Unit II

Cloud as Web-Based Application, **Cloud Service Development: Pros and Cons, Types, Software as a Service, Platform as a Service, Web Services,** On-Demand computing Discovering Cloud Services, Development Services and Tools, overview of major Cloud Service providers- Amazon Ec2, Google App Engine, IBM Clouds, Eucalyptus etc.

Cloud as Web-Based Application

Suppose a company owns and operates some servers and hosts their website on it, I would call that a web based application. If that company moved their web application to Amazon Aws owned servers, I would call that same application as a cloud based application.

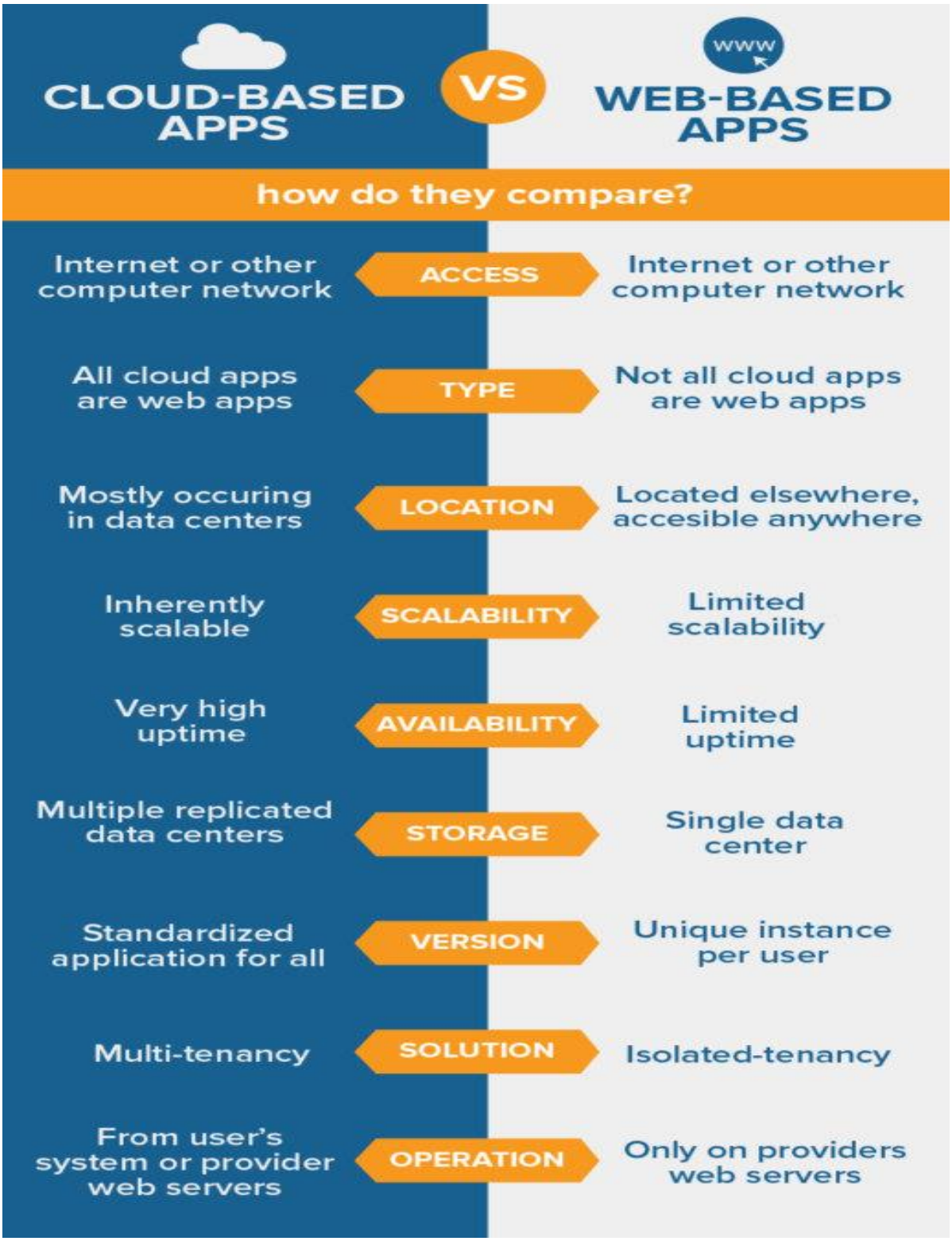
There are more similarities than differences between web apps and cloud apps. Cloud and web applications access data residing on distant storage. Both use server processing power that may be located on premises or in a distant data center.

Web App:

1. A web app can refer to any type of web-based application.
2. A web app requires a browser to be opened and operated.
3. A web-based application must have a continuous/uninterrupted internet connection to be operated.
4. Data used in a web app is stored exclusively in the host server.
5. A web app has limited scalability and availability when compared to a cloud app.

Cloud App:

1. A cloud app is a type of new generation app that uses front-end frameworks based on Javascript.
2. A cloud app can be opened with or without a web browser.
3. Data can be cached locally, so a cloud app can work on an offline mode, and synch in the background when the internet is restored.
4. Data used in a cloud app could be stored anywhere - ie, on the cloud.
5. Usually, a cloud app is scalable on-demand and has little to no downtime.


CLOUD-BASED APPS
VS
WEB-BASED APPS
how do they compare?
Internet or other computer network
ACCESS
Internet or other computer network
All cloud apps are web apps
TYPE
Not all cloud apps are web apps
Mostly occuring in data centers
LOCATION
Located elsewhere, accesible anywhere
Inherently scalable
SCALABILITY
Limited scalability
Very high uptime
AVAILABILITY
Limited uptime
Multiple replicated data centers
STORAGE
Single data center
Standardized application for all
VERSION
Unique instance per user
Multi-tenancy
SOLUTION
Isolated-tenancy
From user's system or provider web servers
OPERATION
Only on providers web servers

Cloud Service Development: Pros and Cons

Advantage:

1) Back-up and restore data

Once the data is stored in the cloud, it is easier to get back-up and restore that data using the cloud.

2) Improved collaboration

Cloud applications improve collaboration by allowing groups of people to quickly and easily share information in the cloud via shared storage.

3) Excellent accessibility

Cloud allows us to quickly and easily access store information anywhere, anytime in the whole world, using an internet connection. An internet cloud infrastructure increases organization productivity and efficiency by ensuring that our data is always accessible.

4) Low maintenance cost

Cloud computing reduces both hardware and software maintenance costs for organizations.

5) Mobility

Cloud computing allows us to easily access all cloud data via mobile.

6) IServices in the pay-per-use model

Cloud computing offers Application Programming Interfaces (APIs) to the users for access services on the cloud and pays the charges as per the usage of service.

7) Unlimited storage capacity

Cloud offers us a huge amount of storing capacity for storing our important data such as documents, images, audio, video, etc. in one place.

8) Data security

Data security is one of the biggest advantages of cloud computing. Cloud offers many advanced features related to security and ensures that data is securely stored and handled.

Disadvantages of Cloud Computing

A list of the disadvantage of cloud computing is given below -

1) Internet Connectivity

As you know, in cloud computing, every data (image, audio, video, etc.) is stored on the cloud, and we access these data through the cloud by using the internet connection. If you do not have good internet connectivity, you cannot access these data. However, we have no any other way to access data from the cloud.

2) Vendor lock-in

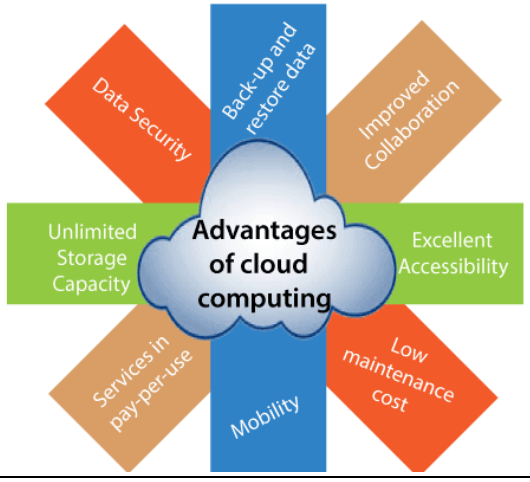
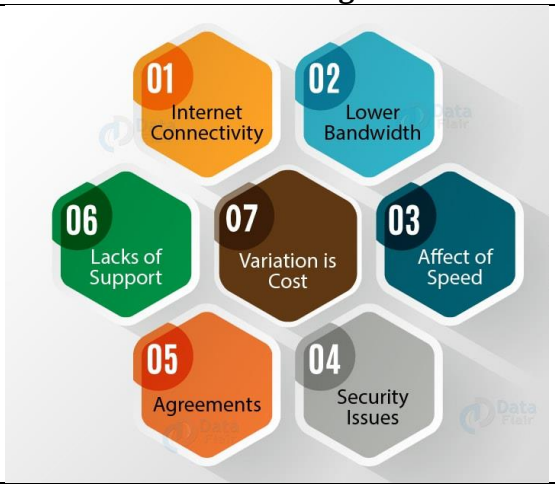
Vendor lock-in is the biggest disadvantage of cloud computing. Organizations may face problems when transferring their services from one vendor to another. As different vendors provide different platforms, that can cause difficulty moving from one cloud to another.

3) Limited Control

As we know, cloud infrastructure is completely owned, managed, and monitored by the service provider, so the cloud users have less control over the function and execution of services within a cloud infrastructure.

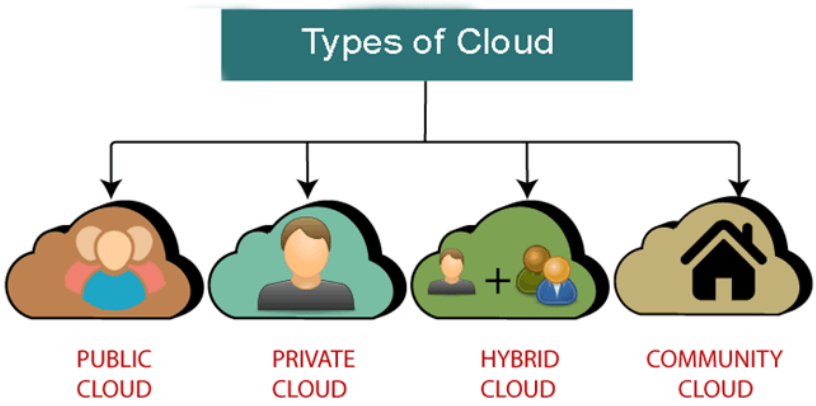
4) Security

Although cloud service providers implement the best security standards to store important information. But, before adopting cloud technology, you should be aware that you will be sending all your organization's sensitive information to a third party, i.e., a cloud computing service provider. While sending the data on the cloud, there may be a chance that your organization's information is hacked by Hackers.

Advantange	Disadvantange
	

Types of Cloud

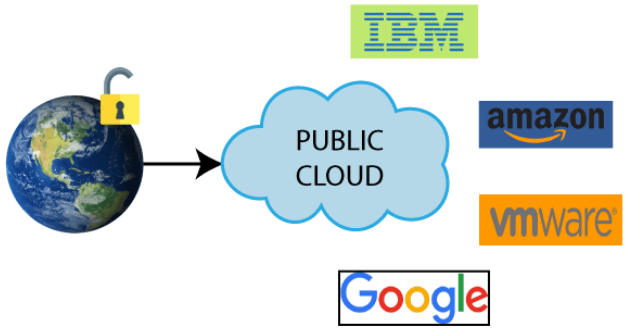
There are the following 4 types of cloud that you can deploy according to the organization's needs-



Public Cloud

Public cloud is **open to all** to store and access information via the Internet using the pay-per-usage method.In public cloud, computing resources are managed and operated by the Cloud Service Provider (CSP).

Example: Amazon elastic compute cloud (EC2), IBM SmartCloud Enterprise, Microsoft, Google App Engine, Windows Azure Services Platform.



Advantages of Public Cloud

There are the following advantages of Public Cloud -

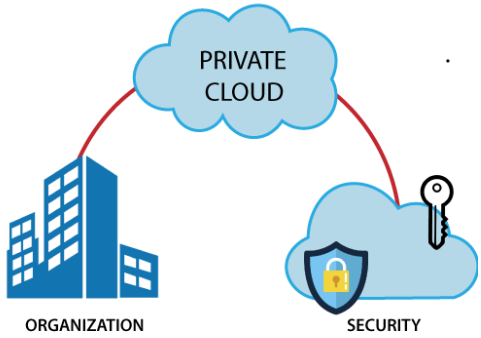
- Public cloud is owned at a lower cost than the private and hybrid cloud.
- Public cloud is maintained by the cloud service provider, so do not need to worry about the maintenance.
- Public cloud is easier to integrate. Hence it offers a better flexibility approach to consumers.
- Public cloud is location independent because its services are delivered through the internet.
- Public cloud is highly scalable as per the requirement of computing resources.
- It is accessible by the general public, so there is no limit to the number of users.

Disadvantages of Public Cloud

- Public Cloud is less secure because resources are shared publicly.
- Performance depends upon the high-speed internet network link to the cloud provider.
- The Client has no control of data.

Private Cloud

Private cloud is also known as an **internal cloud** or **corporate cloud**. It is used by organizations to build and manage their own data centers internally or by the third party. It can be deployed using Opensource tools such as Openstack and Eucalyptus.



Advantages of Private Cloud

There are the following advantages of the Private Cloud -

- Private cloud provides a high level of security and privacy to the users.
- Private cloud offers better performance with improved speed and space capacity.
- It allows the IT team to quickly allocate and deliver on-demand IT resources.
- The organization has full control over the cloud because it is managed by the organization itself. So, there is no need for the organization to depends on anybody.
- It is suitable for organizations that require a separate cloud for their personal use and data security is the first priority.

Disadvantages of Private Cloud

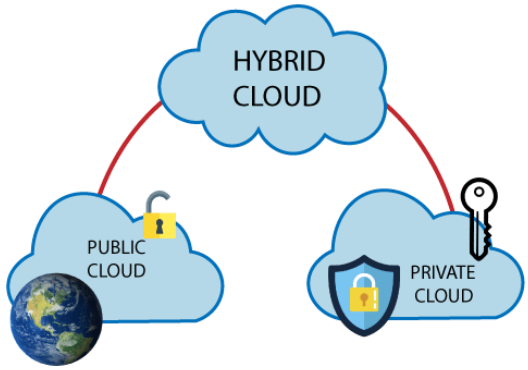
- Skilled people are required to manage and operate cloud services.
- Private cloud is accessible within the organization, so the area of operations is limited.
- Private cloud is not suitable for organizations that have a high user base, and organizations that do not have the prebuilt infrastructure, sufficient manpower to maintain and manage the cloud.

Hybrid Cloud

Hybrid Cloud is a combination of the public cloud and the private cloud. we can say:

Hybrid Cloud = Public Cloud + Private Cloud

Hybrid cloud is partially secure because the services which are running on the public cloud can be accessed by anyone, while the services which are running on a private cloud can be accessed only by the organization's users.



Example: Google Application Suite (Gmail, Google Apps, and Google Drive), Office 365 (MS Office on the Web and One Drive), Amazon Web Services.

Advantages of Hybrid Cloud

There are the following advantages of Hybrid Cloud -

- Hybrid cloud is suitable for organizations that require more security than the public cloud.
- Hybrid cloud helps you to deliver new products and services more quickly.
- Hybrid cloud provides an excellent way to reduce the risk.
- Hybrid cloud offers flexible resources because of the public cloud and secure resources because of the private cloud.

Disadvantages of Hybrid Cloud

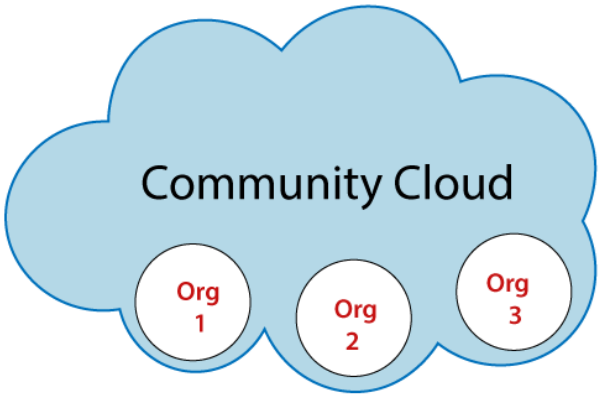
- In Hybrid Cloud, security feature is not as good as the private cloud.

- Managing a hybrid cloud is complex because it is difficult to manage more than one type of deployment model.
- In the hybrid cloud, the reliability of the services depends on cloud service providers.

Community Cloud

Community cloud allows systems and services to be accessible by a group of several organizations to share the information between the organization and a specific community. It is owned, managed, and operated by one or more organizations in the community, a third party, or a combination of them.

Example: Health Care community cloud



Advantages of Community Cloud

There are the following advantages of Community Cloud -

- Community cloud is cost-effective because the whole cloud is being shared by several organizations or communities.
- Community cloud is suitable for organizations that want to have a collaborative cloud with more security features than the public cloud.
- It provides better security than the public cloud.
- It provdes collaborative and distributive environment.

- Community cloud allows us to share cloud resources, infrastructure, and other capabilities among various organizations.

Disadvantages of Community Cloud

- Community cloud is not a good choice for every organization.
- Security features are not as good as the private cloud.
- It is not suitable if there is no collaboration.
- The fixed amount of data storage and bandwidth is shared among all community members.

Difference between public cloud, private cloud, hybrid cloud, and community cloud -

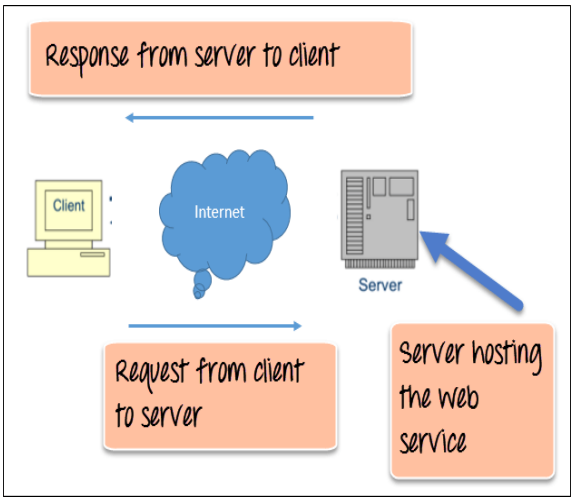
The below table shows the difference between public cloud, private cloud, hybrid cloud, and community cloud.

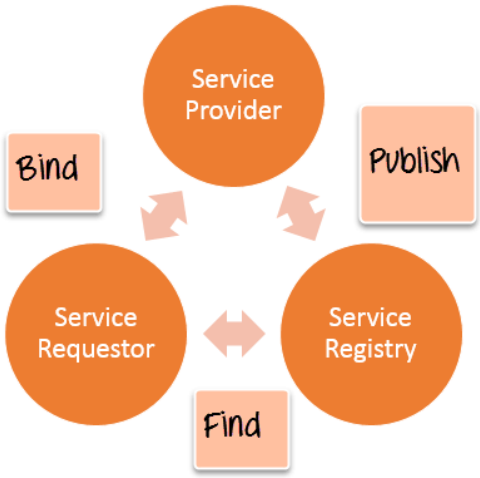
Parameter	Public Cloud	Private Cloud	Hybrid Cloud	Community Cloud
Host	Service provider	Enterprise (Third party)	Enterprise (Third party)	Community (Third party)
Users	General public	Selected users	Selected users	Community members
Access	Internet	Internet, VPN	Internet, VPN	Internet, VPN
Owner	Service provider	Enterprise	Enterprise	Community

Web services :

Web services are the tools that allow users to interact with software over the Internet. Cloud services are the servers that store the data, security and other infrastructure pieces needed to allow Web services to provide unique value as Web-accessible applications.

Web service is a standardized medium to propagate communication between the client and server applications on the World Wide Web.A web service is a software module which is designed to perform a certain set of tasks.





The above diagram shows a very simplistic view of how a web service would actually work. The client would invoke a series of web service calls via requests to a server which would host the actual web service.

The main component of a web service is the data which is transferred between the client and the server, and that is XML. XML (Extensible markup language) is a counterpart to HTML and easy to understand the intermediate language that is understood by many programming languages.

- A **Web service** is a method of communication between two electronic devices over a network.
- A web service is an application that operates over a network.
- a web service is an API that can be accessed over the Internet.

Advantages of web services

- faster (and lower-cost) application development,
- leaner applications, and
- reduced storage and bandwidth demands.

A good example of web services are the **mashups** created by users of the Google Maps API.

What are Web Services?

- Web services are application components
- Web services communicate using open protocols
- Web services are self-contained and self-describing
- Web services can be discovered using UDDI
- Web services can be used by other applications
- XML is the basis for Web services

How Does it Work?

- The basic Web services platform is XML + HTTP.

The HTTP protocol is the most used Internet protocol.

- Web services platform elements:
- SOAP (Simple Object Access Protocol)
- UDDI (Universal Description, Discovery and Integration)
- WSDL (Web Services Description Language)

On demand Computing:

On-demand computing (ODC) is an enterprise-level model of technology and computing in which resources are provided on an as-needed and when-needed basis. ODC makes computing resources such as storage capacity, computational speed and software applications available to users as and when needed for specific temporary projects, known or unexpected workloads, routine work, or long-term technological and computing requirements.

Web services and other specialized tasks are sometimes referenced as types of ODC.

The major advantage of ODC is low initial cost, as computational resources are essentially rented when they are required. This provides cost savings over purchasing them outright.

On Demand Computing

- On-demand computing is also known as utility computing.
- On-demand (OD) computing is an increasingly popular enterprise model in which computing resources are made available to the user as needed. The resources may be maintained within the user's enterprise, or made available by a service provider.

- Companies offering on-demand computing and storage today include Amazon, IBM, Sun, and others.
- company operates on a pay-as-you-go plan with a cloud services provider.
- Previous - On -demand computing was provided from a single server via some sort of time-sharing arrangement.
- Today -the service is based on large grids of computers operating as a single cloud.
- On-demand computing itself is not a new concept, but has acquired new life thanks to cloud computing.

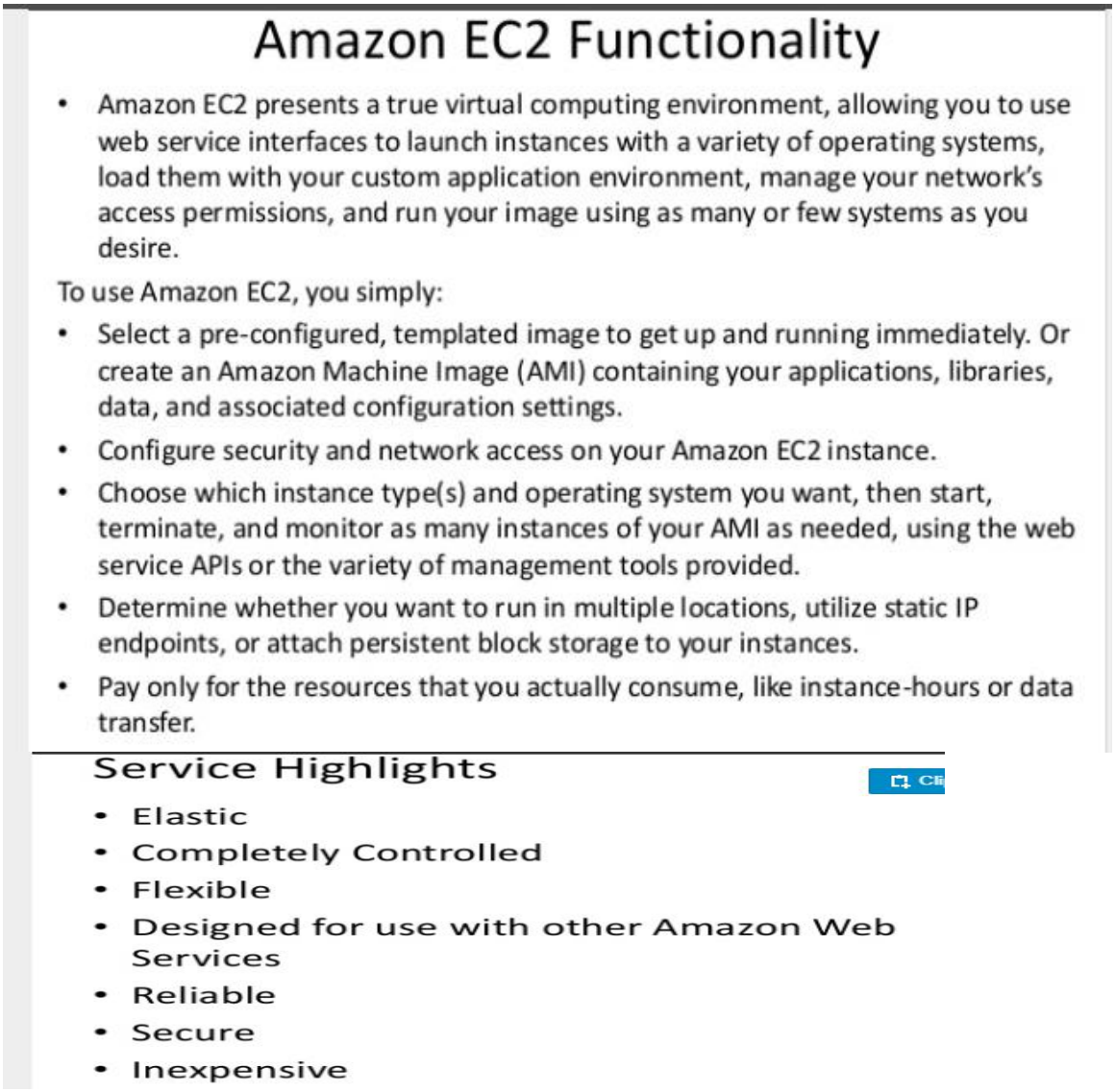
Discovering Cloud computing – it works.

Cloud computing is not just a buzzword or academic fantasy anymore. It is a new computing paradigm that is heavily used in practice today. Various cloud based services are offered by major companies like Google, Microsoft, and Amazon, as well as by smaller players in the form of private clouds. Millions of businesses and individuals use these services either as an extension to their existing computing infrastructure, or sometimes even as a complete replacement of that.

The major advantages of cloud based services for **businesses** include ***scalability and elasticity,*** i.e. the possibility of requesting resources in an on-demand manner in near real-time. Thus, businesses don't need to worry about peak loads and operate an over-provisioned computing infrastructure.

Besides all these advantages, throwing everything in the cloud also has some potential drawbacks: our major concerns are security and privacy.

Development Services & Major Providers



1. Amazon EC2 stands for Amazon Elastic Compute Cloud.
2. It is a part of AWS cloud (Amazon Web Services).
3. It launches a virtual server as per requirement for security and manage storage capacity.
4. It is working with pre-configured template which is known as AMI (Amazon Machine Images).
5. It is designed for developer to make easy, re-sizable and high configure cloud working.
6. It is reliable, secure and quickly working capacity worker.
7. It stores data in file, block and object.

Google App Engine

- developers to build their own web applications utilizing the same infrastructure.
- integrated application environment.
- easy to build, easy to maintain, and easy to scale.

- Google offers a robust cloud development environment.
  - Dynamic web serving
  - Full support for all common web technologies
  - Persistent storage with queries, sorting, and transactions
  - Automatic scaling and load balancing
  - APIs for authenticating users and sending email using Google Accounts

Google Cloud Connect for Microsoft Office brings collaborative multi-person editing to the familiar Microsoft Office experience. You can share, backup and simultaneously edit Microsoft Word, PowerPoint, and Excel documents with coworkers.

Google Apps Key features are:

- Security first
- Stay connected from anywhere
- Work better together
- Get stuff done faster
- Invisible IT that just works
- Go Green

1. It is used for web technologies.
2. Working with Automatic load balancing.
3. Based on transactional database model.
4. It is based on platform as a services.
5. It was launched in September 2011.
6. Its ownership cost are lower.
7. It has a rich set of API (Application Programmable Interface) and full features of SDK (Software Development Kit).

Google cloud platform is one of the leading Cloud Computing services which are offered by Google and it runs on the same infrastructure that Google uses for its end-user products. The Google cloud platform is basically used for Google search and YouTube

IBM Clouds

1. It is used for rapid actions.
2. It is managed by IBM.
3. It is based on Iaas, Saas, Paas.
4. Mostly it works with hybrid computing.
5. It works with security, strategy and implementation consulting.
6. It provides services like compute, management, analytics and IOT (Internet of Things) features.
7. It offers three deployment model-
8. Public model
9. Dedicated model
10. Private model

IBM cloud offers services such as platform as a service and infrastructure as a service. This cloud organization can deploy and access its resources such as

IBM cloud eliminates the complex problem and the problems which face by large companies. IBM Cloud computing services are also helping home appliance manufacturer, retailer, and medical supply businesses. It uses in because it offers the best services with the price as low as possible.

IBM Smart Cloud:

Cloud computing changes the way we think about technology. Cloud is a computing model providing web-based software, middleware and computing resources on demand.

- Architecture for Private & Hybrid Cloud
  (IBM SmartCloud Foundation)
- Cloud Computing as Service for IT
  (IBM SmartCloud Services)
- Software as a service (SaaS) business solutions
  (IBM SmartCloud Solutions)

Eucalyptus

Eucalyptus is an open source Linux based software architecture which provides an EC2-compatible cloud computing platform and S3-compatible cloud storage platform. It implements scalable, efficient-enhancing and private and hybrid clouds within and organization's IT infrastructure. It gives an Infrastructure as a Service (IaaS) solution. Users can use commodity hardware.

Eucalyptus was developed to support the high performance computing (HPC). Eucalyptus can be deployed without modification on all major Linux OS distributions, including Ubuntu, RHEL/CentOS, openSUSE, and Debian.

1. It is paid and open source computer software.
2. Its full form is Elastic Utility Computing Architecture.
3. It follows IaaS platform.
4. It supports Linux and Windows virtual machine.
5. Multiple clusters are used in single cloud.
6. Some features are auto-scaling, elastic-loads, balancing cloud weighing , maintenance.
7. Mostly it is used for accounting report.