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Cloud Native Data Pipelines with Apache Kafka

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What is a Cloud Native Application?

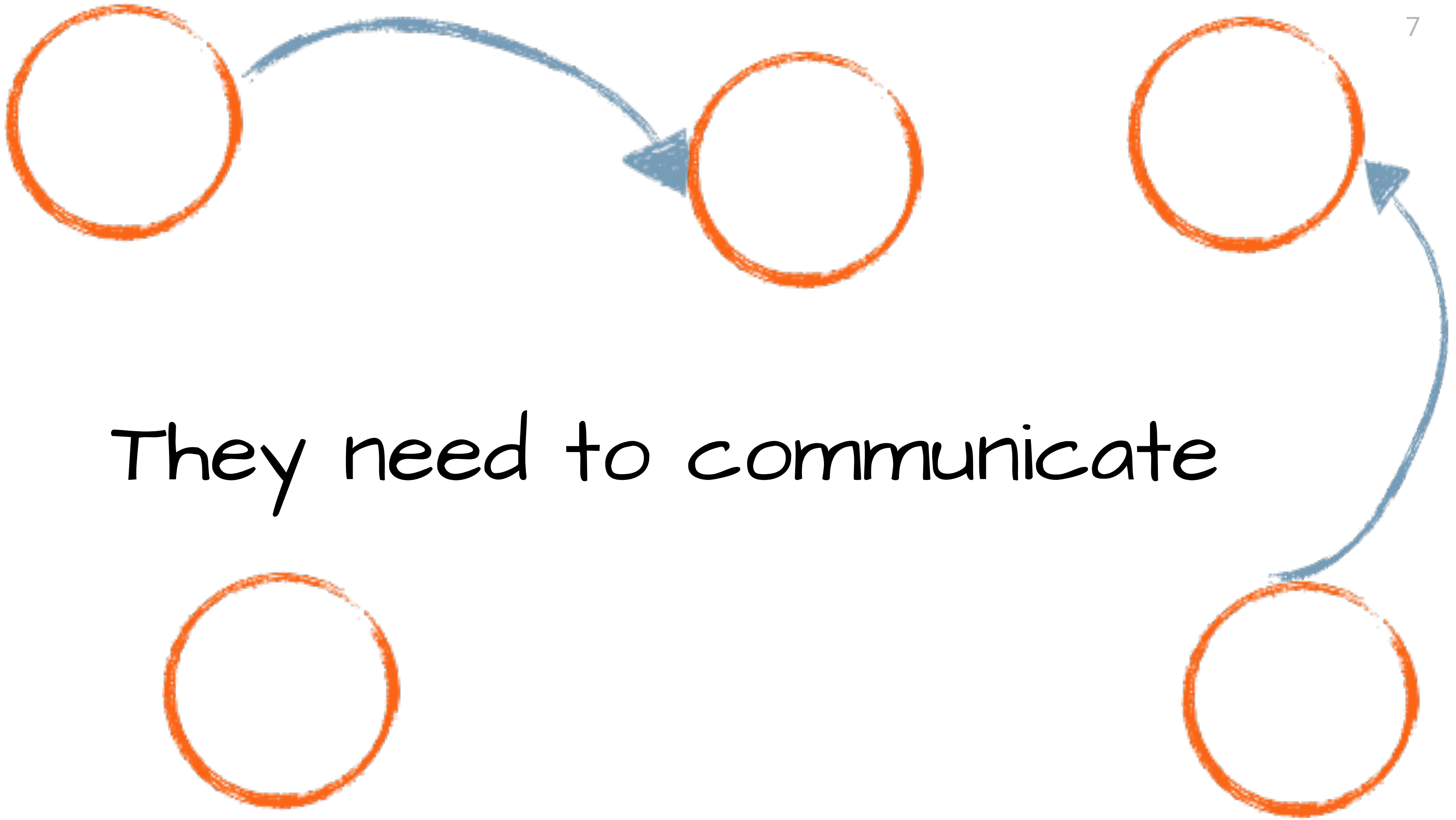
Common ideas

- Resilience
- Elasticity
- Agility
- DevOps

You will build
Cloud Native Applications
from
Non Cloud Native components

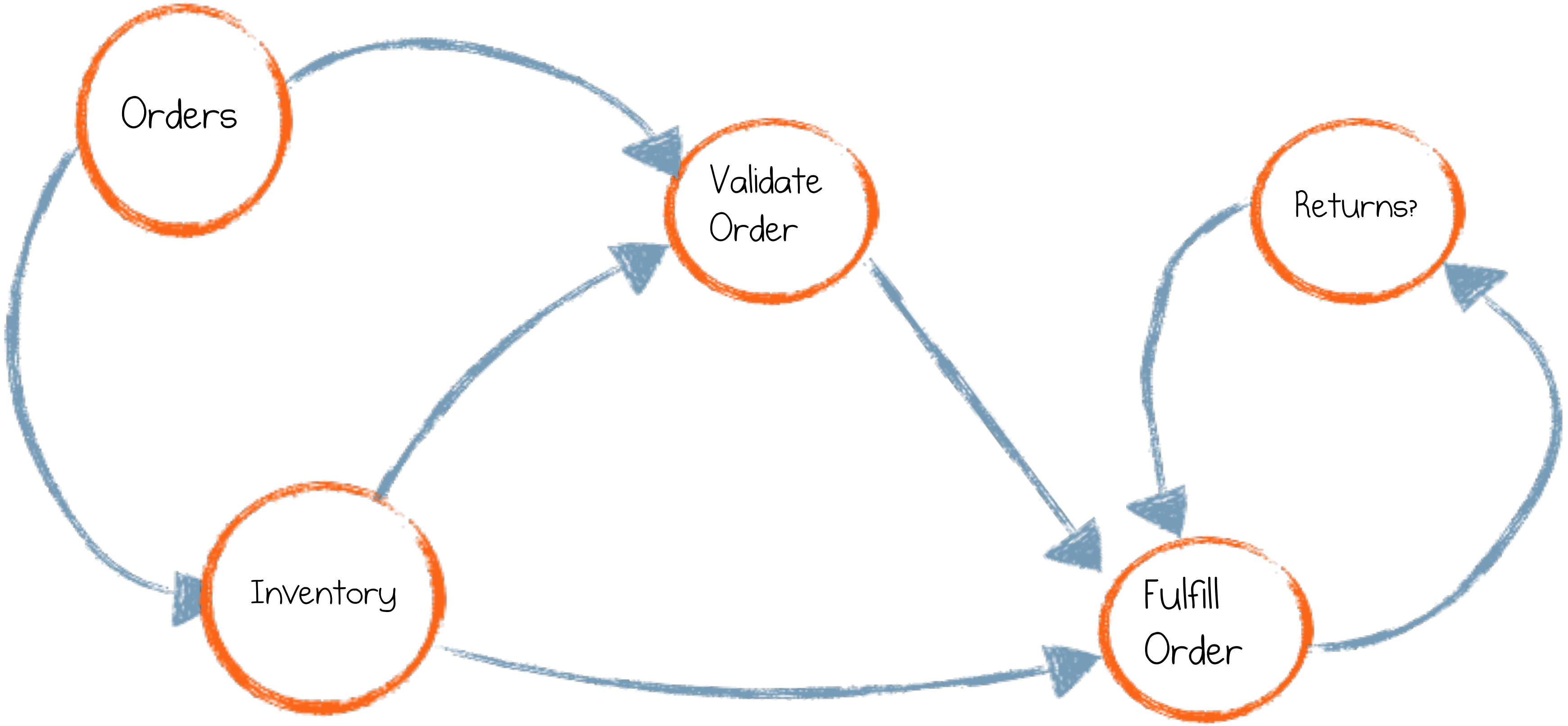
What do
Cloud Native architectures
look like?

You Have Microservices



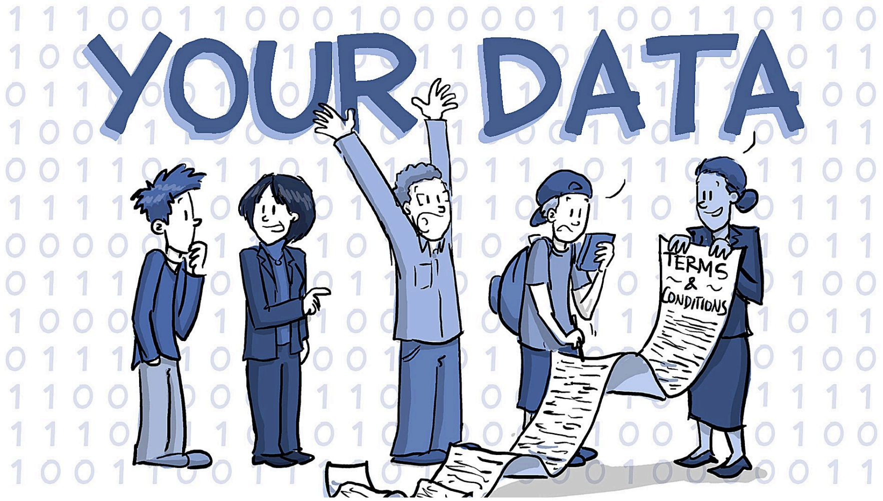
They need to communicate

I know! I'll use REST APIs



But, we forgot something…

The Problem is DATA



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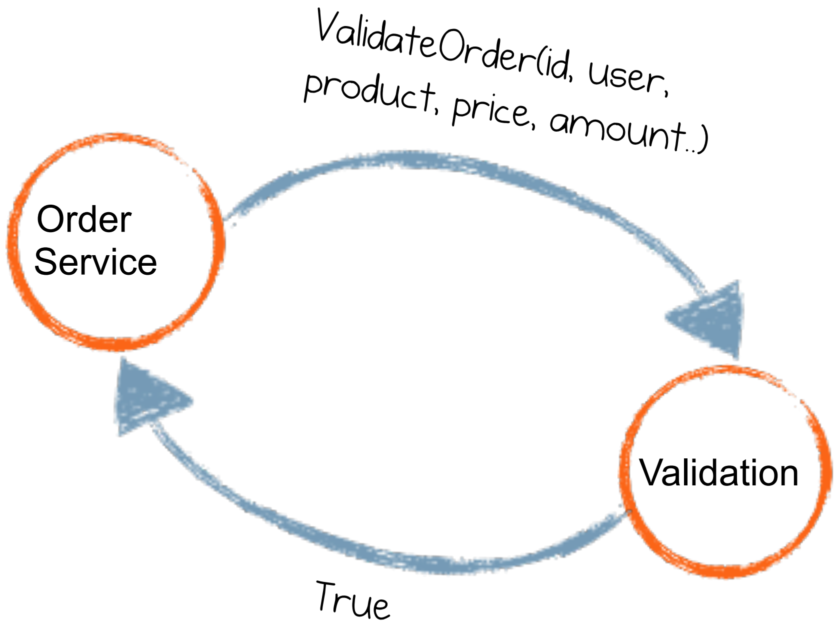
Cloud Native Architectures are Different.

We need data architectures for cloud.

And Data is about context and sharing

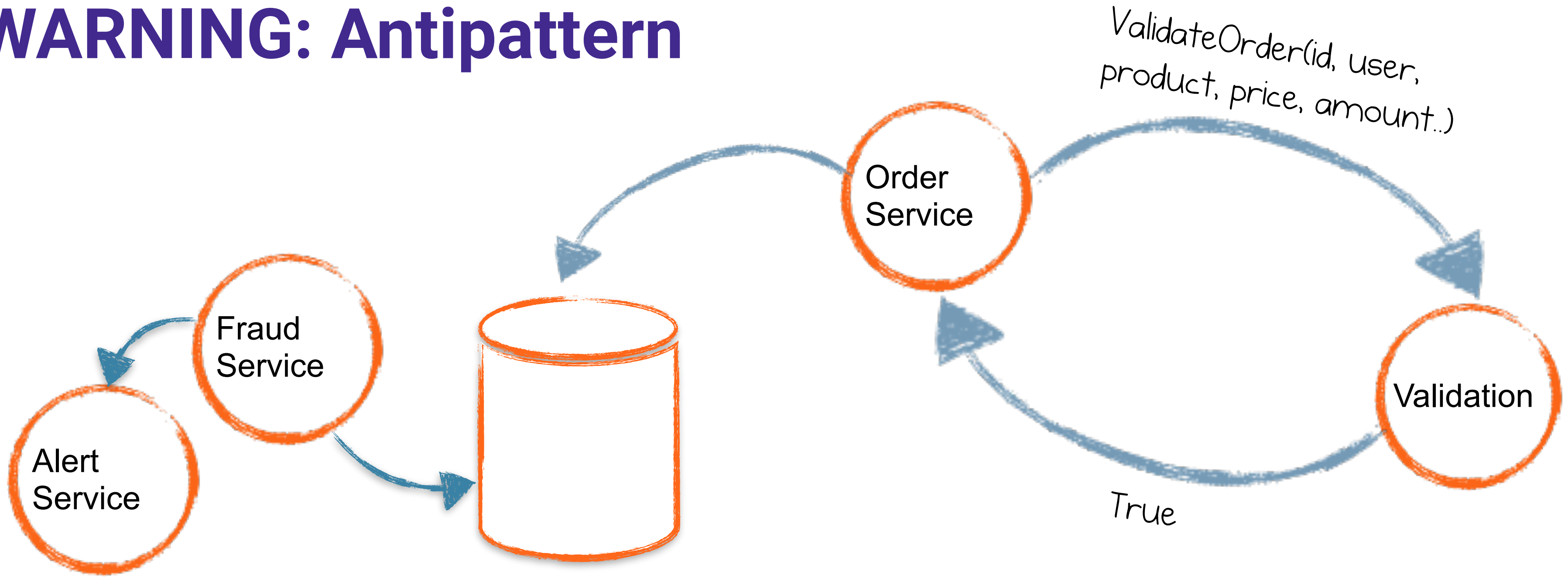
Lets say I have this:



We need Fraud Detection

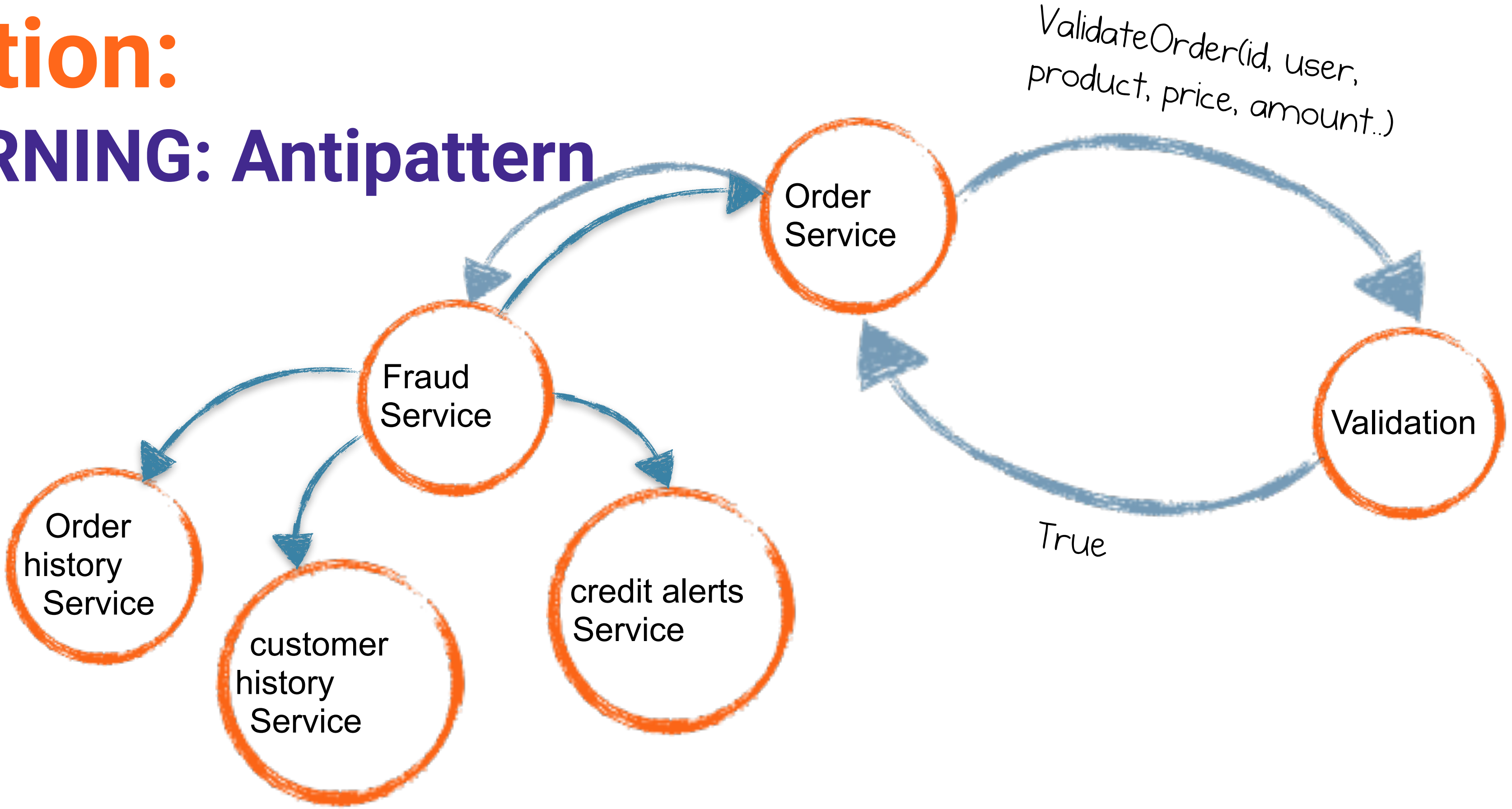
Option:

WARNING: Antipattern

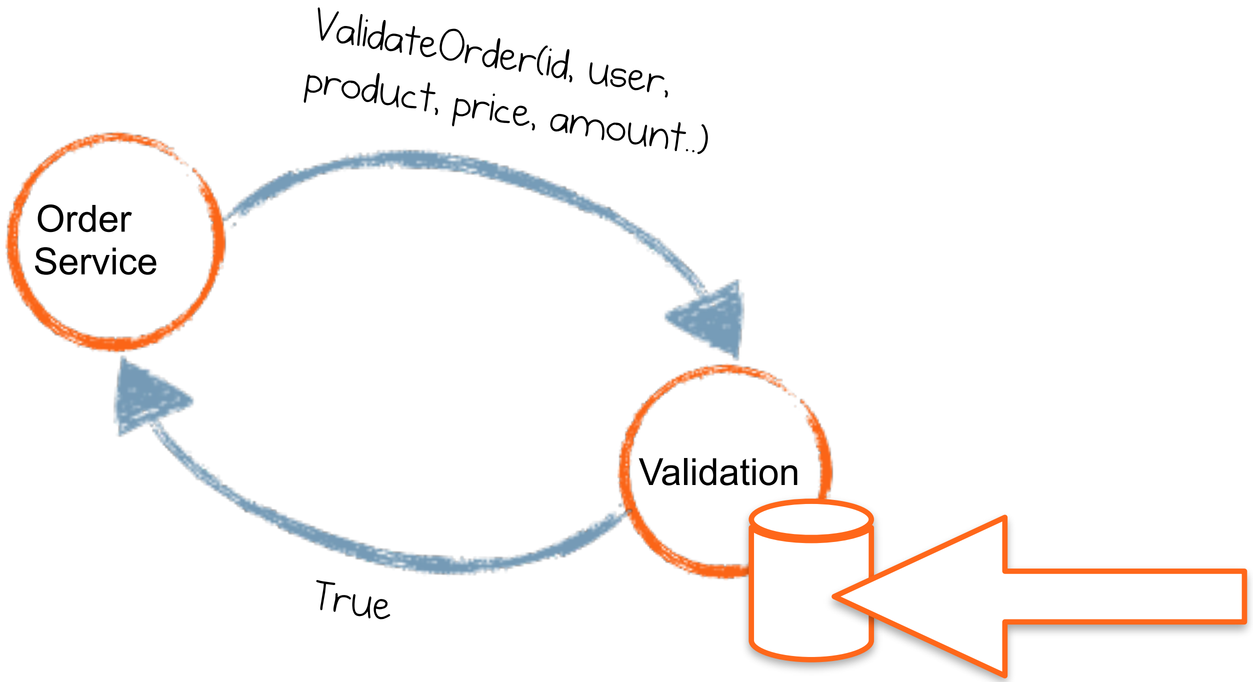


Option:

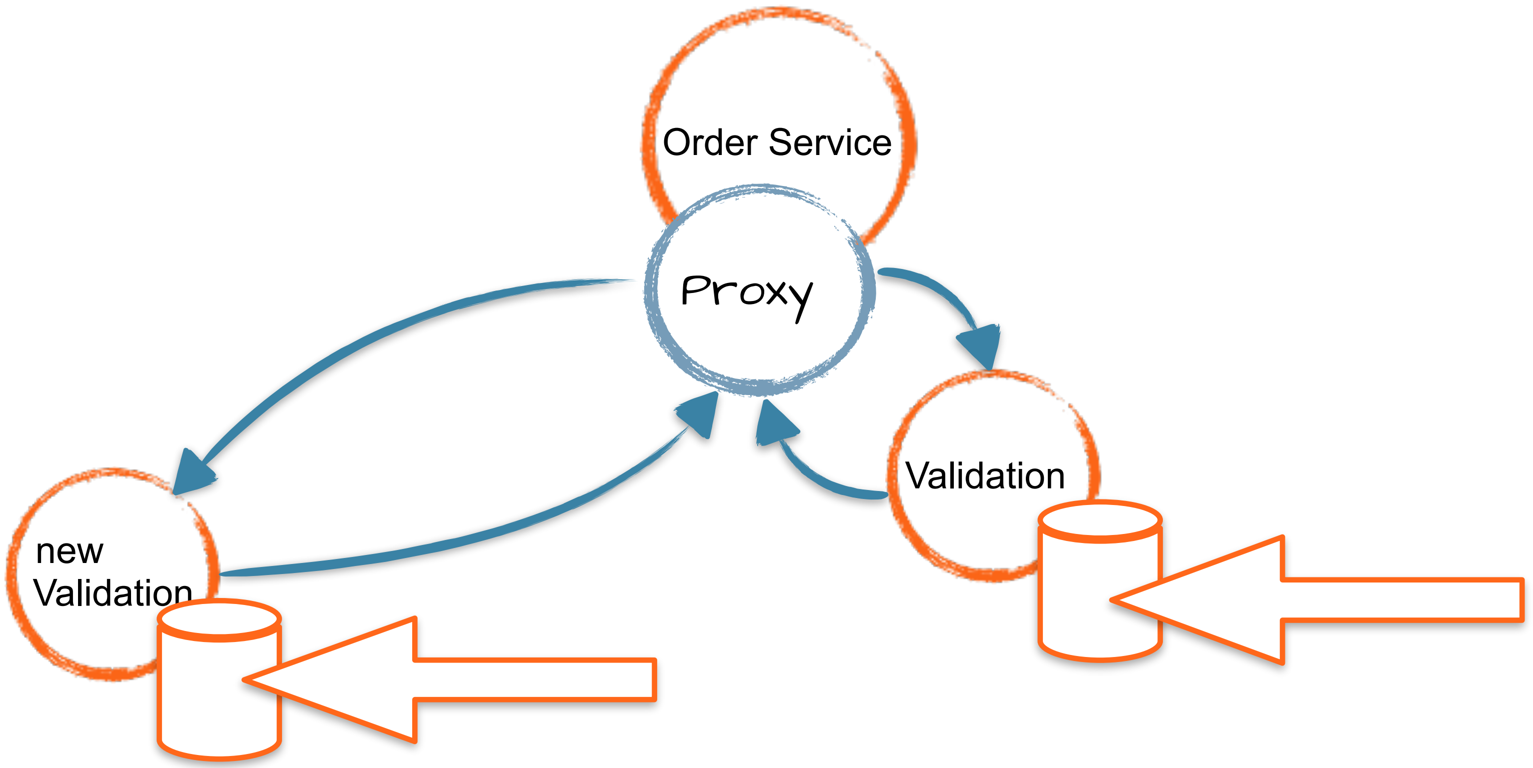
WARNING: Antipattern



What I want is really smart validator



Maybe even more than one



The challenges

- Services are really Stateful
- Data has history
- Data is shared

Lets Look at Patterns

Publish Events

Events are not:

- Commands
- Queries
- Requests

Events are:

- Things that happened
- Notification
- Data

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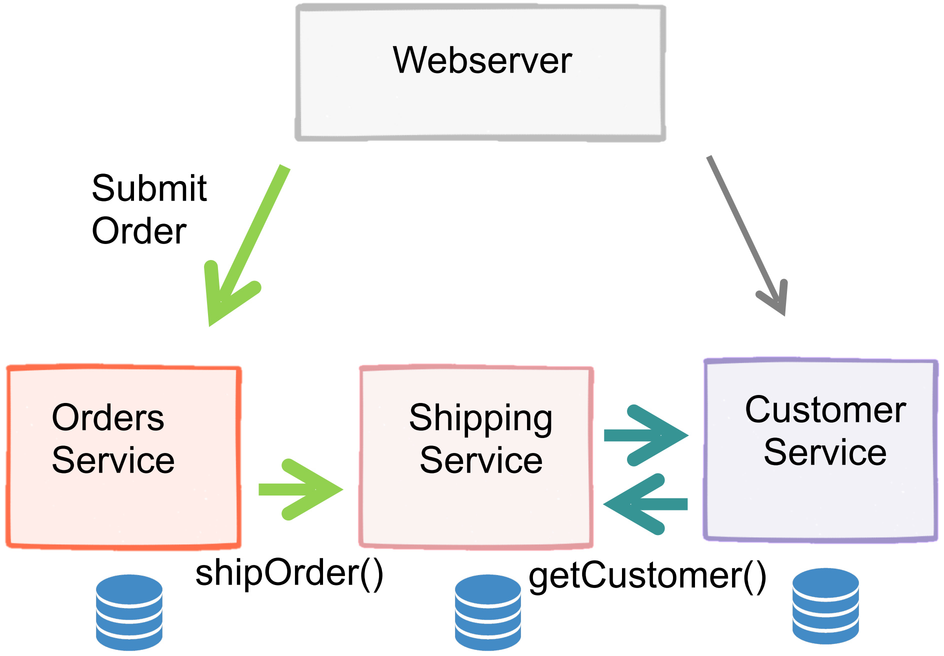
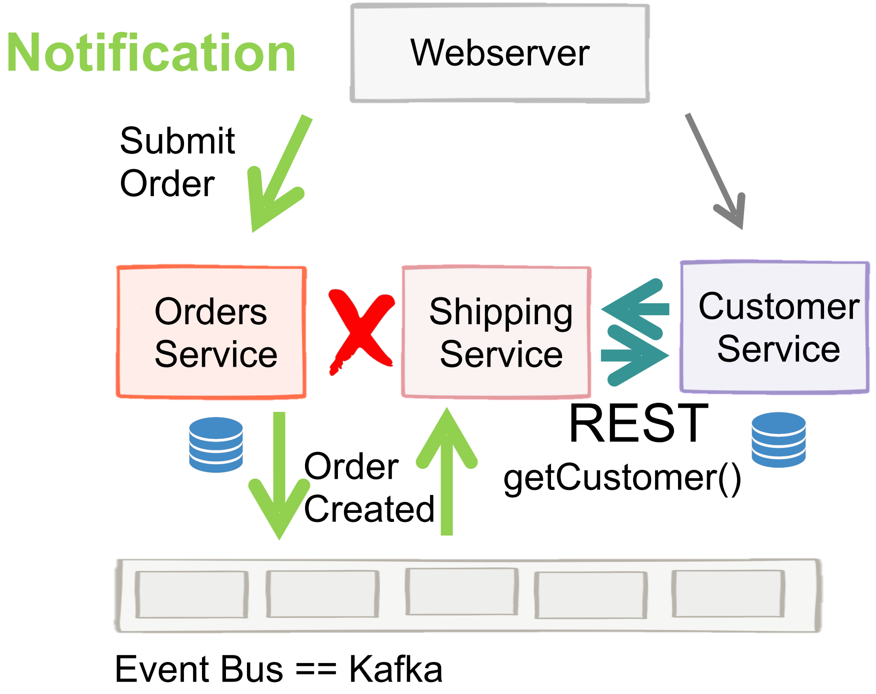
Buying an iPad (with REST)

- Orders Service calls Shipping Service to tell it to ship item.
- Shipping service looks up address to ship to (from Customer Service)



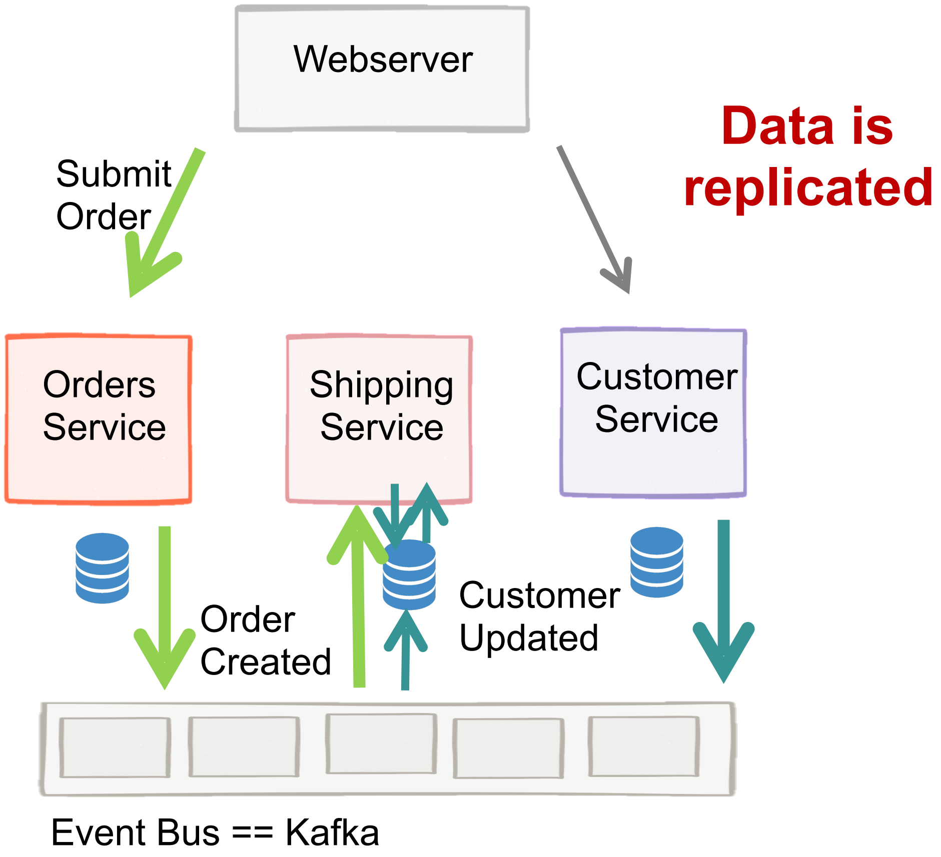
Using events for Notification

- Orders Service no longer knows about the Shipping service (or any other service). Events are fire and forget.



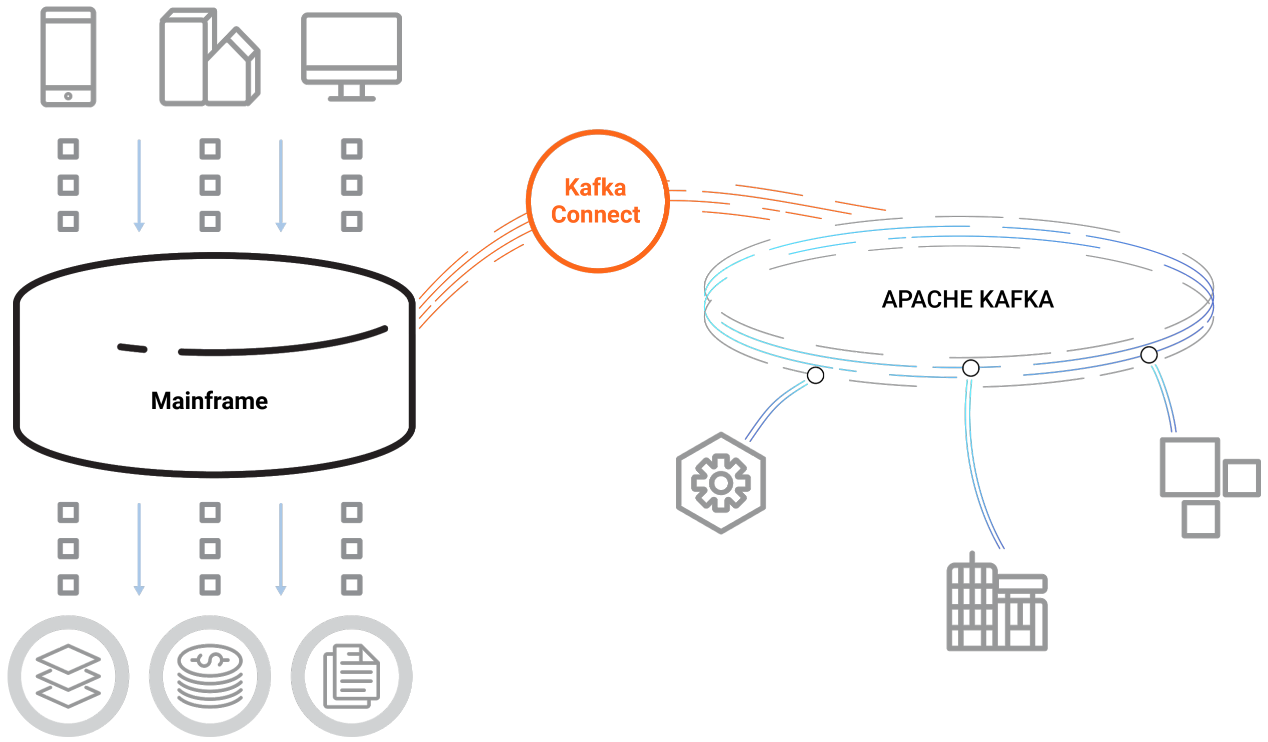
Using events to share facts

- Call to Customer service is gone.
- Instead data in replicated, as events, into the shipping service, where it is queried locally. .



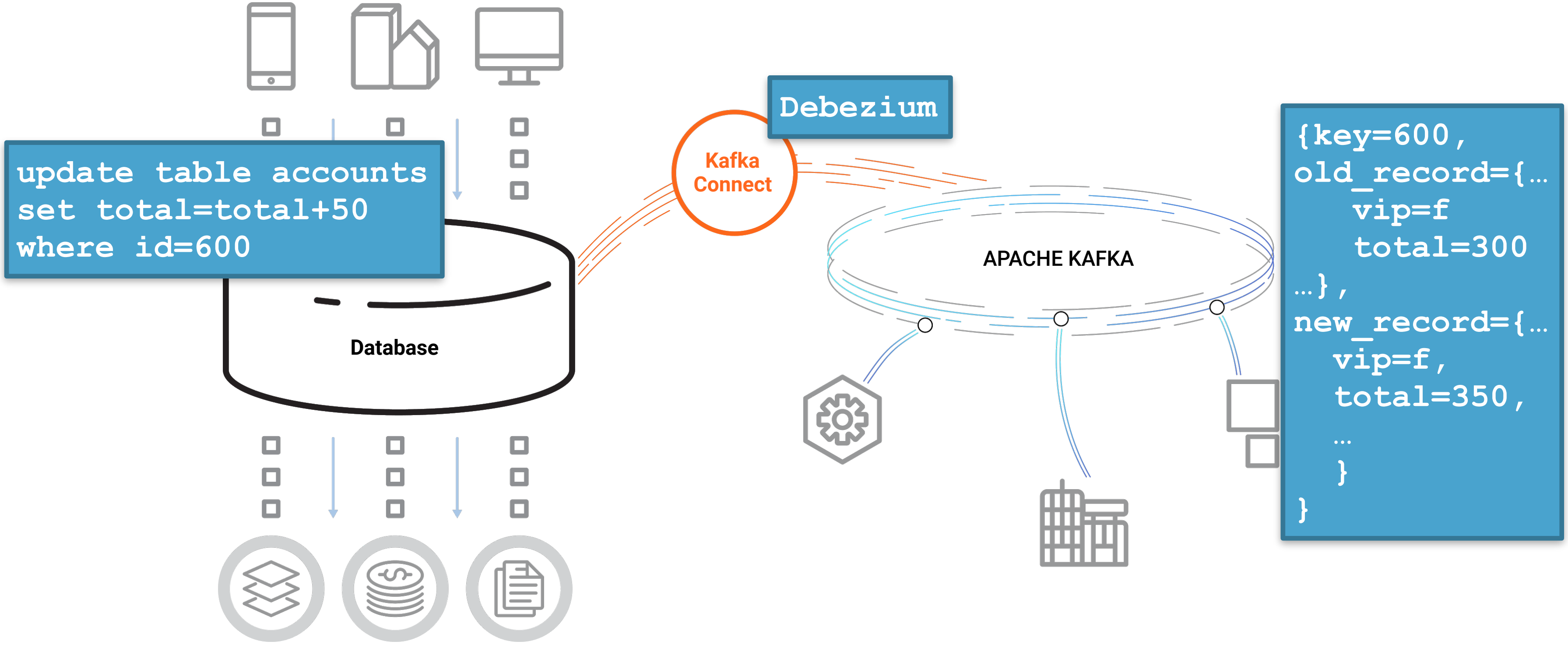
Need someone else's events?

Change Data Capture



Need someone else's events?

Change Data Capture



```
update table accounts
set total=total+50
where id=600
```

```
{key=600,
old_record={…
   vip=f
   total=300
…},
new_record={…
  vip=f,
  total=350,
  …
  }
}
```

Local state
for Microservices

We have a stream of events:

```
{order:1,
 product: iphone,
 status: created
}
```

event 1

```
{order:1,
 product: iphone,
 status: valid
}
```

event 2

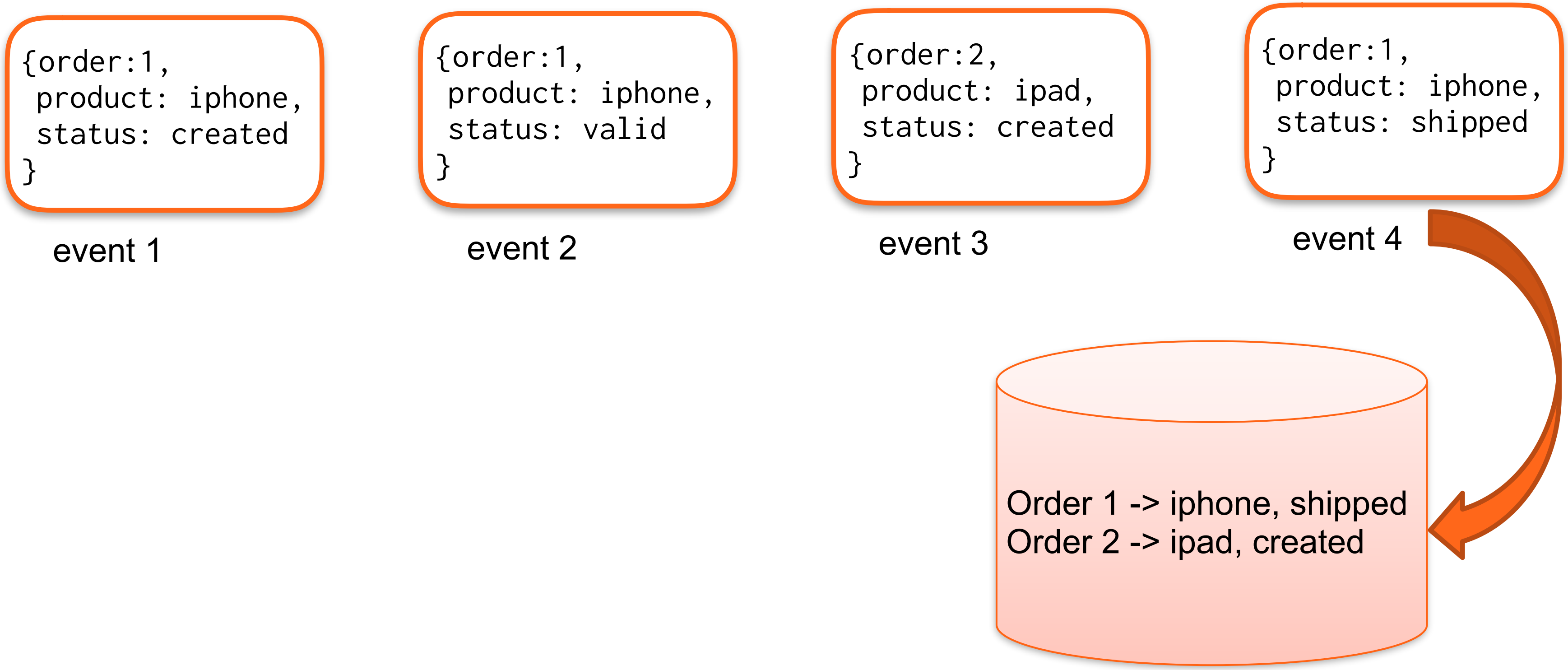
```
{order:2,
 product: ipad,
 status: created
}
```

event 3

```
{order:1,
 product: iphone,
 status: shipped
}
```

event 4

Store current state:



```
{order:1,
 product: iphone,
 status: created
}
```

```
{order:1,
 product: iphone,
 status: valid
}
```

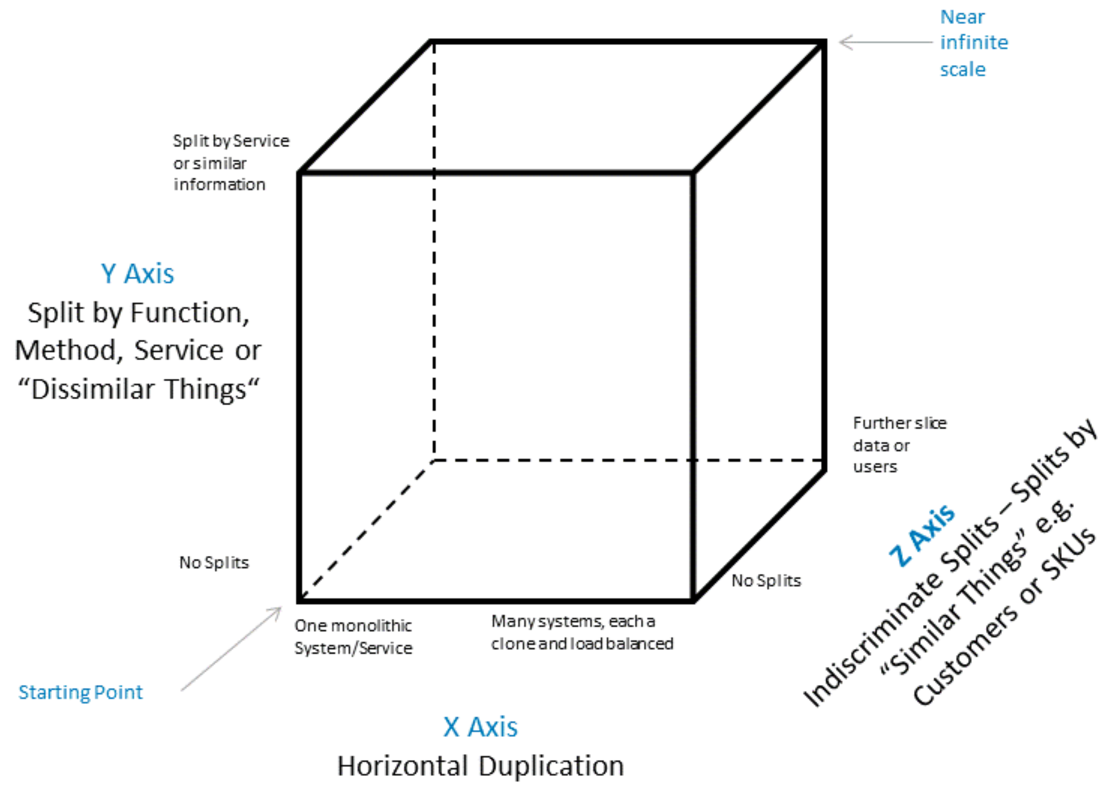
```
{order:2,
 product: ipad,
 status: created
}
```

```
{order:1,
 product: iphone,
 status: shipped
}
```

Duplicate data?

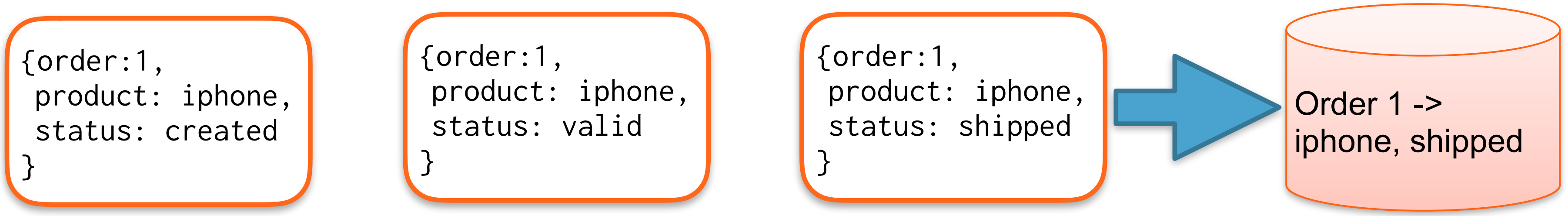
- Low risk due to shared event stream
- Just the data you need
- Sharded with the application
-

AKF Scale Cube


Near infinite scale
Split by Service or similar information
Y Axis
Split by Function, Method, Service or "Dissimilar Things"
No Splits
Starting Point
One monolithic System/Service
Many systems, each a clone and load balanced
X Axis
Horizontal Duplication
No Splits
Further slice data or users
Z Axis
Indiscriminate Splits – Splits by "Similar Things" e.g. Customers or SKUs

Sharded View

Odd orders:

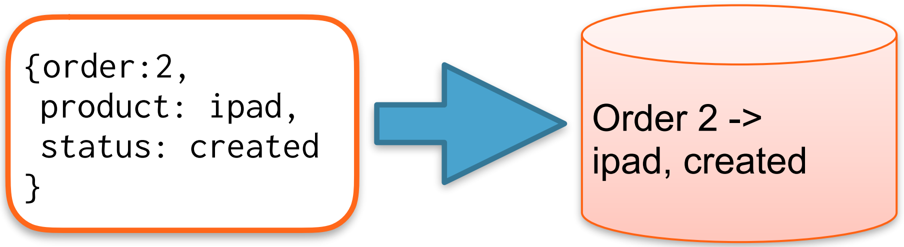


```
{order:1,
 product: iphone,
 status: created
}
```

```
{order:1,
 product: iphone,
 status: valid
}
```

```
{order:1,
 product: iphone,
 status: shipped
}
```

Even orders:



```
{order:2,
 product: ipad,
 status: created
}
```

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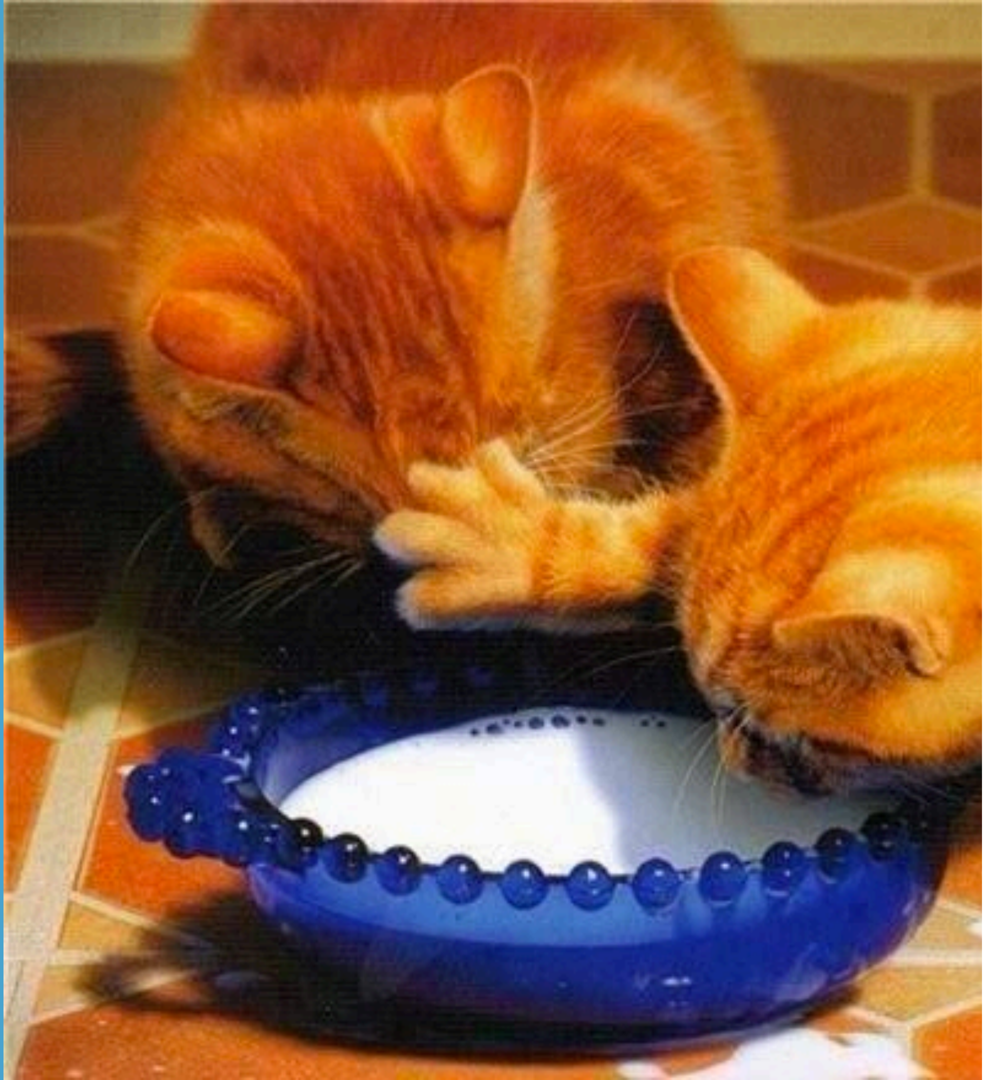
Better than shared DB

- The data I need, the way I need it
- Reduced dependencies
- Low latency
- Events are also triggers

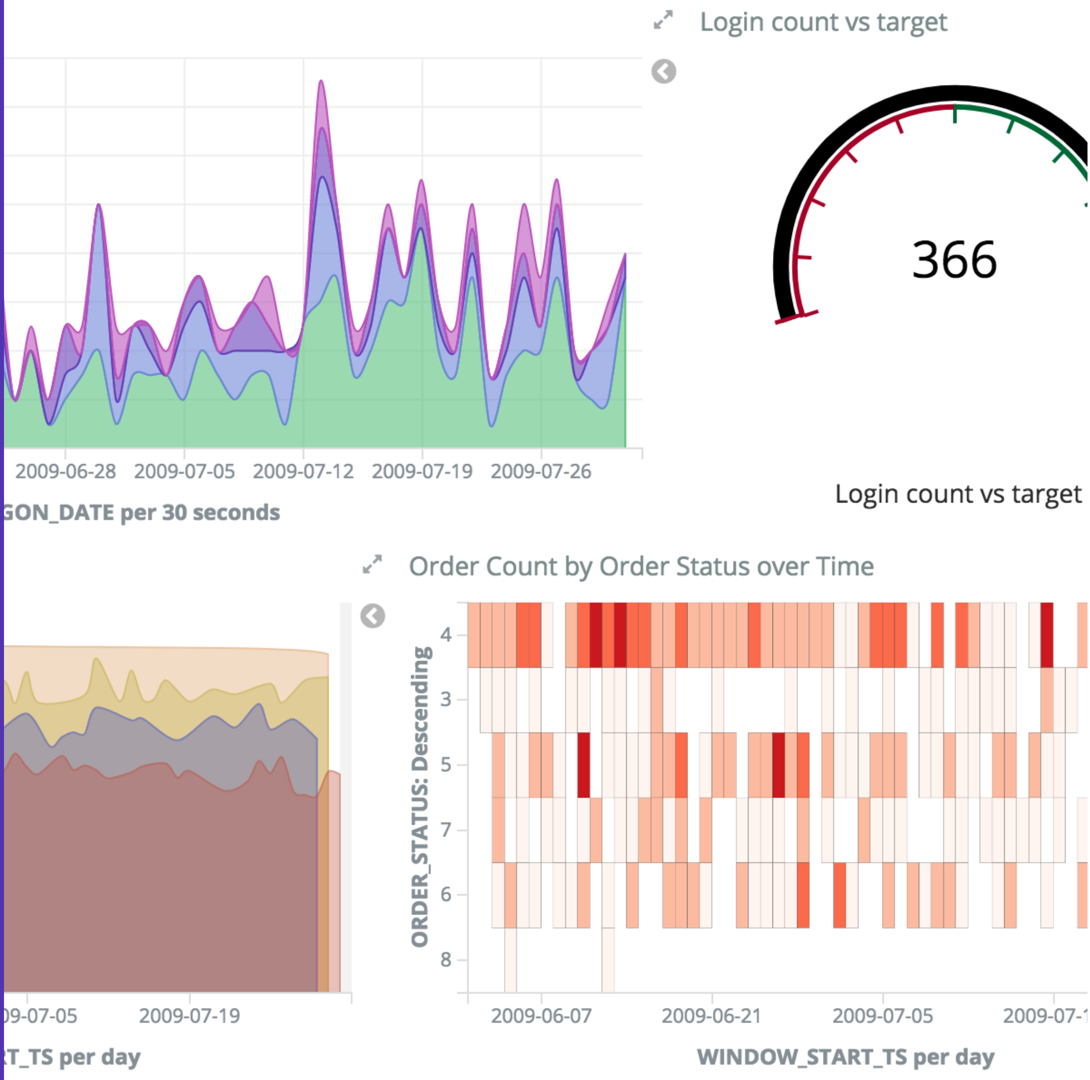


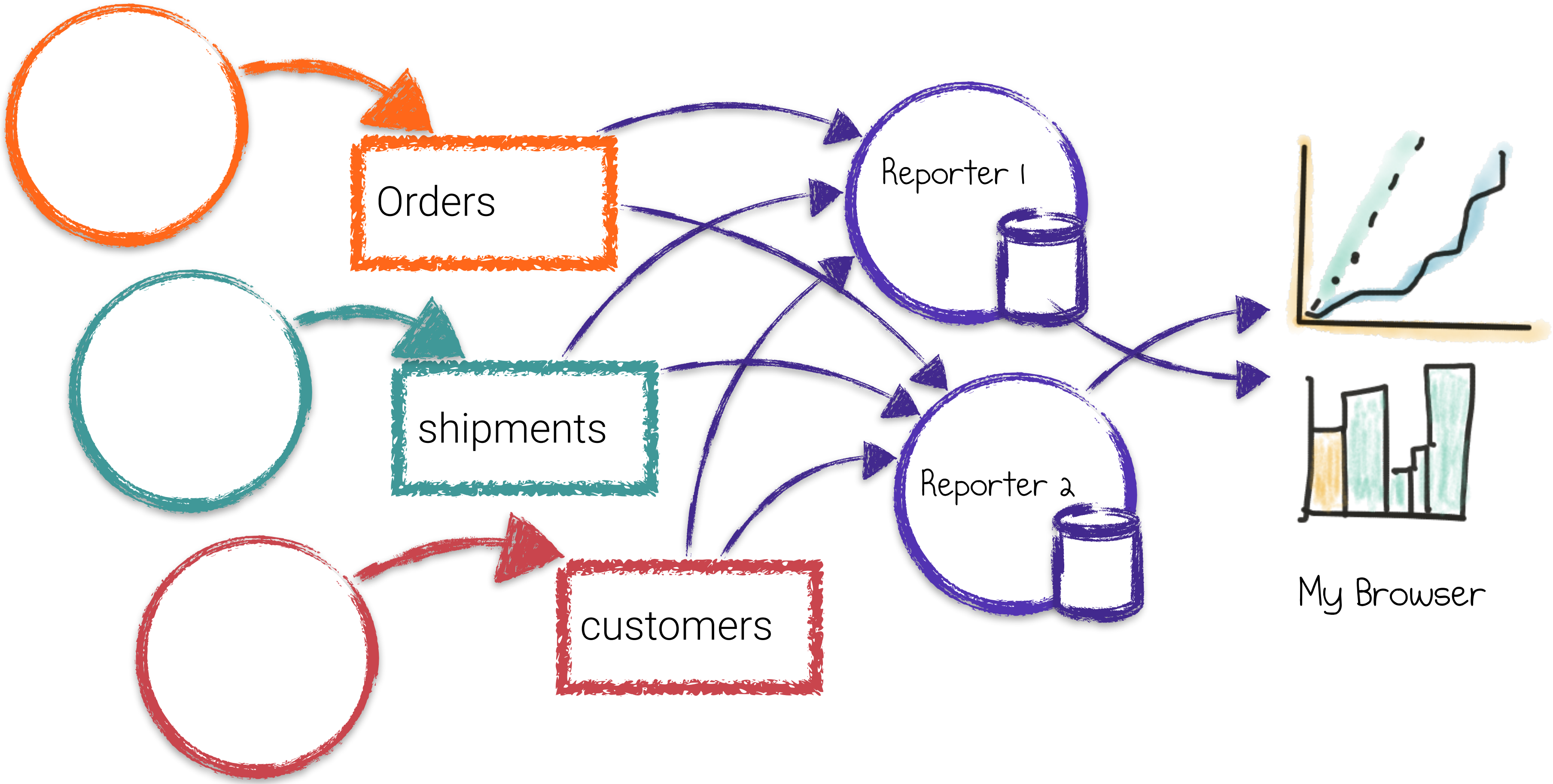
```
select order_id,
customer_id, product where
total_value>10000
…
And also, if you get one
like that in the future,
execute callback()
```

Reporting Live from Streams of Events

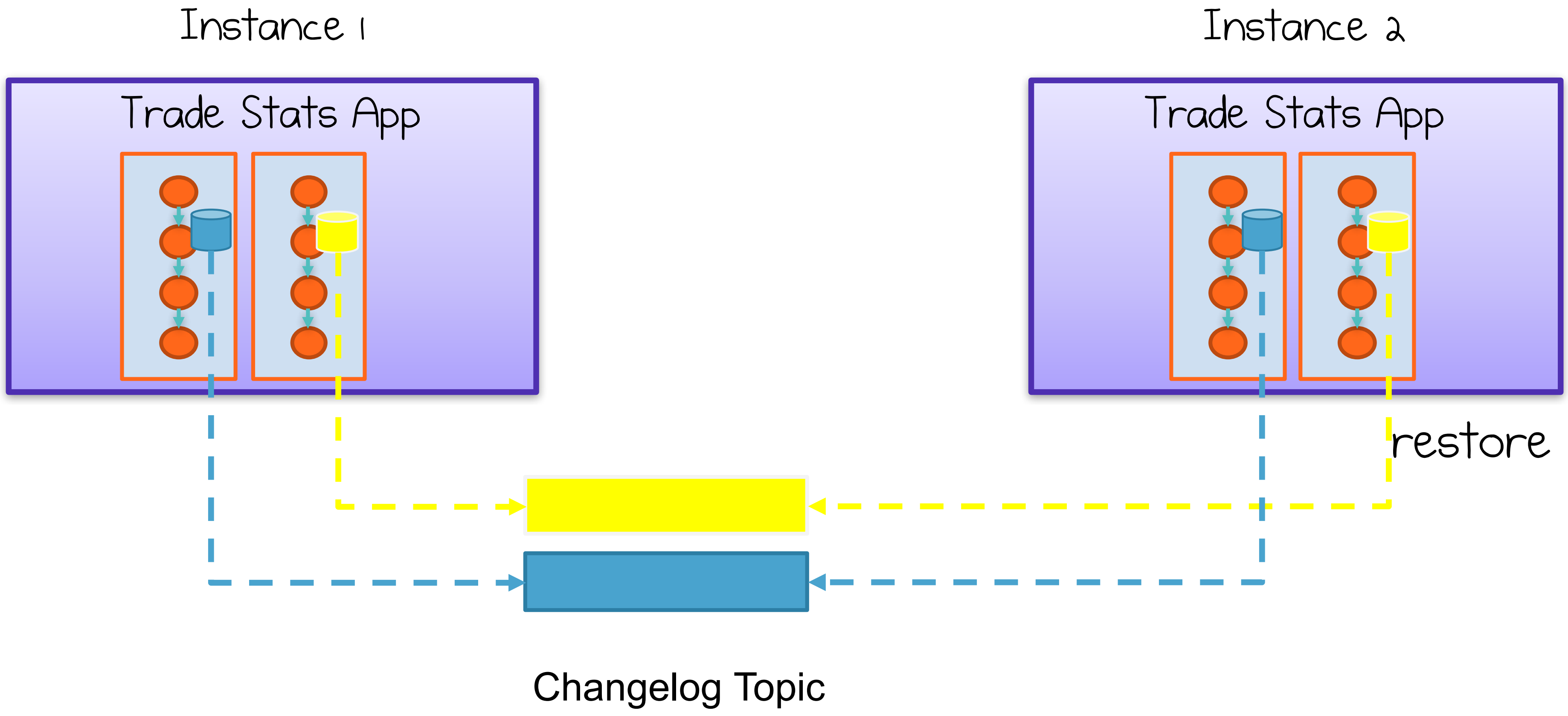
Requirements

- Aggregated reports
- Combining data from many services
- Updated in real time
- Scalable and resilient




Orders
shipments
customers
Reporter 1
Reporter 2
My Browser

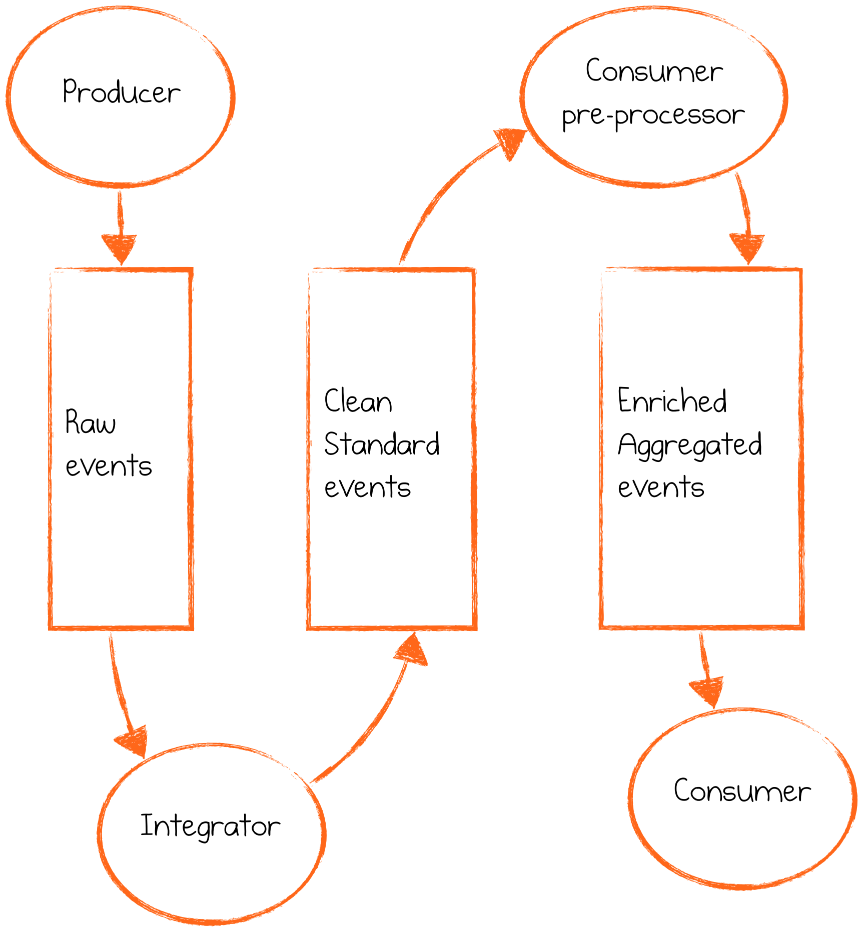
State Recovery



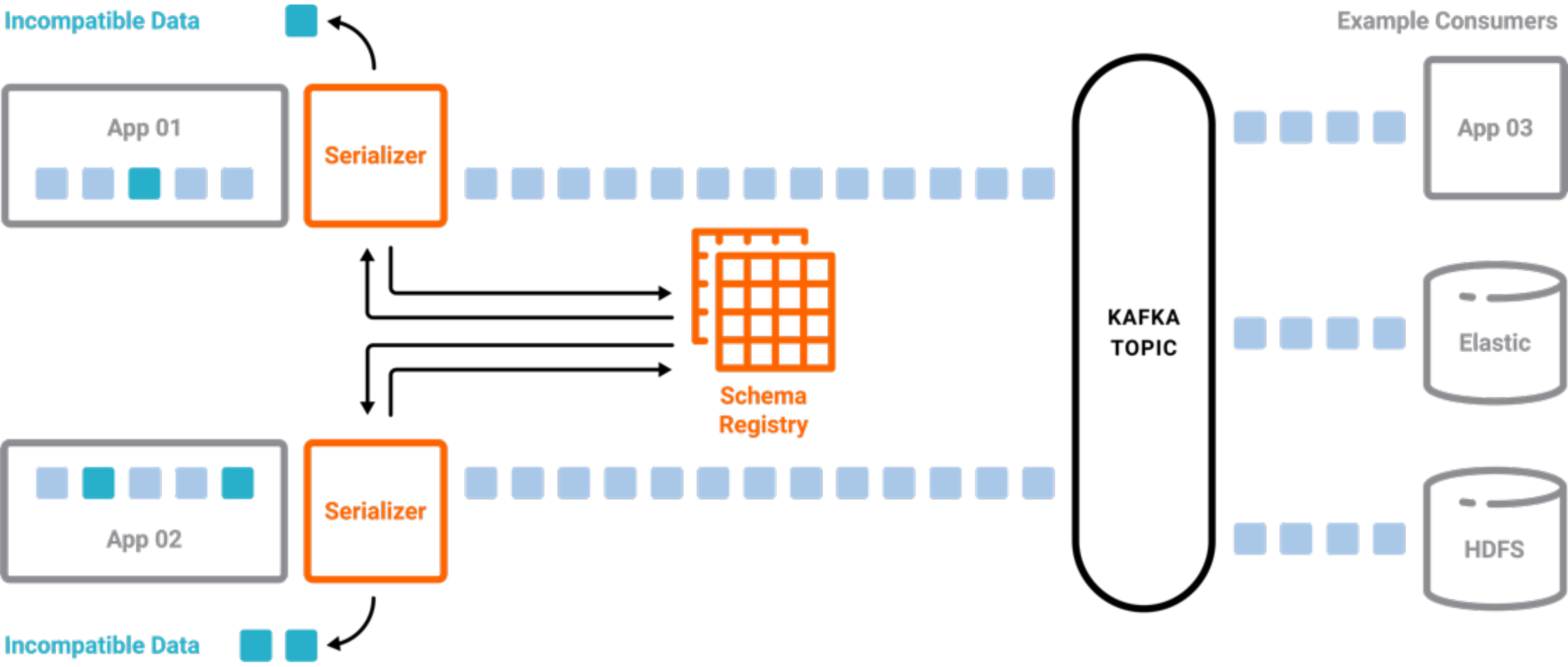
3-layer data model

Who controls the data format?

- Publishers?
- Consumers?
- How do we share events?



In **Event Streaming** World
Event Schemas ARE the API


Incompatible Data
Example Consumers
App 01
Serializer
App 03
Schema
Registry
KAFKA
TOPIC
Elastic
App 02
Serializer
HDFS
Incompatible Data

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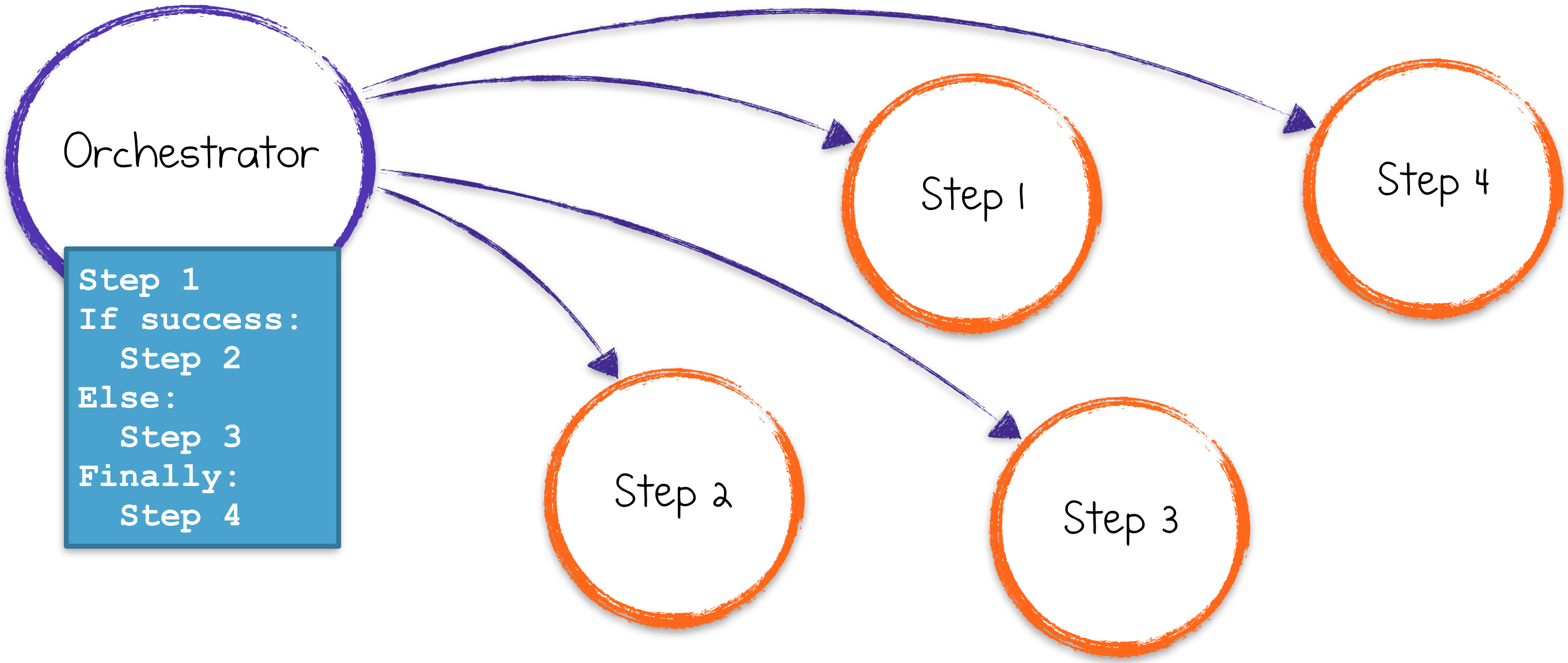
Take Away Points!

Remember This

- As you design cloud-native architectures
  - don't forget the data
- Publish events
- Build views and reports from events
- Be nice to each other

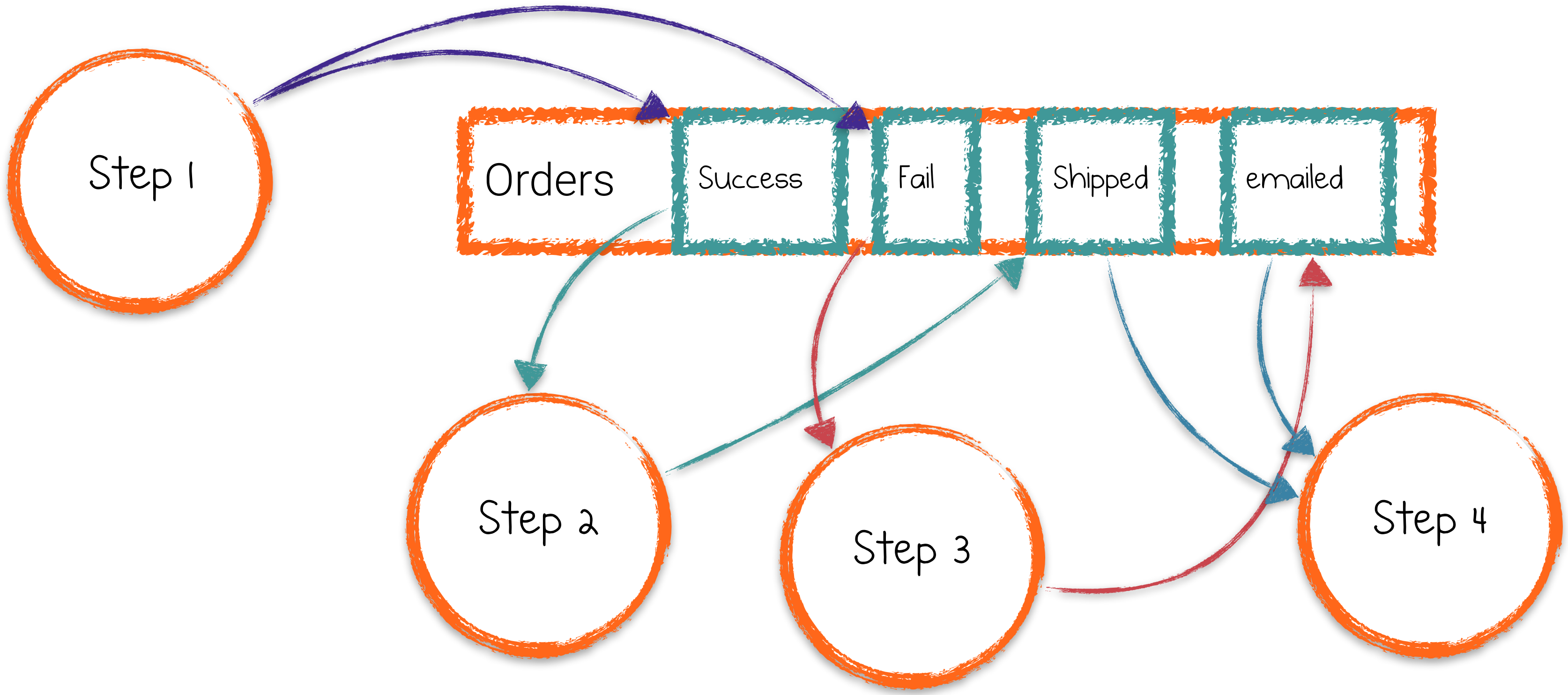
Orchestration vs Choreography

Orchestration: One Service to Rule them all



```
Step 1
If success:
   Step 2
Else:
   Step 3
Finally:
   Step 4
```

Choreography: We react to each other


Step 1
Orders
Success
Fail
Shipped
emailed
Step 2
Step 3
Step 4