OpenStack 기술동향

안명호, MHR Inc,

OpenStack Korea Community

mhr.james@gmail.com

facebook.com/james.ahn.9

Part I

The OpenStack Project

OpenStack?

A Software for "Programmable IT Infrastructure"

- NASA, RackSpace 에 의해 개발, 2010년 오픈소스로 공개
- 180개 이상의 회사가 참여하여 개발하고 있음.

Why OpenStack?

1. **Open Source**
   - 역사상 가장 빠르게 성장하는 오픈소스 프로젝트
   - 가장 큰 펀드규모
2. **Almost industry Standards**
   1. 클라우드 컴퓨팅 표준에 영향을 미치는 거의 모든 회사가 참여하고 있음
   2. IBM, Intel, Cisco, Microsoft, Redhat, AT&T, Vmware, HP, Dell, Yahoo, Rackspace 등
3. **Cover Whole Cloud Computing Area**
   1. 클라우드 컴퓨팅에 필요한 모든 영역을 커버하고 있다.
   2. 10개의 메인프로젝트, 6개의 인큐베이션 프로젝트
   3. Virtual Server, Network, Storage, Billing, Monitoring, Security, Image, UI등
4. **Powerful Community**
   1. 271개 회사 참여, 전세계 67개국에 사용자 그룹, 수만명의 개발자 등록
   2. 강력한 리더쉽에 의해 1년에 2번 major update가 되고 있음
5. **Good References**
   1. NASA, Paypal, Cisco WebEx, CERN, Nectar, Intel, IBM, SeaGate, Sony
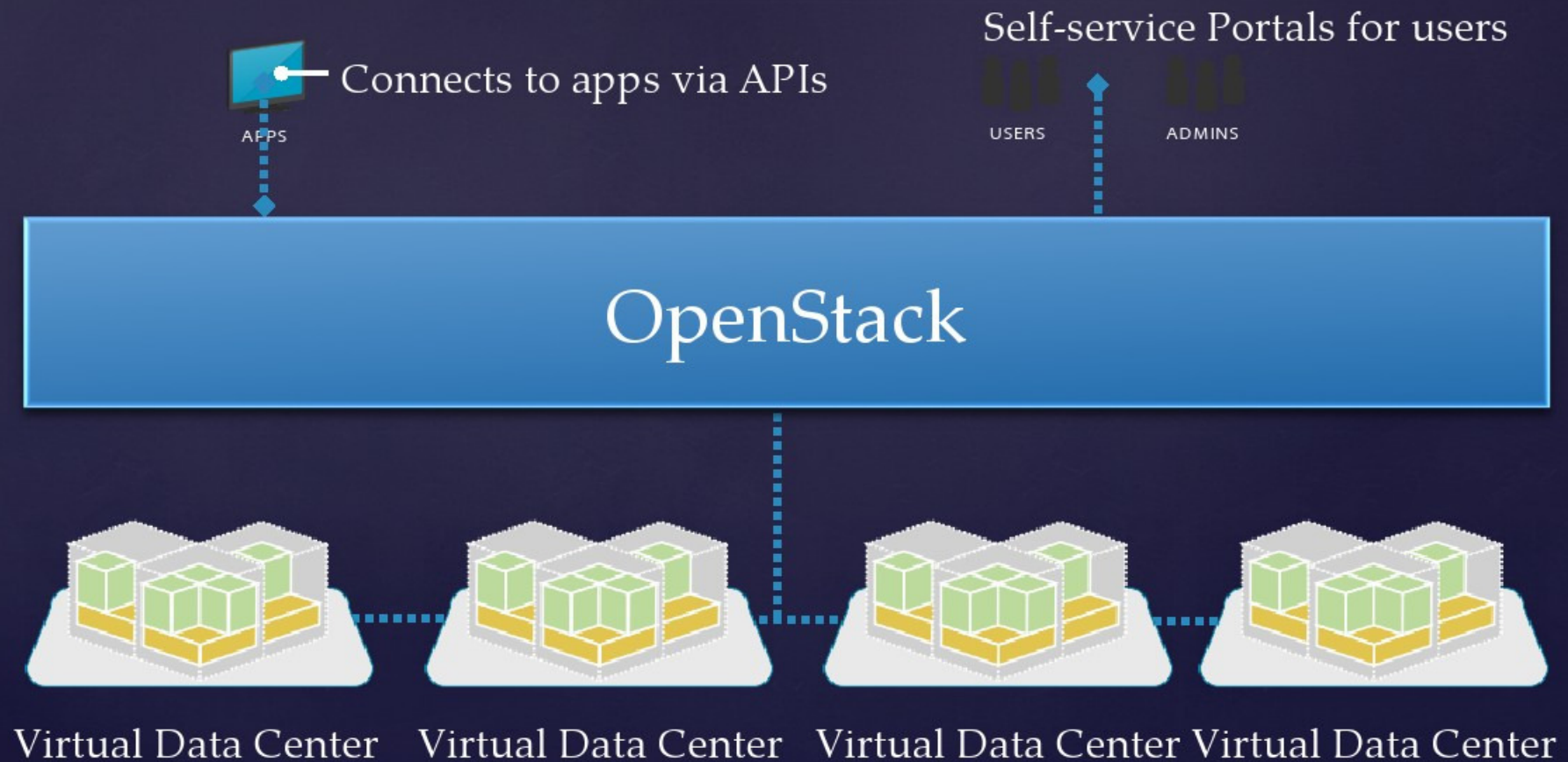
OpenStack Sponsors

Vertical Integration	**Server**	HP, Dell, IBM, Intel, AMD
	Network	Cisco, Juniper
	Storage	EMC(VMware)
	OS	Redhat, Ubuntu, Suse
	Software	Microsoft
	Service	Yahoo, Paypal
	DevOps	OpsCode, RightScale,Scalr

Part II

Core Concept

Drill Down OpenStack

To Provide Unlimited Computing Resources

Connects to apps via APIs

APPS

Self-service Portals for users

USERS   ADMINS

OpenStack

Virtual Data Center   Virtual Data Center   Virtual Data Center   Virtual Data Center

Drill Down Virtual Data Center
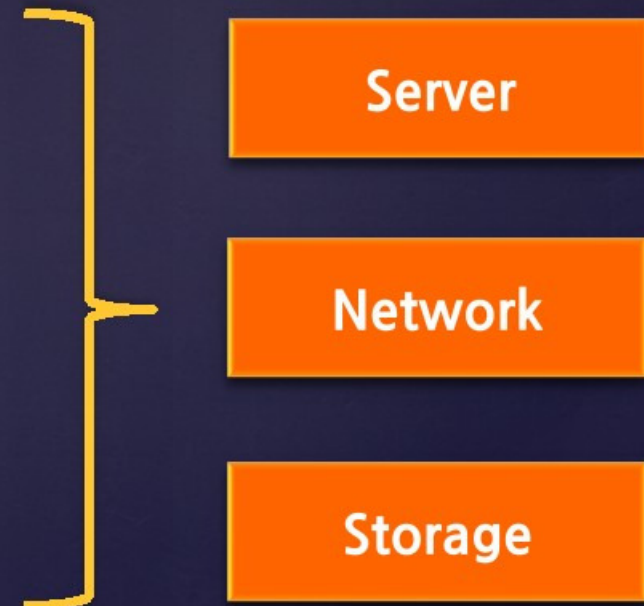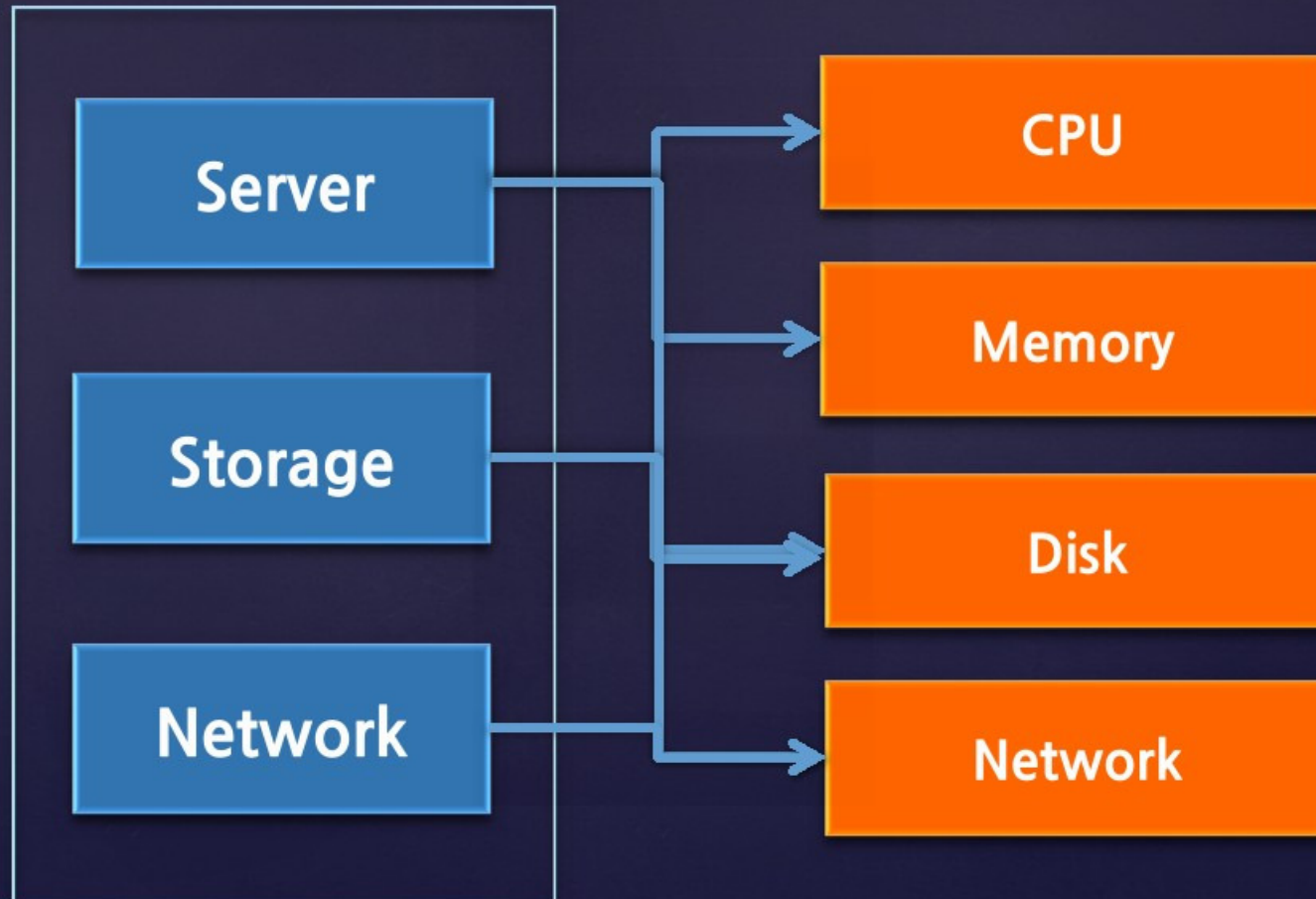
Server

Network

Storage

So, What It Actually Does

OpenStack, (Cloud Computing)

It is

all about

Computing Resources

CPU	Memory	Disk	Network

Projects in OpenStack

To Provide Unlimited Computing Resources

Server	Nova	Glance
Storage	Swift	Cinder
Network	Neutron	
Management	KeyStone	Horizon
	Heat	Ceilometer

Part III

OpenStack Release Timeline
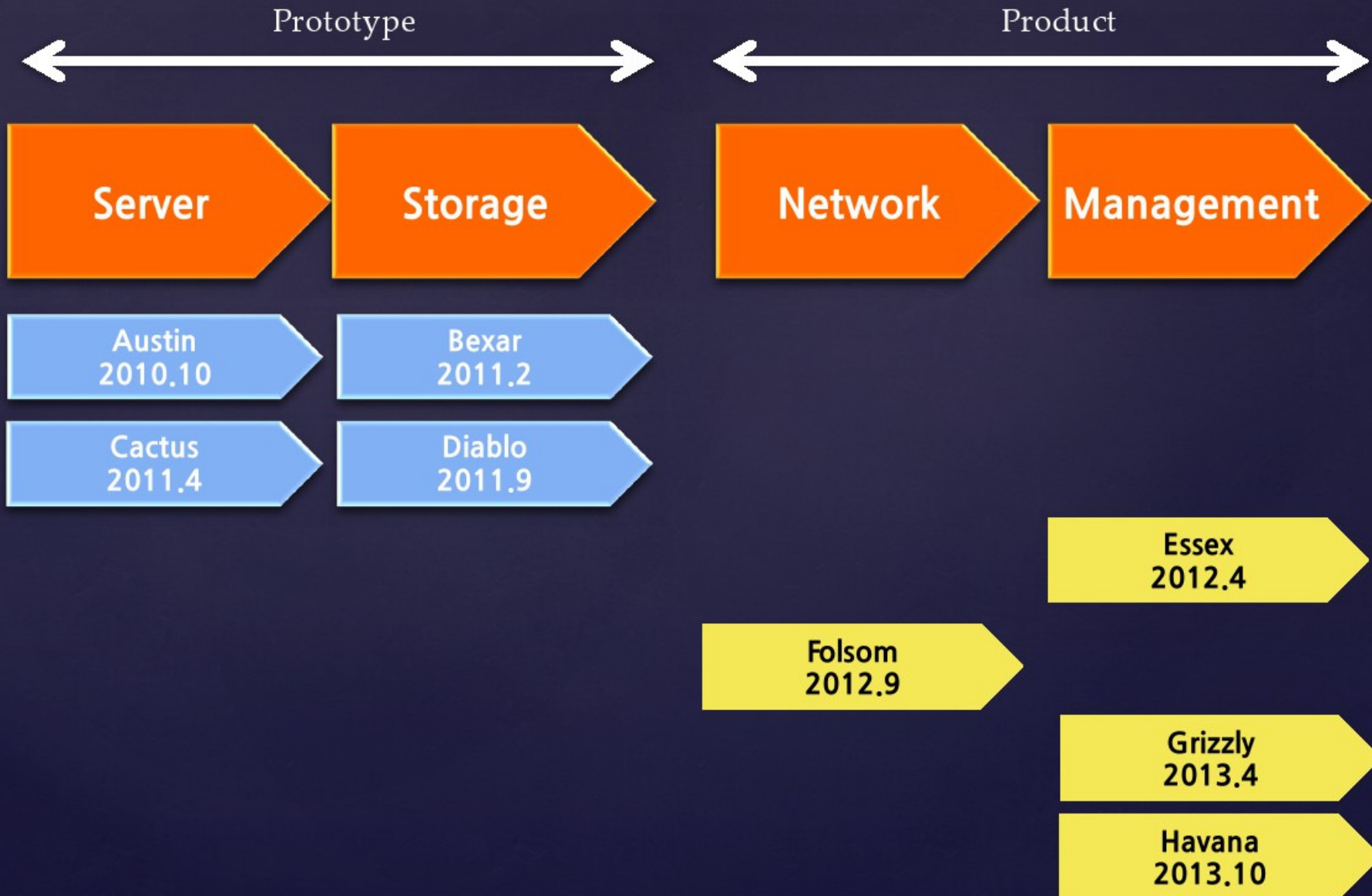
Birth of OpenStack

Chris Kemp at Rainbow Mansion

1. 2 Weeks for prototyping
2. 5 Weeks for first release

July 19 2010

OpenStack Release Timeline

Prototype

Product

Server

Storage

Network

Management

Austin
2010.10

Bexar
2011.2

Cactus
2011.4

Diablo
2011.9

Essex
2012.4

Folsom
2012.9

Grizzly
2013.4

Havana
2013.10

# Austin - 2010.10

Experiment!!!

NOVA

Swift

- Rescue Mode

- Xen Hypervisor Support

- Images without ramdisks are not supported at this time. **Unfortunately this means the Official Ubuntu AMI's will not run.** We will provide alternative images until this is fixed in a later release.
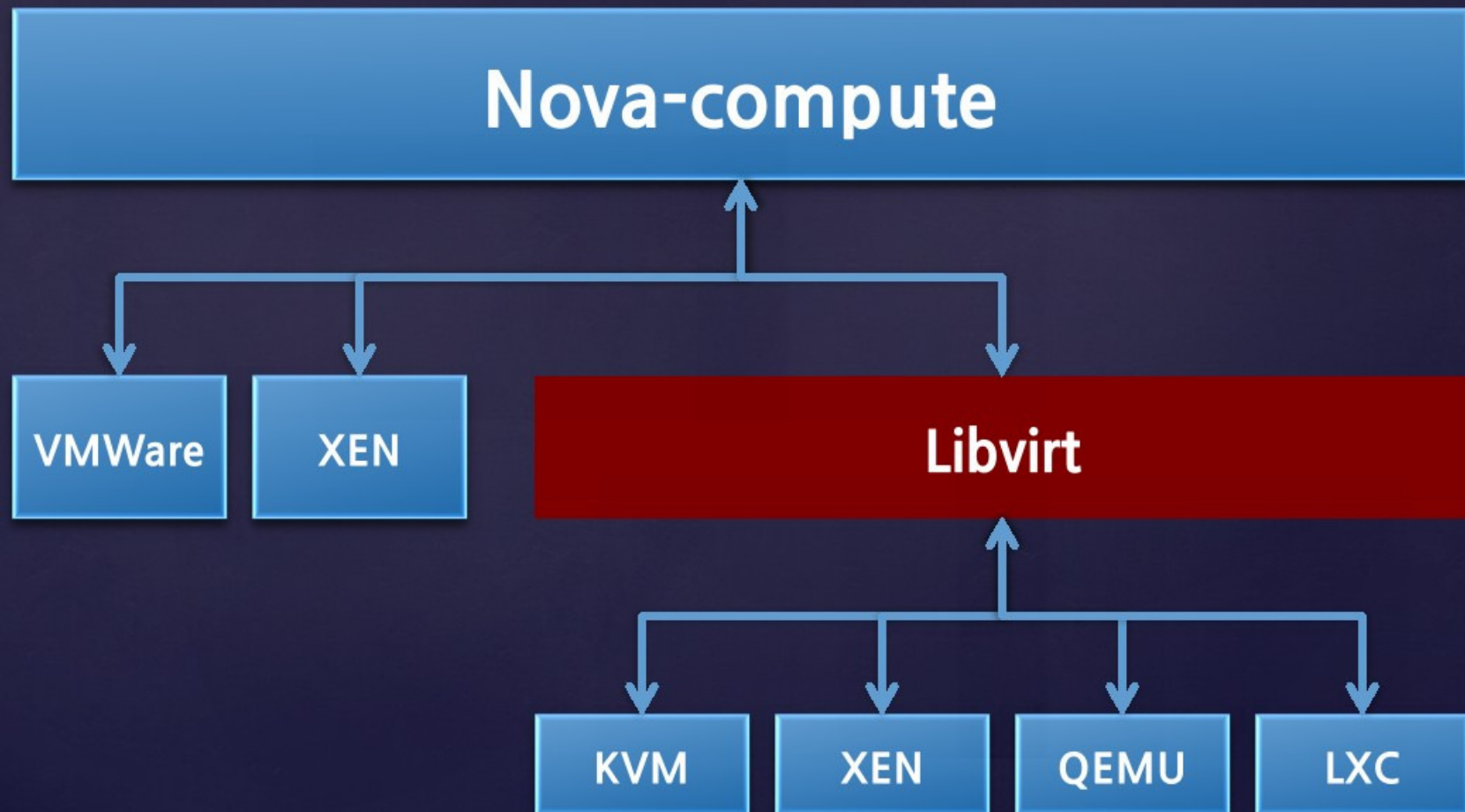
NOVA

Server

- API
  - public facing interface
- Message Queue
  - Broker to handle interactions
- Scheduler
  - Placement of new resources
- Compute Worker
  - Hosts & controls hypervisor and VMs
- Volume
- Network

Libvirt by IBM
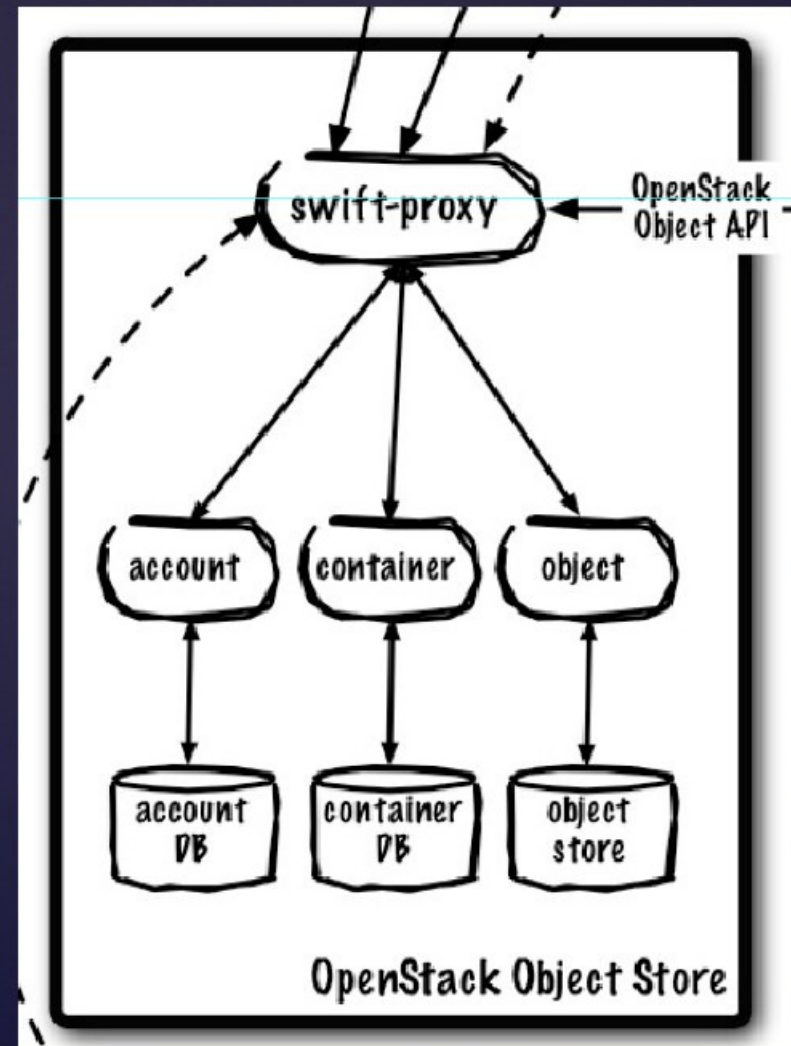
Nova-compute

VMWare **XEN** **Libvirt**

KVM **XEN** **QEMU** **LXC**
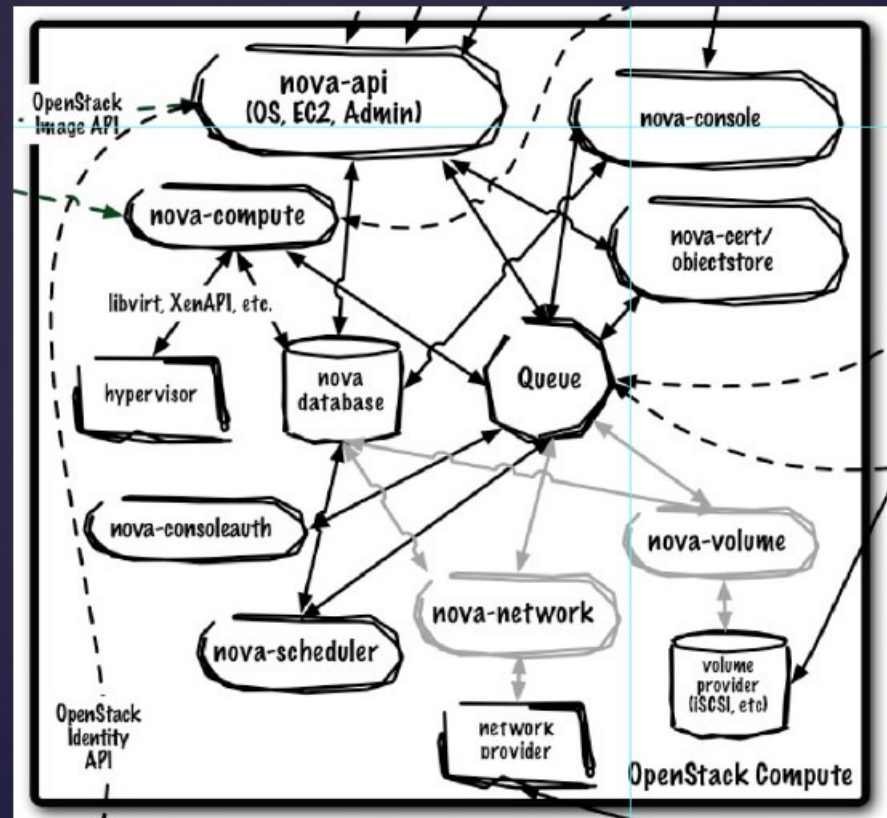
Swift

Storage(Object)

- Proxy Server
  - Handle incoming requests
- Workers
  - Updater, Auditor, Replicator
- Ring
  - Map names to entities and locations
  - Account, Container, Object

Bexar - 2011.2

Virtual Machine at will
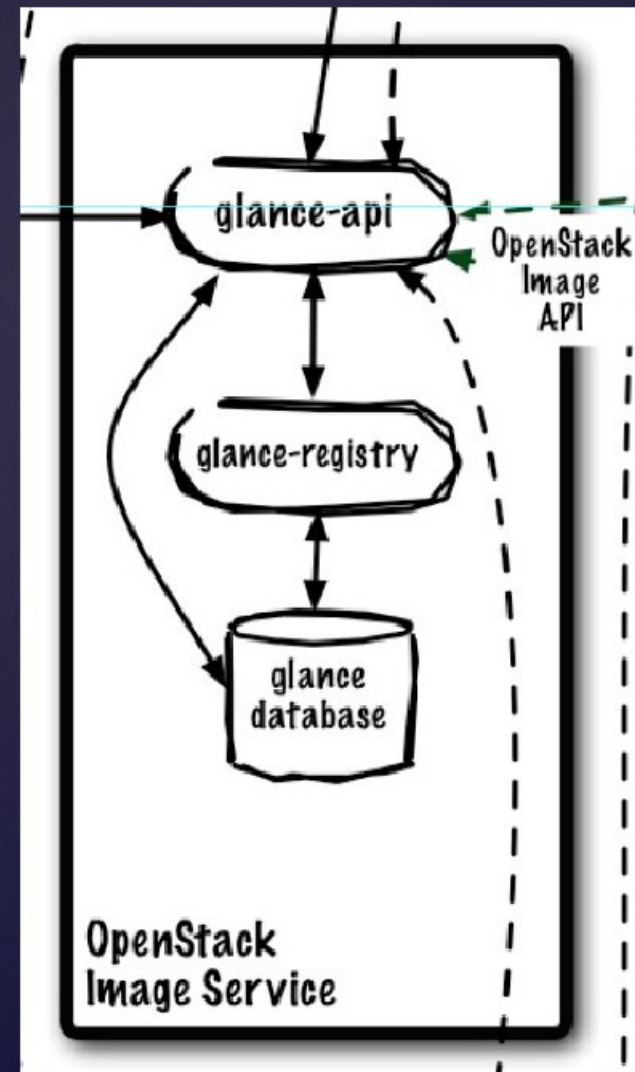
NOVA

Swift

Glance

- Support for <u>raw disk images</u> with libvirt and XenAPI hypervisors, <u>without the complexity of a separate ramdisk or kernel image.</u>

- Admin features to <u>pause, suspend,</u> lock and password reset instances, but also support for per-instance diagnostics.

- <u>Web-based serial console to access</u> instances where networking fails (requires instances with serial console enabled).

- <u>Large objects (greater than 5 GB)</u> can now be downloaded using OpenStack Object Storage.

Glance

Storage(VM Image)

- Image storage and indexing
  - Keeps a database of metadata associated with an image, discover, register, and retrieve.
- Glance-api
  - public interface for uploading and managing images.
- Glance-registry
  - private interface to metadata database

Cactus - 2011.4

Custom Virtual Machine

NOVA

Swift

Glance

- Nova now supports <u>two additional virtualization technologies</u>: LXC containers (through libvirt) and VMWare/vSphere ESX / ESXi 4.1, Update 1.

- <u>Multi-tenant accounting support</u> was added to OpenStack API, allowing multiple accounts (projects) and admin API access to create accounts & users.

- Nova can now start instances from VHDs (with the customer data and kernel in one unified image), <u>allowing to boot instances from user-created snapshots.</u>

- VNC Proxy, Live Migration

Diablo - 2011.9

Networked Virtual Machine

NOVA

Swift

Glance

- A multi-host networking mode providing higher availability in DHCP and VLAN networks
- Ability to snapshot, clone and boot from volumes
- Ability to pause and suspend KVM instances
- Automated instance migration during host maintenance
- Multi cluster synchronization, allowing replication to multiple geographical locations on a container by container basis.
- Ability to share images between tenants

Essex - 2012.4
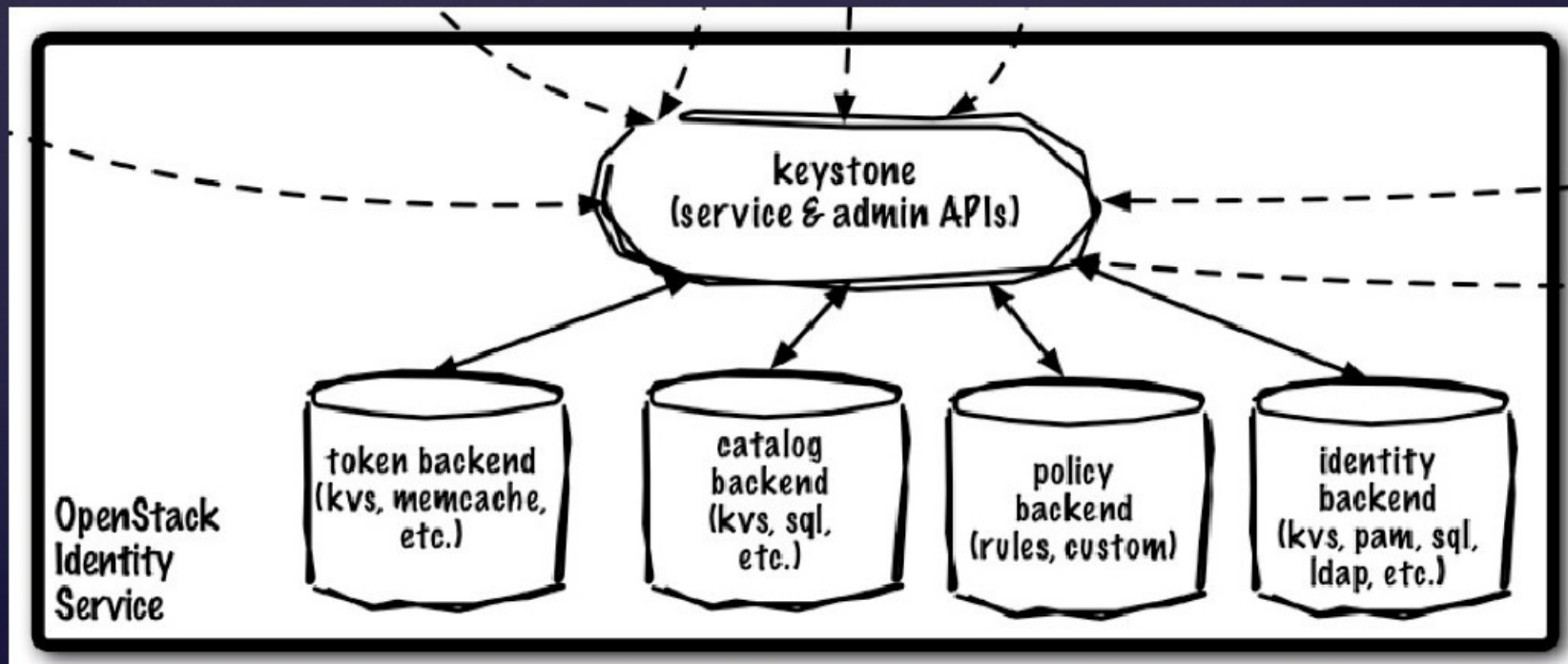
Real OpenStack!!!

NOVA

Swift

Glance

Keystrone

Horizon

- We spent a lot of time during this release cycle focusing on stability and bug fixing.
- Hypervisor feature parity: We spent a lot of time trying to get features as consistent as possible across hypervisors. The ultimate goal here is to be able to run an OpenStack cloud and have users not know or care which hypervisor is underneath.
- Administrative api extensions: Many of the administrative functions have been pushed into api extensions. This means more tasks can be automated via remote tools instead of dealing with the database directly.
- Floating ip pools: It is now possible to have multiple pools of floating ips. This allows you to have a set of internal network natted ips for example.
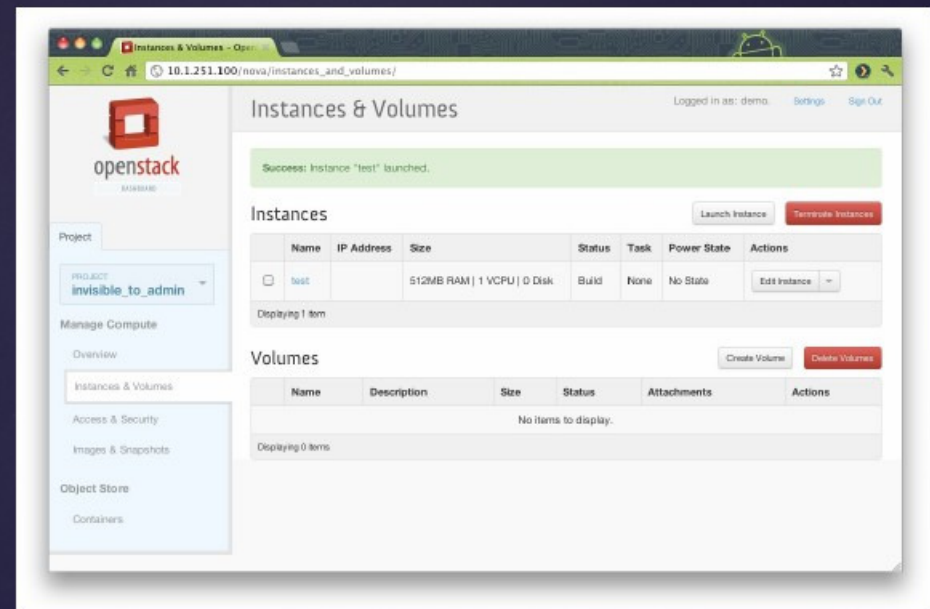
Keystone

Identity

- Identity: User information authentication
- Token: After logged in, replace account-password
- Service catalog: Service units registered
- Policies: Enforces different user levels

Horizon

Management(GUI)

- Manage resources
  - Native OpenStack API
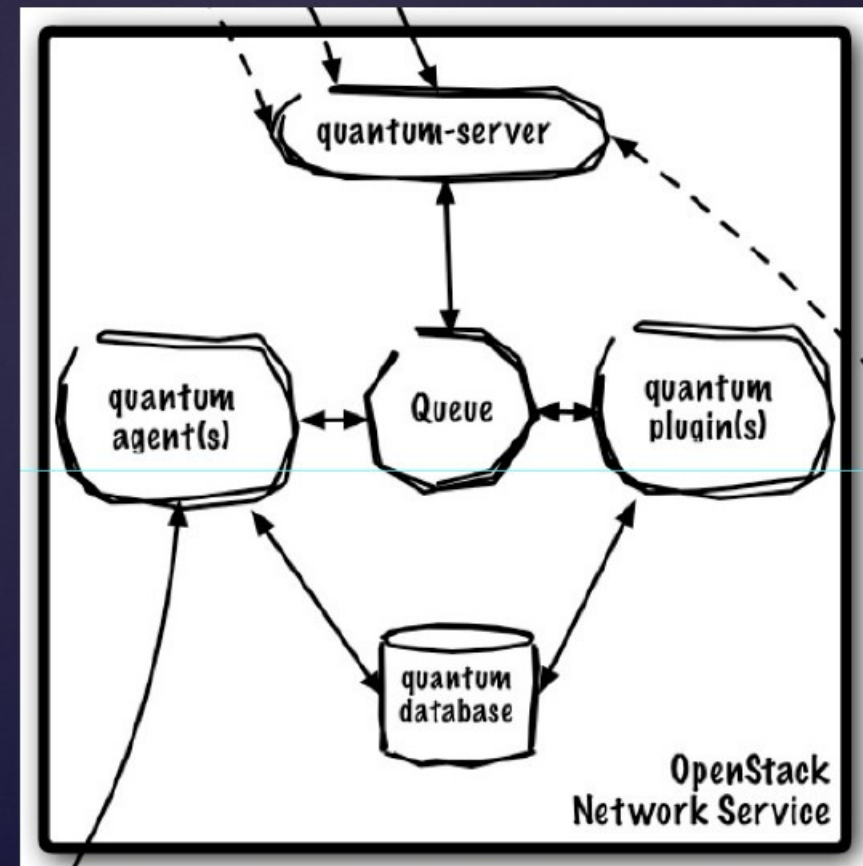 - EC2 compatibility API.

Folsom - 2012.9

Network, Network, Network

- Swift, Unique-as-possible data placement within the cluster
- Lots of improvements were made to the scheduler
- Trusted Computing pools, cloud hosting providers to build trusted computing pools based on H/W-based security features, such as Intel Trusted Execution Technology (TXT).
- Glance, Tenant-specific storage in Swift
- Pluggable network back-ends technologies, including Open vSwitch, Cisco, Linux Bridge, Nicira NVP, Ryu, and NEC
- v2 tenant-facing API to control L2 networking and IP address management
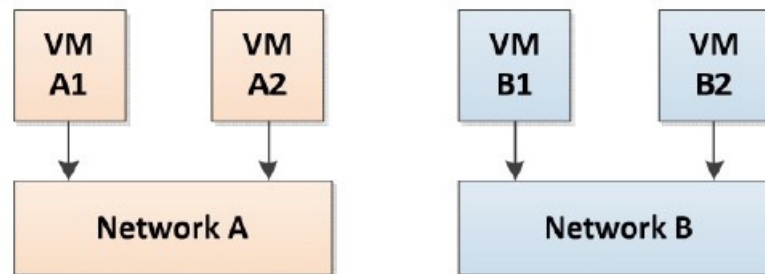- Cinder, Block Storage service, an extraction of nova-volume

NOVA

Swift

Glance

Keystrone

Horizon

Quantum

Cinder

Neutron

Network

- Decouples "Logical" View of the network from "Physical" view
- APIs for creating and managing virtual networks, L2 Networking
- Plugin
  - API Contract by plugin interface
  - Open vSwitch,Cisco UCS, Nicira, NTT-data Ryu
- Manager
  - Handling network related requests
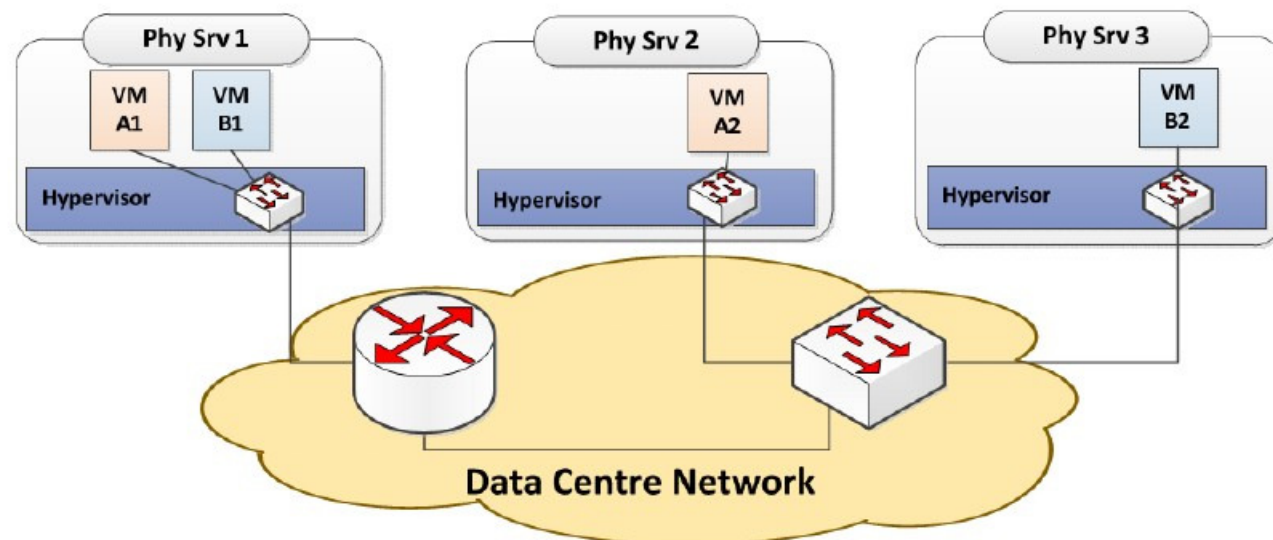 - IP Address Management, DHCP, NAT, Floating IPs

Tenant view vs Provider view

Tenant View

VM A1	VM A2	VM B1	VM B2

Network A Network B

Provider View

Phy Srv 1 | Phy Srv 2 | Phy Srv 3

VM A1 VM B1 | VM A2 | VM B2

Hypervisor | Hypervisor | Hypervisor

Data Centre Network

Cinder

Storage(Disk)

- The goal of the Cinder project is to separate the existing nova-volume block service into its own project.
- For focused and dedicated attention
- Multiple Driver Support
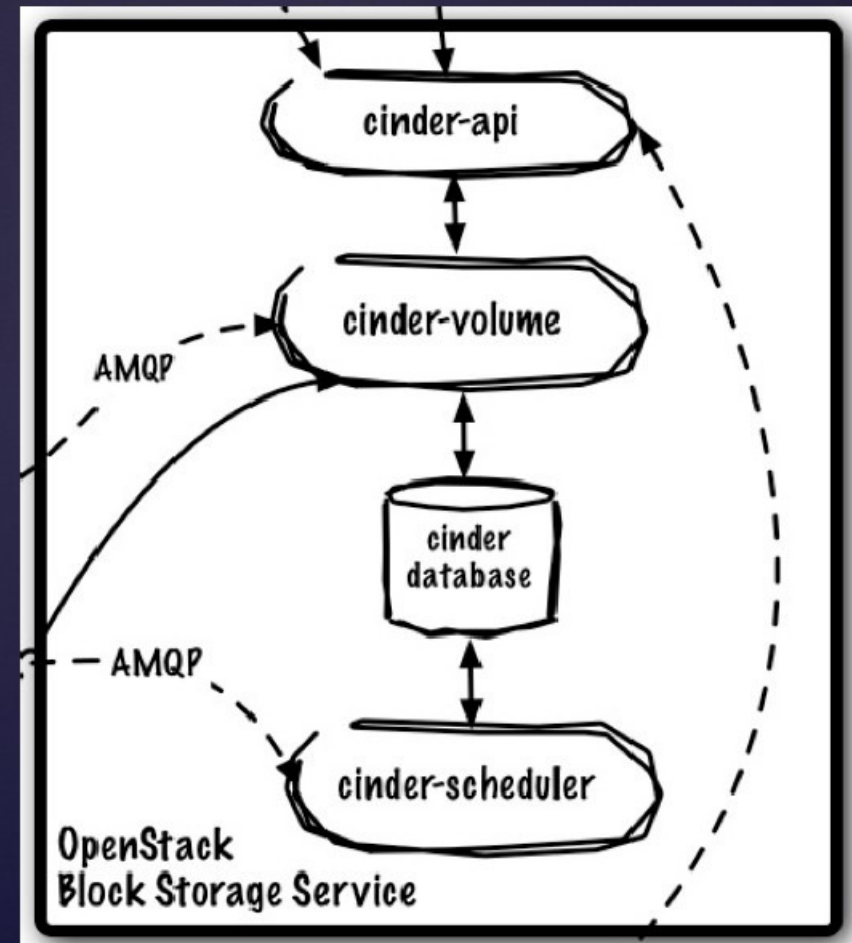
Grizzly - 2013.4

Take a breath

NOVA

Swift

Glance

Keystrone

Horizon

Neutron

Cinder

- Swift
  - Support Custom Log
- Nova
  - Cells, a new way to scale nova deployment regardless of geographic location
  - Instance Action Tracking
- Glance
  - Programtaically expose Glance-control status
- Horizon
  - Networking, Image Upload Glance, Migrate Instance,
- Neutron
  - LbaaS (Load balancing as a Service)
  - New Plugins : Big Switch, midonet Hyper-V
- Cinder
  - New Drivers : GlusterFS, HUAWEI storage, HP 3PAR, CORAID

Havana - 2013.10

From Boy to Adult

NOVA

Swift

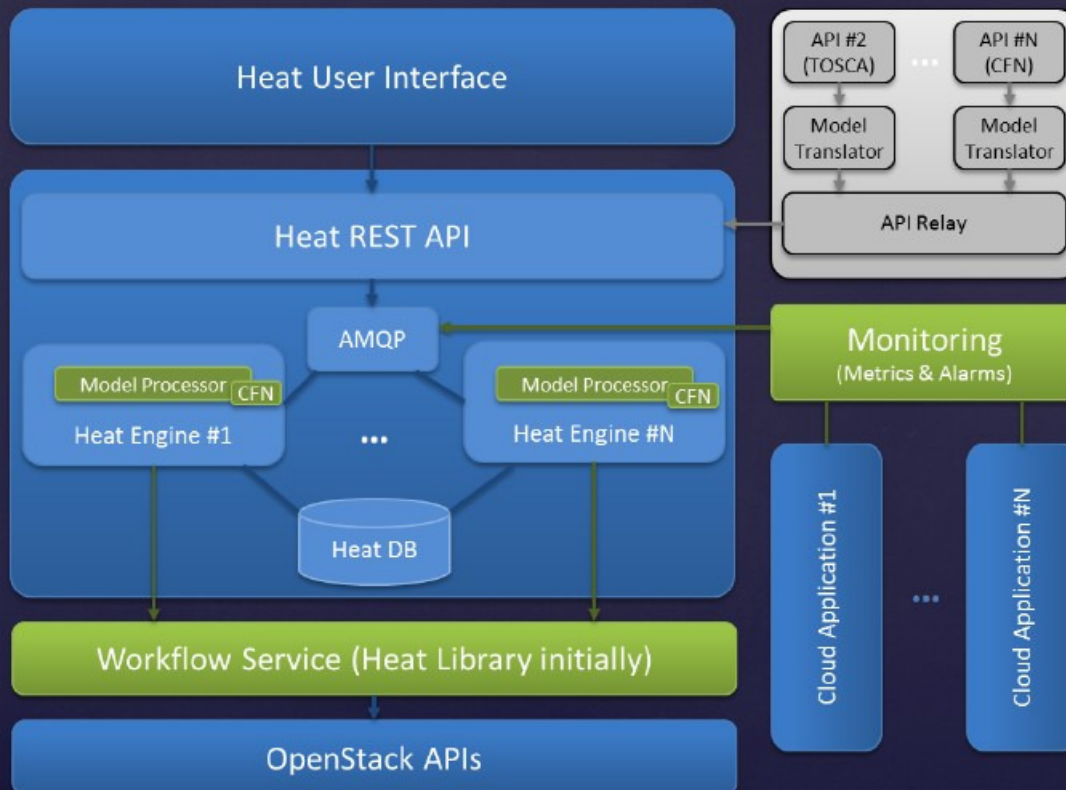Glance

Keystrone

Horizon

Neutron

Cinder

Heat

Ceilometer

- Swift
  - Global Cluster Support
- Nova
  - Per-user basis Quota, (Big Improvement)
- Glance
  - Multiple Image Locations
- Horizon
  - Heat & Orchestration
- Neutron
  - VPNaaS(VPN as a Service), FWaaS(Firewall as a Service)
- Cinder
  - Multiple Image Locations
- Heat
  - Orchestration & Auto Scaling
- Ceilometer
  - Monitoring & Alarms

Heat

- Rest API to orchestrate multiple composite cloud applications
- Template based orchestration
- Integration with Core components
- Custom plugins
- AWS Cloudformation

Ceilometer
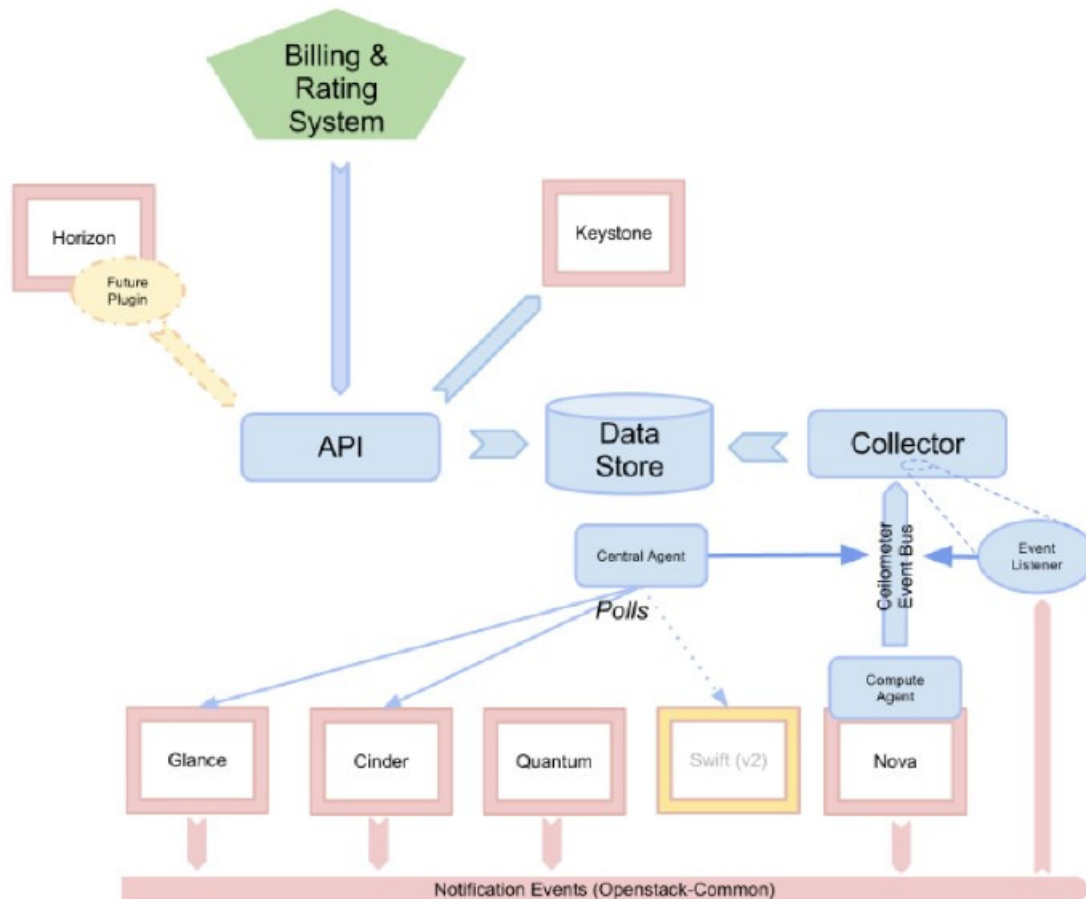
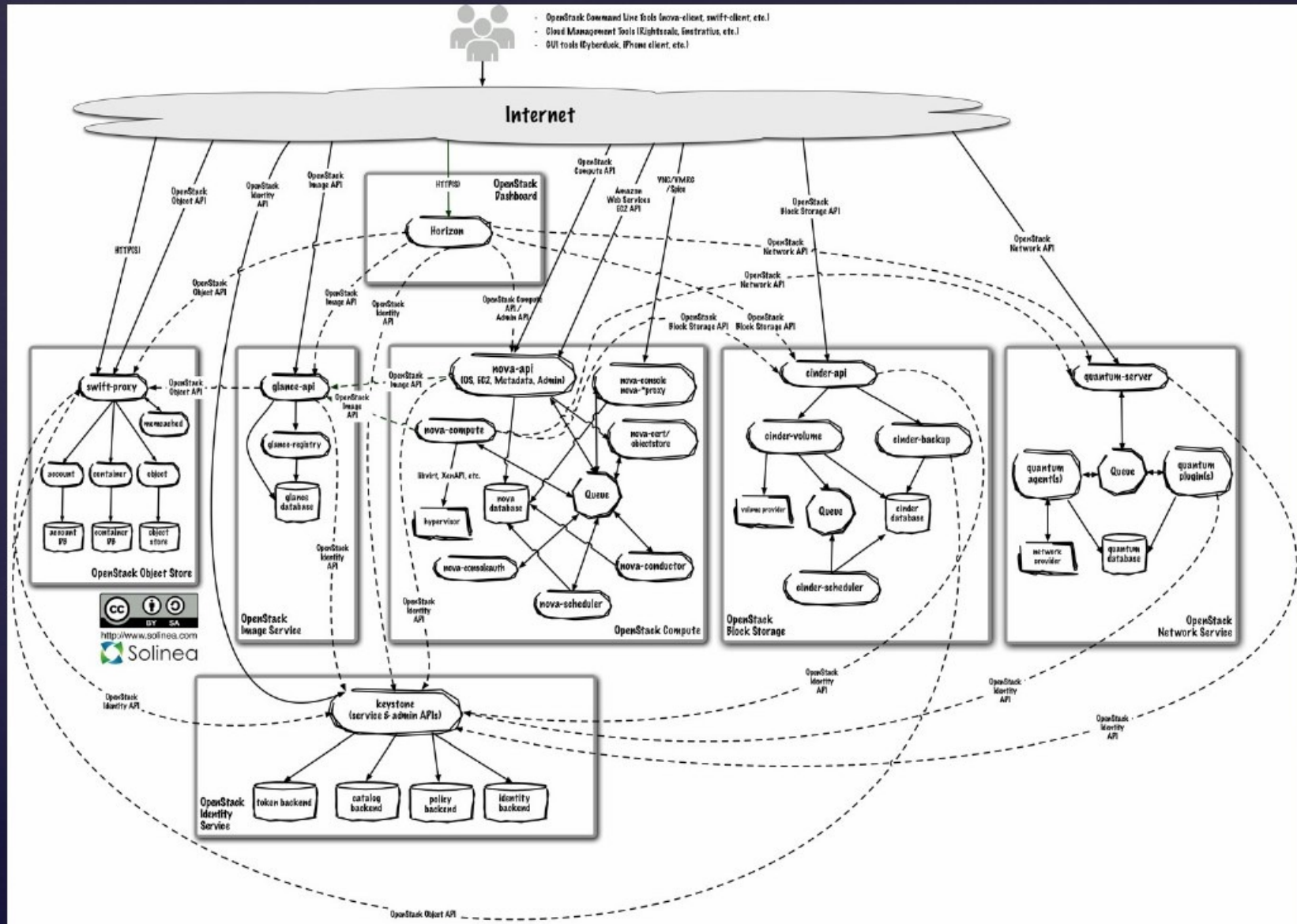- Cloud metering component for openstack based clouds
- Rest API
  - to query collected data from existing billing system
- System monitoring

OpenStack Grizzly Architecture

Other Projects in OpenStack

Incubated Projects

- Ironic (Bare Metal Provisioning)
- Red Dwarf (Relational Database)
- Savanna (Hadoop Provisioning)

Related Projects

- Triple O (OpenStack on OpenStack)
- Moniker (DNS-as-a-Service)
- Marconi (Message Queuing)
- Murano (Windows Orchestration)
- Convection (Task System Service)

Part IV

The Way To Go

Cloud Computing by NTIS

Service Model by NTIS

SaaS	not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities
PaaS	to deploy onto the cloud infrastructure consumer-created or acquired applications
IaaS	to provision processing, storage, networks, and other fundamental computing resources

Cloud Computing by NTIS Ver2

Management!!!

Unlimited Computing Resource by Responsibility

	Application	Computing Resource
SaaS		
PaaS	⊙	
IaaS	⊙	⊙

Private & Public

Cloud Computing

	IaaS	PaaS	SaaS
Private (OpenStack)	◉	○	
Public (Amazon)		◉	◉

On-Demand

Broad Network Access

Resource Pooling

Rapid Elasticity

Measured Service

감사합니다.

안명호, MHR Inc

mhr.james@gmail.com

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