Chapter3: Understanding Cloud Computing

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A Brief History

- The general public has been leveraging forms of Internet-based computer utilities since the mid-1990s .
- In the late 1990s, Salesforce.com pioneered the notion of bringing remotely provisioned services into the enterprise.
- In 2002, Amazon.com launched the Amazon Web Services (AWS) platform, a suite of enterprise-oriented services that provide remotely provisioned storage, computing resources, and business functionality.

Definitions

the National Institute of Standards and Technology (NIST)

- ***"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. "***

Definitions

- *“Cloud computing is a specialized form of distributed computing that introduces utilization models for remotely provisioning scalable and measured resources. “*

Basic Concepts and Terminology

- ***Cloud :***

a distinct IT environment that is designed for the purpose of remotely provisioning scalable and measured IT resources.

Cloud

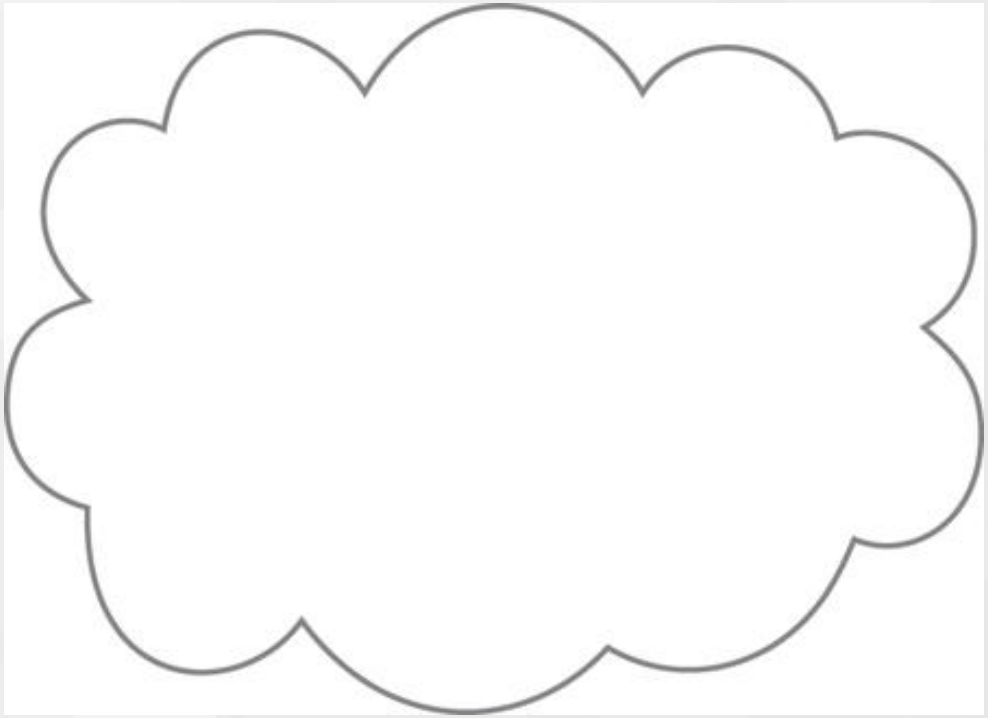


Figure 3.1 The symbol used to denote the boundary of a cloud environment.

IT Resource

- a physical or virtual IT-related artifact that can be either software-based, such as a virtual server or a custom software program, or hardware-based, such as a physical server or a network device.

IT Resource

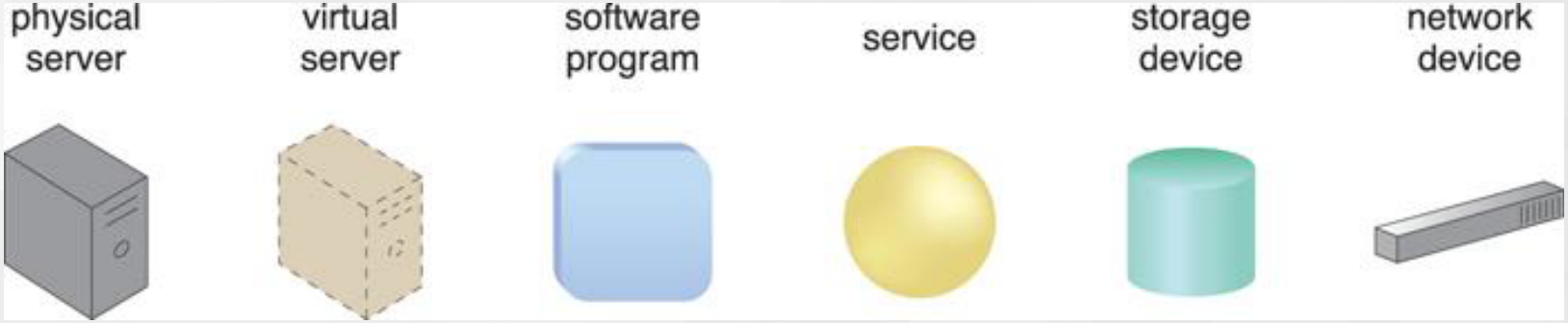


Figure 3.2 Examples of common IT resources and their corresponding symbols.

IT Resource

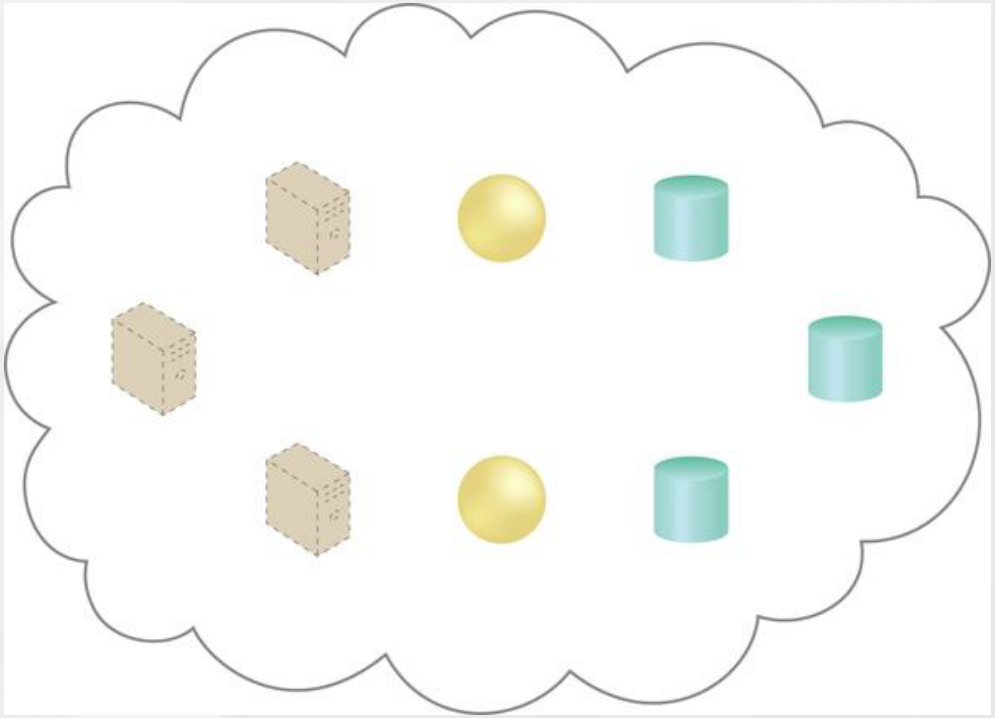


Figure 3.3 A cloud is hosting eight IT resources: three virtual servers, two cloud services, and three storage devices.

On-Premise

- An IT resource that is hosted in a conventional IT enterprise within an organizational boundary (that does not specifically represent a cloud) is considered to be located on the premises of the IT enterprise, or *on-premise* for short.
- An IT resource that is on-premise cannot be cloud-based, and vice-versa.

On-Premise

- An on-premise IT resource can access and interact with a cloud-based IT resource.
- An on-premise IT resource can be moved to a cloud, thereby changing it to a cloud-based IT resource.
- Redundant deployments of an IT resource can exist in both on-premise and cloud-based environments.

Cloud Consumers and Cloud Providers

- The party that provides cloud-based IT resources is the ***cloud provider***.

- The party that uses cloud-based IT resources is the ***cloud consumer***.

Scaling

- Scaling, from an IT resource perspective, represents the ability of the IT resource to handle increased or decreased usage demands.
- *Horizontal Scaling* – scaling out and scaling in
- *Vertical Scaling* – scaling up and scaling down

Horizontal Scaling

- The allocating or releasing of IT resources that are of ***the same type*** .
- The horizontal allocation of resources is referred to as ***scaling out*** .
- the horizontal releasing of resources is referred to as ***scaling in*** .

Horizontal Scaling

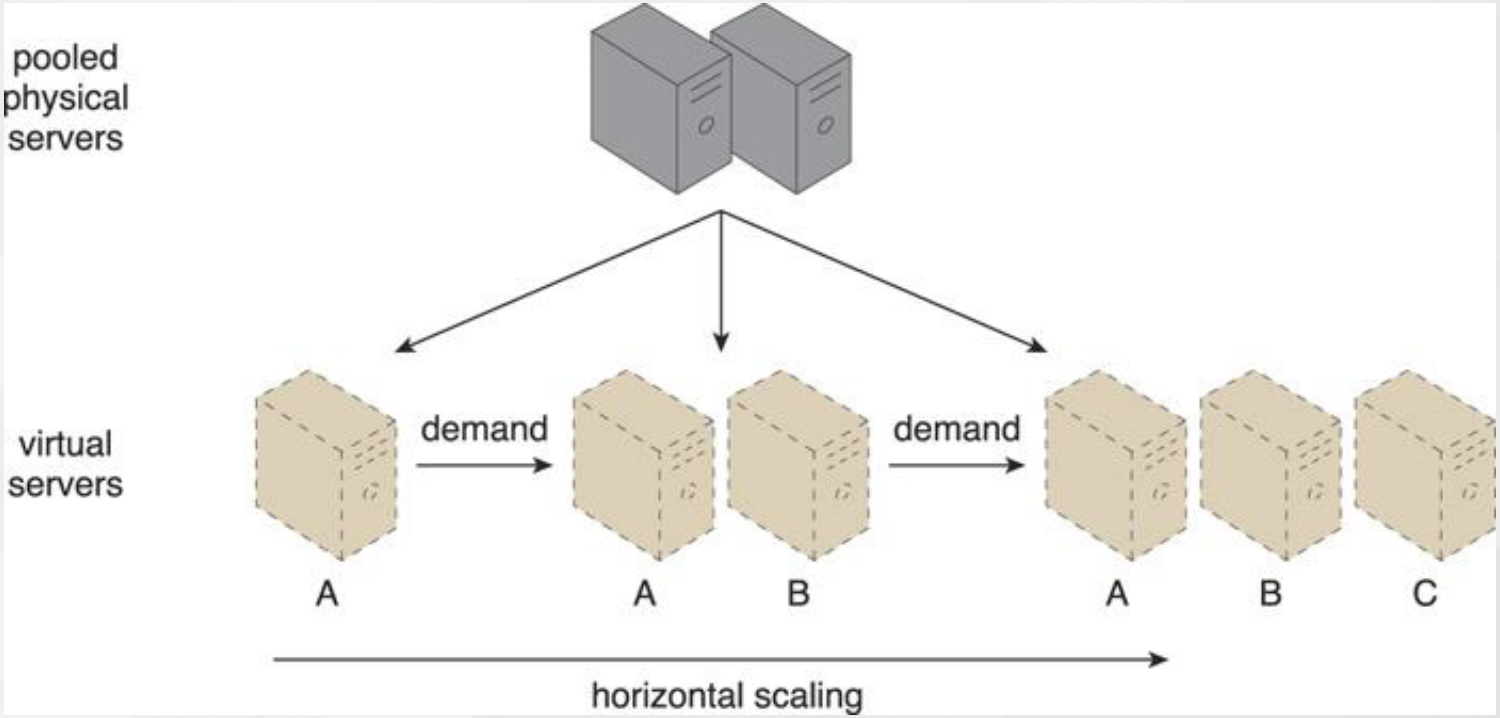


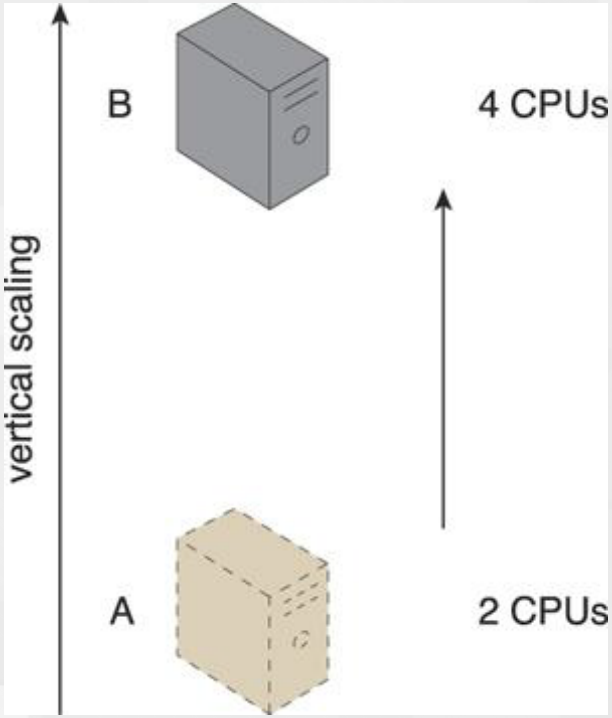
Figure 3.4 An IT resource (Virtual Server A) is scaled out by adding more of the same IT resources (Virtual Servers B and C).

Vertical Scaling

- When an existing IT resource is replaced by another with higher or lower capacity .
- The replacing of an IT resource with another that has a higher capacity is referred to as *scaling up.*
- The replacing an IT resource with another that has a lower capacity is considered *scaling down.*

Vertical Scaling

Figure 3.5 An IT resource (a virtual server with two CPUs) is scaled up by replacing it with a more powerful IT resource with increased capacity for data storage (a physical server with four CPUs).



A comparison of horizontal and vertical scaling

Horizontal Scaling	Vertical Scaling
less expensive (through commodity hardware components)	more expensive (specialized servers)
IT resources instantly available	IT resources normally instantly available
resource replication and automated scaling	additional setup is normally needed
additional IT resources needed	no additional IT resources needed
not limited by hardware capacity	limited by maximum hardware capacity

Cloud Service

- A *cloud service* is any IT resource that is made remotely accessible via a cloud.
- Cloud service usage conditions are typically expressed in a service-level agreement (SLA) that is the human-readable part of a service contract between a cloud provider and cloud consumer that describes QoS features, behaviors, and limitations of a cloud-based service or other provisions.

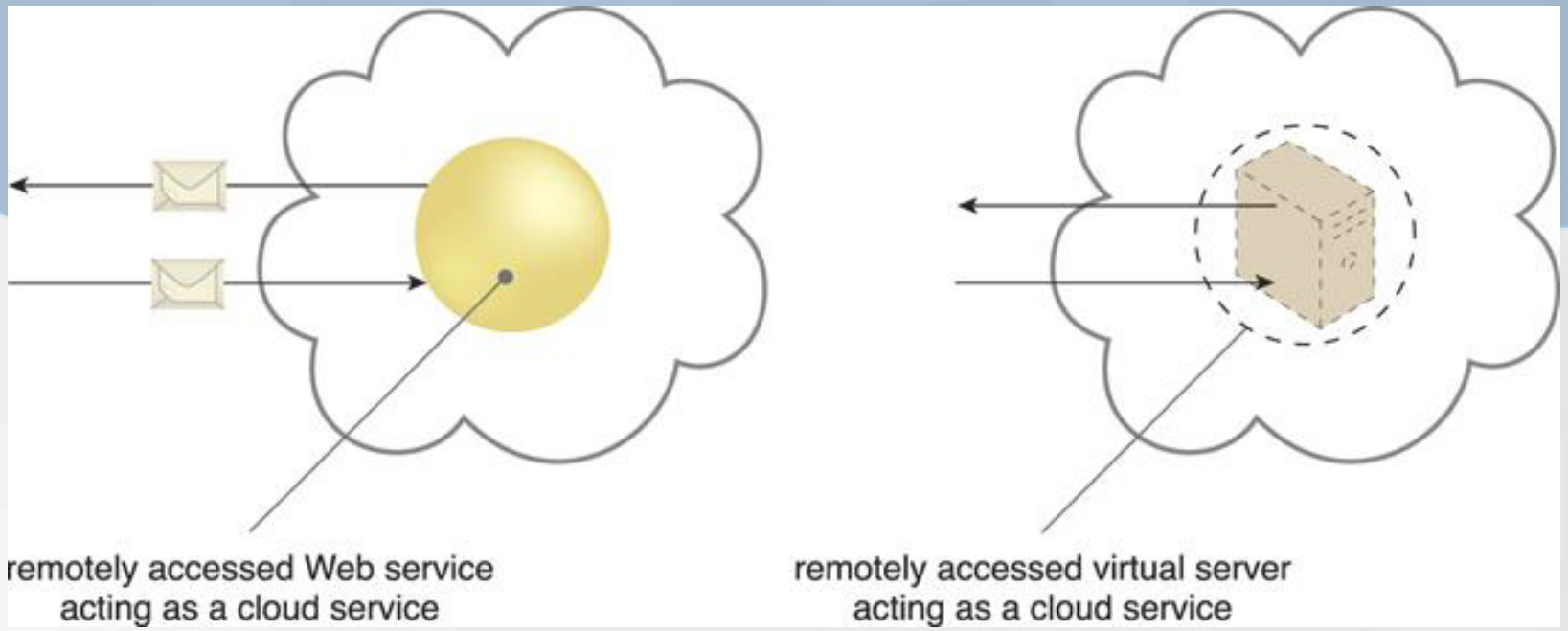


Figure 3.6 A cloud service with a published technical interface is being accessed by a consumer outside of the cloud (left). A cloud service that exists as a virtual server is also being accessed from outside of the cloud's boundary (right). The cloud service on the left is likely being invoked by a consumer program that was designed to access the cloud service's published technical interface. The cloud service on the right may be accessed by a human user that has remotely logged on to the virtual server.

Cloud Service Consumer

- The *cloud service consumer* is a temporary runtime role assumed by a software program when it accesses a cloud service.

Figure 3.7 Examples of cloud service consumers. Depending on the nature of a given diagram, an artifact labeled as a cloud service consumer may be a software program or a hardware device (in which case it is implied that it is running a software program capable of acting as a cloud service consumer).

Goals and Benefits

- Reduced Investments and Proportional Costs
- Increased Scalability
- Increased Availability and Reliability

Risks and Challenges

- Increased Security Vulnerabilities
- Reduced Operational Governance Control
- Limited Portability Between Cloud Providers
- Multi-Regional Compliance and Legal Issues