

(Task 1)

Screenshot of Terraform output which refers to the Lab: Storage resources using a module.module_name prefix

```
+ owner_id      = (known after apply)
+ revoke_rules_on_delete = false
+ tags_all      = (known after apply)
+ vpc_id        = "vpc-0c8a736872c56a149"
}

# module.Portfolio.aws_security_group.efs will be created
+ resource "aws_security_group" "efs" {
+   arn              = (known after apply)
+   description      = "Managed by Terraform"
+   egress           = (known after apply)
+   id               = (known after apply)
+   ingress          = (known after apply)
+   name             = "efs-mount-targets"
+   name_prefix      = (known after apply)
+   owner_id         = (known after apply)
+   revoke_rules_on_delete = false
+   tags_all         = (known after apply)
+   vpc_id           = "vpc-0c8a736872c56a149"
}

# module.Portfolio.aws_security_group_rule.efs_ingress_nfs will be created
+ resource "aws_security_group_rule" "efs_ingress_nfs" {
+   from_port        = 2049
+   id               = (known after apply)
+   protocol          = "tcp"
+   security_group_id = (known after apply)
+   security_group_rule_id = (known after apply)
+   self             = false
+   source_security_group_id = (known after apply)
+   to_port          = 2049
+   type             = "ingress"
}

Plan: 123 to add, 0 to change, 0 to destroy.
```

Note: You didn't use the -out option to save this plan, so Terraform can't guarantee to take exactly these actions if you run "terraform apply" now.

aditya@Aditya:~/IntelligentCloud\$

(Task 2)

Screenshot of the VPC ID in Terraform outputs

```
module.vpc.aws_route.private_nat_gateway[0]: Creation complete after 0s [id=r-rtb-0fb5725562e227aa41080289494]

Apply complete! Resources: 15 added, 0 changed, 0 destroyed.

Outputs:
vpc-id = "vpc-0b10c3a63ce09d298"
aditya@Aditya:~/IntelligentCloud/lab-vpc-adityashahar1$
```

(Task 3)

Screenshot of the script outputting VPC ID

```
ubuntu@ip-10-0-101-143:~$ TOKEN=$(curl -X PUT "http://169.254.169.254/latest/api/token" -H "X-aws-ec2-metadata-token-ttl-seconds: 21600")
MAC_ID=$(curl http://169.254.169.254/latest/meta-data/network/interfaces/macs/ -H "X-aws-ec2-metadata-token: $TOKEN")
VPC_ID=$(curl http://169.254.169.254/latest/meta-data/network/interfaces/macs/${MAC_ID}/vpc-id -H "X-aws-ec2-metadata-token: $TOKEN")

echo "My vpc-id is: $VPC_ID"
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload    Total   Spent    Left    Speed
100    56    100    56    0    0    38277    0 --:--:-- --:--:-- --:--:-- 56000
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload    Total   Spent    Left    Speed
100    18    100    18    0    0   12162    0 --:--:-- --:--:-- --:--:-- 18000
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload    Total   Spent    Left    Speed
100    21    100    21    0    0   17964    0 --:--:-- --:--:-- --:~:~:~ 21000
My vpc-id is: vpc-0b10c3a63ce09d298
ubuntu@ip-10-0-101-143:~$
```

(Task 4)

Screenshot of the ping successfully hitting the private IP address

```
ubuntu@ip-10-0-101-143: $ ping 10.0.1.115 -w 4
PING 10.0.1.115 (10.0.1.115) 56(84) bytes of data.
--- 10.0.1.115 ping statistics ---
4 packets transmitted, 0 received, 100% packet loss, time 3068ms
ubuntu@ip-10-0-101-143: $
```

(Task 5)

Screenshot of the successful SSH into private instance and screenshot of ping hitting google.com

```
ubuntu@ip-10-0-101-143: $ ssh -i ~/key.pem ubuntu@10.0.1.194
The authenticity of host '10.0.1.194 (10.0.1.194)' can't be established.
ED25519 key fingerprint is SHA256:hVsDYeod/HcMWlv3ciKCFneJsF8NPTRlQm6MkcZwU4s.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.0.1.194' (ED25519) to the list of known hosts.
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-1012-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Mon Sep 22 03:46:32 UTC 2025

System load:  0.0           Temperature:   -273.1 C
Usage of /:   22.7% of 6.71GB Processes:      106
Memory usage: 23%          Users logged in: 0
Swap usage:   0%           IPv4 address for ens5: 10.0.1.194

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
```

```
ubuntu@ip-10-0-1-194: $ ping google.com
PING google.com (142.251.46.238) 56(84) bytes of data.
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=1 ttl=117 time=1.76 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=2 ttl=117 time=1.41 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=3 ttl=117 time=1.39 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=4 ttl=117 time=1.40 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=5 ttl=117 time=1.39 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=6 ttl=117 time=1.37 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=7 ttl=117 time=1.45 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=8 ttl=117 time=1.41 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=9 ttl=117 time=1.39 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=10 ttl=117 time=1.39 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=11 ttl=117 time=1.39 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=12 ttl=117 time=1.39 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=13 ttl=117 time=1.41 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=14 ttl=117 time=1.39 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=15 ttl=117 time=1.39 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=16 ttl=117 time=1.40 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=17 ttl=117 time=1.41 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=18 ttl=117 time=1.40 ms
64 bytes from sfo03s27-in-f14.1e100.net (142.251.46.238): icmp_seq=19 ttl=117 time=1.38 ms
^C
--- google.com ping statistics ---
19 packets transmitted, 19 received, 0% packet loss, time 18028ms
rtt min/avg/max/mdev = 1.373/1.417/1.759/0.081 ms
ubuntu@ip-10-0-1-194: $
```

1. One of the pain points of this lab was copying over old code from Lab: Compute and modifying some hard coded values to adjust it to our needs. Use what you learned from the self-study articles and today's lab to propose a cleaner way to create the EC2 instances and security groups.

Ans -

Copy-pasting old code was messy. A cleaner way is to use variables and modules instead of hard coding. For example, an EC2 module could take `subnet_id`, `sg_ids`, and `name` as inputs. Then creating a public or private instance is just a module call with different values. This keeps the code reusable, consistent, and much easier to maintain.

2. The VPC module automatically creates route tables for the subnets. What is the destination for the route to external traffic in the route table associated with the private subnet?

Ans -

The private subnet's route table sends all external traffic (0.0.0.0/0) to the NAT Gateway. This lets instances in the private subnet reach the internet, while still preventing inbound connections from the outside.