The Elements of Kubernetes

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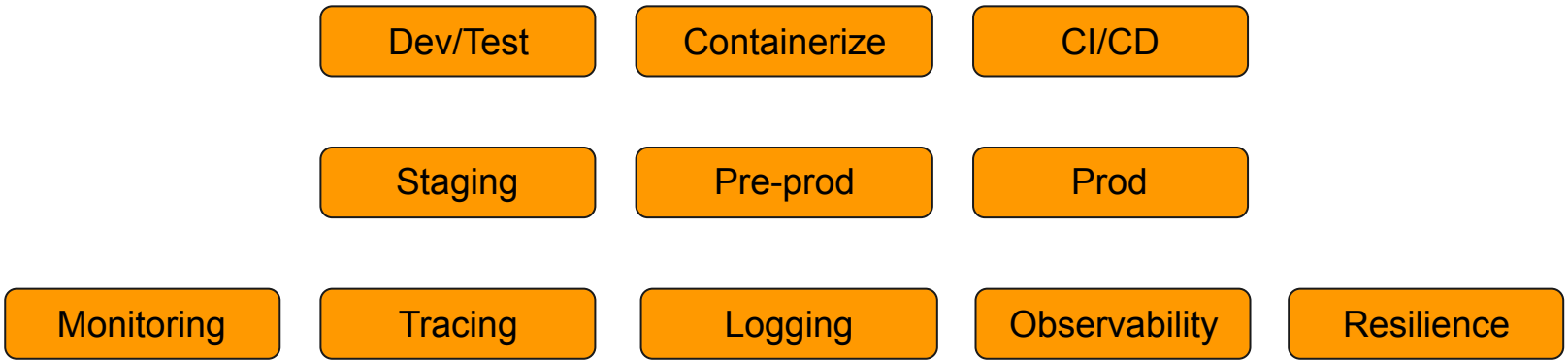
Welcome!

- Cloud Advocate, Microsoft Azure
- Emeritus Chair, Kubernetes SIG-Service-Catalog
- Kubernetes contributor

Why We're Here

- Kubernetes is growing ***fast***
- Cloud Native is brand new
- *We're in the wild west*

Fundamental Shift: Cloud Native



We have lots to figure out.

But one size doesn’t fit all.

What We Have Now

- Opinions
- Evidence
- Fragmentation

We need a “north star” for people building cloud-native apps.

North Star?

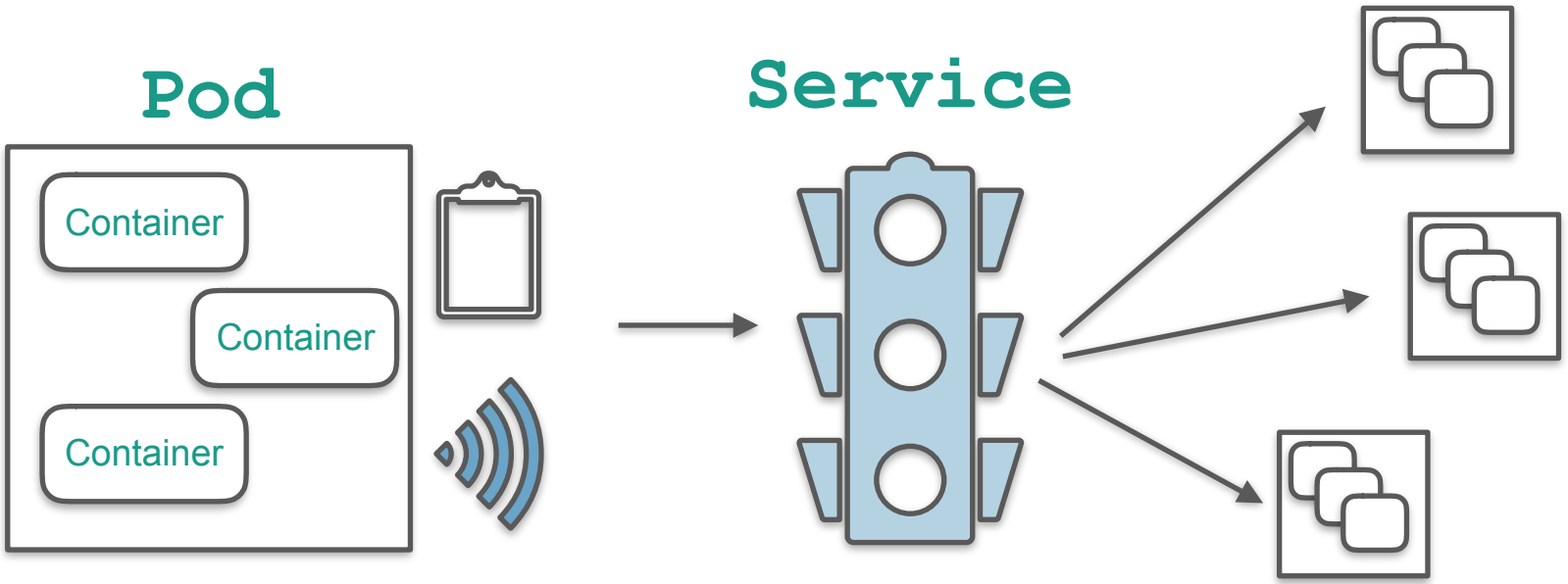
- Help app operators decide what technology to use
- Help developers think about their workflows
- Evolve with technology changes

Best practices, not rules

I’ve seen the good & the bad.

I’m here to propose ideas.

Kubernetes (k8s) Terminology in Pictures



Observability is golden.

Observability is Golden

- Kubernetes schedules & observes containers
- But your team does too!
- Help both parties do their job

Kubernetes Observes Your App

- Resource limits (CPU, Memory, …)
- Custom health probes (AKA readiness / liveness checks)
- Horizontal Pod Autoscaling

You Observe Your App

- Logging
- Service Mesh
- Tracing

When all else fails, crash.

Crash-Only Software

- Realities: bugs, network outages, flaky disk, etc...
- Prior art: Erlang **supervisors**
- Kubernetes *is* your supervisor

Don’t Do This

```
conn = null
while(!conn) {
  conn = connect_to_db()
}
```

Do This

```
conn = connect_to_db()
if !conn {
  exit(1) // tell Kube we failed!
}
```

Unordered is better than ordered.

Unordered is better than ordered

- Your app is a distributed system
- **Ordering is hard**
- *Loose coupling* + *crash only* instead

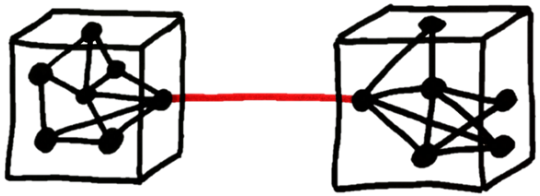
But Sometimes You Need It…

- `Pod` - all containers or none, scheduled together
- *Sidecars* for locks & leader election
- Resource versions for MVCC
- Init containers for setup

Loose coupling is better than tight coupling.

Loose Coupling is Better Than Tight Coupling

- Kubernetes is always watching



- Your app should tolerate dynamism

What That Might Look Like

- Use message passing
- Service discovery via `Service` abstraction
- Crash if you can’t connect (crash-only)

… But tight coupling isn't *always* wrong.

Tight coupling isn't *always* wrong

- `Pod`s have 1+ containers on purpose
- Share localhost, filesystem, etc…
- As good as it gets for coupling

What That Might Look Like

Sidecars for:

- Service Mesh
- Logging
- Metrics aggregation

Record your configuration.

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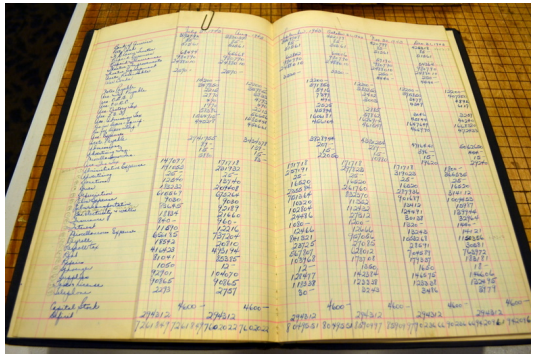

- Kubernetes APIs are *declarative*
- Latest working config lives next to code
- Use SCM to version configs

Declarative “Manifests”

```
apiVersion: v1
kind: Pod
spec:
  containers:
    image: docker.io/gomods/proxy:v0.1.0
    imagePullPolicy: Always
    name: CatVideos!!!
```

What That Might Look Like

- Bundle your Kube templates in a **Helm chart**
- Helm for one-click deployment
- Helm for lifecycle management

Ask for the least.

Ask For The Least

- RBAC permissions
- Containers in a pod
- CPU shares or memory
- Disk space

Just like the principle of least privilege.

What That Might Look Like

- Read-only filesystem for monitoring systems
- One CPU share for web frontends
- Minimal disk for log aggregators
- Tiny memory for local proxies

Where should we go from here?

Who should define our guidelines?

- I’ve started the conversation here
- We all have a wealth of experience
- From many viewpoints
- Let’s share all of it

Contributions Welcome

https://github.com/arschles/kube-best-practices

Thank you

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