School of Computer Science

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
DEHRADUN, UTTARAKHAND

System Provisioning and Configuration Management

Assignment-1
6th Semester

Submitted To:

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Batch - 1

ASSIGNMENT 1

Write Terraform script to do perform following tasks on AWS cloud Platform

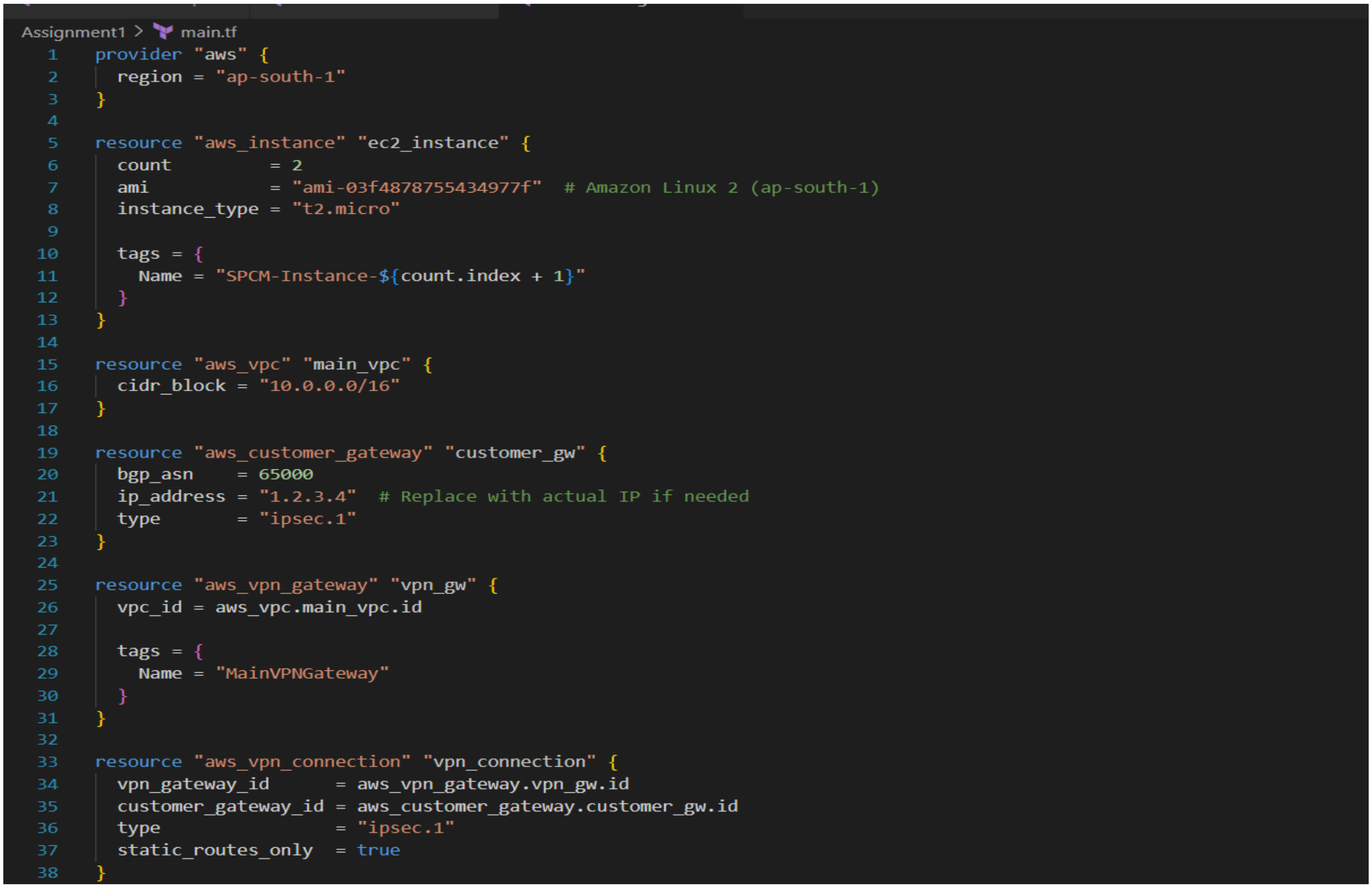
Step 1: Create two T2 Micro EC2 Instances.

Step2: Create a VPN on AWS

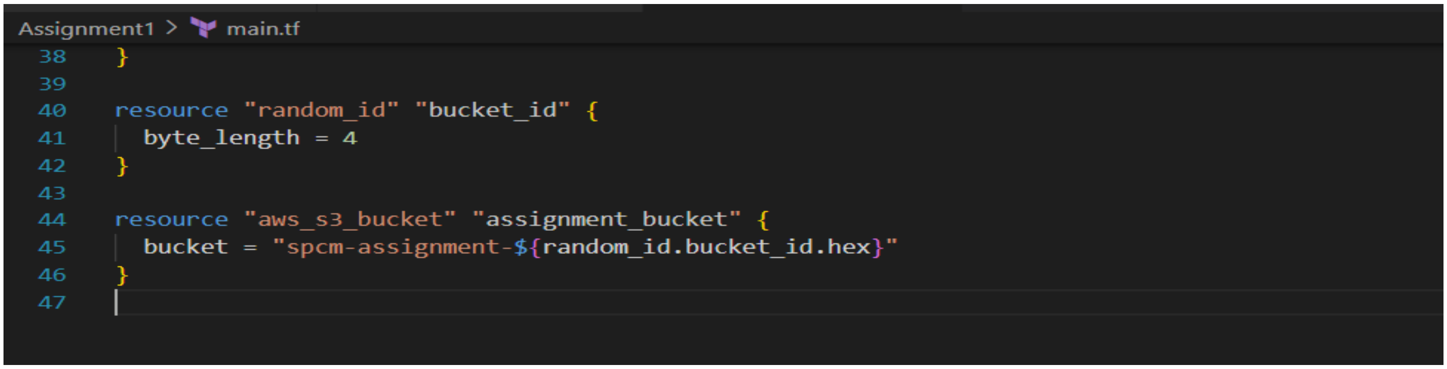
Step 3: Create a S3 Bucket

Step 4: Write the code for step 1,2 and 3 in a IaC terraform file and run terraform commands to execute these steps.

→Create the Terraform Script:

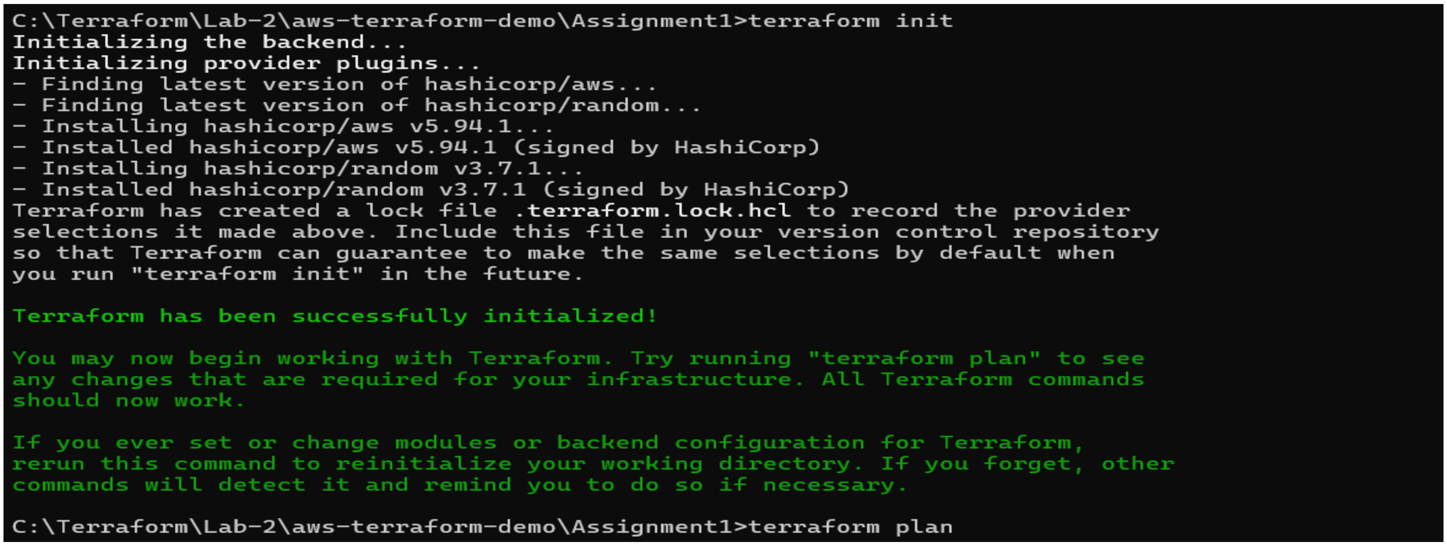


```
provider "aws" {
  region = "ap-south-1"
}

resource "aws_instance" "ec2_instance" {
  count         = 2
  ami           = "ami-03f4878755434977f"  # Amazon Linux 2 (ap-south-1)
  instance_type = "t2.micro"

  tags = {
    Name = "SPCM-Instance-${count.index + 1}"
  }
}

resource "aws_vpc" "main_vpc" {
  cidr_block = "10.0.0.0/16"
}

resource "aws_customer_gateway" "customer_gw" {
  bgp_asn    = 65000
  ip_address = "1.2.3.4"  # Replace with actual IP if needed
  type       = "ipsec.1"
}

resource "aws_vpn_gateway" "vpn_gw" {
  vpc_id = aws_vpc.main_vpc.id

  tags = {
    Name = "MainVPNGateway"
  }
}

resource "aws_vpn_connection" "vpn_connection" {
  vpn_gateway_id      = aws_vpn_gateway.vpn_gw.id
  customer_gateway_id = aws_customer_gateway.customer_gw.id
  type                = "ipsec.1"
  static_routes_only  = true
}
```



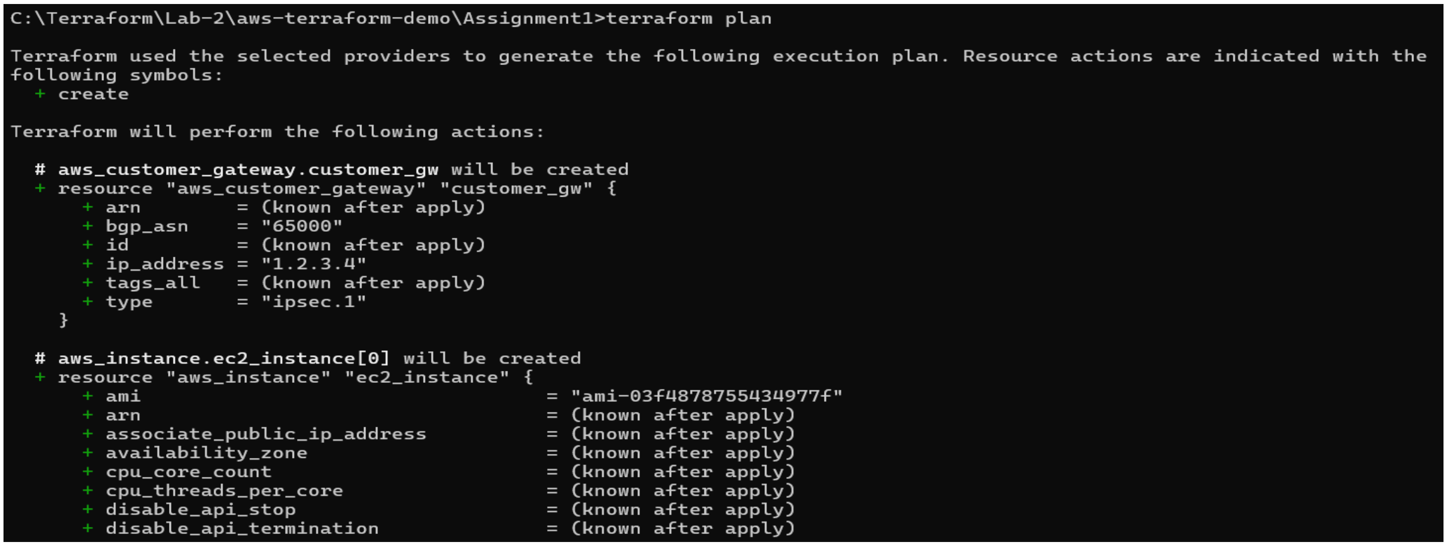
```
}

resource "random_id" "bucket_id" {
  byte_length = 4
}

resource "aws_s3_bucket" "assignment_bucket" {
  bucket = "spcm-assignment-${random_id.bucket_id.hex}"
}

```

→terraform init Output:

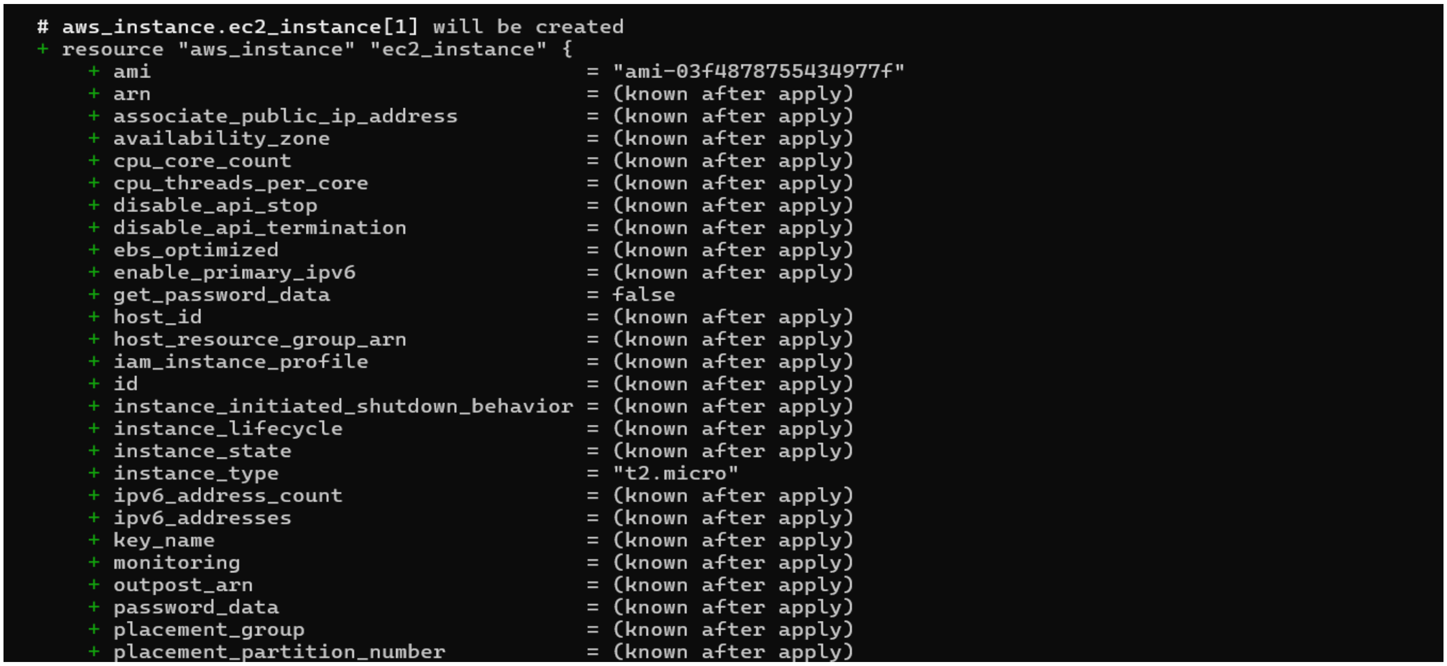


```
C:\Terraform\Lab-2\aws-terraform-demo\Assignment1>terraform init
Initializing the backend...
Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Finding latest version of hashicorp/random...
- Installing hashicorp/aws v5.94.1...
- Installed hashicorp/aws v5.94.1 (signed by HashiCorp)
- Installing hashicorp/random v3.7.1...
- Installed hashicorp/random v3.7.1 (signed by HashiCorp)
Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.

C:\Terraform\Lab-2\aws-terraform-demo\Assignment1>terraform plan
```

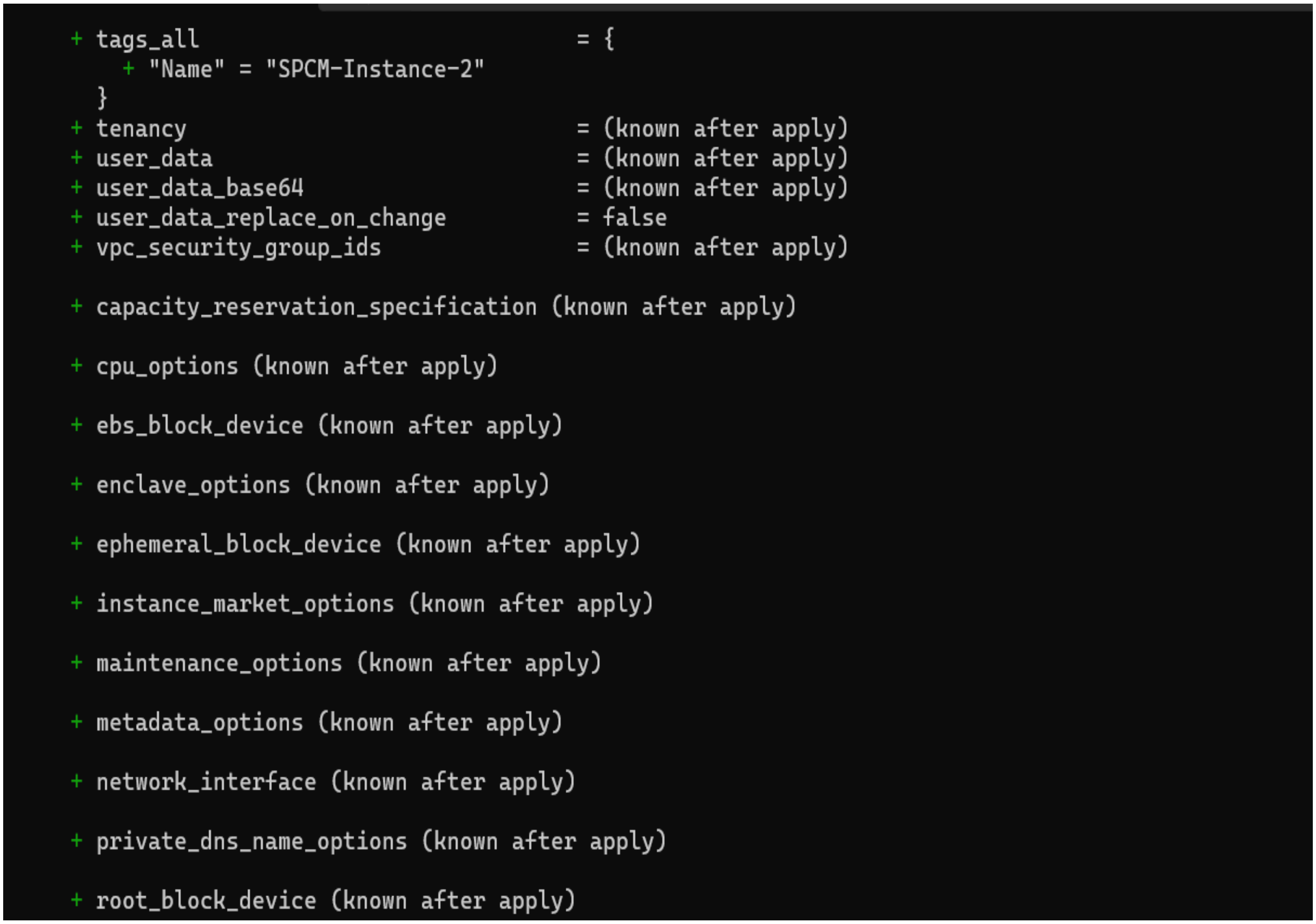
→terraform plan Output:



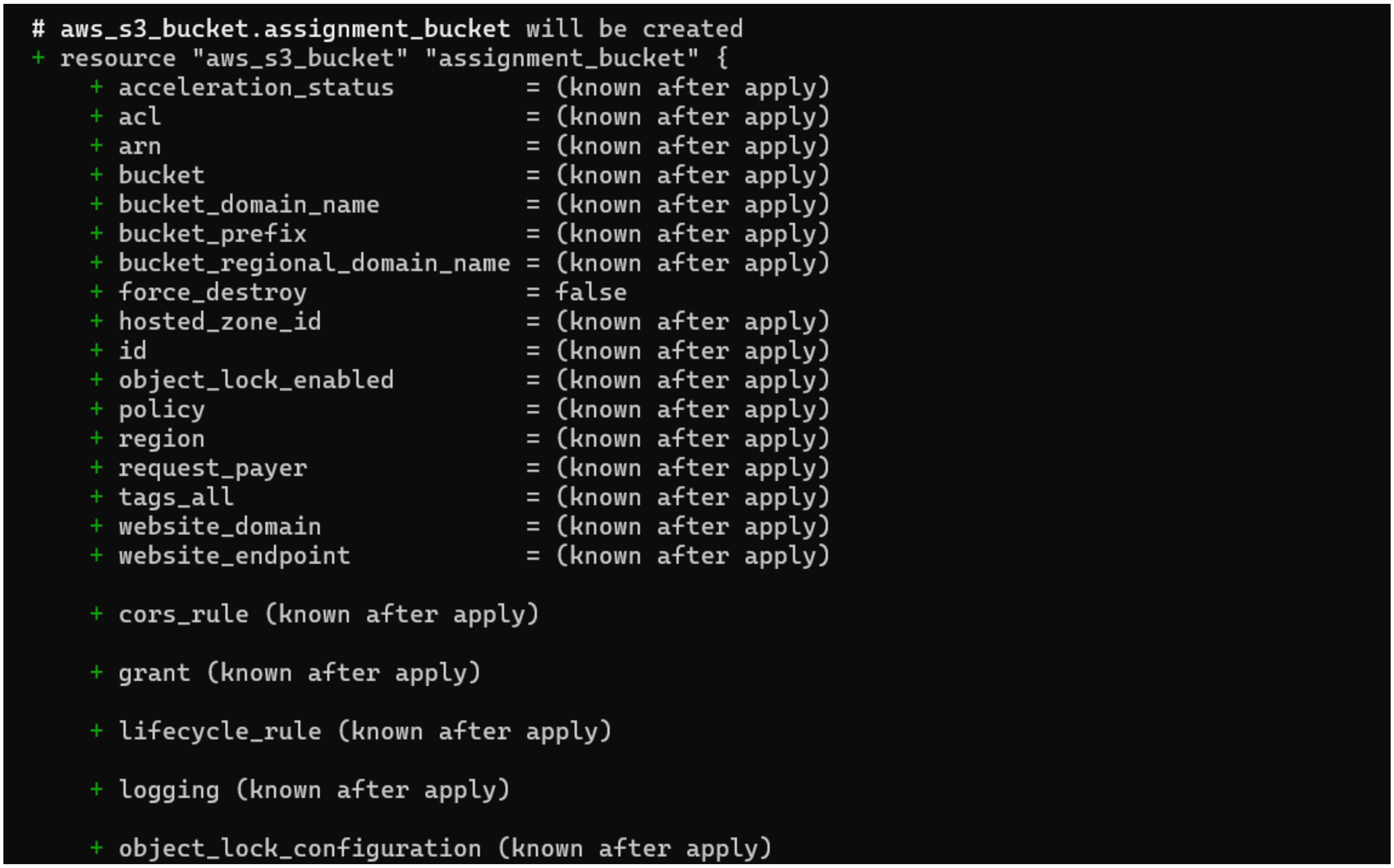
```
C:\Terraform\Lab-2\aws-terraform-demo\Assignment1>terraform plan

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the
following symbols:
  + create

Terraform will perform the following actions:

  # aws_customer_gateway.customer_gw will be created
  + resource "aws_customer_gateway" "customer_gw" {
      + arn        = (known after apply)
      + bgp_asn    = "65000"
      + id         = (known after apply)
      + ip_address = "1.2.3.4"
      + tags_all   = (known after apply)
      + type       = "ipsec.1"
    }

  # aws_instance.ec2_instance[0] will be created
  + resource "aws_instance" "ec2_instance" {
      + ami                                  = "ami-03f4878755434977f"
      + arn                                  = (known after apply)
      + associate_public_ip_address          = (known after apply)
      + availability_zone                    = (known after apply)
      + cpu_core_count                       = (known after apply)
      + cpu_threads_per_core                 = (known after apply)
      + disable_api_stop                     = (known after apply)
      + disable_api_termination              = (known after apply)
```



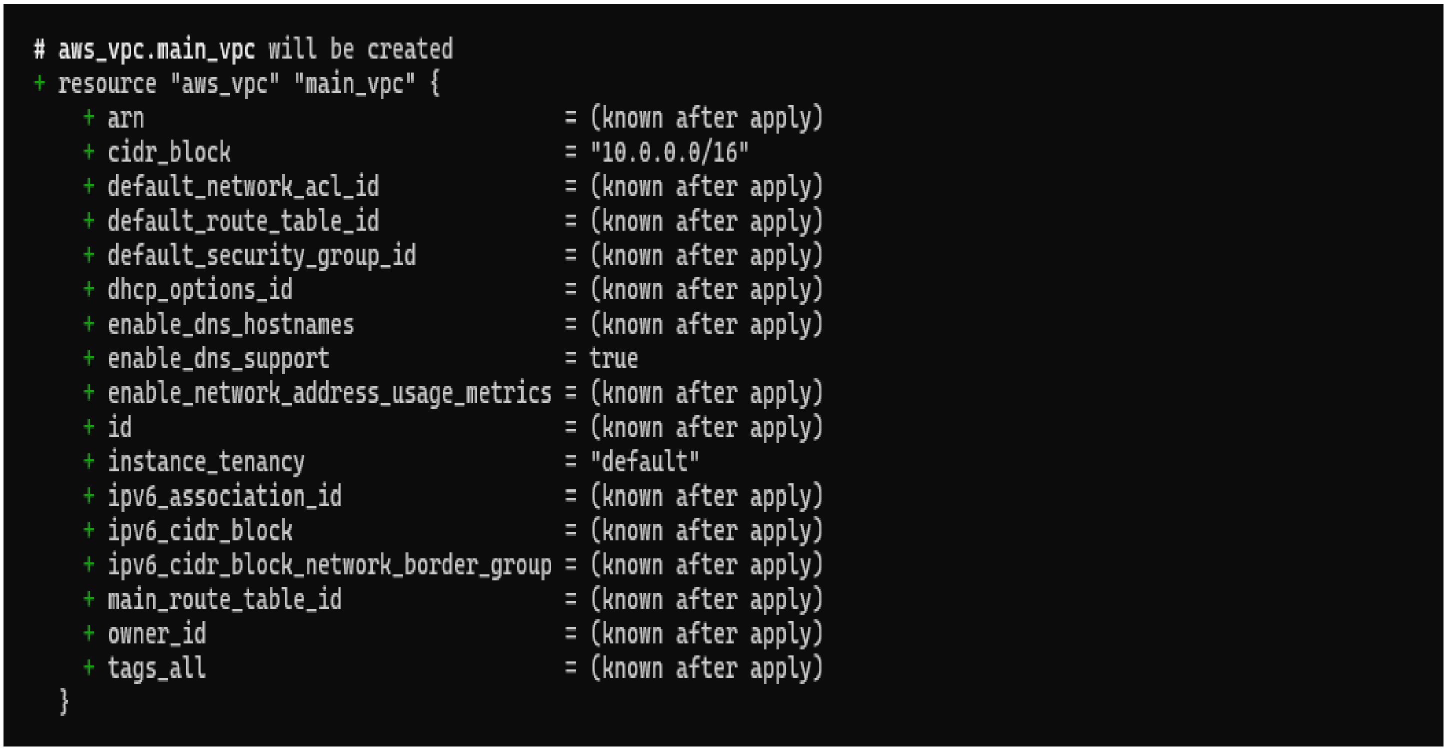
```
  # aws_instance.ec2_instance[1] will be created
  + resource "aws_instance" "ec2_instance" {
      + ami                                  = "ami-03f4878755434977f"
      + arn                                  = (known after apply)
      + associate_public_ip_address          = (known after apply)
      + availability_zone                    = (known after apply)
      + cpu_core_count                       = (known after apply)
      + cpu_threads_per_core                 = (known after apply)
      + disable_api_stop                     = (known after apply)
      + disable_api_termination              = (known after apply)
      + ebs_optimized                        = (known after apply)
      + enable_primary_ipv6                  = (known after apply)
      + get_password_data                    = false
      + host_id                              = (known after apply)
      + host_resource_group_arn              = (known after apply)
      + iam_instance_profile                 = (known after apply)
      + id                                   = (known after apply)
      + instance_initiated_shutdown_behavior = (known after apply)
      + instance_lifecycle                   = (known after apply)
      + instance_state                       = (known after apply)
      + instance_type                        = "t2.micro"
      + ipv6_address_count                   = (known after apply)
      + ipv6_addresses                       = (known after apply)
      + key_name                             = (known after apply)
      + monitoring                           = (known after apply)
      + outpost_arn                          = (known after apply)
      + password_data                        = (known after apply)
      + placement_group                      = (known after apply)
      + placement_partition_number           = (known after apply)
```



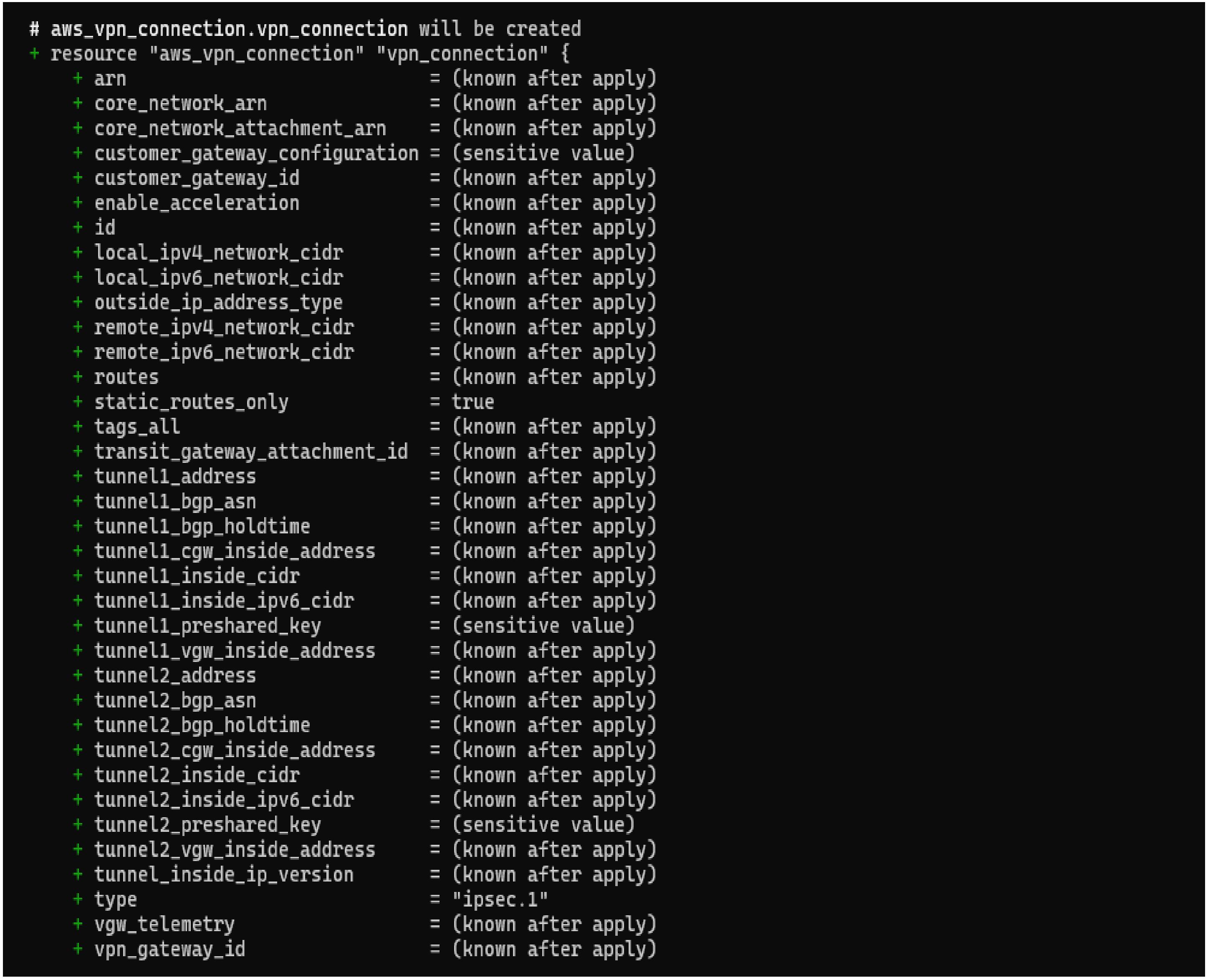
```
      + tags_all                             = {
          + "Name" = "SPCM-Instance-2"
        }
      + tenancy                              = (known after apply)
      + user_data                            = (known after apply)
      + user_data_base64                     = (known after apply)
      + user_data_replace_on_change          = false
      + vpc_security_group_ids               = (known after apply)

      + capacity_reservation_specification (known after apply)

      + cpu_options (known after apply)

      + ebs_block_device (known after apply)

      + enclave_options (known after apply)

      + ephemeral_block_device (known after apply)

      + instance_market_options (known after apply)

      + maintenance_options (known after apply)

      + metadata_options (known after apply)

      + network_interface (known after apply)

      + private_dns_name_options (known after apply)

      + root_block_device (known after apply)
```



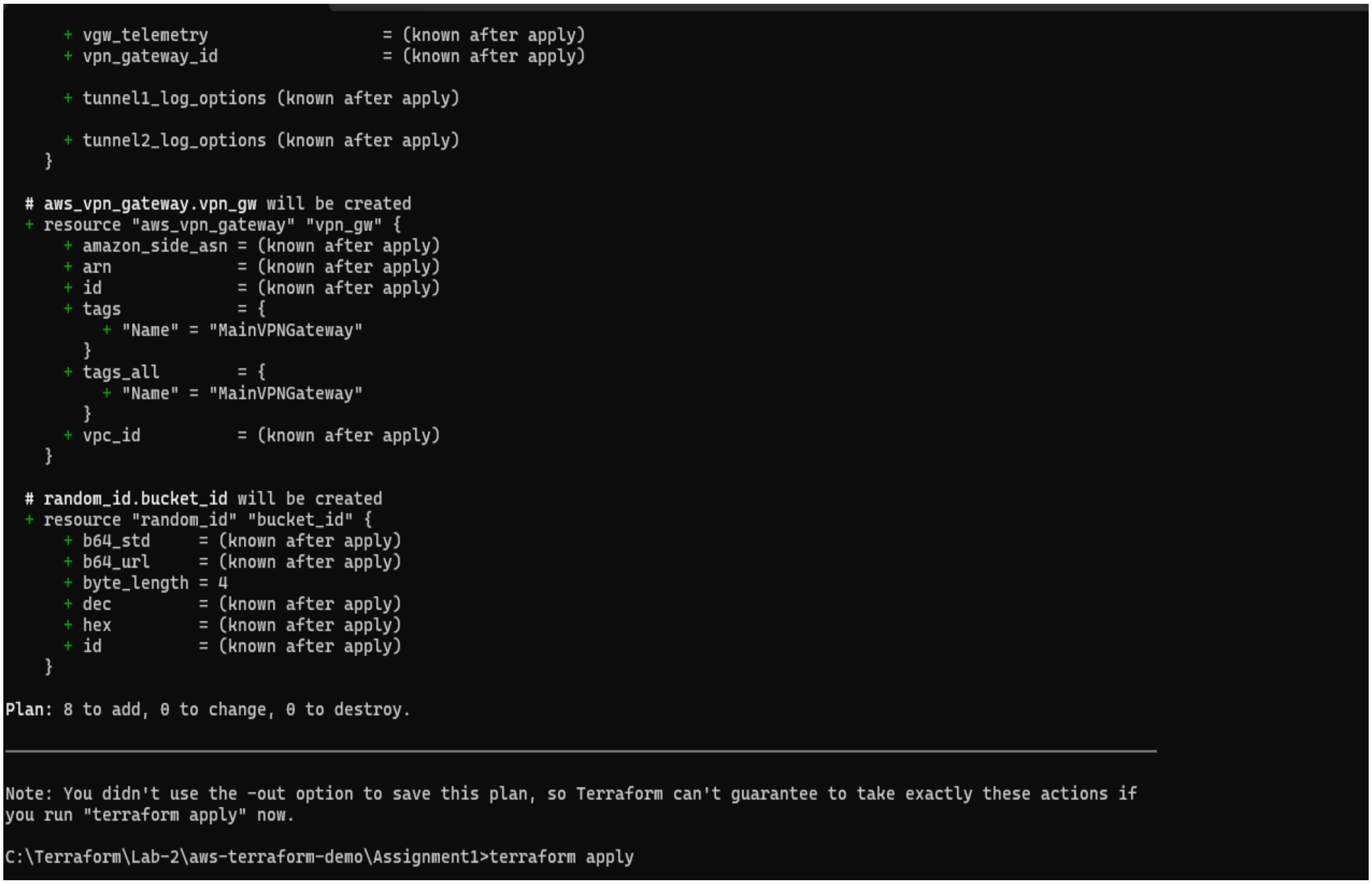
```
  # aws_s3_bucket.assignment_bucket will be created
  + resource "aws_s3_bucket" "assignment_bucket" {
      + acceleration_status         = (known after apply)
      + acl                         = (known after apply)
      + arn                         = (known after apply)
      + bucket                      = (known after apply)
      + bucket_domain_name          = (known after apply)
      + bucket_prefix               = (known after apply)
      + bucket_regional_domain_name = (known after apply)
      + force_destroy               = false
      + hosted_zone_id              = (known after apply)
      + id                          = (known after apply)
      + object_lock_enabled         = (known after apply)
      + policy                      = (known after apply)
      + region                      = (known after apply)
      + request_payer               = (known after apply)
      + tags_all                    = (known after apply)
      + website_domain              = (known after apply)
      + website_endpoint            = (known after apply)

      + cors_rule (known after apply)

      + grant (known after apply)

      + lifecycle_rule (known after apply)

      + logging (known after apply)

      + object_lock_configuration (known after apply)
```



```
  # aws_vpc.main_vpc will be created
  + resource "aws_vpc" "main_vpc" {
      + arn                                  = (known after apply)
      + cidr_block                           = "10.0.0.0/16"
      + default_network_acl_id               = (known after apply)
      + default_route_table_id               = (known after apply)
      + default_security_group_id            = (known after apply)
      + dhcp_options_id                      = (known after apply)
      + enable_dns_hostnames                 = (known after apply)
      + enable_dns_support                   = true
      + enable_network_address_usage_metrics = (known after apply)
      + id                                   = (known after apply)
      + instance_tenancy                     = "default"
      + ipv6_association_id                  = (known after apply)
      + ipv6_cidr_block                      = (known after apply)
      + ipv6_cidr_block_network_border_group = (known after apply)
      + main_route_table_id                  = (known after apply)
      + owner_id                             = (known after apply)
      + tags_all                             = (known after apply)
    }
```



```
  # aws_vpn_connection.vpn_connection will be created
  + resource "aws_vpn_connection" "vpn_connection" {
      + arn                            = (known after apply)
      + core_network_arn               = (known after apply)
      + core_network_attachment_arn    = (known after apply)
      + customer_gateway_configuration = (sensitive value)
      + customer_gateway_id            = (known after apply)
      + enable_acceleration            = (known after apply)
      + id                             = (known after apply)
      + local_ipv4_network_cidr        = (known after apply)
      + local_ipv6_network_cidr        = (known after apply)
      + outside_ip_address_type        = (known after apply)
      + remote_ipv4_network_cidr       = (known after apply)
      + remote_ipv6_network_cidr       = (known after apply)
      + routes                         = (known after apply)
      + static_routes_only             = true
      + tags_all                       = (known after apply)
      + transit_gateway_attachment_id  = (known after apply)
      + tunnel1_address                = (known after apply)
      + tunnel1_bgp_asn                = (known after apply)
      + tunnel1_bgp_holdtime           = (known after apply)
      + tunnel1_cgw_inside_address     = (known after apply)
      + tunnel1_inside_cidr            = (known after apply)
      + tunnel1_inside_ipv6_cidr       = (known after apply)
      + tunnel1_preshared_key          = (sensitive value)
      + tunnel1_vgw_inside_address     = (known after apply)
      + tunnel2_address                = (known after apply)
      + tunnel2_bgp_asn                = (known after apply)
      + tunnel2_bgp_holdtime           = (known after apply)
      + tunnel2_cgw_inside_address     = (known after apply)
      + tunnel2_inside_cidr            = (known after apply)
      + tunnel2_inside_ipv6_cidr       = (known after apply)
      + tunnel2_preshared_key          = (sensitive value)
      + tunnel2_vgw_inside_address     = (known after apply)
      + tunnel_inside_ip_version       = (known after apply)
      + type                           = "ipsec.1"
      + vgw_telemetry                  = (known after apply)
      + vpn_gateway_id                 = (known after apply)
```



```
      + vgw_telemetry                  = (known after apply)
      + vpn_gateway_id                 = (known after apply)

      + tunnel1_log_options (known after apply)

      + tunnel2_log_options (known after apply)
    }

  # aws_vpn_gateway.vpn_gw will be created
  + resource "aws_vpn_gateway" "vpn_gw" {
      + amazon_side_asn = (known after apply)
      + arn             = (known after apply)
      + id              = (known after apply)
      + tags            = {
          + "Name" = "MainVPNGateway"
        }
      + tags_all        = {
          + "Name" = "MainVPNGateway"
        }
      + vpc_id          = (known after apply)
    }

  # random_id.bucket_id will be created
  + resource "random_id" "bucket_id" {
      + b64_std     = (known after apply)
      + b64_url     = (known after apply)
      + byte_length = 4
      + dec         = (known after apply)
      + hex         = (known after apply)
      + id          = (known after apply)
    }

Plan: 8 to add, 0 to change, 0 to destroy.

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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.

C:\Terraform\Lab-2\aws-terraform-demo\Assignment1>terraform apply
```
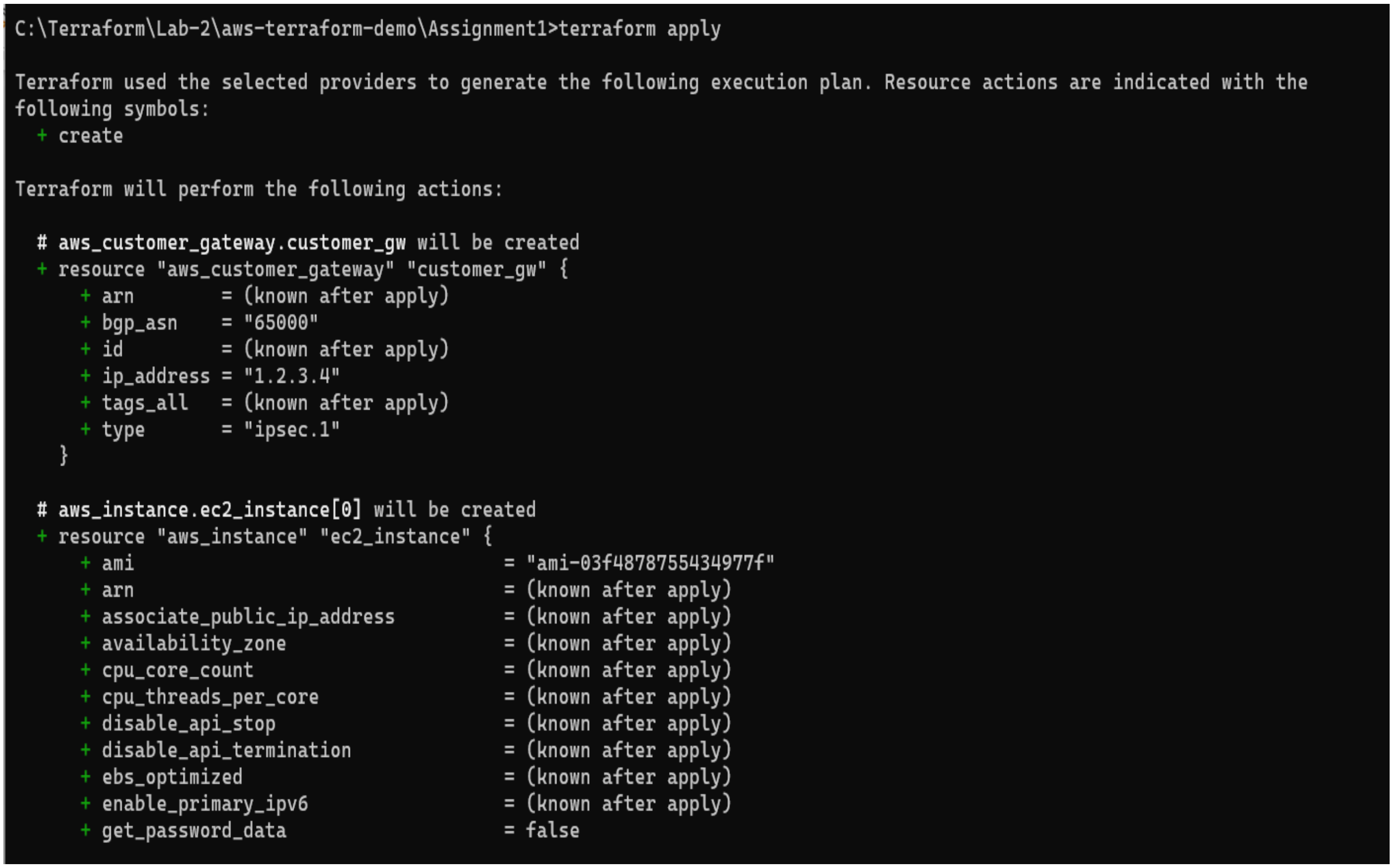
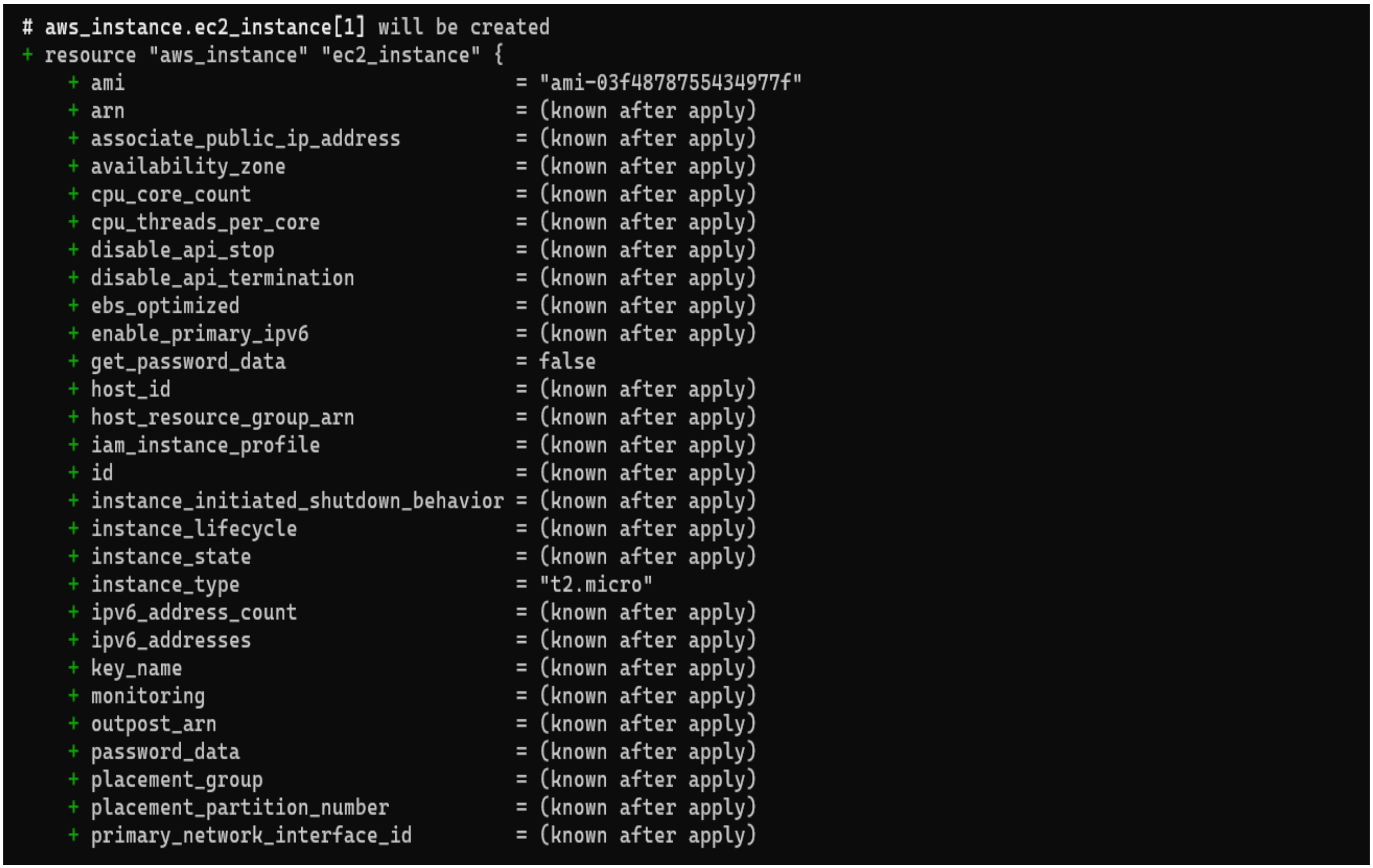
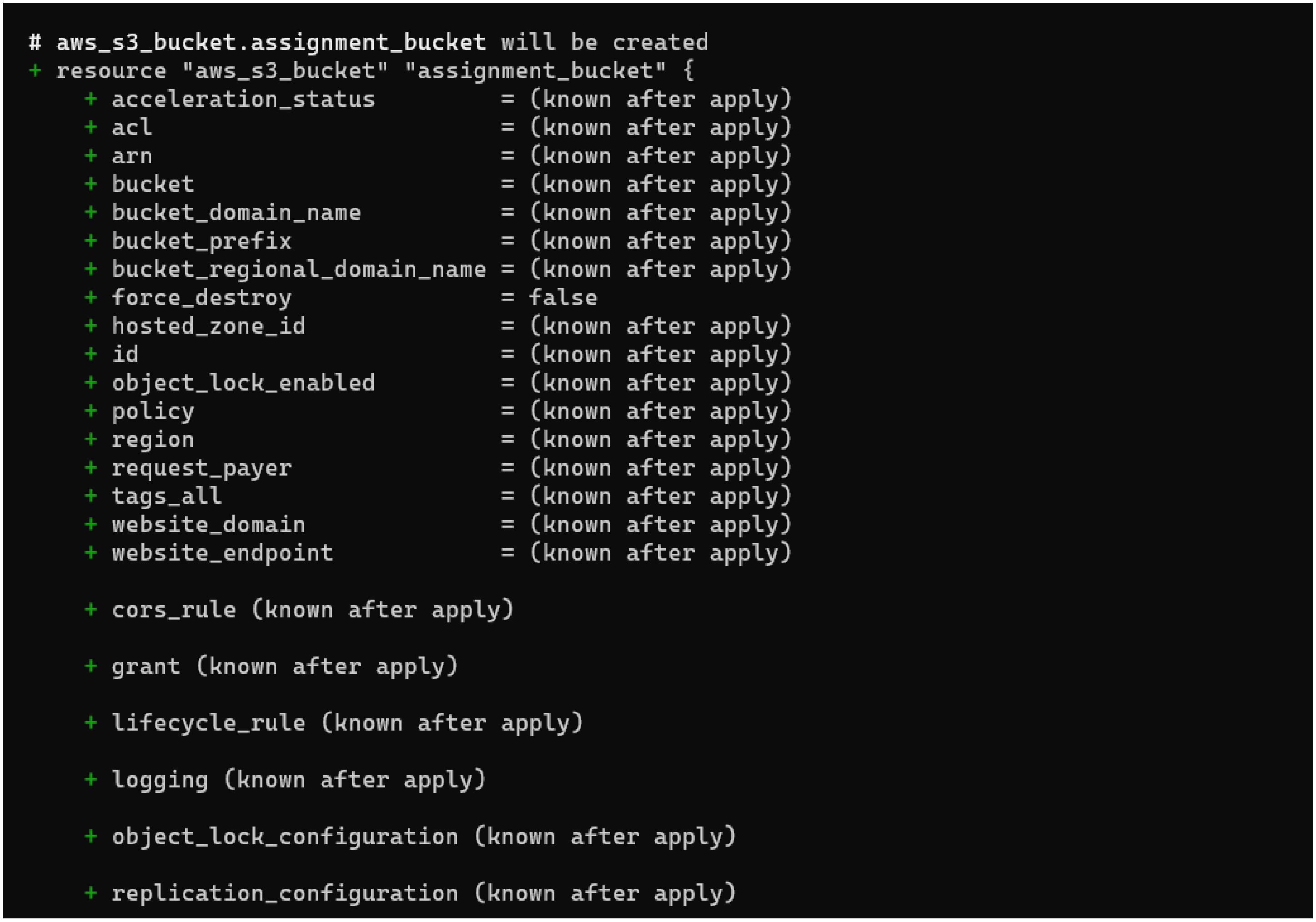

→ terraform apply Output (success message):



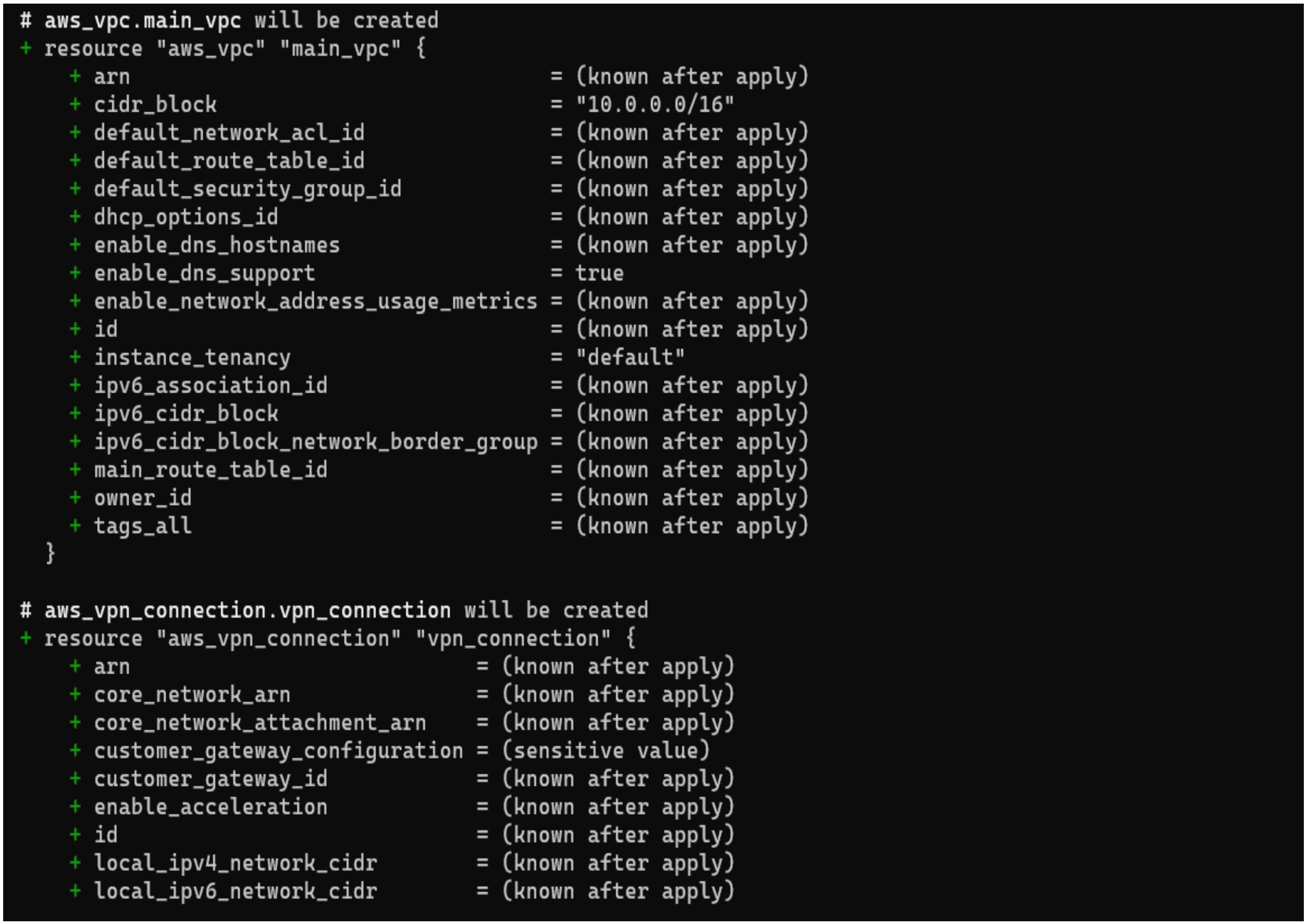
```
C:\Terraform\Lab-2\aws-terraform-demo\Assignment1>terraform apply

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the
following symbols:
  + create

Terraform will perform the following actions:

  # aws_customer_gateway.customer_gw will be created
  + resource "aws_customer_gateway" "customer_gw" {
      + arn        = (known after apply)
      + bgp_asn    = "65000"
      + id         = (known after apply)
      + ip_address = "1.2.3.4"
      + tags_all   = (known after apply)
      + type       = "ipsec.1"
    }

  # aws_instance.ec2_instance[0] will be created
  + resource "aws_instance" "ec2_instance" {
      + ami                                  = "ami-03f4878755434977f"
      + arn                                  = (known after apply)
      + associate_public_ip_address          = (known after apply)
      + availability_zone                    = (known after apply)
      + cpu_core_count                       = (known after apply)
      + cpu_threads_per_core                 = (known after apply)
      + disable_api_stop                     = (known after apply)
      + disable_api_termination              = (known after apply)
      + ebs_optimized                        = (known after apply)
      + enable_primary_ipv6                  = (known after apply)
      + get_password_data                    = false
```



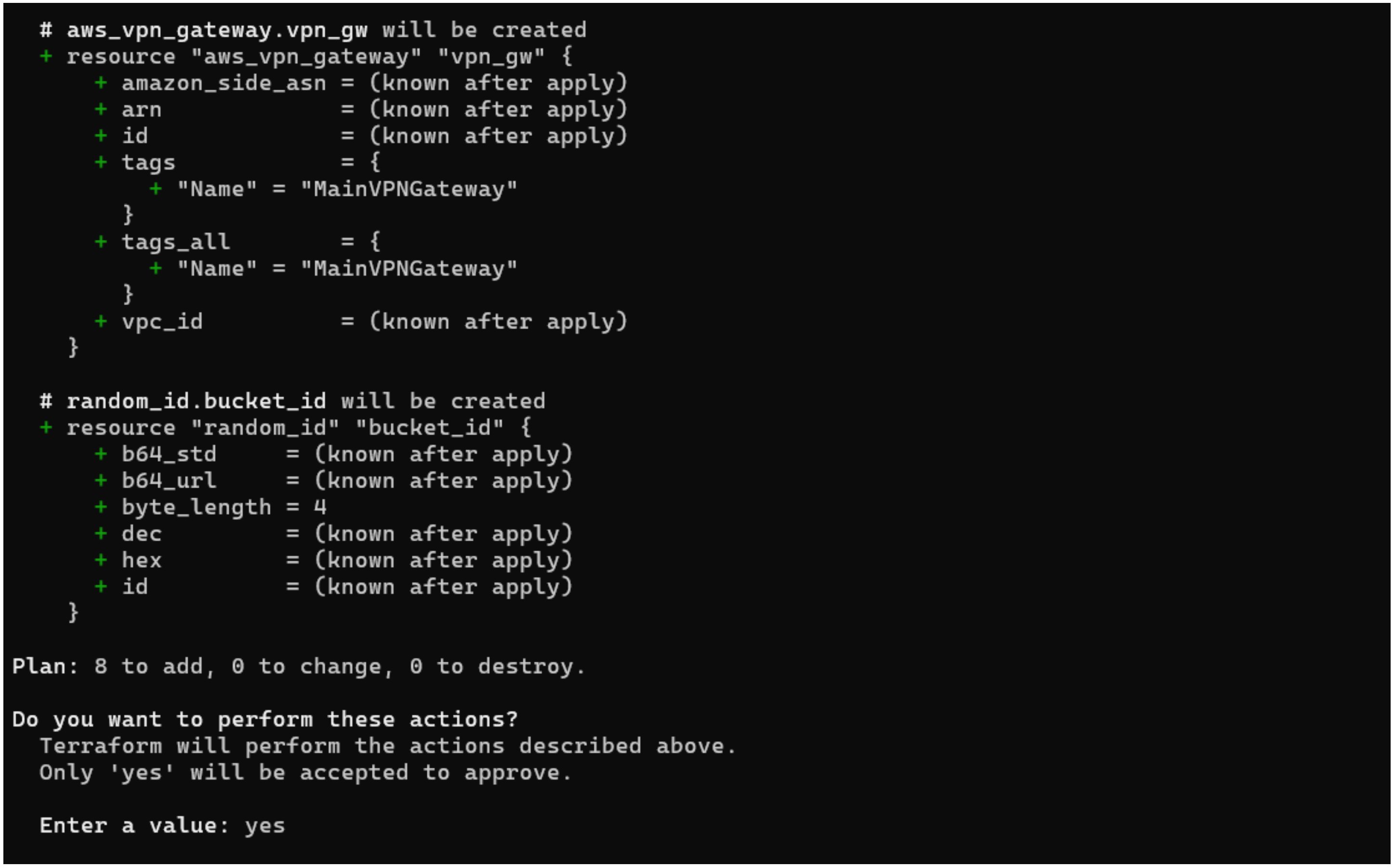
```
# aws_instance.ec2_instance[1] will be created
+ resource "aws_instance" "ec2_instance" {
    + ami                                  = "ami-03f4878755434977f"
    + arn                                  = (known after apply)
    + associate_public_ip_address          = (known after apply)
    + availability_zone                    = (known after apply)
    + cpu_core_count                       = (known after apply)
    + cpu_threads_per_core                 = (known after apply)
    + disable_api_stop                     = (known after apply)
    + disable_api_termination              = (known after apply)
    + ebs_optimized                        = (known after apply)
    + enable_primary_ipv6                  = (known after apply)
    + get_password_data                    = false
    + host_id                              = (known after apply)
    + host_resource_group_arn              = (known after apply)
    + iam_instance_profile                 = (known after apply)
    + id                                   = (known after apply)
    + instance_initiated_shutdown_behavior = (known after apply)
    + instance_lifecycle                   = (known after apply)
    + instance_state                       = (known after apply)
    + instance_type                        = "t2.micro"
    + ipv6_address_count                   = (known after apply)
    + ipv6_addresses                       = (known after apply)
    + key_name                             = (known after apply)
    + monitoring                           = (known after apply)
    + outpost_arn                          = (known after apply)
    + password_data                        = (known after apply)
    + placement_group                      = (known after apply)
    + placement_partition_number           = (known after apply)
    + primary_network_interface_id         = (known after apply)
```



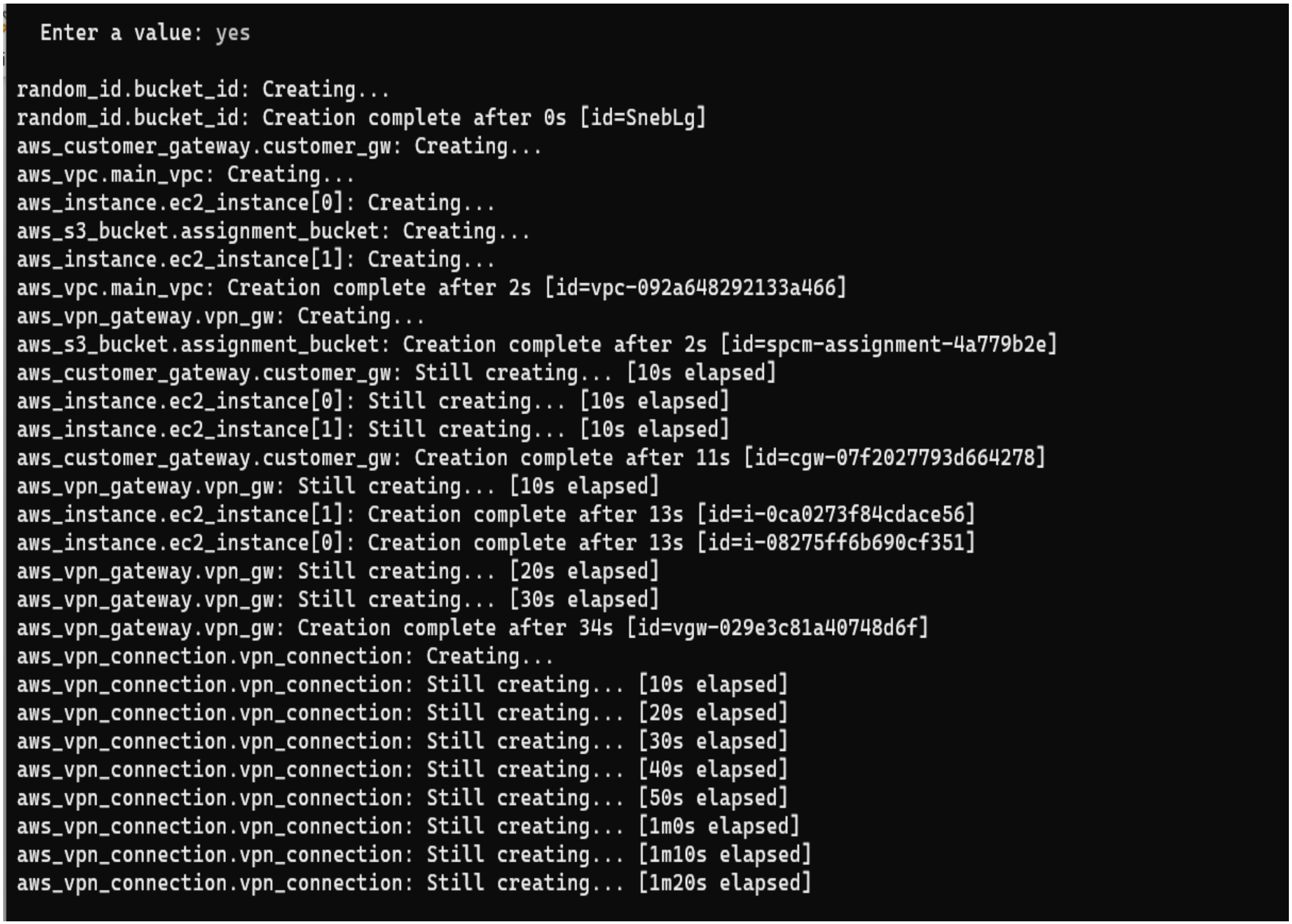
```
# aws_s3_bucket.assignment_bucket will be created
+ resource "aws_s3_bucket" "assignment_bucket" {
    + acceleration_status         = (known after apply)
    + acl                         = (known after apply)
    + arn                         = (known after apply)
    + bucket                      = (known after apply)
    + bucket_domain_name          = (known after apply)
    + bucket_prefix               = (known after apply)
    + bucket_regional_domain_name = (known after apply)
    + force_destroy               = false
    + hosted_zone_id              = (known after apply)
    + id                          = (known after apply)
    + object_lock_enabled         = (known after apply)
    + policy                      = (known after apply)
    + region                      = (known after apply)
    + request_payer               = (known after apply)
    + tags_all                    = (known after apply)
    + website_domain              = (known after apply)
    + website_endpoint            = (known after apply)

    + cors_rule (known after apply)

    + grant (known after apply)

    + lifecycle_rule (known after apply)

    + logging (known after apply)

    + object_lock_configuration (known after apply)

    + replication_configuration (known after apply)
```



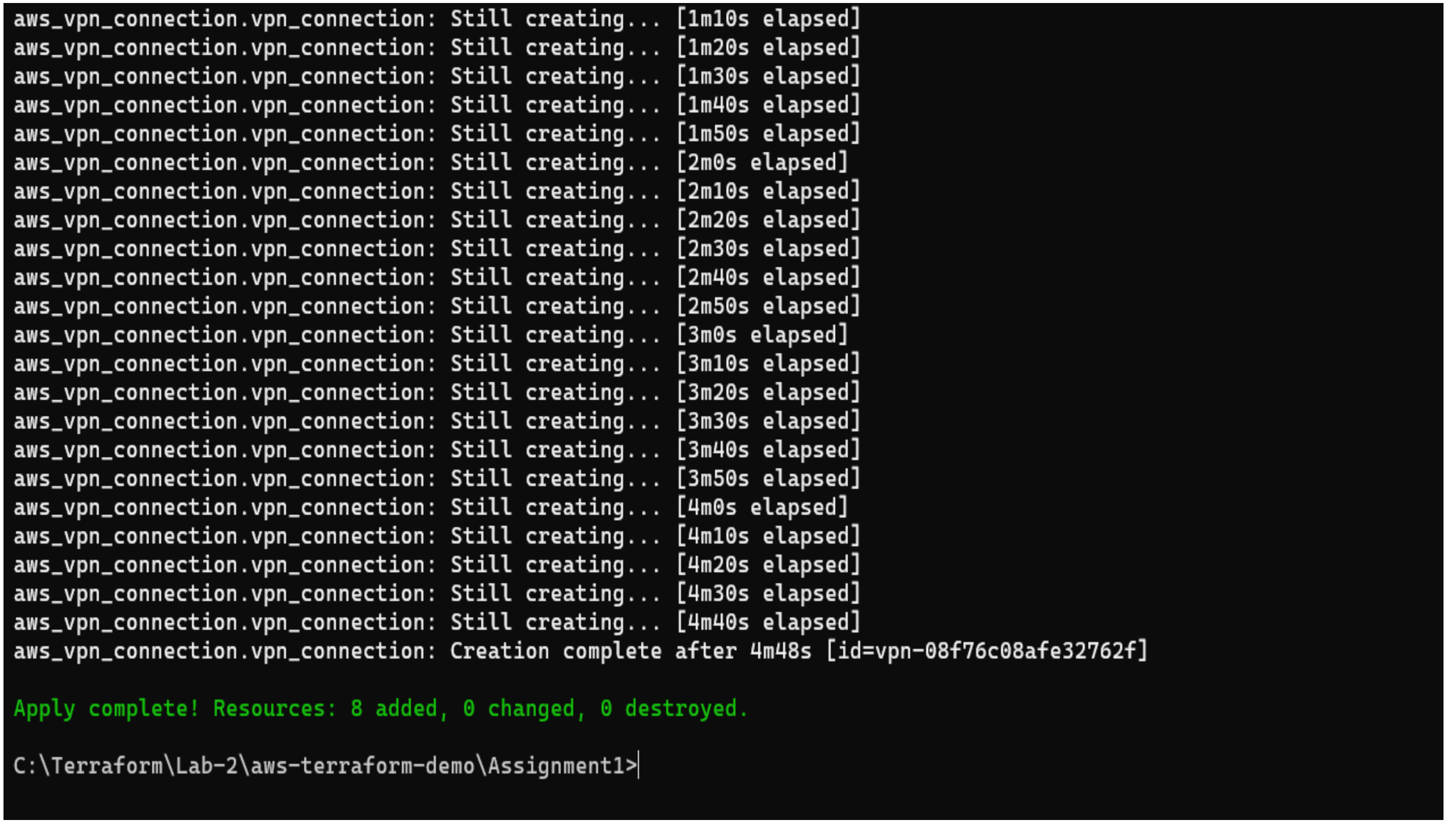
```
# aws_vpc.main_vpc will be created
+ resource "aws_vpc" "main_vpc" {
    + arn                                  = (known after apply)
    + cidr_block                           = "10.0.0.0/16"
    + default_network_acl_id               = (known after apply)
    + default_route_table_id               = (known after apply)
    + default_security_group_id            = (known after apply)
    + dhcp_options_id                      = (known after apply)
    + enable_dns_hostnames                 = (known after apply)
    + enable_dns_support                   = true
    + enable_network_address_usage_metrics = (known after apply)
    + id                                   = (known after apply)
    + instance_tenancy                     = "default"
    + ipv6_association_id                  = (known after apply)
    + ipv6_cidr_block                      = (known after apply)
    + ipv6_cidr_block_network_border_group = (known after apply)
    + main_route_table_id                  = (known after apply)
    + owner_id                             = (known after apply)
    + tags_all                             = (known after apply)
  }

# aws_vpn_connection.vpn_connection will be created
+ resource "aws_vpn_connection" "vpn_connection" {
    + arn                            = (known after apply)
    + core_network_arn               = (known after apply)
    + core_network_attachment_arn    = (known after apply)
    + customer_gateway_configuration = (sensitive value)
    + customer_gateway_id            = (known after apply)
    + enable_acceleration            = (known after apply)
    + id                             = (known after apply)
    + local_ipv4_network_cidr        = (known after apply)
    + local_ipv6_network_cidr        = (known after apply)
```



```
  # aws_vpn_gateway.vpn_gw will be created
  + resource "aws_vpn_gateway" "vpn_gw" {
      + amazon_side_asn = (known after apply)
      + arn             = (known after apply)
      + id              = (known after apply)
      + tags            = {
          + "Name" = "MainVPNGateway"
        }
      + tags_all        = {
          + "Name" = "MainVPNGateway"
        }
      + vpc_id          = (known after apply)
    }

  # random_id.bucket_id will be created
  + resource "random_id" "bucket_id" {
      + b64_std     = (known after apply)
      + b64_url     = (known after apply)
      + byte_length = 4
      + dec         = (known after apply)
      + hex         = (known after apply)
      + id          = (known after apply)
    }

Plan: 8 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes
```



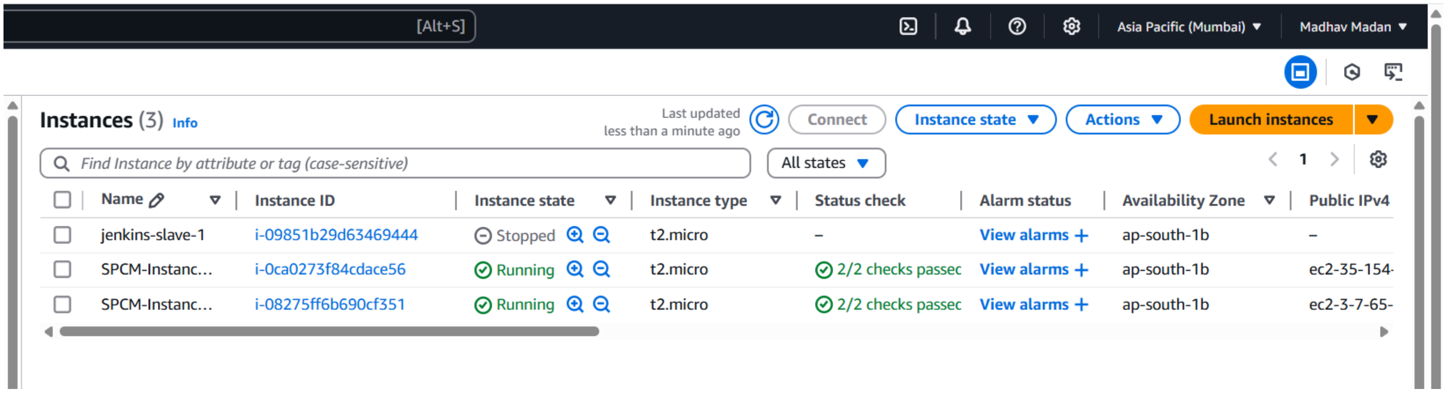
```
  Enter a value: yes

random_id.bucket_id: Creating...
random_id.bucket_id: Creation complete after 0s [id=SnebLg]
aws_customer_gateway.customer_gw: Creating...
aws_vpc.main_vpc: Creating...
aws_instance.ec2_instance[0]: Creating...
aws_s3_bucket.assignment_bucket: Creating...
aws_instance.ec2_instance[1]: Creating...
aws_vpc.main_vpc: Creation complete after 2s [id=vpc-092a648292133a466]
aws_vpn_gateway.vpn_gw: Creating...
aws_s3_bucket.assignment_bucket: Creation complete after 2s [id=spcm-assignment-4a779b2e]
aws_customer_gateway.customer_gw: Still creating... [10s elapsed]
aws_instance.ec2_instance[0]: Still creating... [10s elapsed]
aws_instance.ec2_instance[1]: Still creating... [10s elapsed]
aws_customer_gateway.customer_gw: Creation complete after 11s [id=cgw-07f2027793d664278]
aws_vpn_gateway.vpn_gw: Still creating... [10s elapsed]
aws_instance.ec2_instance[1]: Creation complete after 13s [id=i-0ca0273f84cdace56]
aws_instance.ec2_instance[0]: Creation complete after 13s [id=i-08275ff6b690cf351]
aws_vpn_gateway.vpn_gw: Still creating... [20s elapsed]
aws_vpn_gateway.vpn_gw: Still creating... [30s elapsed]
aws_vpn_gateway.vpn_gw: Creation complete after 34s [id=vgw-029e3c81a40748d6f]
aws_vpn_connection.vpn_connection: Creating...
aws_vpn_connection.vpn_connection: Still creating... [10s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [20s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [30s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [40s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [50s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [1m0s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [1m10s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [1m20s elapsed]
```



```
aws_vpn_connection.vpn_connection: Still creating... [1m10s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [1m20s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [1m30s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [1m40s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [1m50s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [2m0s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [2m10s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [2m20s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [2m30s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [2m40s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [2m50s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [3m0s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [3m10s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [3m20s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [3m30s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [3m40s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [3m50s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [4m0s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [4m10s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [4m20s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [4m30s elapsed]
aws_vpn_connection.vpn_connection: Still creating... [4m40s elapsed]
aws_vpn_connection.vpn_connection: Creation complete after 4m48s [id=vpn-08f76c08afe32762f]

Apply complete! Resources: 8 added, 0 changed, 0 destroyed.

C:\Terraform\Lab-2\aws-terraform-demo\Assignment1>
```

→ **Verify Resources in AWS Console:**

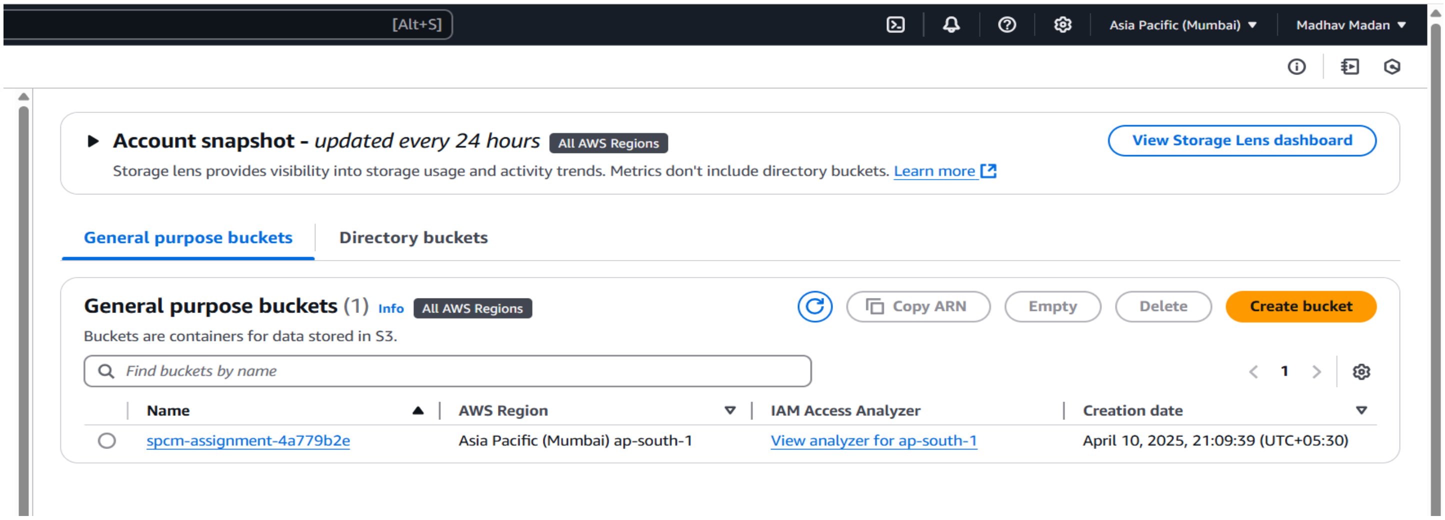
(a) EC2 Instances



Instances (3) Info

☐	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4
☐	jenkins-slave-1	i-09851b29d63469444	Stopped	t2.micro	–	View alarms +	ap-south-1b	–
☐	SPCM-Instanc...	i-0ca0273f84cdace56	Running	t2.micro	2/2 checks passec	View alarms +	ap-south-1b	ec2-35-154-
☐	SPCM-Instanc...	i-08275ff6b690cf351	Running	t2.micro	2/2 checks passec	View alarms +	ap-south-1b	ec2-3-7-65-

(b) S3 Bucket



Account snapshot - *updated every 24 hours*

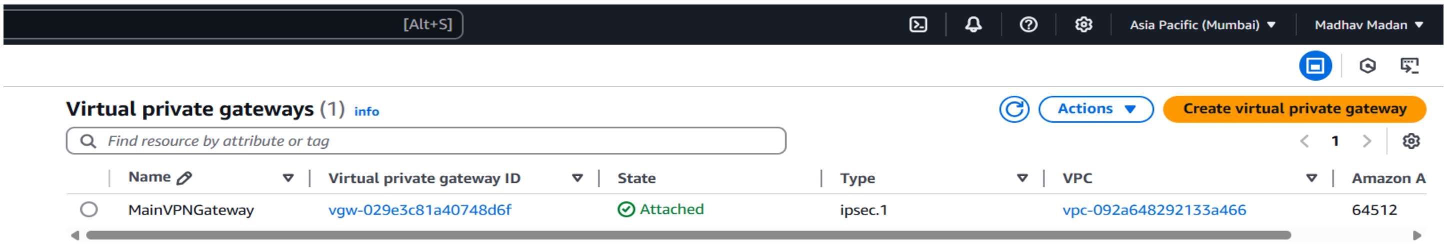
Storage lens provides visibility into storage usage and activity trends. Metrics don't include directory buckets. Learn more

General purpose buckets (1) Info All AWS Regions

Buckets are containers for data stored in S3.

	Name	AWS Region	IAM Access Analyzer	Creation date
○	spcm-assignment-4a779b2e	Asia Pacific (Mumbai) ap-south-1	View analyzer for ap-south-1	April 10, 2025, 21:09:39 (UTC+05:30)

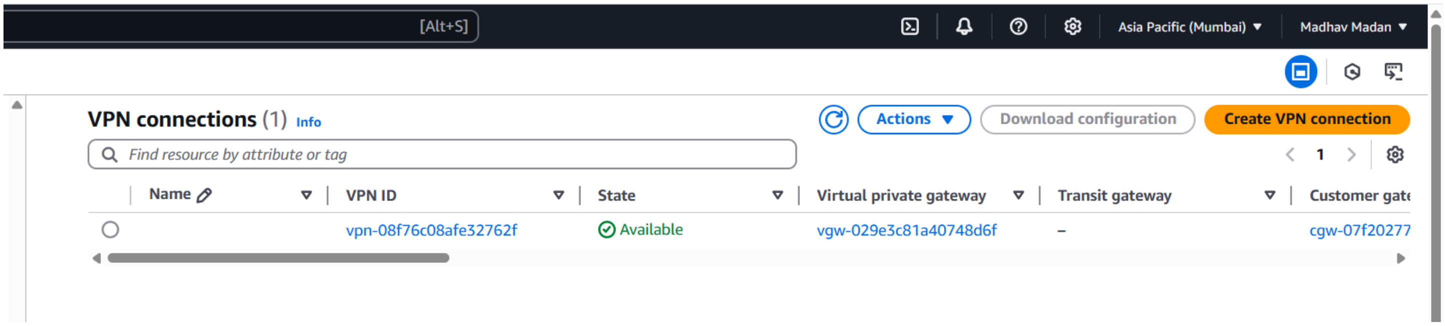
(c) VPN Gateway


[Alt+S]
Asia Pacific (Mumbai) ▼
Madhav Madan ▼
Actions ▼
Create virtual private gateway
Find resource by attribute or tag
1

Virtual private gateways (1) Info

	Name	Virtual private gateway ID	State	Type	VPC	Amazon A
○	MainVPNGateway	vgw-029e3c81a40748d6f	Attached	ipsec.1	vpc-092a648292133a466	64512

(d) VPN Connection



VPN connections (1) Info

	Name	VPN ID	State	Virtual private gateway	Transit gateway	Customer gate
○		vpn-08f76c08afe32762f	Available	vgw-029e3c81a40748d6f	–	cgw-07f20277

Step 5: Create a PDF file using all screenshots. A small description need to be added with each screenshot.

Step 6: PDF filename name should be your complete roll no.

Step 7: Push your pdf file in this GitHub Repo in your respective folder.

https://github.com/hkshitesh/SPCM-2025-ASSIGNMENTS-SUBMISSION.git