Reviews and updates

- Front Range GigaPoP (FRGP)
- UCAR Point of Presence (UPoP)
- Colorado K-12 networking
- Colorado Telehealth Network (CTN)
- NCAR Wyoming Supercomputing Center (NWSC)
- National networking activities
  - The Quilt, Inc.
  - Internet2
  - NLR
  - NTIA BTO P/stimulus
  - FCC NBP
  - Others/misc
FRGP

- Front Range GigaPoP
- 10 years of operation by UCAR Network Engineering and Telecommunications Section (NETS)
- 15 Members
- [http://www.frgp.net](http://www.frgp.net)
Front Range GigaPoP (FRGPP)

- Increasing traffic
  - Qwest and Level3
  - TransitRail (TR) and Internet2/Commercial Peering Service (CPS)
    * working toward integrating these two peering services
  - Peering

- Continued support for the CSU/Lander trace infrastructure and research
  - Proposed 10G capture

- DYNES with CU Boulder
FRGP members

- Albuquerque GigaPop (ABQ G)/University of NM
- Colorado School of Mines
- Colorado State University System
- Ithaka
- National Oceanic and Atmospheric Administration (NOAA-Boulder)
- State of Colorado
- United States Antarctic Program
- University Corporation for Atmospheric Research
- University NAVSTAR Consortium (UNAVCO)
- University of Colorado Boulder
- University of Colorado Colorado Springs
- University of Colorado Denver
- University of Denver
- University of Northern Colorado
- University of Wyoming
FRGP and WRN

- FRGP and Utah Education Network (UEN) Summit agreement ended June 2010
- Western Regional Network (WRN): a multi-state partnership to ensure robust, advanced, high-speed networking availability for research, education, and related uses through the sharing of network services
- Expansion and sharing of network services in support of advanced research and operations
- Support of academic, economic development, and inter-regional services
WRN members

- Pacific Northwest GigaPop (PNWGP)
- Front Range GigaPoP (FRGP)
- The University of New Mexico (on behalf of the State of New Mexico)
- Corporation for Education Network Initiatives in California (CENIC)

http://westernregional.net/
WRN for FRGP

- Intra-region peering
- NLR and Internet2 services shared and backed-up
- Back each other up (provide diverse layer 2 and 3 to cover on-net failures)
- Efficient and cost-effective CIS as well as TR and CPS connections
- Place to land for-profits from CTN, EagleNET, US-UCAN, others
WRN services vs. FRGP services
proposed  2010-10-22, Pete Siemsen

1. Protects FRGP against a failure of WRN switch 1 or 2 in Denver
2. Saves money on Level 3 by sharing with UNM
3. Allows WRN transit VLANs through WRN switches without touching FRGP gear
4. Allows potential commercial traffic to transit WRN without touching FRGP infrastructure
UPoP

- UCAR Point of Presence
- http://upop.ucar.edu
- 3 years of operation
- 21 members
UCAR Point of Presence - member and service connection overview
http://upop.ucar.edu
2009-12-08 (JC)
UPoP members

* Auraria Higher Education Center
* Colorado Association of Research Libraries
* Centennial Board of Cooperative Educational Services
* City of Boulder
* City and County of Denver
* Colorado Community College System
* Colorado Telehealth Network (not active yet)
* Community College of Denver
* Colorado Department of Higher Education
* Colorado Mountain College
* Deproduction
* Denver Health and Hospital Authority
* DIA
* EDUCAUSE
UPoP members

- Fort Lewis College
- Front Range Internet, Inc. (two school districts)
- Metropolitan State College of Denver
- St. Mary's Academy
- Science and Technology in Atmospheric Research (STAR) Institute
- UCD Educational Support Services
  - San Luis
  - Montrose-AHEC
  - Greeley-AHEC
  - Western-AHEC
  - Craig Memorial-AHEC
  - SW Health Hospital
  - Pueblo CC
- University of Colorado Hospital (not active yet)
UPoP – future connections

- Additional school districts
- WICHE - [http://www.wiche.edu/](http://www.wiche.edu/)
- PacketRail [http://www.packetrail.net](http://www.packetrail.net) connections (e.g., FLC)
- Frequent discussions with a variety of others
Colorado Telehealth Network

- FCC Rural Health Care Pilot Program (RHCPP)
- Colorado Health Care Connections (CHCC; from Colorado Hospital Association (CHA))
- Rocky Mountain Healthcare Network (RMHN; from Colorado Behavioral Healthcare Council (CBHC))

- CTN has FCC RHCPP funding
- Qwest rolling out network now
- [http://www.cotelehealth.com](http://www.cotelehealth.com)
- Internet2 Health Network Initiative:
  - [http://www.internet2.edu/health/](http://www.internet2.edu/health/)
EAGLE-Net

- Educational Access Gateway Learning Environment Network
  - [http://www.co-eaglenet.net/](http://www.co-eaglenet.net/)

- BTOP round 2 award received

- Intergovernmental Agency (IGA)
  - rolling out from CBOCES
  - Board in place
  - Technical Advisory Committee being formed
BiSON partnership

- Bi-State Optical Network (BiSON)
- 5 year old partnership between NCAR, NOAA-Boulder, University of Wyoming, University of Colorado and Colorado State University
- Goal: create an optical WDM network connecting Boulder, Denver, Laramie, Fort Collins and Longmont
BiSON evolution

- In 2010 the ring was upgraded to be 10G capable using an NSF ARI grant
- Existing Movaz hardware upgraded with better amplification and dispersion compensation
- New Adva FSP3000-R7 based shelves added to support new 10G lambdas
- Pass-through lambdas enabled to allow direct connections between any two sites
BiSON current deployment

- Six 10G lambdas lit from Denver
  - 1 new 10G to UW
  - 1 new 10G to CSU
  - 2 new 10G to NOAA in Boulder
  - 2 old 10G from Boulder

- ADVA hardware
  - Amplifiers and older lambda on the RayExpress platform
  - New 10G lambdas on the FSP3000 platform.
BiSON future plans

- Expand dark fiber plant to include NCAR Wyoming Supercomputing Center (NWSC)
- Initially at least four 10G circuits will be active
- Expansion to 40G and 100G a possibility
- Direct connections for High Performance Computing to other BiSON members also a possibility
BiSON Capacity

- System is engineered for 40 individual lambdas
- Each lambda can be a 10G, 40G, or soon a 100G connection
- Independent lambdas can be sent each direction around the ring
- With a major upgrade system could support 80 lambdas
- $100\text{Gbps} \times 80 \text{ channels} \times 2 \text{ paths} = 16\text{Tbps}$
NWSC WAN
Conceptual Diagram

NCAR Internal to ML
FRGP / Internet / R&E
Optional UW Dedicated

All links are 10G Ethernet carried via BiSON DWDM.
NWSC

- NCAR Wyoming Supercomputing Center
  - [http://www.cisl.ucar.edu/nwsc](http://www.cisl.ucar.edu/nwsc)
- Scheduled to be operating in early 2012
- BiSON fiber connectivity
Dave Lambert new CEO replaced Doug Van Houweling

http://www.internet2.edu
National Lambda Rail (NLR)

- Glenn Ricart resigned; Wendy Huntoon Acting CEO
- http://www.nlr.net
US UCAN

- Internet2 BTOP proposal (~$97M) - NLR declined to participate
- United States Unified Community Anchor Network (US UCAN)
  - hopes to provide essential national infrastructure
  - complement and link together regional community anchor networks
- Open search for US UCAN director
- Optical vendor chosen
- Regular calls with RONs on design, schedule, impacts
Rise of the RONs

- Increasing RON fiber ownership and operation
  - increasing after ARRA awards (e.g., PA, NC and others in NTIA BTOP round 2).

- Potential for changing landscape for non-profit (R&E et al) networking in U.S.
The Quilt, Inc.

- [http://www.thequilt.net](http://www.thequilt.net)

- 28 members currently:
  - [http://www.thequilt.net/participants.html](http://www.thequilt.net/participants.html)

- Non-profit regional network aggregators providing advanced network services in support of research and education

- Several work groups, lots of tracking, coordination and strategic planning efforts
GENI

* Global Environment for Network Innovations
* [http://www.geni.net/](http://www.geni.net/)
* [http://groups.geni.net/geni/wiki/SpiralTwo](http://groups.geni.net/geni/wiki/SpiralTwo)
NOAA-WAVE (N-WAVE)

- NOAA building national NOAA research network called N-WAVE
- Utilizing I2 and NLR 10Gbps lambdas
- Initial sites: NOAA-Boulder, NOAA-DC, GFDL, ORNL
- Secondary sites: Seattle, Florida, Oklahoma
ESNet

- ARRA Advanced Networking Initiative (~$62M)
- 100G Prototype Network and Testbed
- DOE scientists are now generating data at the terabyte scale, and datasets will soon be in the petabyte range
- LHC: also a very large networking experiment
Discussion

- Any follow up questions or feedback on items covered?
- Other items?

Thank you!