

KUBECON + CLOUDNATIVECON NORTH AMERICA 2026

Zero to Maintainer in 45 Days

An AI-Assisted Migration of a CNCF Project's Legacy Frontend

Jeff Spahr · November 10, 2026



KubeCon CloudNativeCon
North America 2026

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Director, Software Engineering
Capital One

Maintainer
Kubeflow Pipelines

Infrastructure and SRE background
Not a frontend developer



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How did I find myself here? What problem was I trying to solve?

I'm accountable for an internal platform and keeping it well managed.

I needed to eliminate vulnerabilities in the Kubeflow Pipelines frontend.



Why weren't the dependencies getting updated?

Maybe this was a configuration issue?

Dependabot

It was running, using GitHub defaults. There was no config file in the repo.

Renovate

There was a config file, but it had been disabled in 2022.

The renovate file had me looking in the wrong place. Let's remove that confusion for myself, others, and agents.

PR #12631 · removal merged January 9, 2026

My first PR: delete renovate.json5

July 2022

Renovate disabled

→

January 2026

Disabled config removed

→

PR #12631

small, scoped, no risk change.

It had been disabled for about three and a half years.



github.com/kubeflow/pipelines/pull/12631

My first Kubeflow Pipelines PR

Smaller circles show my other merged PRs between milestones.

Jan 9

First PR

Remove disabled Renovate config

#12631



These weren't simple dependency bumps

The frontend server still depended on `request`, deprecated since 2020.

Remove vulnerable packages

`request`, old `tar` and `qs` came through the Kubernetes client.

→

Upgrade that client

`@kubernetes/client-node`
0.16.3 → 1.4.0

→

Change the server

CommonJS → ESM
Rewrite API calls and response handling
Migrate server tests

Fixing the dependency tree meant changing the code that used it.

request deprecation · PR #12756

React 16 → 17 needed other migrations

Create React App was deprecated. We had to replace our entire UI testing framework.

Build + tests

Create React App → Vite
Jest / Enzyme → Vitest / Testing Library
#12754

→

Charting dependencies

Replace react-vis with Recharts
Pin its react-redux dependency for React 17
#12829

→

Then React 17

Upgrade React and its types
Adjust table and graph code
#12849

Even the replacement chart library brought another compatibility problem.

CRA deprecated February 2025 · Merged PRs linked above

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Pre-AI, I would have stopped right here.

Nah, I'm good.



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Could I make these changes with AI tools?

I had to be confident enough in my changes.

I had to convince the maintainers to be confident enough in my changes.



How would I know the AI-written code was good enough?

I wasn't a frontend developer.

What if AI does a bad job?



Image generated with ChatGPT

Human-written code doesn't come with a quality guarantee either.

That doesn't lower the bar for AI.

It means I needed a way to check.

How do we build confidence:

1. Get subject matter expert input - I asked a frontend dev colleague.
2. Increase testing coverage around what you want to change before you change it.
3. Build validation tools.

Tests before the upgrade

Add test coverage

Kubernetes client tests · #12635

→

Upgrade the client

Server security fixes · #12756

These changes helped me get familiar with the project.

Merged PRs #12635, #12756

I started with the frontend tests

Smaller circles show my other merged PRs between milestones.

Jan 9

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#12631



Jan 15

Frontend tests

Stabilize frontend E2E tests

#12636

I built a screenshot comparison tool

I needed to validate that I wasn't introducing visual regressions.

Before

Capture the existing UI.

After

Capture the same views with my changes.

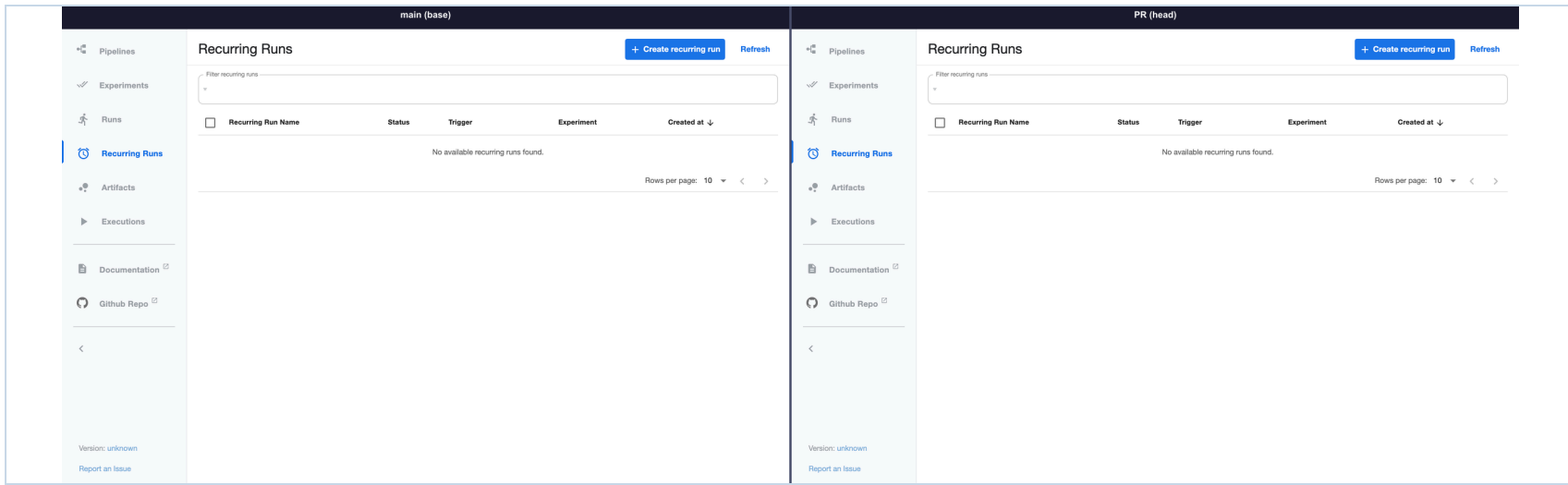
Compare

Highlight pixel differences.

I used the comparisons to check my work, then added them to my PRs so maintainers could see what changed.

PR #12754 · visual evidence · PR #12784 · comparison tool

A comparison from the Vite PR



One of eight comparisons I posted on the Vite migration PR.

PR #12754 · visual comparison comment

Sometimes the UI did change

Before



After



The tooltip text became difficult to read.

Reviewer screenshots · PR #12829

The build and test tools were replaced

Smaller circles show my other merged PRs between milestones.

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CRA to Vite

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We were gaining momentum and more help showed up

Manaswini Das and I made a plan and divided up the work.

Contributors picked up dependencies, tests, and framework upgrades.

Collaborative planning: speaker account · Kubeflow modernization blog

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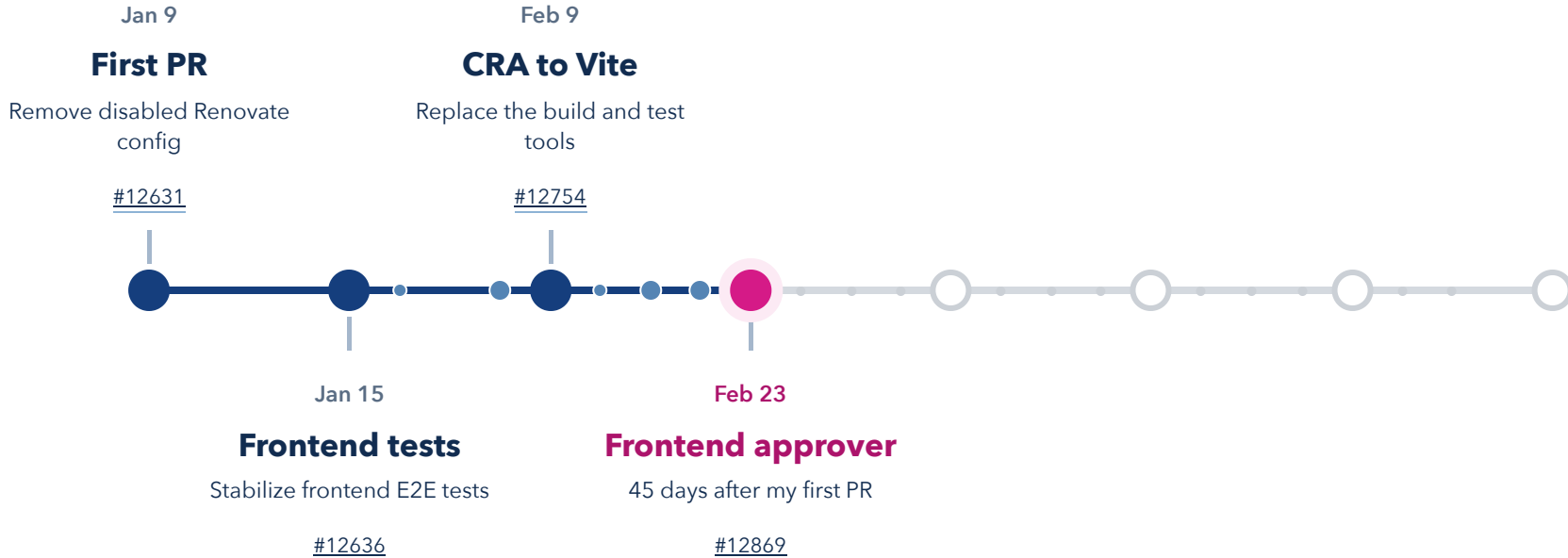
I became a reviewer as much as a contributor.

As others picked up the migration work, I spent more time reviewing their PRs.



I became a frontend approver

16 of my PRs had merged by this point, including the milestones shown.



From React 16 to React 19

Vite + tests
Replace CRA / Enzyme

→

React 17
Clear peer blockers

→

React 18
Upgrade dependencies

→

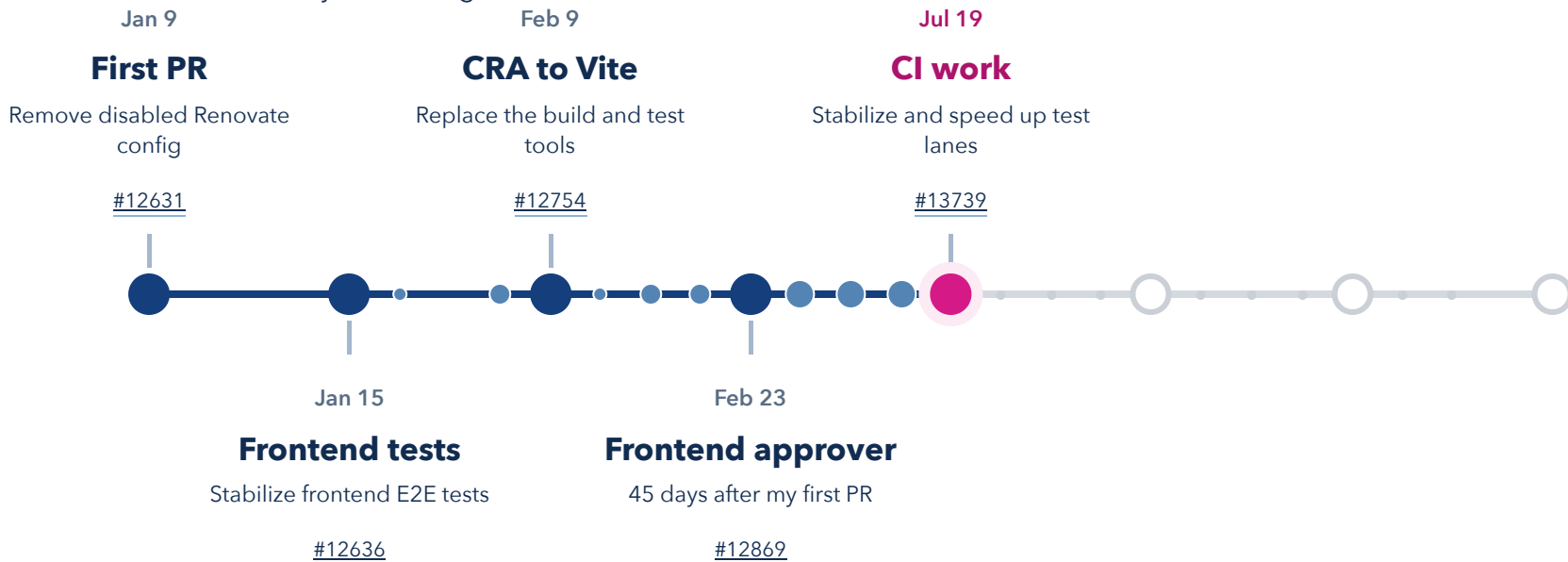
React 19
Community-led upgrade

The migration continued after the 45-day maintainer milestone.

Kubeflow modernization blog · PR #12754 · PR #13153

The work grew into CI

Smaller circles show my other merged PRs between milestones.



From frontend into the wider project

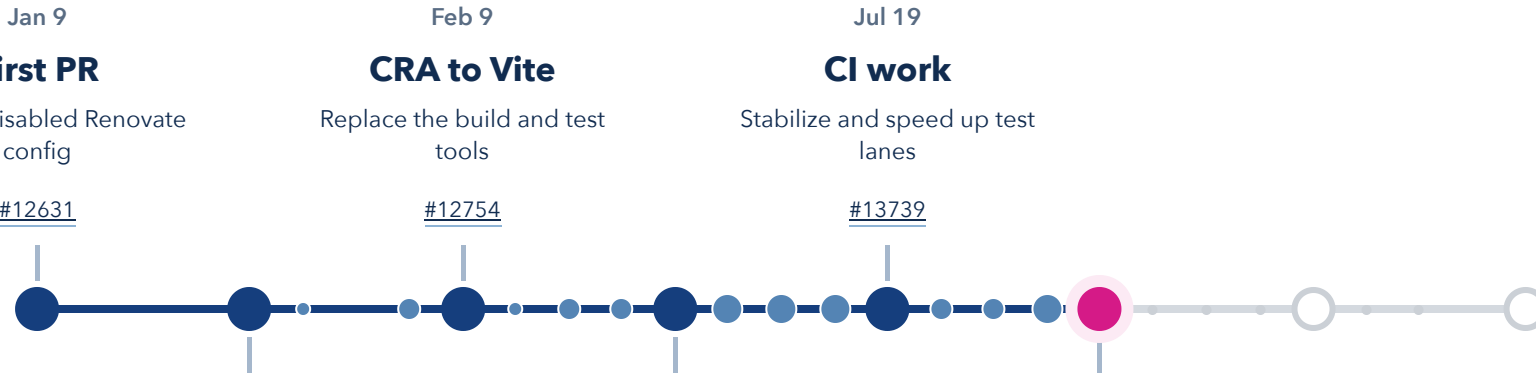
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Frontend	3	21	22	11	17	2	7	9	19	50	·
CI	1	5	5	3	2	2	34	12	35	92	3
Backend / API	·	1	·	1	2	4	24	5	27	78	3
SDK	·	·	1	·	·	·	9	2	9	37	2
Deployment	·	·	·	·	1	·	6	1	13	54	·

Authored PRs by month opened in 2026. November through Nov 9.

Public authored PRs in kubeflow/pipelines · Through Nov 9, 2026 (UTC)

I became a project maintainer

Smaller circles show my other merged PRs between milestones.



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CRA to Vite

Replace the build and test tools

#12754

Feb 23

Frontend approver

45 days after my first PR

#12869

Jul 19

CI work

Stabilize and speed up test lanes

#13739

Jul 28

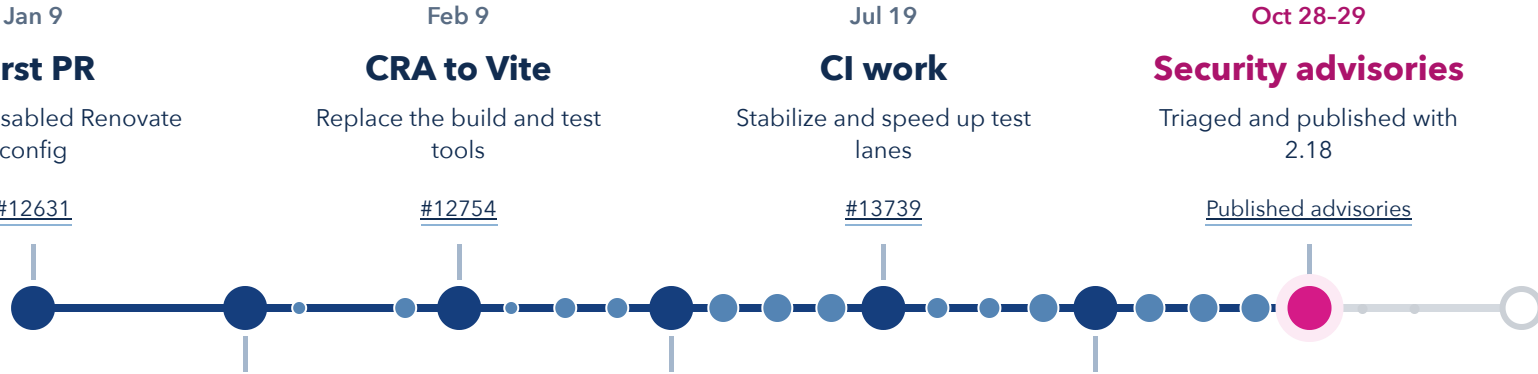
Project maintainer

Responsibility across Pipelines

#13908

Security Advisories and 2.18 Release Lead

Smaller circles show my other merged PRs between milestones.



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Oct 28–29

Security advisories

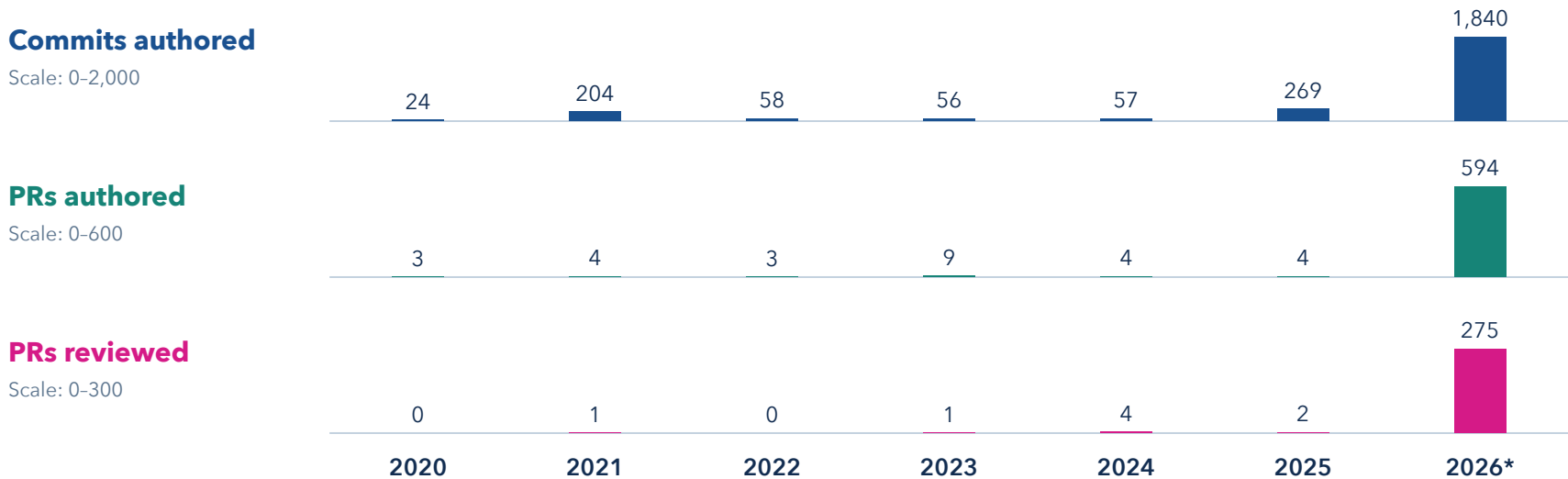
Triaged and published with 2.18

Published advisories

2026 · Public disclosures: October 28–29 · 2.18 release notes

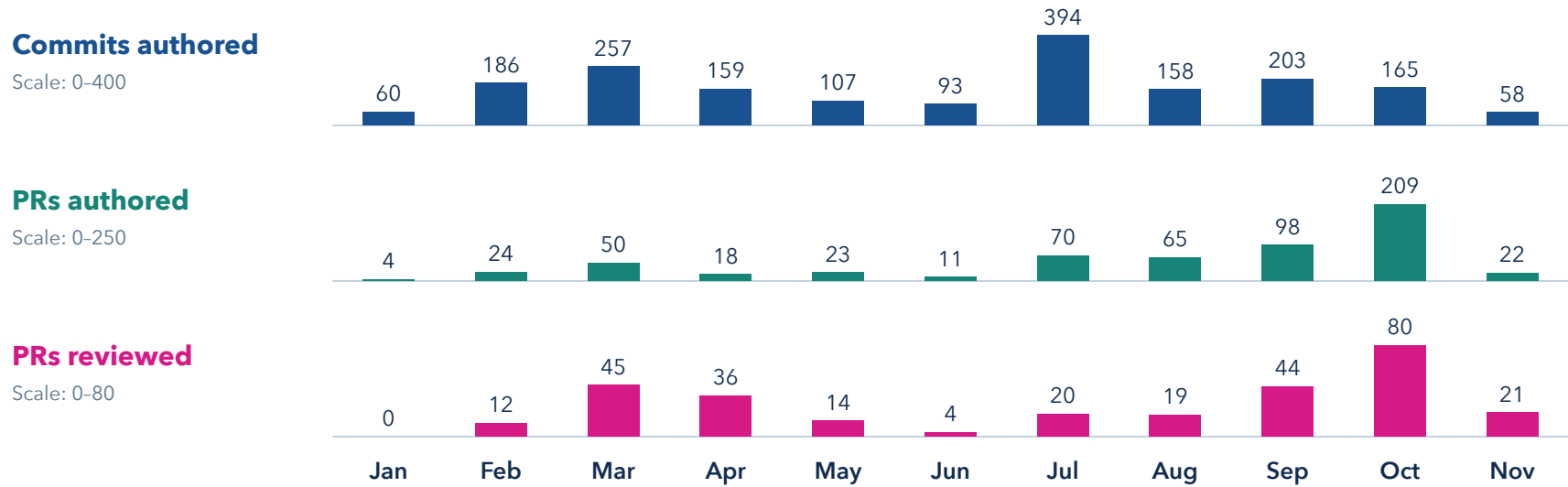
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My GitHub activity over time



All repositories. *2026 through Nov 9; prior years are full years. PRs authored counted by opening date.

My GitHub activity in 2026



All repositories, January–November. November through Nov 9.
A PR reviewed in multiple months can count in each month.

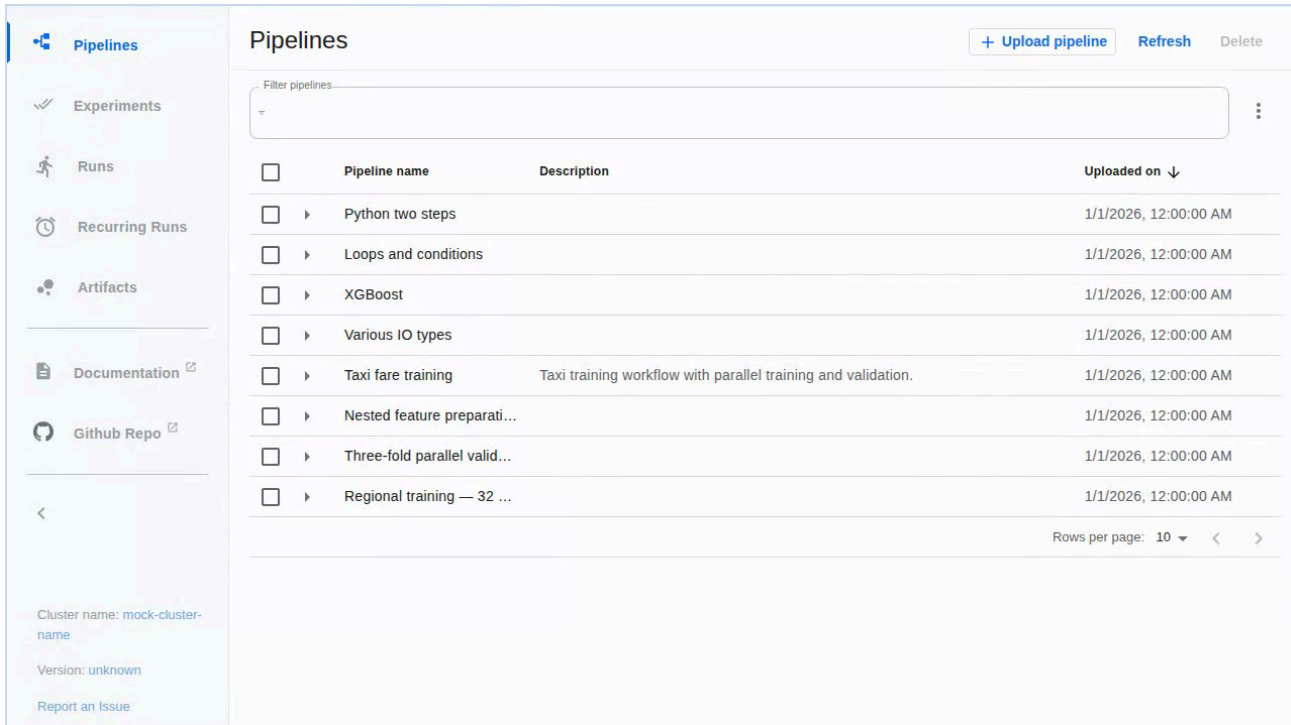
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So why does the UI still look so dated?

Because a visual change was treated as a **regression.**



Before



Pipelines list · Comparison recording · sample data

Today: a new UI

Smaller circles show my other merged PRs between milestones.

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Project maintainer

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#13908

Oct 28–29

Security advisories

Triaged and published with 2.18

Published advisories

Preview

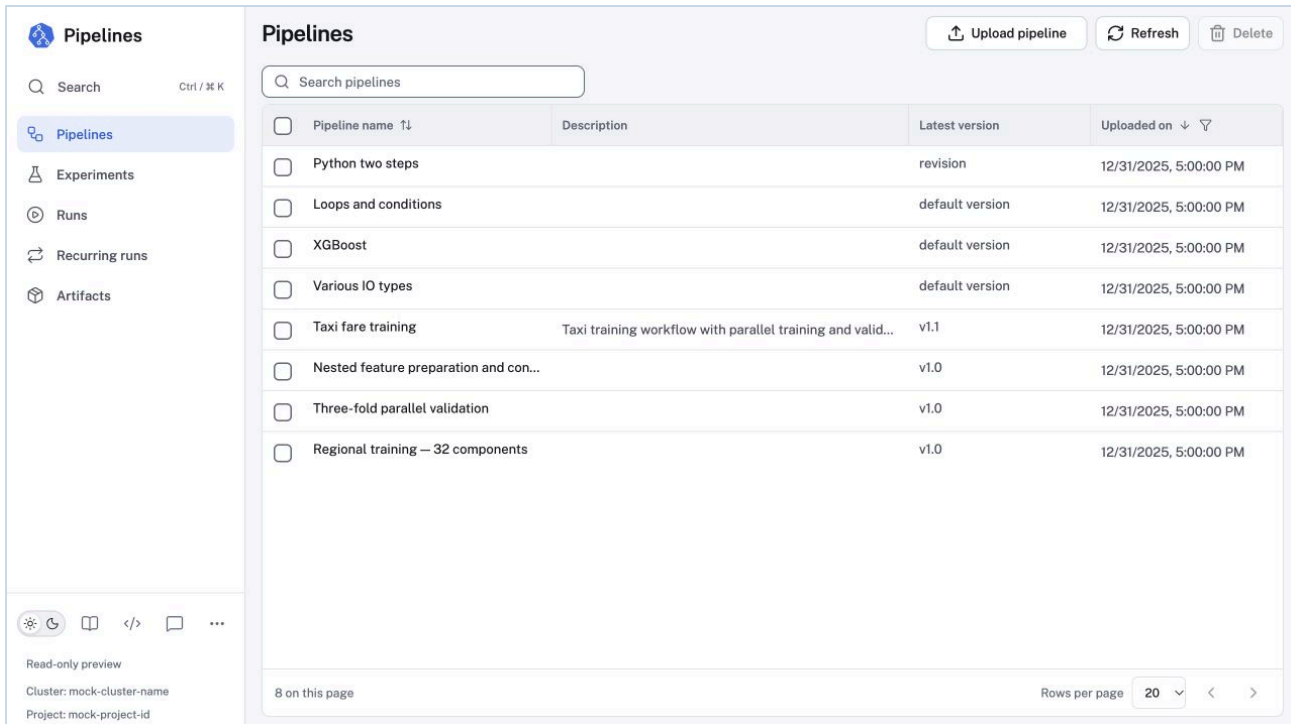
Today: new UI

Separate from the stack migration

#14584

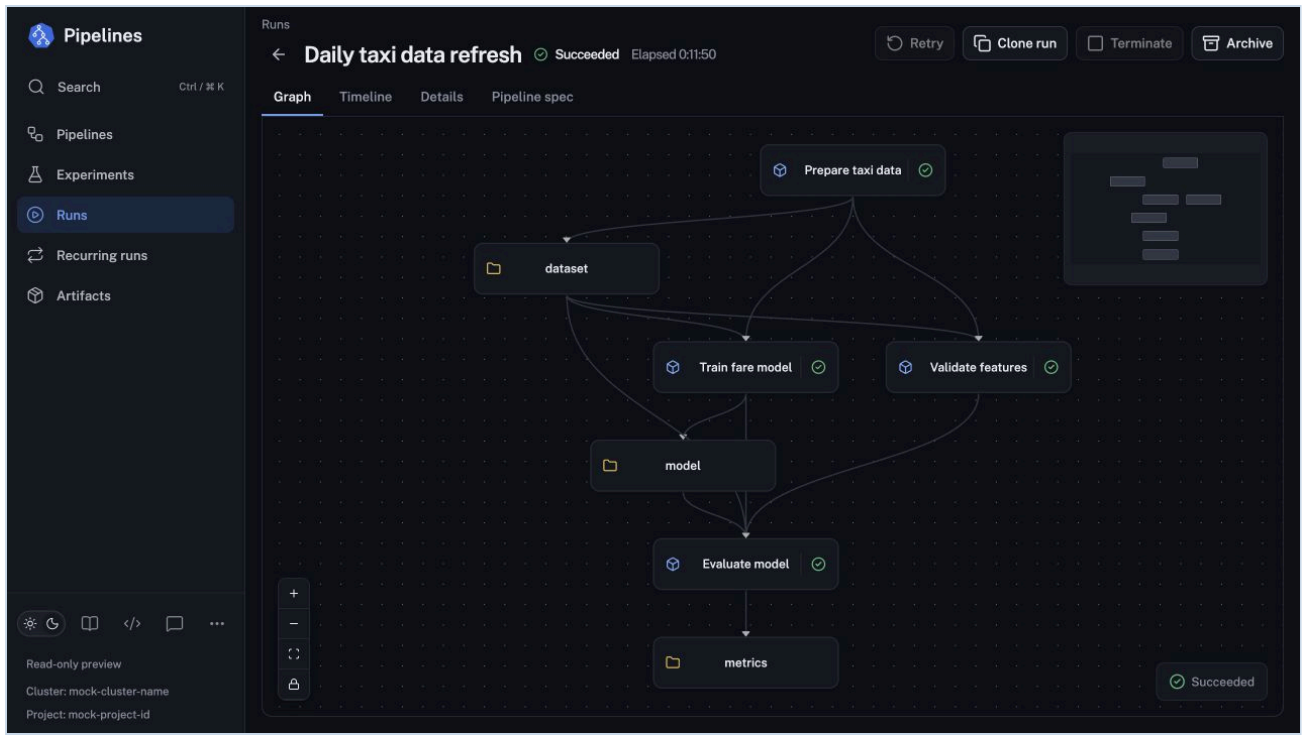
UI PR is open as of November 9. These screenshots are a preview.

This project deserves a modern UI



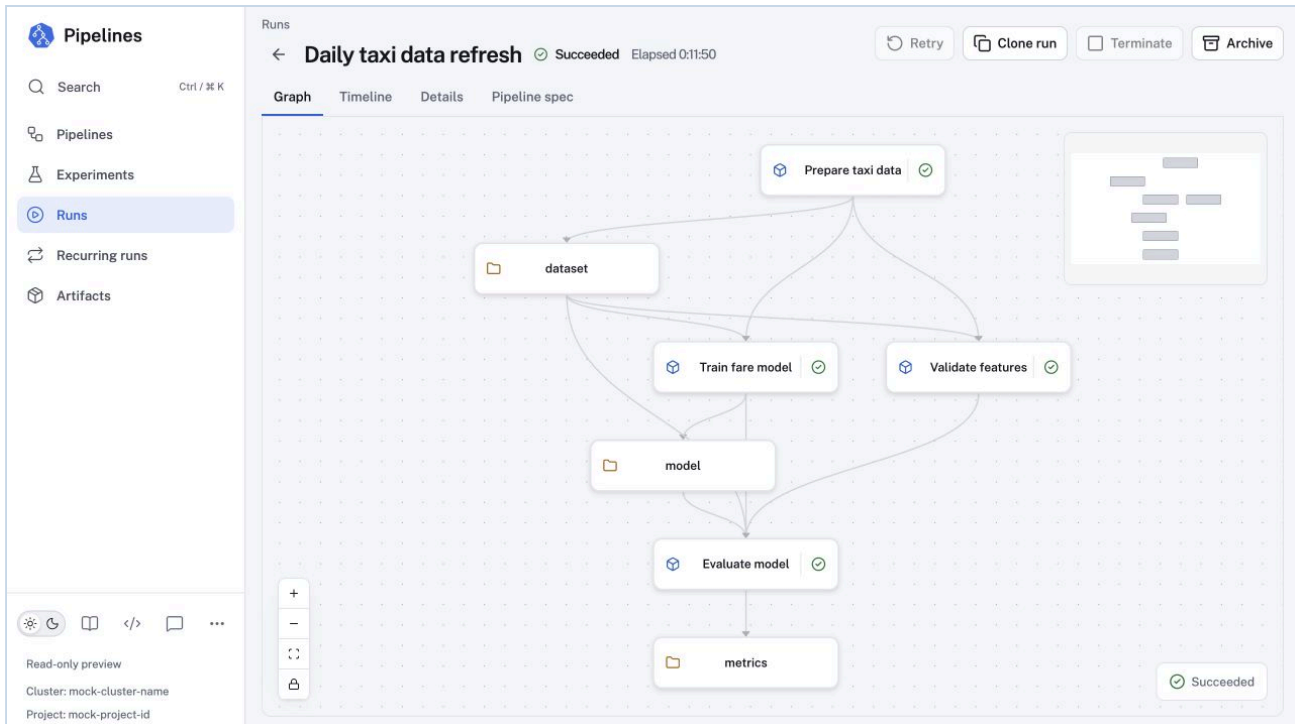
Preview · PR #14584 · sample data

Dark mode



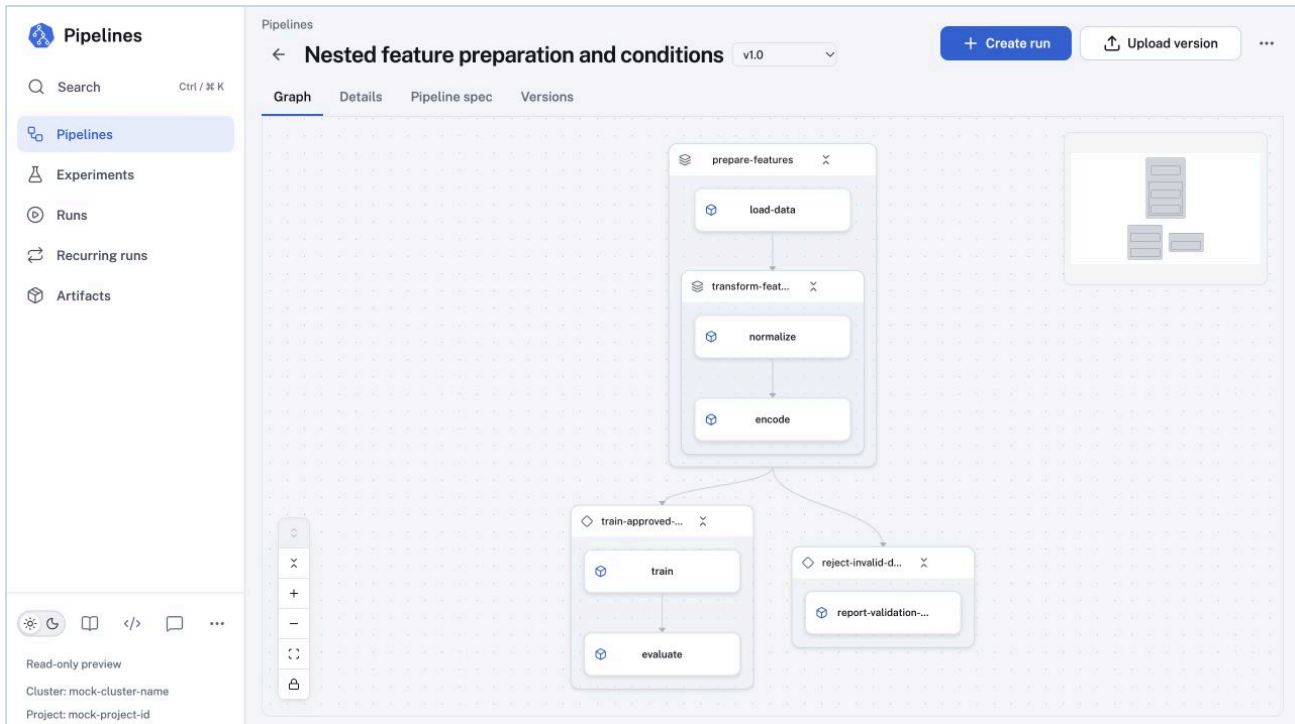
Preview · PR #14584 · sample data

Run details



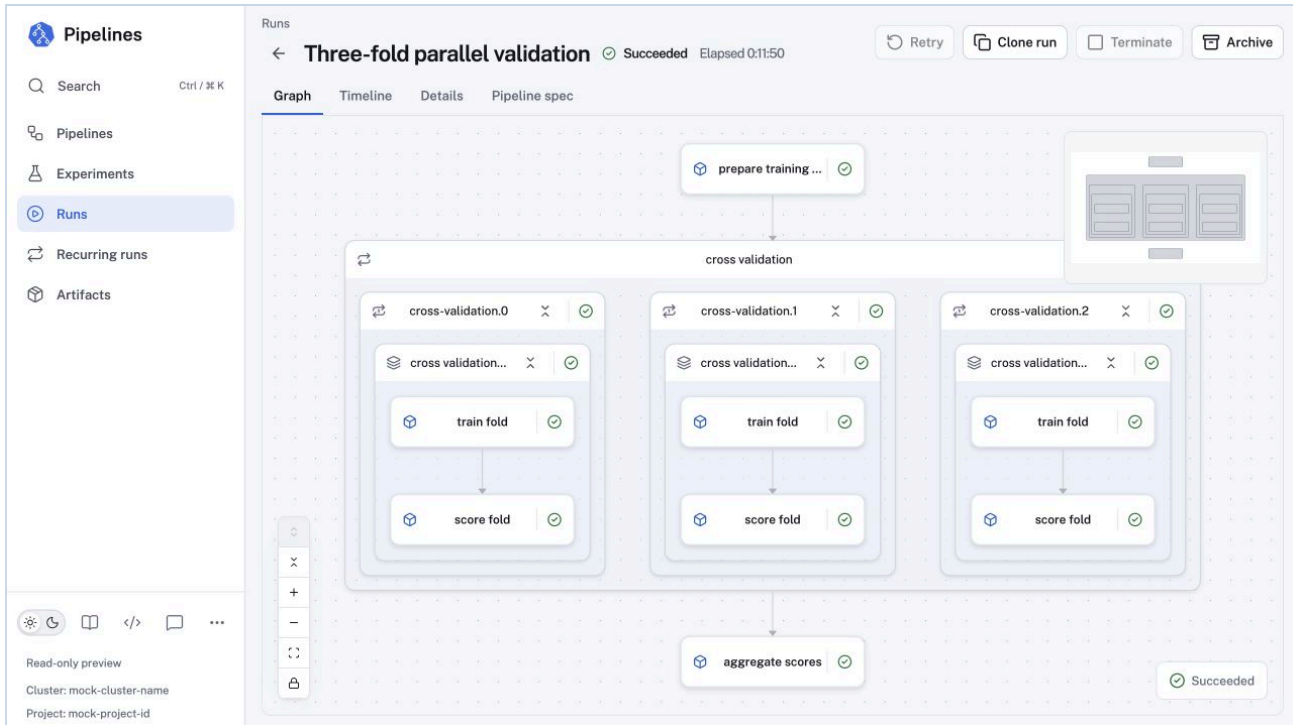
Preview · PR #14584 · sample data

Nested DAGs and conditions



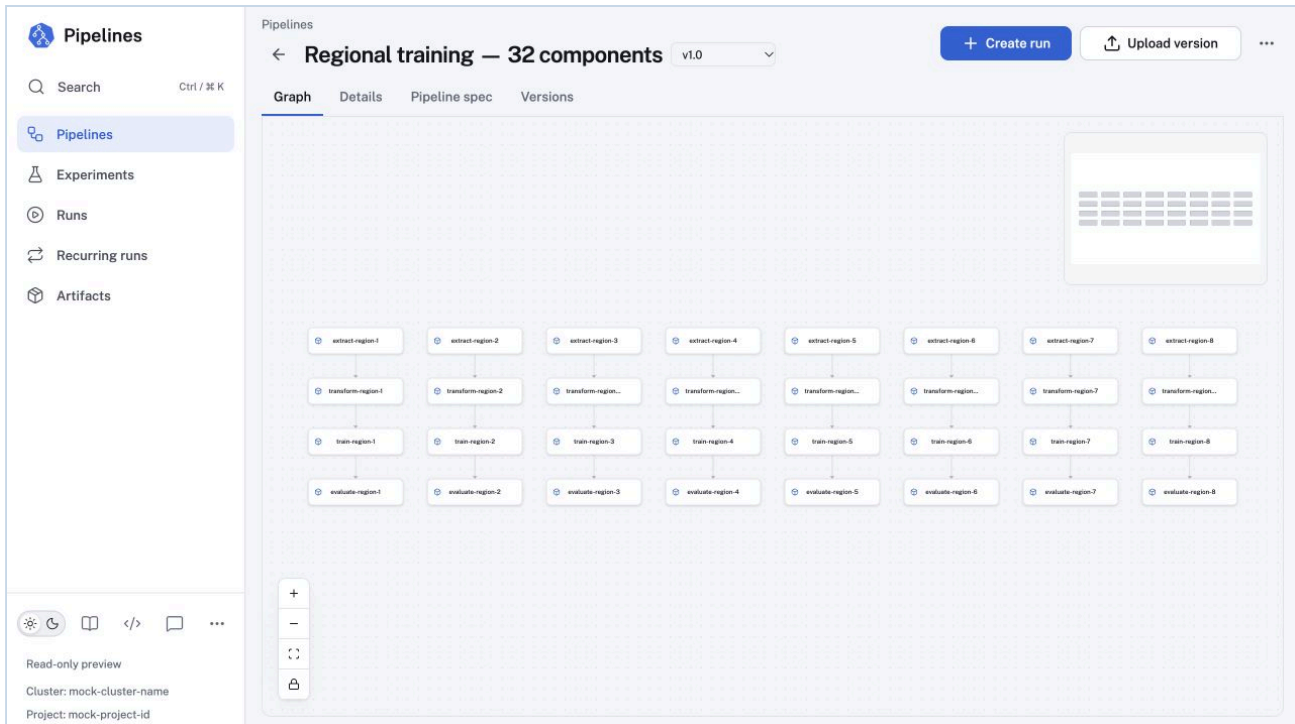
UI review preview · Nov 10, 2026 · mock data

Parallel execution



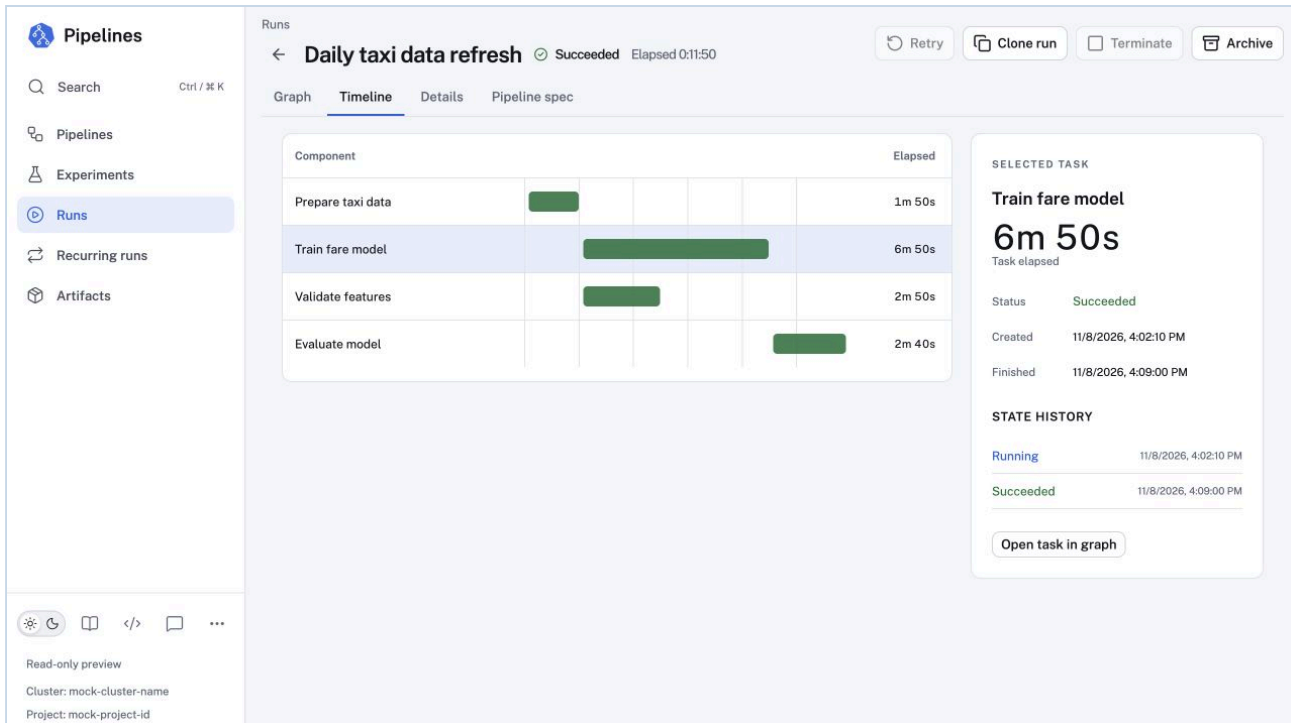
UI review preview · Nov 10, 2026 · mock data

A 32-component pipeline



UI review preview · Nov 10, 2026 · mock data

Run timeline



UI review preview · Nov 10, 2026 · mock data

Thank you

Kubeflow Pipelines maintainers

Alex Perlman
@droctothorpe

Mike Zazula
@zazulam

Matt Prahl
@mprahl

Humair Khan
@HumairAK

Thank you

Manaswini Das · @manaswinidas

Planning, frontend tests, and reliability

@kanishka-commits
@jsonmp-k8

Premved Dhote · @PR3MM

React 19 upgrade

@dpanshug
@rishi-jat

And the colleagues, maintainers, reviewers, and contributors who helped along the way.

Thank you

For the /lgtm and /approve on my PRs:

@droctothorpe
@zazulam
@manaswinidas
@juliusvonkohout
@hbelmiro
@mprahl
@jsonmp-k8
@Priyanshu-u07
@sathish-thangaraj
@HumairAK
@srtanish1992
@dpanshug

And everyone who reviewed, commented, and helped.

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Questions?

Jeff Spahr · Kubeflow Pipelines

The slides

jeffspahr.github.io/story

