

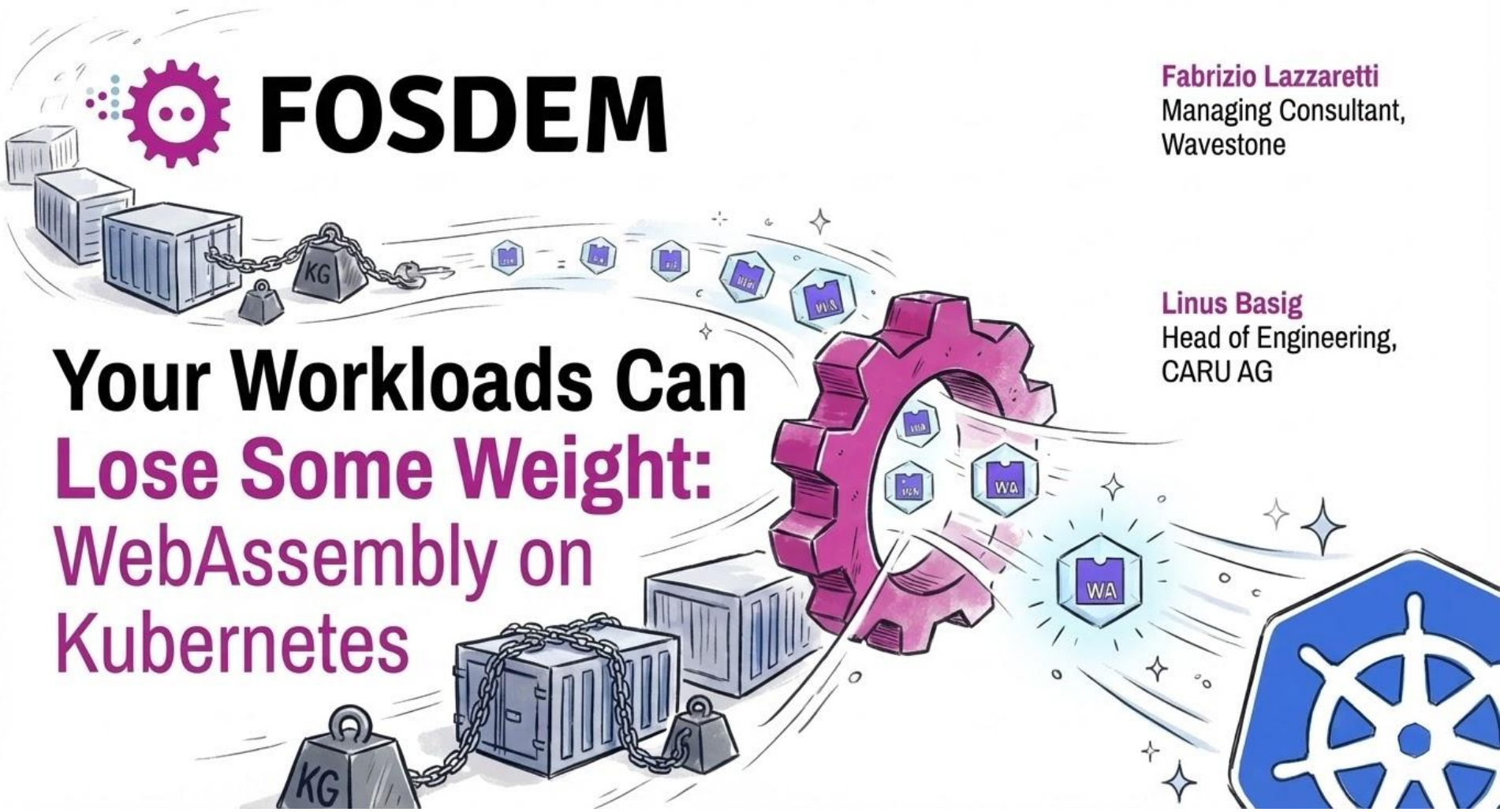


FOSDEM

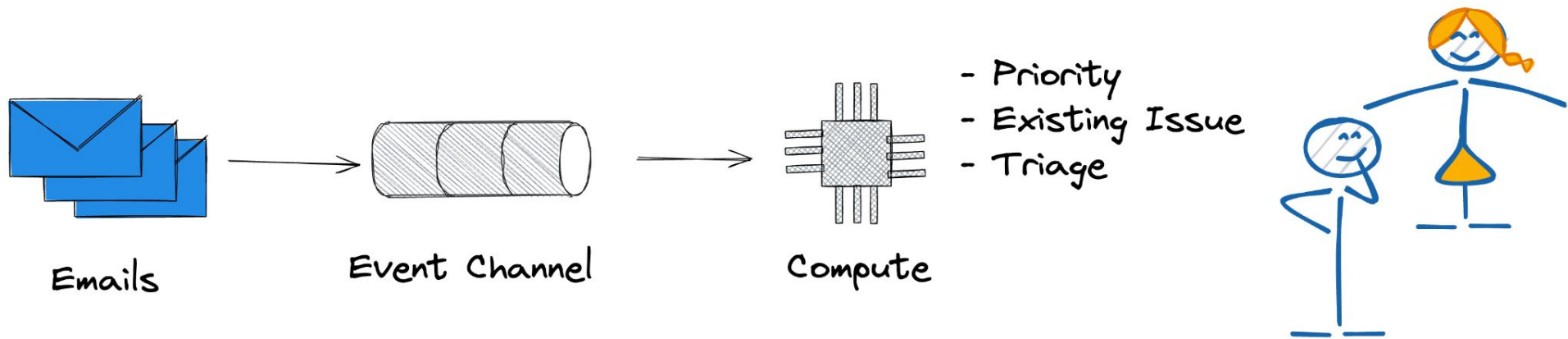
Fabrizio Lazzaretti
Managing Consultant,
Wavestone

Linus Basig
Head of Engineering,
CARU AG

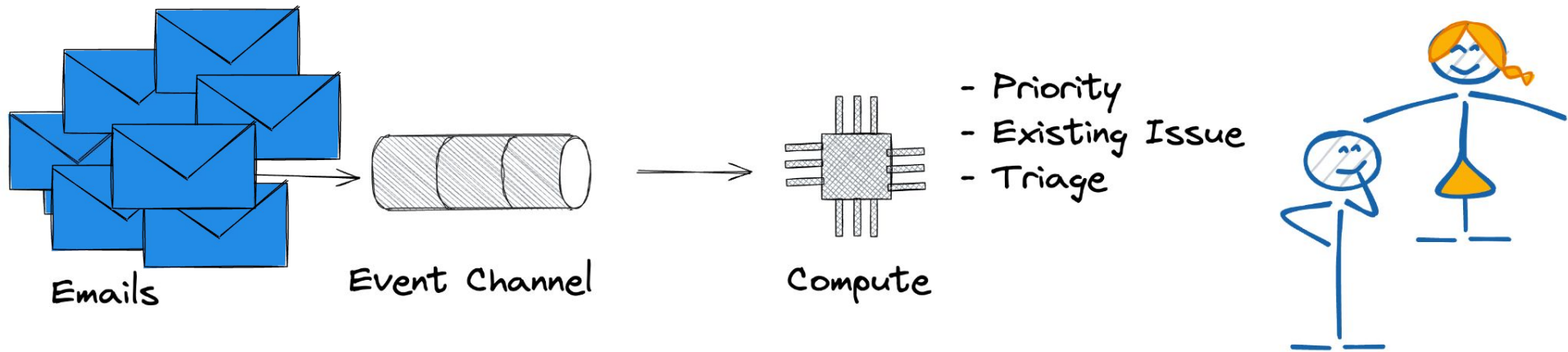
Your Workloads Can Lose Some Weight: WebAssembly on Kubernetes



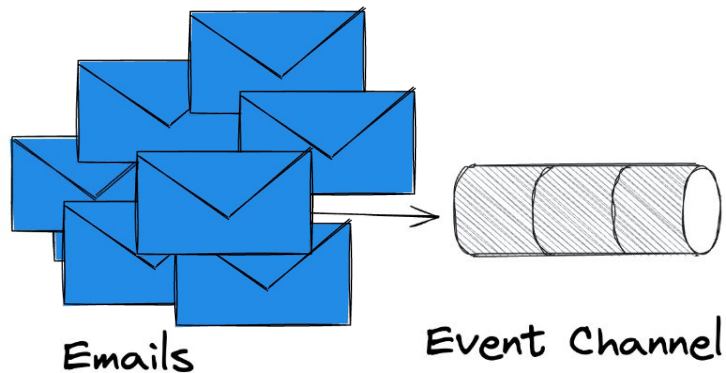
You got Mail!



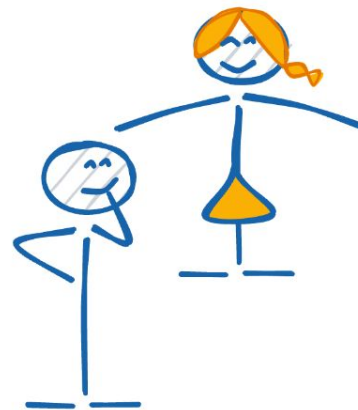
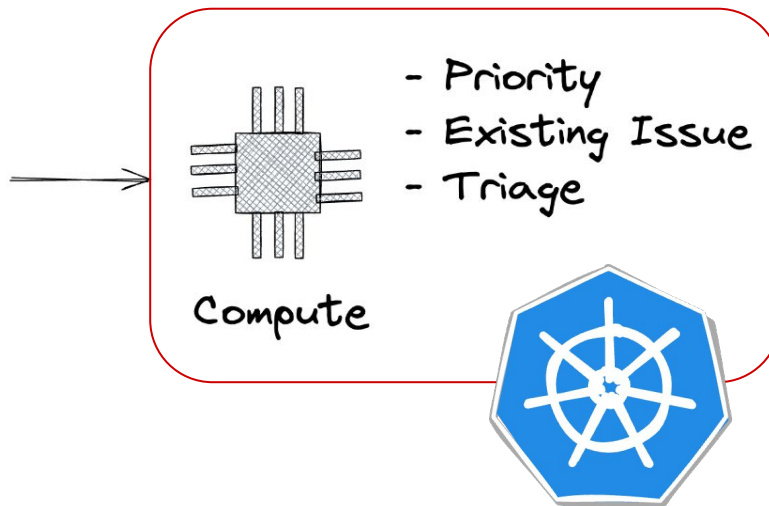
You got Mail!



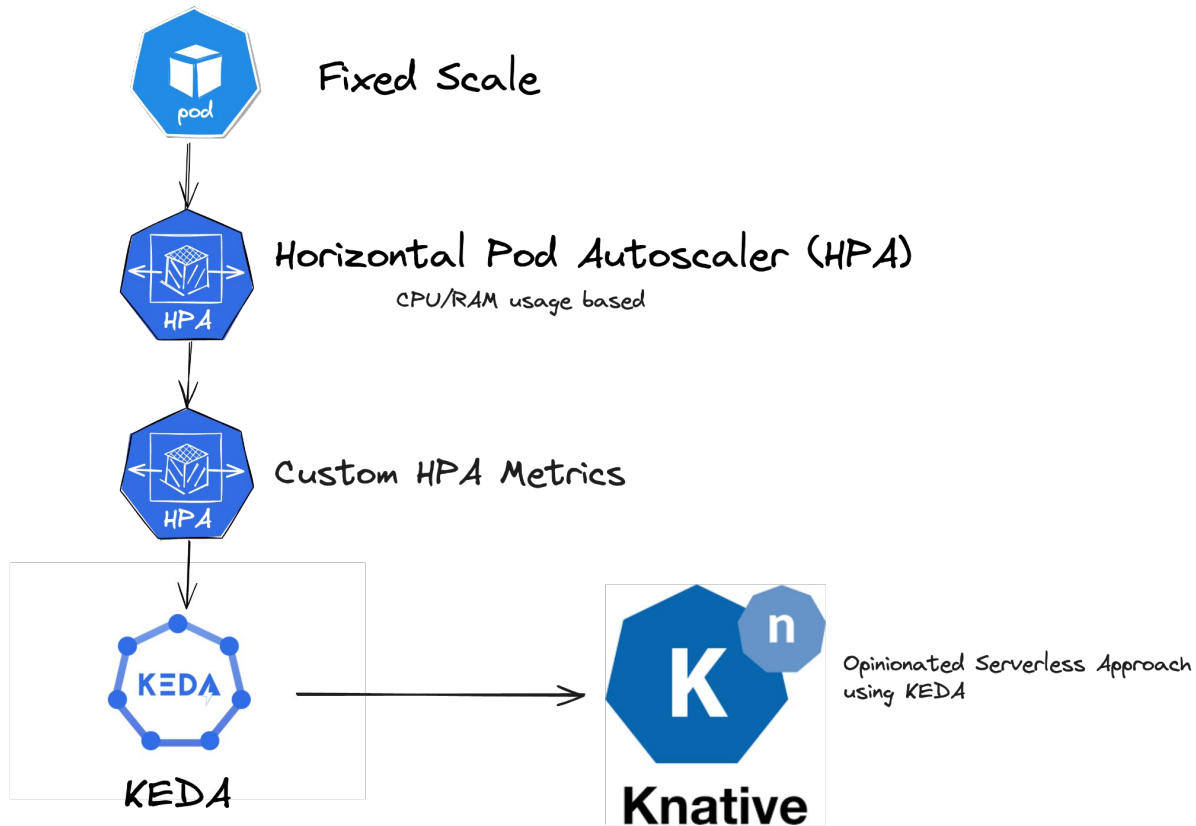
You got Mail!



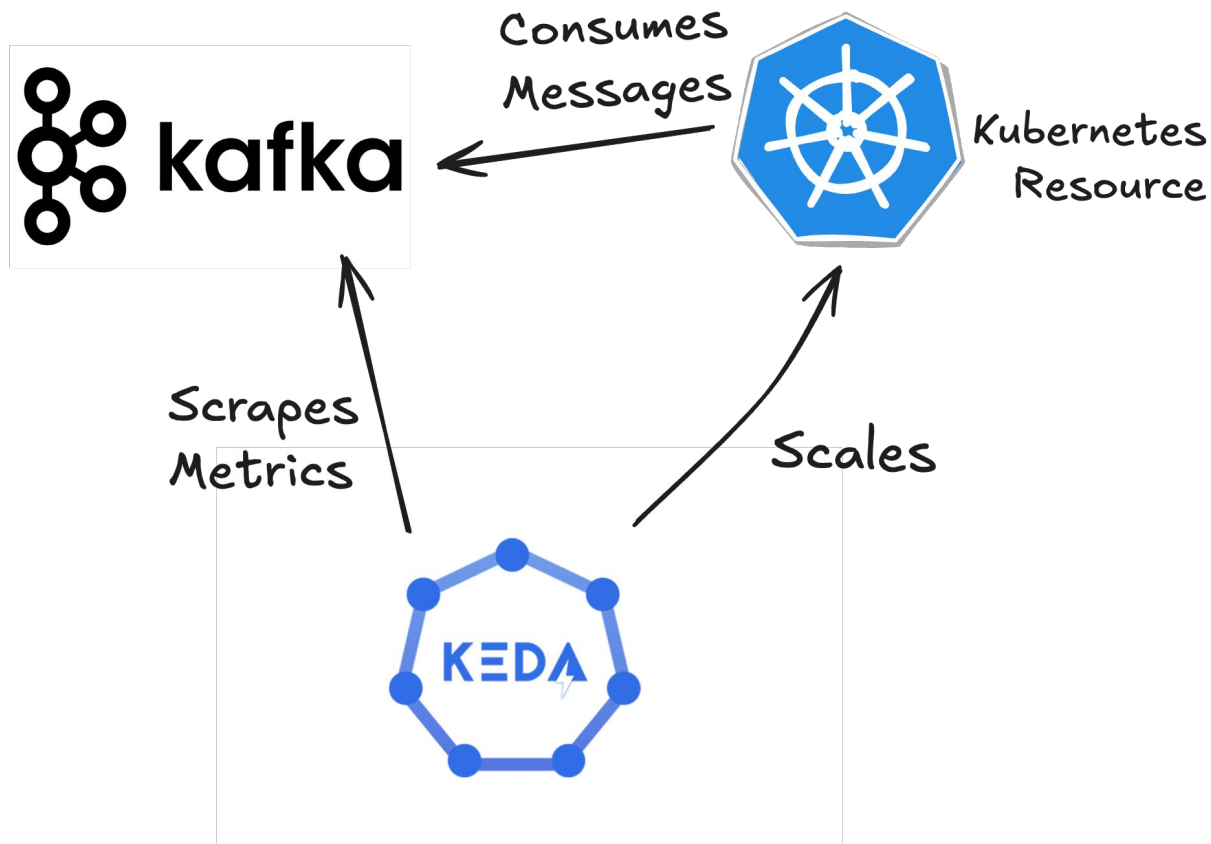
How do we scale?



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

OCI Containers

WebAssembly

Kubernetes



CRI Runtime



OCI Runtime

runc

sysbox

crun

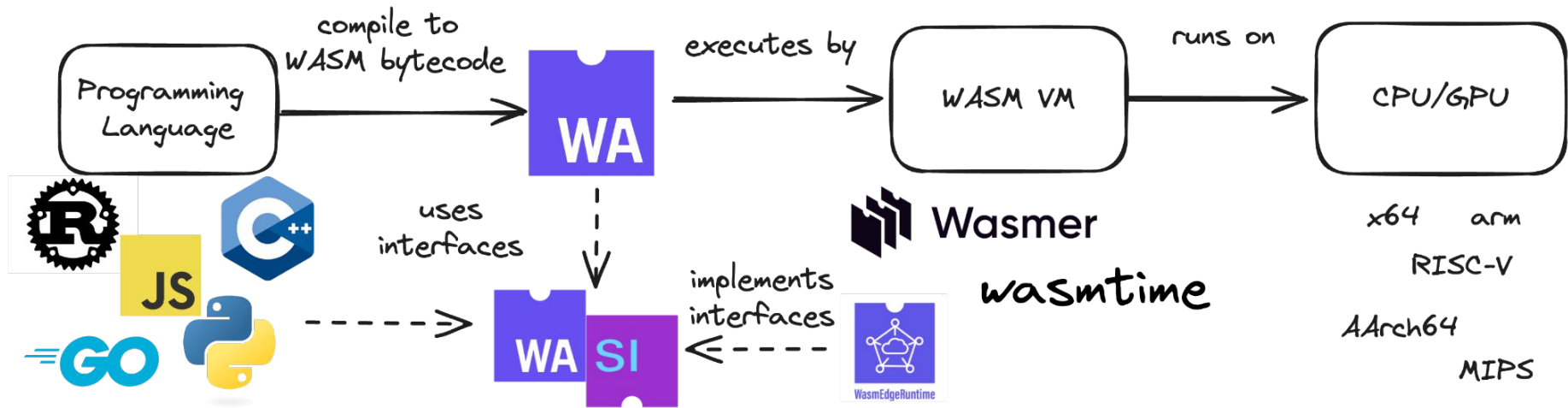
runwasi



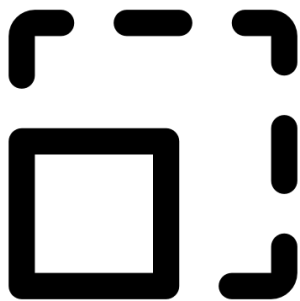
wasmtime



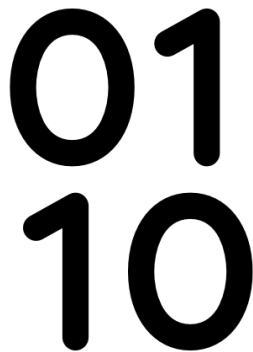
WebAssembly in a nutshell



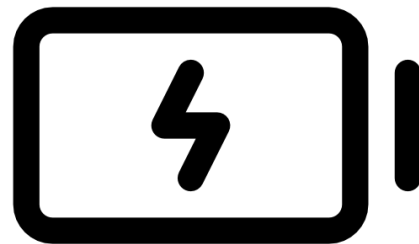
How does WebAssembly (Wasm) help with speed?



Tiny Images

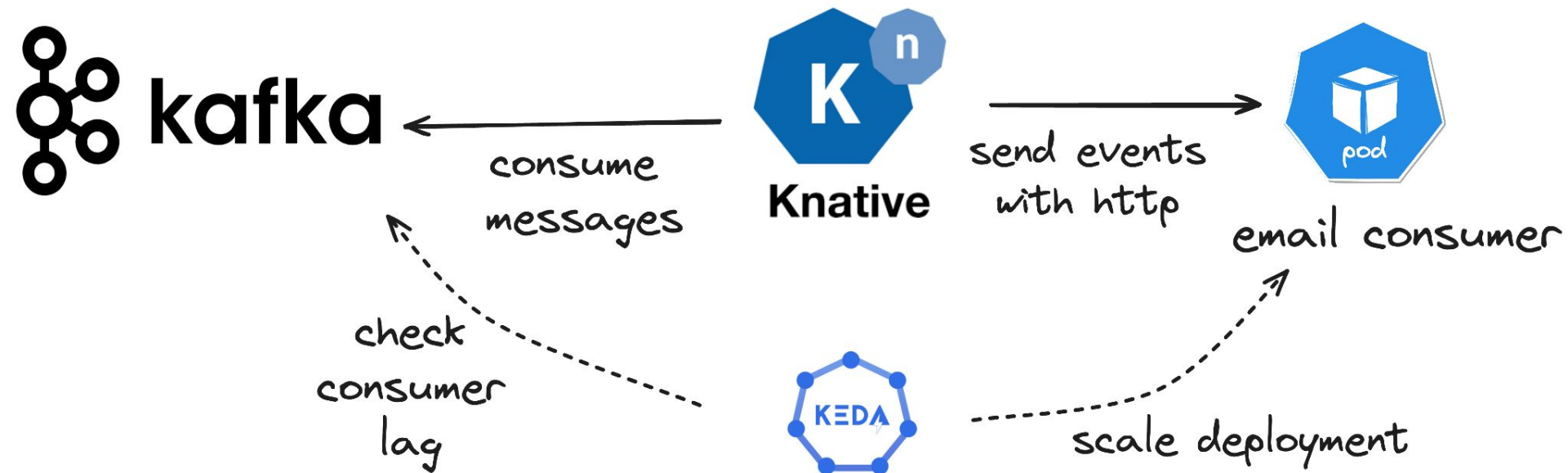


Bytecode



Batteries Included

Demo Architecture



```

Name: 64-bit Windows
Version: 6.0.6002.18004
Type: 64-bit Windows
CPU: Intel Core 2 Duo E6700 3.00 GHz, 3 GB
BIOS: 6A09
OS: 6.0.6002.18004
CPU: 3.00 GHz
Memory: 3 GB

```



```

root@kali:~#

```

| Index | File Name | Size | MD5 | SHA1 | SHA256 |
|-------|----------------|---------|------|------|--------|
| 1 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 2 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 3 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 4 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 5 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 6 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
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| 10 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 11 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 12 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
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| 15 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
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| 31 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 32 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 33 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 34 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 35 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 36 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 37 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 38 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 39 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
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| 56 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 57 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 58 | 64-bit Windows | 3.00 GB | 6A09 | 6A09 | 6A09 |
| 59 | 64-bit Windows | | | | |

[illegible]

The screenshot shows the Apache Kafka website. The navigation bar includes links for Overview, Messages, Products, Settings, and Distribution. A search bar is located below the navigation bar. The 'Products' section features a table with the following data:

| Component | License | Community | Enterprise | Cloud |
|--------------|---------|-----------|------------|-------|
| Apache Kafka | 1 | 1M | 1 | 1M |

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

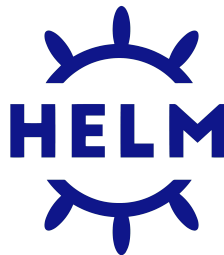


allows extensions with custom logic to compile to WASM using the http-handler



Istio

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

```
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-middlewares/middleware-wasm/#generating-wasm>

Run WASM (host process)

```
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](#)





FOSDEM



<https://lazzaretti.me/fosdem26/>

Fabrizio Lazzaretti
Managing Consultant,
Wavestone

Linus Basig
Head of Engineering,
CARU AG



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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/>
- <https://containerd.io/>
- <https://github.com/containerd/runwasi>
- <https://wasmedge.org/>
- <https://wasmtime.dev/>
- <https://wasmer.io/>
- <https://runwasi.dev>
- <https://archive.fosdem.org/2024/schedule/event/fosdem-2024-2769-the-jvm-vs-webassembly-an-in-depth-comparative-analysis/>
- <https://helm.sh/docs/overview/#plugin-system-overhaul>
- <https://wasi.dev/roadmap>
- <https://docs.dapr.io/reference/components-reference/supported-middleware/middleware-wasm/>
- <https://istio.io/latest/docs/concepts/wasm/>

