

## Assignment 1: Build an artifact and deploy it in tomcat

### 1. Built the .war file through mvn clean install

```
root@ip-172-31-18-107 aravind-hello-world# ls
pom.xml  src
root@ip-172-31-18-107 aravind-hello-world# mvn clean install
[INFO] Scanning for projects...
[INFO]
[INFO] -----< aravind.hello.world:aravind-hello-world >-----
[INFO] Building aravind-hello-world Maven Webapp 1.0.0-SNAPSHOT
[INFO]
[INFO] --- maven-clean-plugin:3.1.0:clean (default-clean) @ aravind-hello-world ---
[INFO]
[INFO] --- maven-resources-plugin:3.0.2:resources (default-resources) @ aravind-hello-world ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /home/ec2-user/aravind-hello-world/src/main/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.8.0:compile (default-compile) @ aravind-hello-world ---
[INFO] No sources to compile
[INFO]
[INFO] --- maven-resources-plugin:3.0.2:testResources (default-testResources) @ aravind-hello-world ---
[INFO] skip non existing resourceDirectory /home/ec2-user/aravind-hello-world/src/test/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.8.0:testCompile (default-testCompile) @ aravind-hello-world ---
[INFO] No sources to compile
[INFO]
[INFO] --- maven-surefire-plugin:2.22.1:test (default-test) @ aravind-hello-world ---
[INFO] No tests to run.
[INFO]
[INFO] --- maven-war-plugin:3.2.0:war (default-war) @ aravind-hello-world ---
[INFO] Packaging webapp
[INFO] Assembling webapp [aravind-hello-world] in [/home/ec2-user/aravind-hello-world/target/aravind-hello-world]
[INFO] Processing war project
[INFO] Copying webapp resources [/home/ec2-user/aravind-hello-world/src/main/webapp]
[INFO] Webapp assembled in [37 msecs]
[INFO] Building war: /home/ec2-user/aravind-hello-world/target/aravind-hello-world.war
[INFO]
[INFO] --- maven-install-plugin:2.5.2:install (default-install) @ aravind-hello-world ---
[INFO] Installing /home/ec2-user/aravind-hello-world/target/aravind-hello-world.war to /root/.m2/repository/aravind/hello/world/aravind-hello-world/1.0.0-SNAPSHOT/aravind-hello-world-1.0.0-SNAPSHOT.war
[INFO] Installing /home/ec2-user/aravind-hello-world/pom.xml to /root/.m2/repository/aravind/hello/world/aravind-hello-world/1.0.0-SNAPSHOT/aravind-hello-world-1.0.0-SNAPSHOT.pom
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 3.111 s
[INFO] Finished at: 2023-06-09T08:39:12Z
[INFO]
root@ip-172-31-18-107 aravind-hello-world# ls target/
aravind-hello-world  aravind-hello-world.war  maven-archiver
root@ip-172-31-18-107 aravind-hello-world#
```

### 2. Pasted the war file from target directory to webapps directory of tomcat and started tomcat with bin/startup.sh

```
root@ip-172-31-18-107/home/ec2-user#
root@ip-172-31-18-107 ec2-user# ls
apache-tomcat-10.1.9  Calculator  helloworld.sh  onlinebookstore  war-web-project
root@ip-172-31-18-107 ec2-user#
root@ip-172-31-18-107 ec2-user# mv target/aravind-hello-world.war /home/ec2-user/apache-tomcat-10.1.9/webapps/
root@ip-172-31-18-107 ec2-user# ls -l /usr/bin | grep tomcat
lrwxrwxrwx. 1 root root      51 May 30 09:22 tomcatdown -> /home/ec2-user/apache-tomcat-10.1.9/bin/shutdown.sh
lrwxrwxrwx. 1 root root      50 May 30 09:22 tomcatup -> /home/ec2-user/apache-tomcat-10.1.9/bin/startup.sh
root@ip-172-31-18-107 ec2-user#
root@ip-172-31-18-107 ec2-user# tomcatup
Using CATALINA_BASE:   /home/ec2-user/apache-tomcat-10.1.9
Using CATALINA_HOME:   /home/ec2-user/apache-tomcat-10.1.9
Using CATALINA_TMPDIR: /home/ec2-user/apache-tomcat-10.1.9/temp
Using JRE_HOME:        /
Using CLASSPATH:       /home/ec2-user/apache-tomcat-10.1.9/bin/bootstrap.jar:/home/ec2-user/apache-tomcat-10.1.9/bin/tomcat-juli.jar
Tomcat started.
root@ip-172-31-18-107 ec2-user#
root@ip-172-31-18-107 ec2-user#
root@ip-172-31-18-107 ec2-user# netstat -tulnp | grep 8080
tcp6      0      0 :::*          LISTEN        1495/java
root@ip-172-31-18-107 ec2-user#
root@ip-172-31-18-107 ec2-user# ps -ef | grep tomcat
root      1495      1  0 08:15 pts/0    00:00:06 /bin/java -Djava.util.logging.config.file=/home/ec2-user/apache-tomcat-10.1.9/conf/logging.properties -Djava.util.logging.manager=org.ap
ache.juli.ClassLoaderLogManager -Djdk.tls.ephemeralDHKeySize=2048 -Djava.protocol.handler.pkcs=org.apache.catalina.webresources -Dorg.apache.catalina.security.SecurityListener=org.apache.catalina.security.SecurityListener -Dorg.apache.catalina.startup.Bootstrap.start
root      1497      0  0 08:16 pts/0    00:00:00 grep --color=auto tomcat
root@ip-172-31-18-107 ec2-user# ls apache-tomcat-10.1.9/webapps/
aravind-hello-world  docs  host-manager  onlinebookstore  ROOT  sample.war  SampleWebApp.war  wvp-1.0.0.war
aravind-hello-world.war  example-manager  onlinebookstore.war  sample  SampleWebApp  wvp-1.0.0
root@ip-172-31-18-107 ec2-user#
```

### 3. Allowed inbound rules for port 8080

The screenshot shows the AWS Management Console interface for an EC2 instance. The instance is named 'tomcat' with ID 'i-00b4f701924b6a7e5'. It is running on a t2.micro instance type in the ap-southeast-1 region. The instance is associated with the security group 'sg-0f2c801cc6f9fc6a6' (launch-wizard-3). The inbound rules section shows two rules: one for port 8080 (TCP) and one for port 22 (TCP). The port 8080 rule is highlighted with a red box.

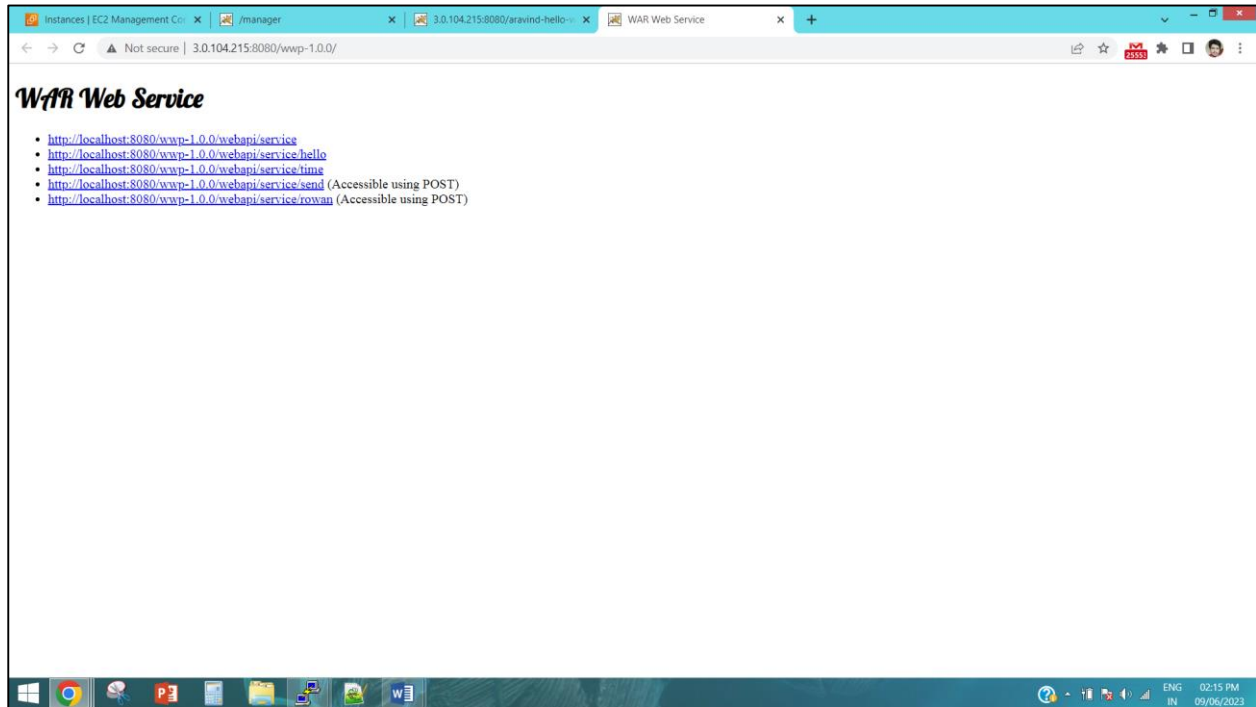
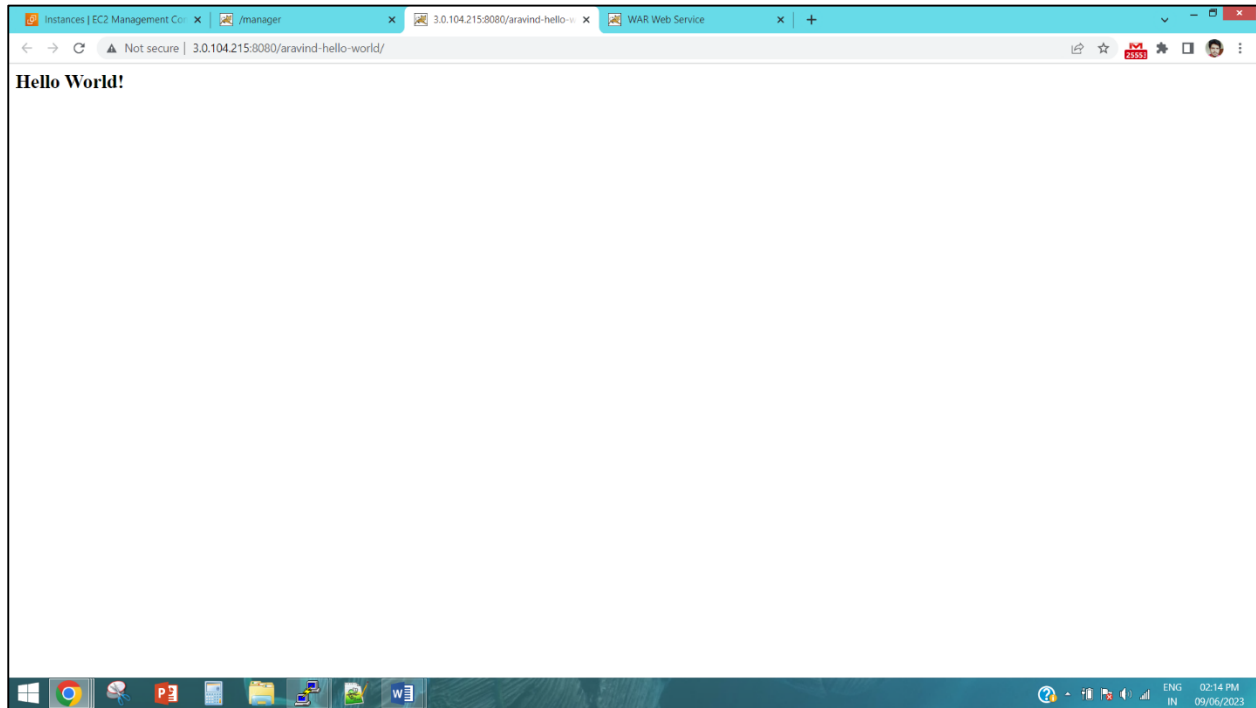
Name	Security group rule ID	Port range	Protocol	Source	Security groups
-	sgr-0ae75ac1d57a33149	8080	TCP	0.0.0.0/0	launch-wizard-3
-	sgr-0e109823b2ad4bbc5	22	TCP	0.0.0.0/0	launch-wizard-3

### 4. Logged in to manager

The screenshot shows the Tomcat Manager application interface. The 'List Applications' tab is selected, displaying a table of applications. The application 'aravind-hello-world' is highlighted with a red box. The table includes columns for Path, Version, Display Name, Running status, Sessions, and Commands.

Path	Version	Display Name	Running	Sessions	Commands
/	None specified	Welcome to Tomcat	true	0	Start Stop Reload Undeploy
/SampleWebApp	None specified		true	0	Start Stop Reload Undeploy
/aravind-hello-world	None specified	Archetype Created Web Application	true	0	Start Stop Reload Undeploy
/docs	None specified	Tomcat Documentation	true	0	Start Stop Reload Undeploy
/examples	None specified	Servlet and JSP Examples	true	0	Start Stop Reload Undeploy
/host-manager	None specified	Tomcat Host Manager Application	true	0	Start Stop Reload Undeploy
/manager	None specified	Tomcat Manager Application	true	1	Start Stop Reload Undeploy
/onlinebookstore	None specified		true	0	Start Stop Reload Undeploy
/sample	None specified	Hello, World Application	true	0	Start Stop Reload Undeploy
/www-1.0.0	None specified		true	0	Start Stop Reload Undeploy

## 5. Opened the URL link



## Assignment 2: Create Bastion host to connect instance in private subnet

1. Created VPC(test-vpc) and two subnet (private-subnet and public-subnet)

This screenshot shows the AWS Management Console interface for a VPC named 'test-vpc'. The left sidebar contains navigation links for VPC dashboard, EC2 Global View, and various VPC components like Subnets, Route tables, and Internet gateways. The main content area displays the 'Subnets (1/2) info' page. A table lists two subnets: 'public-subnet' (subnet-04dfb50984c7a4b6c) and 'private-subnet' (subnet-04e7b2b9470e4dea1). Both are in an 'Available' state. The 'public-subnet' is associated with VPC 'vpc-0dc75e966547b6156 | test-vpc' and has an IPv4 CIDR of 10.180.0.0/24. The 'private-subnet' is also associated with the same VPC and has an IPv4 CIDR of 10.180.1.0/24. Below the table, detailed information for the selected 'public-subnet' is shown, including its ARN, availability zone (ap-southeast-1b), and associated route table (rtb-0223d7c5ea72999bf | public-route-table).

Name	Subnet ID	State	VPC	IPv4 CIDR	IPv6 CIDR
public-subnet	subnet-04dfb50984c7a4b6c	Available	vpc-0dc75e966547b6156   test-vpc	10.180.0.0/24	-
private-subnet	subnet-04e7b2b9470e4dea1	Available	vpc-0dc75e966547b6156   test-vpc	10.180.1.0/24	-

This screenshot shows the AWS Management Console interface for the same VPC 'test-vpc', but with the 'private-subnet' selected. The table in the main content area now highlights the 'private-subnet' (subnet-04e7b2b9470e4dea1). The detailed information below the table shows that this subnet is associated with the same VPC and has an IPv4 CIDR of 10.180.1.0/24. The associated route table is 'rtb-02da4a77f2d89c3fc | private-route-table'.

Name	Subnet ID	State	VPC	IPv4 CIDR	IPv6 CIDR
public-subnet	subnet-04dfb50984c7a4b6c	Available	vpc-0dc75e966547b6156   test-vpc	10.180.0.0/24	-
private-subnet	subnet-04e7b2b9470e4dea1	Available	vpc-0dc75e966547b6156   test-vpc	10.180.1.0/24	-

## 2. Created Internet gateway and attached it to VPC

The screenshot shows the AWS Management Console for the 'ap-southeast-1' region. The 'Internet gateways' page displays a table with one entry: 'test-internet-gateway' with ID 'igw-070d4b89377935344', state 'Attached', and VPC ID 'vpc-0dc75e966547b6156 | test-vpc'. The details section below shows the same information.

Name	Internet gateway ID	State	VPC ID	Owner
test-internet-gateway	igw-070d4b89377935344	Attached	vpc-0dc75e966547b6156   test-vpc	187424272464

**igw-070d4b89377935344 / test-internet-gateway**

**Details**

Internet gateway ID	igw-070d4b89377935344	State	Attached	VPC ID	vpc-0dc75e966547b6156   test-vpc	Owner	187424272464
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## 3. Created the NAT gateway attached it to public subnet

The screenshot shows the AWS Management Console for the 'ap-southeast-1' region. The 'NAT gateways' page displays a table with one entry: 'new-nat-gateway' with ID 'nat-03406ece6e4ff1d4c', connectivity type 'Public', state 'Available', and primary public IP address '18.143.234.125'. The details section below shows the same information.

Name	NAT gateway ID	Connectivity...	State	State message	Primary public I...	Primary p...
new-nat-gateway	nat-03406ece6e4ff1d4c	Public	Available	-	18.143.234.125	10.180.0.6

**Details**

NAT gateway ID	nat-03406ece6e4ff1d4c	Connectivity type	Public	State	Available	State message	-
NAT gateway ARN	arn:aws:ec2:ap-southeast-1:187424272464:natgateway/nat-03406ece6e4ff1d4c	Primary public IPv4 address	18.143.234.125	Primary private IPv4 address	10.180.0.62	Primary network interface ID	eni-083c4aa874fae6c4a
VPC	vpc-0dc75e966547b6156   test-vpc	Subnet	subnet-04dfb50984c7a4b6c / public-subnet	Created	Thursday, June 8, 2023 at 20:32:33 GMT+5:30	Deleted	-

#### 4. Created a public-route-table and created route with internet gateway

The screenshot displays the AWS Management Console interface for the 'Route tables' section. The left-hand navigation pane shows the 'Route tables' link under the 'Virtual private cloud' category. The main content area is titled 'Route tables (1/2) Info' and contains a table listing the available route tables. The 'public-route-table' is selected, and its details are shown below. The 'Routes' tab is active, displaying a table of routes for the selected route table.

Name	Route table ID	Explicit subnet associ...	Edge associations	Main	VPC
public-route-table	rtb-0223d7c5ea72999bf	subnet-04dfb50984c7a4...	-	No	vpc-0dc75e966547b615
private-route-table	rtb-02da4a77f2d89c3fc	subnet-04e7b2b9470e4d...	-	No	vpc-0dc75e966547b615

Destination	Target	Status	Propagated
0.0.0.0/0	igw-070d4b89377935344	Active	No
10.180.0.0/16	local	Active	No

#### 5. Created private-route-table and created route with NAT gate

The screenshot displays the AWS Management Console interface for the 'Route tables' section. The left-hand navigation pane shows the 'Route tables' link under the 'Virtual private cloud' category. The main content area is titled 'Route tables (1/2) Info' and contains a table listing the available route tables. The 'private-route-table' is selected, and its details are shown below. The 'Routes' tab is active, displaying a table of routes for the selected route table.

Name	Route table ID	Explicit subnet associ...	Edge associations	Main	VPC
public-route-table	rtb-0223d7c5ea72999bf	subnet-04dfb50984c7a4...	-	No	vpc-0dc75e966547b615
private-route-table	rtb-02da4a77f2d89c3fc	subnet-04e7b2b9470e4d...	-	No	vpc-0dc75e966547b615

Destination	Target	Status	Propagated
0.0.0.0/0	nat-03406ece6e4f1d4c	Active	No
10.180.0.0/16	local	Active	No



## 6. Created instance in public subnet

Instances (1/2) Info

Find instance by attribute or tag (case-sensitive)

test

Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public I
test-public-vm	i-0a7fa417ef2f4159d	Running	t2.micro	Initializing	No alarms	ap-southeast-1b	-
test-private-vm	i-0156488e730edaf98	Running	t2.micro	-	No alarms	ap-southeast-1b	-

Instance: i-0a7fa417ef2f4159d (test-public-vm)

Instance ID: i-0a7fa417ef2f4159d (test-public-vm)

Public IPv4 address: 54.169.204.251 | open address

Private IPv4 addresses: 10.180.0.152

Instance state: Running

Public IPv4 DNS: -

IPv6 address: -

Private IP DNS name (IPv4 only): ip-10-180-0-152.ap-southeast-1.compute.internal

Hostnames type: IP name: ip-10-180-0-152.ap-southeast-1.compute.internal

Answer private resource DNS name: -

Instance type: t2.micro

Elastic IP addresses: -

Auto-assigned IP address: 54.169.204.251 [Public IP]

AWS Compute Optimizer finding: Opt-in to AWS Compute Optimizer for recommendations. | Learn more

IAM Role: -

VPC ID: vpc-0dc75e966547b6156 (test-vpc)

Subnet ID: subnet-04dfb50984c7a4b6c (public-subnet)

Auto Scaling Group name: -

Instances (1/2) Info

Find instance by attribute or tag (case-sensitive)

test

Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public I
test-public-vm	i-0a7fa417ef2f4159d	Running	t2.micro	Initializing	No alarms	ap-southeast-1b	-
test-private-vm	i-0156488e730edaf98	Running	t2.micro	-	No alarms	ap-southeast-1b	-

Instance: i-0a7fa417ef2f4159d (test-public-vm)

▼ Security details

IAM Role: -

Owner ID: 187424272464

Launch time: Thu Jun 08 2023 20:35:40 GMT+0530 (India Standard Time)

Security groups: sg-0e2b10f0e8bd37d66 (public-vm-sg)

▼ Inbound rules

Filter rules

Name	Security group rule ID	Port range	Protocol	Source	Security groups
-	sgr-04a72af4eb897b9eb	22	TCP	0.0.0.0/0	public-vm-sg

▼ Outbound rules

7. Created instance in private subnet and allowed traffic from private subnet CIDR

Instances (1/2) Info

Find instance by attribute or tag (case-sensitive)

test

Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public I
test-public-vm	i-0a7fa417ef2f4159d	Running	t2.micro	Initializing	No alarms	ap-southeast-1b	-
test-private-vm	i-0156488e730edaf98	Running	t2.micro	-	No alarms	ap-southeast-1b	-

Instance: i-0156488e730edaf98 (test-private-vm)

Instance ID: i-0156488e730edaf98 (test-private-vm)

Public IPv4 address: -

Private IPv4 addresses: 10.180.1.94

Instance state: Running

Public IPv4 DNS: -

IPv6 address: -

Private IP DNS name (IPv4 only): ip-10-180-1-94.ap-southeast-1.compute.internal

Hostname type: -

IP name: ip-10-180-1-94.ap-southeast-1.compute.internal

Answer private resource DNS name: -

Instance type: t2.micro

Auto-assigned IP address: -

IAM Role: -

VPC ID: vpc-0dc75e966547b6156 (test-vpc)

Subnet ID: subnet-04e7b2b9470e4dea1 (private-subnet)

Elastic IP addresses: -

AWS Compute Optimizer finding: Opt-in to AWS Compute Optimizer for recommendations. | Learn more

Auto Scaling Group name: -

Instances (1/2) Info

Find instance by attribute or tag (case-sensitive)

test

Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public I
test-public-vm	i-0a7fa417ef2f4159d	Running	t2.micro	Initializing	No alarms	ap-southeast-1b	-
test-private-vm	i-0156488e730edaf98	Running	t2.micro	-	No alarms	ap-southeast-1b	-

Instance: i-0156488e730edaf98 (test-private-vm)

IAM Role: -

Owner ID: 187424272464

Launch time: Thu Jun 08 2023 20:37:21 GMT+0530 (India Standard Time)

Security groups: sg-0734634e3e04d482d (private-vm-sg)

Inbound rules

Name	Security group rule ID	Port range	Protocol	Source	Security groups
-	sgr-0e98a7a6d1ca21e8f	All	ICMP	10.180.0.0/24	private-vm-sg
-	sgr-07df30f8f120ae17f	22	TCP	10.180.0.0/24	private-vm-sg

Outbound rules



## 8. Copied the private key (.pem) from local machine to instance in public subnet

```
MINGW64/c/Users/aravind etagi/Desktop
aravind etagi@Aravind MINGW64 ~/Desktop (master)
$ scp -i bootcamp.pem bootcamp.pem ec2-user@54.169.204.251:/home/ec2-user/
The authenticity of host '54.169.204.251 (54.169.204.251)' can't be established.
ED25519 key fingerprint is SHA256:lqekrlySR5/+AatBqr9jKxlvXeisBBSJfGdVLFillogQ.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '54.169.204.251' (ED25519) to the list of known hosts.
bootcamp.pem
100% 1678 30.2KB/s 00:00

aravind etagi@Aravind MINGW64 ~/Desktop (master)
$ |
```

## 9. Connected to instance in private subnet through ssh from instance in public subnet

```
ec2-user@ip-10-180-1-94-~
[ec2-user@ip-10-180-0-152 ~]$ ls
bootcamp.pem
[ec2-user@ip-10-180-0-152 ~]$ ping google.com
PING google.com (74.125.130.113) 56(84) bytes of data.
64 bytes from sb-in-f113.1e100.net (74.125.130.113): icmp_seq=1 ttl=100 time=2.09 ms
64 bytes from sb-in-f113.1e100.net (74.125.130.113): icmp_seq=2 ttl=100 time=1.91 ms
64 bytes from sb-in-f113.1e100.net (74.125.130.113): icmp_seq=3 ttl=100 time=1.95 ms
^C
--- google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 1.912/1.982/2.086/0.074 ms
[ec2-user@ip-10-180-0-152 ~]$ ssh -i bootcamp.pem ec2-user@10.180.1.94
The authenticity of host '10.180.1.94 (10.180.1.94)' can't be established.
ED25519 key fingerprint is SHA256:D2GdNH3BGon4J6dM4BHR5WKJglsUj0GOa3+q2VepkH4.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.180.1.94' (ED25519) to the list of known hosts.
#####
# WARNING: UNPROTECTED PRIVATE KEY FILE!
#####
Permissions 0644 for 'bootcamp.pem' are too open.
It is required that your private key files are NOT accessible by others.
This private key will be ignored.
Load key "bootcamp.pem": bad permissions
ec2-user@10.180.1.94: Permission denied (publickey,gssapi-keyex,gssapi-with-mic).
[ec2-user@ip-10-180-0-152 ~]$ chmod 400 bootcamp.pem
[ec2-user@ip-10-180-0-152 ~]$ ssh -i bootcamp.pem ec2-user@10.180.1.94

      ____      _
     /  _/____  (_)
    _/  /_____/  /
   /___/_____/___/

Amazon Linux 2023

https://aws.amazon.com/linux/amazon-linux-2023

[ec2-user@ip-10-180-1-94 ~]$ ping google.com
PING google.com (142.250.4.102) 56(84) bytes of data.
64 bytes from sm-in-f102.1e100.net (142.250.4.102): icmp_seq=1 ttl=50 time=2.59 ms
64 bytes from sm-in-f102.1e100.net (142.250.4.102): icmp_seq=2 ttl=50 time=1.87 ms
64 bytes from sm-in-f102.1e100.net (142.250.4.102): icmp_seq=3 ttl=50 time=1.77 ms
^C
--- google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 1.770/2.076/2.586/0.363 ms
[ec2-user@ip-10-180-1-94 ~]$
```