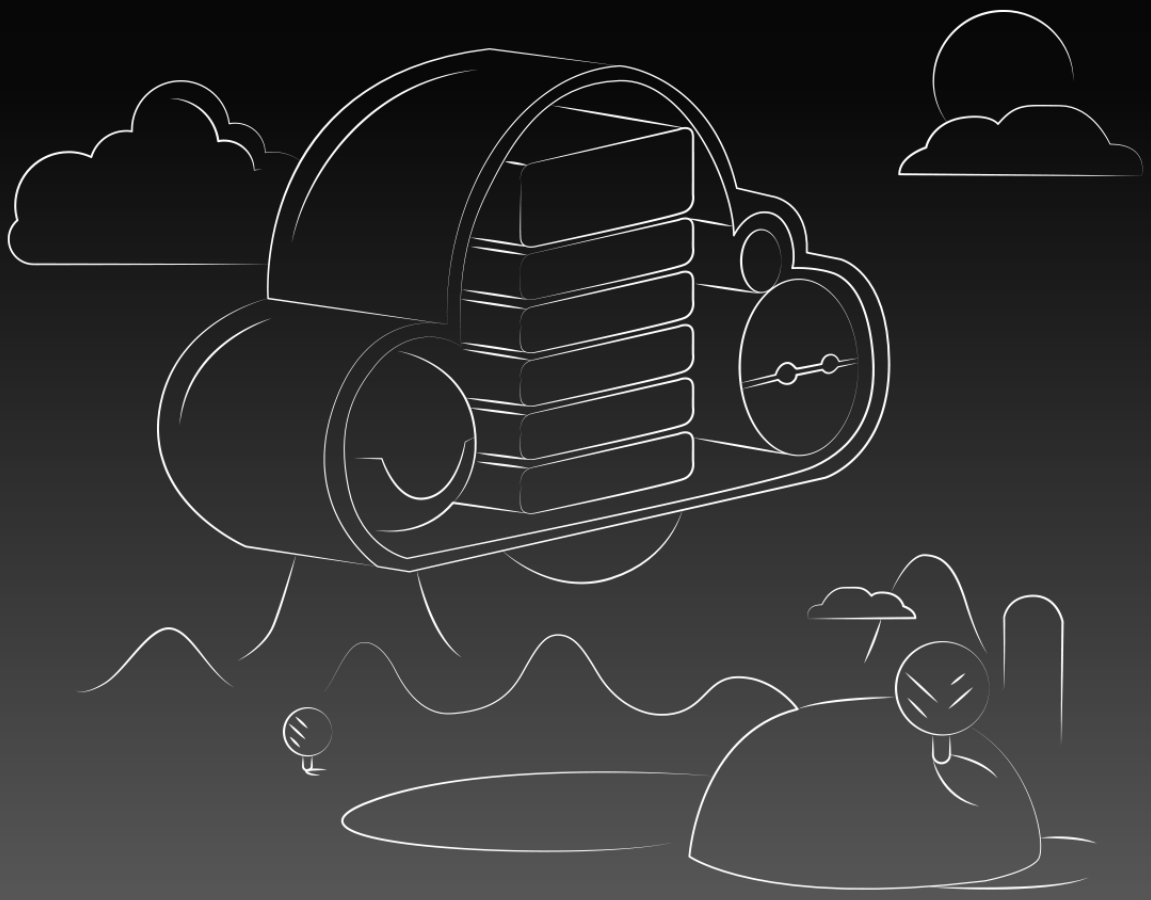
PRIVATE CLOUD

Cloud & Virtualization



GloboTech COMMUNICATIONS

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EXECUTIVE SUMMARY

This report aims to provide basic understanding of cloud computing and virtualization. Cloud computing is a "type of Internet-based computing that provides shared computer processing resources and data to computers and other devices on demand"[1]. The term "Cloud" refers to different service models, such as; Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). These service models deliver different level of abstraction and flexibility for various types of use. Each of these models can be deployed from any of the three main cloud deployment models: public, private and hybrid.

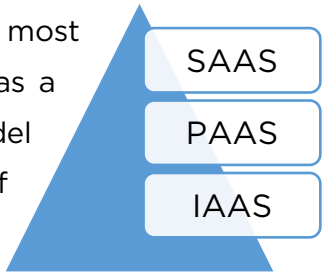
Cloud computing as we know it today is based on virtualization technologies, which helps virtualize servers' resources to generate what is called Virtual Machines. These virtual machines provide their own guest environment, from which a user can install their own Operating System and applications. These can be particularly useful for SMB and major corporations.

After reading this document, you should be able to understand cloud computing and the various elements and benefits associated with it.

INTRODUCTION

According to the NIST (National Institute of Standards and Technology), "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released"[1]. In short, the cloud provides computing power through the Internet, which can then be exploited to provide cloud computing services, such as Platform as a Service, Infrastructure as a Service and/or Software as a service.

SERVICE MODELS



Cloud computing service models or SPI models refer to the three most common cloud models; Software as a Service (SaaS), Platform as a Service and Infrastructure as a Service (IaaS). These three model differ for each other based on the level of abstraction and level of flexibility they provide to the end user. The level of abstraction refers to distance between the infrastructure and the user. IaaS is the model providing the lowest level of abstraction, meaning that the service is closer to the infrastructure. Flexibility, on the other hand, refer to the user ability to create custom platform or software within the infrastructure. IaaS allows for much more manipulation than the two other models.

SOFTWARE AS A SERVICE (SaaS)

Software as a Service or SaaS is a model for the distribution of software, which includes the infrastructure, the platform, and the software. It does not require manipulation from the customer and can be accessed over the web. SaaS are particularly useful for business that do not which to create and maintain software for their applications/operations. One of the most popular field of SaaS is Customer Relationship Management (CRM)[3], which can consist of several modules such as; sales, marketing, support, analytics, etc. Some of the most notable CRM solutions are Salesforce and Netsuite (Oracle).

PLATFORM AS A SERVICE (PaaS)

Platform as a Service or PaaS is a service accountable for the development of new applications/web services. PaaS includes both the infrastructure and the platform. The service consists of both servers (virtualized) and associated services to develop new host applications.[4] For example, a virtual machine preconfigured with the popular LAMP stack (Linux-Apache-MySQL-PHP), for web hosting, would be considered a PaaS. This service only leaves the management of application layer to customers.

INFRASTRUCTURE AS A SERVICE (IaaS)

Infrastructure as a Service or IaaS is a service model for the delivery of computer infrastructure. IaaS is composed of computer hardware (CPU, RAM Storage), networking and hosting in a data center. IaaS providers are responsible for the maintenance and the resilience of their infrastructure, leaving the management of the databases, the security, and the applications to the customer. This solution offer flexibility for the development of custom solutions, allowing for the implementation of both custom platform and software.

These types of service model can be deployed using one of the three types of deployment models.

DEPLOYMENT MODELS

There are three main deployment models for cloud computing: public cloud, private cloud and hybrid cloud.

Public Cloud

Public cloud is a type of cloud computing that delivers shared computing resources to the public and accessible over the Internet.

Private Cloud

Private cloud is cloud computing model, similar to public cloud, but dedicated to a single organization.

Hybrid Cloud

Hybrid cloud is a type of cloud computing that consists of orchestrating a mix of private cloud and public cloud solutions.

These deployment models differ from each other depending on the level of governance they provide. The public cloud offers less control over the solution than the other two, while the private cloud offers much more control over the cloud infrastructure as it is a proprietary solution. That said, we wouldn't have the cloud computing that we know today if we didn't have virtualization.

VIRTUALIZATION

Virtualization is a mix of hardware and software that enable the creation of Virtual Machines (VMs). It's the foundation of cloud computing. Virtualization is a concept that refers to the process of virtualizing a server's resources, such as; computing, storage, and networking, to make it act as if it were multiple machines. It can combine multiple servers' resources into a pool of shared resources that can be assigned to virtual machines. Virtualization deliver availability and security to applications processed in a cloud environment. The process is achieved using a hypervisor. Virtualization offer several advantages, such as cost reduction, fast deployment, and elasticity.

ADVANTAGES

Improved Savings

Virtualization enables multitenancy, thus reducing the number of physical servers required in a data center and allowing businesses to achieve tremendous savings.

Fast Deployment

Server virtualization provide fast system provisioning and deployment, allowing businesses to quickly get a server up and running within minutes. and without setting up a physical server.

Elasticity

Virtualization allows assignment of resources dynamically, meaning that businesses can launch, manage, and terminate VMs on-demand.

VIRTUALIZED RESOURCES

As previously stated: “Virtualization is a concept that refers to the process of virtualizing a server’s resources, such as; computing, storage, and networking”. So, what’s computing referring to? What does virtualizing a network implies? How can you virtualize storage?

Computing

Computing refers to the central processing unit (CPU) and memory (RAM) available in your servers. Virtualizing your computing facilitate the reallocation of resource to your virtual machines, by dividing them into smaller group.

Networking

Virtualization can be accomplished throughout the physical deployment. While physical network equipment is required to interconnect all parts of a cloud, it is possible to virtualize the network management software layer via a Software Define Network (SDN).

Storage

Storage is a crucial point of your cloud. You can use local storage on each compute nodes or a centralized solution available to all Compute using a vendor locked SAN (Storage Attached Network) storage or a SDS (Software Define Storage). In case of the SDS, it can be a vendor locked or an open source solution and in most case, is design to hyperconverge the storage to the computing nodes (Using the space available in the physical compute server) and manage the storage to make it High Availability.

HYPERVISOR

Hypervisors are software used to virtualize server resources. They are accountable for the creation and the operation of virtual machines[5]. Hypervisors can run directly on the host hardware (Type 1) to manage guest Operating Systems. This type of hypervisor can also be referred to as “bare metal” hypervisor. Hypervisors can also run directly from the host OS (Type 2), for an all-in-one virtual environment, usually for development purposes or for a Proof of Concept (PoC).

Type 1	Type 2
Type 1 hypervisors will run directly on the hardware and will make possible the management of guest OS.	Type 2 hypervisors are installed on a conventional OS (Windows, Linux, iOS), and will run guest OS as a process.
VMware ESXI, Xenserver, Hyper-V, KVM	*VirtualBox, VMware Workstation, Parallels*

VIRTUAL MACHINES

Virtual machines are emulated computer systems acting as physical computers, and allowing for the installation of operating system, such as; Linux, Windows, and iOS.

WHY USE VIRTUAL MACHINES?

Isolated Environment

Virtual machines allow for the installation of guest OS and application in an isolated environment, which means that businesses can test software in development without compromising the integrity of the host server. Thus, security and stability of the host server are preserved. Due to the extent of the virtualization, which empower professionals with the ability to generate virtual networks, system administrators can test network configuration without having to go through the hassle of setting up a physical network configuration.

Snapshots

Once virtual machines are generated and set up for development, system administrators can take "snapshot" of the current instance configuration. The "snapshot" will generate a copy of the virtual system at a certain point in time, thus allowing for its re-implementation in case of data corruption or unrecoverable errors. This is particularly useful in the development or debugging process of software applications, since it empowers developers with the means to reinstate their development environment faster and insure that the environment is the same as it initially was, for rigor in testing.

Replication

The ability to replicate a virtual machine to a set of virtual machines, using previously generated “snapshot”, can drastically reduce time wasted on server configuration. For example, this could be particularly useful for a website design company that requires to generate several LAMP stack configurations for their development environments. Since the LAMP stack is widely used in web hosting, the ability to generate these kind of environment on-demand can constitute a competitive advantage for them. This is one of the many possible uses of virtual machine replication.

Automatization

Using a hypervisor with a virtualization stack, businesses can streamline and automate their VMs provisioning process. The deployment request for a virtual machine, sent by the deployment tool within your virtualization stack, will be managed through an API, which will automatically reserve the resources needed to provision your new instance. The automatization process can generate new virtual machines with a clean OS or simply use snapshots to replicate previously created snapshots.

Legacy Systems

Corporations tend to keep systems for a long period. The longer they use the system, the more data they have and the more critical it becomes to support them. If you're lucky the solution vendor will have a newer version of its platform that will be fully compatible with the legacy system, but since a lot of legacy systems/applications are abandoned by vendors, virtual machines can be particularly useful. By allowing the installation of older guest OS and older applications within its core, business can continue to use their legacy system or simply continue accessing its content for extended period. Now it's important to understand that your legacy system was designed to work with a set of specific OS which themselves had hardware limitations. To make sure that your legacy system will work within your virtual environment, it's mandatory to make a proof of concept, using a copy of your system and configuring it in the virtual environment. The beauty behind using legacy systems in a virtual environment is the ability to create a snapshot of it, which will serve as a backup copy and can be used to alter/customize the solution.

SUMMARY

Virtual machines act as physical servers inside the host server. They can run their own guest operating system regardless of their host OS, which ultimately provide a more flexible and secure environment for corporations to test with. There are many software providers that empower business with the means to virtualize server. Two of the most notable solutions are VMware (proprietary) and OpenStack (open-source). If you wish to learn more about these solutions and how they interact with hosting infrastructure, visit GloboTech Communication Documentation.

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