Cloud Computing and Virtualization

Presented by:

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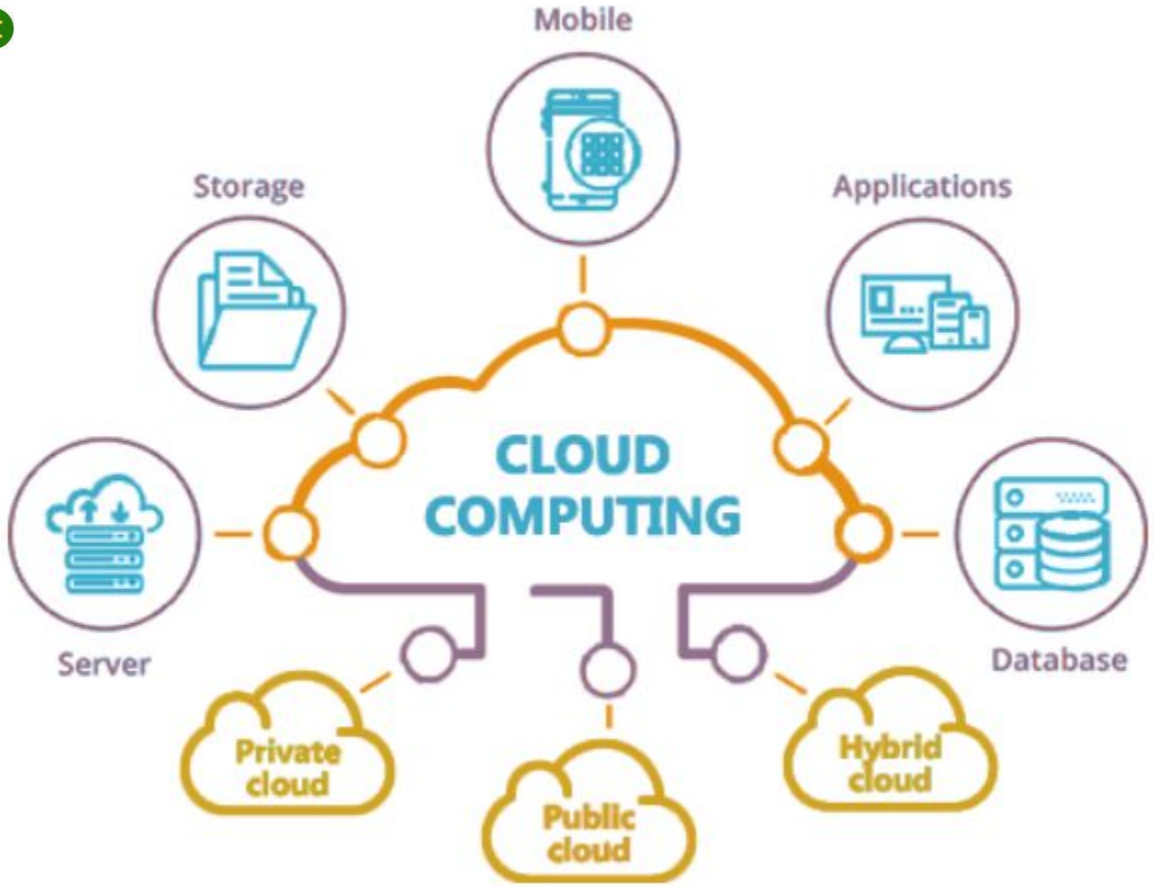


CLOUD COMPUTING
Lecture 1

Define Cloud Computing

Cloud computing is the on-demand delivery of compute power, database storage, applications, and other IT resources through a cloud services platform via the internet with pay-as-you-go pricing.

What is Cloud Computing

- **Cloud Computing** is a general term used to describe a new class of network based computing that takes place over the Internet,
  - basically a step on from **Utility Computing**
  - a collection/group of integrated and networked hardware, software and Internet infrastructure (called a **platform**).
  - Using the Internet for communication and transport provides hardware, software and networking services to clients

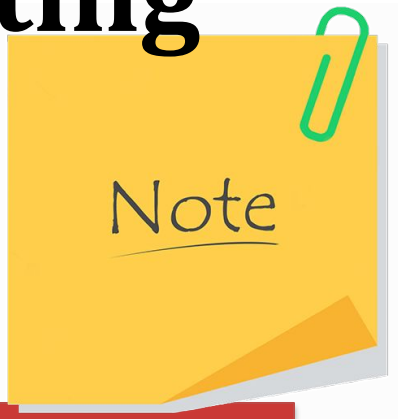
What is Cloud Computing

- The term cloud has historically been used in the telecommunications industry as an abstraction of the network in system diagrams.
- Cloud computing refers to both the applications delivered as services over the Internet and the hardware and system software in the datacenters that provide those services. [as per Armbrust et al]
- 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 with minimal management effort or service provider interaction. [As per NIST]

What is Cloud Computing

- As per Buyya et al: – A cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers.

What is Cloud Computing

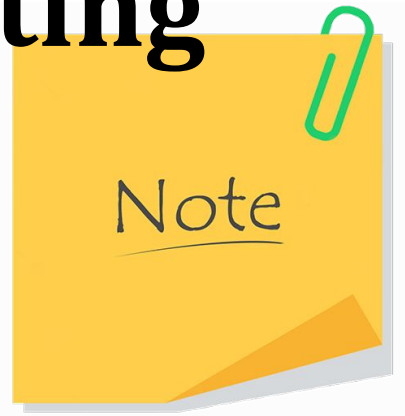


- These platforms hide the complexity and details of the underlying infrastructure from users and applications by providing very simple graphical interface or API (Applications Programming Interface).

What is Cloud Computing

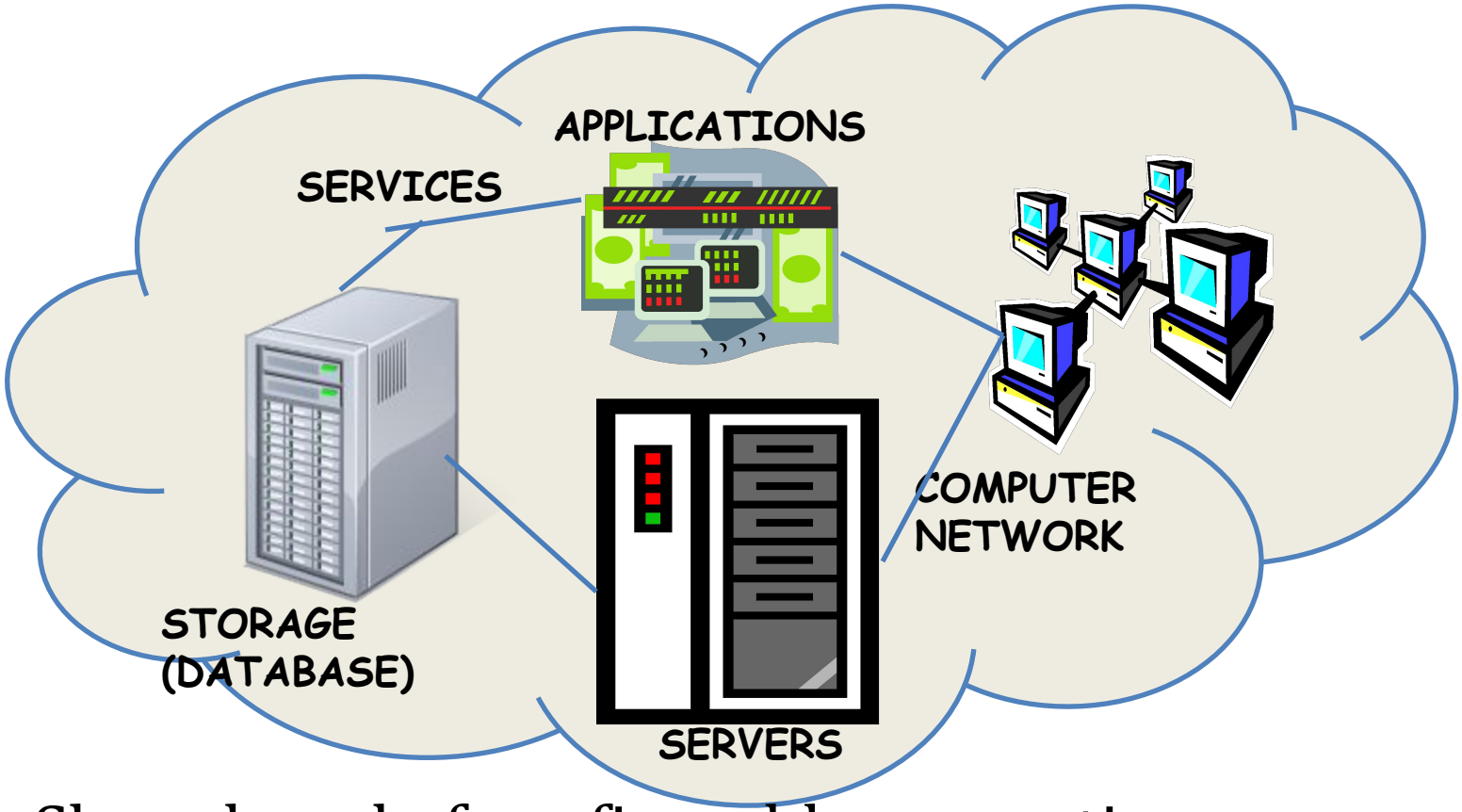
- In addition, the platform provides on demand services, that are always on, **anywhere, anytime and any place**.
- **Pay for use** and as needed,
- **Elastic** scale up and down in capacity and functionalities

What is Cloud Computing



- Cloud computing is an umbrella term used to refer to Internet based development and services.

What is Cloud Computing

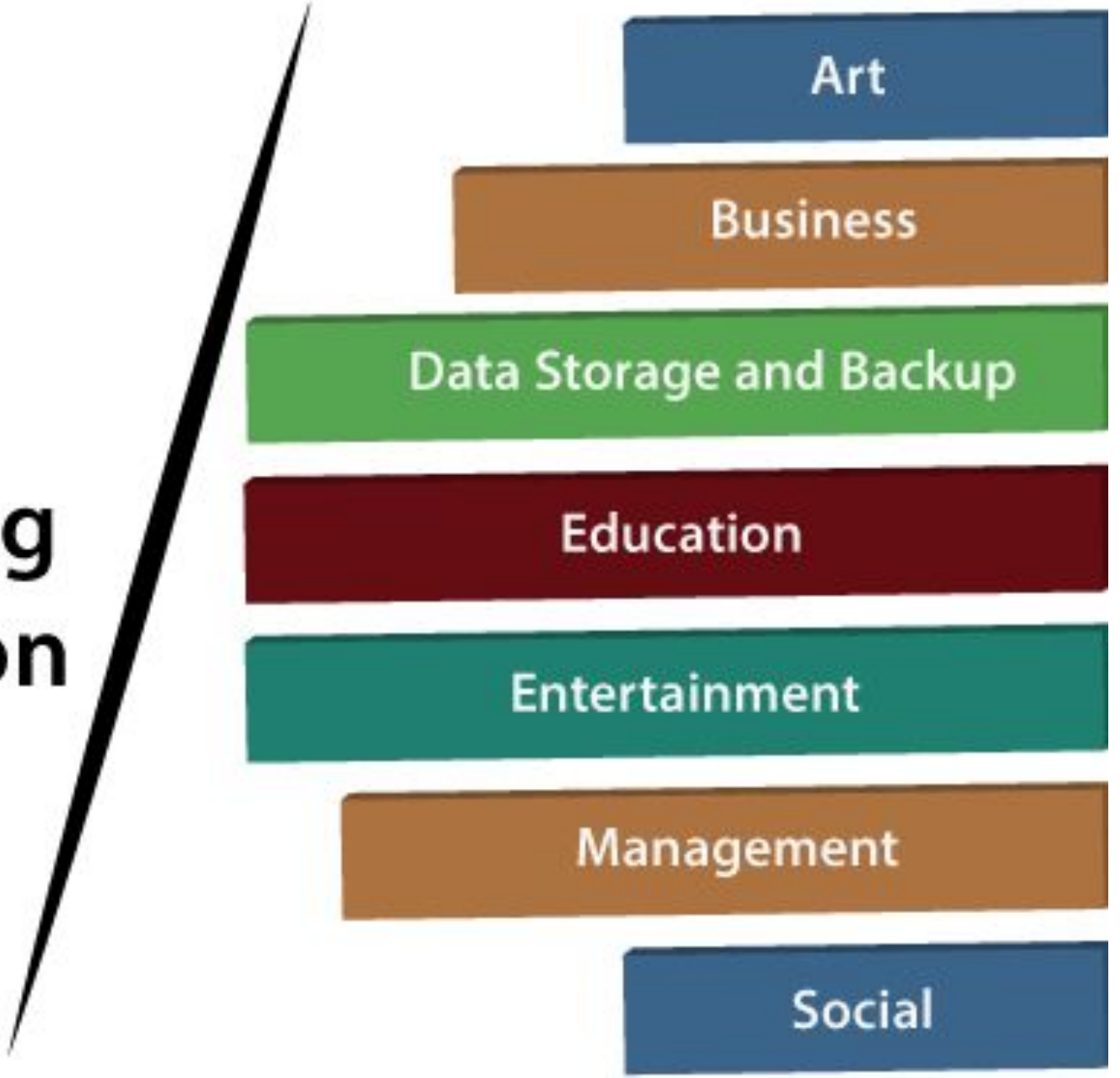


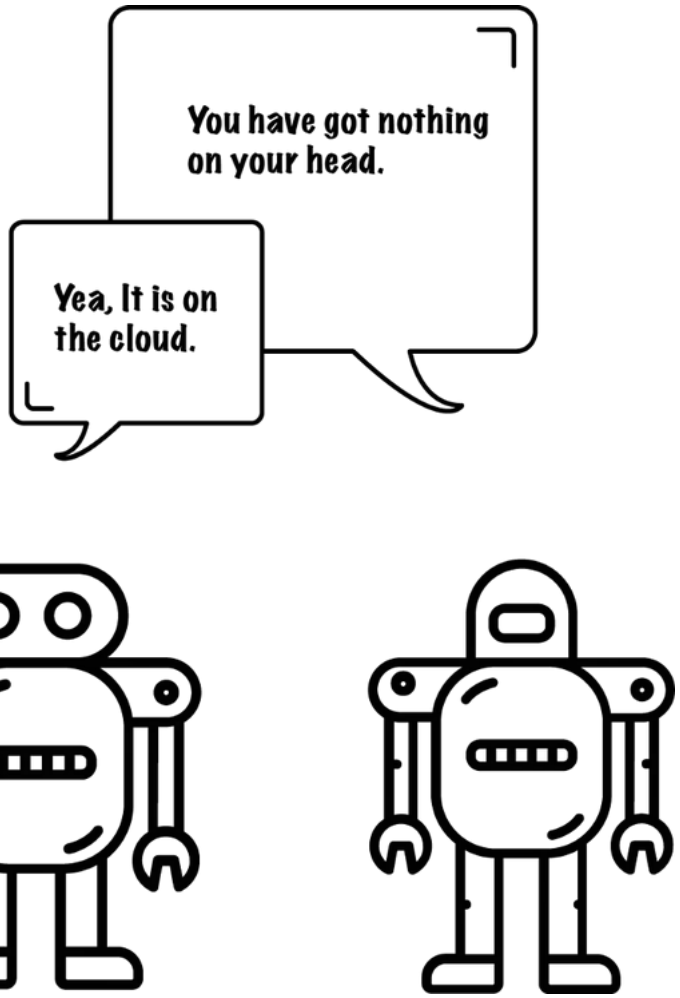
- Shared pool of configurable computing resources
- On-demand network access
- Provisioned by the Service Provider

Cloud Summary

- A number of characteristics define cloud data, applications services and infrastructure:
  - **Remotely hosted**: Services or data are hosted on remote infrastructure.
  - **Ubiquitous**: Services or data are available from anywhere.
  - **Commodified**: The result is a utility computing model similar to traditional that of traditional utilities, like gas and electricity - you pay for what you would want!

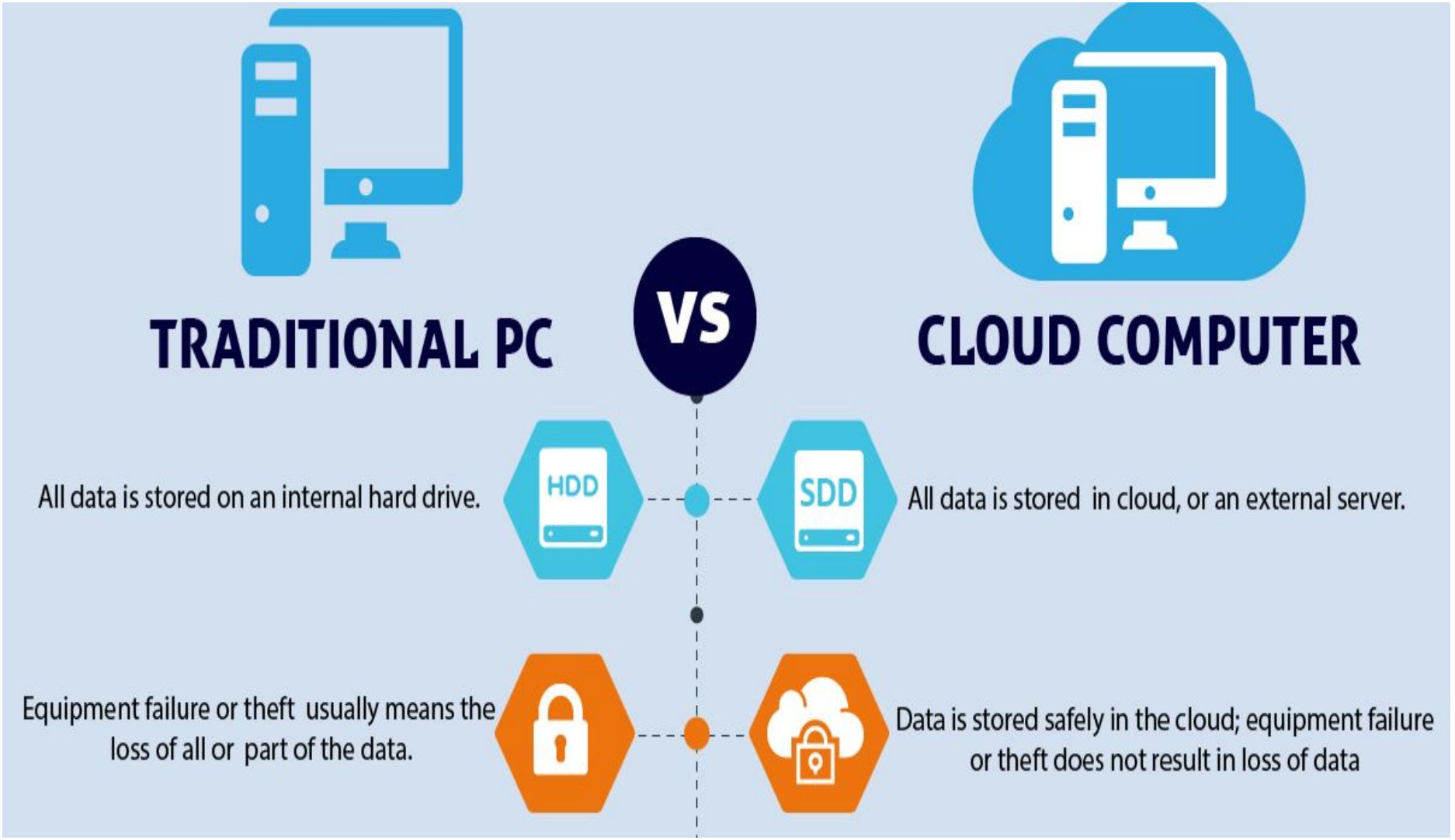
Cloud Computing Application



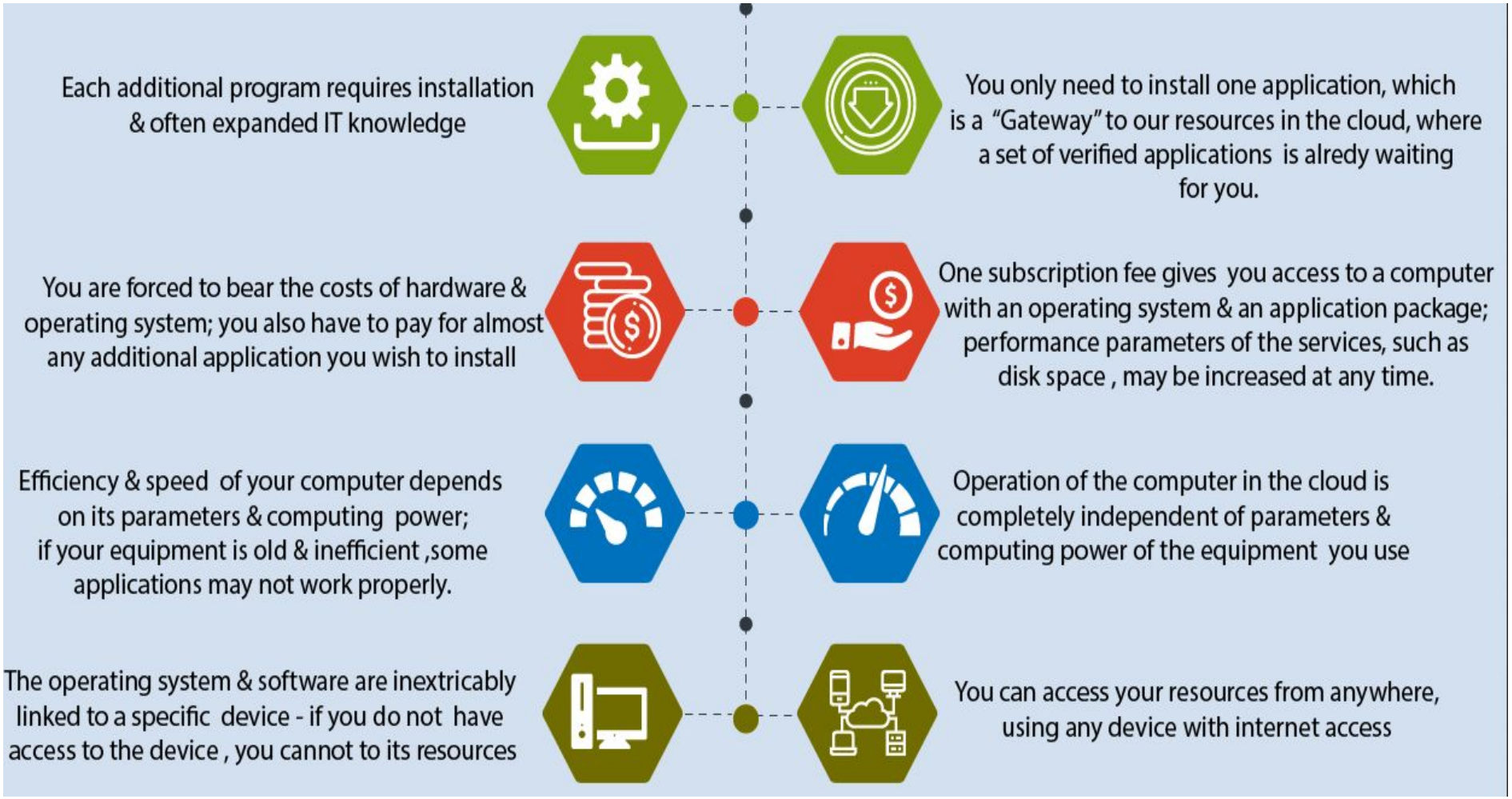


Traditional Vs Cloud computing

Traditional Vs Cloud computing



Traditional Vs Cloud computing



Importance of Cloud Computing

Cloud is inexpensive

- Cloud computing helps in reducing a considerable amount of **CAPEX** (Capital Expenditure) & **OPEX** (Operational Expenditures) an organization does not need to invest in expensive hardware's, storage devices, & software's etc. and you only have to pay for the resources you utilize.

Elasticity & flexibility

- Cloud computing enables you to reduce and increase your resources demands as per your requirements.
- For e.g. if you have heavy traffic on your site you can increase your resources and vice versa.
- **Cloud computing gives you the flexibility to work from wherever you want and whenever you want all you require is an internet connection.**

Auto Updating

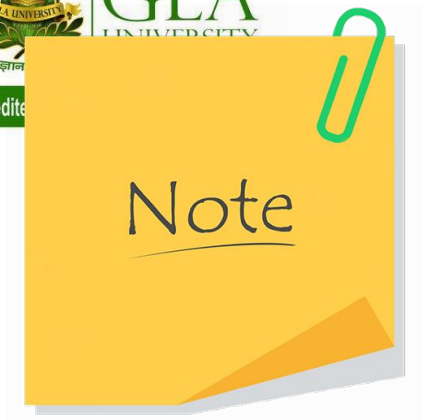
- Software updates and upgrades can be a painful thing cloud computing simplifies it for you as all the **software maintenance** and **upgrades** are looked after and regulated by your cloud service provider.

Increased collaboration

- Cloud computing enables employees to work in a more collaborative and coordinated manner as all the data and information about the organization, & ongoing projects is available to every employee and can be **accessed from anywhere and anytime** which helps in **reducing delays and increase productivity.**

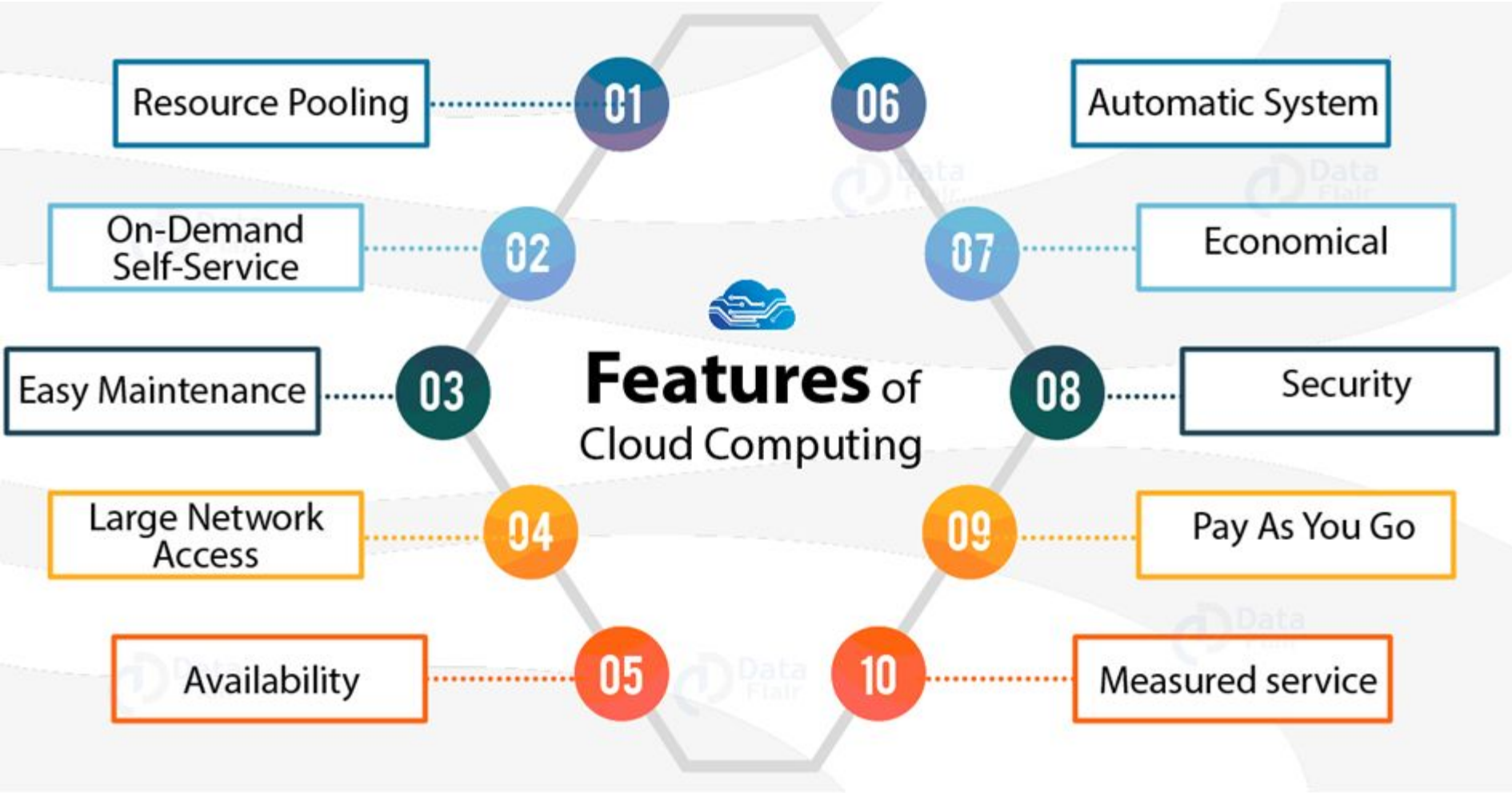
Agility & Speed

- Time is the most crucial factor when it comes to decision-making and execution.
- Cloud computing services have a very prompt and customer-centric **SLA's (Service Level Agreements)**.
- Cloud Service providers offer up to **99.99%** uptimes which ensure continuous flow of business operations and executions.



99.9999999% ("nine nines") means only **31.56** milliseconds downtime is allowed from a cloud service provider.

Features of Cloud Computing



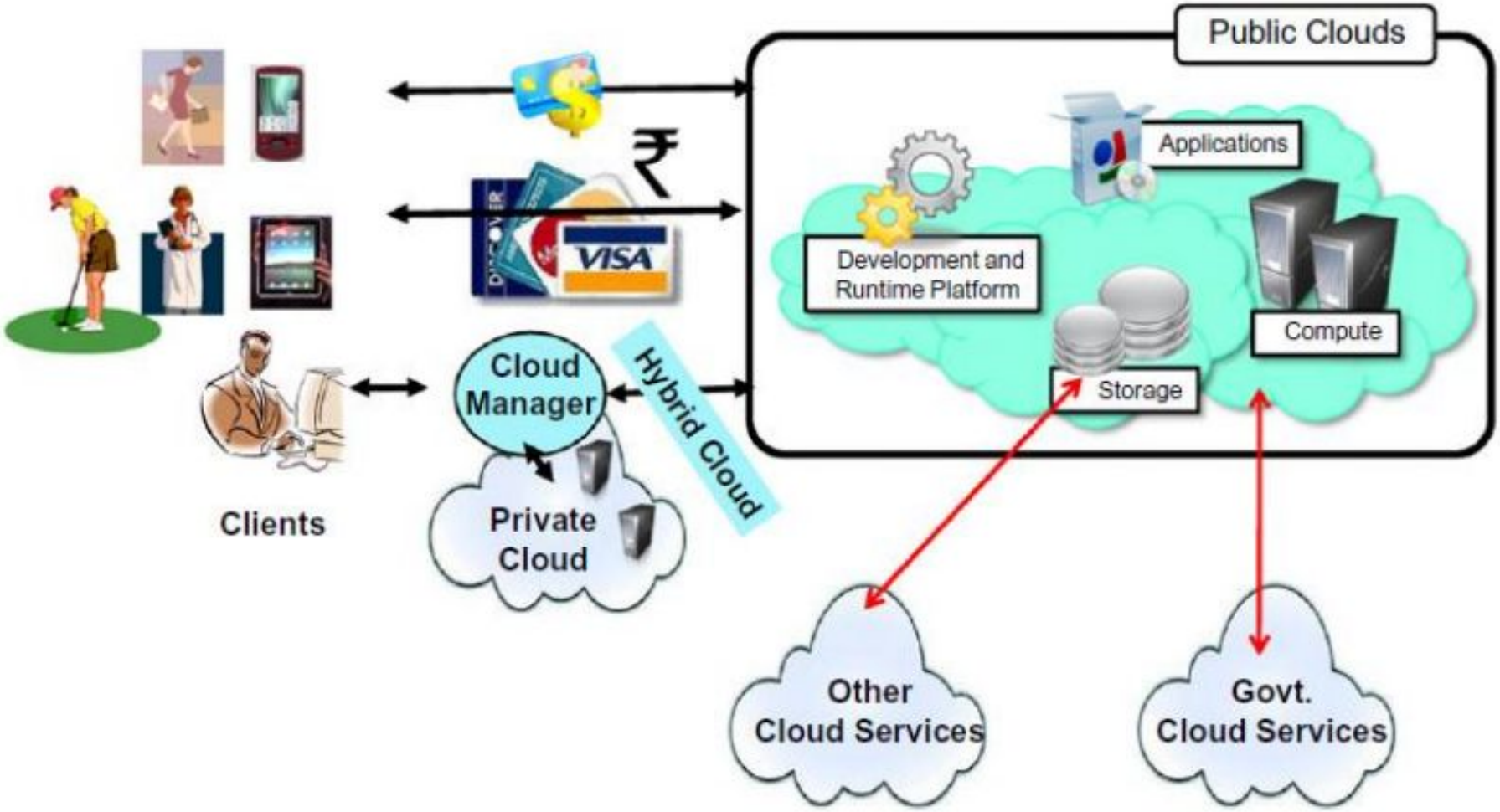
Challenges

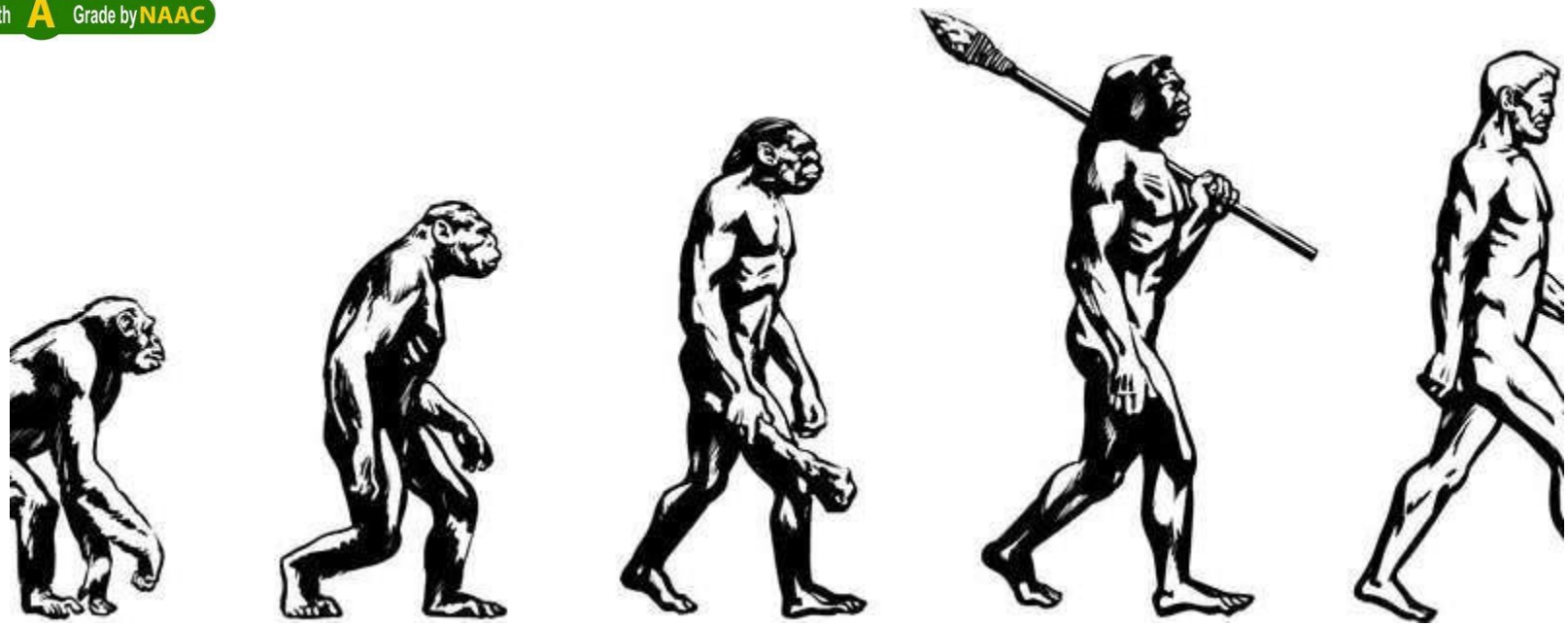
- Security and Privacy
- Lack of Standards
- Continuously Evolving
- Compliance Concerns
- Legal issues

What is Cloud Service???

- According to Reese – The service is accessible via a Web browser (nonproprietary) or a Web services application programming interface (API).
- Zero capital expenditure is necessary to get started.
- You pay only for what you use as you use it.

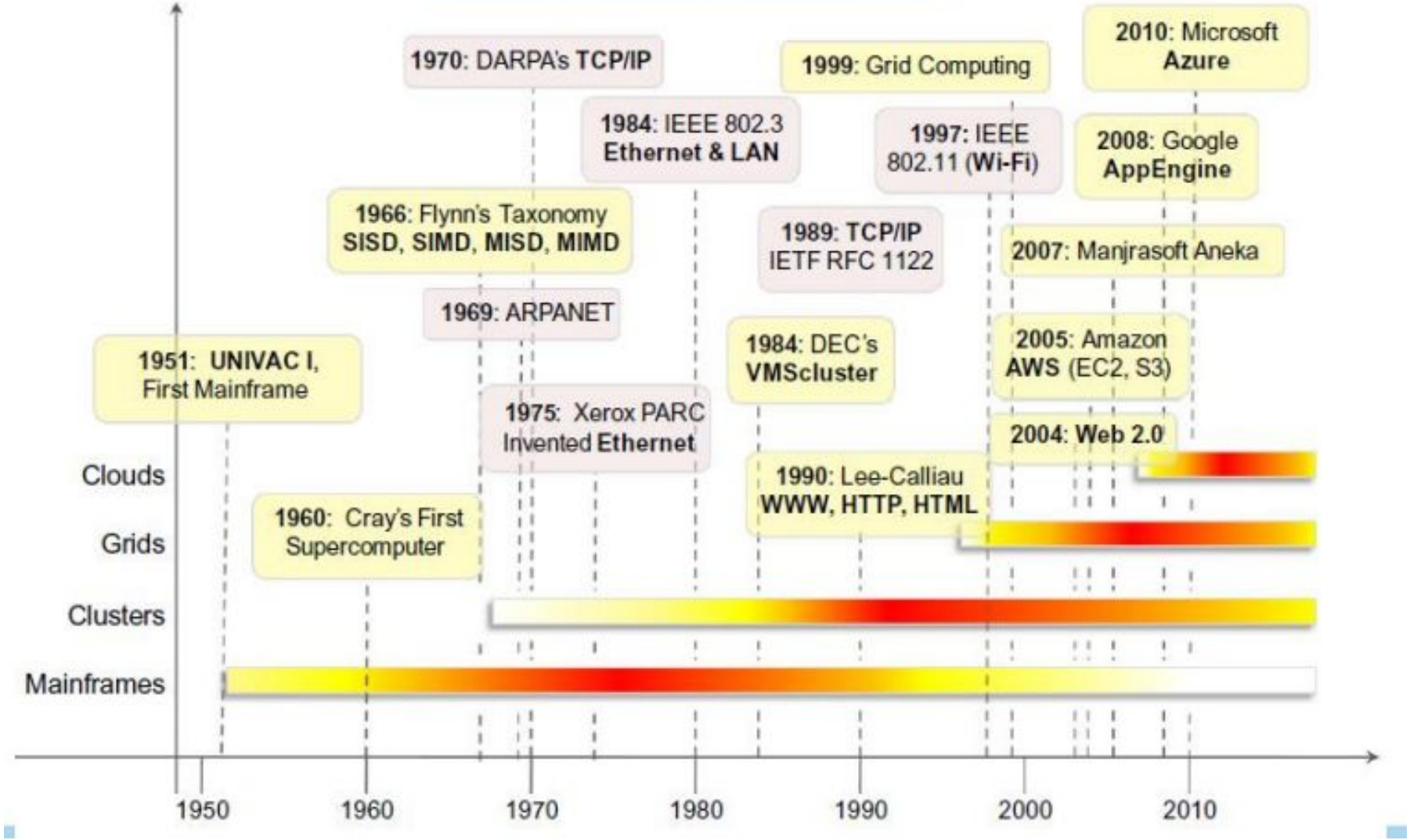
Overall view of Cloud Computing



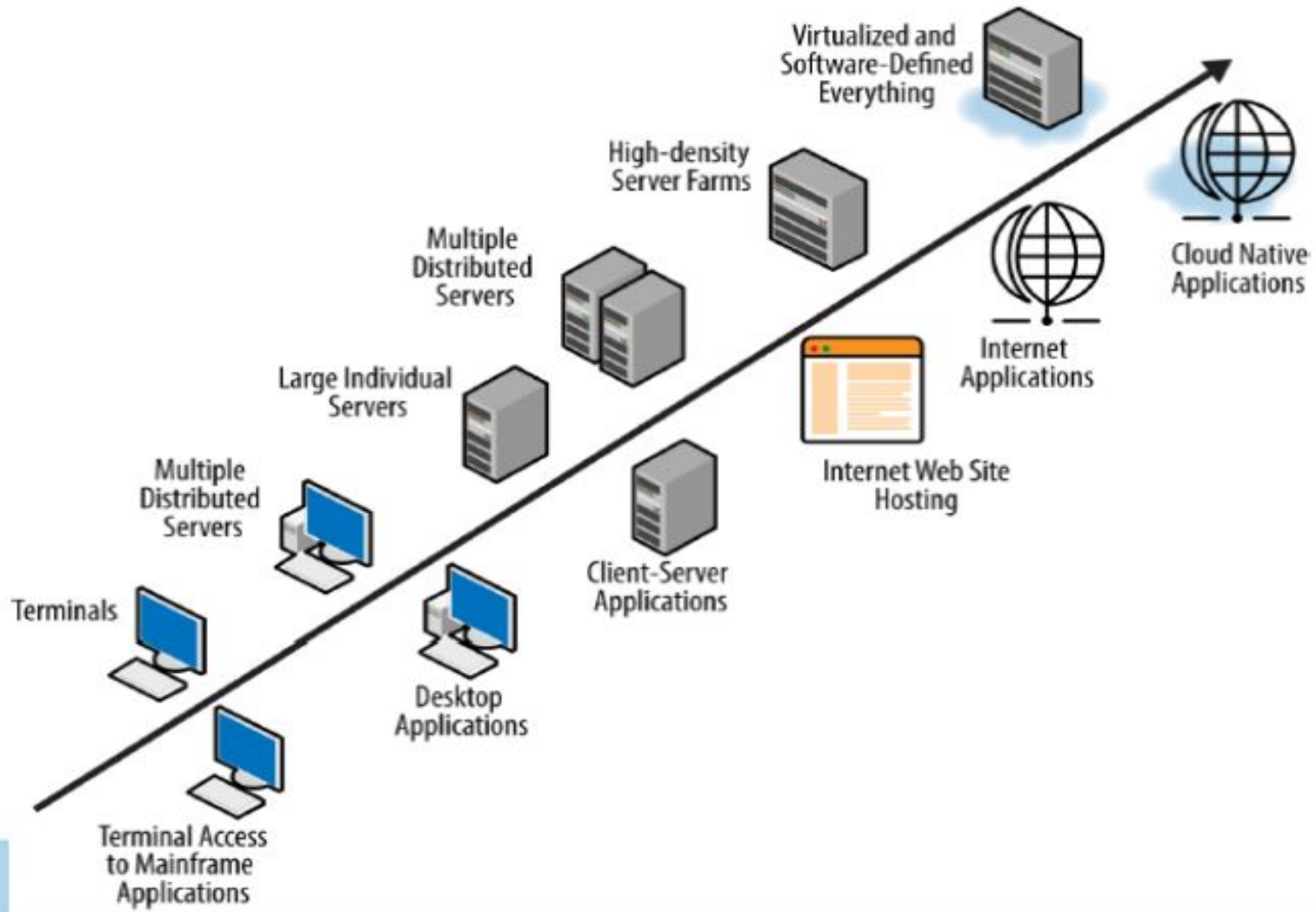


EVOLUTION OF CLOUD COMPUTING

The evolution of computing technologies



The evolution of computing technologies



Evolution of Cloud Computing

Grid Computing

- Solving large problems with Parallel computing
- Made mainstream By Global Alliance

Utility Computing

- Offering computing resources as a metered service
- Introduced in late 1990s

SaaS Computing

- Network-based subscriptions to applications
- Gained momentum in 2001

Cloud Computing

- Next-Generation Internet computing
- Next-Generation Data Centers

The evolution of computing technologies- Mainframe Computing

- These were the first examples of large computational facilities leveraging multiple processing units.
- Mainframes were powerful, highly reliable computers specialized for large data movement and massive input/output (I/O) operations.
- They were mostly used by large organizations for bulk data processing tasks such as online transactions, enterprise resource planning, and other operations.
- Even though mainframes cannot be considered distributed systems, they offered large computational power by using multiple processors, which were presented as a single entity to users.

The evolution of computing technologies- Cluster Computing

- Cluster computing started as a low-cost alternative to the use of mainframes and supercomputers.
- The technology advancement that created faster and more powerful mainframes and supercomputers eventually generated an increased availability of cheap commodity machines as a side effect.
- These machines could then be connected by a high bandwidth network and controlled by specific software tools that manage them as a single system.
- Starting in the 1980s, clusters become the standard technology for parallel and high-performance computing

The evolution of computing technologies- Cluster Computing

- They were cheaper than mainframes and made high performance computing available to a large number of groups .
- Cluster technology contributed considerably to the evolution of tools and frameworks for distributed computing, including Condor, Parallel Virtual Machine (PVM), and Message Passing Interface (MPI).
- One of the attractive features of clusters was that the computational power of commodity machines could be leveraged to solve problems that were previously manage able only on expensive super computers.
- Moreover, clusters could be easily extended if more computational power was required.

The evolution of computing technologies- Grid Computing

- Grid computing appeared in the early 1990s as an evolution of cluster computing.
- Grid computing proposed a new approach to access large computational power, huge storage facilities, and a variety of services.
- Grids initially developed as aggregations of geographically dispersed clusters by means of Internet connections.
- These clusters belonged to different organizations, and arrangements were made among them to share the computational power.

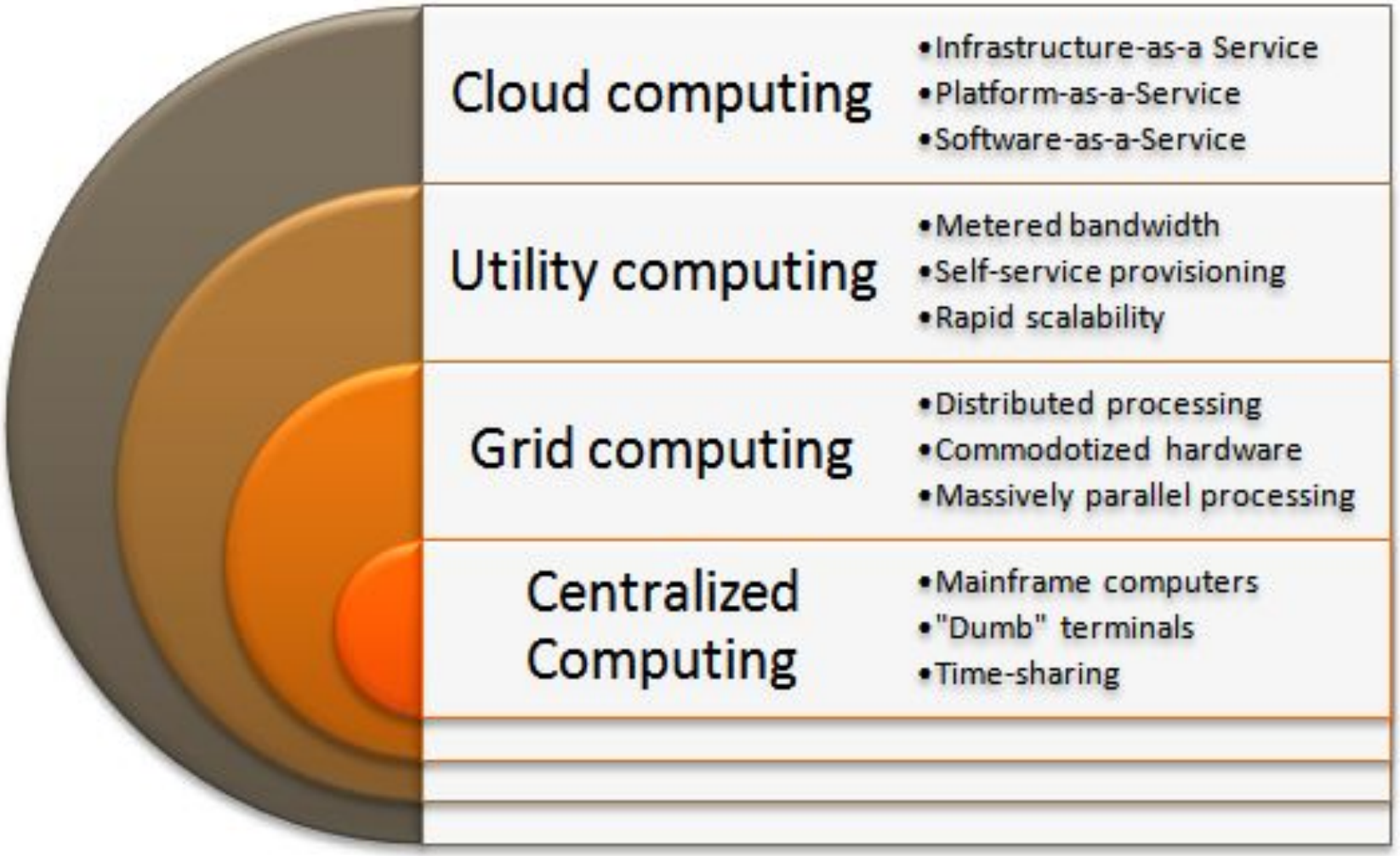
The evolution of computing technologies- Grid Computing

- **Grid computing -** combination of computer resources from multiple administrative domains applied to a common task
- **Grid computing** is a **computer** network in which each **computer's** resources are shared with every other **computer** in the system.
- Processing power, memory and data storage are all community resources that authorized users can tap into and leverage for specific tasks.

Utility Computing

- **Utility computing** focus is on the business model on which providing the computing services are based. , as a **metered service** similar to a traditional public utility (such as electricity, water, natural gas, or telephone network).
- Utility computing merely means **"Pay and Use"**, with regards to computing power.

Quick Revision




Thank You