Fundamental Concepts and Models
1. Roles and Boundaries

• Could provider
  ▪ The organization that provides the cloud-based IT resources

• Cloud consumer
  ▪ An organization (or a human) that has a formal contract or arrangement with a cloud provider to use IT resources made available by the cloud provider
Cloud service owner

- The person or organization that legally owns a cloud service

A cloud consumer can be a cloud service owner when it deploys its own service in a cloud.
Cloud service owner

• The person or organization that legally owns a cloud service

A cloud provider becomes a cloud service owner if it deploys its own cloud service, typically for other cloud consumers to use.
Cloud resource administrator

• The person or organization responsible for administering a cloud-based IT resource (including cloud services)
Cloud resource administrator

• The person or organization responsible for administering a cloud-based IT resource (including cloud services)
Organizational boundary

- The physical perimeter that surrounds a set of IT resources that are owned and governed by an organization.
Trust boundary

- A logical perimeter that typically spans beyond physical boundaries to represent the extent to which IT resources are trusted.
2. Cloud delivery models

- Represents a specific pre-packaged combination of IT resources offered by a cloud provider
  - Infrastructure-as-a-Service (IaaS)
  - Platform-as-a-Service (PaaS)
  - Software-as-a-Service (SaaS)
Infrastructure-as-a-Service (IaaS)

- A self-contained IT environment comprised of infrastructure-centric IT resources that can be accessed and managed via cloud service-based interfaces and tools.
Platform-as-a-Service (PaaS)

• A pre-defined “ready-to-use” environment typically comprised of already deployed and configured IT resources

• Common reasons to invest in a PaaS environment
  ▪ Extend on-premise environments into the cloud for scalability and economic purposes
  ▪ Use the ready-made environment to entirely substitute an on-premise environment
  ▪ Become a cloud provider and deploys its own cloud services to other external cloud consumers
Platform-as-a-Service (PaaS)

PaaS Cloud Service Contract
Product: application server + DMBS platforms
SLA: availability=99.5%, auto-scaling
Price: $0.45 per hour (500,000 requests)
Software-as-a-Service (SaaS)

• A software program positioned as a shared cloud service and made available as a “product” or generic utility

SaaS Cloud Service Contract
SLA: response time=0.5ms
Price: $0.05 per 100 requests
## Comparison to typical cloud delivery model

<table>
<thead>
<tr>
<th>Cloud Delivery Model</th>
<th>Typical Level of Control Granted to Cloud Consumer</th>
<th>Typical Functionality Made Available to Cloud Consumer</th>
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</thead>
<tbody>
<tr>
<td>SaaS</td>
<td>Use and usage-related configuration</td>
<td>Access to the front-end user interface</td>
</tr>
<tr>
<td>PaaS</td>
<td>Limited administrative</td>
<td>Moderate level of administrative control over IT resources relevant to cloud consumer’s usage of platform</td>
</tr>
<tr>
<td>IaaS</td>
<td>Full administrative</td>
<td>Full access to virtualized infrastructure-related IT resources and, probably, to underlying physical IT resources</td>
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## Typical activities

<table>
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<tr>
<th>Cloud Delivery Model</th>
<th>Common Cloud Consumer Activities</th>
<th>Common Cloud Provider Activities</th>
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<tr>
<td>SaaS</td>
<td>Use and configure cloud service</td>
<td>Implement, manage, and maintain cloud service; Monitor usage by cloud consumers</td>
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<tr>
<td>PaaS</td>
<td>Develop, test, deploy, and manage cloud services and cloud-based solutions</td>
<td>Pre-configure platform and provision underlying infrastructure, middleware, and other IT resources; Monitor usage by cloud consumers</td>
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<tr>
<td>IaaS</td>
<td>Set up and configure bare infrastructure, and install, manage, and monitor any needed software</td>
<td>Provision and manage the physical processing, storage, networking, and hosting; Monitor usage by cloud consumers</td>
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3. Cloud deployment models

• A cloud deployment model represents a specific type of cloud environment, primarily distinguished by ownership, size, and access

• Four common models
  ▪ Public cloud
  ▪ Community cloud
  ▪ Private cloud
  ▪ Hybrid cloud
Public clouds

• A public cloud is a publicly accessible cloud environment owned by a third-party cloud provider.
• The cloud provider is responsible for the creation and on-going maintenance of the public cloud and its IT resources.
Primary public clouds in the market

- Salesforce
- Microsoft
- Amazon
- Rackspace
- Yahoo
- Zoho
- Google
Community cloud

- A community cloud is similar to a public cloud except that its access is limited to a specific community of cloud consumers.
- The member cloud consumers of the community typically share the responsibility for defining and evolving the community cloud.
A sample community cloud
Private clouds

• A private cloud is owned by a single organization

• Private clouds enable an organization to use cloud computing technology as a means of centralizing access to IT resources by different parts, locations, or departments of the organization

• Cloud provider and cloud consumer
  ▪ A separate department typically assumes the responsibility for provisioning the cloud  → cloud provider
  ▪ Departments requesting the access to the private cloud assume the cloud consumer role
A sample private cloud
Hybrid cloud

• A hybrid cloud is a cloud environment comprised of two or more different cloud deployment models
  ▪ Example: a cloud consumer may choose to deploy cloud services processing sensitive data to a private cloud and other less sensitive cloud services to a public cloud
Hybrid cloud architecture