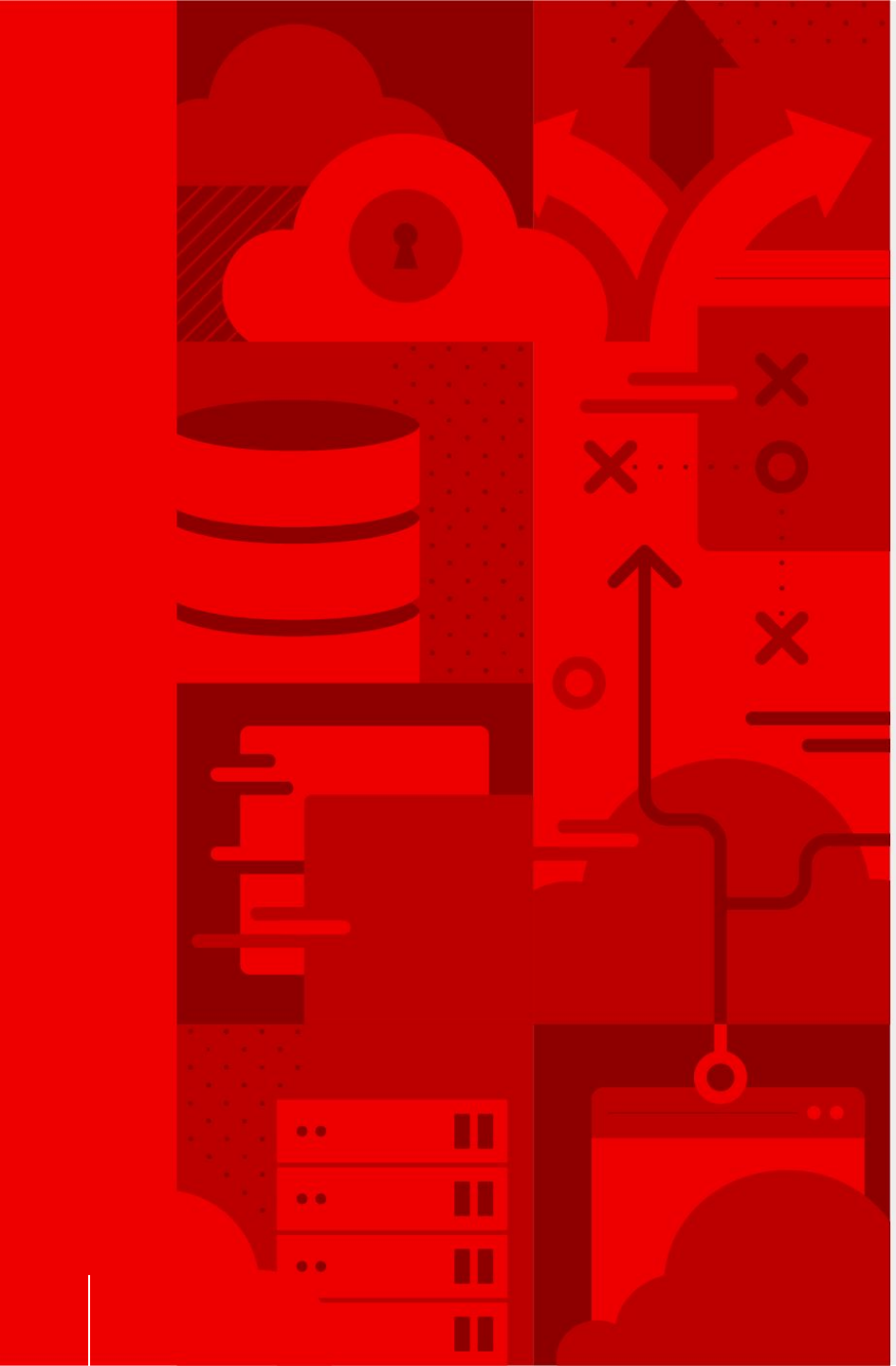


Serverless with Knative

Kubernetes-based platform for modern event-driven serverless workloads

JAX Mainz, September 10, 2020

Dr. Roland Huß @ro14nd
Principal Software Engineer, Red Hat

Red Hat

Serverless

"Serverless computing refers to the concept of building and running **applications** that **do not require server management**. It describes a finer-grained **deployment model** where applications, bundled as one or more functions are uploaded to a platform and then **executed**, **scaled**, and **billed** in response to the exact **demand** needed at the moment"

-- CNCF Definition, https://www.cncf.io/blog/2018/02/14/cncf-takes-first-step-towards-serverless-computing/

Wait... wat ?

Red Hat


Knative

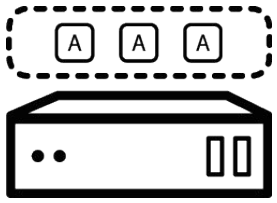
Kubernetes-based platform to **deploy** and **manage** modern **serverless workloads**.

https://knative.dev

Components

Serving

A request-driven model that serves the container with your application and can "scale to zero".



Eventing

Common infrastructure for consuming and producing events that will stimulate applications.

Background Information

- Started as an **Open Source** Project mid-2018 by Google
- Community driven with a lot of vendor backing
  - https://github.com/knative
  - https://knative.dev
  - Support by Google, Red Hat, IBM, VMware, Triggermesh, SAP and more
  - Organized in multiple Working Groups with weekly meetings
- Releases
  - Current: **v0.17**
  - 6 week release cadence

Try Knative !

- Install from resource descriptors on Kubernetes Cluster
  - https://knative.dev/docs/install/
- Google **Cloud Run** (managed and on GKE)
  - https://cloud.google.com/run/
  - Not all Knative features implemented
    - see https://ahmet.im/blog/cloud-run-is-a-knative ?
- Red Hat **OpenShift Serverless**
  - https://www.openshift.com/learn/topics/serverless
  - Supports all Knative features
  - Serving GA with full support, Eventing in Technical Preview


Serving

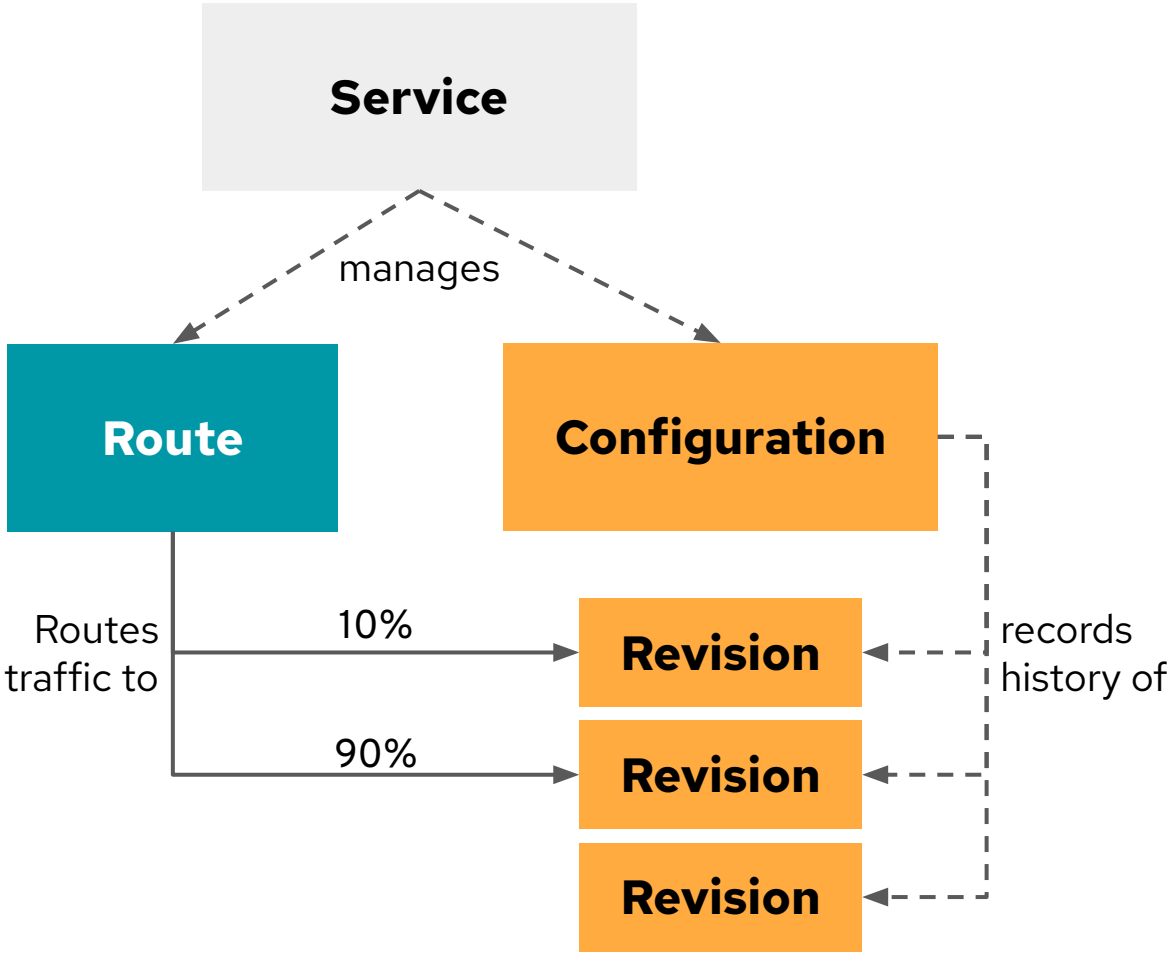
Route, **scale-to-zero** and track application **revisions** with ease.

Concepts

- **Demand-based autoscaling**, including scale-to-zero
- Separation of code and configuration
- Opinionated deployment model catered for **stateless applications**
  - Single Port
  - No PersistentVolumes
  - Single Container (about to change)
- Rich **traffic split capabilities** to enable custom rollout strategies of new versions

Resources

- **Configuration** represent the *floating HEAD* of a history of **Revisions**
- **Revision** represents an immutable snapshot of code and configuration
- **Route** configure ingress over a collection of Revisions
- **Service** (not K8s services !) is a top-level entity that manage a set of Routes and Configurations



From **Deployment** to **KService**

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: random
spec:
  replicas: 1
  selector:
    matchLabels:
      app: random
  template:
    metadata:
      labels:
        app: random
    spec:
      containers:
      - image: rhuss/random
        name: random
        ports:
        - containerPort: 8080
```

```yaml
apiVersion: serving.knative.dev/v1alpha1
kind: Service
metadata:
  name: random
spec:
  replicas: 1
  selector:
    matchLabels:
      app: random
  template:
    metadata:
      labels:
        app: random
    spec:
      containers:
      - image: rhuss/random
        name: random
        ports:
        - containerPort: 8080
```

Red Hat

Demo


Eventing

Universal subscription, **delivery**, and management of **CloudEvents**.

Eventing

cloudevents

- Based on CloudEvents (CNCF Standard)
- Pluggable event transport via **Channels**
  - In-Memory
  - Apache Kafka
  - Google Pub-Sub
- Flexible routing of events from Sources to Sinks
  - **Source**: Adapter for integrating 3rd party systems and emitting CloudEvents
  - **Sink**: Addressable endpoint for CloudEvents (like a Knative Service)

Event Sources

- Integrating 3rd party systems with Knative
- More often "**Adapter**" than an original event source
- Declared with a **Custom Resource**
- Evaluated by an Operator
- Push or Pull based
- Converting custom event formats to **CloudEvents**

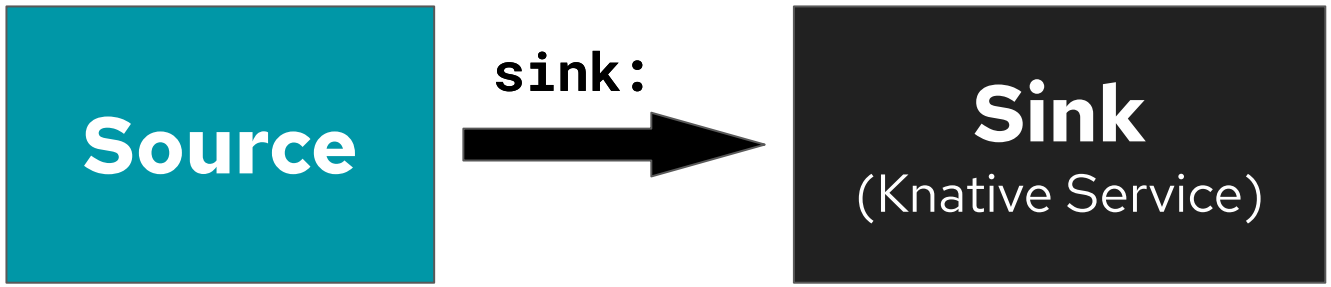
Sources

Builtin Sources	
PingSource	Emitting static CloudEvents periodically
ApiServerSource	Kubernetes API Server events as CloudEvents
SinkBinding	Binds an arbitrary Pod specification to a Sink
ContainerSource	Meta-Source combining SinkBinding & Deployment

Contributed Sources	
GitHubSource	Converts GitHub webhooks events to CloudEvents
KafkaSource	Apache Kafka messages as CloudEvents
CamelKSource	Apache Camel components as sources

and many more: https://knative.dev/docs/eventing/sources/

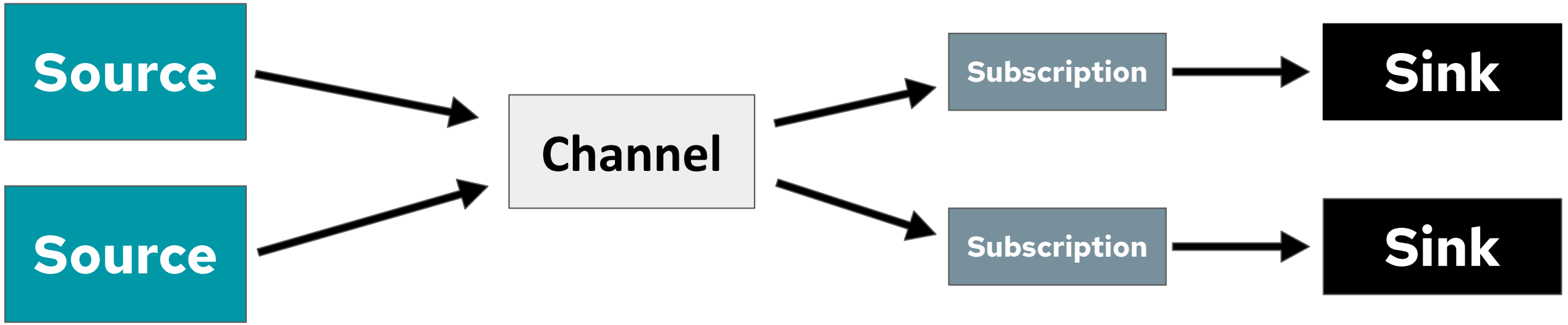
Source → Service : Direct Connection



- Simplest way to get CloudEvents to a service
- Drawbacks:
  - No queuing support when service is unavailable
  - No back pressure support
  - Only one Service can consume events
  - No filtering, Service gets always all events

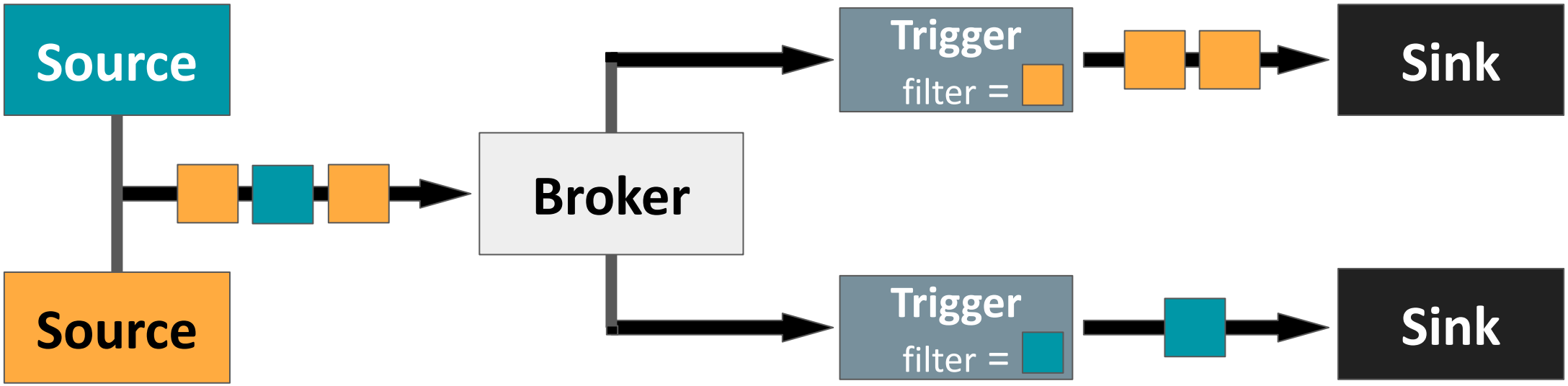
Demo

Source → Service : Channel & Subscription



- Multiple Services can consume the same event
- Subscription can point to a reply channel (not shown here)
- Various Channel Backends available
  - In-Memory, Kafka, GCP PubSub, (write your own)
- Drawbacks:
  - Channel Infrastructure needs to be set up manually
  - No filtering, Service gets always all events

Source → Service: Broker & Trigger



Broker

- Eventing Mesh for distributing Events
- Addressed by sources as sink

Trigger

- Filter on CloudEvent attributes (e.g. type)
- Connects a Sink with Broker

Source → Service: Broker & Trigger

- **Broker**
  - Eventing Mesh (or Event Delivery System)
  - Connects Sources with Sinks
  - Uses Channels internally, creating on the fly
    - Multi-tenant broker option (since 0.14)
- **Trigger**
  - Filter events (e.g. type and/or source)
  - Can produce new events (returned to Broker)
  - Delivered as CloudEvents

Demo

More Knative Eventing

- **EventRegistry**
  - EventType CRD
  - Discoverability of Events
- **Sequence**
  - Chaining multiple Services
  - Sinking to an “Addressable” (Service, Channel, Sequence, Broker ...)
- **Parallel**
  - Branching of events with filters
  - Allows to implement conditional processing

Summary

Summary

Knative Serving

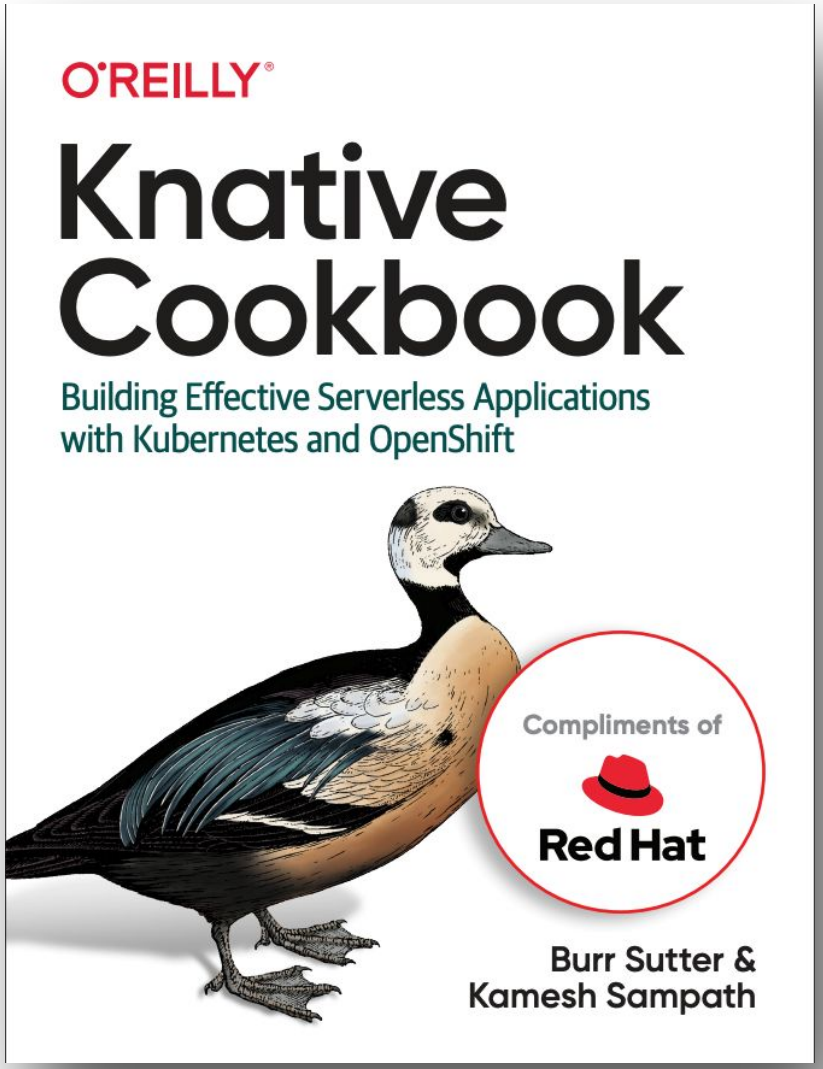
- Simplified Deployment for stateless workloads
- Traffic based autoscaling including Scale-to-Zero
- Traffic splitting for custom rollout / rollback scenarios

Knative Eventing

- External Triggers for feeding Knative Services
- Based on CloudEvents
- Backed by proven messaging systems
- Flexible messaging setup

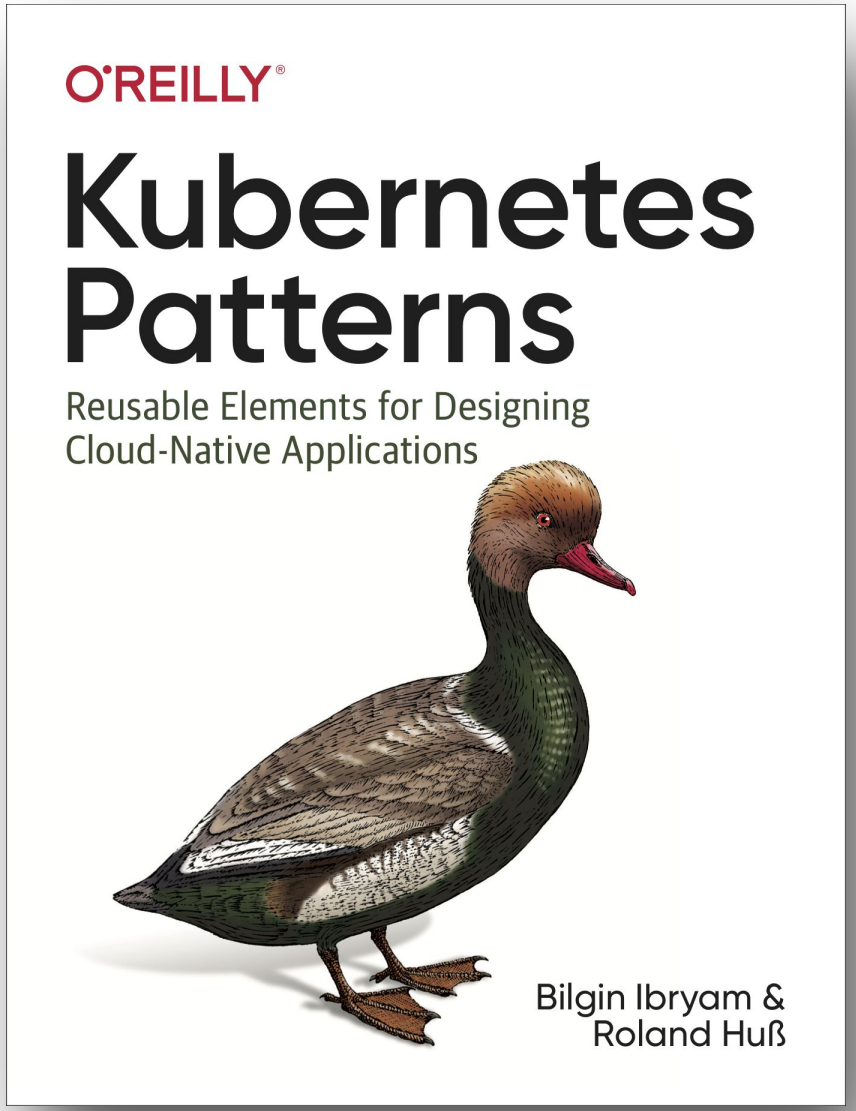

Javamagazin
SERVERLESS WORKLOADS AUF KUBERNETES
native
EVENTING | SERVING | TEKTON

Red Hat



http://dn.dev/knative-cookbook

Red Hat



https://k8spatterns.io

Red Hat

Thank you

https://k8spatterns.io

https://twitter.com/ro14nd

https://twitter.com/mwessendorf

https://twitter.com/k8spatterns

Red Hat

Picture Credits

https://www.pexels.com/photo/boat-island-ocean-sea-218999/

https://unsplash.com/photos/t6t2-gXKxXM

https://unsplash.com/photos/UGMf30W28qc

https://pixabay.com/photos/hamburg-speicherstadt-channel-2976711/

https://pixabay.com/photos/beer-machine-alcohol-brewery-1513436/

https://unsplash.com/photos/9SWHIgu8A8k

https://me.me/i/aws-lambda-is-just-glorified-cgi-bin-imgflip-com-change-my-mind-d0b715592ba34b08b79452ad02783ca2

https://unsplash.com/photos/dodn_0TESN0

Red Hat