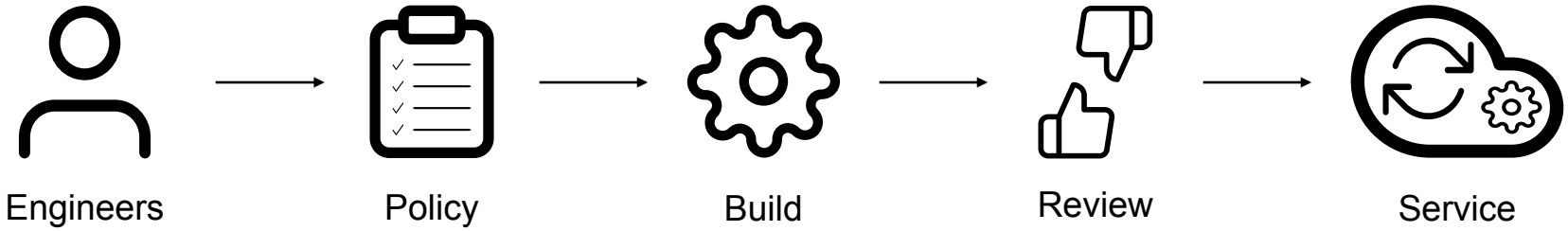
Sentinel from Scratch

Agenda

- Policy-as-Code
- Sentinel CLI
- Policies
- Questions

Policy-as-Code

Policy-as-Code



Policy-as-Code

- Treat policies as applications
- Store in version control
- Automate enforcement and review
- Automate logic testing
- Proactive vs. reactive

Sentinel CLI

Sentinel CLI

Available commands

TERMINAL

```
$ sentinel

Usage: sentinel [--version] [--help] <command> [<args>]

Available commands are:
    apply      Execute a policy and output the result
    fmt        Format Sentinel policy to a canonical format
    test       Test policies
    version    Prints the Sentinel runtime version
```

Sentinel CLI

Using `--help`

TERMINAL

```
$ sentinel --help apply

Usage: sentinel apply [options] POLICY

  Execute the policy file specified by POLICY.

  This runs the policy and outputs whether the policy passed or failed.
  The exit code also reflects the status of the policy: 0 = pass, 1 = fail,
  2 = undefined (fail, but result was undefined), 3 = error.

  A configuration file is typically specified with -config to define the
  available imports, mock data, and global values. This is used to simulate
  a policy embedded within a host system.

Options:

  -color               Enable or disable colorized output. Enabled by
                       default if running interactively.

  -config FILE         Set the configuration file. Default:
                       sentinel.[hcl|json].

  -global 'VAR=VALUE'  Set a global value.
                       This flag can be set multiple times.

  ....
```

Sentinel CLI

Apply policies locally

TERMINAL

```
$ sentinel apply -trace policy.sentinel

Sentinel Result: true

This result means that Sentinel policies returned true and the protected
behavior is allowed by Sentinel policies.

1 policies evaluated.

## Policy 1: policy.sentinel (hard-mandatory)

Result: true

Description:
  Exercise 01 - Main
```

Policies

Policies

File and folder structure

TERMINAL

```
$ tree
.
├── modules
│   └── library.sentinel
├── policy.sentinel
├── sentinel.hcl
├── test
│   └── policy
│       ├── fail.hcl
│       └── pass.hcl
└── testdata
    └── http.sentinel
```

Policies

Main

CODE EDITOR

```
/*
Exercise 01 - Main
*/

main = true
```

Policies

Rules

CODE EDITOR

```
/*
Exercise 02 - Rules
*/

foo = rule { true }

bar = rule when foo { true }

main = rule { bar }
```

Policies

Variables and Values

CODE EDITOR

```
/*
Exercise 03 - Variables and Values
*/

maxPageCount = 1000

main = rule {
        print("Total pages:", maxPageCount)
}
```

Policies

Imports and Parameters

CODE EDITOR

```
/*
Exercise 04 - Imports and Parameters
*/

import "types"

param maxPageCount default 1000

main = rule {
        print("Total pages:", maxPageCount) and
        print("pageCount is of type:", types.type_of(maxPageCount))
}
```

Policies

Operators and Delimiters

CODE EDITOR

```
/*
Exercise 05 - Operators & Delimiters
*/

import "types"

param maxPageCount default 1000

eval_bookPageCount = rule {
        maxPageCount <= 1500
}

main = rule {
        eval_bookPageCount
}
```

Policies

Collections

CODE EDITOR

```
/*
Exercise 06 - Collections
*/
books = [
        {
                "title": "Unlocking Android",
                "pageCount": 416,
                ...
        },
        {..}
]

status = [
        "PUBLISH",
        "PENDING",
]
...
```

Policies

Quantifier Expressions

CODE EDITOR

```
/*
Exercise 07 - Quantifier Expressions
*/
...
eval_book = rule {
        all books as _, book {
                book.pageCount <= 1500 and
                        book.status in status and
                        all book.authors as author {
                                author in authors
                        }
        }
}
```

Policies

Functions and Modules

CODE EDITOR

```
/*
Exercise 08 - Functions & Modules
*/

import "library"

...

books = filter library.search.all() as _, book {
        book.status in status and
                all book.authors as author {
                        author in authors
                }
}

...
```

Policies

Debugging

CODE EDITOR

```
/*
Exercise 09 - Debugging
*/

...

for results as result {
        print("Title:", result["title"])
        print("Description:", result["shortDescription"] else "")
        print("Status:", result["status"])
        ...
}

...
```

Policies

Triage: tfplan.plan

TERMINAL

```
$ terraform plan -out=tfplan.plan

Refreshing Terraform state in-memory prior to plan...
The refreshed state will be used to calculate this plan, but will not be
persisted to local or remote state storage.

...

Plan: 5 to add, 0 to change, 0 to destroy.

------------------------------------------------------------------------

This plan was saved to: tfplan.plan

To perform exactly these actions, run the following command to apply:
    terraform apply "tfplan.plan"
```

Policies

Triage: plan.json

TERMINAL

```
$ terraform show -json tfplan.plan > plan.json

$ cat plan.json | jq
{
    "format_version": "0.1",
    "terraform_version": "0.13.5",
    "planned_values": {...},
    "resource_changes": [...],
    "configuration": {...}
}
```

Policies

Triage: schemas.json

TERMINAL

```
$ terraform providers schema -json > schemas.json

$ cat schemas.json | jq
{
   "format_version": "0.1",
   "provider_schemas": {
       "registry.terraform.io/hashicorp/null": {
          "provider": {...},
          "resource_schemas": {...},
          "data_source_schemas": {...}
       }
   }
}
```

Policies

Triage: mock generation

TERMINAL

```
$ tfe-sentinel-mock-generator
Generating data for current-version imports (Terraform 0.12 and higher).

Wrote import mock type "tfconfig" to <PATH>/mock-tfconfig.sentinel
Wrote import mock type "tfconfig_v2" to <PATH>/mock-tfconfig-v2.sentinel
Wrote import mock type "tfplan" to <PATH>/mock-tfplan.sentinel
Wrote import mock type "tfplan_v2" to <PATH>/mock-tfplan-v2.sentinel
Wrote import mock type "tfstate" to <PATH>/mock-tfstate.sentinel
Wrote import mock type "tfstate_v2" to <PATH>/mock-tfstate-v2.sentinel
Wrote import mock type "sentinel_config" to <PATH>/sentinel.json

Done. 7 files written.
```

Questions?

Docs and links

Download Sentinel

Sentinel Language

Sentinel Language Specification

Sentinel Playground

Sentinel TFE Mock Generator