



XSEDE

Extreme Science and Engineering
Discovery Environment



BRIDGES

A PITTSBURGH SUPERCOMPUTING CENTER RESOURCE

Virtual Machines and Containers

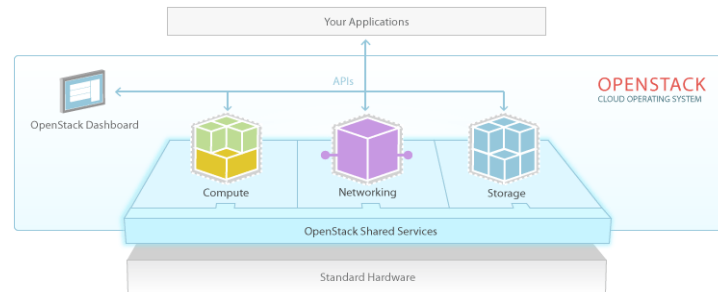
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Challenges of Modern HPC

- Support for heterogeneous environments, workflows, development, and data driven needs
 - Bare Metal Provisioning
 - Virtualization support w/KVM
 - Containers
 - Integration with Existing Cloud Services
 - Amazon EC2
 - OpenStack Deployments (XSEDE: JetStream)
 - Databases
 - Web Portals
 - Hadoop / Spark



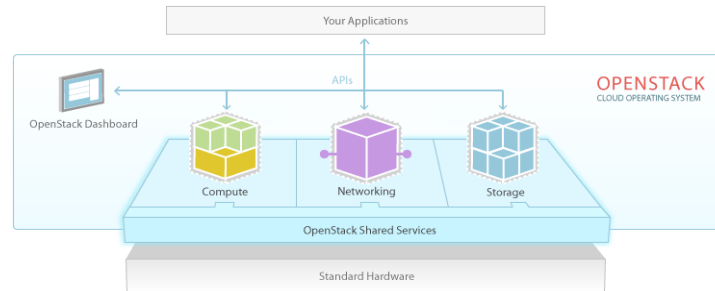
OpenStack



- What is OpenStack?
 - Open source software for creating public and private clouds
 - Abstraction Layer of Physical / Virtual resources
 - Storage
 - Networking
 - Compute
 - IaaS (Infrastructure as a Service) : Orchestration for deploying
 - Virtual Machines
 - Containers
 - Baremetal
 - Community and Industry Success
 - Who uses it?
 - AT&T, PayPal, Ebay, Walmart
 - Who supports it?
 - Intel, RedHat, SuSE, Ubuntu, Rackspace
 - Approximately 2000 active developers



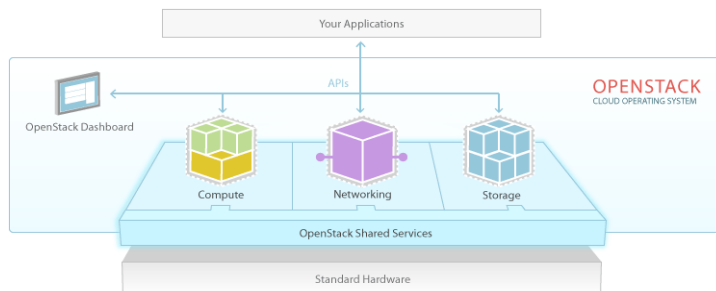
OpenStack



- Why OpenStack?
 - OpenStack services support standalone deployment
 - Sahara : Hadoop
 - Trove : Database
 - Magnum : Containers (Docker/Kubernetes)
 - Ironic : Baremetal Deployment
 - Current Boot Method of Bridges
 - Nova KVM : Virtual Machines
 - Rapidly changing and feature rich
 - HPC community inside OpenStack
 - REST API, integration with Slurm
 - Dedicated resource requests for VMs/Containers



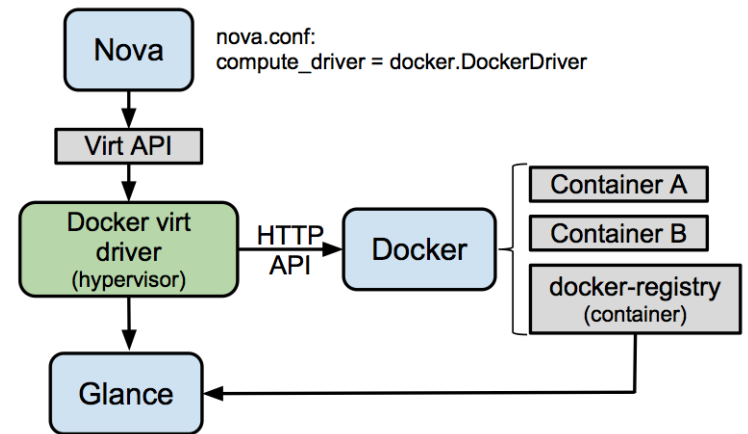
Virtual Machines



- OpenStack w/KVM
 - Support existing research infrastructures
 - VM repository for common science workflows
 - Repeatable, scalable, environments on demand
 - Support custom environments
 - User supplies existing VMs
 - Allows scaling without rebuilding environment/infrastructure
 - User Managed vs PSC Managed
 - Advanced users utilize OpenStack Dashboard
 - Full control over VM
 - Standard VMs handled by PSC staff



Containers



- OpenStack w/Docker Integration
 - Support existing Docker workflows
 - Facilitate large scale Docker deployments
 - Performance benefits over VM
 - Closer to metal : No hypervisor overhead
 - OmniPath w/out needing SR-IOV
 - Enable non traditional HPC users
 - Scale user supplied environment



Application Support

- Primary Goal is Application Support

- Web Portals



- Quick turnaround for httpd deployment
- Facilitate non traditional HPC access
 - Community accounts

- Databases



- Spin up templates MySQL, Postgres environments
- On demand needs w/persistent storage



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Comments? Questions?



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