**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.**

**A screenshot of a computer

Description automatically generated**

1. **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.**

* From the Console Home page in the recently visited tab, click on **EC2.**
* Click on the **“Launch Instance”** tab.
* In the **“Launch and Instance”** menu, click on **“name and tags”**. Give the instance a name.
* In the **“Application and OS Images (Amazon Machine Image)”** menu select **“Windows”. “Microsoft Windows Server Base 2025”** is the free tier AMI that needs to be used.
* On the **“Instance Type”** tab click on the t3.micro option and ensure it is selected.
* On the **“Key Pair”** tab ensure to give the key pair a name. Select **“create new key pair”.** Ensure that the **“RSA”** tab is selected.
* Next click on the **“Network tab”** and select the “create a new security group”. Ensure that “Allow RDP traffic from” is selected.
* In the summary tab select **“Launch Instance”**.
* Now go back to the **“Instances”** tab and wait for the instance **“Running” and “3/3**
* **checks passed”** to be able to connect to the instance.
* On the **“Connect to Instance”** tab go to **“RDP client”**. Then, download the **“Remote Desktop File”**.
* Download the file and the Remote Desktop Connection window will appear. In the window click **“connect”**. Then you will be prompted to input the password to establish connection.
* If you don’t have the password, go back to the **“Connect to Instance”** tab and click on **“Get password”**. It will then take you back to the **“Connect to Instance”** page and you have to decrypted password and enter that into the RDP connection.
* Next, put in the password and click **“connect”.**
* It will ask you ask you if it is okay to proceed with certificate problems and select **“Yes”.**
* Now you will be logged into the Windows Server Instance that was just created.

A blue sky with white clouds

Description automatically generated

**Server was created**

1. **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.**

I have no troubles connecting to my Ubuntu Linux Instance.

A screenshot of a computer

Description automatically generated

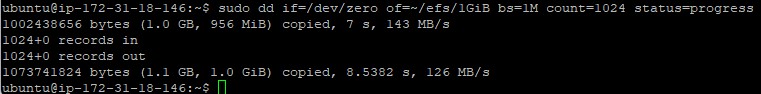
**Connected to my Ubuntu Linux Instance**

1. **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**](https://docs.aws.amazon.com/efs/latest/ug/how-it-works.html) ***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.**

**A screenshot of a computer

Description automatically generated**

**df- h command being used**

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**Sudo dd command being used to create a 1GB file**

**A computer screen with white text

Description automatically generated**

**1GB file as shown**

A network filesystem is extremely valuable in business due to its constant availability, scalability, and security. In this case, I created a network file share in the AWS cloud; this system possesses high fault tolerance and experiences little to no downtime. As a result, organizational documents and information will always be accessible once the network file share setup has been completed on the computer system to which we will provide access. A network file system (NFS), such as Amazon Elastic File System (EFS), provides immense value in modern computing environments by enabling shared file storage across multiple instances. Amazon EFS is a fully managed NFS that dynamically scales as data grows, ensuring organizations can handle fluctuating workloads without manual intervention.

One of its key advantages is its ability to facilitate simultaneous access from multiple instances, making it particularly useful for distributed applications, content management systems, and big data analytics. This shared access allows applications to operate more efficiently and collaboratively without duplicating files across instances. Moreover, EFS eliminates the need for provisioning or capacity planning, reducing administrative overhead and providing cost efficiency by charging only for the storage used. Furthermore, EFS supports high throughput and low-latency file access, crucial for applications requiring quick response times.

1. **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.**

**A screenshot of a computer

Description automatically generated**

**File uploaded in my S3 bucket**

1. **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.**

The decision to select a cloud service provider for the organization's Platform-as-a-Service (PaaS) needs requires a thorough evaluation of the leading options in the market. The three primary contenders—Google Cloud Platform (GCP), Amazon Web Services (AWS), and Microsoft Azure—offer robust solutions tailored for public cloud environments. Each provider has unique strengths, and understanding their differences is crucial to aligning their capabilities with the organization's goals. This document will outline the comparative advantages of these platforms and provide a detailed recommendation for the CTO.

Google Cloud Platform (GCP) is renowned for its advanced data analytics and machine learning capabilities. Its BigQuery service simplifies the analysis of large datasets, and TensorFlow integration makes it an excellent choice for organizations requiring cutting-edge artificial intelligence and machine learning applications. However, GCP lags in global infrastructure coverage compared to its competitors, making it less ideal for businesses with widespread operations. Furthermore, GCP's ecosystem often leans toward tech-heavy and specialized workloads, which may not be suitable for general PaaS requirements.

Amazon Web Services (AWS) is a market leader and boasts the most extensive global infrastructure among the three providers. AWS offers unparalleled scalability, a broad range of services, and flexibility for almost any workload. Its Elastic Beanstalk service provides an intuitive way to deploy and manage applications on various platforms. Additionally, AWS offers a robust free tier, which aligns well with the organization's preference for cost-effective solutions. Despite these advantages, AWS's pricing structure can be complex, potentially leading to unexpected expenses if resource utilization is not meticulously managed. AWS is an excellent choice for organizations seeking versatility, global reach, and a mature ecosystem.

Microsoft Azure is a strong contender for organizations that are already leveraging Microsoft products, such as Windows Server, SQL Server, or Office 365. Azure offers seamless integration with these tools, providing a familiar environment for IT teams. Its Azure App Service simplifies the deployment of web and mobile applications, while its hybrid cloud capabilities ensure flexibility for future infrastructure needs. Azure's pricing model is transparent and often competitive, especially for organizations with existing Microsoft Enterprise Agreements. With its robust security framework and enterprise-focused solutions, Azure is particularly well-suited for businesses seeking ease of integration and operational consistency.

Given these considerations, I recommend that the organization adopt Amazon Web Services (AWS) due to its unparalleled flexibility, scalability, and global reach, which align perfectly with its needs. AWS is the market leader in cloud computing, offering over 200 fully featured services, including compute power, storage, databases, and networking, making it a comprehensive solution for various business applications (AWS, n.d.). Its Elastic Compute Cloud (EC2) and Elastic File System (EFS) provide on-demand resources, ensuring the company can scale operations dynamically as workloads grow. Moreover, AWS offers robust security measures, including encryption at rest and in transit, compliance with over 100 security standards, and built-in tools like AWS Identity and Access Management (IAM) to enforce access control. One of AWS's most significant advantages is its extensive scalability and flexibility.

Businesses can provision resources on demand, enabling them to scale operations up or down based on workload requirements without overinvesting in hardware. This elasticity is particularly beneficial for organizations with fluctuating demands, such as during seasonal spikes or rapid growth. AWS also offers a pay-as-you-go pricing model, which means companies only pay for what they use, reducing upfront capital expenses and optimizing operational costs. Despite its advantages, AWS also has some limitations. One notable disadvantage is its complex pricing structure, making cost management challenging. With numerous services and tiers, businesses may encounter unexpected expenses if resources are not monitored and optimized correctly. AWS also has a steep learning curve for new users, especially those unfamiliar with cloud technology, as its vast ecosystem of services can be overwhelming.

1. **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)**](https://docs.aws.amazon.com/vpc/latest/userguide/what-is-amazon-vpc.html)**. The Amazon VPC en**a**bles 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.**
   1. **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:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subnet** | **End-User** | **CIDR** | **Network** | **Broadcast** | **Mask** |
| **A** | **Developers** | **146.38.70.105/20** | ***146.38.64.0*** | ***146.38.79.255*** | ***255.255.240.0*** |
| **B** | **Marketing** | **172.31.0.0 /16** | ***172.31.0.0*** | ***172.31.255.255*** | ***255.255.0.0*** |

* 1. **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: CIDR 146.38.70.105/20**

**Subnet Mask:**

/20 indicates that the first 20 bits of the IP address are reserved for the network portion, and the remaining bits are for the host. The subnet mask is 255.255.240.0.

**Network Address:**

The network address is calculated by zeroing out the host bits in the IP address (146.38.70.105). Then convert the IP address to binary. Next, apply the /20 mask to retain only the first 20 bits:

**Broadcast Address:**

The broadcast address is calculated by setting all host bits to 1. The first 20 bits are retained from the network address (146.38.64.0) and set the remaining bits to 1.

**Subnet B: CIDR 172.31.0.0/16**

**Subnet Mask:**

/16 indicates that the first 16 bits of the IP address are reserved for the network portion, and the remaining bits are for the host portion. The subnet mask is 255.255.0.0

**Network Address:**

The network address is the first address in the subnet, with all host bits set to 0. Since the CIDR block is 172.31.0.0/16, the network address remains 172.31.0.0.

**Broadcast Address:**

The broadcast address is the last address in the subnet, with all host bits set to 1.

Retain the first 16 bits from the network address (172.31.0.0) and set the remaining bits to 1.

1. **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.**

***Jordan Lee***

References

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* Clancy, R. (2022, November 30). AWS, GCP, and Azure: The 3 Biggest Cloud Service Providers in 2024. EC-Council Cybersecurity Exchange.