Hyak: Supercomputing @UW

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Hyak: Who's it For?

- Speed of Science

- Prep for Petascale

- Keep the Pipeline Flowing

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Hyak: What is it?

- Personal Supercomputers

- In a UW-IT managed cloud

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Hyak: A Supercomputer

- Supercomputer = Big and Fast

  - \> 600 nodes, up to 1,500

  - \> 6,000 cores, up to 24,000

  - Fast (10Gbs), low latency (< 3.5μs) network

  - Fast (> 5GBs) scratch storage

  - Fast (> 4GBs) aggregate uplinks

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Hyak: *PERSONAL* Supercomputers

- Participating groups purchase nodes

- Between one node and170 (or more)

- Choose from a list with the specs you want

- Guaranteed access to your nodes on demand

- Guaranteed access to your storage

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Hyak: a *CLOUD* resource

- Hyak is a *SYSTEM*, not infrastructure

  - Instant-on

  - Integrated with data center, storage, and nets

  - We manage everything below your apps

 - We even manage some of the apps

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Hyak: a *CLOUD* resource

- Hyak is *ELASTIC*

  - Use idle cycles system wide *AT NO COST*

  - Use split 60:40 dedicated/backfill over time

  - Backfill access managed fairly - everyone gets in

  - Buy for your baseline, not your peak

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Hyak Use by Domain

Hyak Allocation by Domain

- Nuclear Physics
- Biochemistry
- Chemical Engineering
- Climate Science
- Astro & Aero Engineering
- Evaluation
- Astronomy
- Elecrtrical Engineering
- Biology
- Bioengineering
- Applied Math
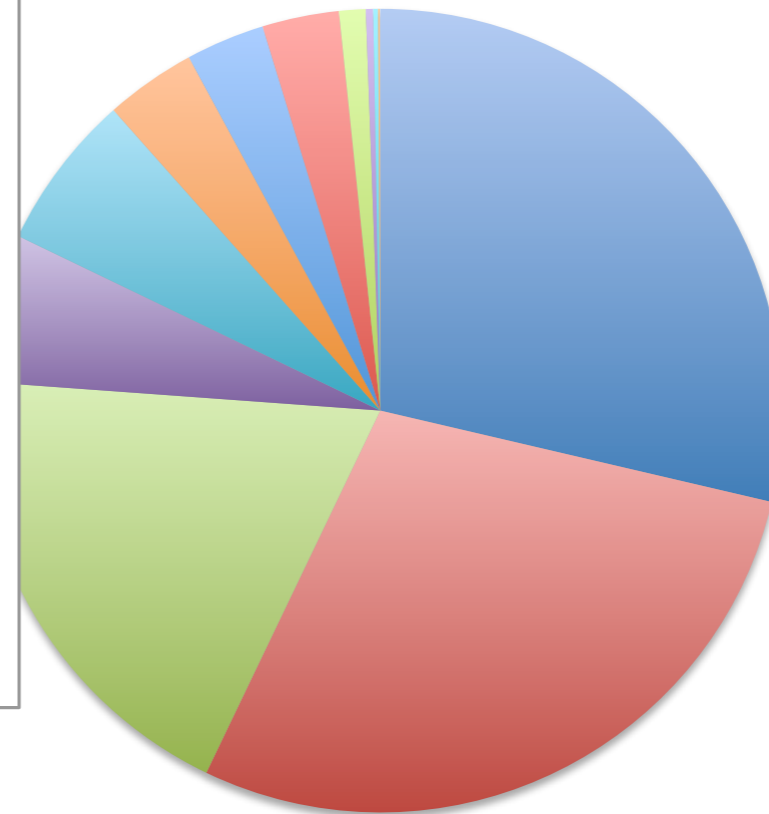- Civil & Environmental Engineering
- Data Science
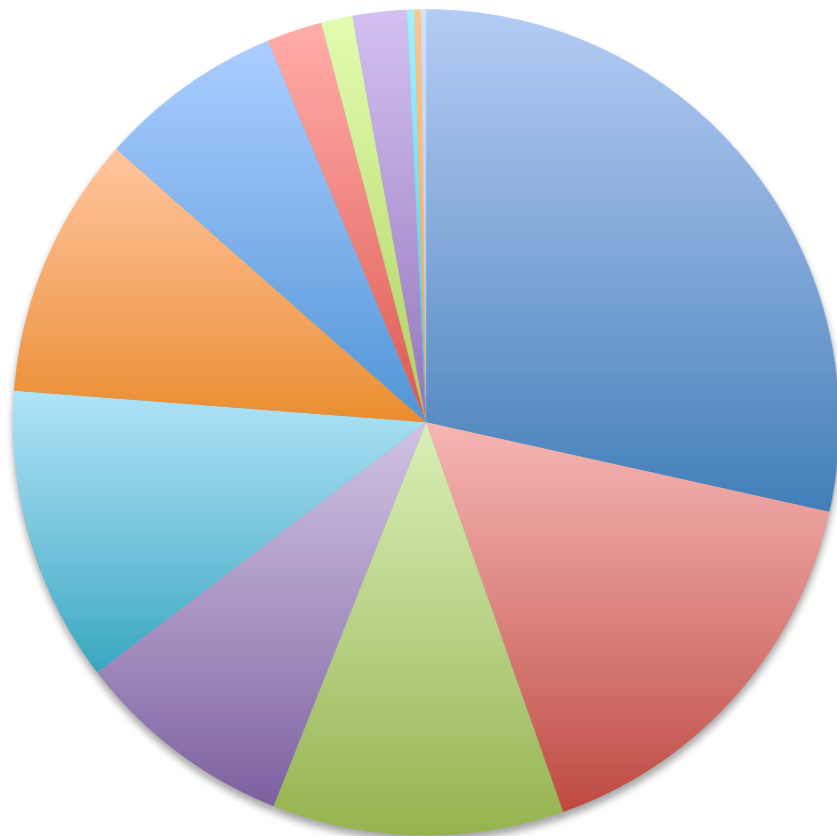
Hyak Utilization by Domain

- Nuclear Physics
- Biochemistry
- Chemical Engineering
- Climate Science
- Astro & Aero Engineering
- Evaluation
- Astronomy
- Elecrtrical Engineering
- Biology
- Bioengineering
- Applied Math
- Civil & Environmental Engineering
- Data Science

Hyak Business Model

- Moore's Law applies to nodes, not the rest

- Cost to users < acting alone

- Cost to UW < users acting alone

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HPC Compute Cycle Cost Trends

UNIVERSITY of WASHINGTON

(https://sig.washington.edu/itsigs/Menu_of_equipment_options_and_prices)
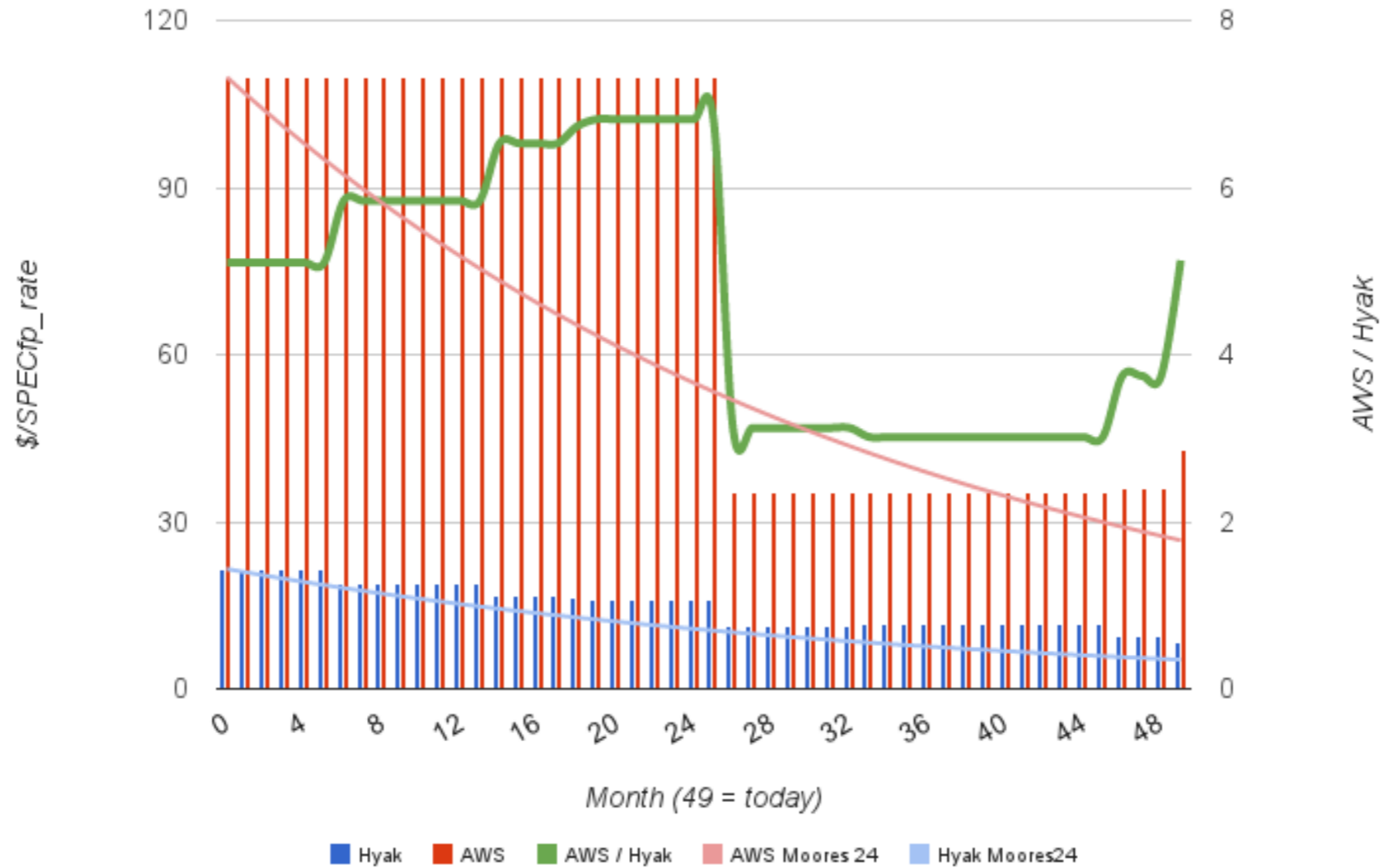
Hyak Business Model

- Sponsors provide infrastructure

  - 6 year lifetime

- Users pay for nodes

  - 3 year lifetime

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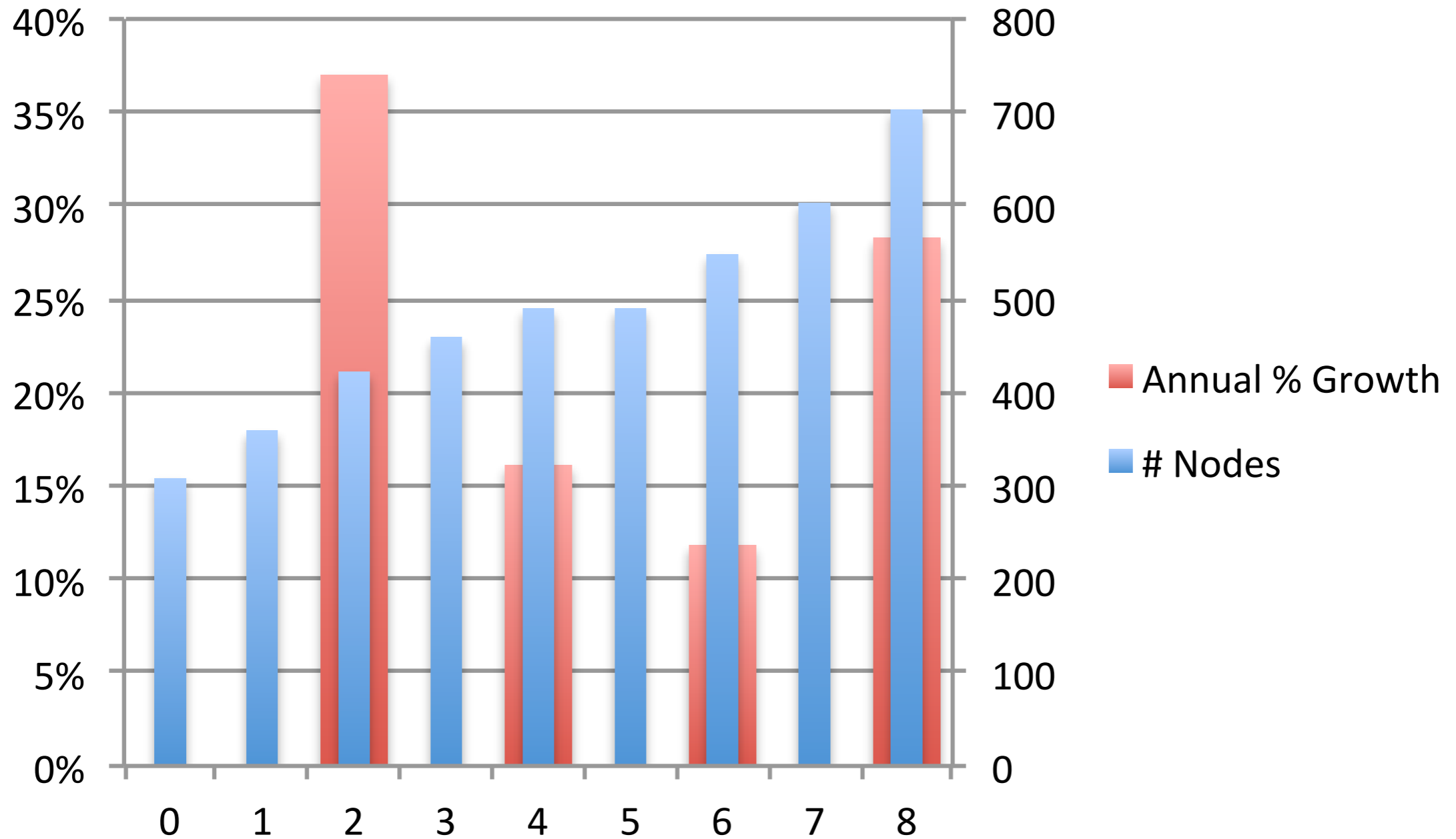
Hyak 4-Year Growth

Iolo: Superstorage@UW

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lolo: What is it?

- Open to ALL UW RESEARCHERS

- Archive Filesystem

  - for safe, long term storage

  - data changes infrequently, if ever

- Collaboration Filesystem

  - general purpose file storage service

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IoIo: Archives ≠ Backups

- Backups protect *HOT* data

- Archives protect *COLD* data

- Most data is cold

- SAVE: archives cost less than backups

- SAVE: operate less first tier storage
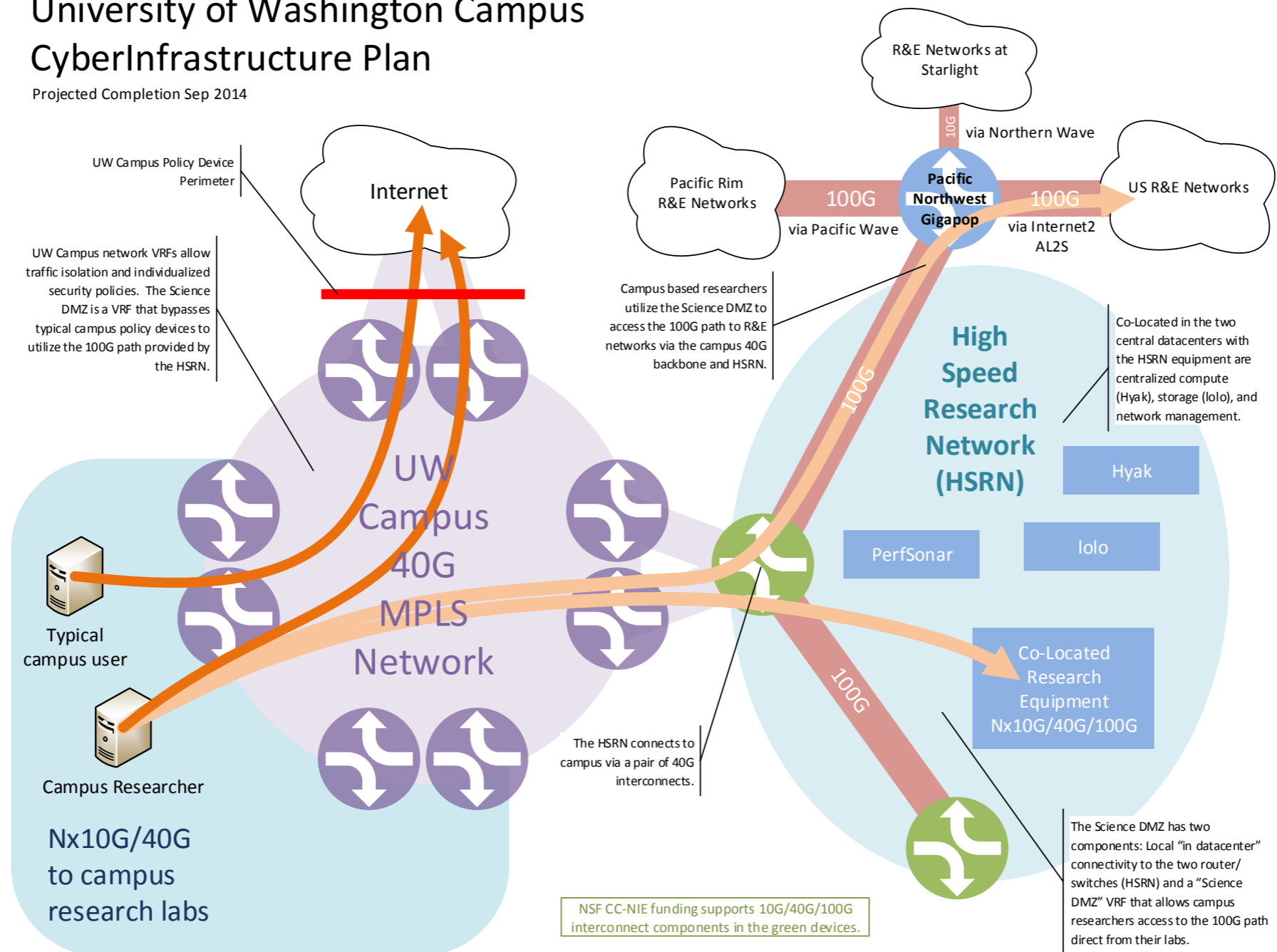
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HSRN & Science DMZ

University of Washington Campus CyberInfrastructure Plan

Projected Completion Sep 2014

UW Campus Policy Device Perimeter

Internet

UW Campus network VRFs allow traffic isolation and individualized security policies. The Science DMZ is a VRF that bypasses typical campus policy devices to utilize the 100G path provided by the HSRN.

UW Campus 40G MPLS Network

Typical campus user

Campus Researcher

Nx10G/40G to campus research labs

R&E Networks at Starlight

via Northern Wave

Pacific Rim R&E Networks

100G

Pacific Northwest Gigapop

100G

US R&E Networks

via Pacific Wave

via Internet2 AL2S

Campus based researchers utilize the Science DMZ to access the 100G path to R&E networks via the campus 40G backbone and HSRN.

Co-Located in the two central datacenters with the HSRN equipment are centralized compute (Hyak), storage (lolo), and network management.

High Speed Research Network (HSRN)

Hyak

PerfSonar

lolo

100G

Co-Located Research Equipment Nx10G/40G/100G

100G

The HSRN connects to campus via a pair of 40G interconnects.

NSF CC-NIE funding supports 10G/40G/100G interconnect components in the green devices.

The Science DMZ has two components: Local "in datacenter" connectivity to the two router/switches (HSRN) and a "Science DMZ" VRF that allows campus researchers access to the 100G path direct from their labs.

HSRN: What is it?

- 100Gbs backbone between data centers

- 10/40/100Gbs links to co-located gear

- 100Gbs link to research Internet

- 40Gbs link to campus

- Option for layer-2 links

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Science DMZ: What is it?

- Virtual network overlay on HSRN

- Optimized path for select hosts

- Paths outside campus security perimeter

- Data Transfer Node (lolo Collaboration)

- Option to extend to campus endpoints

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