venture capital $$) flowing into cloud services for commercial offerings that can be adapted to higher education use.

- Customization of commercial services can happen once, adoption many times. Better R&D leverage.

- Top 200 Research institutions (I2 Members) >$10b in IT spending. Leverage that leading investment.

- Reduce costs of staff and pensions which are increasing faster than technology costs.

- Facilitate cross institutional engagement combining Network and Services.
Internet2 NET+ objective & approach

**Objective**
Create technical and business models for provisioning above-the-network services that

- Leverage the Internet2 Network, middleware and federated authentication
- Encourage an interoperable services marketplace where individual institutions may procure services from a wide range of providers

**Approach**
- Coordinate existing above-the-network initiatives under single services organization
- Establish vendor partnerships
- *Explore alternative specifications, interoperability requirements, user and program interfaces, service-level definitions, business services and pricing models*
Internet2 NET+ Service Provider Ecosystem

Infrastructure-as-a-Service
- HP
- Shi

Software-as-a-Service
- Merit Network
- AASTRA
- DuraSpace
- CenturyLink
- Box

Communications-as-a-Service
- Dell
- Level3
- SDG

Other Services
- Adobe
- Microsoft
- Desire2Learn
Internet2 NET+ Portfolio Growth

One year ago, Internet2 NET+ was announced with 2 services and 13 participating campuses

Six months ago, there were 20 services and 23 participating campuses

Today, there are 29 services and 87 participating campuses…
Internet2 NET+ Portfolio Growth

...plus service trials already underway means over 150 campuses now involved in Internet2 NET+!
Internet2 NET+ Portfolio Growth

Regional Partners Program extends the benefits of Internet2 NET+ services to more communities

A new Global Partners Program in development!
Internet2 NET+ Global Partner Program

- Support International NREN's Adoption of NET+ Services – beyond Internet2 members
- International NRENs become distributor of NET+ services to their constituencies
- Service costs are offered to NET+ Global Parner Program participants at wholesale NET+ member pricing
- As volumes increase across all subscribers, prices drop. Members will always receive better pricing than standard educational discount
- Services from one NET+ Global Partner to others supported through model
About InCommon

- Providing a framework of trust for safe sharing of online resources
- Four services within the InCommon trust framework
  - InCommon Federation
  - InCommon Certificate Service
  - InCommon Assurance Program
  - InCommon Multifactor Authentication Program
Participation Year-to-Year

464 InCommon Participants (as of Oct. 24, 2012)
InCommon Federation

• Campuses leverage their identity databases to allow for the use of one set of credentials to access multiple resources.

• Online service providers no longer need to maintain user accounts.

• Identity providers manage the levels of their users' privacy and information exchange.

• InCommon uses SAML-based authentication and authorization systems (such as Shibboleth®) to enable scalable, trusted collaborations among its community of participants.

• Increasing opportunity for international expansion
"They built HUTS! We must build huts."

"Fire, fire, we need FIRE!"

"SWINGS! They've built SWINGS! We're gonna need Swings."

Building Solutions Together
Thank you!

Questions?
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