Lab Exercise 18- Scanning IaC Templates for Vulnerabilities

Objective

- Learn how to scan Infrastructure as Code (IaC) templates for security vulnerabilities.
- Use open-source IaC security tools to detect misconfigurations.
- Understand common risks such as public access, unencrypted resources, and insecure network rules.

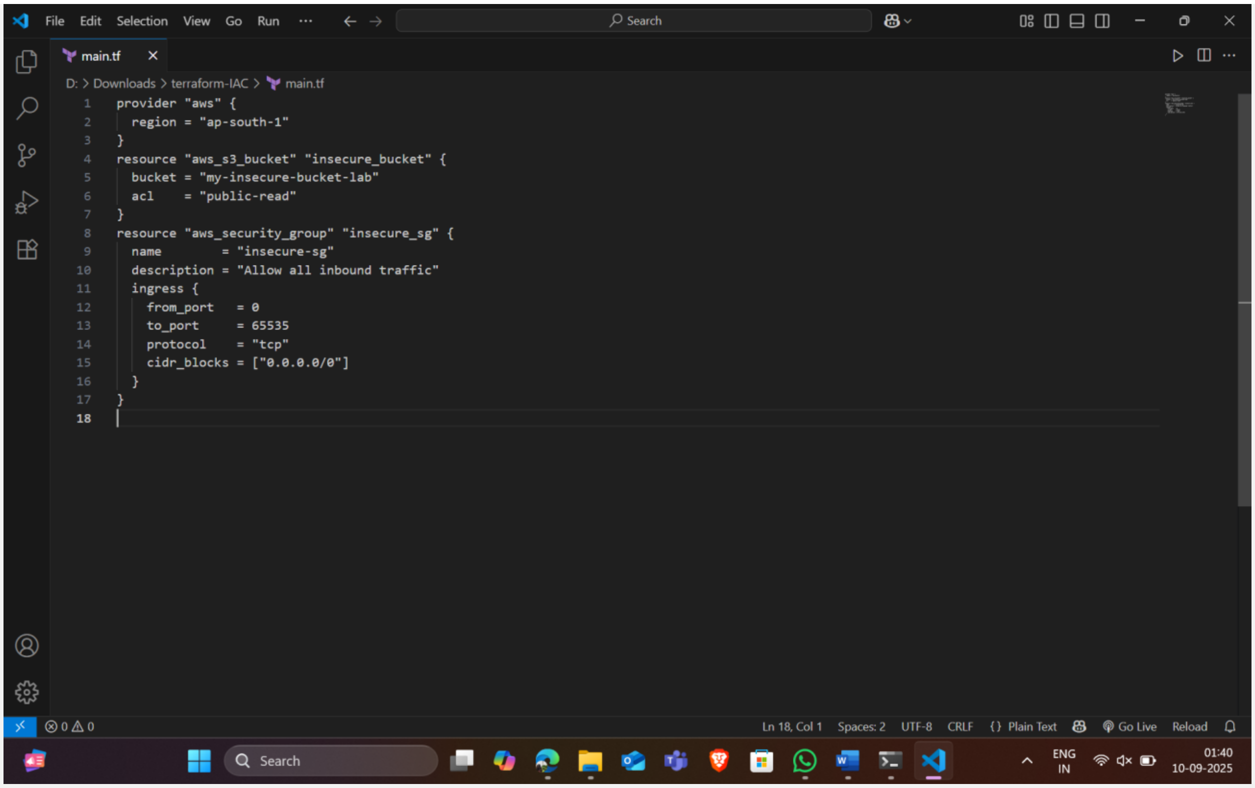
Prerequisites

- A Linux/Windows/Mac machine with:
  - Terraform installed (for sample IaC)
  - **Checkov** (pip install checkov) or **tfsec** (brew install tfsec or binary download)
- Git installed (optional, for version control of IaC templates)

Step 1: Create an Insecure IaC Template

Create a file named main.tf with the following Terraform code:

```
provider "aws" {
  region = "us-east-1"
}
resource "aws_s3_bucket" "insecure_bucket" {
  bucket = "my-insecure-bucket-lab"
  acl    = "public-read"
}
resource "aws_security_group" "insecure_sg" {
  name        = "insecure-sg"
  description = "Allow all inbound traffic"
  ingress {
    from_port   = 0
    to_port     = 65535
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }
}
```

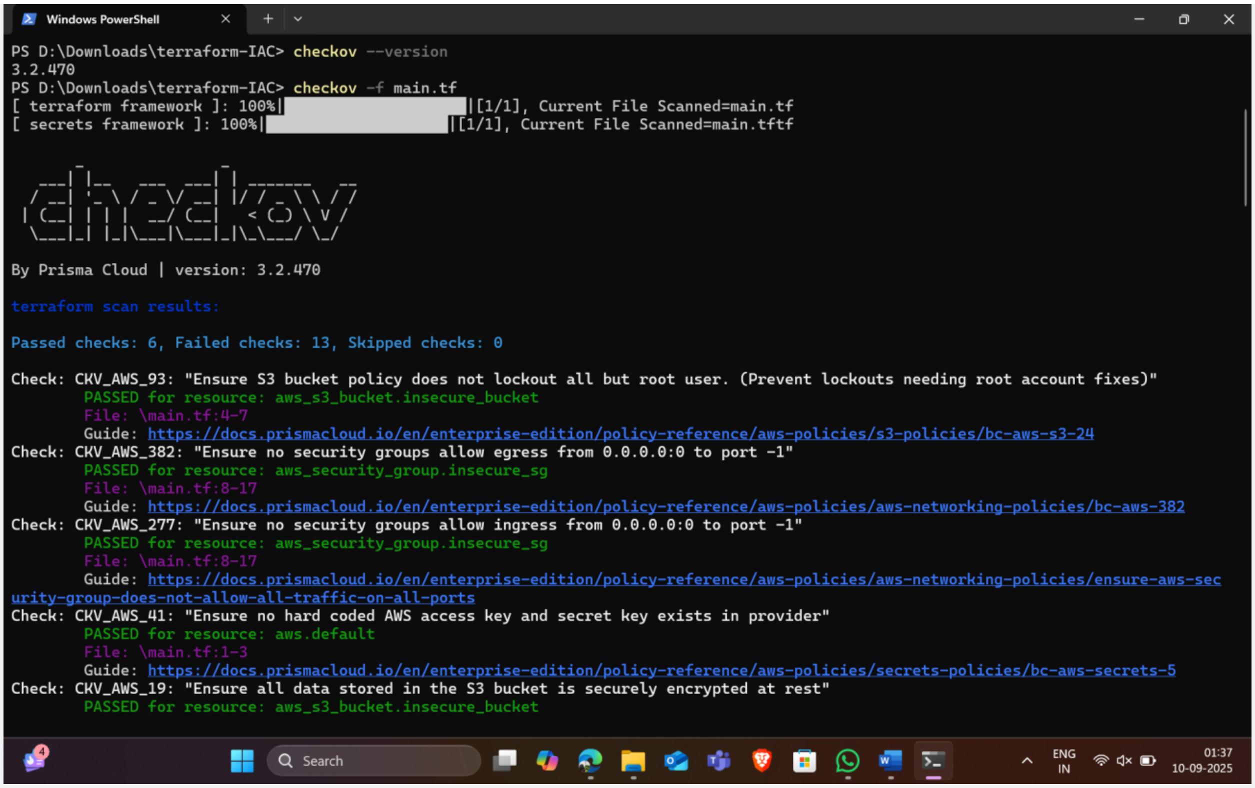


```
provider "aws" {
  region = "ap-south-1"
}
resource "aws_s3_bucket" "insecure_bucket" {
  bucket = "my-insecure-bucket-lab"
  acl    = "public-read"
}
resource "aws_security_group" "insecure_sg" {
  name        = "insecure-sg"
  description = "Allow all inbound traffic"
  ingress {
    from_port   = 0
    to_port     = 65535
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }
}
```

Step 2: Scan the Template with Checkov

Run Checkov on the current directory:

```
checkov -d .
```



```
PS D:\Downloads\terraform-IAC> checkov --version
3.2.470
PS D:\Downloads\terraform-IAC> checkov -f main.tf
[ terraform framework ]: 100%|████████████████████|[1/1], Current File Scanned=main.tf
[ secrets framework ]: 100%|████████████████████|[1/1], Current File Scanned=main.tftf

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terraform scan results:

Passed checks: 6, Failed checks: 13, Skipped checks: 0

Check: CKV_AWS_93: "Ensure S3 bucket policy does not lockout all but root user. (Prevent lockouts needing root account fixes)"
        PASSED for resource: aws_s3_bucket.insecure_bucket
        File: \main.tf:4-7
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/bc-aws-s3-24
Check: CKV_AWS_382: "Ensure no security groups allow egress from 0.0.0.0:0 to port -1"
        PASSED for resource: aws_security_group.insecure_sg
        File: \main.tf:8-17
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-networking-policies/bc-aws-382
Check: CKV_AWS_277: "Ensure no security groups allow ingress from 0.0.0.0:0 to port -1"
        PASSED for resource: aws_security_group.insecure_sg
        File: \main.tf:8-17
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-networking-policies/ensure-aws-sec
urity-group-does-not-allow-all-traffic-on-all-ports
Check: CKV_AWS_41: "Ensure no hard coded AWS access key and secret key exists in provider"
        PASSED for resource: aws.default
        File: \main.tf:1-3
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/secrets-policies/bc-aws-secrets-5
Check: CKV_AWS_19: "Ensure all data stored in the S3 bucket is securely encrypted at rest"
        PASSED for resource: aws_s3_bucket.insecure_bucket
```
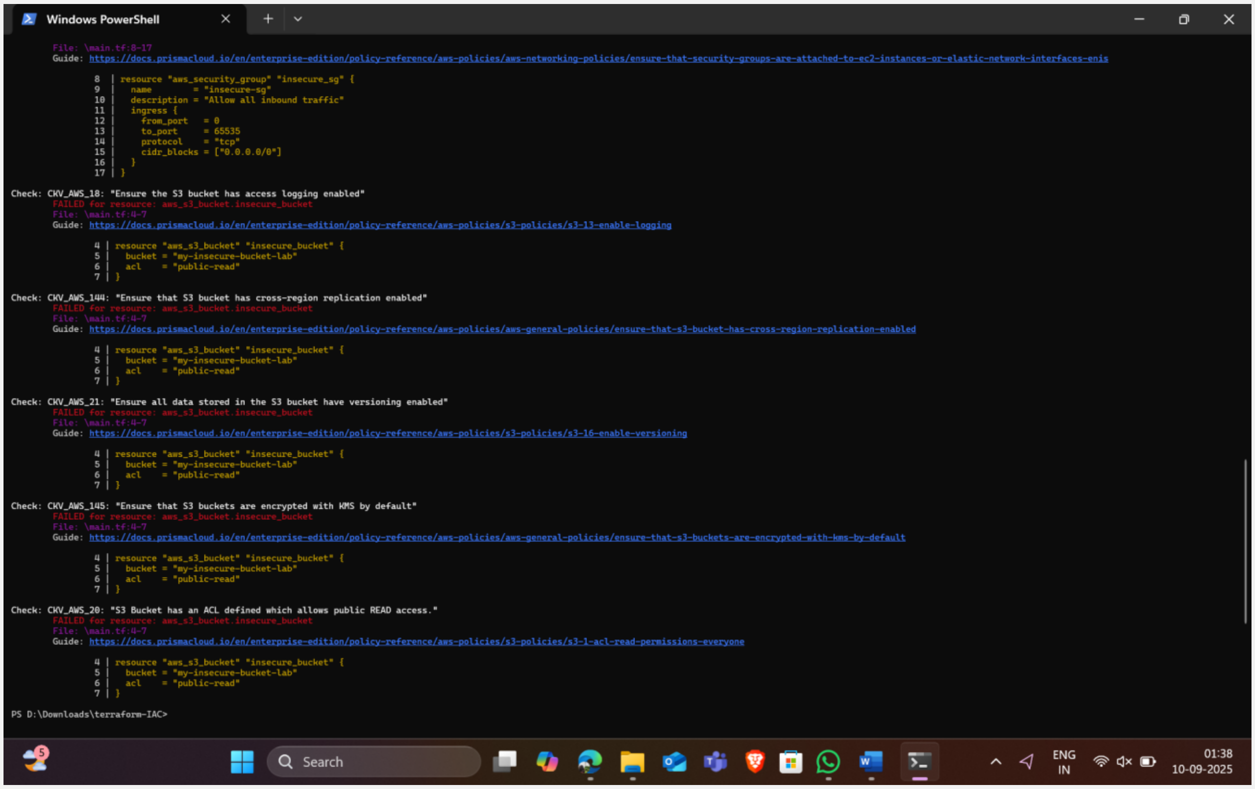



```
        File: \main.tf:8-17
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-networking-policies/ensure-that-security-groups-are-attached-to-ec2-instances-or-elastic-network-interfaces-enis

                8  | resource "aws_security_group" "insecure_sg" {
                9  |   name        = "insecure-sg"
                10 |   description = "Allow all inbound traffic"
                11 |   ingress {
                12 |     from_port   = 0
                13 |     to_port     = 65535
                14 |     protocol    = "tcp"
                15 |     cidr_blocks = ["0.0.0.0/0"]
                16 |   }
                17 | }

Check: CKV_AWS_18: "Ensure the S3 bucket has access logging enabled"
        FAILED for resource: aws_s3_bucket.insecure_bucket
        File: \main.tf:4-7
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/s3-13-enable-logging

                4 | resource "aws_s3_bucket" "insecure_bucket" {
                5 |   bucket = "my-insecure-bucket-lab"
                6 |   acl    = "public-read"
                7 | }

Check: CKV_AWS_144: "Ensure that S3 bucket has cross-region replication enabled"
        FAILED for resource: aws_s3_bucket.insecure_bucket
        File: \main.tf:4-7
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-general-policies/ensure-that-s3-bucket-has-cross-region-replication-enabled

                4 | resource "aws_s3_bucket" "insecure_bucket" {
                5 |   bucket = "my-insecure-bucket-lab"
                6 |   acl    = "public-read"
                7 | }

Check: CKV_AWS_21: "Ensure all data stored in the S3 bucket have versioning enabled"
        FAILED for resource: aws_s3_bucket.insecure_bucket
        File: \main.tf:4-7
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/s3-16-enable-versioning

                4 | resource "aws_s3_bucket" "insecure_bucket" {
                5 |   bucket = "my-insecure-bucket-lab"
                6 |   acl    = "public-read"
                7 | }

Check: CKV_AWS_145: "Ensure that S3 buckets are encrypted with KMS by default"
        FAILED for resource: aws_s3_bucket.insecure_bucket
        File: \main.tf:4-7
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-general-policies/ensure-that-s3-buckets-are-encrypted-with-kms-by-default

                4 | resource "aws_s3_bucket" "insecure_bucket" {
                5 |   bucket = "my-insecure-bucket-lab"
                6 |   acl    = "public-read"
                7 | }

Check: CKV_AWS_20: "S3 Bucket has an ACL defined which allows public READ access."
        FAILED for resource: aws_s3_bucket.insecure_bucket
        File: \main.tf:4-7
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/s3-1-acl-read-permissions-everyone

                4 | resource "aws_s3_bucket" "insecure_bucket" {
                5 |   bucket = "my-insecure-bucket-lab"
                6 |   acl    = "public-read"
                7 | }

PS D:\Downloads\terraform-IAC>
```

Expected Findings:

- Public S3 bucket access (public-read)
- Security group open to all inbound traffic

Expected Findings:

- Warns about S3 bucket without encryption
- Flags open Security Group rules

Step 4: Review the Report

Example output (Checkov):

```
Check: CKV_AWS_20: "S3 Bucket allows public read access"

    FAILED for resource: aws_s3_bucket.insecure_bucket

Check: CKV_AWS_260: "Security group allows ingress from 0.0.0.0/0"

    FAILED for resource: aws_security_group.insecure_sg
```

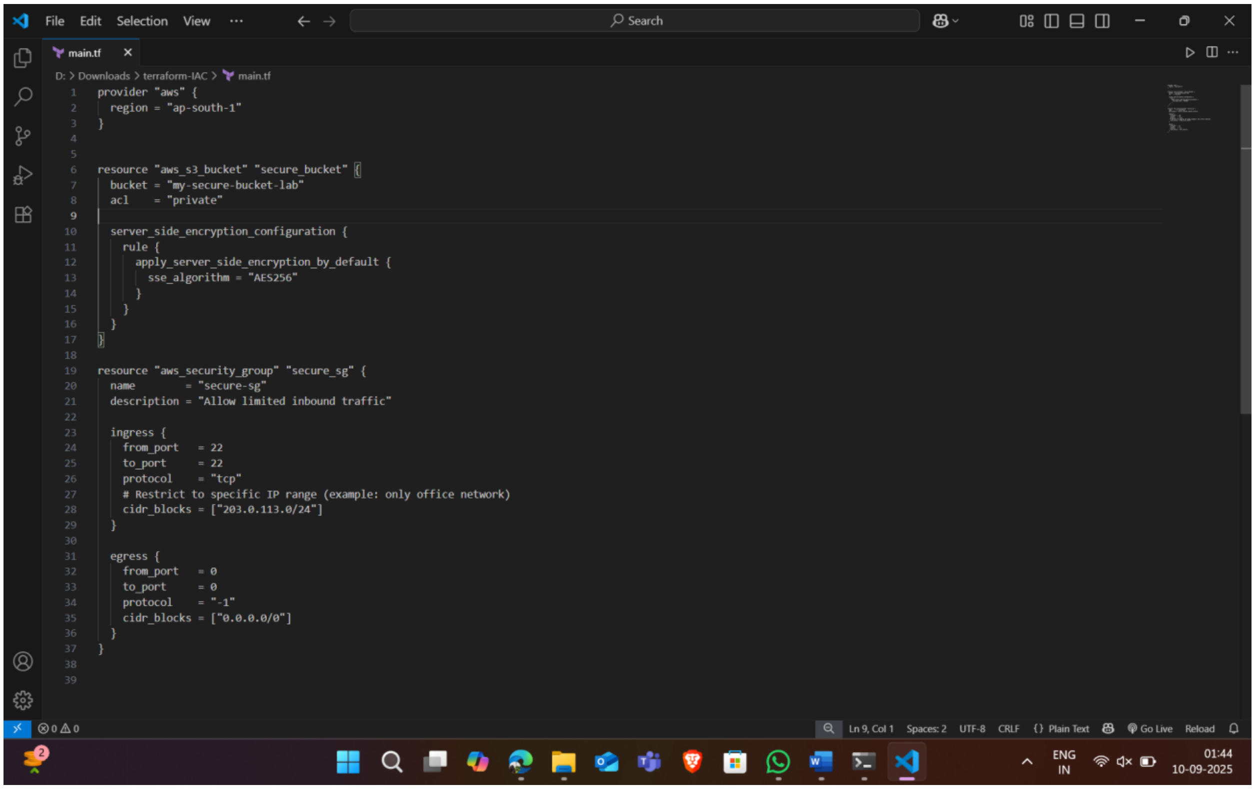
Step 5: Apply Fixes (Optional)

Modify the IaC template to:

- Set S3 bucket ACL to private

- Enable encryption (AES256)

- Restrict Security Group to specific IP ranges



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main.tf
D: > Downloads > terraform-IAC > main.tf

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


resource "aws_s3_bucket" "secure_bucket" {
  bucket = "my-secure-bucket-lab"
  acl    = "private"

  server_side_encryption_configuration {
    rule {
      apply_server_side_encryption_by_default {
        sse_algorithm = "AES256"
      }
    }
  }
}

resource "aws_security_group" "secure_sg" {
  name        = "secure-sg"
  description = "Allow limited inbound traffic"

  ingress {
    from_port   = 22
    to_port     = 22
    protocol    = "tcp"
    # Restrict to specific IP range (example: only office network)
    cidr_blocks = ["203.0.113.0/24"]
  }

  egress {
    from_port   = 0
    to_port     = 0
    protocol    = "-1"
    cidr_blocks = ["0.0.0.0/0"]
  }
}
```

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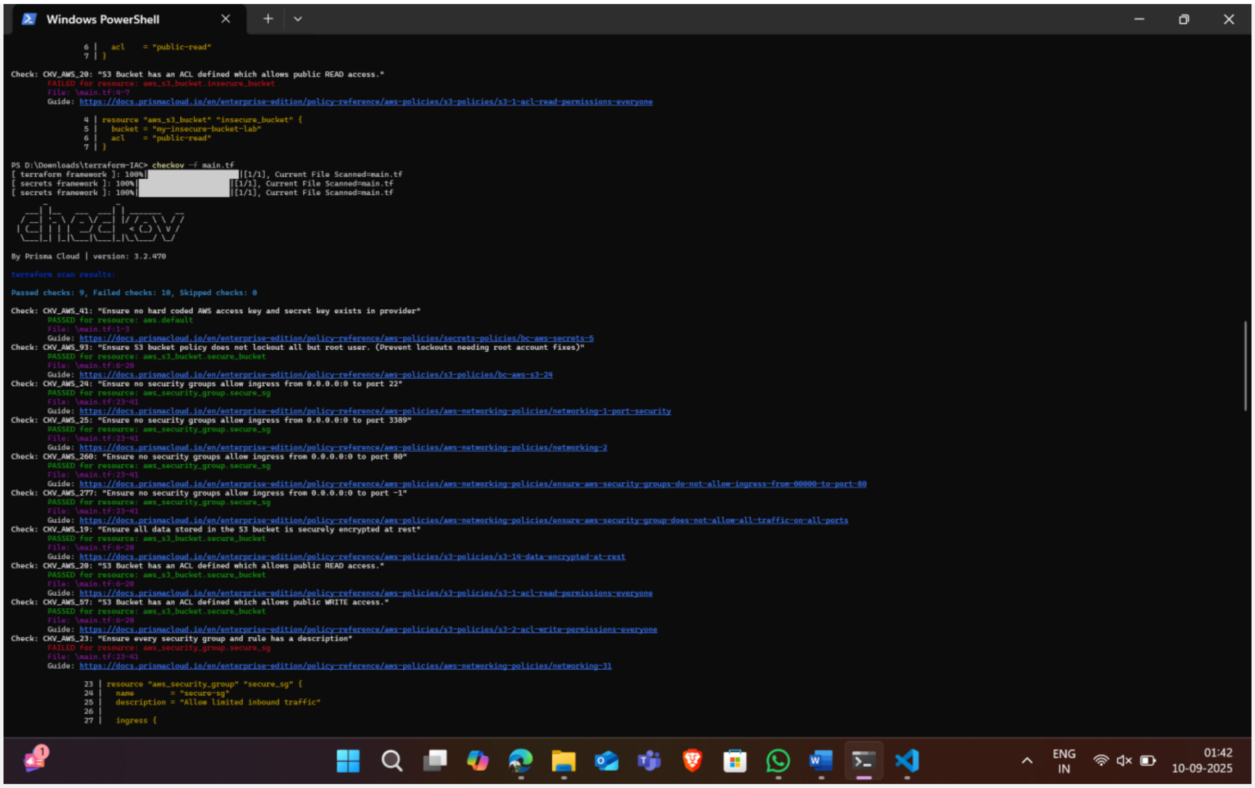
Step 6: Rescan the Template

Run the scan again:

```
checkov -d .
```



```
             6 |   acl    = "public-read"
             7 | }

Check: CKV_AWS_20: "S3 Bucket has an ACL defined which allows public READ access."
        FAILED for resource: aws_s3_bucket.insecure_bucket
        File: \main.tf:4-7
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/s3-1-acl-read-permissions-everyone

             4 | resource "aws_s3_bucket" "insecure_bucket" {
             5 |   bucket = "my-insecure-bucket-lab"
             6 |   acl    = "public-read"
             7 | }

PS D:\Downloads\terraform-IAC> checkov -f main.tf
[ terraform framework ]: 100%|████████████████████|[1/1], Current File Scanned=main.tf
[ secrets framework ]: 100%|████████████████████|[1/1], Current File Scanned=main.tf
[ secrets framework ]: 100%|████████████████████|[1/1], Current File Scanned=main.tf

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terraform scan results:

Passed checks: 9, Failed checks: 10, Skipped checks: 0

Check: CKV_AWS_41: "Ensure no hard coded AWS access key and secret key exists in provider"
        PASSED for resource: aws.default
        File: \main.tf:1-3
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/secrets-policies/bc-aws-secrets-5
Check: CKV_AWS_93: "Ensure S3 bucket policy does not lockout all but root user. (Prevent lockouts needing root account fixes)"
        PASSED for resource: aws_s3_bucket.secure_bucket
        File: \main.tf:6-20
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/bc-aws-s3-24
Check: CKV_AWS_24: "Ensure no security groups allow ingress from 0.0.0.0:0 to port 22"
        PASSED for resource: aws_security_group.secure_sg
        File: \main.tf:23-41
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-networking-policies/networking-1-port-security
Check: CKV_AWS_25: "Ensure no security groups allow ingress from 0.0.0.0:0 to port 3389"
        PASSED for resource: aws_security_group.secure_sg
        File: \main.tf:23-41
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-networking-policies/networking-2
Check: CKV_AWS_260: "Ensure no security groups allow ingress from 0.0.0.0:0 to port 80"
        PASSED for resource: aws_security_group.secure_sg
        File: \main.tf:23-41
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-networking-policies/ensure-aws-security-groups-do-not-allow-ingress-from-00000-to-port-80
Check: CKV_AWS_277: "Ensure no security groups allow ingress from 0.0.0.0:0 to port -1"
        PASSED for resource: aws_security_group.secure_sg
        File: \main.tf:23-41
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-networking-policies/ensure-aws-security-group-does-not-allow-all-traffic-on-all-ports
Check: CKV_AWS_19: "Ensure all data stored in the S3 bucket is securely encrypted at rest"
        PASSED for resource: aws_s3_bucket.secure_bucket
        File: \main.tf:6-20
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/s3-14-data-encrypted-at-rest
Check: CKV_AWS_20: "S3 Bucket has an ACL defined which allows public READ access."
        PASSED for resource: aws_s3_bucket.secure_bucket
        File: \main.tf:6-20
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/s3-1-acl-read-permissions-everyone
Check: CKV_AWS_57: "S3 Bucket has an ACL defined which allows public WRITE access."
        PASSED for resource: aws_s3_bucket.secure_bucket
        File: \main.tf:6-20
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/s3-policies/s3-2-acl-write-permissions-everyone
Check: CKV_AWS_23: "Ensure every security group and rule has a description"
        FAILED for resource: aws_security_group.secure_sg
        File: \main.tf:23-41
        Guide: https://docs.prismacloud.io/en/enterprise-edition/policy-reference/aws-policies/aws-networking-policies/networking-31

            23 | resource "aws_security_group" "secure_sg" {
            24 |   name        = "secure-sg"
            25 |   description = "Allow limited inbound traffic"
            26 |
            27 |   ingress {
```

The findings are reduced (some of them are resolved)

Now the findings should be **resolved or reduced**.

Step 7: Document Findings

Create a simple findings log:

Findings Log – Terraform IaC

ID	Resource	Issue Detected	Risk	Fix Applied
1	aws_s3_bucket.insecure_bucket	S3 bucket ACL set to public-read	Public exposure of data	Changed ACL to private

ID	Resource	Issue Detected	Risk	Fix Applied
2	aws_s3_bucket.insecure_bucket	No encryption configured	Data at rest not protected	Enabled AES256 server-side encryption
3	aws_security_group.insecure_sg	Ingress allows 0.0.0.0/0 on all TCP ports	Full internet exposure (critical risk)	Restricted ingress to specific CIDR (203.0.113.0/24) and limited to port 22