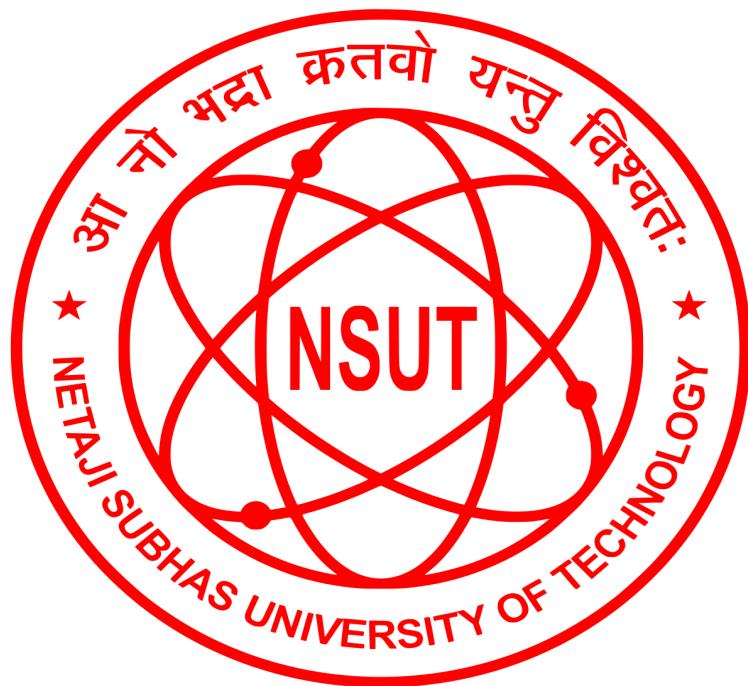


CLOUD COMPUTING (COCSC15)

COE SECTION 3

TOPIC : CASE STUDY ON CLOUD PLATFORMS



Name - Aansh Sardana (2019UCO1672)
COE 3

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MICROSOFT AZURE

Introduction

Microsoft Azure is a Microsoft cloud service provider that provides cloud computing services like computation, storage, security and many other domains. Microsoft is one of the global leaders when it comes to Cloud solutions and global cloud infrastructure. Microsoft Azure provides services in 60+ global regions and serves in 140 countries. It provides services in the form of Infrastructure as a service, Platform as a Service and Software as a service. It even provides serverless computing meaning, you just put your code and all your backend activities as managed by Microsoft Azure.



It easily integrates with Microsoft Products making it very popular using Microsoft products. This platform is now 10 years old and it picked up to compete with the best of the best.

Services List:

Azure IaaS

IaaS is the most flexible category of cloud services. Instead of buying hardware, with IaaS, you rent IT infrastructure servers and virtual machines (VMs), storage, networks, and operating systems from Microsoft on a pay-as-you-go basis, and you are responsible for managing the operating systems, data, and applications.

Therefore, Azure virtual machines are Infrastructure as a Service (IaaS) and Azure page blobs are the backbone of the virtual disks platform for Azure IaaS.

Azure Paas

PaaS solution requires less user management and does not provide access to the operating system. That means that the PaaS is a complete development and deployment environment in the cloud and provides a framework that developers can build upon to develop or customize cloud-based applications.

For example, the Azure Web Apps service provides an environment for you to host your web applications but you don't have to access the virtual machine and the operating system. And Azure SQL Database is a fully managed platform as a service (PaaS) database engine that handles most of the database management functions such as upgrading, patching, backups, and monitoring without user involvement.

Azure SaaS

SaaS solution requires the least management. Microsoft is responsible for managing everything, and you just use the software. SaaS allows you to connect to and use cloud-based apps over the Internet. When you are implementing a SaaS solution, you are responsible for configuring the SaaS solution. Common examples are Outlook email, calendar, and office tools (such as Microsoft Office 365)

Execution Environment

The Windows Azure execution environment consists of a platform for applications and services hosted within one or more roles. The types of roles you can implement in Windows Azure are:

Azure Compute (Web and Worker Roles). A Windows Azure application consists of one or more hosted roles running within the Azure data centers. Typically there will be at least one Web role that is exposed for access by users of the application. The application may contain additional roles, including Worker roles that are typically used to perform background processing and support tasks for Web roles.

Virtual Machine (VM role). This role allows you to host your own custom instance of the Windows Server 2008 R2 Enterprise or Windows Server 2008 R2 Standard operating system within a Windows Azure data center.

Benefits of Microsoft Azure

Microsoft Azure may be considered second to Amazon Web Services in few features, but it has quite a few that make it stand tall on its own. Let us take a look at them, one by one

On-Demand Scalability

When we talk of Application Hosting we can never be sure of how many resources are enough and how many are too much. This is the nature of businesses that rely on varying traffics. What it does is forces businesses to plan a lot and invest a lot of money doing it. Microsoft Azure helps you save all this effort.

Microsoft Azure ensures your applications and data is distributed well enough that means you never run short of Server space. It also means your applications do not run on a single server making them available even in dire situations. Since these resources are properly clustered out and they can scale at will and in no time, your applications function very differently than they would in an on-premise architecture.

Cost Effective

One of the major benefits with cloud service providers is the cut down of upfront costs. Since you can configure and scale at will, you are not required to invest heavily here. Microsoft Azure ensures small scale investment does not require upfront costs. Also when it comes to people who have signed up contracts, they get heavy discounts. It also offers a Pay as go, model, meaning you get cost-cutting in the right sense.

Hybrid Environments

They say cloud is not a one fit solution for all. It is true indeed because every business will have its own set of problems. And not all businesses will always be in a state where they can migrate to the cloud entirely. Microsoft Azure benefits with its Hybrid approach. Meaning, with Microsoft Azure you can build Hybrid infrastructures, where your resources can partially reside on the cloud and can partially operate from an on-premise infrastructure. Hence you are safe from costly workaround.

Big data Applications

Hadoop and Big data are the need of the hour. With data increasing exponentially we need applications that can help process this data. Microsoft Azure brings this capability of processing large volumes of data on top of its cloud platform.

Integration Capabilities

Microsoft has been in the software industry for decades. It has wide reach in the software market and not many can compete with it when it comes to customer base and stack of products it offers. The advantage for Microsoft Azure here is that it readily integrates with most of these products. Be it, connecting to SaaS, PaaS, IaaS applications or even something like Visual Studio or Active Directory, Microsoft Azure has you covered. Hence you can now leverage ERPs and CRMs to enhance your business capacity to a greater level.

Storage and Security

Storage is very critical to any application. It is no different for applications running on cloud. As already discussed, the volume of data we handle these days is huge. It also comes in different formats and from different sources. Your Storage resources have to adept enough to handle this data. Microsoft Azure has you covered here as well. It lets you store data in form of files, objects, structured and unstructured data and a lot more. This happens reliable and securely.

Talking of security Microsoft Azure ensures high level of security for your applications. It ensures all the resources in Azure cloud are guarded with firewalls and data is moved over the network with encryption. You have access to authentication and access management meaning your data and application are secure to the core.

Scheduling and Automation

Everyone hates doing repetitive tasks. What if we could automate mundane tasks or recurring tasks be it fetching some data, setting up triggers or scaling your resources when needed? Microsoft Azure does that for you ensuring you can utilise your workforce for more productive outcomes and get rid of stagnancy or repetition of work.

Data Backup and Recovery

Data Backup ensures you have a copy of your data maintained in case if your primary copy of data or resources is lost. With Microsoft Azure, you have an option of backing up your data in different Azure regions or data centres. You can maintain as many as six copies of your data. This signifies that the chance of losing your data on Microsoft Azure is minimal. When it comes to reliability your data is available 99.9 percent.

So this was about the benefits of Microsoft Azure. Let us go ahead and see what customers have to say about Microsoft Azure and what are some of the popular use cases it has to offer to us.

Screenshots

Creating a virtual machine:

NAME	STATUS	RESOURCE GROUP	LOCATION	SUBSCRIPTION
fidani	Running	Group-3	East US	Free Trial
jusufi	Running	Group-2	Central US	Free Trial
venera	Running	Group-4	East US	Free Trial

Virtual machine created:

Resource group	DNS name	Operating system	Size
Group-3	fidani-a14qj5x7.cloudapp.net	Windows	Standard DS1 (1 Core, 3.5 GB memory)
Running			
Location			
East US			
Subscription name			
Free Trial			
Subscription ID			
7d291c85-900f-4a89-81c5-b2caba079bac			
Virtual network/subnet			
fidani			

Use Cases of Microsoft Azure

Microsoft has many popular customers out there, here are some use cases for you,

University Of Toronto

This is the largest Canadian university and leads the global front when it comes to research at an institutional fare. It made use of Microsoft Azure to avoid heavy hardware renewal costs. It migrated some of its activities to Microsoft Azure Cloud. With it, the university managed to transform IT processes, saving a lot of time

AkzoNobel

AkzoNobel is a popular Dutch Company that leads way in paint and coating business. It serves in more than 100 countries and always needs better connectivity across the globe. It harnessed the power of Microsoft Azure IoT services to improve its performance and connectivity at a global level.

IHG (Intercontinental Hotel Group)

This is one of the largest and leading hotel groups in the world. It owns around 5200 properties across the globe and serves more than a hundred countries. The fact that you own 5200 properties tells you the group holds its values of service very truly and also must have experimented a lot to stay up to date with market needs as well. This fact is also supported by the fact that this group invests a lot of money in innovations to meet the experience quality the customers deserve.

The company has many of its tools that require Agile practices. It already was based on Azure Cloud platform. This is when they decided to use DevOps Services on Microsoft Azure. This not only helped them bring their software and data handling process on track, but also helped them fortify their security and processing principles. The fact that Microsoft Azure Supports Hybrid cloud meant big group like IHG did not have to move to Azure cloud altogether.

Ever since it has moved to Azure StorSimple, which is a hybrid storage service for enterprises. The group has achieved great results when it comes to storing data. It has helped them save more 70 percent in terms of cost. This is something that was initiated four years ago. It needed very little support in setting up and does require too much intervention when it comes to administrative attention.

Before they moved to the above-mentioned service, IHG group had to deal with multiple data and file services to gather and store data. Azure StorSimple ensured this data was consolidated and easy to manage overall. Data Backup issue was also resolved as Azure ensured that easy way to get a snapshot of data. That means data could be backed up easily and quickly.

So this was about different customers and how they used Microsoft Azure to solve their business problems. With this, we have come to the end of this article on Microsoft Azure: Benefits and Use Cases. We hope you liked this article and it has spiked your interest in learning or using Microsoft Azure. We hope you perceive your Cloud Journey further, Happy Learning!

AMAZON WEB SERVICES



INTRODUCTION:

Amazon Web Services (AWS) is a subsidiary of Amazon providing on-demand cloud computing platforms and APIs to individuals, companies, and governments, on a metered pay-as-you-go basis.

Amazon Web Services (AWS) is the world's most comprehensive and broadly adopted cloud platform, offering over 175 fully-featured services from data centres globally.

Millions of customers — including the fastest-growing startups, largest enterprises, and leading government agencies — are using AWS to lower costs, become more agile, and innovate faster.

The AWS technology is implemented at server farms throughout the world, and maintained by the Amazon subsidiary. Fees are based on a combination of usage (known as a "Pay-as-you-go" model), hardware, operating system, software, or networking features chosen by the subscriber required availability, redundancy, security and service options. Subscribers can pay for a single virtual AWS computer, a dedicated physical computer, or clusters of either. As part of the subscription



agreement. Amazon provides security for subscribers' systems. AWS operates from many global geographical regions including 6 in North America

TYPE OF CLOUD:

Amazon Web Services comes under the category of public cloud as all its services are publicly available both free and on a pay per use basis.

SERVICES PROVIDED BY AWS:

AWS provides all Infrastructure as a service, platform as a service as well as software as a service. AWS is PaaS or IaaS or SaaS. Each service of Amazon has its own merits and flaws and is suitable for the specific needs of a company.

Infrastructure as a service

What is AWS IaaS? IaaS or Infrastructure as a service is one of Amazon Web Services that focuses on providing infrastructure services based on cloud computing technology. It has clients in 190 countries and 66 available Zones within 21 geographic regions. IaaS Amazon Service is used to replace physical resources, such as servers, with virtual resources hosted and managed by Amazon. System users can run any operating system or application on these leased servers, without incurring any extra fees for maintenance and operation.

All these features make AWS IaaS a widely-used platform by companies nowadays.

Magento can be considered a typical example of IaaS in AWS.

AWS IaaS Benefits

- Availability of separate development environment
- Hardware and operating system specifications for the service can be selected and used directly from the network
- Allow expanding the resources of the server in terms of quantity and functionality
- No errors or extra costs arise while upgrading the system

Platform as a service

Among 3 Amazon service solutions that apply cloud computing technology namely Iaas Paas Saas AWS, PaaS plays an important role in simplifying the application

development process on the web. With cloud technology, developers can access the platform data from anywhere. This can facilitate project development on a global scale. However, it also means that the developers will have less control over the application design environment.

AWS SaaS benefits

- Able to use directly over the network without having to install any software.
- All data can be stored on the Internet.
- Data can be accessed via any device, as long as an Internet connection is available.
- Multiple users can access the same data warehouse.
- Quick setup and operation of advanced applications.

Software as a service

Apart from AWS IaaS Paas, Amazon also includes SaaS in its services. This Software as a service (also called Web-based software, on-demand software, or hosted software) is a software distribution model whose applications are hosted and made discoverable to the customers over the Internet. When embracing this solution, you will have the access to the application, along with its security, availability, and performance managed by the provider. SaaS is also one of Amazon's web services favored by a large number of users worldwide.

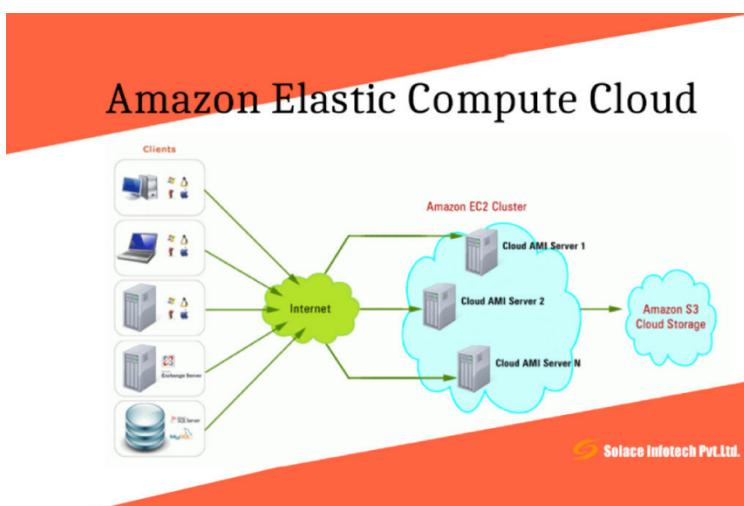
AWS SaaS benefits

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PRODUCTS:

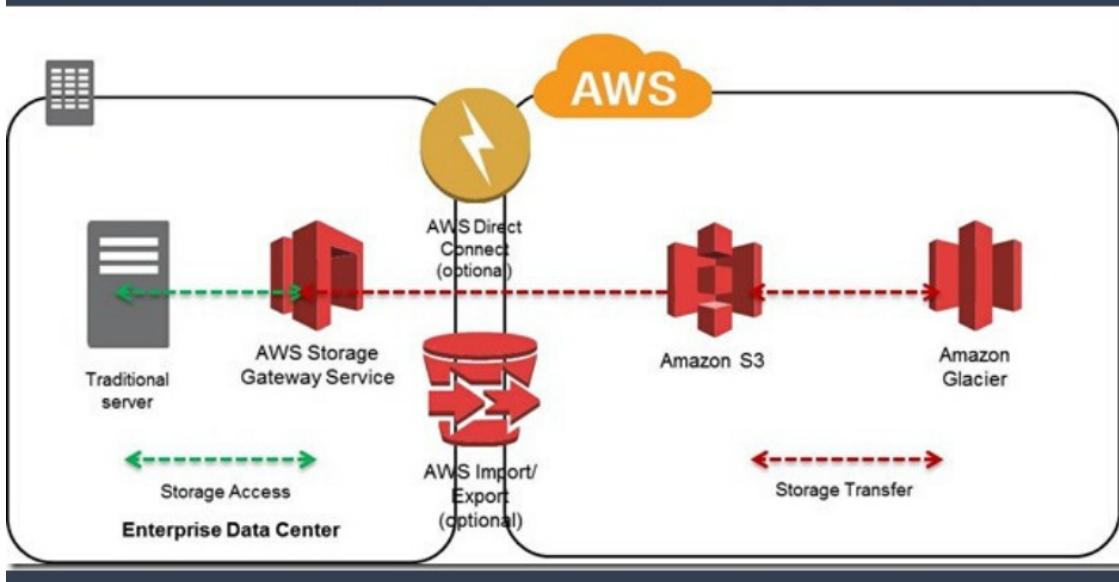
Amazon Elastic Compute Cloud(EC2):

Amazon EC2 is an IaaS offered by AWS and is the leading provider of IaaS in the current market. Powered by a huge infrastructure that the company has built to run its retail business, Amazon EC2 provides a true virtual computing environment. By providing a variety of virtual machine or instance types, operating systems, and software packages to choose from, Amazon EC2 enables the user to instantiate virtual machines of his choice through a web service interface. The user can change the capacity and characteristics of the virtual machine by using the web service interfaces, hence named elastic. Computing capacity is provided in the form of virtual machines or server instances by booting Amazon Machine Images (AMI), which can be instantiated by the user.



Amazon Simple Storage Service:

Amazon simple storage service Lifecycle



Amazon Simple Storage Service known as Amazon S3, is the storage for the Internet. It is designed to make web-scale computing easier for developers. Amazon S3 provides a simple web service interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web. It gives any developer access to the same highly scalable, reliable, secure, fast, inexpensive infrastructure that Amazon uses to run its own global network of websites. The service aims to maximize benefits of scale and to pass those benefits on to developers.

Along with its simplicity, it also takes care of other features like security, scalability, reliability, performance, and cost. Thus, Amazon S3 is a highly scalable, reliable, inexpensive, fast, and also easy to use service that meets design requirements and expectations. Amazon S3 provides a highly durable and available store for a variety of content, ranging from web applications to media files. It allows users to offload storage where one can take advantage of scalability and pay-as-you-go pricing.

Amazon Simple Queue Service:

Another service of AWS is Amazon SQS. It is a fast, reliable, scalable, fully managed message queuing service. SQS makes it simple and cost effective to decouple the components of a cloud application. SQS can be used to transmit any volume of data, at any level of throughput, without losing messages or requiring other services to be always available.



Amazon SQS is a distributed queue system that enables web service applications to quickly and reliably queue messages that one component in the application generates to be consumed by another component. A queue is a temporary repository for messages that are waiting to be processed.

Google Cloud Platform



Google Cloud

Introduction:

Google Cloud Platform (GCP), offered by Google, is a suite of cloud computing services that runs on the same infrastructure that Google uses internally for its end-user products.

Google Cloud consists of a set of physical assets, such as computers and hard disk drives, and virtual resources, such as virtual machines (VMs), that are contained in Google's data centers around the globe.

Google Cloud Platform enables developers to build, test, and deploy applications on Google's highly scalable and reliable infrastructure. Google has one of the largest and most advanced networks across the globe.

Applications hosted on the cloud platform can automatically scale up to handle the most demanding workloads and scale down when traffic subsides. The cloud platform is designed to scale like Google's own products, even when there is a huge traffic spike. Managed services such as App Engine or Cloud Datastore provide autoscaling that enables application to grow with the users. The user has to pay only for what he or she uses.



Type of Cloud Deployment Model:

Google cloud offers a public cloud deployment model comparable to Amazon Web Services and Microsoft Azure.

The difference is that GCP is built upon Google's massive, cutting-edge infrastructure that handles the traffic and workload of all Google users.

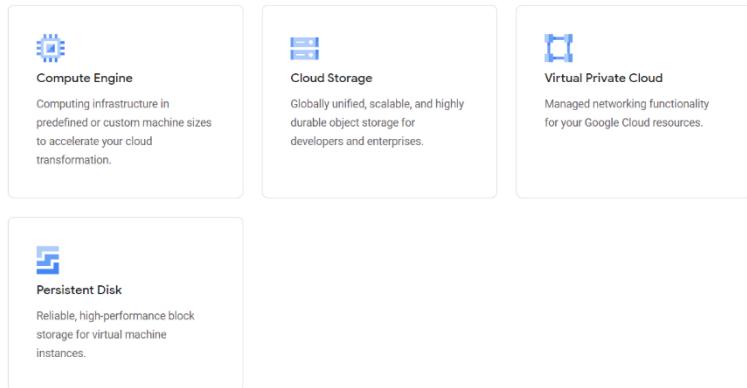
Services Provided by GCP:

There is a wide range of services available in GCP ranging from Infrastructure-as-a-Service (**IaaS**), Platform-as-a-Service (**PaaS**) to completely managed Software-as-a-Service (**SaaS**).

Infrastructure as a Service

Google Cloud's IaaS products allow enterprises to mix and match services into combinations that provide the precise environment they need.

IaaS services at google cloud allow users to run testing and deployment cycles, improve disaster recovery, perform big data analytics, handle scaling and provisioning required resources quickly.



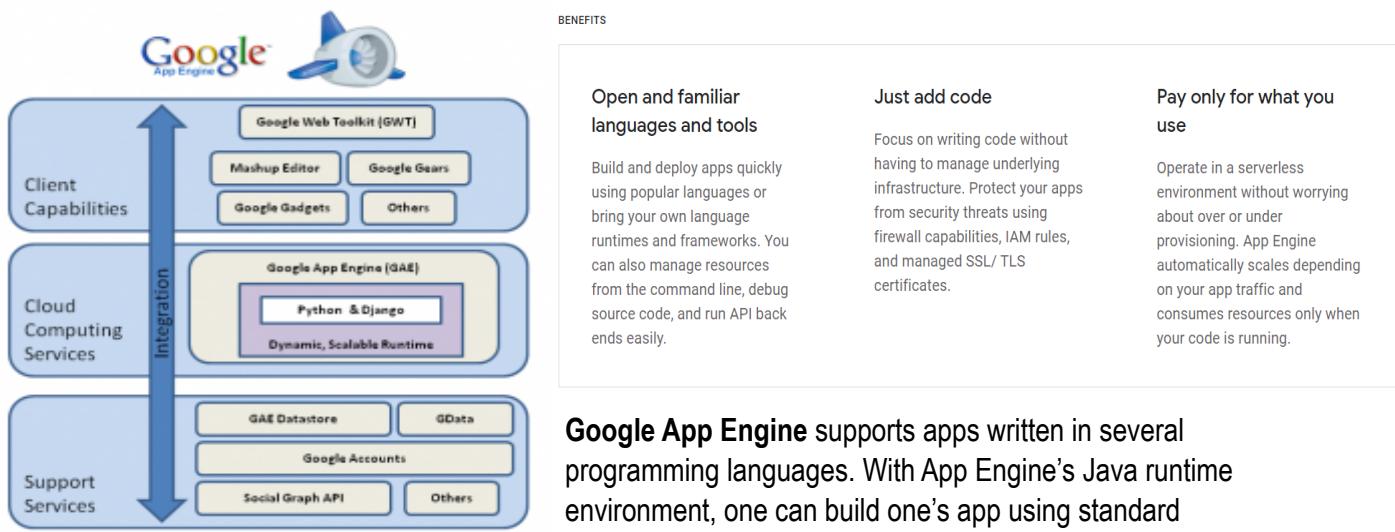
Google Cloud: It is a RESTful online file storage web service for storing and accessing one's data on Google's infrastructure.

The service combines the performance and scalability of Google's cloud with advanced security and sharing capabilities. Google Cloud Storage is safe and secure. Data are protected through redundant storage at multiple physical locations.

Google Compute Engine: GCE is an Infrastructure as a Service ([IaaS](#)) offering that allows clients to run workloads on Google's physical hardware. It provides a scalable number of virtual machines ([VMs](#)) to serve as large [compute clusters](#) for that purpose. Compute Engine is a pay-per-usage service with a 10-minute minimum. There are no up-front fees or time-period commitments. GCE competes with Amazon's Elastic Compute Cloud (EC2) and Microsoft Azure.

Platform as a Service

Google cloud's app engine is the best example of providing a platform as a service. It is used for building web applications and mobile backends using container instances preconfigured with one of several available runtimes, each of which include a set of standard App Engine libraries.



Google App Engine supports apps written in several programming languages. With App Engine's Java runtime environment, one can build one's app using standard Java technologies.

App Engine also features a Python and PHP runtime environment. Finally, App Engine provides a Go runtime environment that runs natively compiled Go code. These runtime environments are built to ensure that your application runs quickly, securely, and without interference from other apps on the system.

Software as a Service

Google cloud provides multiple services such as Anthos, Kubernetes Engine and a large number of APIs as SaaS offerings. These services not only are SaaS but also help other users to build efficient and scalable SaaS products. They open users to cutting-edge data analytics, and machine learning capabilities along with efficient management of users and deployment.



Google Cloud Print is a service that extends the printer's function to any device that can connect to the Internet. To use Google Cloud Print, the user needs to

have a free Google profile, an app, a program, or a website that incorporates the Google Cloud Print feature, a cloud-ready printer or printer connected to a computer logged on to the Internet.

PRODUCTS

Google cloud features over 100 products through its services. Customers interacting with the products interact in a pay-as-you-use type architecture. Some of the featured products that the platform offers are

Featured products

Compute Engine

Virtual machines running in Google's data center.

Cloud Storage

Object storage that's secure, durable, and scalable.

Cloud SDK

Command-line tools and libraries for Google Cloud.

Cloud SQL

Relational database services for MySQL, PostgreSQL, and SQL Server.

Google Kubernetes Engine

Managed environment for running containerized apps.

BigQuery

Data warehouse for business agility and insights.

Cloud CDN

Content delivery network for delivering web and video.

Dataflow

Streaming analytics for stream and batch processing.

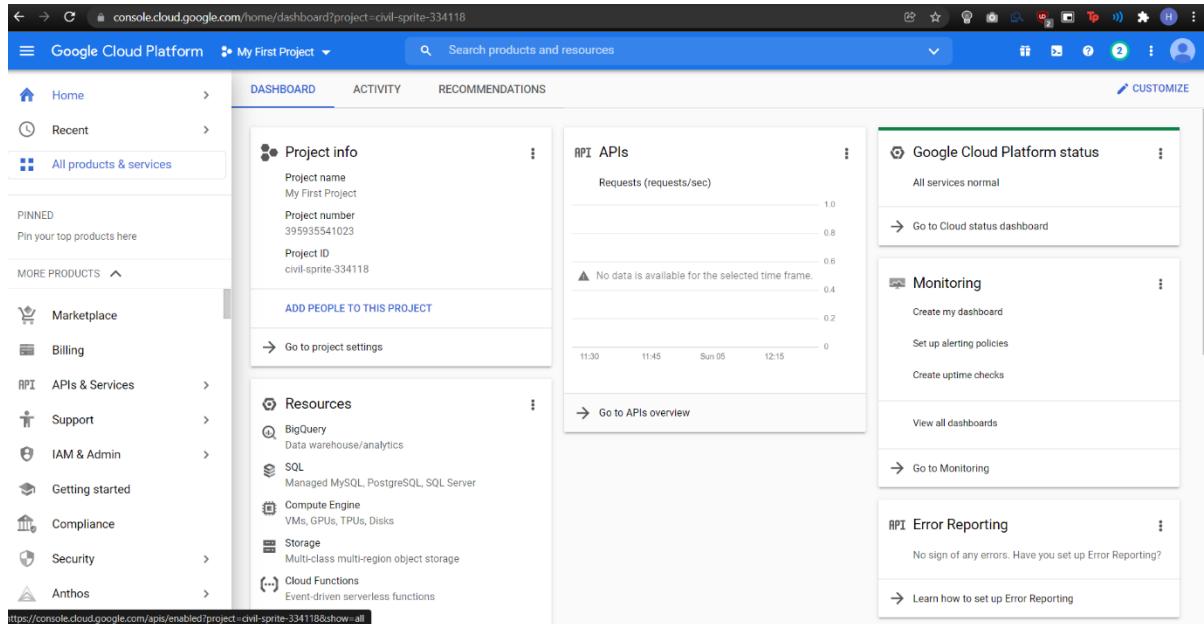
Operations

Monitoring, logging, and application performance suite.

Ways to interact with the services:

The two most common ways are as follows

Google Cloud Console



(My Console Page)

The Google Cloud Console provides a web-based, graphical user interface that you can use to manage your Google Cloud projects and resources. When one uses the Cloud Console, he/she can either create a new project or choose an existing project, and then use the resources that one creates in the context of that project.

Command-line interface

```
test-project-165220 ~ +  
Welcome to Cloud Shell! Type "help" to get started.  
sangeethaa@test-project-165220:~$ gcloud version  
Google Cloud SDK 158.0.0  
alpha 2017.03.24  
app-engine-go  
app-engine-java 1.9.54  
app-engine-python 1.9.54  
beta 2017.03.24  
bq 2.0.24  
cloud-datastore-emulator 1.2.1  
cloud-ml 2017.06.02  
data-fb 20170525  
docker-credential-gcr  
gcloud-emulator v1beta3-1.0.0  
gcloud  
gsutil 4.26  
kubectl  
pubsub-emulator 2017.03.24  
sangeethaa@test-project-165220:~$
```

Most Google Cloud tasks can be performed by using the gcloud command-line tool.



Introduction

VMware, a leader in virtualization technology, has come up with enterprise cloud computing solutions.

Service Offering Model

- Infrastructure as a Service (IaaS).
- Datacenter as a Service

Deployment Model

Software Solutions provided by VMware can be classified into two categories

1. For Private Cloud
2. For Public and Hybrid Cloud

Services Provided by VMware

VMware is currently providing a range of products for the development of private and public clouds and for leveraging the services offered by both as a hybrid cloud, such as VMware vCloud Director, VMware vCloud Datacenter Services, VMware vSphere, and VMware vShield NSX to name a few.

Software Solutions for Private Cloud

VMware's private cloud offering provides greater standardization, rapid provisioning, and self-service for all applications and unparalleled cost savings by consolidating their physical infrastructures.



Private clouds can be created by using the VMware vSphere and VMware vCloud Director. VMware vSphere is a robust virtualization platform used to transform IT infrastructures into virtual storage, compute, and network resources and provide them as a service within the organization. VMware vSphere provides services at both the infrastructure and application levels. At the infrastructure level, it provides options to perform efficient operation and management of the compute, storage, and network resources. At the application level, service-level controls are provided for the applications running on the underlying infrastructures, leading to available, secure, and scalable applications.



vmware®

Cloud Director™

VMware vCloud Director abstracts the virtual computing environment from the underlying resources and provides a multitenant architecture that features isolated virtual resources, independent LDAP authentication, specific policy controls, and unique catalogs.



VMware vShield technologies (now NSX vShield) are used to provide security to these environments by using services like perimeter protection, port-level firewall, NAT and DHCP services, site-to-site VPN, network isolation, and web load balancing

The vCloud API is an open, REST-based API that provides scripted access, complying with the open virtualization format (OVF). The API can be used along with VMware vCenter Orchestrator to automate and orchestrate operational processes like routine tasks, activities, and workflows.

Software Solutions for Public and Hybrid Cloud

Public and hybrid cloud solutions are provided by VMware by partnering with other companies, certified as service providers. VMware vCloud Datacenter Services and VMware vCloud Express offer efficient solutions for utilizing IaaS either as a public cloud or a hybrid cloud.

Cloud Foundation can manage VMware environments hosted either on-prem or in multi-cloud locations, however most of the VMware cloud services are utilized in hybrid architectures. The main concept for VMware Cloud Foundation is to give users an easy way to integrate multiple environment types into one single platform and apply those services to a diverse setup.

VMware Cloud services are grouped into three categories:

- Services which you can use anywhere in your hybrid configuration within Cloud Foundation.
- Services available natively in the cloud.
- Services offered as Datacenter-as-a-Service.

VMware Cloud Storage vSAN



vSAN serves as the storage component for VMware Cloud Foundation. vSAN is a software-defined storage solution that enables a hyper-converged infrastructure, or a cluster of hosts, to group together all of their storage resources and present them as a single available datastore.

These are some of the important features vSAN has to offer:

- **Policy-based provisioning:** Instead of creating volumes or LUNs and then assigning those to particular resources, vSAN provisions storage based on a storage policy you assign your resources (such as a virtual machine) as you create them, based on specific service level parameters.
- **Software-level RAID:** vSAN does not use hardware RAID. Instead, it protects data at the software layer by replicating VMDK files across hosts that are part of the cluster based on fault tolerance parameters associated with the storage provisioning policies mentioned above.

- **Vendor agnostic:** vSAN has been designed to run on industry standard x86 hardware and is vendor independent. Since it is a software-based storage solution, it can run on any hardware that meets the requirements.

VMware Cloud on AWS



[VMware Cloud on AWS](#), runs SDDC on dedicated, elastic, bare-metal AWS infrastructure.

Here are some details of the underlying infrastructure:

- The service runs on EC2 storage optimized high I/O instances with Non-Volatile Memory Express (NVME) SSDs.
- Each SDDC host (up to 16 hosts allowed in one SDDC cluster) has 36 cores, 512 GB of memory, and 15.2 TB of NVME storage.

You can manage this SDDC environment through the Cloud Foundation platform and integrate it with your on-prem SDDC workloads. This easy and seamless integration brings important advantages:

- An easy migration process of all your Virtual Machines to the cloud. VMware has [a step-by-step migration guide](#) available for customers planning to move everything to AWS. You can even migrate live workloads using vMotion.
- No need to rearchitect or refactor apps for use in the cloud. Basically, [the lift and shift approach](#).
- Manage hybrid apps with all existing VMware tools through Cloud Foundation such as vServer, VMware Horizon, or vCenter Server.

Access to all the full range of native AWS services such as Amazon Redshift, Amazon S3, AWS ELB, RDS, and more from your AWS SDDC cloud environment. AWS SDDC is directly connected to the customer's VPC (virtual private cloud) using ENI (Elastic Network Interface) through which the customer has access to all the range of AWS services.

VMware Cloud on Azure



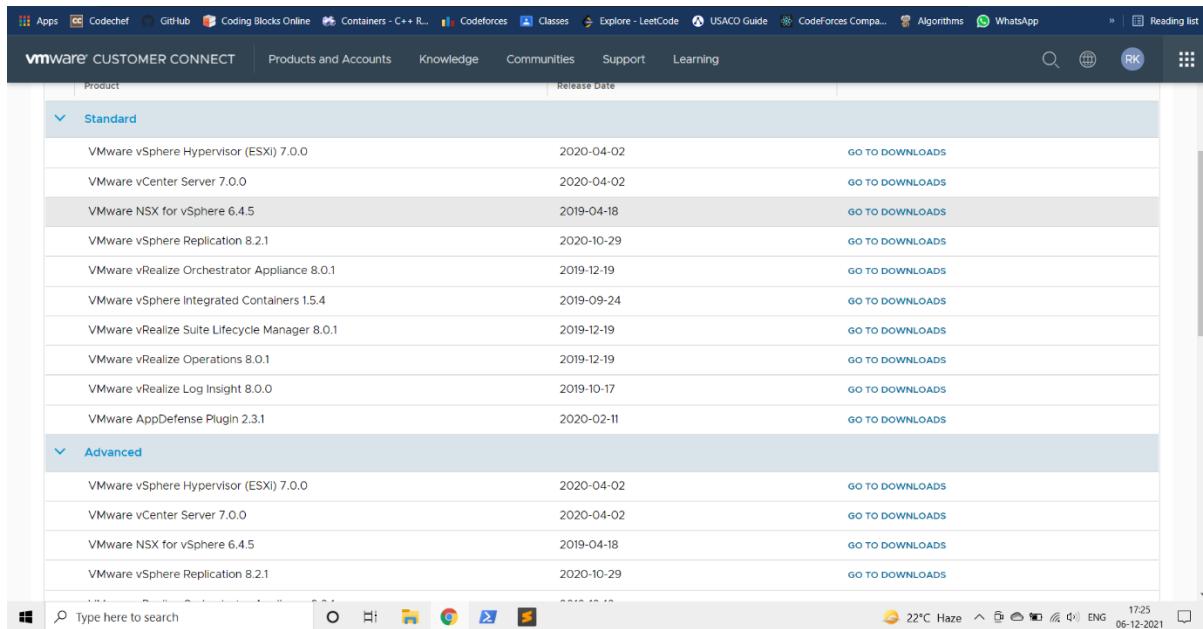
Similar to VMware on AWS, VMware on Azure is built on VMware Cloud Foundation with the same SDDC offerings: virtualized compute, network, and storage. It runs on top of the same concept of hyper-converged infrastructure which sits on dedicated bare-metal Azure servers that share some of the characteristics mentioned before for the AWS case:

- Intel Xeon processors.
- Node with max capacity of up to 36 physical cores each.
- A maximum of 3.2TB of NVME cache per node.
- Up to 11.25 TB of flash storage per cluster.

Unlike VMware Cloud on AWS, which is a platform that was made and managed directly by VMware, VMware Cloud on Azure is a platform offered as a Microsoft service. Though certified by VMware in conjunction with CloudSimple, which facilitates VMware services in the public cloud, VMware Cloud on Azure remains a Microsoft-managed service. This means that under one single contract with Azure, you can get all the terms for both the Cloud Foundation on Azure product plus all the other range of services offered by Azure.

You can integrate your VMware SDDC with Azure services such as Azure storage, Azure Active Directory, Azure Analytics, or Office 365.

Various Products and virtualisation solutions offered by VMware



The screenshot shows the VMware Customer Connect portal. At the top, there's a navigation bar with links like Apps, Codechef, GitHub, Coding Blocks Online, Containers - C++ R..., Codeforces, Classes, Explore - LeetCode, USACO Guide, CodeForces Comp..., Algorithms, WhatsApp, and a Reading list icon. Below the navigation bar, the main header says "vmware CUSTOMER CONNECT". Underneath it, there are tabs for Products and Accounts, Knowledge, Communities, Support, and Learning. On the right side of the header, there are icons for search, globe, and a user profile labeled "RK". Below the header, there's a table with two sections: "Standard" and "Advanced". The "Standard" section lists several VMware products with their release dates and download links. The "Advanced" section lists similar products. At the bottom of the page, there's a search bar with placeholder text "Type here to search", a toolbar with various icons, and a status bar showing weather (22°C Haze), battery level (17:25 06-12-2021), and language (ENG).

Product	Release Date	Action
VMware vSphere Hypervisor (ESXi) 7.0.0	2020-04-02	GO TO DOWNLOADS
VMware vCenter Server 7.0.0	2020-04-02	GO TO DOWNLOADS
VMware NSX for vSphere 6.4.5	2019-04-18	GO TO DOWNLOADS
VMware vSphere Replication 8.2.1	2020-10-29	GO TO DOWNLOADS
VMware vRealize Orchestrator Appliance 8.0.1	2019-12-19	GO TO DOWNLOADS
VMware vSphere Integrated Containers 1.5.4	2019-09-24	GO TO DOWNLOADS
VMware vRealize Suite Lifecycle Manager 8.0.1	2019-12-19	GO TO DOWNLOADS
VMware vRealize Operations 8.0.1	2019-12-19	GO TO DOWNLOADS
VMware vRealize Log Insight 8.0.0	2019-10-17	GO TO DOWNLOADS
VMware AppDefense Plugin 2.3.1	2020-02-11	GO TO DOWNLOADS
Advanced		
VMware vSphere Hypervisor (ESXi) 7.0.0	2020-04-02	GO TO DOWNLOADS
VMware vCenter Server 7.0.0	2020-04-02	GO TO DOWNLOADS
VMware NSX for vSphere 6.4.5	2019-04-18	GO TO DOWNLOADS
VMware vSphere Replication 8.2.1	2020-10-29	GO TO DOWNLOADS

The screenshot shows the VMware Customer Connect website. At the top, there's a navigation bar with links like Apps, Codechef, GitHub, Coding Blocks Online, Containers - C++ R..., Codeforces, Classes, Explore - LeetCode, USACO Guide, CodeForces Comp..., Algorithms, WhatsApp, and a Reading list icon. Below the navigation bar, the main header reads "vmware CUSTOMER CONNECT". The main content area has a breadcrumb trail "Home / VMware vSphere". A section titled "Download VMware vSphere" asks "Select Version:" with a dropdown menu showing "7.0". A note says "Customers who have purchased VMware vSphere 7.0 can download their relevant installation package from the product download tab below. Looking to upgrade from vSphere 6.7? Visit the [VMware vSphere Upgrade Center](#)". Below this is a button "Get Your vSphere License Key" and a "Read More" link. To the right, a sidebar titled "Product Resources" lists "View My Download History", "Product Information", "Documentation", "vSphere Community", "Support Resources", and a "Download Free Trial" link. At the bottom of the page, there's a "Product Downloads" section with tabs for Product, Drivers & Tools, Open Source, Custom ISOs, and OEM Addons. Under the Product tab, a table lists several VMware products with their release dates and "GO TO DOWNLOADS" links. The table includes rows for VMware vSphere Hypervisor (ESXi) 7.0U2a (2021-04-29), VMware vCenter Server 7.0U3a (2021-10-21), VMware NSX for vSphere 6.4.11 (2021-08-26), VMware NSX-T Data Center 3.1.3 For vShield Endpoint (2021-07-22), and VMware Tools 11.3.5 (2021-09-23). The bottom of the screen shows a search bar, system icons, and a status bar indicating 22°C Haze, 17:25, 06-12-2021, and battery level.

Product	Release Date	Action
VMware vSphere Hypervisor (ESXi) 7.0U2a	2021-04-29	GO TO DOWNLOADS
VMware vCenter Server 7.0U3a	2021-10-21	GO TO DOWNLOADS
VMware NSX for vSphere 6.4.11	2021-08-26	GO TO DOWNLOADS
VMware NSX-T Data Center 3.1.3 For vShield Endpoint	2021-07-22	GO TO DOWNLOADS
VMware Tools 11.3.5	2021-09-23	GO TO DOWNLOADS

MeghRaj

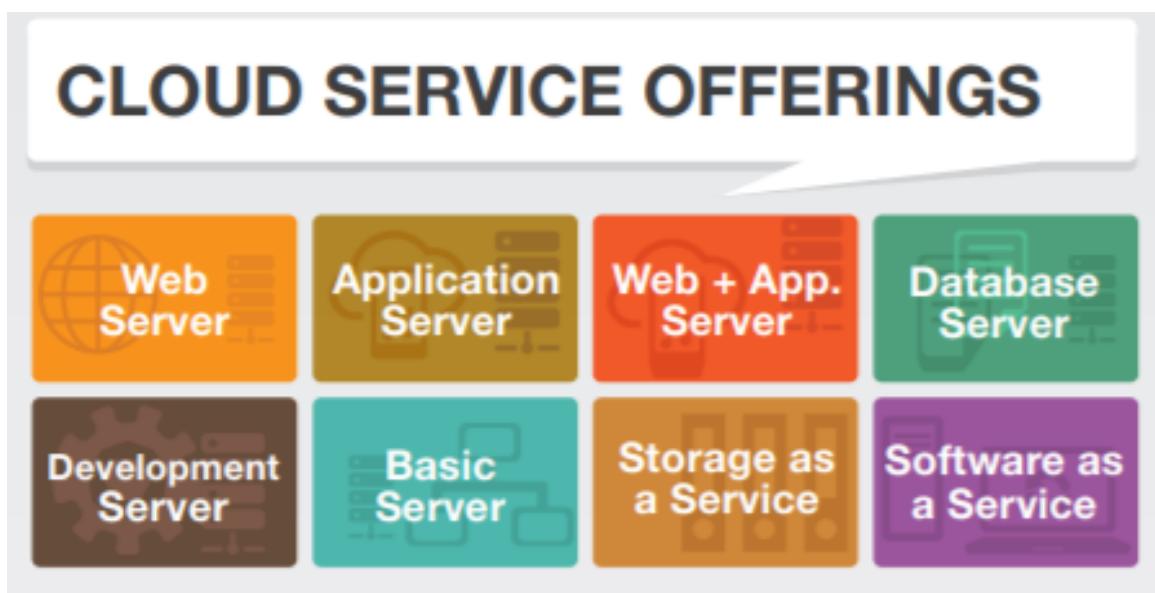


Cloud Computing Services provide the new model of offering services (Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Software as a Services (SaaS) and Storage as a Service (STaaS)) to the users at fast pace which is also cost effective. In order to utilise and harness the benefits of Cloud Computing, Government of India has embarked upon an ambitious initiative - "GI Cloud" which has been named as 'MeghRaj'. This initiative is to implement various components including governance mechanism to ensure proliferation of Cloud in the government. The focus of this initiative is to accelerate delivery of e-services in the country while optimizing ICT spending of the Government.

MeghRaj will ensure optimum utilization of the infrastructure and speed up the development and deployment of eGov applications. The architectural vision of GI Cloud encompasses a set of discrete cloud computing environments spread across multiple locations, built on existing or new (augmented) infrastructure, following a set of common protocols, guidelines and standards issued by the Government of India.

Features of GI Cloud

- Multi-Location Cloud: Multiple cloud nodes are being setup across India in National Data Centres of NIC. This will give Departments a choice of hosting their applications in any of the nodes.
- Self Service Portal: Users can deploy and manage their cloud resources with ease.
- Secure Cloud: Multi-layered secured infrastructure, setup in National Data Centres of NIC is being managed and monitored by highly skilled Cyber Security team of NIC.
- Secured Access: Users can access cloud solutions using their own devices from anywhere at any time over the secured network using VPN.



Advantages of GI Cloud

- Optimum utilization of existing infrastructure
- Rapid deployment and reusability: Any software made available by any government or department in India can be made available to other departments as well without additional costs.
- Manageability and maintainability: It provide single point for maintaining Information & Communication Technology (ICT) infrastructure in India.
- Scalability: According to the demands from the citizens of India, infrastructure of the government can be increased accordingly.

- Efficient service delivery
- Security: A security framework for the entire GI Cloud will lead to less environmental complexity and less potential vulnerability.
- Increased user mobility
- Reduced effort in managing technology
- Ease of first time IT solution deployment
- Cost reduction
- Standardization: GI Cloud shall prescribe the standards around interoperability, integration, security, data security and portability etc.



Services offered as part of National Cloud

The National Informatics Centre (NIC) is providing National Cloud services under the initiative MeghRaj. The services offered are as follows.

Infrastructure as a Service (IaaS)

IaaS provides you basic virtual compute infrastructure resources like CPU, Memory, Disk Storage attached to blank VMs with allowing you to install OS, using ISOs, from scratch and customization. However, you have to use your own licenses for OS and Application software (if any).

Platform as a Services (PaaS)

PaaS provides pre-installed web and database servers so that you can publish and run web application without worrying about server setup. The servers are pre-configured ready with basic security hardening. Use PaaS service to quickly deploy servers and publish your web applications. The OS & Application Software licenses are provided by us as part of offering.

Software as a Services (SaaS)

This provides on demand software service. SaaS is a software delivery model where users are not responsible for supporting the application or any of the components. The server infrastructure, OS and software is being managed by cloud services. If you are having web application and want to distribute it to users, use our Cloud Service to deliver through Software as a Service.

Storage as a Service (STaaS)

STaaS provides need-based storage solution. It provides excellent alternative to the traditional on-site and dedicated storage systems and reduces the complexities of deploying and managing multiple storage tiers. You can use it to mitigate risks in disaster recovery, provide long-term retention for records and enhance both continuity and availability.

Hosting Environments

NIC Cloud Services provides 3 different types of environments for creating virtual machines i.e., Production, Staging and Development so that you keep your VM segregated and manage them properly based on the business need for both PaaS as well as IaaS service model.

MeghRaj Portal

The screenshot shows the MeghRaj Cloud Initiative website. At the top, there's a banner for 'National Cloud by NIC under MeghRaj CLOUD INITIATIVE GOVERNMENT OF INDIA'. The main menu includes links for HOME, ABOUT MeghRaj, SERVICES, FAQ, INFO VIDEO, and CONTACT US. On the right, there are accessibility options (A+, A-, A) and the Indian national emblem. The central area features a large image of a hand holding a network cable against a background of clouds and data centers. To the right of this image is a vertical list of services: 'Virtual Machines on demand', 'Pre-configured web servers', 'Pre-configured database servers', 'Multi location cloud' (which is highlighted in a blue box), and 'Secured Infrastructure'. Below this, there's a section titled 'Get NIC Cloud Services' with input fields for 'Department Name', 'Contact Name', 'Designation', 'Email', and '+91 Mobile'. To the right of this is a large orange button with the text 'MY CLOUD CLICK HERE TO GO TO YOUR CLOUD DASHBOARD'. Another section on the right is titled 'ANNOUNCEMENTS' with the text 'Launch of National Cloud on 4th February 2014'.