



Exotic Runtimes

Ruby and Wasm on Kubernetes and GitOps
Delivery Pipelines

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Full Session Today

ICYMI:

- Yesterday, this was a lightning talk
- Will repeat most of that info today
- (Won't assume you've seen it)
- Check out GitOpsCon when those sessions get posted to YouTube!



Intro

- Hi
I'm Kingdon Barrett
- Find me on YouTube or Mastodon
- youtube.com/@yebyen
- hachyderm.io/@yebyen



Job

- Weaveworks: Developer Experience
- OSS Engineer @ WW since 2021
- Second S is for ~~Smooth Operator~~
(no, it's Open Source **Support!**)
- Work on Flux (Slack/ web/ community maintainer, former Flux v1 maintainer)



Flux

- Flux Bug Scrub - weekly fluxcd.io/#calendar
- What: OS **Support** Engineer
- (I try to use our OSS deeply)
- Lean into fully OSS solutions



Flux Talks



bit.ly/gitopscon2023



Intro (me)

- On YouTube - I'm new here
- Let's Study: Arabic
- Cloud Jockey: %radio DJ
- Live Coding: Ruby + Kubernetes
- (Please mash like & subscribe button)



Wasm and Ruby

- **What are we here for today**
- What is “untrusted code”
- Why do we want to run it
- Healthy skepticism about (yes, even our own) code



Ruby

- Can Wasm? run it
- Yes
- Why would we do that?
 - This is a serious question
 - Do you know why Wasm? (What is Wasm?)



Why Wasm

- Secure Foundation
- “Bytecode Alliance”
- Portable artifacts
 - with a degree of language independence



Why Wasm

- Frankly I cannot sell Wasm
 - No commission either
- If you take it with you, I get nothing
 - I think it will be useful
 - Let's find out together



Why Kubernetes

- For Flux and GitOps
- If you chose Kubernetes, you already know why you did (!)
- Declarative, versioned, immutable artifacts describe a desired state
- Self-healing infrastructure



Compiled Languages

- Rust
- Go
- JavaScript, TypeScript
- C#
- ... (value for you all as well)



History as a Rubyist

- I used Ruby since 2002(?)
 - Thanks Eivind - Enlightenment, E16, E17, #gah on EFnet, Freenode, IRC (I'm old now)
 - First “permanent job” at Metrix Matrix in Rochester, NY
 - Second “permanent job” at University of Notre Dame OIT, South Bend



Why Ruby?

- I know it better than other languages
- Comfort and familiarity
 - Top Notch Debugging ++
 - Bundler, Fibers, Ruby 3.0
- MVP: for faster time to market



Ruby Solutions

- To run a website
- To connect a database
 - scrape content from internet
 - To build an IRC bot
 - No compiler, duck typing, object orientation, imperative, monkey patching, ease of use



More Ideas: Ruby Solutions

- To build a K8s Operator, of course because why not!



Web Assembly in Ruby

- Ruby: interpreted language
- gem: wasmer-ruby
- gem: wasmtime-rb
- Run Wasms in Ruby
- What is a Web Assembly?



Runtime Format

- Can run Ruby in Wasm?
- Yes, but first...
- Wasm is a binary format
- Wasm also builds libraries
 - Include it in other programs



Ruby in Ruby?

- Consider not doing this
- No theoretical benefit afaict
- It was the first thing I tried
- I could not make it work
- Let's try the other thing



Web Assembly

- Call functions from it
- Ship memory around
- Export functions to it
- Use a compiler, or...
- System Interface (WASI)



Features: Format

- What is a system interface?
- Stdio, filesystem, (restricted) HTTP/S
- There is no network
- How do you run a server?
 - WAGI (like CGI!) offload responsibility of conn



Omitted Features

- Has no string type, tough limitations
- Numbers and well-defined data structures only(ish) - hard for Ruby
- Allocate memory, make ptr
- Pass ptr to str+length/size



Ruby and pointers

- I don't want to do pointer math at all
- Could not figure out how do:
 - Wasm as library
- I spent some time on this, couldn't make it work in Ruby unfortunately



Ruby and Wasm lib

- I need string params and return values
- Reverted to WASI for this
- We can parse the output, pass in fs dir
- Now let's try to solve a real problem with some Wasm in Ruby!



What is Spin?

- My first entrypoint to Wasm
- Great docs about Ruby capabilities, references to relevant projects + docs
- “Serverless” - compose Wasms + run
- Test locally, no Kubernetes needed, no “linking” - works like controller/router



What is Spin?

- “Serverless” framework
- Test locally
- Run on Fermyon Cloud



What is Spin?

- “Serverless” framework
- Test locally
- (Run on Hippo Factory)
 - This is OSS Summit!



What is Spin?

- “Serverless” framework
- Test locally
- (Run on Hippo Factory)
 - You’re pulling our leg, right?



What is Spin?

- Serverless framework
- Test locally
- (Run on Kubernetes!)
 - Did I mention I'm a Flux maintainer



Why are we here?

- Hope to gain:
 - Testability
 - Reusability
 - Type safety between languages
- Capacity for polyglot teams to work together, benefit from specialization in many languages



How about we dive in?

- I built some things in Wasm
 - Break misconceptions
 - Follow good examples
- How are we going to use it?
- Let's solve a real problem now



Problem to explore

- GitHub Packages problem - DX needs to know how many downloads over time
- fluxcd/flagger/
 - [pkgs/container/flagger](#)
 - GitHub does not expose this value on any API afaict, so we scrape some HTML and parse it!



I built some things

- EKS cluster: Find on GitHub [kingdonb/eks-cluster](https://github.com/kingdonb/eks-cluster)
 - with Flux bootstrap (eksctl+flux 2.0.0-rc.2)



I built some things

- Blog service: GitHub kingdonb/taking-bartholo
- GitOps via Helm Controller
- Helm + Helmet library chart
 - At this point I understood pain of running Wasm+Kubernetes (not pain from Ruby... yet)



I built some things

- I began to understand some things
 - Fermion isn't using K8s or Helm
 - This would be v. hard without Flux (used Flux OCI to ship content separately from runtime, a novel application of Flux's OCI Artifacts!)



I built more things

- Kubernetes operator: [GitHub kingdonb/stats-tracker-ghcr](https://github.com/kingdonb/stats-tracker-ghcr)
 - Fetch from URL (in Ruby)
 - Write to file, pass in fs context
 - Parse HTML (in rust)
 - Return number as string (WASI!)



Finally

- Kubernetes operator: [kingdonb/stats-tracker-ghcr](https://github.com/kingdonb/stats-tracker-ghcr)
 - Parse number (back in Ruby)
 - Store the number we parsed out of scraped content in CRD status
 - (Come back and retrieve it later)



Based on

- Kubernetes operator: (GitLab) [tobiaskuntzsch/kubernetes-operator](https://github.com/tobiaskuntzsch/kubernetes-operator)
 - Wonderful example to build with Ruby
 - Register CRD, Register `upsert`
 - Reg. `delete` - manages Finalizers



Based on (dependency)

- Kubeclient gem: GitHub [ManagelQ/kubeclient](https://github.com/ManagelQ/kubeclient)
 - Also easy to use
 - Server-side apply only (!)
 - (about SSA, Flux uses this too)
 - can account for admission controllers, wait for ready, ... lots of benefits here!



This is the end

- of the Lightning talk - but today!
- We can dive into topics further
 - (before we do - I've more talks tomorrow)
 - Dev-Driven Automated Deployments Like a Cloud Native Pro (Thu 11:00am)
Juozas Gaigalas, Weaveworks (I'll be standing in)
 - Go/TypeScript: OpenGovCon (Thu 4:05pm)
with co-presenter Will C, Defense Unicorns



~~Operator isn't finished~~

- OK, still not finished, but it works now!
- Did it live on YouTube ([.com/@yebyen](#))
- 3 hours ago - JIT presenting FTW!
- I am very tired, I hope it doesn't show



How is the code?

- Wrote the operator from e2e in 3h
- Code is there, a few things not working yet
- Only missing a bit... we'll tour the code!
- First Rust app - be gentle (it was fun!)



Rust App

- Let's start with the Rust app, then work our way out
- We'll come back to see Taking Bartholomew for a Spin
- How is this deployed using FluxCD?



Thank You

- Visit us for the rest of the week:
bit.ly/gitopscon2023
- Find these slides:
kingdonb/cdcongitopscon2023-slides
on GitHub



Thank You



github.com/kingdonb/cdcongitopscon2023-slides