

**DEVOPS**  
Mr. R N RAJU

**AMAZON WEB SERVICES  
CERTIFIED SOLUTION ARCHITECT**

**By Mr. R N RAJU  
(Red Hat & AWS Certified)**

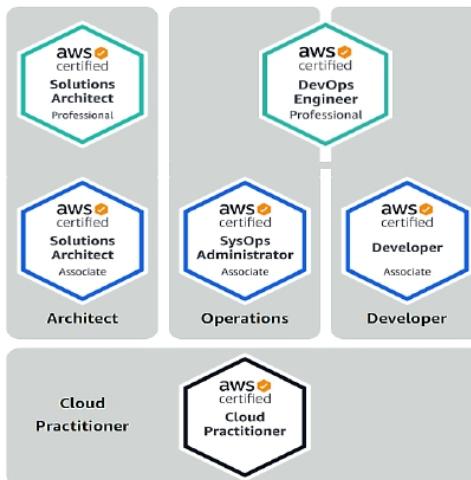
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## AWS CERTIFICATIONS

- AWS Certification is curated by industry professionals as per the industry requirements and demands.

### Professional

Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud



### Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the exam guide



### Foundational

Six months of fundamental AWS Cloud and industry knowledge

- This AWS Training will help you prepare for the AWS Certified Cloud Practitioner and AWS Certified Solutions Architect (Associate exam SAA-C02).

## **AWS CERTIFIED CLOUD PRACTITIONER:**

- AWS Certified Cloud Practitioner is intended for anyone who has basic knowledge of the AWS platform. Before taking this exam, we recommend you have:
  - Basic understanding of IT services and their uses in the AWS Cloud platform
  - Knowledge of core AWS services and use cases, billing and pricing models, security concepts, and how cloud impacts your business



## AWS CERTIFIED SOLUTIONS ARCHITECT (ASSOCIATE):

- AWS Certified Solutions Architect – Associate is intended for anyone with one or more years of hands-on experience designing available, cost-efficient, fault-tolerant, and scalable distributed systems on AWS. Before you take this exam, we recommend you have:
  - One year of hands-on experience with AWS technology, including using compute, networking, storage, and database AWS services as well as AWS deployment and management services
  - Experience deploying, managing, and operating workloads on AWS as well as implementing security controls and compliance requirements
  - Familiarity with using both the AWS Management Console and the Command Line Interface (CLI)
  - Understanding of the AWS Well-Architected Framework, AWS networking, security services, and the AWS global infrastructure
  - Ability to identify which AWS services meet a given technical requirement and to define technical requirements for an AWS-based application



### EXAM OVERVIEW:

**Level:** Associate

**Length:** 130 minutes to complete the exam

**Cost:** 150 USD

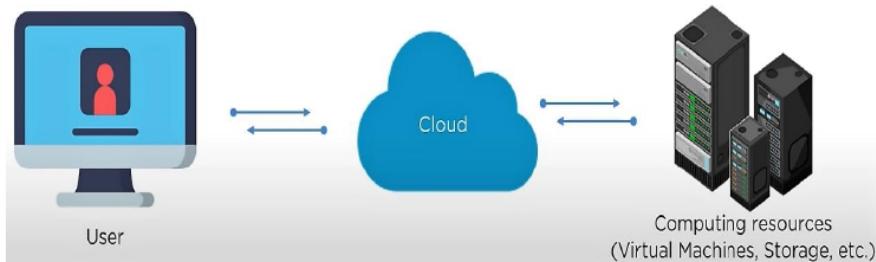
**Format:** 65 questions, either multiple choice or multiple response

**Delivery method:** Pearson VUE and PSI;

**NOTE:** <https://aws.amazon.com/certification/certified-solutions-architect-associate/>

## CLOUD COMPUTING

- Cloud computing is a platform that provides access to **Computing Resources** over the internet with **Pay-As-You-Go Pricing**
- Companies offering these computing services are called **Cloud Providers** and typically charge for cloud computing services based on usage.
- Cloud providers maintain own massive **Datacenters** which have thousands of servers, storages, databases and component critical to the organizations working.



### **CLOUD COMPUTING BENEFITS:**

#### **FLEXIBILITY:**

Users can scale services to fit their needs, customize applications and access cloud services from anywhere with an internet connection.

#### **EFFICIENCY:**

Enterprise users can get applications to market quickly, without worrying about underlying infrastructure costs or maintenance.

#### **AGILITY:**

In a cloud computing context, agility often refers to the ability to rapidly develop, test and launch applications that drive business growth in a constantly changing IT environment.

#### **ELASTICITY:**

Elastic computing is the ability to quickly expand or decrease computer processing, memory and storage resources to meet changing demands without worrying about capacity planning.

### **SCALABILITY:**

Scalability refers to the idea of a system in which every application or piece of infrastructure can be expanded to handle increased load.

### **DISASTER RECOVERY:**

Cloud disaster recovery (CDR) is a cloud-based managed service that helps you quickly recover your organization's critical systems after a disaster and provides you remote access to your systems in a secure virtual environment.

### **PERFORMANCE:**

The biggest cloud computing services run on a worldwide network of secure datacenters, which are regularly upgraded to the latest generation of fast and efficient computing hardware.

**SELF-SERVICE PROVISIONING:** It means the computing resources are used for almost any kind of workload. The end users can spin up compute resources for almost any type of workload on demand.

**AUTOMATIC SOFTWARE UPDATES:** The beauty of cloud computing is that the servers are off-premises, out of sight and out of your hair. Suppliers take care of them for you and roll out regular software updates including security updates so you don't have to worry about wasting time maintain the system yourself.

**SECURITY:** Every day thousands of devices are stolen –laptops, notebooks, call phones- all with critical data. Given that your devices are password protected, you are likely only looking at a monetary loss of the device because all of your data and documents are still readily available in the cloud!

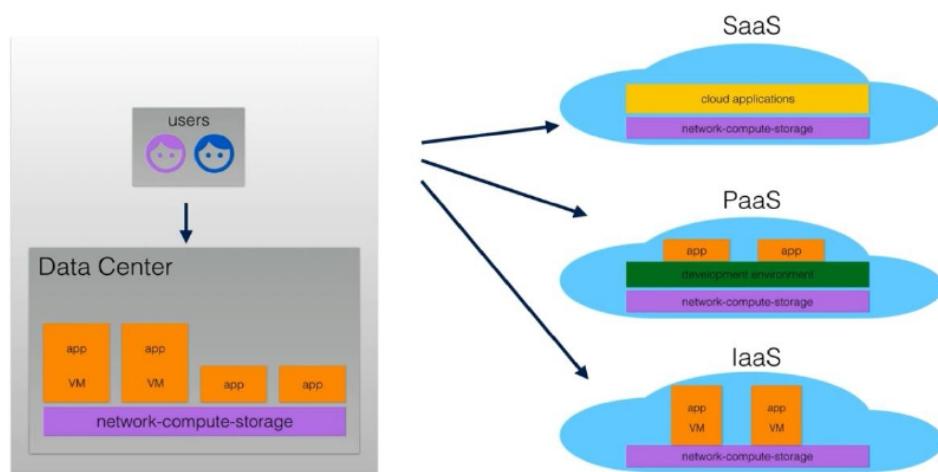
### **HOW CLOUD COMPUTING WORKS:**

Cloud computing services all works a little differently, depending on the cloud provider. But many providers a friendly, browser-based dashboard that makes it easier for IT professionals and developers to order resources and manage their accounts.

Some cloud computing services are also designed to work with REST APIs and a Command Line Interface (CLI), giving developers multiple options.

## CLOUD SERVICE MODELS

- There are three main types of cloud computing services.
- Each type of cloud computing provides different levels of control, flexibility, and management so that you'll select the proper set of services for your needs.



### **IAAS (INFRASTRUCTURE AS A SERVICE):**

- You rent IT infrastructure – Servers, Storage, networks, VMs, Operating Systems from a cloud provider.
- A vendor provides clients pay-as-you-go access to storage, networking, servers, and other computing resources in the cloud.

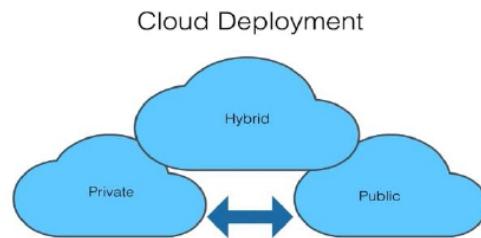
### **PAAS (PLATFORM AS A SERVICE):**

- A service provider offers access to a cloud-based environment in which users can build and deliver applications. The provider supplies underlying infrastructure.
- Supply an on-demand environment for developing, testing, delivering and managing software applications.

### **SAAS (SOFTWARE AS A SERVICE):**

- A service provider delivers software and applications through the internet. Users subscribe to the software and access it via the web or vendor APIs.

## CLOUD DEPLOYMENT MODELS



### **PUBLIC CLOUD:**

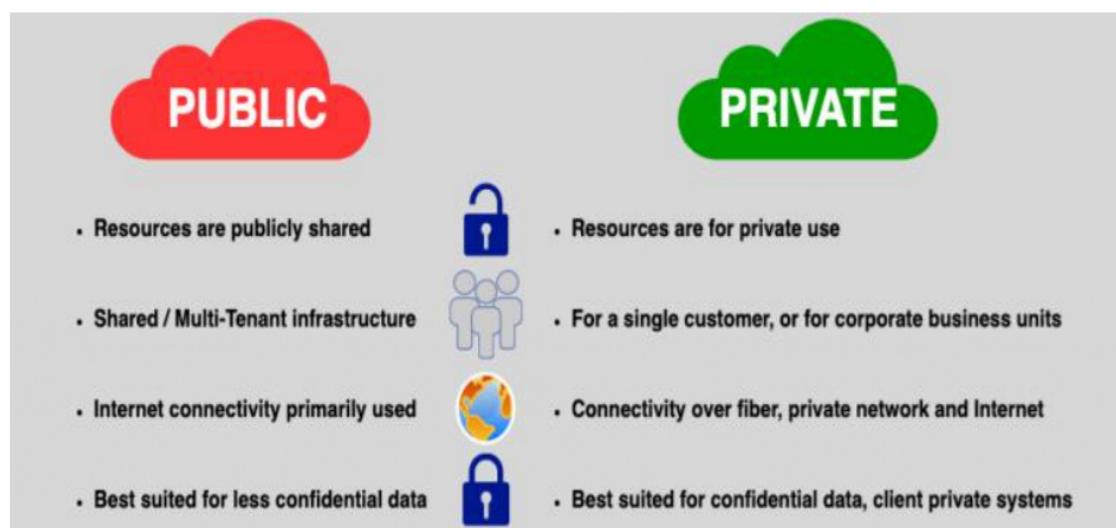
- Computing resources are provided publicly based on a **pay-per-use** model.
- These are owned and operated by a **third-party** cloud service provider.

### **PRIVATE CLOUD:**

- The cloud infrastructure is owned by an organization and hosted and operated internally.
- It can be physically located on the company's **on-site** data center.

### **HYBRID CLOUD:**

- Computing resources are provided by a composition of private and public.
- It gives businesses greater flexibility and more deployment options.
- It is a more complex cloud solution because the organization must manage multiple platforms.
- Suitable for cost effectiveness, backup, disaster recovery, dev and testing.

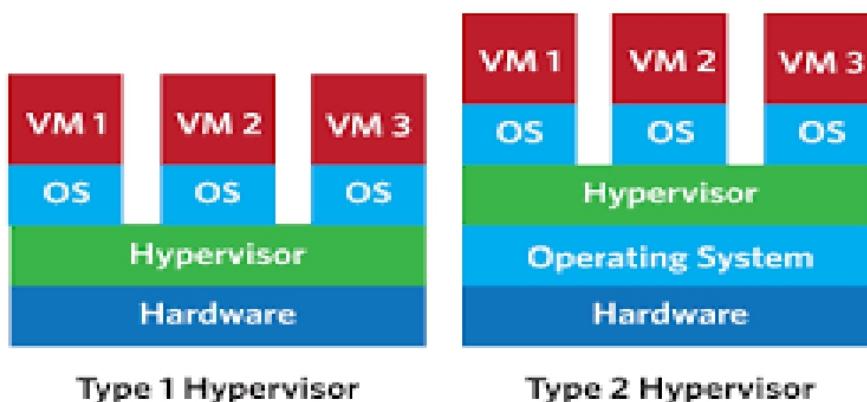


## HYPERVISORS

- Hypervisors are software or firmware components that can virtualize system resources.
- A hypervisor is a hardware virtualization technique that allows multiple guest operating systems (OS) to run on a single host system at the same time.
- The guest OS shares the hardware of the host computer, have its own processor, memory and other hardware resources.
- A hypervisor is also known as a **virtual machine manager (VMM)**.
- For the most part, cloud computing entails you being able to access a virtual machine for you to be able to do what you need to do anywhere.

### **HYPERVISOR TYPES:**

- **TYPE-1:**
  - Type 1 hypervisors can run directly on the system hardware.
  - **Example:** VMware ESXI, Citrix XenServer, Microsoft Hyper-V, Linux KVM.
- **TYPE-2:**
  - Type 2 hypervisors run on a host operating system that provides virtualization services, such as I/O device support and memory management.
  - **Example:** VMware workstation, VMware player, Oracle virtual box.



## **VIRTUALIZATION**

- Virtualization is the process of creating a software-based, or virtual, representation of something, such as virtual applications, servers, storage and networks.
- It is the single most effective way to reduce IT expenses while boosting efficiency and agility for all size businesses.
- Virtualization can increase IT agility, flexibility and scalability while creating significant cost savings.

### **VIRTUALIZATION BENEFITS:**

- Reduced capital and operating costs.
- Minimized or eliminated downtime.
- Increased IT productivity, efficiency, agility and responsiveness.
- Faster provisioning of applications and resources.
- Greater business continuity and disaster recovery.
- Simplified data center management.
- Availability of a true Software-Defined Data Center.

### **VIRTUALIZATION TYPES:**

- Server Virtualization
- Network Virtualization
- Desktop Virtualization
- Para-virtualization
- Hardware-level virtualization

### **NETWORK VIRTUALIZATION:**

- By completely reproducing a physical network, network virtualization allows applications to run on a virtual network as if they were running on a physical network but with greater operational benefits and all the hardware independencies of virtualization. (Network virtualization presents logical networking devices and services logical ports, switches, routers, firewall, load balancers, VPNs and more to connected workloads.)

## **DESKTOP VIRTUALIZATION:**

- Deploying desktops as a managed service enables IT organizations to respond faster to changing workplace needs and emerging opportunities. Virtualized desktops and applications can also be quickly and easily delivered to branch offices, outsourced and offshore employees, and mobile workers using iPad and Android tablets.

## **WHAT IS PARA-VIRTUALIZATION?**

- A virtualization approach that exports a modified hardware abstraction which requires operating systems to be explicitly modified and ported to run.
- What is Hardware-level virtualization?
- Here the virtualization layer sits right on top of the hardware exporting the virtual machine abstraction. Because the virtual machine looks like the hardware, all the software written for it will run in the virtual machine.

## **VIRTUALIZATION VS. CLOUD COMPUTING**

- Although equally buzz-worthy technologies, virtualization and cloud computing are not interchangeable.
- Virtualization is software that makes computing environments independent of physical infrastructure, while cloud computing is a service that delivers shared computing resources (software and/or data) on demand via the Internet.
- As complementary solutions, organizations can begin by virtualizing their servers and then moving to cloud computing for even greater agility and self-service.

## VIRTUAL MACHINE (VM)

- A representation of a real machine using software that provides an operating environment which can run or host a guest operating system.

### **GUEST OPERATING SYSTEM:**

- An operating system running in a virtual machine environment that would otherwise run directly on a separate physical system.

### **KEY PROPERTIES OF VIRTUAL MACHINES:**

#### **PARTITIONING:**

- Run multiple operating systems on one physical machine.
- Divide system resources between virtual machines.

#### **ISOLATION:**

- Provide fault and security isolation at the hardware level.
- Preserve performance with advanced resource controls.

#### **ENCAPSULATION:**

- Save the entire state of a virtual machine to files.
- Move and copy virtual machines as easily as moving and copying files.

#### **HARDWARE INDEPENDENCE:**

- Provision or migrate any virtual machine to any physical server.

## AMAZON WEB SERVICES (AWS)

- AWS is a secure cloud services platform, offering compute power, database storage, content delivery and other functionality to help businesses scale and grow.
- It is a comprehensive cloud computing platform that includes infrastructure as a service (IaaS) and platform as a service (PaaS) offerings.
- AWS services offer scalable solutions for compute, storage, databases, analytics, and more.
- It is the world's most comprehensive and broadly adopted cloud platform.
- This offers over **200+** fully featured services from data centers globally.

### **BENEFITS OF AWS**

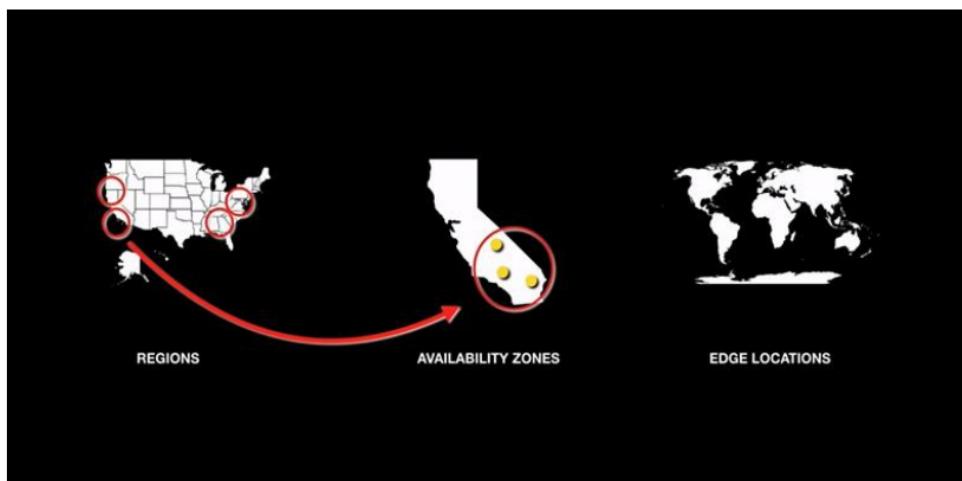
- Easy to use
- Reliable
- Cost-Effective
- Scalable and High Performance
- Secure
- Global Leader

### **FIVE PILLARS OF AWS -ARCHITECTED FRAMEWORK:**

- Creating a software system is a lot like constructing a building. If the foundation is not solid, structural problems can undermine the integrity and function of the building.
- The AWS Well-Architected Framework describes key concepts, design principles, and architectural best practices for designing and running workloads in the cloud.
- The Five pillars are:
  - Operational Excellence
  - Security
  - Reliability
  - Performance Efficiency
  - Cost Optimization

## AWS GLOBAL INFRASTRUCTURE

- AWS cloud operates Availability Zones (AZ'S) with in the Geographic Regions around the world.
- The AWS Cloud spans 84 Availability Zones within 26 geographic regions around the world.



### **REGION:**

- AWS has the concept of a Region, which is a physical location around the world where we cluster data centers.
- Each AWS Region consists of multiple, isolated, and physically separate AZs within a geographic area.

### **AVAILABILITY ZONES (AZ'S):**

- It consists of one or more discrete data centers, each with redundant power, networking and connectivity, housed in separate facilities.
- These AZ's offer you the ability to operate AWS services.

### **DATA CENTER:**

- A data center is a facility that centralizes an organization's IT operations and equipment, as well as where it stores, manages, and disseminates its data.

### **EDGE LOCATION:**

- An Edge Location is an AWS Data center which does not contain AWS services. Instead, it is used to deliver content to parts of the world.

## AWS FREE TIER

- Gain free, hands-on experience with the AWS platform, products, and services

### **TYPES OF OFFERS:**

- Explore more than 100 products and start building on AWS using the Free Tier. Three different types of free offers are available depending on the product used. Click icon below to explore our offers



**Free trials**



**12 months free**



**Always free**

Short-term free trial offers start from the date you activate a particular service

Enjoy these offers for 12-months following your initial sign-up date to AWS

These free tier offers do not expire and are available to all AWS customers

### **12-MONTHS FREE:**

- These free tier offers are only available to new AWS customers, and are available for 12 months following your AWS sign-up date.
- When your 12-month free usage term expires or if your application use exceeds the tiers, you simply pay standard, pay-as-you-go service rates (see each service page for full pricing details). Restrictions apply; see offer terms for more details.

### **ALWAYS FREE:**

- These free tier offers do not automatically expire at the end of your 12-month AWS Free Tier term, but are available to both existing and new AWS customers indefinitely.

### **TRIALS:**

- These free tier offers are short term trial offers that start from the time of first usage begins.
- Once the trial period expires you simply pay standard, pay-as-you-go service rates

**NOTE:** <https://aws.amazon.com/free/>

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## ELASTIC COMPUTE CLOUD (EC2)

- Amazon Elastic Compute Cloud (Amazon EC2) provides scalable computing capacity in the Amazon Web Services (AWS) Cloud.
- Using Amazon EC2 eliminates your need to invest in hardware up front, so you can develop and deploy applications faster.
- **Virtual servers** can run different **OS'S**, but most commonly run a flavor of **Linux, MacOS & Windows**.

### **EC2 FEATURES:**

- Virtual computing environments, known as **instances**
- Preconfigured templates for your instances, known as **Amazon Machine Images (AMIs)**, that package the bits you need for your server (including the operating system and additional software)
- Various configurations of CPU, memory, storage, and networking capacity for your instances, known as **instance types**
- Secure login information for your instances using **key pairs** (AWS stores the public key, and you store the private key in a secure place)
- Storage volumes for temporary data that's deleted when you stop, hibernate, or terminate your instance, known as **instance store volumes**
- Persistent storage volumes for your data using Amazon Elastic Block Store (Amazon EBS), known as **Amazon EBS volumes**
- Multiple physical locations for your resources, such as instances and Amazon EBS volumes, known as **Regions and Availability Zones**
- A firewall that enables you to specify the protocols, ports, and source IP ranges that can reach your instances using **security groups**
- Static IPv4 addresses for dynamic cloud computing, known as **Elastic IP addresses**
- **Metadata**, known as **tags**, that you can create and assign to your Amazon EC2 resources
- Virtual networks you can create that are logically isolated from the rest of the AWS Cloud, and that you can optionally connect to your own network, known as **virtual private clouds (VPCs)**

## EC2 PURCHASING

### **ON-DEMAND:**

- Pay, by the second, for the instances that you launch.

### **SAVING PLANS:**

- Reduce costs by making a commitment to a consistent amount of usage, in USD per hour, for a term of 1 or 3 years.

### **RESERVED INSTANCES:**

- Reduce costs by making a commitment to a consistent instance configuration, including instance type and Region, for a term of 1 or 3 years.

### **SCHEDULED INSTANCES:**

- Purchase instances that are always available on the specified recurring Schedule, for a one-year term.

### **SPOT INSTANCES:**

- It fluctuates based on the supply and demand of available unused EC2 capacity.

### **DEDICATED HOSTS:**

- Pay for a physical host that is fully dedicated to running your instances, and bring your existing per-socket, per-core, or per-VM software licenses to reduce costs.

### **DEDICATED INSTANCES:**

- Pay, by the hour, for instances that run on single-tenant hardware.

### **CAPACITY RESERVATION:**

- Reserve capacity for your EC2 instances in a specific AZ for any duration.

## EC2 INSTANCE TYPES

- EC2 provides a wide selection of instance types optimized to fit different use cases.
- Instance types comprise varying combinations of CPU, memory, storage, and networking capacity and give you the flexibility to choose the appropriate mix of resources for your applications.
- Each instance type includes one or more instance sizes, allowing you to scale your resources to the requirements of your target workload.

### **GENERAL PURPOSE:**

- These are providing a balance of compute, memory and networking resources, and can be used for a variety of diverse workloads. These instances are ideal for applications that use these resources in equal proportions such as web servers and code repositories.

### **COMPUTE OPTIMIZED:**

- These are ideal for compute bound applications that benefit from high performance processors.
- This family are well suited for batch processing workloads, media transcoding, high performance web servers, high performance computing (HPC), scientific modeling, dedicated gaming servers and ad server engines, machine learning inference and other compute intensive applications.

### **MEMORY OPTIMIZED:**

- These instances are designed to deliver fast performance for workloads that process large data sets in memory.

### **ACCELERATED COMPUTING:**

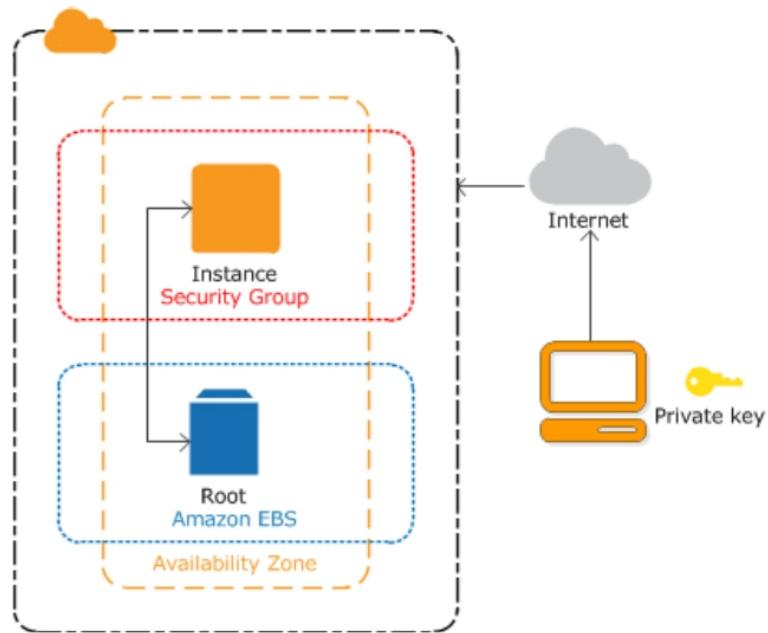
- Accelerated computing instances use hardware accelerators, or co-processors, to perform functions, such as floating-point number calculations, graphics processing, or data pattern matching, more efficiently than is possible in software running on CPUs.

### **STORAGE OPTIMIZED:**

- Storage optimized instances are designed for workloads that require high, sequential read and write access to very large data sets on local storage.
- They are optimized to deliver tens of thousands of low-latency, random I/O operations per second (IOPS) to applications.

## EC2 INSTANCE OVERVIEW

- The instance is an Amazon EBS-backed instance (meaning that the root volume is an EBS volume).
- You can think of an Availability Zone as an isolated data center.



### **SECURITY GROUPS (SG'S):**

- Security Groups act as a virtual firewall for controlling traffic at the **instance level**.
- It contains a set of rules that filter traffic coming **Inbound** and **Outbound** of an EC2 instance.
- Security Groups support only **allow rules**.

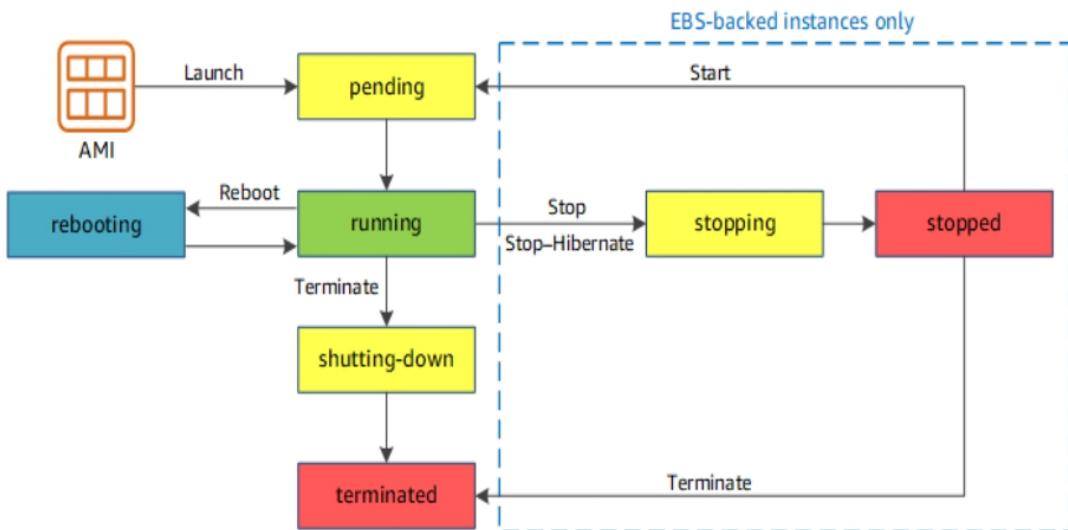
### **KEY-PAIR:**

- EC2 uses public key cryptography to **Encrypt** and **Decrypt** login information.
- **Public key** cryptography uses to encrypt a piece of data, the recipient uses the **private key** to decrypt the data
- The **Public** and **Private** keys are known as a **Key Pair**.

## INSTANCE LIFECYCLE

- Amazon EC2 instance transitions through different states from the moment you launch it through to its termination.
- The following illustration represents the transitions between instance states.

**NOTE:** You can't stop and start an instance store-backed instance.



## **ACCESS AMAZON EC2:**

### **WEB-BASED USER INTERFACE:**

- The Amazon EC2 console. If you've signed up for an AWS account, you can access the Amazon EC2 console by signing into the AWS Management Console and selecting EC2 from the console home page.

### **AWS COMMAND LINE INTERFACE (CLI):**

- Provides commands for a broad set of AWS products, and is supported on Windows, Mac, and Linux.

### **AWS Tools for Windows PowerShell:**

- Provides commands for a broad set of AWS products for those who script in the PowerShell environment.

## **EC2 WINDOWS INSTANCE**

- An instance is a virtual server in the AWS Cloud. With Amazon EC2, you can set up and configure the operating system and applications that run on your instance.
- The instance is an Amazon EBS-backed instance (meaning that the root volume is an EBS volume).

### **LOGIN USERNAME:**

- **Administrator (English)**
- **Administrateur (French)**
- **Administrador (Portuguese)**

### **PORT IN SG:**

- **Remote Desktop Protocol (RDP): 3389**

### **GETTING ADMIN PASSWORD:**

- Actions -> Get Password -> Upload Private Key -> Returns Password

## **EC2 LINUX INSTANCES**

- An instance is a virtual server in the AWS Cloud. With Amazon EC2, you can set up and configure the operating system and applications that run on your instance.
- The instance is an Amazon EBS-backed instance (meaning that the root volume is an EBS volume).

### **LOGIN USER NAME:**

- Amazon Linux : ec2-user
- RHEL & SUSE : ec2-user or root
- Fedora : ec2-user or fedora
- Ubuntu : ubuntu
- centos : centos
- Debian : admin

### **PORT IN SG:**

- **Secure Shell (SSH) : 22**

### **GETTING ADMIN ACCESS:**

- Run a Command : **\$sudo -i (or) \$sudo su -**
- For Update (RHEL) : **yum update -y**
- For Update (Ubuntu) : **apt-get update -y (For Ubuntu)**

## WEB SERVER (HTTP)

- A web server is a network service that serves content (**web pages**) to a client over the web.
- Web servers are also known as **HTTP** (Hypertext Transport Protocol) servers.
- Apache is also an option to use the **SSL protocol**, making websites safe and secure.

### MAIN CONFIGURATION FILES

▪ <b>Package</b>	:	httpd
▪ <b>Document Root Location</b>	:	/var/www/html
▪ <b>Configuration File</b>	:	/etc/httpd/conf/httpd.conf
▪ <b>Default Web Page</b>	:	/etc/httpd/conf.d/welcome.conf
▪ <b>Log Files Location</b>	:	/var/log/httpd/ access_log & error_log
▪ <b>Ports:</b>	:	http-80, https-443
▪ <b>Service and Daemon</b>	:	httpd

### BOOTSTRAPPING / USER-DATA

- Run commands on your Linux instance at launching.
- Refers to a self-starting process or set of commands without external input.
- We can bootstrap the instance for installing packages, running updates and configuring various settings).

#### **BOOTSTRAP VERIFICATION:**

**cat /var/log/cloud-init.log (or) cat cloud-init-output.log**

**\$curl http://169.254.169.254/latest/user-data**

**\$curl http://169.254.169.254/latest/user-data/instance-type**

**\$curl http://169.254.169.254/latest/user-data/hostname**

## META-DATA:

- Metadata is data about your instance that you can use to configure or manage the running instance.
- **Dynamic data** includes an instance identity document that is generated when the instance is launched.

### RETRIEVING INSTANCE METADATA:

```
$curl http://169.254.169.254/latest/meta-data/
```

### RETRIEVING INSTANCE DYNAMIC DATA:

```
$curl http://169.254.169.254/latest/dynamic/
```

## ELASTIC IP-ADDRESS (EIP):

- An EIP is a **Static Ipv4 address** designed for **Dynamic cloud computing**.
- Attaching an EIP to an instance will replace its default public IP address for as long as it is attached.
- Limited to 5 EIP addresses per region.

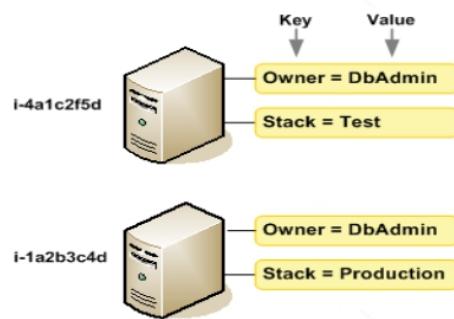
## EC2 SERVICE QUOTAS (LIMITS):

- When you create your AWS account, we set default limits on AWS resources on a per-Region basis.

**NOTE:** You can request an increase for many of these limits.

## RESOURCES & TAGS:

- To manage your instances, images, volumes and snapshots, you can optionally assign your own metadata to each resource in the form of tags.
- Tags enable you to categorize your AWS resources in different ways, for example, by purpose, owner, or environment.
- A tag is a label that you assign to an AWS resource. Each tag consists of a **key** and an optional **value**.



## EC2 SERIAL CONSOLE:

- EC2 Serial Console provides a simple and secure way to **troubleshoot boot and network connectivity issues** by establishing a connection to the serial port of an instance.
- It provides a one-click, text-based access to an instances' serial port as though a monitor and keyboard were attached to it.
- Previously, you could get serial console output as **logs or a screenshot** through the **EC2 management console, API or CLI**.
- You can interactively run troubleshooting commands for **resolving boot and network configuration issues**.
- EC2 Serial Console is ideal for situations where you are unable to connect to your instance via normal SSH or RDP.

**NOTE:** EC2 Serial Console Access is available for **Nitro virtual instances** running either Windows or Linux