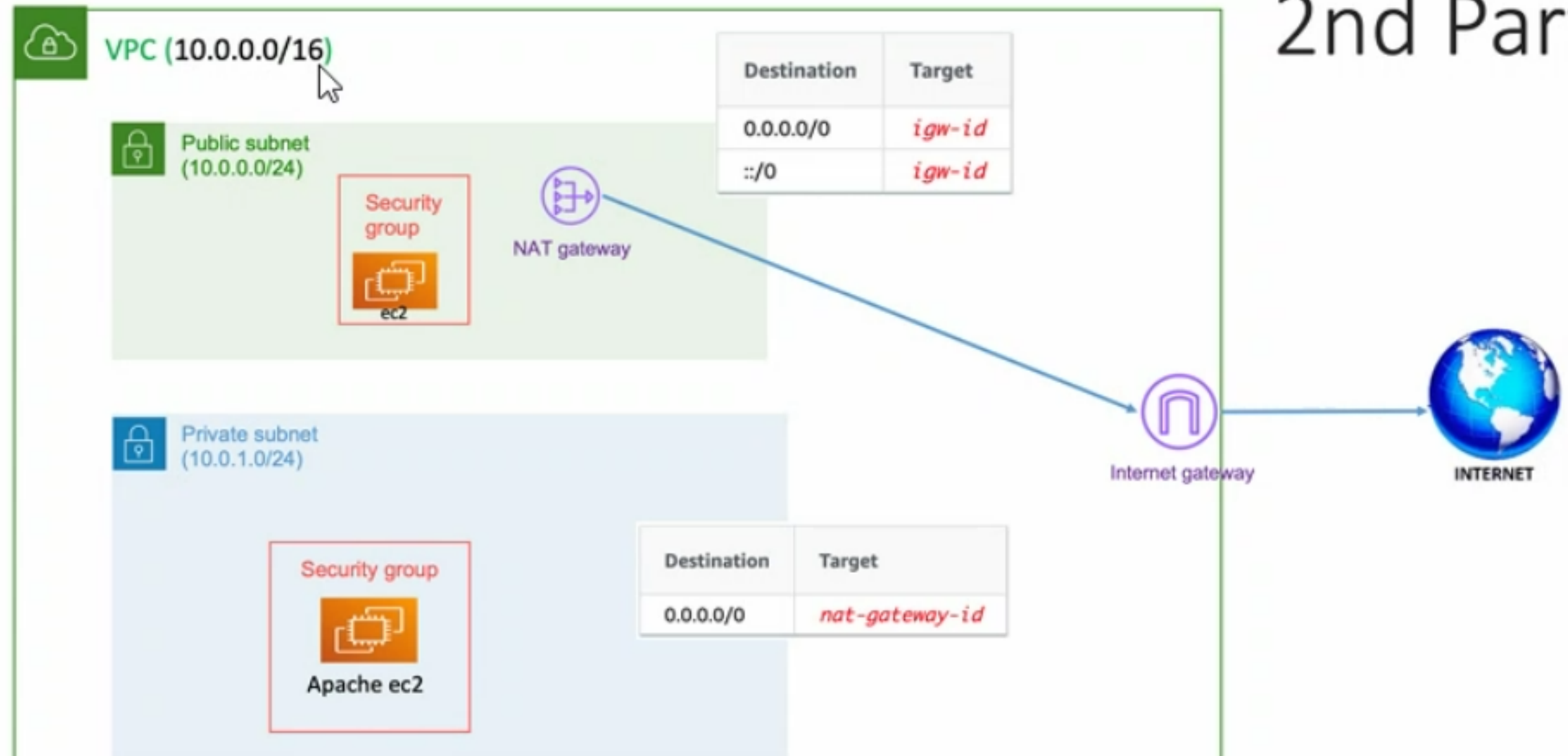


Lab2:

Use variables for all arguments, output `public_ip` , `private_ip` , screenshot of the public ip from the browser, private ip logs also use count for creating subnets.



Welcome to Esmael's Public instance - IP: 10.0.1.100





```
ubuntu@ip-10-0-1-100:~$ curl 10.0.1.100:80
```

```
Welcome to Esmael's Public instance - IP: 10.0.1.100
```

```
ubuntu@ip-10-0-1-100:~$
```

```
ubuntu@ip-10-0-2-46: ~
ubuntu@ip-10-0-1-100: ~$ curl 10.0.1.100:80
Welcome to Esmael's Public instance - IP: 10.0.1.100
ubuntu@ip-10-0-1-100: ~$ ssh -i "~/terraform.pem" ubuntu@10.0.2.46
The authenticity of host '10.0.2.46 (10.0.2.46)' can't be established.
ED25519 key fingerprint is SHA256:FwH5knPhZkkYauDXaAHD35x037qkQlwcC4QPjKrTz3Q.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.0.2.46' (ED25519) to the list of known hosts.
Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 6.8.0-1021-aws x86_64)

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

System information as of Mon Mar 24 13:52:04 UTC 2025

System load:  0.0          Processes:            107
Usage of /:   28.5% of 6.71GB Users logged in:      0
Memory usage: 22%         IPv4 address for enX0: 10.0.2.46
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

150 updates can be applied immediately
```



ubuntu@ip-10-0-2-46: ~



ubuntu@ip-10-0-2-46: ~



serverb@192:~



```
ubuntu@ip-10-0-2-46:~$ curl 10.0.2.46:80
Welcome to Esmael's Private instance - IP: 10.0.2.46
ubuntu@ip-10-0-2-46:~$
```

```
aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]
aws_route_table.private_rt: Creating...
aws_route_table.private_rt: Creation complete after 3s [id=rtb-0d3ce4bf8d82bbe93]
aws_route_table_association.private_assoc: Creating...
aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]
```

Apply complete! Resources: 16 added, 0 changed, 0 destroyed.

Outputs:

```
elastic_ip = "35.168.141.18"
private_apache_private_ip = "10.0.2.46"
public_apache_private_ip = "10.0.1.100"
public_apache_public_ip = "34.204.95.82"
[serverb@192 task2]$
```

←→↺🔒us-east-1.console.aws.amazon.com/ec2/home

aws

☰

🔍Search

[Alt+S]

📺

🔔

❓

⚙️

United States (N. Virginia) ▾

Mohamed_Esmael ▾

📁S3

👤IAM

🏠VPC

🖥️EC2

☰

EC2 > Instances

📄

🔍

💬

EC2

<

Dashboard

EC2 Global View

Events

▼ Instances

Instances

Instance Types

Launch Templates

Spot Requests

Savings Plans

Reserved Instances

Dedicated Hosts

Capacity Reservations

▼ Images

AMIs

AMI Catalog

▼ Elastic Block Store

Volumes

Snapshots

Instances (6) Info

Last updated less than a minute ago 🔄

Connect

Instance state ▾

Actions ▾

Launch instances

🔍 Find Instance by attribute or tag (case-sensitive)

All states ▾

< 1 > ⚙️

<input type="checkbox"/>	Name ✎	Instance ID	Instance state ▾	Instance type ▾	Status check	Alarm status	Availability Zone
<input type="checkbox"/>	apache_ec2_public	i-0a77d8d5380c93a51	⊖ Terminated 🔍 🔍	t2.micro	–	View alarms +	us-east-1a
<input type="checkbox"/>	Esmael_apache_ec2_private	i-054602d4427aae712	✅ Running 🔍 🔍	t2.micro	✅ 2/2 checks passed	View alarms +	us-east-1a
<input type="checkbox"/>	Esmael_apache_ec2_public	i-0bb9bb3175466ab7d	✅ Running 🔍 🔍	t2.micro	✅ 2/2 checks passed	View alarms +	us-east-1a

Select an instance

=

⚙️ ▾

🌀

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VPC dashboard <

EC2 Global View

Filter by VPC

Virtual private cloud

Your VPCs

Subnets

Route tables

Internet gateways

Egress-only internet gateways

Carrier gateways

DHCP option sets

Elastic IPs

Managed prefix lists

NAT gateways

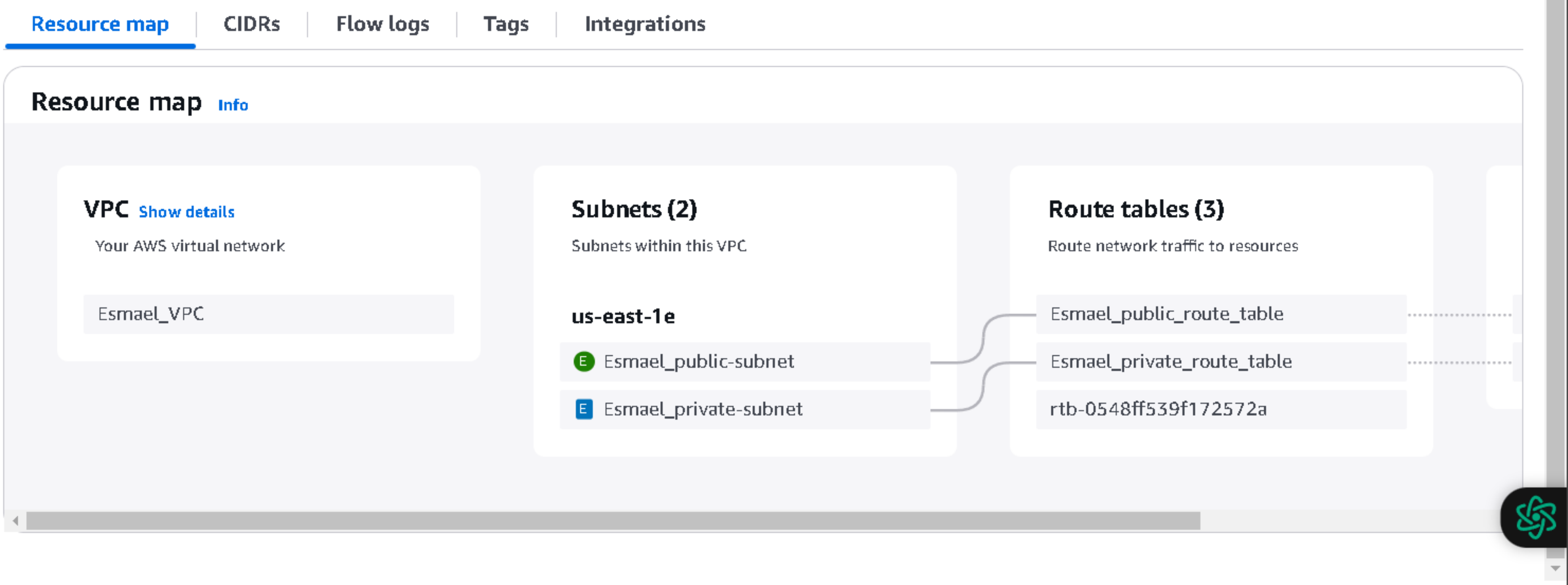
Peering connections

Security

Network ACLs

Security groups

Main network ACL acl-0ff53837f6ca8b34f	Default VPC No	IPv4 CIDR 10.0.0.0/16	IPv6 pool -
IPv6 CIDR (Network border group) -	Network Address Usage metrics Disabled	Route 53 Resolver DNS Firewall rule groups -	Owner ID 025066251600



EC2 Global View

EC2 Global View

Filter by VPC

▼ Virtual private cloud

Your VPCs

Subnets

Route tables

Internet gateways

Egress-only internet gateways

Carrier gateways

DHCP option sets

Elastic IPs

Managed prefix lists

NAT gateways

Peering connections

▼ Security

Network ACLs

Security groups

Main network ACL
acl-0ff53837f6ca8b34f

IPv6 CIDR (Network border group)

Default VPC
No

Network Address Usage metrics
Disabled

IPv4 CIDR
10.0.0.0/16

Route 53 Resolver DNS Firewall rule groups

IPv6 pool
—

Owner ID
025066251600

[Resource map](#) | [CIDRs](#) | [Flow logs](#) | [Tags](#) | [Integrations](#)

Resource map [Info](#)

Subnets (2)

Subnets within this VPC

us-east-1e

E Esmael_public-subnet

E Esmael_private-subnet

Route tables (3)

Route network traffic to resources

Esmael_public_route_table

Esmael_private_route_table

rtb-0548ff539f172572a

Network connections (2)


Connections to other networks

```
.. main_igw
```

.. Esmael_nat_gateway



VPC dashboard <

EC2 Global View 

Filter by VPC ▼

▼ Virtual private cloud

- Your VPCs
- Subnets
- Route tables
- Internet gateways
- Egress-only internet gateways
- Carrier gateways
- DHCP option sets
- Elastic IPs
- Managed prefix lists
- NAT gateways**
- Peering connections







▼ Security

- Network ACLs
- Security groups

nat-0f144026c96e38ef5 / Esmael_nat_gateway

Actions ▼

Details

NAT gateway ID  nat-0f144026c96e38ef5	Connectivity type Public	State  Available	State message Info –
NAT gateway ARN  arn:aws:ec2:us-east-1:025066251600:natgateway/nat-0f144026c96e38ef5	Primary public IPv4 address 35.168.141.18	Primary private IPv4 address  10.0.1.171	Primary network interface ID eni-05715fde1a6a4a92e 
VPC vpc-0ab1f8305092c70a0 / Esmael_VPC	Subnet subnet-01a96da5c8acf8741 / Esmael_public-subnet	Created  Monday, March 24, 2025 at 15:42:13 GMT+2	Deleted –

- Secondary IPv4 addresses
- Monitoring
- Tags**

Tags

Manage tags

 Search tags

< 1 > 

Key	Value
Name	Esmael_nat_gateway





▼

▼

Info




▼

<input type="checkbox"/>	Name	Subnet ID	State	VPC	
<input type="checkbox"/>	-	subnet-0bb5c7f151c754447	Available	vpc-010a1bb0e81ab03be	
<input type="checkbox"/>	public3	subnet-010a3468d0fbd8db1	Available	vpc-095bd4fe70782dc80 my-vpc	
<input type="checkbox"/>	Esmael_private-subnet	subnet-0de485d47ad14dff4	Available	vpc-0ab1f8305092c70a0 Esmael_VPC	
<input type="checkbox"/>	public4	subnet-0234d4731d9ac82d1	Available	vpc-095bd4fe70782dc80 my-vpc	
<input type="checkbox"/>	-	subnet-0cf99d384933db8f5	Available	vpc-010a1bb0e81ab03be	
<input type="checkbox"/>	Esmael_public-subnet	subnet-01a96da5c8acf8741	Available	vpc-0ab1f8305092c70a0 Esmael_VPC	
<input type="checkbox"/>	-	subnet-0d793c4d8d04f9d90	Available	vpc-010a1bb0e81ab03be	


Select a subnet





EXPLORER

- UNTITLED
- aws
- terraform
 - .terraform
 - task2
 - .terraform
 - .terraform.lock.hcl
 - keypairs.tf**
 - main.tf
 - outputs.tf
 - provider.tf
 - terraform.tfstate
 - terraform.tfstate...
 - terraform.tfvars
 - variables.tf

```
terraform > task2 >  keypairs.tf
```

```

1 resource "tls_private_key" "esmael_key" {
2   algorithm = "RSA"
3   rsa_bits  = 4096
4 }
5
6 resource "aws_key_pair" "esmael_keypair" {
7   key_name     = "esmael_key"
8   public_key   = tls_private_key.esmael_key.public_key_openssh
9 }
10
11 resource "null_resource" "generate_key_file" {
12   provisioner "local-exec" {
13     command = "echo '${tls_private_key.esmael_key.private_key}'"
14   }
15
16   depends_on = [aws_key_pair.esmael_keypair]
17 }
18

```

[illegible]

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

bash - task2 + ▾ □ ☒ ... ^ ×

```
aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]
aws_route_table.private_rt: Creating...
aws_route_table.private_rt: Creation complete after 3s [id=rtb-0d3ce4bf8d82bbe93]
aws_route_table_association.private_assoc: Creating...
aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]
```

Apply complete! Resources: 16 added, 0 changed, 0 destroyed.

Outputs:

```
elastic_ip = "35.168.141.18"
private_apache_private_ip = "10.0.2.46"
public_apache_private_ip = "10.0.1.100"
public_apache_public_ip = "34.204.95.82"
```


bash - task2 + ▢ ▢ ... ^ ×

```
elastic_ip = "35.168.141.18"
private_apache_private_ip = "10.0.2.46"
public_apache_private_ip = "10.0.1.100"
public_apache_public_ip = "34.204.95.82"
```


Home

serverb_GUI

ActivitiesVisual Studio Code

Mar 24 16:02

Activities

FileEditSelectionViewGoRunTerminalHelp

Untitled (Workspace)

EXPLORER

UNTITLED...

aws

terraform

.terraform

task2

.terraform

.terraform.lock.hcl

keypairs.tf

main.tf

outputs.tf

provider.tf

terraform.tfstate

terraform.tfstate.b...

terraform.tfvars

variables.tf

.terraform.lock.hcl

main.tf

provider.tf

terraform.tfstate

terraform.tfstate.b...

task2 > provider.tf

1 provider "aws" {

2 region = var.region

3 }

4

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PORTS

bash - task2

aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]

aws_route_table.private_rt: Creating...

aws_route_table.private_rt: Creation complete after 3s [id=rtb-0d3ce4bf8d82bbe93]

aws_route_table_association.private_assoc: Creating...

aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]

Apply complete! Resources: 16 added, 0 changed, 0 destroyed.

Outputs:

elastic_ip = "35.168.141.18"

private_apache_private_ip = "10.0.2.46"

public_apache_private_ip = "10.0.1.100"

public_apache_public_ip = "34.204.95.82"

[illegible]

©


```
≡ terraform.tfstate.b...
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]
aws_route_table.private_rt: Creating...
aws_route_table.private_rt: Creation complete after 3s [id=rtb-0d3ce4bf8d82bbe93]
aws_route_table_association.private_assoc: Creating...
aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]
```

Apply complete! Resources: 16 added, 0 changed, 0 destroyed.

Outputs:

```
elastic_ip = "35.168.141.18"
private_apache_private_ip = "10.0.2.46"
public_apache_private_ip = "10.0.1.100"
public_apache_public_ip = "34.204.95.82"
```

> OUTLINE

Welcome provider.tf variables.tf x

```
terraform > task2 >  variables.tf
```

```
1 variable "region" {
2   type           = string
3   default        = "us-east-1"
4 }
```

```
6 variable "vpc_cidr" {
7   type      = string
8   default   = "10.0.0.0/16"
9 }
```

```
11 variable "public_subnet_cidrs" {
12   type      = list(string)
13   default   = ["10.0.1.0/24"]
14 }
```

```
16 variable "private_subnet_cidrs" {
17     type           = list(string)
18     default        = ["10.0.2.0/24"]
19 }
```

```
21 variable "instance_type" {
22     type          = string
23     default       = "t2.micro"
24 }
```

```
26 variable "aws ami" {
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]
aws_route_table.private_rt: Creating...
aws_route_table.private_rt: Creation complete after 3s [id=rtb-0d3ce4bf8d82bbe93]
aws_route_table_association.private_assoc: Creating...
aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]
```

Apply complete! Resources: 16 added, 0 changed, 0 destroyed.

Outputs:

```
elastic_ip = "35.168.141.18"
private_apache_private_ip = "10.0.2.46"
public_apache_private_ip = "10.0.1.100"
public_apache_public_ip = "34.204.95.82"
```

2. 70
 2. 70
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 2. 70

Home

serverb_GUI

ActivitiesVisual Studio Code

Mar 24 16:02

FileEditSelectionViewGoRunTerminalHelp

Untitled (Workspace)

EXPLORER

UNTIT...

+

+

↺

📄

> aws

> terraform

> .terraform

> task2

> .terraform

terraform.lock.hcl

keypairs.tf

main.tf

outputs.tf

provider.tf

terraform.tfstate

terraform.tfstate...

terraform.tfvars

variables.tf

terraform.lock.hcl

main.tf

provider.tf

terraform.tfstate

terraform.tfstate.b...

main.tf terraform • task2

keypairs.tf

outputs.tf

terraform.tfvars

main.tf terraform

terraform > task2 > main.tf

1 resource "aws_vpc" "main" {

2 cidr_block = var.vpc_cidr

3 tags = {

4 Name = "Esmael_VPC"

5 }

6 }

7

8 resource "aws_subnet" "public_subnet" {

9 vpc_id = aws_vpc.main.id

10 cidr_block = var.public_subnet_cidrs[0]

11 map_public_ip_on_launch = true

12 tags = {

13 Name = var.subnet_name[0]

14 }

15 }

16

17 resource "aws_subnet" "private_subnet" {

18 vpc_id = aws_vpc.main.id

19 cidr_block = var.private_subnet_cidrs[0]

20 tags = {

21 Name = var.subnet_name[2]

22 }

23 }

24

25 resource "aws_internet_gateway" "igw" {

26 vpc_id = aws_vpc.main.id

aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]

aws_route_table.private_rt: Creating...

aws_route_table.private_rt: Creation complete after 3s [id=rtb-0d3ce4bf8d82bbe93]

aws_route_table_association.private_assoc: Creating...

aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]

Apply complete! Resources: 16 added, 0 changed, 0 destroyed.

Outputs:

elastic_ip = "35.168.141.18"

private_apache_private_ip = "10.0.2.46"

public_apache_private_ip = "10.0.1.100"

public_apache_public_ip = "34.204.95.82"

Home

serverb_GUI

ActivitiesVisual Studio Code

Mar 24 16:03

FileEditSelectionViewGoRunTerminalHelp

Untitled (Workspace)

File Explorer

EXPLORER

UNTIT...

aws

terraform

task2

main.tf

outputs.tf

provider.tf

terraform.tfstate

terraform.tfstate....

terraform.tfvars

variables.tf

terraform.lock.hcl

main.tf

provider.tf

terraform.tfstate

terraform.tfstate.b...

terraform > task2 > main.tf

25 resource "aws_internet_gateway" "igw" {
26 vpc_id = aws_vpc.main.id
27 tags = {
28 Name = "main_igw"
29 }
30 }
31
32 resource "aws_eip" "nat_eip" {
33 domain = "vpc"
34 }
35
36 resource "aws_nat_gateway" "nat" {
37 allocation_id = aws_eip.nat_eip.id
38 subnet_id = aws_subnet.public_subnet.id
39 tags = {
40 Name = "Esmael_nat_gateway"
41 }
42 }
43
44 resource "aws_route_table" "public_rt" {
45 vpc_id = aws_vpc.main.id
46 route {
47 cidr_block = "0.0.0.0/0"
48 gateway_id = aws_internet_gateway.igw.id
49 }
50 tags = {
51 Name = "public_route"
52 }
53 }

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PORTS


bash - task2

aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]
aws_route_table.private_rt: Creating...
aws_route_table.private_rt: Creation complete after 3s [id=rtb-0d3ce4bf8d82bbe93]
aws_route_table_association.private_assoc: Creating...
aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]

Apply complete! Resources: 16 added, 0 changed, 0 destroyed.

Outputs:

elastic_ip = "35.168.141.18"
private_apache_private_ip = "10.0.2.46"
public_apache_private_ip = "10.0.1.100"
public_apache_public_ip = "34.204.95.82"


```
terraform > task2 >  main.tf
```

```

54
55 resource "aws_route_table_association" "public_assoc" {
56     subnet_id      = aws_subnet.public_subnet.id
57     route_table_id = aws_route_table.public_rt.id
58 }
59
60 resource "aws_route_table" "private_rt" {
61     vpc_id = aws_vpc.main.id
62     route {
63         cidr_block      = "0.0.0.0/0"
64         nat_gateway_id = aws_nat_gateway.nat.id
65     }
66     tags = {
67         Name = "Esmael_private_route_table"
68     }
69 }
70
71 resource "aws_route_table_association" "private_assoc" {
72     subnet_id      = aws_subnet.private_subnet.id
73     route_table_id = aws_route_table.private_rt.id
74 }
75
76 resource "aws_security_group" "apache_sg" {
77     name      = "Esmael_apache_sg"
78     description = "Allow inbound HTTP and SSH"
79     vpc_id    = aws_vpc.main.id

```

[illegible]

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]
aws_route_table.private_rt: Creating...
aws_route_table.private_rt: Creation complete after 3s [id=rtb-0d3ce4bf8d82bbe93]
aws_route_table_association.private_assoc: Creating...
aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]
```

Apply complete! Resources: 16 added, 0 changed, 0 destroyed.

Outputs:

```
elastic_ip = "35.168.141.18"
private_apache_private_ip = "10.0.2.46"
public_apache_private_ip = "10.0.1.100"
public_apache_public_ip = "34.204.95.82"
```


Home

serverb_GUI

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Mar 24 16:04

FileEditSelectionViewGoRunTerminalHelp

Untitled (Workspace)

EXPLORER

UNTITLED (WORKSPACE)

aws

terraform

.terraform

task2

.terraform

.terraform.lock.hcl

keypairs.tf

main.tf

outputs.tf

provider.tf

terraform.tfstate

terraform.tfstate....

terraform.tfvars

variables.tf

.terraform.lock.hcl

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terraform.tfstate

terraform.tfstate.b...

main.tf

provider.tf

variables.tf

.terraform.lock.hcl

main.tf

keypairs.tf

outputs.tf

terraform.tfvars

main.tf terraform

terraform > task2 > main.tf

112 resource "aws_instance" "Esmael_apache_ec2_public" {

131 }

132

133 resource "aws_instance" "Esmael_apache_ec2_private" {

134 ami = var.aws_ami

135 instance_type = var.instance_type

136 subnet_id = aws_subnet.private_subnet.id

137 vpc_security_group_ids = [aws_security_group.apache_sg.id]

138 associate_public_ip_address = false

139 user_data = <<-EOF

140 #!/bin/bash

141 sudo apt update -y

142 sudo apt install -y apache2

143 echo "Welcome to Esmael's Private instance - IP: \$(hostname -I)" > /var/www/html/index.html

144 sudo systemctl start apache2

145 sudo systemctl enable apache2

146 sudo systemctl restart apache2

147 EOF

148 key_name = aws_key_pair.esmael_keypair.key_name

149 tags = {

150 Name = "Esmael_apache_ec2_private"

151 }

152 }

153

154

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PORTS

bash - task2

aws_nat_gateway.nat: Creation complete after 1m39s [id=nat-0f144026c96e38ef5]

aws_route_table.private_rt: Creating...

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aws_route_table_association.private_assoc: Creating...

aws_route_table_association.private_assoc: Creation complete after 2s [id=rtbassoc-0df194b5c01d183db]

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Outputs:

elastic_ip = "35.168.141.18"

private_apache_private_ip = "10.0.2.46"

public_apache_private_ip = "10.0.1.100"

public_apache_public_ip = "34.204.95.82"