CE644 Cloud Computing and Applications

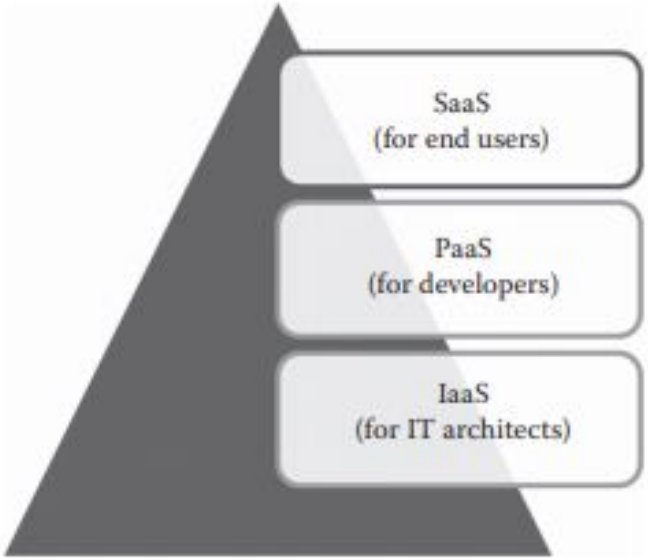
UNIT II

Cloud Types- IaaS, PaaS, SaaS

- IaaS: Compute, Network and Storage
- **Cloud provider is Exempted** from maintaining data center or infrastructure.
- **End user are responsible** for managing applications that are running on top of the service provider cloud.
- End user access IaaS using CLI or API
- Examples: AWS, Google Compute Engine, OpenStack and Eucalyptus.

- PaaS: Development platform.
- Programmers develop and deploy the applications.
- **Developer is exempted** from managing the development platform and the underlying infrastructure.
- **Developers are responsible** for managing the deployed application & configuring the developed environment.
- Developers access PaaS using CLI, UI and IDE
- Examples: Google App Engine, Force.com, Red Hat OpenShift, Heroku, and Engine Yard.

- SaaS: The **ability** given to the **end users** to **access an application over the Internet** that is **hosted and managed** by the service provider.
- **The end users are exempted** from managing or controlling an application, the development platform, and the underlying infrastructure.
- The **end users** can **access the services** from any thin clients or web browsers.
- Examples: Saleforce.com, Google Apps, and Microsoft office 365.



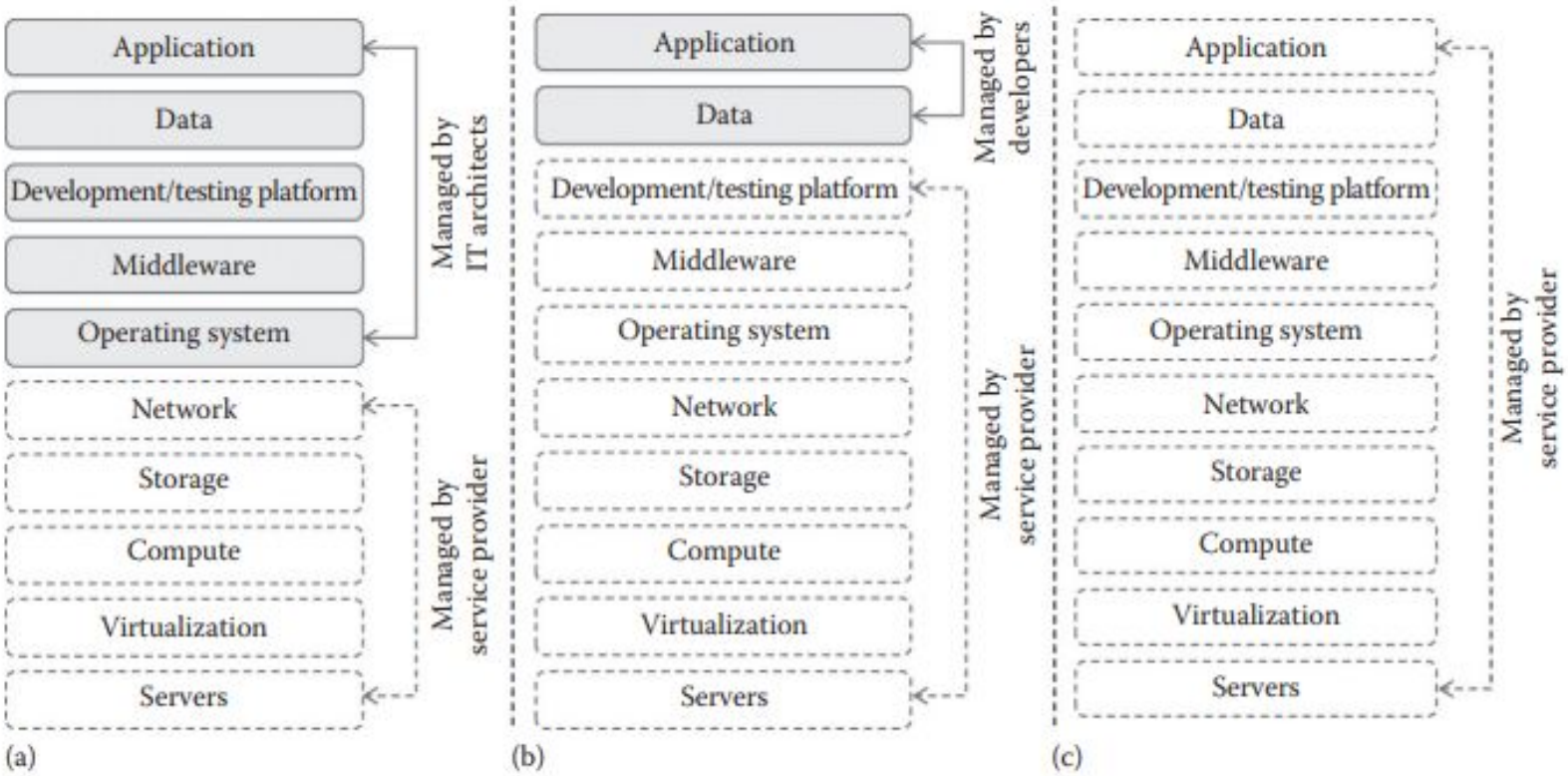


FIGURE 5.2
User and service provider responsibilities of cloud service models: (a) IaaS, (b) PaaS, and (c) SaaS.

- The different service models of cloud computing can be **deployed and delivered** through any one of the cloud deployment models.
- The service delivery of cloud services through different deployment models is shown in Figure

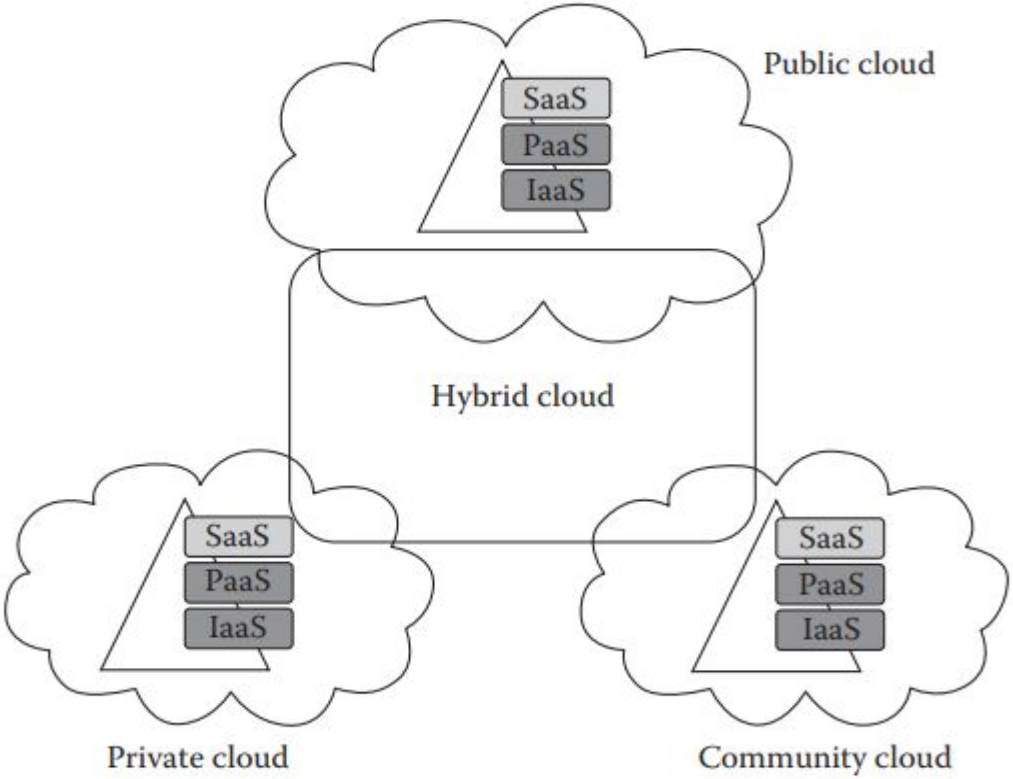


FIGURE 5.3
Deployment and delivery of different cloud service delivery models.

SaaS- Software as a Service

- No need to install software at user end.

Business Services: ERP,CRM, billing, sales & HR.

Social Networks: Social networking sites.

Document Management: Create, Manage & Track electronic docs.

Mail services : Emails.

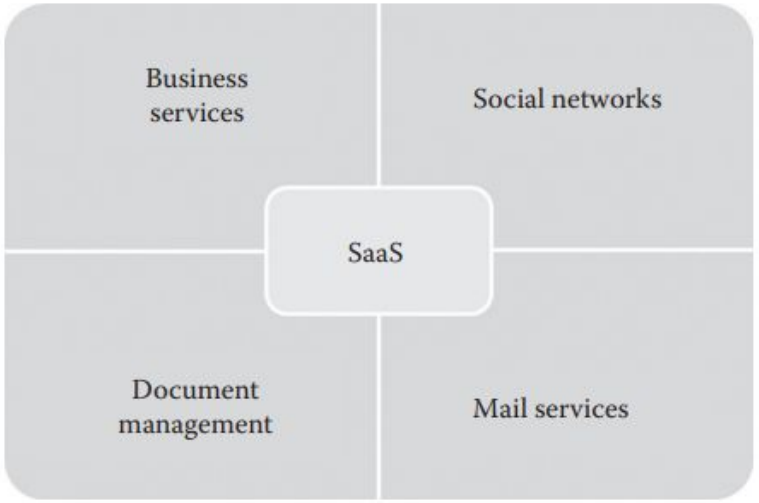


FIGURE 5.8
Services provided by SaaS Providers.

Characteristics of SaaS

1. **One to many** : SaaS services are delivered as a one-to-many model where a single instance of the application can be shared by multiple tenants or customers.
2. **Web access**: SaaS services provide web access to the software.
3. **Centralized management**: Hosted and managed from the central location. Updates are easier.
4. **Multidevice support**: SaaS services can be accessed from any end user devices such as desktops, laptops, tablets, smartphones, and thin clients.
5. **Better scalability**: The dynamic scaling of underlying cloud resources makes SaaS applications work efficiently even with varying loads.
6. **High availability**: SaaS services ensure the 99.99% availability of user data as proper backup and recovery mechanisms are implemented at the back end.
7. **API integration**: SaaS services have the capability of integrating with other software or service through standard APIs.

Suitability of SaaS

1. **On-demand software**: If the end users are looking for on-demand software rather than the licensing-based full-term software, then the SaaS model is the best option.
2. **Software for start-up companies**: Since SaaS services do not require high-end infrastructure for accessing, it is a suitable option for start-up companies that can reduce the initial expenditure on buying high-end hardware.
3. **Software compatible with multiple devices**: The SaaS applications are adaptable with almost all the devices.
4. **Software with varying loads**: With the dynamic scaling capabilities, SaaS applications can handle varying loads efficiently without disrupting the normal behavior of the application.

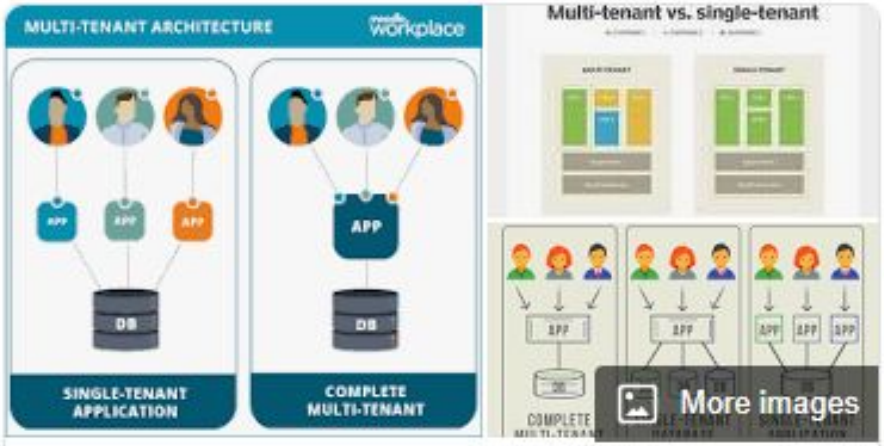
- The SaaS delivery model is not the best option for the applications mentioned in the following:

1. **Real-time applications**: Real-time applications require fast processing of data that may not be possible with the SaaS applications because of the dependency on high-speed Internet connectivity and latency issues.
2. **Applications with confidential data:** It is not recommended to go for SaaS for applications that handle confidential data
3. **Better on-premise application:** In such situations, migrating to the SaaS model may not be the best option.

Pros and Cons of SaaS

Advantages/Pros

- No client-side installation
- Cost savings
- Less maintenance
- Ease of access
- Dynamic scaling
- Disaster recovery
- **Multitenancy**



Multitenancy

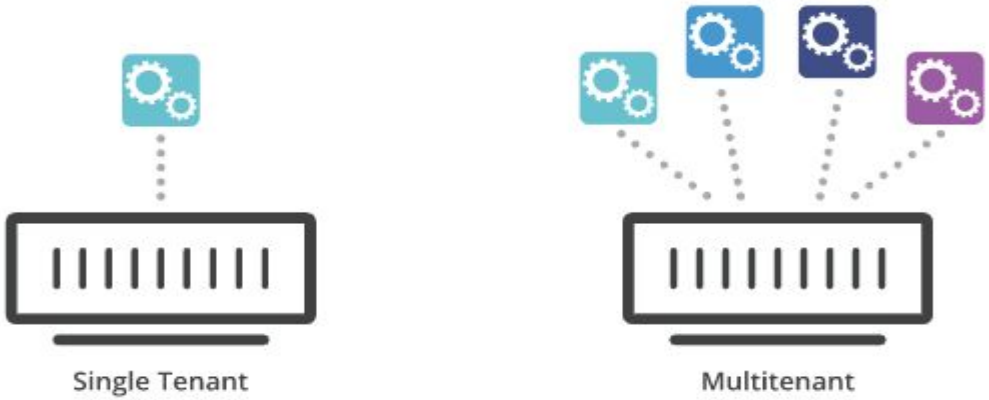
Software multitenancy is a software architecture in which a single instance of software runs on a server and serves multiple tenants. Systems designed in such manner are "shared". A tenant is a group of users who share a common access with specific privileges to the software instance. Wikipedia

Dis-advantages/Cons

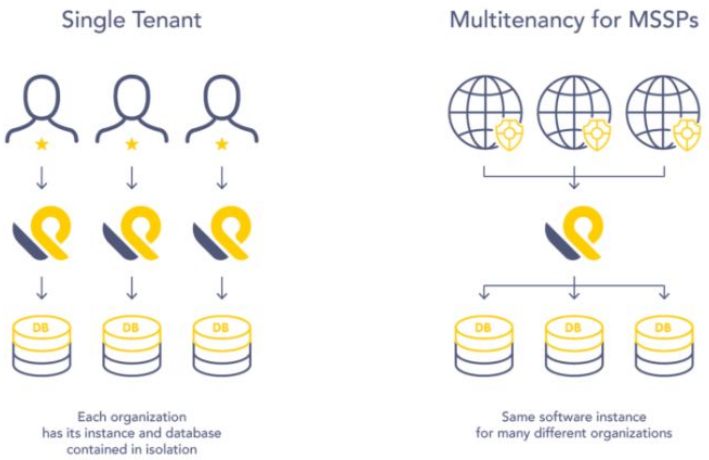
- Security
- Connectivity requirements
- Loss of control

Understanding the Multitenant nature of SaaS Solutions

- In cloud computing, multitenancy means that **multiple customers of a cloud vendor are using the same computing resources**.
- Despite the fact that they share resources, cloud customers aren't aware of each other, and their data is kept totally separate.
- Multitenancy is a crucial component of cloud computing; without it, cloud services would be far less practical.
- Eg: Bank.
- Defination: The classic definition of multitenancy was a ***single software instance* that served multiple users, or tenants***.
- **A software instance is a copy of a running program loaded into random access memory (RAM).*



Single Tenant vs. Multitenant



NaaS

- an ability given to the end users to access virtual network services that are provided by the service provider.

- a business model for delivering virtual network services over the Internet on a pay-per-use basis.
- In on-premise data center, the IT industries spent a lot of money to buy network hardware to manage in-house networks. But, cloud computing changes networking services into a utility-based service.
- NaaS allows network architects to create virtual networks, virtual network interface cards (NICs), virtual routers, virtual switches, and other networking components.
- Additionally, it allows the network architect to deploy custom routing protocols and enables the design of efficient in-network services, such as data aggregation, stream processing, and caching.
- Some of the popular services provided by NaaS include virtual private network (VPN), bandwidth on demand (BoD), and mobile network virtualization.

Desktop as a Service (DEaaS)

- is an ability given to the end users to use desktop virtualization without buying and managing their own infrastructure.
- DEaaS is a pay-per-use cloud service delivery model in which the service provider manages the back-end responsibilities of data storage, backup, security, and upgrades.
- The end users are responsible for managing their own desktop images, applications, and security.
- Accessing the virtual desktop provided by the DEaaS provider is device, location, and network independent.
- DEaaS services are simple to deploy, are highly secure, and produce better experience on almost all devices.

STaaS

- is an ability given to the end users to store the data on the storage services provided by the service provider.
- allows the end users to access the files at any time from any place.
- provider provides the virtual storage that is abstracted from the physical storage of any cloud data center.
- also a cloud business model that is delivered as a utility. Here, the customers can rent the storage from the STaaS provider.
- STaaS is commonly used as a backup storage for efficient disaster recovery.

DBaaS

- is an ability given to the end users to access the database service without the need to install and maintain it.
- The service provider is responsible for installing and maintaining the databases.
- The end users can directly access the services and can pay according to their usage.
- DBaaS automates the database administration process. The end users can access the database services through any API or web UIs provided by the service provider.
- The DBaaS eases the database administration process.
- Popular examples of DBaaS include SimpleDB, DynamoDB, MongoDB as a Service, GAE datastore, and ScaleDB.

Data as a Service (*DaaS*)

- is an ability given to the end users to access the data that are provided by the service provider over the Internet.
- DaaS provides data on demand. The data may include text, images, sounds, and videos.
- is closely related to other cloud service models such as SaaS and STaaS.
- can be easily integrated with SaaS or STaaS for providing the composite service.
- is highly used in geography data services and financial data services.
- The advantages of DaaS include agility, cost effectiveness, and data quality

SECaaS

- *SECaaS* is an ability given to the end user to access the security service provided by the service provider on a pay-per-use basis.
- the service provider integrates their security services to benefit the end users. Generally, the SECaaS includes authentication, antivirus, antimalware/spyware, intrusion detection, and security event management.
- The security services provided by the SECaaS providers are typically used for securing the on-premise or in-house infrastructure and applications.
- Some of the SECaaS providers include Cisco, McAfee, Panda Software, Symantec, Trend Micro, and VeriSign.

IDaaS

- is an ability given to the end users to access the authentication infrastructure that is managed and provided by the third-party service provider.
- The end user of IDaaS is typically an organization or enterprise.
- Using IDaaS services, any organization can easily manage their employees' identity without any additional overhead.
- Generally, IDaaS includes directory services, federated services, registration, authentication services, risk and event monitoring, single sign-on services, and identity and profile management.

- Cloud computing moves to the scenario where everything can be given as a service.
- This can be termed as Everything as a Service (XaaS).
- XaaS may include Backup as a Service (BaaS), Communication as a Service (CaaS), Hadoop as a Service (HaaS), Disaster Recovery as a Service (DRaaS), Testing as a Service (TaaS),
- Firewall as a Service (FWaaS), Virtual Private Network as a Service (VPNaaS), Load Balancers as a Service (LBaaS), Message Queue as a Service (MQaaS), and Monitoring as a Service (MaaS).