

PROFESSIONAL TRAINING REPORT - II
entitled
CREATE YOUR OWN VPC WITH PUBLIC AND PRIVATE
SUBNETS

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in Computer Science and Engineering
with specialization in Internet of Things

By

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF COMPUTING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
CATEGORY-1 UNIVERSITY BY UGC

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MAY 2024



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **MR. G.L.V.SATHYA SAI RAM (Reg.No:41732019)** who carried out the project entitled "**CREATE YOUR OWN VPC WITH PUBLIC AND PRIVATE SUBNETS**" under my supervision from JAN 2024 to MAY 2024.

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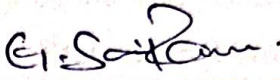
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DECLARATION

I, G.L.V.SATHYA SAI RAM (41732019), hereby declare that the Professional Training Report-II entitled "CREATE YOUR OWN VPC WITH PUBLIC AND PRIVATE SUBNETS" done by me under the guidance of Mrs. K. ABINAYA ME,(ph.D) is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering with specialization in Internet of Things.

DATE: 06/05/24

PLACE: Chennai.


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COURSE CERTIFICATE



ABSTRACT

Amazon Web Services (AWS) customers often rely on hundreds of accounts and virtual private clouds (VPCs) to segment their workloads and expand their footprint. This level of scale often creates challenges around resource sharing, inter-VPC connectivity, and on-premises facilities to VPC connectivity. This whitepaper describes best practices for creating scalable and secure network architectures in a large network using AWS services such as Amazon Virtual Private Cloud (Amazon VPC), AWS Transit Gateway, AWS Private Link, AWS Direct Connect, Gateway Load Balancer, AWS Network Firewall, and Amazon Route 53. It demonstrates solutions for managing growing infrastructure ensuring scalability, high availability, and security while keeping overhead costs low. In the EC-2 Windows Web Server web Server we need to launch the instance and select the particular servers. After creating key pair, we need to generate the password through the RDP client and decrypt the password. Copy the decrypted password and paste it in the remote desktop connection to create the webserver. A VPC peering connection is a networking connection between two VPCs that enables you to route traffic between them using private IPv4 addresses or IPv6 addresses. Instances in either VPC can communicate with each other as if they are within the same network. Cloud computing is the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as needed basis from a cloud provider like Amazon Web Services (AWS).

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LIST OF ABBREVIATIONS

ABBREVIATION	EXPANSION
AWS	AMAZON WEB SERVER
EC2	ELASTIC COMPUTE CLOUD
VPC	VIRTUAL PRIVATE CLOUD
CIDR	CLASS INTER-DOMAIN
RDP	ROUTINGREMOTE DESKTOP
PROTOCOL	

CHAPTER-1

INTRODUCTION

1.1 ABOUT VIRTUAL PRIVATE NETWORK(VPC):

There are several reasons organizations should use cloud computing in the modern world. Businesses of all sizes are switching to the cloud to manage risks, improve data security, streamline processes and decrease costs, or other reasons. Many services are available from top cloud service provider Amazon Web Services (AWS) to integrate local resources with the cloud. One such service provided by Amazon is Virtual Private Cloud (VPC). You can use Amazon services in the mentioned virtual network using the Amazon Virtual Private Cloud (Amazon VPC). A virtual private cloud is a network that closely matches the one you would use in your data center (VPC).

Amazon's Virtual Private Cloud is a core AWS service for both the Compute and Network AWS categories (VPC). Because it is mainly a VPC network is necessary in order to access other AWS services like Elastic Compute Cloud (EC2).

1.2 What is AWS VPC?

Using Amazon VPC, you may create a virtual private network between your on premises resources and the AWS infrastructure. Using this network, you can benefit from AWS's scalable infrastructure while keeping your environment's appearance and functionality close to that of a general network you may run in your data center.

Each virtual private cloud (VPC) you create on the AWS cloud is programmable and logically distinct from other virtual networks. You can select the IP address range, set up route tables, create subnets, set up network gateways, and more. Security settings can also be mentioned using security groups and network access control lists. You are in complete control of your virtual networking environment, including the IP address range, route table setup, network gateway setup, and subnet configuration.

The user can regulate security much more in detail VPC by choosing which AWS resources are usable by the public and which are not. It uses the hybrid approach, according to Amazon, but it also wants to meet the rising popularity of private clouds. Your Amazon Web Services includes a default VPC with each Amazon Web Services Region. Your default VPCs are configured to allow you to launch and connect to EC2 instances immediately.

VPCs and subnets



- A **subnet** defines a range of IP addresses in your VPC.
- You can launch AWS resources into a subnet that you select.
- A **private subnet** should be used for resources that won't be accessible over the Internet.
- A **public subnet** should be used for resources that will be accessed over the Internet.
- Each subnet must reside entirely within one Availability Zone and cannot span zones.

Here are some topics covered in an AWS VPC tutorial:

- Amazon VPC and Subnets
- Private, Public, and Elastic IP Addresses
- Subnet
- Networking
- Security Groups and Network ACLs



Fig1.1 VPC WORK FLOW

1.3 How does AWS VPC Work?

With Amazon Virtual Private Cloud (Amazon VPC), you have total control over your virtual networking environment, including resource distribution, connectivity, and security. To begin, configure your VPC in the AWS service panel. Then add resources, like Amazon Elastic Compute Cloud instances and Amazon Relational Database Service instances.

Each VPC builds its virtual network for your AWS account in the cloud. To use cloud services, other AWS resources and services are executed inside of VPC networks. Anyone used to managing a physical Data Center will identify AWS VPC (DC). A VPC works similarly to a conventional TCP/IP network that may be grown and expanded. However, a VPC does not explicitly have any DC parts you are accustomed to working with, like routers, switches, VLANs, etc. They were redesigned and abstracted into cloud software. A virtual network that AWS instances will launch can be quickly created using VPC.

Define the communication paths your VPCs will use to interact with one another throughout accounts, Availability Zones, and AWS Regions. The sample below segregates network traffic across two VPCs in each Region.

CHAPTER-2

LITERATURE SURVEY

2.1 Survey

The creation of Virtual Private Clouds (VPCs) with public and private subnets has emerged as a crucial aspect of cloud infrastructure deployment, offering enhanced security, scalability, and flexibility. However, traditional VPC configurations often face challenges such as complex setup procedures, limited automation capabilities, and suboptimal network performance. This literature review delves into the existing research and advancements in VPC architecture, focusing on innovative approaches and technologies to streamline VPC creation and management processes.

VPC Architecture and Network Design

Virtual Private Clouds (VPCs) serve as isolated virtual networks within cloud computing environments, allowing users to define their own network configuration, including IP address ranges, subnets, route tables, and gateways. The architecture typically consists of public subnets, accessible from the internet, and private subnets, isolated from external access. However, conventional VPC designs often require manual configuration and lack dynamic scalability, hindering their effectiveness in modern cloud environments.

Automation and Infrastructure as Code (IaC)

The adoption of automation and Infrastructure as Code (IaC) principles has revolutionized cloud infrastructure deployment, enabling organizations to define and provision VPC resources programmatically. Tools such as AWS CloudFormation and Terraform allow users to describe VPC configurations in code, facilitating rapid and consistent deployment of network infrastructure. By automating VPC creation processes, organizations can reduce the risk of human error, improve scalability, and enforce best practices in network design.

Security and Compliance Considerations

Ensuring the security and compliance of VPC environments is paramount in safeguarding sensitive data and mitigating cyber threats. Traditional VPC setups often rely on manual security configurations, leading to inconsistencies and vulnerabilities. However, advancements in security services such as AWS Security Hub, VPC Flow Logs, and Network Access Control Lists (ACLs) offer enhanced visibility and control over network traffic, facilitating proactive threat detection and incident response.

Scalability and Performance Optimization

Scalability and performance optimization are critical considerations in VPC design, especially for applications with fluctuating resource demands. Traditional VPC architectures may struggle to accommodate dynamic workloads efficiently, resulting in resource underutilization or performance degradation. However, innovative approaches such as VPC peering, Transit Gateways, and Elastic Load Balancing (ELB) enable organizations to design highly scalable and resilient network architectures that adapt to evolving business requirements.

Future Directions and Emerging Technologies

Looking ahead, the evolution of VPC architecture is likely to be shaped by emerging technologies such as serverless computing, containerization, and edge computing. These technologies offer novel approaches to VPC design, enabling organizations to build distributed, resilient, and cost-effective network infrastructures. Additionally, advancements in network automation, artificial intelligence (AI), and machine learning (ML) are expected to further optimize VPC performance and security, paving the way for the next generation of cloud-native architectures.

This literature review provides insights into the current state of VPC architecture and highlights the opportunities for innovation and improvement in creating and managing Virtual Private Clouds with public and private subnets. By leveraging automation, security enhancements, and scalability features, organizations can build robust and efficient cloud infrastructures that meet the demands of modern applications and workloads.

Automation and Infrastructure as Code:

Investigate resources that cover automation techniques and Infrastructure as Code (IaC) tools for provisioning and managing VPCs.

Look for tutorials or frameworks that leverage tools like Terraform, AWS CloudFormation, or Azure Resource Manager.

Examine literature that discusses common challenges, limitations, and pitfalls associated with designing and managing VPCs with public and private subnets.

Discuss strategies for addressing scalability, performance, and cost optimization concerns.

Conclusion:

Summarize key findings from the literature survey.

Highlight important considerations for designing and implementing a VPC with public and private subnets.

Provide recommendations for further reading or exploration.

CHAPTER-3

REQUIREMENT ANALYSIS

3.1 AWS VPC Architecture and Elements:

There are many elements involved in creating an AWS VPC. Below are the elements involved in the architecture of AWS VPC:

3.2 Create and configure your VPC:

Create a new VPC:

This tutorial uses one of the VPC creation wizards to create the following:

- The VPC
- One of the subnets
- An Internet gateway

To create your VPC using the VPC wizard

1. Open the Amazon VPC console at Console
2. On the **VPC Dashboard**, choose **Launch VPC Wizard**.
3. Under **Step 1: Select a VPC Configuration**, on **VPC with a Single Public Subnet**, choose **Select**.
4. Enter the following information into the wizard and choose **Create VPC**:

IP CIDR block:

10.0.0.0/16

VPC name: SIST
VPC

Public subnet:

10.0.0.0/24

5. It takes several minutes for the VPC to be created. After the VPC is created, proceed to the following section to add a second subnet.

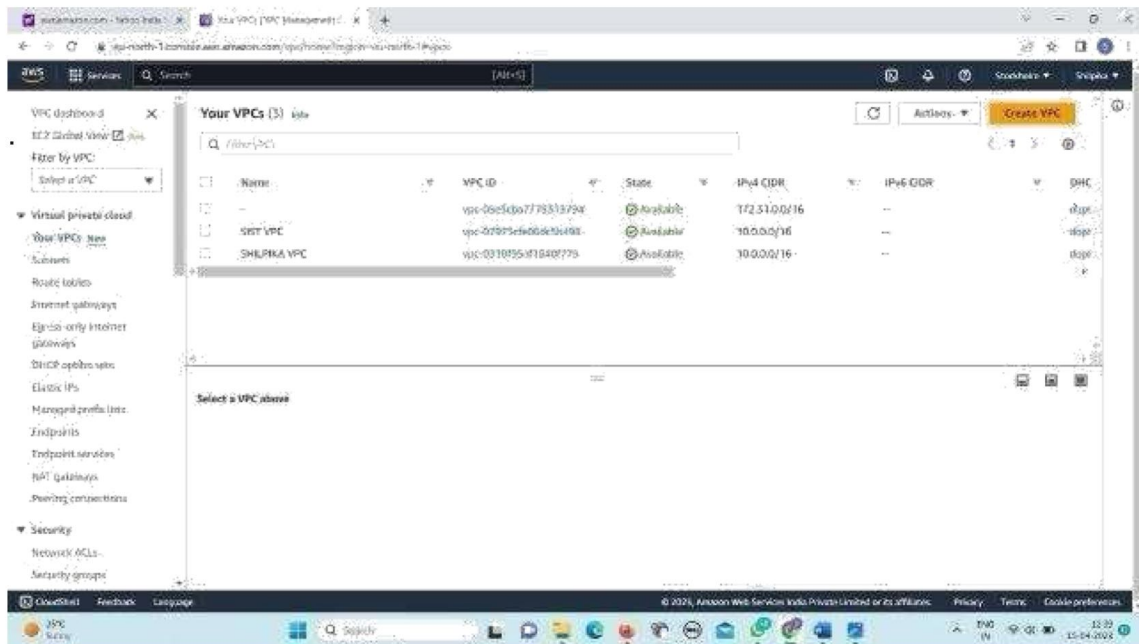


Fig 3.1 Create VPC

3.3 Subnet:

AWS Directory Service requires two subnets in your VPC, and each subnet must be in a different Availability Zone. The VPC wizard only creates one subnet, so you must manually create the second subnet, and specify a different Availability Zone than the first subnet. Create the second subnet by performing the following steps

To create a subnet:

1. Open the Amazon VPC console. In the navigation pane, select **Subnets**, select the subnet with the name ADS
2. Subnet 1, and select the **Summary** tab at the bottom of the page. Make a note of the availability zone of this subnet.
3. Click **Create Subnet** and enter the following information in the **Create Subnet** dialog box and click **Yes, Create**.

VPC ID:

Select your VPC. This is the VPC with the name SIST VPC

Name tag:

SIST Subnet

AVAILABILITY ZONE: No

Preference

CIDR Block:

10.0.0.0/24

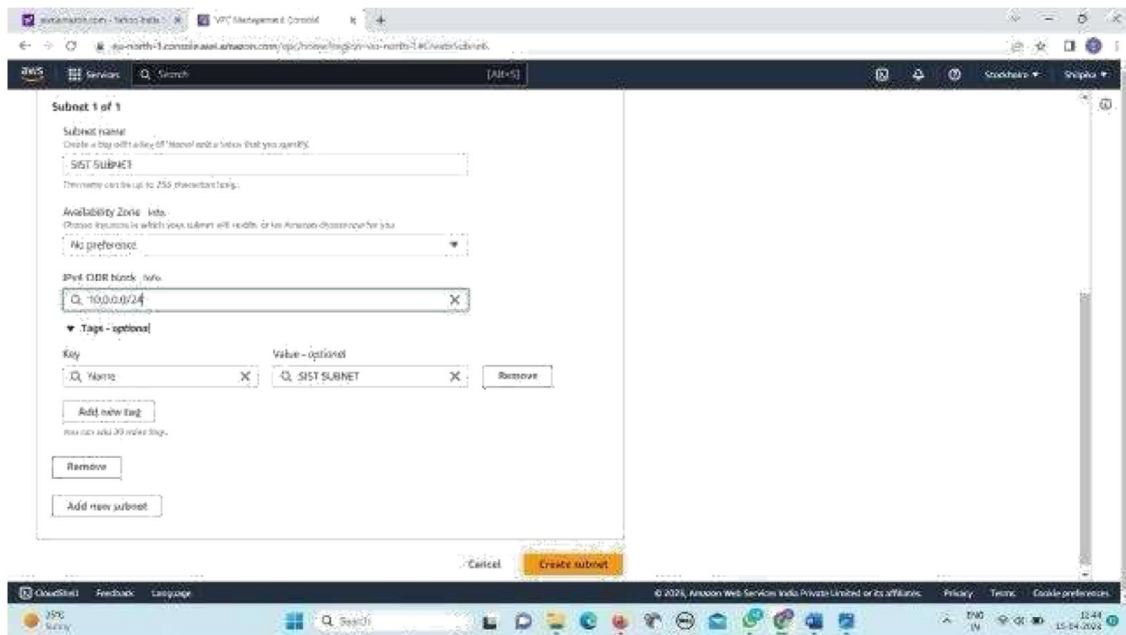


Fig 3.2 create subnet

3.4 INTERNETGATEWAYS:

When more bandwidth, availability, and administrative effort are needed, a network address translation (NAT) gateway is used. An Availability Zone's public subnet is where the NAT gateway is always located. It makes the necessary changes to the private subnet's route table to direct traffic to the NAT gateway. When generating, Elastic IP is connected to the NAT gateway. Only the TCP, UDP, and ICMP protocols are supported.

To create an internet gateway and attach it to your VPC:

1. Open the Amazon VPC console at
2. In the navigation pane, choose **Internet gateways**, and then choose **Create internetgateway**.
3. Optionally name your internet gateway.
4. Optionally add or remove a tag.

[Add a tag] Choose **Add tag** and do the following:

- For **Key**, enter the key name.
- For **Value**, enter the key value.

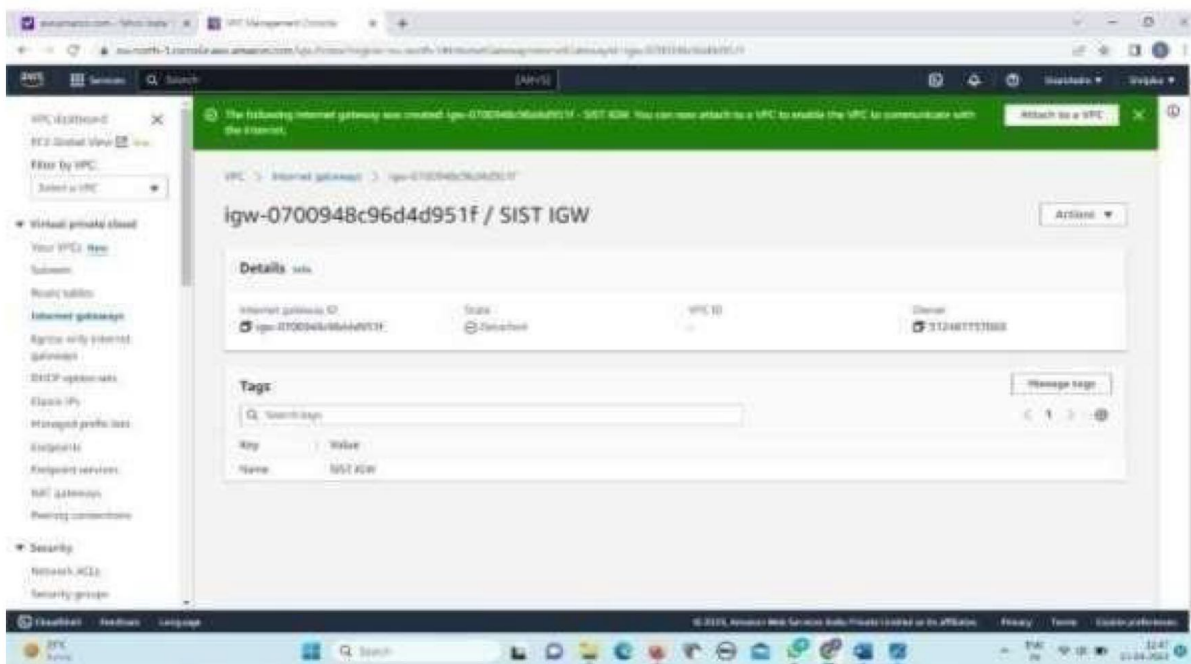
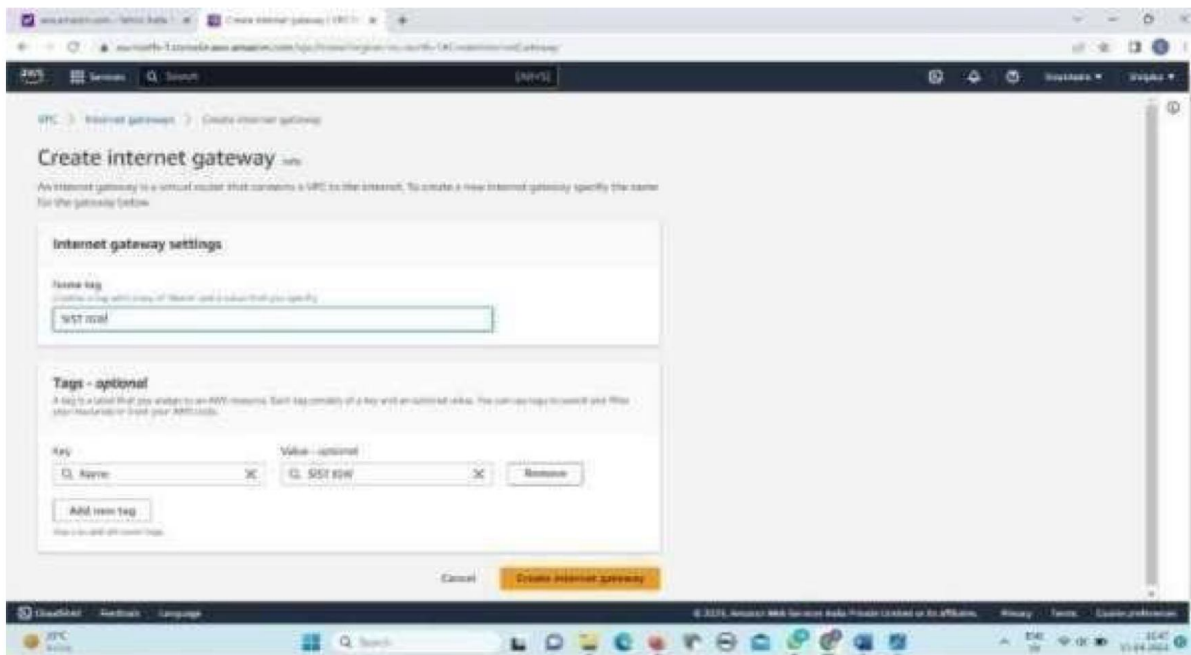


Fig 3.3 Create internet gateway

5.Choose **Createinternet gateway**

6.Select the internet gateway that you just created,and then choose **Actions,Attach to VPC**.

7. Select your VPC from the list, and then choose **Attach internet gateway**

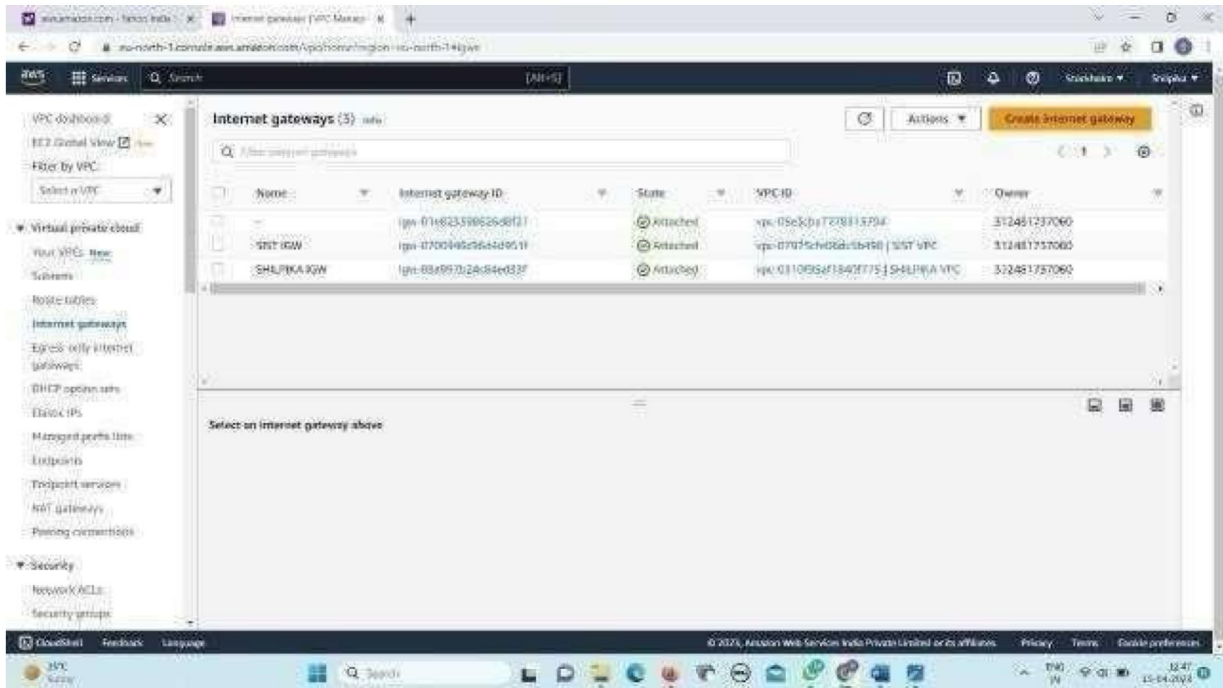


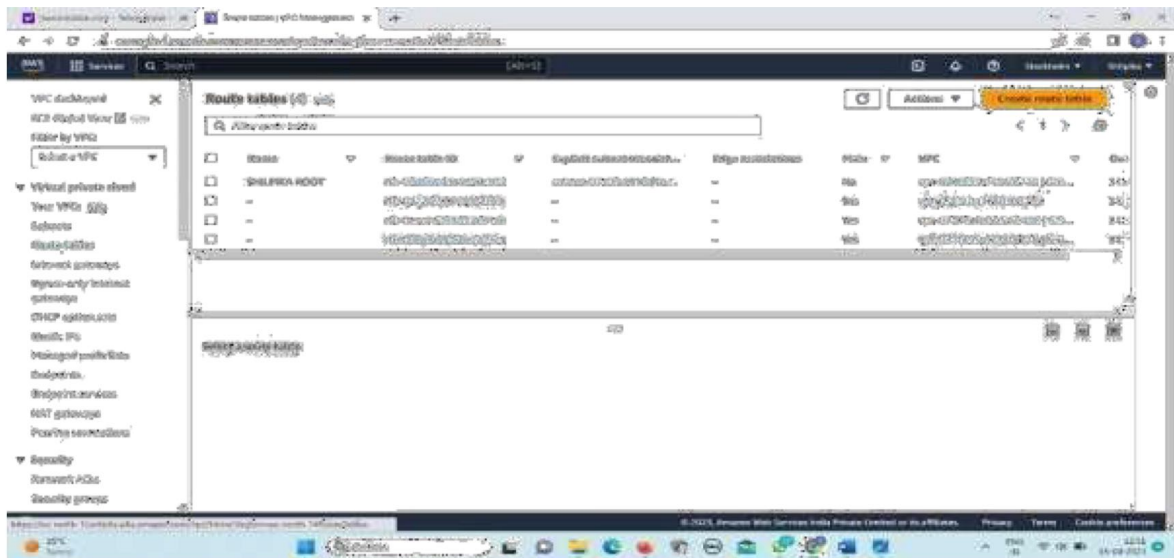
Fig 3.4 Attach internet gateway

3.3 Route table:

When you create a subnet, we automatically associate it with the main route table for the VPC. By default, the main route table doesn't contain a route to an internet gateway. The following procedure creates a custom route table with a route that sends traffic destined outside the VPC to the internet gateway, and then associates it with your subnet.

To create a custom route table:

1. Open the Amazon VPC console
2. In the navigation pane, choose **Route Tables**, and then choose **Create route table**.



3. In the Create route table dialog box, optionally name your route table, then select your VPC, and then choose Create route table.

4. Select the custom route table that you just created. The details pane displays tabs for working with its routes, associations, and route propagation.

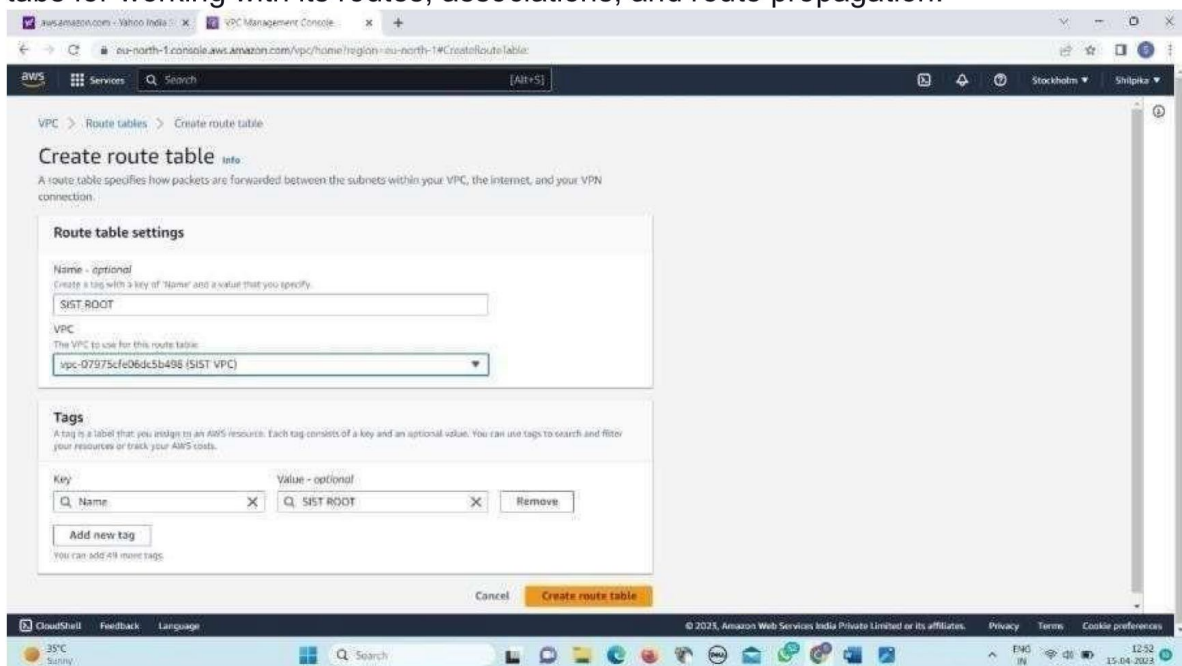


Fig 3.5 Create route table

5. On the **Routes** tab, choose **Edit routes**, **Add route**, and add the following routes as necessary. Choose **Save changes** when you're done.

For IPv4 traffic, specify 0.0.0.0/0 in the **Destination** box, and select the internet gateway ID in the **Target** list.

For IPv6 traffic, specify in the **Destination** box, and select the internet gateway ID in the **Target** list

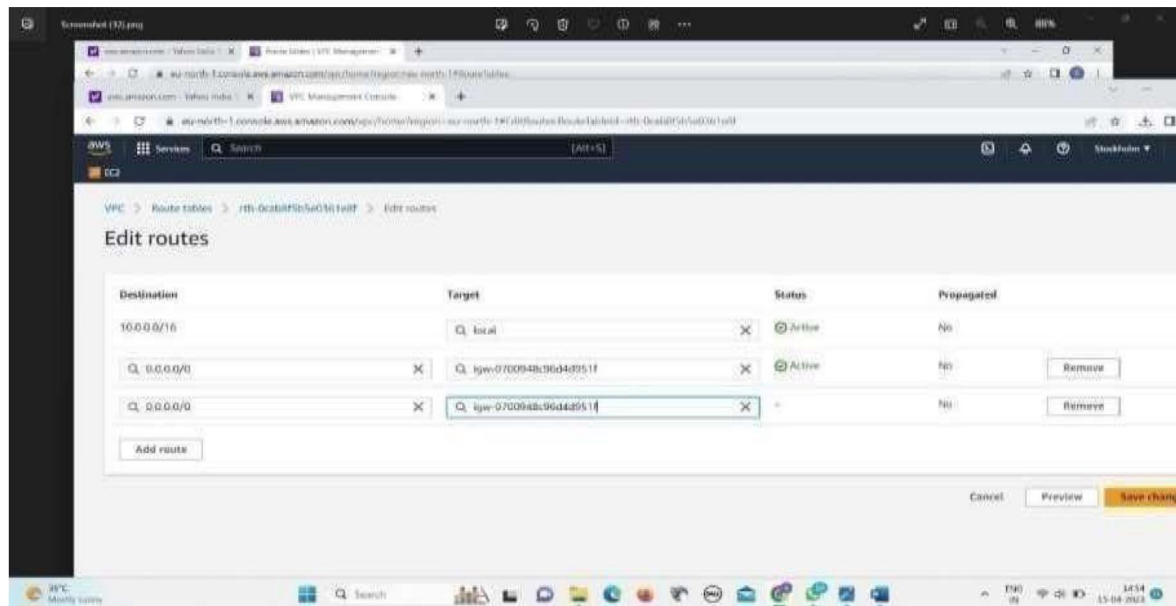


Fig 3.6 Edit routes in route table

6. On the **Subnet associations** tab, choose **Edit subnet associations**, select the check box for the subnet, and then choose **Save associations**.

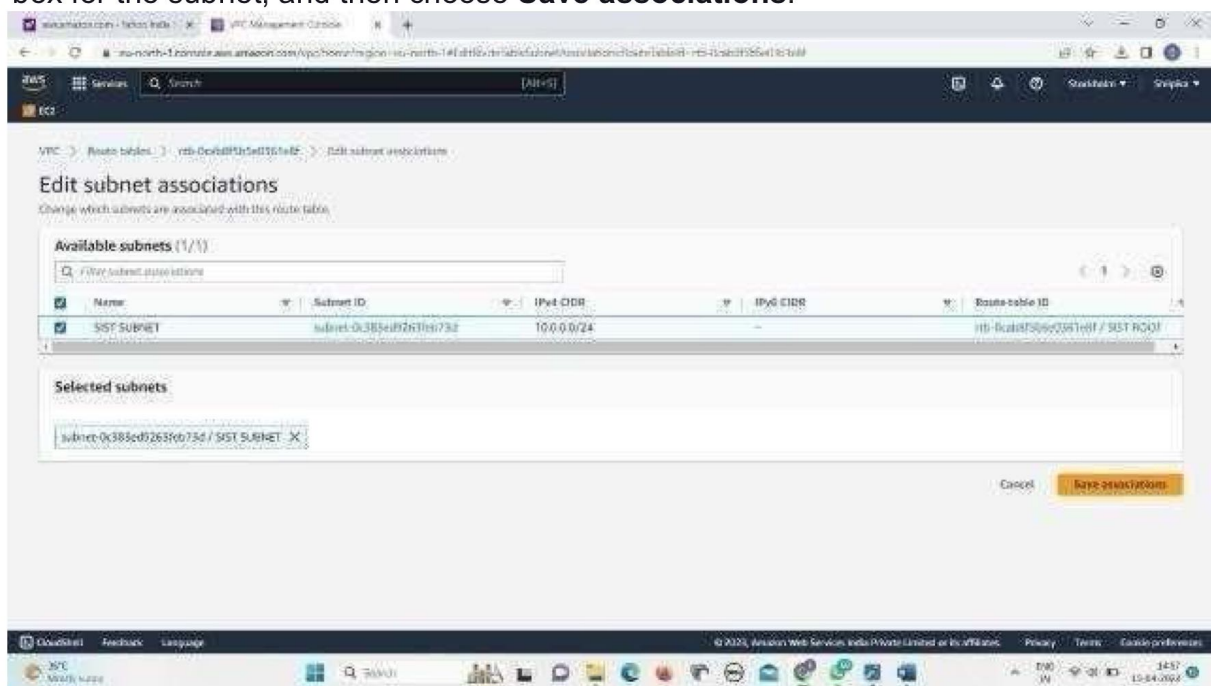


Fig 3.7 Edit subnet associations in route table

3.6 EC2:

Launchinstance:

1. Open the Amazon EC2 console at
2. From the EC2 console dashboard, in the **Launch instance** box, choose **Launch instance**, and then choose **Launch instance** from the options that appear.
3. Under **Name and tags**, for **Name**, enter a descriptive name for your instance.

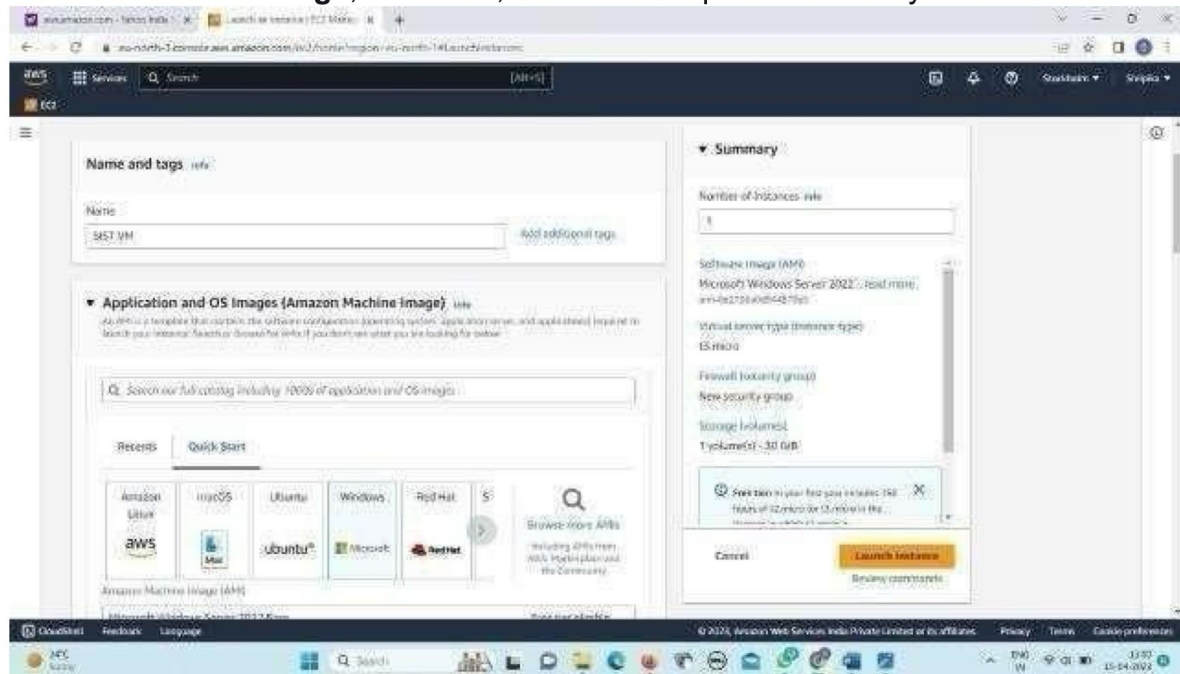


Fig 3.8 Launch instance in EC2

4. Under **Application and OS Images (Amazon Machine Image)**, do the following:
 - a) Choose **Quick Start**, and then choose Windows. This is the operating system(OS) for your instance.
 - b) From **Amazon Machine Image (AMI)**, select the AMI for Windows Server 2016 Base or later.. Notice that these AMIs are marked **Free tier eligible**. An *Amazon Machine Image (AMI)* is a basic configuration that serves as a template for your instance.
5. Under **Instance type**, from the **Instance type** list, you can select the hardware configuration for your instance. Choose the t2.micro instance type, which is selected by default. The t2.micro instance type is eligible for the free tier. In Regions where t2.micro is unavailable, you can use a t3.micro instance under the free tier. For more information, see AWS Free Tier
6. Under **Key pair (login)**, for **Key pair name**, choose the key pair that you created when getting set up. Note that you must select an **RSA** key. **ED25519** keys are not supported for Windows instances.

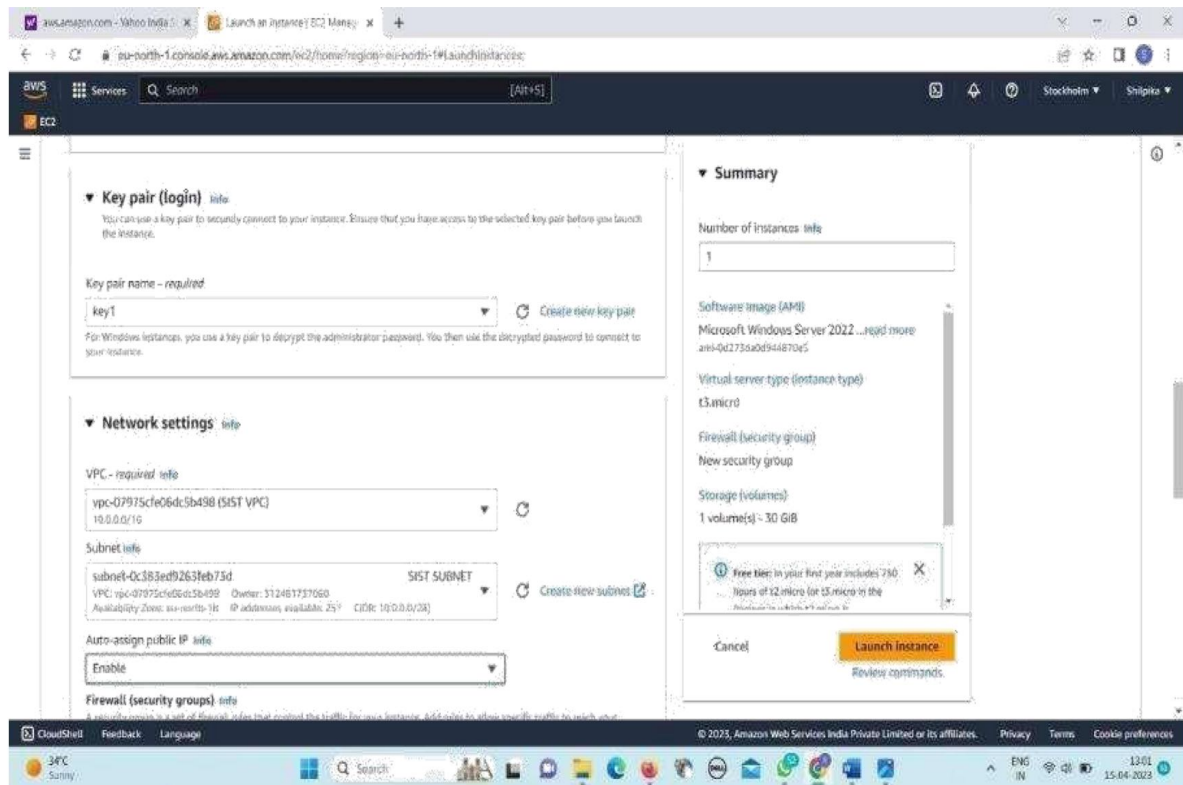


Fig 3.9 Instance type

7. Next to **Network settings**, choose **Edit**. For **Security group name**, you'll see that the wizard created and selected a security group for you. You can use this security group, or alternatively you can select the security group that you created when getting set up using the following steps:
 - a) Choose **Select existing security group**.
 - b) From **Common security groups**, choose your security group from the list of existing security groups.
8. Keep the default selections for the other configuration settings for your instance.
9. Review a summary of your instance configuration in the **Summary** panel, and when you're ready, choose **Launch instance**
10. A confirmation page lets you know that your instance is launching. Choose **View of all instances** to close the confirmation page and return to the console.
11. On the **Instances** screen, you can view the status of the launch. It takes a short time for an instance to launch. When you launch an instance, its initial state is pending. After the instance starts, its state changes to running and it receives a public DNS name. If the **Public IPv4 DNS** column is hidden, choose the settings icon in the topright corner, toggle on **Public IPv4 DNS**, and choose **Confirm**.

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

Connect to your instance:

To connect to a Windows instance, you must retrieve the initial administrator password and then enter this password when you connect to your instance using Remote Desktop. It takes a few minutes after instance launch before this password is available. If you receive an error while attempting to connect to your instance, see Remote Desktop can't connect to the remote computer.

To connect to your Windows instance using an RDP client:

1. Open the Amazon EC2 console at
2. In the navigation pane, select **Instances**. Select the instance choose **Connect**.
3. On the **Connect to instance** page, choose the **RDP client** tab, choose **Get password**.

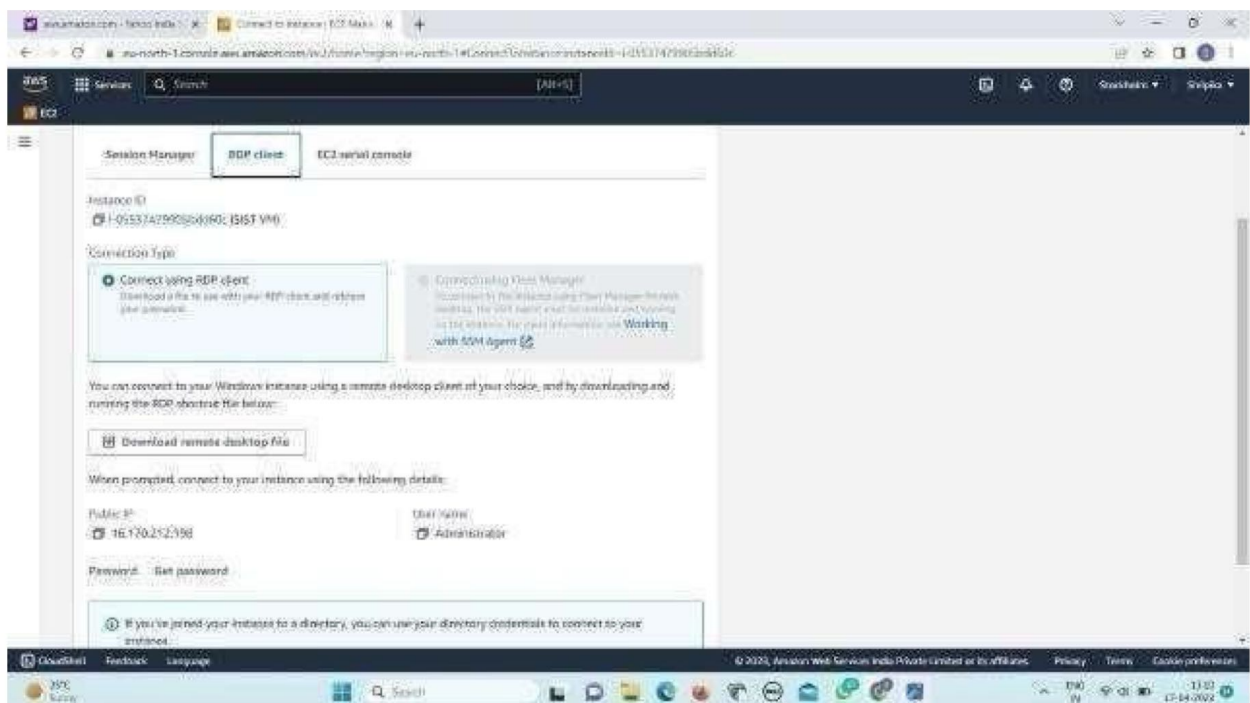


Fig 3.10 Connect to instance

4. Choose **Browse** and navigate to the private key(.pem) file you created when you launched the instance. Select the file and choose **Open** to copy the entire contents of the file to this window
5. Choose **Decrypt Password**. The console displays the default administrators the password for the instance under **Password**, replacing the **Get password** link is in a shown previously. Save the password in a safe place. This password is required to connect to the instance

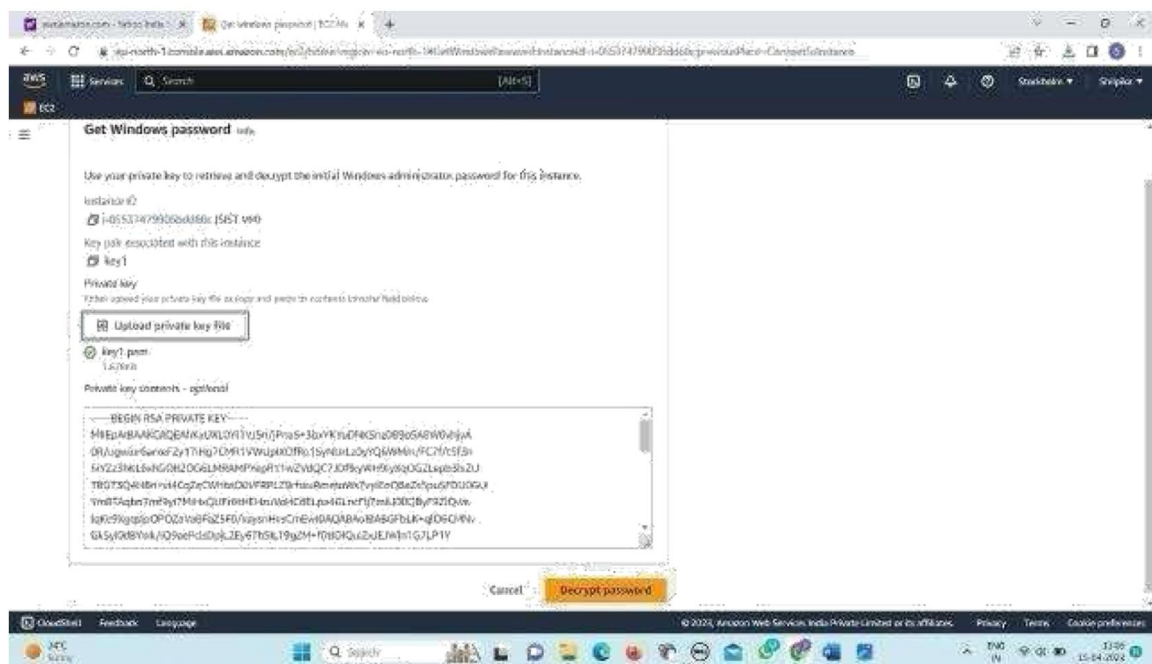


Fig 3.11 Decrypt password

4. Choose **Download remote desktop file**. Your browser prompts you to either open or save the RDP shortcut file. When you have finished downloading the file, choose **Cancel** to return to the **Instances** page.

- If you opened the RDP file, you'll see the **Remote Desktop Connection** dialog box.
- If you saved the RDP file, navigate to your downloads directory, and open the RDP file to display the dialog box.

5. You may get a warning that the publisher of the remote connection is unknown. Choose **Connect** to continue to connect to your instance.

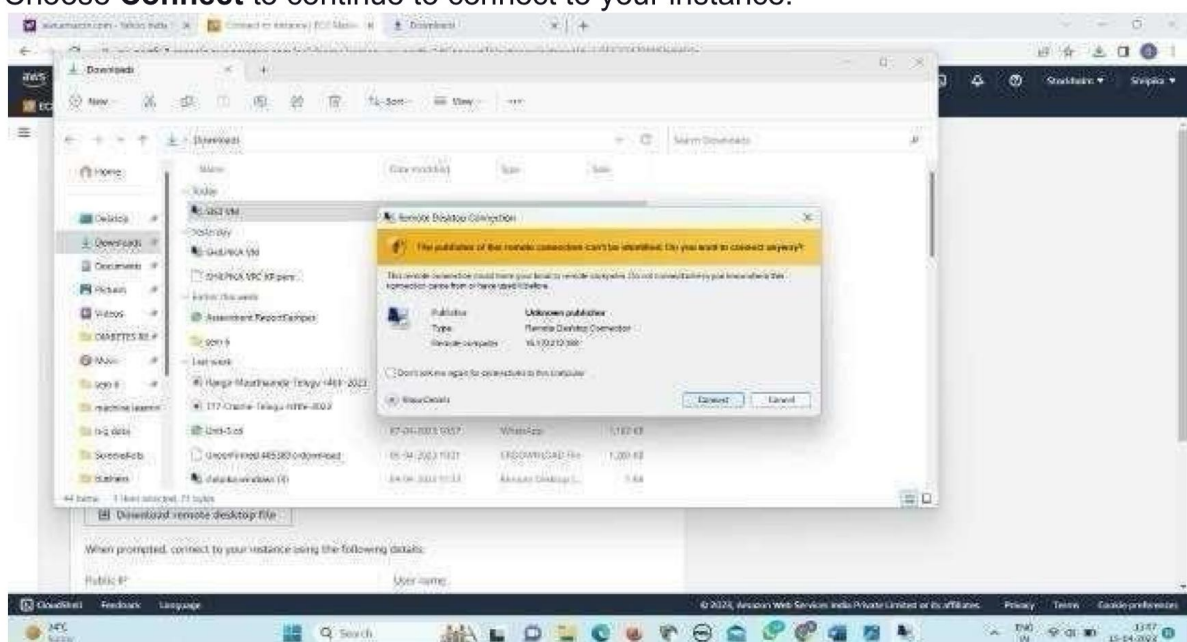


Fig 3.12 RDP

6.The administrator account is chosen by default. Copy and paste the password that you saved previously.

7.Due to the nature of self-signed certificates, you may get a warning that the security certificate could not be authenticated. Use the following steps to verify the identity of the remote computer, or simply choose **Yes** (Windows) or **Continue** (Mac OS X) if you trust the certificate.

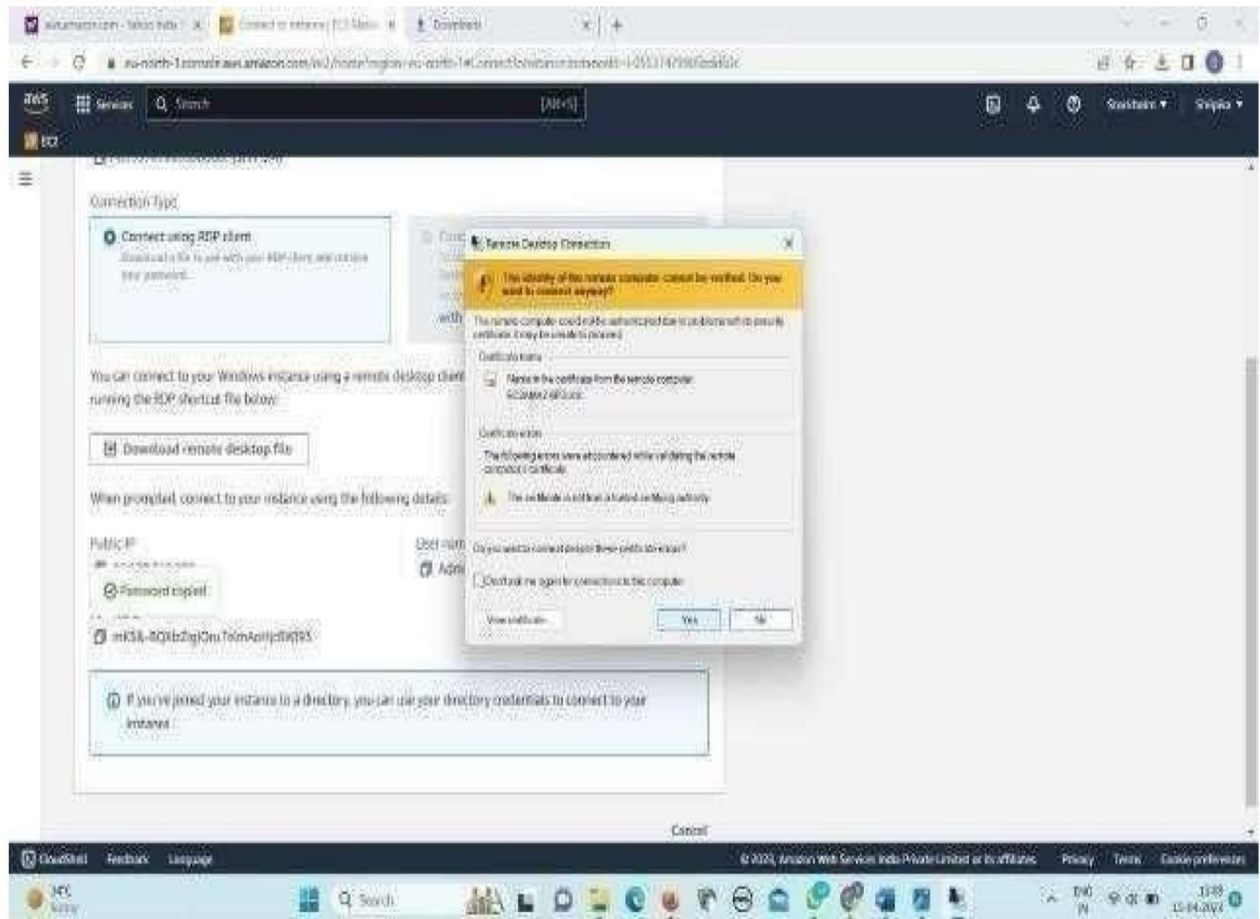


Fig 3.13 warnings in RDP

- a) If you are using **Remote Desktop Connection** on a Windows computer, choose **View certificate**. If you are using **Microsoft Remote Desktop** on a Mac, choose **Show Certificate**.
 - b) Choose the **Details** tab, and scroll down to **Thumbprint** (Windows) or. This is the unique identifier for the remote computer's security certificate.
 - c) In the Amazon EC2 console, select the instance, choose **Actions, Monitor and troubleshoot, Get system log**.
 - d) In the system log output, look for RDPCERTIFICATE-THUMB PRINT If this value matches the thumbprint or fingerprint of the certificate, you have verified the identity of the remote computer.
 - e) If you are using **Remote Desktop Connection** on a Windows computer, return to the **Certificate** dialog box and choose **OK**. If you are using **Microsoft Remote Desktop** on a Mac, return to the **Verify Certificate** and choose **Continue**.
 - f) [Windows] Choose **Yes** in the **Remote Desktop Connection** window to connect to your instance.
8. After the above process AWS windows will open
9. Window+R run file will open type CMD command prompt will open

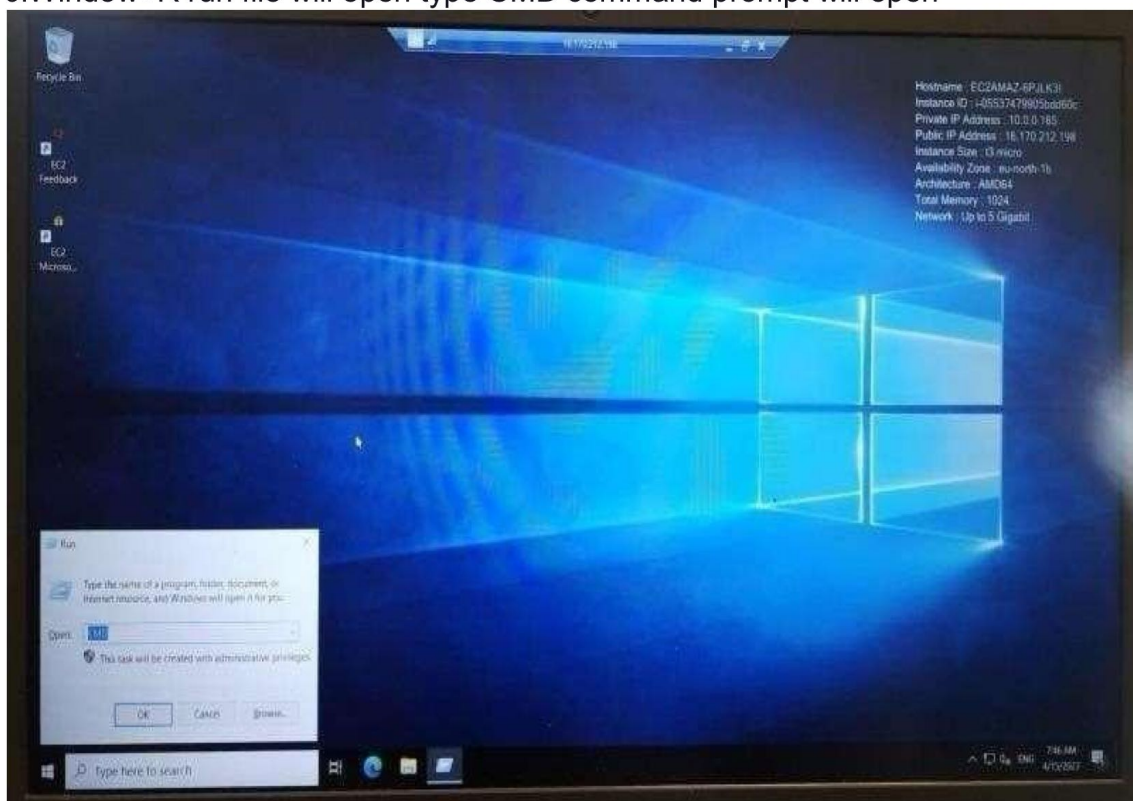


Fig 3.14 AWS windows

10. In command prompt type ping 8.8.8.8 it shows the network is connected or not

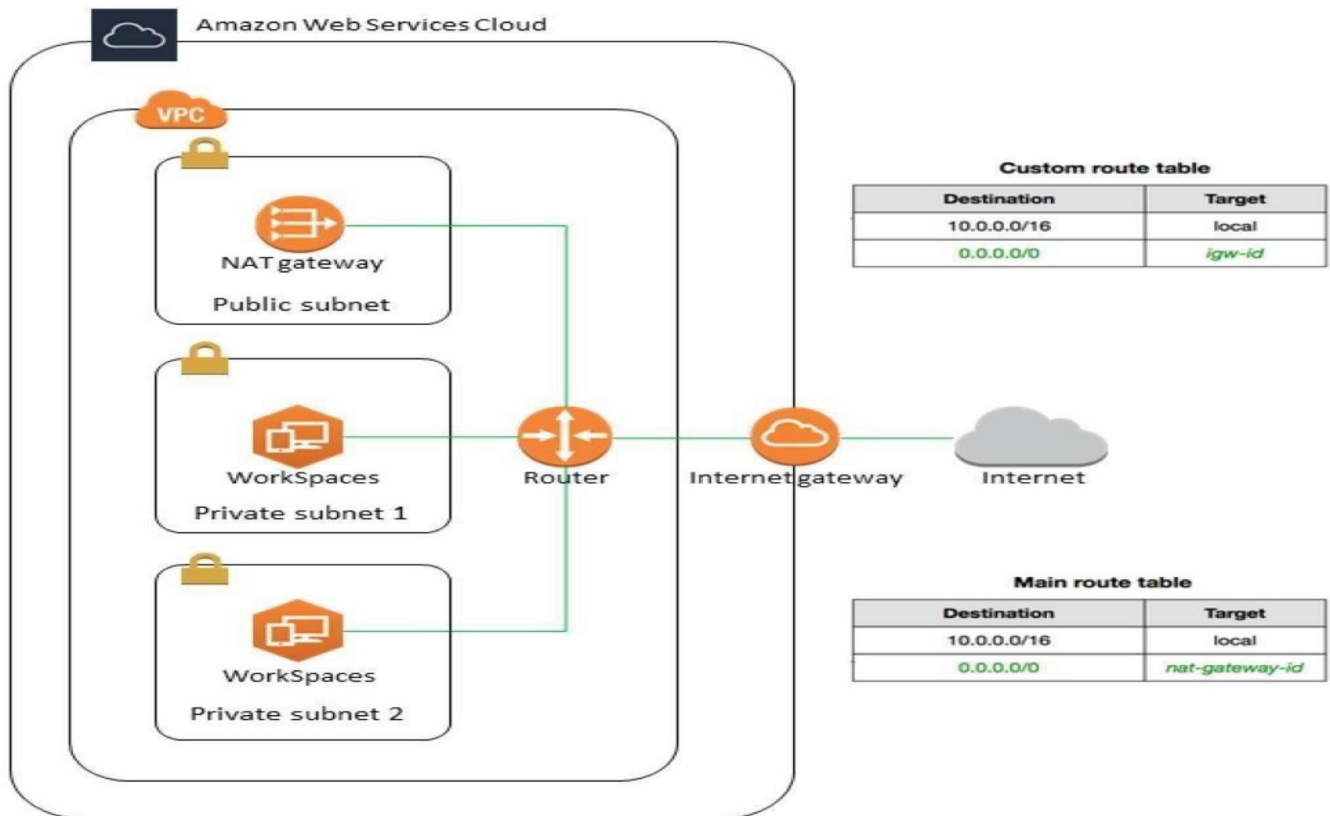


Fig 3.15 network is connected in command prompt

CHAPTER-4

DESIGN DESCRIPTION OF PROPOSED PROJECT

4.1 IDEATION MAP/SYSTEM ARCHITECTURE



4.2 VARIOUS STAGES

Create an AWS VPC:

- Steps for creating AWS VPC.
- First of all we need to launch an instance from AWS Management Console.
- • Open the amazon EC2 console at
- Search for an VPC and the and open the VPC

- On the **VPC Dashboard**, choose **Launch VPC Wizard**
- Under
- **Step 1: Select a VPC Configuration**, on **VPC with a Single Public Subnet**, choose **Select**
- Enter the following information into the wizard and choose **Create VPC: IP CIDR block:**

10.0.0.0/16

VPC name:

SIST VPC

Public subnet:

10.0.0.0/24

To create a subnet:

- Open the Amazon VPC console.
- In the navigation pane, select **Subnets**, select the subnet with the name SIST.
- Subnet 1, and select the **Summary** tab at the bottom of the page. Make a note of the Availability Zone of this subnet.
- Click **Create Subnet** and enter the following information in the **Create Subnet** dialog box and click **Yes, Create**.

VPC ID:

Select your VPC. This is the VPC with the name SIST VPC

Name tag:

SIST Subnet

AVAILABILITY ZONE:

No Preference

CIDR Block:

10.0.0.0/24

4.3 Working Principles:

Network Isolation: Public and private subnets are segregated to control access and improve security.

Routing: Route tables are configured to direct traffic between subnets and the internet gateway/NAT gateway based on destination.

Security: Security Groups and Network ACLs enforce access controls and filter traffic at both subnet and instance levels.

High Availability: Components are deployed across multiple availability zones to ensure fault tolerance and resilience.

Scalability: Auto-scaling groups and load balancers are used for scalable deployment of resources in public subnets.

4.4 Novelty of the Project:

Automation with IaC: Leveraging Infrastructure as Code principles streamlines VPC provisioning and management, enhancing efficiency and repeatability.

Customization and Control: Designing a VPC from scratch allows fine-grained control over network configurations, catering to specific application requirements.

Security-First Approach: Implementation of strict security measures ensures protection against unauthorized access and potential security threats.

Scalable Architecture: The design supports scalability, enabling seamless expansion of resources to accommodate growing workloads and user demand

CHAPTER 5

CONCLUSION AND REFERENCES

5.1 CONCLUSION:

So, you may create a virtual network in the AWS cloud using Amazon VPC without hardware, VPNs, or real data centers. You can control how your network and the Amazon EC2 resources it contains are accessible to the Internet, and you can design your own network space. Some of the key points of VPC are:

- It helps us in creating a virtual private network on the cloud. You can have your own private network on the cloud rather than on a local network.
- It has many elements like subnets, NACLs, route tables, etc. These elements are used to create a VPC and maintain its availability and security.
- You can also give security settings in your private network using securitygroups and NACLs options. This helps us secure our cloud network.
- It is very easy to set up and can be integrated with other AWS services. We can integrate with various AWS services that we are using and make it more of an integrated environment.

When integrating your remote networks with Amazon VPC, AWS offers several effective, secure connectivity solutions to help you make the most of the platform. You can launch AWS resources into a defined virtual network using AWS Virtual Private Cloud. While closely mimicking a traditional network that you would run in your own data center, this virtual network provides the advantages of using the scalable infrastructure of AWS.

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CHAPTER 6

APPENDIX

A.RESEARCH PAPER

Creating a Virtual Private Cloud (VPC) with Public and Private Subnets

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ABSTRACT

The adoption of cloud computing has become ubiquitous in modern IT infrastructure, with Virtual Private Clouds (VPCs) serving as a cornerstone for network isolation and resource management. This research paper presents a comprehensive guide to designing and implementing a VPC with both public and private subnets. We delve into the architectural considerations, configuration steps, and best practices necessary for building a secure, scalable, and efficient cloud network infrastructure. Through a combination of theoretical analysis, practical examples, and real-world case studies, we demonstrate the significance of VPC design in achieving robust cloud environments and offer insights into optimizing performance, enhancing security, and ensuring compliance with industry standards.

Keywords: Virtual Private Cloud (VPC), Public Subnet, Private Subnet, Cloud Computing, Network

Architecture, Security, Scalability

RESEARCH METHODOLOGY

The research methodology for the conference paper "Creating a Virtual Private Cloud (VPC) with Public and Private Subnets: Design, Implementation, and Best Practices" encompasses a multi-faceted approach to gather insights, validate hypotheses, and derive practical recommendations.

Beginning with a thorough literature review, the methodology involves mining existing academic research, industry documentation, and case studies to establish a foundational understanding of VPC architecture and cloud networking principles. Subsequently, case study analysis provides real-world context and practical insights into VPC deployments with public and private subnets. Drawing from these sources, a theoretical framework is

developed, outlining fundamental design considerations and best practices.

I.INTRODUCTION TO VIRTUAL CLOUD

Virtual private cloud (VPC) is a private network within public cloud infrastructure [6]. It offers multiple users with the provision of private, isolated section of cloud infrastructure where the user can launch resources on-demand in a virtual network that they define. Using a public cloud environment gives businesses the flexibility and benefits of a cloud, such as scalability and reduced IT costs. Adding a private network within the public cloud. Environment adds enhanced security features to the public cloud for sensitive corporate data Cloud service provider (CSP) has to maintain jobs running in the servers, network of computers and information stored in the database or any other storage medium such as disk. VPC describes a situation whereby cloud service provider virtually partitions a portion of public cloud environment into an isolated environment for exclusive use by single customer [6]. This service is accessible via private network connection and not through the public internet. This is achieved by establishing secure virtual network over the public cloud. This is an area which could grow alongside the wider growth in cloud computing. The conveys that the users with the help of internet, approach public cloud to access services. Where in for the purpose of security, CSP can logically partition the portion of public cloud into Virtual Private cloud and the users can access resources through a separate Virtual Private Network (VPN). The cloud infrastructure services market, and in particular the VPC market, is a compelling

II. NEED OF VPC

Security in the Cloud is a very popular topic among cloud analysts and bloggers. Many leading analysts point out that security is the main concern for Enterprises considering a Public Cloud strategy, while others suggest that migration to the cloud actually improves IT security for many Small and Medium Enterprise (SMEs), or at least that security threats in the cloud are not as severe as first anticipated . The first step before making a prediction or drawing a conclusion on the state of cloud security is to determine what „cloud“ are we talking about. Cloud services are usually divided into three „as-a-service“ paradigms: SaaS (Software as Service), PaaS (Platform as Service) and IaaS (Infrastructure as Service). Each paradigm has different security aspects and therefore any discussion must clearly distinguish between the three. The following discusses IT security in Public Cloud IaaS (Public Cloud for short). Public Cloud data centers are multi-tenant (virtualized), multi-user environments (unlike Private Clouds that may be multi-tenant but are „hosting“ single user/organization) . What is unique in the Public Cloud environment is that the responsibility on IT security is shared between the Cloud User (the organization consuming IaaS services) and the Cloud service provider (CSP), with a clearly defined limits or boundaries.

III .HOW TO USE VIRTUAL PRIVATE CLOUD

After utilizing the benefits from virtual private cloud internally, it is possible to offer this to customers as another source of revenue [6]. Providing virtual private cloud services to existing users is an easy way to give your users accessibility to a cloud environment while using resources already at your disposal. Virtual private cloud also gives your customers increased levels of scalability and the ability to customize their solution. There are three ways to provide virtual private cloud to customers: white label cloud, using virtual private cloud for internal business purposes or purchasing cloud infrastructure. 1. White label cloud (also called as white labeling) provides a branded public cloud solution through a wholesale model that you can offer to your customers without purchasing infrastructure. 2. Using virtual private cloud for internal business purposes allows customers to purchase a cloud environment from a provider and reduces cost by helping to consolidate infrastructure. Further, it increases security in the cloud and provides scalability for the business. 3. Purchase cloud infrastructure, from which customers can directly purchase virtual private cloud environments. This option also gives the flexibility to run the internal cloud applications and servers on the same infrastructure [6]. Only particular users are able to access the cloud environment, giving peace of mind that has control over the traffic moving within their cloud. Further, the clouds performance increases because of the decreased number of users. In-bound and out-bound traffic in the cloud is reduced, which stabilizes the predictability of bandwidth and provides a better performing cloud environment

CONCLUSION

In conclusion, this research paper has provided a comprehensive guide to designing and implementing Virtual Private Clouds (VPCs) with both public and private subnets. Through a thorough literature review, case study analysis, theoretical framework development, surveys, interviews, and experimental validation, we have established best practices and design considerations for creating secure, scalable, and efficient cloud network architectures. By synthesizing insights from both academic research and industry expertise, we have presented a practical approach to VPC design that addresses key challenges and maximizes the benefits of cloud computing.

Moving forward, future research directions include further exploration of advanced VPC features, such as hybrid cloud integration, multiregion architectures, and containerized workloads.

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B.SOURCE CODE

AWS::TemplateFormatVersion: '2010-09-09'

Description: 'Create a VPC with public and private subnets'

Parameters:

VpcCIDR:

Description: CIDR block for the VPC

Type: String

Default: '10.0.0.0/16'

Resources:

VPC:

Type: 'AWS::EC2::VPC'

Properties:

CidrBlock: !Ref VpcCIDR

EnableDnsSupport: true

EnableDnsHostnames: true Tags:

- Key: Name

Value: MyVPC

PublicSubnet:

Type: 'AWS::EC2::Subnet' Properties:

VpcId: !Ref VPC

CidrBlock: '10.0.1.0/24'

AvailabilityZone: !Select [0, !GetAZs "]

MapPublicIpOnLaunch: true Tags:

- Key: Name

Value: PublicSubnet

PrivateSubnet:

Type: 'AWS::EC2::Subnet' Properties:

VpcId: !Ref VPC
CidrBlock: '10.0.2.0/24'
AvailabilityZone: !Select [0, !GetAZs "] Tags:
- Key: Name
Value: PrivateSubnet

InternetGateway:
Type: 'AWS::EC2::InternetGateway' Properties:
Tags:
- Key: Name
Value: MyInternetGateway

AttachGateway:
Type: 'AWS::EC2::VPCGatewayAttachment'
Properties:
VpcId: !Ref VPC
InternetGatewayId: !Ref InternetGateway

PublicRouteTable: Type:
'AWS::EC2::RouteTable'
Properties:
VpcId: !Ref VPC Tags:
- Key: Name
Value: PublicRouteTable

PrivateRouteTable: Type:
'AWS::EC2::RouteTable'
Properties:
VpcId: !Ref VPC Tags:
- Key: Name
Value: PrivateRouteTable

PublicRoute: Type:
'AWS::EC2::Route'
Properties:
RouteTableId: !Ref PublicRouteTable
DestinationCidrBlock: '0.0.0.0/0'
GatewayId: !Ref InternetGateway

PublicSubnetRouteTableAssociation: Type:
'AWS::EC2::SubnetRouteTableAssociation'
Properties:
SubnetId: !Ref PublicSubnet
RouteTableId: !Ref PublicRouteTable

PrivateSubnetRouteTableAssociation: Type:
'AWS::EC2::SubnetRouteTableAssociation'
Properties:
RouteTableId: !Ref PrivateRouteTabl

