EXPERIMENT 1

Aim: To study introduction and overview of cloud computing

Objective:

- Understand the fundamental concepts, characteristics, and service models of cloud computing.
- Explore different deployment models and major cloud service providers.
- Analyze real-world examples and case studies of cloud computing adoption.
- Gain hands-on experience with cloud computing platforms through practical exercises.
- Discuss challenges, considerations, and future trends in cloud computing.

Introduction: Cloud computing has emerged as a transformative technology, revolutionizing the way businesses and individuals access and manage computing resources. This report aims to provide a comprehensive overview of cloud computing, exploring its inception, evolution, key components, and its impact on various industries.

Definition And Concept: Cloud computing refers to the delivery of computing services, including storage, processing power, and applications, over the internet. It enables users to access and use these resources on-demand, without the need for extensive local infrastructure. The term "cloud" in cloud computing is a metaphor for the internet, symbolizing the abstraction of complex infrastructure into a simplified, easily accessible service.

History: Cloud computing has a rich history that extends back to the 1960s, with the initial concepts of time-sharing becoming popularized via remote job entry (RJE). The "data center" model, where users submitted jobs to operators to run on mainframes, was predominantly used during this era. This was a time of exploration and experimentation with ways to make large-scale computing power available to more users through time-sharing, optimizing the infrastructure, platform, and applications, and increasing efficiency for end users. The use of the "cloud" metaphor to denote virtualized services traces back to 1994, when it was used by General Magic to describe the universe of "places" that mobile agents in the Telescript environment could go. This metaphor is credited to David Hoffman, a General Magic communications employee, based on its long-standing use in networking and telecom. The expression cloud computing became more widely known in 1996 when the Compaq Computer Corporation drew up a business plan for future computing and the Internet. The company's ambition was to supercharge sales with "cloud computing-enabled applications". The business plan foresaw that online consumer file storage would most likely be commercially successful. As a result, Compaq decided to sell server hardware to internet service providers. In the 2000s, the application of cloud computing began to take shape with the establishment of Amazon Web

Services (AWS) in 2002, which allowed developers to build applications independently. In 2006 the beta version of Google Docs was released, Amazon Simple Storage Service, known as Amazon S3, and the Amazon Elastic Compute Cloud (EC2), in 2008 NASA's development of the first open-source software for deploying private and hybrid clouds. The following decade saw the launch of various cloud services. In 2010, Microsoft launched Microsoft Azure, and Rackspace Hosting and NASA initiated an open-source cloud-software project, OpenStack. IBM introduced the IBM SmartCloud framework in 2011, and Oracle announced the Oracle Cloud in 2012. In December 2019, Amazon launched AWS Outposts, a service that extends AWS.

Architecture Of Cloud Computing:

Cloud computing architecture refers to the components and sub-components required for cloud computing. These components typically refer to:

- Front end (Fat client, Thin client)
- Back-end platforms (Servers, Storage)
- Cloud-based delivery and a network (Internet, Intranet, Intercloud)

Front End (User Interaction Enhancement): The User Interface of Cloud Computing consists of 2 sections of clients. The Thin clients are the ones that use web browsers facilitating portable and lightweight accessibilities and others are known as Fat Clients that use many functionalities for offering a strong user experience.

Back-end Platforms (Cloud Computing Engine): The core of cloud computing is made at back-end platforms with several servers for storage and processing computing. Management of Applications logic is managed through servers and effective data handling is provided by storage. The combination of these platforms at the backend offers the processing power, and capacity to manage and store data behind the cloud.

Cloud-Based Delivery and Network: On-demand access to the computer and resources is provided over the Internet, Intranet, and Intercloud. The Internet comes with global accessibility, the Intranet helps in internal communications of the services within the organization and the Intercloud enables interoperability across various cloud services. This dynamic network connectivity ensures an essential component of cloud computing architecture on guaranteeing easy access and data transfer.

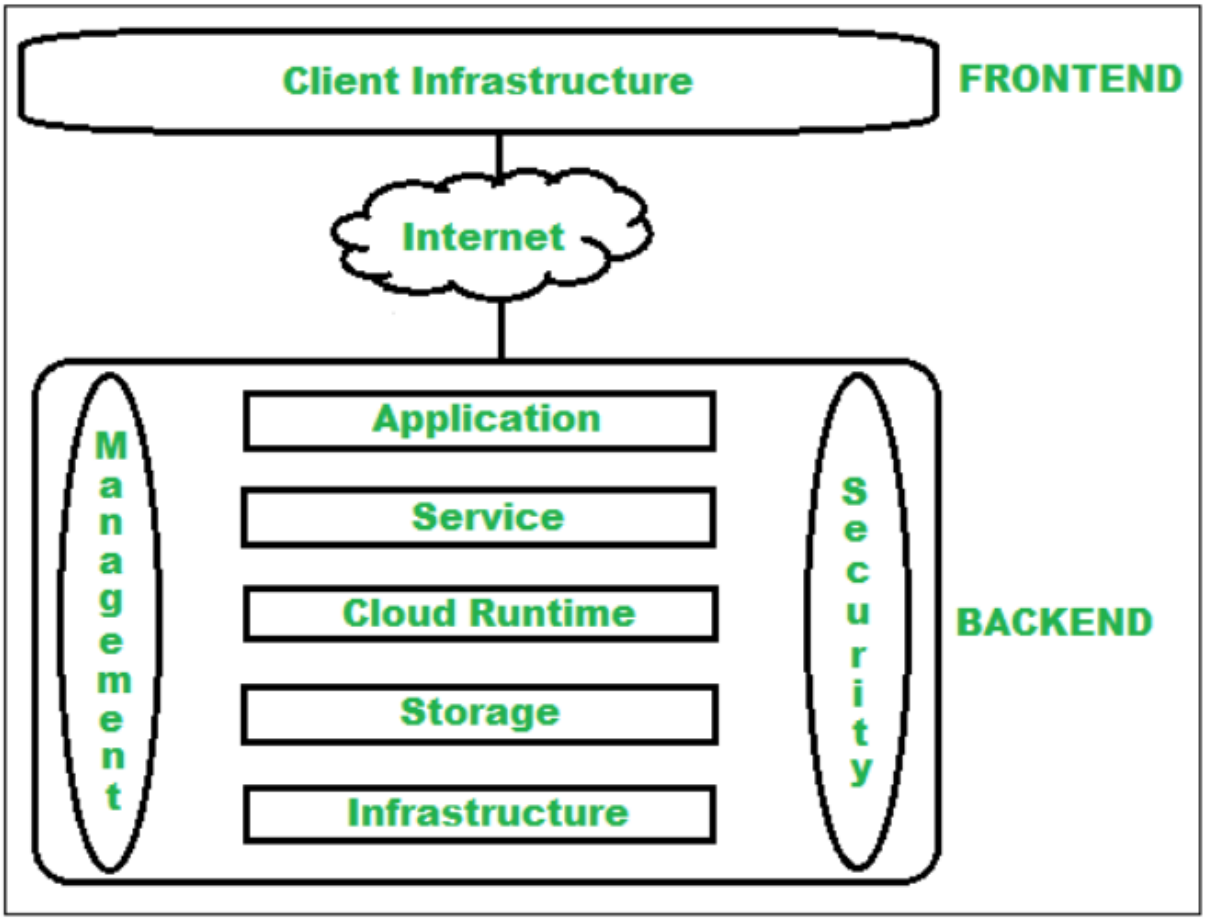

Fig. Architecture of Cloud Computing

Characteristics of Cloud Computing:

1) Agility: The Cloud Works in a distributed environment.It shares resources among the user which makes it faster.
2) High availability and reliability: The availability of servers is high and more reliable because the chances of infrastructure failure are minimum.
3) High Scalability: Cloud offers "on-demand" provisioning of resources on a large scale, without having engineers for peak loads.
4) Multi-Sharing: With the help of cloud computing, multiple users and applications can work more efficiently with cost reductions by sharing common infrastructure.
5) Device and Location Independence: Cloud computing enables the users to access systems using a web browser regardless of their location or what device they use e.g. PC, mobile phone, etc. As infrastructure is off-site (typically provided by a third-party) and accessed via the Internet, users can connect from anywhere.

6) Maintenance: Maintenance of cloud computing applications is easier, since they do not need to be installed on each user's computer and can be accessed from different places. So, it reduces the cost also.
7) Low Cost: By using cloud computing, the cost will be reduced because to take the services of cloud computing, IT companies need not to set its own infrastructure and pay-as-per usage of resources.

Cloud computing can be broadly categorized into several types based on service models and deployment models:

1. **Service Models:**
    - **Infrastructure as a Service (IaaS):** Provides virtualized computing resources over the internet, such as virtual machines, storage, and networking. Users can deploy and manage their own applications and software on these resources without worrying about underlying infrastructure.
    - **Platform as a Service (PaaS):** Offers a complete platform for developing, deploying, and managing applications without the complexity of infrastructure management. Developers can focus on building and deploying applications without dealing with underlying hardware or software components.\
    - **Software as a Service (SaaS):** Delivers software applications over the internet on a subscription basis. Users can access and use applications hosted by a third-party provider without needing to install or maintain software locally.

2. **Deployment Models:**
    - **Public Cloud:** Infrastructure and services are hosted and managed by third-party cloud service providers, making them accessible to the general public over the internet. Examples include AWS, Azure, and Google Cloud Platform.
    - **Private Cloud:** Infrastructure and services are dedicated to a single organization and are either hosted on-premises or by a third-party provider. Private clouds offer greater control, security, and customization options but may require higher initial investment and maintenance.
    - **Hybrid Cloud:** Combines public and private cloud environments, allowing data and applications to be shared between them. Organizations can leverage the scalability and cost-effectiveness of public clouds while maintaining sensitive data and applications in a private cloud.
    - **Community Cloud:** Shared infrastructure and services are tailored to meet the specific needs of a group of organizations with similar interests or requirements, such as regulatory compliance or industry standards.

Advantages of Cloud Computing:

1. Scalability: Cloud computing offers the ability to scale resources up or down based on demand, allowing organizations to efficiently manage fluctuating workloads without over-provisioning or under-utilizing resources.
2. Cost Savings: By eliminating the need for on-premises hardware infrastructure and associated maintenance costs, cloud computing offers significant cost savings. Users pay only for the resources they consume on a pay-as-you-go basis, reducing upfront capital expenses.
3. Flexibility: Cloud computing provides flexibility in terms of resource allocation, deployment models, and service options. Users can easily deploy and access resources from anywhere with an internet connection, enabling remote work and global accessibility.
4. Accessibility and Collaboration: Cloud-based applications and data can be accessed from any device with an internet connection, facilitating collaboration and productivity among geographically dispersed teams.
5. Reliability and Availability: Cloud service providers typically offer high levels of reliability and availability through redundant infrastructure, data replication, and disaster recovery measures. This ensures continuous access to applications and data, minimizing downtime and business disruptions.

Disadvantages of Cloud Computing:

1. Security Concerns: Cloud computing raises security concerns related to data breaches, unauthorized access, and data loss. Organizations may have limited control over data security and compliance in a shared infrastructure environment.
2. Dependency on Internet Connectivity: Cloud computing relies on internet connectivity for access to resources and services. Disruptions in internet connectivity can hinder access to critical applications and data, impacting business operations.
3. Potential for Vendor Lock-in: Migrating applications and data between cloud providers or back to on-premises infrastructure can be challenging, leading to vendor lock-in. Organizations may face difficulties in switching providers or integrating with existing systems.
4. Performance Variability: Performance in cloud computing environments may vary based on factors such as network latency, resource contention, and geographic location. Users may experience performance issues during peak usage periods or due to shared infrastructure.
5. Compliance and Data Governance: Cloud computing introduces complexities in managing compliance requirements and data governance, especially in regulated

industries. Organizations must ensure compliance with data protection regulations and industry standards while maintaining data sovereignty and privacy.

Conclusion: In conclusion, the journey to study the introduction and overview of cloud computing has provided valuable insights into the fundamental concepts and dynamics shaping modern IT infrastructure. Through exploration of key characteristics, service models, deployment options, and major providers, we have gained a comprehensive understanding of the cloud computing landscape. Real-world examples and hands-on exercises have enriched our learning experience, demonstrating the practical applications and benefits of cloud technologies across various industries. As we reflect on the challenges, considerations, and future trends discussed, it becomes evident that cloud computing continues to revolutionize the way organizations operate and innovate. Armed with this knowledge, we are better equipped to navigate the evolving landscape of IT and harness the transformative potential of cloud computing to drive success in our endeavors.