OPENSTACK PRIVATE CLOUD WITH GITHUB

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Abstract

Today, with rapid growth of the cloud computing technology, enterprises and organizations need to build their private cloud for their own specific requirements. Infrastructure itself is not sufficient for users, they need platforms and software on which scalable solutions should be available with on demand computing resources with Authentication & storage. In this paper, I am going to introduce one of the most successful open source that is openstack github, where opentack/Nova with github provides a cloud computing fabric controller, supporting vide variety of virtulization technologies and analogus to Amazon EC2 service also discuss about openstack keystone for Authentication with openstack storage cinder with openstack dashboard where github is a web-based Git repository hosting service, which offers all of the distributed revision control and source code management (SCM) functionality of Git as well as adding its own features.

Keywords: Cloud Computing, OpenStack, Openstack components with GitHub

1. Introduction to Cloud Computing

Cloud computing is Internet ("CLOUD") based development and use of computer technology ("COMPUTIG") Cloud Computing is a general term for anything that involves delivering hosted services over the internet.

Cloud computing provides on demand services, Broad Network access, Ubiquitous, Shared Resource Pooling, Rapid Elasticity with scalable cloud services & Measured cloud hosted services.

Cloud Computing defines different types of services

1)   Iaas (Infrasture as a service)
2)   Saas (Software as a service)
3)   Pass (Platform as a service)
4)   Daas (Desktop as a service)
5)   Storage as a service
6)   Anything as a service

It is used to describe both a platform and type of application, Cloud computing also describes applications that are executed to be accessible through the Internet The Cloud application use large data centers and powerful servers that host Web applications and Web services.

Different types of visibility of cloud is :

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1)Private Cloud
2) Public cloud
3) Community Cloud
4) Hybrid Cloud

Cloud computing services can be classified as either computing or storage. Cloud storage is becoming a very popular research field. One reason is that more and more data-intensive applications are being attracted by the clouds. Cloud storage can provide high scalability, availability, fault tolerance, security, and cost-effective data services. In a cloud storage environment, data is usually stored and managed in the space provided by the third-party companies. The common storage protocols include two types: NAS and SAN.

Cloud storage has become more and more popular since the successful simple storage service (S3) of Amazon, SQL Azure with NOSQL and Biddata, Block Storage with cinder in openstack cloud.

In cloud computing Storage can be provide by following mechanisms.

1) Storage network technology has developed in the following three main
 configurations: Direct Attached Storage (DAS), Network Attached Storage (NAS), and Storage Area Networks (SAN).

2) Hadoop :Apache Hadoop is an open-source software framework for storage and large-scale processing of data-sets on clusters of commodity hardware

3) BigData: Big Data is a heterogeneous mix of data both structured (traditional datasets – in rows and columns like DBMS tables, CSV's and XLS's) and unstructured data like e-mail attachments, manuals, images, PDF documents, medical records such as x-rays, ECG and MRI images, forms, rich media like graphics, video and audio, contacts, forms and documents.

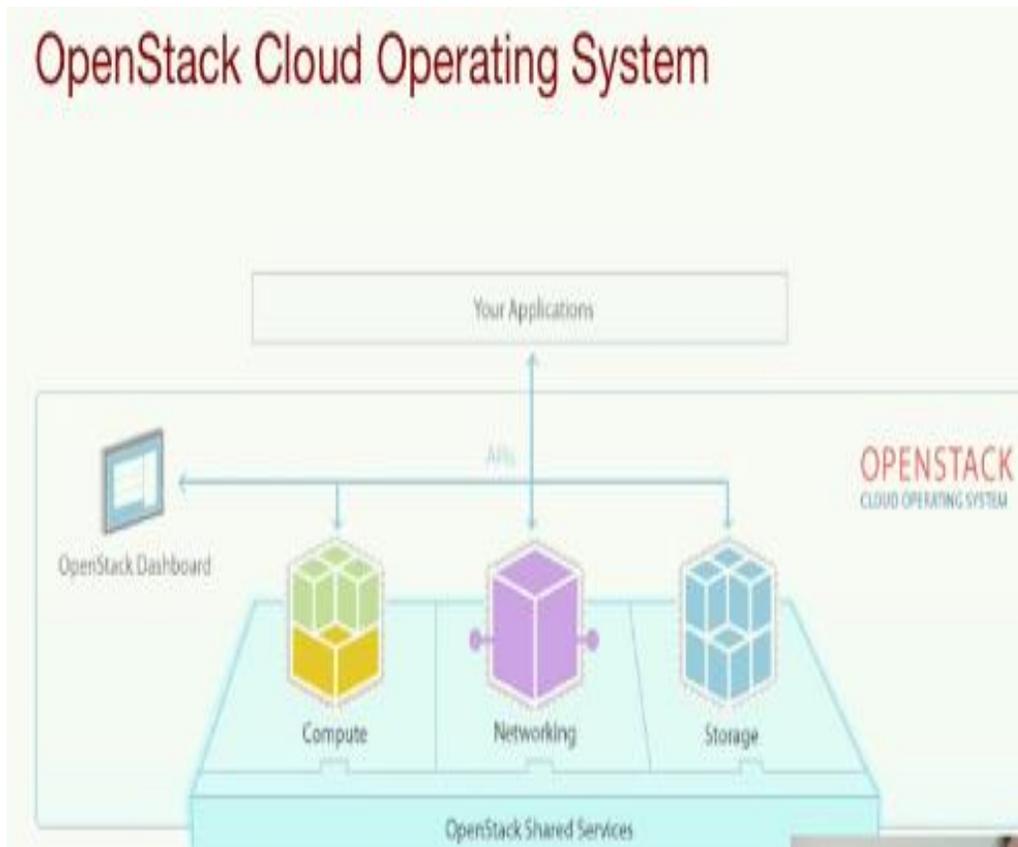**2. OpenStack Cloud**
2.1. Concepts
OpenStack is a collection of open source software projects that service providers or enterprises can setup their own computation or storage infrastructure with help of it. NASA and Rackspace are the two key initial contributors who started the OpenStack project in July 2010. Rackspace contributed their "Cloud Files & Cloud Servers" platform to power the Object Storage part of the OpenStack, whilst NASA contributed their "Nebula with NovaCC" platform to power the Compute part. Openstack uses python language.
Openstack Mission :

 "To produce Open Source cloud computing platform that will meet the needs of public and private cloud providers regardless of size, by being simple to implement and massively scalable."
There are 5 main stack services under OpenStack :-

OpenStack Cloud Operating System

2.2. OpenStack Compute Service (Nova)

Nova is the computing brain of the OpenStack. All activities regarding to the life cycle of an instance is managed with help of nova. This management platform includes: managing compute resources, authorization, networking and scalability activities of the cloud. Nova uses libvirt API to interact with supported hypervisors and does not able to perform virtualization activities.

Some essential components of nova are: API Server (to interact with outside world), Message Queue (for internal communications between services), Compute Workers (instance lifecycle manager), Network Controller (manages network configuration of host machines), Volume Worker (LVM-based instance volume manager) and Scheduler (to mapping the nova-API calls to the appropriate OpenStack components).

2.3. OpenStack Imaging Service (Glance)

Glance is a lookup and retrieval system to manage virtual machine images. By default it uses Local Filesystem storage backend, but it can be also configured to use OpenStack Object Store or S3 Storage backend.

2.4. OpenStack Storage Service (Swift)

Swift infrastructure provides distributed and consistent virtual object store for cloud. It is similar to Amazon Web Service – Simple Storage Service (S3) [6] and capable of media streaming and working with large databases.

Swift components are: Swift Account (lists containers), Swift Container (lists the objects as SQLite files in a con-tainer), Swift Object (handle storage, retrieval and dele-tion of

objects stored in the local storage), Swift Proxy (by using Swift API through the proxy server, consumers interact with the Swift setup), and The Ring (contains information about the physical location of the objects stored inside Swift).

2.5. OpenStack Identity Service (Keystone)

Keystone provides policy rules and identity mechanism for all components in cloud including: nova, swift and glance.
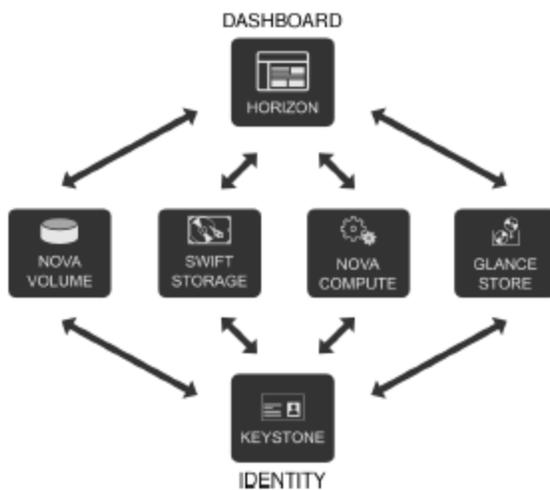
Keystone provides authentication and authorization. Authentication refers to the process where an entity's identity is authenticated, typically by providing evidence that it holds a specific digital identity such as an identifier and the corresponding credentials, while authorization function determines whether a particular entity is authorized to perform a given activity, typically inherited from authentication when logging on to an application or service .

2.6. OpenStack Web-Interface (Horizon)

With horizon administrators can manage whole cloud like managing instances and images, allocating volume to instances and setting rules for policies through web-interface. Moreover, it provides web access to instances through VNC console for users.

Fig. 1 [8] illustrates a simple representation of interaction between keystone and horizon with the remaining OpenStack components.

Opentack Components

3. OPenStack Framework with GitHub Multi Node Architecture

OpenStack is open source cloud computing software. It is basically an international collaboration of cloud computing engineers, developers and users. Its aim is to produce different solutions for numerous types of cloud which are simple to implement, highly scalable and rich in functionality. It provides Infrastructure as service (IaaS) solution.

Openstack Juno Installation can be done to design multi-node architecture with Openstack Networking (Neutron) that requires three node types:

The cloud is deployed using OpenStack platform with 3-nodes architecture i.e. Controller, Compute and Network. Each node is configured for some basic and optional services. Some of the details related to these nodes are discussed is as below :

A. The Controller Node

It is central point of the cloud services and controls all other nodes of cloud. Basic services provided by this node are the Dashboard, Image service and Identity service.

Management portions of Compute and Network nodes are also maintained here. Networking plug-in as shown in Fig.1. This node also delivers supporting services such as Database, message broker service , keystone , Horizon and Network time protocol (NTP).
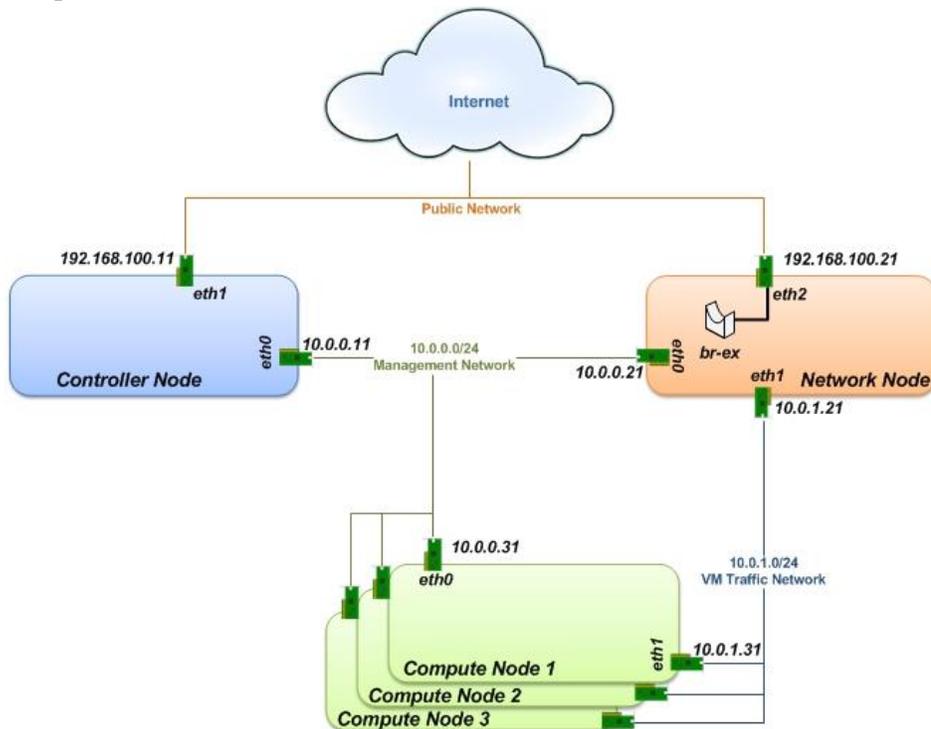
B. The Compute Node

It provides the actual computational services. This node has the responsibility of running the hypervisor. Instances are spawned on this node. This mode also manages layer 2 agents which operate tenant networks, networking plug-in and implementation of security groups.

C. The Network Node

It provides and controls the networking services. It delivers different layer 2 and layer 3 services like deployment of virtual networks and tunnels, NAT, DHCP and routing.
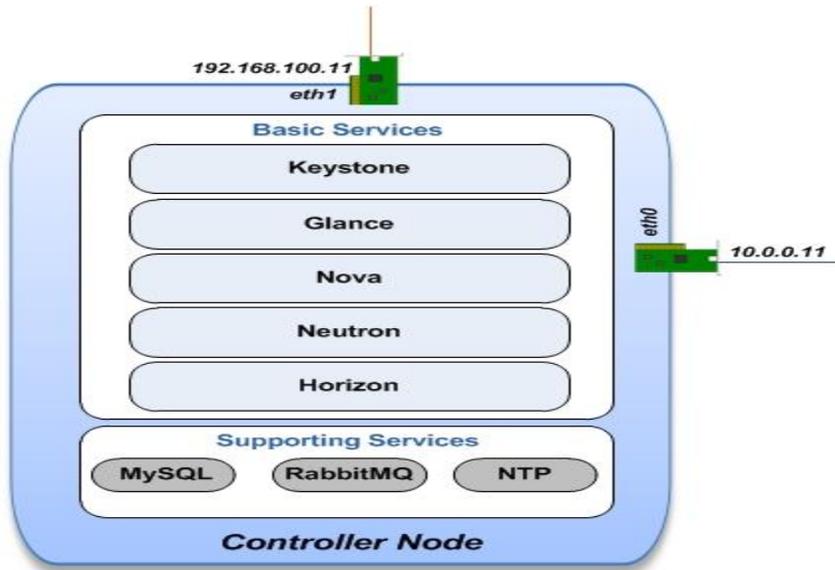
Internet connectivity of the instances is also the responsibility of this node. It is responsible for virtual network provisioning and for connecting virtual machines to external networks.We have deployed a single compute node but you can simply add more compute nodes to our multi-node installation, if needed.

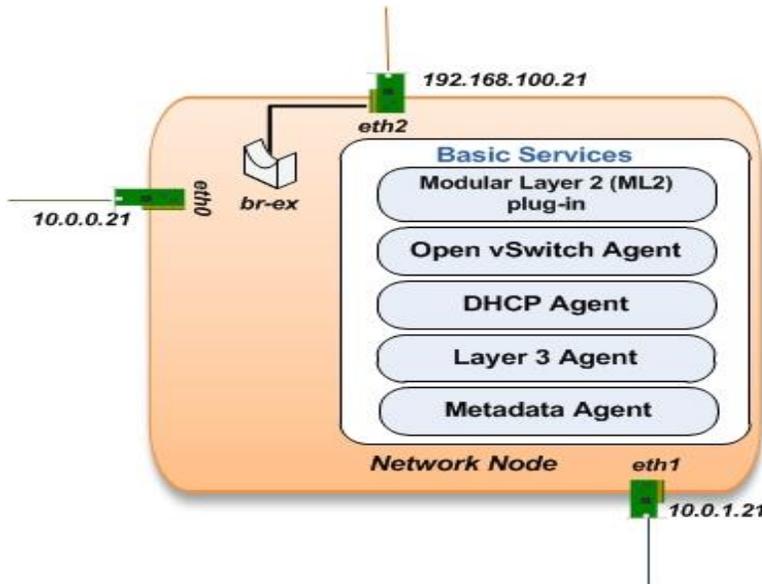For OpenStack Multi-Node setup you need to create three networks:

- **Management Network** (10.0.0.0/24): A network segment used for administration, not accessible to the public Internet.

- **VM Traffic Network** (10.0.1.0/24): This network is used as internal network for traffic between virtual machines in OpenStack, and between the virtual machines and the network nodes that provide L3 routes out to the public network.
- **Public Network**: This network is connected to the controller node so users can access the OpenStack interfaces, and connected to the network node to provide VMs with publicly routable traffic functionality.

Controller Node can be configured by Installing following services (Keystone, glance, nova, neutron and horizon)
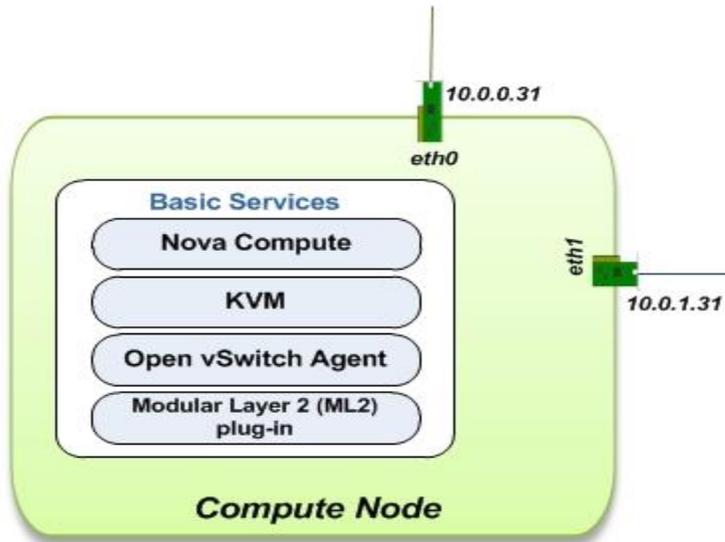

Network Node

Network node runs the Networking plug-in and different agents :-

Compute Node

In Compute Node it will run nova-compute node by using KVM as hypervisor by Networking plug-in and layer 2 agent.

Conclusion

Cloud computing has becoming a new paradigm in computation and delivering services through internet. Private clouds are a division of cloud computing that enterprises and organizations try to take benefit from it for their specific intentions. In this paper open source openstack acrchitecture is disscuseed with its all services.Linux services play an important part in Cloud configurations. Certain services might contribute in increasing the elapsed time of a job. In order to improve this phenomenon, by Openstack, the paper designs the enterprise private cloud platform architecture by introducing basic Networking services with juno installation Multi node architecture is introduced to provide different service in compute, network & Controller Node. Hence with Multi Node architecture of openstack we can achieve many types of services NTP, MySQL and RabbitMQ ,Neutron (Networking service),Horizon, Keystone, Nova and Glance along with many types of Networks,Hence increasing overall cloud performance.

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