01 NOVEMBER 2022

Writing Policies for Kubewarden

Agenda

1. Who am I?
2. What is Kubewarden?
3. Policies
   - Writing our first policy.
   - Deploying it to a cluster.
4. Next Steps

Who am I?

This isn’t me

This is me

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I'm the Head of Community Evangelism at SUSE. I specialize in cloud-native development and cloud operations.

Follow me on:

- Twitter: @robertsirc
- BlueSky: @sirchia.cloud

What is Kubewarden?

Kubewarden

Kubewarden is a policy engine for Kubernetes.

Its mission is to simplify the adoption of policy-as-code.

Policy Developers

Write policies in your favorite language not one specific to Kubewarden.

Kubernetes Operators

Policies can be distributed using container registries use your existing infrastructure and processes.

Highlights of Kubewarden

Open source Hub of existing policies to download and use.

POLICY HUB

Support of multiple languages such as Rust, Rego, and Go.

GO

Once a WASM is built you can run it anywhere.

WA

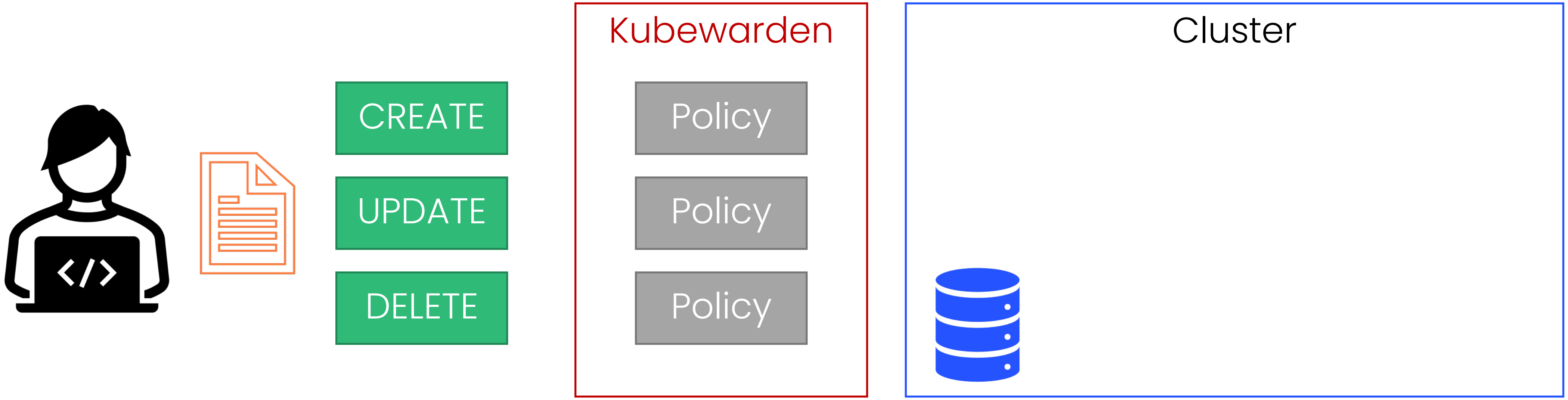
Policies

What is a policy?

In the context of Kubewarden

- These are small compiled binaries that do a specific task.
- Delivered as Web Assembly binaries.
- All run in Kubewarden’s policy-server.

How policies work?



CREATE

UPDATE

DELETE

Kubewarden

Policy

Policy

Policy

Cluster

Accept

Reject

Mutate

Monitor

Writing our first Policy

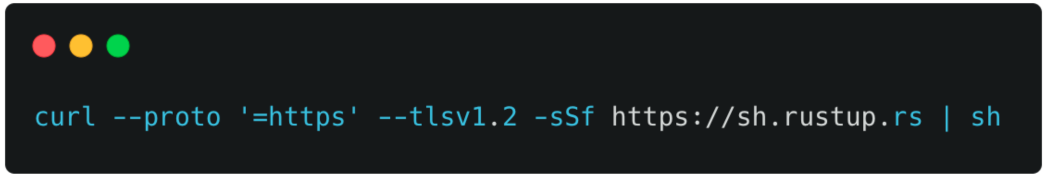
For this we will be using Rust

What are we building?

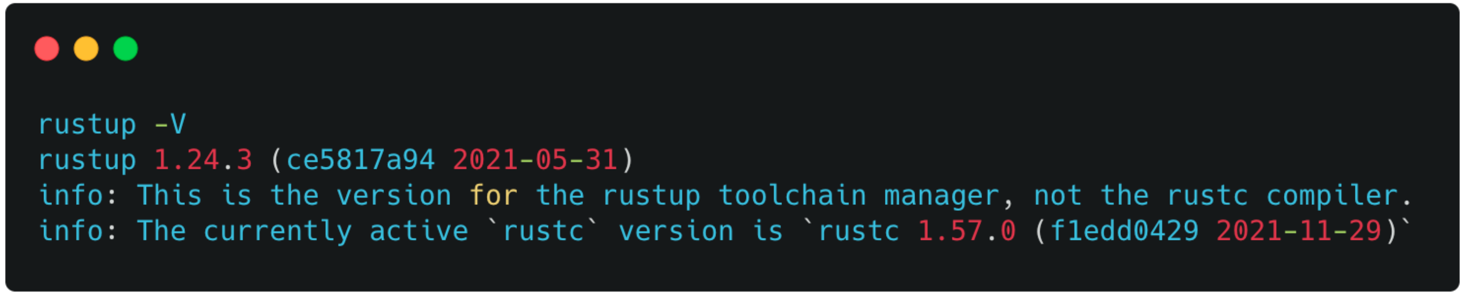
Policy that limits the CPU of a container.

Setup and Configuration

- VSCode
  - Rust Extension
- Install
- Verify



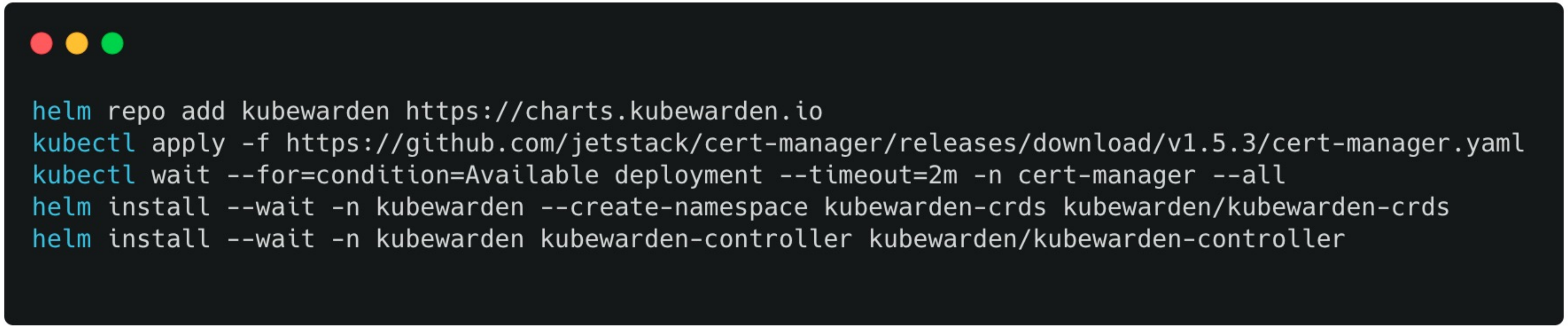
```
curl --proto '=https' --tlsv1.2 -sSf https://sh.rustup.rs | sh
```



```
rustup -V
rustup 1.24.3 (ce5817a94 2021-05-31)
info: This is the version for the rustup toolchain manager, not the rustc compiler.
info: The currently active `rustc` version is `rustc 1.57.0 (f1edd0429 2021-11-29)`
```

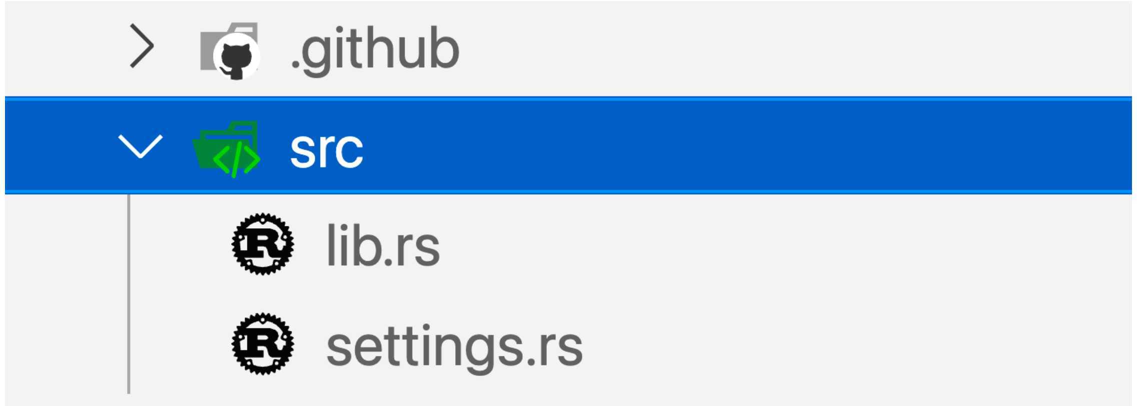
Cluster Configuration

- Rancher Desktop (or another cluster)
- Helm
- Kwctl
- Install Kubewarden

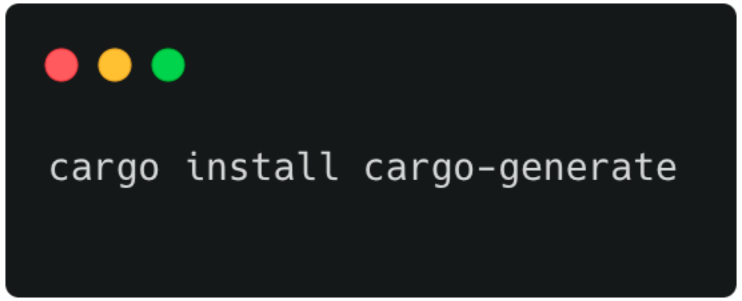


```
helm repo add kubewarden https://charts.kubewarden.io
kubectl apply -f https://github.com/jetstack/cert-manager/releases/download/v1.5.3/cert-manager.yaml
kubectl wait --for=condition=Available deployment --timeout=2m -n cert-manager --all
helm install --wait -n kubewarden --create-namespace kubewarden-crds kubewarden/kubewarden-crds
helm install --wait -n kubewarden kubewarden-controller kubewarden/kubewarden-controller
```

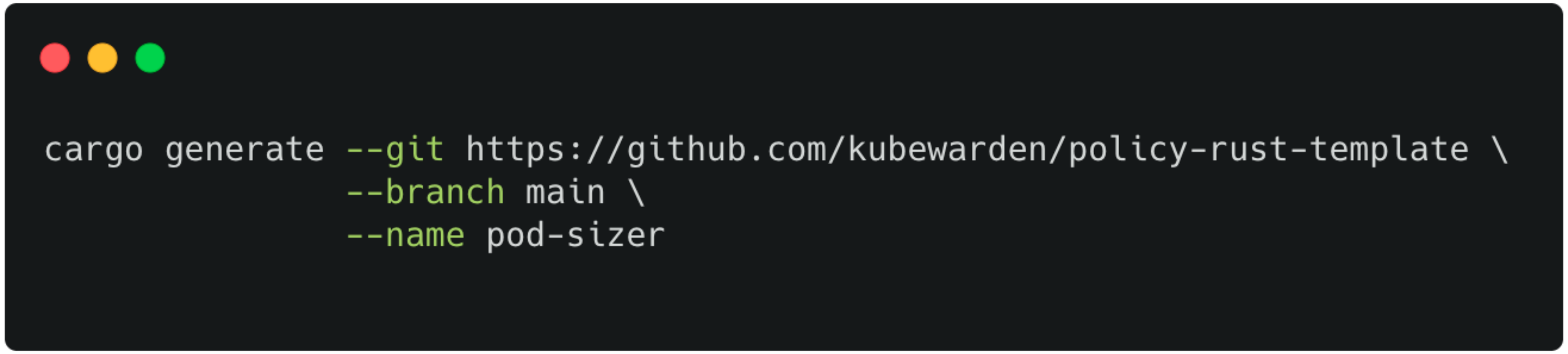
Creating a Rust Policy



```
> .github
v src
    lib.rs
    settings.rs
```

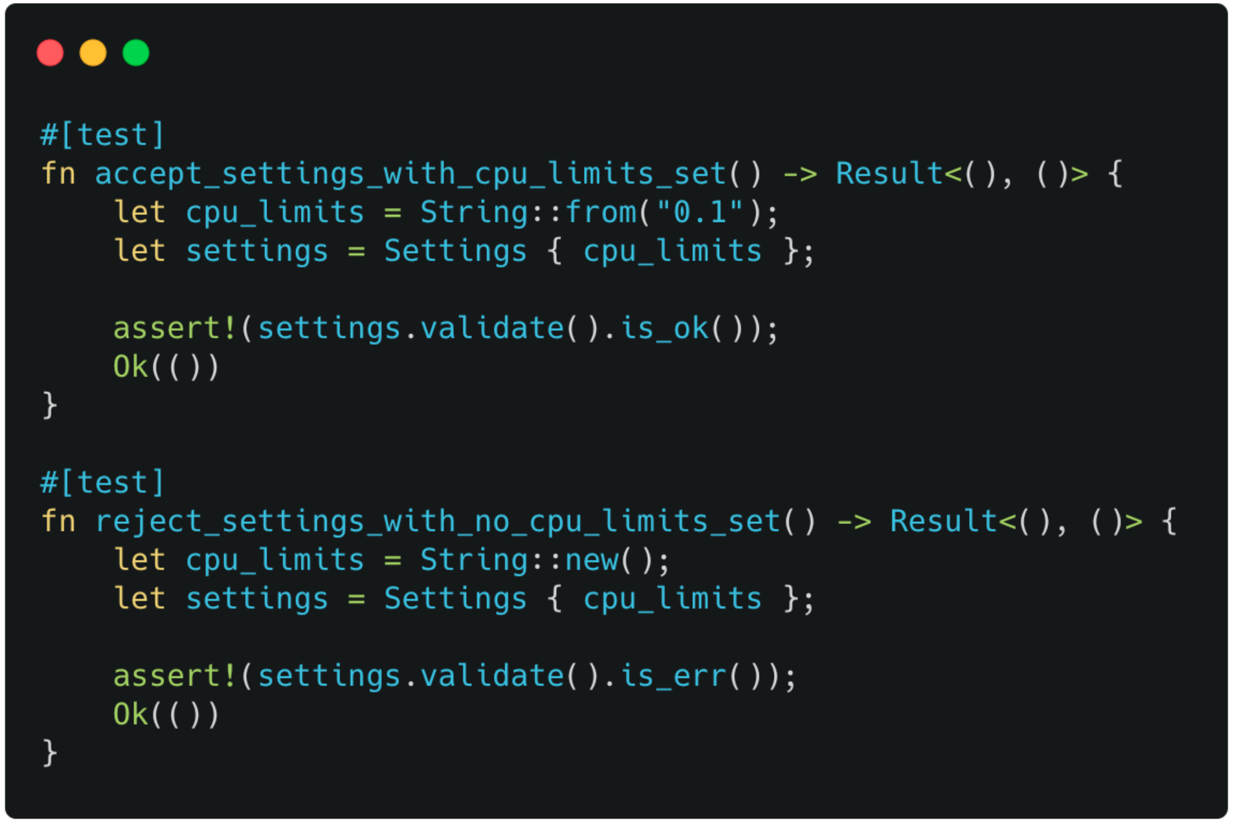


```
cargo install cargo-generate
```

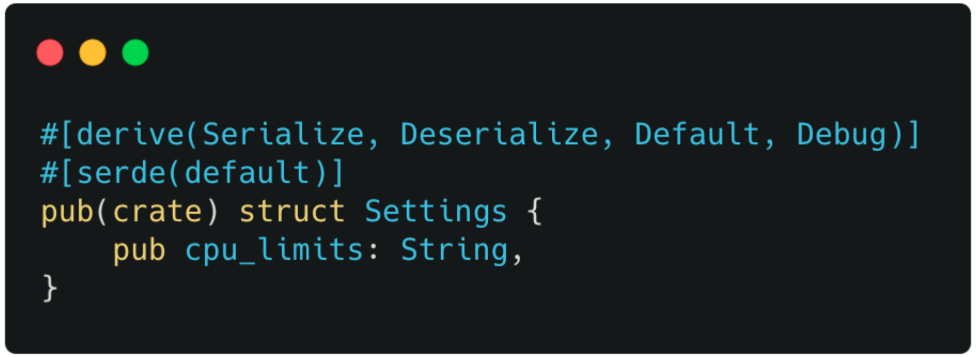


```
cargo generate --git https://github.com/kubewarden/policy-rust-template \
               --branch main \
               --name pod-sizer
```

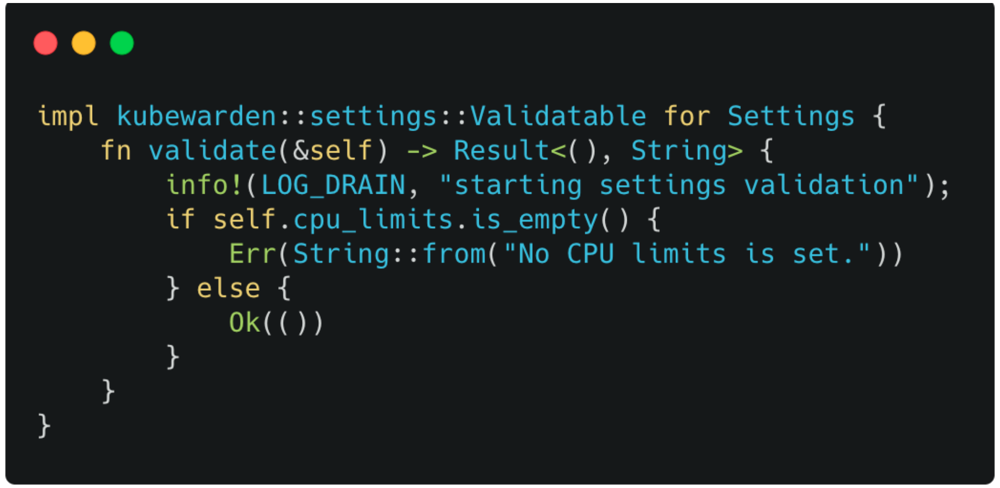
Updating the Settings for the Policy



```rust
#[test]
fn accept_settings_with_cpu_limits_set() -> Result<(), ()> {
    let cpu_limits = String::from("0.1");
    let settings = Settings { cpu_limits };

    assert!(settings.validate().is_ok());
    Ok(())
}

#[test]
fn reject_settings_with_no_cpu_limits_set() -> Result<(), ()> {
    let cpu_limits = String::new();
    let settings = Settings { cpu_limits };

    assert!(settings.validate().is_err());
    Ok(())
}
```

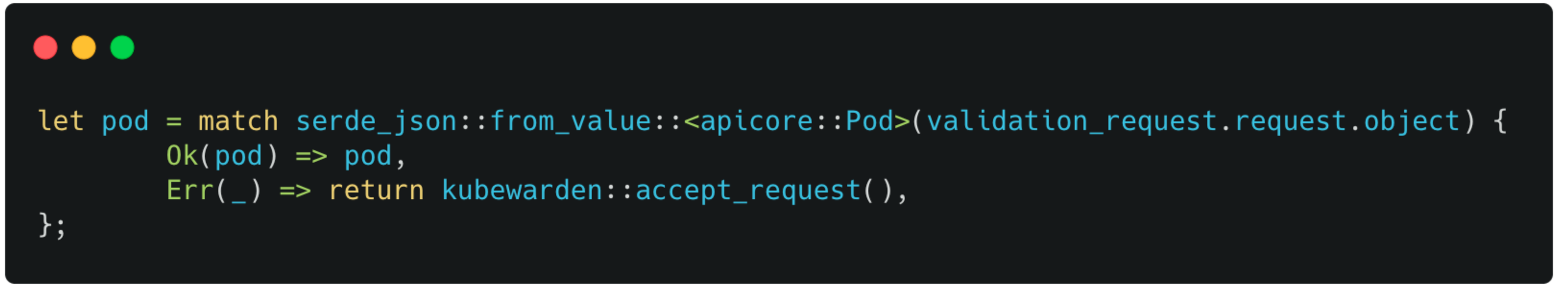


```rust
#[derive(Serialize, Deserialize, Default, Debug)]
#[serde(default)]
pub(crate) struct Settings {
    pub cpu_limits: String,
}
```

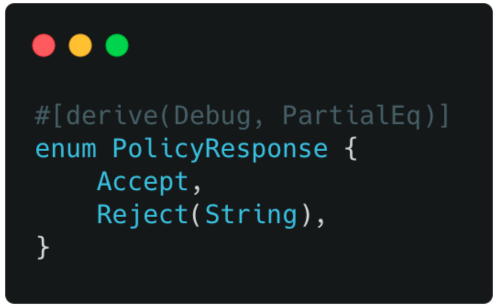


```rust
impl kubewarden::settings::Validatable for Settings {
    fn validate(&self) -> Result<(), String> {
        info!(LOG_DRAIN, "starting settings validation");
        if self.cpu_limits.is_empty() {
            Err(String::from("No CPU limits is set."))
        } else {
            Ok(())
        }
    }
}
```

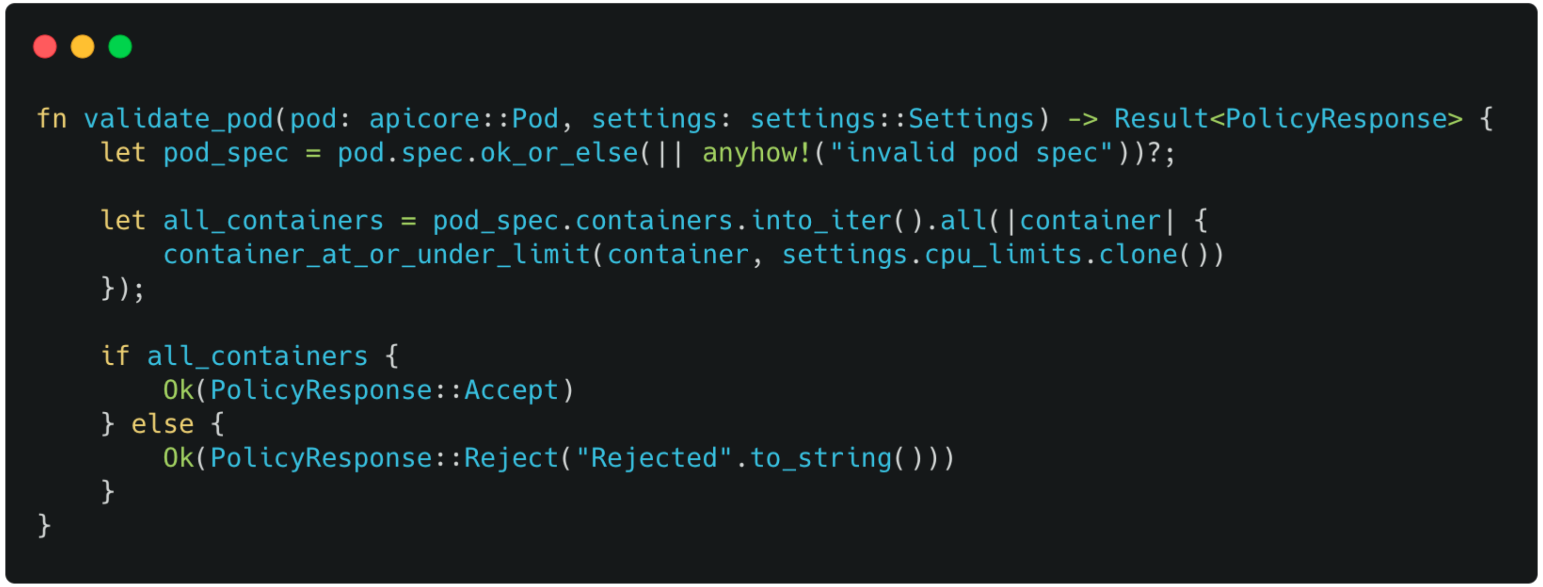
Updating the Policy



```
let pod = match serde_json::from_value::<apicore::Pod>(validation_request.request.object) {
        Ok(pod) => pod,
        Err(_) => return kubewarden::accept_request(),
};
```

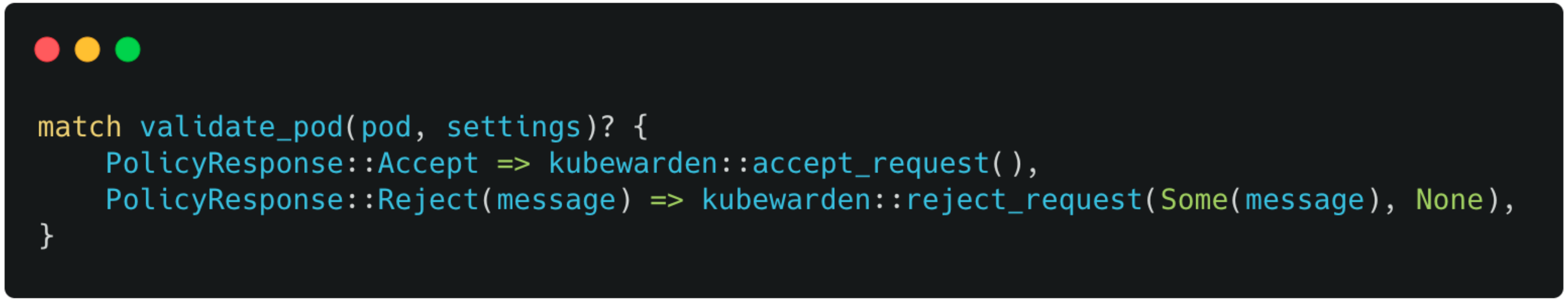


```
#[derive(Debug, PartialEq)]
enum PolicyResponse {
    Accept,
    Reject(String),
}
```

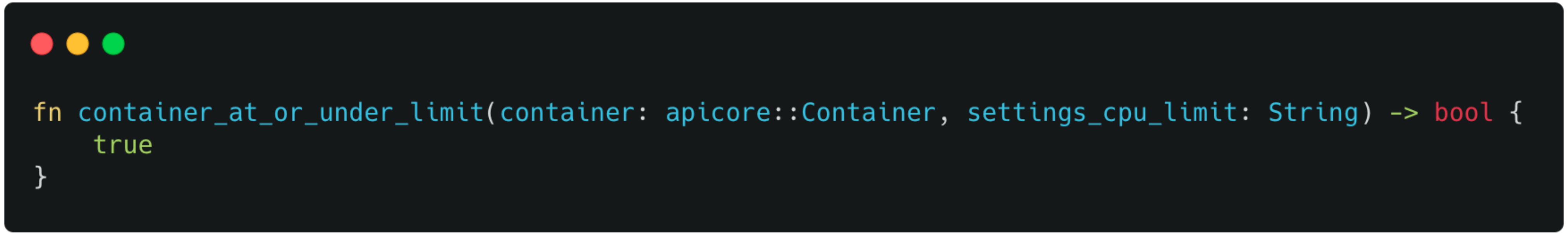


```
fn validate_pod(pod: apicore::Pod, settings: settings::Settings) -> Result<PolicyResponse> {
    let pod_spec = pod.spec.ok_or_else(|| anyhow!("invalid pod spec"))?;

    let all_containers = pod_spec.containers.into_iter().all(|container| {
        container_at_or_under_limit(container, settings.cpu_limits.clone())
    });

    if all_containers {
        Ok(PolicyResponse::Accept)
    } else {
        Ok(PolicyResponse::Reject("Rejected".to_string()))
    }
}
```

Updating the Policy cont.

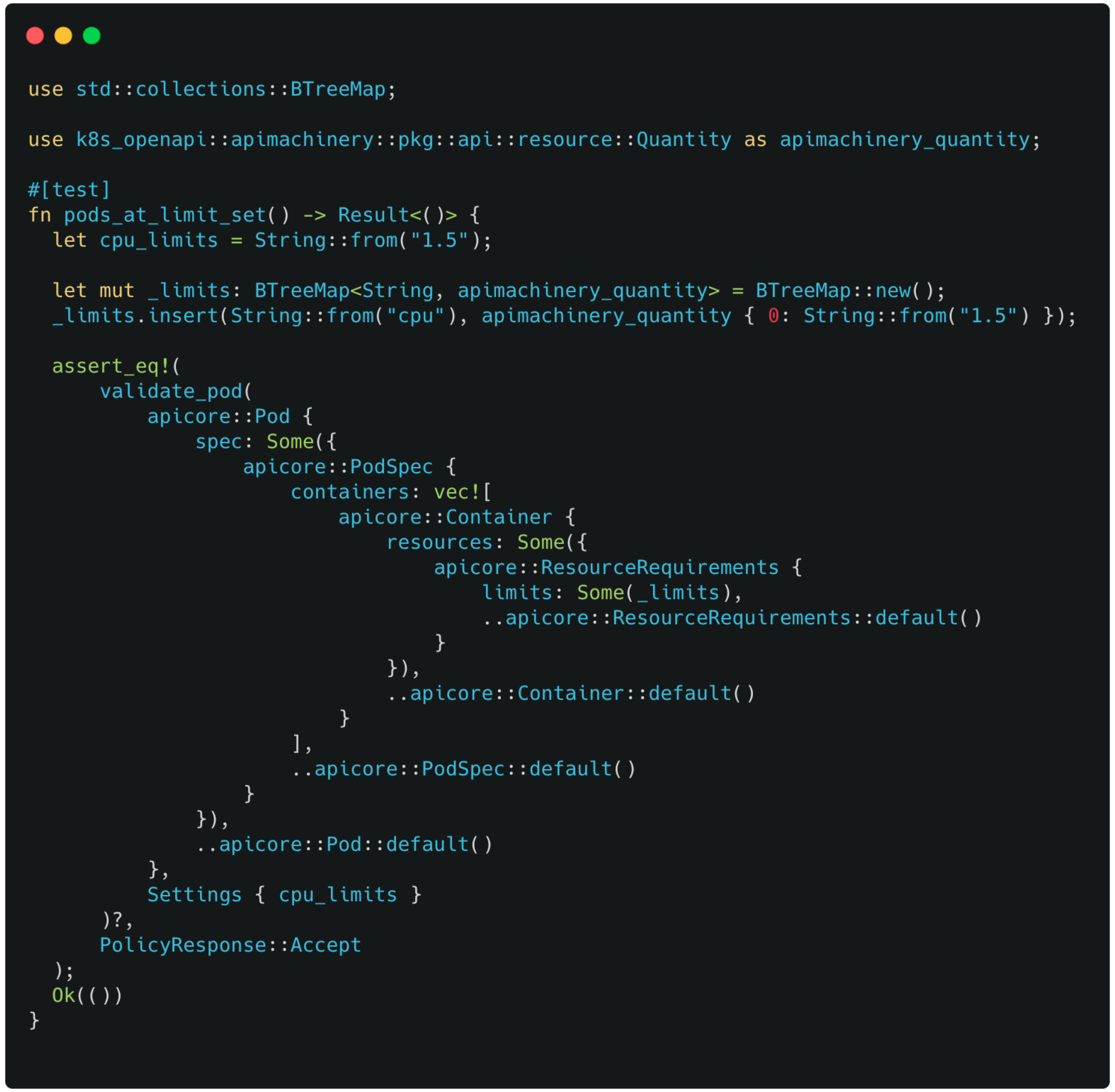


```rust
match validate_pod(pod, settings)? {
    PolicyResponse::Accept => kubewarden::accept_request(),
    PolicyResponse::Reject(message) => kubewarden::reject_request(Some(message), None),
}
```



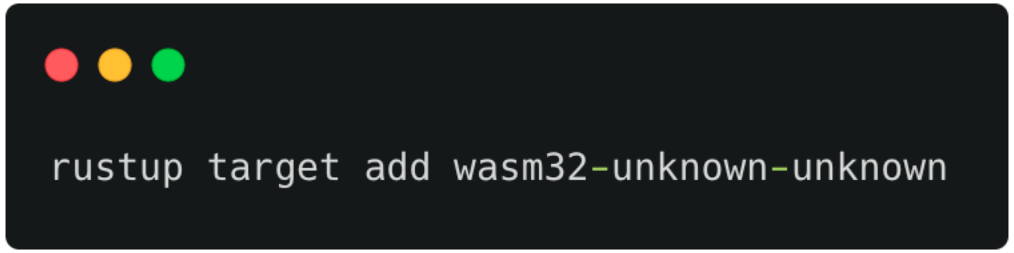
```rust
fn container_at_or_under_limit(container: apicore::Container, settings_cpu_limit: String) -> bool {
    true
}
```

Policy Testing

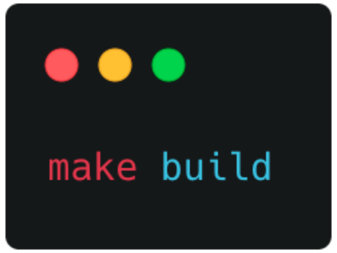


```
use std::collections::BTreeMap;

use k8s_openapi::apimachinery::pkg::api::resource::Quantity as apimachinery_quantity;

#[test]
fn pods_at_limit_set() -> Result<()> {
  let cpu_limits = String::from("1.5");

  let mut _limits: BTreeMap<String, apimachinery_quantity> = BTreeMap::new();
  _limits.insert(String::from("cpu"), apimachinery_quantity { 0: String::from("1.5") });

  assert_eq!(
      validate_pod(
          apicore::Pod {
              spec: Some({
                  apicore::PodSpec {
                      containers: vec![
                          apicore::Container {
                              resources: Some({
                                  apicore::ResourceRequirements {
                                      limits: Some(_limits),
                                      ..apicore::ResourceRequirements::default()
                                  }
                              }),
                              ..apicore::Container::default()
                          }
                      ],
                      ..apicore::PodSpec::default()
                  }
              }),
              ..apicore::Pod::default()
          },
          Settings { cpu_limits }
      )?,
      PolicyResponse::Accept
  );
  Ok(())
}
```

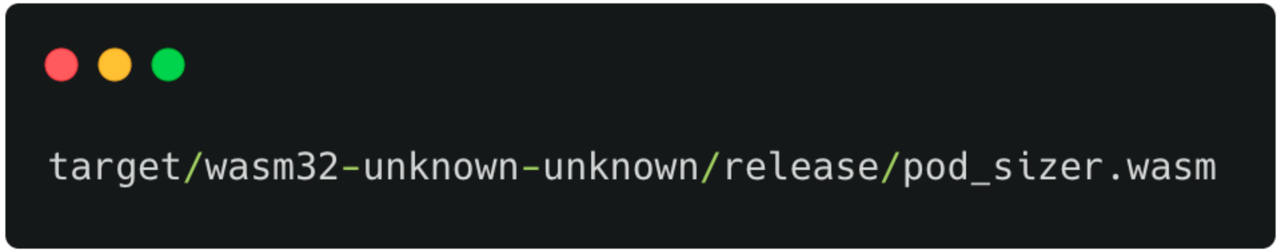
Building the Policy



```
rustup target add wasm32-unknown-unknown
```

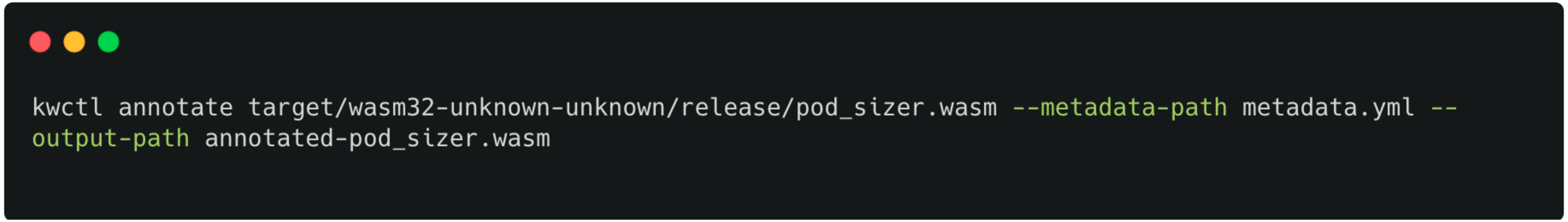


```
make build
```

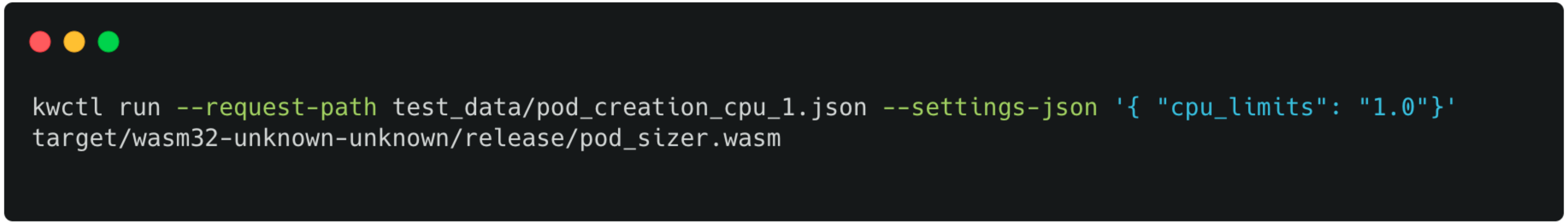


```
target/wasm32-unknown-unknown/release/pod_sizer.wasm
```

Annotating the Policy

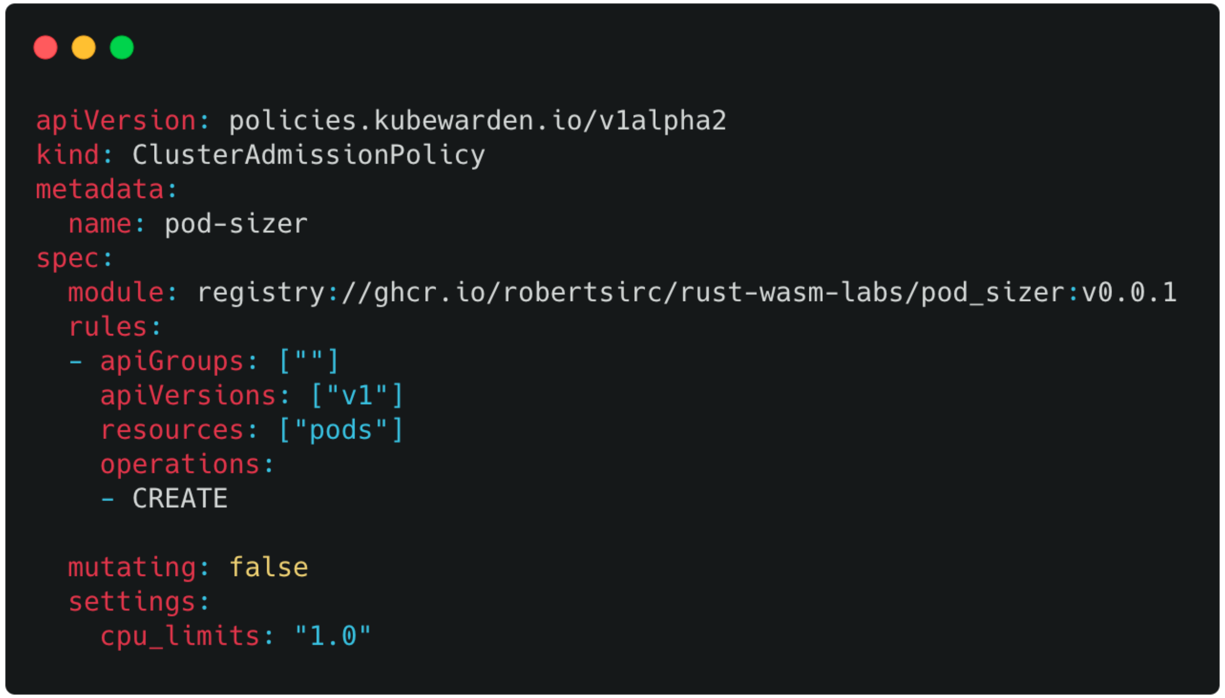


```
kwctl annotate target/wasm32-unknown-unknown/release/pod_sizer.wasm --metadata-path metadata.yml --
output-path annotated-pod_sizer.wasm
```

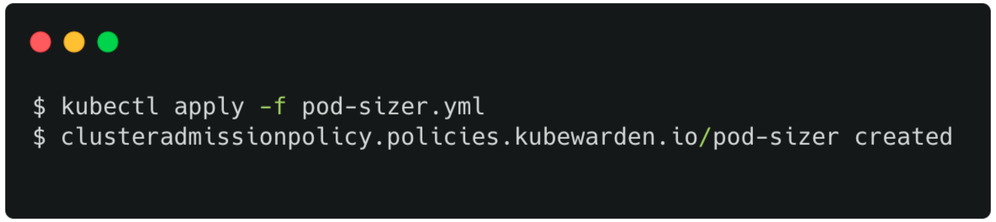


```
kwctl run --request-path test_data/pod_creation_cpu_1.json --settings-json '{ "cpu_limits": "1.0"}'
target/wasm32-unknown-unknown/release/pod_sizer.wasm
```

Deploying

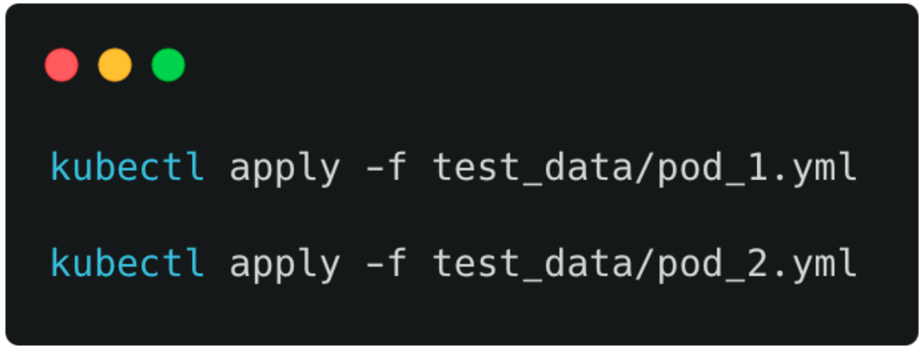


```yaml
apiVersion: policies.kubewarden.io/v1alpha2
kind: ClusterAdmissionPolicy
metadata:
  name: pod-sizer
spec:
  module: registry://ghcr.io/robertsirc/rust-wasm-labs/pod_sizer:v0.0.1
  rules:
  - apiGroups: [""]
    apiVersions: ["v1"]
    resources: ["pods"]
    operations:
    - CREATE

  mutating: false
  settings:
    cpu_limits: "1.0"
```



```
$ kubectl apply -f pod-sizer.yml
$ clusteradmissionpolicy.policies.kubewarden.io/pod-sizer created
```

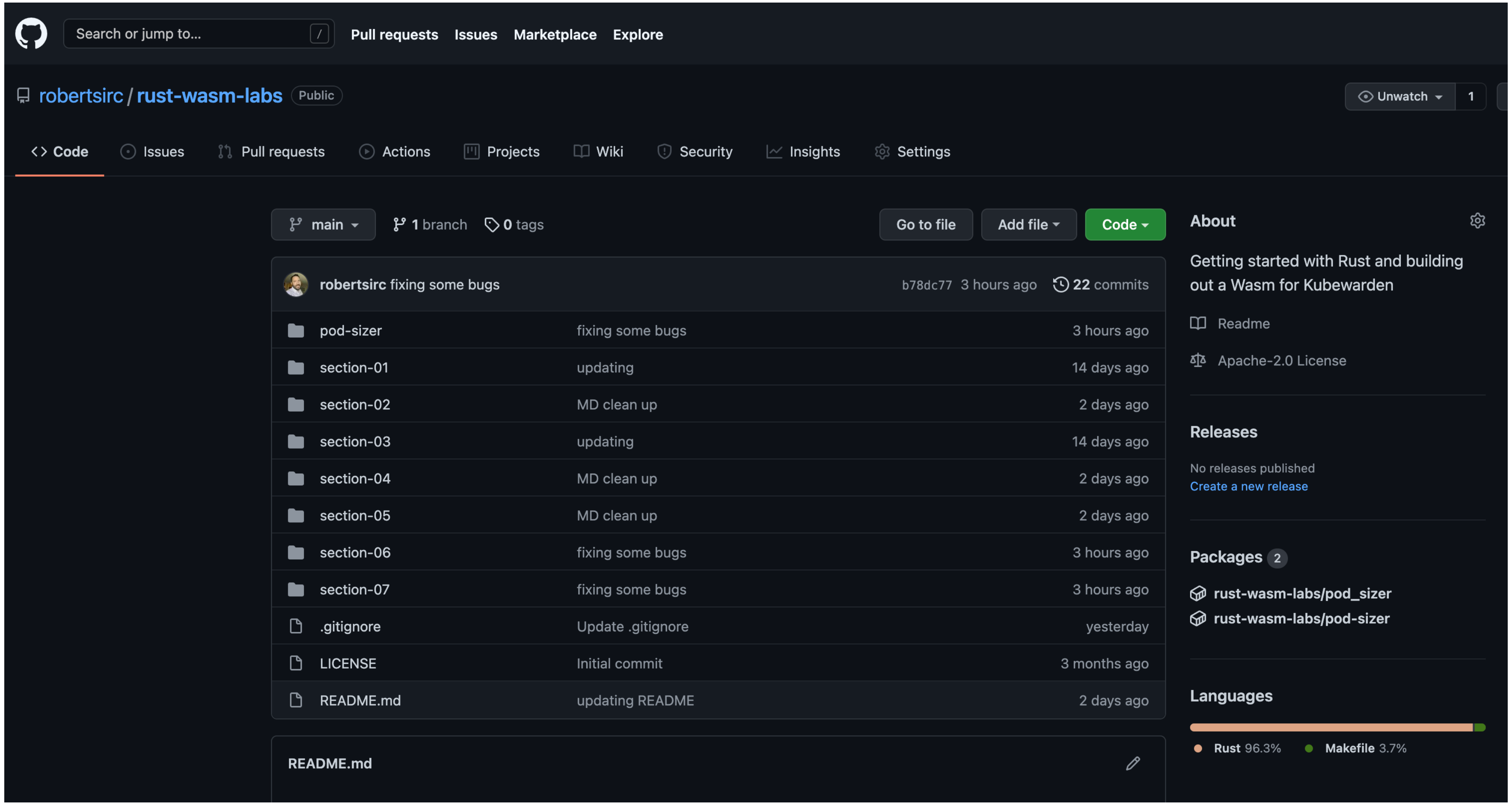
Testing on a Cluster



```
kubectl apply -f test_data/pod_1.yml

kubectl apply -f test_data/pod_2.yml
```

Next Steps

Try this yourself



robertsirc fixing some bugs b78dc77 3 hours ago 22 commits

pod-sizer	fixing some bugs	3 hours ago
section-01	updating	14 days ago
section-02	MD clean up	2 days ago
section-03	updating	14 days ago
section-04	MD clean up	2 days ago
section-05	MD clean up	2 days ago
section-06	fixing some bugs	3 hours ago
section-07	fixing some bugs	3 hours ago
.gitignore	Update .gitignore	yesterday
LICENSE	Initial commit	3 months ago
README.md	updating README	2 days ago

README.md

About

Getting started with Rust and building out a Wasm for Kubewarden

Readme

Apache-2.0 License

Releases

No releases published
Create a new release

Packages 2

rust-wasm-labs/pod_sizer
rust-wasm-labs/pod-sizer

Languages

● Rust 96.3% ● Makefile 3.7%

https://github.com/robertsirc/rust-wasm-labs

Questions?

If not, you can ask after the session

Additional Resources

- Kubewarden
- Docs
- Rust
- Rancher Desktop
- Slack

SUSE

Thank you

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