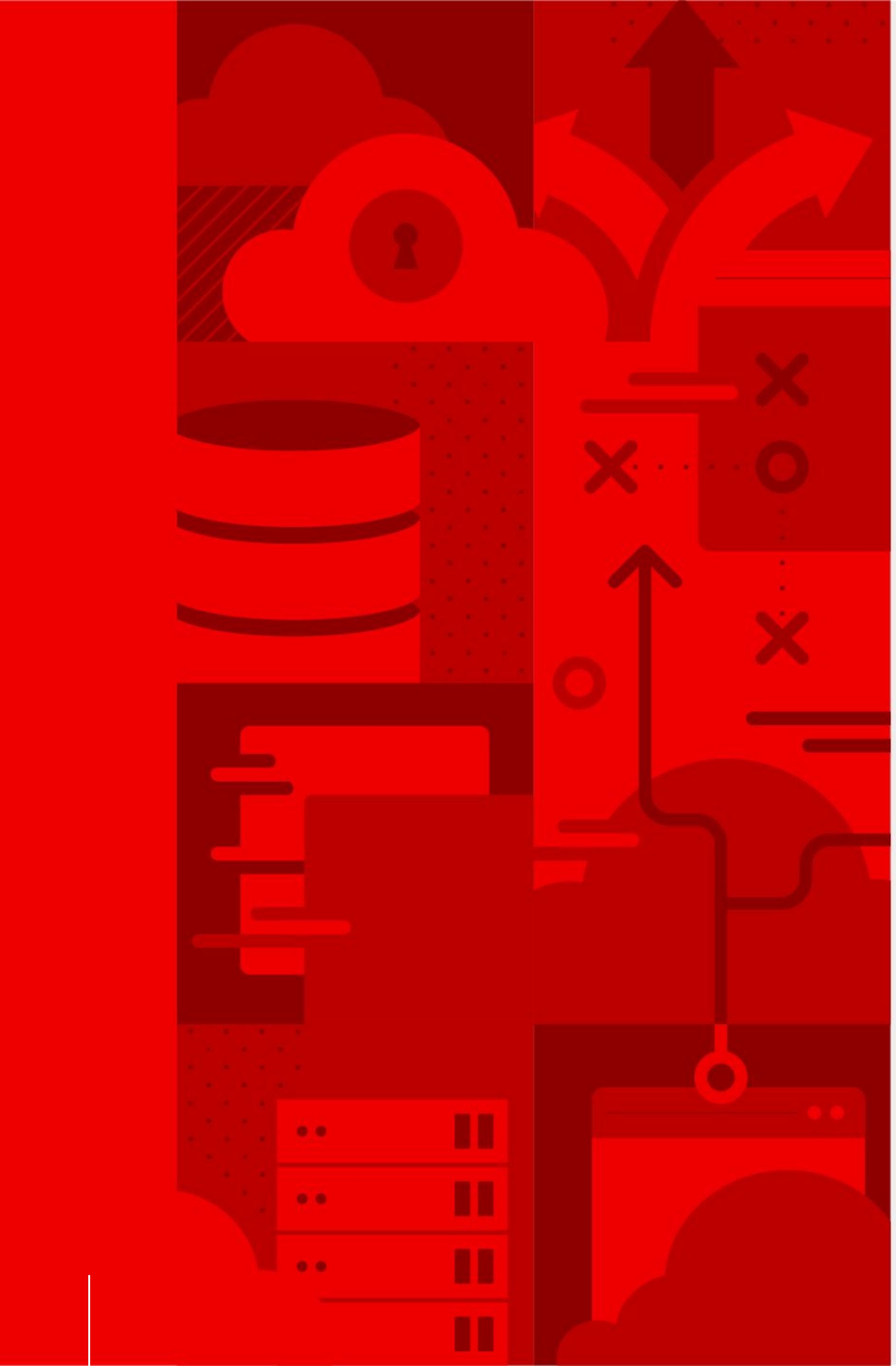

Modern Event-Driven Workloads with Knative

j4k.io, June 9th 2021

Roland Huß **@ro14nd**

OpenShift Serverless Architect, Red Hat

Wait … wat ?

AWS LAMBDA
IS JUST
GLORIFIED CGI-BIN
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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/

Serverless vs. FaaS

Serverless is a **Deployment Model** that abstracts away the driving machine infrastructure.

- No server management required
- Executed, scaled and billed according to demand
- Defines a deployment packaging, but otherwise agnostic to the application

FaaS (Function-as-a-Service) is a **Programming Model** that mandates developing your application with fine grained function that match a given signature.

- Deployed as Serverless application
- Typically used as *glue code* to connect services

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: **v0.23**
  - 6 week release cadence

Try Knative !

- Install from resource descriptors on any Kubernetes Cluster
  - https://knative.dev/docs/install/
- IBM Cloud **Code Engine**
  - https://www.ibm.com/cloud/code-engine
- Google **Cloud Run**
  - https://cloud.google.com/run/
- Red Hat **OpenShift Serverless**
  - https://www.openshift.com/learn/topics/serverless
  - Supports all Knative features
  - Full support for Knative Serving & Eventing

Serving

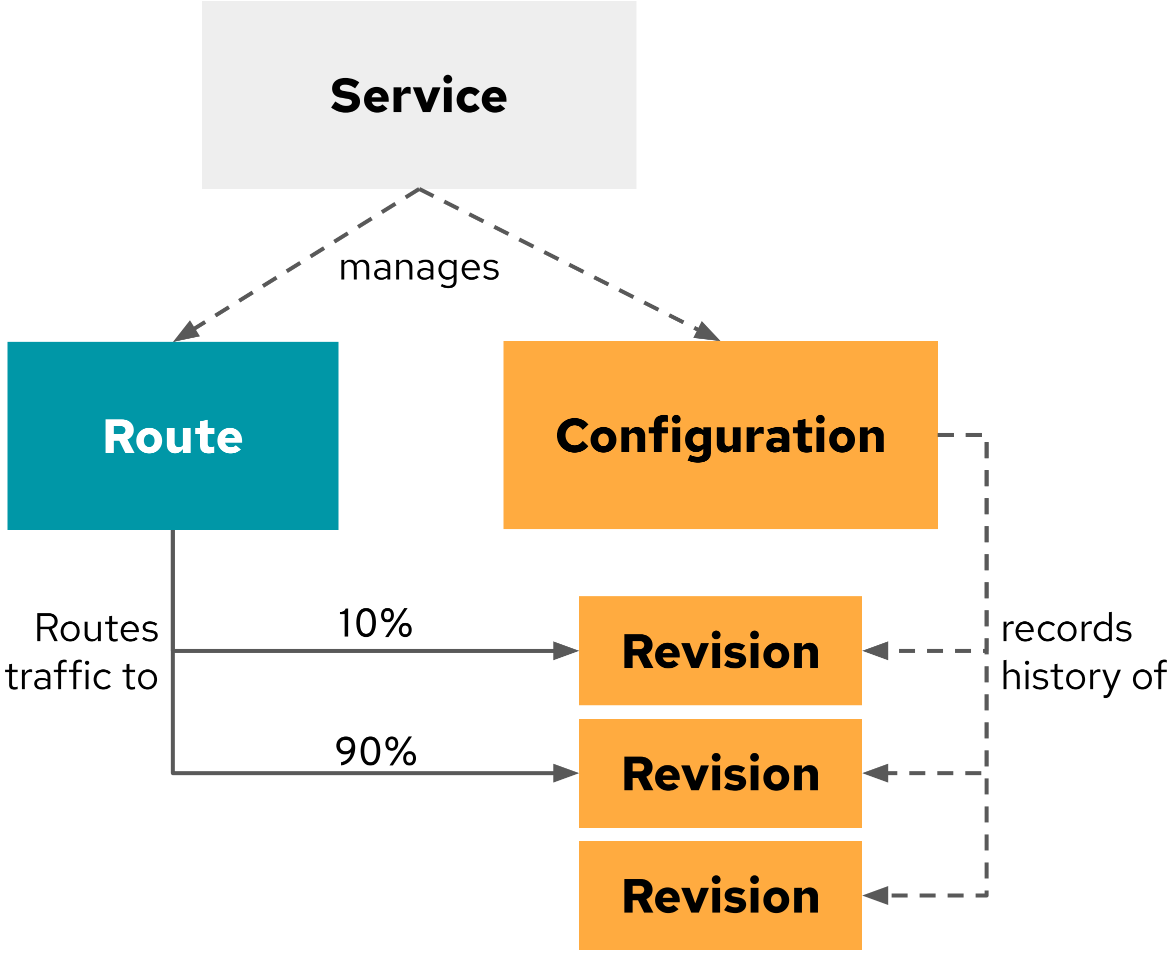
Route, **scale-to-zero** and track application **revisions** with ease.

Concepts

- Extends the Kubernetes model by leveraging **Custom Resource Definitions** (CRDs)
- **Demand-based autoscaling**, including scale-to-zero
- Separation of code and configuration
- Opinionated and simplified deployment model catered for **stateless applications**
  - Single Port
  - No PersistentVolumes
- Rich **traffic split capabilities** to enable custom rollout strategies of new versions

Serving 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**

```
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-number
        name: random
        ports:
        - containerPort: 8080
```

```
apiVersion: serving.knative.dev/v1
kind: Service
metadata:
  name: random
spec:
  replicas: 1
  selector:
    matchLabels:
      app: random
  template:
    metadata:
      labels:
        app: random
    spec:
      containers:
      - image: rhuss/random-number
        name: random
        ports:
        - containerPort: 8080
```

No more K8s **Service** or **Ingress/Route** required !

Demo

Eventing

Demo

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

Eventing

- Based on CloudEvents (CNCF Standard)
- Pluggable event transport via **Channels**
  - In-Memory
  - Apache Kafka
- Flexible event routing 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**

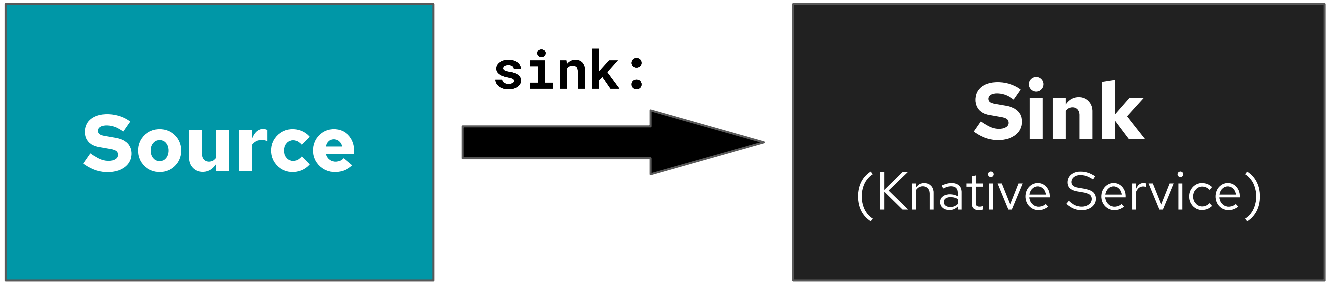
Sources

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
`Kamelet`	Apache Camel components as sources (and sinks)

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

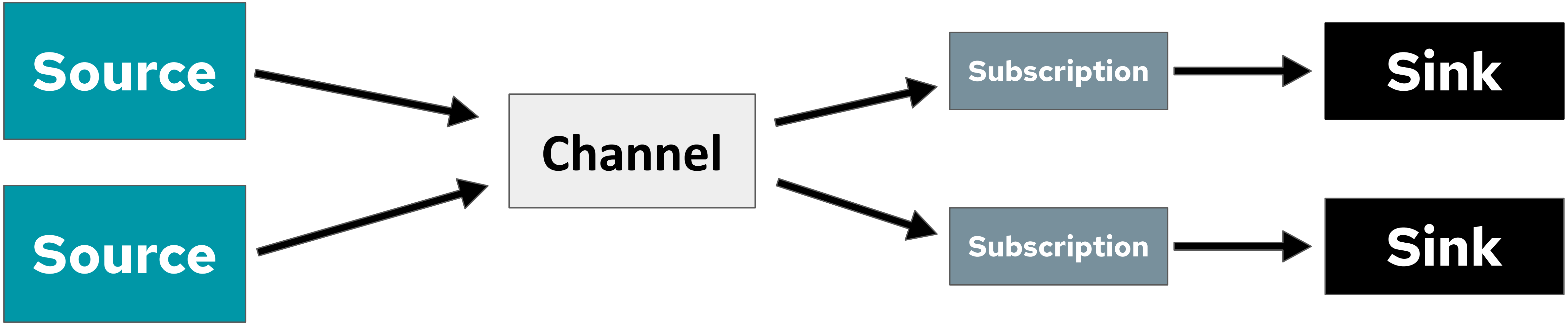
Source → Sink : Direct Connection



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

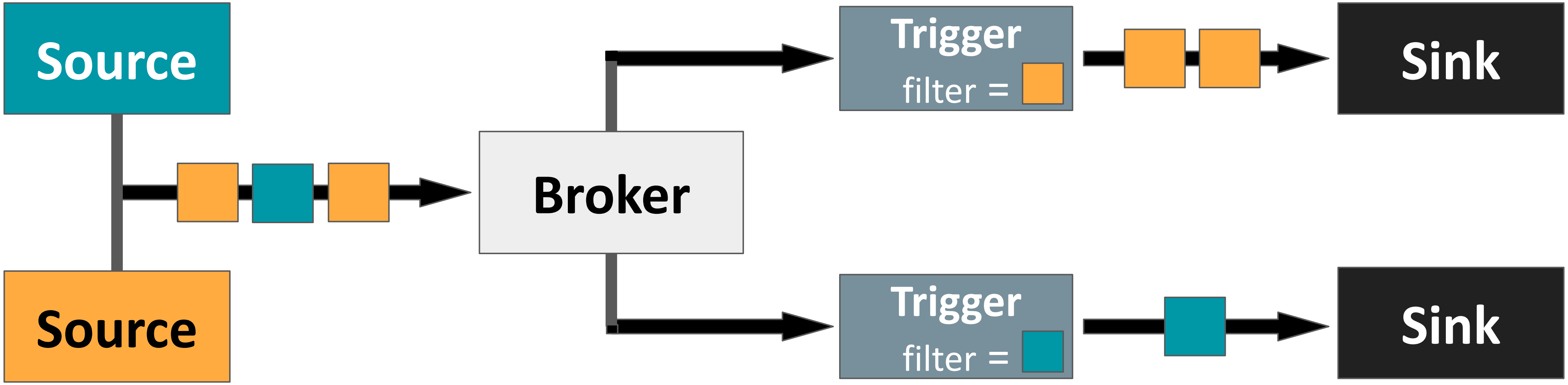
Demo

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, (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
- **Trigger**
  - Filter events (e.g. type and/or source)
  - Can produce new events (returned to Broker)
  - Delivered as CloudEvents

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

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Knative Cookbook

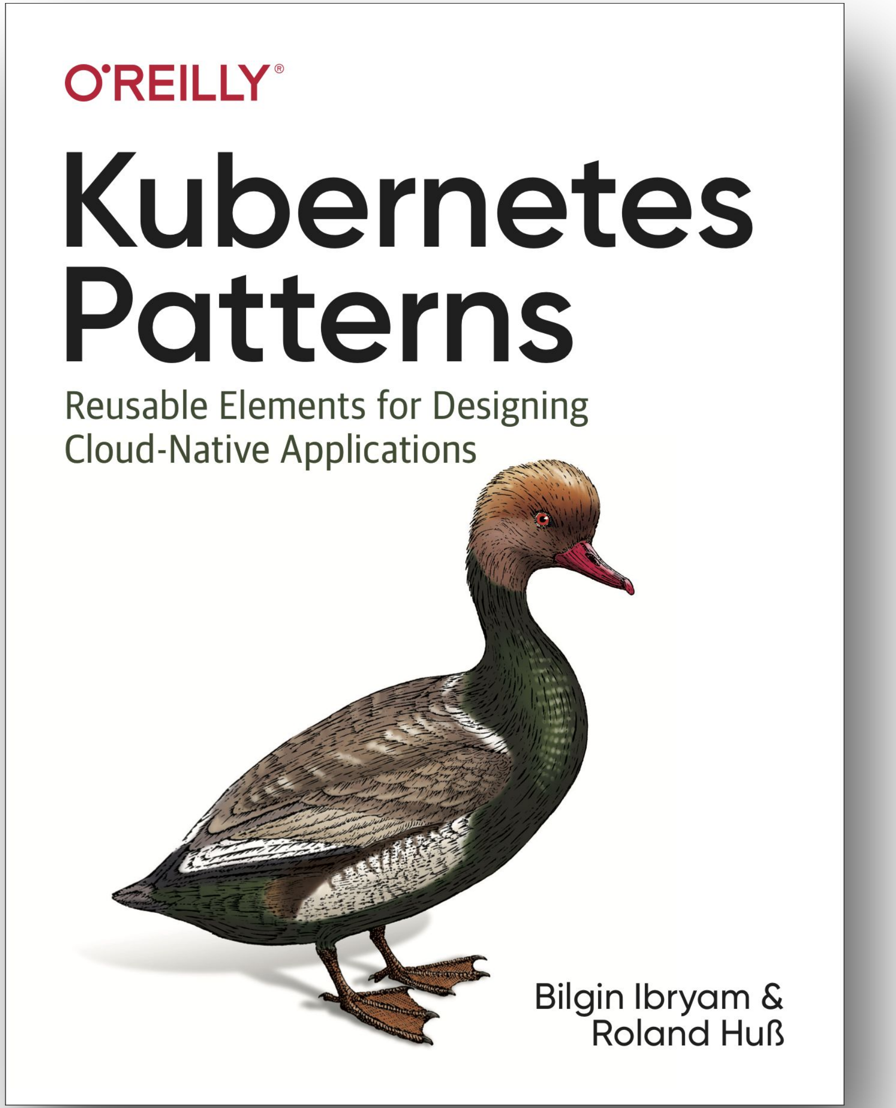
Building Effective Serverless Applications with Kubernetes and OpenShift

Compliments of Red Hat

Burr Sutter &
Kamesh Sampath

http://dn.dev/knative-cookbook

Kubernetes Patterns



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Kubernetes Patterns

Reusable Elements for Designing Cloud-Native Applications

Bilgin Ibryam &
Roland Huß

https://k8spatterns.io

Thank you

🐦 **@ro14nd**

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