


A light blue world map is centered in the background, overlaid on a network of white lines and nodes that represent a global network. The map shows the continents in a darker shade of blue.

POWERED BY
BOUNDLESS COLLABORATION.
COMMUNITY
CONNECTED RESEARCH. ACCELERATED DISCOVERY.

www.internet2.edu  [@internet2](https://twitter.com/internet2)

Agenda

- Intro to Internet2 today
- Internet2 Global Programs
- Global REN CEO Forum
- US/Mexico Collaboration Opportunities



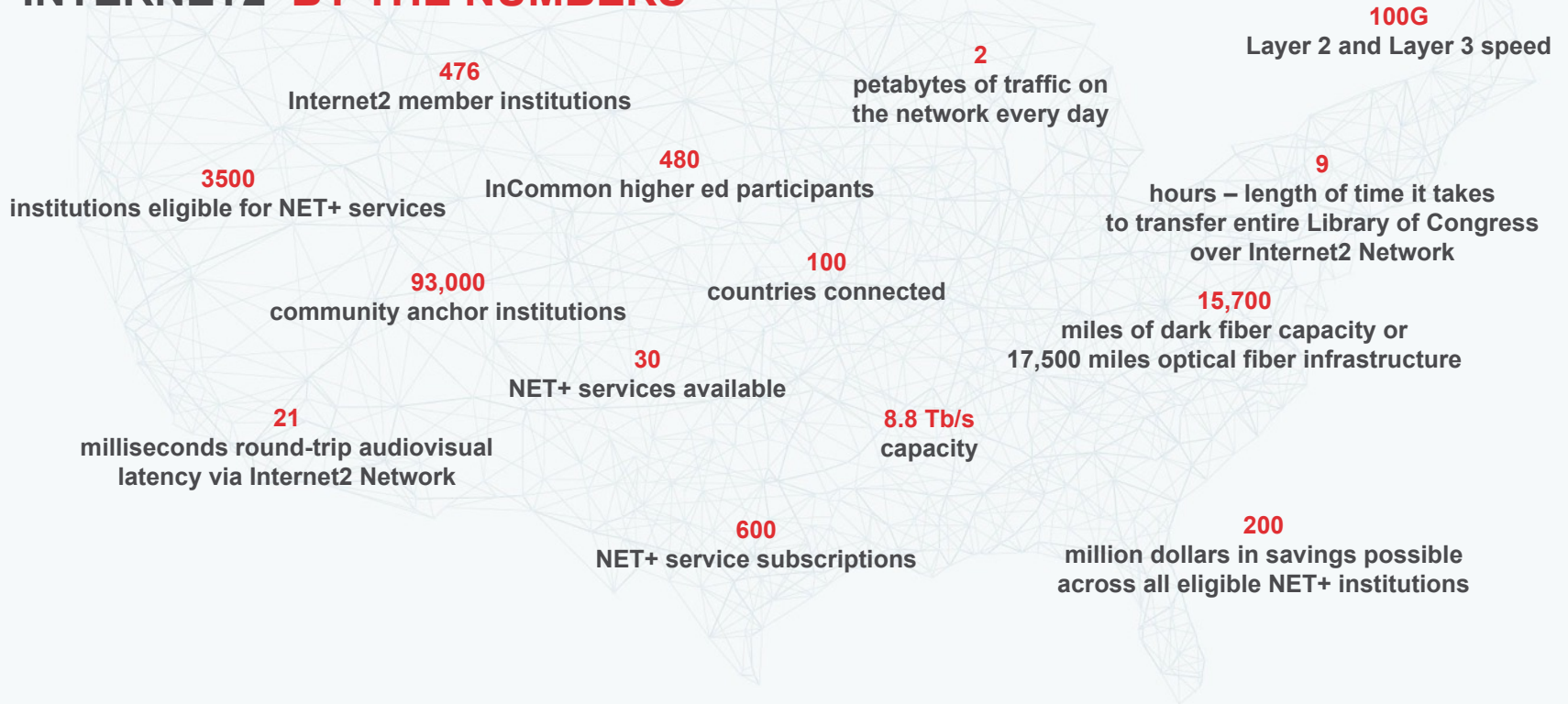
INTERNET2 TODAY



THEN, NOW AND BEYOND. **INTERNET2 IS US.**



INTERNET2 BY THE NUMBERS





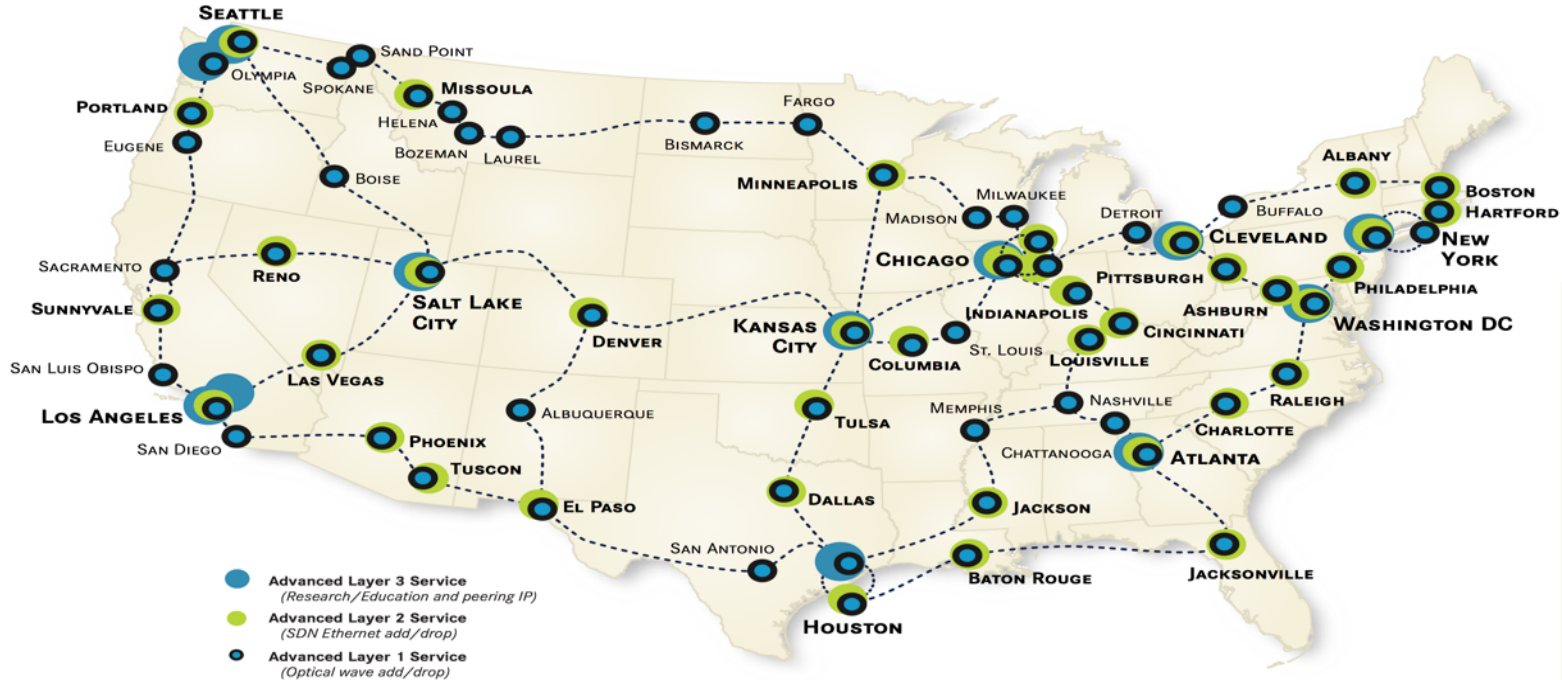
Goals

- Realize the **power of collaborative scale** to create capabilities no single institution could produce on its own
- Create **advanced technology capabilities** to extend leading edge scholarship and research
- **Enable new generation of applications** and core supporting infrastructure and technologies
- Achieve **durable measure of control** over the community's operating environment
- Transfer technology and experience to **drive innovation and advance the global internet**



INTERNET2 NETWORK INFRASTRUCTURE TOPOLOGY

SEPTEMBER 2015



- Advanced Layer 3 Service
(Research/Education and peering IP)
- Advanced Layer 2 Service
(SDN Ethernet add/drop)
- Advanced Layer 1 Service
(Optical wave add/drop)

INTERNET2 NETWORK BY THE NUMBERS

17	JUNIPER MX960 ROUTERS SUPPORTING LAYER 3 SERVICE
34	BROCADE AND JUNIPER SWITCHES SUPPORTING LAYER 2 SERVICE
62	CUSTOM COLLOCATION FACILITIES
250+	AMPLIFICATION RACKS
15,717	MILES OF NEWLY ACQUIRED DARK FIBER
8.8	TBPS OF OPTICAL CAPACITY
100	GBPS OF HYBRID LAYER 2 AND LAYER 3 CAPACITY
300+	CIENA ACTIVEFLEX 6500 NETWORK ELEMENTS
2,400	MILES PARTNERED CAPACITY WITH ZAYO COMMUNICATIONS IN SUPPORT OF THE NORTHERN TIER REGION



IN SUPPORT OF
U.S.UCAN

NETWORK PARTNERS

ciena



INDIANA UNIVERSITY

infinera

JUNIPER
NETWORKS

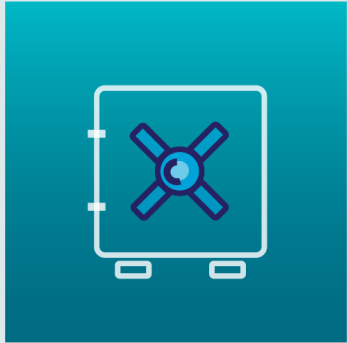


- 2010** – Investigation launched by 13 member campuses
- 2011** – Designed NET+ to leverage InCommon
- 2012** – Internet2 NET+ launched with 2 services
- 2013** – 86 campuses involved in Service Validation
- 2014** – Over 350 campuses have participated and subscribed over 650 times to an Internet2 NET+ Service



Internet² NET+

Internet2 NET+



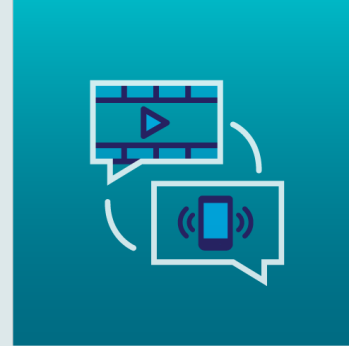
INFRASTRUCTURE
& PLATFORM



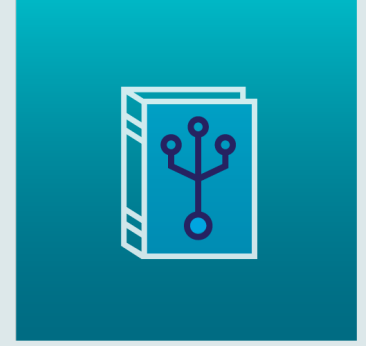
SOFTWARE
AS SERVICE



SECURITY &
IDENTITY



VIDEO, VOICE &
COLLABORATION



DIGITAL CONTENT
FOR R&E

INTERNET2 NET+ SERVICES: CURRENT ENGAGEMENTS



INQUIRY



EVALUATION



EARLY ADOPTER



SERVICE VALIDATION



GENERAL AVAILABILITY

Alfresco | Citrix | UNISYS | Phybridge | AnCrypted Cloud | cspire | THREE RIVERS SYSTEMS | Accellion | foliotek ONLINE PORTFOLIO SYSTEM | DOMO | Hortonworks | cloudera | COMODO | Gigamon | SCALITY | Google | FIDELIS | TriCore solutions

Ignite IT to Drive Higher Education | KeyNexus | E-Content | netskope | SAP | CISCO | Akamai | SAVVIS A CenturyLink Company | LastPass | DELL | RSYSTEMS powering innovation | workday | salesforce

ACQUIA | cloud bearing Solutions for the Modern Workforce | at&t | DocuSign The Global Standard for eSignatures | Kaltura open source video | philo | verizon | terremark | virtustream. | ORACLE | ENDECA | Adobe | VMware Horizon Air

Microsoft Azure | Bluejeans | amazon web services | eduroam | ICE | 2sms.com | One | fuze | SeeVogh | Office 365 | Office 365 | labarchives Chance Favours the Organized Lab | MEDIACORE | SkySync

Blackboard | box | canvas | InCommon CERTIFICATES | InCommon MULTIFACTOR | merit Cloud Storage | MERITLIST MANAGER | MERITMAIL Collaboration Suite | SIP Services powered by AAstra Level(3) | INTERNET Video Exchange | Desire2Learn | splunk | DUO SECURITY

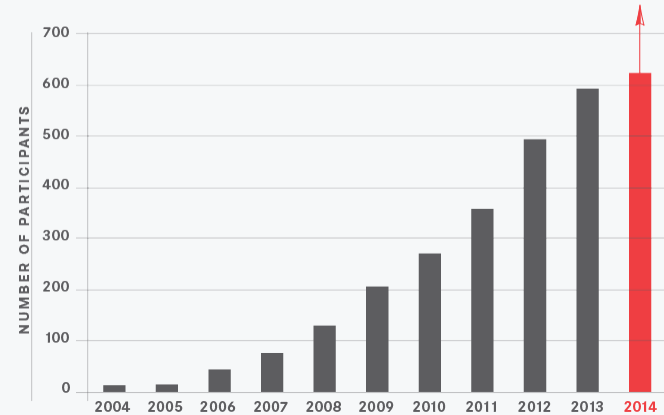
INCOMMON FOUNDATION FOR TRUST & IDENTITY

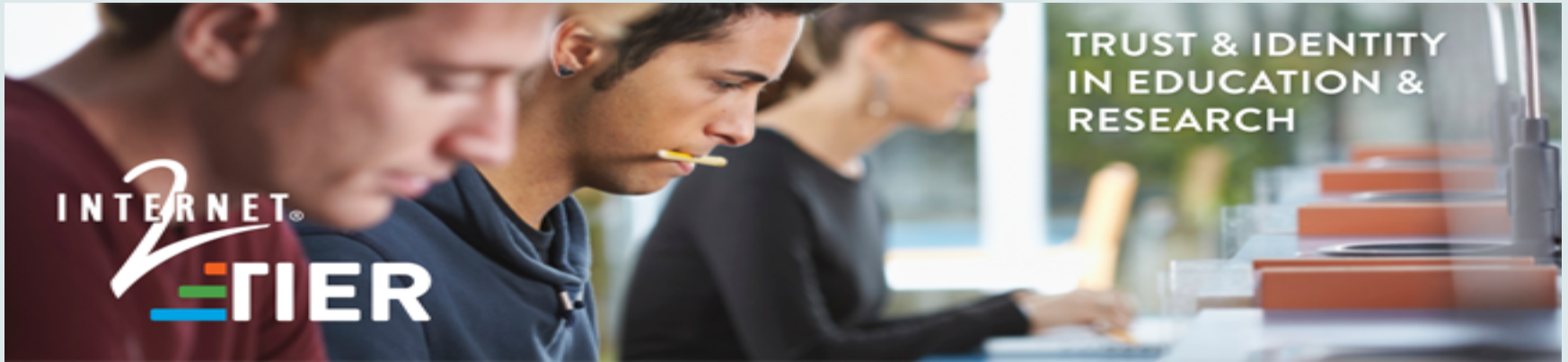
InCommon®

Celebrating our 10 year Anniversary

- 15 → **500+** Academic Participants
- 2 → **200+** Sponsored Partners
- 0 → **2000+** Registered Service Providers

8+ million individuals served by federated IdM





TIER, a community-initiated effort, coordinated by Internet2, to develop a consistent, rationalized approach to identity and access management that simplifies campus processes and advances inter-institutional collaboration and research.

TIER is both an open source toolset and a campus practice set.

TIER: TRUST & IDENTITY IN EDUCATION & RESEARCH

InCommon®

COmanage™

Grouper™

 Shibboleth.



**THE STANDARD
FOR OVER 700 HIGHER
EDUCATION INSTITUTIONS
AND COUNTING!**

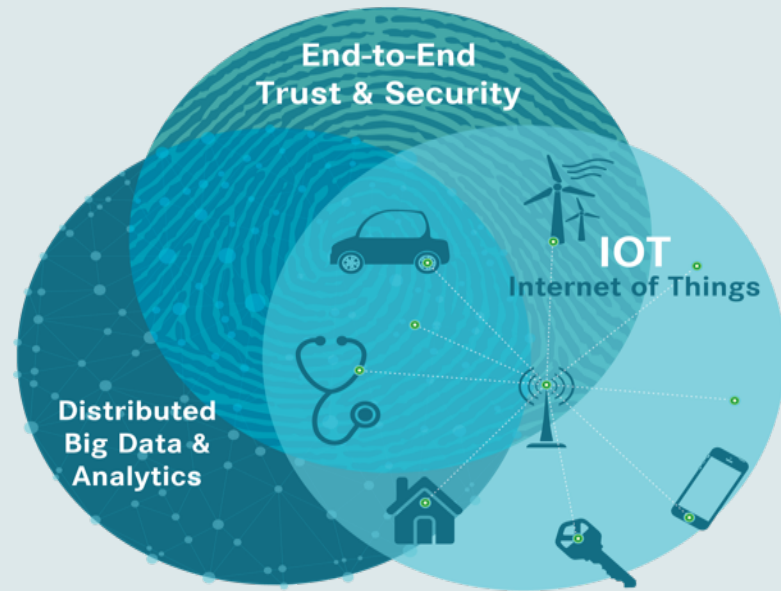
- Secure, streamlined sharing of protected resources
- Consolidated management of user identities and access
- Delivery of an integrated portfolio of community-developed solutions

Collaborative Innovation Program



Goal:

Stimulate and lead development of collaborative initiatives leading to innovations which will benefit the research & education community. This can result in new programs, services, members.





Collaborative Innovation Program

Three new collaborative
Innovation Working Groups



The Internet2 Community: An Unparalleled Human Network

Nearly 500 member institutions



93,000+ community anchor institutions



International partners



initiatives, working groups, special interest groups



Core staff

Internet2 Community Anchor Events



Assembles CIOs, VPRs, decision makers, thought leaders, technologists, and end users from institutions around the world

Anchor events complemented by whole range of focused technical events: FTW, Shib, TIER, IAM Online workshops/webinars, and more!

- Explore critical issues
- Drive R&E advancement
- Gauge progress toward community goals
- Determine collective priorities

2014
TECHNOLOGY
exchange



Convenes CTOs, engineers, architects, operators and students from around the U.S. and the globe

- Keep global technology leaders aligned and moving forward in sync
- Redefine the state of the art
- Invite pioneers and architects to “cross-pollinate” and exchange ideas and expertise
- Forge new intersections



INTERNET2 GLOBAL PROGRAMS



The Changing World: Global Scope / Local Access

- Leading Universities are global
 - Education
 - Global Campuses, Gateway offices, MOOCs, etc.
 - Research
 - Science collaborations are increasing global
 - Large “Big Data” instruments are distributed, multinational investments

Globalization = New User Demands and NREN Challenges

-
- More deterministic, reliable, scalable network
 - More generic shared infrastructure (VPN, DNS, VM's, storage) at global hosting sites and less campus-driven infrastructure
 - Additional support services around the world to facilitate more predictable service delivery and operations
 - Identity and Security must be expressed at global scale

In other words, national and campus infrastructure and services need to be projected at a global scale!

Internet2 Investments

ANA-200G

- Internet2, NORDUnet, CANARIE and SURFnet partnered on this project.
- Both ANA-200G and ESnet attained full production status at the end of 2014.
- Reciprocal back-up agreement of 340Gbit/second between ANA-200 and ESnet since April 2015

Middle East:

- AGE – OX (Arabian Global Education Open Exchange Point) in Fujairah
- Commitment to fund 10G connectivity to Singapore – NYU Abu Dhabi/Ankabut/Internet2 (currently 2.5G)

TransPacific:

- 100G Internet2/SingAREN partnership (Singapore to LA). Production 2016.
- 10G Internet2/CERNET partnership (Beijing/LA).

Other investments

- Development of strategic partnership programs in countries and regions important to our members (campuses in China and Qatar, study abroad facilities in Italy)
- Creation of Starter Kits targeted towards CIOs tasked with supporting TNE
- Regional Consulting Services
- Delegation trips to in country workshops and campuses

Upgrading US-Mexico cross-border connectivity

- Internet2 and CUDI worked together to upgrade cross boarder connectivity at El Paso from 1gb to 10gb
- A consortium is forming to also fund an upgrade from 1gb to 10gb at Nogales

These new strategic investments will:

- Support the extension of the Internet2 Innovation Platform into Mexico
 - Abundant Bandwidth
 - Programmability
 - Friction-free Science
- Enhance support for US/Mexico big data science collaborations

The Need for New Global Partner Strategies

To date...

- Standard MoU partnerships – simple “handshake,” best-effort agreements
- Limited Global REN strategy coordination

Move towards...

- Alignment of efforts to build consensus on global strategies

How can we work together to enhance global relationships?

Can we scale our collaborative models up to the global stage?



GLOBAL REN CEO FORUM



CEO Forum Representatives

Australia

Canada

China

Mexico

Europe (GEANT)

Germany

USA

European Nordics

UK

New Zealand

Latin America (RedClara)

France

Brazil

South Africa

Japan

The Netherlands

Southern and Eastern Africa

Global REN CEO Forum Working Areas:

1. Global Network Architecture
2. Global RealTime Communications
3. Global Federated Identity, Delivery, Management and Services
4. Global Services Delivery
5. Global Knowledge Exchange
6. Security Study Group
7. Big Science Study Group

Global Network Architecture (GNA)

- The GNA is a:
 - an “architecture” to facilitate more cooperative interaction among R/E networks in the delivery of services to the global R/E community.
- Achieved by the global REN community contributing resources to:
 - Defining a blueprint that R&E Networks can use to align their investments in intercontinental circuits
- To ensure that
 - R&E Networks can better meet the expectations and requirements of their member institutions and funders

Goals:

- To describe an inclusive, collaborative, and sustainable Next Gen intercontinental R&E network infrastructure with a 5 to 10 year horizon
- To define a framework for regional and national networks and exchange points to participate in
- To build a collaboration or federation of existing networks/exchange points
- To coordinate and align spending for intercontinental bandwidth
- Use coalitions and co-investment strategies to leverage current investments to extend the same advanced infrastructure you enjoy at home to the global stage

GNA to-date

- GNA Technical WG: now over 30 network engineers from REN organizations around the world
- Creation of first draft framework documents:
 - Reference Architecture (governance and policy; technical and operational)
 - Open Exchange Expectations
 - Network Services
 - Operations
 - AUP
 - Privacy
- GNA Pathfinder:
 - ANA-300g

GNA Website - <http://gna-re.net/>

MEMBERS LOGIN

global network architecture

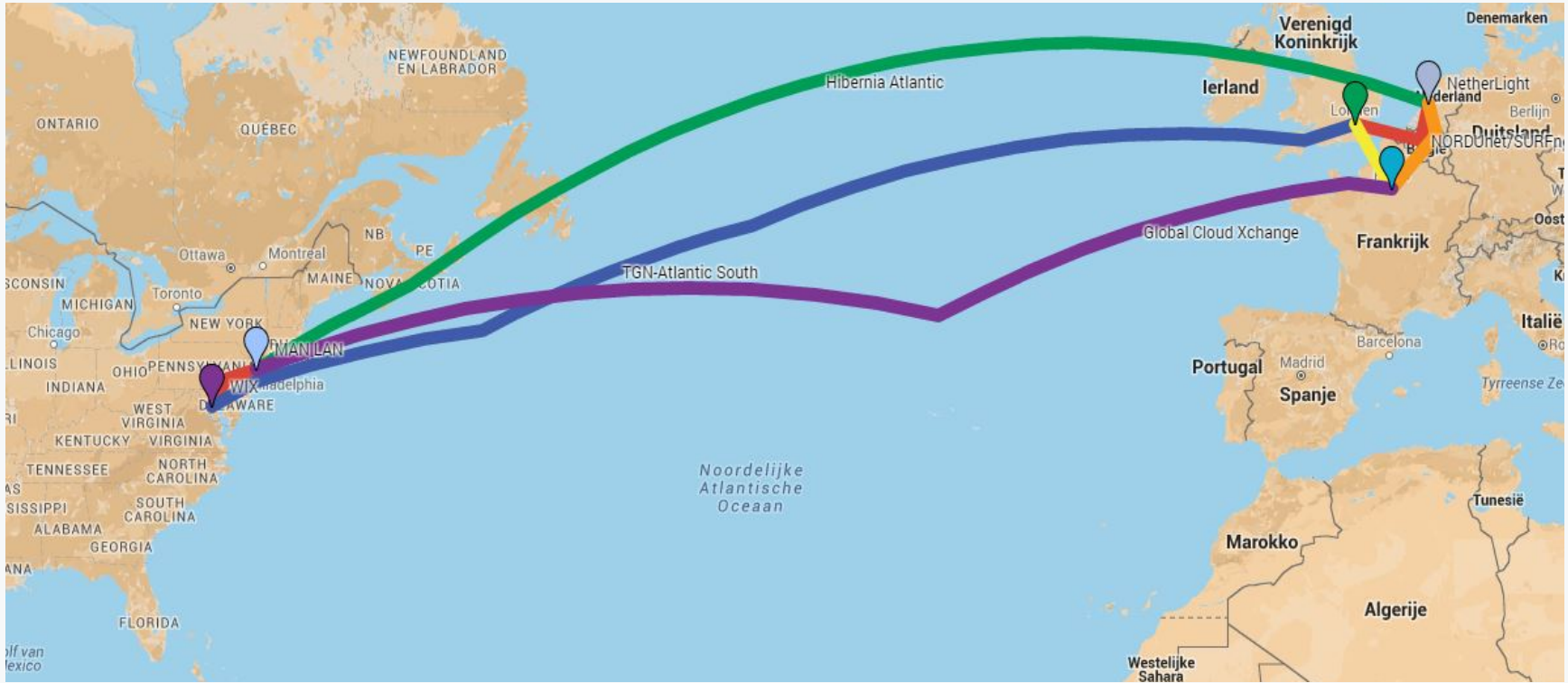
HOME ABOUT OUR PLAN **RESOURCES** MEETINGS GET INVOLVED

White paper:
Global R&ENetwork Architecture Program

FIND OUT MORE

Developing a blueprint for global
R&E network architecture

A GNA Pathfinder – ANA-300g



- Global Federated Identity Management
 - Inter-federating the federations – ensuring user credentials are valid globally – moving towards edugain adoption
- Global Real Time Communications
 - Ensuring Video Conference capabilities are fully interoperable
- Global Service Delivery
 - Using aggregation power of the NRENs to deliver common services

- **Big Science Support**
 - Working with distributed international science facilities to understand and support their long-term international data requirements (eg. Alma, SKA)
- **Knowledge Sharing**
 - Combining efforts to support NREN development in emerging regions
- **Security**
 - How can the NRENs work together to ensure privacy of data on their networks?

"The unique partnership between the U.S. and Mexico allows us to leverage our strengths and resources to address similar goals,"

Córdova

I welcome comments and discussion.

Thanks!

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