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What is AWS?

Amazon web service is a platform that offers flexible, reliable, scalable, easy-to-use and cost-effective cloud computing solutions.

AWS is a comprehensive, easy to use computing platform offered Amazon. The platform is developed with a combination of infrastructure as a service (IaaS), platform as a service (PaaS) and packaged software as a service (SaaS) offerings.

History of AWS

- 2002- AWS services launched
- 2006- Launched its cloud products
- 2012- Holds first customer event
- 2015- Reveals revenues achieved of $4.6 billion
- 2016- Surpassed $10 billon revenue target
- 2016- Release snowball and snowmobile
- 2019- Offers nearly 100 cloud services

Important AWS Services

Amazon Web Services offers a wide range of different business purpose global cloud-based products. The products include storage, databases, analytics, networking, mobile, development tools, enterprise applications, with a pay-as-you-go pricing model.

Important AWS Services

Here, are essential AWS services.

AWS Compute Services

Here, are Cloud Compute Services offered by Amazon:

1. **EC2(Elastic Compute Cloud)** - EC2 is a virtual machine in the cloud on which you have OS level control. You can run this cloud server whenever you want.
2. **LightSail**-This cloud computing tool automatically deploys and manages the computer, storage, and networking capabilities required to run your applications.
3. **Elastic Beanstalk—** The tool offers automated deployment and provisioning of resources like a highly scalable production website.
4. **EKS (Elastic Container Service for Kubernetes)—**The tool allows you to Kubernetes on Amazon cloud environment without installation.
5. **AWS Lambda—**This AWS service allows you to run functions in the cloud. The tool is a big cost saver for you as you to pay only when your functions execute.

Migration

Migration services used to transfer data physically between your datacenter and AWS.

1. **DMS (Database Migration Service)**-DMS service can be used to migrate on-site databases to AWS. It helps you to migrate from one type of database to another — for example, Oracle to MySQL.
2. **SMS (Server Migration Service)**-SMS migration services allows you to migrate on-site servers to AWS easily and quickly.

3. **Snowball**—Snowball is a small application which allows you to transfer terabytes of data inside and outside of AWS environment.

Storage

1. **Amazon Glacier-** It is an extremely low-cost storage service. It offers secure and fast storage for data archiving and backup.
2. **Amazon Elastic Block Store (EBS)-** It provides block-level storage to use with Amazon EC2 instances. Amazon Elastic Block Store volumes are network-attached and remain independent from the life of an instance.
3. **AWS Storage Gateway-** This AWS service is connecting on-premises software applications with cloud-based storage. It offers secure integration between the company's on-premises and AWS's storage infrastructure.

Security Services

1. **IAM (Identity and Access Management)**— IAM is a secure cloud security service which helps you to manage users, assign policies, form groups to manage multiple users.
2. **Inspector**—It is an agent that you can install on your virtual machines, which reports any security vulnerabilities.
3. **Certificate Manager**—The service offers free SSL certificates for your domains that are managed by Route53.
4. **WAF (Web Application Firewall)**— WAF security service offers application-level protection and allows you to block SQL injection and helps you to block cross-site scripting attacks.
5. **Cloud Directory**—This service allows you to create flexible, cloud-native directories for managing hierarchies of data along multiple dimensions.
6. **KMS (Key Management Service)**—It is a managed service. This security service helps you to create and control the encryption keys which allows you to encrypt your data.
7. **Organizations**—You can create groups of AWS accounts using this service to manages security and automation settings.
8. **Shield**—Shield is managed DDoS (Distributed Denial of Service protection service). It offers safeguards against web applications running on AWS.
9. **Macie**—It offers a data visibility security service which helps classify and protect your sensitive critical content.
10. **GuardDuty** —It offers threat detection to protect your AWS accounts and workloads.

Database Services

1. **Amazon RDS-** This Database AWS service is easy to set up, operate, and scale a relational database in the cloud.

2. **Amazon DynamoDB-** It is a fast, fully managed NoSQL database service. It is a simple service which allow cost-effective storage and retrieval of data. It also allows you to serve any level of request traffic.
3. **Amazon ElastiCache-** It is a web service which makes it easy to deploy, operate, and scale an in-memory cache in the cloud.
4. **Neptune-** It is a fast, reliable and scalable **graph database** service.
5. **Amazon RedShift-**It is Amazon's data warehousing solution which you can use to perform complex OLAP queries.

Analytics

1. **Athena**—This analytics service allows perm SQL queries on your S3 bucket to find files.
2. **CloudSearch**—You should use this AWS service to create a fully managed search engine for your website.
3. **ElasticSearch**—It is similar to CloudSearch. However, it offers more features like application monitoring.
4. **Kinesis**—This AWS analytics service helps you to stream and analyzing real-time data at massive scale.
5. **QuickSight** —It is a business analytics tool. It helps you to create visualizations in a dashboard for data in Amazon Web Services. For example, S3, DynamoDB, etc.
6. **EMR (Elastic Map Reduce)**—This AWS analytics service mainly used for big data processing like Spark, Splunk, Hadoop, etc.
7. **Data Pipeline**—Allows you to move data from one place to another. For example from DynamoDB to S3.

Management Services

1. **CloudWatch**—Cloud watch helps you to monitor AWS environments like EC2, RDS instances, and CPU utilization. It also triggers alarms depends on various metrics.
2. **CloudFormation**—It is a way of turning infrastructure into the cloud. You can use templates for providing a whole production environment in minutes.
3. **CloudTrail**—It offers an easy method of auditing AWS resources. It helps you to log all changes.
4. **OpsWorks**—The service allows you to automated Chef/Puppet deployments on AWS environment.
5. **Config**—This AWS service monitors your environment. The tool sends alerts about changes when you break certain defined configurations.
6. **Service Catalog**—This service helps large enterprises to authorize which services user will be used and which won't.
7. **AWS Auto Scaling**—The service allows you to automatically scale your resources up and down based on given CloudWatch metrics.

8. **Systems Manager**—This AWS service allows you to group your resources. It allows you to identify issues and act on them.
9. **Managed Services**—It offers management of your AWS infrastructure which allows you to focus on your applications.

Internet of Things

1. **IoT Core**— It is a managed cloud AWS service. The service allows connected devices like cars, light bulbs, sensor grids, to securely interact with cloud applications and other devices.
2. **IoT Device Management**—It allows you to manage your IoT devices at any scale.
3. **IoT Analytics**—This AWS IOT service is helpful to perform analysis on data collected by your IoT devices.
4. **Amazon FreeRTOS**—This real-time operating system for microcontrollers helps you to connect IoT devices in the local server or into the cloud.

Application Services

1. **Step Functions**—It is a way of visualizing what's going inside your application and what different microservices it is using.
2. **SWF (Simple Workflow Service)**—The service helps you to coordinate both automated tasks and human-led tasks.
3. **SNS (Simple Notification Service)**—You can use this service to send you notifications in the form of email and SMS based on given AWS services.
4. **SQS (Simple Queue Service)**—Use this AWS service to decouple your applications. It is a pull-based service.
5. **Elastic Transcoder**—This AWS service tool helps you to changes a video's format and resolution to support various devices like tablets, smartphones, and laptops of different resolutions.

Deployment and Management

1. **AWS CloudTrail:** The services records AWS API calls and send backlog files to you.
2. **Amazon CloudWatch:** The tools monitor AWS resources like Amazon EC2 and Amazon RDS DB Instances. It also allows you to monitor custom metrics created by user's applications and services.
3. **AWS CloudHSM:** This AWS service helps you meet corporate, regulatory, and contractual, compliance requirements for maintaining data security by using the Hardware Security Module(HSM) appliances inside the AWS environment.

Developer Tools

1. **CodeStar**—Codestar is a cloud-based service for creating, managing, and working with various software development projects on AWS.
2. **CodeCommit**— It is AWS's version control service which allows you to store your code and other assets privately in the cloud.

3. **CodeBuild**—This Amazon developer service help you to automates the process of building and compiling your code.
4. **CodeDeploy**—It is a way of deploying your code in EC2 instances automatically.
5. **CodePipeline**—It helps you create a deployment pipeline like testing, building, testing, authentication, deployment on development and production environments.
6. **Cloud9** —It is an Integrated Development Environment for writing, running, and debugging code in the cloud.

Mobile Services

1. **Mobile Hub**—Allows you to add, configure and design features for mobile apps.
2. **Cognito**—Allows users to signup using his or her social identity.
3. **Device Farm**—Device farm helps you to improve the quality of apps by quickly testing hundreds of mobile devices.
4. **AWS AppSync** —It is a fully managed GraphQL service that offers real-time data synchronization and offline programming features.

Business Productivity

1. **Alexa for Business**—It empowers your organization with voice, using Alexa. It will help you to Allows you to build custom voice skills for your organization.
2. **Chime**—Can be used for online meeting and video conferencing.
3. **WorkDocs**—Helps to store documents in the cloud
4. **WorkMail**—Allows you to send and receive business emails.

Desktop & App Streaming

1. **WorkSpaces**—Workspace is a VDI (Virtual Desktop Infrastructure). It allows you to use remote desktops in the cloud.
2. **AppStream —**A way of streaming desktop applications to your users in the web browser. For example, using MS Word in Google Chrome.

Artificial Intelligence

1. **Lex**—Lex tool helps you to build chatbots **quickly.**
2. **Polly**— It is AWS's text-to-speech service allows you to create audio versions of your notes.
3. **Rekognition** —It is AWS's face recognition service. This AWS service helps you to recognize faces and object in images and videos.
4. **SageMaker**—Sagemaker allows you to build, train, and deploy machine learning models at any scale.
5. **Transcribe**— It is AWS's speech-to-text service that offers high-quality and affordable transcriptions.
6. **Translate**—It is a very similar tool to Google Translate which allows you to translate text in one language to another.

AR & VR (Augmented Reality & Virtual Reality)

1. **Sumerian**—Sumerian is a set of tool for offering high-quality virtual reality (VR) experiences on the web. The service allows you to create interactive 3D scenes and publish it as a website for users to access.

Customer Engagement

1. **Amazon Connect**—Amazon Connect allows you to create your customer care center in the cloud.
2. **Pinpoint**—Pinpoint helps you to understand your users and engage with them.
3. **SES (Simple Email Service)**—Helps you to send bulk emails to your customers at a relatively cost-effective price.

Game Development

1. **GameLift-** It is a service which is managed by AWS. You can use this service to host dedicated game servers. It allows you to scale seamlessly without taking your game offline.

Applications of AWS services

Amazon Web services are widely used for various computing purposes like:

- Web site hosting
- Application hosting/SaaS hosting
- Media Sharing (Image/ Video)
- Mobile and Social Applications
- Content delivery and Media Distribution
- Storage, backup, and disaster recovery
- Development and test environments
- Academic Computing
- Search Engines
- Social Networking

Companies using AWS

- Instagram
- Zoopla
- Smugmug
- Pinterest
- Netflix
- Dropbox
- Etsy
- Talkbox
- Playfish
- Ftopia

Advantages of AWS

Following are the pros of using AWS services:

- AWS allows organizations to use the already familiar programming models, operating systems, databases, and architectures.
- It is a cost-effective service that allows you to pay only for what you use, without any up-front or long-term commitments.
- You will not require to spend money on running and maintaining data centers.
- Offers fast deployments

- You can easily add or remove capacity.
- You are allowed cloud access quickly with limitless capacity.
- Total Cost of Ownership is very low compared to any private/dedicated servers.
- Offers Centralized Billing and management
- Offers Hybrid Capabilities
- Allows you to deploy your application in multiple regions around the world with just a few clicks

Disadvantages of AWS

- If you need more immediate or intensive assistance, you'll have to opt for paid support packages.
- Amazon Web Services may have some common cloud computing issues when you move to a cloud. For example, downtime, limited control, and backup protection.
- AWS sets default limits on resources which differ from region to region. These resources consist of images, volumes, and snapshots.
- Hardware-level changes happen to your application which may not offer the best performance and usage of your applications.

Best practices of AWS

- You need to design for failure, but nothing will fail.
- It's important to decouple all your components before using AWS services.
- You need to keep dynamic data closer to compute and static data closer to the user.
- It's important to know security and performance tradeoffs.
- Pay for computing capacity by the hourly payment method.
- Make a habit of a one-time payment for each instance you want to reserve and to receive a significant discount on the hourly charge.

How to Create EC2 Instance in AWS:

What is Amazon EC2 Instance?

An **EC2 instance** is nothing but a virtual server in Amazon Web services terminology. It stands for**Elastic Compute Cloud.** It is a web service where an AWS subscriber can request and provision a compute server in AWS cloud.

An **on-demand** EC2 instance is an offering from AWS where the subscriber/user can rent the virtual server per hour and use it to deploy his/her own applications.

The instance will be charged per hour with different rates based on the type of the instance chosen. AWS provides multiple instance types for the respective business needs of the user.

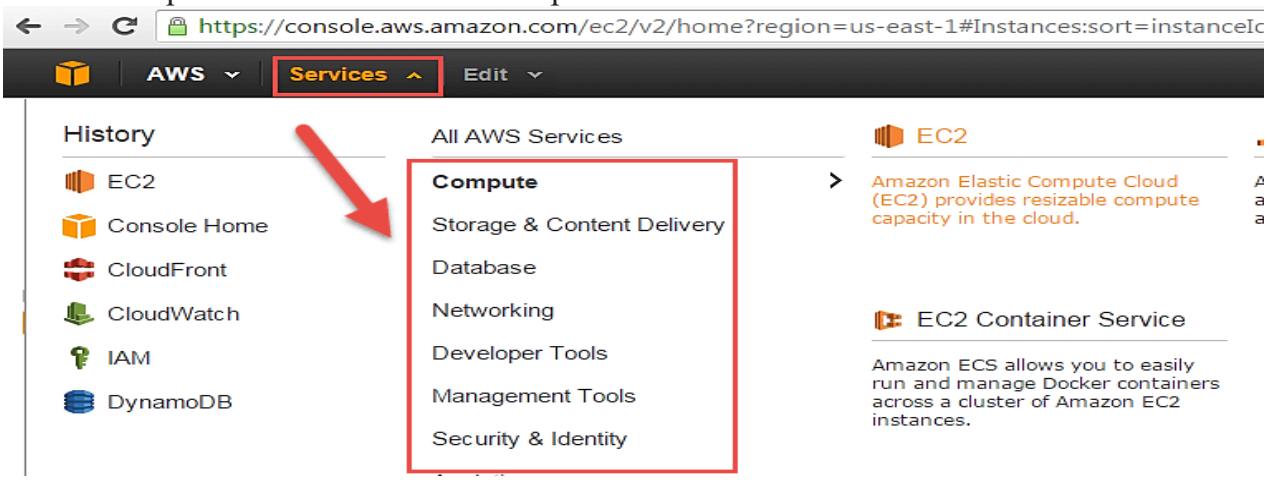
Thus, you can rent an instance based on your own CPU and memory requirements and use it as long as you want. You can terminate the instance when it’s no more used and save on costs. This is the most striking advantage of an on-demand instance- you can drastically save on your CAPEX.

Let us see in detail how to launch an on-demand EC2 instance in AWS Cloud.

Login and access to AWS services

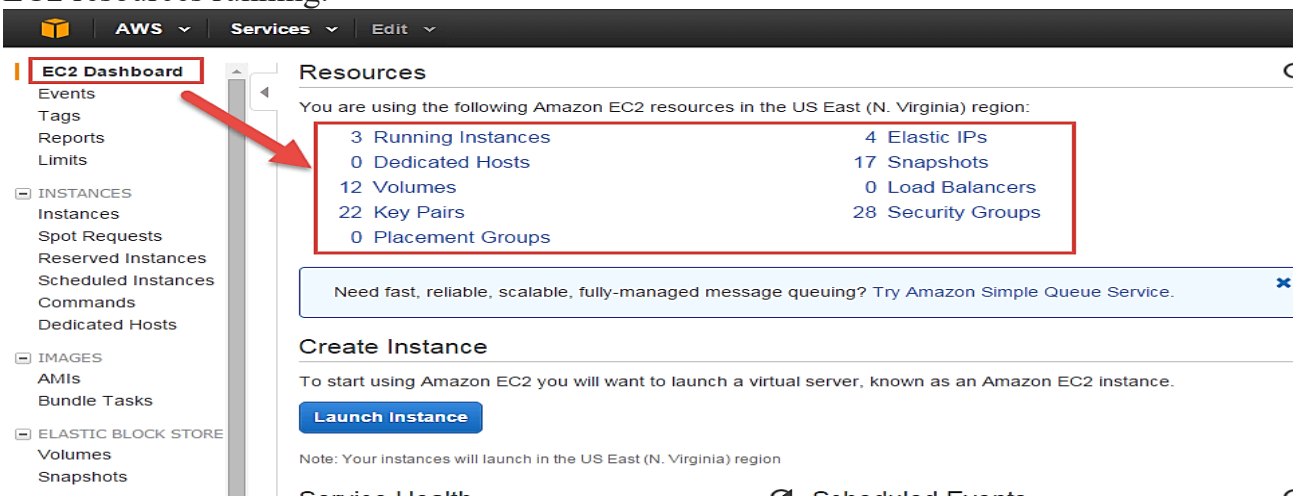
Step 1) In this step,

- Login to your AWS account and go to the AWS Services tab at the top left corner.
- Here, you will see all of the AWS Services categorized as per their area viz. Compute, Storage, Database, etc. For creating an EC2 instance, we have to choose Computeà EC2 as in the next step.



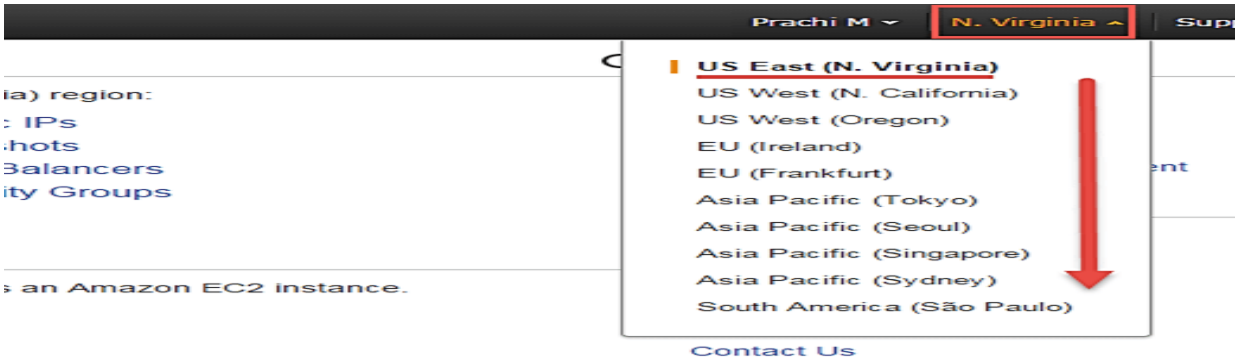
- Open all the services and click on EC2 under Compute services. This will launch the dashboard of EC2.

Here is the EC2 dashboard. Here you will get all the information in gist about the AWS EC2 resources running.



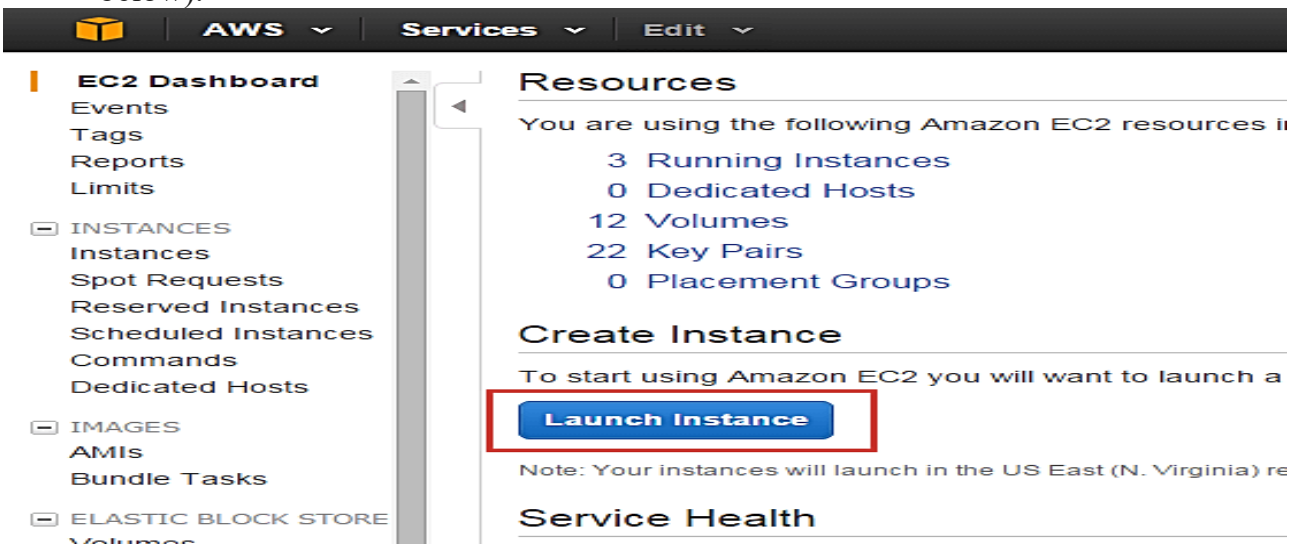
Step 2) On the top right corner of the EC2 dashboard, choose the AWS Region in which you want to provision the EC2 server.

Here we are selecting N. Virginia. AWS provides 10 Regions all over the globe.



Step 3) In this step

- Once your desired Region is selected, come back to the EC2 Dashboard.
- Click on 'Launch Instance' button in the section of Create Instance (as shown below).

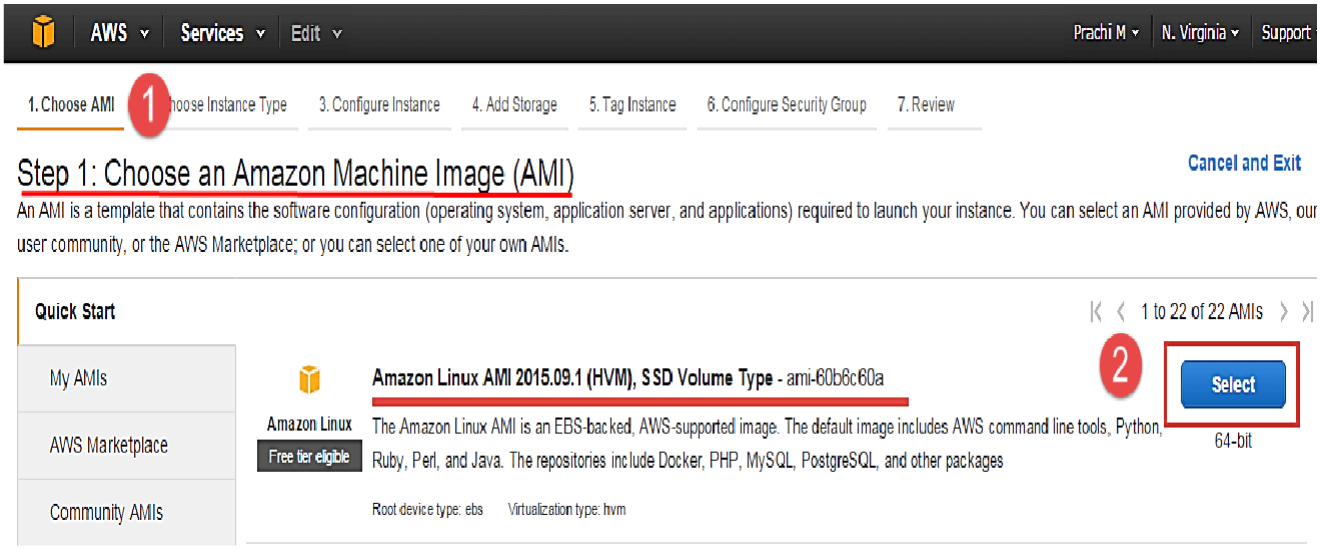


- Instance creation wizard page will open as soon as you click 'Launch Instance'.

Choose AMI

Step 1) In this step we will do,

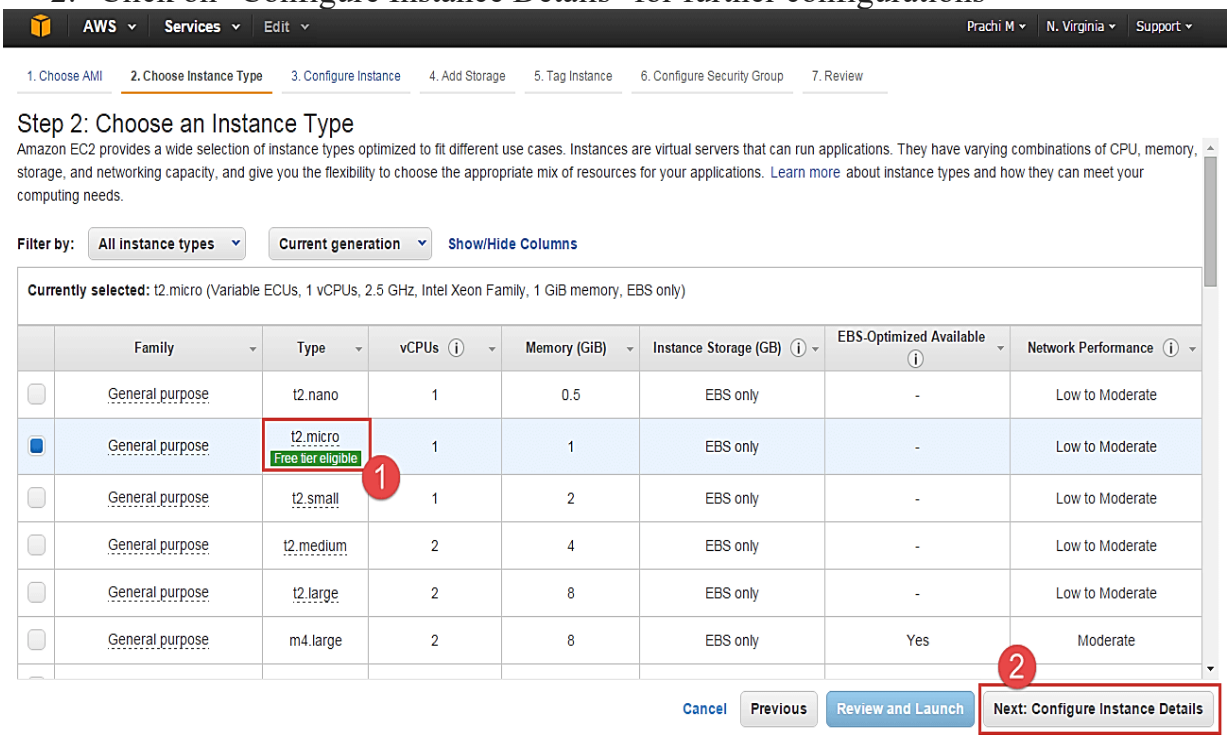
1. You will be asked to choose an AMI of your choice. (An AMI is an Amazon Machine Image. It is a template basically of an Operating System platform which you can use as a base to create your instance). Once you launch an EC2 instance from your preferred AMI, the instance will automatically be booted with the desired OS. (We will see more about AMIs in the coming part of the tutorial).
2. Here we are choosing the default Amazon Linux (64 bit) AMI.



Choose EC2 Instance Types

Step 1) In the next step, you have to choose the type of instance you require based on your business needs.

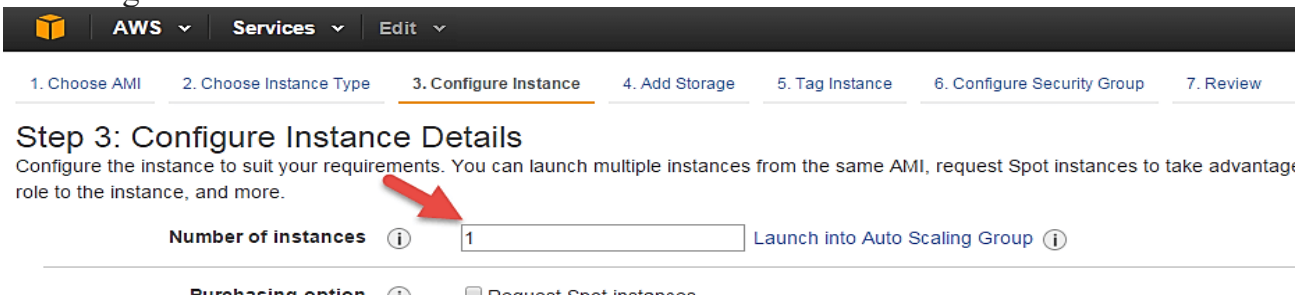
1. We will choose t2.micro instance type, which is a 1vCPU and 1GB memory server offered by AWS.
2. Click on "Configure Instance Details" for further configurations



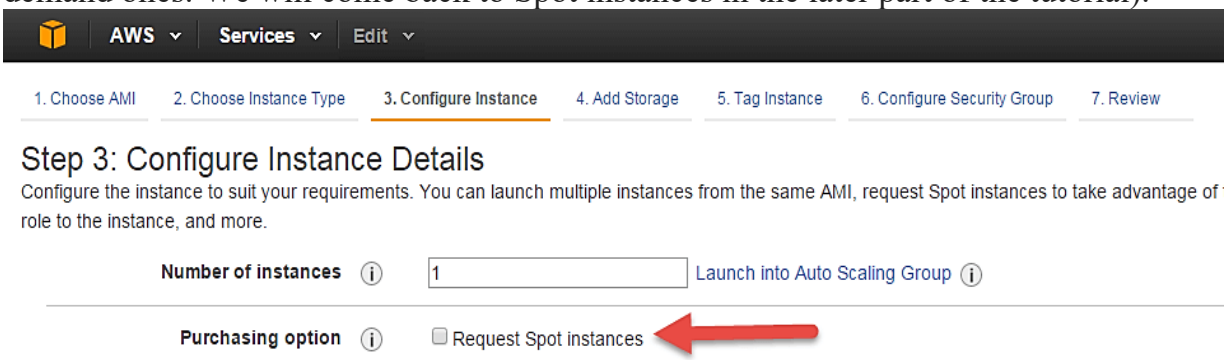
- In the next step of the wizard, enter details like no. of instances you want to launch at a time.
- Here we are launching one instance.

Configure Instance

Step 1) No. of instances- you can provision up to 20 instances at a time. Here we are launching one instance.



Step 2) Under Purchasing Options, keep the option of 'Request Spot Instances' unchecked as of now. (This is done when we wish to launch Spot instances instead of on-demand ones. We will come back to Spot instances in the later part of the tutorial).



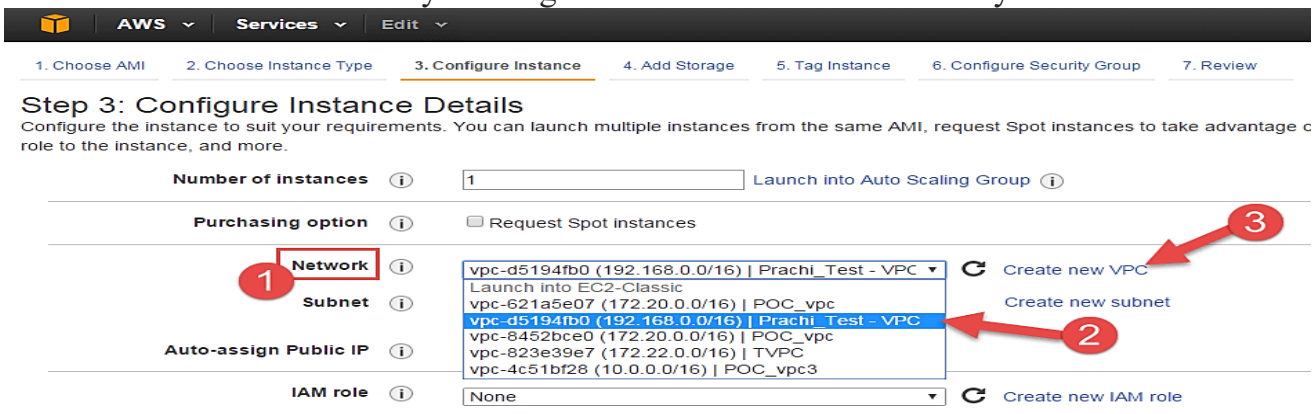
Step 3) Next, we have to configure some basic networking details for our EC2 server.

- You have to decide here, in which VPC (Virtual Private Cloud) you want to launch your instance and under which subnets inside your VPC. It is better to determine and plan this prior to launching the instance. Your AWS architecture set-up should include IP ranges for your subnets etc. pre-planned for better management. (We will see how to create a new VPC in Networking section of the tutorial.
- Subnetting should also be pre-planned. E.g.: If it's a web server you should place it in the public subnet and if it's a DB server, you should place it in a private subnet all inside your VPC.

Below,

1. Network section will give a list of VPCs available in our platform.
2. Select an already existing VPC
3. You can also create a new VPC

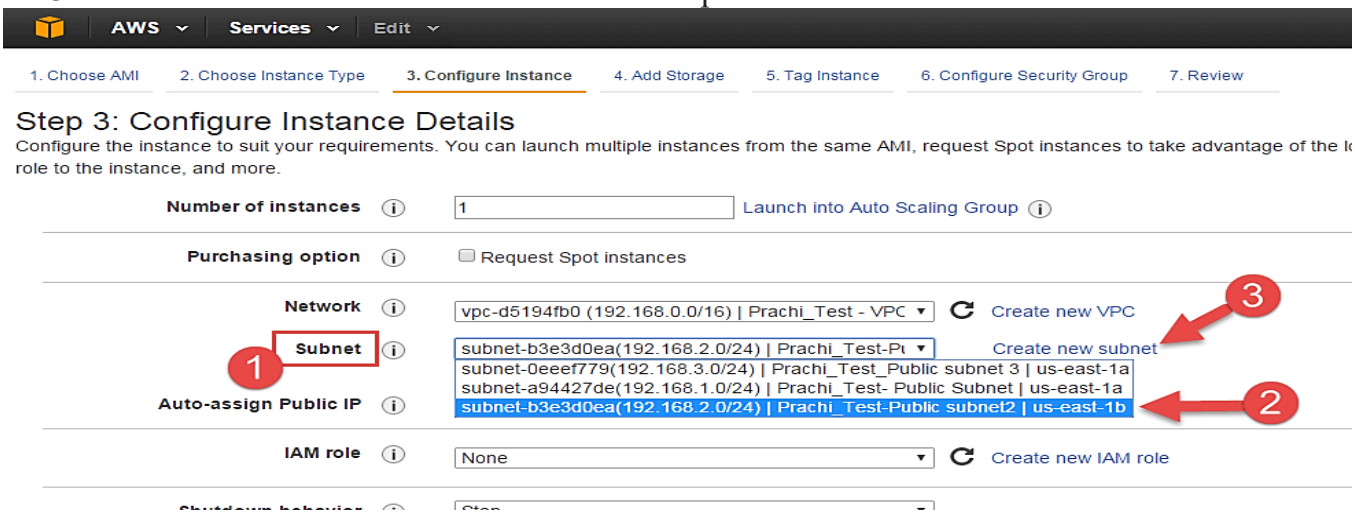
Here I have selected an already existing VPC where I want to launch my instance.



Step 4) In this step,

- A VPC consists of subnets, which are IP ranges that are separated for restricting access.
- Below,

1. Under Subnets, you can choose the subnet where you want to place your instance.
2. I have chosen an already existing public subnet.
3. You can also create a new subnet in this step.

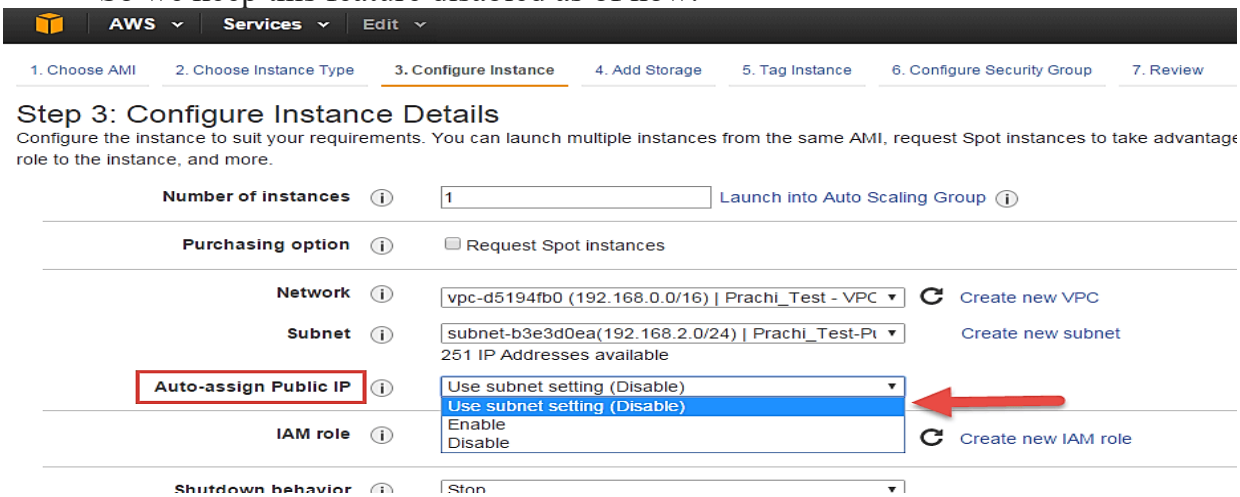


- Once your instance is launched in a public subnet, AWS will assign a dynamic public IP to it from their pool of IPs.

Step 5) In this step,

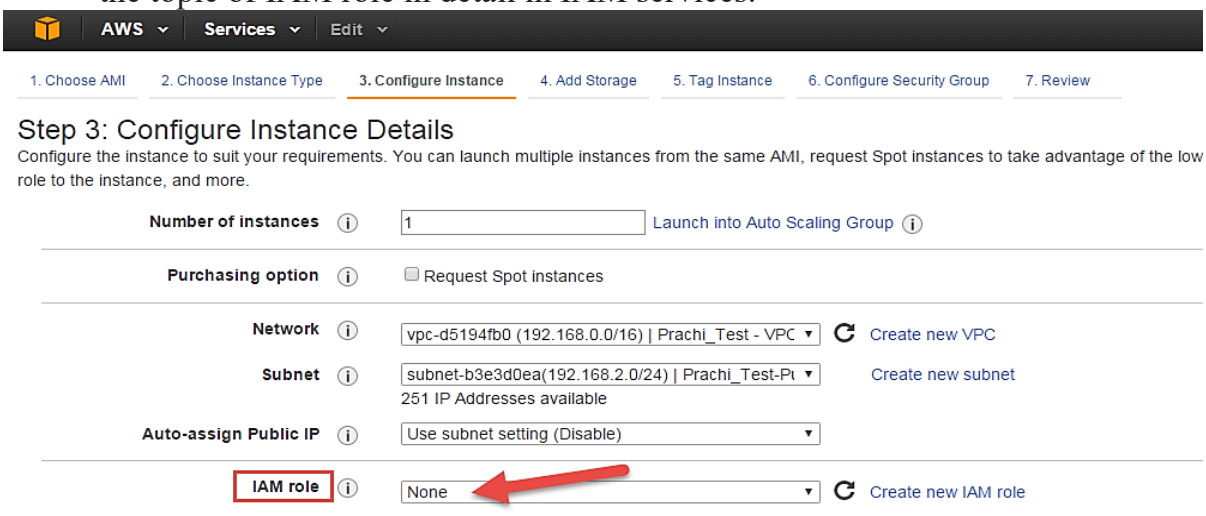
- You can choose if you want AWS to assign it an IP automatically, or you want to do it manually later. You can enable/ disable 'Auto assign Public IP' feature here likewise.

- Here we are going to assign this instance a static IP called as EIP (Elastic IP) later. So we keep this feature disabled as of now.



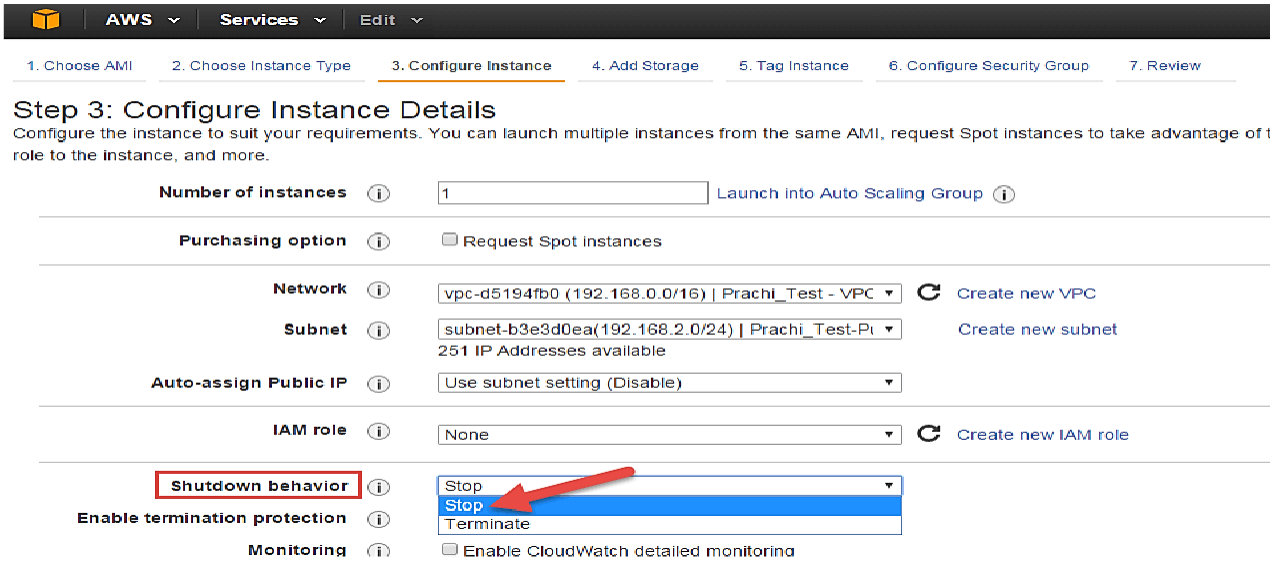
Step 6) In this step,

- In the following step, keep the option of IAM role 'None' as of now. We will visit the topic of IAM role in detail in IAM services.



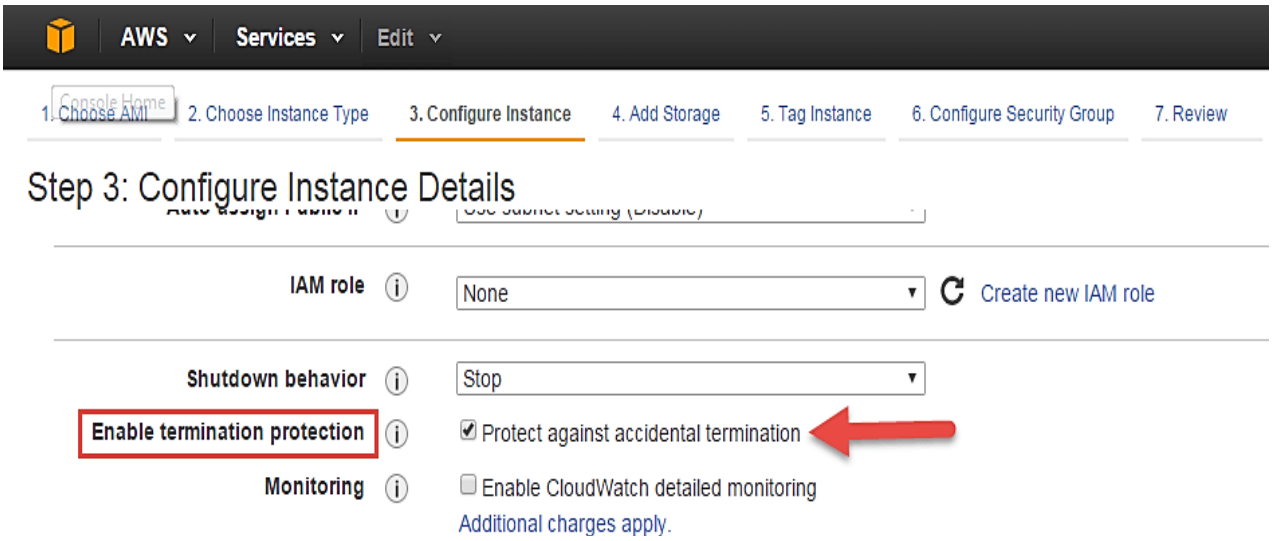
Step 7) In this step, you have to do following things

- Shutdown Behavior – when you accidently shut down your instance, you surely don't want it to be deleted but stopped.
- Here we are defining my shutdown behavior as Stop.



Step 8) In this step,

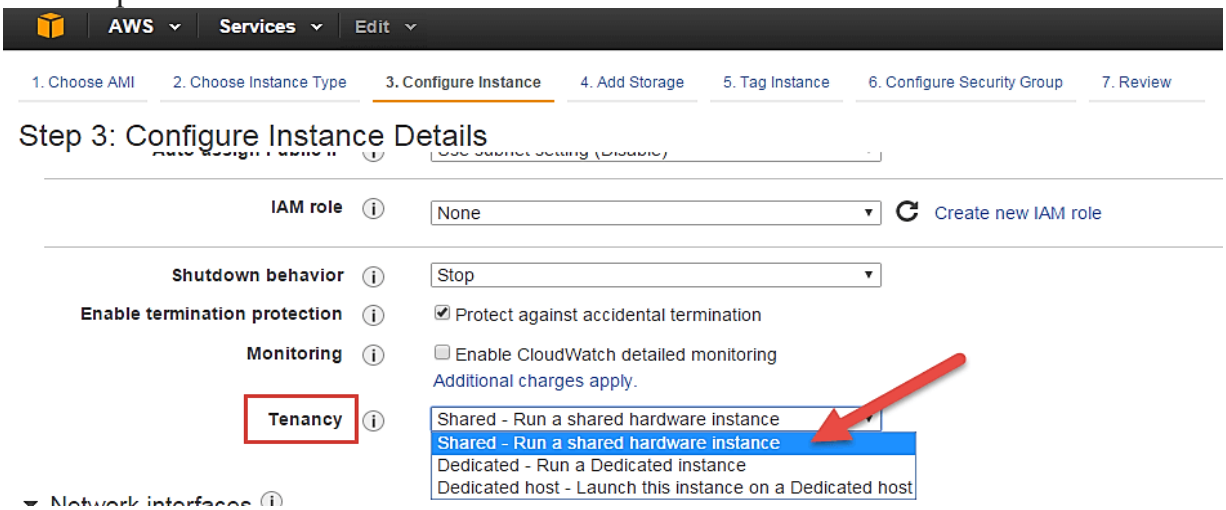
- In case, you have accidently terminated your instance, AWS has a layer of security mechanism. It will not delete your instance if you have enabled accidental termination protection.
- Here we are checking the option for further protecting our instance from accidental termination.



Step 9) In this step,

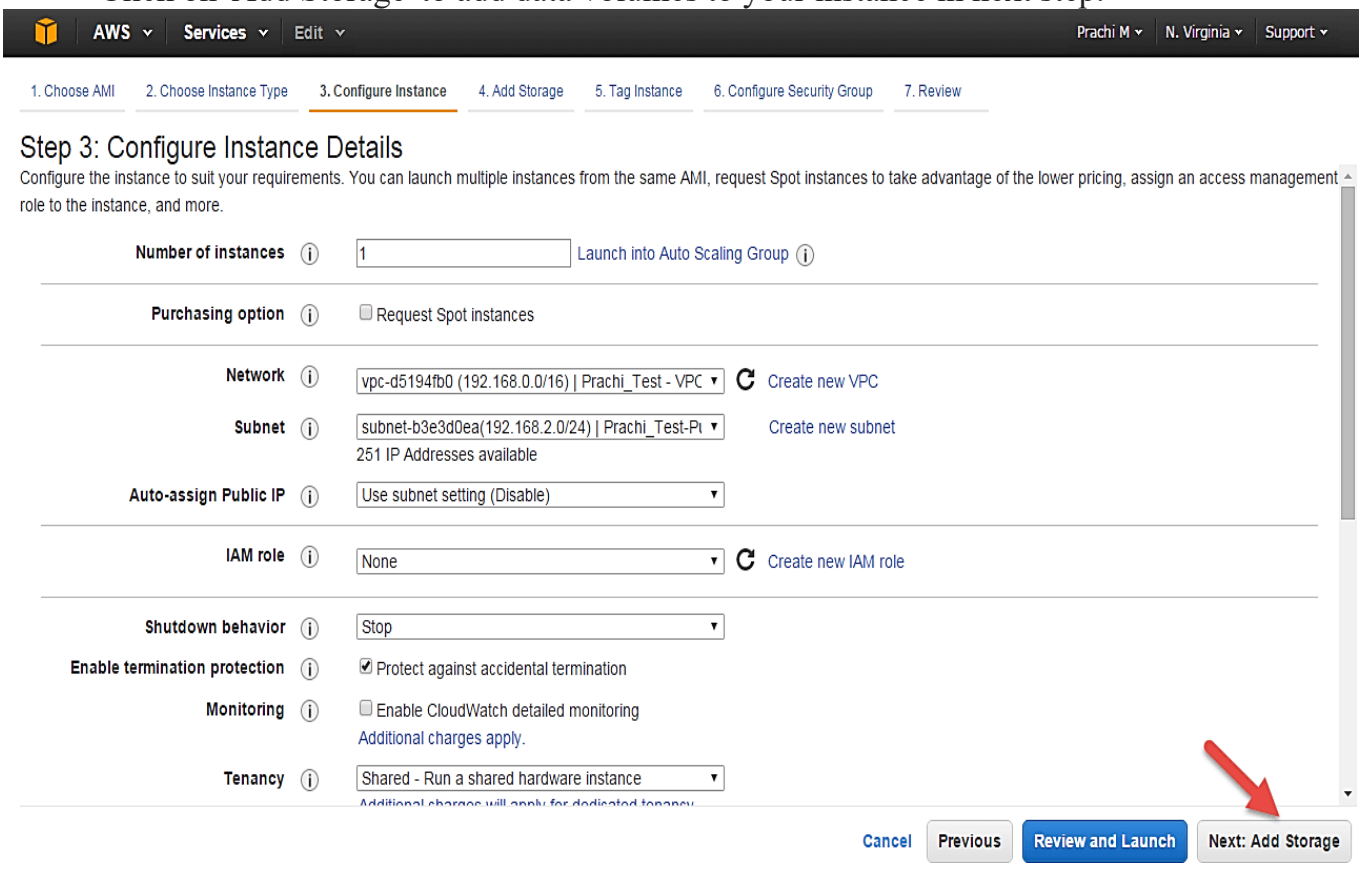
- Under Monitoring- you can enable Detailed Monitoring if your instance is a business critical instance. Here we have kept the option unchecked. AWS will always provide Basic monitoring on your instance free of cost. We will visit the topic of monitoring in AWS Cloud Watch part of the tutorial.

- Under Tenancy- select the option if shared tenancy. If your application is a highly secure application, then you should go for dedicated capacity. AWS provides both options.



Step 10) In this step,

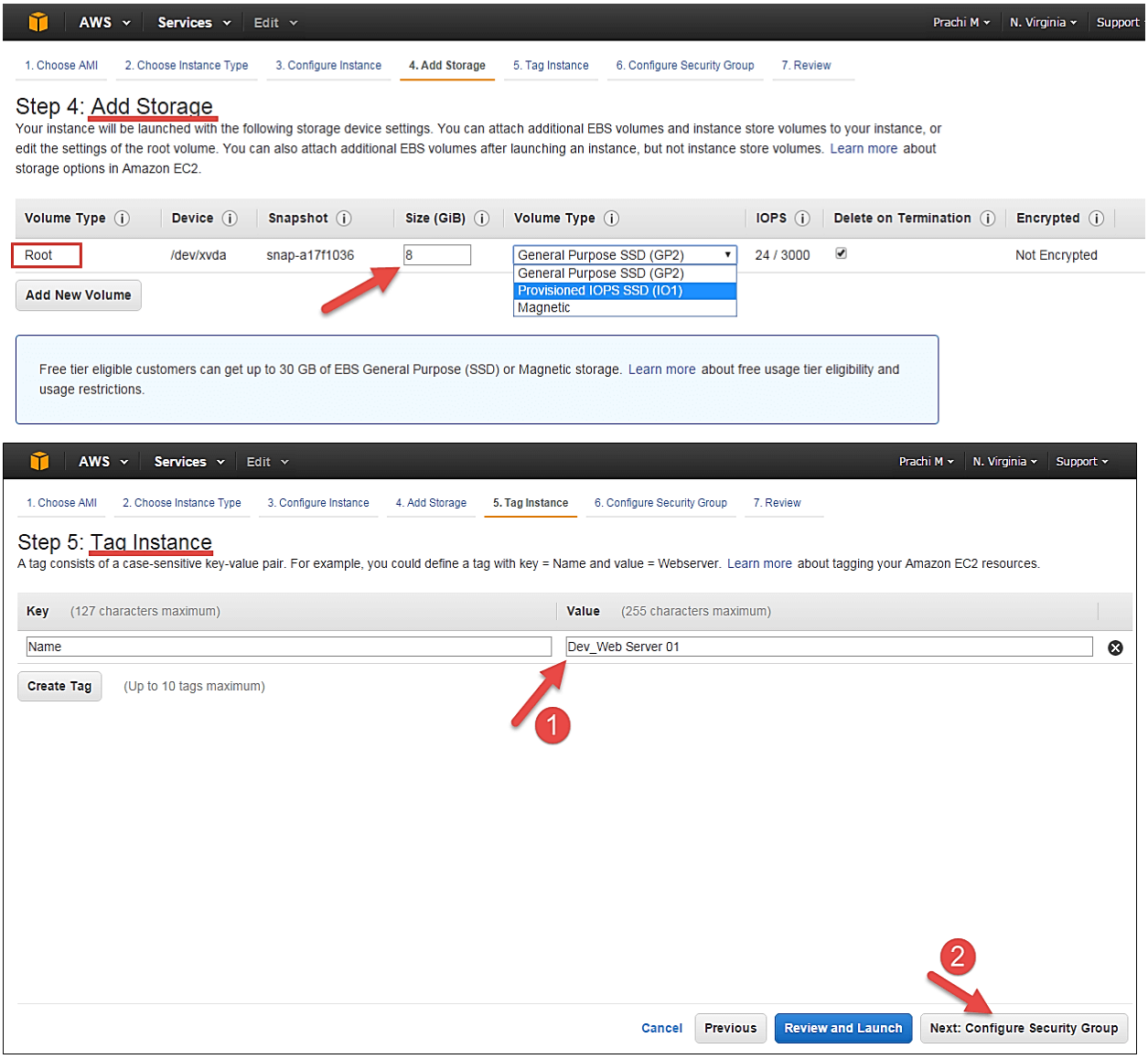
- Click on 'Add Storage' to add data volumes to your instance in next step.



Add Storage

Step 1) In this step we do following things,

- In the Add Storage step, you'll see that the instance has been automatically provisioned a General Purpose SSD root volume of 8GB. (Maximum volume size we can give to a General Purpose volume is 16GB)
- You can change your volume size, add new volumes, change the volume type, etc.
- AWS provides 3 types of EBS volumes- Magnetic, General Purpose SSD, Provisioned IOPs. You can choose a volume type based on your application's IOPs needs.



Tag Instance

Step 1) In this step

- you can tag your instance with a key-value pair. This gives visibility to the AWS account administrator when there are lot number of instances.
- The instances should be tagged based on their department, environment like Dev/SIT/Prod. Etc. this gives a clear view of the costing on the instances under one common tag.

1. Here we have tagged the instance as a **Dev_Web server 01**
2. Go to configure Security Groups later

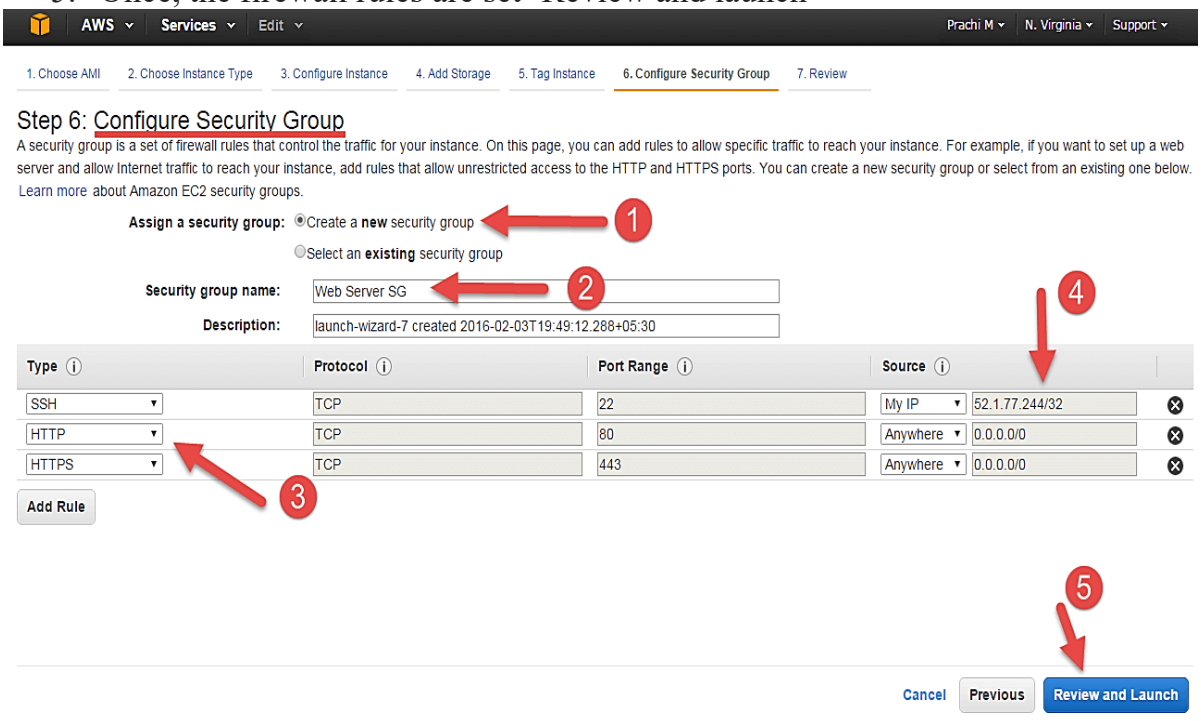
Configure Security Groups

Step 1) In this next step of configuring Security Groups, you can restrict traffic on your instance ports. This is an added firewall mechanism provided by AWS apart from your instance's OS firewall.

You can define open ports and IPs.

- Since our server is a webserver=, we will do following things

1. Creating a new Security Group
2. Naming our SG for easier reference
3. Defining protocols which we want enabled on my instance
4. Assigning IPs which are allowed to access our instance on the said protocols
5. Once, the firewall rules are set- Review and launch



What is Azure?

Azure is an open source and flexible cloud platform which helps in development, service hosting, service management, and data storage. The Azure cloud computing tool hosts web applications over the internet with the help of Microsoft data centers.

What is Aws?

Amazon Web Services is widely used secure cloud services platform, offering computing power, content delivery, database storage, and other functionality to help businesses scale and grow.

Comparison between Azure and AWS

Parameters	**AWS**	**Azure**
Launched Date	Launched in 2006.	Launched In 2010.
Market Share	31% Share of the global computing market	11% Share from the worldwide market.
Availability Zone	61 Availability Zone	140 Availability Zones
Storage services	• S3 • Buckets • EBS • SDB • domains • Easy to use • SQS • CloudFront • AWS Import/Export	• Blob Storage • Containers • Azure Drive • Table Storage • Tables • Storage Stats
Databases Services	• MySQL • Oracle • DynamoDB	• MS SQL • SQL Sync
Deployment Services	• Amazon Web Services • Amazon Machine Instance (AMI) • Traditional Deployment Models	Cspkg (fancy zip file) Upload via portal or API via blob storage Course-grained updates "click to scale." More magic

	• Fine-grained updates • Elastic Beanstalk • Cloud Formation	
Networking Services	• IP/Elastic IP/ELB • Virtual Private Cloud • Route 53 • ELB • Firewall heavily configurable	• Automatic IP assignment • Load-balancing • Azure Connect • Balancing • Endpoints defined in csdef/cscfg
Price	Per hour- rounded up	On-demand reserved spot.
Customers	Adobe, Airbnb, Expedia, Yelp, Nokia, Netflix, Novartis.	Pearson, 3M, Towers Watson, NBC, Essar, Serko, etc.
Type of Cloud	Virtual Private Cloud (VPC)	Virtual Network
Connection type	Direct Connect	ExpressRoute
Pricing models	• Free Tier • Per Hour • Free Trial Per Minute • No change for stopped • Pay for EBS volume	• Free Trial • Per Minute
Government Cloud	AWS has an edge as far as government cloud offerings.	Limited reach for government cloud offerings.
Support for Hybrid cloud	Does not offers the best of hybrid cloud support.	With Hybrid Cloud, organizations can integrate onsite servers with Cloud instances.
Ecosystem	AWS has a software marketplace with an extensive partner ecosystem.	With very few Linux options, Azure doesn't' have a big ecosystem.
Support for Big Data	EBS storage is ideal for handling big data.	Standard storage has many issues for big data, and therefore you need premium storage.

Maturity	More mature cloud environment for big data.	The less mature environment for big data.
Machine access	In AWS machine can be accessed separately.	Machines are grouped into cloud service and respond to the same domain name with various ports.
Salary	The average salary for "AWD engineer" is approximately $141,757 per year for Software Architect.	The average salary for "Microsoft Azure" ranges from approximately $113,582 per year.
Key features	Zero setups, Detail Monitoring, Auto-scaling groups.	Startup friendly, High performance, Low cost.
Long term data archiving	Allows long term data archiving and retrieval.	Does not offer any long term data archiving and retrieval option.
Security	Security is provided using defined roles with permission control feature.	Provides security by offering permissions on the whole account.

Popularity Index with Market Share

Stack Overflow Questions AWS vs. Azure

AWS continues to dominate a global cloud-infrastructure services industry which is likely to hit proximately $70 billion last year. Today, it enjoys market share which is better than some top public cloud providers.

Google Trends Azure vs. AWS

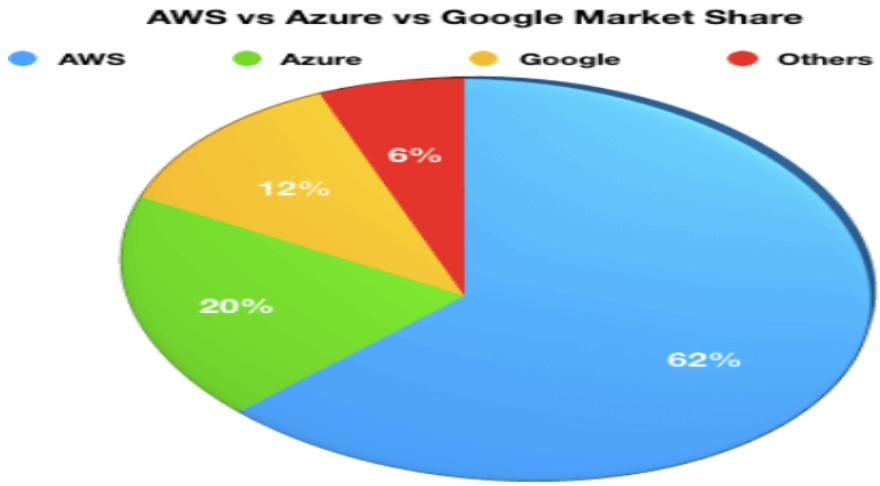
In the past year, Azure's cloud adoption rate is almost 85 percent that of AWS', up from 70 percent last year.

Advantages of AWS

Here, are significant advantages of adopting AWS cloud services:

- Compute Cloud allows you to increase or decrease storage according to the need of your organization
- AWS enables you to select an operating system, programming language, database of your choice.
- Broad & deep service offerings
- Robust partner ecosystem
- Trusted by high-profile customers
- High Transfer Stability
- Minimal information is lost during server and storage transfer

- Offers more data centers for availability and low latency
- Better DevOps support
- Simpler licensing method
- Stronger support for Bl and analytics



Advantages of Azure

Here, are some major advantages of using Azure cloud services:

- Capability for developers and users to create, maintain and deploy applications
- Fully scalable cloud computing platform offers open access across multiple languages, frameworks, and tools
- Total support for Microsoft legacy apps
- Greater awareness of enterprise needs
- Easy one-click migrations in many cases
- Conversion of on-prem licenses to the cloud
- Support for mixed Linux/Windows environments
- Offers inbuilt tool like Azure stack to help the organization deliver Azure service from the own data center

Disadvantages of AWS

Here, are few drawbacks of Amazon Web Services:

- Less hybrid- cloud-friendly
- AWS elastic load balancer is not equipped to handle as many requests as it receives
- AWS lacks customer support, so it more suitable for a technically savvy group of consumers and those companies who have their inbuild tech support team
- The number of choices offered by AWS is confusing to those who may not speak the language of technology.
- Incompatible and Weak Hybrid Strategy

- AWS is a less open private cloud. This makes it an unpopular storage option for sensitive industries like banking
- AWS has too many products which makes the selection process much harder

Disadvantages of Azure

The major Drawbacks of Azure cloud services are:

- Customer service is not transparent, and data is hosted globally. So, if you have data restrictions where it must be stored in a specific country, at that time you need to verify/specify with Microsoft
- You will be charged extra for paying as you go
- Azure cloud-based services are full of glitches. To fix these bugs, you will need to spend additional money
- Less flexibility about non-Windows server platforms, when compared to AWS