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OpenStack in Solaris 11.2
OS-Technologien für Clouds

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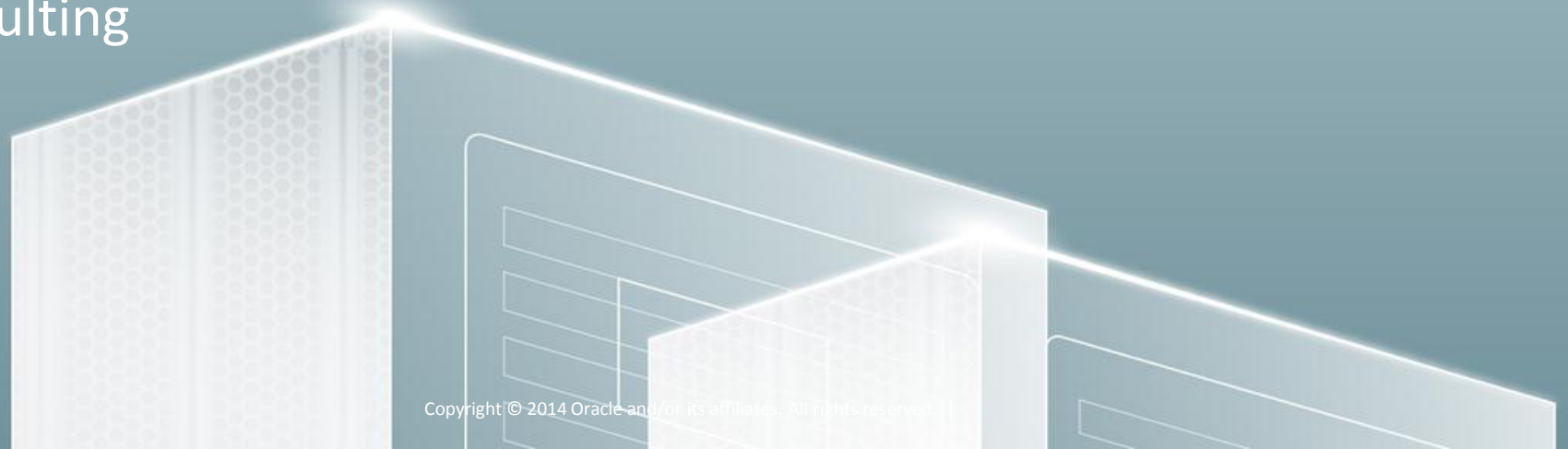
Chief Technologist
Oracle Systems Sales Consulting
Europe North



Evolution of Datacenters

Computing

Storage

Networking

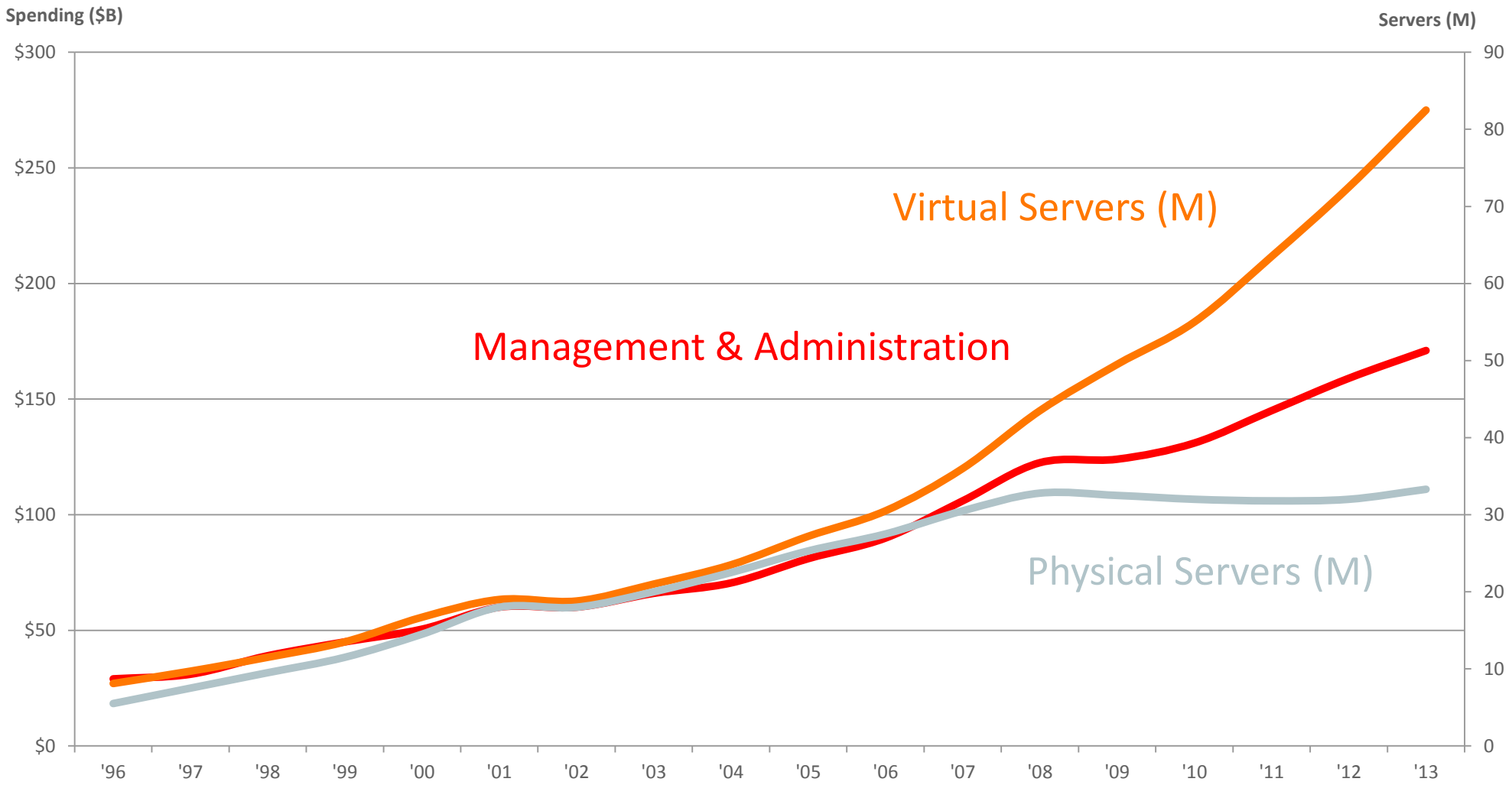
Evolution of Datacenters ... Virtualization

More Computing

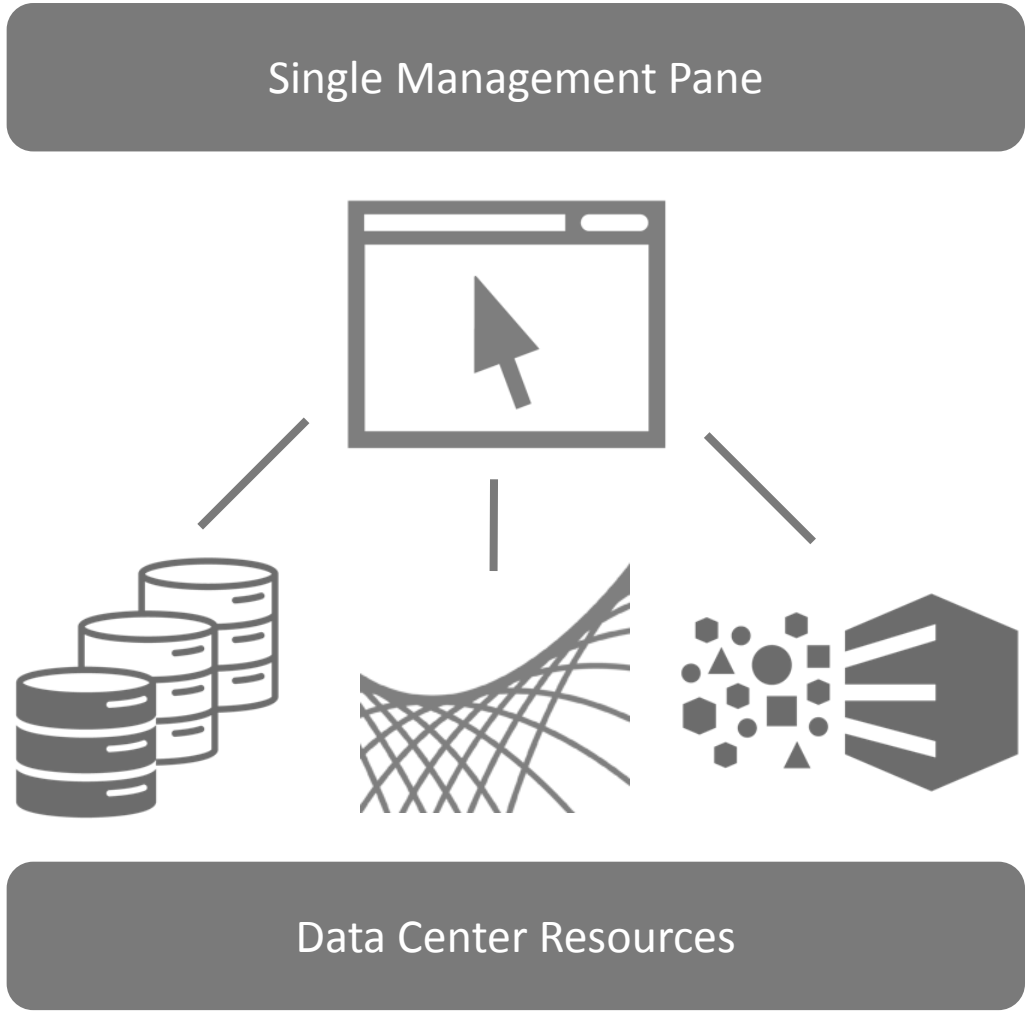
More Storage

More Networking

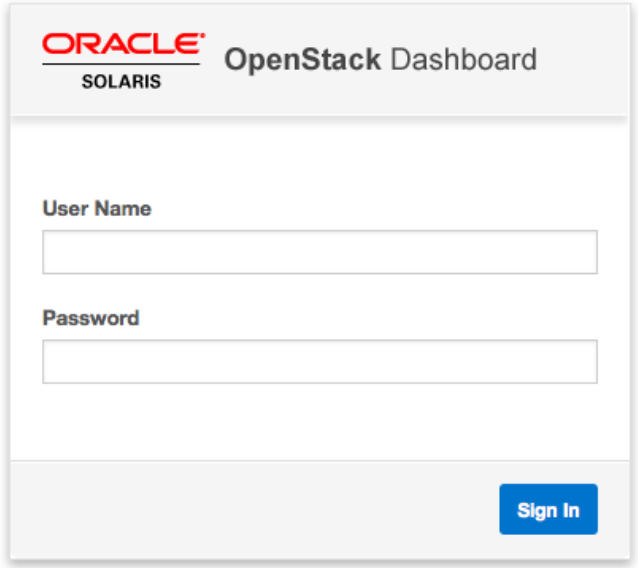
Virtualization Drives Management Costs



OpenStack - A Quick View



openstack™
CLOUD SOFTWARE



ORACLE SOLARIS OpenStack Dashboard

Logged in as: glfoste | Settings | Help | Sign Out

Project

CURRENT PROJECT
sct

Manage Compute
- Overview
- Instances
- Volumes
- Images & Snapshots
- Access & Security

Manage Network
- Network Topology
- Networks
- Routers

Object Store
- Containers

Overview

Limit Summary

Instances
Used 11 of 60

VCPUs
Used 61 of 200

RAM
Used 63.0 GB of 4.9 TB

Floating IPs
Used 56 of 60

Security Groups
Used 0 of 10

Select a period of time to query its usage:

From: 2014-07-01 To: 2014-07-18 Submit The date should be in YYYY-mm-dd format.

Active Instances: 11 **Active RAM:** 63GB **This Period's VCPU-Hours:** 75.62 **This Period's GB-Hours:** 1718.53

Download CSV Summary

Instance Name	VCPUs	Disk	RAM	Uptime
dminer-x86-1	1	10	2GB	2 weeks
esaxe-kzt-1	1	10	2GB	1 week, 2 days
ssdickso-x86-kz-1	4	20	4GB	1 week, 2 days
esaxe_ngz_1	1	10	2GB	1 week, 2 days
ssdickso-x86-ngz-1	4	20	3GB	1 week, 2 days

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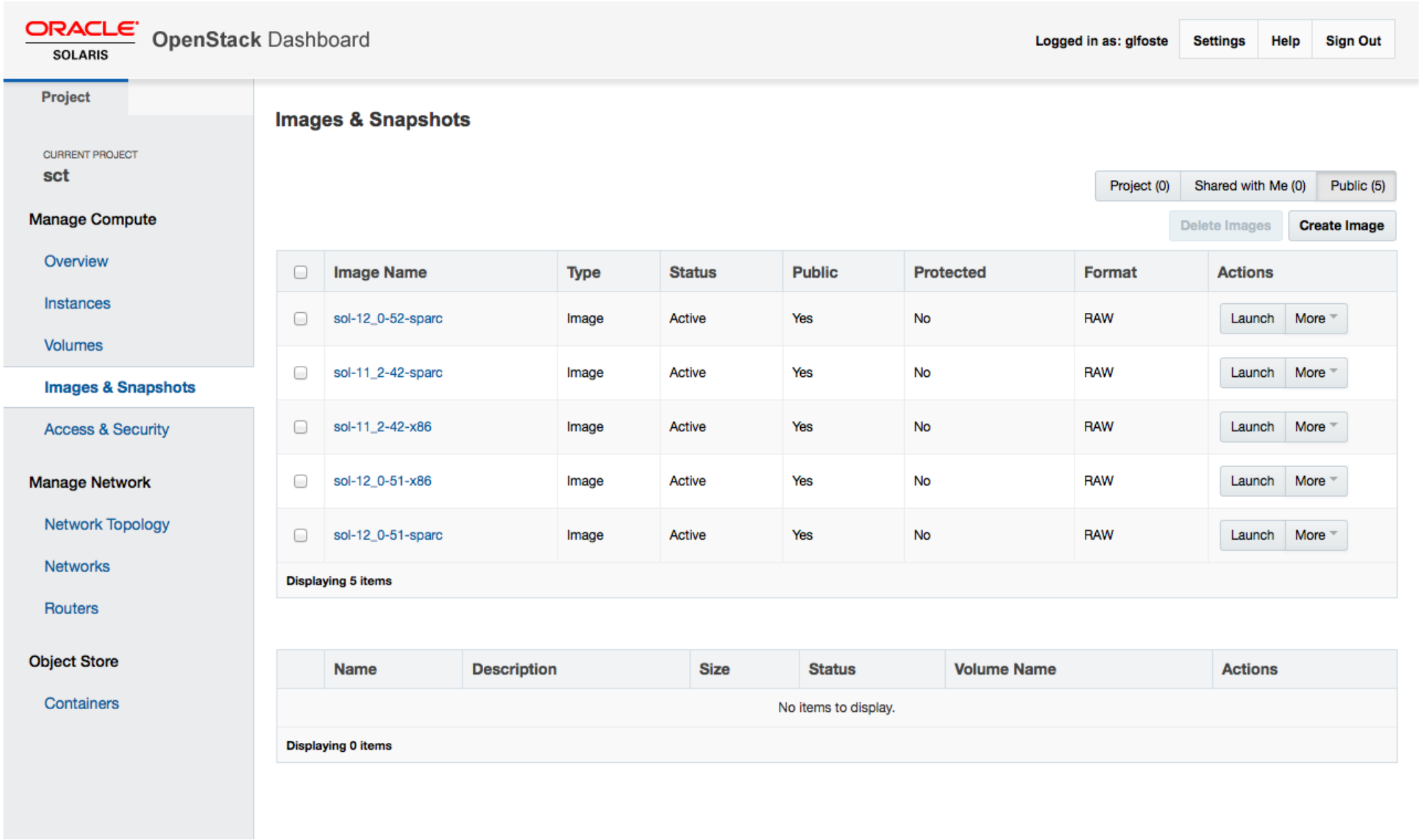
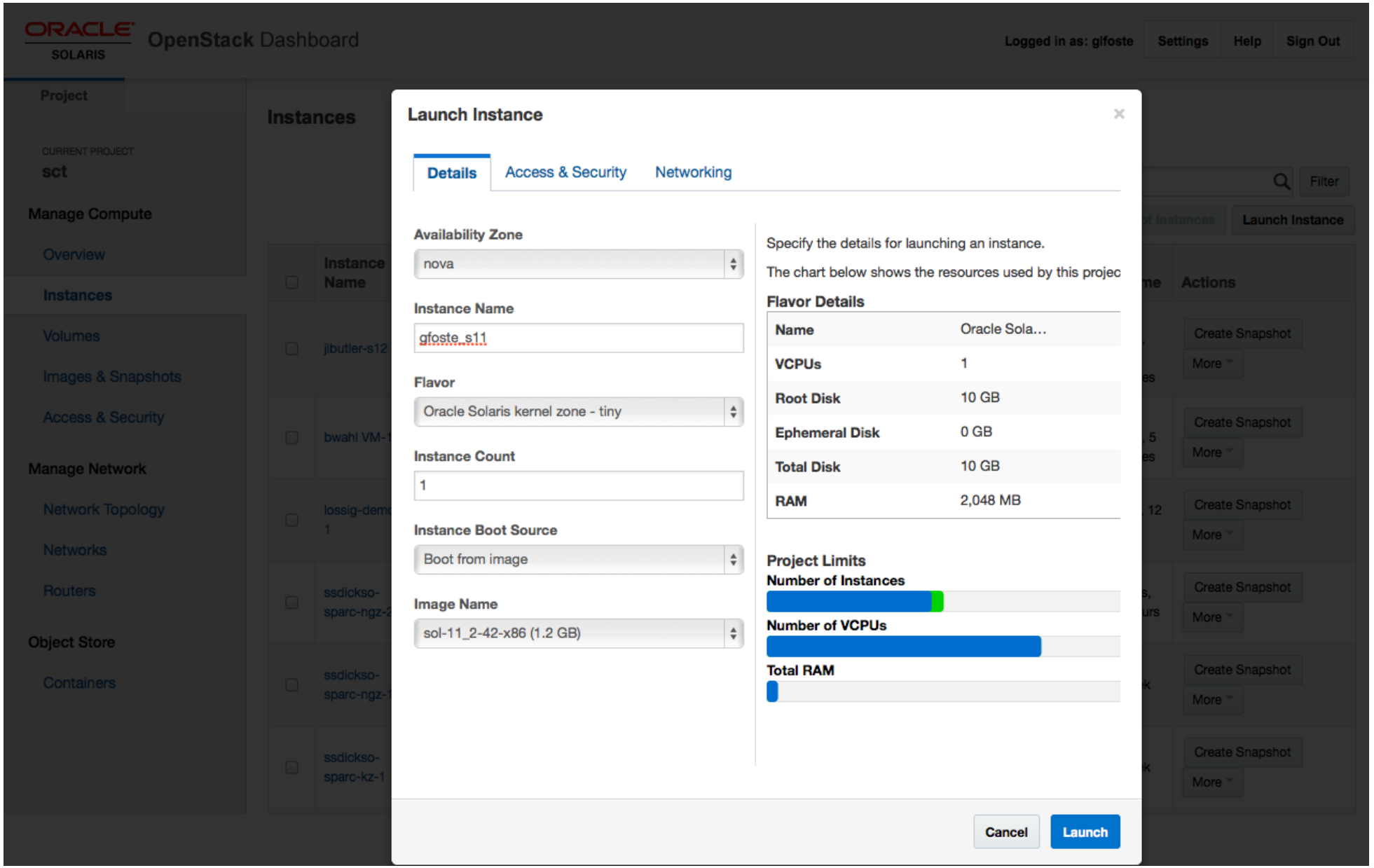
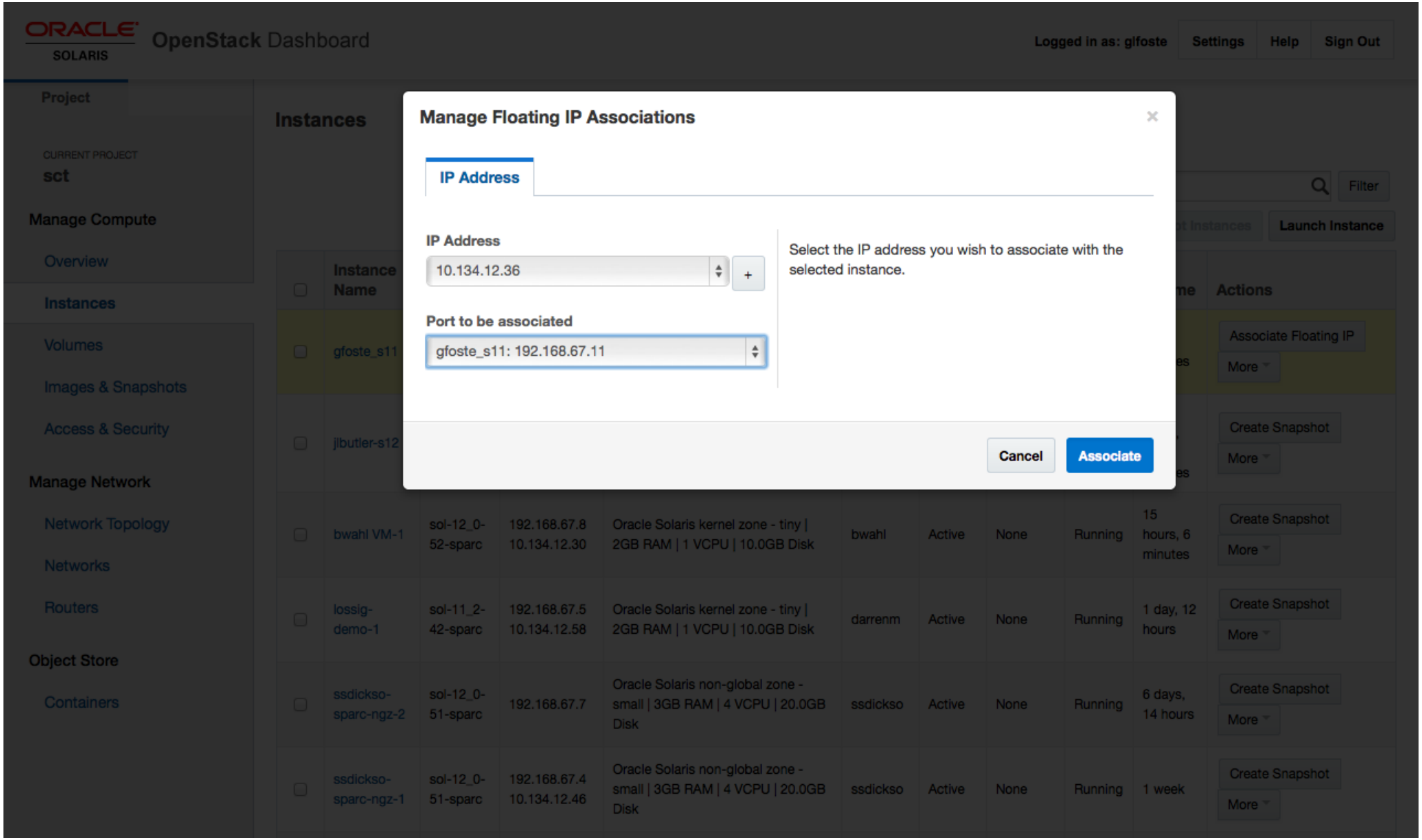


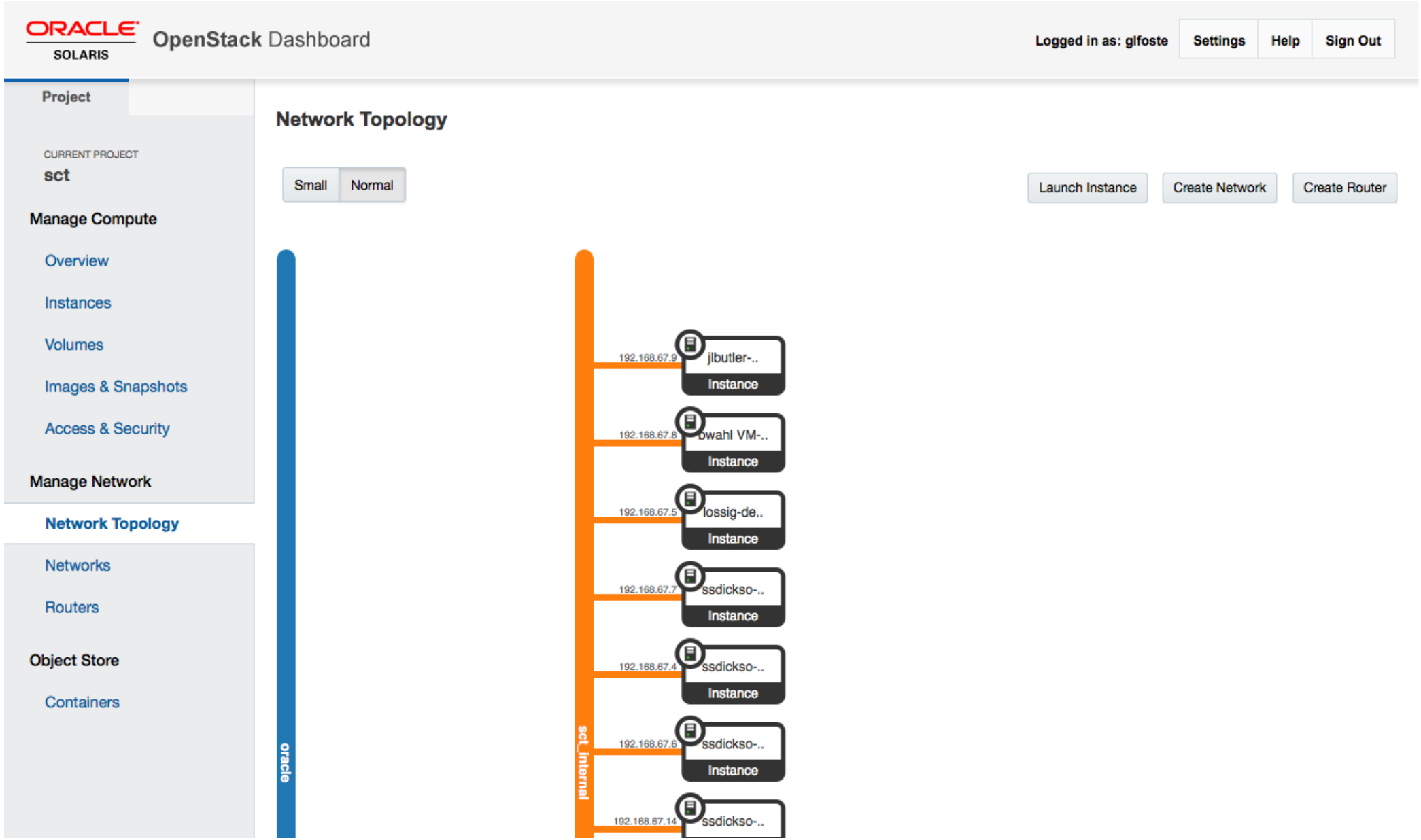




Filter Filter

Terminate Instances | Soft Reboot Instances | Launch Instance

Instance Name	Image Name	IP Address	Size	Keypair	Status	Task	Power State	Uptime	Actions
gfoste_s11	sol-11_2-42-x86	192.168.67.11	Oracle Solaris kernel zone - tiny | 2GB RAM | 1 VCPU | 10.0GB Disk	-	Active	None	Running	3 minutes	Create Snapshot More



What is OpenStack?

Open source software for managing private and public clouds

- A set of distributed services which control compute, storage, network, identity management, orchestration, and much more
  - Open source
    - Governed by Apache 2.0 License
  - Driven by a global community
  - 6 month release cycle
- Initial focus on Iaas, evolving into PaaS and SaaS
- Single management dashboard
- Open standardized API's

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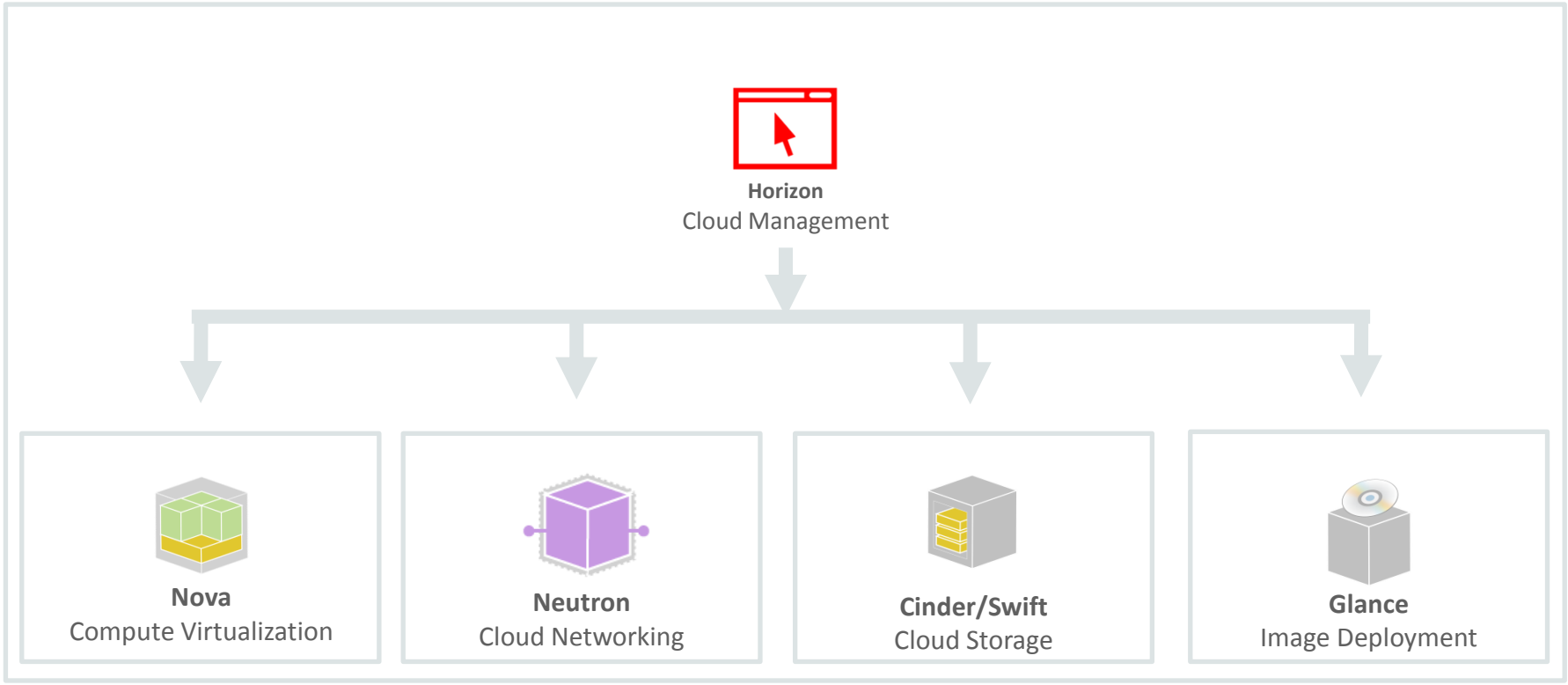
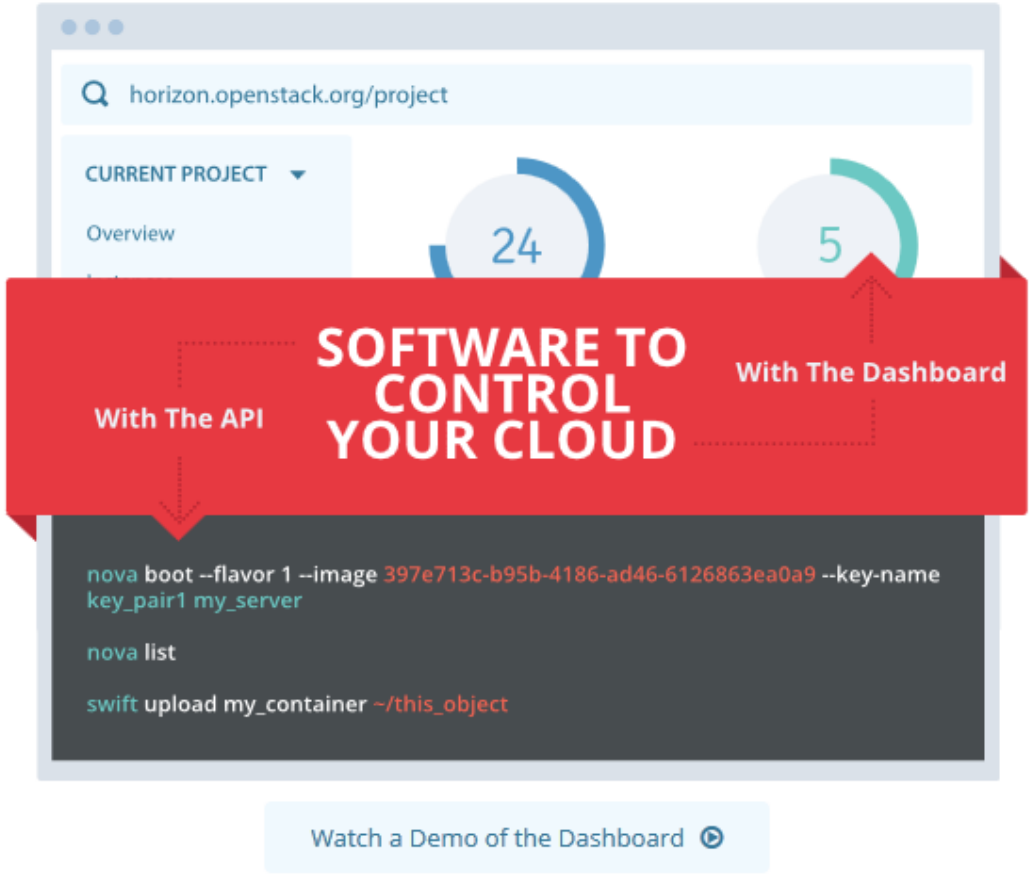
OpenStack Simplified



OpenStack - Modular Architecture

- Web portal / dashboard for cloud admins and self-service users
- Cloud services exposed through APIs
- CLI, Python libraries, ...
- Interoperating services with REST APIs



www.openstack.org

OpenStack API

RESTful API - http://docs.openstack.org/api

REpresentational State Transfer

Table 2.1. Response formats

Format	Accept Header	Query Extension	Default
JSON	application/json	.json	Yes
XML	application/xml	.xml	No

* XML support is now deprecated

Example 2.1. Request with headers: Get volume types

```
GET /v2/441446/types HTTP/1.1
Host: dfw.blockstorage.api.openstackcloud.com
X-Auth-Token: eaaafd18-0fed-4b3a-81b4-663c99ec1cbb
Accept: application/xml
```

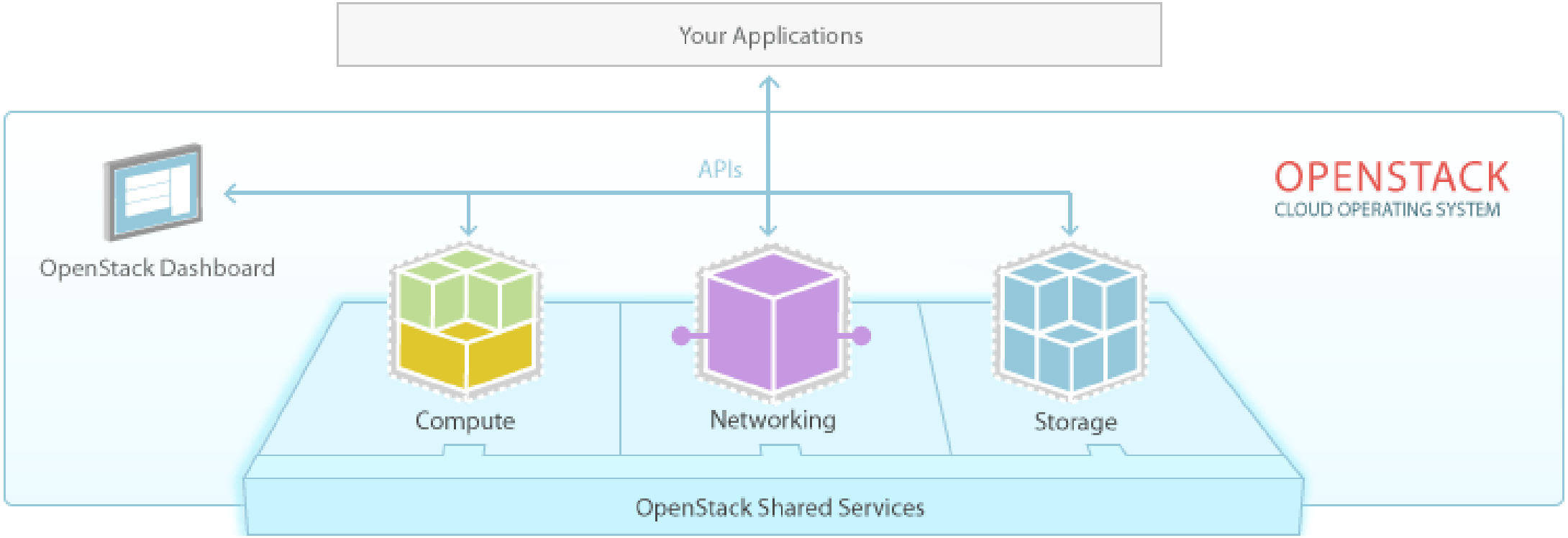
An XML response format is returned:

Example 2.2. Response with headers

```
HTTP/1.1 200 OK
Date: Fri, 20 Jul 2012 20:32:13 GMT
Content-Length: 187
Content-Type: application/xml
X-Compute-Request-Id: req-8e0295cd-a283-46e4-96da-cae05cbfd1c7

<?xml version='1.0' encoding='UTF-7'?>
  <volume_types>
      <volume_type id="1" name="SATA">
          <extra_specs/>
      </volume_type>
      <volume_type id="2" name="SSD">
          <extra_specs/>
      </volume_type>
  </volume_types>
```

OpenStack - Open APIs for Cloud Services



OpenStack History

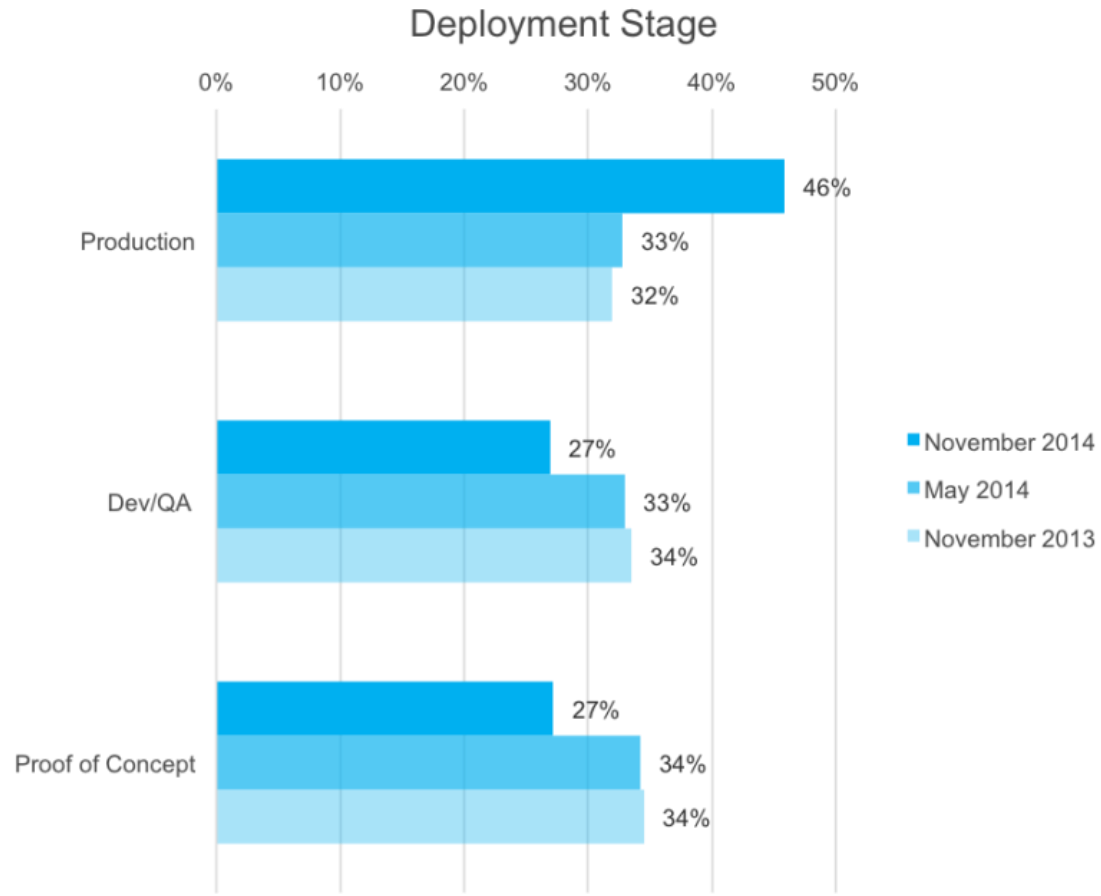
- Joint project launched by RackSpace and NASA in July 2010
- Evolved to non-profit corporate entity in September 2012
  - Kick-off Design Summit in Austin, TX: 2010
    - 25+ Companies, 100+ Advisors, Developers, and Founding Members
- Grown to 300+ Companies and Organizations
  - Oracle joined in December 2013 as Corporate Sponsor
  - Oracle Sponsors OpenStack Foundation;
    Offers Customers Ability to Use OpenStack
    to Manage Oracle Cloud Products and Services
    - http://www.oracle.com/us/corporate/press/2079843
- 2014: 4.500 attendees at OpenStack Summit in Atlanta, 4.600 in Paris
  May 18-22, 2015 in Vancouver

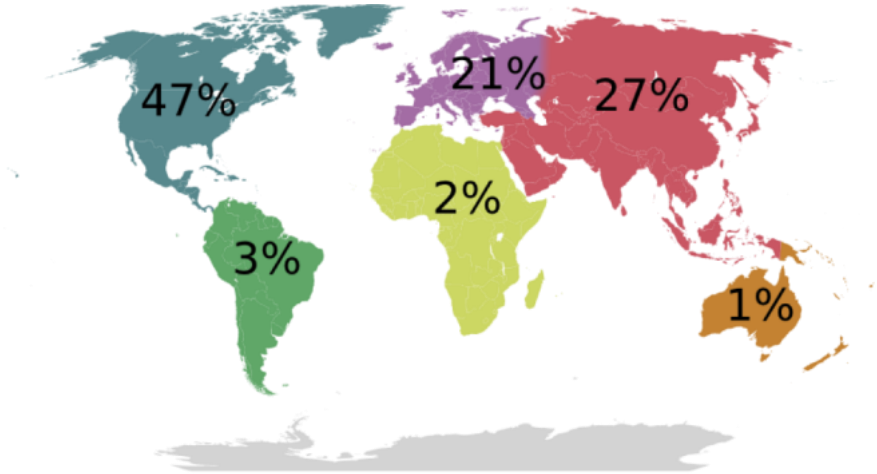
OpenStack Deployment Survey

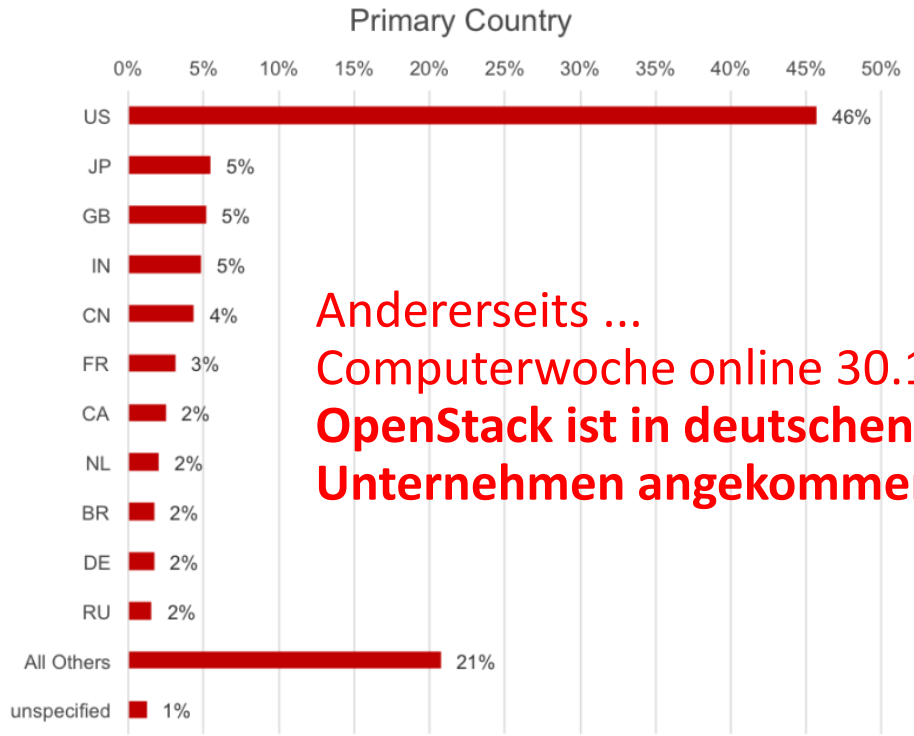
Paris Summit, November 2014

1500 responses, 740 unique deployments

http://superuser.openstack.org/articles/openstack-user-survey-insights-november-2014



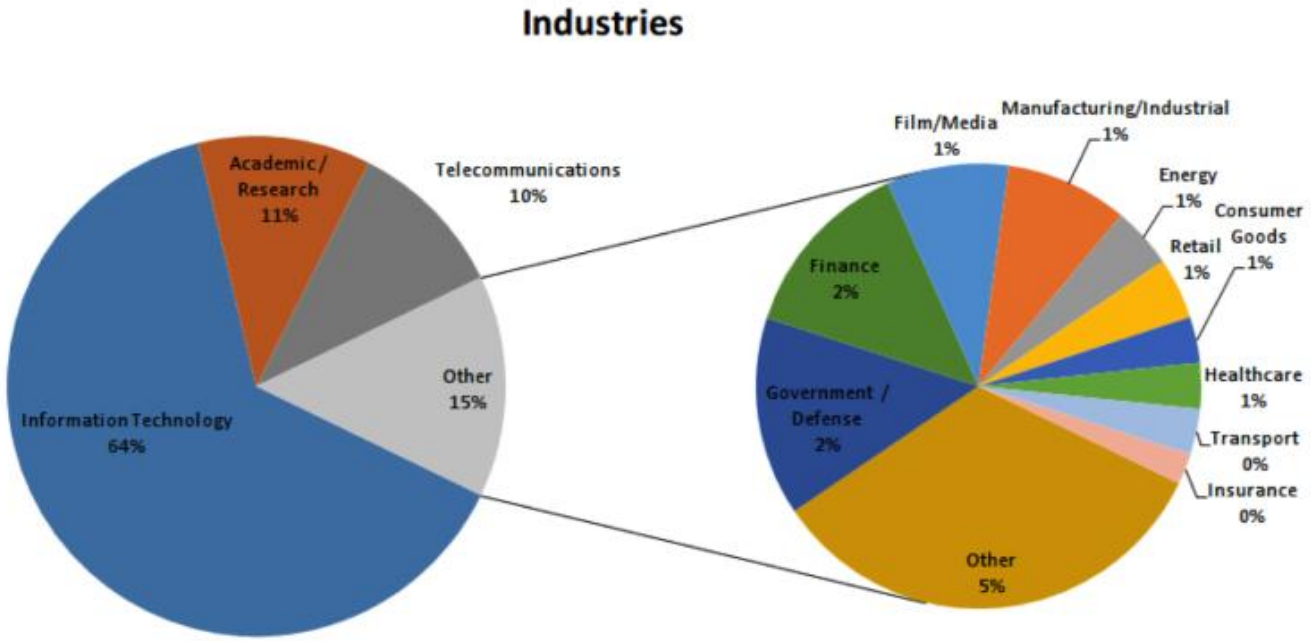




Andererseits ...
Computerwoche online 30.10.2014
OpenStack ist in deutschen Unternehmen angekommen

https://www.openstack.org/user-survey

OpenStack Deployments and Superusers



OpenStack User Survey, November 2014

openstack.org/user-stories

Forbes 2013

TECH 3/26/2013 @ 9:28AM | 61,125 views

Paypal To Drop VMware From 80,000 Servers and Replace It With OpenStack (Updated)

+ Comment Now + Follow Comments

(Update: VMware Loses More Than $2 Billion in Market Cap on PayPal / Ebay Rumors)

InformationWeek NETWORKComputing

DATA CENTERS

9/20/2013 10:21 PM

PayPal: OpenStack Won't Replace VMware In Data Center

VMware vs. OpenStack won't be an either/or decision for PayPal. It will layer OpenStack on top of existing tech as it moves toward a software-defined data center.

Featured Superusers at OpenStack Summits

Atlanta May 2014:
Wells Fargo, Disney, AT&T, Sony, Digital Film Tree
Paris, November 2014:
BMW, CERN, Expedia, Tapjoy, BBVA Bank

Telcos: NFV – Network Function Virtualization
Telekom Deutschlands Arroach to NFV

CERN: 75.000+ cores, Rackspace: 20.000+ cores
Walmart: 100.000+ cores

Pets versus Cows Service Models

Heavily versus lightly managed workloads

Origins of this paradigm
Are your servers PETS or CATTLE?
http://www.theregister.co.uk/2013/03/18/servers_pets_or_cattle_cern/

Pattern:
Scale-out, not UP

Scale Up: (Virtual*)
Servers are like pets

garfield.company.com

You name them and when they get sick, you nurse them back to health

Scale Out: (Virtual*)
Servers are like cattle

web001.company.com

You number them and when they get sick, you shoot them

attrib: Bill Baker, Distinguished Engineer, Microsoft
* added by yours truly ...
19
cloudscaling

Service Model

- Pets are given names like pussinboots.cern.ch
- They are unique, lovingly hand raised and cared for
- When they get ill, you nurse them back to health

- Cattle are given numbers like vm0042.cern.ch
- They are almost identical to other cattle
- When they get ill, you get another one

- Future application architectures should use Cattle but Pets with strong configuration management are viable and still needed

CERN Data Centre Evolution
http://www.slideshare.net/gmccance/cern-data-centre-evolution

OpenStack Community Releases

5 Years, 12 Releases

Version	Release Date
Austin	October, 2010
Bexar	February, 2011
Cactus	April, 2011
Diablo	September , 2011
Essex	April 2012
Folsom	September, 2012
Grizzly	April, 2013
Havana	Oct, 2013
Icehouse	April, 2014
Juno	Oct 2014
Kilo	April 2015 (Expected)
Liberty	Q4 2015 (Expected)

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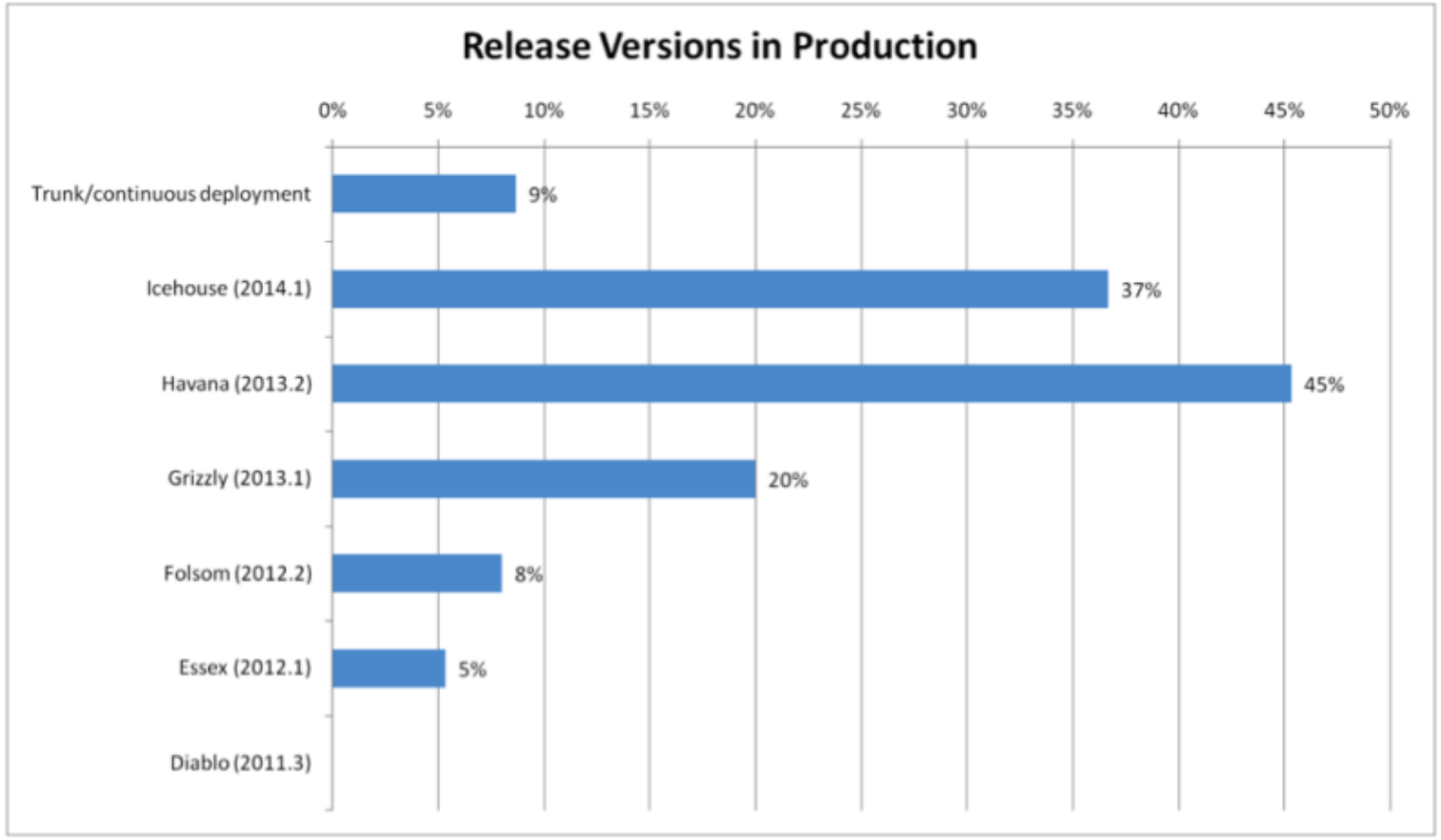
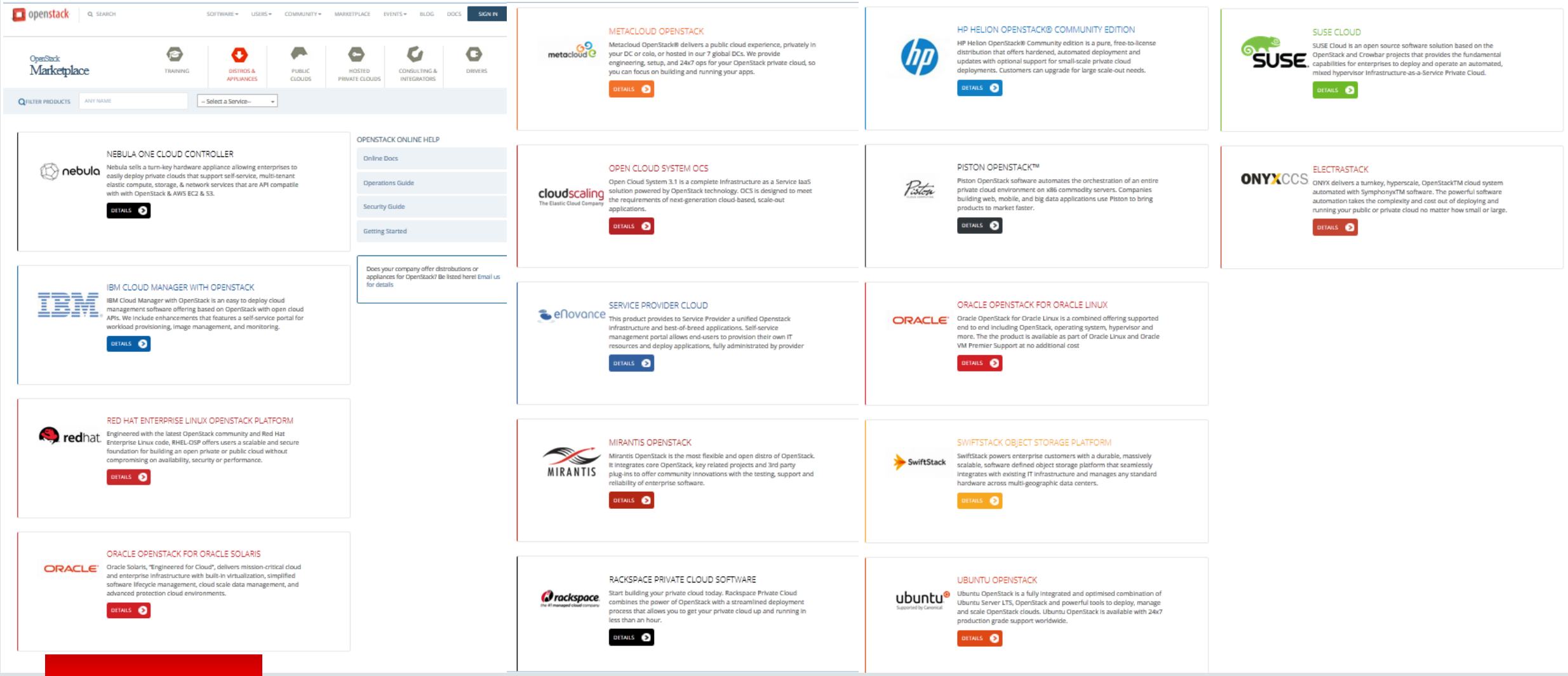
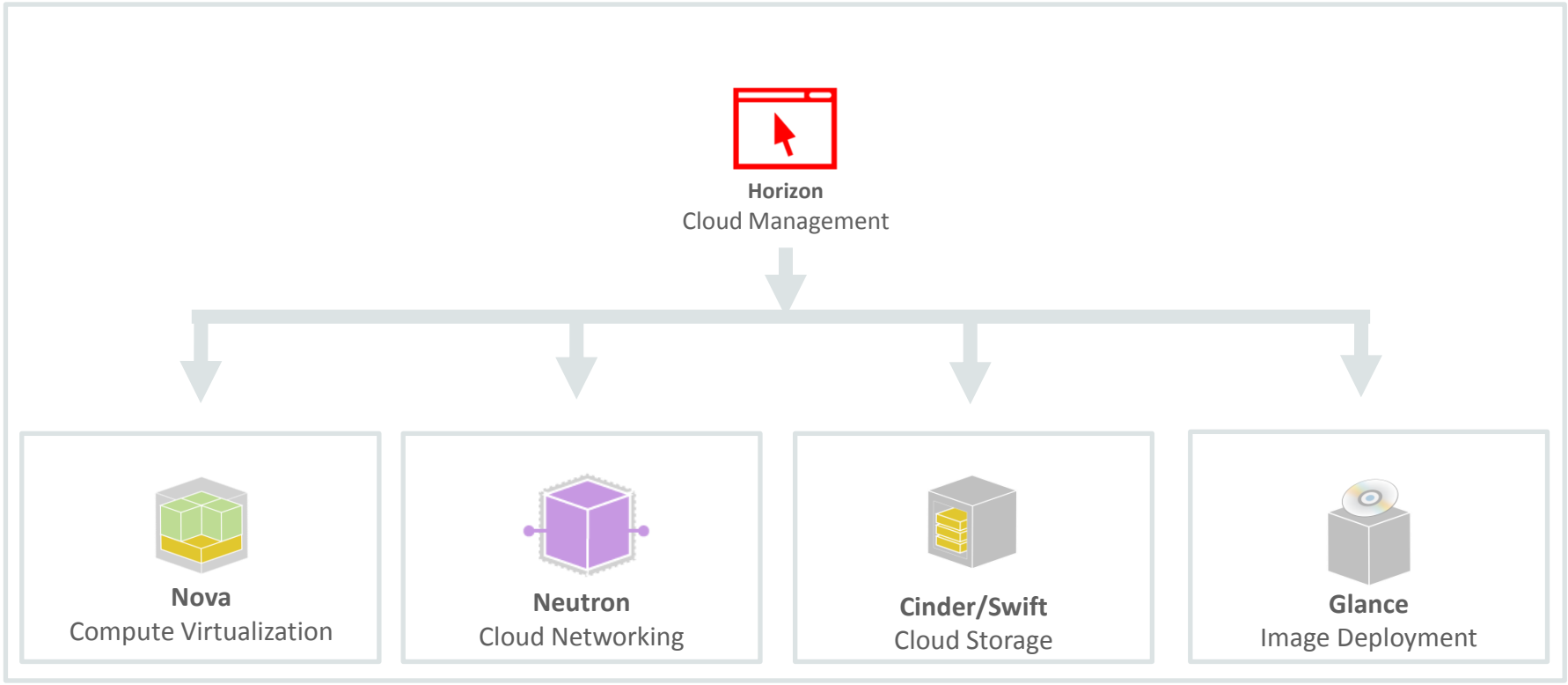


OpenStack Distros

http://www.openstack.org/marketplace/distros



OpenStack Simplified



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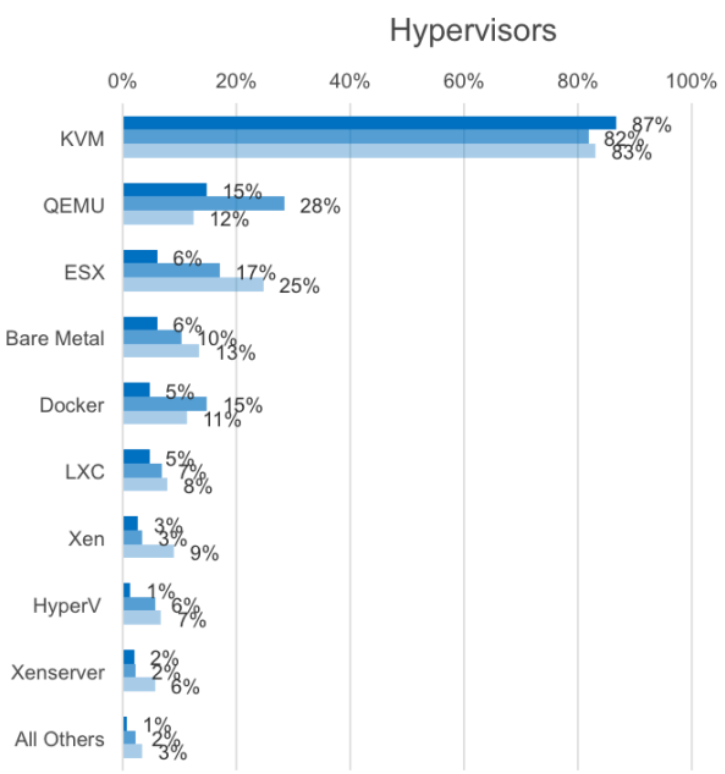
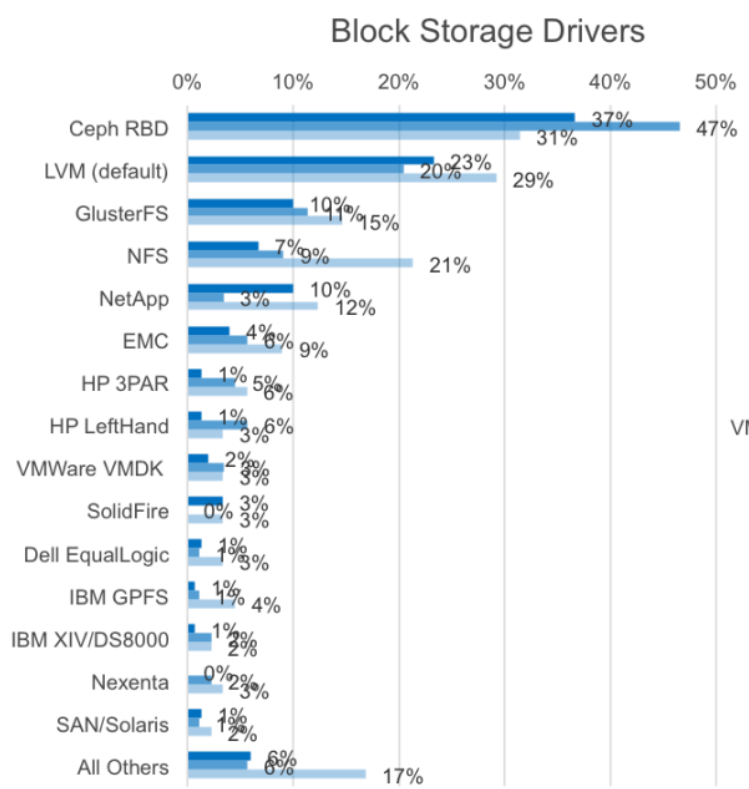
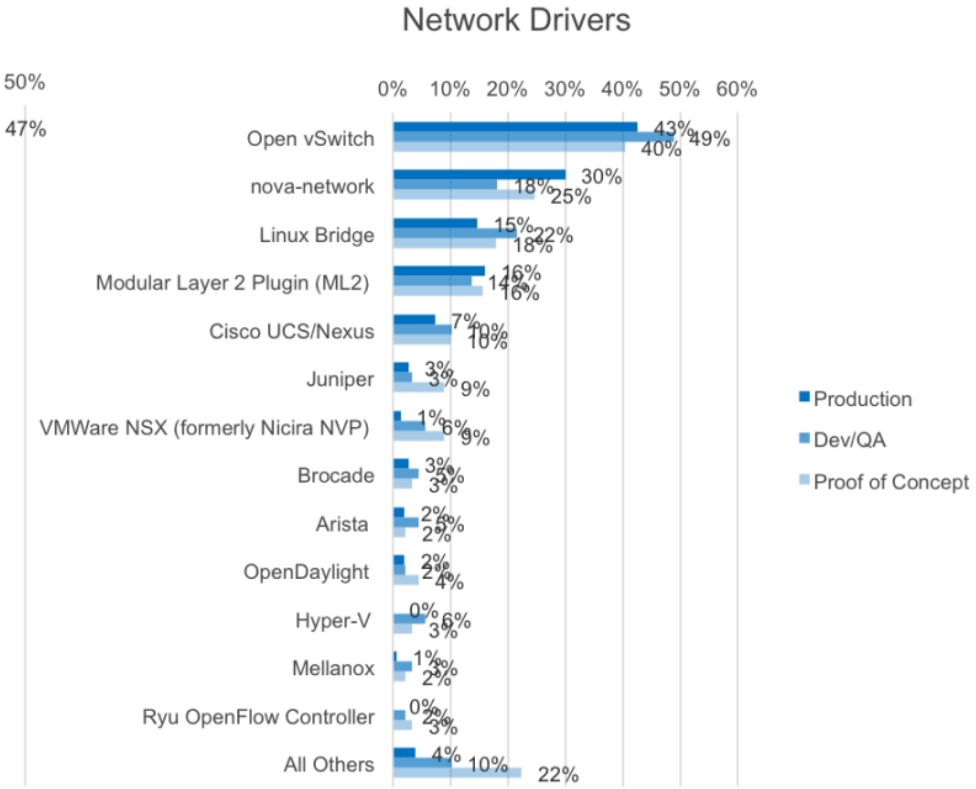
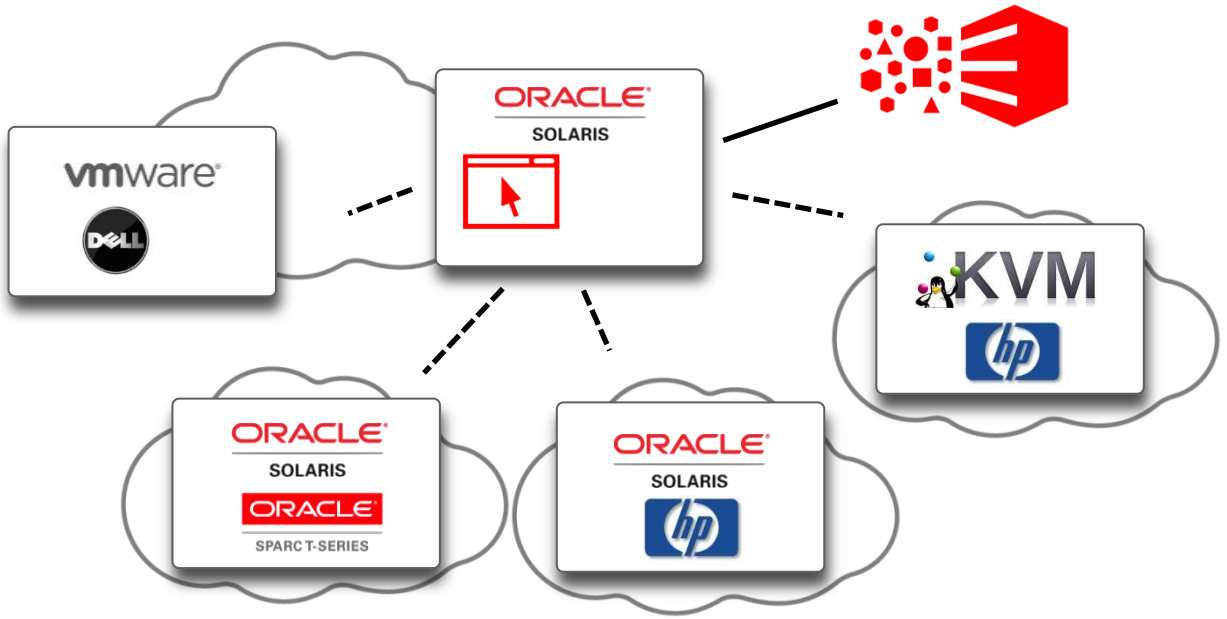




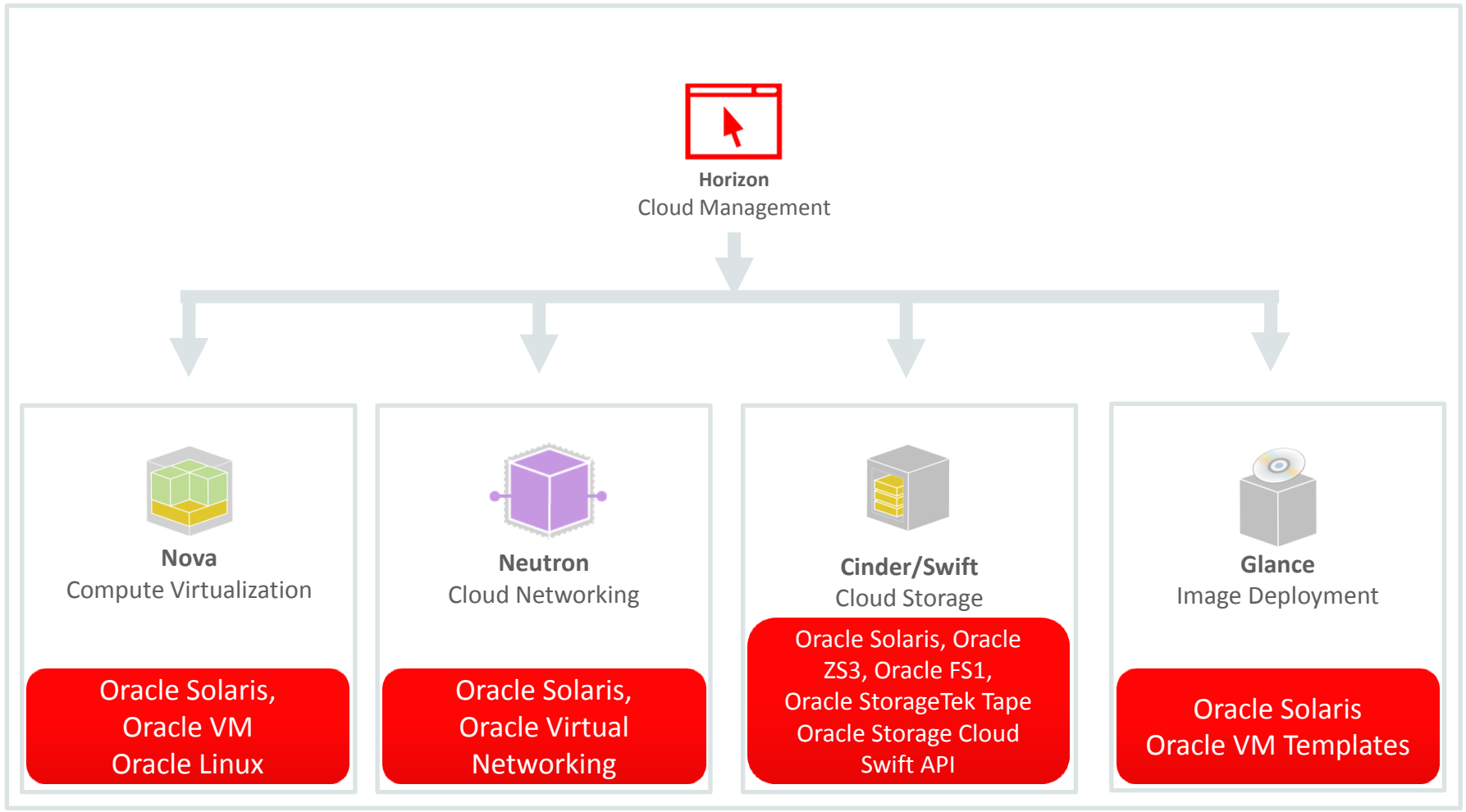


OpenStack Use Cases – Heterogeneous IaaS



Today some caveats e.g. networking

OpenStack Engineering Across Oracle's Portfolio



Oracle Solaris 11.2: Enterprise OpenStack

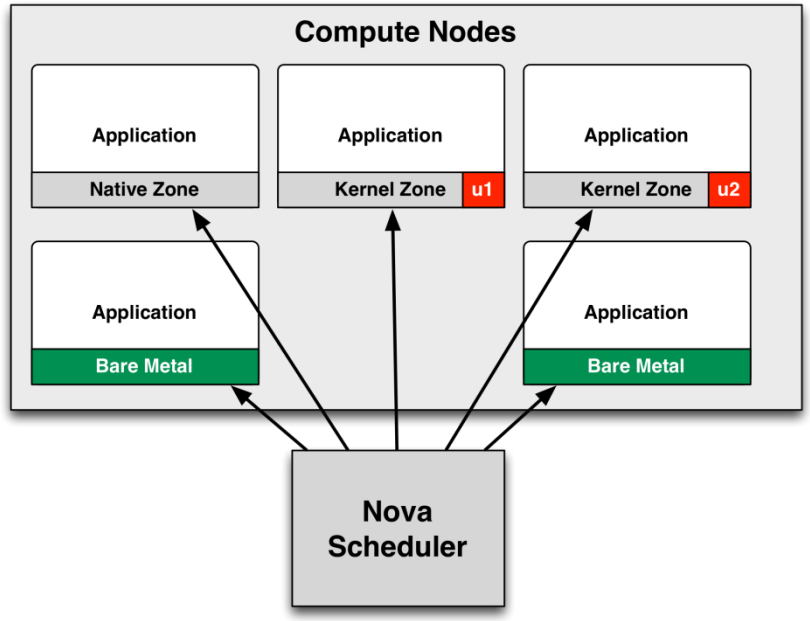
OS. Virtualization. SDN. OpenStack. Complete.

- Complete OpenStack
  - Havana-based
    - Nova, Neutron, Cinder, Swift, Glance, Keystone, Horizon
  - Heat engine with SRU 11.3.4.1
- All integrated into Oracle Solaris 11.2
- Upstream contributions to OpenStack Project
  - https://openstack.java.net/ -> Browse Source

OpenStack Nova Compute – Oracle Solaris Zones

High density virtual environments – ideal for multi-tenant cloud

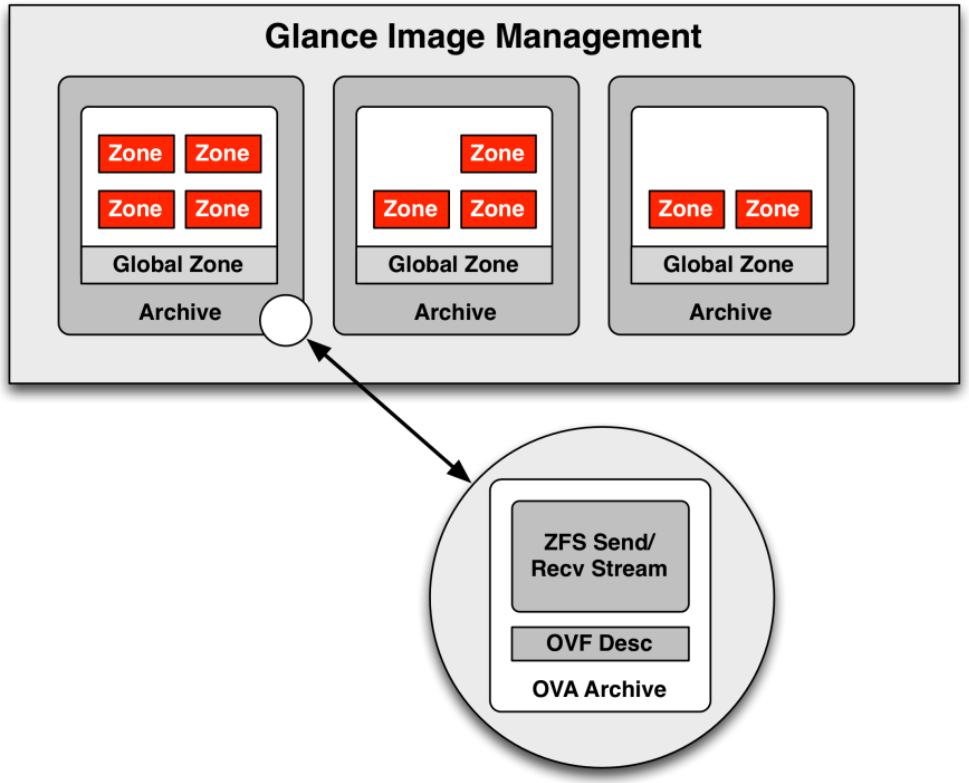
- Provision Native Zones and/or Kernel Zones
  - Independent patching and updating with Oracle Solaris Kernel Zones
  - Same administrative interfaces
- Integrated SDN
- Fully portable with Unified Archives
  - Easy transitioning between Kernel Zones, Native Zones, Oracle VM and bare-metal



OpenStack Glance Image Management – Unified Archives

Rapid deployment through VM templates

- Flexible deployment on bare metal or virtualized
  - Same archive image for both
  - Unified Archives introduced in Solaris 11.2
    - archive formats for cloning and for recovery
    - archiveadm(1M)
- Snapshot a running VM as an image back to Glance to later re-deploy
- Rapid deployment with Automated Installer across all compute nodes



Creating and Importing an Unified Archive into Glance

- global# **zonecfg -z myzone create**
  global# **zoneadm -z myzone install**
  global# **…**
  global# **archiveadm create -z myzone /var/tmp/myzone.uar**
  global# **glance image-create --container-format bare --disk-format raw **
  **--is-public true --name "Oracle Solaris 11.2 x86 NGZ" **
  **--property architecture=x86_64 **
  **--property hypervisor_type=solariszones **
  --property vm_mode=solariszones < /var/tmp/myzone.uar

OpenStack Nova Flavor

extra_spec zonecfg:brand

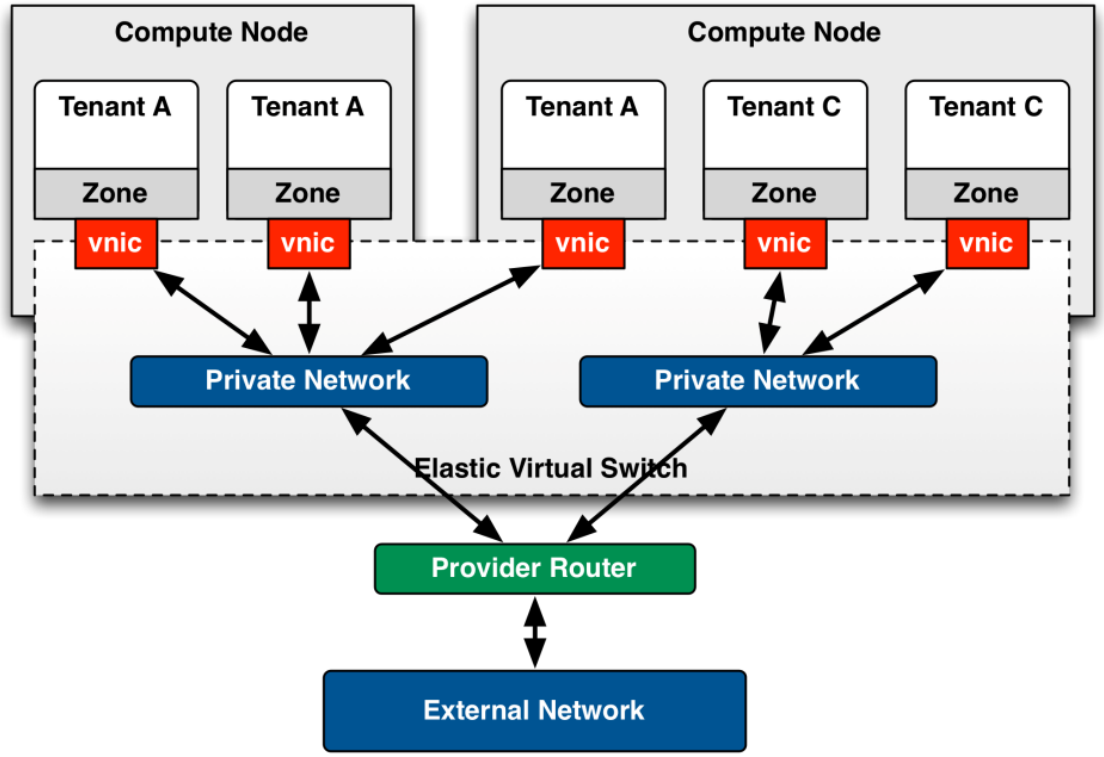
```
$ nova flavor-list
+----+------------------------------+-----------+------+-----------+------+-------+
| ID | Name                         | Memory_MB | Disk | Ephemeral | Swap | VCPUs |
+----+------------------------------+-----------+------+-----------+------+-------+
| 1  | Oracle Solaris               |           |      |           |      |       |
|    |  kernel zone - tiny          | 2048      | 10   | 0         |      | 1     |
| 10 | Oracle Solaris               |           |      |           |      |       |
|    |  non-global zone - xlarge    | 16384     | 80   | 0         |      | 32    |
| 2  | Oracle Solaris               |           |      |           |      |       |
|    |  kernel zone - small         | 4096      | 20   | 0         |      | 4     |
| 3  | Oracle Solaris               |           |      |           |      |       |
|    |  kernel zone - medium        | 8192      | 40   | 0         |      | 8     |
| 4  | Oracle Solaris               |           |      |           |      |       |
|    |  kernel zone - large         | 16384     | 40   | 0         |      | 16    |
| 5  | Oracle Solaris               |           |      |           |      |       |
|    |  kernel zone - xlarge        | 32768     | 80   | 0         |      | 32    |
| 6  | Oracle Solaris               |           |      |           |      |       |
|    |  non-global zone - tiny      | 2048      | 10   | 0         |      | 1     |
| 7  | Oracle Solaris               |           |      |           |      |       |
|    |  non-global zone - small     | 3072      | 20   | 0         |      | 4     |
| 8  | Oracle Solaris               |           |      |           |      |       |
|    |  non-global zone - medium    | 4096      | 40   | 0         |      | 8     |
| 9  | Oracle Solaris               |           |      |           |      |       |
|    |  non-global zone - large     | 8192      | 40   | 0         |      | 16    |
+----+------------------------------+-----------+------+-----------+------+-------+
```

```
$ nova flavor-show 4
+----------------------------+-----------------------------------------------+
| Property                   | Value                                         |
+----------------------------+-----------------------------------------------+
| name                       | Oracle Solaris                                |
|                            |  kernel zone - large                          |
| ram                        | 16384                                         |
| OS-FLV-DISABLED:disabled   | False                                         |
| vcpus                      | 16                                            |
| extra_specs                | {u'zonecfg:brand':                            |
|                            |    u'solaris-kz', u'zonecfg:bootargs': u'-v'} |
| swap                       |                                               |
| os-flavor-access:is_public | True                                          |
| rxtx_factor                | 1.0                                           |
| OS-FLV-EXT-DATA:ephemeral  | 0                                             |
| disk                       | 40                                            |
| id                         | 4                                             |
+----------------------------+-----------------------------------------------+
```

OpenStack Neutron Networking – Solaris EVS

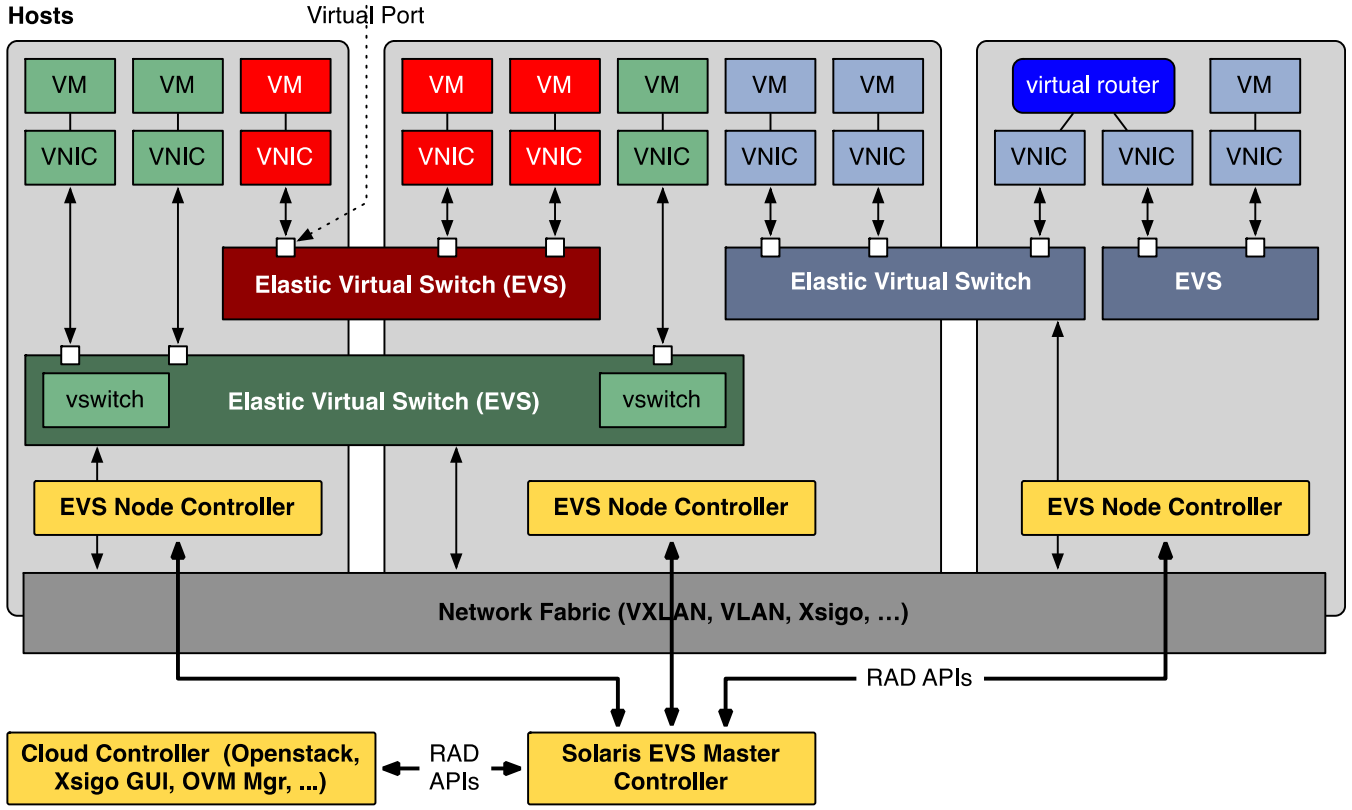
SDN for servers and switches

- Integrated with Oracle Solaris network virtualization
  - Elastic Virtual Switch connects compute resources with virtual switching
  - Flexible resource management to help maintain critical SLAs



Multi-Tenant Virtual Networks
Solaris Elastic Virtual Switches (EVS)

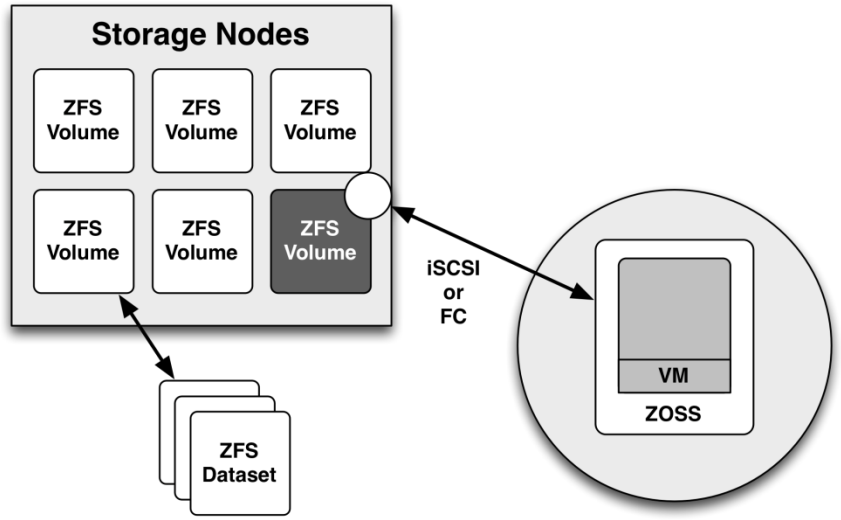
- Deploy on any fabric
  - VLAN or VxLAN
    - VxLAN: Virtual segments layered on top of generic IP networks – RFC 7348
  - evsadm(1M)
- Virtual Ports (VPorts)
  - Centralized management and statistics
  - SLA enforcement per VPort
- Application-driven SLA
  - Limit bandwidth, set priority from the application
    - setsockopt() SO_FLOW_SLA
  - High-priority hardware-assisted L7 flows



OpenStack Cinder/Swift Data Management – ZFS

Production ready data management, no compromises

- ZFS is primary backend for block and object storage
  - Integrated data services including snapshots, encryption, and deduplication
  - iSCSI or FC LUN provisioning
- Integrated Cinder Driver for the ZFS Storage Appliance
- Choose volume driver in /etc/cinder/cinder.conf
  - ZFSVolumeDriver - local volumes for use by Nova on the same node as the Cinder volume service.
  - ZFSISCSIDriver Supports creation and export of iSCSI targets for use by remote Nova compute nodes.



OpenStack Cinder Data Management – ZFS
Volume Driver

- Choose volume driver in /etc/cinder/cinder.conf
  - ZFSVolumeDriver
    - Supports creation of local volumes for use by Nova on the same node as the Cinder volume service.
  - ZFSISCSIDriver
    - Supports creation and export of iSCSI targets for use by remote Nova compute nodes.
  - ZFSFCDriver
    - Supports creation and export of Fibre Channel LUNs for use by remote Nova compute nodes.
  - ZFSSAISCSIDriver
    - Supports creation and export of iSCSI targets from a remote Oracle ZFS Storage Appliance for use by remote Nova compute nodes.

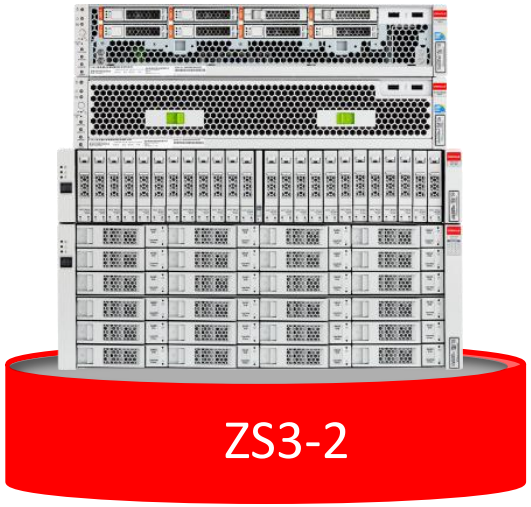
Oracle ZFS Storage Appliance

ZFS Storage OS

Most powerful storage software suite

Co-Engineered with Oracle software

- HCC Support
- Oracle Intelligent Storage Protocol (OISP)
- Hybrid Storage Pools
- BUI
  - Fine Grained Real Time Analytics



ZS3-2

- Single or Dual Controllers
- 512GB or 1TB DRAM
- 8 PCIe Slots
- 12TB Read Flash
- 4TB Write Flash
- 1.5PB scalability (16 DE's)
- 32 CPU cores

ZS4-4

- Single or Dual Controllers
- 3TB DRAM
- 11 PCIe Slots
- 12TB Read Flash
- 10TB Write Flash
- 3.5PB scalability (36 DE's)
- 120 CPU cores

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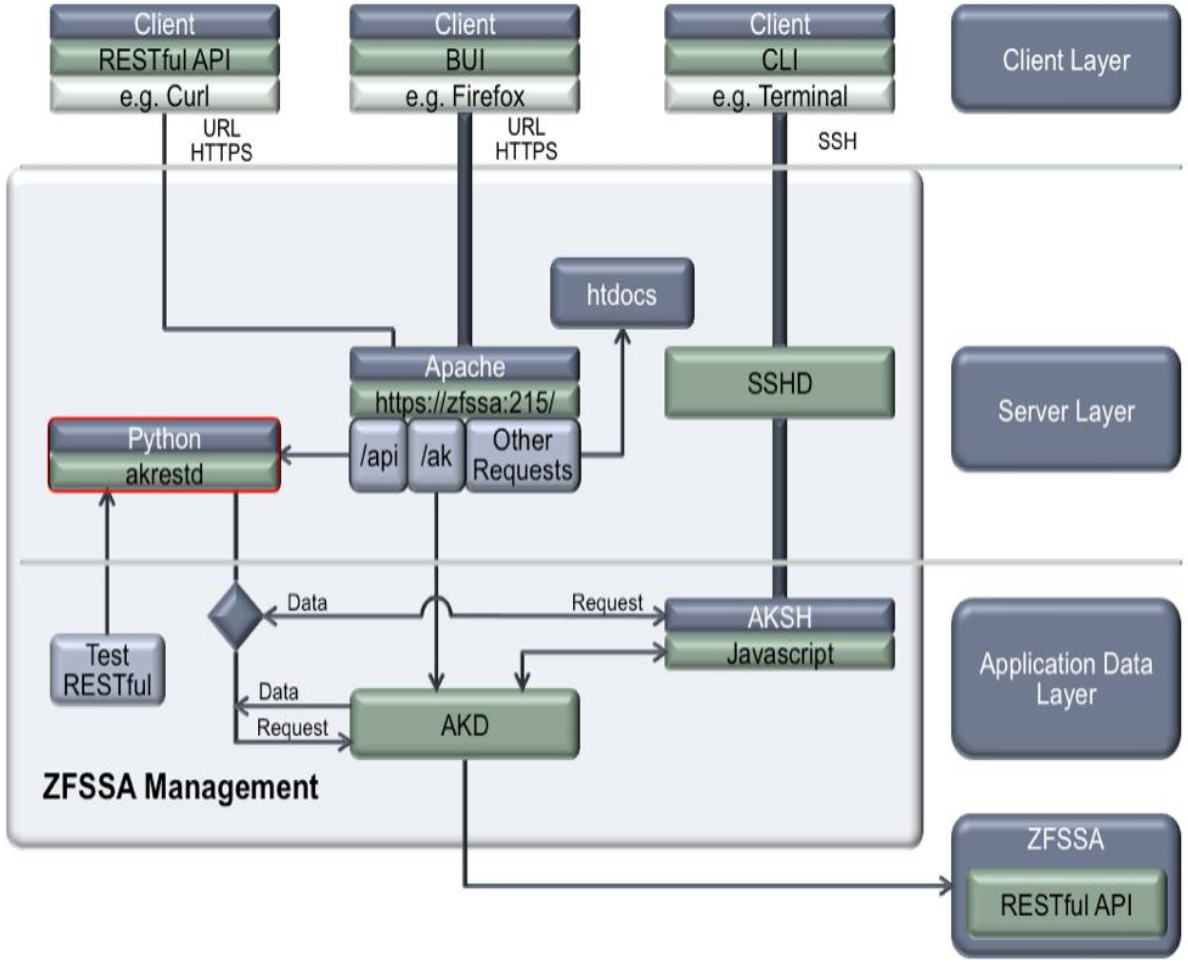
RESTful Management API for Cloud Orchestration

A full-featured management interface



Full Programmatic API

- REST compatible: Every ZFS feature available using HTML/JSON semantics
- Full-featured, fully documented API interface
- Plug compatibility for next-generation management architectures

Simplifies Cloud Integration

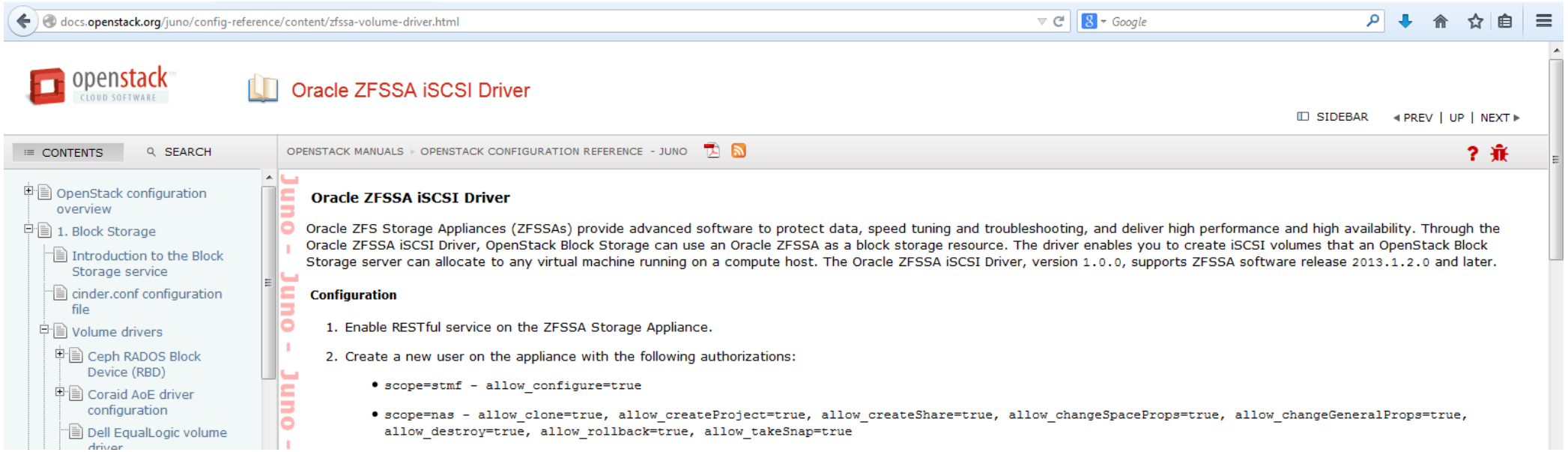
- Compatible with popular cloud architectures
- Access to OpenStack cinder implementation for EC2-like block storage implementations

Integration Point for Other Services

- N-Way management
- Object storage capabilities
- OpenStack Cinder services

How to Configure the ZFS Storage Appliance iSCSI Cinder Driver

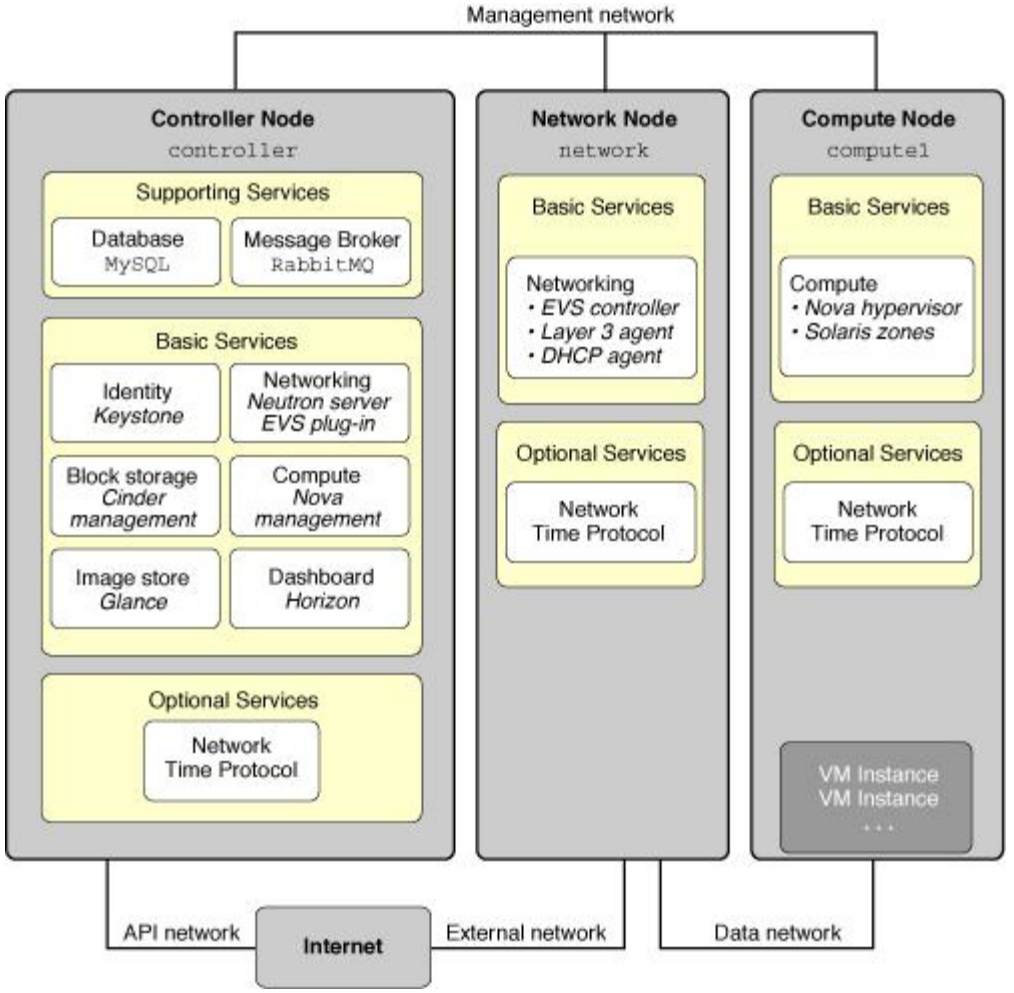
- Run Workflow on ZFS SA: Create Cinder user, set role authorizations, enable RESTful service, set corrosponding parameters in /etc/cinder/cinder.conf
- Create Running (Oracle Linux) OpenStack Icehouse with ZFS Storage Appliance (Simulator in VirtualBox) by Ronen Kofman
  - https://blogs.oracle.com/ronen/entry/running_openstack_icehouse_with_zfs
- OpenStack in Oracle Solaris 11.2 Docs
  - http://docs.oracle.com/cd/E36784_01/html/E54155/cinderinst.html#OSTCKzfssadriver
- OpenStack Juno Community Release Docs



Oracle OpenStack for Oracle Solaris

Simplified Deployment

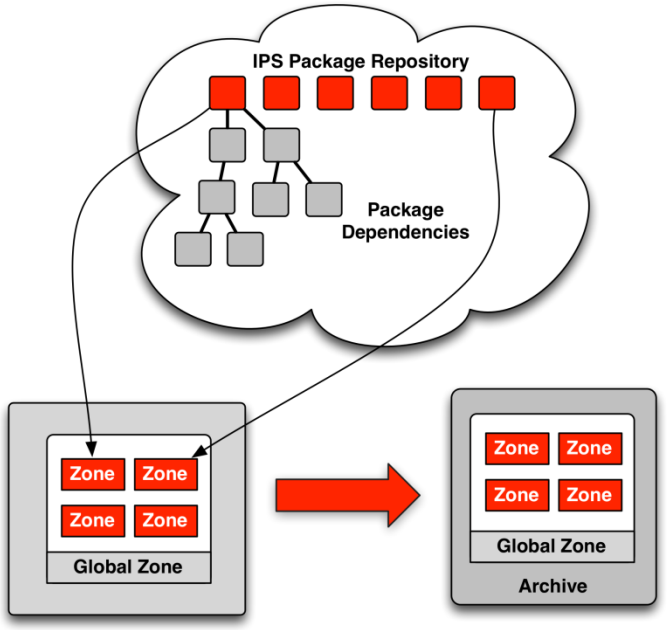
- Unified Archive for single node deployment
- Documentation for multi node deployments
- Blog Series by Dave Miner
  Building an OpenStack Cloud for Solaris Engineering
  - Rationale and Architecture
  - Automated Installer and SMF Configuration Profiles
  - Puppet Configuration Management
  - Configuring OpenStack



OpenStack Packaging – IPS

Easy and fast cloud update

- Fail proof updates with IPS
  - Full rollback to previous state if needed
  - Integrated with Oracle Solaris Zones and Unified Archives for seamless lifecycle management



OpenStack and Oracle Solaris 11.2 - Package List

```
# pkg list -af | grep openstack
cloud/openstack                                 0.2013.2.3-0.175.2.0.0.42.1 ---
cloud/openstack/cinder                          0.2013.2.3-0.175.2.0.0.42.1 ---
cloud/openstack/glance                          0.2013.2.3-0.175.2.0.0.42.1 ---
cloud/openstack/horizon                         0.2013.2.3-0.175.2.0.0.42.1 ---
cloud/openstack/keystone                        0.2013.2.3-0.175.2.0.0.42.1 ---
cloud/openstack/neutron                         0.2013.2.3-0.175.2.0.0.42.1 ---
cloud/openstack/nova                            0.2013.2.3-0.175.2.0.0.42.1 ---
cloud/openstack/swift                           1.10.0-0.175.2.0.0.42.1     ---
```

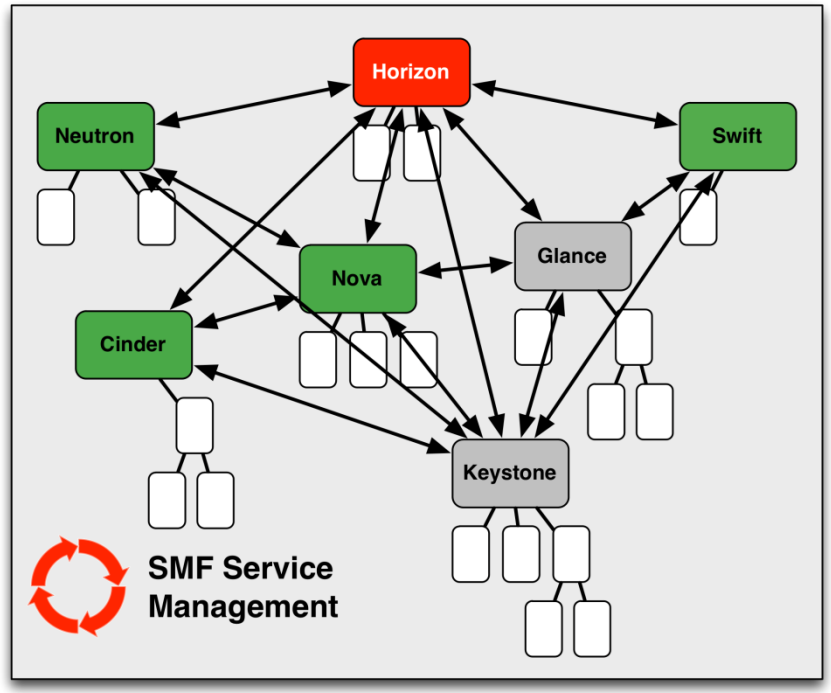
Openstack and Oracle Solaris 11.2 - Versioning

```
# pkg info -r cloud/openstack
               Name: cloud/openstack
            Summary: OpenStack
        Description: OpenStack is a cloud operating system that controls large pools
                     of compute, storage, and networking resources throughout a data
                     center, all managed through a dashboard that gives
                     administrators control while empowering their users to provision
                     resources through a web interface.
           Category: Meta Packages/Group Packages (org.opensolaris.category.2008)
                     System/Administration and Configuration (org.opensolaris.category.2008)
                     System/Enterprise Management (org.opensolaris.category.2008)
                     System/Virtualization (org.opensolaris.category.2008)
                     Web Services/Application and Web Servers (org.opensolaris.category.2008)
              State: Not installed
          Publisher: solaris
            Version: 0.2013.2.3 (Havana 2013.2.3)
    Build Release: 5.11
             Branch: 0.175.2.0.0.42.1
Packaging Date: June 23, 2014 01:03:42 AM
               Size: 5.46 kB
               FMRI: pkg://solaris/cloud/openstack@0.2013.2.3,5.11-0.175.2.0.0.42.1:20140623T010342Z
```

OpenStack Services – SMF

Highly available and reliable and secure cloud services

- Automatic service restart in case of failure
  - Integrated with Oracle Solaris fault management
  - Full dependency checking for precise and efficient cloud start up
- OpenStack services run with minimum privileges necessary, and don't run as root



OpenStack Heat - Orchestration

- Represent an application (topology and resource needs) with a Heat Template
- Perform fully automated, orchestrated deployment of Heat Templates to the cloud.
- Components
  - heat-api: OpenStack-native RESTful API
  - heat-api-cfn: AWS CloudFormation compatible API.
  - heat-engine

    Drives orchestration from a user-provided template
    - defines Parameters, Resources, Output
    - formats:
      - HOT (Heat Orchestration Template, based on YAML)
      - CFN (AWS CloudFormation template syntax , typically JSON)

Heating Up Your OpenStack Cloud
https://blogs.oracle.com/dminer/entry/heating_up_your_openstack_cloud

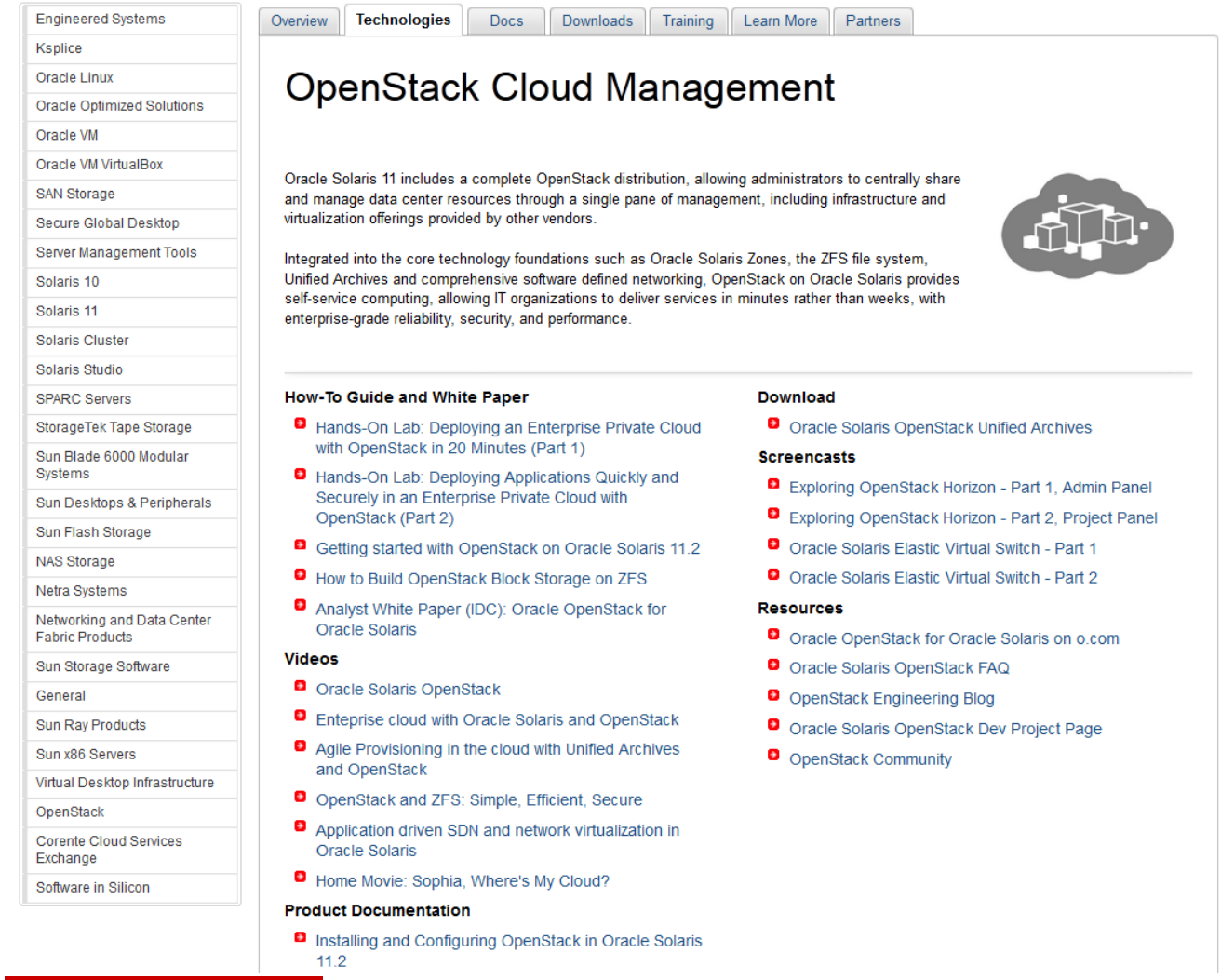
Oracle Solaris 11.2: Enterprise OpenStack

OS. Virtualization. SDN. OpenStack. Complete.

- Complete OpenStack
  - Havana-based
    - Nova, Neutron, Cinder, Swift, Glance, Keystone, Horizon
  - Heat engine with SRU 11.3.4.1
- All integrated into Oracle Solaris 11.2
- Simplified deployment
  - Unified Archive for single node deployment
  - Documentation for multi node deployments
- Upstream contributions to OpenStack Project
  - https://openstack.java.net/ -> Browse Source

OpenStack and Solaris

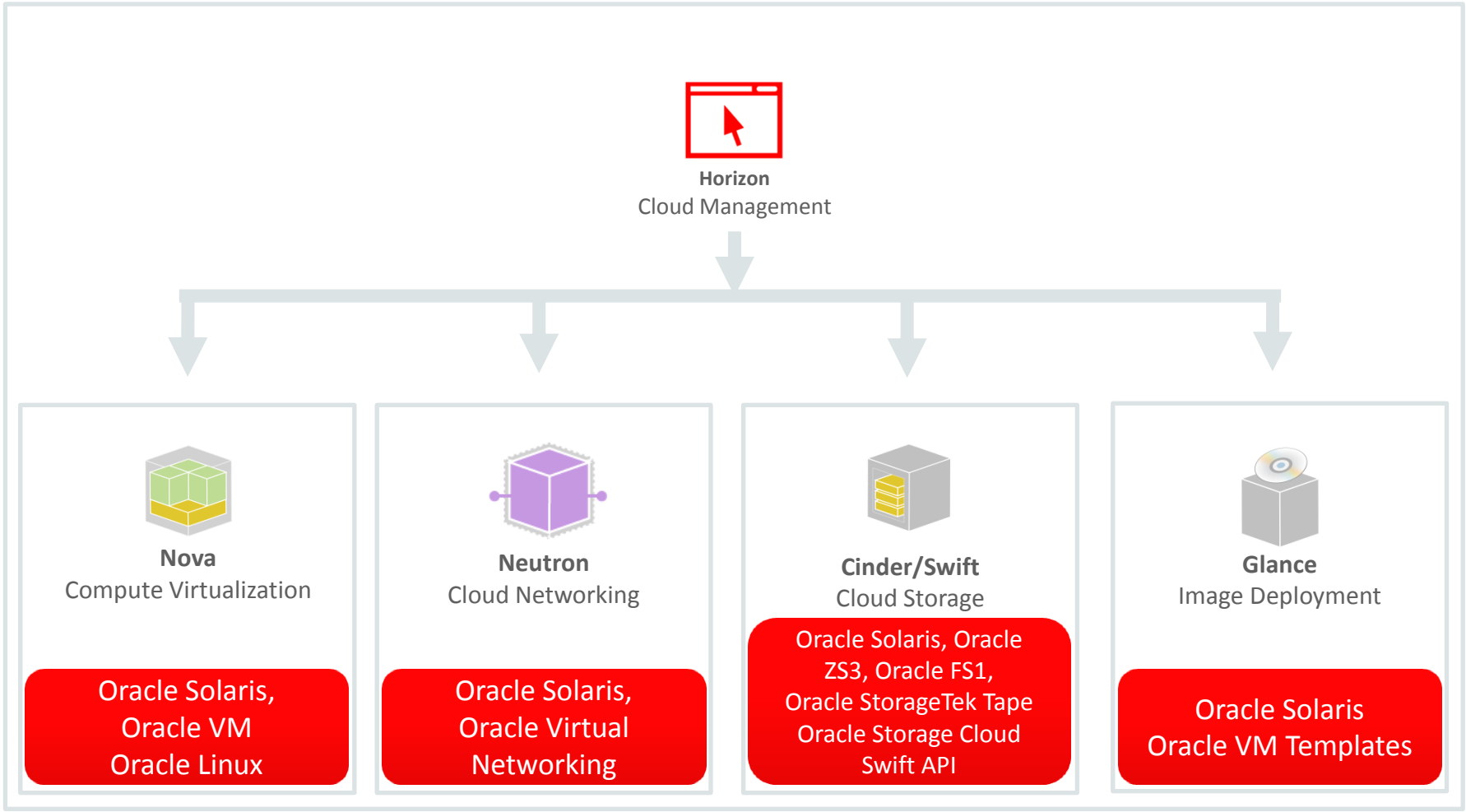
http://www.oracle.com/technetwork/server-storage/solaris11/technologies/openstack-2135773.html



OpenStack Cloud in Solaris Engineering blogs.oracle.com/dminer

IDC White Paper: Oracle OpenStack for Oracle Solaris

OpenStack Engineering Across Oracle's Portfolio



OpenStack Component Projects

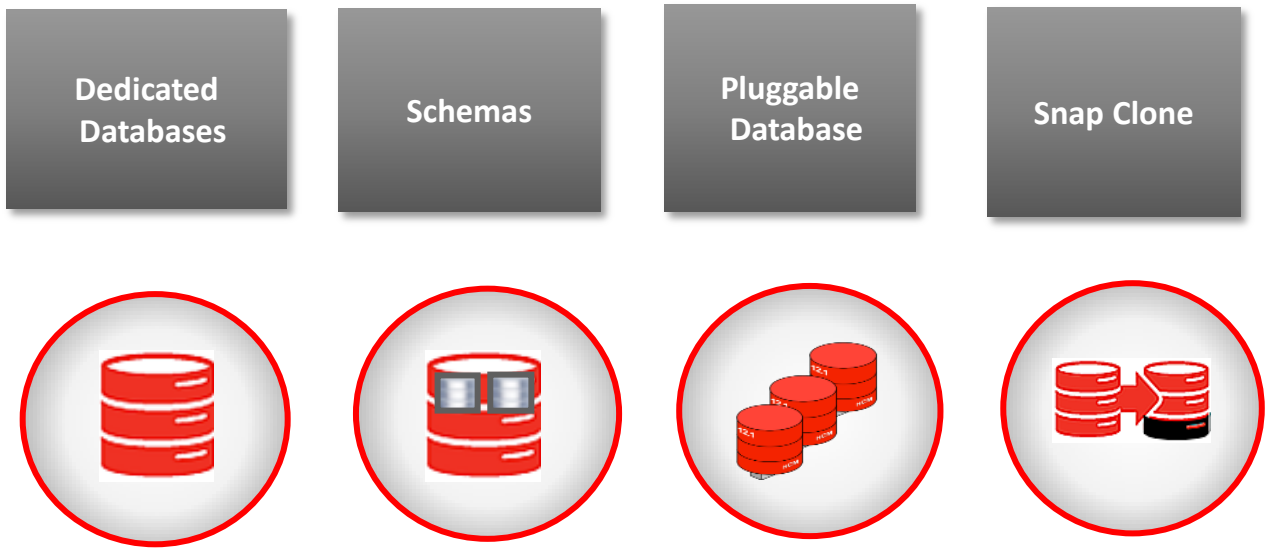
Component	Project Name	First Release	Brief Overview
Compute	Nova	Austin	On-demand compute resources
Object Storage	Swift	Austin	Manage redundant scalable block storage
Image Services	Glance	Bexar	Repository and delivery of disk and server images
Dashboard	Horizon	Essex	Admin and user admin control
Identity	Keystone	Essex	Access and security
Block Storage	Cinder	Folsom	Raw block level storage
Networking	Neutron (Quantum)	Folsom	Network integration
Orchestration	Heat	Havana	Automate compute, storage, & network
Telemetry	Ceilometer	Icehouse	Usage & Performance
Database	Trove	Icehouse	DBaaS – relational & non-relational
Data Processing	Sahara	Juno	Hadoop as a Service
Bare Metal	Ironic	TBD	Bare Metal Provisioning
Queue Service	Zagar (Marconi)	TBD	Messaging and Queueing
Shared File System	Manila	TBD	File Sharing Service

https://www.openstack.org/software/roadmap

EM12c Database as a Service

- Rapid Database Provisioning
- Catalog based on Service Levels
- Data Cloning
- Database Performance and Lifecycle Management
- Real Application Testing

Oracle Enterprise Manager 12*c*
(Planning, Provisioning, Management, Chargeback)



oracle.com/openstack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