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OpenStack Overview

history, architecture, components, flow

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Three Topics Today

1. OpenStack History & Architecture

- OpenStack 역사 및 기본 아키텍처

2. OpenStack Components

- Nova(API, Scheduler, Compute, Network, Volume)
- Horizon, Keystone, Glance, Cinder, Neutron

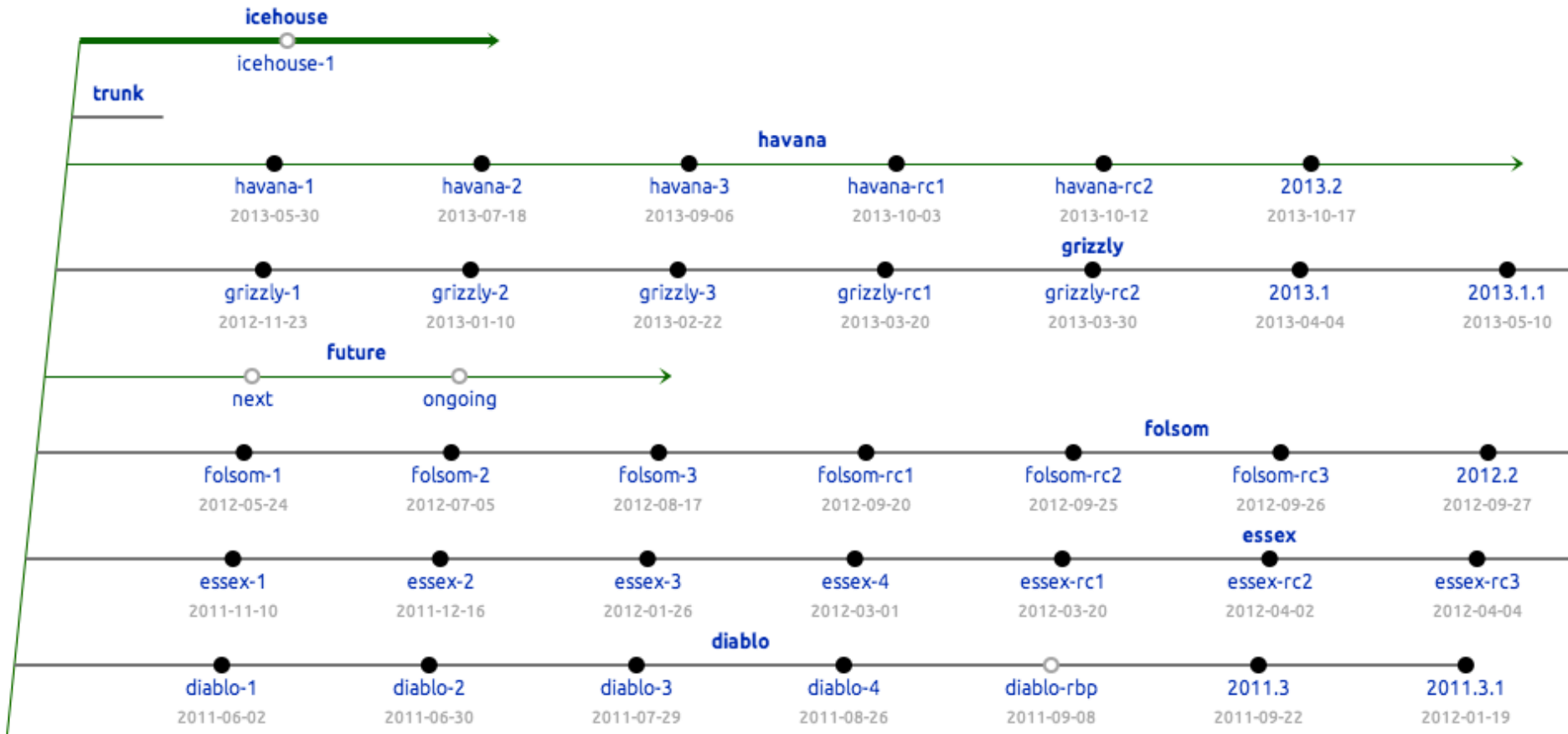
What is OpenStack?

- “Open source Cloud software”
 - codename : Nova, Swift
 - Global software 업체가 참여
 - Rackspace, HP, Dell, IBM, VMWare, EMC, Redhat, Ubuntu...
 - Apache2.0 License
- Capabilities (Nova)
 - VMs (OS,CPU, Memory), Volumes, Networks
 - Images
- Others open source cloud software
 - CloudStack, Eucalyptus, OpenNebula...

OpenStack History

- 2010년 10월 21일 - Austin (2010.1) - Deprecated
 - NASA : Nova, Rackspace : Swift
- 2011년 2월 2일 - Bexar (2011.1) - Deprecated
- 2011년 4월 15일 - Cactus (2011.2) - Deprecated
- 2011년 9월 22일 - Diablo (2011.3, 2011.3.1) - EOL
- 2012년 4월 5일 - Essex (2012.1, ~ 2012.1.3) - EOL
- 2012년 9월 27일 - Folsom (2012.2 ~ 2012.2.3) - EOL
- 2013년 4월 4일 - Grizzly (2013.1 ~ 2013.1.4)
- 2013년 10월 17일 - Havana (2013.2)

OpenStack Timeline



<https://launchpad.net/nova>

OpenStack Milestone



openstack

OpenStack Compute (Nova)

Overview

Code

Bugs

Blueprints

Translations

Answers

OpenStack Compute (nova) 2013.1.3

OpenStack Compute (nova) » 2013.1.3

Milestone information

Project:

[OpenStack Compute \(nova\)](#)

Series:

[grizzly](#)

Version:

2013.1.3

Released:

2013-08-08

Registrant:

[Alan Pevec](#)

Release registered:

2013-08-08

Active:

No. Drivers cannot target bugs and blueprints to this milestone.

[Download RDF metadata](#)

Activities

Assigned to you:

No blueprints or bugs assigned to you.

Assignees:

5 [Aaron Rosen](#), 1 [Alessandro Pilotti](#), 2 [Ben Nemeec](#), 1 [Brent Eagles](#),
2 [ChangBo Guo](#), 1 [Edward Hope-Morley](#), 4 [Gary Kotton](#), 1 [Hans Lindgren](#),
2 [Kieran Spear](#), 1 [Mathieu Gagné](#), 1 [Matt Riedemann](#), 2 [Nikola Đipanov](#),
2 [Rafi Khardalian](#), 1 [Rosario Di Somma](#), 9 [Ruby Loo](#), 2 [Russell Bryant](#),
1 [Sylvain Afchain](#), 1 [Thierry Carrez](#), 5 [Vish Ishaya](#), 2 [Xavier Queralt](#),
6 [Yaguang Tang](#), 1 [Édouard Thuleau](#)

Blueprints:

No blueprints are targeted to this milestone.

Bugs:

53 [Fix Released](#)

<https://launchpad.net/nova/+milestone/2013.1.3>

OpenStack Core Projects

- Integrated Projects

- Nova (Compute) : since Austin release
- Swift (Object Storage) : since Austin release
- Glance (Image Service) : since Bexar release
- Keystone (Identity) : since Essex release
- Horizon (Dashboard) : since Essex release
- Neutron (Networking) : since Folsom release
- Cinder (Block Storage) : since Folsom release
- Ceilometer (Monitoring and Metering) : since Havana release
- Heat (Orchestration) : since Havana release

<http://www.openstack.org/software/roadmap>

OpenStack Related Projects

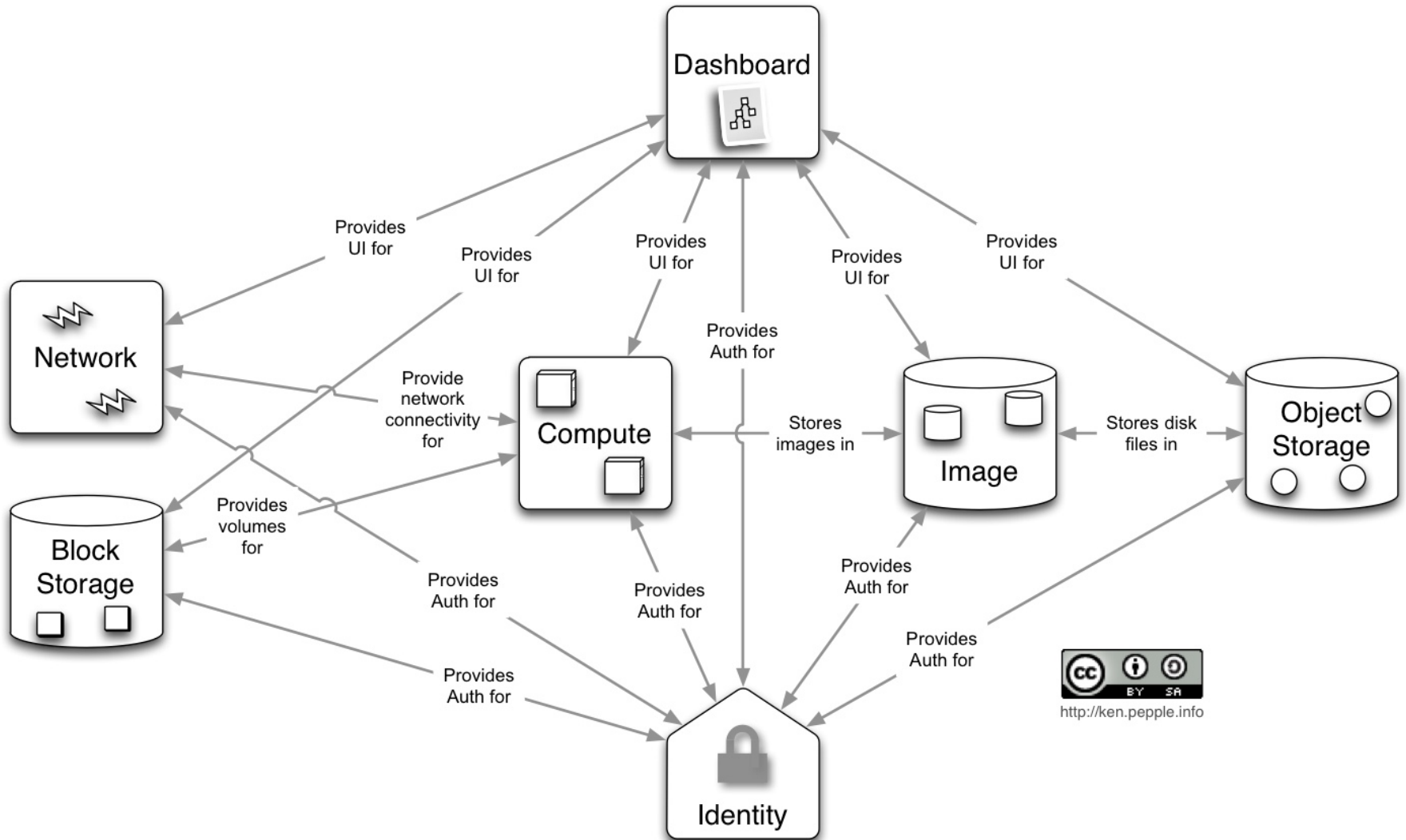
- Trove (under Incubation)
 - Database as a Service
- Ironic (under Incubation)
 - provision bare metal machines
- Marconi (under Incubation)
 - Queue Service
- Savanna (under Incubation)
 - easily provision and manage Hadoop clusters on OpenStack

<https://wiki.openstack.org/wiki/Programs>

OpenStack Features

- VM 관리 (Nova)
 - Instance : boot / reboot / start / stop / terminate
- Security Group / rule 관리 (Nova)
 - Security group : create / delete
 - Rule : add / delete
- key pair 관리 (Nova)
 - Private key : create / delete
- Floating IP 관리 (Nova)
 - Floating ip create / add / remove / delete
- Block Storage 관리 (Cinder)
 - Volume create / attach / detach / delete
- Network 관리 (Neutron)
 - Network, Subnet, Gateway, Router : create / delete

Conceptual Architecture



Componets

- **Horizon**
 - A modular Django web application
- **Nova : nova-api**
 - 사용자 compute API 요청에 대한 처리
 - OpenStack Compute API, Amazon's EC2 API, Admin API 등
- **Nova : nova-compute**
 - 가장 중요한 모듈로 hypervisor APIs (XenAPI for XenServer/XCP, libvirt for KVM or QEMU, VMware API for VMWare 등) 를 통해 VM을 생성/삭제
 - Queue 로 부터 요청을 받아 필요한 System call 을 실행하고 결과를 Database 에 저장
- **Nova : nova-network**
 - Bridging interfaces 세팅하고 iptables rules 를 변경
- **Nova : nova-scheduler**
 - VM instance 를 어느 Compute Host 에 생성할 것인가를 결정
- **Nova : nova-volume**
 - Block storage 를 생성/삭제
 - LVM, iSCSI

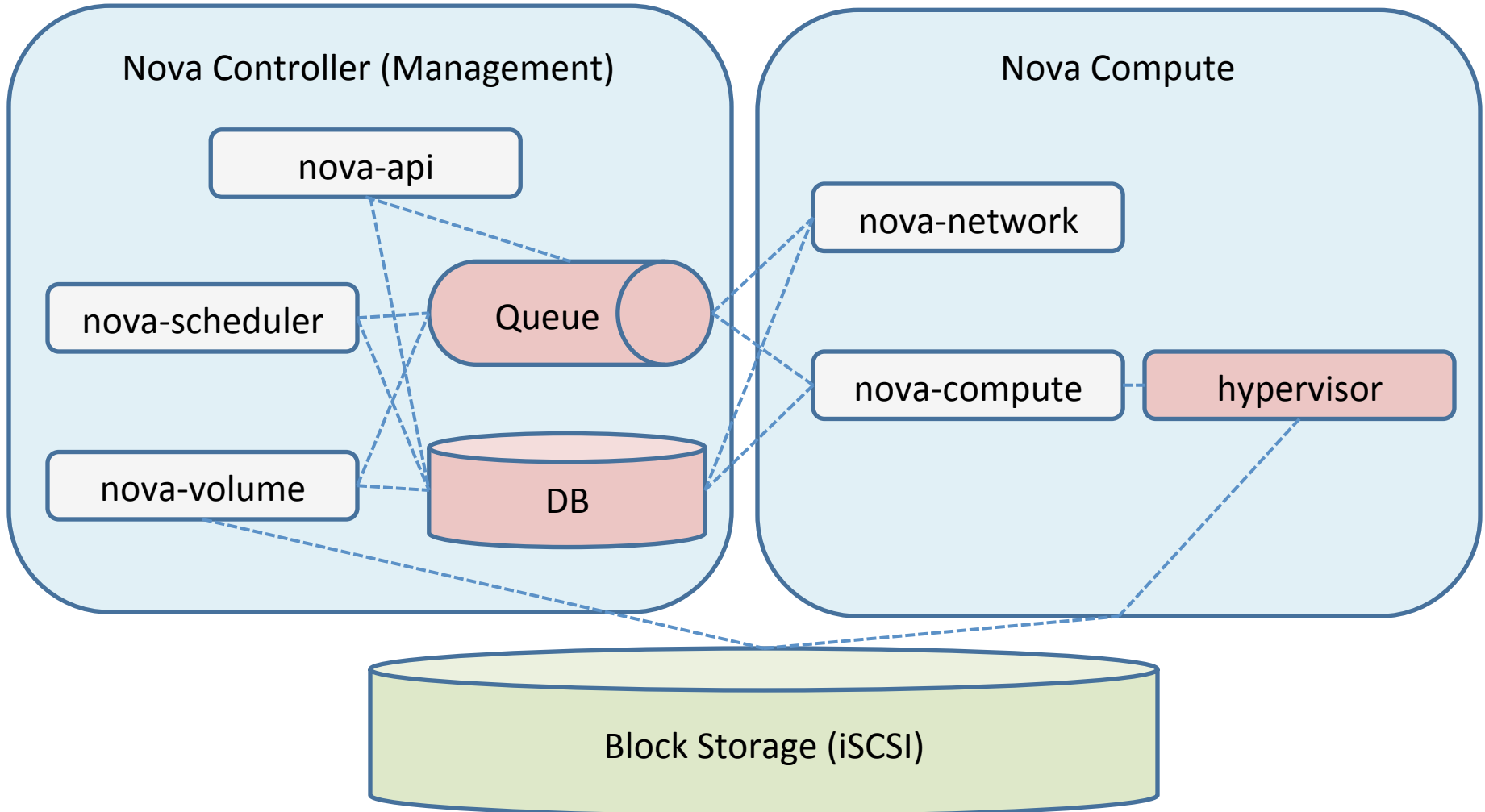
Componets

- **Glance : glance-api**
 - 사용자의 Image API (image discovery, retrieval, storage) 요청에 대한 처리
- **Glance : glance-registry**
 - Image 저장 및 Image metadata (syze, type, etc.)에 대한 조회
 - Image 저장소로 Swift, normal file systems, RADOS block devices, Amazon S3
- **Keystone**
 - 사용자의 API (catalog, policy, token, identity services) 요청에 대한 처리
 - Standard backends (LDAP, SQL, etc.), Key Value Stores
- **Neutron : neutron-server**
 - 사용자의 API 를 처리
 - 적당한 Neutron plugin 을 선택
- **Neutron plugins and agents**
 - ports plugging and unplugging, create networks, subnets, IP addressing
 - Cisco virtual and physical switches, Nicira NVP product, NEC OpenFlow products, Open vSwitch, Linux bridge, Ryu Network Operating System, Midokura Midonet

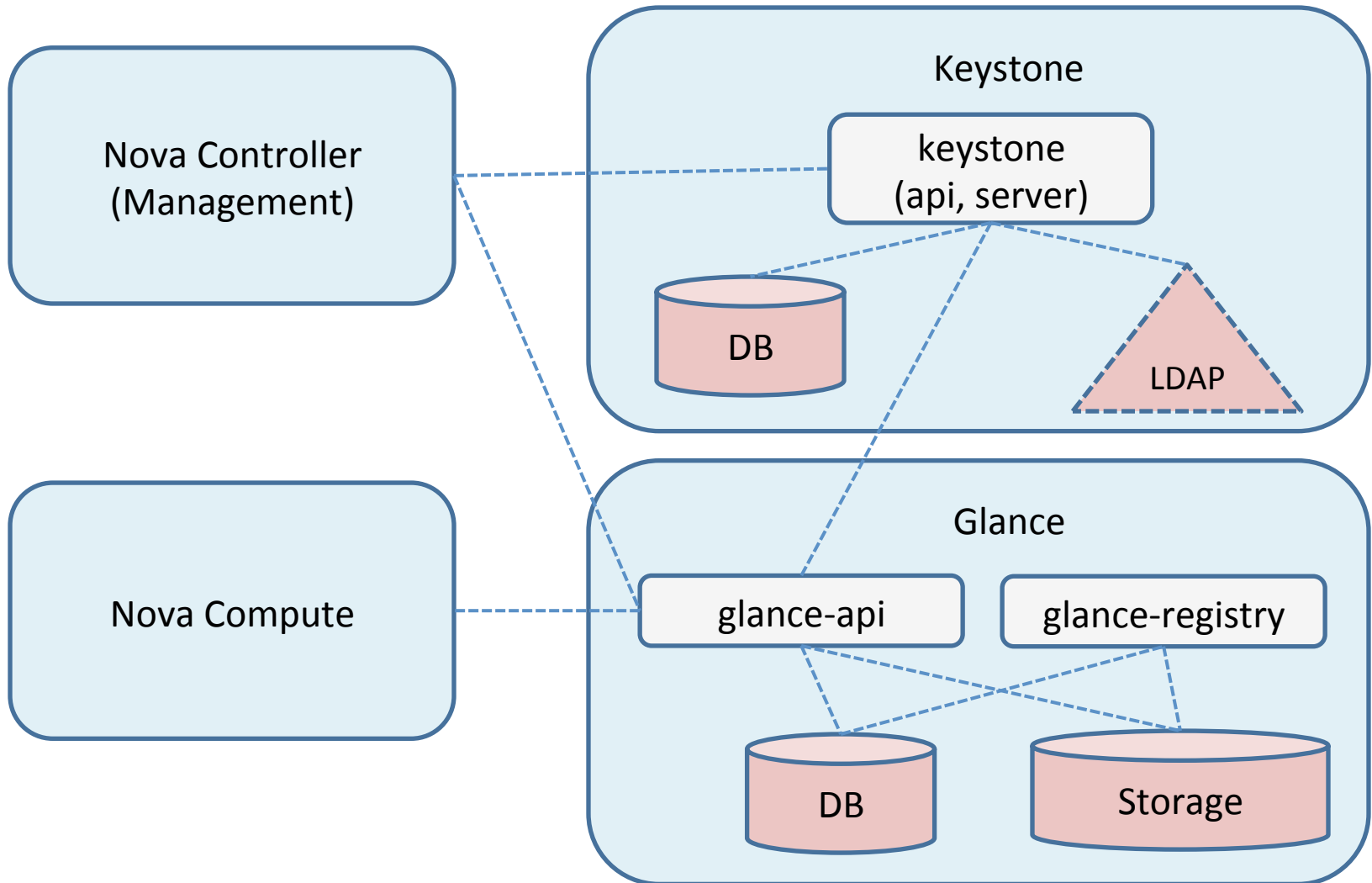
Componets

- Cinder : cinder-api
 - 사용자의 API 요청을 받아 cinder-volume 에 전달
- Cinder : cinder-volume
 - Block storage volume 에 대한 처리
 - 다양한 storage provider 를 지원
 - IBM, SolidFire, NetApp, Nexenta, Zadara, linux iSCSI, other storage providers
- Cinder : cinder-scheduler
 - nova-scheduler 와 같이 어떤 block storage provider node 에 volume 을 생성할 것인가를 결정

Logical Architecture (1)



Logical Architecture (2)



Keystone

Keystone is an OpenStack project that provides Identity, Token, Catalog and Policy services for use specifically by projects in the OpenStack family

Keystone Data Model

- User
 - has account credentials, is associated with one or more tenants
- Tenant
 - unit of ownership in openstack, contains one or more users
- Role
 - a first-class piece of metadata associated with many user-tenant pairs
- Token
 - identifying credential associated with a user or user and tenant
- Extras
 - bucket of key-value metadata associated with a user-tenant pair
- Rule
 - describes a set of requirements for performing an action

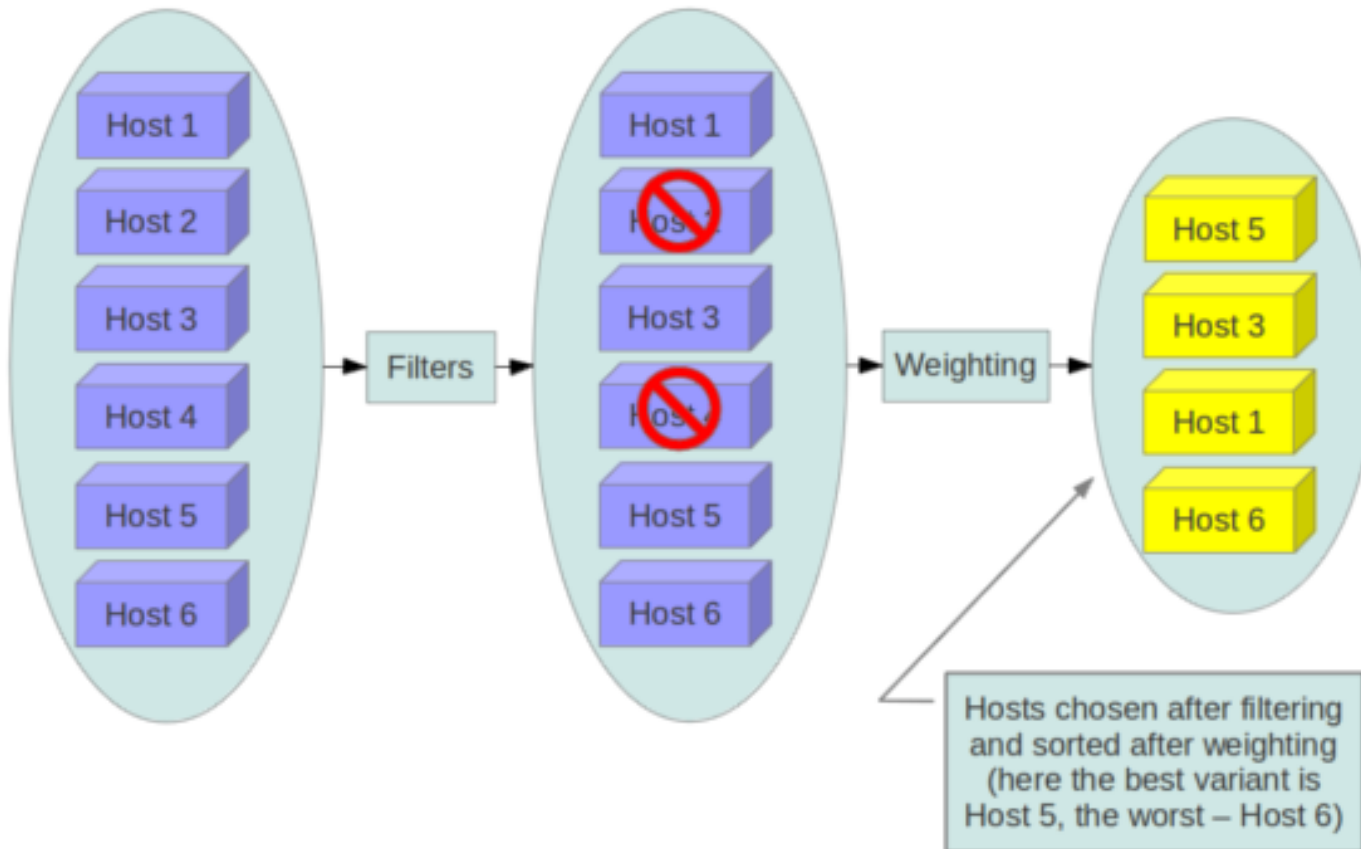
Nova Scheduler

The **nova-scheduler** service determines which host a VM should launch on. The term "host" in the context of filters means a physical node that has a **nova-compute** service running on it.

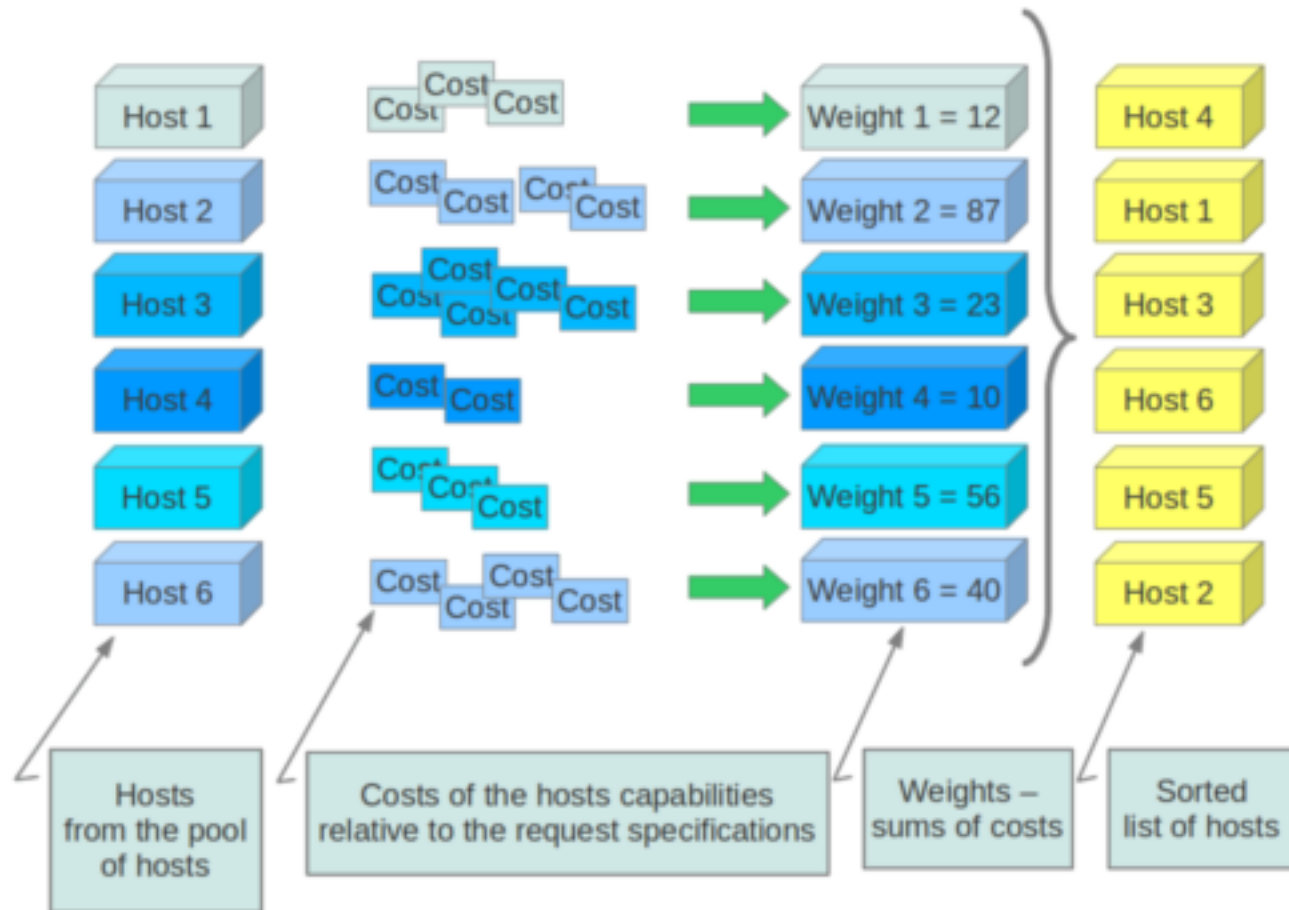
Nova Scheduler Types

- **Chance**
 - Random 으로 Host 를 선택
- **Simple**
 - VM instance 가 가장 적은 Host 를 선택
- **Filter**
 - Filter 조건에 맞는 Host를 제외하고 weight 를 통해 Host를 선택
- **Multi**
 - 모듈 별로 특정 Scheduler 를 선택

Filter Scheduler (Filtering)



Filter Scheduler (Cost & Weight)



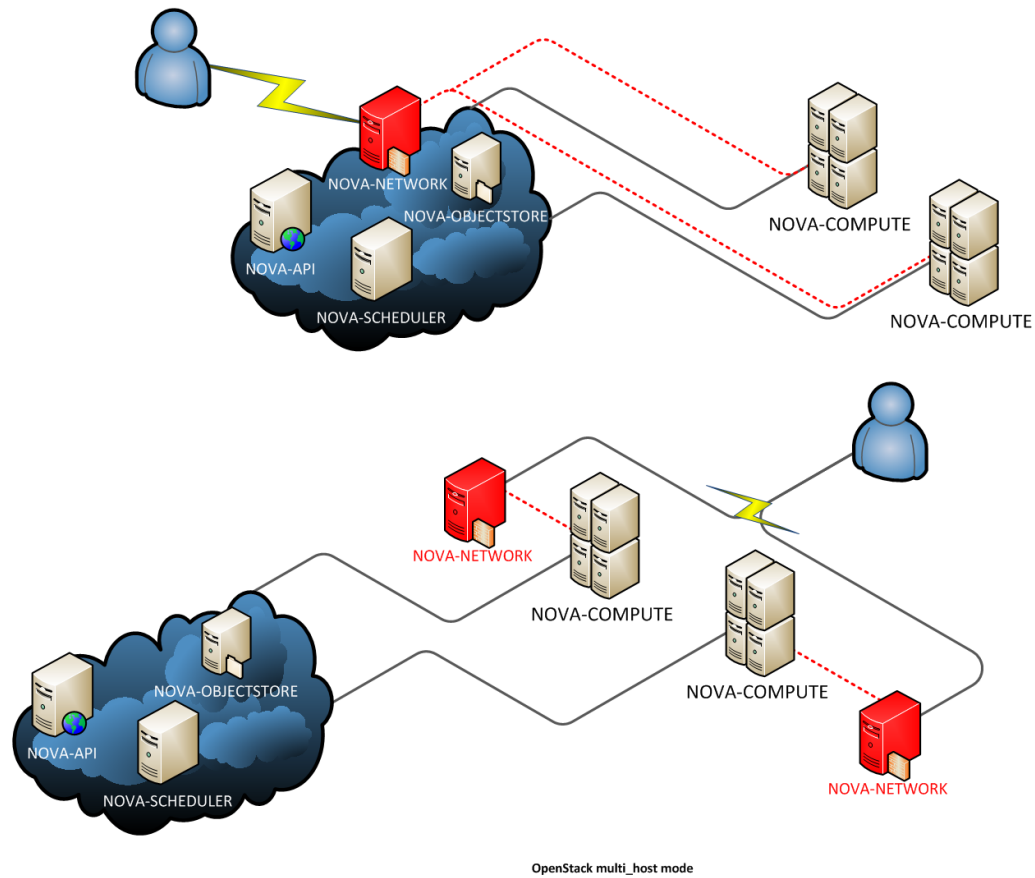
Nova Network

OpenStack Networking is a pluggable, scalable and API-driven system for managing networks and IP addresses.

Nova Network Features

- dnsmasq start (dhcp server)
- fixed ip allocate
- floating ip allocate (using iptables)
- Linux Bridge 생성
- vlan interface 생성

Nova Network SPOF



Network Model

- Flat Network Manager
- Flat DHCP Network Manager
- VLAN Network Manager
- Neutron Network
(Virtual Network Service)

Fixed IPs & Floating IPs

- Fixed IPs

- VM Instance 에 할당되는 Private IP
- VM 이 삭제될 때 까지 고정되는 IP

- Floating IPs

- VM Instance 에 동적으로 할당할 수 있는 Public IP
- 언제든지 VM 할당/제거 할 수 있는 유동적인 IP
- 고객이 IP 를 reserve 하여 사용할 수 있는 IP

Application Architecture

- Communication Method
 - Queue : call, cast
 - Rest API
- Structure
 - API : 다른 Component 를 호출할 때
 - Manager : Queue Subscribe Method 의 집합
 - Driver : Plugin 이 가능한 Abstract 모듈
 - DB : SQLAlchemy (Database toolkit for python)
- Component
 - Nova : API, Scheduler, Compute
 - Cinder : API, Scheduler, Volume
 - Neutron : API, L3 agent, DHCP agent, Plugin agent

How to Contribute

- Making an account at launchpad.net
- Join the OpenStack developers mailing list & #openstack-dev IRC Channel
- Agreeing to the CLA (Contributors License Agreement)
- Writing Blueprints
- Getting the OpenStack code from github
- Setting up girrit (code review system)
- Making a git new branch
- pushing the your code

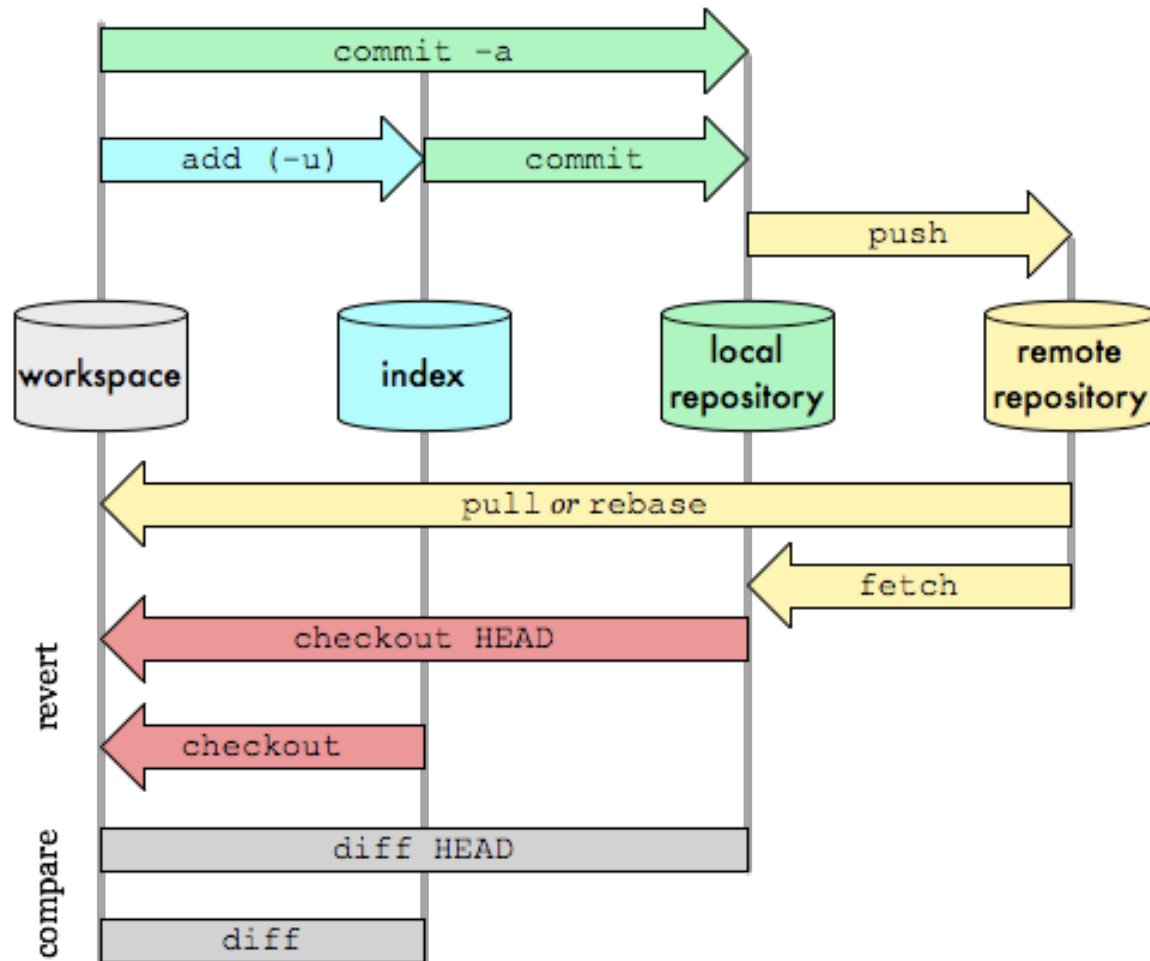
Git install

- tortoisegit (GUI version) download
 - <https://code.google.com/p/tortoisegit/wiki/Download>
- msysgit (Git for Windows) download
 - <https://code.google.com/p/msysgit/downloads/list?q=full+installer+official+git>

Git Concept

Git Data Transport Commands

<http://osteele.com>



OepnStack Source Download

- source location
 - <https://github.com/openstack/nova>
- source download using git
 - `git clone git://github.com/openstack/nova.git`

Git command

- branch 보기
 - local branch : git branch
 - remote branch : git branch -r
- tag 보기
 - git tag
- remote branch 를 로컬로 연결 생성
 - git checkout -b stable/folsom origin/stable/folsom
- remote tag 를 로컬로 연결 생성
 - git checkout -b 2012.1 tags/2012.1
- branch 이동
 - git checkout master

IDE install

- python 2.7.3(for Windows) download
 - <http://www.python.org/getit/releases/2.7.3/>
- java download
 - <http://www.java.com/ko/download/>
- 환경변수 세팅
 - PYTHONPATH %PYTHONPATH%;python 설치 디렉토리
 - JAVA_HOME java 설치 디렉토리
 - Path 에 python 추가 python 설치 디렉토리
- Eclipse download
 - <http://www.eclipse.org/downloads/>
- Eclipse plugin 설치
 - 설치 방법 : menu -> help -> Eclipse Marketplace
 - PyDev, EGit