

The Internet2 Research and Development Agenda for 2010: The Year of End to End Deployment

Randall Frank
Chief Technology Officer, Internet2
5 December 2009
CANS'2009 Beijing



Being Honest With Ourselves

- Lots of great advanced technology out there deployed in pockets
- Great at custom demos that show off incredible bandwidth, high quality video, seamless authentication, ...
- Not so great at making this all available to normal end users at their desks
- Users often need to become network experts to make all of this work

Example Technologies

- High performance networking (reserved bandwidth, predictable QoS)
- Performance monitoring
- Authentication

What's missing?

- Predictable deployment in a large scale end to end environment
- Technologies that work across the incredible diversity of networking infrastructures that are present within the R&E community
- Troubleshooting tools that enable end user to know what to do when things don't work

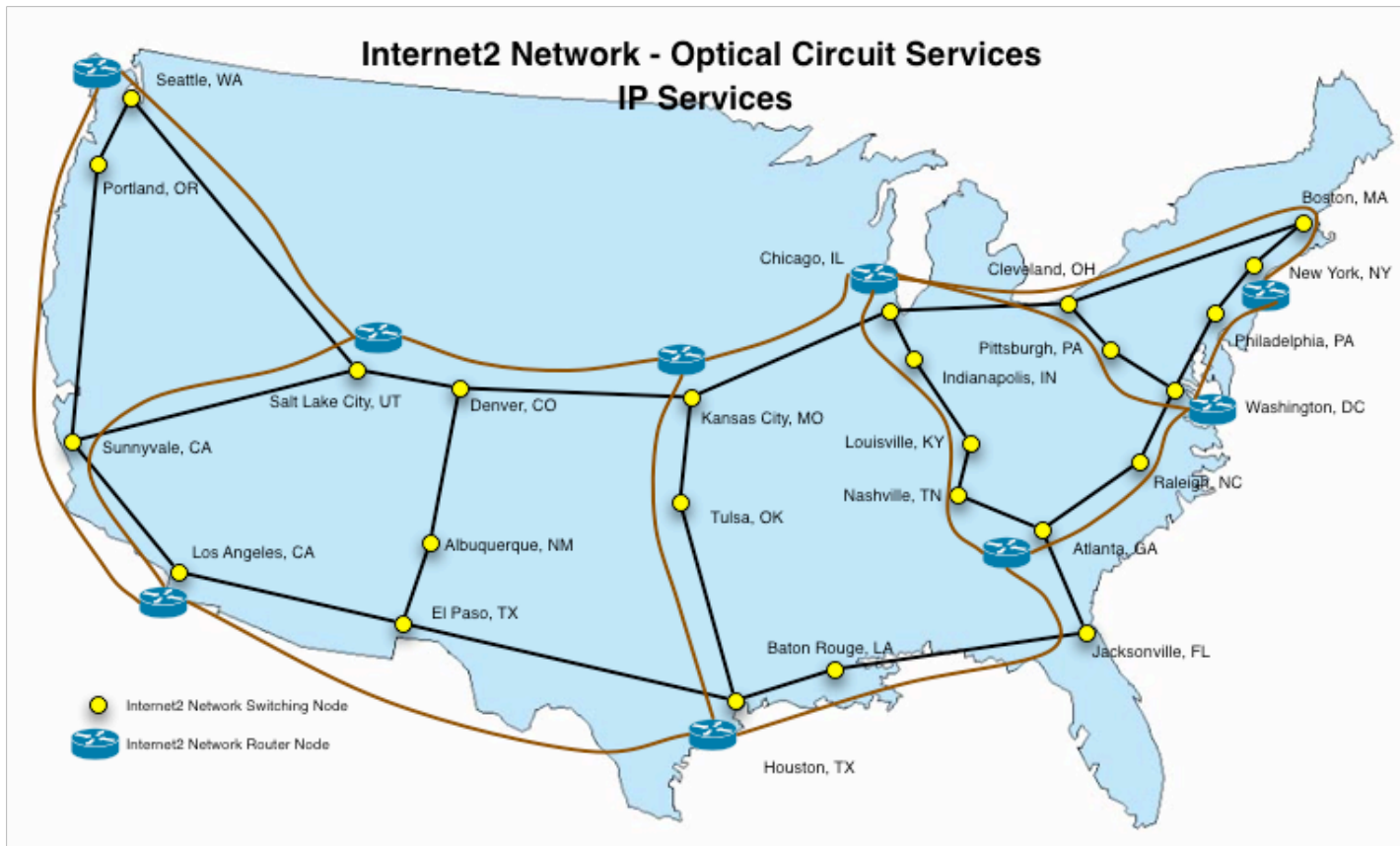
2010: Concerted Effort to Move from Demos to Production

- Previous model: we did our work in the network core, now if only campuses and regionals would do their part...
- New model: joint effort to make technology work end to end
- Work with campuses and regionals to develop plans for funding and deployment

High Performance Networking

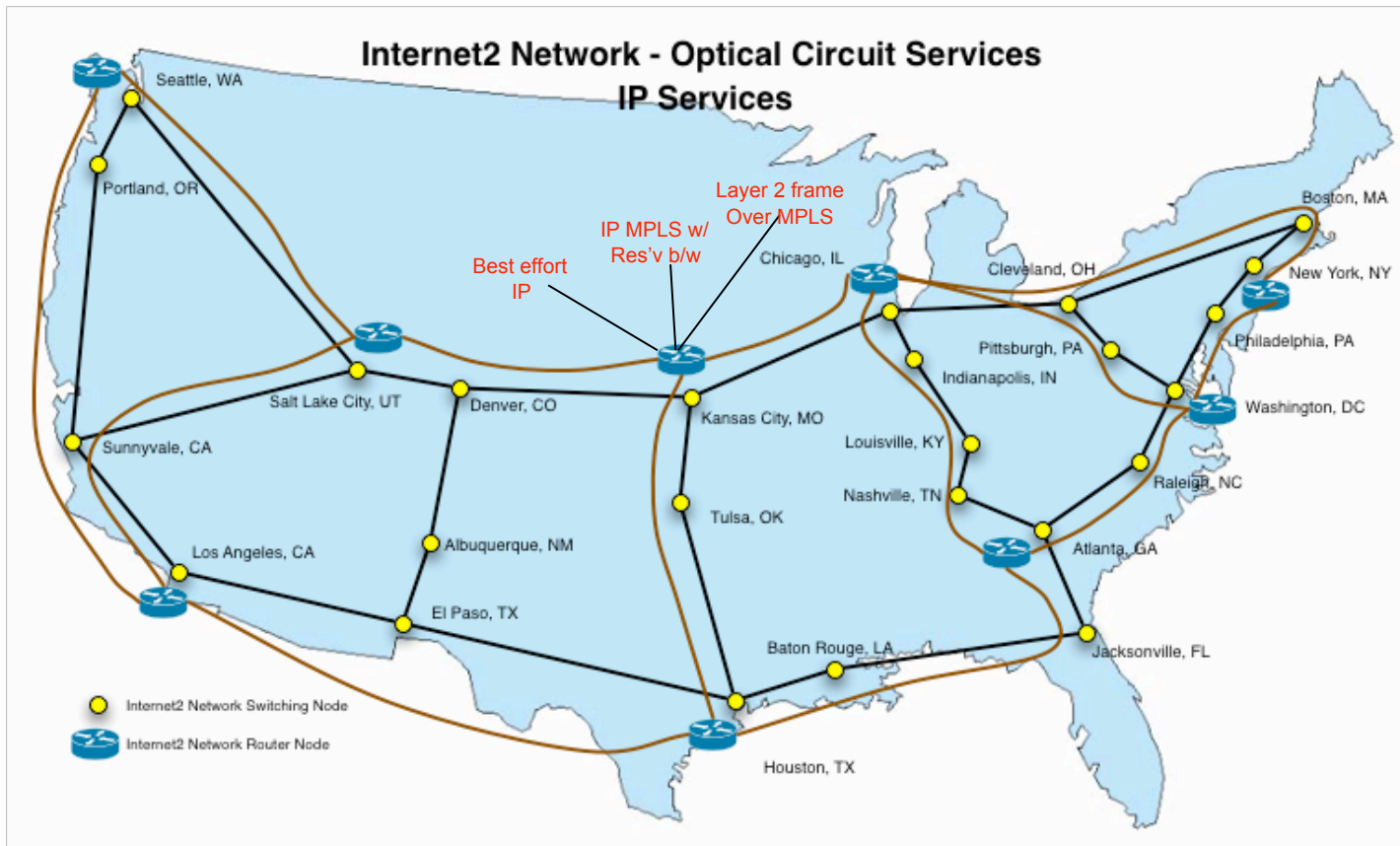
- Goal: allow research users access to predictable high performance/high bandwidth flows
- Allow network be better handle needs of research users by capacity reservation

Internet2 Network - Optical Circuit Services IP Services



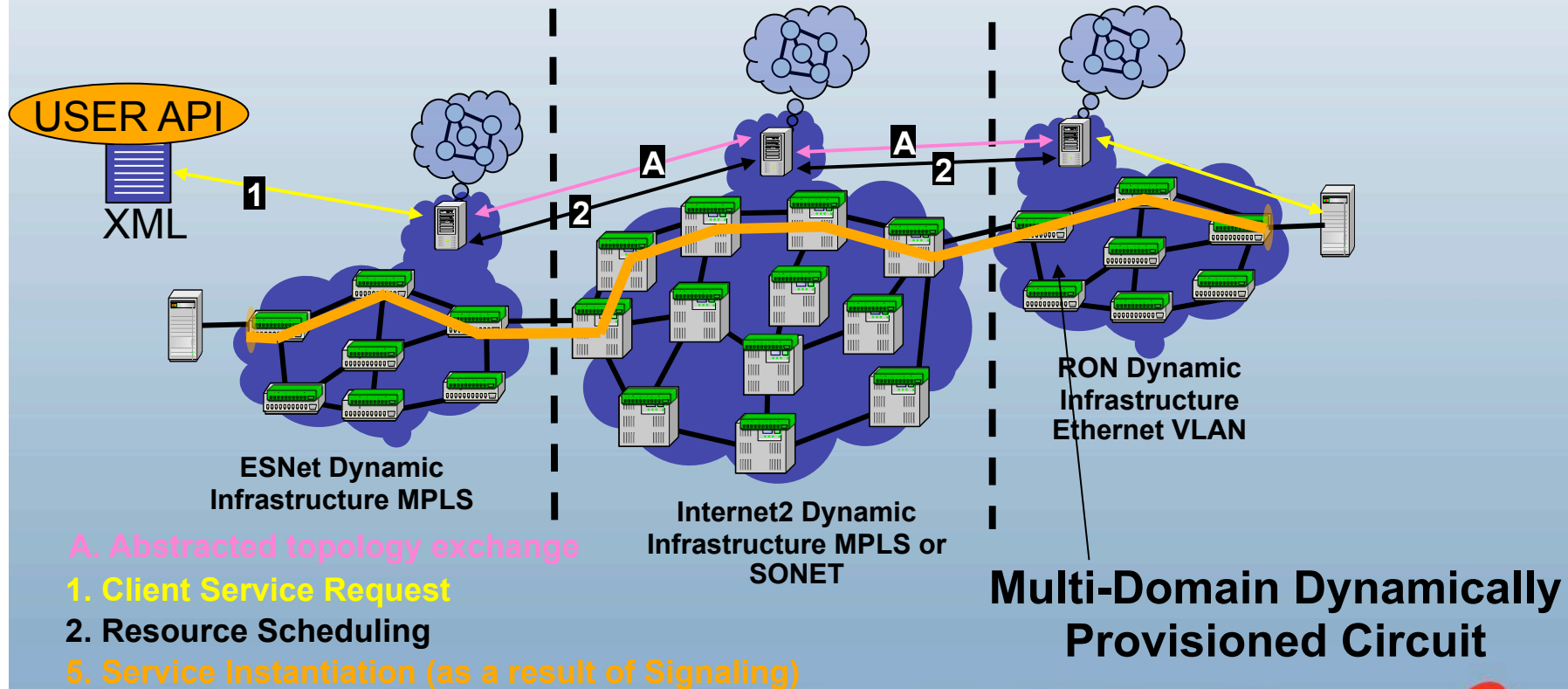
Some Experiments didn't have right scaling/deployment characteristics

- Implemented separate circuit based network for reserved capacity
 - Required separate interface(s) for downstream networks
 - Didn't integrate into financial or operational model, not financially viable given current funding models
 - Didn't deal with campus/regional issues
 - Physical vs. virtualized services
 - Required users to become network experts

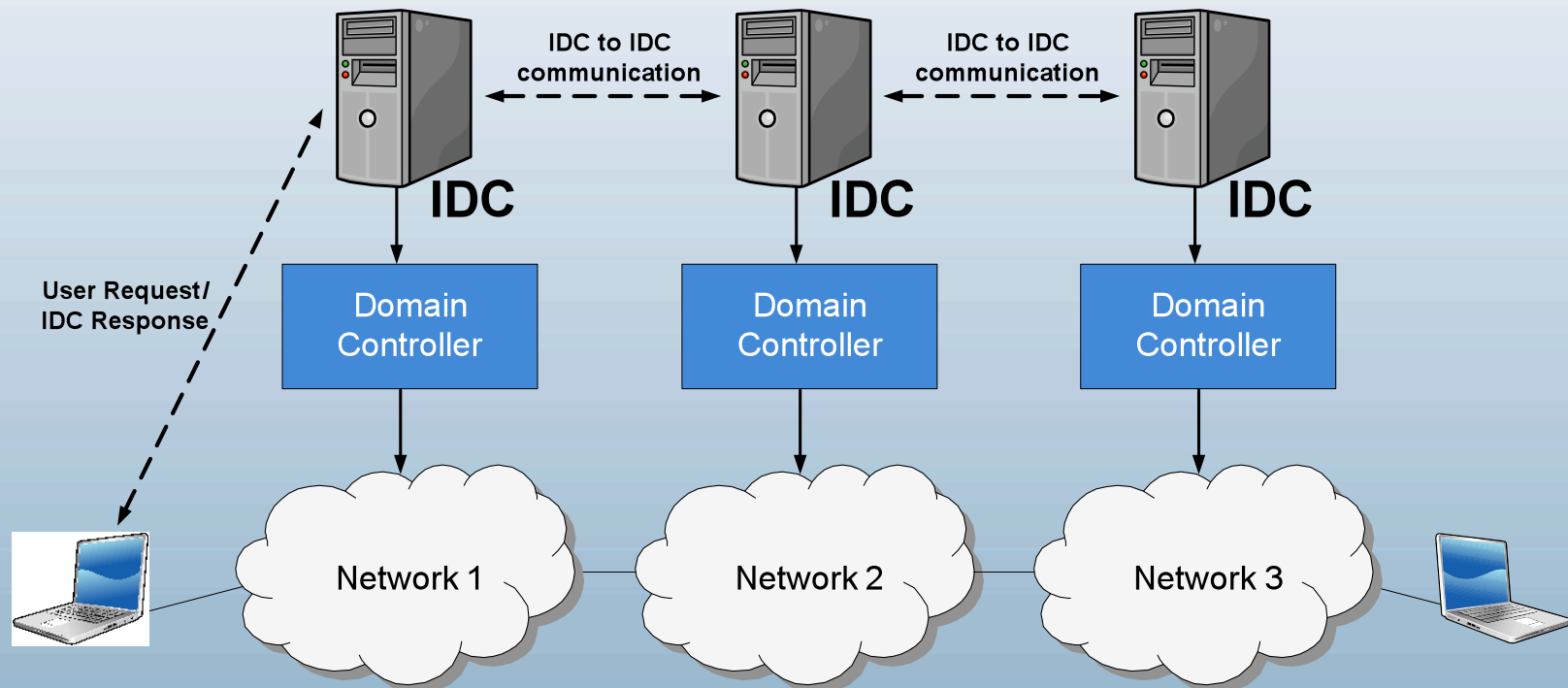


ION Services InterDomain

- No difference from a client (user) perspective for InterDomain vs IntraDomain



DCN Control Plane



InterDomain Controller (IDC) Protocol (IDCP)

- Developed via collaboration with multiple organizations
 - Internet2, ESnet, GEANT2, Nortel, University of Amsterdam, others
- The following organizations have implemented/deployed systems which are compatible with this IDCP
 - Internet2 Dynamic Circuit Network (DCN)
 - ESNET Science Data Network (SDN)
 - GÉANT2 AutoBahn System
 - Nortel (via a wrapper on top of their commercial DRAC System)
 - Surfnet (via use of above Nortel solution)
 - LHCNet (use of I2 DCN Software Suite)
 - Nysernet (use of I2 DCN Software Suite)
 - University of Amsterdam (use of I2 DCN Software Suite)
 - DRAGON Network

Performance Measurement

- Perfsonar
 - Widely adopted framework for exchange of network measurement data
 - Joint development of ESNET, Internet2, GEANT2, RNP and others
 - Goal: allows users world-wide to obtain data on end-end performance of a network path

Successes

- Gaining widespread acceptance across diverse networks and communities
- Extensive deployment within some networks (e.g., ESNET)

Limitations

- Not ubiquitous – users can't rely on available of data collection points
- Implementation somewhat complex
 - Lack of standard, low cost deployment devices
 - Authorization environment still lags
- End user friendly analysis tools

2010 Goals

- Low cost deployment kits
- Work with (virtual) communities to spur deployment
- Partner with other orgs that have specialized expertise (Gloriad?)
- Work with vendors to build Perfsonar collection into network devices

Authentication

- Shibboleth: international R&E standard for federated authentication
 - Each campus continues to use local authentication environment
 - SAML based
 - Allow inter-campus trust (within federation) of other campus authentication assertions
 - InCommon: US Federation, 300+ campuses

Inter-Federation Authentication

- EduGain – allows for trust relationship between federations
- EduRoam – service that allows for shared access to campus wireless services (Europe deploying, under investigation in other locations)

Goals for 2010

- “productize” InCommon Federation in US
- Gain acceptance outside of R&E for R&E authentication
 - US Federal government acceptance of InCommon for US Gov’t authentication of academic users
- Eduroam expansion
- Expansion of services using Shib
 - Today primarily web based authentication
 - Deployment within other API services (e.g., Perfsonar)

Lots of possibilities for US/China Cooperation

- Extension of IDC services between US and Chinese R&E networks
- Perfsonar deployment
- EduGain/EduRoam possible deployments
- Others ...

Thank You

