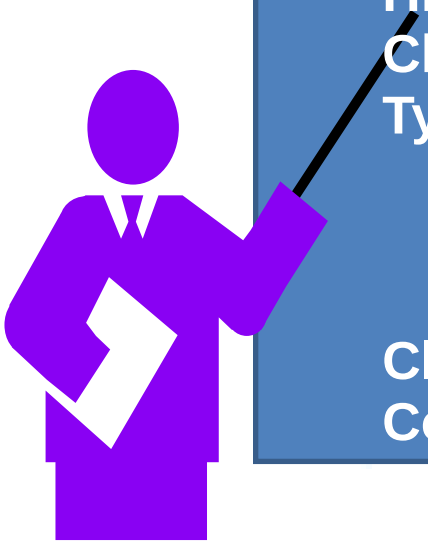

AWS Administration

MODULE#1 -Introduction to Cloud Computing

Agenda



- What is Cloud Computing ?
- Why we go for Cloud Computing?
- History and Origins of Cloud Computing
- Characteristics of Cloud Computing
- Types of cloud services
  - Software as a Service SaaS
  - Platform as a Service PaaS
  - Infrastructure as a Service IaaS
- Cloud implementation types
- Conclusion

What is Cloud Service?

Services and Solutions that are delivered and consumed in real time over internet are Cloud Services

-When you store your photos online, use webmail or social networking site, you will use "Cloud Computing" Service

What is Cloud Computing?

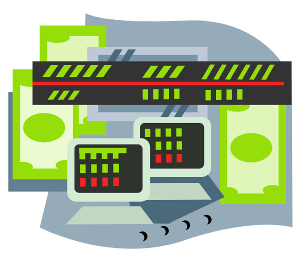
Cloud Computing is a delivery model of Computing services over the internet

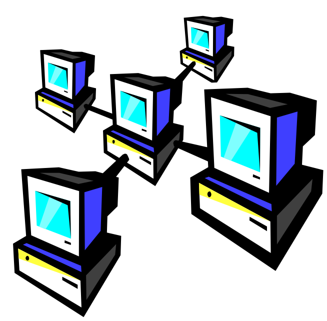
-It enables real time development, development and delivery of broad range of products, services and solutions

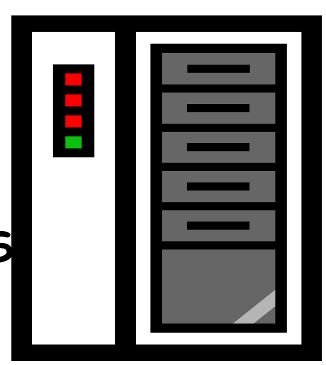
"Cloud computing is a style of computing where massively scalable IT-related capabilities are provided as a service across the Internet to multiple external customers"

What is Cloud Computing?

Computing and software resources that are delivered on demand, as service..



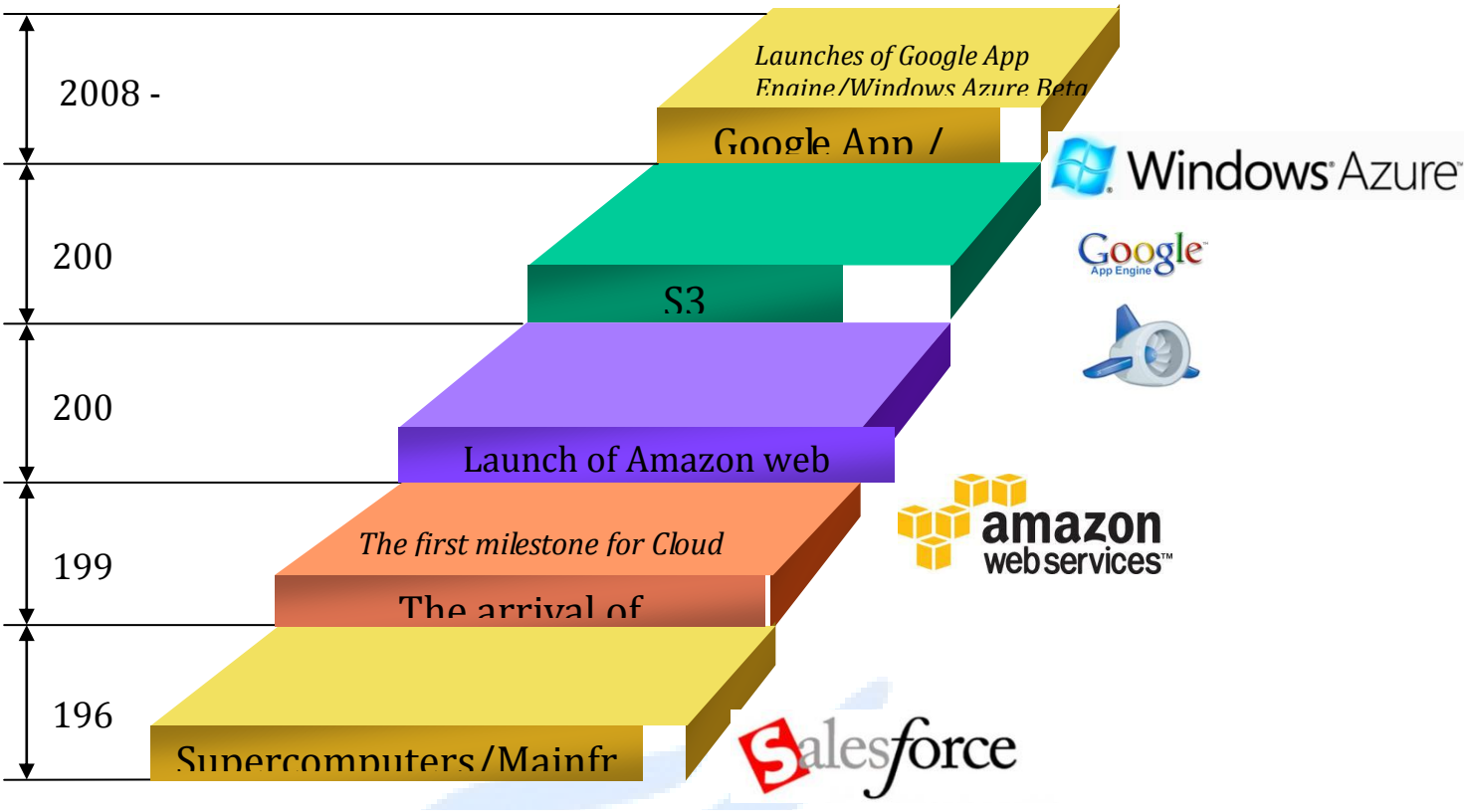




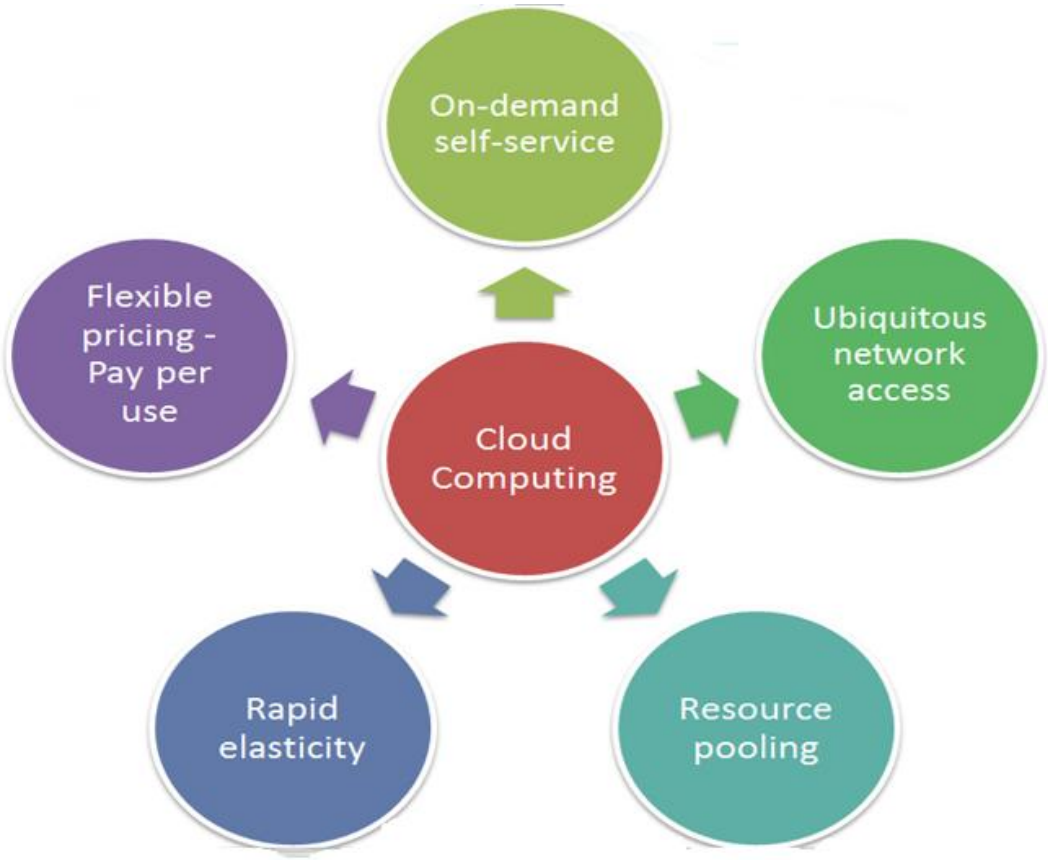
Why we go for Cloud Computing?

- Lower Computing Cost
- Improved Performance
- Reduced Software Cost
- Instant Software Updates
- Unlimited Storage Capacity
- Increased Data Reliability
- Device Independence and the “always on!, anywhere and any place”
- Free From Maintenance and the “no-need-to-know”

History and Origins of Cloud Computing



Characteristics of Cloud Computing



Characteristics of Cloud Computing

- On-demand self-service
- Ubiquitous network access
- Resource pooling (advanced virtualization)
- Rapid elasticity
- Flexible pricing - Pay per use

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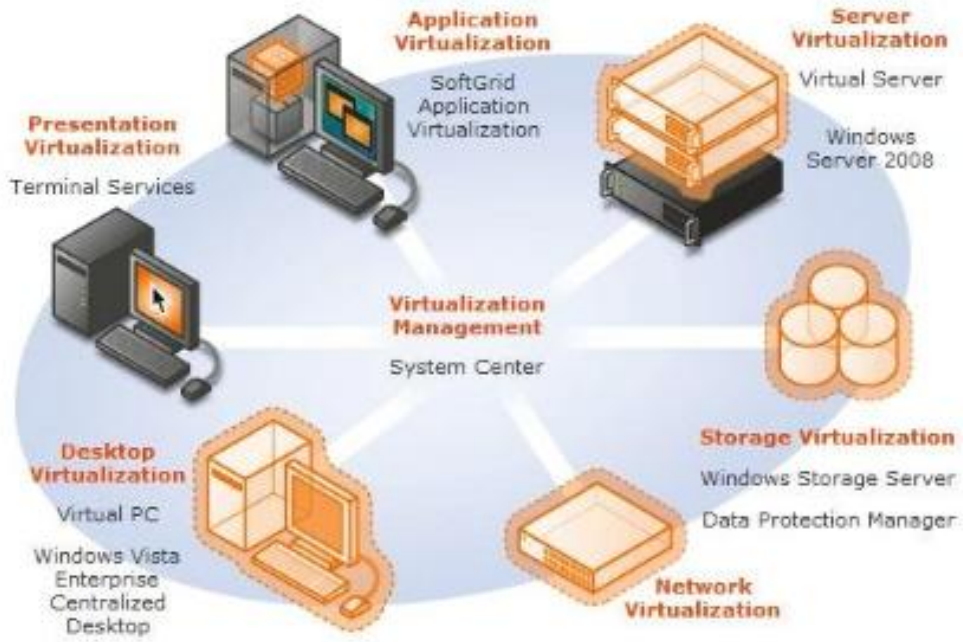

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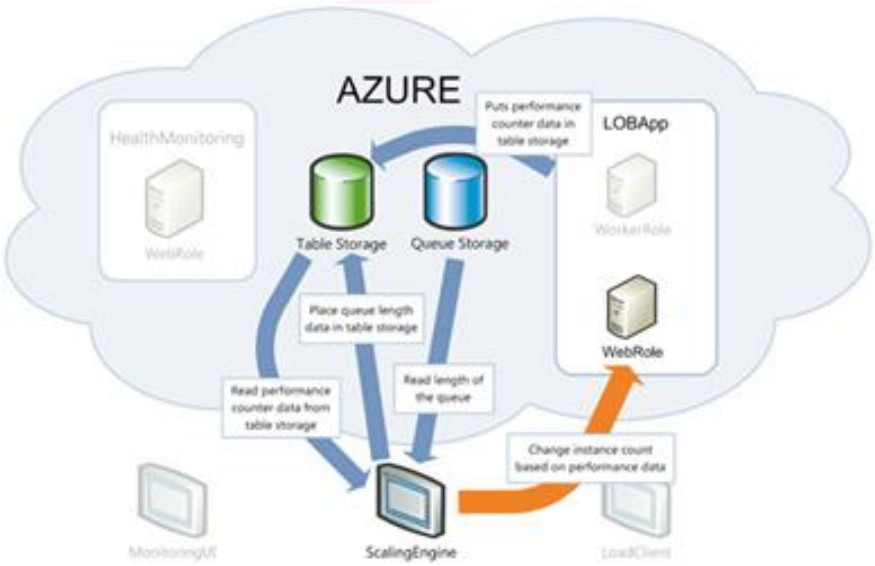

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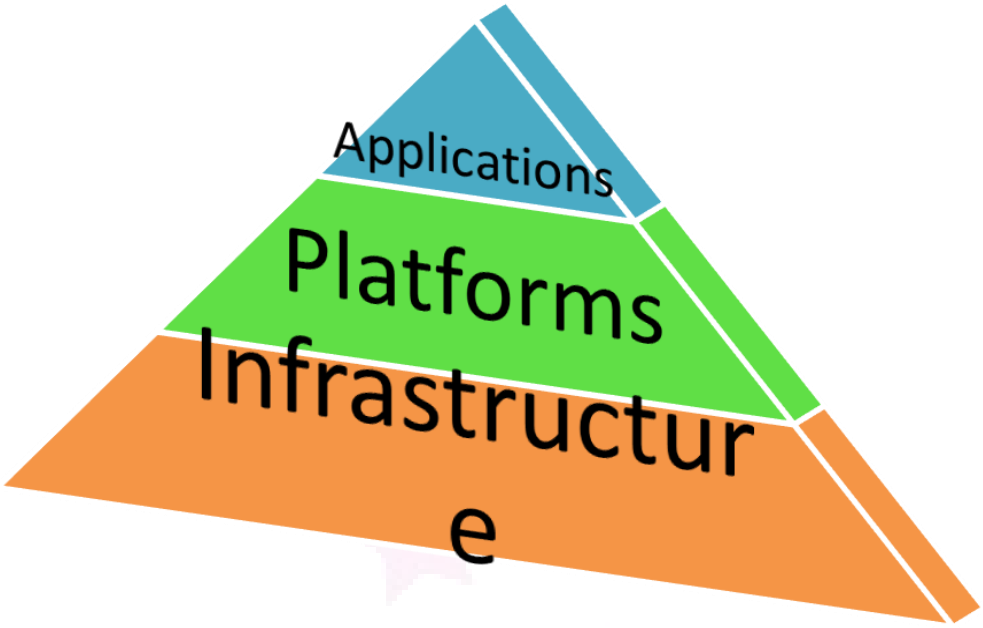
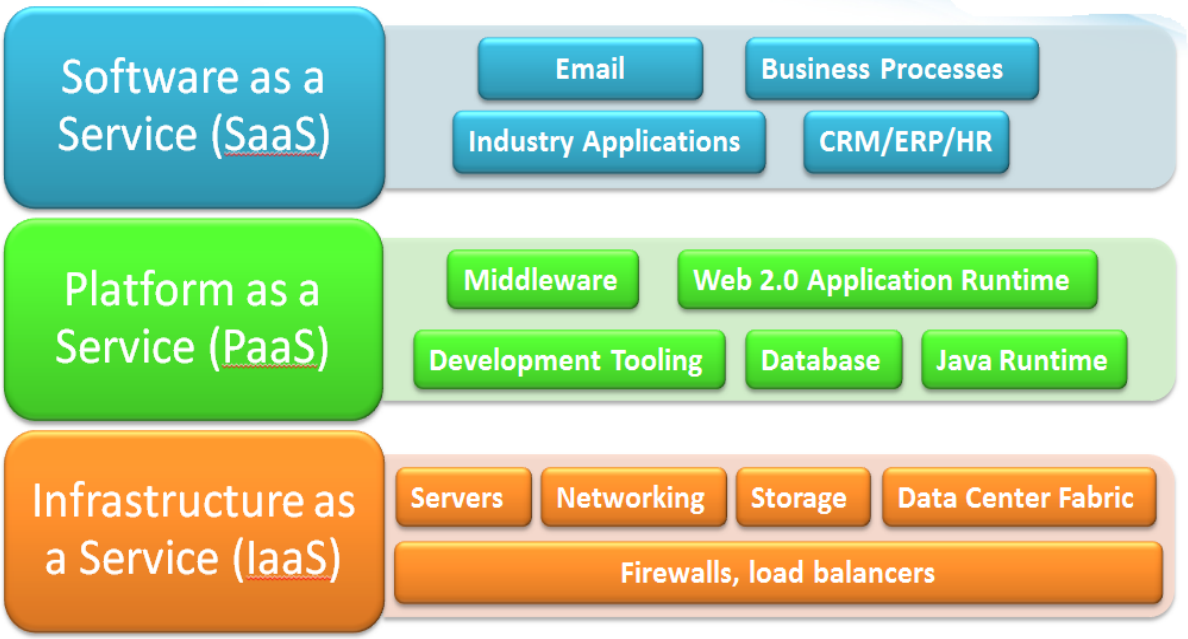
Cloud Service Layers



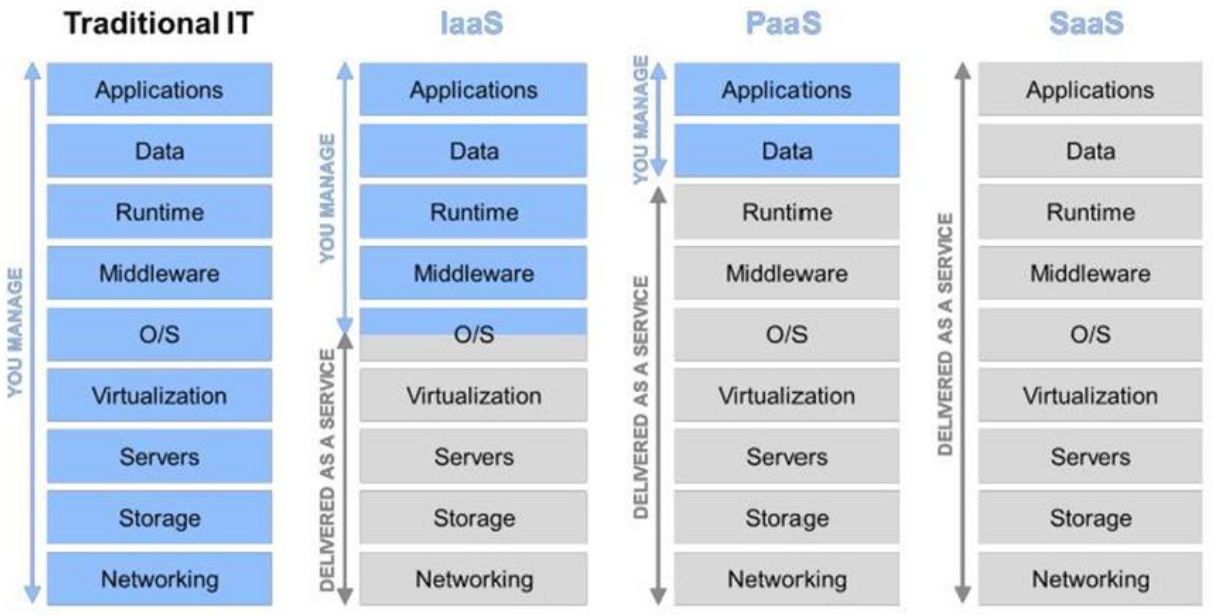
Cloud Service Layers

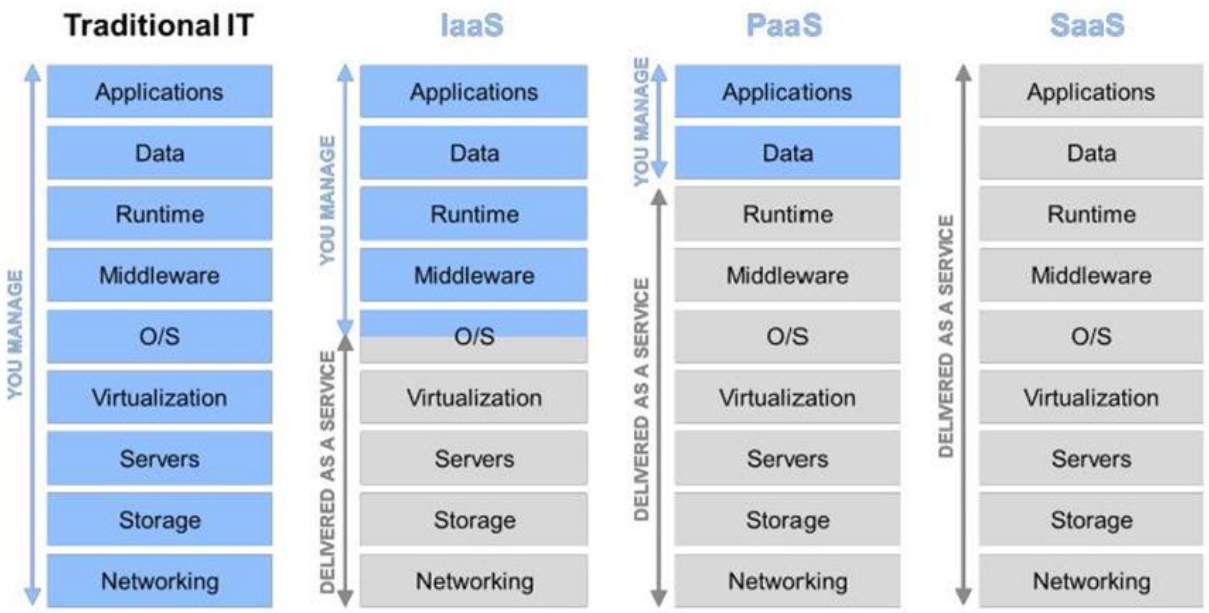
Software as a Service (SaaS)	• SaaS is a software delivery methodology that provides licensed multi-tenant access to software and its functions remotely as a Web-based service.
Platform as a Service (PaaS)	• PaaS provides all of the facilities required to support the complete life cycle of building and delivering web applications and services entirely from the Internet.
Infrastructure as a Service (IaaS)	• IaaS is the delivery of technology infrastructure as an on demand scalable service.

Cloud Service Layers

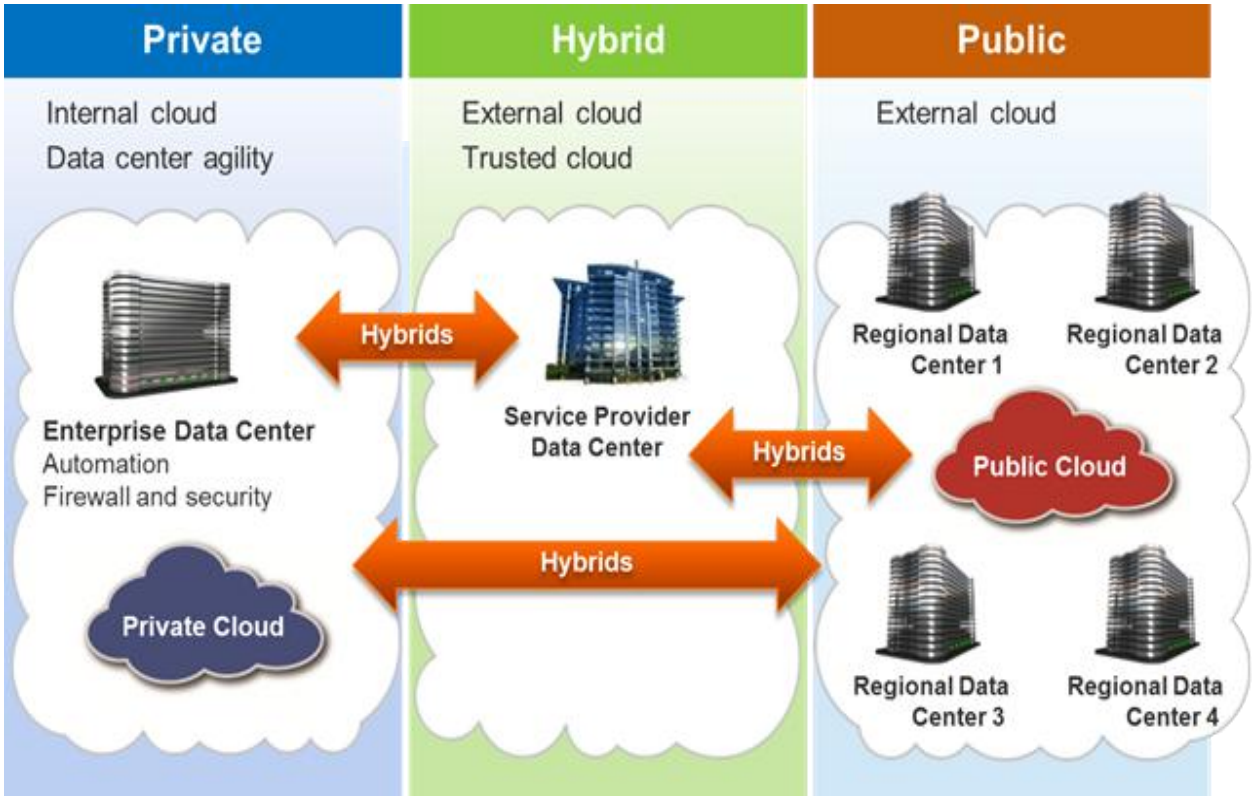


Cloud Service Model -Comparison





Cloud implementation types

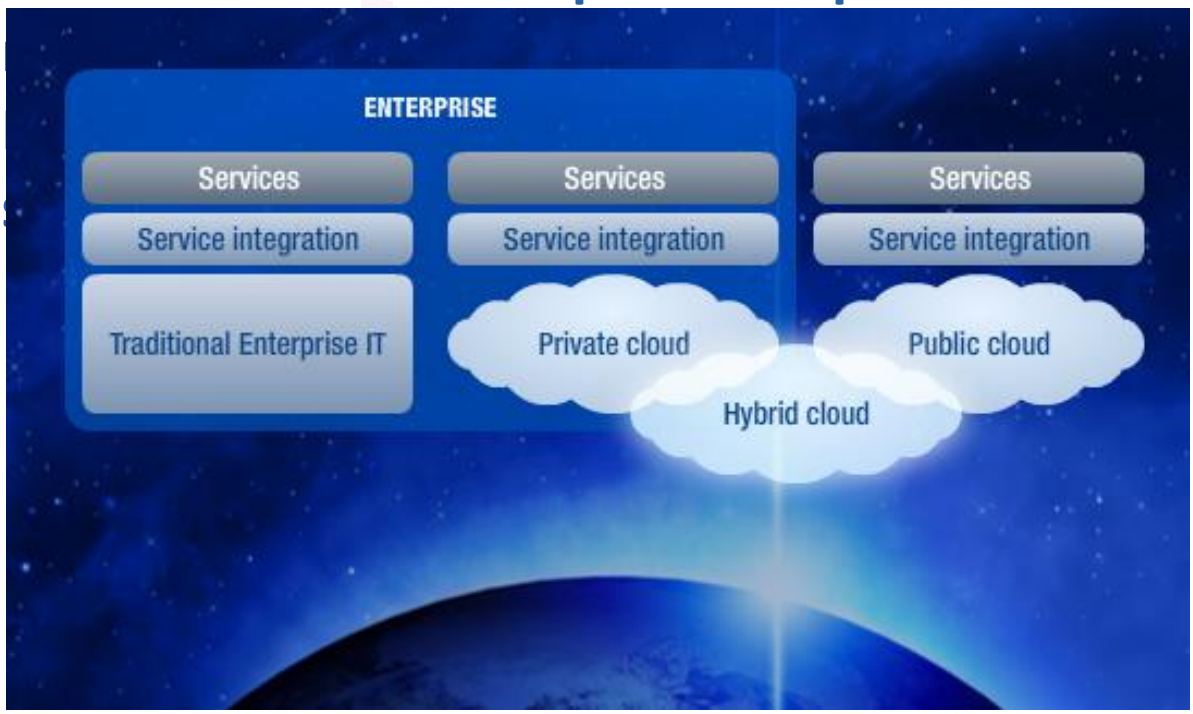


Public Cloud

- Owned and managed by service provider
- Made available to the general public or a large industry group

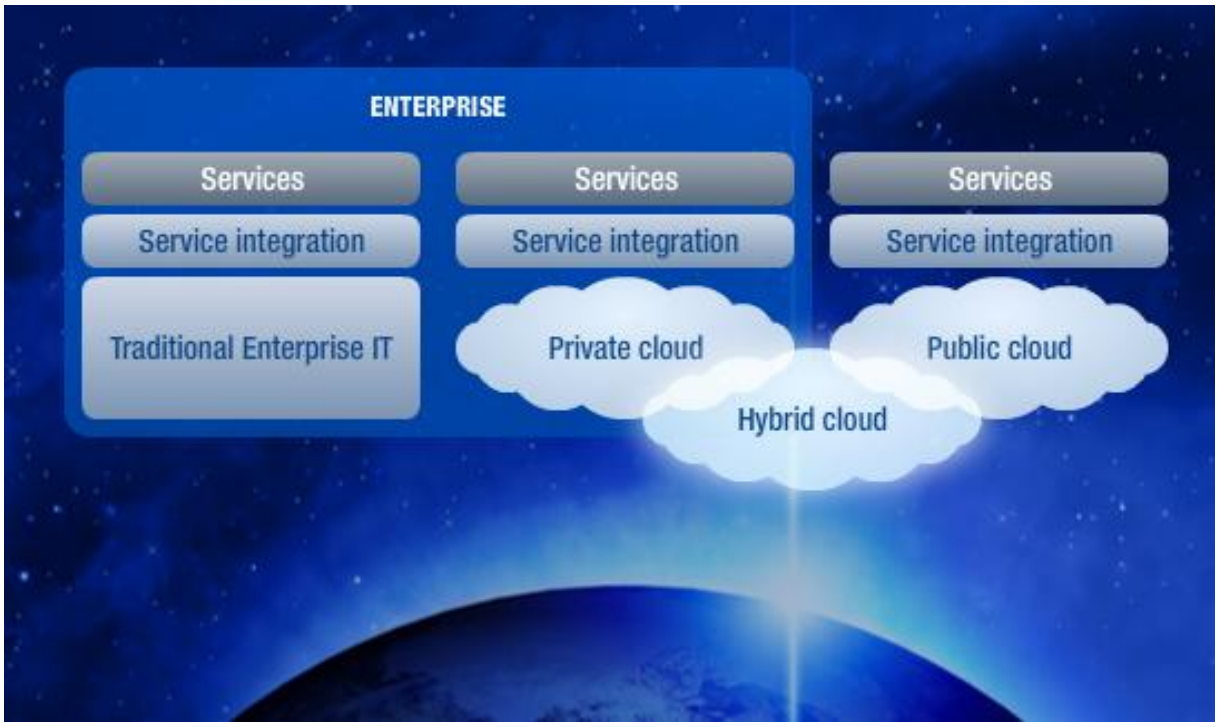
Private Cloud

- Operated solely for an organization
- May be managed by the organization or a third party
- Limits access to enterprise and partner
-



Hybrid Cloud

- Composition of two or more clouds (private, community, or public) bound together by standardized or proprietary technology that enables data and application portability



Conclusion

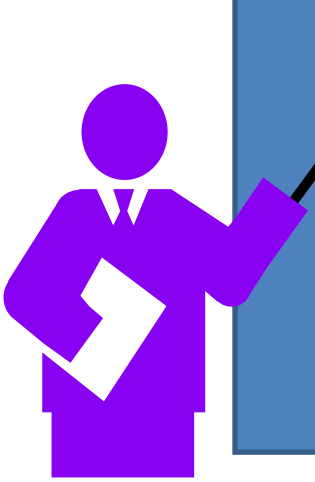
Cloud Computing is the fastest growing part of network based computing. It provides tremendous benefits to customers of all sizes: simple users, developers, enterprises and all types of organizations.

Lab Activity

MODULE#2 -Introduction to AWS

Agenda

- What is AWS ?
- Benefits of using AWS?
- History and Origins of AWS
- AWS Components
- AWS Services
- AWS Regions
- AWS Availability Zones
- AWS Edge Locations
- AWS Certifications

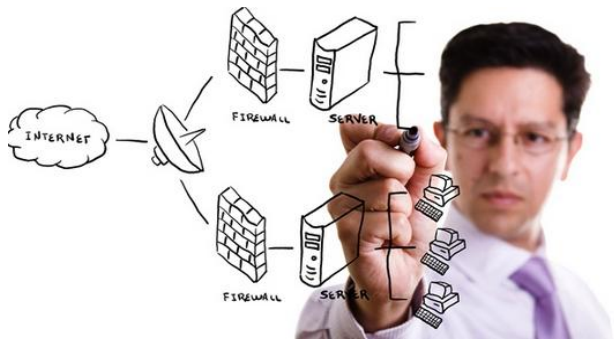


What is AWS?

Amazon Web Services(AWS) are a collection of remote services(Also called as web service) offered by the amazon.com over the internet build and run an application.

Amazon Web Services (AWS) - robust, scalable and affordable infrastructure for cloud computing.

AWS provide compute, storage and database service quickly provisioning the IT needs



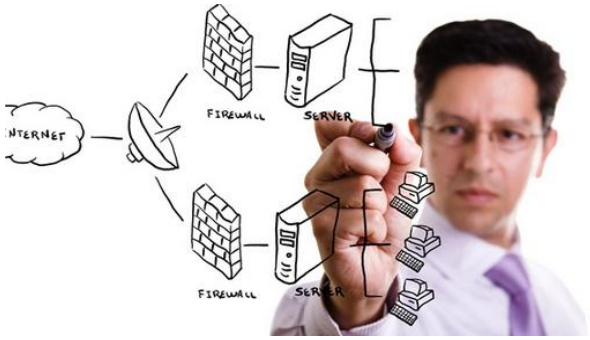
What is AWS ?

AWS is a set of cloud computing services

AWS is flexibility, availability, and scalability

AWS is Elasticity: scale up or scale down as needed, We can get recourses instantly

AWS is fully on demand



Benefits of using AWS ?

- ***Pay-per use model***
  you are only charged for disk space, CPU time and bandwidth that you use.

- ***Instant scalability***
  Your Service automatically scales on AWS stack.

- ***Reliable/Redundant***
  Infrequent outages (so far).
  Data is redundant in the cloud.
  All services have built-in security

- ***Security***

  AWS delivers a scalable cloud-computing platform that provides customers with end-to-end security and end-to-end privacy.

- ***Most services accessed via simple REST/SOAP API***
  Libraries are available in all major languages.
  Minimal learning curve.

Service Level Agreement (SLA)

SLA between 99.99 and 100% availability
Amazon S3 maintains a durability of 99.99999%

- ***Availability***
  Availability Zones exist on isolated fault lines, flood plains, and electrical grids to substantially reduce the chance of simultaneous failure

- ***Support***
  AWS provides 24/7 support in the real-time operational status of all services around the globe

History and Origins of AWS

Grew out of Amazon's need to rapidly provision and configure machines of standard configurations for its own business.

Early 2000s – Both private and shared data centers began using virtualization to perform "server consolidation"

2003 – Internal memo by Chris Pinkham describing an "infrastructure service for the world."

2006 – S3 first deployed in the spring, EC2 in the fall

2008 – Elastic Block Store available.
- Amazon EC2 Now Offers Windows Server 2008

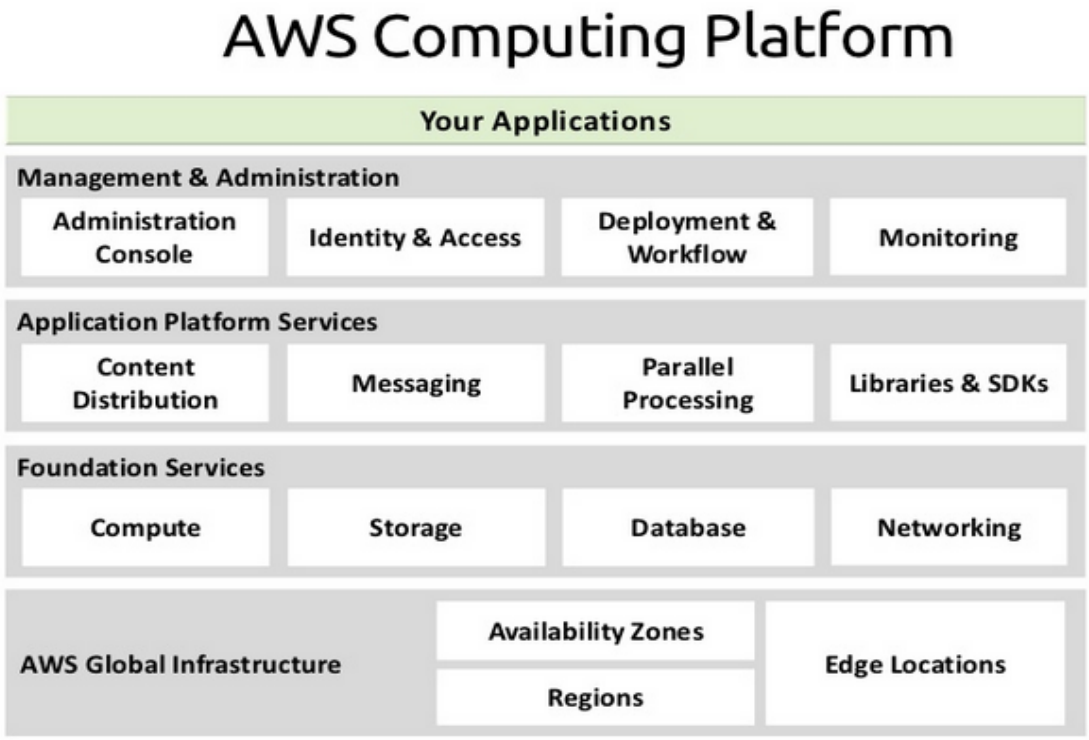
2009 – Relational Database Service
- Announcing Amazon CloudFront Streaming
- AWS Launches the Northern California Region
- Amazon EC2 Instances Now Can Boot from Amazon EBS
- Introducing Amazon EBS Shared Snapshots

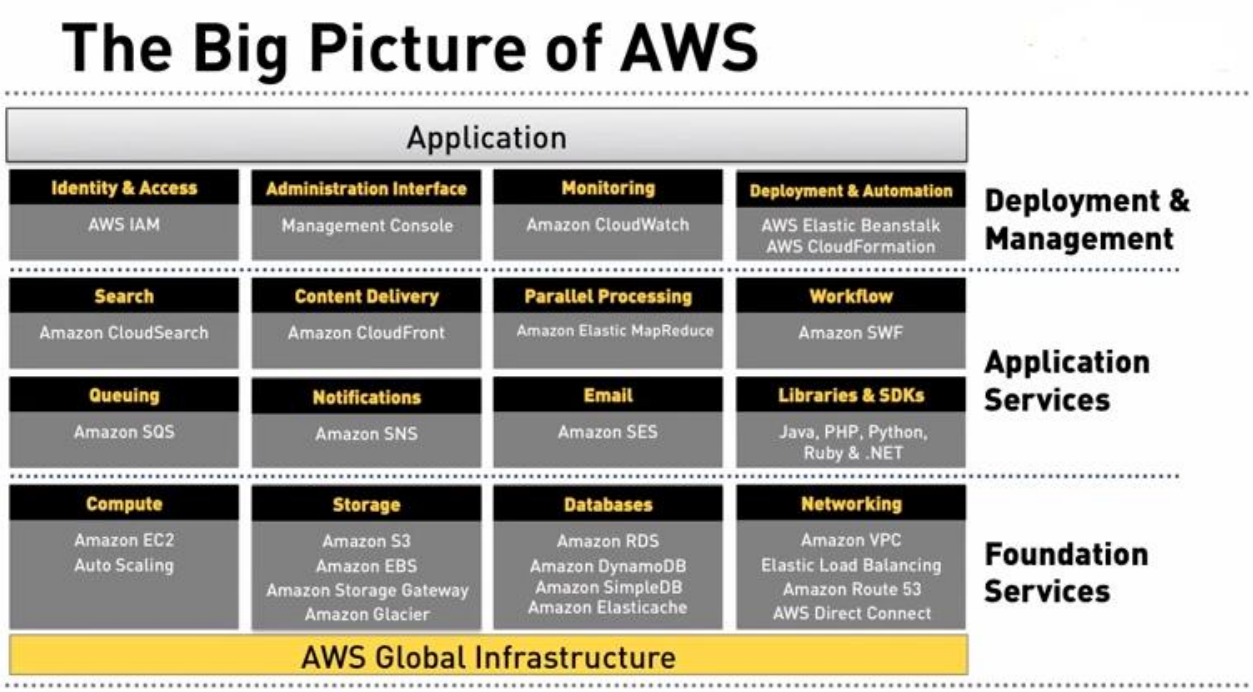
2012 – DynamoDB
- Announcing Windows Server 2012 on AWS

2013 – Amazon DynamoDB Console now available in AWS GovCloud (US)
- New Management Console and support for more AWS features
- Announcing the next generation of Amazon EC2 High I/O instance

2014 – Amazon Glacier is Now Available in the AWS GovCloud (US) Region
- Amazon CloudWatch Logs - Cross Account Subscriptions
- Amazon EC2 container Service Available in US West (N. California)

Various Components of AWS





AWS Services

Amazon provides the various types of services as below

EC2 – Virtual Private Servers

- Similar to standard VPS's and are called instances
- Available in a variety of sizes (613MB to 64GB of RAM)
- All major operating systems supported

S3 – Cloud Storage

- Highly scalable (some companies have PBs of data)
- Highly available – data is stored in multiple data centers

RDS – Relational Database

- MySQL, SQL and Oracle databases
- Variety of sizes
- High availability available for an extra cost
- Read replication
- Scheduled backups

Route 53 – DNS

- High availability
- Works well with other AWS services
- Fast and secure
- Pay per zone and million queries

CloudFront – Content Delivery Network

- Uses a number of global edge locations
- Fast
- Pay per GB of data transfer (prices vary on the region)

Glacier – Data Archiving

- Store data for a prolong period of time (years)
- Very cheap
- Data retrieval takes a few hours

DynamoDB – NoSQL Database

- High availability
- Data stored on SSDs for speed
- Pay for number of read/writes per second

ElastiCache – Memcache

- **Cache database results**
- **Available in a variety of sizes**
- **Pay per hours**

AWS Administration

AWS Services

Compute
- EC2 — Virtual Servers in the Cloud
- Lambda — Run Code in Response to Events
- EC2 Container Service — Run and Manage Docker Containers

Storage & Content Delivery
- S3 — Scalable Storage in the Cloud
- Elastic File System PREVIEW — Fully Managed File System for EC2
- Storage Gateway — Integrates On-Premises IT Environments with Cloud Storage
- Glacier — Archive Storage in the Cloud
- CloudFront — Global Content Delivery Network

Database
- RDS — MySQL, Postgres, Oracle, SQL Server, and Amazon Aurora
- DynamoDB — Predictable and Scalable NoSQL Data Store
- ElastiCache — In-Memory Cache
- Redshift — Managed Petabyte-Scale Data Warehouse Service

Networking
- VPC — Isolated Cloud Resources
- Direct Connect — Dedicated Network Connection to AWS
- Route 53 — Scalable DNS and Domain Name Registration

Administration & Security
- Directory Service — Managed Directories in the Cloud
- Identity & Access Management — Access Control and Key Management
- Trusted Advisor — AWS Cloud Optimization Expert
- CloudTrail — User Activity and Change Tracking
- Config — Resource Configurations and Inventory
- CloudWatch — Resource and Application Monitoring
- Service Catalog — Personalized Catalog of AWS Resources

Deployment & Management
- Elastic Beanstalk — AWS Application Container
- OpsWorks — DevOps Application Management Service
- CloudFormation — Templated AWS Resource Creation
- CodeDeploy — Automated Deployments
- CodeCommit — Managed Git Repositories
- CodePipeline — Continuous Delivery

Analytics
- EMR — Managed Hadoop Framework
- Kinesis — Real-time Processing of Streaming Big Data
- Data Pipeline — Orchestration for Data-Driven Workflows

Application Services
- SQS — Message Queue Service
- SWF — Workflow Service for Coordinating Application Components
- AppStream — Low Latency Application Streaming
- Elastic Transcoder — Easy-to-use Scalable Media Transcoding
- SES — Email Sending Service
- CloudSearch — Managed Search Service
- API Gateway — Build, Deploy and Manage APIs

Mobile Services
- Cognito — User Identity and App Data Synchronization
- Device Farm — Test Android, Fire OS, and iOS apps on real devices in the Cloud
- Mobile Analytics — Collect, View and Export App Analytics
- SNS — Push Notification Service

Enterprise Applications
- WorkSpaces — Desktops in the Cloud
- WorkDocs — Secure Enterprise Storage and Sharing Service
- WorkMail PREVIEW — Secure Email and Calendaring Service

AWS Regions

AWS Regions are completely isolated from each other and are in different parts of the world and AWS Regions is

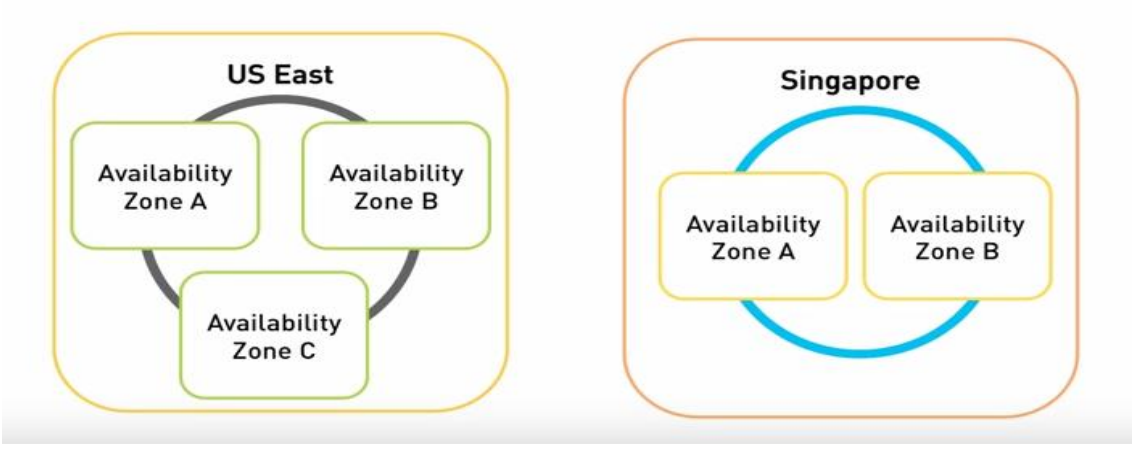
- **A collection of data centers (Availability Zones or "AZ")**
- **Each region has a set number of AZs**
- **All AZs in a region connected by high-bandwidth**
- **Cost vary from Region to Region**
- **Default Region in US East**

AWS Regions

- Datacenters spread across the globe
- There are 9 Regions
  - US-East (N.Virginia)
  - US-West-1 (N.California)
  - EU (Ireland)
  - APAC-1 (Singapore)
  - APAC-2 (Tokyo)
  - APAC-3 (Sydney)
  - GovCloud
  - US-West-2 (Oregon)
  - South America (Sao Paulo)

AWS Availability Zones

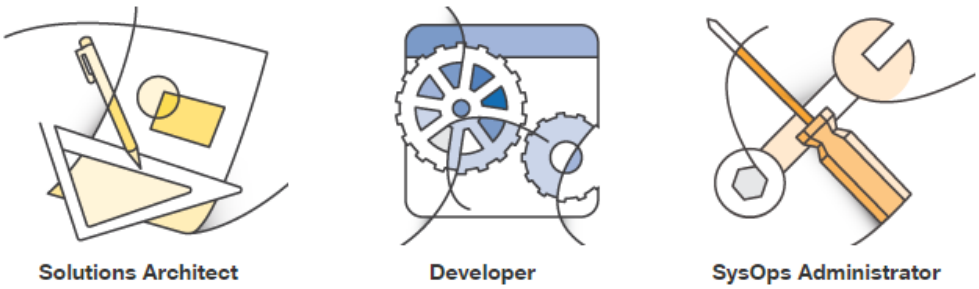
- Subset of a Region
- Physically isolated & independent infrastructure
- High speed connectivity
- Low latency
- Every Region has a minimum of 2 AZs



AWS Edge Locations

Edge locations are the important part of the AWS infrastructure. There are currently 40 edge locations. They are located in most the major cities around the world and are used by CloudFront (CDN) and route53(DNS) to distribute content nearer to the end user

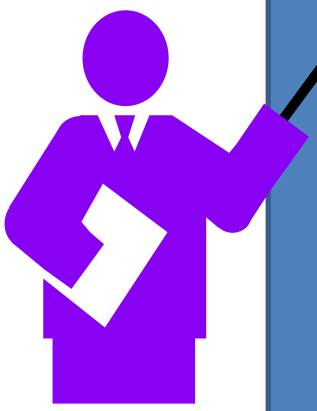
AWS Certifications



Lab activity

MODULE#3 –Elastic Cloud Computing EC2

Agenda



- Introduction to AWS EC2
- Benefits of using AWS EC2?
- Amazon EC2 use cases
- AWS EC2 Pricing Model
- AWS Instance type
- Amazon Machine Image [AMI]
- Selecting EC2 instance
- AWS Regions and Availability zones
- Launching Amazon EC2 Instance Step by Step

Introduction to Amazon EC2

Amazon EC2, which is also known as Amazon Elastic Compute Cloud, provides resizable computing capacity in the Amazon Web Services (AWS)

It is a simple web service interface allows you to obtain and configure capacity with minimal friction.

It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment.

EC2 is the core service of AWS cloud platform and launched in 2006

These are the virtual servers, also called as an instances we can use these instances pay per use basis

Benefits of using AWS EC2?

Easier and Faster - Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change.

Elastic and Scalable – Quickly add and subtract resources to applications to meet customer demand and manage costs. Avoid provisioning resources up-front for projects with variable consumption rates or short lifetimes.

High Availability – Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios.

Cost-Effective – Consume only the amount of compute, storage and other IT resources needed. No long-term commitment, minimum spend or up-front investment is required.

Amazon EC2 Typical Use Cases

- Application Hosting
- Content Delivery
- E-Commerce
- Media Hosting
- Web Hosting

EC2 Pricing Model

- Free Usage Tier
- On-Demand Instances
  - Start and stop instances whenever you like, costs are rounded up to the nearest hour. (Worst price)
- Reserved Instances
  - Pay up front for one/three years in advance. (Best price)
  - Unused instances can be sold on a secondary market.
- Spot Instances
  - Specify the price you are willing to pay, and instances get started and stopped without any warning as the marked changes. (Kind of like Condor!)
  - Dedicated Instances

- Charge for instance

AWS Instance type

- Mapped to the H/W specification
- Classified based on the CPU, memory and storage
- Choice of instance types
  - Standard
  - Medium
  - Micro
  - High-Memory
  - High-CPU
  - High I/O
  - Cluster Compute
  - Cluster GPU

- Instance type influences the performance & cost

Model	vCPU	CPU Credits / hour	Mem (GiB)	Storage (GB)
t2.micro	1	6	1	EBS Only
t2.small	1	12	2	EBS Only
t2.medium	2	24	4	EBS Only

Use Cases

Development environments, build servers, code repositories, low-traffic web applications, early product experiments, small databases.

Model	vCPU	Mem (GiB)	SSD Storage (GB)
m3.medium	1	3.75	1 x 4
m3.large	2	7.5	1 x 32
m3.xlarge	4	15	2 x 40
m3.2xlarge	8	30	2 x 80

Use Cases

Small and mid-size databases, data processing tasks that require additional memory, caching fleets, and for running backend servers for SAP, Microsoft SharePoint, and other enterprise applications.

Model	vCPU	Mem (GiB)	SSD Storage (GB)
c3.large	2	3.75	2 x 16
c3.xlarge	4	7.5	2 x 40
c3.2xlarge	8	15	2 x 80
c3.4xlarge	16	30	2 x 160
c3.8xlarge	32	60	2 x 320

Use Cases

High performance front-end fleets, web-servers, on-demand batch processing, distributed analytics, high performance science and engineering applications, ad serving, batch processing, MMO gaming, video encoding, and distributed analytics.

Model	vCPU	Mem (GiB)	SSD Storage (GB)
r3.large	2	15.25	1 x 32
r3.xlarge	4	30.5	1 x 80
r3.2xlarge	8	61	1 x 160
r3.4xlarge	16	122	1 x 320
r3.8xlarge	32	244	2 x 320

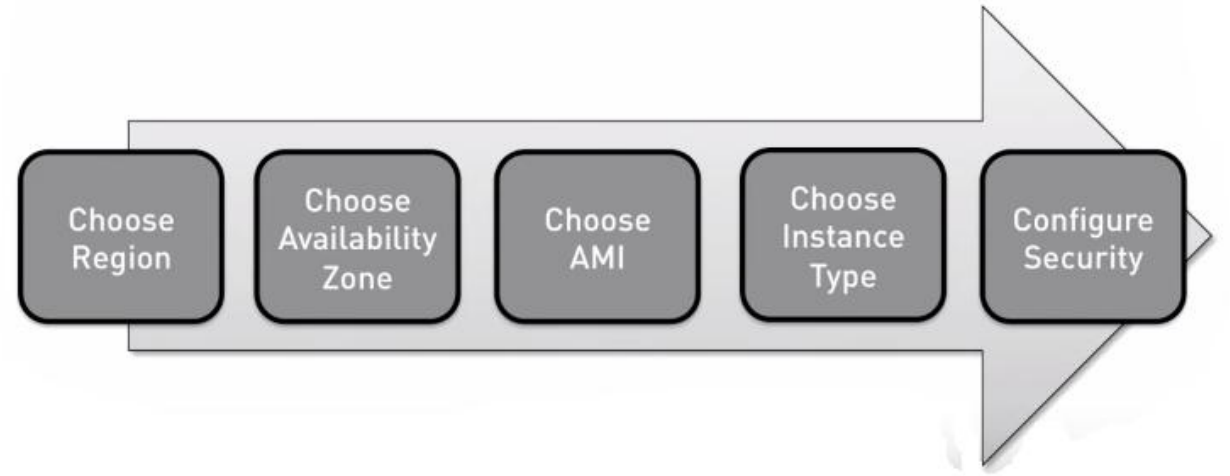
Use Cases

We recommend memory-optimized instances for high performance databases, distributed memory caches, in-memory analytics, genome assembly and analysis, larger deployments of SAP, Microsoft SharePoint, and other enterprise applications.

Amazon Machine Image [AMI]

- Server template / VM image
- Comes with pre-installed OS and optional S/W
- AMI can be launched to create Instances
- A variety of pre-built AMIs in the catalog
- Existing AMIs can be customized and saved (Bundling)
- Independent of the configuration
- Every AMI is uniquely identified

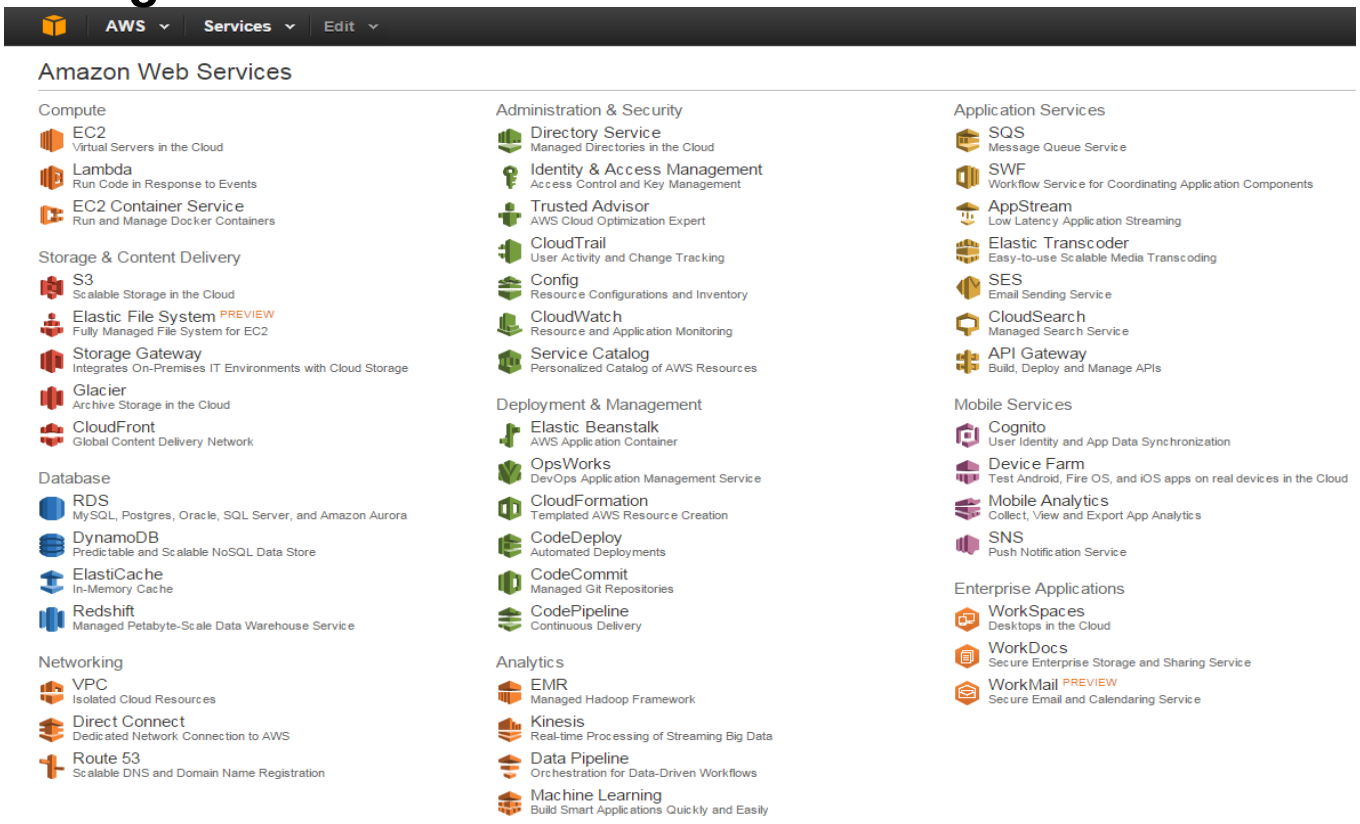
Launching an Amazon EC2 Instance Step by Step



Launching an Amazon EC2 Instance Step by Step

- **Sign up for AWS at http://aws.amazon.com**
- **Apply the service credit you received by email.**
- **Create and download a Key-Pair, save it in your home directory.**
- **Create a VM via the AWS Console**
- **Connect to your newly-created VM like this:**
  - **ssh -i my-aws-keypair.pem ec2-user@ip-address-of-vm**

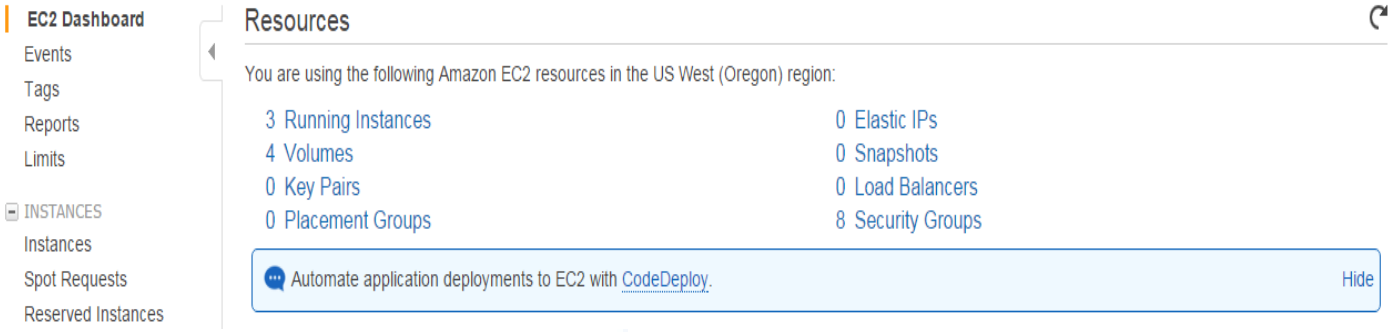
Login to AWS Console



Click on EC2 from Compute services from AWS Console

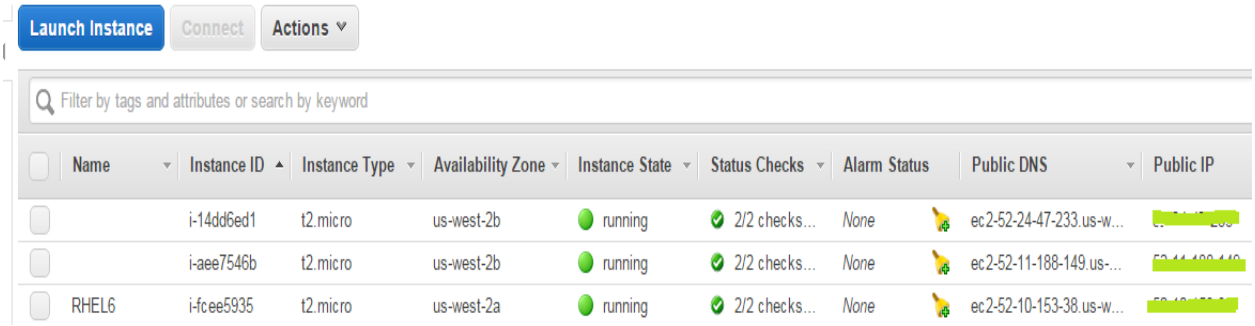
AWS Administration

You can see the EC2 dashboard and all EC2 instance

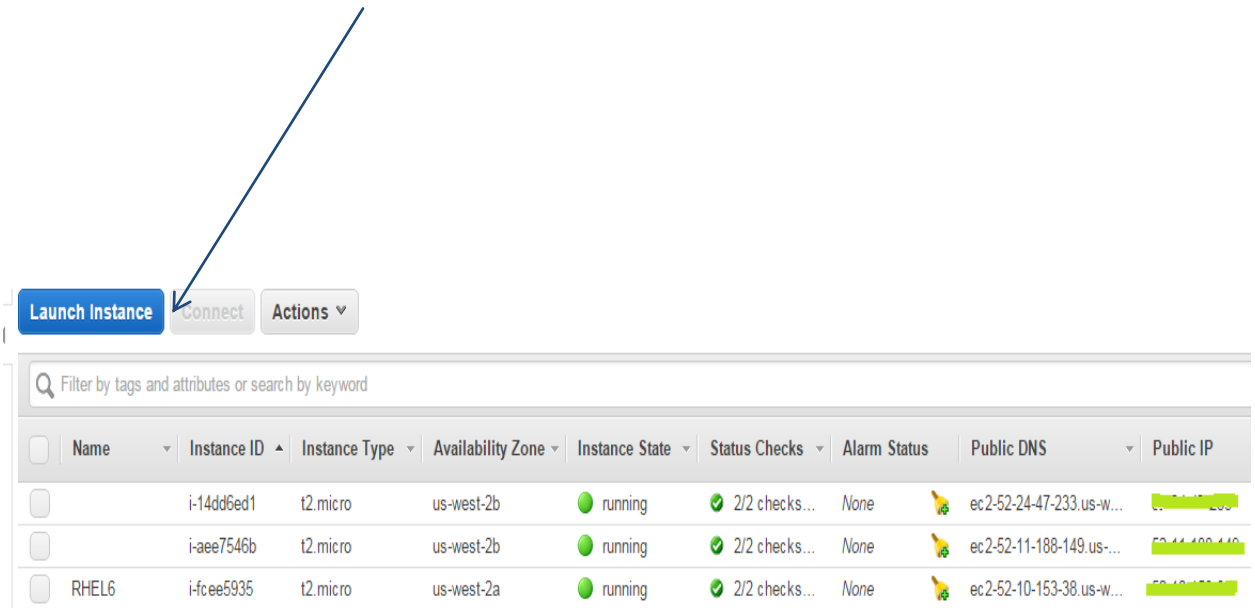


Click on running instances to see the existing running instances

Running instances



Click on Launch Instance to create New Instance

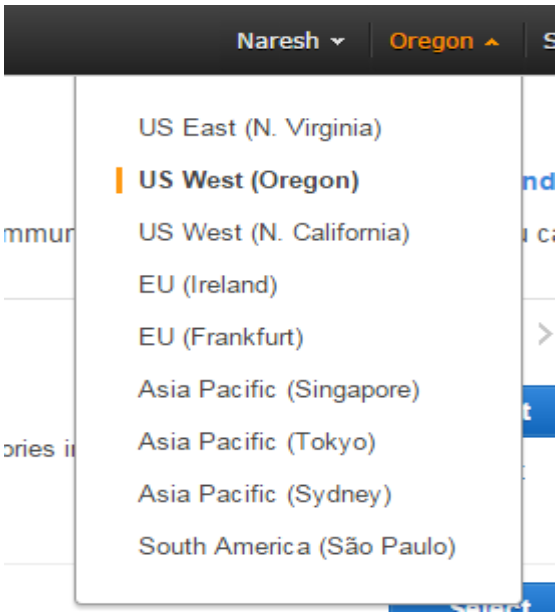


AWS Regions

- Datacenters spread across the globe
- There are 9 Regions
  - US-East (N.Virginia)
  - US-West-1 (N.California)
  - EU (Ireland)
  - APAC-1 (Singapore)
  - APAC-2 (Tokyo)
  - APAC-3 (Sydney)
  - GovCloud
  - US-West-2 (Oregon)
  - South America (Sao Paulo)

Note: There is an extra region called the AWS GovCloud region, but this can only be used by government agencies

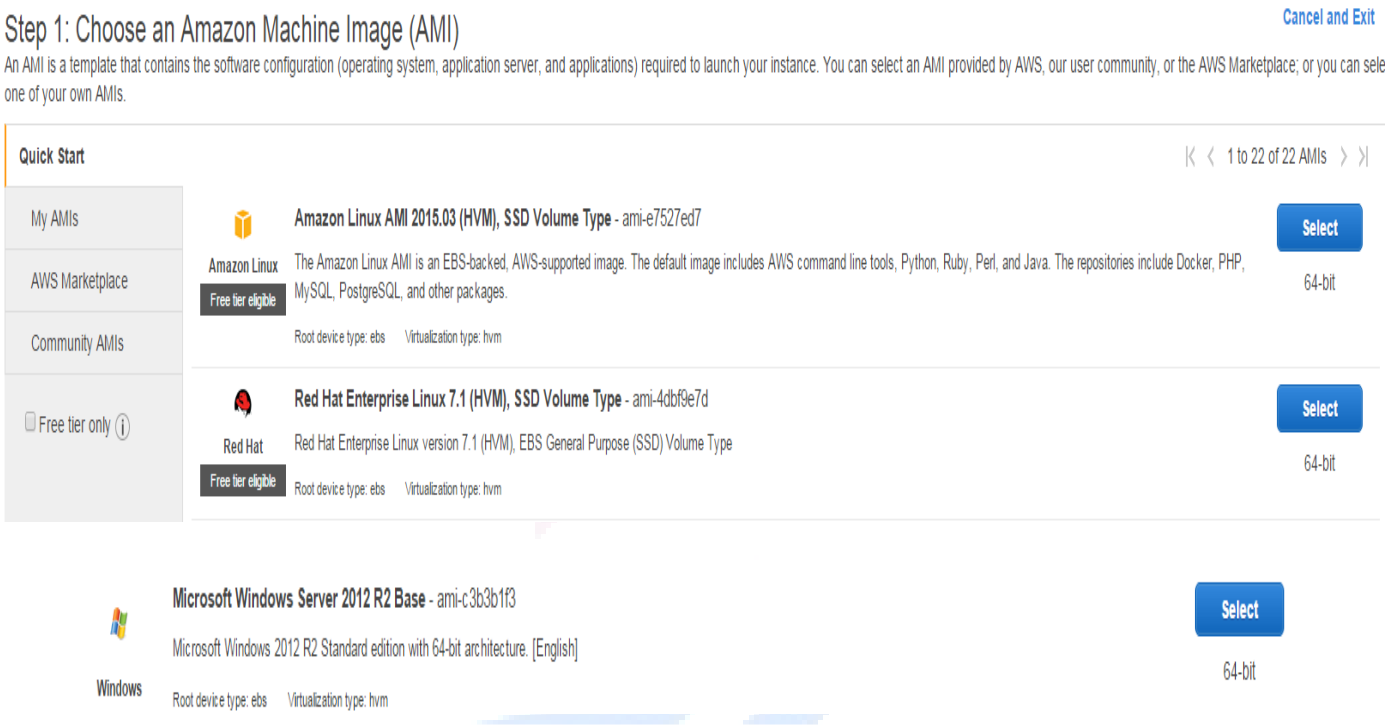
AWS Regions



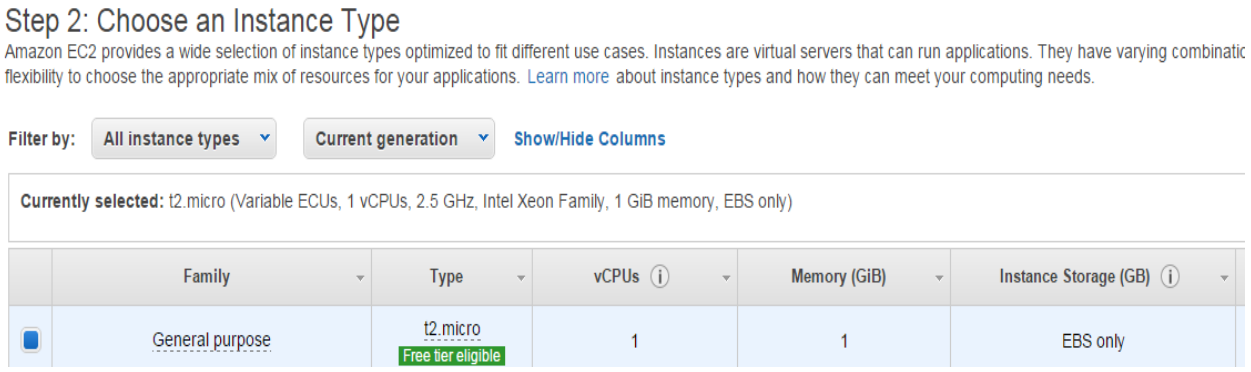
AWS Availability Zones

- Subset of a Region
- Physically isolated & independent infrastructure
- High speed connectivity
- Low latency
- Every Region has a minimum of 2 AZs

Select the respective OS Image to install



Select the Instance type



Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot Instances to tak

Number of instances	1
Purchasing option	Request Spot Instances
Network	vpc-f17e1f94 (172.31.0.0/16) (default) — Create new VPC
Subnet	No preference (default subnet in any Availability Zo — Create new subnet
Auto-assign Public IP	Use subnet setting (Enable)
IAM role	None — Create new IAM role
Shutdown behavior	Stop
Enable termination protection	Protect against accidental termination
Monitoring	Enable CloudWatch detailed monitoring Additional charges apply.
Tenancy	Shared tenancy (multi-tenant hardware) Additional charges will apply for dedicated tenancy.

Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. Learn more about storage options in Amazon EC2.

Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Delete on Termination	Encrypted
Root	/dev/sda1	snap-6bbf7736	10	General Purpose (SSD)	30 / 3000	☑	Not Encrypted

Add New Volume

Step 5: Tag Instance

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver. Learn more about tagging your Amazon EC2 resources.

Key (127 characters maximum)	Value (255 characters maximum)
Name	

Create Tag (Up to 10 tags maximum)

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. Learn more about Amazon EC2 security groups.

Assign a security group: Create a **new** security group

Select an **existing** security group

Security group name: launch-wizard-8

Description: launch-wizard-8 created 2015-08-14T17:28:31.937-04:00

Type	Protocol	Port Range	Source
SSH	TCP	22	Anywhere 0.0.0.0/0

Add Rule

Warning

Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

Improve your instances' security. Your security group, launch-wizard-8, is open to the world.

Your instances may be accessible from any IP address. We recommend that you update your security group rules to allow access from known IP addresses only.
You can also open additional ports in your security group to facilitate access to the application or service you're running, e.g., HTTP (80) for web servers. Edit security groups

AMI Details

Red Hat Enterprise Linux 7.1 (HVM), SSD Volume Type - ami-4dbf9e7d

Free tier eligible

Red Hat Enterprise Linux version 7.1 (HVM), EBS General Purpose (SSD) Volume Type

Root Device Type: ebs Virtualization type: hvm

Instance Type

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
t2.micro	Variable	1	1	EBS only	-	Low to Moderate

Select an existing key pair or create a new key pair

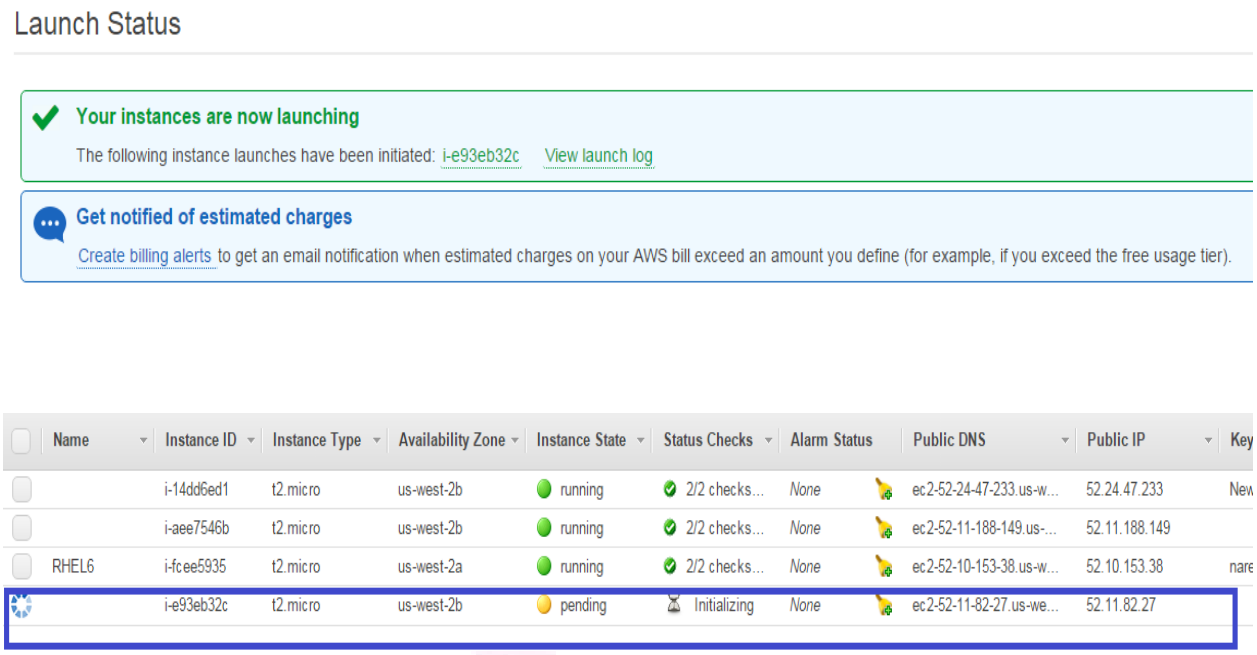
A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

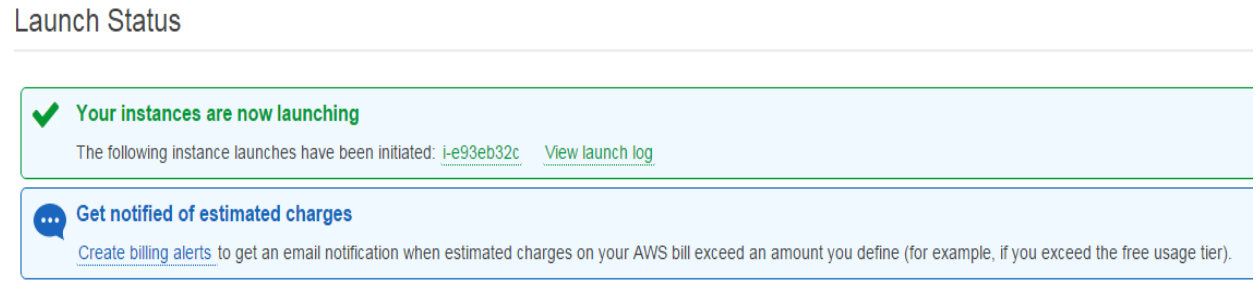
Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about removing existing key pairs from a public AMI.

Proceed without a key pair

I acknowledge that I will not be able to connect to this instance unless I already know the password built into this AMI.

Cancel **Launch Instances**





When NOT to user EC2 ?

- Physical Access to the system
- Non supporting Operating system
- Multicast/Manipulation of L2 Networking
- Disks attached to multiple VM's
- You don't want to do system administration

Lab Activity

MODULE#4 –Identity and Access Management[IAM]

Agenda

- Introduction to Identity and Access management (IAM)
- Understanding IAM console
- Creating and managing security group
- Creating and managing users
- Managing the user passwords and security Key ID
- Creating and managing roles
- Understanding and managing policy
- Understanding multi factor authentication
- User login process

➢What is IAM?

IAM stands for Identity and Access Management
IAM is a web services that enable you to manage users and group permissions in AWS

It is targeted at organizations with multiple users or systems that use AWS products such as Amazon Elastic Compute Cloud, Amazon Relational Database Service, and the AWS Management Console

➢Why we go for IAM?

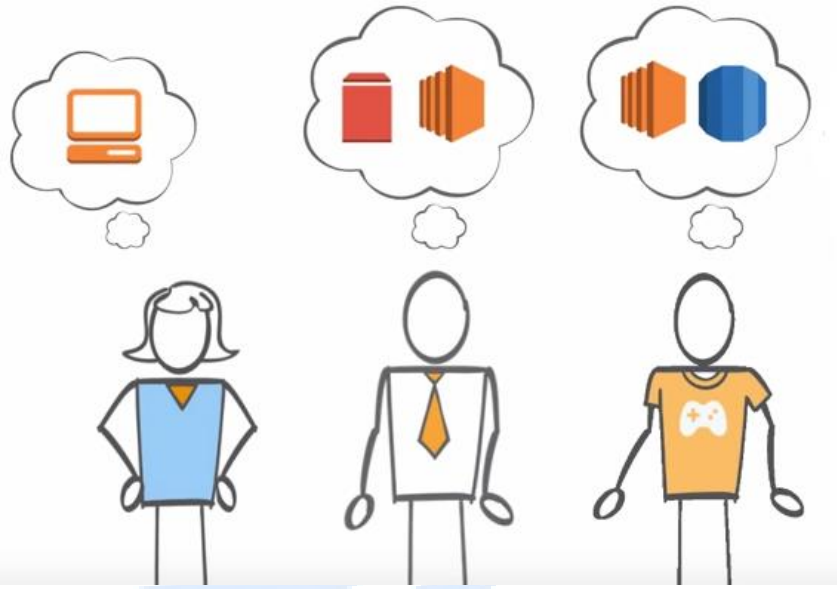
To avoid a security and logistical headache

When you create an AWS account, it has permissions to do anything and everything with all the resources

IAM Allows you to limit access as needed and gives you the peace of mind that approved people are accessing the right resources in the desired manner

➢Why we go for IAM?

IAM will allow us to create multiple users with individual security credentials and permissions, with this IAM, each user is allowed to do only what they need to do

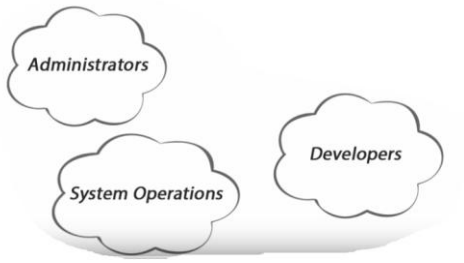


➢Why we go for IAM?

Each user in the AWS account must have a unique set of credentials to access the console

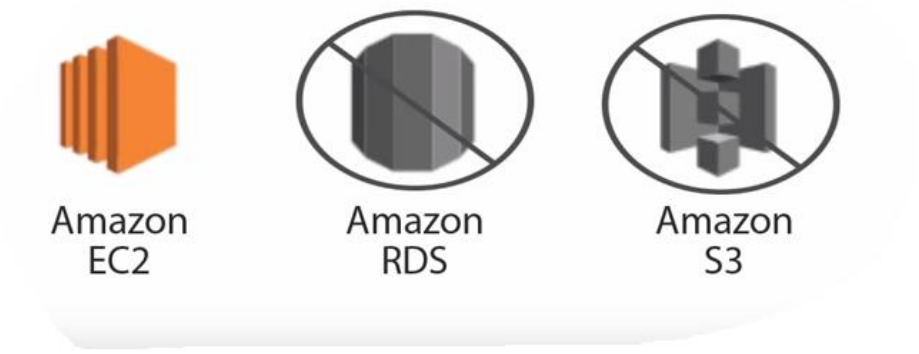
➢What is IAM?

Different types of users have different set of permissions



Administrators need to access all AWS resources

Developers need only access on Amazon Elastic Compute Cloud (EC2)



AWS Administration

➢What is IAM ?

We can use IAM to create a unique user for each employee and define their permissions

➢What is a Group ?

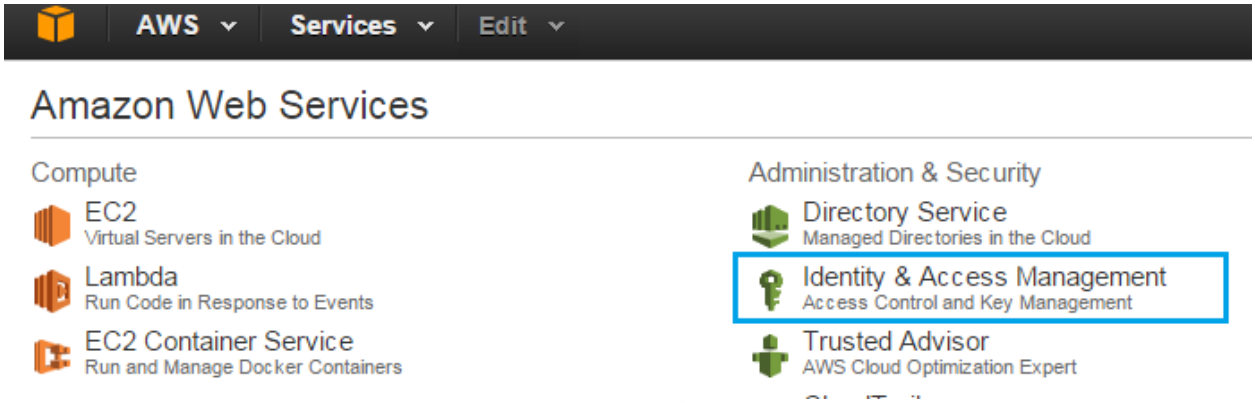
A group is a collection of IAM users

After you set permissions on a group, those permissions are set to all users in the group

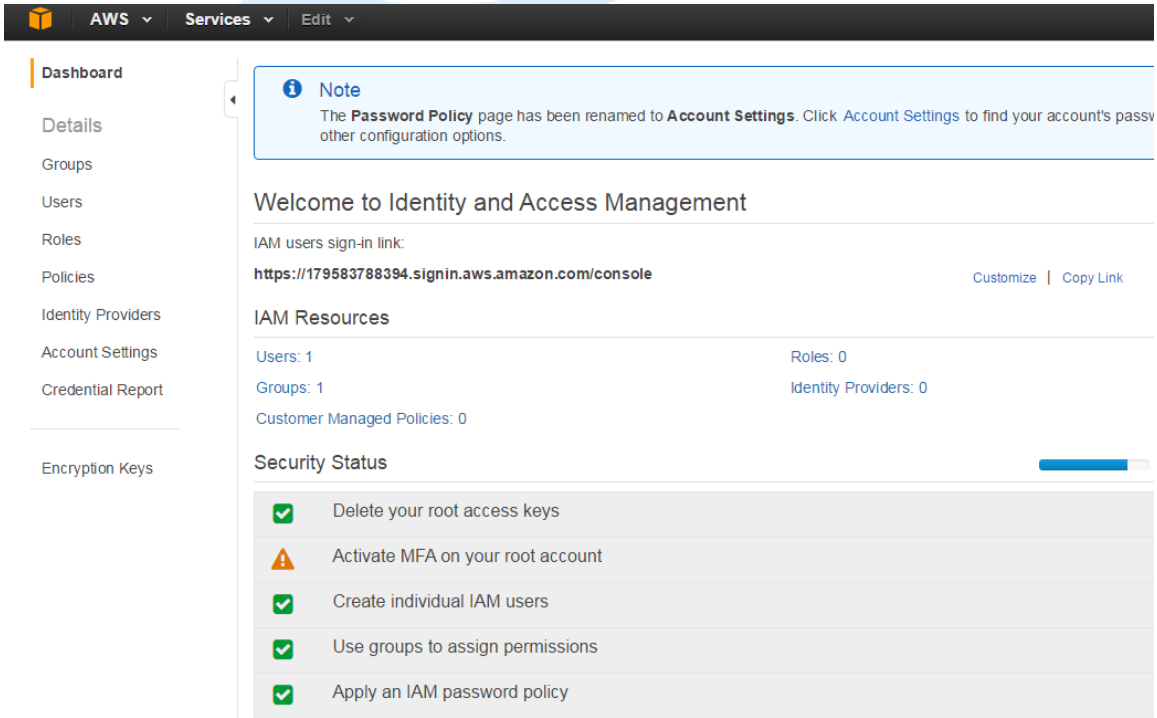
Even if we create user, we need to use groups to set permissions.
We need to manage access for number if groups instead of managing access for every individual user.

➢Creating group

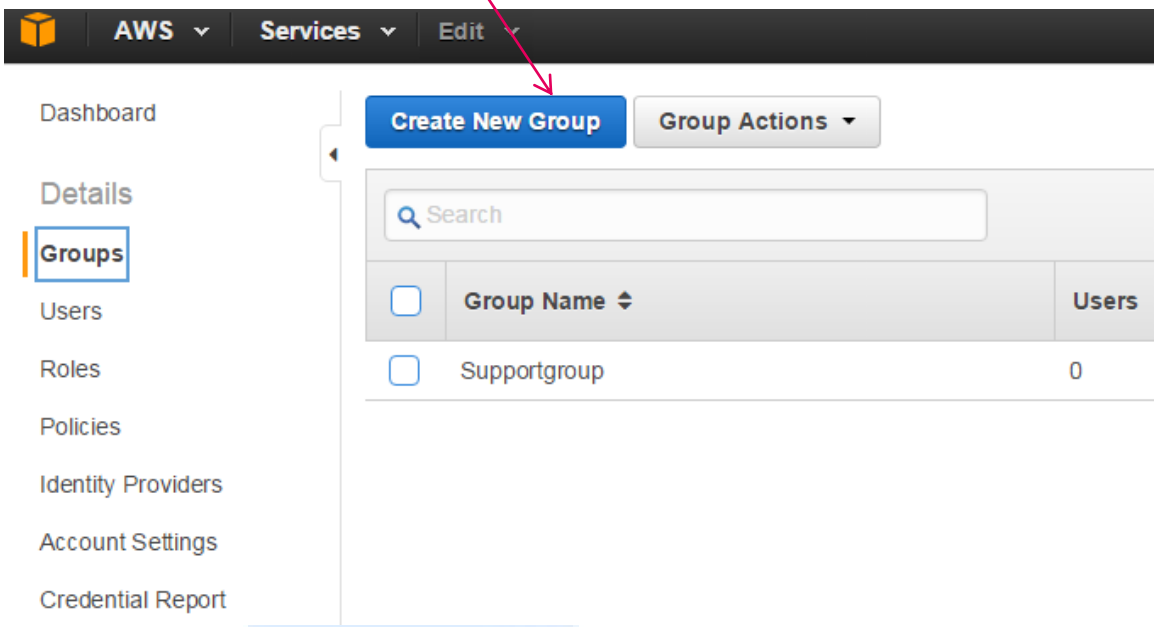
Select IAM from AWS console



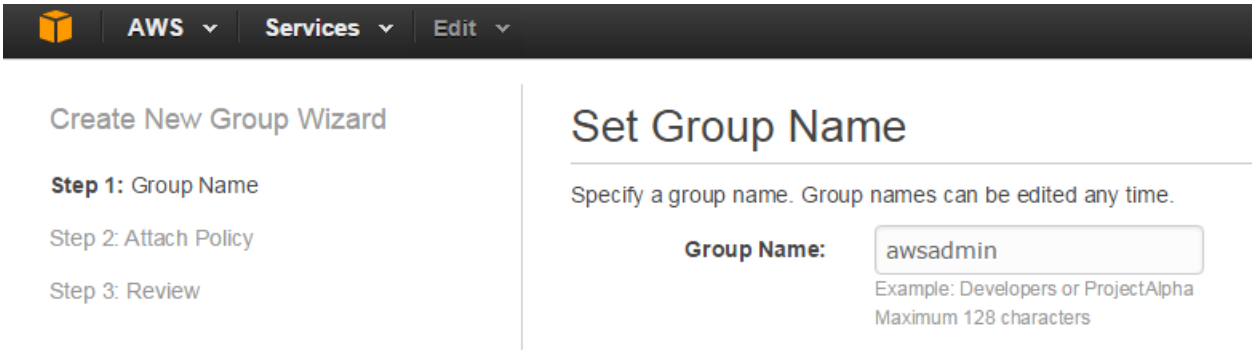
➢Creating Group



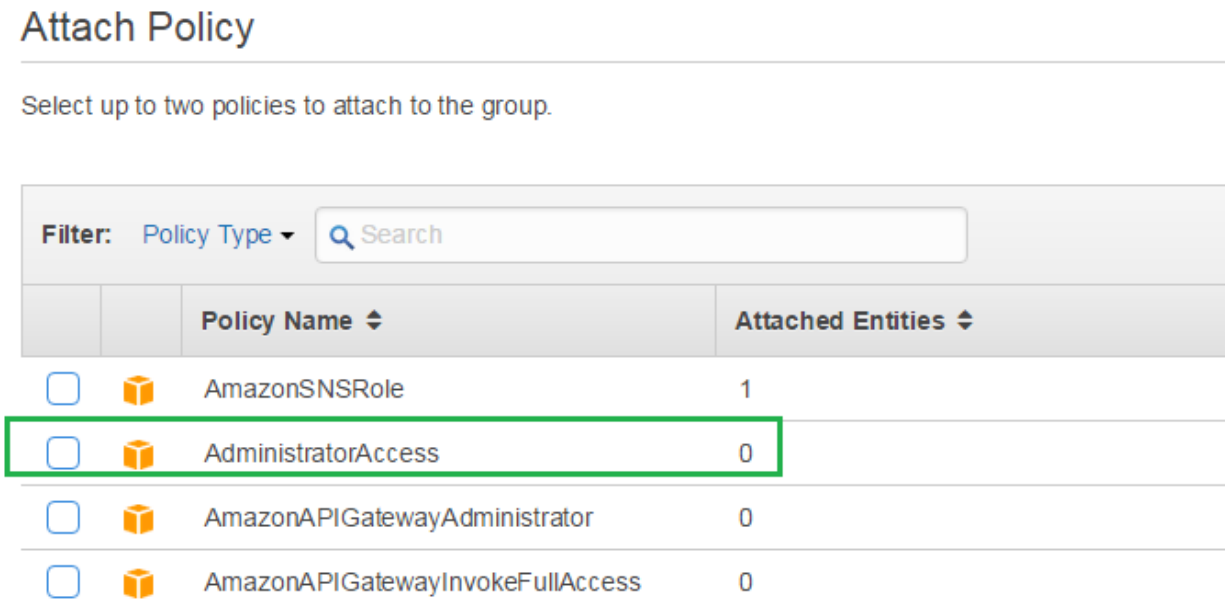
➢Creating Group



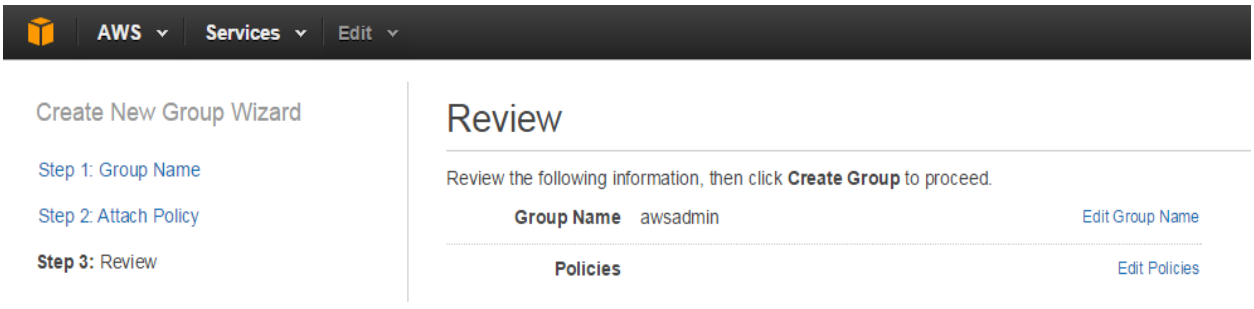
➢Creating Group



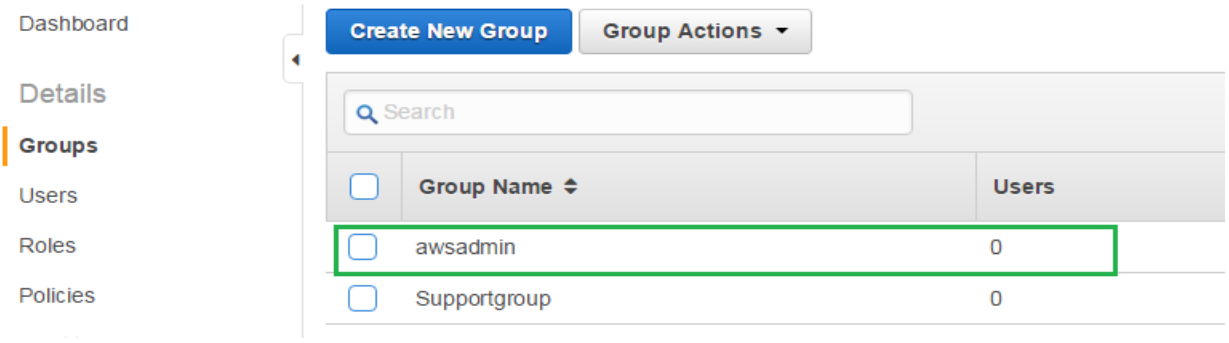
➢Attach the policy



➢Review the group

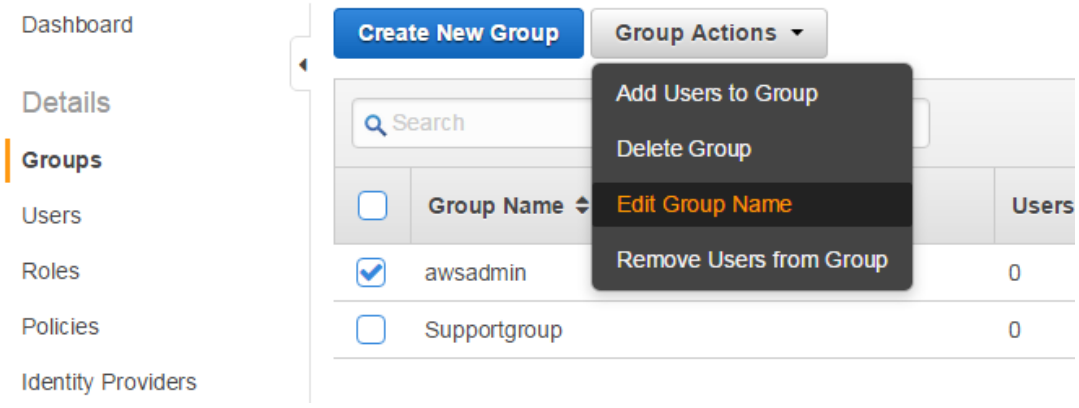


Group created



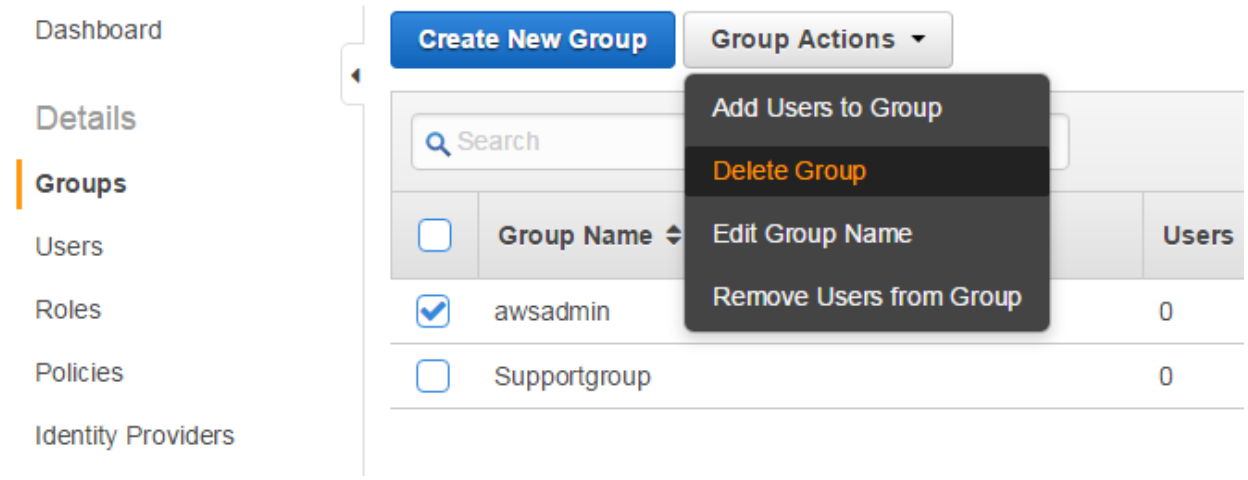
➢Changing group name

Select group->Group actions->Edit group



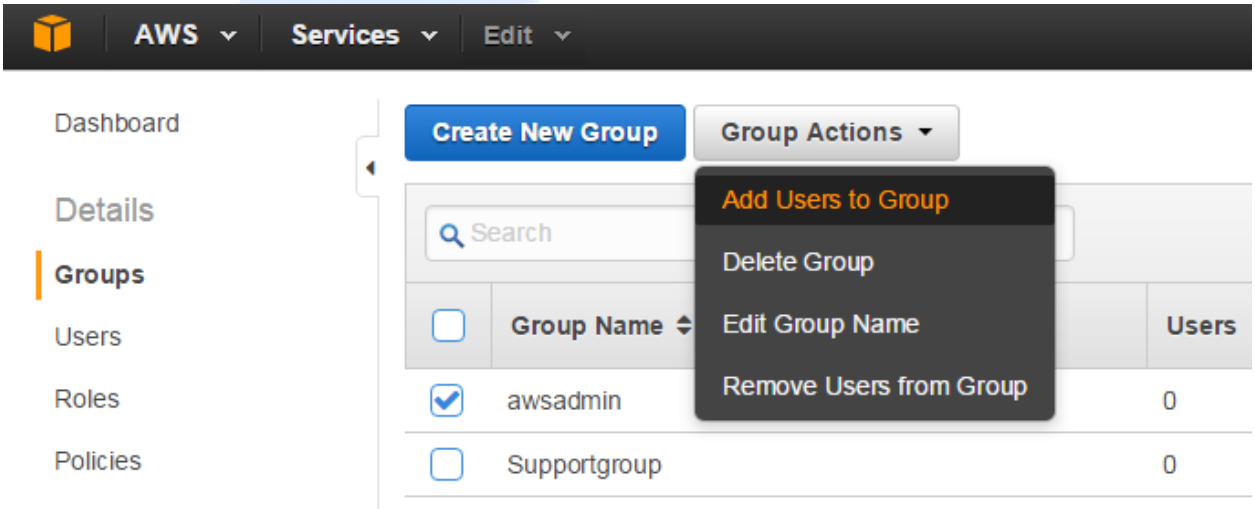
➢Deleting group

Select group->Group actions->Delete group

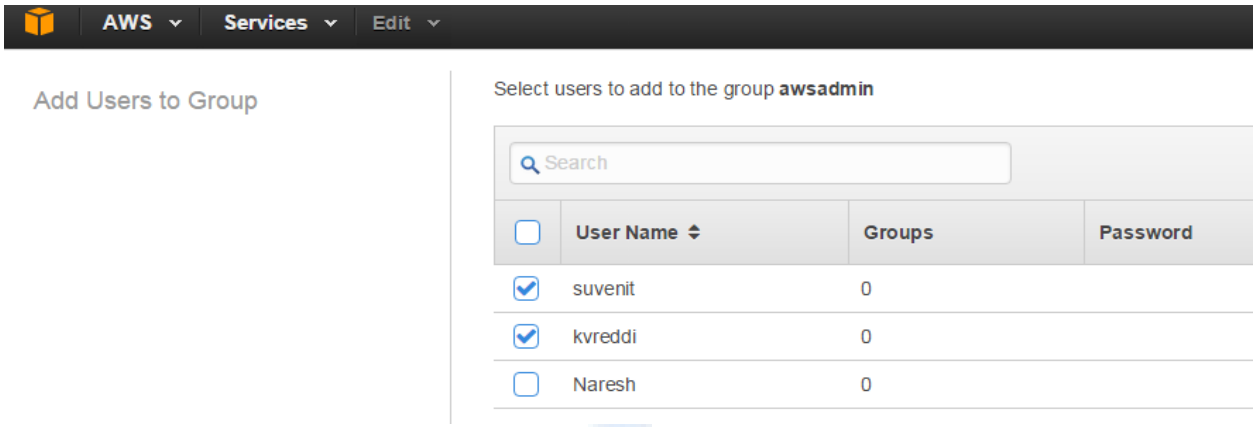


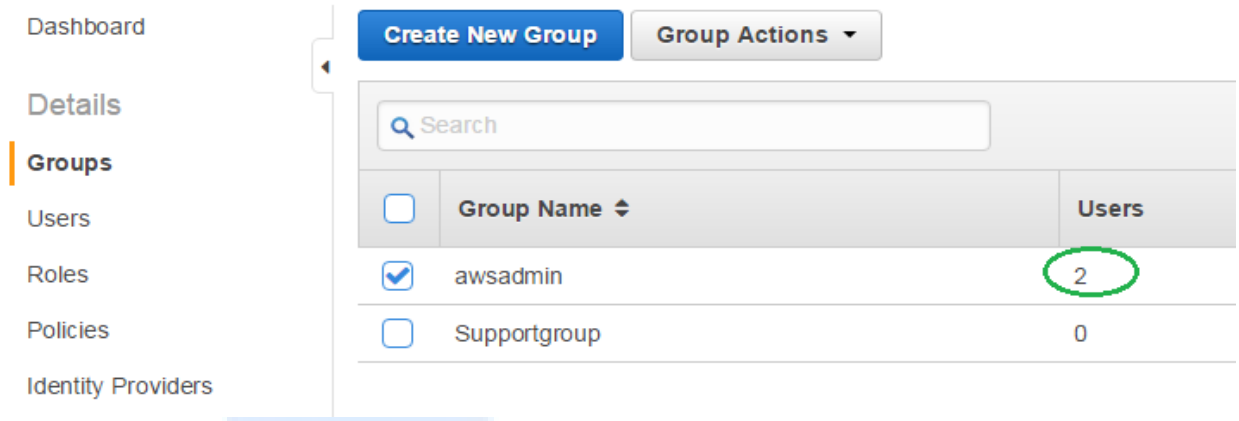
➢Adding users to group

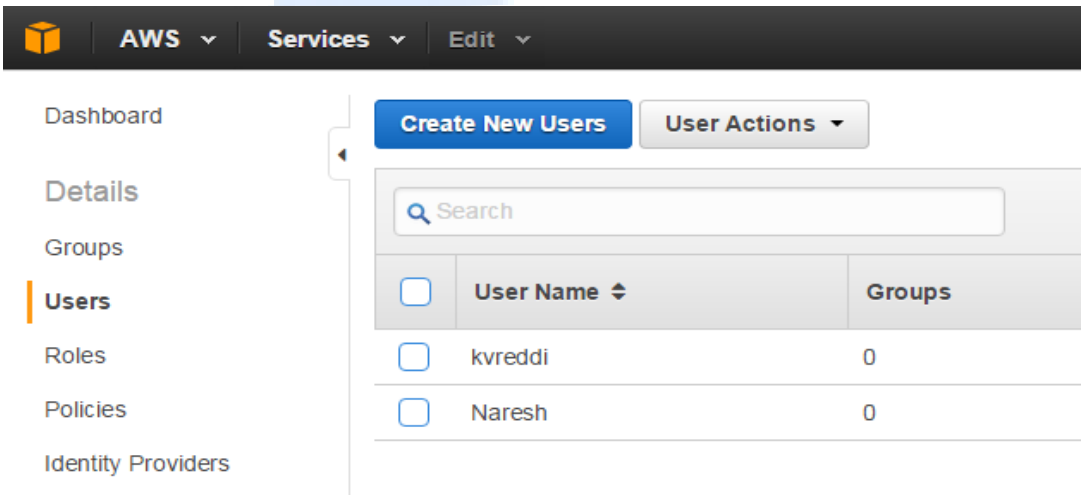
Select group->Group actions->Add users to Group



➢Select users to add group

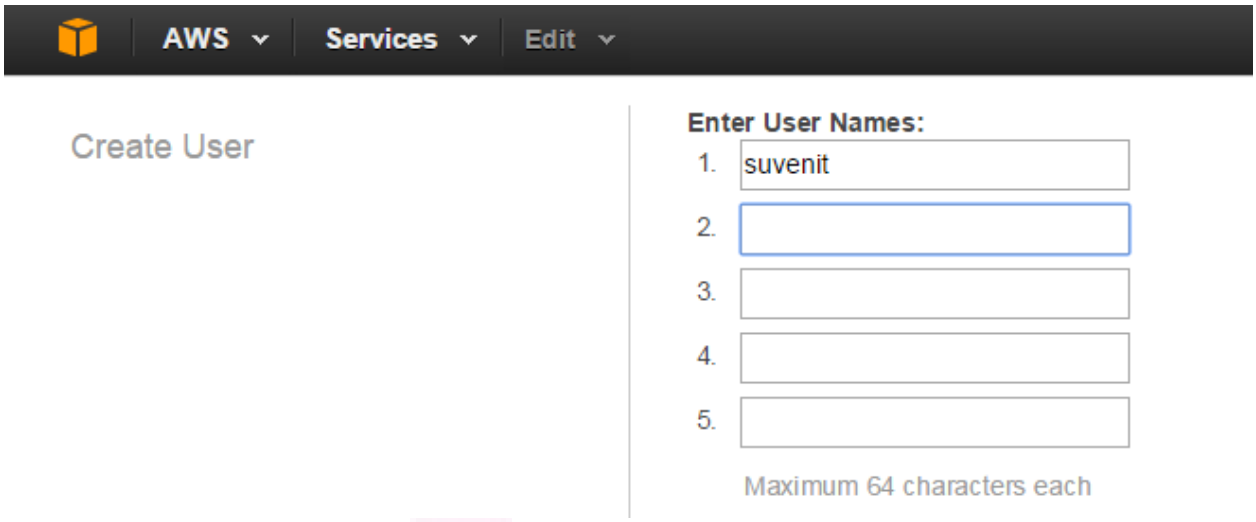




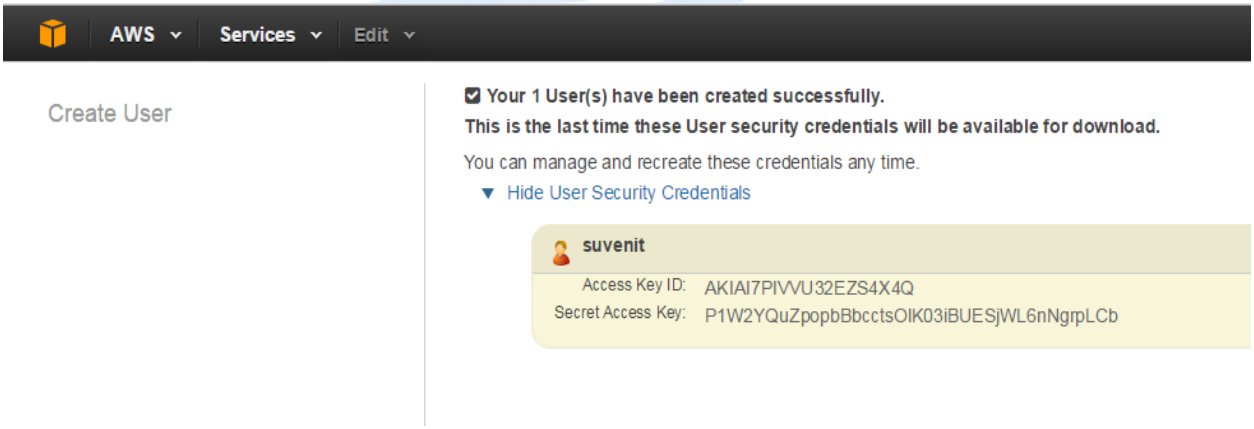


AWS Administration

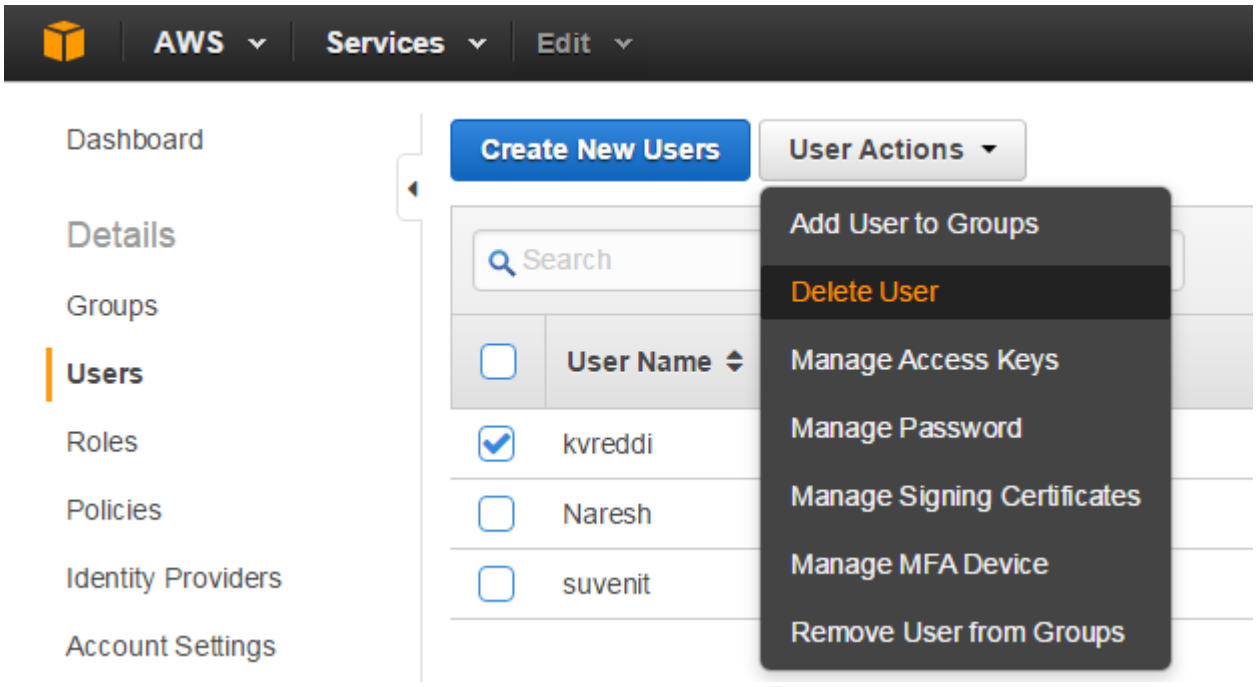
➢Creating user



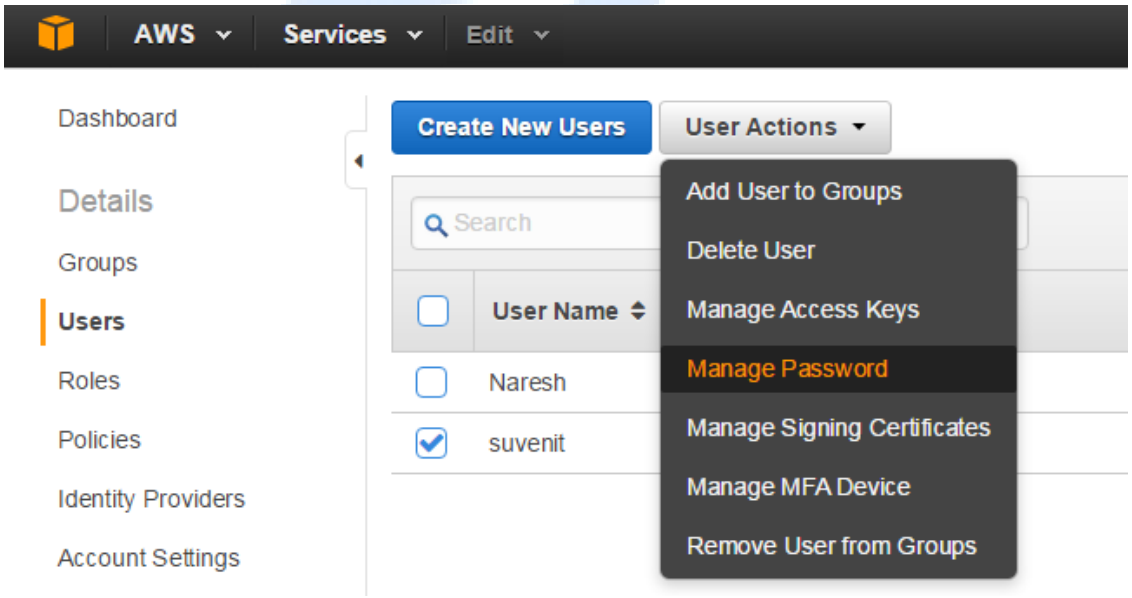
➢User key ID



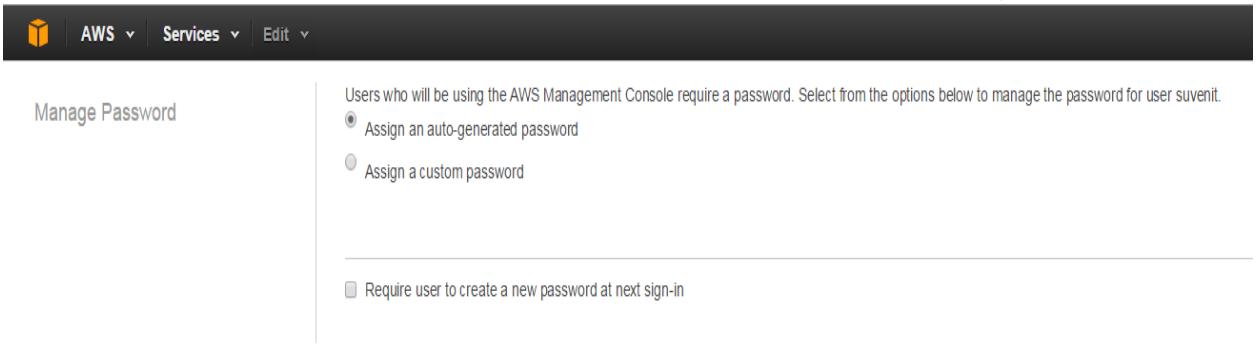
➢Deleting user

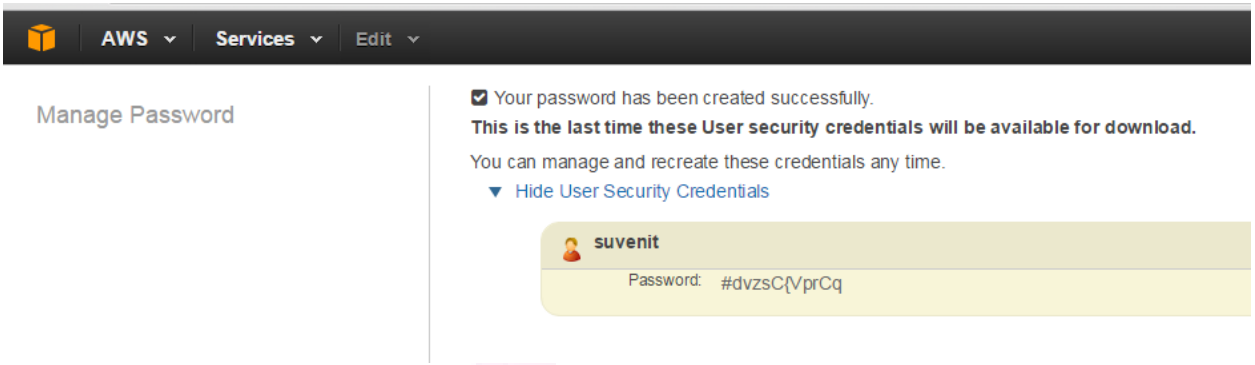


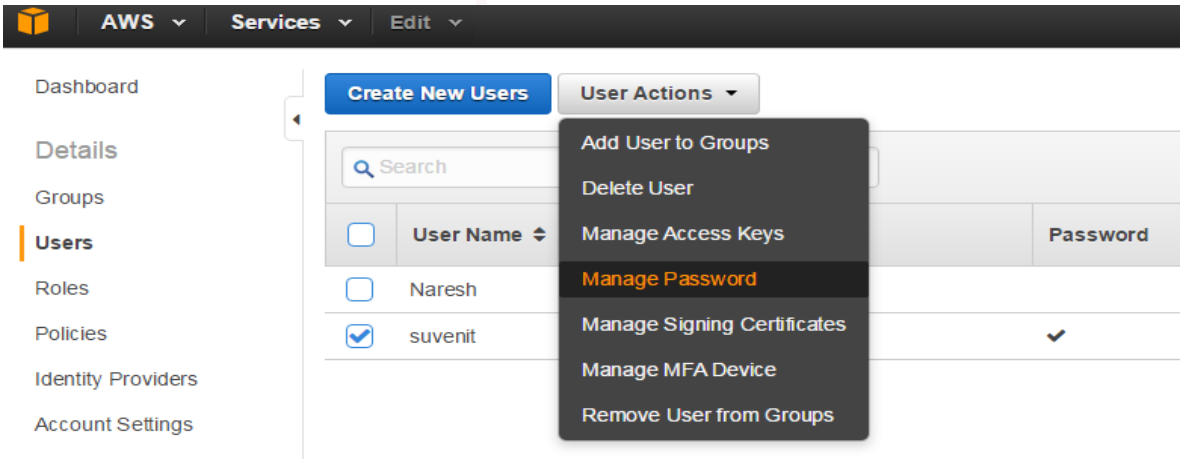
➢Managing user password

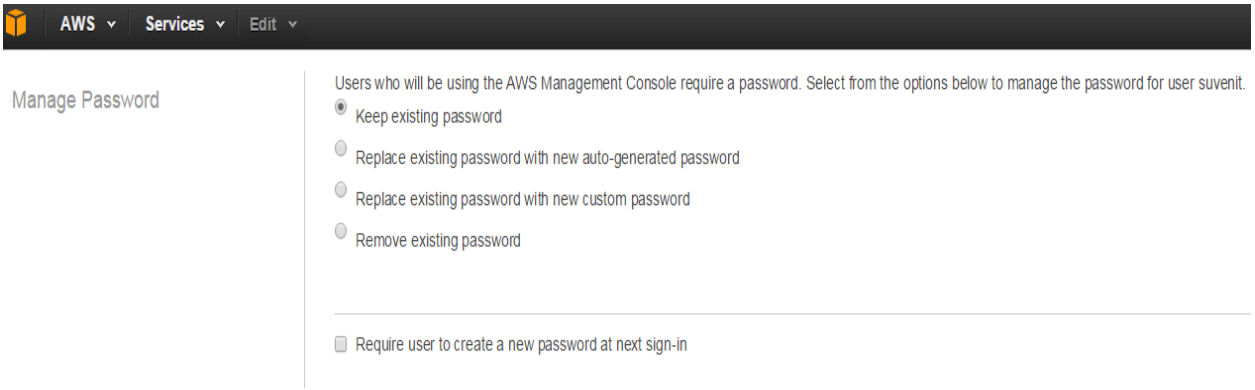


AWS Administration

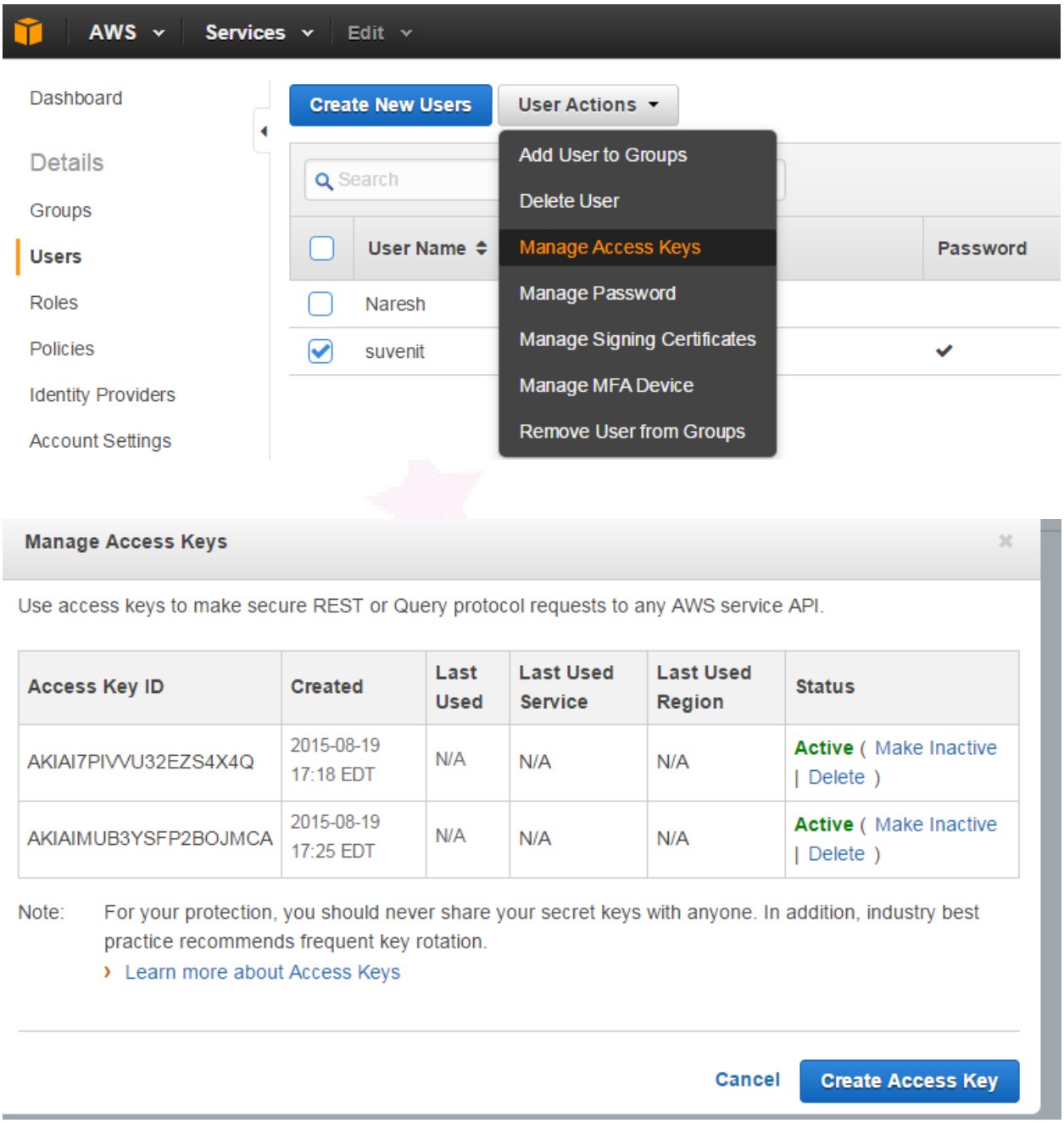




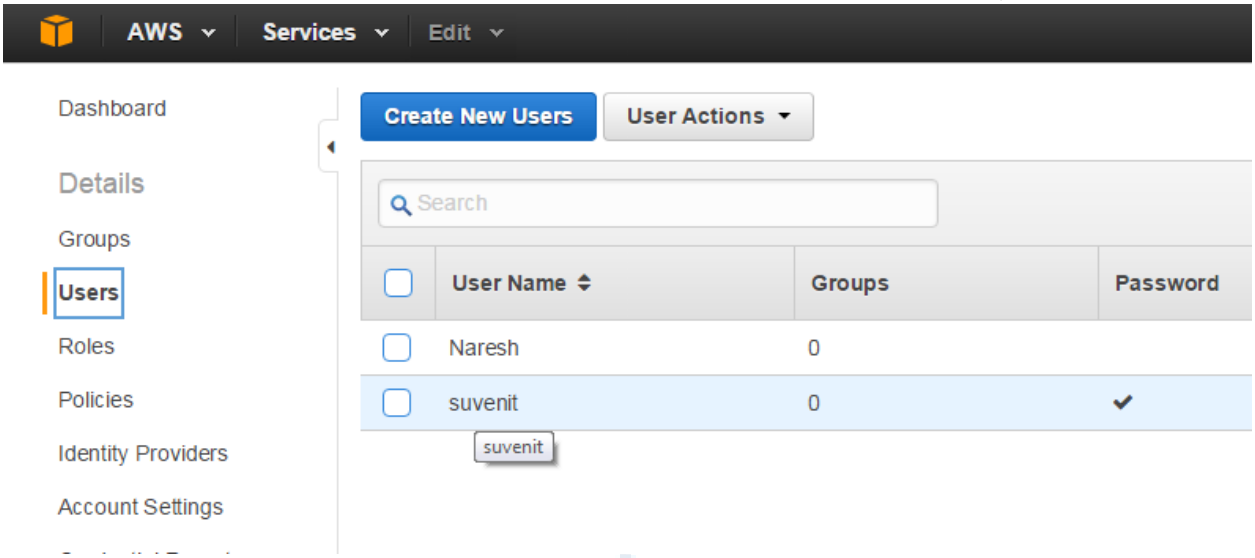


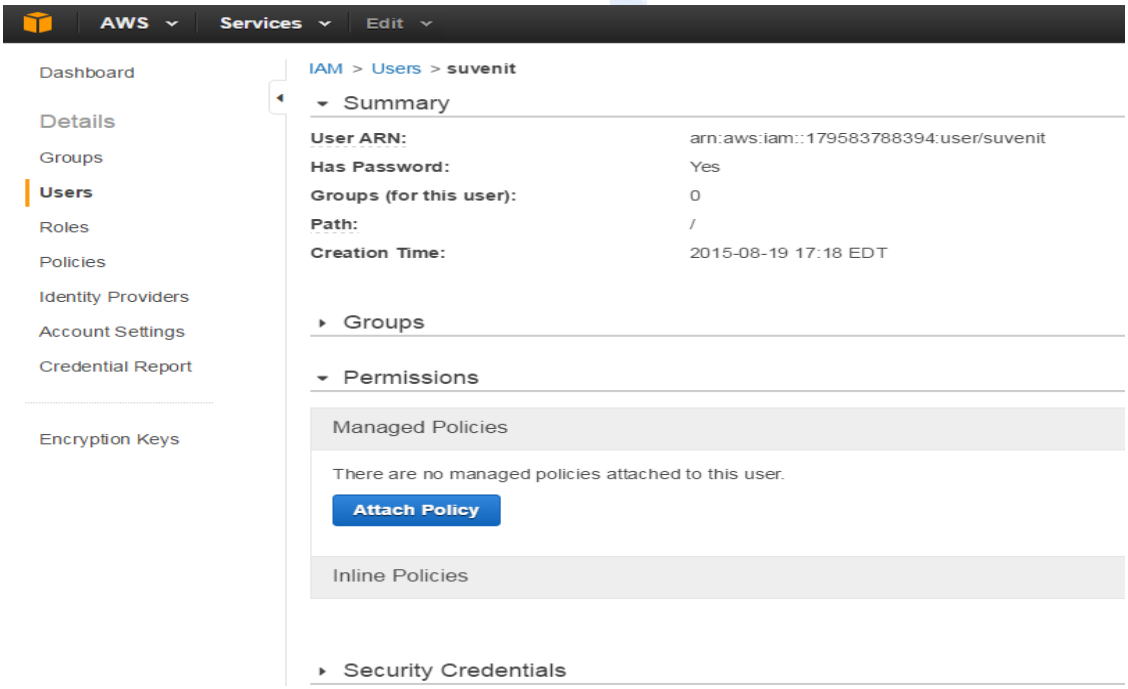


➢Managing access Keys

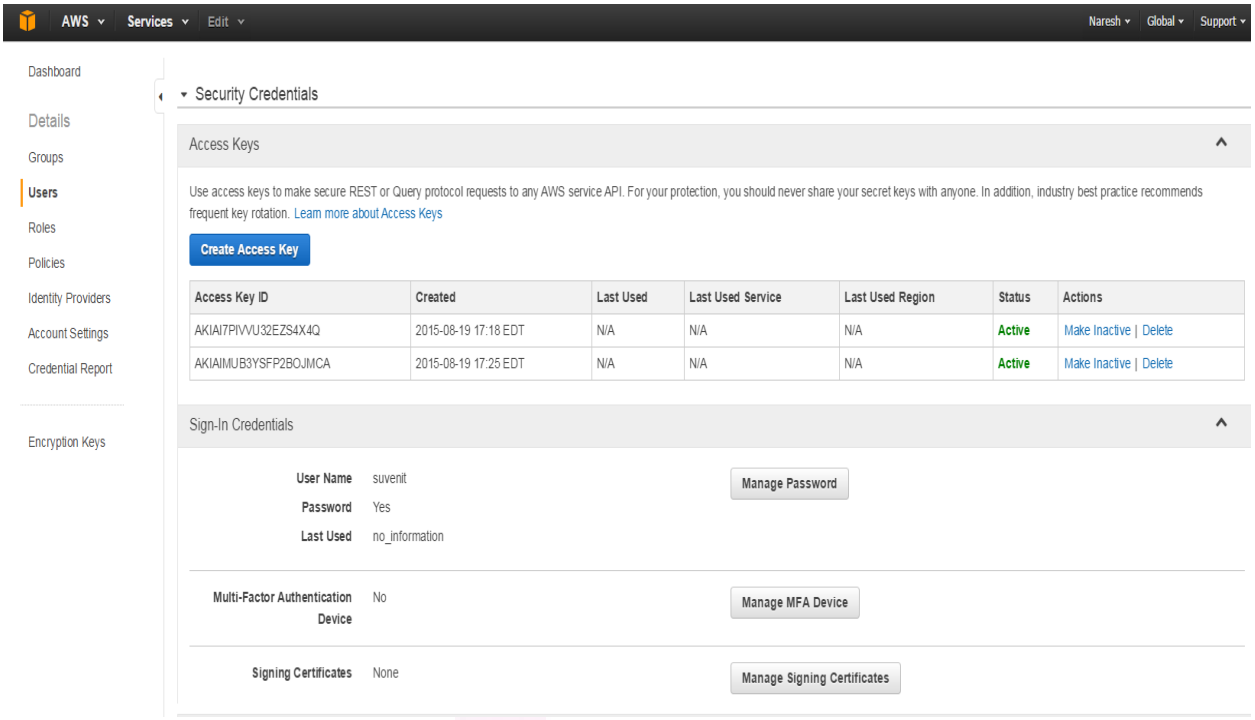


AWS Administration

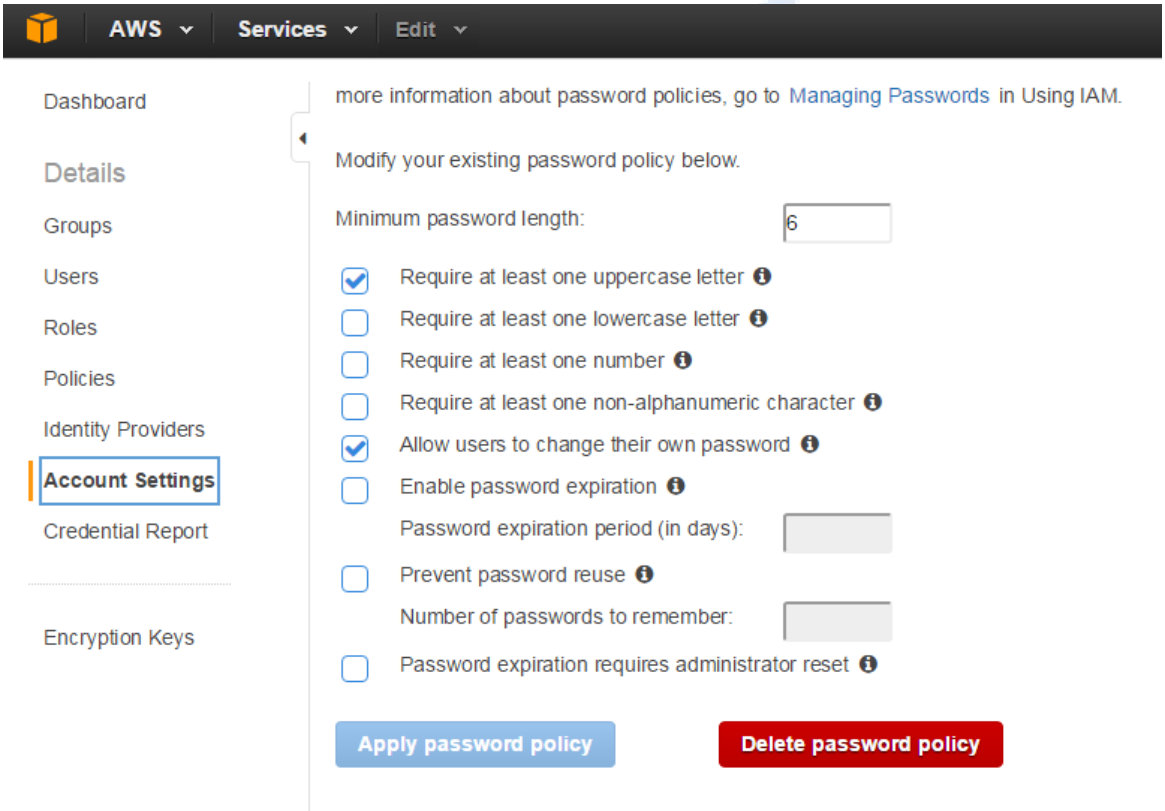




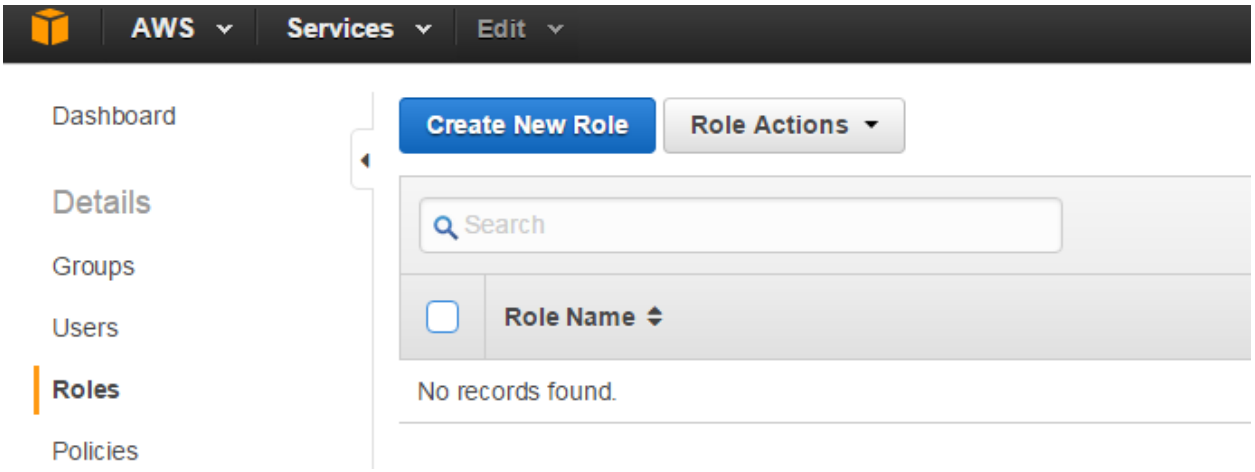
AWS Administration



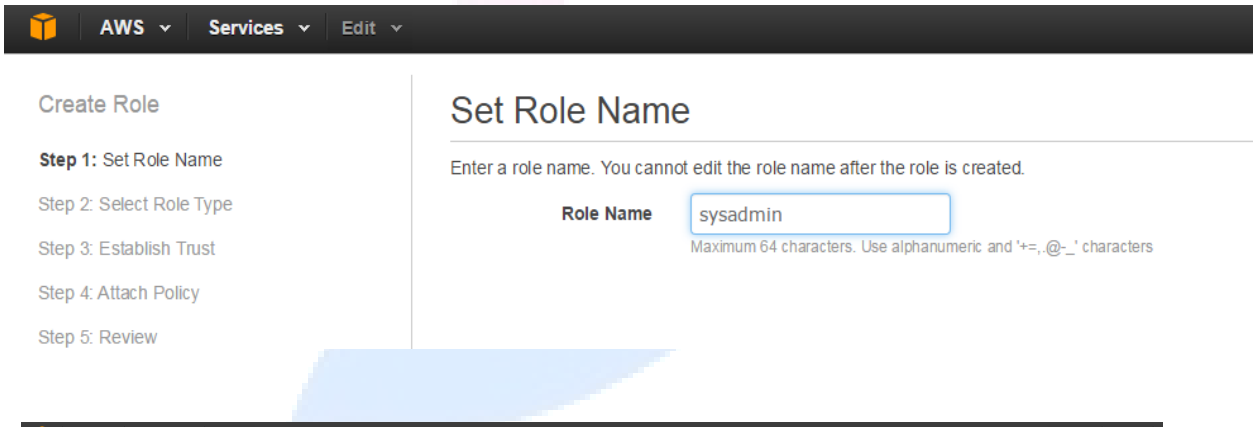
➢User default password settings

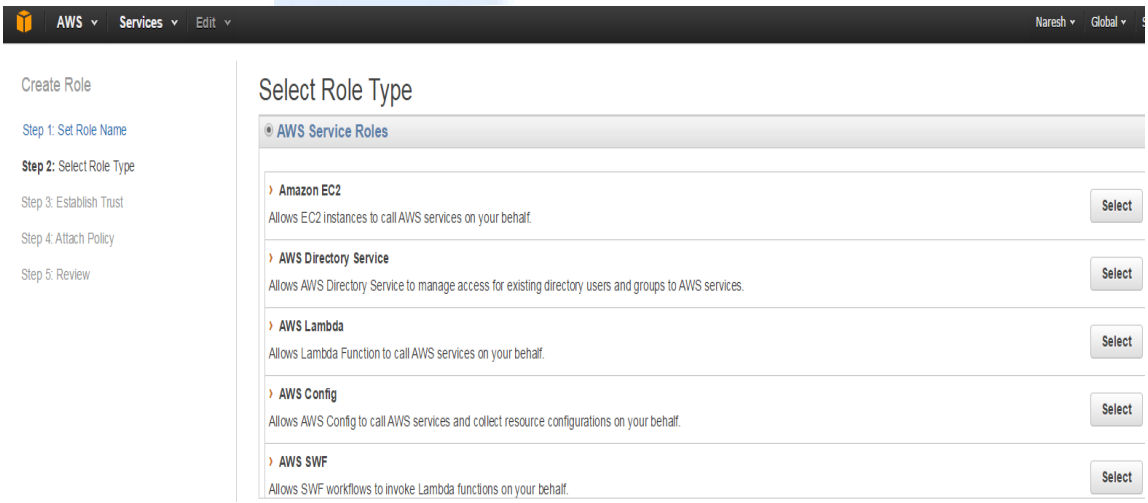


➢Understanding roles

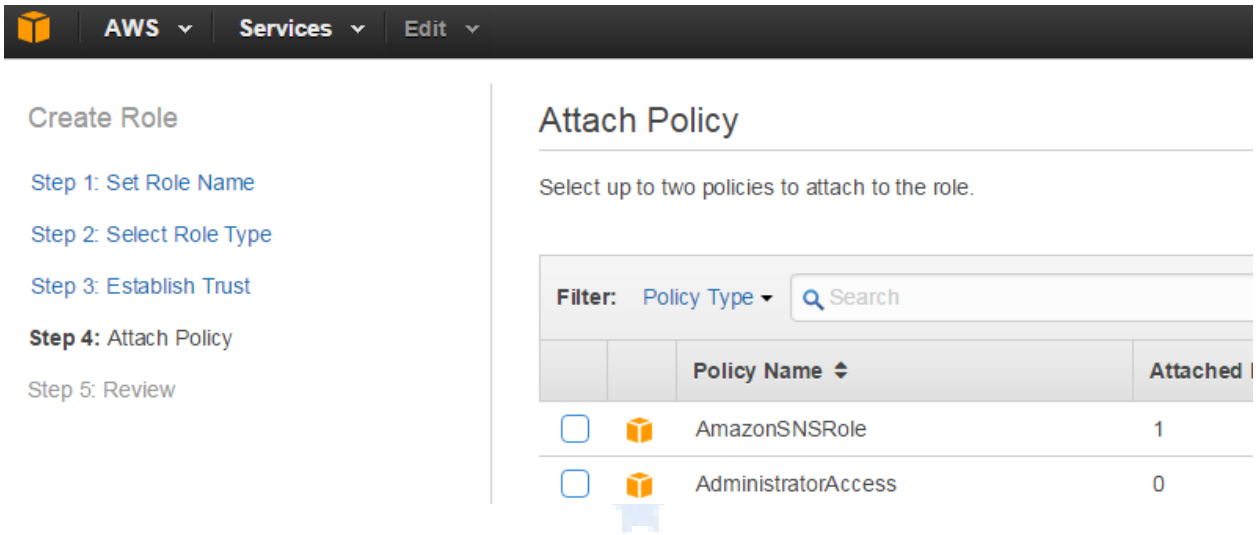


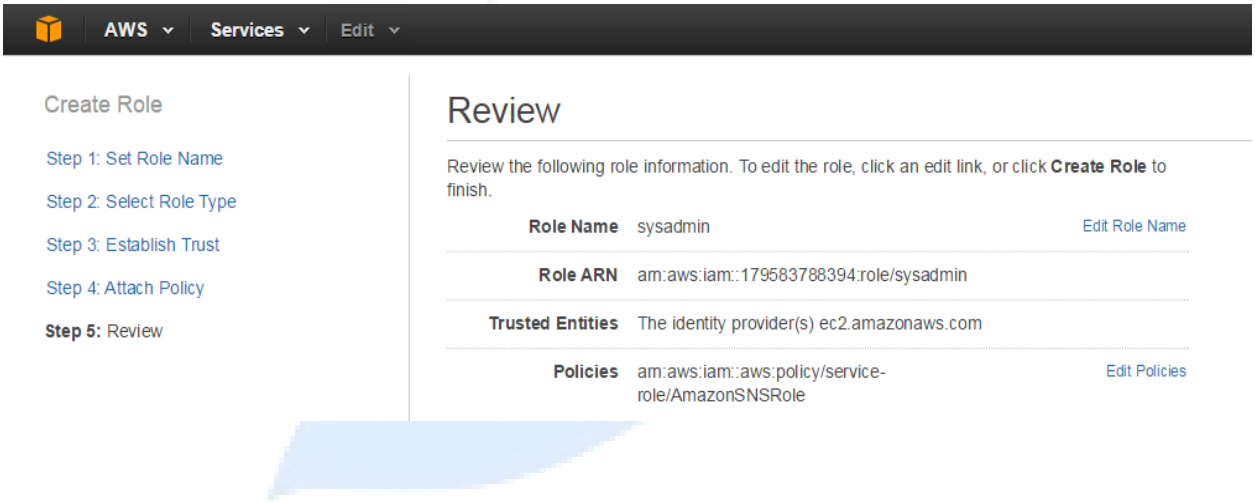
➢Creating roles

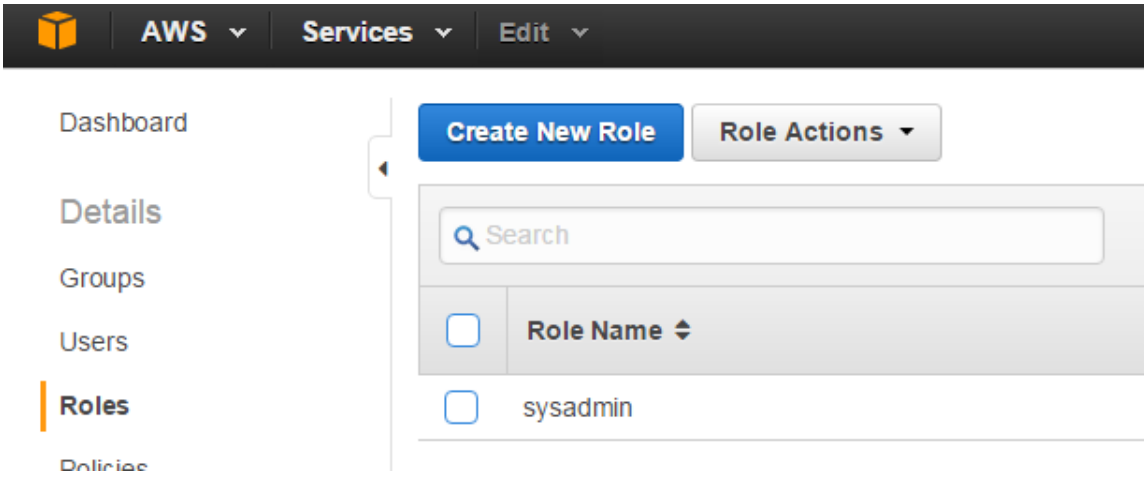


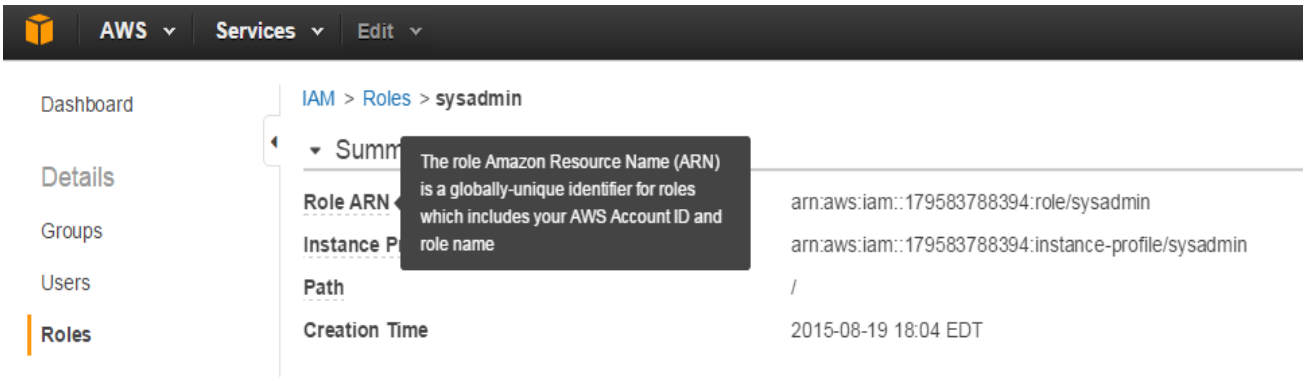


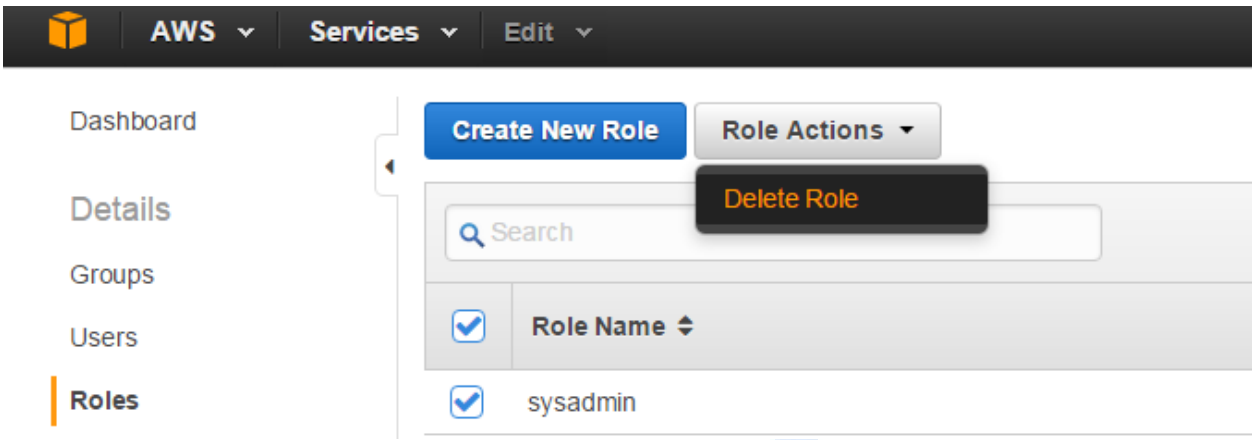
➢Attaching policy to role


AWS
Services
Edit
Create Role
Step 1: Set Role Name
Step 2: Select Role Type
Step 3: Establish Trust
Step 4: Attach Policy
Step 5: Review
Attach Policy
Select up to two policies to attach to the role.
Filter:
Policy Type
Search
Policy Name
Attached
AmazonSNSRole
1
AdministratorAccess
0

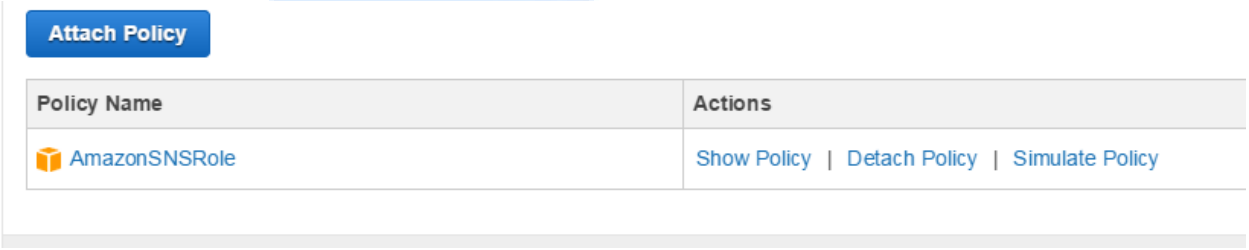

AWS
Services
Edit
Create Role
Step 1: Set Role Name
Step 2: Select Role Type
Step 3: Establish Trust
Step 4: Attach Policy
Step 5: Review
Review
Review the following role information. To edit the role, click an edit link, or click Create Role to finish.
Role Name
sysadmin
Edit Role Name
Role ARN
arn:aws:iam::179583788394:role/sysadmin
Trusted Entities
The identity provider(s) ec2.amazonaws.com
Policies
arn:aws:iam::aws:policy/service-role/AmazonSNSRole
Edit Policies


AWS
Services
Edit
Dashboard
Details
Groups
Users
Roles
Create New Role
Role Actions
Search
Role Name
sysadmin





➢Deleting role

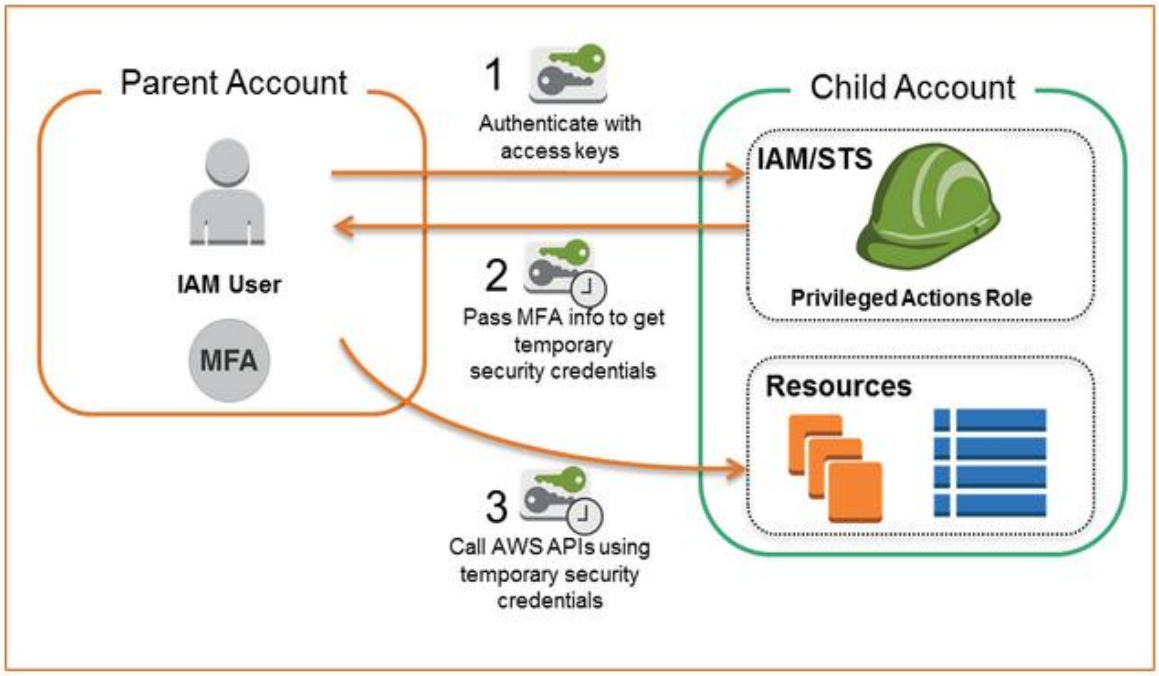


➢Multi Factor Authentication [MFA]

Multi-Factor Authentication, or MFA.
MFA provides additional security by requiring users to use a password and an authentication code from an external device

MFA is especially recommended for the AWS root accounts and account with administrator permissions since they have access to all your AWS resources

➢Login process



Lab activity

MODULE5# –Simple Storage Solution[S3]

Agenda

- Understanding Storage in AWS
- Different types of Storages in AWS
- What is Amazon S3
- Functions and concepts of S3
- Advantages and disadvantage of S3
- Requirement for S3
- Understanding pricing of S3
- Creating and managing S3 Buckets
- Creating and managing Objects in S3
- Uploading Objects to S3
- Deleting Buckets
- Deleting objects

Storages available in AWS?

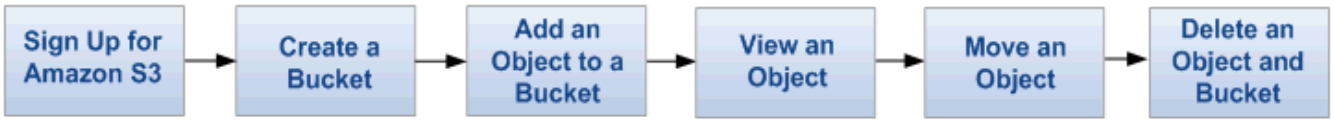
Storage is an important role AWS and find the below storages available in AWS and uses

Amazon S3	Scalable storage in the cloud
Amazon Glacier	Low-cost archive storage in the cloud
Amazon EBS	Persistent block storage volumes for Amazon EC2 virtual machines
Amazon EC2 Instance Storage	Temporary block storage volumes for Amazon EC2 virtual machines
AWS Import/Export	Large volume data transfer
AWS Storage Gateway	Integrates on-premises IT environments with cloud storage
Amazon CloudFront	Global content delivery network (CDN)
Amazon SQS	Message queue service
Amazon RDS	Managed relational database server for MySQL, Oracle, and Microsoft SQL Server
Amazon DynamoDB	Fast, predictable, highly-scalable NoSQL data store
Amazon ElastiCache	In-memory caching service
Amazon Redshift	Fast, powerful, full-managed, petabyte-scale data warehouse service
Databases on Amazon EC2	Self-managed database on an Amazon EC2 instance

What is AWS S3?

Amazon Simple Storage Service (Amazon S3) is storage for the Internet. We can use Amazon S3 to store and retrieve any amount of data at any time, from anywhere on the web.

We can accomplish these tasks using the AWS Management Console, which is a simple and intuitive web interface.



S3 is designed for

Remote data storage
Low cost, pay-as-you go
No up-front costs
High-availability
High bandwidth
Uses Amazon's own network

Features

- 99.999999999% durability (on a given year)
- 99.99% availability (on a given year)
- designed to support concurrent data failure in two physical facilities.

March 2006: Amazon launched Simple Storage Service (S3)

Functions & concepts of S3

- Allows unlimited storage of objects(files) containing of 1 byte to 5 gigabytes each.
- Objects consist of the raw object data and metadata.
- Objects are stored and retrieved using a developer-assigned key.
- Data are kept secured from unauthorised access through authentication mechanism.
- Objects can be made available to public by the http or bittorrent protocol.

- All objects are stored in buckets.
- A bucket is simply a container for objects.It is used to partition the namespace of objects at the highest level.
- Buckets are similar to Internet domain names. They are accessed via bucketname.s3.amazonaws.com.
- Each developer account has a limit of 100 buckets.

- A key is the unique identifier for an object within a bucket.
- A bucket and a key together uniquely identify each object in S3.Every object can be addressed through bucket and key combination.
- For example, if your bucket name is mybucket and key is myhomepage.html, the URL for the object will be http://mybucket.s3.amazonaws.com/myhomepage.html

Advantages of S3?

- Scalability.The amount of storage & bandwidth you need can scale as you like without any configuration changes needed.
- Availability, speed, throughput, capacity, and robustness is not affected even if you gain 10,000 users overnight.
- Unlimited storage. You pay as you go.
- Inexpensive and no capital outlay. Great for startups!
- Data is accessible from any location.
- Since it is based on the Amazon infrastructure, it is probably more reliable than other cheap data storage providers.

Use cases

- Asset storage and CDN
- Data storage
- Static site
- Backups
- Mobile storage backend
- File distribution

Pricing

- Charges for using S3 is based on the location of your buckets.
- You are billed according to storage(average), data transfer in and out and the number of requests per month.
- There is no minimum fee to use S3, you pay for only what you use.
- You can view your current charges incurred almost immediately on the S3 portal.

What is Bucket?

A bucket is the basic storage unit in Amazon S3. It is a single-level container (no hierarchy supported), and it's based on key-object associations.

Details

- Sub-folder are supported through specific `Content-Type` headers and a "substring mechanism"
- Upload and download are easy
- Renaming of folders; navigation of complex hierarchy can be problematic.

Bucket is a

- Collection of objects
- Globally unique id
- a-z A-Z 0-9 . –
- Max 100 buckets/user
- No limit on number of objects

Buckets
- Equivalent of directories
- Single, common namespace across S3
- But bucketNames can include "/", eg
  - mgateway/backups/presentations

Objects
- Equivalent of files
- Up to 5Gb in size
- Identified by key (== filename)

Best practices on naming

- DNS compatible
- FQDN ○ Allows for vhost ○ watch out for SSL: no dots :-(

Objects

- Blob
- Don't care about file formats
- Metadata can be added (like mimetype)
- Maximum 5 TB/object

How to Access AWS S3 storage?

Accessible using simple HTTP URLs

http://s3.amazonaws.com/*bucket*/*key*

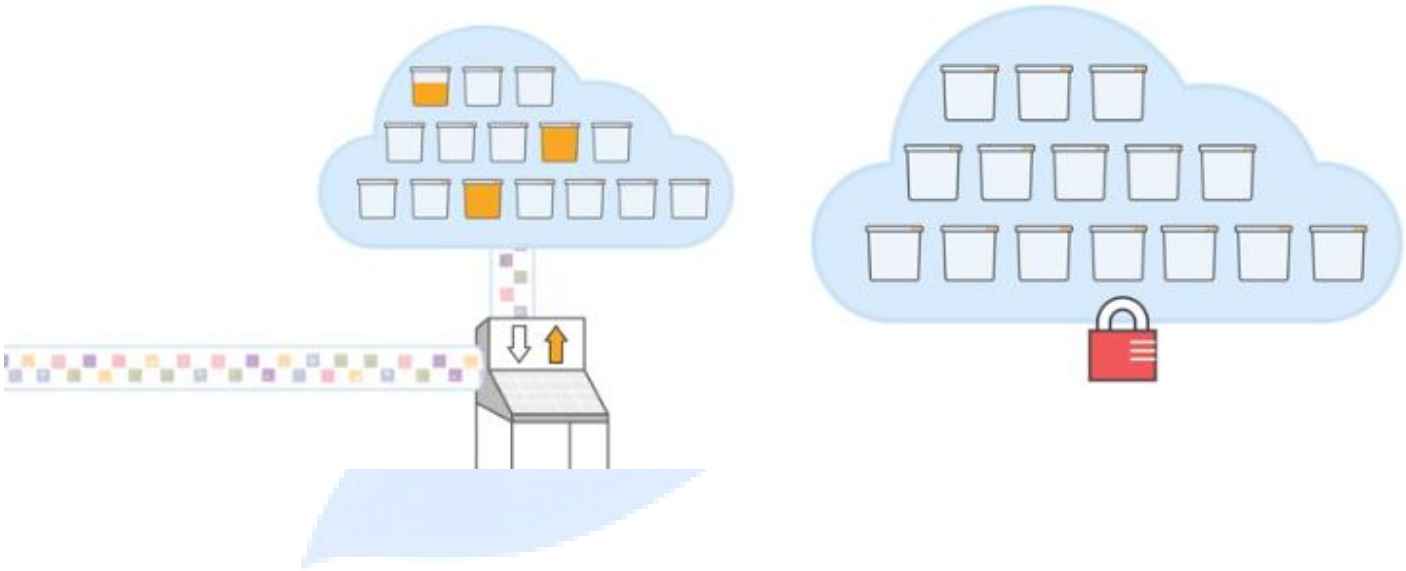
http://*bucket*.s3.amazonaws.com/*key*

http://*bucket*/*key*

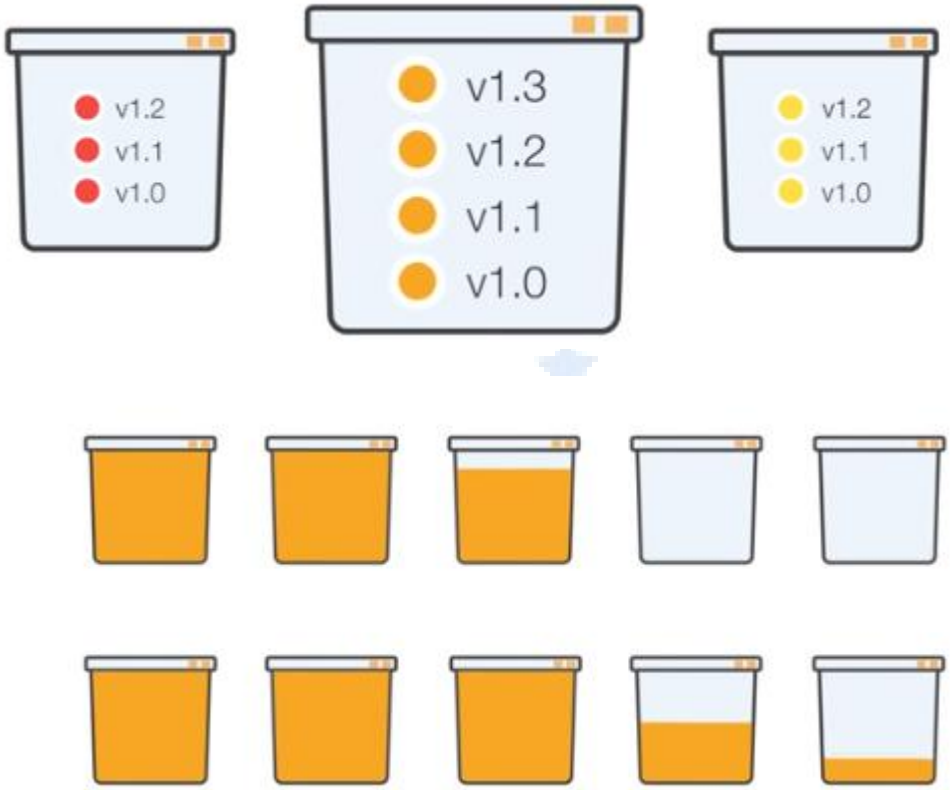
where *bucket* is a DNS CNAME record pointing to s3.amazonaws.com)

- Use Amazon AWS Management Console
- Use Cloudberry Explorer

- S3 allows you to specify an Access Control List for every object in the database
- You can set permissions for the owner, for authenticated user, for specific users (e-mail and Amazon ID) and for everybody.
- It's even possible to create public URLs that expire at a given date

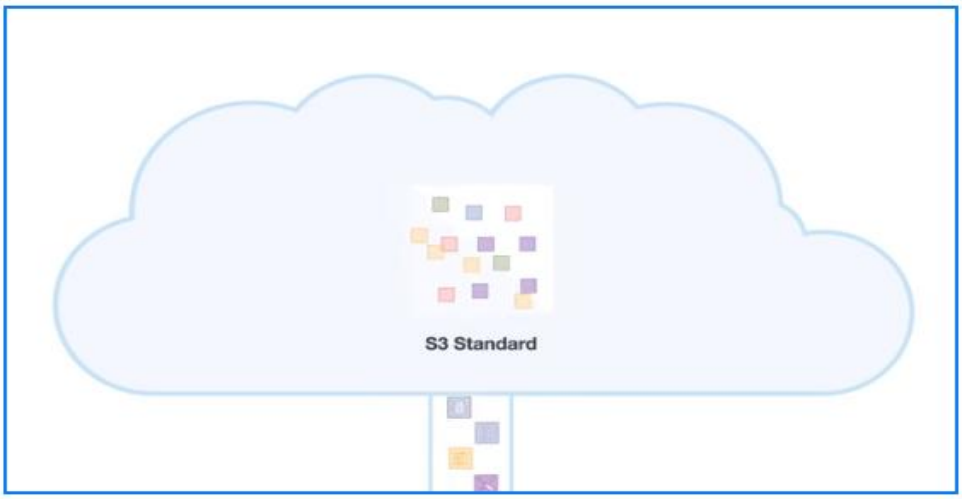


It maintains the versions of Objects stored in S3 and recover in case of data loss



S3 Range of Classes

S3 Standard class for frequently accessed data

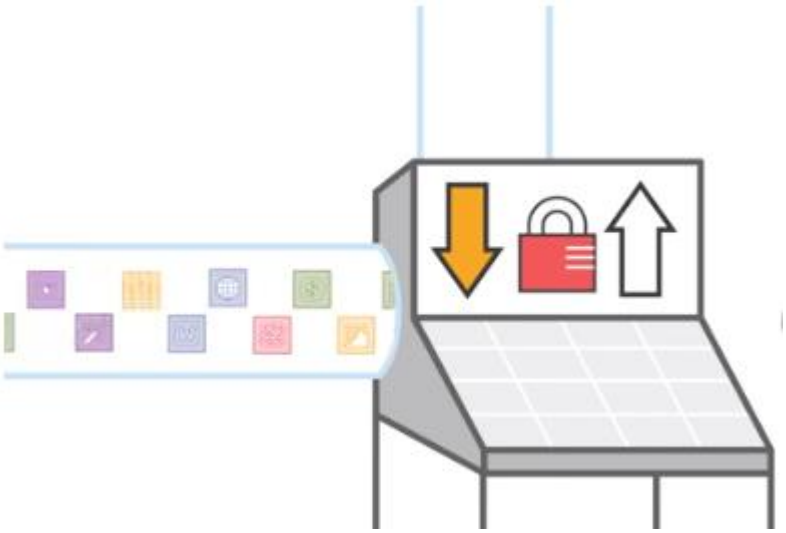


We can also setup auto policy to migrate data from one class to another class like standards to Glacier etc..

AWS Administration

Security in S3

Access Control List
Bucket Policy
Key Authentication
S3 also offer SSL encryption for data upload and download

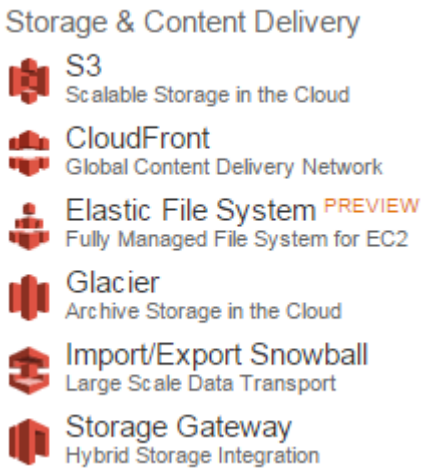


AWS Administration

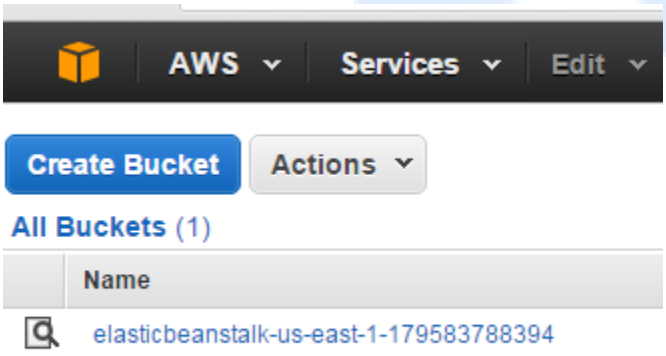
To sign up for Amazon S3

1. Go to http://aws.amazon.com/s3 and click **Sign Up**.
2. Follow the on-screen instructions.

Once we login to AWS console click on S3 from Storage and content delivery



We are in S3 dashboard.



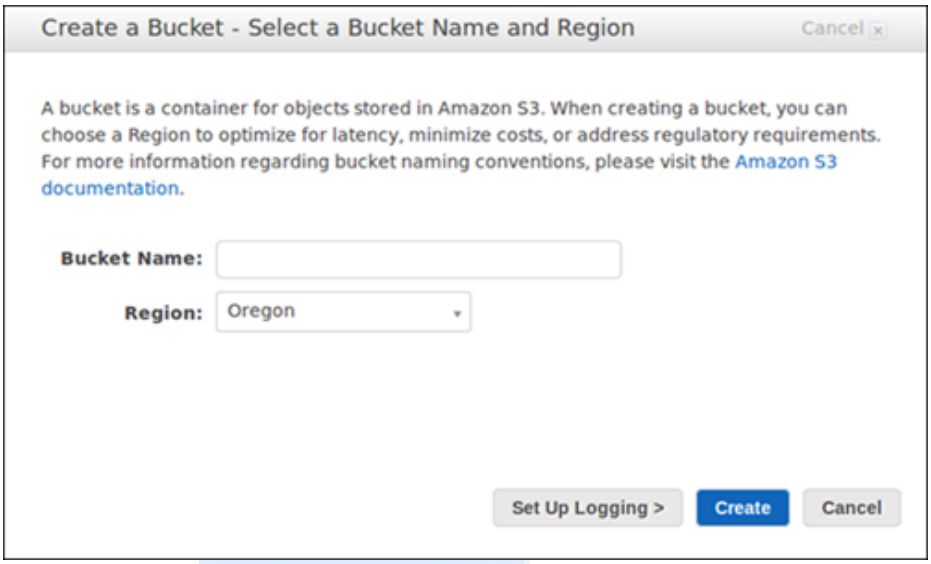
We are ready to create a bucket using the AWS Management Console. Every object in Amazon S3 is stored in a bucket. Before we can store data in Amazon S3, We must create a bucket.

Note: You are not charged for creating a bucket; you are charged only for storing objects in the bucket and for transferring objects in and out of the bucket.

To create a bucket

A bucket is a logical unit of storage in Amazon Web Services (AWS) object storage service, Simple Storage Solution S3. Buckets are used to store objects, which consist of data and metadata that describes the data.

1. Sign into the AWS Management Console and open the Amazon S3 console at https://console.aws.amazon.com/s3.
2. Click **Create Bucket**.

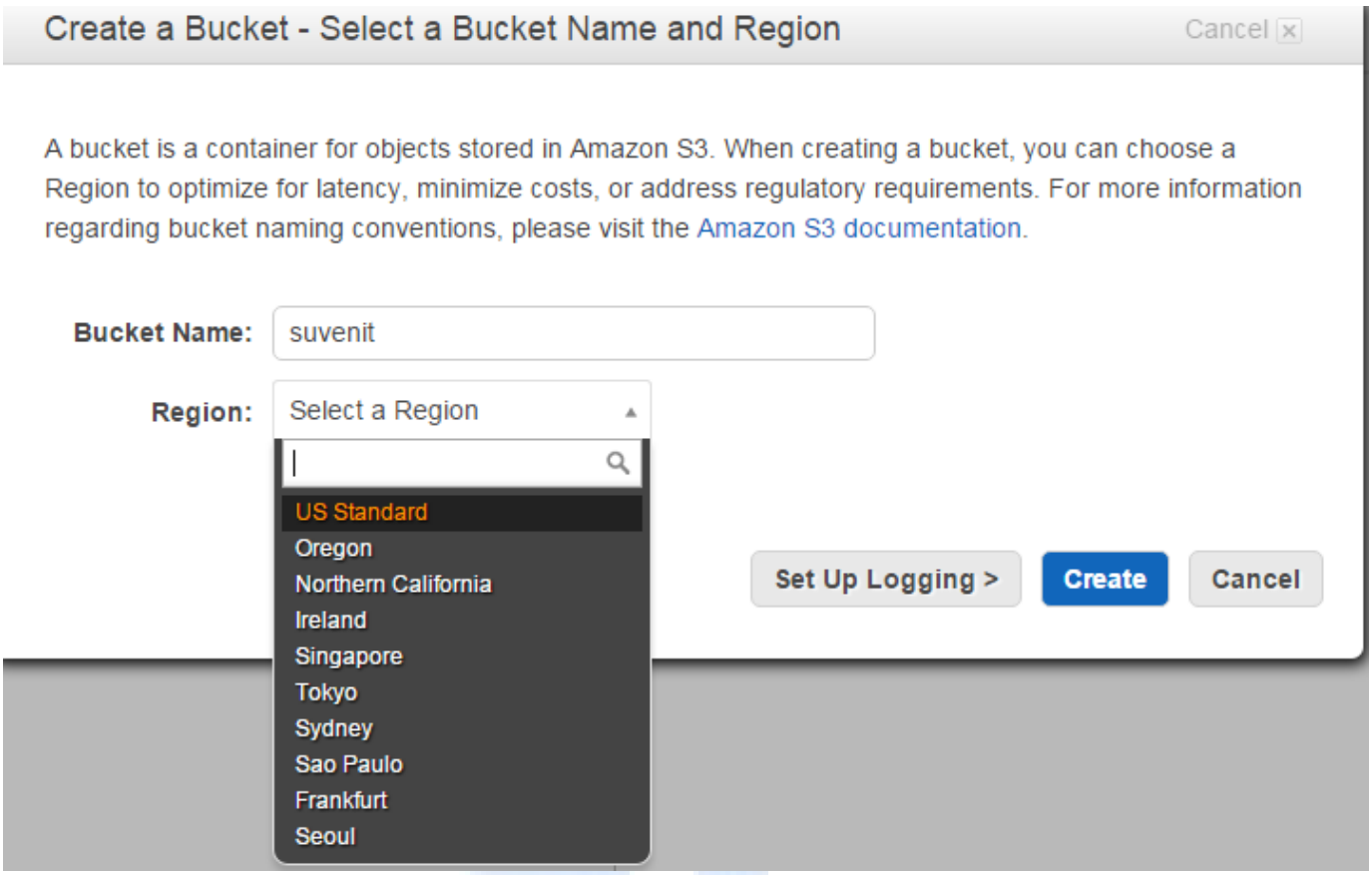


3. In the **Create a Bucket** dialog box, in the **Bucket Name** box, enter a bucket name.

The bucket name you choose must be unique across all existing bucket names in Amazon S3.

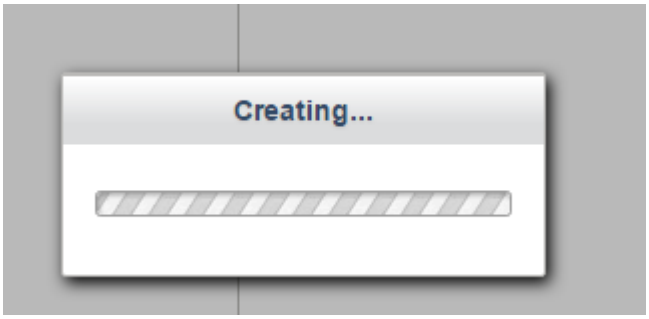
Note: After we create a bucket, we cannot change its name. In addition, the bucket name is visible in the URL that points to the objects stored in the bucket. Ensure that the bucket name we choose is appropriate.

4. In the **Region** box, select a region. For this exercise, select **Oregon** from the drop-down list. We can choose a region to optimize latency, minimize costs, or address regulatory requirements. Objects stored in a region never leave that region unless you explicitly transfer them to another region.

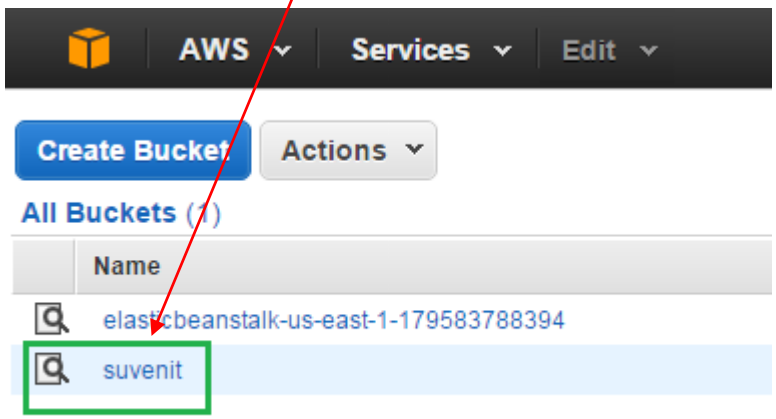


5. Click **Create**.

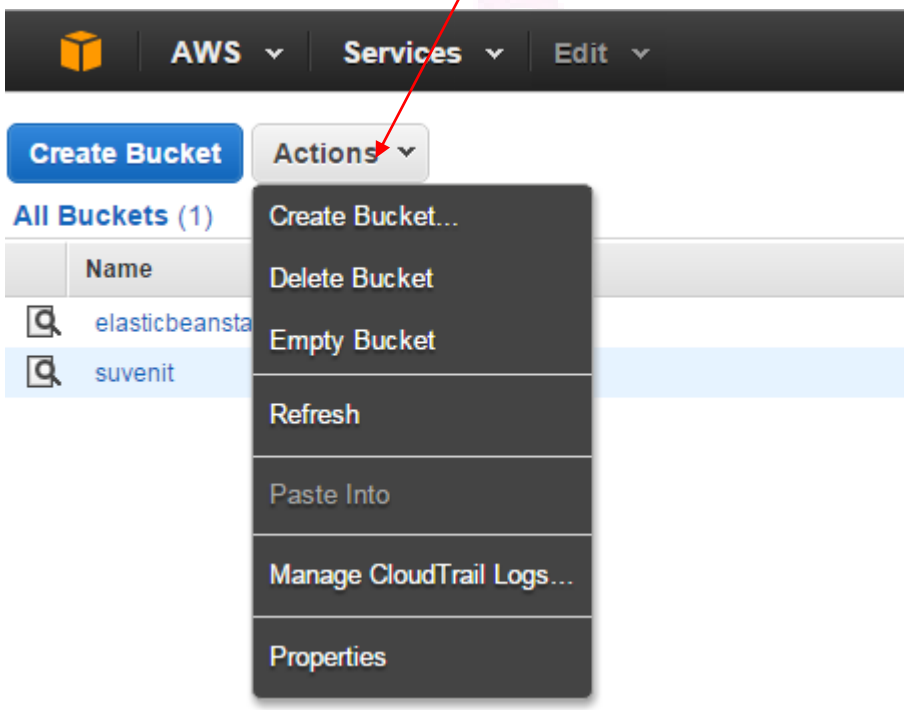
When Amazon S3 successfully creates your bucket, the console displays your empty bucket in the **Buckets** panel.



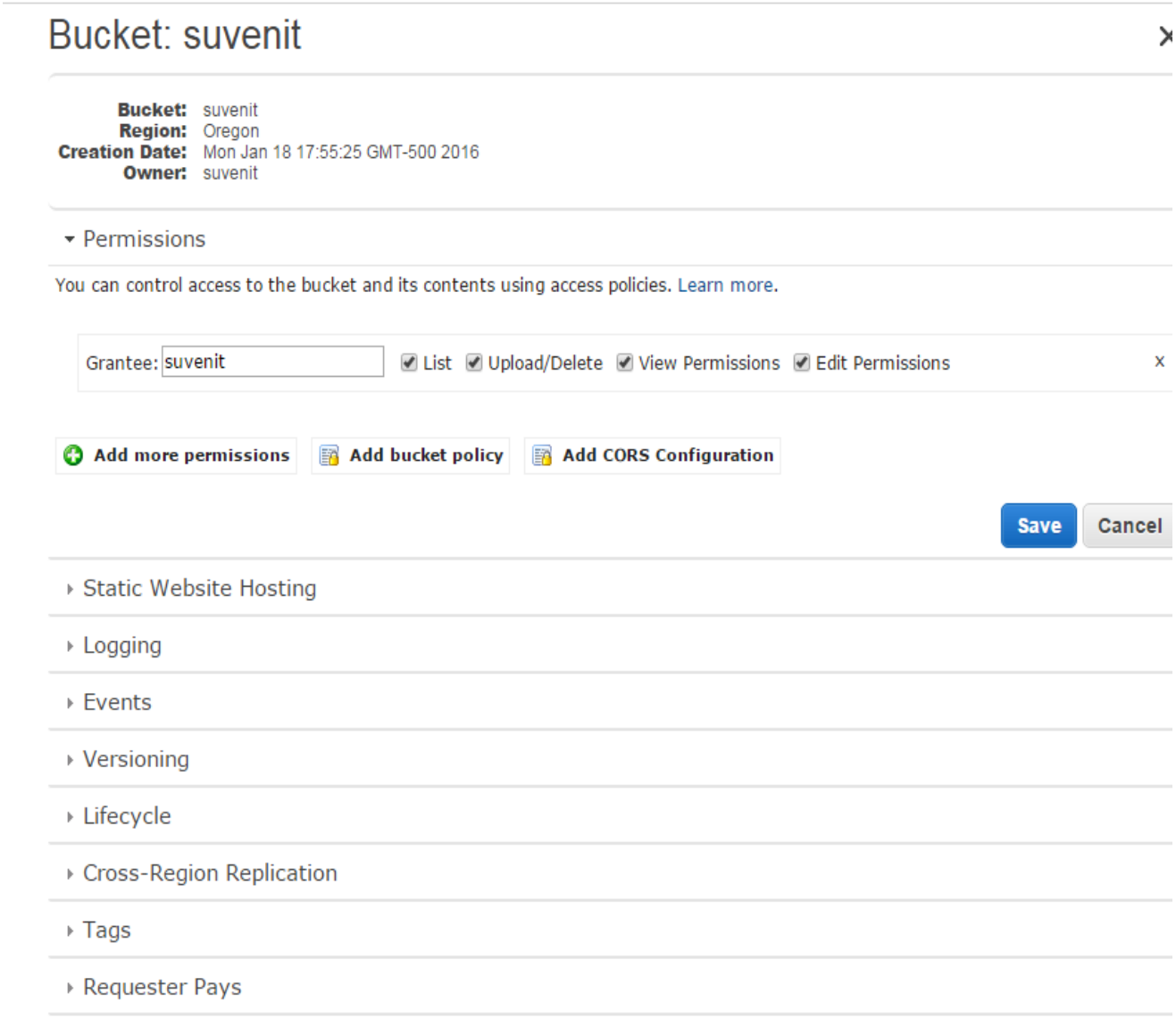
Bucket "suvenit" is created



We can create, delete and manage the buckets by action button.



Once we click on Bucket properties, we can see all below properties.

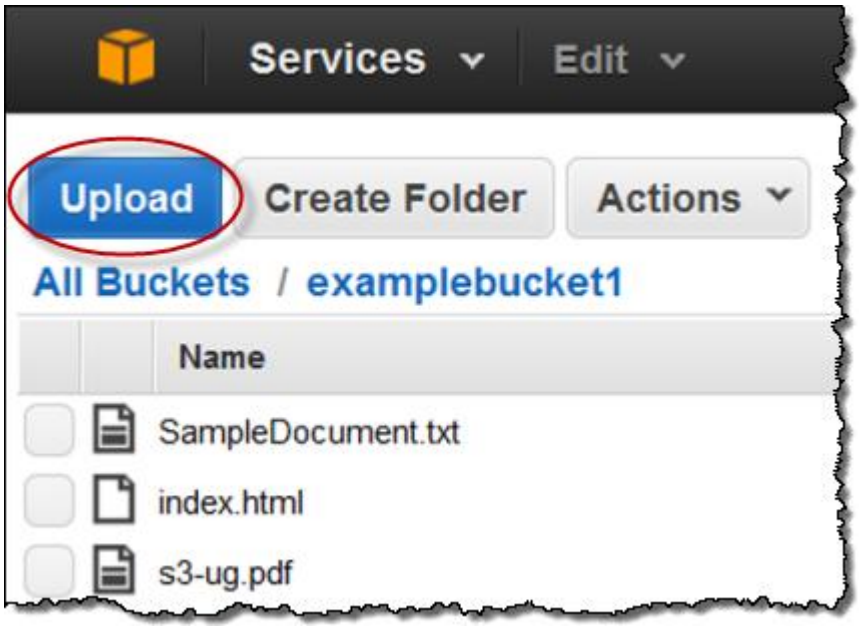


Add an Object to a Bucket.

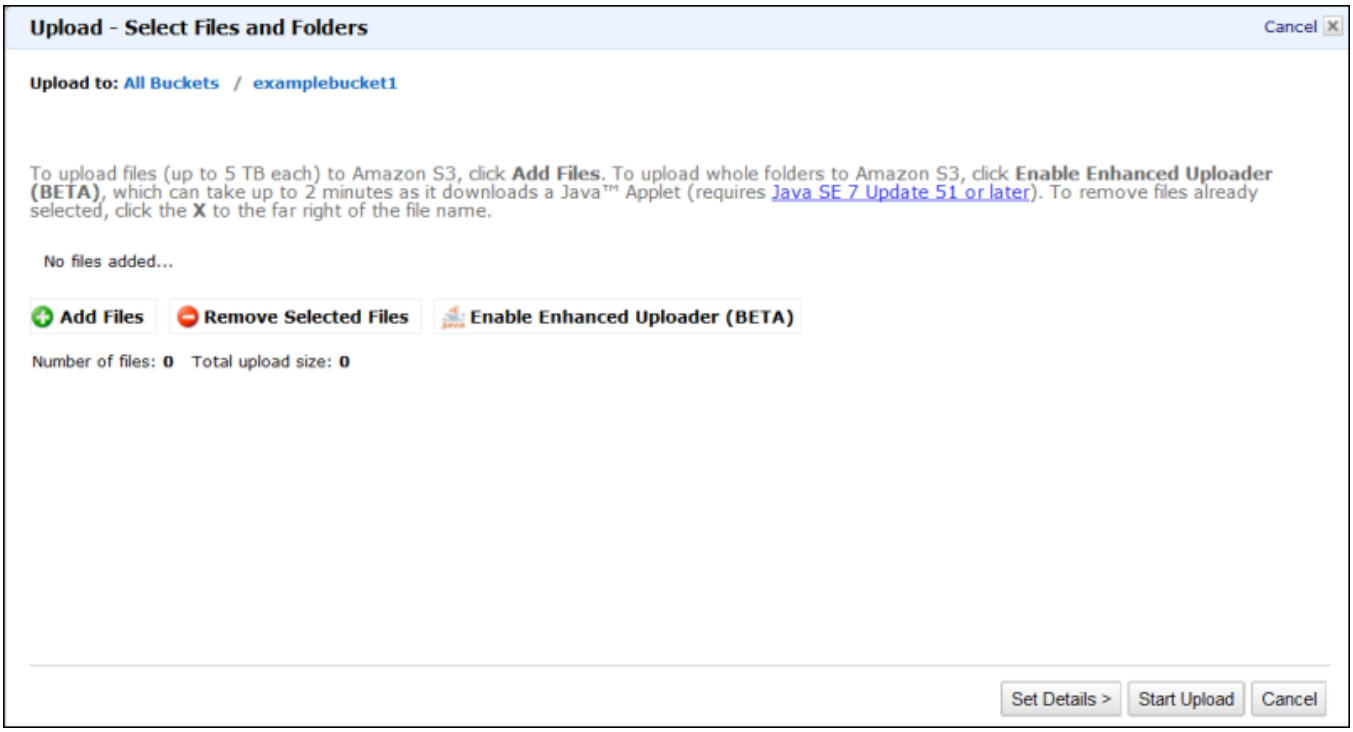
An object can be any kind of file: a text file, a photo, a video and so forth. When you add a file to Amazon S3, you have the option of including metadata with the file and setting permissions to control access to the file.

To upload an object

1. In the Amazon S3 console, click the name of bucket that you want to upload an object to and then click **Upload**.



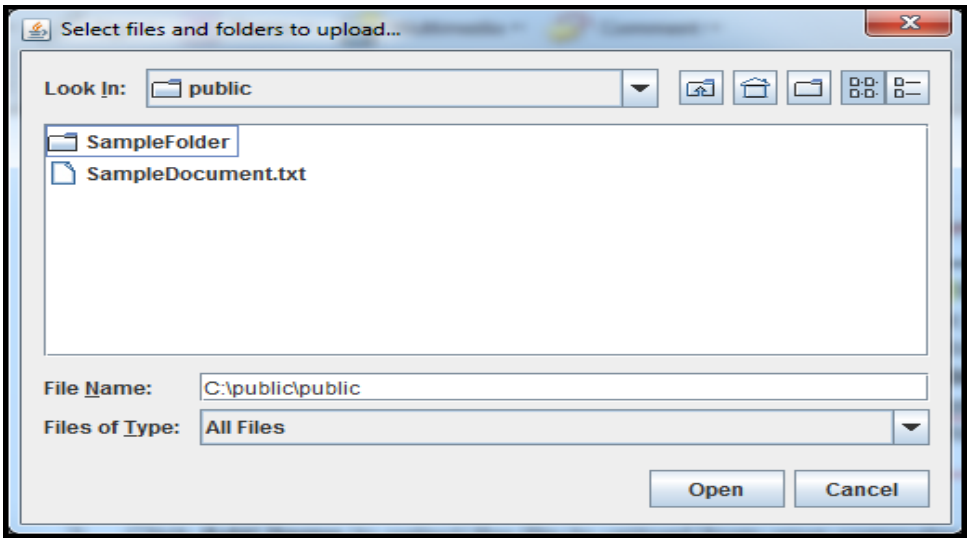
2. In the **Upload - Select Files** wizard, if you want to upload an entire folder, you must click **Enable Enhanced Uploader** to install the necessary Java applet. You only need to do this once per console session.



3. Click **Add Files**.

A file selection dialog box opens:

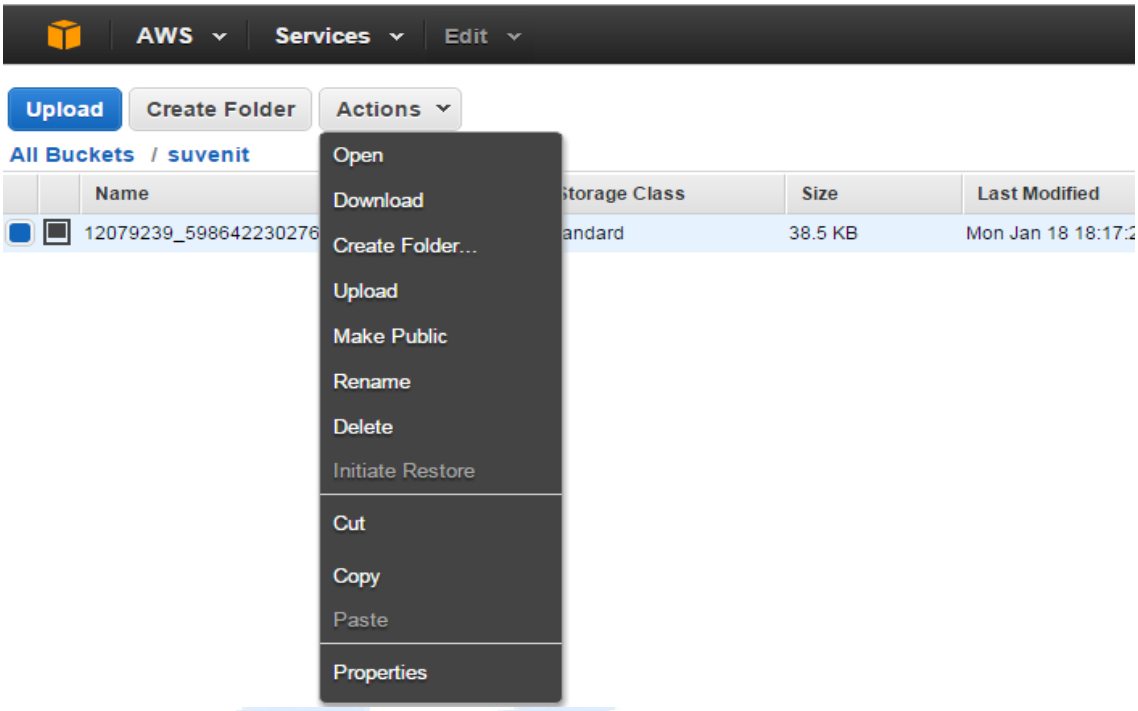
- If you enabled the advanced uploader in step 2, you see a Java dialog box titled **Select files and folders to upload**, as shown.
- If not, you see the **File Upload** dialog box associated with your operating system.



4. Select the file that you want to upload and then click **Open**.
5. Click **Start Upload**.

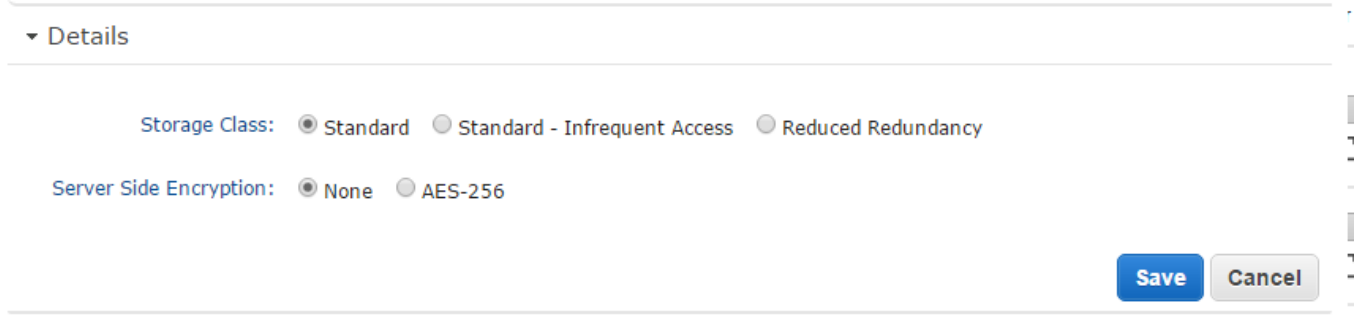
   You can watch the progress of the upload from within the **Transfer** panel.

6. Click on action button to manage an objects

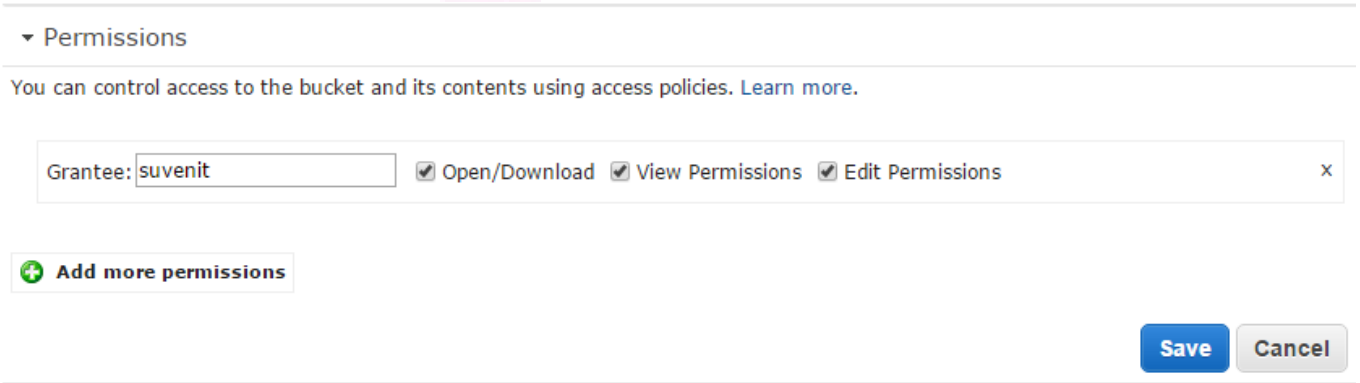


7. **Click on properties to see the object properties and url to access.**

Click on Details to change the Storage class



Click on permission to see and to change permissions.

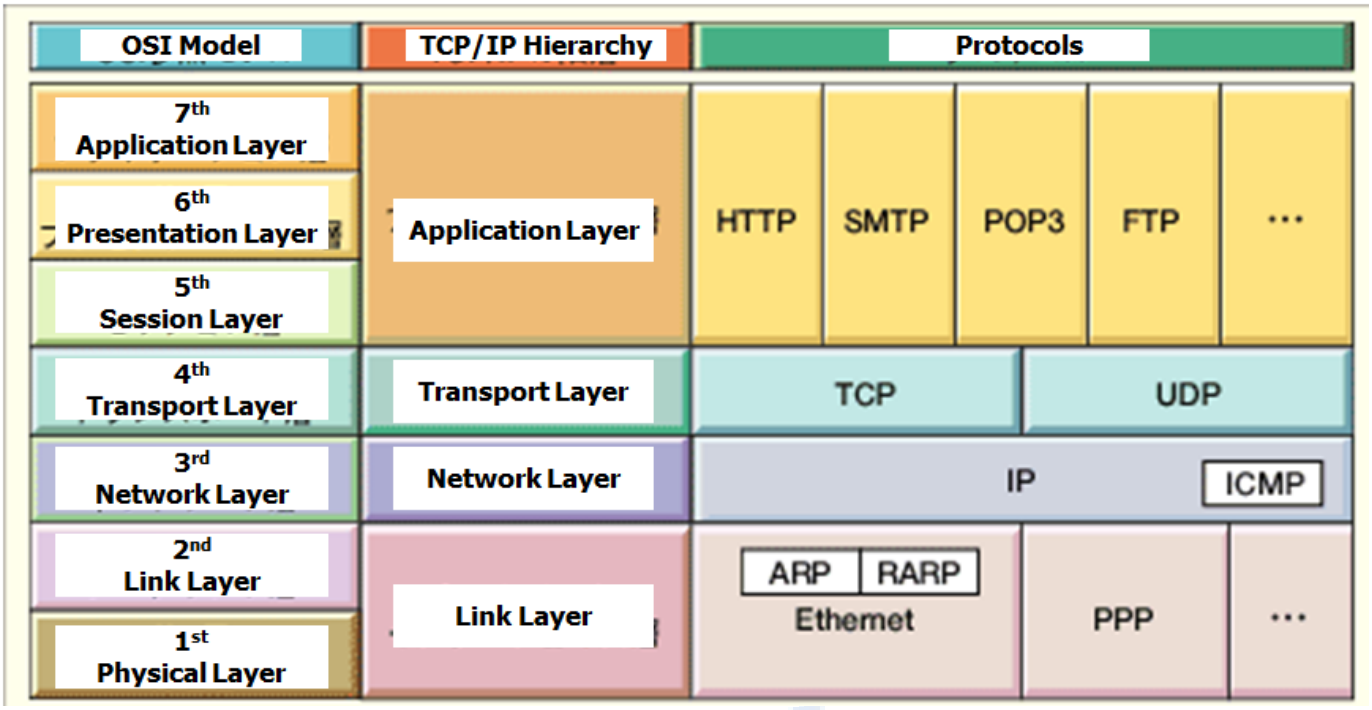


MODULE6# –Virtual Private Cloud

Agenda

- Understanding Networking(TCP/IP, IP Address etc)
- Understanding network in AWS
- Subnet and AWS Communications
- Internet gateway & Routing tables
- Security groups and ACL's
- CloudFront, Route53, VPN's, VPG's and direct connect
- Load Balancing
- Auto Scaling

Understanding the TCP/IP model



Link Layer : includes device driver and network interface card
Network Layer : handles the movement of packets, i.e. Routing
Transport Layer : provides a reliable flow of data between two hosts
Application Layer: handles the details of the particular application

IP

Responsible for end to end transmission, Sends data in individual packets, Maximum size of packet is determined by the networks
Fragmented if too large
Unreliable Packets might be lost, corrupted, duplicated, delivered out of order

IP addresses

4 bytes
- e.g. 163.1.125.98
- Each device normally gets one (or more)
- In theory there are about 4 billion available

Routing

How does a device know where to send a packet?
All devices need to know what IP addresses are on directly attached networks If the destination is on a local network, send it directly there

If the destination address isn't local
- Most non-router devices just send everything to a single local routerRouters needs to know which network corresponds to each possible IP address

Allocation of addresses

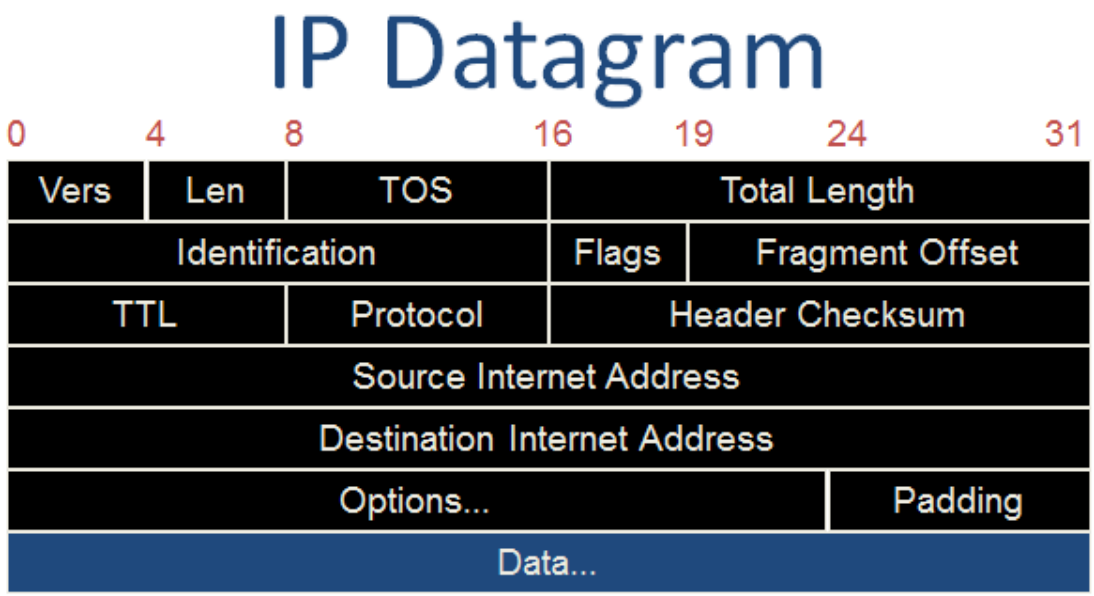
Controlled centrally by ICANN
-Fairly strict rules on further delegation to avoid wastage
Have to demonstrate actual need for them
Organizations that got in early have bigger allocations than they reallv need

IP packets

Source and destination addresses
Protocol number
- 1 = ICMP, 6 = TCP, 17 = UDP

Various options
- e.g. to control fragmentation

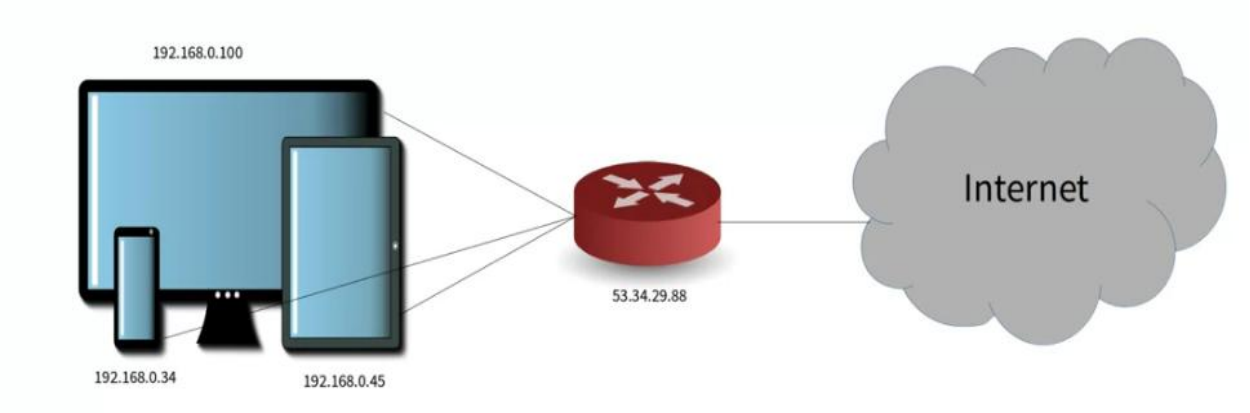
Time to live (TTL)
- Prevent routing loops



Field	Purpose
Vers	IP version number
Len	Length of IP header (4 octet units)
TOS	Type of Service
T. Length	Length of entire datagram (octets)
Ident.	IP datagram ID (for frag/reassembly)
Flags	Don't/More fragments
Frag Off	Fragment Offset

Field	Purpose
TTL	Time To Live - Max # of hops
Protocol	Higher level protocol (1=ICMP, 6=TCP, 17=UDP)
Checksum	Checksum for the IP header
Source IA	Originator's Internet Address
Dest. IA	Final Destination Internet Address
Options	Source route, time stamp, etc.
Data...	Higher level protocol data

NAT Translation

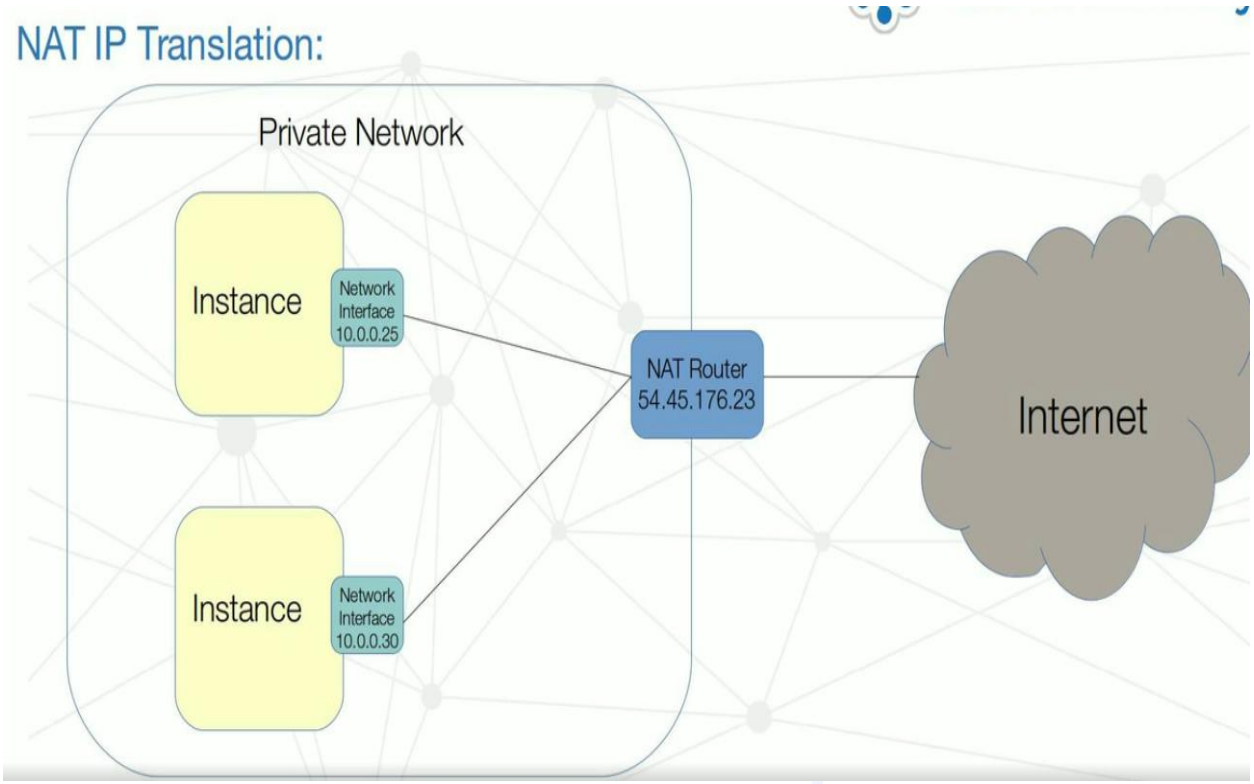


Reserved NAT Ranges:

Start:	End:	Number of addresses:
10.0.0.0	10.255.255.255	16,777,216
172.16.0.0	172.31.255.255	1,048,576
192.168.0.0	192.168.255.255	65,536

EC2- Classic VS. VPC Networks

EC2-Classic	VPC
part of AWS network	discrete networks
Instance bound to group	apply new group to running instance
instance and group must be from the same region	able to attach group from any region

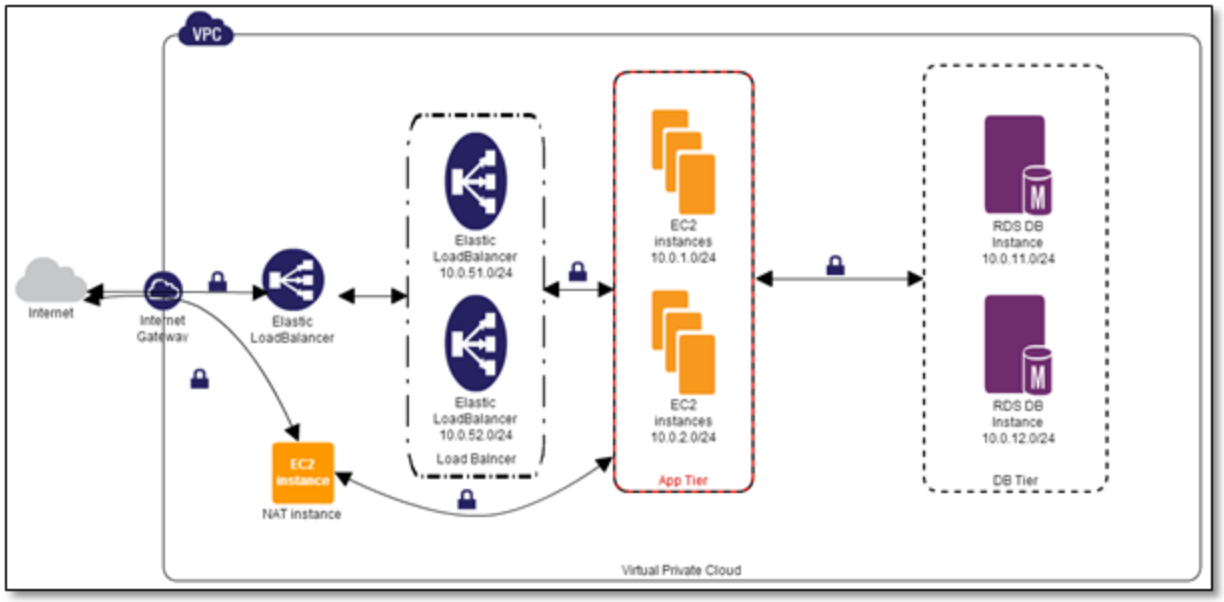


Reserved NAT Ranges:

Start	End	No. of addresses
10.0.0.0	10.255.255.255	16777216
172.16.0.0	172.31.255.255	1048576
192.168.0.0	192.168.255.255	65536

VPC Best Configuration Practices

A *virtual private cloud* (VPC) is a virtual network dedicated to your AWS account. It is logically isolated from other virtual networks in the AWS cloud. We can launch your AWS resources, such as Amazon EC2 instances, into your VPC. We can configure your VPC; we can select its IP address range, create subnets, and configure route tables, network gateways, and security settings.



1. Create VPC

Log in to the AWS console.

Navigate to Services->VPC->Your VPCs.

Click "**Create VPC**".

When you create a VPC, you specify a set of IP addresses in the form of a Classless Inter-Domain Routing (CIDR) block (for example, 10.0.0.0/16). For more information about CIDR notation and what "/16" means, see Classless Inter-Domain Routing.

You can assign a single CIDR block to a VPC. The allowed block size is between a /28 netmask and /16 netmask. In other words, the VPC can contain from 16 to 65,536 IP addresses.

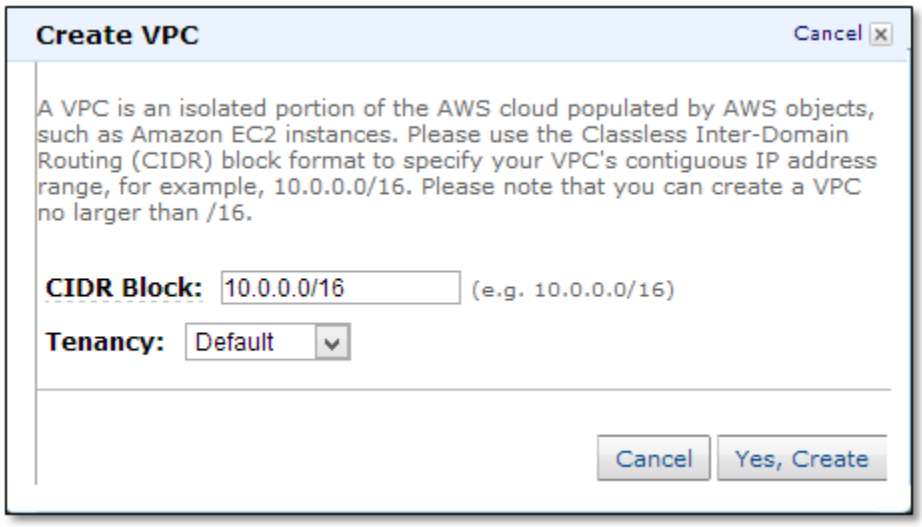
You cannot change a VPC's size after creating it. If your VPC is too small for your needs, you'll need to terminate all of the instances in the VPC, delete it, and then create a new, larger VPC.

To create your VPC, go to the Create VPC dialog box, specify the following VPC details and then click "**Yes, Create**".

CIDR Block: Specify the CIDR block for your VPC. I prefer 10.0.0.0/16.

Tenancy: Default tenancy: This is for running instances on shared hardware and is is free of charge.

Dedicated Tenancy: This is for running your instances on single-tenant hardware. A $2 fee applies for each hour in which any dedicated instance is running in a region.



2. Create Subnets

In the navigation pane click on "**Subnets**".

Click "**Create Subnet**".

Before we create a subnet, let's understand the best practices for creating them.

You should create subnets across multiple availability zones, with each subnet residing within a single zone. Creating subnets in and launching instances across multiple availability zones will ensure a high-availability environment.

When creating separate subnets for ELB, EC2 and RDS instances, each tier should have at least 2 subnets across availability zones.

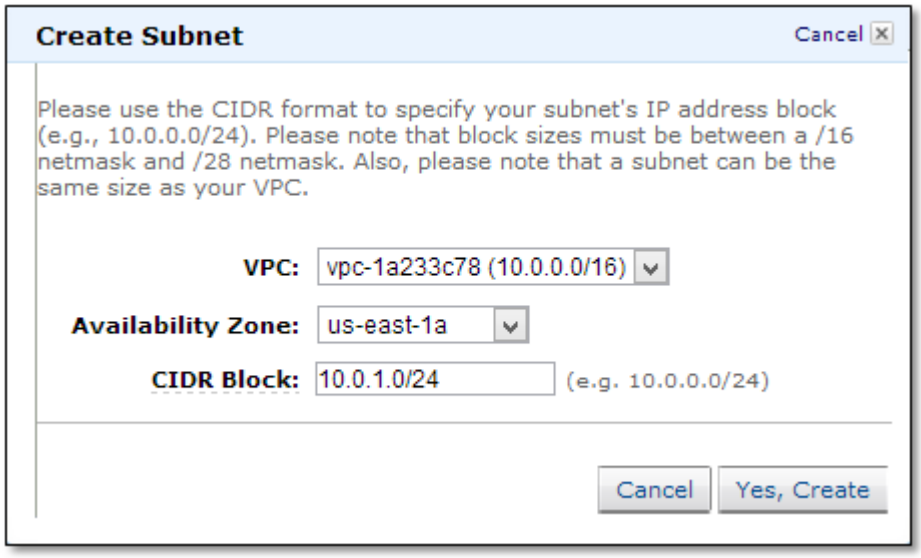
For this example, we created subnets using zones us-east1b and us-east-1d. These subnets are called “private subnets” because the instances we launch are not accessible from the Internet. In other words, these instances don’t have a public IP unless you assign an EIP.

App Tier: 10.0.1.0/24(zone-b), 10.0.2.0/24(zone-d)

ELB: 10.0.51.0/24(zone-b), 10.0.52.0/24(zone-d)

Database (RDS): 10.0.11.0/24(zone-b), 10.0.12.0/24(zone-d)

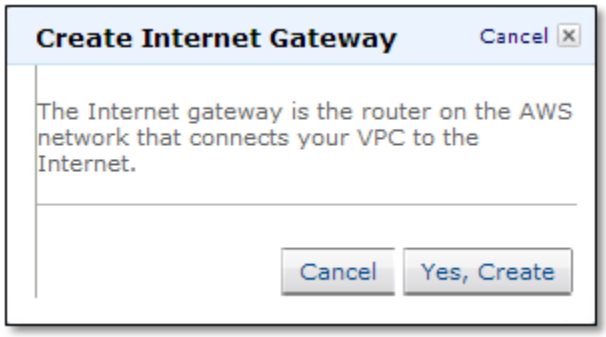
Always choose the same availability zones for all tiers. For example, if you choose two zones for high availability and use us-east-1a and us-east1b, then maintain those same 1a and 1b zones for all tiers. This will minimize data transfer charges because data transfers between instances within the same availability zone are free.



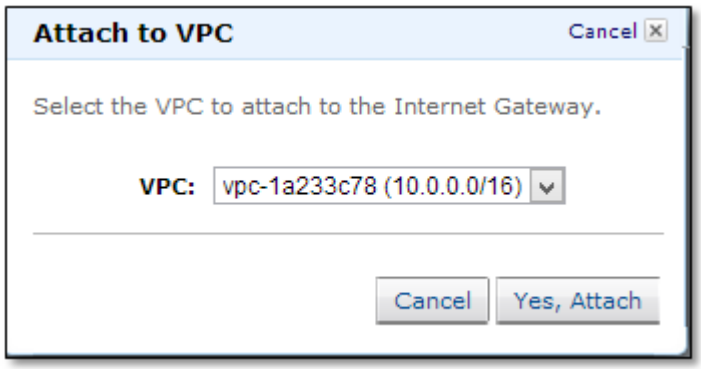
3. Create Internet Gateway

By default, instances that are launched into a VPC can't communicate with the Internet. However, you can enable Internet access by attaching an Internet gateway to the VPC.

Go to Internet Gateways in the navigation pane and click “**Create Internet Gateway**”.



Now attach the gateway to a VPC by right clicking on “VPC” and selecting “**Attach to VPC**”.



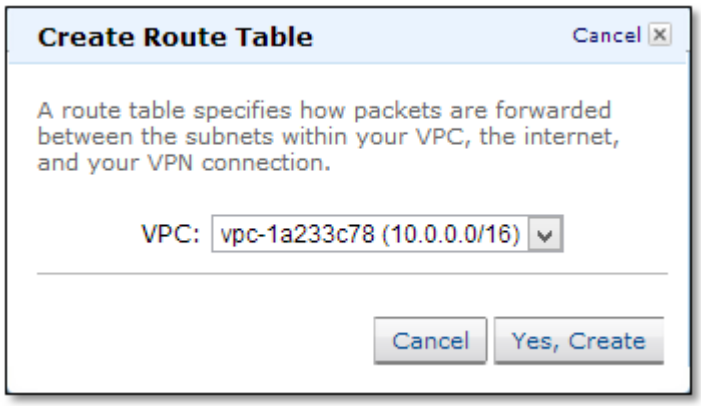
4. Create Route Tables

A route table contains a set of rules, called routes, that determine where network traffic is directed.

Each subnet in your VPC must be associated with a route table that will control that subnet’s routing. You can associate multiple subnets with a single route table; however, you can only associate a subnet with one route table.

Creating a VPC automatically creates a main route table which, by default, enables the instances in your VPC to communicate with one other.

Go to Route Tables in the navigation pane and click on “**Create Route Table**”.



As a best practice create separate route tables for each tier. This will provide more control in maintaining the security of each subnet.

Now associate the subnets to the route tables.

Click on one route table and go to the Associations tab.

Select the subnet and click "**Associate**".

Associate each tier's subnets separately to the dedicated route table.

Create 3 new route tables:

1. **ELB Route table**—Associate 10.0.51.0/24 and 10.0.52.0/24.

2. **APP route table**—Associate 10.0.1.0/24 and 10.0.2.0/24.

3. **RDS route table**—Associate 10.0.11.0/24 and 10.0.12.0/24.

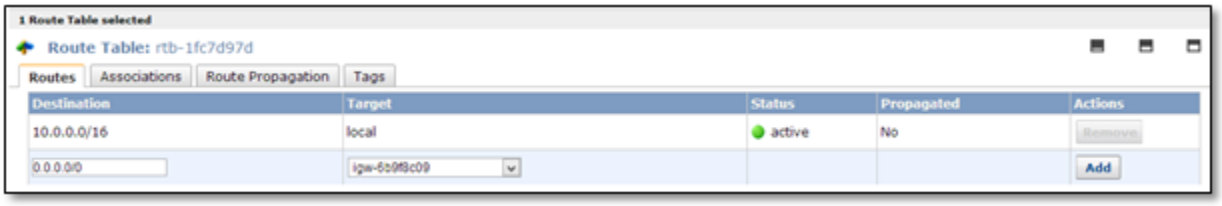
Do not associate any subnets with the main route table.

Now navigate to the main route table to add a route to allow Internet traffic to the VPC.

Go to Routes and specify the following values:

Destination: 0.0.0.0/0

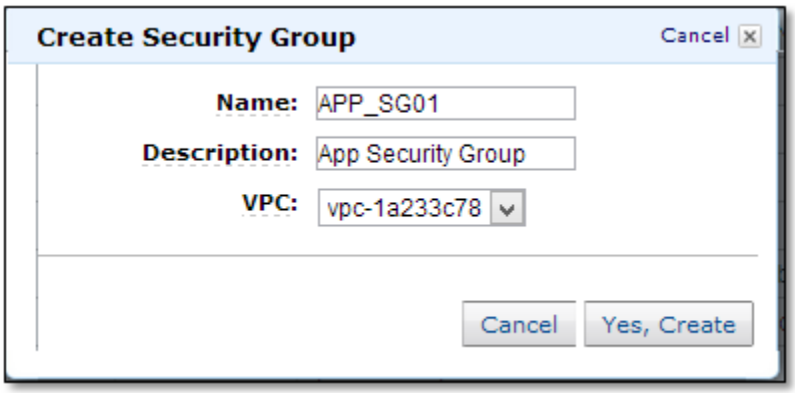
Target: Select “Internet Gateway” from the dropdown menu.



5. Create Security Groups

This process is similar to creating an SG (Security Group) in classic EC2.

Create separate security groups for ELB, APP, DB (RDS) and NAT instances.



1. APP_SG01
2. NAT_SG01
3. ELB_SG01
4. DB_SG01

Allow Inbound rules for ELB, DB and APP to suit your needs. We’ll address NAT security group rules later in this post.

6. Create NAT instance

Instances launched into a private subnet in a VPC cannot communicate with the Internet unless you assign a public IP or EIP to the instance. However, assigning a public IP to an instance will allow everyone to initiate inbound Internet traffic.

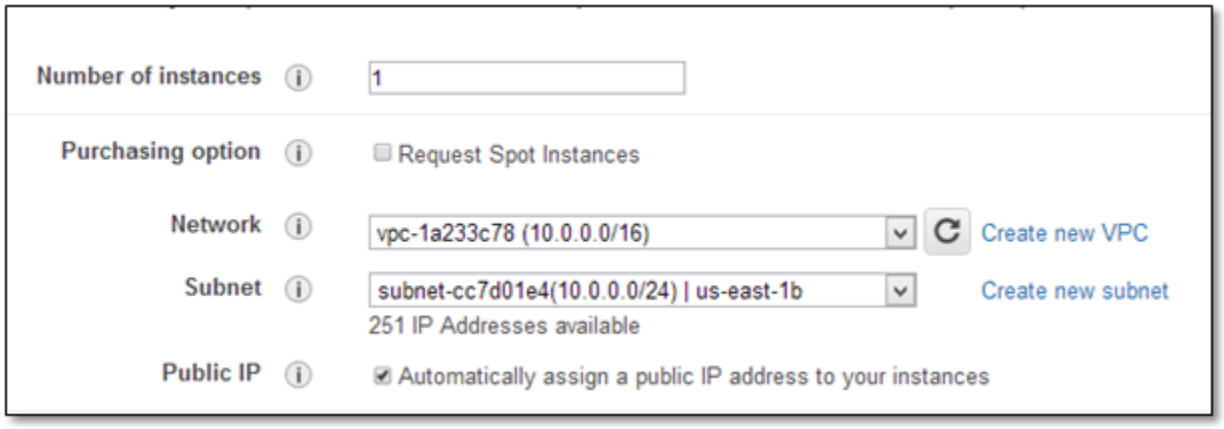
Using a Network Address Translation (NAT) instance in your VPC enables instances in the private subnet to initiate outbound Internet traffic.

Create a subnet with netmask 10.0.0.0/24 for NAT instance. [Refer to section #2 of this post]. We call this subnet a “public subnet” and the others “private subnets”. While, technically, there is no difference between public or private subnet, for clarity we call publicly accessible instances public subnets.

Associate this subnet to the main route table. You can also create separate route tables to associate to the subnet. If you do create a separate route table, don’t forget to add a route that will allow Internet traffic into the subnet. [Refer to section #4 of this post].

Now navigate to Services->EC2->Launch Instance

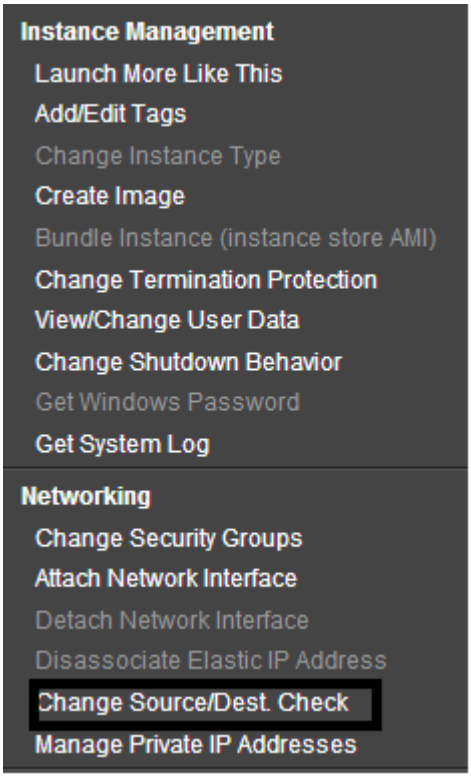
In the Launch Wizard select “**Community AMIs**” and search for “**ami-vpc-nat**”. “ Select the first AMI from the results list to launch the instance into the VPC created in section #1. Choose the subnet 10.0.0.0/24 and then check the “Assign public IP” box. You can also assign an EIP, if needed. On the Configure Security Group page, choose “Select an existing security group” and select the NAT_SG security group that you created earlier.



For this example, we created a micro server.

Choose a NAT instance type based on your intended workload. If your application only occasionally needs to connect to the Internet and doesn't require high network bandwidth, then a micro instance will suffice. If your application talks to the Internet continuously and requires better bandwidth, then start with m1.medium instances. You may need to upgrade the NAT instance to m1.large because network I/O varies between instance types.

Now, deselect the "**Source/Destination**" check box, right click on the NAT instance, select "Change Source/Dest. Check", and click on "Disable".



The NAT instance must be able to send and receive traffic from sources or destinations other than itself, so you'll need to deselect the "source/destination" check boxes.

Now navigate to Security Groups to add rules for inbound traffic.

Go to the Inbound tab for NAT_SG01. These rules will allow app servers to talk to the NAT instance on the 80 and 443 ports.

1. Select "**HTTP**" from the Create a new rule list. In the Source box, specify the IP address range of your private subnet (App server subnets) and then click "Add Rule".

2. Select “**HTTPS**” from the Create a new rule list. In the Source box, specify the IP address range of your private subnet, and then click “Add Rule”.

Click “**Apply Rule Changes**”.

Now navigate to Route Tables and select the private subnets 10.0.1.0/24 and 10.0.2.0/24.

On the Routes tab, specify 0.0.0.0/0 in the Destination box, specify the instance ID of the NAT instance in the Target box, and then click “**Add**”.

If you don’t need an additional instance for NAT, you can minimize cost by assigning a public IP to the instance that needs Internet access. That will allow the instance to access the Internet directly.

7. Create App Servers

Now go to Services->EC2 ->Launch Instance.

On the Configure Instance Details page, from the Network list choose the VPC that you created previously and select your app server subnet (10.0.1.0/24, 10.0.2.0/24) from the Subnet list.

Optional: Select the “**Public IP**” check box to request that your app instance receive a public IP address. This is required when you don’t have a NAT instance, but your instance requires Internet access.

On the Configure Security Group page, select the option “Select an existing security group” and then select the APP_SG01 security group that you created previously. Click “Review and Launch”.

Now log in to the server and check to see whether or not you can access the Internet.

```
$ ping google.com
```

You now might ask, “How can I access from my desktop an instance that was created in a private subnet and has no assigned public IP?” The answer is that you can’t. To do so, you’ll need a bastion box in the public subnet. You can use a NAT instance as a bastion server (also known as a jump box).

Log in to the bastion (NAT) server first. You can access any instance from this server that was created in a private subnet.

For more details, see here.

8. Create RDS

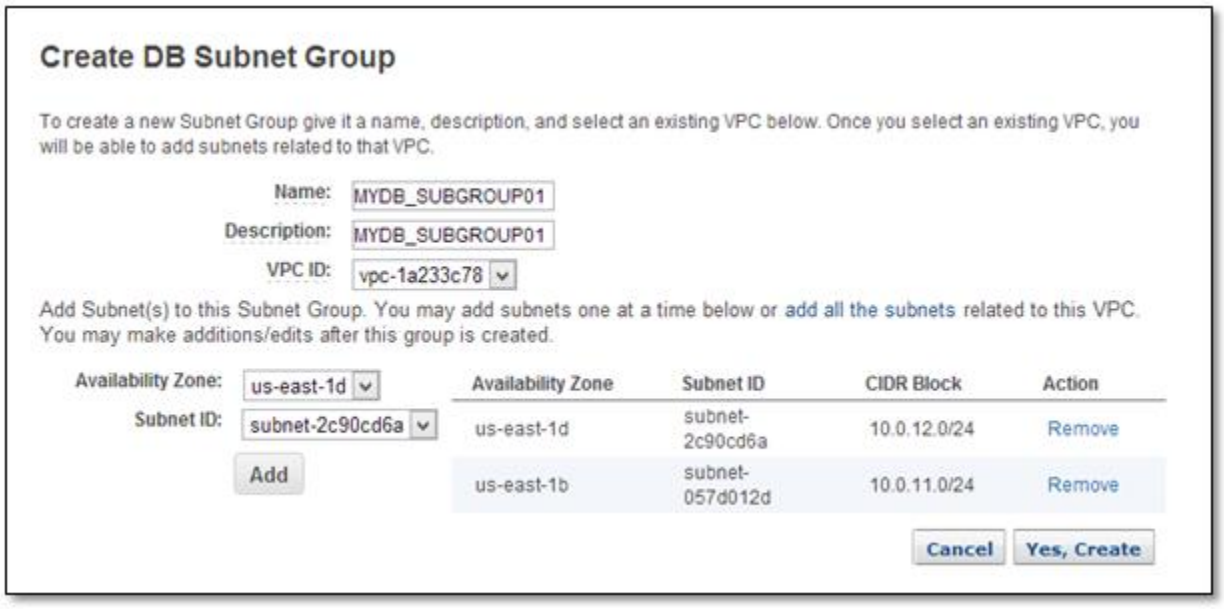
Navigate to Services->RDS

Go to Subnet Groups in the navigation pane and click "**Create DB Subnet Group**".

Select the VPC ID from the drop down menu.

Select "**Availability Zone**" and choose the Subnet IDs of 10.0.11.0/24 and 10.0.12.0/24. Then click "**Add**"

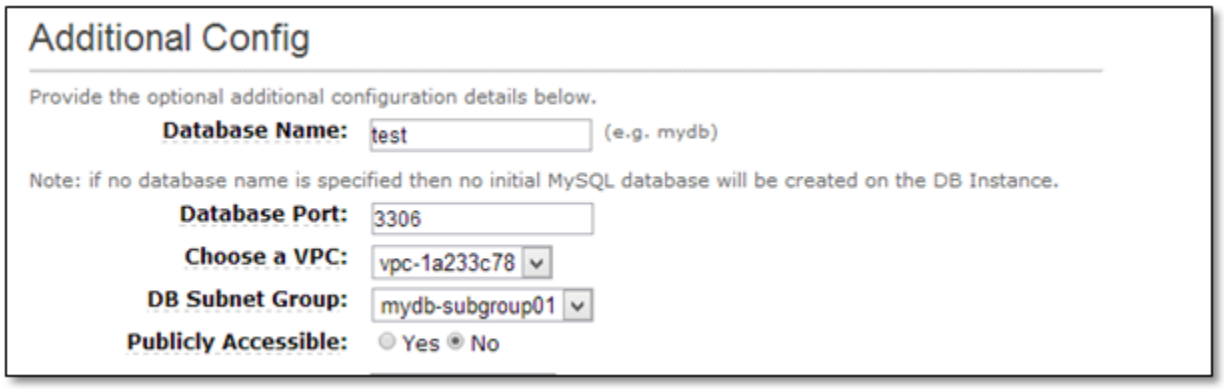
Click "**Yes, Create**" to create the subnet group.



Creating an Options Group and a Parameters Group is similar to doing so in classic EC2.

Launch an RDS instance within the subnet group created above.

In the Additional Config window, select the VPC and DB Subnet Groups created previously.



To make sure that your RDS instance is launched in subnets 10.0.11.0/24 and 10.0.12.0/24, select the "mydb-subgroup01" subnet group.

All other steps for creating an RDS are as usual.

9. Create ELB

Now it's time to create the load balancer. The load balancer will be the frontend and will be accessible from the Internet, which means that the ELB will be launched in public subnets 10.0.51.0/24 and 10.0.52.0/24.

At this point the two subnets can't access the Internet. To make them public subnets, update the route table that these subnets are associated to.

Navigate to Services->VPC->Route Tables

Select the ELB route table.

On the Routes tab, specify 0.0.0.0/0 in the Destination box, select the Internet gateway in the Target box, and then click "Add".

Navigate to Services-> EC2-> Load Balancers

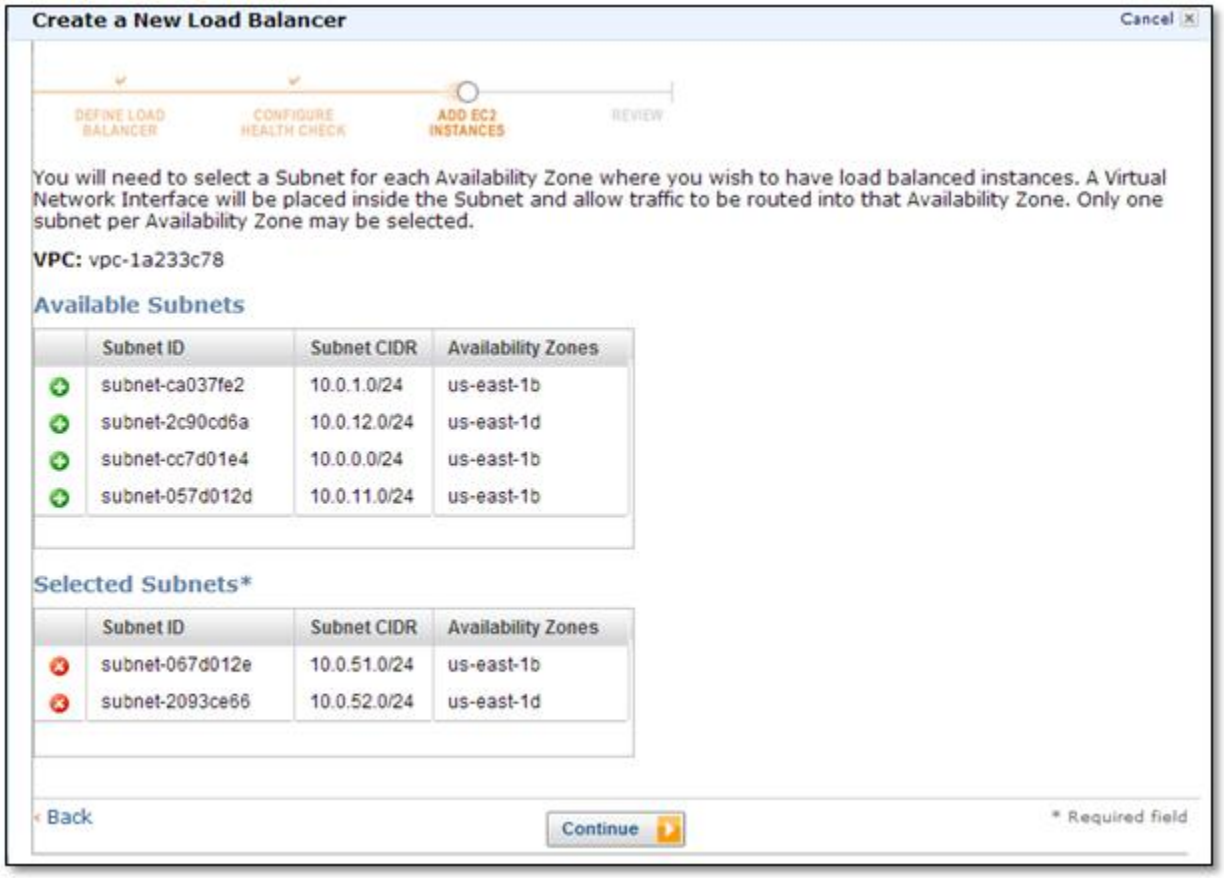
Click "**Create Load Balancer**".

In the Launch Wizard, select "Create LB inside" as your VPC ID.

Do not select "**Create an internal load balancer**".

Click "**Continue**"

In Add EC2 Instances select the subnets where you want the load balanced instances to be. Select 10.0.51.0/24 and 10.0.52.0/24.



In the next window select ”Choose from your existing security group” and then select the ELB_SG01 security group that you created previously. Click “**Continue**”.

In the next window select the App servers. Click “**Continue**”.

Review the details and click “**Create**”.

Make sure that you’ve enabled the APP_SG01 inbound ports (80/443) to ELB_SG01 so that the ELB can route traffic to backend app servers. Also make sure that ELB_SG01 HTTP and HTTPS ports are publicly accessible (0.0.0.0/0).

AWS Administration

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