



A Utah-Wyoming Cyberinfrastructure
Water Modeling Collaboration



Cyberinfrastructure Facilities in Utah

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CI objectives

- Provide coordinated, high-performance information technology resources and services to CI-WATER team and other Utah and Wyoming EPSCoR researchers
- Support research data analysis, management, and curation; modeling; and simulation needs
- Tools: computing cycles, data storage, advanced networking, visualization environments, middleware, software libraries, software development, data centers
- Strategies
 - Leverage campus facilities and services – new Downtown Data Center
 - Leverage Utah Education Network (UEN), Front Range Gigapop (FRGP), and Internet2 for advanced networking
 - Leverage other public sector partners – e.g., UDOT, UTA
 - Collaborate with local HPC centers – new relationship with University of Wyoming
 - Leverage national HPC activities – CASC, XSEDE, Open Science Grid

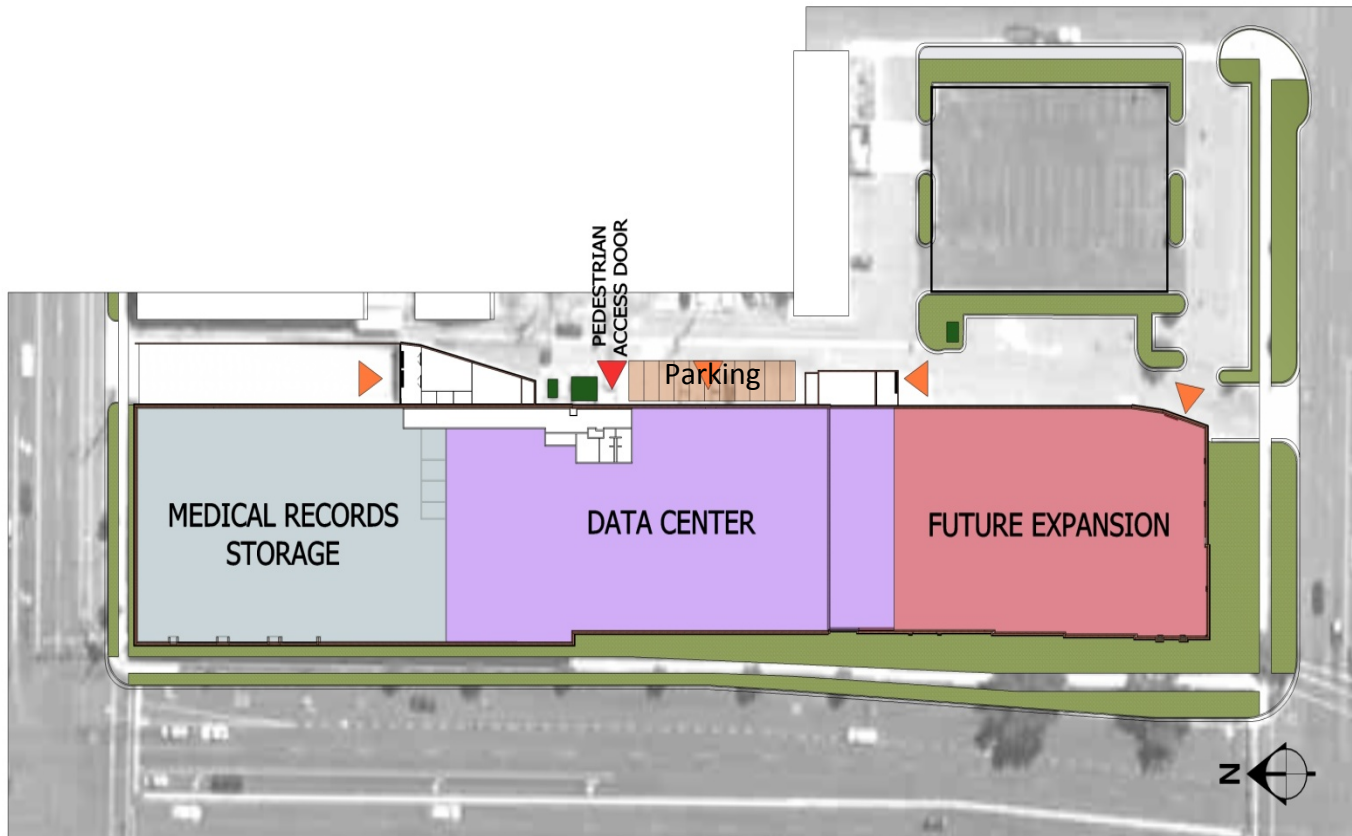
New Downtown Data Center



- 74,000+ sq ft² former industrial building south of downtown SLC (~4 miles off-campus)
- Designing for enterprise & HPC (2.4 MW)
- Co-location by research groups & partners
- Low industrial electric power rates in Utah
- High desert climate: energy efficiency
- Now in production – March 2012



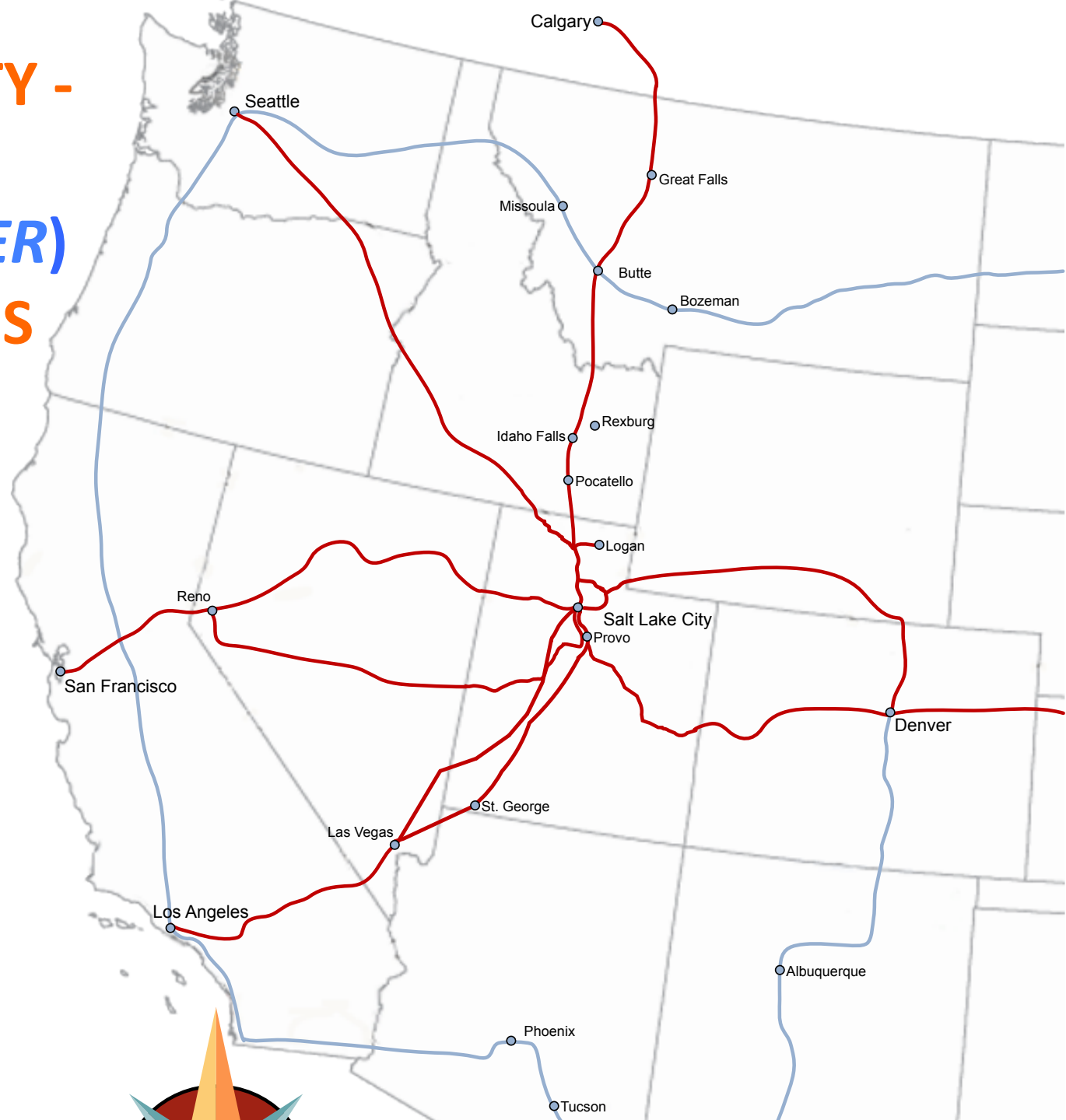




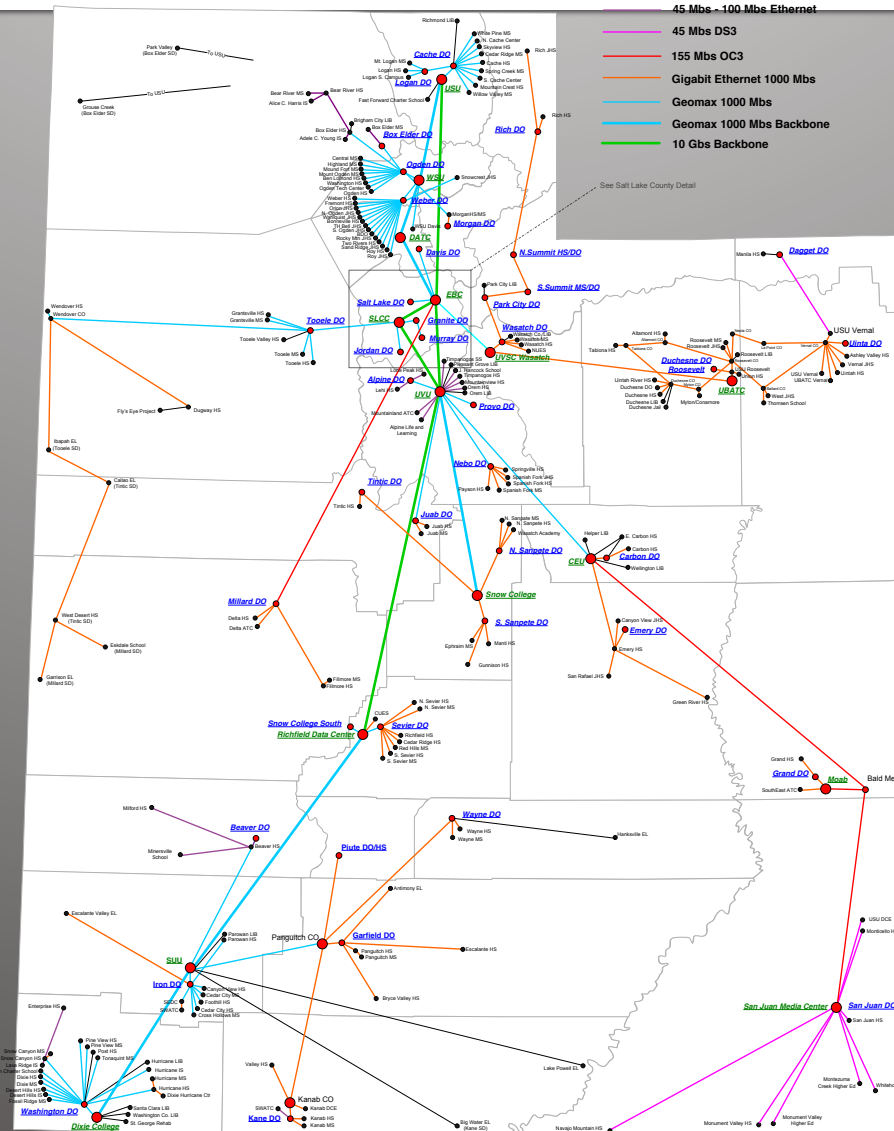
Why build an optical network?

- Research capacity and competitiveness
 - Matching network capacity to the research data explosion and remote collaboration demands by providing greater capacity and scalability
 - 30 Gbps at outset
 - 10 Tbps maximum
 - Enhancing competitiveness for research funding and faculty hiring
 - Enhancing potential for in-state collaboration with UofU and BYU
 - Joint NSF EPSCoR projects
 - Utah Field Station Network
 - Interconnection with new 100-Gbps Internet2 network
- Economics
 - Buying vs. renting - home/condo ownership analog
 - Additional network capacity can be added at incremental cost
 - Customer (UEN, BYU & USU) control of bandwidth, provisioning, and services
 - Trend toward customer ownership & control of networks in higher education
- Technology
 - Ability to innovate in new network technologies
 - Support for new applications
 - Support for enhanced disaster recovery capabilities

SALT LAKE CITY - THE *(OPTICAL FIBER)* CROSSROADS OF THE WEST



Key partner: Utah Education Network (UEN)



RII Cyber Connectivity Award



- Special EPSCoR program based on ARRA funding
- Collaboration partners: UofU, USU, BYU, and UEN
- Award: \$1.17M (9/1/2010 for three years)
 - One-year no-cost extension granted through 8/31/2013
 - Better coordination with Tracks -1 and -2 outreach efforts
- Leadership
 - S. Corbató (PI) and Jim Ehleringer, U. of Utah
 - Larry Baxter and Kelly McDonald, BYU
- Key partners
 - Eric Hawley and Robert Spall, USU
 - Jim Stewart and Laura Hunter, UEN

Regional Optical Network Development in Utah

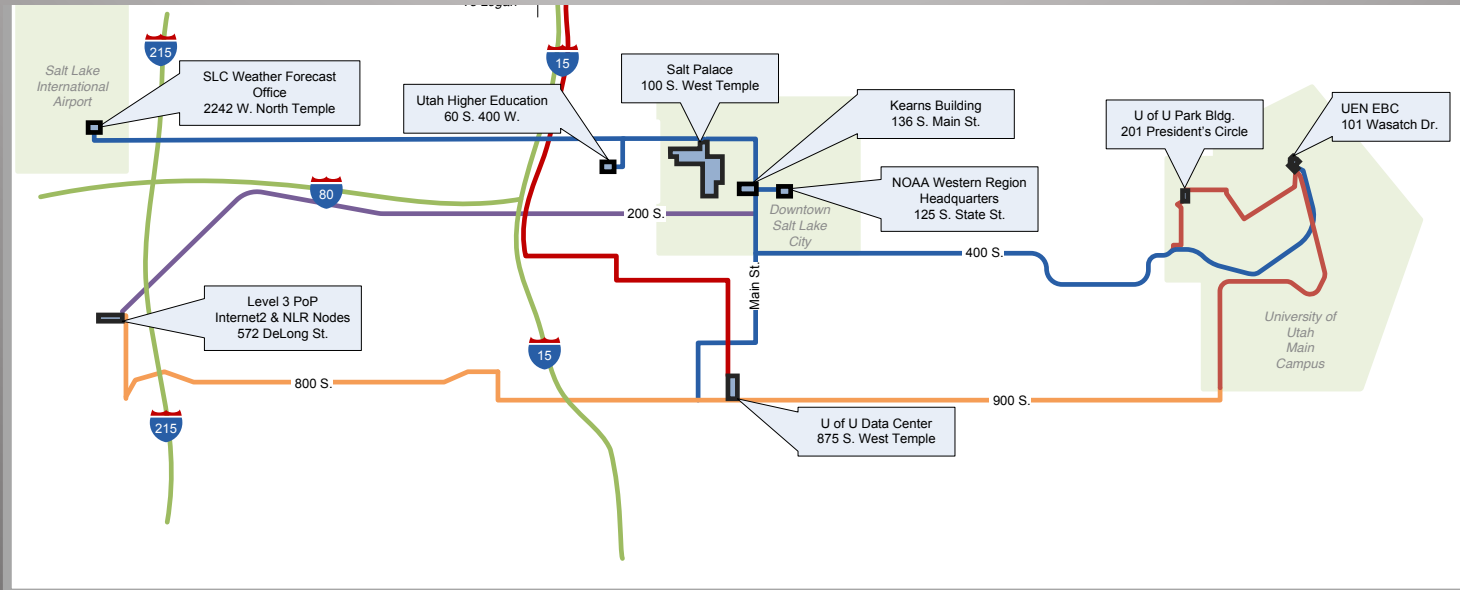


- Collaboration of Utah Education Network (UEN) , Univ. of Utah, Utah State, and Brigham Young Univ.
 - Leverage UEN operational capability & statewide reach
- Motivations
 - New University off-campus data center in downtown SLC
 - Reach national R&E networks (Internet2, ESnet, N-Wave) at SLC Level 3 PoP at 100 Gbps
 - Enhanced interconnectivity among 3 research universities in Utah – BYU, USU, and UofU
 - **Connect federal R&D partners: NOAA/NWS, USFS RSAC**

Regional Optical Network Development in Utah - II

- Leverage public sector partner assets (fiber & conduit) wherever possible
 - UDOT (Interstate/state highway RoW)
 - Utah Transit Authority (UTA/TRAX light rail)
- Work with wholesale oriented carriers (e.g., Zayo, Syringa)
- Leverage federal stimulus funding
 - NSF EPSCoR RII Cyber Connectivity award - \$1.18M (S. Corbató, U of Utah)
 - NTIA BTOP Round 1 award - \$13.4M (M. Petersen/ D. Sampson, UEN) – revised statement of work

Salt Lake City metro optical network



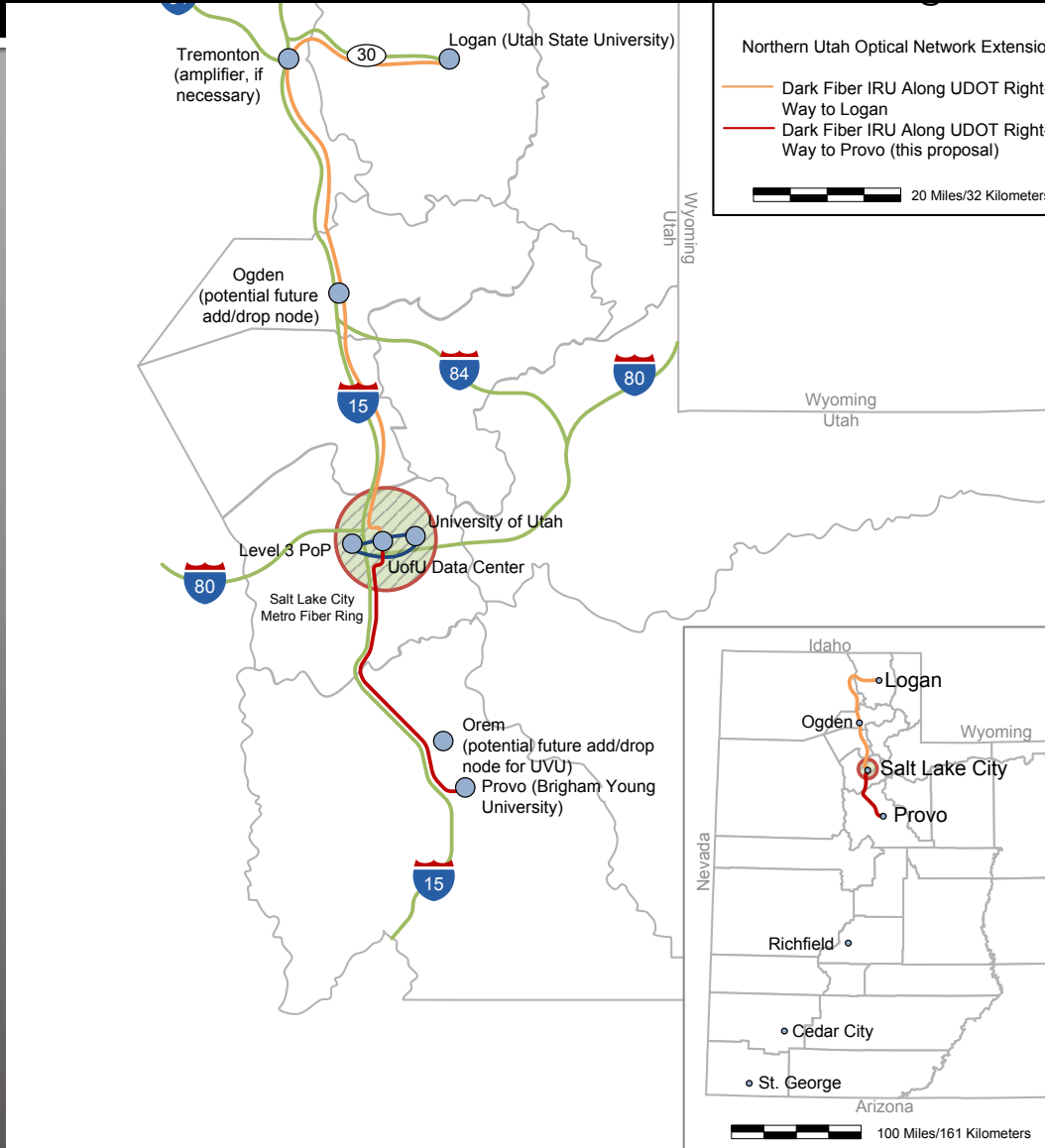
Research@UEN: Salt Lake City Metro Optical Network

- U of U Campus Fiber —
- UTA Light Rail Routes (proposed) —
- CENIC/LLC Fiber IRU (through AFS) —
- AFS Fiber IRU (proposed) —
- Northern Utah Extension (proposed) —

1 Mile

Carrier proprietary information included

Extensions for USU and BYU





CI-WATER data repository for Big Data – September 2012

- Support acquired and simulated data curation needs of project
 - Key driver: atmospheric science simulations (Court Strong)
 - Needs: access to high speed computation; long-term preservation
 - Help support EPSCoR Track 1 projects
- Goal: 250 Terabytes in Year 2; 350 Terabytes by Year 3
- Leverage existing data storage system at Univ. of Utah CHPC (HP iBRIX)
- Location: new Univ. of Utah Downtown Data Center in Salt Lake City
- Distributed storage: Develop and maintain high-performance connectivity to ARCC resources at UWyo as well as HPC/CI resources at BYU and USU
- Access: Open to all CI-WATER collaborators
- Status: Hardware specification and procurement underway



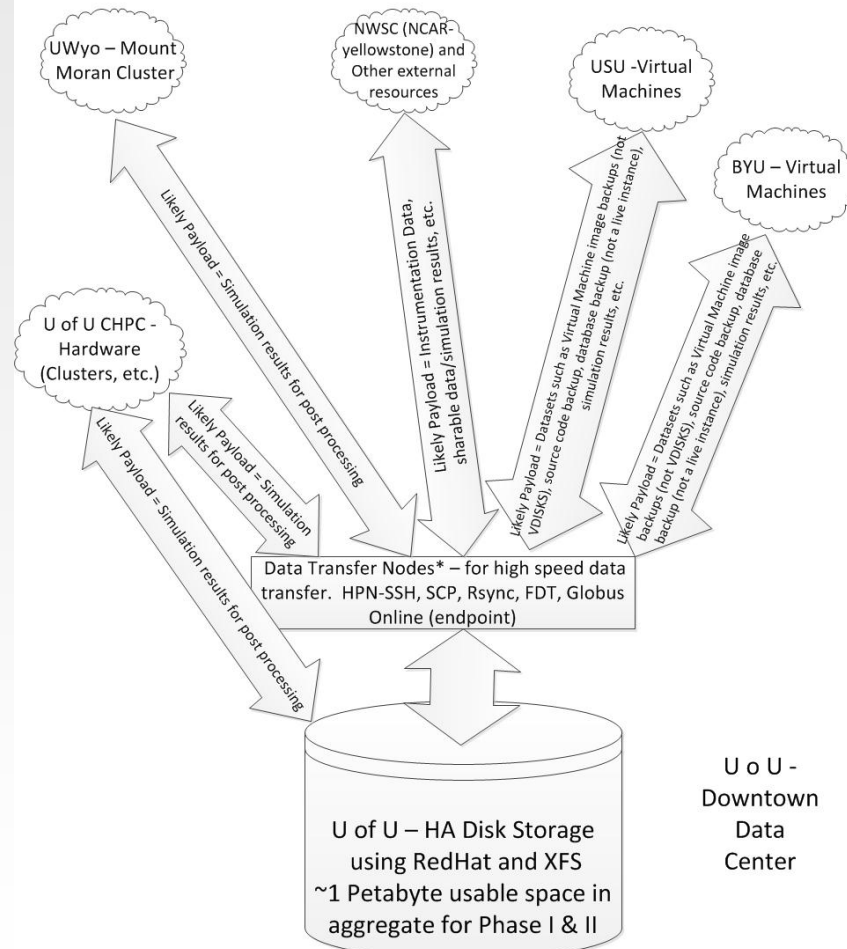
CI-WATER data repository for Big Data – March 2013

- CHPC is moving away from previous file storage system (HP) due to software reliability and performance issues
- Started new RFI/bid process
- Coordination with another campus Big Data project
 - Partnered with UofU Physics & Astronomy in its role as data management site for Sloan Digital Sky Survey 4 (SDSS-4) – 175 TB (separate space)
- Successful bid: 1 Petabyte usable space (\$230/TB – Dell) including DTN
- Access: Open to all CI-WATER and iUTAH collaborators
 - DTN-DTN connections with U Wyoming and NWSC HPC sites
- Status: Purchase underway – in production early May



- Shared data repository among CI-WATER and iUTAH institutions
- Supports both fast I/O computation and long-term data archiving
- Hosted at CHPC in Utah DDC
- Leverages high-speed, secure data transfer nodes (DTNs) as advocated by NERSC and ESnet

CI-WATER STORE – EPSCoR Data Repository Data Access Schematic – 2/8/2013



* Data Transfer Nodes are utilized for "put & get" type of operations. The software stack typically offers fast transfer of data.



- November 10-16, 2012 – Salt Palace
 - International conference and exhibition for HPC & computational science
 - Large Utah research and EPSCoR presence
- >10K attendees and >160K s.f. exhibit space
 - General chair: Jeff Hollingsworth, U Maryland
 - SCinet chair: Linda Winkler, Argonne National Lab
 - Jim Stewart & Kevin Quire, UEN
 - Exhibits: Mary Hall & Steve Corbató, Univ. of Utah

<http://sc12.supercomputing.org/>





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Questions?

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