Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

IBM

CSU2013/3013
Final Presentation

GROUP 39

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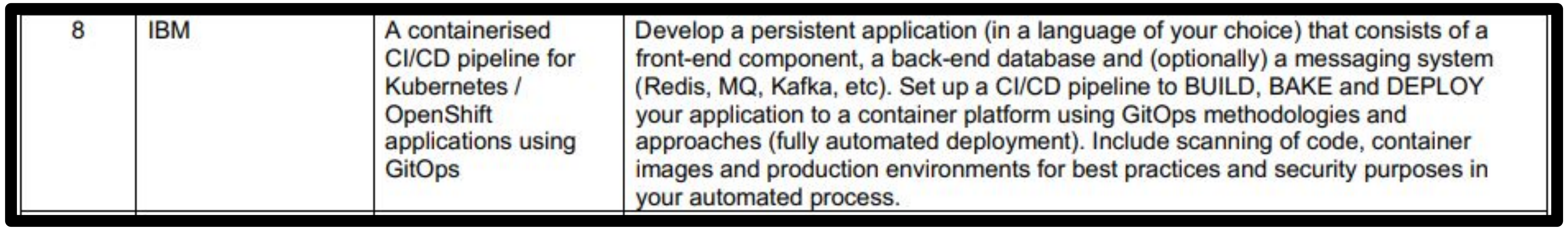


8	IBM	A containerised CI/CD pipeline for Kubernetes / OpenShift applications using GitOps	Develop a persistent application (in a language of your choice) that consists of a front-end component, a back-end database and (optionally) a messaging system (Redis, MQ, Kafka, etc). Set up a CI/CD pipeline to BUILD, BAKE and DEPLOY your application to a container platform using GitOps methodologies and approaches (fully automated deployment). Include scanning of code, container images and production environments for best practices and security purposes in your automated process.

Project Overview

Our project was to set up a **complete CI/CD pipeline** and **develop a simple application** to demonstrate the use of this pipeline. We used **GitHub** as our Version Control, and we'll use **GitHub Actions** as the Continuous Integration server. Instead of a database, we used an **external API** to retrieve our data.

Functional requirements

- ➔ The pipeline should take code submitted by developers on GitHub, build it, then **perform static analysis such as unit testing.**
- ➔ The DevOps pipeline must package the application using podman or buildah, and then deploy the containers onto a **Red Hat OpenShift Container Platform** (OCP).
- ➔ The containers should then run individually on Linux systems using "podman".

RED HAT® OPENSHIFT Container Platform

podman

CI/CD Pipeline

Why?

Why spend time and resource to develop a CI/CD pipeline?

Short answer: *Laziness.*

Long answer: *It streamlines development and enables development on a larger scale.*

What does it do?

- Automated **testing/linting.**
- Automated **code packaging.**
- Automated **code deployment.**
- And many more depending on the configuration.

1.

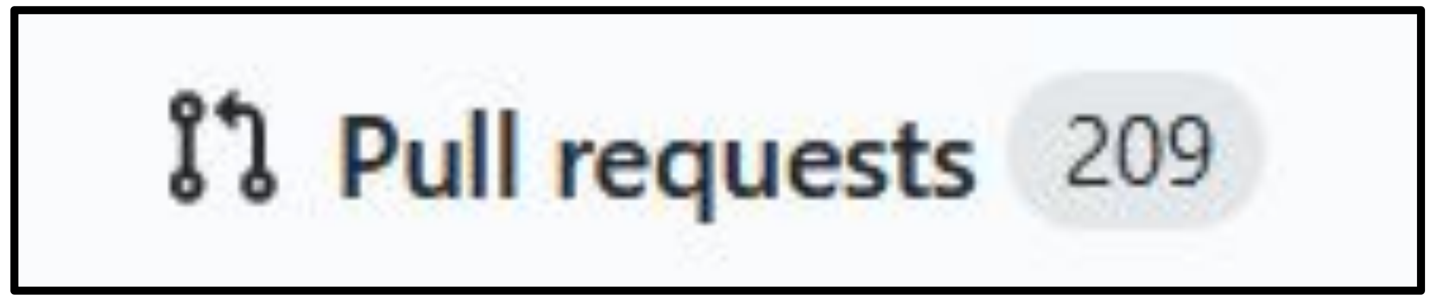
I am a lazy developer

I trust my fellow developers to make proper tests before making a pull request. This means I don't have to checkout their branch, build and run tests. I could have watched anime with that free time!

2.

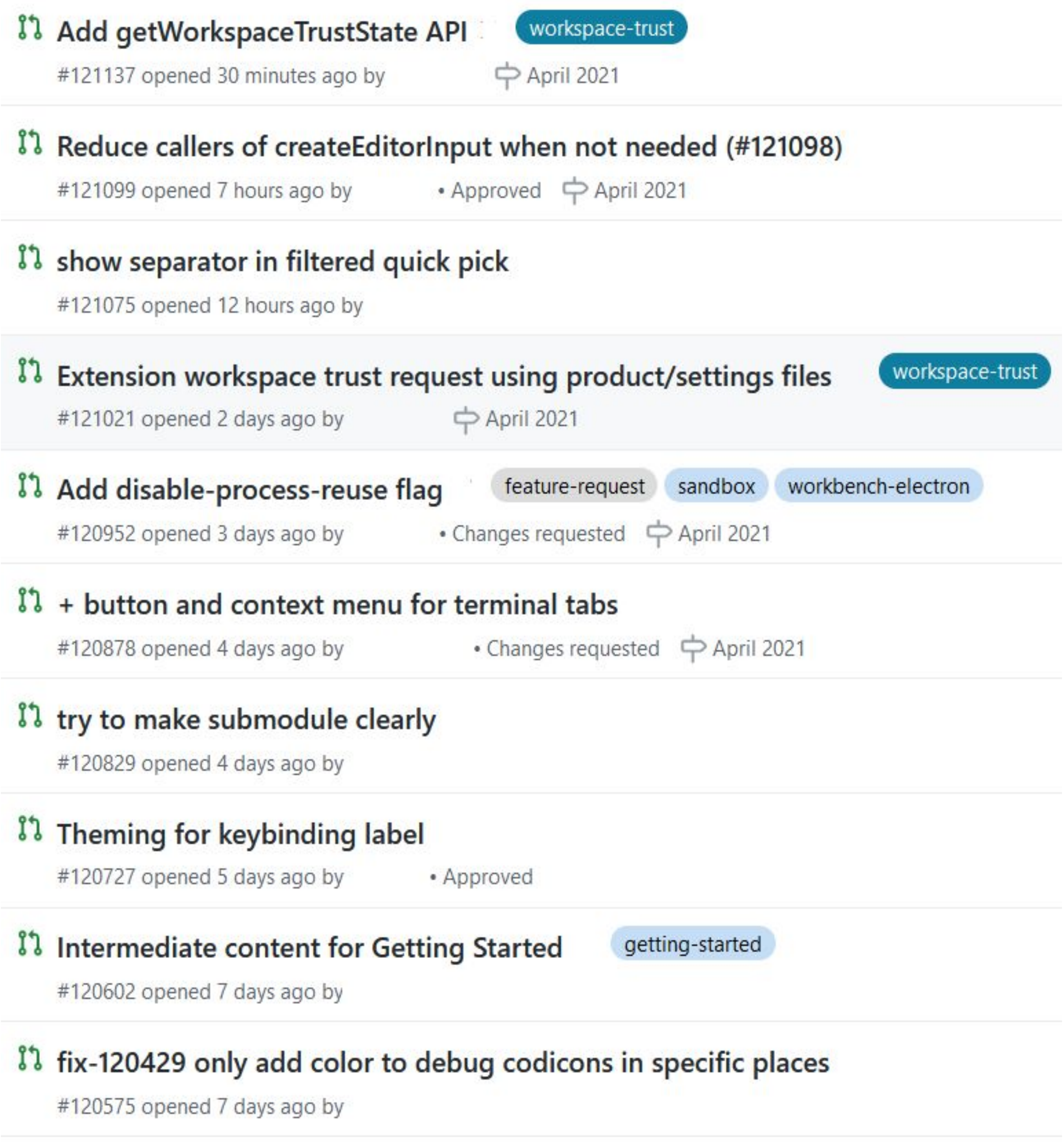
Too much pull requests

I am a small time developer, but my project exploded and there are too many pull requests coming in!



Pull requests 209

What you see



Add getWorkspaceTrustState API workspace-trust
#121137 opened 30 minutes ago by April 2021

Reduce callers of createEditorInput when not needed (#121098)
#121099 opened 7 hours ago by • Approved April 2021

show separator in filtered quick pick
#121075 opened 12 hours ago by

Extension workspace trust request using product/settings files workspace-trust
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Add disable-process-reuse flag feature-request sandbox workbench-electron
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+ button and context menu for terminal tabs
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Theming for keybinding label
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Intermediate content for Getting Started getting-started
#120602 opened 7 days ago by

fix-120429 only add color to debug codicons in specific places
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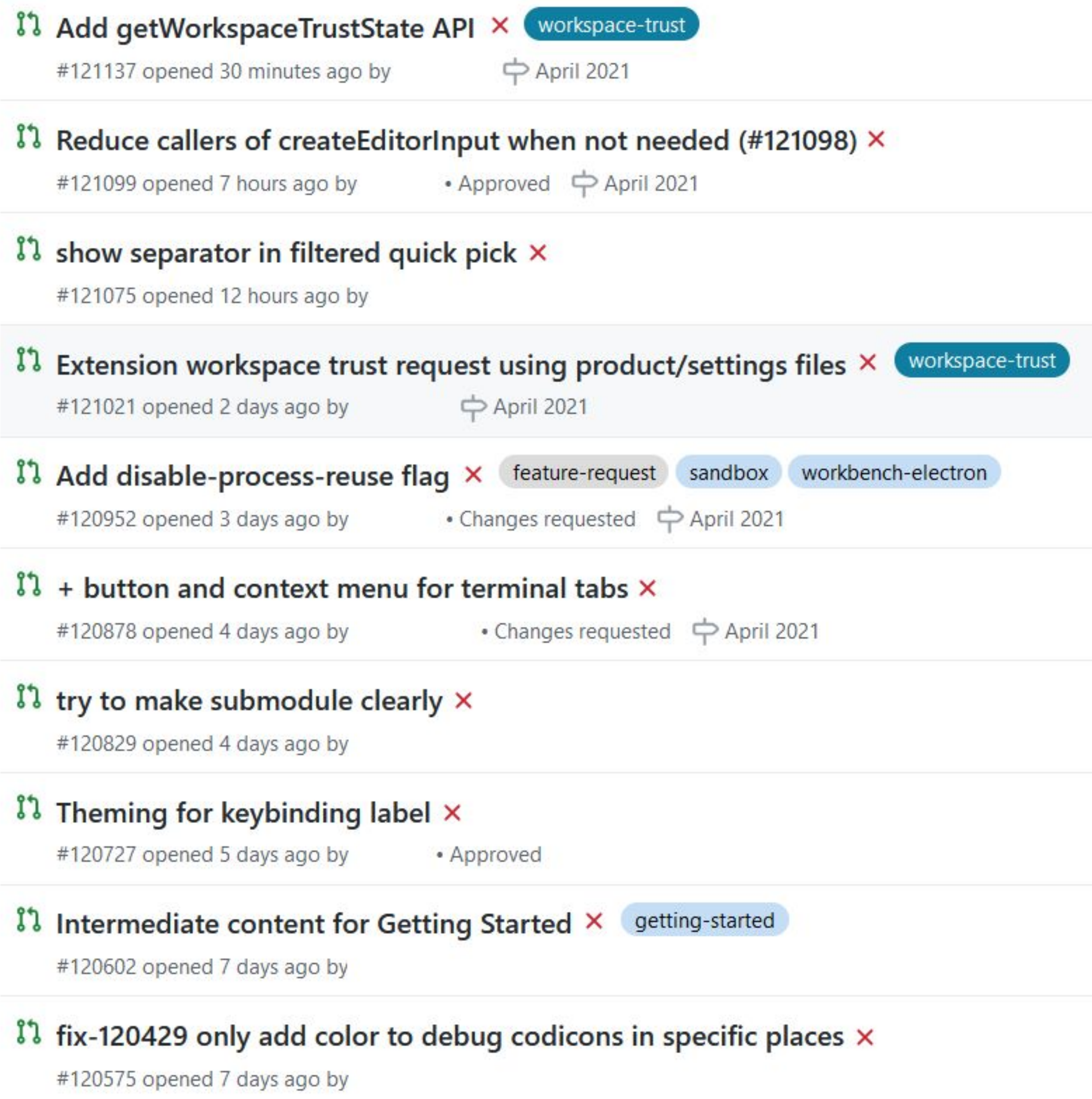
Truth



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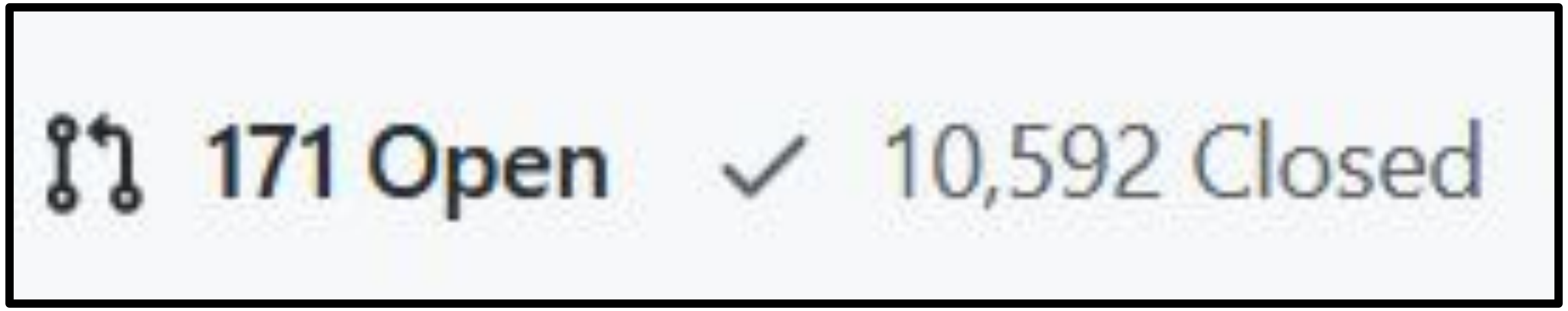
Think about this.

- Time saved.
- Errors avoided.
- Volume increased.
- Development velocity.
- Heart attacks avoided.



171 Open ✓ 10,592 Closed

GitHub Actions

Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings

Get started with GitHub Actions

Build, test, and deploy your code. Make code reviews, branch management, and issue triaging work the way you want. Select a workflow template to get started.

Skip this and set up a workflow yourself →

Workflows made for your JavaScript repository

Suggested

Publish Node.js Package

By GitHub Actions

Publishes a Node.js package to npm and GitHub Packages.

Set up this workflow

```
npm ci
npm test
npm ci
```

Node.js

By GitHub Actions

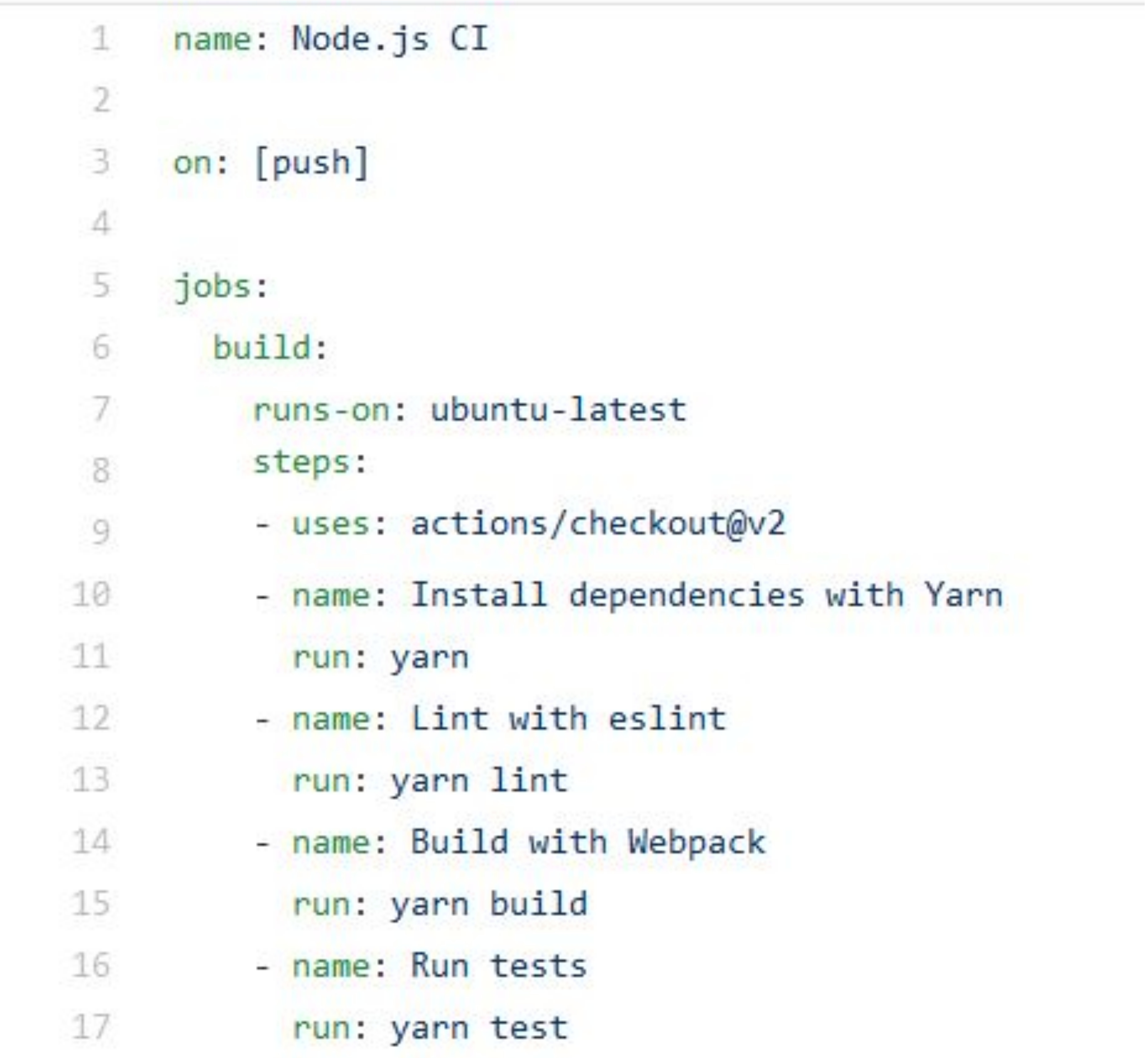
Build and test a Node.js project with npm.

Set up this workflow

```
npm ci
npm run build --if-present
npm test
```

The best part?

- It’s cheap (to make and maintain).
- It’s basically English (very descriptive).
- It’s already there for free! (premade)



```yaml
name: Node.js CI

on: [push]

jobs:
  build:
    runs-on: ubuntu-latest
    steps:
    - uses: actions/checkout@v2
    - name: Install dependencies with Yarn
      run: yarn
    - name: Lint with eslint
      run: yarn lint
    - name: Build with Webpack
      run: yarn build
    - name: Run tests
      run: yarn test
```

Containerisation

Why?

People use and **develop products for different environments. (Windows/MacOS/Linux).**

Q: How do we ensure the **same behaviour on every environment?**

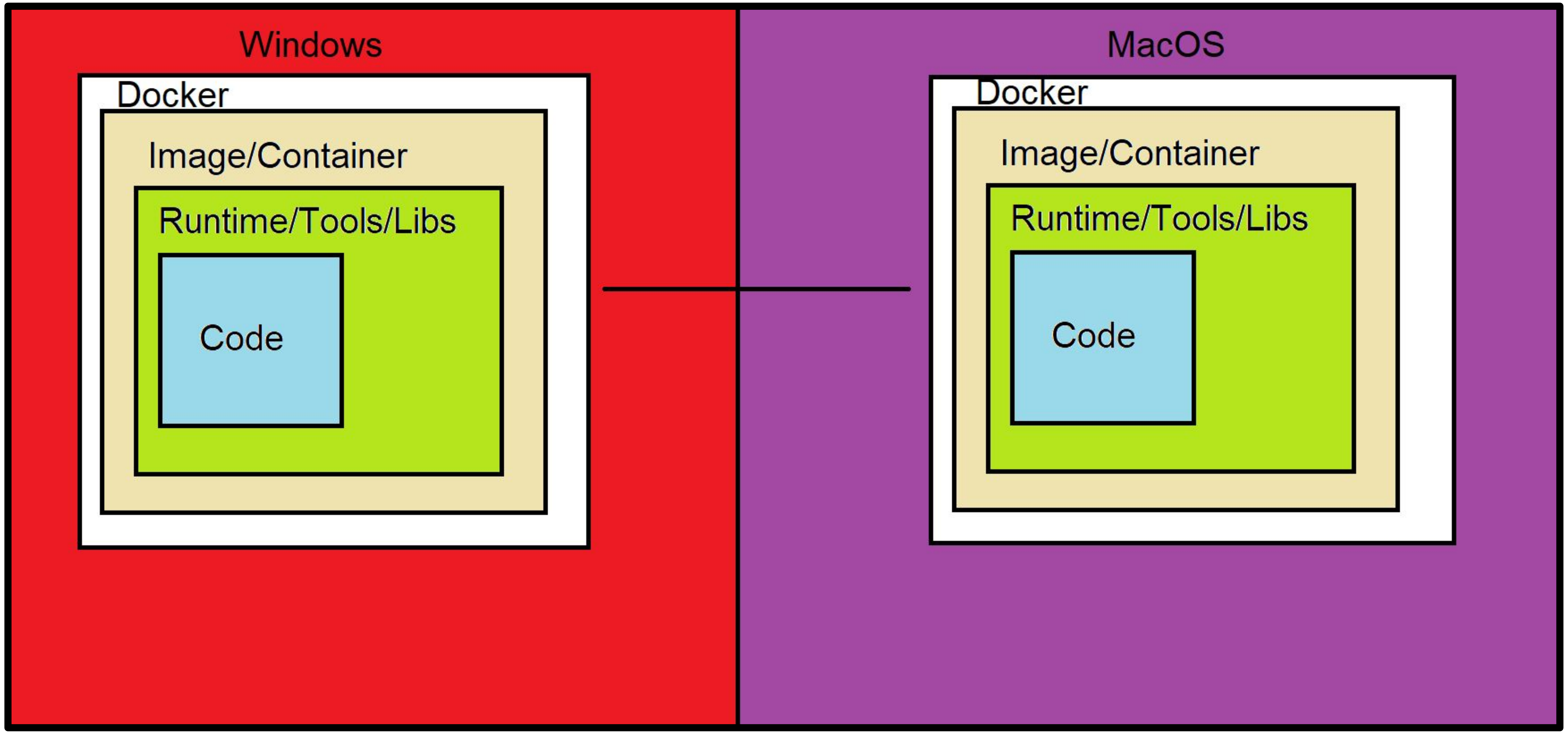
A: We **just replicate one environment** and put it everywhere else.

What is it?

“A container is a standard unit of software that **packages up code and all its dependencies so the application runs quickly and reliably** from one computing environment to another.” - *Docker*

TL;DR: *We stuff the bare minimum and ship it.*

As long as it supports Docker...



Podman vs Docker

The greatest **difference between Docker** and **Podman** is their architecture. **Docker** runs on a client-server architecture, while **Podman** runs on a daemonless architecture.

- **Daemonless.**
  - One can only view their own containers.
  - Rootless to start up.
- **Can be run as root or non-root.**
  - Rootless.
  - If one escapes container, they’re still user!
- **Podman is a more secure Docker.**

OpenShift

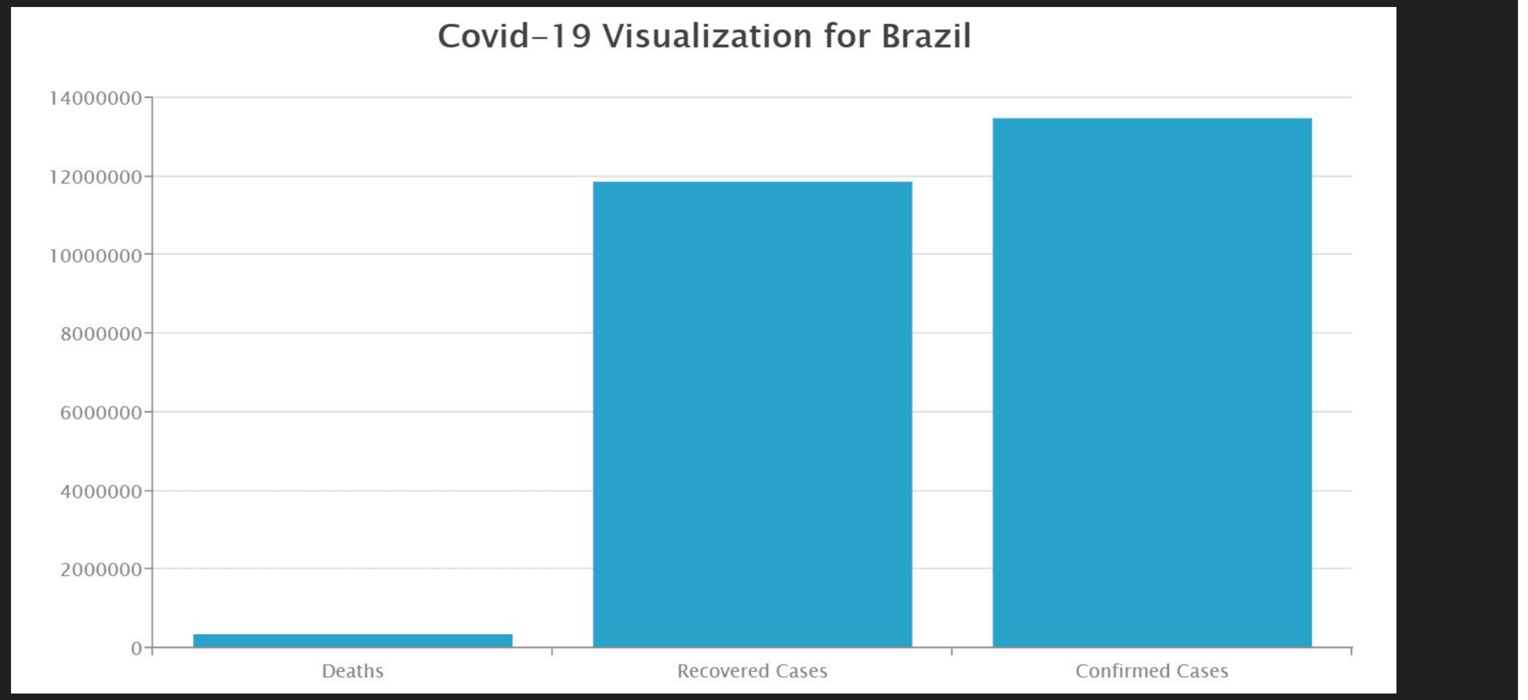
What is it?

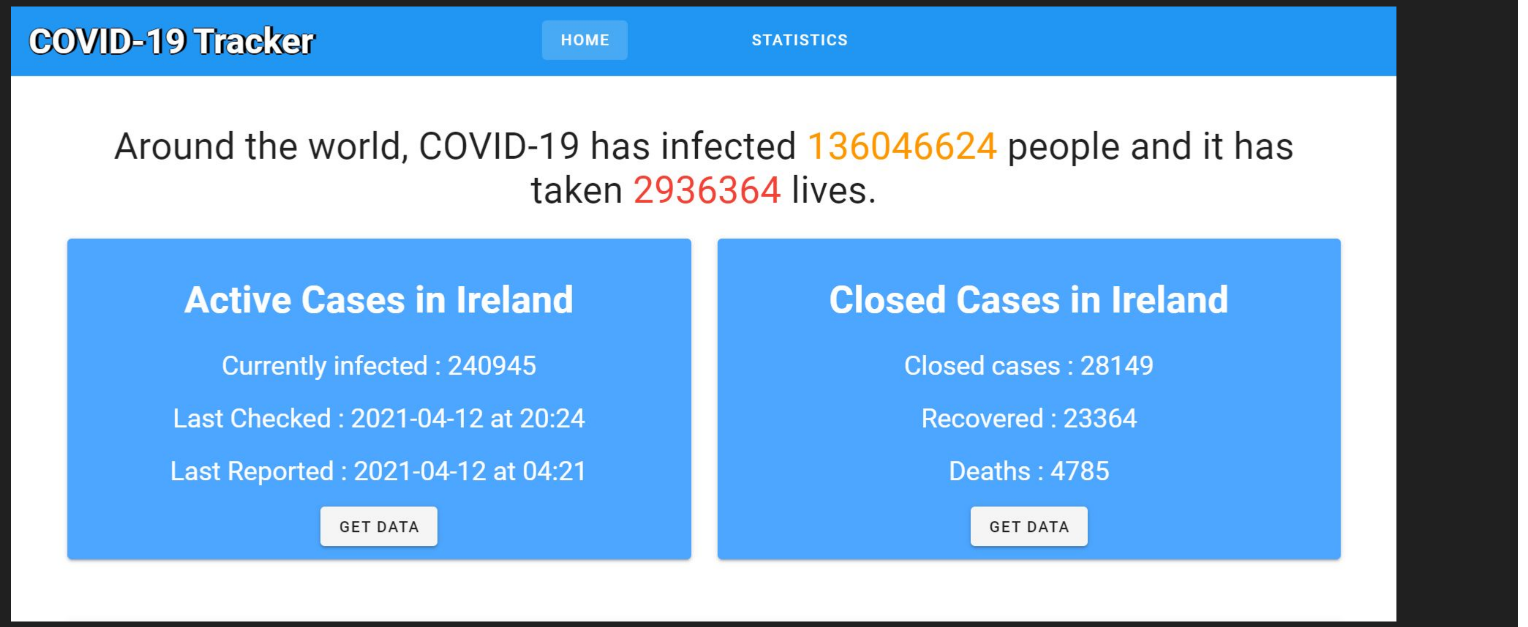
OpenShift offers a platform for building and scaling containerized applications.

How does it work?

OpenShift creates nodes from a *cloud provider, physical systems, or virtual systems.* Kubernetes interacts with *node objects that are a representation of those nodes*. The master uses the information from node objects to validate nodes with health checks.

Our Application





Around the world, COVID-19 has infected 136046624 people and it has taken 2936364 lives.

Active Cases in Ireland

Currently infected : 240945

Last Checked : 2021-04-12 at 20:24

Last Reported : 2021-04-12 at 04:21

GET DATA

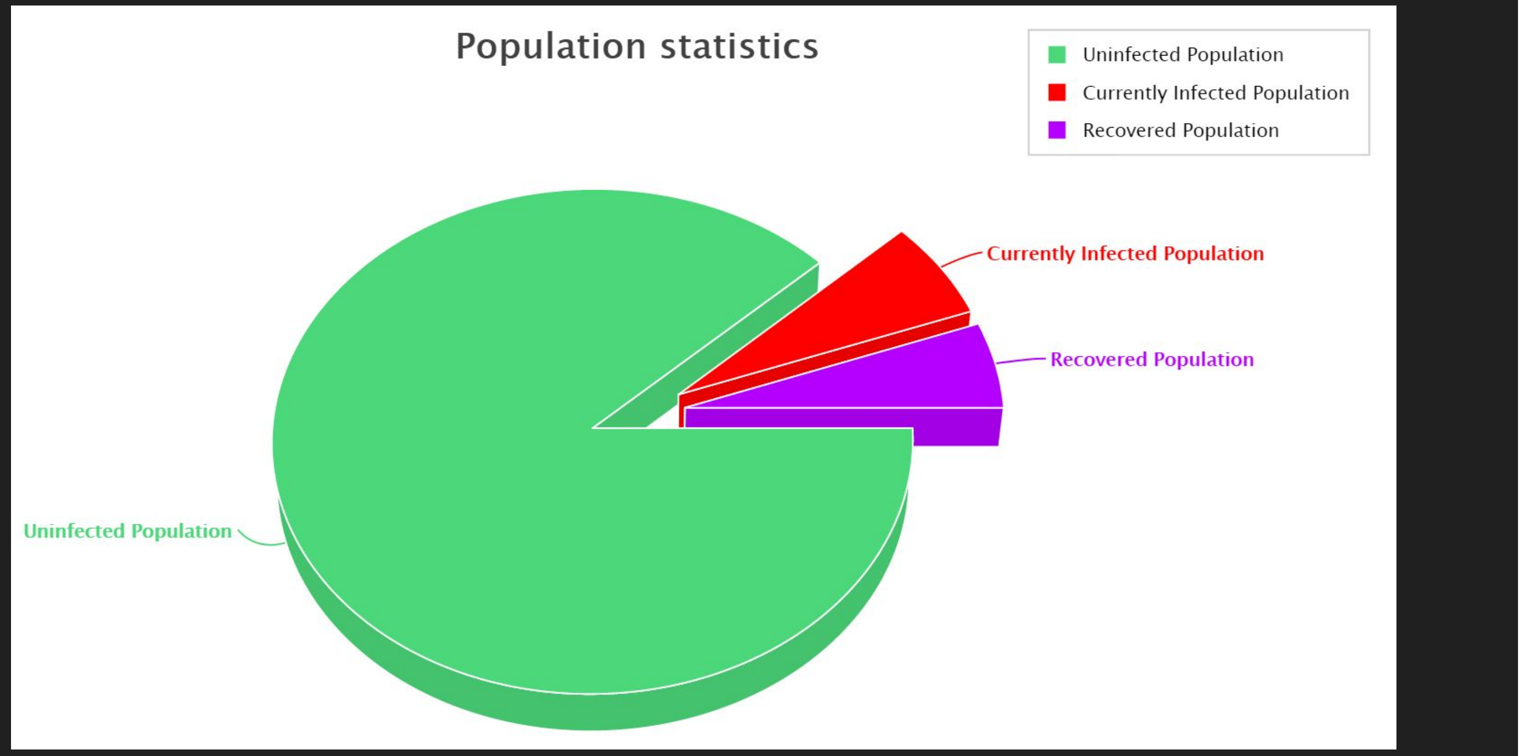
Closed Cases in Ireland

Closed cases : 28149

Recovered : 23364

Deaths : 4785

GET DATA



The Application

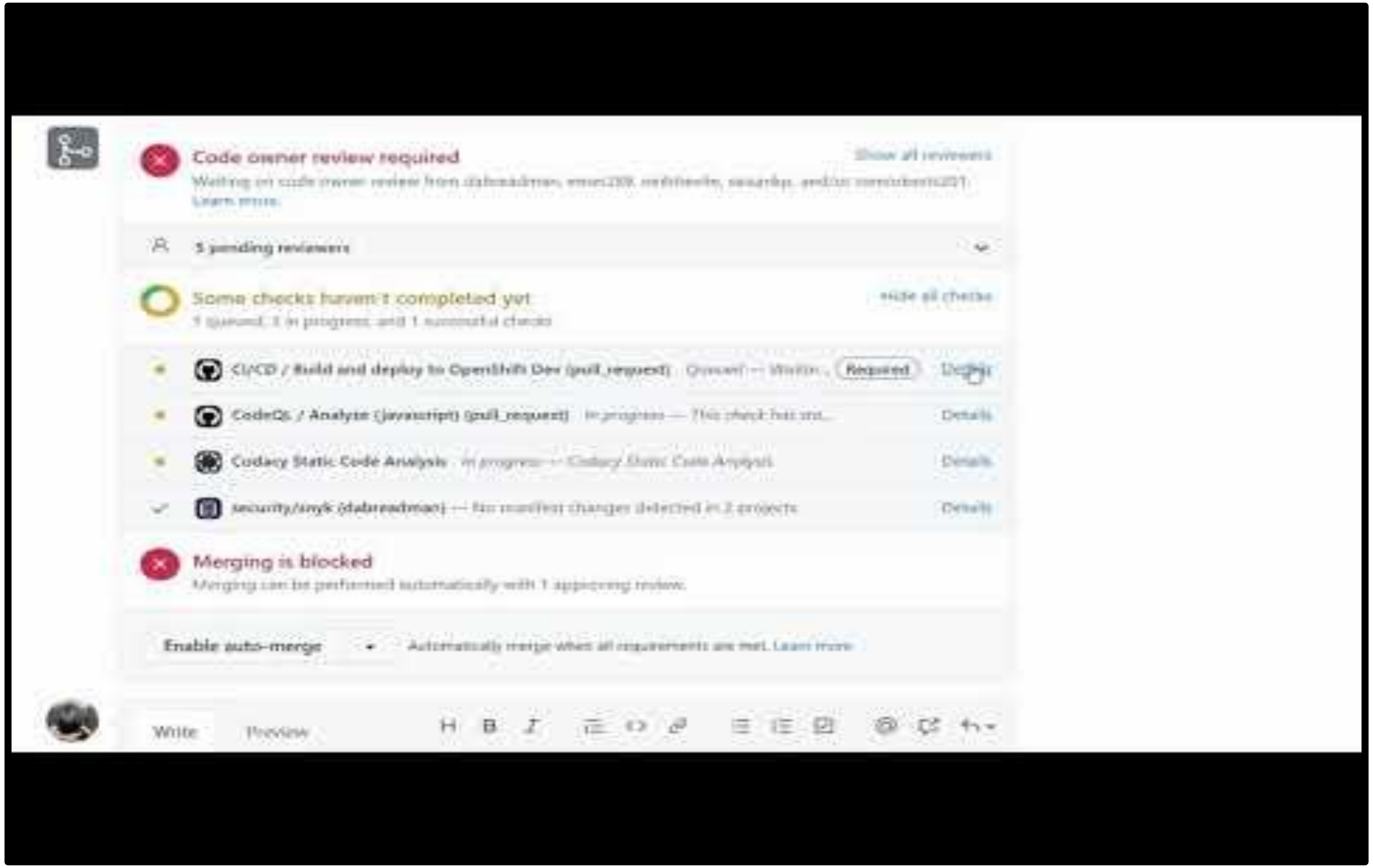
- Our application is made with **Vue.js** and **Node.js.**
- It is a **COVID-19 Tracker** which shows information about COVID-19 for each country.
- It gets its **information from an API** with an API key.
- Shows this information both through **text**, and with **graphs** such as the **bar chart** and **pie chart** shown on the left.

The purpose of it?

- We can then use this application to **test our CI/CD pipeline.**
- It will be deployed on to **OpenShift.**

Our Demo

https://www.youtube.com/watch?v=mD3vXeTYzVg&ab_channel=CormacMadden



Code owner review required

Waiting on code owner review from dabreadman, ... and/or ... Learn more.

5 pending reviewers

Some checks haven't completed yet

1 queued, 3 in progress, and 1 successful checks

CI/CD / Build and deploy to OpenShift Dev (pull_request) Queued — Waitin... Required

CodeQL / Analyze (javascript) (pull_request) In progress — This check has sta...

Codacy Static Code Analysis In progress — Codacy Static Code Analysis

security/snyk (dabreadman) — No manifest changes detected in 2 projects

Merging is blocked

Merging can be performed automatically with 1 approving review.

Enable auto-merge Automatically merge when all requirements are met. Learn more