

**ZOOM**  
TECHNOLOGIES



Course Presentation



**A Practical Guide to Configuring**

**AWS**

(Amazon Web Services)

**Cloud Platform**

**Course Presentation**

© 2017 Zoom Technologies India Pvt. Ltd.

All rights reserved. No part of this book or related material may be reproduced in any form or by any means without prior permission from Zoom Technologies India Pvt. Ltd. All precautions have been taken to make this book and related material error-free. However, Zoom Technologies India Pvt. Ltd. is not liable for any errors or omissions. The contents of this book are subject to change without notice.

**DISCLAIMER:** AWS, AMAZON, and all associated terms are registered trademarks of Amazon Inc. We are in no way affiliated with Amazon Inc.

# **Introduction**

We are pleased to release the practical guide to configuring AWS (Amazon Web Services). This lab manual can be used as a standalone guide or in conjunction with the AWS course taught at Zoom Technologies.

The list of exercises ranges from the basic to the advanced, with each exercise building over the one before it. All the steps are clearly outlined with screenshots so that students can practically work through the manual by themselves.

Each of the exercises is divided into four sections:

1. Objective
2. Prerequisite
3. Topology
4. Tasks

We hope this practical guide will be a useful addition to an IT professional's collection, providing reliable step by step how-tos for general AWS configuration. Any feedback or suggestions to improve this would be gratefully accepted.





DAY 1

# Introduction to Cloud Computing with Amazon Web Services

AWS

# Introduction to Cloud Computing with Amazon Web Services

AWS

## Agenda



- What is cloud ?**
- Cloud Deployment Model**
- Cloud Service Model**
- Advantage of Cloud**
- Cloud Market and scope**
- AWS certification**
- Course content of AWS**

AWS

## Cloud Definition



### What is cloud ?

- **IBM**

Cloud computing, often referred to as simply “the cloud,” is the delivery of on-demand computing resources—everything from applications to data centers—over the Internet on a pay-for-use basis.

- **NIST**

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

AWS

## Cloud Definition

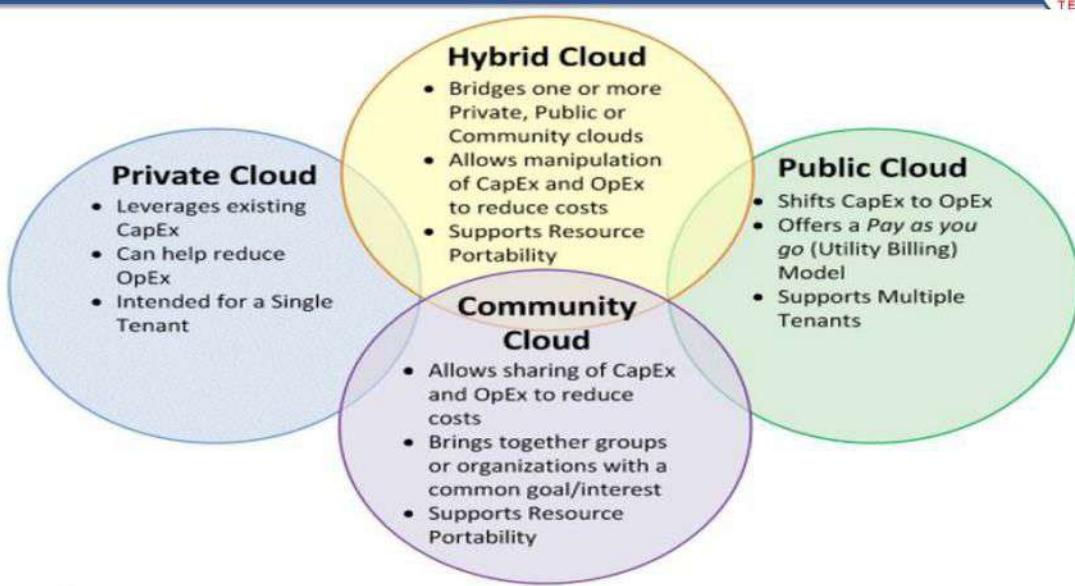


### Definitions:

In the simplest terms, cloud computing means it provides services to access programs, application, storage, network, servers over the Internet through browser or client-side application on your PC or Laptop, Mobile, TAB, or Smart TV , by the end user without installing, updating and maintaining them.

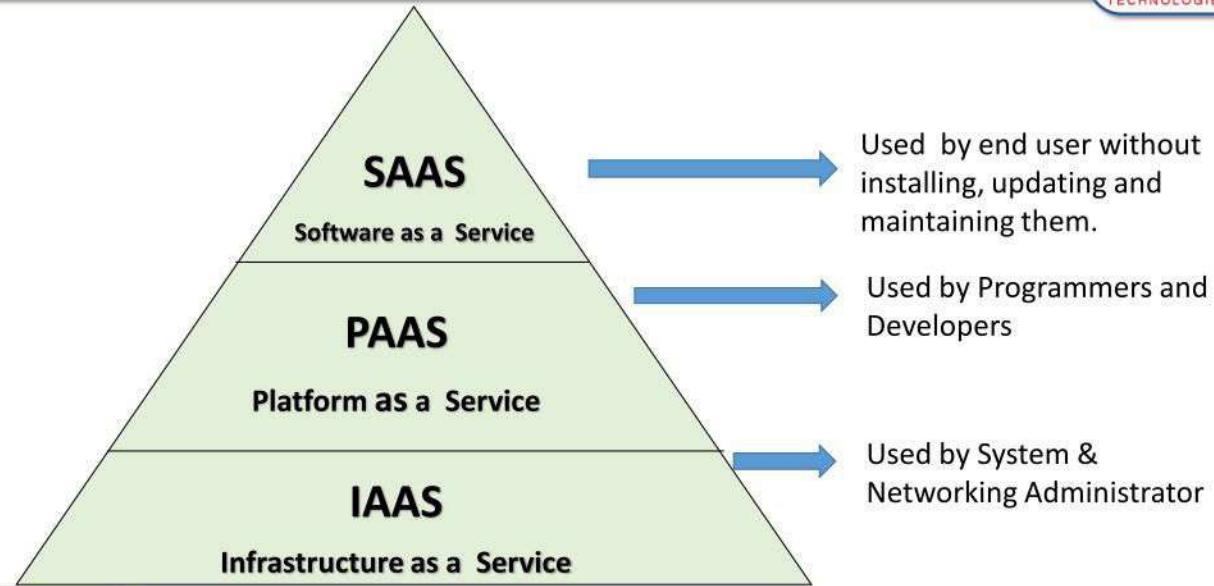
AWS

## Cloud Deployment Models



AWS

## Cloud Services Models



AWS

## Software as a Service ( SaaS )



**Software as a Service (SaaS)** is software distribution model in which applications are hosted by a vendor over the Internet for the end users freeing end users from complex software and hardware management.

Users can subscribe to the service and use the app, normally through a web browser or by installing a client-side app.

### SaaS Providers

- Google – Mail, Calendar, docs, presentation etc..
- Microsoft - Mail, MSWord, paint
- Twitter,  
•Facebook  
•Flipkart  
•Paypal  
•Gotomeeting  
•Pixlr ( image editor)  
•Jaycut (video editor),  
Aviary ( photo editor)



AWS

## Platform as a Service ( PaaS )



**Platform as a service (PaaS)** is a category of cloud computing that provides a platform and environment to allow developers to build applications. It frees developers without going into the complexity of building and maintaining the infrastructure.

With PaaS, developers and organizations can create highly scalable custom apps without having to provision and maintain hardware and operating system resources.

### PaaS Providers

- AWS beanstalk
- Google App Engine
- Windows Azure
- Force.com from salesforce
- IBM Bluemix
- RedHat OpenShift open source PaaS
- Pivotal CF from VMware

AWS

## Infrastructure As A Service (IaaS)



**Infrastructure as a service (IaaS)** is a form of cloud computing that provides virtualized computing resources, over the internet. Like CPU, harddisk, memory, switches, routers, firewall, DNS, DHCP, Load Balancer, Autoscaling etc...

### IaaS Providers

- Amazon AWS.
- Windows Azure.
- Google Compute Engine.
- Rackspace Open Cloud.
- IBM SmartCloud Enterprise.
- HP Enterprise Converged Infrastructure.
- GoGrid,
- Joyent,
- AppNexus

AWS

## Advantages of Cloud Computing



- Scalability/Elasticity
  - Demand on cloud infrastructures
- Cost saving
  - Reducing up-front IT cost by buying server machines, no need for hiring/training manpower.
  - Pay as you go, charges are applied hourly, monthly and yearly basis.
- Disaster recovery and Back up
  - Cloud Services have very high availability of ~99.9999%, by proactively taking backups, having stand-by virtual resources in place and moving failed instances of Virtual resources across seamlessly

AWS

## Cloud examples



### For Example

DropBox	<a href="https://www.dropbox.com/home">https://www.dropbox.com/home</a>
Google drive	<a href="https://drive.google.com/drive/my-drive">https://drive.google.com/drive/my-drive</a>
Google Docs	<a href="https://docs.google.com/document/u/0/">https://docs.google.com/document/u/0/</a>
Google presentation	<a href="https://docs.google.com/presentation/u/0/">https://docs.google.com/presentation/u/0/</a>
Google Calendar	<a href="https://calendar.google.com/calendar">https://calendar.google.com/calendar</a>

AWS

## AWS Certification



### aws CERTIFIED

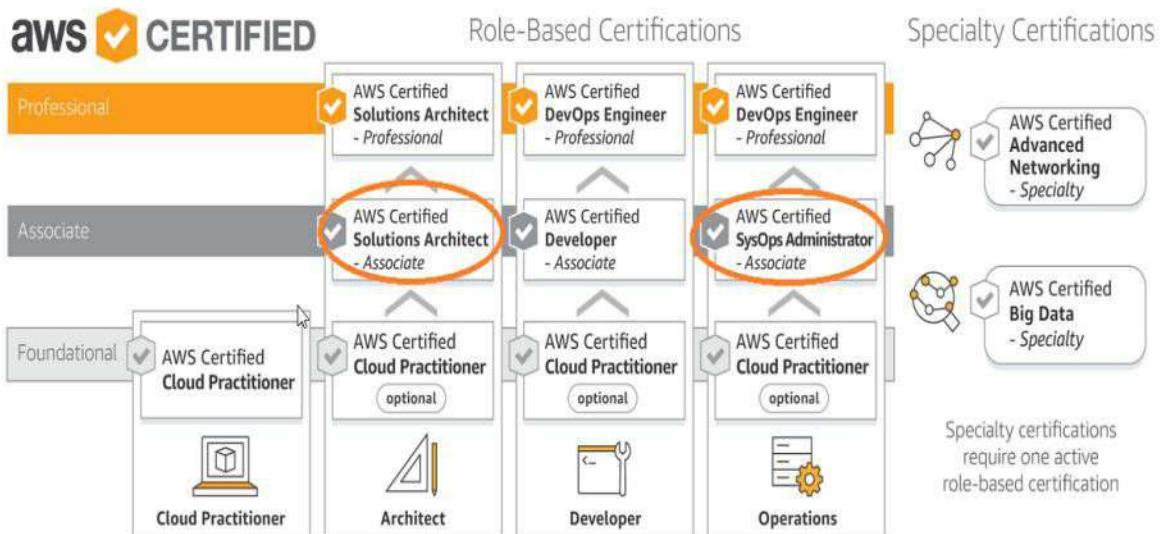


AWS

## Course covered



### aws CERTIFIED



AWS

## Course Content of AWS



### Compute

#### EC2

- Launch Instance
- AMI
- Elastic Block Storage
- Networking & Security
- Load Balancer
- Autoscaling

Elastic BeanStack

### Networking & Content Delivery

#### VPC

- Subnet
- Route Table
- Internet Gateways
- Elastic IP
- Nat Gateway
- Peering Connection

#### Route53

#### CloudFront

#### Security

- Network ACLs
- Security Group

#### VPN Connection

AWS

## Course Content of AWS



### Storage

S3 (Simple Storage Service)

EFS (Elastic File System)

Glacier

Security, Identity & Compliance

IAM

### Database

RDS

Dynamodb

Amazon Redshift

### Management Tools

CloudWatch

CloudFormation

CloudTrail

AWS

## Course Content of AWS



### Application Integration

Simple Queue Service

Simple Notification  
Service

Simple WorkFlow  
Service (SWF)

### Advance Topics

Active Directory Integration

Server Migration

Integration with Devops

### Customer Engagement

Simple Email Service

AWS

## AWS future and Job Scope



<http://www.financialexpress.com/industry/tech/what-the-future-holds-for-india-in-cloud-computing/108207/>

<http://www.zdnet.com/article/predictions-2017-three-reasons-businesses-cant-ignore-the-rapidly-growing-cloud-market/>

<http://www.cxotoday.com/story/global-public-cloud-market-to-reach-over-200-bn-in-2016-gartner/>

<https://www.quora.com/What-is-the-future-of-cloud-computing-in-India>

AWS

## DAY 2

### AWS Infrastructure

#### Launching of Windows and Linux instance

AWS

### What is AWS ?

Amazon Web Services (AWS) is a secure cloud services platform, offering compute power, database storage, content delivery and other functionality to help businesses scale and grow.

The first AWS offerings were launched in 2006 with S3 storage service.

AWS

How did Amazon... get into cloud computing?

**ZOOM**  
TECHNOLOGIES



AWS

AWS global infrastructure over the map

**ZOOM**  
TECHNOLOGIES



AWS

## AWS Global Infrastructure



- 16 Geographic Regions

Name	Code Name
US East (N. Virginia)	us-east-1
US East (Ohio)	us-east-2
US West (N. California)	us-west-1
US West (Oregon)	us-west-2
Canada (Central)	ca-central-1
EU (Ireland)	eu-west-1
EU (Frankfurt)	eu-central-1
EU (London)	eu-west-2
Asia Pacific (Tokyo)	ap-northeast-1
Asia Pacific (Seoul)	ap-northeast-2
Asia Pacific (Singapore)	ap-southeast-1
Asia Pacific (Sydney)	ap-southeast-2
Asia Pacific (Mumbai)	ap-south-1
South America (São Paulo)	sa-east-1

- 44 Availability Zones

- Coming soon 17 more Availability Zones and six more Regions in Bahrain, China, France, Hong Kong, Sweden, and a second AWS GovCloud Region in the US.
- 90 Edge Location by November 6, 2017

AWS

## AWS Region, Availability Zones, Edges



### Regions

An independent collection of AWS resources in a defined geography

A solid foundation for meeting location-dependent privacy and compliance requirements



### Availability Zones

Designed as independent failure zones

Physically separated within a typical metropolitan region

### Edge Locations

To deliver content to end users with lower latency

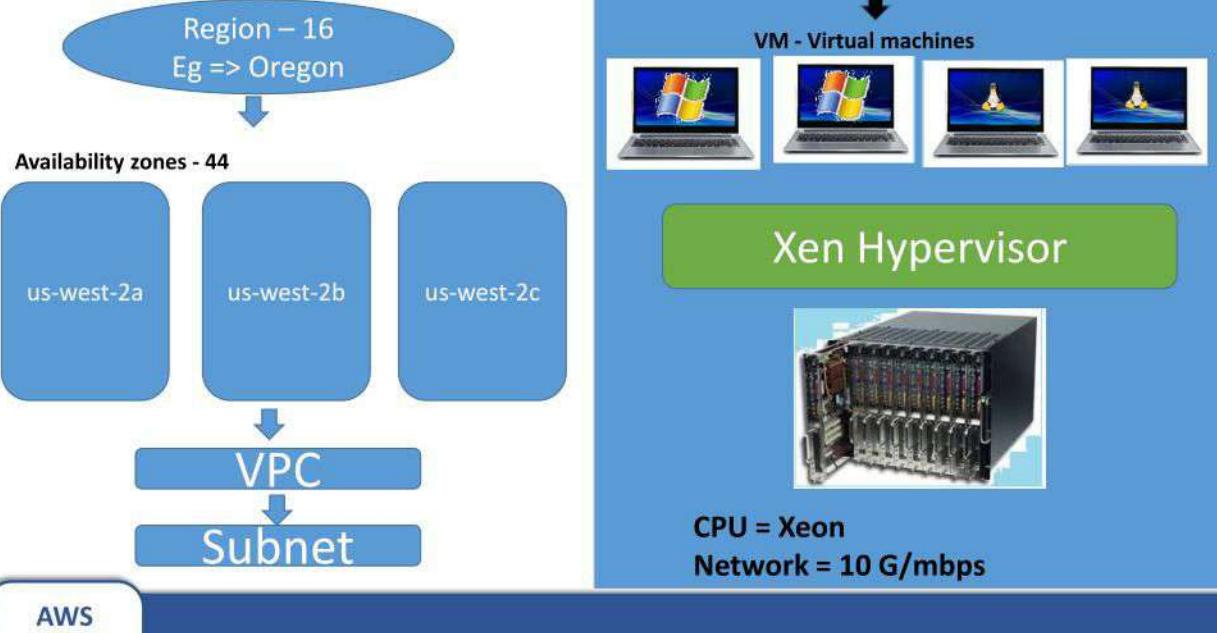
A global network of edge locations

Supports global DNS infrastructure (Route53) and CloudFront CDN

AWS

## AWS infrastructure in a Region

**ZOOM**  
TECHNOLOGIES



AWS

## To launch Windows Server instance in AWS and connect

**ZOOM**  
TECHNOLOGIES

### Windows Client



To connect from windows client to Windows instance of AWS Data Center  
 Click on RDP file  
 or  
 Start -> Run -> mstsc  
 Provide DNS / IP, username and password

### OREGON REGION



Windows Server  
In AWS Cloud Data  
Center

### Linux Client



To connect from Linux client to Windows Instance in AWS Data Center  
 Login to Linux and run this command in terminal  
`$ rdesktop -u administrator <PUB_IP / DNS_Pub_name>` { RHEL 6 or Ubuntu }  
 Or  
`$ xfreerdp -u administrator <PUB_IP / DNS_Pub_name>` { RHEL 7 }

AWS

## To launch Linux Server instance in AWS and connect



Linux Client



Download \*.pem file  
Open terminal follow the syntax  
\$ chmod 400 <\*.pem>  
\$ ssh -i <\*.key> <DNS\_name / Public\_IP>

OREGON REGION



Linux Server  
In AWS Cloud Data  
Center

Windows Client



Download putty.exe/puttygen.exe from putty.org  
Connect through  
1. putty.exe/puttygen.exe  
2. mobaxterm

AWS

## Amazon Elastic Block Storage



# DAY 3

## Amazon Elastic Block Storage

AWS

# Amazon Elastic Block Storage

AWS

### Types of Storage

- Direct-attached storage (DAS)
- Network attached storage ( NAS )
- Storage area network ( SAN )
- Cloud Storage i.e. storage over Internet

AWS

## Direct attached storage ( DAS )



- **Direct-attached storage (DAS)**

Direct-attached storage (DAS) is attached directly to the computer system mother board connectors or through usb. Examples of DAS include hard drives, CDROM/DVD , external hard drives, optical disc drives, pendrive etc.

Amazon provide these facility through **EBS (Elastic Block Storage service)**

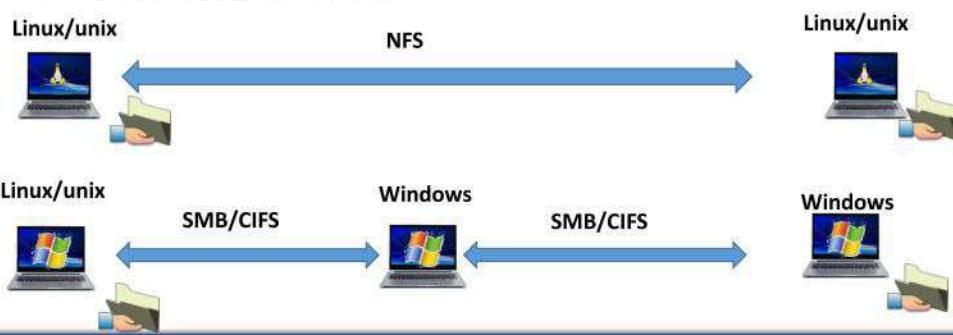
AWS

## Network-attached storage (NAS)



- **Network-attached storage (NAS)**

- NAS uses file-based protocols for sharing folders using NFS for Linux/UNIX, SMB/CIFS for windows.
- It is a shared folder over the network.
- Amazon provide these facility through **EFS ( Elastic File system )** service.
- A shared folder cannot be formatted.



AWS

## Storage Area Network (SAN)



### • Storage Area Network (SAN)

A storage-area network (SAN) is a dedicated high-speed network block level data storage, It can be formatted.

It provide shared pools of storage devices to multiple servers in the form of LUN.

Fiber cable, bus adapters (HBAs) and fiber switches are used to provide SAN storage.

ISCSI target make use of normal network over cat5/6 cables to provide LUN over SAN storage.



AWS

## Cloud Storage



### • Cloud storage

Cloud storage is a storage over internet provided by cloud service venders.

It is not a block level storage i.e. cannot be formatted.

Eg.

Google drive

One drive

Dropbox

Amazon provides this services through

- S3 (Simple storage service )
- Glacier service

AWS

## Elastic Block Storage



- Elastic Block Store (EBS)

Amazon Elastic Block Store (EBS) is a block level storage volumes which can be formatted according to required filesystem, for e.g. In Windows FAT32, NTFS, in Linux ext3, ext4, resirfs etc.

Data on EBS volume are persistence, they are not lost if a instance is started/stopped or restarted.

When an instance is launched by default it contains an EBS volume which is called as root volume, where operating system is installed.

These EBS root volumes are highly available because AWS by default automatically creates a snapshot of launched instance which are used to recover if any disaster or failover occurs.

AWS

## Elastic Block Storage



With Amazon EBS, you can scale your usage up or down within minutes.

Software's like Oracle, SAP, Big Data workloads, Data warehouses, Log processing, Boot Volume are used on EBS volumes.

EBS volumes are 99.9999% Availability, with 0.1% to 0.2% Annual Failure Rate (AFR)

AWS

## Elastic Block Storage



EBS volumes are specific to their Availability Zones

An instance can have Multiple EBS volume attached.

These EBS volumes can be attached as well as detached from an instance without any data loss.

EBS volumes at one particular time can be attached to only one instance, it cannot be used with two or more instance at the same time.

EBS volume can be attached to an instance which is in same Availability zone, it cannot be attached to an instance which is another availability zone.

Each EBS volume will have a volume id, which will be used by cloudwatch and other services.

AWS

## EBS snapshot



EBS Snapshot

Snapshot are used to take EBS point-in-time backup.

Snapshot are incremental back up of the EBS volume.

Snapshots are region specific, where as volumes are specific to availability zones.

EBS volumes cannot be increased directly through volumes.

To increase the size of EBS Volumes first create the snapshots, then from this snapshot create the required size of volume.

AWS

## EBS snapshot



### EBS Snapshot

Volume size cannot be decrease lesser than the snapshot size

Volumes in another Availability zones can be created using snapshot

To have the same volume in another region, first copy the snapshot in other region, then from this snapshot create the volume in required availability zones .

Volumes are not deleted if snapshots are removed, similarly snapshots are not deleted if volumes are removed

AWS

## IOPS / Throughput



### IOPS

Input/output operations per second (#)

After ~33 GB adds 3 IOPS for each GB in general purpose volume

### Throughput

Read/write rate to storage (MB/s)

AWS

## Types of EBS Volumes



Volume Types	Hardware Type	Minimum Size	Maximum Size	Max IOPS/Vol's	Max Throughput MB/s	Price
EBS Provisioned IOPS SSD (io1)	SSD	4 GB	16 TB	20,000	Not applicable	\$0.125/GB-month \$0.065/provisioned IOPS
EBS General Purpose SSD (gp2)*	SSD	1 GB	16 TB	10000	Not applicable	\$0.10/GB-month
Throughput Optimized HDD (st1)	HDD	500 GB	16 TB	500	500 MB/s	\$0.045/GB-month
Cold HDD (sc1)	HDD	500 GB	16 TB	250	250 MB/s	\$0.025/GB-month
Magnetic	HDD	1GB	1 TB	Not applicable	Not applicable	\$0.05/GB-month

AWS

## Costing of EBS snapshot



Snapshot are charged around the same as storage for your EBS volumes

Prices are calculated depending on the type of Volumes.

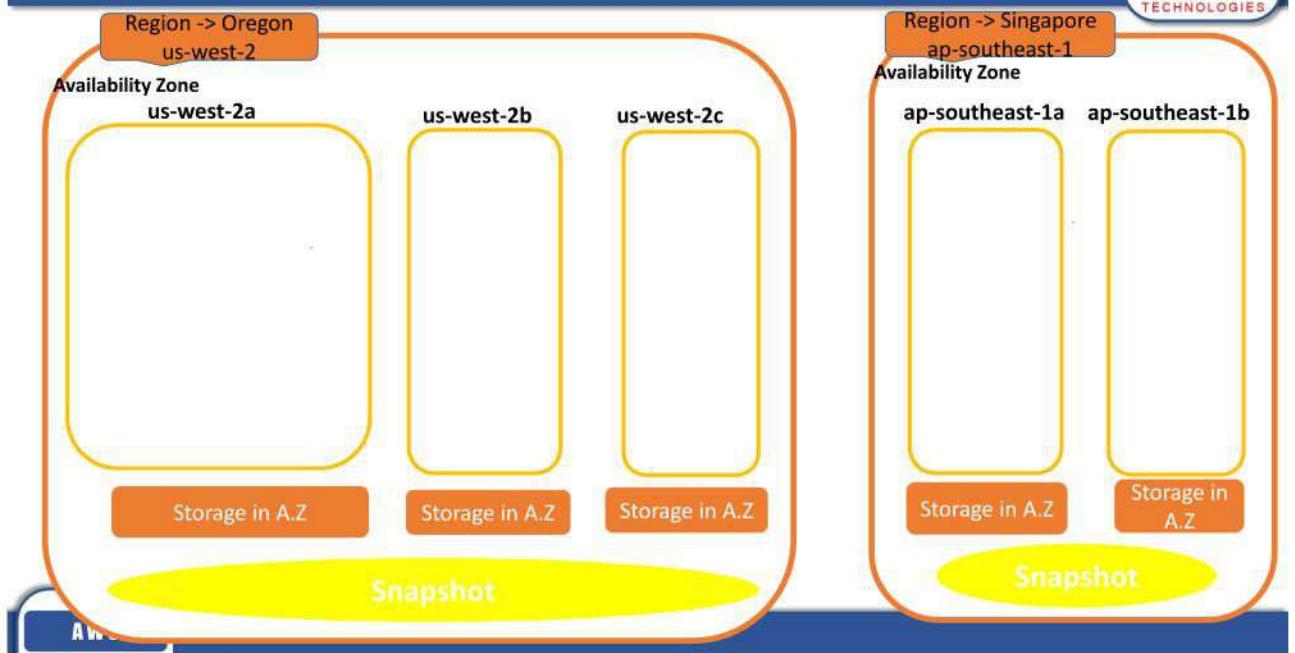
### Scenario

If you take 1TB of local snapshots every day for one month with 3% daily increment changes and a 30-day retention period, it will cost you the same as snapshots for 2TB per month. With \$0.10 per GB-month of snapshots, it will cost around \$200 (\$0.1/GB x 2TB) per disk.

AWS

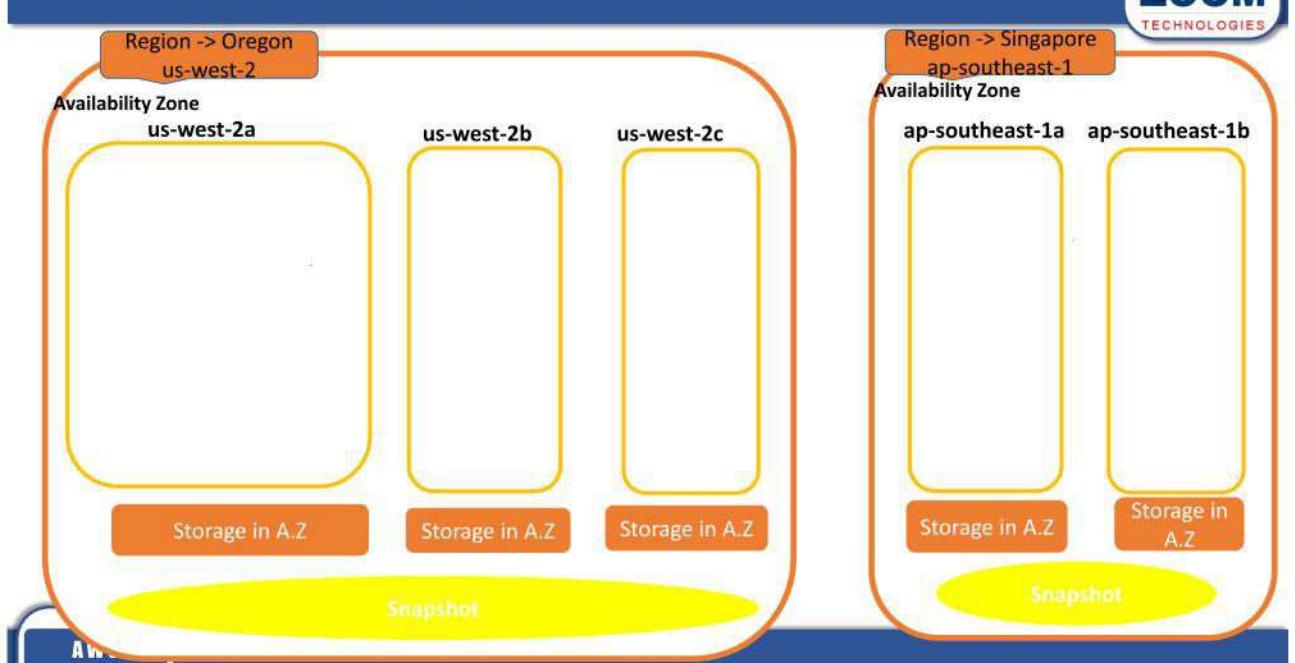
## Attach and detach EBS volume ?

**ZOOM**  
TECHNOLOGIES

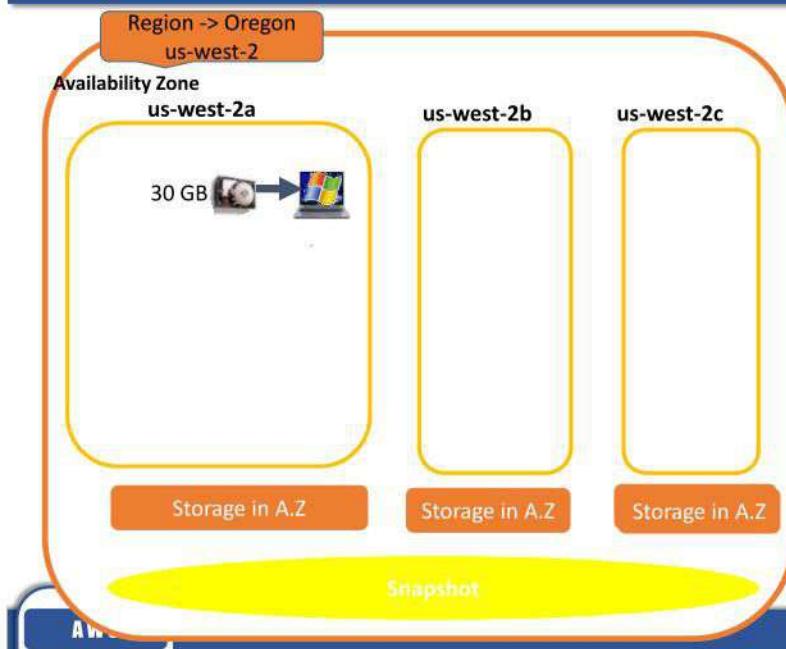


## Attach and detach EBS volume ?

**ZOOM**  
TECHNOLOGIES

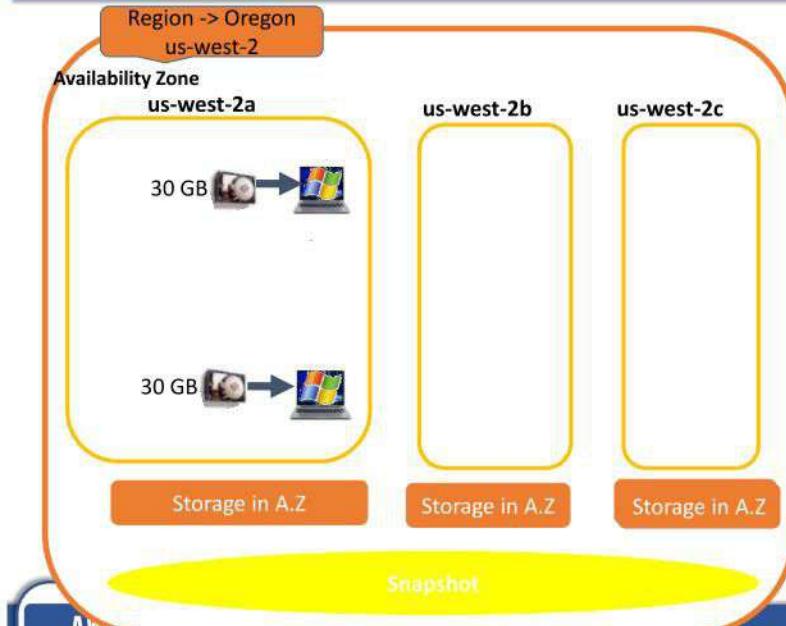


## Attach and detach EBS volume ?



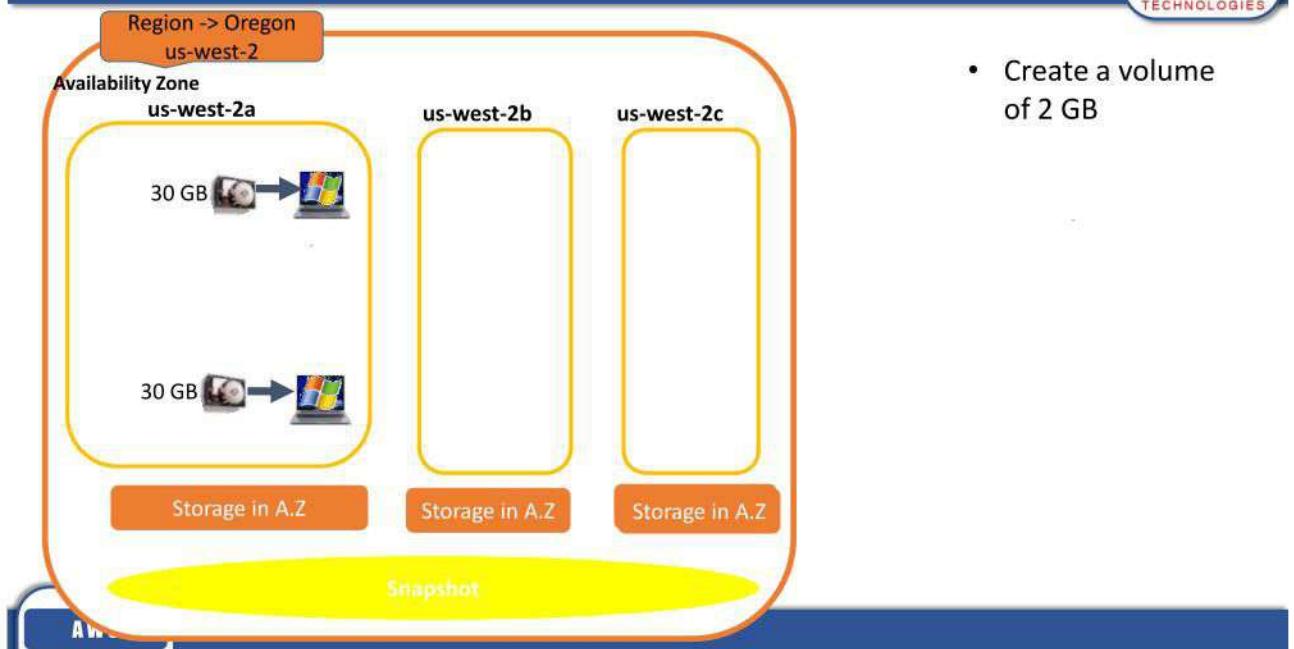
- Launch an instance in one A.Z

## Attach and detach EBS volume ?

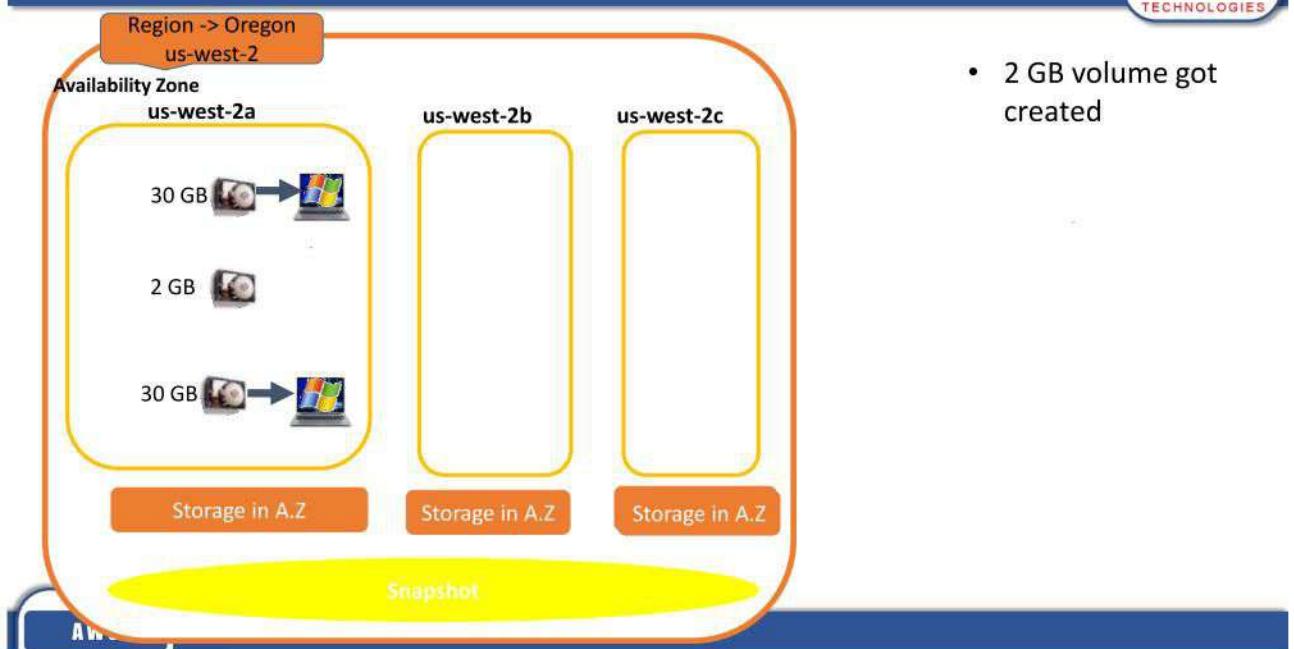


- Launch another instance in the same A.Z

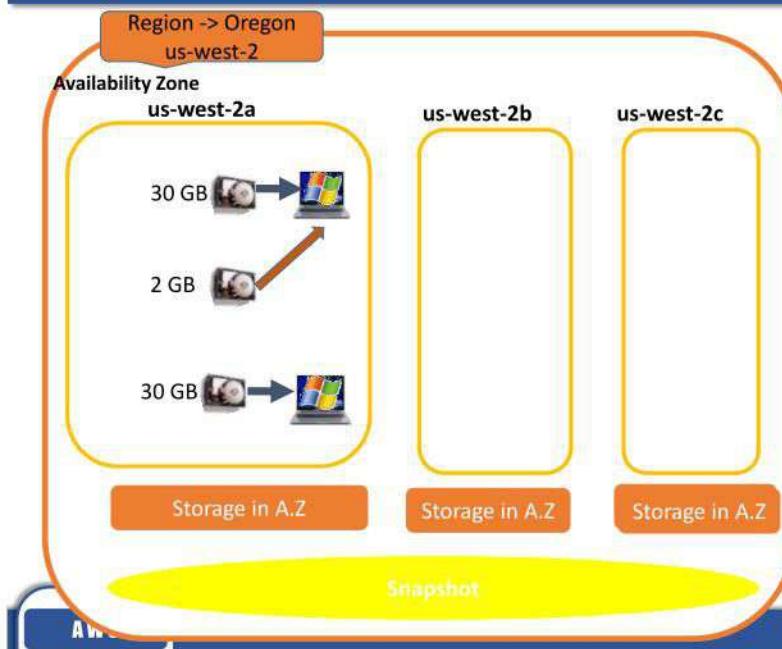
## Attach and detach EBS volume ?



## Attach and detach EBS volume ?

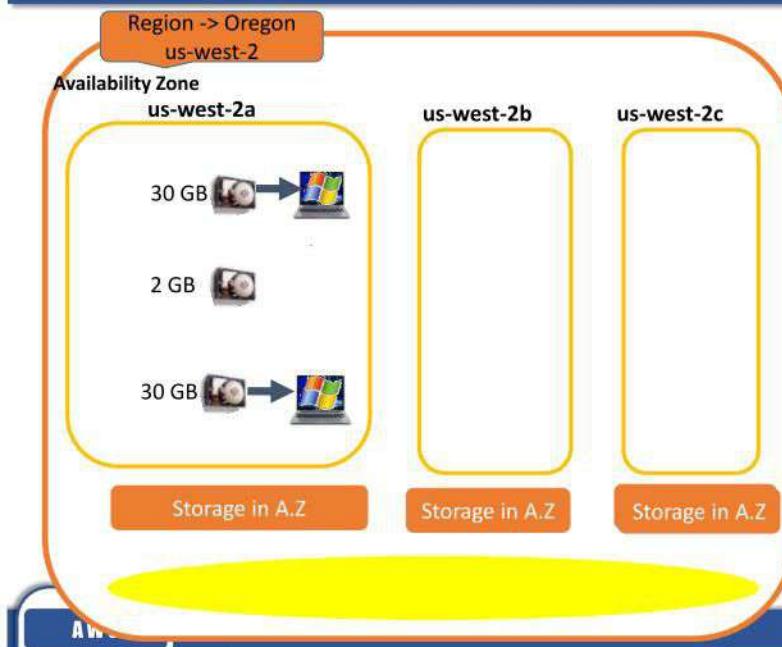


## Attach and detach EBS volume ?



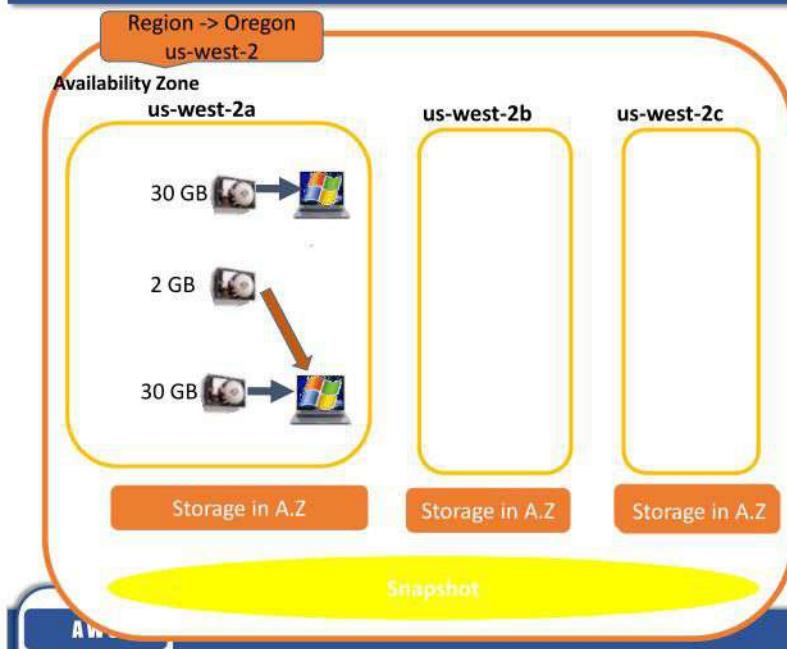
- Attach the volume to an instance
- EBS volume can be attached to only one instance at one time
- Same volume if u want to use with other instance then, first detach from existing instance and attach to another instance.

## Attach and detach EBS volume ?



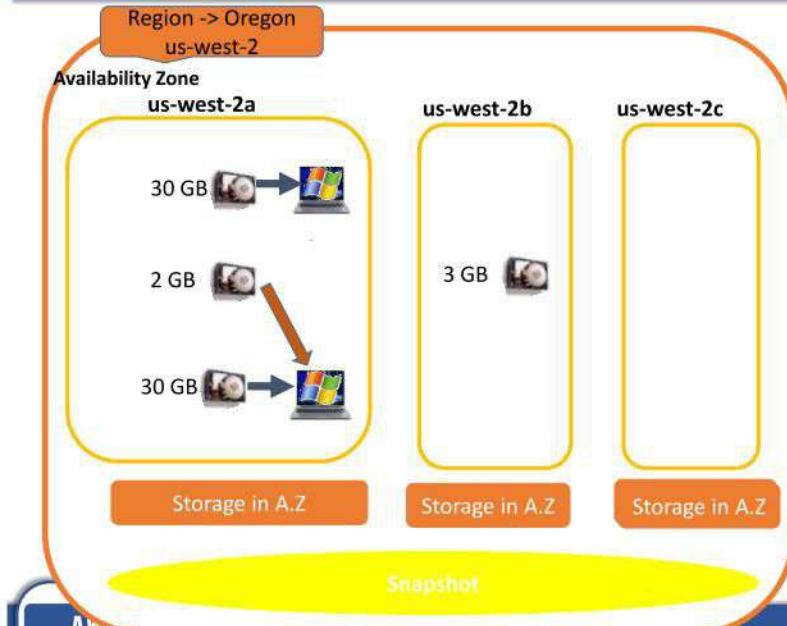
- Now volume is detached.
- Now it could be attached to another instance.

## Attach and detach EBS volume ?



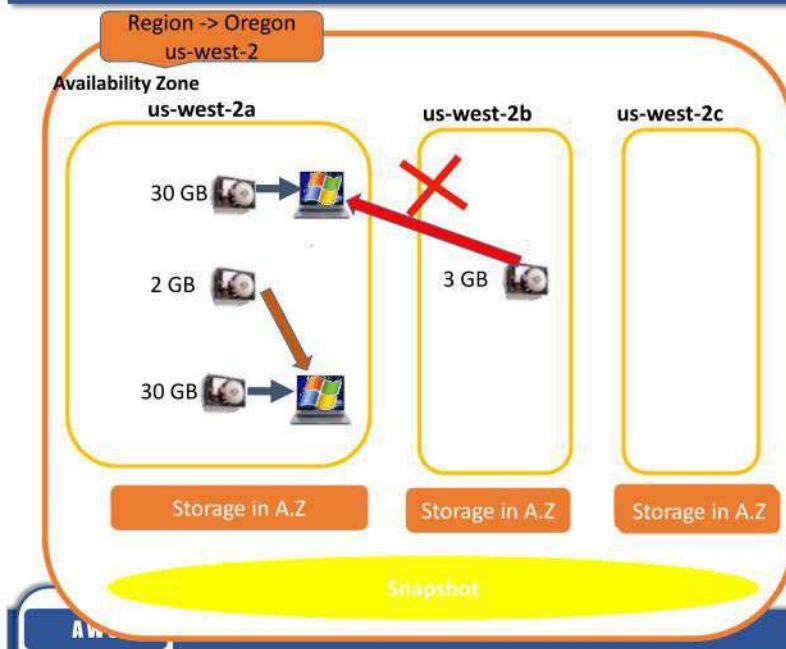
- Attached to another instance.

## Attach and detach EBS volume ?



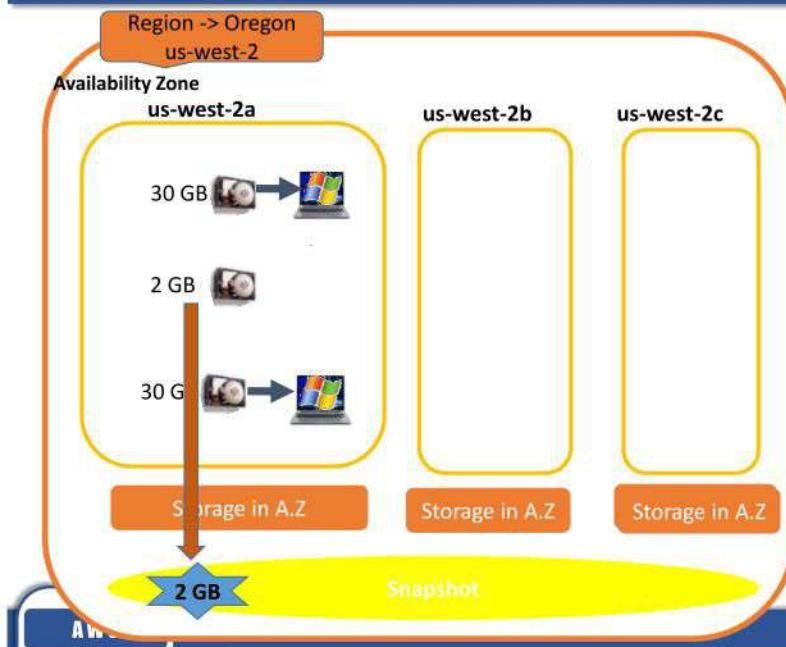
- Create a volume in another A.Z
- A volume of one A.Z cannot be attached to instance in another A.Z

## Attach and detach EBS volume of other region S?



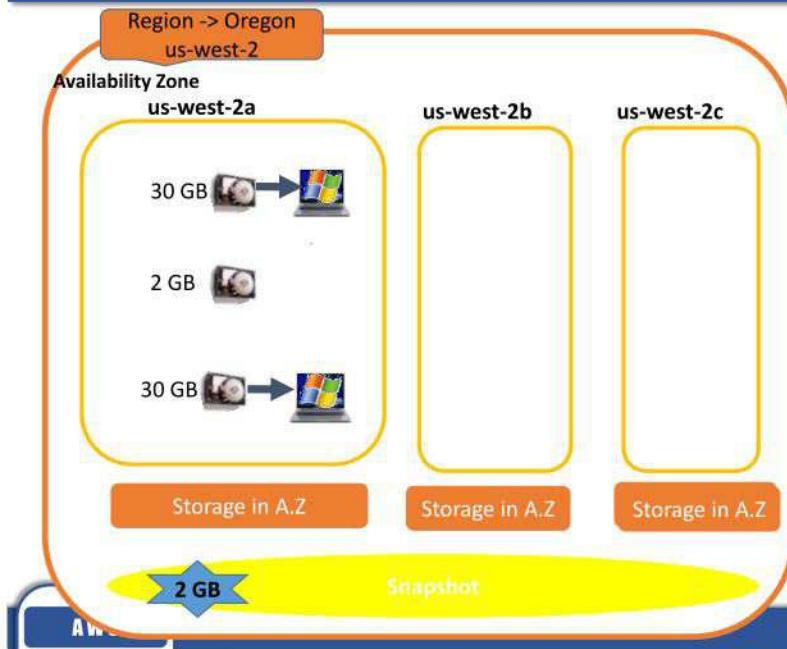
- A volume of one A.Z cannot be attached to instance in another A.Z

## To Increase the size of the Volume



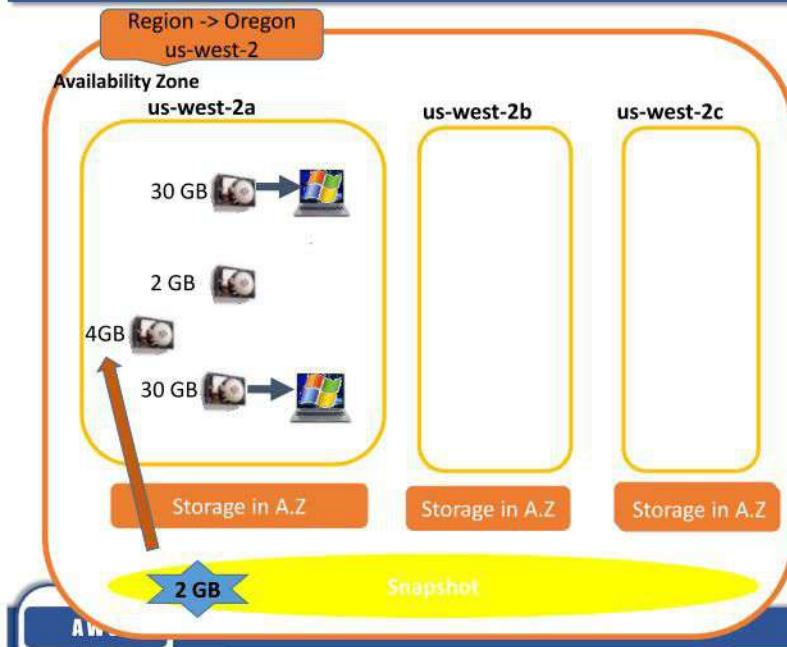
- Snapshots are specific to the region
- To increase the size of the volume first take the snapshot
- Now from this snapshot create a volume of required size.

## To Increase the size of the Volume



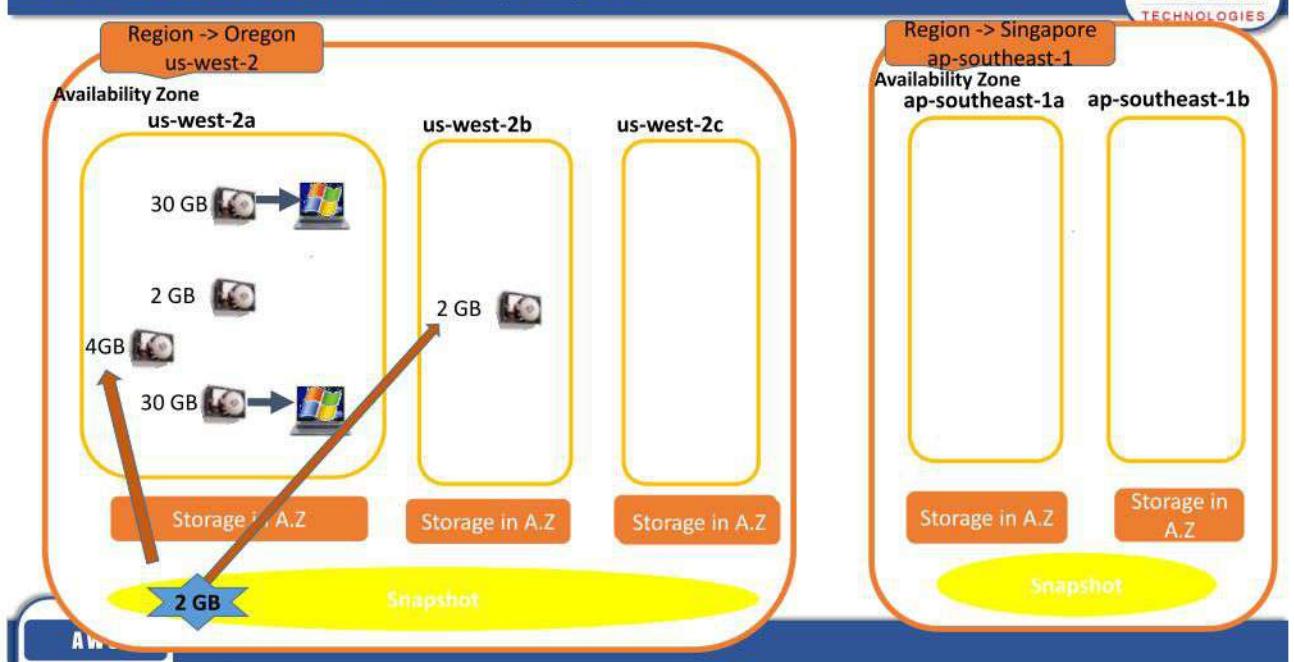
- Snapshot is created
- Snapshot belongs to whole region

## Attach and detach EBS volume ?

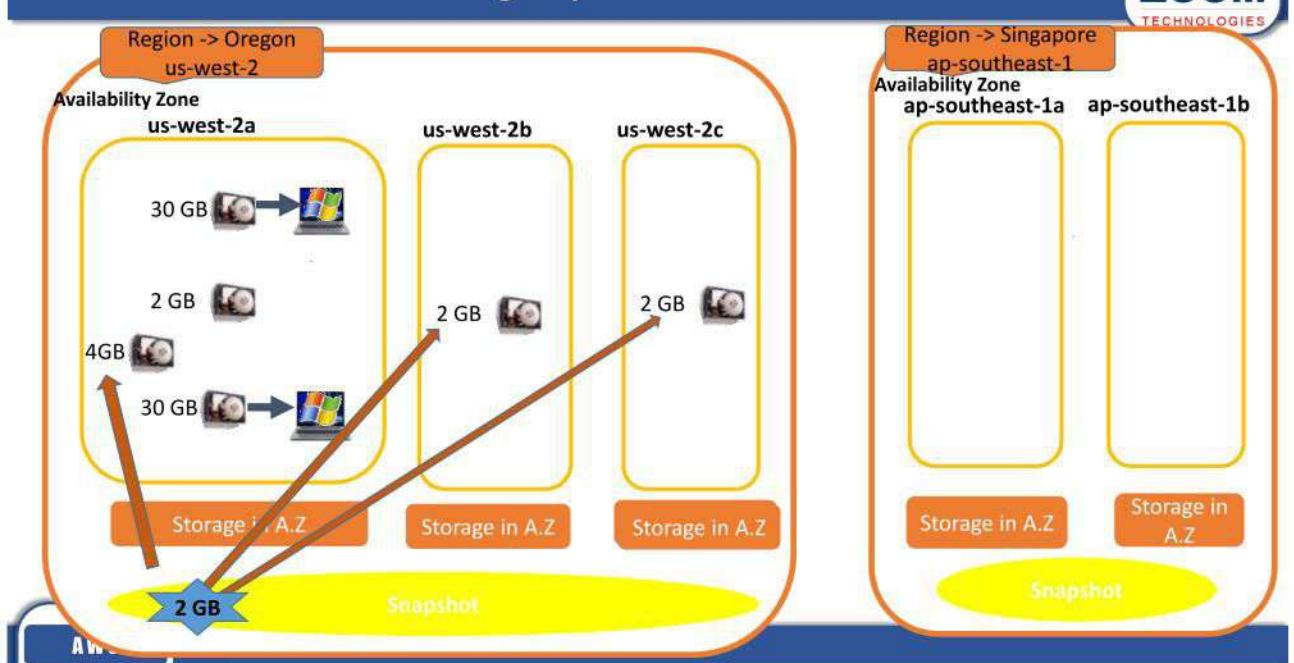


- Now from this snapshot create a volume of required size.

### Create volume in other A.Z using snapshot

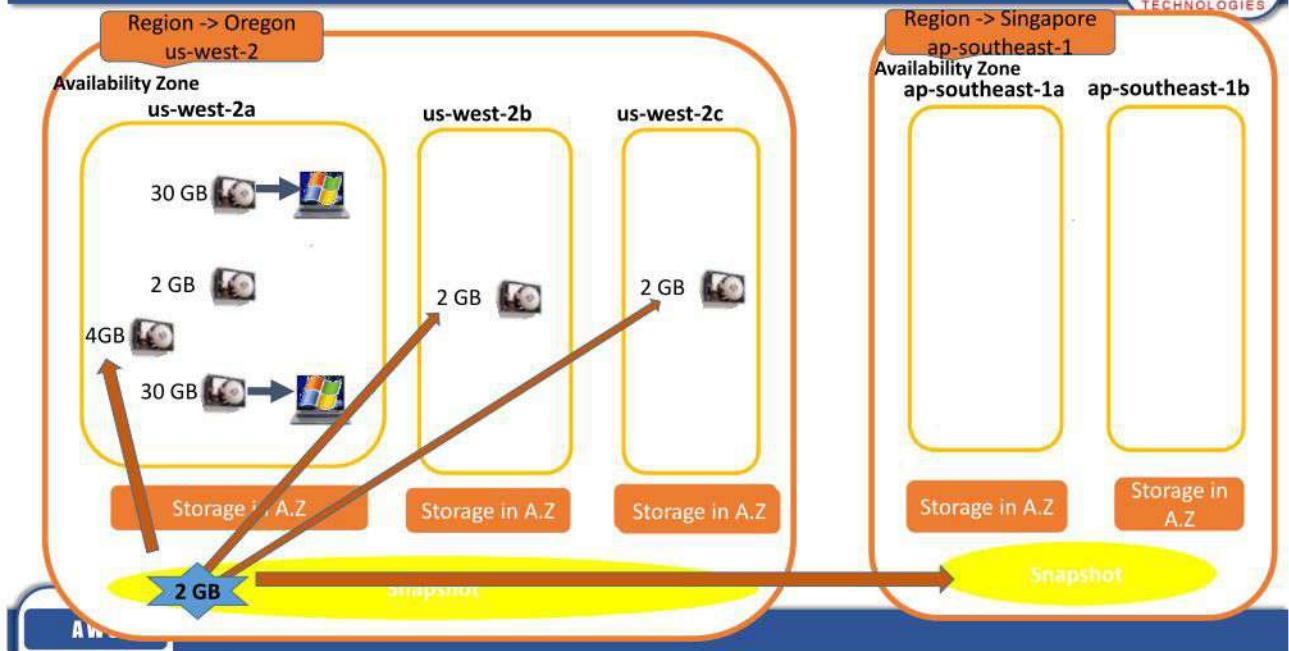


### Create volume in other A.Z using snapshot



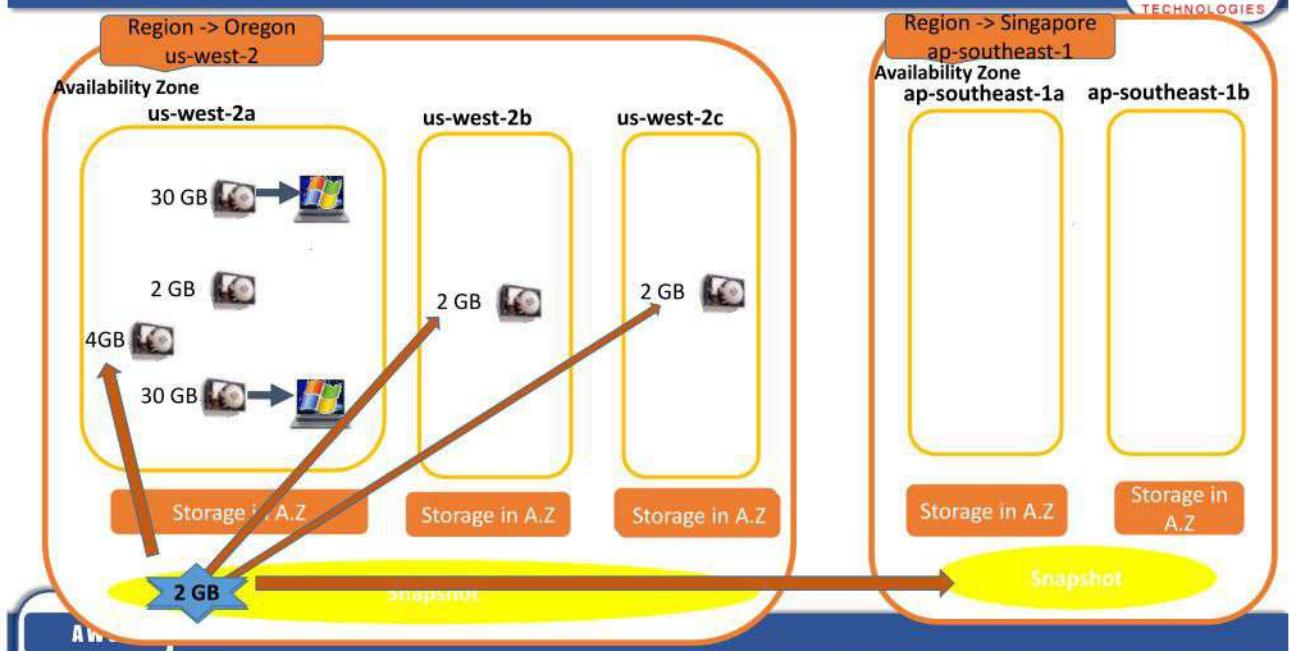
## Copy snapshot in other region to create similar volumes

**ZOOM**  
TECHNOLOGIES



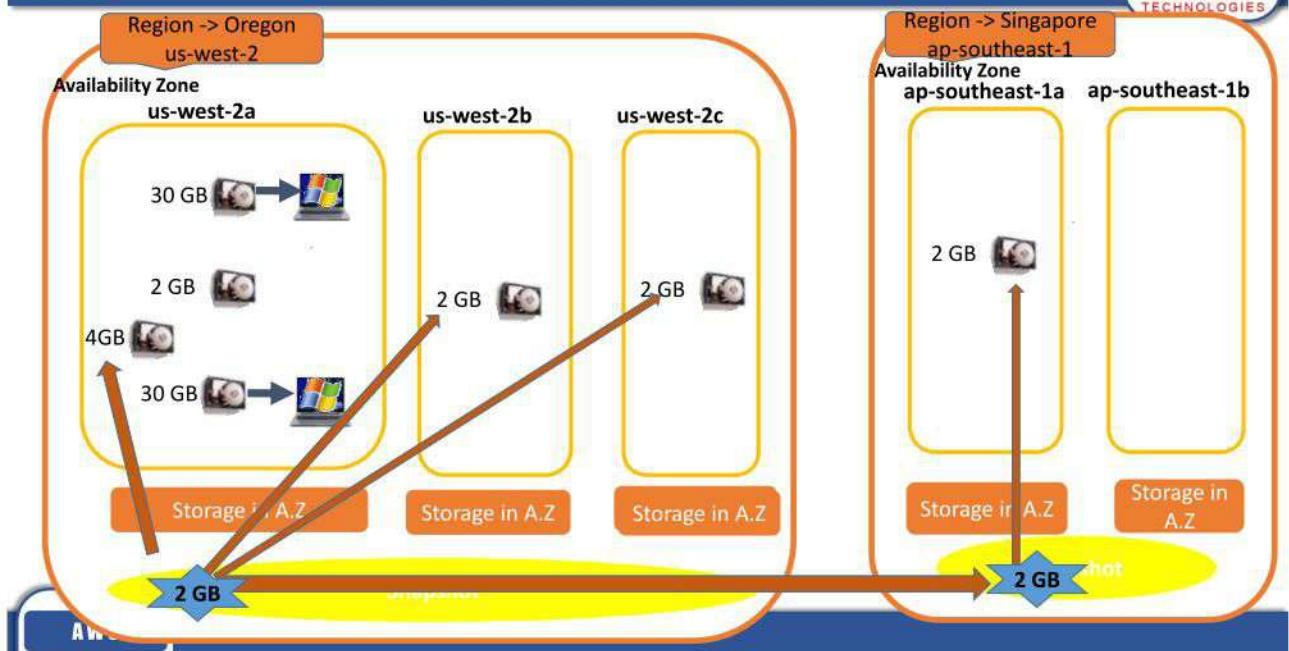
## Copy snapshot in other region to create similar volumes

**ZOOM**  
TECHNOLOGIES



## Copy snapshot in other region to create similar volumes

**ZOOM**  
TECHNOLOGIES



## Managing partitions

**ZOOM**  
TECHNOLOGIES

- In windows by using diskmgmt.msc drives and partitions can be managed.
- In linux to manage drive and partition use fdisk.

AWS

## **DAY 4**

# **Identity and Access Management ( IAM )**

AWS

# **Identity and Access Management ( IAM )**

AWS

## Agenda



### IAM (Identity and Access Management)

**IAM Users**

**IAM Groups**

**IAM Roles**

**IAM Policies**

**Multi-Factor Authentication**

AWS

## What is IAM ?



- **What is IAM ?**

- By default when AWS account is created it treats that user as a root user who has the access to all AWS services and resources, but to give the access to AWS services to other users, group members, applications, or instances IAM users, groups and roles are created.
- (IAM) is a web service that helps you securely control access to AWS resources
- IAM is a global service, it's free.
- A primary use for IAM users is to give people the ability to sign in to the AWS Management Console for interactive tasks and to make programmatic requests to AWS services using the API or CLI.

AWS

## Main components of IAM



- The main components of IAM

- IAM Users
- IAM Groups
- IAM Roles
- IAM Policies

AWS

## IAM



### Working of IAM

#### Policies

##### Examples of Policies :

AmazonEC2ReadOnlyAccessAWS  
AmazonS3FullAccess  
AmazonS3ReadOnlyAccess  
AmazonRDSFullAccess  
AmazonRDSReadOnlyAccess

#### Users

#### Groups

#### Roles

AWS

- **IAM users**

- IAM users can manage AWS service and resources either through Console access or programmatic Access.
- If an IAM user is not having any policy attached then that user cannot do any task that means an IAM user without policy is of no use.
- IAM user requires a username/password to login to console or access/secret key to connect programmatically to use AWS services.
- An IAM User with only AWS creds can be created so the creds can be used by an application to make API calls into AWS.
- Multiple policies can be attached to a Single IAM users
- An IAM user can belong to multiple Groups

- **IAM Groups**

- An IAM group is a collection of IAM users.
- Groups let you specify permissions (policy) for multiple users, which can make it easier to manage the permissions for those users
- Permissions assigned to groups are inherited to all the users in that group
- Groups can't be nested; they can contain only users, not other groups.
- IAM user can be a member of 10 Groups

- **IAM Roles**

- When policies are applied on an AWS ec2 instance or AWS application or service then it is called as roles.
- An IAM role is very similar to a user, in that it is an identity with permission policies that determine what the identity can and cannot do in AWS.
- Roles do not use username and password but they use access key and secret key in order to use the services like ec2, lambda, s3, RDS, autoscaling etc.
- Scenario

Suppose you had configured any server and now u want to upload the data to s3 without any user interaction then if that EC2 instance is having a role of s3 then it can automatically upload with the help of script without users interaction.

- **IAM Policy**

- Permissions that we grant to users, groups, and roles are called as policies.
- These policies will give the access to that service or resource to read, write, or fullaccess.
- IAM Policies are JSON formatted

## Elements of IAM policy



- Elements of IAM policy
  - Version
  - Statement
  - Contains an array of statements
- Each statement defines whether permissions are allowed or denied
  - These are defined by the values of the following elements in each statement:
    - Effect – Allow or Deny
    - Action – array of service actions
    - Resource – array of ARNs that actions can occur on
    - Principal – identifies who/what is allowed/denied access

AWS

## Example Policies



- Allows an Amazon EC2 instance to attach or detach volumes

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Effect": "Allow",  
            "Action": [  
                "ec2:AttachVolume",  
                "ec2:DetachVolume"  
            ],  
            "Resource": [  
                "arn:aws:ec2:<REGION>:<ACCOUNTNUMBER>:volume/*"  
            ]  
        }  
    ]  
}
```

AWS

## Security firsts for new AWS accounts



- For AWS root account:
  - Store username/password somewhere safe and secure
  - Setup multi-factor authentication
- Create IAM User(s) with "[least privileges](#)" necessary
  - Least privilege = only the permissions necessary to accomplish needed tasks

AWS

## Multi factor authentication (MFA)



- MFA provides added security for AWS resources and account settings.
- It is a two factor authentication
- First factor i.e. it asks for username and password, and the second factor is it ask for MFA code.
- If a user logs in to AWS account he will be prompted for username, password and Multi factor authentication code.
- AWS does not charge any additional fees for using MFA.

AWS

## Multi factor authentication (MFA)



Virtual MFA applications are available for smartphones including Android, iOS and Windows.

- These are the list of authenticated mobile application

Android	Google Authenticator; Authy 2-Factor Authentication
iPhone	Google Authenticator; Authy 2-Factor Authentication
Windows Phone	Authenticator
Blackberry	Google Authenticator

AWS

## Limits of IAM



### Limits :

- **User name** 64 characters
- **Group name** 128 characters
- **Role name** 64 characters
- **Policy name** 128 characters
  
- **Groups in an AWS account** 300
- **Roles in an AWS account** 1000
- **Users in an AWS account** 5000

AWS

## **DAY 5**

# **Amazon S3 ( Simple Storage Service ) & Glacier**

AWS

## **Amazon S3 (Simple Storage Service) – Object storage**

AWS

# Amazon Simple Storage service ( S3 )



- Agenda

Cloud Storage

S3

Object

Bucket

Keys

Static Web Hosting

Versioning

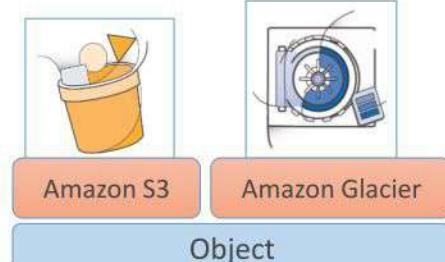
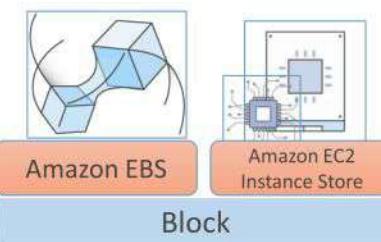
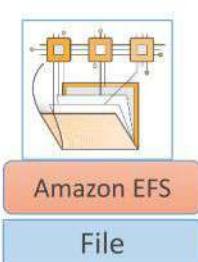
Replication

AWS

# Cloud Storage



Storage is a platform: AWS Storage



Data Transfer

AWS

## Cloud Storage



- **Cloud Storage**

Storage over the internet is called as Cloud storage or Object Storage.

Every file on cloud storage is called an object.

Cloud storage differs from block storage (i.e. cannot be formatted) and file storage (i.e. shared folders.)

It is a model in which data is maintained, managed, backed up remotely and made available to users over network (typically the Internet).

AWS

## Cloud Storage



Cloud storage is based on a virtualized infrastructure with accessible interfaces, elasticity and scalability, multi-tenancy and metered resources.

Under hood architecture is used to provide highest reliability by replicating objects across multiple servers and hardware and disk drives form the same or different locations.

To configure Cloud storage minimum 3 to 5 nodes are required to maintain multiple copies across the nodes.

AWS

## Example of Cloud Storage



### Examples of Cloud or Object storage services

Amazon S3                            EMC Atmos, EMC ECS

Google Drive                        Hitachi Content Platform

One Drive                            OceanStore

DropBox                              VISION Cloud

Microsoft Azure Storage

Openstack Swift

AWS

## Amazon Simple Storage service ( S3 )



- S3 ( Simple Storage Service )

Amazon S3 is a cloud or object storage service, started in 2006 as a first service.

By the end of 2012, 1.3 trillion objects were stored in Amazon S3, the world's largest and most widely known object storage system. Now, that number was growing faster, so the 2 trillion mark is right around the corner.

S3 is a Global service.

S3 enables a customer to upload, store and download practically any file or object .

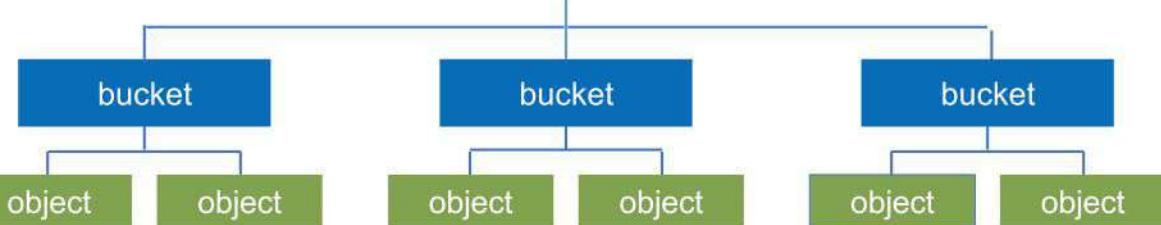
AWS

Globally Unique



Bucket Name + Object Name (key)

Amazon S3



AWS

## Bucket

- **Bucket**

A bucket is a logical unit of storage in Amazon Web Services (AWS) object storage service,

Instead of organizing files in a directory hierarchy, object storage systems store files in a flat organization of containers (called "buckets" in Amazon S3) and use unique IDs (called "keys" in S3) to retrieve them.

Buckets are used to store objects, which consist of data and metadata that describes the data.

There is no limit to the number of objects a customer can store in a bucket, but each AWS account can only have 100 buckets at one time.

AWS

## Object Keys & Metadata

- **Object Keys**

When you create an object, you specify the key name, which uniquely identifies the object in the bucket. These names are the object keys.

The name for a key is a sequence of Unicode characters ( UTF-8 encoding ) is at most 1024 bytes long.

- **Object Metadata**

For each object stored in a bucket, Amazon S3 maintains a set of system metadata, which contains object creation date and size, last modified date, etc and uses this information as part of object management.

## S3 Standard and IA

Amazon S3 comes in two storage classes:

- S3 Standard and ,
- S3 Infrequent Access.

Amazon S3 Standard – Any time could be retrieved or uploaded,

Infrequent Access (Standard - IA) is an Amazon S3 storage class for data that is accessed less frequently, but requires rapid access when needed, retrieval of data should be at least after 30 days.

Amazon does not impose a limit on the number of items that a subscriber can store.

A subscriber can choose to keep data private or make it publicly accessible

## Pricing of S3 Standard



**Services**      Estimate of your Monthly Bill (\$ 2.18)

**Choose region:** US-East / US Standard (Virginia) Inbound Data Transfer is Free and Outbound Data Transfer is 1 GB free per region per month

Amazon S3 is storage for the Internet. It is designed to make web-scale computing easier for developers. Please check the [Amazon S3 Storage Classes](#) page details. [Clear Form](#)

**Standard Storage:**

Storage:	100	GB
PUT/COPY/POST/LIST Requests:	2	Requests
GET and Other Requests:	2	Requests

**Standard - Infrequent Access Storage:**

Storage:	0	GB
PUT/COPY/POST/LIST Requests:	2	Requests
GET and Other Requests:	2	Requests
Lifecycle Transitions:	0	Transitions
Data Retrieval:	0	GB

AWS

## Pricing of S3 Infrequent Access storage



**Services**      Estimate of your Monthly Bill (\$ 1.25)

**Choose region:** US-East / US Standard (Virginia) Inbound Data Transfer is Free and Outbound Data Transfer is 1 GB free per region per month

Amazon S3 is storage for the Internet. It is designed to make web-scale computing easier for developers. Please check the [Amazon S3 Storage Classes](#) page details. [Clear Form](#)

**Standard Storage:**

Storage:	0	GB
PUT/COPY/POST/LIST Requests:	2	Requests
GET and Other Requests:	2	Requests

**Standard - Infrequent Access Storage:**

Storage:	100	GB
PUT/COPY/POST/LIST Requests:	2	Requests
GET and Other Requests:	2	Requests
Lifecycle Transitions:	0	Transitions
Data Retrieval:	0	GB

AWS

## Key features of S3



- Data Management
  - Cost monitoring and controls Lifecycle management
- Ease of use
  - Programmatic access using AWS SDKs & REST APIs
  - Management Console, AWS CLI
- Event Notifications
  - Delivered using SQS, SNS, or Lambda

AWS

## Key features of S3



- Data protection
  - Versioning
  - Cross-region replication
- Security
  - Flexible access control mechanisms
  - Time-limited access to object
  - Access logs

AWS

## Static Website Hosting



- **Static Website Hosting**

Amazon allow to configure static website on Amazon s3.

It can contains client-side scripts comprised of only HTML, CSS, and/or JavaScript at client side, but Amazon S3 does not support server-side scripting.

To configure Static website first create a bucket , then upload all your website code into that bucket.

Add a bucket policy so that all folders, files and subfolders in that bucket can have access.

Enable Static Website Hosting providing index document and error document page.

Provide Endpoint url in brower and check the site.

AWS

## Bucket Policy



----- To create Bucket policy-----

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "PublicReadForGetBucketObjects",  
            "Effect": "Allow",  
            "Principal": "*",  
            "Action": "s3:GetObject",  
            "Resource": "arn:aws:s3:::www.indiahydameerpet.com/*"  
        }  
    ]  
}
```

AWS

## Versioning is S3



- Versioning offers an additional level of protection.
- Once versioning is enabled on s3 bucket, then it allows you to preserve, retrieve, and restore every version of every object stored.
- It protects from unintended user actions and application failures,

AWS

## Cross-region Replication



With cross-region replication, every object uploaded to an S3 bucket is automatically replicated to a destination bucket in a different AWS region that you choose.

Copies of replicated objects inside a bucket are identical to the ones in the destination bucket.

Versioning is required

AWS

## S3 in CLI mode



1) First create IAM user with S3fullaccess policy.

Select AWS access type

Programmatic access

AWS Management Console access

2) In windows install AWSCLI64.msi

3) Configure aws cli providing IAM user access key & secret key

c:> aws configure

Access Key : \*\*\*\*\*

Secret Key : \*\*\*\*\*

Region : us-west-2

Note : o/p format are's

a) text

b) table

c) json

AWS

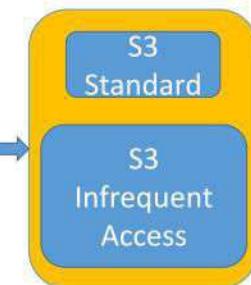
## Transferring data to S3 then to Glacier



On Premises

EMC  
Netapp  
Hitachi  
Veritas

Amazon Storage



Lifecycle Rule



Using 3<sup>rd</sup> party s/w  
FastGlacier  
Blackberry

AWS

# Amazon Glacier

AWS

- **Agenda**

- Glacier
- Vault
- Archive
- Tools to use Glacier

AWS

## Transferring data to Glacier



On Premises

EMC  
Netapp  
Hitachi  
Veritas

Amazon Storage

S3  
Standard  
S3  
Infrequent  
Access

Lifecycle Rule



Using 3<sup>rd</sup> party s/w  
FastGlacier  
Blackberry

AWS

## Glacier Definition



- Glacier is extremely low cost cloud storage, with average annual durability of 99.999999999%.
- It also stores data on multiple facilities before running success on uploaded archives similar to S3, it has built in mechanism for data integrity check.
- It reduces burdens of operating and scaling storage to AWS, without having to worry about capacity planning, hardware provisioning, data replication, hardware failure detection and recovery, or time-consuming hardware migrations.

AWS

## Glacier Definition



- Data which are not used frequently should be uploaded in glacier, minimum retention period is 90 days, If any data is retrieved or deleted before 90 days extra charges are applied.
- When the data is uploaded it cannot be accessed immediately it takes minimum 3 to 5 hr. to retrieve data from standard Glacier.
- Amazon does not provide direct access to glacier storage, either it should be uploaded from s3 using lifecycle properties or use third party software's like fastglacier or blackberry.

AWS

## Components of Glacier



- Components of Glacier
  - Vault
  - Archive

AWS

## Vault



- Vault

It is logical container where data i.e. archives are stored, similar to bucket in s3.

It is region specific.

Max 1000 vaults can be created per account

The largest archive that can be uploaded in a single Upload request is 4 gigabytes. For items larger than 100 megabytes, customers should consider using the Multipart upload capability.

Vault can be deleted, but before deleting remove all archives in it.

AWS

## Archives



- Archives

A file or object stored in Vault is called as archive.

The total volume of data and number of archives you can store are unlimited.

Individual Amazon Glacier archives can range in size from 1 byte to 40 terabytes

AWS

## S3 vs Glacier



Reference Point	S3	Glacier
Data are stored in.	Bucket	Vault
Object	Key	Archive
Total number	100 Bucket per account	1000 Vault per account
Redundancy	99.999999999 %	99.999999999 %
Object size	128 KB	Not applicable
Minimum storage retrieval	Immediate	3-5 hrs.
Cost	\$0.005 per GB put \$0.004 per GB get	\$0.005 per GB put \$0.012 per GB get
Max file size in single upload	Earlier 5 GB now 5 TB	4 GB up to 40 TB ( multipart upload 4 GB)
Free tier	5GB	10GB

AWS

## Elastic Load Balancer (ELB)



# DAY 6

## Elastic Load Balancer (ELB)

AWS

# Elastic Load Balancer (ELB)

AWS

## Agenda

- Cluster
- Types of Cluster
- What is Elastic Load Balancer ( ELB )
- Types of Load Balancer
- Features
- Advantage of Load Balancer

AWS

### Cluster

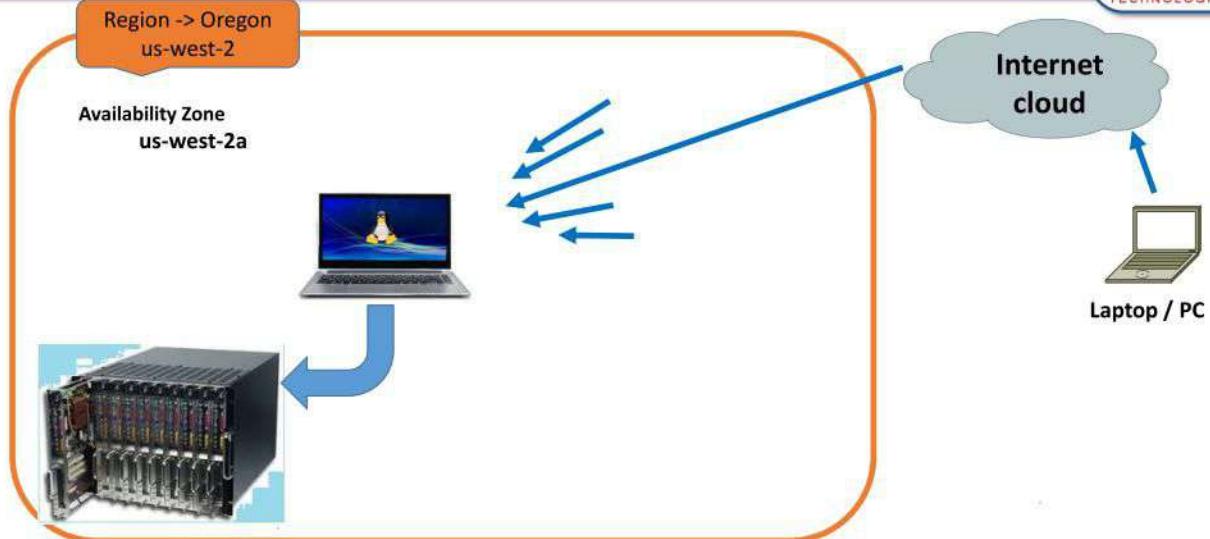
- In a computer system, a cluster is a group of servers and other resources that act like a single system and enable high availability and load balancing or parallel processing

### Types of Cluster

- **Load Balancing**
  - Multiple Nodes are added and scales horizontally
  - Used with Front End Application servers i.e web servers
    - IIS, Apache, NginX, Wordpress, Tomcat , MiddleWare
- **High Availability**
  - More Compute and Memory is added scales vertically
  - Used with Backend Application servers i.e data base servers
    - Oracle , MS-SQL, mysql, mariadb, PostgreSQL etc.

## Elastic Load Balancer ( ELB )

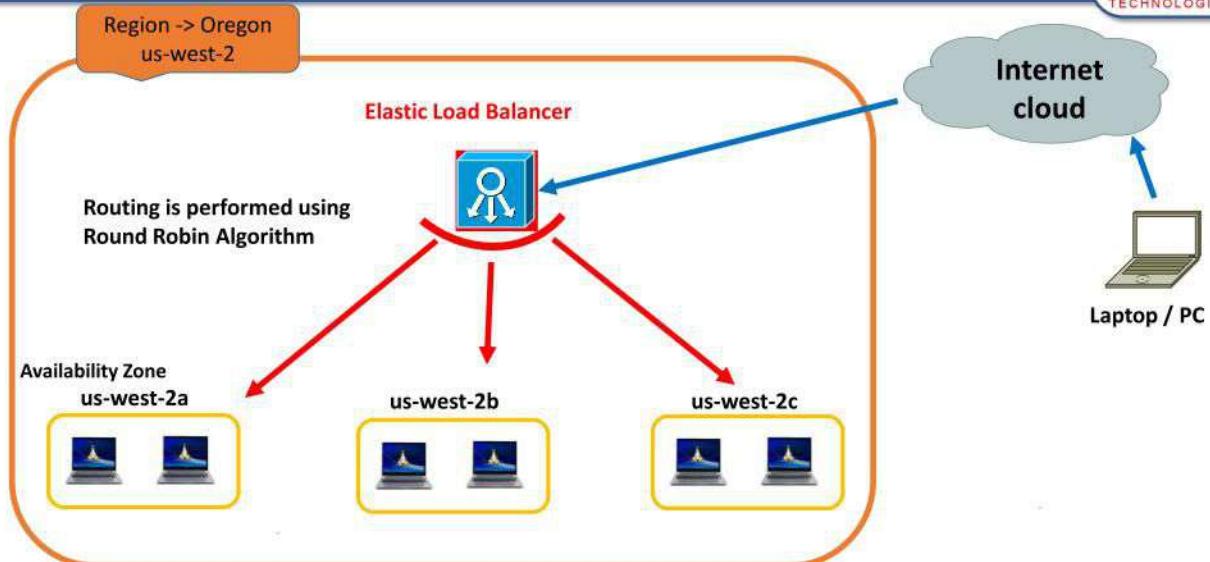
**ZOOM**  
TECHNOLOGIES



AWS

## Elastic Load Balancer ( ELB )

**ZOOM**  
TECHNOLOGIES



AWS

## Definition



### Elastic Load Balancer

- Elastic Load Balancer (ELB) is one of the key architecture component inside the AWS cloud.
- Elastic Load Balancing automatically distributes incoming web traffic across multiple applications and containers hosted on Amazon EC2 instances
- With Elastic Load Balancing, you can add and remove EC2 instances as your needs change without disrupting the overall flow of information

AWS

117

## Definition



- Scaling up and down can be automated by integrating with AutoScaling
- If an EC2 instance fails, ELB automatically reroutes the traffic to the remaining running healthy EC2 instances.
- If a failed EC2 instance is restored, Elastic Load Balancing restores the traffic to that instance.
- It is elastic, which means that it will automatically scale to meet your incoming traffic.
- Load Balancers only work across AZs within a region

AWS

118

## Type of Load Balancer

- **Internet Load Balancer**
  - An Internet-facing load balancer takes requests from clients over the Internet and distributes them across the EC2 instances that are registered with the load balancer
- **Internal Load Balancer**
  - Internal load balancer routes traffic to EC2 instances in private subnets

## Routing Algorithm

- Routing is performed using the round robin routing algorithm

### Main Features of Load Balancer

- **Failover Handling**
  - Avoid single point of failure by hosting multiple instances of a given service.
- **Auto-scaling**
  - Manage number of instances of an application according to the incoming traffic.

### Advantage of Load Balancer

- Optimize resource usage
  - Start and stop resources on demand.
- Maximize the throughput
  - Increase the average rate of successful message delivery.
- Minimize the response time
  - Reduce the time it takes to process a message and send a response back

**DAY 7,8**

## **Amazon VPC ( Virtual Private Cloud)**

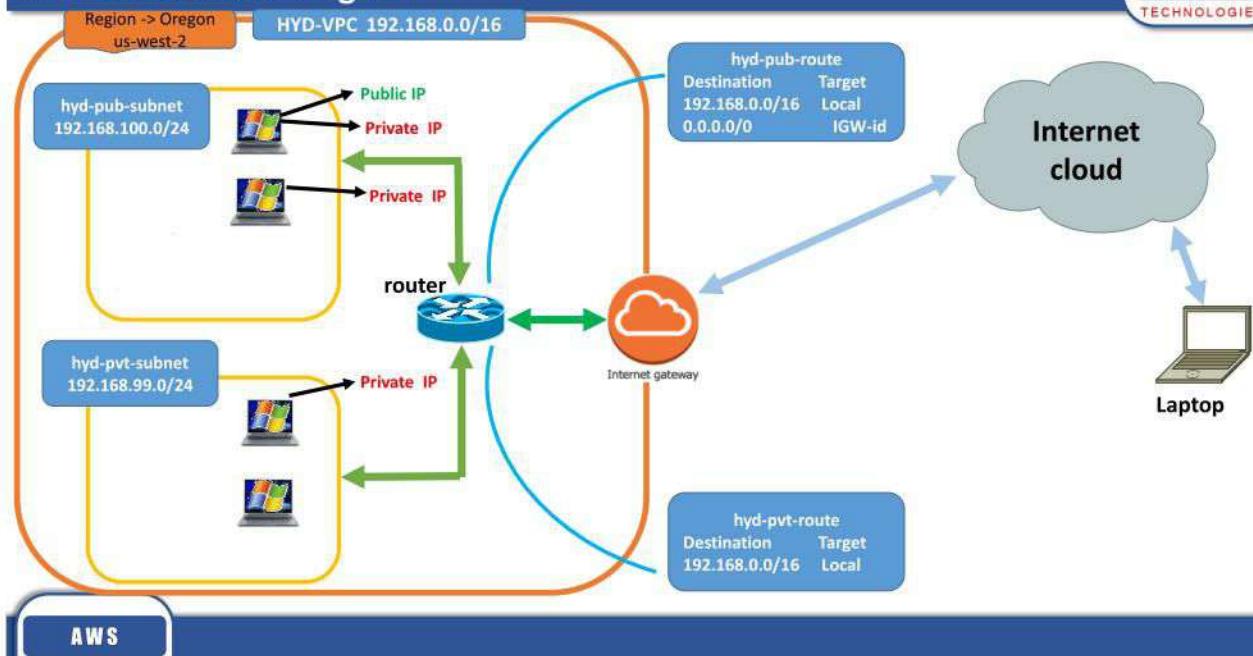
**AWS**

### **Introduction to Amazon Virtual Private Cloud (VPC)**

**AWS**

## VPC Architecture Diagram

**ZOOM**  
TECHNOLOGIES



AWS

## VPC Definition

**ZOOM**  
TECHNOLOGIES

- Amazon VPC is a network infrastructure architecture within the AWS cloud, which closely resembles a traditional network. It isolates your network infrastructure under your account from others account, otherwise all network will conflict with each other.
- It is Based on CIDR/ VLSM subnet networking concept.
  - CIDR [ Classless Inter Domain Routing ]
  - VLSM [ Variable Length Subnet Mask ]
- A user can create his own VPC which is highly customizable.
- By default every Region will have Default VPC with predefined subnets in each zone.
- As an extension of the corporate network – access through a VPN

AWS

126

- Subnet
- Route tables
- Internet Gateway
- Nat Gateway
- Network ACLs
- Security Groups
- Peering Connections
- VPN

### Subnet

A range of IP addresses in your VPC

#### Type of Subnet

##### Public Subnet

If a subnet has a route to an AWS Internet Gateway it is called a *public subnet*.

##### Private Subnet

If there is no route from a subnet to an AWS Internet Gateway it is a *private subnet*

- *Instances in a VPC communicate based on Route Table, VPC Security Groups and Access Control Lists*

### Route tables

Applied to subnet(s) specifying route policies.

VPC automatically comes with a main route table.

Every route table contains a local route for communication within the VPC over IPv4.

### IGW

Internet gateway is attached to a VPC.

It provide access to the internet for instances in a VPC subnet.

### NAT Gateway

NAT gateway provides Internet to your private instances

### Security groups

Specify inbound and outbound access policies for an Amazon EC2 instance

### Network ACLs

Network access control lists acts as a firewall for controlling traffic in and out of one or more subnets within the VPC

### VPC peering

Enables you to route traffic between two or more VPC within the same region

### VPN

Bridge your VPC and your onsite IT infrastructure with private connectivity

## VPC Architecture Scenarios



- VPC with a Public Subnet Only
- VPC with Public and Private Subnets
- VPC with Public and Private Subnets and VPC Peering Access
- VPC with Public and Private Subnets and VPN Access
- VPC with a Private Subnet Only and VPN Access

AWS

131

## Amazon VPC Products



Products currently available in Amazon VPC are

- Amazon EC2
- Amazon RDS
- Auto Scaling
- Elastic Load Balancing
- Elastic Beanstalk
- ElastiCache

AWS

132

## Steps to Create VPC infrastructure

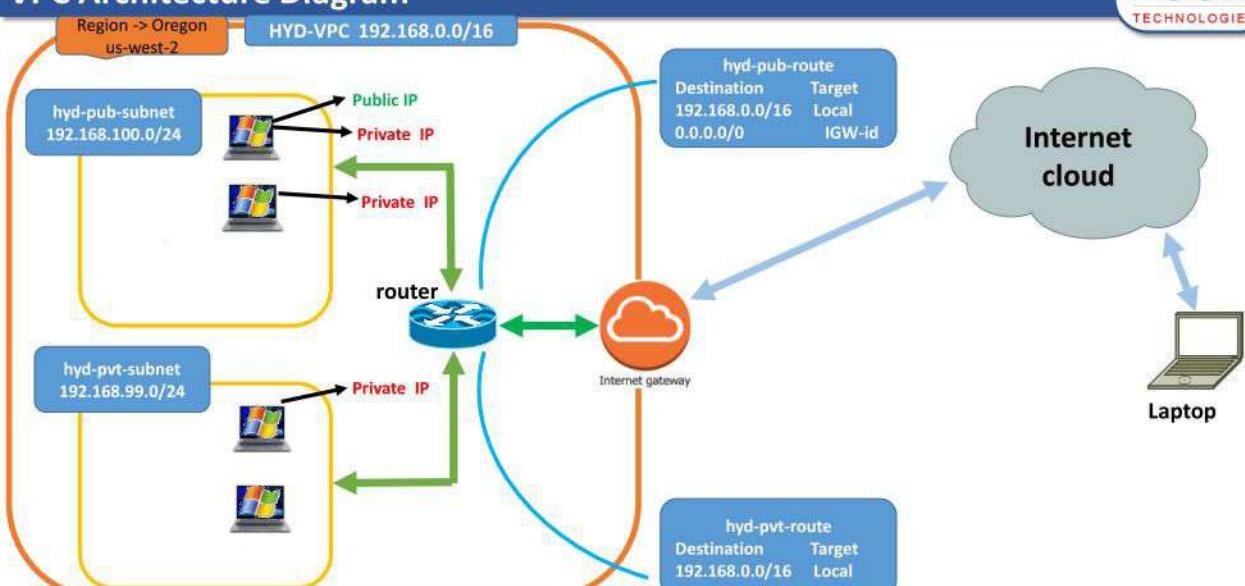


- Step 1) Create VPC with a particular subnet range ( max 16 to 28 bit )
- Step 2) Create public subnet
- Step 3) Create private subnet
- Step 4) Create IGW and attach to your VPC
- Step 5) Create pub route and Associate respective subnet and add route to IGW
- Step 6) Create private route and Associate respective subnet Don't add IGW,  
Nat-GW or NAT-instance can be added.
- Step 7) Launch VM in Public subnet
- Step 8) Launch VM in Pvt subnet
- Step 9) Check connectivity

AWS

133

## VPC Architecture Diagram



AWS

## Step 1) Create VPC with CIDR block 192.168.0.0/16



Region -> Oregon  
us-west-2

HYD-VPC 192.168.0.0/16

1

AWS

## Step 2) Create public subnet



Region -> Oregon  
us-west-2

HYD-VPC 192.168.0.0/16

1

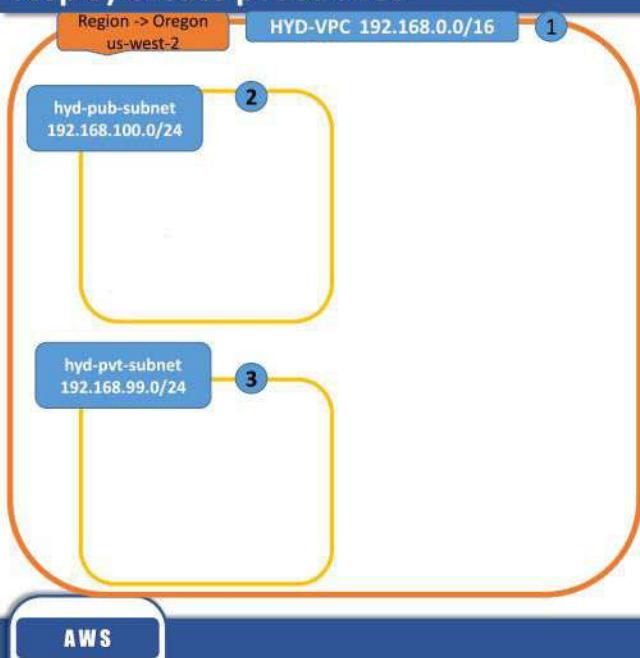
hyd-pub-subnet  
192.168.100.0/24

2

AWS

### Step 3) Create pvt subnet

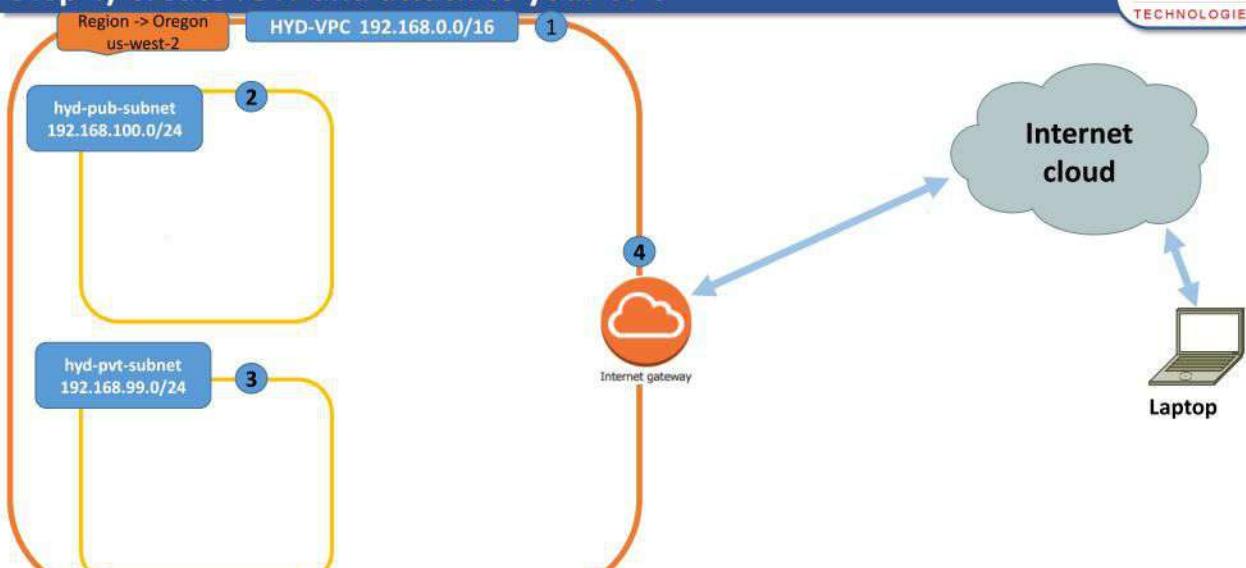
**ZOOM**  
TECHNOLOGIES



AWS

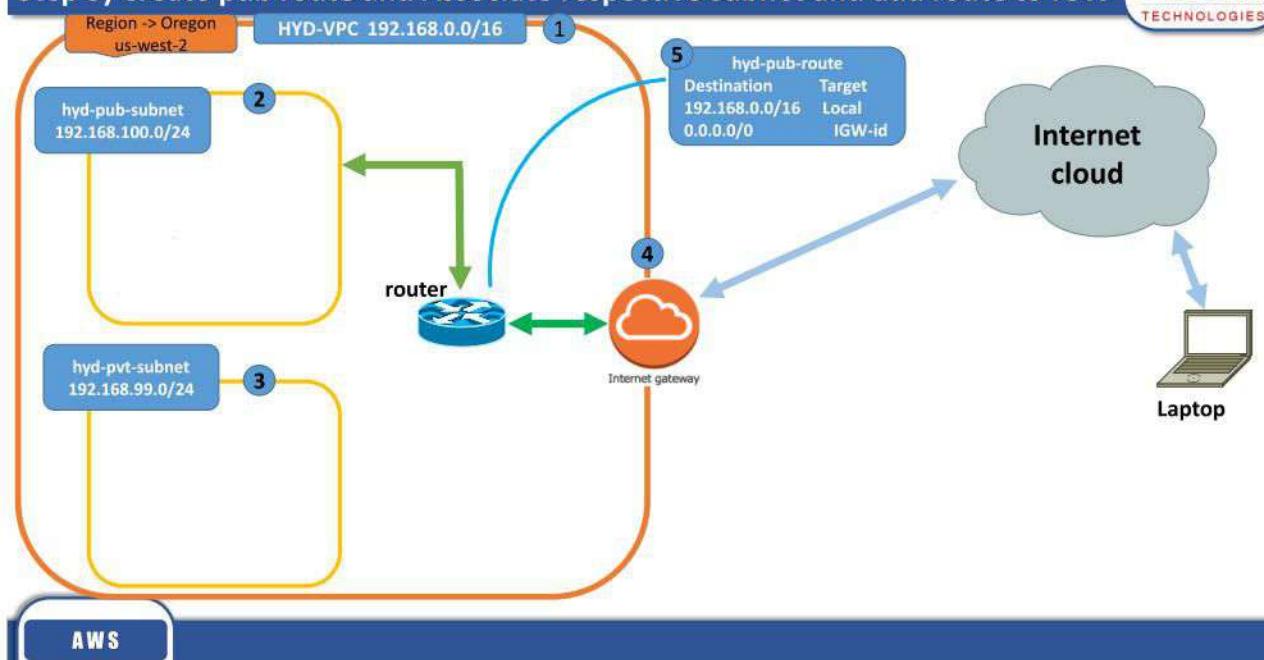
### Step 4) Create IGW and attach to your VPC

**ZOOM**  
TECHNOLOGIES



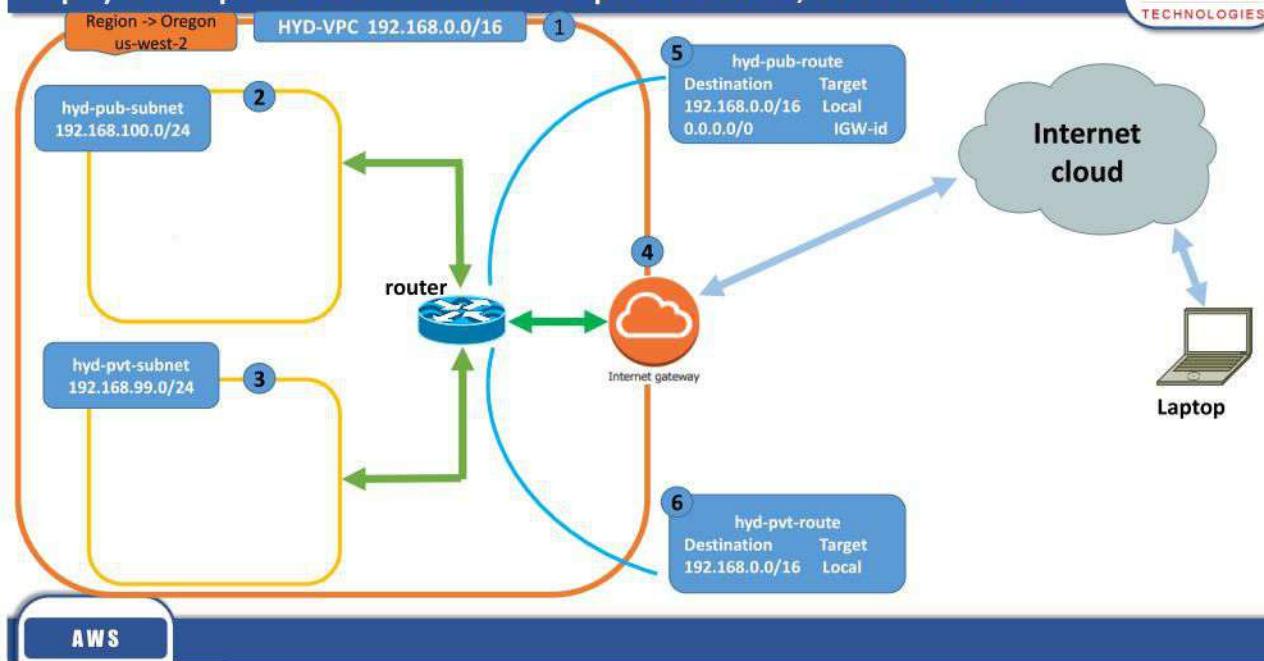
AWS

### Step 5) Create pub route and Associate respective subnet and add route to IGW



AWS

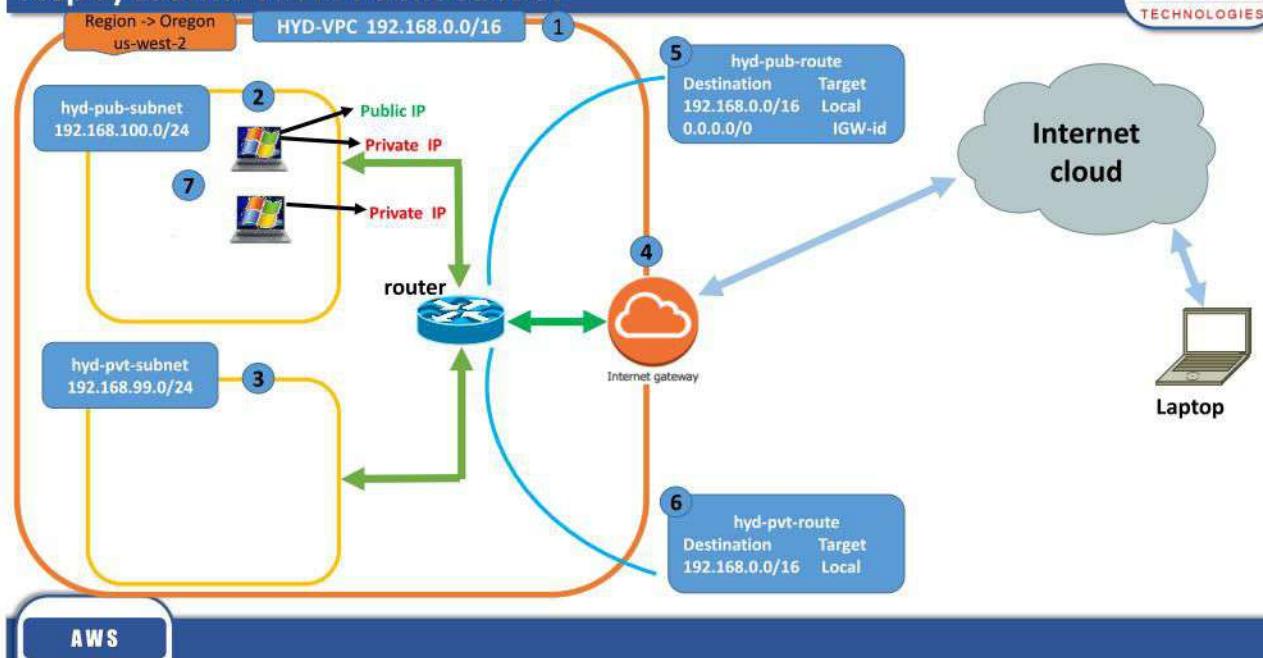
### Step 6) Create pvt route and Associate respective subnet, Don't add IGW



AWS

## Step 7) Launch VM in Public subnet

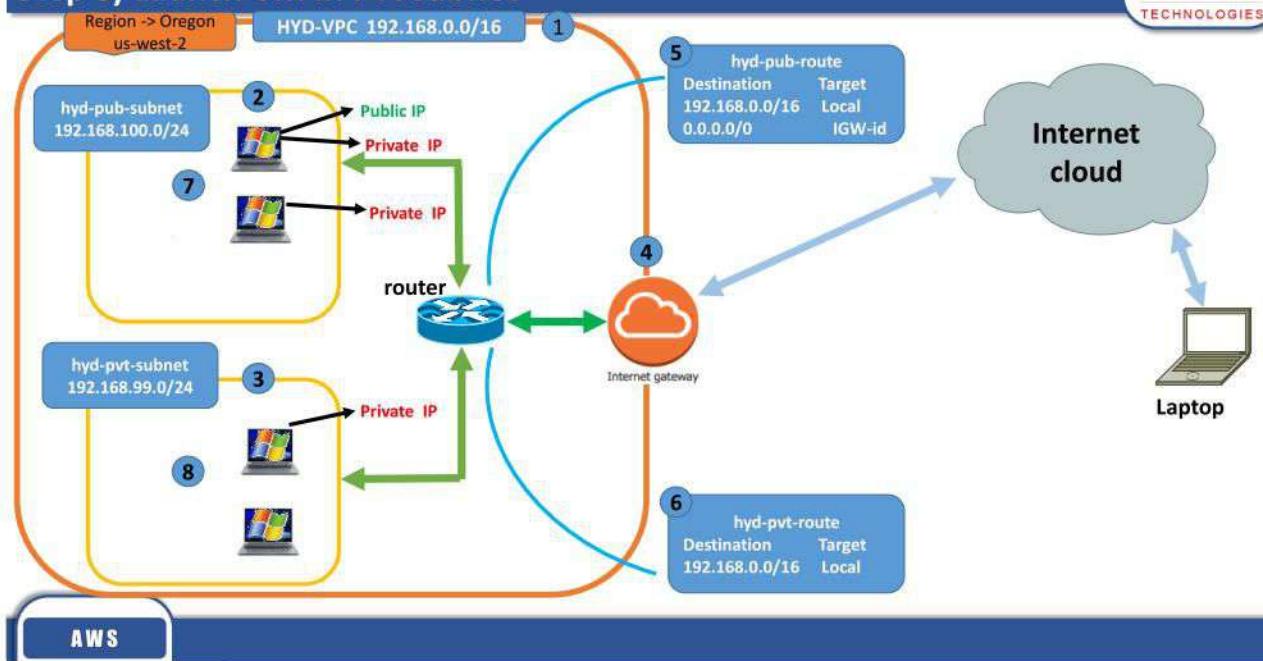
**ZOOM**  
TECHNOLOGIES



AWS

## Step 8) Launch VM in Pvt subnet

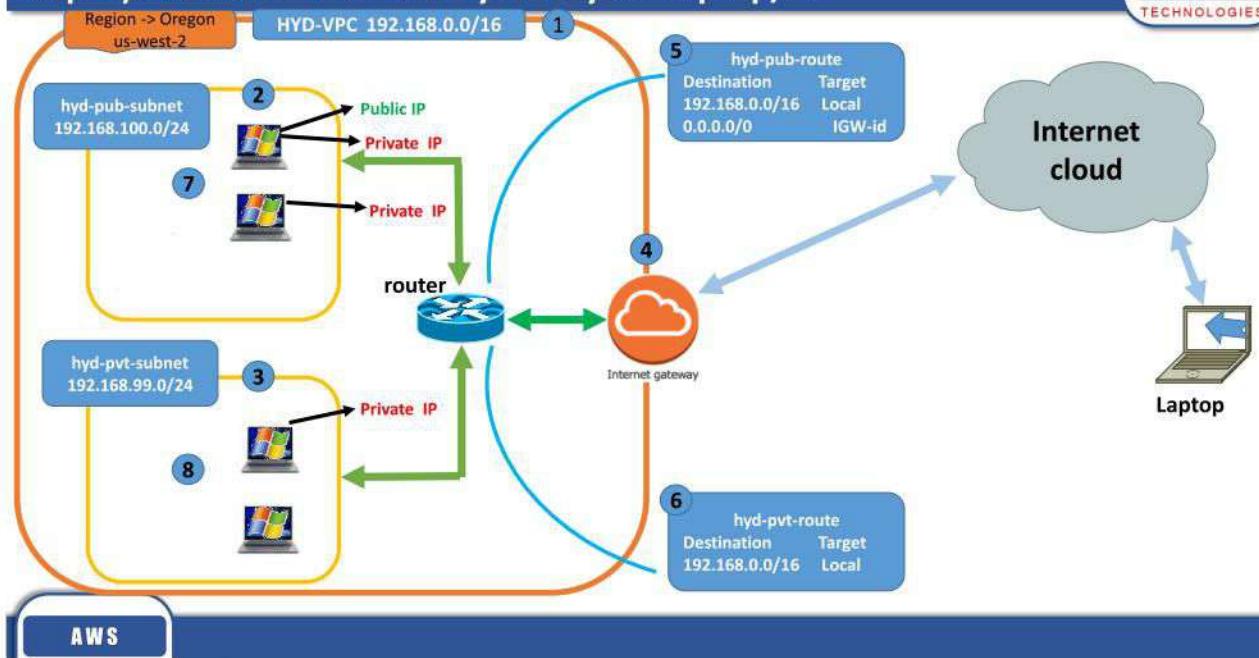
**ZOOM**  
TECHNOLOGIES



AWS

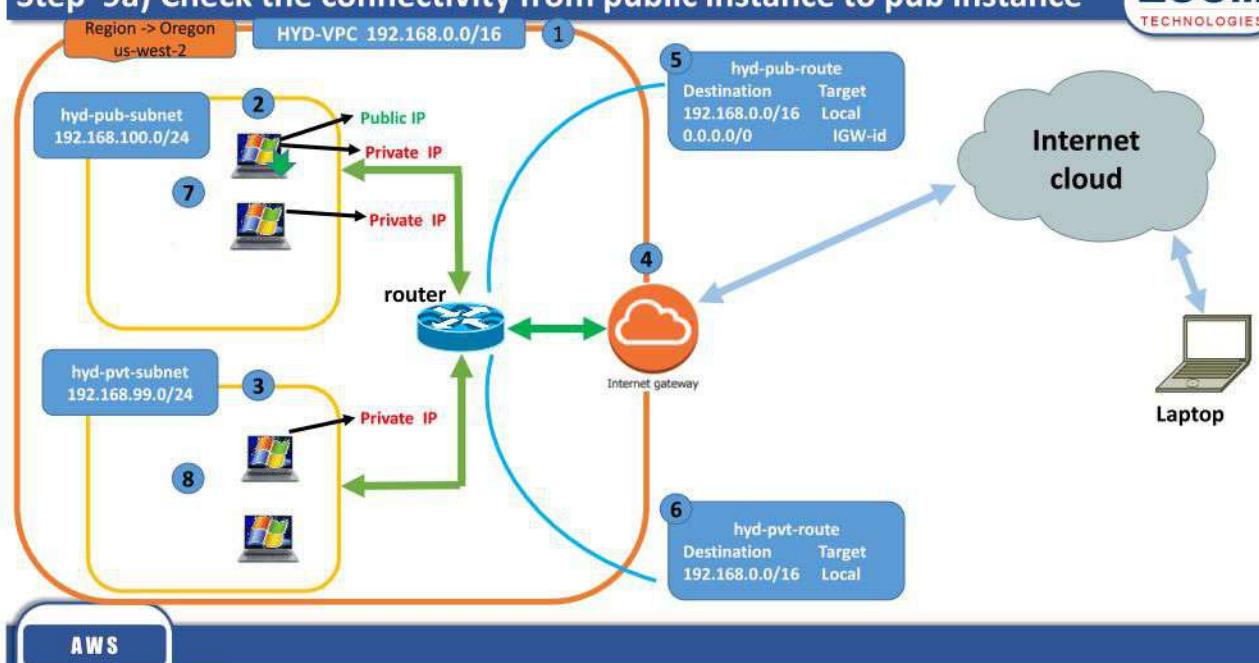
## Step 9) Check the connectivity from your Laptop/PC

**ZOOM**  
TECHNOLOGIES

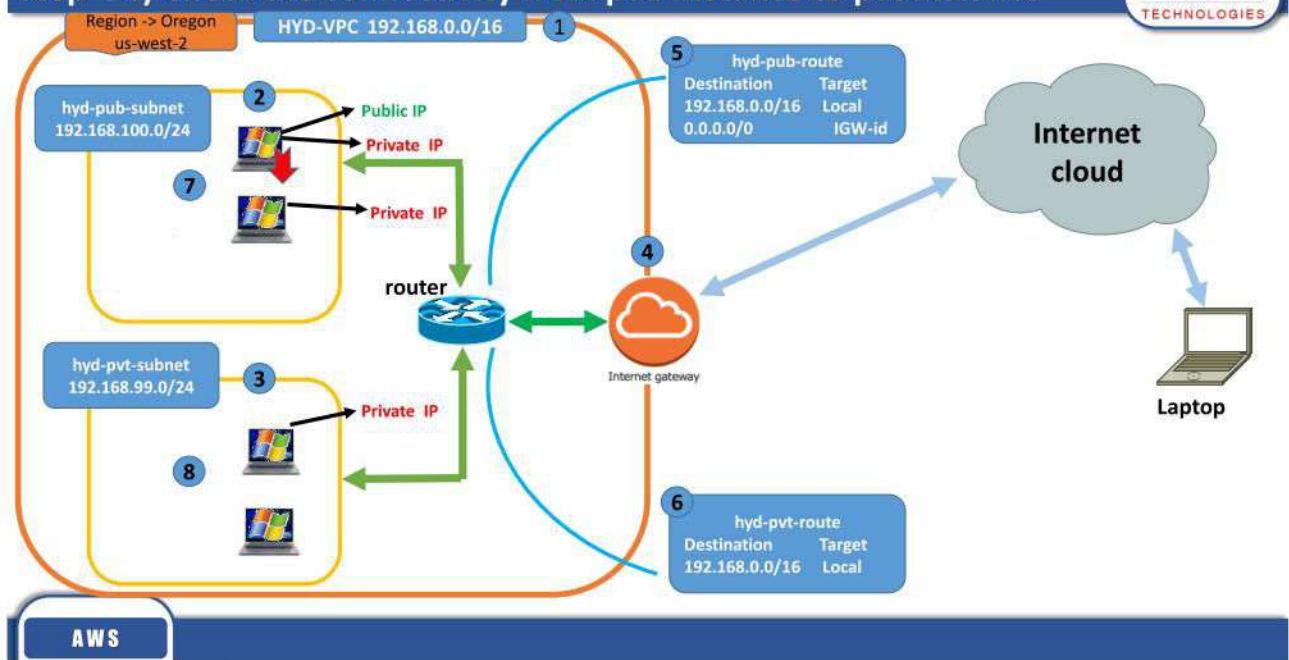


## Step 9a) Check the connectivity from public instance to pub instance

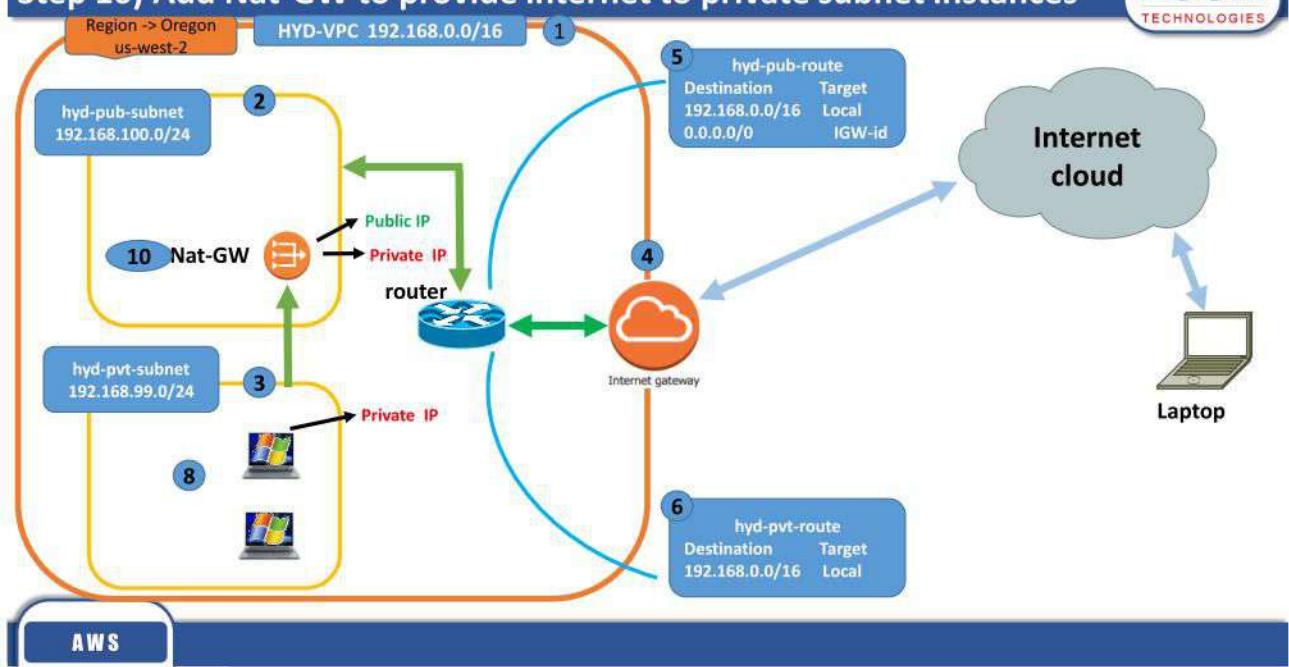
**ZOOM**  
TECHNOLOGIES



### Step 9b) Check the connectivity from pub instance to pvt instance

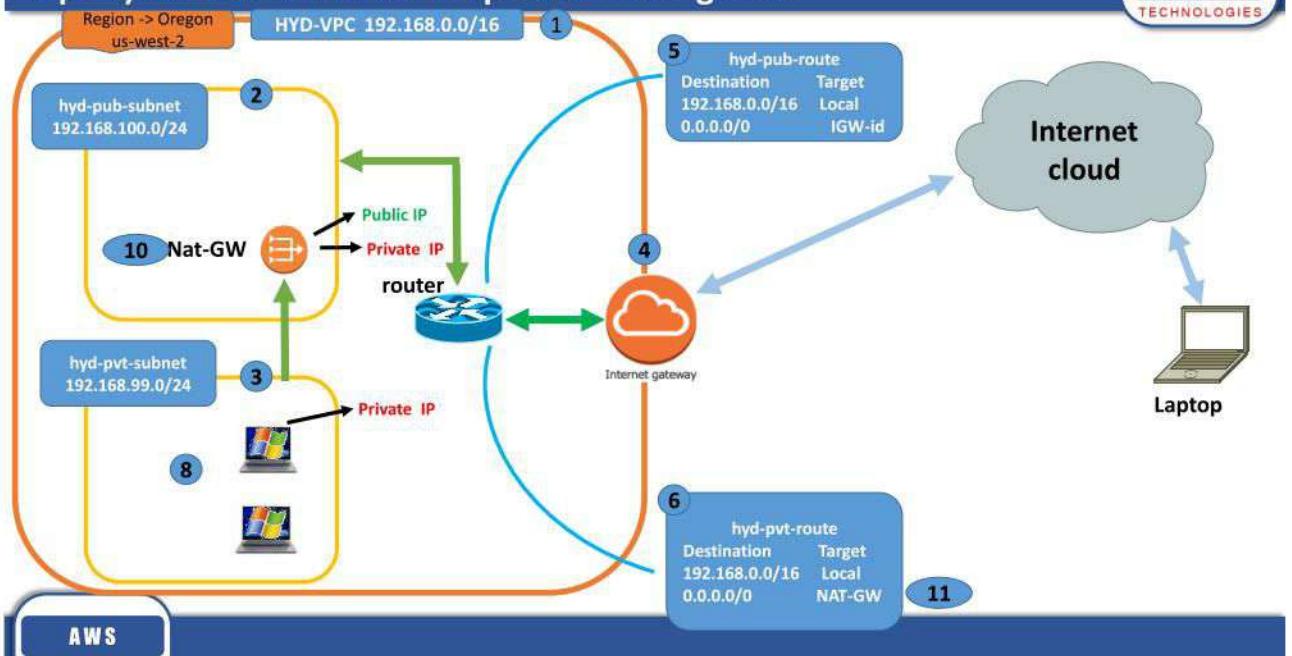


### Step 10) Add Nat-GW to provide internet to private subnet instances



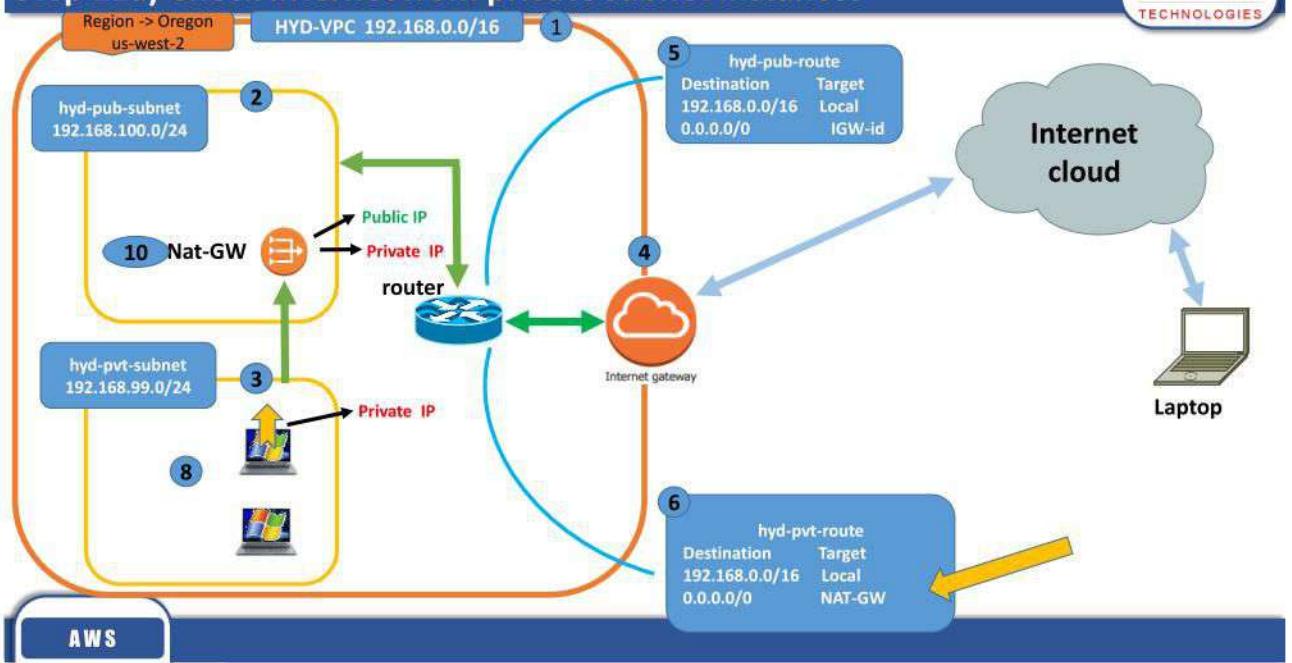
## Step 11) Add Nat-GW route to private routing table

**ZOOM**  
TECHNOLOGIES



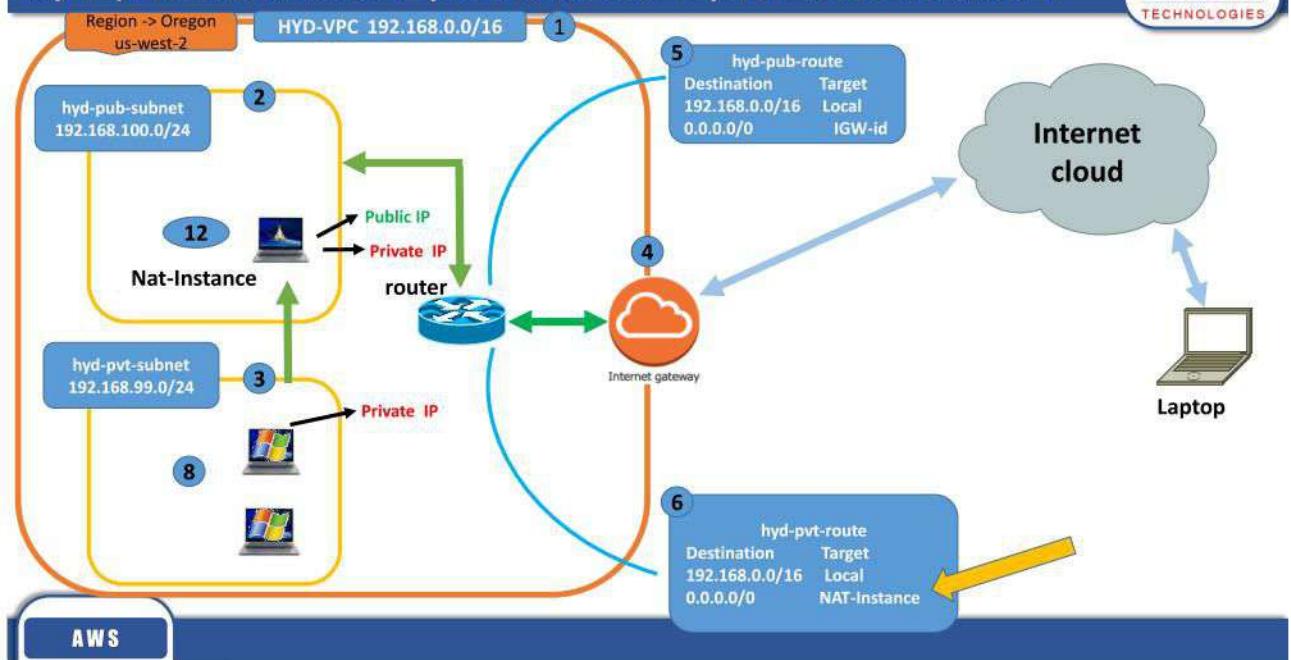
## Step 11a) Check internet from private subnet instances

**ZOOM**  
TECHNOLOGIES



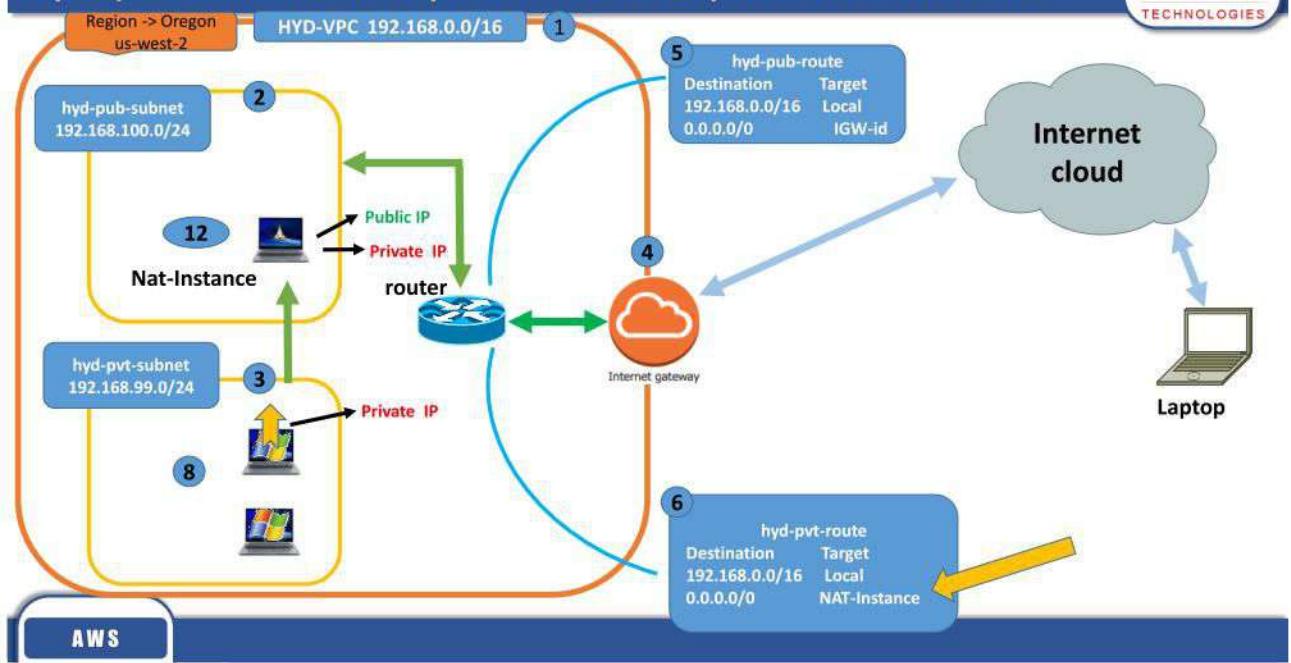
## Step 12) Add Nat-Instance to provide internet to private subnet instances

**ZOOM**  
TECHNOLOGIES



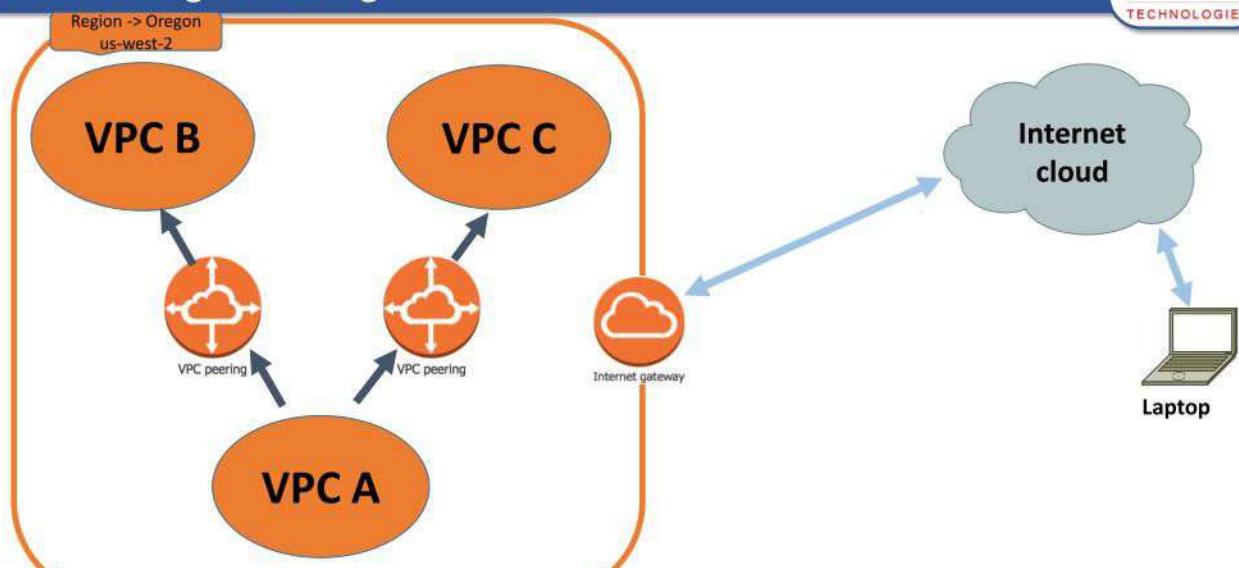
## Step 12) Add Nat-Instance to provide internet to private subnet instances

**ZOOM**  
TECHNOLOGIES



- VPC peering is used to have communication across multiple VPC's within the same or different region.
- Peering can be done within your own account or other AWS account.
- Transitive peering is not supported.

## VPC Inter Region Peering



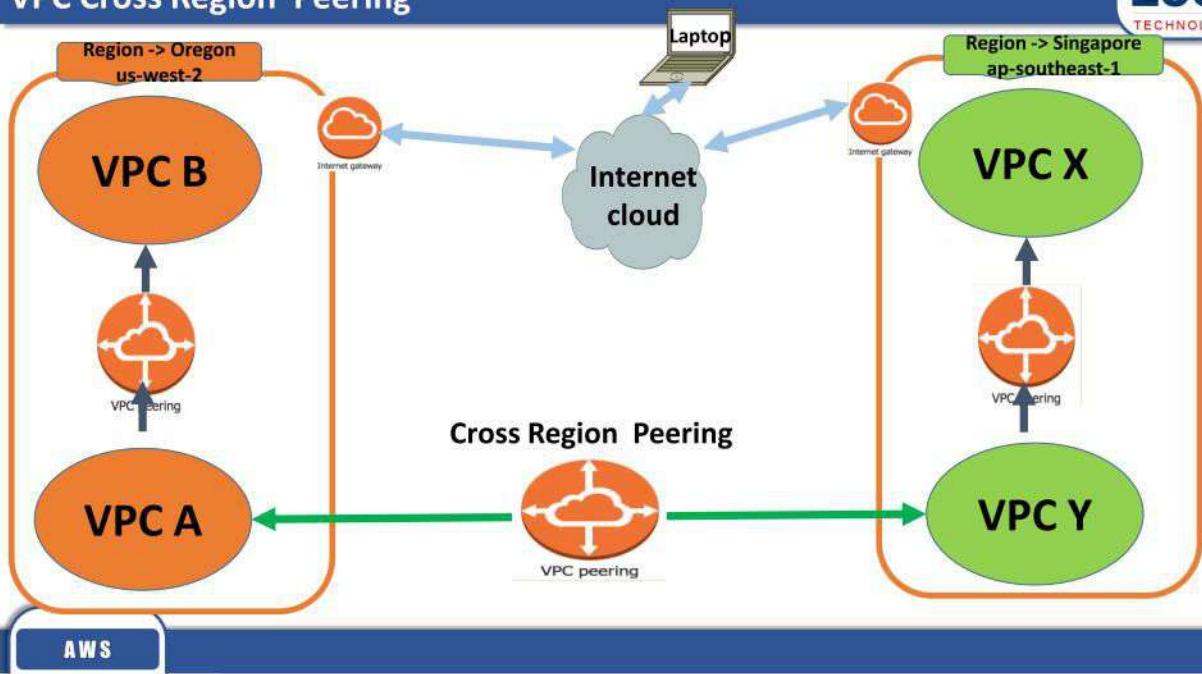
## VPC Cross Region Peering



- Cross Region peering is used to have communication across multiple VPC's across two or more different regions.

AWS

## VPC Cross Region Peering



AWS

## DAY 9

# Amazon Route53

AWS

# Amazon Route53

AWS

## Agenda



- What is Route53
- Key Features
- Routing Policies

AWS

## Amazon Route53 ?



- DNS is a client/server network communication systems.
- The Domain Name System (DNS) translates Internet domain and host names to IP addresses and vice versa.
- Amazon route 53 is a DNS service Provided by AWS.
- It is an authoritative DNS service.
- **Route 53 is built using AWS's highly available and reliable, global infrastructure of amazon.**
- Improves your availability and application performance at lower cost with Amazon Route 53

AWS

- It uses a global anycast network of DNS servers around the world.
- Anycast is a networking and routing technology that helps your end users' DNS queries get answered from the optimal Route 53 location given network conditions. As a result, your users get high availability and improved performance with Route 53.
- Amazon Route 53 is designed to propagate updates within 60 seconds under normal conditions
- Amazon also supports Private DNS, that lets you have authoritative DNS within your VPCs without exposing your DNS records (including the name of the resource and its IP address(es) to the Internet.

- Amazon Route 53 DNS record types:
  - A (address record)
  - AAAA (IPv6 address record)
  - CNAME (canonical name record)
  - MX (mail exchange record)
  - NS (name server record)
  - PTR (pointer record)
  - SOA (start of authority record)
  - SRV (service locator)
  - TXT (text record)

### Health Check

- To route the traffic to the end points amazon can perform health checks.
- A health check tells Amazon Route 53 how to send requests to the endpoint.
- A health check is performed using (HTTP, HTTPS, or TCP) protocols, over IP address and ports.
- Amazon Route 53 cannot check the health of endpoints for which the IP address is in local, private, nonroutable, or multicast ranges.

- Reliable
- Fast
- Integrated with AWS
- Easy to use
- Cost Effective
- Flexible

- **Simple Routing:**

- With simple routing, Amazon Route 53 responds to DNS queries based only on the values in the resource record set (i.e., the IP).

- **Weighted routing policy**

- Weighted routing policy is used when multiple resources performs the same function, and you want Amazon Route 53 to route traffic to those resources in proportions that you specify. For example, sending 30% of queries to one server, and 70% to the other.

- For example while testing new versions of software or under load balancer

- **Latency routing policy**

- Use when you have resources in multiple locations and you want to route traffic to the resource that provides the best latency.

- **Failover Routing:**

- In Failover routing Route 53 performs the health check , and route traffic to a primary and secondary resource record set.
- If Primary resource is down the it sends the traffic to secondary resource record set.

- **Geolocation Routing**

- Geolocation works by mapping IP addresses to locations from where the DNS queries originated from.
- Example If you have a website on different language then from that region that website can be access
- To improve the accuracy of geolocation routing, Amazon Route 53 supports the edns-client-subnet extension of EDNS0 (Extension Mechanisms for DNS (EDNS0)).

- \$0.50 per hosted zone / month for the first 25 hosted zones
- \$0.10 per hosted zone / month for additional hosted zones

### Standard Queries

- \$0.400 per million queries – first 1 Billion queries / month
- \$0.200 per million queries – over 1 Billion queries / month

Step 1) Register your domain name with local ISP.

Eg. godaddy.com

Step 2) Host your domain name in Route 53, it adds minimum 4 AWS DNS server of amazon.

Step 3) Remove the DNS NS record from local ISP and replace with AWS DNS NS record.

Step 4) Now configure a instance with web server and elastic IP.

Step 5) Now add your record set ( A record, CNAME record) in Route 53.

Step 6) Check the site with name instead of IP.

### Hosting domain in Route 53

**ZOOM**  
TECHNOLOGIES

Godaddy.com

**cloudskillindia.com**

Dns  
Server  
**NS1**

Dns  
Server  
**NS1**

Amazon  
Route 53



AWS

### Register Domain name with some local ISP

**ZOOM**  
TECHNOLOGIES

Godaddy.com

**cloudskillindia.com**

Dns  
Server  
**NS1**

Dns  
Server  
**NS1**

Amazon  
Route 53



AWS

## Host Domain name in Amazon Route 53

**ZOOM**  
TECHNOLOGIES

Godaddy.com

**cloudskillindia.com**

Dns  
Server  
**NS1**

Dns  
Server  
**NS1**



Amazon  
Route 53

AWS

## Route 53 add's your domain name in it DNS server

**ZOOM**  
TECHNOLOGIES

Godaddy.com

**cloudskillindia.com**

Dns  
Server  
**NS1**

Dns  
Server  
**NS1**



Amazon  
Route 53

ns-  
596.aw  
dns-  
10.net

ns-  
428.aw  
dns-  
53.com.

ns-  
1079.aw  
sdns-  
06.org.

ns-  
2026.aw  
sdns-  
61.co.uk.

AWS

## Remove DNS entries from Local ISP

**ZOOM**  
TECHNOLOGIES

Godaddy.com

**cloudskillindia.com**

Dns  
Server  
**NS1**

Dns  
Server  
**NS1**



AWS

Amazon  
Route 53

**cloudskillindia.com**

ns-  
596.aw  
dns-  
10.net

ns-  
428.aw  
dns-  
53.com.

ns-  
1079.aw  
sdns-  
06.org.

ns-  
2026.aw  
sdns-  
61.co.uk.

## DNS entries from Local ISP removed

**ZOOM**  
TECHNOLOGIES

Godaddy.com

**cloudskillindia.com**



AWS

Amazon  
Route 53

**cloudskillindia.com**

ns-  
596.aw  
dns-  
10.net

ns-  
428.aw  
dns-  
53.com.

ns-  
1079.aw  
sdns-  
06.org.

ns-  
2026.aw  
sdns-  
61.co.uk.

Add DNS server name from Route 53 in your local DNS server



Godaddy.com

**cloudskillindia.com**



Amazon  
Route 53

**cloudskillindia.com**

ns-  
596.aws  
dns-  
10.net

ns-  
428.aws  
dns-  
53.com.

ns-  
1079.aw  
sdns-  
06.org.

ns-  
2026.aw  
sdns-  
61.co.uk.

AWS

Add DNS server name from Route 53 in your local DNS server



Godaddy.com

**cloudskillindia.com**

ns-  
596.aws  
dns-  
10.net

ns-  
428.aws  
dns-  
53.com.

ns-  
1079.aw  
sdns-  
06.org.

ns-  
2026.aw  
sdns-  
61.co.uk.



Amazon  
Route 53

**cloudskillindia.com**

ns-  
596.aws  
dns-  
10.net

ns-  
428.aws  
dns-  
53.com.

ns-  
1079.aw  
sdns-  
06.org.

ns-  
2026.aw  
sdns-  
61.co.uk.

AWS

Now Local ISP points to Route 53 DNS server

Godaddy.com



AWS

Now Local ISP points to Route 53 DNS server

Godaddy.com



AWS

Now Local ISP points to Route 53 DNS server

Godaddy.com ←

Amazon  
Route 53

**cloudskillindia.com**

ns-  
596.aws  
dns-  
10.net

ns-  
428.aws  
dns-  
53.com.

ns-  
1079.aw  
sdns-  
06.org.

ns-  
2026.aw  
sdns-  
61.co.uk.



AWS

**cloudskillindia.com**

ns-  
596.aws  
dns-  
10.net

ns-  
428.aws  
dns-  
53.com.

ns-  
1079.aw  
sdns-  
06.org.

ns-  
2026.aw  
sdns-  
61.co.uk.

Amazon VPC ( Virtual Private Cloud)

# Day 10

## SNS (Simple Notification Service)

## Cloudwatch

## Autoscaling

AWS

## AWS SNS (Simple Notification Service)

AWS

- SNS service is used to deliver or sending notification to subscribed endpoints or clients by using push messaging mechanism.
- Service like CloudWatch, Load Balancer, RDS, dynamodb and other aws services uses SNS to send alerts and alarms to the endpoints i.e. through API, HTTP/HTTPS, SQS, EMAIL, AWS Lambda, Mobile Push Notifications, Email, Email-JSON.

AWS

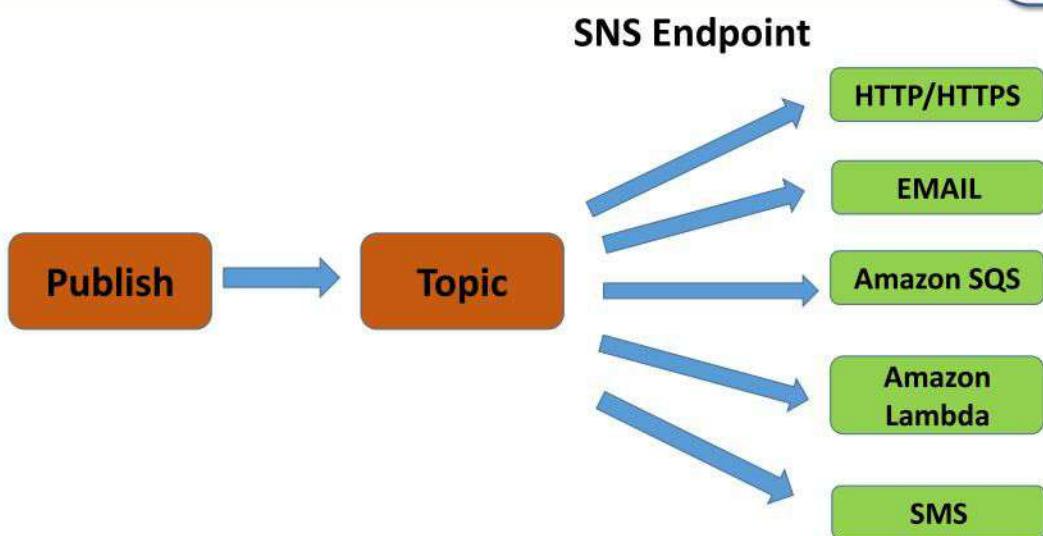
## AWS Simple Notification Service(SNS)



- Topics are created which is a logical access point.
- Defines Subscriber to whom messages should be published.
- SNS can only guarantee a single delivery to each subscriber of a given topic. This means that if there was a bug or a problem processing the message and there was no specific code to save it somewhere, then the message is lost.

AWS

## SNS WORK FLOW



AWS

## AWS Simple Notification Service(SNS)



- Topic names are limited to 256 characters.
- By default, SNS offers 10 million subscriptions per topic, and 100,000 topics per account.
- Amazon SNS messages can contain up to 256 KB of text data, including XML, JSON and unformatted text.
- Each 64KB chunk of published data is billed as 1 request.
- Each SMS message can contain up to 140 bytes,

AWS

## Amazon SNS Pricing



Endpoint Type	Free Tier	Price
Mobile Push Notifications	million	\$0.50 per million
Worldwide SMS	100 ( US )	Learn more [ Charges are applied countries wise ]
email/email-JSON	1,000	\$2.00 per 100,000
HTTP/s	100,000	\$0.60 per million
Simple Queue Service (SQS)	No charge for deliveries to SQS Queues	
Lambda functions	No charge for deliveries to Lambda	

AWS

## Amazon CloudWatch

AWS

### What CloudWatch cannot do ?

Cloud watch is not going to monitor your on premises Data Center infrastructure. For that we use traditional monitoring tools like :

- Nagios
- Zabbix
- Bigbrother
- MRTG , CACTI
- Airwatch
- Wireshark
- Zenoss
- ps, kill, nice, renice
- vmstat, iostat , Syslog
- Iptraf, netcool
- HPServiceManager
- Windows Task Manager

AWS

## What Cloud Watch is going to do ?



- Cloud watch is going to monitor only Service and Resource of AWS infrastructure.
- Monitoring is done based on Metrics.
- Metrics is collection of data through which amazon keeps track of all services and resources.
- Each region contains its own metrics, and are stored for only 14 days, then it gets expire automatically.

AWS

## Retention period changd



- From November 1, 2016 retention period of all metrics changed from 14 days to 15 months.
- Data points with a period of
  - Less than 60 sec                    3 hrs.
  - 1 min                                16 days
  - 5 min                                63 days
  - 1 hr                                455 days ( 15 months)

AWS

## Metrics frequency and charges



Monitored AWS resources	Frequency	Charge
EC2 instance (basic)	every 5 mins	free
EC2 instance (detail)	every 1 min	additional
EBS volumes	every 5 mins	free
Elastic Load Balancers	every 5 mins	free
RDS DB instance	every 1 min	free
SQS queues	every 5 mins	free
SNS topics	every 5 mins	free

AWS

## Default Metrics



- **EC2 instance**

- CPUUtilization
- DiskReadBytes
- DiskReadOps
- DiskWriteBytes
- DiskWriteOps
- NetworkIn
- NetworkOut

- **RDS**

- BinLogDiskUsage
- CPUUtilizati
- DatabaseConnection
- DiskQueueDepth

- **S3**

- BucketSizeBytes
- NumberOfObjects

AWS

## Metrics Description



Metrics Name	Description	Units
CPUUtilization	The percentage of allocated EC2 compute-units	Percent
DiskReadOps	Completed read operations from all ephemeral disks available to the instance	Count
DiskWriteOps	Completed write operations to all ephemeral disks available to the instance.	Count
DiskReadBytes	Bytes read from all ephemeral disks available to the instance	Bytes
DiskWriteBytes	Bytes written to all ephemeral disks available to the instance.	Bytes
NetworkIn	The number of bytes received on all network interfaces by the instance.	Bytes
NetworkOut	The number of bytes sent out on all network interfaces by the instance.	Bytes

AWS

## CloudWatch Alaram



- Alarms exist only in the region in which they are created.
- Alarm actions must reside in the same region as the alarm
- Alarm watches a single metric over a specified time period.
- Based on the value of the metric relative to a given threshold over a number of time periods takes Action.
- Action can be a
  - SNS notification
  - Auto Scaling policies
  - EC2 action – stop or terminate EC2 instances

AWS

## Alarm State



- **OK**

- The metric is within the defined threshold

- **ALARM**

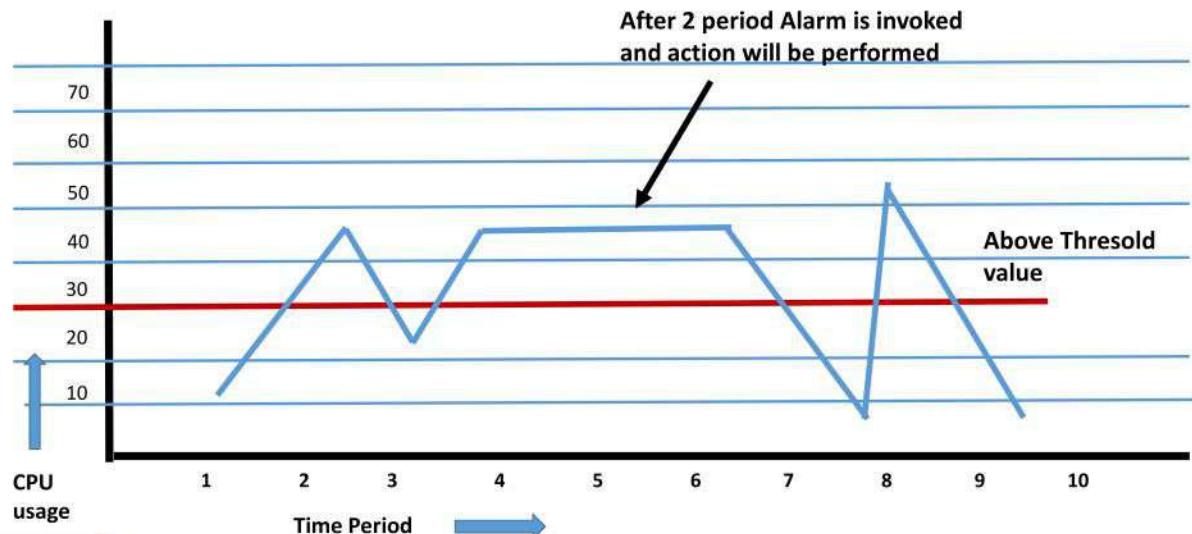
- The metric is outside of the defined threshold

- **INSUFFICIENT\_DATA**

- the metric is not available, alarm started
- not enough data is available for the metric to determine the alarm state
- Can create up to 400 alarms per AWS account

AWS

## CloudWatch Graph



AWS

# Amazon Autoscaling

AWS

## Agenda

- What is Autoscaling ?
- Autoscaling supported application
- Benefits of Autoscaling
- Pricing of Autoscaling
- Autoscaling Implementation

AWS

## Autoscaling ?

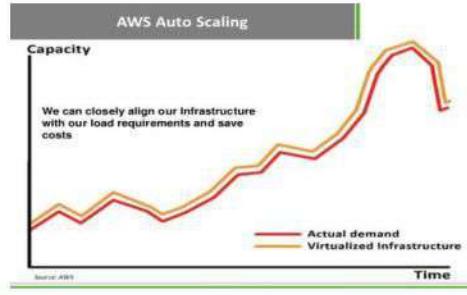
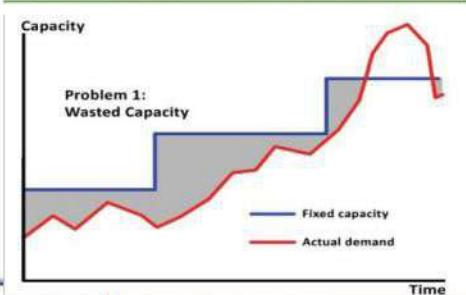
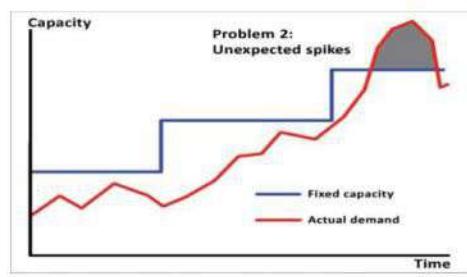
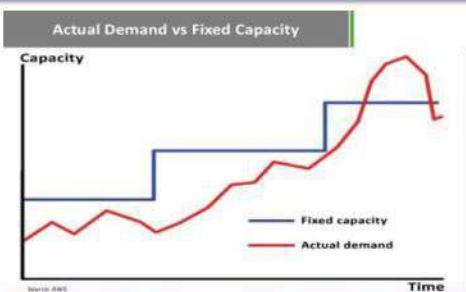
**ZOOM**  
TECHNOLOGIES

- Whenever load increase on the server related with compute power, network, or storage then to balance that load or distribute the load technologies like clustering, load balancing, high availability are implemented.
- These loads can be managed by using either vertical scaling or horizontal scaling, both type of scaling have there pros and cons.
- Autoscaling is one of the tool provided by amazon which is broadly and widely used in cloud computing.
- In amazon cloud computing it is one of the best tool to scale up or down the resources based on load patterns.

AWS

## Load pattern

**ZOOM**  
TECHNOLOGIES



AWS

- Amazon Auto scaling uses Horizontal scaling to add number of ec2 instances ( i.e. number of nodes ) dynamically whenever the load on your application increases.
- It is fully designed to launch or terminate the correct number of EC2 instances to handle the load of your application
- Amazon Autoscaling uses Fleet management technique
  - Fleet management is a functionality that checks the health of EC2 instances and automatically replaces unhealthy instances with new instance
  - If any instance faces any problem then instead of recovering or restoring that instance a new instance is launched.

- Autoscaling takes the advantage of amazon infrastructure where it can span ec2 instances across multiple AZs.
- It can add or terminate the ec2 instances in the period of 30 seconds to 180 secs.
- If the AZs are not available or unhealthy then it redistributes the traffic across all the healthy AZs
- Autoscaling is Region specific means it can scale only within the regions.
- Cross region scaling is not supported by Autoscaling.

## Autoscaling supports



- Autoscaling supports only frontend application like
  - ✓ Apache
  - ✓ IIS
  - ✓ Nginx
  - ✓ Wordpress
  - ✓ Tomcat or middleware applications ( Jboss )

AWS

## Autoscaling does not supports



- Autoscaling does not supports backend application, i.e. cannot used with database application.
  - Oracle
  - Mysql
  - Mariadb,
  - MS-SQL
  - NoSQL ( mongodb, rediss )

AWS

## Benefits of Auto Scaling



- **Better fault tolerance.**

It automatically terminates or launches an ec2 instance when an instance or AZs are unhealthy

- **Better availability**

Always ensures the right amount of capacity to handle the current traffic demands.

- **Better cost management.**

Saves money by launching or terminating instances when they are actually needed.

AWS

## Pricing for Auto Scaling



- **Pricing for Auto Scaling**

- Auto Scaling carries no additional fees.
- Autoscaling depends on Cloudwatch services, so Cloudwatch billing will be applied.
- Ec2 instance charges will be applied.

AWS

## Components of Autoscaling



- **Launch Configuration**

➤ It creates a template containing following information :

Amazon Machine Image (AMI)

Instance type

Key pair

Security groups

Block device mapping.

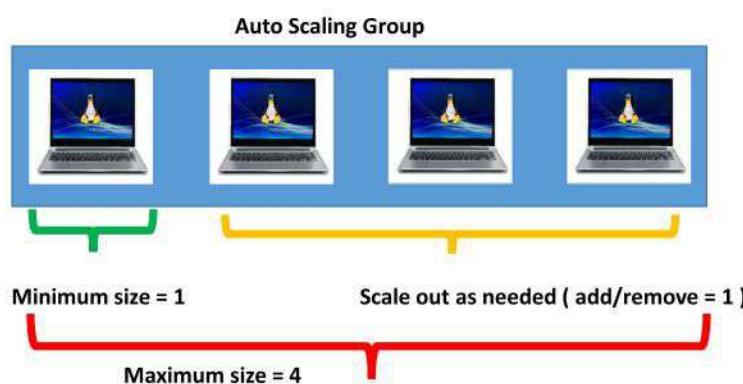
AWS

## Autoscaling Group



- **Autoscaling group**

➤ Auto Scaling group you can specify the minimum and maximum number of instance to ensure that instance in the group never goes above or below the required size



AWS

## Autoscaling Policy

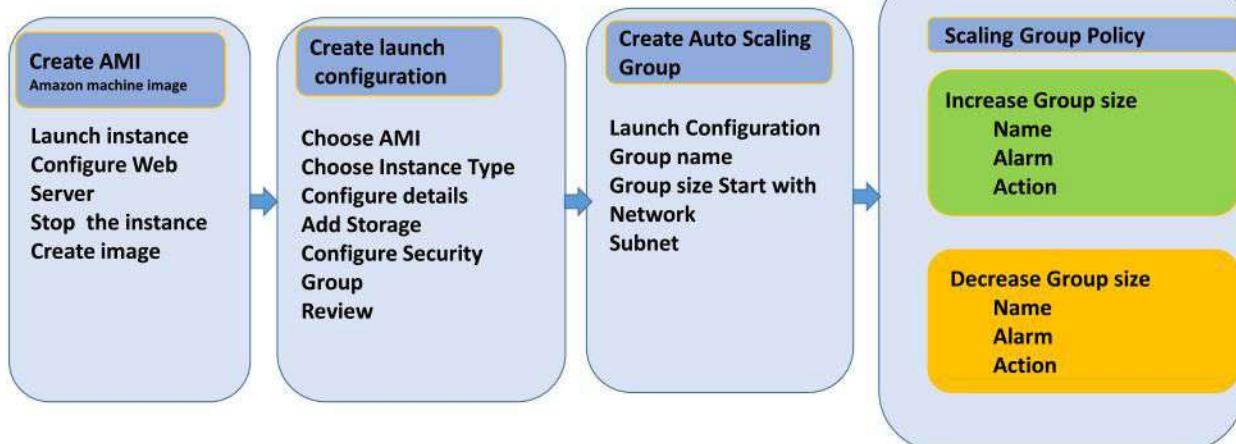


- **Autoscaling Policy**

- Autoscaling Policy defines rules for dynamically increase or decrease the EC2 instance count based on Cloudwatch Alarms.

AWS

## AWS Autoscaling Configuration



AWS

## Auto Scaling with Elastic Load Balancer ( ELB )

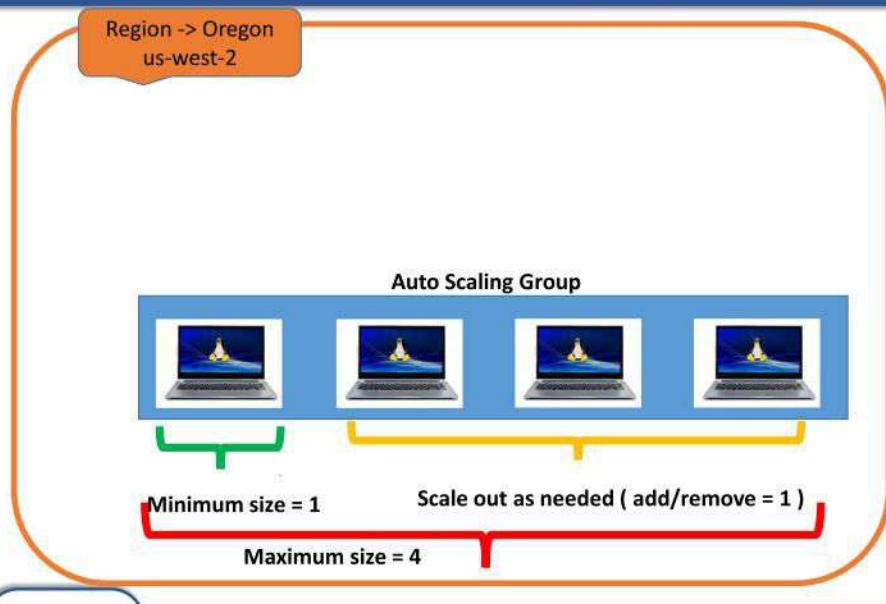
**ZOOM**  
TECHNOLOGIES



AWS

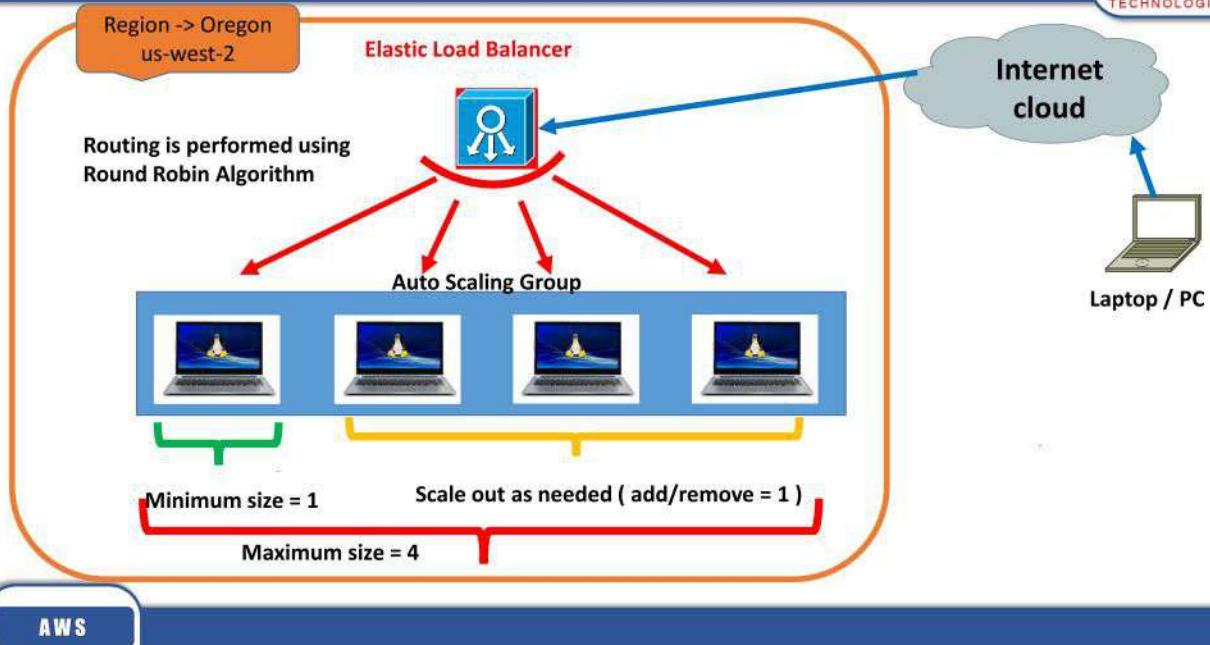
## Auto Scaling with Elastic Load Balancer ( ELB )

**ZOOM**  
TECHNOLOGIES



AWS

## Auto Scaling with Elastic Load Balancer ( ELB )



AWS

## Amazon RDS, Dynamodb, Redshift



# DAY 11

## RDS, Dynamodb, Redshift

AWS

# Amazon RDS Relational Database Service

AWS

- Overview RDS
- RDS Engine
- Benefits
- Backup
- Multi Availability Zones
- Storage Type

AWS

- To configure Database over AWS cloud you have two options:
  - a) Launch an instance and install database software over the instance from scratch where you are responsible of software, backups, high availability and all.
  - b) Amazon provides database service where instance, software, updates, patches, scalability, high availability all will be maintained by amazon.
- Amazon provides these database services through RDS, dynamodb and Redshift, these are PAAS service.

### What is RDS ?

- Amazon Relational Database Service (or Amazon RDS) is a distributed relational database service
- Amazon RDS was first released on 22 October 2009, supporting MySQL databases.
- It simplifies the setup, operation, and scaling of a relational database for use in applications.
- It automatically manages and updates patches, backups and enabling point-in-time recovery.
- You do not have access to the operating system, access is given to only Relational Database, which can be managed by console or client application or AWS-cli.

## What is RDS ?



- CPU, memory, storage, and IOPS can be scaled independently.
- In addition to the security in the database package, IAM users and permissions can help to control who has access to the RDS databases
- Amazon RDS supports Amazon Aurora, MySQL, MariaDB, Oracle, SQL Server, and PostgreSQL database engines.

AWS

## Currently Supported Database Engines



- Amazon Aurora
- MySQL
- MariaDB
- Oracle
- SQL Server
- PostgreSQL

AWS

## Amazon RDS engines

**ZOOM**  
TECHNOLOGIES

### Commercial

**ORACLE**



Microsoft  
**SQL Server**

### Open source



PostgreSQL



MariaDB

### Amazon Aurora

**Amazon**  
**Aurora**

AWS

## Benefits of RDS

**ZOOM**  
TECHNOLOGIES

- No infrastructure management
- Cost-effective
- Application compatibility
- Instant provisioning
- Scale up/down
- Automatic minor updates
- Automatic backups
- Not required to manage operating system
- Multi-AZ with 1 click
- Automatic recovery in event of failover

AWS

## Backups



- Daily Automated Backups
- RDS provides backup storage up to 100% of the provisioned database storage at no additional charge for e.g., if you have 10 GB-months of provisioned database storage, RDS provides up to 10 GB-months of backup storage at no additional charge.
- Most databases require less raw storage for a backup than for the primary dataset, so if multiple backups are not maintained, you will never pay for backup storage.

AWS

## Multi-AZ Deployment



- Automatically replicates data to a secondary AZ
- During maintenance or "Unavailable" times AWS automatically routes traffic to the secondary instance and replicates the data back to primary

AWS

## Storage type



- Standard : Utilizes AWS EBS Volumes
- Provisioned IOPS: Optimized EBS volumes and optimized for IOP

AWS

## Client Application



- To connect to RDS database

Using mysql-client for mysql database.

```
# mysql -h <rds_endpoint> -u <username> -p<password>
      mysql > show databases;
              > use <database_name>
              > show <tables>
```

- Using WorkBench

AWS

## Selected RDS customers



## Amazon Dynamodb



# Amazon DynamoDB

AWS

- Relational (SQL) vs. non-relational (NoSQL)
- Dynamodb

AWS

### Relational (SQL) vs. non-relational (NoSQL)

SQL	NoSQL
SQL databases are primarily called as Relational Databases (RDBMS)	NoSQL database are primarily called as non-relational or distributed database
Represent data in form of tables which consists of n number of rows	Collection of key-value pair, documents, graph databases or wide-column , without standard schema
Vertically scalable ( increasing the hardware)	Horizontally scalable increasing the databases servers in the pool of resources
MySQL, Oracle, Sqlite, Postgres and MS-SQL	MongoDB, BigTable, Redis, RavenDb, Cassandra, Hbase, Neo4j and CouchDb.
SQL databases are good fit for the complex query	NoSQL databases are not good fit for complex queries

## Amazon CloudTrail

AWS

- AWS CloudTrail is an AWS service that allows to track actions taken by a user, role, AWS Management Console, AWS Command Line Interface, AWS SDKs, APIs or an AWS service.
- CloudTrail is used to view, search, download, archive, analyze, and respond to account activity across your AWS infrastructure.
- CloudTrail Event History will only show the results for the current region you are viewing for the last 90 days.

AWS

## Amazon CloudTrail



- For a complete record of account activity, including all management events, data events, and read-only activity, you'll need to configure a CloudTrail trail.
- 5 Trails per region can be configured in your account by default, this limit cannot be increased.
- CloudTrail delivers log files to your S3 bucket approximately every 5 minutes. CloudTrail does not deliver log files if no API calls are made on your account.

AWS

## Amazon CloudTrail



- Amazon SNS notifications can be turned on so that you can take immediate action on delivery of new log files.
- There is no charge from AWS CloudTrail for creating a CloudTrail trail and the first copy of management events within each region is delivered to the S3 bucket specified in your trail free of charge.
- Once a CloudTrail trail is setup, Amazon S3 charges apply based on your usage.

AWS

- Log management tools available in the market to read the logs stored by Cloudtrail.
  - Loggy
  - SumoLogic
  - CloudTrailViewer
  - Splunk

## **MCSE-2012 Full Course**

### **MICROSOFT CERTIFIED SOLUTIONS EXPERT**

Practicals in real-time environment. Detailed curriculum with all 5 papers

**Duration: 1 Month | 4 Hrs Per Day** (starts on 15<sup>th</sup> & 30<sup>th</sup> of every month)

Batches: Morning: 8.30 to 10.30 • Afternoon: 2.00 to 4.00 • Evening: 7.30 to 9.30

## **CCNA (v 3.0) Full Course**

### **CISCO CERTIFIED NETWORK ASSOCIATE**

Cisco Routers with BSNL/TELCO MUX & Live Channelised E1

**Duration: 1 Month | 4 Hrs Per Day** (starts on 7<sup>th</sup>, 15<sup>th</sup> & 30<sup>th</sup> of every month)

Batches: Morning: 8.30 to 10.30 • Afternoon: 2.00 to 4.00 • Evening: 7.30 to 9.30

## **LINUX ADMINISTRATION**

### **COMPLETE RHCE LINUX**

Practicals on Live Web Administration + Integration of Windows with Linux/Unix (Samba Server)

**Duration: 2 Weeks | 4 Hrs Per Day** (starts on 15<sup>th</sup> & 30<sup>th</sup> of every month)

Batches: Morning: 8.30 • Afternoon: 2.00 • Evening: 7.30

## **EMERGING TECHNOLOGIES - AN INSIGHT**

## **NETWORKING AND NETWORK SECURITY**

### **Free MCSE & CCNA Exam Practice Questions**

## **EHCE | Ethical Hacking & Countermeasures Expert**

Course is mapped to EHCE course from US-Council ([www.us-council.com](http://www.us-council.com))  
(Pre requisite is CCNA / MCSE / LINUX)

**Duration: 2 Weeks | 4 Hrs Per Day** (starts on 15<sup>th</sup> & 30<sup>th</sup> of every month)

Batches: Morning: 7.30 or Evening: 7.30

**Complete Package for Only**

**Fees: ₹ 5,900/-**

+ 18% GST

**Duration: 3 Months  
4 Hrs Per Day**

**100%**

**GUARANTEED**

**JOB**

**ASSISTANCE**

**Fees: ₹ 9,500/-  
+ 18% GST**

## **CCNP R&S**

### **CISCO CERTIFIED NETWORK PROFESSIONAL**

**Duration: 1 Month | 4 Hrs Per Day** (starts on 15<sup>th</sup> of every month)

Batches: Morning: 7.30 • Afternoon: 2.00 • Evening: 7.00

- Labs on latest routers with IOS version 15.X

### **Monitoring, Diagnostics & Troubleshooting Tools**

- PRTG • Wireshark • SolarWinds, etc.

### **Exam Practice Challenge Labs**

## **CCIE R&S**

### **CISCO CERTIFIED INTERNETWORK EXPERT**

**Duration: 1 Month | 4 Hrs Per Day** (starts on 15<sup>th</sup> of every month)

Batches: Morning: 7.30 • Evening: 6.00

- Individual Rack For Every Student
- Real time scenarios by 20+ years experienced CCIE certified industry expert who has worked on critical projects worldwide.

### **Written + Lab Exam Focus**

### **FREE Full Scale 8 Hours Exam Lab Included**

### **Unlimited Lab Access For 1 Year**

**Fees: ₹ 10,000/-**

**Introductory Special Offer**

**Fees: ₹ 6,500/-**

+ 18% GST

**Fees: ₹ 25,500/-**

+ 18% GST

## MICROSOFT EXCHANGE SERVER-2013

Duration: 2 Weeks | 4 Hrs Per Day

Batches: (Contact the Counselors for the next available batch)

Fees: ₹ 2,500/-

+ 18% GST

## MICROSOFT PRIVATE CLOUD

Microsoft Certified Solutions Expert [MCSE] Private Cloud

Duration: 2 Weeks | 4 Hrs Per Day

Batches: (Contact the Counselors for the next available batch)

Fees: 4,500/-

+ 18% GST

## ADVANCED LINUX

Duration: 2 Weeks | 4 Hrs Per Day (starts on 15<sup>th</sup> & 30<sup>th</sup> of every month)

Batches: Morning: 8.30 or Evening: 7.30

Fees: ₹ 3,000/-

+ 18% GST

## CCNA SECURITY

(Pre requisite is CCNA R&S)

CISCO CERTIFIED NETWORK ASSOCIATE - SECURITY

Duration: 2 Weeks | 4 Hrs Per Day (starts on 15<sup>th</sup> of every month)

Batches: Morning: 7.30 or Evening: 6.00

Fees: ₹ 5,500/-

+ 18% GST

## CCNP SECURITY

(Pre requisite is CCNA sECURITY AT ZOOM)

CISCO CERTIFIED NETWORK PROFESSIONAL - SECURITY

Duration: 2 Weeks | 4 Hrs Per Day (starts on 30<sup>th</sup> of every month)

Batches: Morning: 7.30 or Evening: 6.00

Fees: ₹ 7,500/-

+ 18% GST

## CCIE SECURITY

(Pre requisite is CCNA & CCNP Security at ZOOM)

CISCO CERTIFIED INTERNETWORK - SECURITY

Duration: 1 Month | 4 Hrs Per Day

Batches: (Contact the Counselors for the next available batch)

Fees: ₹ 15,500/-

+ 18% GST

## VMware vSphere

(Pre requisite is MCSE)

Duration: 1 Month | 4 Hrs Per Day (starts on 15<sup>th</sup> of every month)

Batches: Morning: 7.30 and Evening: 7.30

Fees: ₹ 5,950/-

+ 18% GST

## VMware vCloud

(Pre requisite is VMware vSphere)

Duration: 1 Week | 4 Hrs Per Day (starts on 15<sup>th</sup> of every month)

Batches: Morning: 9.30 to 11.30

Fees: ₹ 2,500/-

+ 18% GST

## CHECKPOINT FIREWALL

Duration: 2 Weeks | 4 Hrs Per Day

Batches: (Contact the Counselors for the next available batch)

Fees: ₹ 5,500/-

+ 18% GST

## CISCO ASA FIREWALL+CISCO IPS

(CCNA Security + CCNP Security)

Duration: 2 Weeks | (Starts on 15th of every month)

Batches: Morning: 7.30 am or Evening 7.30 pm

Fees: ₹ 10,500/-

+ 18% GST

We also offer the following courses (Contact the Counselors for the next available batch)

- › CCNA Voice @ ₹7,500/-
- › CCNP Voice @ ₹9,500/-
- › CCIE Collaboration @ ₹15,500/-
- › CCNA Data Center @ ₹7,500/-
- › CCNP Data Center @ ₹9,500/-
- › CCIE Data Center @ ₹15,500/-
- › IPv6 Migration @ ₹5,500/-

## FACULTY

- › All Senior Engineers of Zoom working on Live projects
- › Training Engineers of British Army, CISCO, CMC, GE, BSNL, Tata Teleservices and Several Corporates etc for 18 Years.

# **FREE Training**

Zoom Technologies offers a number of free resources for the professional development of network engineers.

Register on our website to get access to the video recordings of live sessions on:

- **MCSE – Windows Server 2012**
- **Cisco – CCNA**
- **Cisco – CCNP** } All Tracks (R & S, Security and Voice)
- **Cisco – CCIE**
- **Exchange Server 2013**
- **Linux** } All Flavors
- **Advanced Linux**
- **Ethical Hacking and Countermeasure Expert ([www.us-council.com](http://www.us-council.com))**

Find us at: [www.zoomgroup.com](http://www.zoomgroup.com)

Like us on Facebook and get access to free online webinars as well as special offers and discounts.  
<https://www.facebook.com/ZoomTechnolgies>

## **Online Training**

Online Training at Zoom is a cost effective method of learning new networking skills from the convenience of your home or workplace.

Taking an online training course has many advantages for everyone (Freshers / Working Professionals). Zoom offers online training for the highly coveted CCNA, CCNP and CCIE courses as well as MCSE, Linux, VMware, Ethical Hacking and Firewalls, IPv6 with more courses planned for the near future. These are live instructor led courses, using Cisco WebEX. Check out our online course offerings at: [http://zoomgroup.com/online\\_course](http://zoomgroup.com/online_course)

## **Job Opportunities**

There is a high demand for network and security professionals at all times. Apart from job opportunities in India and the Middle East, network and security administrators are also sought-after in the US and Europe.

If you do not have the right skills, then get them now! Choose the experts in network and security training, an organization which has already trained over one hundred thousand engineers.

For the latest job openings in networking and security, register and upload your resume on: <http://zoomgroup.com/careers> or visit zoom to choose job offering from several multinational companies.



## ABOUT US

**ZOOM Technologies** India Pvt. Ltd. is a pioneering leader in network and security training, having trained over two hundred thousand engineers over the last two decades.

We offer a world class learning environment, with state-of-the-art labs which are fully equipped with high-end routers, firewalls, servers and switches. All our courses are hands-on so you'll get much needed practical experience.

The difference between us and the competition can be summed up in one simple sentence. Our instructors are real-time network professionals who also teach.

Zoom has designed, developed and provided network and security solutions as well as training to all the big names in the Indian industry, for the public sector as well as corporate leaders. Some of our clients are:

- TATA
- BSNL
- VSNL
- Indian Railways
- National Police Academy
- Air Force Academy
- IPCL - Reliance Corporation
- CMC
- British Army

No other training institute can boast of a customer base like this. This is the reason for the resounding success of our networking courses. If you do not have the right skills, then get them now. Come, join the experts!



### TELANGANA

#### Hyderabad

##### Ameerpet

# 203 to 206, 2nd Floor,  
HUDA Maitrivanam.  
Tel: +91-40-2374 5252 / 2374 5259  
eMail: [ameerpet@zoomgroup.com](mailto:ameerpet@zoomgroup.com)

##### Banjara Hills

Above HDFC Bank, Road No. 12.  
Tel: +91-40-2339 4150 / 2330 3160  
eMail: [banjara@zoomgroup.com](mailto:banjara@zoomgroup.com)

### ANDHRA PRADESH

#### Vijayawada

# 64-9-2, Second Floor,  
SBH Building, Patamata,  
**NTR Circle.**  
Mobile: +91 733 744 5253  
733 744 5254  
eMail: [vijayawada@zoomgroup.com](mailto:vijayawada@zoomgroup.com)

### GUJARAT

#### Surat

# 40/A, 3rd Floor,  
River Front Building,  
Opp. Dutch Garden,  
**Nanpura.**  
Mobile: +91 964 233 8901  
eMail: [surat@zoomgroup.com](mailto:surat@zoomgroup.com)