به نام خدا

بررسی محصولات مدیریت زیرساخت ابری

دکتر محمد کاظم اکبری

مرتضی سرگلزایی جوان

Data Center: Pool of Server, Storage, Network and Applications

Compute Nodes


SYS-1028UX-CR-LL1/-LL2


SYS-1028U-TNRT+/-TNR4T+/-TNRTP+

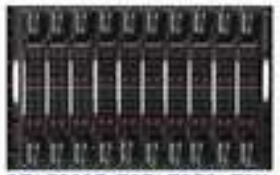

SYS-1028U-TN10RT+


SYS-2028U-TNRT+/-TNR4T+


SYS-5038ML-H12TRF


SYS-5038MA-H24TRF


SYS-F618R2-FT


SBI-7228R-T2F/-T2F2/-T2X

Storage Nodes


SSG-2028R-E1CR24H/24L


SSG-6038R-E1CR16N


SYS-F628R3-RTBN+/-RTBPTN+


SSG-6048R-E1CR36N


SC946ED-R2KJBOD


SBI-7128R-C6/-C6N

Controller Nodes


SYS-6017R-72RFTP+


SYS-2028U-TNRT+/-TNR4T+

Network Nodes


SYS-5018A-FTN4


SYS-5018A-MHN4


SYS-5038ML-H12TRF


SYS-5038MA-H24TRF

Network Switches


SSE-X3648S/SR


SSE-X3848T/TR


SSE-X3848S/SR


SSE-G48-TG4


SSE-G2252


SSE-3348S/SR

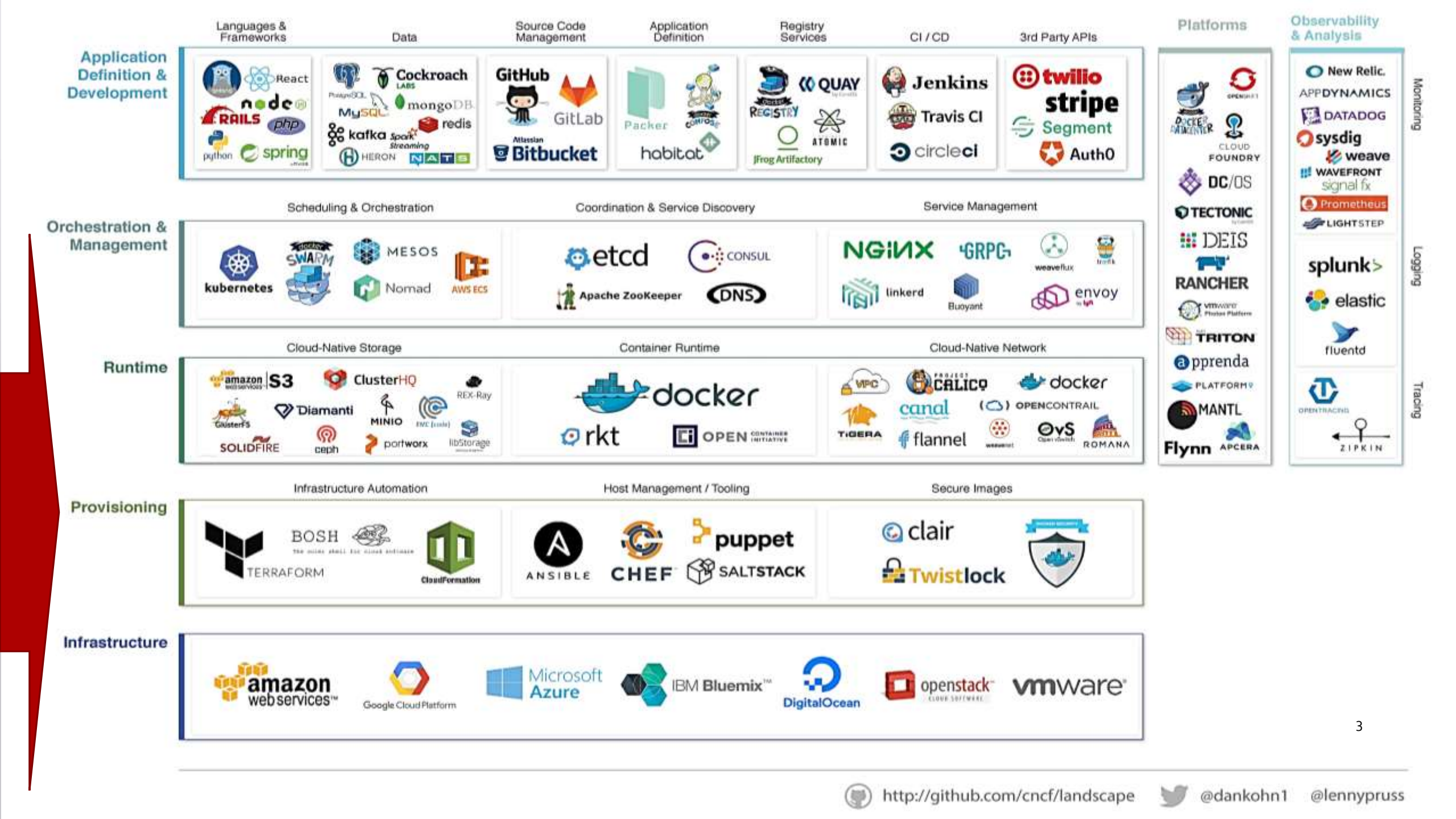
Server Management Software

Onsite Service and Support

SuperRack®

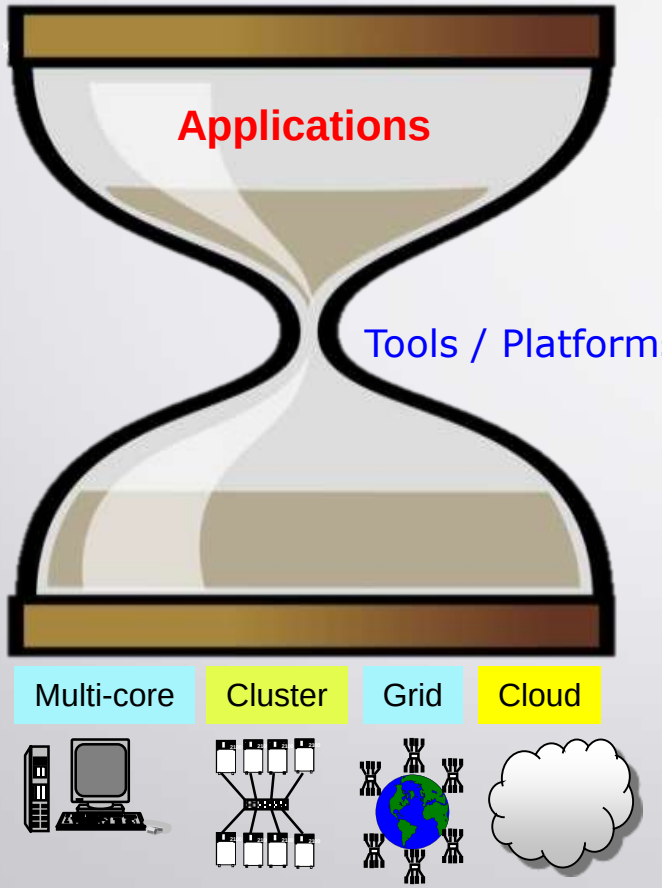

SRS-42E172-CEPH-01

openstack
ARISTA
CANONICAL
ceph
cumulus networks
intel
Mellanox
Microsoft
MIRANTIS
nexenta
redhat.
SEAGATE
vmware



http://github.com/cncf/landscape @dankohn1 @lennypruss

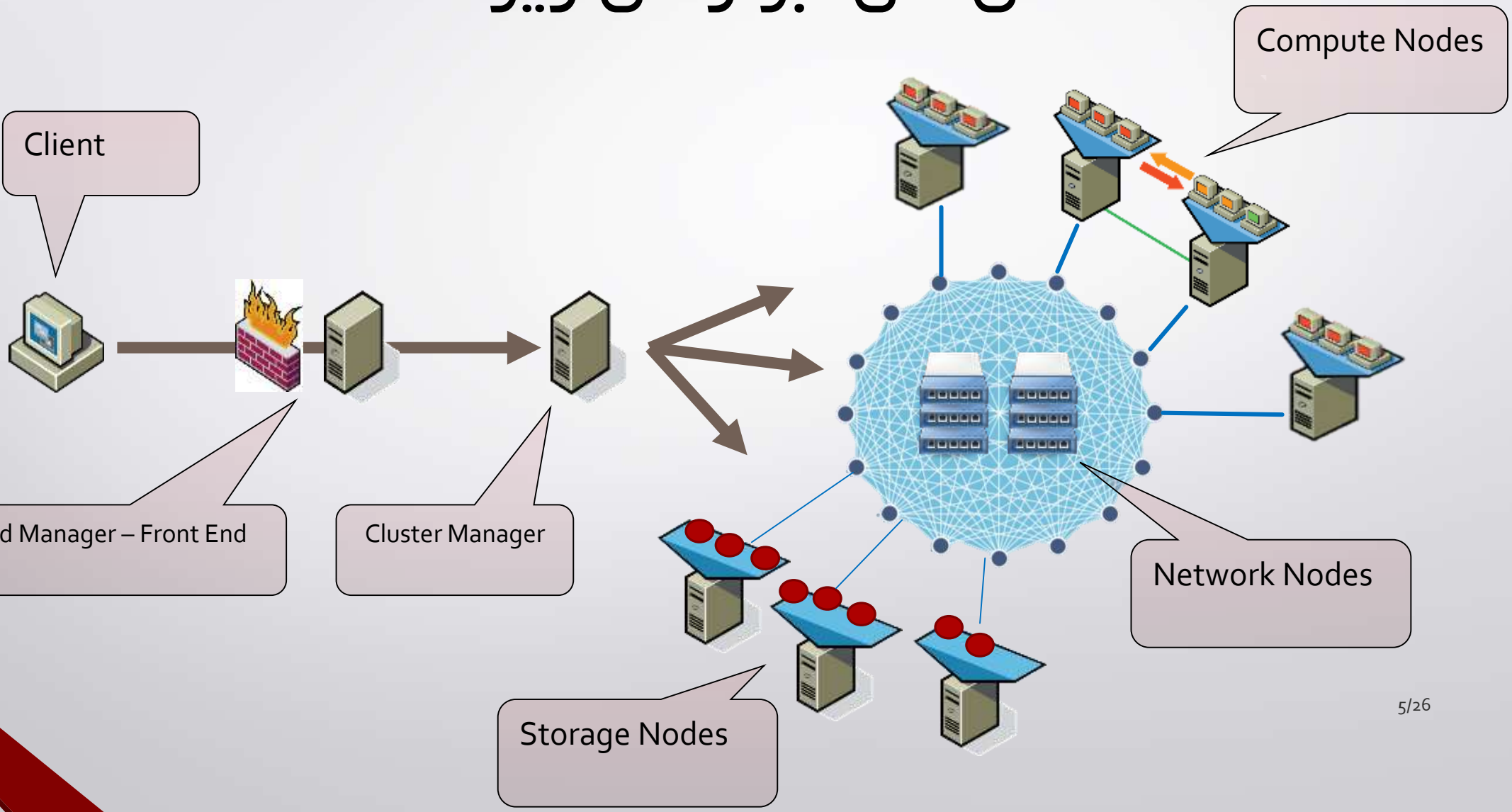
ابزارهای مدیریت منابع و مرکز داده



openstack ceph docker FUEL ...

مدیریت منابع و مدیریت استقرار
و اجرای برنامه های کاربردی
و خدمات بر روی منابع

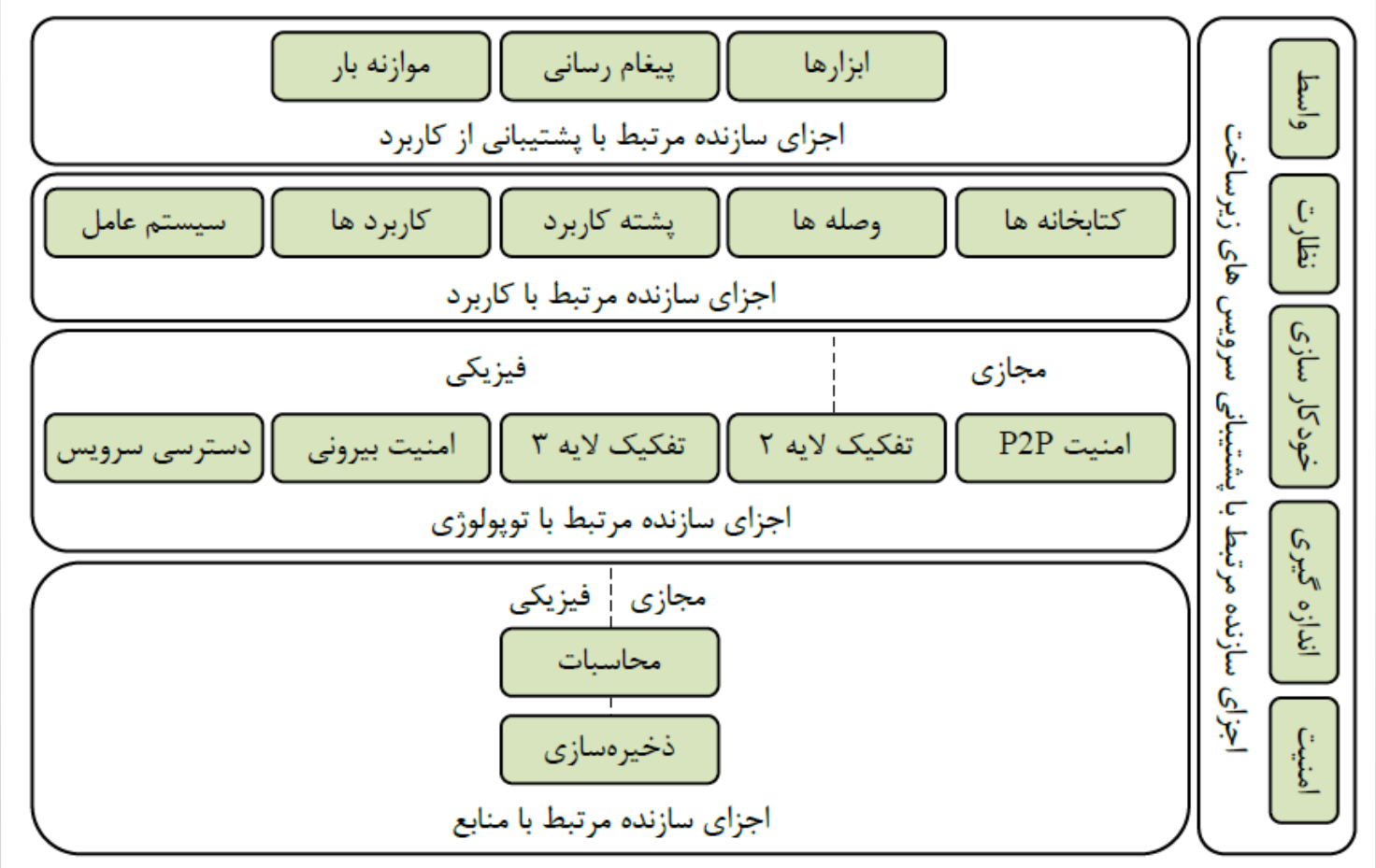
نمای کلی ابزارهای زیرساخت



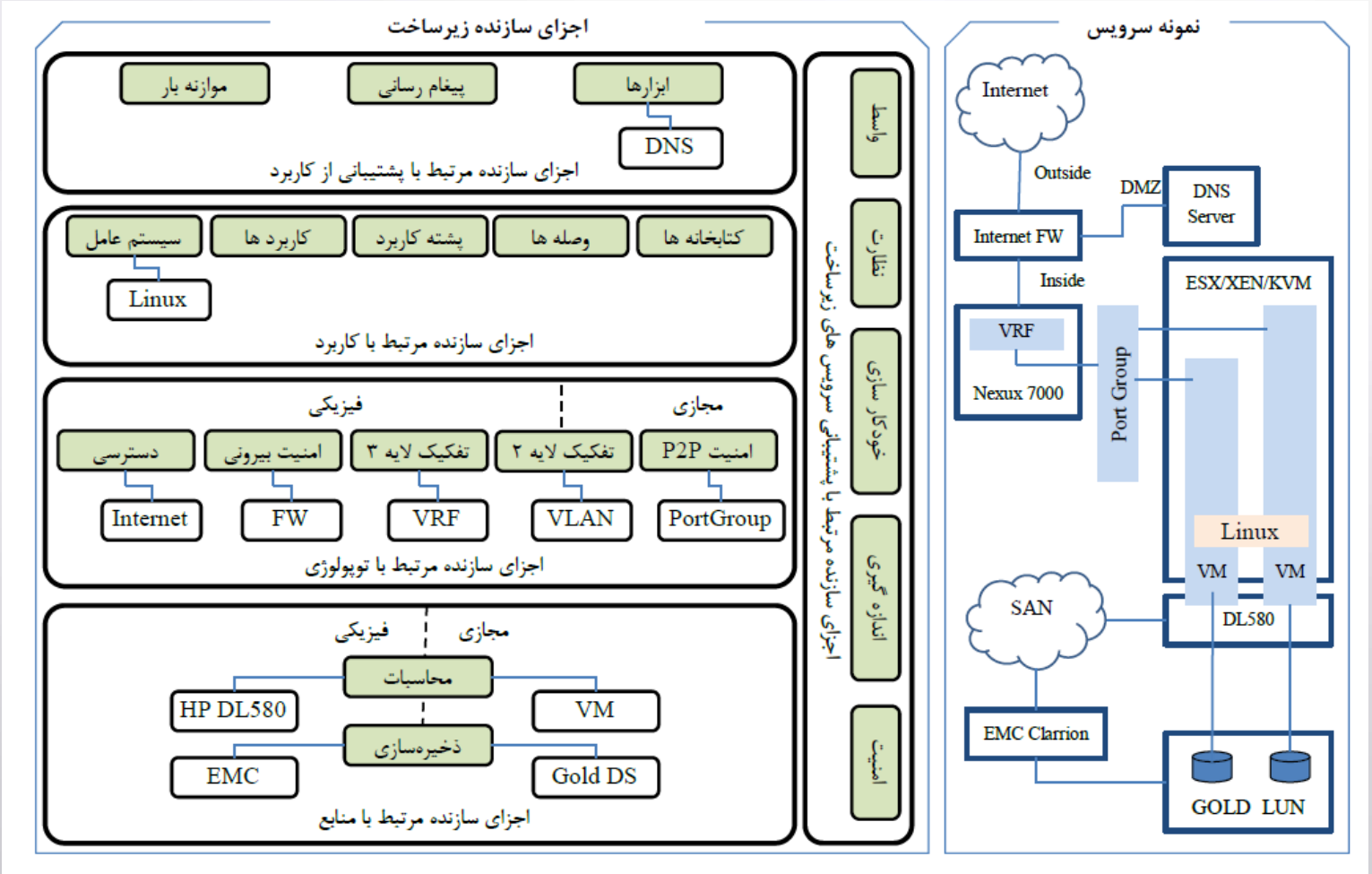
Cloud Computing Infrastructure as a Service Roadmap

انتزاع	خودکارسازی	مدیریت متمرکز	مجازی سازی	سازگاری!
Cloud	**Self-Service**	**On-demand**	**Consolidation**	**Convergence**
				
Cloud Framework and application standardization for full stack interoperability and mobility	Network standardization and service-based infrastructure	Server standardization and services-based compute	Virtualization maturity	**HW Assisted**

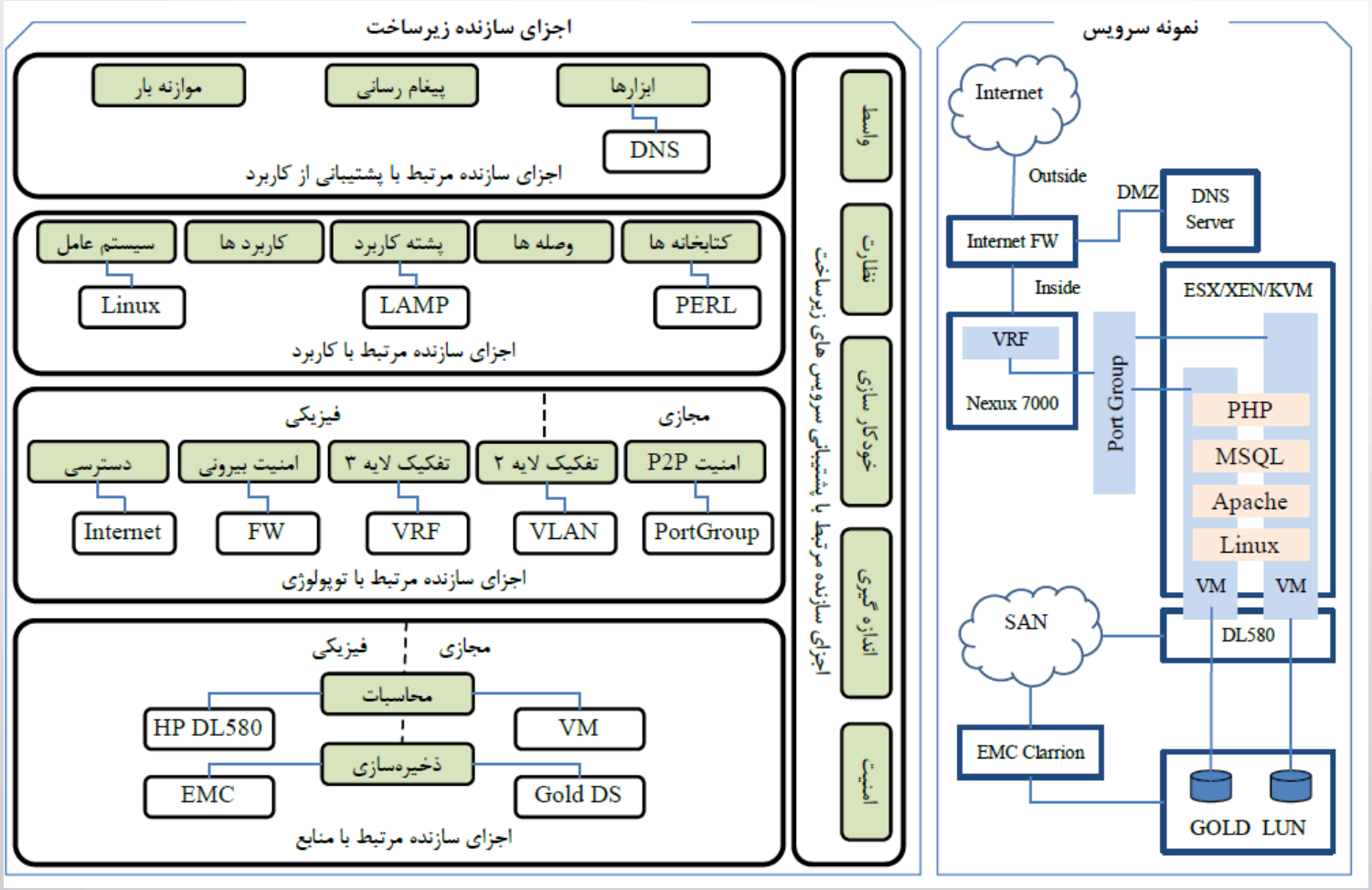
لایه ها و اجزای سازنده سرویس IaaS



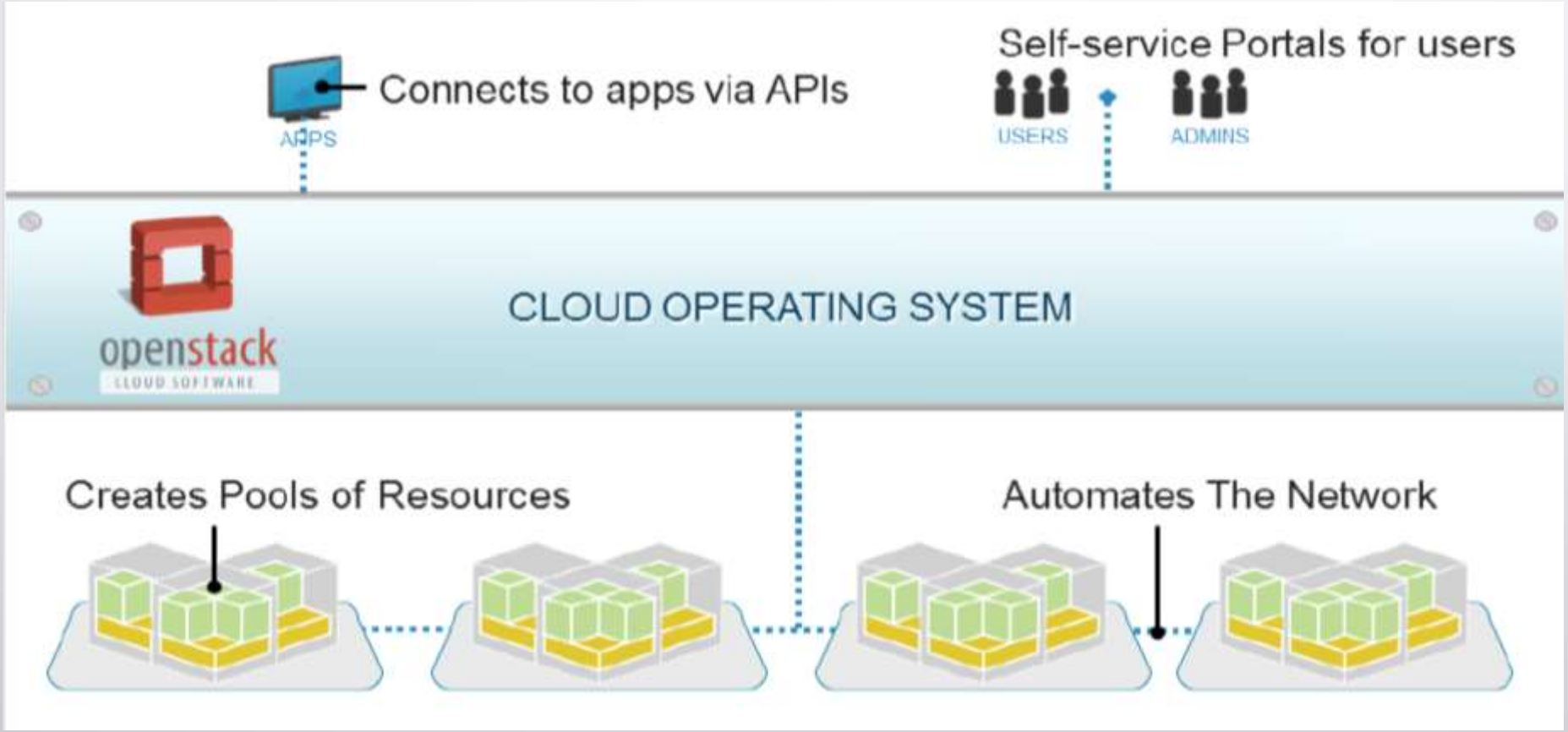
مثالی از ارایه سرویس



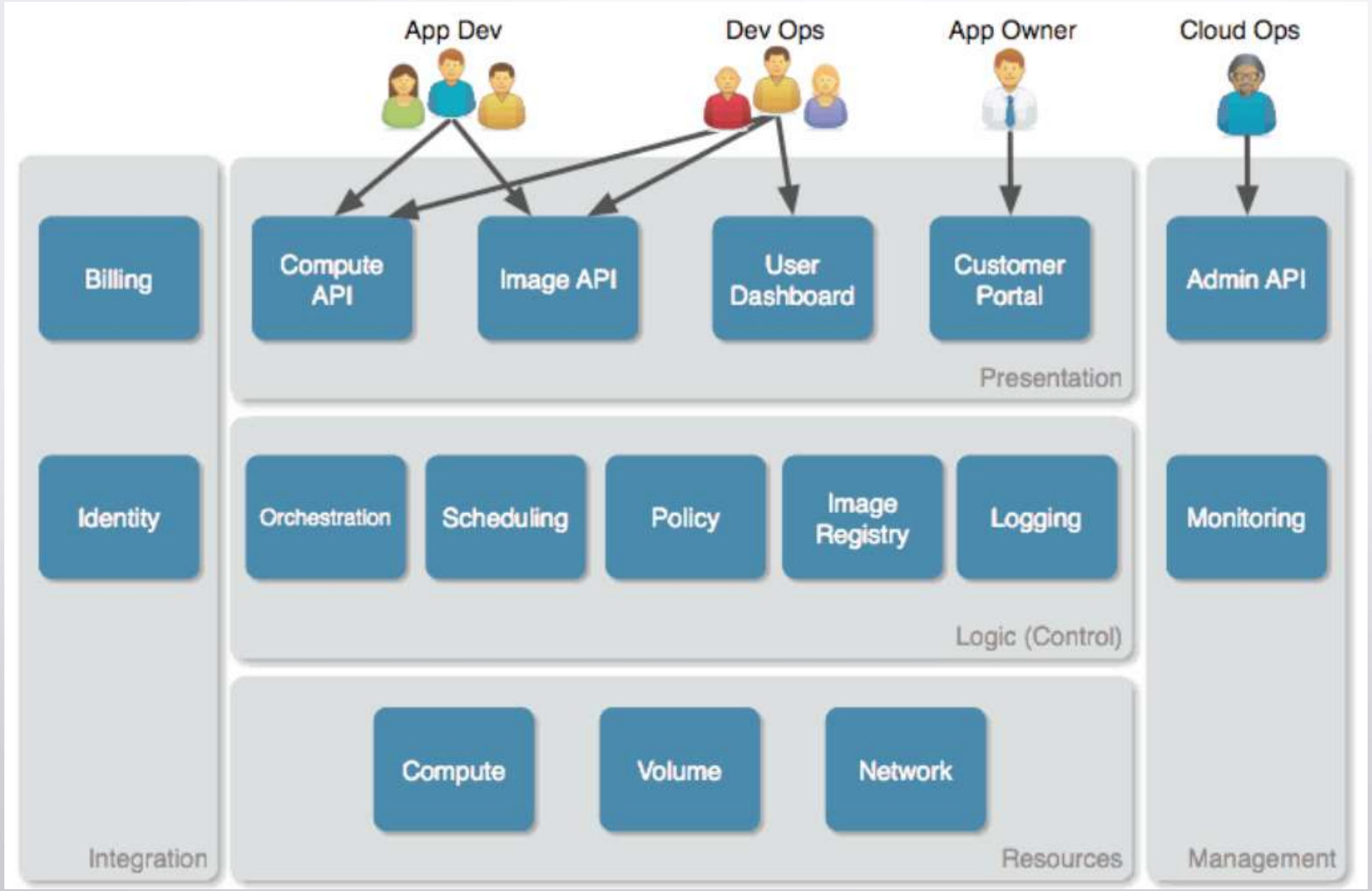
مثالی از ارایه سرویس (LAMP)



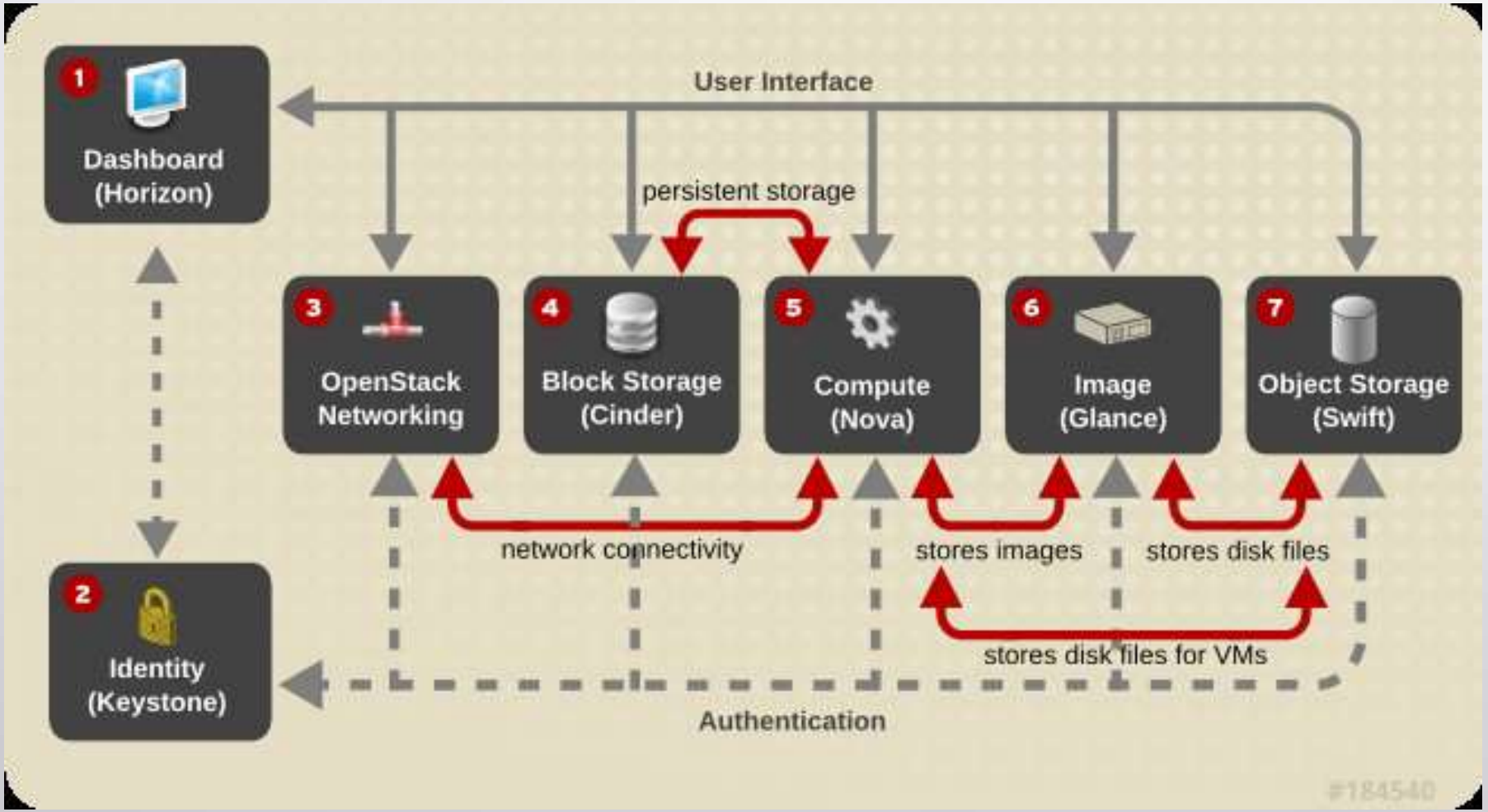
Openstack


Connects to apps via APIs
APPS
Self-service Portals for users
USERS
ADMINS
openstack
CLOUD SOFTWARE
CLOUD OPERATING SYSTEM
Creates Pools of Resources
Automates The Network

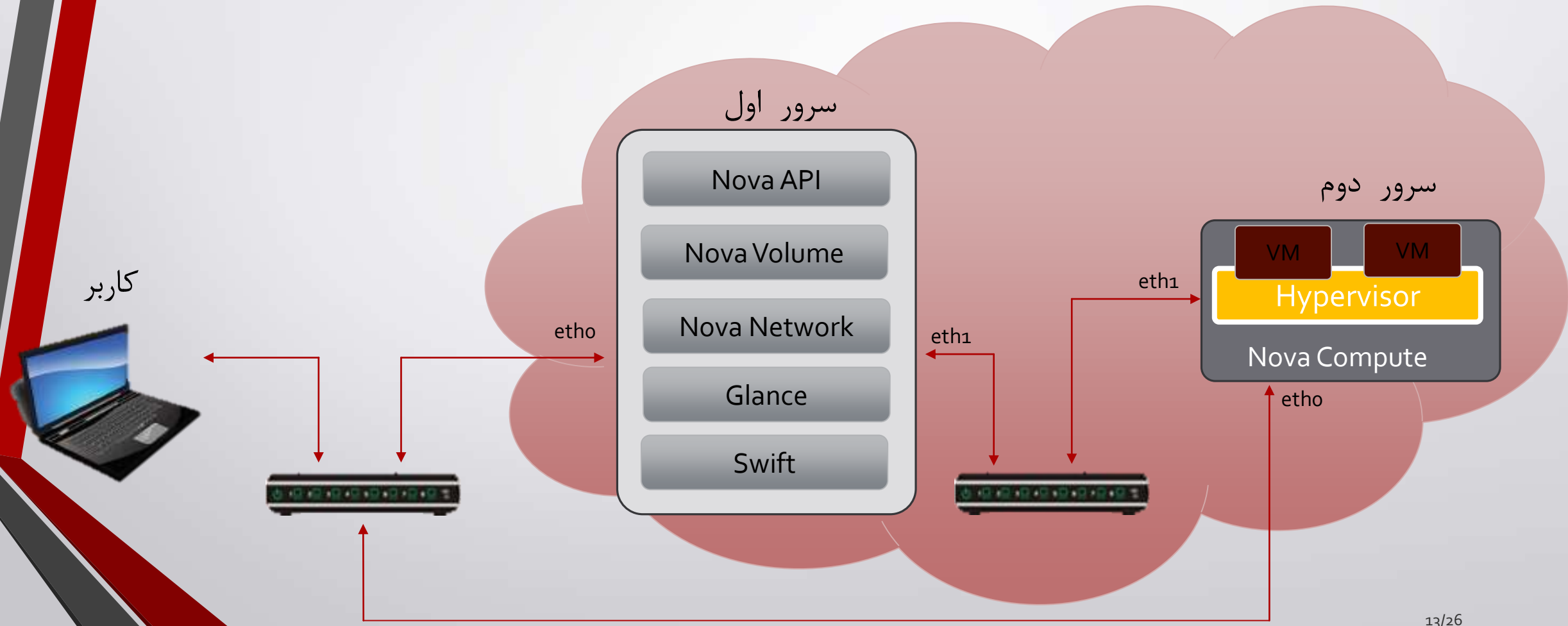
معماری مفهومی OpenStack

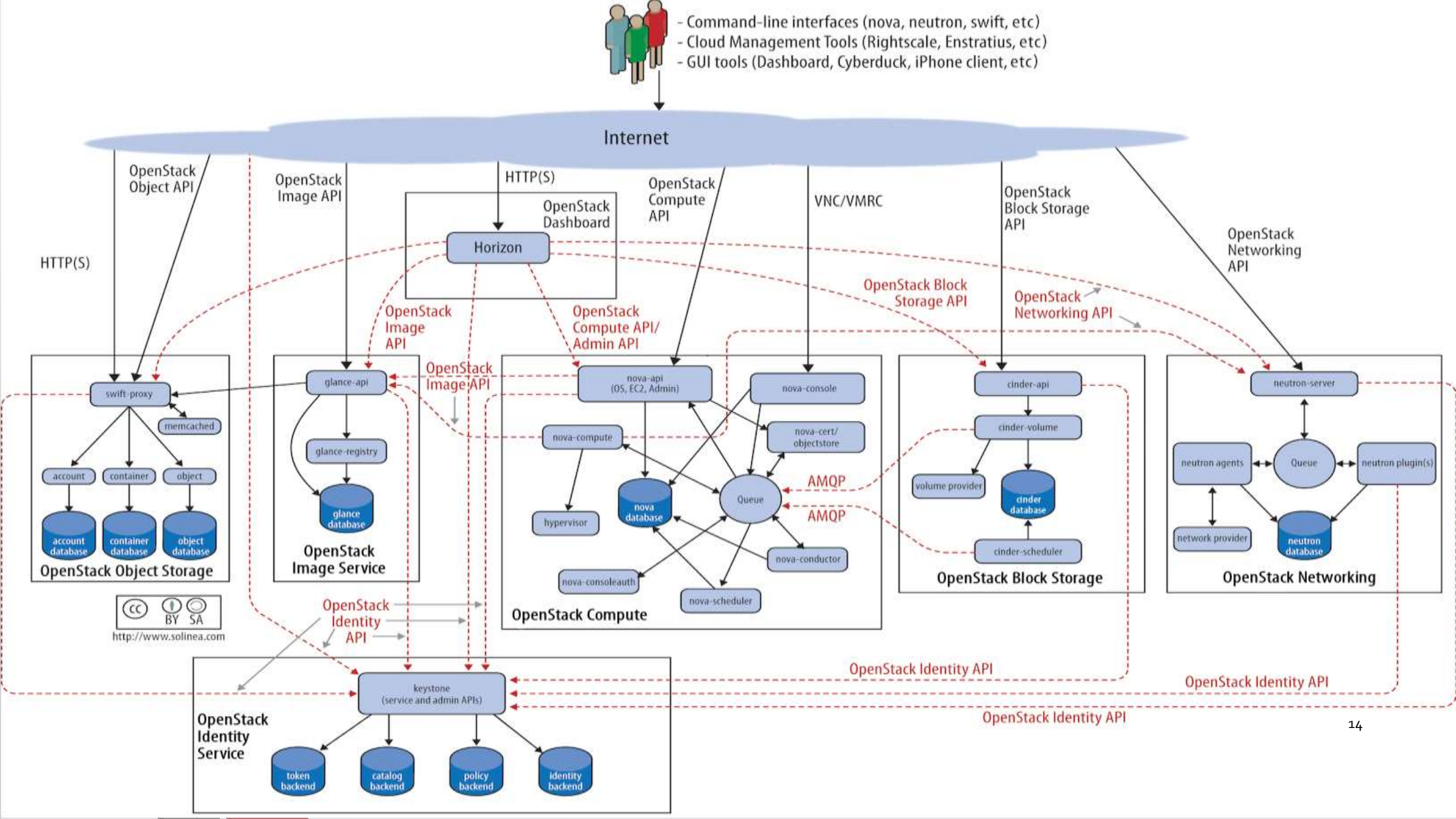


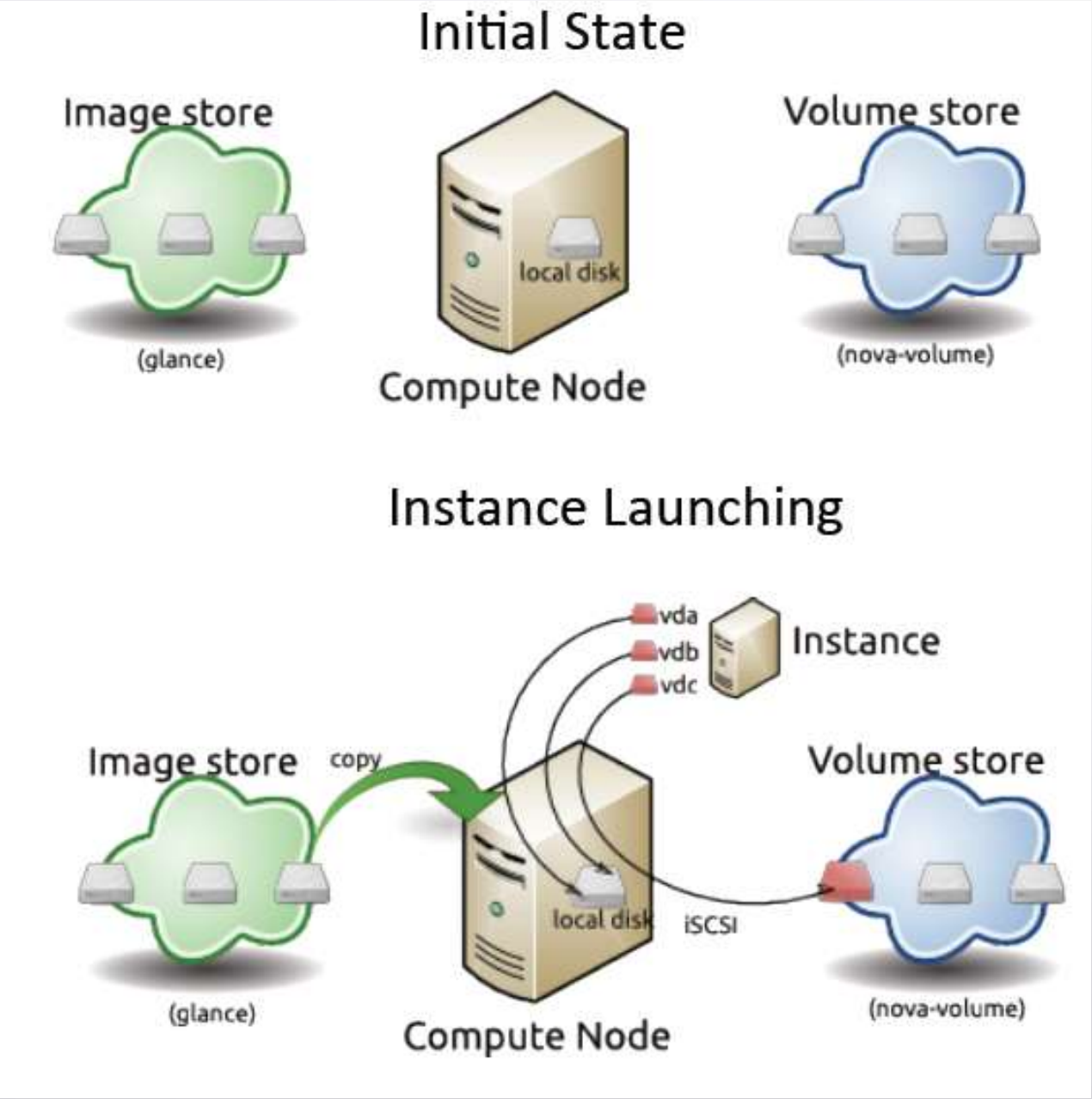
معرفی اجزای اصلی



نحوه ی استقرار OpenStack

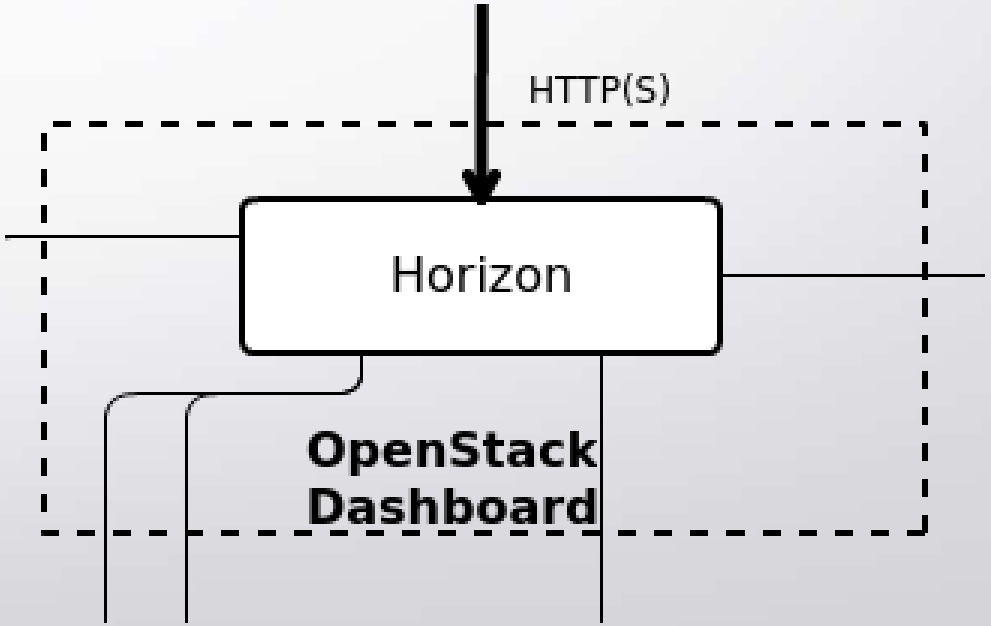



- Command-line interfaces (nova, neutron, swift, etc)
- Cloud Management Tools (Rightscale, Enstratius, etc)
- GUI tools (Dashboard, Cyberduck, iPhone client, etc)
Internet
OpenStack Object API
OpenStack Image API
HTTP(S)
OpenStack Dashboard
Horizon
OpenStack Compute API
VNC/VMRC
OpenStack Block Storage API
OpenStack Networking API
HTTP(S)
OpenStack Block Storage API
OpenStack Networking API
OpenStack Image API
OpenStack Compute API/ Admin API
OpenStack Image API
swift-proxy
memcached
account
container
object
account database
container database
object database
OpenStack Object Storage
glance-api
glance-registry
glance database
OpenStack Image Service
nova-api (OS, EC2, Admin)
nova-console
nova-compute
nova-cert/ objectstore
hypervisor
nova database
Queue
AMQP
AMQP
nova-conductor
nova-consoleauth
nova-scheduler
OpenStack Compute
cinder-api
cinder-volume
volume provider
cinder database
cinder-scheduler
OpenStack Block Storage
neutron-server
neutron agents
Queue
neutron plugin(s)
network provider
neutron database
OpenStack Networking
CC BY SA
http://www.solinea.com
OpenStack Identity API
keystone (service and admin APIs)
OpenStack Identity Service
token backend
catalog backend
policy backend
identity backend
OpenStack Identity API
OpenStack Identity API
OpenStack Identity API


Initial State
Image store
(glance)
local disk
Compute Node
Volume store
(nova-volume)
Instance Launching
vda
vdb
vdc
Instance
Image store
copy
local disk
iSCSI
Volume store
(glance)
Compute Node
(nova-volume)

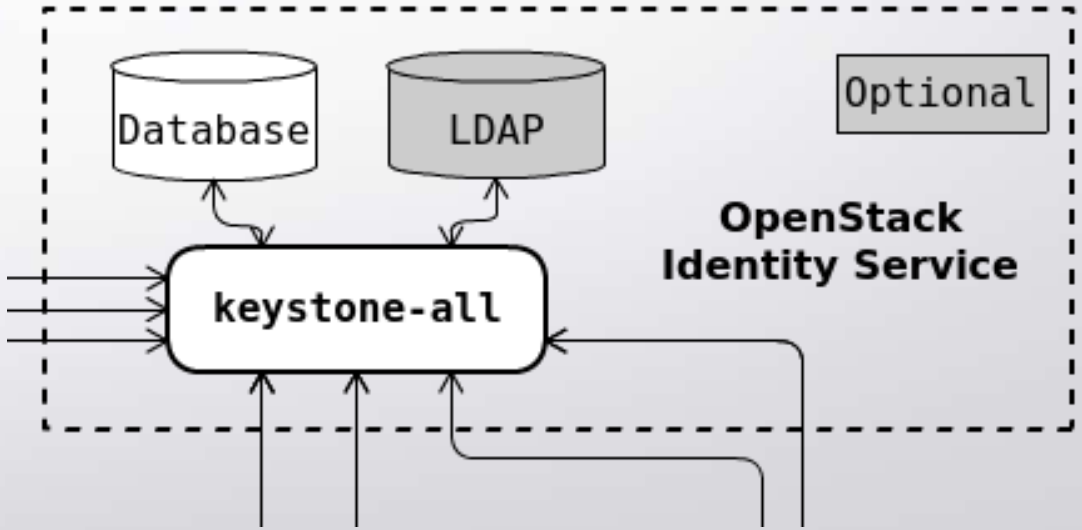
Dashboard (“Horizon”)

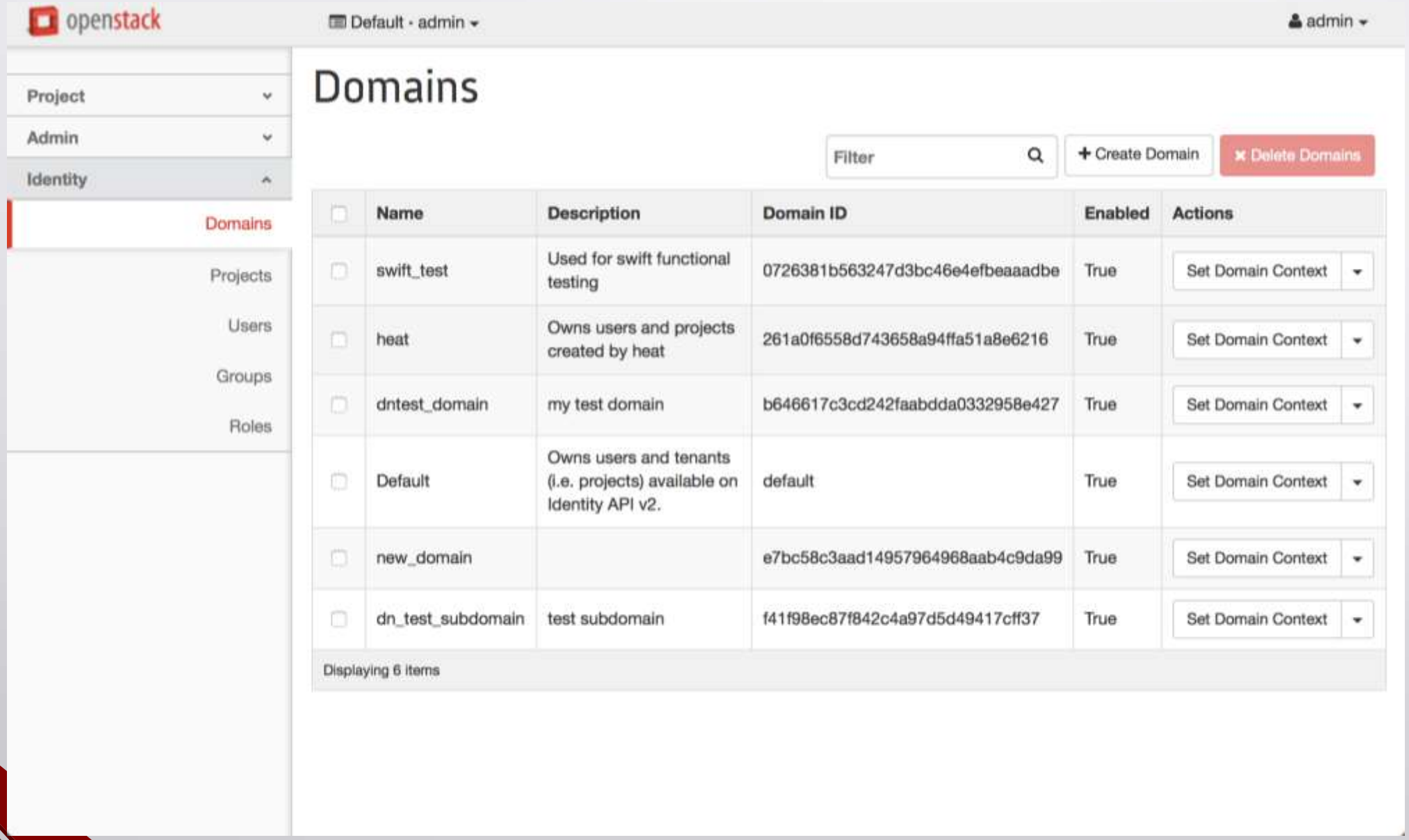
- Django application that users can access in their web browser
- Communicates with each OpenStack service through their API (and sometimes their admin API)



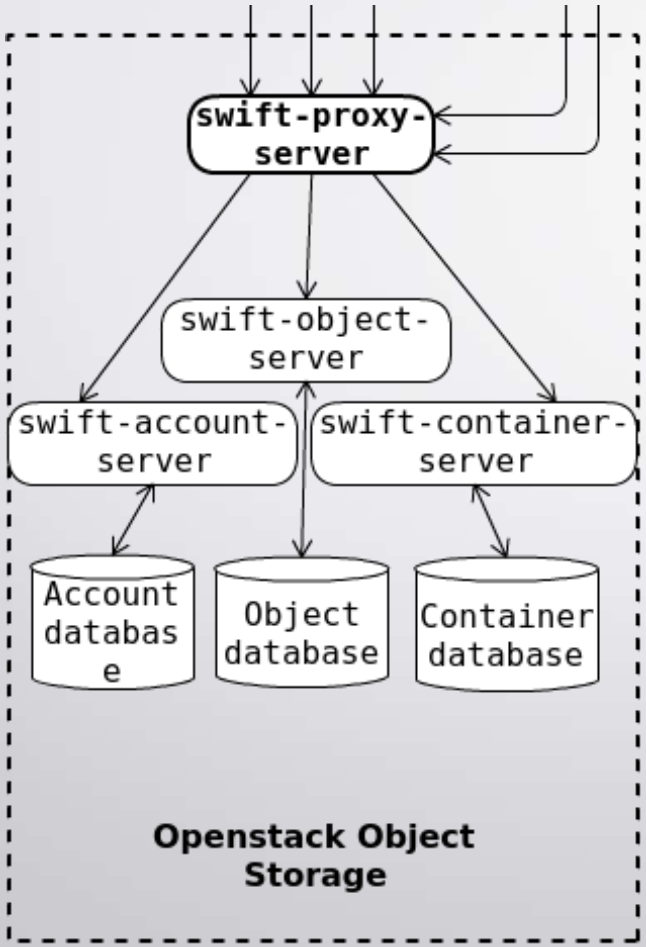
Identity (“Keystone”)

- Keystone provides a single point of integration for OpenStack policy, catalog, token and authentication.
- **`keystone`** handles API requests as well as providing configurable catalog, policy, token and identity services.
- Standard backends include LDAP or SQL, as well as Key Value Stores (KVS).
- Most people will use this as a point of customization for their current authentication services.




openstack
Default · admin
admin
Project
Admin
Identity
Domains
Projects
Users
Groups
Roles
Domains
Filter
+ Create Domain
× Delete Domains
Name
Description
Domain ID
Enabled
Actions
swift_test
Used for swift functional testing
0726381b563247d3bc46e4efbeaaadbe
True
Set Domain Context
heat
Owns users and projects created by heat
261a0f6558d743658a94ffa51a8e6216
True
Set Domain Context
dntest_domain
my test domain
b646617c3cd242faabdda0332958e427
True
Set Domain Context
Default
Owns users and tenants (i.e. projects) available on Identity API v2.
default
True
Set Domain Context
new_domain
e7bc58c3aad14957964968aab4c9da99
True
Set Domain Context
dn_test_subdomain
test subdomain
f41f98ec87f842c4a97d5d49417cff37
True
Set Domain Context
Displaying 6 items

Object Storage ("Swift")



- Stores and serves objects (files)
- Employs object level replication to safeguard data
- Accepts client requests via Objectstore API or HTTP from clients through **`swift-proxy`**
- Maintains distributed account and container databases
- Stores objects according the ring layout on filesystem with extended attributes (XFS, EXT4, etc.)

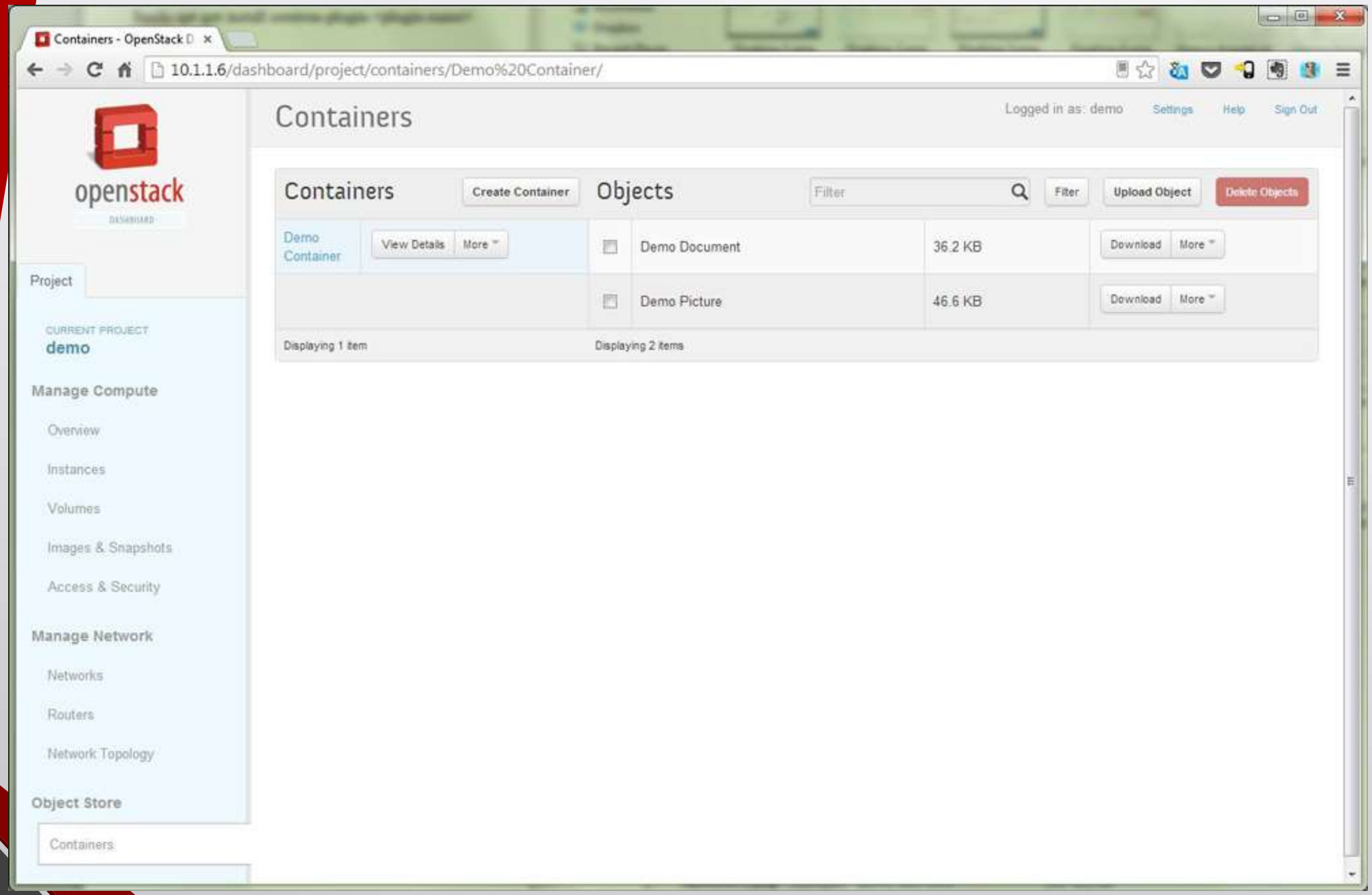
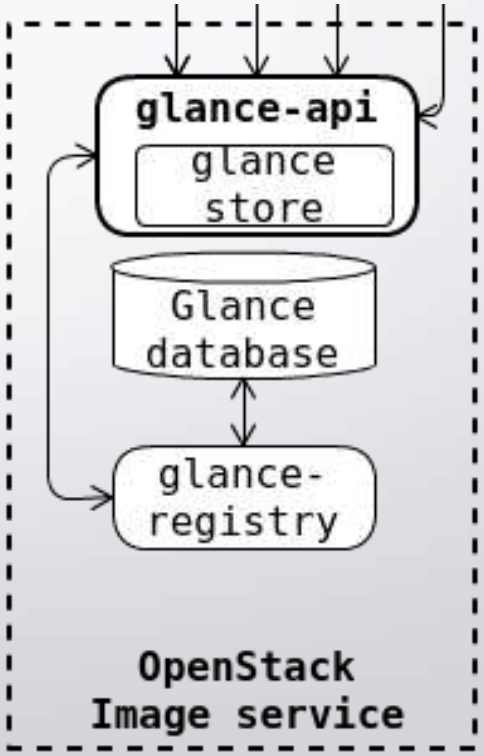
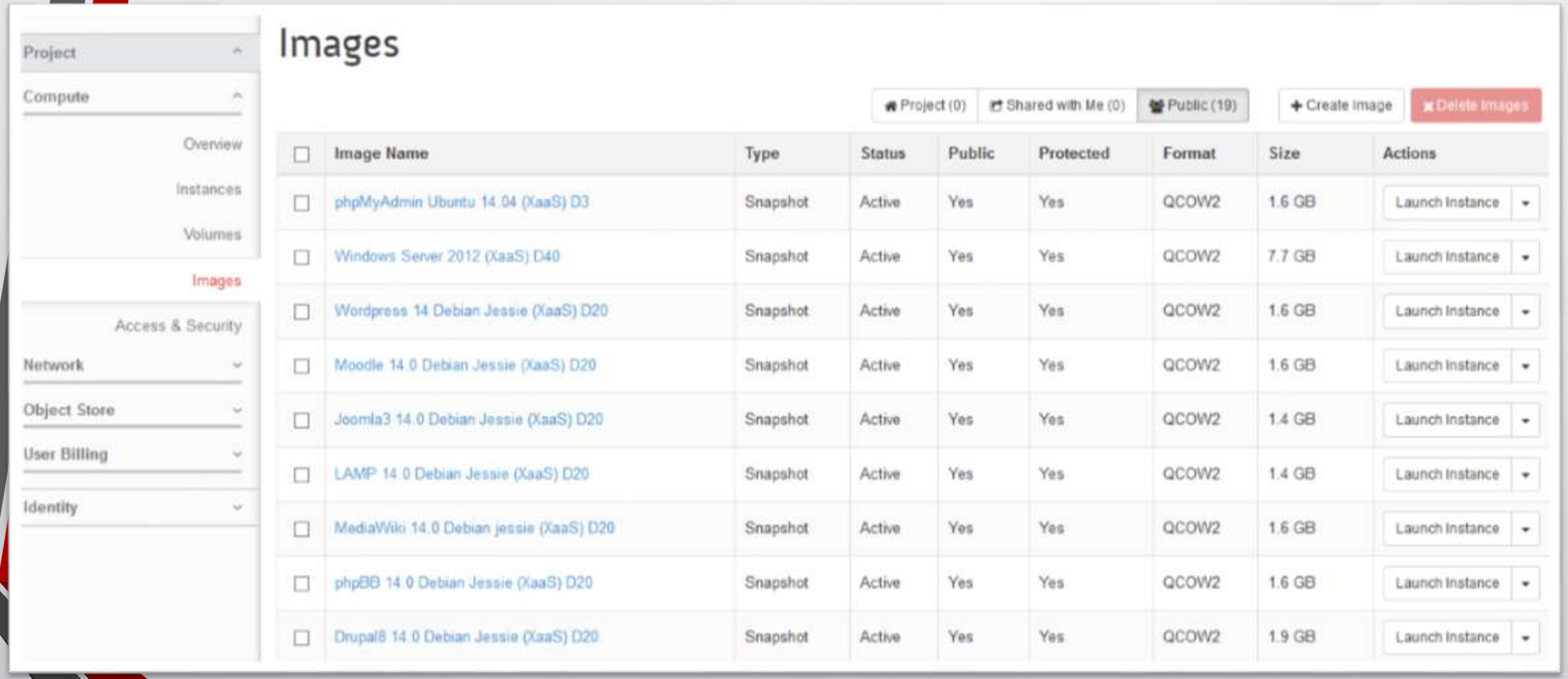

Containers - OpenStack
10.1.1.6/dashboard/project/containers/Demo%20Container/
openstack
DASHBOARD
Containers
Logged in as: demo
Settings
Help
Sign Out
Project
CURRENT PROJECT
demo
Manage Compute
Overview
Instances
Volumes
Images & Snapshots
Access & Security
Manage Network
Networks
Routers
Network Topology
Object Store
Containers
Containers
Create Container
Demo Container
View Details
More
Objects
Filter
Filter
Upload Object
Delete Objects
Demo Document
36.2 KB
Download
More
Demo Picture
46.6 KB
Download
More
Displaying 1 item
Displaying 2 items

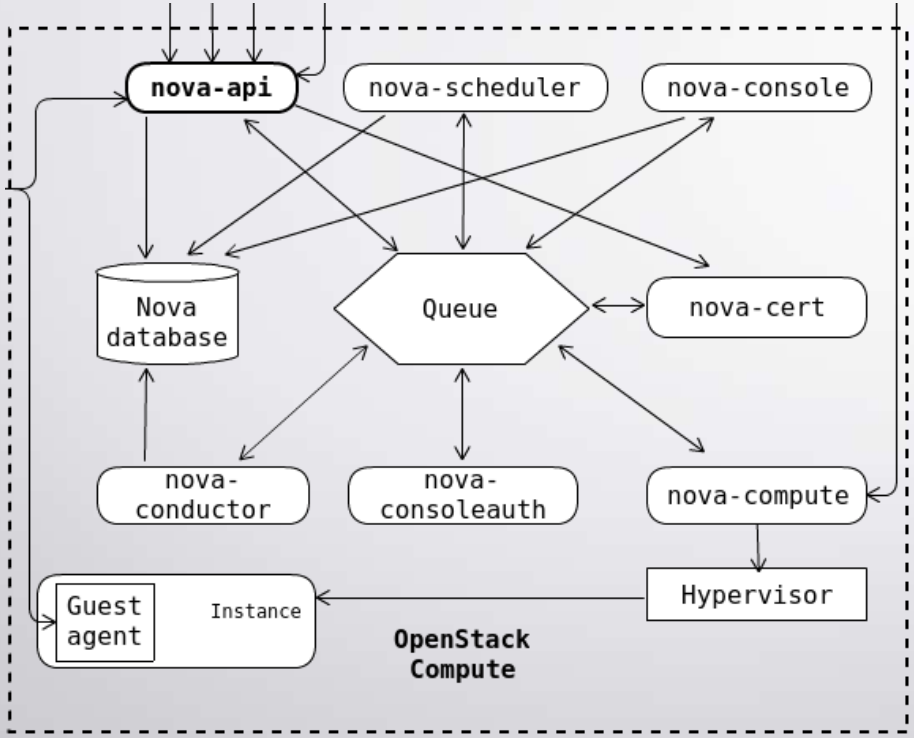
Image Service ("Glance")

- **`glance-api`** accepts Image API calls for image discovery, image retrieval and image storage.
- **`glance-registry`** stores, processes and retrieves metadata about images (size, type, etc.).
- Database to store the image metadata.
- A storage repository for the actual image files. In many deployments, this is OpenStack Swift



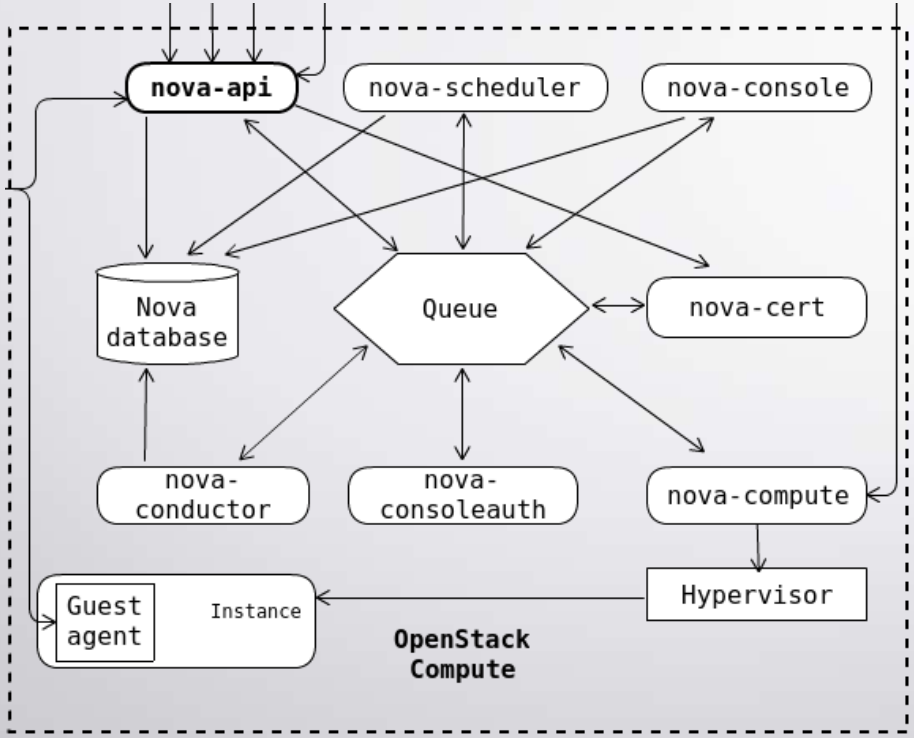

Project
Compute
Overview
Instances
Volumes
Images
Access & Security
Network
Object Store
User Billing
Identity
Images
Project (0)
Shared with Me (0)
Public (19)
+ Create Image
Delete Images
Image Name
Type
Status
Public
Protected
Format
Size
Actions
phpMyAdmin Ubuntu 14.04 (XaaS) D3 Snapshot Active Yes Yes QCOW2 1.6 GB Launch Instance
Windows Server 2012 (XaaS) D40 Snapshot Active Yes Yes QCOW2 7.7 GB Launch Instance
Wordpress 14 Debian Jessie (XaaS) D20 Snapshot Active Yes Yes QCOW2 1.6 GB Launch Instance
Moodle 14.0 Debian Jessie (XaaS) D20 Snapshot Active Yes Yes QCOW2 1.6 GB Launch Instance
Joomla3 14.0 Debian Jessie (XaaS) D20 Snapshot Active Yes Yes QCOW2 1.4 GB Launch Instance
LAMP 14.0 Debian Jessie (XaaS) D20 Snapshot Active Yes Yes QCOW2 1.4 GB Launch Instance
MediaWiki 14.0 Debian jessie (XaaS) D20 Snapshot Active Yes Yes QCOW2 1.6 GB Launch Instance
phpBB 14.0 Debian Jessie (XaaS) D20 Snapshot Active Yes Yes QCOW2 1.6 GB Launch Instance
Drupal8 14.0 Debian Jessie (XaaS) D20 Snapshot Active Yes Yes QCOW2 1.9 GB Launch Instance

Compute ("Nova")

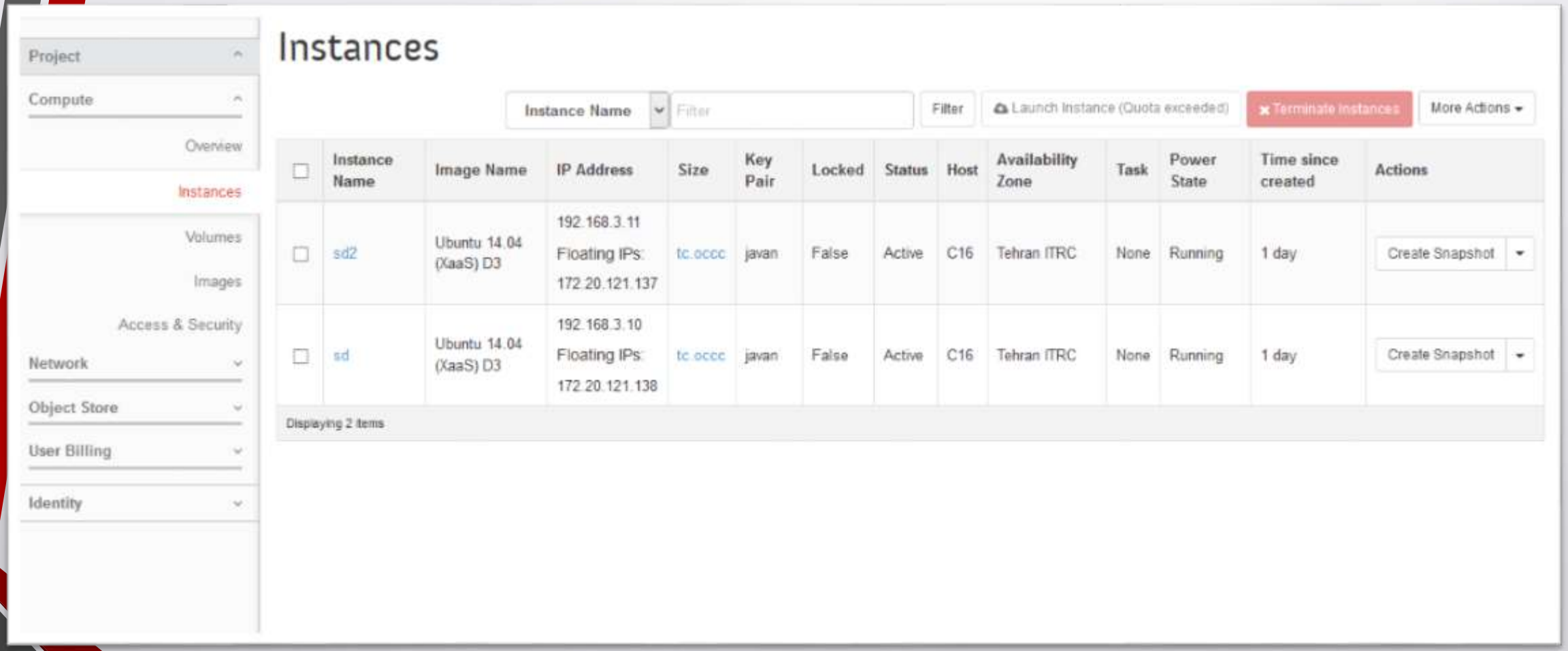


- **`nova-api`** accepts and responds to end user compute API calls.
- Supports OpenStack Compute API, Amazon's EC2 API and a special Admin API (for privileged users to perform administrative actions).
- Initiates most of the orchestration activities (such as running an instance)
- Enforces some policy (mostly quota checks)
- Authentication is handled through middleware before getting to this daemon

Nova Compute



- The **`nova-compute`** process is primarily a worker daemon that creates and terminates virtual machine instances via hypervisor's APIs (XenAPI for XenServer/XCP, libvirt for KVM or QEMU, VMwareAPI for VMware, etc.).
- The process by which it does so is fairly complex but the basics are simple: accept actions from the queue and then perform a series of system commands (like launching a KVM instance) to carry them out while updating state in the database.


Project
Compute
Overview
Instances
Volumes
Images
Access & Security
Network
Object Store
User Billing
Identity
Instances
Instance Name
Filter
Filter
Launch Instance (Quota exceeded)
Terminate Instances
More Actions
Instance Name
Image Name
IP Address
Size
Key Pair
Locked
Status
Host
Availability Zone
Task
Power State
Time since created
Actions
sd2
Ubuntu 14.04 (XaaS) D3
192.168.3.11
Floating IPs:
172.20.121.137
tc.occc
javan
False
Active
C16
Tehran ITRC
None
Running
1 day
Create Snapshot
sd
Ubuntu 14.04 (XaaS) D3
192.168.3.10
Floating IPs:
172.20.121.138
tc.occc
javan
False
Active
C16
Tehran ITRC
None
Running
1 day
Create Snapshot
Displaying 2 items

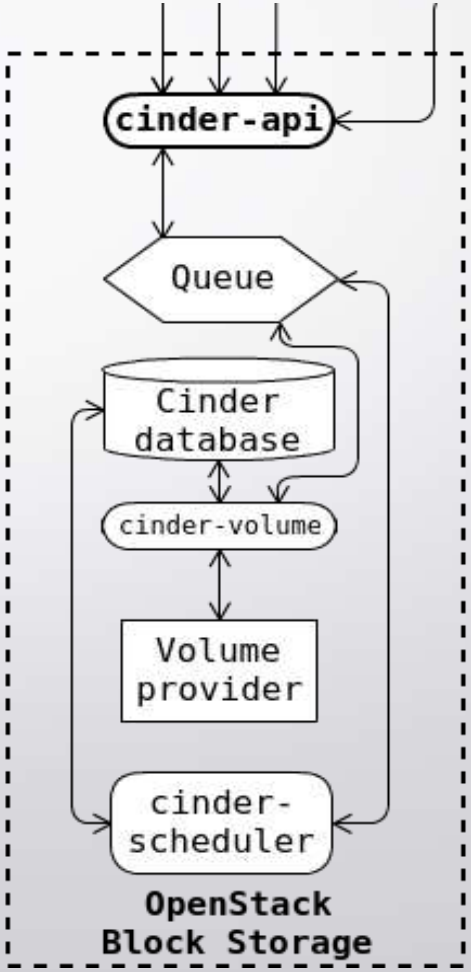
Nova Scheduler

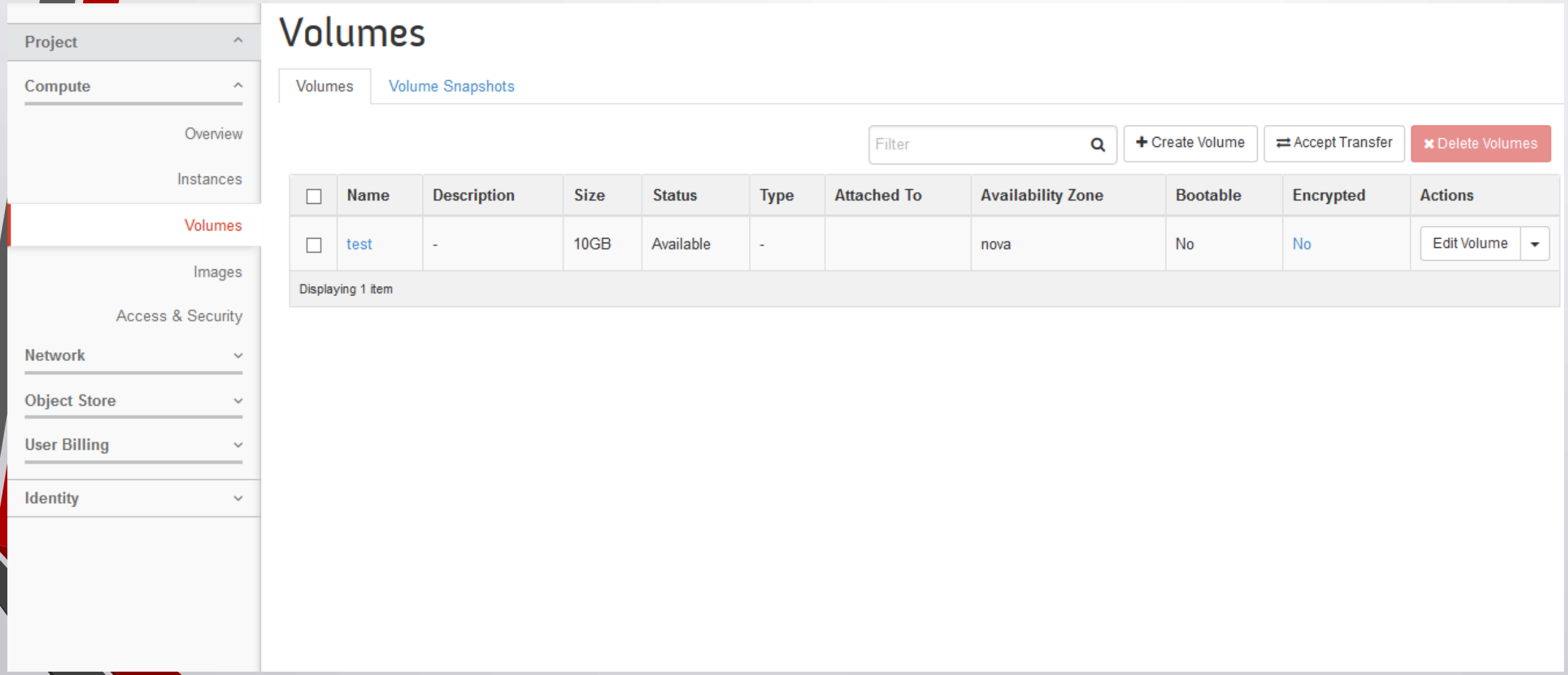
- The **nova-schedule** process is conceptually the simplest piece of code in OpenStack Nova: take a virtual machine instance request from the queue and determines where it should run (specifically, which compute server host it should run on).

```
def _schedule(self, context, topic, request_spec, filter_properties):
        """Picks a host that is up at random."""

        elevated = context.elevated()
        hosts = self.hosts_up(elevated, topic)
        if not hosts:
            msg = _("Is the appropriate service running?")
            raise exception.NoValidHost(reason=msg)

        hosts = self._filter_hosts(request_spec, hosts, filter_properties)
        if not hosts:
            msg = _("Could not find another compute")
            raise exception.NoValidHost(reason=msg)

        return hosts[int(random.random() * len(hosts))]
```

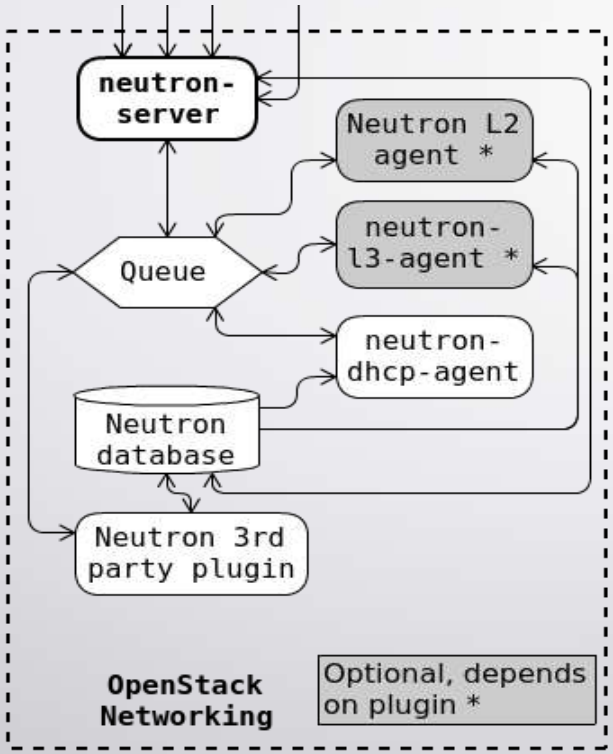
Block Storage ("Cinder")

- **cinder-api** accepts API requests and routes them to cinder-volume for action.
- **cinder-volume** acts upon the requests by reading or writing to the Cinder database to maintain state, interacting with other processes (like cinder-scheduler) through a message queue and directly upon block storage providing hardware or software. It can interact with a variety of storage providers through a driver architecture. Currently, there are drivers for IBM, SolidFire, NetApp, Nexenta, Zadara, linux iSCSI and other storage providers.
- Much like nova-scheduler, the **cinder-scheduler** daemon picks the optimal block storage provider node to create the volume on.

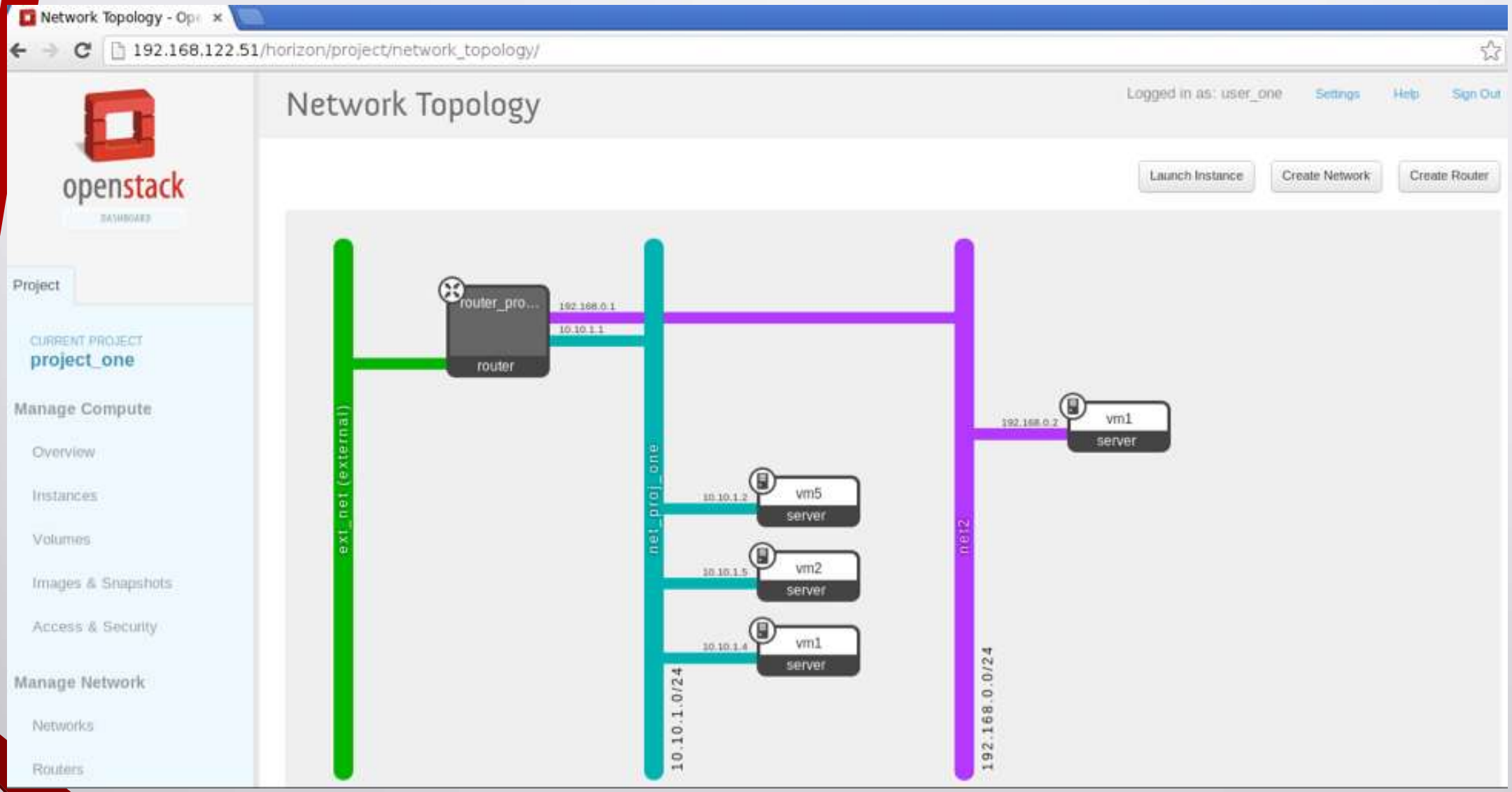



Project
Compute
Overview
Instances
Volumes
Images
Access & Security
Network
Object Store
User Billing
Identity
Volumes
Volumes
Volume Snapshots
Filter
+ Create Volume
⇄ Accept Transfer
✖ Delete Volumes
Name
Description
Size
Status
Type
Attached To
Availability Zone
Bootable
Encrypted
Actions
test
-
10GB
Available
-
nova
No
No
Edit Volume
Displaying 1 item

Networking ("Neutron")

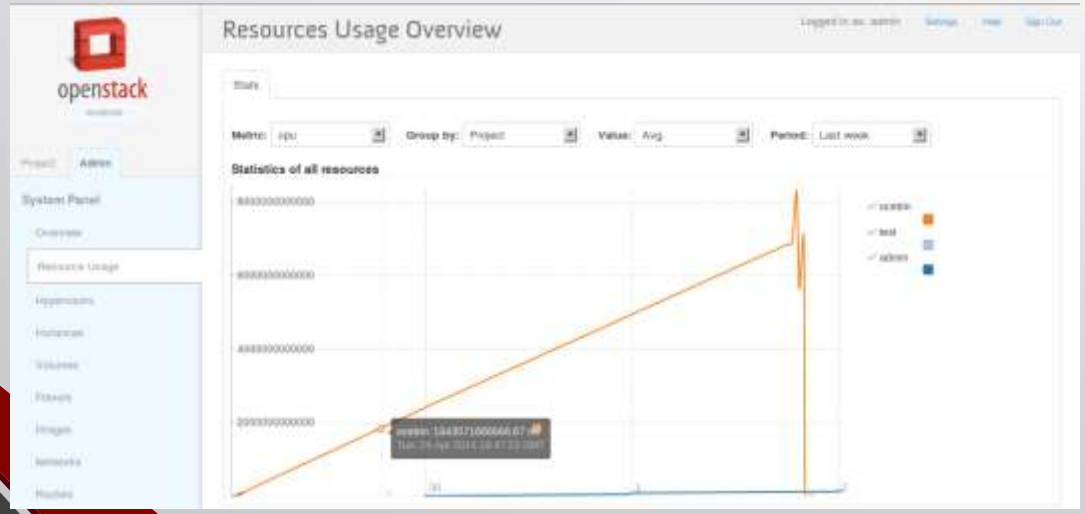


- **Neutron-server** accepts API requests and then routes them to the appropriate quantum plugin for action.
- Quantum ships with plugins and agents for:
  - Cisco virtual and physical switches
  - Nicira NVP product
  - NEC OpenFlow products
  - Open vSwitch
  - Linux bridging
  - Ryu Network Operating System
  - Midokua
- The common agents are L3 (layer 3), DHCP (dynamic host IP addressing) and the specific plug-in agent.

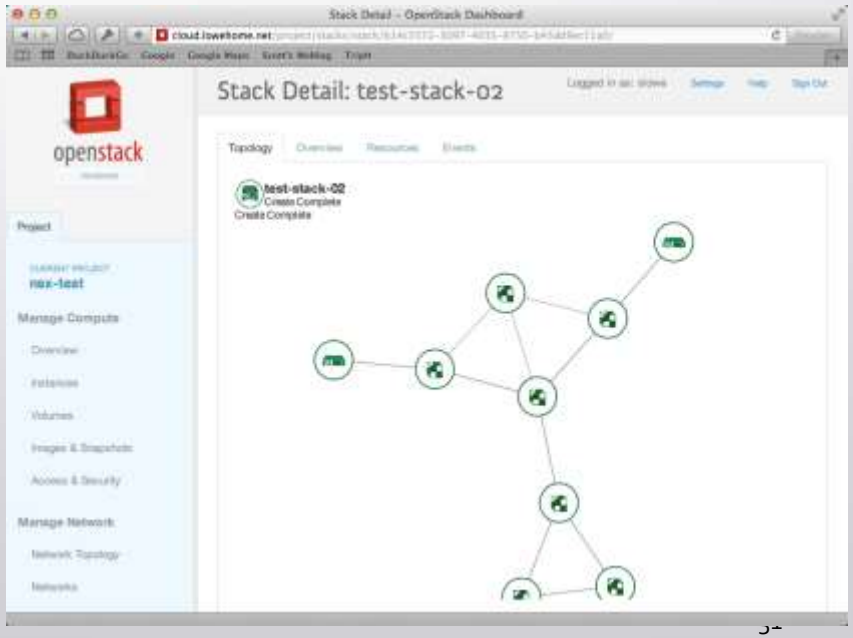

Network Topology - Op
192.168.122.51/horizon/project/network_topology/
openstack
DASHBOARD
Network Topology
Logged in as: user_one
Settings
Help
Sign Out
Launch Instance
Create Network
Create Router
Project
CURRENT PROJECT
project_one
Manage Compute
Overview
Instances
Volumes
Images & Snapshots
Access & Security
Manage Network
Networks
Routers
router_pro...
router
192.168.0.1
10.10.1.1
ext_net (external)
net_proj_one
10.10.1.0/24
net2
192.168.0.0/24
192.168.0.2
vm1
server
10.10.1.2
vm5
server
10.10.1.5
vm2
server
10.10.1.4
vm1
server

Some Other Projects

- **Ceilometer** is a metering project. The project offers metering. Metering lets you know what actions have taken place, rating enables pricing and line items, and billing gathers the line items to create a bill to send to the consumer and collect payment.



- **Heat** provides a REST API to orchestrate multiple cloud applications implementing standards such as AWS CloudFormation.

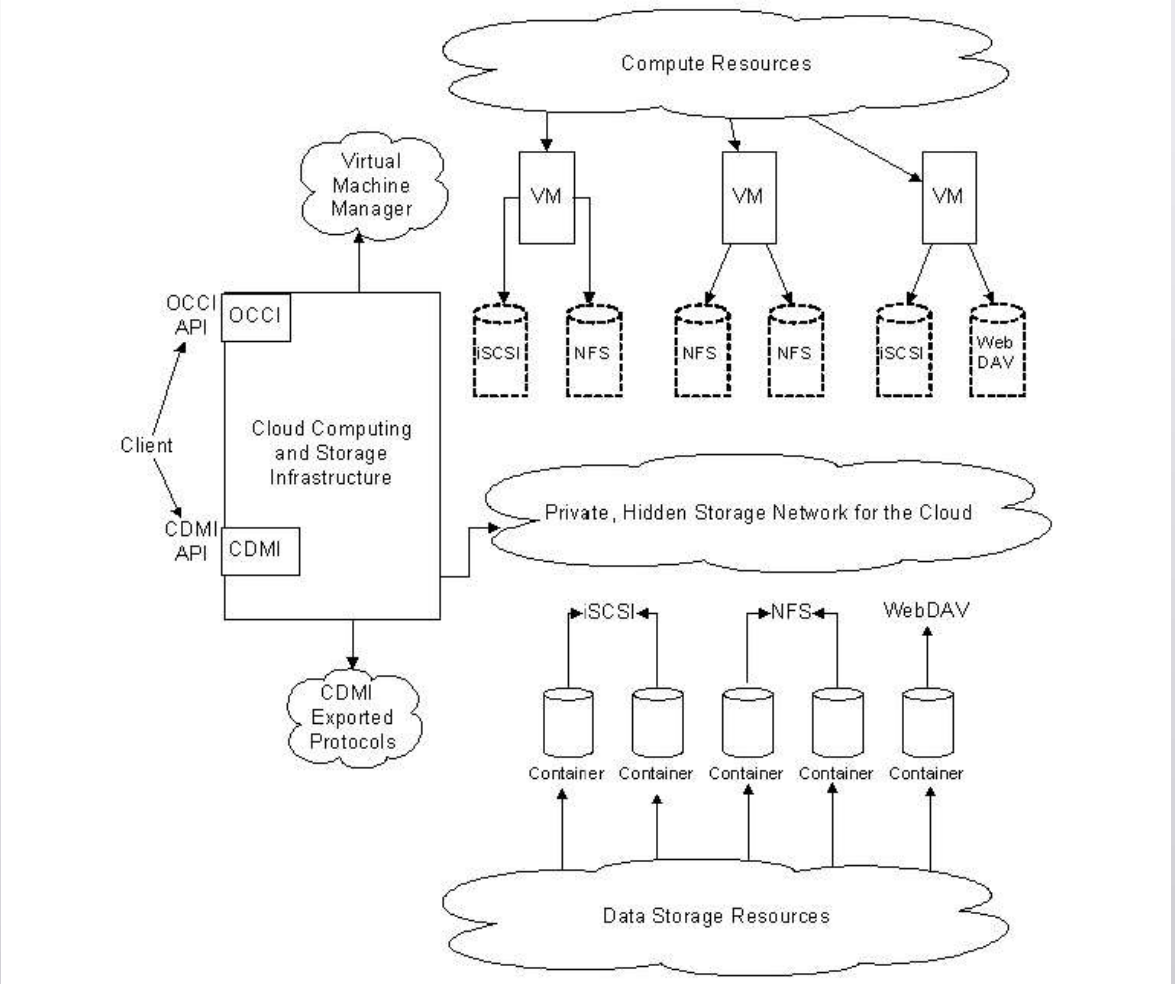


ویژگی های عمومی ابزارهای مدیریت سرویس زیرساخت

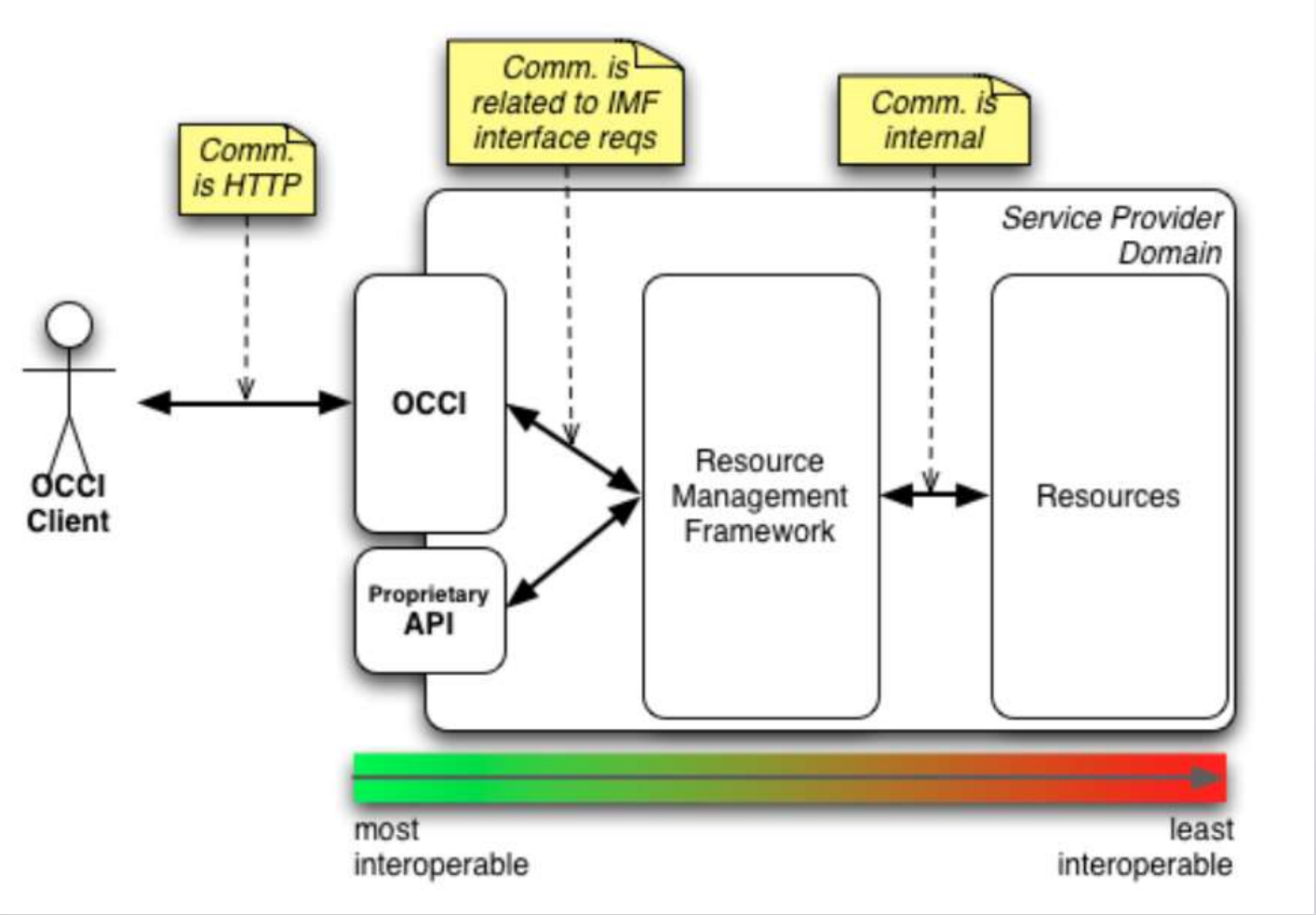
- API / Interoperability
- Offloading / Cloud Bursting
- Design Patterns
- Redundancy / High Available Configurations
- Fault Tolerant Configurations
- Vertical Scaling / Horizontal Scaling
- Network and Security
- Automation and Orchestration
- Data Protection
- Placement / Scheduling
- Migration
- Power Management
- User / Tenant / Identity Management

استانداردهای ارایه سرویس زیرساخت

- **OCCI** : Open Cloud Computing Interface
- **CDMI**: Cloud Data Management Interface
- **OVF**: Open Virtualization Format



واسط باز سرویس محاسباتی ابری



OCCI API

- Create a VM
- Get a Listing of VMs
- Get an Individual VM's Details
- Execute a Stop Action Upon a VM
- Execute a Start Action Upon a VM
- Create Some a Block Storage Volume
- Show the Volume Details:
- Link and Associate that Volume to the New Instance
- Inspect the Storage Link
- Unlink and disassociate that volume with the new instance
- Delete Storage Volume
- Scale Up a VM
- Scale Down a VM
- Delete a VM
- Update a VM: Change the OS
- Create a Security Group
- List Security Groups
- Create a Security Rule
- List the Associated Rules/Compute Resources to a Group
- Get Security Rule's Details
- Delete a Security Rule
- Delete a Security Group
- Create a Secured VM with a Security Group
- Allocate Floating IP to VM
- Deallocate Floating IP to VM
- Change VM Administrative (root) Password
- Create a Image from an Active VM

CDMI

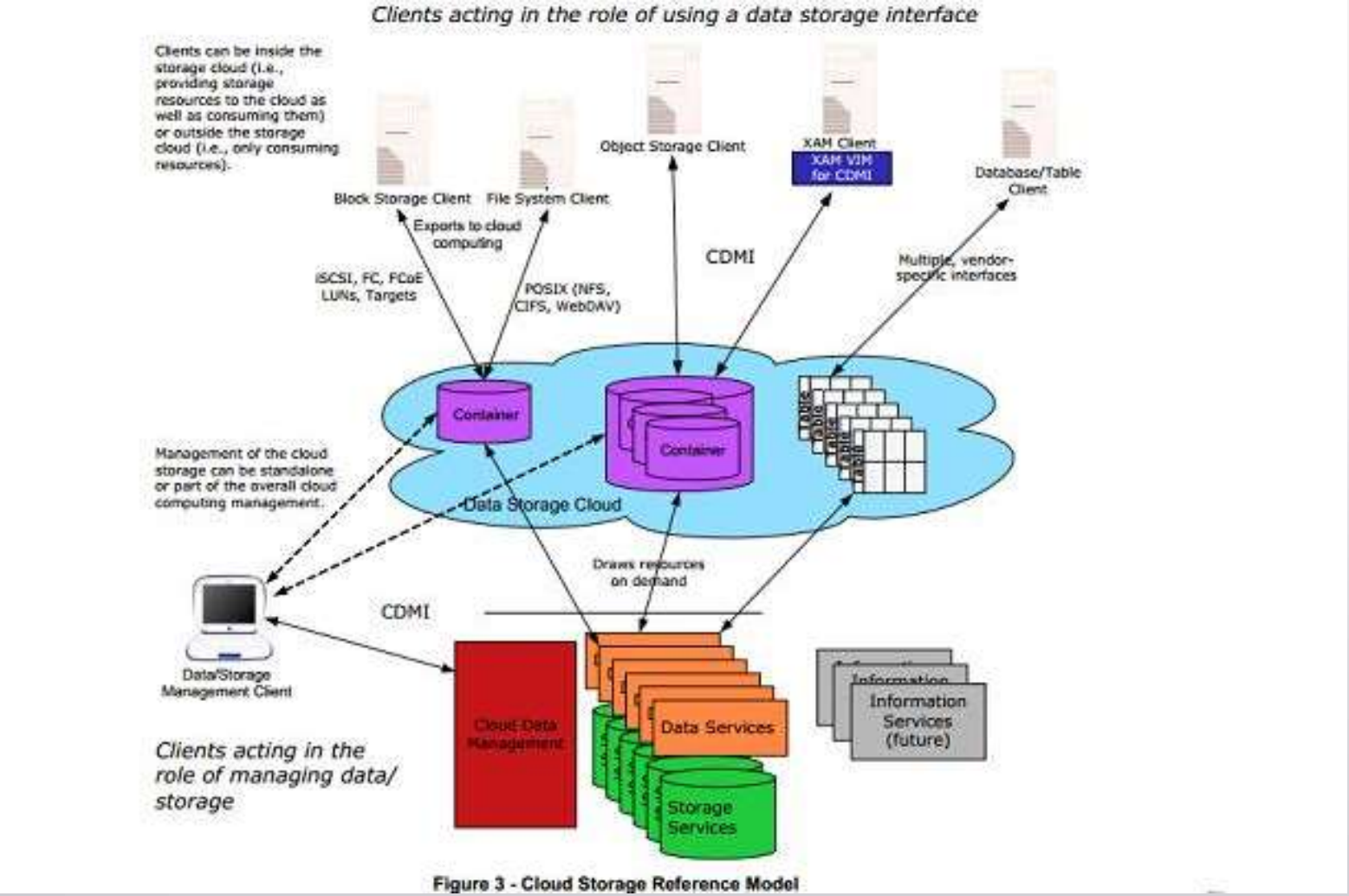


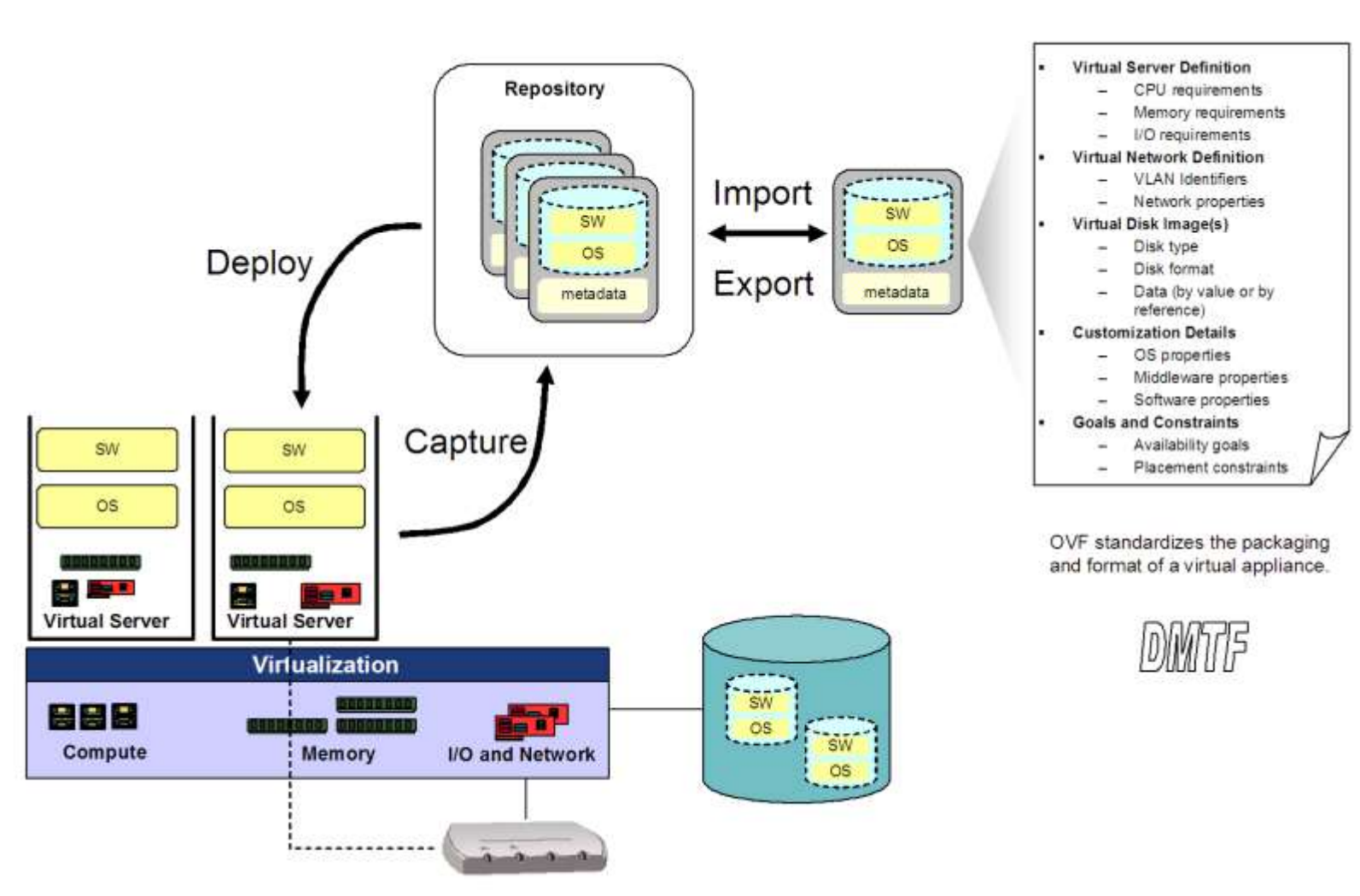
Figure 3 - Cloud Storage Reference Model

CDMI API

- createContainer
- createObject
- listContainerContents
- readObjectContents
- deleteObject
- …

http://cdmi.sniacloud.com/

OVF

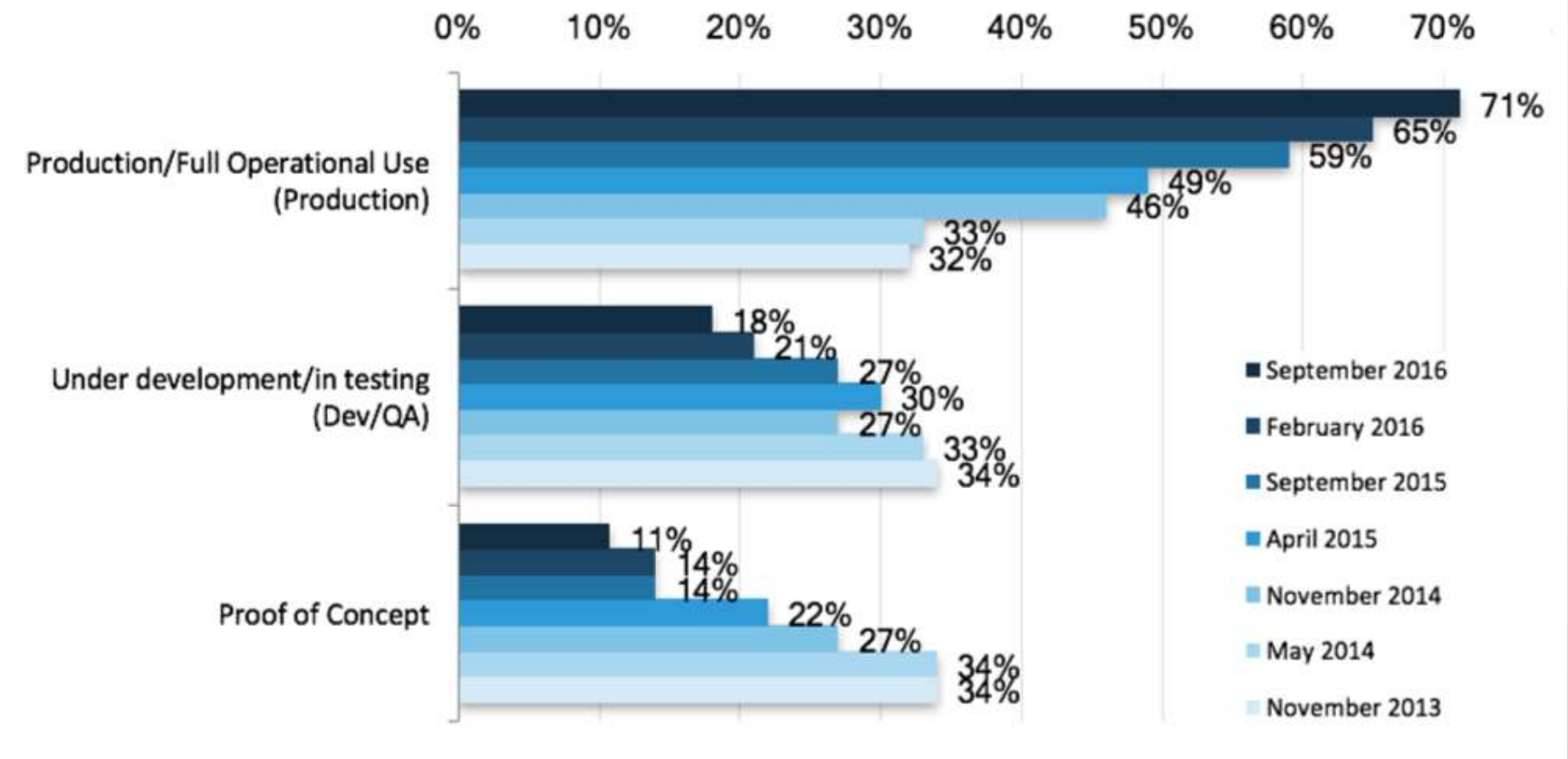

Repository
SW
OS
metadata
Import
Export
SW
OS
metadata
Deploy
Capture
SW
OS
Virtual Server
SW
OS
Virtual Server
Virtualization
Compute
Memory
I/O and Network
SW
OS
SW
OS
Virtual Server Definition
CPU requirements
Memory requirements
I/O requirements
Virtual Network Definition
VLAN Identifiers
Network properties
Virtual Disk Image(s)
Disk type
Disk format
Data (by value or by reference)
Customization Details
OS properties
Middleware properties
Software properties
Goals and Constraints
Availability goals
Placement constraints
OVF standardizes the packaging and format of a virtual appliance.
DMTF

Exercise 7

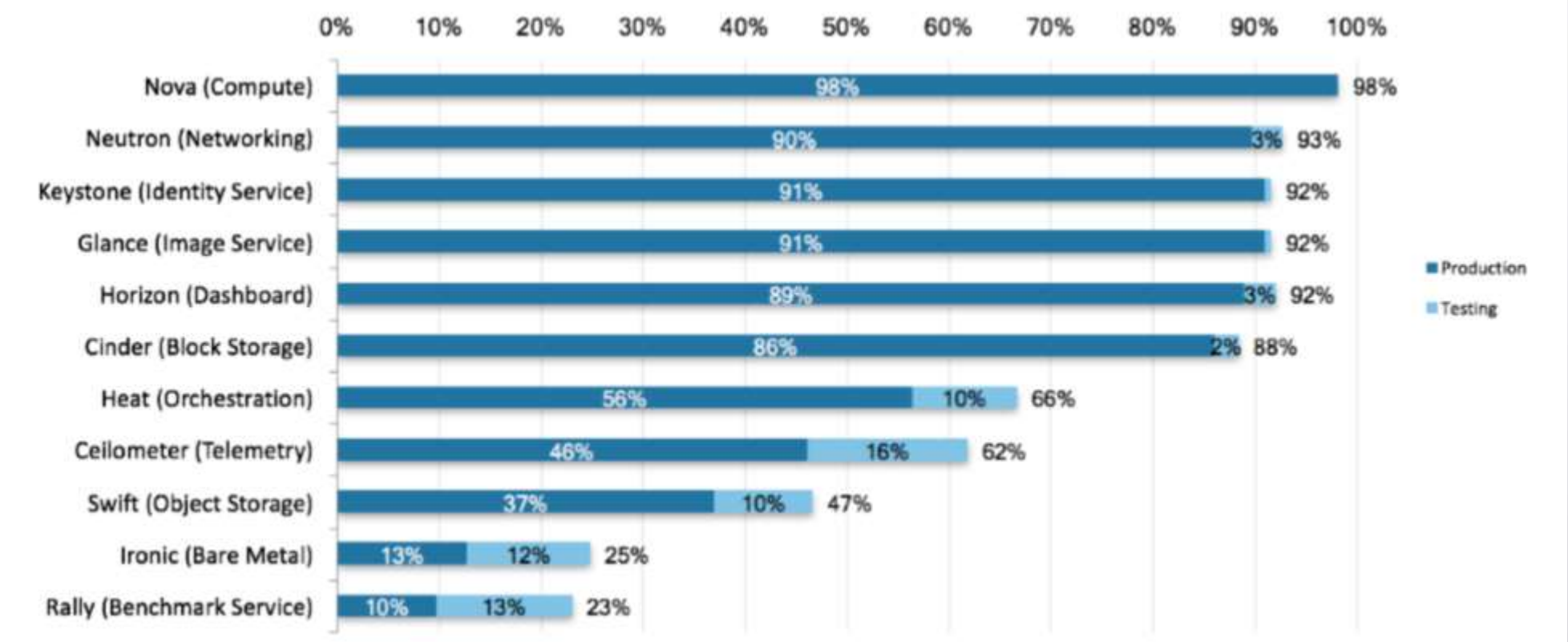
- Survey one of Openstack related projects:
  - Ironic
  - Fuel
  - Barbiacan
  - Dragonflow
  - Manila
  - Oslo
  - …
- Hint: Stackalytics.com

با تشکر از توجه شما

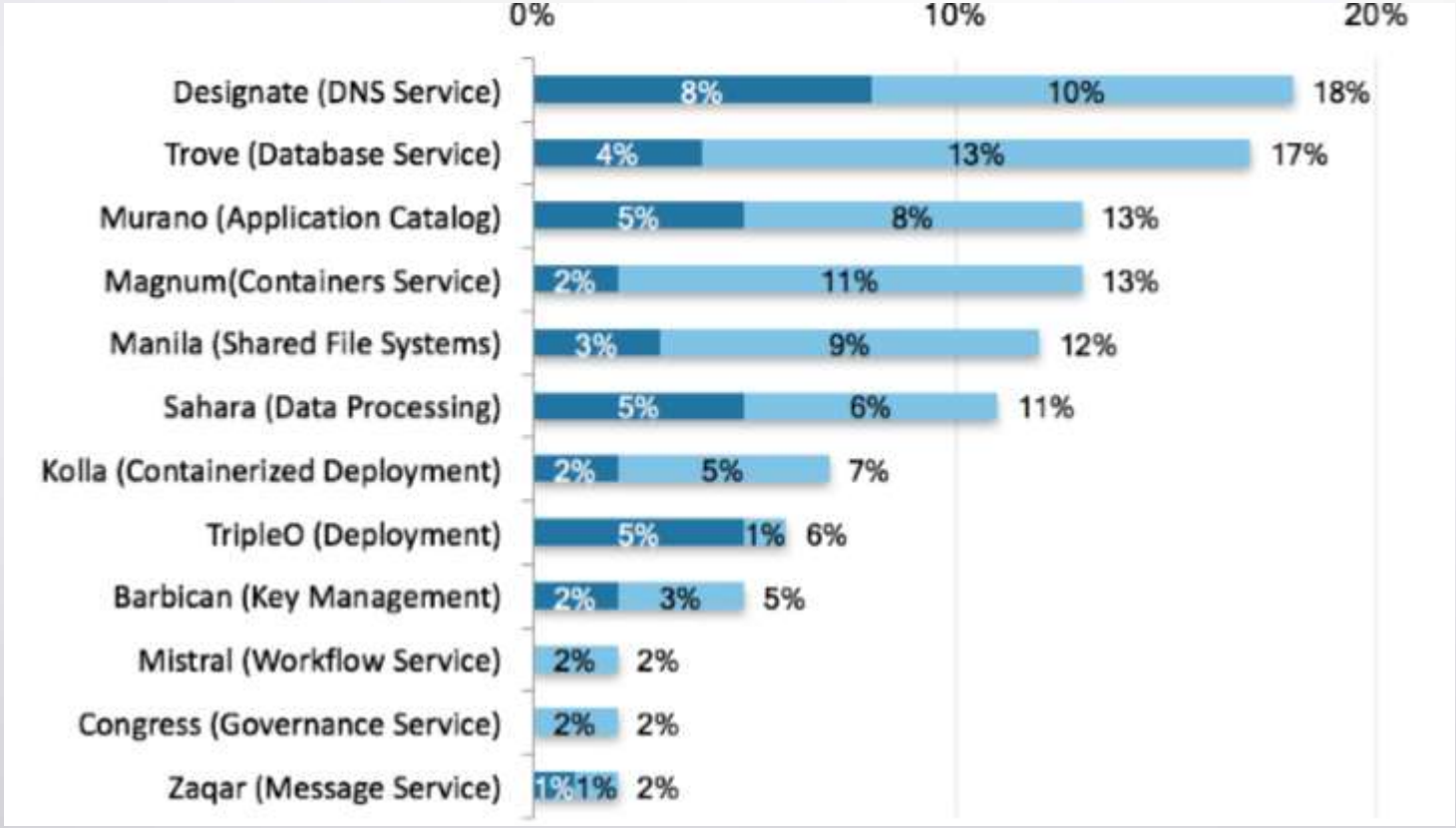
Openstack Deployments



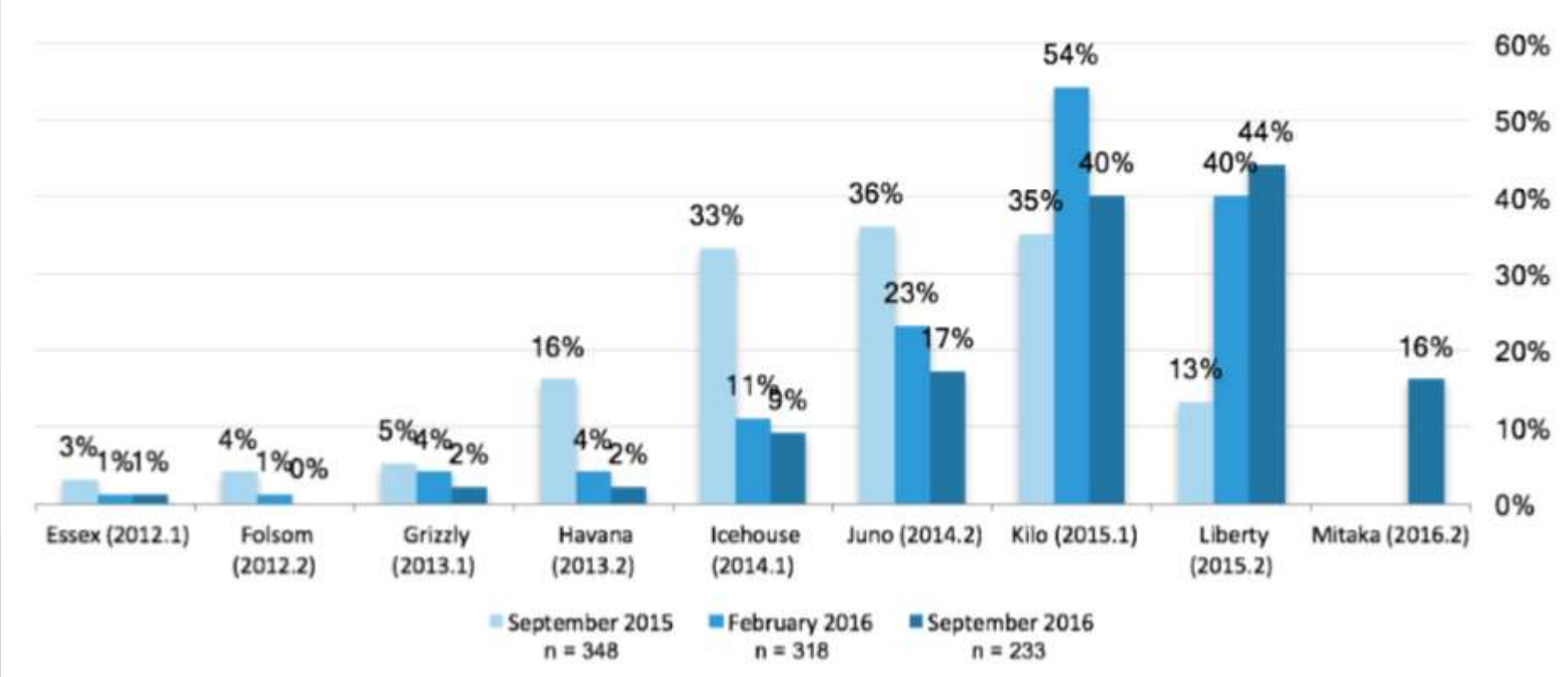
Openstack Deployments - Project adoption



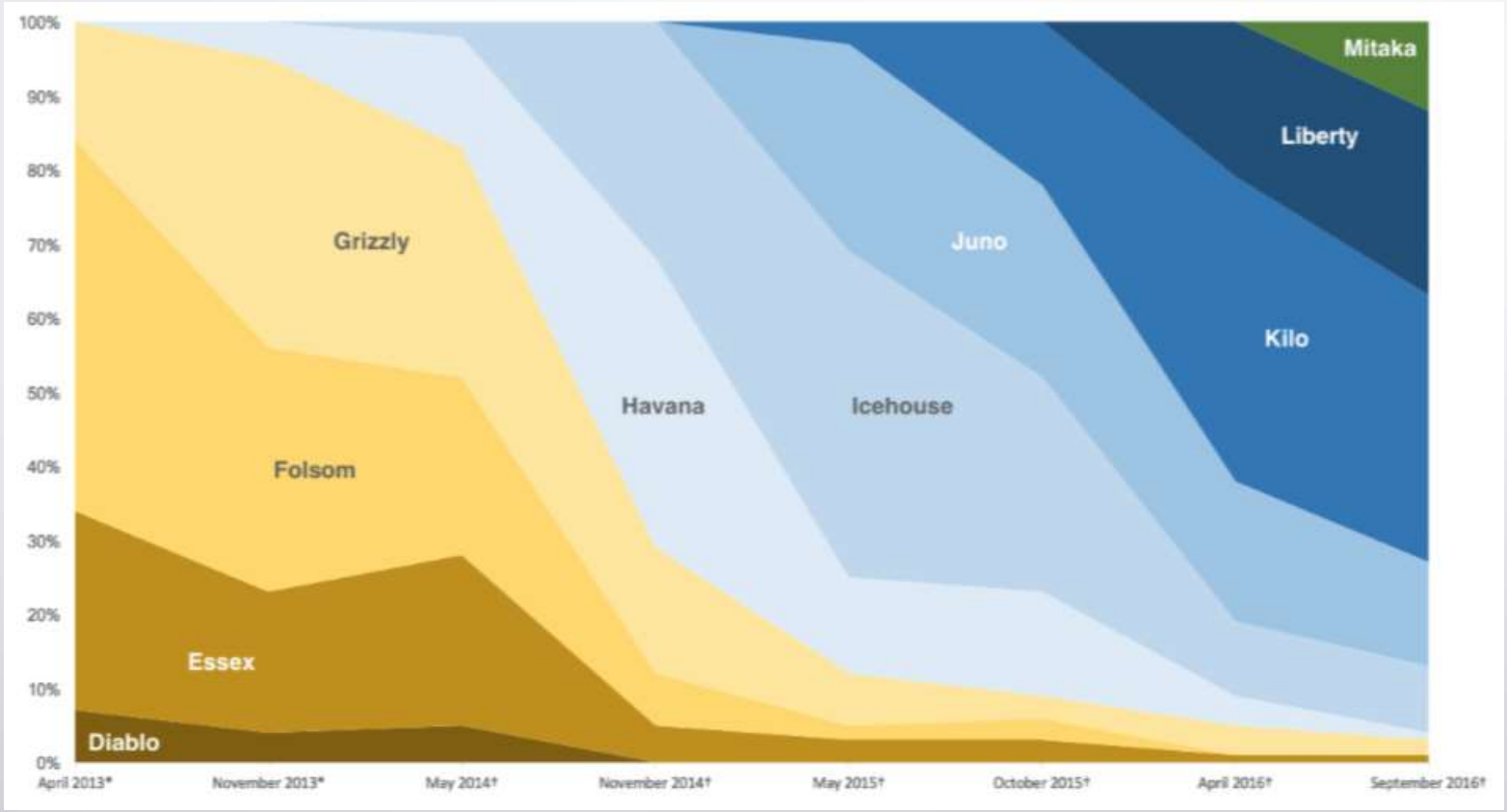
Openstack Deployments - Project adoption



Openstack Deployments – Software Releases



Adoption of OpenStack's software releases over time



Organizations of all sizes finding success with OpenStack