



# **INTERNET2 UPDATE: Community Network, Network Services, NET+ Services & Collaborations**

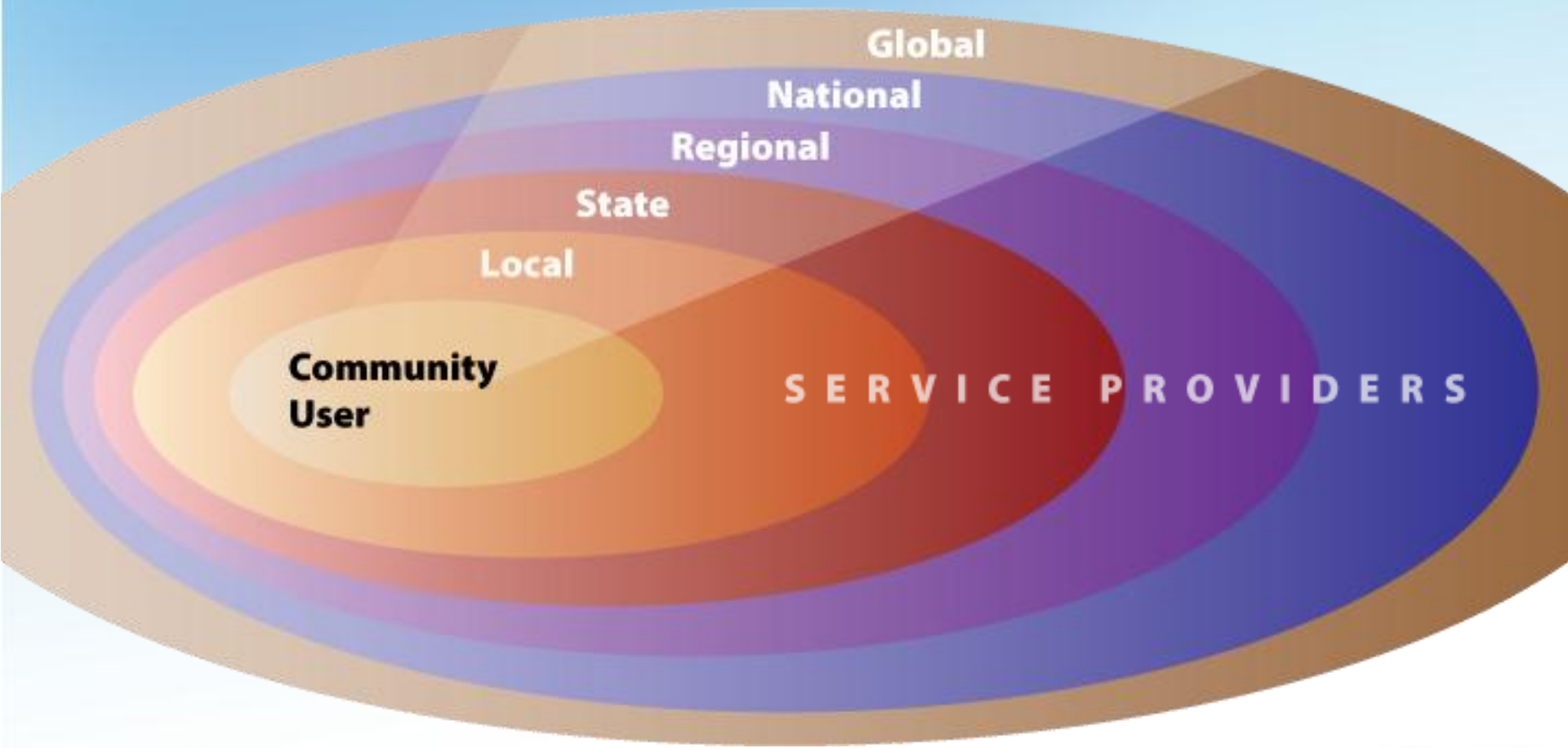
H. David Lambert  
President and CEO, Internet2

September 17, 2012

innovation • transformation  
**INTERNET**  
community

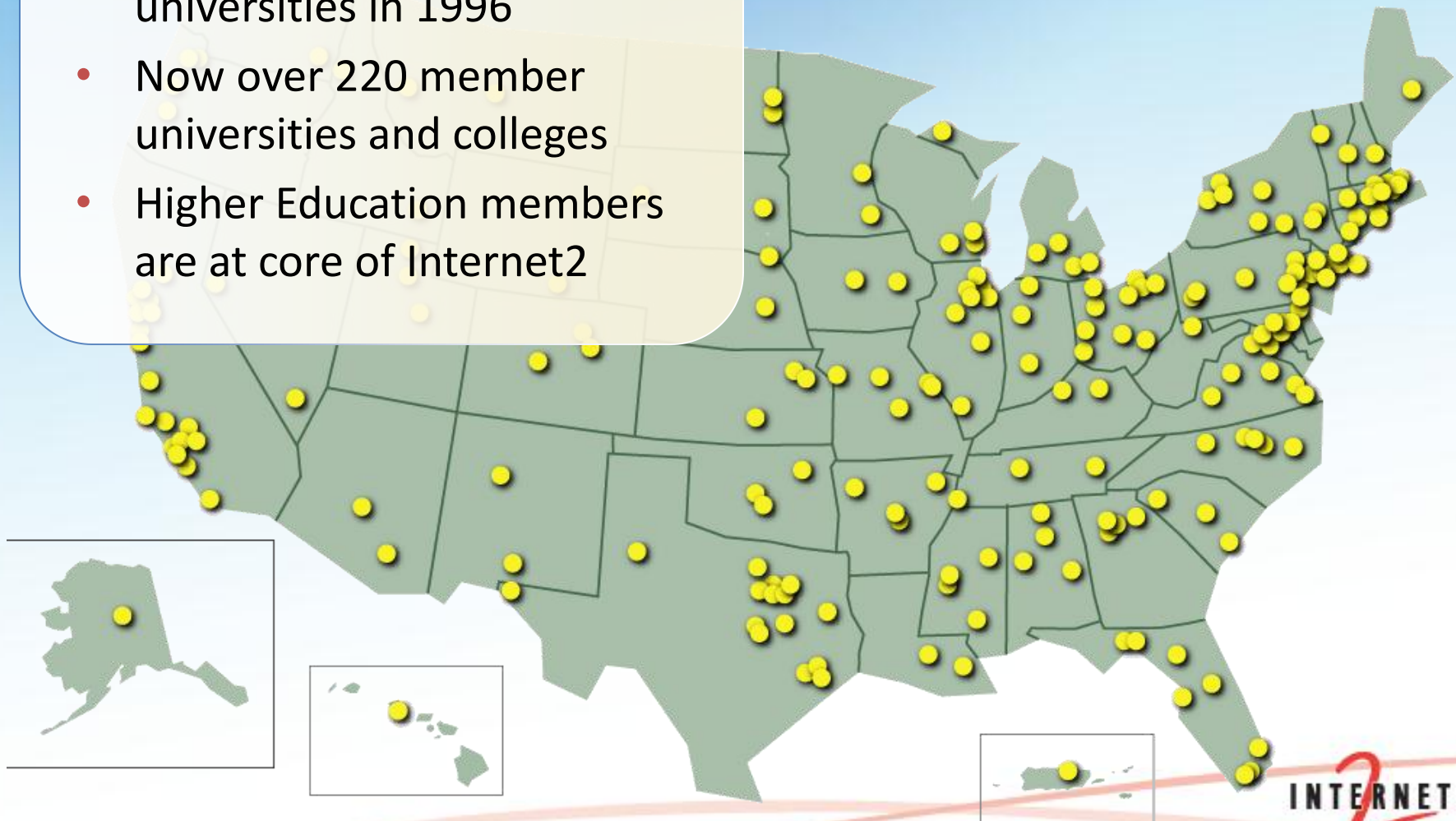


# An Ecosystem Built on Partnerships



# Higher Education members

- Internet2 was formed by 34 universities in 1996
- Now over 220 member universities and colleges
- Higher Education members are at core of Internet2



# Industry members

- Over 40 members from industry
- Committed to development and deployment of advanced networking applications and services in partnership with R & E community
- Work toward transferring technology developed within community to broader public

The IBM logo, consisting of the letters 'IBM' in a blue, horizontally-striped font.The ciena logo, with 'ciena' in a red, lowercase, sans-serif font.The FUJITSU logo, with 'FUJITSU' in a red, serif font and a red infinity symbol above the 'J'.The hp invent logo, featuring the 'hp' logo in a blue square above the word 'invent' in a blue, lowercase, sans-serif font.The CISCO logo, with a blue signal icon above the word 'CISCO' in a red, bold, sans-serif font.The infinera logo, with a yellow infinity symbol above the word 'infinera' in a blue, lowercase, sans-serif font.The Microsoft logo, with the word 'Microsoft' in a bold, black, sans-serif font.The Level 3 Communications logo, with 'Level 3' in a bold, black, sans-serif font and 'COMMUNICATIONS' in a smaller, black, sans-serif font below it.The JUNIPER NETWORKS logo, with 'JUNIPER' in a large, black, sans-serif font and 'NETWORKS' in a smaller, black, sans-serif font below it.

# Affiliate members

- Over 65 Affiliate members: non-profit, research- or education-oriented organizations
- Many government organizations with important roles in creating and executing national policy

US Dept of Veterans Affairs (VA)

US Dept of State

Howard Hughes Medical Institute

Library of Congress

National Geographic

National Institutes of Health (NIH)

Nat'l Oceanic & Atmospheric Admin (NOAA)

National Science Foundation (NSF)

The World Bank

United Nations System of Organizations (UN)

US Antarctic Program (USAP)

US Dept of Energy ESnet

ESnet Laboratories

Federal Highway Admin, Turner-Fairbank Center

Jet Propulsion Lab

Los Alamos National Lab

NASA Goddard Space Flight Center

Nat'l Institute of Standards & Technology (NIST)

The Children's Hospital of Philadelphia

US Department of Commerce, Boulder Labs

Coalition For Networked Information (CNI)

Desert Research Institute

EDUCAUSE

Healthcare Info & Mgmt Sys Society (HIMSS)

Indian Health Service

Indiana Higher Education Telecom System

Internet Educational Equal Access Foundation

Laboratory for Telecom Sciences (LTS)

National Archives & Records Administration

New World Symphony

Manhattan School of Music

Berklee College of Music

Cleveland Institute of Music

Online Computer Library Center (OCLC)

National Institute for Technology and Liberal Education

Philadelphia Orchestra Association

Ruth Lilly Health Education Center

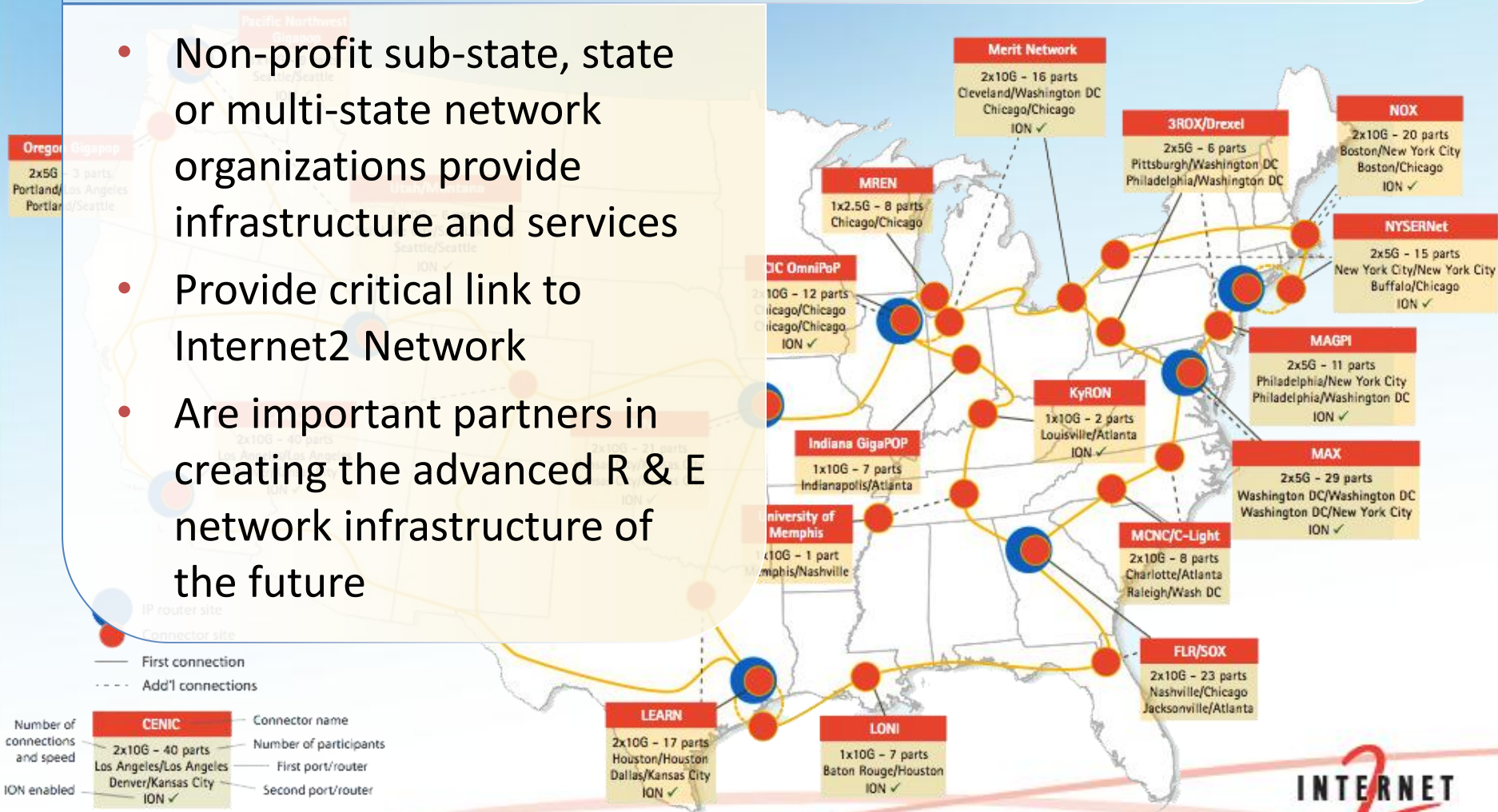
Southeastern Universities Research Association

US Holocaust Memorial Museum

Univ Corp for Atmospheric Research (UCAR/NCAR)

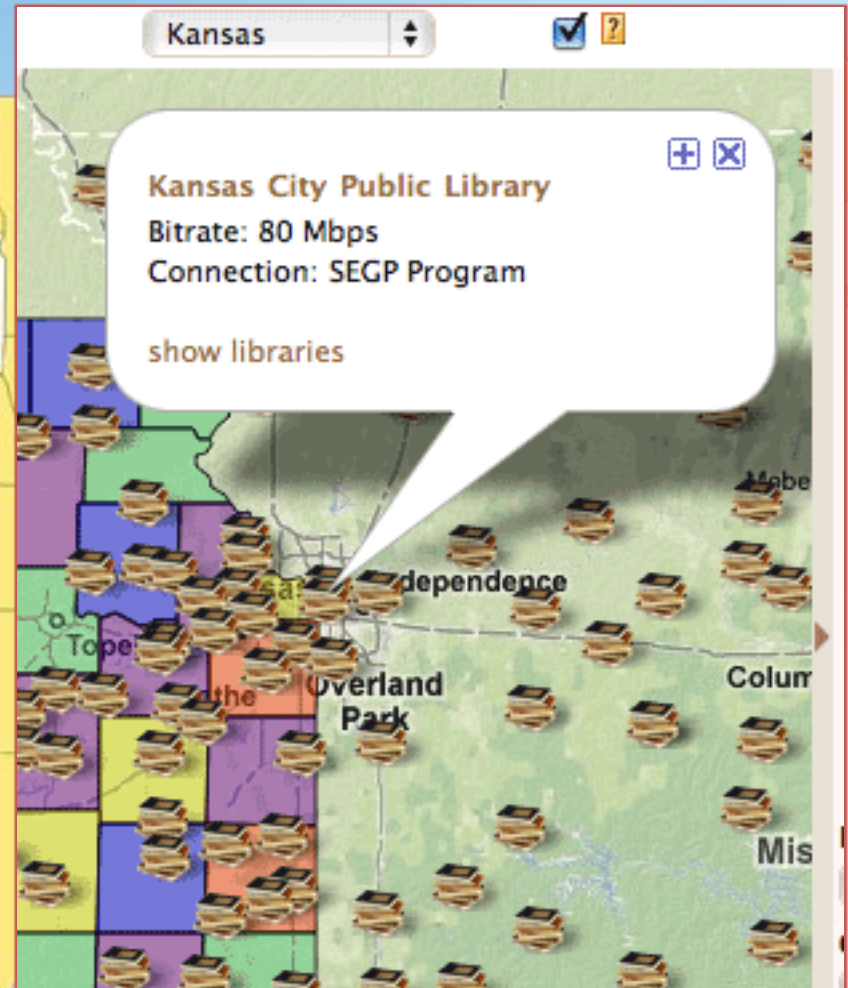
# Research and Education Network and Connector members

- Non-profit sub-state, state or multi-state network organizations provide infrastructure and services
- Provide critical link to Internet2 Network
- Are important partners in creating the advanced R & E network infrastructure of the future



# Broader Internet2 community

- 40 education networks across U.S. connect to the Internet2 Network through member sponsors
- Over 66,000 community anchor institutions connect to advanced network capabilities
- Includes primary and secondary schools, community and vocational colleges, public libraries, healthcare institutions, museums, zoos and aquariums





# International partners

- Agreements between Internet2 and international networking partners offer interoperability and access
- Enable collaboration between U.S. researchers and overseas counterparts
- Create bridges for virtual collaboration between R & E communities and over 100 international R & E networks



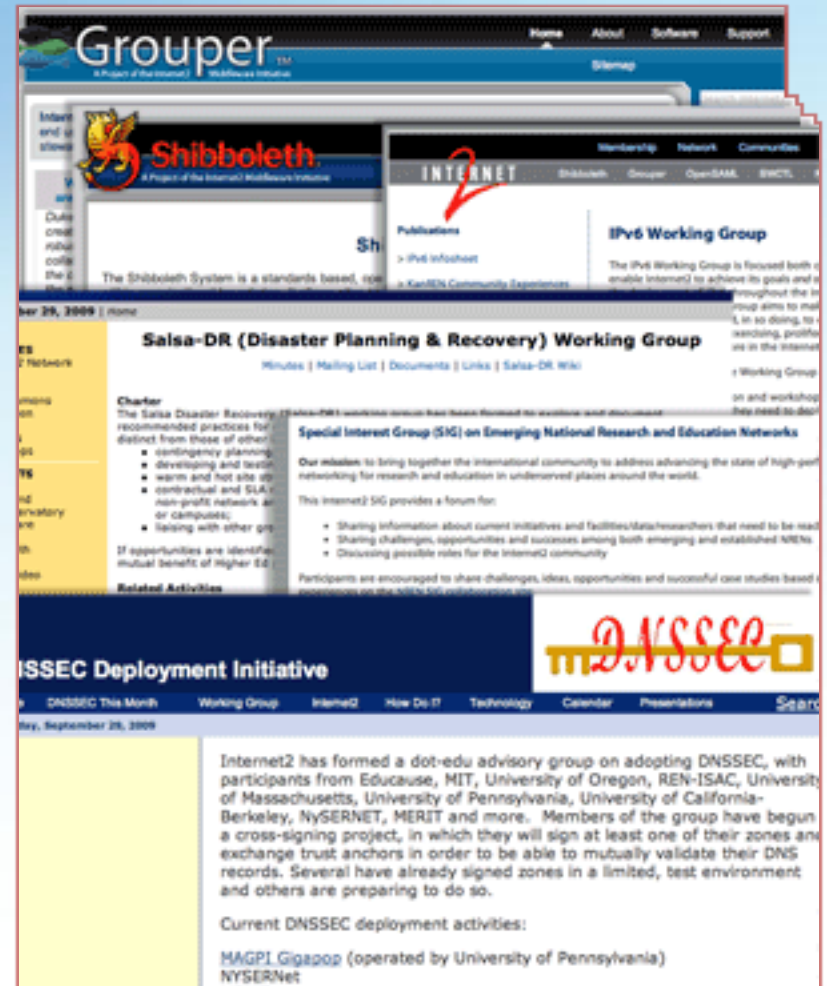
# Initiatives and special communities

- Bring together thought leaders from member organizations and broader research and education community
- Work together to advance frontiers of network-enabled applications in various communities of interest
- Arts and Humanities, Health Sciences, Science and Engineering, K20, Network Research and Middleware



# Working, special interest, advisory groups

- Develop common tools, encourage common approaches and standards
- Support discipline-specific development efforts and address their network needs
- Provide strategic framework and guide efforts
- Communicate through Web sites and e-mail lists and sponsor special events



The screenshot displays the Grouper website interface, which is a platform for organizing and managing groups. The main navigation bar includes links for Home, About, Software, and Support. Below the navigation, there are several group listings and details:

- Shibboleth**: A project of the Internet2 Middleware Initiative. The page shows a search bar and a list of publications, including "IPv6 InfoSheet" and "Kerberos Community Experiences".
- IPv6 Working Group**: A group focused on enabling Internet2 to achieve its goals and aims to make it easier for members to participate in the group.
- Salsa-DR (Disaster Planning & Recovery) Working Group**: A group with a charter that includes developing and testing disaster recovery plans, warm and hot site operations, and contractual and SLA arrangements for non-profit networks and/or campuses. It also mentions identifying mutual benefit opportunities for higher education.
- Special Interest Group (SIG) on Emerging National Research and Education Networks**: A group that provides a forum for sharing information about current initiatives and facilitating data researchers that need to be used, sharing challenges, opportunities and successes among both emerging and established NRENs, and discussing possible roles for the Internet2 community.
- DNSSEC Deployment Initiative**: A group that has formed a dot-edu advisory group on adopting DNSSEC, with participants from Educause, MIT, University of Oregon, REN-ISAC, University of Massachusetts, University of Pennsylvania, University of California-Berkeley, NySERNET, MERIT and more. Members have begun a cross-signing project, in which they will sign at least one of their zones and exchange trust anchors in order to be able to mutually validate their DNS records. Several have already signed zones in a limited, test environment and others are preparing to do so. Current DNSSEC deployment activities include MAGPI Gigapop (operated by University of Pennsylvania) and NYSENET.

# Seven strategic focus areas

Advanced network and network services leadership

Internet2 NET+: services “above the network”

U.S. UCAN

National/Regional collaboration

Global reach and leadership

Research community development and engagement

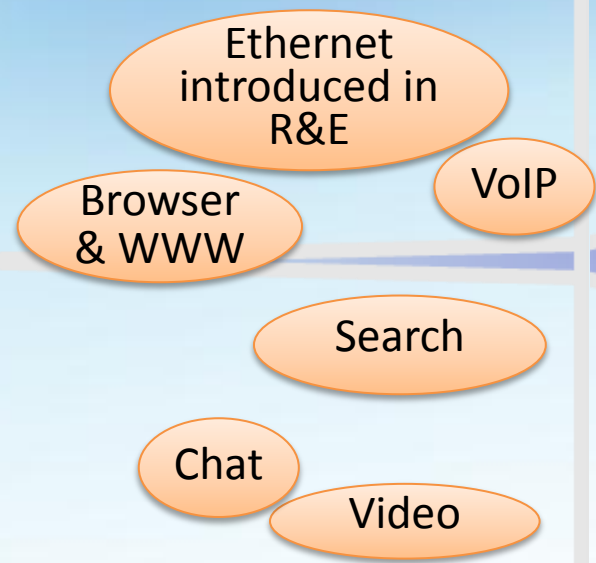
Industry partnership development and engagement



# THE NETWORK AS AN “INNOVATION PLATFORM”

# An observation

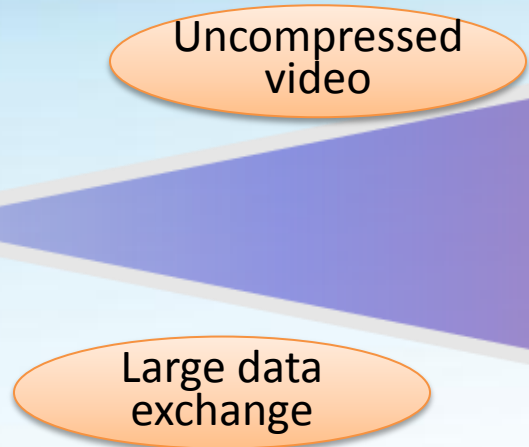
**1.5 Mb – 100 Mb**  
*innovation accelerates  
R&E out in front*



*Theme in this era is  
investment and positioning  
for the future*

# about our past

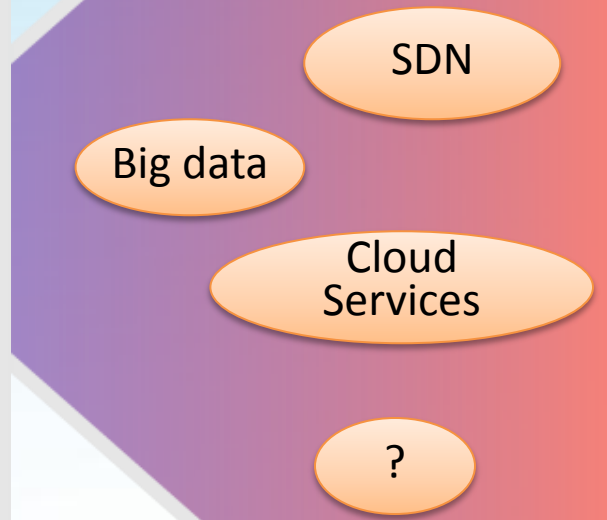
**100 Mb – 10 Gb**  
*innovation slows  
R&E leadership fades*



*Theme in this era becomes  
aggregation, cost savings,  
efficiency, competition*

# and the future

**10 Gb – 1Tb Gb**  
*innovation opportunity  
where is R&E?*



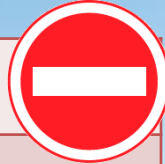
*What will the theme of  
this era be?*



## *Innovation Platform vision:*

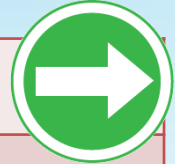
# Abundant bandwidth

### Innovation roadblocks



- Limited capacity is a major research barrier—*need more than incremental boosts*
- Too expensive and risky to try totally new approaches

### Innovation route

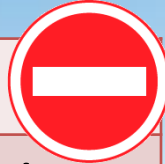


- Raw capacity now available on Internet2 network is a key enabler
- Incent disruptive use of new, advanced capabilities

## *Innovation Platform vision:*

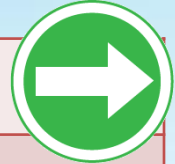
# Software-defined networking (SDN)

## Innovation roadblocks



- Proprietary software in routers and switches
- Communications with hardware limited by actual, physical, proprietary components
- Application developers have to use the network as prescribed

## Innovation route



- Open up network layer to innovation
- Let innovators communicate with and program *the network itself*
- Allow developers to optimize the network for specific apps



## *Innovation Platform vision:*

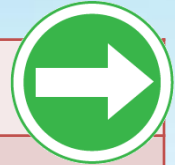
# Science DMZ

### **Innovation roadblocks**



- One-size-fits-all approach to network data flows
- Lack of transparent performance monitoring solution
- No way to customize and optimize the network

### **Innovation route**



- Architect a special solution to allow higher-performance data flows
- Include end-to-end performance monitoring
- Include SDN server to support programmability

# Innovation Platform: *Key components*

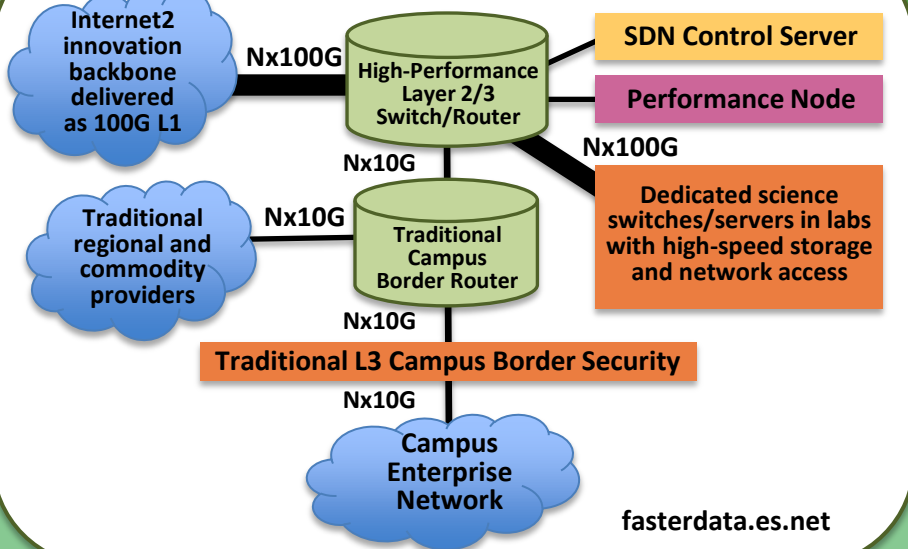
*A commitment over three years to...*

- Invest in *abundant bandwidth* through a **100GE Layer 2 connection**
- Introduce *software-defined networking* (**SDN**) capabilities
- Support *data-intensive science* by implementing a **Science DMZ**

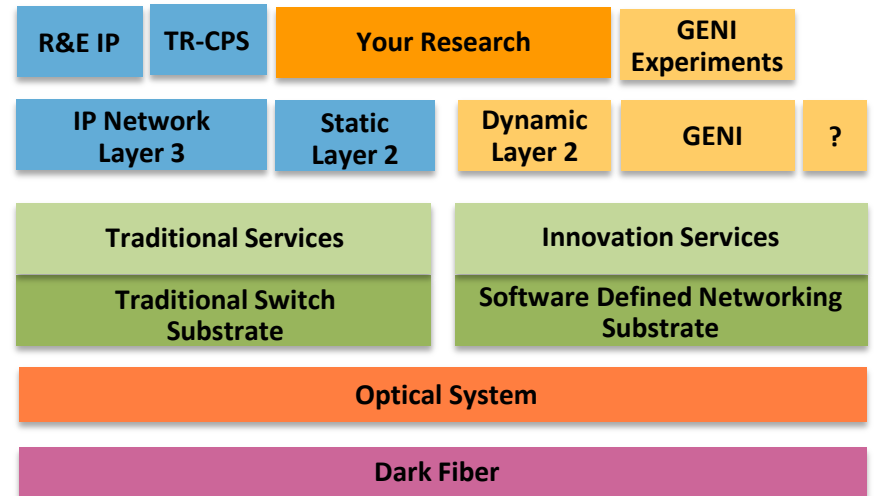


## 100 GigE Layer 2 Connection

### Science DMZ



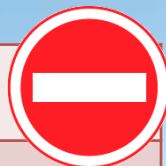
### Software Defined Networking



## *Innovation Platform vision:*

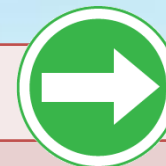
# Cloud Services (“Internet2 NET+”)

### **Innovation roadblocks**



- Individual institutions going it alone (“I’m different”)
- Lack of convener for “community” approach
- Dependence on commercial networks for core services
- Commercial vendors ignoring how higher ed really is different!

### **Innovation route**



- Internet2 acting on behalf of its members -- and all of higher ed
- Providing direct connection to the Internet2 R&E network for key service providers
- Working with service providers to meet the needs of the community

# 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+ Services providers

Infrastructure-as-a-Service

Software-as-a-Service

Communications-as-a-Service

Other Services



# NET+ Service Development

## Research Evaluation

Internet2, service provider, and university studies an offering to determine whether suited for a NET+ service

## Service Validation

Sponsor and group of universities work with service provider and Internet2 to define the NET+ service

## Early Adopter

Universities begin using the NET+ service and continue working with Internet2 and service provider to develop it further

## General Availability

NET+ service open to eligible universities and quarterly Advisory Board meetings continue informing roadmap

# Internet2 NET+ Services: Fall 2012

## Research & Evaluation

- Microsoft - Big Data Genomics
- Microsoft – Big Data “Long Tail”
- HP – High Performance Cluster
- eText 1: Coursload/McGraw-Hill
- eText 2: CourseSmart/Pearson
- eText 3: Inkling/ Cengage
- eText 4: Kno/Wiley
- CenturyLink-Savvis (Linux Servers) \*\*

## Service Validation

- Crashplan – (Remote Backup)
- Dell – (Virtual Desktop)
- Pearson eText (Volume Discount)
- SHI – (Linux Servers)
- Splunk – (Big Data Analytics Software)

RED: NEW Open for Sponsor / SV campuses GREEN: NEW- Team in place. BLACK: Open for Sponsor/ SV Campus



# Internet2 NET+ Services: Fall 2012

## Early Adopter

- Amazon AWS (Cenic)
- Aastra (Voice over IP Phone)
- Desire2Learn (Lecture Capture)
- Evogh (Desktop Video Conference)
- **Instructure (Canvas LMS)**
- Solution Design Group

## General Availability

- Box (File Collaboration)
- Comodo (Web/Personal Certificates)
- Adobe (Connect)
- DuraSpace (Research File Storage)
- Merit Storage (File Storage)
- Merit Email (Email Service)
- Merit Maillist (Email List Manager)
- Duo (Two Factor Authentication)
- SafeNet (Two Factor Authentication)

RED: NEW Open for Sponsor / SV campuses GREEN: NEW- Team in place. BLACK: Open for participation



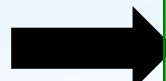
# Service Validation Process

ROADMAP:  
TECHNICAL  
FUNCTIONAL

SECURITY:  
STANDARD  
ASSESSMENT

CONTRACT:  
LEGAL  
BUSINESS

DEPLOYMENT:  
DOCUMENTATION  
SUPPORT



## NET+SERVICE

1. Service Tuned for HE
2. Quarterly Plan
3. Security Information  
Published & Peer Reviewed.
4. Master Contract: Provider &  
Internet2 in Place
5. Customer Contract: Campus  
and Internet2 in Place
6. Waterfall /Special Pricing
7. Best Practices and FAQ
8. Crowd Sourced Support
9. SLA and Escalation
10. Exit Strategy

# Expanding Internet2's Global Services

- Developing a Global Engagement team with resources assigned to Europe, South America, The Middle East, Africa, Asia and South Asia.
  - Jonathon Chapman is the leader of our Middle East engagement(s)
- Deploying resources to support US campus members developing campuses outside the US.
  - New 'Exchange Point and Hosting Site' in Singapore to Support US universities in Asia and the Middle East.
    - Includes HDVC/Telepresence exchange and Net+ service hosting capabilities.
- Deploying Global Net+ Partners Program
- Working with global NREN partners on 'Next Generation' global R&E 'Cyber-Infrastructure'.

# The NET+ Partners

EXAMPLE ONLY



Community Colleges K-

K-12 &



R1-R2-R3



International

EXAMPLE ONLY



Labs



# Internet2 NET+ Partner Program

1. Support Regional and International Network Adoption of NET+ Services – beyond Internet2 member including K-20 US education community.
2. NET+ Partners become distributors of NET+ services to their constituencies.
3. Service costs are offered to NET+ Partners have access to services at I2 member pricing.

# The Internet2 NET+ Partner Program

4. As volumes increase across all subscribers, prices drop. Members will always receive better pricing than standard educational discount.
5. Additional pricing tiers created to support K-12 and very small schools.
6. Services from one NET+ Partner participant to others supported through model

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FOR MORE INFORMATION

[innovation@internet2.edu](mailto:innovation@internet2.edu)

[netplus@internet2.edu](mailto:netplus@internet2.edu)

[rs@internet2.edu](mailto:rs@internet2.edu)

(research support)