Overview

This project implements continuous deployment for a static website hosted on Oracle Cloud Infrastructure. The pipeline uses GitHub Actions to automatically deploy code changes via SSH, eliminating manual intervention while maintaining security controls.

Architecture

```
Developer Workstation
        ↓
   Git Push (HTTPS)
        ↓
GitHub Repository (master branch)
        ↓
GitHub Actions Runner (Ubuntu Latest)
        ↓
SSH Connection (ED25519 Key Auth)
        ↓
OCI Compute Instance (VM.Standard.E2.1.Micro)
        ↓
Nginx Web Server (/var/www/html)
```

Infrastructure

Cloud Platform: Oracle Cloud Infrastructure (OCI)
Compute: VM.Standard.E2.1.Micro (Always Free tier)
Operating System: Ubuntu 24.04 LTS
Web Server: Nginx
Region: Netherlands Northwest (Amsterdam)

Network Configuration:

- Public IP: Assigned
- Security List: Custom ingress rules
- VCN: Default OCI configuration

Security Controls

SSH Hardening

- **Password Authentication:** Disabled
- **Root Login:** Prohibited
- **Public Key Authentication:** Required (ED25519)

Firewall Configuration (UFW)

- Port 22 (SSH): Allowed from anywhere
- Port 80 (HTTP): Allowed from anywhere
- Port 80 (HTTP IPv6): Allowed from anywhere
- Default Policy: Deny incoming, allow outgoing

Access Control

- GitHub Actions authentication via encrypted secrets
- SSH private key stored in GitHub repository secrets
- Server credentials never exposed in workflow files

CI/CD Pipeline

Workflow Trigger

```
on:
  push:
    branches: [ master ]
```

Deployment Process

1. GitHub detects push to master branch
2. Workflow spins up Ubuntu runner
3. SSH connection established using private key from secrets
4. Commands execute on remote server:
    - Navigate to web directory
    - Pull latest code from GitHub
    - Reload Nginx (zero downtime)
5. Changes live within 10-15 seconds

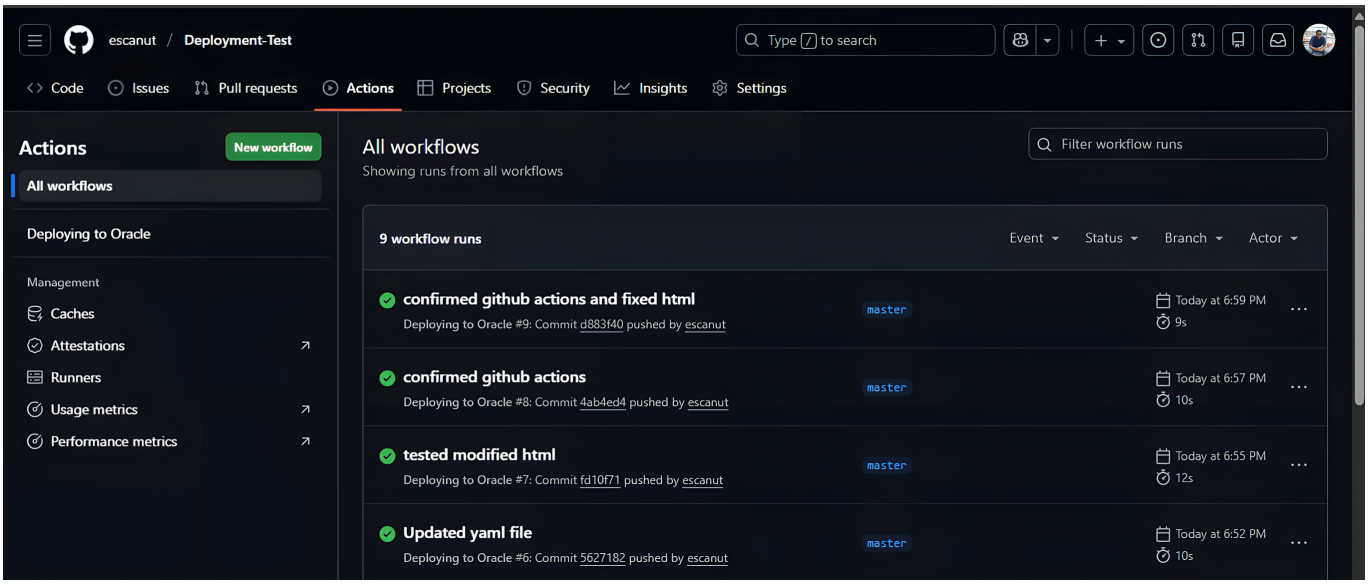
Secrets Configuration

Three repository secrets required:

- `SSH_PRIVATE_KEY`: ED25519 private key for authentication
- `SERVER_IP`: OCI instance public IP
- `SERVER_USER`: SSH username

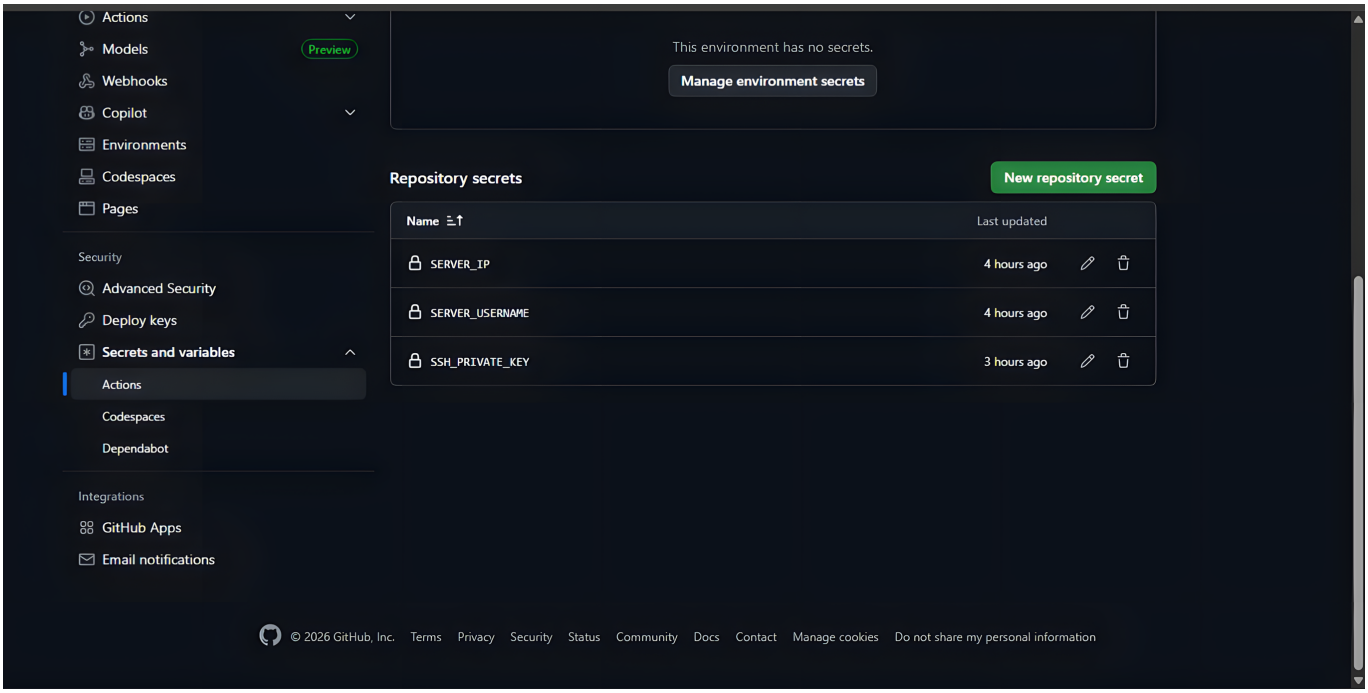
Deployment Evidence

Successful Pipeline Execution



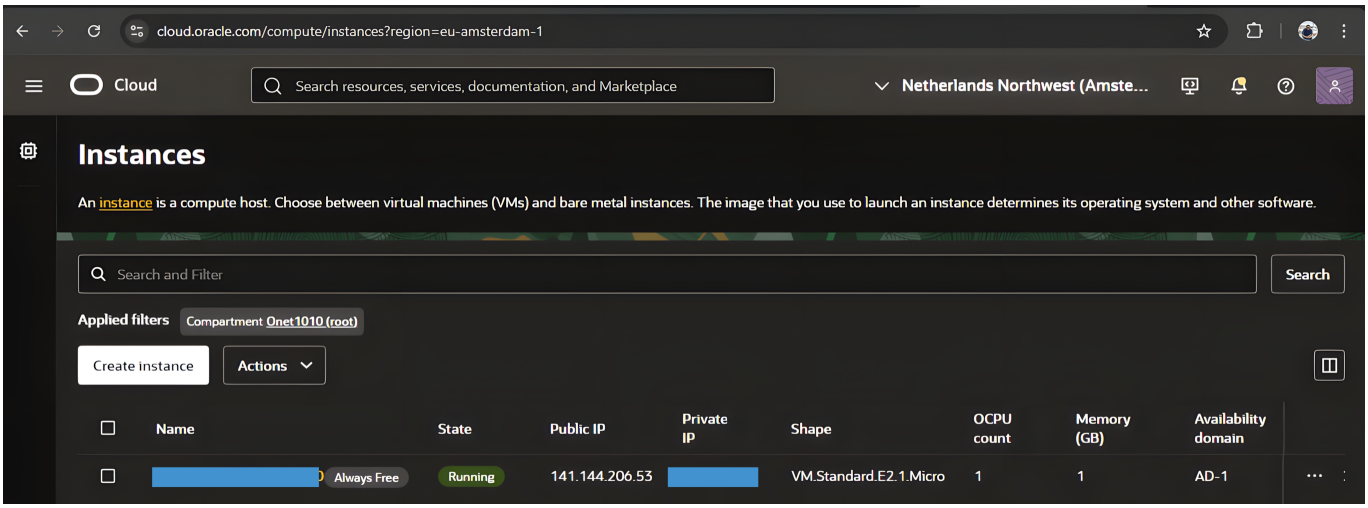
Multiple successful deployments showing consistent 9-12 second execution times

Repository Secrets



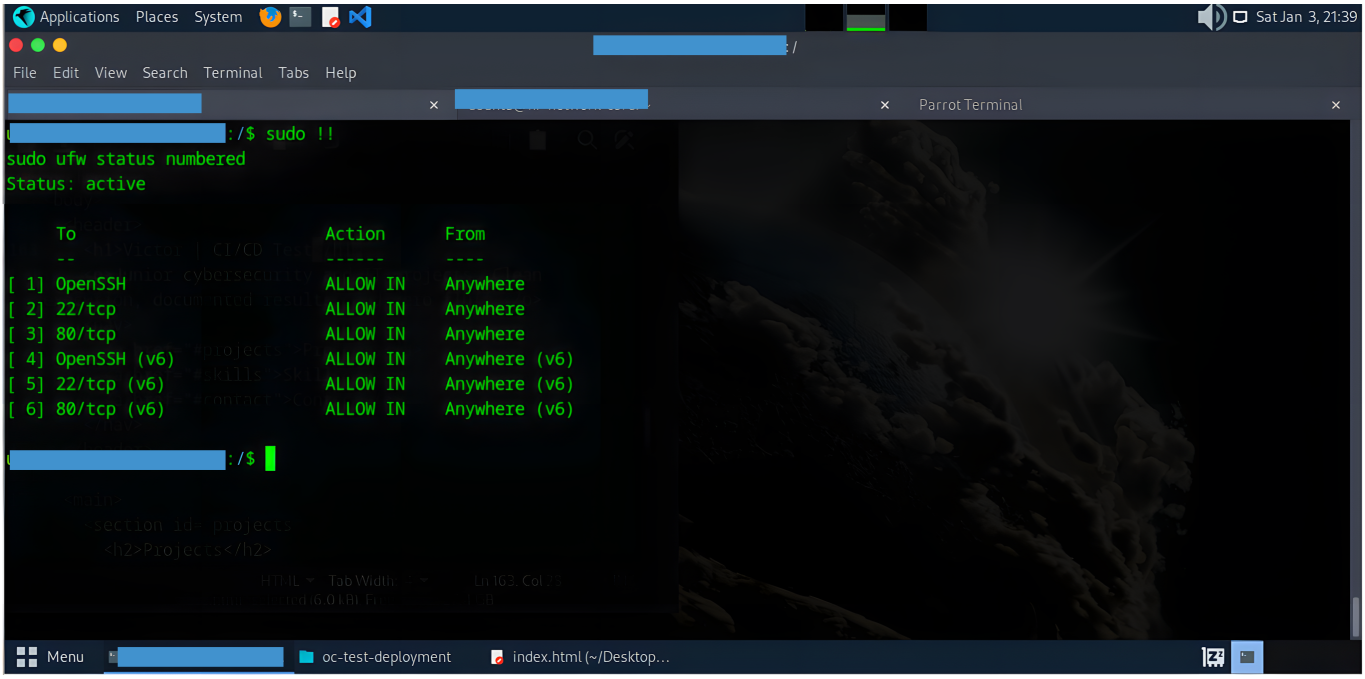
Encrypted credentials stored securely in GitHub

Infrastructure Status

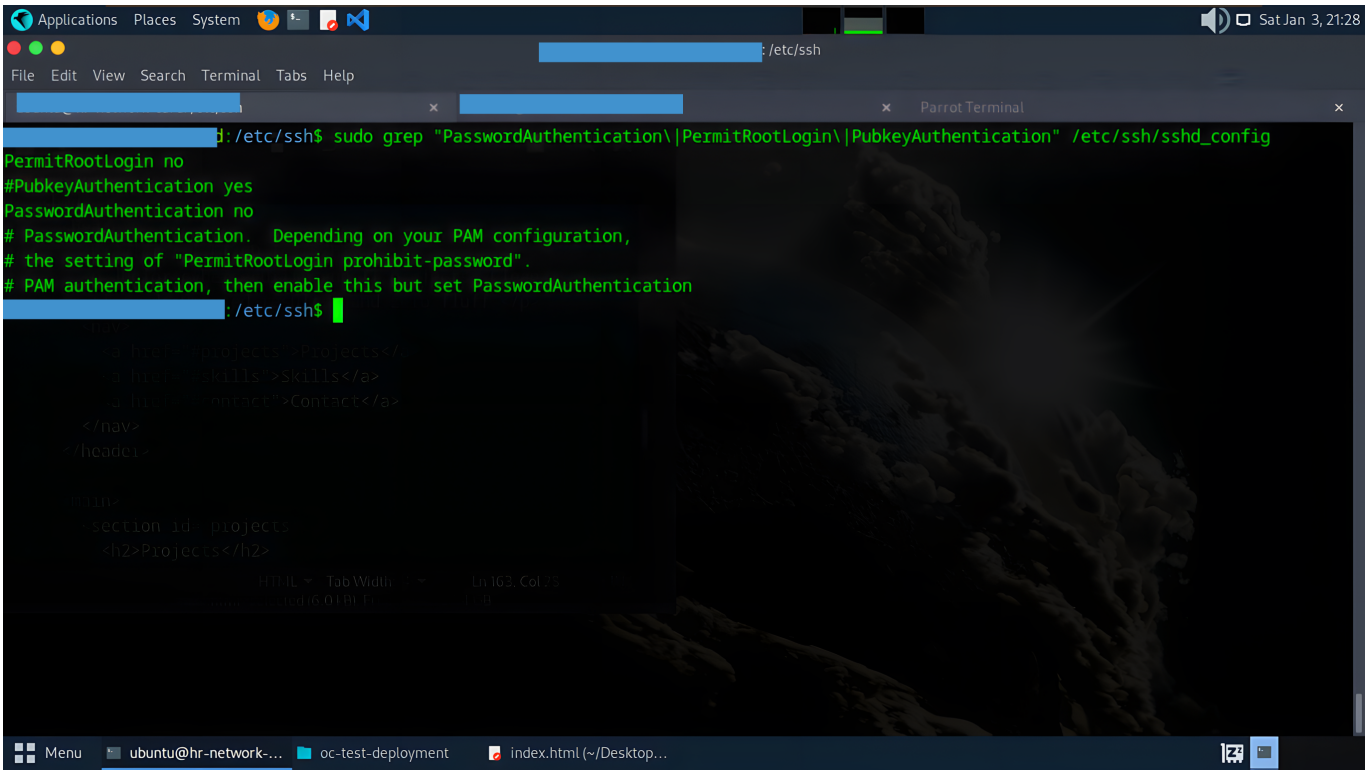


Always Free tier compute instance in running state

Security Configuration

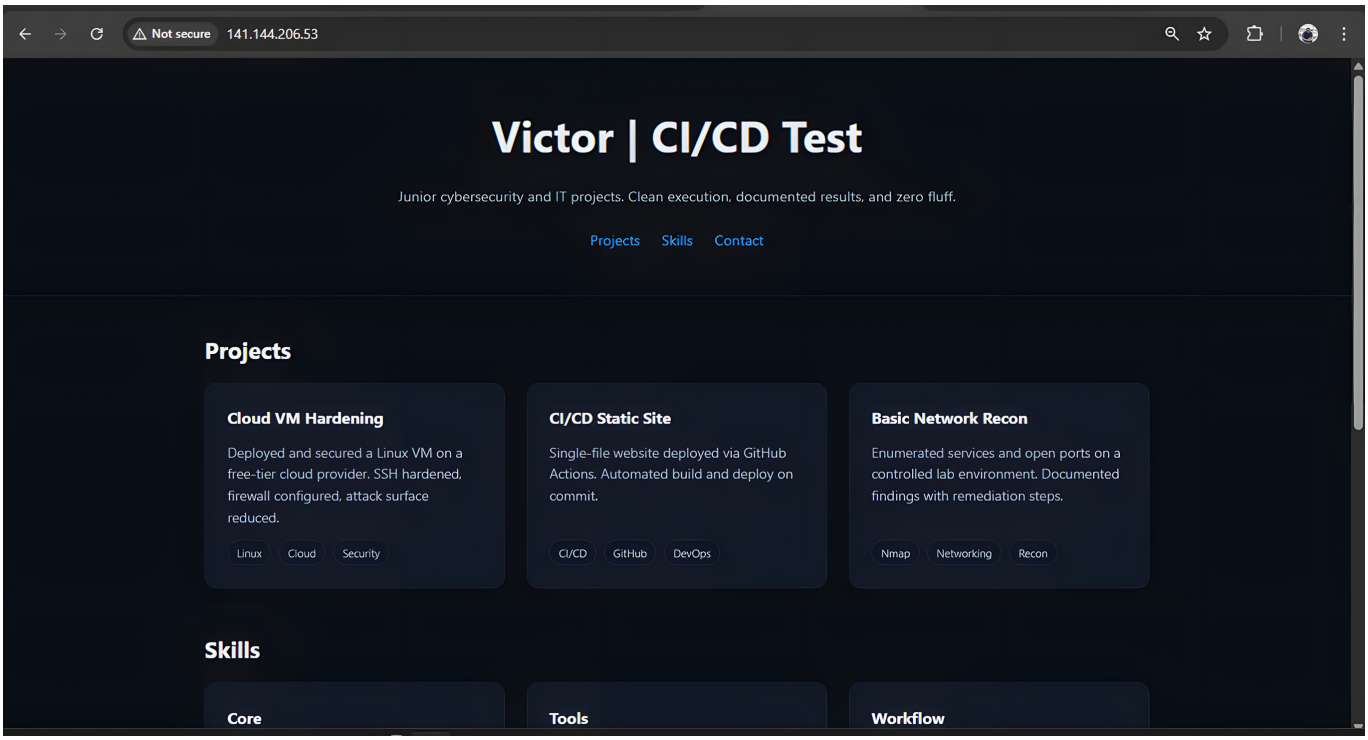


Active firewall with restrictive ingress rules



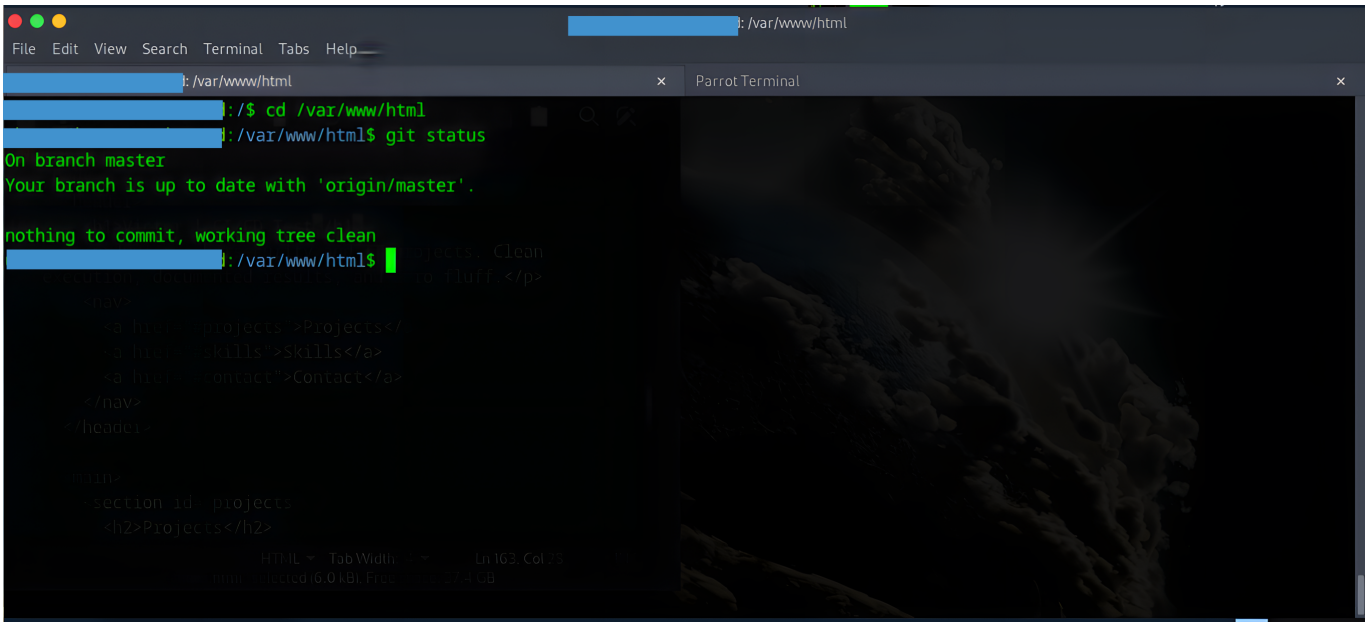
Hardened SSH configuration with password authentication disabled

Live Deployment



Deployed website accessible via public IP

Git Repository Status



Clean working tree synced with remote repository

Technical Implementation

GitHub Actions Workflow

Location: `.github/workflows/deploy.yml`

The workflow uses GitHub's hosted runners to establish SSH connections and execute remote commands. All commands run within a single SSH session to maintain context and reduce connection overhead.

Server Configuration

- Web root: `/var/www/html`
- Git repository: Cloned directly into web root
- Nginx: Reloads configuration on each deployment

Performance Metrics

Based on production deployment data:

Metric	Value
Average Deployment Time	10-12 seconds
Successful Deployments	9/9 shown
SSH Connection Time	< 2 seconds
Git Pull Time	< 3 seconds
Nginx Reload Time	< 1 second

This deployment uses one compute instance with standard storage allocation.

Operational Considerations

Monitoring

- GitHub Actions provides execution logs for all deployments
- Nginx access and error logs available on server
- UFW logs track connection attempts

Backup Strategy

Git serves as the primary backup mechanism. Full repository history maintained on GitHub with the ability to roll back to any previous commit.

Reproduction Steps

Prerequisites

- Oracle Cloud account (Always Free tier)
- GitHub account
- SSH key pair (ED25519 recommended)
- Basic Linux command line knowledge

Setup Process

1. Provision OCI compute instance (Ubuntu 24.04)
2. Configure security list for HTTP/HTTPS traffic
3. Harden SSH configuration
4. Enable UFW firewall
5. Install Nginx and Git
6. Clone repository to `/var/www/html`
7. Generate deployment SSH key pair
8. Add public key to server's `authorized_keys`
9. Store private key and credentials in GitHub secrets
10. Create GitHub Actions workflow file
11. Push to master branch to test deployment

Technologies Used

- **Cloud:** Oracle Cloud Infrastructure (OCI)
- **CI/CD:** GitHub Actions
- **Web Server:** Nginx
- **Operating System:** Ubuntu 24.04 LTS
- **Security:** UFW, SSH key authentication
- **Version Control:** Git, GitHub

Project Context

This deployment demonstrates practical DevOps implementation suitable for client environments requiring automated deployments without enterprise tooling complexity. The architecture scales to support multiple sites on a single instance or can be replicated across multiple instances for different applications.

The security posture aligns with standard cloud infrastructure requirements including SSH hardening, firewall configuration, and credential management through encrypted secrets.
