A national science & engineering cloud

UISO/UIPO Chalk Talk: Jetstream

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Research Technologies - High Performance Systems

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What is Jetstream?

- **User-friendly**, widely accessible cloud environment
- **User-selectable library** of preconfigured virtual machines; no need for system administration skills.
- **NSF's first production cloud** facility supporting all areas of science and engineering within NSF's scope
- **Enable discoveries across disciplines** such as biology, atmospheric science, economics, network science, observational astronomy, and social sciences.

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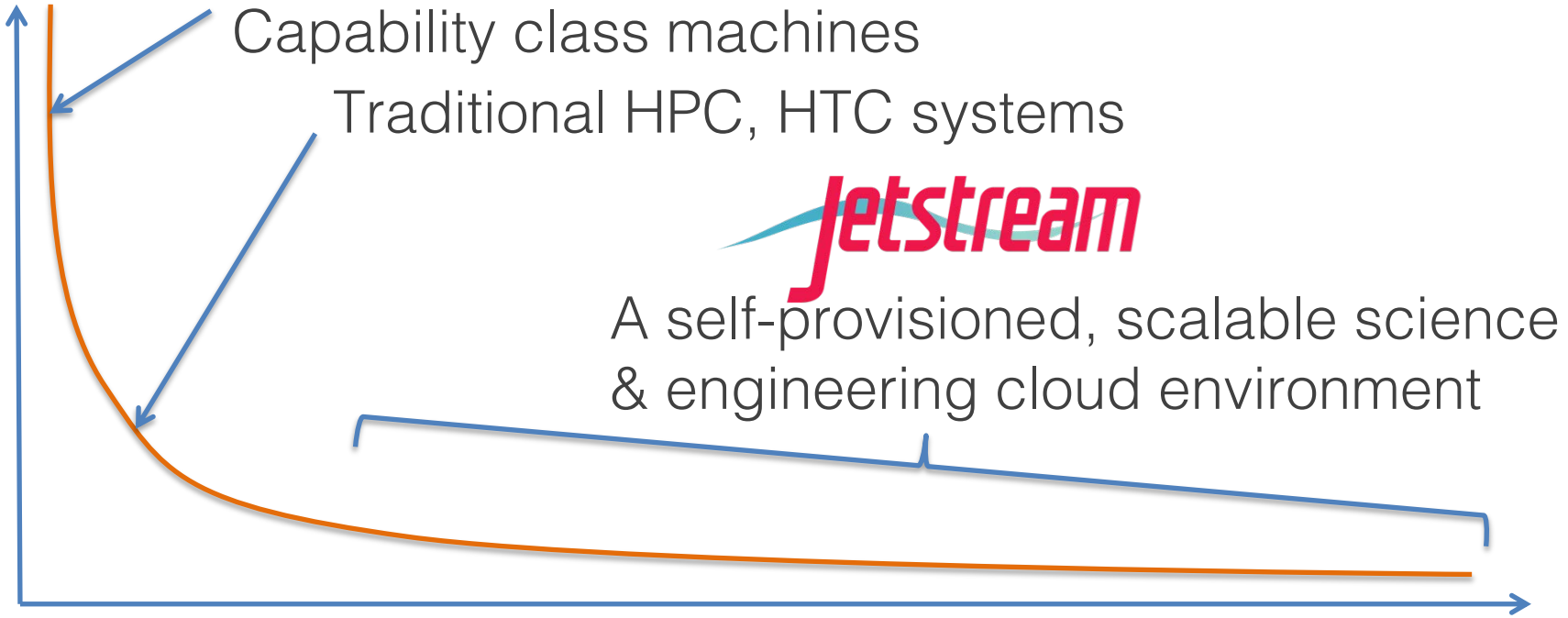
What is Jetstream? (cont)

- Particularly focused on researchers working in the "**long tail" of science** with born digital data

"Long tail" of the NSF XD Ecosystem



What is Jetstream? (cont)

- Primary goal is to **expand the userbase** of XD program resources beyond the current community of users.
- **Reproducibility**: store, publish via IU Scholarworks (DOI)
- **Cloudy**: clouds are more the just virtual machines (VM)
  - old way: robust infrastructure, weak software
  - Cloudy way: commodity infrastructure, robust software
  - cows, not pets

What is Jetstream? (cont)

- Software layers
  - **Atmosphere** web interface
    - library of images, genertic, domain specific
    - simplify VM administration
  - **Openstack:** software tools for building and managing cloud computing platforms for public and private clouds.
  - **KVM** hypervisor: what the VMs run on\
  - **Ceph**: storage platform that stores data on a single distributed computer cluster, and provides interfaces for **object**-, **block**- and *file-level* storage.
  - Operating systems: CentOS, Ubuntu, Windows?

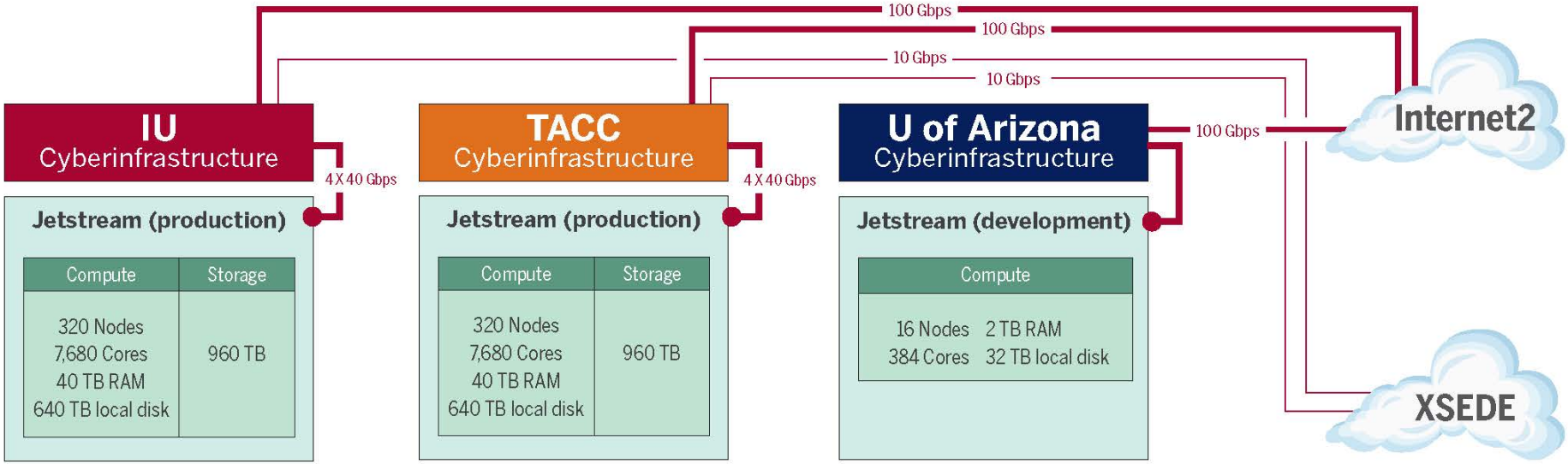
Who will use Jetstream

- **Researchers & students** needing access to **interactive computing** and data analysis resources on demand. "*A few processors now instead of thousands next week.*"
- Researchers & **software developers** creating & maintaining ***domain specific software packages***
- As a backend supporting **science gateways**

21st century workforce development

- Jetstream will include **virtual Linux desktops** and applications specifically aimed to enable research and research education at small colleges and universities including **HBCU**s (Historically Black Colleges and Universities), **MSI**s (Minority Serving Institutions), Tribal colleges, and higher-Ed institutions in **EPSCoR** States

Jetstream System Overview



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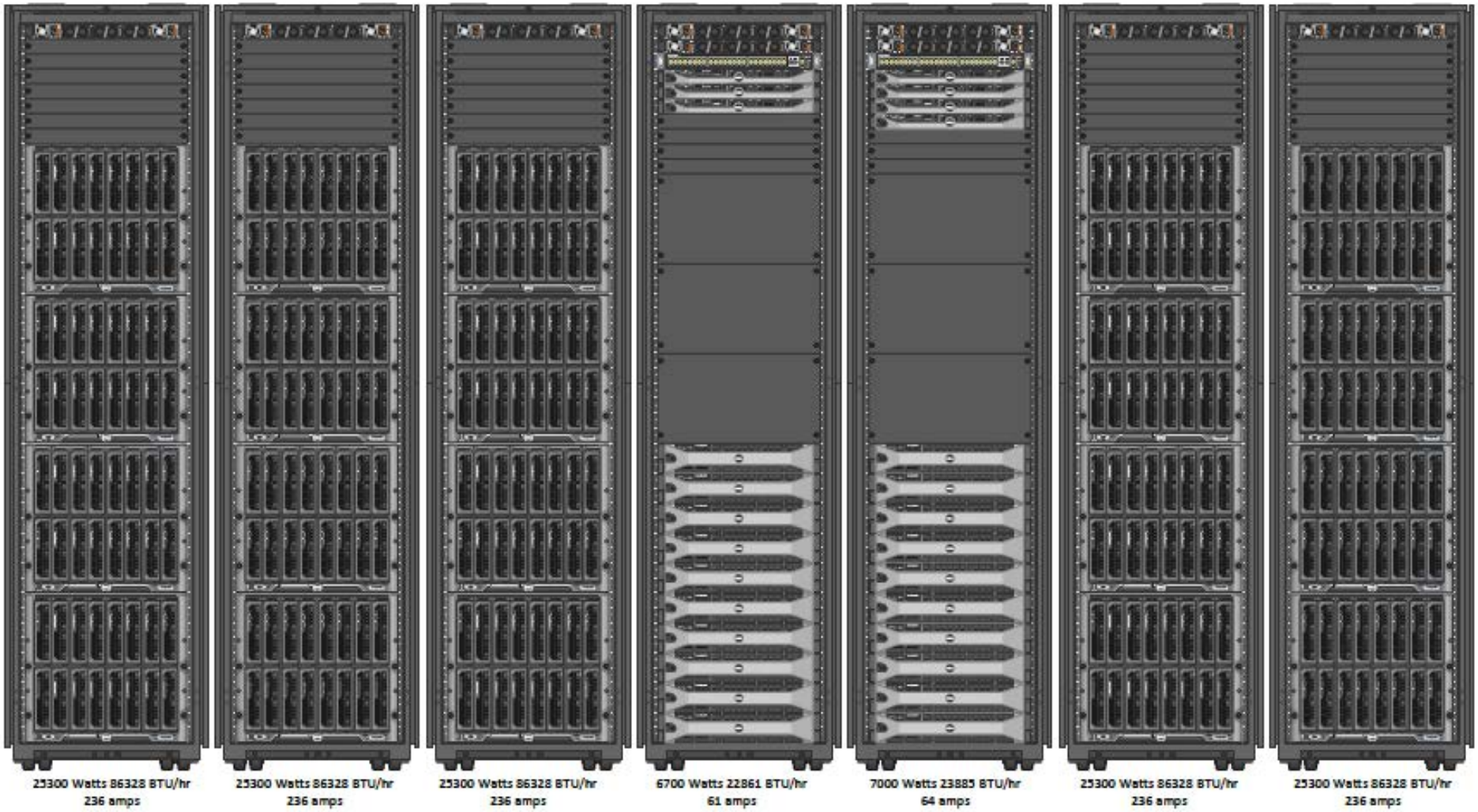
http://jetstream-cloud.org/

Jetstream hardware



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VM Instance Sizes (Flavors)

Instance Type	vCPUs	RAM	Storage	Instances/Node
Tiny	1	2	20	46
Small	2	4	40	23
Medium	6	16	130	7
Large	10	30	230	4
X-Large	22	60	460	2
XX-Large	44	120	920	1

Node config: dual Intel E-2680v3 “Haswell”, 24 physical cores/node @ 2.5 GHz, 128 GB RAM, dual 1 TB local disks.

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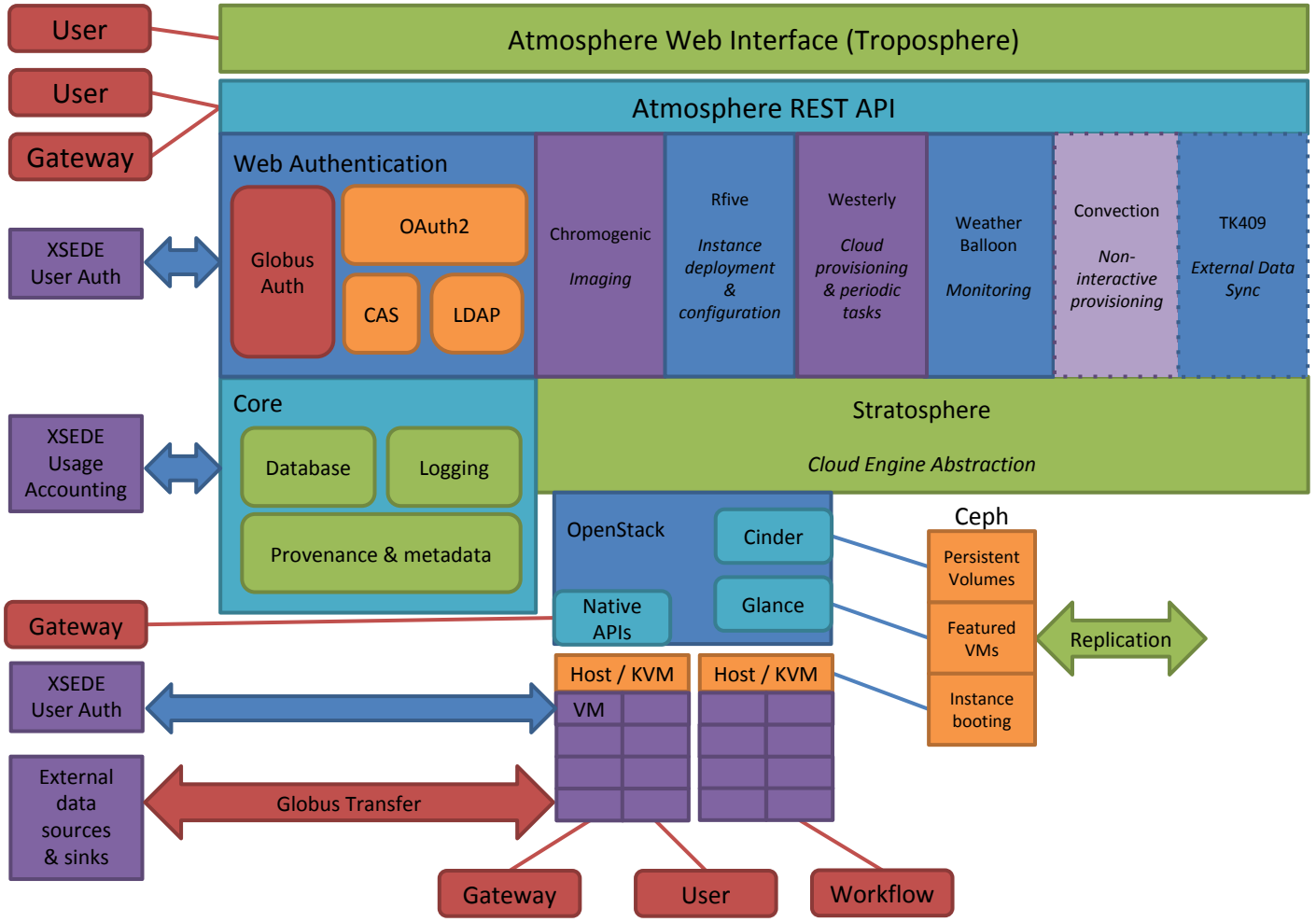
Software Stack: Metal to Atmosphere



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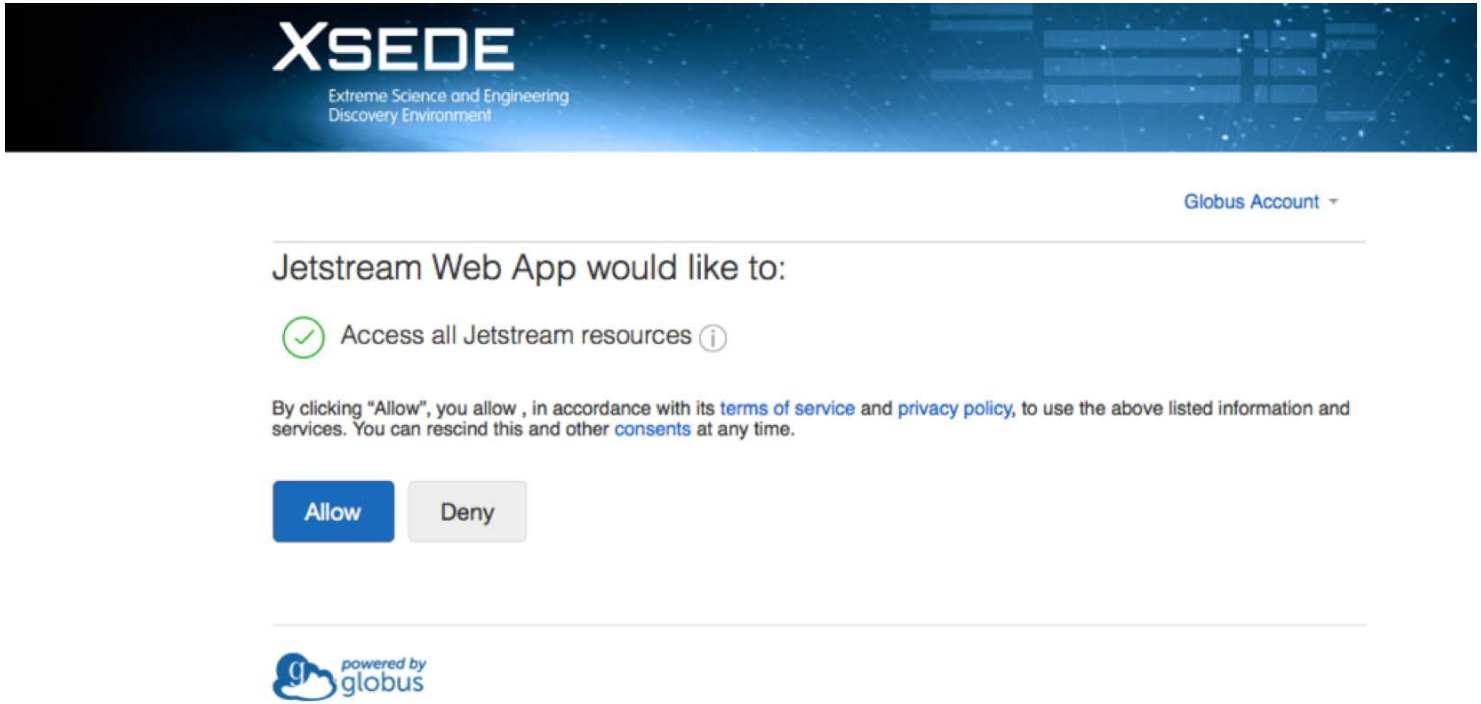
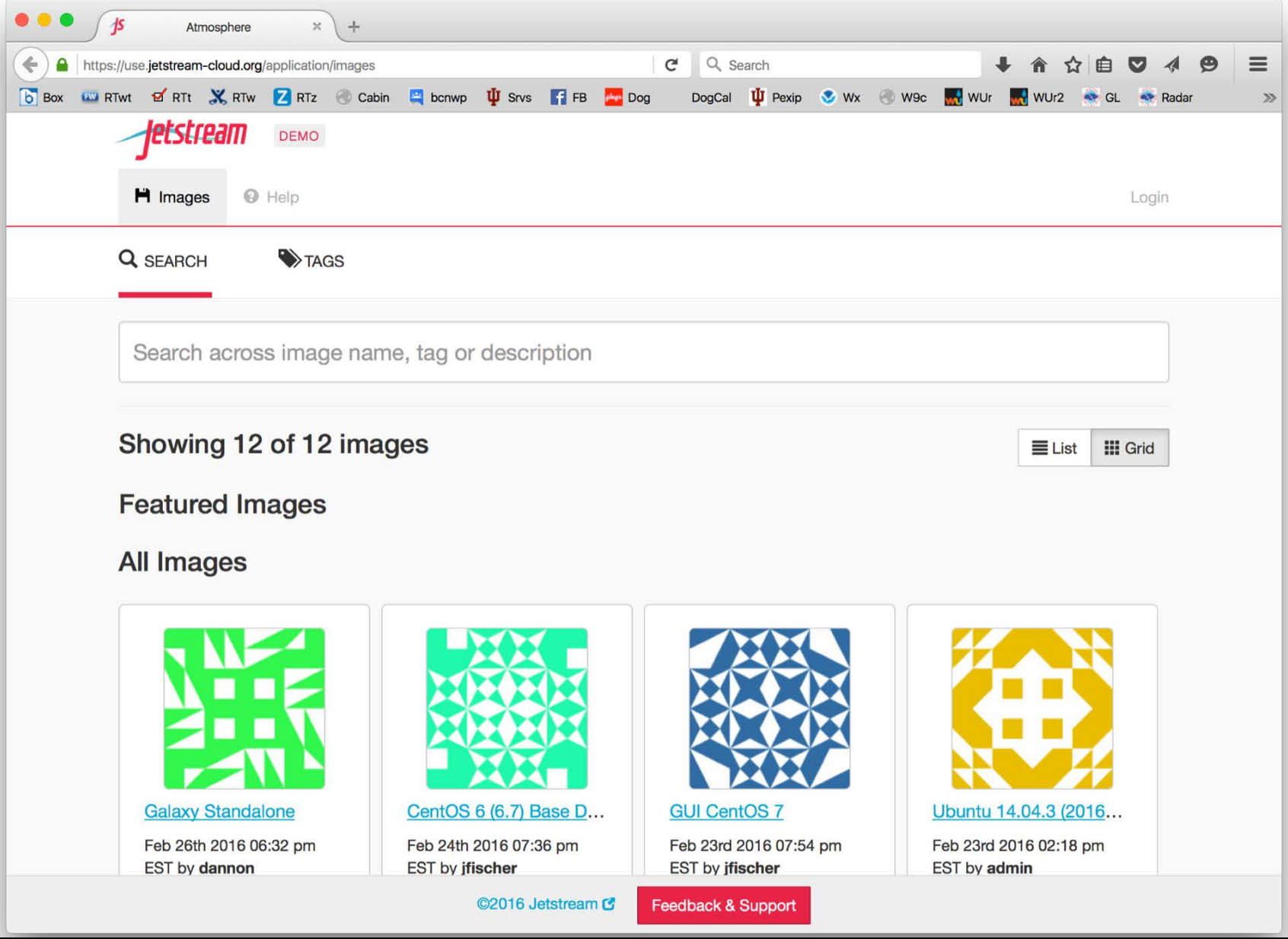
Jetstream click-through agreement



XSEDE Acceptable Use Policy: https://portal.xsede.org/usage-policy



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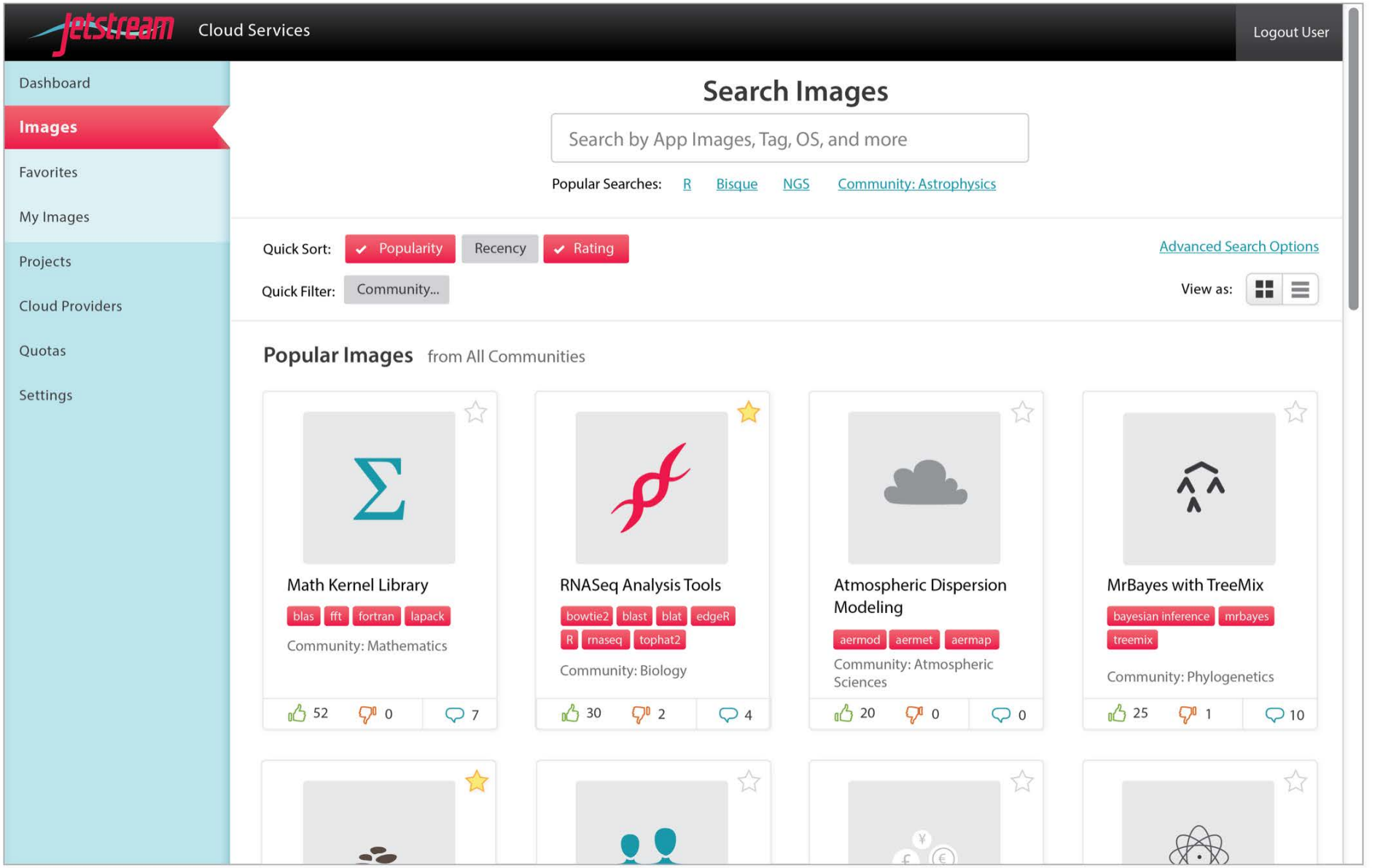

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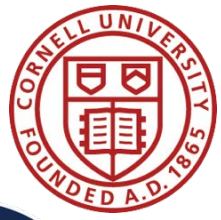
Jetstream Partner Organizations

Initial construction (funded partners)



Planned funded partners (O&M phase)

Unfunded partners

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Jetstream

http://jetstream-cloud.org/

How do we onboard users onto Jetstream?

- An XSEDE User Portal (XUP) account is required. They are free! Get one at https://portal.xsede.org
- Read the Allocations Overview - https://portal.xsede.org/allocations-overview
- Write a successful allocation request – start with a Startup or Education request - https://portal.xsede.org/successful-requests

Jetstream Information Sources

- Jetstream: https://use.jetstream-cloud.org/
- XSEDE User Portal is required to actually login: https://portal.xsede.org
- User guide: http://jetstream-cloud.org/training.php
- Paper describing Jetstream Jetstream: A self-provisioned, scalable scince and engineering cloud environment

Openstack Projects …the core services

Service	Name	Adoption	Maturity	Age
• Identity	Keystone	96%	7/8	4 yrs
• Images	Glance	94%	6/8	6 yrs
• Block device	Cinder	86%	7/8	4 yrs
• Networking	Neutron	89%	7/8	4 yrs
• Compute	Nova	96%	8/8	6 yrs
• Object store	Swift	62%	7/8	6 yrs

http://www.openstack.org/software/project-navigator/

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Jetstream

Openstack Projects …some other services

Service	Name	Adoption	Maturity	Age
Dashboard	Horizon	95%	6/8	4 yrs
Telemetry	Ceilometer	61%	6/8	3 yrs
Database	Trove	27%	1/8	2 yrs
Orchestration	Heat	68%	6/8	3 yrs
Provisioning	Ironic	17%	2/8	2 yrs
Object store	Swift	62%	7/8	6 yrs
Elastic Map Reduce	Sahara	20%	1/8	2 yrs

http://www.openstack.org/software/project-navigator/

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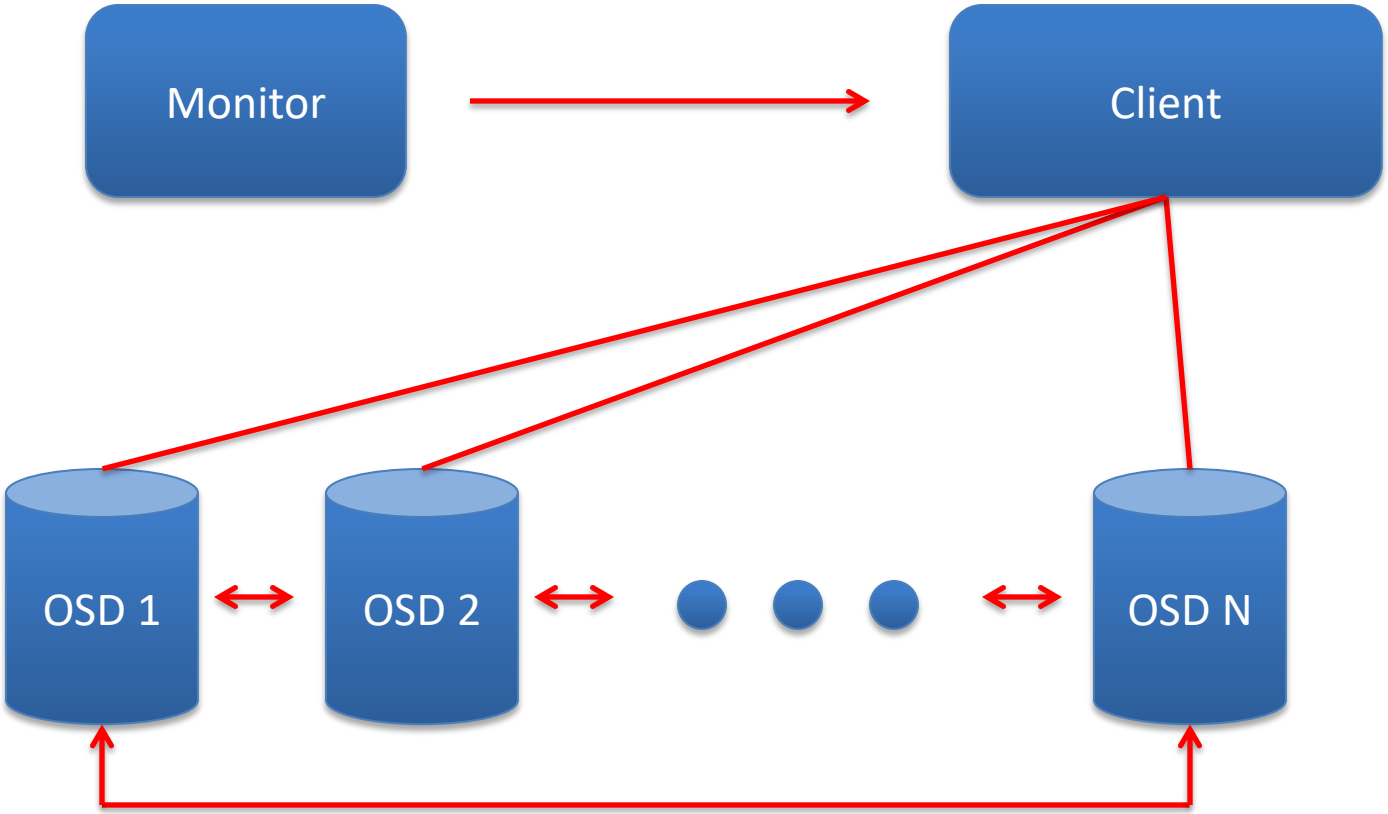
Glance - Cinder - Ceph



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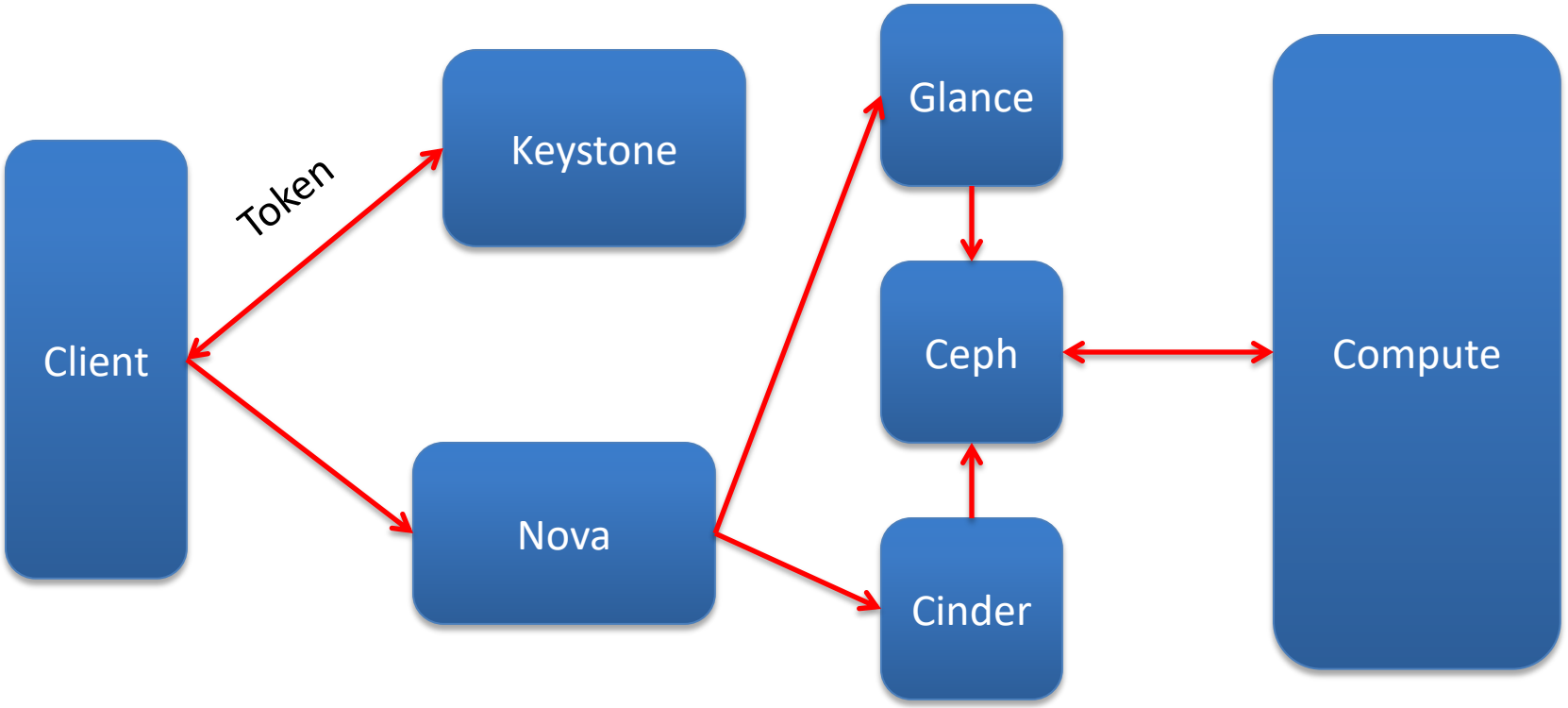

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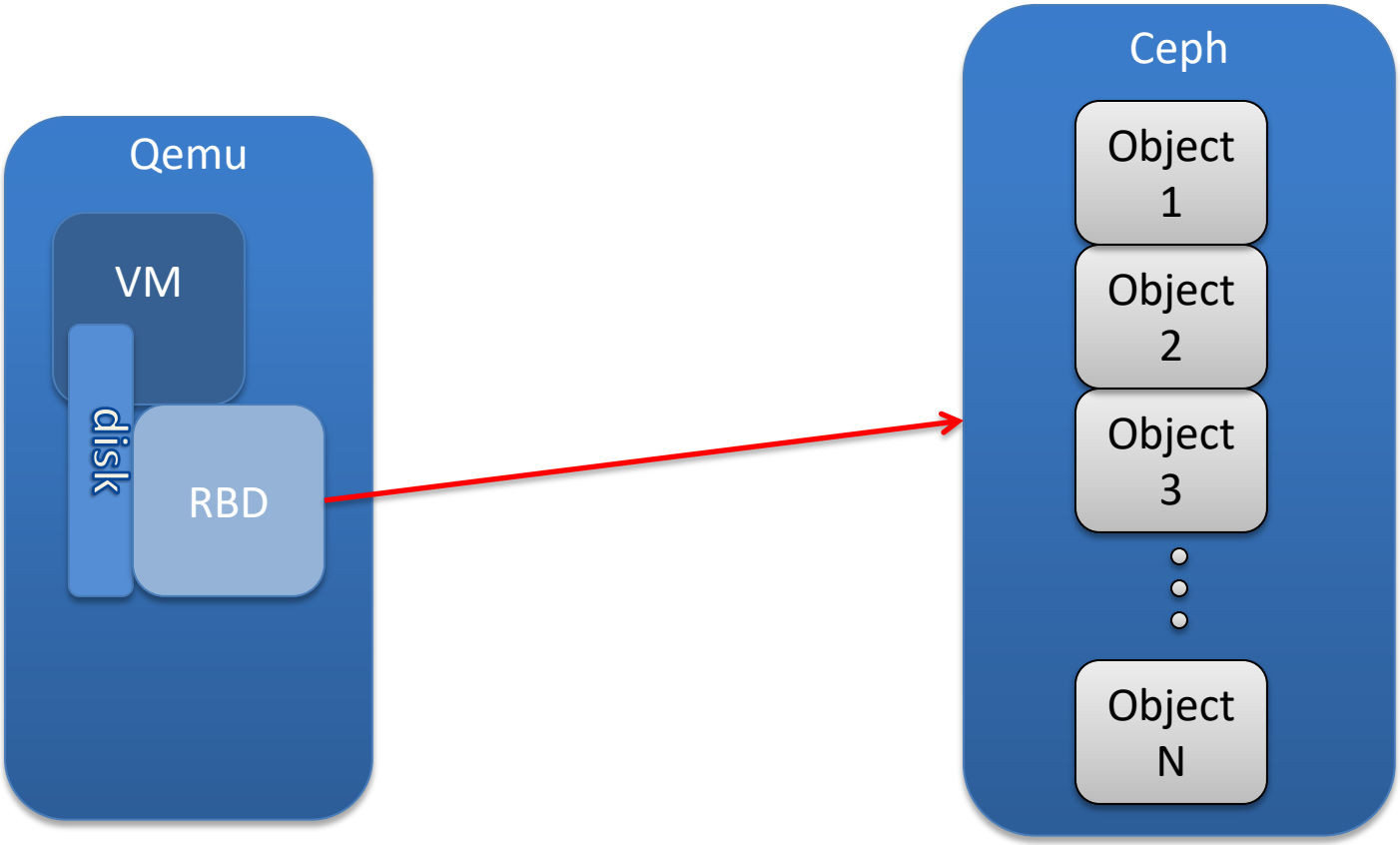

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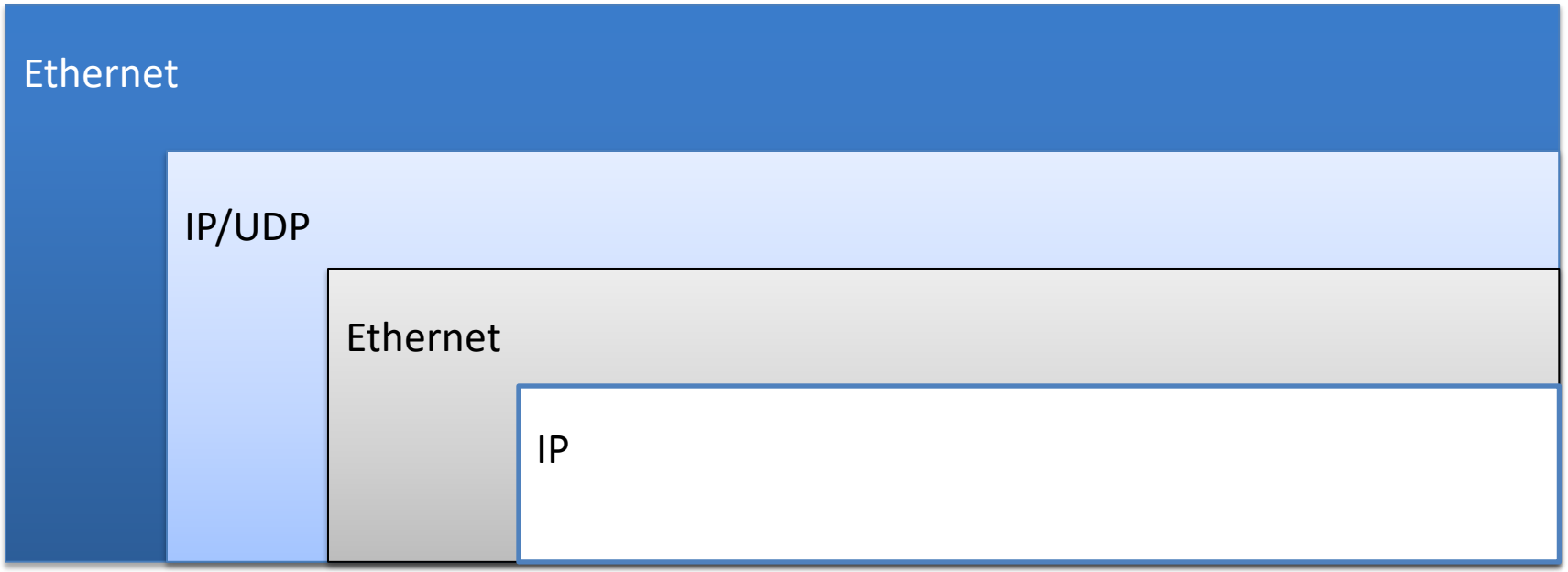
VXLAN Packet



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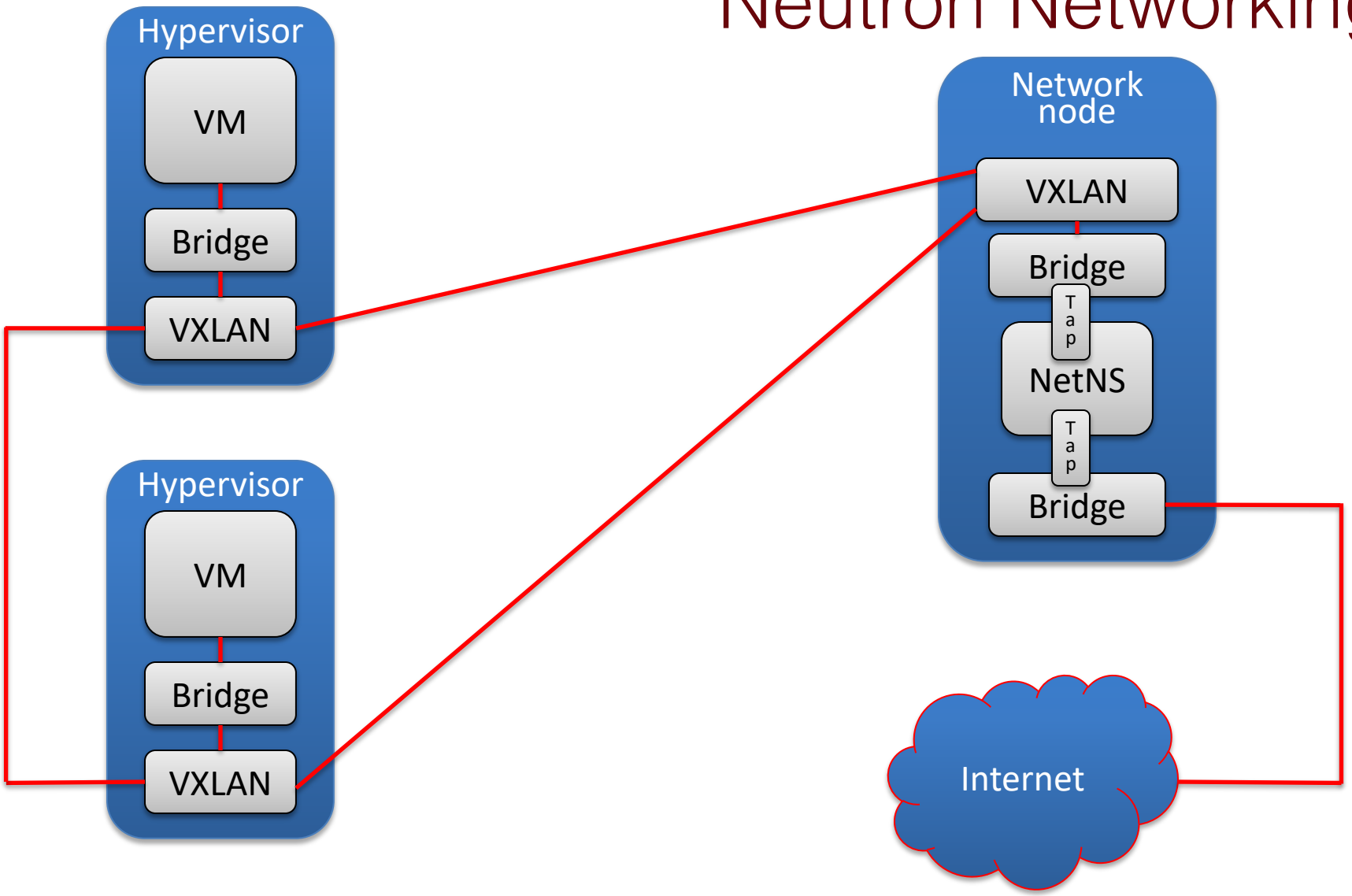
Neutron Networking



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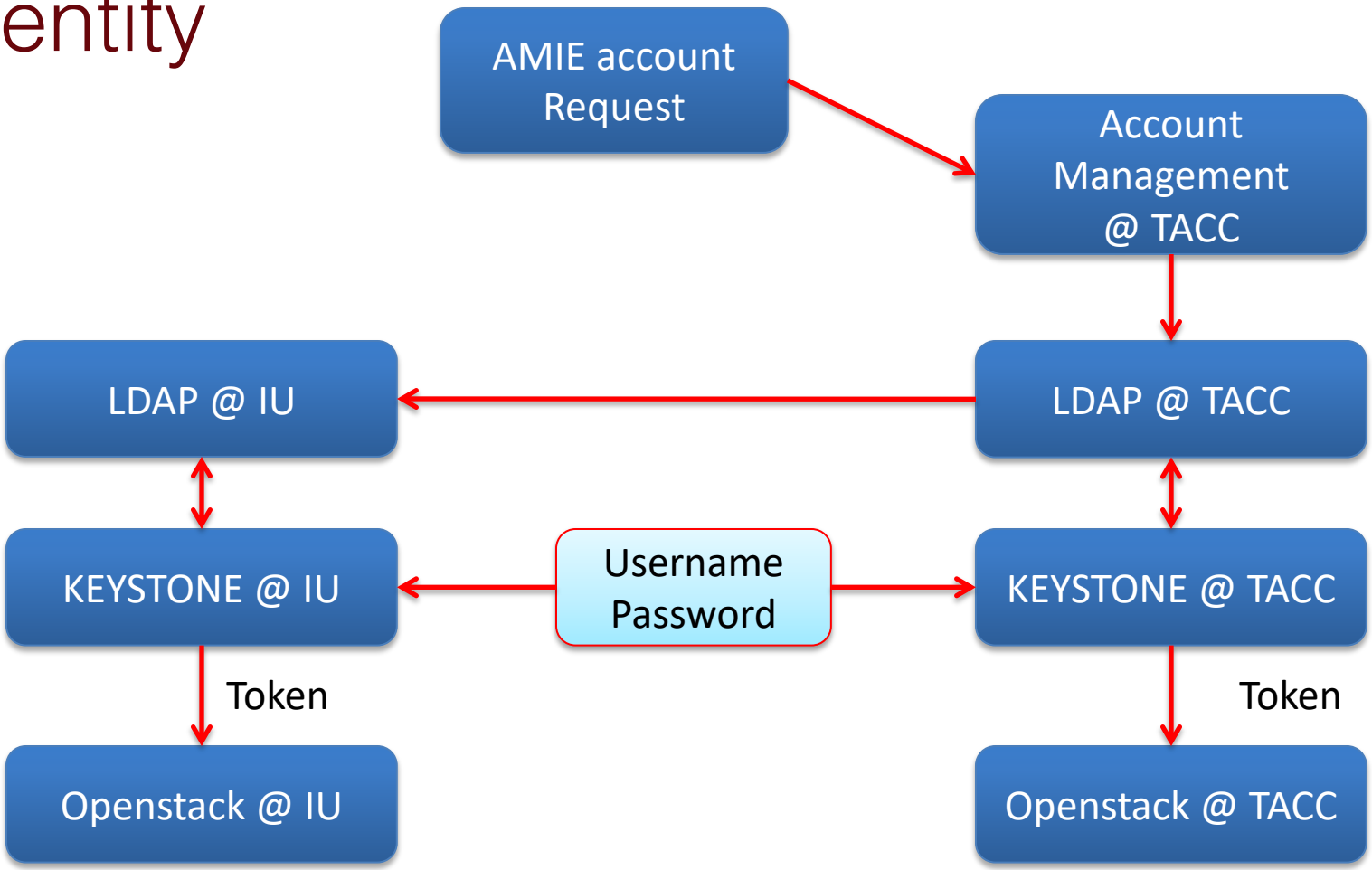
Identity



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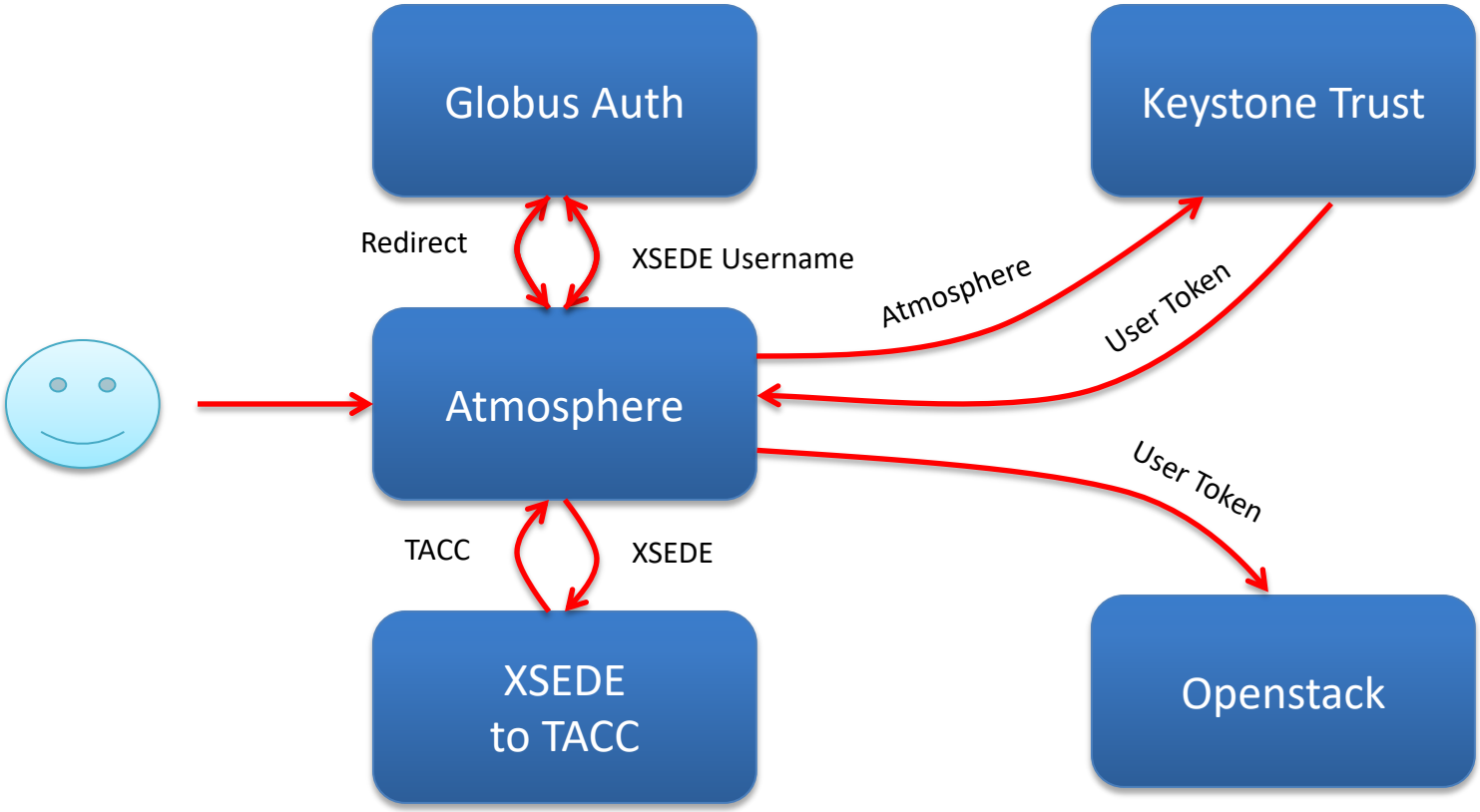
Authentication



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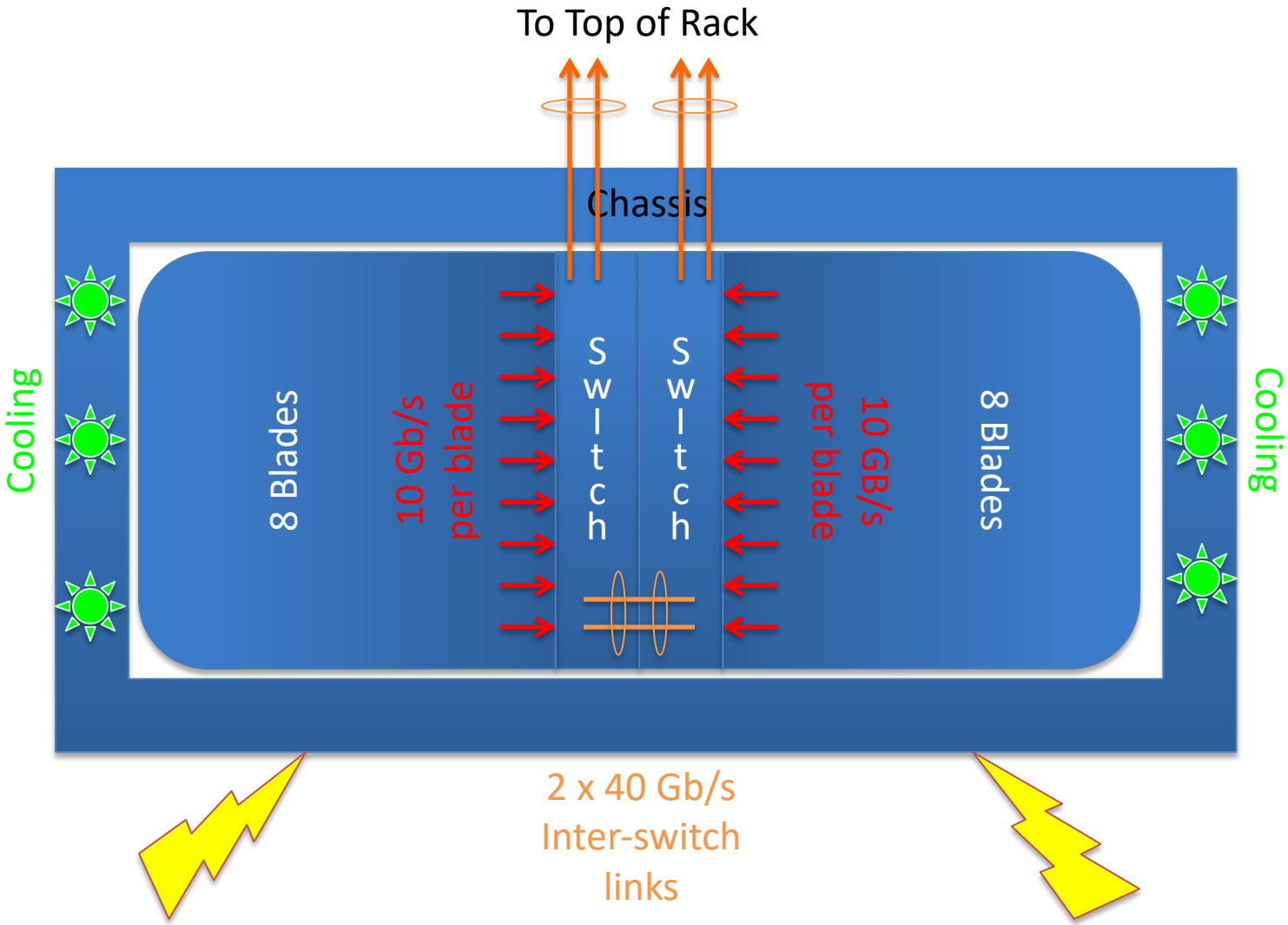
Compute Chassis & Network Topology



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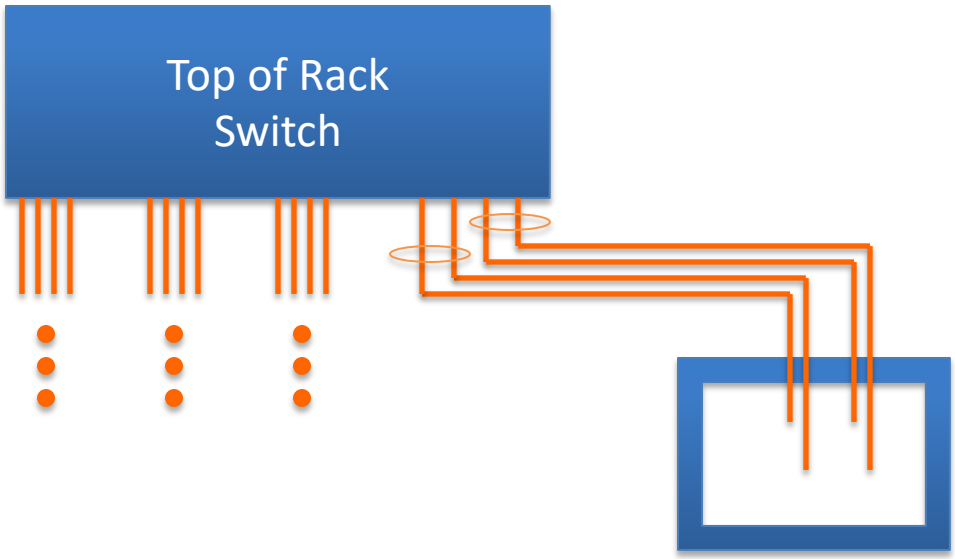
Network Topology

Chassis to Top of Rack



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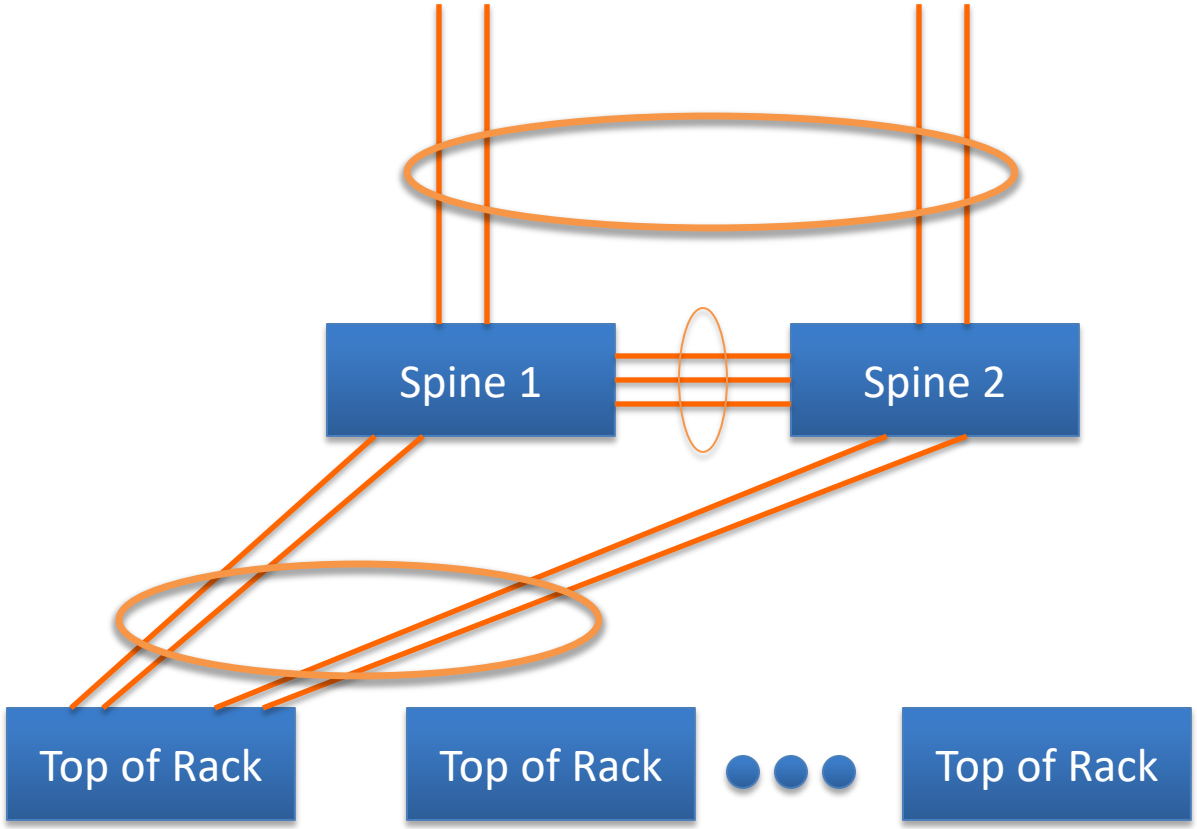
Network Topology …cont.



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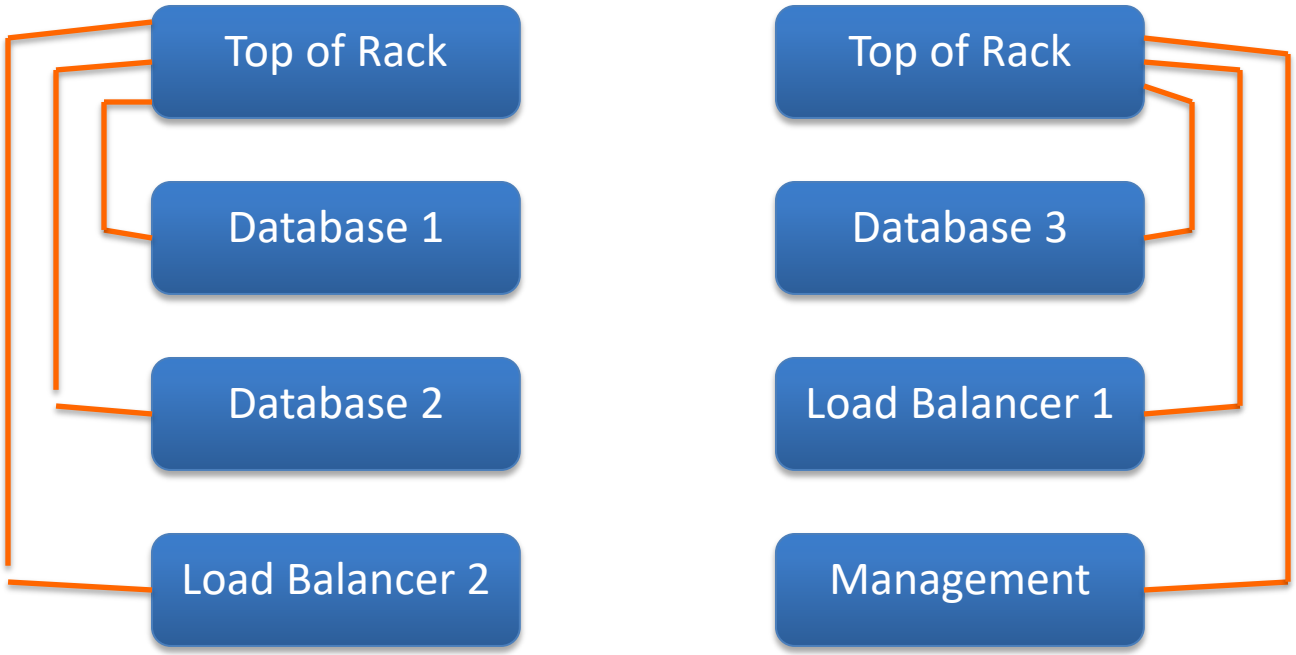

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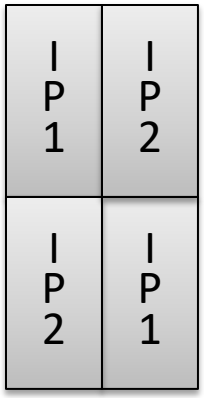
Load Balancer 1



Keep Alive

Load Balancer 2

DNS Round Robin
IP1 – IP2

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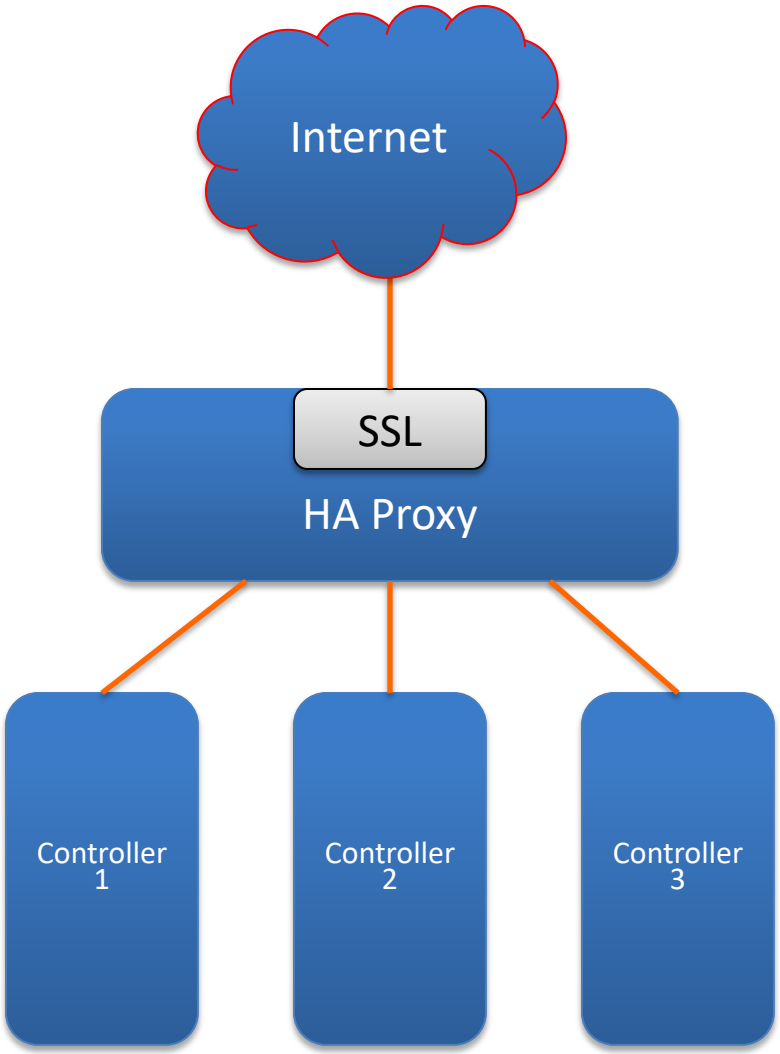

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http://jetstream-cloud.org/

Questions?

Project website: http://jetstream-cloud.org/
Project email: jethelp@iu.edu
Direct email: jomlowe@iu.edu, turnerg@iu.edu

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