CE644 Cloud Computing and Applications

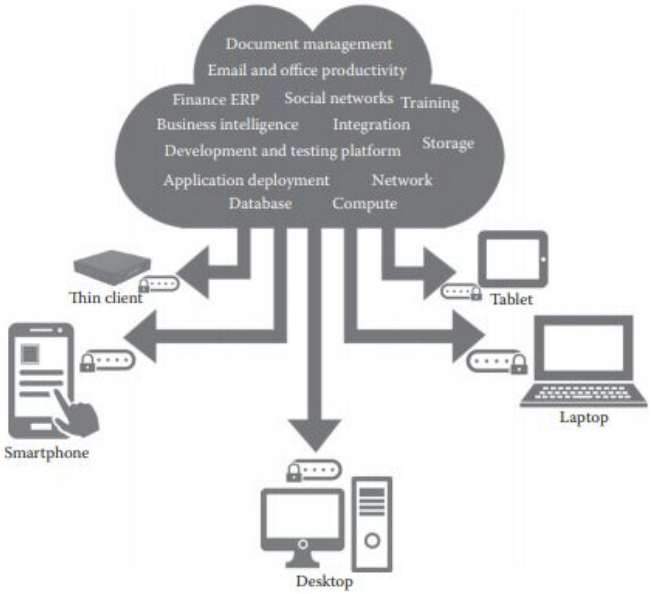
Cloud Computing Fundamental's

Motivation for cloud computing:

- Earlier: Buy resources : H/W, S/W, N/W, Storage (eg. Computer)
- Now: get Required computing power and resources **pay as you go**. (general eg. Electricity)
- Advantages: Cost efficiency, Data security, Data recovery, maintenance etc.

Need for Cloud Computing:

- Convenience and reliability



Defining Cloud Computing:

- In the simplest terms, cloud computing means **storing** and **accessing** data and programs **over the Internet** from a **remote location or computer** instead of our computer's hard drive.
- Cloud metaphor for Internet

l) NIST definition of cloud computing:

- National Institute of Standards and Technology
- 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.
- This cloud model is composed of **five essential characteristics**, **three service models, and four deployment models.(5-4-3)**
- ***Pay as you use*** or ***pay as you go***
- Both the **International Standards Organization** (ISO) and the **Institute of Electrical and Electronics Engineers** (IEEE) back the NIST definition.

II) Cloud computing is a service:

- The simplest thing that any computer does is allow us to **store and retrieve information**.
- While Flickr started with an emphasis on **sharing photos and images**, it has emerged as a great place to **store** those images.

- First, Flickr allows us to easily **access** our images
- Second, Flickr lets us **share** the images.
- Third, Flickr provides **data security**

III) Cloud computing is a platform:

- The basic meaning of the term **platform** is that it is the support on which applications run or give results to the users. For example, **Microsoft Windows** is a platform.
- But, *a platform does not have to be an operating system*. **Java** is a platform even though it is not an operating system.
- Word processors like ***Buzzword and office suites like Google Docs*** are now available in the cloud as their desktop counterparts.

5-4-3 Principals of cloud computing:

(a) The five essential characteristic ***features that promote cloud computing***,

(b) The four deployment models that are used to ***narrate the cloud computing opportunities for customers*** while looking at architectural models,

(c) The three important and basic ***service offering models*** of cloud computing

a) 5 Essential characteristics

1. **On-demand self service** : consumers can obtain **computing capabilities** such as **server time or network storage** as needed automatically on their own.
2. **Broad network access**: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).
3. **Resource pooling**: The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.
4. **Rapid elasticity**: computing resources can be rapidly provisioned, increased, or decreased to meet changing user demand.
5. **Measured service**: clients can monitor and measure transactions and use of resources

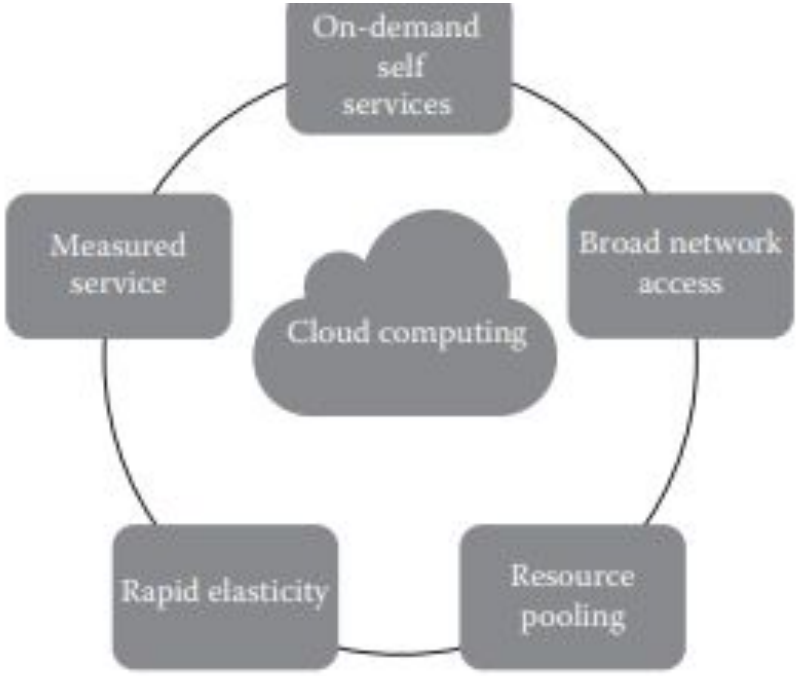


FIGURE 2.2
The essential characteristics of cloud computing.

b) 4 Cloud Deployment Model: **Public, Private, Community, Hybrid.**

i) Private: A cloud that is owned and operated by an organization for its own benefit.

ii) Public: what Provides cloud services to just about anyone.

iii) Community: This cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns. (e.g., mission, security requirements, policy, and compliance considerations)

iv) Hybrid: This cloud infrastructure is a composition of 2+ distinct cloud infrastructures that remain unique entities but are bound together by standardized or propriety technology that enables data and application portability.

c) 3 service offering models: **SaaS, Paas, IaaS**

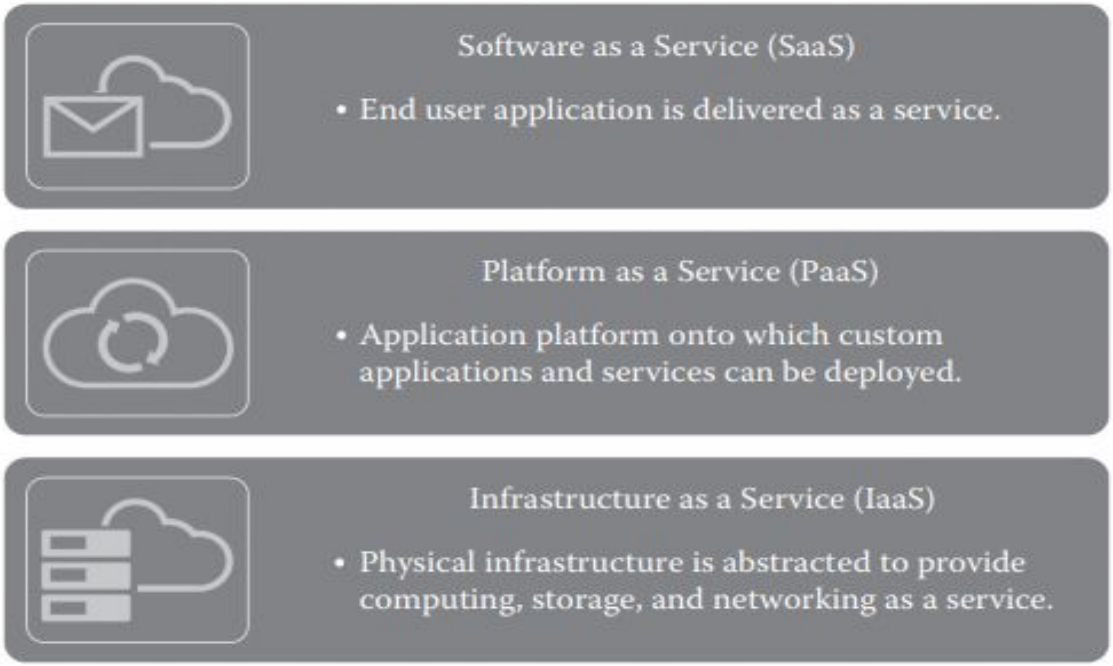


FIGURE 2.3
SPI—service offering model of the cloud.

- Major difference between PaaS and Iaas?
- PaaS allows **vendors to manage everything** while IaaS requires **more management from the customer side**.

Cloud Ecosystem: is a term used to describe the complete environment or system of interdependent components or entities that work together to enable and support the cloud services.

1. Cloud service user (CSUs): consumes delivered cloud services (end users, intermediate users that deliver cloud services provided by CSP)
2. Cloud service provider (CSP): organization that provides or delivers and maintains or manages cloud services (provider of SaaS, PaaS, IaaS)
3. cloud service partners (CSNs): person/org that provides support to the building of a service offered by a CSP (e.g. application developer, system integrator)

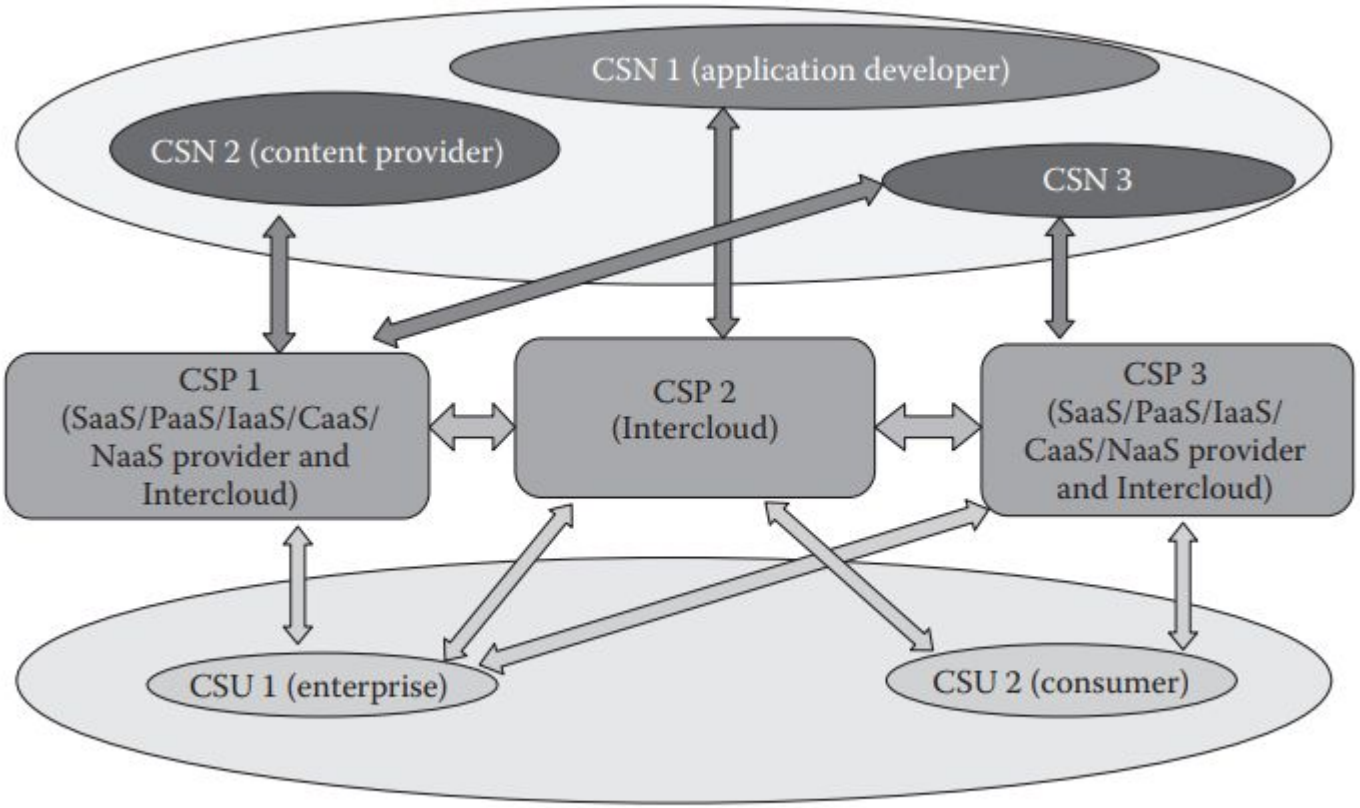


FIGURE 2.4
Actors with some of their possible roles in a cloud ecosystem.

Requirements for cloud services:

1. Multitenancy: a characteristics of cloud systems aiming to provide isolation of the different users of the cloud systems while maximizing resource sharing.
2. Service life cycle management: characteristic of a cloud service that supports automatic service provisioning, metering and charging or billing settlement
3. Security: characteristic of a cloud services that provides strict control for tenants' service access to different resources to avoid the abuse of cloud resources
4. Responsiveness: characteristic of cloud system that enables early detection, diagnosis, and fixing of service-related problems
5. Intelligent service deployment: characteristic of cloud system that enables efficient use of resources in service deployment

6. Portability:

7. Interoperability:

8. Environmental sustainability: the capability to access, through a broad network and thin clients, on-demand shared pools of configurable resources that can be rapidly provisioned and released.

9. Service reliability, service availability, and quality assurance:

10. Service access:

11. Flexibility

12. Accounting and charging:

13. Massive data processing:

Cloud Application: is an application program that functions in the cloud; the application can exhibit some characteristics of a pure desktop application and some characteristics of a pure web-based application.

examples of cloud application: Gmail, Yahoo, Dropbox

Benefits & Drawbacks:

I) Benefits of Cloud Computing (10)

1. achieve economies of scale
2. reduce spending on technology infrastructure
3. globalize the workforce
4. streamline business processes
5. reduce capital costs
6. pervasive accessibility
7. monitor projects more effectively
8. less personnel training is needed
9. minimize maintenance and licensing software
10. improved flexibility

II) Drawbacks of cloud computing

1. if we lose Internet connection
2. security concerns
3. no permission to control the resources, underlying infrastructure
4. interoperability of applications

- Q) Explain Requirements for cloud services in details.