CLOUD COMPUTING LAB

Name: Maria Abdul Malik
Reg No: 2023-BSE-076
Submitted to: Sir Muhammad Shoaib
Class: 5B

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

- task1_file_created.png

- task1_main_tf.png

```
@mariamalik11 ▣ /workspaces/CC_Maria_076/lab13 (main) $ cat main.tf
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
  }
}
```

- task1_terraform_init.png

```
@mariamalik11 ▣ /workspaces/CC_Maria_076/lab13 (main) $ terraform init
Initializing the backend...
Initializing provider plugins...
- 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 working directory. 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::291506017390:group/groups/developers"
  "group_name" = "developers"
  "unique_id" = "AGPAUHXY42RXDWDNXBYRY"
}
```
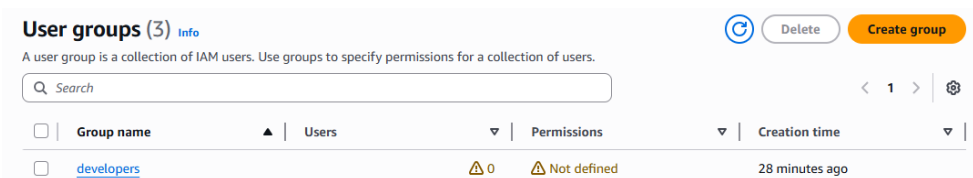
- task1_terraform_output.png


```
@mariamalik11 🗗 /workspaces/CC_Maria_076/lab13 (main) $ terraform output
group_details = {
  "group_arn" = "arn:aws:iam::291506017390:group/groups/developers"
  "group_name" = "developers"
  "unique_id" = "AGPAUHXY42RXDWDNXBYRY"
}
@mariamalik11 🗗 /workspaces/CC_Maria_076/lab13 (main) $ _
```

- task1_aws_console_group.png

User groups (3) Info
A user group is a collection of IAM users. Use groups to specify permissions for a collection of users.

	Group name ▲	Users ▽	Permissions ▽	Creation time ▽
☐	developers	⚠ 0	⚠ Not defined	28 minutes ago

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


```
Changes to Outputs:
  + user_details  = {
      + unique_id = (known after apply)
      + user_arn  = (known after apply)
      + user_name = "loadbalancer"
    }
aws_iam_user.lb: Creating...
aws_iam_user.lb: Creation complete after 2s [id=loadbalancer]
aws_iam_user_group_membership.lb_membership: Creating...
aws_iam_user_group_membership.lb_membership: Creation complete a
m-2026012207572280240000001]

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

- task2_terraform_output.png

- task2_aws_console_user.png

- task2_aws_console_user_groups.png

Task 3 — Attach Policies to IAM Group

- task3_main_tf_policies.png

- task3_terraform_apply.png

- `task3_aws_console_policies.png`
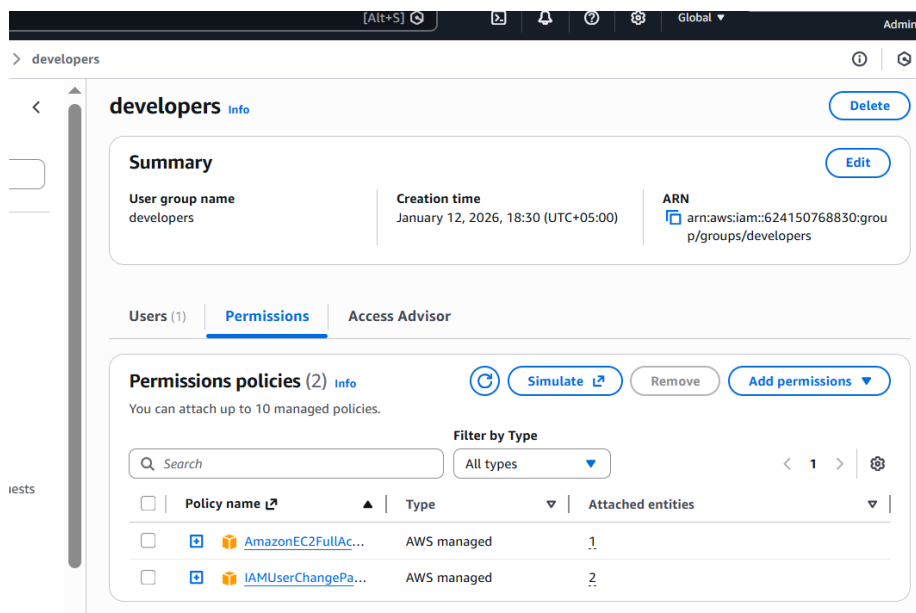
Task 4 — Create Login Profile for IAM User

- `task4_variables_tf.png`

```
@mariamalik11 ▣ /workspaces/CC_Maria_076/lab13 (main) $ cat variables.tf
variable "iam_password" {
  type     = string
  sensitive = true
  default   = "1dontKnow"
}
```

- `task4_create_login_script.png`

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

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

aws iam create-login-profile \
  --user-name "$USERNAME" \
  --password "$PASSWORD" \
  --password-reset-required || true
```

- task4_chmod_script.png

```
@mariamalik11 ▯ /workspaces/CC_Maria_076/lab13 (main) $ chmod +x create-login-profil
e.sh
```

- 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

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

- `task5_tfstate_secret. Png`

- `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

```
@mariamalik11 ⊡ /workspaces/CC_Maria_076/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-2026011214094044440000001
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
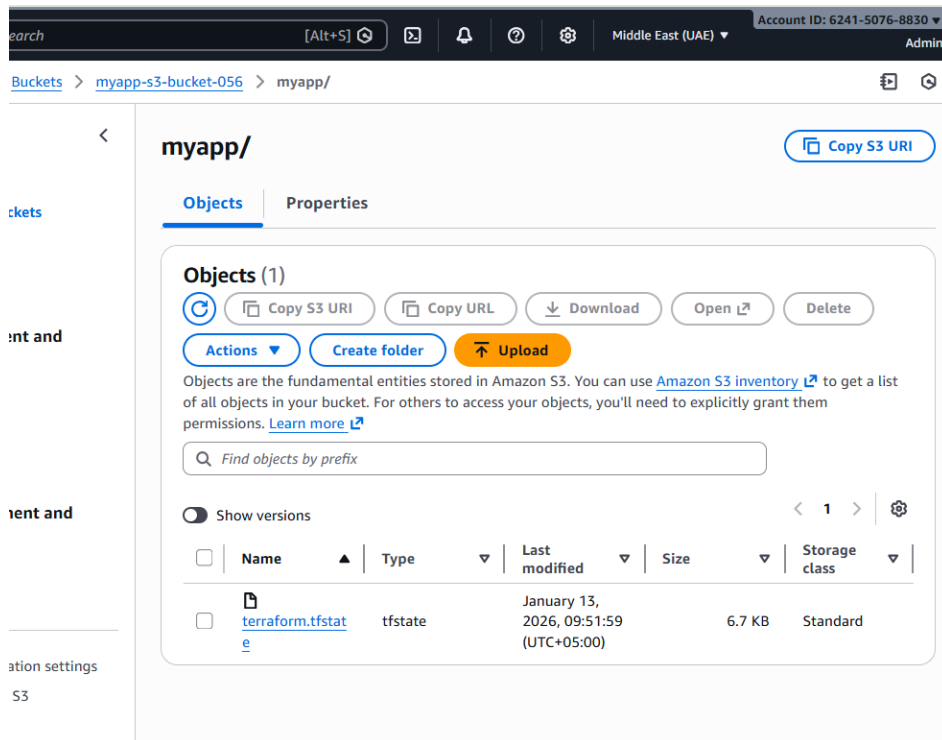
- task6_local_state_backup.png

```
@mariamalik11 🖉 /workspaces/CC_Maria_076/lab13 (main) $ ls -la terraform.tfstate*
-rw-rw-rw- 1 codespace codespace    0 Jan 13 04:51 terraform.tfstate
-rw-rw-rw- 1 codespace codespace 6882 Jan 13 04:51 terraform.tfstate.backup
```

- task6_terraform_destroy.png

```
aws_iam_group_policy_attachment.change_password: Destruction complete after
aws_iam_group_policy_attachment.developer_ec2_fullaccess: Destruction comple
aws_iam_user_group_membership.lb_membership: Destruction complete after 1s
aws_iam_user.lb: Destroying... [id=loadbalancer]
aws_iam_group.developers: Destroying... [id=developers]
aws_iam_group.developers: Destruction complete after 0s
aws_iam_user.lb: Destruction complete after 3s

Destroy complete! Resources: 7 destroyed.
```

- task6_s3_tfstate_destroyed. Png

Pretty-print

```
"version": 4,
"terraform_version": "1.14.3",
"serial": 2,
"lineage": "46f2a50a-befd-1786-5486-911df1a43971",
"outputs": {},
"resources": [],
"check_results": null
```

Task 7 — Create Multiple Users from CSV File

- task7_locals_tf.png

```
@mariamalik11 ⌂ /workspaces/CC_Maria_076/lab13 (main) $ vim locals.tf
@mariamalik11 ⌂ /workspaces/CC_Maria_076/lab13 (main) $ cat locals.tf
locals {
  users = csvdecode(file("users.csv"))
}
```

- task7_users_csv.png

```
  GNU nano 7.2                                              users
Michael
Dwight
Jim
Pam
Ryan
Andy
Robert
Stanley
Kevin
Angela
Oscar
Phyllis
Toby
Kelly
Darryl
Creed
Meredith
Erin
Gabe
Jan
David
Holly
Charles
Jo
Clark
Peter
                                                       [ Wrote 27 ]
```

- task7_main_tf_multiple_users.png

```
@mariamalik11 ⬚ /workspaces/CC_Maria_076/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


```
@mariamalik11 ⬚ /workspaces/CC_Maria_076/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 s
any changes that are required for your infrastructure. All Terraform comman
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, o
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

- `task7_tfstate_secrets. Png`

- `task7_aws_console_all_users. Png`

- `task7_aws_console_group_members. Png`
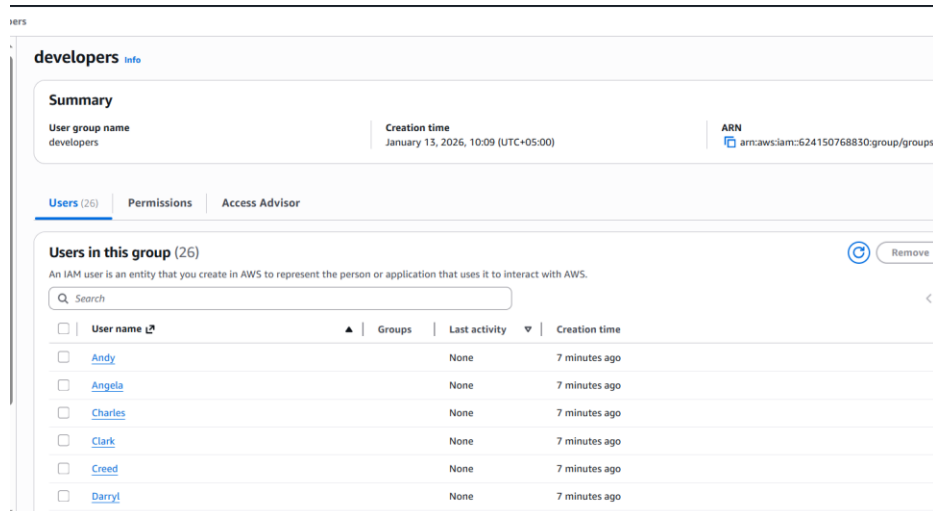
- `task7_aws_console_user_access_key.png`
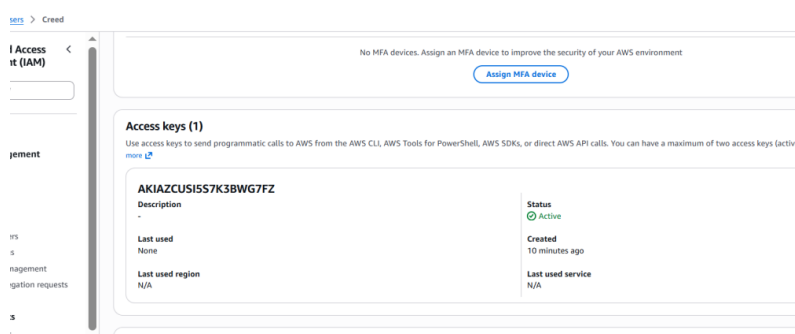
- `task7_s3_tfstate_multiple_users.png`
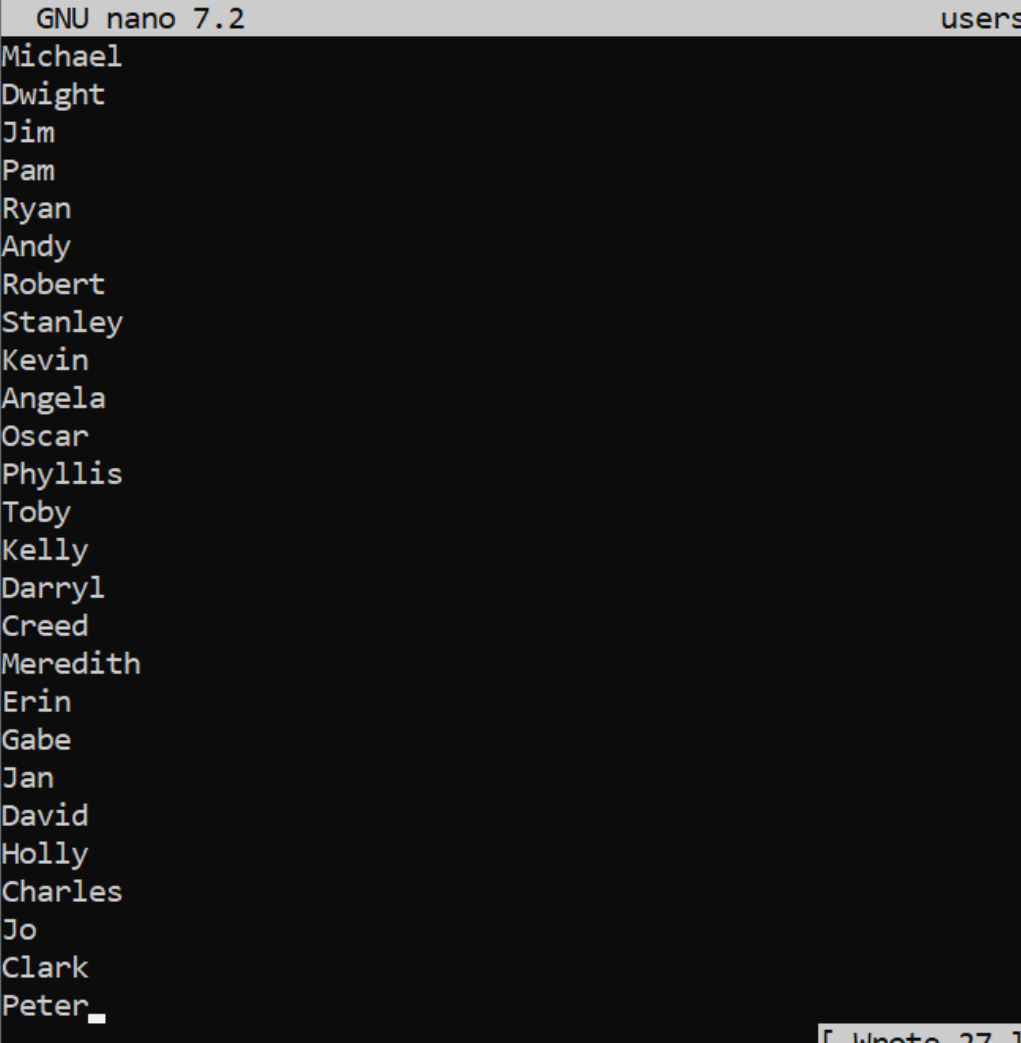
```
{
  "version": 4,
  "terraform_version": "1.14.3",
  "serial": 5,
  "lineage": "46f2a50a-befd-1786-5486-911df1a43971",
  "outputs": {
    "all_access_key_secrets": {
      "value": {
        "Andy": "xSH56b/f9rl28TKyZkVHLqBx80+HCCJSA+bDB/1A",
        "Angela": "EQVFQJetu7FkIEdaVdNbt21wZ8xdm73flaXug7dP",
        "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": "10pFHRRparpOvgveJUG4fxtvWGgiPRvL54pdLmio",
```

Cleanup

- `cleanup_destroy_complete.png`

```
aws_iam_user.users["Clark"]: Destroying... [id=Clark]
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.
```
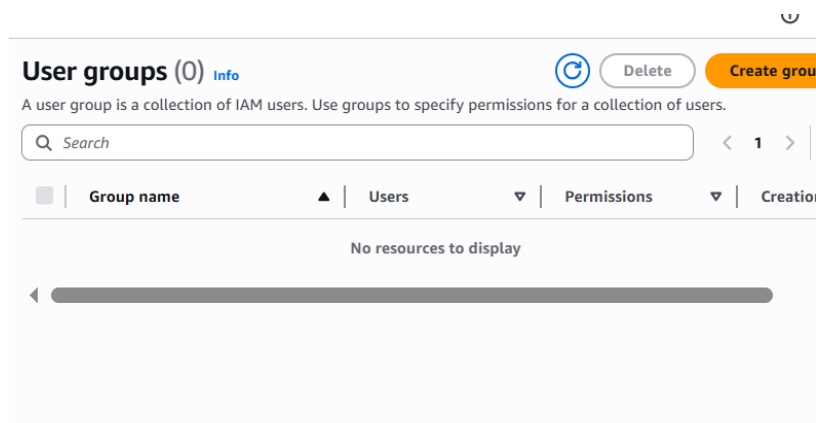
- cleanup_aws_console_users_deleted.png
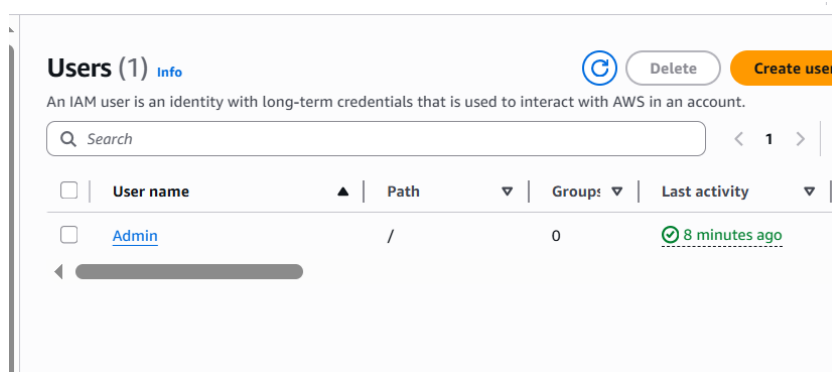
- cleanup_aws_console_group_deleted.png

- cleanup_s3_empty_state.png

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```xml
<Error>
    <Code>AccessDenied</Code>
    <Message>Access Denied</Message>
    <RequestId>FJJH1VJEQ1ZCP910</RequestId>
    <HostId>XpGVya1jGgR52SDDhZi6HTAbco2VmeVZ6u5pTQbk08OMB525CPjZM9E3iuJbj7/9ACP7c2fN+A3oas4z66vSgI+N9+fTIaES</HostId>
</Error>
```

- cleanup_final_files.png

```
@mariamalik11 ▯ /workspaces/CC_Maria_076/lab13 (main) $ ls -la
total 65324
drwxrwxrwx+  4 codespace root         4096 Jan 13 05:10 .
drwxrwxrwx+ 17 codespace root         4096 Jan 12 14:05 ..
drwxr-xr-x+  3 codespace codespace    4096 Jan 13 04:51 .terraform
-rw-r--r--   1 codespace codespace    2422 Jan 13 04:20 .terraform.lock.hcl
-rw-rw-rw-   1 codespace root            0 Jan 12 13:05 README.md
drwxr-xr-x+  3 codespace codespace    4096 Jan  9 19:14 aws
-rw-rw-rw-   1 codespace codespace 66842323 Jan 12 13:21 awscliv2.zip
-rwxrwxrwx   1 codespace codespace     423 Jan 13 04:17 create-login-profile.sh
-rw-rw-rw-   1 codespace codespace      50 Jan 13 05:00 locals.tf
-rw-rw-rw-   1 codespace codespace    2509 Jan 13 05:10 main.tf
-rw-rw-rw-   1 codespace codespace       0 Jan 13 04:51 terraform.tfstate
-rw-rw-rw-   1 codespace codespace    6882 Jan 13 04:51 terraform.tfstate.backup
-rw-rw-rw-   1 codespace codespace     167 Jan 13 05:02 users.csv
-rw-rw-rw-   1 codespace codespace     150 Jan 13 04:15 variables.tf
```