This study guide demonstrates the lesson from *Introduction to EC2.*
My full AWS Architect Associate course can be found here:
https://www.udemy.com/course/ultimateaws/?referralCode=7ED214B795C444141361

Introduction to Amazon EC2 Study Guide

Amazon Elastic Compute Cloud (EC2) is a core service within the Amazon Web Services (AWS) ecosystem, offering scalable virtual servers in the cloud. This lesson will guide you through the fundamental concepts of EC2, including its architecture, the process of creating virtual servers, and the essential considerations for managing these resources effectively.

What is EC2?

Amazon EC2 provides **Infrastructure as a Service (IaaS)**, enabling users to deploy and manage virtual servers in the AWS Cloud. These servers, called **EC2 instances**, run on **physical hosts** managed by AWS in their global data centers. Through virtualization technology, AWS allows multiple virtual servers to share the same physical infrastructure.

Key Characteristics of EC2:

1. **Virtual Servers**: Each EC2 instance functions like a standalone computer, running its own operating system and applications.
2. **User Responsibility**: While AWS provides the physical infrastructure and virtualization layer, users are responsible for tasks such as:
    - Managing the operating system (e.g., updates, patches).
    - Installing and maintaining software.
    - Configuring security settings.

EC2 Instances and Hypervisors

EC2 instances operate on physical servers equipped with **hypervisors**. A hypervisor is software that enables multiple virtual machines to share the physical resources of a single server.

How It Works:

- A single physical host in an AWS data center can run multiple EC2 instances simultaneously.
- The hypervisor manages the allocation of CPU, memory, and storage resources, ensuring isolation between instances.
- Instances from different customers may run on the same physical host, but AWS implements strong isolation to maintain security.

Storage for EC2: Elastic Block Store (EBS)

Every EC2 instance requires storage to function. AWS uses **Elastic Block Store (EBS)** to provide persistent block storage for instances.

Features of EBS:

1. **Virtual Disks**: EBS volumes act as virtual hard drives for EC2 instances, storing operating systems, applications, and data.
2. **Persistent Storage**: Data on an EBS volume persists independently of the instance, allowing recovery in case of instance termination.
3. **Flexible Sizing**: Users can customize the size, performance, and type of EBS volume based on application needs.

Creating an EC2 Instance

Step 1: Select an Amazon Machine Image (AMI)

An **AMI** serves as a template for your EC2 instance, defining the operating system and pre-installed software. AWS offers:

- **Pre-configured AMIs**: Include popular operating systems like Linux and Windows.
- **Custom AMIs**: Users can create their own AMIs tailored to specific requirements.

Step 2: Choose an Instance Type

The instance type determines the hardware configuration of the EC2 instance, including:

- **CPU**: Number and speed of virtual processors.
- **Memory**: Amount of RAM.
- **Network Performance**: Bandwidth and throughput.
- **Storage Performance**: Read/write speeds for attached EBS volumes.

Step 3: Configure the Instance

After selecting an AMI and instance type, you configure additional settings such as:

- Security groups (firewall rules).

- Key pairs for SSH access.
- Placement within a specific **Availability Zone** (a distinct data center within a region).

Availability Zones and Instance Placement

Each EC2 instance is deployed within a single **Availability Zone (AZ)**. An AZ is a physically separate location within an AWS region, designed for high availability.

Key Points:

- **Instance Locality**: Instances are tied to the AZ where they were created and cannot be moved while running.
- **Workaround for Movement**: To relocate an instance, create an image of the existing instance and launch it in a new AZ.

Cost and Pricing

The cost of running an EC2 instance varies based on:

- **Instance Type**: More powerful instances with higher CPU and memory cost more.
- **Billing Model**: AWS offers several pricing options, including:
  - **On-Demand**: Pay by the hour or second without long-term commitments.
  - **Reserved Instances**: Save costs with upfront payment for long-term usage.
  - **Spot Instances**: Bid for unused capacity at lower prices.

Security and Multi-Tenancy

AWS employs robust security mechanisms to ensure isolation between instances, even when they share the same physical host:

- **Network Isolation**: Virtual networks ensure instances cannot communicate unless explicitly configured.
- **Instance Isolation**: The hypervisor prevents unauthorized access between instances.

Diagram of EC2 Architecture

A typical EC2 setup includes:

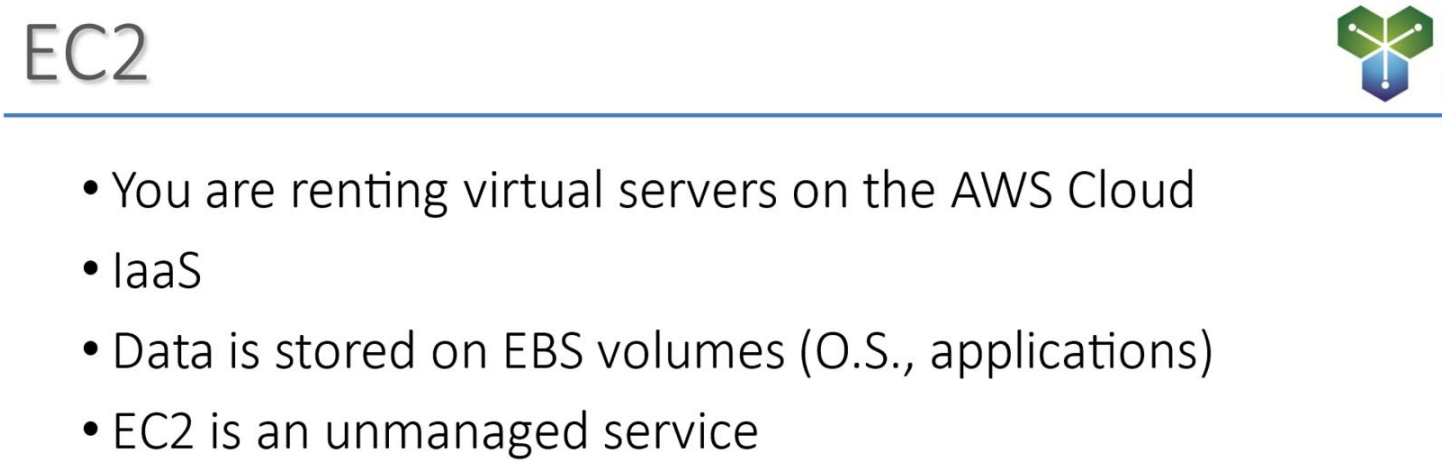
- **Physical Host**: Runs multiple EC2 instances.
- **Hypervisor**: Manages resource allocation and isolation.
- **EC2 Instances**: Virtual servers for customers, running operating systems and applications.

Summary

1. EC2 provides IaaS, enabling users to deploy virtual servers in the AWS Cloud.
2. Users are responsible for managing their EC2 instances, including the operating system and software.
3. Elastic Block Store (EBS) offers persistent block storage for EC2 instances.
4. Instances are tied to specific Availability Zones and cannot be moved directly.
5. Pricing varies by instance type, size, and billing model.
6. AWS ensures strong security and isolation between instances.

By understanding these foundational concepts, you can confidently deploy and manage EC2 instances to meet your application's needs.

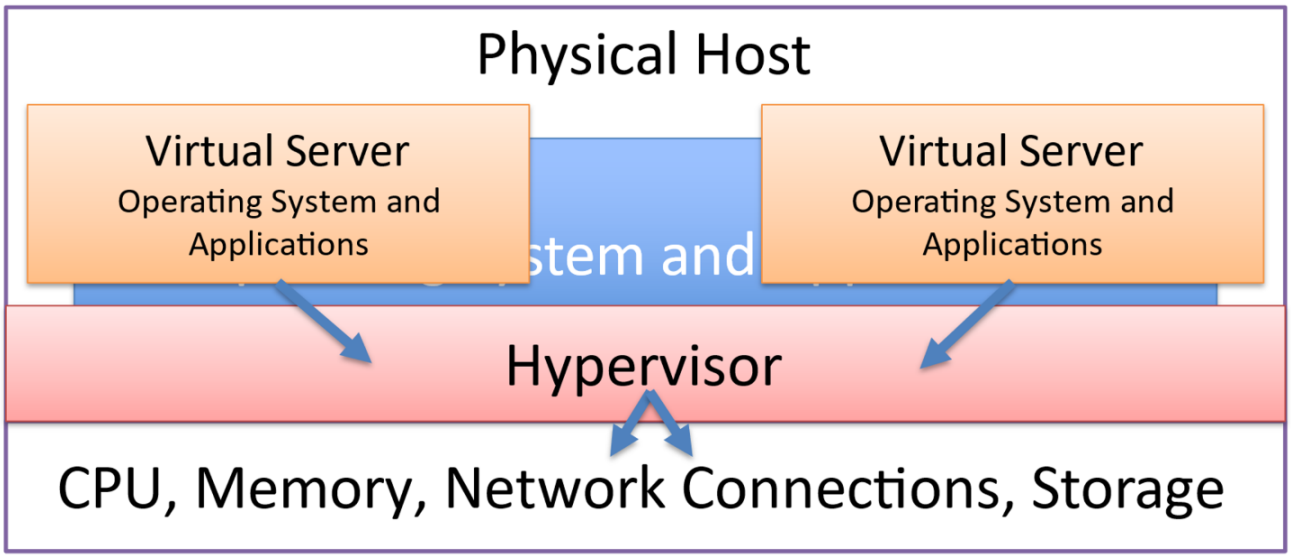
See slides below:



EC2 Instances

- You choose Operating System (AMI)
- You choose resources (CPU, memory, network)
- Different prices for different instance types
- Local to an AZ

Hypervisors and Virtual Machines



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