Cloud System Administration using OpenStack

Md. Mahedi Hasan

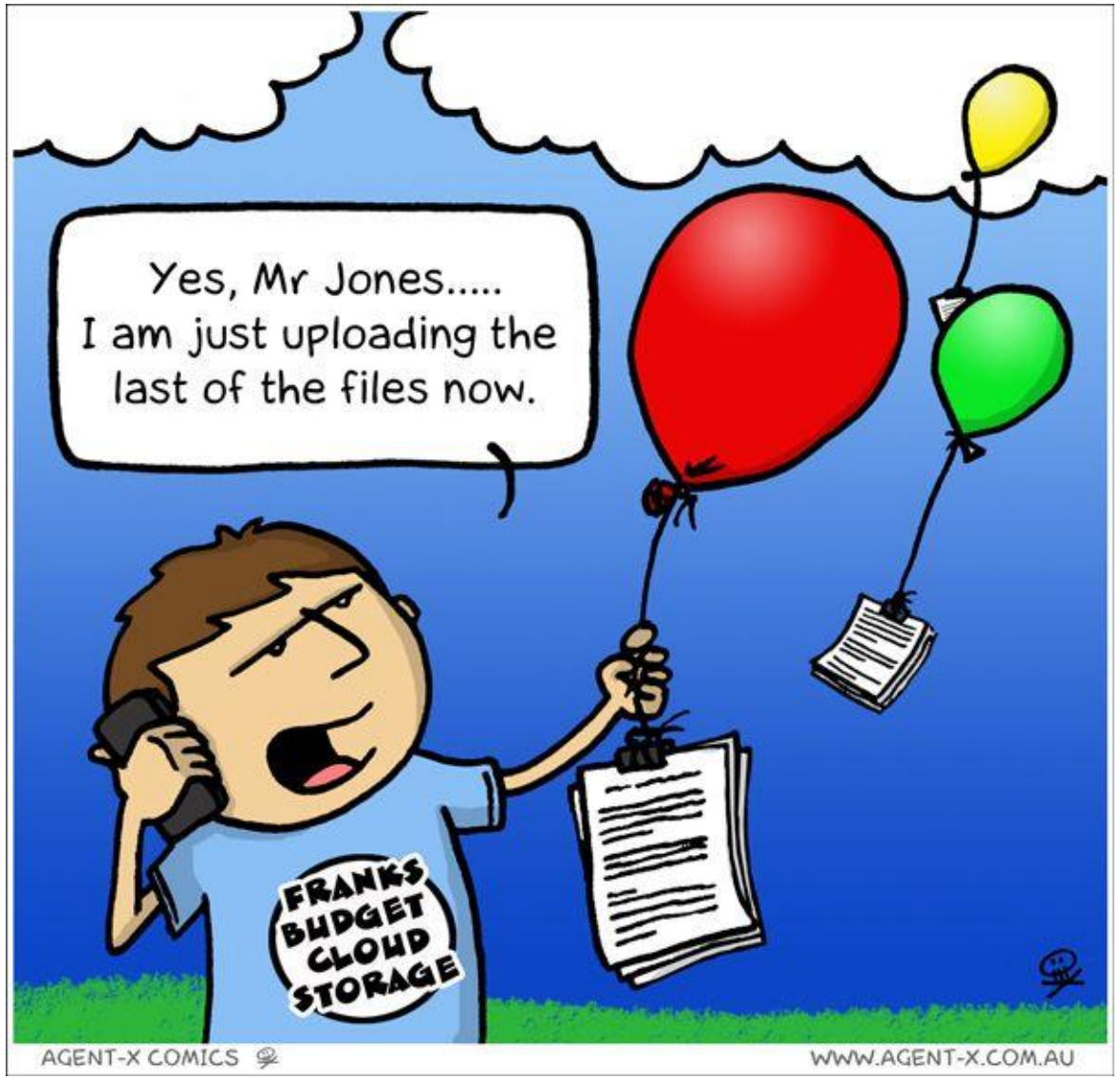
Sr. System Engineer (BdREN)

mahedi@bdren.net.bd | www.Mahedi.me

/in/mahedicse/ | /mahedi.cse

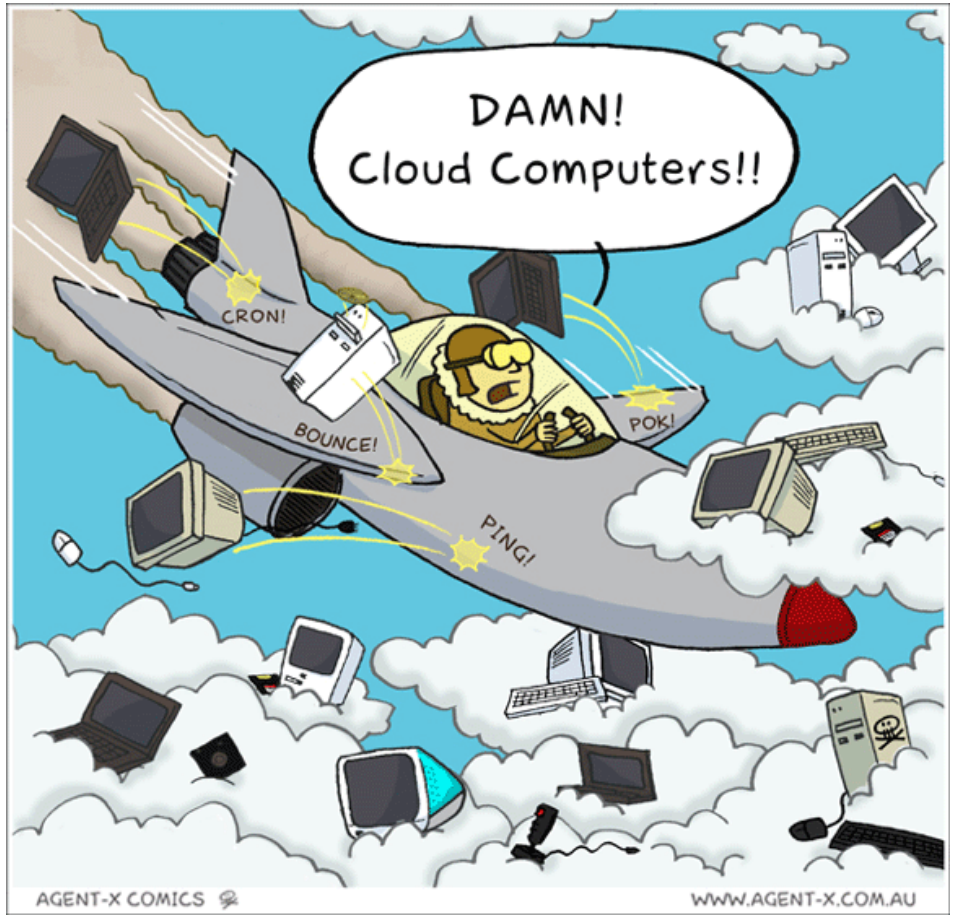
What is Cloud Computing ?

- Is it's a Standard?
- Is it's a Hardware?
- Is it's a Software?
- So What is actually it?



Introduction to Cloud Computing

- Todays the modern technology of computing is cloud computing that can provide mobility and massive scalability of computing.
- It's can be integrated all of the computing services in a single umbrella.
- Cloud Computing is actually nothing except a concept of computing that integrate the generic computing via Internet or Intranet (e.g.: office online, g-drive, VPSs etc.)

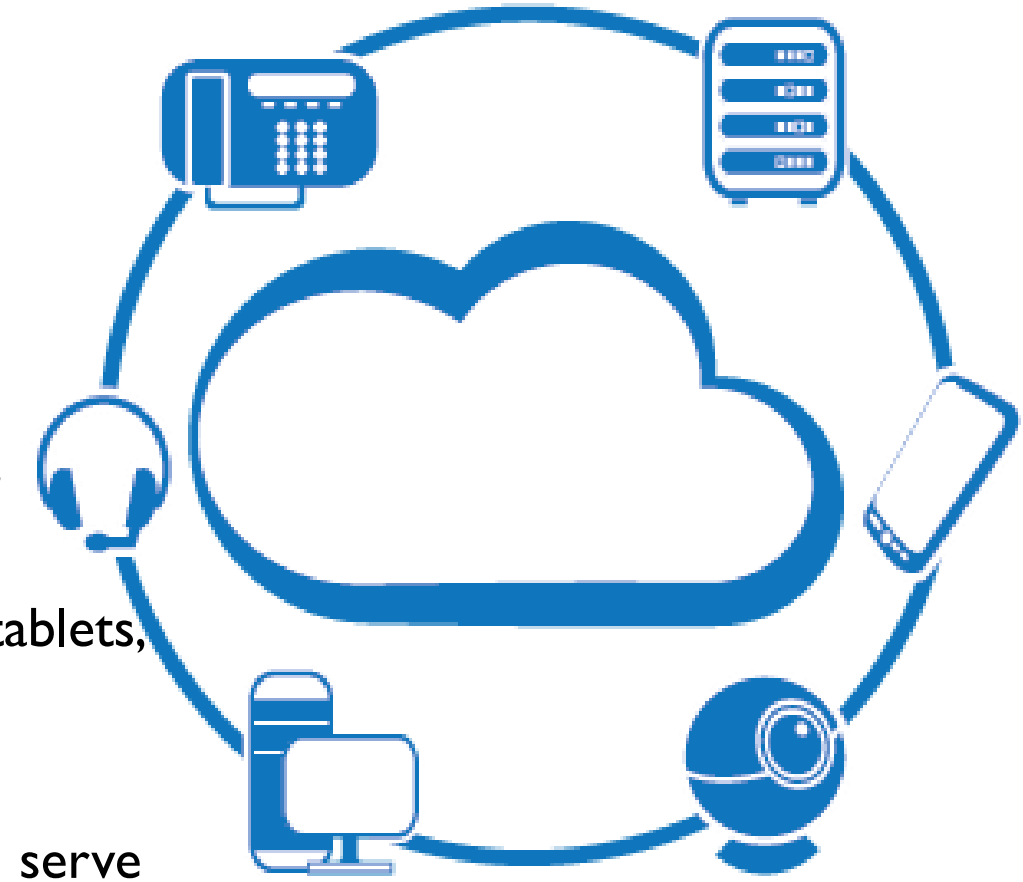


Definition of Cloud Computing ?

The NIST Definition of Cloud Computing: Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Essential Characteristics:

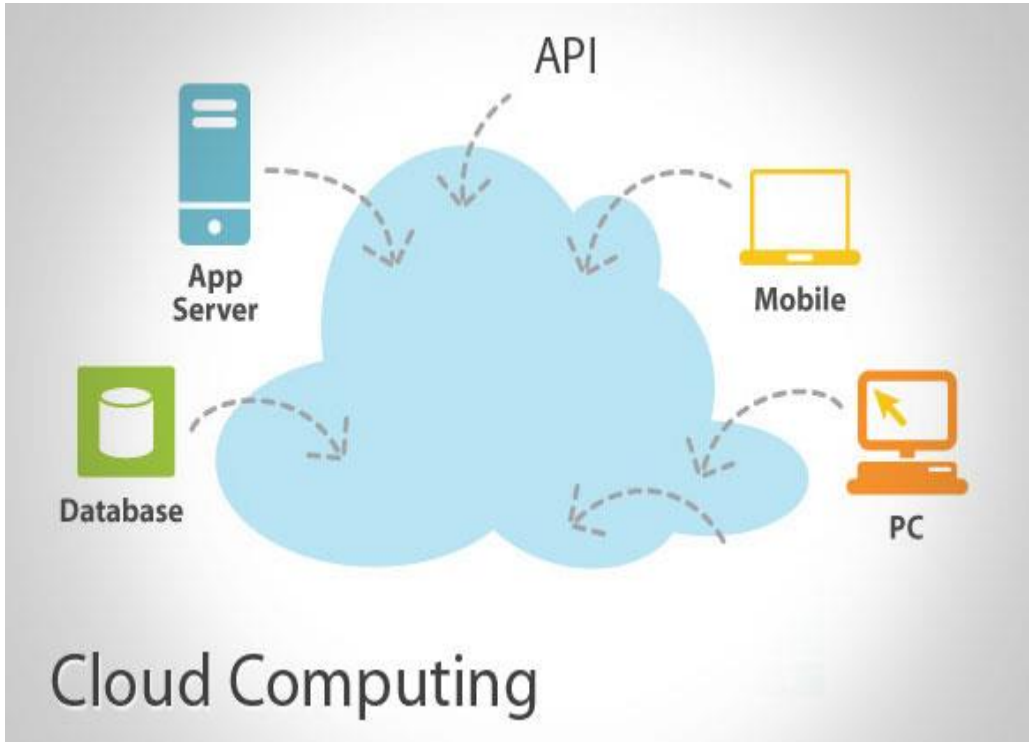
- ***On-demand self-service:***
  - It's provided recourses to user's on demand
  - User operate their services by their self
  - No user interaction required with physical systems
- ***Broad network access:***
  - High speed network capacity to operate all the services
  - Accessible from via Internet or Intranet or Both
  - Support thin and thick client (e.g., mobile phones, tablets, laptops, and workstations).
- ***Resource pooling:***
  - The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model
  - Different physical and virtual resources dynamically assigned and reassigned according to consumer demand (e.g.: storage, processing, memory, and network bandwidth.)



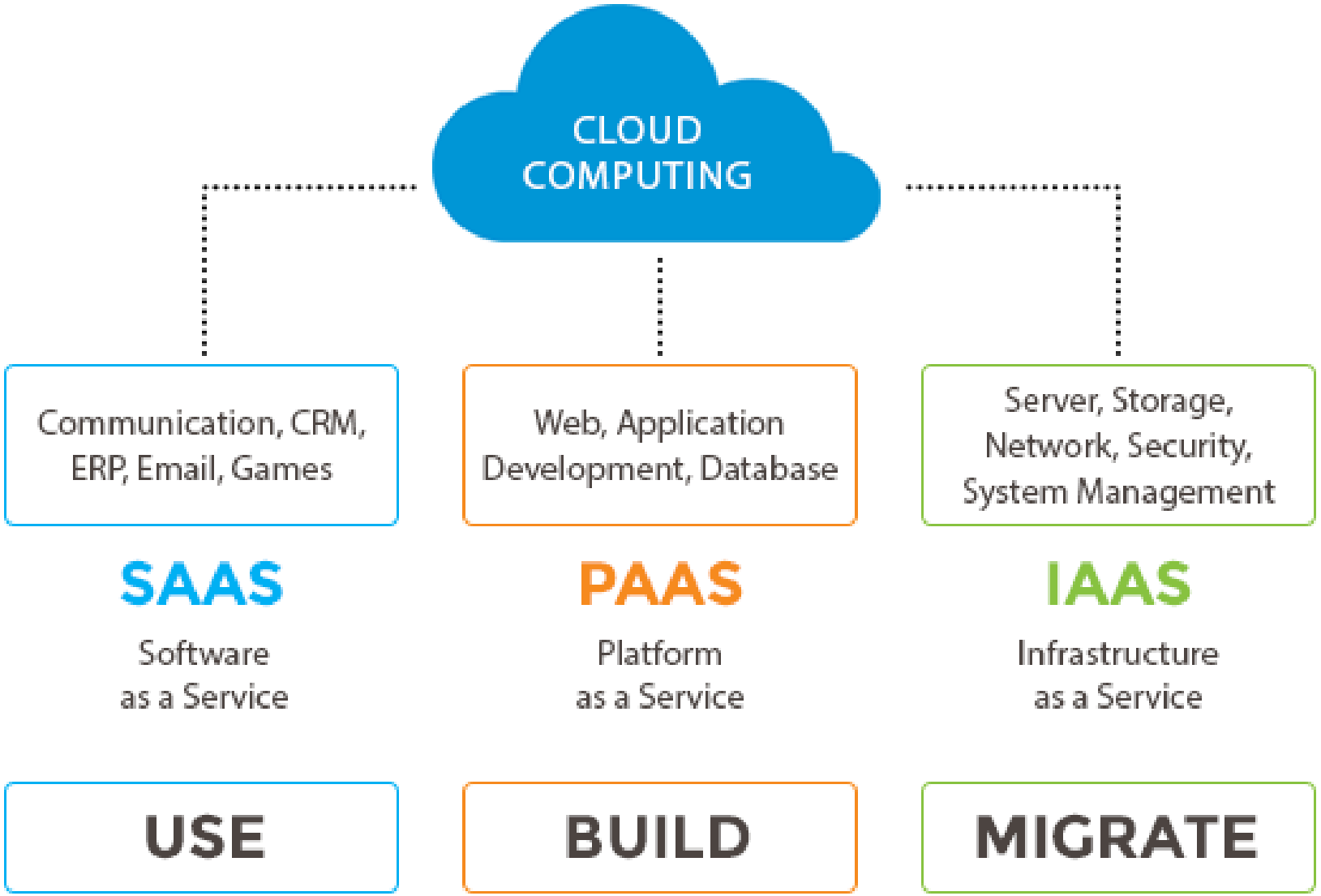
Essential Characteristics (Cont.):

- ***Rapid elasticity:***
  - Capabilities can be elastically provisioned and released, in some cases automatically.
  - To the customer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

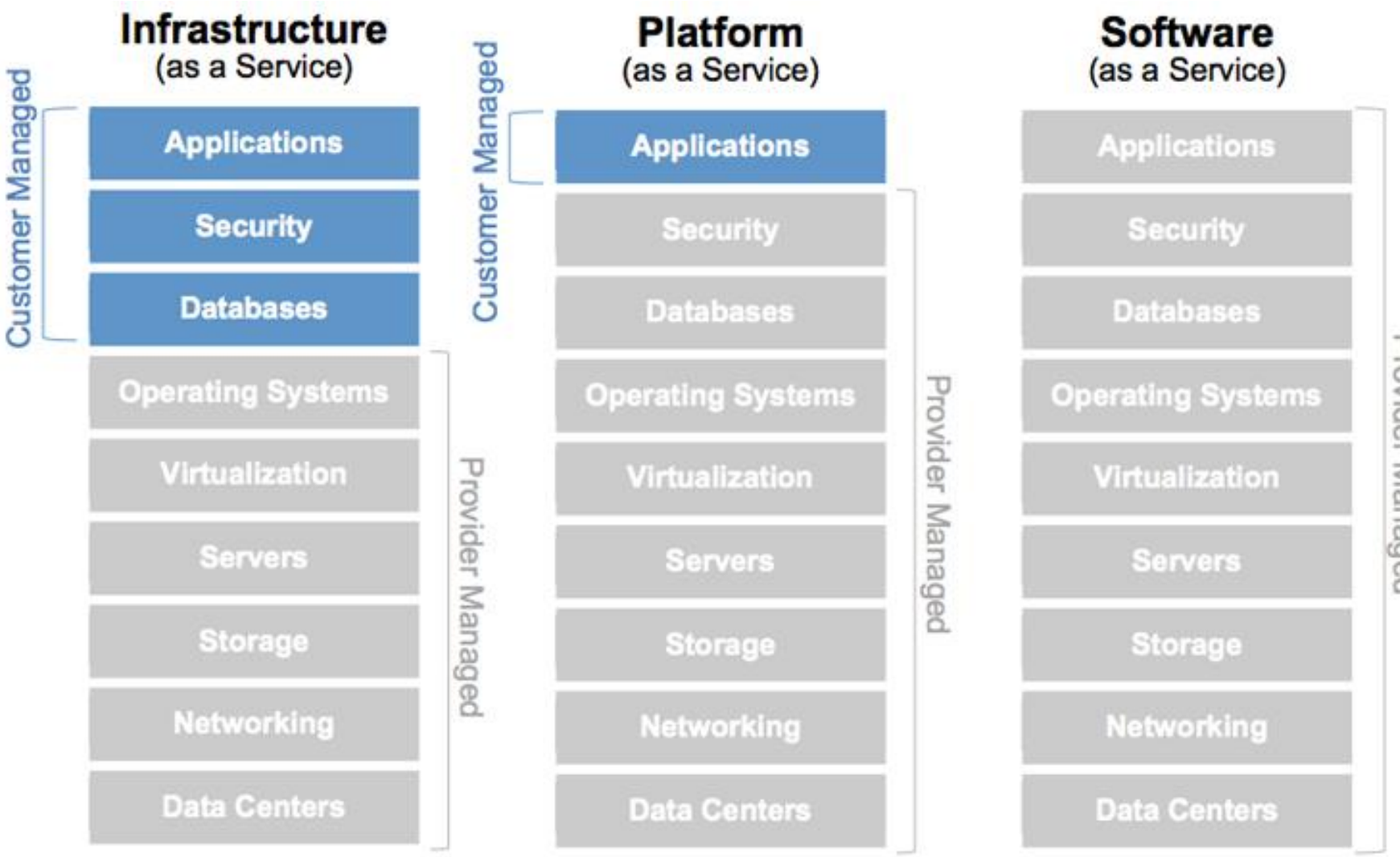
- ***Measured service:***
  - Cloud systems automatically control and optimize resource (e.g., storage, processing, bandwidth, and active user accounts).
  - Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and customer of the utilized service.



Service Model

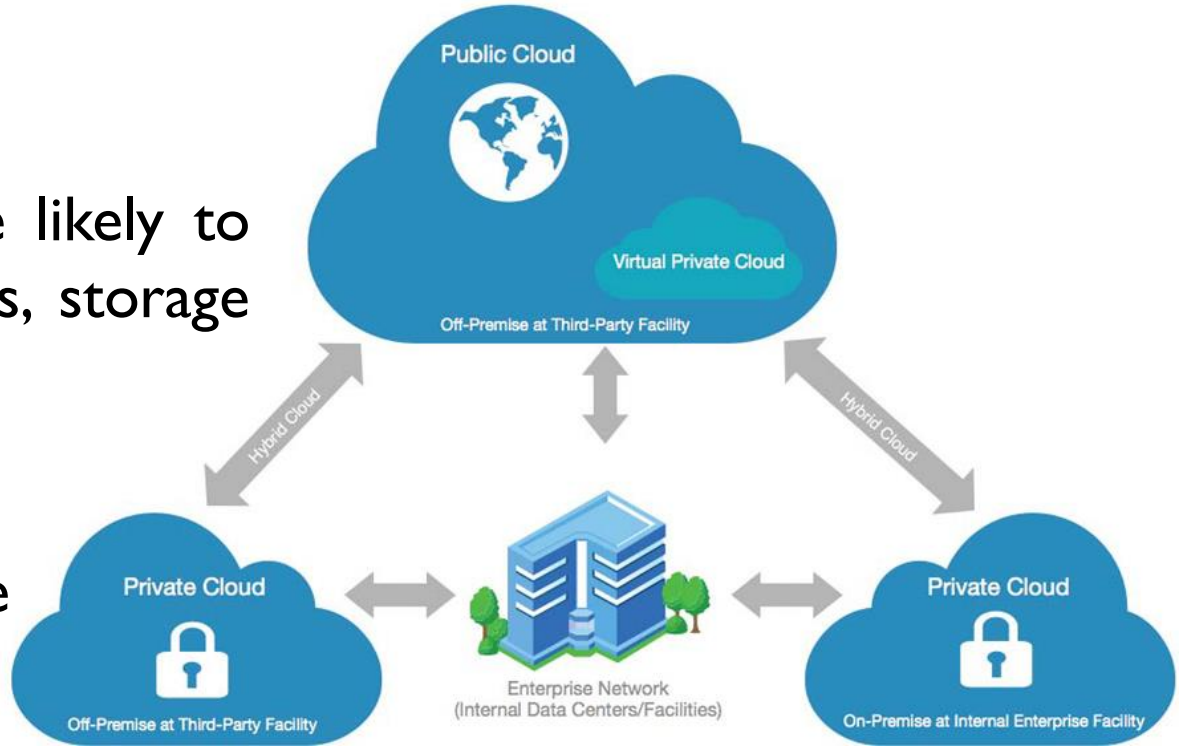


Cloud Provider vs. Customer Roles for Managing Cloud Services



Deployment Model

- ***Public Cloud:***
  - Public clouds are run by third parties
  - Applications from different customers are likely to be mixed together on the cloud's servers, storage systems, and networks.
- ***Private Cloud:***
  - Private clouds are built for the exclusive use by a single organization.
  - Providing the control over data, security, and quality of service
  - The company owns the infrastructure and has control over how applications are deployed on it

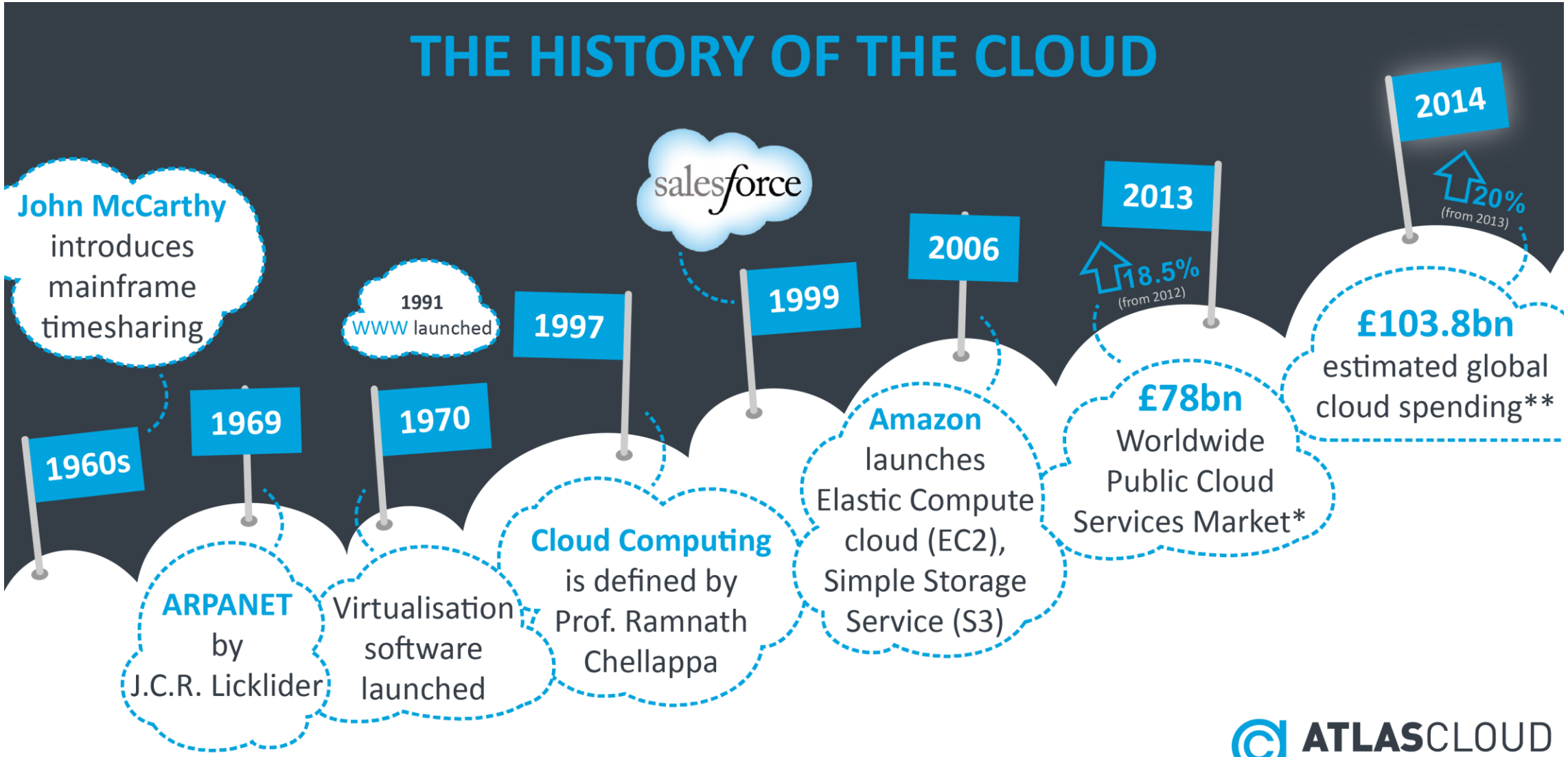


Deployment Model (Cont.)

- ***Hybrid Cloud:***
  - Hybrid clouds combine both public and private cloud models.
  - They can help to provide on-demand, externally provisioned scale.
  - The ability to expand a private cloud with the resources of a public cloud

- ***Community Cloud:***
  - A cloud service that provides for a community of users or organizations with shared interests/concerns.
  - The system is managed by one or more of the organizations, by a central provider, or a combination.
  - Organizations utilizing this cloud service have shared missions, governance, security requirements, and policies.
  - Cloud services can be hosted within the consumer organization's premises, at peer organization facilities.

History and Evaluation of Cloud

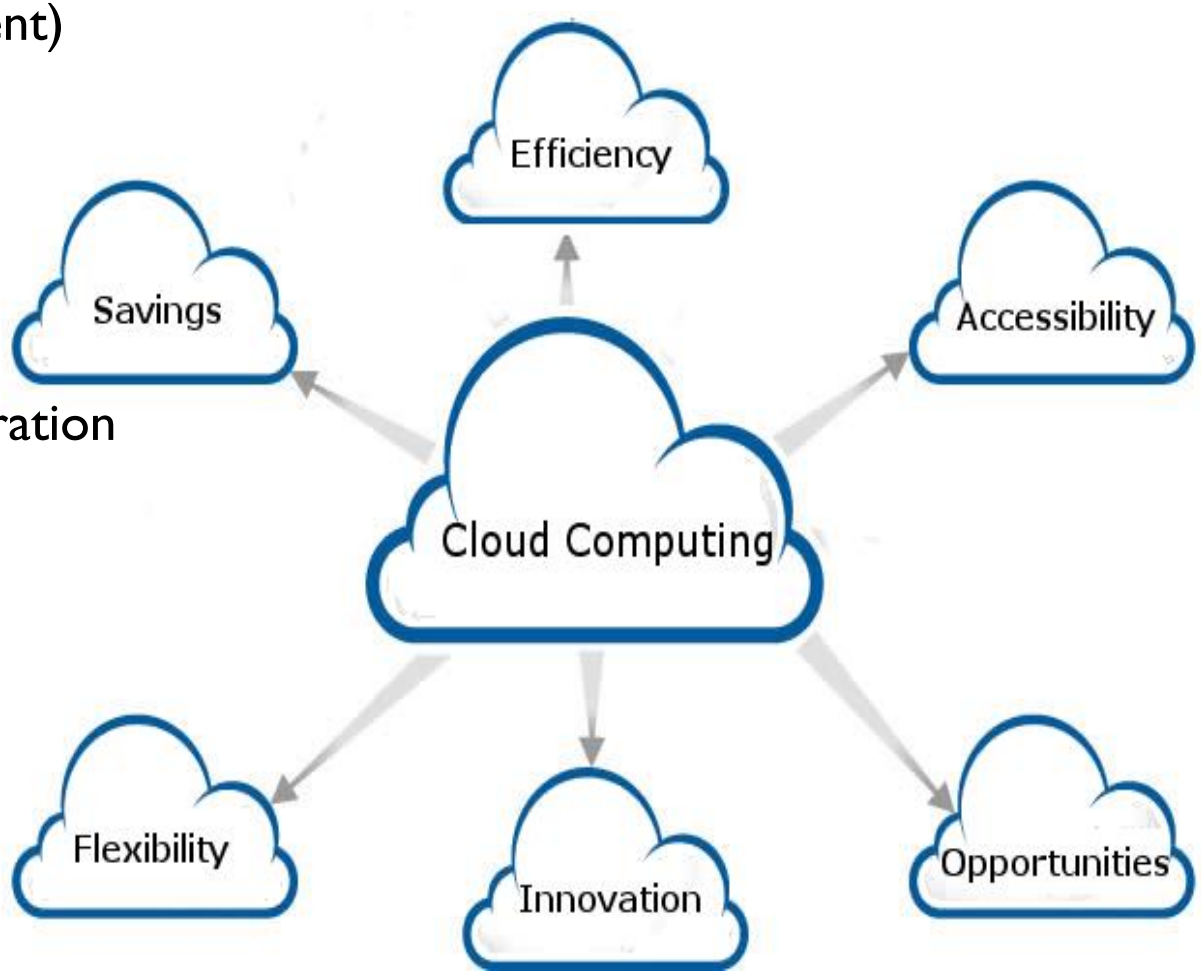


* Gartner, ** Constellation Research

ATLASCLOUD
DESIGN | BUILD | MANAGE

Advantage of Cloud Computing

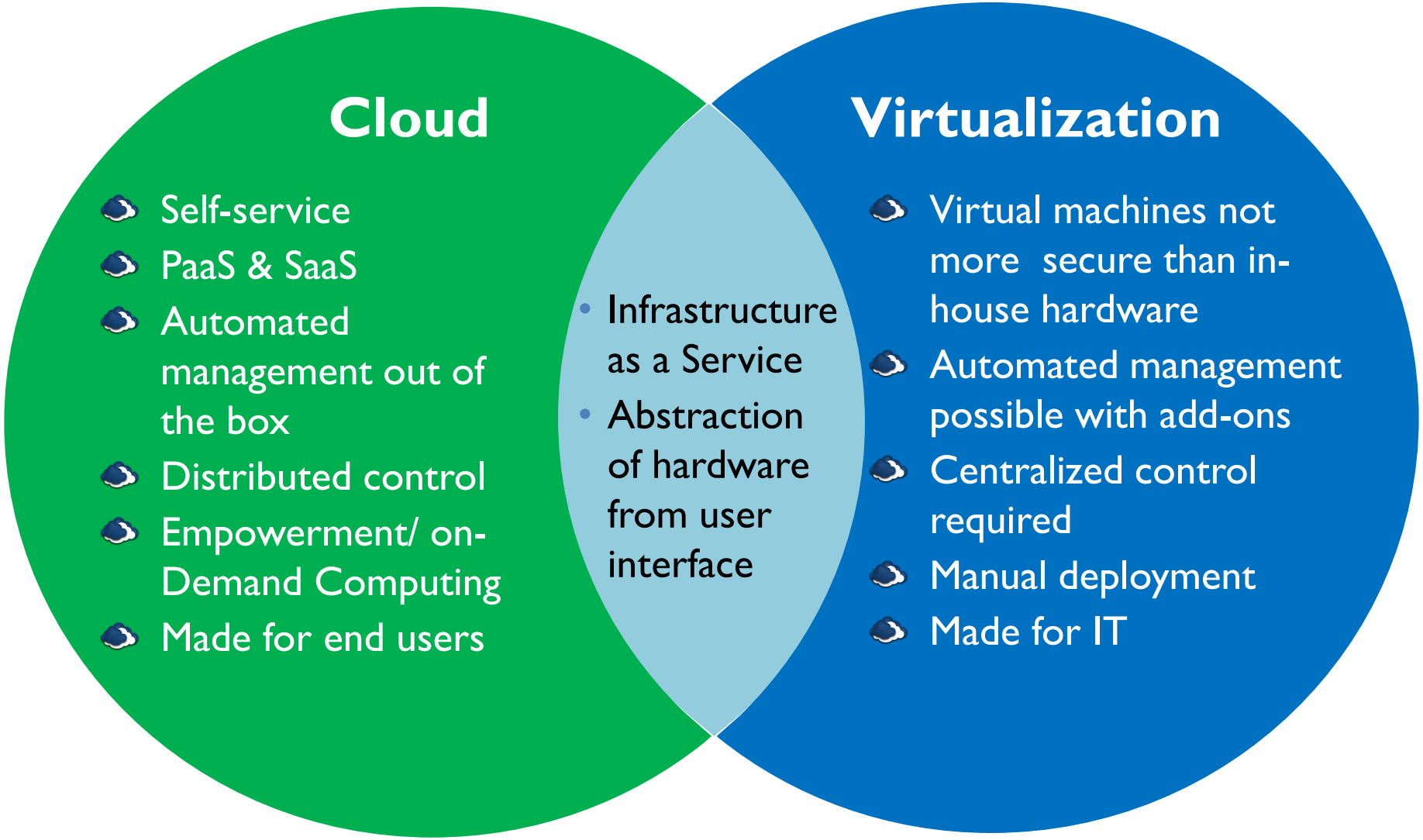
- ***Accessibility:*** It's provide easy to access via internet or intranet used various type of application (e.g.: portal, ssh, apps, api etc.). Real-time statistics, monitoring, and metering of services (transparency into the cloud environment)
- ***Efficiency:***
  - Self-service management
  - Reduce run time and response time
  - Data reliability & High Availability
  - Role-based security for multi-level administration
- ***Saving:***
  - Minimize infrastructure risk
  - Lower cost of entry
  - Saving Energy
  - Pay per use
- ***Increased pace of innovation:***
- ***Portability/Flexibility and Opportunities***



Pros and Cons

- ***Pros:***
  - *Reduces cost*
  - *Pure maintenance cost*
  - *Increases in computing power*
  - *Universal Access*
  - *Up to date software*
  - *Disaster recovery*
- ***Cons :***
  - *Security, Privacy*
  - *Vendor lock in*
  - *Limited control*
  - *Technical issue*
  - *Server breakdown*

Cloud Computing Vs. Virtualization

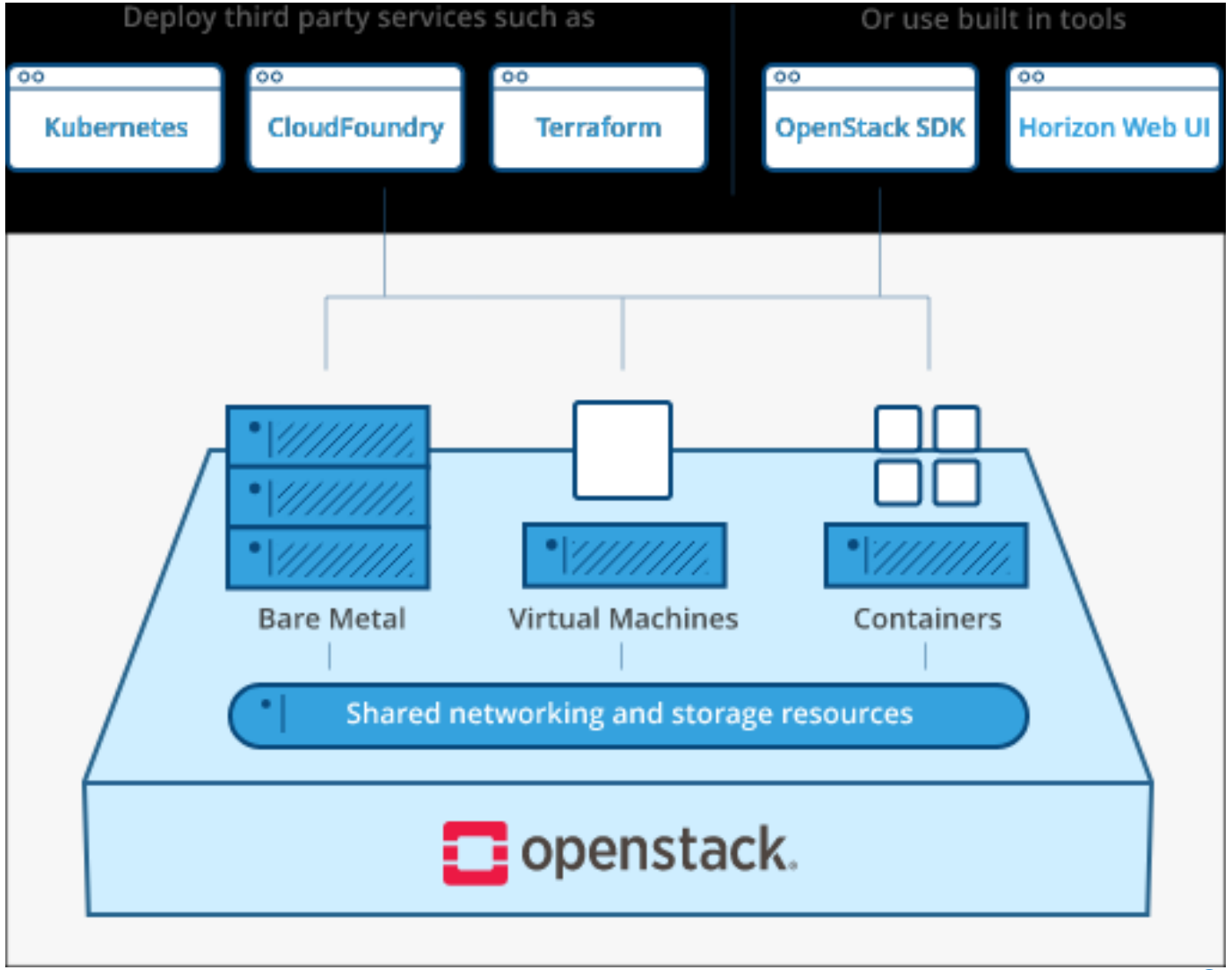


Cloud Computing Vs. Grid Computing

	Cloud Computing	Grid Computing
What?	Cloud enable access to leased computing power and storage from client's devices	Grid enable access to shared computing power and storage capacity from terminal.
Who Provide the service?	Large individual companies	Research institutes and universities federate their services around the world
Who use the service?	Normal user to commercial business	Research collaboration
Where are the computing resources ?	In the provider's private data centers, which is often centralized	In computing centers distributed across different sites, countries and continents.
Why are the useful for?	Clouds best support long-term support and on demand self service.	Grids were designed to handle large set of limited duration jobs that produce or use huge amount of data.

What is OpenStack ?

- OpenStack is a Cloud management software
- It's Open Source
- A rich of feature of Cloud Services
- Renowned vendor work on it (NASA, Rackspace, Wal-Mart, HP, Red Hat etc.)
- A large number of community
- Strong Documentation
- Huge opportunity for developer
- Fully configurable by developer
- Support RESTFul API



OpenStack Service Catalog

IaaS Services		
Service	**Project name**	**Description**
Dashboard	Horizon	Provides a web-based self-service portal to interact with underlying OpenStack services, such as launching an instance, assigning IP addresses and configuring access controls.
Compute	Nova	Manages the lifecycle of compute instances in an OpenStack environment. Responsibilities include spawning, scheduling and decommissioning of virtual machines on demand.
Networking	Neutron	Enables Network-Connectivity-as-a-Service for other OpenStack services, such as OpenStack Compute. Provides an API for users to define networks and the attachments into them. Has a pluggable architecture that supports many popular networking vendors and technologies.

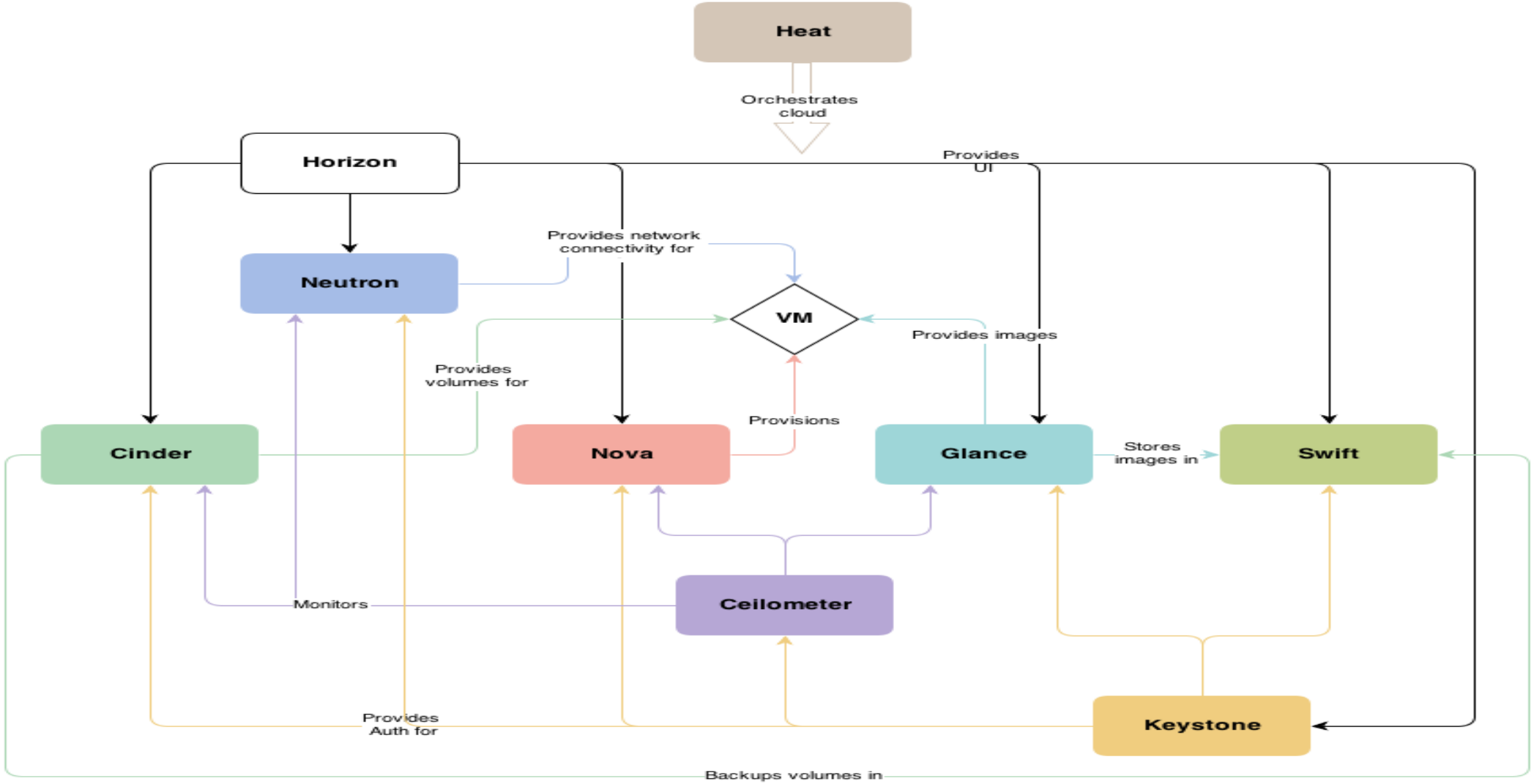
OpenStack Service Catalog Cont.

Storage		
Service	**Project name**	**Description**
Object Storage	Swift	Stores and retrieves arbitrary unstructured data objects via a RESTful, HTTP based API. It is highly fault tolerant with its data replication and scale out architecture. Its implementation is not like a file server with mountable directories.
Block Storage	Cinder	Provides persistent block storage to running instances. Its pluggable driver architecture facilitates the creation and management of block storage devices.
Shared services		
Identity service	Keystone	Provides an authentication and authorization service for other OpenStack services. Provides a catalog of endpoints for all OpenStack services.
Image Service	Glance	Stores and retrieves virtual machine disk images. OpenStack Compute makes use of this during instance provisioning.
Telemetry	Ceilometer	Monitors and meters the OpenStack cloud for billing, benchmarking, scalability, and statistical purposes.

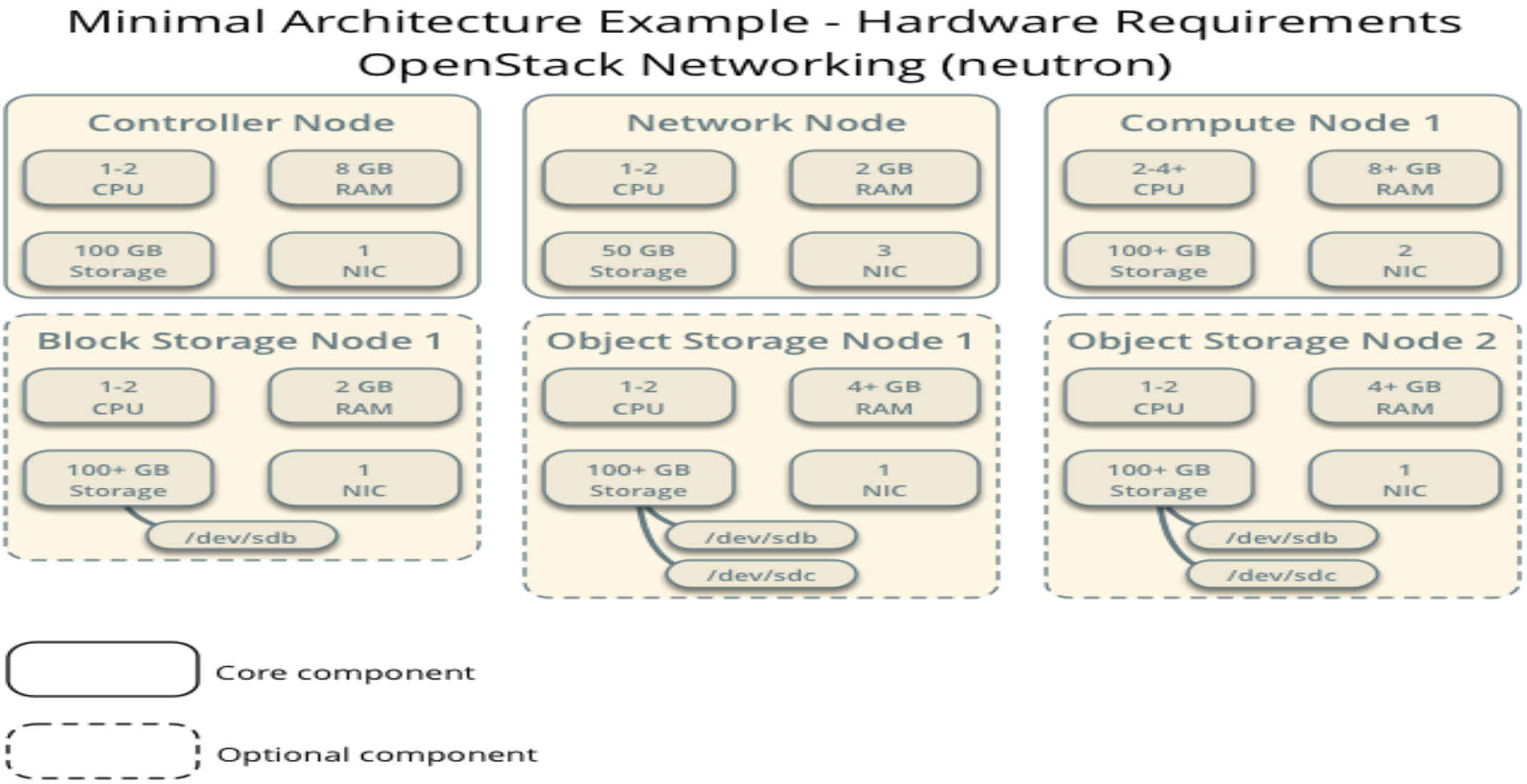
OpenStack Service Catalog Cont.

Higher-level services		
Service	**Project name**	**Description**
Orchestration	Heat	Orchestrates multiple composite cloud applications by using either the native HOT template format or the AWS Cloud Formation template format, through both an OpenStack-native REST API and a Cloud Formation-compatible Query API.
Database Service	Trove	Provides scalable and reliable Cloud Database-as-a-Service functionality for both relational and non-relational database engines.

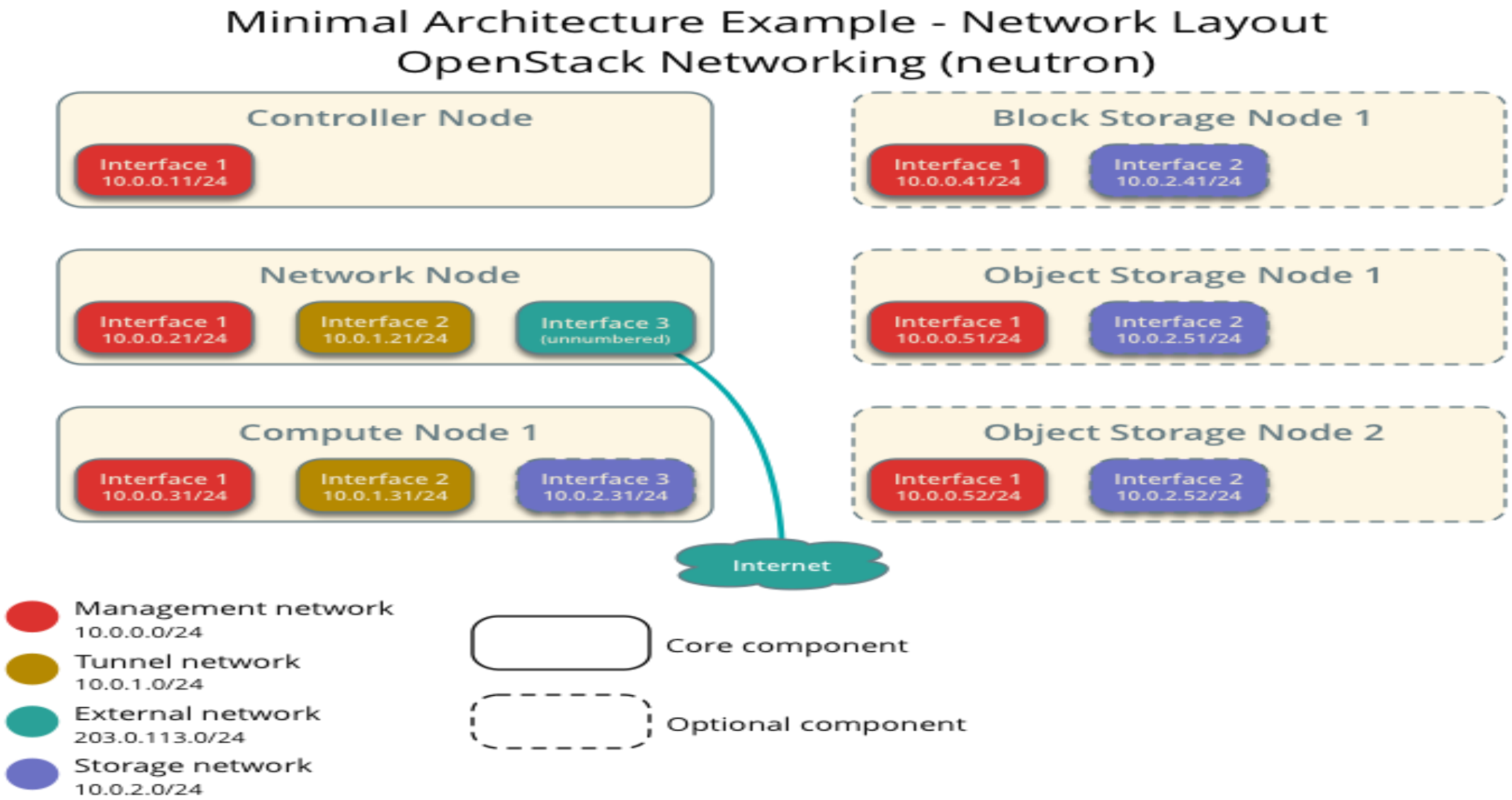
OpenStack Architecture



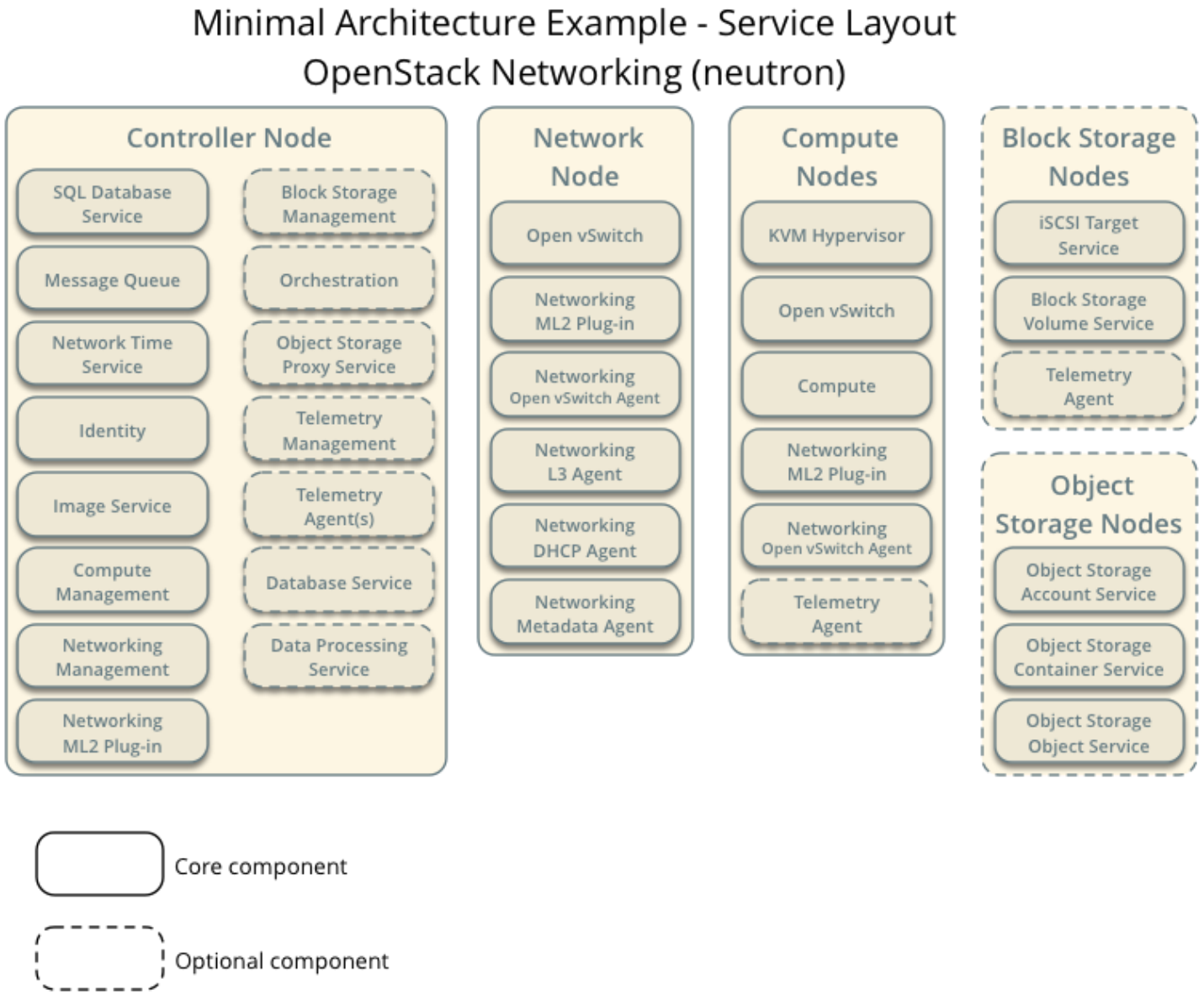
OpenStack Architecture Cont.



OpenStack Architecture Cont.



OpenStack Architecture Cont. (Service Layout)



Conceptual Diagram of a private cloud

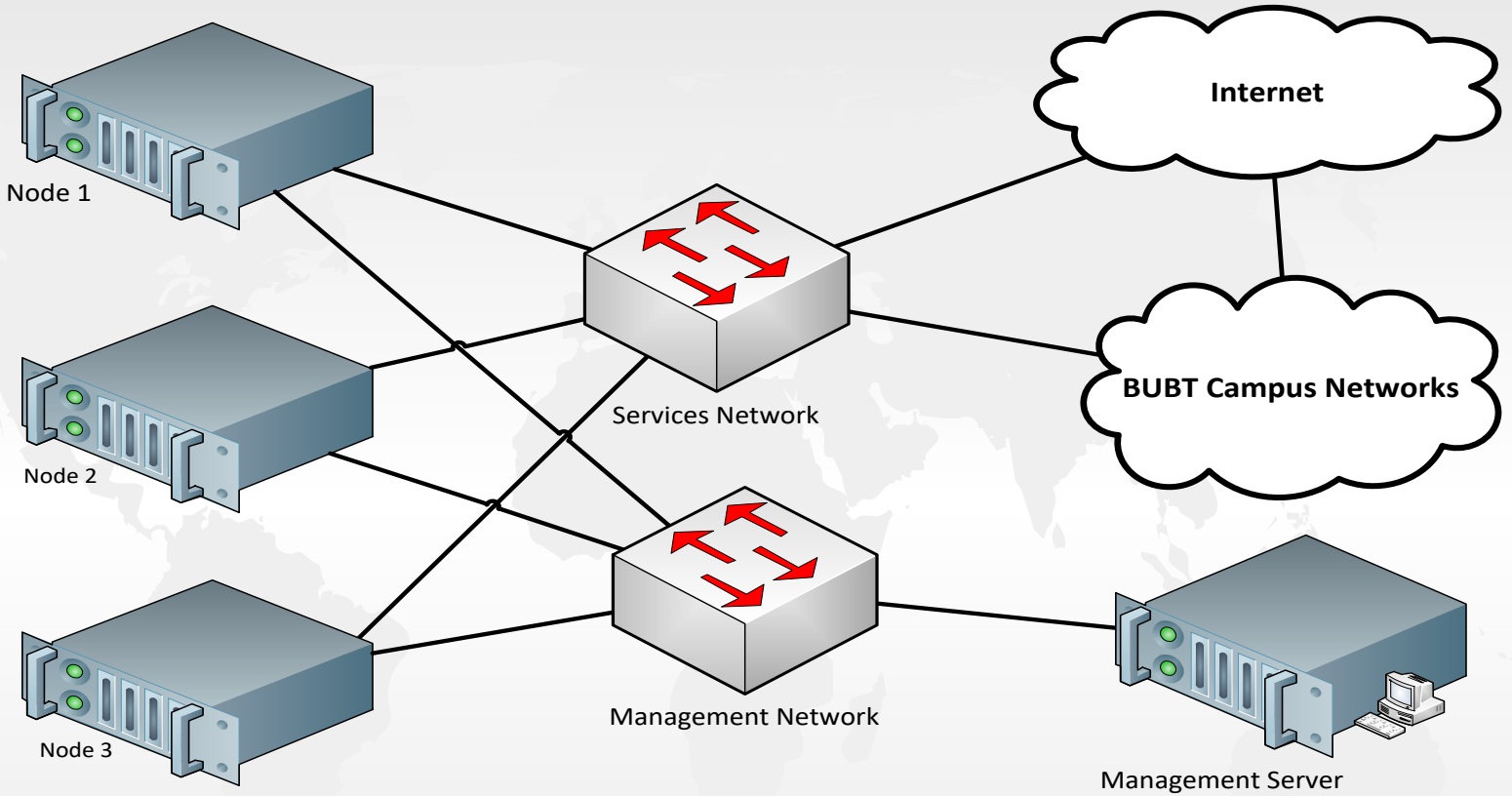
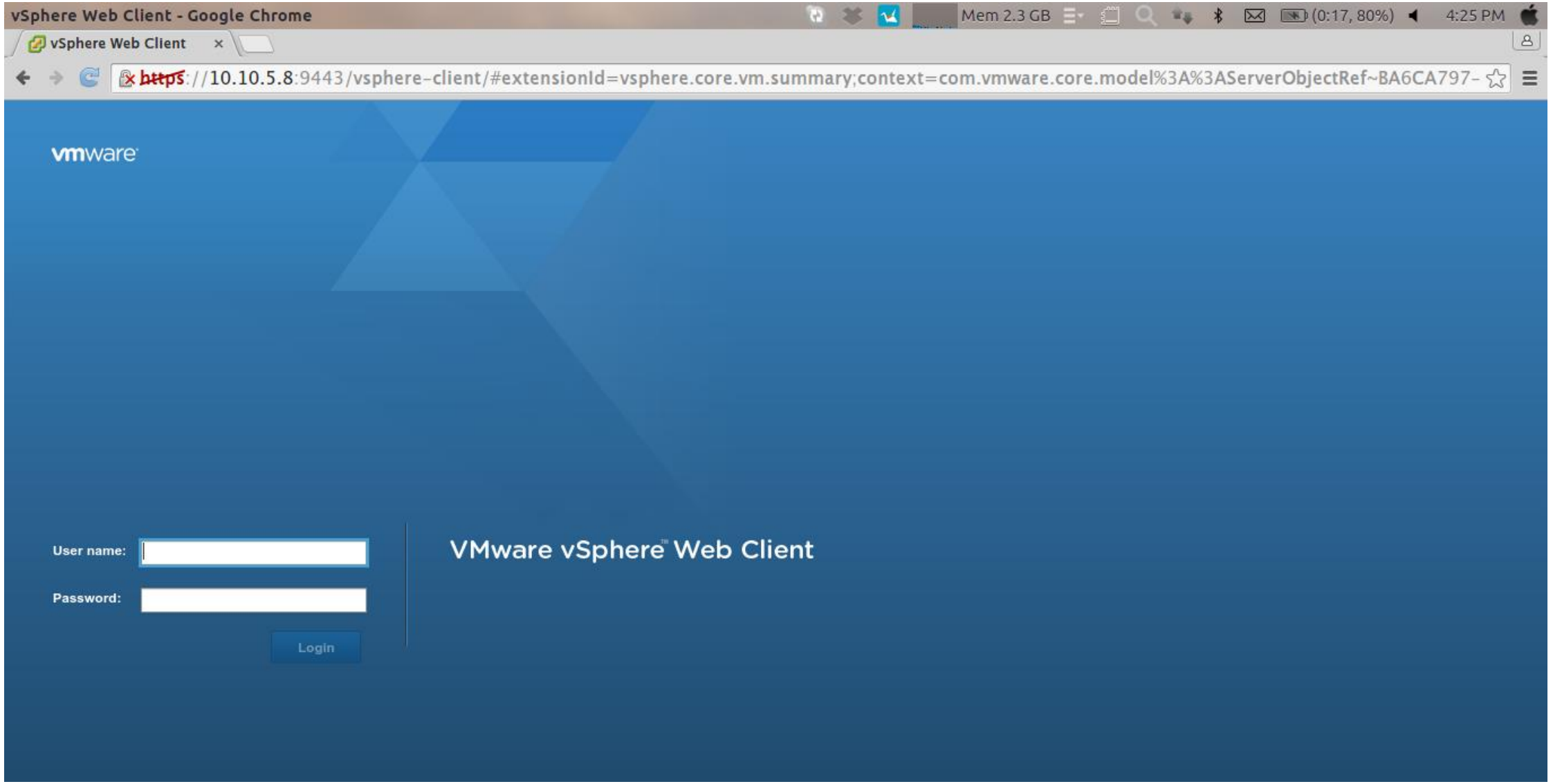
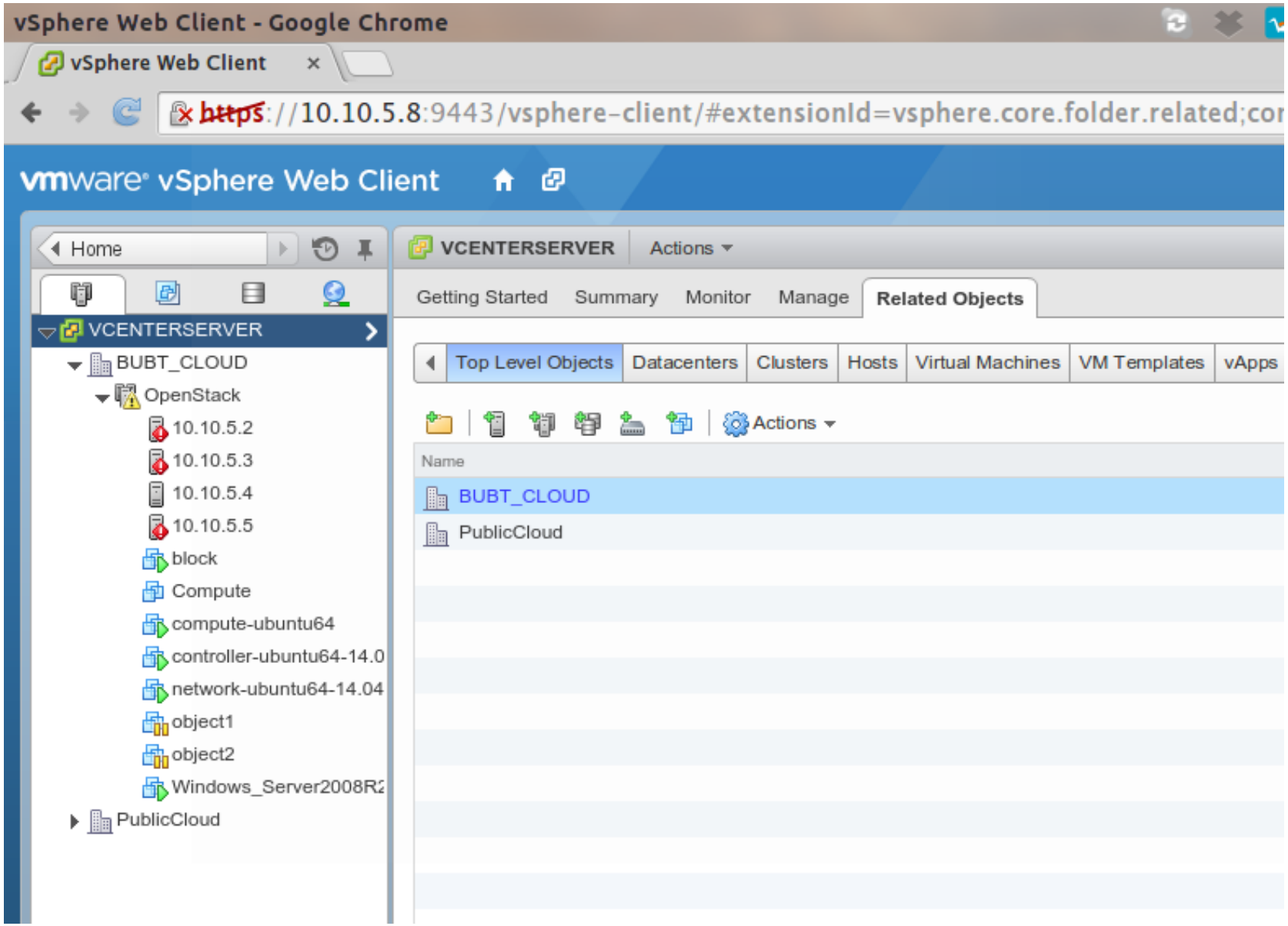


Fig-02: Physical connectivity between Nodes, Management server and Services Network

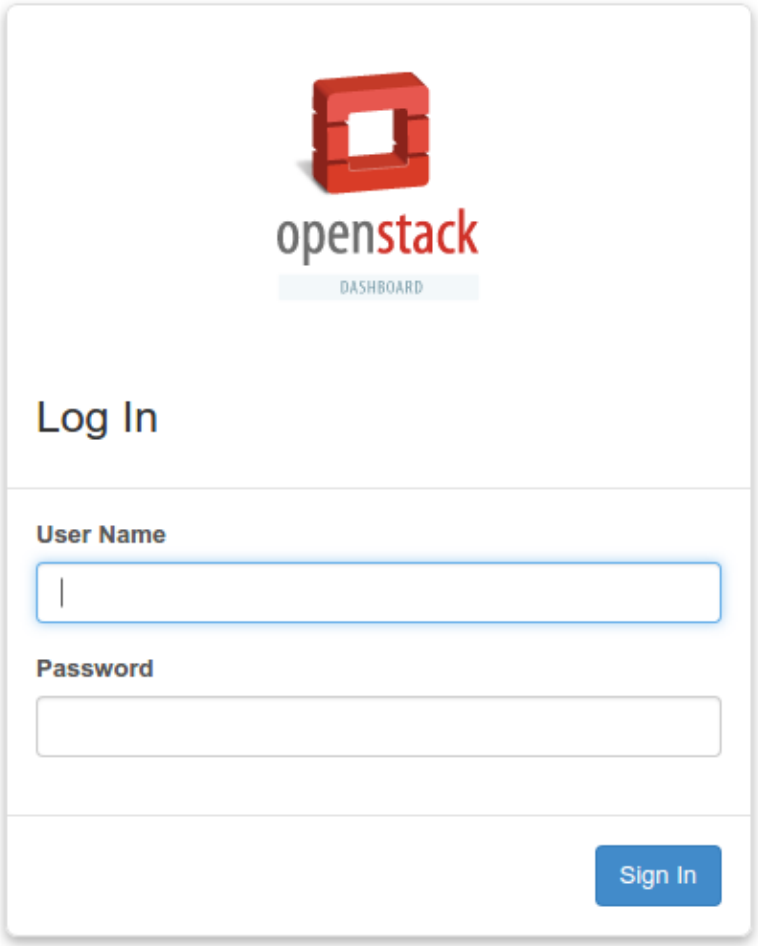
Demonstrations of a Private Cloud



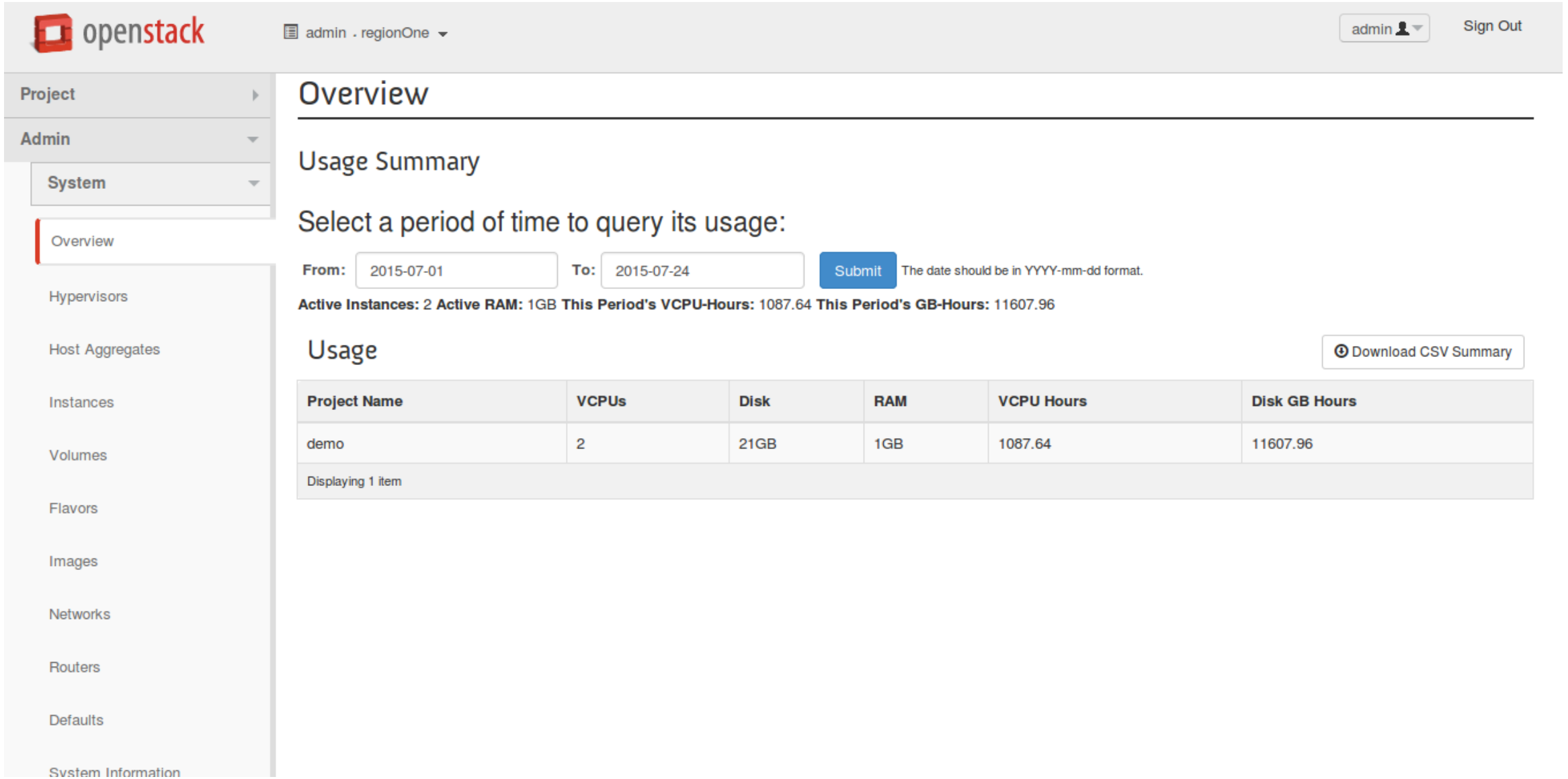
Demonstrations of a Private Cloud



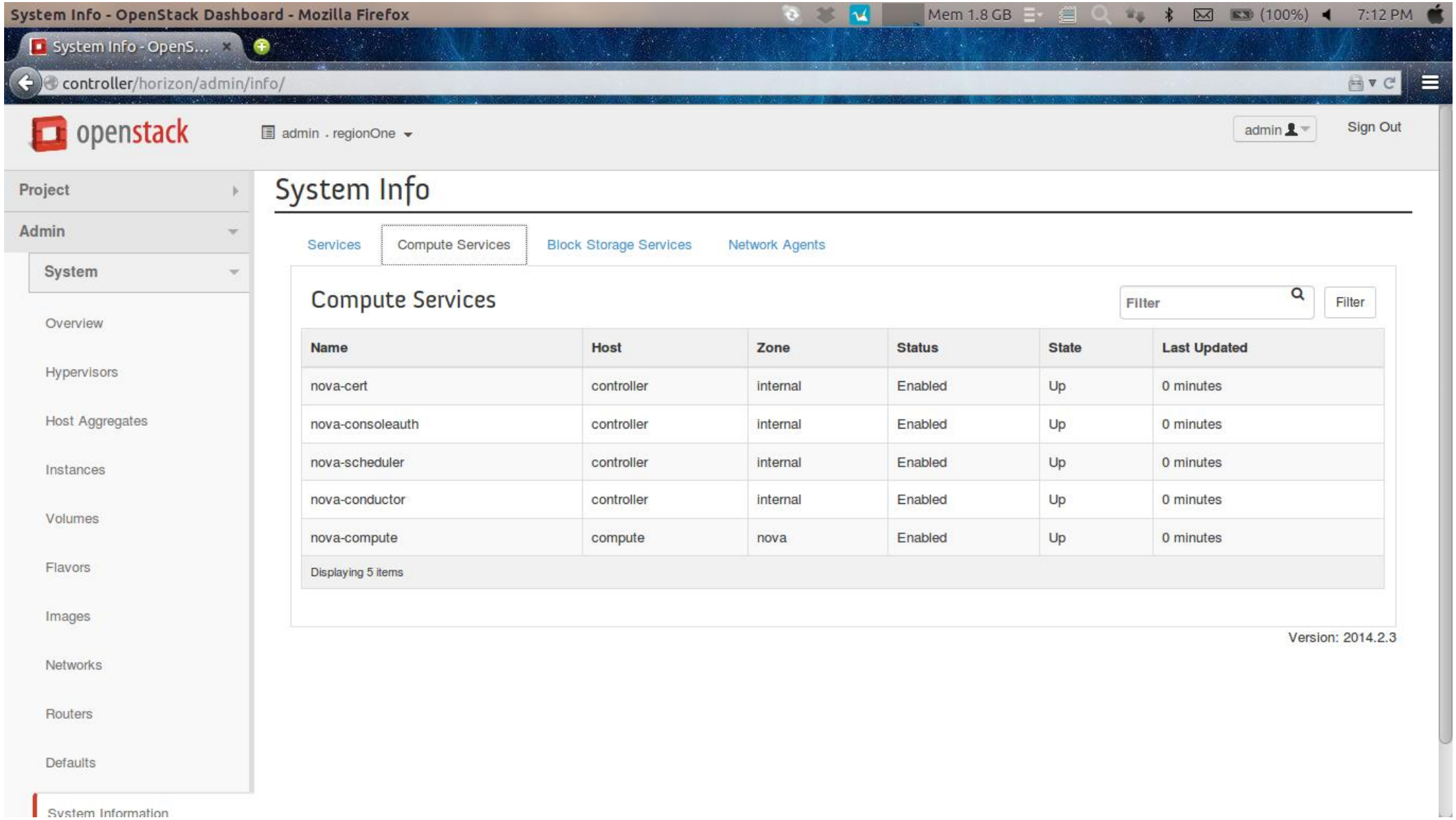
Demonstrations of a Private Cloud



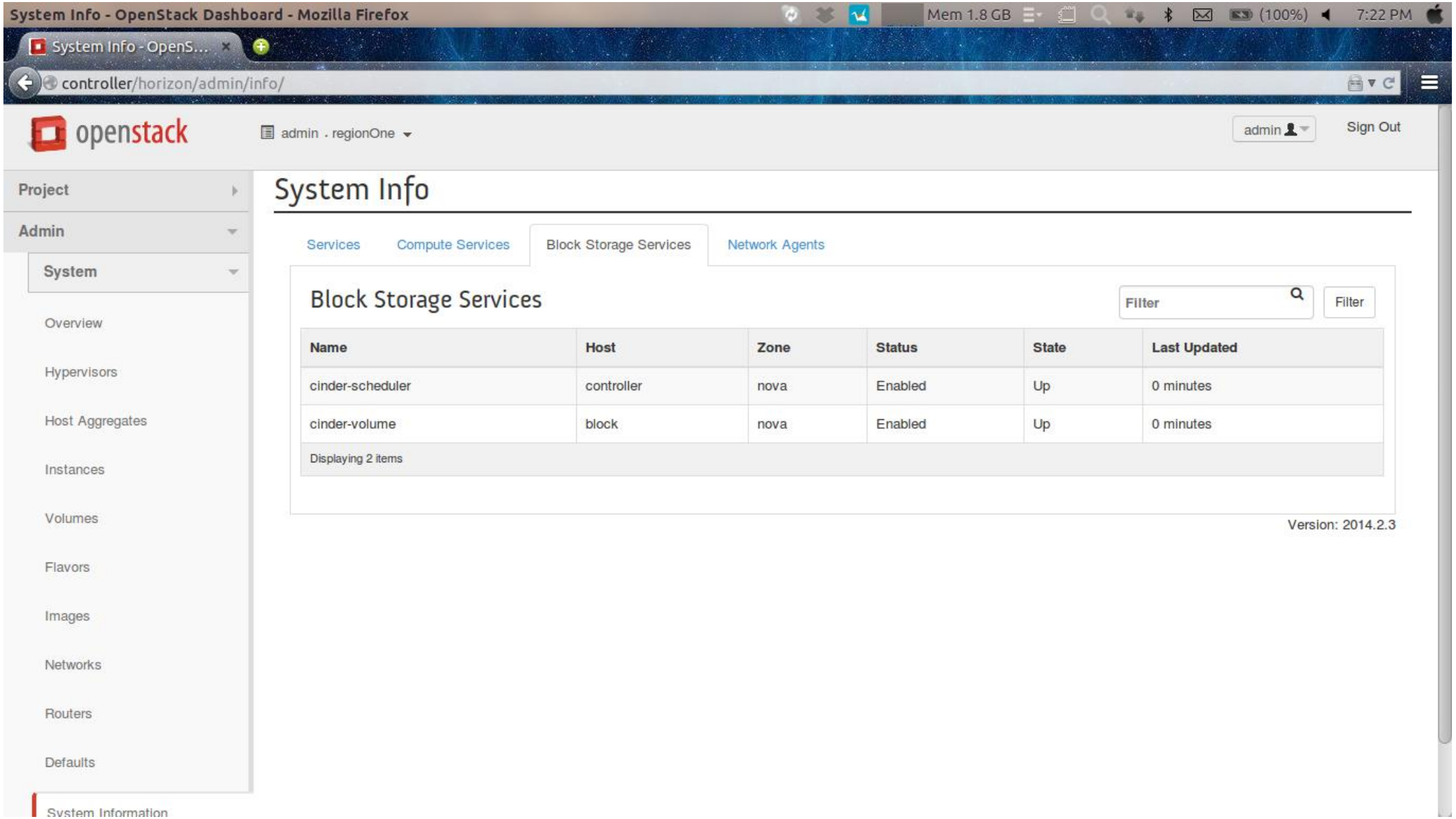
Demonstrations of a Private Cloud



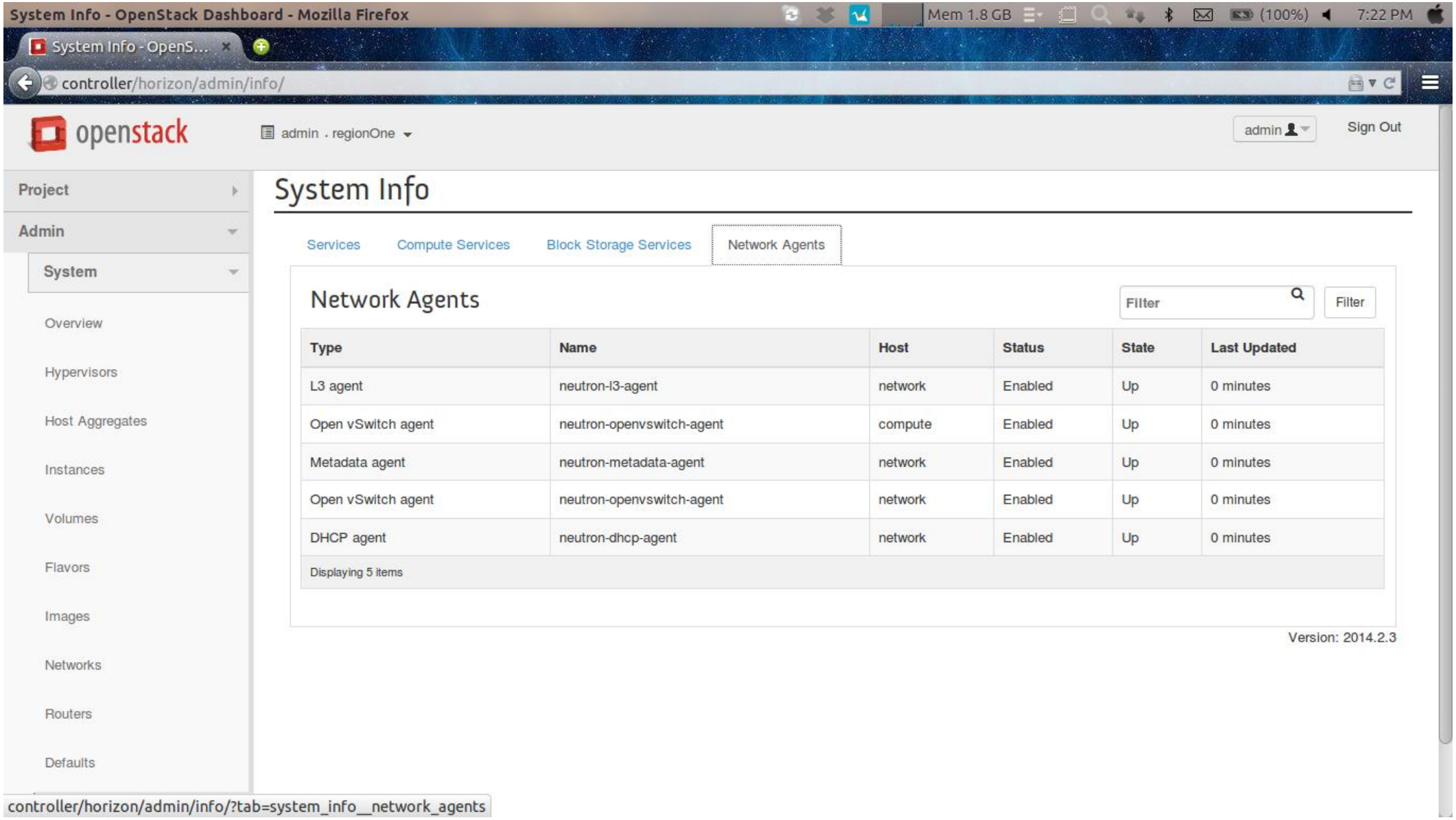
Demonstrations of a Private Cloud



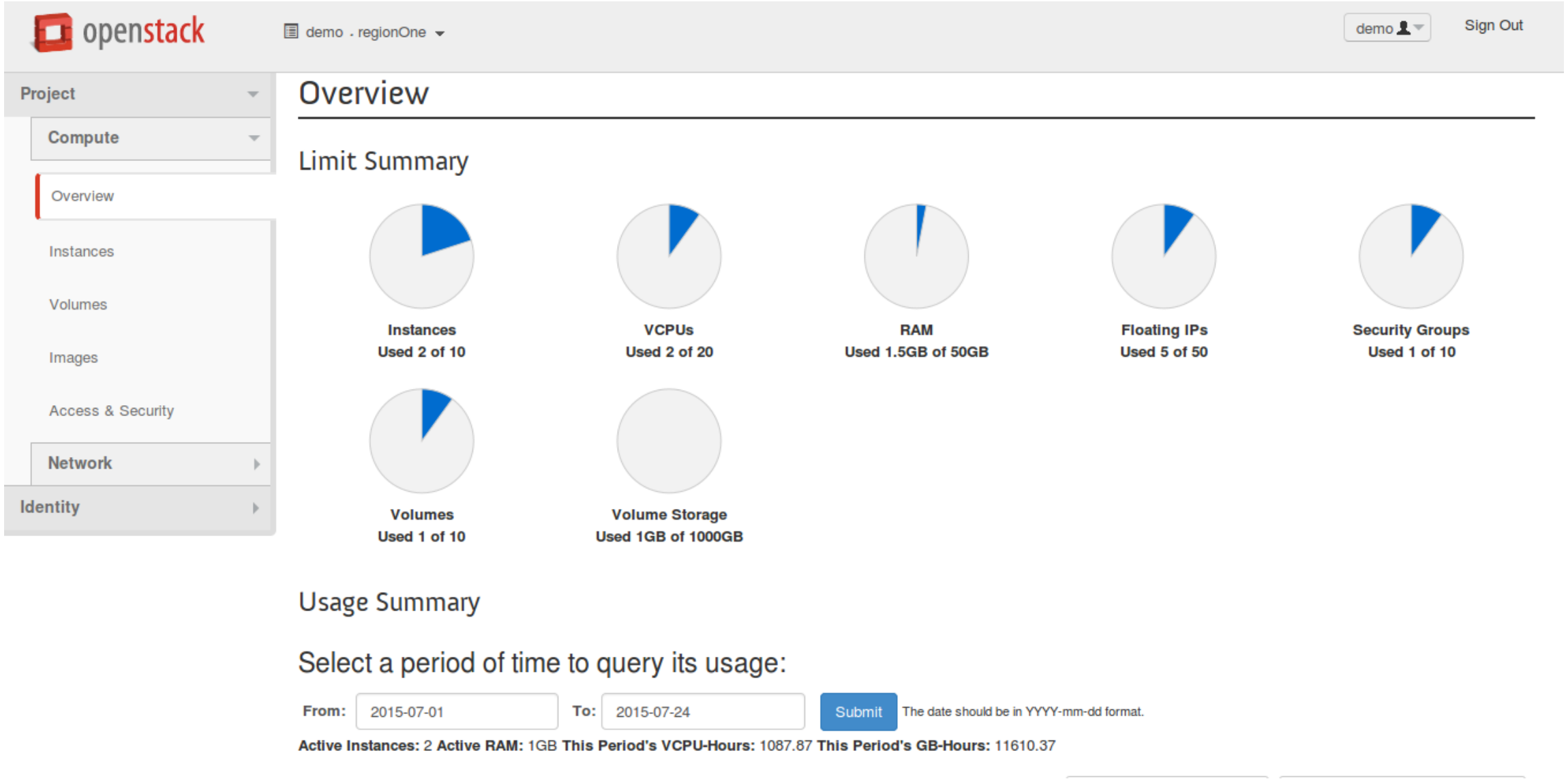
Demonstrations of a Private Cloud



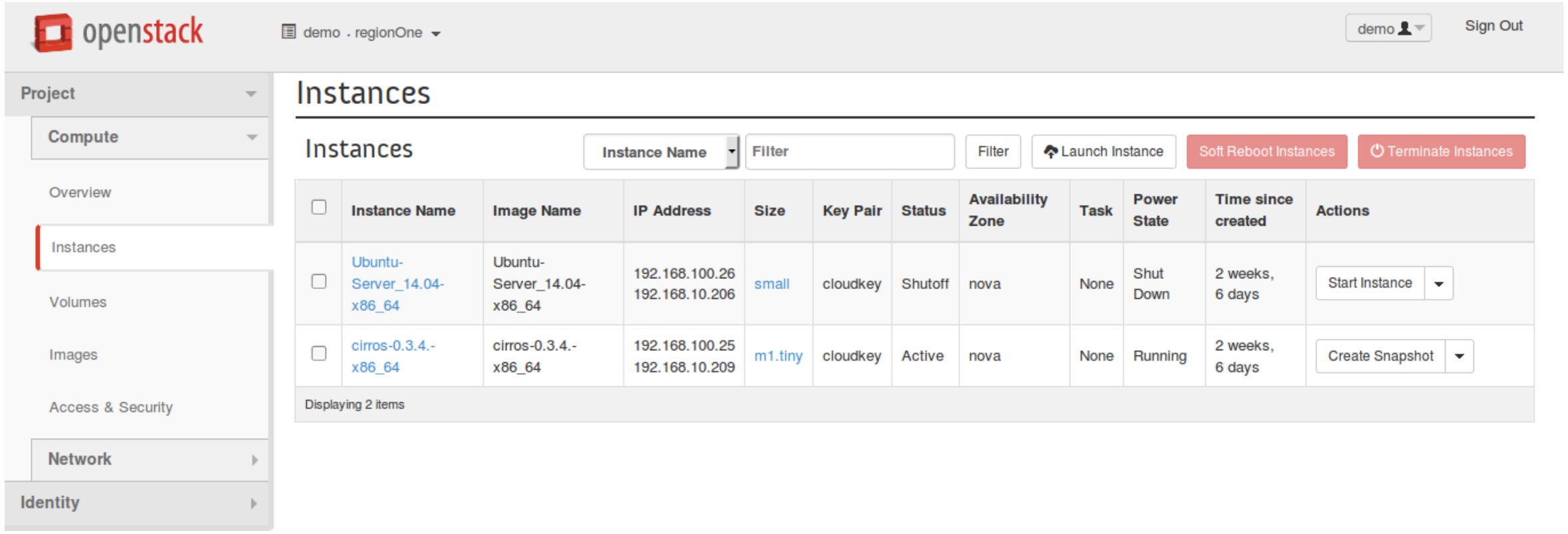
Demonstrations of a Private Cloud



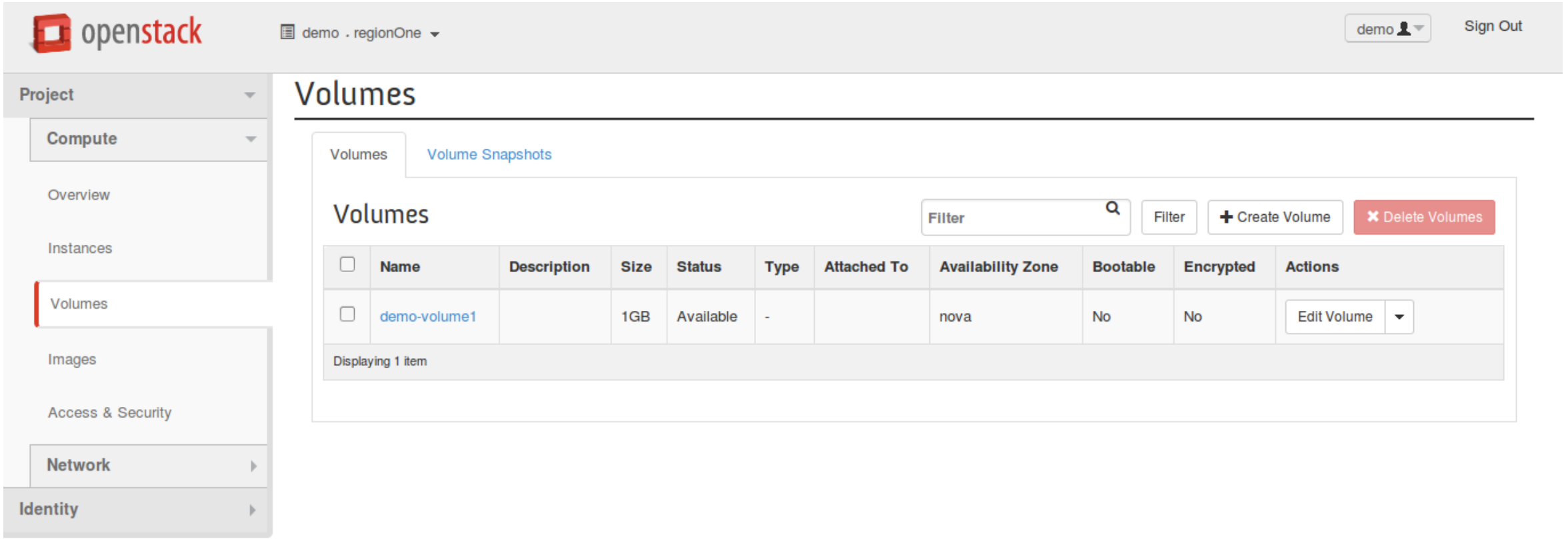
Demonstrations of a Private Cloud



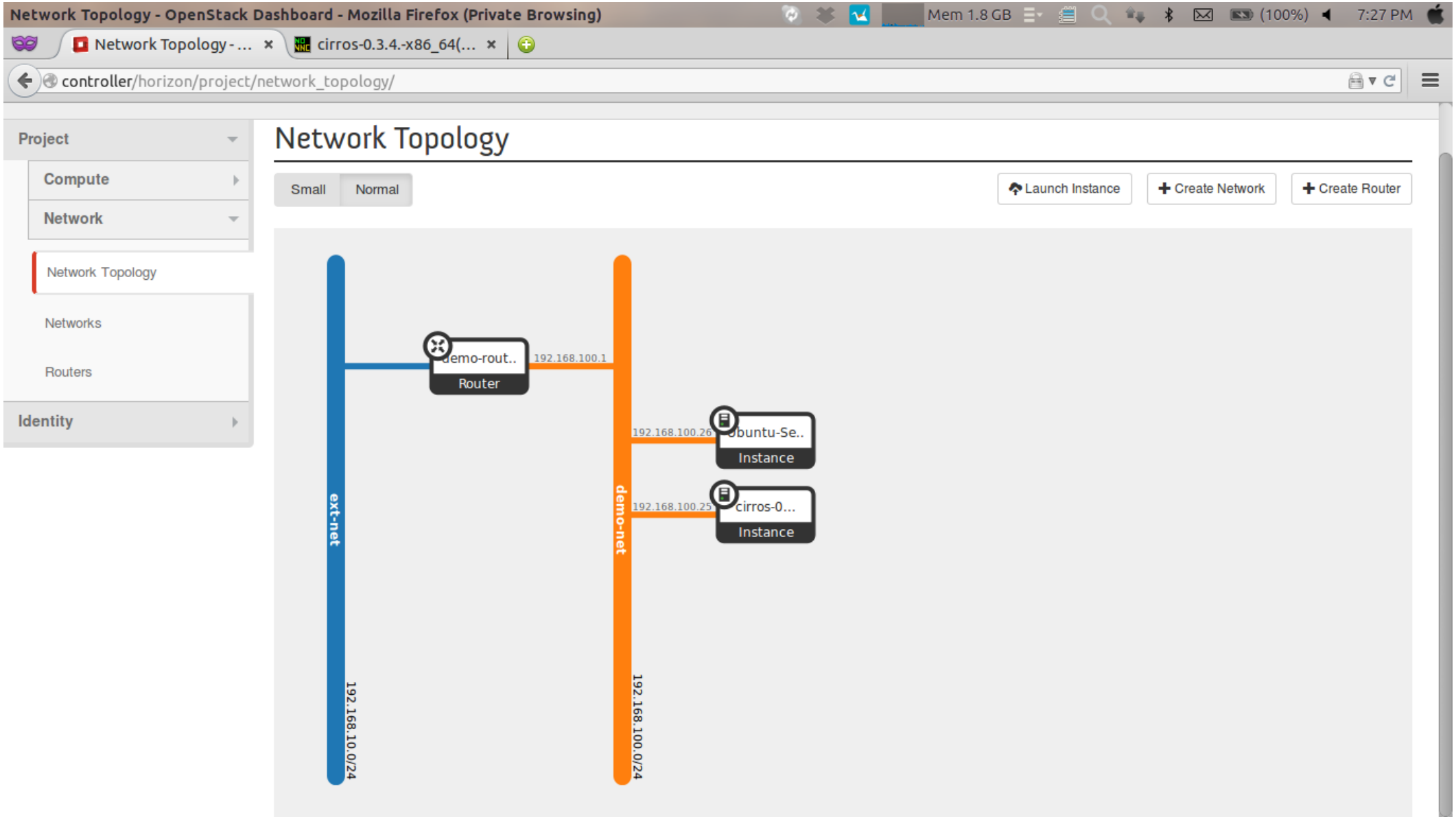
Demonstrations of a Private Cloud



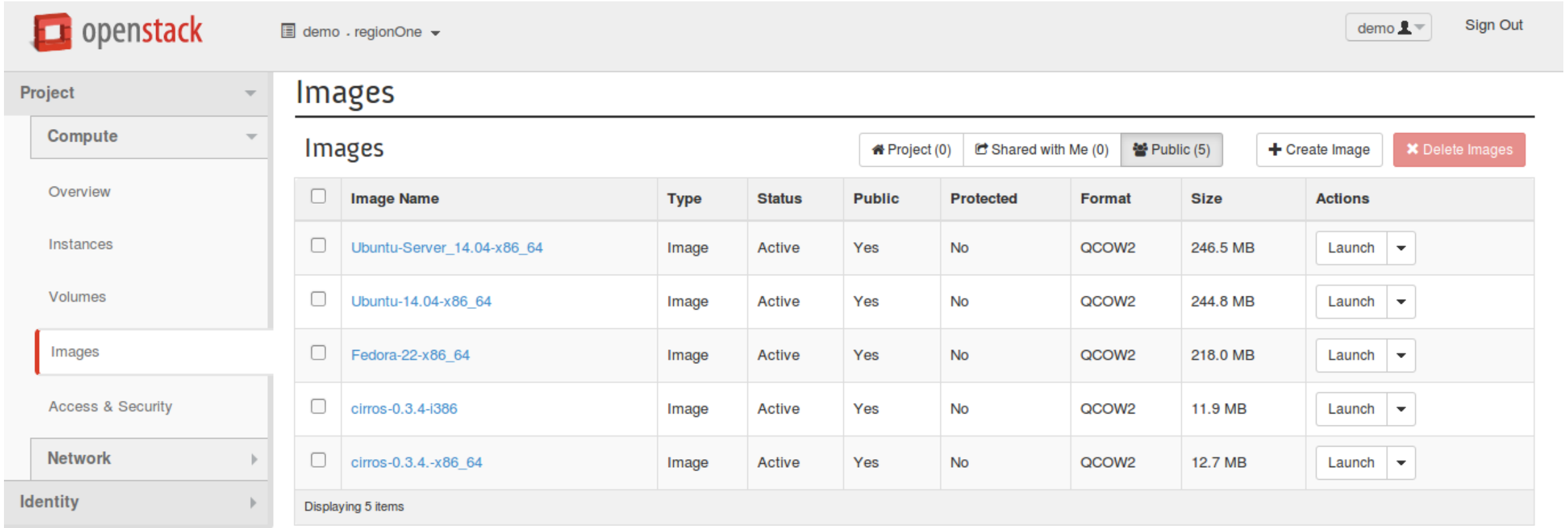
Demonstrations of a Private Cloud



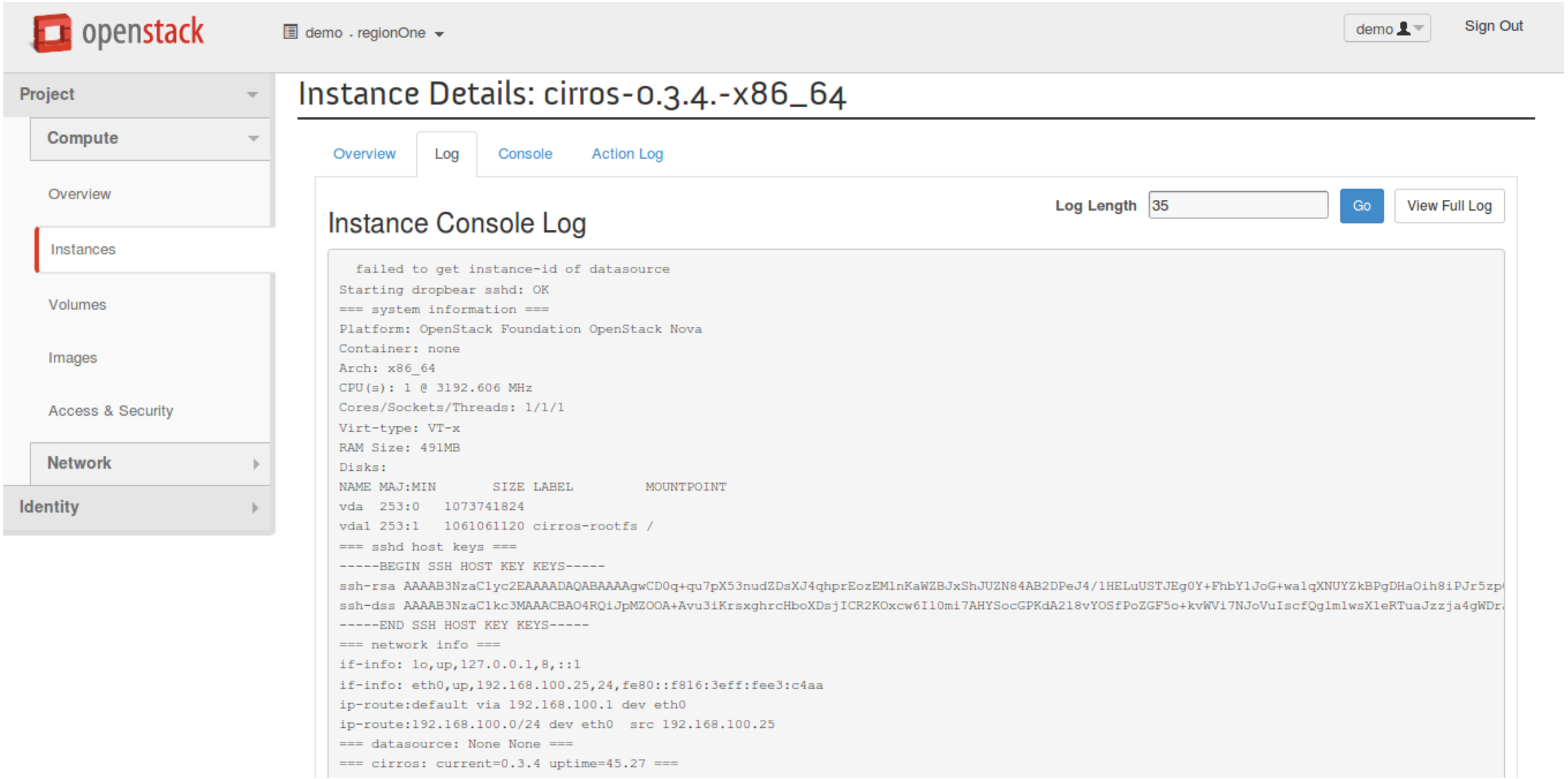
Demonstrations of a Private Cloud



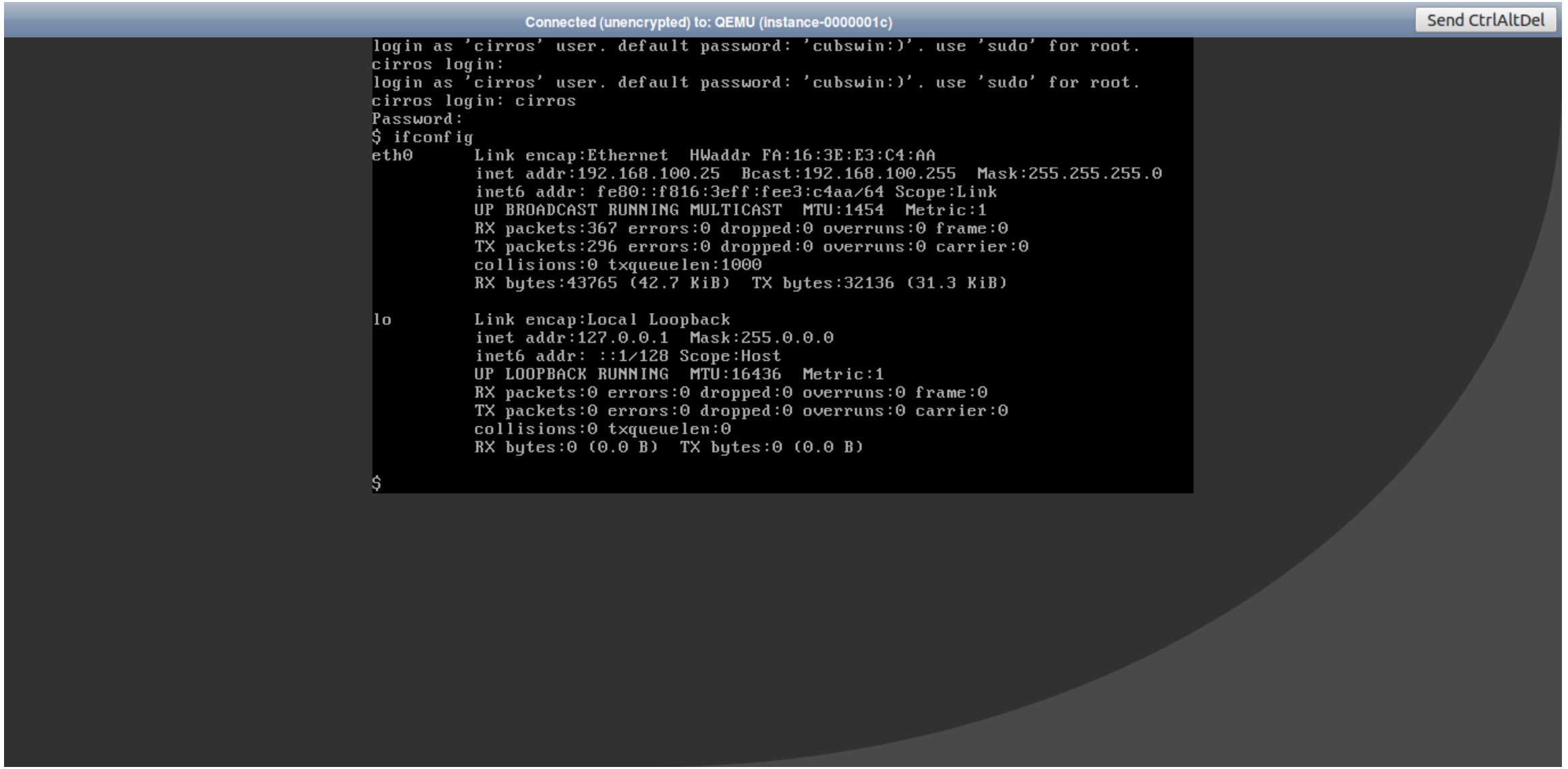
Demonstrations of a Private Cloud



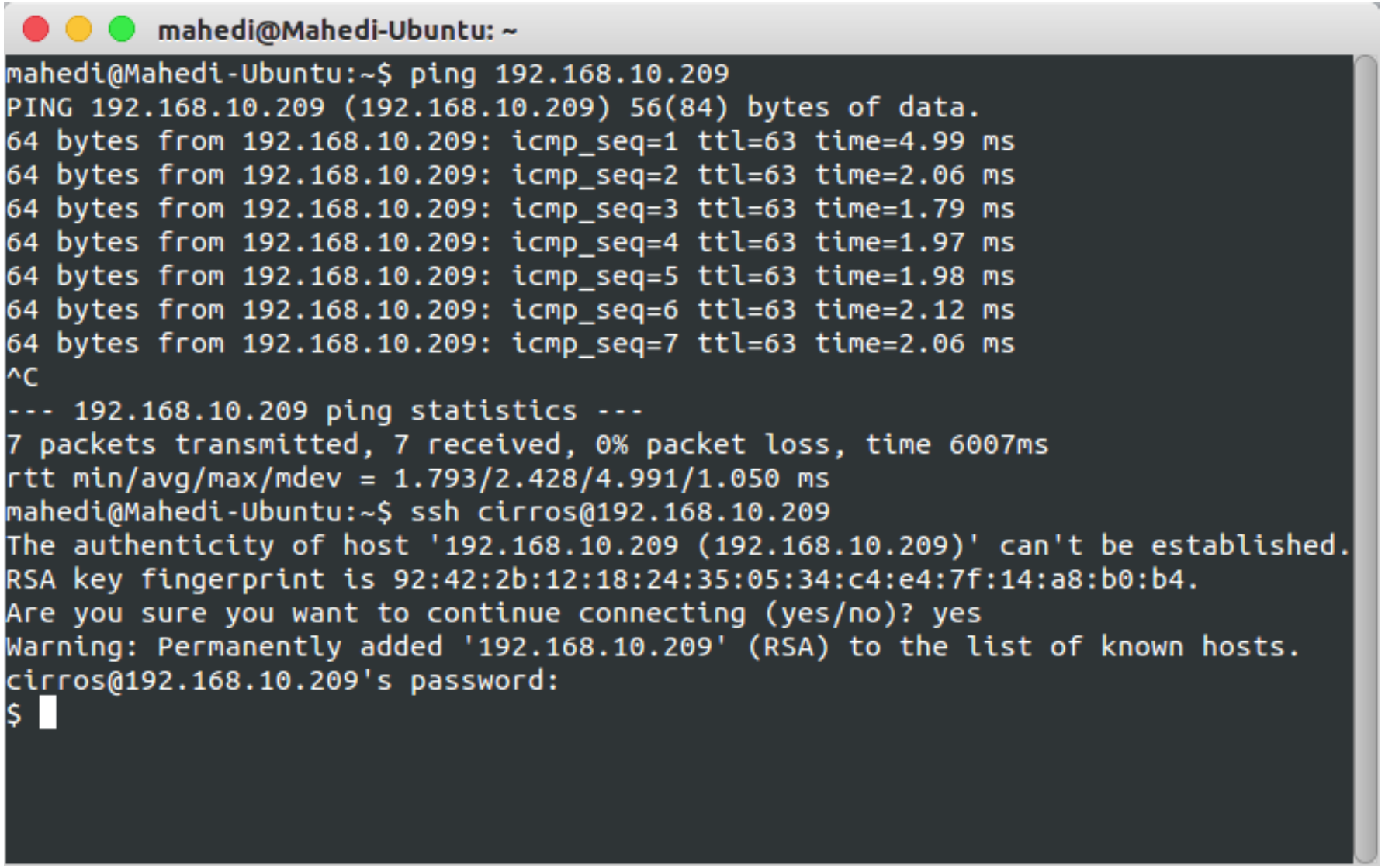
Demonstrations of a Private Cloud



Demonstrations of a Private Cloud



Demonstrations of a Private Cloud



Challenges

- Clear concept is required to implement cloud system (e.g.: Services, Multi tenant model and network tropology of cloud system etc.)
- Huge configuration is needed for implementation each services manually.
- Need to understand communication between different services.
- Need to handle multiple databases and remember a number password set.
- Good knowledge works in Linux/Unix system.

Live Demonstrations

Lab: https://github.com/mahedicse/microstack

http://openstack-lab-xy.bdren.net.bd/


THANK YOU


Q
&
A