Kafka, Serverless, and OpenShift

Empowering Event Driven Architectures Across the Hybrid Cloud

David Brugger

Solution Architect: Application Development

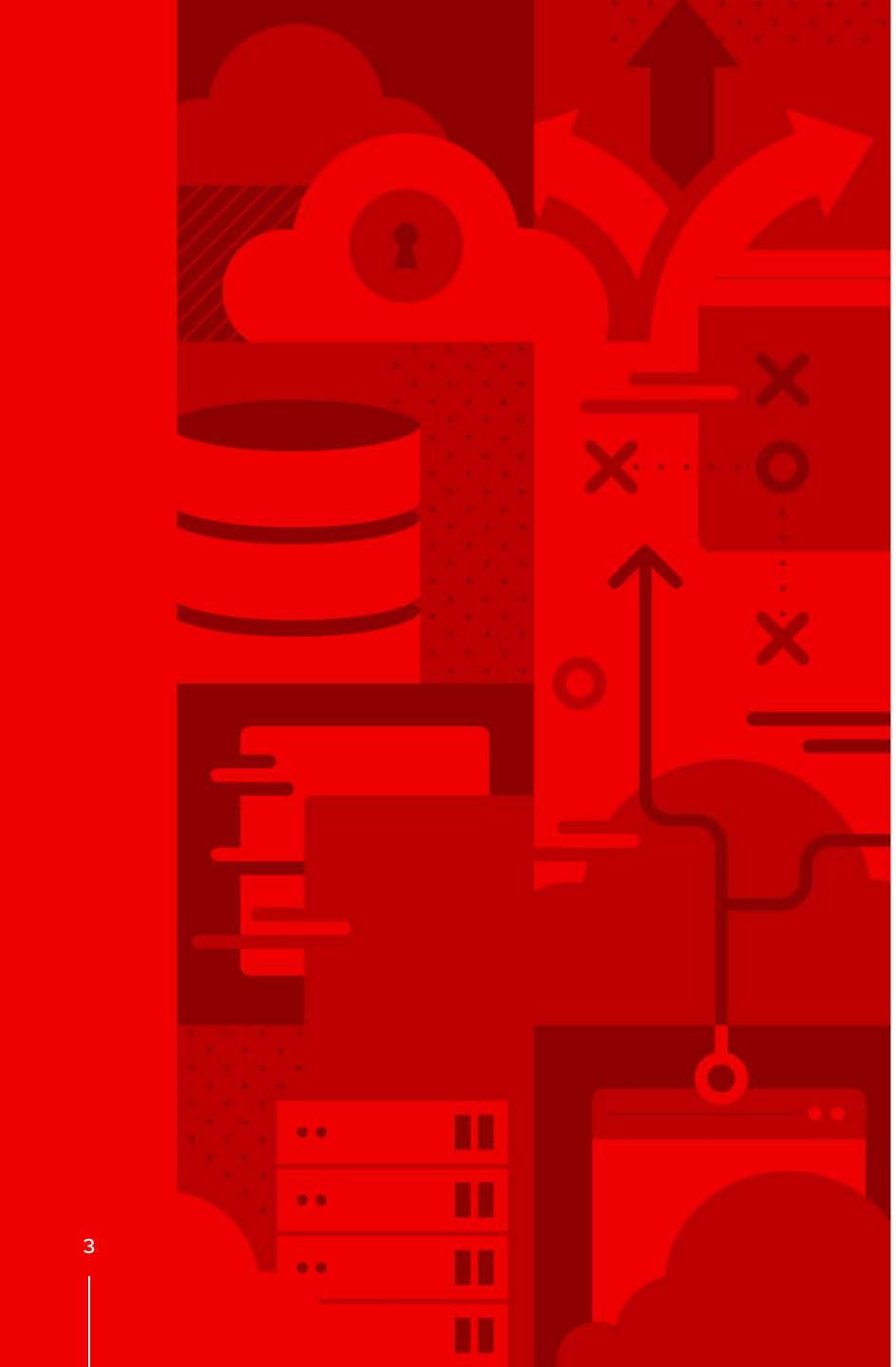
Red Hat

Welcome and Introduction

David Brugger

Specialist Solution Architect for Application Development and Middleware

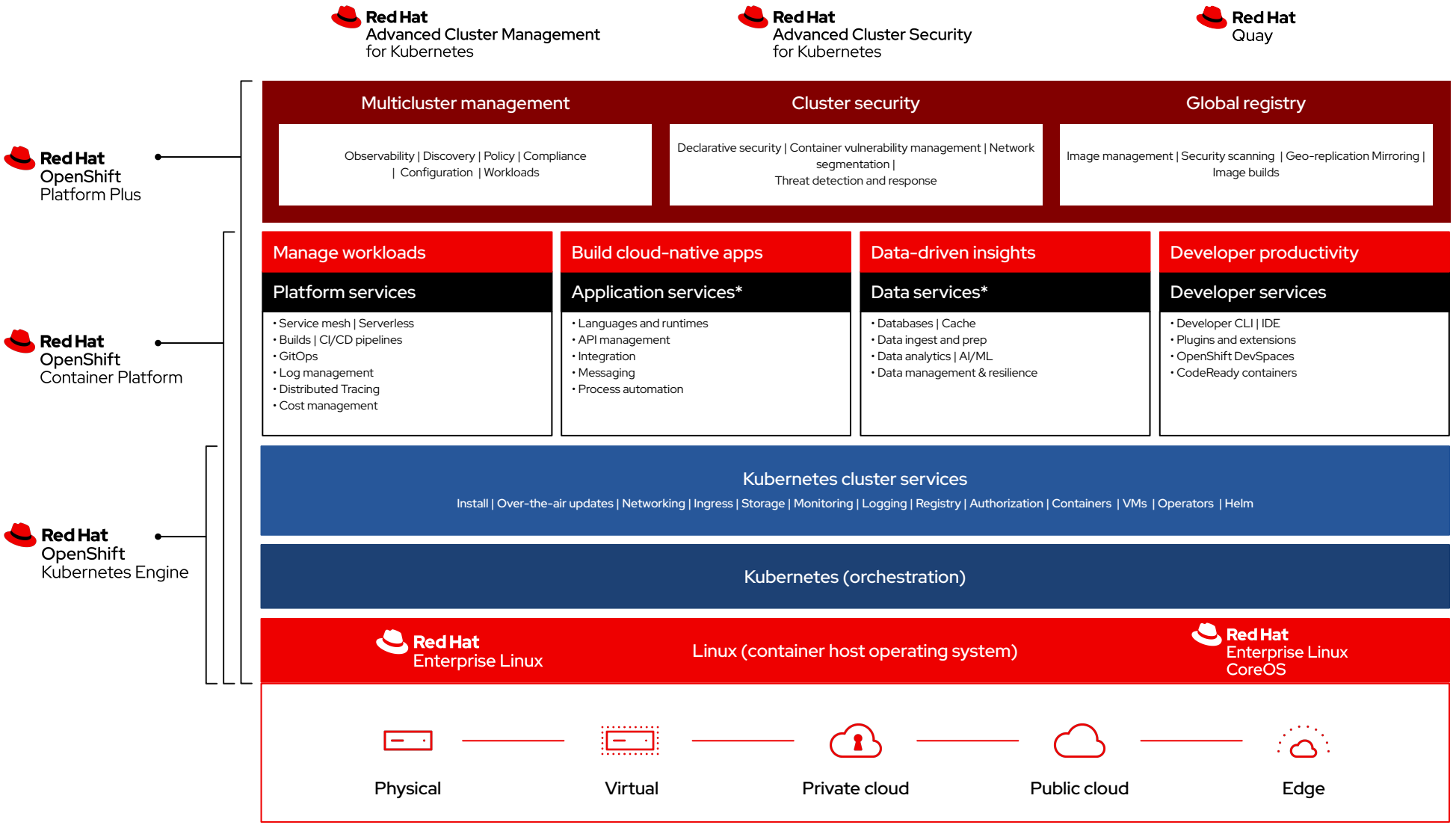
David supports Red Hat customers as a Specialist Solution Architect for Application Development and Middleware, aka Application Services. He has been in Software Development & Solutions Architecture for over 20 years. Within Red Hat, he most recently moved from supporting the Federal Government sector to North America- Commercial.



The Ecosystem

Red Hat

Red Hat OpenShift



OpenShift supports developer productivity

- Red Hat OpenShift service mesh with Istio to connect, secure and observe services
- Red Hat OpenShift serverless with Knative to enable hybrid serverless, FaaS, & event driven architectures
- Red Hat OpenShift pipelines with Tekton to provide Kubernetes-native CI/CD pipelines
- Red Hat OpenShift GitOps with ArgoCD to enable declarative GitOps based continuous delivery
- Red Hat OpenShift builds with Shipwright to build images from code using S2I + other & integrate with Github actions
- Red Hat OpenShift developer console & CLI enhancements to improve dev experience
- OpenShift DevSpaces with Eclipse Che for cloud native development & collaboration
- Red Hat OpenShift IDE plugin integrations to meet the developer where they are
- OpenShift developer sandbox and local cluster enhancements to improve access
- Application level observability for developers to build and manage their apps

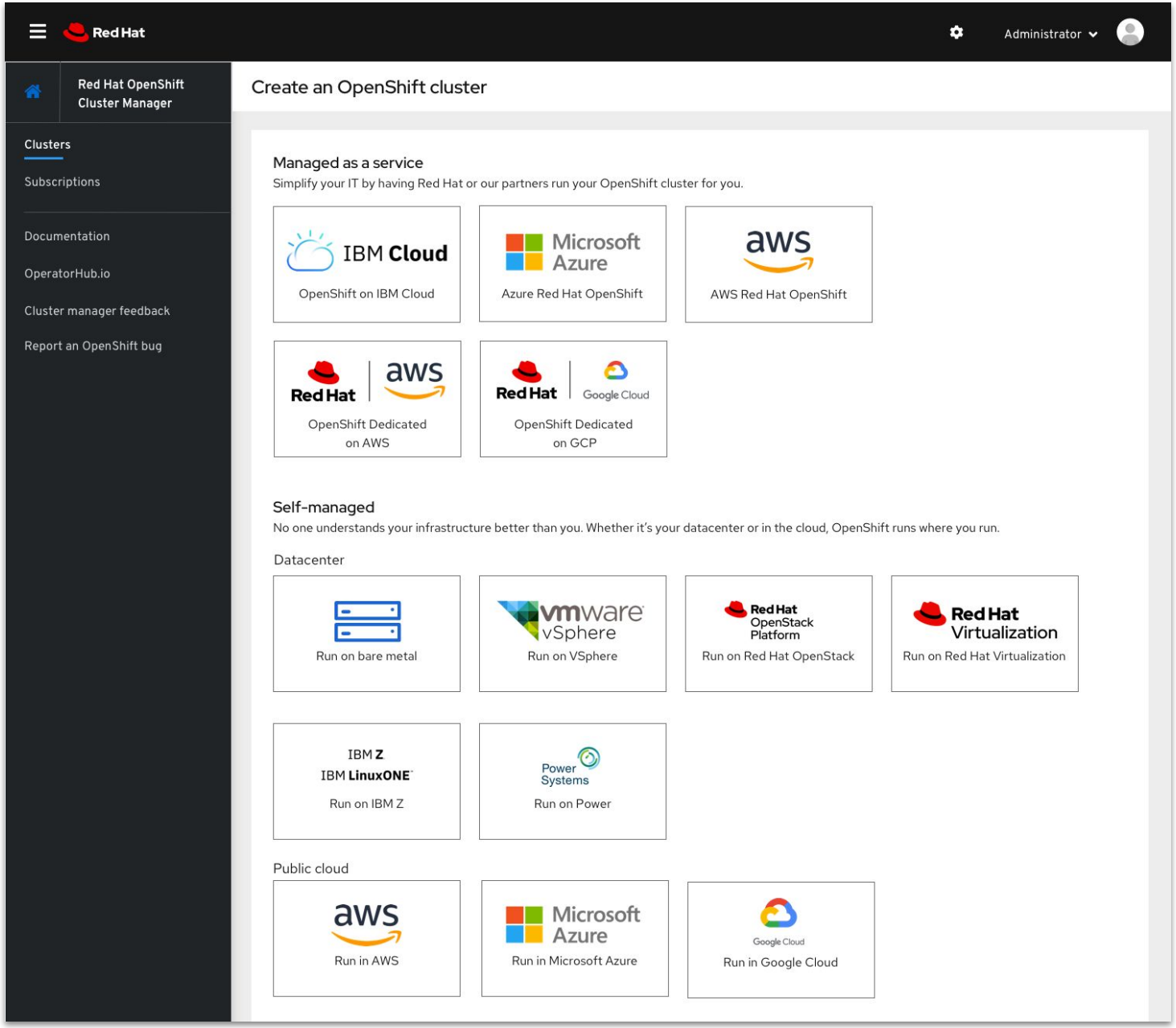
Red Hat

* Red Hat OpenShift® includes supported runtimes for popular languages/frameworks/databases. Additional capabilities listed are from the Red Hat Application and Data Services portfolio.

Red Hat OpenShift

Simplifies Kubernetes and deliver **managed** and **self-managed** options with a number of value added services

- ✓ OpenShift Pipelines
- ✓ OpenShift Service Mesh
- ✓ OpenShift Serverless
- ✓ and rich ecosystem of **Operators**



Red Hat

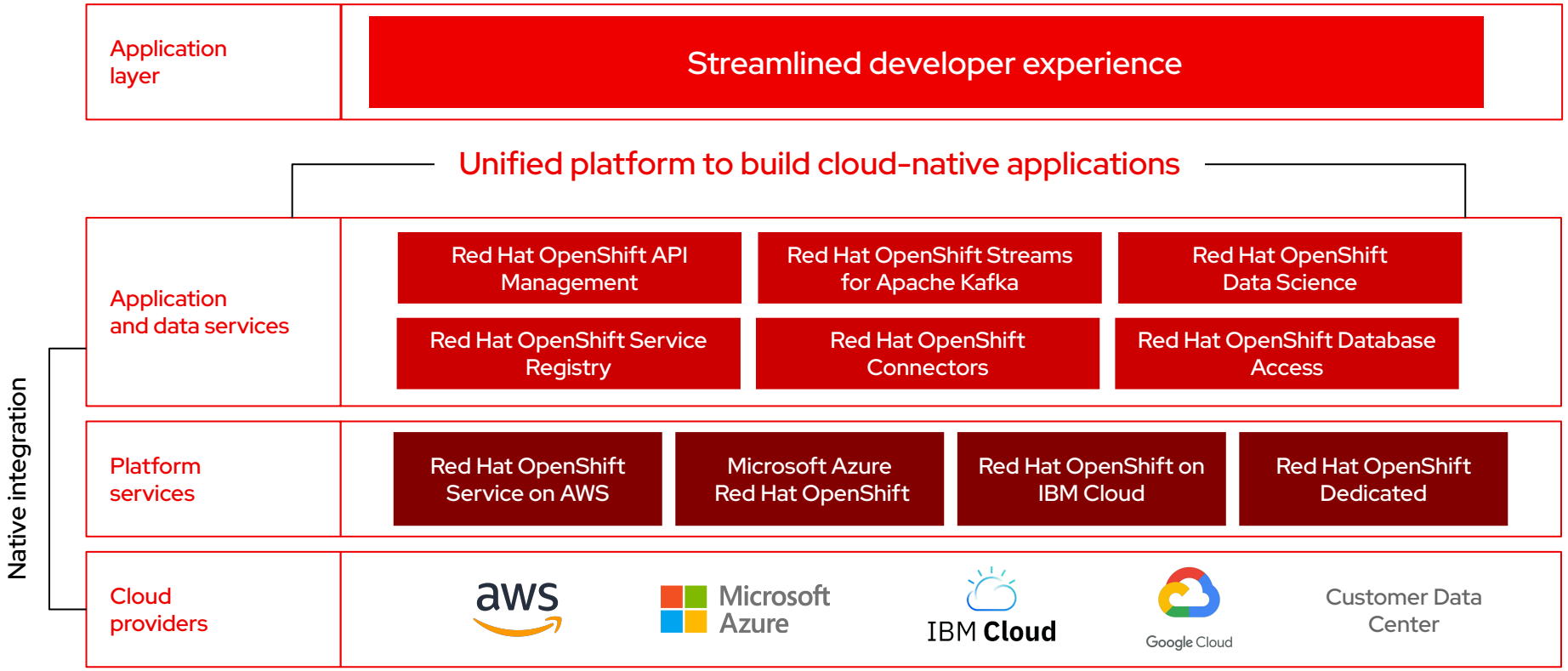
Red Hat Cloud Services

Managed OpenShift + Application Services + Data Services

Full stack management and unified experience

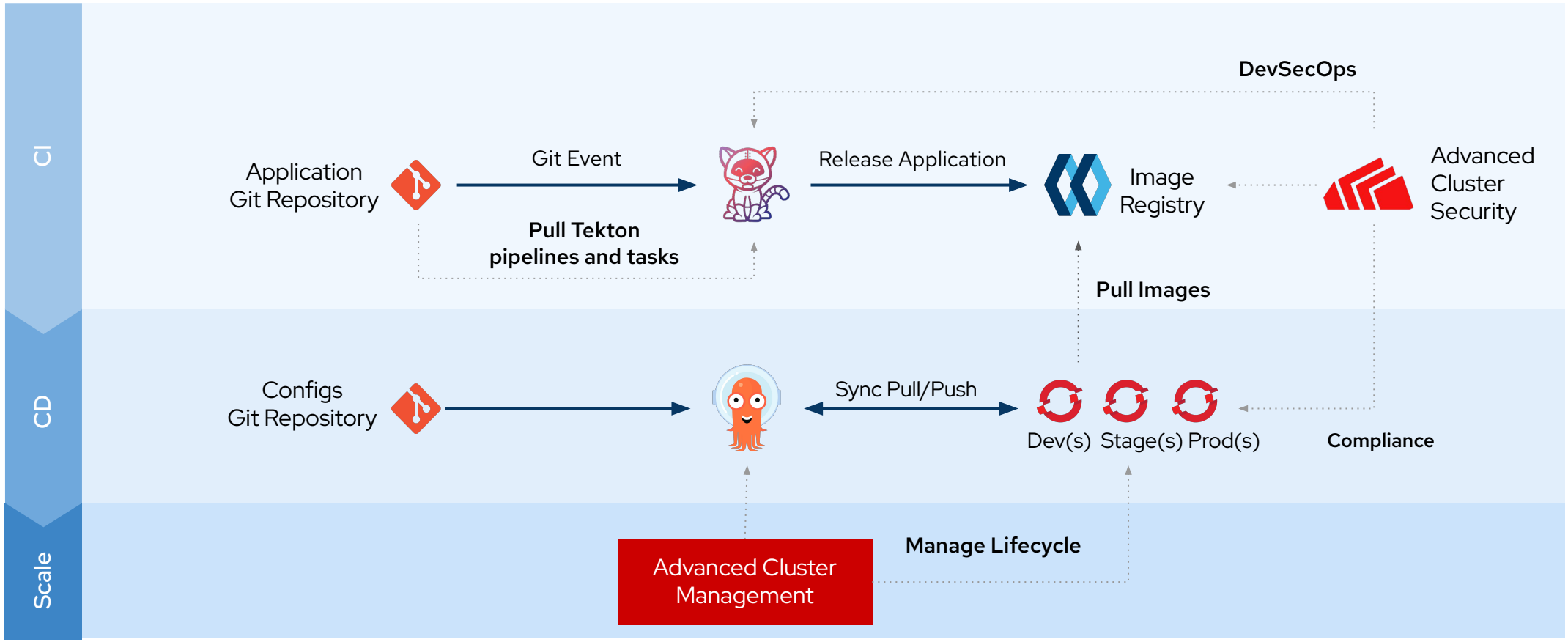
Maximize full value of Red Hat OpenShift

Hybrid cloud flexibility



Red Hat

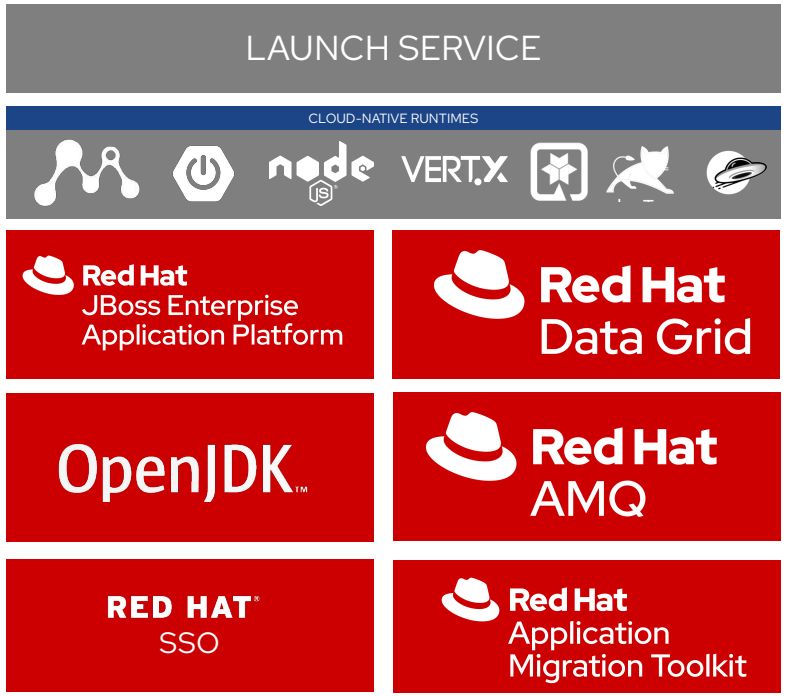
Declarative CI & App Delivery with GitOps



Red Hat

Red Hat Runtimes

Offering lightweight runtimes and frameworks for highly-distributed **cloud native** architectures such as microservices or serverless, with distributed in-memory caching for fast data access, single sign-on for authentication and authorization, and durable messaging for reliable data transfer between existing and new applications.



- Best-of-breed runtimes, frameworks and languages
- OpenShift & Kubernetes Services native integration
- Modernization and optimization initiatives
- Established middleware technologies (EAP)
- In-memory data grid
- Standards-based enterprise messaging
- SSO authentication

Red Hat

Guided Choice Of Runtimes & Languages

ENTERPRISE JAVA

Red Hat JBoss Enterprise Application Platform

JAKARTA EE

SPRING APPS

spring

Apache Tomcat

JAVA MICROSERVICES

MICROPROFILE

THORNTAIL

JAVASCRIPT FLEXIBILITY

node JS

REACTIVE SYSTEMS

VERT.X

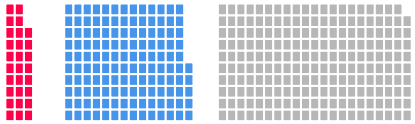
TOMCAT SIMPLICITY

Red Hat JBoss Web Server

QUARKUS

Kubernetes-Native Development with Quarkus

TIOBE : #1
IEEE : #1
SlashData : #2
RedMonk : #2



Solid Foundation

Java consistently ranks in the Top 3 of programming languages in use today with a community of 7-10 million developers.

Stunning Performance

Optimized to provide native-level memory footprint and startup time, allowing for increased density, performance and elasticity at lower cost.

Toolchain

End-to-end toolchain including OpenShift Developer Console, Code Ready Workspaces, project generators in IDE and web, live-reload for lightning fast inner loop workflow, and Tekton pipelines integration.

Community

Large catalog of extensions connects your applications with best of breed-technologies including Camel, Jaeger, Prometheus, Istio, Kafka and more.

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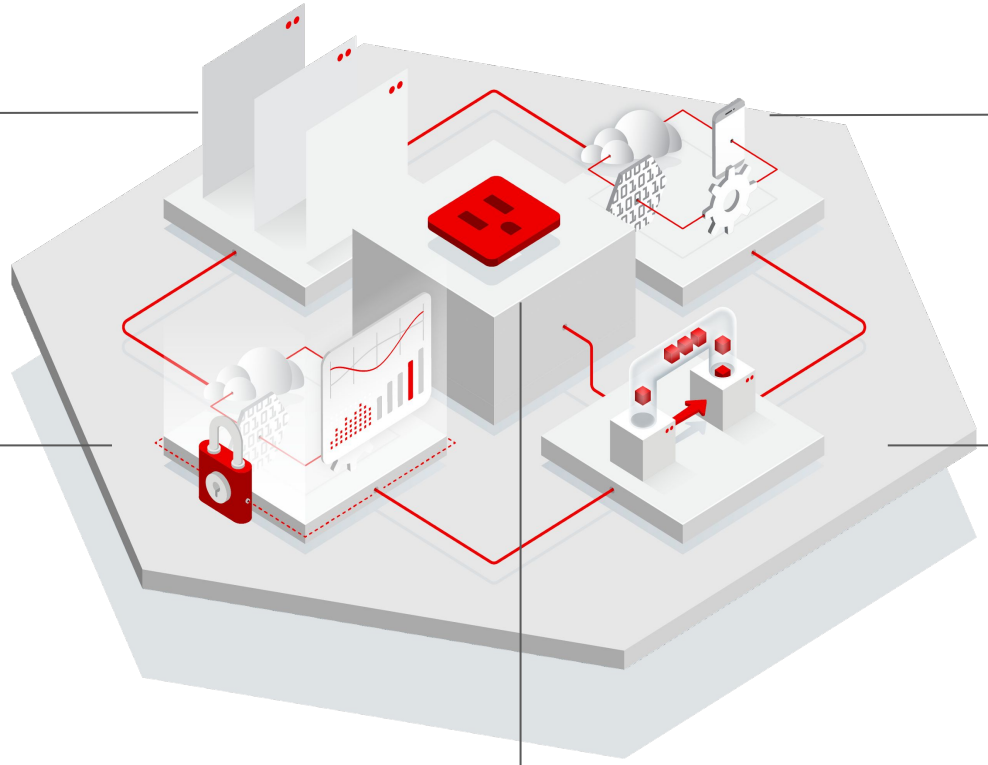
Red Hat Integration

Data Integration

- Change Data Capture with Debezium

API Management

- API Manager
- API Gateway
- Istio Service Mesh Adapter



Tooling & Metadata

- Service Registry (TP)
- API Designer

Enterprise Integration

- Comprehensive connectors
- Microservices orchestration
- Data Transformation
- Low-code iPaaS
- Serverless Composition with Camel K

Events & Messaging

- JMS Message Broker
- Wide Area Routing
- Data Streaming with Apache Kafka
- Self-service messaging

Source

Red Hat

Command Line Heroes : Major Options

oc new-app
- S2i (Git and binary)
- Dockerfile
- Custom

oc apply -f file.yaml

oc new-build
oc start-build
oc ...

odo
- catalog (odo create *java* sample-app)
- devfile mode

Maven (and other language build/package tools)

mvn
- jvm, native, Dockerfile
- local, ocp, serverless

container (mgmt/create/deploy)
- **podman**
- **buildah**
- **skopeo**

Quay

knative serverless
kn
- serving
- eventing
- functions

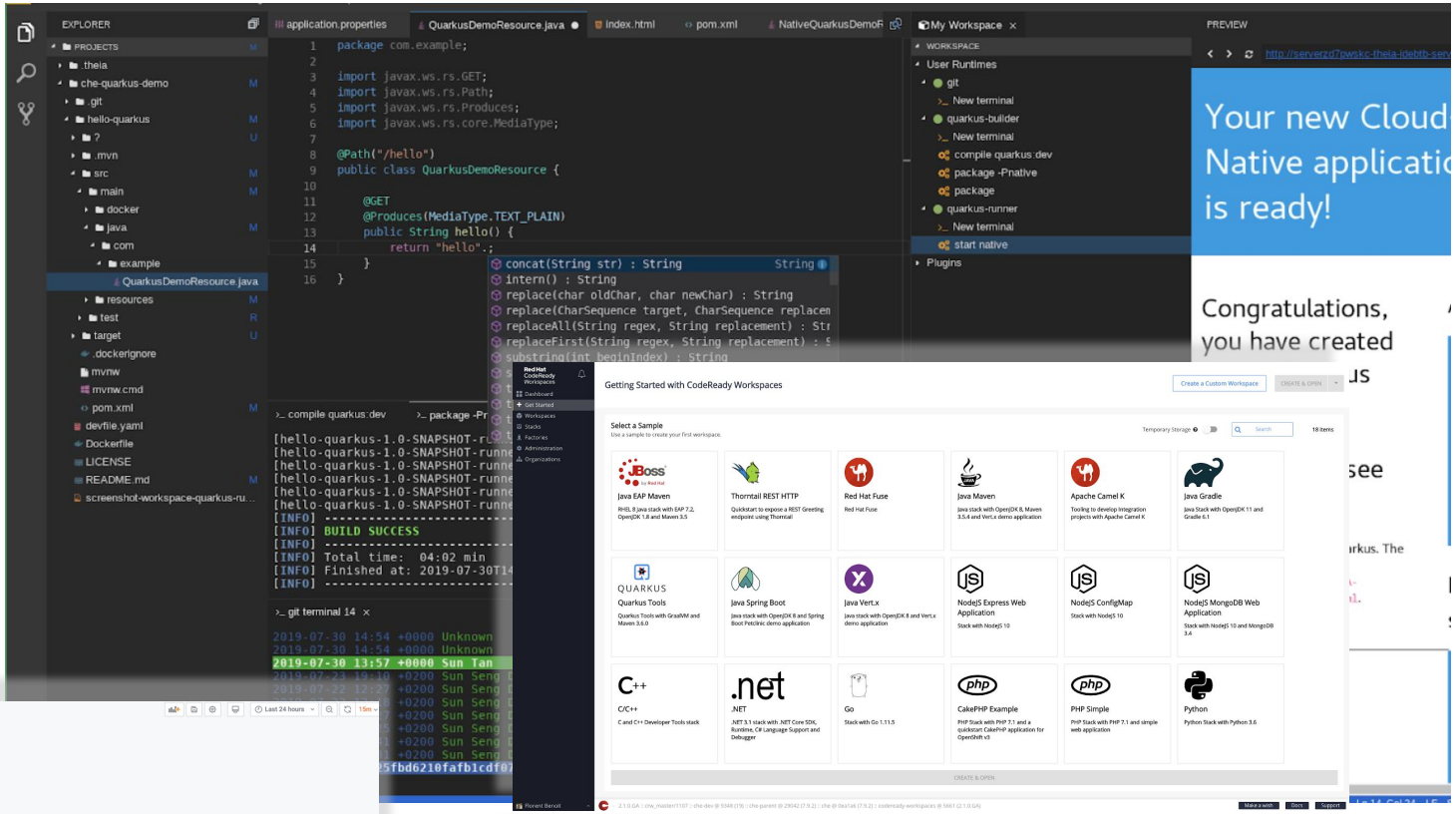
Camel K
kamel
- serverless routes
- kamelets

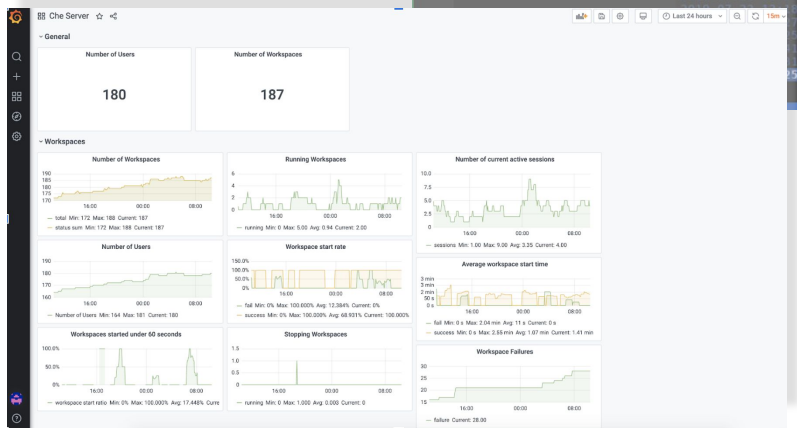
Red Hat

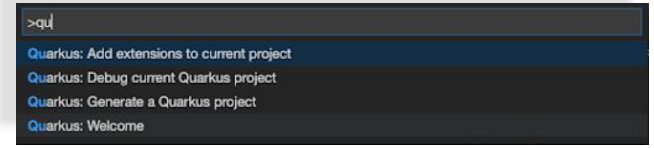
Red Hat OpenShift Dev Spaces

The OpenShift-Native Developer Workspace Server and IDE

- In-Browser IDE
- one-click Onboarding of Developers
- Broad set of Application Runtimes and Languages, and plug-ins
- Secure Authentication via Red Hat SSO
- Inner Loop easy live updates, preview pane
- Central Standardization and Management
- Link to Repositories, Enable Teams







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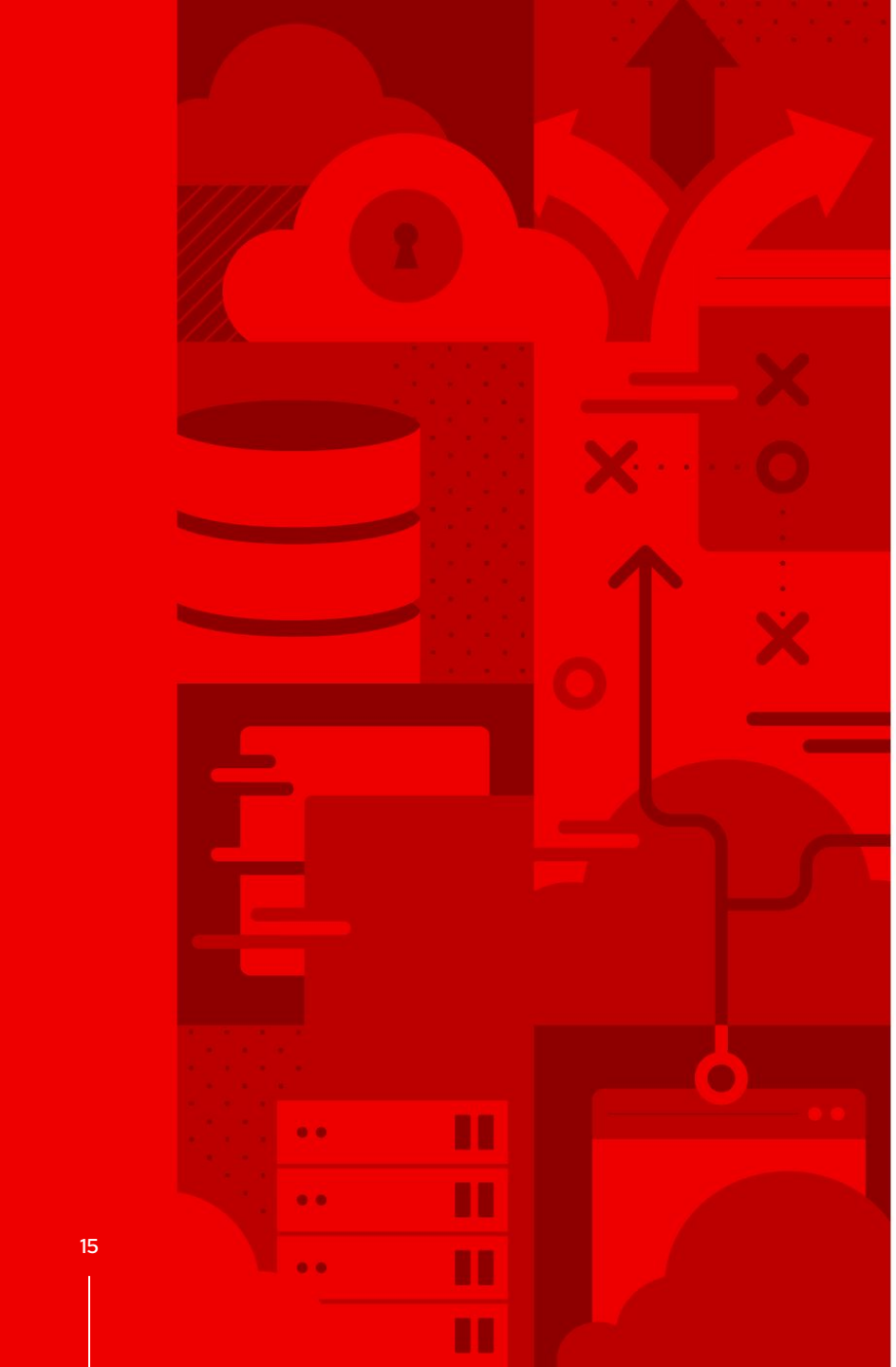
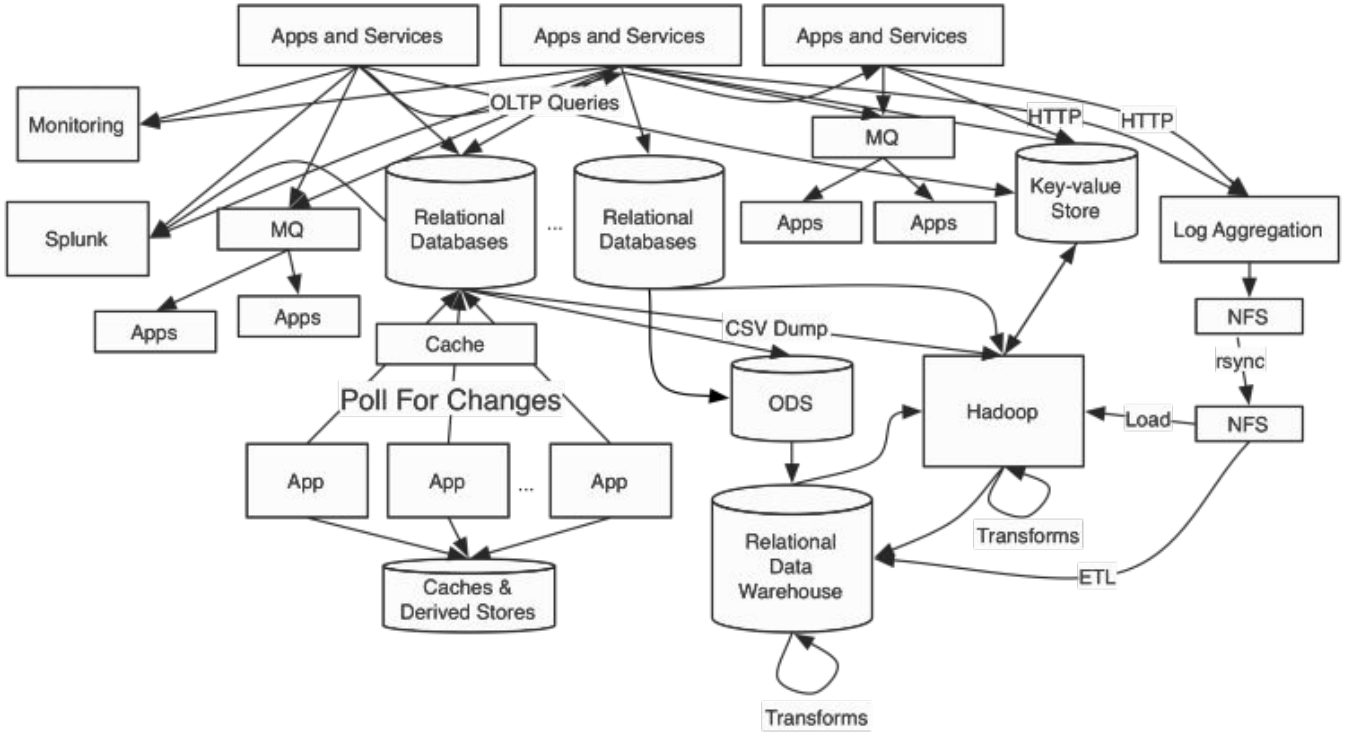


Event Driven Architecture
EDA

Red Hat

Data Integration Systems Today



Passive storage-based data systems “data warehouse” / “data lake”

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Why Event-Driven Architecture

Mirrors the real world

The real world is event-driven. Systems generate and respond to events in everyday life, e.g., the human central nervous system.

Reduced coupling

Traditional RPC-style service architecture results in tightly-bound services. Changes to the application flow typically require service code changes. EDA allows new functionality to be added by adding services that consume existing event streams.

Encapsulation

Microservices concepts have grown in popularity due to the ability for service teams to develop services in isolation. EDA means that service designers need not be aware of how events are consumed.

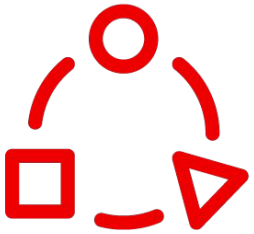
Fine-grained scaling

Services can be independently scaled up and down to meet the event volume.

Near real-time latency

Customers increasing expect a near real-time experience. Polling on APIs is a delicate trade-off between responsiveness and load. EDA allow apps to react in near real-time without compromise.

Event-driven architecture use cases



Reactive notification

Behavior capture

Cache store

Complex event processing

Command query responsibility segregation (CQRS)

Streaming between data centers

Auditing

Source:

Red Hat

AI/ML powered intelligent software apps can help you achieve key business goals

Serve your customers better

Gain a competitive advantage

Increase your revenue

Reduce your costs

Why Event Driven Architecture (EDA)

Respond to business events in real time. Adapt faster, Get Faster Insights!

Immersive websites

Predictive analytics

Situational Awareness

Incident management

AI / ML

Edge

Fleet management

What is Apache Kafka?

Open-source distributed event streaming platform

Learn more on the Apache Kafka community page:
https://kafka.apache.org/

Apache Kafka is a distributed system designed for streams. It is built to be an high-availability, horizontally-scalable, fault-tolerant, commit log, and allows distributed data streams and stream processing applications.

Known use cases are:

- High-performance data pipelines
- Streaming analytics
- Data integration
- Event bus in Event Driven Architecture

Kafka in use today

Digital experiences

Delivers real-time experiences with immediate access to information and response time

Microservices applications

Loosely couples microservices so development teams can remain agile

Streaming ETL

Modernize applications driven by batch data for real-time performance

Real-time analytics

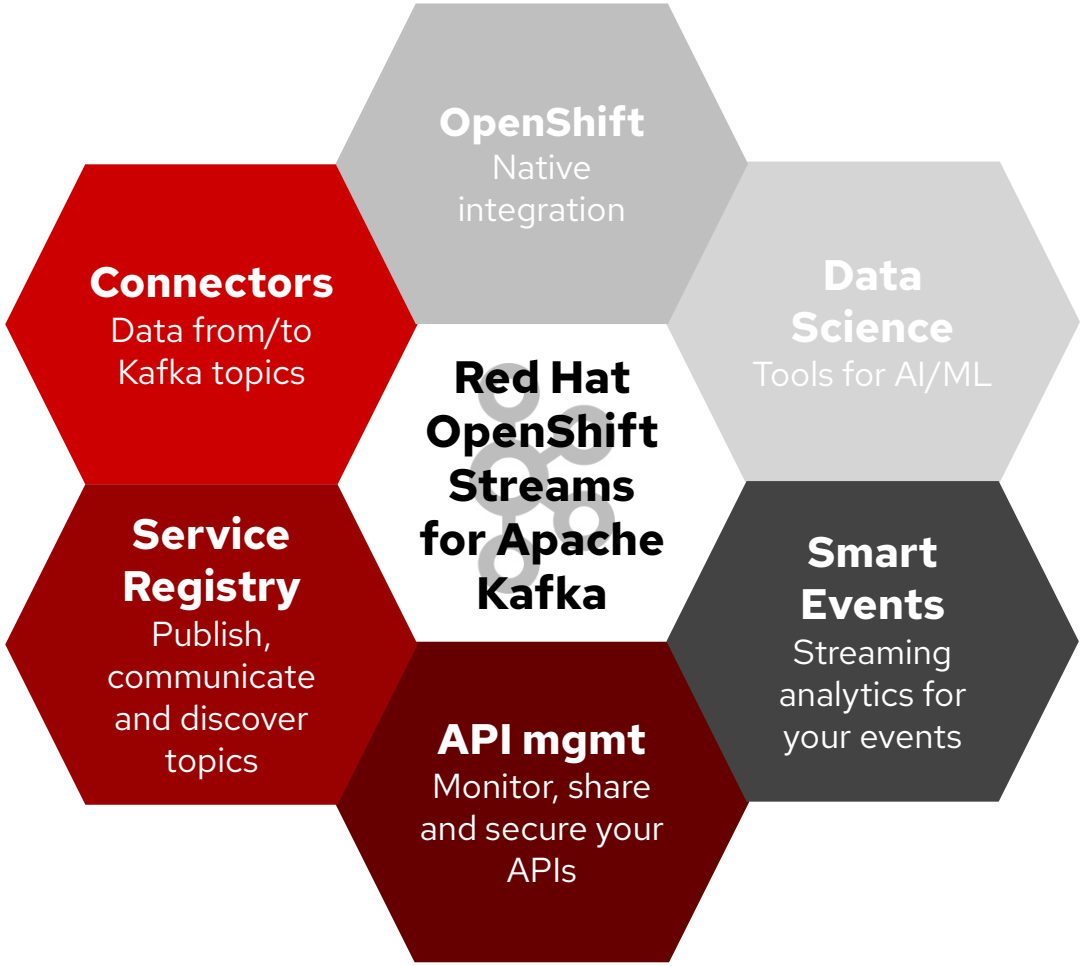
Ingest data from multiple sources for better business insights

Edge & hybrid scenarios

Collect data from diverse and disparate devices and systems

The Red Hat Kafka Ecosystem

Simplify the delivery of stream-based applications in public and private clouds

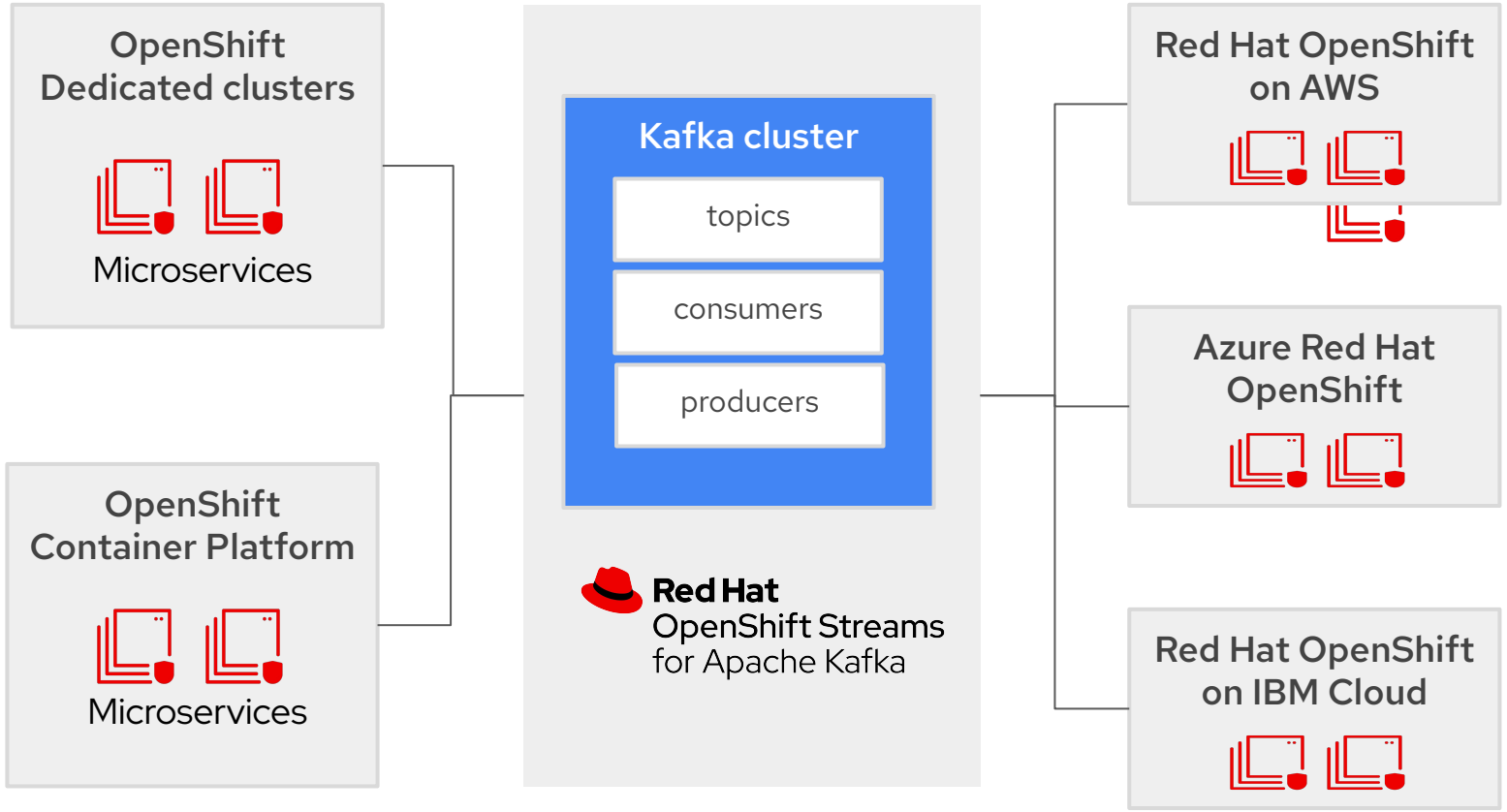


Red Hat is delivering a set of cloud services that support building, deploying and maintaining stream-based applications that require:

- Streamlined developer experience
- Integration with the platform and between the services
- Shared identity management and access controls
- Red Hat Management with 24x7 support and 99.95% SLA

Streams for Apache Kafka and OpenShift

Seamless operations across hybrid-cloud environments



- Many clouds, same Kafka instance
- Kafka infrastructure is hidden
- Service bindings: Easy to connect
- Schema registry: easy to discover

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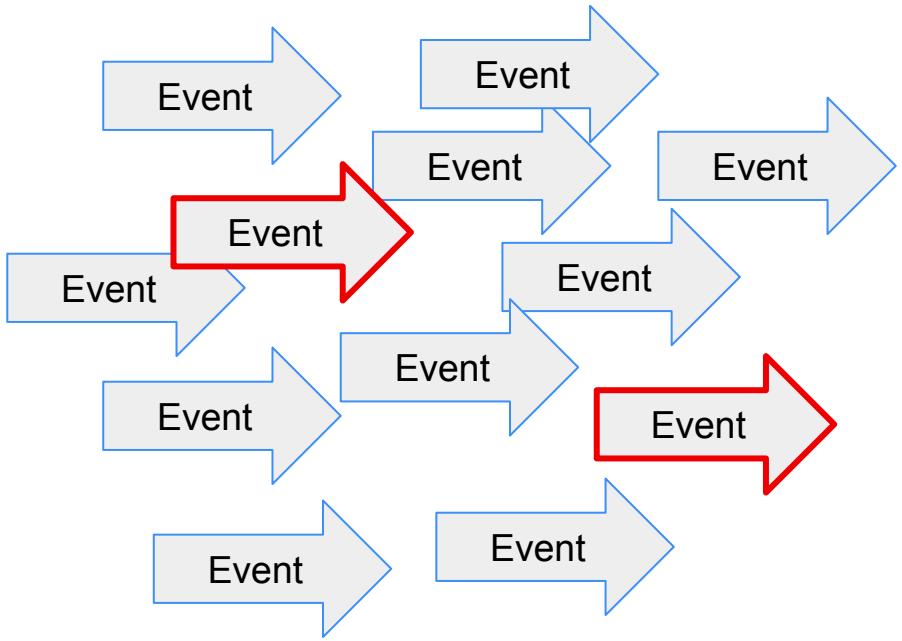
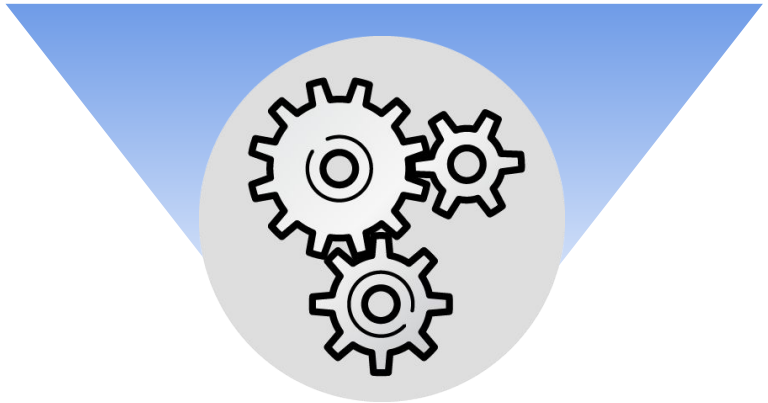
Why Event Driven Decisioning?

- An event is a significant change of state at a particular point in time



when
- the transaction amount is high
- the email is changed less than 36 hours ago

then
- trigger fraud investigation



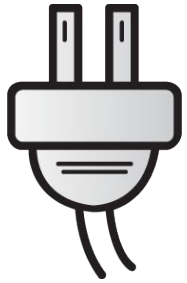
APACHE Camel

PATTERN BASED INTEGRATION

Apache Camel, a powerful pattern-based integration engine with a comprehensive set of connectors and data formats to tackle any integration problem.

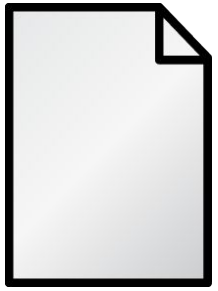
ENTERPRISE INTEGRATION PATTERNS

Build integrations using enterprise best practices.



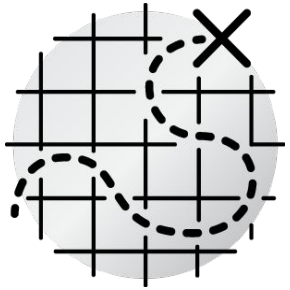
300 COMPONENTS

Batch, messaging, web services, cloud, APIs, and more ...



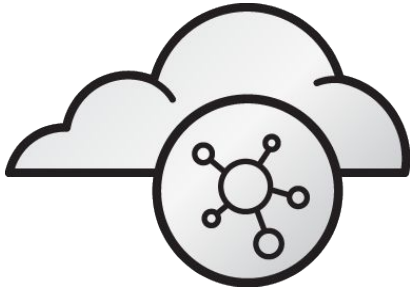
BUILT-IN DATA TRANSFORMATION

JSON, XML, HL7, YAML, SOAP, Java, CSV, and more ...



INTUITIVE ROUTING

Develop integrations quickly in Java or XML.



NATIVE REST SUPPORT

Create, connect, and compose APIs with ease.

camel.apache.org/camel-kamelets/latest/index.html

BLOG DOCUMENTATION COMMUNITY DOWNLOAD

Search

Kamelet Catalog

Edit this Page

Kamelet Catalog

- AWS DynamoDB Streams Source
- AWS Kinesis Firehose Sink
- AWS Kinesis Sink
- AWS Kinesis Source
- AWS Lambda Sink
- AWS S3 Sink
- AWS S3 Source
- AWS S3 Streaming upload Sink
- AWS SNS FIFO Sink
- AWS SNS Sink
- AWS SQS Batch Sink
- AWS SQS FIFO Sink
- AWS SQS Sink
- AWS SQS Source

KAMELET CATALOG

This page contains the default Apache Camel Kamelets catalog. **We love contributions for this catalog**: you can follow the Kamelets Developer Guide for information on how to create new Kamelets and contribute them to the official github.com/apache/camel-kamelets repository.

AWS DynamoDB Streams Source

AWS Kinesis Firehose Sink

AWS Kinesis Sink

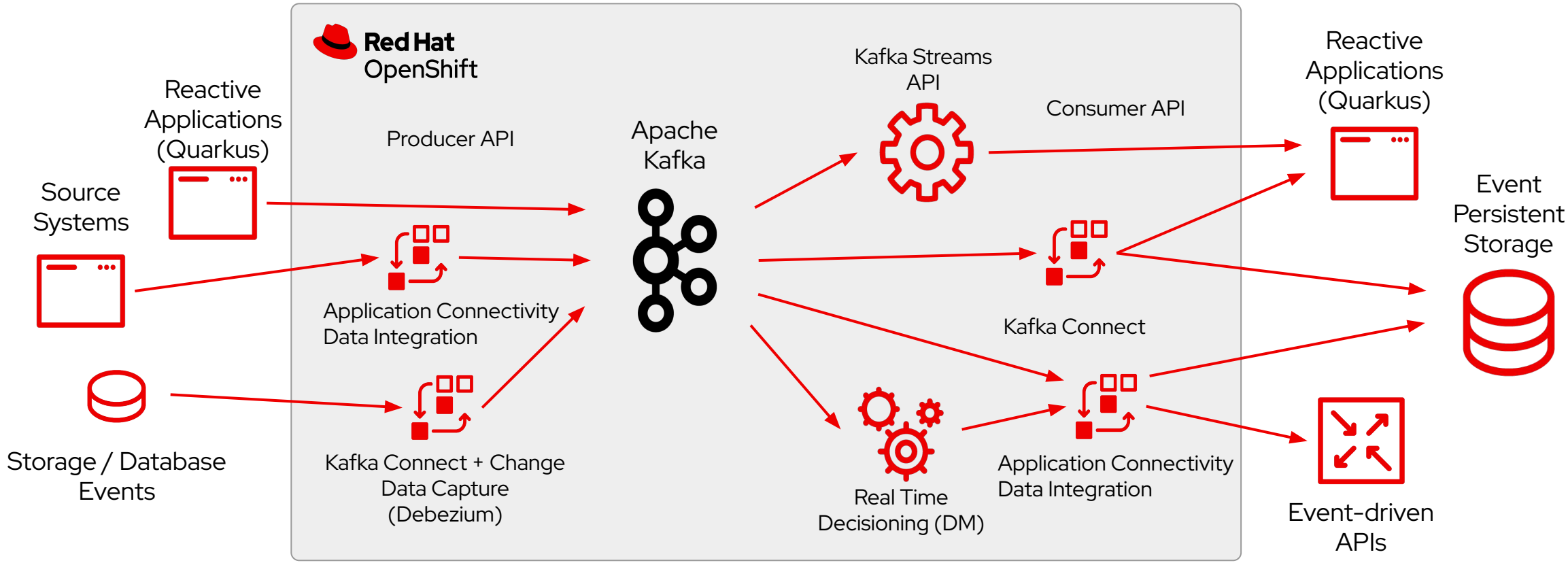
AWS Kinesis Source

AWS Lambda Sink

AWS S3 Sink

Red Hat's Portfolio of capabilities for EDA

EDA requires more than just Kafka



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What is Knative ?

Serving

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

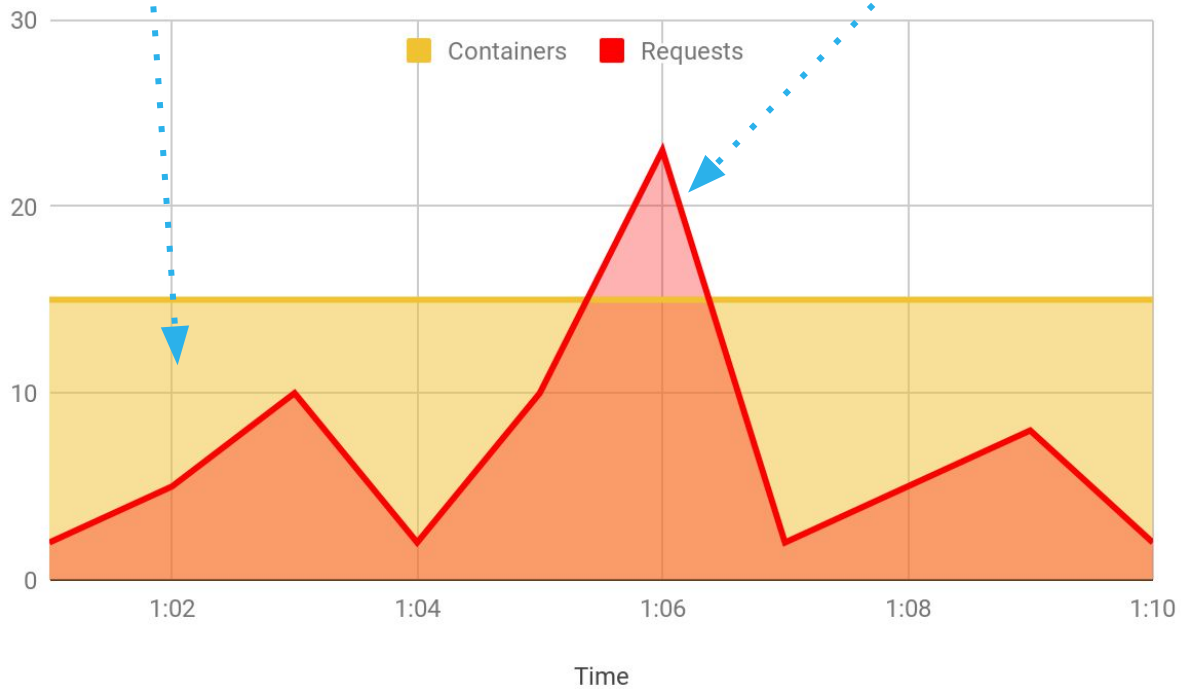
Eventing

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

Serverless Operational Benefits

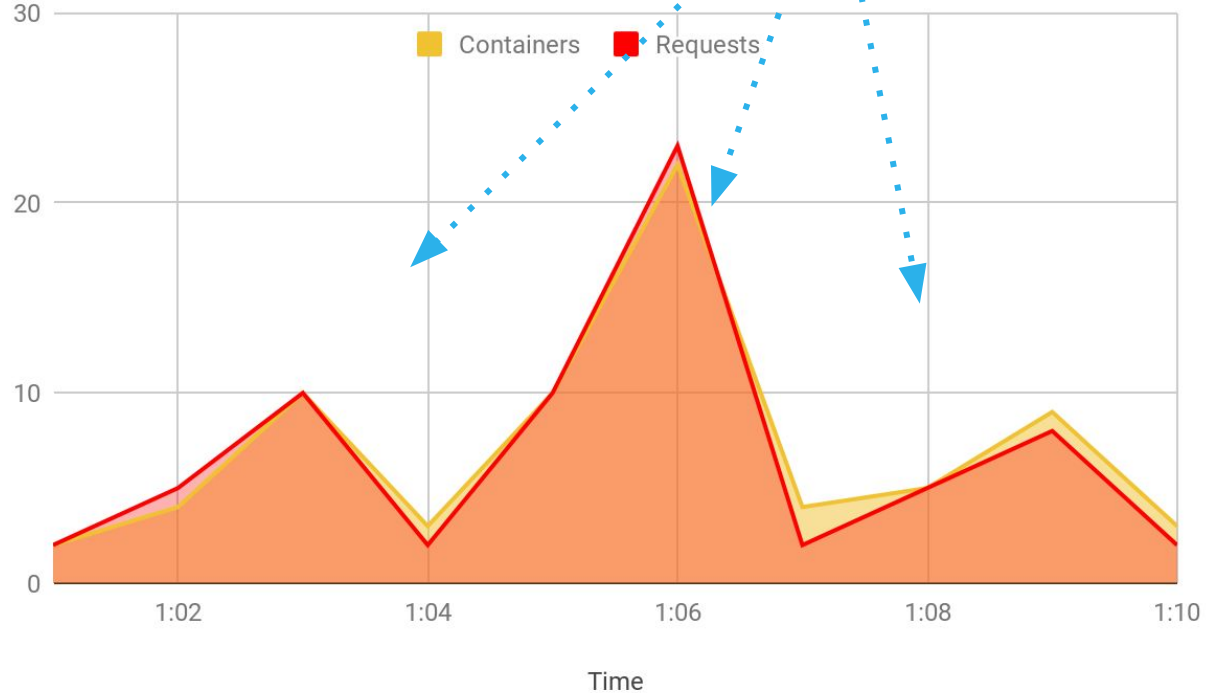
Over provisioning
Time in capacity planning
IT cost of idle resources

Under provisioning
Lost business revenue
Poor quality of service



NOT Serverless

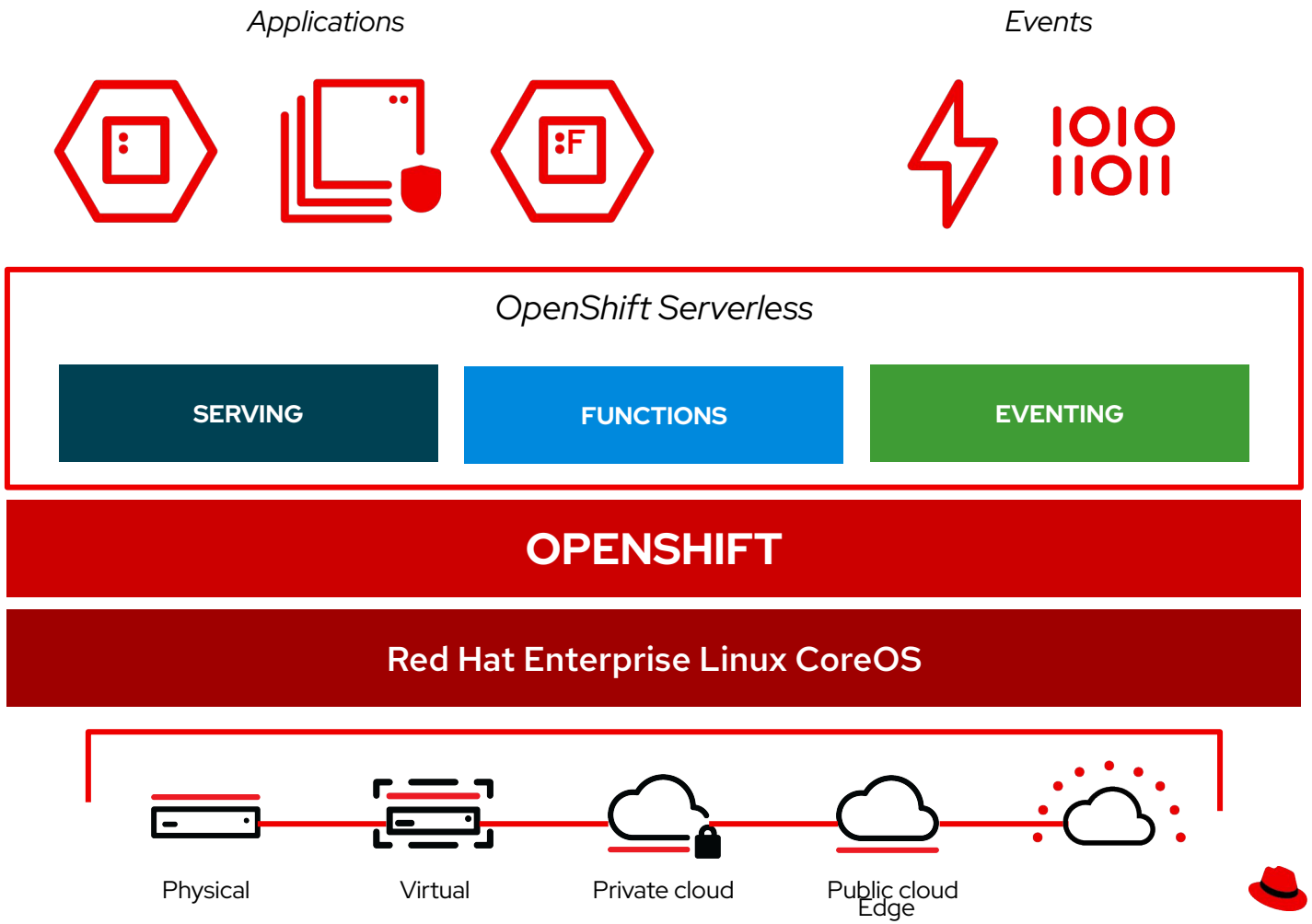
More applications
Direct line between IT
costs & business revenue



with Serverless

What is OpenShift Serverless ?

- ✓ Knative Serving and Eventing
- ✓ Functions
- ✓ Operator based install
- ✓ Great User Experience



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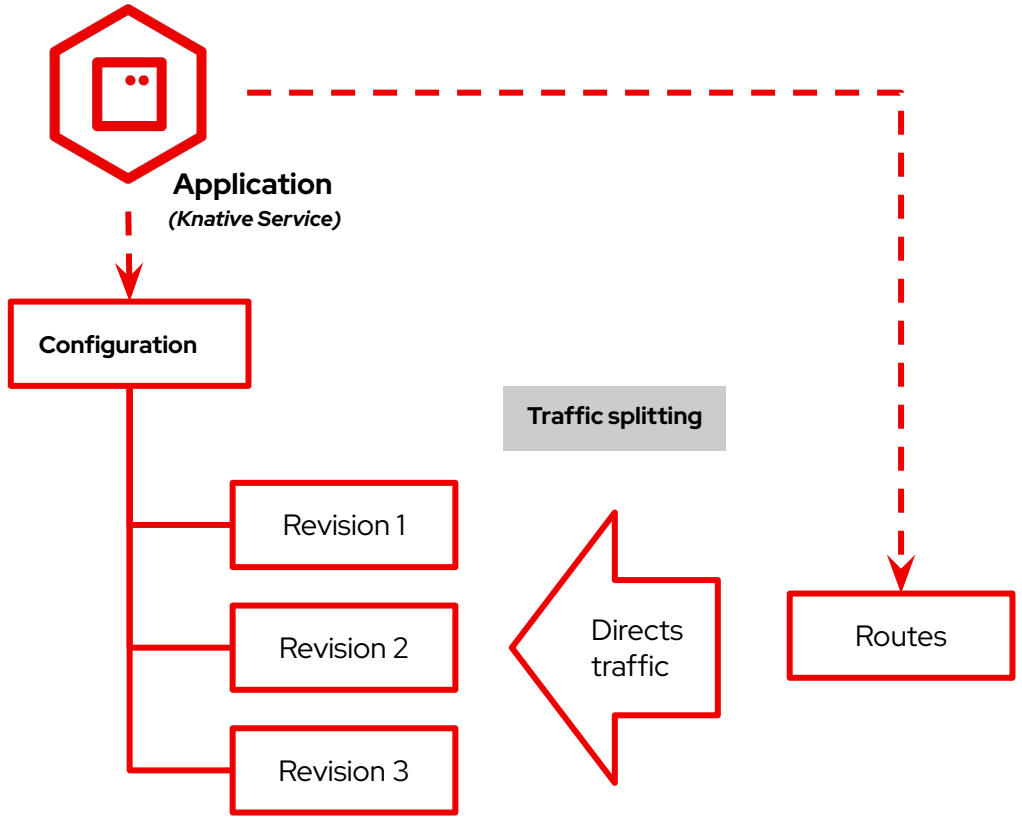
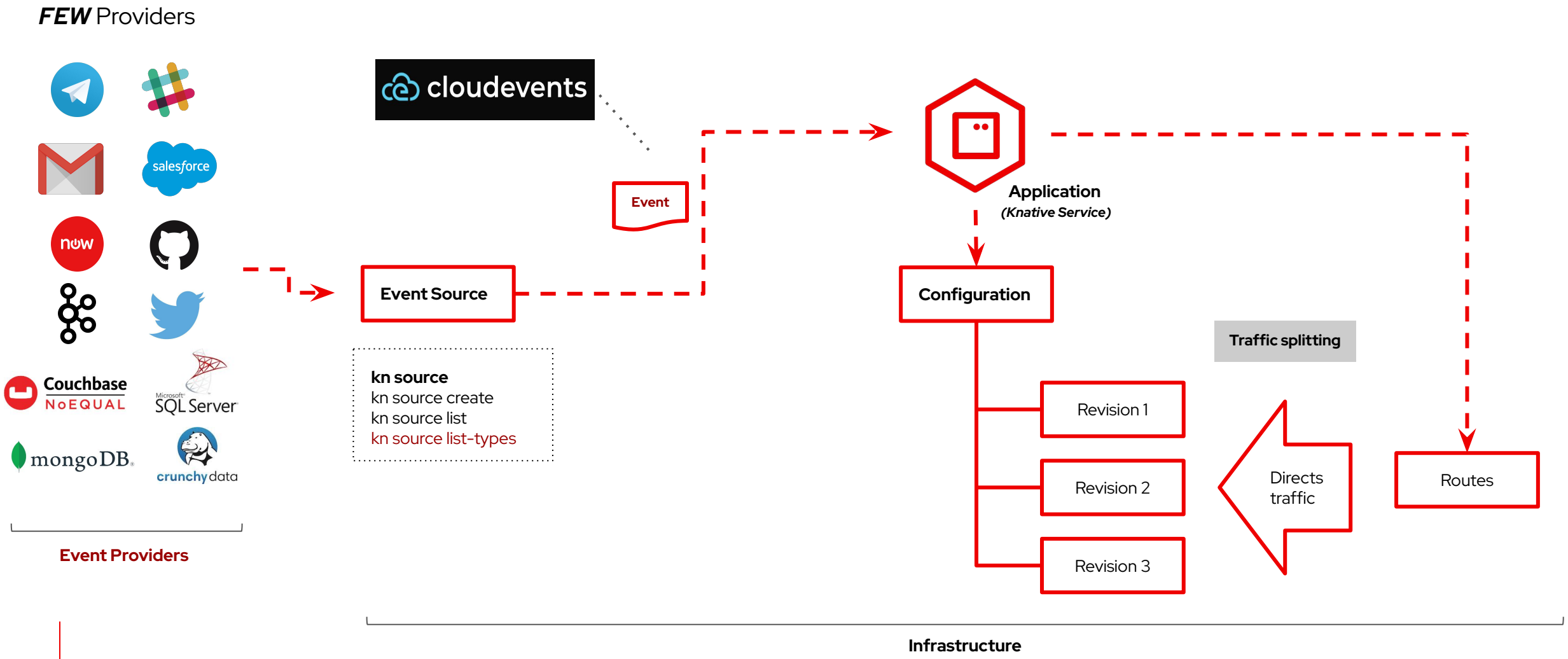
Serving

- From container to URL within seconds
- Easier developer experience for Kubernetes
- Built-in versioning, traffic split and more
- Simplified Installation experience with Kourier
- Automatic TLS/SSL for Applications



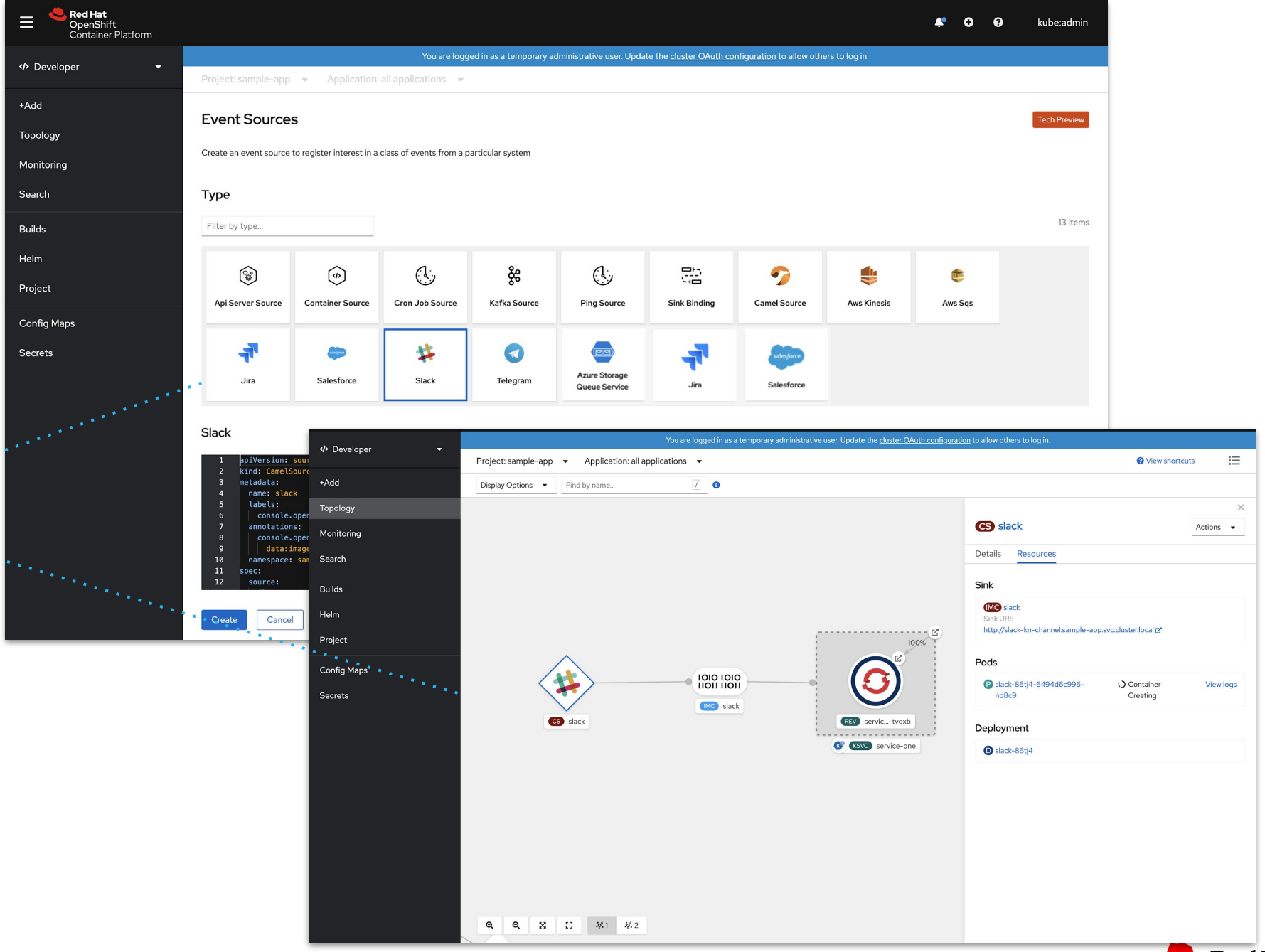
Eventing


FEW Providers
cloudevents
Event
Application
(Knative Service)
Event Source
Configuration
Traffic splitting
kn source
kn source create
kn source list
kn source list-types
Revision 1
Revision 2
Revision 3
Directs traffic
Routes
Event Providers
Infrastructure

More event sources powered by Camel-K

- AWS Kinesis
- AWS SNS Queue Services
- Azure Storage Blob Service
- Azure Storage Queue Service
- Jira
- Salesforce
- Telegram
- Slack

"Connect your application with anything, anywhere."



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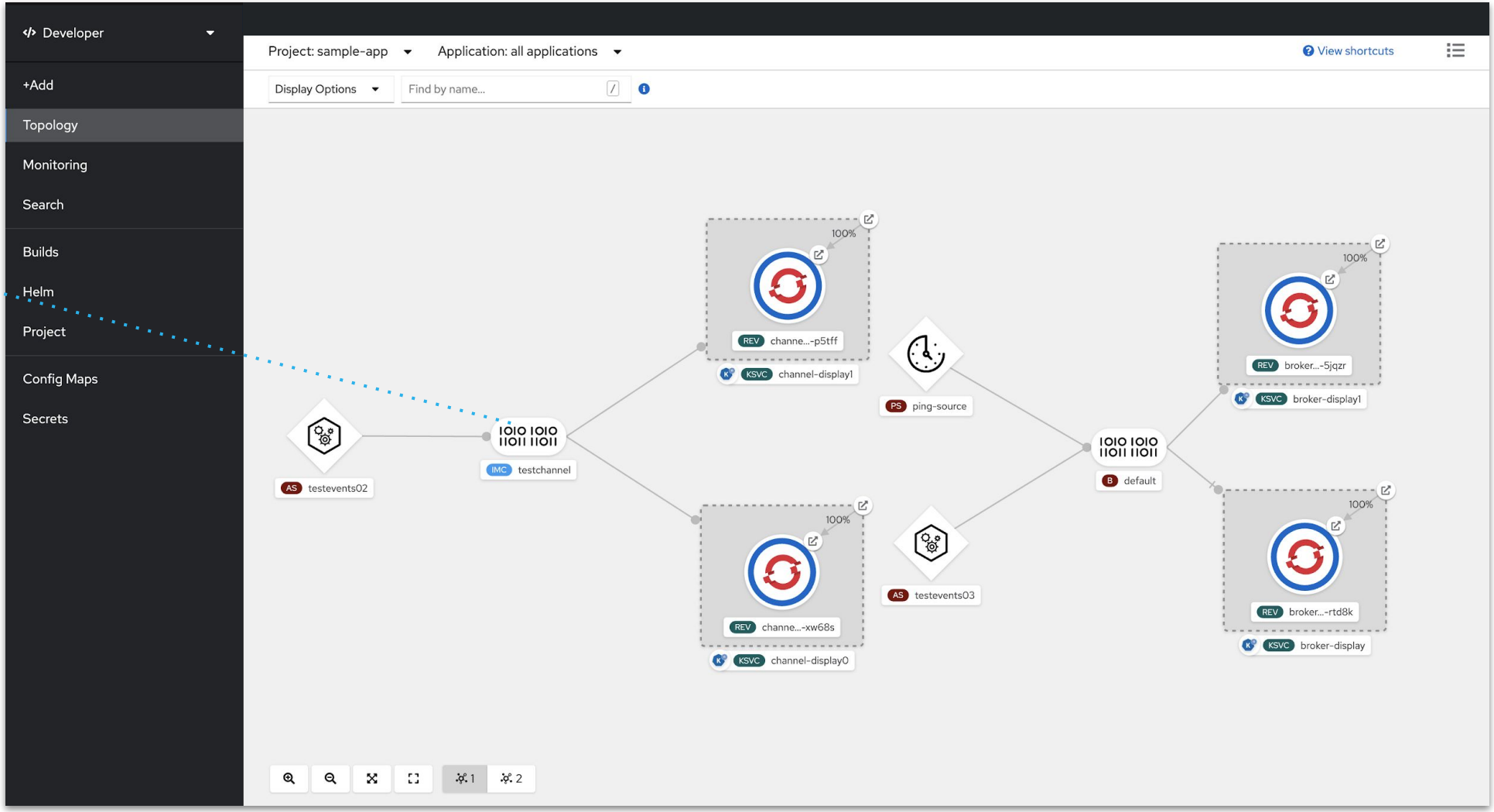
Channels & Brokers
Connect Event Sources to multiple applications reliably with support for fan-out, redelivery.

Channels and Brokers can be in **In-memory** or backed by **Apache Kafka.**



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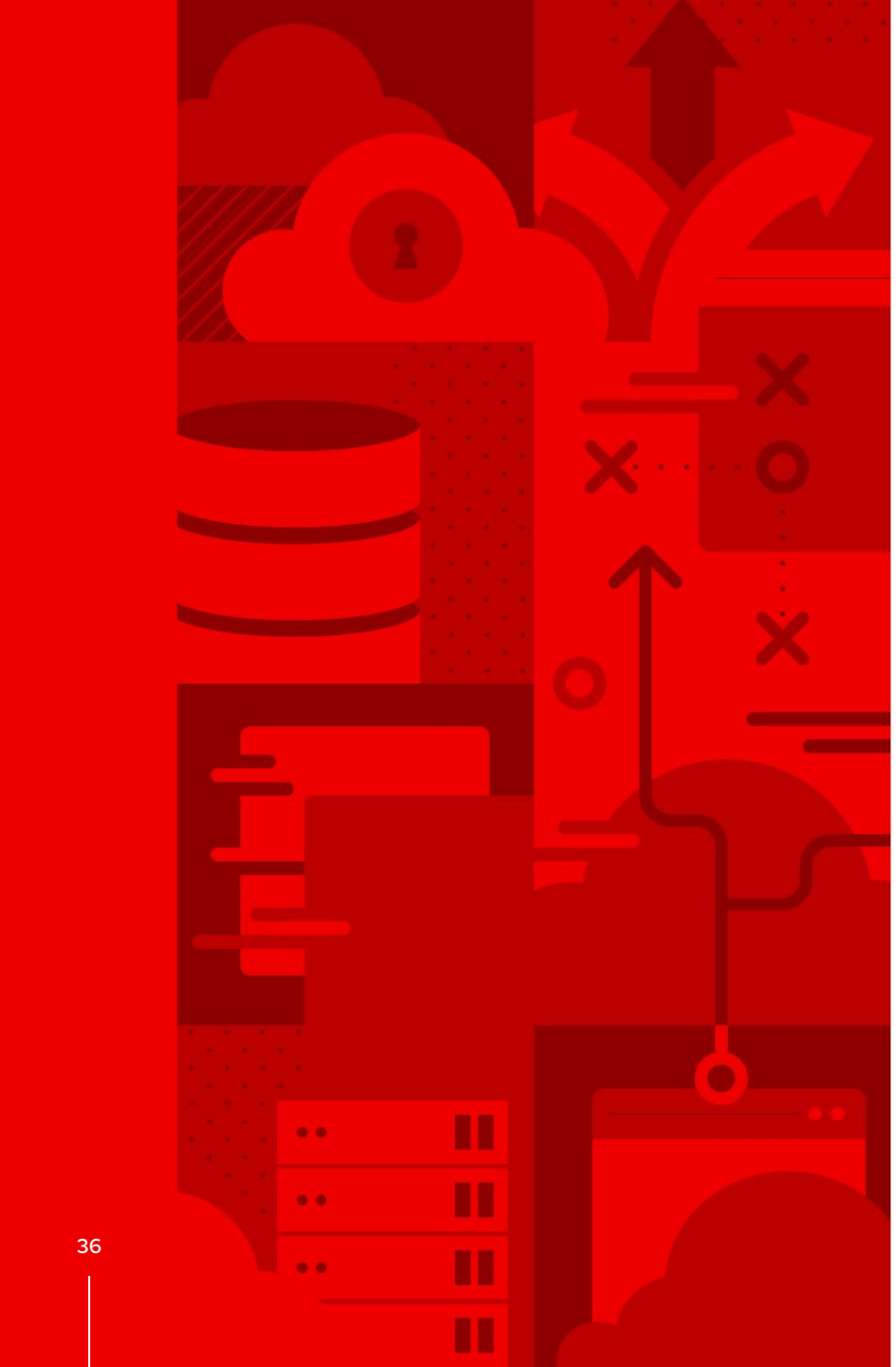


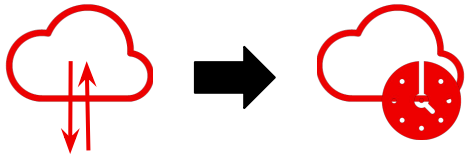
Use Cases

Arch Based - Domain Based

Red Hat

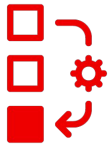
Streaming data use cases

Red Hat OpenShift Streams for Apache Kafka in action



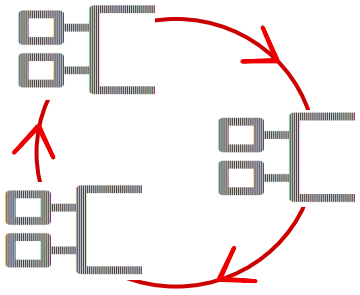
Replace batch data with real-time events

Enable digital experiences to deliver faster and better customer experiences



Create an event-driven architecture

Capture, communicate and process events for modern, distributed application architectures

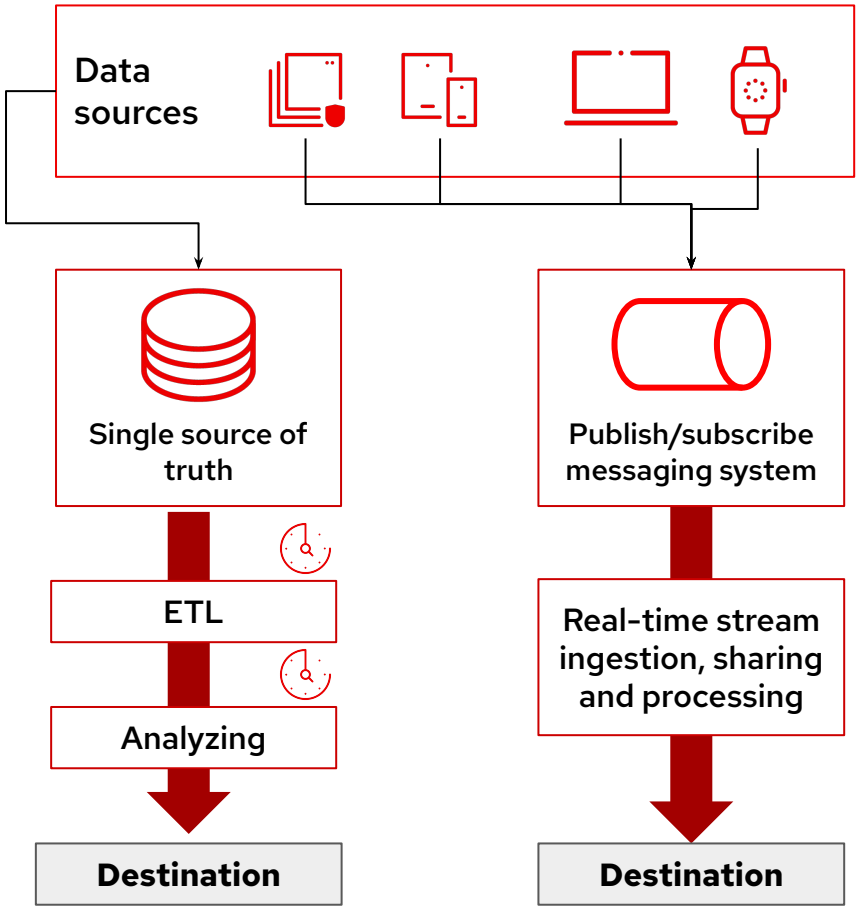


Connect loosely-coupled microservices

Deliver a scalable, reliable, and secure Kafka-centric microservice architectures

Replace batch data with real time events

Enable better, more immediate digital experiences

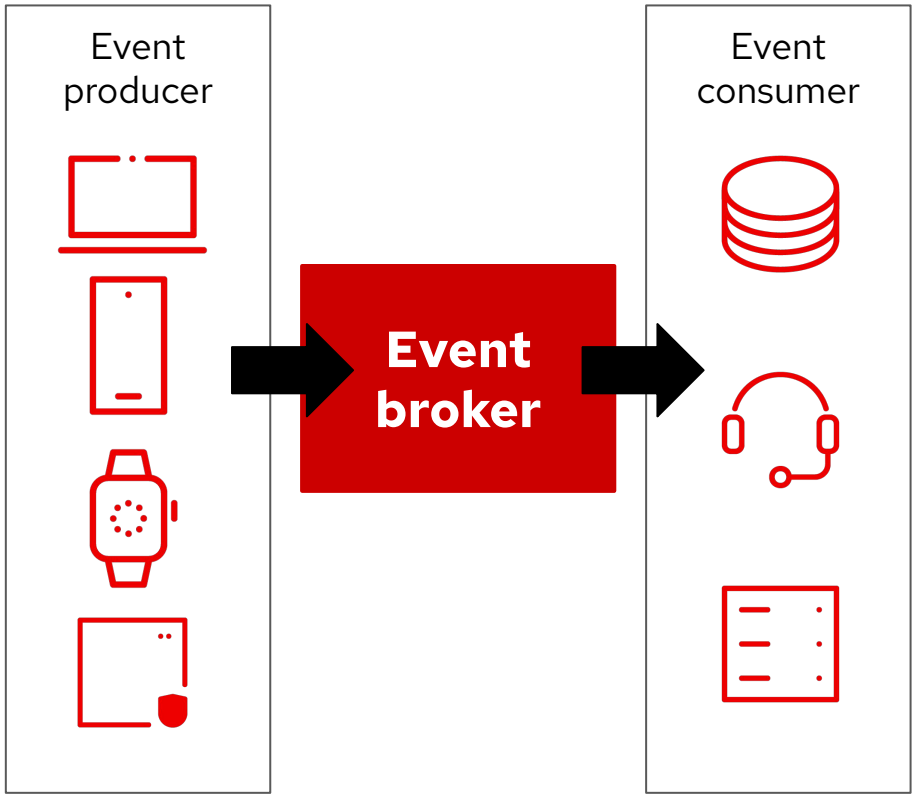


Smooth migration path:

- Enable real-time applications to send/receive large volumes of data from different sources
- Allow organizations to horizontally scale when necessary by deploying more Kafka clusters
- Respond fast to real-world events and requests by collecting and analyzing time-bound data
- Free developers from coding data integration mechanisms and focus on stream processing

Create an event-driven architecture

Events for modern, distributed application architectures

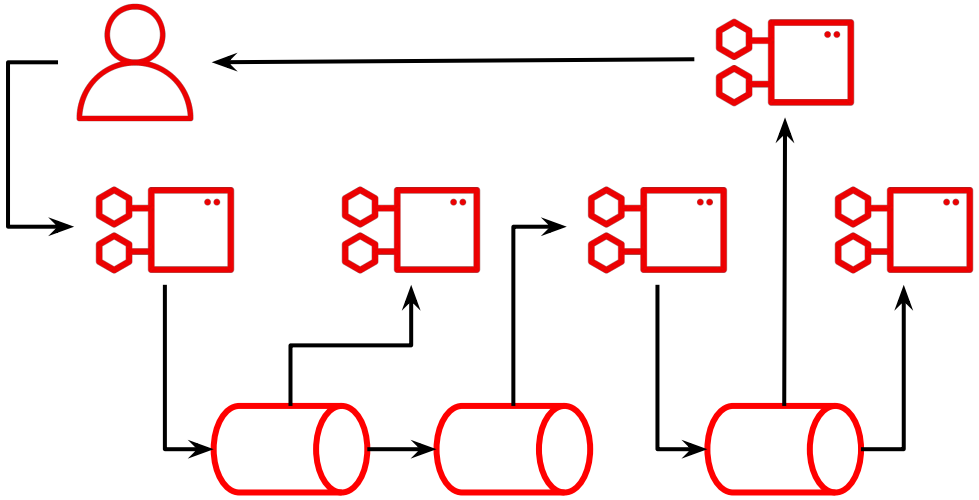


Modernize existing systems

- Identify and react immediately to critical events
- Share data instantaneously between teams within an organization and external strategic partners
- Build event-driven applications to support data streaming, events analysis and decision making
- Simplify data integration by decoupling the data from your systems
- Modernize existing systems and services

Connect loosely-coupled microservices

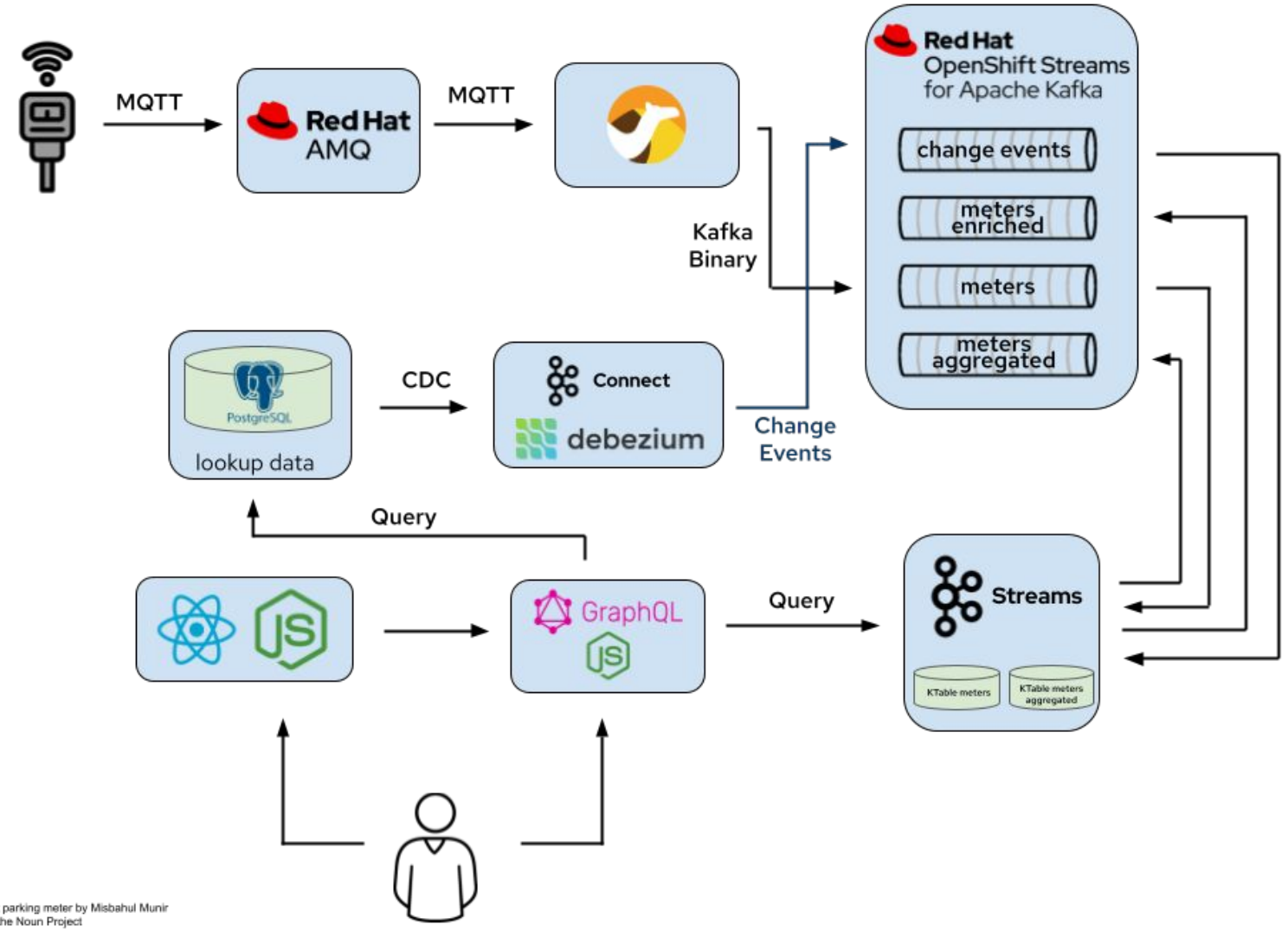
Remain agile with Kafka-centric microservice architecture



Connect microservices and stay agile

- Publish events to Kafka brokers and decouple the data from the event-consuming services
- Meet event volumes by independently scaling up and down your microservices
- Avoid hard-coding integrations and connections between microservices applications

Parking on The Edge



smart parking meter by Misbahul Munir from the Noun Project

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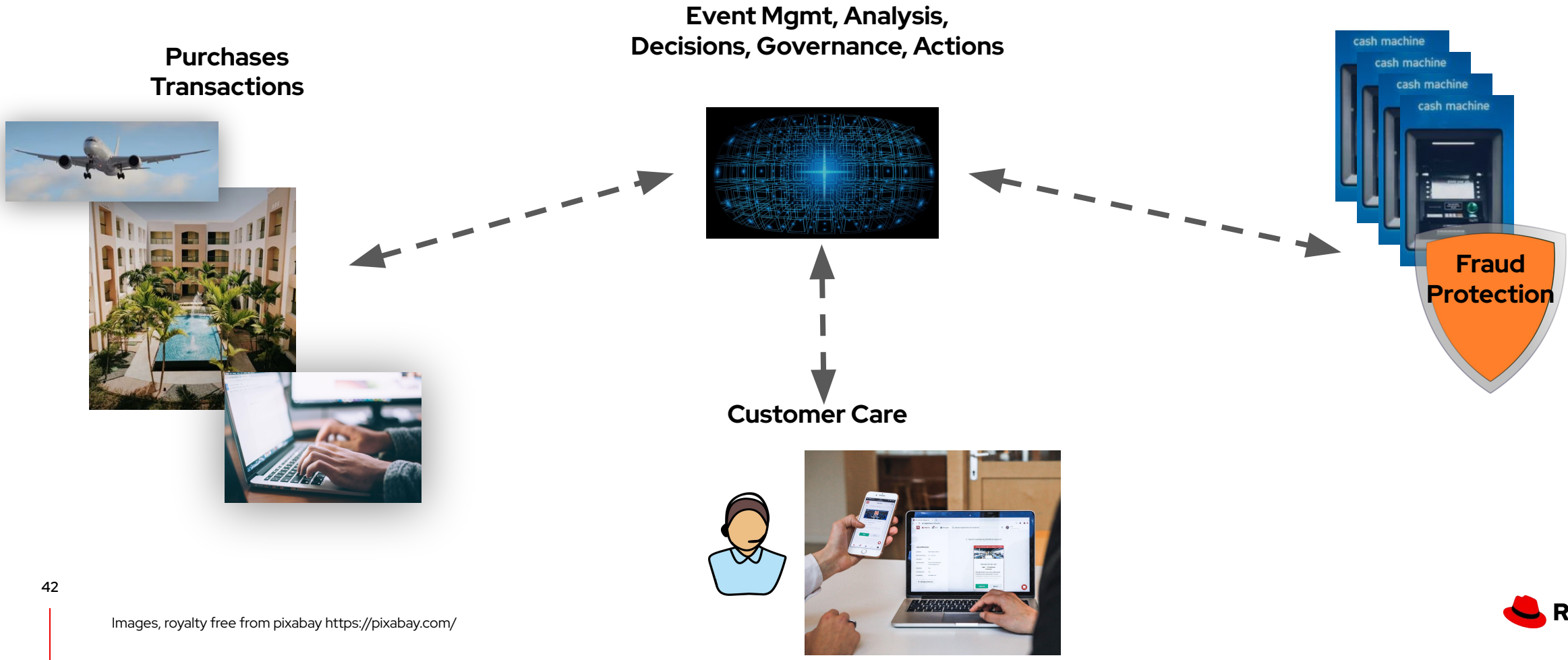
Elevating the Customer: Bank Events

Art of the Possible Demo - Proactive Customer Experience

Loyalty, Cross-Sell, Fraud Detection



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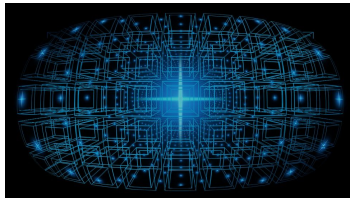
Growing Customer Value - Event Driven Decision

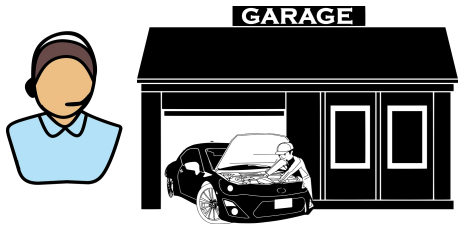
Art of the Possible Demo - Proactive Customer Experience

Vehicle Events

Event Mgmt, Analysis, Decisions, Governance, Actions



Customer Care



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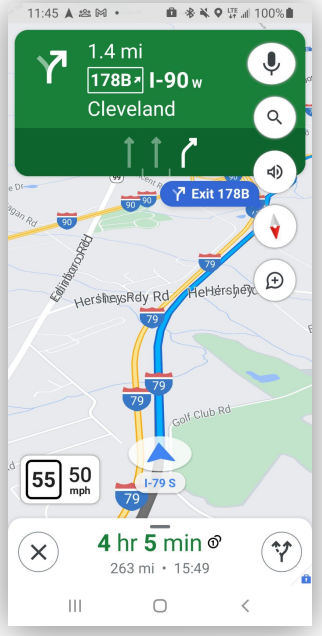
Vehicle Event Sent to Event Management System

Raise, Evaluate, Act



Vehicle Event Scenario Types -- *what does the vehicle think*

- Is sensor working?
- Is there an issue with the vehicle?
- Was a maintenance item identified?

Data and It's Context -- *is there enough information to decide and act*

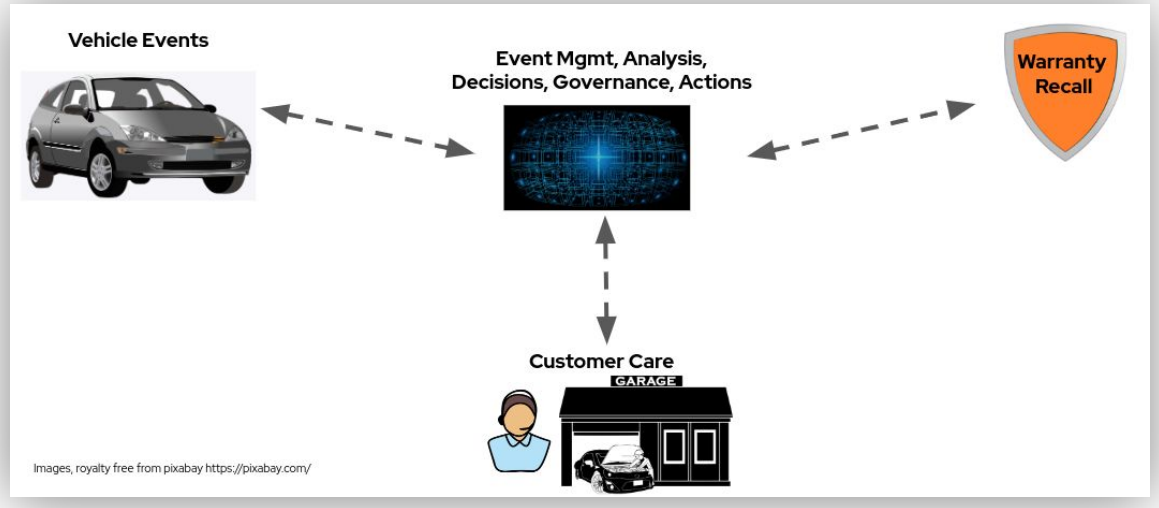
- All data is in the event passed
- Erich data from another system: API, Database, Event Mgmt Service
- Additional Context in the rule logic

Making a Decision -- *through a decision service/system*

- Analyze Data (business rules, analytics, validation)
- Apply Safety, Maintenance, Policy rules
- Decide a course of action

Action -- *kick off another set of events, or act*

- Raise another event
- Put Customer Care in motion
- Inform customer directly



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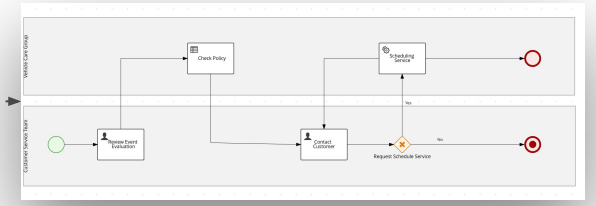
Edge - Vehicle Events

QUARKUS

Customer Care



- Business Process Mgmt
- Workflow
- Business Rules

STRIMZI kafka

Red Hat AMQ

vehicle-events

evaluated-vehicle-events

Topics (event data streams)

Vehicle Events (json)

QUARKUS Kogito

DMN - Vehicle Event Rules

QUARKUS Kogito

CEP - Temporal Rules Across Time

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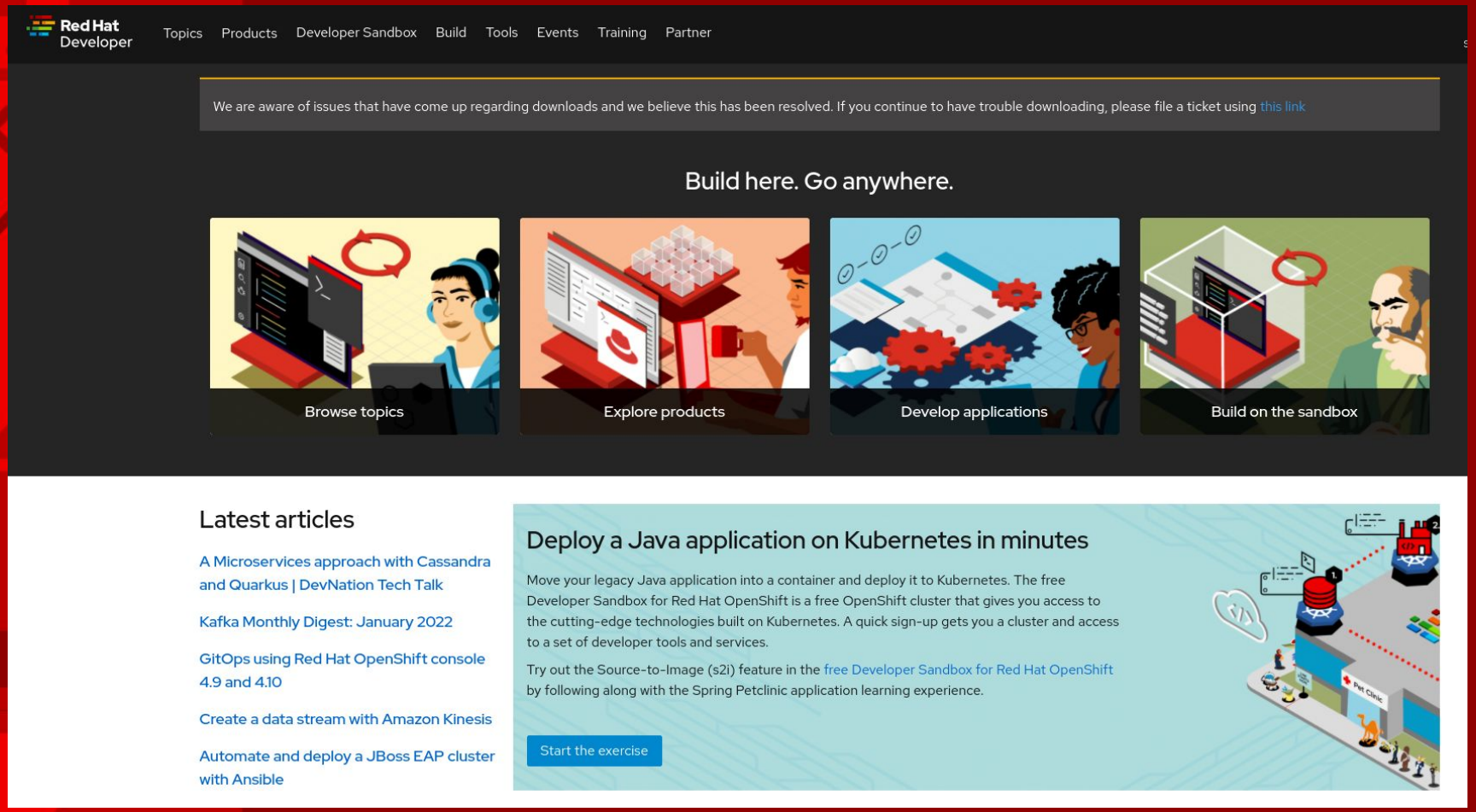
Resources

https://developers.redhat.com/



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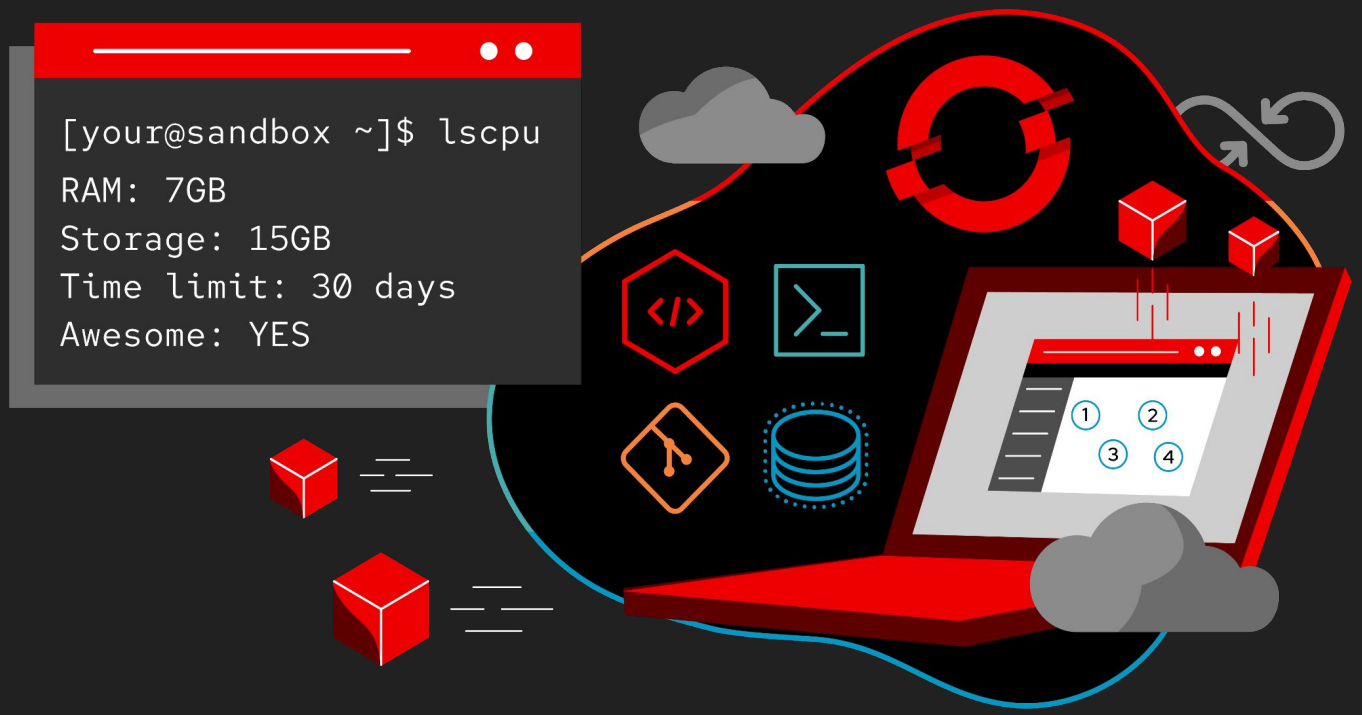

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- Quarkus
- Playgrounds - full cluster for an hour

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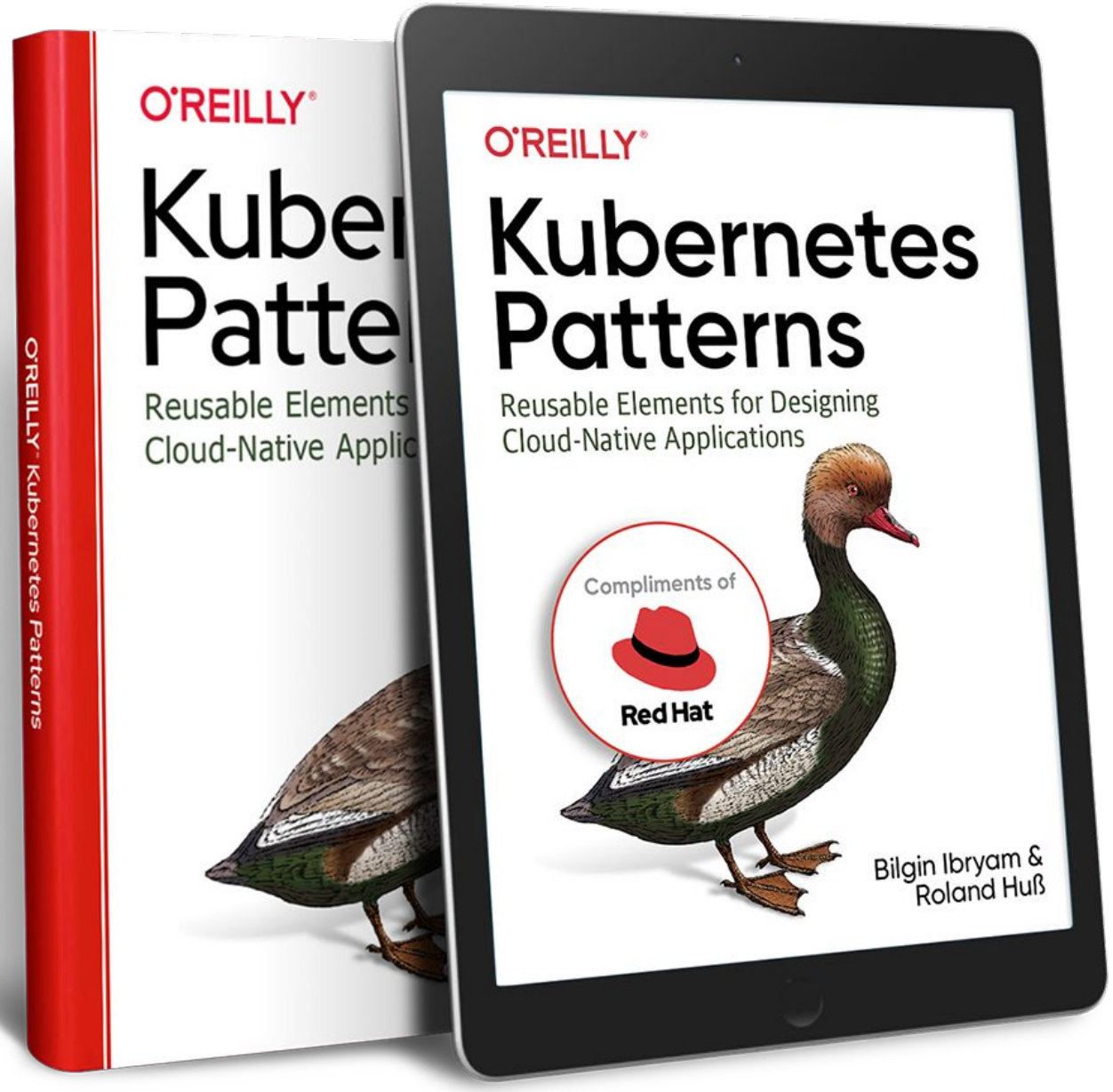

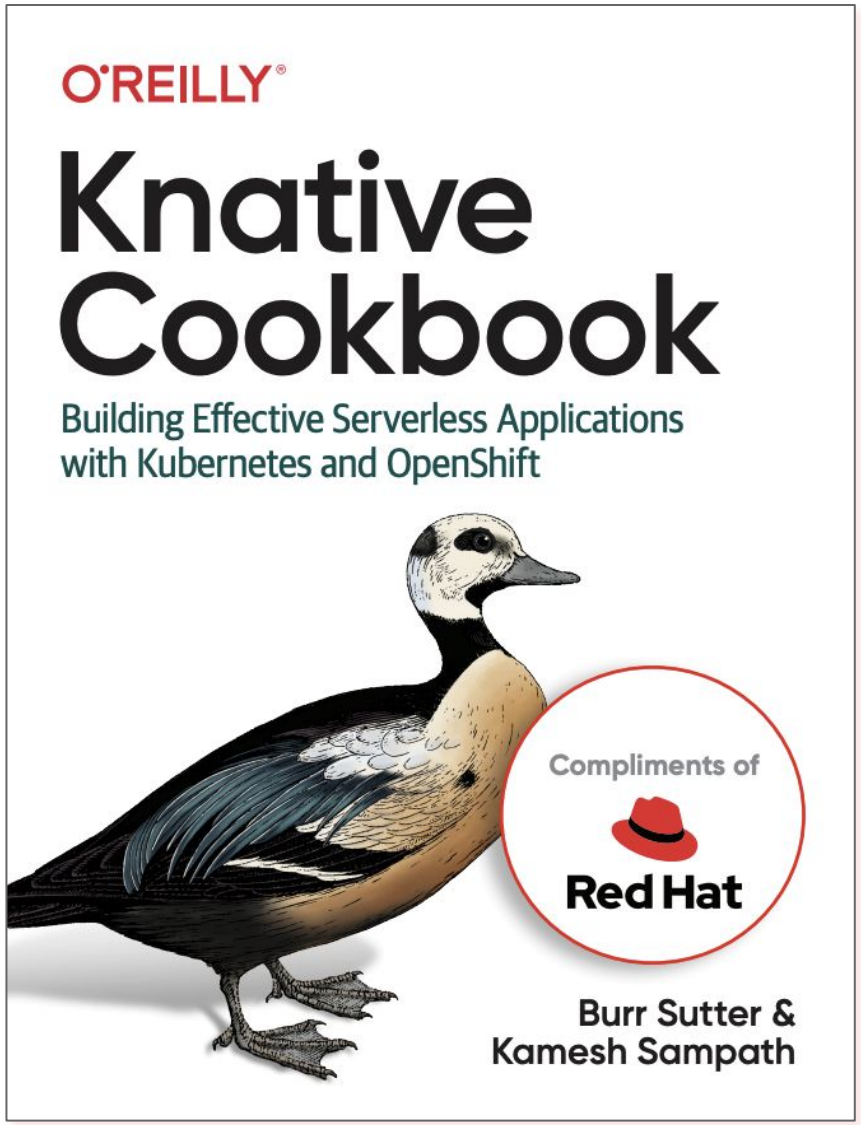

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