

Design of a Cloud Architecture using SDN Integration with Open Stack

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Abstract— *the existing virtualization technology provides increase in number of system utilization by virtual infrastructure and provides sharing data and virtualized resources among an organization. This paper contains how to create a cloud architecture by the usage of OpenStack, which will be integrated with SDN technology. And we also discuss about how to integrate OpenStack neutron plugin with SDN controller. We also consider the importance of creating and executing OpenStack and SDN testbed in Virtual networking technology and how much it gives more advanced technology when comparing with existing SDN testbed. All also discuss about the types which we had used here.*

Keywords; *Virtualization, OpenStack, SDN, neutron, SDN controller.*

I. INTRODUCTION

Now days all over the world each and every Organization needs enormous amount of computing resources. If the organization needs a resource suddenly or urgently, mostly it is practically impossible to satisfy all resources needed for the organization. The resources can be both short-term and long-term. If it is long term need then they must have to move to Physical resources but if they need high configuration of computing resource for small term usage, Of course they need to move access virtualized resources, which is available in Cloud. Cloud computing provides Virtualized usage of Hardware, Software, Networks, Storage, Operating System, etc., We can virtualize each and every computing resources it includes virtualization of Storage, Memory, Processors, Networks, etc., For virtualizing the resources there are many software

like V-sphere, Microsoft Hyper-V Oracle Virtual-boxes are available.

Among the cloud management tools in existing system OpenStack hold the highest popularity when compared with other management tools. Mostly combination of OpenStack and existing traditional networking devices does not always give result, which we have needed. There can be lack of load balancing and inefficient traffic filtering.

Software Defined Networking (SDN) technology is frequently used for establishing proper and suitable communication between Physical and virtualized resources using in the network. The main and important feature of Software Defined Networking technology is o manage and control the whole network centralized by the use of various SDN controller. SDN technology has more number of advantages, but it also having equal number of disadvantages. The main thing is the whole network is controlled by the SDN controller if the controller fails to work the whole network will be collapsed. And there is no enough number of Documents and paper resources for SDN, OpenStack and Integration between them. This will make confusion to the peoples in the market about QoS on SDN and OpenStack integration. Finally, this shows what is SDN? and What is OpenStack? and How to make integration Between OpenStack and SDN?

II. CONTROL PLANE VS DATA PLANE

Internet protocol is the thing which controls whole the network applications and it can be both connection oriented and connectionless communication. The network traffic coming inside the network can be managed by two things called Control plane and Data plane. In the existing traditional network devices, both the control and data plane present inside the devices. They can cause inefficient usage of protocols made of the devices and for the network infrastructure. Control plane controls

the route or path for the IP packets with respect to the MAC address table or Routing table present in the respective network devices. Data plane have the responsibility of send the packets to the ports, which has been identified by the control plane.

But this existing technology of control and data plan consume more memory and it takes more processing memory. To overcome this problem, there is another way needed, and then only SDN technology arises. In SDN, Both the control and data plane has been separated. Here the data plane is present inside each and every network devices and control plane has been moved outside to the devices. In SDN, one Control plane can control many devices, instead of using MAC and Routing table. It has Flow tables, which controls each and every flow to every device in the network. On the other hand, Data plane carries the packets to the respective port as like as in tradition network infrastructure.

III. OPENFLOW:

OpenFlow is a standard protocol, which has been used to establish forwarding between multiple switches of different vendors. This gives a way to control the network devices throughout the network both dynamically and programmatically. If a packet moves into open flow devices, it will check the local flow table. Since, this is the first packet to the flow i.e., it doesn't have a flow entry table matching. This packet is called as table miss packet and this type of flow is called table miss. Usually when there are no more packets to flow, the switch does the default action to pump the packet to the controller. Then the controller takes the packet and encapsulate the packet with usual SYN message and A buffer id. After this operation, the controller do two important tasks as send the packet out from the switch to the destination host or to the next hop and a flow modification message to the switch. If the packet entry is present inside the flow table, the switch directly passes the packet to the host without referring the controller.

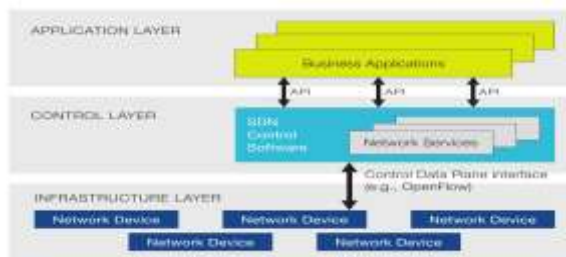


Fig. 1. OpenFlow Architecture

IV. OPENFLOW CONTROLLER:

OpenFlow controller is a type of API, which controls the flow in Software Defined Networking. It also acts as operating system for the virtualized

resources. Data transfer between the switch and API have to pass through the controller.

The controller will need to derive the desired forwarding data in software. Then OpenFlow message to update the Forwarding table. The message can add, update, delete entries in the flow table. There are various types of controllers are available. E.g.: Floodlight controller, Opendaylight controller, Pox controller, RYU controller etc.,

In this paper are going to see about the Opendaylight controller which can be integrate with OpenStack. Opendaylight can be installed in any devices having various vendors. Opendaylight provides opensource network platform and network framework in the OpenFlow networking standards. This controlled can able to control small size and medium size network infrastructure. Each and every version of Opendaylight is managed and maintained by Linux foundation. The latest release of Opendaylight is oxygen.

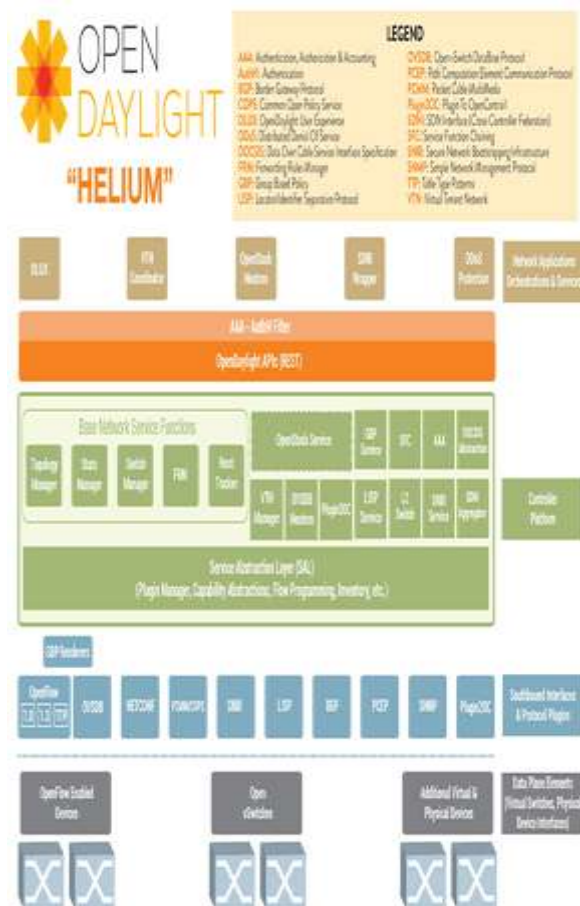


Fig.2. OpenDayLight Architecture

V. OPENSTACK:

OpenStack is a opensource cloud operating system, which is used to create public, private and hybrid cloud architecture. It is mainly installed, as

Infrastructure as a service (IaaS) and it is responsible for creating virtualized resources like storage, memory, servers, and network at the datacenter. It can be managed by both GUI (web based) and CLI. OpenStack consists of seven important projects namely Nova, Horizon, Cinder, Glance, Neutron, Keystone, and Swift.

A. Nova (Compute)

Nova is a fabric controller for the total cloud architecture. And it is created to maintain the Infrastructure as a service deployment model. It also controls the life cycle of the instances present in the cloud.

B. Neutron (Networking)

Neutron is a project developed to maintain the whole network in the architecture and to provide Network as a Service (NaaS) for the cloud.

C. Glance (Image)

Glance is an OpenStack project developed to store and discover, storing and querying virtual disk images. Along with Nova, it provides end-to-end protection for Cloud disk images.

D. Horizon (Dashboard)

It is the level entry of OpenStack. It is developed to provide administrative login to the user. It can manage disk images and add new volume to the instances.

E. Cinder (Block storage)

Cinder is a OpenStack project developed to provide continuous block storage device for cloud instances.

F. Keystone (Authentication)

Keystone is designed to provide security and access policy to each and every project present inside the OpenStack cloud. Along with Horizon, it is responsible for making login in the dashboard.

G. Swift (Object storage)

Swift is designed to make redundancy of the files written inside the cloud architecture. It contains of built-in redundancy management, archiving and fail over management.

VI. OPENSTACK AND SDN INTEGRATION:

OpenStack Nova is the project, which plays main role for creating a scalable cloud platform. OpenStack Nova is the thing, which has the responsibility of creating and maintain the virtual machines. It manages the lifecycle of the created virtual machines and for storing the data, MySQL is used. Project Nova has a special option called Nova Scheduler, which is used to make decision about resource allocation and distance of each and every node allocated or created. Their next project called neutron is as same as Project nova. This is the main

reason for managing networks in the proposed cloud architecture by providing Network as a Service (NaaS). Project Horizon provides a Graphical user interface in the web browser for accessing and creating cloud architecture.

The integration of OpenStack and SDN controller (OpenDaylight) is an important topic in these days. OpenDaylight have a plugin called Modular layer-2 (ML-2) to establish connection between OpenDaylight and OpenStack Neutron for integration. SDN controller have north bound API to communicate with OpenStack Neutron. It has Open vSwitch for communicating with southbound communication of vSwitch configuration. The security needed for this network is also configured in the API used in the SDN controller.

SDN controller controls the total information about the total network topology, which has been created, and also its status and management and maintenance. The OpenDaylight controller controls the hardware devices and the virtual machines in the network by the help of South bound APIs using OpenFlow protocol.

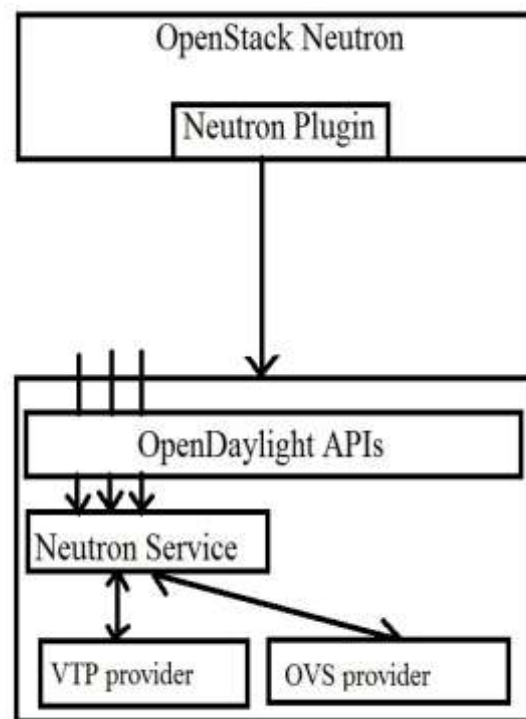


Fig.3. OpenDaylight OpenStack Integration

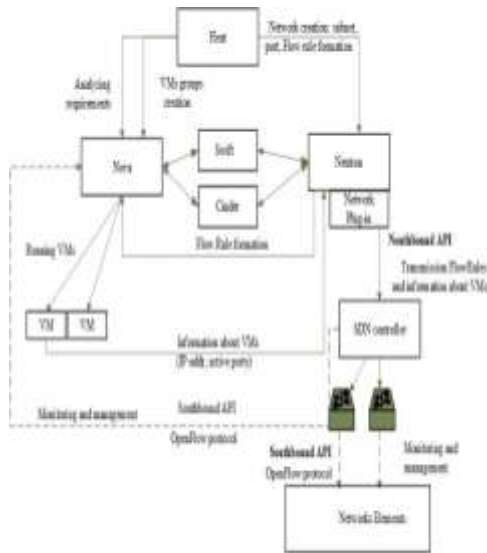


Fig.4. Proposed Architecture

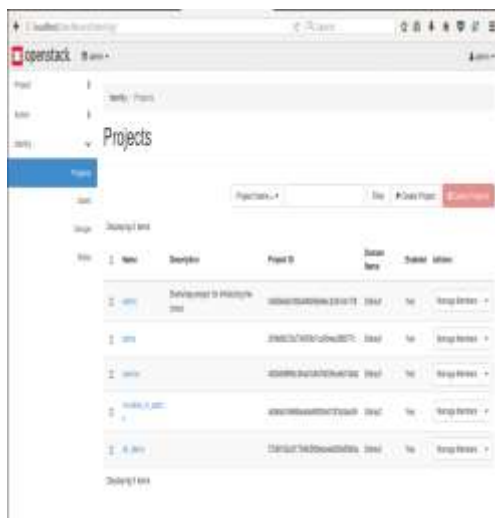


Fig.5. OpenStack Dashboard after installation



Fig.6. Created Cloud VM in OpenStack

VII. CONCLUSION

The current traditional network technology has data plane and control plane together for all systems. Software Defined Networking is an emerging technology where there will be one control plane, which provide a centralized vision to control plane, allowing a centralized vision of all data plane to the Control plane. OpenStack becomes an emerging opensource cloud-computing platform in many organizations. SDN is a way of approach to cloud computing, which enables network management, configuration of a network based upon organization requirement and it helps in improving network performance and monitoring of a network. Cloud computing provides Infrastructure as a Service, which makes many of the organization to switch into a private cloud network. In this paper we had seen about Design of a cloud architecture using integration of OpenDaylight SDN controller with a open source Cloud software OpenStack.

The main and major drawback is there is no enough number of Documents and Resources available in internet itself. These domains are still in Research and Development cell of major MNC over the world.

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