CS6006 - CLOUD COMPUTING

Module 4 - OPEN SOURCE CLOUD PLATFORMS

Presented By

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OPEN SOURCE CLOUD PLATFORMS

- Features of Cloud platforms

- Overview of various open-source platforms

- Eucalyptus and OpenNebula

- Insight into OpenStack Architecture and Components

FEATURES OF CLOUD PLATFORMS

- Self-service On-Demand

- Resources Pooling

- Easy Maintenance

- Economical

- Rapid Elasticity and Scalability

- Efficient Reporting services

- Automation

- Security

- Huge Network Access

- Resilience

BENEFITS OF CLOUD SERVICES

- Flexibility

- Work from anywhere

- Cost savings

- Automatic updates

- Disaster recovery

OVERVIEW OF VARIOUS OPEN-SOURCE PLATFORMS

- An open source cloud is any cloud service or solution that is developed using open source technologies and software.

- This covers any public, private or hybrid cloud models providing SaaS, IaaS and PaaS that have been built and operate entirely on open source technologies.

- OPEN SOURCE CLOUD SOFTWARE AND SOLUTIONS LIST

- Open Stack

- Cloud Stack

- Apache Mesos

- Eucalyptus

- Open Nebula

- AppScale

OVERVIEW OF VARIOUS OPEN-SOURCE PLATFORMS

- **OPEN STACK**

- Open stack is a lot of open source cloud software programming contraptions for regulating distributed computing stages for public and private clouds. This programming stage is contained interrelated parts that control grouped, multi-dealer hardware pools of taking care of, amassing, and frameworks organization resources all through a server farm. Open Stack could be regulated through an electronic dashboard, through request line instruments, or through peaceful web organizations.

- **Key Highlights of Open Stack**

- Limitless accumulating: Tremendous and level namespace, incredibly versatile read/make access, prepared to serve substance clearly from the limit structure.

- Multi-dimensional adaptability: cale-out designing: It scales vertically and equitably scattered limit. It can back up and chronicles a ton of data with straight execution.

- Record/holder: No settling, not a standard record system. It scales to various petabytes just as billions of articles.

OVERVIEW OF VARIOUS OPEN-SOURCE PLATFORMS

- **Cloud stack** is an open source cloud software platform expected to pass on and administer immense associations of the virtual machine, as a significantly available, especially adaptable establishment as an assistance distributed computing. It's a java-based undertaking that gives an organization labourer, and trained professionals (if essential) for hypervisor has so you can likewise run an iaas cloud. Cloud stack as of now reinforces the most well-known hypervisors: VMware, kvm, citric XenServer, xen cloud Stage (XCP), Prophet VM specialist and MS Hyper-v.

- **Key Highlights of Cloud stack**

- Works with have running xen worker, kvm, Hyper-v, just as VMware esxi with vsphere.

- Gives an agreeable Electronic UI to managing the cloud.

- Gives a nearby Programming interface. Customers can bargain their cloud with an easy to use Web interface, request line mechanical assemblies, or conceivably a full-included Serene Programming interface.

OVERVIEW OF VARIOUS OPEN-SOURCE PLATFORMS

- **APACHE MESOS**

- Apache mesos is a complete open-source solution that handles occupations capably in a passed on the environment through ground-breaking resource sharing just as disconnection. It dynamic PC processor, memory, storing, and other register resources from machines, enabling issue liberal and adaptable appropriated structures to be helpfully built and run sufficiently.

- **Features of Mesos**

- Mesos is a cross-stage: It runs on Linux, osx and Windows. It is a Cloud provider freethinker all the while.

- Local assistance for dispatching compartments with Docker and appc pictures.

- Accomplishes staggering levels of High Availability: Issue tolerant repeated master and experts using Creature controller. Non-hazardous updates.

OVERVIEW OF VARIOUS OPEN-SOURCE PLATFORMS

- **EUCALYPTUS**

- Eucalyptus is an open source cloud software storage for building aws-feasible private and hybrid clouds. It is a Linux based programming designing that executes versatile private and cross variety cloud inside your present IT establishment. As and on-premise System as a Help cloud game plan, it licenses you to use your own collections of resources (hardware, storing, and association) using a self-organization interface subordinate upon the circumstance.

- **Key Highlights of Eucalyptus**

- Design of Eucalyptus is awes Practical and appropriately has five key parts, Cloud controller, Walrus, Pack controller, Accumulating controller, Center controller and Euca2ool.

- Clients can likewise run Amazon or Eucalyptus machine pictures as events on both the cloud.

- Since it is aws suitable, there is 100% AWS Programming interface similitude ans maintain.

OVERVIEW OF VARIOUS OPEN-SOURCE PLATFORMS

- **Open nebula** is clear yet mind boggling and versatile turnkey open source answer for manufacture Private Cloud and regulate Worker ranch virtualization. It completes IaaS. The chief open-source variation of Open nebula was conveyed in Walk 2008.

- **Key Highlights of Open cloud**

- Fine-grained upper leg ligaments for resource task.

- Asset Offer the chiefs to follow and confine figuring, amassing and frameworks organization resource utilization

- Dynamic creation of Bundles as pool of hosts that shares information stores and virtual associations for load changing, high availability, and prevalent enrolling.

OVERVIEW OF VARIOUS OPEN-SOURCE PLATFORMS

- **APPSCALE**

- Appscale is an open source cloud software distributed computing stage that thus passes on and scales unmodified Google Application Engine applications over open and private fog systems. It's a circled programming system that completes a cloud stage as assistance (PaaS). In light of everything, AppScale is an easy to-regulate worker less stage for building and for running flexible web and versatile applications on any establishment. The objective of Appscale is to give designers a quick, programming interface driven improvement stages that can run application on any cloud foundation.

- **Highlights of AppScale**

- Snappy prototyping

- AppScale isn't hard to use hence making associations favour it.

OVERVIEW OF VARIOUS OPEN-SOURCE PLATFORMS

EUCALYPTUS

- Eucalyptus is an open source software platform for implementing Infrastructure as a Service (IaaS) in a private or hybrid cloud computing environment.

- The Eucalyptus cloud platform pools together existing virtualized infrastructure to create cloud resources for infrastructure as a service, network as a service and storage as a service.

- The name Eucalyptus is an acronym for Elastic Utility Computing Architecture for Linking Your Programs To Useful Systems.

- Eucalyptus was founded out of a research project in the Computer Science Department at the University of California, Santa Barbara, and became a for-profit business called Eucalyptus Systems in 2009.

EUCALYPTUS

- Eucalyptus Systems announced a formal agreement with Amazon Web Services (AWS) in March 2012, allowing administrators to move instances between a Eucalyptus private cloud and the Amazon Elastic Compute Cloud (EC2) to create a hybrid cloud.

- The partnership also allows Eucalyptus to work with Amazon's product teams to develop unique AWS-compatible features.

EUCALYPTUS

- **Eucalyptus features include:**

- Supports both Linux and Windows virtual machines (VMs).

- Application program interface- (API) compatible with Amazon EC2 platform.

- Compatible with Amazon Web Services (AWS) and Simple Storage Service (S3).

- Works with multiple hypervisors including VMware, Xen and KVM.

- Can be installed and deployed from source code or DEB and RPM packages.

- Internal processes communications are secured through SOAP and WS-Security.

- Multiple clusters can be virtualized as a single cloud.

- Administrative features such as user and group management and reports.

EUCALYPTUS

- **Eucalyptus features include:**

- Version 3.3, which became generally available in June 2013, adds the following features:

- Auto Scaling: Allows application developers to scale Eucalyptus resources up or down based on policies defined using Amazon EC2-compatible APIs and tools

- Elastic Load Balancing: AWS-compatible service that provides greater fault tolerance for applications

- CloudWatch: An AWS-compatible service that allows users to collect metrics, set alarms, identify trends, and take action to ensure applications run smoothly

- Resource Tagging: Fine-grained reporting for showback and chargeback scenarios; allows IT/ DevOps to build reports that show cloud utilization by application, department or user

EUCALYPTUS

- **Eucalyptus features include:**

- Expanded Instance Types: Expanded set of instance types to more closely align to those available in Amazon EC2. Was 5 before, now up to 15 instance types.

- Maintenance Mode: Allows for replication of a virtual machine's hard drive, evacuation of the server node and provides a maintenance window.

EUCALYPTUS

- History

- Eucalyptus architecture

- Eucalyptus components

- Other tools

- The advantages of the Eucalyptus cloud

- Eucalyptus vs other IaaS private clouds

- What is the use of eucalyptus in cloud computing?

EUCALYPTUS

- **Eucalyptus architecture**

1. Images: Any software application, configuration, module software or framework software packaged and conveyed in the Eucalyptus cloud is known as a Eucalyptus Machine Image.

2. Instances: When we run the picture and utilise it, it turns into an instance.

3. Networking: The Eucalyptus network is partitioned into three modes: Static mode, System mode, and Managed mode.

4. Access control: It is utilised to give limitation to clients.

5. Eucalyptus elastic block storage: It gives block-level storage volumes to connect to an instance.

6. Auto-scaling and load adjusting: It is utilised to make or obliterate cases or administrations dependent on necessities.

EUCALYPTUS

- **Eucalyptus components**

1. Cluster Controller: It oversees at least one Node controller and liable for sending and overseeing occurrences on them.

2. Storage Controller: It permits the making of depictions of volumes.

3. Cloud Controller: It is a front end for the whole environment.

4. Walrus Storage Controller: It is a straightforward record storage framework.

5. Node Controller: It is an essential part of Nodes. It keeps up the life cycle of the occasions running on every node.

EUCALYPTUS

- **OTHER TOOLS**

- Numerous other tools can be utilised to associate with AWS and Eucalyptus in cloud computing, and they are recorded below.

1. Vagrant AWS Plugin: This instrument gives config records to oversee AWS instances and oversee VMs on the local framework.

2. s3curl: This is a device for collaboration between AWS S3 and Eucalyptus Walrus.

3. s3fs: This is a FUSE record framework, which can be utilised to mount a bucket from Walrus or S3 as a local document framework.

4. Cloudberry S3 Explorer: This Windows instrument is for overseeing documents among S3 and Walrus.

EUCALYPTUS

- **THE ADVANTAGES OF THE EUCALYPTUS CLOUD**

- The benefits of Eucalyptus in cloud computing are:

1. Eucalyptus can be utilised to benefit both the eucalyptus private cloud and the eucalyptus public cloud.

2. Clients can run Amazon or Eucalyptus machine pictures as examples on both clouds.

3. It isn't extremely mainstream on the lookout yet is a solid contender to CloudStack and OpenStack.

4. It has 100% Application Programming Interface similarity with all the Amazon Web Services.

5. Eucalyptus can be utilised with DevOps apparatuses like Chef and Puppet.

EUCALYPTUS

- **Features of eucalyptus in cloud computing are:**

- Supports both Windows and Linux virtual machines.

- API is viable with the Amazon EC2 platform.

- Viable with Simple Storage Service (S3) and Amazon Web Services (AWS).

EUCALYPTUS

- **EUCALYPTUS VS OTHER IAAS PRIVATE CLOUDS**

- There are numerous Infrastructure-as-a-Service contributions accessible in the market like OpenNebula, Eucalyptus, CloudStack and OpenStack, all being utilised as private and public Infrastructure-as-a-Service contributions.

- Of the multitude of Infrastructure-as-a-Service contributions, OpenStack stays the most well-known, dynamic and greatest open-source cloud computing project. At this point, eagerness for OpenNebula, CloudStack and Eucalyptus stay strong.

EUCALYPTUS

- **WHAT IS THE USE OF EUCALYPTUS IN CLOUD COMPUTING?**

- It is utilised to assemble hybrid, public and private cloud. It can likewise deliver your own datacentre into a private cloud and permit you to stretch out the usefulness to numerous different organisations.

OpenNebula

- OpenNebula is a powerful, but easy-to-use, open source platform to build and manage Enterprise Clouds.

- OpenNebula provides unified management of IT infrastructure and applications, avoiding vendor lock-in and reducing complexity, resource consumption and operational costs.
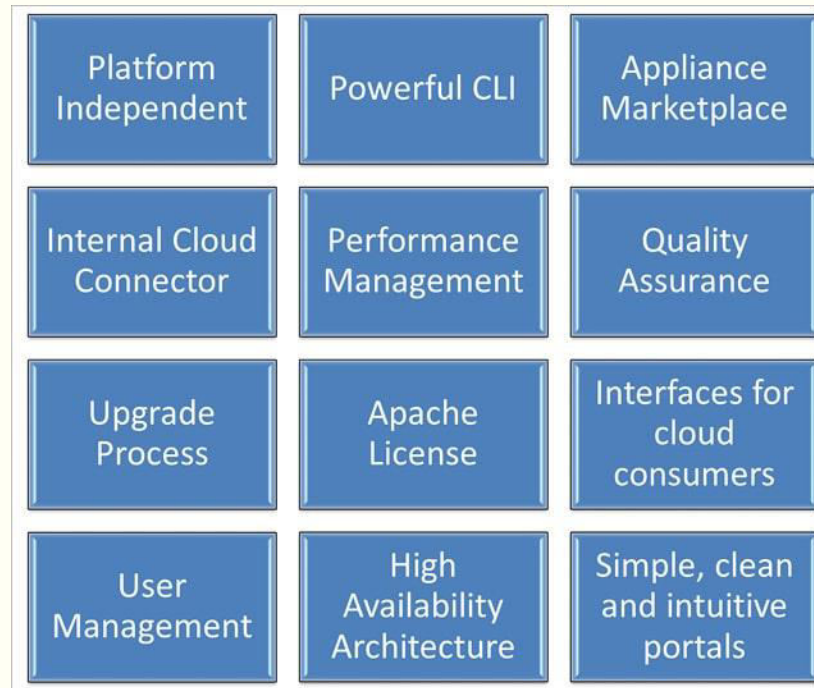
OpenNebula
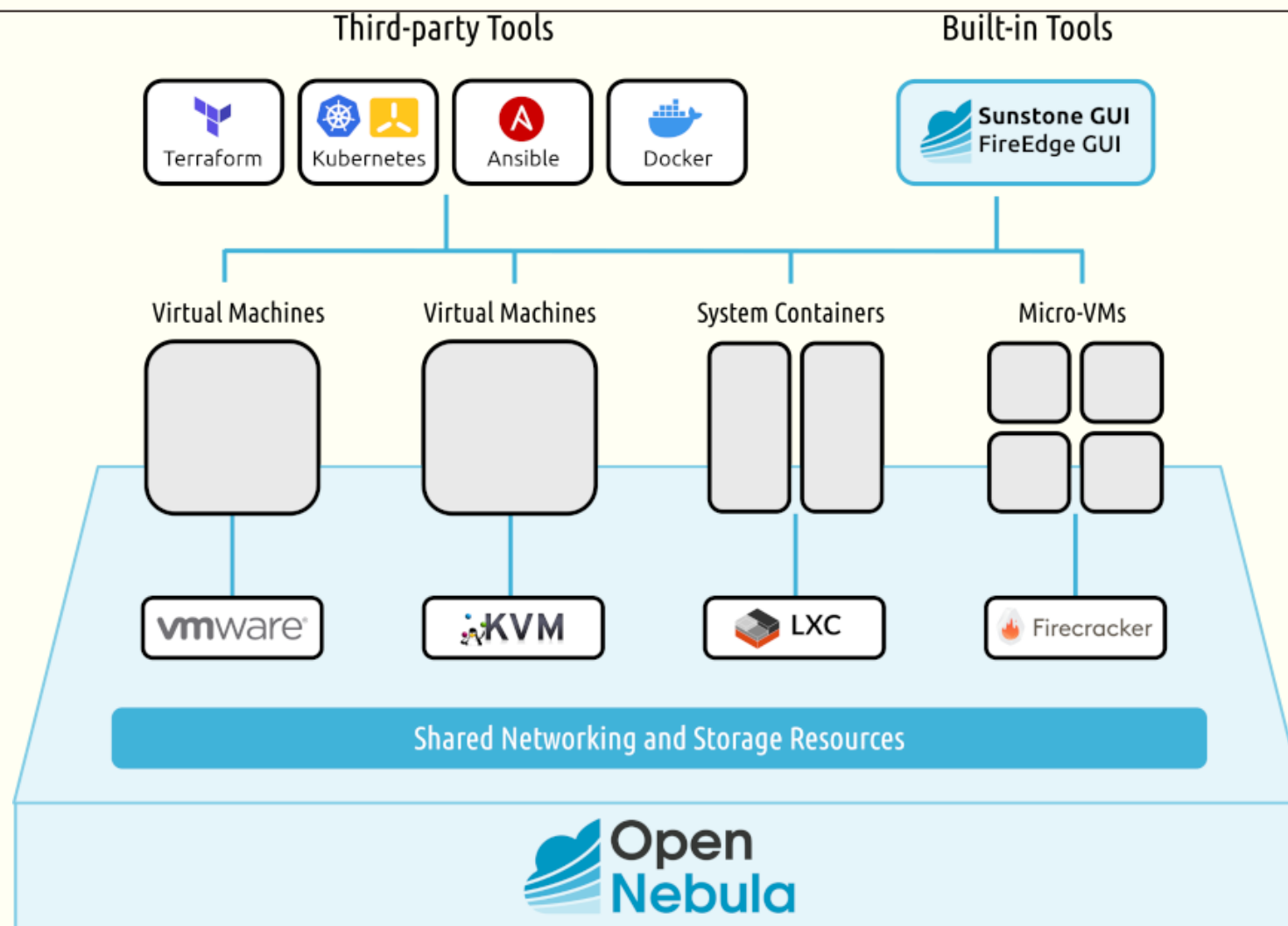
OpenNebula

- OpenNebula combines virtualization and container technologies with multi-tenancy, automatic provision and elasticity to offer on-demand applications and services.

- It supports both containers with virtual machines in a common shared environment to get the best of both worlds.

- It integrates multiple virtualization technologies, from VMware and KVM for fully virtualized clouds to LXC and Firecracker for containerized and serverless deployments.

- It can easily deploy hybrid and edge environments with infrastructure resources from AWS, Google and Equinix.

OpenNebula

- **Key features of OpenNebula**

- OpenNebula has features for scalability, integration, security and accounting. The developers also claim that it supports standardisation, interoperability and portability. It allows cloud users and administrators to choose from several cloud interfaces.

Platform Independent	Powerful CLI	Appliance Marketplace
Internal Cloud Connector	Performance Management	Quality Assurance
Upgrade Process	Apache License	Interfaces for cloud consumers
User Management	High Availability Architecture	Simple, clean and intuitive portals

OpenNebula

- **Why OpenNebula?**

- Web interface or CLI – the choice is yours

- By using the OpenNebula CLI or Web interface, you can keep track of activities at any time. There is a central directory service through which you can add new users, and those users can be individually entitled. Managing systems, configuring new virtual systems or even targeting the right users and groups is easy in OpenNebula.

- Availability at all times

- OpenNebula not only takes care of the initial provisioning, but the high availability of its cloud environment is much better compared to other cloud solutions. Of course, the central OpenNebula services can be configured for high availability, but this is not absolutely necessary. All systems continue to operate in their original condition and are automatically included in the restored availability of the control processes.

OpenNebula

- **Why OpenNebula?**

- Easy remote access

- In virtual environments, one lacks the ability to directly access the system when there are operational problems or issues with the device. Here, OpenNebula offers an easy solution — using the browser, one can access the system console of the host system with a VNC integrated server.

- Full control and monitoring

- All host and guest systems are constantly monitored in OpenNebula, which keeps the host and VM dashboards up to date at all times. Depending on the configuration, a virtual machine is to be restarted in case of the host system failing or if migrating to a different system. If a data store is used with parallel access, the systems can of course be moved, while in operation, on to other hardware. The maintenance window can be minimised and can often be completely avoided.

OpenNebula

- **Why OpenNebula?**

- Open standards

- OpenNebula is 100 per cent open source under the Apache License. By supporting open standards such as OCCI and a host of other open architecture, OpenNebula provides the security, scalability and freedom of a reliable cloud solution without vendor lock-in, which involves considerable support and follow-up costs.
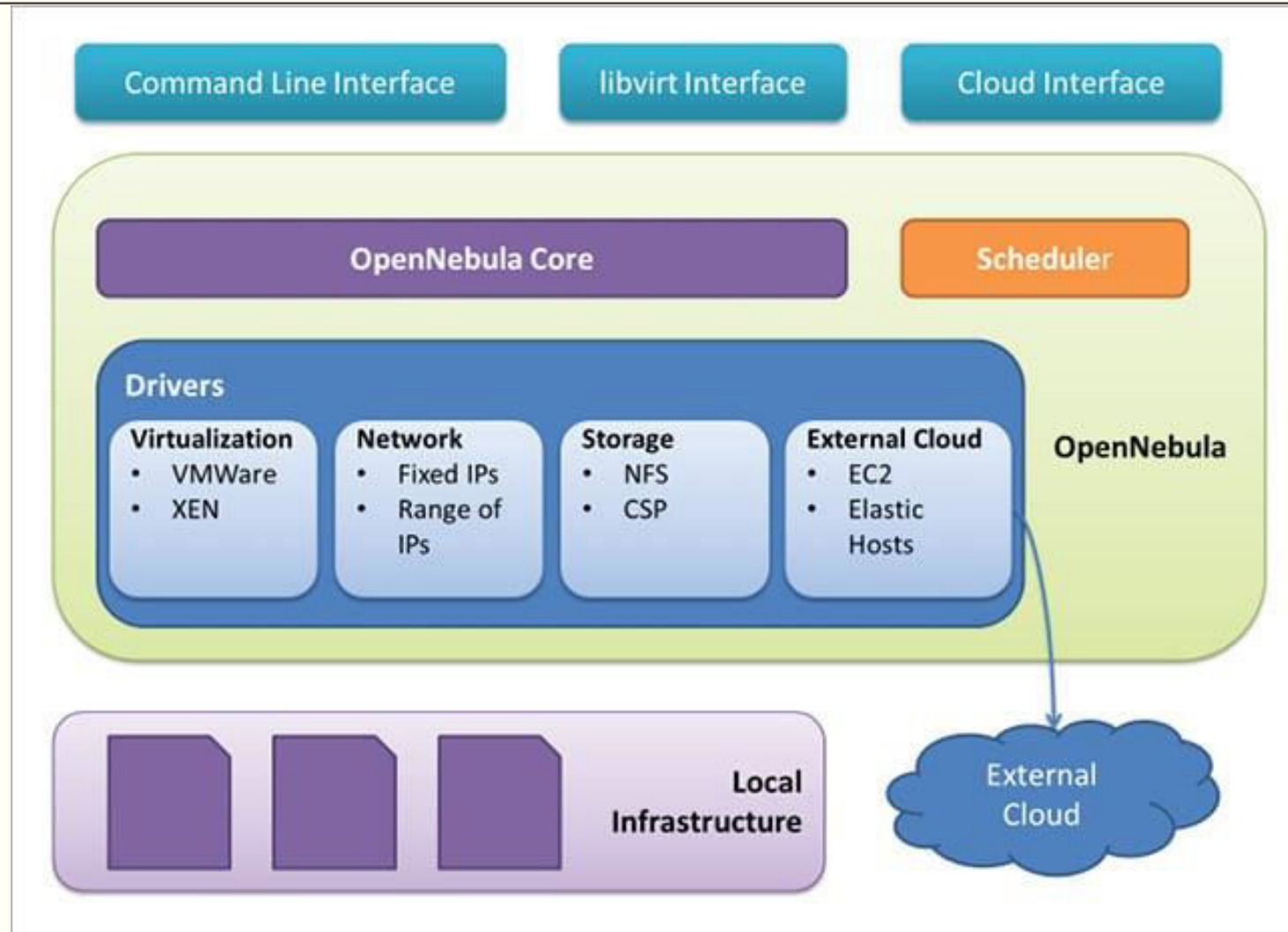
OpenNebula

- **OpenNebula architecture**

- To control a VM's life cycle, the OpenNebula core coordinates with the following three areas of management:

1. Image and storage technologies — to prepare disk images

2. The network fabric — to provide the virtual network environment

3. Hypervisors — to create and control VMs

OpenNebula

- **OpenNebula architecture**

- Through pluggable drivers, the OpenNebula core can perform the above operations. It also supports the deployment of services.

- VM placement decisions are taken by a separate scheduler component. It follows the rank scheduling policy, which makes place for VMs on a physical host according to the rank given by the scheduler. These ranks are decided by the scheduler, using a ranking algorithm.

- OpenNebula uses cloud drivers to interact with external clouds, and also integrates the core with other management tools by using management interfaces.

OpenNebula - Architecture

OpenNebula - Components
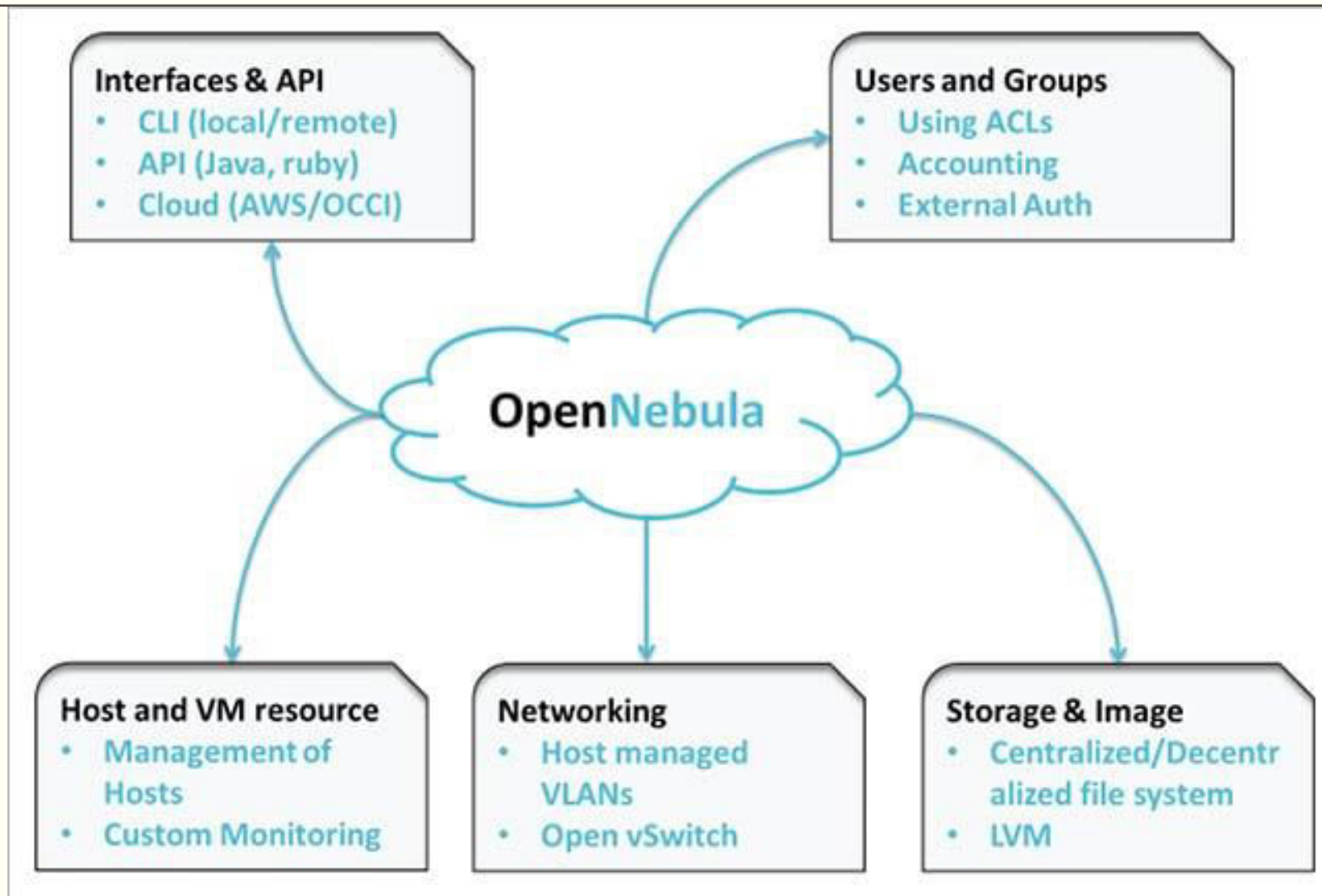
OpenNebula - Components

- Based on the existing infrastructure, OpenNebula provides various services and resources.

- APIs and interfaces: These are used to manage and monitor OpenNebula components. |To manage physical and virtual resources, they work as an interface.

- Users and groups: These support authentication, and authorise individual users and groups with the individual permissions.

- Hosts and VM resources: These are a key aspect of a heterogeneous cloud that is managed and monitored, e.g., Xen, VMware.

- Storage components: These are the basis for centralised or decentralised template repositories.

- Network components: These can be managed flexibly. Naturally, there is support for VLANs and Open vSwitch.

OpenNebula - Components

- The front-end

- The machine that has OpenNebula installed on it is known as the front-end machine, which is also responsible for executing OpenNebula services.

- The front-end needs to have access to the image repository and network connectivity to each node.

- It requires Ruby 1.8.7 or above.

- OpenNebula's services are listed below:

- 1. Management daemon (Oned) and scheduler (mm_sched)

- 2. Monitoring and accounting daemon (Onecctd)

- 3. Web interface server (Sunstone)

- 4. Cloud API servers (EC2- query or OCCI)

OpenNebula - Components

- Virtualisation hosts

- To run the VMs, we require some physical machines, which are called hosts.

- The virtualisation sub-system is responsible for communicating with the hypervisor and taking the required action for any node in the VM life cycle.

- During the installation, the admin account should be enabled to execute commands with root privileges.

OpenNebula - Components

- **Storage**

- Data stores are used to handle the VM images, and each data store must be accessible by the front-end, using any type of storage technology.

- OpenNebula has three types of data stores:

- File data store – used to store the plain files (not disk images)

- Image data store – repository for images only

- System data store – used to hold the running VM images

- The image data store type depends on the storage technology used. There are three types of image data stores available:

OpenNebula - Components

- **Storage**

- File system – stores VM images in file formats

- LVM – reduces the overhead of having the file system in place; the LVM is used to store virtual images instead of plain files

- Ceph – stores images using Ceph blocks

- OpenNebula can handle multiple storage scenarios, either centralised or decentralised.

OpenNebula - Components

- **Networking**

- There must be at least two physical networks configured in OpenNebula:

- Service network – to access the hosts to monitor and manage hypervisors, and to move VM images.

- Instance network – to offer network connectivity between the VMs across the different hosts.

- Whenever any VM gets launched, OpenNebula will connect its network interfaces to the bridge described in the virtual network definition.

OpenNebula - Components

- **Networking**

- **OpenNebula supports four types of networking modes:**

- Bridged–where the VM is directly attached to the physical bridge in the hypervisor.

- VLAN–where the VMs are connected by using 802.1Q VLAN tagging.

- Open vSwitch–which is the same as VLAN but uses an open vSwitch instead of a Linux bridge.

- VXLAN–which implements VLAN using the VXLAN protocol.

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Thank You…