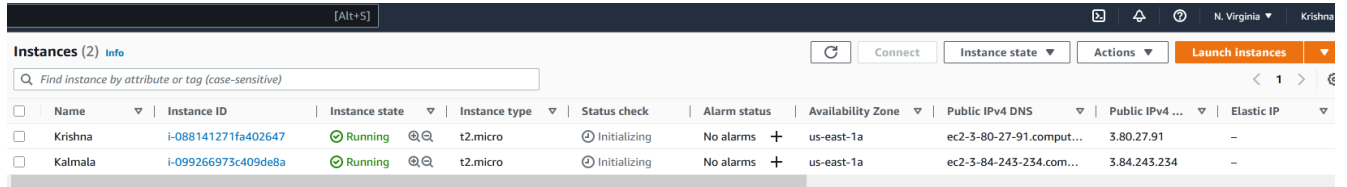


## 1. Creating Instances:

- As per below screenshot, Created 2 instances with names as Instance1 - "Krishna" & Instance2 - "Kalmala".

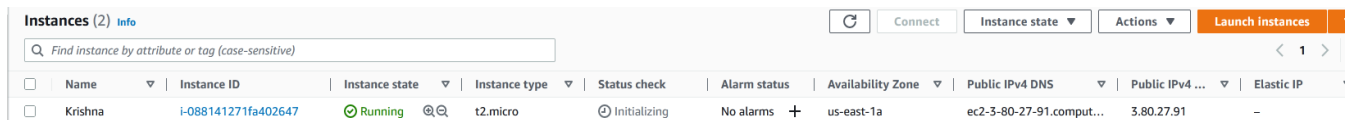


The screenshot shows the AWS Management Console 'Instances (2)' page. It displays two EC2 instances:

| Name    | Instance ID         | Instance state | Instance type | Status check | Alarm status | Availability Zone | Public IPv4 DNS          | Public IPv4 ... | Elastic IP |
|---------|---------------------|----------------|---------------|--------------|--------------|-------------------|--------------------------|-----------------|------------|
| Krishna | i-088141271fa402647 | Running        | t2.micro      | Initializing | No alarms +  | us-east-1a        | ec2-3-80-27-91.comput... | 3.80.27.91      | -          |
| Kalmala | i-099266973c409de8a | Running        | t2.micro      | Initializing | No alarms +  | us-east-1a        | ec2-3-84-243-234.com...  | 3.84.243.234    | -          |

## 2. Creating Elastic Block Store (EBS):

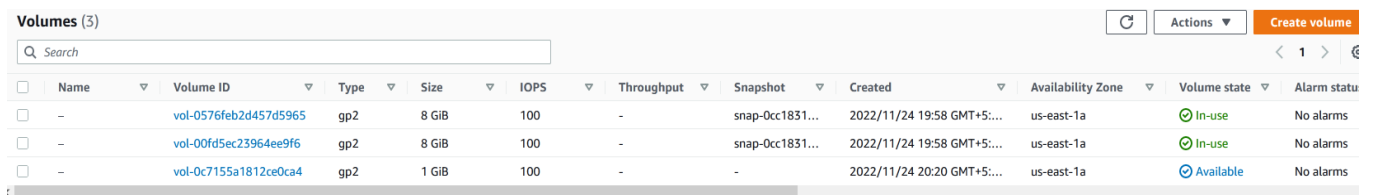
- Initially created an instance with name as "Krishna"



The screenshot shows the AWS Management Console 'Instances (2)' page with one instance:

| Name    | Instance ID         | Instance state | Instance type | Status check | Alarm status | Availability Zone | Public IPv4 DNS          | Public IPv4 ... | Elastic IP |
|---------|---------------------|----------------|---------------|--------------|--------------|-------------------|--------------------------|-----------------|------------|
| Krishna | i-088141271fa402647 | Running        | t2.micro      | Initializing | No alarms +  | us-east-1a        | ec2-3-80-27-91.comput... | 3.80.27.91      | -          |

- then, created volume of 1GB



The screenshot shows the AWS Management Console 'Volumes (3)' page. It displays three EBS volumes:

| Name | Volume ID             | Type | Size  | IOPS | Throughput | Snapshot        | Created                    | Availability Zone | Volume state | Alarm status |
|------|-----------------------|------|-------|------|------------|-----------------|----------------------------|-------------------|--------------|--------------|
| -    | vol-0576feb2d457d5965 | gp2  | 8 GiB | 100  | -          | snap-0cc1831... | 2022/11/24 19:58 GMT+5:... | us-east-1a        | In-use       | No alarms    |
| -    | vol-00fd5ec23964ee9f6 | gp2  | 8 GiB | 100  | -          | snap-0cc1831... | 2022/11/24 19:58 GMT+5:... | us-east-1a        | In-use       | No alarms    |
| -    | vol-0c7155a1812ce0ca4 | gp2  | 1 GiB | 100  | -          | -               | 2022/11/24 20:20 GMT+5:... | us-east-1a        | Available    | No alarms    |

- now its attached to instance "Krishna" & then through terminal checking commands like

"lsblk" (lists all file systems)

```
https://aws.amazon.com/amazon-linux-2/
1 package(s) needed for security, out of 1 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-31-28-112 ~]$ sudo su
[root@ip-172-31-28-112 ec2-user]# lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
xvda        202:0    0   8G  0 disk
└─xvda1     202:1    0   8G  0 part /
xvdf        202:80   0   1G  0 disk
[root@ip-172-31-28-112 ec2-user]# fdisk -l
Disk /dev/xvda: 8 GiB, 8589934592 bytes, 16777216 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: DA90AB95-8C11-4BAE-9157-C48213FBAD0C

Device            Start      End  Sectors  Size Type
/dev/xvda1         4096 16777182 16773087   8G Linux filesystem
/dev/xvda128       2048      4095     2048   1M BIOS boot

Partition table entries are not in disk order.

Disk /dev/xvdf: 1 GiB, 1073741824 bytes, 2097152 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
[root@ip-172-31-28-112 ec2-user]# |
```

- Making directory & Mounting

```
Disk /dev/xvdf: 1 GiB, 1073741824 bytes, 2097152 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
[root@ip-172-31-28-112 ec2-user]# mkdir testdir
[root@ip-172-31-28-112 ec2-user]# mkfs -t xfs /dev/xvdf
meta-data=/dev/xvdf          isize=512    agcount=4, agsize=65536 blks
=                               sectsz=512   attr=2, projid32bit=1
=                               crc=1       finobt=1, sparse=0
data      =                   bsize=4096  blocks=262144, imaxpct=25
=                               sunit=0    swidth=0 blks
naming    =version 2          bsize=4096  ascii-ci=0 ftype=1
log       =internal log     bsize=4096  blocks=2560, version=2
=                               sectsz=512   sunit=0 blks, lazy-count=1
realtime  =none             extsz=4096  blocks=0, rtextents=0
[root@ip-172-31-28-112 ec2-user]# mount -t xfs /dev/xvdf /home/ec2-user/testdir
[root@ip-172-31-28-112 ec2-user]# pwd
/home/ec2-user
[root@ip-172-31-28-112 ec2-user]# lsblk
NAME        MAJ:MIN RM SIZE RO TYPE MOUNTPOINT
xvda        202:0    0  8G  0 disk
└─xvda1     202:1    0  8G  0 part /
xvdf        202:80   0  1G  0 disk /home/ec2-user/testdir
[root@ip-172-31-28-112 ec2-user]# |
```

- Creating file under dir

```
[root@ip-172-31-28-112 ec2-user]# cd testdir
[root@ip-172-31-28-112 testdir]# touch testfile.txt
[root@ip-172-31-28-112 testdir]# ls
testfile.txt
[root@ip-172-31-28-112 testdir]# |
```

- Now, created another instance "Kalmala" & detached volume from instance Krishna & attached to instance "Kalmala"

```
[ec2-user@ip-172-31-18-204 ~]$ sudo su
[root@ip-172-31-18-204 ec2-user]# lsblk
NAME        MAJ:MIN RM SIZE RO TYPE MOUNTPOINT
xvda        202:0    0  8G  0 disk
└─xvda1     202:1    0  8G  0 part /
xvdf        202:80   0  1G  0 disk
[root@ip-172-31-18-204 ec2-user]# |
```

- now from instance2 we can view the file system which was created through instance1

```
[root@ip-172-31-18-204 ec2-user]# mkdir test2
[root@ip-172-31-18-204 ec2-user]# mount -t xfs /dev/xvdf test2
[root@ip-172-31-18-204 ec2-user]# cd test2
[root@ip-172-31-18-204 test2]# ls
testfile.txt
[root@ip-172-31-18-204 test2]# |
```

-----

### 3. Creating SNAPSHOT:

- We can create snapshot from snapshot section or from volume section
- Creating snapshot from volume

EC2 > Volumes > vol-074a1a0b887369fac > Create snapshot

## Create snapshot [Info](#)

Create a point-in-time snapshot to back up the data on an Amazon EBS volume to Amazon S3.

### Details

Volume ID  
vol-074a1a0b887369fac

Description  
Add a description for your snapshot  
  
255 characters maximum.

Encryption [Info](#)  
Not encrypted

- Snapshot created in another region (Ohio) from region (N Virginia)

h [Alt+S] Ohio Krishna

### Snapshots (1)

Owned by me Search < 1 >

| Name | Snapshot ID            | Size  | Description                                                 | Storage... | Snapshot status | Started                    | Progress      |
|------|------------------------|-------|-------------------------------------------------------------|------------|-----------------|----------------------------|---------------|
| -    | snap-077e624a824076079 | 1 GiB | [Copied snap-06f201292e5c6735f from us-east-1] Vol Snapshot | Standard   | Completed       | 2022/11/25 17:03 GMT+5:... | Available (1) |

& Through snapshot we have created similar volume in different availability zone & same with instance - "Machine-C"

**Volumes (4)** Actions Create

Q Search < 1

| Name | Volume ID             | Type | Size  | IOPS | Throughput | Snapshot        | Created                    | Availability Zone | Volume state | Ala |
|------|-----------------------|------|-------|------|------------|-----------------|----------------------------|-------------------|--------------|-----|
| -    | vol-0dcf5d4c30117c54e | gp2  | 1 GiB | 100  | -          | snap-06f2012... | 2022/11/25 17:15 GMT+5:... | us-east-1b        | Available    | No  |
| -    | vol-03aeca11ff424835f | gp2  | 8 GiB | 100  | -          | snap-0cc1831... | 2022/11/25 16:13 GMT+5:... | us-east-1a        | In-use       | No  |
| -    | vol-06cc9c9ba538bf31f | gp2  | 8 GiB | 100  | -          | snap-0cc1831... | 2022/11/25 16:33 GMT+5:... | us-east-1a        | In-use       | No  |
| -    | vol-074a1a0b887369fac | gp2  | 1 GiB | 100  | -          | -               | 2022/11/25 16:51 GMT+5:... | us-east-1a        | Available    | No  |

**Instances (3)** Info Connect

Q Find instance by attribute or tag (case-sensitive)

| Name      | Instance ID         | Instance state | Instance type | Status check | Alarm status | Availability Zone |
|-----------|---------------------|----------------|---------------|--------------|--------------|-------------------|
| Kalmala   | i-0825e4c3b397a182e | Stopped        | t2.micro      | -            | No alarms +  | us-east-1a        |
| Krishna   | i-01775ea6116cc2d3d | Stopped        | t2.micro      | -            | No alarms +  | us-east-1a        |
| Machine C | i-0b416cc9d41881bac | Running        | t2.micro      | Initializing | No alarms +  | us-east-1b        |

now by connecting to Machine-C we can use already created filesystem files in volume.

---

#### 4. AMI (Amazon Machine Image):

- Created instance with Ubuntu server & followed instructions as step-by-step

[Alt+S] N. Virginia Krishna

EC2 > Instances > i-09fe0174a45b1b5c3

### Instance summary for i-09fe0174a45b1b5c3 (ApachePhp) Info

Updated less than a minute ago

Refresh
Connect
Instance state ▼
Actions ▼

|                                                         |                                                                    |                                                                                                                    |
|---------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Instance ID<br>i-09fe0174a45b1b5c3 (ApachePhp)          | Public IPv4 address<br>3.86.206.221   <a href="#">open address</a> | Private IPv4 addresses<br>172.31.83.165                                                                            |
| IPv6 address<br>-                                       | Instance state<br><span style="color: green;">●</span> Running     | Public IPv4 DNS<br>ec2-3-86-206-221.compute-1.amazonaws.com   <a href="#">open address</a>                         |
| Hostname type<br>IP name: ip-172-31-83-165.ec2.internal | Private IP DNS name (IPv4 only)<br>ip-172-31-83-165.ec2.internal   | Elastic IP addresses<br>-                                                                                          |
| Answer private resource DNS name<br>IPv4 (A)            | Instance type<br>t2.micro                                          | AWS Compute Optimizer finding<br><a href="#">Opt-in to AWS Compute Optimizer for recommendations.   Learn more</a> |
| Auto-assigned IP address<br>3.86.206.221 [Public IP]    | VPC ID<br>vpc-0a02f6109be7082e5                                    | Auto Scaling Group name<br>-                                                                                       |
| IAM Role<br>-                                           | Subnet ID<br>subnet-09a48e84231db9f71                              |                                                                                                                    |

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

▼ Instance details Info

|                               |                                 |                        |
|-------------------------------|---------------------------------|------------------------|
| Platform<br>Ubuntu (Inferred) | AMI ID<br>ami-08c40ec9ead489470 | Monitoring<br>disabled |
|-------------------------------|---------------------------------|------------------------|

```

38 packages can be upgraded. Run 'apt list --upgradable' to see them.
root@ip-172-31-83-165:/home/ubuntu# ufw allow ssh
Rules updated
Rules updated (v6)
root@ip-172-31-83-165:/home/ubuntu# ufw allow 80
Rules updated
Rules updated (v6)
root@ip-172-31-83-165:/home/ubuntu# ufw allow 443
Rules updated
Rules updated (v6)
root@ip-172-31-83-165:/home/ubuntu# ufw enable
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
root@ip-172-31-83-165:/home/ubuntu#

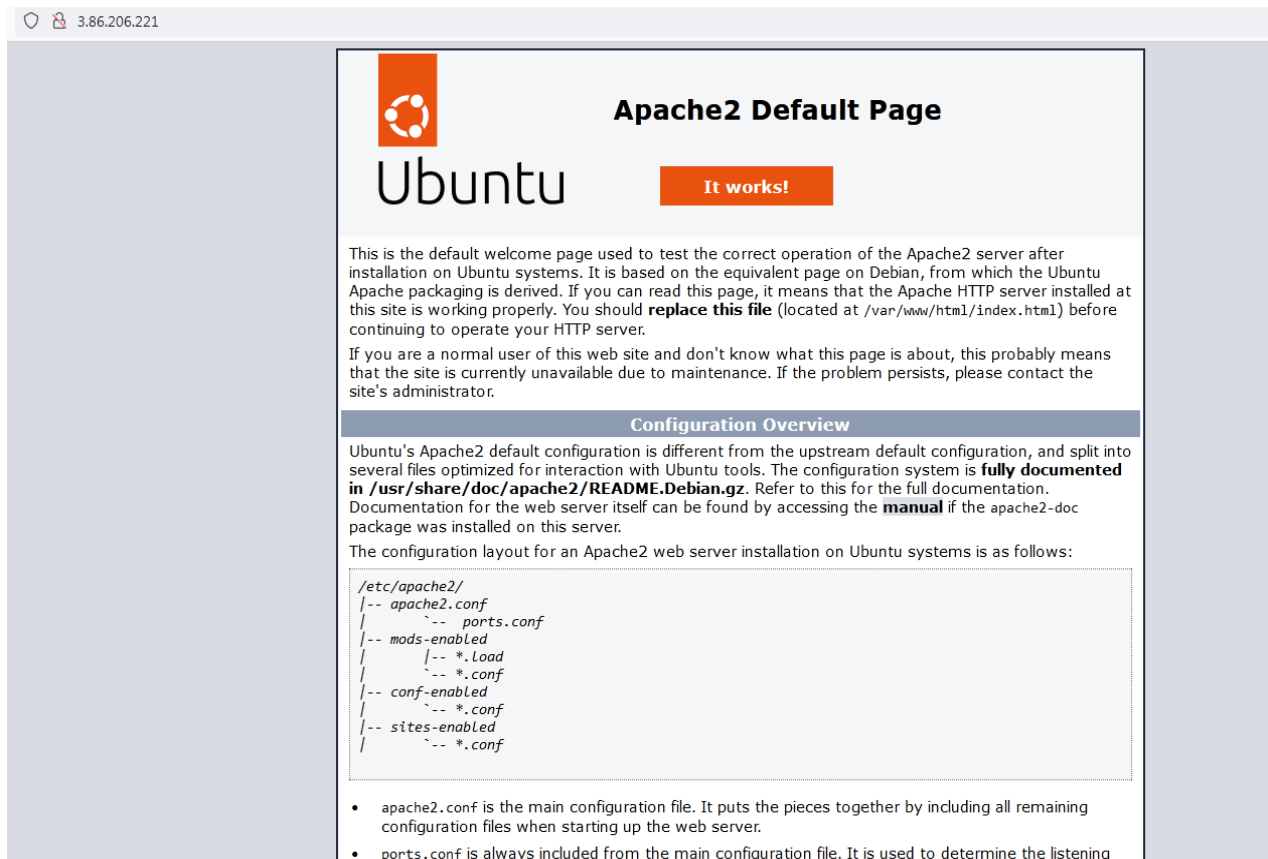
```

- Now, from below screenshot we can check apache2 service is active & running

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
root@ip-172-31-83-165:/home/ubuntu# systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
   Active: active (running) since Sat 2022-11-26 08:11:16 UTC; 33s ago
     Docs: https://httpd.apache.org/docs/2.4/
  Main PID: 2397 (apache2)
    Tasks: 55 (limit: 1143)
   Memory: 4.9M
      CPU: 30ms
  CGroup: /system.slice/apache2.service
          └─2397 /usr/sbin/apache2 -k start
            └─2399 /usr/sbin/apache2 -k start
              └─2400 /usr/sbin/apache2 -k start

Nov 26 08:11:16 ip-172-31-83-165 systemd[1]: Starting The Apache HTTP Server...
Nov 26 08:11:16 ip-172-31-83-165 systemd[1]: Started The Apache HTTP Server.
root@ip-172-31-83-165:/home/ubuntu#
```

- now by searching with Instance public IP address( added HTTP-80 Port in Inbound Rule) in web we can view Default Apache2 page as below



3.86.206.221

## Apache2 Default Page

# Ubuntu

**It works!**

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

### Configuration Overview

Ubuntu's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Ubuntu tools. The configuration system is **fully documented in `/usr/share/doc/apache2/README.Debian.gz`**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the `apache2-doc` package was installed on this server.

The configuration layout for an Apache2 web server installation on Ubuntu systems is as follows:

```
/etc/apache2/
|-- apache2.conf
|   |-- ports.conf
|-- mods-enabled
|   |-- *.Load
|   |-- *.conf
|-- conf-enabled
|   |-- *.conf
|-- sites-enabled
|   |-- *.conf
```

- `apache2.conf` is the main configuration file. It puts the pieces together by including all remaining configuration files when starting up the web server.
- `ports.conf` is always included from the main configuration file. It is used to determine the listening

- installing PHP 8.1.2 version

```
root@ip-172-31-83-165:~# php --version
PHP 8.1.2-1ubuntu2.9 (cli) (built: Oct 19 2022 14:58:09) (NTS)
Copyright (c) The PHP Group
Zend Engine v4.1.2, Copyright (c) Zend Technologies
with Zend OPcache v8.1.2-1ubuntu2.9, Copyright (c), by Zend Technologies
root@ip-172-31-83-165:~#
```

- we can view PHP in web with instance private IP address

The screenshot shows the AWS Management Console interface. On the left, the 'Instance summary for i-09fe0174a45b1b5c3 (ApachePhp)' is displayed. The instance is in a 'Running' state. A browser window is overlaid on the console, showing the URL '3.86.206.221/phpinfo.php'. The browser displays the 'PHP Version 8.1.2-1ubuntu2.9' page, which includes a table of system information:

| System                            | Linux ip-172-31-83-165 5.15.0-1019-aws #23-Ubuntu SMP Wed Aug 17 18:33:13 UTC 2022 x86_64 |
|-----------------------------------|-------------------------------------------------------------------------------------------|
| Build Date                        | Oct 19 2022 14:58:09                                                                      |
| Build System                      | Linux                                                                                     |
| Server API                        | Apache 2.0 Handler                                                                        |
| Virtual Directory Support         | disabled                                                                                  |
| Configuration File (php.ini) Path | /etc/php8.1/apache2                                                                       |
| Loaded Configuration File         | /etc/php8.1/apache2/php.ini                                                               |

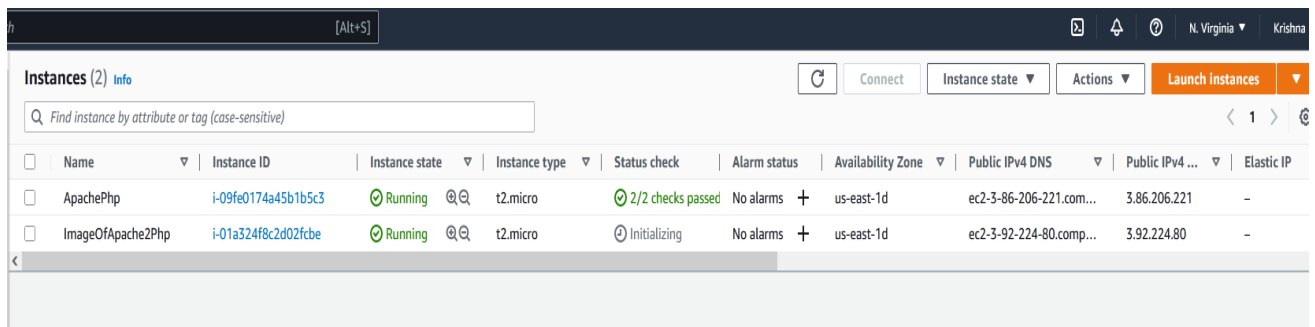
- Now, Creating Image from above Instance (applications with PHP & Apache2)

The screenshot shows the 'Amazon Machine Images (AMIs) (1) Info' page in the AWS Management Console. A table lists the AMIs:

| me | AMI ID                | AMI name        | Source                       | Owner        | Visibility | Status    | Creation date             |
|----|-----------------------|-----------------|------------------------------|--------------|------------|-----------|---------------------------|
|    | ami-06f05bc18560ce28c | APachePhp-Image | 386224948107/APachePhp-Image | 386224948107 | Private    | Available | 2022/11/26 14:16 GMT+5:30 |



- And from above image we have created Instance (which comes with PHP & Apache2)



The screenshot shows the AWS Management Console interface for EC2 instances. At the top, there are navigation icons and the user's name 'Krishna' in 'N. Virginia'. Below that, the 'Instances (2)' section is visible, with a search bar and buttons for 'Connect', 'Instance state', 'Actions', and 'Launch instances'. A table lists two instances:

| Name              | Instance ID         | Instance state | Instance type | Status check      | Alarm status | Availability Zone | Public IPv4 DNS         | Public IPv4 ... | Elastic IP |
|-------------------|---------------------|----------------|---------------|-------------------|--------------|-------------------|-------------------------|-----------------|------------|
| ApachePhp         | i-09fe0174a45b1b5c3 | Running        | t2.micro      | 2/2 checks passed | No alarms    | us-east-1d        | ec2-3-96-206-221.com... | 3.86.206.221    | -          |
| ImageOfApache2Php | i-01a324f8c2d02fcbe | Running        | t2.micro      | Initializing      | No alarms    | us-east-1d        | ec2-3-92-224-80.comp... | 3.92.224.80     | -          |

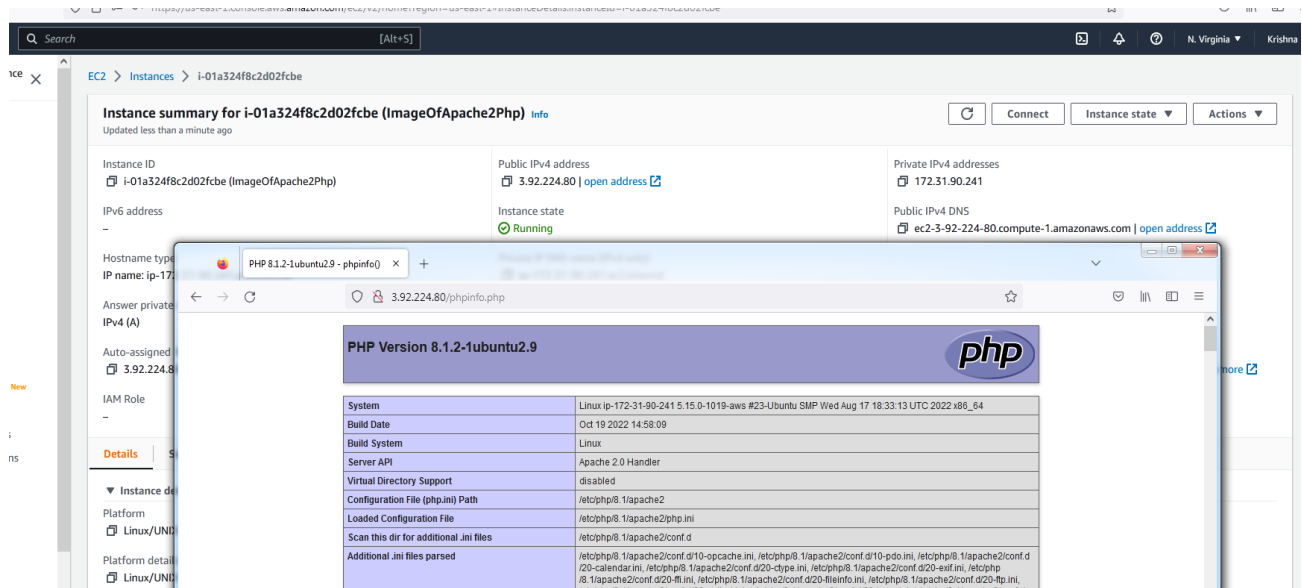
- Now from below screenshot we can see Instance created with Image is loaded with PHP & Apache2 in it

```
ubuntu@ip-172-31-90-241:~$ systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
   Active: active (running) since Sat 2022-11-26 08:55:38 UTC; 21min ago
     Docs: https://httpd.apache.org/docs/2.4/
   Process: 514 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
   Main PID: 752 (apache2)
     Tasks: 9 (limit: 1143)
    Memory: 26.3M
       CPU: 152ms
   CGroup: /system.slice/apache2.service
           └─ 752 /usr/sbin/apache2 -k start
             └─ 810 /usr/sbin/apache2 -k start
               └─ 811 /usr/sbin/apache2 -k start
                 └─ 813 /usr/sbin/apache2 -k start
                   └─ 814 /usr/sbin/apache2 -k start
                     └─ 815 /usr/sbin/apache2 -k start
                       └─ 1057 /usr/sbin/apache2 -k start
                         └─ 1058 /usr/sbin/apache2 -k start
                           └─ 1059 /usr/sbin/apache2 -k start

Nov 26 08:55:36 ip-172-31-90-241 systemd[1]: Starting The Apache HTTP Server...
Nov 26 08:55:38 ip-172-31-90-241 systemd[1]: Started The Apache HTTP Server.
ubuntu@ip-172-31-90-241:~$ systemctl status php*
● phpsessionclean.timer - Clean PHP session files every 30 mins
   Loaded: loaded (/lib/systemd/system/phpsessionclean.timer; enabled; vendor preset: enabled)
   Active: active (waiting) since Sat 2022-11-26 08:55:37 UTC; 22min ago
     Trigger: Sat 2022-11-26 09:39:00 UTC; 21min left
   Triggers: ● phpsessionclean.service

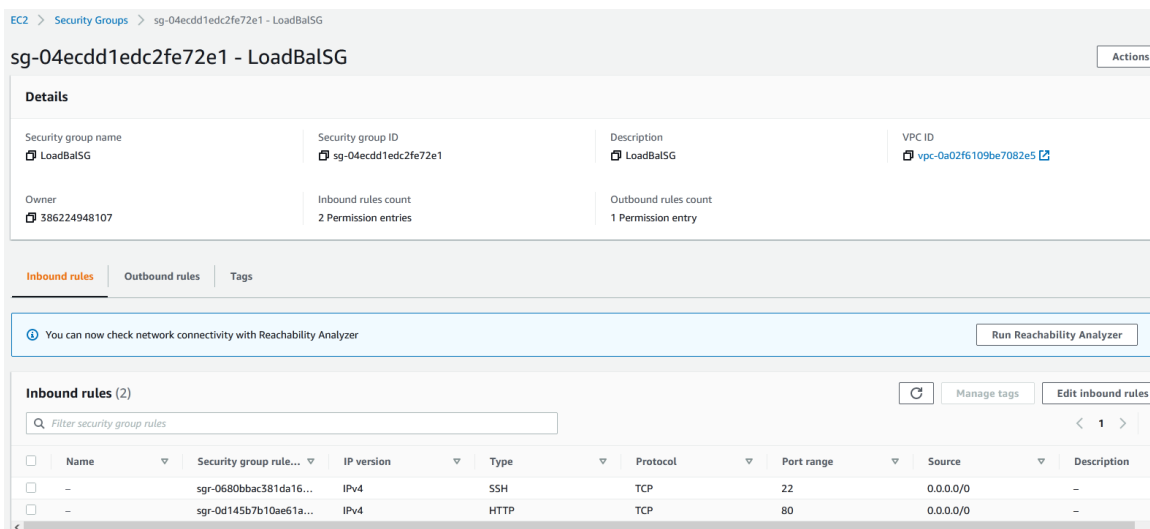
Nov 26 08:55:37 ip-172-31-90-241 systemd[1]: Started Clean PHP session files every 30 mins.
ubuntu@ip-172-31-90-241:~$
```

- & also we can ping in web with above created instance IP

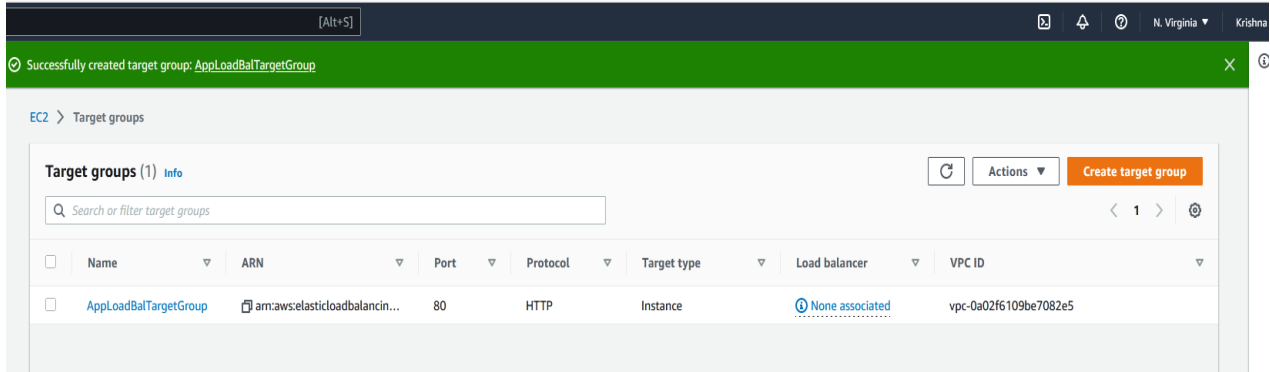


## 5. Load Balancer:

- Created Load Balancer with Customized Security Group -
- Edited Inbound rules as SSH & HTTP Ports



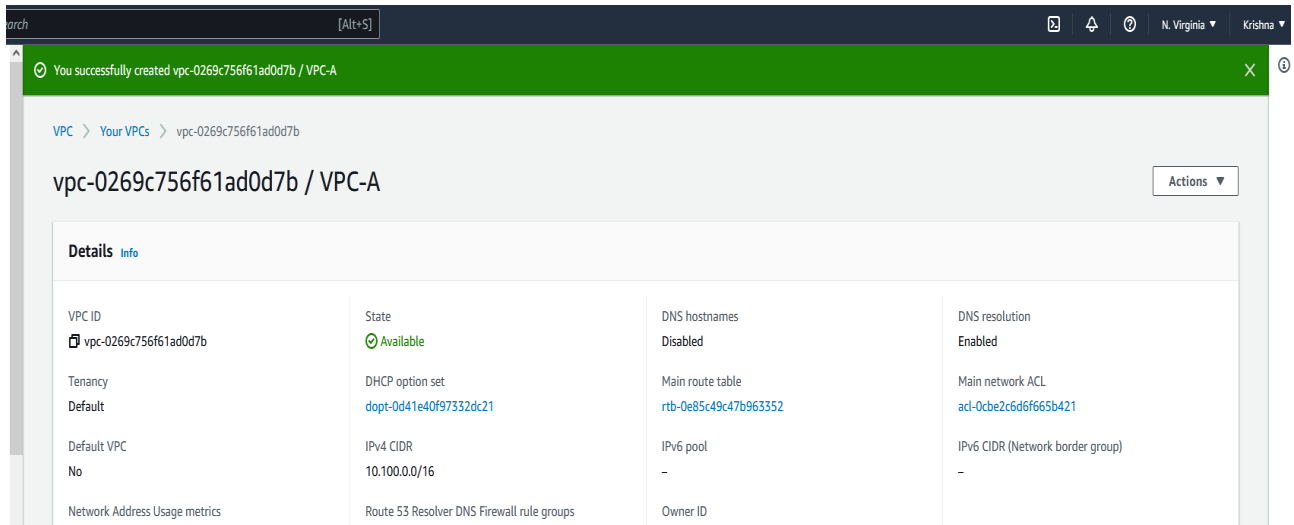
& Created Target Group which included 2 instances



- Now by Copy & Pasting the DNS of Load Balancer in web, we can see 2Instance's Private IP addresses changing by refreshing web tab.

## 6. Virtual Private Cloud (VPC):

- As per below screenshot, Created VPC with name "VPC-A"



- And Created 4subnets (2-Public Subnets & 2-Private Subnets)

| Name               | Subnet ID                | State     | VPC                           | IPv4 CIDR      | IPv6 CIDR | Available IPv4 addresses | Availability Zone |
|--------------------|--------------------------|-----------|-------------------------------|----------------|-----------|--------------------------|-------------------|
| VPC A-PrivSubnet02 | subnet-0c60750b15080eb8c | Available | vpc-0269c756f61ad0d7b   VP... | 10.100.3.0/24  | -         | 251                      | us-east           |
| -                  | subnet-09a48e84231db9f71 | Available | vpc-0a02f6109be7082e5         | 172.31.80.0/20 | -         | 4091                     | us-east           |
| -                  | subnet-05b5d64fbb3d0600e | Available | vpc-0a02f6109be7082e5         | 172.31.48.0/20 | -         | 4091                     | us-east           |
| VPC A-PubSubnet01  | subnet-01f690bd29e3436de | Available | vpc-0269c756f61ad0d7b   VP... | 10.100.0.0/24  | -         | 251                      | us-east           |
| -                  | subnet-03d17fcd37cfe05c  | Available | vpc-0a02f6109be7082e5         | 172.31.0.0/20  | -         | 4091                     | us-east           |
| -                  | subnet-0143fd6aa0b9835b5 | Available | vpc-0a02f6109be7082e5         | 172.31.32.0/20 | -         | 4091                     | us-east           |
| VPC A-PubSubnet02  | subnet-01187b1dca55df4ef | Available | vpc-0269c756f61ad0d7b   VP... | 10.100.2.0/24  | -         | 251                      | us-east           |
| -                  | subnet-0ab6c13e66a444c41 | Available | vpc-0a02f6109be7082e5         | 172.31.64.0/20 | -         | 4091                     | us-east           |
| VPC A-PrivSubnet01 | subnet-06ea4efc6fa38020c | Available | vpc-0269c756f61ad0d7b   VP... | 10.100.1.0/24  | -         | 251                      | us-east           |
| -                  | subnet-07f408e189ecfa5a  | Available | vpc-0a02f6109be7082e5         | 172.31.16.0/20 | -         | 4089                     | us-east           |

- Created Internet gateway & attached it to VPC-A

Internet gateway igw-0097792959c19eff9 successfully attached to vpc-0269c756f61ad0d7b

VPC > Internet gateways > igw-0097792959c19eff9

### igw-0097792959c19eff9 / VPC-A InternetGateway

Actions

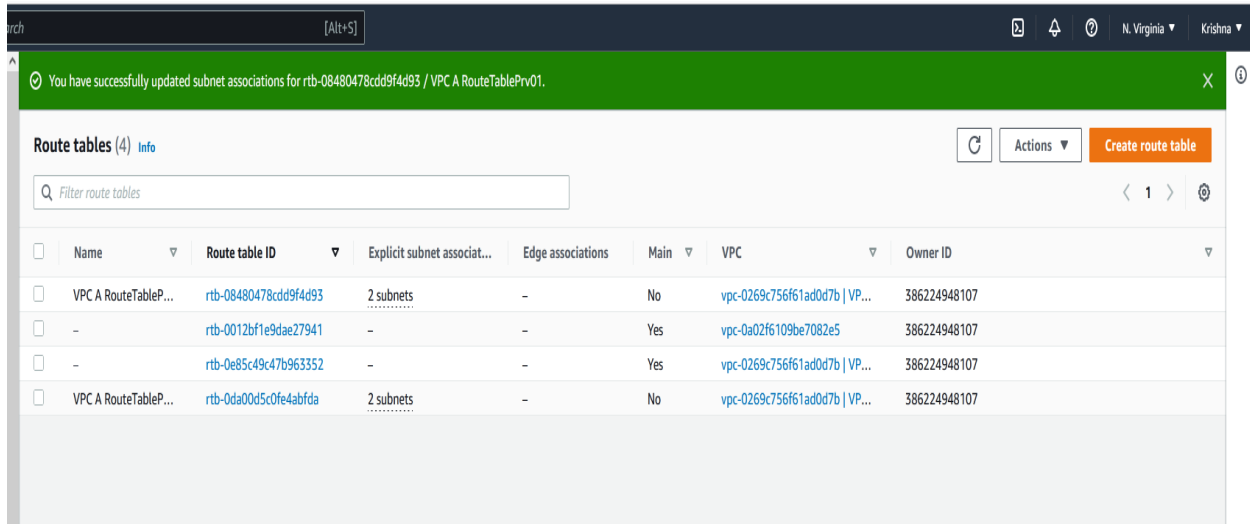
**Details** Info

|                                              |                   |                                         |                       |
|----------------------------------------------|-------------------|-----------------------------------------|-----------------------|
| Internet gateway ID<br>igw-0097792959c19eff9 | State<br>Attached | VPC ID<br>vpc-0269c756f61ad0d7b   VPC-A | Owner<br>386224948107 |
|----------------------------------------------|-------------------|-----------------------------------------|-----------------------|

**Tags** Manage tags

| Key  | Value                 |
|------|-----------------------|
| Name | VPC-A InternetGateway |

- Created 1Public route table & 1Private route table & associated with respective subnets
- Now, Public route table is connected to internet gateway



- Created SG with Inbound rules (SSH, All ICMP-IPv4, All TCP)
- Created 2 instances (Public & Private)
- we can ping from public to private but not from private to public

```

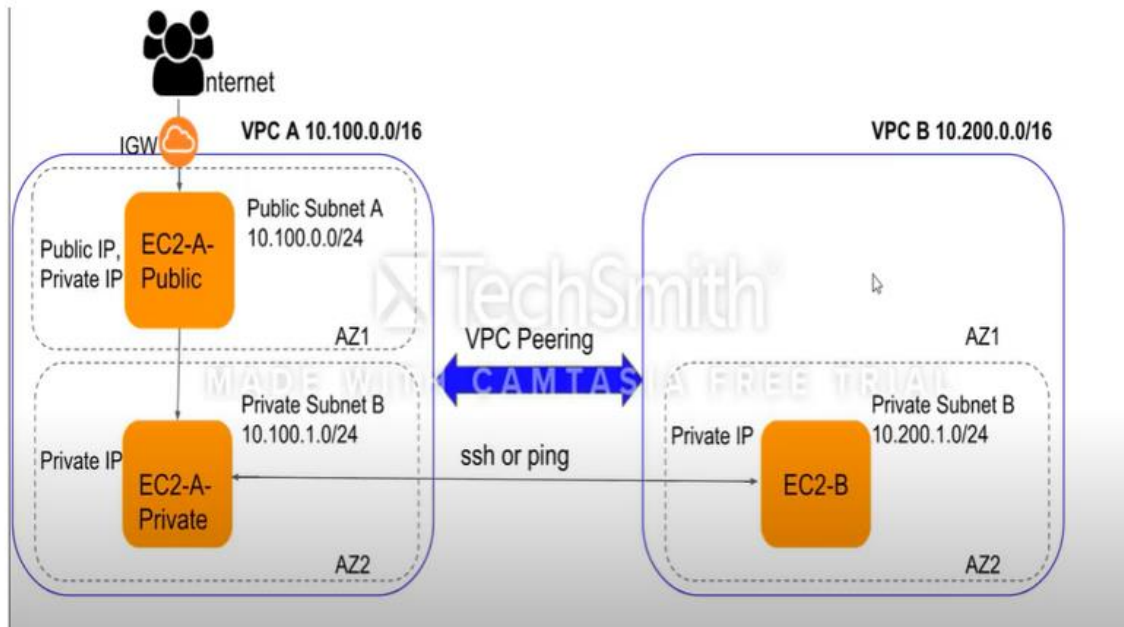
https://aws.amazon.com/amazon-linux-2/
1 package(s) needed for security, out of 1 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-10-100-0-168 ~]$ sudo su
[root@ip-10-100-0-168 ec2-user]# ping 10.100.1.76
PING 10.100.1.76 (10.100.1.76) 56(84) bytes of data:
64 bytes from 10.100.1.76: icmp_seq=1 ttl=255 time=0.814 ms
64 bytes from 10.100.1.76: icmp_seq=2 ttl=255 time=0.490 ms
64 bytes from 10.100.1.76: icmp_seq=3 ttl=255 time=0.460 ms
64 bytes from 10.100.1.76: icmp_seq=4 ttl=255 time=0.530 ms
64 bytes from 10.100.1.76: icmp_seq=5 ttl=255 time=0.553 ms
64 bytes from 10.100.1.76: icmp_seq=6 ttl=255 time=0.472 ms
64 bytes from 10.100.1.76: icmp_seq=7 ttl=255 time=0.576 ms
64 bytes from 10.100.1.76: icmp_seq=8 ttl=255 time=0.521 ms

```

- By using command " scp -i keypair -r keypair ec2-user@PublicIPAddress:/home/ec2-user" we can copy keypair from Outside to Ec2-user of Public-Instance & to Private instance
- **chmod** - gives read/write/execute permissions
- to access internet from Private subnet we need Nat gateway
- Created NAT Gateway in public subnet by allocating Elastic IP address & edited private route table by adding Nat gateway at edit routes
- Created Nat gateway at Public Subnet & associated it with Private route table
- Now by doing ssh from public instance with Private subnet of Private IP address we can access internet.

## 7. VPC Peering:

# VPC Peering



- For the purpose of connecting & to solve any issue in Private subnet Instance of One VPC from Private subnet Instance of Other VPC we use VPC Peering

- Created a VPC - "VPC A"

The screenshot shows the AWS Management Console interface for a newly created VPC. A green notification banner at the top states: "You successfully created vpc-04d7db1c7ae94b0bc / VPC A". The breadcrumb navigation is "VPC > Your VPCs > vpc-04d7db1c7ae94b0bc". The main heading is "vpc-04d7db1c7ae94b0bc / VPC A". Below this is a "Details" section with the following information:

| Details                       |                                            |                       |                                  |
|-------------------------------|--------------------------------------------|-----------------------|----------------------------------|
| VPC ID                        | State                                      | DNS hostnames         | DNS resolution                   |
| vpc-04d7db1c7ae94b0bc         | Available                                  | Disabled              | Enabled                          |
| Tenancy                       | DHCP option set                            | Main route table      | Main network ACL                 |
| Default                       | dopt-0d41e40f97332dc21                     | rtb-0ba2c5c412b931289 | acl-0f66f789032eddb61            |
| Default VPC                   | IPv4 CIDR                                  | IPv6 pool             | IPv6 CIDR (Network border group) |
| No                            | 10.100.0.0/16                              | -                     | -                                |
| Network Address Usage metrics | Route 53 Resolver DNS Firewall rule groups | Owner ID              |                                  |
| Disabled                      | -                                          | 386224948107          |                                  |

- Created 2 Subnets under VPC A (from below screenshot 1<sup>st</sup> & 3<sup>rd</sup> - 1Public & 1Private)

|                          |                    |                          |           |                               |               |   |     |     |
|--------------------------|--------------------|--------------------------|-----------|-------------------------------|---------------|---|-----|-----|
| <input type="checkbox"/> | VPC A-PubSubnet01  | subnet-010b4b43c7556d504 | Available | vpc-04d7db1c7ae94b0bc   VP... | 10.100.0.0/24 | - | 251 | us- |
| <input type="checkbox"/> | VPC A-PubSubnet02  | subnet-0b4d60550a1f3ea8d | Available | vpc-04d7db1c7ae94b0bc   VP... | 10.100.2.0/24 | - | 251 | us- |
| <input type="checkbox"/> | VPC A-PrivSubnet01 | subnet-0978080fb79ec3179 | Available | vpc-04d7db1c7ae94b0bc   VP... | 10.100.1.0/24 | - | 251 | us- |

- Created Internet gateway & attached to VPC A

VPC > Internet gateways > igw-0dfba4e9e19accd85

### igw-0dfba4e9e19accd85 / VPC A InternetGateway

**Details** Info

|                                              |                   |                                         |                       |
|----------------------------------------------|-------------------|-----------------------------------------|-----------------------|
| Internet gateway ID<br>igw-0dfba4e9e19accd85 | State<br>Attached | VPC ID<br>vpc-04d7db1c7ae94b0bc   VPC A | Owner<br>386224948107 |
|----------------------------------------------|-------------------|-----------------------------------------|-----------------------|

**Tags**

Search tags

- 2Route Tables created & associated with respective subnets (i.e., public route table to public subnet & Private route table to private subnet)

Route tables (4) Info

Filter route tables

| <input type="checkbox"/> | Name             | Route table ID        | Explicit subnet associat... | Edge associations | Main | VPC                           | Owner ID     |
|--------------------------|------------------|-----------------------|-----------------------------|-------------------|------|-------------------------------|--------------|
| <input type="checkbox"/> | -                | rtb-0012bf1e9dae27941 | -                           | -                 | Yes  | vpc-0a02f6109be7082e5         | 386224948107 |
| <input type="checkbox"/> | VPC A Pub RT-01  | rtb-08fe53e72ebd42bac | 2 subnets                   | -                 | No   | vpc-04d7db1c7ae94b0bc   VP... | 386224948107 |
| <input type="checkbox"/> | VPC A Priv RT-01 | rtb-05b0d7a2cccc9e0c0 | subnet-0978080fb79ec...     | -                 | No   | vpc-04d7db1c7ae94b0bc   VP... | 386224948107 |
| <input type="checkbox"/> | -                | rtb-0ba2c5c412b931289 | -                           | -                 | Yes  | vpc-04d7db1c7ae94b0bc   VP... | 386224948107 |

- Now associated Public Route Table to Internet Gateway

VPC > Route tables > rtb-08fe53e72ebd42bac

## rtb-08fe53e72ebd42bac / VPC A Pub RT-01

You can now check network connectivity with Reachability Analyzer

**Details** [Info](#)

|                                         |                          |                                           |                 |
|-----------------------------------------|--------------------------|-------------------------------------------|-----------------|
| Route table ID<br>rtb-08fe53e72ebd42bac | Main<br>No               | Explicit subnet associations<br>2 subnets | Edge assoc<br>- |
| VPC<br>vpc-04d7db1c7ae94b0bc   VPC A    | Owner ID<br>386224948107 |                                           |                 |

**Routes** | Subnet associations | Edge associations | Route propagation | Tags

**Routes (2)**

Both ▾

| Destination   | Target                | Status | Propag |
|---------------|-----------------------|--------|--------|
| 0.0.0.0/0     | igw-0dfba4e9e19accd85 | Active | No     |
| 10.100.0.0/16 | local                 | Active | No     |

- Now Created 2-Instances (1-Public & 1-Private) by associating public instance with public subnet & private instance with private subnet

**Instances (2)** [Info](#) Refresh Connect Instance state ▾ Action

| <input type="checkbox"/> | Name         | Instance ID         | Instance state | Instance type | Status check      | Alarm status | Availability Zone | Public IPv4 DNS |
|--------------------------|--------------|---------------------|----------------|---------------|-------------------|--------------|-------------------|-----------------|
| <input type="checkbox"/> | Prv Instance | i-0ab42a0387c89dbaf | Running        | t2.micro      | Initializing      | No alarms +  | us-east-1b        | -               |
| <input type="checkbox"/> | Pub Instance | i-073288fa7b507a3d2 | Running        | t2.micro      | 2/2 checks passed | No alarms +  | us-east-1b        | -               |



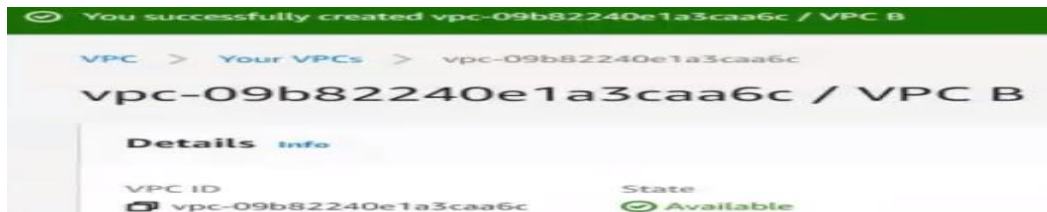
- Now connect the public instance.....it pings if we try to ping private subnet instance (#ping Private IP Address) with private IP address (below screenshot is copied one)

```
[ec2-user@ip-10-100-0-207 ~]$ sudo su
[root@ip-10-100-0-207 ec2-user]# ping 10.100.1.176
PING 10.100.1.176 (10.100.1.176) 56(84) bytes of data:
64 bytes from 10.100.1.176: icmp_seq=1 ttl=255 time=1.29 ms
64 bytes from 10.100.1.176: icmp_seq=2 ttl=255 time=0.718 ms
64 bytes from 10.100.1.176: icmp_seq=3 ttl=255 time=0.719 ms
64 bytes from 10.100.1.176: icmp_seq=4 ttl=255 time=0.707 ms
64 bytes from 10.100.1.176: icmp_seq=5 ttl=255 time=0.703 ms
^C
```

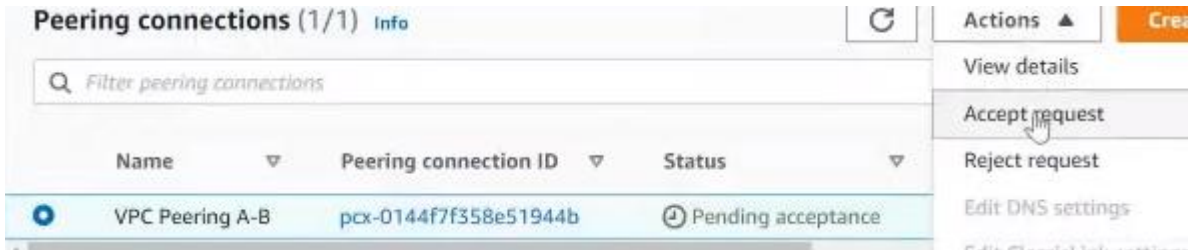
- Now need to copy the key file to do SSH
- We can connect Private instance from public instance

```
[root@ip-10-100-0-207 ec2-user]# ls -lt
total 4
-rwxrwxrwx 1 ec2-user ec2-user 1674 Oct
[root@ip-10-100-0-207 ec2-user]# ssh -i
_ _ | _ _ | _ _ )
_ | ( _ _ | /
_ | \ _ _ | _ _ |
---|---|---|
https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-10-100-1-176 ~]$
```

- We can't ping from private subnet as we don't have internet gateway connection
- Now create another VPC - VPC B



- Create a Private subnet & Private route table on VPC B
- Create an Instance of VPC B
- To establish a connection between Private instances of VPC A & VPC B we need to create Peering connection by selecting requester as VPC A & Peer with as VPC B & accept peering connection



- Need to edit route tables of private instances to establish a connection between them & by copying pem file from public instance to private instance of VPC A
- Now connection can be established by doing SSH from private instance of VPC A to private instance of VPC B.