**Client Server Computing**:

Client – Server computing refers to a way of describing a relationship between the devices in the network where the tasks that are carried out are distributed among various machines on the network.

A client is a machine which request a service : Ex: Printing out a document

A Server is a machine which is dedicated to provide a particular function or service requested by client. Ex: Print server

**Distributed Computing:**

A distributed system is a **collection of computers** that work together to form a single computer for the end-user. All these distributed machines have one shared state and operate concurrently.

They can **fail independently** without damaging the whole system, much like microservices. These interdependent, autonomous computers are linked by a network to share information, communicate, and exchange information easily.

**Note:** Distributed systems must have a shared network to connect its components, which could be connected using an IP address or even physical cables.

Diagram

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**Disadvantages of Distributed Computing:**

**Failure Handling:** Failure handling can be difficult with distributed systems because some components fail while others continue to function.

* **Concurrency:** A common issue occurs when several clients attempt to access a shared resource simultaneously. You must ensure that all resources are safe in a concurrent environment.
* **Security issues:** Data security and sharing have increased risks in distributed computer systems. The network must be secured, and users must be able to safely access replicated data across multiple locations.
* **Higher initial infrastructure costs:** The initial deployment cost of a distributed system can be higher than a single system.

**Cloud vs distributed systems**

Cloud computing and distributed systems are different, but they use similar concepts. Distributed computing uses distributed systems by spreading tasks across many machines. Cloud computing, on the other hand, uses network hosted servers for storage, process, data management.

Distributed computing aims to create collaborative resource sharing and provide size and geographical scalability. Cloud computing is about **delivering an on demand environment** using transparency, monitoring, and security.

Compared to distributed systems, cloud computing offers the **following advantages:**

* Cost effective
* Access to a global market
* Encapsulated change management
* Access storage, servers, and databases on the internet

**What is Cloud Computing:**

Cloud computing is the delivery of on demand computing services like Storage, infrastructure, applications, etc over the internet on a PAY AS YOU GO or PAY AS YOU Use model.

* + Properties and characteristics
    - High ***scalability*** and ***elasticity***
    - High ***availability*** and ***reliability***
    - High ***manageability*** and ***interoperability***
    - High ***accessibility*** and ***portability***
    - High ***performance*** and ***optimization***

**Infrastructure as a Service – IaaS**

* + The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications.
  + The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly limited control of select networking components .
* Examples :
  + Amazon EC2
  + Eucalyputs
  + OpenNebula

**Platform as a Service – PaaS**

* + The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider.
  + The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations.
* Examples :
  + Microsoft Windows Azure
  + Google App Engine
  + Hadooop

**Software as a Service – SaaS**

* + The capability provided to the consumer is to use the provider’s applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email).
  + The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.
* Examples :
  + Google Apps (e.g., Gmail, Google Docs, Google sites, …etc)

SalesForce.com

Diagram

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Diagram

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**Deployment Models**

**Public cloud definition**

* + The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.

Also known as external cloud or multi-tenant cloud, this model essentially represents a cloud environment that is openly accessible

Diagram

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**Private cloud definition:**

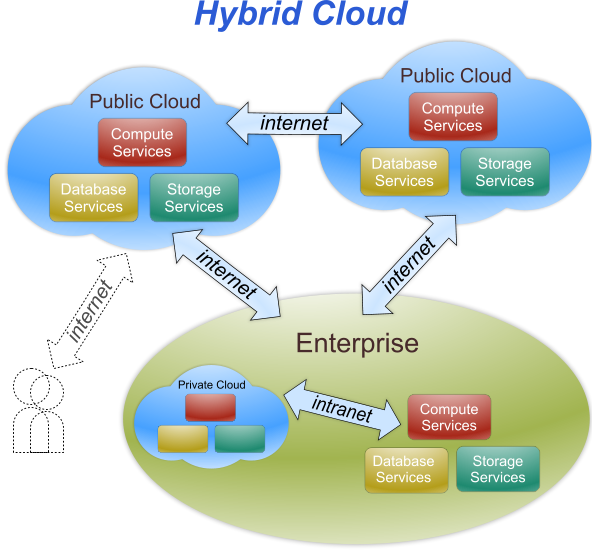
* + The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on premise or off premise.
  + Also referred to as internal cloud or on-premise cloud, a private cloud intentionally limits access to its resources to service consumers that belong to the same organization that owns the cloud.
  + Basic characteristics :
    - Heterogeneous infrastructure
    - Customized and tailored policies
    - Dedicated resources
    - In-house infrastructure

Diagram

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**Hybrid cloud definition**

* + The cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application  
    portability (e.g., cloud bursting  
    for load-balancing between  
    clouds).



Diagram

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