Introduction to Cloud Computing

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What is Cloud Computing?
Cloud computing refers to the practice of providing a software service using a remote, shared set of Commercial-Off-The-Shelf servers (COTS), storage facilities, and networking infrastructure instead of local dedicated resources. Cloud computing reduces the burden of purchasing and managing resources when other external services, such as email servers and CRM systems are used. Thus establishing a relationship between cloud service providers and the users. It also consolidates different services into a single infrastructure.

Virtualization: Unlocking the Full Potential of Cloud Computing
Virtualization complements cloud computing with the ability to emulate many computers from a single machine. Virtual networks in a cloud environment provide flexibility to create, remove, rearrange, and reconfigure services in the cloud without adding or removing hardware, as well as emulating network equipment, such as routers, switches, and firewalls.

Cloud Management Software
The cloud management software must meet different requirements for both cloud service providers and users. The cloud users require control, security, availability and access to the services, whereas, the cloud service providers need rich set of tools to manage the cloud infrastructure.

The services are also scaled-up or down based on requirements, and the required capacity and services are delivered with little or no manual intervention.

The Cloud services help the service providers:
- Fully utilize their revenue-generating equipment to sell services to more than one consumer from a single installation.
- Provides service monitoring tools to track usage for billing purposes as well as to grow and shrink the cloud equipment infrastructure based on the demand.
- Provides the software to efficiently allocate physical resources among the clients, virtual machines and services.

The essential components of cloud management systems are shown in the cloud architecture:

Figure 1: Cloud Architecture
The components are briefly described as:

- **Dashboard or UI**: Both the provider and users need access to various parts to manage services delivered by cloud that is based on Web-Centre, the Web GUI and/or a TCP protocol such as REST is used.
- **Identity**: Controls access to both service providers and users.
- **Compute power**: Manages the underlying hardware CPU resources and services (Virtual or otherwise) that consume its hardware.
- **Networking**: Manages the physical network equipment and the virtual networks created within the network, and securely controls the network access in and out of the cloud for both resource management and service utilization.
- **Block Storage**: All services use the block storage devices. Software that manage physical disk or RAM resources and partitions them between virtual services are essential.
- **Image Repository**: Generally, services come in the form of disk image, which must be instantiated (loaded onto hardware or turned into a running virtual machine).

*Example: Consider a Cloud service user is a retailer whose business relies on the availability of a website. The user uploads an image of a web server with the website pre-installed on an operating system. When more users visit the website and the demand for web sessions saturates the server capacity, the Cloud management software brings up more instances of the website to fulfill the demand. The image store gives the Cloud quick access to these images.*

- **Object Store**: Few services operate without access to some kind of off-line data store or configuration repository. Most Cloud infrastructures provide some form of integration with indexed storage.
- **Telemetry**: Monitors the equipment to provide both operational and billing information.
- **Orchestration**: Orchestration is a collection of activities that automate the creation of services, which require coordinated deployment and interconnection of more than one image, and multiple resources.

**Dynamic Networks in Cloud**

The flexibility of Sonus Cloud architecture maximizes the physical network transport equipment, and allows service providers, carriers, and enterprises to:

- Construct entire virtual networks and networks paths in response to real time data traffic flow patterns, leveraging least cost routes or low volume paths.
- Dynamically create and delete virtual networks enabling ephemeral service connections required by applications.
- Scale up or down endpoints or VLANs to handle high traffic hour conditions.
- Rewire networks dynamically in response to the changing business requirements without affecting hardware or requiring downtime.

To achieve these goals, the Sonus product portfolio has adapted to following cloud-centric behaviors:

- **Elasticity**: Elasticity provides the ability to expand or contract the capacity of a service in response to demand. This implies some degree of automation required to detect the demand conditions that invoke change in resources, and to add or remove these resources from the pool available to the users.
- **Orchestration readiness**: Orchestration is used to describe the set of activities that enable automated deployment of services, scripted relationships between services, and the automation of dynamic service sizing. For more information on Cloud and Cloud Orchestration, refer to Cloud Orchestration FAQs and Red Hat Cloud Foundations: Cloud 101 whitepaper.
- **Cloud Awareness and Configuration**: Orchestration defines network dynamically. The SBC used in an orchestrated environment must coordinate with Orchestrator to understand:
  - About the network
  - Relationship with other components in the network
  - Fetching required for configuration information

  Standards for this kind of communication are evolving, but methods of information exchange such as Userdata and Metadata used during cloud initialization, are implemented in SBC SWe.
- **Hardware independence**: To successfully virtualize network components, such as SBC, means the software must run on COTS, platforms that do not require specialized hardware or process pipe-lining. Primarily, the SBC is dependent on special hardware to accelerate the CPU intensive operations of CODEC processing, and transcoding.

**SBC SWe Cloud in OpenStack**

OpenStack is a collection of open-source Cloud management and infrastructure software, which is downloaded and installed on COTS hardware and operating systems. Adopted as a focus for Cloud implementations by many Telecom and Operating System vendors, it has become an important target for SBC SWe Cloud deployment.
Figure 2: OpenStack Dashboard

Sonus provides SBC SWe Cloud application as a qcow2 image, which can be instantiated on a simple OpenStack environment. The SBC SWe is instantiated on OpenStack in the following ways:

- Using Horizon GUI dashboard
- Using OpenStack REST API, or using Heat
- Using OpenStack orchestration through EMS SWe

Heat is the main project in the OpenStack Orchestration program. It implements an orchestration engine to launch multiple composite cloud applications based on templates in the form of text files. Sonus provides sample Heat templates for instantiating SBC SWe in either Standalone or High Availability (HA) configurations. For more information on instantiating SBC SWe Cloud on OpenStack, refer to Instantiating and Configuring SBC SWe on OpenStack.