1. Purpose of the Lab

Understand definitions of various Amazon Web Services (AWS) and their use in cloud computing based web applications that are accessible over the Internet through an AWS account.

2. References to guide Lab work

- *Chapter 1, Distributed and Cloud Computing,* Hwang, Fox & Dongarra
- *Chapter 1, Programming Amazon EC2, Vliet and Paganelli*
- AWS Free Usage for Education:
  - Overview of AWS, http://media.amazonwebservices.com/AWS_Overview.pdf
  - Services on the free usage tier, http://aws.amazon.com/free/
  - Make the most of your free monthly usage, http://docs.aws.amazon.com/gettingstarted/latest/awsgsg-freetier/TestDriveFreeTier-monthly.html
- AWS Documentation: http://aws.amazon.com/documentation/
- AWS Reference Architectures: http://aws.amazon.com/architecture/
- General AWS Reading: T. Morgan, "A Rare Peek Into The Massive Scale of AWS", Nov. 2014 - http://www.enterprisetech.com/2014/11/14/rare-peek-massive-scale-aws/
- AWS educational resources (AWS credit, training, learning resources) https://aws.amazon.com/education/awseducate/

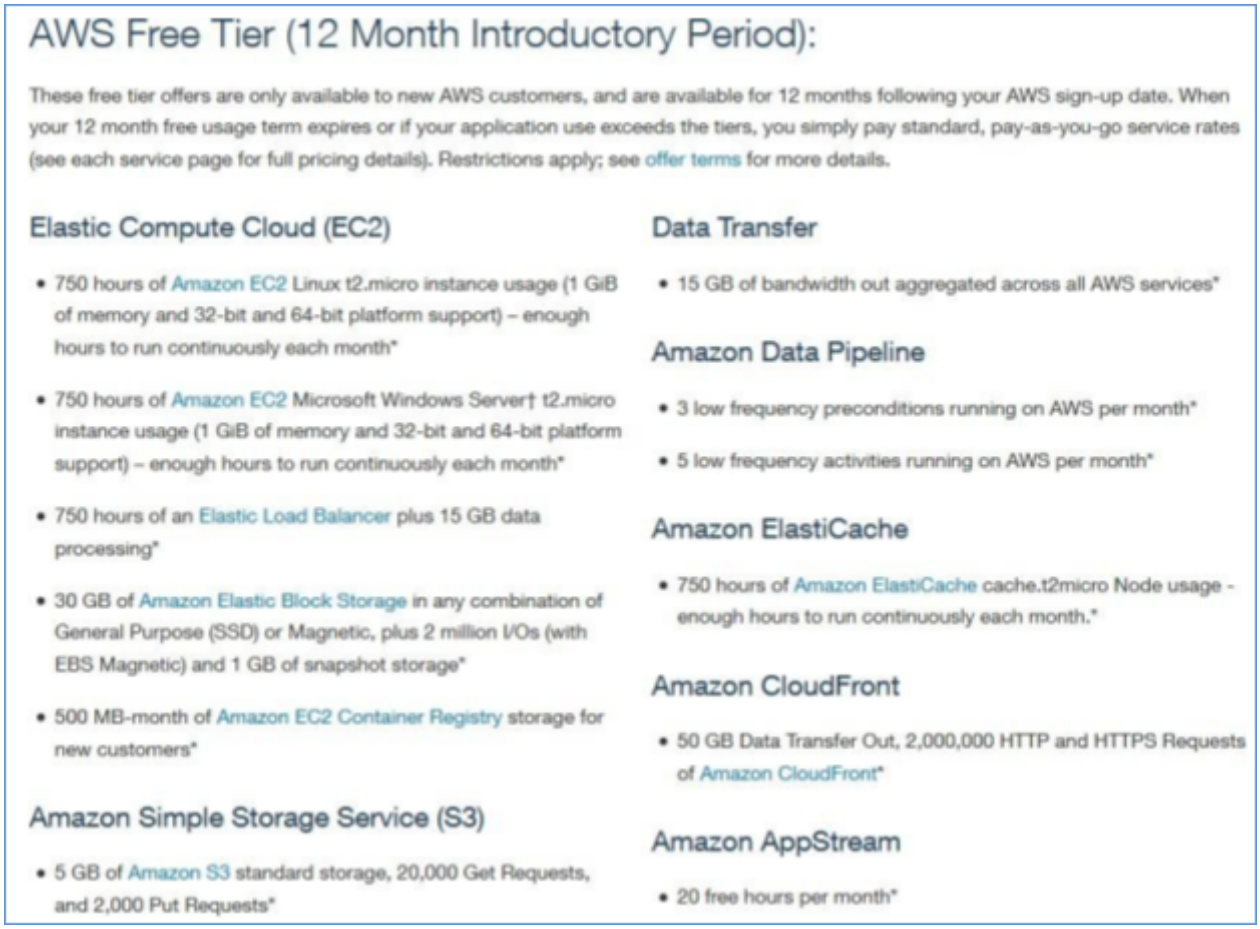
3. Lab Steps and output collection guidelines

Figure 1: Lab Steps Overview

The Figure 1 shows the required steps to be followed in order to successfully create an account credited with funds for this course. You will need to understand pricing conditions and services documentation related with 'AWS free usage tier', understand AWS Architecture, create your 'AWS account' and request for $100 credit. Then, you will launch your first AWS EC2 (Elastic Compute Cloud) instance. The final step will show you the ways to connect to your instance through local Linux/Mac or Windows computer.

3.1 Amazon Web Services

Take your time in order to understand the conditions of free usage that involve free account availability, restrictions in terms of instance types, pay-as-you-go service rates, operating systems that are under the free usage condition, and free usage accumulation, detailed information can be found on http://aws.amazon.com/free/.



AWS Free Tier (12 Month Introductory Period):

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

Elastic Compute Cloud (EC2)

- 750 hours of Amazon EC2 Linux t2.micro instance usage (1 GiB of memory and 32-bit and 64-bit platform support) – enough hours to run continuously each month*
- 750 hours of Amazon EC2 Microsoft Windows Server† t2.micro instance usage (1 GiB of memory and 32-bit and 64-bit platform support) – enough hours to run continuously each month*
- 750 hours of an Elastic Load Balancer plus 15 GB data processing*
- 30 GB of Amazon Elastic Block Storage in any combination of General Purpose (SSD) or Magnetic, plus 2 million I/Os (with EBS Magnetic) and 1 GB of snapshot storage*
- 500 MB-month of Amazon EC2 Container Registry storage for new customers*

Amazon Simple Storage Service (S3)

- 5 GB of Amazon S3 standard storage, 20,000 Get Requests, and 2,000 Put Requests*

Data Transfer

- 15 GB of bandwidth out aggregated across all AWS services*

Amazon Data Pipeline

- 3 low frequency preconditions running on AWS per month*
- 5 low frequency activities running on AWS per month*

Amazon ElastiCache

- 750 hours of Amazon ElastiCache cache.t2micro Node usage - enough hours to run continuously each month.*

Amazon CloudFront

- 50 GB Data Transfer Out, 2,000,000 HTTP and HTTPS Requests of Amazon CloudFront*

Amazon AppStream

- 20 free hours per month*

Go through the http://aws.amazon.com/documentation/ to find detailed information of each service that AWS provides. Pay special attention to the service groups: Getting started with AWS, Compute, Storage & Content Delivery and Database.

3.2. AWS Architecture Center

You will need to understand overall http://aws.amazon.com/architecture/ to help you build your application architecture customized according to your requirements, and for maximizing the AWS services usage. Web application hosting related customization example is shown below in Figure 1.

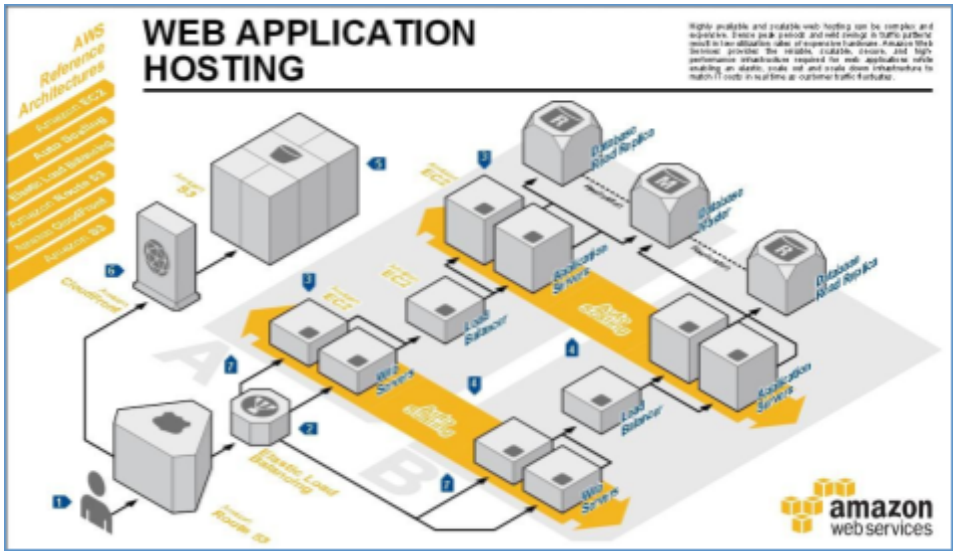


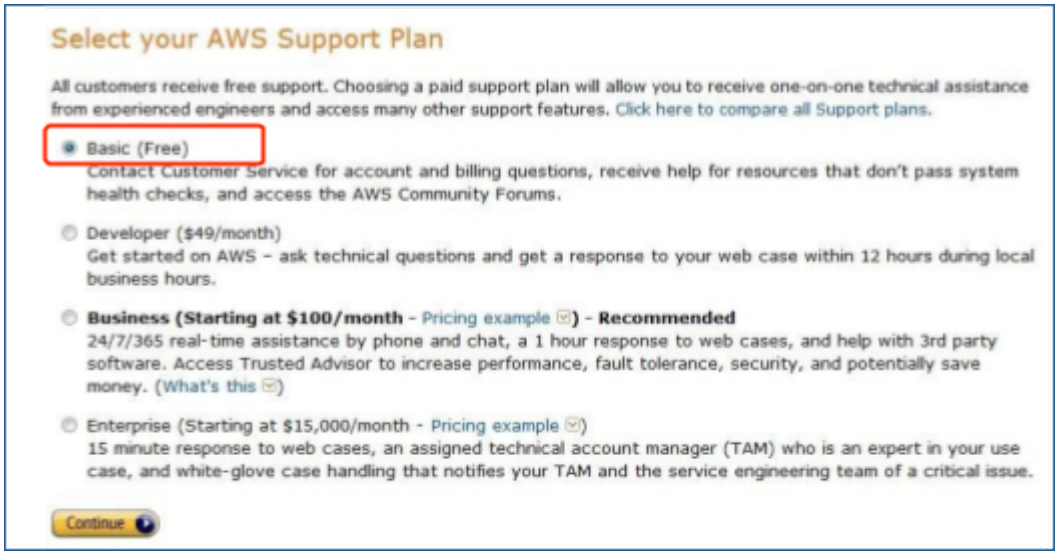
Figure 1: Example application customization of AWS architecture

3.3. AWS Account Creation

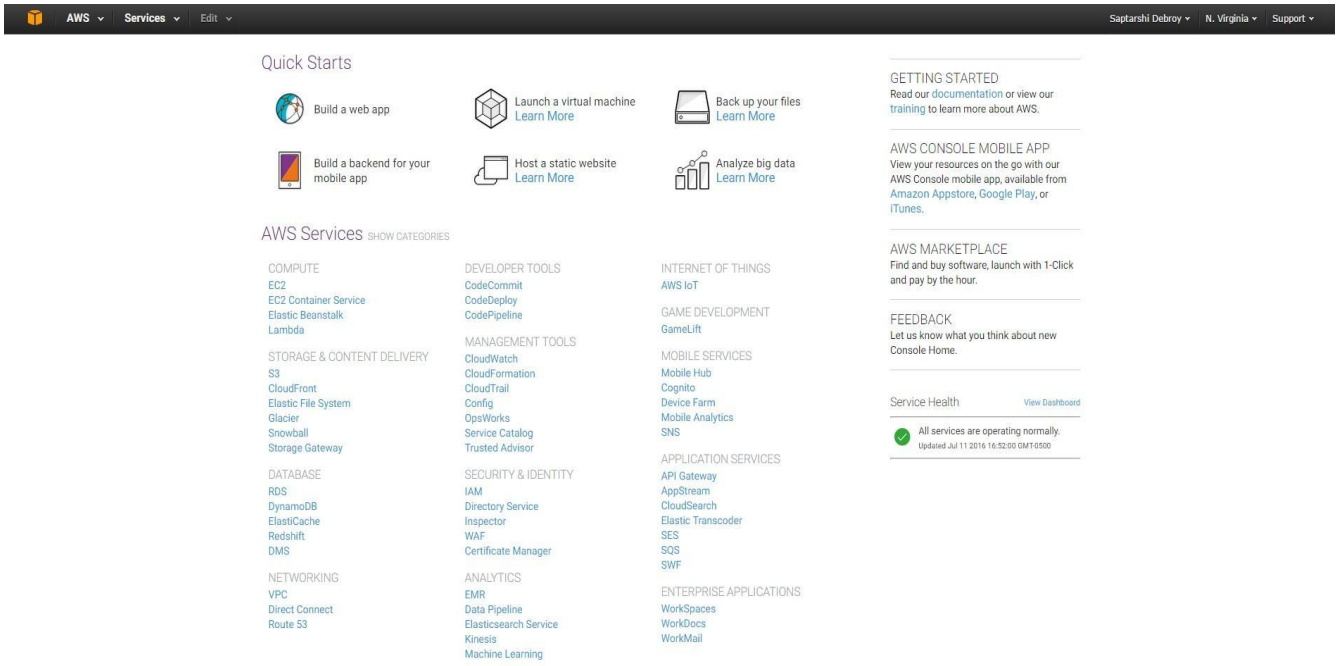
Create an (AWS) Amazon Web Service account in http://aws.amazon.com by clicking the button 'Create a Free Account' and follow the instructions. A credit/debit card and a cellphone/Landline number is required.

- Follow the instruction to create your account. At some point you will also need to enter your credit/debit card information.

- Don't forget to select 'Basic (Free)' Support plan to access to AWS free services (if that information is required).



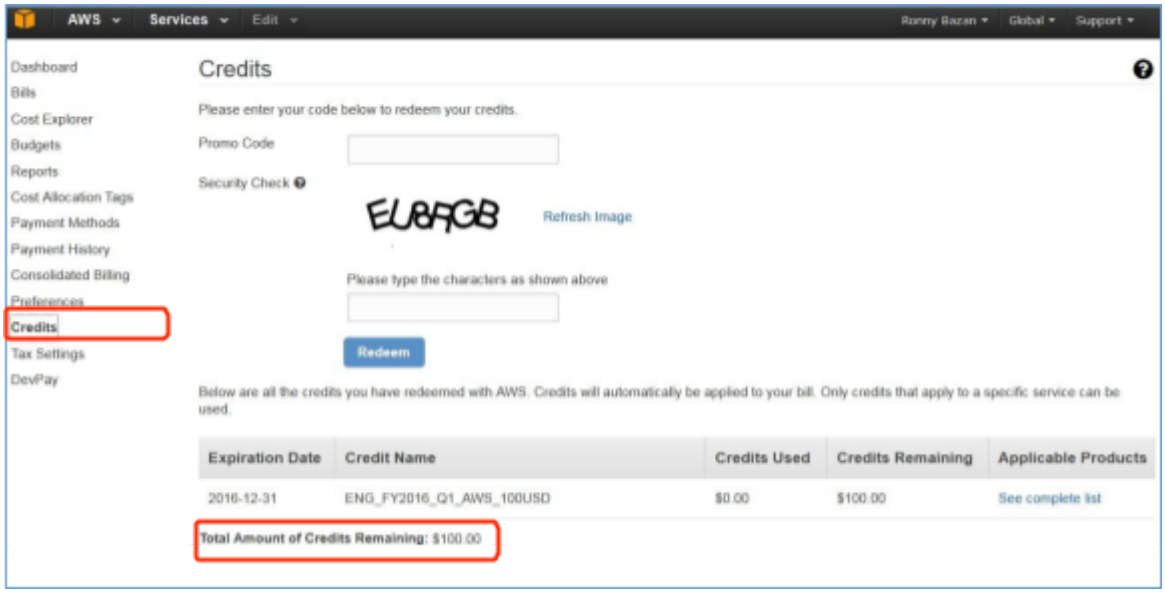
- Once you create your account you will see all AWS services available for you.



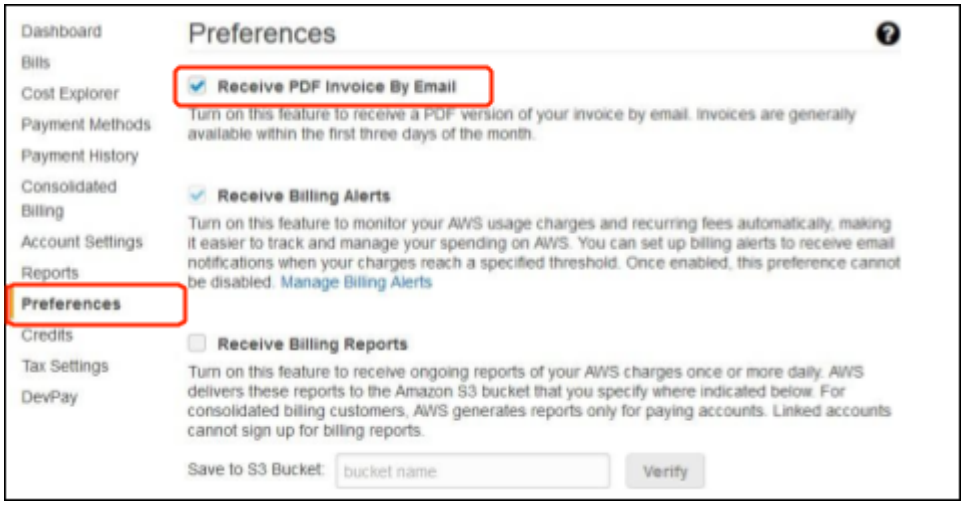
3.4. Add AWS Education Credit for $100 to your Account.

- In https://aws.amazon.com/education/awseducate/apply/ Apply for AWS credit using the 'Apply for AWS Educate for students' link.

- Once you received an email from AWS with the Promo Code, activated it by enter it on ‘Credits’ tag as shown below.



- You will be able to see your detailed usage and Credits Balance by accessing ‘Bills’ option in the left menu.
- Another useful option is to enable ‘Receive PDF Invoice my Email’ as well ‘Receive Billing Alerts’ to keep track of the usage.



3.5 Launching your first AWS Instance

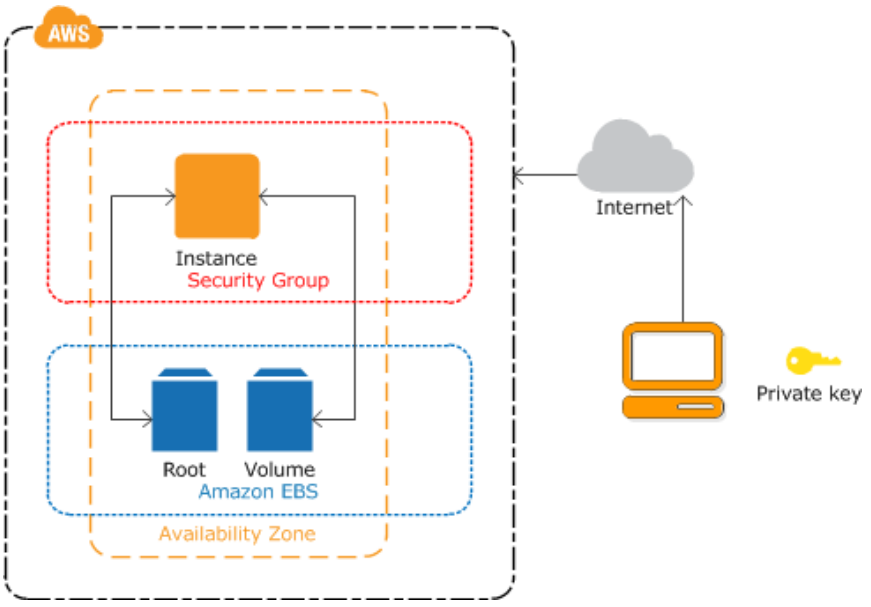
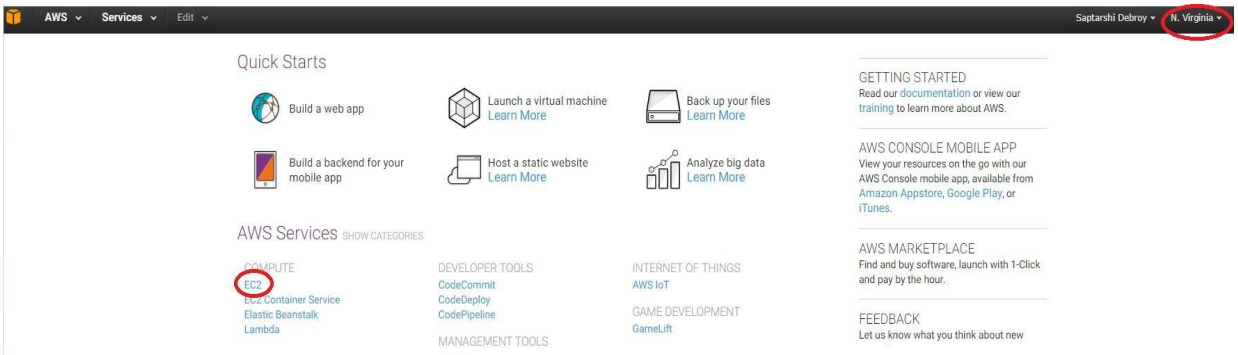


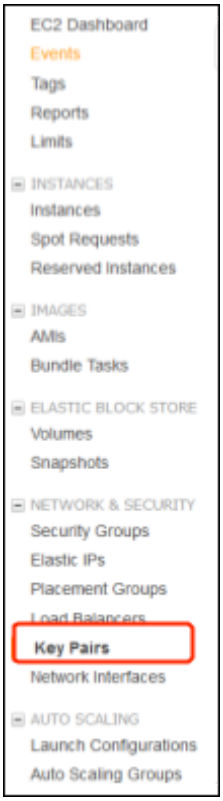
Figure 3: Overview of an AWS Instance

Figure 3 shows the instance architecture to be configured in this Lab. Using your AWS account, you will launch a virtual instance created in a new 'Volume' from an Amazon EBS-backed instance snapshot (called 'Root'), in order to access your reserved infrastructure resources over the Internet; you will need to create key pairs and secure it through a security group; all the infrastructure will be created in a specific zone.

3.5.1 Click 'Console Home', make sure to select the US East (N. Virginia) region in the top-right part of your screen and select AWS EC2 service (Elastic Compute Cloud).



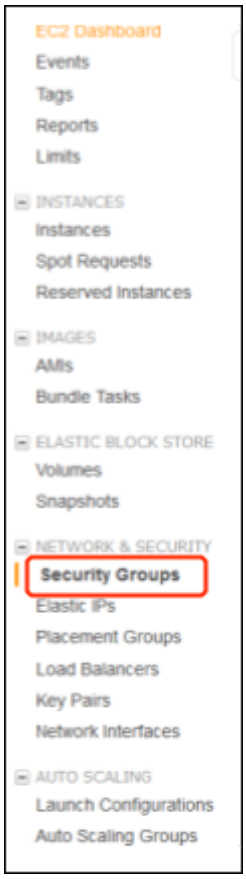
3.5.2 In left menu select “Key Pairs”.



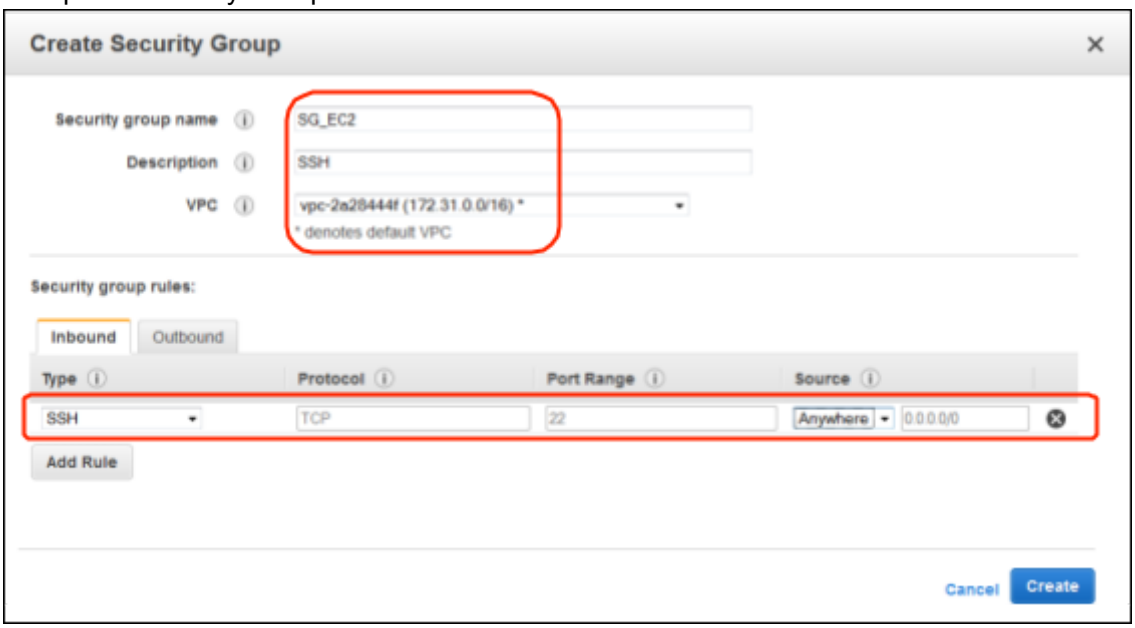
- Create a KeyPair called ‘key-ec2’ and **store it in a safe location**, you will need this key to connect to the instances.

If you are a Linux/MAC user, remember to set the priority for the key pair: chmod 700 <path-to-the-keypairs>.

3.5.3 Select “Security Groups” from the left menu, name a Security Group ‘SG_EC2’, add description and a SSH rule with ‘anywhere’ option selected in source field.

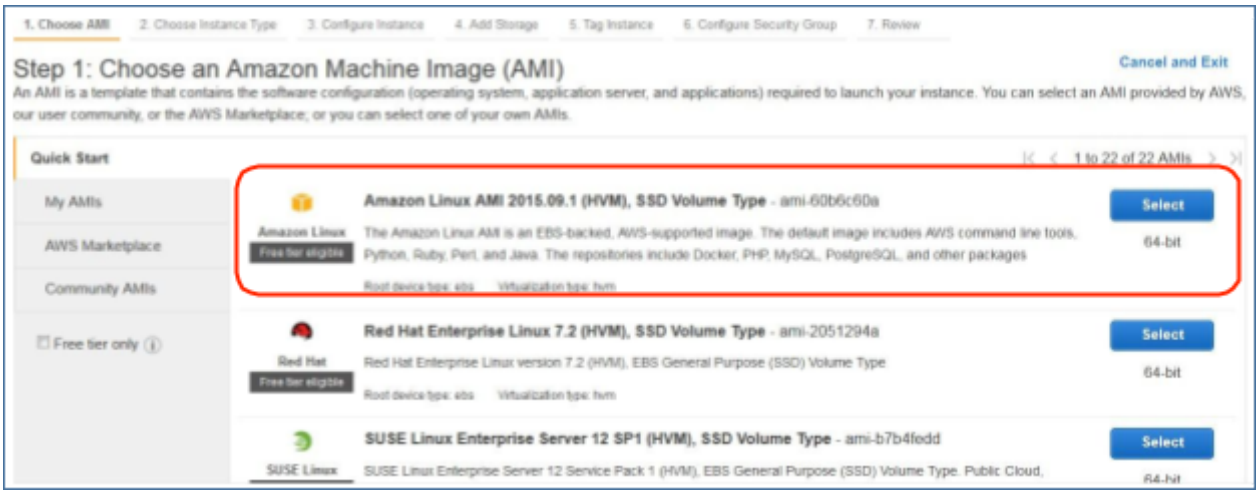


- Example of Security Group creation.

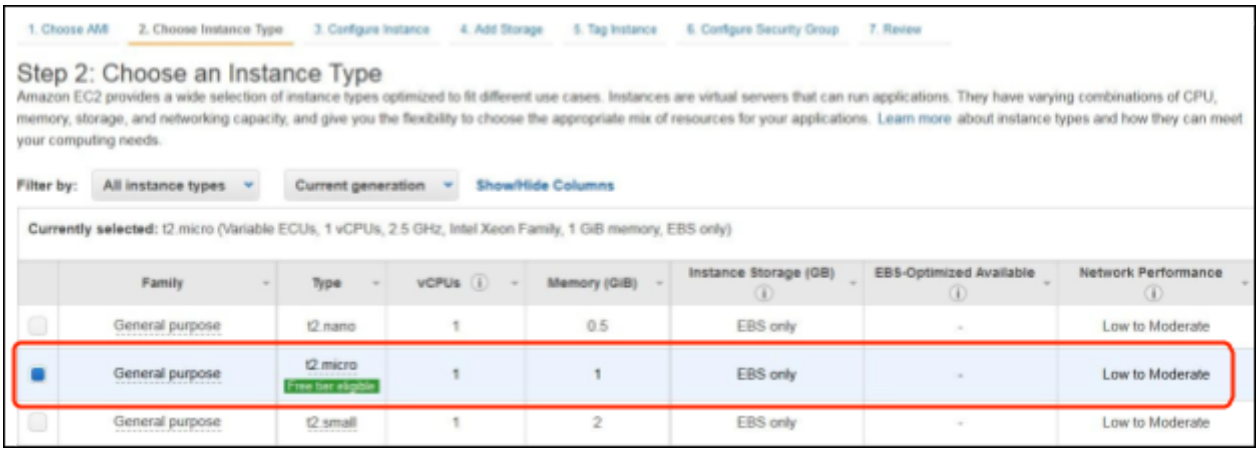


3.5.4 Launch your Instance

- In left menu, launch a new instance in the ‘Instances’ option Click on the ‘Launch Instance’ button and select the first Image of ‘Amazon Linux’ on the list

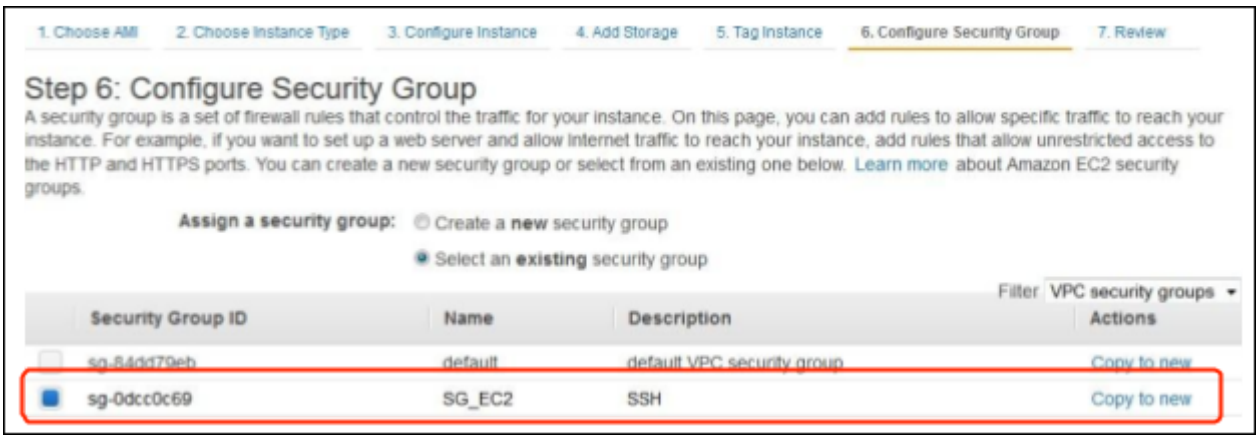


- Select the t2.micro instance that is ‘Free’.

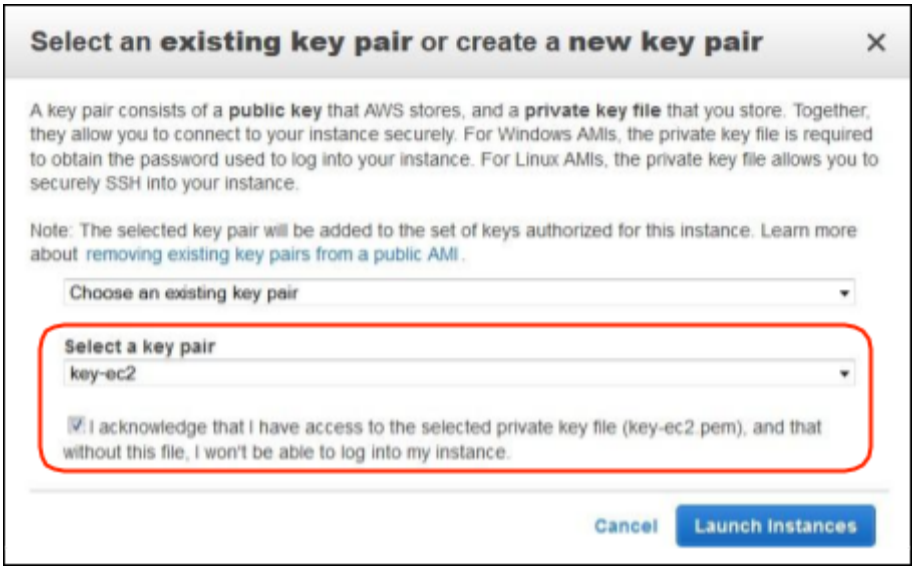


- Keep default values in the next configuration windows and continue until you get to the ‘Tag Instance’ option. Add ‘Key’ and ‘Value’ as shown in figure below and click on ‘Next: Configure Security Group’.

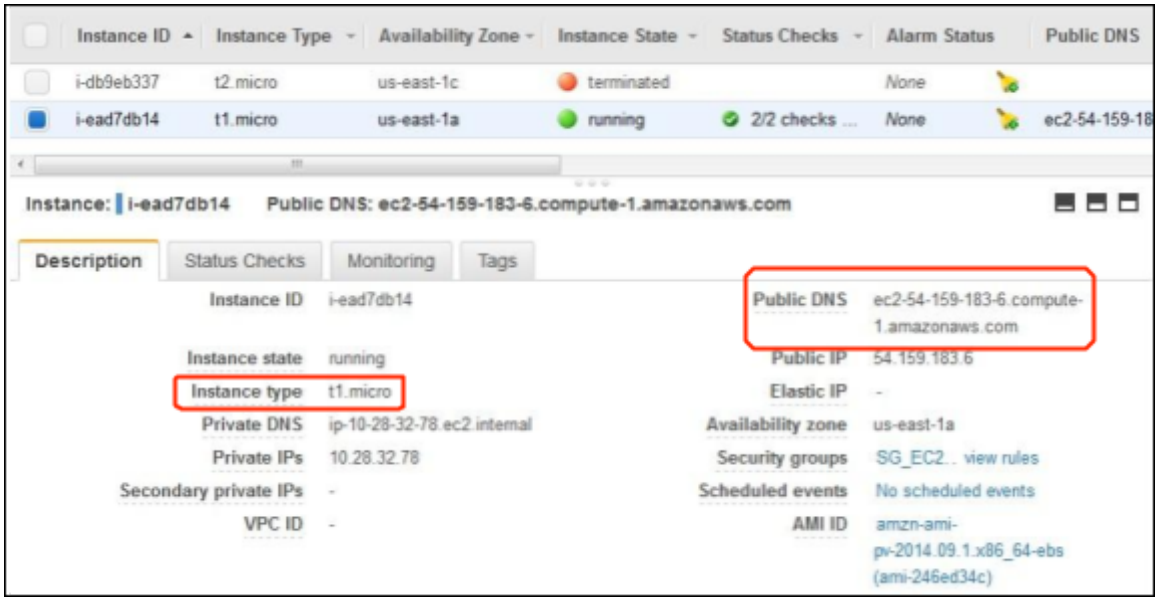
- Select the ‘Security Group’ created previously and click on ‘Review and Launch’.



- Once you click ‘launch’ you will be prompted to choose the key pair ‘key-ec2’ created previously.

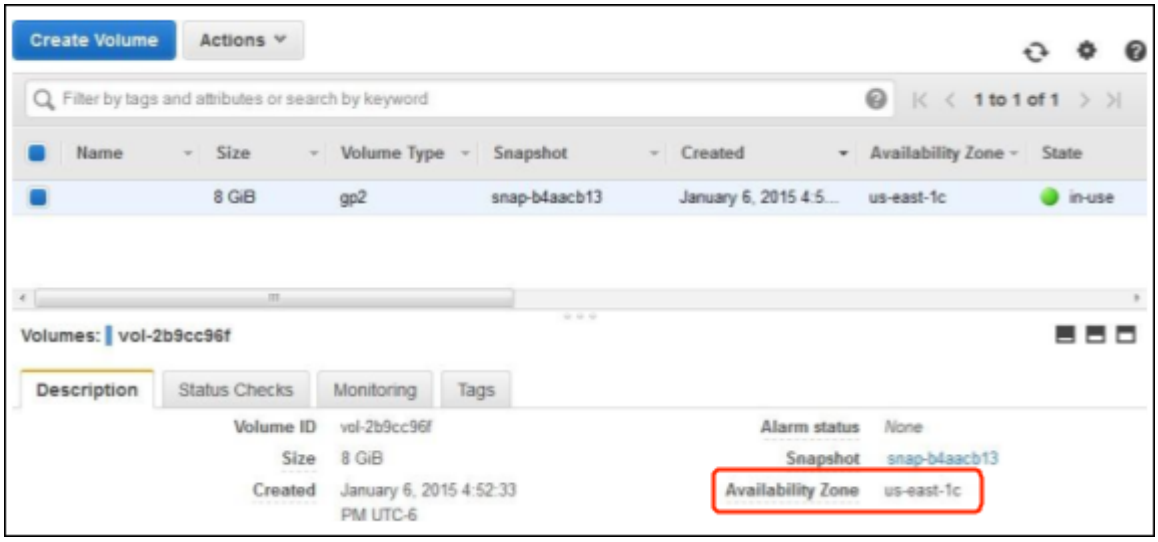


- In a short time your new instance will be deployed and ready to be used.

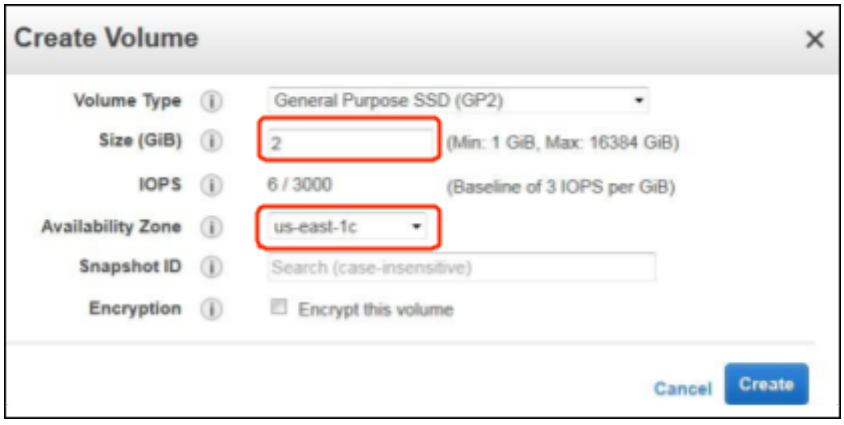


3.6 Adding volume

In left menu “Elastic Block Store”, select ‘Volumes’ and you will see the default volume where your instance is stored.



- Click in ‘Create Volume’ for creating a new **2GB** volume **and Volume Type ‘General Purpose (SSD)’**. Be sure that the ‘**Availability Zone**’ in the new volume is the same as the ‘Zone’ of the first volume (For this specific case us-east-1c)

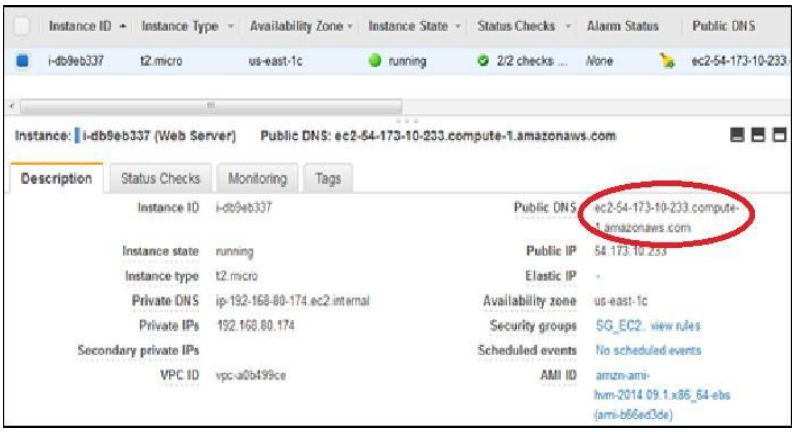


- Once the new volume is ‘available’, right click on it and select ‘Attach volume’, select your created instance and attach it. Note the path will be established in the ‘Device’ option.

- You will end up with a new 2 GB SDD storage drive attached to your instance.
- It is good practice to name your volumes.

3.7 Connection to the instance using SSH

First up, copy the public DNS.



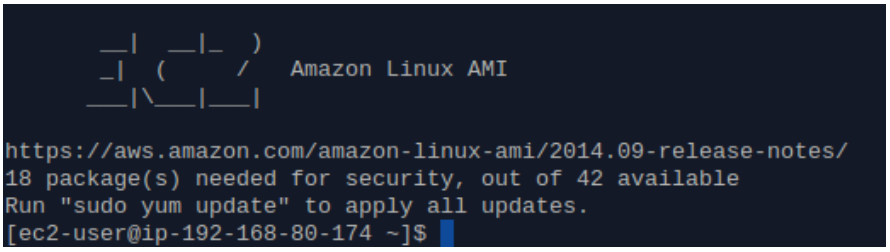
3.7.1 For Linux and MAC OS

Open a terminal and type in:

```
ssh -i <path-to-your-key-pairs> <public DNS>
```

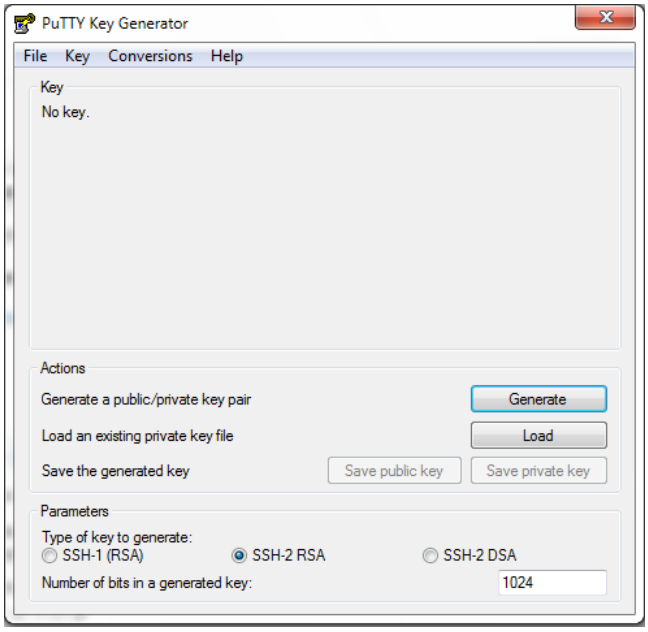
```
$ ssh -i key-ec2.pem ec2-user@ec2-54-173-10-233.compute-1.amazonaws.com
```

You will be logged in the amazon instance.

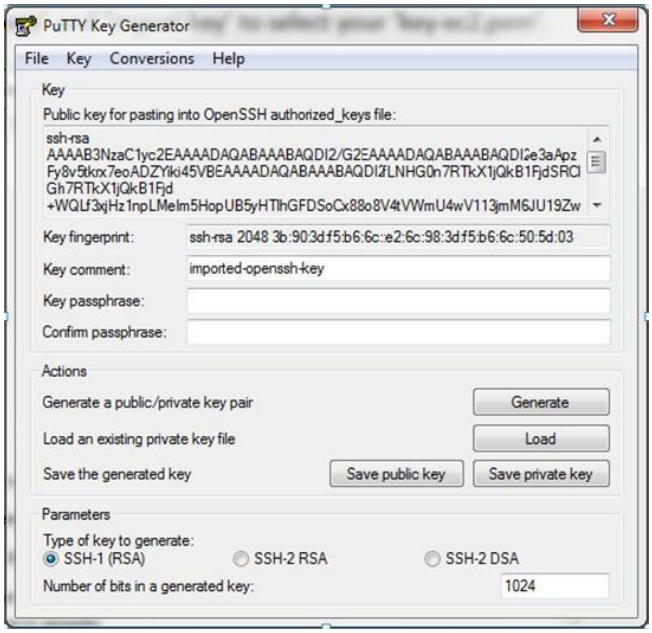


3.7.2 For Windows

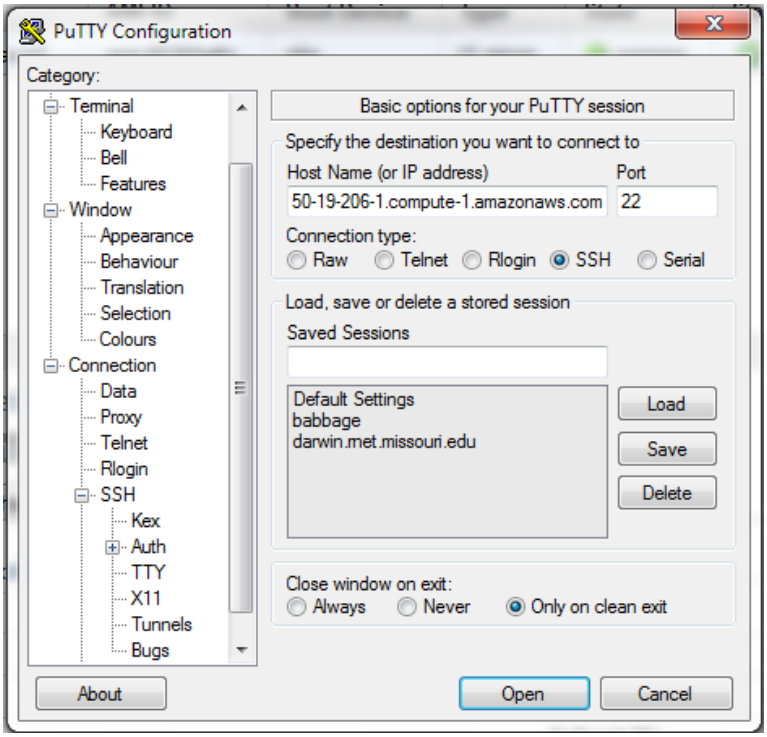
Download ‘PuTTY Key Generator’ to convert your key to PuTTY compatible format. Click in ‘conversions’ and ‘import key’ to select your ‘key-ec2.pem’.



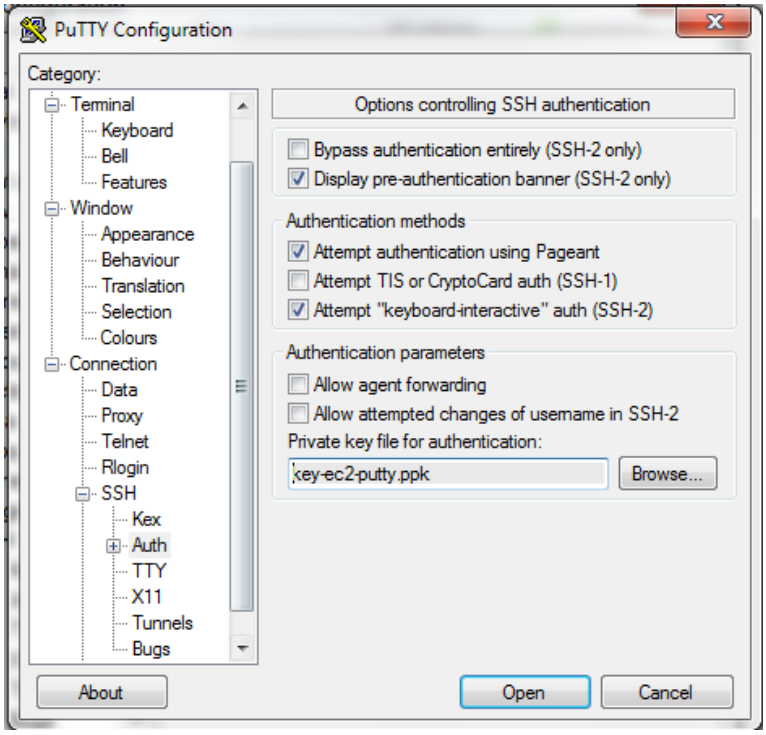
Select the ‘SSH-1 (RSA)’ check box and click on ‘Save private key’ for storing. Name it ‘key-ec2-putty’



Now with PuTTY. Paste [public dns] in ‘Host Name (or IP address)’



Browse the ‘key-ec2-putty’ in Connection/SSH/Auth then click Browse.



Select ‘Yes’ in the PuTTY alert. Then Login as ‘ec2-user’

3.8 You should stop your instance after finishing the lab.

In your AWS EC2 service select ‘Instances’ under ‘INSTANCES’ option, select your running instance, click on ‘Actions’ button and ‘Stop’ option.