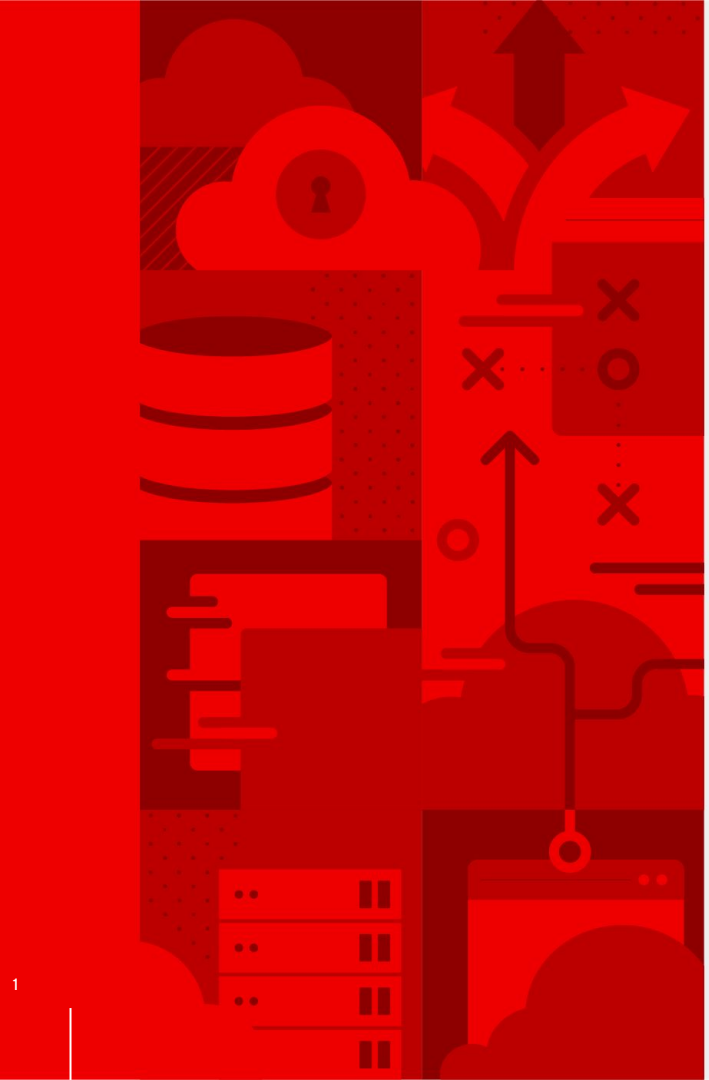

Event-driven Microservices in the Serverless Age

Microservices Day NYC, August 2019

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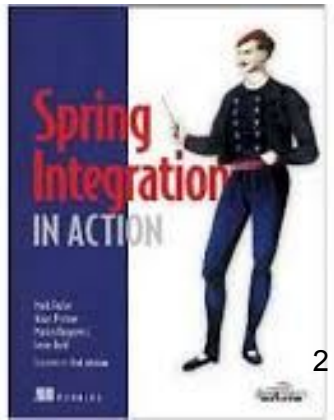
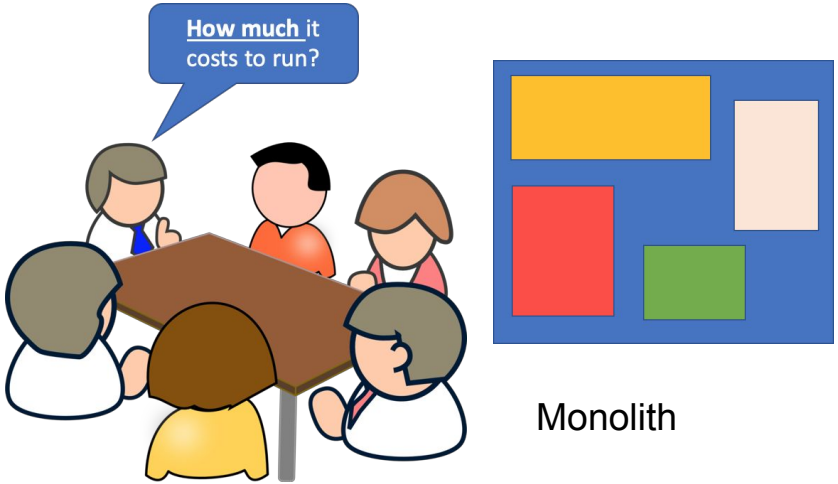
Marius Bogoevici

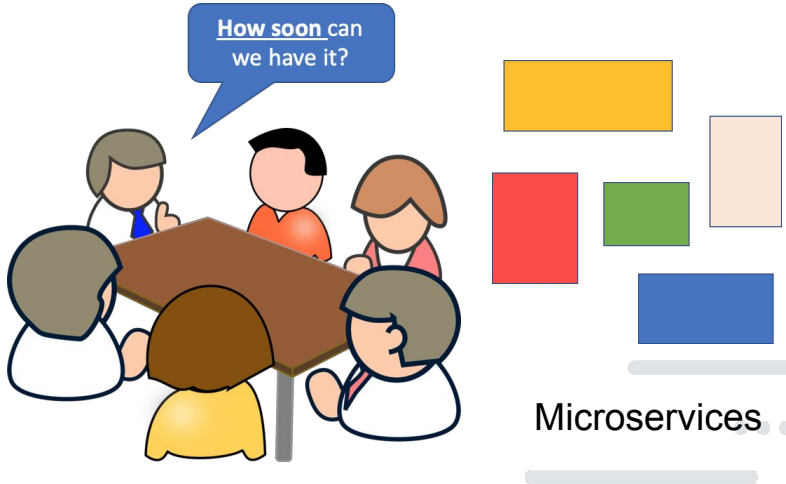
- Principal Specialist Solutions Architect at Red Hat
  - Specialize in Integration/Messaging/Data Streaming
- OSS contributor since 2008
  - Spring Integration
  - JBoss ecosystem
  - Spring XD, Spring Integration Kafka
  - Former Spring Cloud Stream project lead
- Co-author “Spring Integration in Action”, Manning, 2012



WHY MICROSERVICES?
WHY SERVERLESS?



Monolith



Microservices

Operational efficiency

Fast value delivery

Still, **why** fast value delivery?

Fast value delivery

New features

Experimentation

Increased confidence

Unfortunately, we cannot predict the future. As an organization, we must be able to observe and experiment in our environments and react accordingly.

We need to be agile.

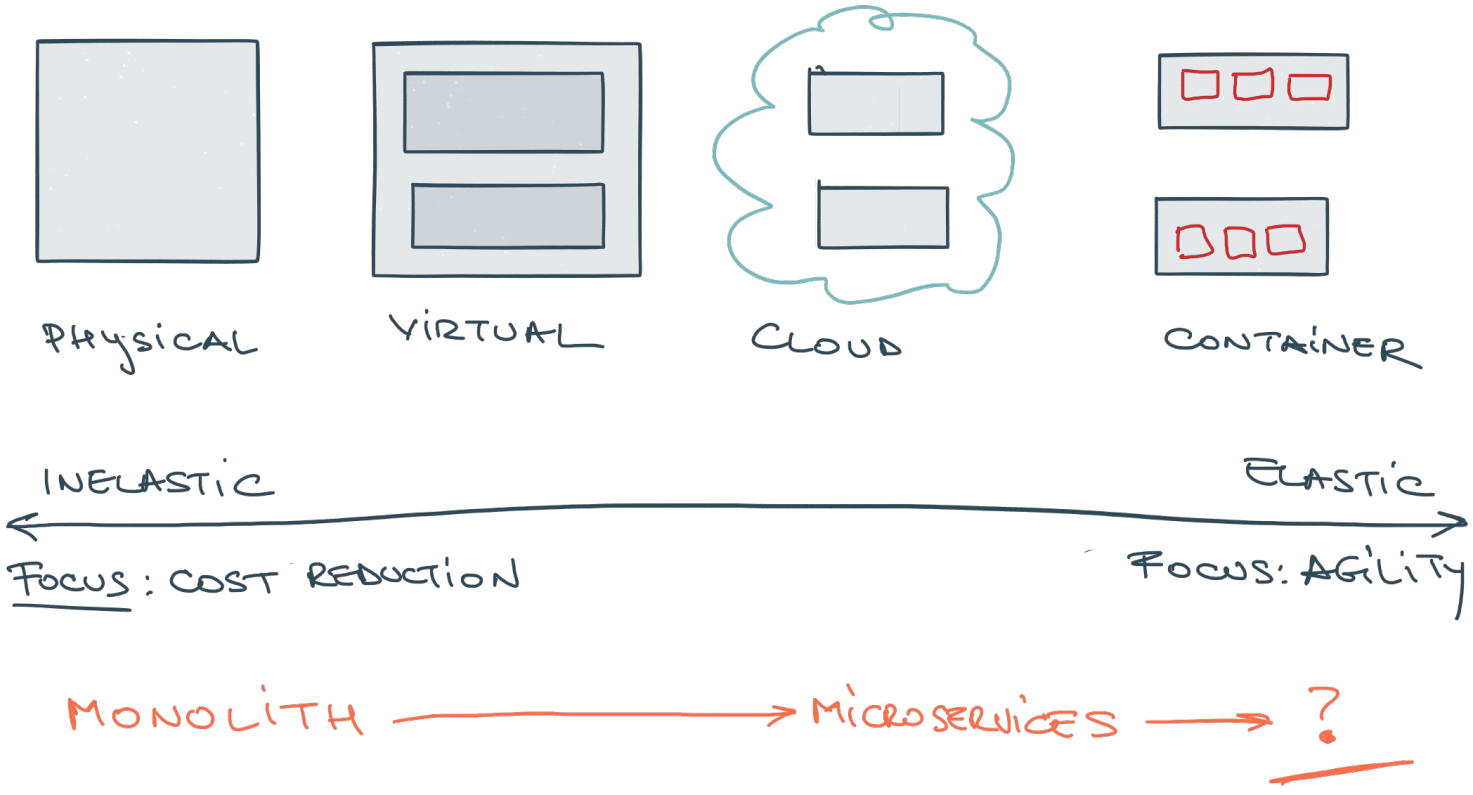
On the other hand we must be mindful of our resources;

We want to eliminate waste, reduce time to experiment, and make it cheap so we can increase our returns.

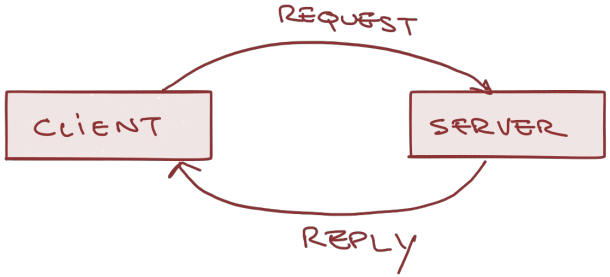
We cannot build complex systems from complex parts.

We must keep our components as simple and understandable as possible.

As hardware evolves, we have more options



Request-reply vs. event-driven



Synchronous & ephemeral
Low composability
Simplified model
Low tolerance to failure
Best practices evolved as REST

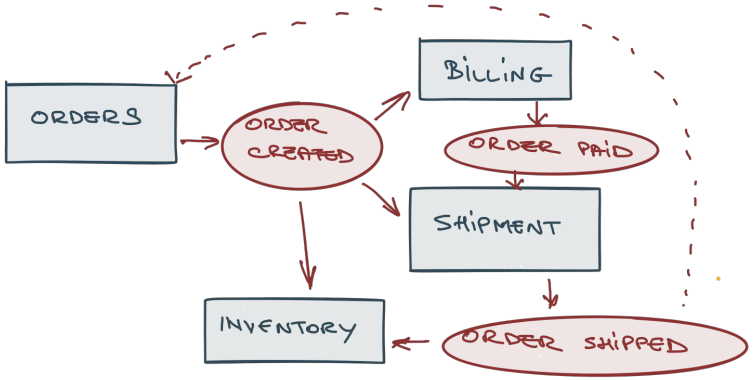
Asynchronous and persistent
Decoupled
Highly composable
Complex model
High tolerance to failure
Best practices are still evolving

What is an event?

- Action or occurrence, something that happened in the past
  - ‘Order created’, ‘user logged in’, ‘
- Event characteristics:
  - Immutable
  - Optionally persistent
  - Shareable
- Event types: [1]
  - Notification
  - State Transfer (Command)
  - Event-Sourcing/CQRS

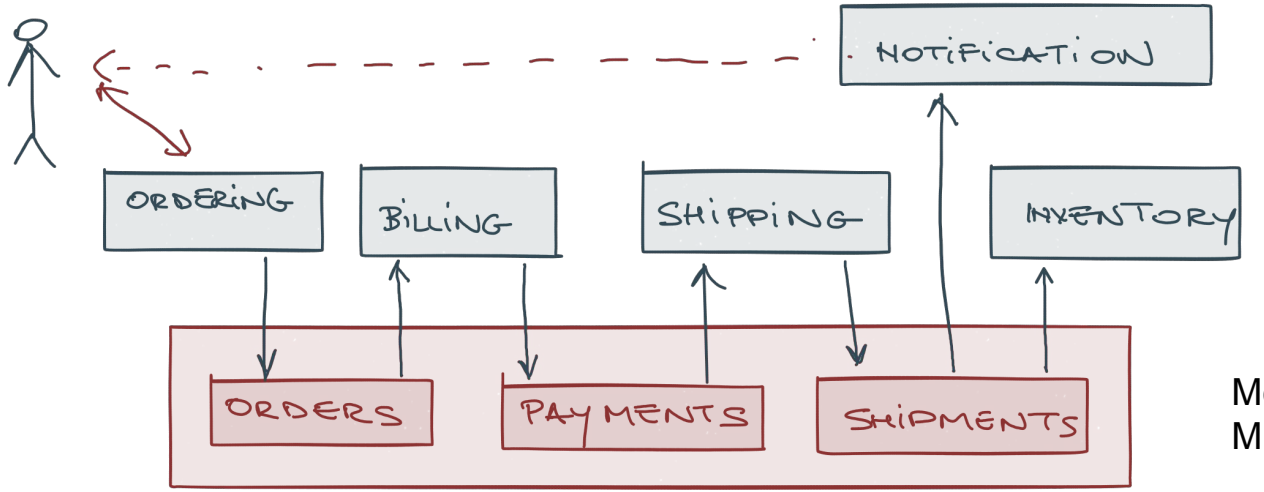
[1] https://martinfowler.com/articles/201701-event-driven.html

Designing systems with events



- EDA: event-centric approach in system design
  - Treating events as part of your domain model
  - Designing components as event handlers and emitters
- EDA is aligned with the goals of domain-driven design
  - Enforce isolation and decoupling between bounded contexts
  - Properly designed events can create an expressive ubiquitous language
- EDA creates highly observable and extensible systems
- Event storming: events-first design

Event-driven microservices



Applications

Messaging
Middleware

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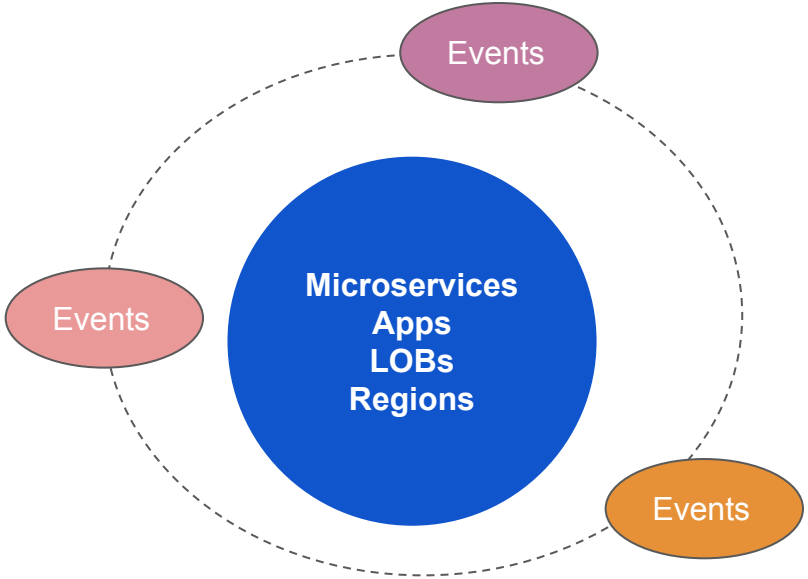
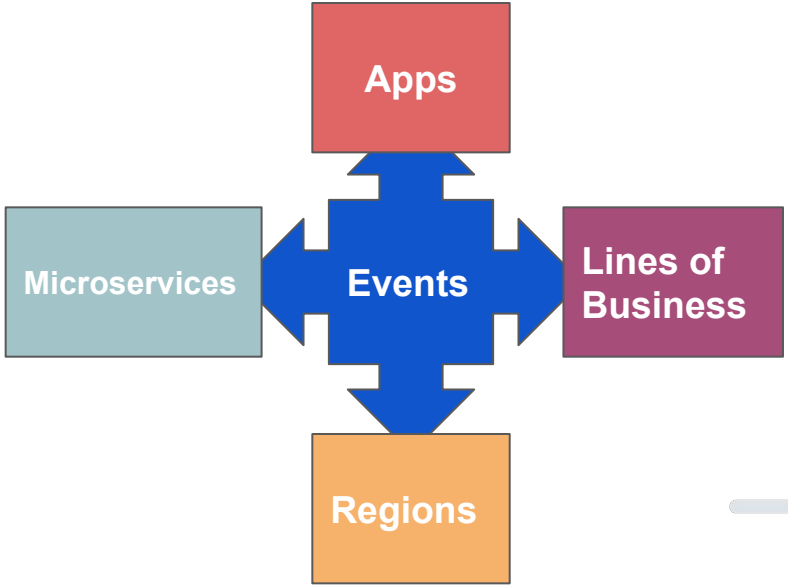
RETHINKING EVENT-DRIVEN ARCHITECTURE



System and data-centric

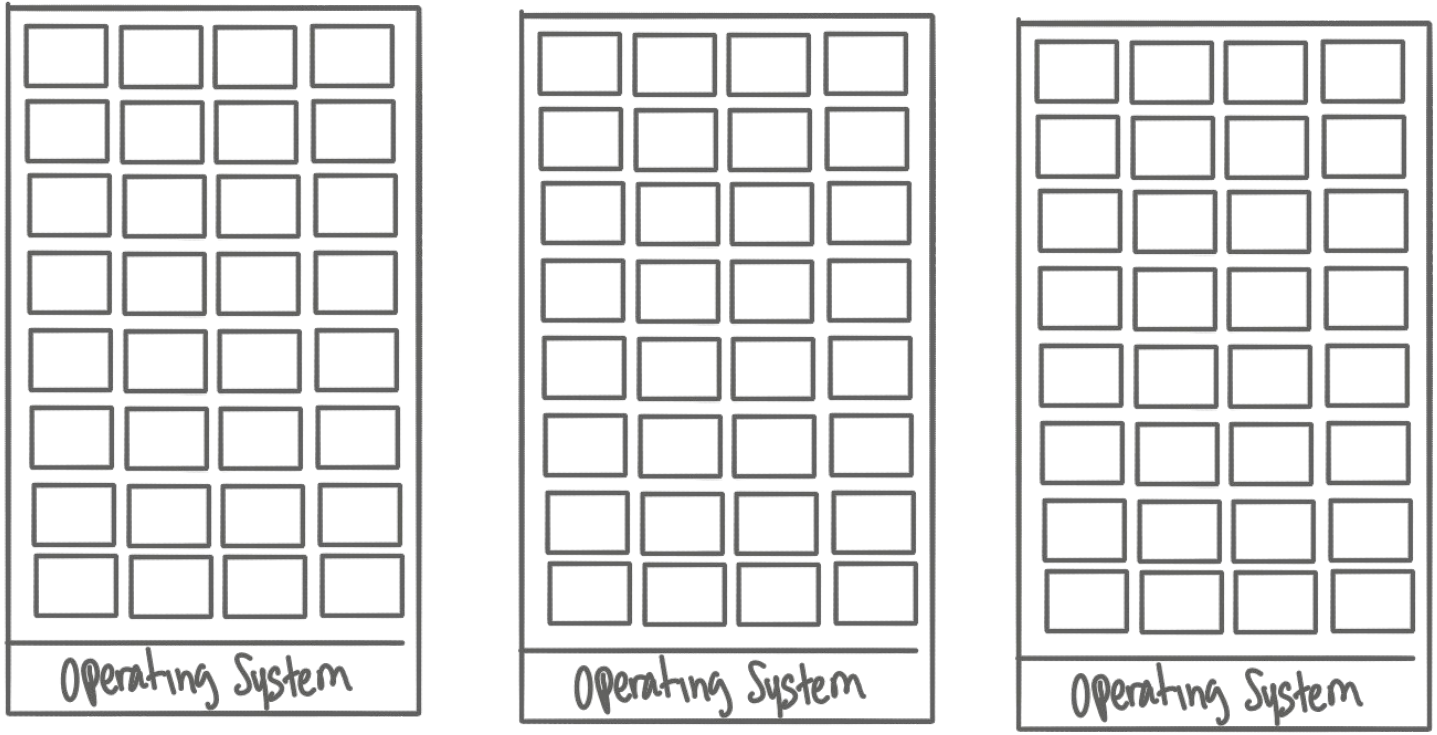
Events are designed to respond to ad-hoc connectivity needs



Event-centric

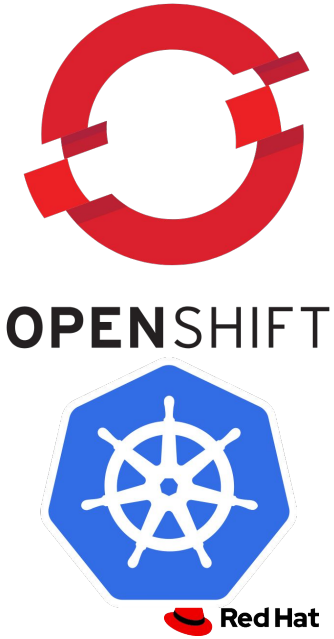
Events are first class citizens that describe the interactions in the enterprise

Microservices in containers:
Increasing agility, isolation, utilization



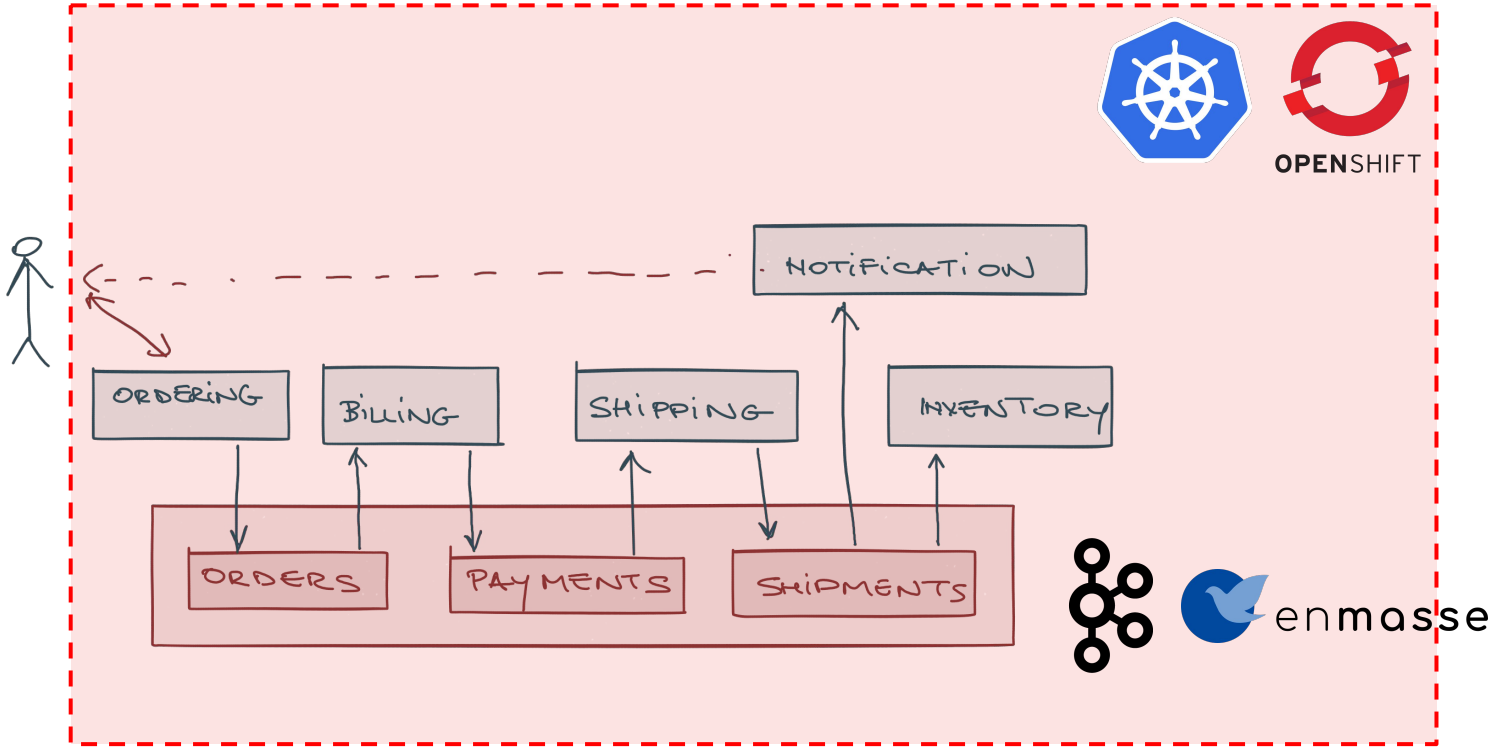
Orchestrating containers on cloud native platforms

- Use a **platform** that makes running apps reliable, transparent and boring
- In-built resource management
  - Memory, CPU, disk
- Elastic scaling
- Monitoring and failover
  - Health, logging, metrics
- Routing and load balancing
- Rolling upgrades and CI/CD
- Namespacing



Event-driven microservices in the **cloud** native age:

Elastic computing and utility messaging



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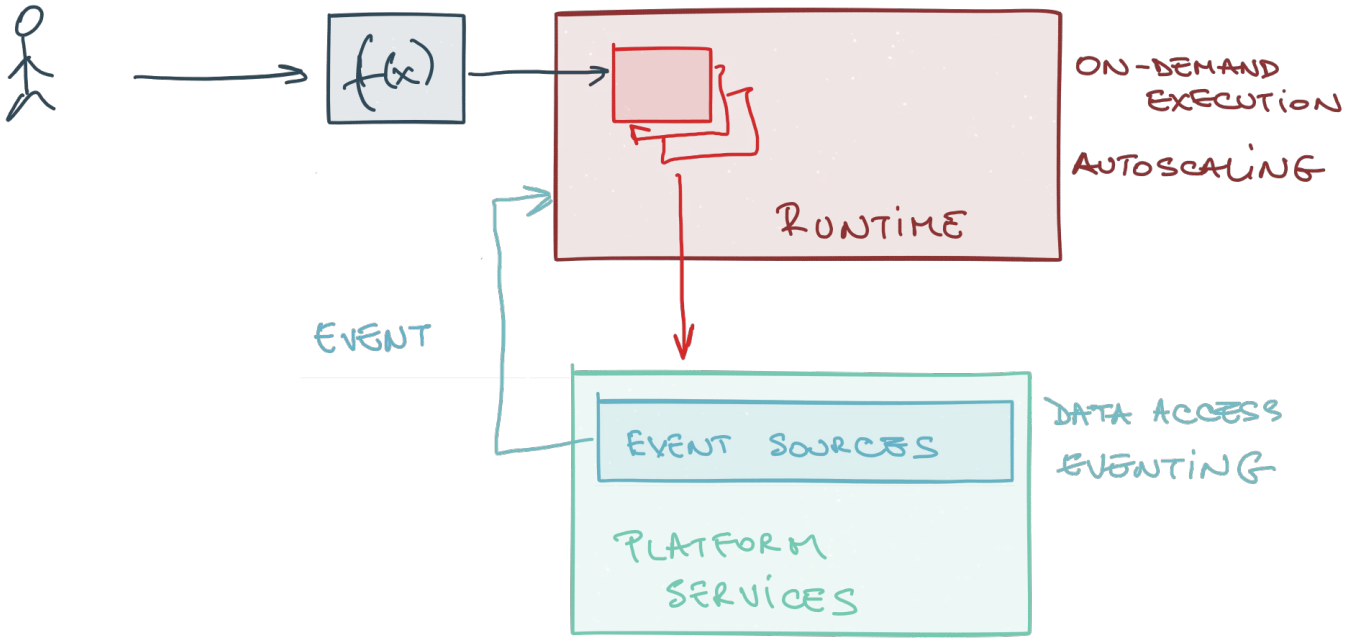
Some challenges with microservices ...

- Utilization
  - Idling under low traffic
  - High resource consumption - memory, disk
- Connectivity
  - Must know broker location
  - Integration with event sources
- Abstraction
  - Must know broker type
  - Dependence on data/payload formats
- Observability
- Security

Serverless model: event-based and elastic



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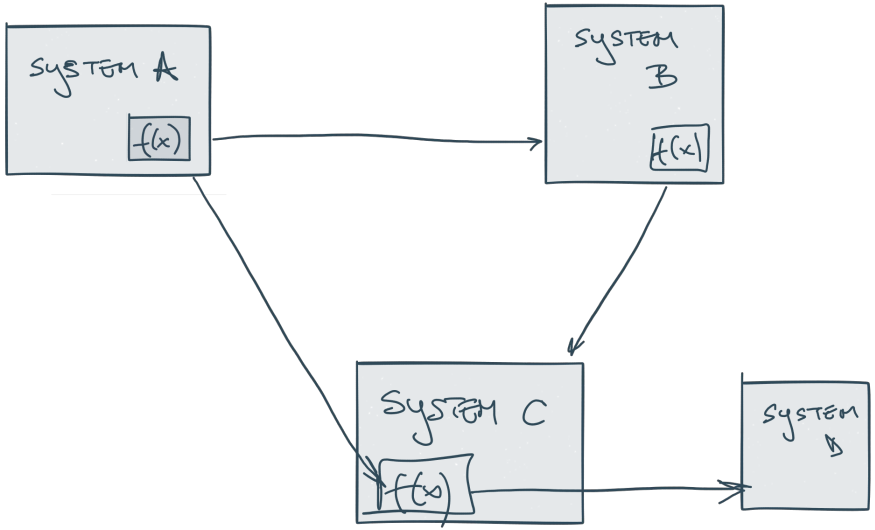
Enriching microservice architecture with serverless facilities

- Elastic execution and avoidance of idling (autoscale)
- Utility data and messaging infrastructure
  - Provided via platform services
- Decoupling of business logic from messaging infrastructure

Architectural risks with serverless:

loss of domain perspective ...



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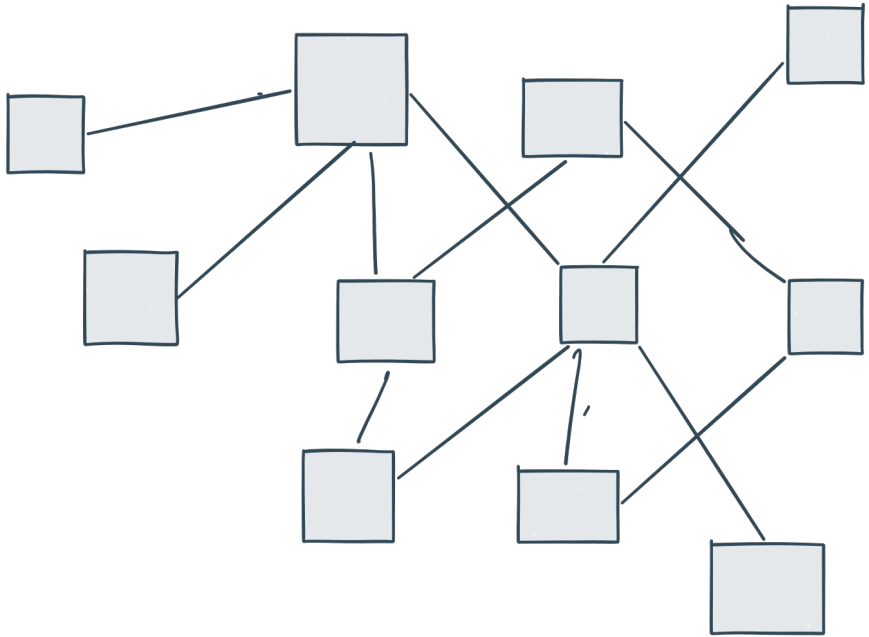
Architectural risks with serverless:

... point-to-point integrations and sprawl



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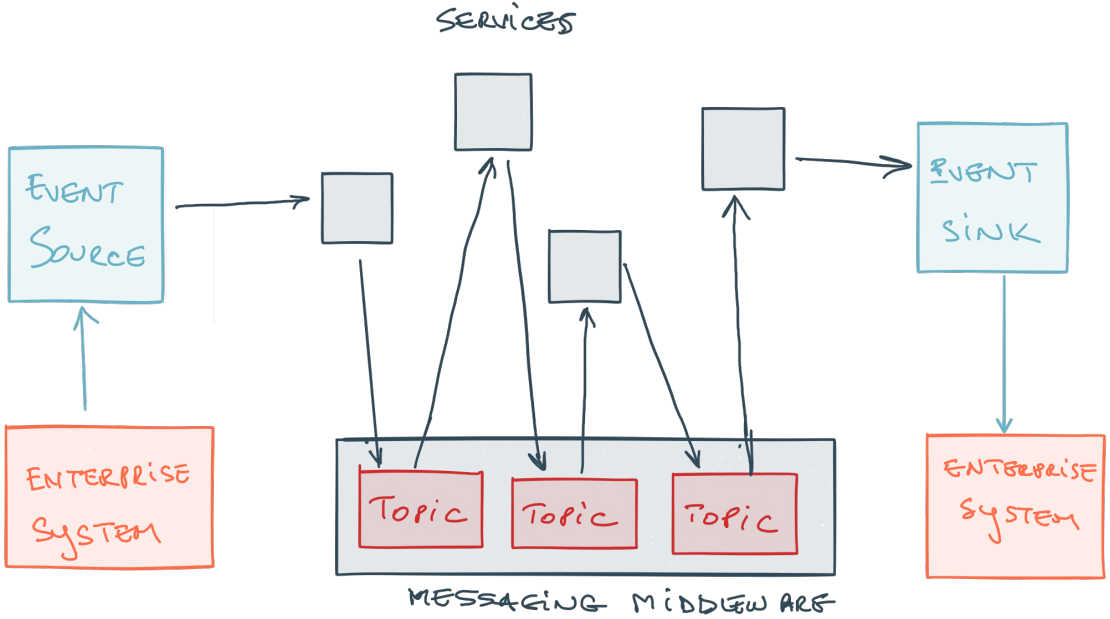
Recap: event hubs in microservice arhitecture



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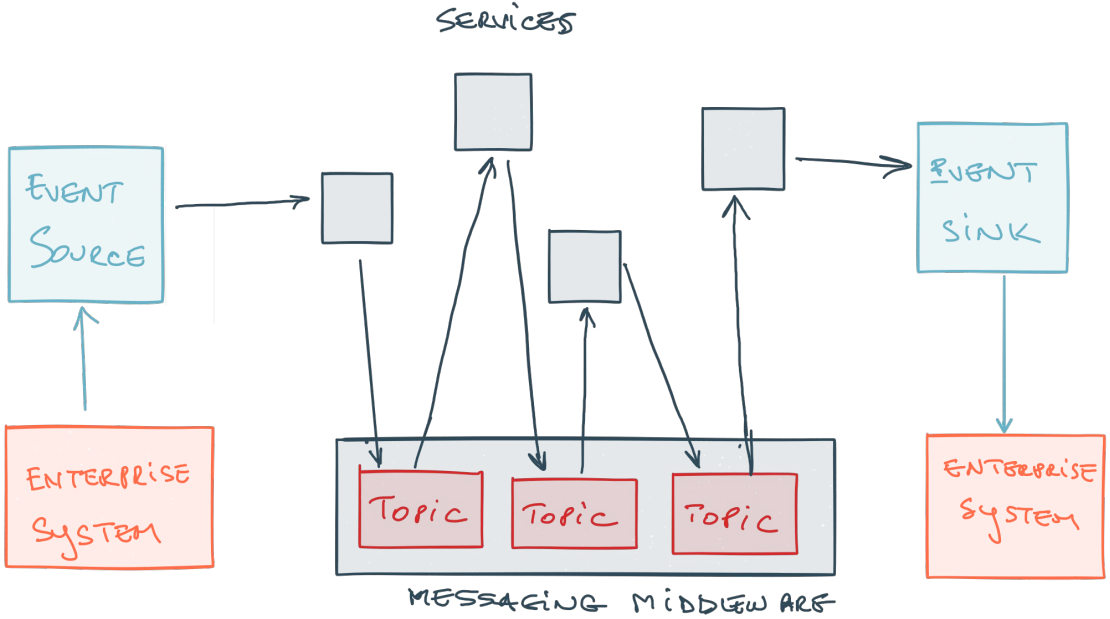
Event-centric microservice arhitectures...



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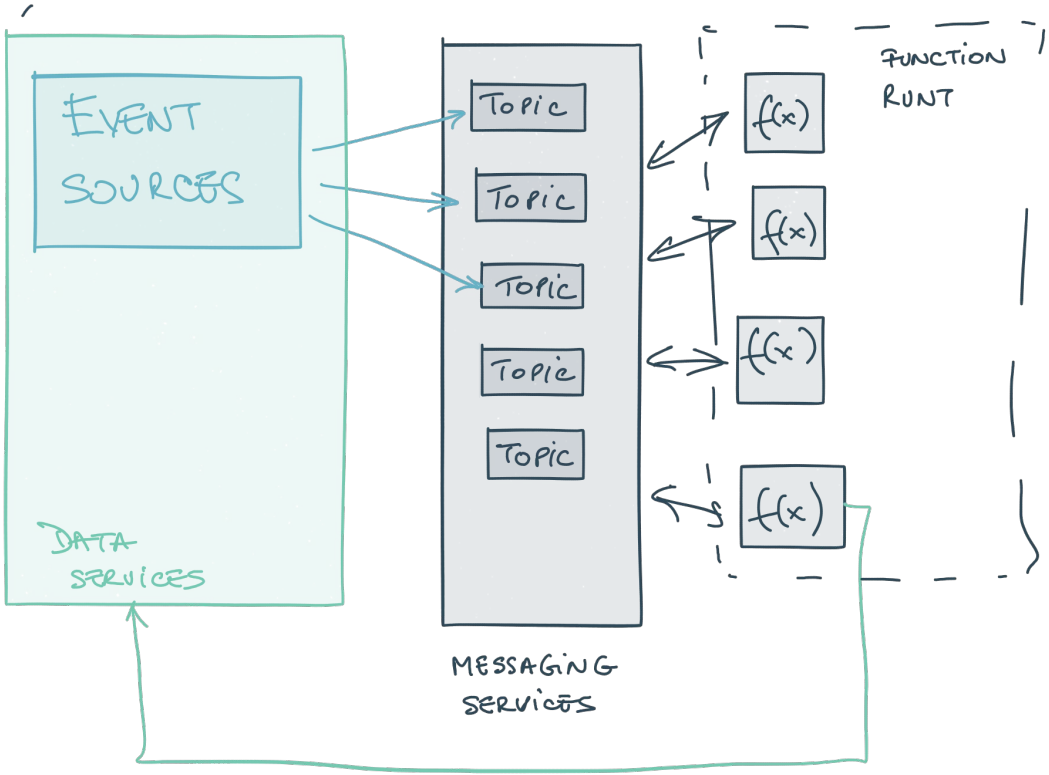
... can be easily adopted for serverless design



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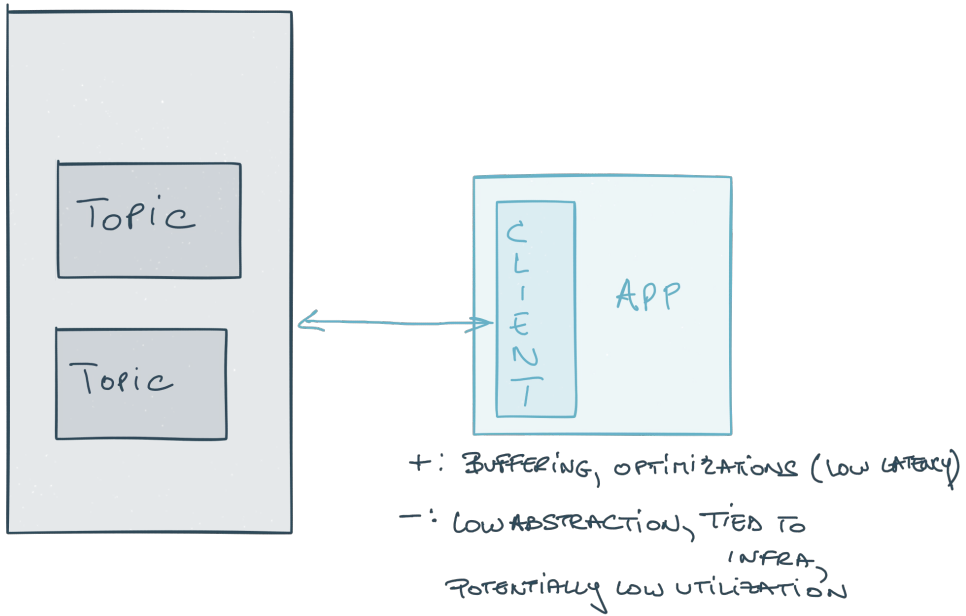
Microservices in Event-driven Architecture: Pros and cons



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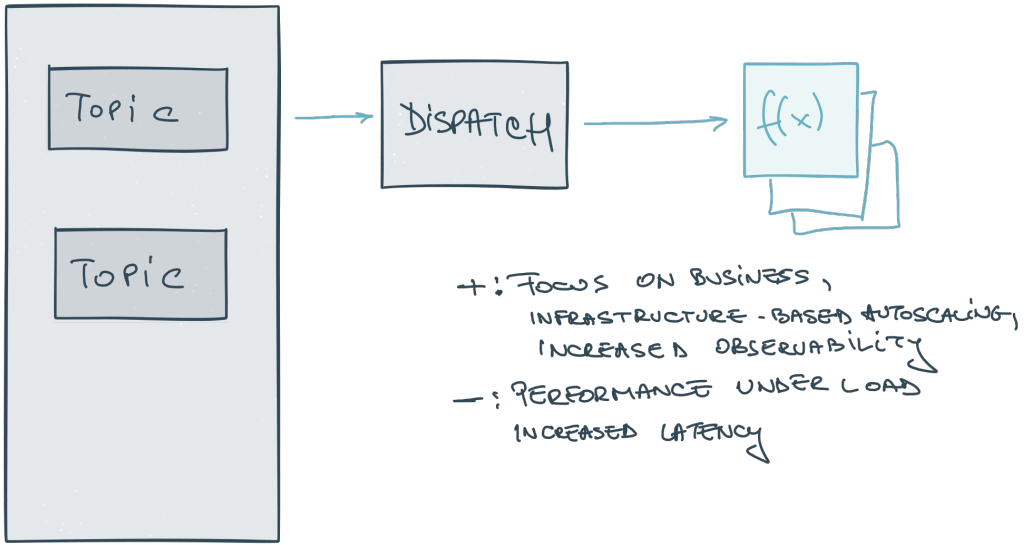
Functions in Event-driven Architecture: Pros and cons



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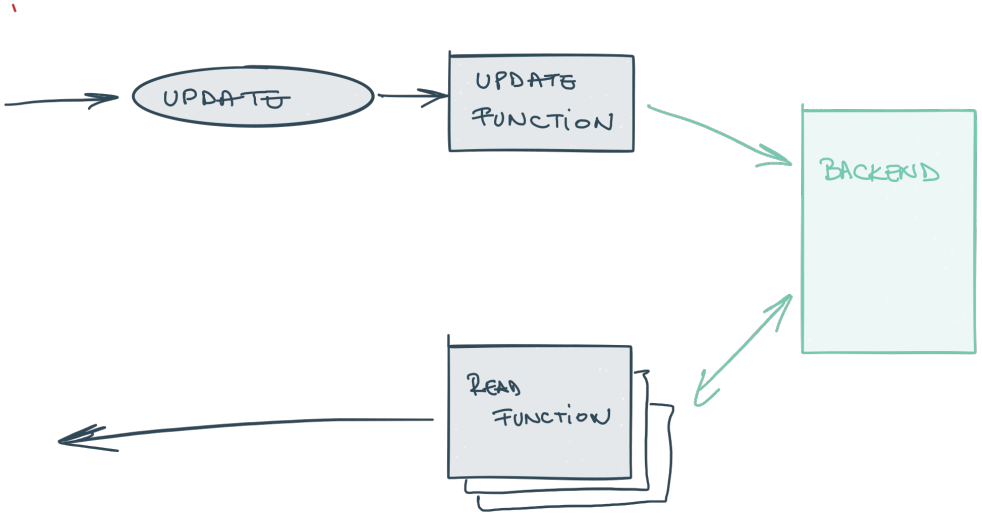
Event-driven microservice use cases applied to serverless

Event Sourcing/CQRS



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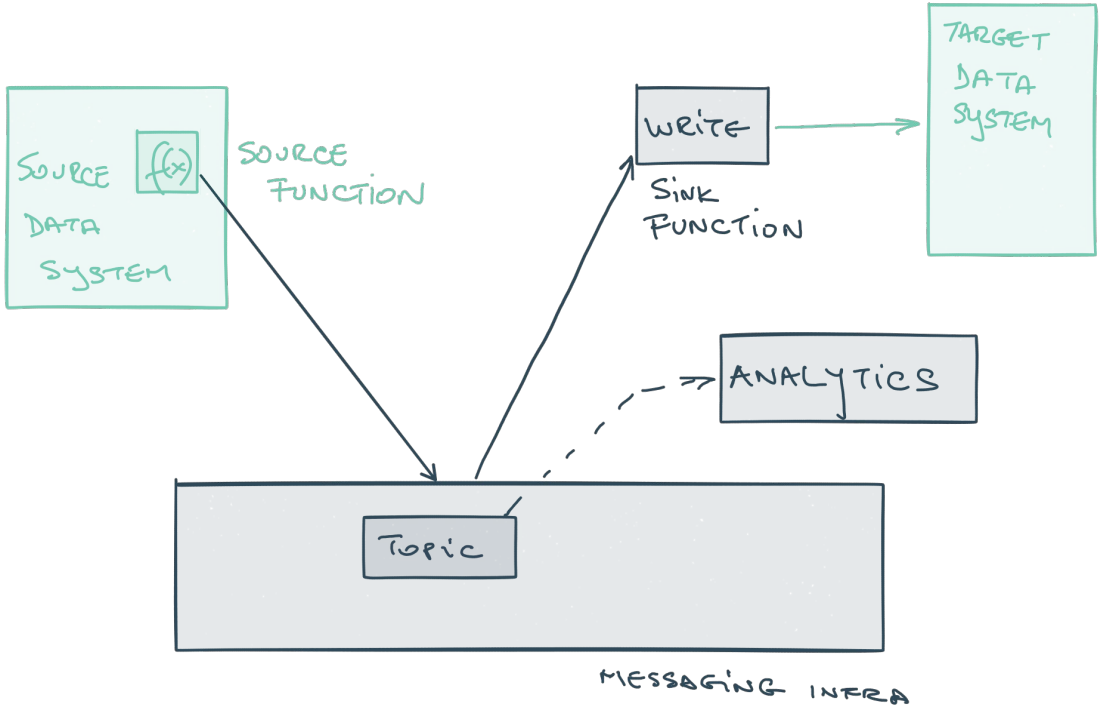
Event-driven microservice use cases applied to serverless

Streaming ETL, CDC



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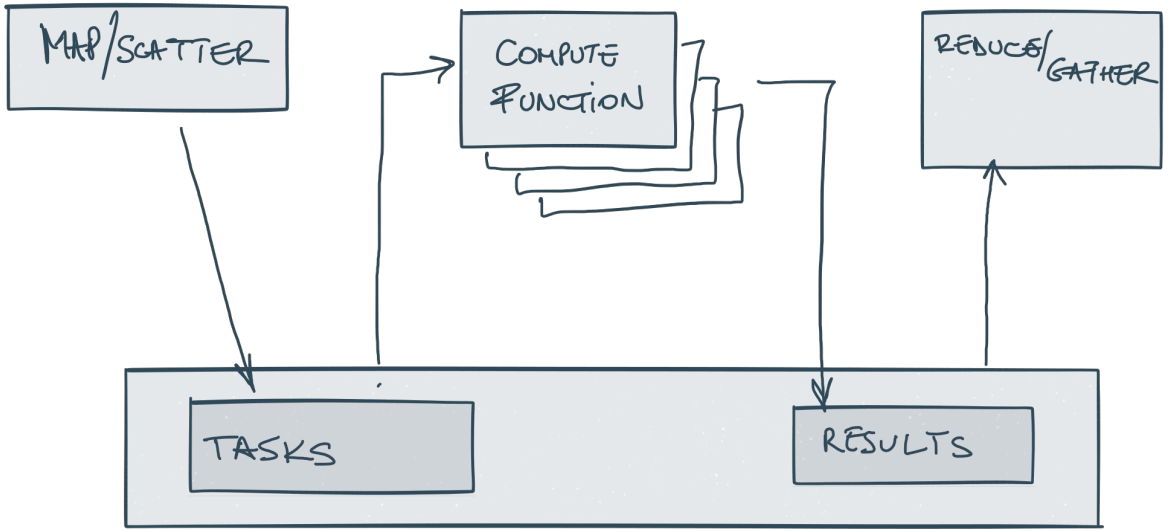
Event-driven microservice use cases applied to serverless

Load Balancing and High Scale Compute



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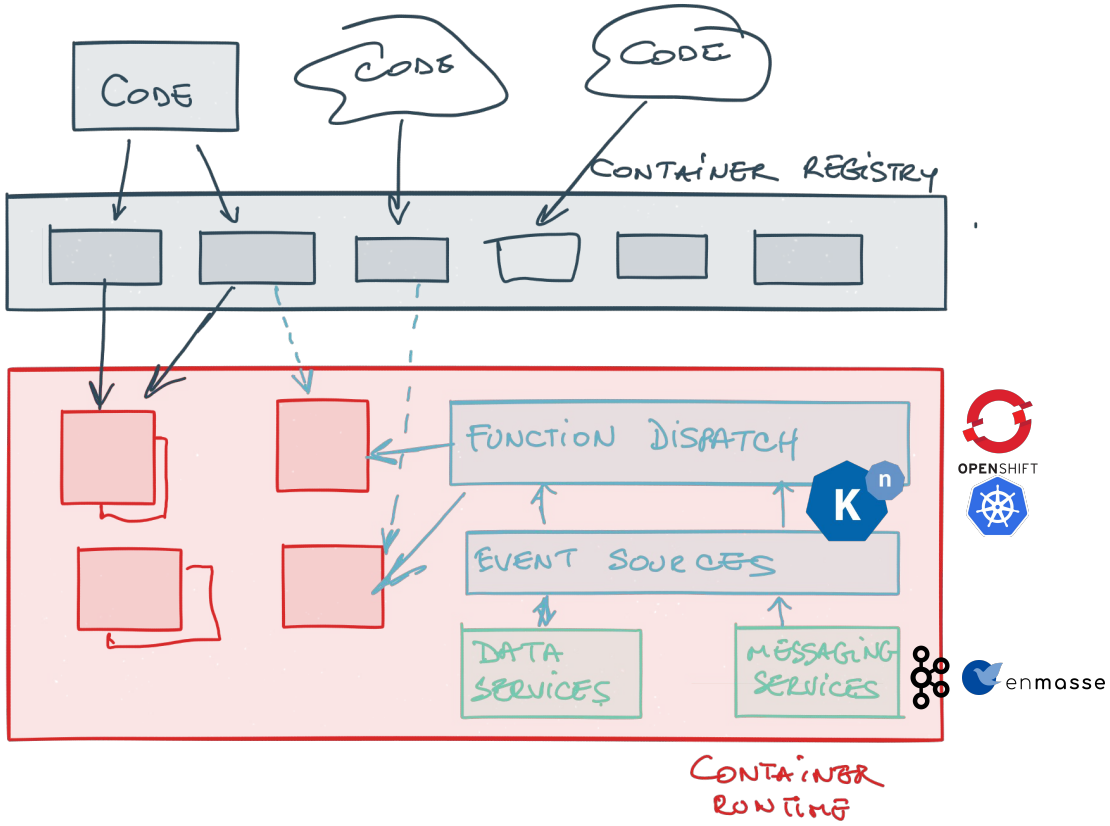
Container-centric microservices and functions on Kubernetes



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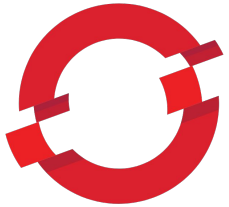
Optimizing utilization outside of autoscaling

- Impedance mismatch between runtimes optimized for physical/virtual environments and containerization
  - Large footprint (low density)
  - Long startup times - latency
- Recommendations:
  - Favor technologies with small footprint and low latency, in particular for serverless
  - Favor technologies that allow for easy change of deployment model (independent deployment vs on-demand/serverless) while preserving investment in business logic

Your technology radar



OPENSHIFT

- Service Mesh (e.g. Istio):
  - Provide microservice interconnectivity
- Serverless platforms (e.g. Knative)
  - Container build and on-demand scheduling
- Container-native frameworks (e.g. Quarkus)
  - Optimize Java workloads for containerized apps
- Strimzi - Kafka operator for Kubernetes/OpenShift
- EnMasse - Messaging-as-a-Service for Kubernetes/OpenShift
- FaaS frameworks (e.g. Camel-K)
  - Schedule integration code directly on platform or via Knative

Istio

enmasse

APACHE Camel

STRIMZI

Conclusions

- Event-driven microservices are key for implementing highly distributed, extensible architectures
- Serverless platforms are a natural fit for several event-driven microservice use cases
- Serverless architectures should complement event-based execution with event-centric design
- Always consider tradeoffs:
  - Serverless vs independent deployment (aka ‘traditional’ microservice)
  - Optimizied runtime vs technical investment (can you have both?)