Module 1

- Introduction to cloud computing

- Advantages of cloud computing

- Introduction to Amazon Web Services (AWS)

- AWS Cloud Adoption Framework (AWS CAF)

Introduction to cloud computing

Cloud computing is the on-demand delivery of compute power, database, storage, applications, and other IT resources via the internet with pay-as-you-go pricing.

 These resources run on server computers that are located in large data centers in different locations around the world. When you use a cloud service provider like AWS, that service provider owns the computers that you are using.

These resources can be used together like building blocks to build solutions that help meet business goals and satisfy technology requirements.

→ Infrastructure as software

Traditional computing model

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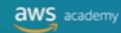
- Infrastructure as hardware
- Hardware solutions:
  - Require space, staff, physical security, planning, capital expenditure
  - Have a long hardware procurement cycle
  - Require you to provision capacity by guessing theoretical maximum peaks

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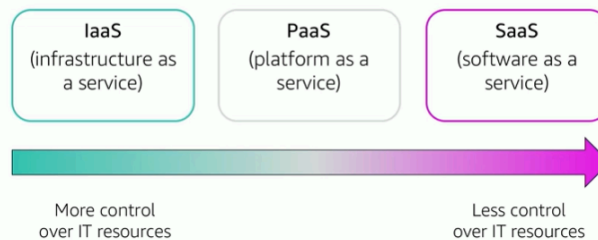

Cloud computing model

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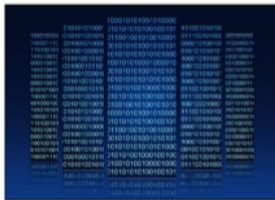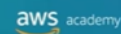
- Infrastructure as software
- Software solutions:
  - Are flexible
  - Can change more quickly, easily, and cost-effectively than hardware solutions
  - Eliminate the undifferentiated heavy-lifting tasks

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Cloud service models

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| IaaS (infrastructure as a service) | PaaS (platform as a service) | SaaS (software as a service) |

More control over IT resources → Less control over IT resources

There are three main cloud service models. Each model represents a different part of the cloud computing stack and gives you a different level of control over your IT resources:

• **Infrastructure as a service (IaaS):** Services in this category are the basic building blocks for cloud IT and typically provide you with access to networking

features, computers (virtual or on dedicated hardware), and data storage space. IaaS provides you with the highest level of flexibility and management control over your IT resources. It is the most similar to existing IT resources that many IT departments and developers are familiar with today.

• **Platform as a service (PaaS):** Services in this category reduce the need for you to manage the underlying infrastructure (usually hardware and operating systems) and enable you to focus on the deployment and management of your applications.

• **Software as a service (SaaS):** Services in this category provide you with a completed product that the service provider runs and manages. In most cases, software as a service refers to end-user applications. With a SaaS offering, you do not have to think about how the service is maintained or how the underlying infrastructure is managed. You need to think only about how you plan to use that particular piece of software. A common example of a SaaS application is web-based email, where you can send and receive email without managing feature additions to the email product or maintaining the servers and operating systems that the email program runs on.
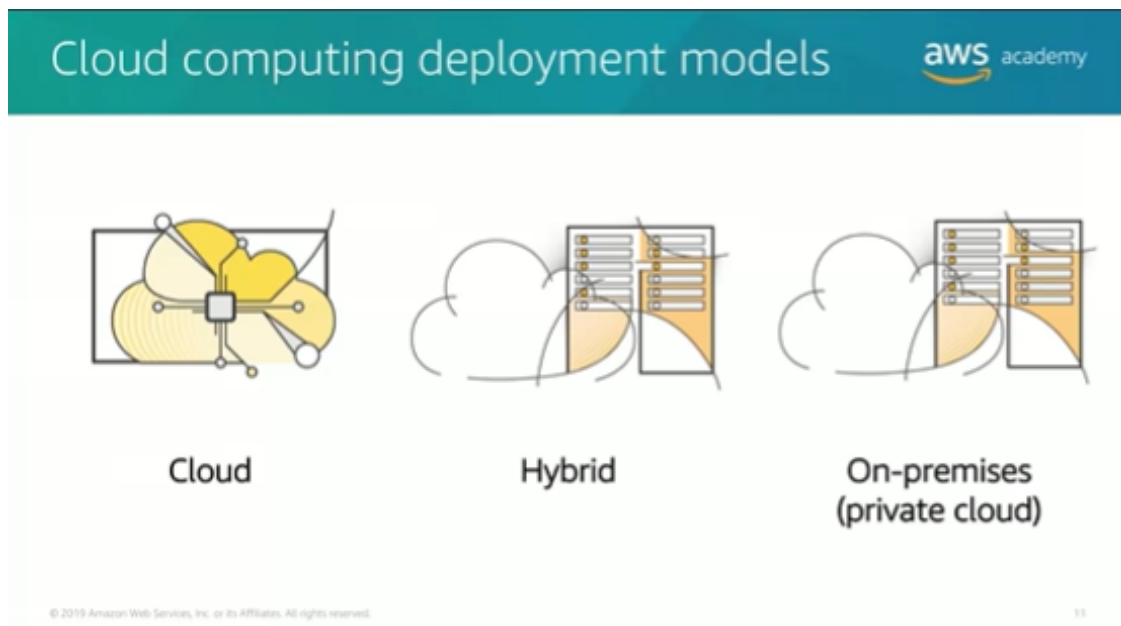
There are three main cloud computing deployment models, which represent the cloud environments that your applications can be deployed in:

• **Cloud:** A cloud-based application is fully deployed in the cloud, and all parts of the application run in the cloud. Applications in the cloud have either been created in the cloud or have been migrated from an existing infrastructure to take advantage of the benefits of cloud computing. Cloud-based applications can be built on low-level infrastructure pieces or they can use higher-level services that provide abstraction from the management, architecting, and scaling requirements of core infrastructure.

• **Hybrid:** A hybrid deployment is a way to connect infrastructure and applications between cloud-based resources and existing resources that are not located in the cloud. The most common method of hybrid deployment is between the cloud and existing on-premises infrastructure. This model enables an organization to extend and grow their infrastructure into the cloud while connecting cloud resources to internal systems.

• **On-premises:** Deploying resources on-premises, using virtualization and resource management tools, is sometimes called private cloud. While on-premises deployment does not provide many of the benefits of cloud computing, it is sometimes sought for its ability to provide dedicated resources. In most cases, this deployment model is the same as legacy IT infrastructure, but it might also use application management and virtualization technologies to increase resource utilization.
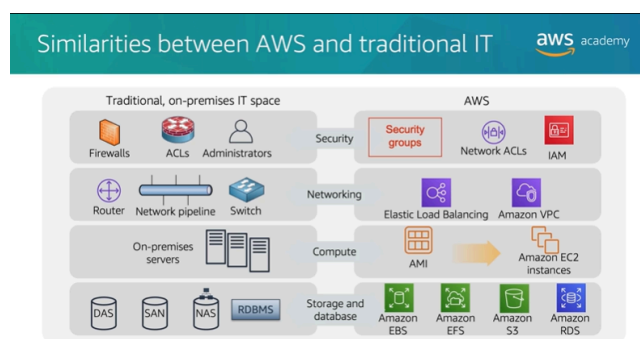
There are many similarities between AWS and the traditional, on-premises IT space:

• AWS security groups, network access control lists (network ACLs), and AWS Identity and Access Management (IAM) are similar to firewalls, access control lists

(ACLs), and administrators.

• Elastic Load Balancing and Amazon Virtual Private Cloud (Amazon VPC) are similar to routers, network pipelines, and switches.

• Amazon Machine Images (AMIs) and Amazon Elastic Compute Cloud (Amazon EC2) instances are similar to on-premises servers.

• Amazon Elastic Block Store (Amazon EBS), Amazon Elastic File System (Amazon EFS), Amazon Simple Storage Service (Amazon S3), and Amazon Relational Database Service (Amazon RDS) are similar to direct attached storage (DAS), storage area networks (SAN), network attached storage (NAS), and a relational database management service (RDBMS).

With AWS services and features, you can do almost everything that you would want to do with a traditional data center

A router is a device that enables all of your wired and wireless devices to access the internet simultaneously and to communicate with one another.

*Switching in IT and computer networking is **the transfer of data packets, or blocks of data, through a network switch.***

*An **on-premise server** is a physical, on-site server that a company must manage and maintain individually.*

- *Direct Attached Storage (DAS)*
- *Network Attached Storage (NAS)*
- *Storage Area Network (SAN)*

STORAGE TYPES COMPARISON

Section 1 key takeaways

- Cloud computing is the on-demand delivery of IT resources via the internet with pay-as-you-go pricing.
- Cloud computing enables you to think of (and use) your infrastructure as software.
- There are three cloud service models: IaaS, PaaS, and SaaS.
- There are three cloud deployment models: cloud, hybrid, and on-premises or private cloud.
- Almost anything you can implement with traditional IT can also be implemented as an AWS cloud computing service.

Some key takeaways from this section of the module include:
- Cloud computing is the on-demand delivery of IT resources via the internet with pay-as-you-go pricing.
- Cloud computing enables you to think of (and use) your infrastructure as software.
- There are three cloud service models: IaaS, PaaS, and SaaS.
- There are three cloud deployment models: cloud, hybrid, and on-premises or private cloud.
- There are many AWS service analogs for the traditional, on-premises IT space.

Advantages of cloud computing

1. Trade capital expense for variable expense

2. Massive economies of scale

3. Stop guessing capacity

4. Increase speed and agility

5. Stop spending money on running and maintaining data centers

6. Go global in minutes

The key takeaways from this section of the module include the six advantages of cloud computing:
- Trade capital expense for variable expense
- Massive economies of scale
- Stop guessing capacity
- Increase speed and agility
- Stop spending money on running and maintaining data centers
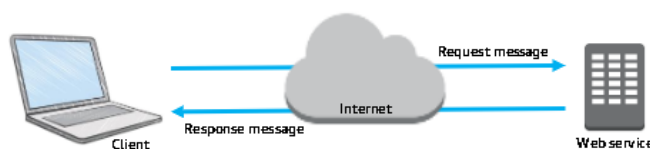- Go global in minutes

Introduction to AWS

A web service is any piece of software that makes itself available over the internet and uses a standardized format - such as Extensible Markup Language (XML) or JavaScript Object Notation (JSON) - for the request and the response of an application programming interface (API) interaction.

AWS

compute - In cloud computing, the term "compute" describes concepts and objects related to software computation. It is a generic term used to reference processing power, memory, networking, storage, and other resources required for the computational success of any program.

Categories of AWS services

Simple solution example
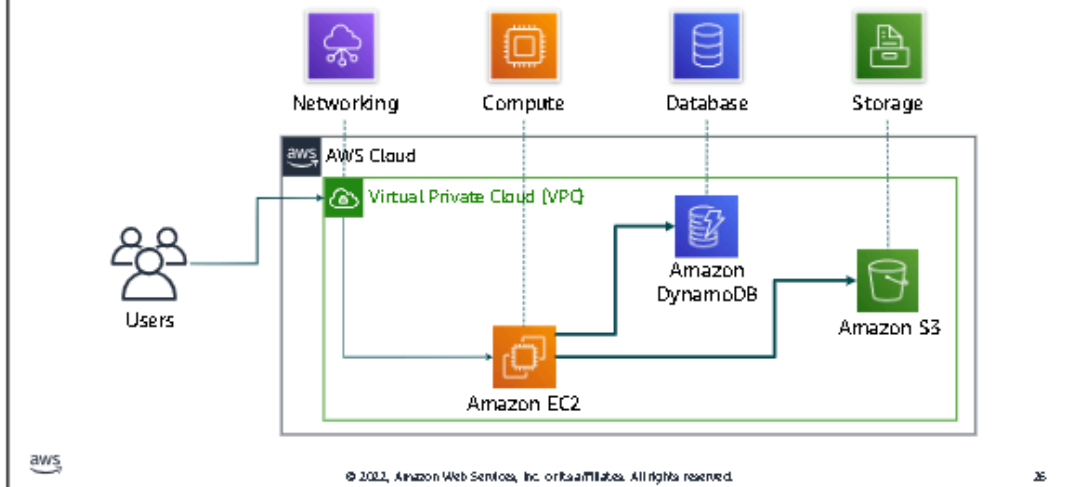
For example, say you're building a database application. Your customers might be sending data to your Amazon Elastic Compute Cloud (Amazon EC2) instances, which is a service in the compute category. These EC2 servers batch the data in one-minute increments and add an object per customer to Amazon Simple Storage Service (Amazon S3), the AWS storage service you've chosen to use. You can then use a nonrelational database like Amazon DynamoDB to power your application, for example, to build an index so that you can find all the objects for a given customer that were collected over a certain period. You might decide to run these services inside an Amazon Virtual Private Cloud (Amazon VPC), which is a service in the networking category.

The purpose of this simple example is to illustrate that you can select web services from different categories and use them together to build a solution (in this case, a database application). Of course, the solutions you build can be quite complex.
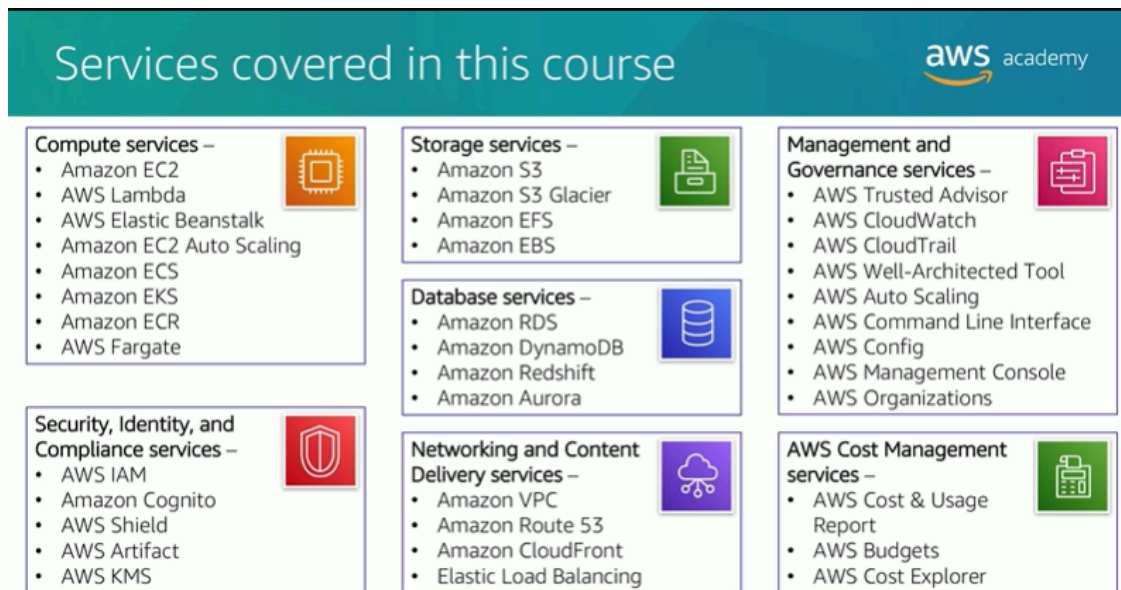
Which service you choose to use will depend on your business goals and technology requirements. In the example you just looked at, the solution made use of Amazon EC2 as the compute service. However, that is only one of many compute services that AWS offers. Here are some other AWS compute offerings that you might choose to use for the following example use cases:

• Amazon EC2(https://aws.amazon.com/ec2/): You want complete control over your AWS computing resources.

• AWS Lambda (https://aws.amazon.com/lambda/): You want to run your code and not manage or provision servers.

• AWS Elastic Beanstalk (https://aws.amazon.com/elasticbeanstalk/): You want a service that deploys, manages, and scales your web applications for you.

• Amazon Lightsail(https://aws.amazon.com/lightsail/): You need a lightweight cloud platform for a simple web application.

• AWS Batch (https://aws.amazon.com/batch/): You need to run hundreds of thousands of batch workloads.

• AWS Outposts (https://aws.amazon.com/outposts/): You want to run AWS infrastructure in your on-premises data center.

• Amazon Elastic Container Service (Amazon ECS) (https://aws.amazon.com/ecs/)

• Amazon Elastic Kubernetes Service (Amazon EKS) (https://aws.amazon.com/eks/)

• AWS Fargate(https://aws.amazon.com/fargate/): You want to implement a containers or microservices architecture.

• VMware Cloud on AWS (https://aws.amazon.com/vmware/): You have an on-premises server virtualization platform that you want to migrate to AWS.

Similarly, there are a variety of services for you to choose from in the other categories, and the number of offerings keeps growin

Services covered in this course

Compute services –
- Amazon EC2
- AWS Lambda
- AWS Elastic Beanstalk
- Amazon EC2 Auto Scaling
- Amazon ECS
- Amazon EKS
- Amazon ECR
- AWS Fargate

Storage services –
- Amazon S3
- Amazon S3 Glacier
- Amazon EFS
- Amazon EBS

Database services –
- Amazon RDS
- Amazon DynamoDB
- Amazon Redshift
- Amazon Aurora

Management and Governance services –
- AWS Trusted Advisor
- AWS CloudWatch
- AWS CloudTrail
- AWS Well-Architected Tool
- AWS Auto Scaling
- AWS Command Line Interface
- AWS Config
- AWS Management Console
- AWS Organizations

Security, Identity, and Compliance services –
- AWS IAM
- Amazon Cognito
- AWS Shield
- AWS Artifact
- AWS KMS

Networking and Content Delivery services –
- Amazon VPC
- Amazon Route 53
- Amazon CloudFront
- Elastic Load Balancing

AWS Cost Management services –
- AWS Cost & Usage Report
- AWS Budgets
- AWS Cost Explorer

Three ways to interact with AWS

AWS Management Console
Easy-to-use graphical interface

Command Line Interface (AWS CLI)
Access to services by discrete commands or scripts

Software Development Kits (SDKs)
Access services directly from your code (such as Java, Python, and others)

You might wonder how to access the broad array of services that are offered by AWS. There are three ways to create and manage resources on the AWS Cloud:

• **AWS Management Console:** The console provides a rich graphical interface to a majority of the features offered by AWS. (Note: From time to time, new features might not have all of their capabilities included in the console when the feature initially launches.)

• **AWS Command Line Interface (AWS CLI):** The AWS CLI provides a suite of utilities that can be launched from a command script in Linux, macOS, or Microsoft Windows.

• **Software development kits (SDKs):** AWS provides packages that enable accessing AWS in a variety of popular programming languages. This makes it easy to use AWS in your existing applications and it also enables you to create applications that deploy and monitor complex systems entirely through code

Section 3 key takeaways

- AWS is a secure cloud platform that offers a broad set of global cloud-based products called services that are designed to work together.
- There are many categories of AWS services, and each category has many services to choose from.
- Choose a service based on your business goals and technology requirements.
- There are three ways to interact with AWS services.

The key takeaways from this section of the module include:
- AWS is a secure cloud platform that offers a broad set of global cloud-based products called services that are designed to work together.
- There are many categories of AWS services, and each category has many services to choose from.
- Choose a service based on your business goals and technology requirements.
- There are three ways to interact with AWS services.

Moving to AWS cloud

-using the Cloud Adoption Framework
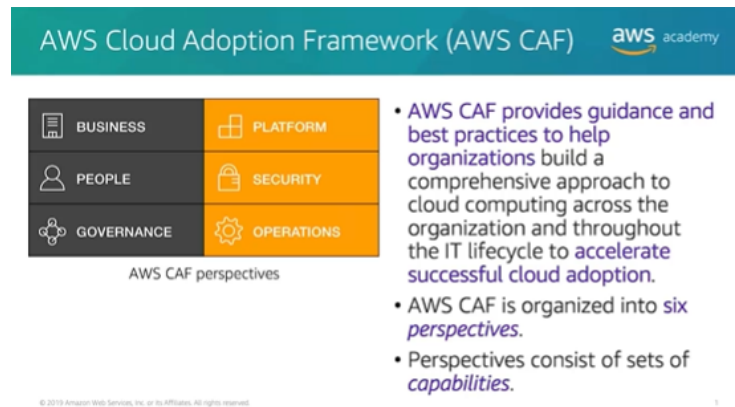
Each organization's cloud adoption journey is unique. However, in order for any organization to successfully migrate its IT portfolio to the cloud, three elements (that is, people, process, and technology) must be in alignment. Business and technology leaders in an organization must understand the organization's current state, target state, and the transition that is needed to achieve the target state so they can set goals and create processes for staff.

The AWS Cloud Adoption Framework (AWS CAF) provides guidance and best practices to help organizations identify gaps in skills and processes. It also helps organizations build a comprehensive approach to cloud computing—both across the organization and throughout the IT lifecycle—to accelerate successful cloud adoption.

At the highest level, the AWS CAF organizes guidance into six areas of focus, called perspectives. Perspectives span people, processes, and technology. Each perspective consists of a set of capabilities, which covers distinct responsibilities that are owned or managed by functionally related stakeholders.

Capabilities within each perspective are used to identify which areas of an organization require attention. By identifying gaps, prescriptive work streams can be created that support a successful cloud journey

In general, the Business, People, and Governance perspectives focus on business capabilities, while the Platform, Security, and Operations perspectives focus on technical capabilities.
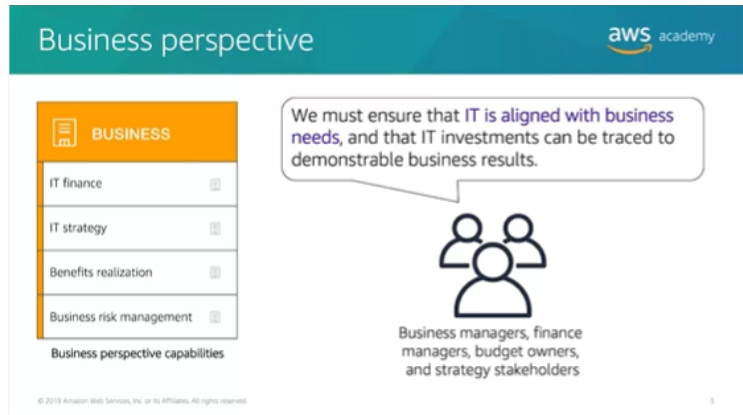
Governance perspective
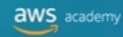
GOVERNANCE

Portfolio management

Program and project management

Business performance measurement

License management

Governance perspective capabilities

We must ensure that skills and processes align IT strategy and goals with business strategy and goals so the organization can maximize the business value of its IT investment and minimize business risks.

CIO, program managers, enterprise architects, business analysts, and portfolio managers

Platform perspective

PLATFORM

Compute provisioning

Network provisioning

Storage provisioning

Database provisioning

Systems and solution architecture

Application development
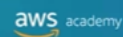
Platform perspective capabilities

We must understand and communicate the nature of IT systems and their relationships. We must be able to describe the architecture of the target state environment in detail.

CTO, IT managers, and solutions architects

Security perspective

SECURITY

Identity and access management

Detective control

Infrastructure security

Data protection
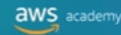
Incident response

Security perspective capabilities

We must ensure that the organization meets its security objectives.

CISO, IT security managers, and IT security analysts

Operations perspective

OPERATIONS

- Service monitoring
- Application performance monitoring
- Resource inventory management
- Release management/ change management
- Reporting and analytics
- Business continuity/ Disaster recovery
- IT service catalog

Operations perspective capabilities

We align with and support the operations of the business, and define how day-to-day, quarter-to-quarter, and year-to-year business will be conducted.

IT operations managers and IT support managers

Section 4 key takeaways

- Cloud adoption is not instantaneous for most organizations and requires a thoughtful, deliberate strategy and alignment across the whole organization.
- The AWS CAF was created to help organizations develop efficient and effective plans for their cloud adoption journey.
- The AWS CAF organizes guidance into six areas of focus, called perspectives.
- Perspectives consist of sets of business or technology capabilities that are the responsibility of key stakeholders.

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