Application Support Engineer
- Assignment -

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Key points

- AWS EC2 instance is a **t2.micro RHEL** environment
- Status of the commands run in the script are echo'd to the terminal for easy reference of the user.
- AWS CLI has been configured on external machine using Access key ID, Secret Access Key and the Region to give access to IAM user from external machine. (screenshots attached below)
- SMTP server has been configured on the external machine to send emails. (screenshots attached below)
- Bash scripts were created part by part for different questions, later added them altogether to create 2 final scripts for Question 3 and Question 4.

Considered Security Points

- All the procedures are done using an **IAM** user. Root user is not used unless it’s necessary
- A security group is configured with only access to 22 and 80 ports which can be accessed externally.
- Changed the access permission of the private key using **# chmod 400 key.pem**
- Private key less login method has been configured between the external machine and EC2 instance.
- Access key ID and Secret Access key are used to configure AWS CLI on external machine.

Logging Mechanisms used

- In script 1 all the log data along with a timestamp are uploaded into DynamoDB.
- For both script 1 and script 2 a log file is maintained inside the directory where script is running. The logs are stored in these text files for easy reference of the user.
- Every step is checked with an if statement and if any error pops while running the script, it is displayed in the terminal and it sends an email to application support team as well.

Enterprise Architecture Diagram

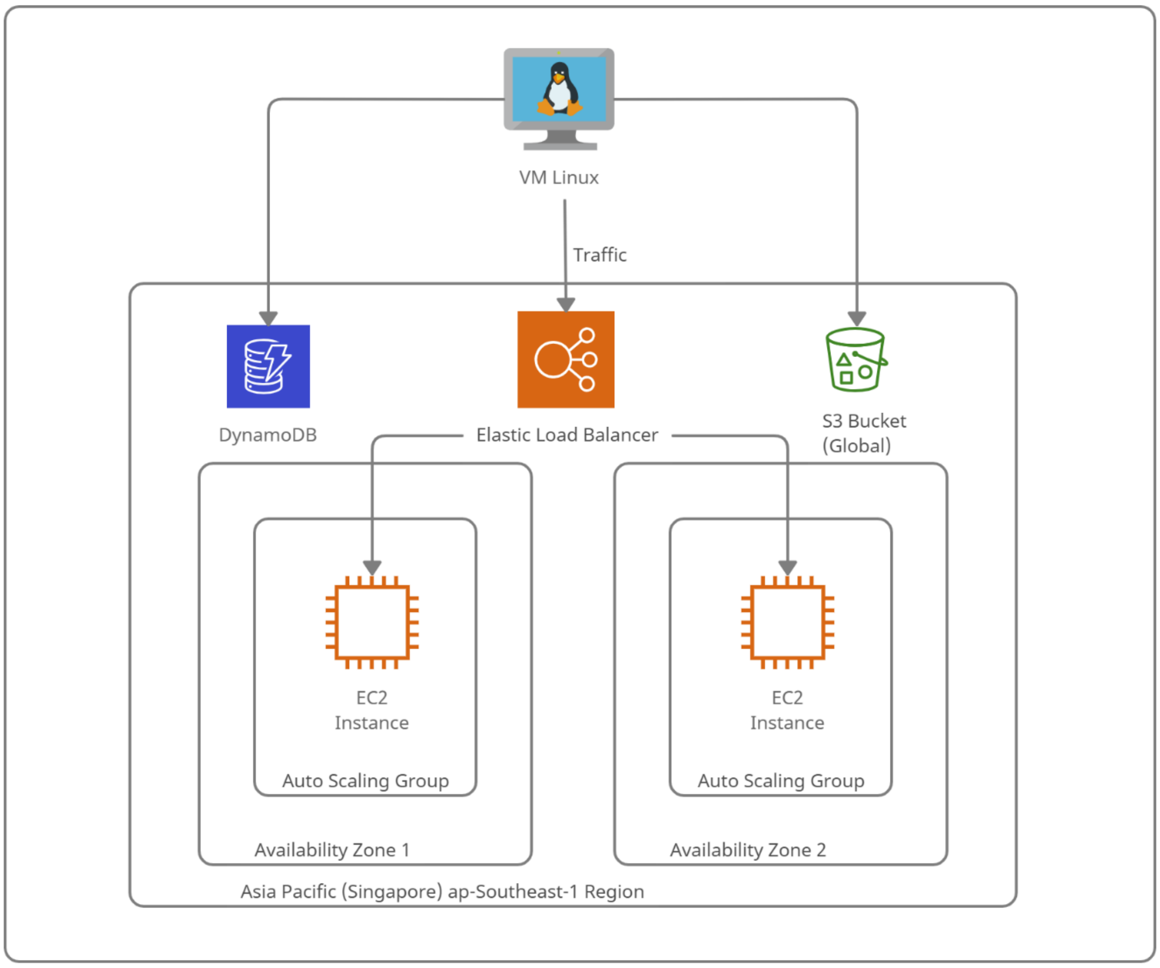


Figure 1

Q1 - Creating a new server with public access

1. Create a new free AWS root account if already not.

2. Using that root account, create an IAM account on AWS

3. Create a new EC2 instance

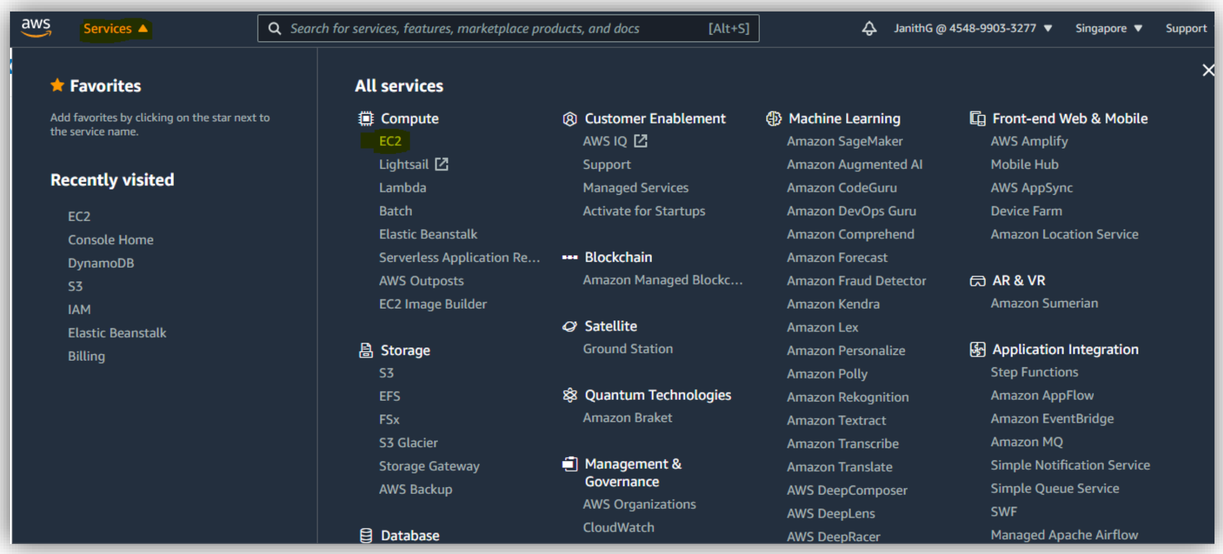
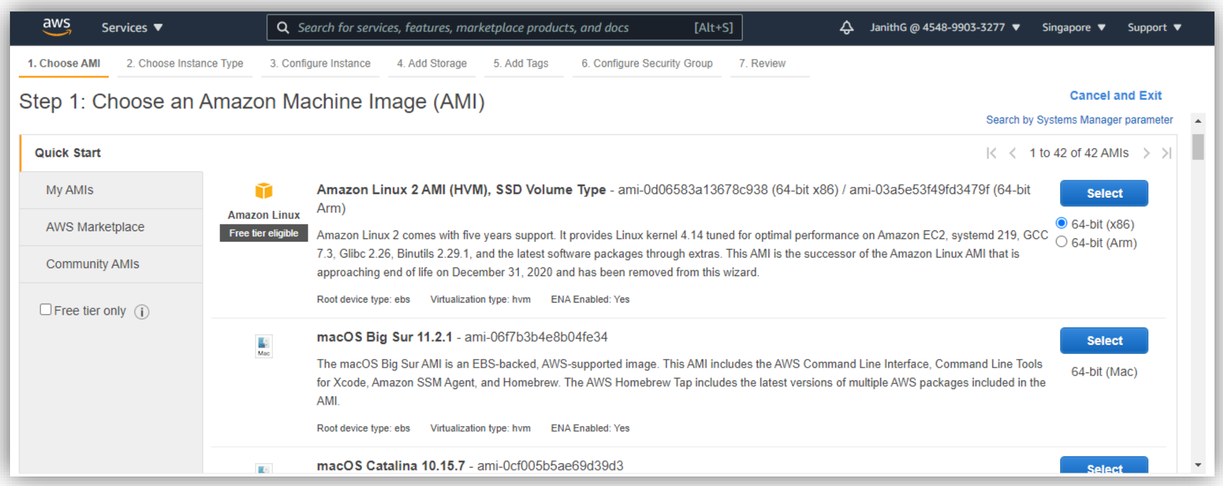


Figure 2

3.1. Go to services and select EC2

3.2. Select "Launch Instance"

3.3. Choose the preferred Amazon Machine Image (AMI) to install



Step 1: Choose an Amazon Machine Image (AMI)

Amazon Linux 2 AMI (HVM), SSD Volume Type - ami-0d06583a13678c938 (64-bit x86) / ami-03a5e53f49fd3479f (64-bit Arm)

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 approaching end of life on December 31, 2020 and has been removed from this wizard.

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

[✓ 64-bit (x86)] 64-bit (Arm)

macOS Big Sur 11.2.1 - ami-06f7b3b4e8b04fe34

The macOS Big Sur AMI is an EBS-backed, AWS-supported image. This AMI includes the AWS Command Line Interface, Command Line Tools for Xcode, Amazon SSM Agent, and Homebrew. The AWS Homebrew Tap includes the latest versions of multiple AWS packages included in the AMI.

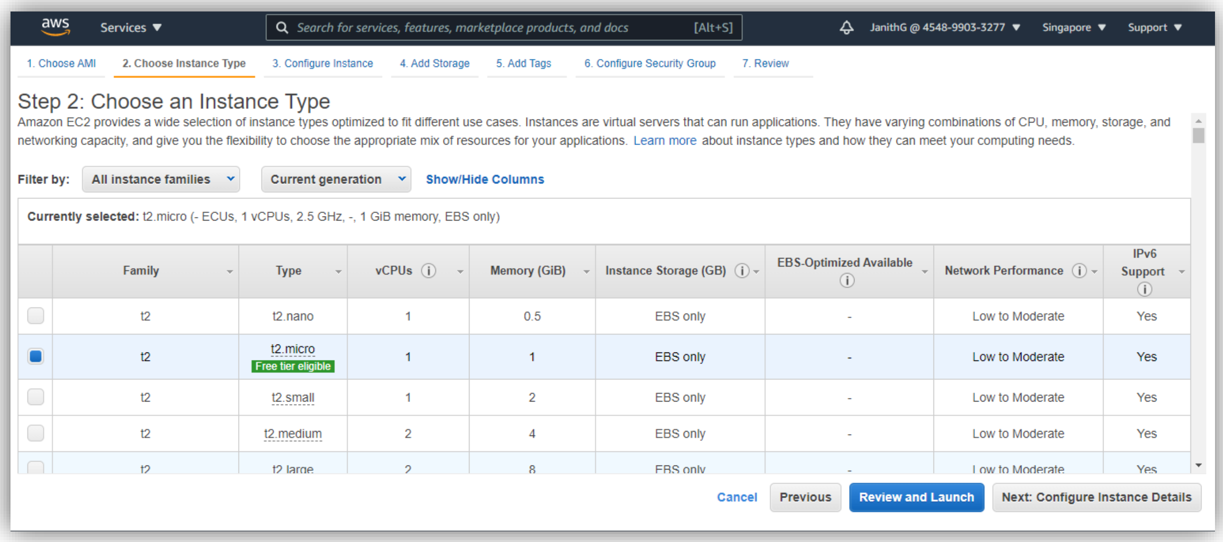
Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

64-bit (Mac)

macOS Catalina 10.15.7 - ami-0cf005b5ae69d39d3

Figure 3

3.4. Choose an Instance Type



Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. Learn more about instance types and how they can meet your computing needs.

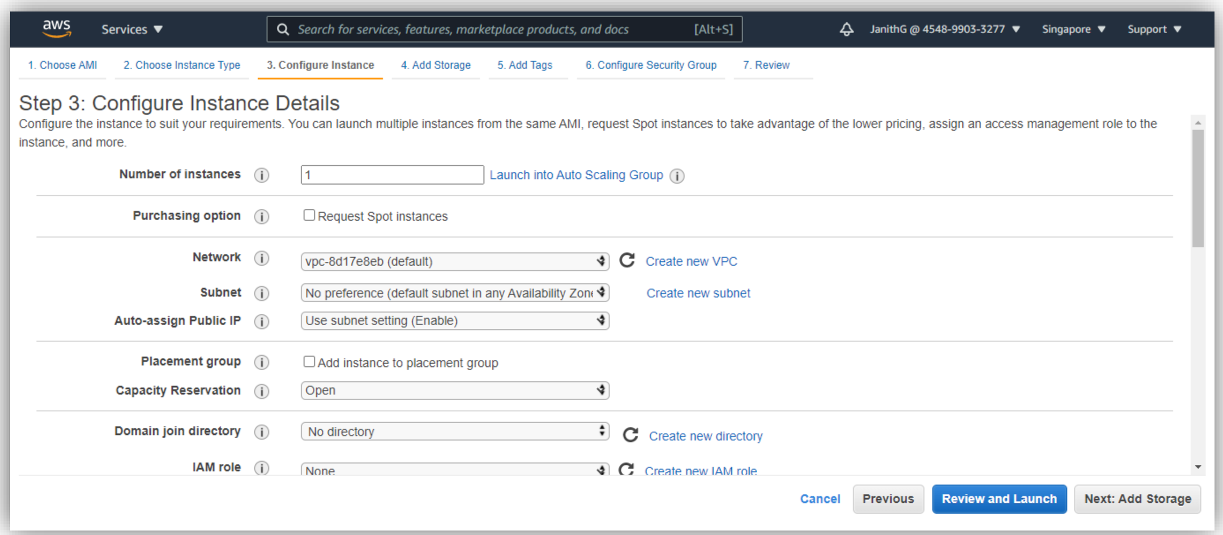
Filter by: All instance families | Current generation | Show/Hide Columns

Currently selected: t2.micro (- ECUs, 1 vCPUs, 2.5 GHz, -, 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
☐	t2	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
■	t2	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
☐	t2	t2.small	1	2	EBS only	-	Low to Moderate	Yes
☐	t2	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
☐	t2	t2.large	2	8	EBS only	-	Low to Moderate	Yes

Figure 4

3.5. Configure the instance



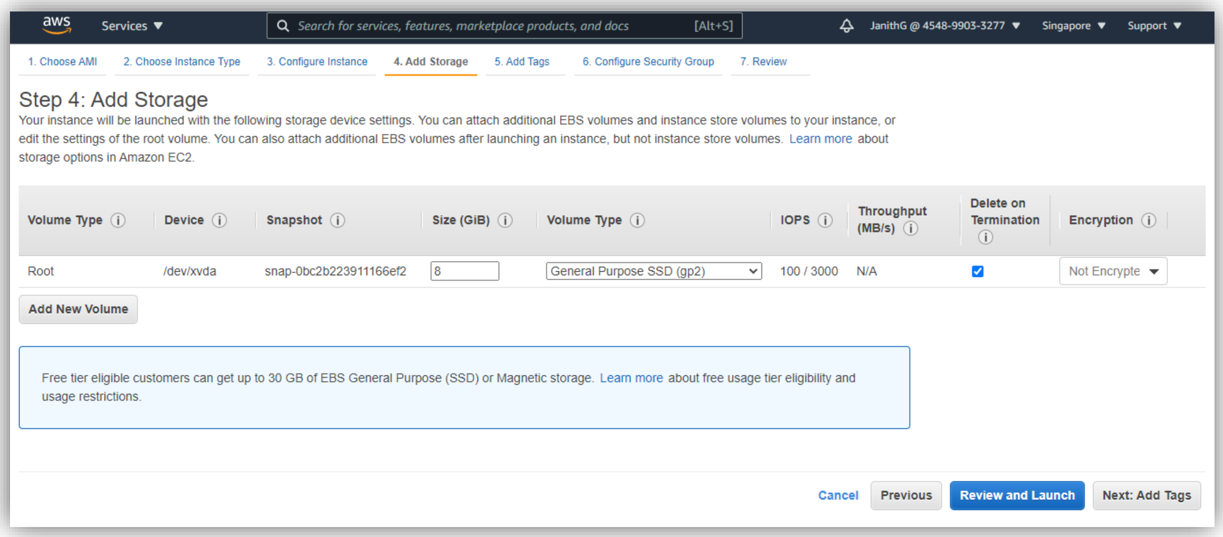
Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances	1 — Launch into Auto Scaling Group
Purchasing option	☐ Request Spot instances
Network	vpc-8d17e8eb (default) — Create new VPC
Subnet	No preference (default subnet in any Availability Zone) — Create new subnet
Auto-assign Public IP	Use subnet setting (Enable)
Placement group	☐ Add instance to placement group
Capacity Reservation	Open
Domain join directory	No directory — Create new directory
IAM role	None — Create new IAM role

Figure 5

3.6. Add storage and tags



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-0bc2b223911166ef2	8	General Purpose SSD (gp2)	100 / 3000	N/A	✓	Not Encrypte

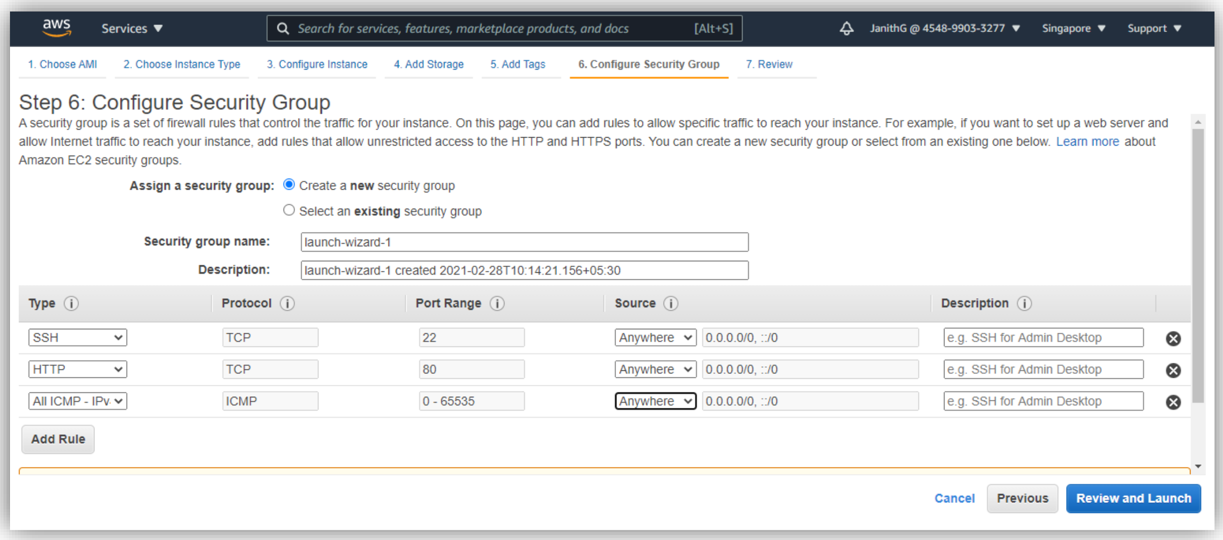
Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. Learn more about free usage tier eligibility and usage restrictions.

Figure 6

3.7. Configure a Security Group

3.7.1. Allow HTTP, SSH and ICMP -IPv4 protocols from anywhere to access the server publicly

- HTTP – Access the web service
- SSH – Access the EC2 instance externally via SSH
- ICMP – Ipv4 – To activate ping



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

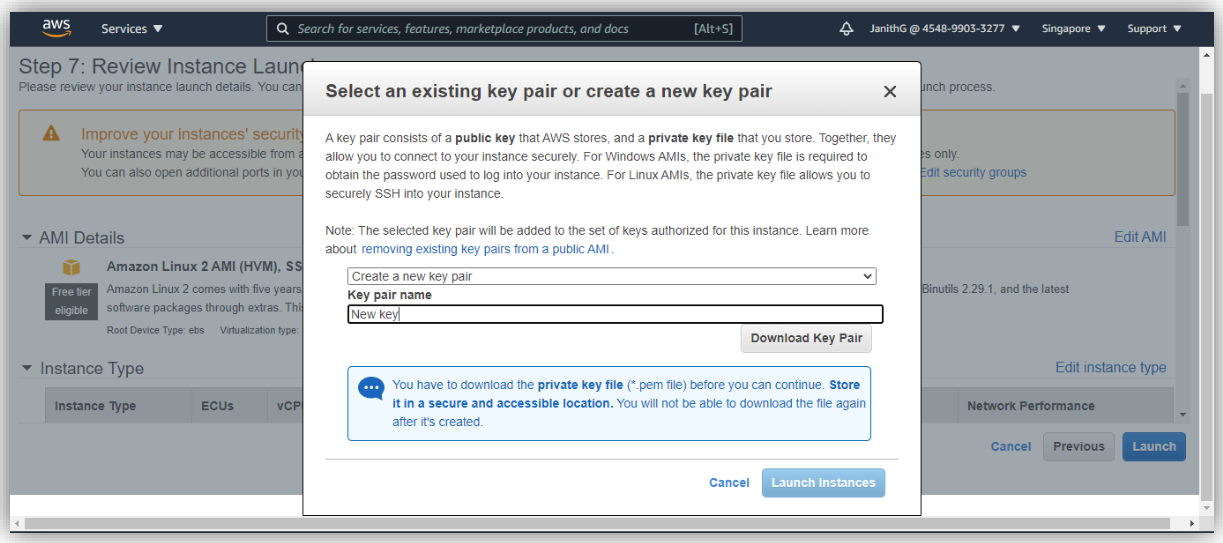
Security group name: launch-wizard-1

Description: launch-wizard-1 created 2021-02-28T10:14:21.156+05:30

Type	Protocol	Port Range	Source		Description
SSH	TCP	22	Anywhere	0.0.0.0/0, ::/0	e.g. SSH for Admin Desktop
HTTP	TCP	80	Anywhere	0.0.0.0/0, ::/0	e.g. SSH for Admin Desktop
All ICMP - IPv	ICMP	0 - 65535	Anywhere	0.0.0.0/0, ::/0	e.g. SSH for Admin Desktop

Figure 7

3.8. Create a new key pair (Public and Private key) and save it safe. This key is needed to access the sever from externally.



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Step 7: Review Instance Launch

Please review your instance launch details. You can … launch process.

Improve your instances' security. … Your instances may be accessible from … only. You can also open additional ports in yo… Edit security groups

AMI Details — Edit AMI

Amazon Linux 2 AMI (HVM), SS… Free tier eligible. Amazon Linux 2 comes with five years … Binutils 2.29.1, and the latest software packages through extras. … Root Device Type: ebs Virtualization type: …

Instance Type — Edit instance type

Instance Type | ECUs | vCP… | Network Performance

Cancel Previous Launch

Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about removing existing key pairs from a public AMI.

Create a new key pair

Key pair name: New key

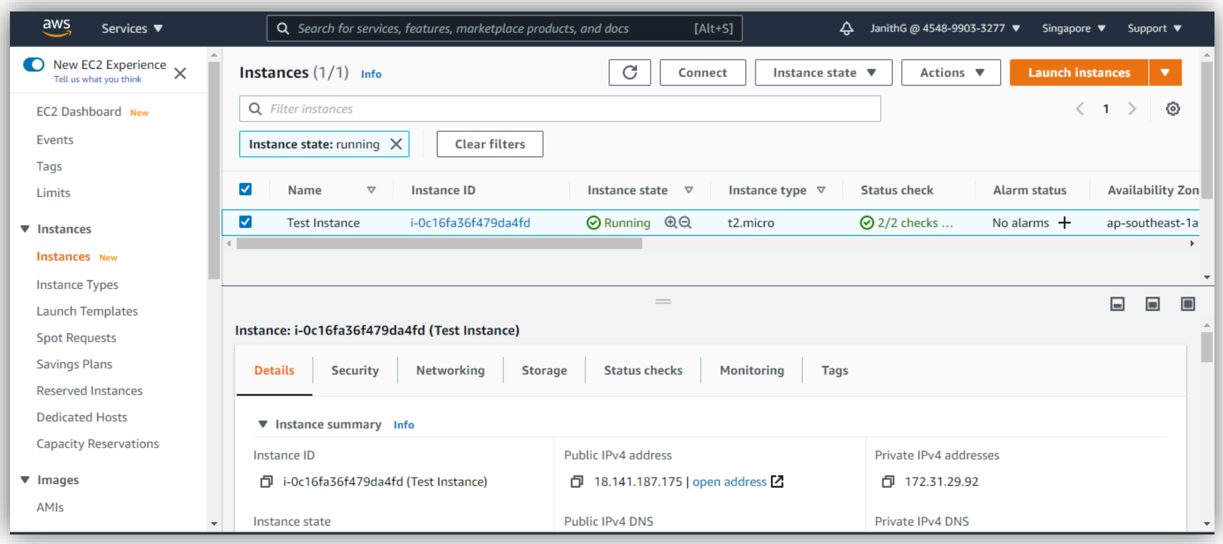
Download Key Pair

You have to download the **private key file** (*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

Cancel Launch Instances

Figure 8

3.9. Review and launch the new Instance



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New EC2 Experience — Tell us what you think

EC2 Dashboard New, Events, Tags, Limits, Instances: Instances New, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, Images: AMIs

Instances (1/1) Info — Connect | Instance state ▼ | Actions ▼ | Launch instances ▼

Filter instances — Instance state: running ✕ | Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zon
Test Instance	i-0c16fa36f479da4fd	Running	t2.micro	2/2 checks …	No alarms	ap-southeast-1a

Instance: i-0c16fa36f479da4fd (Test Instance)

Details | Security | Networking | Storage | Status checks | Monitoring | Tags

Instance summary Info

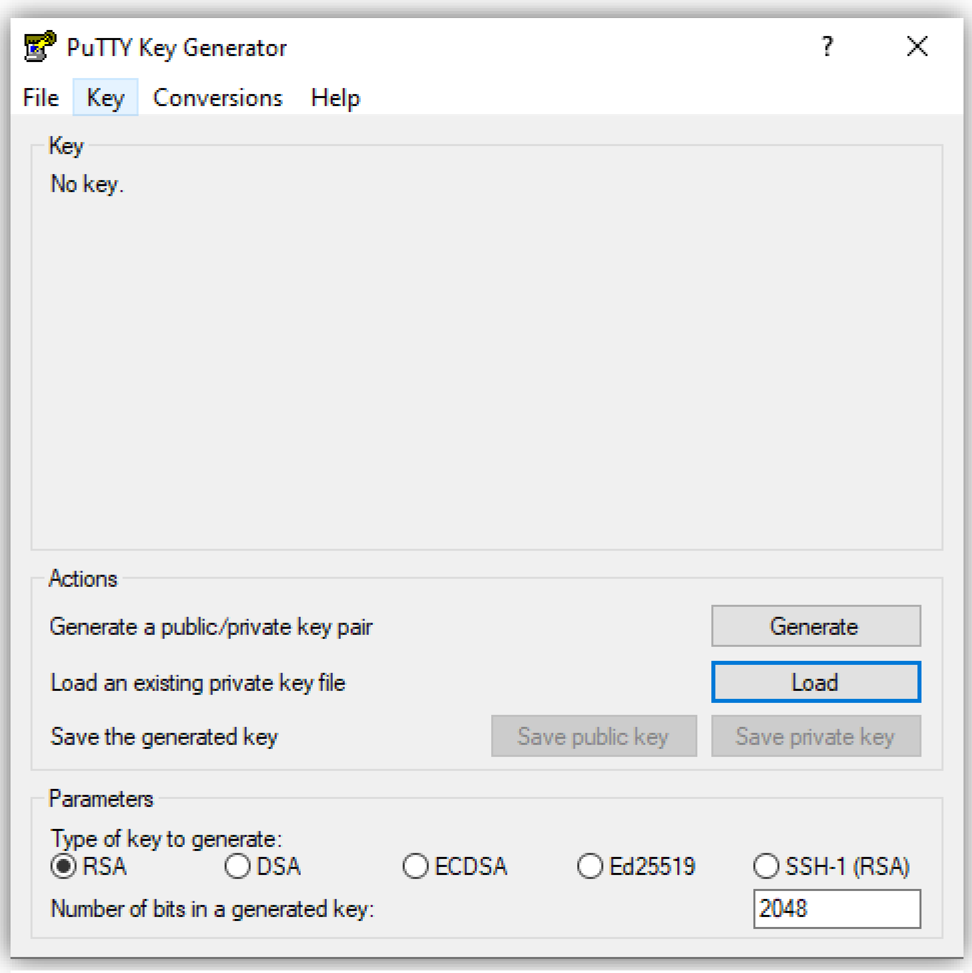
Instance ID	Public IPv4 address	Private IPv4 addresses
i-0c16fa36f479da4fd (Test Instance)	18.141.187.175 | open address	172.31.29.92
Instance state	Public IPv4 DNS	Private IPv4 DNS

Figure 9

Checking if the newly created EC2 instance can be accessed publicly (SSH using putty)

1. Install PuTTY

2. Open PuTTYgen and load the .pem key which downloaded earlier



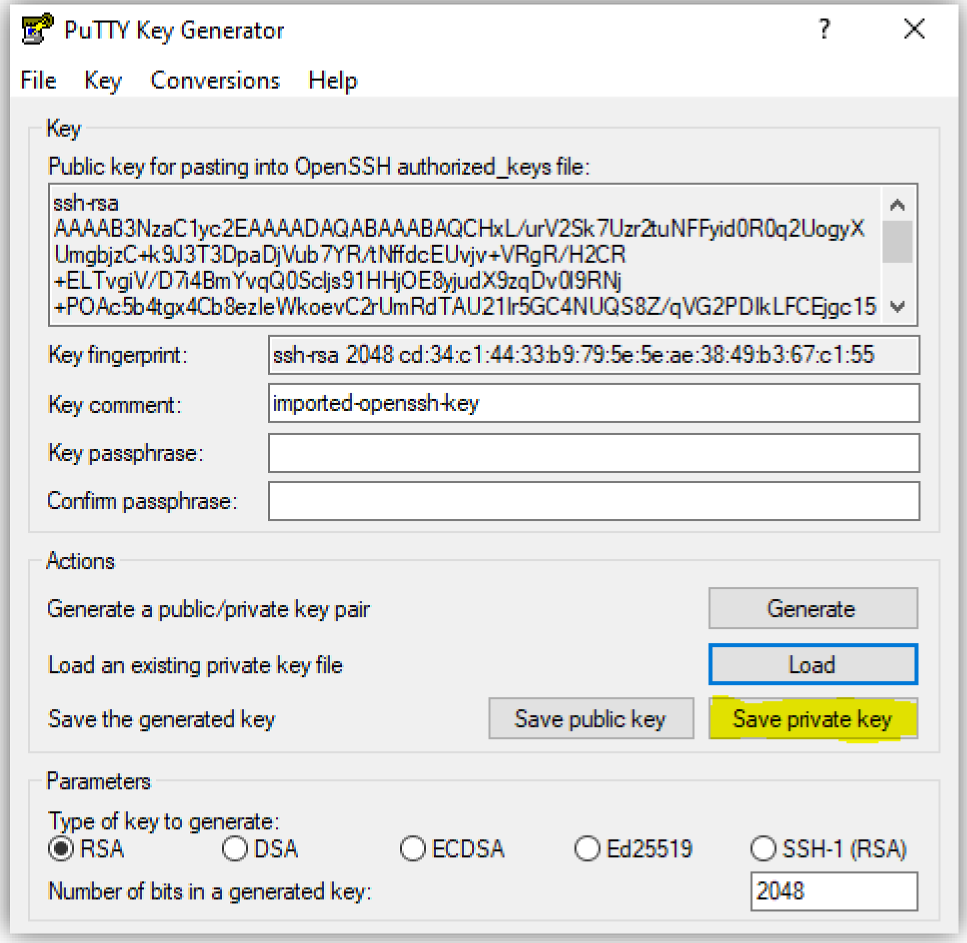
Key
No key.

Actions
Generate a public/private key pair
Load an existing private key file
Save the generated key

Parameters
Type of key to generate:
[✓ RSA] DSA ECDSA Ed25519 SSH-1 (RSA)
Number of bits in a generated key: 2048

Figure 10

3. Click “Save private key” to save the converted .ppk file using the same file name



Key

Public key for pasting into OpenSSH authorized_keys file:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQCHxL/urV2Sk7Uzr2tuNFFyid0R0q2UogyX
UmgbjzC+k9J3T3DpaDjVub7YR/tNffdcEUvjv+VRgR/H2CR
+ELTvgiV/D7i4BmYvqQ0Scljs91HHjOE8yjudX9zqDv0I9RNj
+POAc5b4tgx4Cb8ezleWkoevC2rUmRdTAU21lr5GC4NUQS8Z/qVG2PDlkLFCEjgc15
```

Key fingerprint: ssh-rsa 2048 cd:34:c1:44:33:b9:79:5e:5e:ae:38:49:b3:67:c1:55

Key comment: imported-openssh-key

Key passphrase:

Confirm passphrase:

Actions

Generate a public/private key pair

Load an existing private key file

Save the generated key

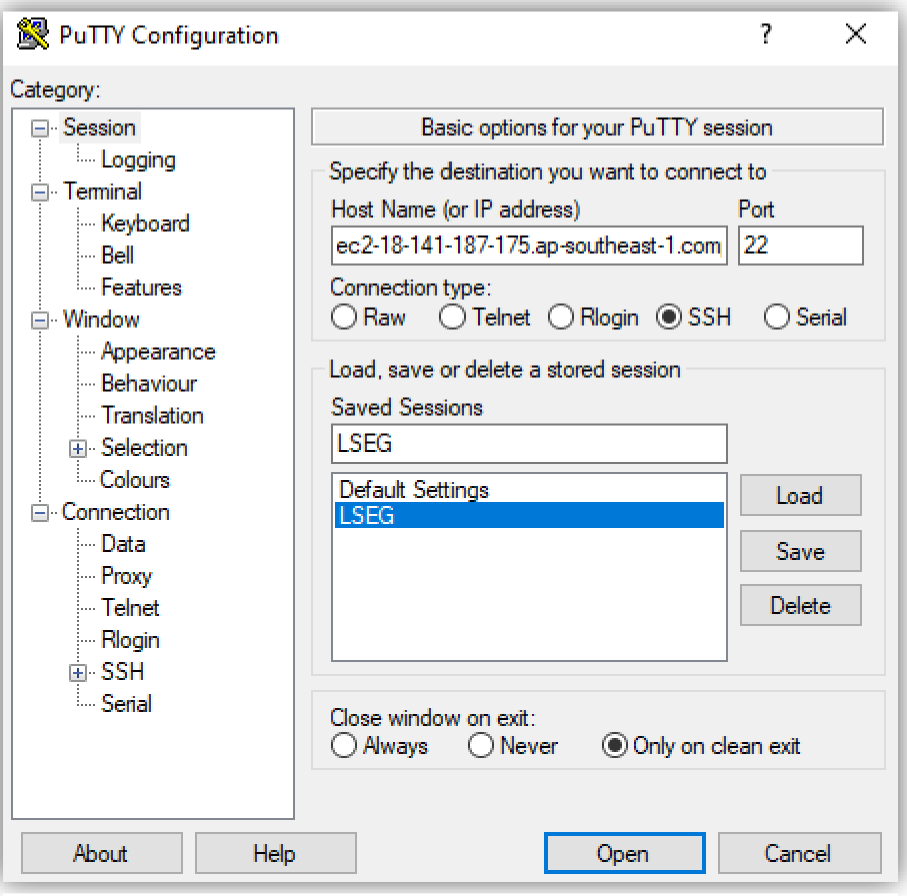
Parameters

Type of key to generate:
[✓ RSA] DSA ECDSA Ed25519 SSH-1 (RSA)

Number of bits in a generated key: 2048

Figure 11

4. Open PuTTY and enter the following data then click “open”
   - Hostname – copy the public IPv4 DNS from EC2 instance
   - Connection type – SSH
   - Connection -> SSH -> Auth and select .ppk private key file
   - Connection -> Data -> Enter login username as “ec2-user”



Specify the destination you want to connect to

Host Name (or IP address): ec2-18-141-187-175.ap-southeast-1.com

Port: 22

Connection type: Raw Telnet Rlogin [✓ SSH] Serial

Load, save or delete a stored session

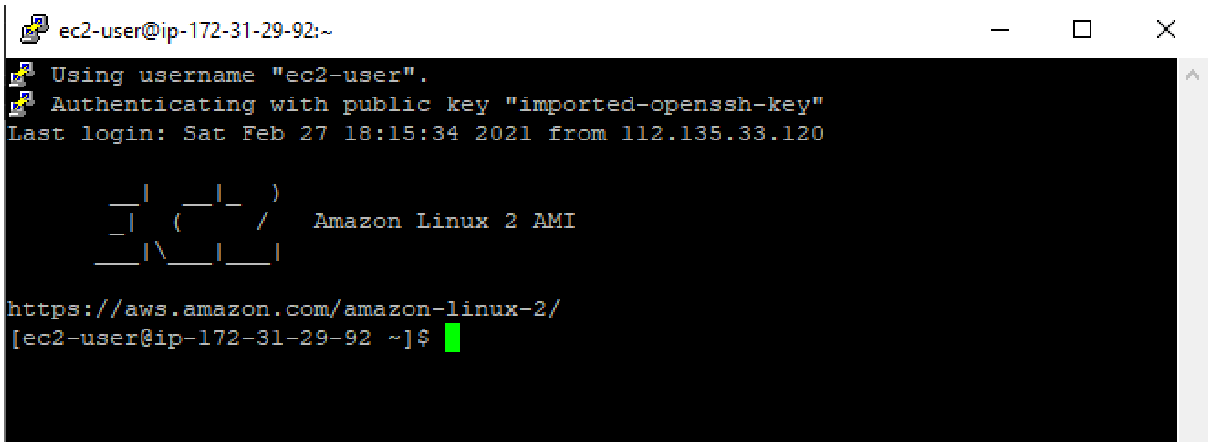
Saved Sessions: LSEG

Default Settings
LSEG

Close window on exit: Always Never [✓ Only on clean exit]

Figure 12

5. Successful connection will display the following window



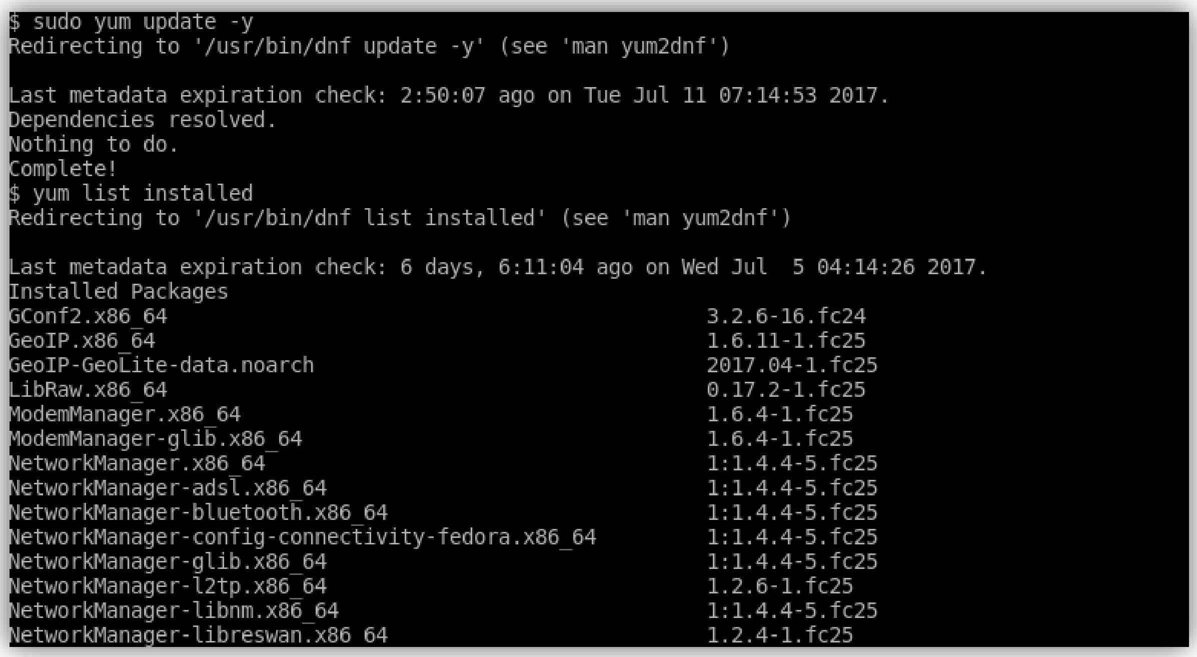
```
Using username "ec2-user".
Authenticating with public key "imported-openssh-key"
Last login: Sat Feb 27 18:15:34 2021 from 112.135.33.120

       __|  __|_  )
       _|  (     /   Amazon Linux 2 AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-172-31-29-92 ~]$
```

Figure 13

Q2 - Installing Apache server on EC2 instance

1. Update the server in the first launch

   # sudo yum update



```
$ sudo yum update -y
Redirecting to '/usr/bin/dnf update -y' (see 'man yum2dnf')

Last metadata expiration check: 2:50:07 ago on Tue Jul 11 07:14:53 2017.
Dependencies resolved.
Nothing to do.
Complete!
$ yum list installed
Redirecting to '/usr/bin/dnf list installed' (see 'man yum2dnf')

Last metadata expiration check: 6 days, 6:11:04 ago on Wed Jul  5 04:14:26 2017.
Installed Packages
GConf2.x86_64                                          3.2.6-16.fc24
GeoIP.x86_64                                           1.6.11-1.fc25
GeoIP-GeoLite-data.noarch                              2017.04-1.fc25
LibRaw.x86_64                                          0.17.2-1.fc25
ModemManager.x86_64                                    1.6.4-1.fc25
ModemManager-glib.x86_64                               1.6.4-1.fc25
NetworkManager.x86_64                                  1:1.4.4-5.fc25
NetworkManager-adsl.x86_64                             1:1.4.4-5.fc25
NetworkManager-bluetooth.x86_64                        1:1.4.4-5.fc25
NetworkManager-config-connectivity-fedora.x86_64       1:1.4.4-5.fc25
NetworkManager-glib.x86_64                             1:1.4.4-5.fc25
NetworkManager-l2tp.x86_64                             1.2.6-1.fc25
NetworkManager-libnm.x86_64                            1:1.4.4-5.fc25
NetworkManager-libreswan.x86_64                        1.2.4-1.fc25
```

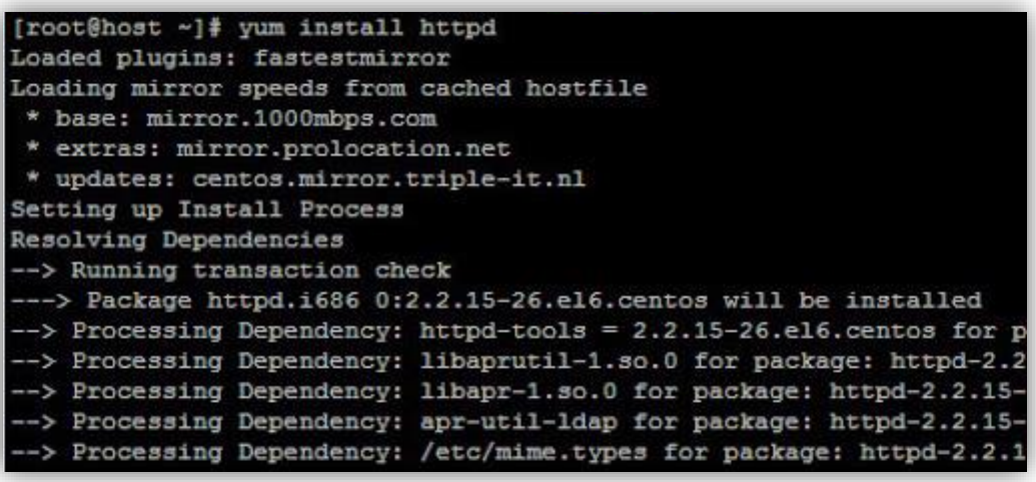
Figure 14

2. Install the HTTP server

   # sudo yum -y install httpd

   # systemctl start httpd

   # systemctl enable httpd



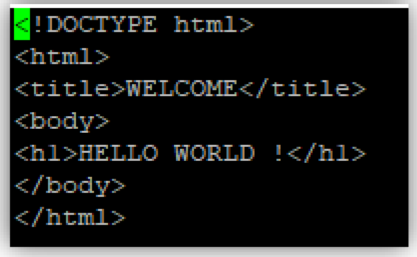
```
[root@host ~]# yum install httpd
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
 * base: mirror.1000mbps.com
 * extras: mirror.prolocation.net
 * updates: centos.mirror.triple-it.nl
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package httpd.i686 0:2.2.15-26.el6.centos will be installed
--> Processing Dependency: httpd-tools = 2.2.15-26.el6.centos for p
--> Processing Dependency: libaprutil-1.so.0 for package: httpd-2.2
--> Processing Dependency: libapr-1.so.0 for package: httpd-2.2.15-
--> Processing Dependency: apr-util-ldap for package: httpd-2.2.15-
--> Processing Dependency: /etc/mime.types for package: httpd-2.2.1
```

Figure 15

3. Check the status of the http service

   # systemctl status httpd

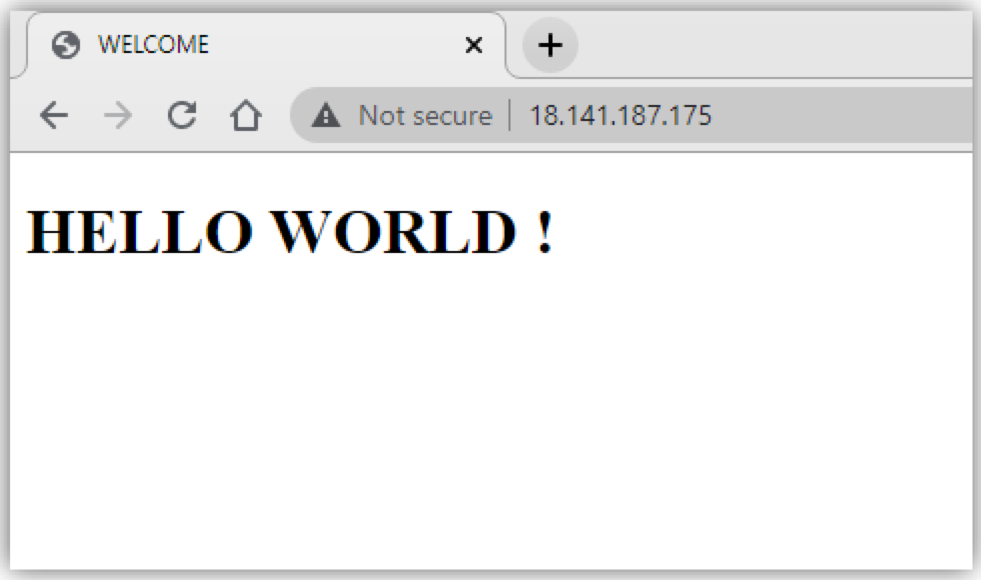
4. Go to **/var/www/html** and edit the **index.html** file



```
<!DOCTYPE html>
<html>
<title>WELCOME</title>
<body>
<h1>HELLO WORLD !</h1>
</body>
</html>
```

Figure 16

5. Open web browser and type the public IP and press Enter to display the message



HELLO WORLD !

Figure 17

Q3 (i) - SSH to EC2 instance and check for web server status

1. Create access to EC2 instance from outside without private key
   1.1. Generate SSH key –

      # ssh-keygen -t rsa -m PEM

   1.2. Check for the key saved in ~/.ssh folder –

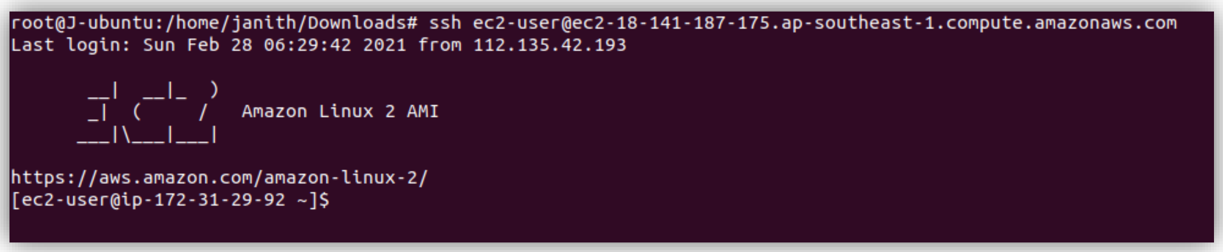
      # ls -lah ~/.ssh

   1.3. Copy the public key to EC2 instance –

      # cat ~/.ssh/id_rsa.pub | sudo ssh -i /home/janith/Downloads/key.pem ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "cat >> /home/ec2-user/.ssh/authorized_keys"

   1.4. Try SSH into server without key –

      # **SSH ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com**



```
root@J-ubuntu:/home/janith/Downloads# ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com
Last login: Sun Feb 28 06:29:42 2021 from 112.135.42.193

       __|  __|_  )
       _|  (     /   Amazon Linux 2 AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-172-31-29-92 ~]$
```

Figure 18

2. SSH into the EC2 instance Linux server and run the below command to get the number of lines returned for the process status of the web server

   # ps -ef | grep -c httpd

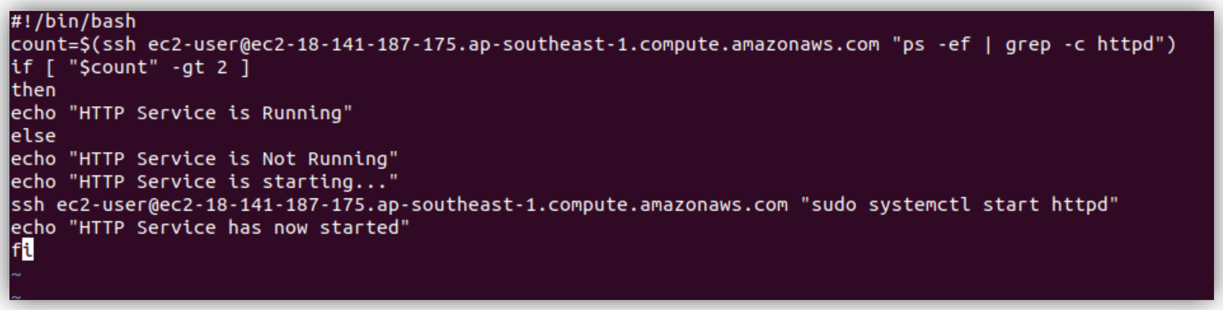
3. If the count is equal to 1, then the web services are down. If the count is greater than 2, then the web services are up and running.

```
if [ "$count" -gt 2 ]
then
echo "HTTP Service is Running"
else
echo "HTTP Service is Not Running"
fi
```

4. If the web services are down, using the below command, services can be started.

   # sudo systemctl start httpd

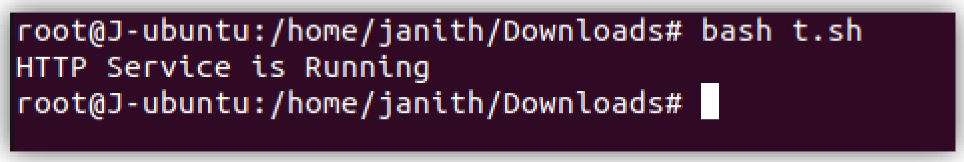
5. Following script is created to process the above tasks at once



```
#!/bin/bash
count=$(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "ps -ef | grep -c httpd")
if [ "$count" -gt 2 ]
then
echo "HTTP Service is Running"
else
echo "HTTP Service is Not Running"
echo "HTTP Service is starting..."
ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "sudo systemctl start httpd"
echo "HTTP Service has now started"
fi
~
~
```

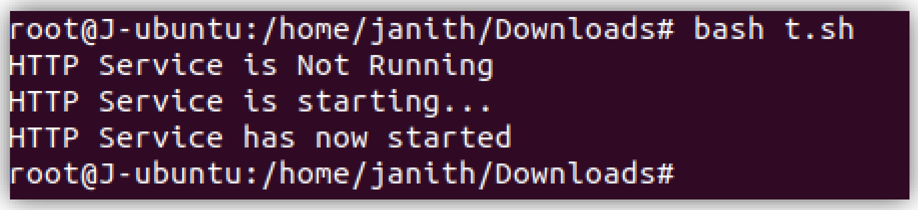
Figure 19

6. Follow image shows the result of above script



```
root@J-ubuntu:/home/janith/Downloads# bash t.sh
HTTP Service is Running
root@J-ubuntu:/home/janith/Downloads#
```

Figure 20



```
root@J-ubuntu:/home/janith/Downloads# bash t.sh
HTTP Service is Not Running
HTTP Service is starting...
HTTP Service has now started
root@J-ubuntu:/home/janith/Downloads#
```

Figure 21

Q3 (ii) – Check if the web server is serving the content and return 200 code

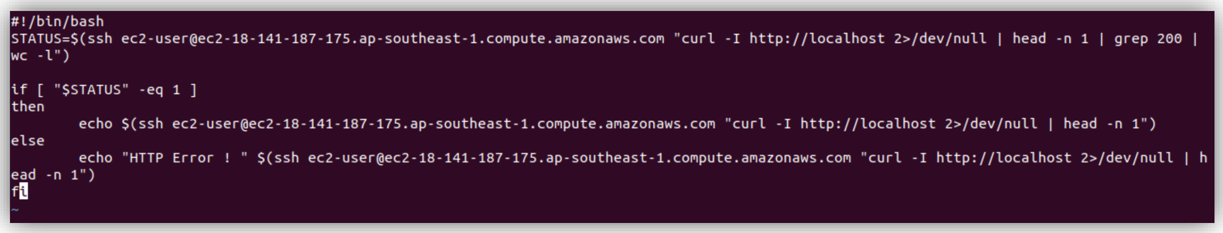
1. Run the following command to get the details of the HTTP server

   # curl -I http://localhost

2. Below command will check the top row for the status code "200" and return the word count

   # curl -I http://localhost 2>/dev/null | head -n 1 | grep 200 | wc -l

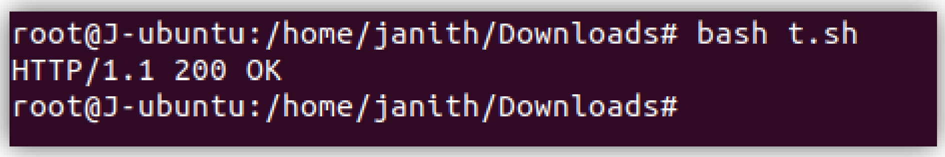
3. Check the above result in an if condition. If the word count is equal to 1, then the web server is serving the content.



```
#!/bin/bash
STATUS=$(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | head -n 1 | grep 200 |
wc -l")

if [ "$STATUS" -eq 1 ]
then
        echo $(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | head -n 1")
else
        echo "HTTP Error ! " $(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | h
ead -n 1")
fi
~
```

Figure 22

4. Above script will return the below result

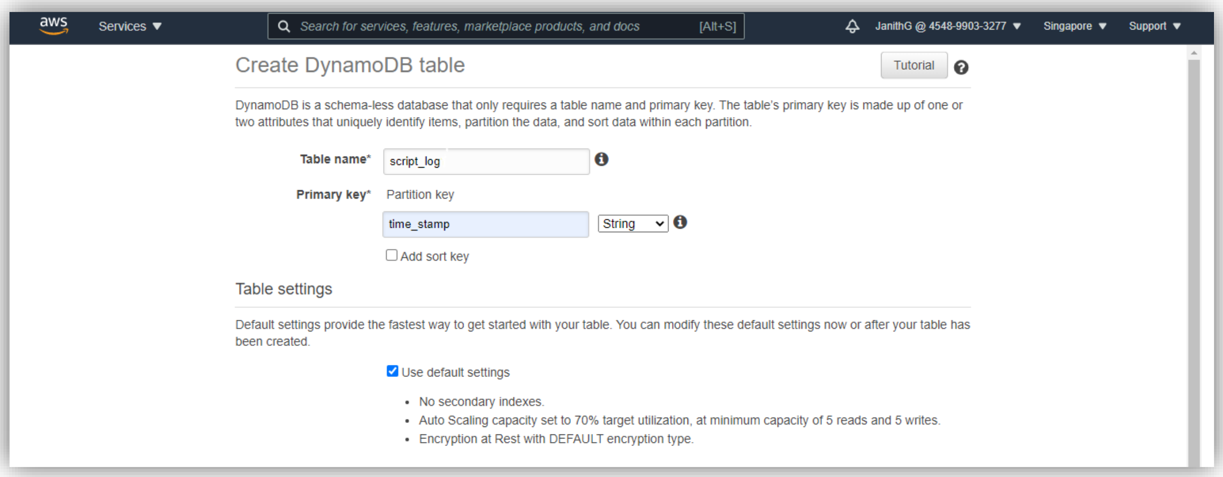


```
root@J-ubuntu:/home/janith/Downloads# bash t.sh
HTTP/1.1 200 OK
root@J-ubuntu:/home/janith/Downloads#
```

Figure 23

Q3 (iii) – Save the script result in a database

1. DynamoDB in AWS is used for this section
2. Create a new table with required fields and their respected data types


aws
Services
Search for services, features, marketplace products, and docs [Alt+S]
JanithG @ 4548-9903-3277
Singapore
Support
Tutorial

Create DynamoDB table

DynamoDB is a schema-less database that only requires a table name and primary key. The table's primary key is made up of one or two attributes that uniquely identify items, partition the data, and sort data within each partition.

Table name* script_log

Primary key* Partition key

time_stamp String

Add sort key

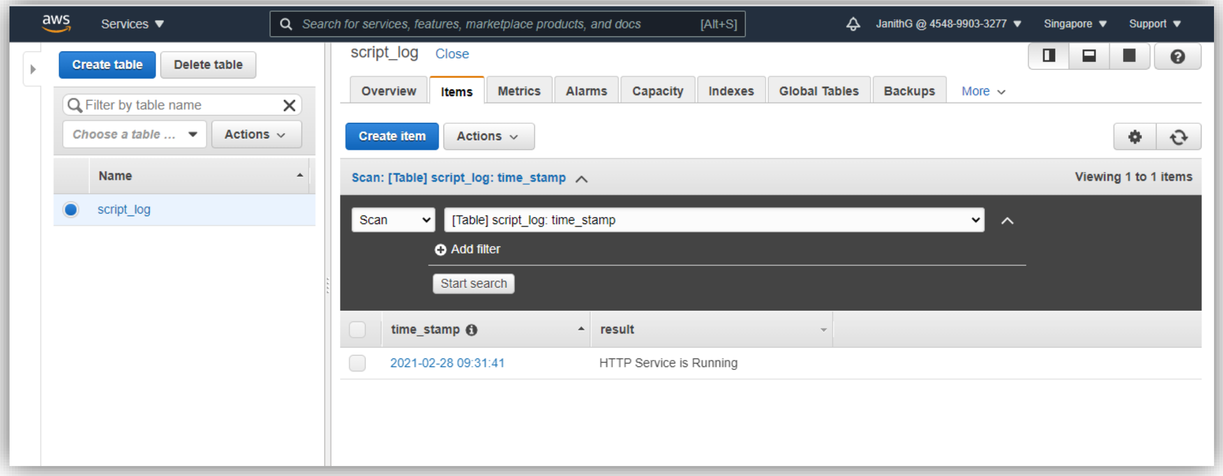
Table settings

Default settings provide the fastest way to get started with your table. You can modify these default settings now or after your table has been created.

☑ Use default settings

- No secondary indexes.
- Auto Scaling capacity set to 70% target utilization, at minimum capacity of 5 reads and 5 writes.
- Encryption at Rest with DEFAULT encryption type.

Figure 24



script_log

Scan: [Table] script_log: time_stamp

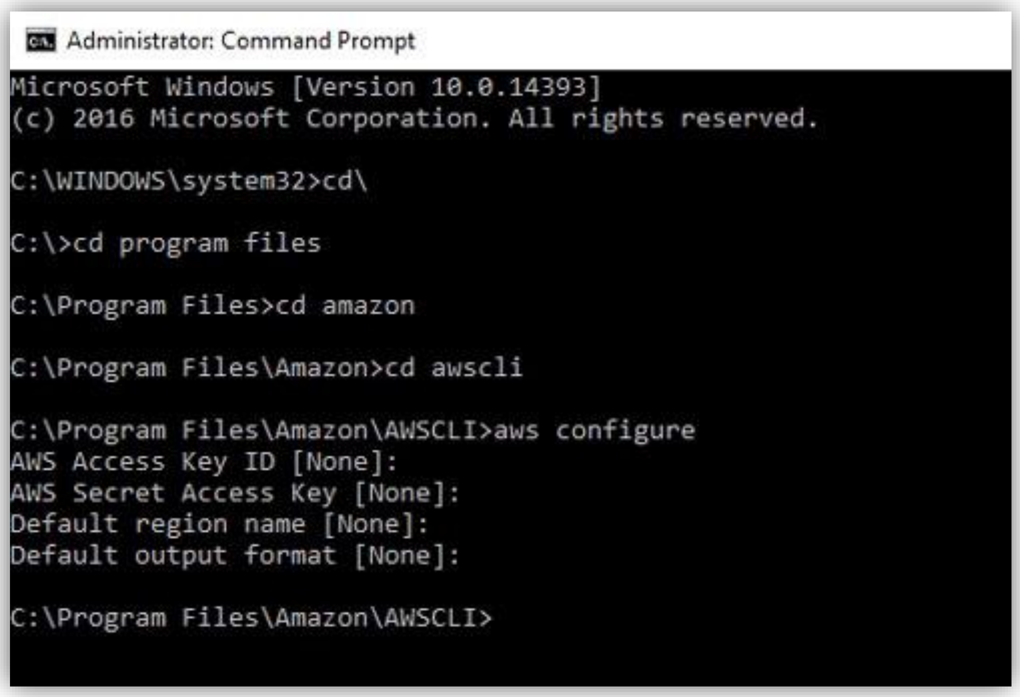
Viewing 1 to 1 items

Scan [Table] script_log: time_stamp

time_stamp	result
2021-02-28 09:31:41	HTTP Service is Running

Figure 25

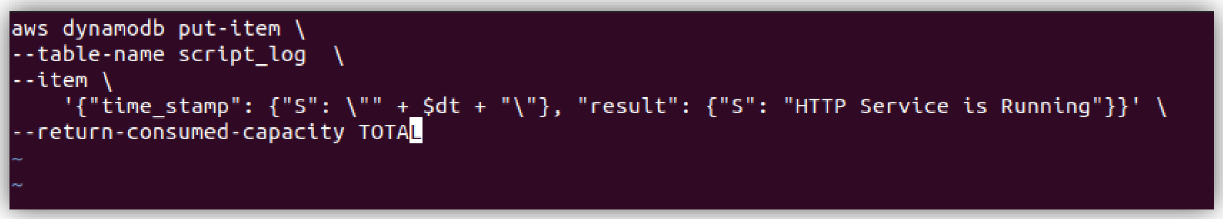
3. Configure AWS CLI in the server to perform rest of the commands
   - Enter the Key ID for the AWS user
   - Enter the Secret Access Key provided for the user
   - Enter the region name used for the AWS services and configure



```
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>cd\

C:\>cd program files

C:\Program Files>cd amazon

C:\Program Files\Amazon>cd awscli

C:\Program Files\Amazon\AWSCLI>aws configure
AWS Access Key ID [None]:
AWS Secret Access Key [None]:
Default region name [None]:
Default output format [None]:

C:\Program Files\Amazon\AWSCLI>
```

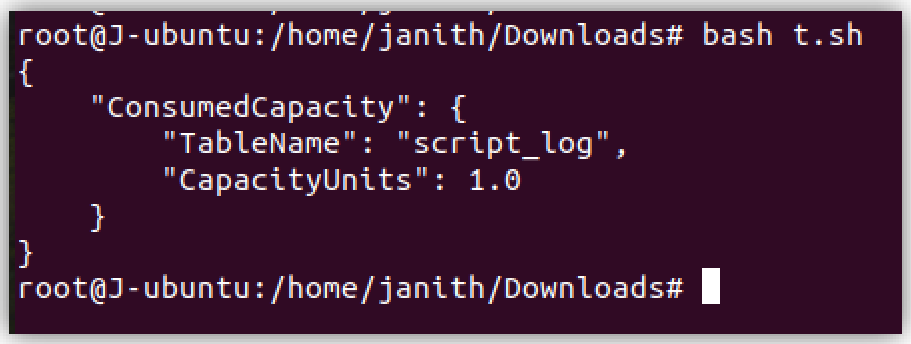
Figure 26

4. Data can be inserted into this DynamoDB using below command



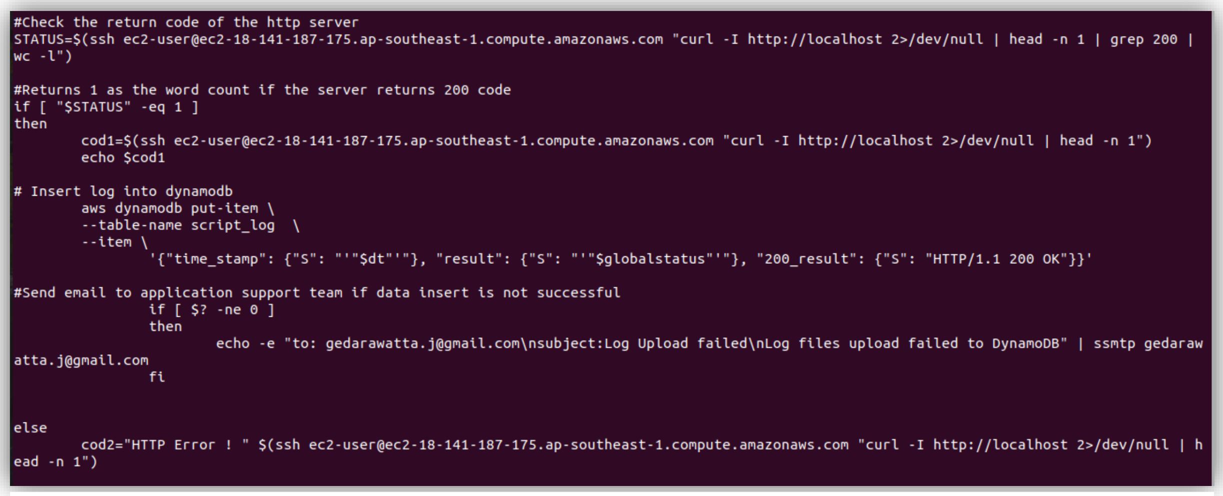
```
aws dynamodb put-item \
--table-name script_log  \
--item \
    '{"time_stamp": {"S": \"" + $dt + "\"}, "result": {"S": "HTTP Service is Running"}}' \
--return-consumed-capacity TOTAL
~
~
```

Figure 27



```
root@J-ubuntu:/home/janith/Downloads# bash t.sh
{
    "ConsumedCapacity": {
        "TableName": "script_log",
        "CapacityUnits": 1.0
    }
}
root@J-ubuntu:/home/janith/Downloads#
```

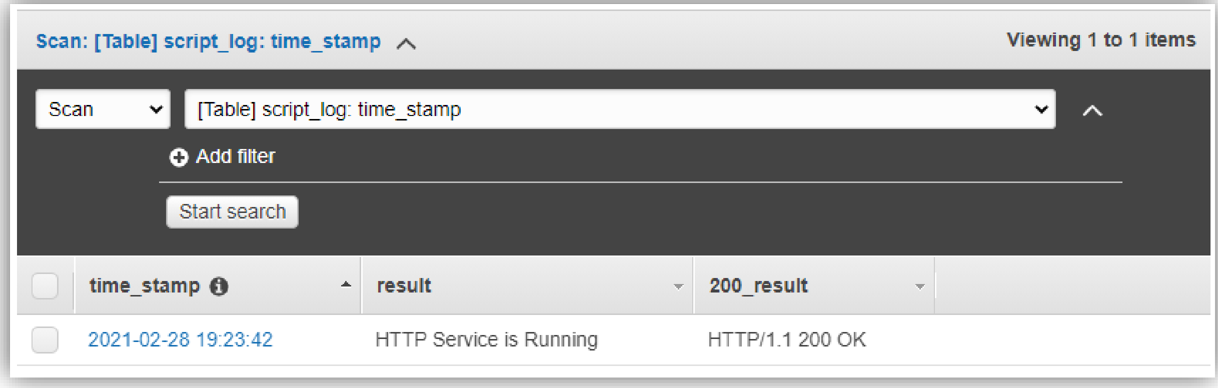
Figure 28



```
#Check the return code of the http server
STATUS=$(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | head -n 1 | grep 200 |
wc -l")

#Returns 1 as the word count if the server returns 200 code
if [ "$STATUS" -eq 1 ]
then
        cod1=$(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | head -n 1")
        echo $cod1

# Insert log into dynamodb
        aws dynamodb put-item \
        --table-name script_log  \
        --item \
                '{"time_stamp": {"S": "'"$dt"'"}, "result": {"S": "'"$globalstatus"'"}, "200_result": {"S": "HTTP/1.1 200 OK"}}'

#Send email to application support team if data insert is not successful
                if [ $? -ne 0 ]
                then
                        echo -e "to: gedarawatta.j@gmail.com\nsubject:Log Upload failed\nLog files upload failed to DynamoDB" | ssmtp gedaraw
atta.j@gmail.com
                fi


else
        cod2="HTTP Error ! " $(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | h
ead -n 1")
```

Figure 29

5. Pushed data is stored in the DynamoDB



Scan: [Table] script_log: time_stamp

Viewing 1 to 1 items

time_stamp	result	200_result
2021-02-28 19:23:42	HTTP Service is Running	HTTP/1.1 200 OK

Figure 30

Q3 (iv) - Sending email to the App Support Team with suitable error message

1. Configuring SMTP in the server – Install SMTP

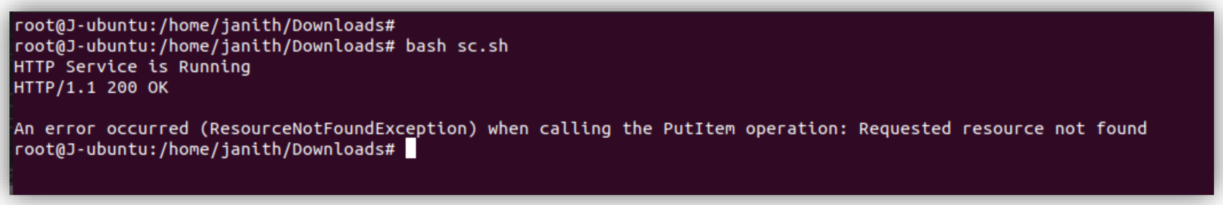
   # sudo apt-get install ssmtp

2. Go to **/etc/ssmtp/** and edit **ssmtp.conf** file with below configurations

   mailhub=smtp.gmail.com:587
   useSTARTTLS=YES
   AuthUser=username-here
   AuthPass=password-here
   TLS_CA_File=/etc/pki/tls/certs/ca-bundle.crt

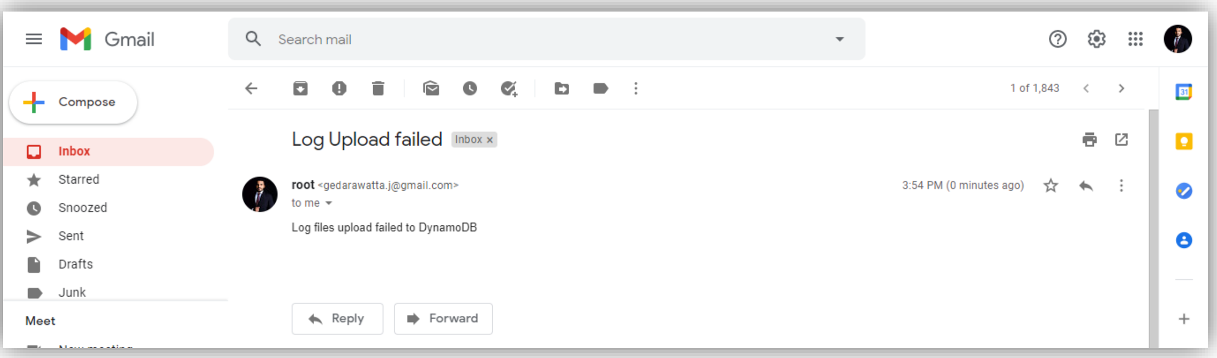
3. Use the below command to send emails to the App Support Team

   # -e "to: gedarawatta.j@gmail.com\nsubject:Scrip Failed\An error has occurred while executing the script" | ssmtp gedarawatta.j@gmail.com



```
root@J-ubuntu:/home/janith/Downloads#
root@J-ubuntu:/home/janith/Downloads# bash sc.sh
HTTP Service is Running
HTTP/1.1 200 OK

An error occurred (ResourceNotFoundException) when calling the PutItem operation: Requested resource not found
root@J-ubuntu:/home/janith/Downloads#
```

Figure 31



Log Upload failed Inbox ×

root <gedarawatta.j@gmail.com>
to me
3:54 PM (0 minutes ago)

Log files upload failed to DynamoDB

Figure 32

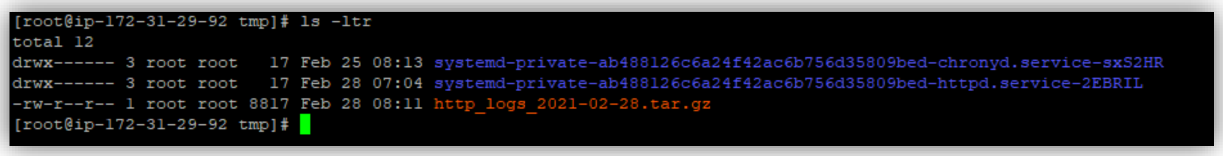
Q4 (i) – Collect log files of the web server daily and create a compressed file

1. Access the log files of HTTP server

   # cd /var/log/httpd/

2. Create a compressed file of daily log files in location /tmp/ renaming it to current date

   # sudo tar -czf /tmp/http_logs_`date '+%F'`.tar.gz /var/log/httpd/



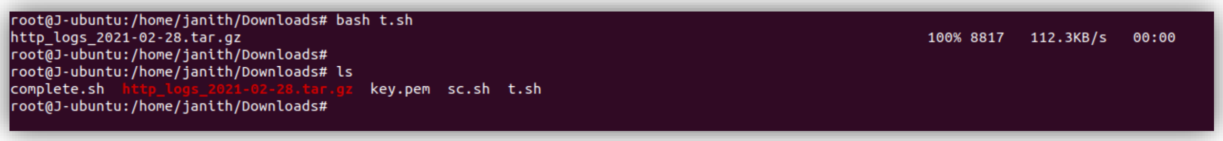
```
[root@ip-172-31-29-92 tmp]# ls -ltr
total 12
drwx------ 3 root root   17 Feb 25 08:13 systemd-private-ab488126c6a24f42ac6b756d35809bed-chronyd.service-sxS2HR
drwx------ 3 root root   17 Feb 28 07:04 systemd-private-ab488126c6a24f42ac6b756d35809bed-httpd.service-2EBRIL
-rw-r--r-- 1 root root 8817 Feb 28 08:11 http_logs_2021-02-28.tar.gz
[root@ip-172-31-29-92 tmp]#
```

Figure 33

Q4 (ii) – Move the compressed file to the location of the script

1. Following command will copy the above created compressed file to the location where script is running

   # ssh -tt ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "sudo tar -czf /tmp/http_logs_`date '+%F'`.tar.gz /var/log/httpd/";

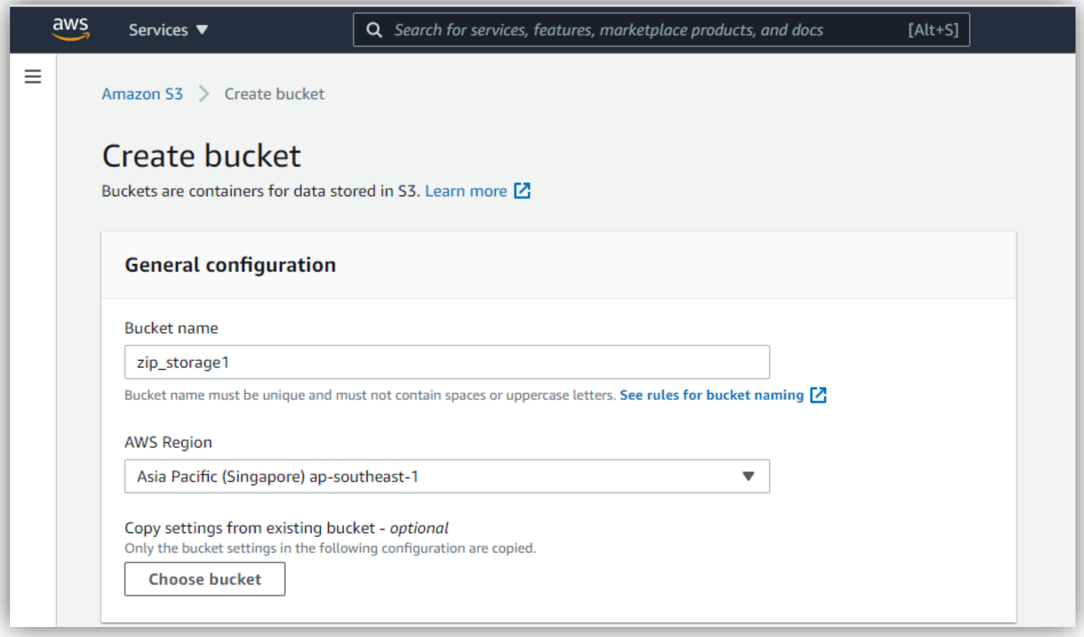


```
root@J-ubuntu:/home/janith/Downloads# bash t.sh
http_logs_2021-02-28.tar.gz                                                             100% 8817   112.3KB/s   00:00
root@J-ubuntu:/home/janith/Downloads#
root@J-ubuntu:/home/janith/Downloads# ls
complete.sh  http_logs_2021-02-28.tar.gz  key.pem  sc.sh  t.sh
root@J-ubuntu:/home/janith/Downloads#
```

Figure 34

Q4 (iii) – Upload the compressed file to S3 bucket

1. Create a S3 bucket in AWS


aws
Services ▼
Search for services, features, marketplace products, and docs [Alt+S]
Amazon S3 > Create bucket

Create bucket

Buckets are containers for data stored in S3. Learn more

General configuration

Bucket name: zip_storage1

Bucket name must be unique and must not contain spaces or uppercase letters. See rules for bucket naming

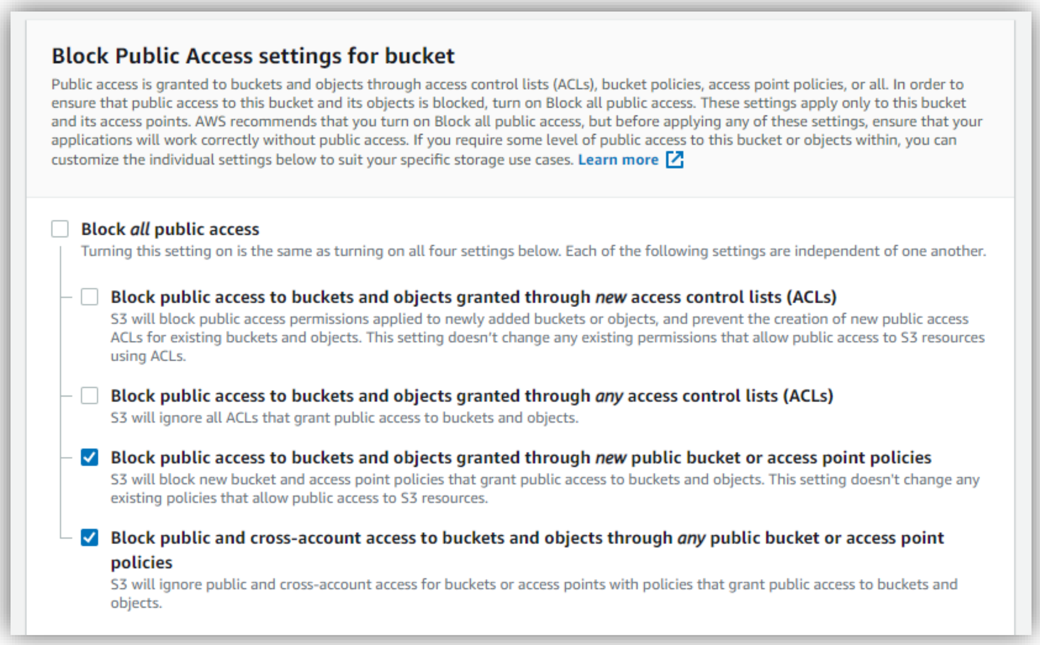
AWS Region: Asia Pacific (Singapore) ap-southeast-1

Copy settings from existing bucket - *optional*

Only the bucket settings in the following configuration are copied.

Figure 35

2. Apply below settings to access the S3 bucket from externally



Block Public Access settings for bucket

Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to this bucket and its objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to this bucket or objects within, you can customize the individual settings below to suit your specific storage use cases. Learn more

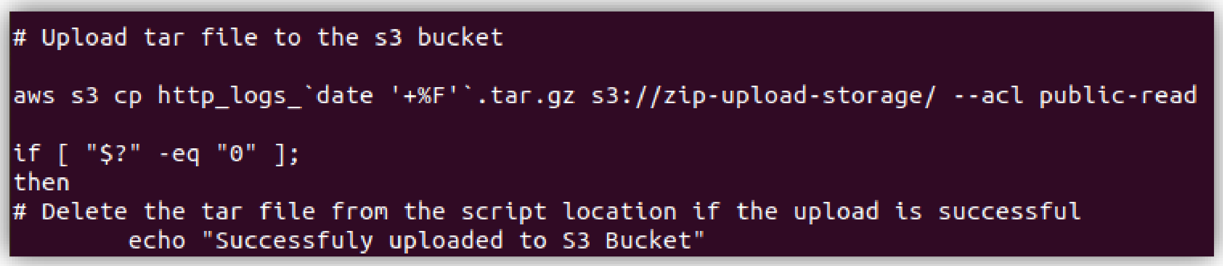
- [ ] Block *all* public access
  Turning this setting on is the same as turning on all four settings below. Each of the following settings are independent of one another.
  - [ ] Block public access to buckets and objects granted through *new* access control lists (ACLs)
    S3 will block public access permissions applied to newly added buckets or objects, and prevent the creation of new public access ACLs for existing buckets and objects. This setting doesn't change any existing permissions that allow public access to S3 resources using ACLs.
  - [ ] Block public access to buckets and objects granted through *any* access control lists (ACLs)
    S3 will ignore all ACLs that grant public access to buckets and objects.
  - [✓] Block public access to buckets and objects granted through *new* public bucket or access point policies
    S3 will block new bucket and access point policies that grant public access to buckets and objects. This setting doesn't change any existing policies that allow public access to S3 resources.
  - [✓] Block public and cross-account access to buckets and objects through *any* public bucket or access point policies
    S3 will ignore public and cross-account access for buckets or access points with policies that grant public access to buckets and objects.

Figure 36

3. After creating the S3 bucket, files can be uploaded to is externally using the below command

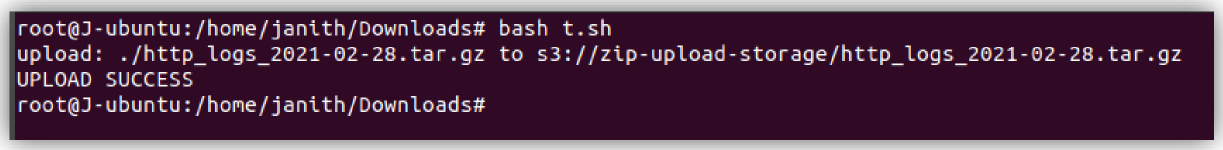
   # aws s3 cp http_logs_`date '+%F'`.tar.gz s3://zip-upload-storage/ --acl public-read

4. Below script will upload the compressed file into the S3 bucket successfully



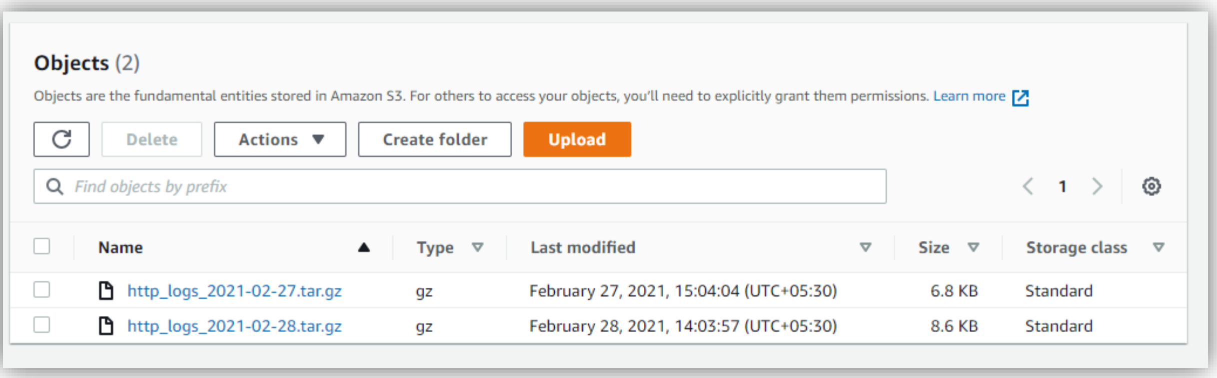
```
# Upload tar file to the s3 bucket

aws s3 cp http_logs_`date '+%F'`.tar.gz s3://zip-upload-storage/ --acl public-read

if [ "$?" -eq "0" ];
then
# Delete the tar file from the script location if the upload is successful
        echo "Successfuly uploaded to S3 Bucket"
```

Figure 37



```
root@J-ubuntu:/home/janith/Downloads# bash t.sh
upload: ./http_logs_2021-02-28.tar.gz to s3://zip-upload-storage/http_logs_2021-02-28.tar.gz
UPLOAD SUCCESS
root@J-ubuntu:/home/janith/Downloads#
```

Figure 38



Objects (2)

Objects are the fundamental entities stored in Amazon S3. For others to access your objects, you'll need to explicitly grant them permissions. Learn more

	Name	Type	Last modified	Size	Storage class
	http_logs_2021-02-27.tar.gz	gz	February 27, 2021, 15:04:04 (UTC+05:30)	6.8 KB	Standard
	http_logs_2021-02-28.tar.gz	gz	February 28, 2021, 14:03:57 (UTC+05:30)	8.6 KB	Standard

Figure 39

Q4 (iv) – Delete the compressed file if successful and send the email if not successful

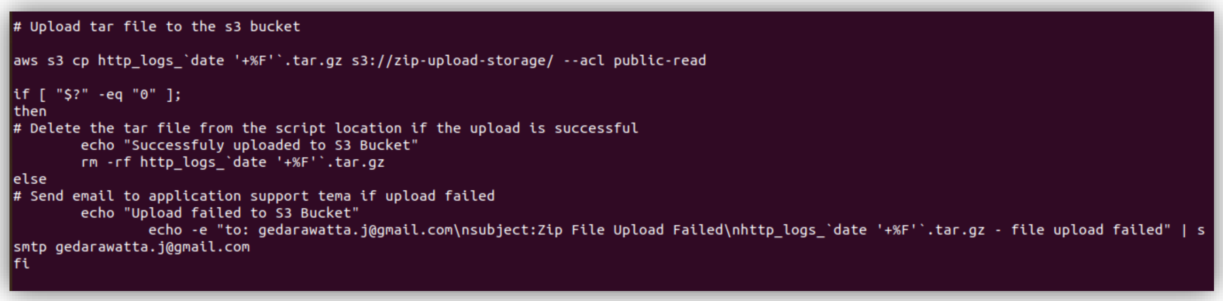
1. Below command will delete the compressed file from the location

   # rm -rf http_logs_`date '+%F'`.tar.gz

2. Below command will send an email to Application Support Team if the upload was unsuccessful

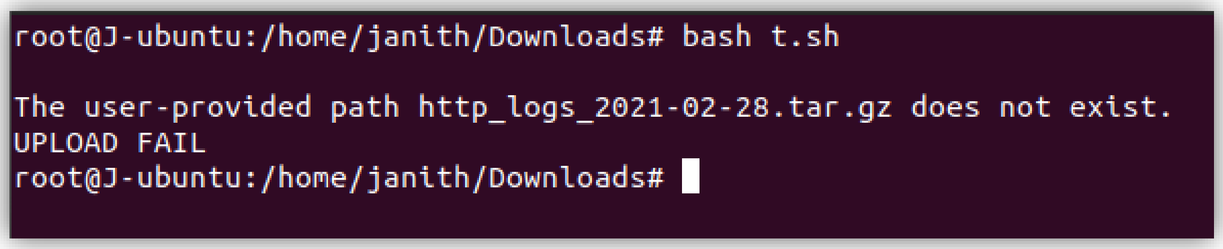
   # echo -e "to: gedarawatta.j@gmail.com\nsubject:Zip File Upload Failed\nhttp_logs_`date '+%F'`.tar.gz - file upload failed" | ssmtp gedarawatta.j@gmail.com

3. Below script will run the above commands



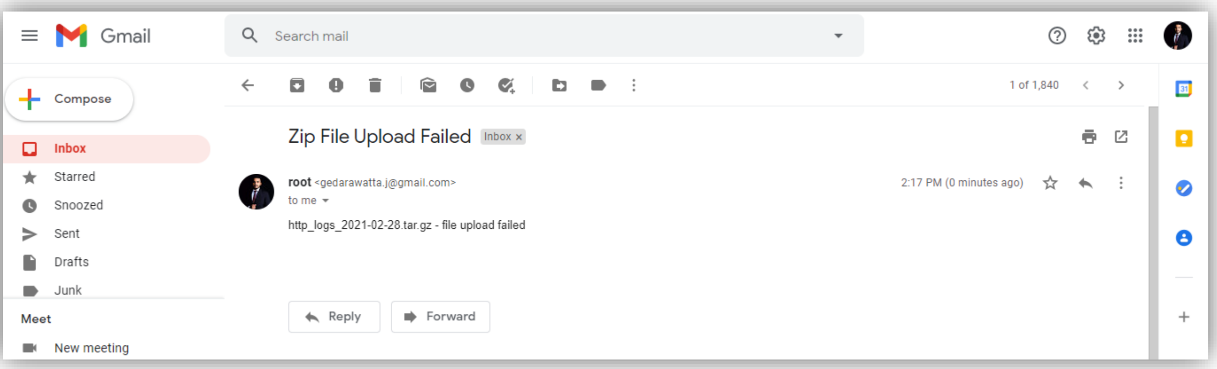
```
# Upload tar file to the s3 bucket

aws s3 cp http_logs_`date '+%F'`.tar.gz s3://zip-upload-storage/ --acl public-read

if [ "$?" -eq "0" ];
then
# Delete the tar file from the script location if the upload is successful
        echo "Successfuly uploaded to S3 Bucket"
        rm -rf http_logs_`date '+%F'`.tar.gz
else
# Send email to application support tema if upload failed
        echo "Upload failed to S3 Bucket"
                echo -e "to: gedarawatta.j@gmail.com\nsubject:Zip File Upload Failed\nhttp_logs_`date '+%F'`.tar.gz - file upload failed" | s
smtp gedarawatta.j@gmail.com
fi
```

Figure 40



```
root@J-ubuntu:/home/janith/Downloads# bash t.sh

The user-provided path http_logs_2021-02-28.tar.gz does not exist.
UPLOAD FAIL
root@J-ubuntu:/home/janith/Downloads#
```

Figure 41



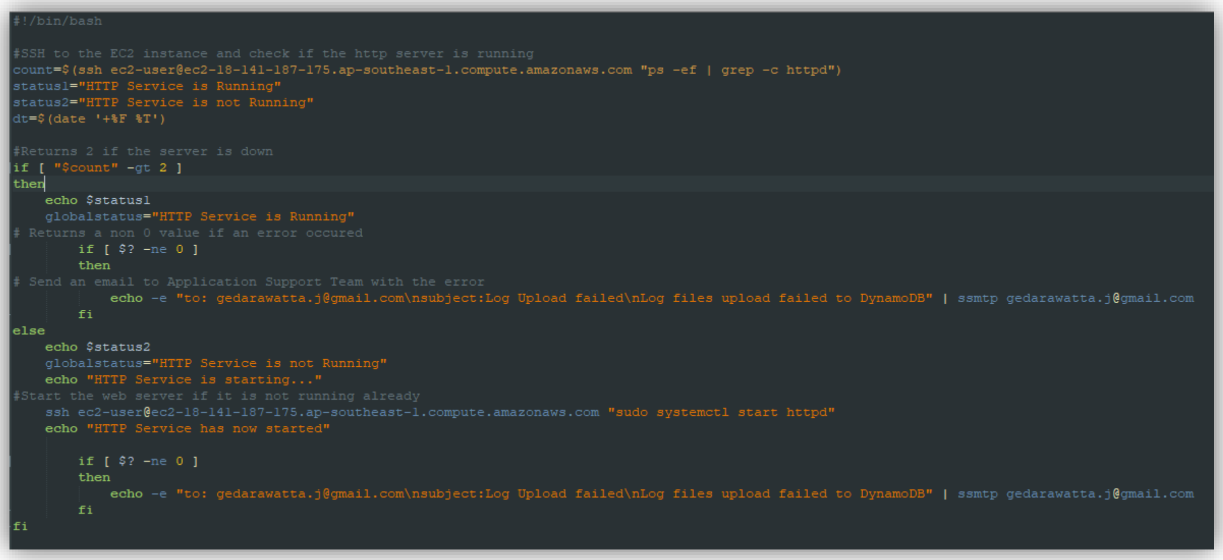
Zip File Upload Failed

root <gedarawatta.j@gmail.com>
to me
2:17 PM (0 minutes ago)

http_logs_2021-02-28.tar.gz - file upload failed

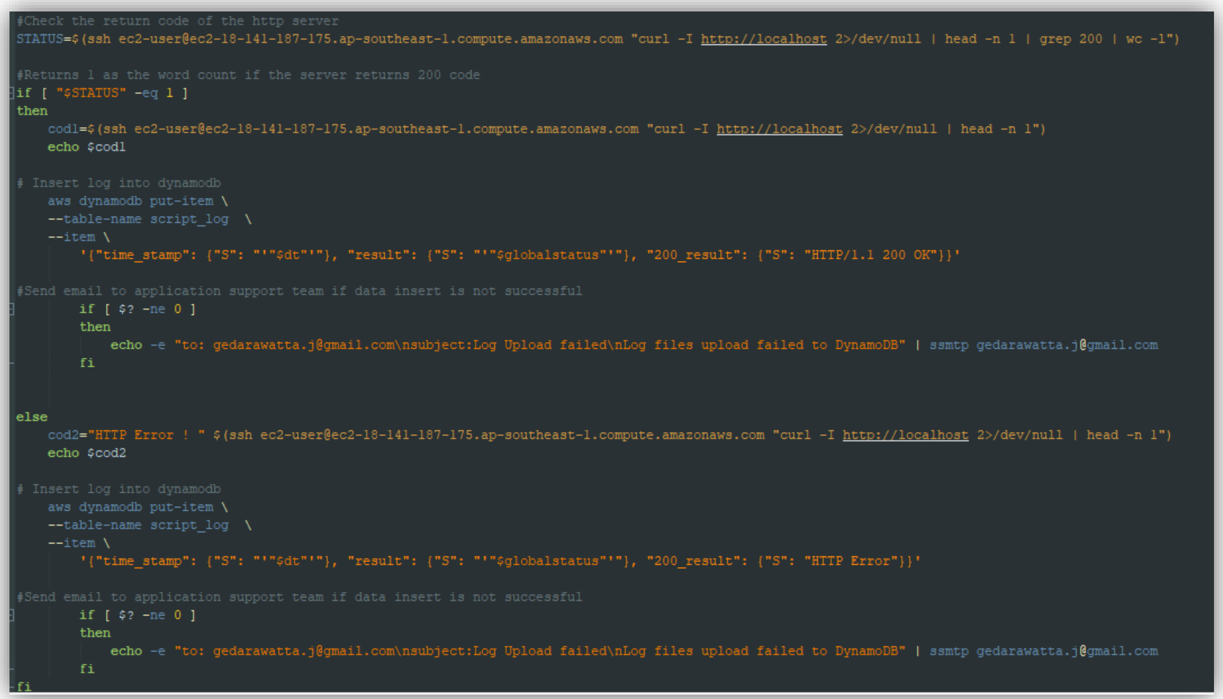
Figure 42

Complete Script for Question 03



```bash
#!/bin/bash

#SSH to the EC2 instance and check if the http server is running
count=$(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "ps -ef | grep -c httpd")
status1="HTTP Service is Running"
status2="HTTP Service is not Running"
dt=$(date '+%F %T')

#Returns 2 if the server is down
if [ "$count" -gt 2 ]
then
    echo $status1
    globalstatus="HTTP Service is Running"
# Returns a non 0 value if an error occured
        if [ $? -ne 0 ]
        then
# Send an email to Application Support Team with the error
            echo -e "to: gedarawatta.j@gmail.com\nsubject:Log Upload failed\nLog files upload failed to DynamoDB" | ssmtp gedarawatta.j@gmail.com
        fi
else
    echo $status2
    globalstatus="HTTP Service is not Running"
    echo "HTTP Service is starting..."
#Start the web server if it is not running already
    ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "sudo systemctl start httpd"
    echo "HTTP Service has now started"

        if [ $? -ne 0 ]
        then
            echo -e "to: gedarawatta.j@gmail.com\nsubject:Log Upload failed\nLog files upload failed to DynamoDB" | ssmtp gedarawatta.j@gmail.com
        fi
fi
```

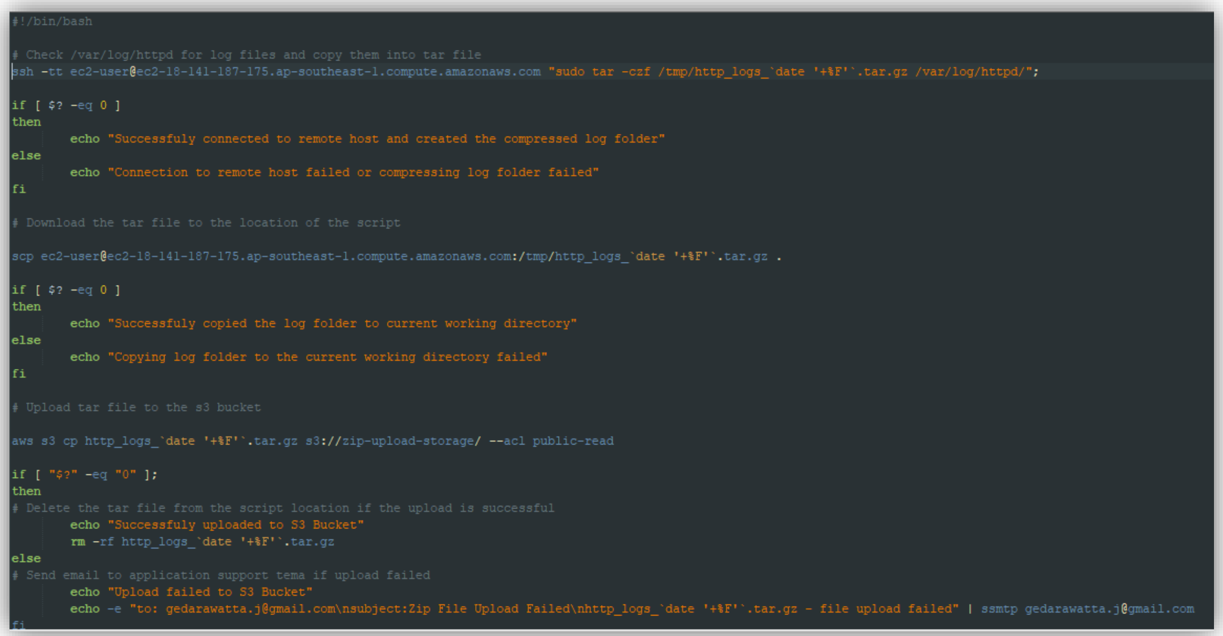
Figure 43



```bash
#Check the return code of the http server
STATUS=$(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | head -n 1 | grep 200 | wc -l")

#Returns 1 as the word count if the server returns 200 code
if [ "$STATUS" -eq 1 ]
then
    cod1=$(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | head -n 1")
    echo $cod1

# Insert log into dynamodb
    aws dynamodb put-item \
    --table-name script_log  \
    --item \
        '{"time_stamp": {"S": "'"$dt"'"}, "result": {"S": "'"$globalstatus"'"}, "200_result": {"S": "HTTP/1.1 200 OK"}}'

#Send email to application support team if data insert is not successful
        if [ $? -ne 0 ]
        then
            echo -e "to: gedarawatta.j@gmail.com\nsubject:Log Upload failed\nLog files upload failed to DynamoDB" | ssmtp gedarawatta.j@gmail.com
        fi


else
    cod2="HTTP Error ! " $(ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "curl -I http://localhost 2>/dev/null | head -n 1")
    echo $cod2

# Insert log into dynamodb
    aws dynamodb put-item \
    --table-name script_log  \
    --item \
        '{"time_stamp": {"S": "'"$dt"'"}, "result": {"S": "'"$globalstatus"'"}, "200_result": {"S": "HTTP Error"}}'

#Send email to application support team if data insert is not successful
        if [ $? -ne 0 ]
        then
            echo -e "to: gedarawatta.j@gmail.com\nsubject:Log Upload failed\nLog files upload failed to DynamoDB" | ssmtp gedarawatta.j@gmail.com
        fi
fi
```

Figure 44

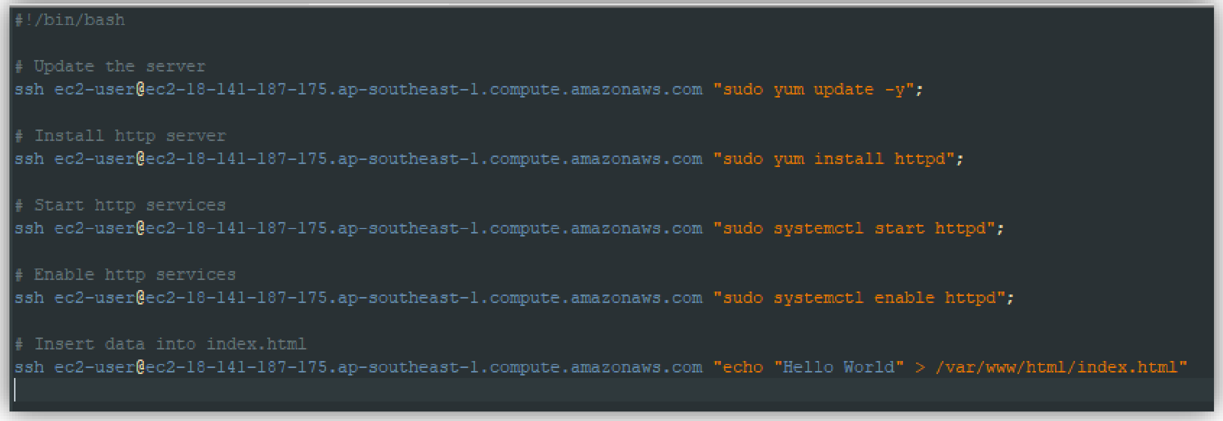
Complete Script for Question 04



```
#!/bin/bash

# Check /var/log/httpd for log files and copy them into tar file
ssh -tt ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "sudo tar -czf /tmp/http_logs_`date '+%F'`.tar.gz /var/log/httpd/";

if [ $? -eq 0 ]
then
        echo "Successfuly connected to remote host and created the compressed log folder"
else
        echo "Connection to remote host failed or compressing log folder failed"
fi

# Download the tar file to the location of the script

scp ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com:/tmp/http_logs_`date '+%F'`.tar.gz .

if [ $? -eq 0 ]
then
        echo "Successfuly copied the log folder to current working directory"
else
        echo "Copying log folder to the current working directory failed"
fi

# Upload tar file to the s3 bucket

aws s3 cp http_logs_`date '+%F'`.tar.gz s3://zip-upload-storage/ --acl public-read

if [ "$?" -eq "0" ];
then
# Delete the tar file from the script location if the upload is successful
        echo "Successfuly uploaded to S3 Bucket"
        rm -rf http_logs_`date '+%F'`.tar.gz
else
# Send email to application support tema if upload failed
        echo "Upload failed to S3 Bucket"
        echo -e "to: gedarawatta.j@gmail.com\nsubject:Zip File Upload Failed\nhttp_logs_`date '+%F'`.tar.gz - file upload failed" | ssmtp gedarawatta.j@gmail.com
fi
```

Figure 45

Script for updating server and installing HTTP server



```
#!/bin/bash

# Update the server
ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "sudo yum update -y";

# Install http server
ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "sudo yum install httpd";

# Start http services
ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "sudo systemctl start httpd";

# Enable http services
ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "sudo systemctl enable httpd";

# Insert data into index.html
ssh ec2-user@ec2-18-141-187-175.ap-southeast-1.compute.amazonaws.com "echo "Hello World" > /var/www/html/index.html"
```

Figure 46

Steps to run the scripts

In order to perform the above scripts following setup should be configured

- AWS EC2 instance – Linux
- External machine – Linux/Ubuntu
- Open ports of 22 and 80 on EC2 instance
- HTTP services installed on EC2 instance
- S3 bucket
- DynamoDB table
- Keyless SSH to EC2 instance from external machine
- AWS CLI configured on external machine
- SMTP server configured on external machine

Order of running the scripts

1. Run terraform to provision

   ```
   # terraform plan
   # terraform apply
   ```

2. Run **httpconf.sh** to Update the newly created EC2 instance server and install HTTP service

   ```
   # bash httpconf.sh
   ```

3. Run **script1.sh** which contains the commands for Question 3

   ```
   # bash script1.sh
   ```

   Note : #bash script1.sh > log_script1.txt will collect the log files to **log_script1.txt**

4. Run **script2.sh** which contains the commands for Question 4

   ```
   # bash script2.sh
   ```

   Note : #bash script2.sh > log_script2.txt will collect the log files to **log_script2.txt**

Automating the setup

- Infrastructure provisioning is automated with terraform for EC2, Security groups, S3 Bucket , and DynamoDB instances.

- Installing HTTP related configurations in provisioned EC2 remote host can be done through running the script.

- Part one of the assignment can be fulfilled by running the first bash script.

- Part two of the assignment can be fulfilled by running the second bash script.

- In order to facilitate the Business requirement of make the website available 9*5, cronjobs are configured to run the scripts on daily, at the start of the day.

Key Points of high availability and reliability of the proposed enterprise architecture

- In order to ensure the availability of the architecture, with minimized downtime, the architecture can be deployed into multiple availability zones inside a single region, unless the multi-region deployment is necessary.

- Furthermore, in order to distribute the incoming traffic to web servers across multiple Availability Zones, internet facing load balancer can be used. Load Balancer is not only capable of distributing the load between instances, but also it will recognize and respond to unhealthy instances.

- Also to ensure that the architecture can handle changes in demand, the web server instances can be placed inside auto-scaling group. It will launch and terminate instances based on the specified conditions. The auto scaling groups also need to be registered with the load balancer.

Technologies Used

- Linux
- Ubuntu
- Amazon Web Services (AWS)
- Identify and Access Management (IAM)
- Amazon Machine Images (AMI)
- Amazon Simple Storage Service (S3)
- Amazon Elastic Compute Cloud (EC2)
- DynamoDB
- Terraform