Cloud Computing Lab

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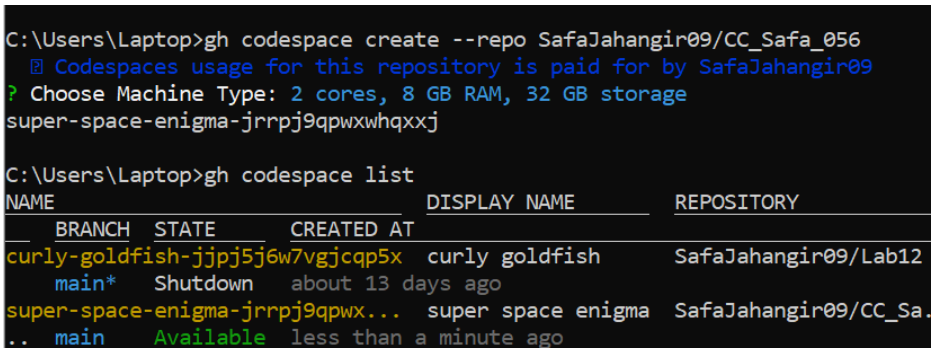
BSE-V B

2023-BSE-056

LAB 13

Task 0 Lab Setup (Codespace & GH CLI)

- task0_codespace_create_and_list.png



- task0_codespace_ssh_connected.png

Task 1 — Create IAM Group and Output Details

- task1_project_directory.png

```
@SafaJahangir09 ⍰ /workspaces/CC_Safa_056 (main) $ cd Lab13
@SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $
```

- task1_file_created.png

```
SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $ touch main.tf
SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $ ls
EADME.md  main.tf
```

- task1_main_tf.png

```
SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $ cat main.tf
rovider "aws" {
 shared_config_files      = ["~/.aws/config"]
 shared_credentials_files = ["~/.aws/credentials"]


esource "aws_iam_group" "developers" {
 name = "developers"
 path = "/groups/"


utput "group_details" {
 value = {
   group_name = aws_iam_group.developers.name
   group_arn  = aws_iam_group.developers.arn
   unique_id  = aws_iam_group.developers.unique_id
 }

SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $
```

- task1_terraform_init.png

```
@SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $ terraform init
Initializing the backend...
Initializing provider plugins...                                    e- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v6.28.0...
- Installed hashicorp/aws v6.28.0 (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 workir
ory. If you forget, other
commands will detect it and remind you to do so if necessary.
```

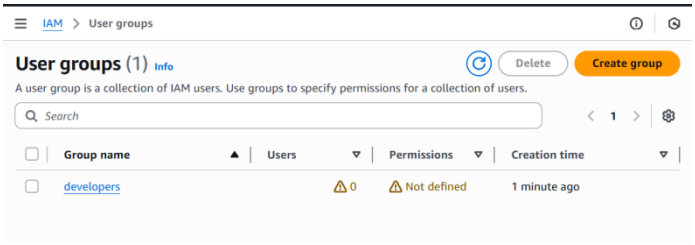
- task1_terraform_apply.png

```
Plan: 1 to add, 0 to change, 0 to destroy.

Changes to Outputs:
  + group_details = {
      + group_arn  = (known after apply)
      + group_name = "developers"
      + unique_id  = (known after apply)
    }
aws_iam_group.developers: Creating...
aws_iam_group.developers: Creation complete after 2s [id=developers]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.

Outputs:

group_details = {
  "group_arn" = "arn:aws:iam::624150768830:group/groups/developers"
  "group_name" = "developers"
  "unique_id" = "AGPAZCUSI5S7AOCKZMXY3"
}
```

- task1_terraform_output.png

```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ terraform output
group_details = {
  "group_arn" = "arn:aws:iam::624150768830:group/groups/developers"
  "group_name" = "developers"
  "unique_id" = "AGPAZCUSI5S7AOCKZMXY3"
}
```

- task1_aws_console_group.png



Task 2 — Create IAM User with Group Membership

- task2_main_tf_user.png

```
output "group_details" {
  value = {
    group_name = aws_iam_group.developers.name
    group_arn  = aws_iam_group.developers.arn
    unique_id  = aws_iam_group.developers.unique_id
  }
}
resource "aws_iam_user" "lb" {
  name = "loadbalancer"
  path = "/users/"
  force_destroy = true
  tags = {
    DisplayName = "Load Balancer"
  }
}

resource "aws_iam_user_group_membership" "lb_membership" {
  user = aws_iam_user.lb.name
  groups = [
    aws_iam_group. developers.name
  ]
}

output "user_details" {
  value = {
    user_name = aws_iam_user.lb.name
    user_arn  = aws_iam_user.lb.arn
    unique_id = aws_iam_user.lb.unique_id
  }
}
-- INSERT --
```

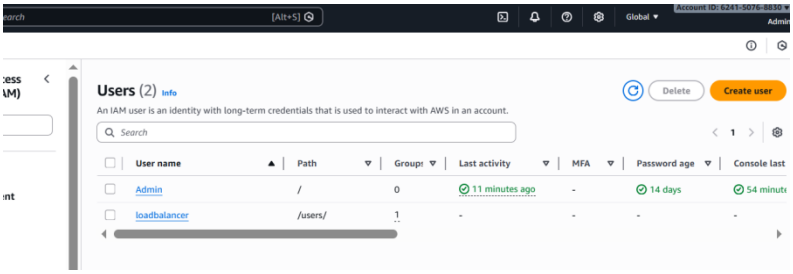
- task2_terraform_apply.png

```
    }
aws_iam_user.lb: Creating...
aws_iam_user.lb: Creation complete after 1s [id=loadbalancer]
aws_iam_user_group_membership.lb_membership: Creating...
aws_iam_user_group_membership.lb_membership: Creation complete after 1s [i
d=terraform-20260112140940444400000001]

Apply complete! Resources: 2 added, 0 changed, 0 destroyed.

Outputs:
```

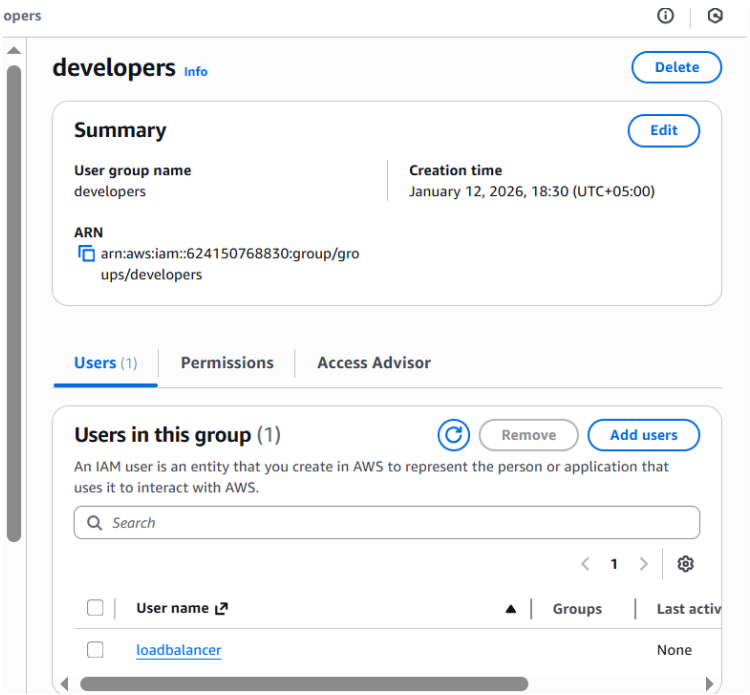
- task2_terraform_output.png

```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ terraform output
group_details = {
  "group_arn" = "arn:aws:iam::624150768830:group/groups/developers"
  "group_name" = "developers"
  "unique_id" = "AGPAZCUSI5S7AOCKZMXY3"
}
user_details = {
  "unique_id" = "AIDAZCUSI5S7FQSZOE3YF"
  "user_arn" = "arn:aws:iam::624150768830:user/users/loadbalancer"
  "user_name" = "loadbalancer"
}
```

- task2_aws_console_user.png



- task2_aws_console_user_groups.png



Task 3 — Attach Policies to IAM Group

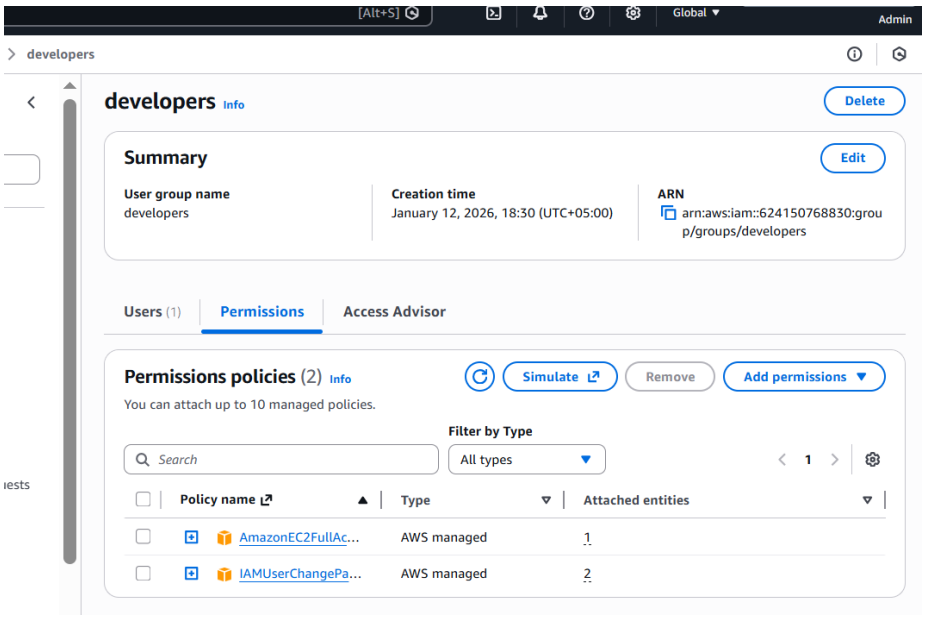
- task3_main_tf_policies.png

```
  }
}
resource "aws_iam_group_policy_attachment" "developer_ec2_fullaccess" {
    group = aws_iam_group.developers.name
    policy_arn = "arn:aws:iam::aws:policy/AmazonEC2FullAccess"
}

resource "aws_iam_group_policy_attachment" "change_password" {
    group = aws_iam_group.developers.name
    policy_arn = "arn:aws:iam::aws:policy/IAMUserChangePassword"
}
:wq
```

- task3_terraform_apply.png

```
Plan: 2 to add, 0 to change, 0 to destroy.
aws_iam_group_policy_attachment.change_password: Creating...
aws_iam_group_policy_attachment.developer_ec2_fullaccess: Creating...
aws_iam_group_policy_attachment.developer_ec2_fullaccess: Creation complete after
1s [id=developers-20260112142454533200000001]
aws_iam_group_policy_attachment.change_password: Creation complete after 1s [id=de
velopers-20260112142454646500000002]

Apply complete! Resources: 2 added, 0 changed, 0 destroyed.
```

- task3_aws_console_policies.png



Task 4 — Create Login Profile for IAM User

- task4_variables_tf.png

```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ cat variables.tf
variable "iam_password" {
  description = "Temporary password for the IAM user"
  type        = string
  sensitive   = true
  default = "1dontKnow"
```

- task4_create_login_script.png

```
  GNU nano 7.2                                  create-login-profile.sh
#!/usr/bin/env bash
set -euo pipefail

USERNAME="$1"
PASSWORD="$2"

# Check if login profile already exists
if aws iam get-login-profile --user-name "$USERNAME" >/dev/null 2>&1; then
  echo "Login profile already exists for $USERNAME.  Skipping."
else
  echo "Creating login profile for $USERNAME"
  aws iam create-login-profile \
    --user-name "$USERNAME" \
    --password "$PASSWORD" \
    --password-reset-required
fi
```

- task4_chmod_script.png

```
_056/Lab13 (main) $
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ chmod +x create-login-profile.sh
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $
```

- task4_main_tf_login_profile.png

```
resource "null_resource" "create_login_profile" {
  triggers = {
    password_hash = sha256(var.iam_password)
    user          = aws_iam_user.lb.name
  }

  depends_on = [aws_iam_user. lb]

  provisioner "local-exec" {
    command = "${path.module}/create-login-profile.sh ${aws_iam_user.lb.name} '${var.iam_passw
ord}'"
  }
```

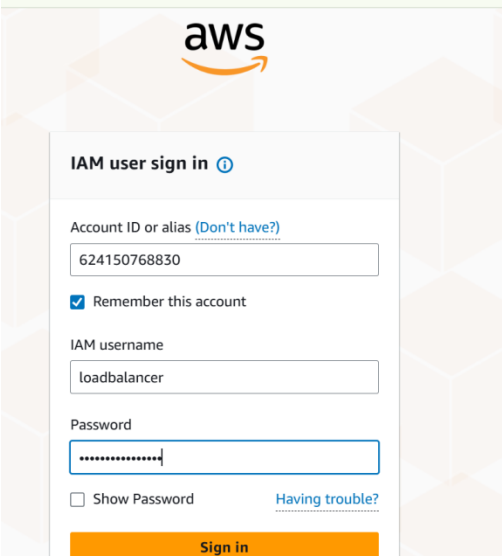
- task4_terraform_apply.png

```
Plan: 1 to add, 0 to change, 0 to destroy.
null_resource.create_login_profile: Creating...
null_resource.create_login_profile: Provisioning with 'local-exec'...
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile (local-exec): (output suppressed due to sensitive value in co
null_resource.create_login_profile: Creation complete after 7s [id=1355112466946589324]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
```

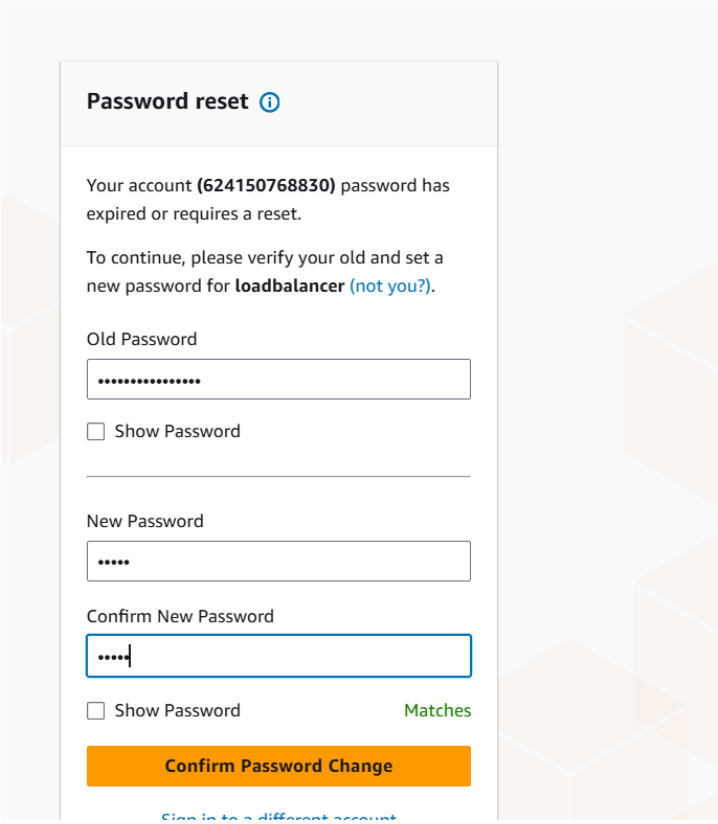
- task4_aws_cli_verify.png

```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ aws iam get-login-profile --user-name loadbalancer
{
    "LoginProfile": {
        "UserName": "loadbalancer",
        "CreateDate": "2026-01-13T04:20:43+00:00",
        "PasswordResetRequired": true
    }
}
```

- task4_aws_console_login.png

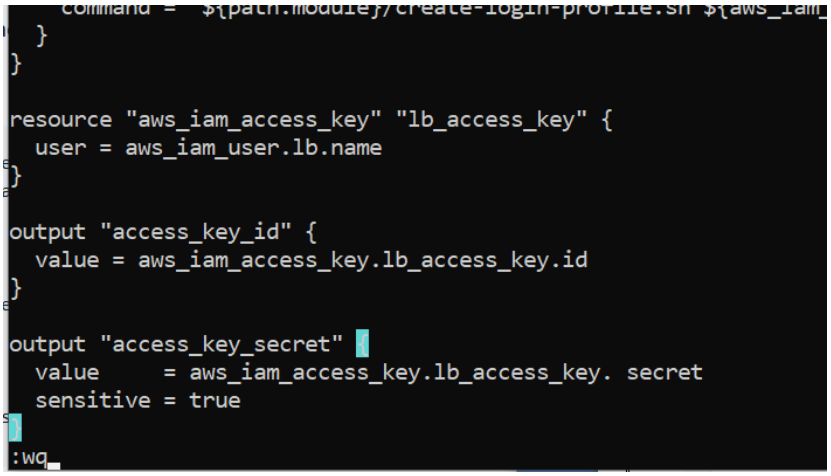


- task4_aws_console_password_reset.png



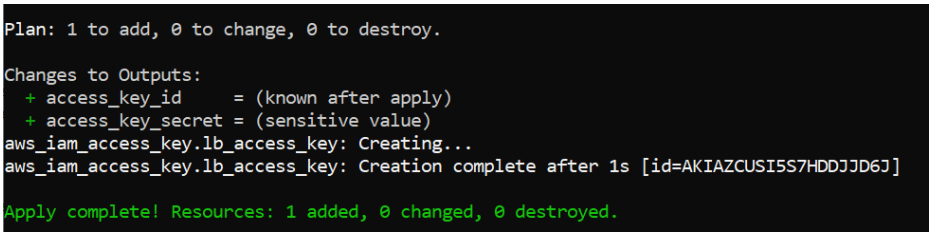
Task 5 — Generate Access Keys for IAM User

- task5_main_tf_access_keys.png



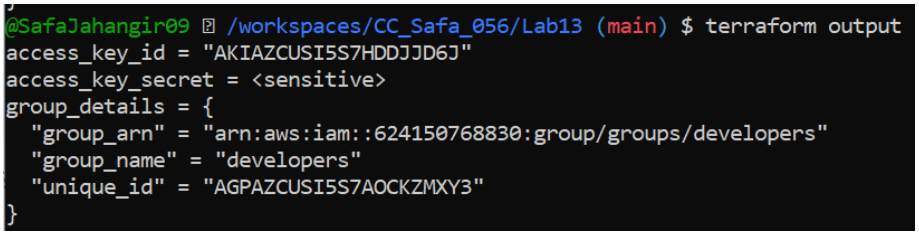
```
    command = "${path.module}/create-login-profile.sh ${aws_iam_
  }
}

resource "aws_iam_access_key" "lb_access_key" {
  user = aws_iam_user.lb.name
}

output "access_key_id" {
  value = aws_iam_access_key.lb_access_key.id
}

output "access_key_secret" {
  value     = aws_iam_access_key.lb_access_key. secret
  sensitive = true
}
:wq
```

- task5_terraform_apply.png



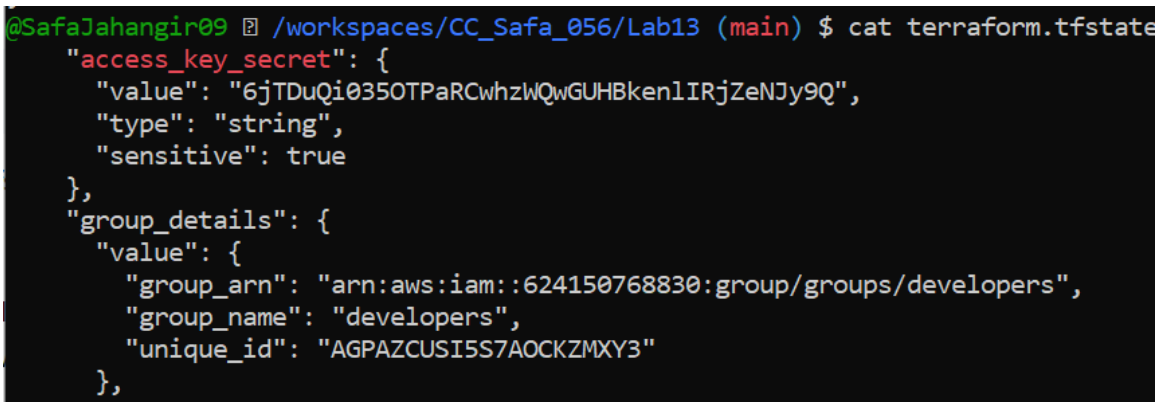
```
Plan: 1 to add, 0 to change, 0 to destroy.

Changes to Outputs:
  + access_key_id     = (known after apply)
  + access_key_secret = (sensitive value)
aws_iam_access_key.lb_access_key: Creating...
aws_iam_access_key.lb_access_key: Creation complete after 1s [id=AKIAZCUSI5S7HDDJJD6J]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
```

- task5_terraform_output.png



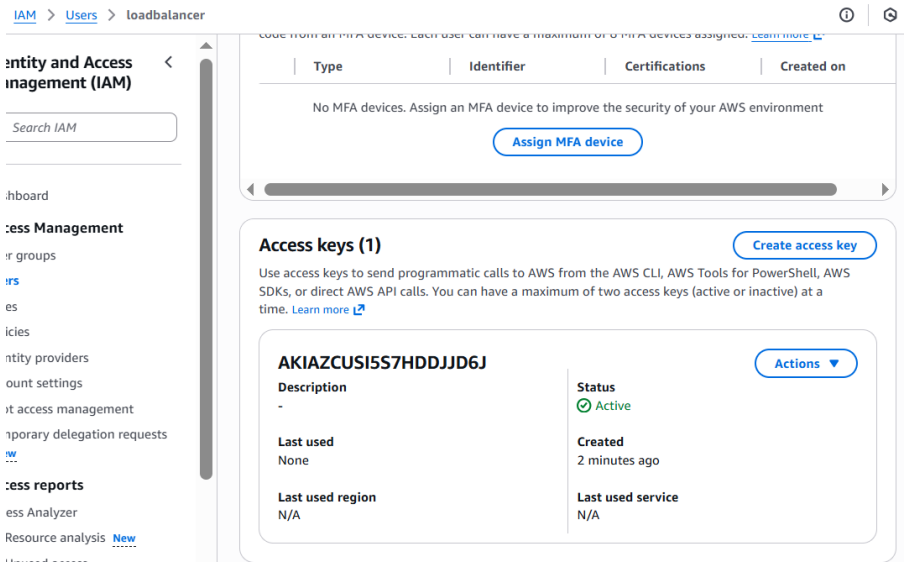
```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ terraform output
access_key_id = "AKIAZCUSI5S7HDDJJD6J"
access_key_secret = <sensitive>
group_details = {
  "group_arn" = "arn:aws:iam::624150768830:group/groups/developers"
  "group_name" = "developers"
  "unique_id" = "AGPAZCUSI5S7AOCKZMXY3"
}
```

- task5_tfstate_secret. Png



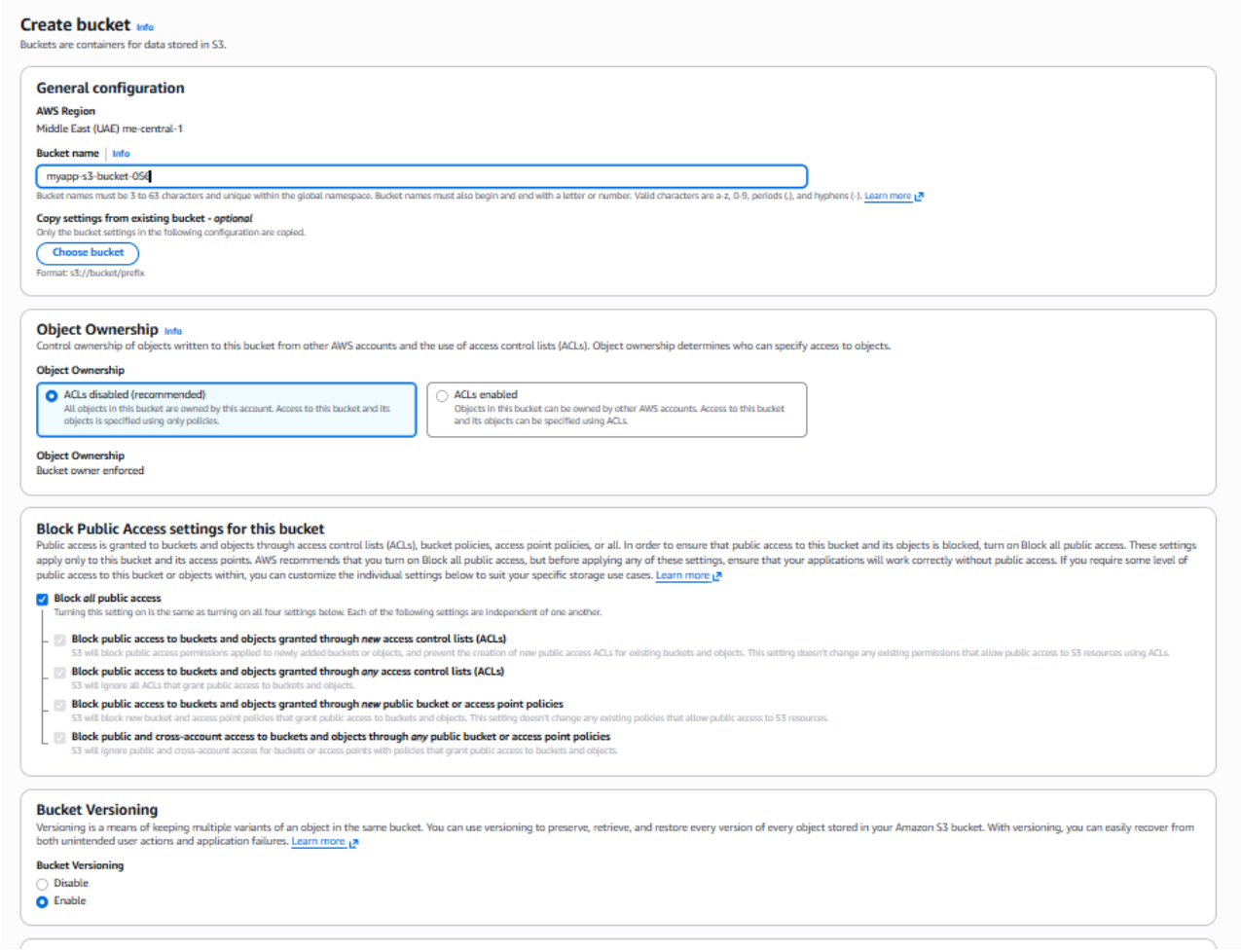
```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ cat terraform.tfstate
    "access_key_secret": {
      "value": "6jTDuQi035OTPaRCwhzWQwGUHBkenlIRjZeNJy9Q",
      "type": "string",
      "sensitive": true
    },
    "group_details": {
      "value": {
        "group_arn": "arn:aws:iam::624150768830:group/groups/developers",
        "group_name": "developers",
        "unique_id": "AGPAZCUSI5S7AOCKZMXY3"
      },
```

- task5_aws_console_access_keys. Png

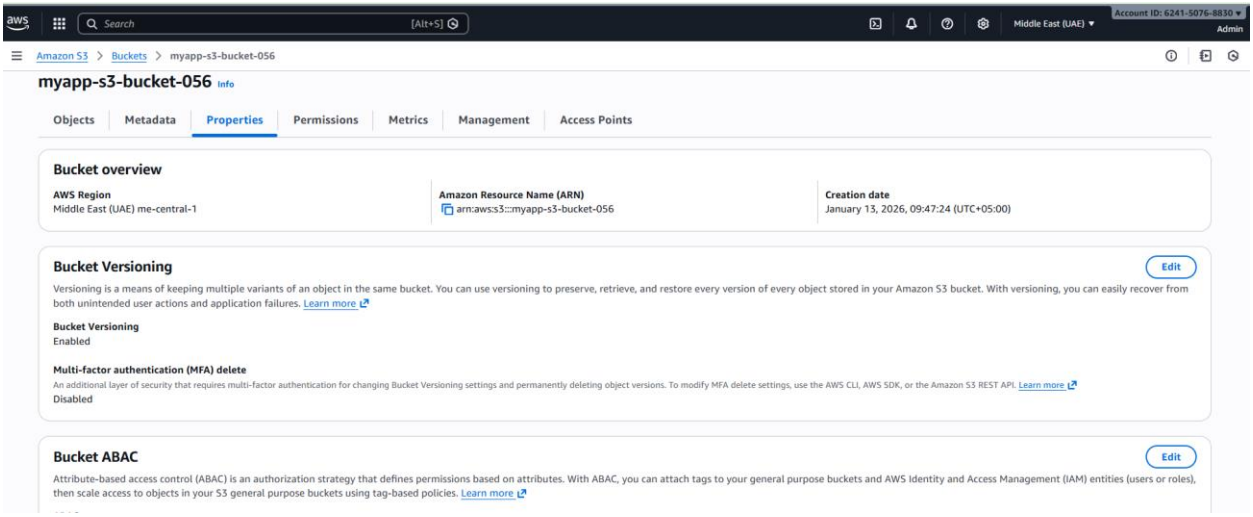


Task 6 — Implement Terraform Remote State with S3

- task6_s3_bucket_create.png



- task6_s3_bucket_versioning.png



- task6_main_tf_backend.png

```
terraform {
  backend "s3" {
    bucket = "myapp-s3-bucket-056"
    key    = "myapp/terraform.tfstate"
    region = "me-central-1"
    encrypt = true
    use_lockfile = true
  }
}

provider "aws" {
```

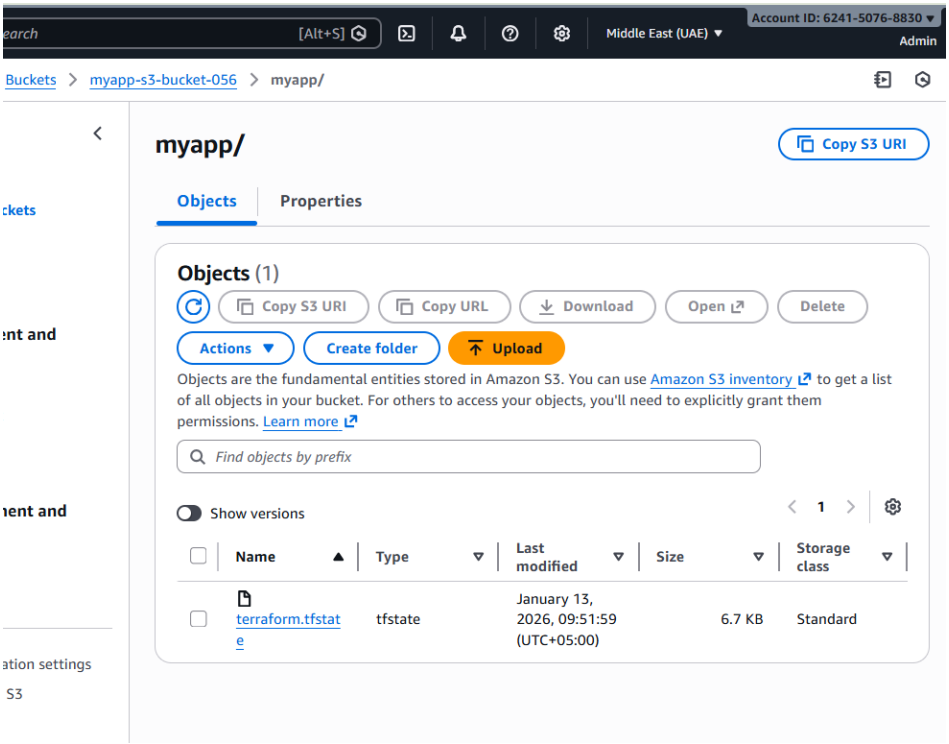
- task6_terraform_init_migrate.png

```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ terraform init -migrate-state
Initializing the backend...
Do you want to copy existing state to the new backend?
  Pre-existing state was found while migrating the previous "local" backend to the
  newly configured "s3" backend. No existing state was found in the newly
  configured "s3" backend. Do you want to copy this state to the new "s3"
  backend? Enter "yes" to copy and "no" to start with an empty state.

  Enter a value: yes


Successfully configured the backend "s3"! Terraform will automatically
use this backend unless the backend configuration changes.
Initializing provider plugins...
- Reusing previous version of hashicorp/aws from the dependency lock file
- Reusing previous version of hashicorp/null from the dependency lock file
- Using previously-installed hashicorp/aws v6.28.0
- Using previously-installed hashicorp/null v3.2.4

Terraform has been successfully initialized!
```

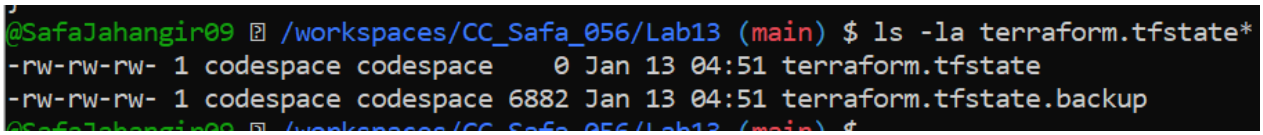
- task6_terraform_apply.png

```
aws_iam_user_group_membership.lb_membership: Refreshing state... [id=terraform-20260112140940444400000001
aws_iam_access_key.lb_access_key: Refreshing state... [id=AKIAZCUSI5S7HDDJJD6J]

No changes. Your infrastructure matches the configuration.

Terraform has compared your real infrastructure against your configuration and found no differences, so n
changes are needed.

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

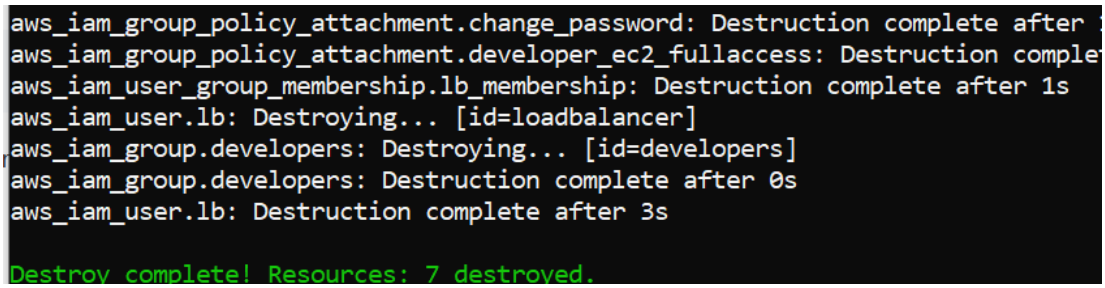
- task6_s3_tfstate_file.png



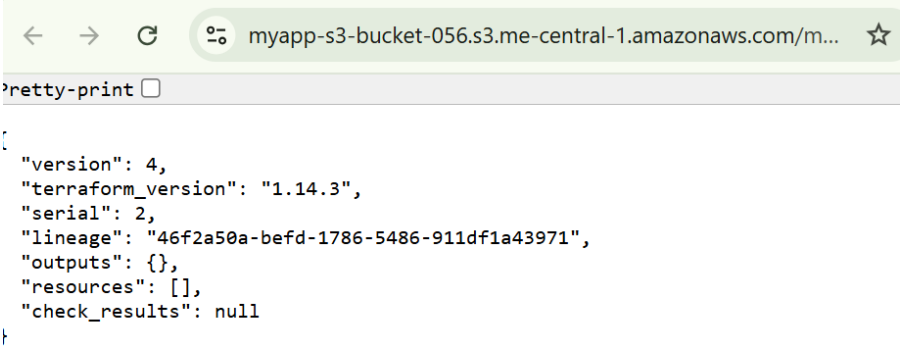
- task6_local_state_backup.png



- task6_terraform_destroy.png



- task6_s3_tfstate_destroyed. Png

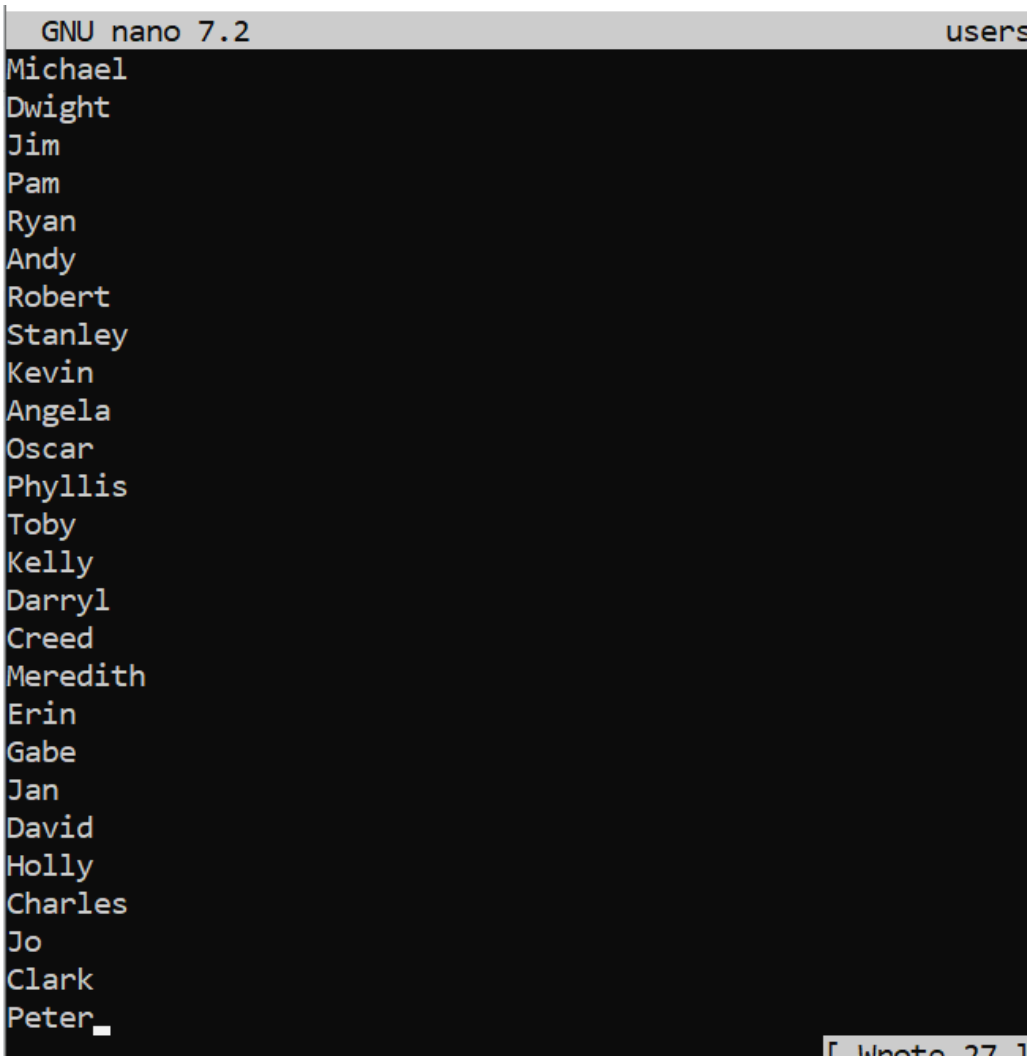


Task 7 — Create Multiple Users from CSV File

- task7_locals_tf.png

```
@SafaJahangir09 ➜ /workspaces/CC_Safa_056/Lab13 (main) $ vim locals.tf
@SafaJahangir09 ➜ /workspaces/CC_Safa_056/Lab13 (main) $ cat locals.tf
locals {
  users = csvdecode(file("users.csv"))
}
```

- task7_users_csv.png



- task7_main_tf_multiple_users.png

```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ cat main.tf
terraform {
  backend "s3" {
    bucket = "myapp-s3-bucket-056"
    key    = "myapp/terraform.tfstate"
    region = "me-central-1"
    encrypt = true
    use_lockfile = true
  }
}

provider "aws" {
  shared_config_files      = ["~/.aws/config"]
  shared_credentials_files = ["~/.aws/credentials"]
}

resource "aws_iam_group" "developers" {
  name = "developers"
  path = "/groups/"
}

output "group_details" {
  value = {
    group_name = aws_iam_group.developers.name
    group_arn  = aws_iam_group.developers.arn
    unique_id  = aws_iam_group.developers.unique_id
  }
}
# Create multiple IAM users from CSV
resource "aws_iam_user" "users" {
  for_each = { for user in local.users : user.user_name => user }

  name          = each.value.user_name
  path          = "/users/"
  force_destroy = true
```

- task7_terraform_init.png

```
@SafaJahangir09 /workspaces/CC_Safa_056/Lab13 (main) $ terraform init
Initializing the backend...
Initializing provider plugins...
- Reusing previous version of hashicorp/null from the dependency lock file
- Reusing previous version of hashicorp/aws from the dependency lock file
- Using previously-installed hashicorp/null v3.2.4
- Using previously-installed hashicorp/aws v6.28.0

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to se
any changes that are required for your infrastructure. All Terraform commanc
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, ot
commands will detect it and remind you to do so if necessary.
```

- task7_terraform_apply.png

```
null_resource.create_login_profiles["Meredith"] (local-exec): (output suppressed due to sensitive value in con
)
null_resource.create_login_profiles["Meredith"] (local-exec): (output suppressed due to sensitive value in con
)
null_resource.create_login_profiles["Meredith"] (local-exec): (output suppressed due to sensitive value in con
)
null_resource.create_login_profiles["Meredith"] (local-exec): (output suppressed due to sensitive value in con
)
null_resource.create_login_profiles["Meredith"] (local-exec): (output suppressed due to sensitive value in con
)
null_resource.create_login_profiles["Meredith"] (local-exec): (output suppressed due to sensitive value in con
)
null_resource.create_login_profiles["Meredith"] (local-exec): (output suppressed due to sensitive value in con
)
null_resource.create_login_profiles["Meredith"]: Creation complete after 10s [id=8521261764303816648]

Apply complete! Resources: 26 added, 0 changed, 26 destroyed.
```

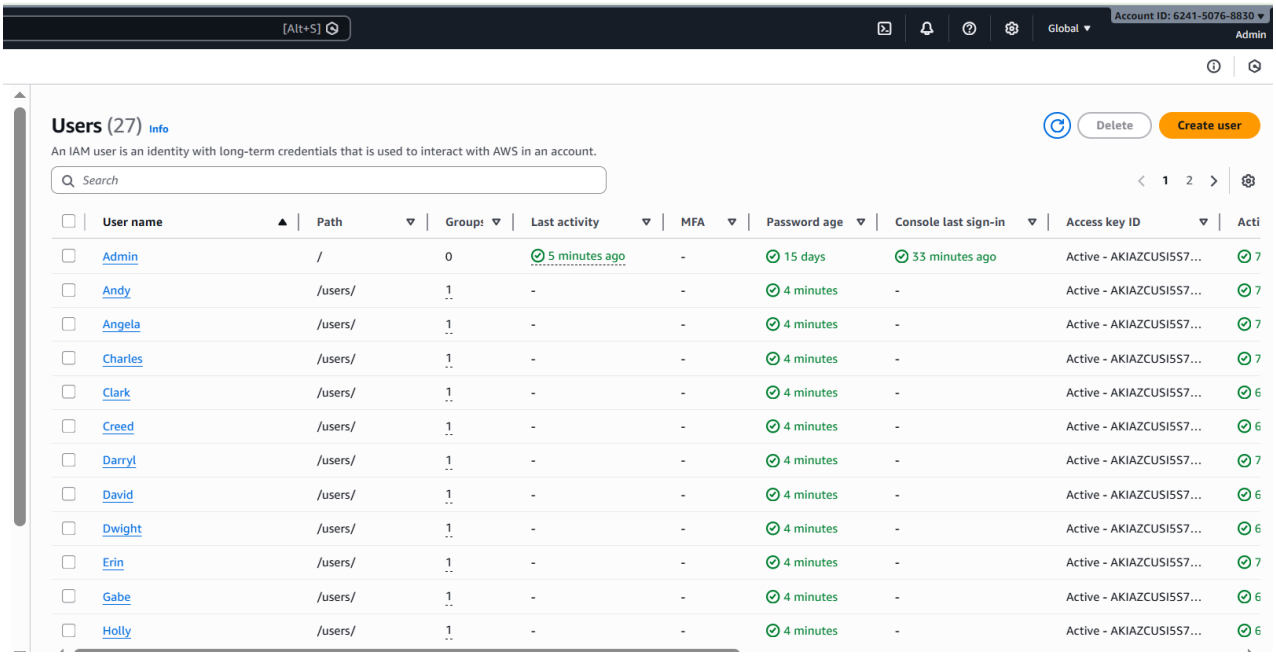
- task7_terraform_output.png

```
@SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $ terraform output
all_access_key_secrets = <sensitive>
all_users_details = {
  "Andy" = {
    "access_key_id" = "AKIAZCUSI5S7DTWGSAXQ"
    "user_arn" = "arn:aws:iam::624150768830:user/users/Andy"
    "user_unique_id" = "AIDAZCUSI5S7EU66BIZMN"
  }
  "Angela" = {
    "access_key_id" = "AKIAZCUSI5S7JFJMRYV6"
    "user_arn" = "arn:aws:iam::624150768830:user/users/Angela"
    "user_unique_id" = "AIDAZCUSI5S7MJJHZDLXE"
  }
  "Charles" = {
    "access_key_id" = "AKIAZCUSI5S7DCMWLCW2"
    "user_arn" = "arn:aws:iam::624150768830:user/users/Charles"
    "user_unique_id" = "AIDAZCUSI5S7II2DWPH4H"
  }
  "Clark" = {
    "access_key_id" = "AKIAZCUSI5S7CF4EMTBO"
    "user_arn" = "arn:aws:iam::624150768830:user/users/Clark"
    "user_unique_id" = "AIDAZCUSI5S7DOBR3VI4X"
  }
```

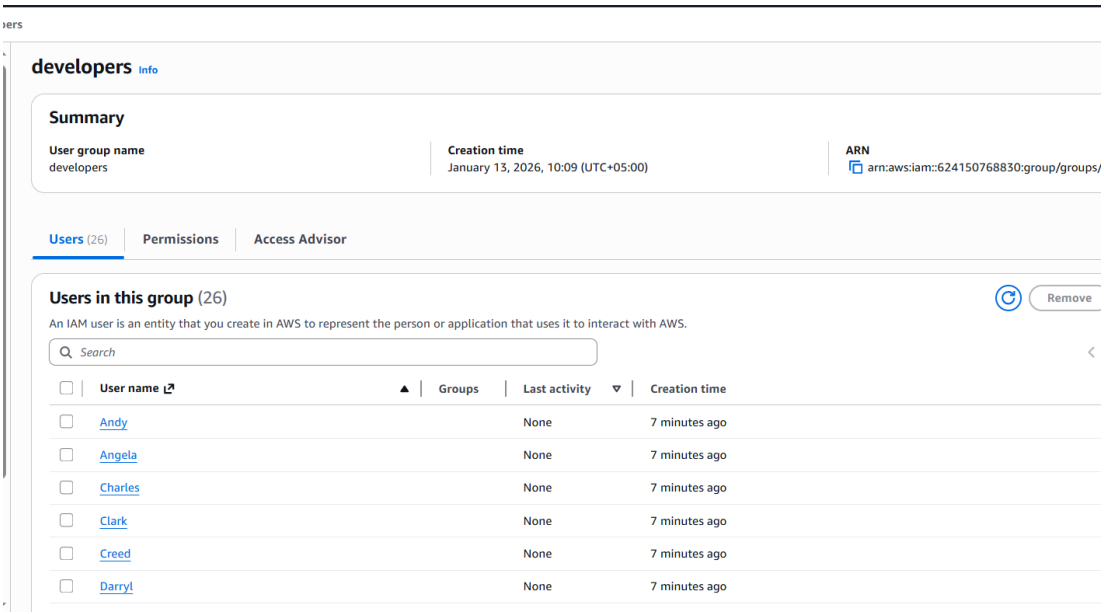
- task7_tfstate_secrets. Png

```
@SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $ terraform state pull | grep -A 5 "all_access_key_secrets"
    "all_access_key_secrets": {
      "value": {
        "Andy": "xSH56b/f9rl28TKyZkVHLqBx80+HCCJSA+bDB/1A",
        "Angela": "EQVFQJetu7FkIEdaVdNbt21wZ8xdm73flaXug7dP",
        "Charles": "vNbQvIth16w3qsLVSqlSXWL8nLvJQIbEineNCise",
        "Clark": "bY8ye5Ya762nEcnuEK2Z8UmCrgGa2q6NuOExsTTz",
@SafaJahangir09 ⍰ /workspaces/CC_Safa_056/Lab13 (main) $
```

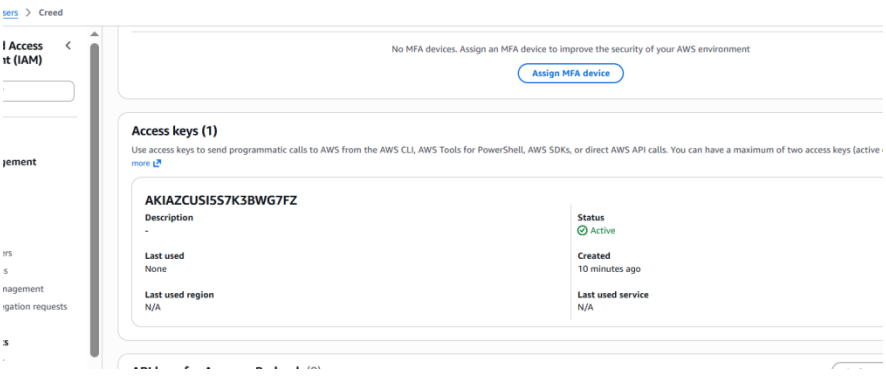
- task7_aws_console_all_users. Png



- task7_aws_console_group_members. Png



- task7_aws_console_user_access_key.png



- task7_s3_tfstate_multiple_users.png

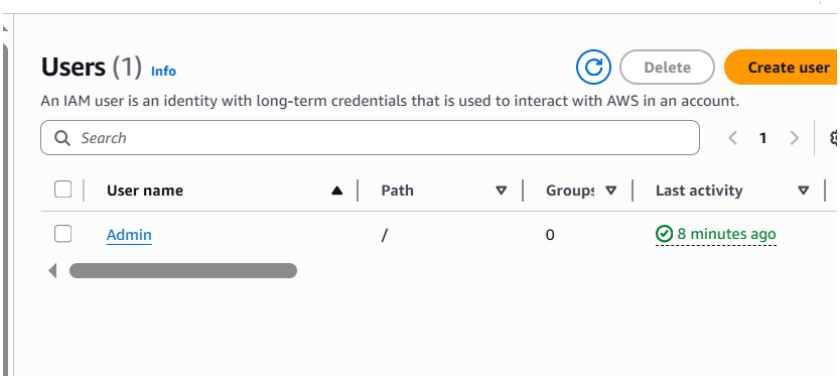
```
{
  "version": 4,
  "terraform_version": "1.14.3",
  "serial": 5,
  "lineage": "46f2a50a-befd-1786-5486-911df1a43971",
  "outputs": {
    "all_access_key_secrets": {
      "value": {
        "Andy": "xSH56b/f9rl28TKyZkVHLqBx80+HCCJSA+bDB/1A",
        "Angela": "EQVFQJetu7FkIEdaVdNbt21wZ8xdm73flaXug7dP",
        "Charles": "vNbQvIth16w3qsLVSqlSXWL8nLvJQIbEineNCise",
        "Clark": "bY8ye5Ya762nEcnuEK2Z8UmCrgGa2q6NuOExsTTz",
        "Creed": "LhNNTtlgCCIHwToBUP/w8Y7WDRubMGzvDf3JOLiQ",
        "Darryl": "+TIBY0xlo4VJaA54JESfsqsMG+l68fun2EODLzR+",
        "David": "/NjUr5QyVoxBRuYc0yvJf+HCXYx+ulIlAU04DmTb",
        "Dwight": "1Ca+g3uuSA+Pb7T3ubaEnDeEEkjTJ1G90eNgsJge",
        "Erin": "DPK9wN03vios1Un/Gu+MSoOE7tXmhcpwsq1sSFqy",
        "Gabe": "omPpczXRMWqN0rTPifxYRsZ8u1/RYUXk4nkH/f5L",
        "Holly": "tsRO0ybcSvx4nD/5MXotSwNnhvIM/Uw3bwNZUNVq",
        "Jan": "K6SN+yFTygBK9qtvrbM9Iav2MhUOby2WTcv1bQQ2",
        "Jim": "Xe9oyCqW+ebleUEqD3cDZC4NXEm3aMQMcyDt/Hbx",
        "Jo": "YVe4Ljr2hkFx6dmjxtzkxj2pshkF4jwgmk0vdAOA",
        "Kelly": "iaQ3HM1RZkyIFRkByNucoGiL2dqeqBmFNo0vJGcT",
        "Kevin": "Aedm3PKPdlEBQGe1C5kzgRrUyRF1oTvyloB1z4vp",
        "Meredith": "a6lZiBMxF2OgMeI2Z1C5OThLur6UMXUt8AxRI7lh",
        "Michael": "PV5sO2R+oP8Bl9Oenn0uShc3HyNGkQupmpUDq0gn",
        "Oscar": "z3VtCwkSvTo3k23XZA5hmtOgZbsgWiuwoY5XmK55",
        "Pam": "Miw9nmVlXmMUfxQxwmmQc6FwH+XcwIFINCGs4PO5",
        "Peter": "YkNKnpcolu4kk04UR2iv25ZGIQ6SlgysWQHGWNlw",
        "Phyllis": "f86kJunO3jR0hpYu+0Femj0V/4Q8/DT9+FBF2sG5",
        "Robert": "vxyOK0beJ7hP9mGHTdXpZXOUs/9JazR+K2ROCR5a",
        "Ryan": "10pFHRRparpOvgveJUG4fxtvWGgiPRvL54pdLmjo",
```


Cleanup

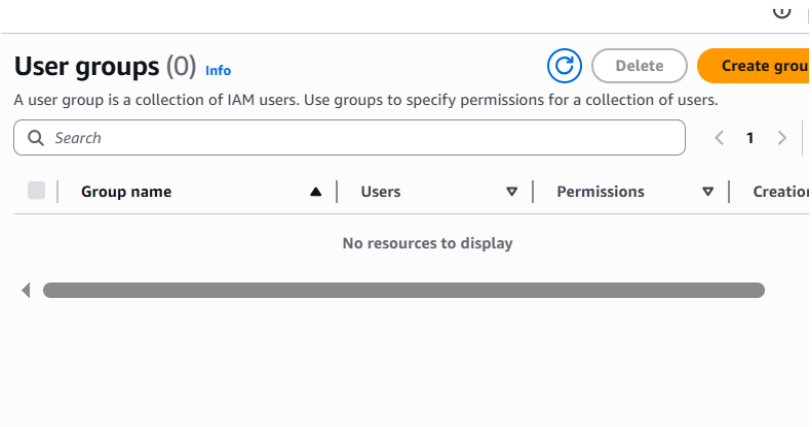
- cleanup_destroy_complete.png

```
aws_iam_user.users["Jan"]: Destruction complete after 8s
aws_iam_user.users["Andy"]: Destroying... [id=Andy]
aws_iam_user.users["Jo"]: Destruction complete after 2s
aws_iam_user.users["Gabe"]: Destruction complete after 8s
aws_iam_user.users["David"]: Destruction complete after 3s
aws_iam_user.users["Creed"]: Destruction complete after 4s
aws_iam_user.users["Michael"]: Destruction complete after 5s
aws_iam_user.users["Holly"]: Destruction complete after 4s
aws_iam_user.users["Andy"]: Destruction complete after 2s
aws_iam_user.users["Oscar"]: Destruction complete after 5s
aws_iam_user.users["Pam"]: Destruction complete after 4s
aws_iam_user.users["Clark"]: Destruction complete after 5s

Destroy complete! Resources: 107 destroyed.
```

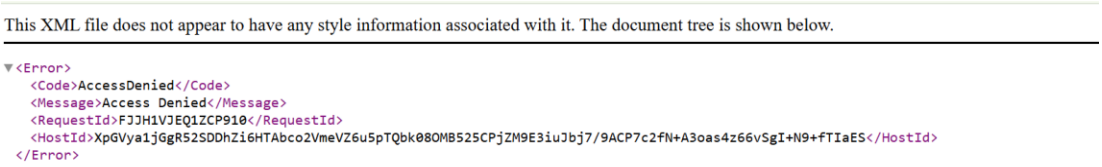
- cleanup_aws_console_users_deleted.png



- cleanup_aws_console_group_deleted.png



- cleanup_s3_empty_state.png



- cleanup_final_files.png