AMRITA VISHWA VIDYAPEETHAM

15CSE337
Cloud Computing and Services

AWS Overview

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What have we learnt so far?

- Various distributed computing paradigms
- Basic concepts in large scale network programming
  - APIs
  - Web services
- SaaS – Google APIs in detail
- Now we are going to spend some time on IaaS and PaaS
  - Amazon Web Services as example

Compute
Amazon EC2
Amazon EC2 Auto Scaling
Amazon Elastic Container Service
Amazon Elastic Container Service for Kubernetes
Amazon Elastic Container Registry
Amazon Lightsail
AWS Batch
AWS Elastic Beanstalk
AWS Fargate
AWS Lambda
AWS Serverless Application Repository
Elastic Load Balancing
VMware Cloud on AWS

Storage
Amazon Simple Storage Service (S3)
Amazon Elastic Block Store (EBS)
Amazon Elastic File System (EFS)
Amazon Glacier
AWS Storage Gateway
AWS Snowball
AWS Snowball Edge

Networking & Content Delivery
Amazon VPC
Amazon VPC PrivateLink
Amazon CloudFront
Amazon Route 53
Amazon API Gateway
AWS Direct Connect
Elastic Load Balancing

Developer Tools
AWS CodeStar
AWS CodeCommit
AWS CodeBuild
AWS CodeDeploy
AWS CodePipeline
AWS Cloud9
AWS X-Ray
AWS Tools & SDKs

Management Tools
Amazon CloudWatch
AWS Auto Scaling
AWS CloudFormation
AWS CloudTrail

Machine Learning
Amazon SageMaker
Amazon Comprehend
Amazon Lex
Amazon Polly
Amazon Rekognition
Amazon Machine Learning
Amazon Translate
Amazon Transcribe
AWS DeepLens
AWS Deep Learning AMIs
Apache MXNet on AWS
TensorFlow on AWS

Analytics
Amazon Athena
Amazon EMR
Amazon CloudSearch
Amazon Elasticsearch Service
Amazon Kinesis
Amazon Redshift
Amazon QuickSight
AWS Data Pipeline
AWS Glue

AR & VR
Amazon Sumerian

Application Integration
Amazon MQ
Amazon Simple Queue Service (SQS)
Amazon Simple Notification Service (SN
AWS AppSync
AWS Step Functions

Customer Engagement
Amazon Connect
Amazon Pinpoint
Amazon Simple Email Service (SES)

Business Productivity
Alexa for Business
Amazon Chime
Amazon WorkDocs
Amazon WorkMail

Desktop & App Streaming
Amazon WorkSpaces
Amazon AppStream 2.0

Database
Amazon Aurora
Amazon RDS
Amazon DynamoDB
Amazon ElastiCache
Amazon Redshift
Amazon Neptune
AWS Database Migration Service

Migration
AWS Migration Hub
AWS Application Discovery Service
AWS Database Migration Service
AWS Server Migration Service
AWS Snowball
AWS Snowball Edge
AWS Snowmobile

AWS OpsWorks
AWS Service Catalog
AWS Systems Manager
AWS Trusted Advisor
AWS Personal Health Dashboard
AWS Command Line Interface
AWS Management Console
AWS Managed Services

Media Services
Amazon Elastic Transcoder
Amazon Kinesis Video Streams
AWS Elemental MediaConvert
AWS Elemental MediaLive
AWS Elemental MediaPackage
AWS Elemental MediaStore
AWS Elemental MediaTailor

Security, Identity & Compliance
AWS Identity and Access Management (IAM)
Amazon Cloud Directory
Amazon Cognito
Amazon GuardDuty
Amazon Inspector
Amazon Macie
AWS Certificate Manager
AWS CloudHSM
AWS Directory Service
AWS Firewall Manager
AWS Key Management Service
AWS Organizations
AWS Secrets Manager
AWS Single Sign-On
AWS Shield
AWS WAF
AWS Artifact

Mobile Services
AWS Mobile Hub
Amazon API Gateway

Internet of Things
AWS IoT Core
Amazon FreeRTOS
AWS Greengrass
AWS IoT 1-Click
AWS IoT Analytics
AWS IoT Button
AWS IoT Device Defender
AWS IoT Device Management

Game Development
Amazon GameLift
Amazon Lumberyard

Software
AWS Marketplace

AWS Cost Management
AWS Cost Explorer
AWS Budgets
Reserved Instance Reporting
AWS Cost and Usage Report

Overview

- AWS started as a IaaS provider in the beginning
- Over a time, they have started offering a lot more including PaaS and SaaS offerings

IaaS	PaaS	SaaS
• EC2 • RDS • Load Balancing • Auto scaling	• Elastic Beanstalk • X-Ray • CodeDeploy	• WorkMail • Chime • Kinesis

AWS

Compute

Storage

Database

Migration

Networking & Content Delivery

Developer Tools

Management Tools

Media Services

Security, Identity & Compliance

Analytics

Machine Learning

Mobile Services

AR & VR

Application Integration

Customer Engagement

Business Productivity

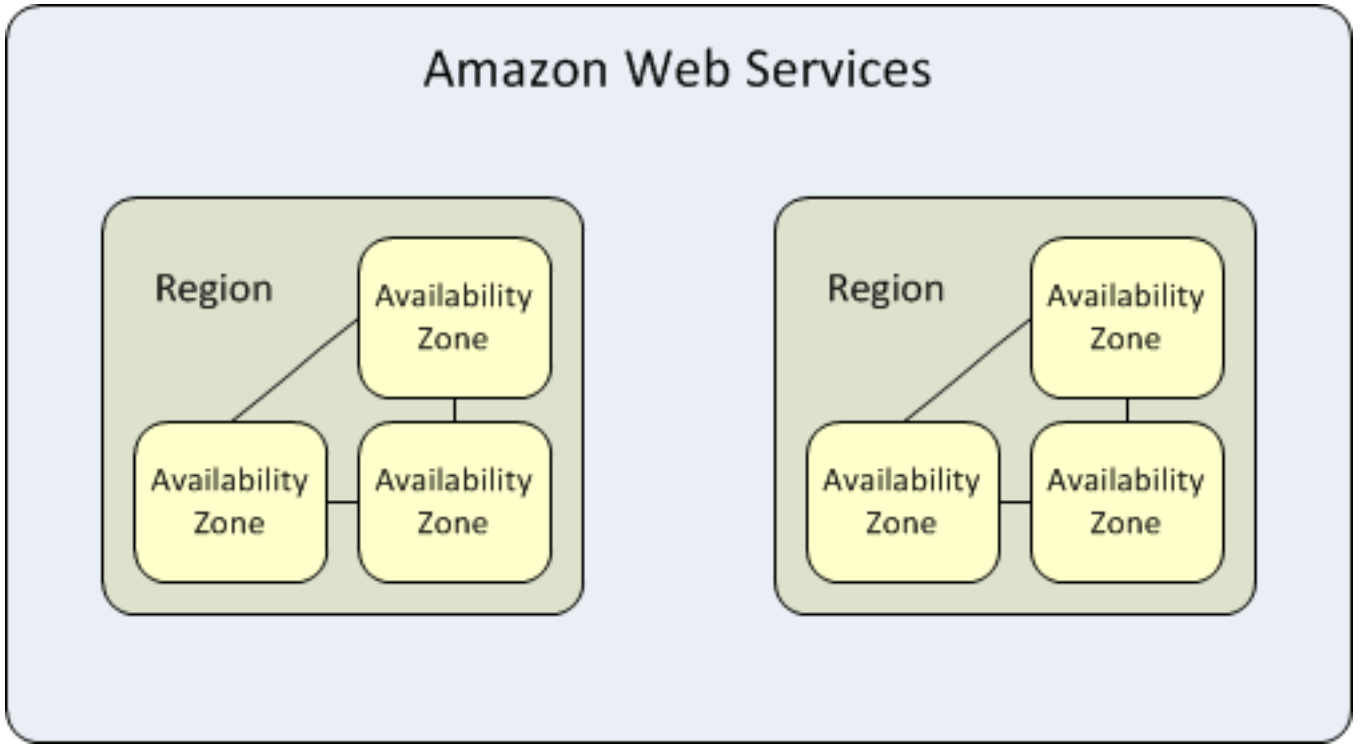
Desktop & App Streaming

Internet of Things

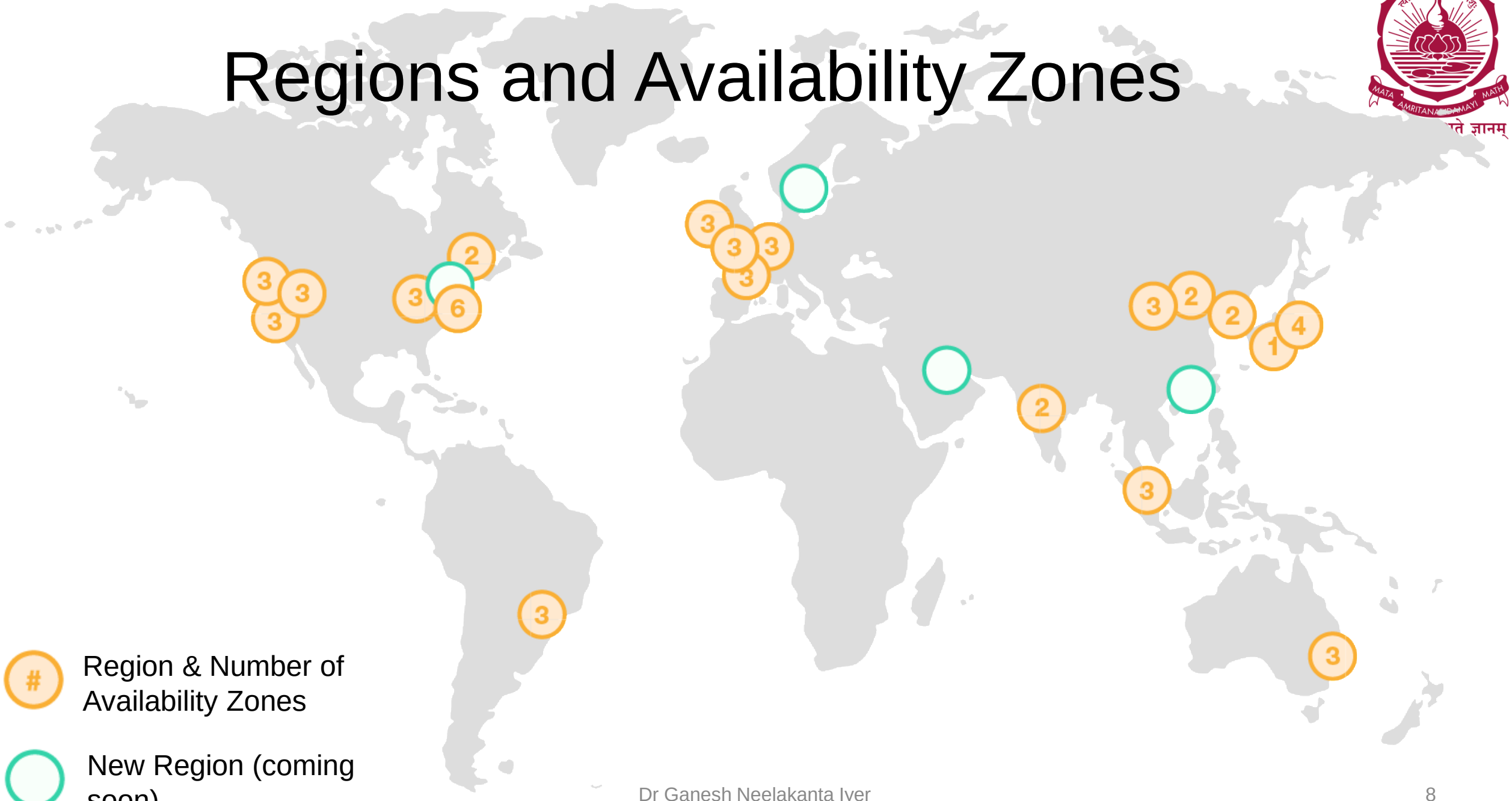
Game Development

Regions and Availability Zones

- Each region is completely independent
- Each Availability Zone is isolated, but the Availability Zones in a region are connected through low-latency links.

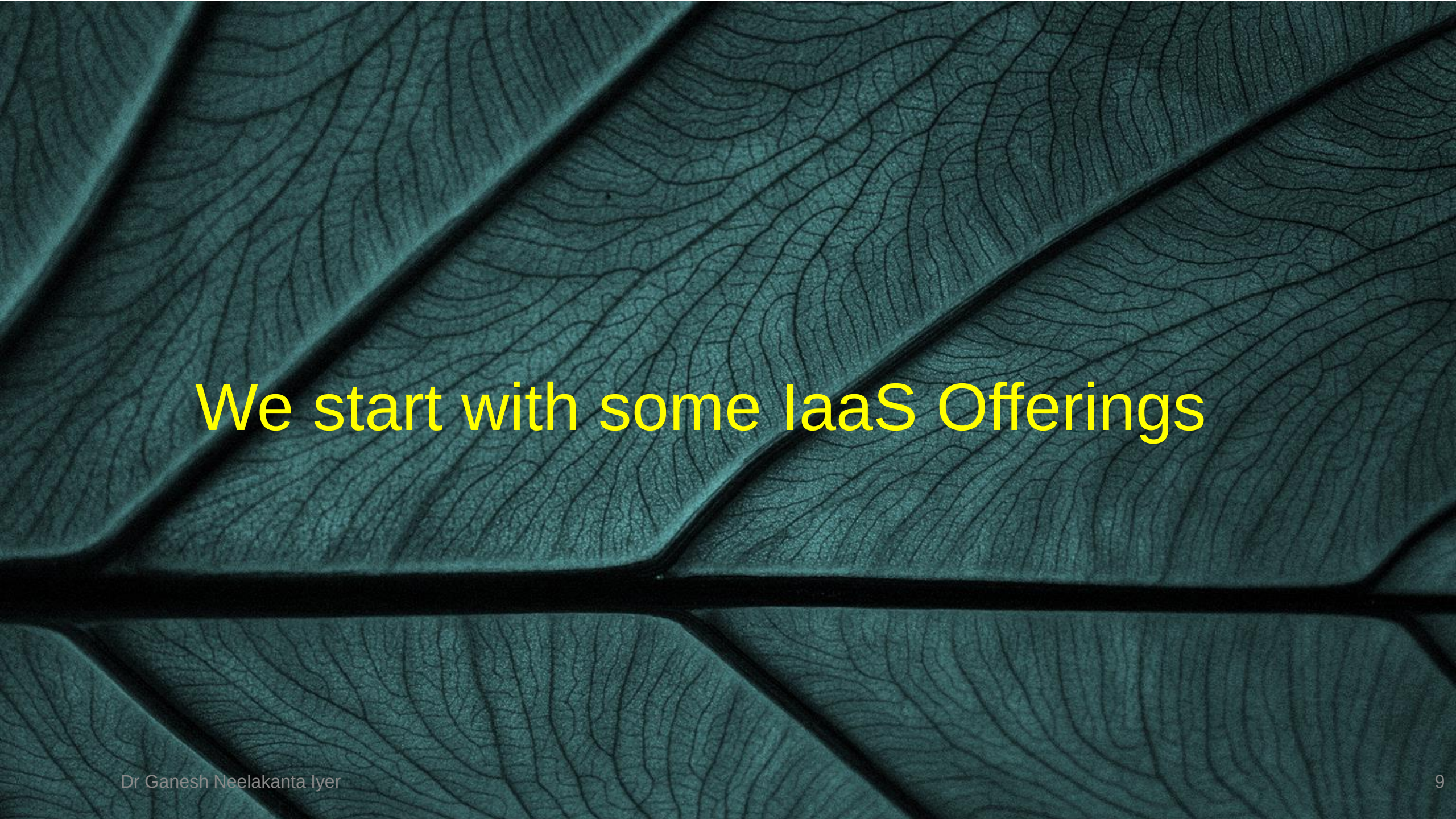


Regions and Availability Zones



Region & Number of Availability Zones

New Region (coming soon)


We start with some IaaS Offerings

EC2

- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure, resizable compute capacity in the cloud. It is designed to make web-scale cloud computing easier for developers
- Amazon EC2’s 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

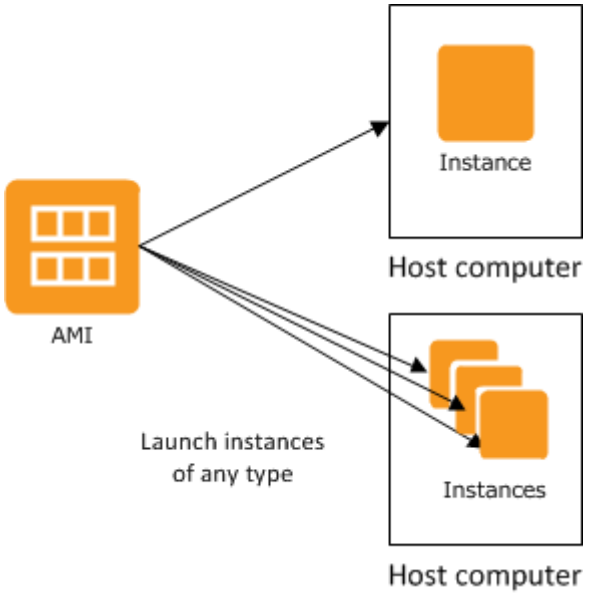
- Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change
- Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use
- Amazon EC2 provides developers the tools to build failure resilient applications and isolate them from common failure scenarios

AMI

- An *Amazon Machine Image (AMI)* is a template that contains a software configuration (for example, an operating system, an application server, and applications)

- From an AMI, you launch an *instance*, which is a copy of the AMI running as a virtual server on a host computer in Amazon's datacenter

- You can launch multiple instances from an AMI.



Advantages

ELASTIC WEB-SCALE COMPUTING

- Amazon EC2 enables you to increase or decrease capacity within minutes, not hours or days. You can commission one, hundreds, or even thousands of server instances simultaneously

COMPLETELY CONTROLLED

- You have complete control of your instances including root access and the ability to interact with them as you would any machine.

FLEXIBLE CLOUD HOSTING SERVICES

- You have the choice of multiple instance types, operating systems, and software packages

INTEGRATED

- Amazon EC2 is integrated with most AWS services such as Amazon S3, Amazon RDS, and VPC to provide a complete, secure solution for computing, query processing, and cloud storage across a wide range of applications.

https://aws.amazon.com/ec2/?p=tile

Advantages

RELIABLE

- Amazon EC2 offers a highly reliable environment where replacement instances can be rapidly and predictably commissioned

SECURE

- Amazon EC2 works in conjunction with Amazon VPC to provide security and robust networking functionality for your compute resources.

INEXPENSIVE

- You pay a very low rate for the compute capacity you actually consume

EASY TO START

- There are several ways to get started with Amazon EC2. You can use the AWS Management Console, the AWS Command Line Tools (CLI), or AWS SDKs

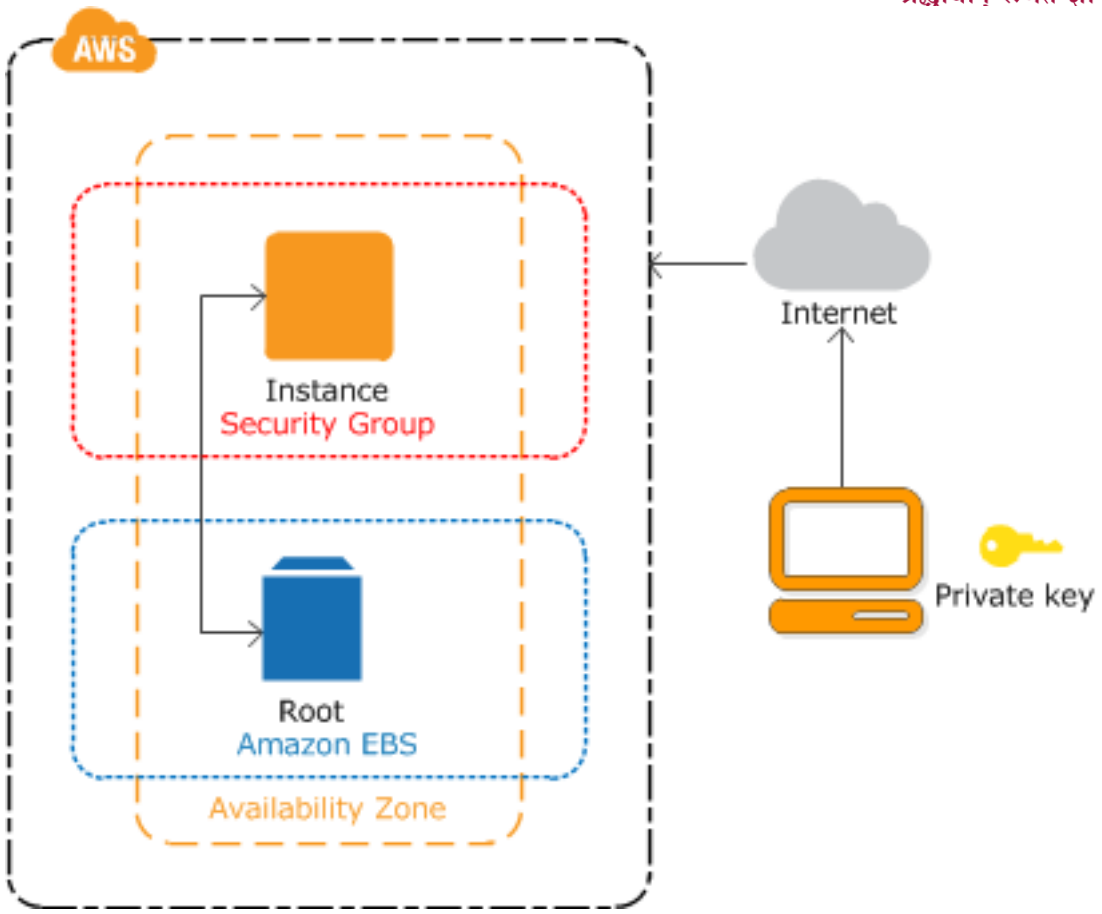
https://aws.amazon.com/ec2/?p=tile

Getting Started

- Prerequisite: Your AWS Educate Account is ready
- Then, create a free Linux EC2 instance
- https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/get-set-up-for-amazon-ec2.html

Overview

- The instance is an Amazon EBS-backed instance (meaning that the root volume is an EBS volume)
- You can either specify the Availability Zone in which your instance runs, or let Amazon EC2 select an Availability Zone for you
- When you launch your instance, you secure it by specifying a key pair and security group
- When you connect to your instance, you must specify the private key of the key pair that you specified when launching your instance.



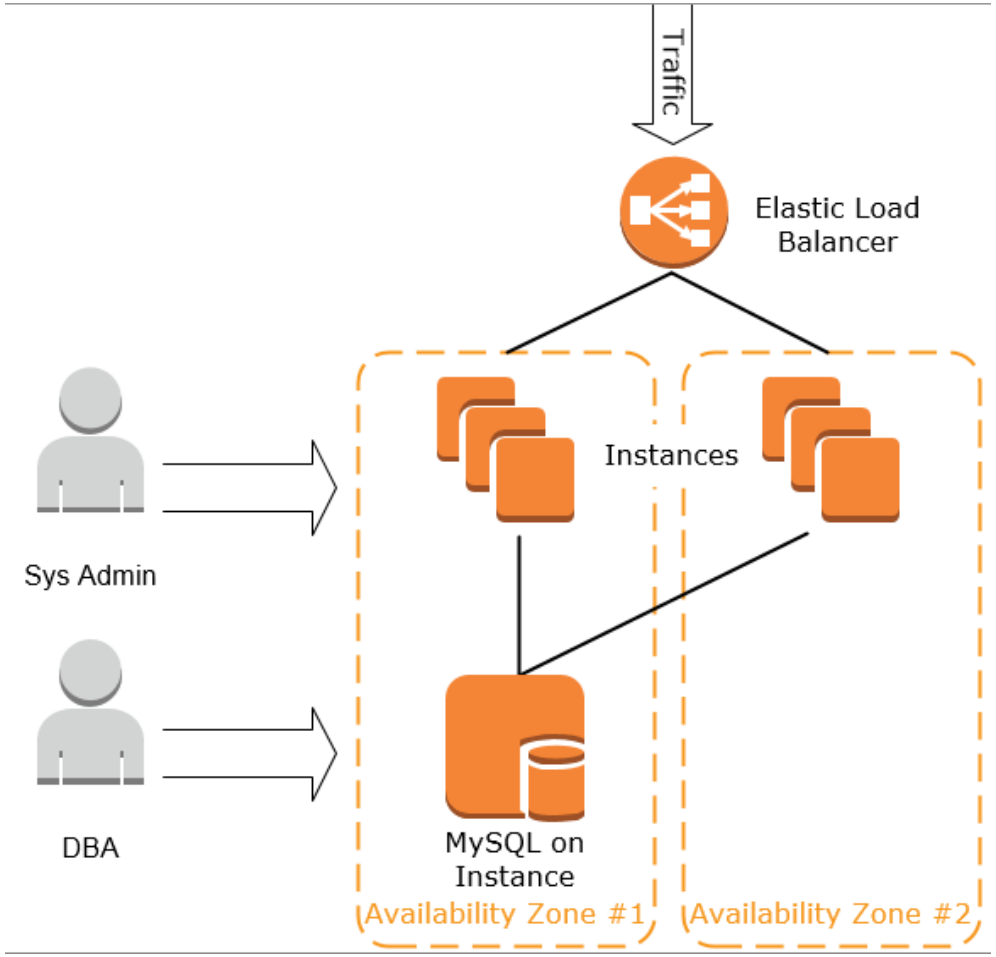
- https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/EC2_GetStarted.html

Host a web application in EC2

- Amazon EC2 Windows instances allow customers to deploy Java applications to AWS using their existing application deployment tools and processes, or to integrate Java application deployment with automated deployment tools and services

- Self-managed Amazon EC2 instances offer the flexibility to choose specific operating system, Java, and Java web container versions that an application or a company's IT standards require

Host a web application in EC2




Getting started

Step 1 : Create an AWS free Account

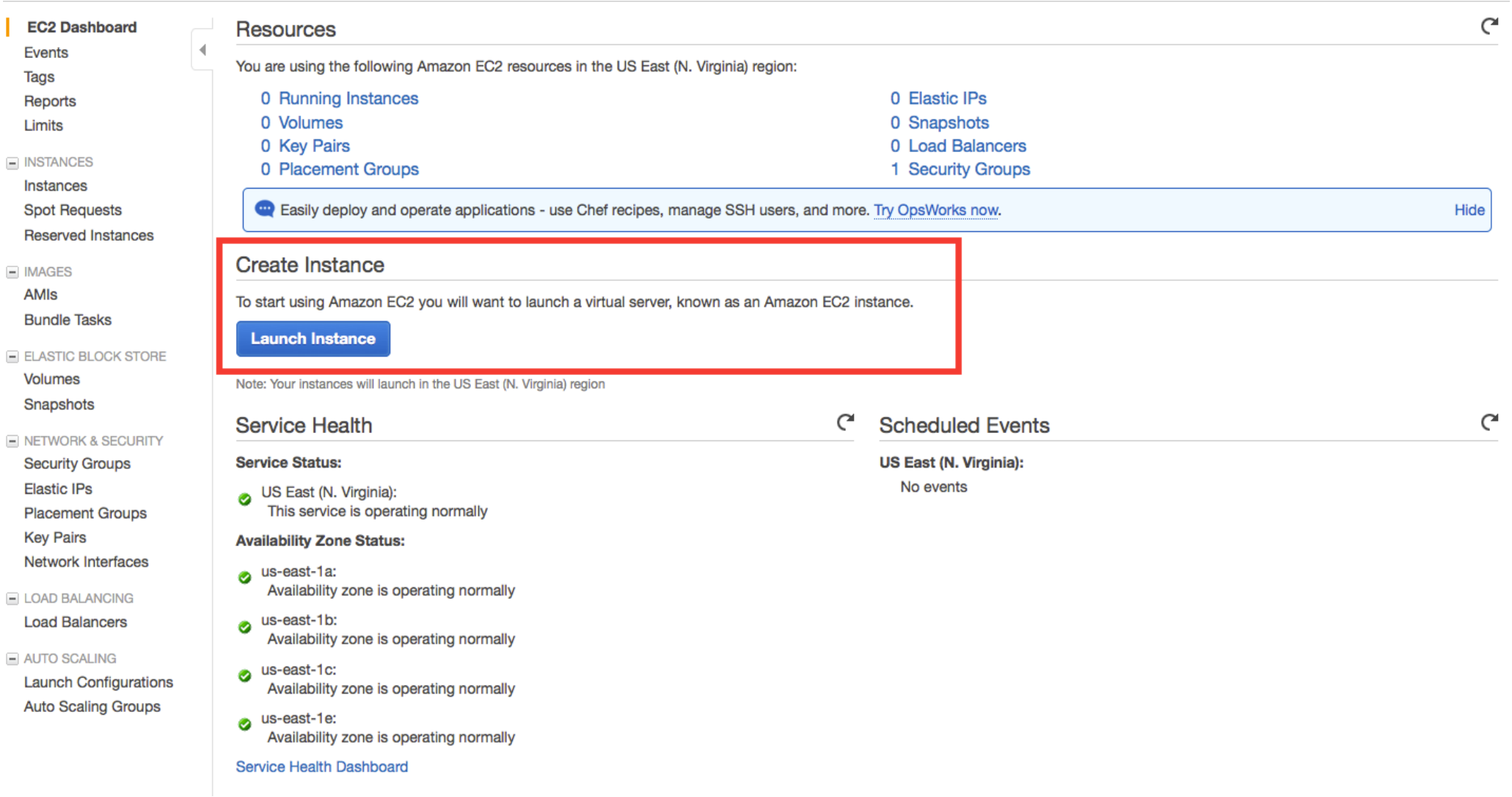
- https://aws.amazon.com/education/awseducate/

https://aws.amazon.com/premiumsupport/knowledge-center/educate-starter-account/

If you choose Starter account in sign up through AWS Educate, it does not require credit card

You are responsible to choose only free tier eligible services during this course in order to avoid any charges on your credit card.

Example 1 Launch an Ubuntu Virtual Machine Step 1: Create Instance



Step 2: Configure your Instance

Step 1: Choose an Amazon Machine Image (AMI)

Cancel and Exit

AWS Marketplace

Community AMIs

Free tier only

Amazon Linux — Free tier eligible

Amazon Linux 2 comes with five years support. It provides Linux kernel 4.14 tuned for optimal performance on Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1, and the latest software packages through extras.

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

64-bit (x86)
64-bit (Arm)

Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-035b3c7efe6d061d5

Amazon Linux — Free tier eligible

The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl, and Java. The repositories include Docker, PHP, MySQL, PostgreSQL, and other packages.

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

64-bit (x86)

Red Hat Enterprise Linux 8 (HVM), SSD Volume Type - ami-0c322300a1dd5dc79 (64-bit x86) / ami-03587fa4048e9eb92 (64-bit Arm)

Red Hat — Free tier eligible

Red Hat Enterprise Linux version 8 (HVM), EBS General Purpose (SSD) Volume Type

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

64-bit (x86)
64-bit (Arm)

SUSE Linux Enterprise Server 15 SP1 (HVM), SSD Volume Type - ami-0b5372ab3202bd20b (64-bit x86) / ami-0072af0151fbe67b9 (64-bit Arm)

SUSE Linux — Free tier eligible

SUSE Linux Enterprise Server 15 Service Pack 1 (HVM), EBS General Purpose (SSD) Volume Type. Public Cloud, Advanced Systems Management, Web and Scripting, and Legacy modules enabled.

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

64-bit (x86)
64-bit (Arm)

Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-026c8acd92718196b (64-bit x86) / ami-0c46f9f09e3a8c2b5 (64-bit Arm)

Free tier eligible

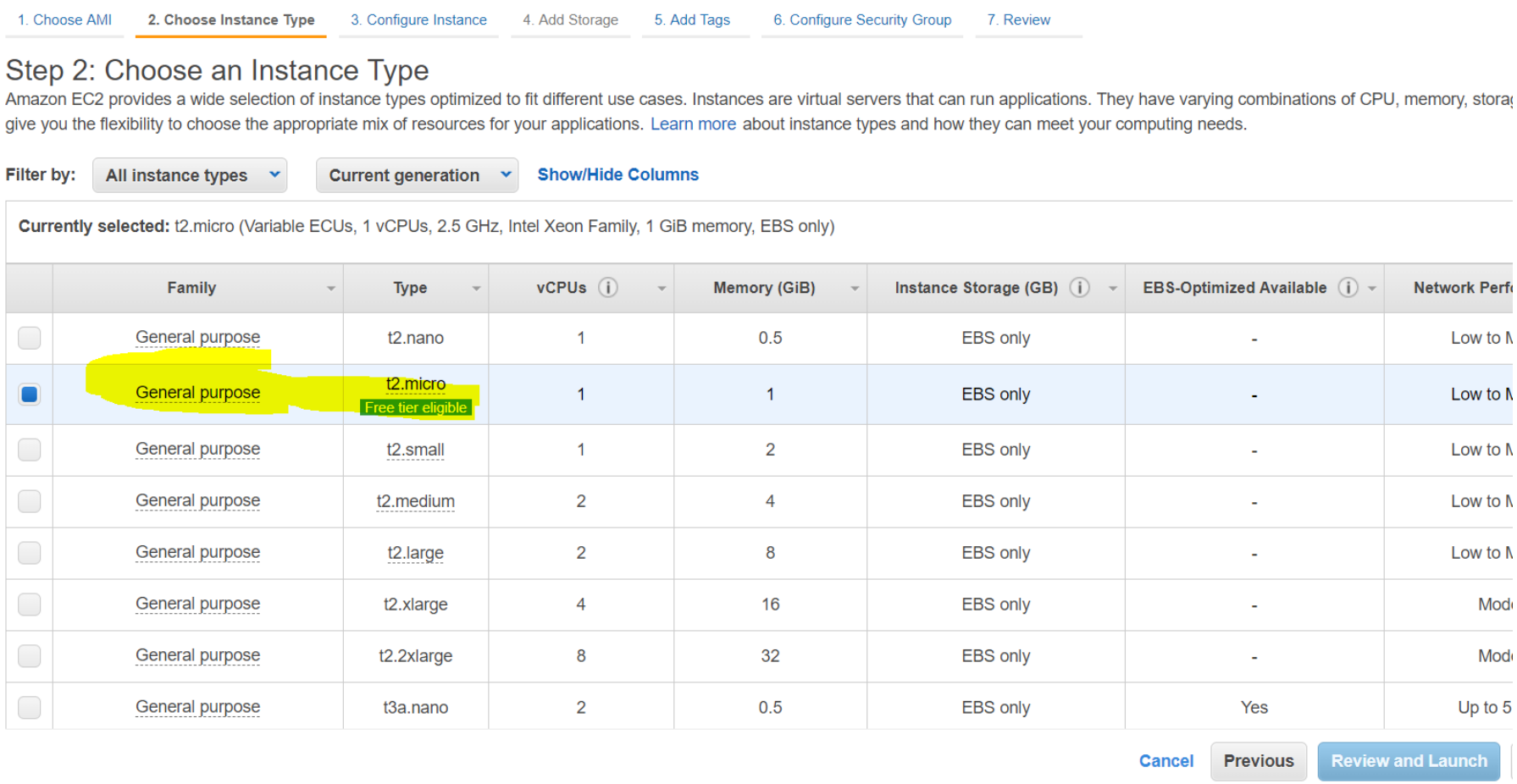
Ubuntu Server 18.04 LTS (HVM),EBS General Purpose (SSD) Volume Type. Support available from Canonical (http://www.ubuntu.com/cloud/services).

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

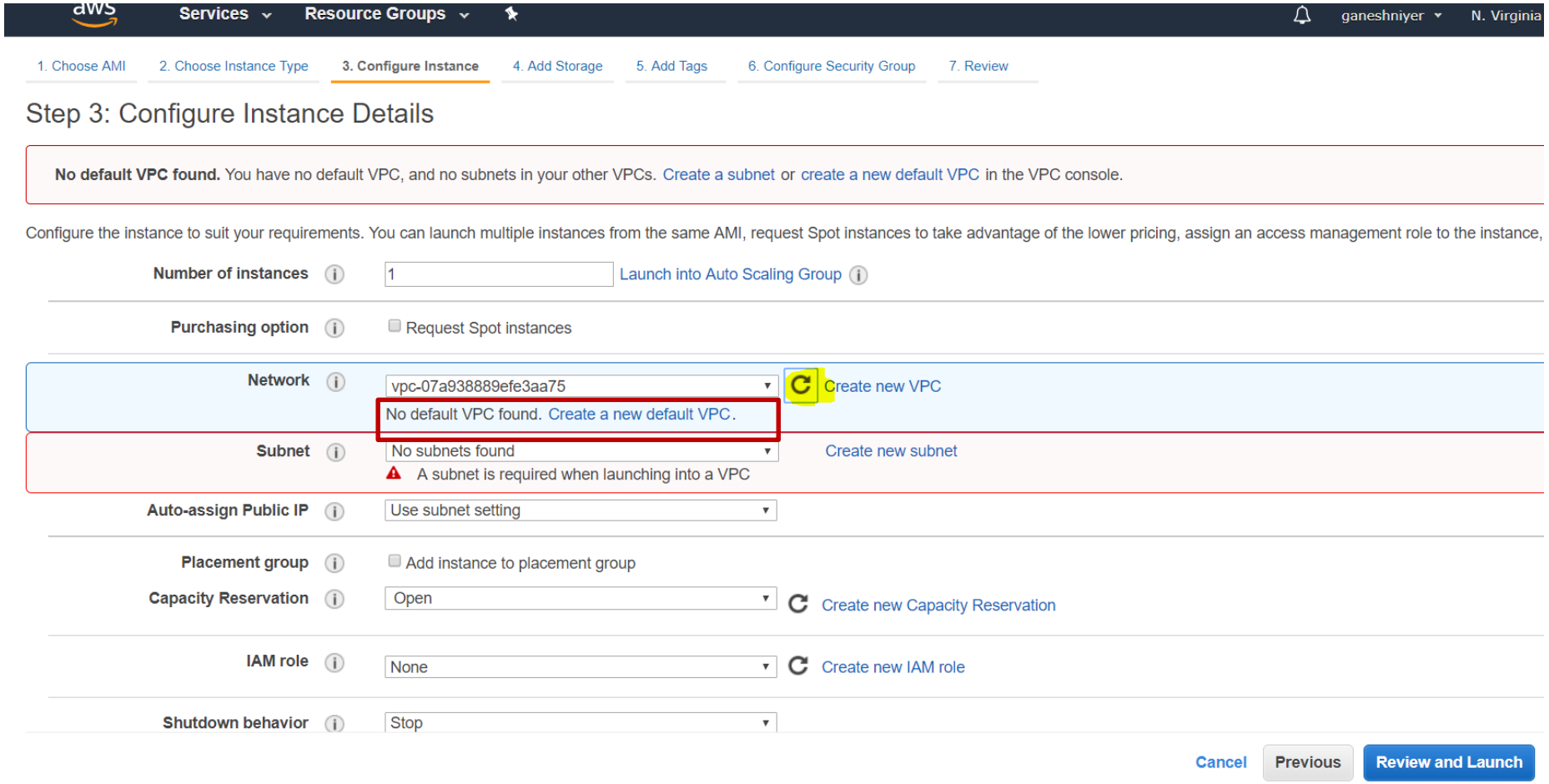
Select

64-bit (x86)
64-bit (Arm)

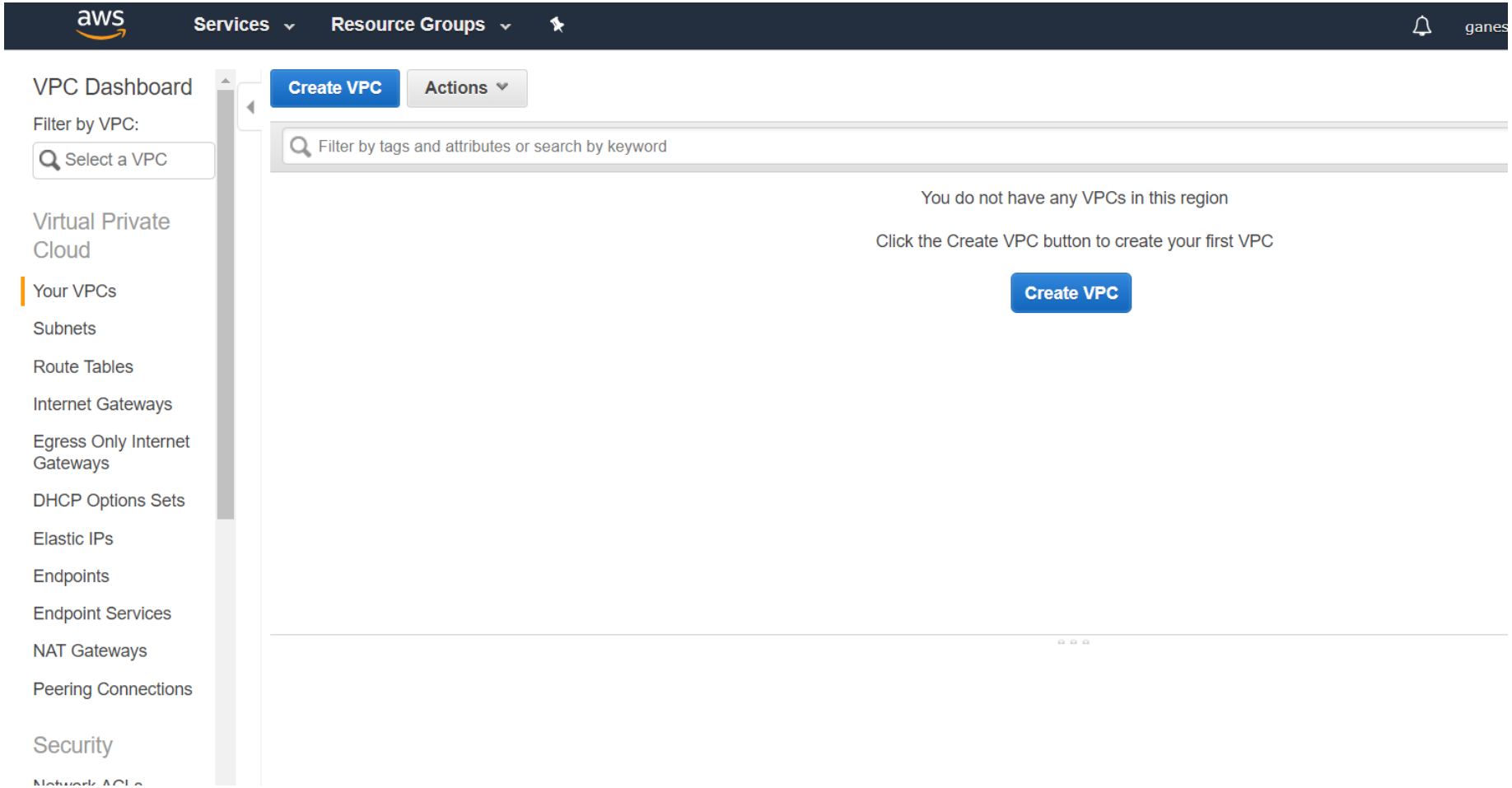
Step 3 : Choose Instance Type



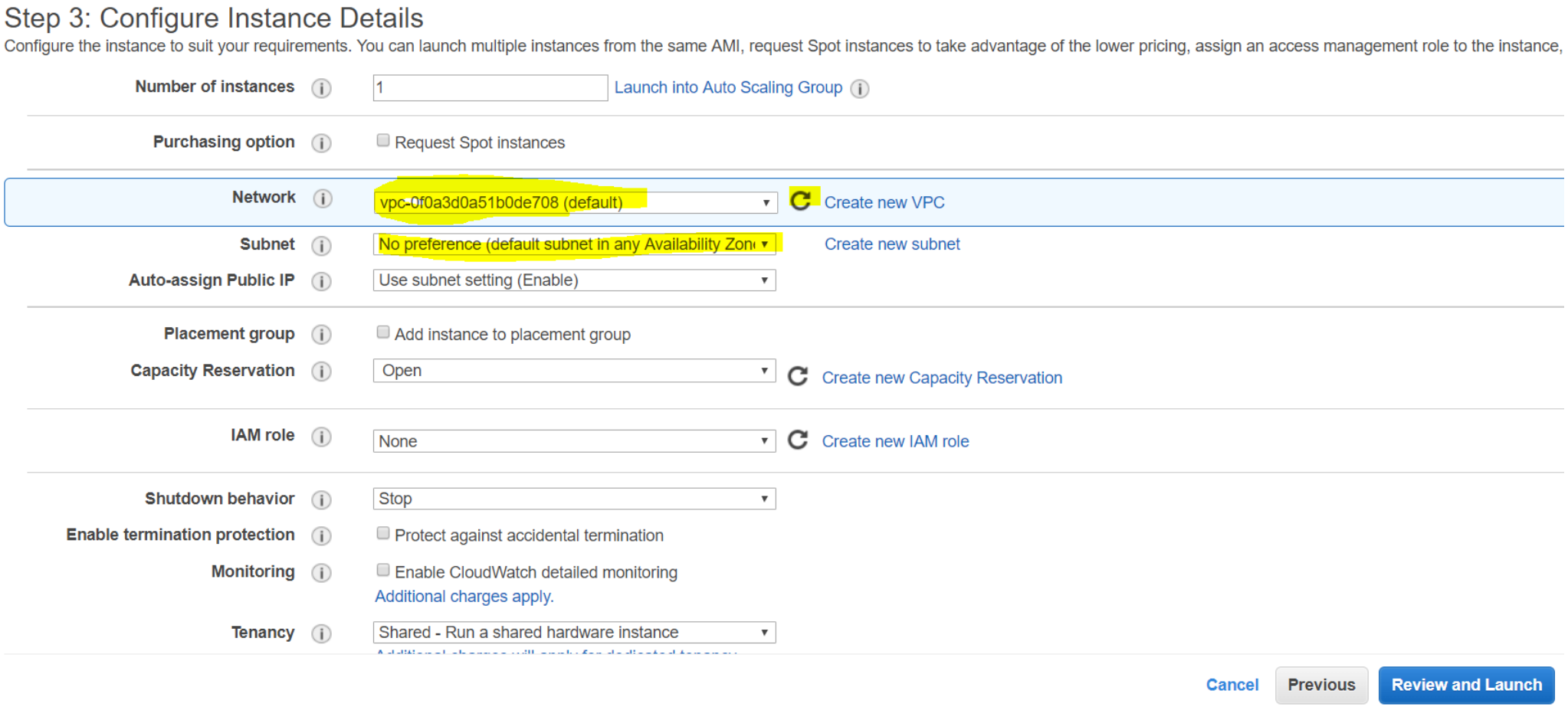
Step 4 : Configure Instance
Create a New Default VPC



Step 4a: Create New VPC

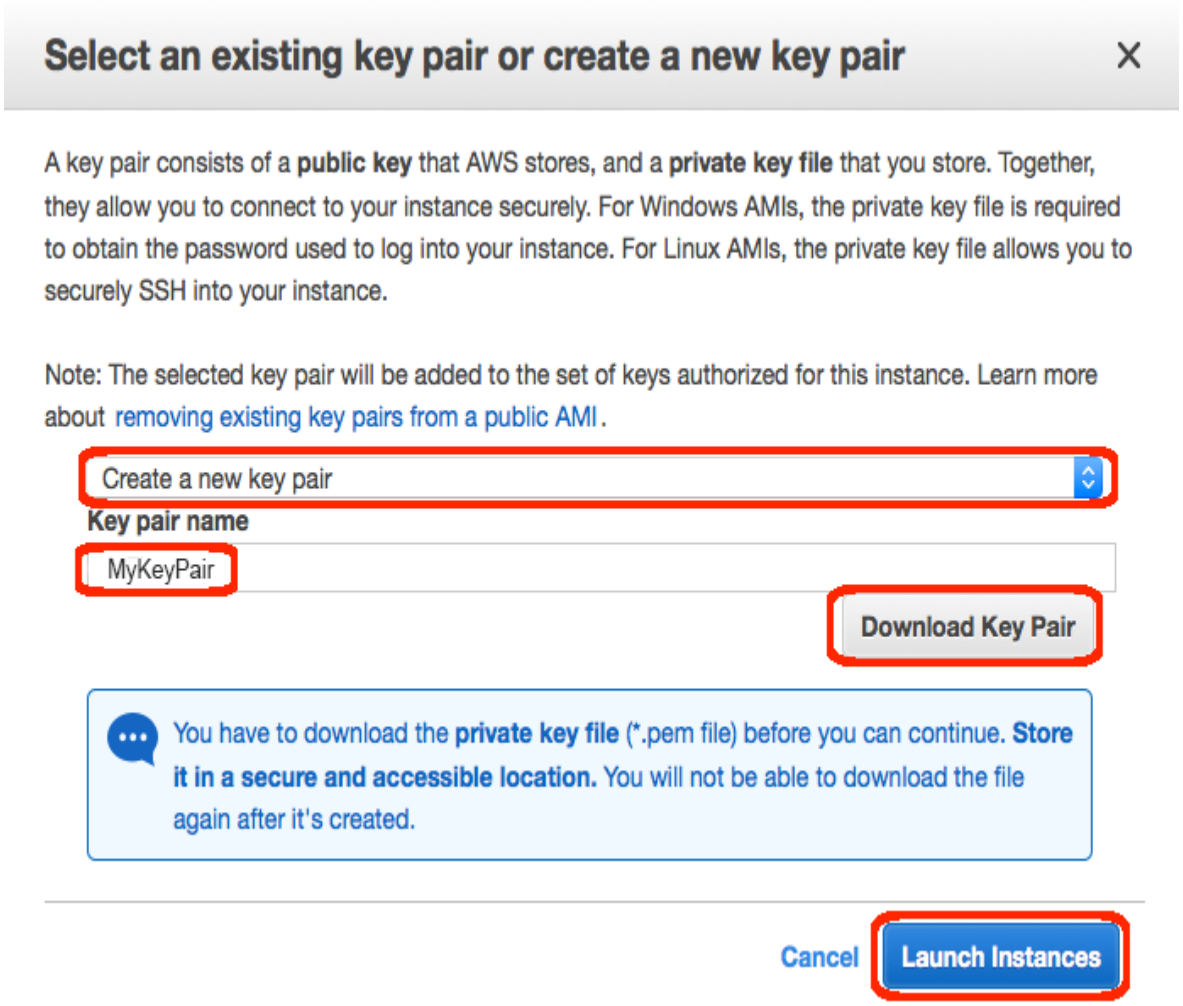


Step 5: Review and Launch



Step 5: Create a key pair

- Download and Store it in your machine.
- Your house key is used to enter your home



Step 6: View Instances

Launch Status

Your instances are now launching
The following instance launches have been initiated: i-[redacted] View launch log

Get notified of estimated charges
Create billing alerts to get an email notification when estimated charges on your AWS bill exceed an amount you define (for example, if you exceed the free usage tier).

How to connect to your instances

Your instances are launching, and it may take a few minutes until they are in the **running** state, when they will be ready for you to use. Usage hours on your new instances will start immediately and continue to accrue until you stop or terminate your instances.

Click **View Instances** to monitor your instances' status. Once your instances are in the **running** state, you can **connect** to them from the Instances screen. Find out how to connect to your instances.

Here are some helpful resources to get you started

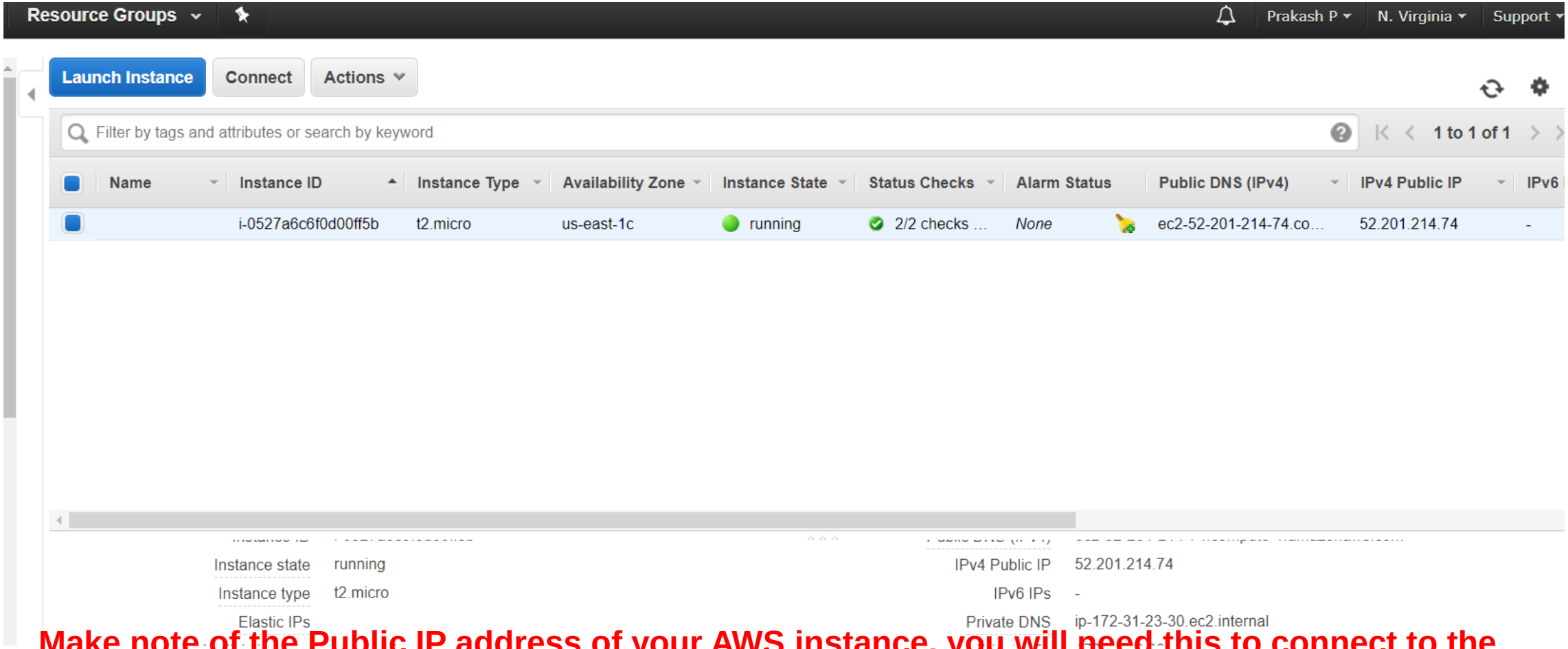
- How to connect to your Linux instance
- Learn about AWS Free Usage Tier
- Amazon EC2: User Guide
- Amazon EC2: Discussion Forum

While your instances are launching you can also

Create status check alarms to be notified when these instances fail status checks. (Additional charges may apply)
Create and attach additional EBS volumes (Additional charges may apply)
Manage security groups

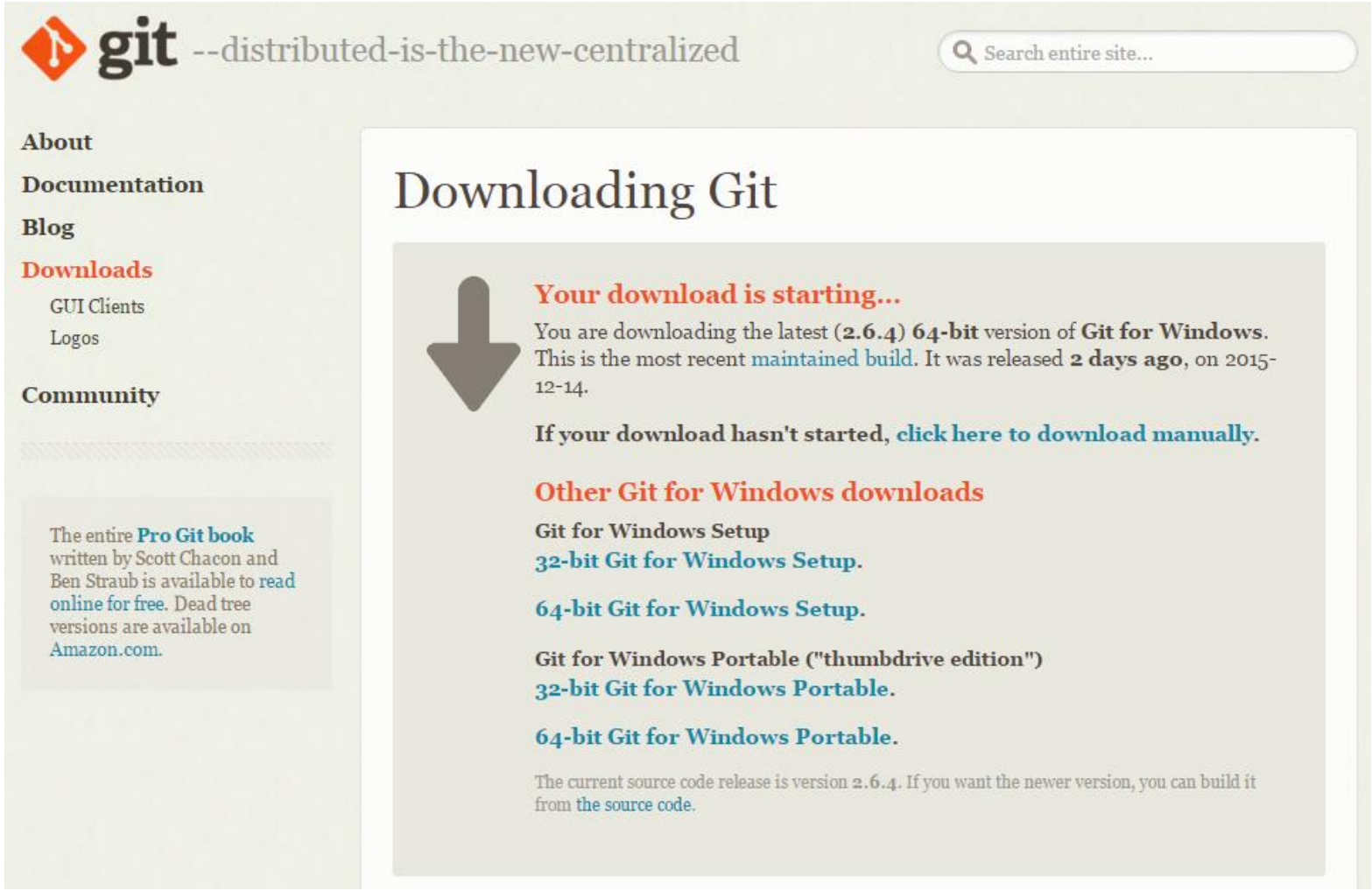
View Instances

Step 7: Make note of IP address

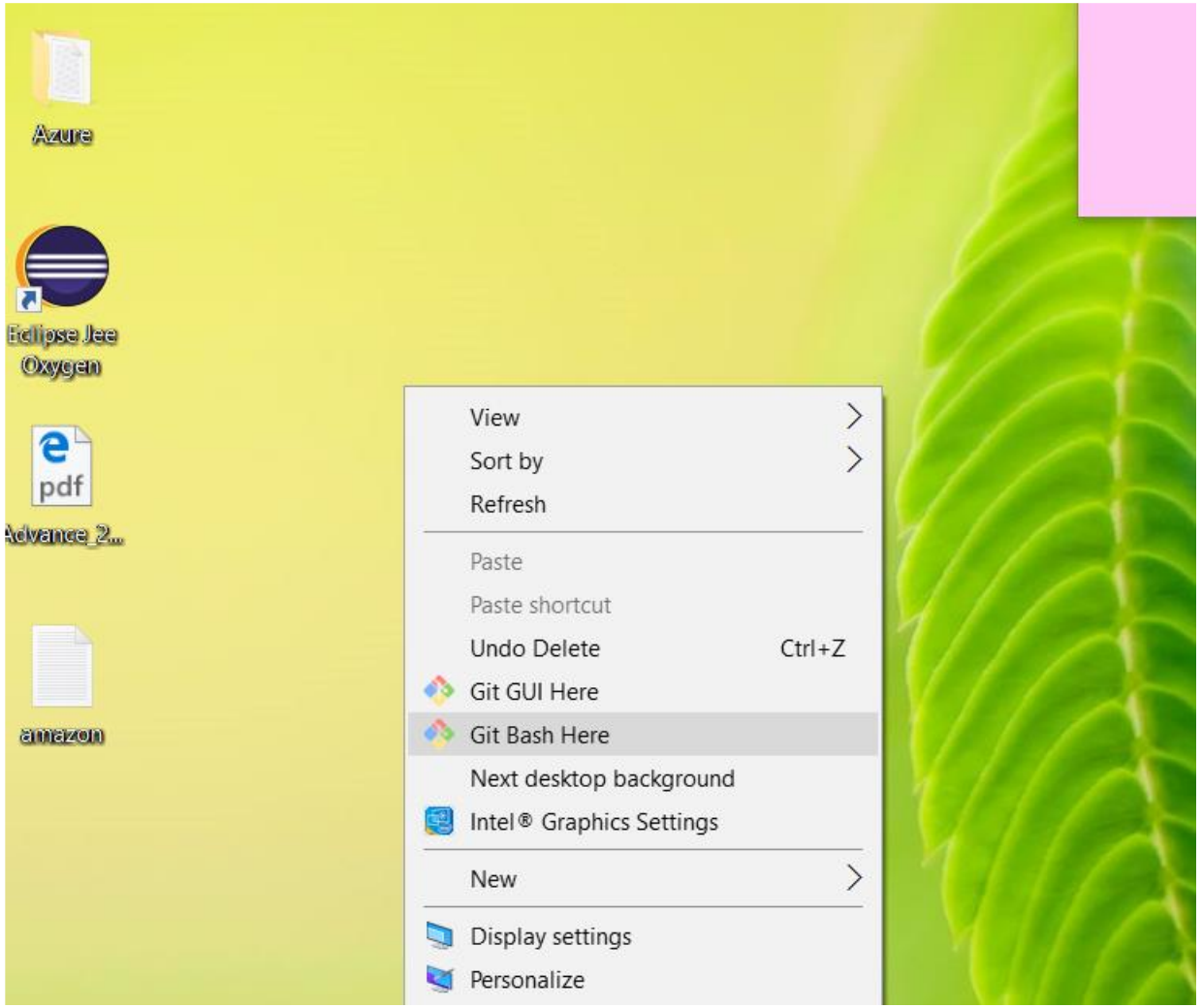


Make note of the Public IP address of your AWS instance, you will need this to connect to the instance

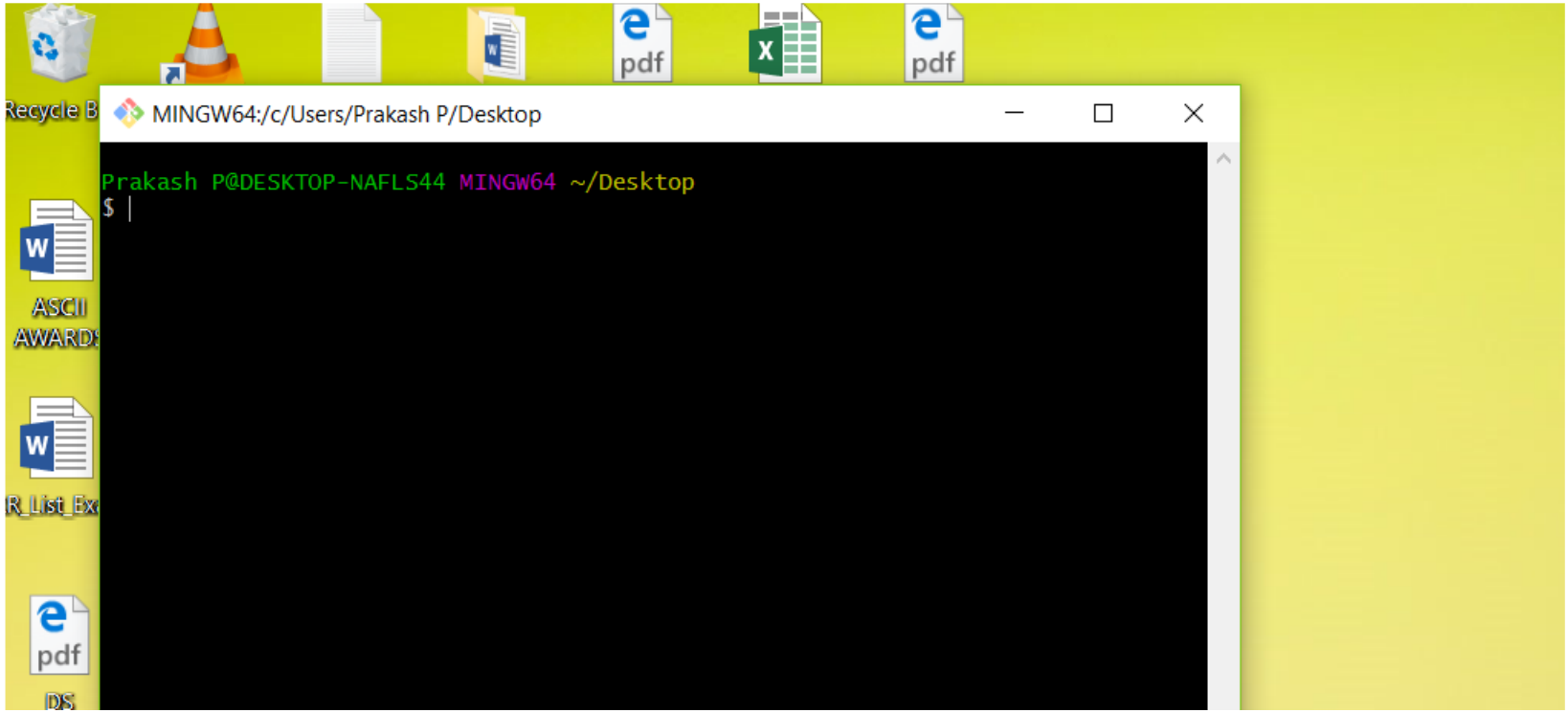
Step 8: Download the Git and Install



Step 9: Right click → Git Bash Here



Step 9.1 : Opens Git terminal



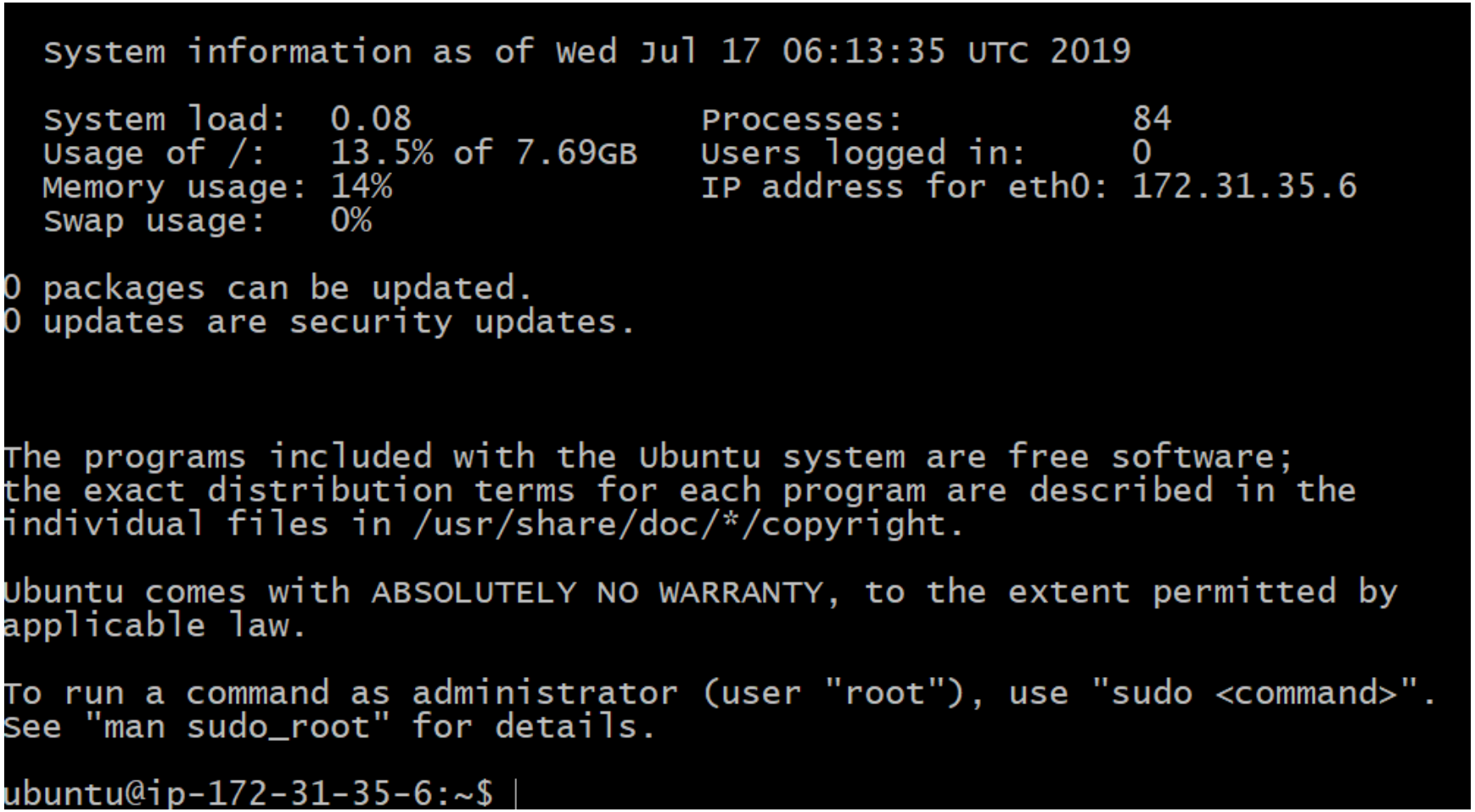
Step 10 : Use SSH to connect to your instance

- ssh -i ‘<PATH>\MyKeyPair.pem' ec2-user@*{IP_Address}*

```
GiRi@GiRi-IyEr MINGW64 ~/Desktop
$ ssh -i "D:\\JideDemo.pem" ubuntu@ec2-52-90-106-181.compute-1.amazonaws.com
```

```
GiRi@GiRi-IyEr MINGW64 ~/Desktop
$ ssh -i "D:\\JideDemo.pem" ubuntu@ec2-52-90-106-181.compute-1.amazonaws.com
The authenticity of host 'ec2-52-90-106-181.compute-1.amazonaws.com (52.90.106.1
81)' can't be established.
ECDSA key fingerprint is SHA256:r41mYBWNkfuMIMWErsptJWIs7b2/KJ0e4i6T0o4maNI.
Are you sure you want to continue connecting (yes/no)?
```

You are now in AWS… ☺



Finally in EC2

- You can now use this as a remote compute resource and use it for anything

- Self-exercise: Deploy and run your first React app from AWS

After using AWS, Never forget to terminate the instance. Otherwise, expect to pay bills.

Thank you!

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Office Hours

- Tuesday 4-445 PM @ My office