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Specialization - Cloud Computing - I

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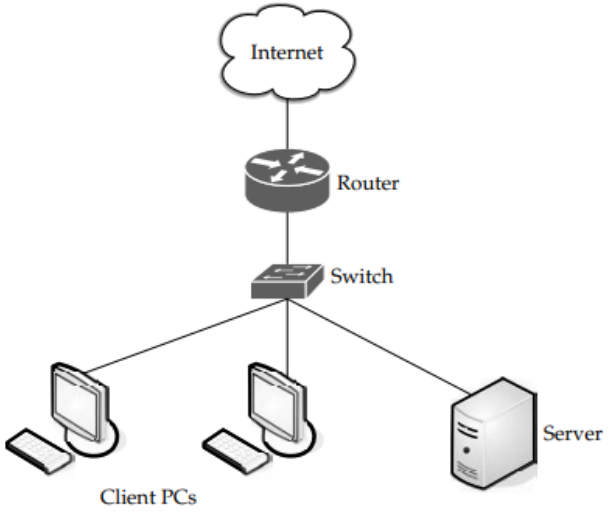
Unit – 1

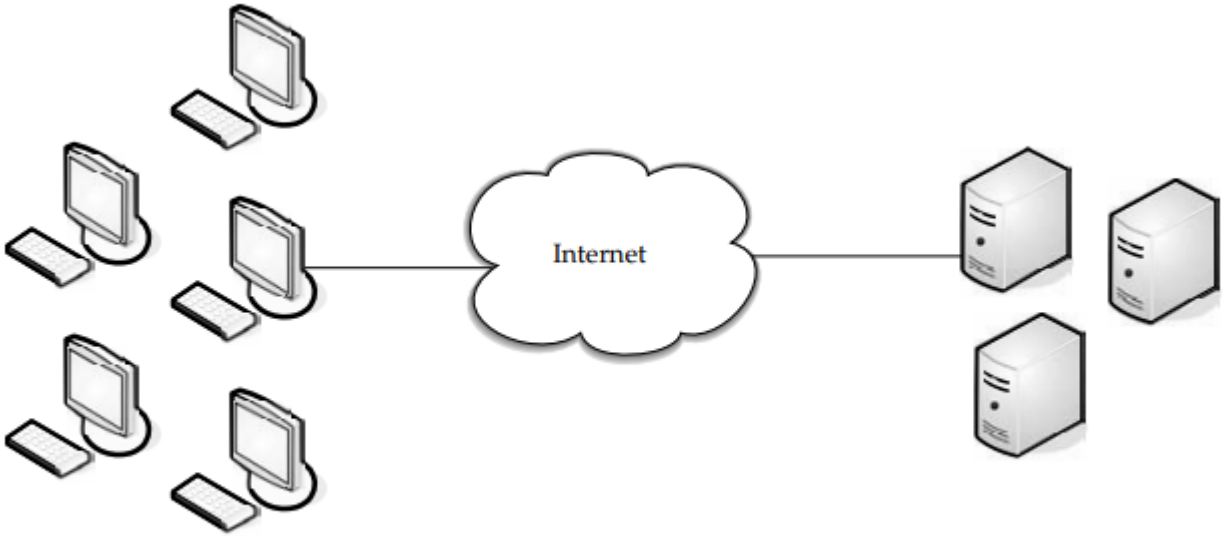
Introduction To Cloud Computing

Introduction to Cloud Computing

- Cloud computing gets its name as a metaphor for the Internet. Typically, the Internet is represented in network diagrams as a cloud,as shown in Figure
- The cloud icon represents “all that other stuff” that makes the network work. It’s kind of like “etc. for the rest of the solution map



Introduction to Cloud Computing



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Introduction to Cloud Computing

- This diagram represents a cloud computing model where users access computing resources (e.g., servers, storage, or applications) over the internet. Here's an explanation of the key elements:
- Your Company's Devices:
- The left side represents the users (your company) using various devices such as desktops, laptops, or tablets.
- These devices connect to the internet to access services.

- Internet:
- The internet acts as the medium through which the users access the cloud services provided by the service provider.

- Service Provider's Infrastructure:
- The right side represents the service provider's servers and equipment.
- The service provider is responsible for purchasing, maintaining, and updating the hardware and software infrastructure.

- Key Features:
- No Hardware Costs for the User: The company does not need to invest in or manage its own servers or other infrastructure.
- Service Provider Responsibility: The provider takes care of hardware, software updates, and maintenance.

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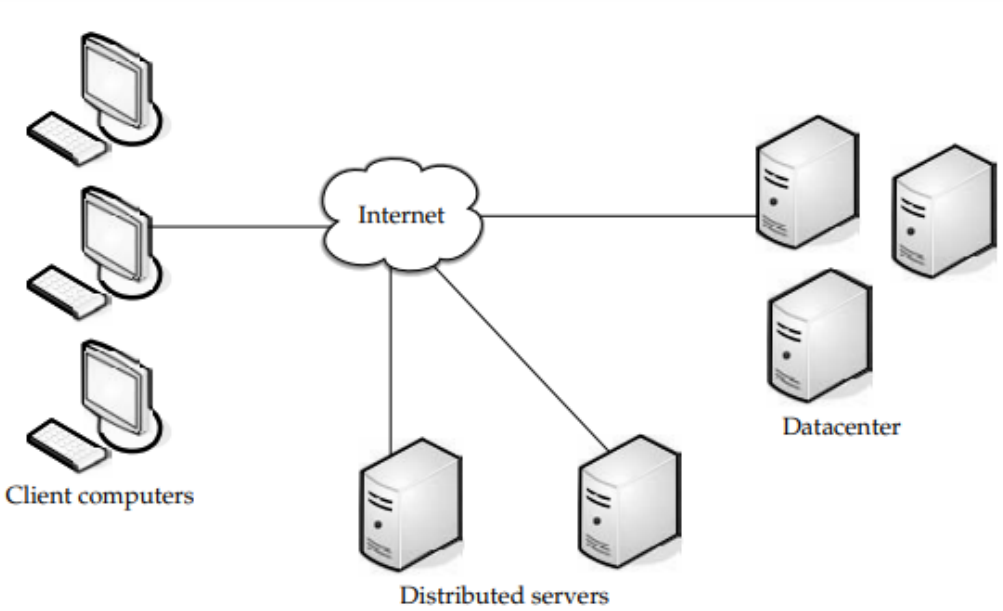
Introduction to Cloud Computing

- Your Company's Devices: Employees use laptops or smartphones to store, access, or share files.
- Internet: Files are uploaded or accessed via the internet using Google Drive.
- Google's Servers: Google maintains the servers and infrastructure that store and protect the data.
- This setup allows businesses to save costs on hardware and focus on their core activities while the cloud service provider manages the underlying infrastructure.

Introduction to Cloud Computing



Introduction to Cloud Computing

- Client Computers:

- Located on the left, these are devices (e.g., desktops, laptops, or mobile devices) used by users to interact with the cloud resources.
- They connect to the cloud infrastructure through the internet.
- Internet:

- Acts as the medium that connects the client computers to the cloud services hosted by distributed servers and centralized data centers.
- Distributed Servers:

- Represented at the bottom, these servers are located in various geographic locations to improve performance and reliability.
- Distributed servers enable faster access to resources by reducing latency for users in different regions.

Introduction to Cloud Computing

- Data Center:

- Represented on the right, this is a centralized location that hosts a large-scale, robust infrastructure for cloud services.
- It acts as the backbone for storing and processing data while providing redundancy and scalability.
- Key Features of the Model:
- Distributed Resources:

- Resources are spread across distributed servers to provide lower latency, better availability, and fault tolerance.
- Centralized Management:

- The data center ensures centralized control, data consistency, and backup.
- Scalability and Efficiency:

- Users benefit from scalable computing power as the load is distributed among multiple servers.

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Introduction to Cloud Computing

- Let’s take Netflix as an example:

- Client Computers:

- Users stream Netflix on devices like laptops, smart TVs, or mobile phones.
- Internet:

- The internet connects the user to Netflix’s distributed servers and centralized data centers.
- Distributed Servers:

- Netflix uses Content Delivery Networks (CDNs) to distribute its servers worldwide. This ensures that users get fast access to videos from servers closest to their geographic location.
- Data Center:

- The centralized Netflix data center stores and processes a master copy of the content library, user data, and analytics.

History of Cloud Computing

1960s: Foundation of Cloud Concepts

- J.C.R. Licklider introduced the concept of an intergalactic computer network, envisioning universal connectivity and access to programs and data from anywhere.
- John McCarthy, a computer scientist, proposed that computing could be offered as a public utility.

Mainframe Era and Utility Computing

- Utility computing was introduced, where computing power was provided as a metered service, similar to electricity or telephony.
- Large companies like IBM capitalized on this model by offering mainframe services to businesses.

History of Cloud Computing

Challenges of Early Utility Computing

Limitations in bandwidth and disk space restricted its growth.

The rise of personal computers made utility computing less appealing, as PCs became affordable and widely accessible.

1990s: Internet and Web Revolution

The rise of the Internet and distributed computing changed information distribution.

Companies like Sun Microsystems promoted the idea of "the network is the computer."

Amazon leveraged utility computing to establish server farms and offer applications to customers, laying the foundation for modern cloud services.

History of Cloud Computing

Late 1990s: SaaS and Cloud Emergence

- Salesforce.com (1999) pioneered Software as a Service (SaaS), delivering enterprise applications via the web.
- Amazon further developed cloud computing after the dot-com bubble, focusing on infrastructure as a service.

Modern Cloud Evolution

- Cloud computing evolved with concepts like Web 2.0 and became essential for handling vast amounts of data in a structured, usable manner.
- Companies now use cloud for scalability, cost-efficiency, and processing power.

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To-Do List

- Cloud_Computing_A_Practical_Approach
  - read page number 3 to 8
  - cloud-computing-a-practical-approach-for-learning-and-implementation
    - read topic 1.2 and 1.3

Characteristics of Cloud Computing

Dynamic Computing Infrastructure

IT Service-centric Approach

Self-service Based Usage Model

Minimally or Self-managed Platform

Consumption-based Billing

Characteristics of Cloud Computing

Dynamic Computing Infrastructure

- Dynamic infrastructure environment is needed for cloud computing. The basis of a dynamic infrastructure is standardized, scalable and secure physical infrastructure. There should be various redundancies to ensure high levels of availability, but mostly it must be easy to enlarge as the demand increases, without requiring architecture restructure.
- Next, it must be virtualized.
- Virtualized environment uses server virtualization to run the services, these services needs

to be easily provisioned and de-provisioned via software automation. These service workloads have to be switched over from one physical server to another as capacity demands increase or decrease. Finally, this infrastructure should be utilized by an external or an internal provider. The infrastructure must provide business value beyond the investment.

A dynamic computing infrastructure is complex in supporting the fl exible nature of service provisioning and de-provisioning as requested by a client, still maintaining high levels of reliability and security.

Characteristics of Cloud Computing

IT Service Centric Approach

Cloud computing is service-centric business. This is in stark difference to more conventional system- or server-centric models. In the majority cases, users of the cloud usually want to run some business service or application for an exact timely purpose and they don't want to get bogged down in the system and network administration of the environment. They would prefer to rapidly and easily access a devoted application or service

Characteristics of Cloud Computing

Self Service Based Usage Model

Interaction with the cloud needs some level of user self-service. Best of breed self-service creates the chance to the users to upload, build, deploy, schedule, manage and report on their business services on-demand basis. Self-service cloud must provide easy-to-use, intuitive user interfaces that help the users to effectively manage the service-delivery life cycle. The superiority of self-service from the users' purpose of business is a stage of empowerment and yields valued enterprise agility

Characteristics of Cloud Computing

Minimally of self-managed platforms

- A provisioning engine where the services are deployed should have high levels of reuse. Mechanisms for scheduling the resources and reserving resource capacity.
- Capabilities for confi guring, organizing and reporting to make sure resources are allocated and reallocated to several groups of users.
- Tools must be available for controlling access to resources and policies for resources to be
- utilized or operations to be performed.

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Pros and Cons of Cloud Computing

PROS	CONS
Cost Reduction	Security Concerns
Scalability	Risk of loosing Internet connection
Levels the playing field	Limited resources for customization
Easy Collaboration	Availibility
Affordable	Data mobility and ownership
Flexibility	Privacy
Efficiency	

Nature of Cloud Computing

1. Organizational perspective, the cloud give services for client and enterprise needs in a simplified way, brought ahead of scale and high worth of service that drives the capability for expansion and innovation.

2. User's perspective, it enables computing services in a simpler, more responsive model without complete knowledge of the underlying technology. It is an effective service acquisition and delivery model for IT resources if properly implemented within an all-inclusive technology strategy. Cloud computing can help to improve overall business performance while controlling the costs of distributing IT resources to the organization.

Nature of Cloud Computing

Cloud computing curves the economics of IT business onto its head. Delivery of information technology services (including infrastructure, platform and applications) from the cloud has both capital expense advantages and operation disbursement advantages. The capability to pool resources virtualizes them and then dynamically provision from the resource pool yields a much higher consumption rate and thus better economics sometimes from 15% to 90% consumption, according to IBM research. The cloud aspects of standardization and automation greatly reduce the overhead required to deliver IT services. By focusing on a few common IT confi gurations (like software stacks, storage allocations and application options) and then automating the provisioning of these confi gurations, the amount of labour required to deliver that service is greatly reduced.

Technologies in Cloud Computing

Now-a-days, the news about cloud computing is that the cost of the hardware is very high. International Data Corporation has predicted that the revenue is estimated to grow from $582 million, which was in 2009, to about $718 million in 2014. In addition, for the private cloud computing this revenue will spurt up from $2.6 billion to nearly about $5.7 during the same period. This increase in the income clearly indicates that the cloud computing, now will have to splurge much more funds on the server hardware.

Cloud computing is based on the advance distributed technologies. They may, although be a bit related to each other, but their functions are different from each other. The past few years, the concept of cloud computing is the only technology has evolved in the fi eld of computer science.

Technologies in Cloud Computing

- Grid computing: It defi ned as an extension of distributed and parallel computing in which a super and virtual computer consists of a number of networked and loosely coupled computers that act together to perform enormous tasks.'
- Utility computing: When the resources used in computing process are packaged as a metered service similar to electricity—a traditional public utility.
- Autonomic computing: It defi nes that systems are capable of self-management.

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