



I

Introduction to Cloud Computing

CERTIFICATION OBJECTIVES

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| I.01 | Cloud Computing: Common Terms and Definitions | I.05 | Positive Indicators for Cloud Readiness |
| I.02 | Cloud Computing and Virtualization | I.06 | Negative Indicators for Cloud Readiness |
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Over the past few years, virtualization and cloud computing have changed the way information technology (IT) is organized. It has become less important for companies to maintain their own local servers and more advantageous for them to share computing resources, which may be owned by a third-party service provider. Virtualization enables hardware to be shared among virtual servers. Cloud computing enables these servers to be shared with multiple users so that their location does not matter anymore, as shown in Figure 1-1.

CERTIFICATION OBJECTIVE 1.01

Cloud Computing: Common Terms and Definitions

Figure 1-2 illustrates that cloud computing is a business model using old technology (virtualization, servers, and disk storage) where ownership of physical resources rests with one party and where the service users are billed for their real use. An organization can even use virtualization for internal customers, or an organization can subscribe to cloud services over the Internet.

Cloud computing means different things to different types of people. An IT administrator might define it as the sharing of pooled computing resources over the Internet. A business owner could refer to cloud computing as using software that is hosted on a cloud provider's equipment, which could result in a cost advantage compared to hosting these services internally. A home user might refer to cloud computing in terms of the free storage of files at a cloud provider's site as opposed to storing files locally on a personal device.

All of these definitions share common characteristics, including the use of offsite hosted computing services accessible over a network, such as the Internet. However, these definitions differ in terms of what types of computing services are offered and

FIGURE 1-1

With cloud computing, location is not relevant.

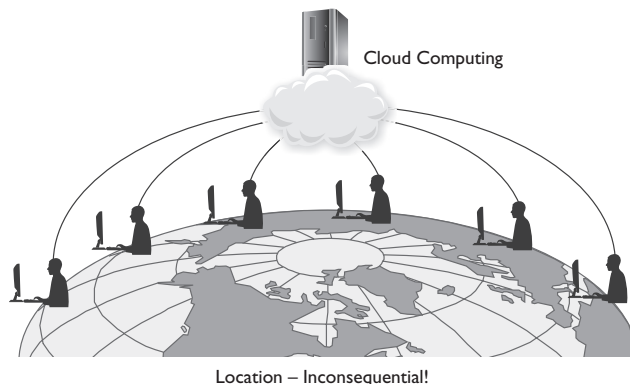
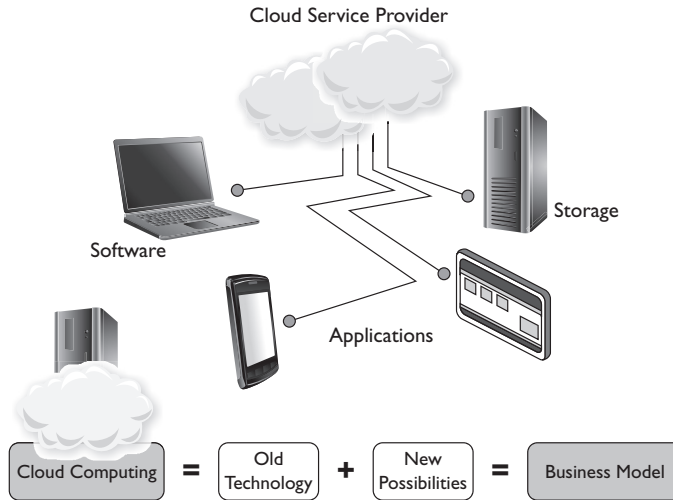


FIGURE 1-2

Cloud computing is a business model using old technology.



at what cost. Public cloud computing refers to IT services being offered to any user with an Internet connection, whereas private cloud computing refers to IT services being offered within a single organization on that organization's equipment.

With cloud computing, the cloud service provider hosts and gives access to the software and data storage. Data might be stored in one or more data centers and might even be replicated between data centers for data redundancy.

Existing technologies such as *virtualization* allows multiple computer operating systems (virtual servers, or cloud servers) to run simultaneously on one physical computer as if they were each running on their own dedicated computer.

There are distinct categories of cloud computing services. *Platform as a Service* (PaaS) allows developers to create and test software without the investment in expensive in-house hardware. *Software as a Service* (SaaS) answers desktop productivity needs for end users. *Infrastructure as a Service* (IaaS) allows IT operations personnel to run applications in the cloud instead of using in-house computing equipment.

As organizations grow or shrink, they can simply request more (or less) computing resources from their provider and pay the corresponding fee. This ability to rapidly add and remove computing resources is called *elasticity*. For paid cloud services, in addition to a monthly subscription fee, you would pay usage fees. For example, the more disk space you use to store files in the cloud, the more you would pay. This means capacity planning is an important skill since it can save organizations money.

Types of computing resources a client could consume include the following:

- Email accounts
- Data storage
- Data backup
- Servers (virtual machines)
- Customized websites

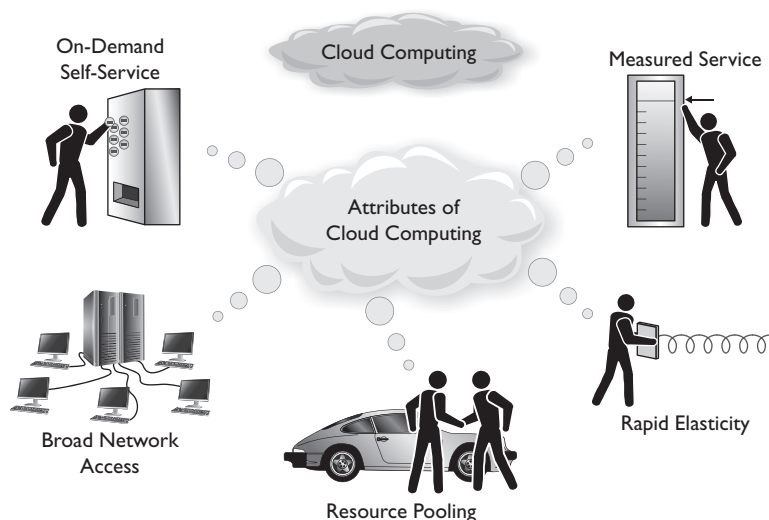
Cloud Computing Characteristics

The National Institute of Standards and Technology (NIST) states that cloud computing services have the following attributes, as shown in Figure 1-3:

- **Elasticity** You can add or remove services/users quickly. This allows an organization to grow or shrink on demand as there are spikes in business activity.
- **On-demand** You can access the service from anywhere, anytime, often simply using a web browser. The physical location of the software and your data at any given time is not known and may be spread across multiple data centers; this maximizes the “anywhere, anytime” nature of cloud computing.
- **Pooled computing resources at the provider’s site** The provider invests in the proper hardware, configuration, maintenance, and auditing of their physical infrastructure.
- **Monitored and measured service usage** Paid cloud services often have a monthly recurring subscription fee as well as usage fees. Time using a specific resource, percentage of processing capabilities, amount of disk space used—these are all monitored by the cloud provider that then charges customers accordingly.
- **Broad network access** Access to cloud services is available from any type of computing device such as a smartphone, table, laptop, or desktop computer over the Internet.

FIGURE 1-3

Cloud computing characteristics



exam**Watch**

Cloud elasticity is similar to scalability. Whereas scalability is defined as the ability of a system to grow to accommodate need, elasticity

allows cloud customers to not only increase but also decrease the amount of IT services consumed.

CERTIFICATION OBJECTIVE 1.02**Cloud Computing and Virtualization**

Virtualization technology makes cloud computing possible, and it has been around for decades. Providers can host many virtual machines based on client needs without allocating a physical server to each client. Some cloud offerings do allow clients to use physical servers, but this is costly and is not a common approach.

Nonvirtualized computers have one set of hardware and one set of software, as shown in Figure 1-4. Virtualization is a set of techniques for hiding hardware resources behind software abstractions to simplify the way in which other software or end users interact with those resources.

The popular press typically identifies virtualization as a category of vendor products. However, in an enterprise, virtualization should be understood as an integrated approach encompassing software, hardware, and a number of techniques and processes that, when taken together, increase the ease with which IT assets can be delivered, managed, and shared.

Besides creating cloud virtual servers on demand, you can even migrate a physical or virtual on-premises server in your organization to the cloud. This allows for a quicker and smoother transition to cloud-delivered services.

FIGURE 1-4

Multiple virtual machines run on a single virtualization host.



Virtual Environment

CERTIFICATION OBJECTIVE 1.03

Early Examples of Cloud Computing

The swinging 1960s introduced the concept of what we now know as cloud computing. Computing resources were so expensive during that era that time sharing became a common means of allowing different groups of people to use computing power concurrently by doing their work in isolated sessions. Government agencies, universities, and some private organizations were part of this. Cloud computing does not have to be available to public subscribers; *private clouds* offer computing access within an organization.

In the 1990s Hotmail was (and still is!) widely used as a *public cloud* service to access email from a web browser instead of a specific mail program. This meant you could access your email from any Internet-connected machine without having to install and configure specific mail software. *Application service providers* (ASPs) at this time offered additional services beyond email that were available to users through a web browser. ASPs differ from cloud services in that clients purchased specific software to be hosted by the ASP. The problem with this approach was that providers did not have expertise in the wide array of hosted software used by their clients. With cloud services, providers offer standard software to their clients, such as Hotmail or Google Docs; these both are examples of Software as a Service.

INSIDE THE EXAM

Don't get too caught up in technical details for the Cloud Essentials exam. Much of what you will be asked applies to making decisions that relate to business needs. This includes saving money while

not sacrificing performance, security, and reliability.

However, knowing the correct meaning for terminology and acronyms will go a long way toward ensuring your success, so keep reading!

CERTIFICATION OBJECTIVE 1.04

Cloud Computing Deployment Models

As we have seen, cloud computing can be available to any subscriber or just within an organization. In addition to the cloud service models, there are also a number of ways to deliver or roll out these cloud services. In some of these deployment models, the financial commitment lies with the organizations that use these clouds. This means they do not completely fit our earlier definitions of cloud computing.

- Private cloud
- Community cloud
- Public cloud
- Hybrid cloud

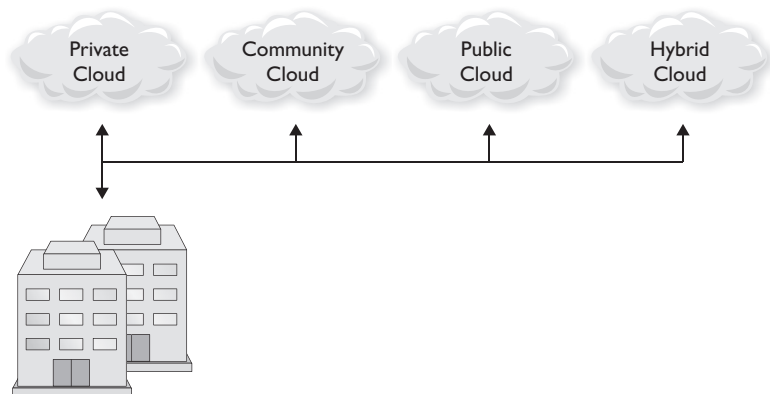
Figure 1-5 depicts the ways in which these cloud services can be deployed.

Private Cloud

Companies using their own hardware and software assets to deliver web services are said to be using a *private cloud*. This solution will usually use virtualization and may offer a web portal that allows managers to provision services for their users.

FIGURE 1-5

Cloud
deployment
models



Community Cloud

Community clouds pool computing resources and make them available to several organizations with common needs, such as very quick access time to an application or adherence to strict security and audit guidelines. Cloud customers are often referred to as *tenants*. *Multitenancy* often describes the multiple cloud customers using a shared pool of computing resources. Even if cloud customers are using the same cloud services, each customer must have an isolated computing environment from other cloud customers where their configurations and data are stored separately.

Public Cloud

Public clouds offer computing services to all Internet users. This is what most people think of when they think of cloud computing. Some cloud offerings are free, such as Gmail and Google Docs. Others, such as Microsoft Office 365, require that customers pay a subscription and usage fee for services delivered via their Internet connection. The service provider has made the investment in computing resources, and this frees up capital resources for enterprise customers.

An Internet connection is required for public cloud subscribers. The nature of the cloud service and how many local users will access it concurrently can sometimes necessitate a better Internet link. The amount of data throughput, often expressed in bits per second (bps), is referred to as *bandwidth*. A 100 megabit per second (100Mbps) connection allows more throughput than a 20Mbps connection.

Hybrid Cloud

Hybrid clouds are a combination of both public and private clouds. An organization can integrate some of their on-premises services with a cloud provider. For example, a company's local user accounts can be used to authenticate against cloud services such as cloud email and cloud storage. Authenticating users in one environment and authorizing them to use resources in a different environment is referred to as *federation*, which is discussed in further detail in Chapter 3.

A second hybrid cloud example might include a company with an on-premises email server that uses a cloud antivirus service. Of course, this would imply a trusted network connection between the mail server and the cloud provider.

Cloud computing appeals to business leaders because it is a business concept; in other words, you pay only for what you use ("pay as you go" or "rent instead of buy"). From a business or financial perspective, this could be interpreted as

meaning computing dollars can be categorized as operating costs rather than capital expenditures. Accountants and business leaders will not be interested in the underlying virtualization technology that makes this all possible. Chapter 3 discusses public and private cloud deployment models in more detail.

CERTIFICATION OBJECTIVE 1.05

Positive Indicators for Cloud Readiness

Buying hardware, buying software licenses, paying IT staff to install and support the hardware and software—these all require capital that might be put to better use elsewhere within an organization. For small and new businesses, the capital to invest in IT might be nonexistent. Paying only for what you use can be an affordable solution to meet your computing needs, and this applies equally to larger enterprises. Virtualization and cloud computing can overcome the following problems:

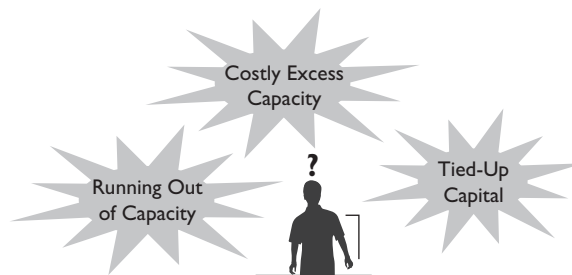
- Running out of capacity
- Costly excess capacity
- Tied-up capital

Figure 1-6 shows the problems that can be solved with the proper cloud solution.

Businesses that grow or shrink rapidly benefit greatly from elasticity. Sometimes projects undertaken by a business require an IT investment only until project completion. Why have expensive computer hardware and software sit idle at the end of a project? Cloud services can grow and shrink as your business needs do, and

FIGURE 1-6

Problems overcome by using cloud computing



you pay only for what you are using. Think of your water bill; you pay only for the amount of water you've used.

Netflix presents a great example of elastic infrastructure needs. Media content must be converted to many different formats since there are so many different viewing devices. Even though Netflix is Internet content delivered to the end user (otherwise known as Software as a Service), Netflix requires enormous processing and storage capabilities (also known as Infrastructure as a Service). Once the media conversion is complete, the usage charges for CPU utilization cease. Compare this to Netflix purchasing all of the hardware required for periodic media conversions.



One of the most common cloud computing concerns is data security. Cloud providers must pass periodic third-party audits, and as such your data is probably safer with them than with you. Despite this, many decision makers consider this a showstopper.

CERTIFICATION OBJECTIVE 1.06

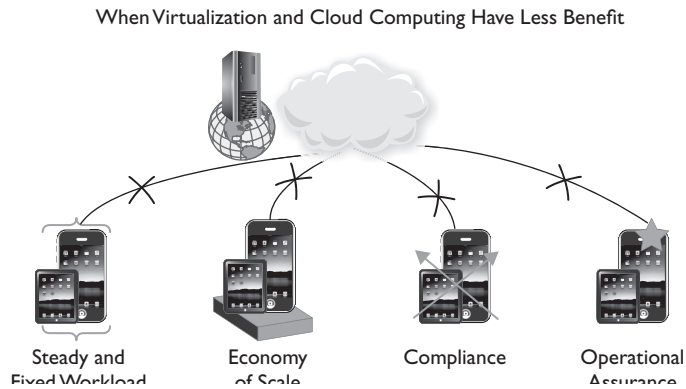
Negative Indicators for Cloud Readiness

Not all organizations benefit from virtualization and public cloud computing.

- Predictable and fixed workloads can typically make optimal use of their hardware and do not need the scaling.
- Organizations that own large data centers often have enough scale to be as flexible and efficient as cloud computing providers are. They will, however, typically benefit from virtualizing their infrastructure.
- Legal and security reasons, also termed *compliance reasons*, can require an organization to know more details about the location of its data and servers than a cloud computing provider can provide.
- Organizations with systems requiring a high degree of operational assurance, such as military systems and systems responsible for health, safety, and emergency response, may be a poor fit for the guarantees offered by typical public cloud service providers today.

FIGURE 1-7

Cloud computing is not always the best choice.



Cloud computing is not a cookie-cutter solution to all financial and technology challenges an organization may face, as shown in Figure 1-7. Care must be taken when evaluating potential cloud solutions.

As mentioned, essential services such as emergency, health, law enforcement, or the military may not be suitable cloud customers. Cloud providers provide *service level agreements* (SLAs) to their clients. SLAs guarantee clients a certain level of service and uptime, but this may not be acceptable to the essential services listed earlier.

CERTIFICATION OBJECTIVE 1.07

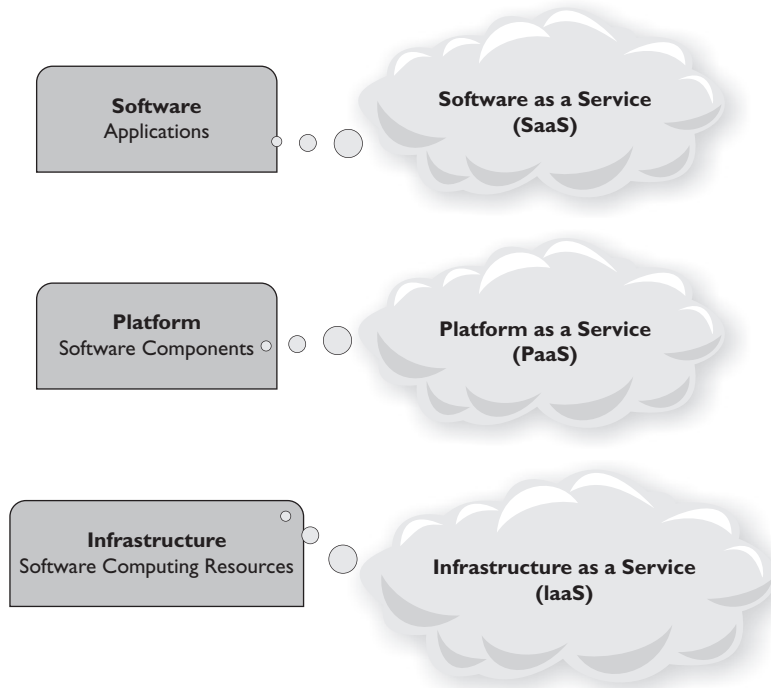
Cloud Service Categories

Cloud usage models have evolved over time as a result of user needs. What follows are the three most common cloud service categories, also listed in Figure 1-8.

- **Software as a Service (SaaS)** For users. A user account allows access to software that is accessible anytime from anywhere using a web browser. Data is stored in the cloud and thus facilitates collaboration. Examples include Gmail, Salesforce, and LinkedIn.
- **Platform as a Service (PaaS)** For developers. This service model allows rapid development of new applications and websites. Servers, networking, storage, databases, and so on, are made available by the cloud provider. Vendor-specific

FIGURE 1-8

Cloud computing models



tools present the issue of vendor lock-in. Examples include Windows Azure and Google App Engine.

- **Infrastructure as a Service (IaaS)** For IT administrators. Infrastructure includes the self-provisioning of servers, storage, and so on, via a web-based portal. This service model includes the creation of cloud servers, cloud-based storage, and backup. Examples include Rackspace and Amazon S3 Storage. Companies using some of these services include Shell, the *New York Times*, and NASDAQ.

Anything as a Service (XaaS) is a term for any service delivered over the Internet instead of being hosted locally on your network, so it includes IaaS, PaaS, SaaS, and many others.



There are many other classifications of cloud services such as Disaster Recovery as a Service (DRaaS), Desktop as a Service (DaaS), and many more.

exam**Watch**

Watch out for the wording on exam questions testing your knowledge of IaaS, PaaS, and SaaS. Remember that

SaaS is of interest to end users, PaaS is of interest to developers, and IaaS is of interest to IT administrators.

CERTIFICATION SUMMARY

This chapter defined cloud computing terms and provided examples illustrating their meaning. We discussed the meaning of terms such as *elasticity*, as well as how cloud services allow subscribers to pay only for services they use.

We then canvassed how virtualization makes cloud services possible. The cloud user may not even be aware that virtualized servers are hosting the services they use (SaaS), where other times the administrator creates their own virtual machines (IaaS).

Just like virtualization, we learned that cloud computing is not a new, cutting-edge technology. Time-sharing on expensive computer equipment in the 1960s paved the way for shared resource usage today with cloud computing.

Where virtualization is the enabling technology, cloud computing is a business concept. It sometimes makes business sense to allocate funds as operational costs (cloud computing) versus capital expenditures (locally hosted applications).

We then weighed the benefits and disadvantages of cloud solutions for differing organizations. Those with relatively unchanging IT workload demands and number of employees might not benefit from the cloud. Because cloud services can scale quickly, they make sense for businesses that grow and shrink and for businesses not interested or able to tie up capital in computer-related costs.

Finally, we identified types of cloud services and gave examples of each.



TWO-MINUTE DRILL

Cloud Computing: Common Terms and Definitions

- ☐ Cloud services are hosted on hardware at another location, and as such, the hardware is somebody else's responsibility.
- ☐ Cloud services are accessible on demand from any device using a web browser and an Internet connection.
- ☐ Elasticity allows you to add or remove cloud services or user accounts at any time.
- ☐ Virtualization allows multiple installed operating systems to run simultaneously on a single computer system.

Cloud Computing and Virtualization

- ☐ Virtualization hides the details related to physical hardware from a virtual machine.
- ☐ Virtualization is a technology, whereas cloud computing is a business model.
- ☐ Cloud computing can use self-provisioning web portals where administrators can create their own virtual machines in the cloud.
- ☐ An existing physical or virtual server in an organization can be migrated to the cloud to save configuration time.

Early Examples of Cloud Computing

- ☐ Time-sharing on expensive mainframe computers stems from the 1960s and was the first form of shared resource pooling.
- ☐ The 1980s and 1990s saw application service providers (ASPs) offering hosted solutions.
- ☐ Cloud services differ from ASPs in that clients don't buy software and provide it to ASPs for hosting; cloud clients simply pay to use software already offered by the provider.

Cloud Computing Deployment Models

- ☐ Cloud computing is a business concept where software is delivered to clients over the Internet, so there is minimal local hardware and software to maintain.
- ☐ Private clouds are designed within a specific organization.

- ☐ Community clouds are designed for multiple organizations sharing the same computing needs.
- ☐ Public clouds are available to any public subscriber on the Internet.
- ☐ Hybrid clouds combine a company's local private cloud with a provider's public cloud, often for authentication purposes.

Positive Indicators for Cloud Readiness

- ☐ Because of elasticity, cloud services are best suited for businesses that grow and shrink often or whose IT workloads are unpredictable.
- ☐ Investing in local hardware, software, and licensing, as well as IT support, can be costly; most of this gets shifted to the cloud provider.
- ☐ Similar to utilities such as water and electricity, with cloud computing you pay only for the services you use.

Negative Indicators for Cloud Readiness

- ☐ Predictable workloads better utilize costly computer hardware.
- ☐ Companies that do not grow or shrink dynamically do not need to scale their computer resource usage.
- ☐ Legal or regulatory requirements might disallow the use of cloud resources.
- ☐ Cloud reliability may not be enough for mission-critical systems related to law enforcement, military, or emergency services.

Cloud Service Categories

- ☐ Anything as a Service (XaaS) is a generic term for any computing service delivered over a network.
- ☐ Software as a Service (SaaS) is for end users and delivers a web app over the Internet to a user using a web browser.
- ☐ Platform as a Service (Paas) is for software developers and allows the use of virtual machine environments with specific development environments and back-end databases.
- ☐ Infrastructure as a Service (IaaS) is for IT administrators and includes cloud servers, cloud storage, cloud backup, and so on.

SELF TEST

The following questions will help you measure your understanding of the material presented in this chapter. Read all the choices carefully because there might be more than one correct answer.

Cloud Computing: Common Terms and Definitions

1. With cloud computing services, hardware purchases, software purchases, and IT support are the responsibility of whom?
 - A. Internet service provider
 - B. RaaS provider
 - C. SaaS provider
 - D. Application service provider
2. Which term best describes the ability to rapidly increase user accounts for a given cloud service?
 - A. Volatility
 - B. Synchronicity
 - C. Viability
 - D. Elasticity

Cloud Computing and Virtualization

3. Which option describes a benefit of virtualized servers?
 - A. Shared hardware
 - B. Individual hardware per virtual server
 - C. Physical servers taking less room space than virtual servers
 - D. Virtual servers taking less disk space than physical servers
4. Your company runs a virtualized web application server in-house. You decide to make the web applications available over the Internet through a cloud provider. Which method represents the quickest way to accomplish this?
 - A. Create a new cloud server, install web services, and install and configure web applications.
 - B. Create a new cloud server, install web services, and import web application data.
 - C. Migrate your in-house web application server to the cloud.
 - D. This cannot be done—only generic applications are available through the cloud.

Early Examples of Cloud Computing

5. Which term from the past describes the sharing of mainframe computing resources?
 - A. Time-sharing
 - B. Time division multiplexing
 - C. Mainframe-sharing
 - D. XaaS
6. Purchasing software and providing it to a third party that installs and manages that software is an example of which of the following?
 - A. Virtualization
 - B. Application service provider
 - C. Platform as a service
 - D. Private cloud

Cloud Computing Deployment Models

7. You are the IT director for a retail clothing outlet. Your competitors are using Internet-delivered inventory, storage, and backup solutions from a specific provider. You conclude it is best that your company use the same services from the same provider. What type of cloud will you be subscribing to?
 - A. Community cloud
 - B. Retail cloud
 - C. Private cloud
 - D. Public cloud

Positive Indicators for Cloud Readiness

8. For which businesses would cloud computing be best suited? (Choose two.)
 - A. Waterfront marketplace that thrives during the summer tourist season
 - B. Rural medical practice with four employees
 - C. Law enforcement agency
 - D. A new company start-up that manufactures watercraft

Negative Indicators for Cloud Readiness

9. Which of the following are valid reasons for not adopting a cloud solution? (Choose two.)
- A. Local hardware is being fully utilized for unchanging IT workloads.
 - B. The number of employees rarely changes.
 - C. The number of employees changes often.
 - D. A business experiences unpredictable project spikes throughout the year.

Cloud Service Categories

10. As a developer for a software company, you have decided to build and test your web applications in a cloud environment. Which type of cloud service best meets your needs?
- A. PaaS
 - B. SaaS
 - C. IaaS
 - D. XaaS

SELF TEST ANSWERS

Cloud Computing: Common Terms and Definitions

1. With cloud computing services, hardware purchases, software purchases, and IT support are the responsibility of whom?
 - A. Internet service provider
 - B. RaaS provider
 - C. SaaS provider
 - D. Application service provider

☒ **C.** Software as a Service (SaaS) providers deliver web-based software over an Internet connection. The user requires only a machine with a web browser to connect. The cloud providers must supply the hardware and software to deliver the service over the Internet.

☒ **A** is incorrect. Internet service providers present us with a connection to the Internet but not cloud services. **B** is incorrect. RaaS is not a valid acronym that relates to cloud computing. **D** is incorrect because application service providers (ASPs) are not the same as cloud providers; ASPs host software that you provide to them.

2. Which term best describes the ability to rapidly increase user accounts for a given cloud service?
 - A. Volatility
 - B. Synchronicity
 - C. Viability
 - D. Elasticity

☒ **D.** Elasticity allows consumer of cloud services to quickly add or remove user accounts.

☒ **A, B, and C** are incorrect because these terms are not related to rapidly adding user accounts related to a cloud service.

Cloud Computing and Virtualization

3. Which option describes a benefit of virtualized servers?
 - A. Shared hardware
 - B. Individual hardware per virtual server
 - C. Physical servers taking less room space than virtual servers
 - D. Virtual servers taking less disk space than physical servers

- ☒ **A.** A single physical server can host multiple virtual machines so that the hardware is shared by the virtual machines.
- ☒ **B, C, and D** are incorrect. Virtual servers do not each have their own hardware; they share the physical hardware of the virtualization host. Physical servers take much more physical room space than virtual servers, of which there could be many running on a single physical server. Disk space varies depending on the role of the server, whether it is physical or virtual.

4. Your company runs a virtualized web application server in-house. You decide to make the web applications available over the Internet through a cloud provider. Which method represents the quickest way to accomplish this?
- A.** Create a new cloud server, install web services, and install and configure web applications.
 - B.** Create a new cloud server, install web services, and import web application data.
 - C.** Migrate your in-house web application server to the cloud.
 - D.** This cannot be done—only generic applications are available through the cloud.

- ☒ **C.** Since the in-house server is already virtualized, it is quicker to simply migrate it to the cloud as a cloud server.
- ☒ **A and B** are incorrect because they both involve the creation of the web application server from scratch—this is not a quick method. **D** is incorrect because the cloud offers much more than simply generic web apps.

Early Examples of Cloud Computing

5. Which term from the past describes the sharing of mainframe computing resources?
- A.** Time-sharing
 - B.** Time division multiplexing
 - C.** Mainframe-sharing
 - D.** XaaS

- ☒ **A.** Time-sharing allowed groups of people to use expensive mainframe computing resources concurrently by working in isolated computing sessions.
- ☒ **B** is incorrect because time division multiplexing is a signal transmission protocol. **C** is not an industry-accepted term. **D** refers to any web service delivered over the Internet (Anything as a Service) and thus is incorrect.

6. Purchasing software and providing it to a third party that installs and manages that software is an example of which of the following?
- A. Virtualization
 - B. Application service provider
 - C. Platform as a service
 - D. Private cloud

☒ B. Application service providers (ASPs) host software that their client provides.
☒ A, C, and D are incorrect. Virtualization uses physical hardware to run multiple virtual machines. Platform as a Service is a cloud solution for software developers. Private clouds deliver services over networks to private organizations.

Cloud Computing Deployment Models

7. You are the IT director for a retail clothing outlet. Your competitors are using Internet-delivered inventory, storage, and backup solutions from a specific provider. You conclude it is best that your company use the same services from the same provider. What type of cloud will you be subscribing to?
- A. Community cloud
 - B. Retail cloud
 - C. Private cloud
 - D. Public cloud

☒ A. Community clouds are used by organizations with the same type of computing needs.
☒ B is incorrect because there is no such thing as a retail cloud. C and D are incorrect because private clouds serve a single organization, while *public cloud* is a much too generic term; community cloud is the best answer.

Positive Indicators for Cloud Readiness

8. For which businesses would cloud computing be best suited? (Choose two.)
- A. Waterfront marketplace that thrives during the summer tourist season
 - B. Rural medical practice with four employees
 - C. Law enforcement agency
 - D. A new company start-up that manufactures watercraft

- ☒ **A and D.** A waterfront marketplace that thrives seasonally means more computing resources are needed during certain times of the year; cloud computing provides elasticity, which means adding or removing computing services and user accounts as needed. New companies present a financial risk and may not have the desire to invest capital in computing resources on-site, so cloud computing offers an affordable solution without an expensive long-term commitment.
- ☒ **B and C** are incorrect. These choices are not great cloud computing candidates since they deal with very sensitive data that is protected by legislation.

Negative Indicators for Cloud Readiness

9. Which of the following are valid reasons for not adopting a cloud solution? (Choose two.)
- A. Local hardware is being fully utilized for unchanging IT workloads.
 - B. The number of employees rarely changes.
 - C. The number of employees changes often.
 - D. A business experiences unpredictable project spikes throughout the year

- ☒ **A and B.** If local hardware is being fully and efficiently utilized for unchanging IT workloads, there is no benefit to using a cloud solution. Also, if the number of employees rarely changes, the business will not benefit from elasticity.
- ☒ **C and D** are incorrect because they are valid reasons for adopting a cloud solution.

Cloud Service Categories

10. As a developer for a software company, you have decided to build and test your web applications in a cloud environment. Which type of cloud service best meets your needs?
- A. PaaS
 - B. SaaS
 - C. IaaS
 - D. XaaS

- ☒ **A.** Platform as a Service (PaaS) offers developers an inexpensive method by which they can develop and test their applications.
- ☒ **B** is incorrect because Software as a Service (SaaS) delivers end-user software over the Internet. **C** is incorrect because Infrastructure as a Service (IaaS) allows administrators to use cloud servers, storage, backup, networking, and so on. **D** does not apply since Anything as a Service (XaaS) is a generic term and PaaS is specific to the stated need.