**AWS Overview Notes**

**What Is Cloud Computing?**

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

**Six Advantages and Benefits of Cloud Computing**

* Trade capital expenses for variable expense
* Benefit from massive economies of scale
* Stop guessing capacity
* Increase speed and agility
* Stop spending money on running and maintaining data centers
* Go global in minutes

Additional information is available at: <https://aws.amazon.com/what-is-cloud-computing/>.

**Deployment Models**

There is a range of deployment models, from all on-premises to fully deployed in the cloud. Many users begin with a new project in the cloud, and they might integrate some on-premises applications with these new projects in a hybrid architecture. They might decide to keep some legacy systems on-premises. Over time, they might migrate more and more of their infrastructure to the cloud, and they might eventually reach an all-in-the-cloud deployment.

Details can be found at: <https://aws.amazon.com/types-of-cloud-computing/>.

**Products and Services**

AWS offers a broad set of global cloud-based products, including compute, storage, databases, analytics, networking, mobile, developer tools, management tools, Internet of Things (IoT), security, and enterprise applications.

Details can be found at: <https://aws.amazon.com/products/>.

**AWS Partner Network (APN)**

APN Partners are focused on your success, and they help customers take full advantage of all the business benefits that AWS has to offer.

More details about accessing the AWS Partner Network--or becoming an AWS Partner--can be found at: <https://aws.amazon.com/partners/>.

**AWS Marketplace**

The AWS Marketplace is a digital catalog with thousands of software listings from independent software vendors, where you can find, test, buy, and deploy software to run on AWS.

These offerings can range from simple web server applications to security, networking business intelligence, databases, DevOps, and media. Many of these applications offer pay-as-you-go or Bring Your Own License (BYOL) models.

Details on the AWS Marketplace can be found at: <https://aws.amazon.com/marketplace>

<https://aws.amazon.com/what-is-cloud-computing/>

<https://aws.amazon.com/types-of-cloud-computing/>

<https://aws.amazon.com/partners/>

<https://aws.amazon.com/marketplace>

<https://aws.amazon.com/about-aws/global-infrastructure/>

<https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.RegionsAndAvailabilityZones.html>

## Compute Services Notes

Building and running your application starts with compute, whether you are building enterprise, cloud-native, or mobile applications; or running massive clusters to sequence the human genome.

AWS offers a comprehensive portfolio of compute services that allow you to develop, deploy, run, and scale your applications and workloads in the world’s most powerful, secure, and innovative compute cloud.

Details about the full range of AWS compute services can be found [here](https://aws.amazon.com/products/compute/) .

<https://aws.amazon.com/products/compute/>

Later in this module, you will learn about both Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Lightsail. See those sections for more details.

Both serverless computing and container services are beyond the scope of this class. We will cover these topics in subsequent courses, but the following descriptions provide an introduction to some of the key services for serverless computing and containers.

## AWS Lambda

AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume--there is no charge when your code isn't running. Additional information about Lambda can be found at: <https://aws.amazon.com/lambda>

## AWS Container Services

Amazon Elastic Container Service (Amazon ECS) is a highly scalable, high-performance container orchestration service that supports Docker containers. It allows you to run and scale containerized applications on AWS. You can find more details at: <https://aws.amazon.com/ecs/>

Amazon Elastic Container Service for Kubernetes (Amazon EKS) makes it straightforward to deploy, manage, and scale containerized applications that use Kubernetes on AWS. Details can be found at: <https://aws.amazon.com/eks/>

AWS Fargate is a compute engine for Amazon ECS and Amazon EKS that allows you to run containers without having to manage servers or clusters. You can find more information at: <https://aws.amazon.com/fargate/>

Note that before you use any of these services, you should check whether they are eligible for the AWS Free Tier: [https://aws.amazon.com/free](https://aws.amazon.com/free/)

## Amazon EC2 Notes

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure and resizable compute capacity in the cloud. It's designed to make web-scale cloud computing easier for developers.

Amazon EC2 presents a true virtual computing environment, and it allows you to use web service interfaces to launch instances with a variety of operating systems, load them with your custom application environment, manage your network’s access permissions, and run your image by using as many or few systems as you want.

Details on the features and cost of Amazon EC2 are available at: <https://aws.amazon.com/ec2/>

### Amazon EC2 instance types

Amazon EC2 provides a wide selection of instance types that are optimized to fit different use cases. Instance types comprise varying combinations of CPU, memory, storage, and networking capacity. They give you the flexibility to choose the appropriate mix of resources for your applications. Each instance type includes one or more instance sizes, which allows you to scale your resources to the requirements of your target workload. Current details about available instance types are available at: <https://aws.amazon.com/ec2/instance-types/>

## Amazon Lightsail Notes

Amazon Lightsail is the easiest way to get started with AWS for developers, small businesses, students, and other users who need a simple virtual private server (VPS) solution. Lightsail provides developers compute, storage, and networking capacity, and it also provides capabilities to deploy and manage websites and web applications in the cloud. Lightsail includes everything you need to launch your project quickly--a virtual machine, solid state drive (SSD)-based storage, data transfer, Domain Name System (DNS) management, and a static IP--for a low, predictable monthly price.

A more detailed introduction from AWS re:Invent 2017 is available here: <https://www.youtube.com/watch?v=29_LqYnomdg>. Note that pricing has changed (decreased) since this video was created. Specific details are on the [Lightsail web page](https://aws.amazon.com/lightsail).

Details on Lightsail and the 30 day trial are available at: <https://aws.amazon.com/lightsail/>

Lightsail pricing can be found here: [https://aws.amazon.com/lightsail/pricing](https://aws.amazon.com/lightsail/pricing/)

## Networking on AWS Notes

## CIDR Notation

An important concept that's used in networking on AWS is CIDR, or Classless Inter-Domain Routing. CIDR network addresses are allocated in a virtual private cloud (VPC) and in a subnet by using CIDR notation. A /16 block provides 65,536 IPv4 addresses. A /24 block provides 256 addresses. [See this article](https://en.wikipedia.org/wiki/Classless_Inter-Domain_Routing) for more information about CIDR.

## Amazon Virtual Private Cloud

Amazon Virtual Private Cloud (Amazon VPC) lets you provision a logically isolated section of the AWS Cloud where you can launch AWS resources in a virtual network that you define. You have complete control over your virtual networking environment, including the selection of your own IP address range, the creation of subnets, and the configuration of route tables and network gateways. You can use both IPv4 and IPv6 in your VPC for secure and easy access to resources and applications. You could create up to five non-default VPCs per AWS account per Region. (See below for information about default VPCs.)

Details on Amazon VPC can be found here: <https://aws.amazon.com/vpc>

## Subnets

A VPC spans all the Availability Zones in the Region. After creating a VPC, you can add one or more subnets in each Availability Zone. When you create a subnet, you specify the CIDR block for the subnet, which is a subset of the VPC CIDR block. Each subnet must reside entirely within one Availability Zone, and it can't span Availability Zones.

This is an important fundamental topic, and we strongly recommend that you review the information at: <https://docs.aws.amazon.com/vpc/latest/userguide/VPC_Subnets.html>

Security in a VPC is provided by using Security Groups and Network Access Control Groups. We will talk about AWS Security in a later module.

## Default VPC

In each Region, AWS will provision a default VPC. This VPC has a /16 IPv4 CIDR address block of 172.31.0.0/16. This provides 65,536 private IPv4 addresses. In addition, there will be a /20 subnet that is created for each Availability Zone in the Region, which provides 4,096 addresses per subnet, with a few addresses reserved for AWS usage. The route table that is associated with the default VPC will have a public route, which in turn is associated with a provisioned internet gateway.

You can modify or delete the default VPC if you want to do so.

The most current details on the default VPC can be found here: <https://docs.aws.amazon.com/vpc/latest/userguide/default-vpc.html>

## Amazon EBS Notes

Amazon Elastic Block Store (Amazon EBS) provides persistent block storage volumes for use with Amazon EC2 instances in the AWS Cloud. Each Amazon EBS volume is automatically replicated inside an Availability Zone to protect you from component failure, which offers high availability and durability. Amazon EBS volumes offer the consistent and low-latency performance that you need to run your workloads.

Amazon EBS provides a range of options that allow you to optimize storage performance and cost for your workload. These options are divided into two major categories: SSD-backed storage for transactional workloads, such as databases and boot volumes (performance depends primarily on IOPS), and hard disk drive (HDD)-backed storage for throughput-intensive workloads, such as MapReduce and log processing (performance depends primarily on MB/s).

The Elastic Volume feature of Amazon EBS allows you to dynamically increase capacity, tune performance, and change the type of live volumes with no downtime or performance impact. This allows you to easily right-size your deployment and adapt to performance changes.

Pricing for Amazon EBS is based on the amount (volume) and type of Amazon EBS volume that you provision. For pricing information, see:<https://aws.amazon.com/ebs/pricing/>. Confirm that you are looking at cost in the correct Region.

Full details on Amazon EBS are available here: <https://aws.amazon.com/ebs>

## Amazon S3 Notes

Amazon Simple Storage Service (Amazon S3) stores data as objects within resources that are called buckets. You can store as many objects as you want within a bucket, and you can write, read, and delete objects in your bucket. Objects can be up to 5 TB in size.

You can control access to both the bucket and the objects (who can create, delete, and retrieve objects in the bucket for example), and view access logs for the bucket and its objects. You can also choose the AWS Region where a bucket is stored to optimize for latency, minimize costs, or address regulatory requirements.

With Amazon S3, you pay only for what you use. There is no minimum fee. Estimate your monthly bill by using the [AWS Simple Monthly Calculator](https://calculator.s3.amazonaws.com/index.html). We charge less where our costs are less, and prices are based on the location of your Amazon S3 bucket.

Full details on Amazon S3 can be found here: <https://aws.amazon.com/s3>.

## Amazon EFS Notes

Amazon Elastic File System (Amazon EFS) provides simple, scalable, elastic file storage for use with AWS Cloud services and on-premises resources. It is straightforward to use, and it offers a simple interface that allows you to create and configure file systems quickly and easily.

Amazon EFS is designed to provide massively parallel shared access to thousands of Amazon EC2 instances. This enables your applications to achieve high levels of aggregate throughput and IOPS that scale as a file system grows, with consistent low latencies.

When an Amazon EFS file system is mounted on Amazon EC2 instances, it provides a standard file system interface and file system access semantics, which allows you to seamlessly integrate Amazon EFS with your existing applications and tools. Multiple Amazon EC2 instances can access an Amazon EFS file system at the same time, thus allowing Amazon EFS to provide a common data source for workloads and applications that run on more than one Amazon EC2 instance.

Current details on Amazon EFS can be found at: <https://aws.amazon.com/efs/>

One of the ans to ques:

How would you configure your application? Single-AZ? Multi-AZ, cross-Region?

What are use cases for using Amazon S3 over Amazon EBS?

What questions do you have on AWS solutions for networking and storage?

Single AZ : The Single-AZ, single-node deployment option provisions a single EC2 instance with your choice of Amazon EBS storage and operating system to host the SAP HANA platform. The Quick Start follows security best practices by establishing a VPC with public and private subnets. For secure access, the SAP HANA server is placed in the private subnet, which is not directly accessible from the internet. You can also install SAP HANA Studio manually in the optional Windows Server instance that is provisioned in the public subnet. For SSH access to the SAP HANA server, you can use the bastion host or an SSH client on the optional Windows Server instance.

Multi-AZ : In a Multi-AZ deployment, Amazon RDS automatically provisions and maintains a synchronous standby replica in a different Availability Zone. The primary DB instance is synchronously replicated across Availability Zones to a standby replica to provide data redundancy, eliminate I/O freezes, and minimize latency spikes during system backups. Running a DB instance with high availability can enhance availability during planned system maintenance, and help protect your databases against DB instance failure and Availability Zone disruption

Cross-Region : Using AWS Backup, you can copy backups to multiple AWS Regions on demand or automatically as part of a scheduled backup plan. Cross-Region replication is particularly valuable if you have business continuity or compliance requirements to store backups a minimum distance away from your production data.

You can use the AWS Backup console, the AWS Command Line Interface (AWS CLI), or the AWS Backup API to copy your backups for the following resources, defining different backup lifecycles in different Regions as appropriate:

· Amazon Elastic File System (Amazon EFS) file systems

**Note**

Copy rules are at the plan level. If you want to apply a different copy rule to a subset of file systems, you should create a new plan.

· Amazon Elastic Block Store (Amazon EBS) volumes

· Amazon Relational Database Service (Amazon RDS) databases

· AWS Storage Gateway volumes

You can also recover from backups stored in different Regions. For information about creating copies, see [Creating a Backup Copy](https://docs.aws.amazon.com/aws-backup/latest/devguide/recov-point-create-a-copy.html).

Cross-Region backups are available in all AWS Regions that are available in AWS Backup except Asia Pacific (Hong Kong) and Middle East (Bahrain).

Q. What are use cases for using Amazon S3 over Amazon EBS?

Answer.

1. EBS can only be used with EC2 instances while S3 can be used outside EC2

2. EBS appears as a mountable volume while the S3 requires software to read and write data

3. EBS can accommodate a smaller amount of data than S3

4. EBS can only be used by one EC2 instance at a time while S3 can be used by multiple instances

S3 typically experiences write delays while EBS does not

## Amazon RDS Notes

Amazon Relational Database Service (Amazon RDS) makes it straightforward to set up, operate, and scale a relational database in the cloud. It provides cost-efficient and resizable capacity while automating time-consuming administration tasks such as provisioning hardware, setting up the database, patching, and making backups.

Amazon RDS currently supports six database engines:

* Amazon Aurora: <https://aws.amazon.com/rds/aurora/>
* PostgreSQL: <https://aws.amazon.com/rds/postgresql/>
* MySQL: <https://aws.amazon.com/rds/mysql/>
* MariaDB: <https://aws.amazon.com/rds/mariadb/>
* Oracle: <https://aws.amazon.com/rds/oracle/>
* Microsoft SQL Server: <https://aws.amazon.com/rds/sqlserver/>

You can use the AWS Database Migration Service (AWS DMS) (<https://aws.amazon.com/dms>) to quickly and securely migrate your databases to AWS.

Amazon RDS is eligible for the AWS Free Tier. More details on pricing for Amazon RDS are available here: <https://aws.amazon.com/rds/pricing/>

## Amazon DynamoDB Notes

[Amazon DynamoDB](https://aws.amazon.com/dynamodb) is a fast and flexible NoSQL database service for applications that need consistent, single-digit millisecond latency at any scale. Its a fully managed cloud database, and it supports both document and key-value store models. Its flexible data model, reliable performance, and automatic scaling of throughput capacity make it a great fit for mobile, web, gaming, advertising technology (ad tech), Internet of Things (IoT), and many other applications. [Pricing for DynamoDB](https://aws.amazon.com/dynamodb/pricing/) includes a non-expiring AWS Free Tier allotment.

Q. when would you use amazon dynamodb versus using amazon rds

Answer: **Amazon DynamoDB** as "*Fully managed NoSQL database service*". All data items are stored on Solid State Drives (SSDs), and are replicated across 3 Availability Zones for high availability and durability. With DynamoDB, you can offload the administrative burden of operating and scaling a highly available distributed database cluster, while paying a low price for only what you use. On the other hand, **Amazon RDS for PostgreSQL** is detailed as "\* Set up, operate, and scale PostgreSQL deployments in the cloud\*". Amazon RDS manages complex and time-consuming administrative tasks such as PostgreSQL software installation and upgrades, storage management, replication for high availability and back-ups for disaster recovery. With just a few clicks in the AWS Management Console, you can deploy a PostgreSQL database with automatically configured database parameters for optimal performance. Amazon RDS for PostgreSQL database instances can be provisioned with either standard storage or Provisioned IOPS storage. Once provisioned, you can scale from 10GB to 3TB of storage and from 1,000 IOPS to 30,000 IOPS.

Q.In what situation would "Bring your own database" be appropriate?

Answer: Dynamics 365 For Finance and Operations, or Fin & Ops, has a feature that lets you export data entities into an external Azure SQL database. This can be any number of SQL databases which can be broken up by functional area or legal entity. You can also do full and incremental pushes to those databases on a schedule and get access to this data just like it was on any other SQL database, similar to 2009 and 2012. This is a very different solution than the Entity Store, however. BYOD is recommended for use in scenarios when you want to use reporting tools other than Power BI, you need SQL level access or would like integrate with other systems, potentially with SQL triggers.

## Monitoring and Amazon CloudWatch Notes

## Amazon CloudWatch

[Amazon CloudWatch](https://aws.amazon.com/cloudwatch/) is a monitoring service for AWS Cloud resources and the applications that you run on AWS. You can use Amazon CloudWatch to collect and track metrics, collect and monitor log files, set alarms, and automatically react to changes in your AWS resources.

## Amazon CloudWatch Events

[Amazon CloudWatch Events](https://docs.aws.amazon.com/AmazonCloudWatch/latest/events/WhatIsCloudWatchEvents.html) delivers a near real-time stream of system events that describe changes in AWS resources. Using simple rules that you can quickly set up, you can match events and route them to one or more target functions or streams. CloudWatch Events becomes aware of operational changes as they occur.

## Amazon CloudWatch Logs Metrics

You can use [Amazon CloudWatch Logs](https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/WhatIsCloudWatchLogs.html) to monitor, store, and access your log files from Amazon EC2 instances, AWS CloudTrail, Amazon Route 53, and other sources. You can then retrieve the associated log data from CloudWatch Logs.

You can collect [metrics](https://docs.aws.amazon.com/AmazonCloudWatch/latest/monitoring/CW_Support_For_AWS.html) from servers by installing the CloudWatch agent on the server. You can install the agent on both Amazon EC2 instances and on-premises servers, and on servers that run either Linux or Windows Server.

## Amazon EC2 Elastic Load Balancing Notes

[Elastic Load Balancing](https://aws.amazon.com/elasticloadbalancing/) (ELB) automatically distributes incoming application traffic across multiple targets, such as Amazon EC2 instances, containers, and IP addresses. It can handle the varying load of your application traffic in a single Availability Zone or across multiple Availability Zones.

ELB offers three types of load balancers that all feature the high availability, automatic scaling, and robust security that are necessary to make your applications fault-tolerant.

An Application Load Balancer operates at the request level (Layer 7), routing traffic to targets--such as EC2 instances, microservices and containers--within Amazon VPC, based on the content of the request. It's ideal for the advanced load balancing of Hypertext Transfer Protocol (HTTP) and Secure HTTP (HTTPS) traffic.

A Network Load Balancer operates at the connection level (Layer 4), routing connections to targets--such as Amazon EC2 instances, microservices, and containers--within Amazon VPC, based on IP protocol data. It's ideal for load-balancing Transmission Control Protocol (TCP) traffic.

The Classic Load Balancer provides basic load balancing across multiple Amazon EC2 instances, and it operates at both the request level and the connection level.

## Amazon EC2 Auto Scaling Notes

[Amazon EC2 Auto Scaling](https://aws.amazon.com/ec2/autoscaling) helps you maintain application availability, and it allows you to dynamically scale your Amazon EC2 capacity up or down automatically according to conditions that you define. You can use Amazon EC2 Auto Scaling for fleet management of Amazon EC2 instances, which can help maintain the health and availability of your fleet, and ensure that you are running your desired number of Amazon EC2 instances. You can also use Amazon EC2 Auto Scaling to dynamically scale Amazon EC2 instances. Dynamic scaling automatically increases the number of Amazon EC2 instances during demand spikes to maintain performance and decrease capacity during lulls, which can help reduce costs. Amazon EC2 Auto Scaling is well-suited to applications that have stable demand patterns, or applications that experience hourly, daily, or weekly variability in usage.

Q.what it be best to scale fewer larger instances or more smaller instances

Answer: There is no need to provision large instances when not needed and burn out money. There can be many instances when your CPU on one goes high and the next large instance you created remains under-utilized.

fewer larger or more smaller depends on the application need.. if the application is compute intensive fewer larger instances or if application is lightweight might go with more smaller instances. Also depends on cost factors and time to bring up instances.

## Security in AWS Notes

## Amazon Shared Responsibility Model

Security and compliance are shared responsibilities between us and the customer. This shared model can help relieve a customer’s operational burden because we operate, manage, and control the components from the host operating system and virtualization layer down to the physical security of the facilities where the service operates. The customer is responsible for--and manages--the guest operating system (including updates and security patches) and other associated application software, in addition to the configuration of the AWS-provided security group firewall. Customers should carefully consider the services that they choose because their responsibilities will vary depending on the services that they use, the integration of those services into their IT environment, and applicable laws and regulations. The nature of this shared responsibility also provides the flexibility and customer control that permits the deployment. This differentiation of responsibility is commonly referred to as Security of the Cloud versus Security in the Cloud.

## AWS responsibility

Security of the Cloud: We are responsible for protecting the infrastructure that runs all of the services that are offered in the AWS Cloud. This infrastructure is composed of the hardware, software, networking, and facilities that run AWS Cloud services.

## Customer responsibility

Security in the Cloud: Customer responsibility will be determined by the AWS Cloud services that a customer selects. This determines the amount of configuration work the customer must perform as part of their security responsibilities.

For more details about the Shared Responsibility Model, see: <https://aws.amazon.com/compliance/shared-responsibility-model/>

## Cost Management on AWS Notes

AWS uses a pay-as-you-go pricing model. This allows you to easily adapt to changing business needs without over-committing budgets, and it improves your responsiveness to changes. General pricing information can be found at: <https://aws.amazon.com/pricing/>.

As mentioned in the segment on Regions, AWS pricing varies by Region. When you explore costs, make sure that you select the appropriate Region.

Pricing for each service can be found on the AWS website under the specific service listing. For example, Amazon EC2 pricing can be found at: <https://aws.amazon.com/ec2/pricing/>. The price for Amazon S3 can be found at: <https://aws.amazon.com/s3/pricing/>.

## AWS Pricing Calculator

AWS has announced a new pricing tool, the [AWS Pricing Calculator](https://calculator.aws/#/). This new tool, which is currently in beta, can be used to calculate Amazon EC2 and Amazon EBS pricing. For further information about this tool, see [this blog post](https://aws.amazon.com/blogs/aws/check-it-out-new-aws-pricing-calculator-for-ec2-and-ebs/). For other services, you can use the [AWS Simple Monthly Calculator.](https://calculator.s3.amazonaws.com/index.html)

## AWS Cost Explorer

[AWS Cost Explorer](https://aws.amazon.com/aws-cost-management/aws-cost-explorer/) lets you visualize, understand, and manage your AWS costs and usage over time. You can create custom reports (including charts and tabular data) that analyze cost and usage data, both at a high level (e.g., total costs and usage across all accounts) and for highly specific requests (e.g., m2.2xlarge costs within account Y that are tagged **project: secretProject**).

## AWS Trusted Advisor

[AWS Trusted Advisor](https://aws.amazon.com/premiumsupport/trustedadvisor/) is an online resource to help you reduce costs, increase performance, and improve security by optimizing your AWS environment. Trusted Advisor provides real-time guidance to help you provision your resources by following our best practices.