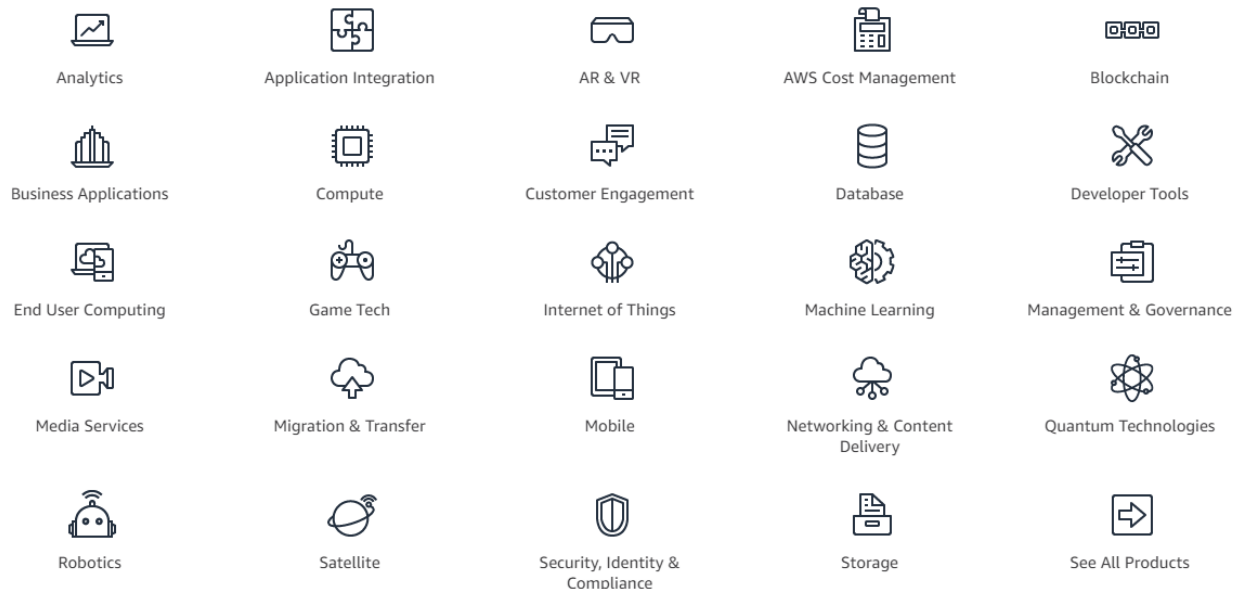# Lab 2: Getting Started with Amazon EC2
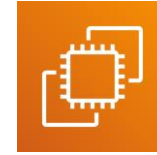
CS4296/CS5296

Cloud Computing

OVERVIEW

▸ This lab provides step-by-step instructions on how to open an Amazon Web Services (AWS) account to enable access to the services provided.

▸ This lab will also help you launch a Linux virtual machine on Amazon EC2 within AWS Free Tier.

AWS: A Leading Cloud Platform

▸ **Amazon Web Services** (or AWS) is a comprehensive and broadly adopted cloud platform offered by Amazon. It provides a mix of Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS) offerings.

▸ AWS offers over 175 (as of 2020) fully featured services, from infrastructure technologies like compute, storage, and databases to emerging technologies, such as machine learning and artificial intelligence, data lakes and analytics, and Internet of Things.

| Analytics	Application Integration	AR & VR	AWS Cost Management	Blockchain
Business Applications	Compute	Customer Engagement	Database	Developer Tools
End User Computing	Game Tech	Internet of Things	Machine Learning	Management & Governance
Media Services	Migration & Transfer	Mobile	Networking & Content Delivery	Quantum Technologies
Robotics	Satellite	Security, Identity & Compliance	Storage	See All Products

EC2: Virtual Servers in the Cloud

▸ Amazon Elastic Compute Cloud (EC2) is the Amazon Web Service you use to create and run virtual machines in the cloud. Amazon calls these virtual machines 'instances'.

▸ A user can create, launch, and terminate server-instances as needed, paying by the second for active servers – hence the term "elastic".

▸ EC2 provides users with control over the geographical location of instances that allows for latency optimization and high levels of redundancy.

General-Purpose
Ideal for business critical applications, small and mid-sized databases, web tier applications, and more.
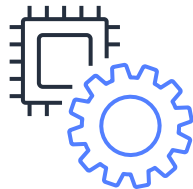
Compute Optimized
Ideal for high performance computing, batch processing, video encoding, and more.
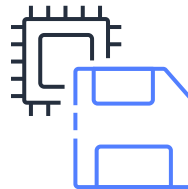
Memory Optimized
Ideal for high performance databases, distributed web scale in-memory caches, real time big data analytics, and more.
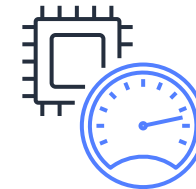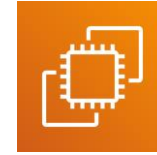
Accelerated Computing
Ideal for machine learning, graphic intensive applications, gaming, and more.
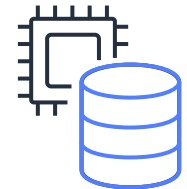
Storage Optimized
Ideal for NoSQL databases, data warehousing, distributed file systems, and more.

▲ Instance Categories

https://aws.amazon.com/ec2

EC2: Virtual Servers in the Cloud (cont'd)

▸ 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.
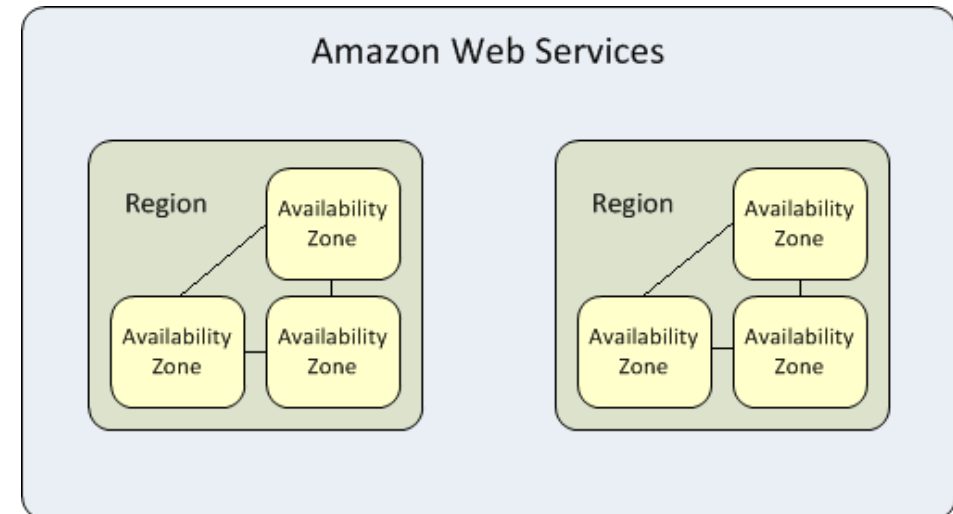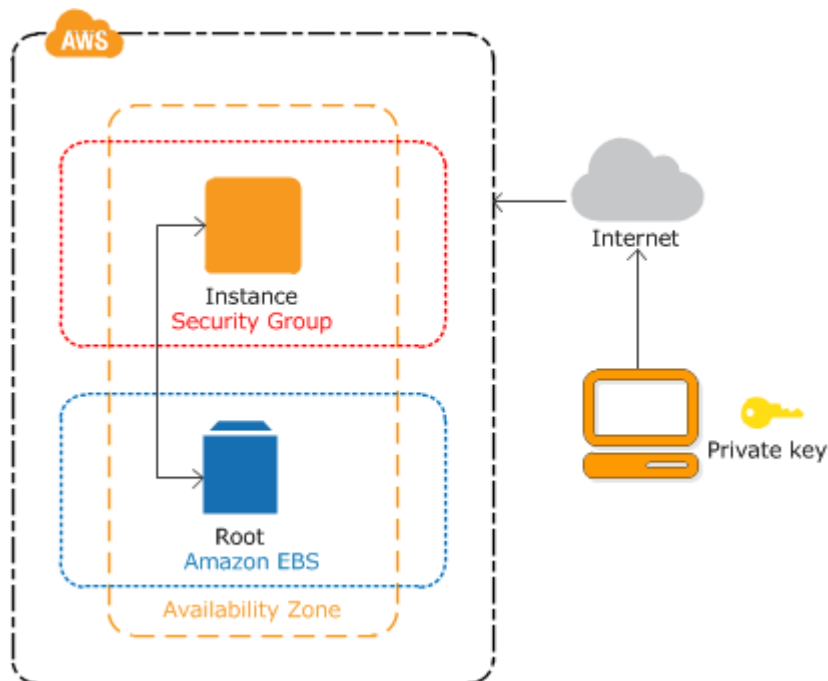
GETTING STARTED WITH AMAZON EC2

▸ Follow these steps to get started with Amazon EC2.

- Step 1: Set up and log into your AWS account

- Step 2: Launch an Amazon EC2 instance

- Step 3: Configure your instance

- Step 4: Connect to your instance

- Step 5: Terminate your instance

Step 1: Set up and log into your AWS account

▸ When you sign up for Amazon Web Services (AWS), your AWS account is automatically signed up for all services in AWS, including Amazon EC2.

▸ With Amazon EC2, you pay only for what you use.

  – If you are a new AWS customer, you can get started with Amazon EC2 for free. For more information, see AWS Free Tier.

  – If you created your AWS account less than 12 months ago, and have not already exceeded the free tier benefits for Amazon EC2, it will not cost you anything to complete this tutorial.

▸ If you have an AWS account already, skip to the next task. If you don't have an AWS account, use the following procedure to create one.

Step 1: Set up and log into your AWS account (cont'd)

▸ Additional remarks:
- A valid credit card is required to complete the signup*.
- A mobile phone is required to receive the security number. Part of the sign-up procedure involves receiving a phone call and entering a verification code on the phone keypad;

▸ To create an AWS account
- Open https://portal.aws.amazon.com/billing/signup.
  - Follow the online instructions (learn more)
  - Select *Account Type* as **Personal** . Personal accounts and professional accounts have the same features and functions.
  - Select the **Free (Basic Plan)** option under *support plans*.
- If you have successfully finished creating an AWS account, you can you can now proceed by clicking on the **Sign in to the Console** button.

Step 1: Set up and log into your AWS account (cont'd)

▸ AWS Educate
- – You get a free tier when you create an account. However, not all stuff available on AWS qualifies for Free. Some paid AWS services are required for this course.
- – AWS Educate is Amazon's program to help students learn real-world cloud technology skills. It provides students and educators with the resources needed to accelerate cloud-related learning, including grants of AWS credits for use in courses and projects.

- – CityU is a member institution of AWS Educate (see member institution list). Registered CityU members are eligible for a grant of 100USD in AWS credits.

- – We strongly recommend that you join AWS Educate.

Step 1: Set up and log into your AWS account (cont'd)

▸ To sign up for an AWS Educate account through CityU, please follow the instructions

1. Access the AWS Educate website here and click Join AWS Educate.
2. Click to apply for AWS Educate for Student.
3. Enter the information requested on the AWS Educate Student Application form.
    ✓ Make sure you use *City University of Hong Kong* under the Institution Name section of the application.
    ✓ Also make sure to use a *.cityu.edu.hk* email address when you register. Otherwise, your account application will not be accepted.
    ✓ One of the required fields in the application form is the AWS Account ID. Sign into your AWS Account, click your name located on the top right navigation pane, and select "My Account". Your AWS ID is located underneath the Account Settings section.
4. Verify your email address and complete a captcha to verify that you are not a robot.
5. Click-through to accept AWS Educate Terms and Conditions.

Step 1: Set up and log into your AWS account (cont'd)

▸ After the Student application is submitted:

1. You will receive an email indicating that the application was received.

2. AWS Educate team reviews the application and performs any necessary validation.

   📌 It usually takes the AWS Educate team around 48 hours to review student applications*.

3. After you are accepted, a welcome message is forwarded to your email address. The message includes a link for the AWS Educate Student portal (not required for this course) and an AWS credit code. It also includes a link to the AWS credits redemption web site where the credits will be applied to your AWS account.

4. Here's how to redeem your promotional credit:

   • Visit: https://console.aws.amazon.com/billing/home#/credits.

   • Follow the instructions and enter your promo code.

* **AWS Educate account is required for later labs. The resources you create in this lab (week 2) are Free Tier eligible.**

Step 2: Launch an Amazon EC2 instance

▸ You can launch a Linux instance using the AWS Management Console as described in the following procedure. This lab is intended to help you launch your first instance quickly, so it doesn't cover all possible options.

– For more information about the advanced options, see Launching an Instance.

▸ **To launch an instance**

– Log into the AWS Management Console, then type *EC2* in the search bar and select **Amazon EC2** to open the service console.

• https://console.aws.amazon.com/console/home

– Or open the Amazon EC2 console at https://console.aws.amazon.com/ec2

– In the Amazon EC2 Dashboard, choose "Launch Instance" to create and configure your virtual machine.

Step 2: Launch an Amazon EC2 instance

Step 3: Configure your instance

▸ You are now in the EC2 Launch Instance Wizard, which will help you configure and launch your instance.

▸ The **Choose an Amazon Machine Image (AMI)** page displays a list of basic configurations, called *Amazon Machine Images (AMIs)*, that serve as templates for your instance. Each AMI includes an operating system, and can also include applications and application servers.

▸ For this lab, find **Ubuntu Server 18.04 LTS (HVM), SSD Volume Type** and click Select.

▸ Notice that this AMI is marked "Free tier eligible."

Step 3: Configure your instance

Step 3: Configure your instance

▸ On the **Choose an Instance Type** page, you can select the hardware configuration of your instance. Instance types comprise of varying combinations of CPU, memory, storage, and networking capacity so you can choose the appropriate mix for your applications. For more information, see Amazon EC2 Instance Types.

▸ The default option of *t2.micro* should already be checked. This instance type is covered within the Free Tier and offers enough compute capacity to tackle simple workloads.

▸ Click **Review and Launch** at the bottom of the page to let the wizard complete the other configuration settings for you.

Step 3: Configure your instance

Step 3: Configure your instance

▸ You can review the configuration, storage, tagging, and security settings that have been selected for your instance.

▸ While you have the option to customize these settings, we recommend accepting the default values for this lab.

▸ Click **Launch** at the bottom of the page.

Step 3: Configure your instance

Step 3: Configure your instance

▸ On the next screen you will be asked to choose an existing key pair or create a new key pair. A key pair is used to securely access your Linux instance using SSH*.

▸ Select **Create a new key pair**, enter a name for the key pair, and then choose **Download Key Pair**.

⚠ • This is the only chance for you to save the private key file, so be sure to download it. Save the private key file in a safe place. You'll need to provide the name of your key pair when you launch an instance and the corresponding private key each time you connect to the instance.
  • **Warning:** Don't select the **Proceed without a key pair** option. If you launch your instance without a key pair, then you can't connect to it.

💡 When prompted for a key pair for launching a new instance later, select **Choose an existing key pair**, then select the key pair that you created when getting set up.

▸ After you have stored your key pair, click **Launch Instance** to start your Linux instance.

* AWS stores the public part of the key pair which is just like a house lock. You download and use the private part of the key pair which is just like a house key.

Step 3: Configure your instance

Step 3: Configure your instance

▶ A confirmation page lets you know that your instance is launching. Click **View Instances** to close the confirmation page and return to the console to view your instances and see the status of the instance you have just started.

Step 3: Configure your instance

▸ It can take a few minutes for the instance to be ready so that you can connect to it. Check that your instance has passed its status checks; you can view this information in the **Status Checks** column.

▸ In a few minutes, the *Instance State* column on your instance will change to "*running*" and a Public IP address will be shown. You can refresh these Instance State columns by pressing the **refresh button** on the right just above the table.

▸ Copy the **Public IP address** or **Public DNS (IPv4)** of your AWS instance, so you can use it when we connect to the instance using SSH in Step 4.

Step 3: Configure your instance

Step 4. Connect to your Instance

▸ After launching your instance, it's time to connect to it using SSH. Your local computer's operating system determines the type of method you use to connect to your Linux instance.

  – Windows users:
    • PuTTY (and PuTTYgen)
    • MobaXterm

  – Mac/Linux users:
    • Terminal and SSH command

Step 4. Connect to your Instance (Windows + PuTTY)

▸ Prerequisites
- Because PuTTY does not natively support the private key format for SSH keys. You must convert your private key (.pem file) into correct format (.ppk file) with **PuTTYgen** in order to connect to your instance using PuTTY*.

▸ To convert your private key ([learn more](#)):
- From the Windows Start menu, choose All Programs > PuTTY > PuTTYgen to launch PuTTYgen.
- Under **Type of key to generate**, choose **RSA**.
- Choose **Load**. By default, PuTTYgen displays only files with the extension .ppk, choose the option to display files of **All Files (*.*)** types.
- Select your .pem file for the key pair that you specified when you launched your instance. PuTTYgen displays a notice that the .pem file was successfully imported. Choose OK.
- To save the key in the format that PuTTY can use, choose **Save private key**. PuTTYgen displays a warning about saving the key without a passphrase. Choose **Yes**.
- Specify the same name for the key that you used for the key pair (for example, cloudcomputing) and choose **Save**. PuTTY automatically adds the .ppk file extension.

* You do not need to do this every time you connect to you instance, you only need to set this once per SSH key that you have.

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Step 4. Connect to your Instance (Windows + PuTTY)
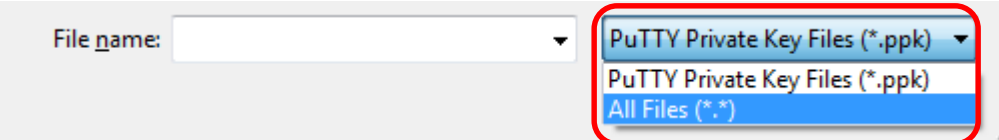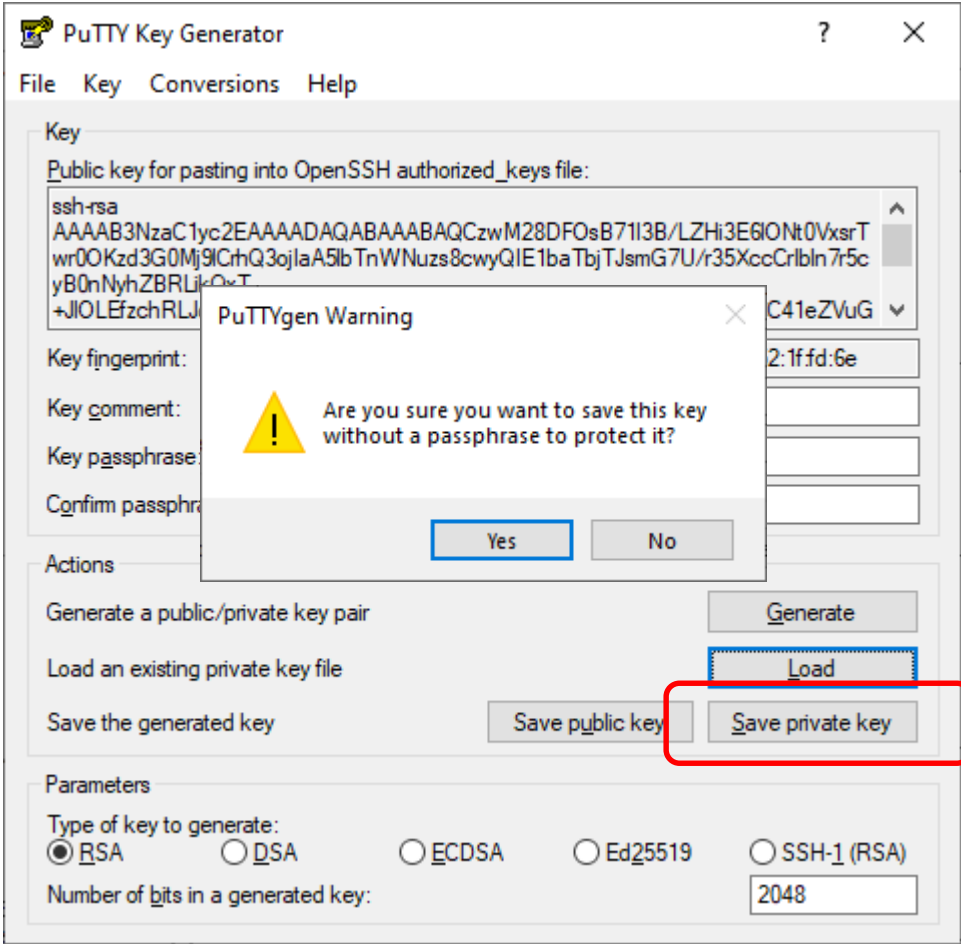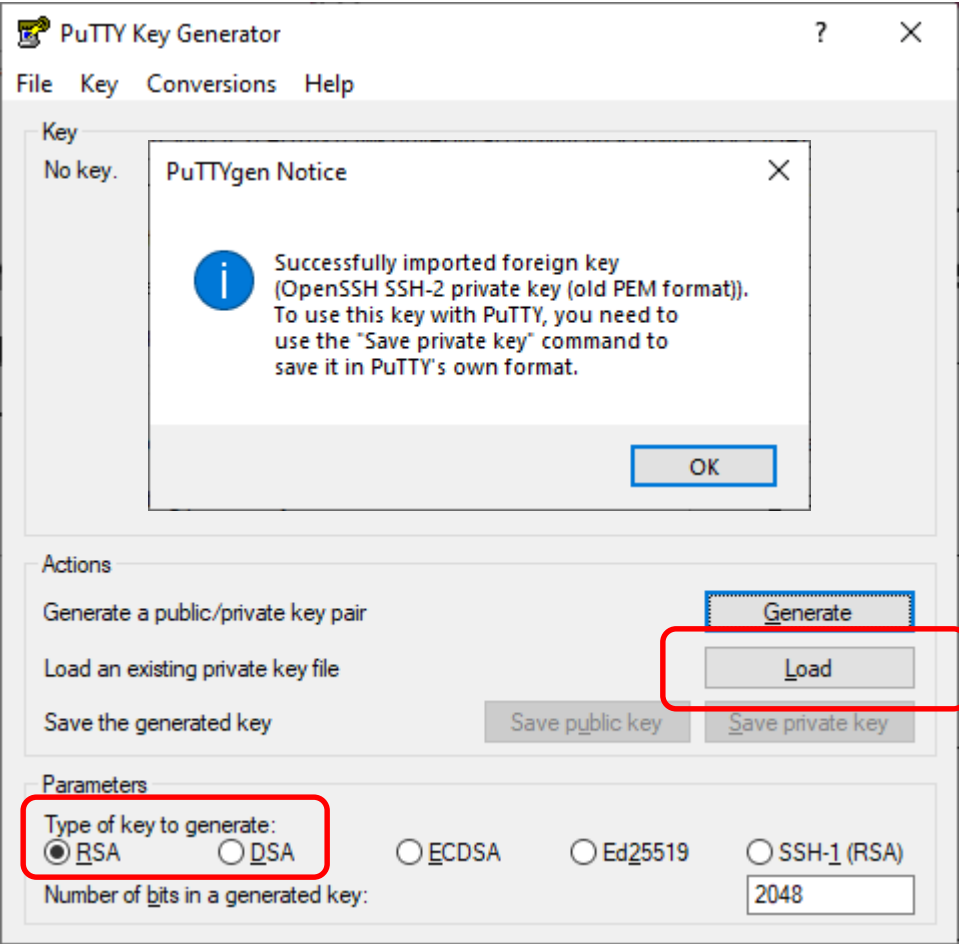
Step 4. Connect to your Instance (Windows + PuTTY)

- To connect to your instance using PuTTY,
  - Start PuTTY
  - In the **Category** pane, choose **Session** and complete the following fields:

    To connect using your instance's public DNS, enter username@public_dns_name or username@public_ip_address. For an Ubuntu AMI, the user name is **ubuntu**. Ensure that **Port** value is 22, **Connection type is SSH**.

  - In the **Category** pane, expand **Connection**, expand **SSH**, and then choose **Auth**. Complete the following:
   - Choose **Browse**.
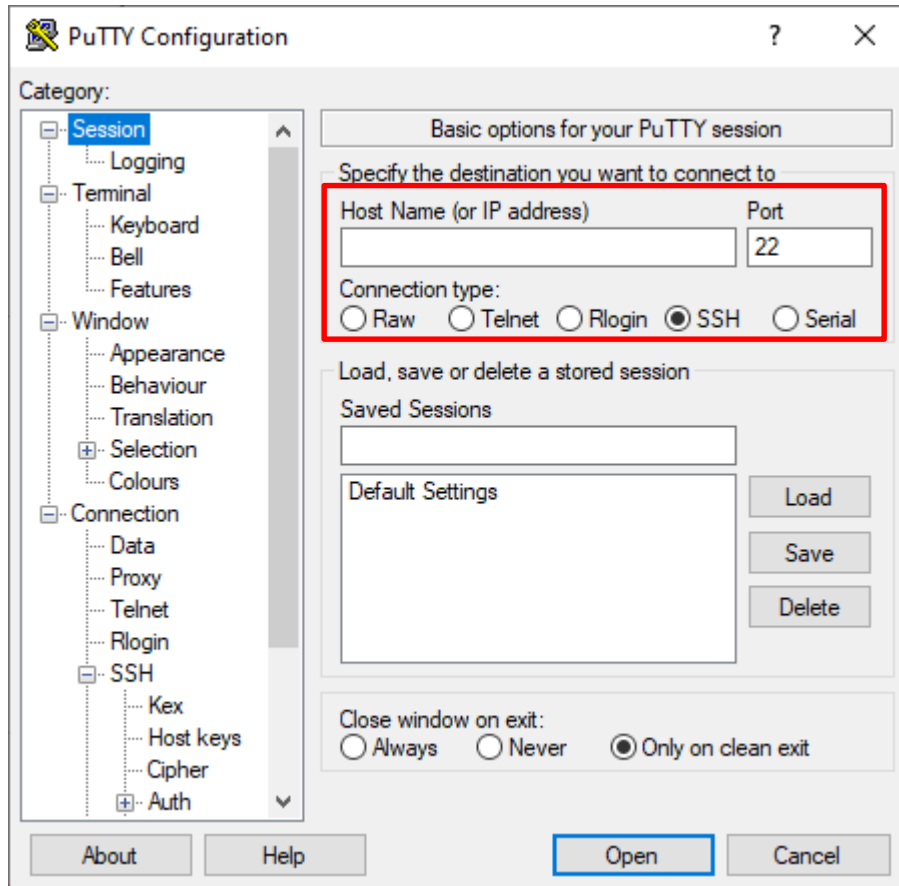   - Select the .ppk file that you generated for your key pair and choose **Open**.
    - If this is the first time you have connected to this instance, PuTTY displays a security alert dialog box that asks whether you trust the host to which you are connecting. Choose **Yes**. A window opens and you are connected to your instance.

Step 4. Connect to your Instance (Windows + PuTTY)
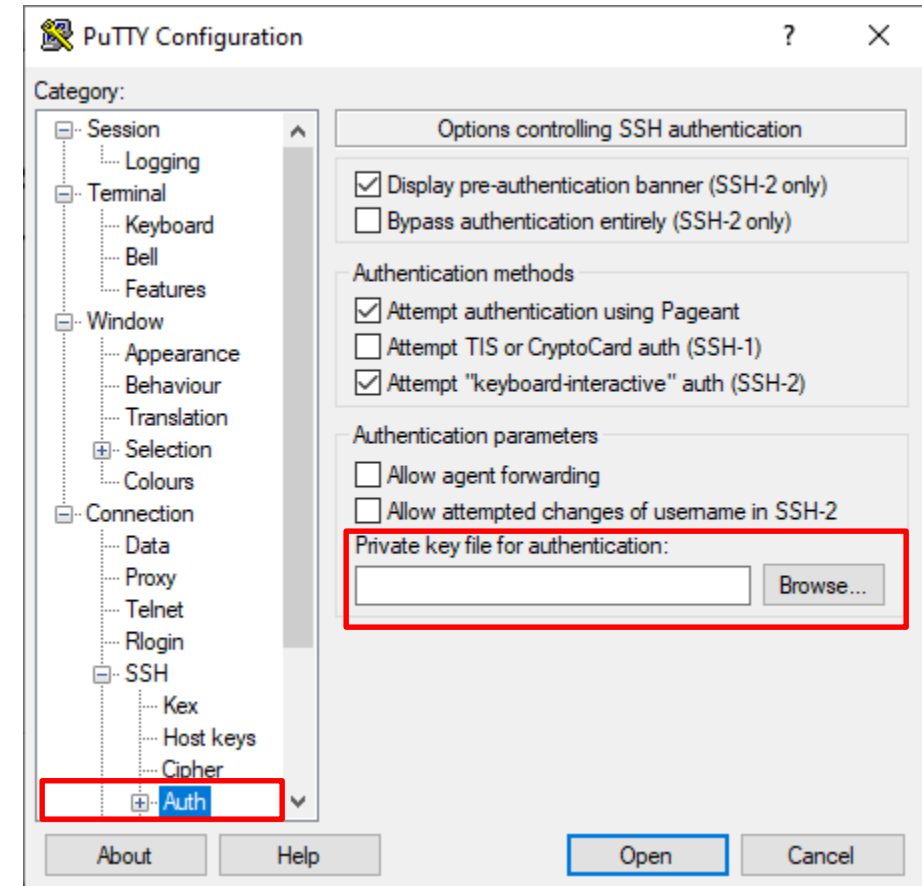
Step 4. Connect to your Instance (Windows + MobaXterm)

▸ To access your instance with MobaXterm on Windows:

- Launch MobaXterm and start a "New Session".

- Select "SSH" as the session type.

Specify **Public IP address** or **Public DNS (IPv4)** of your AWS instance as the remote host, **ubuntu** as the username.

Choose **Advanced SSH settings** tab, check the **Use private key** checkbox, and select the key pair (e.g., cloudcomputing.pem) that you created for passwordless login.

Step 4. Connect to your Instance (Windows + MobaXterm)

Step 4. Connect to your Instance (Mac/Linux Users)

▶ Mac or Linux computer most likely includes an SSH client by default. You can check for an SSH client by typing **ssh** at the command line.

▶ To access your instance, Mac/Linux users should:
  – Open a terminal window.
  – Locate your private key file (e.g., ~/Downloads/cloudcomputing.pem).
  – Use the **chmod** command to make sure your private key file is not publicly viewable by entering the following command to restrict permissions to your private SSH key:
    • `chmod 400 ~/Downloads/cloudcomputing.pem`
    • You do not need to do this every time you connect to you instance, you only need to set this once per SSH key that you have.
  – Use SSH to connect to your instance. The format is:
    • `ssh -i {full path of your .pem file} ubuntu@{instance IP address}`
    • Example: `ssh -i "~/Downloads/cloudcomputing.pem" ubuntu@18.234.189.34`

Step 4. Connect to your Instance

▸ After you start your instance, you might want to try some of the following commands:

- `ls`   list files
- `cd`   change directory
- `pwd`   print current directory
- `cp [file1] [file2]`   copy file
- `mkdir [name]`   make directory
- `mv [file] [destination]`   move/rename file
- `rm [file]`   remove (-r for recursive)
- `cat [file] [file2…]`   display file(s)
- `top`   display Linux processes
- `ps`   report a snapshot of the current processes

Step 5. Terminate your instance

▸ Amazon EC2 is free to start, but you should terminate your instances to prevent additional charges. The EC2 instance and the data associated will be deleted.

▸ Back on the EC2 Console, select the box next to the instance you created. Then click the **Actions** button, navigate to *Instance State*, and click **Terminate**.

▸ You will be asked to confirm your termination - select **Yes, Terminate**.

▸ Note: This process can take several seconds to complete. Once your instance has been terminated, the Instance State will change to *terminated* on your EC2 Console.

👍 It is a best practice to terminate instances you are no longer using so you don't keep getting charged for them.

Step 5. Terminate your instance

Congratulations!

You have learned how to use Amazon EC2 to launch, configure, connect, and terminate an instance in the cloud.