

# HTTP Feeds

Asynchrone Schnittstellen  
ohne Kafka

**INNOQ**



**JOCHEN CHRIST**  
@JOCHEN\_CHRIST



Hi,  
I am Jochen

## Jochen Christ

Senior Consultant at INNOQ



*Java Technologies*

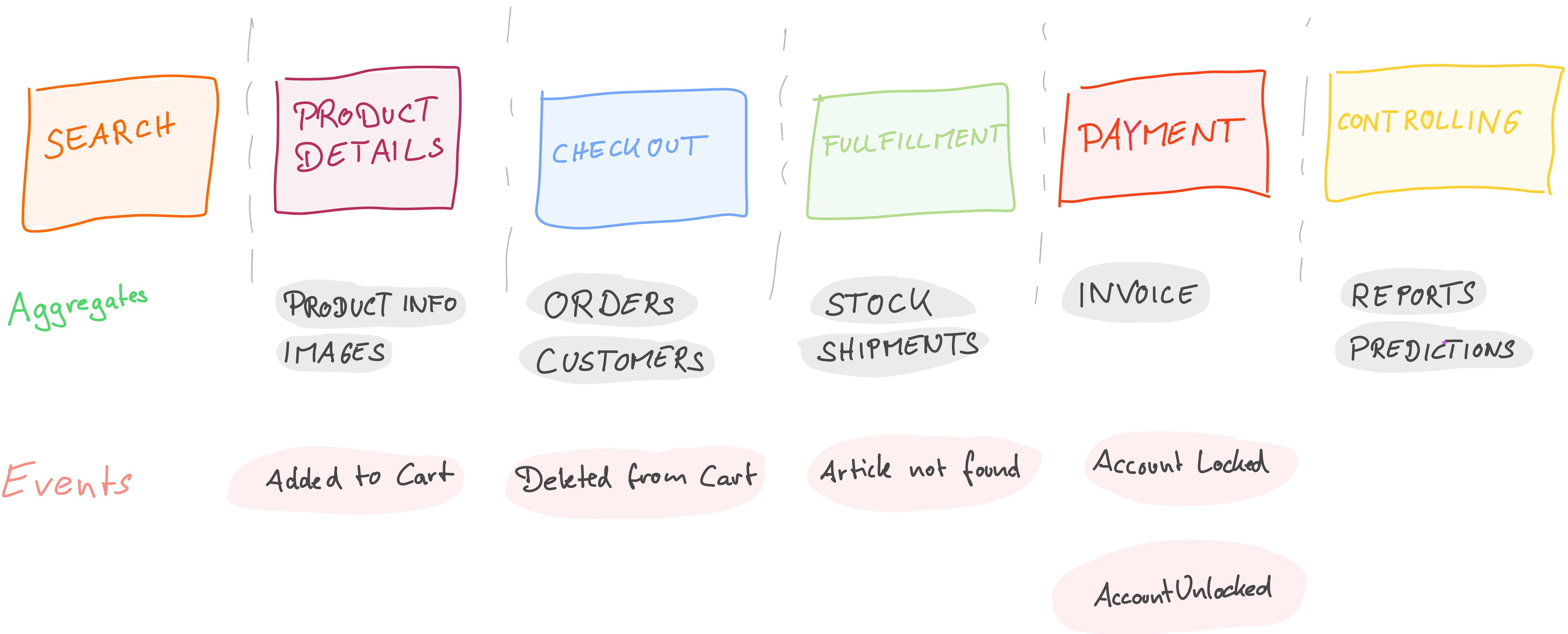


*Self-contained Systems*



*Remote Mob Programming*





SEARCH

PRODUCT  
DETAILS

CHECK OUT

FULL FILLMENT

PAYMENT

CONTROLLING

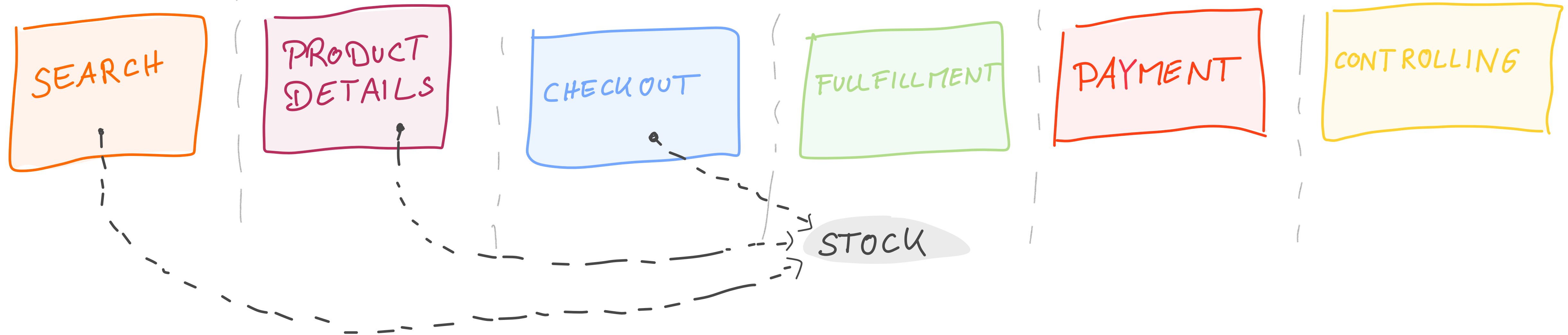
ORDERS

SHIPMENT

INVOICE

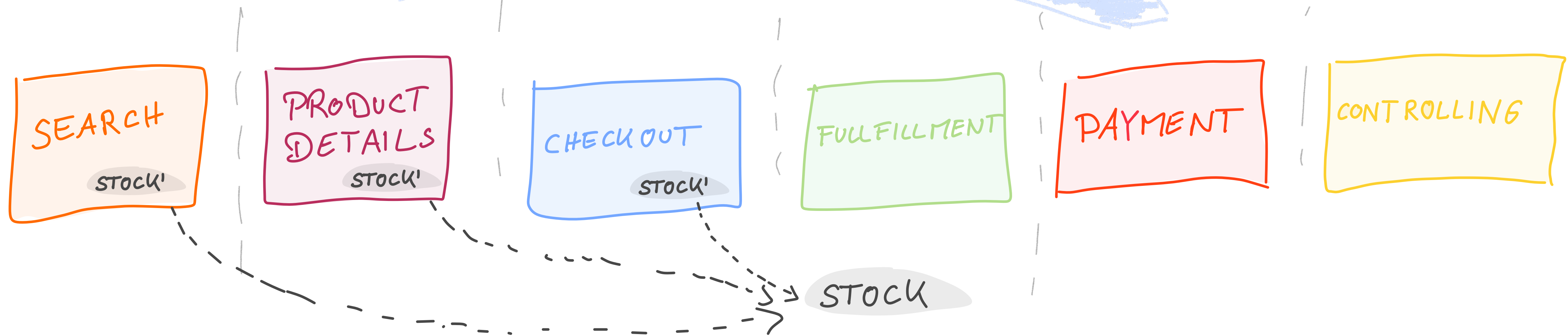


# CROSS-DOMAIN DATA ACCESS





# DATA REPLICATION



- ☑ ASYNC
- 🕒 REALTIME
- ★ DON'T CALL US



# Event Streaming

SEARCH

PRODUCT  
DETAILS

CHECKOUT

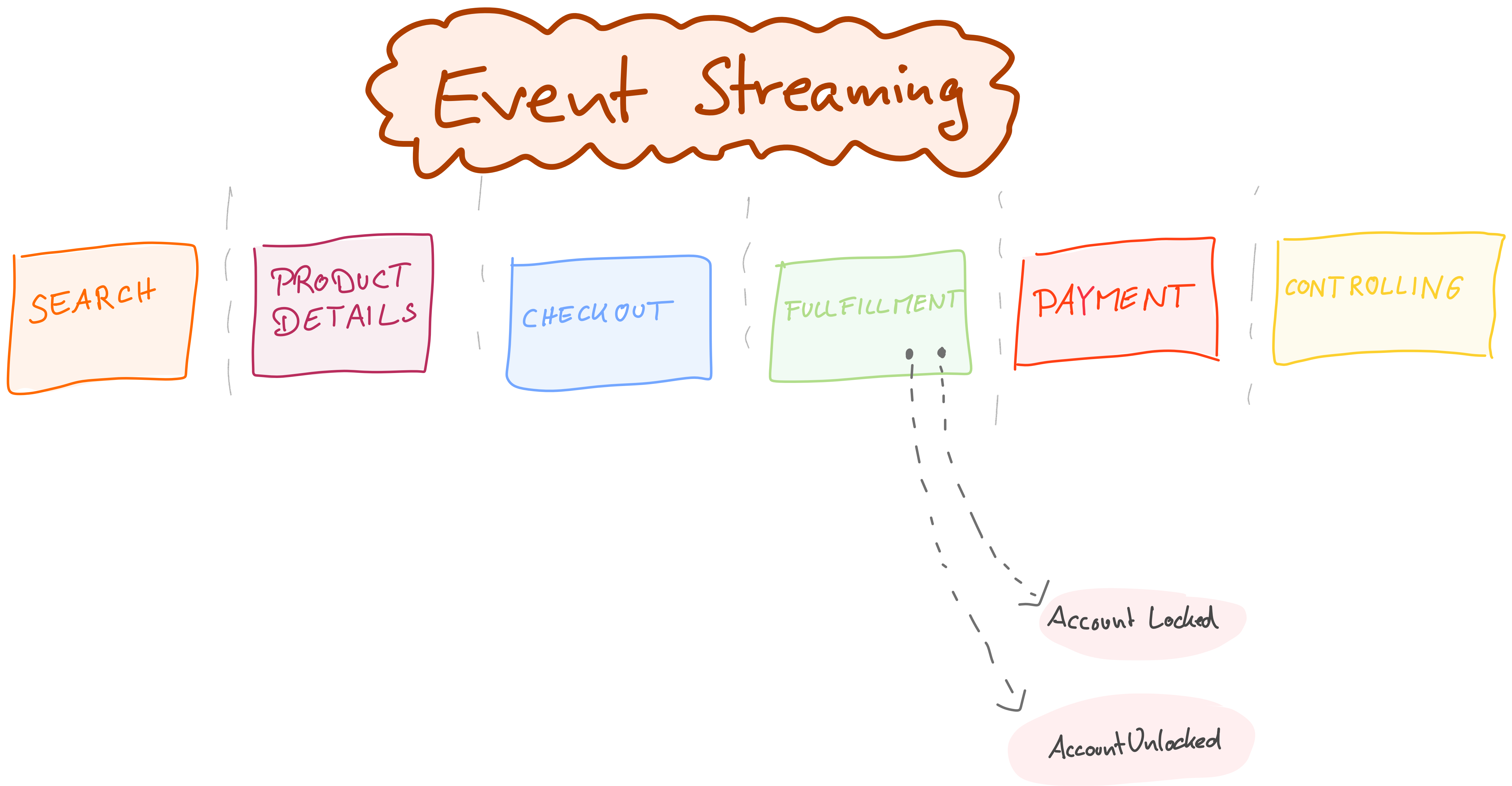
FULLFILLMENT

PAYMENT

CONTROLLING

Account Locked

Account Unlocked





# File Export



→ FTP  
→ S3-Buckets

Hadoop

Nightly Exports

XML / CSV / JSON

Fast Batch  
Processing



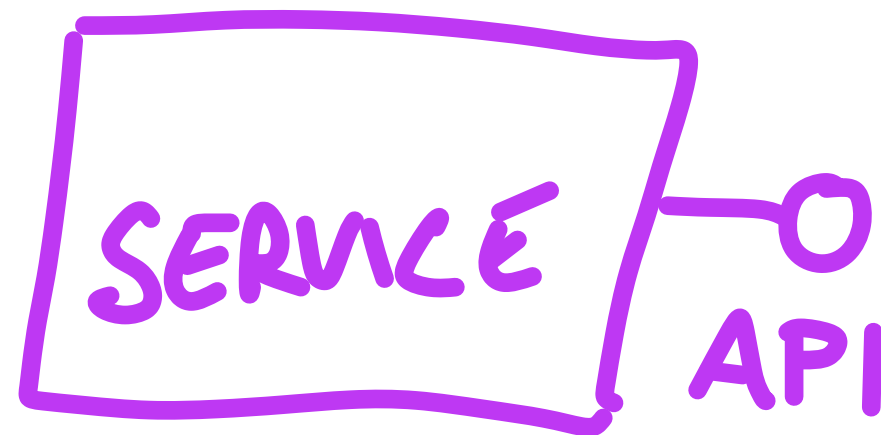
# Synchronous API

Real time

REST

gRPC

Routine  
Dependency



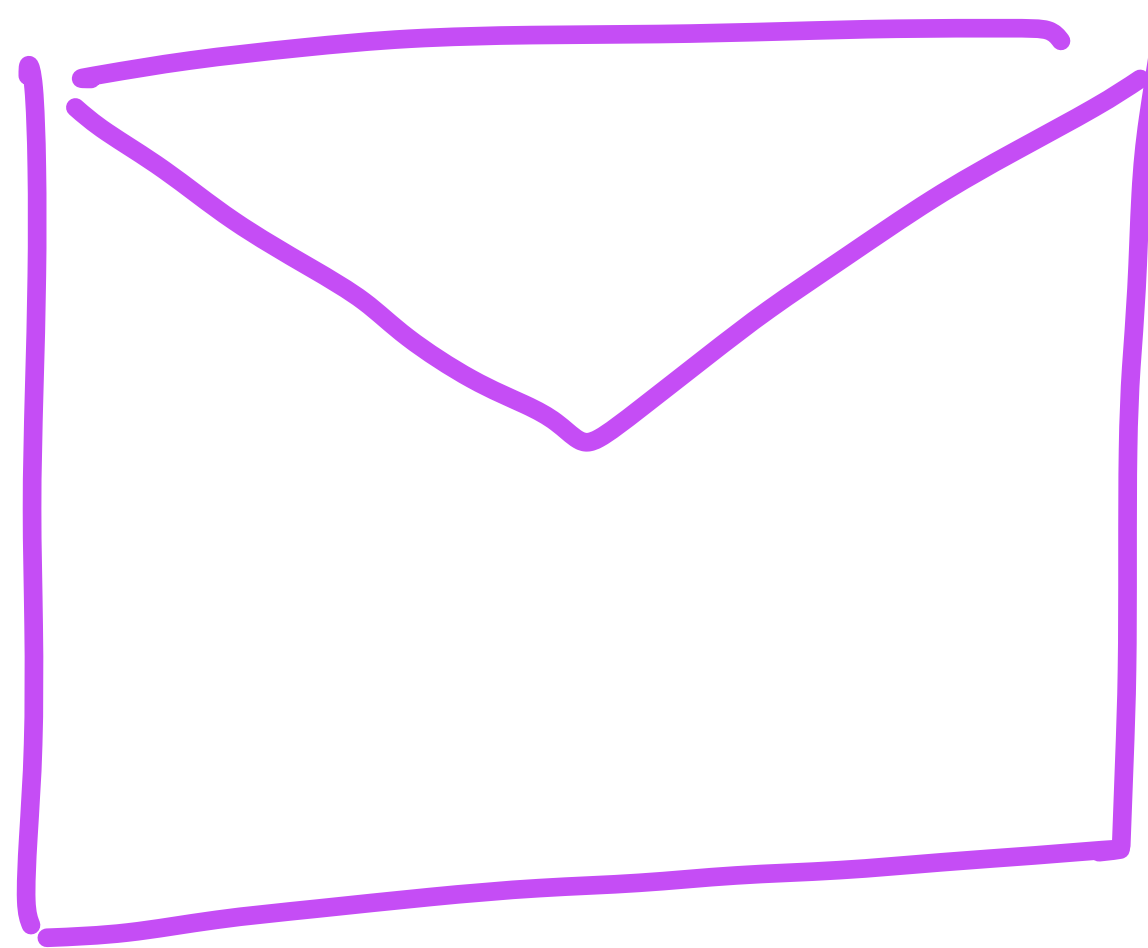
JSON/  
HTTP

Simple

WS - \*

# Async Messaging

Near-  
Realtime



MQ

JMS

KAFKA

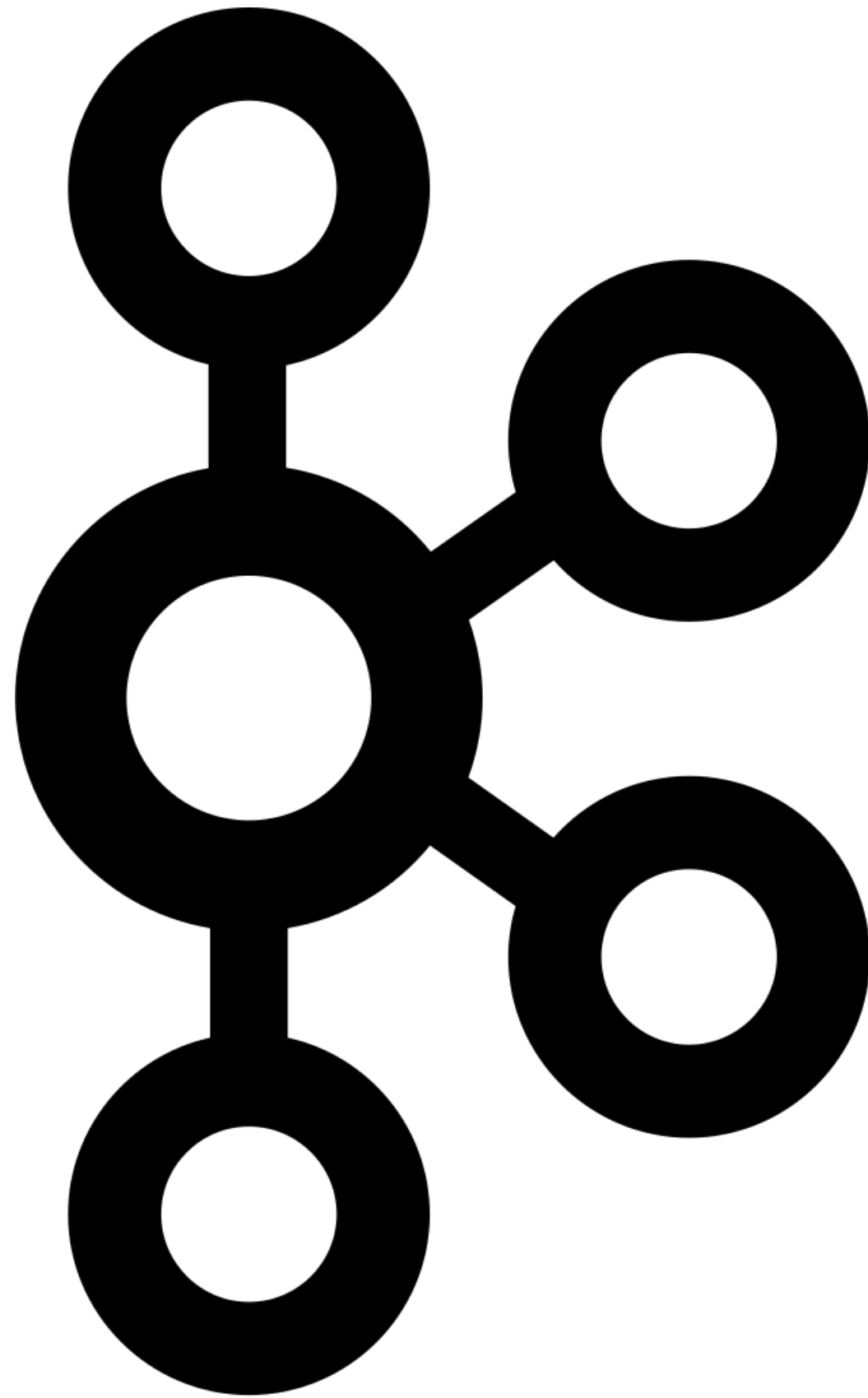
One-Way

Middleware/  
Broker

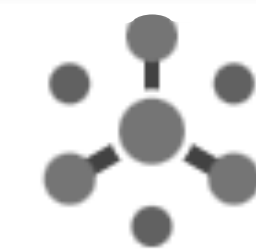




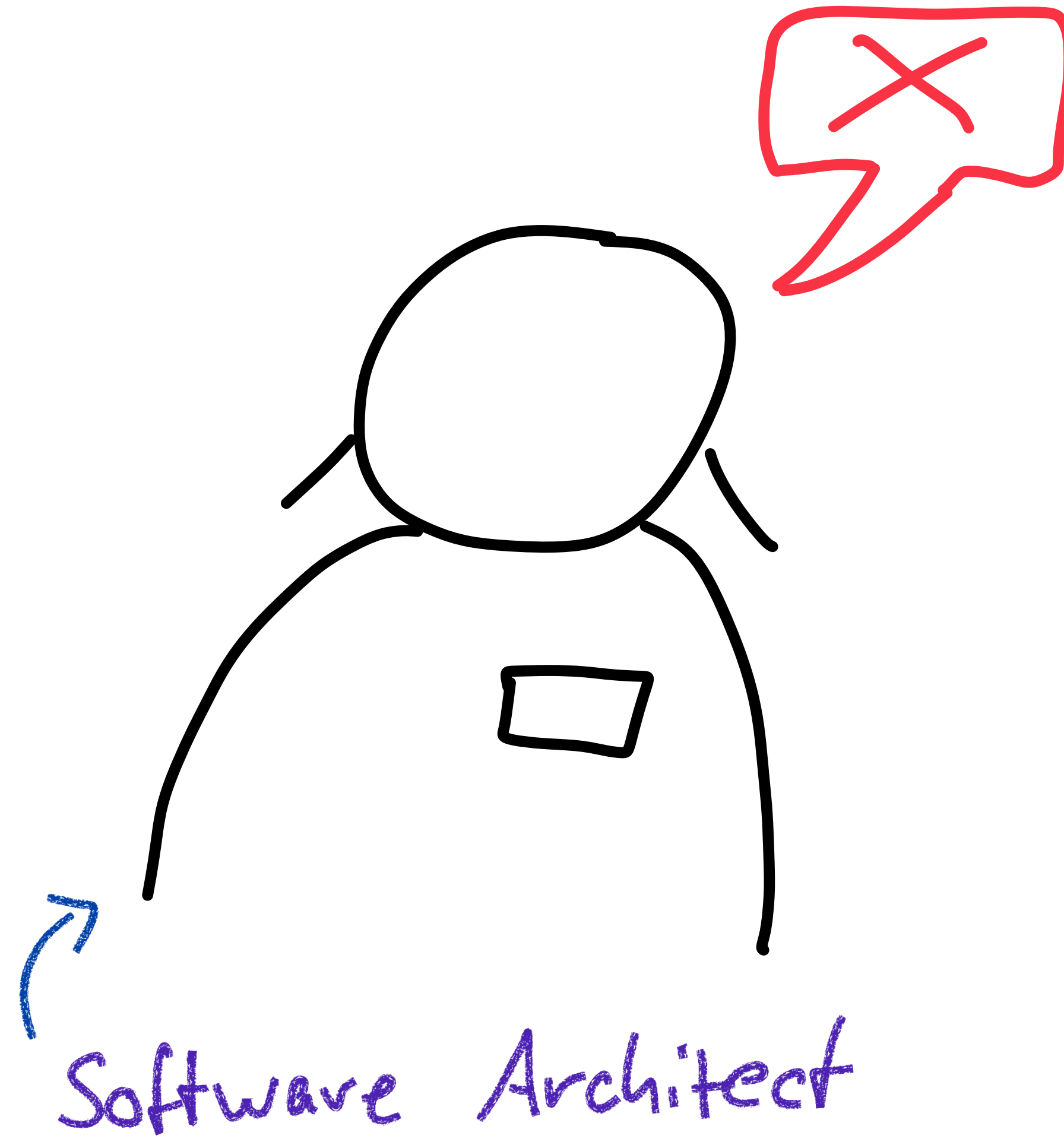
 RabbitMQ



 APACHE kafka®

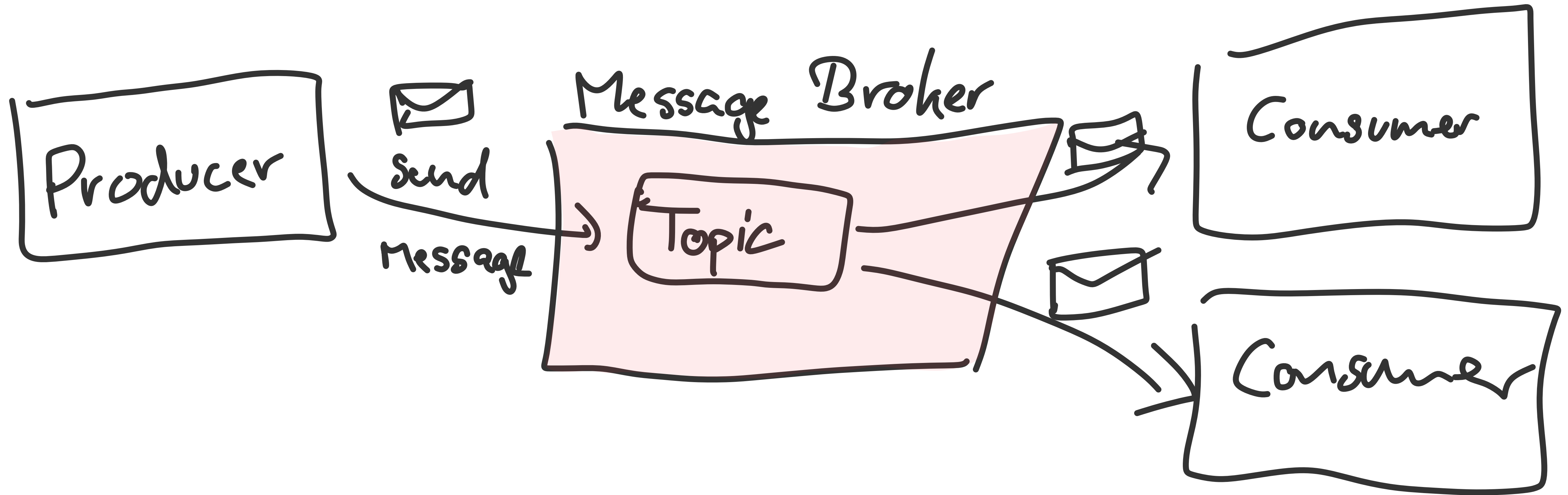


Pub/Sub





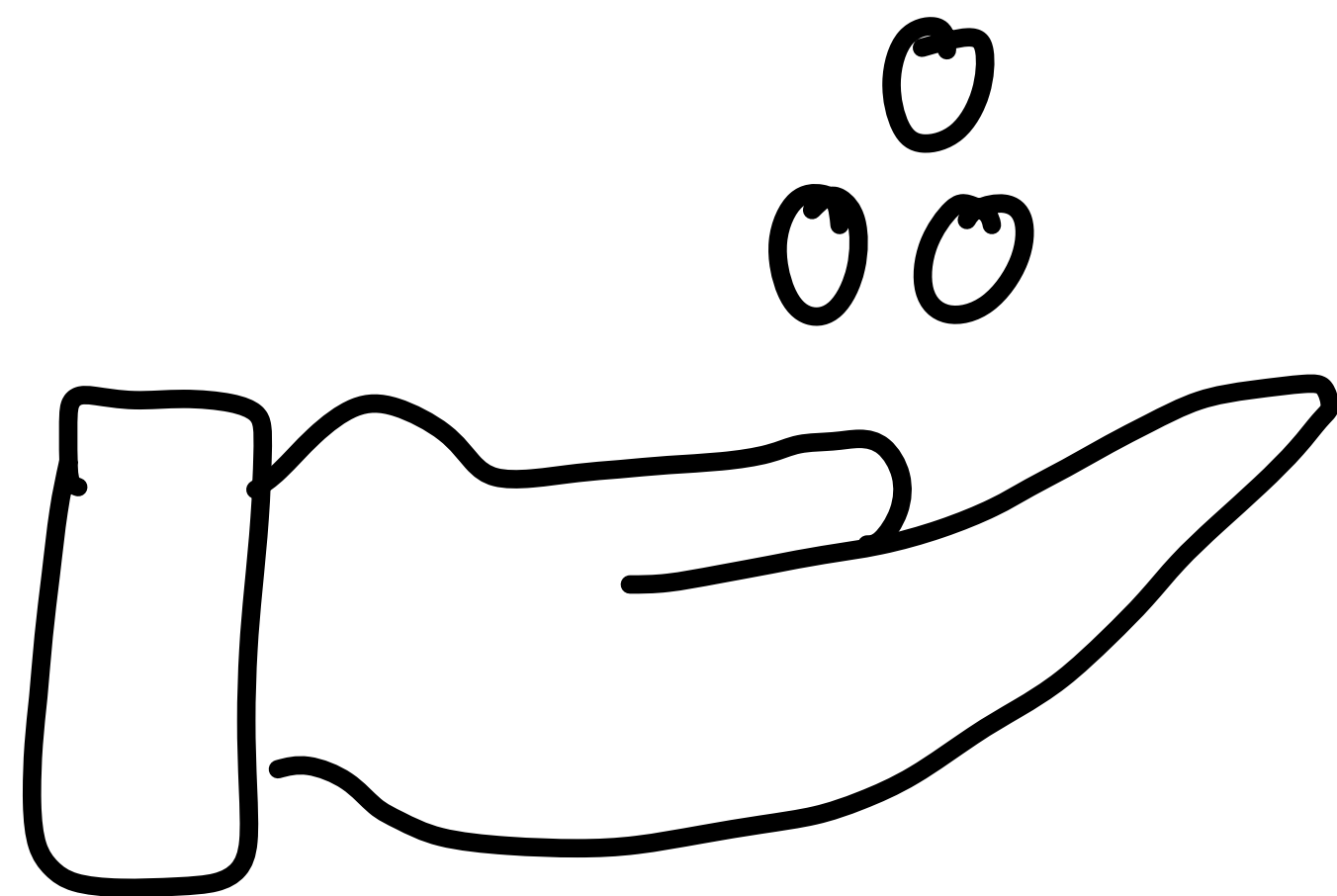
# Async Messaging





⚡ Time to  
changes

24/7 Support?



# OWNERSHIP

Ops

Access  
Control

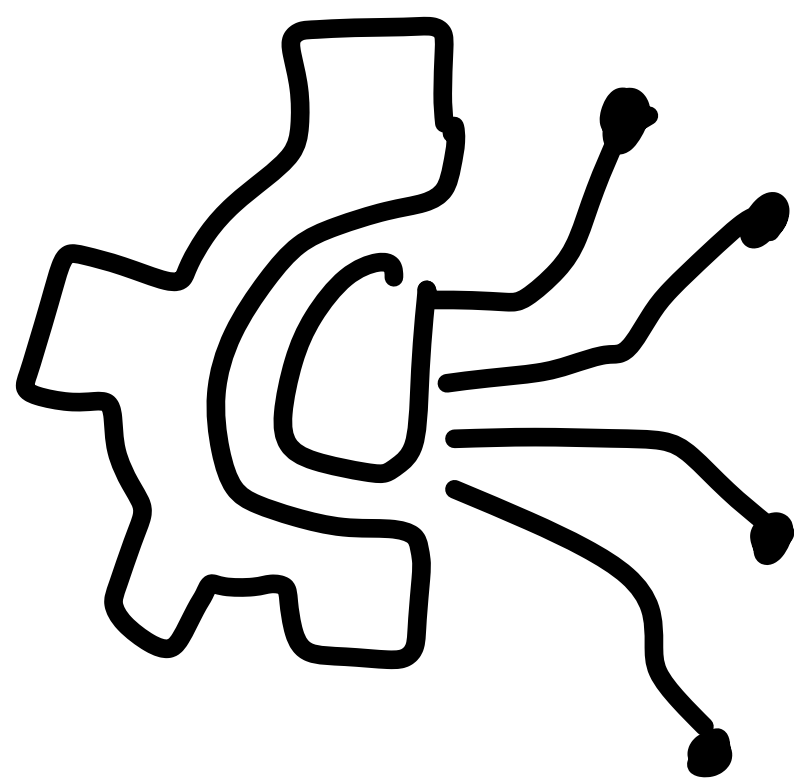
Costs

Updates

New  
Topics

Update  
Schema





TECHNOLOGY  
INJECTION

Failure  
Cascading

Load  
Impact

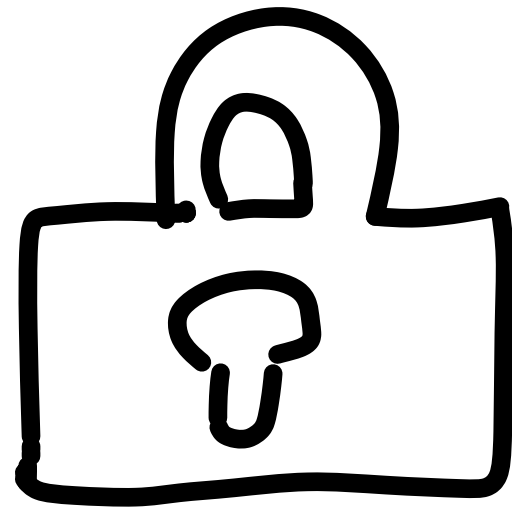
Force to use  
client Library

ONLY IN  
VERSION X.Y



B2B

Firewalls  
& Ports



SECURITY

Monitoring

VPNs

DDoS  
Protection

TLS Management

Admin - UI

Access Control

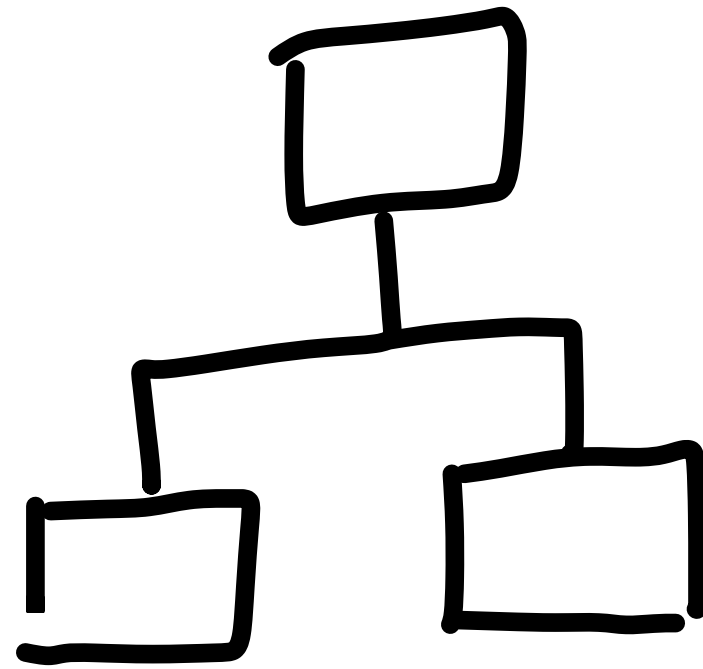




Required/  
Optional

Schema  
Migration

Schema  
Registry



# SCHEMA MANAGEMENT

Field  
Order

Multi-  
Node

Consumer/  
Producer First





3., aktualisierte und erweiterte Auflage



Tilkov · Eigenbrodt · Schreier · Wolf

# REST und HTTP

Entwicklung und Integration  
nach dem Architekturstil des Web

dpunkt.verlag

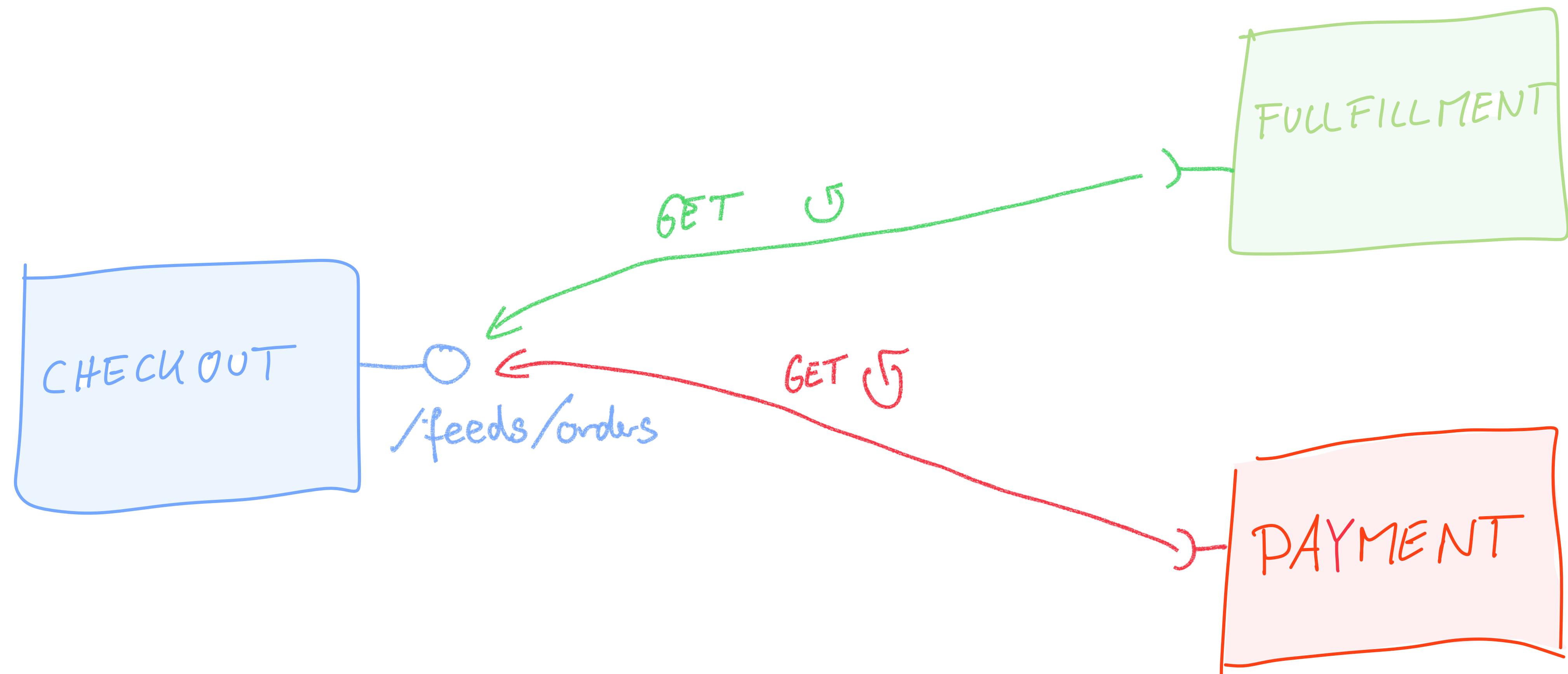


introducing...

HTTP

Feeds





GET https://team.company.com/feeds/orders?lastEventId = 70310

Domain Ownership ↑

poll only for new entries

Event ID	OPERATION	KEY	PAYLOAD
70311	created	2001	{ ... }
70312	created	2002	{ ... }
70313	updated	2001	{ ... }
70314	created	2004	{ ... }
70315	deleted	2004	-
...	...	...	...

Current STATE!

chronological ordered!



# FORMATS

- ATOM
- SERVER-SENT EVENTS
- JSON



Programmiersprache

## PHP 8.1 führt Enumerations ein



Zu den Neuerungen der aktuellen PHP-Version zählen unter anderem Enums, Fibers und Leistungen zur Steigerung der Performance.

84

Klimaschutz

## Sustainability in Software Engineering - Teil 5: Klimakompensation

Automatisierung

## Unterwegs zum autonomen Fahren: Mit V2X-Kommunikation simulationsbasiert testen

Anzeige



## Veranstaltungskalender

November 2021						
Mo	Di	Mi	Do	Fr	Sa	So
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Fehlt ein wichtiger Termin?

Hier können Sie eine neue Veranstaltung eintragen.

Developer Blogs



GET

https://www.heise.de/developer/rss/news-atom.xml

Send

Params

Authorization

Headers (7)

Body

Pre-request Script

Tests

Settings

Cookies

	KEY	VALUE	DESCRIPTION	...	Bulk Edit	Presets
<input checked="" type="checkbox"/>	Accept	application/atom+xml				

Body

Cookies

Headers (15)

Test Results

Status: 200 OK Time: 15 ms Size: 6.92 KB

Save Response

Pretty

Raw

Preview

Visualize

XML

```
1 <?xml version="1.0" encoding="utf-8"?>
2 <feed xmlns="http://www.w3.org/2005/Atom">
3   <title type="text">heise Developer - Neueste Meldungen</title>
4   <subtitle type="html">Informationen für Entwickler</subtitle>
5   <updated>2021-11-29T08:52:00+01:00</updated>
6   <id>https://www.heise.de/developer/rss/news-atom.xml</id>
7   <author>
8     <name>heise online</name>
9     <uri>https://www.heise.de</uri>
10  </author>
11  <link rel="self" type="application/atom+xml" href="https://www.heise.de/developer/rss/news-atom.xml"/>
12  <link rel="alternate" type="text/html" href="https://www.heise.de/developer/">
13  <rights>Copyright (c) 2021 Heise Medien</rights>
14  <entry>
15    <title type="text">Die Type-Traits Bibliothek: Typvergleiche</title>
16    <id>http://heise.de/-6277964</id>
17    <updated>2021-11-29T08:52:00+01:00</updated>
18    <published>2021-11-29T08:52:00+01:00</published>
19    <link href="https://www.heise.de/developer/artikel/Die-Type-Traits-Bibliothek-Typvergleiche-6277964.html?wt_mc=rss.red.developer.developer.atom.beitrag.beitrag"/>
20    <summary type="html">Nach dem Artikel zu Typprüfungen zur Compiletime mit der Type-Traits-Bibliothek folgen nun Typvergleichen beim Kompilieren. </summary>
21    <content type="html">
22      <![CDATA[<p><a href="https://www.heise.de/developer/artikel/Die-Type-Traits-Bibliothek-Typvergleiche-6277964.html?wt_mc=rss.red.developer.developer.atom.beitrag.beitrag"></a></p><p>Nach dem Artikel zu Typprüfungen zur Compiletime mit der Type-Traits-Bibliothek folgen nun Typvergleichen beim Kompilieren. </p>]]>
23    </content>
24  </entry>
25  <entry>
26    <title type="text">heise-Angebot: In eigener Sache: Die iX-Redaktion sucht Verstärkung</title>
```

GET

http://localhost:8080/orders

Send

Params

Authorization

Headers (8)

Body

Pre-request Script

Tests

Settings

Cookies



Accept

application/atom+xml

Key

Value

Description

Body

Cookies

Headers (5)

Test Results



200 OK

16 ms

1.44 KB

Save Response

Pretty

Raw

Preview

Visualize

XML



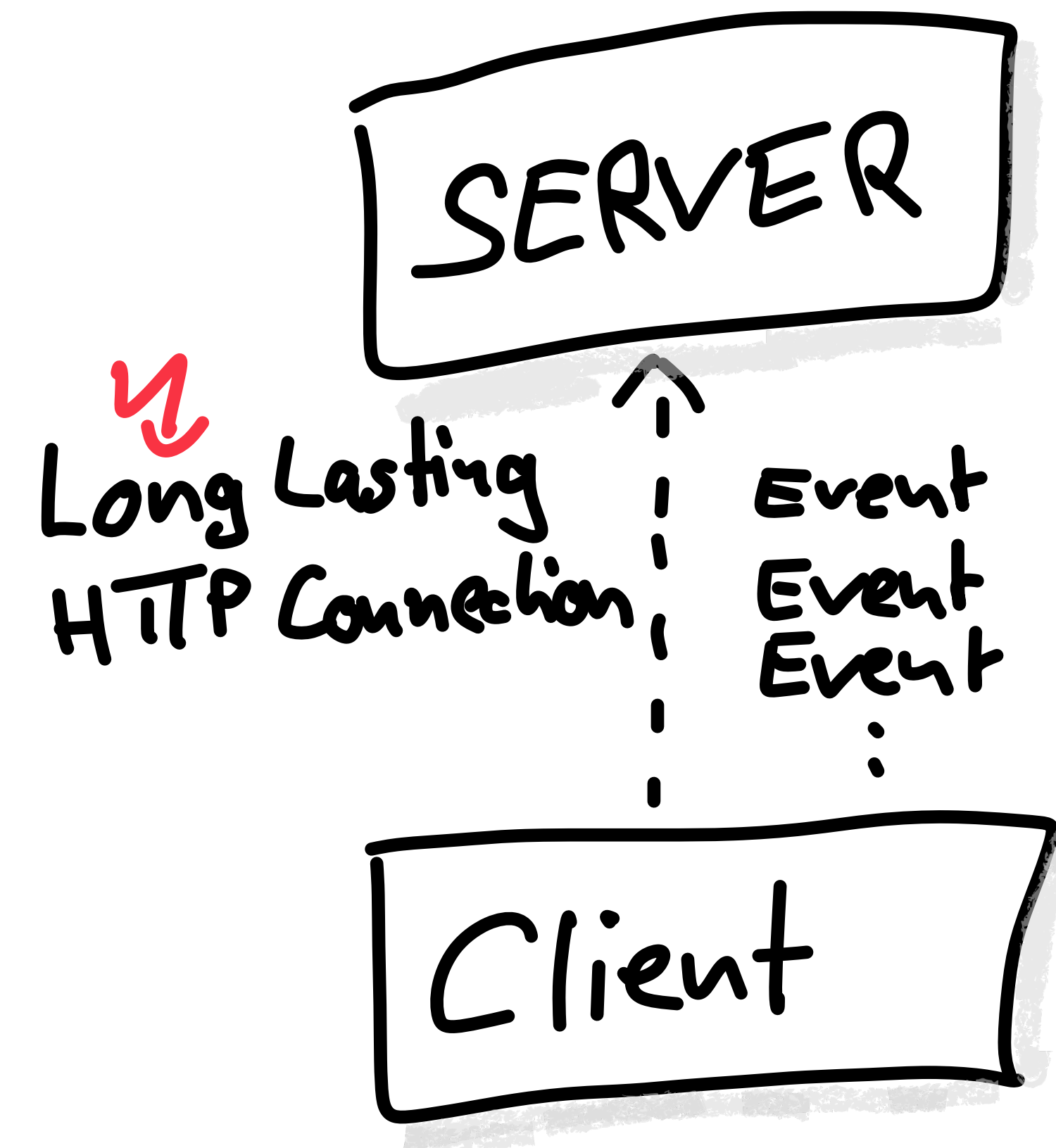
```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <feed xmlns="http://www.w3.org/2005/Atom">
3   <title>orders</title>
4   <entry>
5     <id>af498fbd-b2f5-4319-b60b-7cf275cb2caa</id>
6     <content type="application/xml">
7       <Order xmlns="">
8         <orderNumber>20210005</orderNumber>
9         <orderTimestamp>2021-03-01T12:00:00Z</orderTimestamp>
10        <customerId>e3099711-31cd-4634-aa46-e4f52fde20d1</customerId>
11        <positions>
12          <positions>
13            <sku>34999991</sku>
14            <name>Veja V-10 42</name>
15            <priceCents>12499</priceCents>
16          </positions>
17        </positions>
18        <shippingAddress />
19      </Order>
20    </content>
21  </entry>
22  <entry>
23    <id>2b16c532-9304-4924-a4c9-f34c63af10fd</id>
24    <content type="application/xml">
```

# FORMATS

- ATOM
- SERVER-SENT EVENTS
- JSON



# SERVER-SENT Events



- One-Way Communication
- HTTP-Streaming
- W3C HTML5 Standard EventSource
- Auto-Reconnect

```
jochen@Jochens-MBP rest-feeds % curl localhost:8080/orders --header "Accept: text/event-stream"
```

```
[jochen@Jochens-MBP rest-feeds % curl localhost:8080/orders --header "Accept: text/event-stream"
id:af498fbd-b2f5-4319-b60b-7cf275cb2caa
event:checkout.order.v1
data:{"orderNumber":"20210005","orderTimestamp":"2021-03-01T12:00:00Z","customerId":"e3099711-31cd-4634-aa46-e4f52fde20d1","positions":[{"sku":"34999991","name":"Veja V-10 42","priceCents":12499}]}

id:33654a39-c183-4567-af86-8b565df19738
event:checkout.order.v1
data:{"orderNumber":"20210010","orderTimestamp":"2021-11-29T14:39:12.671392Z","customerId":"2fbd243b-d592-4aa0-99bf-5e1a8348d930","positions":[{"sku":"888974441","priceCents":367}]}

id:e853952b-b8df-48ec-b44d-2a03654f8416
event:checkout.order.v1
data:{"orderNumber":"20210011","orderTimestamp":"2021-11-29T14:39:13.277849Z","customerId":"1fa92aa5-871a-4d3d-9860-a676305bc396","positions":[{"sku":"623088881","priceCents":1991}]}

id:2dd94cb3-8e49-4e66-a98d-98a203beadfc
event:checkout.order.v1
data:{"orderNumber":"20210012","orderTimestamp":"2021-11-29T14:39:14.424602Z","customerId":"71b520c5-cd8a-4f2e-90af-d859b1642f2e","positions":[{"sku":"931880123","priceCents":6676}]}

id:dc0de1cb-d9e7-4641-9736-73f8bdba03cd
event:checkout.order.v1
data:{"orderNumber":"20210013","orderTimestamp":"2021-11-29T14:39:16.713038Z","customerId":"468f6ba6-66c9-4e96-82b4-0fbfc2394b4f","positions":[{"sku":"275794641","priceCents":3327}]}

id:38ef4ee5-28c5-4a10-9c59-403456b68c37
event:checkout.order.v1
data:{"orderNumber":"20210014","orderTimestamp":"2021-11-29T14:39:17.688018Z","customerId":"f2bdad9d-e808-4488-9fc5-1472688260ae","positions":[{"sku":"499854505","priceCents":9515}]}

id:27865155-3ab6-4e75-9db4-bdd26a294973
event:checkout.order.v1
data:{"orderNumber":"20210015","orderTimestamp":"2021-11-29T14:39:19.136368Z","customerId":"9244a88b-956f-43d5-96ad-a1ba8a235fc2","positions":[{"sku":"719944284","priceCents":3038}]}

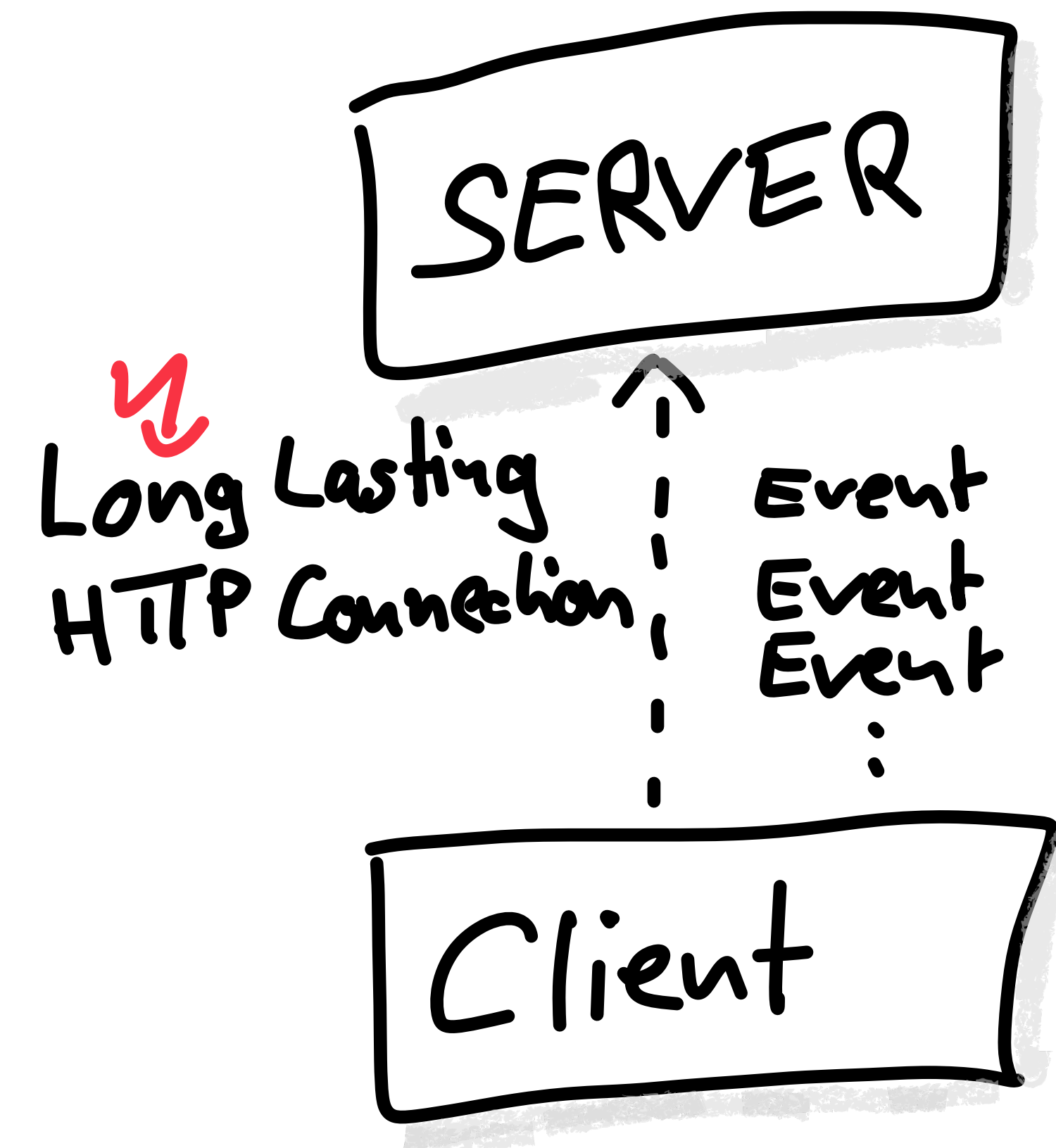
id:324b6ff9-cfab-4da2-95a2-9a145c1be03c
event:checkout.order.v1
```

```
jochen@Jochens-MBP rest-feeds % curl localhost:8080/orders --header "Accept: text/event-stream" --header "Last-Event-ID: █
```

I



# SERVER-SENT Events



- One-Way Communication
- HTTP-Streaming
- W3C HTML5 Standard EventSource
- Auto-Reconnect

# FORMATS

- ATOM
- SERVER-SENT EVENTS
- JSON



# Cloud Events

- CNCF Standard
- Specification for event data
- Bindings for JSON, Kafka, Protobuf, Avro...

cloudevents.io

application/cloudevents-batch+json

```
{
  "specversion" : "1.0",
  "type" : "com.example.someotherevent",
  "source" : "/mycontext/9",
  "id" : "C234-1234-1234",
  "time" : "2018-04-05T17:31:05Z",
  "comexampleextension1" : "value",
  "comexampleothervalue" : 5,
  "datacontenttype" : "application/json",
  "data" : {
    "appinfoA" : "abc",
    "appinfoB" : 123,
    "appinfoC" : true
  }
}
```

[ ]

	Latest Release	Working Draft
<b>Core Specification:</b>		
CloudEvents	v1.0.1	WIP
<b>Optional Specifications:</b>		
AMQP Protocol Binding	v1.0.1	WIP
AVRO Event Format	v1.0.1	WIP
HTTP Protocol Binding	v1.0.1	WIP
JSON Event Format	v1.0.1	WIP
Kafka Protocol Binding	v1.0.1	WIP
MQTT Protocol Binding	v1.0.1	WIP
NATS Protocol Binding	v1.0.1	WIP
WebSockets Protocol Binding	-	WIP
Protobuf Event Format		v1.0-rc1
Web hook	v1.0.1	WIP



# DOMAIN EVENT



```
{  
  "specversion" : "1.0",  
  "type" : "org.example.customer.newsletter-subscribed",  
  "source" : "/checkout/customers",  
  "id" : "6817b2c1-82e4-4be2-aefb-21022399bf37",  
  "time" : "2021-11-30T12:24:37Z",  
  "data" : {  
    "customerId": "4f16ee9d-eee8-4f0d-9772-7ab7f0efbd5a",  
    "timestamp": "2021-03-13T09:00:00Z",  
    "email": "jochen.christ@innoq.com",  
    "reference": "website-coupon-42"  
  }  
}
```

# AGGREGATE



```
{
  "specversion" : "1.0",
  "type" : "org.example.customer",
  "source" : "/checkout/customers",
  "id" : "1c6b8c6e-d8d0-4a91-b51c-1f56bd04c758",
  "time" : "2021-11-30T12:00:00Z",
  "subject" : "4f16ee9d-eee8-4f0d-9772-7ab7f0efbd5a",
  "data" : {
    "customerId": "4f16ee9d-eee8-4f0d-9772-7ab7f0efbd5a",
    "customerNumber": "C10042",
    "created": "2021-03-01T12:01:01Z",
    "updated": "2021-03-01T12:01:01Z",
    "email": "jochen.christ@innoq.com",
    "newsletter": false,
    "address": {
      "name": "Jochen Christ",
      "address1": "Krischerstr. 100",
      "zip": "40789",
      "city": "Monheim",
      "countryIsoCode2": "DE"
    }
  },
}
```

# AGGREGATE



```
{
  "specversion" : "1.0",
  "type" : "org.example.customer",
  "source" : "/checkout/customers",
  "id" : "8a69cf97-47b0-4882-bc83-84835c7d5e56",
  "time" : "2021-11-30T13:00:00Z",
  "subject" : "4f16ee9d-eee8-4f0d-9772-7ab7f0efbd5a",
  "data" : {
    "customerId": "4f16ee9d-eee8-4f0d-9772-7ab7f0efbd5a",
    "customerNumber": "C10042",
    "created": "2021-03-01T12:01:01Z",
    "updated": "2021-11-30T13:00:00Z",
    "email": "jochen.christ@innoq.com",
    "newsletter": true,
    "address": {
      "name": "Jochen Christ",
      "address1": "Krischerstr. 100",
      "zip": "40789",
      "city": "Monheim",
      "countryIsoCode2": "DE"
    },
  },
}
```

GET https://team.company.com/feeds/orders?lastEventId = 70310

Domain Ownership ↑

poll only for new entries

Event ID	OPERATION	KEY	PAYLOAD
70311	created	2001	{ ... }
70312	created	2002	{ ... }
70313	updated	2001	{ ... }
70314	created	2004	{ ... }
70315	deleted	2004	-
...	...	...	...

Current STATE!

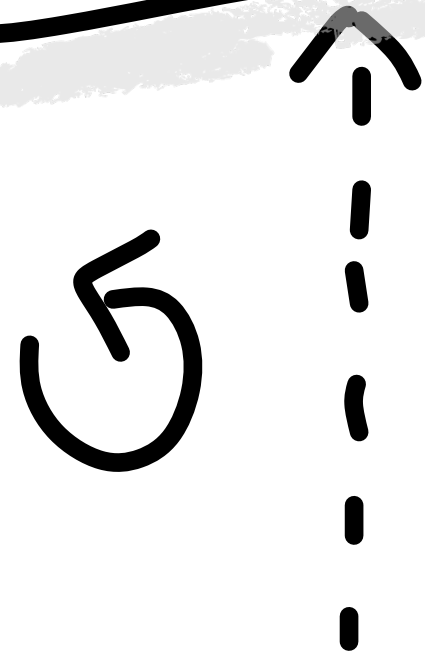
chronological ordered!





# Simple Polling

SERVER



Client

max 1000  
events per  
request

Client-Code

link = /feeds/orders

while true:

response = GET link ?lastEventId=event.id

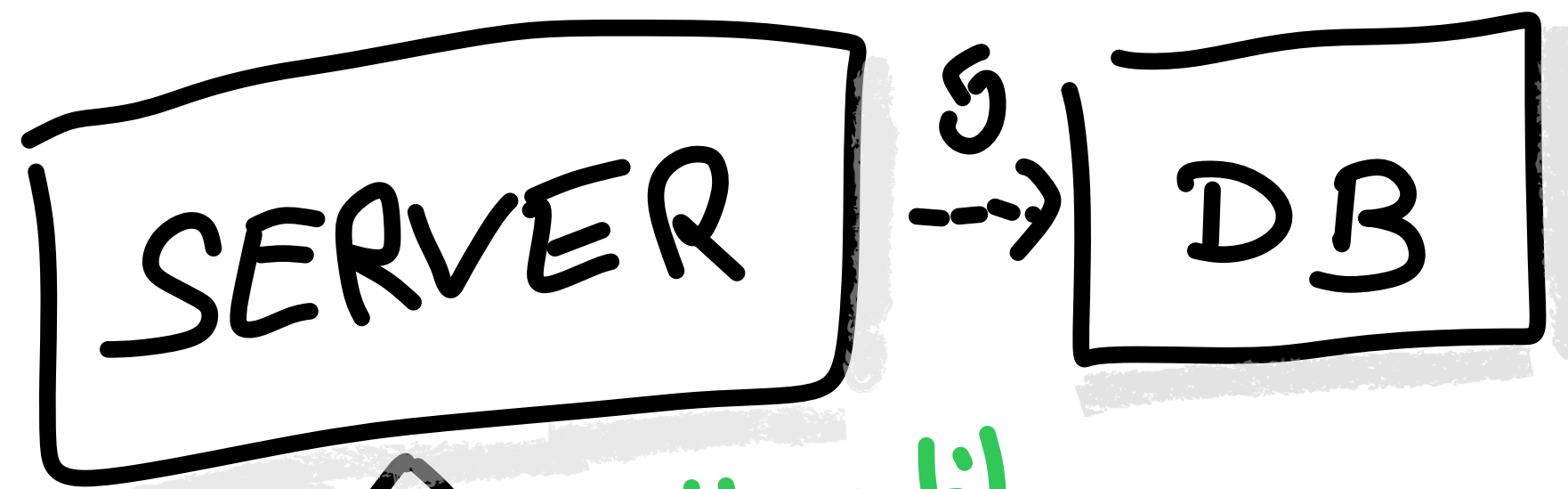
for event in response:

process event

save event.id as lastEventId

if response is empty:  
wait N seconds

# Long Polling



wait until  
data arrives  
or 5s timeout

Client

max 1000  
events per  
request

Simple  
Client-Code

link = /feeds/orders

while true:

response = GET link ?lastEventId=event.id

for event in response:  
process event  
save event.id as lastEventId

~~if response is empty:~~

~~wait N seconds~~

GET

⌵

http://localhost:8080/orders?lastEventId=78587621-ef8d-42a1-8886-0e06da2e1ff6

Send⌵

Params●AuthorizationHeaders (7)BodyPre-request ScriptTestsSettings

Cookies

BodyCookiesHeaders (5)Test Results

⌐Status: 200 OKTime: 20 msSize: 364.19 KBSave Response⌵

PrettyRawPreviewVisualizeJSON⌵

📄🔍

```
1  [
2    {
3      "specversion": "1.0",
4      "type": "org.example.checkout.order",
5      "source": "/checkout/orders",
6      "id": "0f26a0b1-7cf4-48b1-8c49-be997ccee481",
7      "time": "2021-11-30T16:03:50.765673Z",
8      "subject": "20211010",
9      "data": {
10         "orderNumber": "20211010",
11         "orderTimestamp": "2021-11-30T16:03:50.765635Z",
12         "customerId": "bc15d76f-88b3-4665-9720-a7edaeada587",
13         "positions": [
14           {
15             "sku": "449026488",
16             "priceCents": 1339
17           }
18         ]
19       }
20     },
21     {
22       "specversion": "1.0",
23       "type": "org.example.checkout.order",
24       "source": "/checkout/orders",
25       "id": "29aa1f41-fae3-407d-b6d1-6702d2e2b796",
26       "time": "2021-11-30T16:03:50.765679Z",
27       "subject": "20211011",
28       "data": {
29         "orderNumber": "20211011",
```

GET

⌵

http://localhost:8080/orders?lastEventId=2b16c532-9304-4924-a4c9-f34c63af10fd

Send

⌵

Params

●

Authorization

Headers (7)

Body

Pre-request Script

Tests

Settings

Cookies

Body

Cookies

Headers (5)

Test Results

⌚

Status: 200 OK

Time: 5.02 s

Size: 166 B

Save Response

⌵

Pretty

Raw

Preview

Visualize

JSON

⌵

↺

📄

🔍

1

[ ]



# AGGREGATES

= Entities, Domain Objects, Master Data

PRODUCT INFO  
IMAGES  
ORDERS  
CUSTOMERS  
STOCK  
SHIPMENTS  
INVOICE

- Have a Primary Key
- Most relevant: Current State
- May become deleted

=> Replicate for Lookups  
& to trigger actions

# DOMAIN EVENTS

Added to Cart

Article not found

Deleted from Cart

Account Locked

Account Unlocked

- Facts: What happened when
- Contain only event-specific data
- 1 Feed may contain N event types

=> trigger actions

# Compaction

<u>method</u>	<u>type</u>	<u>subject</u>
---------------	-------------	----------------

<del>created</del>	<del>customer</del>	<del>7 { }</del>
--------------------	---------------------	------------------

<del>updated</del>	<del>customer</del>	<del>7 { }</del>
--------------------	---------------------	------------------

<del>created</del>	<del>customer</del>	<del>9 { }</del>
--------------------	---------------------	------------------

deleted	customer	7
---------	----------	---

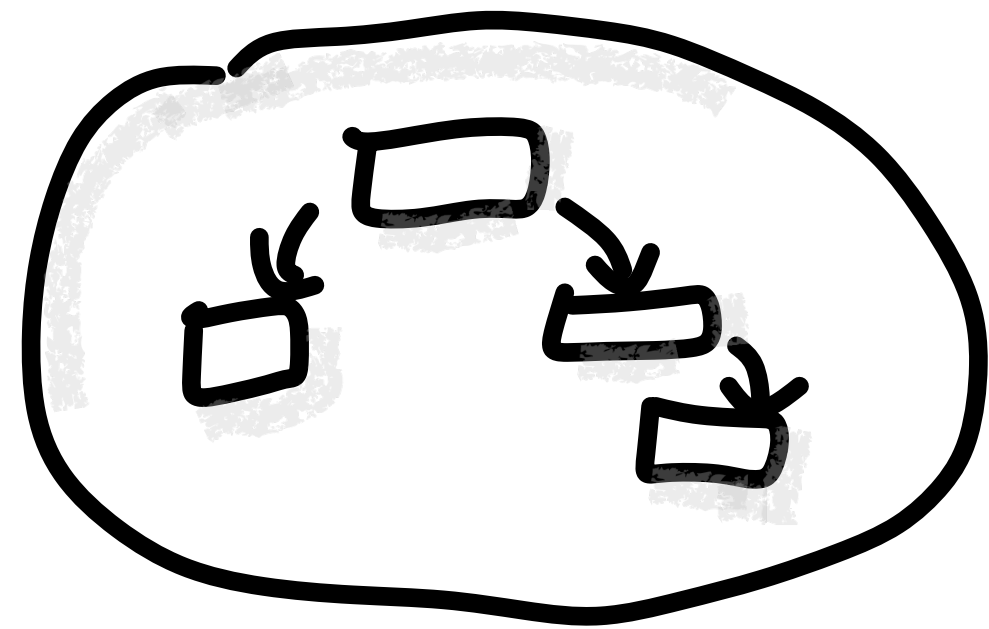
updated	customer	9 { }
---------	----------	-------

⊕ Tombstone Entry  
←

Full current State  
←



# AGGREGATE FEEDS



- Contain every aggregate at least once
- Include full current state with every change
- Compact
- Support deletes

=> Full data replication & real-time updates

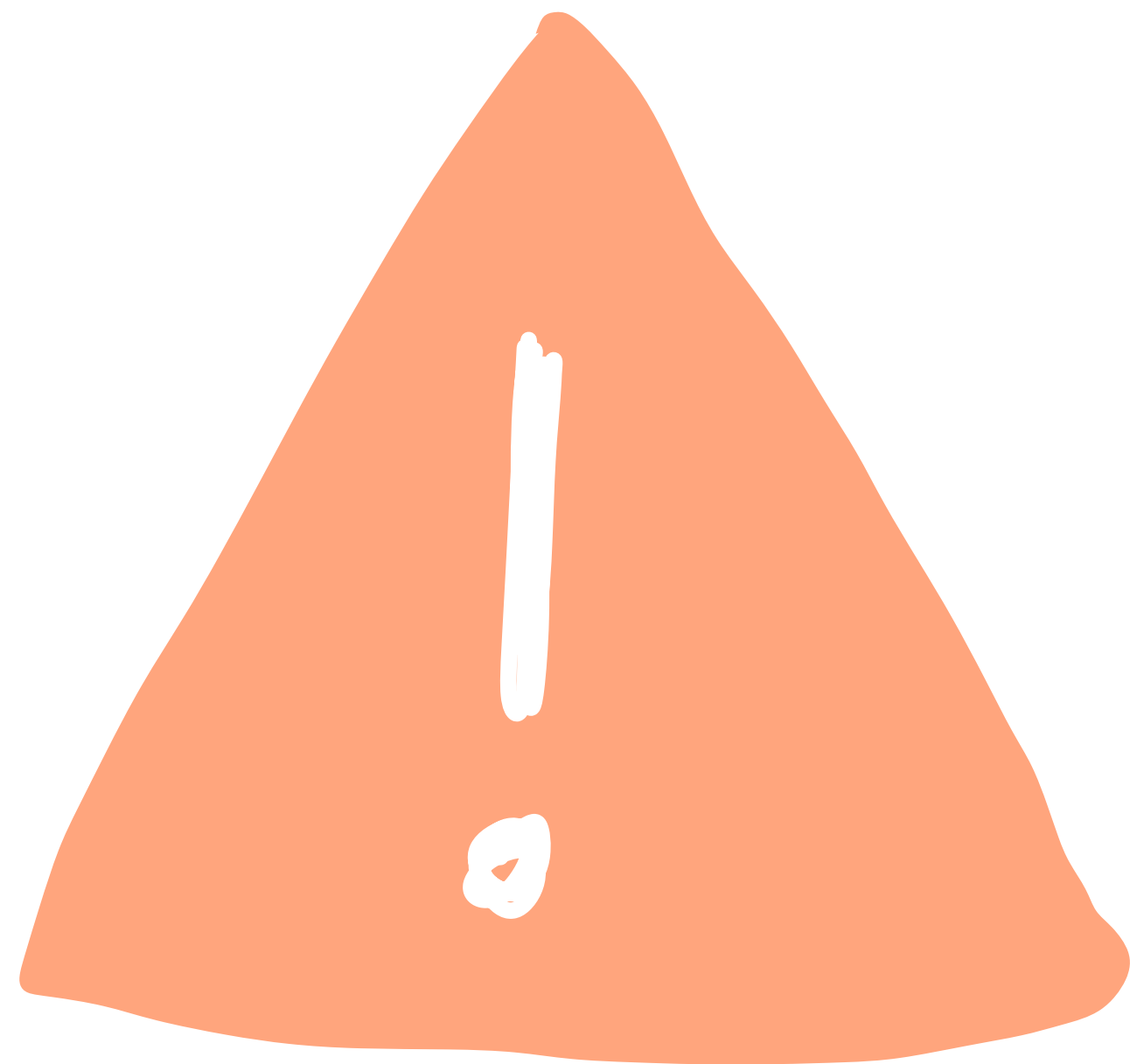
# HTTP Feeds



- Plain HTTP Endpoints
- POLLING with LastEventId → Realtime Subscription
- CloudEvents Event Format
- Type
  - Aggregate Feed
  - Domain Event Feed



When not to use?



- Commands
- Request-Response
- High Volume

# Implementation Aspects

## Server

- Database as event-store
- Append only
- event ID order
  - even for deleted events
  - sequence encoded?
- May implement caching

## Client

- Idempotency
  - technical
  - logical
- persist last Event Id

App

Feed Ingestor

Feed API Controller

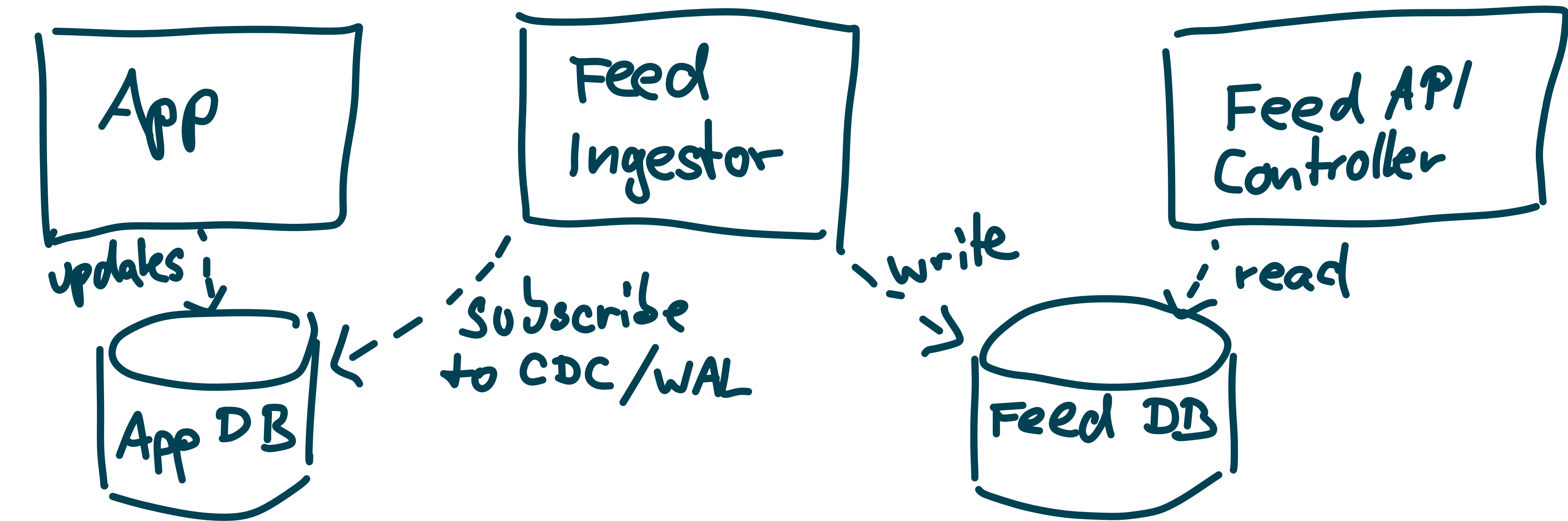


write

read



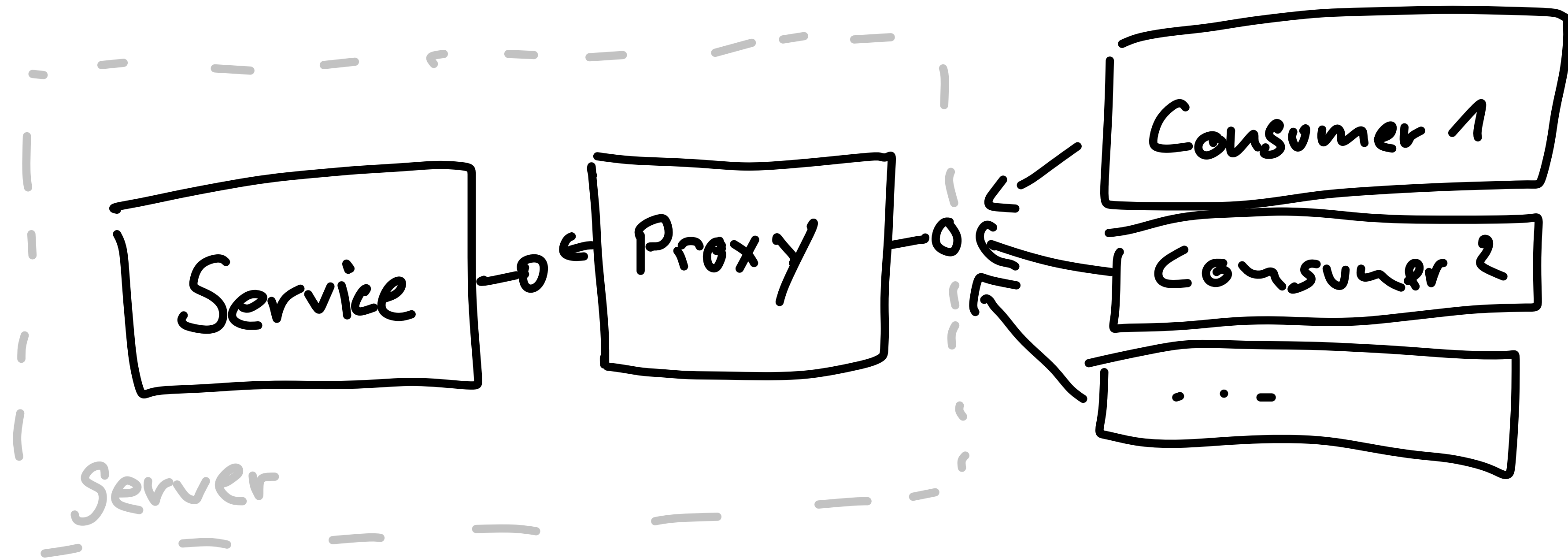
Server



Server



# Caching



Service may set `Cache-Control: public, max-age=31536000` when batch limit was reached.

# rest-feeds.org

rest-feeds / rest-feedsPublic

Unwatch6Unstar34Fork3

CodeIssues2Pull requestsActionsSecurityInsightsSettings

master2 branches0 tagsGo to fileAdd fileCode

jochenchrist Update README.md8bd93c14 hours ago59 commits

ADRs.md	fix[doc]: fix typo widly → widely	15 days ago
FAQ.md	Simplify model, long polling	2 years ago
LICENSE	Initial commit	2 years ago
README.md	Update README.md	4 hours ago

README.md

## rest-feeds

Asynchronous data replication and event streaming with plain REST/HTTP.

### 1-Minute Overview

A REST feed provides access to resources in a *chronological sequence of changes*.

```
GET /movies
Accept: application/json
```

About

Asynchronous data replication and event streaming with plain REST/HTTP.

[rest-feeds.org/](#)

jsonrestfeed

Readme

Apache-2.0 License

### Releases

No releases published

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### Packages

No packages published

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### Contributors2

jochenchrist

# Documentation



# AsyncAPI

From <https://raw.githubusercontent.com/asynccapi/asynccapi/v2.2.0/examples/simple.yml>

```

1  asyncapi: '2.2.0'
2  info:
3    title: Domain Checkout
4    version: 1.0.0
5  channels:
6    feeds/customers:
7      subscribe:
8        message:
9          payload:
10           type: object
11           properties:
12             specversion:
13               type: string
14               enum: ['0.1']
15             type:
16               type: string
17               example: com.example.customer
18             source:
19               type: string
20               example: /checkout/customers
21             id:
22               type: string
23               example: '8a69cf97-47b0-4882-bc83-84835c7d5e56'
24             time:
25               type: string
26               format: date-time
27               example: 2021-11-30T13:00:00Z
28             subject:
29               type: string
30               format: string
31               example: '4f16ee9d-eee8-4f0d-9772-7ab7f0efbd5a'
32             data:
33               type: object
34               properties:
35                 customerId:

```

PROBLEMS 0

✓ VALID YAML

## Operations

**SUB** feeds/customers

Accepts the following message:

<anonymous-message-1>

Payload ▾

Object

specversion	String	Allowed values: "0.1"
type	String	
source	String	
id	String	
time	String	format: date-time
subject	String	format: string
data ▾	Object	
customerId	String	
email	String	format: email

Additional properties are allowed.

Additional properties are allowed.



# HTTP Feeds



- Plain HTTP Endpoints
- POLLING with LastEventId → Realtime Subscription
- CloudEvents Event Format
- Type
  - Aggregate Feed
  - Domain Event Feed



# HTTP Feeds

Asynchrone Schnittstellen  
ohne Kafka

**INNOQ**



**JOCHEN CHRIST**  
@JOCHEN\_CHRIST