

Topics - notes page

- Danial
 - Internet2 related projects - Trusted Infrastructure Federation
 - LLM Research - Network Ops chatbot
 - Merging network metrics and performance measurement data w/ Brady
 - RAG Internal Documentation w/ Prajakta
 - OFCnetLLM paper (2025)
- Jeff
 - Wildfire Camera project
 - Utah FORGE project
 - County/district collaboration projects
 - Kane County Seismic
 - Frisco Peak - Willard Observatory and Frisco Peak
 - Millard County - U of U Cosmic Ray Research
 - Seismic w/ UDOT, Jon Rusho
 - SHEKATE - neighbor REN collaboration
- Joe
 - WildWEST
 - Field stations (Bonderman, etc.)
 - Collaboration with ORNL
 - LLM output validation w/ Bryan
 - Metrics Prediction, anomaly detection w/ Owen
 - Redtail project

Presentation format

- Current research projects and partnerships
- Panel Q&A
- Open to questions

Why research?

- Supporting research is a part of the fundamental mission of UETN in supporting education

Effective 10/14/2025

53H-4-213.4. Educational telecommunications -- Utah Education and Telehealth Network.

(1) There is created the Utah Education and Telehealth Network, or UETN.



(2) UETN shall:

(a) coordinate and support the telecommunications needs of public and higher education, public libraries, and entities affiliated with the state systems of public and higher education as approved by the Utah Education and Telehealth Network Board, including the statewide development and implementation of a network for education, which utilizes satellite, microwave, fiber-optic, broadcast, and other transmission media;

- Specific goals in UETN's 2026-2029 strategic plan
 - Cultivate Stakeholder Relationships and Partnerships*
 - Drive Innovation and Effective Technology Adoption*

Strategic Plan

2026 - 2029

UTAH EDUCATION AND TELEHEALTH NETWORK

Mission Statement

We elevate access to education and healthcare through technology for all Utahns.

Core Values

Excellence. We deliver exceptional work and continuously strive for excellence in all that we do.

Collaboration. We work as a team internally and with our partners, combining decades of collective expertise to innovate, solve problems, and build long-term solutions.

Investment. We are deeply committed to our mission, our people, and the communities we serve, dedicating time and resources to create lasting impact.

Integrity. We act with honesty and uphold the highest ethical standards.

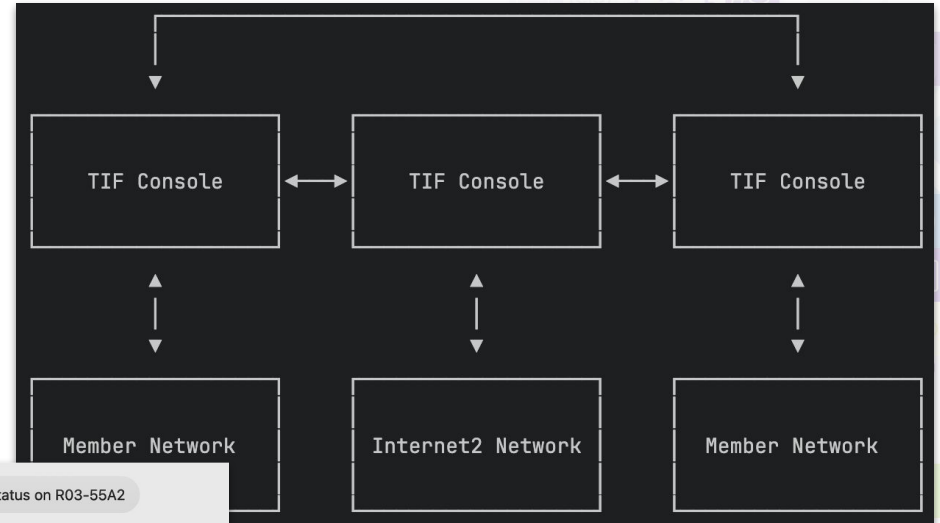
Accountability. We take responsibility for our actions, decisions, and outcomes, ensuring that we meet our commitments, learn from challenges, and practice fiscal responsibility.

Trust. We build and maintain trust through transparency, reliability, and respect in every interaction.

First, let's start with some of the fundamental infrastructure

Trusted Infrastructure Federation Pilot

- Collaboration with Internet2
- Distributed/multi-org Looking Glass
- Looking Glass LLM agent



what is the bgp status on R03-55A2

Looking Glass Chatbot (Prompt2)
Thought for 13 seconds ▾

The BGP status on R03-55A2 is **Established** with neighbor 140.197.255.5 (Remote AS 210) for a duration of 2 weeks and 2 days

lookingglass-la...xecute_get . The router is advertising routes for IPv4 Unicast (59 accepted, 58 bestpaths), IPv4 Multicast (35 accepted, 34 bestpaths), VPNv4 Unicast (2 accepted, 2 bestpaths), and IPv6 Labeled-unicast (11 accepted, 11 bestpaths)

lookingglass-la...xecute_get .

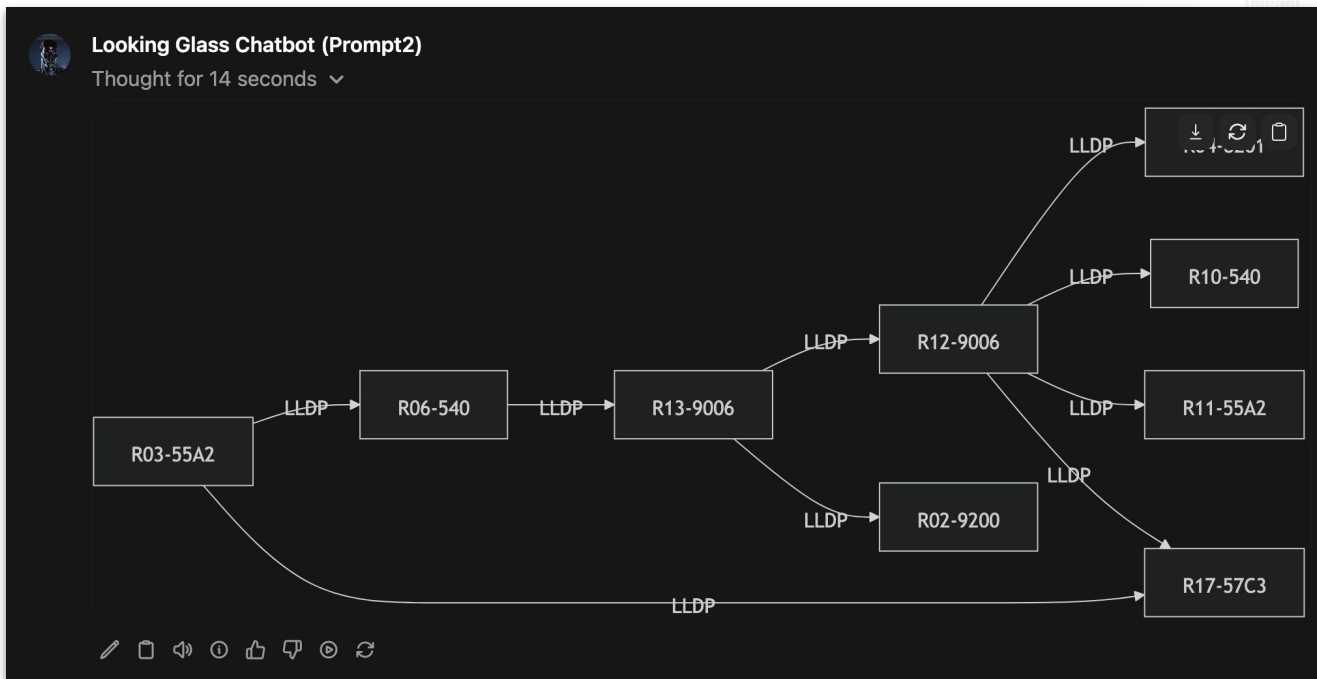
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Trusted Infrastructure Federation Pilot

- Looking Glass LLM agent







Unified metrics/network performance Dashboard

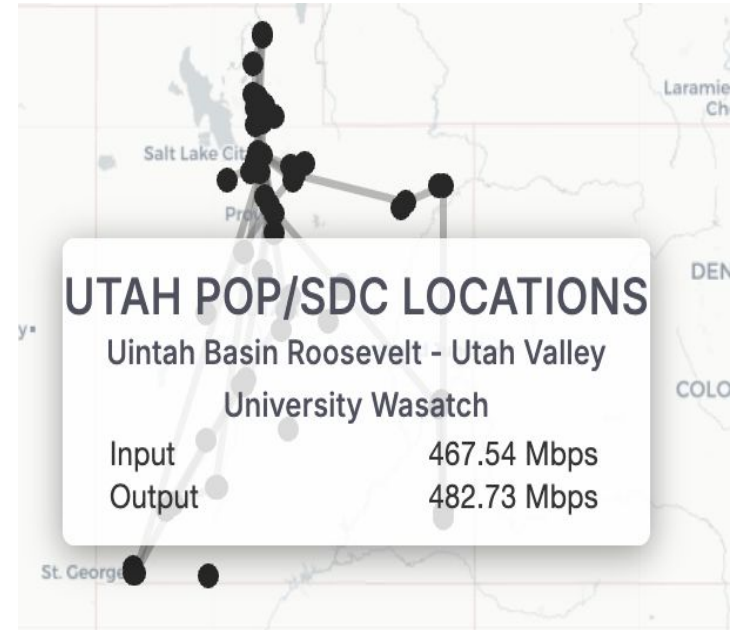
- As part of a UETN and Univ of Utah CHPC collaboration to explore a Field Research Dashboard for scientists, we have been piloting different aspects of what a dashboard might look like.
- The first part is displaying unified metrics and network performance on a dashboard.
- Brady Spinti (Univ of Utah Computer Science student) is the primary on this portion.
- Network monitoring vs. network performance measurement

UEN Backbone Live Map

Utah centric view leveraging the Indiana GlobalNoc Worldview Panel

This grafana visualization serves as a centralized hub for scientists and network engineers to monitor the UEN backbone data intuitively. By integrating multiple telemetry streams, we provide a holistic view of network performance across Utah.

-  **Utah UEN Backbone Mapping** Real-time visualization of all network connections, nodes, and inter-site relationships across the state.
-  **Integrated Telemetry** Single map view for critical metrics including data rates, link reliability, current load, and packet errors.
-  **Performance Insights** Instant identification of network slowdowns and technical bottlenecks.
-  **Topology Perspectives** Both network overview and traffic specific path visualizations



Monitoring Research Traffic Paths with Grafana

Science Flow Dashboard

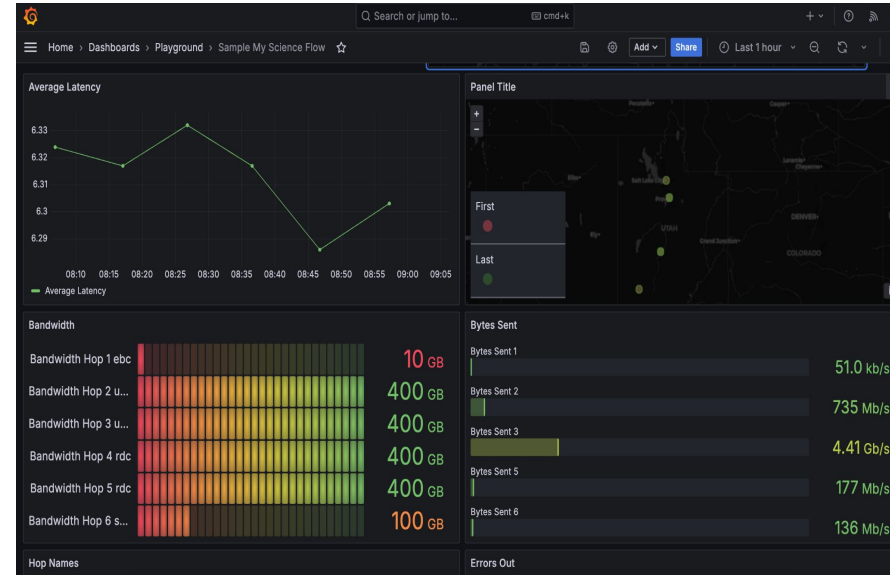
We are leveraging Grafana to provide real-time visibility into research traffic flows across the UEN backbone. This visualization enables engineers and researchers to quickly identify traffic routes, monitor performance, analyze utilization, and troubleshoot issues affecting scientific data transfers.

PATH-SPECIFIC TRAFFIC

Visualizations to isolate and show traffic data only on the specific path a dataset is currently traversing.

AUTO-DISCOVERY

Automated synchronization so dashboards update instantly when new sites are added to the UEN network.



Internal Documentation with RAG

- As part of the UETN and Univ of Utah CHPC collaboration for the Field Science Research Dashboard, we also want to be able to have a natural language query interface
- Prajakta Amate (School of Business Masters of Information Technology student) is the primary on this portion.
- This portion is creating a RAG - Retrieval Augmentation Generation chatbot.
 - The initial prototype utilizes the UETN web site as its information source.
 - The second prototype is utilizing a portion of the internal UETN wiki to provide a network engineer centric feedback and functionality.
 - A third prototype will present a more user-focused interface based on “to be determined” data sources.

UEN ASSISTANT – AN LLM POWERED RAG APPLICATION

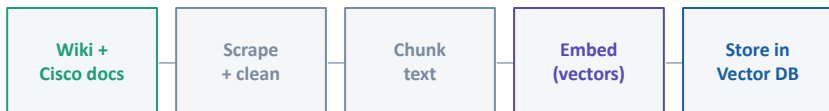
What It Does

An AI assistant that answers questions from UEN's internal Wiki documentation (**6K+ docs across 10+ years of data**) including:

- PDFs and screenshot attachments (9,080 files)
- Naming standards documentation
- Hardware and network configuration guides
- Cisco vendor documentation

Staff type a question → get a direct answer with source link

Data Pipeline (offline — runs periodically)



Query Pipeline (online — every question)



Technology Used

Scraping	Python, BeautifulSoup, PyMuPDF
Chunking	LangChain
Embeddings	HuggingFace all-mpnet-base-v2
Vector DB	ChromaDB
Keyword search	BM25
Semantic search	Cosine similarity
Re-ranker	CrossEncoder ms-marco-MiniLM
LLM	gpt-oss:20b via Ollama
Frontend	Open WebUI
Server	Starlette + Uvicorn

100% Open Source | 100% Private

All tools are open source. All data stays on UEN infrastructure. Nothing sent to external APIs or cloud services.

Demo

uen-assistant ▾ +

What are the technical advocate meeting dates in 2024?

OI uen-assistant
Technical Advisory Committee meeting dates in 2024:

- January 18, 2024
- February 15, 2024
- April 18, 2024
- May 16, 2024
- June 20, 2024
- July 18, 2024
- August 15, 2024
- September 19, 2024
- October 17, 2024
- November 21, 2024

Sources:

- Technology Advisory Committee Past Meetings
<https://www.uen.org/network/advisory/past.shtml>
- TACMeeting 02 15 2024 - Page 1
<https://www.uen.org/network/advisory/downloads/TACMeeting-02-15-24.pdf>
- TAC%20Meeting 07 18 2024 - Page 1
<https://www.uen.org/network/advisory/downloads/TAC%20Meeting-07-18-24.pdf>

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What's Working

- UEN website chatbot live on Open WebUI for staff testing
- Wiki + Cisco docs(500 MB Size) chatbot live on Open WebUI for staff testing

What's Next

- Scale to full internal Wiki (6K+ documents)
- Image/diagram support via OCR + vision models

Large Language Model for Network Monitoring and Alertness (2025)

- Collaboration of UETN, CHPC and Oak Ridge National Laboratory
 - [OFCNetLLM: Large Language Model for Network Monitoring and Alertness \(2025\)](#)
- Bryan Alvarez (CHPC student) is currently working on Validation
- Owen Wallace (CHPC student) is working on anomaly detection

OFCnetLLM: Large Language Model for Network Monitoring and Alertness

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ABSTRACT

The rapid evolution of network infrastructure is bringing new challenges and opportunities for efficient network management, optimization, and security. With very large monitoring databases becoming expensive to explore, the use of AI and Generative AI can help reduce costs of managing these datasets. This paper explores the use of Large Language Models (LLMs) to revolutionize network monitoring man-

As data increases to vast levels, many networking tasks are exploring the use of artificial intelligence (AI) and machine learning (ML) to help solve complex predictions and find patterns in their data. As networks grow in complexity and scale, the need for a flexible, scalable, and efficient data management solution becomes critical, where traditional data models are becoming cumbersome to monitor, query, and control. For example, multiple databases for Simple Network Management Protocol (SNMP) counters, netflow

PROTOTYPING VALIDATION

An LLM can give answers that sound confident even when they are wrong, irrelevant, or unsupported by available data, so a second step is needed to check the response before it is trusted.

Challenges:

- **Response Time** (Adding a validation step adds processing time, delaying the final answer given to the user.)
- **Big Data** (There are extremely large datasets to read through which slows it down)
- **AI Judgement** (What if the LLM still fails validation? What defines a good answer?)
- **Redundant Validation** (Running the same tools and expecting different answers)

Solutions:

- **Intent Routing** (Helps flow and response time.)
- **Cheaper models for simpler queries** (Response time.)
- **Refined tools and chunk viewing** (Templated scripts and honed data searching for viewing Big Data.)
- **Context Preservation** (Loop failed validations to generate a more accurate response. Can hurt response time, but can solve possible timeline discrepancies too.)
- **Templated Tools** (Generate its own methods of obtaining data. Prevents redundant validation.)
- **Rubric** (Giving a rubric to score answers.)

ARCHITECTURE

Core Framework

- **Langchain:** Standard framework for binding python tools to custom agents.
- **Langgraph:** Allows for complex workflows instead of one way chats.

AI usage: Ollama

- **Model Tiering:** Switching between models for faster responses.

State Management:

- **Agentstate memory:** Custom state definitions that track chat history and other variables needed for better responses.

Separation of Concerns:

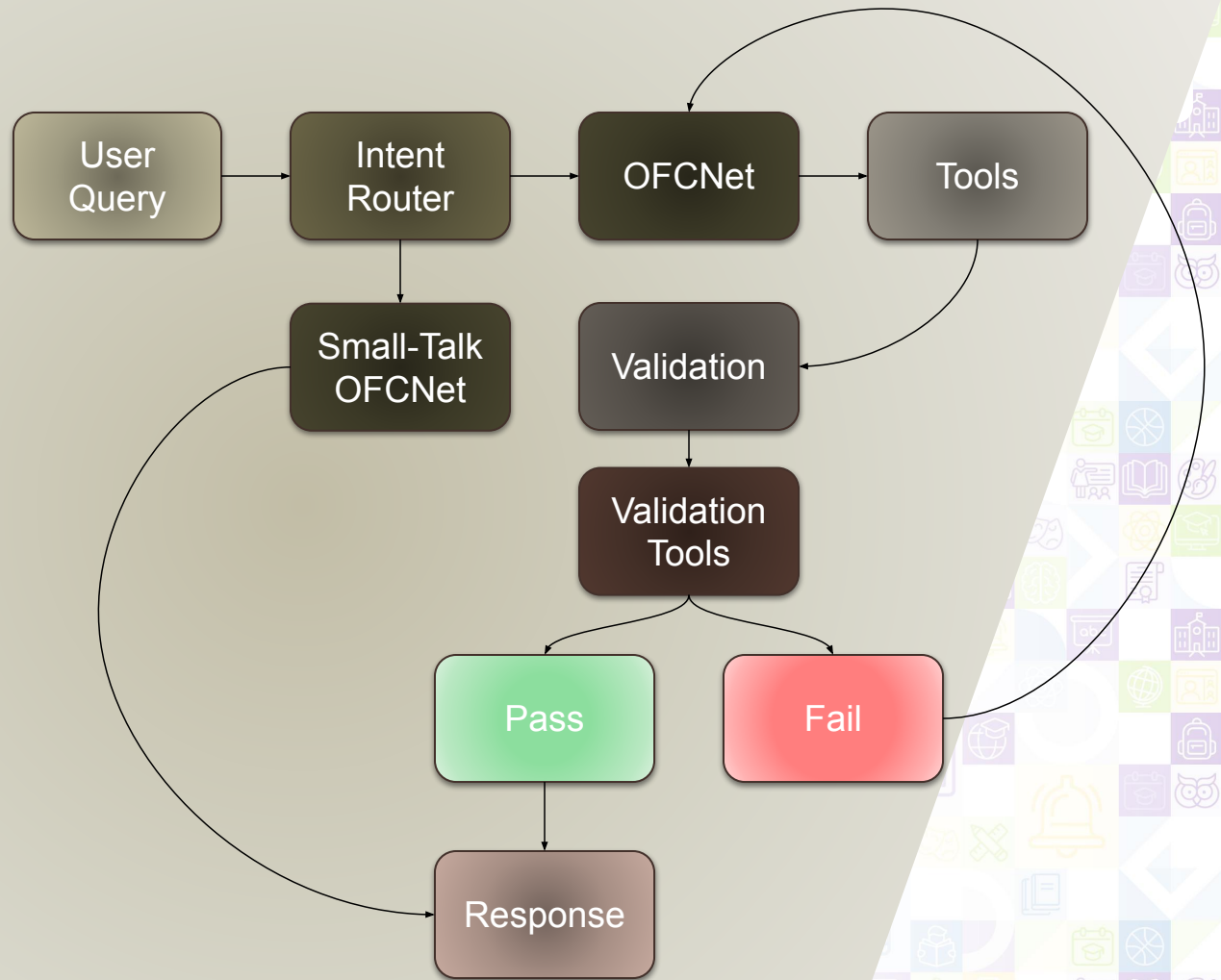
- **Nodes:** Intent routing node, validation node, and soon to be more nodes for a better flow overall.

Current Prototype Flow.

Small-Talk OFCNet will be a lightweight LLM that will deal primarily with questions that do not require nor involve any specific data.

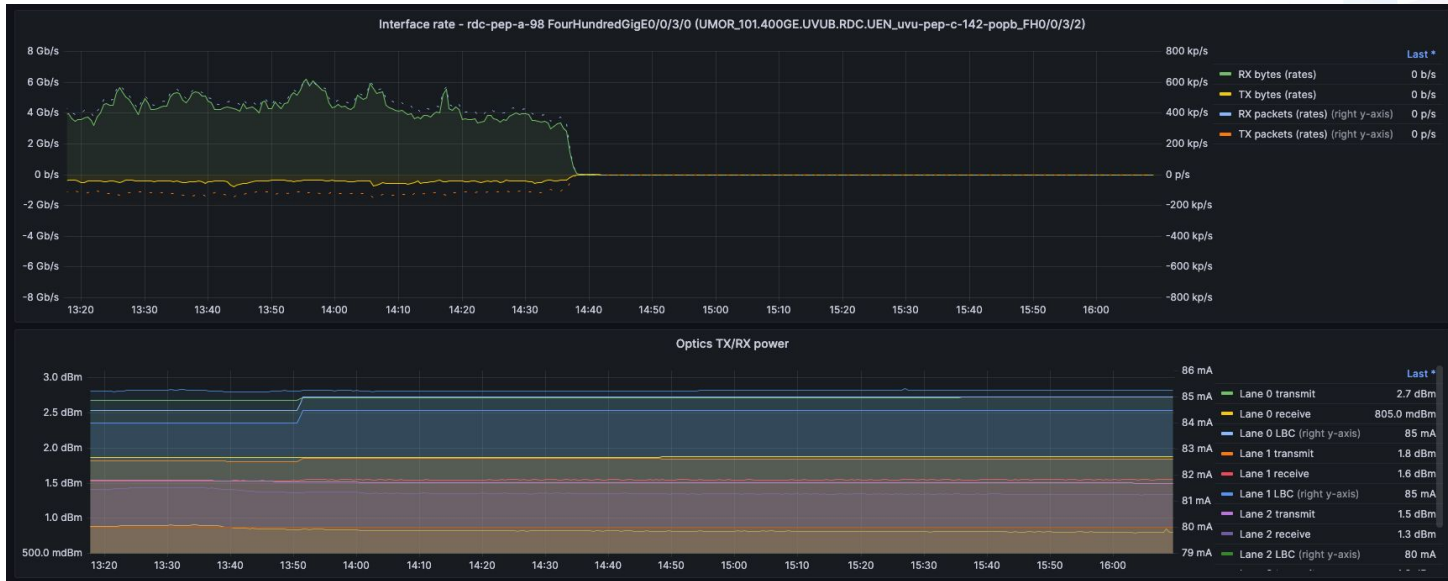
WIP:

- Templated tools.
- Refined validation.
- Testing with multiple types of data.
- Prompt Engineering
- Contextualization



Anomaly Detection

- Looking for spikes in traffic, microbursts, errors, and other data readily accessible in time series graphs and through SNMP queries
- Working with LLM and machine learning to identify the anomalies
- Eventually tie together with other sources of information like logs



Now, let's broaden our horizons

UETN Research Collaboration at a broader scale

UETN/High Education

Field Stations (utahfieldstations.org)

Wireless research

POWDER

Future CIWiCs

AI Network Support

Seismic Sensors

K12

Seismic Sensors

Observatories

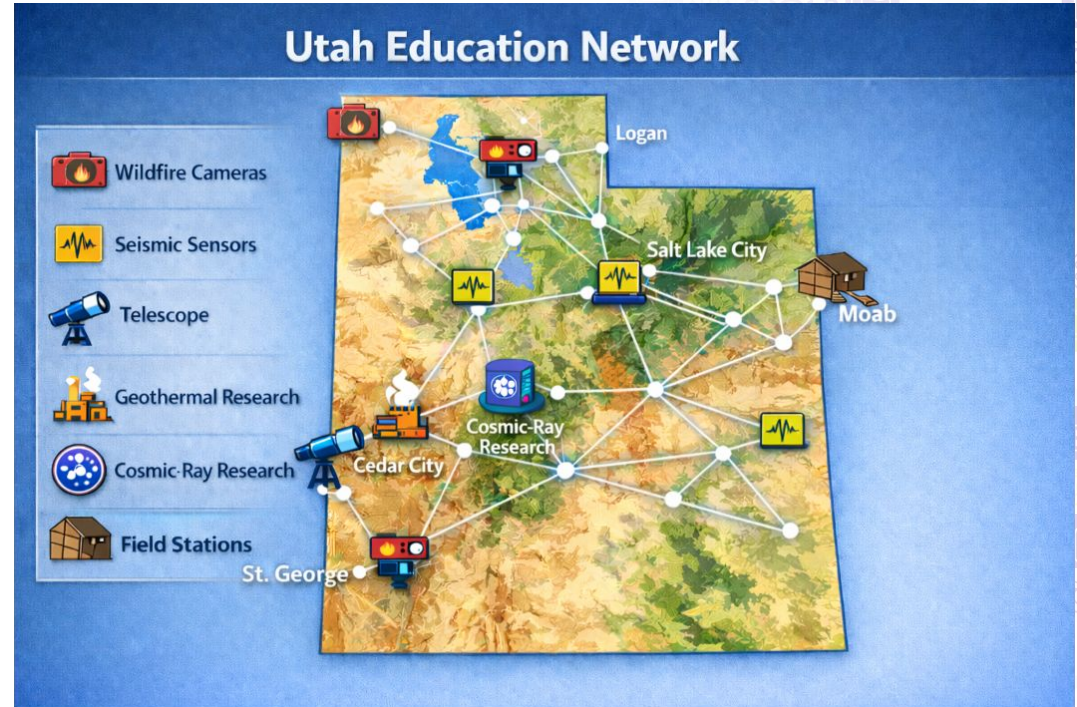
Geothermal

UDOT

Seismic Sensors

Wildfire Cameras

Fiber & infrastructure
for research



Regional and National Networks

National Research Networks

Internet2

ESnet (Dept of Energy)

Regional Network (Western counterparts to UETN)

Sun Corridor - Arizona

Link Oregon - Oregon

CENIC - California

Consortium (Advanced Regional Network in Support of Research and Education)

The Quilt

Research and REN Coordination

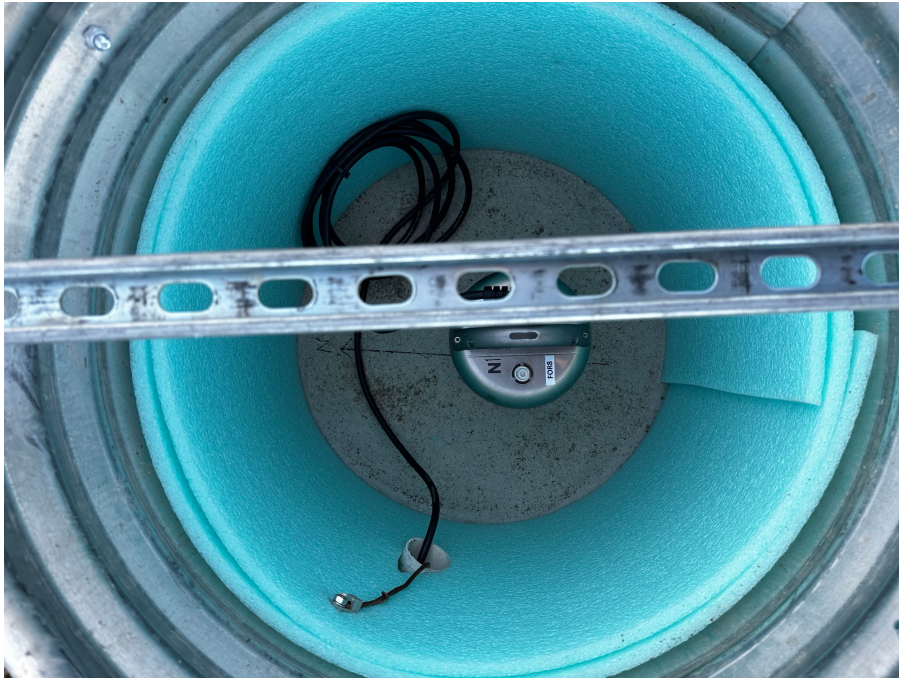
Southwestern Higher Education Knowledge and Technology Exchange (SHEKATE)

From the the National Radio Astronomy Observatory's Very Large Array in New Mexico to Bristlecone Pine studies in the Great Basin

Near you! Seismic Station Support



- Collaboration with U of U Geology & Jon Rusho



Utah FORGE Connecting Geothermal Research



Dept of Energy image

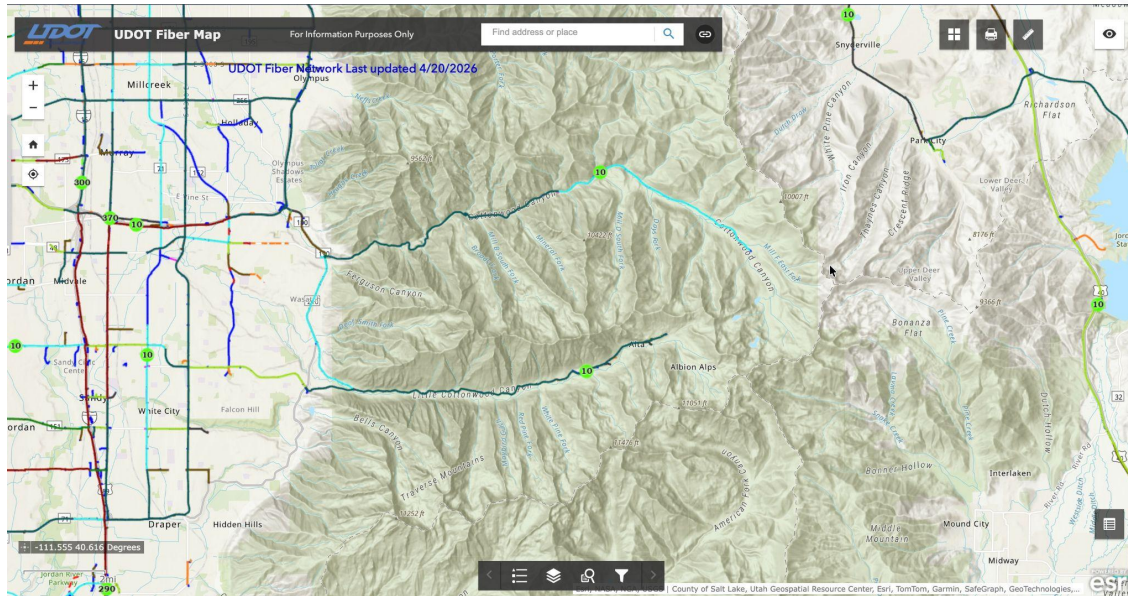


On the horizon

UDOT/Nokia Bell Labs Fiber Seismic Sensing Collaboration



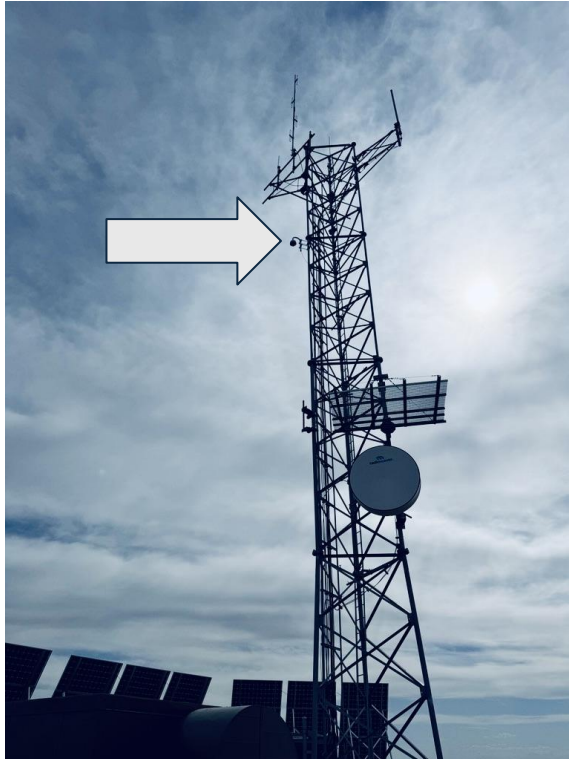
- Collaboration with
 - Utah Dept. of Transportation
 - Bell Labs,
 - University of Utah Center for High Performance Computing



AI monitored wildfire cameras

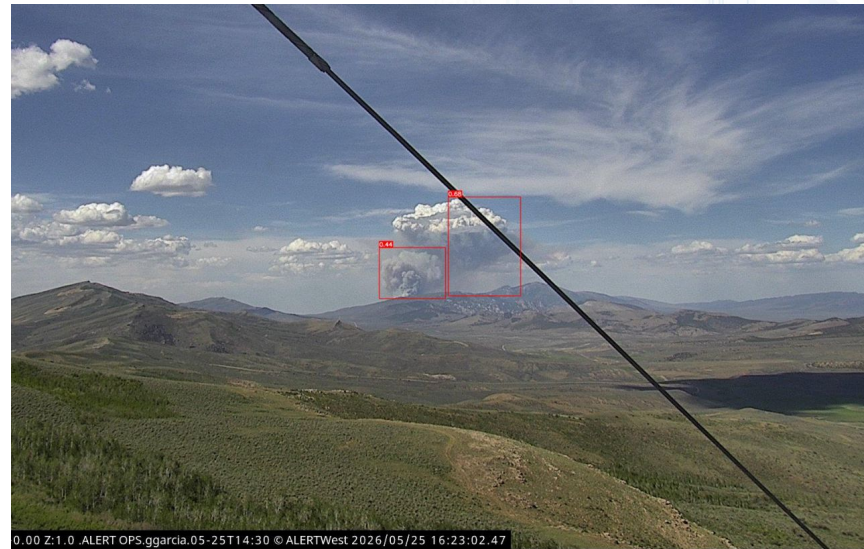
(UETN, University of Utah, University of Nevada-Reno, University of Oregon, University of California - San Diego)

RENs, research and wildfire management



AI monitored wildfire cameras

Summit Creek Fire - southern Idaho



AI monitored wildfire cameras

Summit Creek Fire - southern Idaho



Research Data Opportunities

- Both the Wildfire Camera project and the Fibersensing project have the potential to generate Terabytes and even Petabytes of data.
- This data represents a lot of value to the research scientist and even the community scientist.
- UETN and CHPC are collaborating with UETN developers, CHPC virtual machines, and CHPC storage resources to stand up active data repository pilots.
- UETN and CHPC will also be working with our partners to explore funding opportunities as the projects progress.
- Thoughts on how to explore this data? Contact us and let us know your use cases.

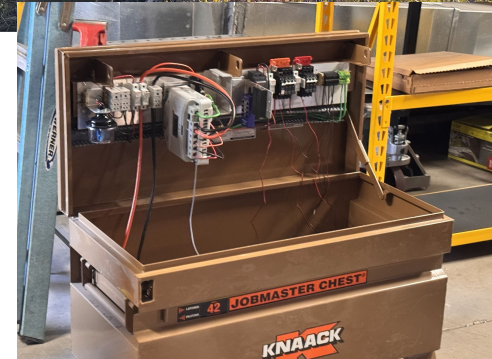
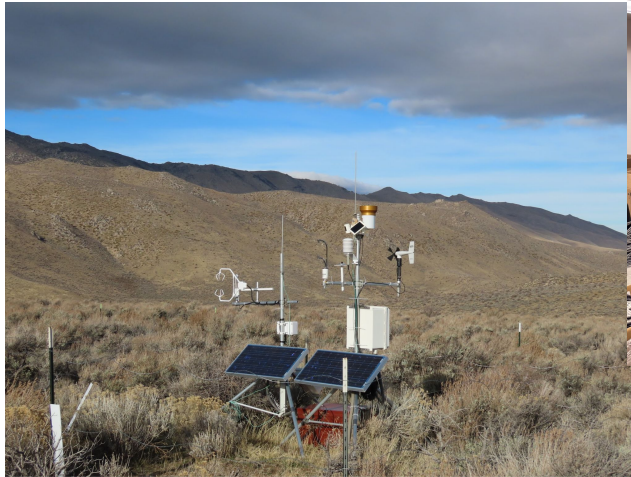
Gotta' build in the people



WildWEST

Wild-area-networks Wireless Enabling Science Team

- Developing Field Engineer expertise
 - Connecting field science and associated technology
 - Different requirements means a different approach



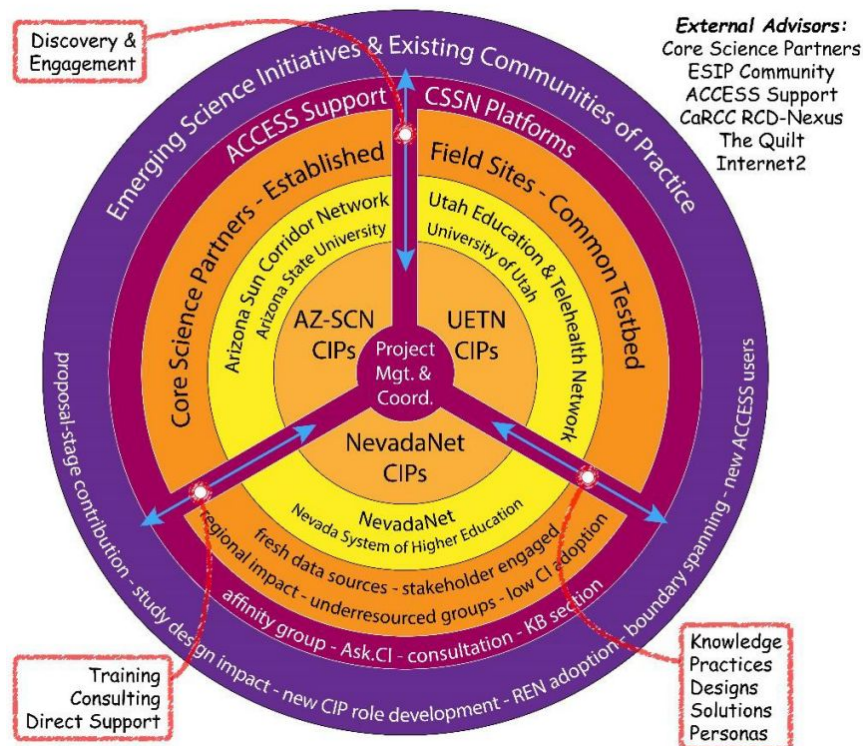


WildWEST

- Led by Scotty Strachan from Nevada
- Collaborators UETN, CHPC, and SunCorridor
- Focus on Field Research across the 3 states regardless of geographic boundaries
- Working with the national platforms such as ACCESS and the NAIRR pilot



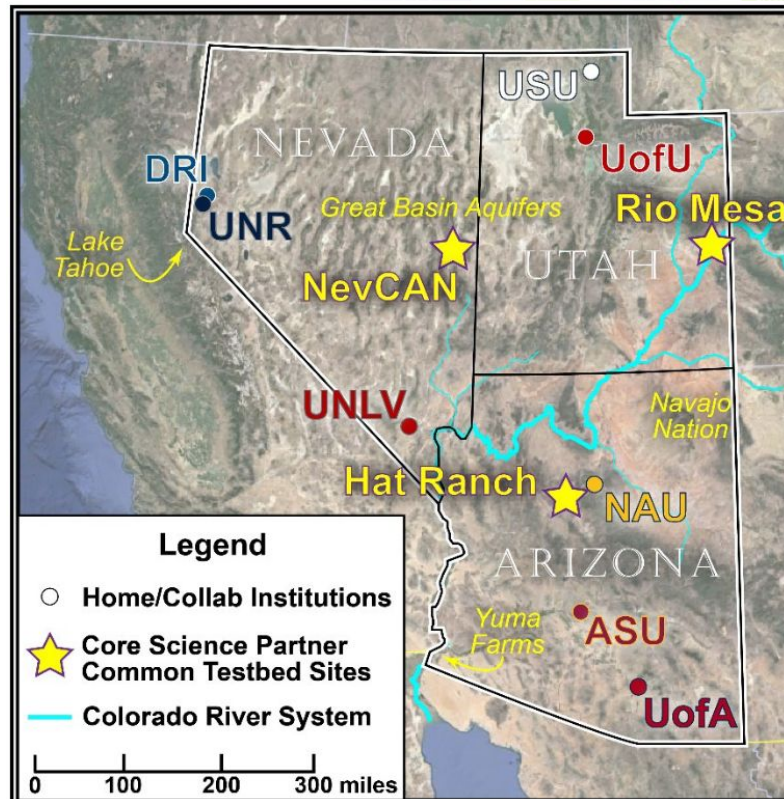
Wild-area Wireless Enabling Science Team (WildWEST) Engagement Structure





WildWEST

- Three main sites for training and developing a true regional approach
 - Bonderman Rio Mesa
 - Hat Ranch
 - NevCAN
- Additional research collaborations across the region with different soil, temperature, humidification, sound, picture and other environmental sensors
- Reaching out across the “last 100 miles” of Field Science
- Open Science? Yes. Security required? Yes!



Then mix in the right amount of hardware

HPE Sovereign AI project

- AI really comes down to the data.
- A lot of data looks similar, for example field research sensor data looks similar to network sensor data (time series, data loggers, real-time telemetry)
 - How to correlate that data?
 - How to take time series data, log data, and other metadata and either train on it or make inference from it?
 - How to mix in some image, sound, and other data?
- How do you make sense of all of the data from the field and from the networks?
 - Hook yourself up with a GPU based supercomputer!

HPE Sovereign AI project

- Partnership with HPE, the State of Utah, University of Utah, and private donors.
- 33 nodes, each with 8 x Nvidia H200
- Divided into traditional HPC batch and Kubernetes “tenants”
- Able to manually resize each tenant to address changing workflows over time



Utah AI Factory Supercomputer

Catalyzing Utah's AI Innovation Ecosystem

- \$50 million, 5-year shared investment. First-of-its-kind HPE-NVIDIA-University-Philanthropy partnership.
 - \$15M from UT Legislature in 2027 appropriation.
 - Advances Utah as a national AI leader.

Elements

- A. **State-of-the-art AI computing resource** for researchers, educators, and innovators across the Utah.
- Installed at DataBank datacenter south of SLC
 - Initial onboarding estimated for early July 2026
 - U of U Center for High Performance Computing (CHPC) will conduct operations and enablement.
- B. **Enablement program** including training, access, and facilitation for all levels of users; student and professional development, entrepreneurship.



<https://chpc.utah.edu/resources/utah-ai-supercomputer.php>



Utah AI Factory Supercomputer

Catalyzing Utah's AI Innovation Ecosystem

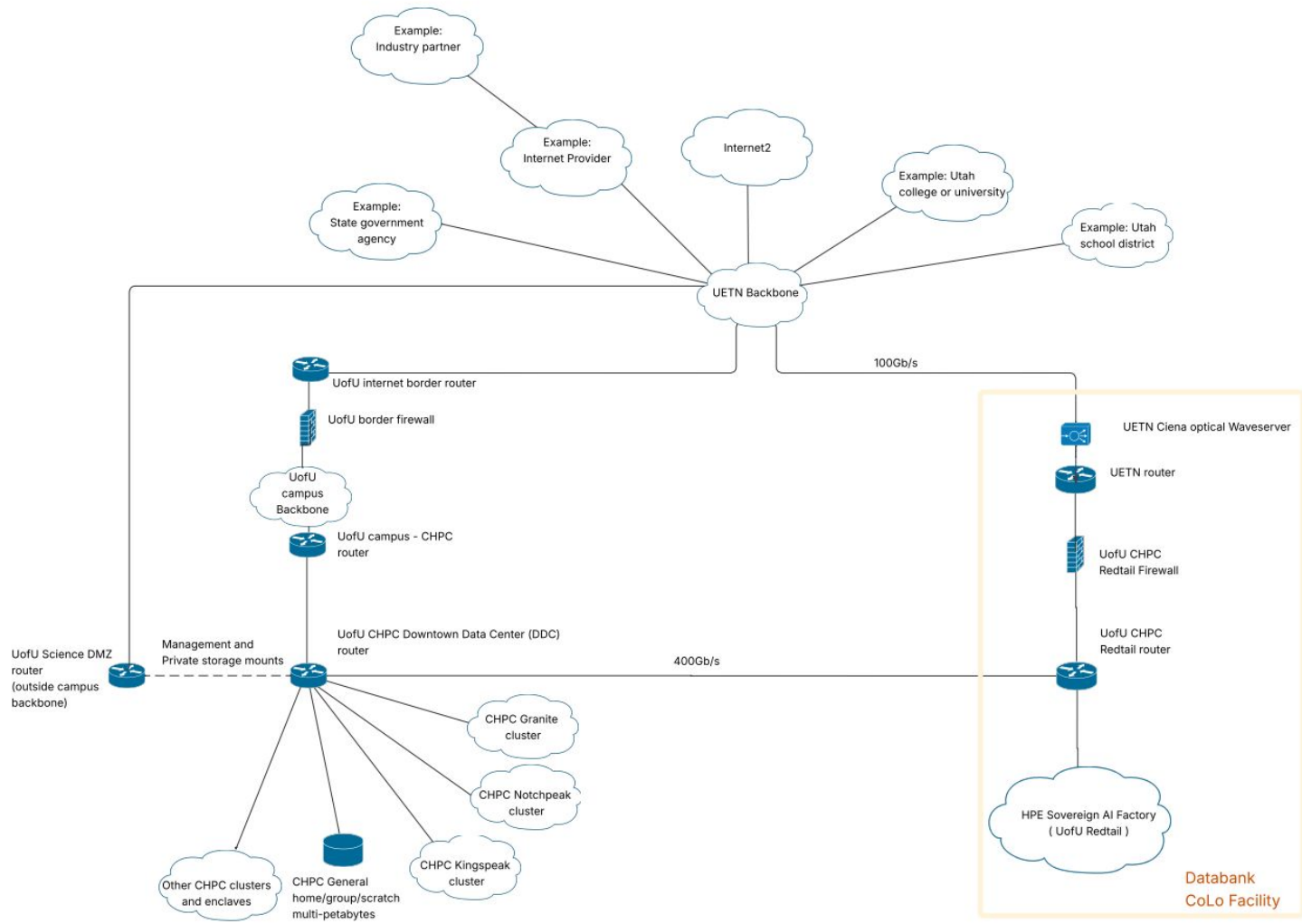
System Details

- HPE GreenLake system with managed services for flexible resource provisioning.
- **Compute.**
 - 33 HPE Cray XD670 nodes. Each node with 8 H200 SXM5 GPUs (each with 141 GB of high-speed VRAM) and two Intel Xeon-P 8570 56-core CPUs and 2 TB of DDR5-5600 RAM. In aggregate: 264 GPUs and 3,696 CPU cores (96 Intel Xenon Platinum 8568Y, 66 TB of RAM)
 - Interconnectivity: Multi-GPU connectivity with 900 gbs bidirectional GPU-to-GPU bandwidth; and each GPU with 400 gbs interface to an Infiniband fabric for high-speed between-node exchange for efficient AI scaling
- **Data.** 1 PB temporary storage and local node storage for high-speed input-output.
- **External connectivity.** The AI Factory is connected to UETN and U of U at 100 and 400 gbs, respectively for rapid data transfer at scale.



<https://chpc.utah.edu/resources/utah-ai-supercomputer.php>







Tune into today's keynote by Bill Miller for all the detail on the Utah AI Factory program!

Topics - notes for questions

- What is the relevance to school districts?
- What is broader outreach within research grants?
 - Collaboration
- How does K-12 get involved with research?
 - Citizen Science
- What does more data and compute mean for my community?
 - Large datacenter projects

Questions for the Panel

- What is the relevance to school districts?
- How does K-12 get involved with research?
- What does more data and compute mean for my community?

- What questions do YOU have?

