Securely Deploying Infrastructure As Code

Chris Ayers

HashiCorp Terraform

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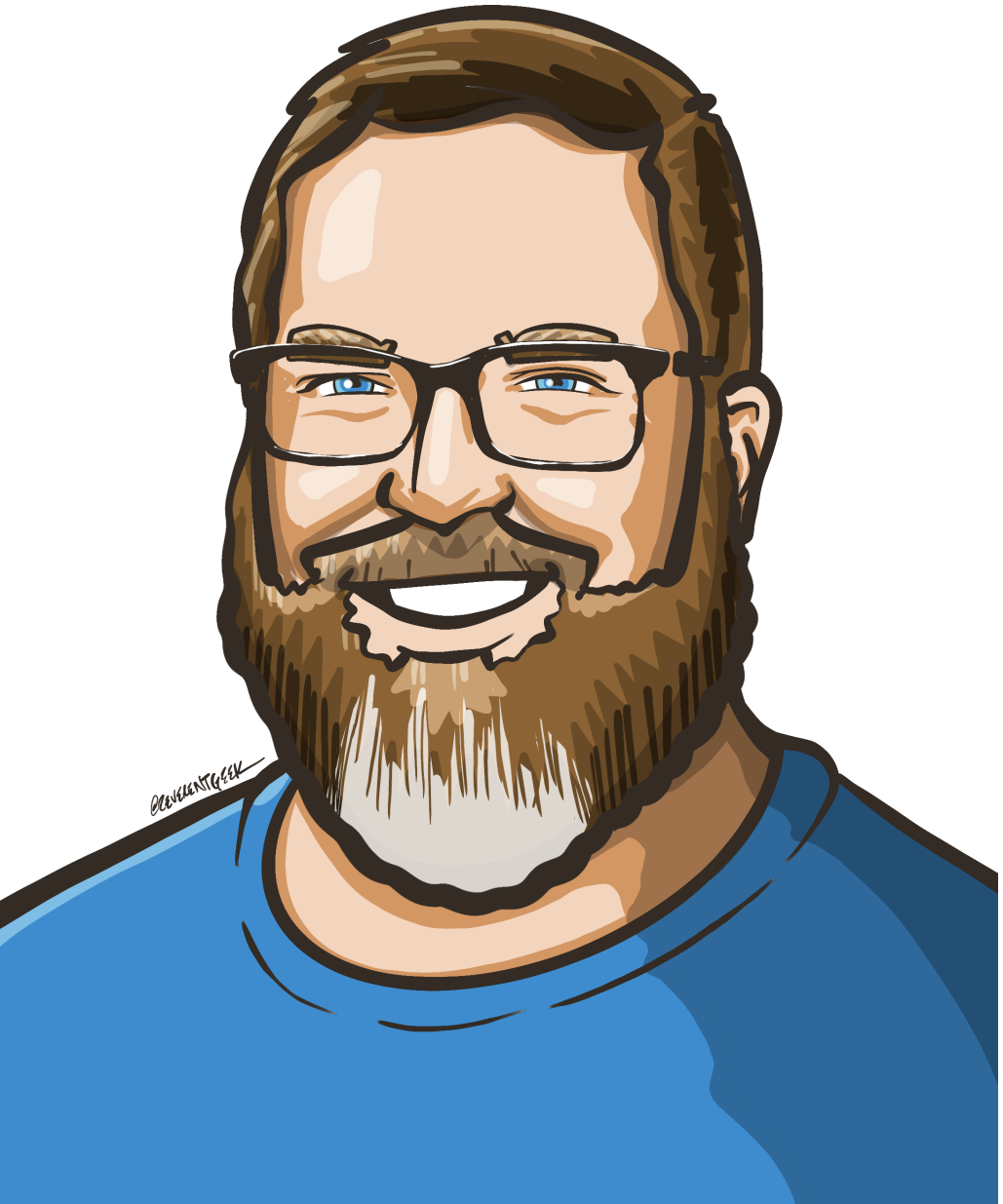
https://github.com/codebytes/secure-terraform-on-azure



Chris Ayers

Principal Software Engineer
Azure EngOps AzRel
Microsoft

BlueSky: @chris-ayers.com

LinkedIn: - chris-l-ayers

Blog: https://chris-ayers.com/

GitHub: Codebytes

Mastodon: @Chrisayers@hachyderm.io

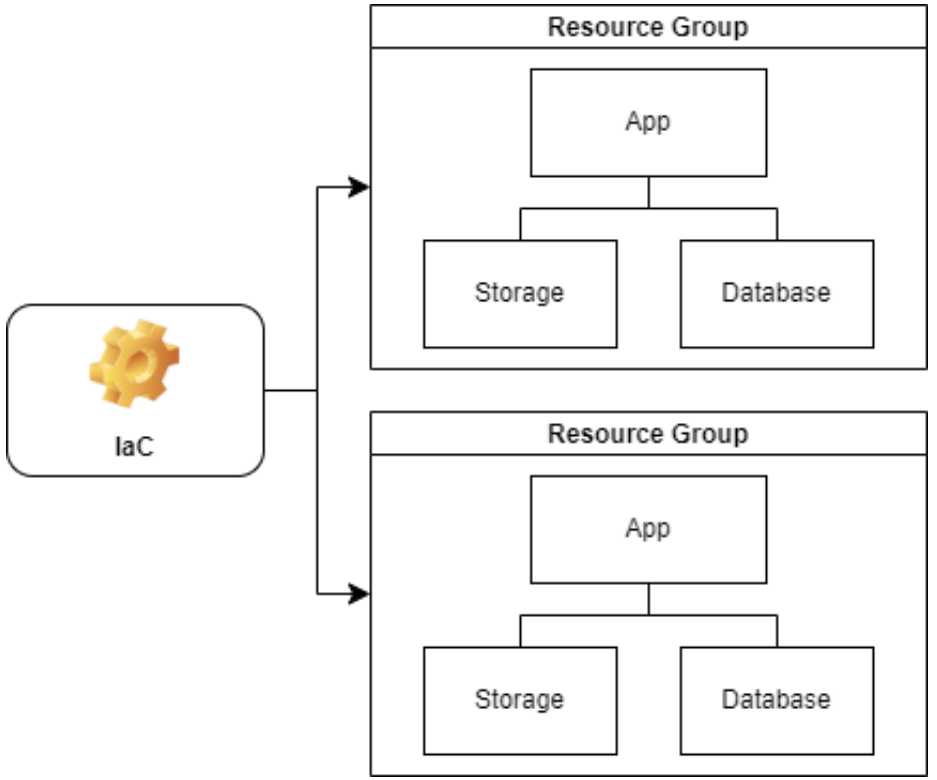
~~Twitter: @Chris_L_Ayers~~

Agenda

- **What is Infrastructure as Code (IaC)?**
- **Security Tooling**
  - Rules & Customization
  - Workflow
- **Integration**
  - Precommit hook
  - VSCode Integration
  - GitHub Actions

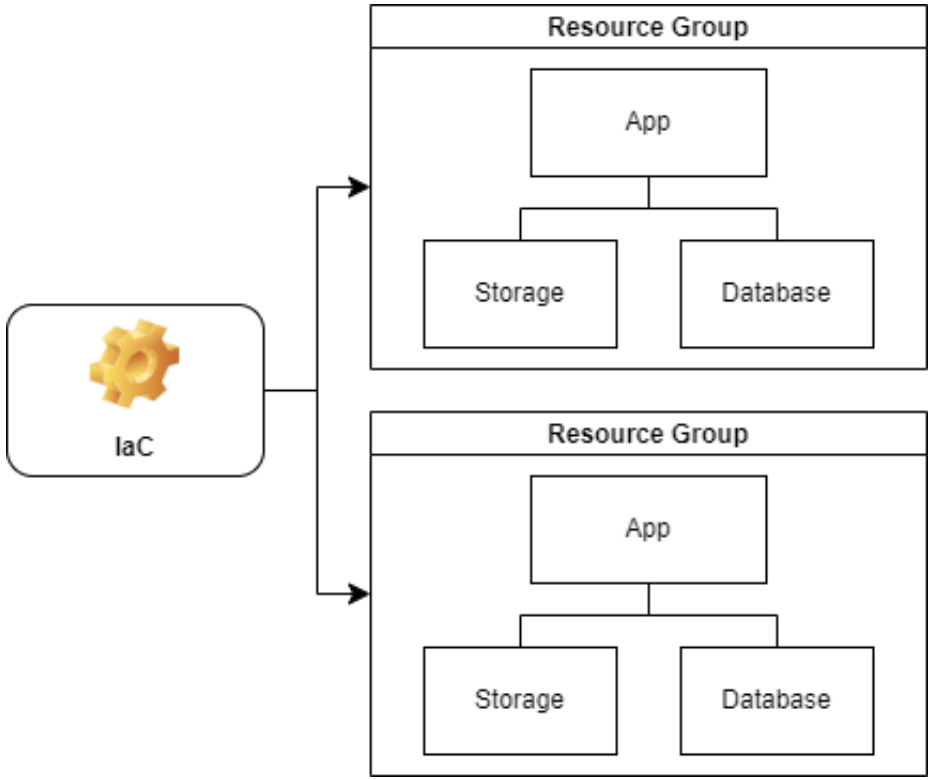
What is Infrastructure as Code (IaC)?

Infrastructure as code (IaC) is a way to manage and provision infrastructure resources using configuration files and automation tools.



Why use Infrastructure as Code (IaC)?

The goal of IaC is to make it easier to deploy and manage infrastructure in a repeatable, reliable way, and to reduce the risk of errors caused by manual configuration.

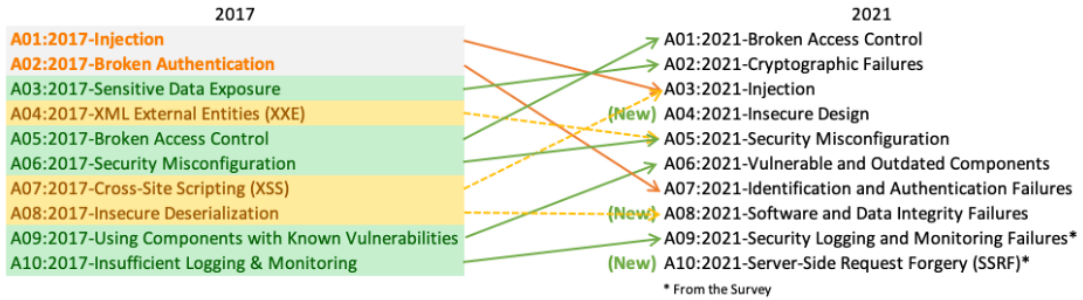


Security and Compliance

There have been multiple breaches and attacks due to misconfiguration. Vulnerabilities can be a simple omitted property.

OWASP Top 10

A05:2021 – Security Misconfiguration



Kubernetes OWASP Top Ten

OWASP Kubernetes Top Ten

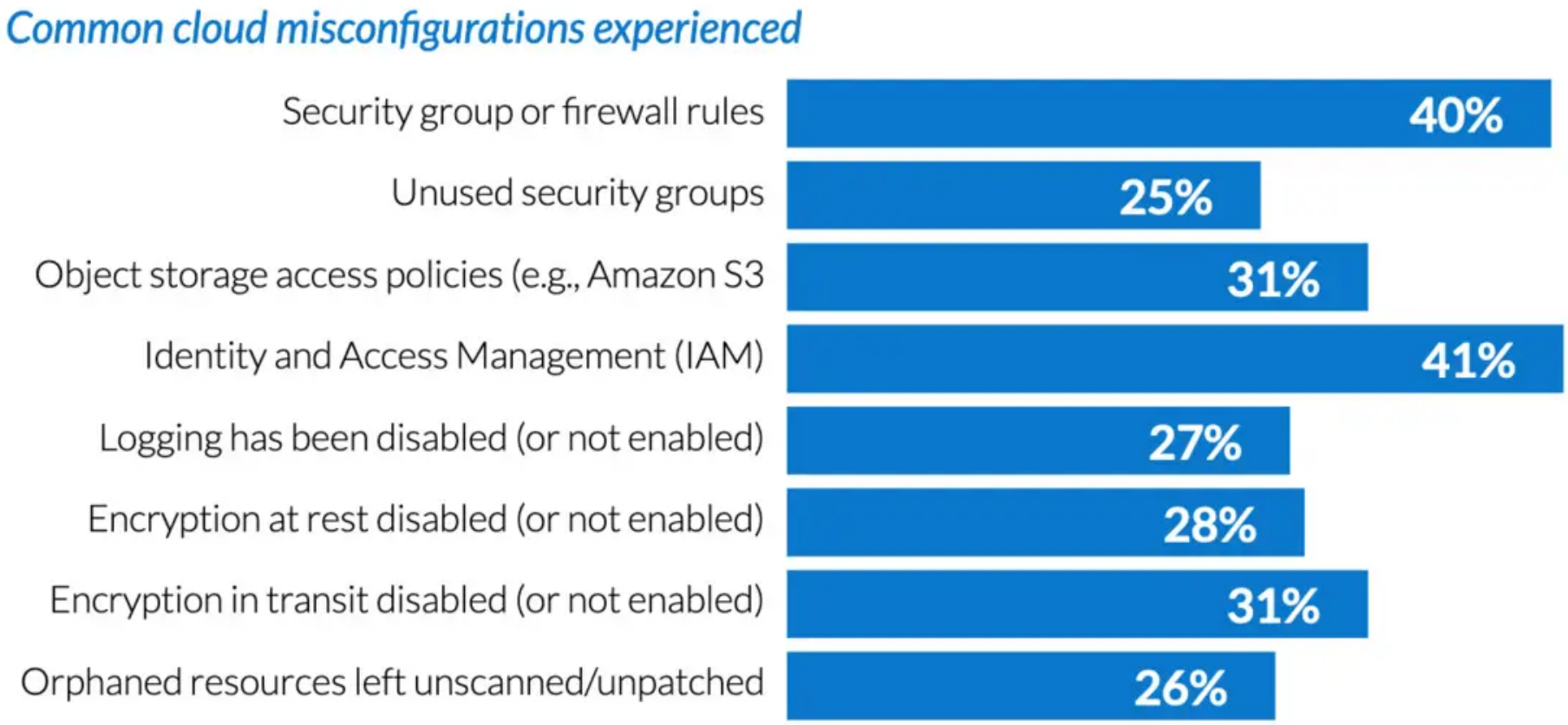
Main

About the Kubernetes Top 10

When adopting Kubernetes, we introduce new risks to our applications and infrastructure. The *OWASP Kubernetes Top 10* is aimed at helping security practitioners, system administrators, and software developers prioritize risks around the Kubernetes ecosystem. The Top Ten is a prioritized list of these risks backed by data collected from organizations varying in maturity and complexity.

- K00:2022 Welcome to the Kubernetes Security Top Ten
- K01:2022 Insecure Workload Configurations
- K02:2022 Supply Chain Vulnerabilities
- K03:2022 Overly Permissive RBAC Configurations
- K04:2022 Lack of Centralized Policy Enforcement
- K05:2022 Inadequate Logging and Monitoring
- K06:2022 Broken Authentication Mechanisms
- K07:2022 Missing Network Segmentation Controls
- K08:2022 Secrets Management Failures
- K09:2022 Misconfigured Cluster Components
- K10:2022 Outdated and Vulnerable Kubernetes Components

Cloud Misconfiguration



Source: The State of Cloud Security 2021 Report

Shift Left on Security

Save time and money

We can't just do security in production after everything is built, we need to go into solutions with security baked in.

Security Tooling

Running security testing tools against infrastructure as code (IaC) is a way to ensure that the infrastructure being provisioned is secure and compliant with best practices.

Why run Security Tooling?

- To catch security issues early
- To ensure compliance
- To improve the security of your infrastructure
- To save time and effort by shifting Left

Security Tooling: SAST vs DAST

Static Application Security Testing (SAST)

SAST is a method of debugging that is performed by looking at the source code of an application without actually executing the application.

Dynamic Application Security Testing (DAST)

DAST, on the other hand, involves testing an application while it is running, in order to identify potential security vulnerabilities.

Security Tooling - Terraform

Each of these tools does similar things and are SAST (Static Analysis Security Tooling). With Terraform you can analyze in a few ways.

- HCL files
- Terraform Plan

Security Tooling - OSS

There are many open-source tools as well as commercial solutions. We can integrate these tools in our local environments as well as our pipelines to secure things earlier.

Feature	tfsec	terrascan	checkov
CI/CD	Yes	Yes	Yes
Rules	100+	100+	100+
Custom Rules	Yes	Yes	Yes
Rule Language	json, yaml, rego	rego	python

Rule customization

- Ignoring rules
- Overriding rules
- Add custom rules

tfsec

tfsec is a static analysis security scanner for your Terraform code supported by Aquasecurity.

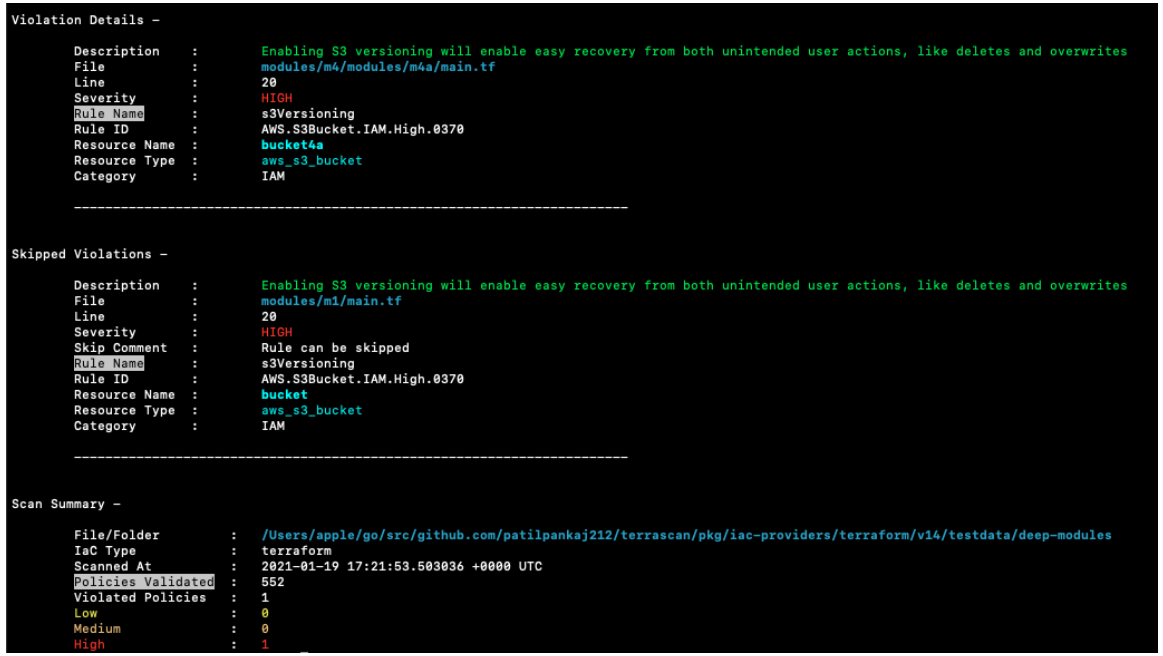
Designed to run locally and in your CI pipelines, developer-friendly output and fully documented checks.

- OPA/Rego Policies
- VS Code Extension
- GitHub Actions

Terrascan

Terrascan has support for Terraform, Azure, GCP, AWS, Kubernetes (manifests, Helm, Kustomize), Docker and even GitHub. Supported by Tenable and now integrated into nessus.

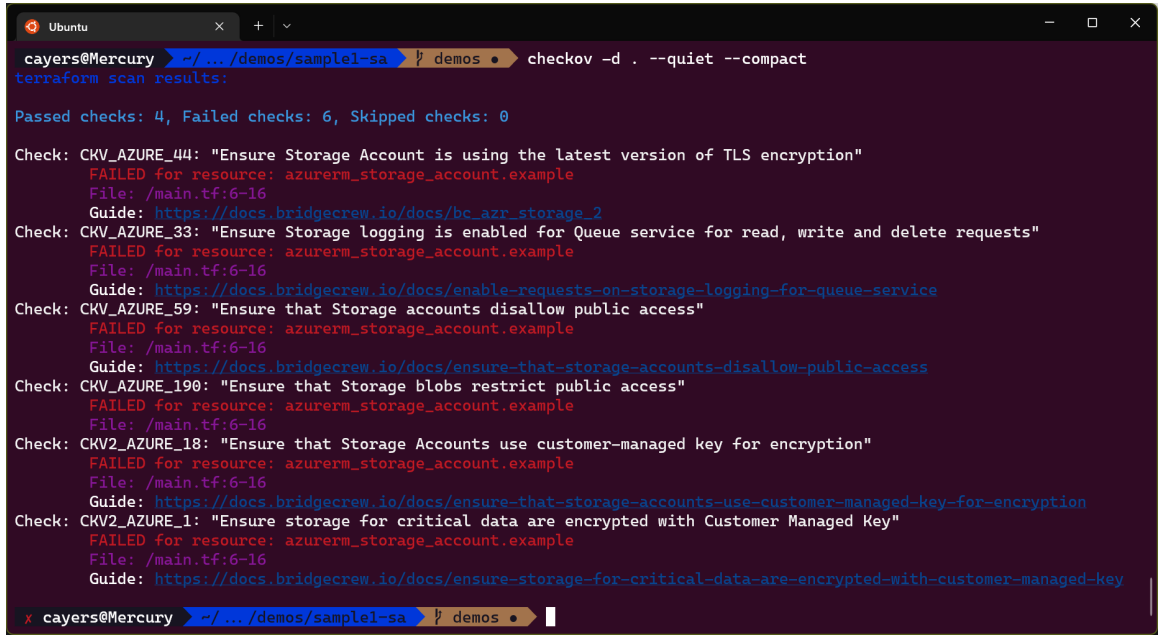
Terrascan has a large number of built in policies as well as support for custom OPA/Rego Policies.



Checkov

Checkov is another tool that lets us do scanning and compliance.

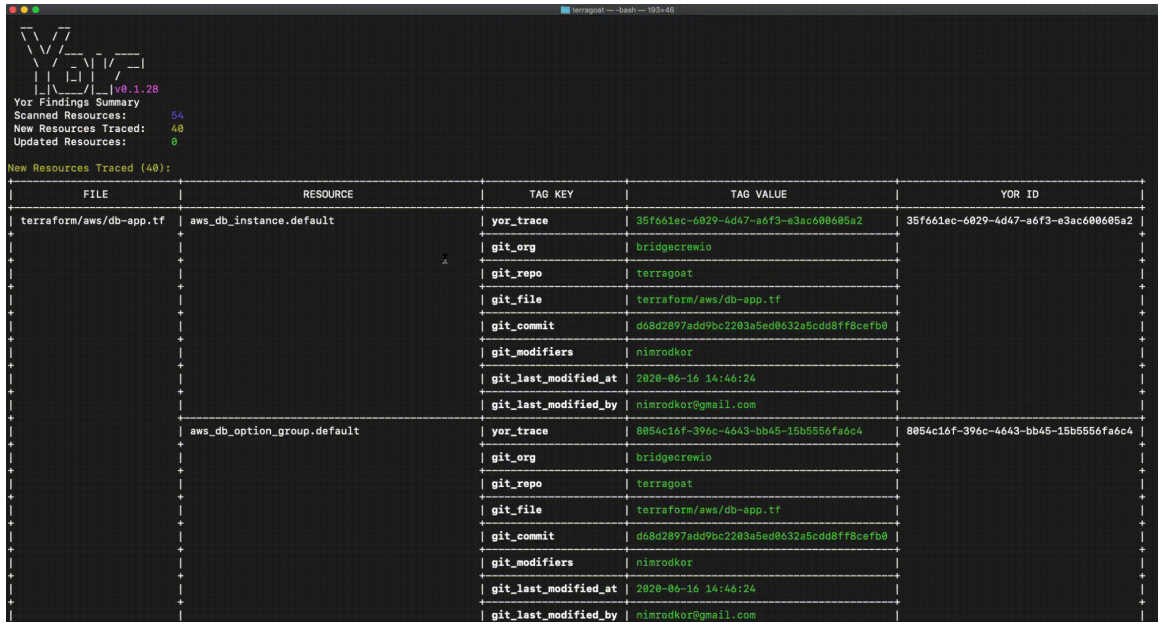
Checkov is by BridgeCrew and python based. Checkov, like terrascan, supports Terraform, Azure, GCP, AWS, Kubernetes (manifests, Helm, Kustomize) and Docker.



Bonus Tool - Yor

https://yor.io/

- **Tagging**: Automates tagging in IaC for better resource traceability.
- **Context**: Provides enriched data on resource deployment.
- **CI/CD Integration**: Facilitates automated tagging at scale.

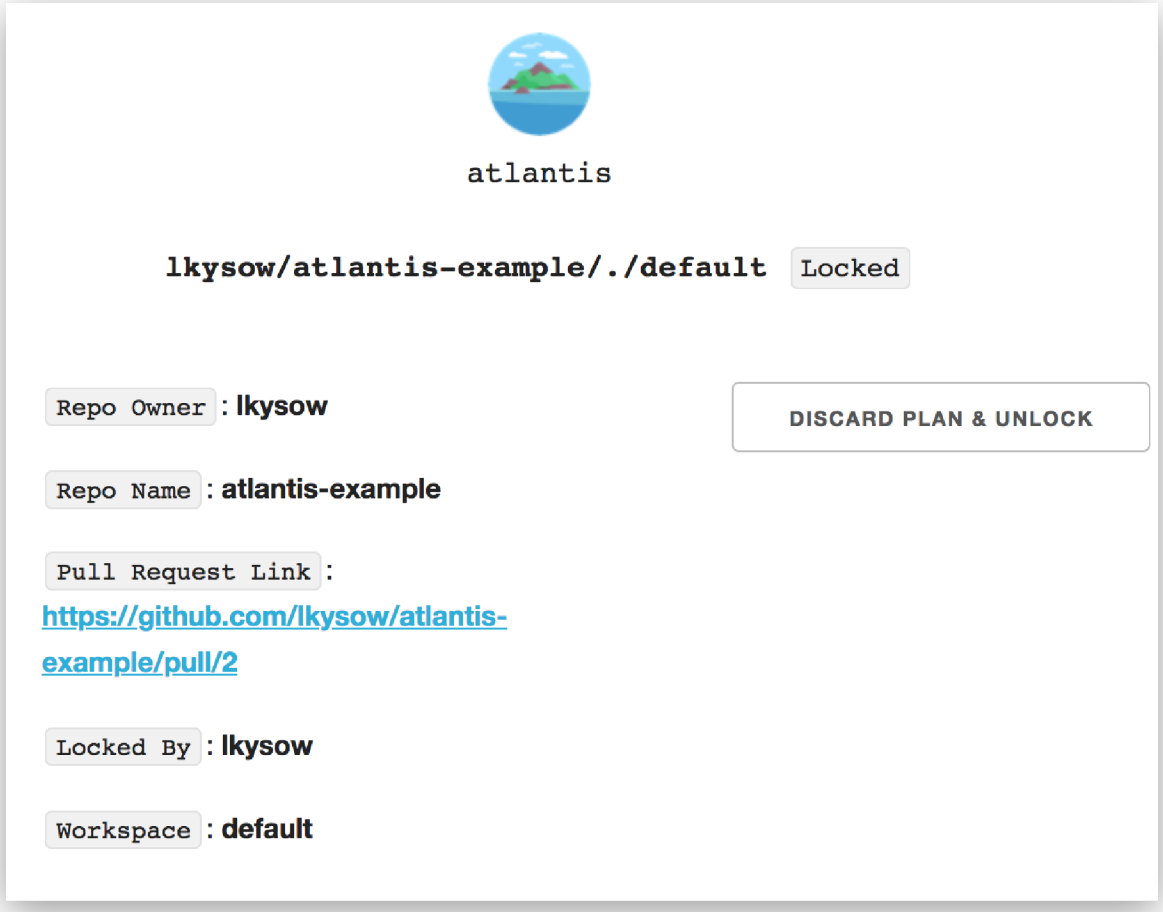


Bonus Tool - Atlantis

https://www.runatlantis.io/

Terraform PR Automation

Handles planning, locking, and applying



You Can Use Multiple Tools

Defense in Depth

Because these tools are independent and all scan the raw HCL or interpreted HCL, you can get different rules and potentially better compliance.

You can also hit a Signal to Noise problem.

Workflow Options

- Pre-Commit Hooks
- IDE Integration
- CI/CD Integration

Pre-Commit Hooks

Pre-commit Hooks run before code gets committed to a git repo.

You do it yourself or use the Pre-Commit Framework.

IDE Integration

- Extensions for VSCode
  - tfsec
  - checkov
- DevContainer features
  - tfsec
  - terrascan
  - checkov

Pipeline integration

- GitHub Marketplace Extensions
  - tfsec action
  - Run tfsec PR commenter
  - Terrascan IaC scanner
  - Checkov GitHub Action

DEMOS

Backend providers

- AzureRM
- Terraform on Azure Docs
- Docs for other providers

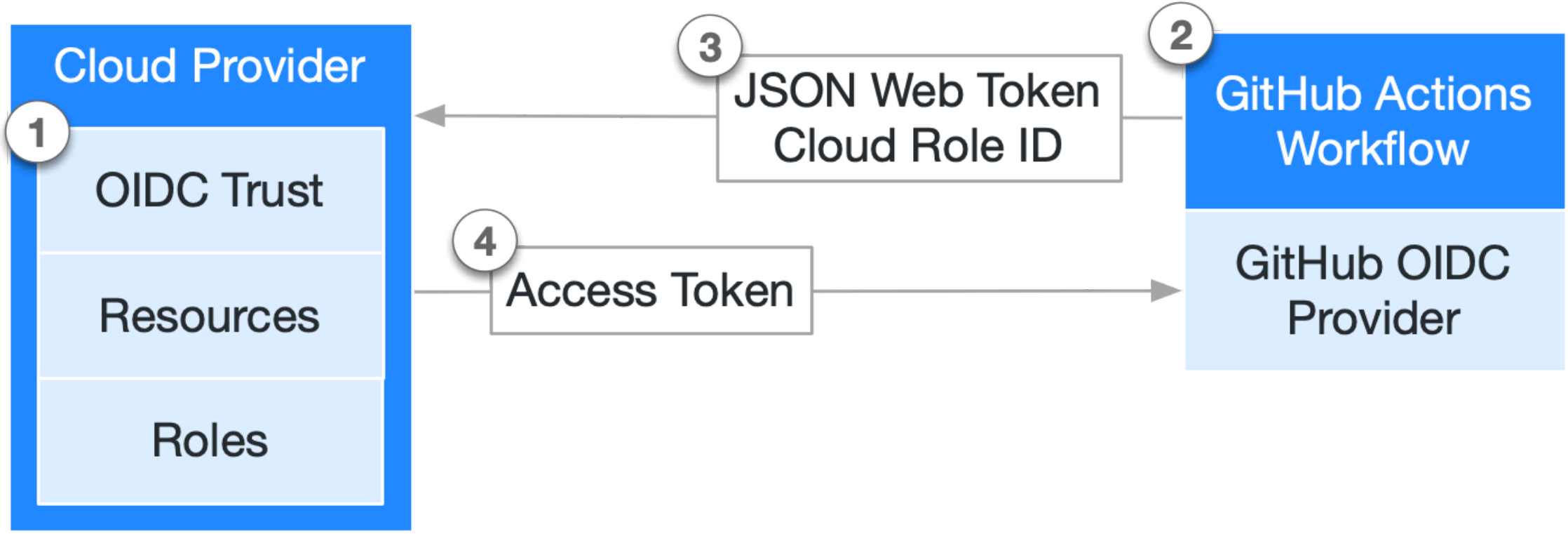
Overriding backend provider configuration

- Check docs
- Use environment vars

Open ID Connect (OIDC) Auth

No more passwords

Auth is claims based on repo, environment, branch..



Demos

Questions

https://chris-ayers.com

Resources

GitHub Repo

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Blog

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Contact

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