Research Cyberinfrastructure @ UW

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Campus Research Cyberinfrastructure

- Currently includes:
  - high-performance computing (Hyak)
  - object storage (Lolo)
  - archive storage
  - cloud computing via eScience & UW-IT
  - Indirect Cost Waiver and tax-exempt for all research computing services through UW-IT
  - quantum computing via QuantumX
- Serving all three UW campuses and >2000 researchers.
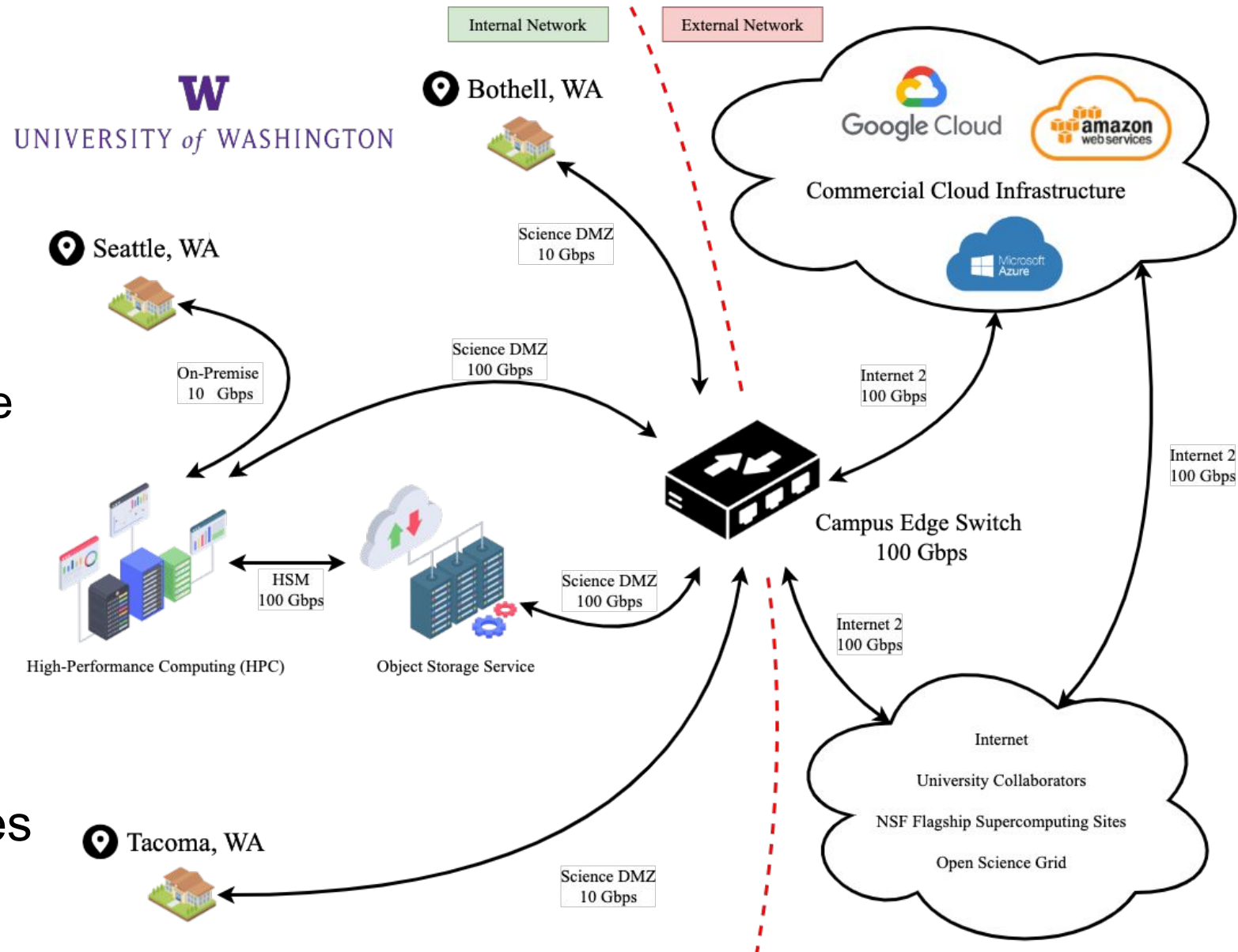
Compute

| 2,061 Researchers | 18,376 Compute Cores | 368 GPUs |

- HYAK is an ecosystem of high-performance compute (HPC) clusters and supporting infrastructure
  - offers traditional HPC and machine learning capabilities
  - data management, computational training, scientific computing consulting
  - access to all (unused) compute cores and GPUs via the Checkpoint Queue

- Operates on a "condo" model w/ 4-year node service life – PI pays Node Cost, Sponsors & UW pay Infrastructure Costs
  - Annual Cost (Infrastructure) Sponsors:
    - College of Arts & Sciences;
    - College of Engineering;
    - College of the Environment;
    - Institute for Protein Design;
    - Physiology and Biophysics;
    - UW Bothell & UW Tacoma.

Storage

- Lolo is a Petabyte-scale storage service
  - initial investment by the Office of the Vice Provost for Research from an NSF CC* grant
  - Condo model, to provide long-term storage (up to 7 years) beyond the life of a grant. Disk drives purchased on a grant budget, then very low post-grant monthly cost *(i.e., close to <u>pre-purchasing</u> long-term storage on a grant)*

- A scalable low-latency data storage framework
  - parallel file system
    - working toward compliance with NIST 800-171 (*i.e.*, "Controlled Unclassified Information in Nonfederal Information Systems and Organizations") as well as HIPAA (Health Insurance Portability and Accountability Act)
  - intelligent hierarchical storage management software and policies
  - hybrid cloud integration - object storage accessible from on-prem and cloud

W Storage

Coming Soon

🔥 **Hyak (Parallel File System)**

☕ **Lolo Collaboration (Object Storage)**

🧊 **Lolo Archive**
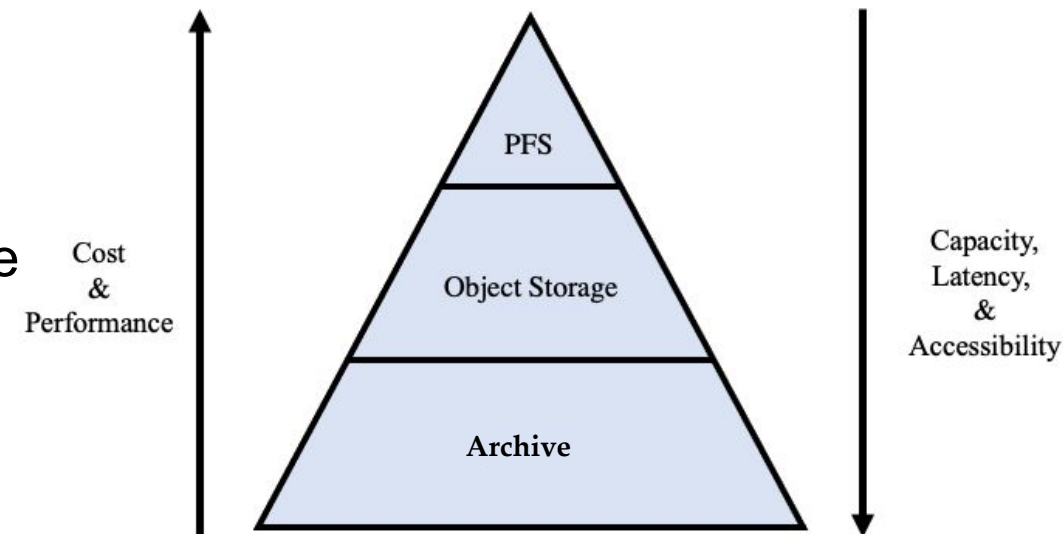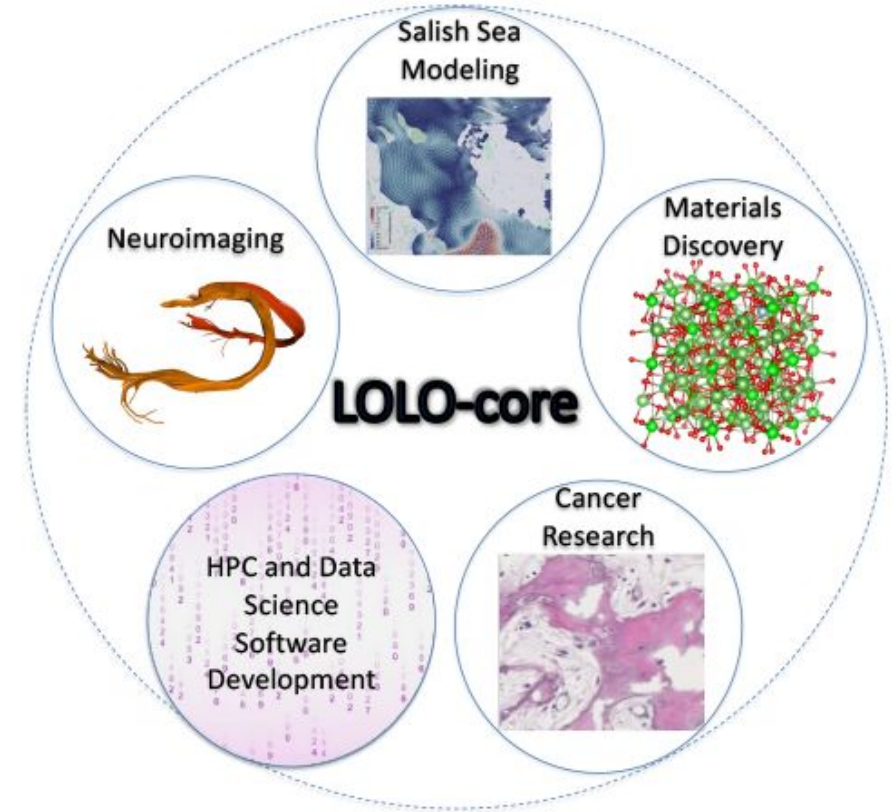
1TB / node free (4 years); supplemental at $10 / TB / month

Condo pricing model - *up-front disk drive purchase, w/ low monthly cost*

Also "pay as you go" @ higher Mo. cost

$4 / TB / month Separate fee to retrieve data *(future)*

What's included?

✅ A "hot" storage tier

✅ On-campus high-performance parallel file system directly connected to Hyak Nodes at 100 Gbps

✅ 100 Gbps connectivity to external collaborators and to cloud

✅ 10 Gbps connectivity to campus labs

✅ "scratch" storage - **not** backed up, use Lolo Collab or Archive

✅ Use of common tools to move data (e.g., scp, rsync)

What's included?

✅ A "warm" storage tier

✅ On-campus object storage at PB scale, intended for long life (~7 years) and low cost *(close to "pre-purchasing" on a grant)*

✅ 100 Gbps connectivity to external collaborators and to cloud

✅ 10 Gbps connectivity to campus labs

✅ **not** backed up - use Archive

✅ S3 file access (cloud compatible)

✅ Standard POSIX (Unix) file access (e.g., scp, rsync)

✅ Accessible from campus and cloud

✅ Public buckets for external sharing

✅ Private buckets for internal and lab-only access

What's included?

✅ A "cold" storage tier

✅ Will be moving from an on-prem tape base, to cloud-based

✅ Automatic geo-redundancy of data (2 copies)

✅ Use of common tools to migrate data (e.g., scp, rsync)

Indirect Cost Waiver

- UW waives indirect costs (F&A) on grants for research computing equipment (which is standard) *and services* (which is special) – *a 55% savings*

- Granting agencies really like this, because it means more of their funds go to research, which may make us a bit more competitive

- Includes:
    - Hyak, including supplemental scratch storage
    - research storage services *offered by UW-IT*
    - commercial cloud services offered *through* UW-IT (AWS, Azure, GCP)
    - *does not apply* when using a Procard for cloud services, or when contracting directly with a cloud provider

- All research equipment is also exempt from State sales tax – *a 10% savings*

Cloud Computing and Access to Cloud Credits

Multiple engagements with the major cloud providers including Amazon (AWS), Google (GCP), and Microsoft (Azure). This includes access to starter credits and architectural and design consultations

Cloud starter grants (AWS, Azure, GCP)

UW Azure Cloud Computing Initiative with Microsoft: $20k in cloud credits through a lightweight proposal process (includes consulting with Azure software engineers)

Cloud 101 training programs to get researchers up on the cloud

For federal grants indirect-free (no overhead) ways to pay for cloud through DLT (AWS), UW-IT (Azure), Strategic Blue and Burwood (GCP)

UW partners with federal programs (e.g. Cloudbank, NIH STRIDES) to simplify access to resources (Cloudbank is currently for CISE researchers)

Cyberinfrastructure Training Programs

Through the eScience Institute there are programs for training you and your students (and postdocs) in computational techniques.

Office hours (year-round): drop-in (including virtual) consulting with data scientists and software engineers (cloud, ML, programming, NLP, databases)

Incubator (proposals due in the fall quarter): a quarter-long engagement with a data scientist to work on accelerating or advancing a data intensive of computationally intensive project

Software Carpentry (4 per year): short courses introducing programing and software development processes for graduate students and beyond

Hackweeks (proposal driven): research focused week-long events combining hands-on work with tutorials and presentations (neuro-, ocean-, geo-, astro-, ...)

We run other training programs and seminars through the year (see the eScience website)