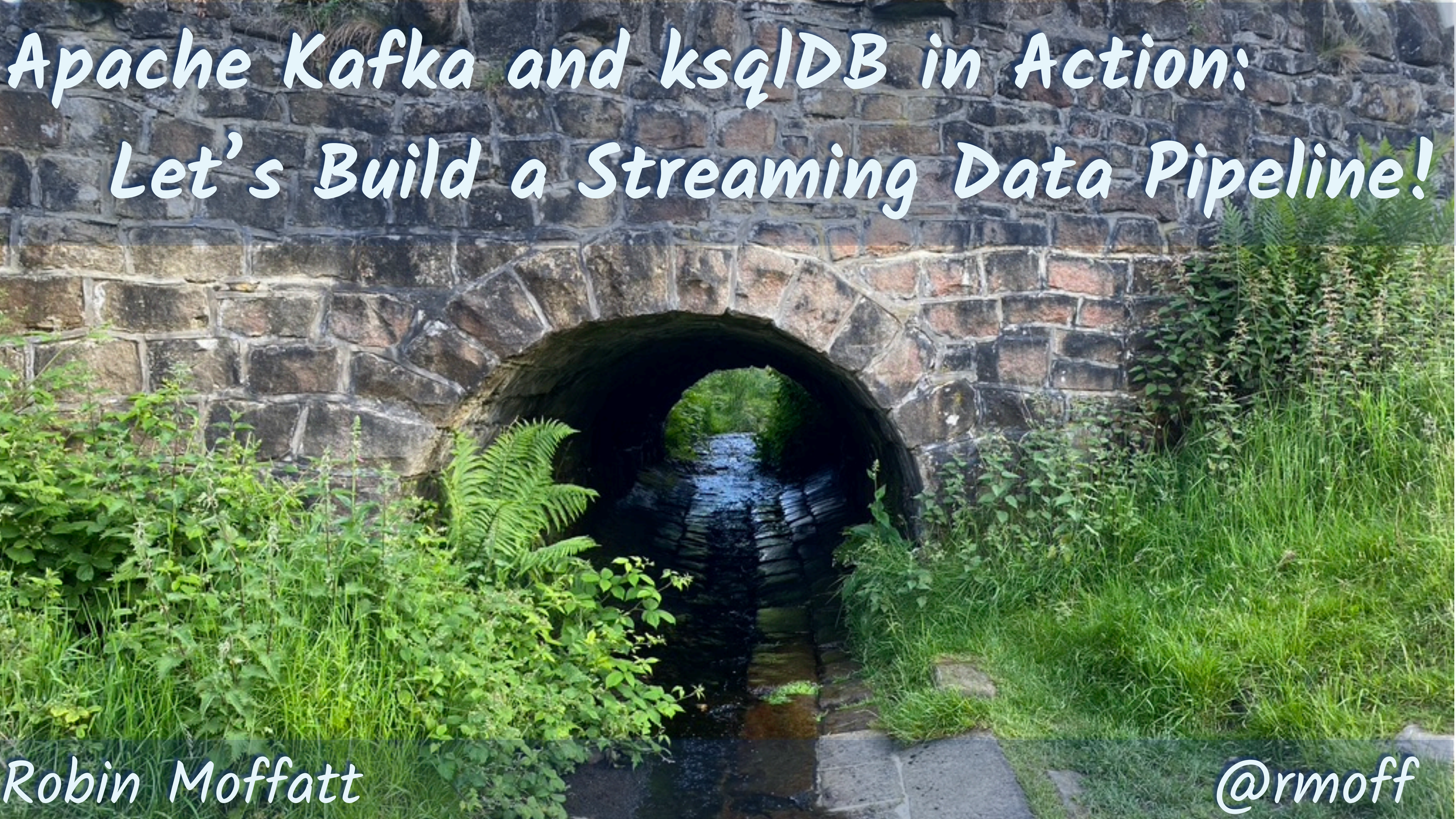

Apache Kafka and ksqlDB in Action:
Let's Build a Streaming Data Pipeline!
Robin Moffatt
@rmoff

$ whoami

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

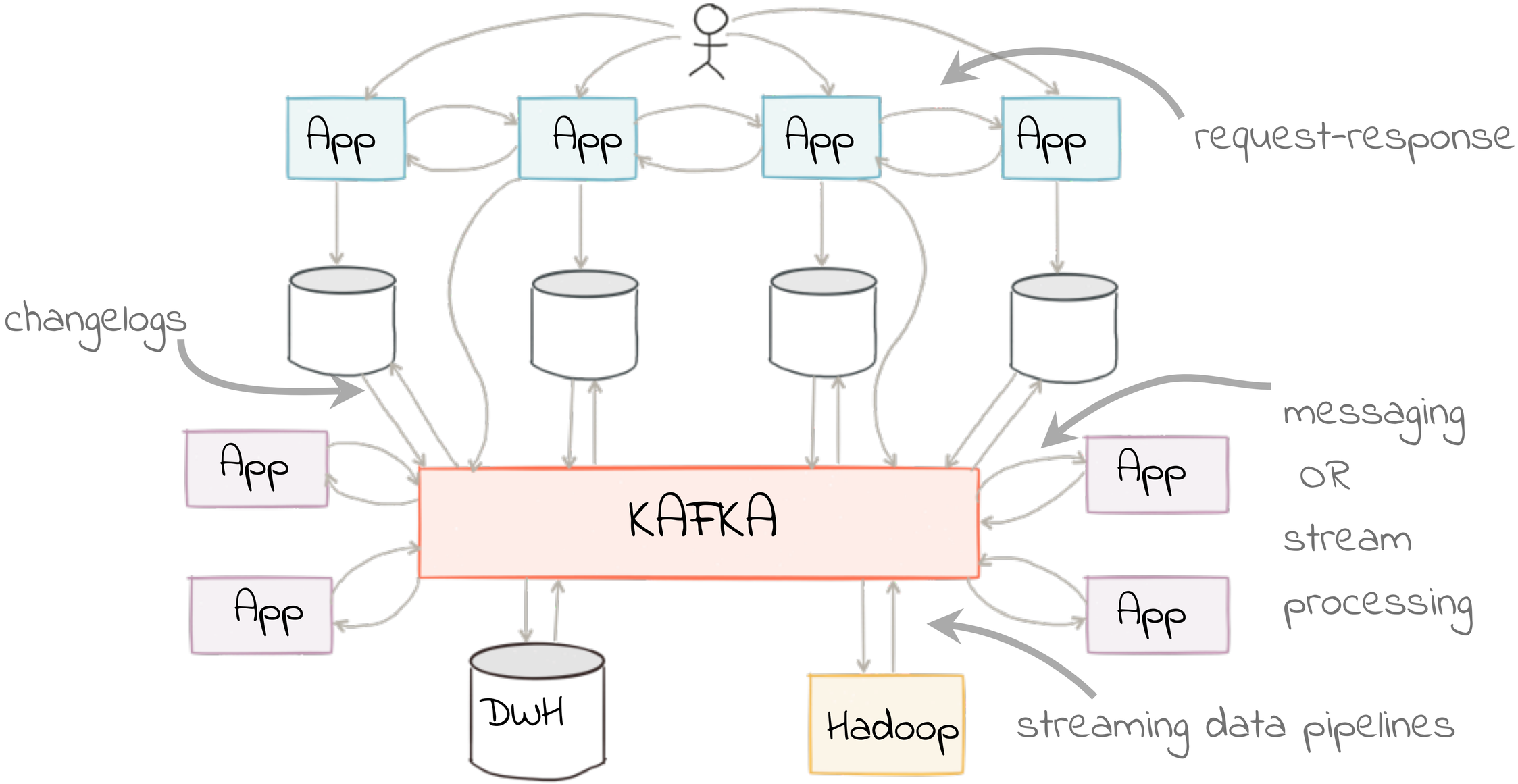
  (Apache Kafka, not Wikis 😉)

- Working in data & analytics since 2001
-  Oracle ACE Director (Alumnus)

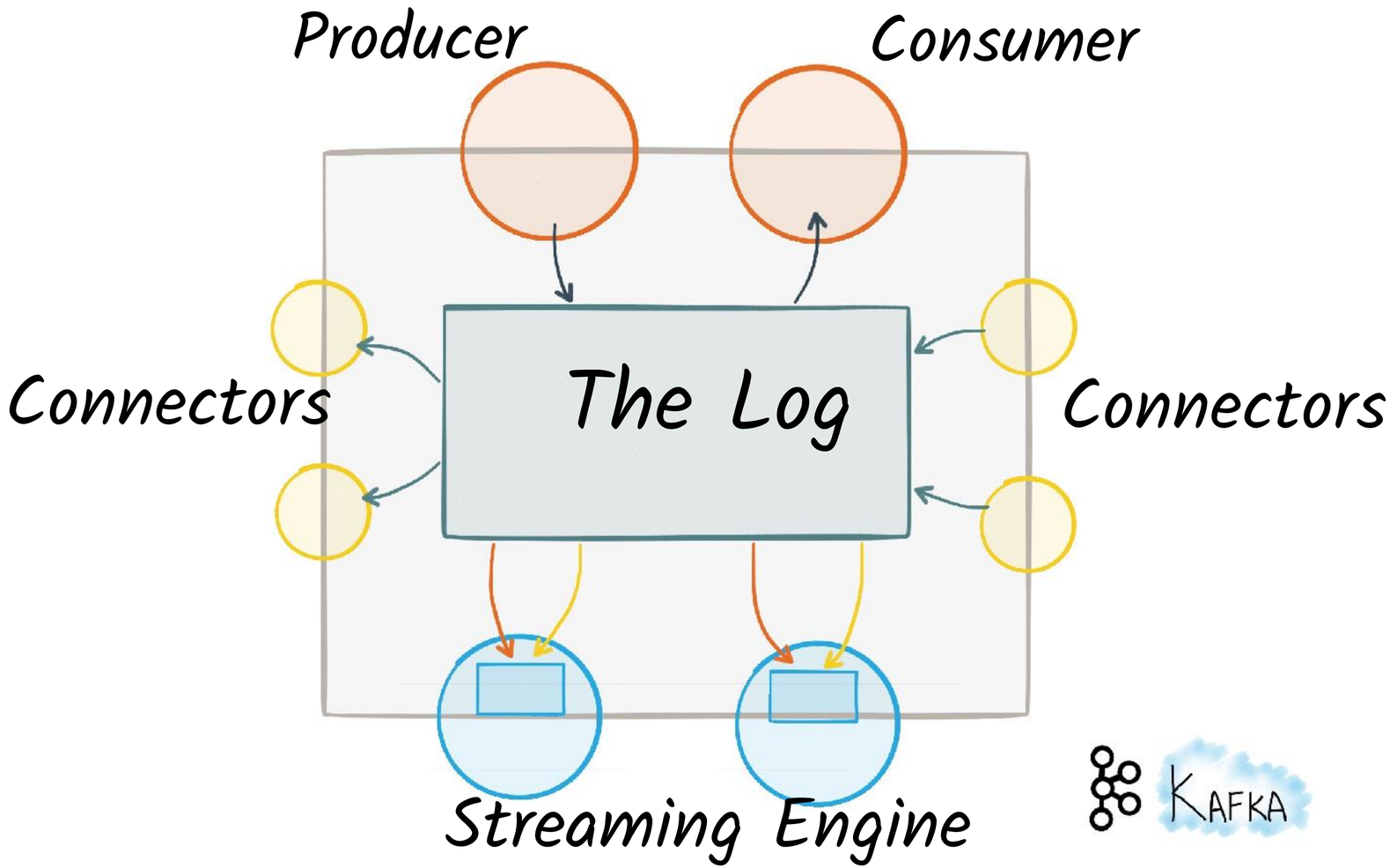


http://rmoff.dev/**talks** • http://rmoff.dev/**blog** • http://rmoff.dev/**youtube**

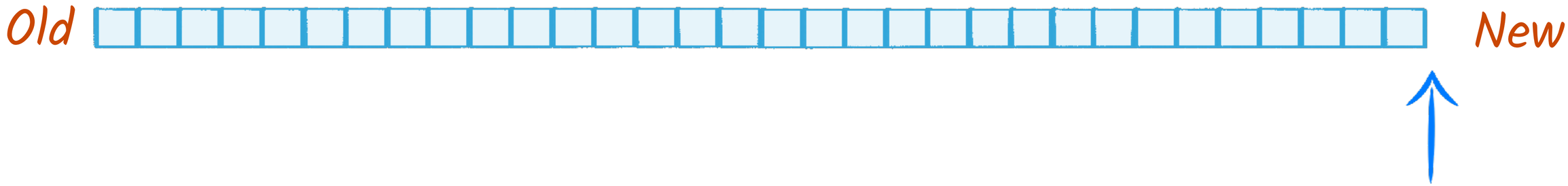
Kafka is an Event Streaming Platform



What is an Event Streaming Platform?



Immutable Event Log



Messages are added at the end of the log

Topics

Clicks



Orders



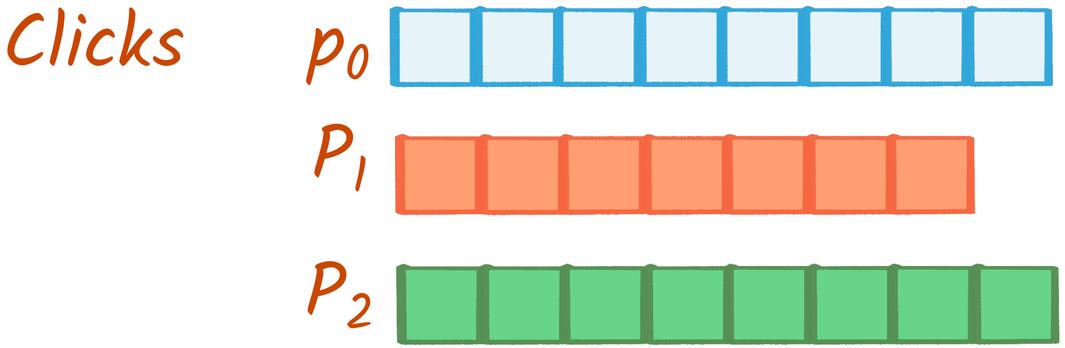
Customers



Topics are similar in concept

to tables in a database

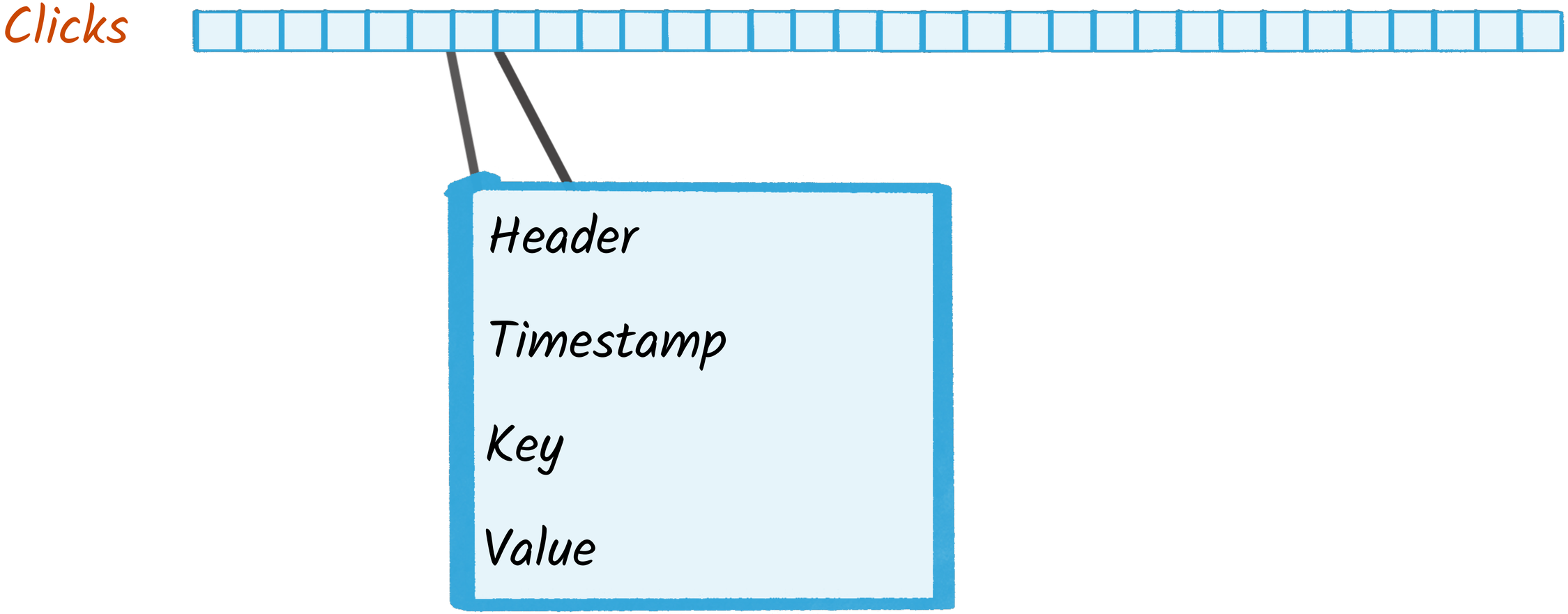
Partitions



Messages are guaranteed to be strictly ordered within a partition

Messages are just KN bytes

plus headers + timestamp



Serialisation & Schemas

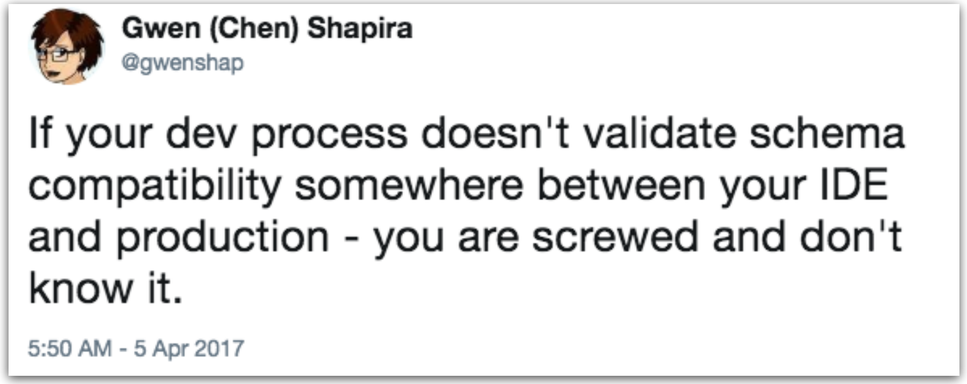
Avro 👍

Protobuf 👍

JSON Schema 👍

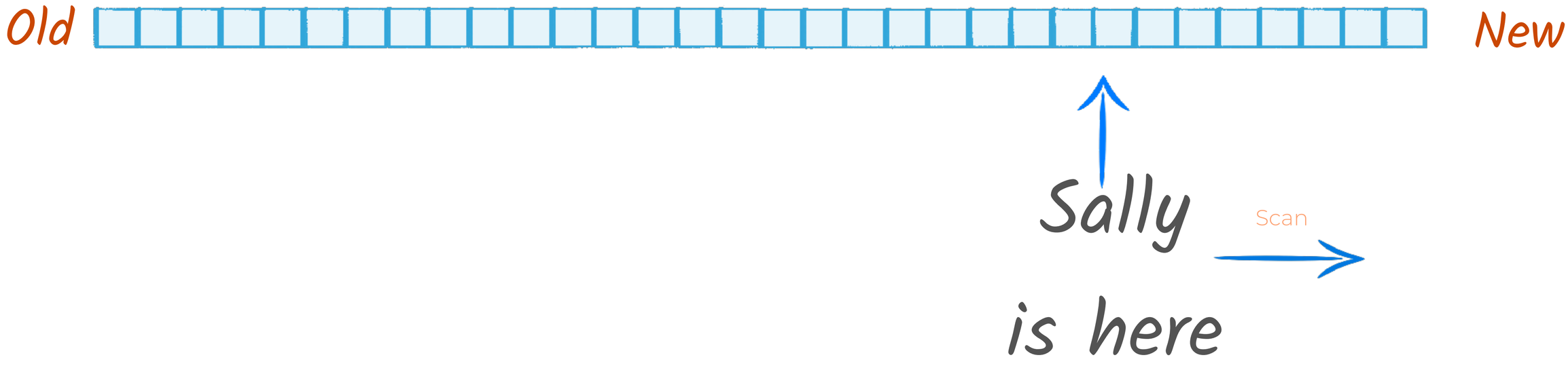
JSON 😬

CSV 

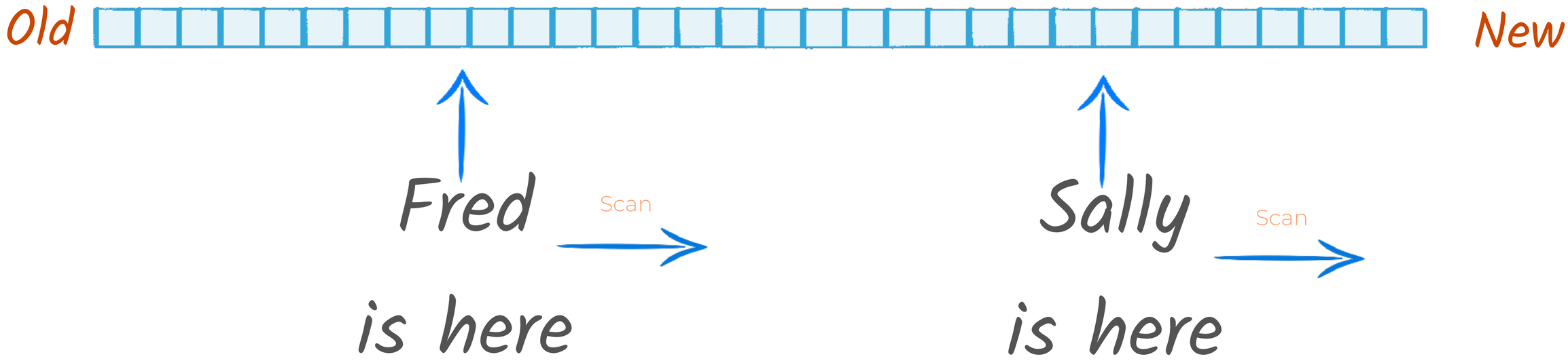


https://rmoff.dev/qcon-schemas

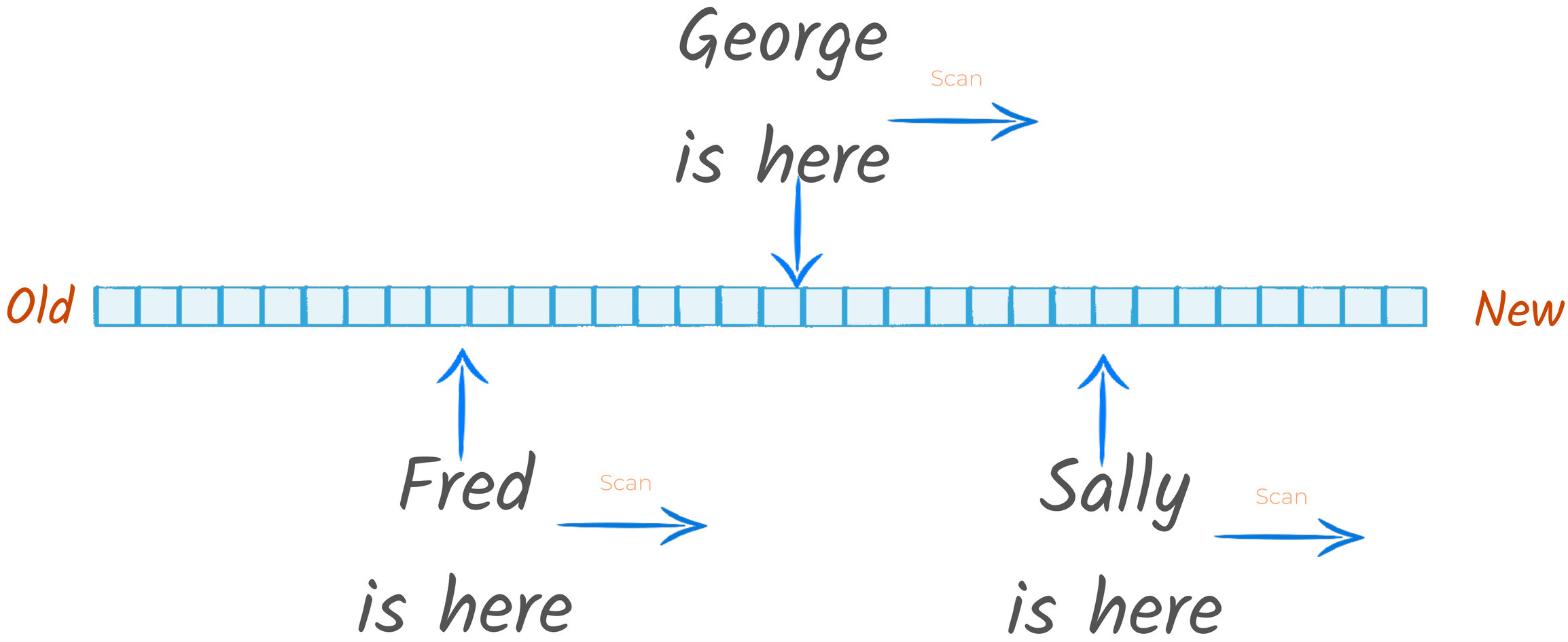
Consumers have a position all of their own



Consumers have a position all of their own

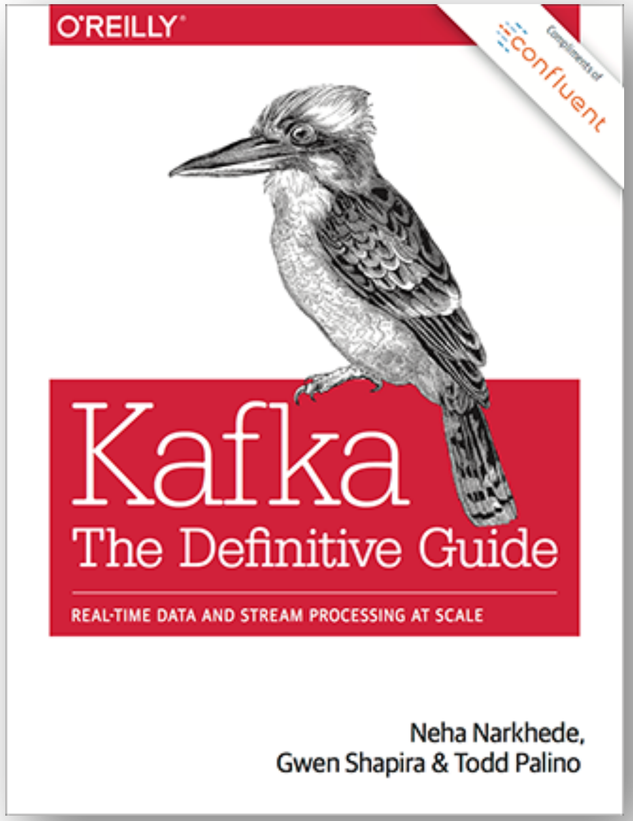


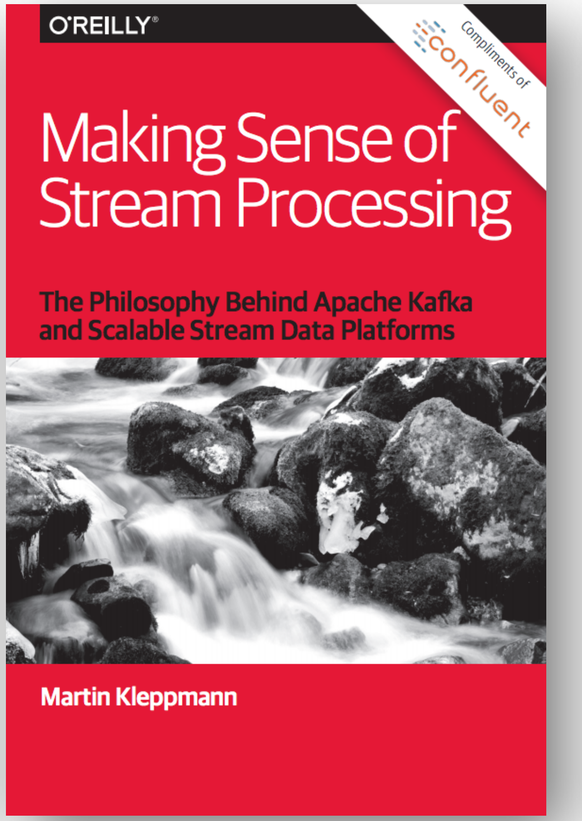
Consumers have a position all of their own

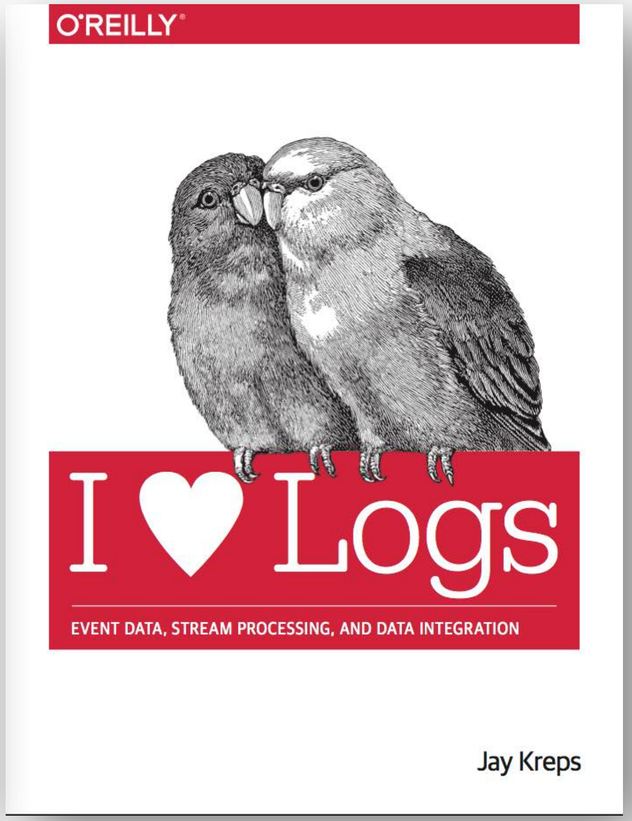


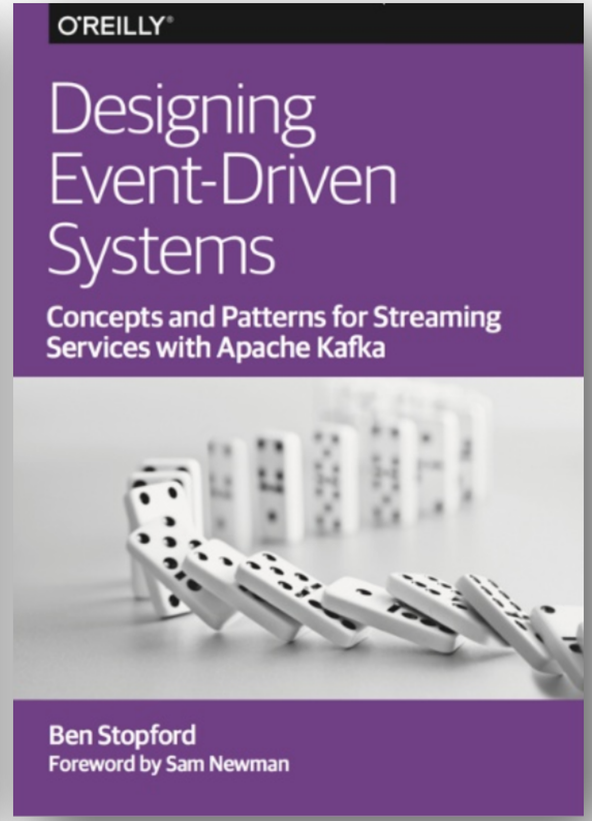
Free Books!

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CONFLUENT

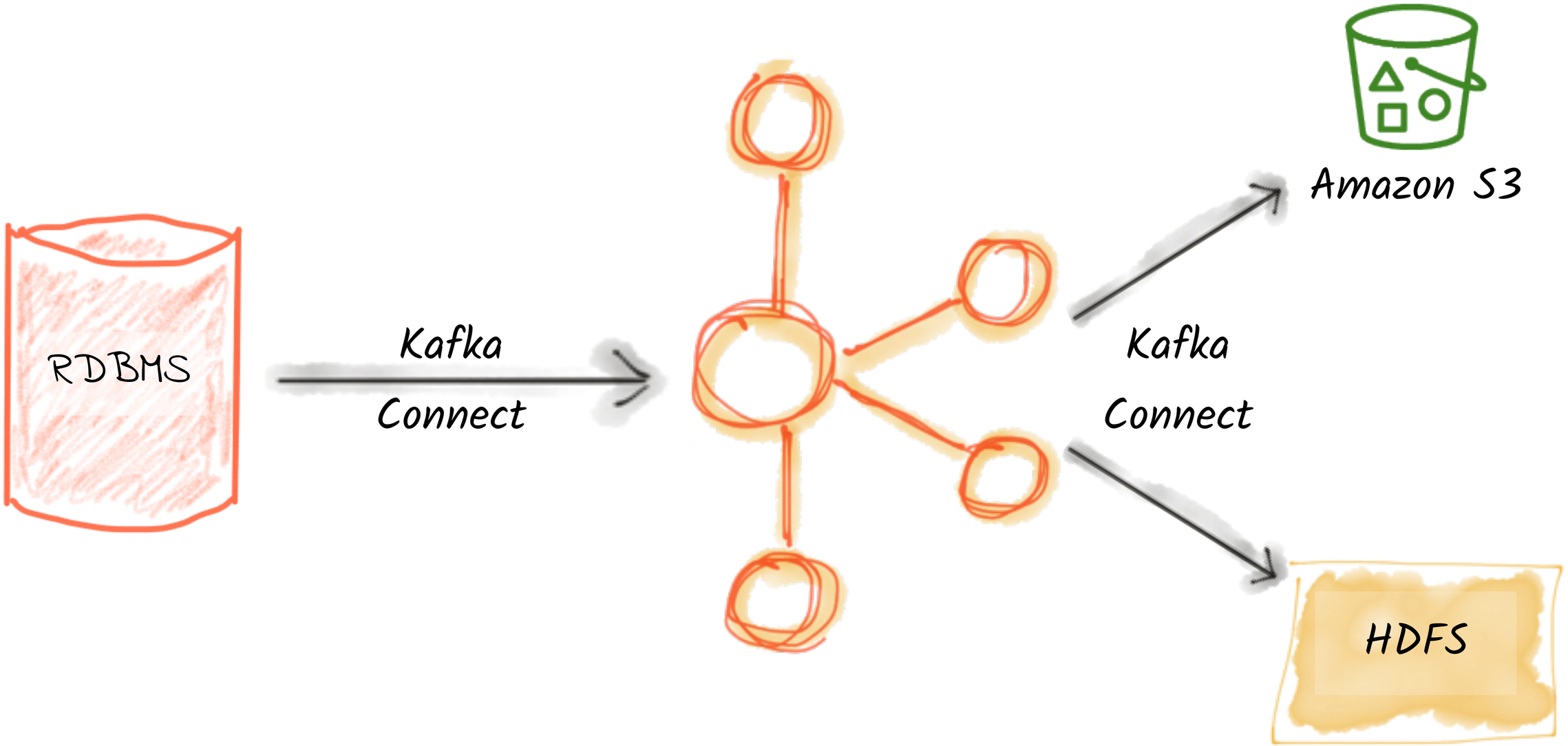
Streaming Data Pipelines

@rmoff | #ConfluentVUG | @confluentinc

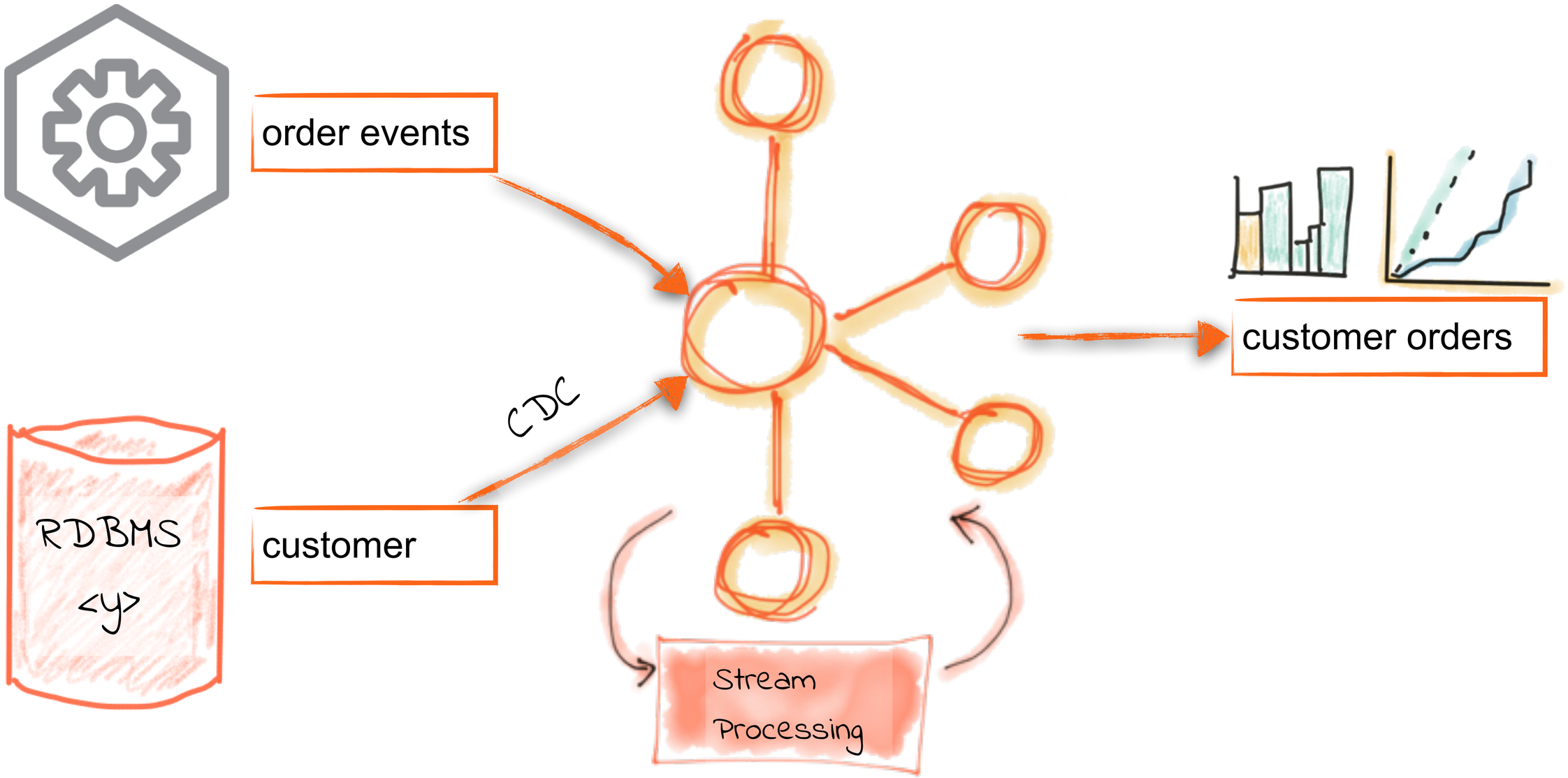


Photo by Victor Garcia on Unsplash

Database Offload



Real-time Event Stream Enrichment



Building a streaming data pipeline

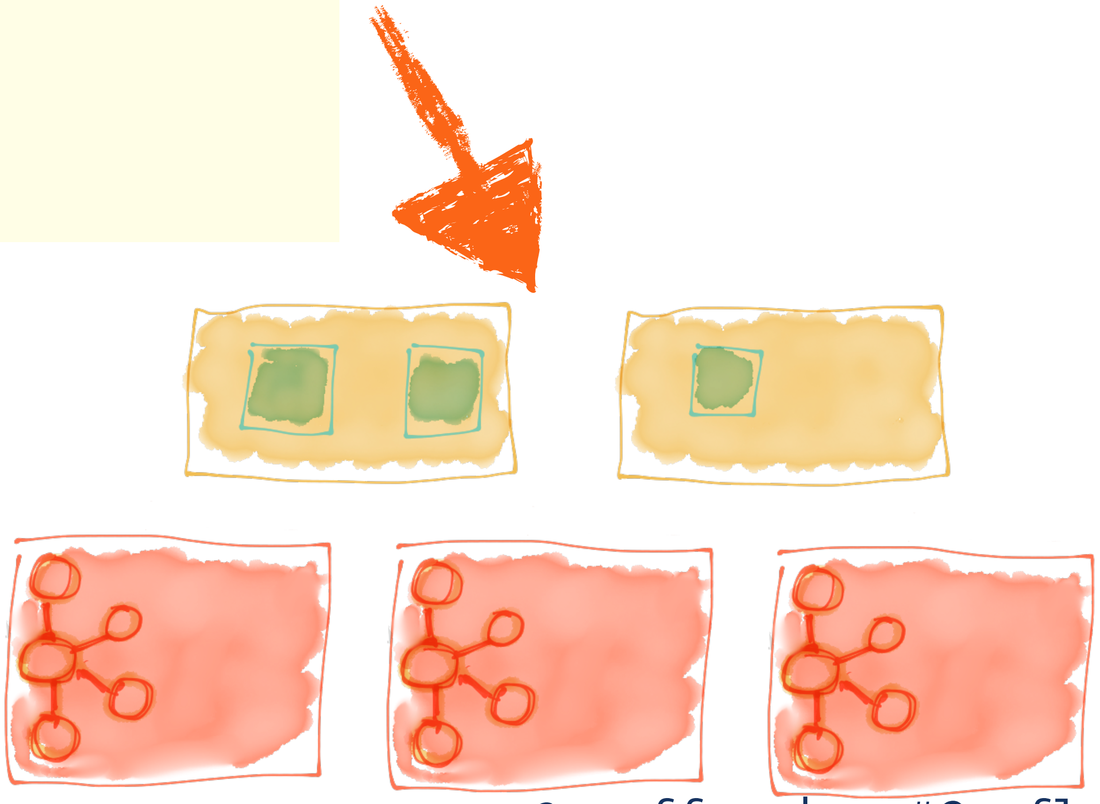
Integration + Stream Processing

Integration

Streaming Integration with Kafka Connect



Sources



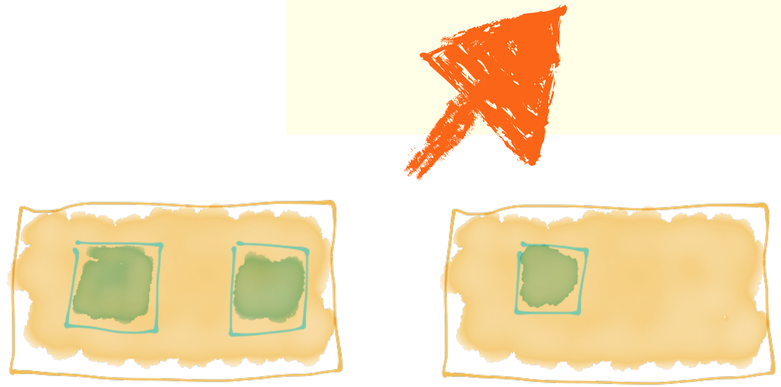
Kafka Connect

Kafka Brokers

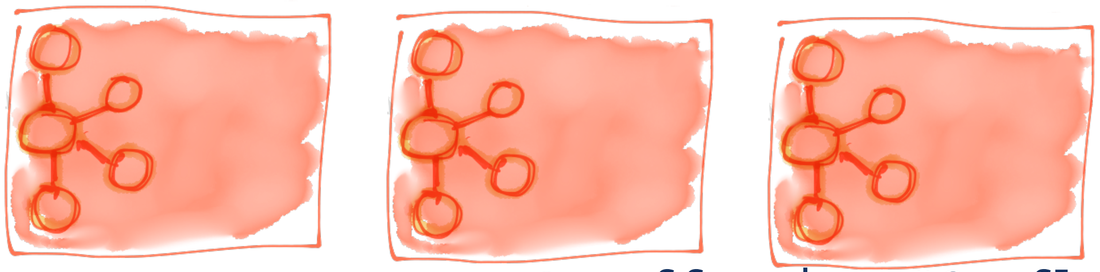
Streaming Integration with Kafka Connect

Sinks





Kafka Connect



Kafka Brokers

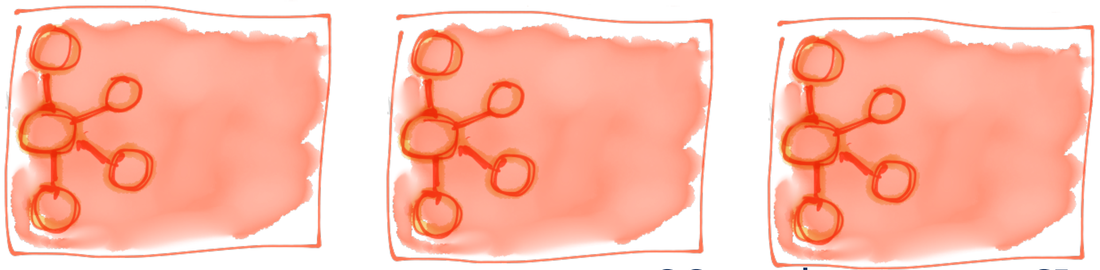
Streaming Integration with Kafka Connect







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

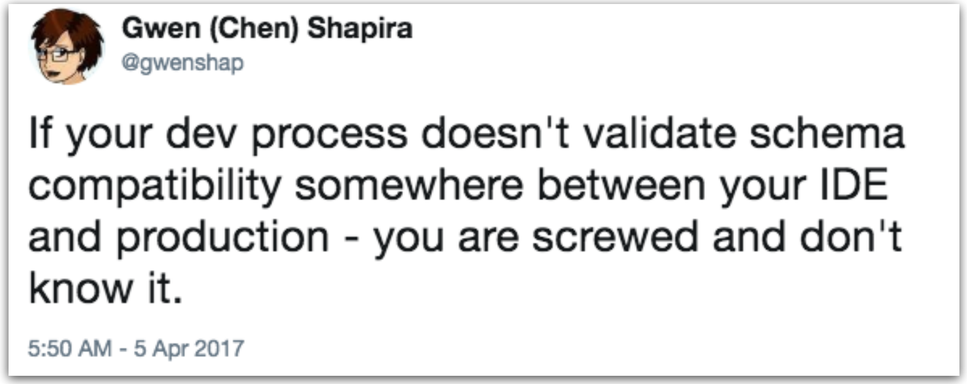
Avro 👍

Protobuf 👍

JSON Schema 👍

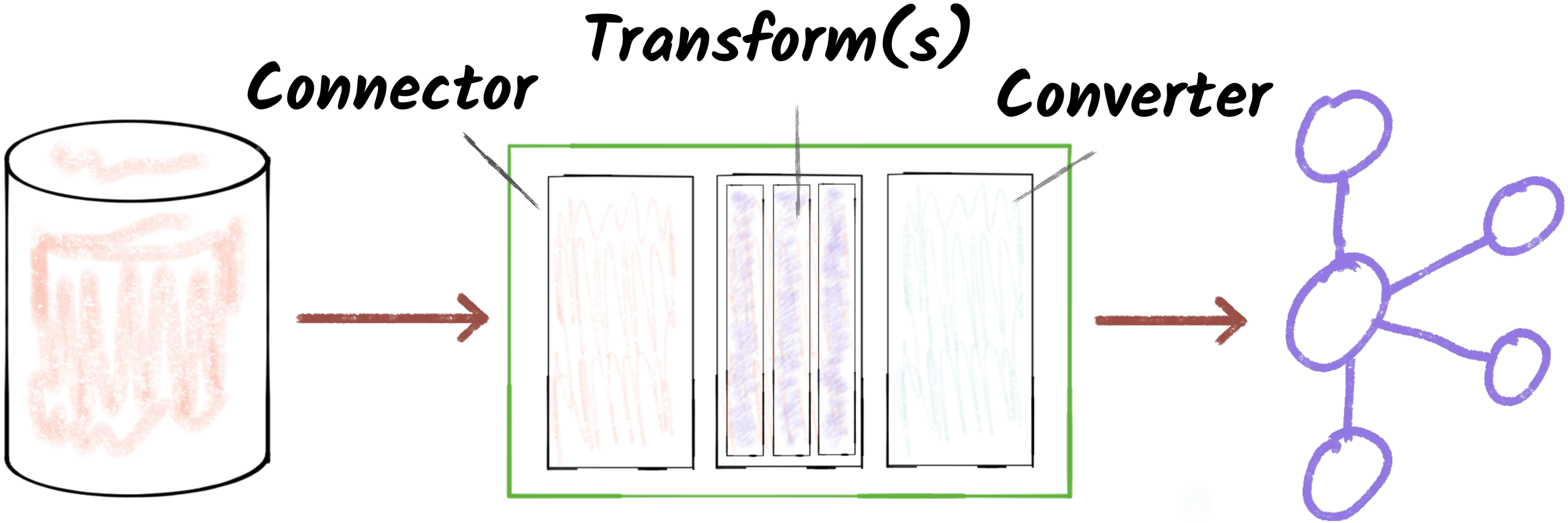
JSON 😬

CSV 

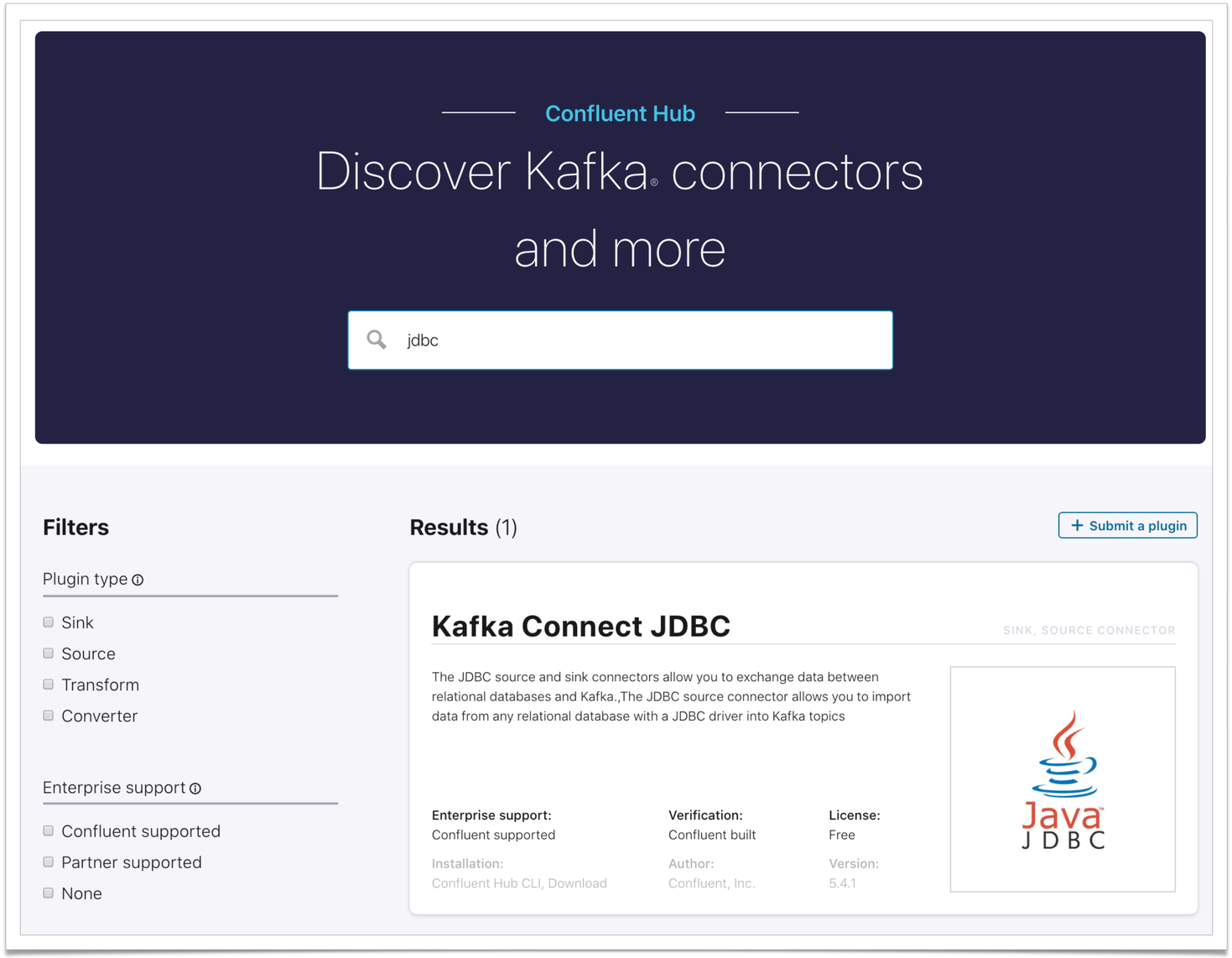


https://rmoff.dev/qcon-schemas

Extensible

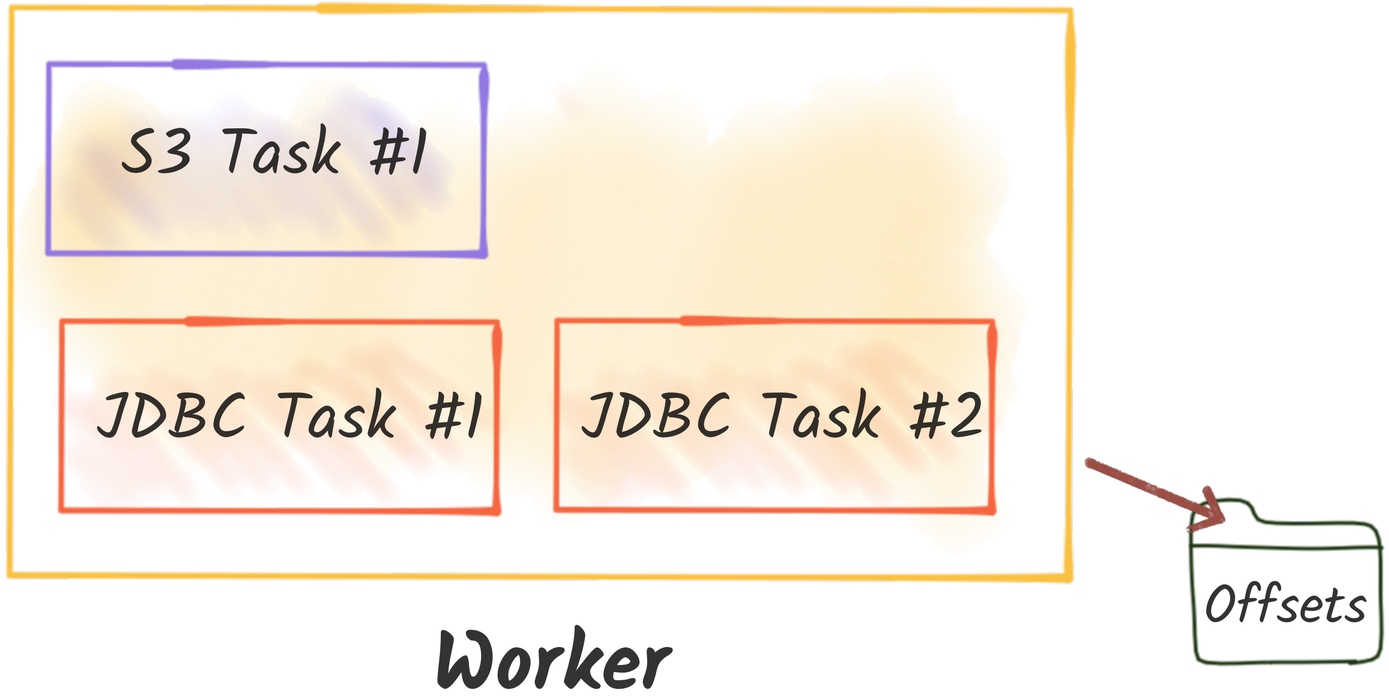


Confluent Hub

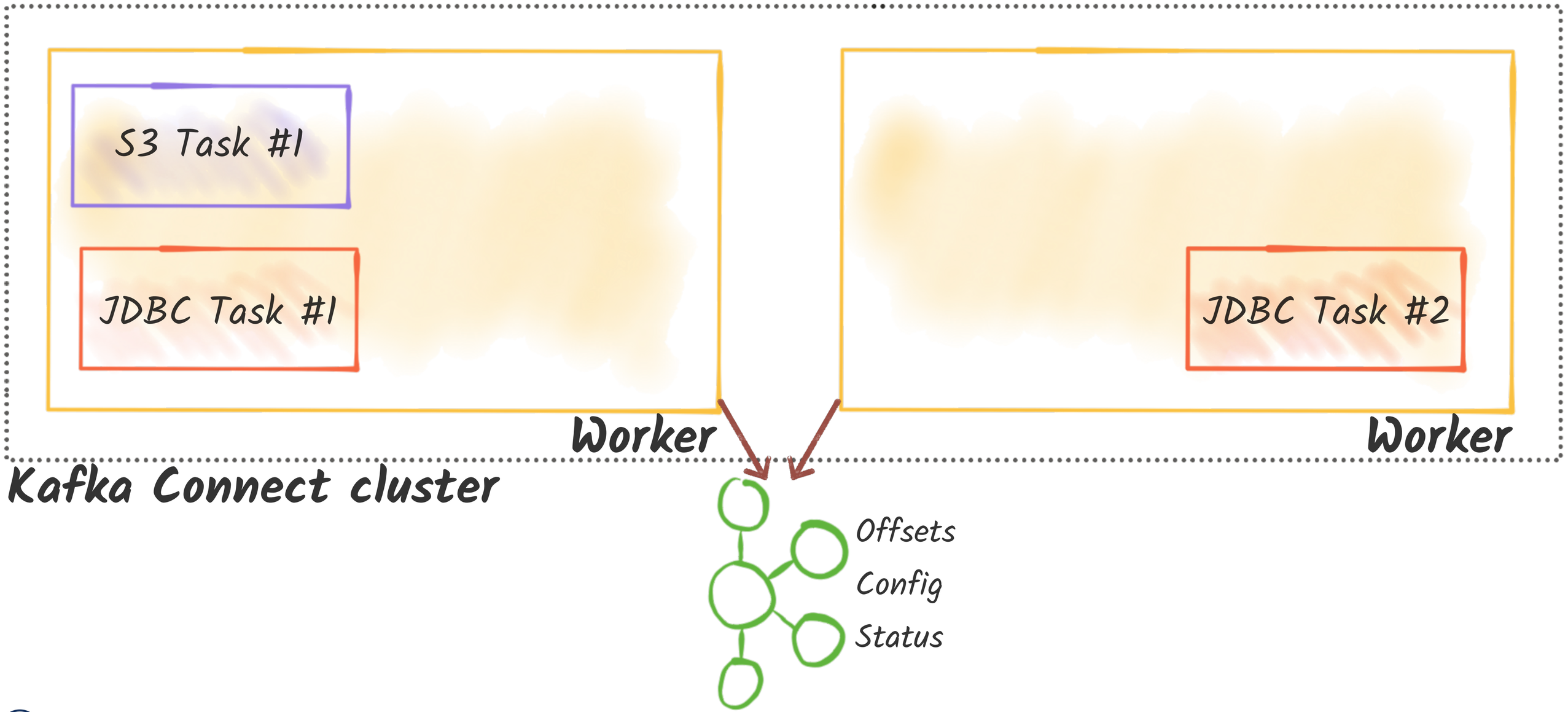


hub.confluent.io

Kafka Connect Standalone Worker

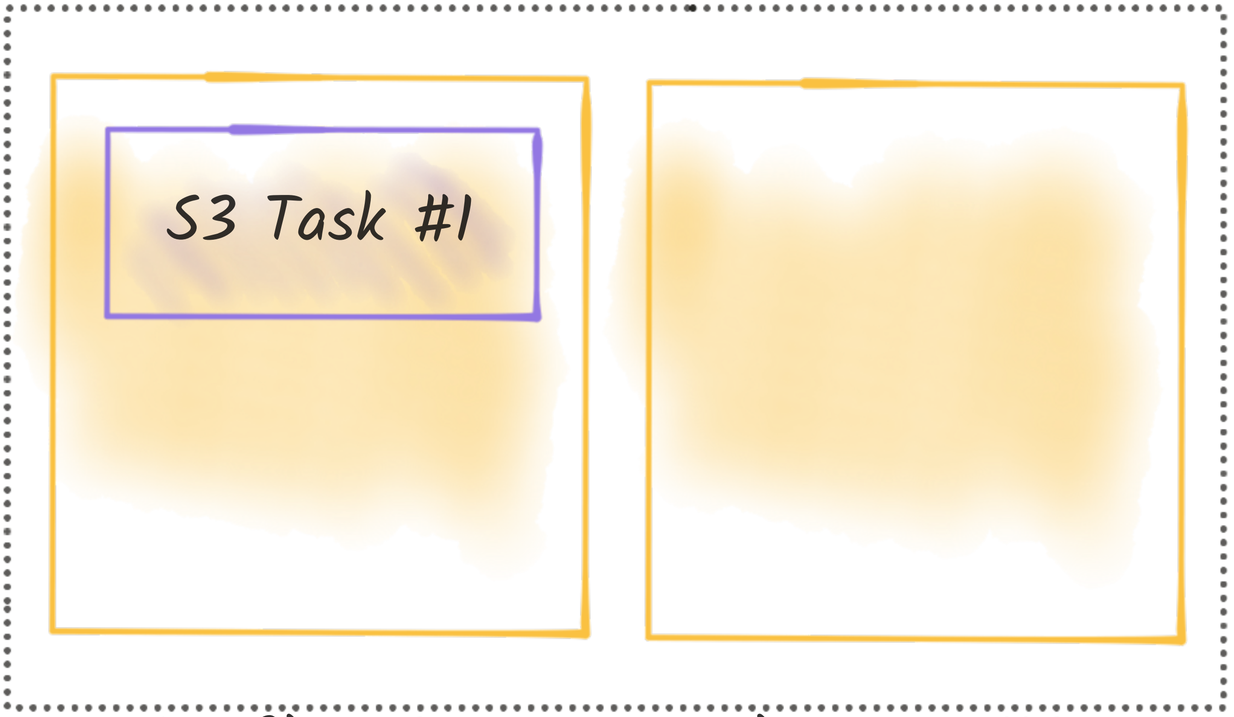


Kafka Connect Distributed Workers



Fault-tolerant? Yeah!

Multiple Distributed Clusters



Kafka Connect cluster #1





Kafka Connect cluster #2



Integration + Stream Processing

Stream Processing



Photo by Franck V. on Unsplash



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



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



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

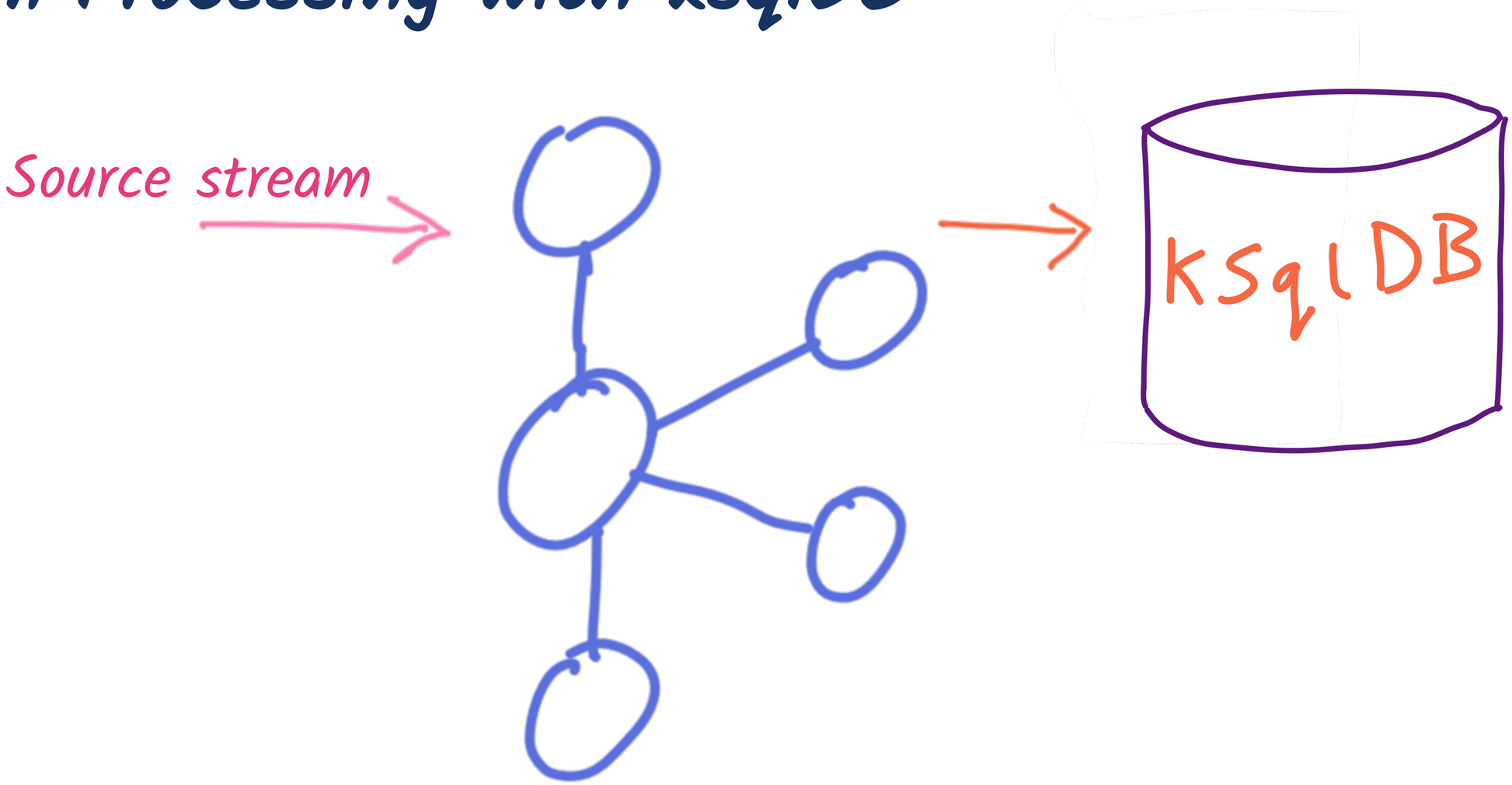


Object store, data warehouse, RDBMS

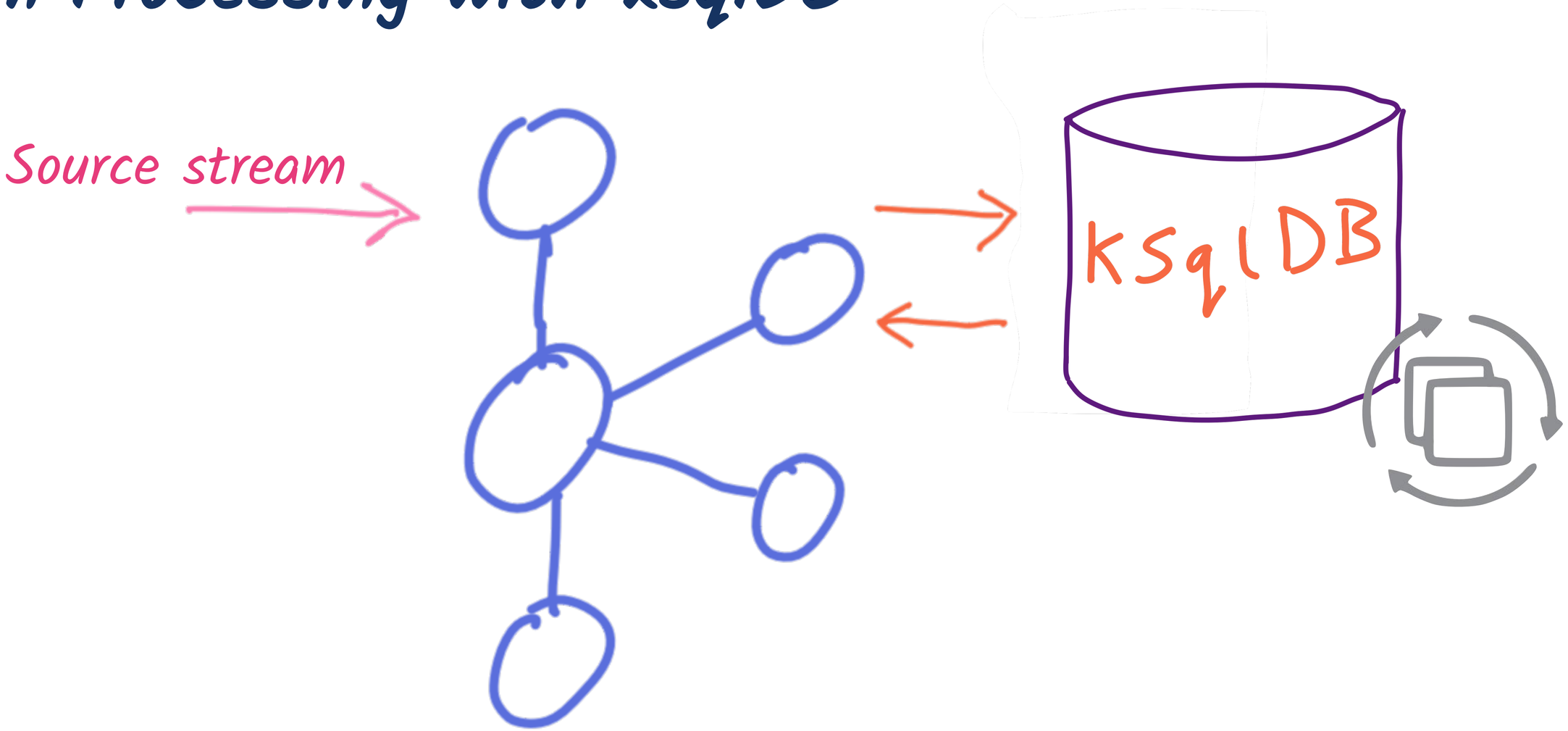
```
CREATE SINK CONNECTOR dw WITH (
'connector.class' = 'S3Connector',
'topics' = 'widgets'
…);
```


Photo by Franck V. on Unsplash

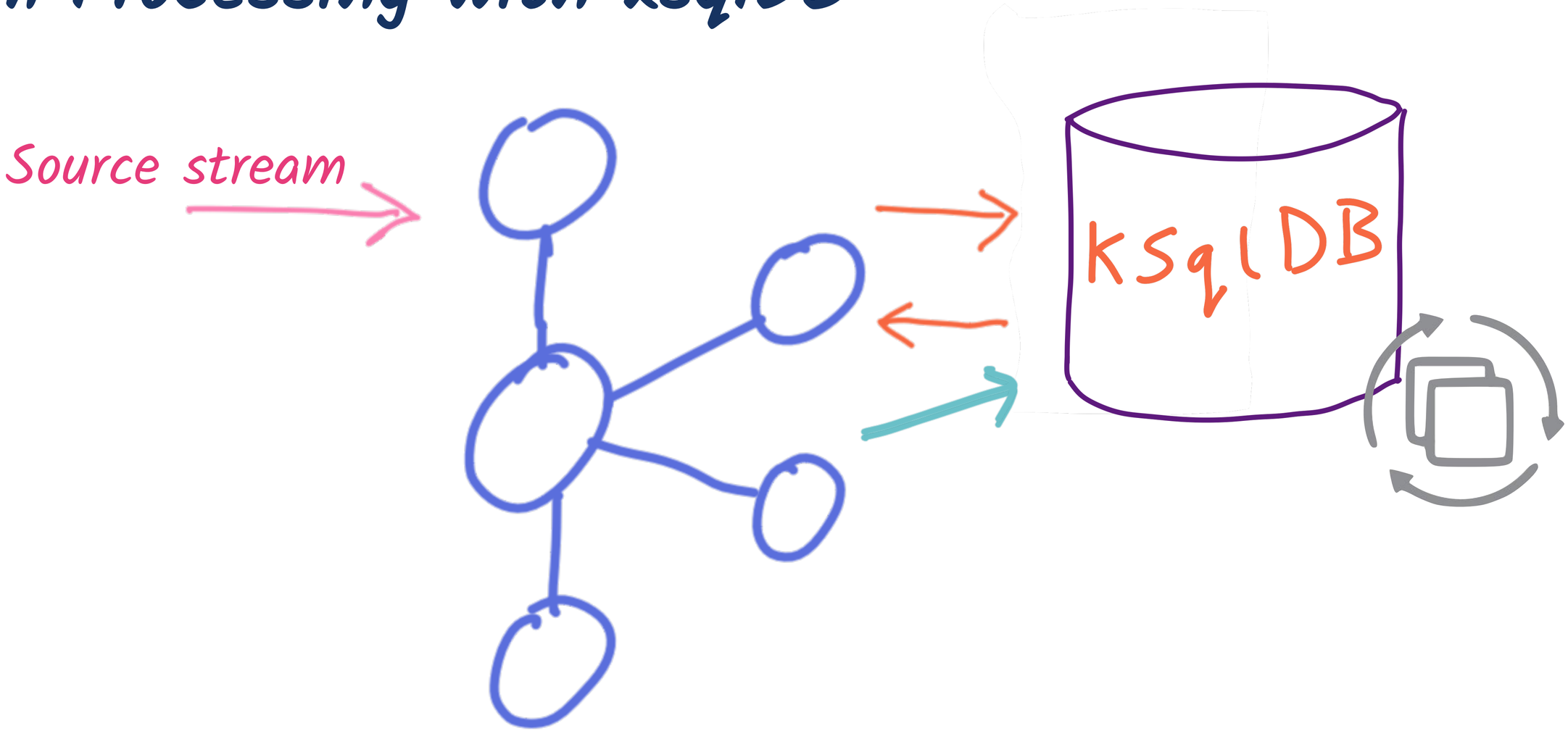
Stream Processing with ksqlDB



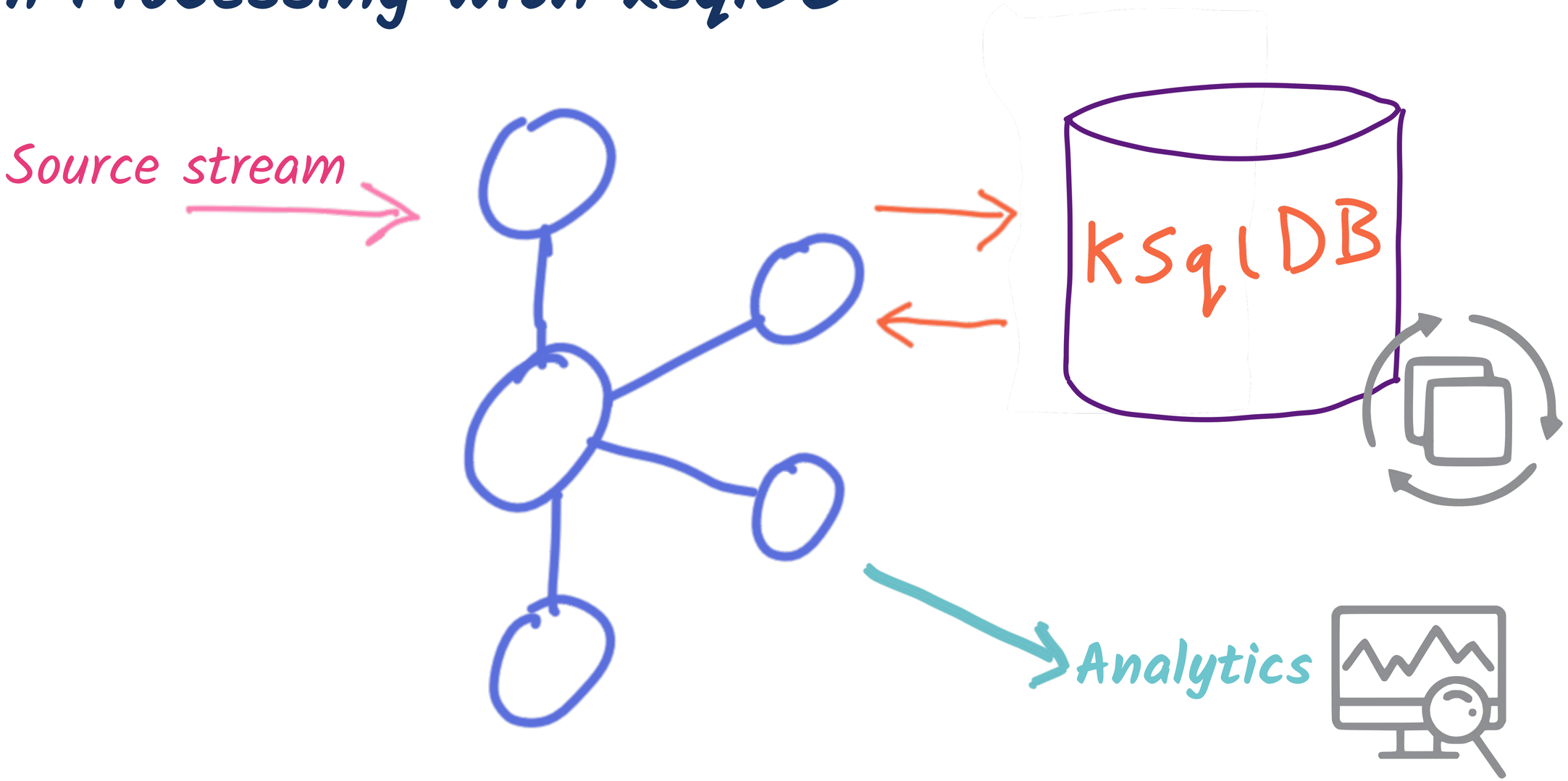
Stream Processing with ksqlDB



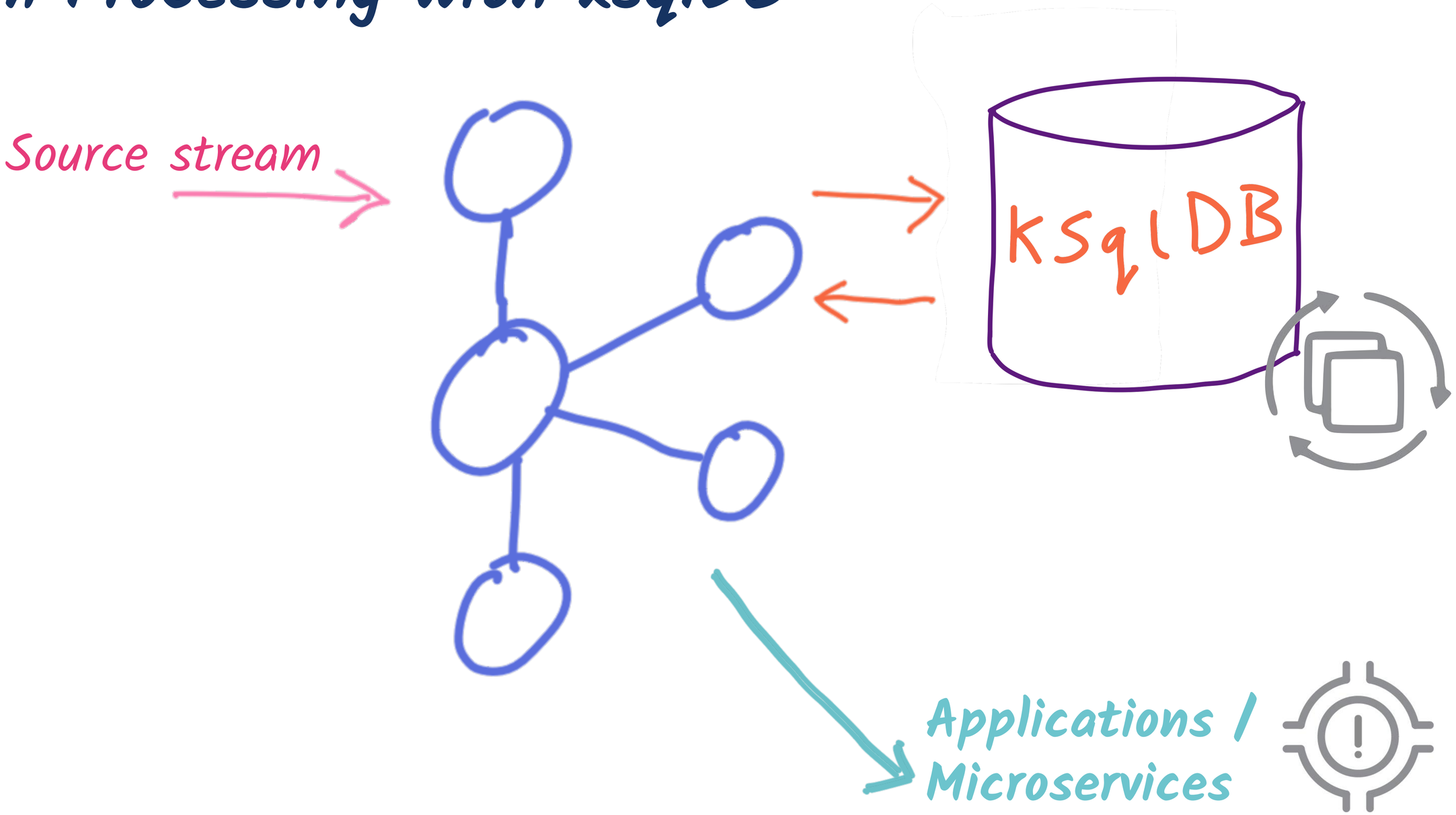
Stream Processing with ksqlDB



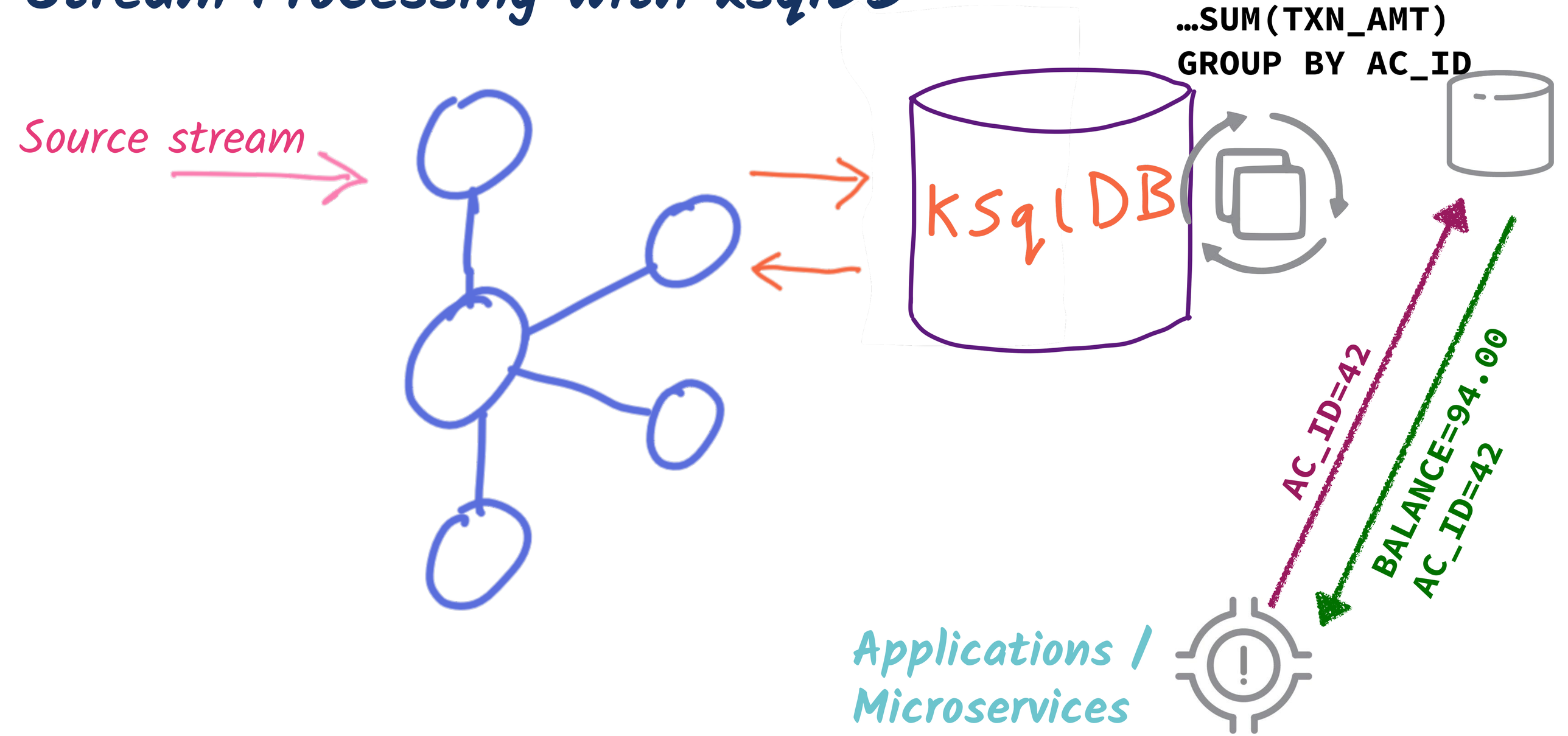
Stream Processing with ksqlDB



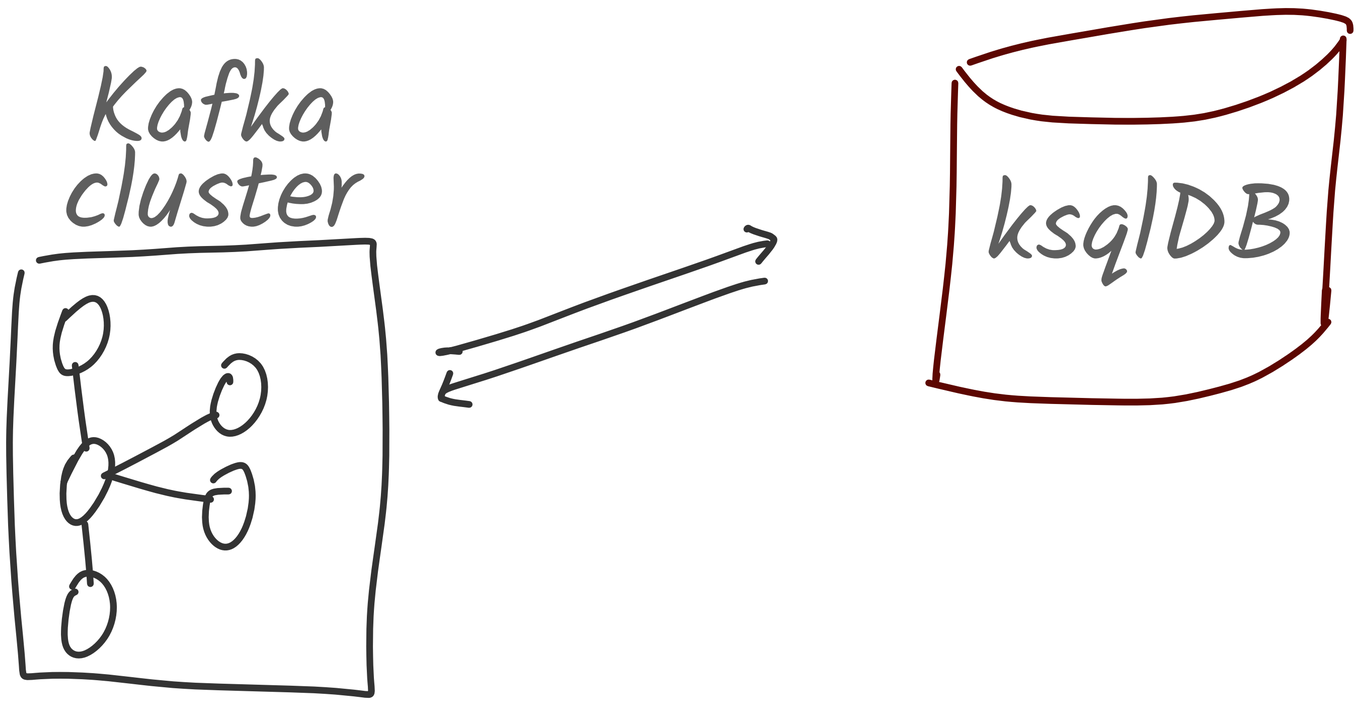
Stream Processing with ksqlDB



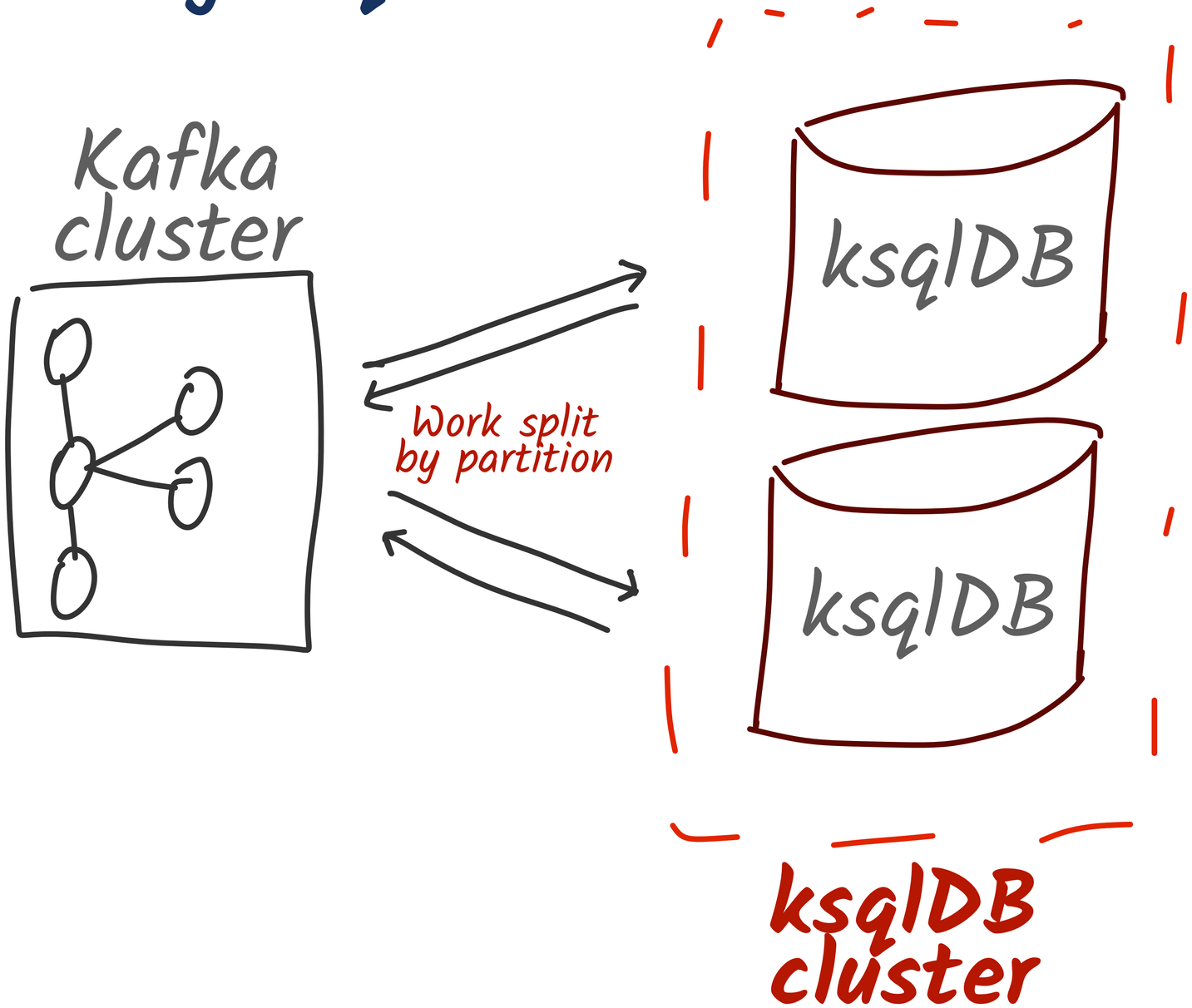
Stream Processing with ksqlDB



Scaling ksqlDB

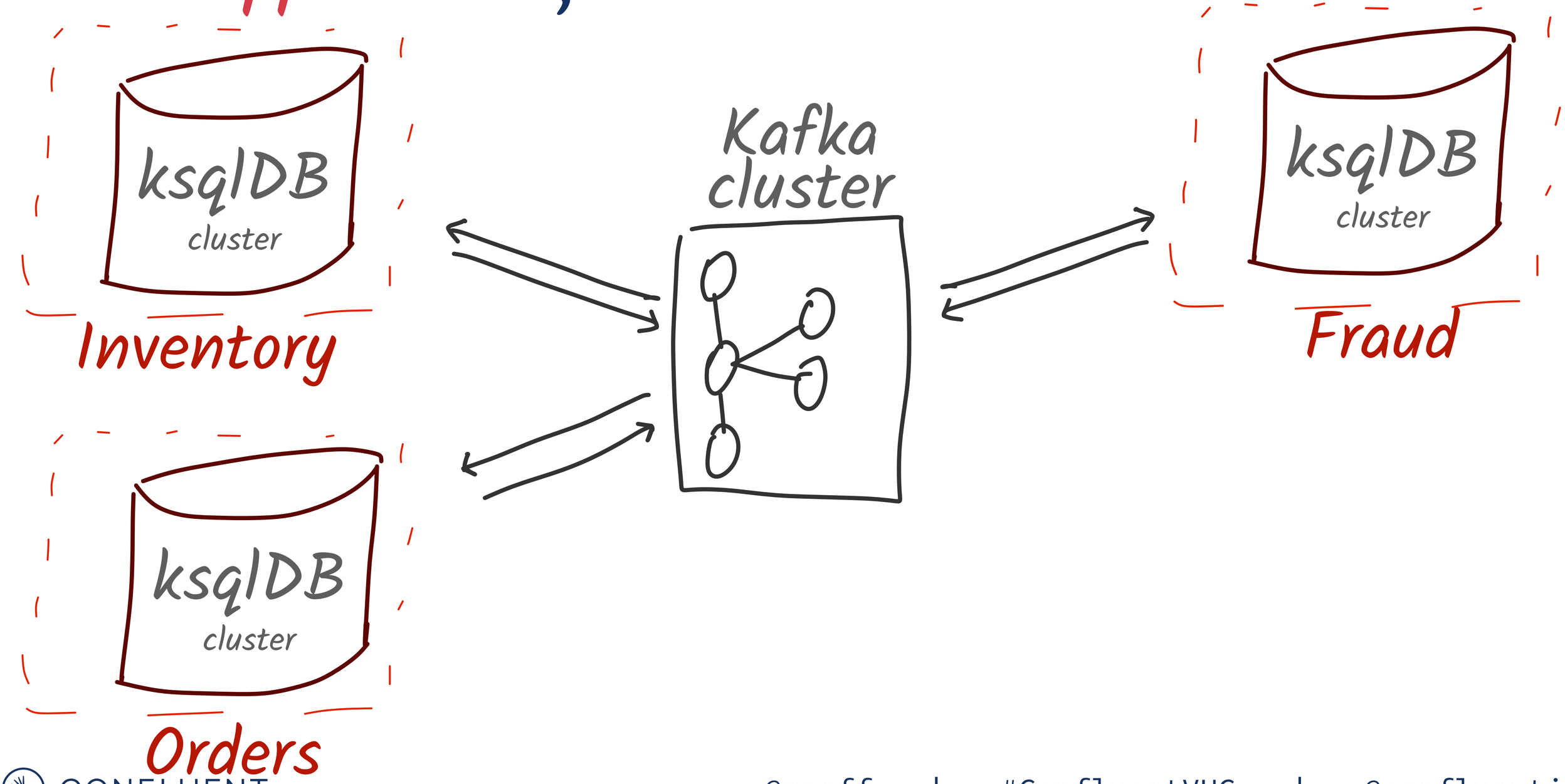


Scaling ksqlDB

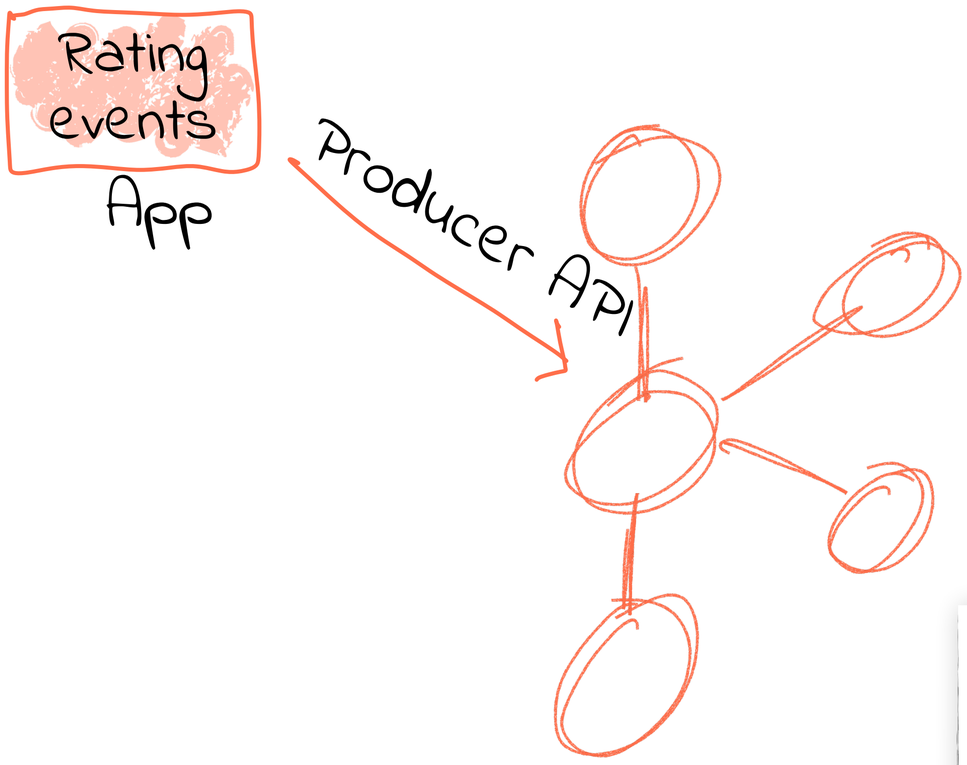



ONE DOES NOT SIMPLY RUN
ONE SINGLE KSQLDB CLUSTER

Think Applications, not database instances

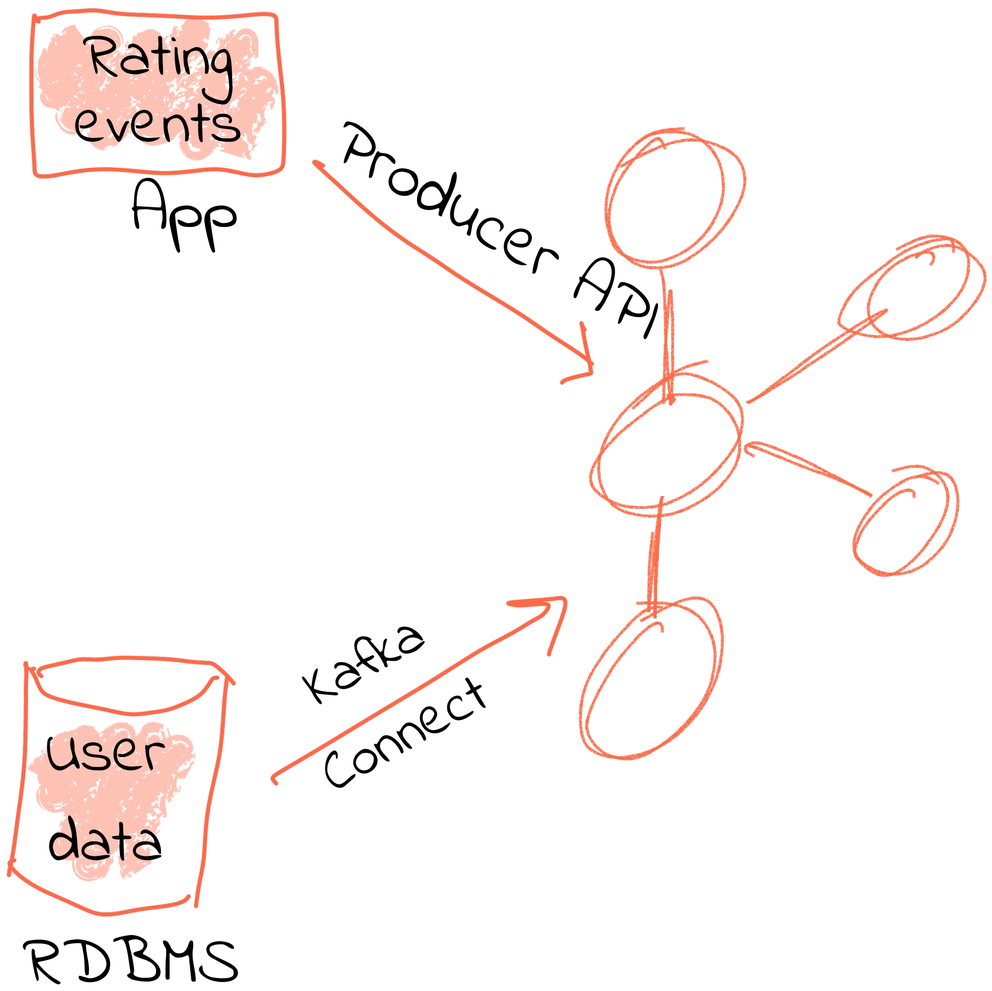


Let's Build It!

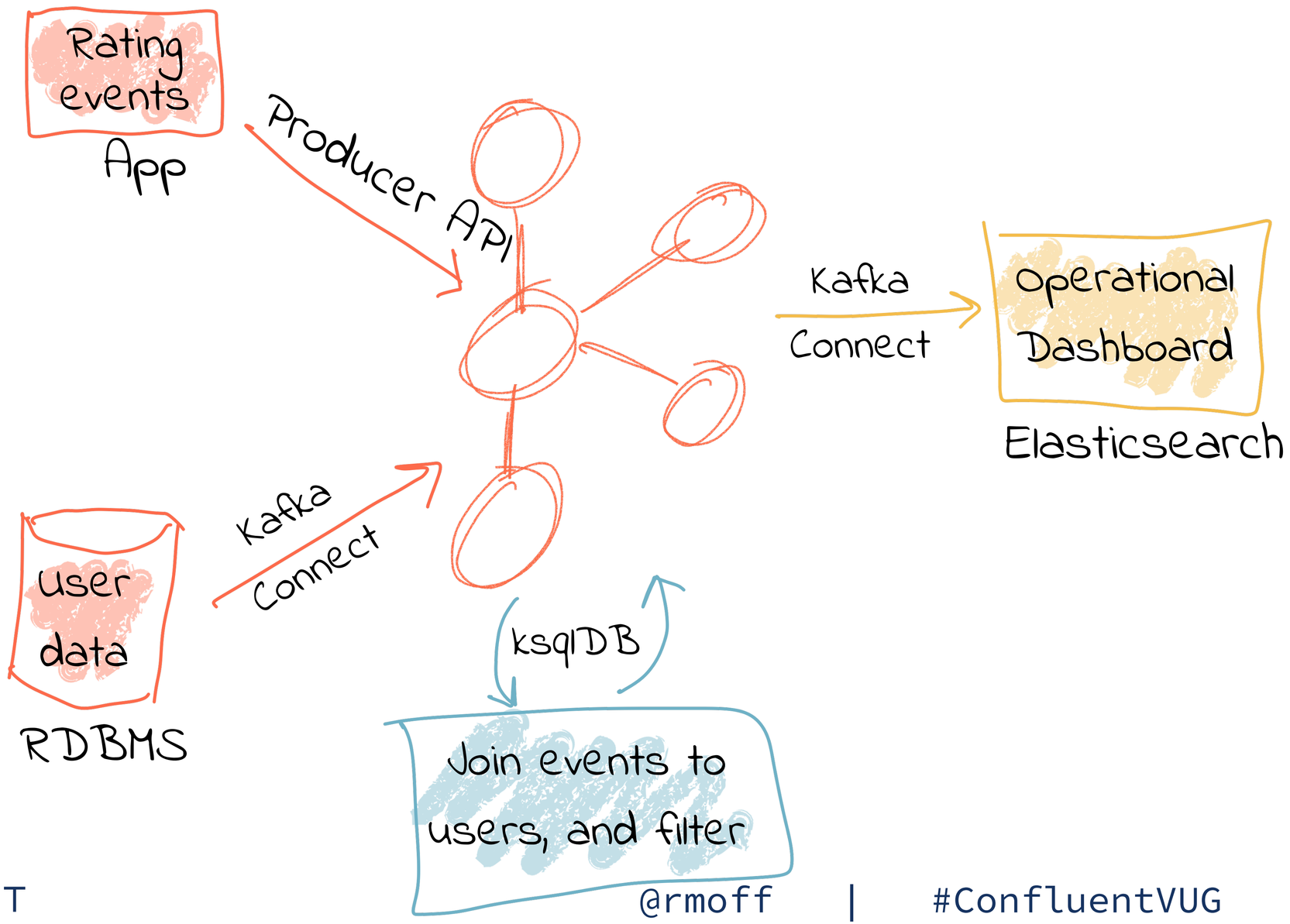



```
{
 "rating_id": 5313,
 "user_id": 3,
 "stars": 4,
 "route_id": 6975,
 "rating_time": 1519304105213,
 "channel": "web",
 "message": "worst. flight. ever. #neveragain"
}
```

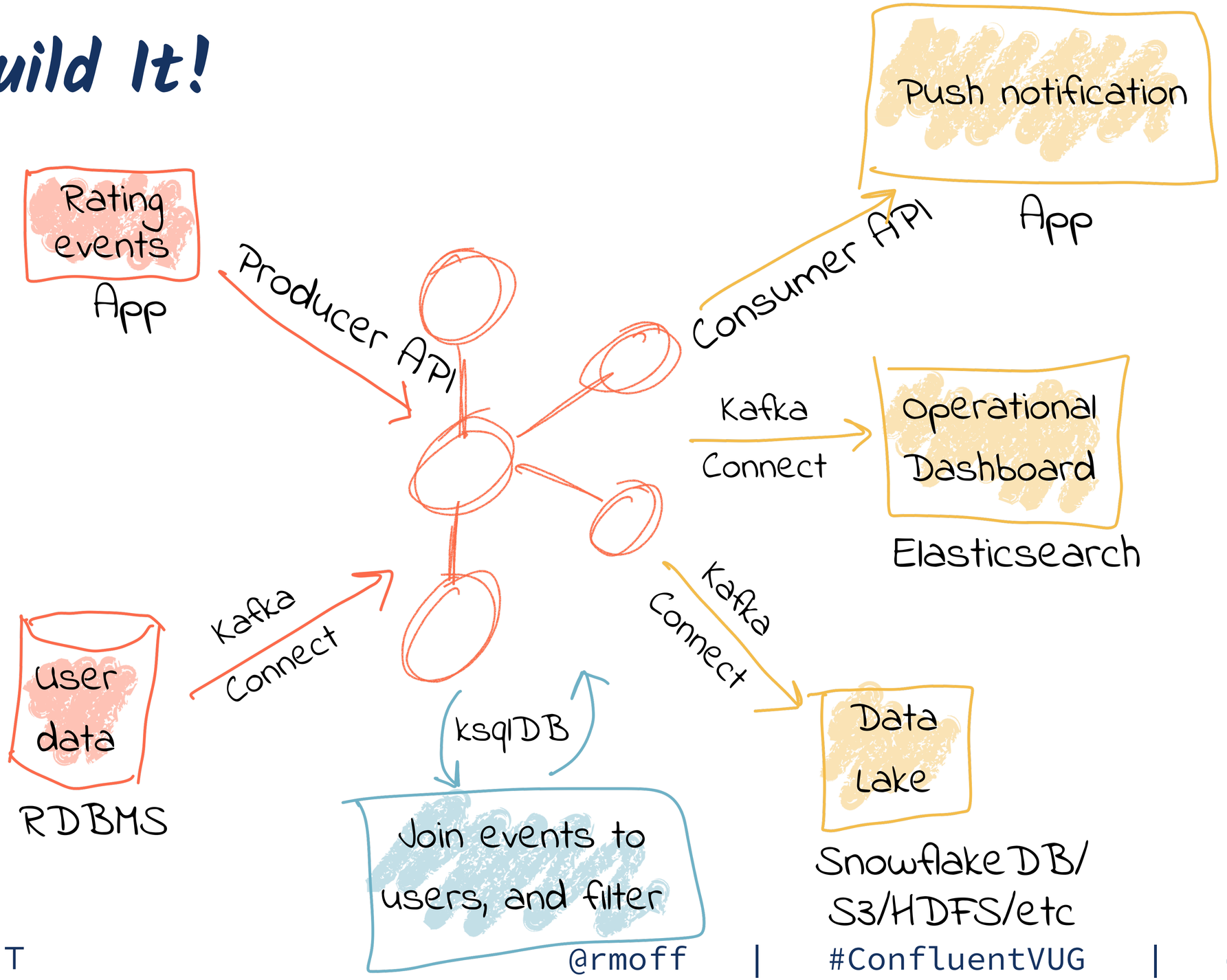
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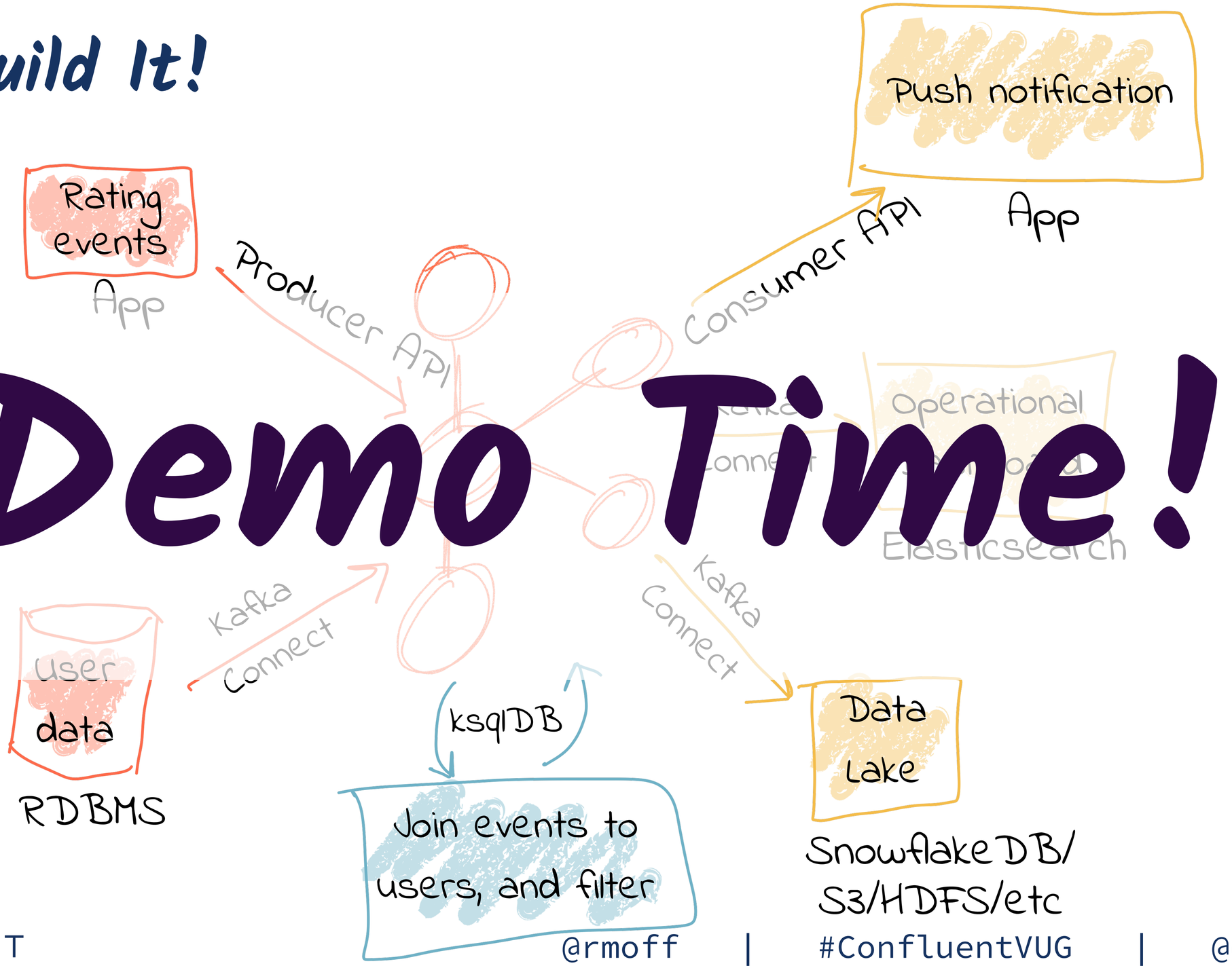
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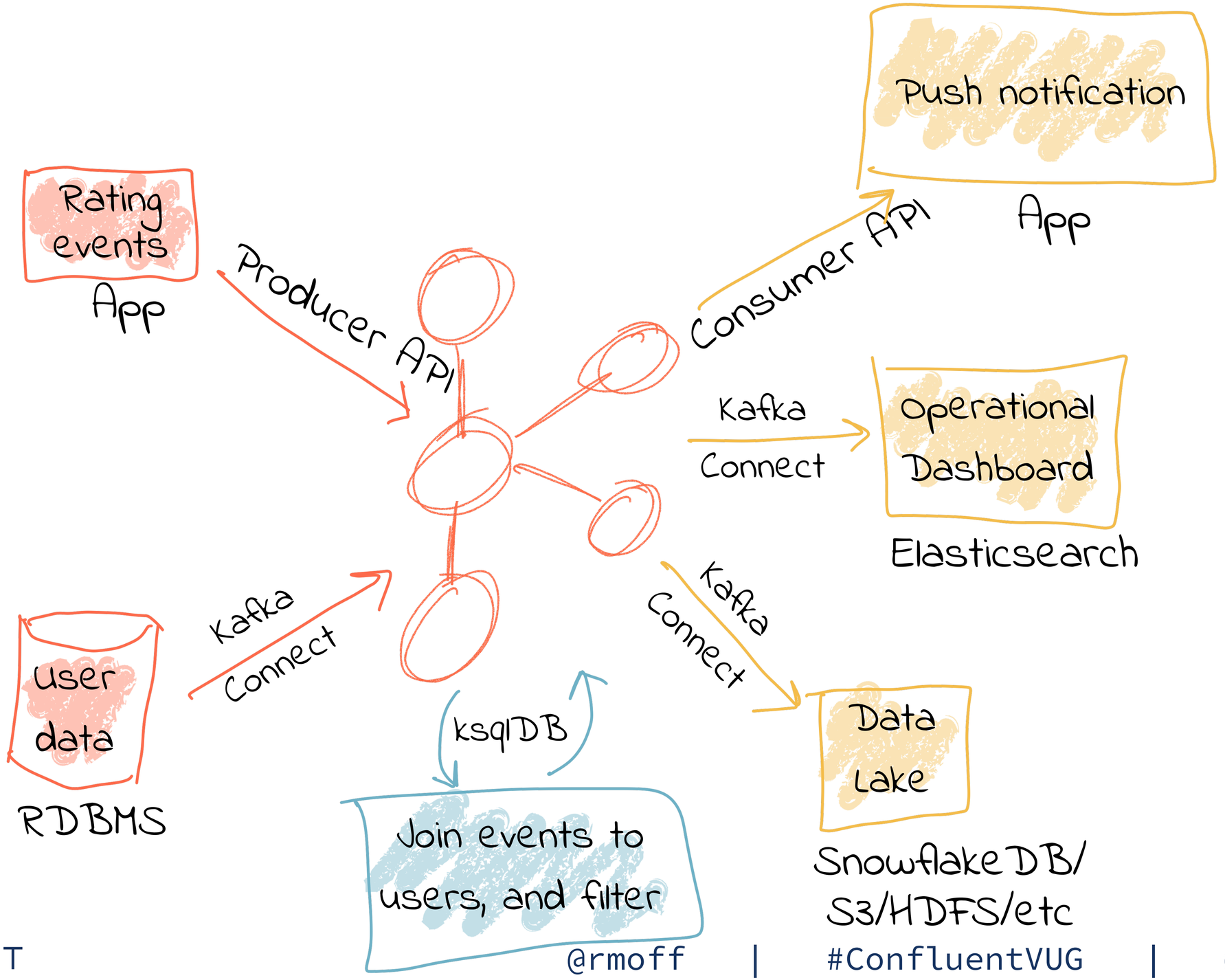


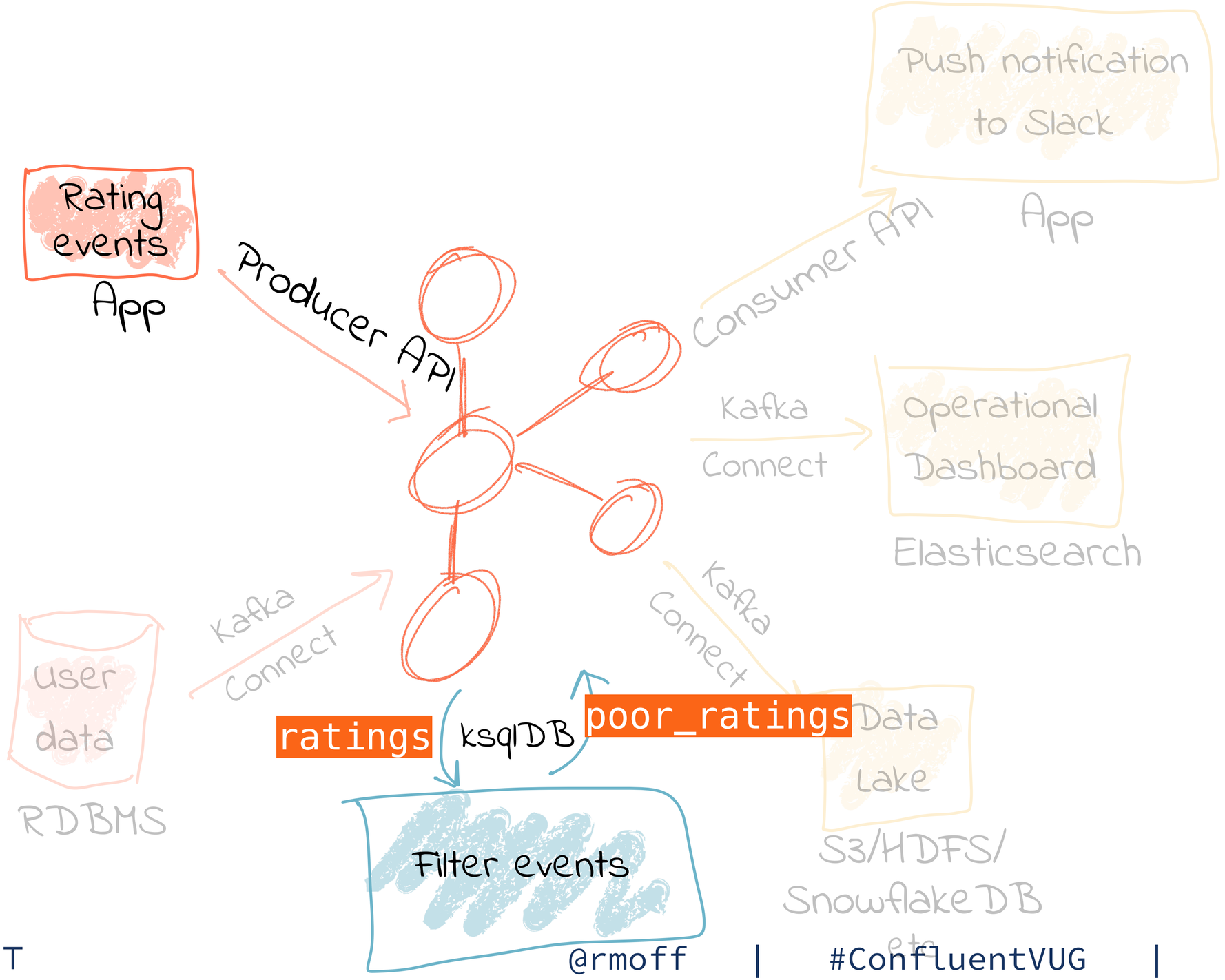
Let's Build It!



Let's Build It!

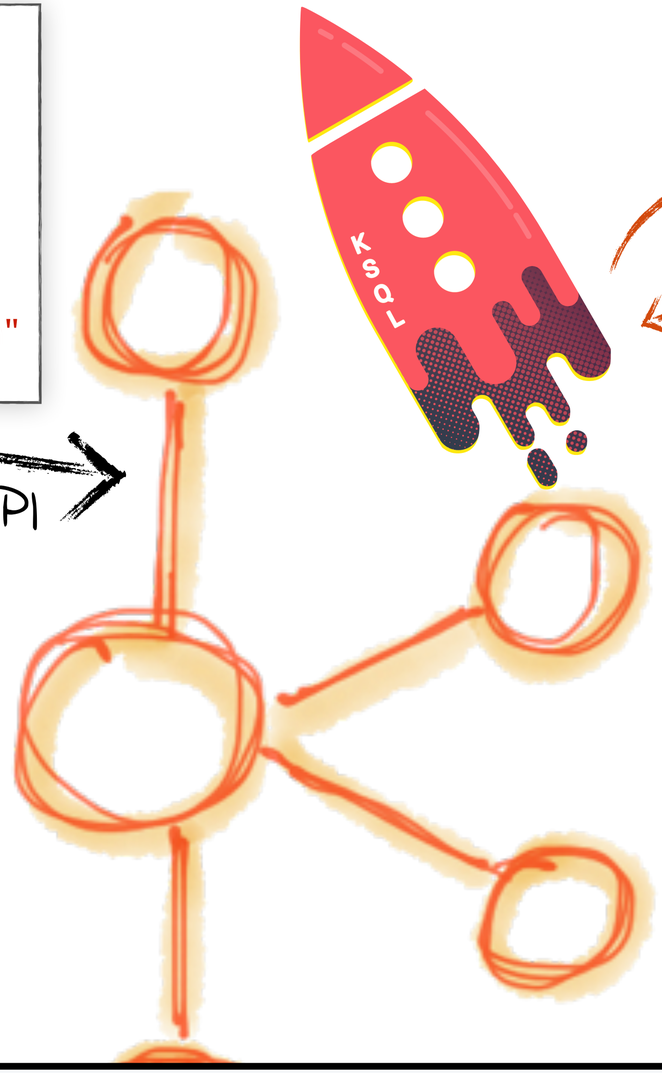



Rating events
App
Producer API
Push notification
App
Consumer API
Kafka
Connect
Operational Dashboard
Elasticsearch
User data
RDBMS
Kafka
Connect
ksqlDB
Join events to users, and filter
Kafka
Connect
Data Lake
SnowflakeDB/
S3/HDFS/etc


Rating events
App
Producer API
Push notification to Slack
App
Consumer API
Kafka Connect
Operational Dashboard
Elasticsearch
Kafka Connect
User data
RDBMS
Kafka Connect
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"
}
```


Producer API

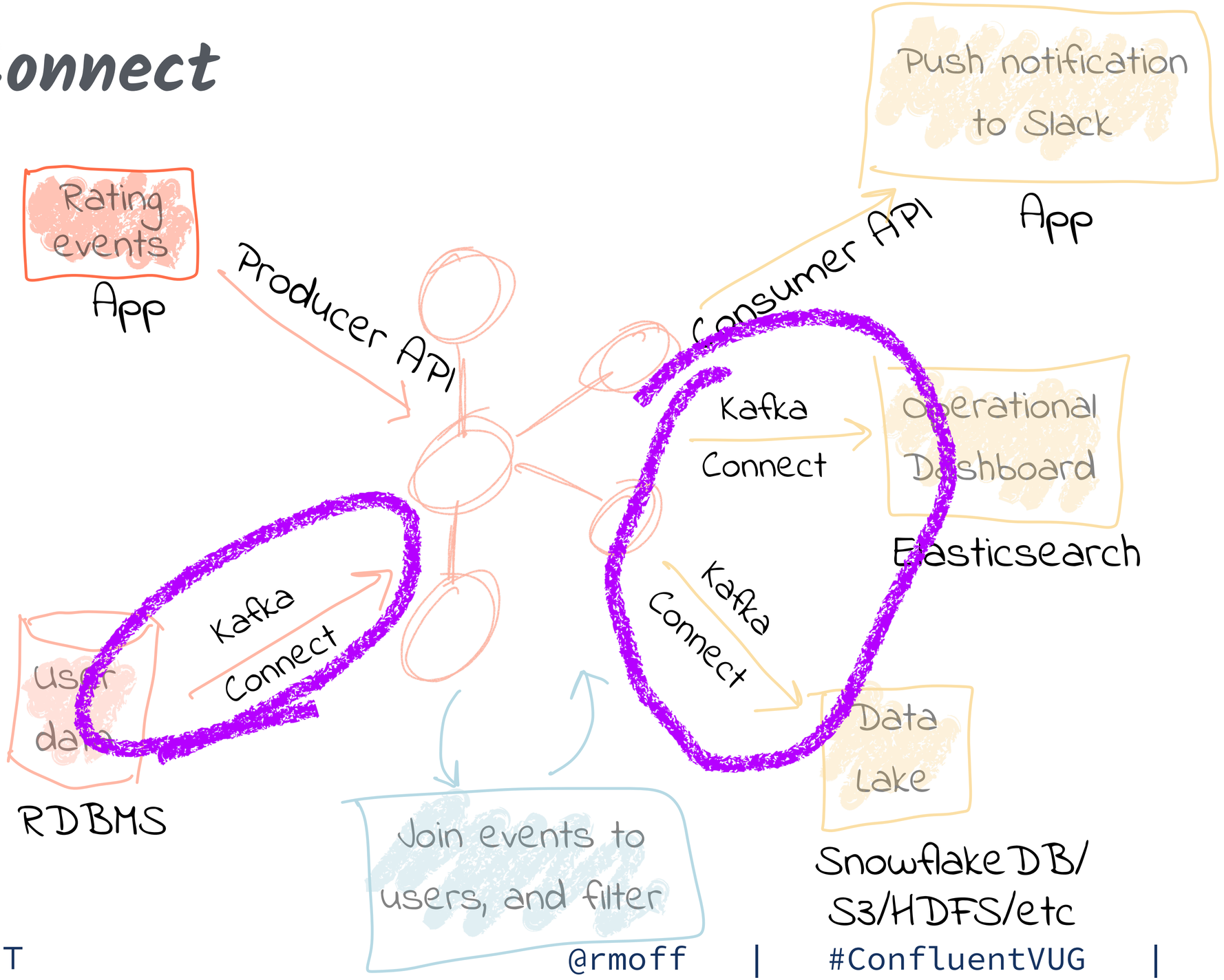


Filter all ratings where STARS<3

POOR_RATINGS

```
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"
}
```


Producer API



Kafka Connect

Debezium




```
{
  "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

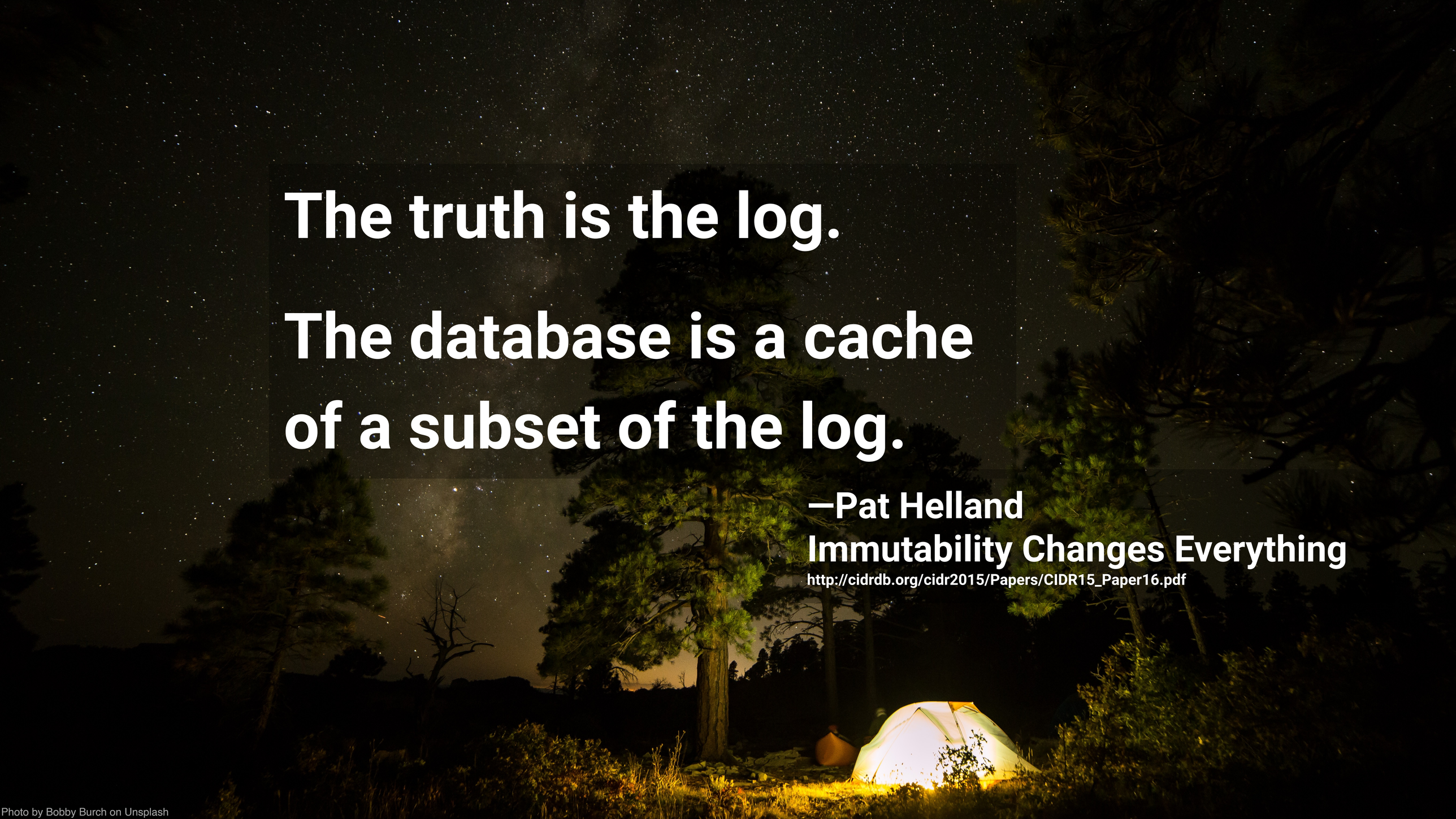
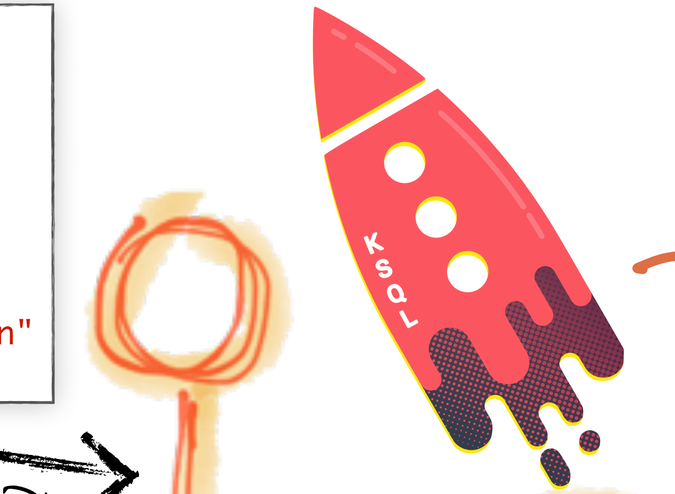


Photo by Bobby Burch on Unsplash

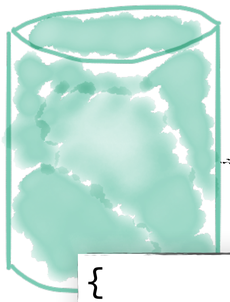
```
{
 "rating_id": 5313,
 "user_id": 3,
 "stars": 4,
 "route_id": 6975,
 "rating_time": 1519304105213,
 "channel": "web",
 "message": "worst. flight. ever. #neveragain"
}
```


Producer API



Join each rating to customer data

RATINGS_WITH_CUSTOMER_DATA



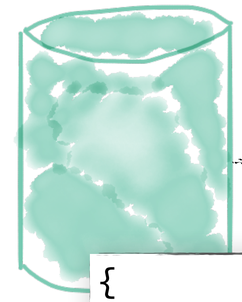
Kafka Connect


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

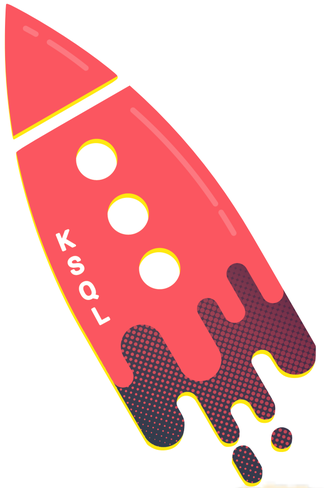

```
CREATE STREAM RATINGS_WITH_CUSTOMER_DATA AS
SELECT * FROM RATINGS
       LEFT JOIN CUSTOMERS ON R.ID=C.ID;
```

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


Producer API



Kafka Connect



Join each rating to customer data

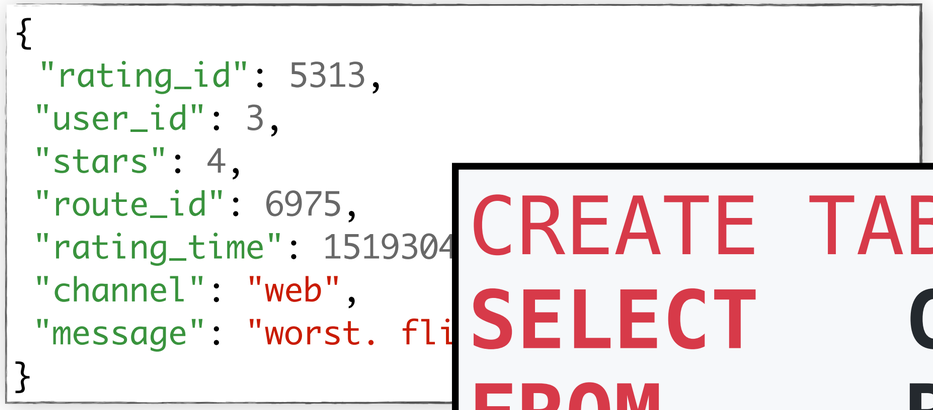
RATINGS_WITH_CUSTOMER_DATA

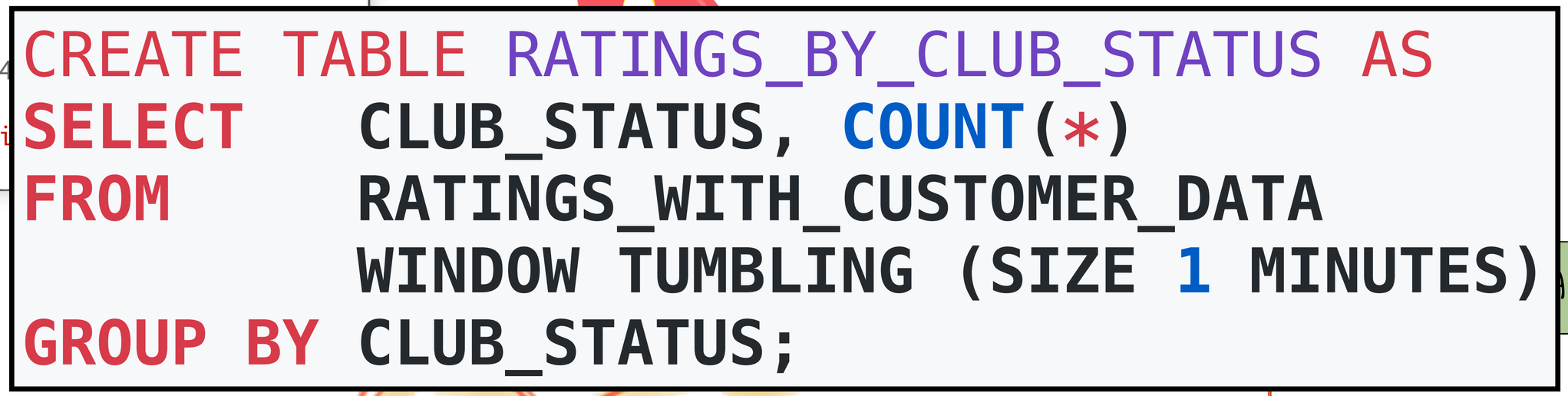
Filter for just PLATINUM customers

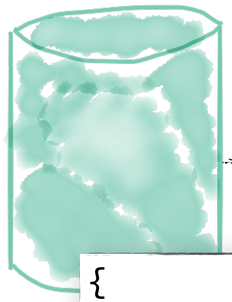
UNHAPPY_PLATINUM_CUSTOMERS


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


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

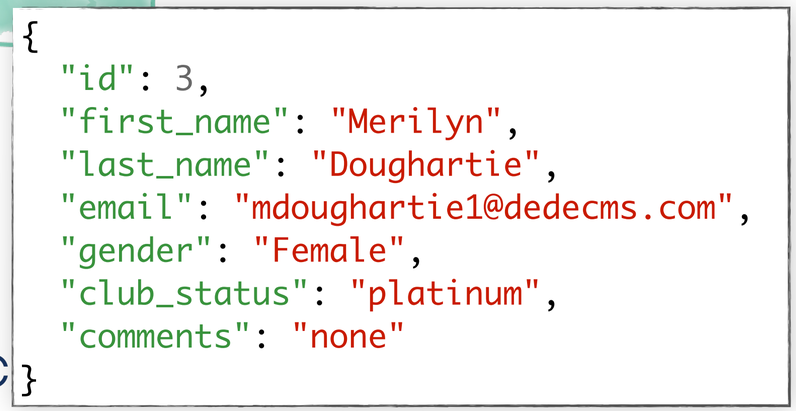






Kafka Connect

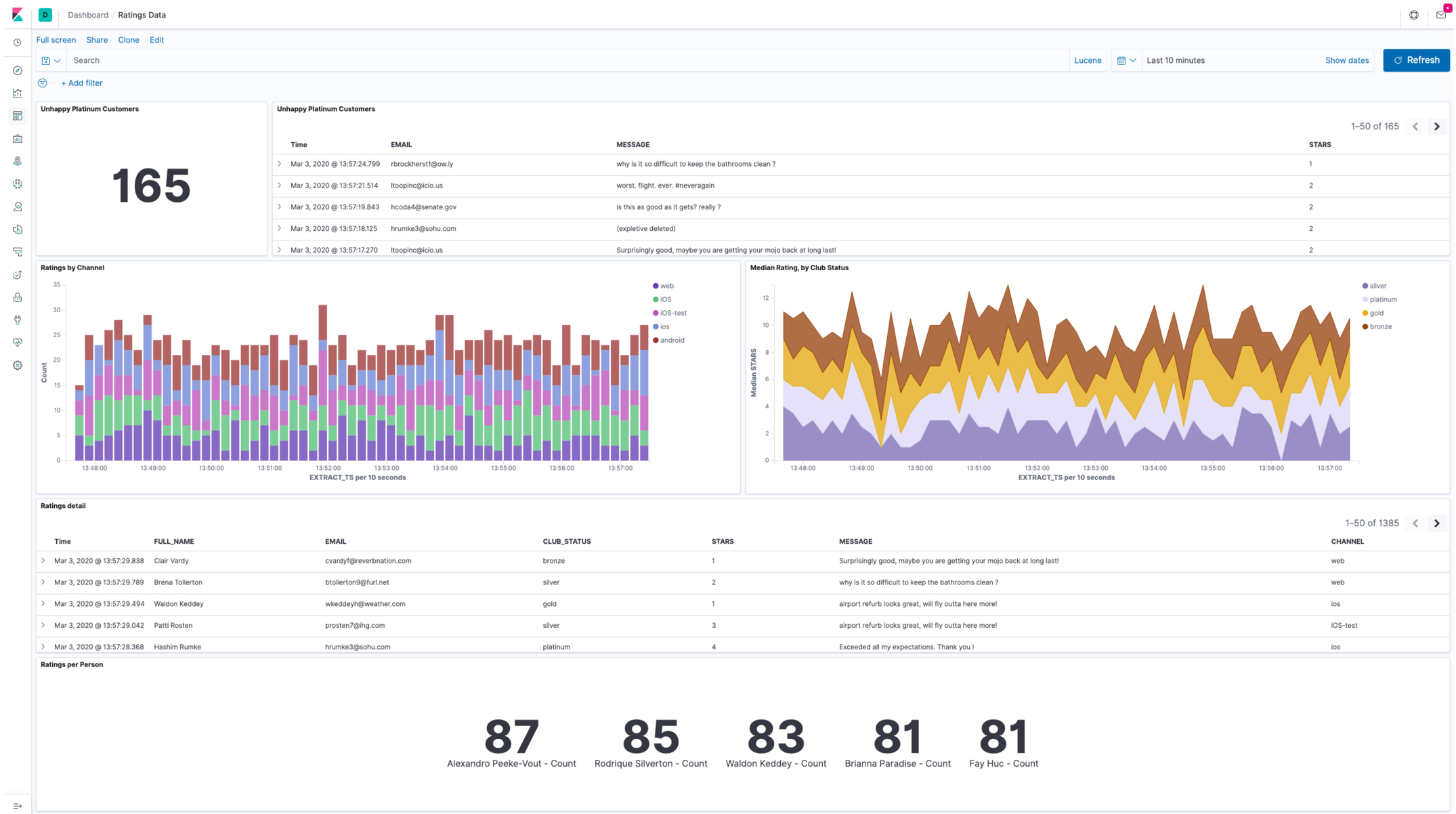




Aggregate per-minute by CLUB_STATUS

RATINGS_BY_CLUB_STATUS_1MIN

Kafka Connect → Elasticsearch

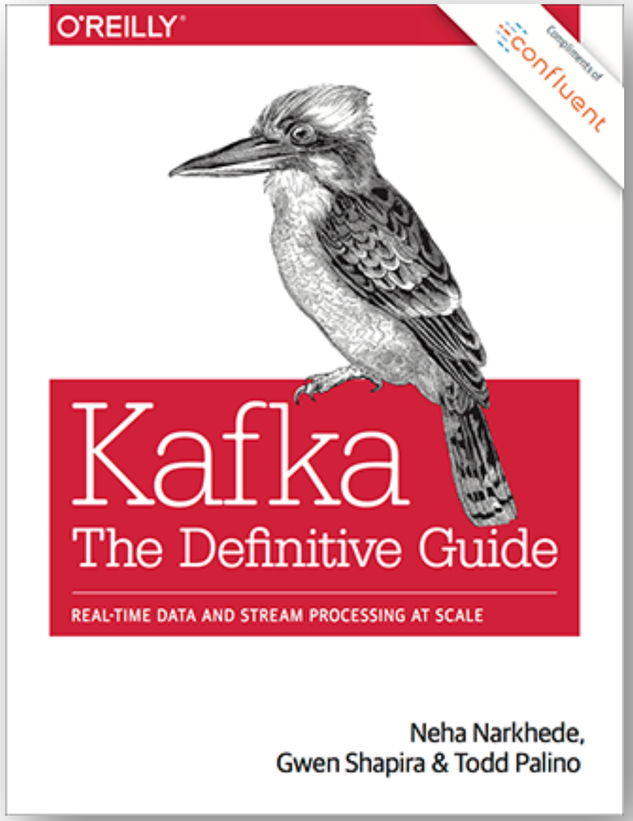


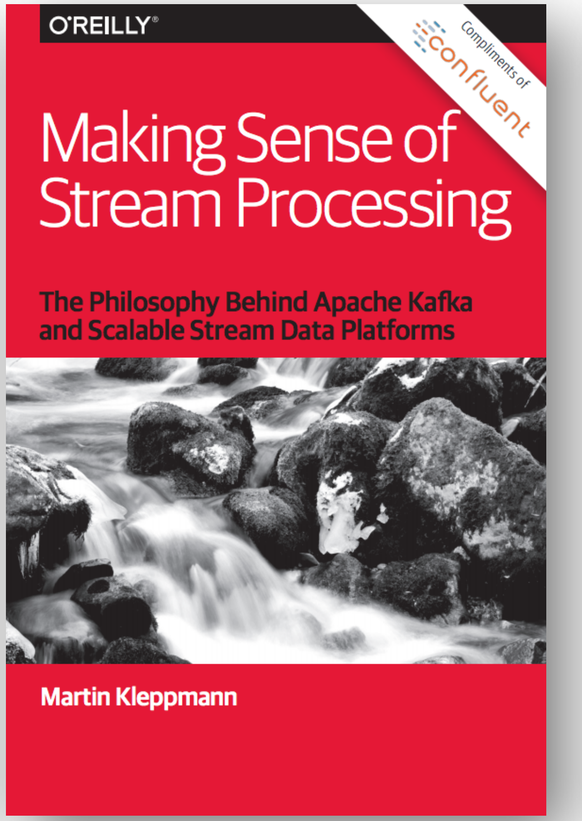
Want to learn more?

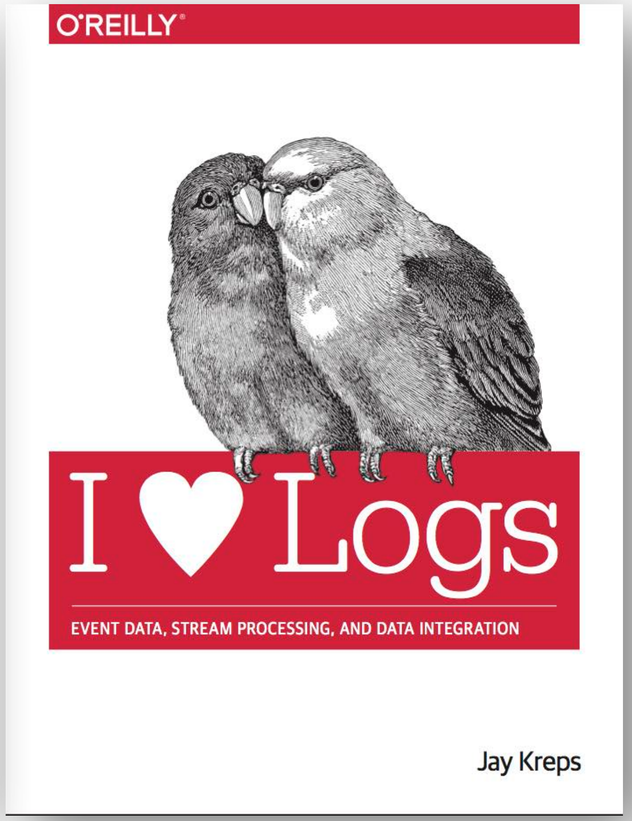


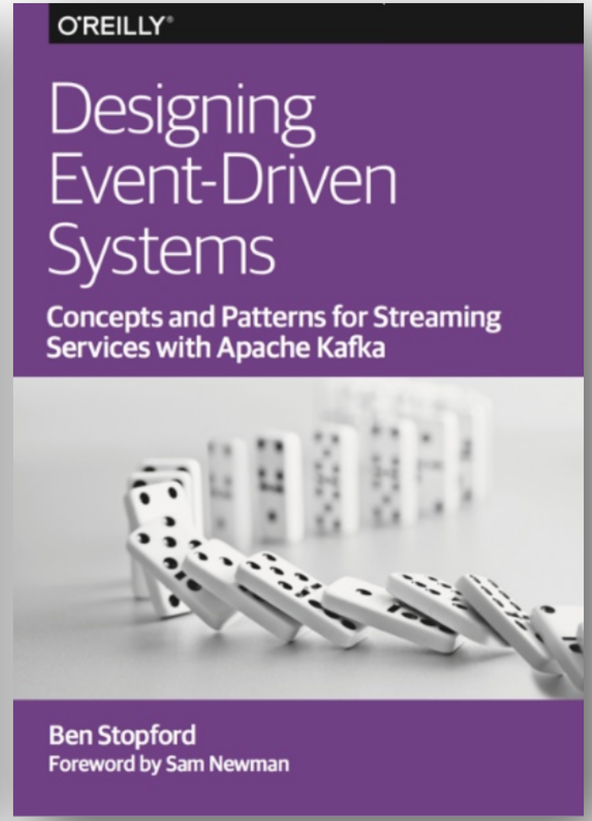
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Further reading / watching

- **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