Cyber Security and Digital Forensics Internship

ASSIGNMENT 17

CLOUD FUNDAMENTALS

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TASK 1 - THE CLOUD COMPUTING GLOSSARY

1) **CLOUD -** In cloud computing, the word "cloud" (also phrased as "the cloud") is used as a metaphor for "the Internet".

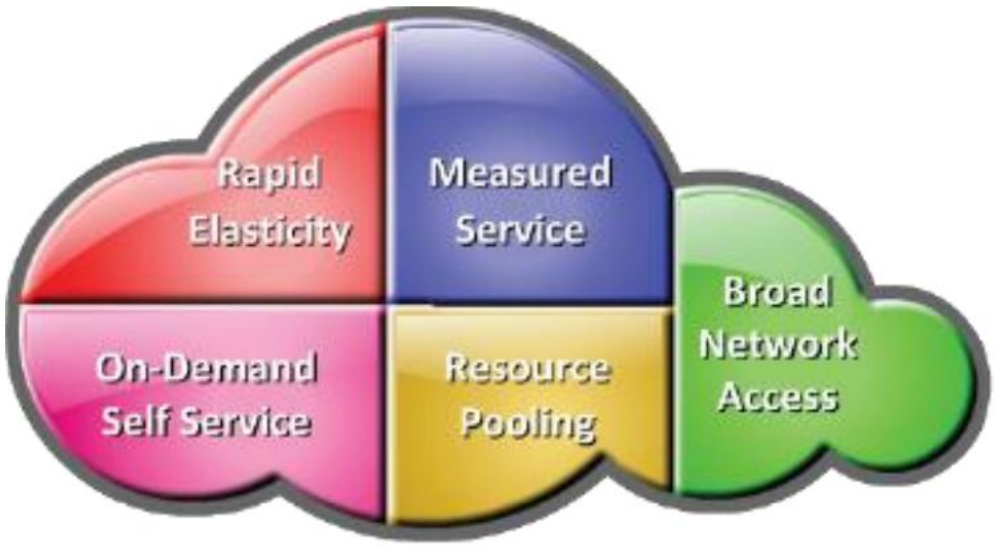
2) **CLOUD COMPUTING** - As per NIST, } Cloud computing is a model for enabling convenient, on demand, pay-per-use network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

3) **DISTRIBUTED COMPUTING** - Cloud computing uses the concept of distributed computing. A distributed system is a collection of independent computers that appears to its users as a single coherent system.

4) The major milestones that led to cloud computing:
   (i) Mainframe
   (ii) Clusters
   (iii) Grids

5) **Mainframes** are very powerful, highly reliable computers, specialized for large data movement and massive IO operations.

6) **Clusters** are low-cost alternative to the use of mainframes and supercomputers.
7) **Grids** are an aggregation of geographically dispersed clusters by means of internet connections.
8) **Virtualization** allows the creation and execution of multiple virtual machines in single system. It may be implemented at compute, storage, network, and/or application layers. It transforms from "one server- one application" to multiple virtual machines on each physical machine.
9) **Hypervisor** or VMM is a software that creates and runs VMs. It can access any of the VM spawned by it. It emulates the physical hardware and prevents direct access to physical hardware.
10) Characteristics of Cloud Computing:



11) **On Demand Self Service -** Enables consumers to get computing resources as and when required, without any human intervention. Facilitates consumer to

leverage “ready to use” services or, enables to choose required services from the service catalogue.

12) **Broad Network Access -** Cloud services are accessed via the network, usually the internet, from a broad range of client platforms such as: Desktop computer, Laptop, Mobile phone, Thin Client. It Eliminates the need for accessing a particular client platform to access the services.

13) **Resource Pooling -** IT resources (compute, storage, network) are pooled to serve multiple consumers. Consumer has no knowledge about the exact location of the resources provided. Resources are dynamically assigned and reassigned based on the consumer demand

14) **Rapid Elasticity -** Ability to scale IT resources rapidly, as required, to fulfil the changing needs without interruption of service. Resources can be both scaled up and scaled down dynamically.

15) **Metered Service -** Consumers are billed based on the metered usage of Cloud resources. Resource usage is monitored and reported.

16) **Cloud Provider** - An organization or entity that provides cloud services to cloud consumers.

17) **Cloud Carrier -** It works as glue in Cloud ecosystem between Cloud consumers and Cloud Service Providers. CSPs use it for connectivity and transport of cloud services to consumers.

18) **Cloud Broker** - Often, cloud brokers are responsible to manage delivery, performance, and

quality of Cloud services to the cloud consumers. Ex. Appirio, which offers integration services for Google Apps, Salesforce.com and WorkDay, among others.

19) **Cloud Consumer** - End user or organization that acquires and uses cloud products and services from Cloud Service Providers.

20) **Cloud Auditor -** Cloud auditors conduct third party assessment of cloud services, information system operations, performance, and security of the cloud implementation based on existing rules and regulations.

21) **Aggregation** - A cloud broker combines and integrates multiple services into one or more new services.

22) **Arbitrage** - Service arbitrage is similar to service aggregation, except that the services being aggregated are not fixed. Service arbitrage means a broker has the flexibility to choose services from multiple Providers, depending upon the characteristics of the data or the context of the service.

23) **Intermediation** - A cloud broker enhances a given service by improving some specific capability and providing value-added services to cloud consumers. The improvement can be managing access to cloud services, identity management, performance reporting, enhanced security, etc.

24) **Infrastructure-as-a-Service (IaaS) -** Provides capability to the consumer to hire infrastructure components such as servers, storage, and network . It

enables consumers to deploy and run software, including OS and applications . It pays for infrastructure components usage, for example, Storage capacity, CPU usage, etc.

25) **Platform -as - a -Service (PaaS) -** It provides a platform allowing customers to develop, run, and manage applications without the complexity of building and maintaining the infrastructure typically associated with developing and launching an app. Consumer has control over Deployed applications, Possible application hosting environment configurations. Consumer is billed for platform software components : OS, Database, Middleware ((e.g. Java runtime, .NET runtime, integration, etc.))

26) **Software-as-a-Service (SaaS) -** Capability provided to the consumer to use provider's applications running in a Cloud infrastructure . Complete stack including application is provided as a service. Application is accessible from various client devices, for example, via a thin client interface such as a Web browser. Billing is based on the application usage

27) **Amazon Web Services (AWS) -** AWS stands for Amazon Web Service which is a collection of remote computing services also known as cloud computing. This technology of cloud computing is also known as IaaS or Infrastructure as a Service.

Key Components of AWS

28) **Route 53:** A DNS (Domain Name SERVER) web based service platform.

29) **Simple E-mail Service:** Sending of E-mail is done by using RESTFUL API call or via regular SMTP (Simple Mail Transfer Protocol).

30) **Identity and Access Management:** Improvised security and Identity management is provided for AWS account.

31) **Simple Storage Device or (S3):** It is a huge storage medium, widely used for AWS services.

32) **Elastic Compute Cloud (EC2):** Allows on-demand computing resources for hosting applications and essentially useful for unpredictable workloads

33) **Elastic Block Store (EBS) :** Storage volumes which is being attached to EC2 and allows the data lifespan of a single EC2

34) **Cloud Watch:** It is used to monitor AWS resources and Access is provided so that one can set a notification alarm in case of trouble.

35) **Total Cost Ownership (TCO) :** In the IT industry, TCO represents the total cost of purchasing (in case of on premise) / subscribing to (in the case of cloud computing) and operating a technology solution over its useful life.

TASK 2 – COMPARISON TABLE

Category	Amazon Web Services (AWS)	Microsoft Azure	Google Cloud Platform (GCP)
Compute Services	**EC2** – Flexible VMs with various families **Lambda** – Event-driven serverless **Elastic Beanstalk** – App deployment	**Virtual Machines** – Windows/Linux support **Functions** – Serverless execution **App Services** – Managed app hosting	**Compute Engine** – Custom VMs **Cloud Functions** – Lightweight serverless **App Engine** – Fully managed apps
Compute Highlights	Largest instance variety (GPU, memory-optimized, etc.) Highly mature ecosystem	Strong integration with Windows Server, .NET, Active Directory	Best-in-class live migration of VMs Early Kubernetes pioneer (GKE)
Storage Services	**S3** – Durable object storage **EBS** – Scalable block storage **EFS** – Managed file system **Glacier** – Archival	**Blob Storage** – Tiered object storage **Disk Storage** – HDD/SSD options **Azure Files** – SMB-based file storage	**Cloud Storage** – Multi-class object storage **Persistent Disk** – SSD/HDD **Filestore** – High-performance NFS
Storage Strengths	Best-in-industry lifecycle policies and tools Strong cross-region replication	Built-in redundancy and lifecycle management Tiered pricing: Hot, Cool, Archive	Competitive cold storage pricing Seamless object versioning and multi-region
Pricing Model	**Pay-as-you-go** with per-second billing **Savings Plans** **Spot Instances** for discounted workloads	**Pay-as-you-go** with per-minute billing **Reserved Instances** **Azure Hybrid Benefit**	**Sustained Use Discounts** (auto-applied) **Committed Use Discounts** **Preemptible VMs** for huge cost savings

Category	Amazon Web Services (AWS)	Microsoft Azure	Google Cloud Platform (GCP)
Unique Pricing Benefit	Deep discount for long-term reserved usage (up to 72%)	Hybrid Benefit reduces cost for on-prem licenses	Discounts automatically increase with usage over time
Free Tier Offerings	12 months free + Always Free services (e.g., Lambda, S3)	12 months free + Azure Credits ($200)	$300 credit for 90 days + Always Free tier (Cloud Functions, etc.)
Best Fit For	Enterprises, startups, and varied use cases Wide industry adoption	Organizations heavily using Microsoft stack Hybrid cloud strategies	Startups, AI/ML teams, data scientists Big data & analytics workloads