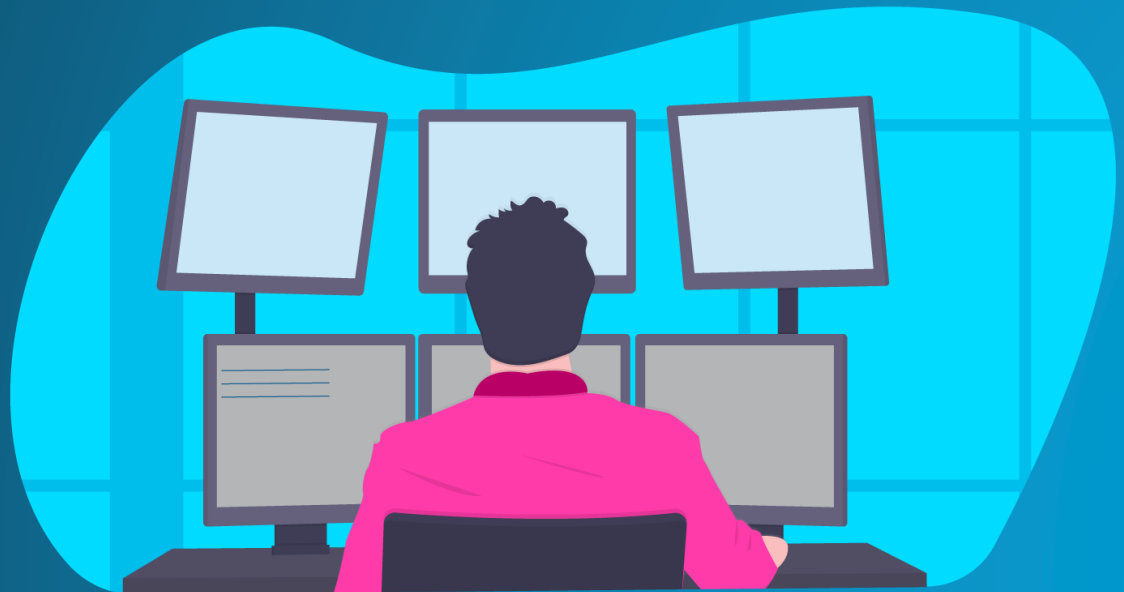
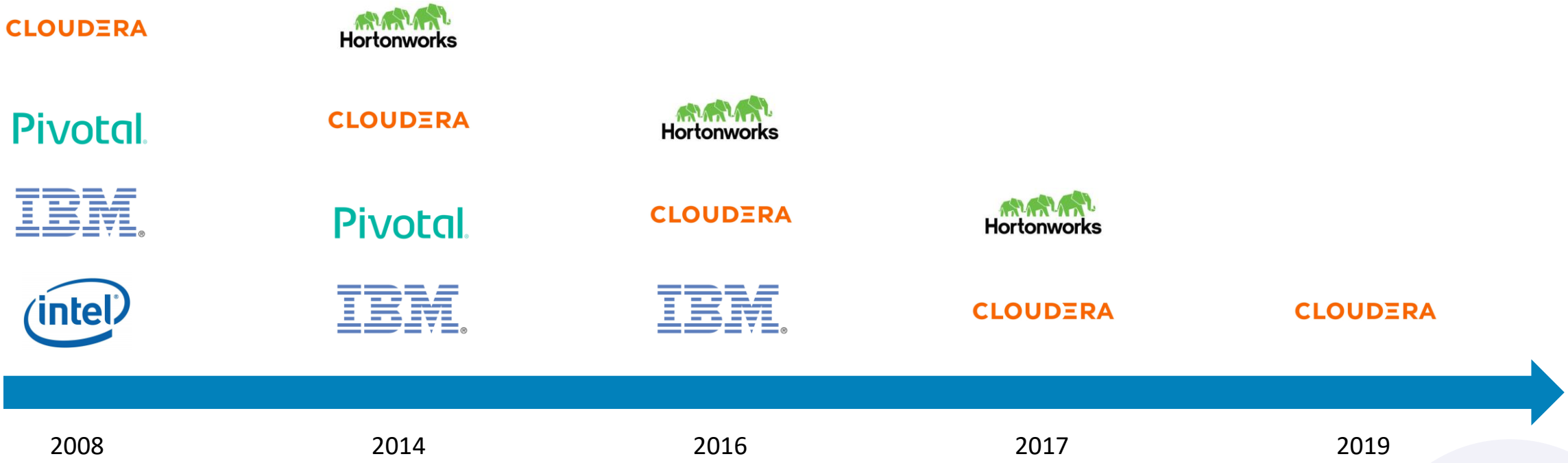
Stackable @ >BLN BZZ/ WRDS

Building a New Big Data Distribution Based on Kubernetes – With a Twist!

15th June 2021 | Track **Scale** | Format **Talk Intermediate**



Hadoop Distributions over Time



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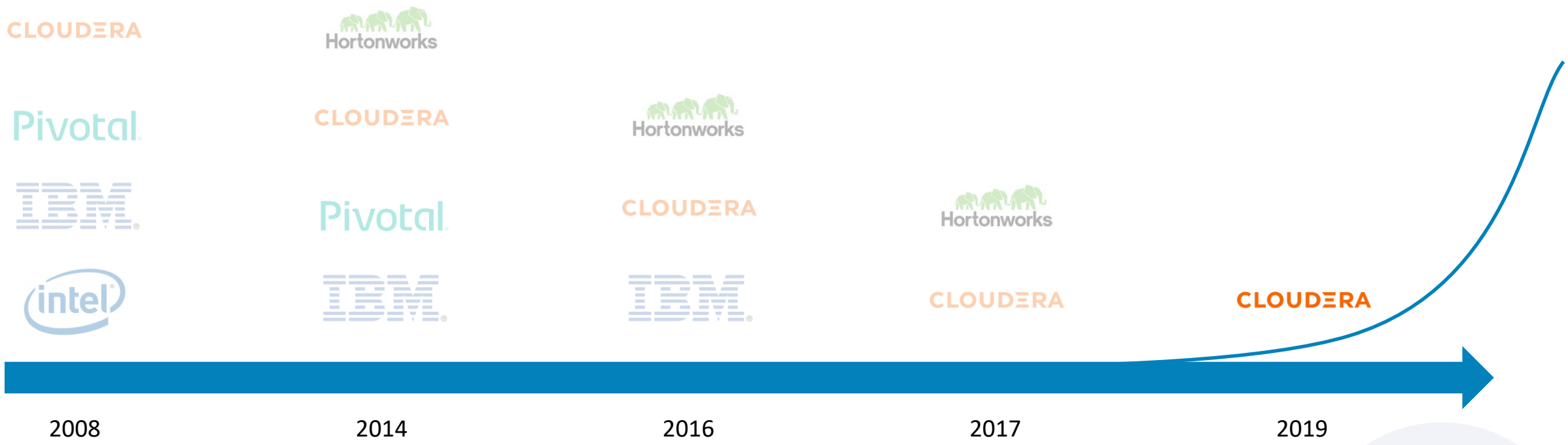
How Did This Impact the per Node Price?



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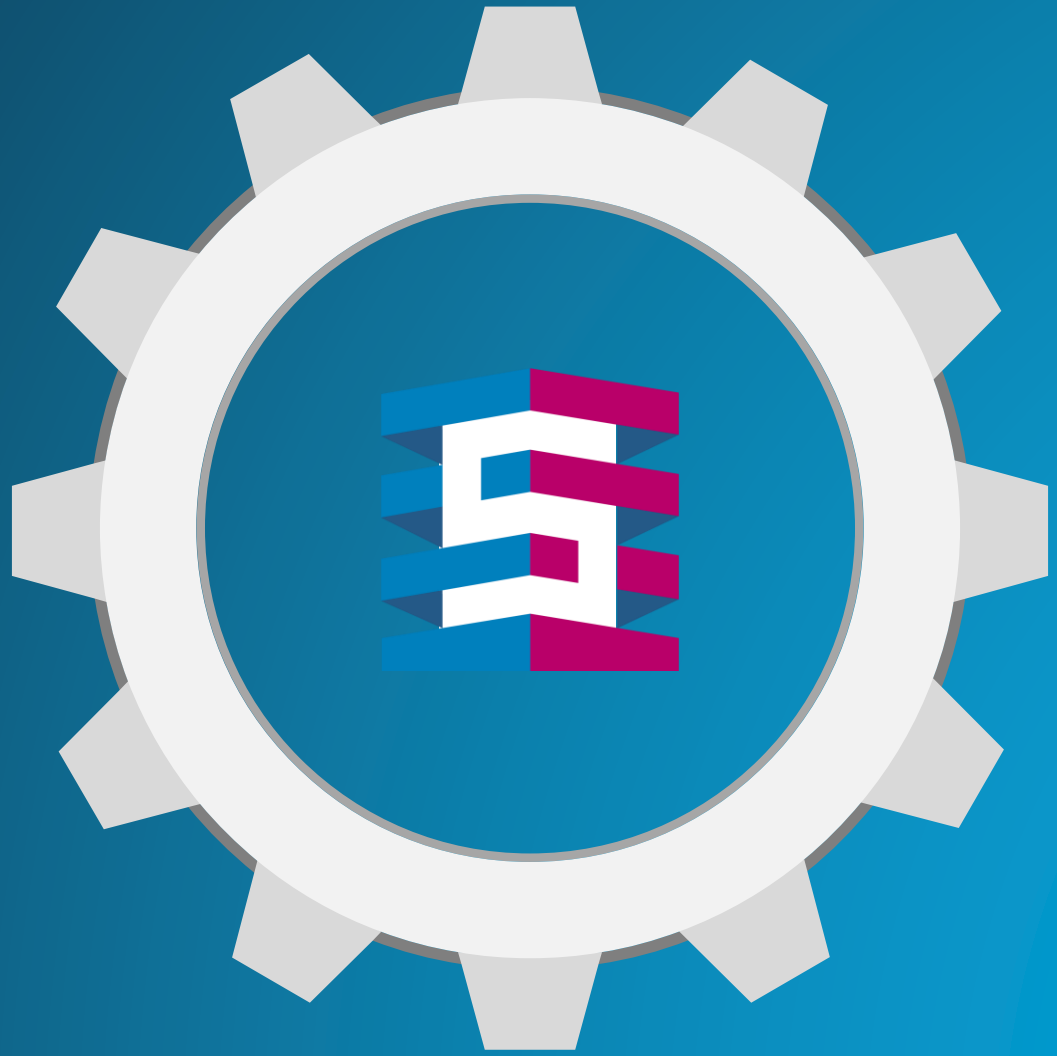
The History of Stackable



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Kubernetes on One (Well, Two) Slide(s)

An orchestration framework to manage services

Declarative by nature - you define what reality should look like and Kubernetes goes and makes it happen

(This has some shortcomings, more on that later)

Kubernetes has built-in data types

Extensible via Custom Resource Definitions

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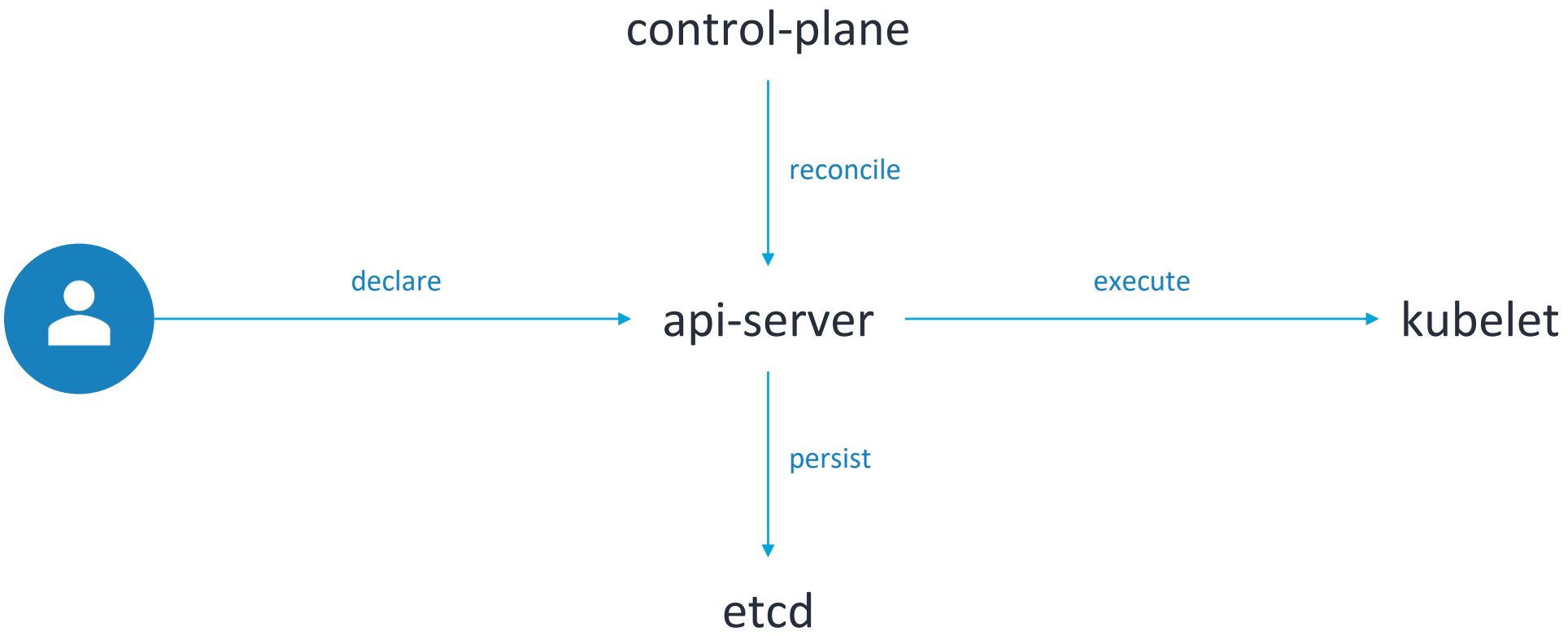
Kubernetes from Outer Space



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Stackable & Kubernetes

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- We wanted to build a distribution on top of Kubernetes.
- Customers told us “no”.
- So, we came up with a way to use the best of both worlds.
- Use the Kubernetes control plane and concepts (e.g. Operators,GitOps, …) but allow reusing existing admin knowledge (e.g. systemd, OS Packages, …)
- This allows hybrid scenarios:
  - Part of the stack on “bare metal”
  - Part in native Kubernetes in containers

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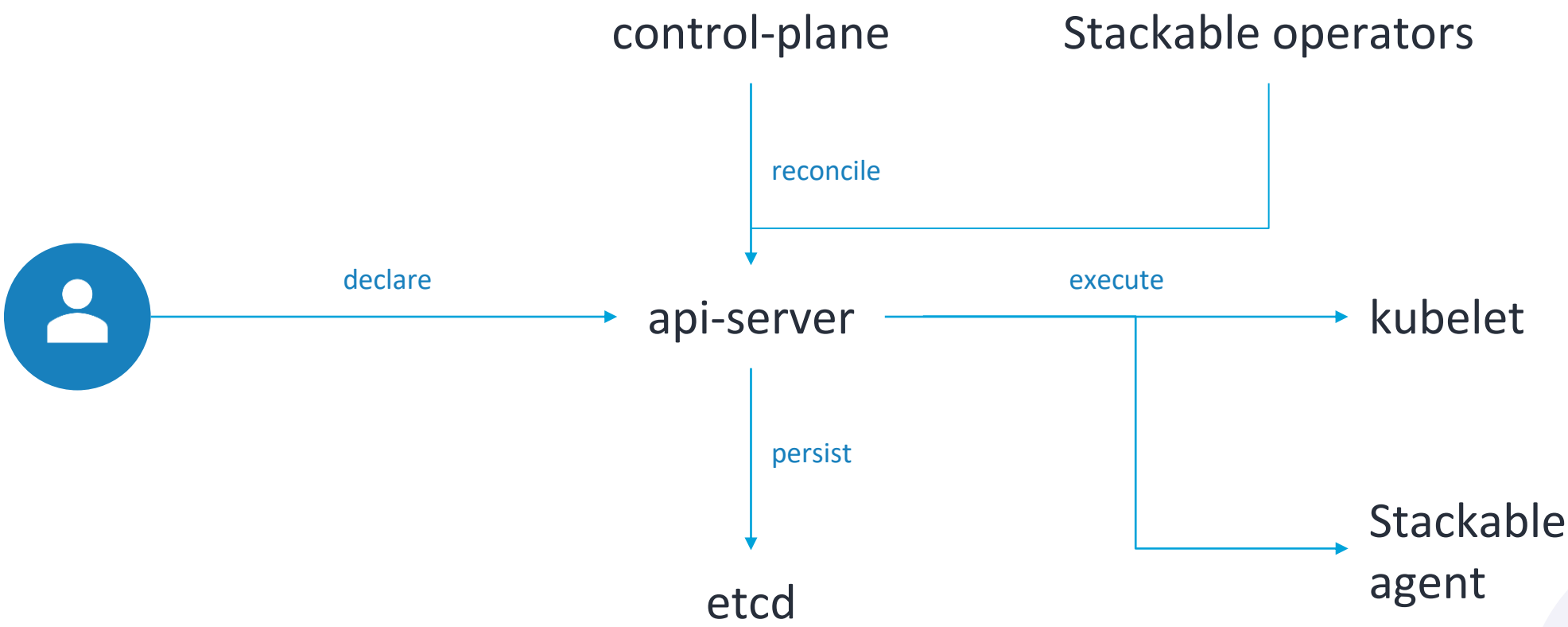

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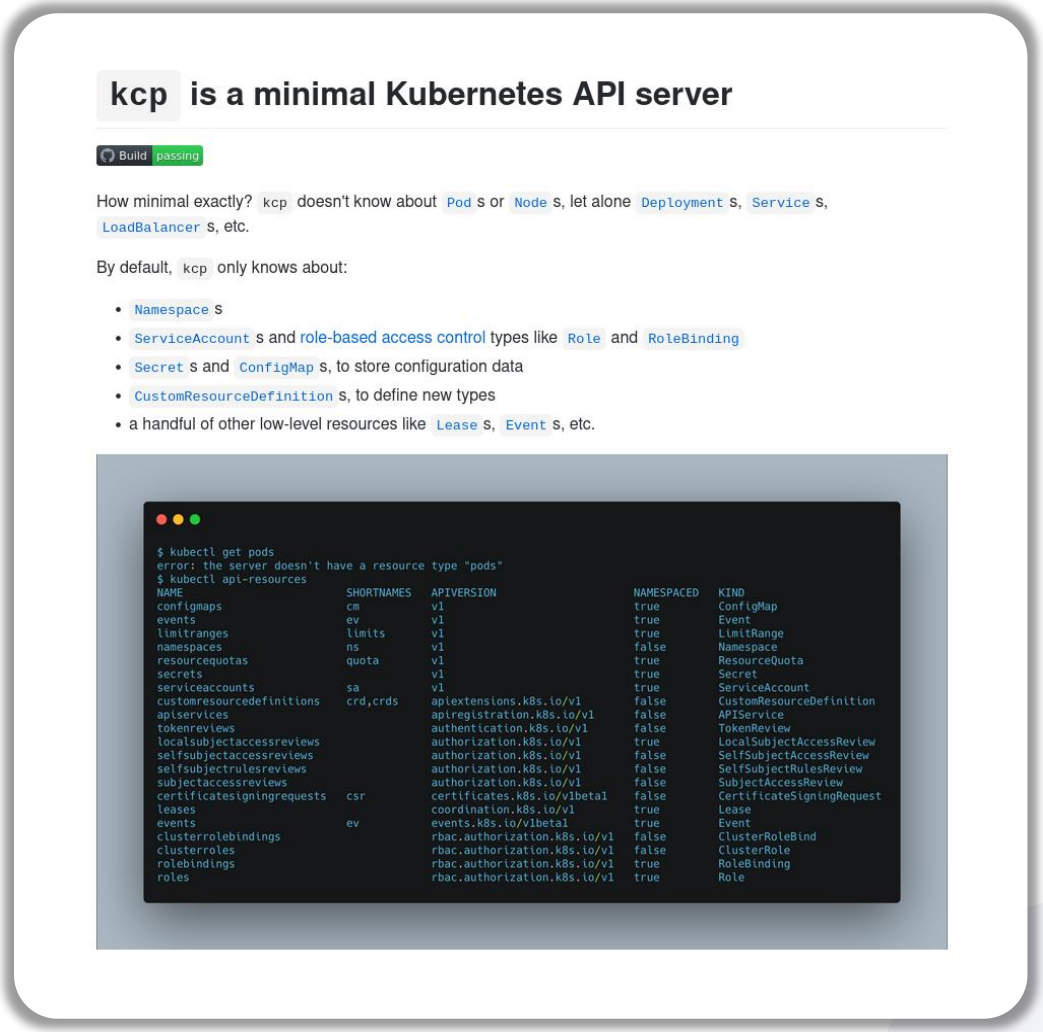
We only use a few core concepts at the moment:

- Pod
- Node
- ConfigMap
- Secret
- …add more as needed



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Operators

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Operator

```
let operator = extract_brain(human);
operator.run(my_cluster);
```

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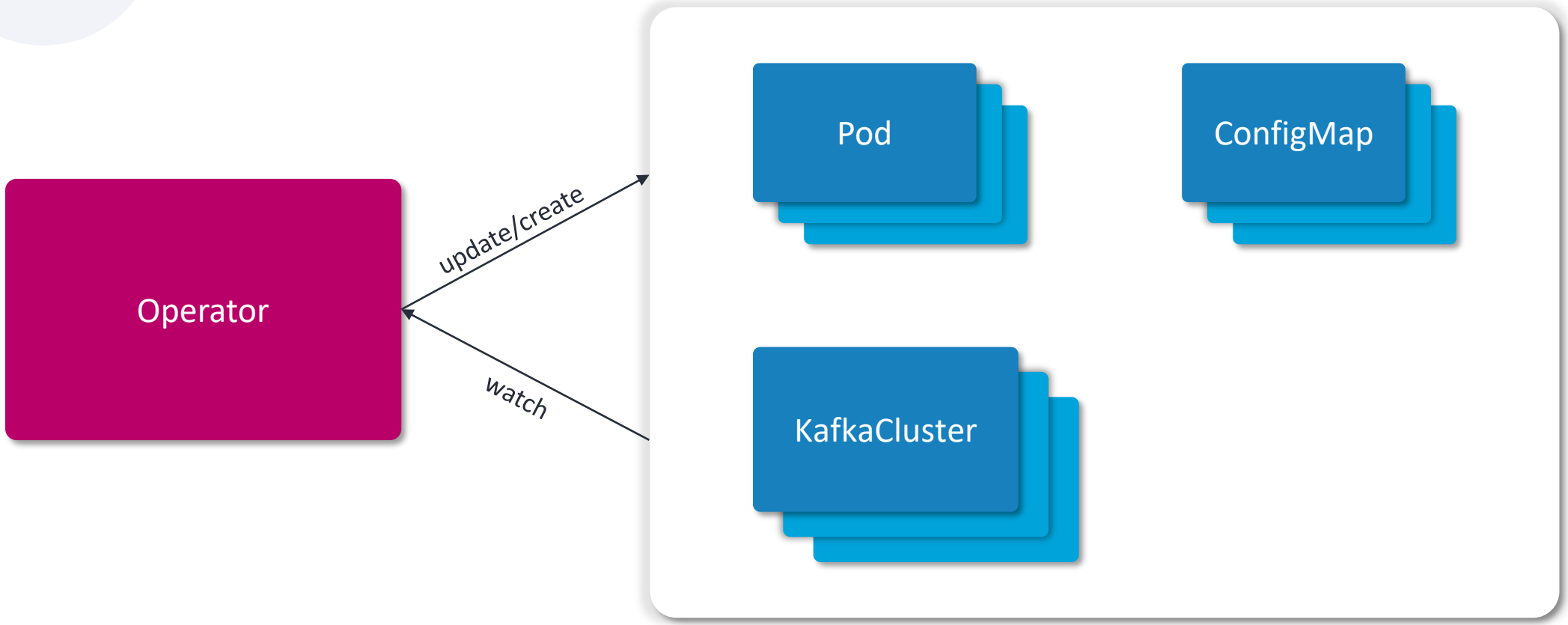
Operator



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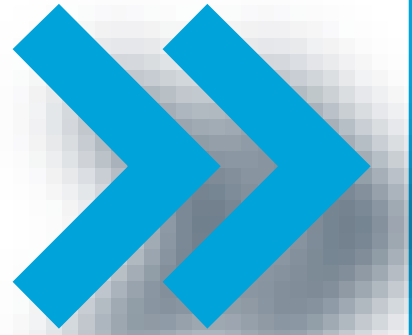
Operator Best Practices

- Reconcile loop
- Common labels
- Common nomenclature
- Common status & events
- Common configuration/CRDs
- Common monitoring, tracing, metrics
- Hacks: Imperative commands



Our distribution should feel consistent hence we decided to write our own framework.

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Reconcile Loops – Two Alternative Styles

SMALL STEPS

```
pub fn reconcile(resource) -> ReconcileResult {

    let changed = reconcile_pod1(...)?;

    if changed {

        return ReconcileResult::Requeue;

    }


    let changed = reconcile_pod2(...)?;

    if changed {

        return ReconcileResult::Requeue;

    }

    ...

}
```

HUGE STEPS

```
pub fn reconcile(resource) -> ReconcileResult {

    reconcile_pod1().await?;

    reconcile_pod2().await?;

    ...

}
```

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Operator Framework

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Stackable Operator Framework

Lots of convenience functions

- Retrieve existing Pods
- Retrieve/Set conditions
- Remove pods
- …

Often used Higher Level Abstractions

- Remove unneeded pods
- Find nodes which should have pods
- …

This requires a few conventions about what our objects look like!

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So, How Does It Work in Real Life?

```
self.init_status()
  .then(self.context.delete_illegal_pods(ContinuationStrategy::AllRequeue))
   .then(self.context.wait_for_terminating_pods())
   .then(self.context.wait_for_running_and_ready_pods())
   .then(self.context.delete_excess_pods(ContinuationStrategy::OneRequeue))
   .then(self.create_missing_pods())
```

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Why Rust?

Most Kubernetes code & 3rd-party operators are written in Go.
Why did you choose Rust?

 We didn't know either language

 We tried both

 We looked at the library ecosystem

 We liked Rust. End of story.

 If you want details:

- Error Handling
- Enums
- Generics
- No GC
- Security

 Go's structural typing is sweet

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Rust Kubernetes Ecosystem - k8s-openapi

This crate is a Rust Kubernetes API client. It contains bindings for the resources and operations in the Kubernetes client API, auto-generated from the OpenAPI spec.

This crate is *not* generated using Swagger or the OpenAPI Generator directly, as clients generated by the common client generator are. This gives this crate a few important advantages.

More Details on
https://github.com/Arnavion/k8s-openapi

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Rust Kubernetes Ecosystem - kube-rs

kube-rs

Rust client for Kubernetes in the style of a more generic client-go, a runtime abstraction inspired by controller-runtime, and a derive macro for CRDs inspired by kubebuilder.

More Details on
https://github.com/clux/kube-rs

GitHub

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Rust Kubernetes Ecosystem - Krustlet

Krustlet: Kubernetes Kubelet in Rust for running WASM

Krustlet 1.0 coming soon!

Krustlet acts as a Kubelet by listening on the event stream for new pods that the scheduler assigns to it based on specific Kubernetes tolerations.

The default implementation of Krustlet listens for the architecture `wasm32-wasi` and schedules those workloads to run in a `wasmtime`-based runtime instead of a container runtime.

More Details on
https://github.com/deislabs/krustlet

GitHub

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Demo Time!

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Thank You!

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