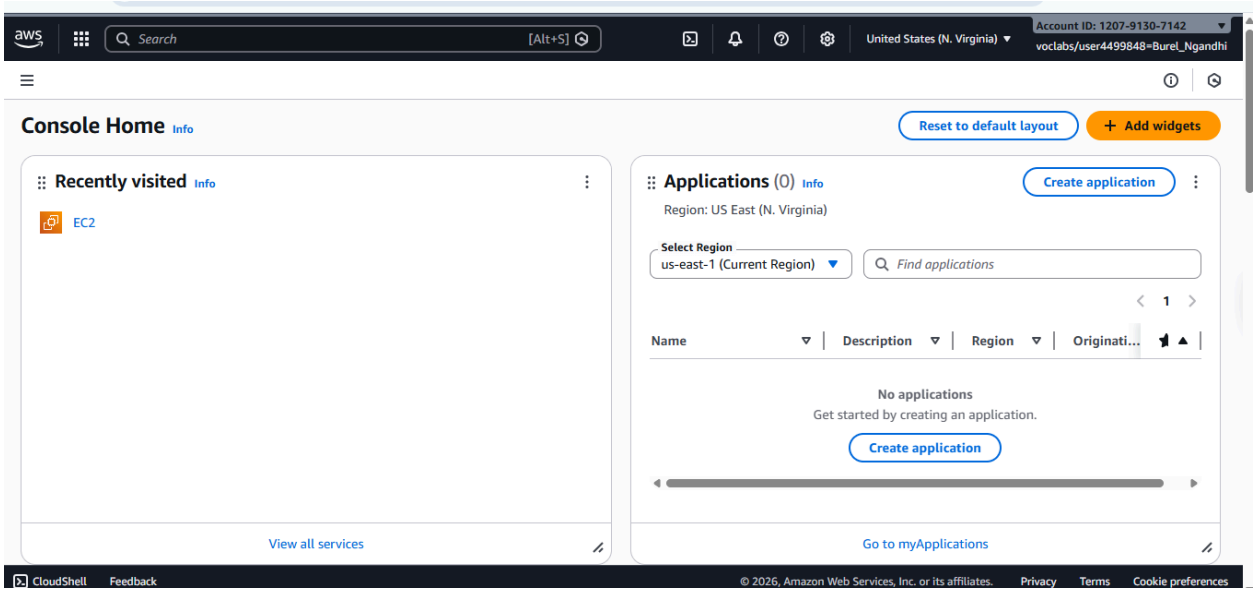
Week 2 Project **[Burel Ngandhi]**

CMIT 495 Current Trends and Projects in Computer Networks and Security

Week 2 – Cloud Computing

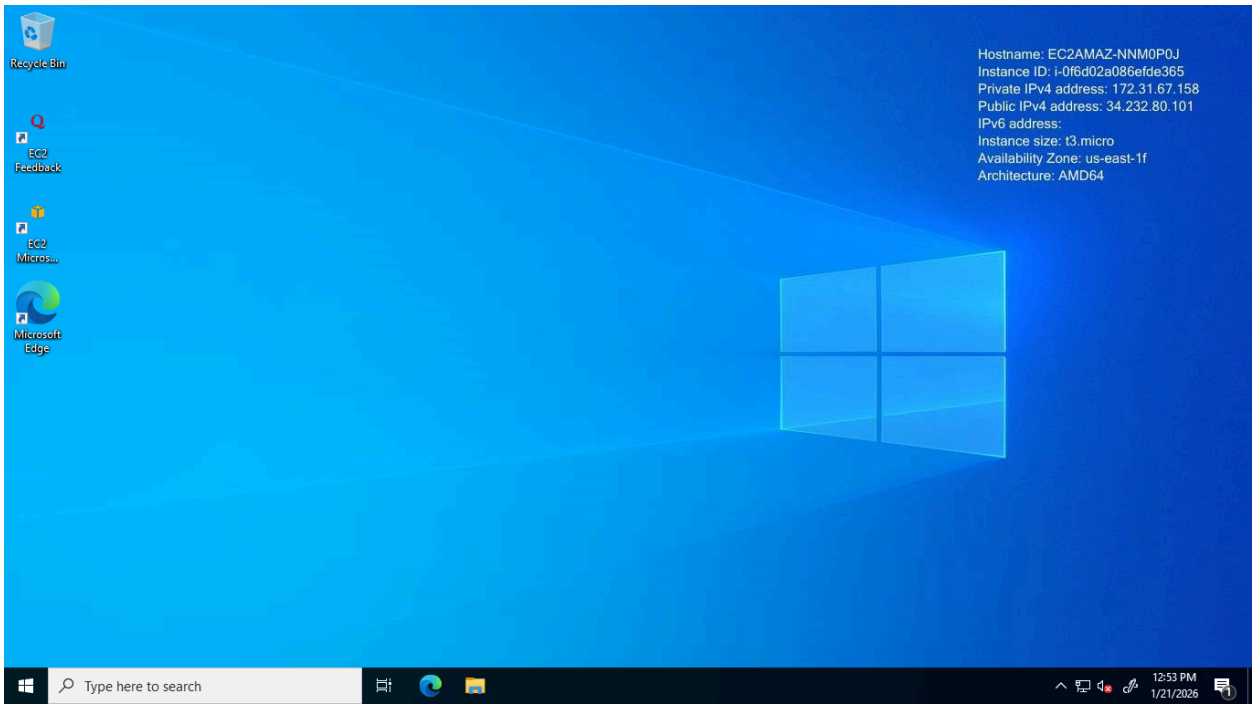
1. **Access your AWS Learner Lab and take a screenshot of the AWS Management Console (Dashboard) and paste it below question 1. The screenshot should include the username you were assigned during the setup phase.**



2. **Launch a Windows Virtual Machine (VM). Provide a detailed overview of the steps required to install the Microsoft Windows operating system (OS) on the VM. The steps may be listed in the form of bullet points or a summary with complete sentences. Use as much space as required. Finally, take a screenshot of the desktop and paste it with your response below this question.**

- Selected Windows AMI
- Configured EC2 instance
- Configured security group
- Retrieved credentials

- Successfully accessed the VM

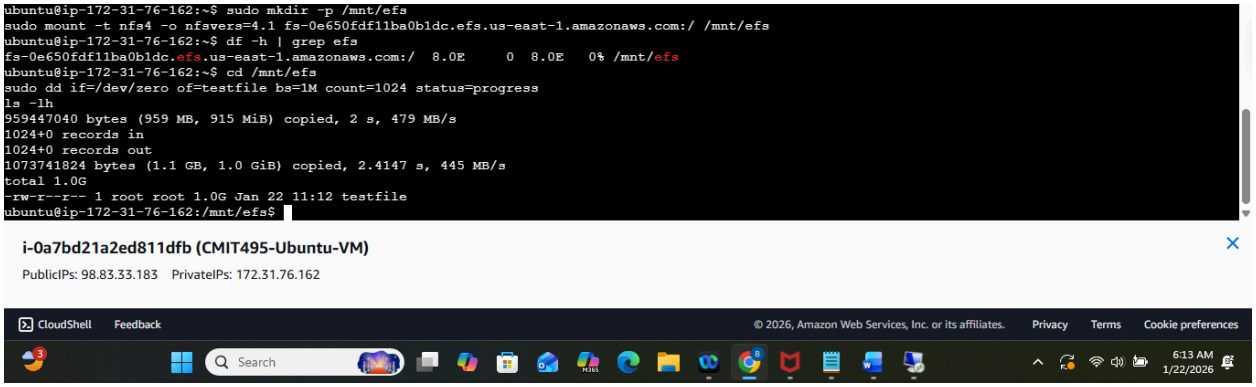


3. **Using what you learned from Project 1, provision and launch a new AWS EC2 Ubuntu Linux Server and connect to it via the SSH protocol. Note any challenges or opportunities associated with this provisioning.**

- The Ubuntu Linux EC2 instance was provisioned using AWS. Secure access was established via the SSH protocol using a key pair. A security group was configured to allow inbound SSH traffic on port 22. The connection was successfully established, demonstrating secure remote access to the Linux server.

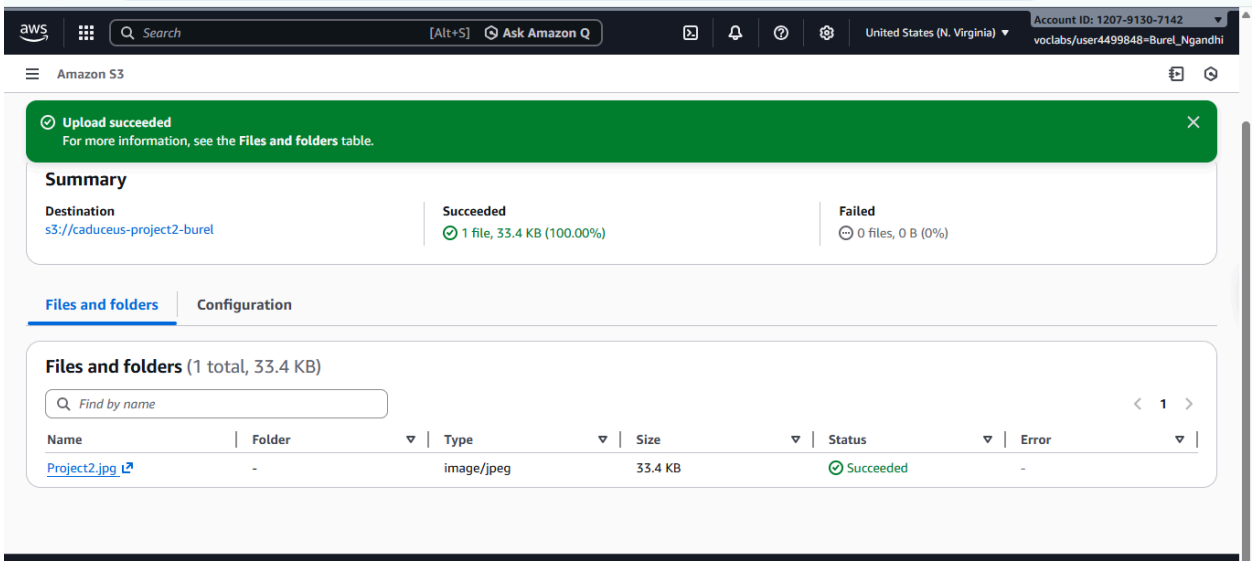
4. **Using AWS, *create a network file system* with Amazon Elastic File Systems (EFS) and attach it to the running Ubuntu Server instance. You may use the AWS *web page* for step-by-step instructions and understand how the EFS works. Take a screenshot of the result and embed it below. Specifically, take a screenshot to verify *that your file system has been successfully mounted*, along with the results from *creating a test file in your new file system. This will be done by running a simple dd command to generate a 1GiB file in your new directory.* Finally, describe the value of a network file system.**

- The Amazon Elastic File System (EFS) was successfully created and mounted to the Ubuntu EC2 instance using the NFS protocol. An initial connection timeout occurred due to missing NFS permissions in the EFS security group. After configuring inbound TCP port 2049 to allow access from the EC2 instance's security group, the file system mounted successfully.



5. **Using the AWS platform, create an S3 bucket and upload any file to the S3 bucket. Take a screenshot showing the file was uploaded to the S3 bucket and paste it below. If necessary, use the AWS webpage above for step-by-step instructions.**

- An Amazon S3 bucket was created to demonstrate object storage capabilities. A file was successfully uploaded to the bucket, confirming proper configuration. Amazon S3 provides highly durable, scalable storage for unstructured data such as documents, images, and backups.



6. **The CTO will be reviewing this document. You have shown how easy it is to provision a Microsoft OS using the AWS platform. The CTO chose AWS because it offered a free account. She will now expect a recommendation from you on what cloud service to use for the organization's PaaS (e.g., the infrastructure, OS, runtime, etc.) needs. There is no need for a private cloud, so the public option will work just fine. Describe the difference between the Google Cloud platform, Amazon AWS platform, and Microsoft Azure platform. Provide a recommendation for the CTO as to which service provider you would recommend and why. Be explicit and detailed in your recommendation.**

- Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP) are the three leading public cloud providers. AWS offers the most mature and comprehensive service portfolio, including compute, storage, networking, and security services. Microsoft Azure integrates seamlessly with Windows Server, Active Directory, and enterprise Microsoft environments, making it ideal for organizations heavily invested in Microsoft technologies. Google Cloud Platform excels in data analytics and machine learning but has a smaller enterprise service footprint.

  Based on service maturity, documentation quality, scalability, and cost-effective free-tier offerings, AWS is the recommended platform for Caduceus. AWS provides robust infrastructure, flexible storage options such as EFS and S3, and secure networking through Amazon VPC, making it well-suited for the organization's current and future needs.

7. **The CTO approved your comparative analysis between the cloud service providers (i.e. Amazon, Google, and Microsoft). She has decided to proceed with an Amazon Virtual Private Cloud (Amazon VPC). The Amazon VPC enables one to launch AWS resources into a virtual network, which is similar to a traditional network that can be operated in an on-premises data center. Keep in mind that networking, storage, and security associated with a VPC are as important as the overall scalable infrastructure of AWS.**
   a. **To begin, the CEO would like you to provide the network settings needed to provision two (2) subnets for the VPC as shown in the table below:**

A	**Developers**	**CIDR:** **146.38.70.105/20**	*Network Address:* *146.38.64.0*	*Broadcast Address:* *146.38.79.255*	*Subnet:* *255.255.240.0*
B	**Marketing**	**172.31.0.0 /16**	*172.31.0.0/16*	*172.31.0.0*	*255.255.0.0*

b. Based on your understanding, list the network address, broadcast address, and subnet mask for subnet A and subnet B in the table above. Perform the necessary calculations and explain how you arrived at your answer.

Subnet A – Developers (146.38.70.105/20)

A /20 CIDR indicates that the first 20 bits of the address represent the network portion, leaving 12 bits for host addresses.

A /20 subnet corresponds to a subnet mask of **255.255.240.0**, which creates address blocks in increments of 16 in the third octet.

- The given IP address is **146.38.70.105**
- The third octet (70) falls within the range **64–79**

  Therefore:
- **Network Address:** 146.38.64.0
- **Broadcast Address**: 146.38.79.255

Subnet B – Marketing (172.31.0.0/16)

A **/16 CIDR** indicates that the first 16 bits define the network, leaving the remaining 16 bits for host addresses.

A /16 subnet corresponds to a subnet mask of **255.255.0.0**.

- The given network already starts at **172.31.0.0**

  With a /16 mask:
- **Network Address:** 172.31.0.0

- **Broadcast Address:** 172.31.255.255

To better help you understand IP addressing, IP subnetting, and IP address summarization, review the following AWS documentation prior to answering the questions in this section:

- **VPCs and subnets**
- **CIDR and Peering for VPC and AWS Control Tower**
- **Subnet CIDR reservations**

Note:

The key benefit of an Amazon VPC (or a virtual private network) is that the internal network devices are not openly accessible via the Internet and can only be accessed from within a secure network. Thus, it keeps the proprietary applications and data protected.

Classless Internet Domain Routing (CIDR) notation: CIDR was introduced as a means to primarily improve address space utilization as a result of the rapid growth of the Internet and growth of the IP routing tables held in the Internet routers. Represented by an IP prefix, CIDR moves away from the traditional IP classes (e.g., Class A, Class B, Class C, etc.). Subnetting a network address space using CCIDR leads to an effective IP address space only for the number of hosts needed without wasting IP addresses.

Classless Inter-Domain Routing (CIDR) allows organizations to design flexible and efficient IP addressing schemes without relying on traditional IP classes. By using CIDR within an Amazon VPC, network address space can be allocated precisely based on business needs, reducing waste and improving scalability.

An **Amazon VPC** provides network isolation, ensuring that internal resources are not publicly accessible unless explicitly configured. This improves security by protecting proprietary applications and data while still allowing scalable cloud infrastructure, controlled access, and integration with AWS services.

8. **Please note the following carefully. Confirm that you have stopped and terminated your Microsoft Windows virtual machine, deleted your file system from the Amazon EFS console, deleted the contents of your Amazon S3 bucket, and deleted your Amazon S3 bucket. To confirm, simply type your name below.**

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Export/print your completed file as a PDF and upload to your LEO/Assignments folder.