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by Sha Chan

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Proof-of-Concept Report

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Abstract

This lab project involves building a virtual machine on the AWS cloud platform to demonstrate the cloud computing idea in a report. This report details the procedures for setting up a VPC, a web server, and launching the website server inside the VPC. For a better understanding of the cloud computing idea, screenshots of the results of each stage are included in the appendix section. The following goals have been accomplished: setting up a VPC, a subnet, security groups, and starting EC2 instances inside the VPC. Don & Associates' virtual private cloud was built using the Amazon cloud platform VPC. After all lab operations have been completed and analysed, the proof-of-concept report is then created.

Introduction

After conducting a lab test utilising Amazon Virtual Private Cloud (VPC), setting up Don & Associates' VPC, and launching a website server to host Don & Associates' website server, this proof report was created. The report's appendix contains all the screenshots for the lab activity steps. Servers, networks, and other physical and digital infrastructures are run by Don & Associates. On the company's property are all of these infrastructures. The project shows that these infrastructures may be relocated to the cloud and continue to operate as if they were physically present at the business's facilities.

Statement of Need

The company we operate intends to grow both in terms of the services it offers and the areas in which it operates. The Don & Associates business needs to purchase new machinery, pay for their upkeep, and secure more storage space. Since the company will have offices in



several locations during the expansion process, hiring additional employees will also be necessary will also be necessary to hire additional employees (Vidal and Jose, 2018).

Assumptions

This proof-of-concept report was developed under the assumption of various things. The initial presumption was that the business possesses the necessary cloud knowledge (skilled labour) to assist with cloud migration and oversee cloud operations once they are up and running. Also presumed is that the business won't look for any other alternative options, opting instead to move to the cloud to address its current issues. Thirdly, it is anticipated that the business will pick AWS cloud service providers above competitors like GCP and ¹Microsoft Azure (Runyon, 2021).

Description of Current Infrastructure

Networks, servers, and other tangible digital infrastructures are managed by the company Don & Associates. The infrastructures are located on the corporate grounds. The business will buy cloud-based networking software and servers as part of its cloud migration (Neeru, 2021). The company's server-dependent operations will be connected to the cloud-based servers to use their services. Physical servers won't be required for the business to keep on site.

Cloud Service Providers

AWS, Azure, and GCP are the most popular and leading providers of cloud services. AWS is a full-featured cloud platform that has gained widespread acceptance and adoption. Over 175 fully operational services are offered by AWS from data centres all over the world. ¹Elastic Compute Cloud, Amazon Cloud-Front, Elastic Book Store, Elastic Beanstalk, Dynamo-DB, and

Relational Database Services are among the services offered (Runyon, 2021). The majority of the essential security capabilities are offered by AWS, such as Robust API monitoring, guard duty for threat information, and Security event triggers for automation.

⁵ More than 200 cloud services and products from Microsoft Azure are available to help create, run, and manage applications using the clients' preferred tools and frameworks. Services like Backup, Logic Apps, and Bots are available through Microsoft Azure (Neeru, 2021). Utilising Microsoft Azure has advantages such as high availability, scalability, cost effectiveness, and improved security measures. Its drawbacks include the fact that management and platform knowledge are prerequisites.

A public cloud-based system called Google Cloud Platform provides users with services on a pay-as-you-go basis. Computing and hosting, storage, databases, networking, machine learning, and big data are all services offered by GCP (Vidal and Jose', 2018). The advantages of using GCP include improving solid documentation, having affordable rates, great durability, ease of interaction ¹ with other cloud services, availability of numerous regions to store data, and various storage classes for each requirement. However, its drawbacks include exorbitant support fees, increased costs for cloud storage, and extremely high pricing to download data from the platform.

Project Details

¹ In this lab, Amazon Virtual Cloud (VPC) is used to construct a VPC and add other components to create the customised network. EC2 instances are set up and customised in order to host a web server ¹ for the network and launch it into the VPC. A VPC can be made to accomplish the task of spanning different availability zones.

Building a VPC on AWS

You can begin creating a VPC by logging into ¹the AWS Management Console and following the on-screen instructions. For a successful VPC creation, the steps listed below must be followed.

i. VPC Creation

In this phase, ¹the VPC Wizard is used to build the VPC. The Internet Gateway and two subnets are likewise created using the VPC Wizard ¹in a single availability zone. The creation of the VPC is described below. ¹From the services menu of the AWS Management Console, select "Create AWS VPC in 10 steps, less than 5 minutes, 2021). From the navigation pane, choose ⁴the VPC that has both Public and Private Subnets, and then configure the VPC name. Additionally configured are the public subnet name and the availability zone. After entering the necessary data, the VPC is subsequently formed.

ii. Create Additional Subnets

Two more subnets are formed in the second Availability Zone. The actions taken in accordance with this clause are as follows; By selecting Subnets from ¹the left navigation pane in the AWS Management Console, a second public subnet is created and the configuration is complete.

Create a VPC Security Group.

¹The VPC security group then launches instances connected to security groups, implicating a virtual firewall. The VPC name must be configured, and HTTP must be enabled

¹ (Lab 2: Build Your VPC and Launch Web Server, 2021). The rules that specify the type, source, and description of permitted web requests must then be added.

Launching a Web Server on AWS

⁴ An Amazon EC2 instance, which functions as a web server through easy procedures, is launched in the new VPC. From the service menu, the instance is started. This is accomplished by choosing the Amazon machine image that contains the necessary operating system. T2 Micro and Amazon Linux 2 are what we utilise. Make use of the information needed to set up ¹ the new instance to start in the public subnet. During the initial run, the code to configure and load a PHP web application is copied and pasted on the advanced details (Vidal and Jose, 2018). The following step involves adding storage by choosing the Add Tags below using the webserver's Key and Value. After all of this setting, the security group that was previously created will allow access to the instance through HTTP. The webserver is launched when everything has been examined. ¹ Build Your VPC and Launch Web Server in Lab 2 (2021). ¹ During the web server promotion, the proceed button should be clicked if the connection to the instance through port 22 fails. The following step is to watch ¹ all the instances and wait to see if the freshly established Web server displays 2/2 passed checks. When the ¹ Public DNS (IPv4) is copied and pasted on a new browser tab, ¹ the Aws logo, instance, and all meta-data values are shown.

Challenges Encountered

The incorrect IP addresses entered for the internet gateway before launch was one of the issues we ran across, which prevented our VPCs from effectively communicating. When ¹ it was realised, the issue was fixed, communication was tested, and everything was tested to make sure the VPC was functioning properly.

Conclusion

The launching procedure shows that, if the laid forth stages are correctly followed, deploying cloud resources is simple. The business must subsequently start¹ an AWS VPC to address any issues with infrastructure, price, and dependability (Vidal and Jose, 2018). The launch demonstrates how simple it is for businesses to implement cloud technologies and increase earnings.

¹ References

- Neeru, J. (2021, January 19). *List of Top 10 Azure Services - Whizlabs Blog*. Retrieved from Whizlabs Blog: <https://www.whizlabs.com/blog/top-azure-services/>
- Runyon, M. (2021, January 19). *8 Ways AWS Beats Azure in the cloud*. Retrieved from Business 2 Community: <https://www.business2community.com/cloud-computing/8-ways-aws-beats-azure-in-the-cloud-02190398>
- Vidal, & Jose'. (2018). Google Cloud Storage: Pros/Cons and How to Use It with Javascript. *How to Create AWS VPC in 10 steps, less than 5 min.* (2021, Feb 11). Retrieved from Medium: <https://medium.com/@varunmanik1/how-to-create-aws-vpc-in-10-steps-less-than-5-min-a49ac12064aa>
- Lab 2: Build Your VPC and Launch Web Server. (2021, Feb 11). Retrieved from Raman Deol's Blog: <https://balrm.wordpress.com/2018/05/03/lab-2-build-your-vpc-and-launch-web-server/>

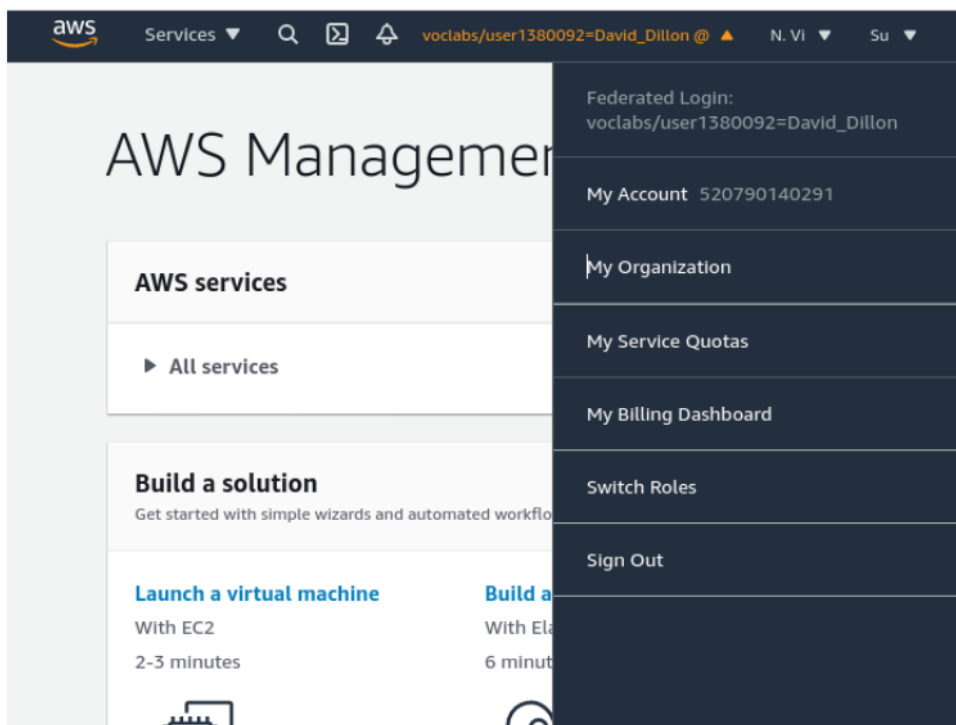
Appendix - Screenshots

3 Start Lab page

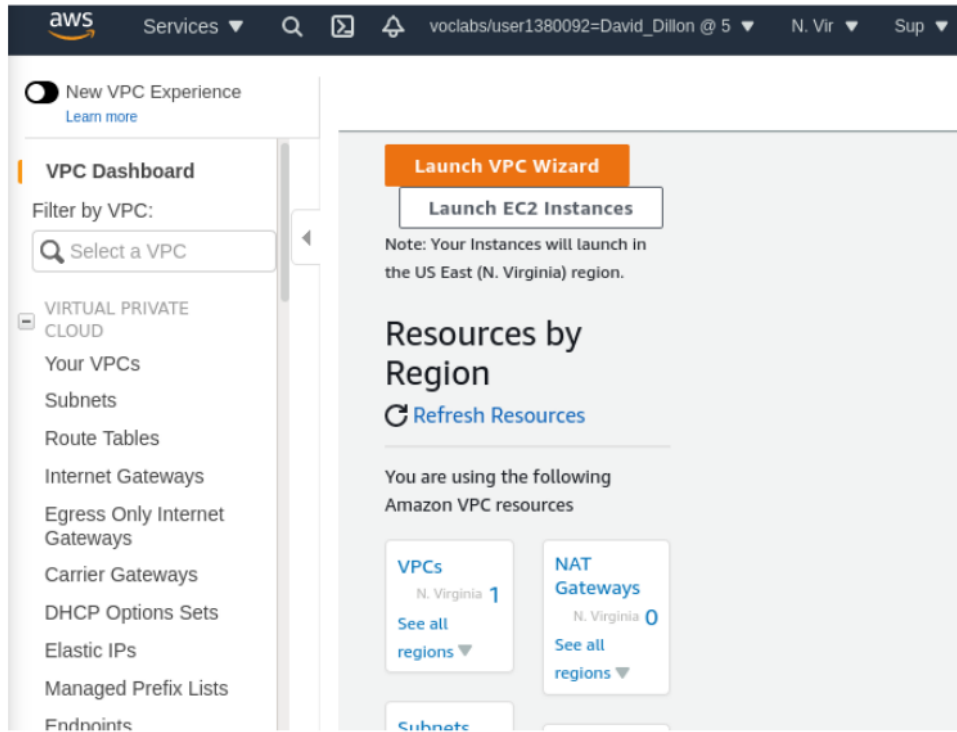
```
Start Lab
Region: us-east-1
Lab ID: arn:aws:cloudformation:us-east-1:520790140291:stack/c13546a1333191572329t1w520790140291/b46e1a20-a3fd-11eb-bbff-0e762363e33d
Creation Time: 2021-04-22T23:32:41-0700

Start session at: 2021-04-22T23:32:41-0700
Remaining session time: 04:00:00 (240 minutes)
Lab status: ready
```

AWS Management Console Name with your name visible from user drop-down



Task 1: Create Your VPC



The screenshot shows the AWS Management Console interface for the VPC Dashboard. The top navigation bar includes the AWS logo, a 'Services' dropdown, a search icon, a document icon, a notification bell, and the user profile 'voclabs/user1380092=David_Dillon @ 5' with a dropdown arrow. The region is set to 'N. Vir' and the account type is 'Sup'.

On the left sidebar, the 'New VPC Experience' toggle is turned on, with a 'Learn more' link. Below this is the 'VPC Dashboard' section, which includes a 'Filter by VPC:' dropdown and a search box labeled 'Select a VPC'. A list of VPC resources is shown, including 'VIRTUAL PRIVATE CLOUD', 'Your VPCs', 'Subnets', 'Route Tables', 'Internet Gateways', 'Egress Only Internet Gateways', 'Carrier Gateways', 'DHCP Options Sets', 'Elastic IPs', 'Managed Prefix Lists', and 'Endpoints'.

The main content area features a 'Launch VPC Wizard' button and a 'Launch EC2 Instances' button. A note states: 'Note: Your Instances will launch in the US East (N. Virginia) region.' Below this is the 'Resources by Region' section, which includes a 'Refresh Resources' button. A summary of resources is provided: 'You are using the following Amazon VPC resources'. The resources listed are 'VPCs' (1 in N. Virginia) and 'NAT Gateways' (0 in N. Virginia). Each resource has a 'See all regions' link with a dropdown arrow. A 'Subnets' button is also visible at the bottom of the resource list.

aws Services 🔻 🔍 📧 🔔 voclabs/user1380092=David_Dillon @ 5 🔻 N. Vir 🔻 Sup 🔻

Public subnet name:

Private subnet's IPv4 CIDR:* (251 IP addresses available)

Availability Zone:*

Private subnet name:

You can add more subnets after AWS creates the VPC.

Specify the details of your NAT gateway ([NAT gateway rates apply](#))

Elastic IP Allocation ID

Service endpoint

34%

Setting up routes...

Enable DNS hostnames:* ☒ Yes ☐ No

Hardware tenancy:*

[Cancel and Exit](#)

The screenshot shows the AWS VPC Dashboard. At the top, the navigation bar includes the AWS logo, 'Services', a search icon, a user profile 'voclabs/user1380092=David_Dillon @ 5', and location 'N. Vir'. The left sidebar has a 'New VPC Experience' link and a 'VPC Dashboard' section with a search filter 'Filter by VPC:'. Below this is a list of VPC-related services: VIRTUAL PRIVATE CLOUD, Your VPCs, Subnets, Route Tables, Internet Gateways, Egress Only Internet Gateways, Carrier Gateways, DHCP Options Sets, Elastic IPs, Managed Prefix Lists, and Endpoints. The main content area displays a 'VPC Successfully Created' message. The message states: 'Your VPC has been successfully created. You can launch instances into the subnets of your VPC. For more information, see [Launching an Instance into Your Subnet](#).' There is an 'OK' button to the right of the message.

The screenshot shows the AWS VPC Dashboard with a list of VPCs. The navigation bar is the same as the previous screenshot. The left sidebar is also the same. The main content area shows 'Your VPCs (2)' with a search filter 'Filter VPCs'. Below the filter is a table with the following columns: Name, VPC ID, State, IPv4 CIDR, and IPv6 CIDR. The table contains two rows of VPCs.

Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR
Lab VPC	vpc-0caae7385bba6d844	Available	10.0.0.0/16	-
-	vpc-0877e1630b059553d	Available	172.31.0.0/16	-

Below the table, there is a 'Select a VPC above' prompt and a 'Create VPC' button. The footer of the page includes 'Feedback', 'English (US)', and copyright information: '© 2009 - 2021 Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use Cookie preferences'.

Task 2: Create Additional Subnets

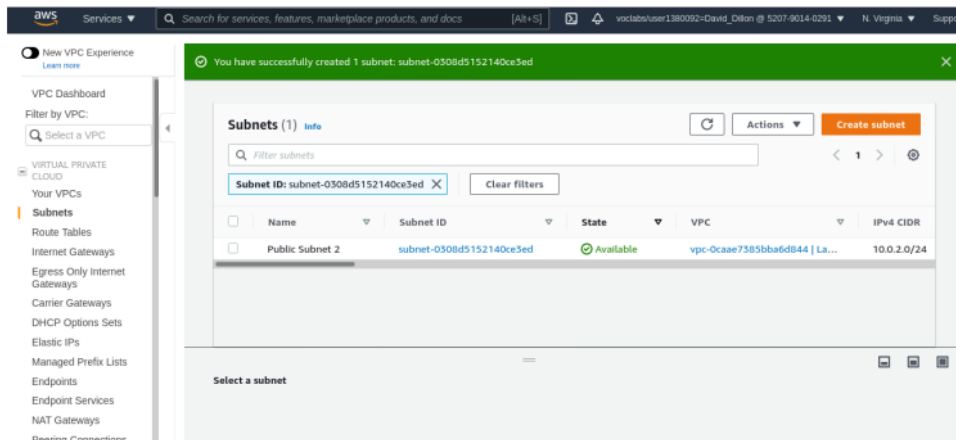


Figure 1: Public Subnet 2

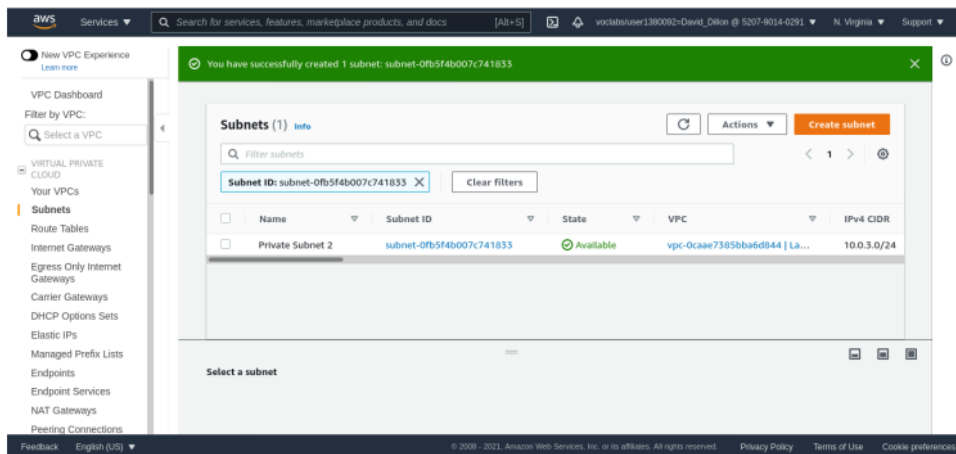


Figure 2: Private Subnet 2

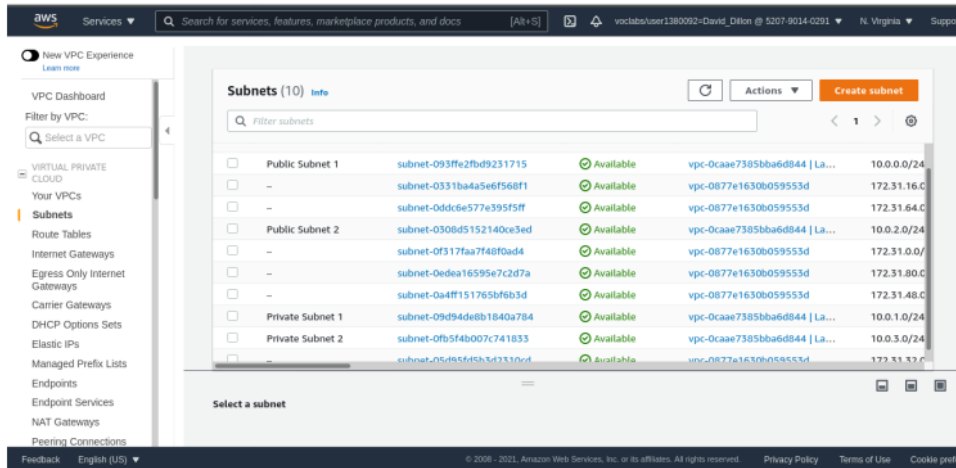


Figure 3: Public and Private Subnets Created

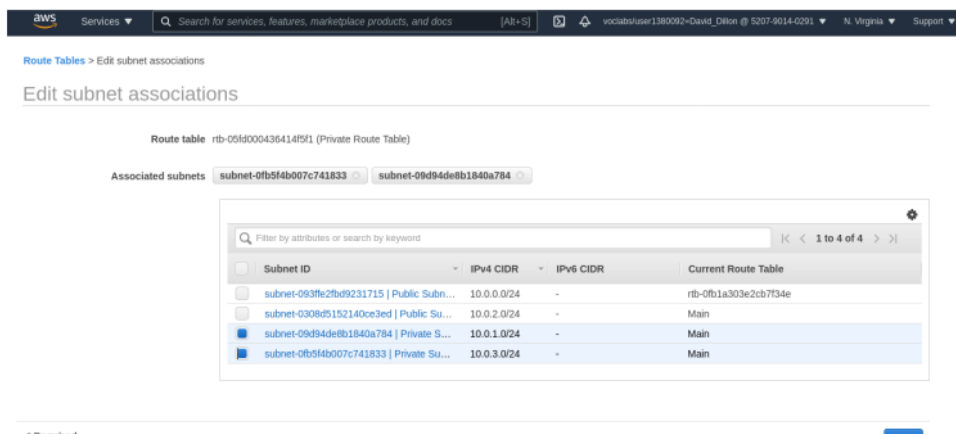


Figure 4: Subnet Associations for Route Tables

The screenshot displays the AWS Management Console interface for the 'Route Tables' section. The left-hand navigation pane shows the 'Route Tables' link selected under the 'VIRTUAL PRIVATE CLOUD' category. The main content area shows a list of route tables. The route table 'rtb-05f000436414f5f1' is highlighted, and the 'Subnet Associations' tab is active. This tab shows a table with two subnets associated with the route table:

Subnet ID	IPv4 CIDR	IPv6 CIDR
subnet-09d94de8b1840a7...	10.0.1.0/24	-
subnet-0fb54b007c74183...	10.0.3.0/24	-

Figure 5: Private Subnet Route Tables Created and linked

1 Task 3: Create a VPC Security Group

The screenshot shows the 'Create security group' wizard in the AWS Management Console. The 'Basic details' section is completed with the following information:

- Security group name:** Web Security Group
- Description:** Enable HTTP access
- VPC:** vpc-0caae7385bba6d844 (Lab VPC)

The 'Inbound rules' section is partially visible below, showing a table with columns for Type, Protocol, Port range, Source, and Description - optional.

Figure 6: Configuring Security Group

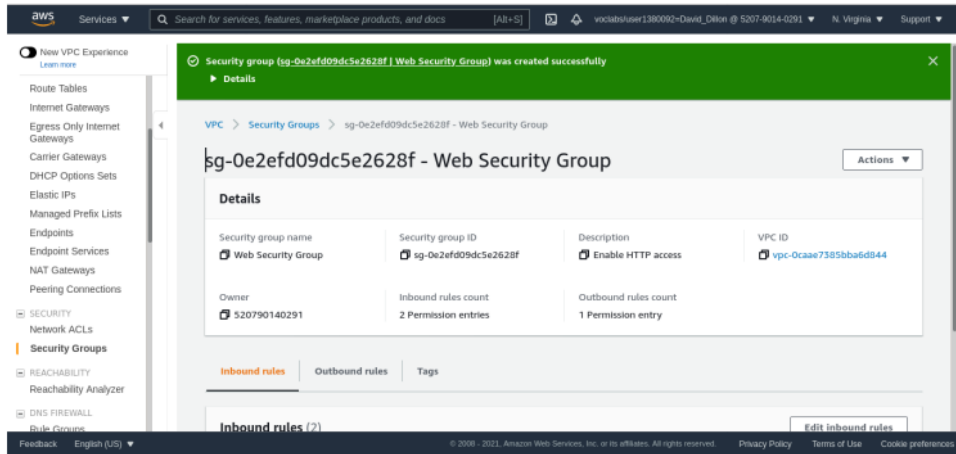
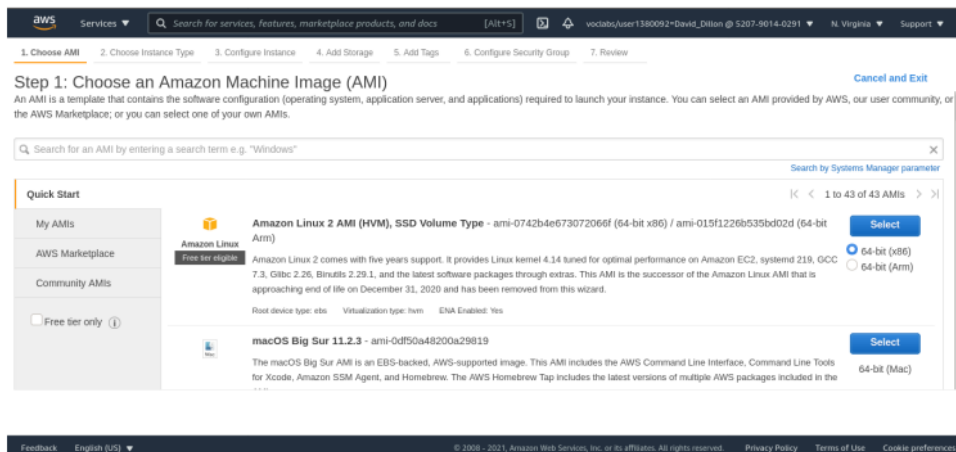


Figure 7: Security Group Created

Task 4: Launch a Web Server Instance



Services

Search for services, features, marketplace products, and docs

[Alt+S]

vociabz/user1380092*David_Dillon @ 5207-9014-0291

N. Virginia

Support

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. [Learn more](#) about storage options in Amazon EC2.

Volume Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Throughput (MB/s)	Delete on Termination	Encryption
Root	/dev/xvda	snap-097c45e6d3c6e1d1b	8	General Purpose SSD (gp2)	100 / 3000	N/A	<input checked="" type="checkbox"/>	Not Encrypt

Add New Volume

Free tier eligible customers can get up to 30 GiB of EBS General Purpose (SSD) or Magnetic storage. [Learn more](#) about free usage tier eligibility and usage restrictions.

Cancel

Previous

Review and Launch

Next: Add Tags

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Services

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vociabz/user1380092*David_Dillon @ 5207-9014-0291

N. Virginia

Support

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☒ Create a new security group
☐ Select an existing security group

Security group name:

Description:

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	Custom 0.0.0.0/0	e.g. SSH for Admin Desktop

Add Rule

Warning

Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

Cancel

Previous

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Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☐ Create a new security group
☒ Select an existing security group

Security Group ID	Name	Description	Actions
sg-094e1dce2fcb50132	default	default VPC security group	Copy to new
sg-0e2efd09dc5e2628f	Web Security Group	Enable HTTP access	Copy to new

Inbound rules for sg-0e2efd09dc5e2628f (Selected security groups: sg-0e2efd09dc5e2628f)

Type	Protocol	Port Range	Source	Description
HTTP	TCP	80	0.0.0.0/0	Permit web request...
HTTP	TCP	80	:::0	Permit web request...

[Cancel](#) [Previous](#) [Review and Launch](#)


Figure 8: Choosing the previously created Web Security Group

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☐ Create a new security group
☒ Select an existing security group

Warning

 **Warning**
 You will not be able to connect to this instance as the AMI requires port(s) 22 to be open in order to have access. Your current security group doesn't have port(s) 22 open.

[Continue](#)

Type	Protocol	Port Range	Source	Description
HTTP	TCP	80	0.0.0.0/0	Permit web request...
HTTP	TCP	80	:::0	Permit web request...

[Cancel](#) [Previous](#) [Review and Launch](#)

Step 7: Review Instance Launch
Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

▼ **AMI Details** [Edit AMI](#)

Amazon Linux 2 AMI (HVM), SSD Volume Type - ami-0742b4e673072066f
Free tier eligible
Amazon Linux 2 comes with five years support. It provides Linux kernel 4.14 tuned for optimal performance on Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1, and the latest software packages through extras. This AMI is the successor of the Amazon Linux AMI that is a...
Root Device Type: ebs Virtualization type: hvm

▼ **Instance Type** [Edit instance type](#)

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
t2.micro	-	1	1	EBS only	-	Low to Moderate

▼ **Security Groups** [Edit security groups](#)

Security Group ID	Name	Description

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Launch Status

✓ **Your instances are now launching**
The following instance launches have been initiated: [i-06feca0a31aadafb](#) [View launch log](#)

ℹ **Get notified of estimated charges**
[Create billing alerts](#) to get an email notification when estimated charges on your AWS bill exceed an amount you define (for example, if you exceed the free usage tier).

How to connect to your instances
Your instances are launching, and it may take a few minutes until they are in the **running** state, when they will be ready for you to use. Usage hours on your new instances will start immediately and continue to accrue until you stop or terminate your instances.
Click **View instances** to monitor your instances' status. Once your instances are in the **running** state, you can **connect** to them from the Instances screen. [Find out](#) how to connect to your instances.

▼ **Here are some helpful resources to get you started**

- [How to connect to your Linux instance](#)
- [Amazon EC2: User Guide](#)
- [Learn about AWS Free Usage Tier](#)
- [Amazon EC2: Discussion Forum](#)

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Figure 9: Instance Launched

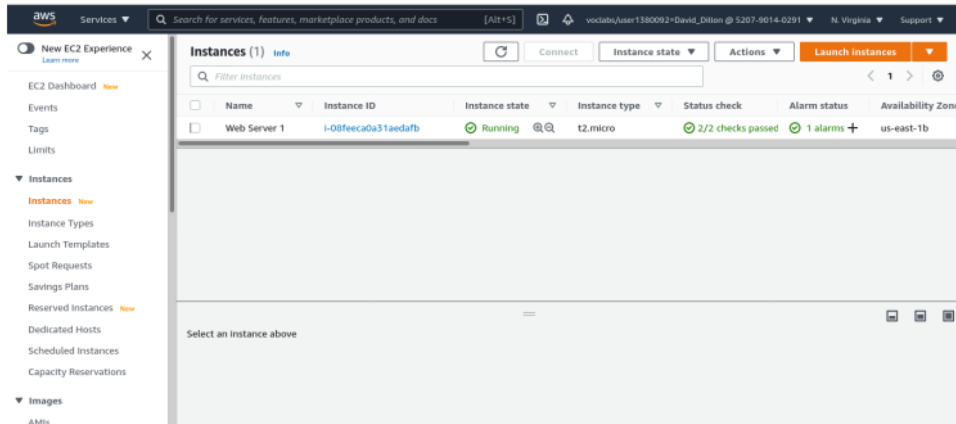


Figure 10: 2/2 Checks Passed

End Lab

```

End Lab
Region: us-east-1
Lab ID: arn:aws:cloudformation:us-east-1:520790140291:stack/c13546a1333191572329t1w520790140291/b46e1a20-a3fd-11eb-
bbff-0e762363e33d
Creation Time: 2021-04-22T23:32:41-0700

----> DELETE has been initiated...
You may close this message box now. Lab resources are terminating ...

```

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