The Corporation for Education Network Initiatives in California

R&E Networking: 2012

and Opportunities for Mexico/California Collaboration

Dave Reese • CTO, CENIC

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Presentation Overview

- The Latest Developments in R&E Networks:
  - Mexico/California Collaboration
  - New Technologies – 100G, wireless
  - New Services – the coming of the cloud
  - New Projects – Broadband deployment
  - Openflow/Software Defined Networks (SDN)

Mexico/California Collaboration

- Perfectly positioned for advanced collaborations
- 10G upgrade between Mexico and California
  - Part of NSF-funded AmLight project (Award #OCI-0963053)
  - CUDI, CENIC, Florida Int'l University
  - CUDI Connected to Pacific Wave Exchange
- CUDI Extension to CICESE
  - 10G service to CICESE!!!!
  - CUDI providing service at meet point for CLARA

The Latest Developments: Technology

- 100G networking is deploying rapidly
  - Internet2 stimulus-funded project to implement 100G networking
  - Dept of Energy projects funding 100G networks for research laboratories
  - CENIC/PNWGP/Internet2 cooperative agreement to implement 100G on US West Coast
- Intercontinental submarine fiber systems are starting to support 40G
- Openflow and Software Defined Networks (SDN)

The Latest Developments: Services

- Infrastructure has become established in the last decade and is now assumed to work at a high level.
- The cloud is rapidly growing in size:
  - CalREN VoIP services
  - CENIC and Amazon Web Services Agreement
  - Google Docs/Drive, Dropbox, Skype, Internet2 NET+, academic cloud services (cloud.sdsc.edu), Open Cloud Initiative (non-profit)
  - Allows institutions to start and scale services quickly without major infrastructure investments.

The Latest Developments: Projects

- Assumptions:
  - Broadband is a major economic driver and strategic necessity for a nation to compete successfully on the global stage.
  - Universities enjoy advanced networking beyond that of most communities.
  - That networking (and the expertise that made it possible) can and should be leveraged to expand broadband and services beyond the university campus to surrounding communities.

The Latest Developments: CENIC Projects in California

- CENIC leveraging its position as a leading R&E networking organization to promote broadband in remote or rural communities and anchor institutions
  - Central Valley Broadband Project
    - www.cvngbip.org
  - Northern California projects:
    - Northeastern CA Connect Consortium
    - Upstate CA Connect Consortium
    - www.necalbroadband.org, www.upcalbroadband.org

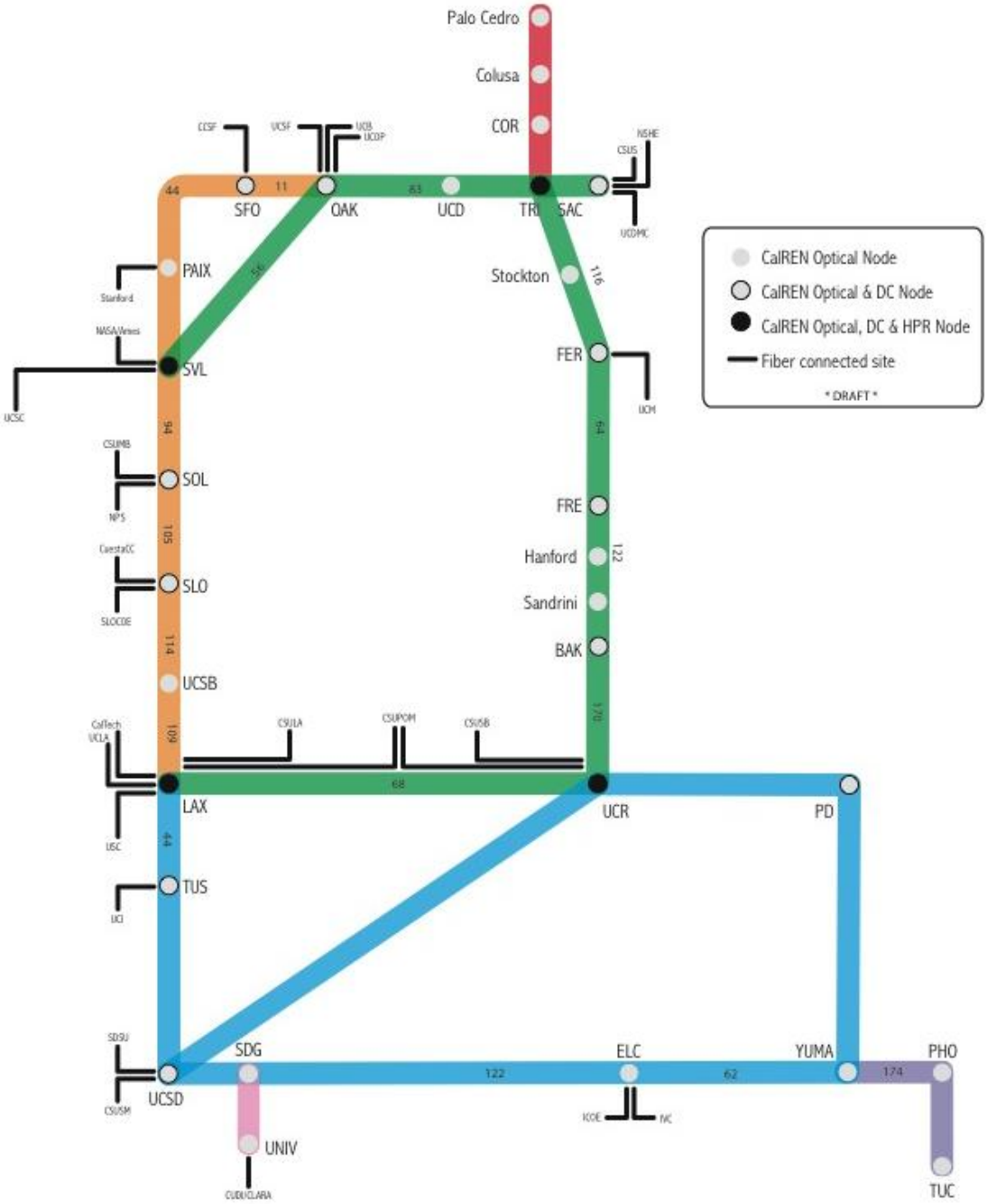
The Latest Developments: Openflow in the Backbone

- CENIC is deploying Brocade switches supporting Openflow in the backbone
- Universities can connect their Openflow testbeds to CENIC's testbed to test interoperability
- CENIC will connect to Openflow testbeds in both Internet2 and NLR

CENIC Optical Fiber Network

CENIC deploys and operates a dense wave division multiplexed (DWDM) optical backbone throughout California.

The fiber network consists of over 2,400 miles of fiber



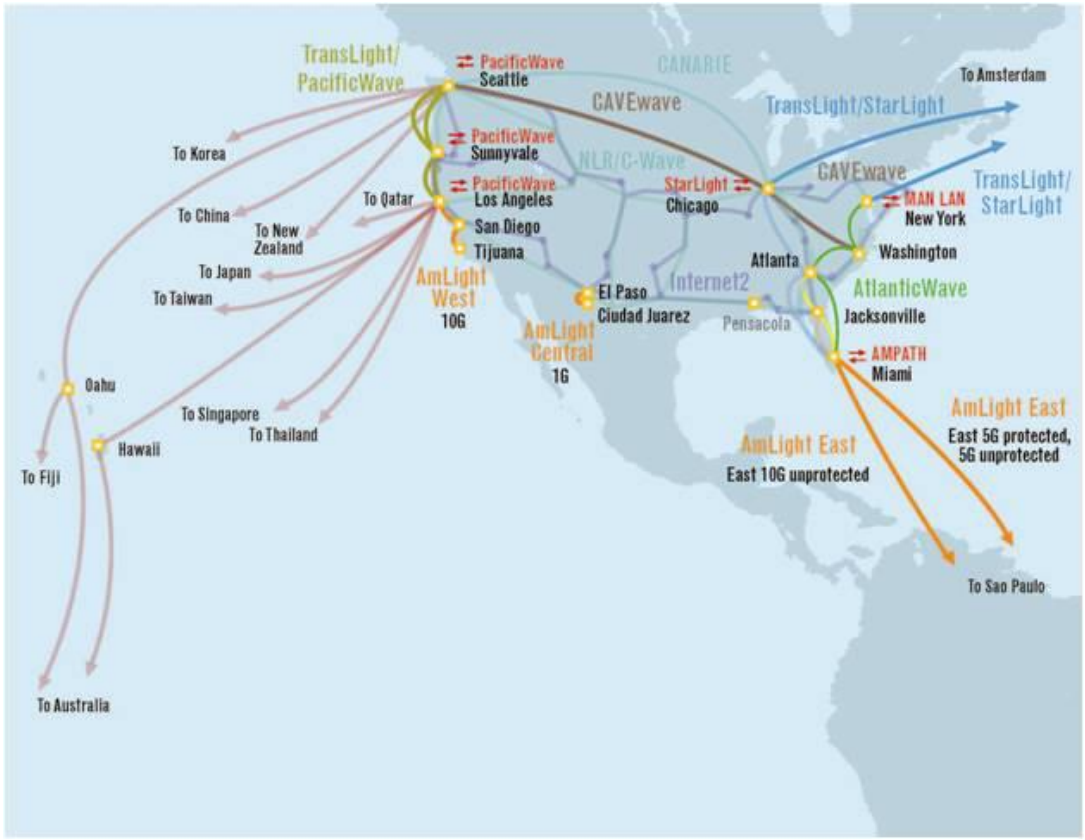
CENIC • 16700 Valley View Ave. #400 La Mirada, CA 90638
(714) 220-3400 • info@cenic.org • www.cenic.org

Pacific Wave

Serving the International R&E Community

Pacific Wave is a state-of-the-art international peering exchange facility designed to serve research and education networks around the Pacific Rim and the world.

It is flexible, adaptable, and able to leverage rapidly changing technologies to meet the diverse needs of different networks.



Pacific Wave 100G

- CENIC and PNWGP partner with Internet2 to light West Coast (Los Angeles to Seattle) at 100G
- Pacific Wave deployment of 100G
  - 100G transport
    - Los Angeles to San Luis Obispo
    - San Luis Obispo to Sunnyvale
    - Sunnyvale to Seattle
  - 100G switches in Los Angeles CA, Sunnyvale CA and Seattle WA
  - NSF ARI (Univ of New Mexico & CENIC)
  - Pacific Wave will be first exchange to offer Openflow at 100G on a distributed platform

Potential Collaborators: Disaster Response

- San Diego State University Visualization Center (VizCenter): geographic data visualization to aid first-responders and planning
  - Example: Hosted Exercise 24 México humanitarian and disaster relief exercise in Feb 2012
- Naval Postgraduate School
  - Rapid deployment of *ad hoc* networks in disaster scenarios

Potential Collaborators: Seismic Study

- UC system:
  - Studying mitigation, networked sensors, large survey data sets, quake simulation, etc.
  - Collaboration between Mexico/CA enabled by 10G AmLight upgrade
    - Enables sharing of large data sets between UC Davis, CICESE, San Diego Supercomputer Center
    - More examples of seismic research in CA at www.universityofcalifornia.edu/everyday/earthquake/

Potential Collaborators: Seismic Study

- University of Southern CA:
  - Southern CA Earthquake Center (www.scec.org)
- Caltech
  - Carrying out GPS investigations in Jalisco, monitoring plate subduction
  - Collaborators in Mexico: Universidad Nacional Autonoma de Mexico, partnerships with University of Guadalajara, Proteccion Civil del Estado de Jalisco, and the Colima Volcano Observatory

Potential Collaborators: Astronomy

- UC system, Caltech, Lawrence Berkeley National Laboratory, and Australian researchers collaborate with Keck Observatory telescopes on Mauna Kea
  - Collaborative observing, remote teams split among multiple sites
  - Remote observing stations in many university locations
- Thirty Meter Telescope project (HQ in Pasadena)
  - Partners in CA, Canada, China, India, Japan

THANK YOU
GRACIAS