

@kevindubois.com
@thomasvitale.com



KubeCon



CloudNativeCon

Europe 2025

From 0 to Production-Grade with Kubernetes Native Development

Kevin Dubois & Thomas Vitale
KubeCon+CloudNativeCon Europe
April 2nd, 2025





Kevin Dubois



KubeCon



CloudNativeCon

Europe 2025



- ★ Sr. Principal Developer Advocate at Red Hat
- ★ Java Champion 
- ★ Based in Belgium  (prev. USA, Italy)
- ★ Speak English, Dutch, French, Italian



@kevindubois.com



youtube.com/@thekevindubois



linkedin.com/in/kevindubois



github.com/kdubois

Thomas Vitale

Systematic



@thomasvitale.com



Developer Experience on Kubernetes

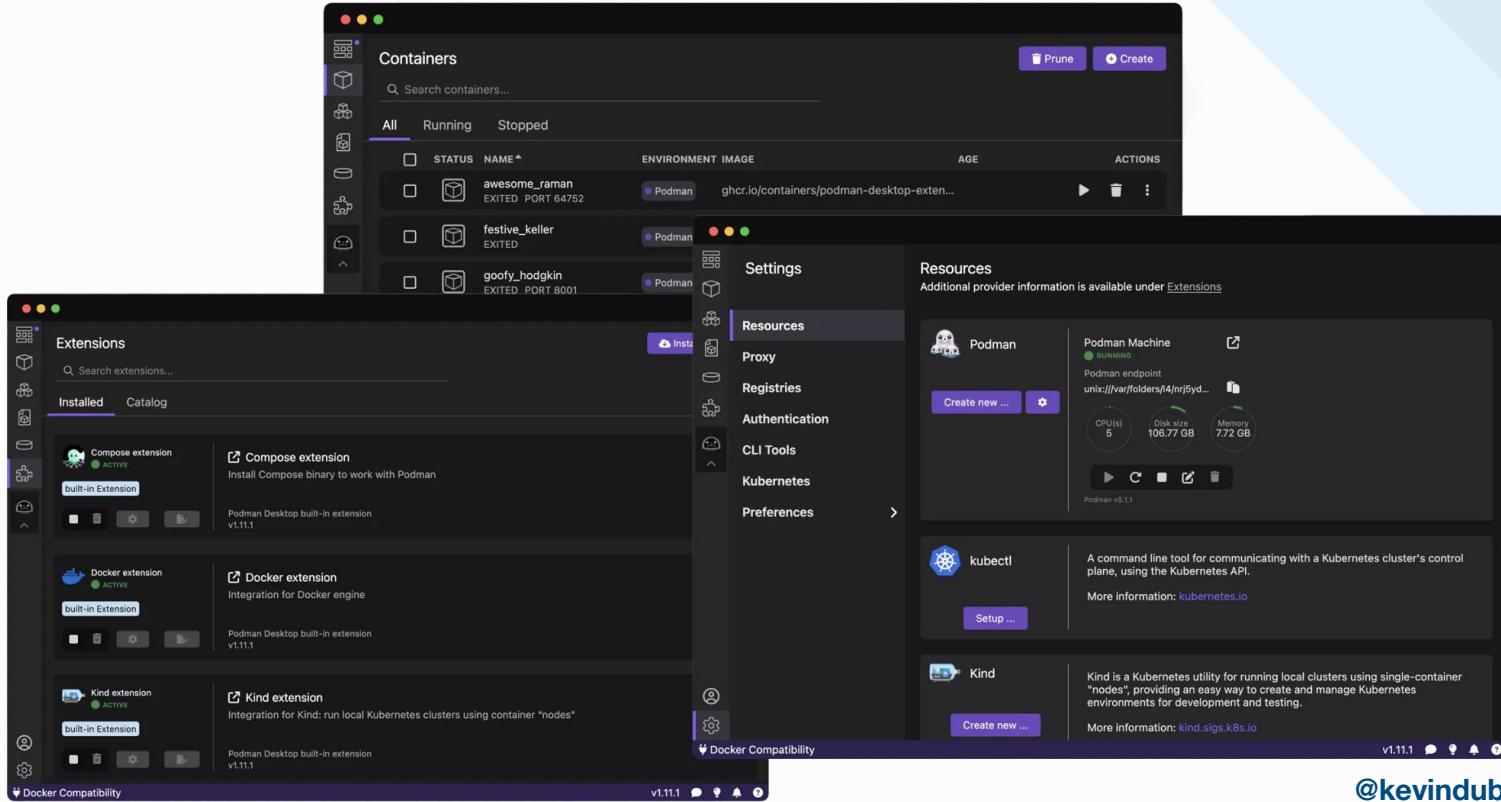
Mauricio Salatino
Thomas Vitale

Working with Containers

Podman Desktop

OSS Container Runtime, CNCF Sandbox

podman-desktop.io



The screenshot displays the Podman Desktop application interface. On the left, the "Containers" section shows a list of three containers: "awesome_raman" (Exited, Port 64752), "festive_keller" (Exited), and "goofy_hodgkin" (Exited, Port 8001). On the right, the "Resources" section shows a "Podman Machine" entry with details: 5 CPUs, 106.77 GB Disk size, and 7.72 GB Memory. Below the machine, there are sections for "kubectl" (a command-line tool for Kubernetes) and "Kind" (a utility for running local Kubernetes clusters). The bottom navigation bar indicates the application version is v1.11.1.

Containers

All Running Stopped

Status	Name	Image	Age	Actions
Exited	awesome_raman	Podman	ghcr.io/containers/podman-desktop-exten...	▶️ 🗑️ ⋮
Exited	festive_keller	Podman		
Exited	goofy_hodgkin	Podman	EXITED PORT 8001	▶️ 🗑️ ⋮

Extensions

Q. Search extensions...

Installed Catalog

- Compose extension** (ACTIVE, built-in Extension)
- Docker extension** (ACTIVE, built-in Extension)
- Kind extension** (ACTIVE, built-in Extension)
- Docker Compatibility**

Containers

All Running Stopped

Status	Name	Image	Age	Actions
Exited	awesome_raman	Podman	ghcr.io/containers/podman-desktop-exten...	▶️ 🗑️ ⋮
Exited	festive_keller	Podman		
Exited	goofy_hodgkin	Podman	EXITED PORT 8001	▶️ 🗑️ ⋮

Resources

Additional provider information is available under [Extensions](#)

Podman Machine

Podman endpoint: unix:///var/folders/l4/nrj5yd...

CPU(s): 5 | Disk size: 106.77 GB | Memory: 7.72 GB

kubectl

A command line tool for communicating with a Kubernetes cluster's control plane, using the Kubernetes API.
More information: [kubernetes.io](#)

Kind

Kind is a Kubernetes utility for running local clusters using single-container "nodes", providing an easy way to create and manage Kubernetes environments for development and testing.
More information: [kind.sigs.k8s.io](#)

v1.11.1

@kevindubois.com
@thomasvitale.com

Cloud Native Buildpacks

From source code to container image



GraalVM™

Java

node.js



python™

= GO



APACHE
HTTP SERVER PROJECT



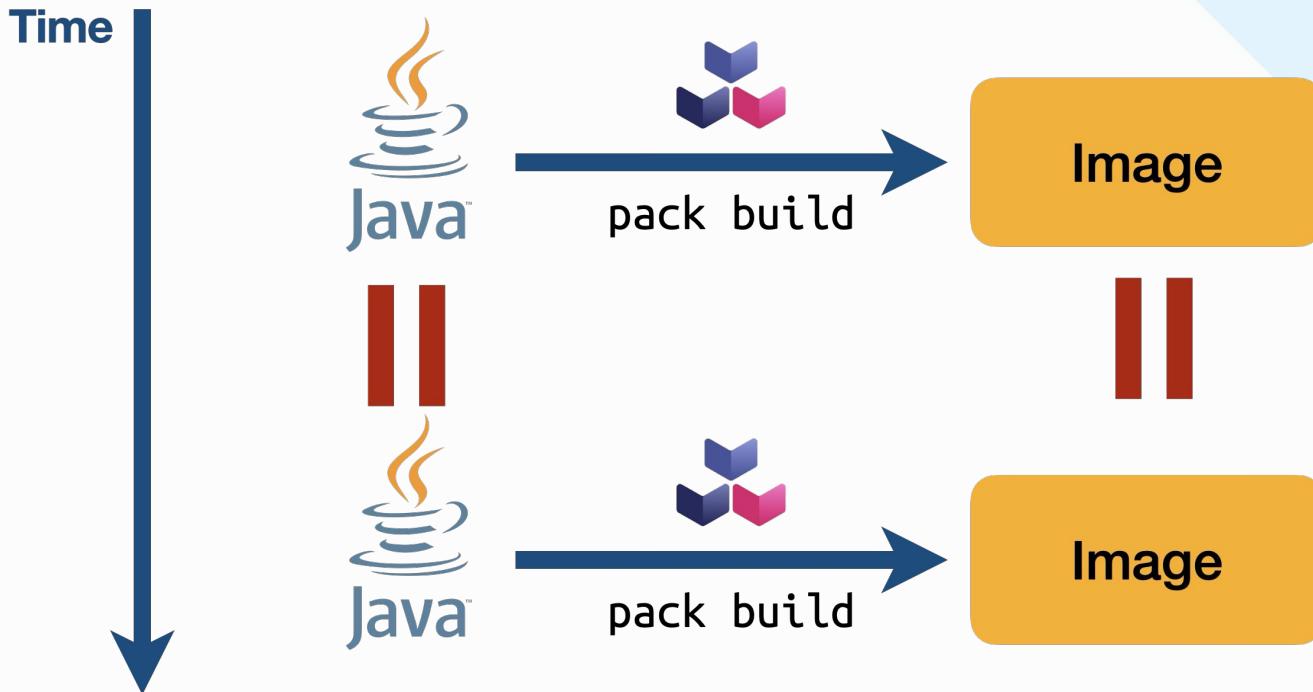
pack build



Image

Eliminate sources of non-determinism

Reproducible builds with Cloud Native Buildpacks

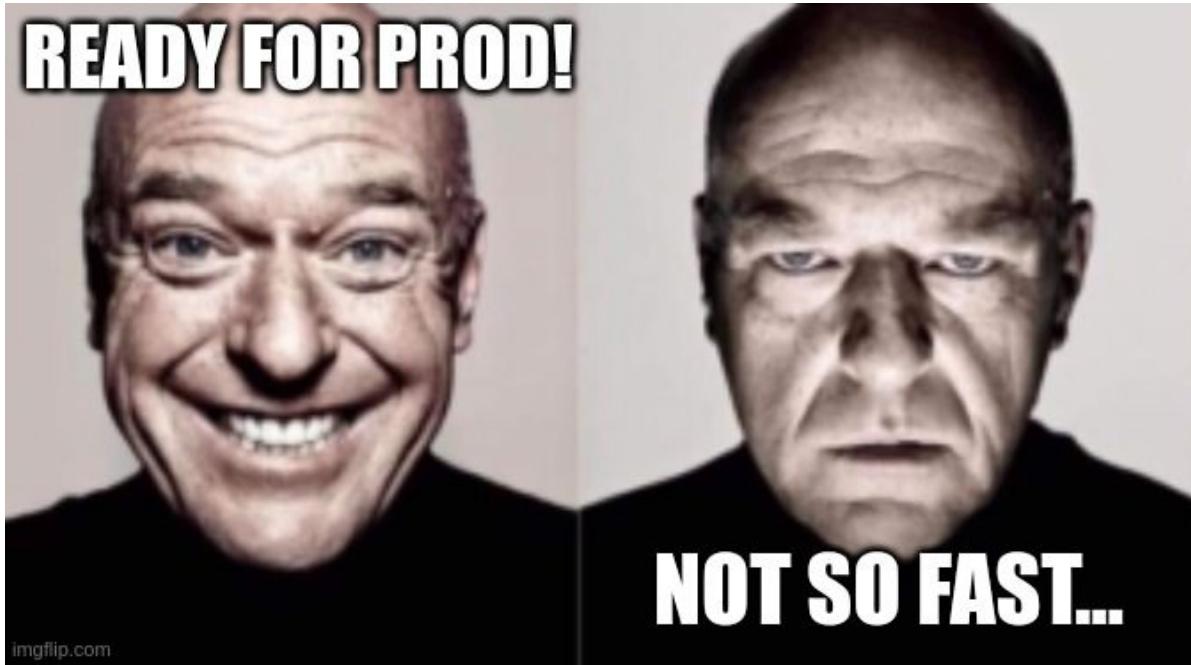


Kubernetes Deployments

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: kubenative
spec:
  replicas: 1
  selector:
    matchLabels:
      app.kubernetes.io/name: kubenative
template:
  spec:
    containers:
      - image: quay.io/kevin-dubois/kubenative
        name: kubenative
        ports:
          - containerPort: 8080
            name: http
            protocol: TCP
```



```
1
tive
tp
: TCP
rt: 8080
etes.io/name: kubenative
```



Ready??

Container Running
Sends traffic
App not ready



Ready??

Container Running
Sends traffic
App not ready

```
Starting the Java application using /opt/jboss/container/java/run/run-java.sh ...
INFO exec java -Dquarkus.http.host=0.0.0.0 -Djava.util.logging.manager=org.jboss.logmanager.LogManager -cp ." -jar /deployments/quarkus-run.jar
[REDACTED]
2023-09-27 15:34:14,109 WARN [io.qua.run.con.ConfigRecorder] (main) Build time property cannot be changed at runtime:
- quarkus.openshift.route.expose is set to 'true' but it is build time fixed to 'false'. Did you change the property quarkus.openshift.route.expose after building the application?
2023-09-27 15:34:14,534 INFO [io.sma.rea.mes.kafka] (main) SRMSG18229: Configured topics for channel 'power-in': [power]
2023-09-27 15:34:14,542 INFO [io.sma.rea.mes.kafka] (main) SRMSG18214: Key deserializer omitted, using String as default
2023-09-27 15:34:14,727 INFO [io.sma.rea.mes.kafka] (main) SRMSG18229: Configured topics for channel 'game-events-in': [game-events]
2023-09-27 15:34:14,730 INFO [io.sma.rea.mes.kafka] (main) SRMSG18214: Key deserializer omitted, using String as default
2023-09-27 15:34:14,786 INFO [io.sma.rea.mes.kafka] (smallrye-kafka-producer-thread-0) SRMSG18258: Kafka producer kafka-producer-user-actions-out, connected to Kafka brokers 'my-cluster-kafka-bootstrap:9092', is configured to write records to 'user-actions'
2023-09-27 15:34:14,834 INFO [io.sma.rea.mes.kafka] (smallrye-kafka-producer-thread-1) SRMSG18258: Kafka producer kafka-producer-power-out, connected to Kafka brokers 'my-cluster-kafka-bootstrap:9092', is configured to write records to 'power'
2023-09-27 15:34:14,861 INFO [io.sma.rea.mes.kafka] (smallrye-kafka-producer-thread-2) SRMSG18258: Kafka producer kafka-producer-game-events-out, connected to Kafka brokers 'my-cluster-kafka-bootstrap:9092', is configured to write records to 'game-events'
2023-09-27 15:34:14,997 INFO [org.acm.GameResource] (main) List of names initialized with 151671 items
2023-09-27 15:34:15,043 WARN [org.inf.HOTROD] (main) ISPNO04001: Could not find 'hotrod-client.properties' file in classpath, using defaults.
2023-09-27 15:34:15,144 INFO [org.inf.HOTROD] (main) ISPNO04074: Native Epoll transport not available, using NIO instead: io.netty.channel.epoll.Epoll
2023-09-27 15:34:15,144 INFO [org.inf.HOTROD] (main) ISPNO04108: Native IOUring transport not available, using NIO instead: io.netty.incubator.channel.uring.IOUring
2023-09-27 15:34:15,214 INFO [org.inf.HOTROD] (main) ISPNO04021: Infinispan version: Infinispan 'Flying Saucer' 14.0.17.Final
2023-09-27 15:34:15,227 WARN [io.qua.inf.cli.run.InfinispanClientProducer] (main) Use 'quarkus.infinispan-client.hosts' instead of the deprecated 'quarkus.infinispan-client.server-list'
2023-09-27 15:34:15,227 WARN [io.qua.inf.cli.run.InfinispanClientProducer] (main) Use 'quarkus.infinispan-client.username' instead of the deprecated 'quarkus.infinispan-client.auth-username'
2023-09-27 15:34:15,228 WARN [io.qua.inf.cli.run.InfinispanClientProducer] (main) Use 'quarkus.infinispan-client.password' instead of the deprecated 'quarkus.infinispan-client.auth-password'
2023-09-27 15:34:15,380 INFO [org.inf.HOTROD] (main) ISPNO04021: Infinispan version: Infinispan 'Flying Saucer' 14.0.17.Final
2023-09-27 15:34:15,394 INFO [org.inf.HOTROD] (HotRod-client-async-pool-2-1) ISPNO04006: Server sent new topology view (id=1793682273, age=0) containing 1 addresses: [10.128.2.21/<unresolved>:1222]
2023-09-27 15:34:15,397 INFO [org.inf.HOTROD] (HotRod-client-async-pool-2-1) ISPNO04014: New server added(10.128.2.21/<unresolved>:11222), adding to the pool.
2023-09-27 15:34:15,403 INFO [org.inf.HOTROD] (HotRod-client-async-pool-2-1) ISPNO04016: Server not in cluster anymore(<unresolved>:11222), removing from the pool.
2023-09-27 15:34:15,481 INFO [org.inf.HOTROD] (HotRod-client-async-pool-2-2) ISPNO04006: Server sent new topology view (id=1682076575, age=0) containing 1 addresses: [10.128.2.21/<unresolved>:1222]
2023-09-27 15:34:15,481 INFO [org.inf.HOTROD] (HotRod-client-async-pool-2-2) ISPNO04014: New server added(10.128.2.21/<unresolved>:11222), adding to the pool.
2023-09-27 15:34:15,481 INFO [org.inf.HOTROD] (HotRod-client-async-pool-2-2) ISPNO04016: Server not in cluster anymore(<unresolved>:11222), removing from the pool.
2023-09-27 15:34:15,502 INFO [io.sma.rea.mes.kafka] (smallrye-kafka-consumer-thread-1) SRMSG18257: Kafka consumer kafka-consumer-game-events-in, connected to Kafka brokers 'my-cluster-kafka-bootstrap:9092', belongs to the 'da3528f6-bd3c-45da-9186-90f0addee5d5b' consumer group and is configured to poll records from [game-events]
2023-09-27 15:34:15,550 INFO [io.quarkus] (main) quinoa-wind-turbine 1.0.0-SNAPSHOT on JVM (powered by Quarkus 3.4.1) started in 2.685s. Listening on: http://0.0.0.0:8080
2023-09-27 15:34:15,550 INFO [io.quarkus] (main) Profile openshift-cluster activated.
```

After 2.6s (Kafka, DB, Caching)
App is ready to receive traffic

Ready??



Downtime of 2.6s

Readiness, Liveness, Startup Probes



```
readinessProbe:  
failureThreshold: 3  
  
httpGet:  
path: /q/health/ready  
port: 8080  
scheme: HTTP  
  
initialDelaySeconds: 5  
  
livenessProbe:  
failureThreshold: 3  
  
httpGet:  
path: /q/health/live  
port: 8080  
scheme: HTTP  
  
initialDelaySeconds: 5
```

Kubernetes Secrets & ConfigMaps

```
kind: ConfigMap
apiVersion: v1
metadata:
  name: properties
immutable: false
data:
  'kafka-servers': kafka-bootstrap:9092
```

```
kind: Secret
apiVersion: v1
metadata:
  name: postgresql
data:
  database-name : xyz
  database-password: xyz
  database-user : xyz
type: Opaque
```

```
containers:
  - name: nginx-container
    image: nginx:latest
    ports:
      - containerPort: 80
volumes:
  - name: secret-volume
    secret:
      secretName: your-secret-name
```

Resource Requests & Limits



Aw, Snap!

Something went wrong while displaying this webpage.

Error code: Out of Memory

[Learn more](#)

[Reload](#)

```
resources:  
  
requests:  
  
    memory: "300Mi"  
  
    cpu: "250m" # 1/4 core  
  
limits:  
  
    memory: "400Mi"  
  
    cpu: "1000m" # 1 core
```

A photograph of a fox standing behind a chain-link fence. The fox is looking over the fence towards the left. It has reddish-orange fur on its head and neck, with a white patch on its chest. The background is a blurred green field.

HEY KID

WANNA FORMAT SOME YAML?



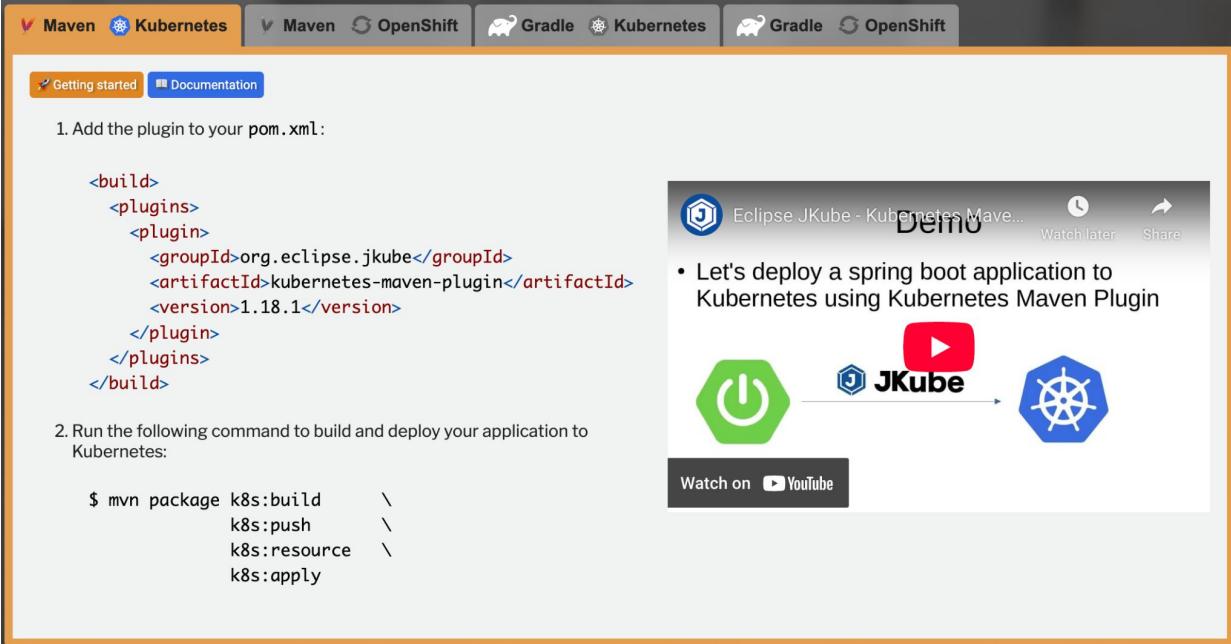
Getting started Documentation

1. Add the plugin to your pom.xml:

```
<build>
  <plugins>
    <plugin>
      <groupId>org.eclipse.jkube</groupId>
      <artifactId>kubernetes-maven-plugin</artifactId>
      <version>1.18.1</version>
    </plugin>
  </plugins>
</build>
```

2. Run the following command to build and deploy your application to Kubernetes:

```
$ mvn package k8s:build \
          k8s:push \
          k8s:resource \
          k8s:apply
```



Eclipse JKube - Kubernetes Maven... Watch later Share

- Let's deploy a spring boot application to Kubernetes using Kubernetes Maven Plugin

Watch on YouTube



QUARKUSS

Supersonic. Subatomic. Java

```
# Container image settings
quarkus.container-image.registry=quay.io
quarkus.container-image.group=kevindubois
quarkus.container-image.name=demo

quarkus.kubernetes.image-pull-policy=IfNotPresent

# secrets
%prod.quarkus.kubernetes-config.secrets=postgresql
%prod.quarkus.kubernetes-config.secrets.enabled=true
# configmaps
%prod.quarkus.kubernetes-config.enabled=true
%prod.quarkus.kubernetes-config.config-maps=properties

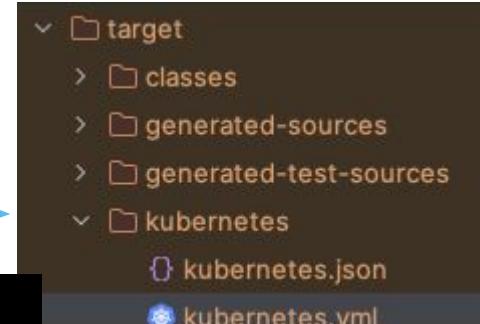
# limits
quarkus.kubernetes.resources.limits.cpu=2
quarkus.kubernetes.resources.limits.memory=400Mi

# requests
quarkus.kubernetes.resources.requests.cpu=200m
quarkus.kubernetes.resources.requests.memory=200Mi

# env variables
quarkus.kubernetes.env.vars.JDK_JAVA_OPTIONS.value=-XX:+UseParallelGC -XX:MaxRAMPercentage=75
```



mvn package



@kevindubois.com
@thomasvitale.com

```
git clone https://github.com/kdubois/quarkus-kubernetes-kafka-db.git
cd quarkus-kubernetes-kafka-db
mvn clean package
mv target/kafka-quarkus-1.0-SNAPSHOT.jar ./kafka-quarkus-1.0-SNAPSHOT.jar
curl -X POST -H "Content-Type: application/json" -d @{"topic": "test", "value": "Hello World"} http://localhost:8080/test
```

github.com/kdubois/quarkus-kubernetes-kafka-db

Serverless Kubernetes



```
kduboisi ~ > goapp $ kn func deploy
function up-to-date. Force rebuild with --build
Please provide credentials for image registry (quay.io).
? Username: kduboisi
? Password: *****
Credentials will not be saved.
If you would like to save your credentials in the future,
you can install docker credential helper https://github.com/docker/docker-credential-helpers.
Pushing function image to the registry "quay.io" using the "kduboisi"
user credentials
[?] Deploying function to the cluster
[!] Creating Triggers on the cluster
[?] Function updated in namespace "kduboisi-dev" and exposed at URL:
https://goapp-kduboisi-dev.apps.rhel7mcx.p1.openshiftapps.com
kduboisi ~ > goapp $
```

Development Services

@kevindubois.com
@thomasvitale.com

Kubernetes for Local Development?

@kevindubois.com
@thomasvitale.com

Development Services

Code, Test, Run, Debug

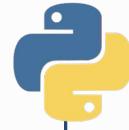
Development Workflow



quarkus dev



gradle bootRun

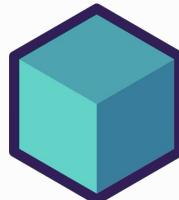


flask --debug run



yarn dev

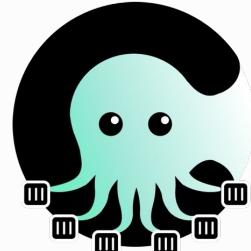
Dev & Test Services



Testcontainers



MICROCKS



@kevindubois.com
@thomasvitale.com

Testcontainers

Services for development and testing



```
with KeycloakContainer() as keycloak:  
    client = keycloak.get_client()
```



```
var rabbit = new RabbitMQContainer("rabbitmq:4.0");  
rabbit.start();
```



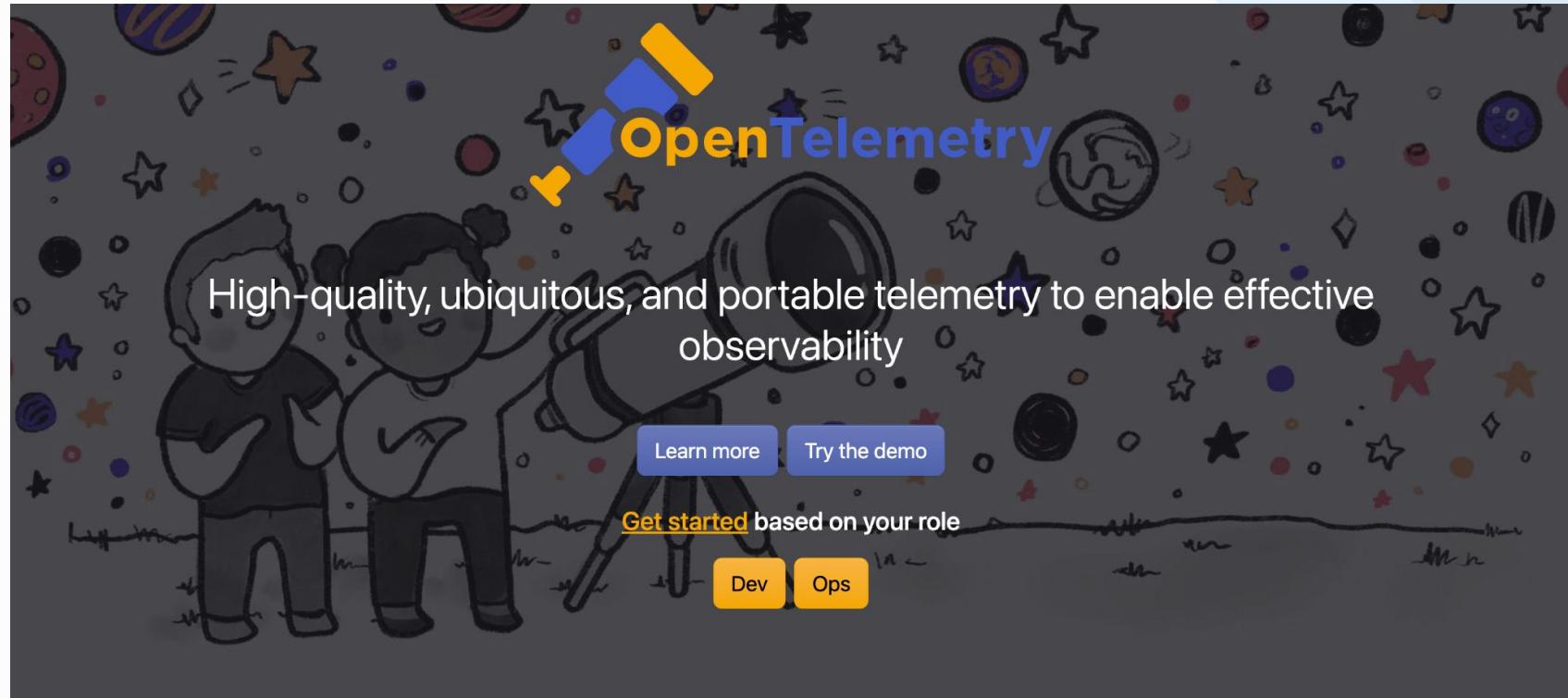
```
postgresContainer, err := postgres.Run(context.Background(),  
    "postgres:17-alpine",  
    postgres.WithDatabase("test"),  
    postgres.WithUsername("user"),  
    postgres.WithPassword("password"),  
)
```



Observability

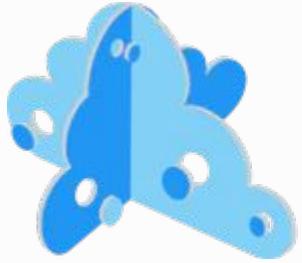
OpenTelemetry

Unified observability



API Testing

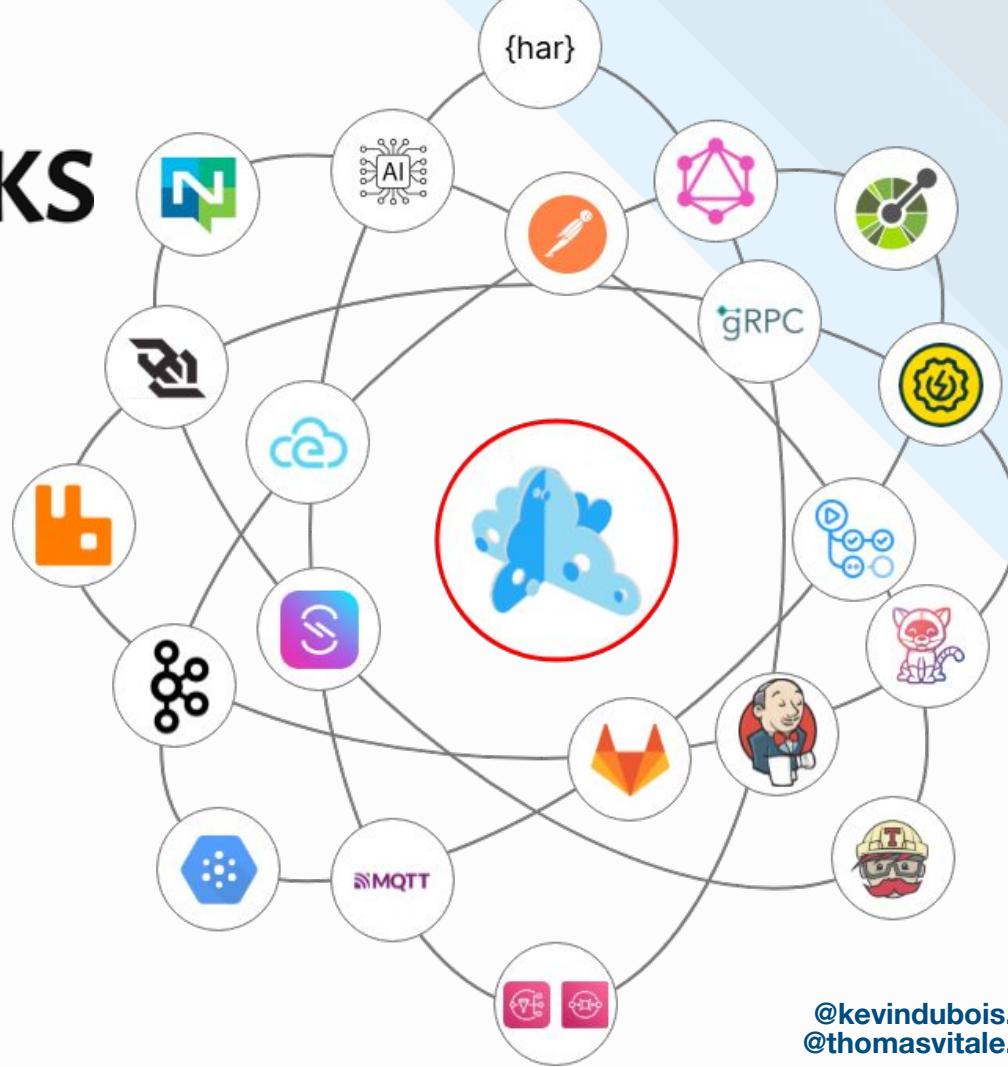
@kevindubois.com
@thomasvitale.com



MICROCKS

The open source,
cloud native tool for
API Mocking and
Testing

 CLOUD NATIVE
SANDBOX



@kevindubois.com
@thomasvitale.com



APIs & Services

These are the APIs & Services managed by Microcks. You can discover new ones adding import job or creating a new Dynamic API.

Icon	Name	Type	Version	Last Update	Operations	Details
	API Pastry - 2.0	REST	Version 2.0.0	Updated on Mar 24, 2023, 12:03:37 PM	3 Operations	Details
	Hello API Mock	REST	Version 0.8	Updated on Mar 24, 2023, 12:04:50 PM	1 Operations	Details
	HelloService	GRPC	Version v1	Updated on Mar 24, 2023, 12:04:24 PM	1 Operations	Details
	HelloService Mock	SOAP	Version 0.9	Updated on Jul 26, 2023, 1:45:02 PM	1 Operations	Details
	Movie Graph API	GRAPH	Version 1.0	Updated on Mar 24, 2023, 12:04:34 PM	4 Operations	Details
	Petstore API	REST	Version 1.0	Updated on Apr 18, 2023, 3:20:54 PM	2 Operations	Details

Tests

Conformance index

Index 82.5

Learn More [View Tests Runs](#)

Conformance score

82.5%

[View Tests Runs](#) [New Test](#)

Pipelines

Learn More [i](#)

beer-catalog-pipeline created 21 days ago

Recent Runs



Start Pipeline

Average Duration: 19m 56s

Service Binding

Kubernetes Service Binding

Bind Services to Kubernetes Workloads

```
● ● ●

apiVersion: servicebinding.io/v1
kind: ServiceBinding
metadata:
  name: ollama-binding
spec:
  service:
    apiVersion: kadras.io/v1
    kind: ServiceClaim
    name: ollama
  workload:
    apiVersion: apps/v1
    kind: Deployment
    name: spring-boot-application
```

Conclusion

Kubernetes Native Development

From 0 to Production-Grade

Fast
Feedback
Loop

Reduced
Cognitive
Load

Developer
Joy

Kevin Dubois

@kevindubois.com
kevindubois.com



feedback



source code

Thomas Vitale

@thomasvitale.com
thomasvitale.com

Breaking Barriers: Bringing Application Developers Closer To the CNCF - Thomas Vitale, Systematic & Mauricio "Salaboy" Salatino, Diagrid

📅 Friday April 4, 2025 14:30 - 15:00 BST

📍 Level 1 | Hall Entrance N10 | Room H