FOSDEM

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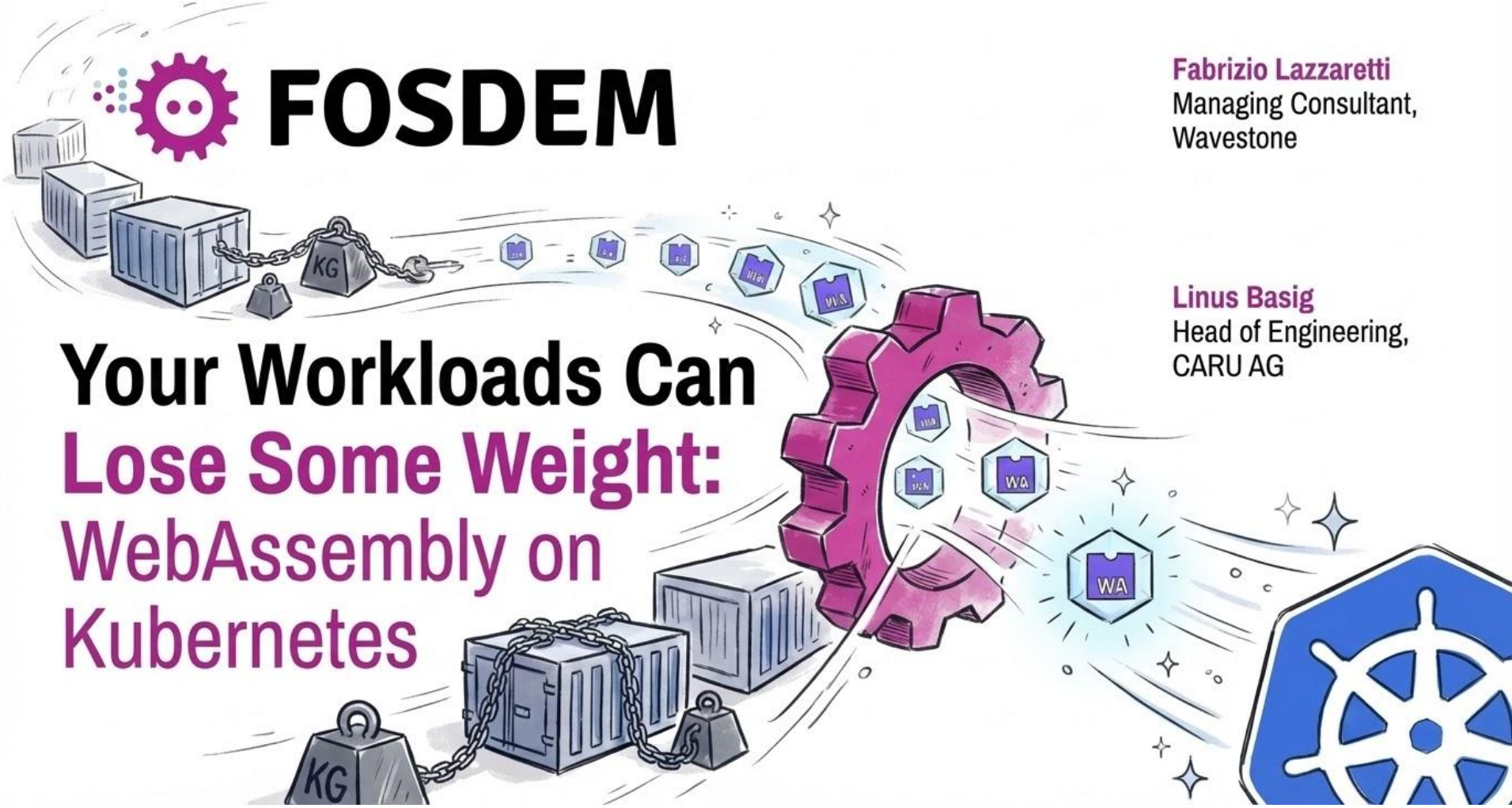
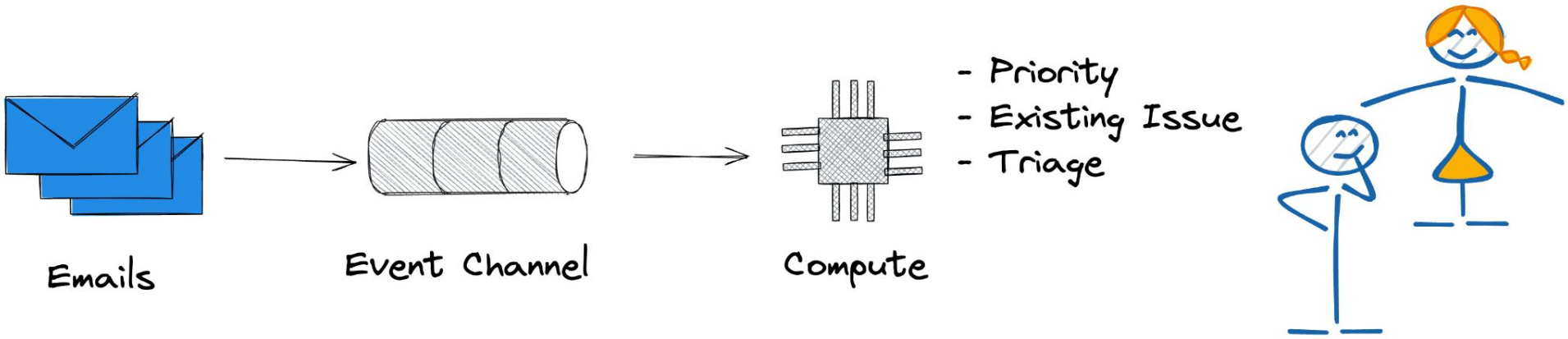
Your Workloads Can Lose Some Weight: WebAssembly on Kubernetes



You got Mail!


- Priority
- Existing Issue
- Triage
Emails
Event Channel
Compute

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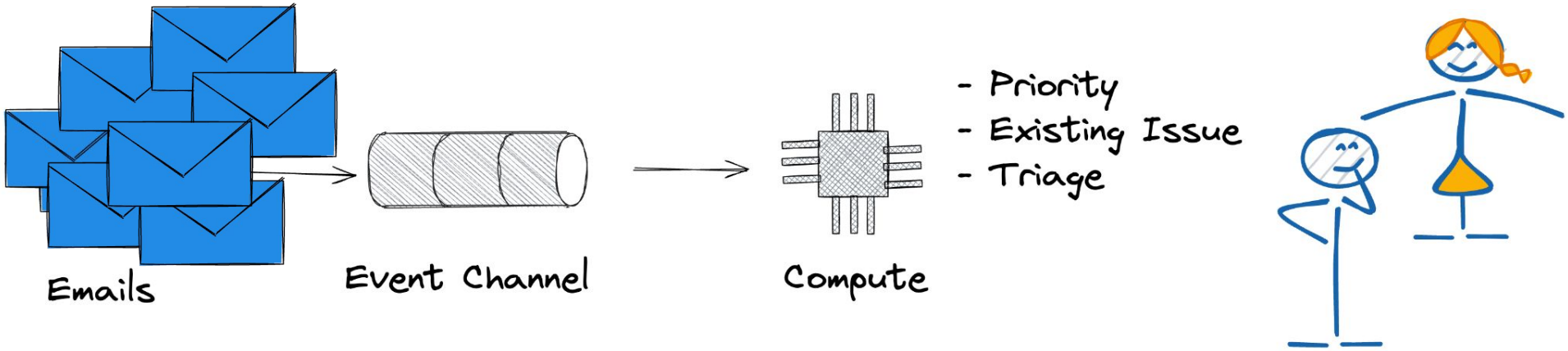
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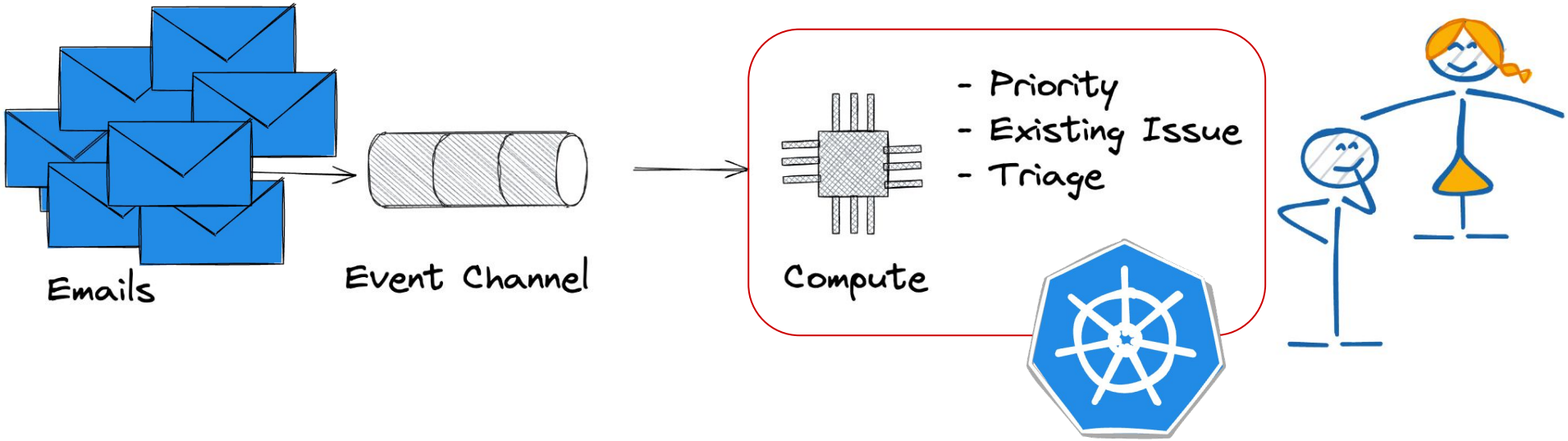
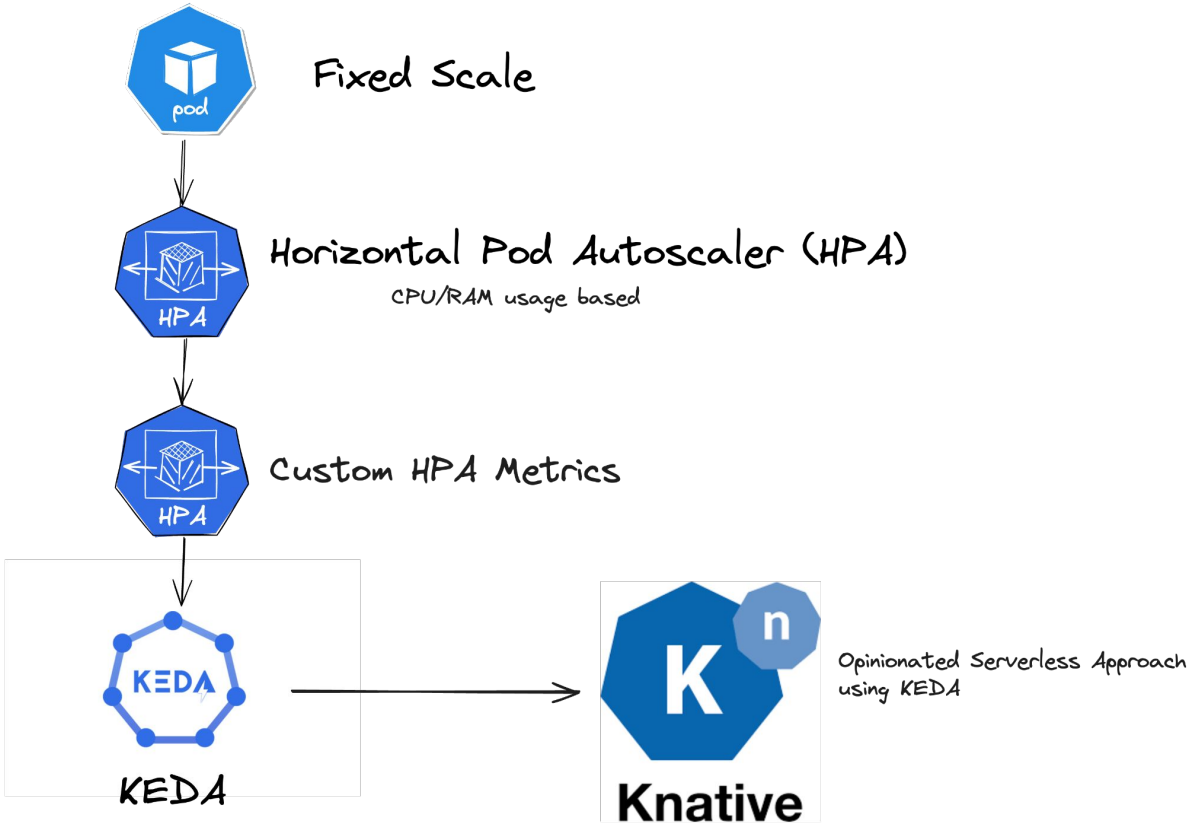
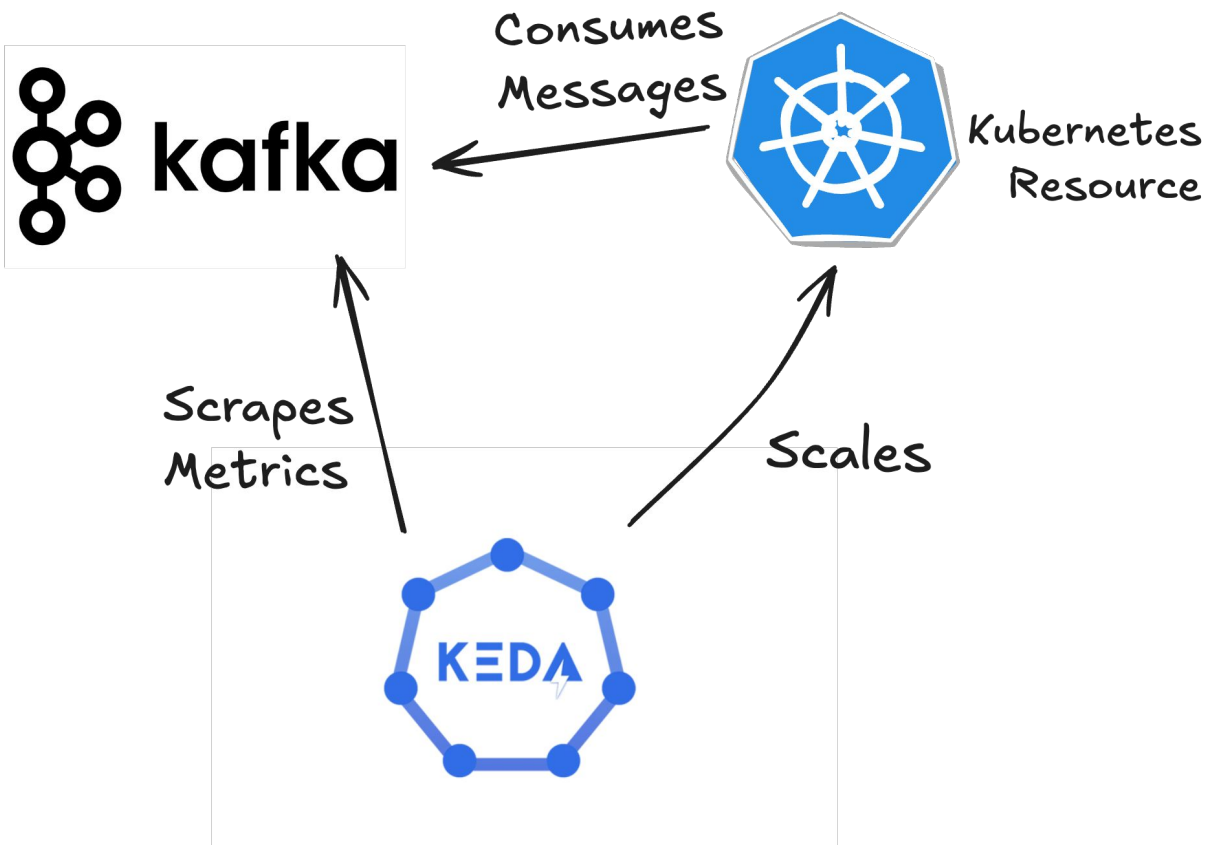

How do we scale?
Emails
Event Channel
- Priority
- Existing Issue
- Triage
Compute

Scaling Event-Driven Architecture on Kubernetes



How does KEDA work?



Now that we have scaling

How do we make it fast?

DISCLAIMER: Cutting Edge

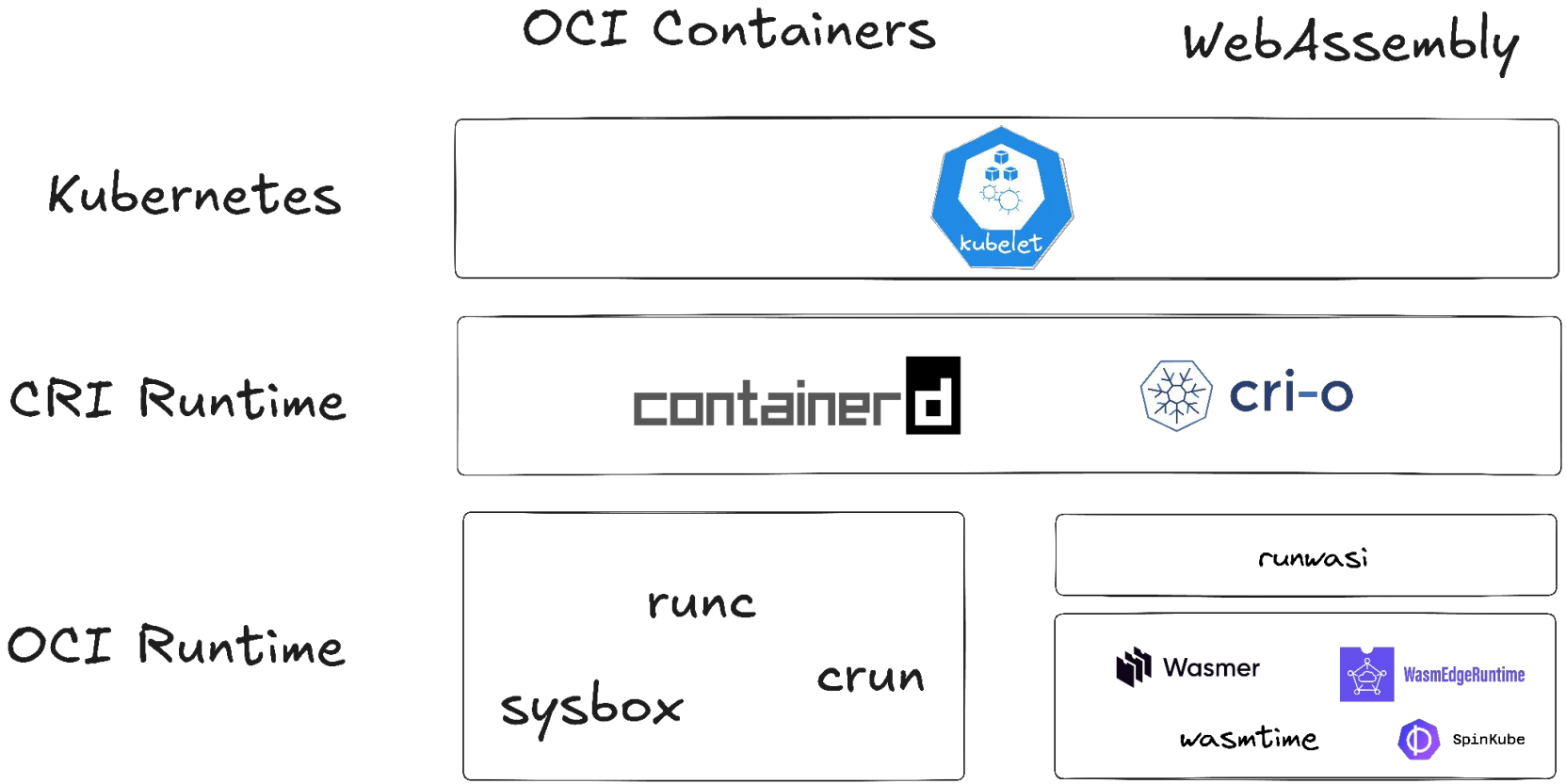
Working with WebAssembly on Kubernetes may lead to unexpected emotional distress. Side effects may include, but are not limited to:

- Frustration from complex configurations
- Anxiety due to compilation issues
- Despair when debugging across multiple layers of abstraction
- Euphoria upon successful deployment (followed by crashes)

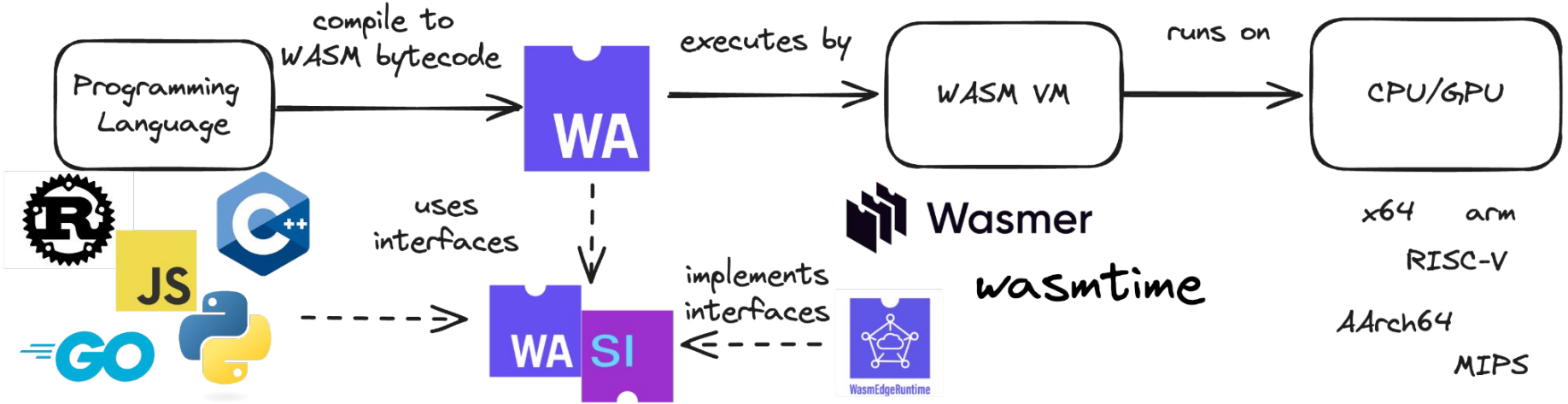
Users are advised to proceed with caution and maintain a sense of humor. Remember: it's just code, not a reflection of your worth as a human being.

Consult your nearest DevOps therapist if symptoms persist for more than two sprints.

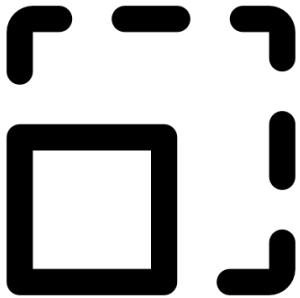
WebAssembly on Kubernetes



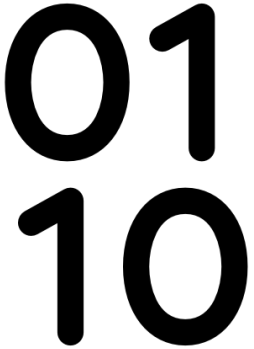
WebAssembly in a nutshell



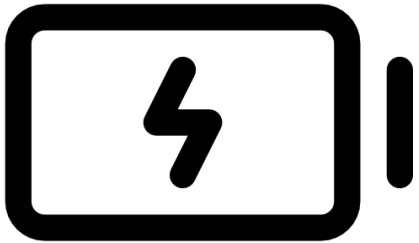
How does WebAssembly (Wasm) help with speed?



Tiny Images

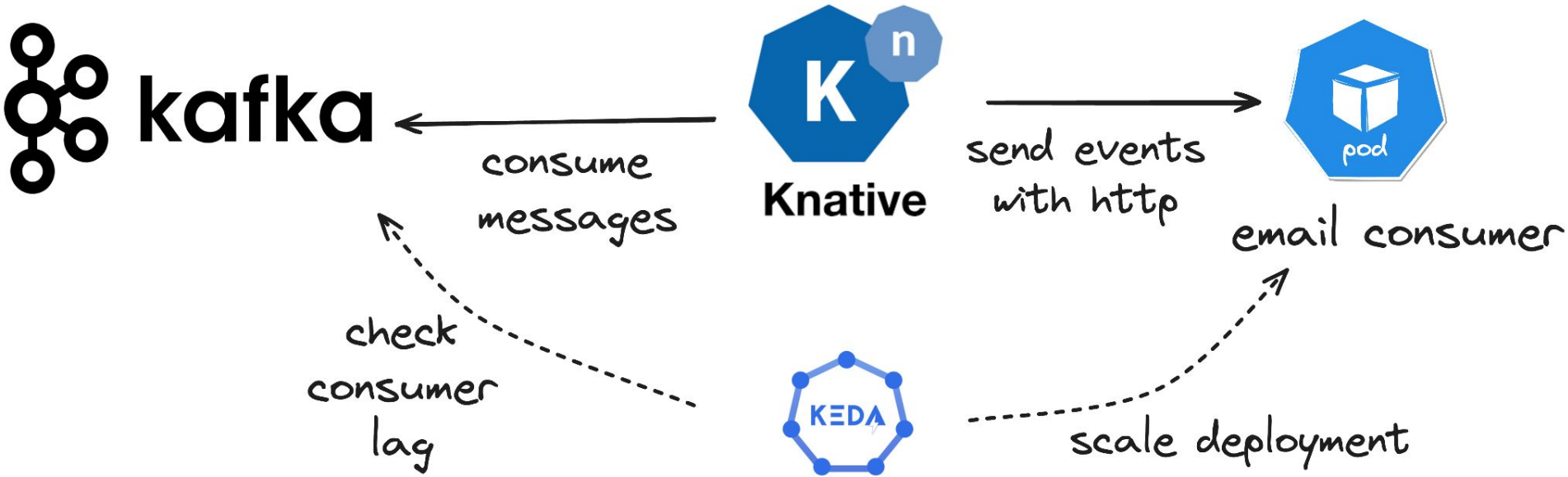


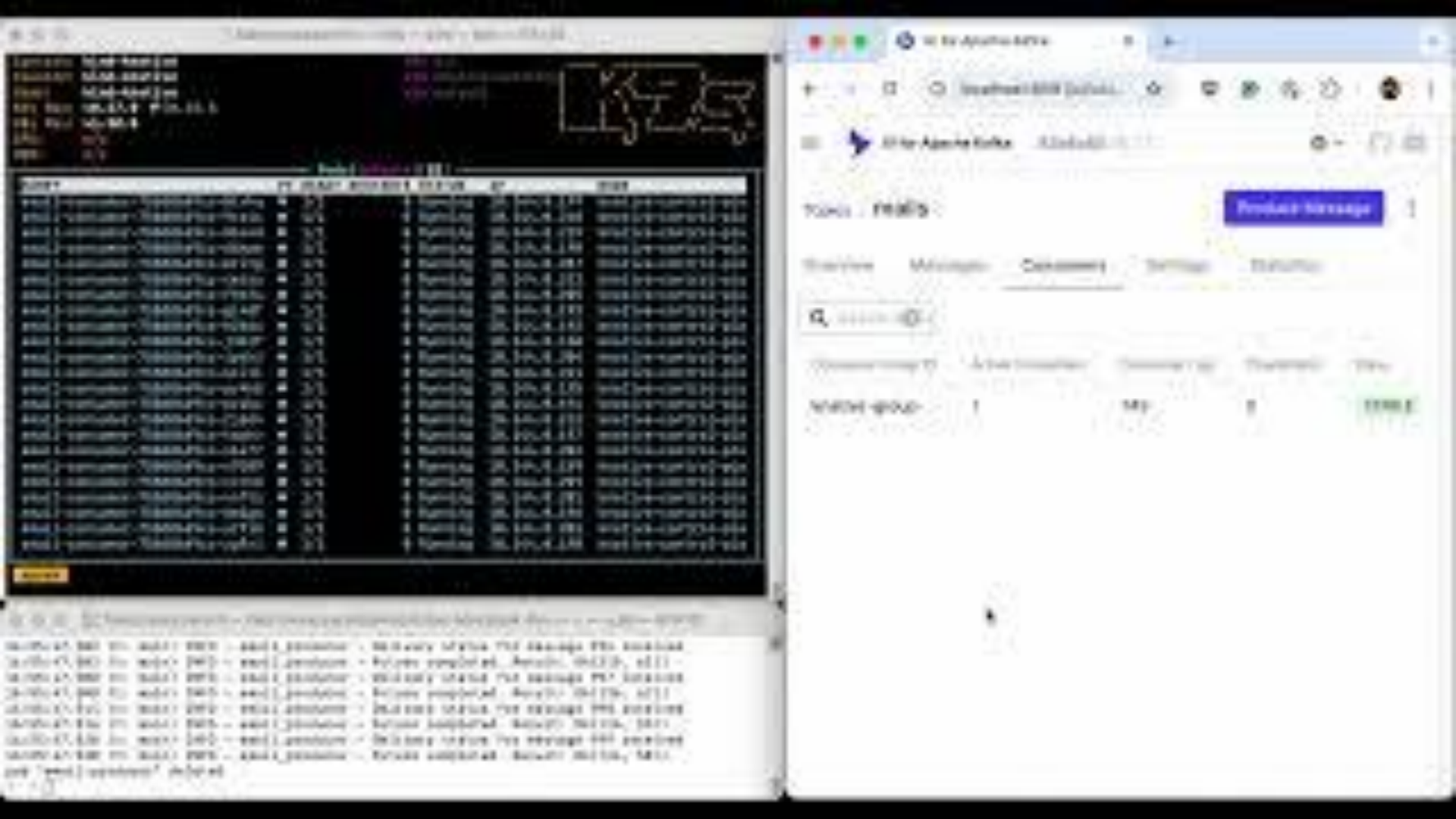
Bytecode



Batteries Included

Demo Architecture





Productive usage

WASI is in v0.2

- v0.3: expected around February 2026
  - Adds native async support
- v1: sometime in the future

CNCF Usage of WASM

allows extensions with custom logic to compile to WASM using the http-handler

allows filtering of requests with the Proxy-Wasm sandbox API

added support for Wasm plugins in Helm 4

Dapr usage of WASI (simplified)

Wasm http-handler in TinyGo

```go
package main

import (
    "strings"

    "github.com/http-wasm/http-wasm-guest-tinygo/handler"
    "github.com/http-wasm/http-wasm-guest-tinygo/handler/api"
)

func main() {
    handler.HandleRequestFn = handleRequest
}

// handleRequest implements a simple HTTP router.
func handleRequest(req api.Request, resp api.Response) (next bool, reqCtx uint32) {
    // If the URI starts with /host, trim it and dispatch to the next handler.
    if uri := req.GetURI(); strings.HasPrefix(uri, "/host") {
        req.SetURI(uri[5:])
        next = true // proceed to the next handler on the host.
        return
    }

    // Serve a static response
    resp.Headers().Set("Content-Type", "text/plain")
    resp.Body().WriteString("hello")
    return // skip the next handler, as we wrote a response.
}
```

https://docs.dapr.io/reference/components-reference/supported-middleware/middleware-wasm/#generating-wasm

Run WASM (host process)

```go
import "github.com/tetratelabs/wazero"

// ...

r := wazero.NewRuntime(ctx)
defer r.Close(ctx)
mod, _ := r.Instantiate(ctx, wasmAdd)
res, _ := mod.ExportedFunction("add").Call(ctx, 1, 2)
```

https://wazero.io/

How to get started?

1. Familiarize yourself with the WebAssembly Component Model.
2. Familiarize yourself with the WebAssembly System Interface.
3. Implement a Hello World in Rust
4. Choose a WebAssembly Runtime
   a. Wasmer
   b. WasmEdge
   c. WAMR
   d. Wasmtime
5. Prepare Kubernetes Nodes
   a. runwasi
   b. crun

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https://lazzaretti.me/fosdem26/

Credits & License

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References & Links

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- https://kubernetes.io/docs/tasks/run-application/horizontal-pod-autoscale/
- https://webassembly.org/
- https://wasi.dev/
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- https://github.com/containerd/runwasi
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- https://wasmtime.dev/
- https://wasmer.io/
- https://runwasi.dev
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