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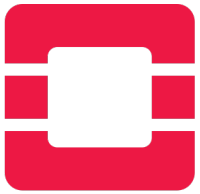

openstack®

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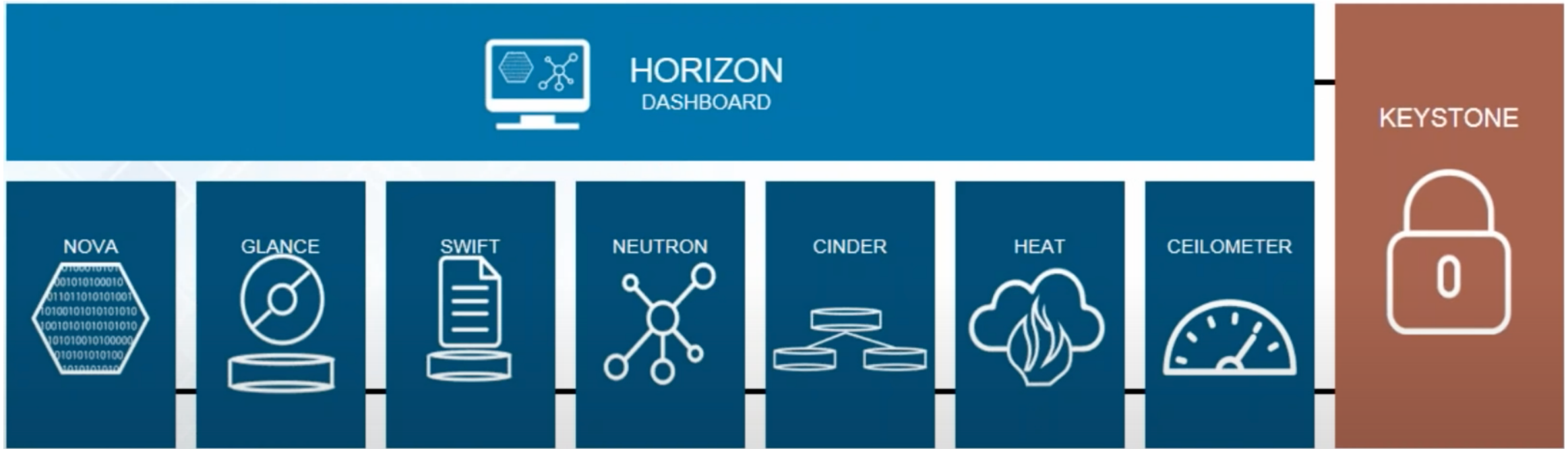
OPENSTACK ARCHITECTURE

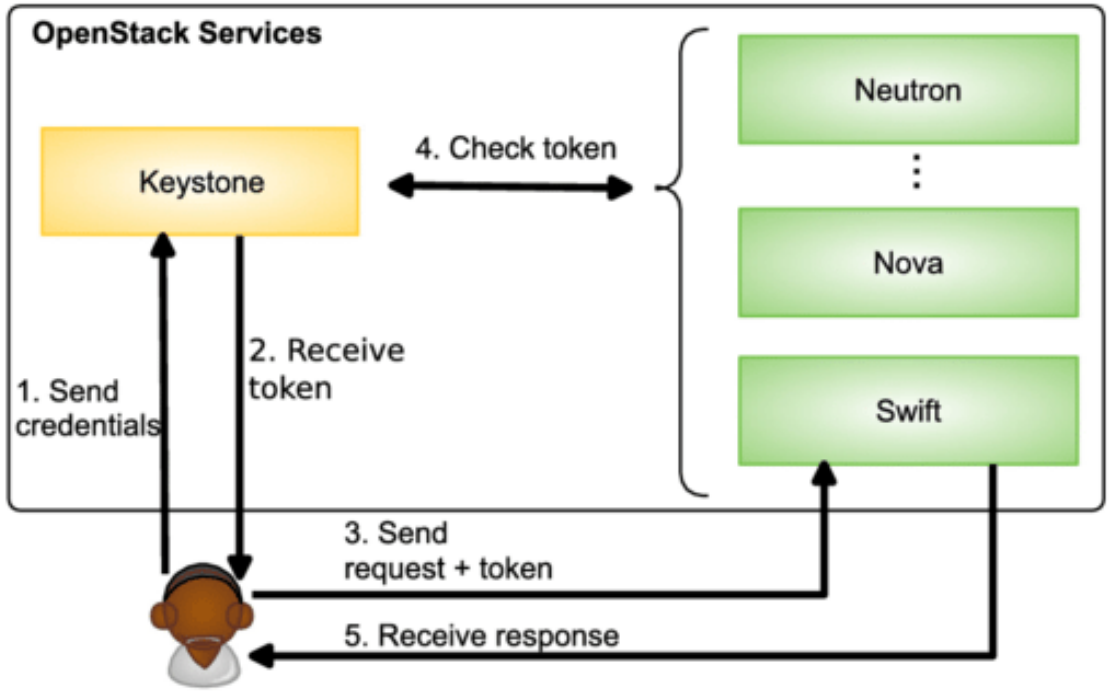


OPENSTACK COMPONENTS

- OpenStack identifies nine key components...
  - Keystone
  - Glance
  - Nova
  - Neutron
  - Horizon
  - Swift
  - Cinder
  - Ceilometer
  - Heat

KEYSTONE

- Keystone: provides identity services for OpenStack. A central list of users/permissions mapped against OpenStack services. Provides multiple means of access.
- keystone is an OpenStack service that provides API client authentication, service discovery and distributed multi-tenant and authorization by implementing OpenStack identity API



KEYSTONE
an OpenStack Community Project

GLANCE

- Glance: provides image services to OpenStack. "images" refers to images (or virtual copies) of hard iso or disks.
  - Stores and retrieves disk images (virtual machine templates)
  - Supports Raw, QCOW, VMDK, VHD, ISO, OVF & AMI/AKI
  - Backend storage : Filesystem, Swift, Gluster, Amazon S3

NOVA

- Nova: cloud computing fabric controller, main part of an IaaS system. It is designed to manage and automate pools of computer resources.
- Core compute service comprised of
  - Compute Nodes – hypervisors that run virtual machines
    - Supports multiple hypervisors KVM, Xen, LXC, Hyper-V and ESX
  - Distributed controllers that handle scheduling, API calls, etc
    - Native OpenStack API and Amazon EC2 compatible API

NEUTRON

- Neutron: provides the networking capability for OpenStack.
- Network Service
- Provides framework for Software Defined Network (SDN)
- Plugin architecture
  - Allows integration of hardware and software based network solutions
    - Open vSwitch, Cicso UCS, Standard Linux Bridge, Nicira NVP

SWIFT

- Swift: storage system for objects and files.
  - Object Storage service
  - Modeled after Amazon's S3 service
  - Provides simple service for storing and retrieving arbitrary data
  - Native API and S3 compatible API

CINDER

- Cinder: block storage component, analogous to the traditional access on a disk drive.
- Block Storage (Volume) Service
- Provides block storage for virtual machines (persistent disks)
- Similar to Amazon EBS service

HORIZON

- Horizon: The dashboard behind OpenStack. The only native graphical interface to OpenStack.
- Provides simple self-service UI for end-users
- Basic cloud administrator functions
  - Define users, tenants and quotas
  - No infrastructure management

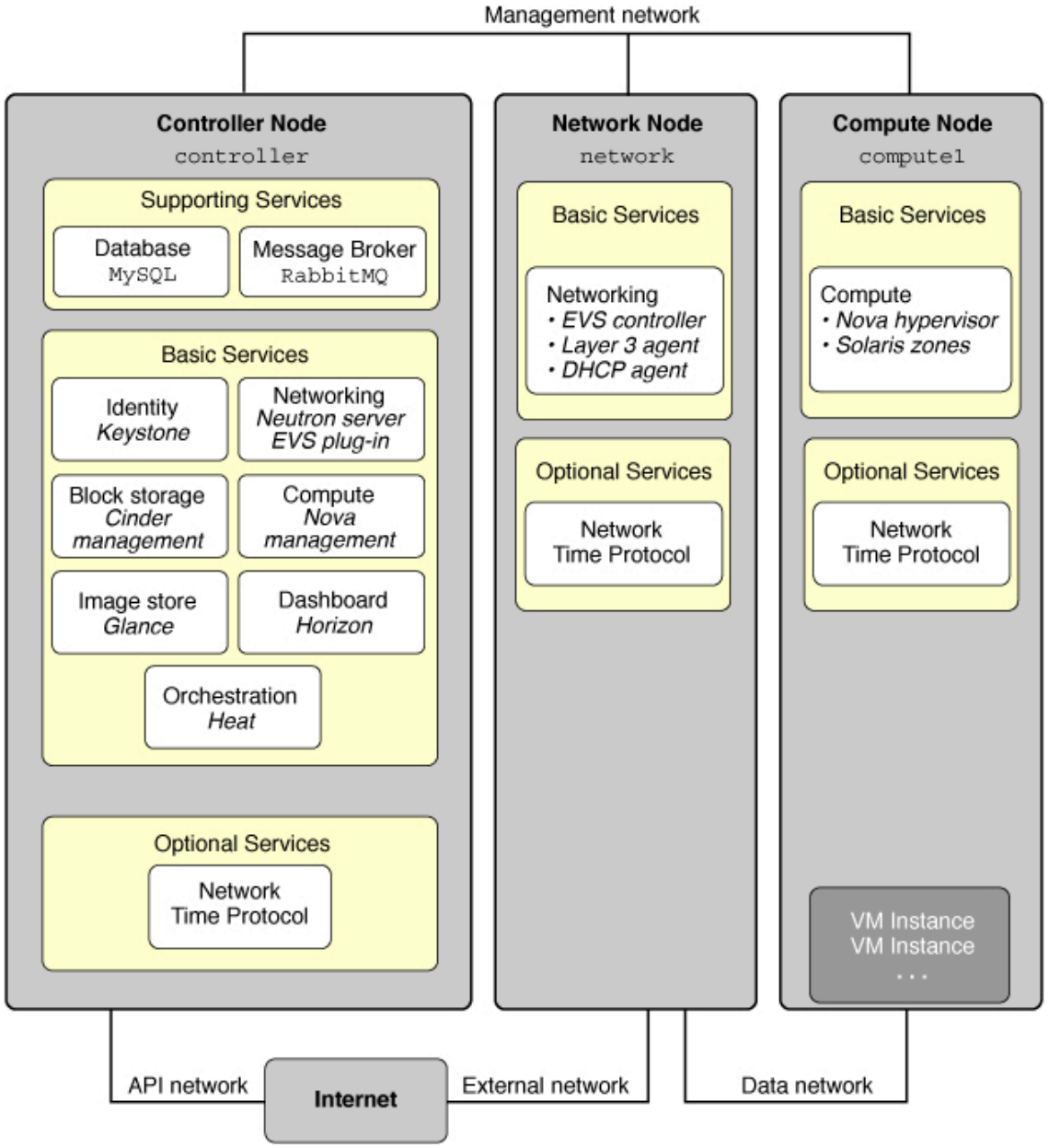
CEILOMETER

- Ceilometer: provides telemetry services.
- Metering and reporting. Allows OpenStack to provide billing services to users.

HEAT

- Heat: the orchestration component of OpenStack.
- Cloud orchestration does the, deployment or starting servers; acquire and assign storage capacity; manage networking; create VMs; and gain access to specific software on cloud services.
- This is done through three main attributes : service, workload and resource orchestration.

THREE-NODE ARCHITECTURE OVERVIEW



CONTROLLER NODE

- **Controller node Runs:**
  - Identity service (Keystone), Image Service (Glance)
  - Management portions of Compute and Networking
  - Networking plug-in (Open vSwitch), and the dashboard (Horizon).
  - Supporting services: SQL database, message queue, and Network Time Protocol (NTP).

NETWORK AND COMPUTE NODES

- **Network node:**
  - Runs Networking plug-in (Open vSwitch)
  - Provides switching, routing, NAT, and DHCP services. Also handles external (Internet) connectivity for tenant VMs.
- **Compute node(s)**
  - Runs the hypervisor (default KVM) that operates tenant VMs.
  - Networking plug-in (Open vSwitch) and an agent to connect tenant networks to VMs.
  - Agent to provide firewalling (security groups) services.

MINIMUM REQUIREMENTS

- A fresh Ubuntu 18.04 installation
- User with sudo privileges
- 4 GB RAM
- 2 vCPUs
- Hard disk capacity of 10 GB
- Internet connection

UPDATE AND UPGRADE THE SYSTEM

- apt update -y && apt upgrade –y

```
root@ubuntu:/# apt update -y && apt ugrade -y
Hit:1 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic InRelease
Get:2 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:3 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-backports InRelease [74.6 kB]
Get:4 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic/universe amd64 Packages [8570 kB]
Get:5 http://archive.canonical.com/ubuntu bionic InRelease [10.2 kB]
Get:6 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:7 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic/universe Translation-en [4941 kB]
Get:8 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic/multiverse amd64 Packages [151 kB]
Get:9 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic/multiverse Translation-en [108 kB]
Get:10 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [627 kB]
```

CREATE STACK USER AND ASSIGN SUDO PRIVILEDGE

- sudo adduser -s /bin/bash -d /opt/stack -m stack
- echo "stack ALL=(ALL) NOPASSWD: ALL" | sudo tee /etc/sudoers.d/stack

```
root@ubuntu:/# sudo useradd -s /bin/bash -d /opt/stack -m stack
root@ubuntu:/#
root@ubuntu:/# echo "stack ALL=(ALL) NOPASSWD: ALL" | sudo tee /etc/sudoers.d/stack
stack ALL=(ALL) NOPASSWD: ALL
root@ubuntu:/#
```

INSTALL GIT AND DOWNLOAD DEVSTACK

- su – stack
- sudo apt install git -y

```
root@ubuntu:~# su - stack
stack@ubuntu:~$
stack@ubuntu:~$ sudo apt install git -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
git is already the newest version (1:2.17.1-1ubuntu0.4).
The following packages were automatically installed and are no longer required:
  grub-pc-bin libnuma1
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

USING GIT, CLONE DEVSTACK'S GIT REPOSITORY

- git clone https://git.openstack.org/openstack-dev/devstack

```
stack@ubuntu:~$ git clone https://git.openstack.org/openstack-dev/devstack
Cloning into 'devstack'...
warning: redirecting to https://opendev.org/openstack/devstack/
remote: Enumerating objects: 43615, done.
remote: Counting objects: 100% (43615/43615), done.
remote: Compressing objects: 100% (12575/12575), done.
remote: Total 43615 (delta 31152), reused 42370 (delta 30360)
Receiving objects: 100% (43615/43615), 8.27 MiB | 24.61 MiB/s, done.
Resolving deltas: 100% (31152/31152), done.
stack@ubuntu:~$
stack@ubuntu:~$ ls
devstack
stack@ubuntu:~$
```

- **DevStack** is a series of extensible scripts used to quickly bring up a complete OpenStack environment based on the latest versions of everything from git master.

CREATE DEVSTACK CONFIGURATION FILE

- cd devstack
- vim local.conf
- Paste the following content

```
[[local|localrc]]
 # Password for KeyStone, Database, RabbitMQ and Service
ADMIN_PASSWORD=StrongAdminSecret
DATABASE_PASSWORD=$ADMIN_PASSWORD
RABBIT_PASSWORD=$ADMIN_PASSWORD
SERVICE_PASSWORD=$ADMIN_PASSWORD

 # Host IP - get your Server/VM IP address from ip addr command
HOST_IP=10.208.0.10
```

INSTALL OPENSTACK WITH DEVSTACK

- ./stack.sh
- The following features will be installed:
  - Horizon – OpenStack Dashboard
  - Nova – Compute Service
  - Glance – Image Service
  - Neutron – Network Service
  - Keystone – Identity Service
  - Cinder – Block Storage Service
  - Placement – Placement API

AT THE END OF THE INSTALLATION

```
This is your host IP address: 10.128.0.8
This is your host IPv6 address: ::1
Horizon is now available at http://10.128.0.8/dashboard
Keystone is serving at http://10.128.0.8/identity/
The default users are: admin and demo
The password: StrongAdminSecret

WARNING:
Using lib/neutron-legacy is deprecated, and it will be removed in the future


Services are running under systemd unit files.
For more information see:
https://docs.openstack.org/devstack/latest/systemd.html

DevStack Version: train
Change: 16d11d27f375b8c027bbc3a1db1885e90ce6c604 Merge "Option "lock_path" from group "DEFAULT"
OS Version: Ubuntu 18.04 bionic

2019-06-04 12:19:19.207 | stack.sh completed in 884 seconds.
```