CLOUD BEHIND THE CURTAIN

In the previous article, we have learned about cloud, its types – public, private, and hybrid and cloud service models like SaaS, PaaS and IaaS.

Now, next question which crops up are like what makes a cloud? How to build a cloud infrastructure? Are there any standardized architectures for cloud?

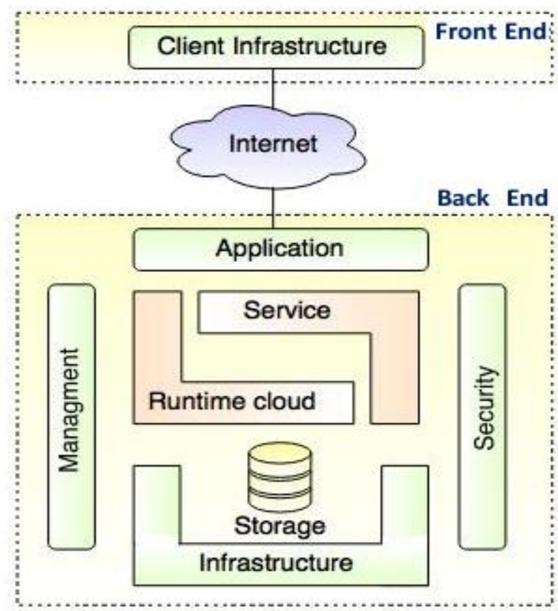
What is Cloud architecture?

Cloud Computing architecture refers to the components and subcomponents required for cloud computing. These components typically consist of a front end platform (fat client, thin client, mobile device), back end platforms (servers, storage), a cloud based delivery, and a network (Internet, Intranet, Intercloud). Combined, these components make up cloud computing architecture.

Front End: This is the visible interface that computer users or clients encounter through their web-enabled client devices.

Back End: is the **"cloud"** part of a cloud computing architecture, comprising all the resources required to deliver cloud-computing services. A system's back end can be made up of a number of bare metal servers, data storage facilities, virtual machines, a security mechanism, and services, all built in conformance with a deployment model, and all together responsible for providing a service. Managing the resources, their performance and security are the responsibilities of cloud provider.

10,000 ft view

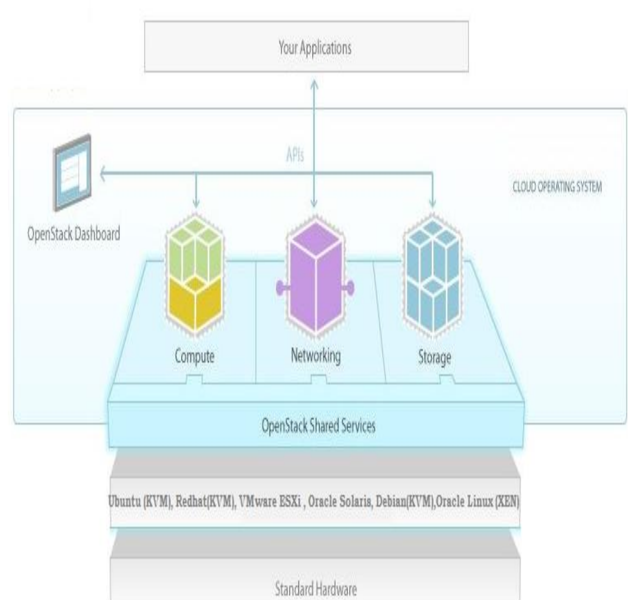


Cloud Infrastructure: It means the hardware and software components, which are server, storage, and networking and virtualization software. These components are required to support the computing requirements of a cloud computing model.

Hypervisor: The operating system on a bare metal server – known popularly as a **hypervisor** – makes use of well-defined protocols allowing multiple guest virtual machines to run concurrently. The hypervisor guides communication between its containers and the connected world beyond. Eg: **Windows HyperV , Vmware , KVM**

Server: A central server is responsible for managing and running the system, systematically reviewing the traffic and client requests to make certain that everything is running smoothly. Eg : **Windows Server 2016**

Network: Network is the key component of the cloud infrastructure. It enables to connect cloud services over the Internet. The customer can customize the network route and protocol i.e. possible to deliver network as a utility over the Internet. Eg: **Cisco switches**



Cloud Storage:

Cloud Storage is a service that allows to save data on offsite storage system managed by third-party and is made accessible by a web services API. Storage devices are classified as **Block Storage Devices** and **File Storage Devices**

Cloud storage can be classified into two categories:

Unmanaged cloud storage means the storage is preconfigured for the customer. The customer can neither format, nor install his own file system or change drive properties. Eg : NAS solution

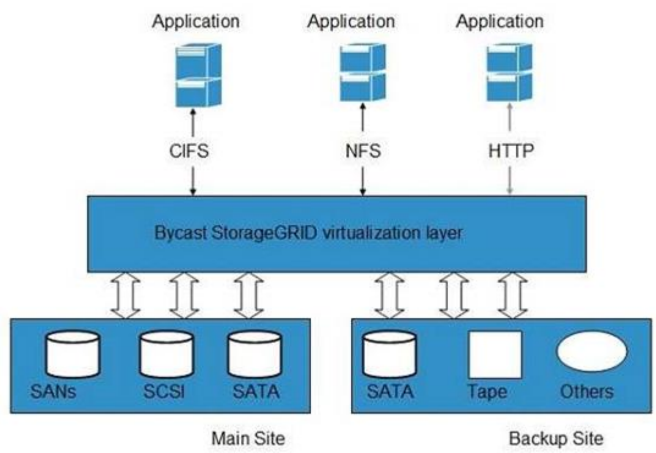
Managed cloud storage offers online storage space on-demand. The storage system appears to the user to be a raw disk that the user can partition and format. Eg : SAN solutions

Creating Cloud Storage System

The cloud storage system stores multiple copies of data on multiple servers, at multiple locations. If one system fails, then it is required only to change the pointer to the location, where the object is stored.

To aggregate the storage assets into cloud storage systems, the cloud provider can use storage virtualization software known as StorageGRID. It creates a virtualization layer that fetches storage from different storage devices into a single management system. It can also manage data from CIFS and NFS file systems over the Internet. The following diagram shows how StorageGRID virtualizes the storage into storage clouds:

Example : HP StoreVirtual and StoreOnce



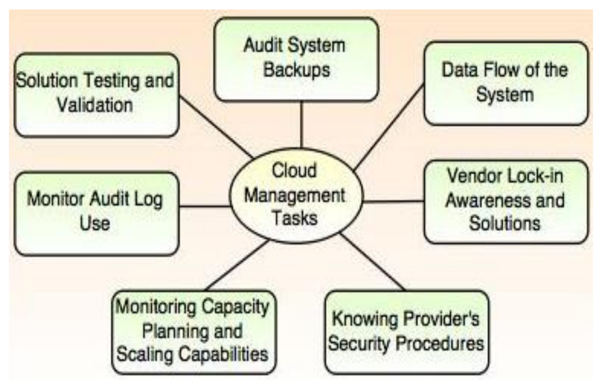
Cloud Management & Security Aspects:

Management of resources involves various aspects of cloud computing like load balancing, performance, storage, backups, capacity, deployment etc. The management is necessary to access complete functionality of resources in the cloud.

Audit System Backups: two ways to perform backups
> Backing up files, from on-site computers to disks in the cloud.
> Backing up files by the cloud provider.

Vendor Lock-In Awareness: The procedure to exit from services of a particular cloud provider must be known to export data of an organization from their system to another cloud provider.

Some of the cloud mgmt tasks executed by cloud provider are:

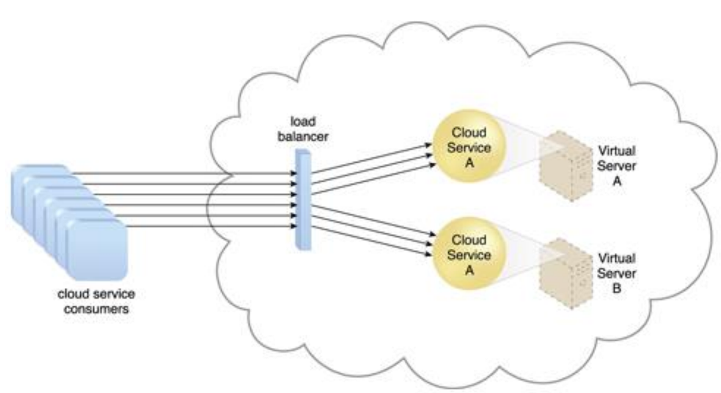


Fundamental Cloud Architectures:

Workload Distribution Architecture:

IT resources can be horizontally scaled via the addition of one or more identical IT resources, and a load balancer that pro-vides runtime logic capable of evenly distributing the workload among the available IT resources. This architecture reduces both IT resource over and under-utilization to an extent dependent on sophistication of load balancing algorithms and runtime logic.

Diagram: *A redundant copy of Cloud Service A is implemented on Virtual Server B. The load balancer intercepts cloud service consumer requests and directs them to both Virtual Servers A and B to ensure even workload distribution.*



Dynamic Scalability Architecture:

The dynamic scalability architecture is an architectural model based on a system of predefined scaling conditions that trigger the dynamic allocation of IT resources from resource pools. Dynamic allocation enables variable utilization as dictated by usage demand fluctuations

Diagram 1: *The number of requests coming from cloud service consumers increases (3). The workload exceeds the performance thresholds. The automated scaling listener determines the next course of action based on a predefined scaling policy (4). If the cloud service implementation is deemed eligible for additional scaling, the automated scaling listener initiates the scaling process (5).*

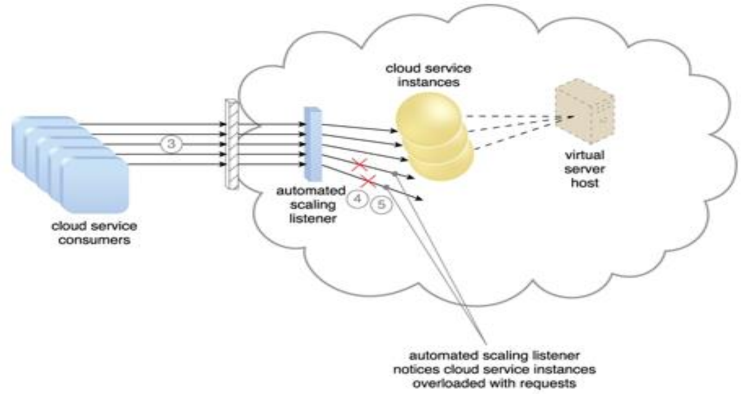
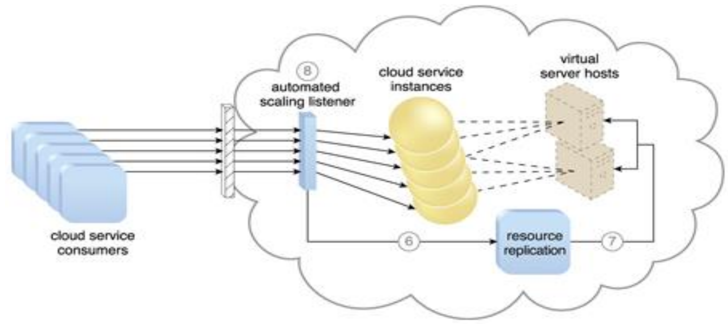


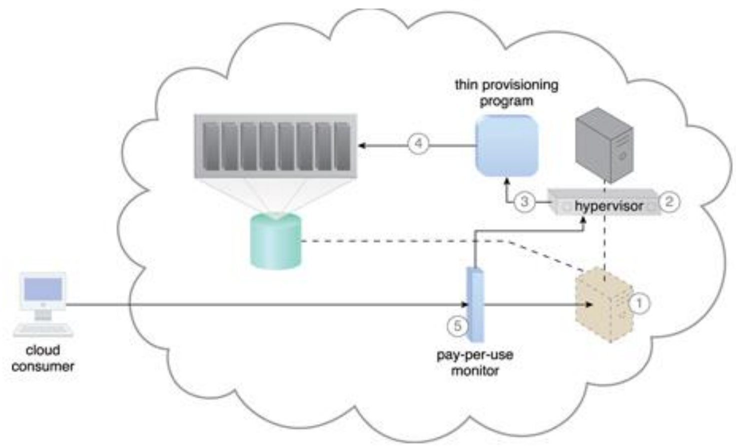
Diagram 2*: The automated scaling listener sends a signal to the resource replication mechanism (6), which creates more instances of the cloud service (7). Now that the increased workload has been accommodated, the automated scaling listener resumes monitoring and detracting and adding IT resources, as required (8).*



Elastic Disk Provisioning Architecture:

The elastic disk provisioning architecture establishes a dynamic storage provisioning system that ensures that the cloud consumer is granularly billed for the exact amount of storage that it actually uses.
Thin-provisioning software is installed on virtual servers that process dynamic storage allocation via the hypervisor, while the pay-per-use monitor tracks and reports granular billing-related disk usage data

Diagram*: Request received from consumer, & provisioning of new virtual server instance begins (1). As per provisioning, the hard disks chosen as dynamic or thin-provisioned disks (2). The hypervisor calls dynamic alloc component to create thin disks for the virtual server (3). Virtual disks are created & saved in a folder of near-zero size. The size grow as files copied onto the virtual server (4).The pay-per-use monitor tracks the dynamically allocated storage for billing purposes (5).*



References: http://cloudacademy.com/blog/cloud-computing-architecture-an-overview

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