
Apache Kafka and ksqlDB in Action:
Let's Build a Streaming Data Pipeline!
Robin Moffatt | #ConfluentVUG | @rmoff

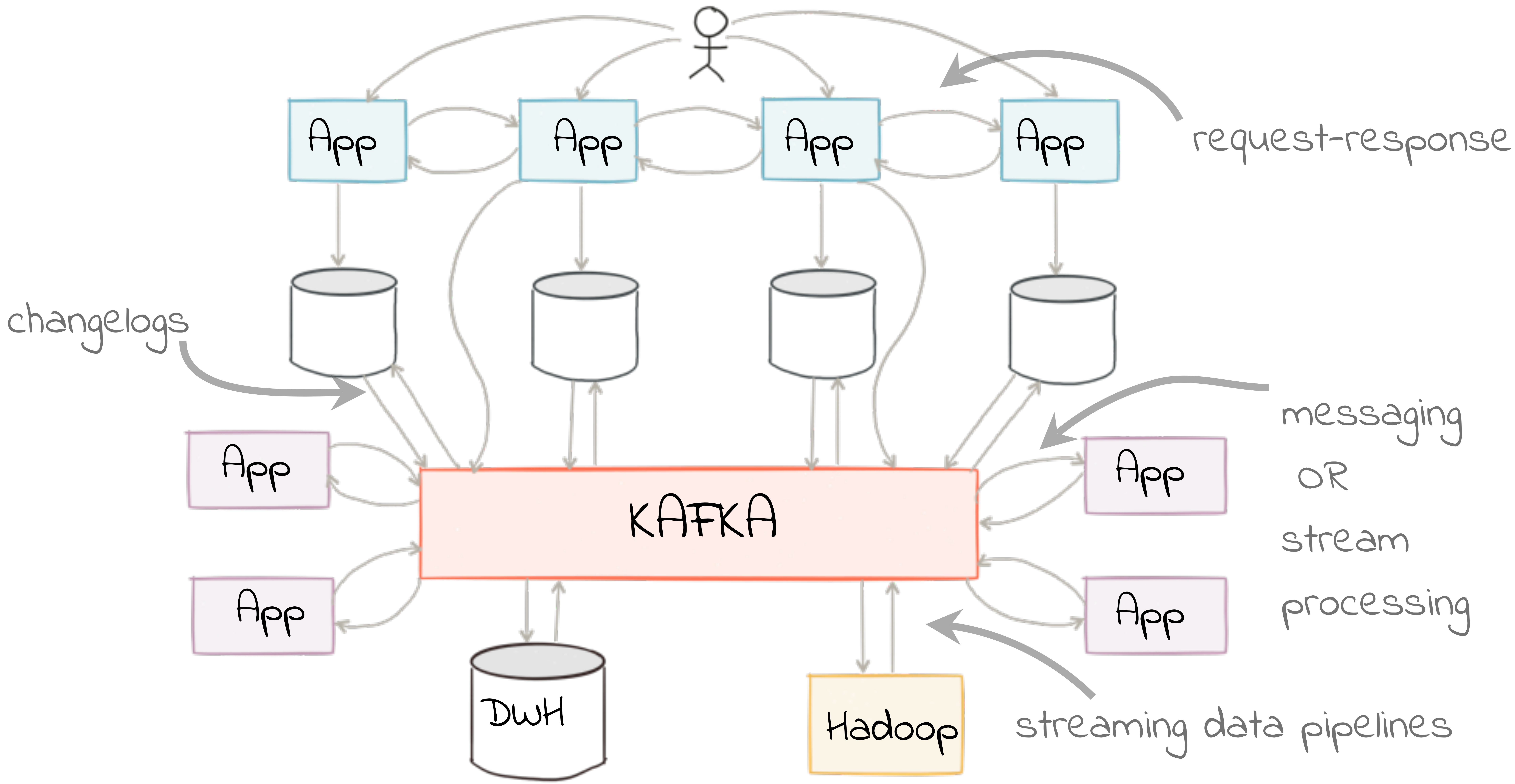
$ whoami

- Robin Moffatt (@rmoff)
- Senior Developer Advocate at Confluent

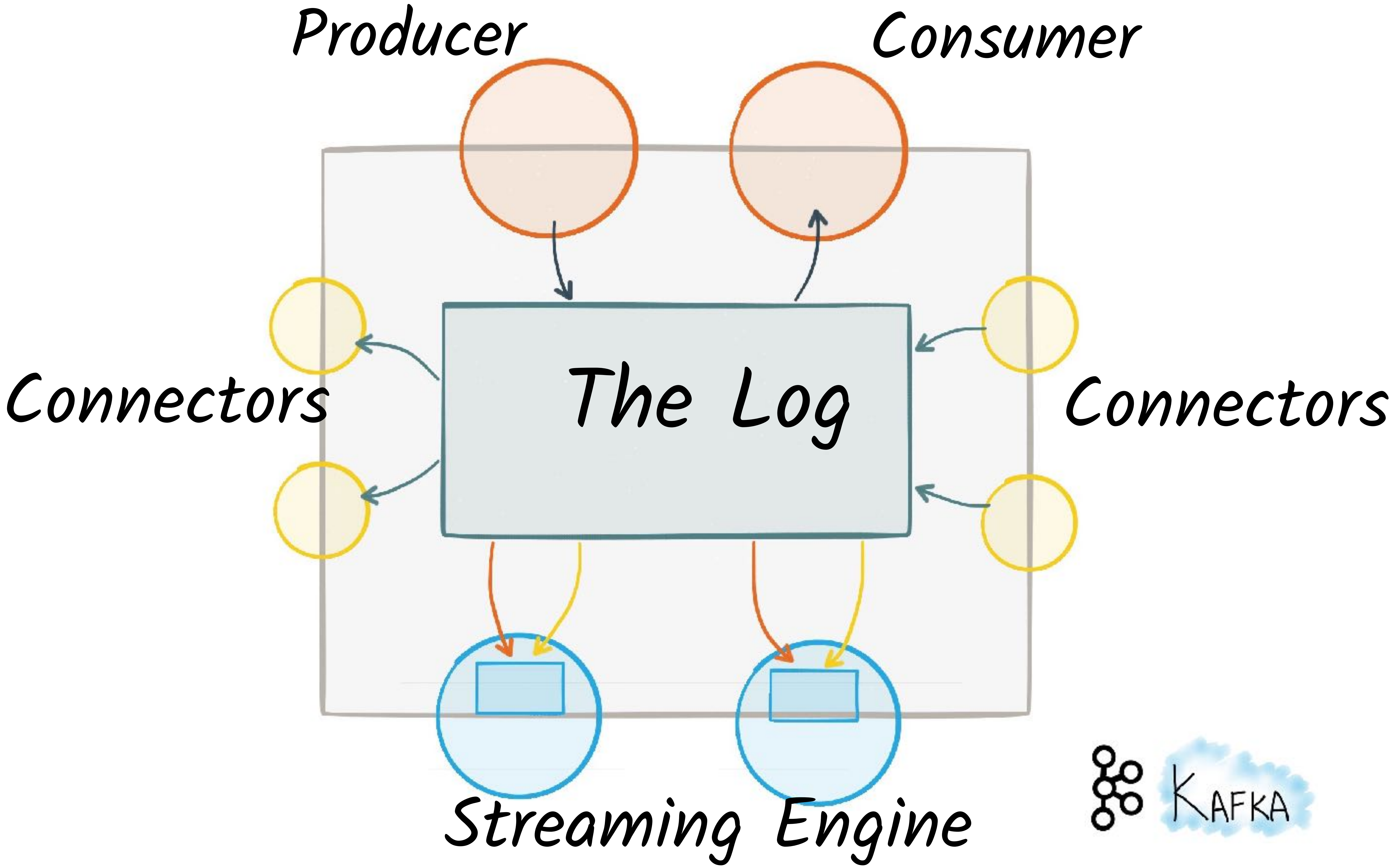
  (Apache Kafka, not Wikis 😉)
- Working in data & analytics since 2001
- Oracle ACE Director (Alumnus)

http://rmoff.dev/**talks** • http://rmoff.dev/**blog** • http://rmoff.dev/**youtube**

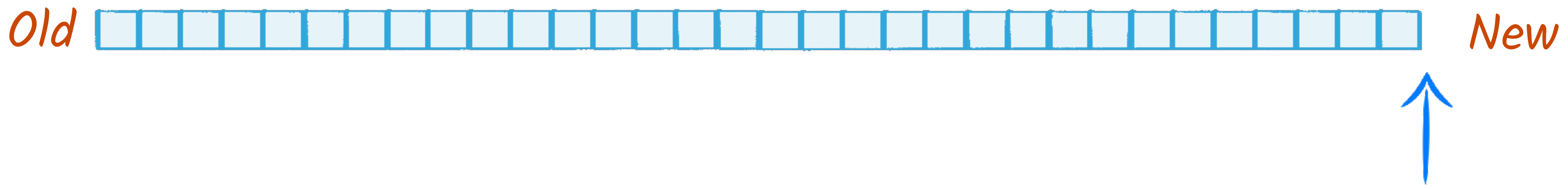
Kafka is an Event Streaming Platform



What is an Event Streaming Platform?

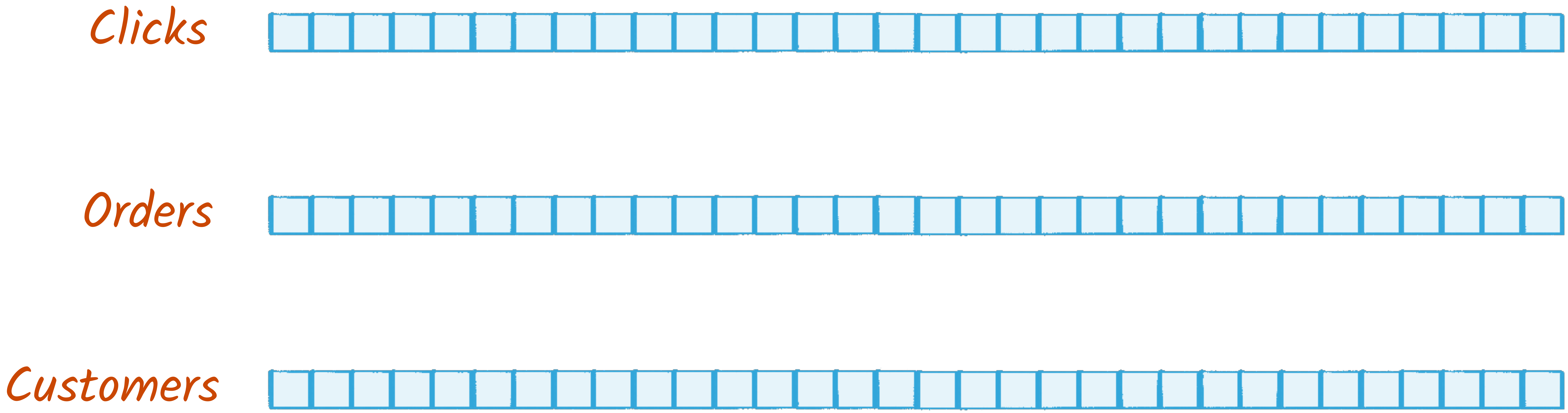


Immutable Event Log



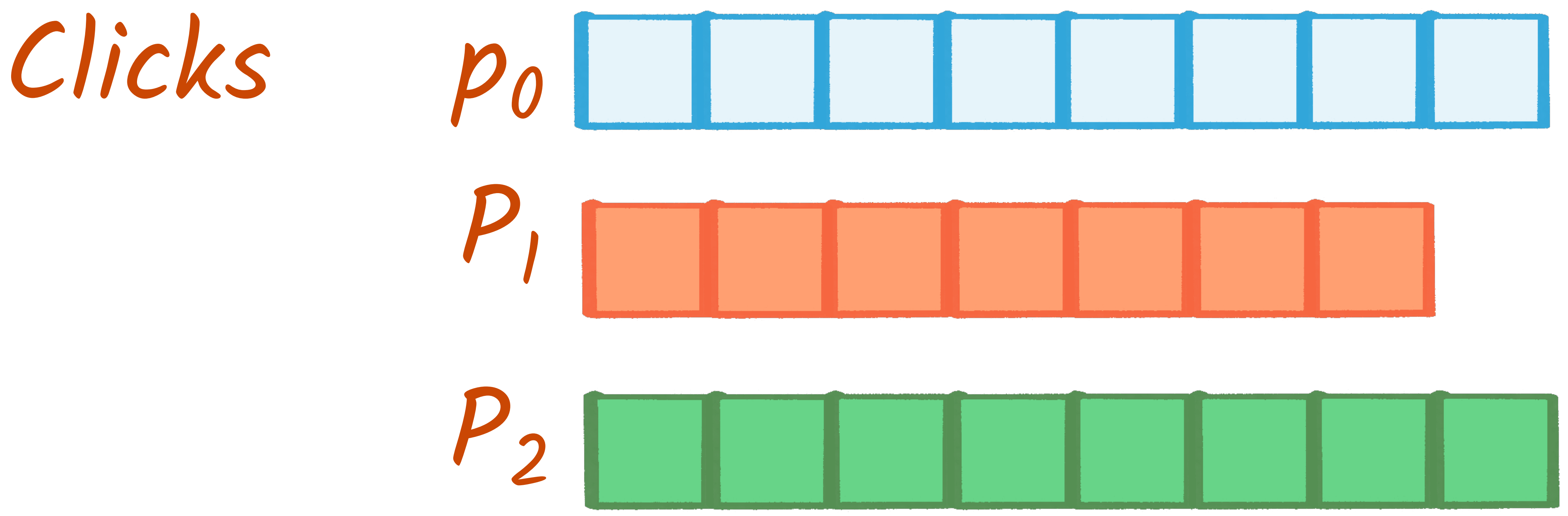
Messages are added at the end of the log

Topics



Topics are similar in concept to tables in a database

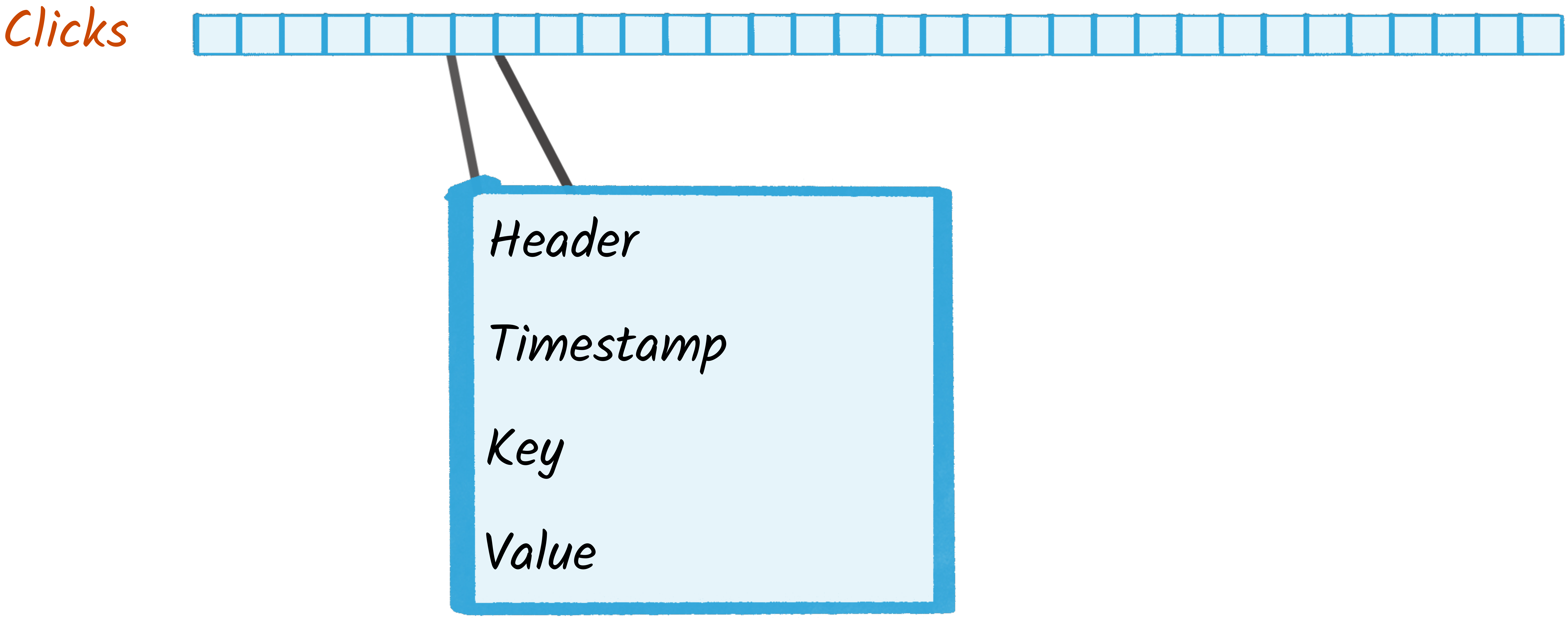
Partitions



Messages are guaranteed to be strictly ordered <u>within a partition</u>

Messages are just K/V bytes

plus headers + timestamp



Serialisation & Schemas

Avro	Protobuf	JSON Schema	JSON	CSV
👍	👍	👍	😬	

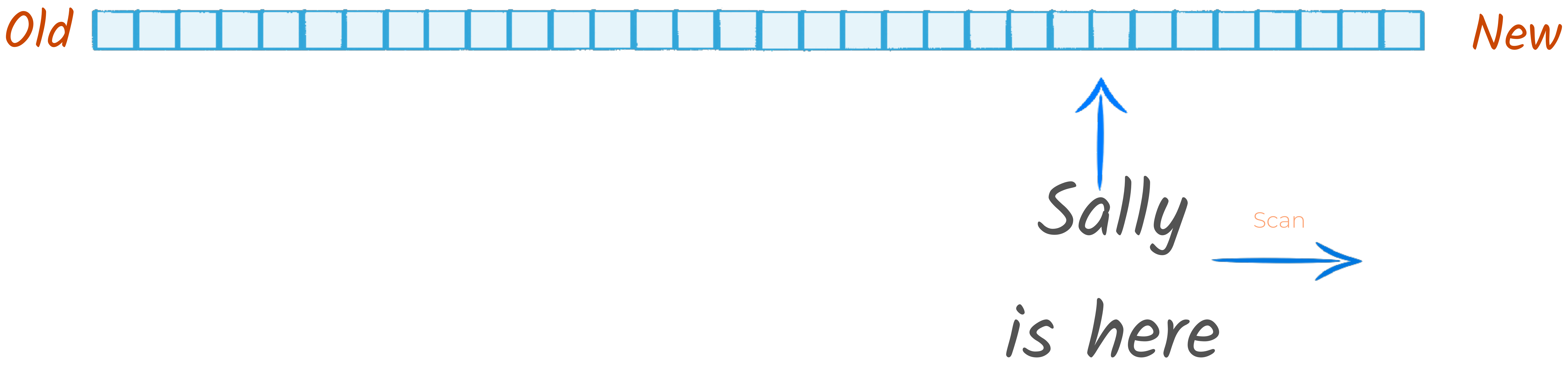
Gwen (Chen) Shapira
@gwenshap

If your dev process doesn't validate schema compatibility somewhere between your IDE and production - you are screwed and don't know it.

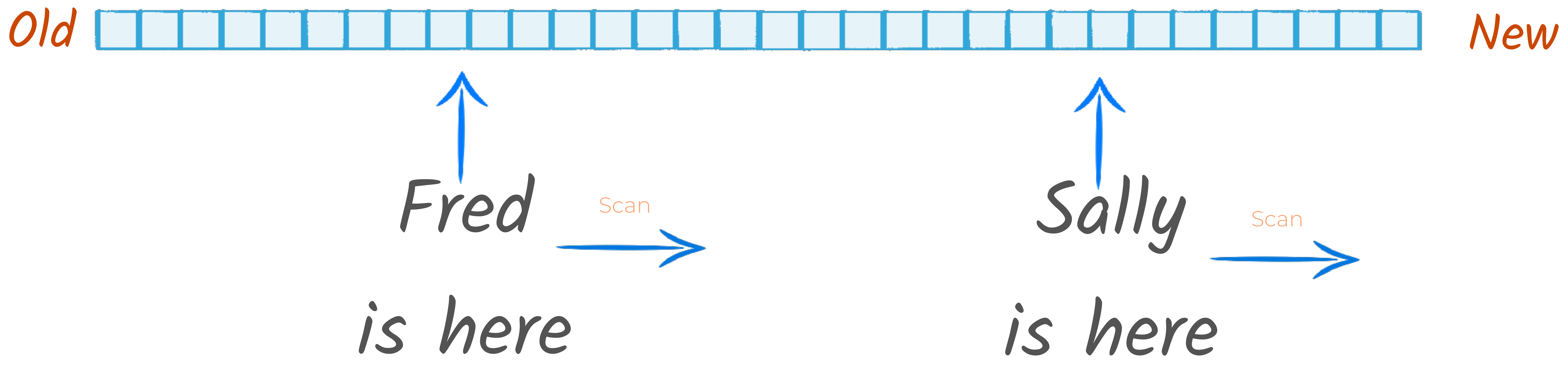
5:50 AM - 5 Apr 2017

https://rmoff.dev/qcon-schemas

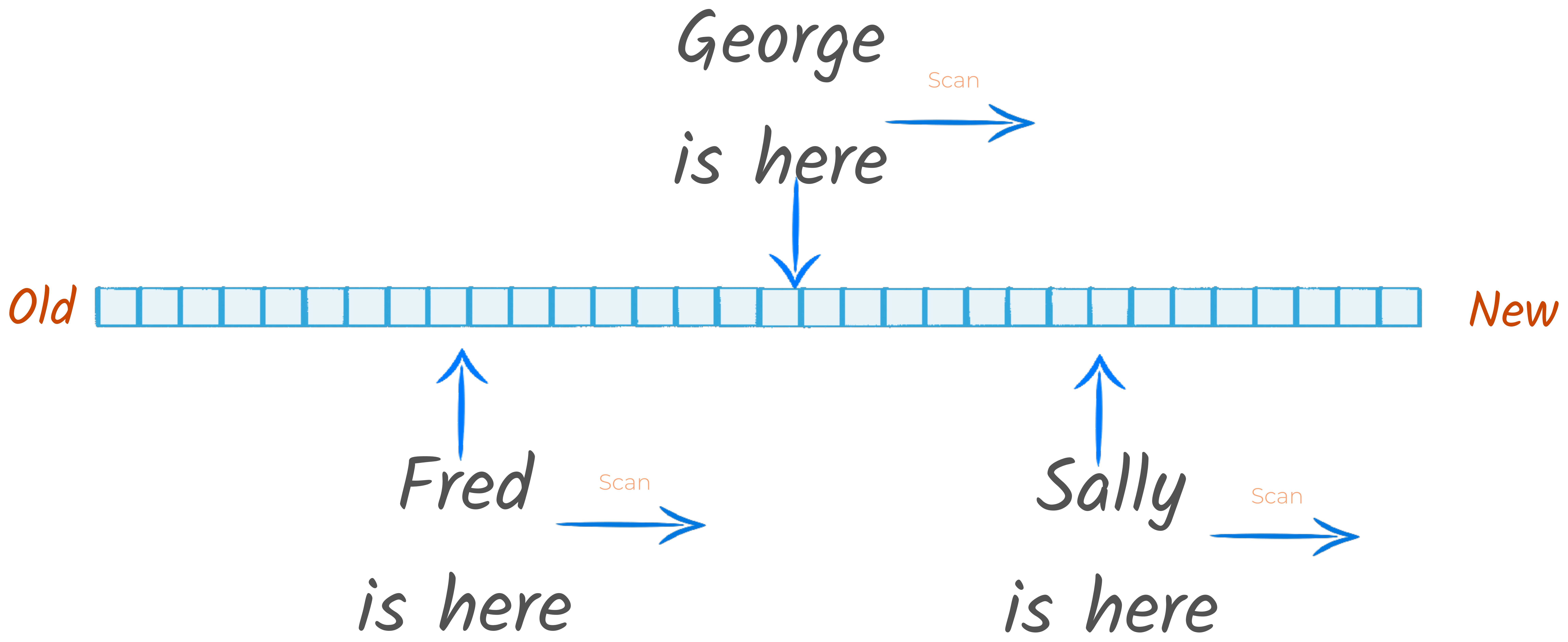
Consumers have a position all of their own



Consumers have a position all of their own

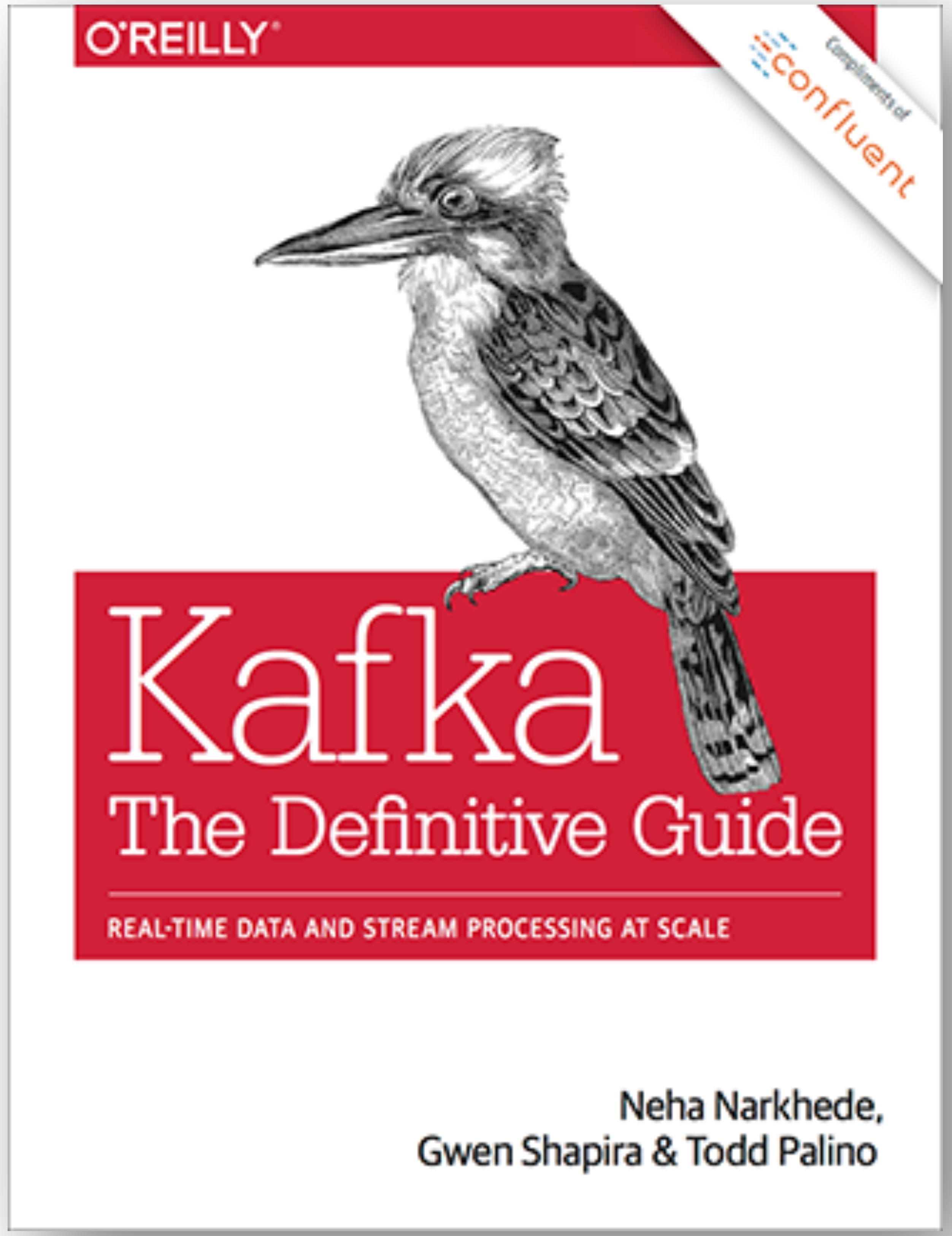


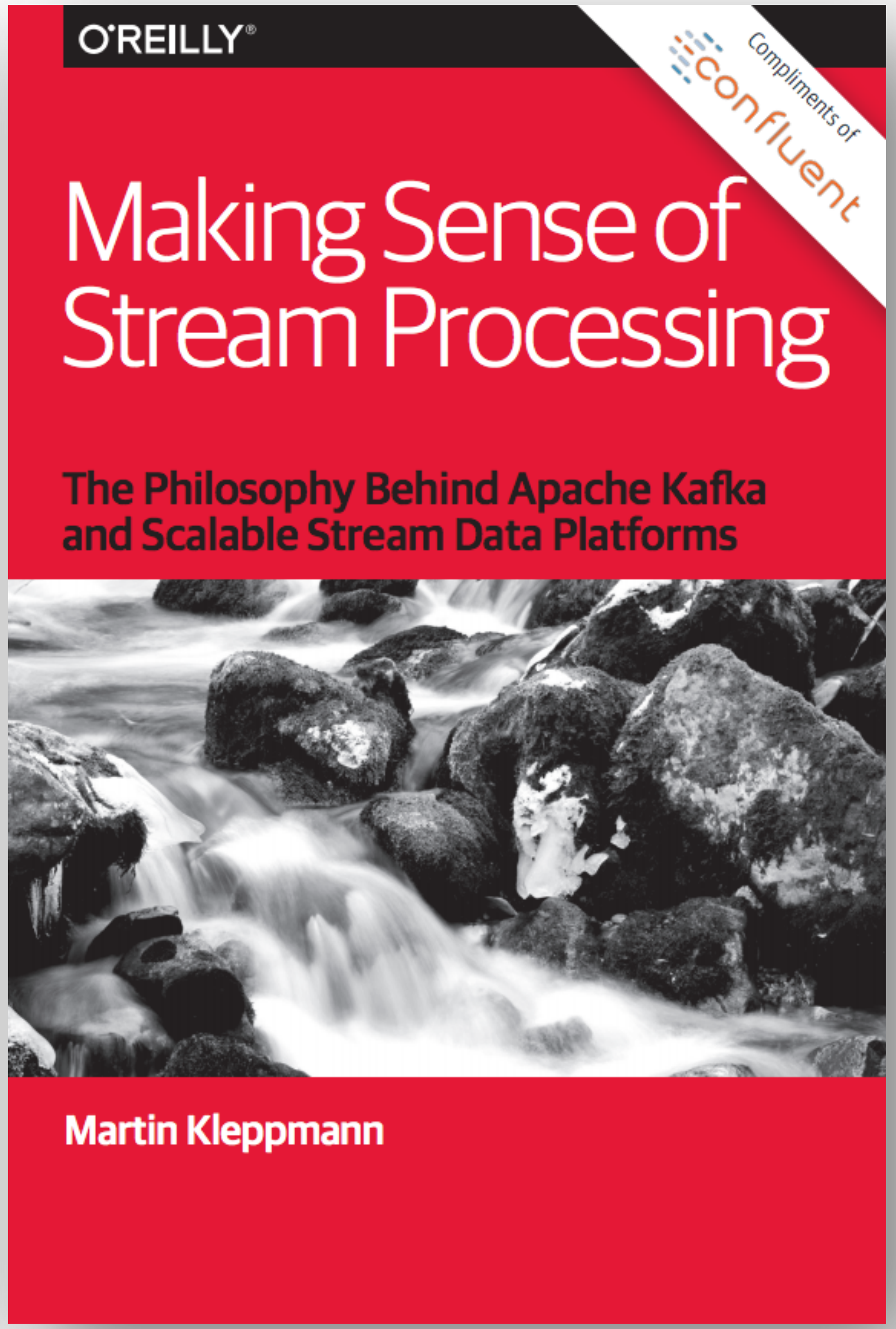
Consumers have a position all of their own

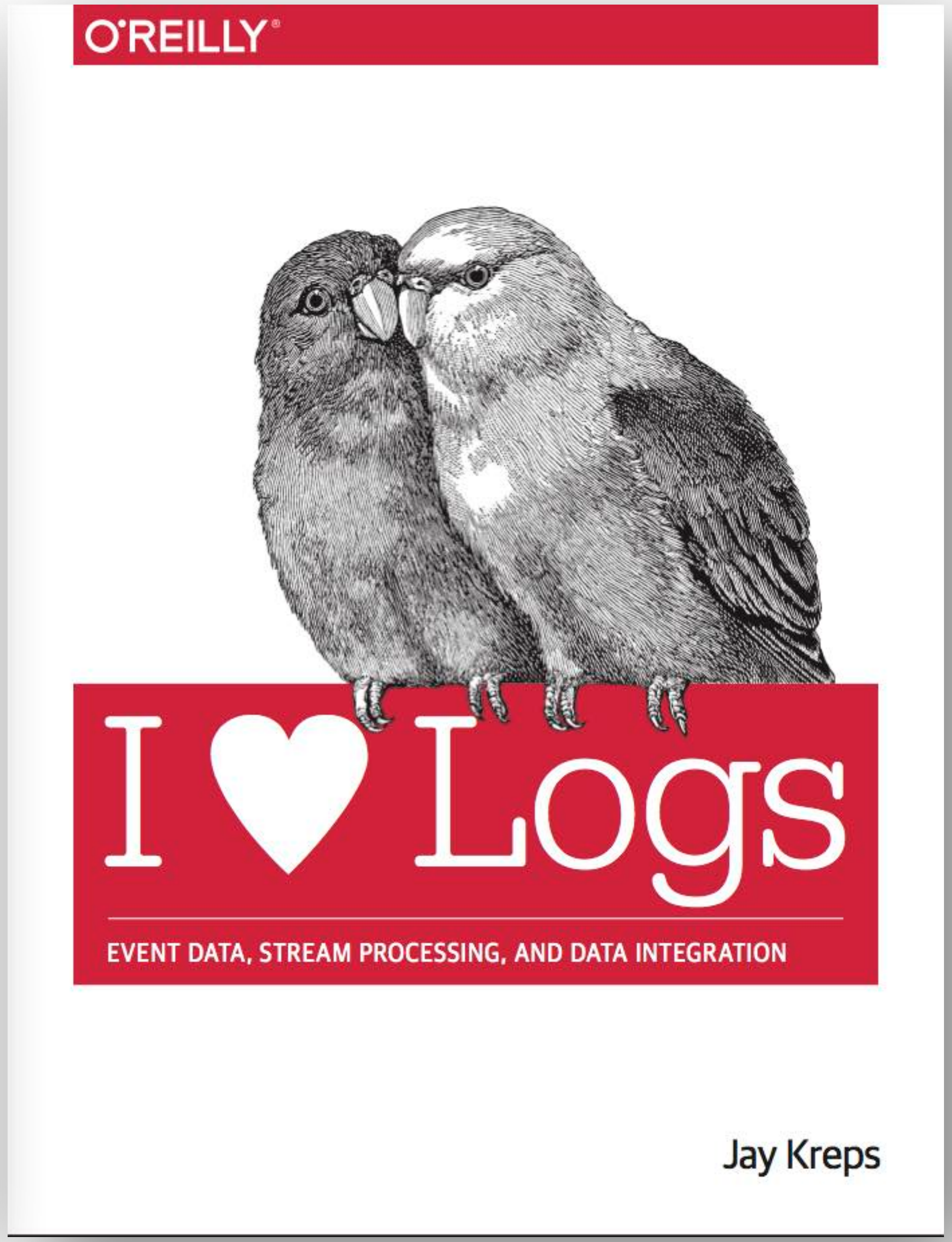


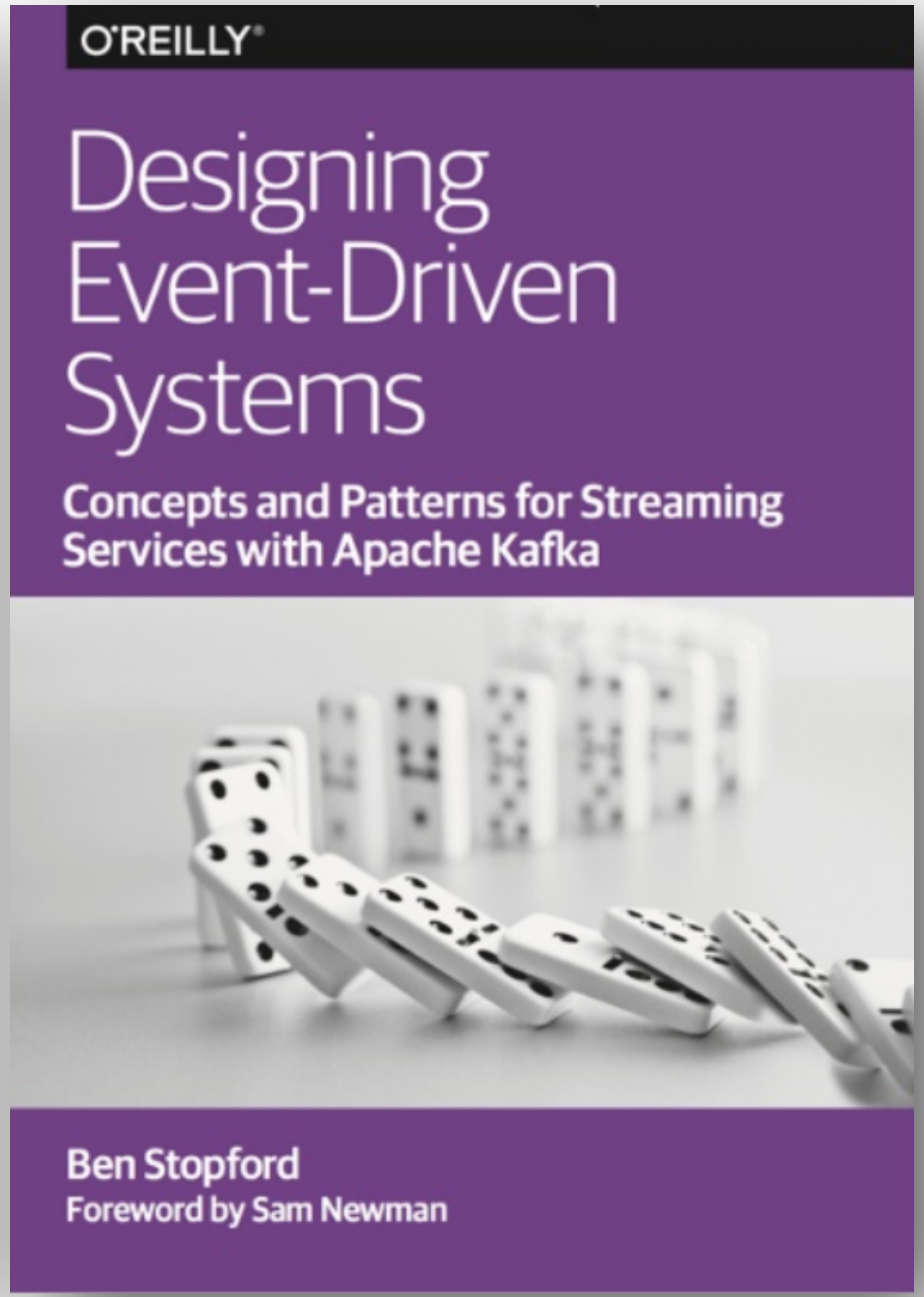
Free Books!

https://rmoff.dev/aq7



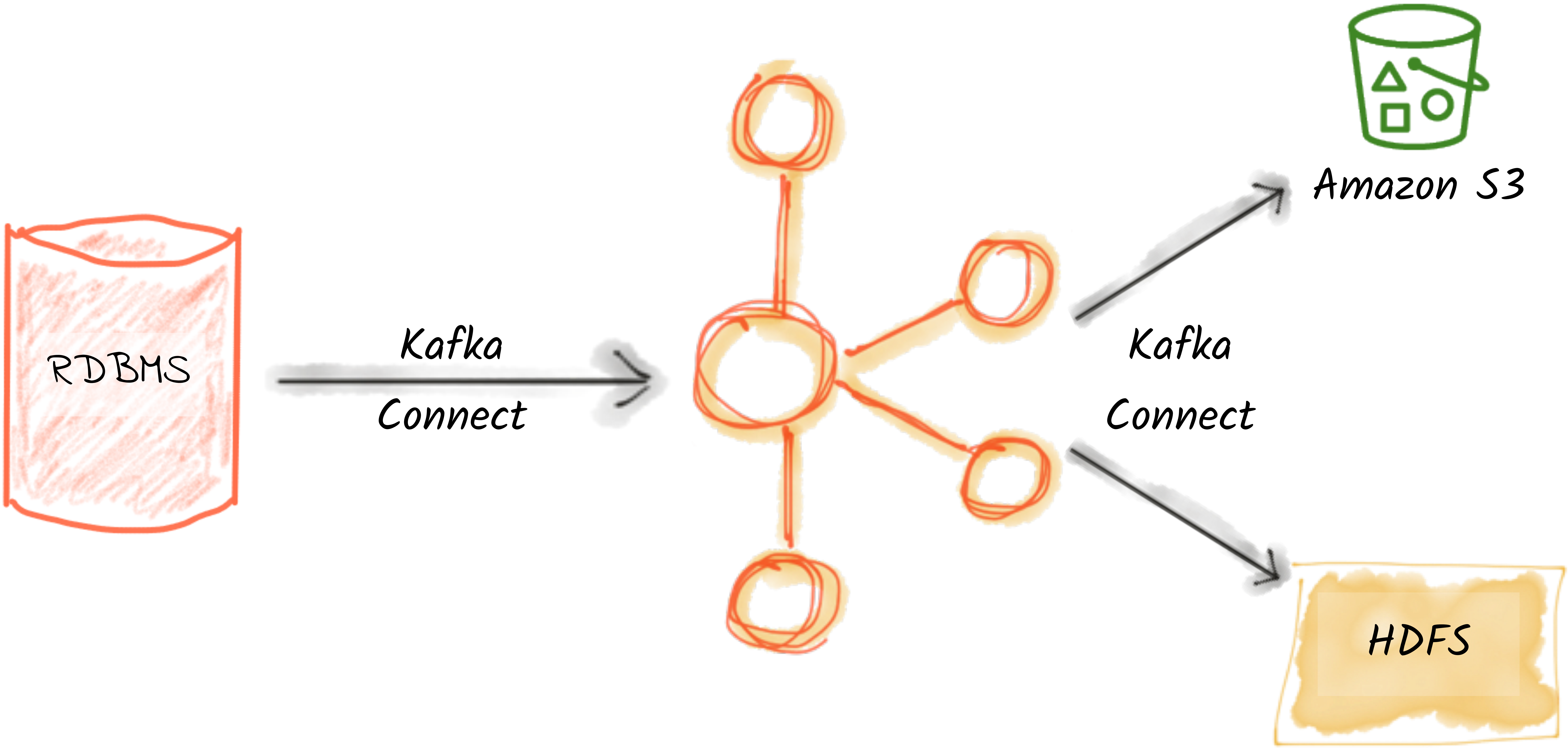




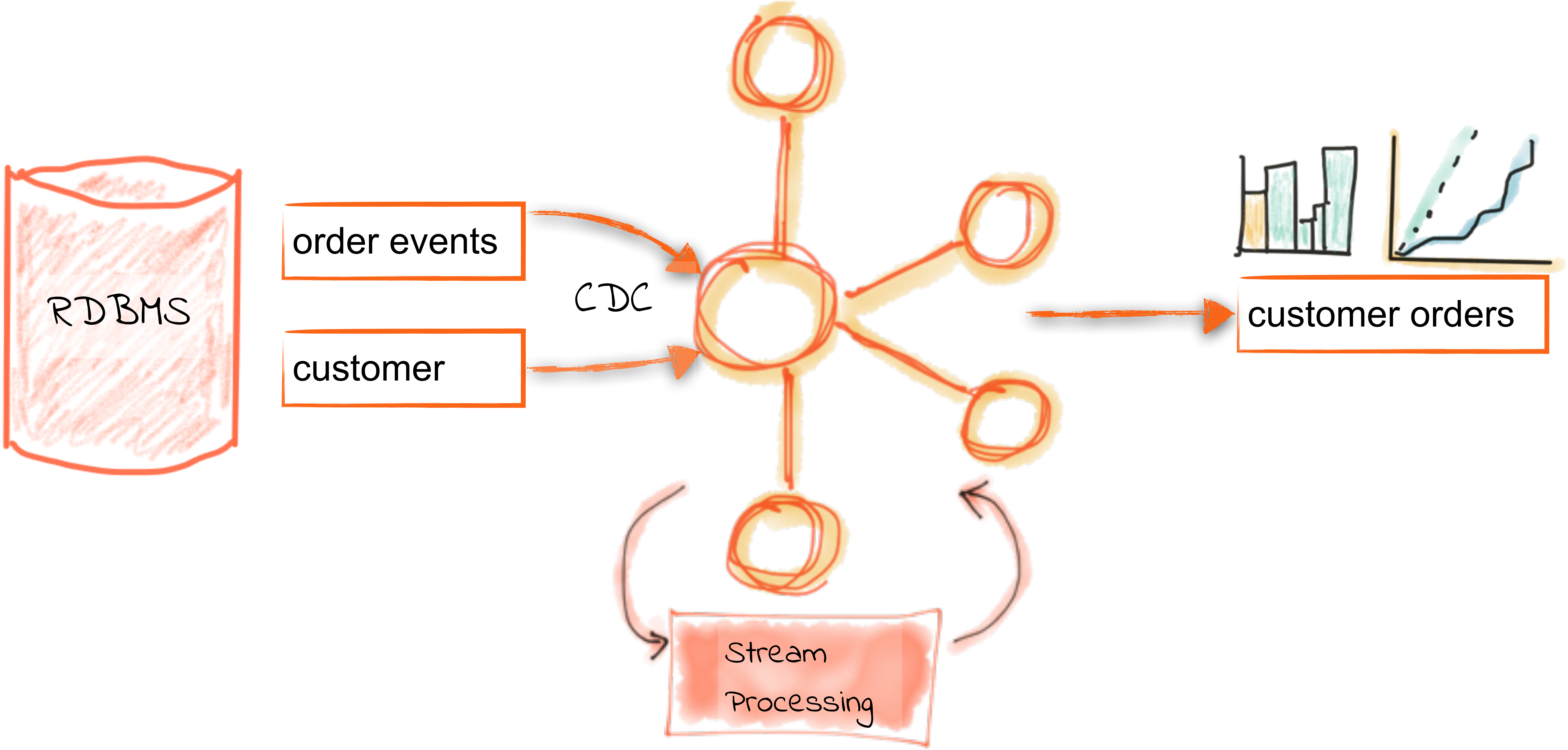


Streaming Data Pipelines

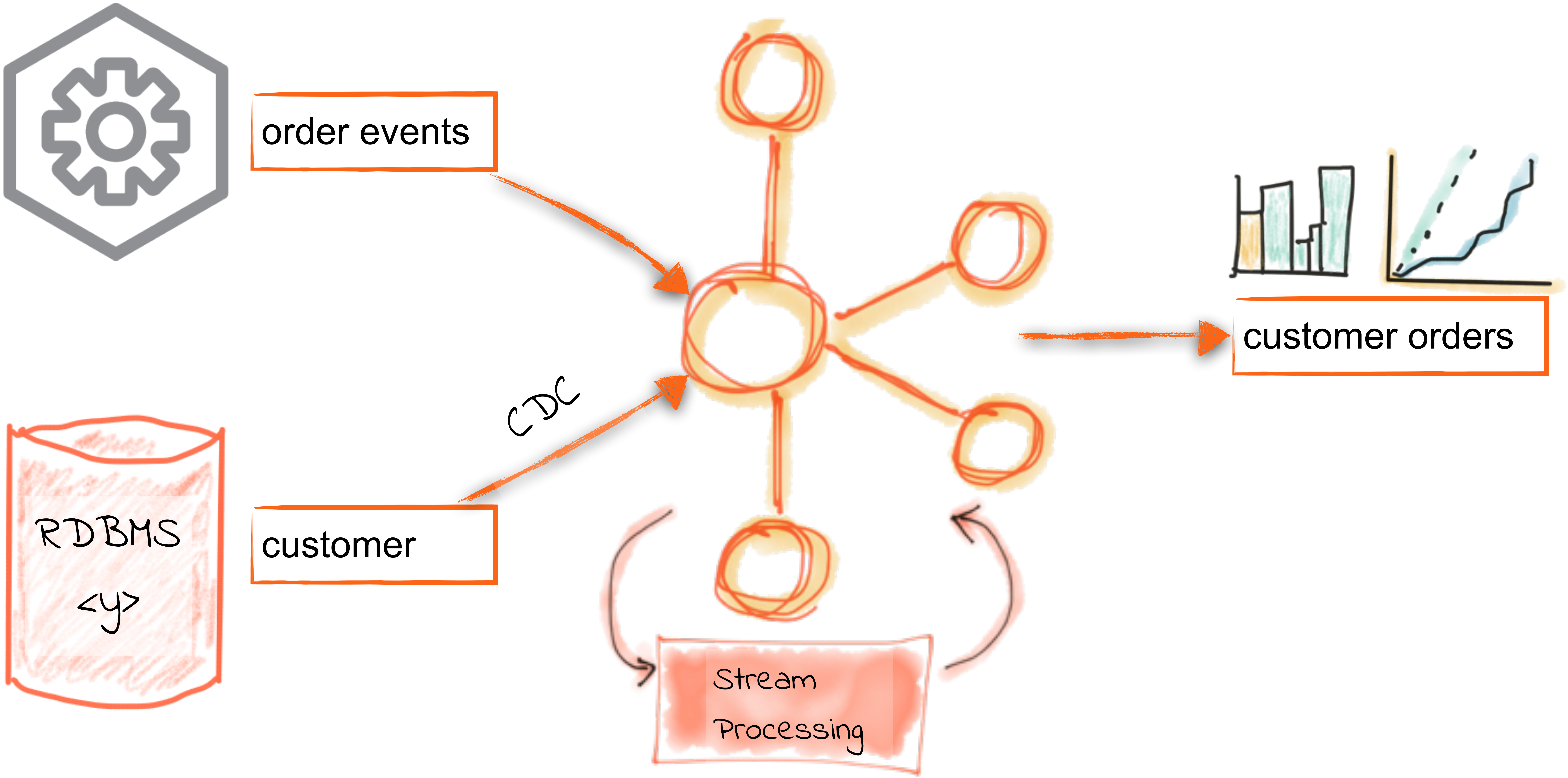
Database Offload



Stream Processing with Apache Kafka and ksqlDB



Real-time Event Stream Enrichment



Building a streaming data pipeline

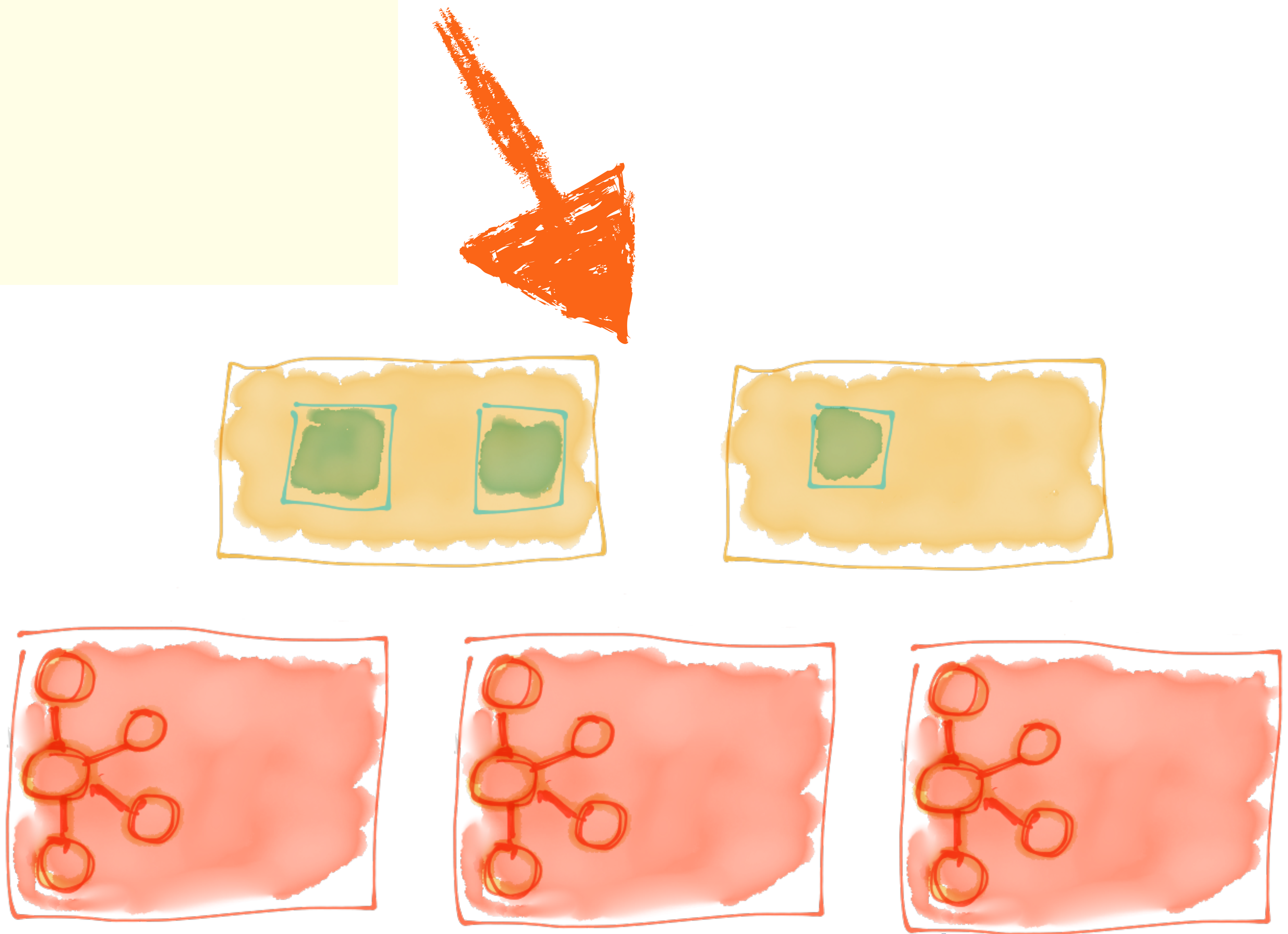
Integration + Stream Processing

Integration

Streaming Integration with Kafka Connect

JSON
MQTT.ORG
MySQL
ORACLE
syslog
CSV
salesforce
http://
Microsoft SQL Server

Sources



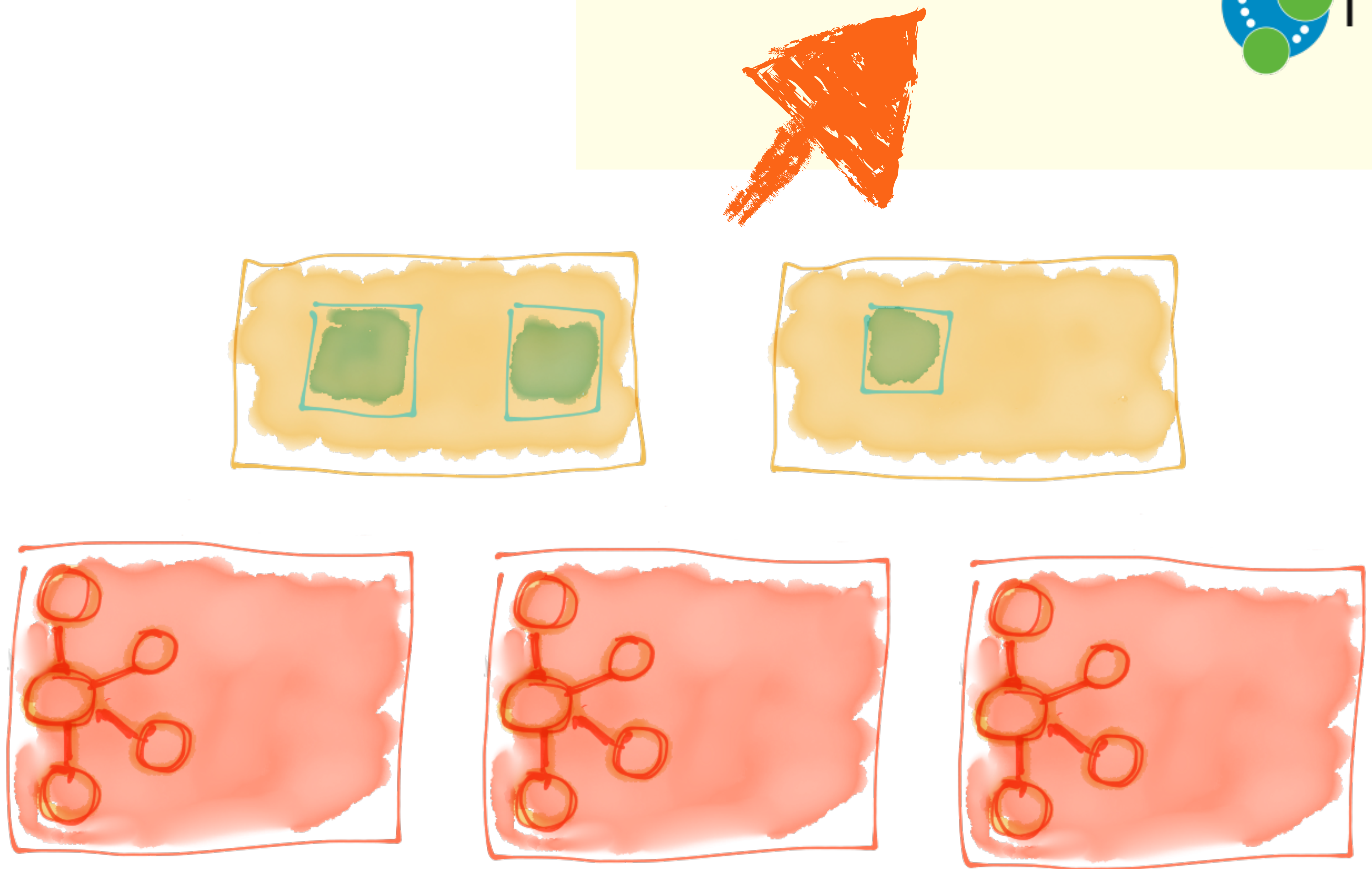
Kafka Connect

Kafka Brokers

Streaming Integration with Kafka Connect

mongoDB
Java JDBC
Amazon S3
snowflake
elasticsearch
influxdb
IBM MQ
Google BigQuery
salesforce
http://
ORACLE
neo4j
hadoop HDFS
splunk
MQTT.ORG

Sinks



Kafka Connect

Kafka Brokers

Streaming Integration with Kafka Connect

Kafka Connect

Kafka Brokers

Look Ma, No Code!

```
{
  "connector.class":
    "io.confluent.connect.jdbc.JdbcSourceConnector",
  "connection.url":
    "jdbc:mysql://asgard:3306/demo",
  "table.whitelist":
    "sales,orders,customers"
}
```

Serialisation & Schemas

Avro 👍

Protobuf 👍

JSON Schema 👍

JSON 😬

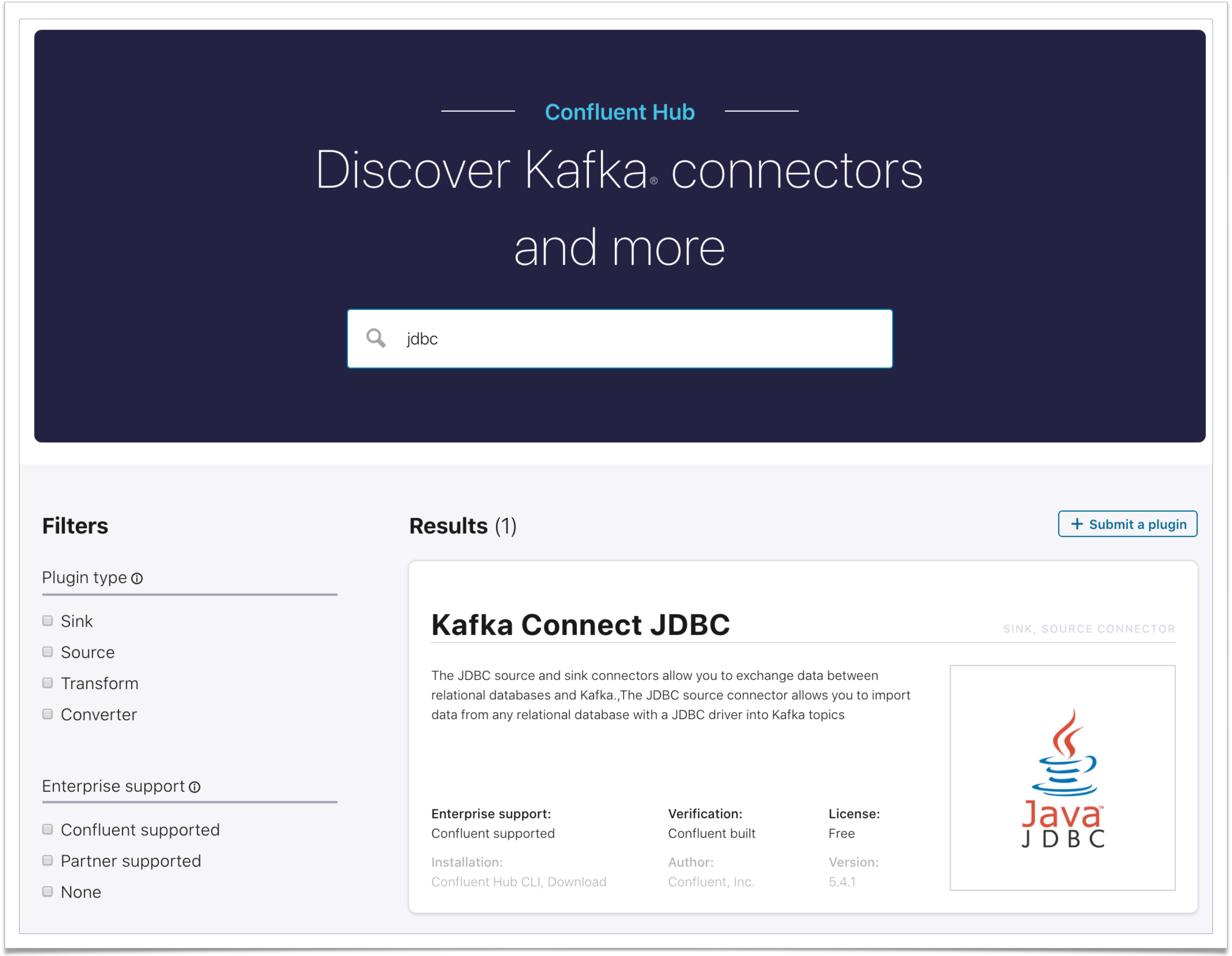
CSV 

> **Gwen (Chen) Shapira**
> @gwenshap
>
> If your dev process doesn't validate schema compatibility somewhere between your IDE and production - you are screwed and don't know it.
>
> 5:50 AM - 5 Apr 2017

https://qconnewyork.com/system/files/presentation-slides/qcon_17_-_schemas_and_apis.pdf

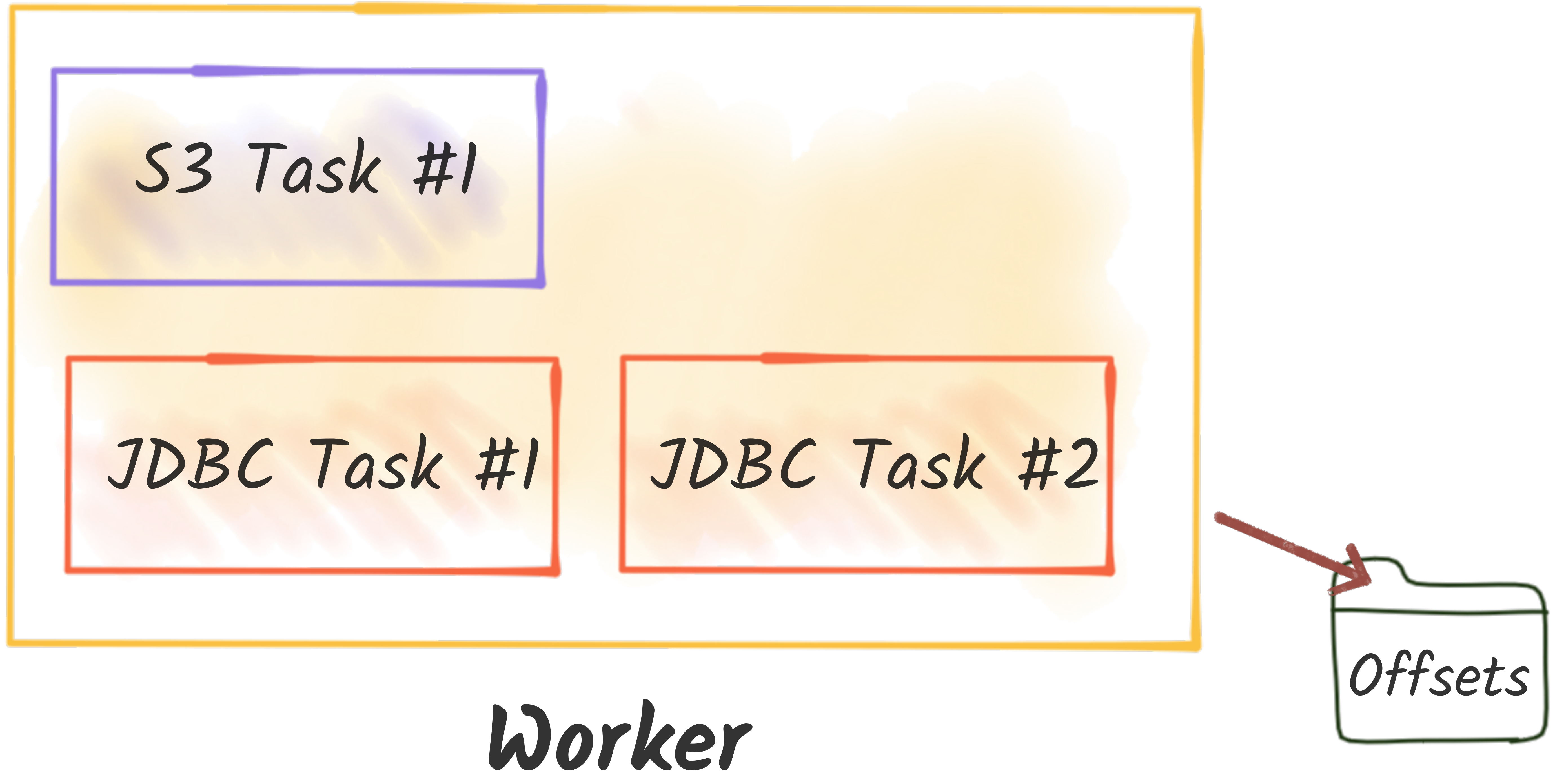
Extensible

Confluent Hub



hub.confluent.io

Kafka Connect Standalone Worker



Kafka Connect Distributed Workers

Multiple Distributed Clusters

Integration + Stream Processing

Stream Processing

```json
{
    "reading_ts": "2020-02-14T12:19:27Z",
    "sensor_id": "aa-101",
    "production_line": "w01",
    "widget_type": "acme94",
    "temp_celcius": 23,
    "widget_weight_g": 100
}
```


Photo by Franck V. on Unsplash

```
SELECT *
FROM WIDGETS
WHERE WEIGHT_G > 120
```

```
SELECT COUNT(*)
FROM WIDGETS
GROUP BY PRODUCTION_LINE
```


```json
{
    "reading_ts": "2020-02-14T12:19:27Z",
    "sensor_id": "aa-101",
    "production_line": "w01",
    "widget_type": "acme94",
    "temp_celcius": 23,
    "widget_weight_g": 100
}
```

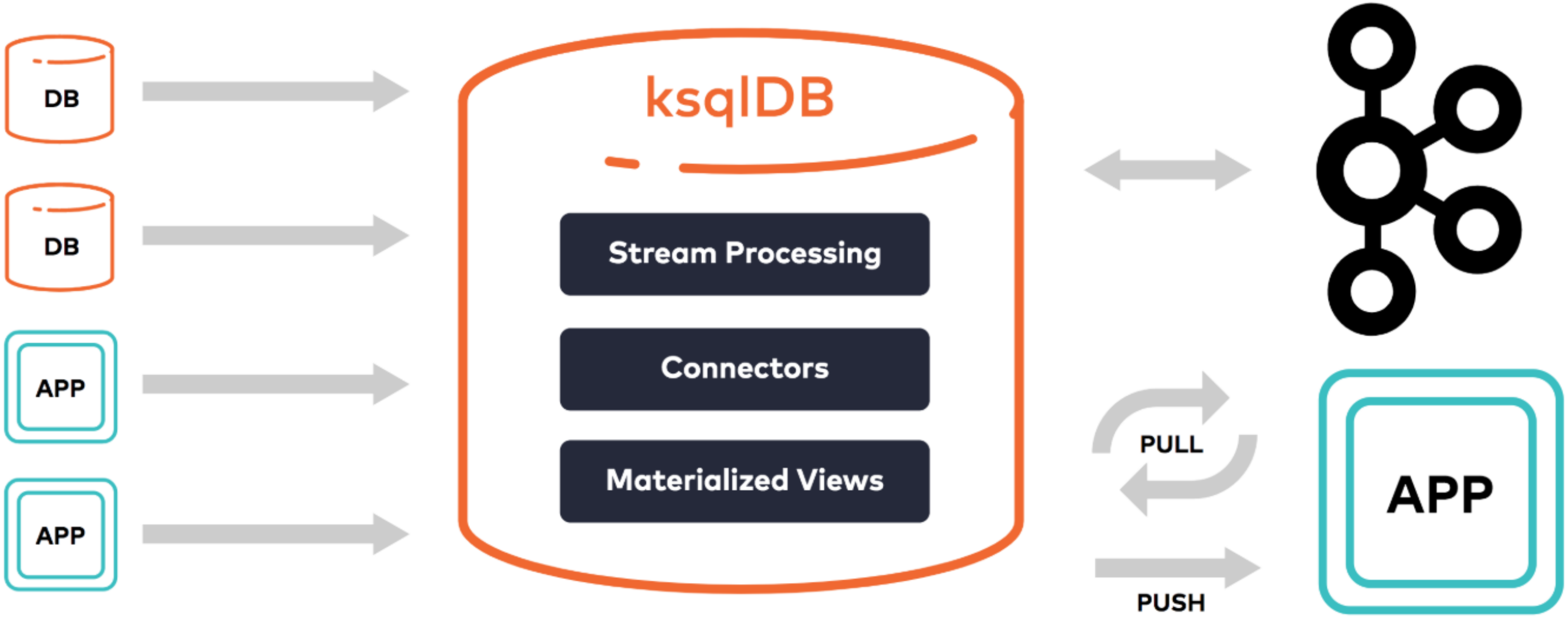

```
SELECT AVG(TEMP_CELCIUS) AS TEMP
FROM WIDGETS
GROUP BY SENSOR_ID
HAVING TEMP>20
```

Object store,
data warehouse,
RDBMS

```
CREATE SINK CONNECTOR dw WITH (
'connector.class' = 'S3Connector',
'topics' = 'widgets'
…);
```

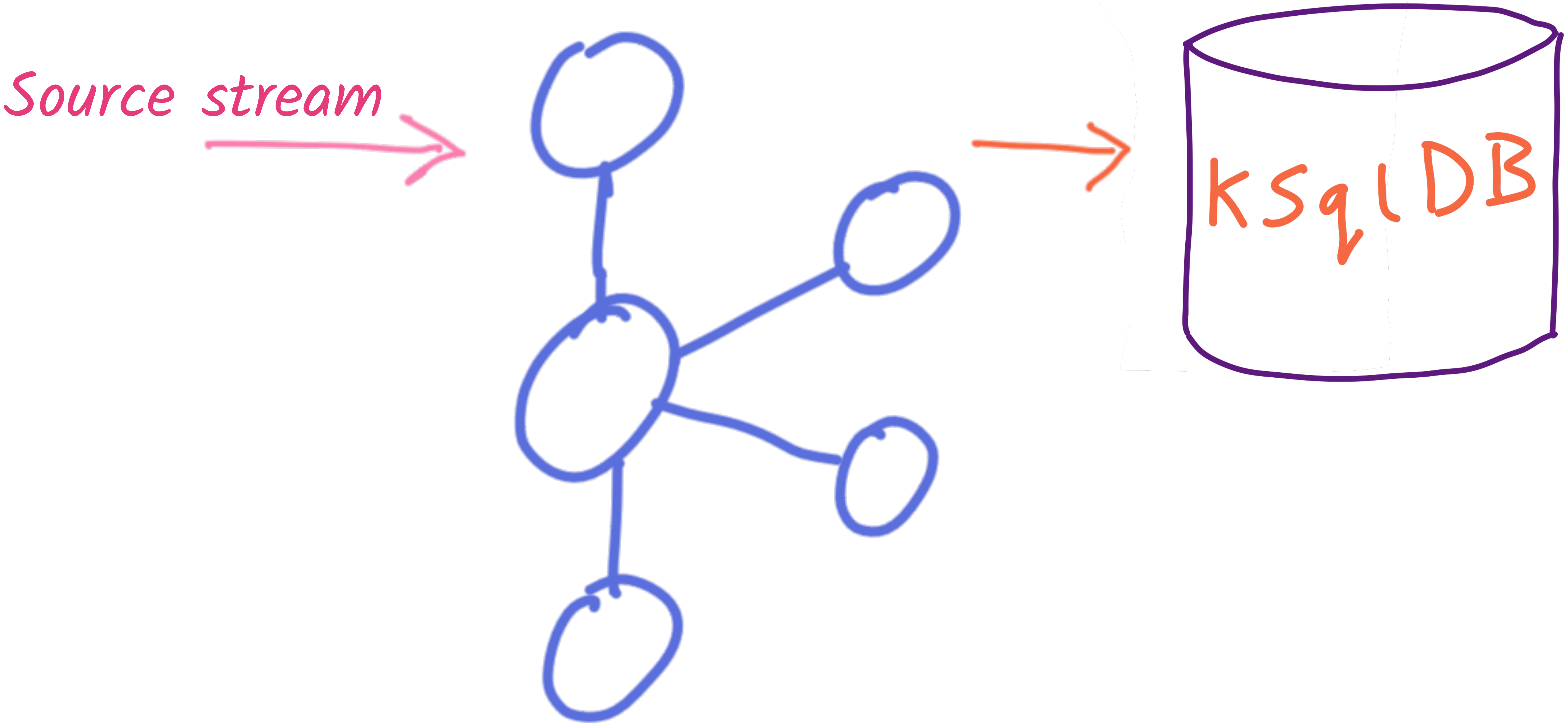
Photo by Franck V. on Unsplash

ksqlDB

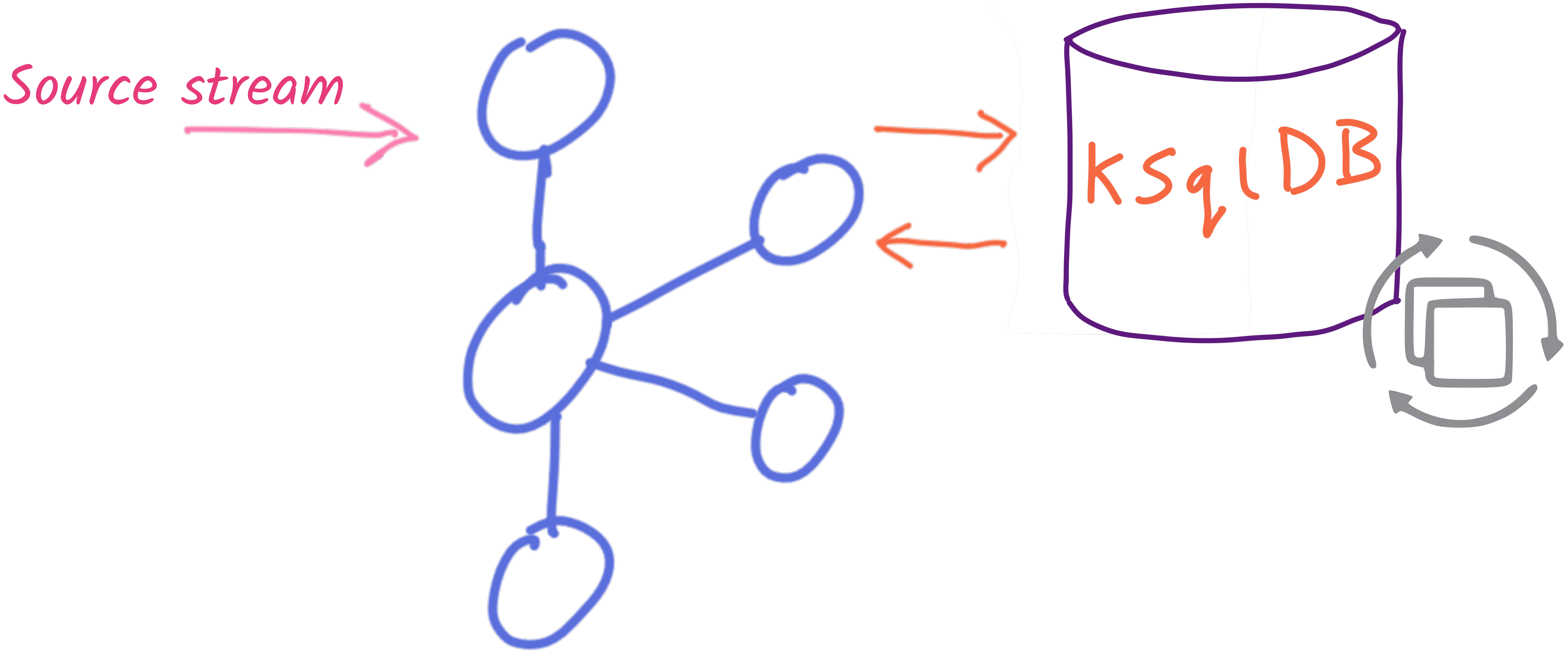


The event streaming database purpose-built for stream processing applications.

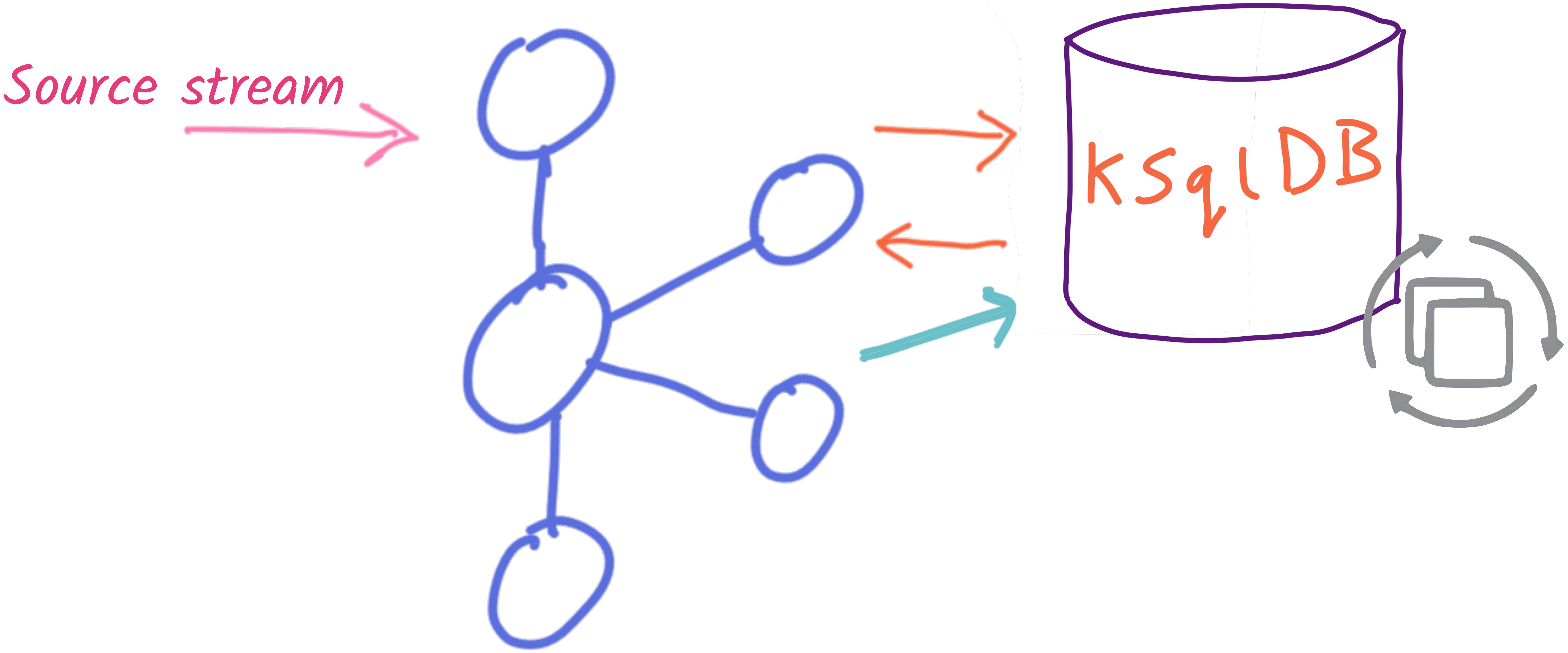
Stream Processing with ksqlDB



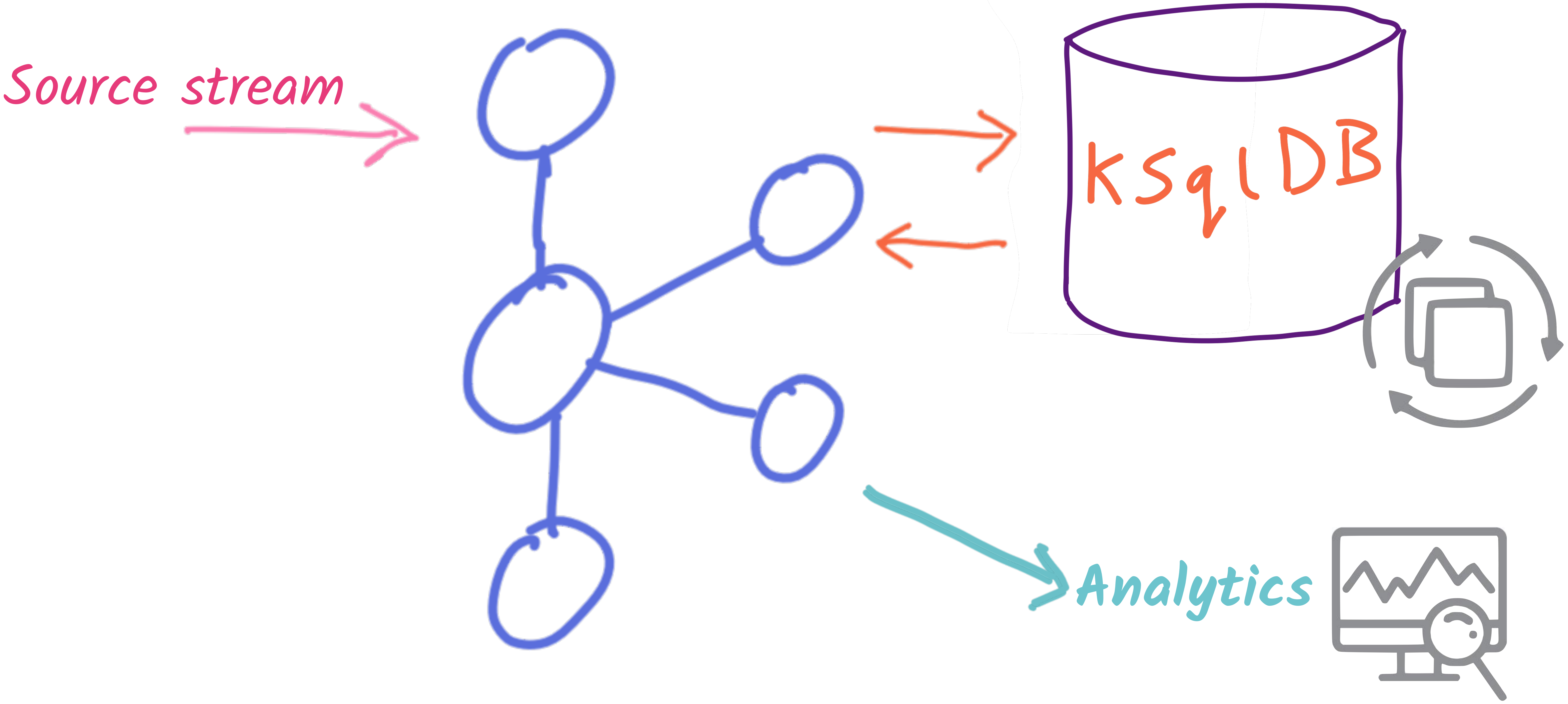
Stream Processing with ksqlDB



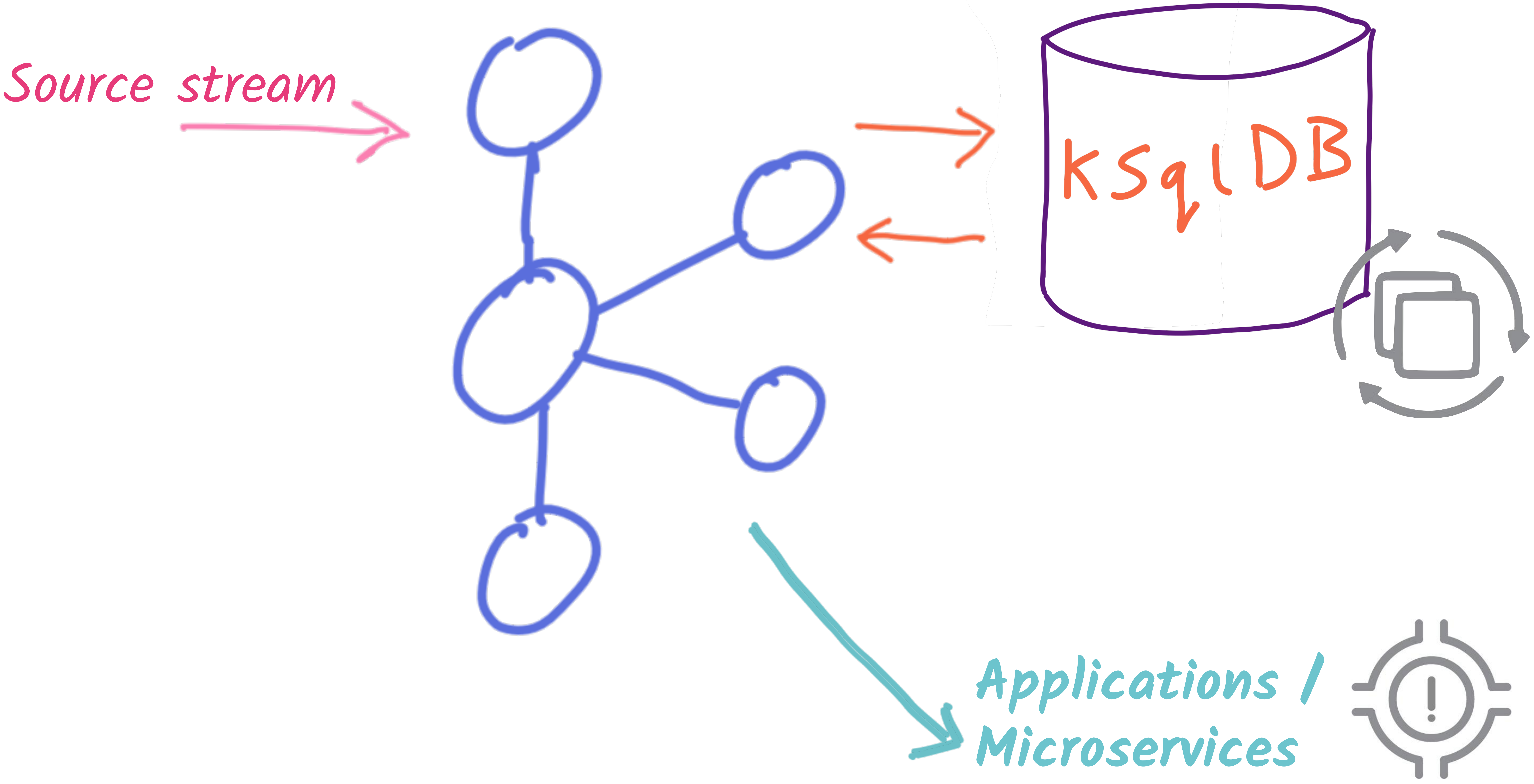
Stream Processing with ksqlDB



Stream Processing with ksqlDB

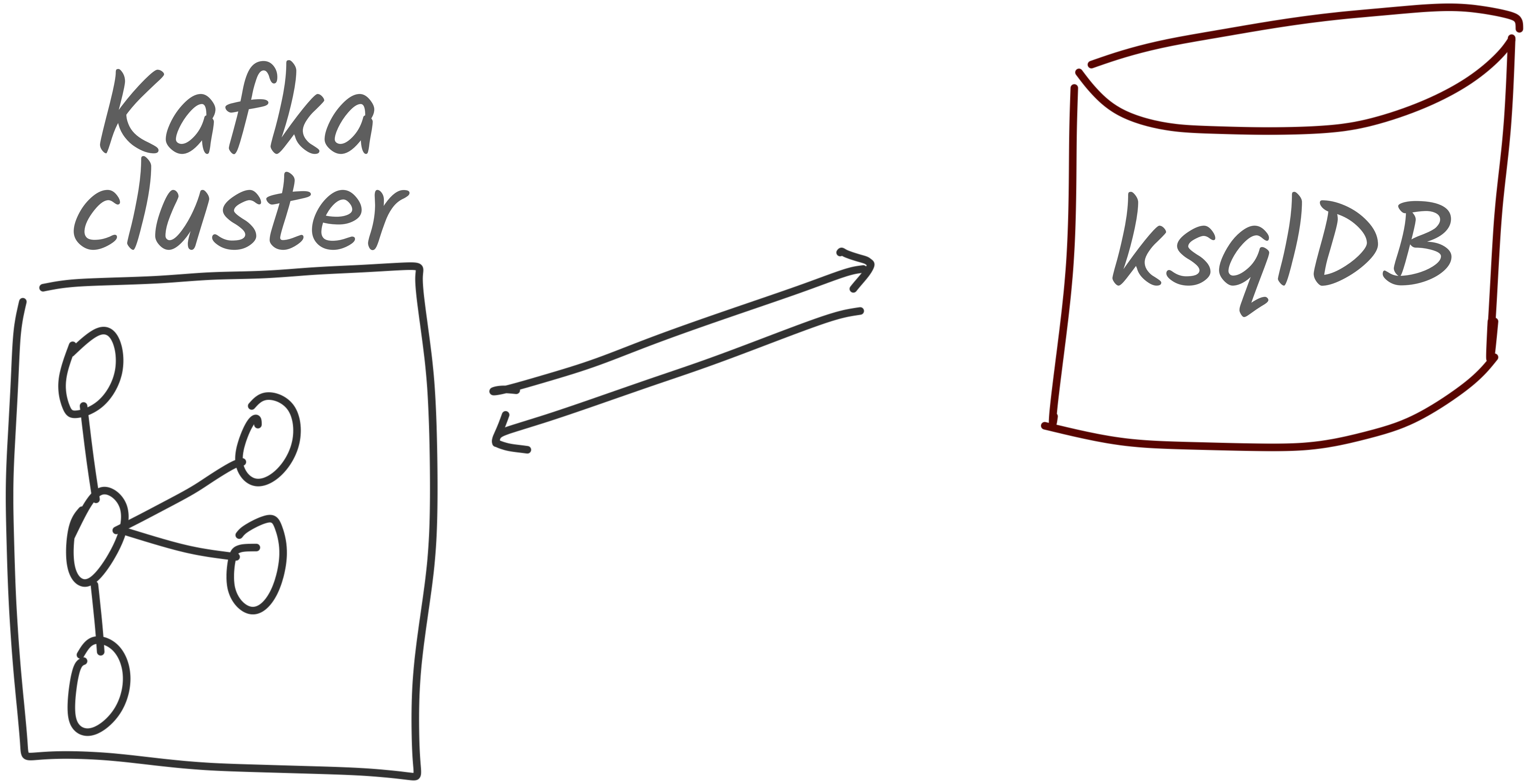


Stream Processing with ksqlDB

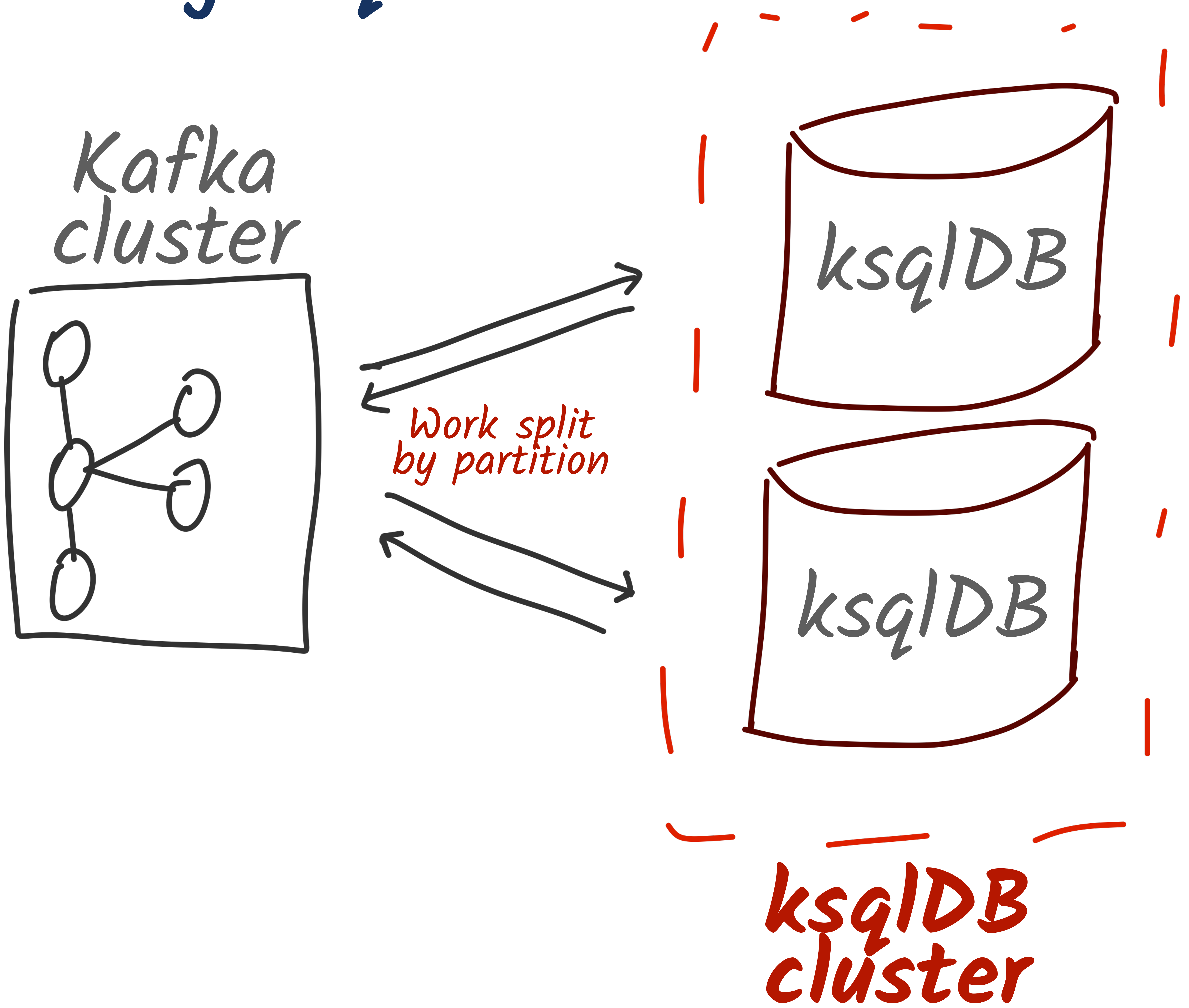


Stream Processing with ksqlDB

Scaling ksqlDB

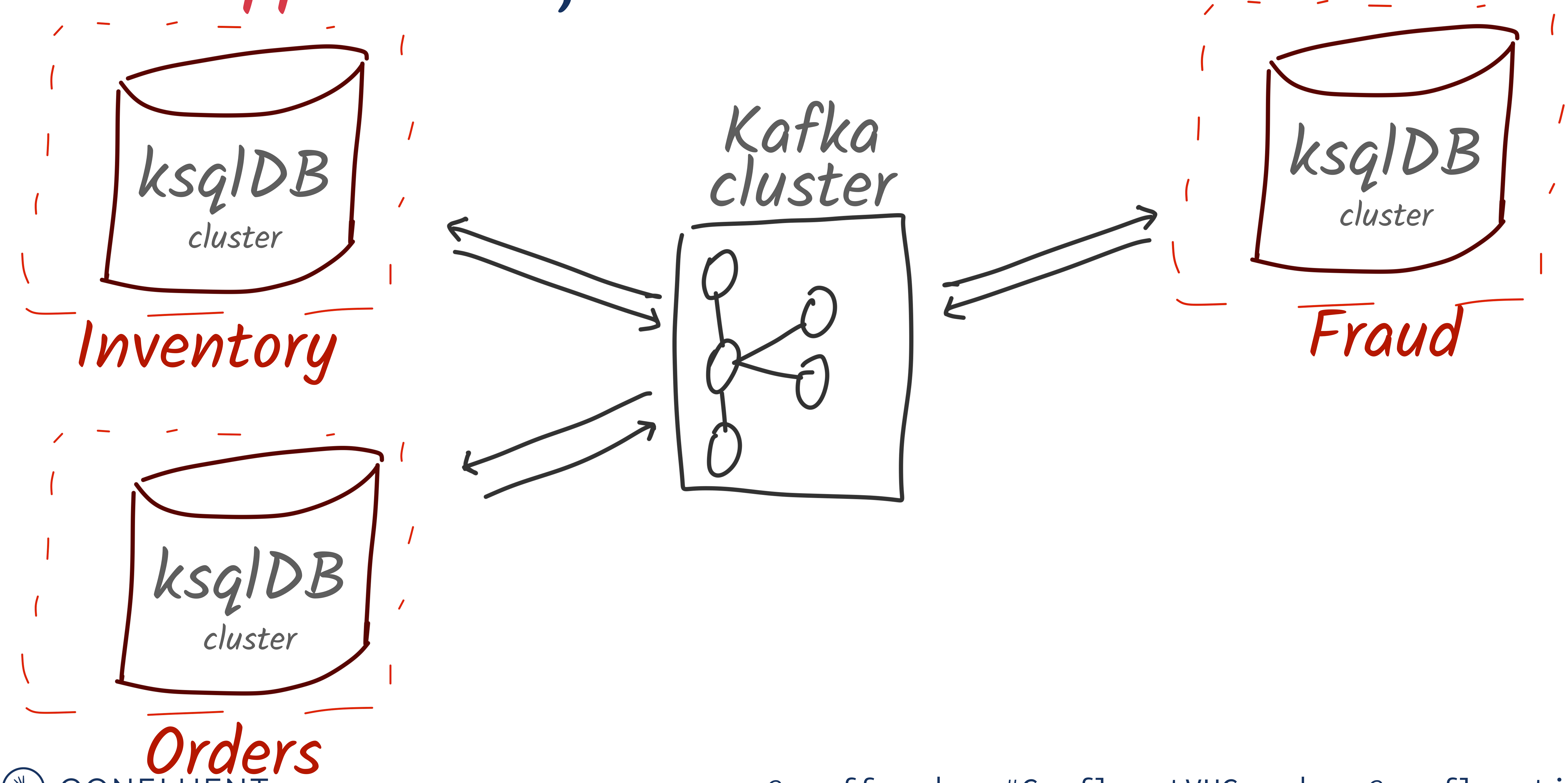


Scaling ksqlDB

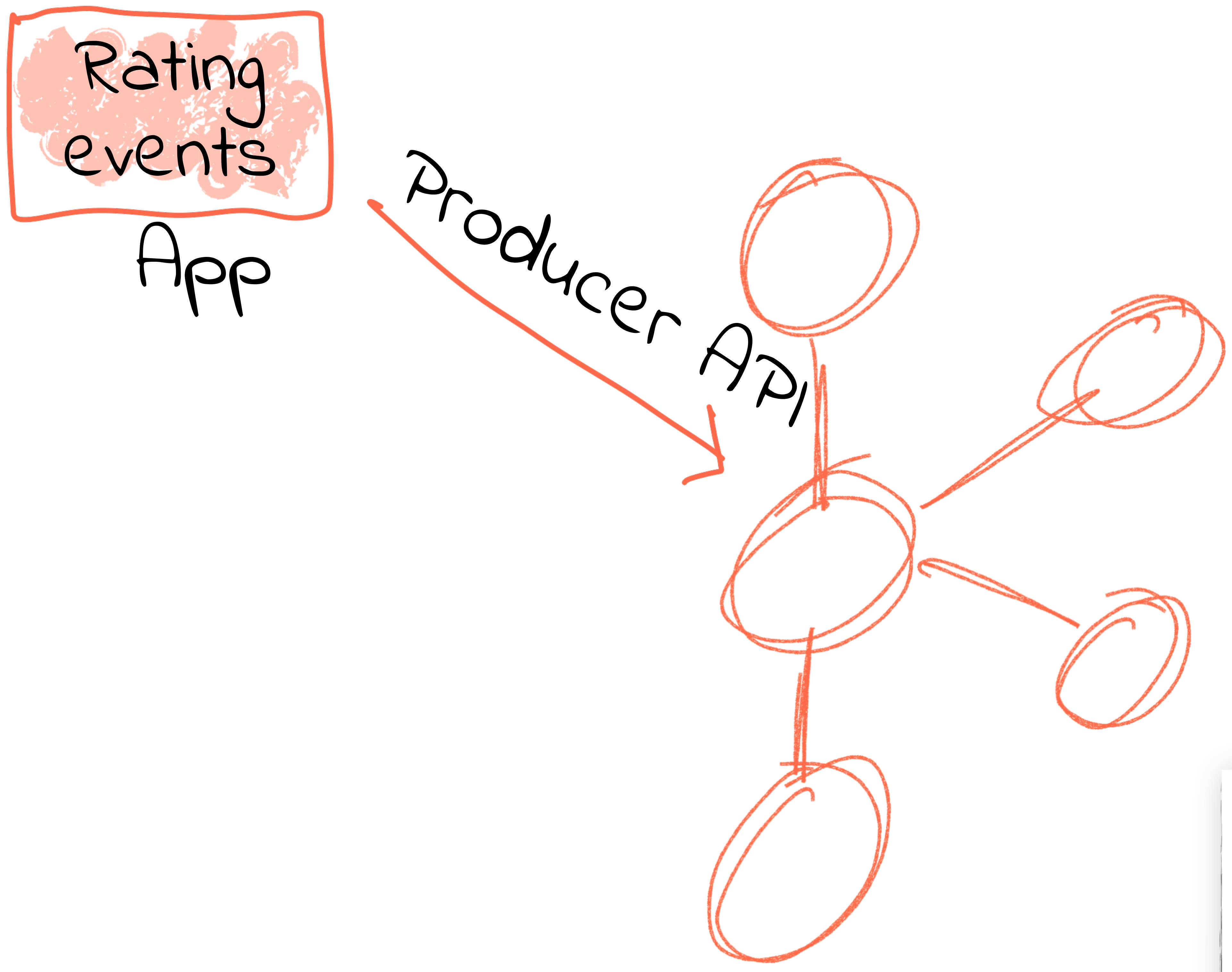



ONE DOES NOT SIMPLY RUN
ONE SINGLE KSQLDB CLUSTER

Think Applications, not database instances

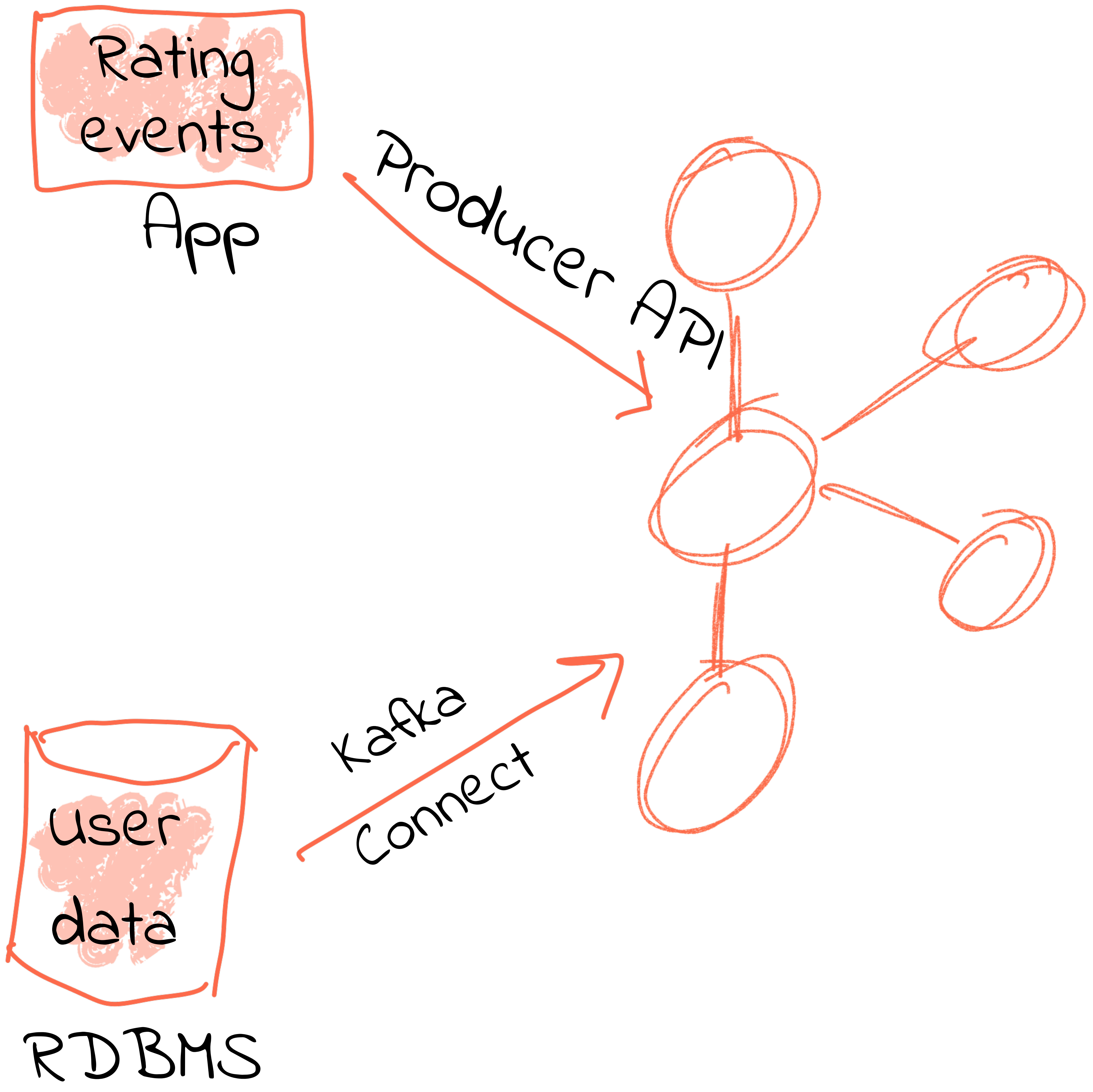


Let's Build It!




```
{
 "rating_id": 5313,
 "user_id": 3,
 "stars": 4,
 "route_id": 6975,
 "rating_time": 1519304105213,
 "channel": "web",
 "message": "worst. flight. ever. #neveragain"
}
```

Let's Build It!



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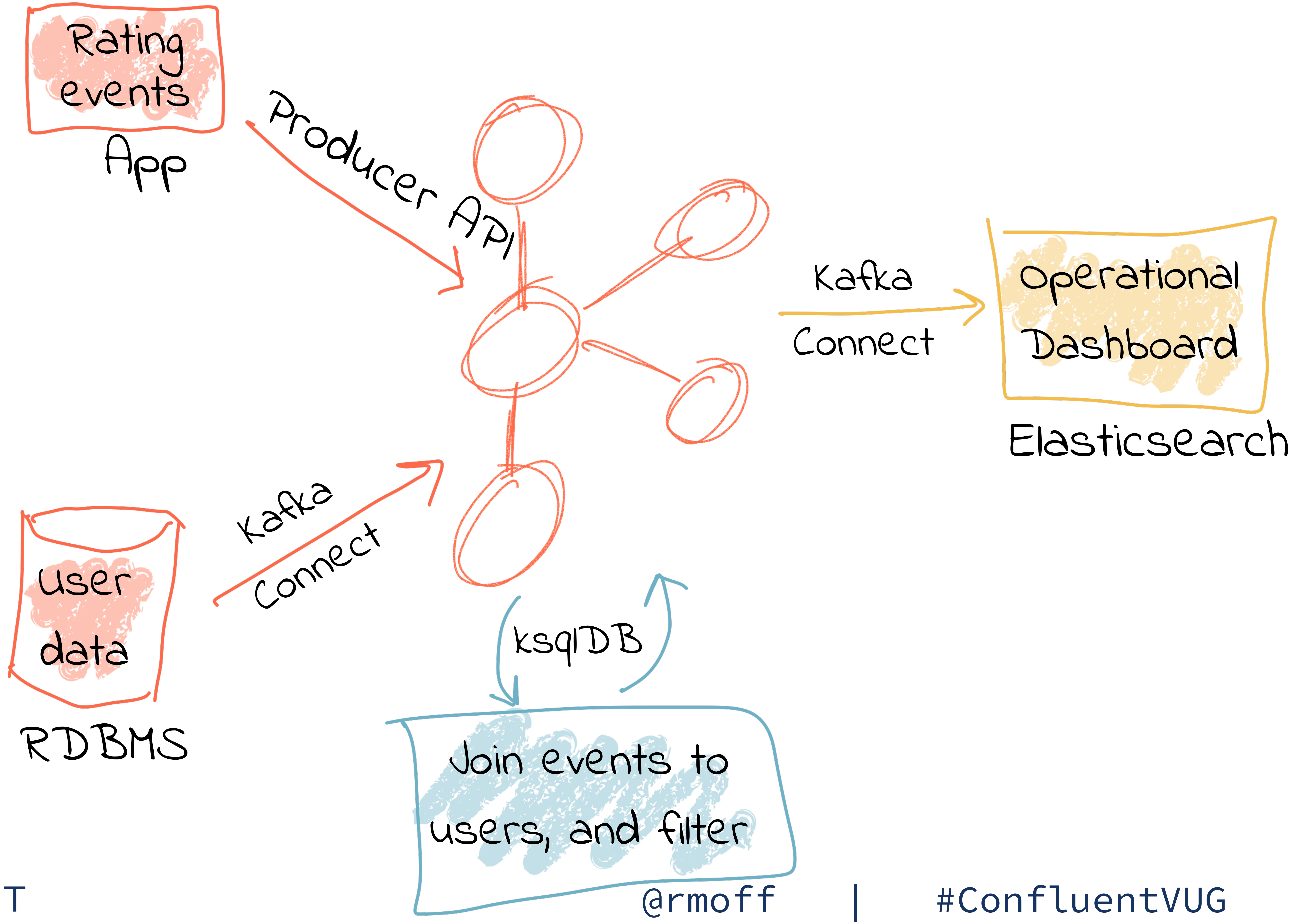
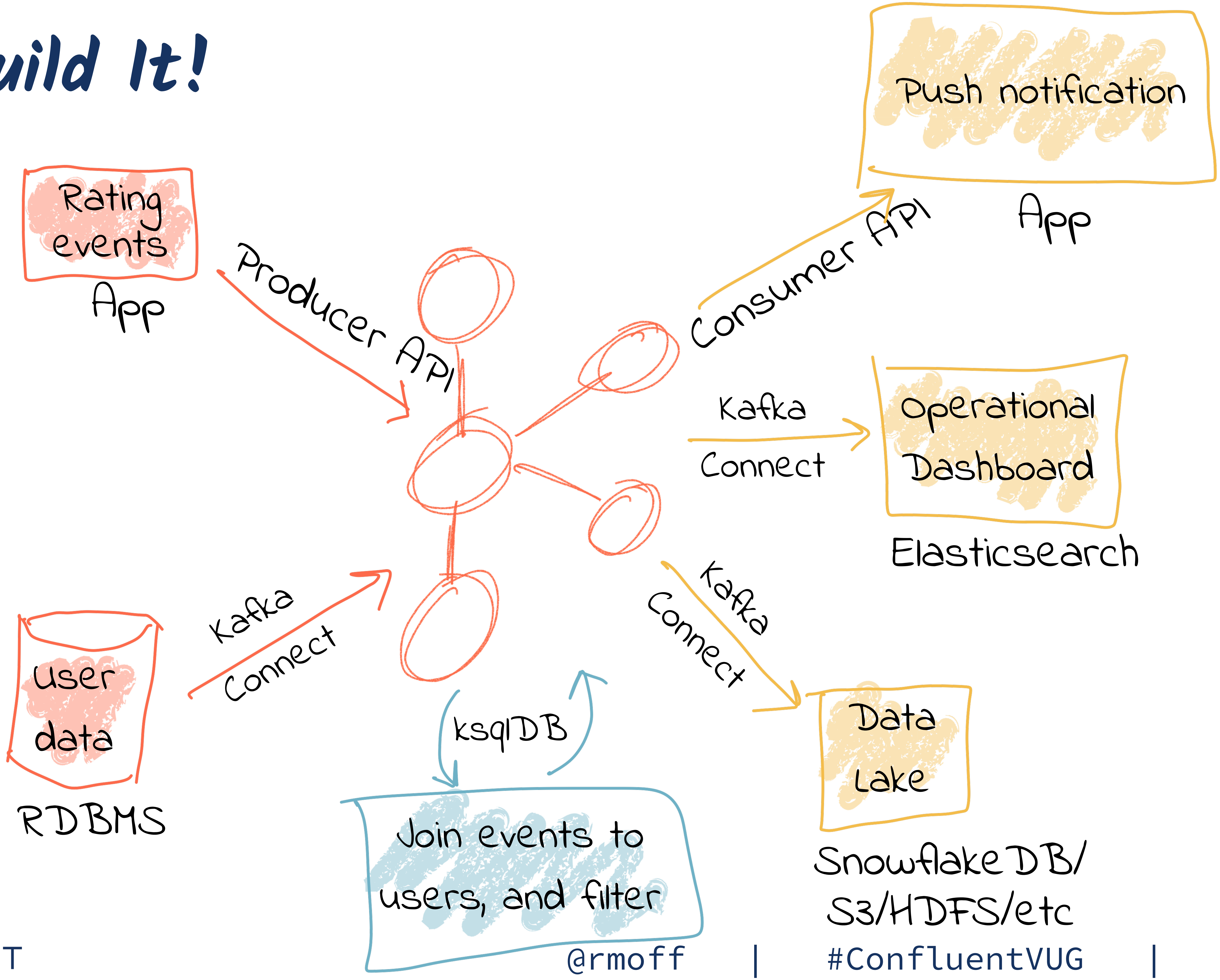
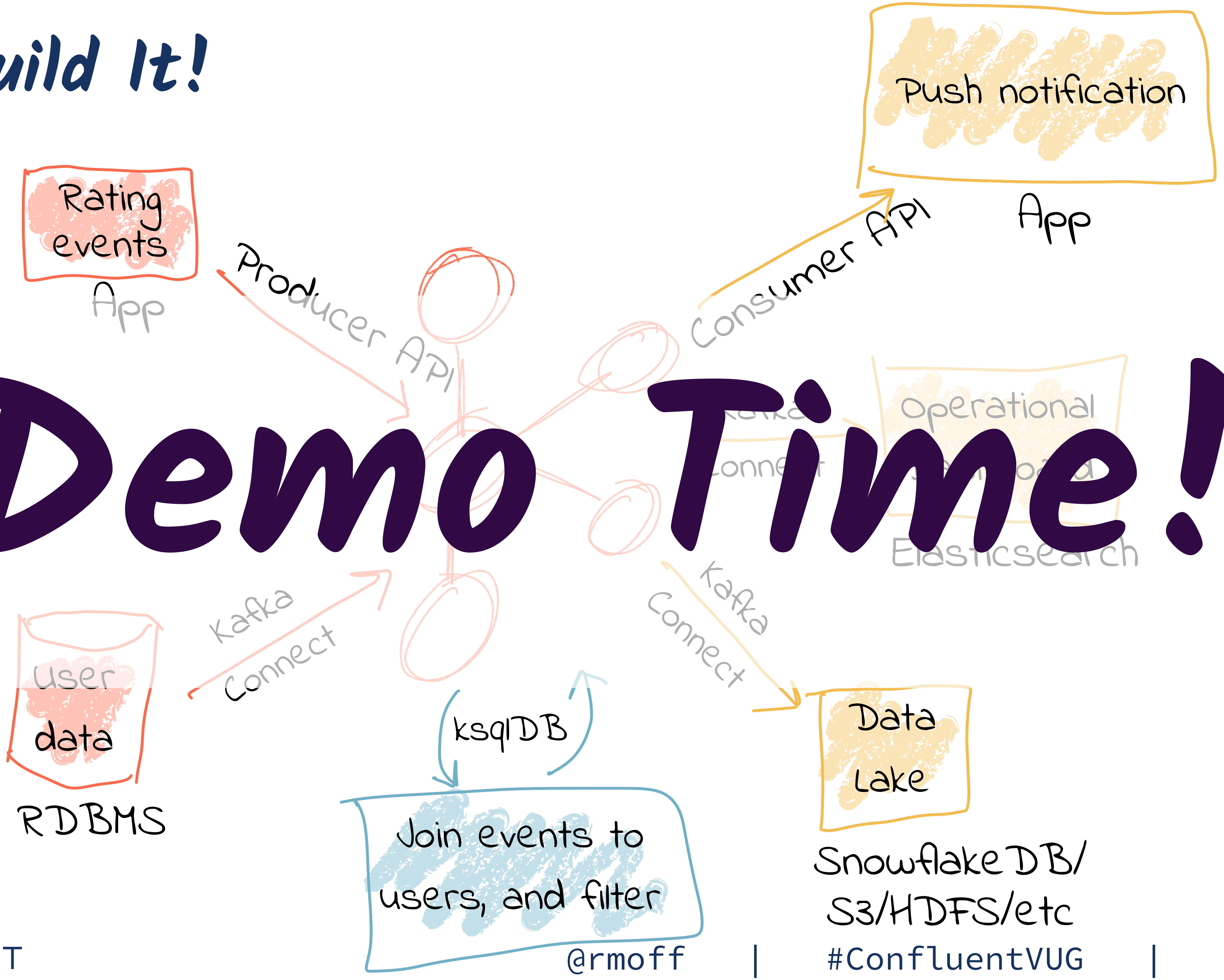


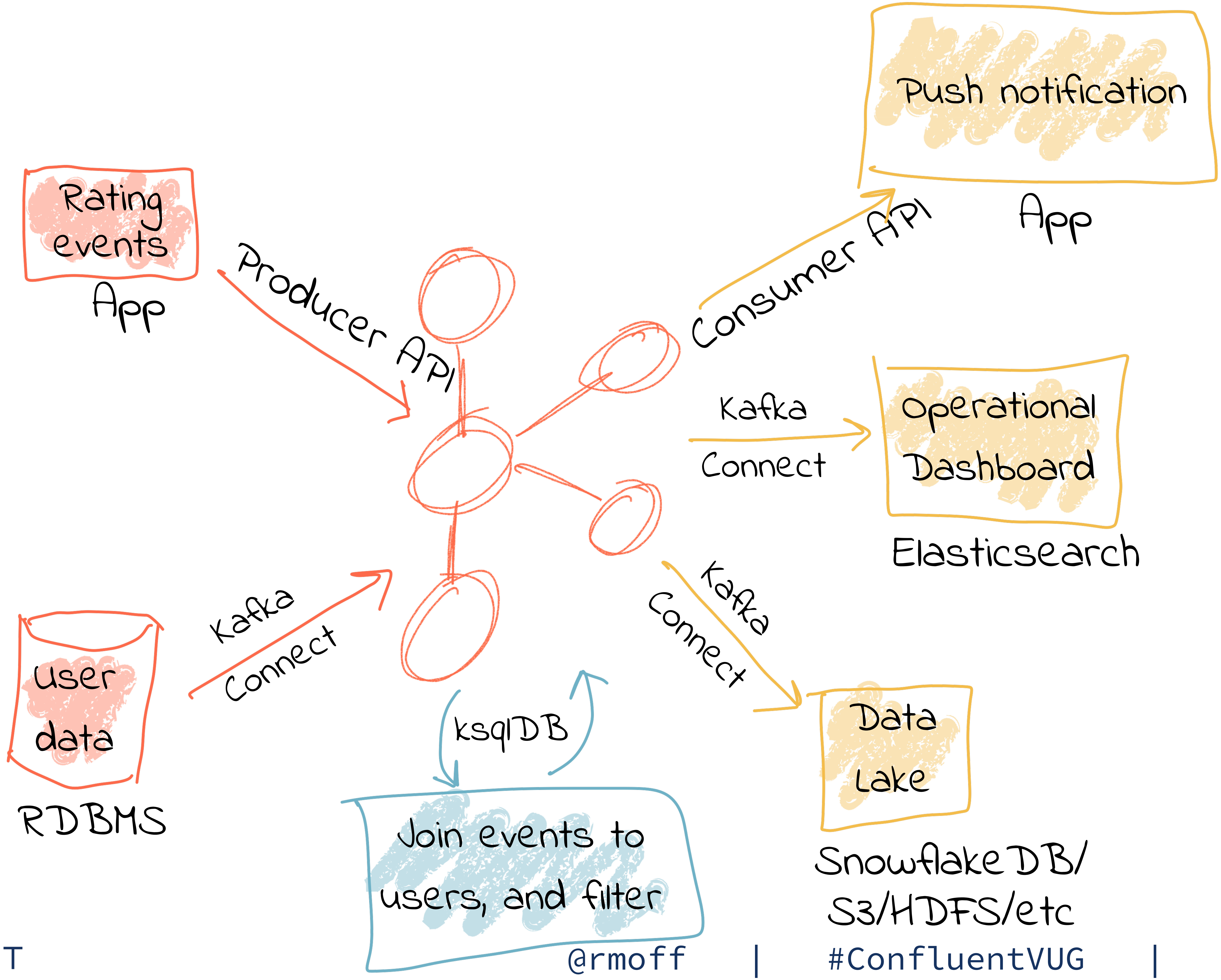
Let's Build It!

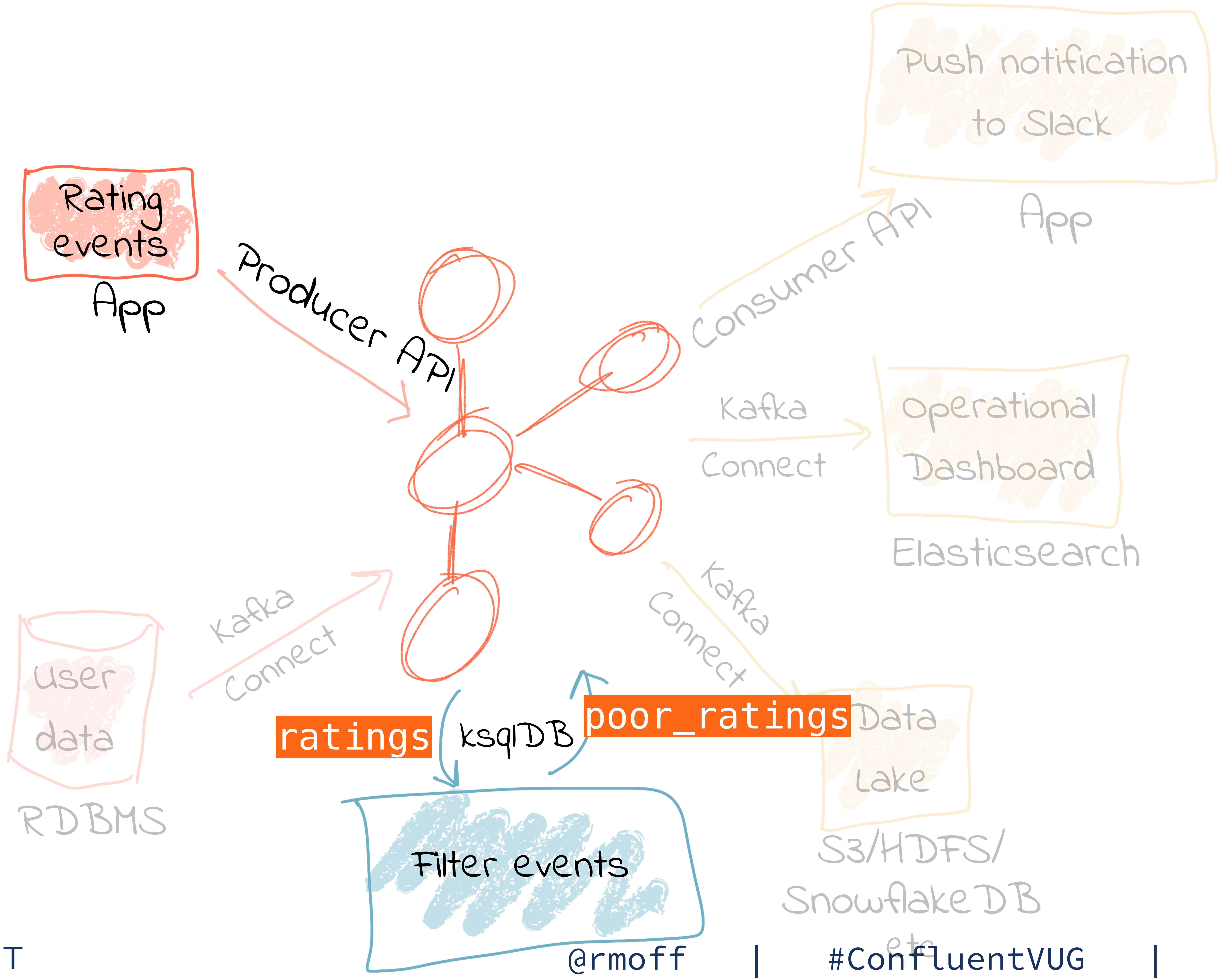


Let's Build It!

Demo Time!




Push notification
App
Consumer API
Rating events
App
Producer API
Kafka Connect
Operational Dashboard
Elasticsearch
Kafka Connect
Kafka Connect
User data
RDBMS
ksqlDB
Join events to users, and filter
Data Lake
SnowflakeDB/ S3/HDFS/etc



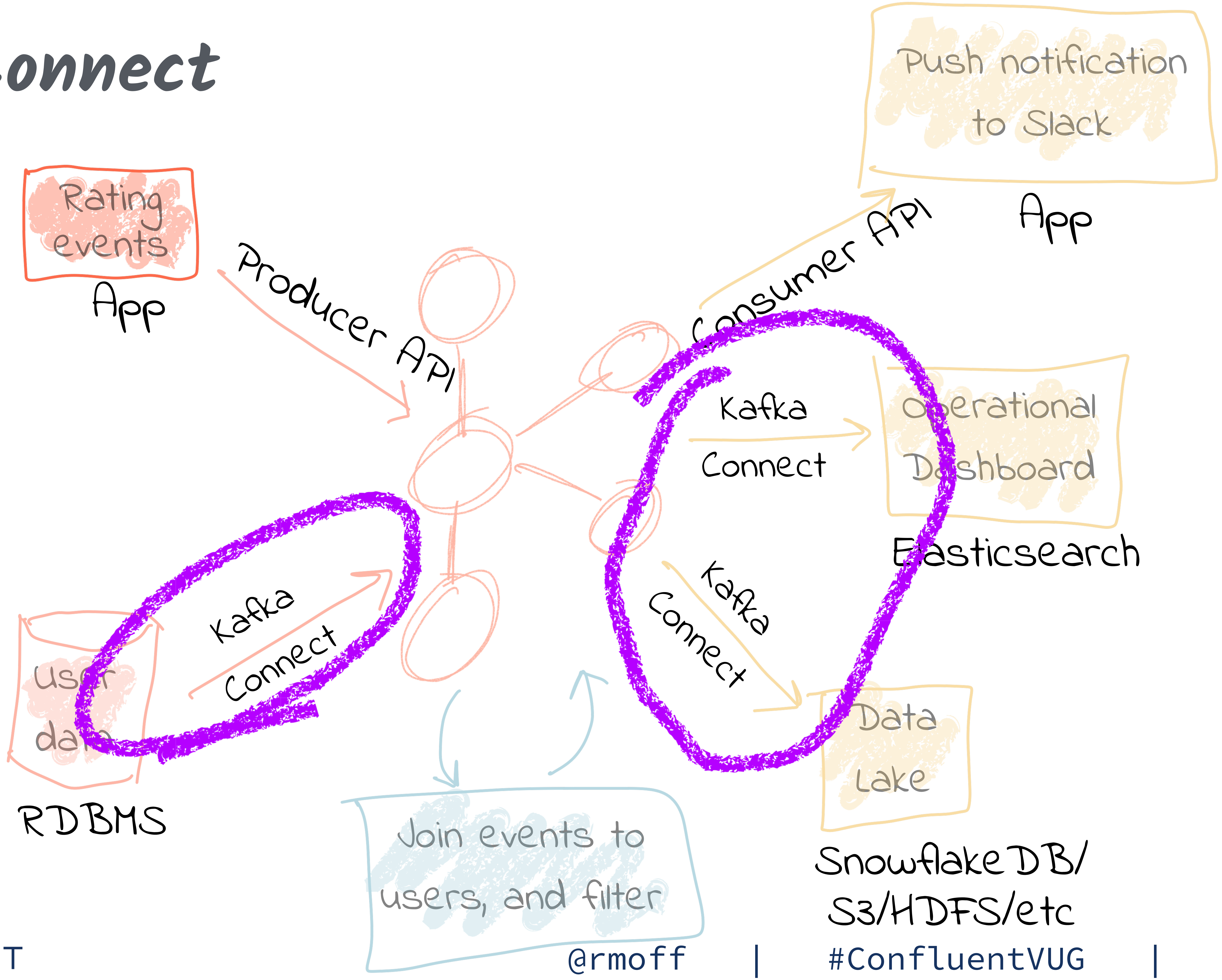
Push notification to Slack
App
Rating events
App
Producer API
Consumer API
Kafka Connect
Operational Dashboard
Elasticsearch
Kafka Connect
Kafka Connect
User data
RDBMS
ratings
ksqlDB
poor_ratings
Data Lake
S3/HDFS/ SnowflakeDB etc
Filter events

```
{
 "rating_id": 5313,
 "user_id": 3,
 "stars": 4,
 "route_id": 6975,
 "rating_time": 1519304105213,
 "channel": "web",
 "message": "worst. flight. ever. #neveragain"
}
```

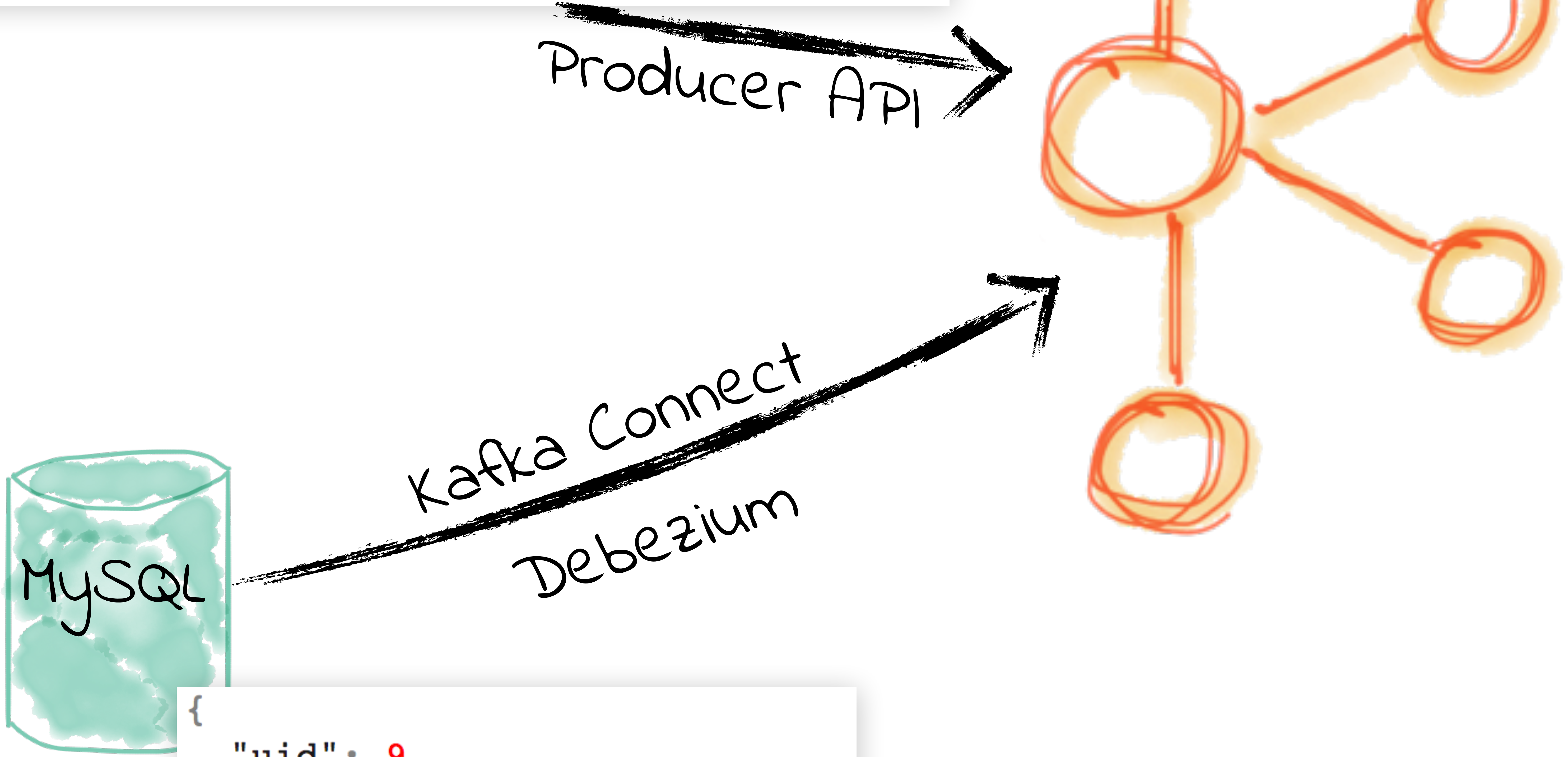


```
CREATE STREAM POOR_RATINGS AS
SELECT * FROM ratings WHERE STARS <3
```

Kafka Connect



```
{
  "rating_id": 2133,
  "user_id": 9,
  "stars": 1,
  "route_id": 7219,
  "rating_time": 1519402815063,
  "channel": "web",
  "message": "worst. flight. ever. #neveragain"
}
```


```
{
  "uid": 9,
  "name": "Neha",
  "locale": "en_US",
  "address_city": "Palo Alto",
  "elite": "P"
}
```

The Stream/Table Duality

Stream

Time

Account ID	Amount
12345	+ £50
12345	+ £25
12345	- £60

Table

Account ID	Balance
12345	£50

Account ID	Balance
12345	£75

Account ID	Balance
12345	£15

The truth is the log.

The database is a cache of a subset of the log.

—Pat Helland
Immutability Changes Everything
http://cidrdb.org/cidr2015/Papers/CIDR15_Paper16.pdf

Photo by Bobby Burch on Unsplash

{
 "rating_id": 5313,
 "user_id": 3,
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 "rating_time": 1519304105213,
 "channel": "web",
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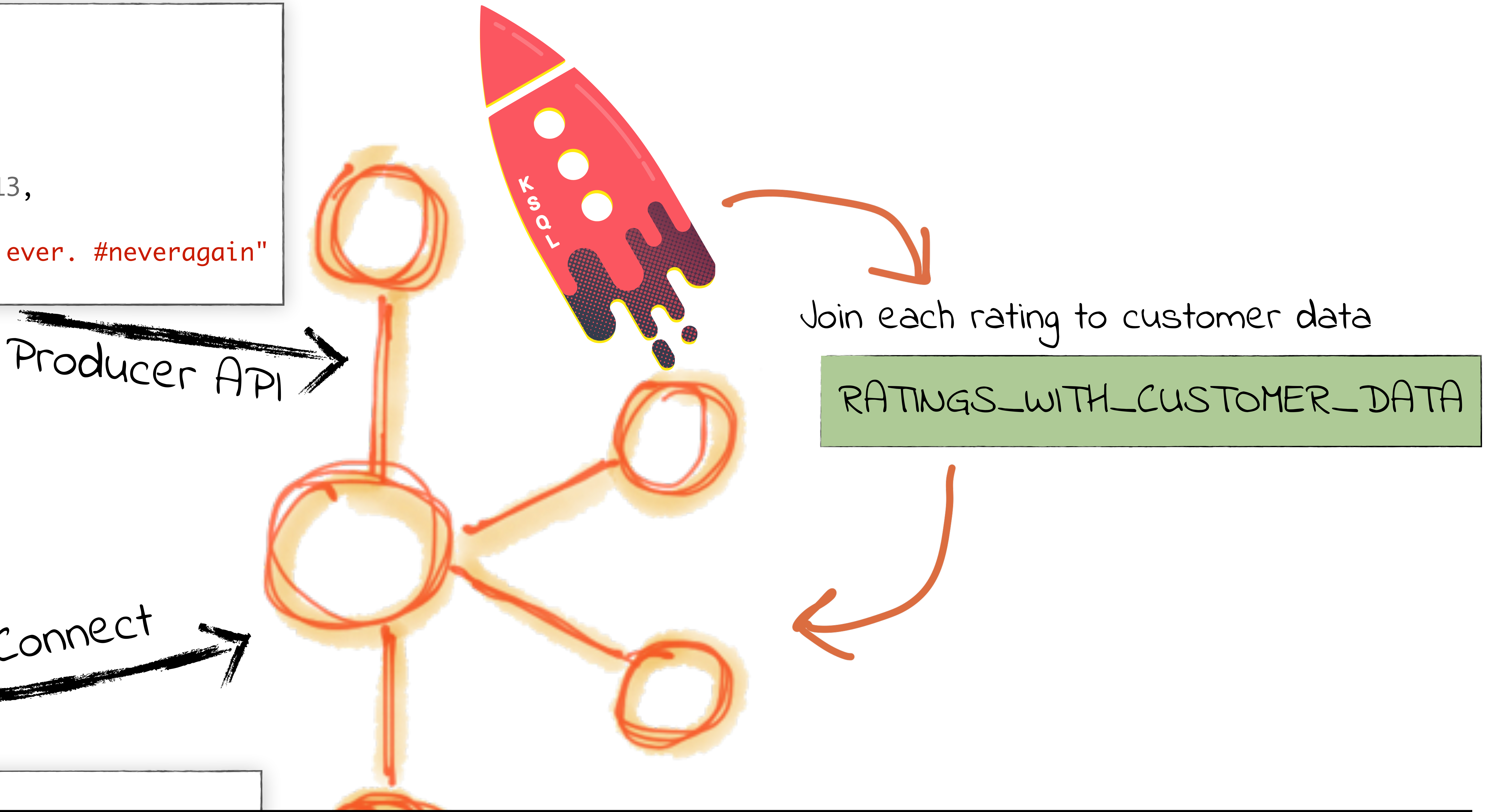
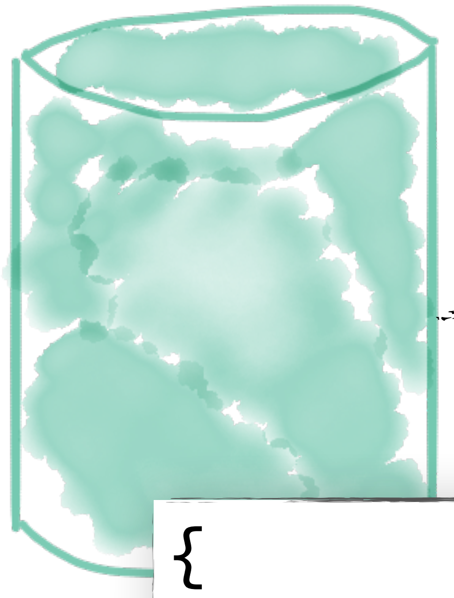
}

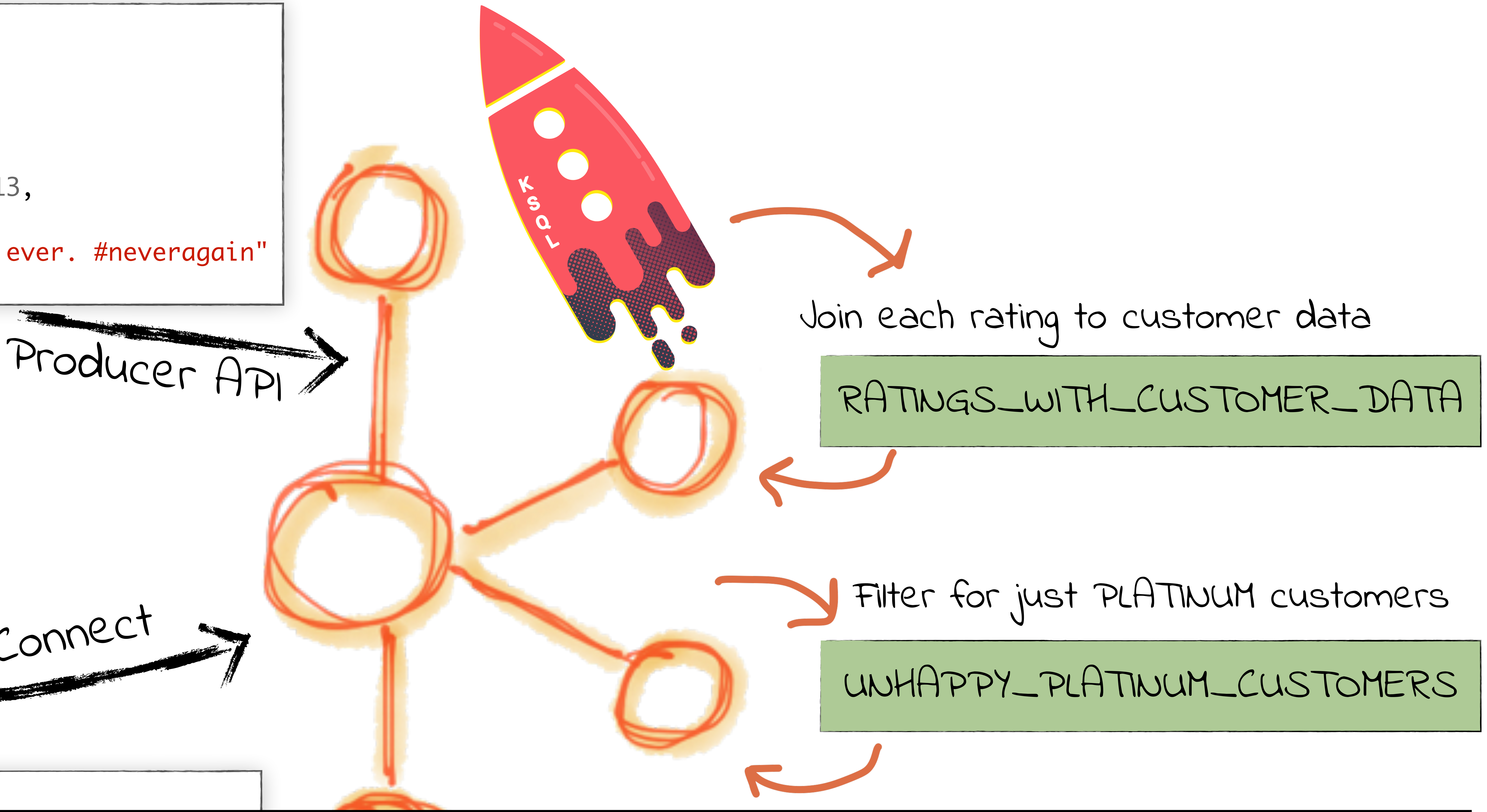


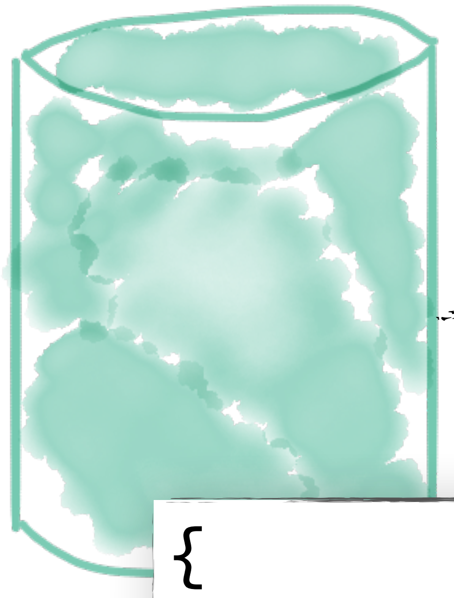


{
 "id": 3,
 "first_name
 "last_name"
 "email": "m
 "gender": "
 "club_statu
 "comments":
}


```
CREATE STREAM RATINGS_WITH_CUSTOMER_DATA AS
SELECT * FROM RATINGS
         LEFT JOIN CUSTOMERS ON R.ID=C.ID;
```

```
{
 "rating_id": 5313,
 "user_id": 3,
 "stars": 4,
 "route_id": 6975,
 "rating_time": 1519304105213,
 "channel": "web",
 "message": "worst. flight. ever. #neveragain"
}
```

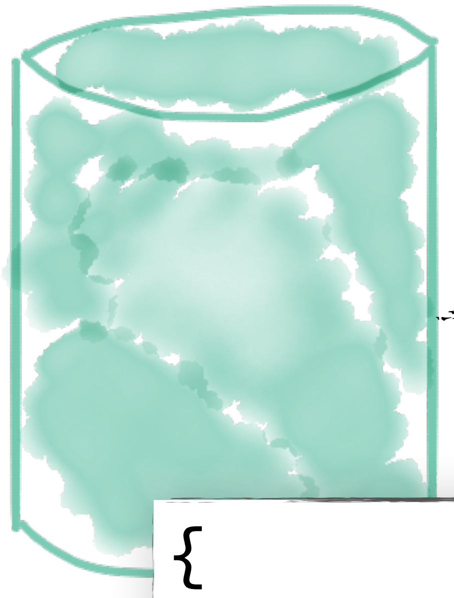



```
{
  "id": 3,
  "first_name
  "last_name"
  "email": "m
  "gender": "
  "club_statu
  "comments":
}
```


```sql
CREATE STREAM UNHAPPY_PLATINUM_CUSTOMERS AS
SELECT * FROM RATINGS_WITH_CUSTOMER_DATA
WHERE  STARS < 3
```

```
{
 "rating_id": 5313,
 "user_id": 3,
 "stars": 4,
 "route_id": 6975,
 "rating_time": 1519304
 "channel": "web",
 "message": "worst. fli
}
```


```sql
CREATE TABLE RATINGS_BY_CLUB_STATUS AS
SELECT    CLUB_STATUS, COUNT(*)
FROM      RATINGS_WITH_CUSTOMER_DATA
          WINDOW TUMBLING (SIZE 1 MINUTES)
GROUP BY CLUB_STATUS;
```



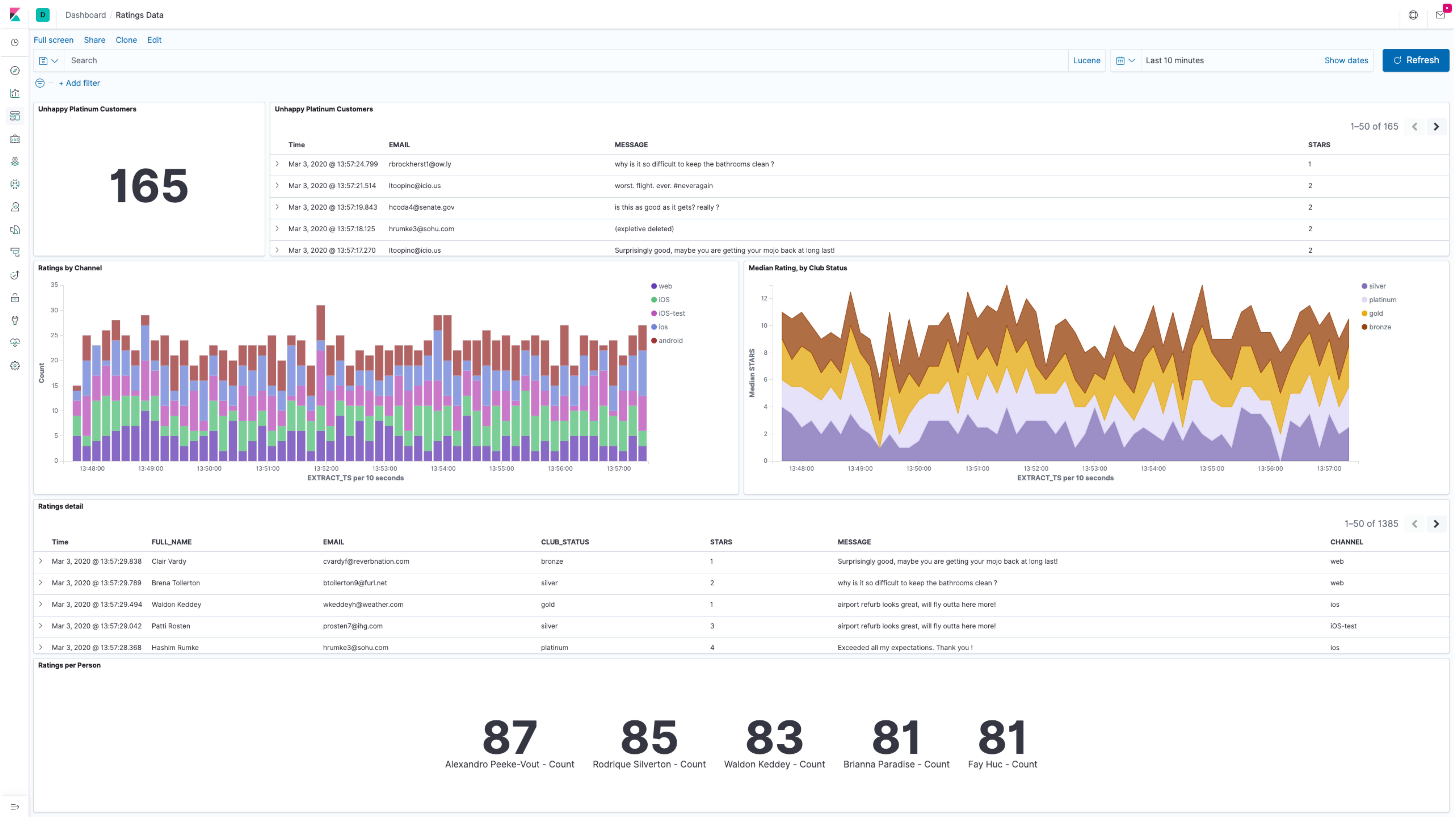
Kafka Connect


```
{
  "id": 3,
  "first_name": "Merilyn",
  "last_name": "Doughartie",
  "email": "mdoughartie1@dedecms.com",
  "gender": "Female",
  "club_status": "platinum",
  "comments": "none"
}
```


Aggregate per-minute by CLUB_STATUS

RATINGS_BY_CLUB_STATUS_1MIN

Kafka Connect → Elasticsearch



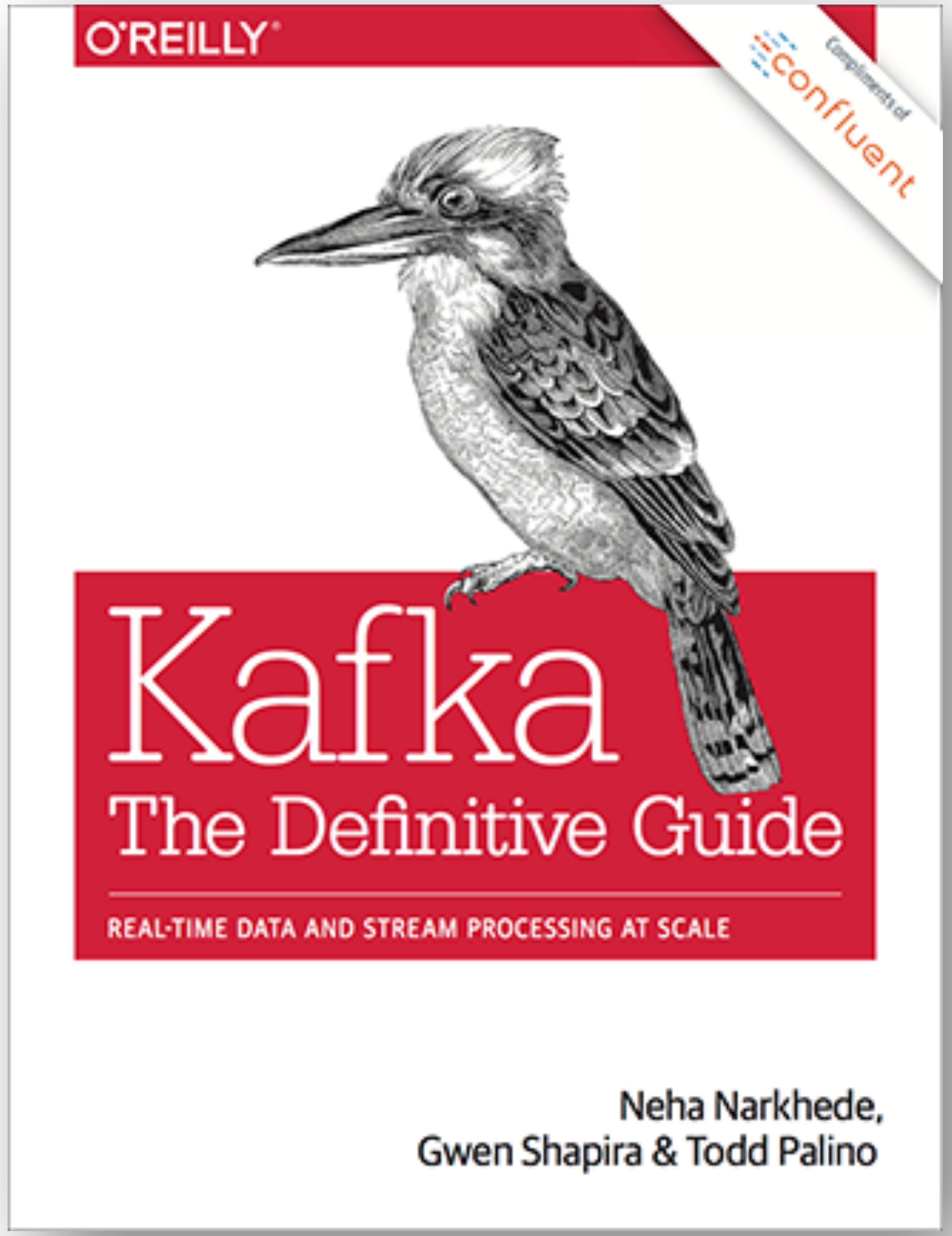
Want to learn more?

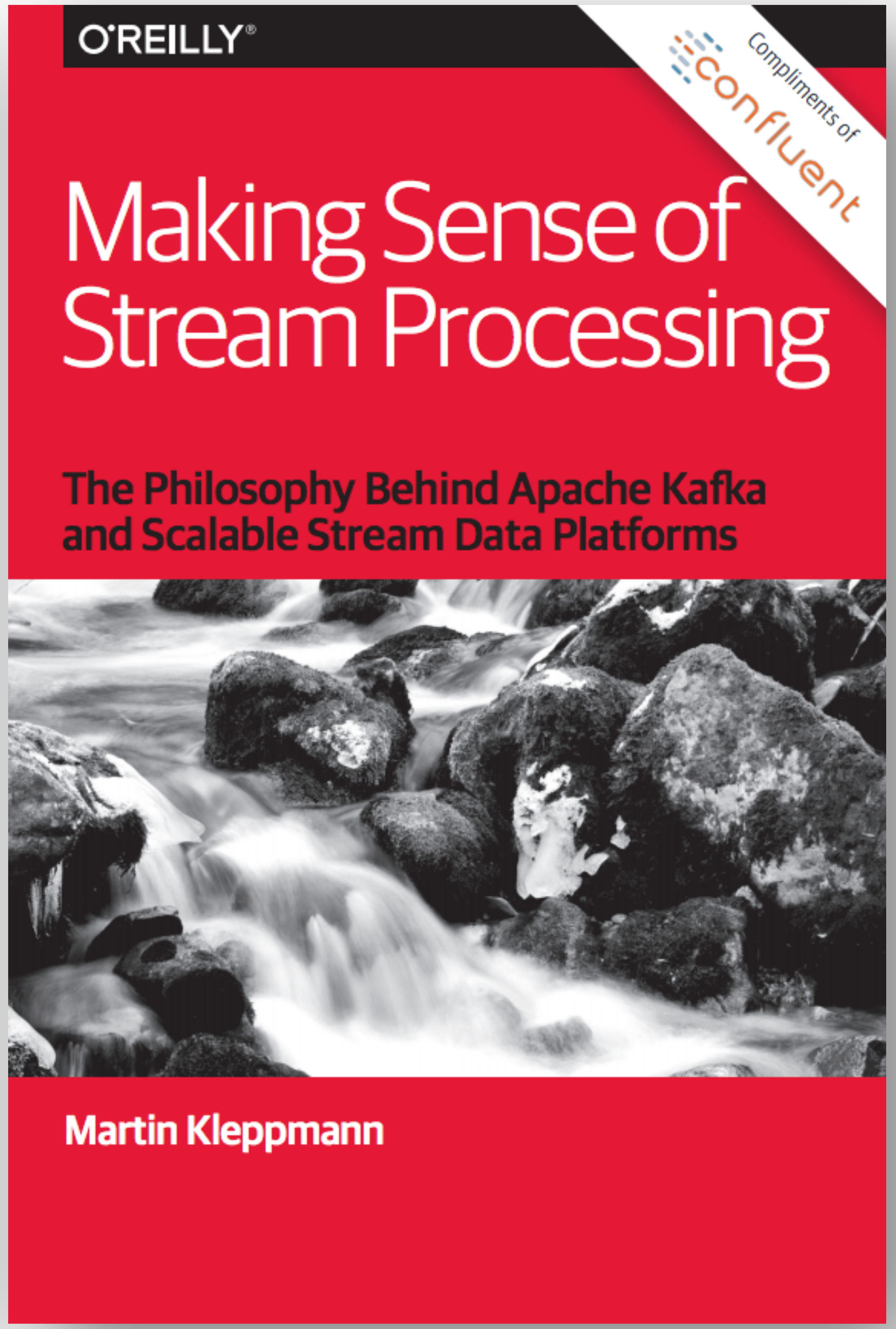
CONFLUENT

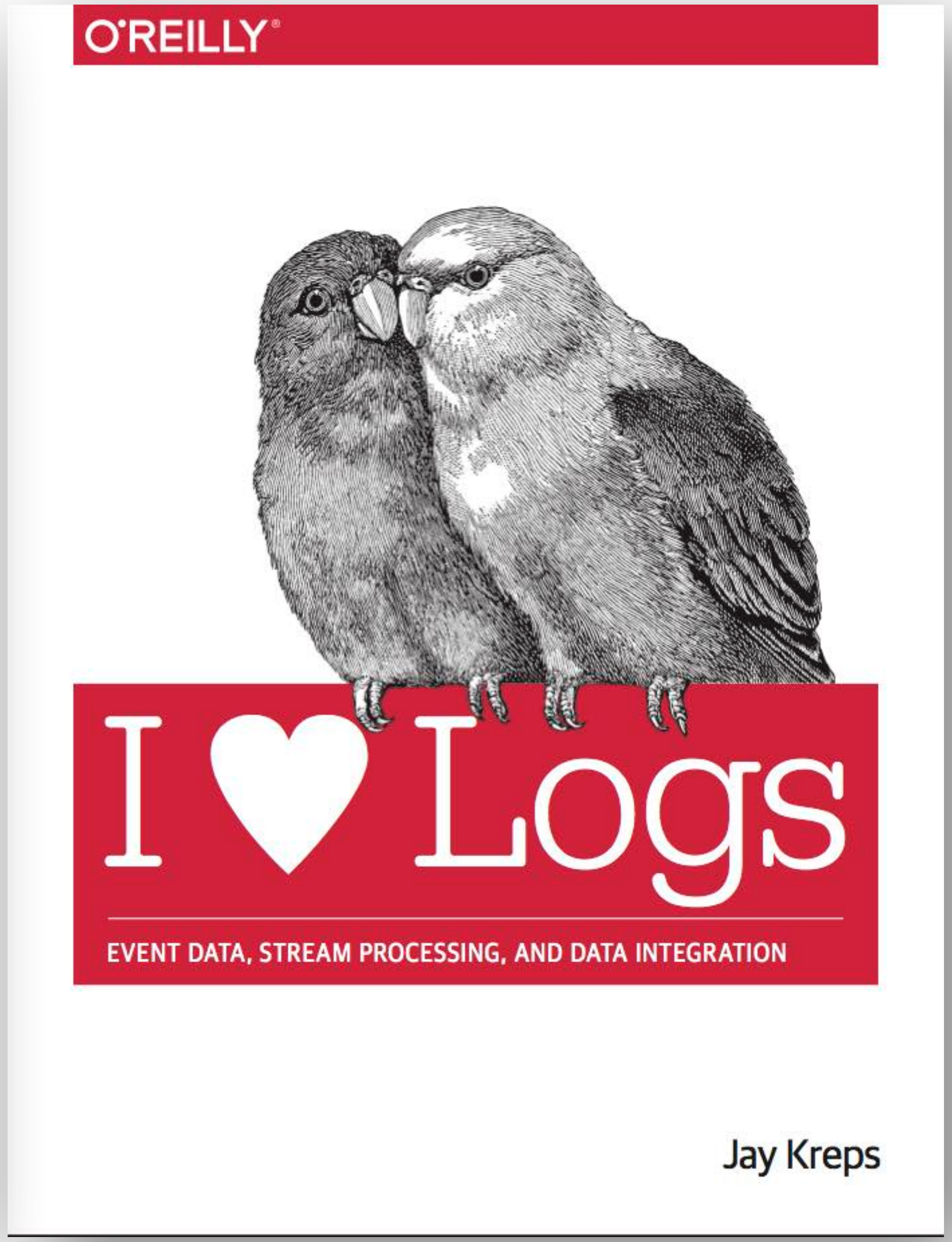
CTAs, not CATs
(sorry, not sorry)

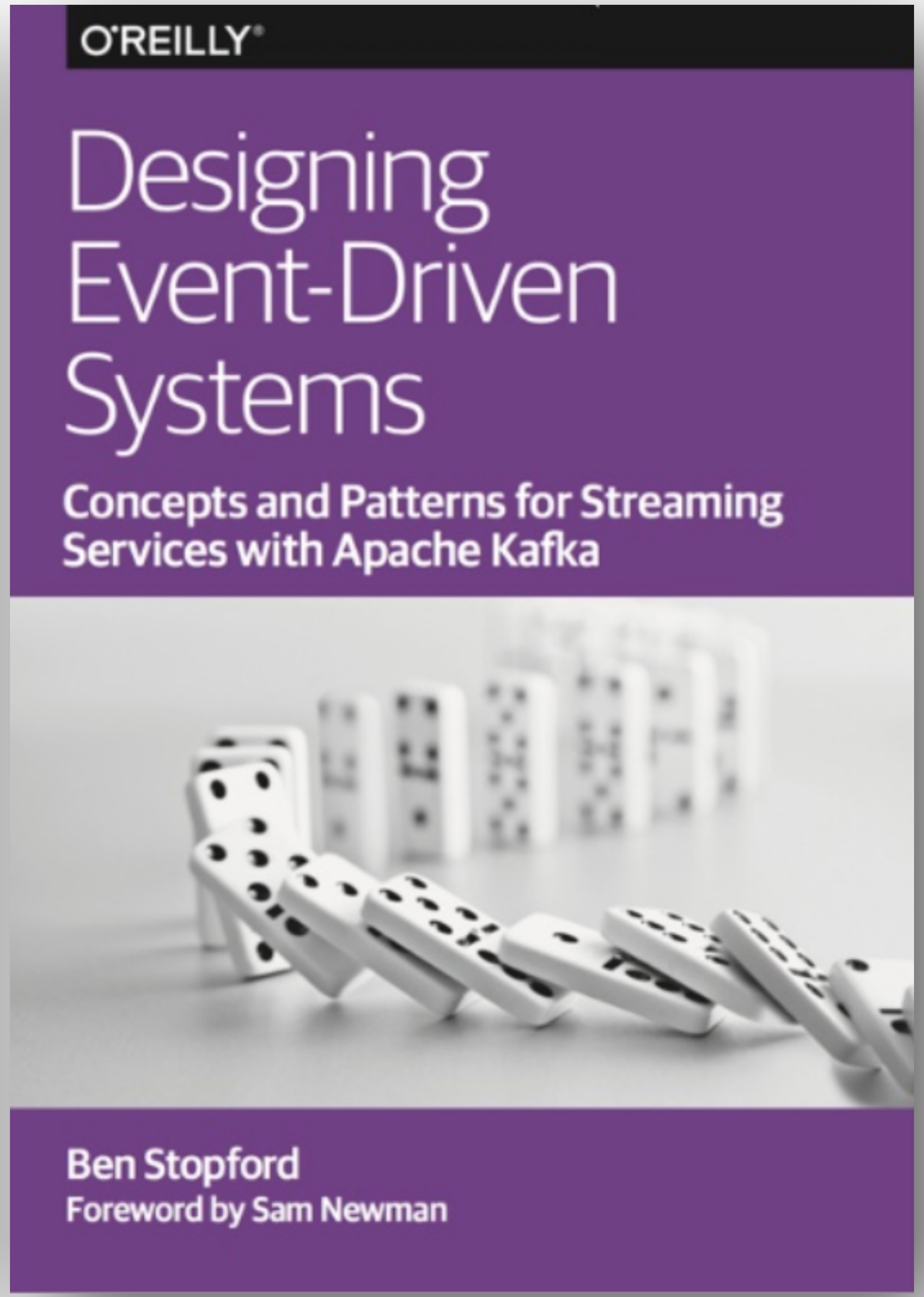
Free Books!

https://rmoff.dev/aq7









60DEVADV

Free money!

(additional $60 towards your bill 😄)

$50 USD off your bill each calendar month for the first three months when you sign up

`https://rmoff.dev/ccloud`

confluent cloud

Fully Managed Kafka as a Service

* Limited availability. Activate by 11th September 2020. Expires after 90 days of activation. Any unused promo value on the expiration date will be forfeited.


Learn Kafka.
Start building with Apache Kafka at Confluent Developer.
developer.confluent.io

Confluent Community Slack group

cnfl.io/slack

Further reading / watching

- **Kafka as a Platform: the Ecosystem from the Ground Up**
  - https://rmoff.dev/kafka101
- **Apache Kafka and ksqlDB in Action: Let's Build a Streaming Data Pipeline!**
  - https://rmoff.dev/ljc-kafka-01
- **From Zero to Hero with Kafka Connect**
  - https://rmoff.dev/ljc-kafka-02
- **Introduction to ksqlDB**
  - https://rmoff.dev/ljc-kafka-03
- **Integrating Oracle and Kafka**
  - https://rmoff.dev/oracle-and-kafka
- **The Changing Face of ETL: Event-Driven Architectures for Data Engineers**
  - https://rmoff.dev/oredev19-changing-face-of-etl
- **🚂On Track with Apache Kafka: Building a Streaming Platform solution with Rail Data**
  - https://rmoff.dev/oredev19-on-track-with-kafka

#EOF