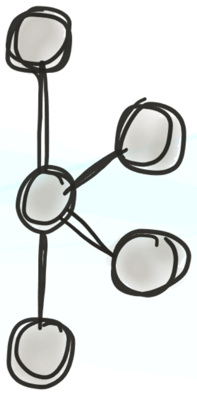
Demystifying Stream Processing with Apache Kafka



Neha Narkhede, Confluent

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What is STREAM PROCESSING

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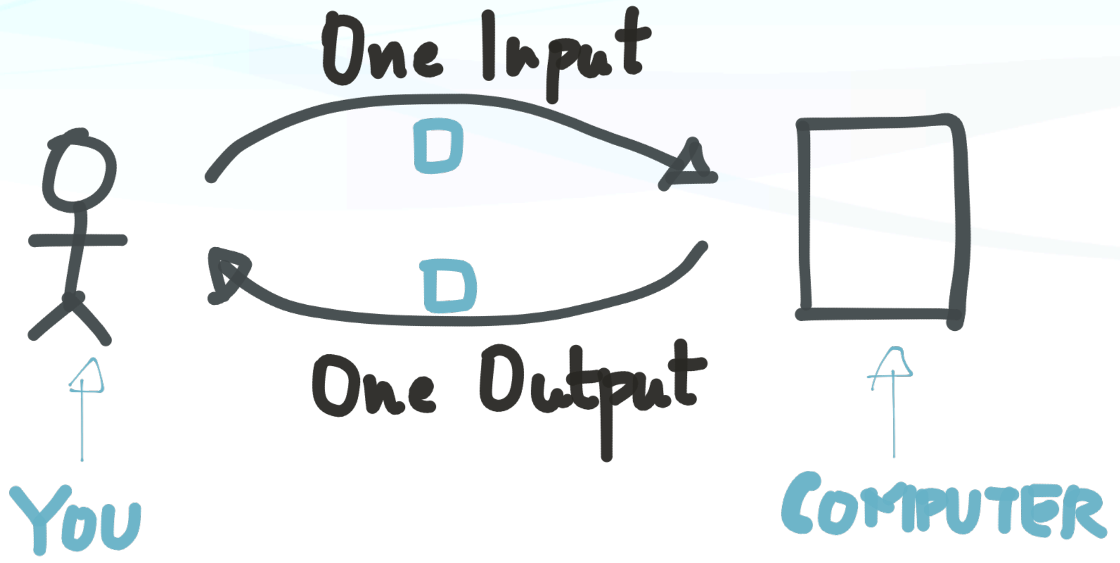
3 Paradigms for Programming

1. request/response
2. batch
3. stream processing

Request/Response



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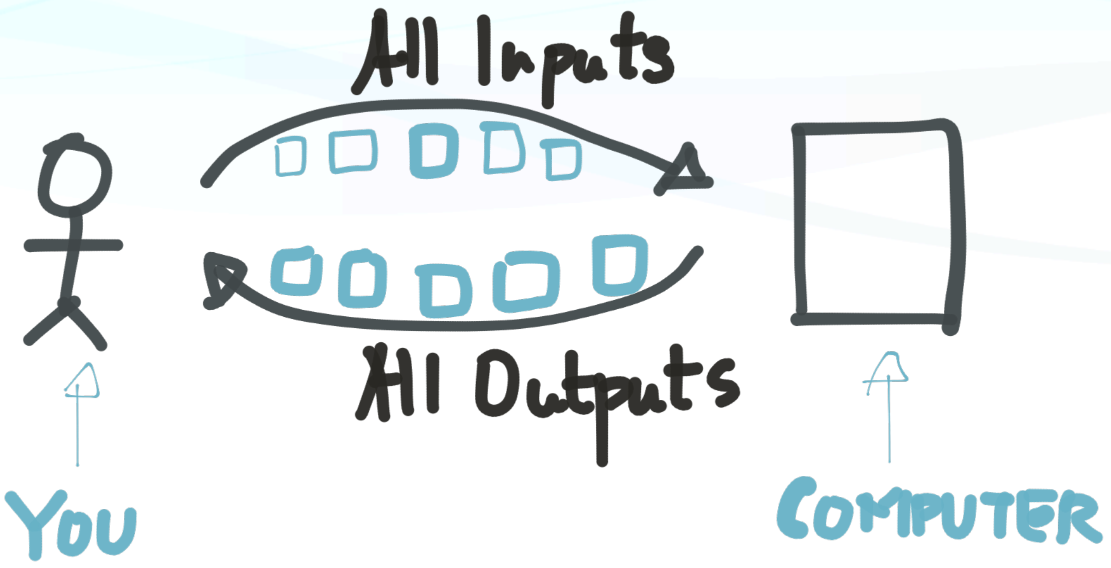
BATCH



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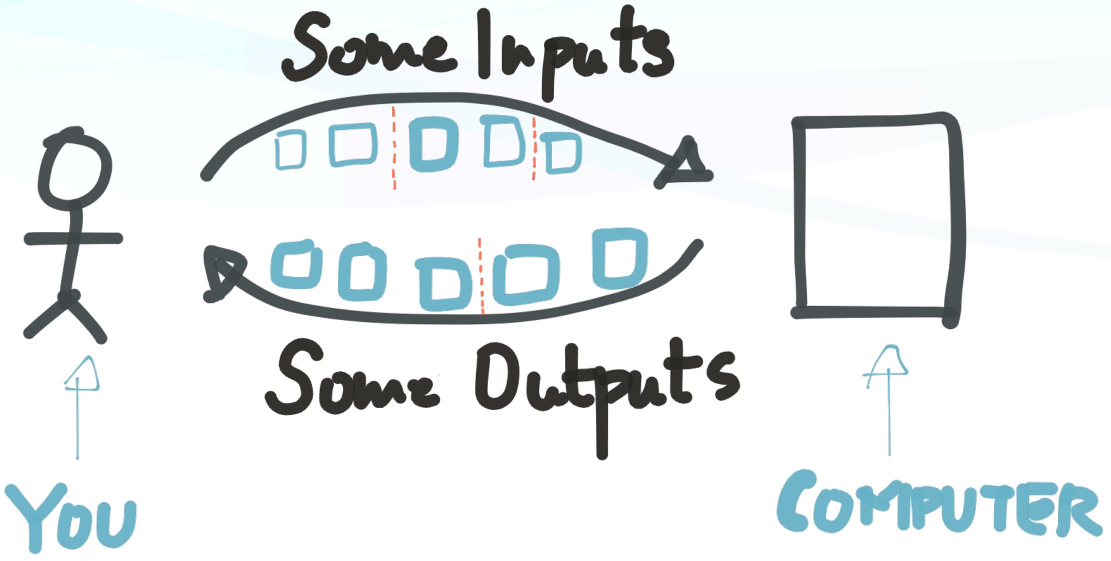
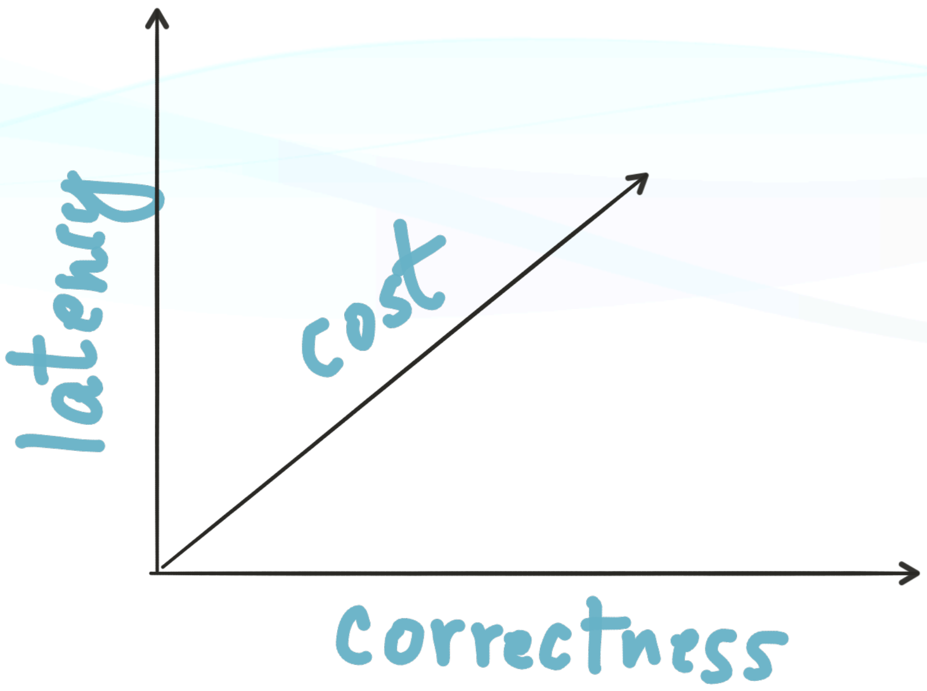
STREAM PROCESSING



STREAM PROCESSING isn't (NECESSARILY)

- Transient
- Approximate
- Lossy

TRADE OFFS



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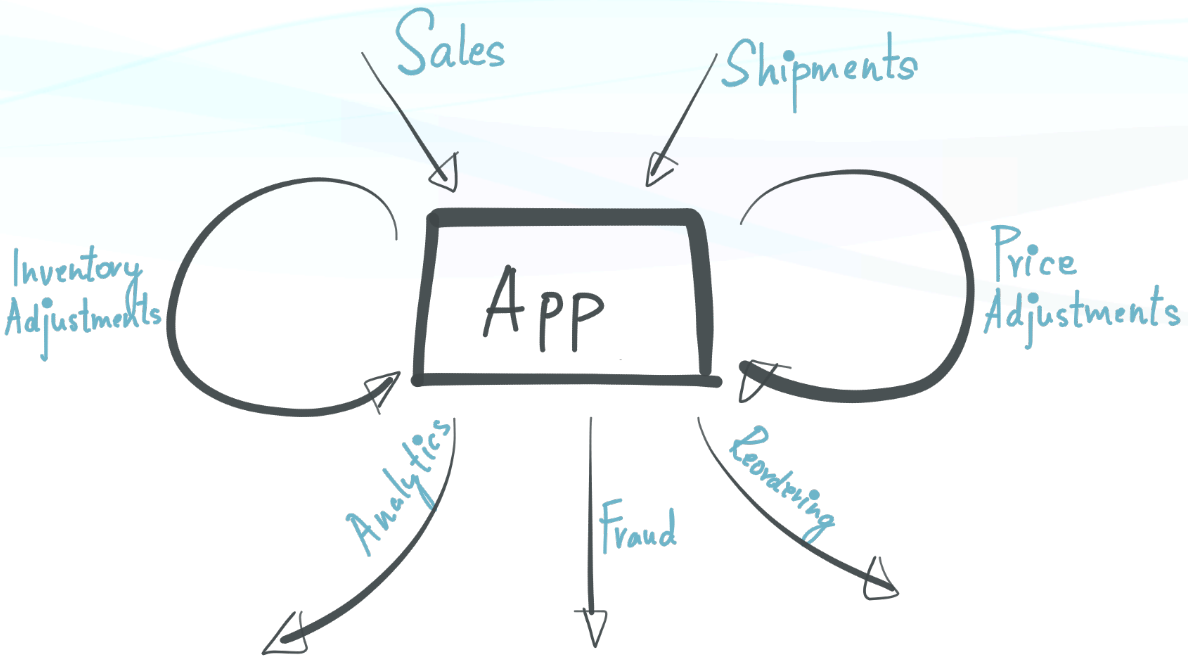
Stream Processing in the Large

Retail



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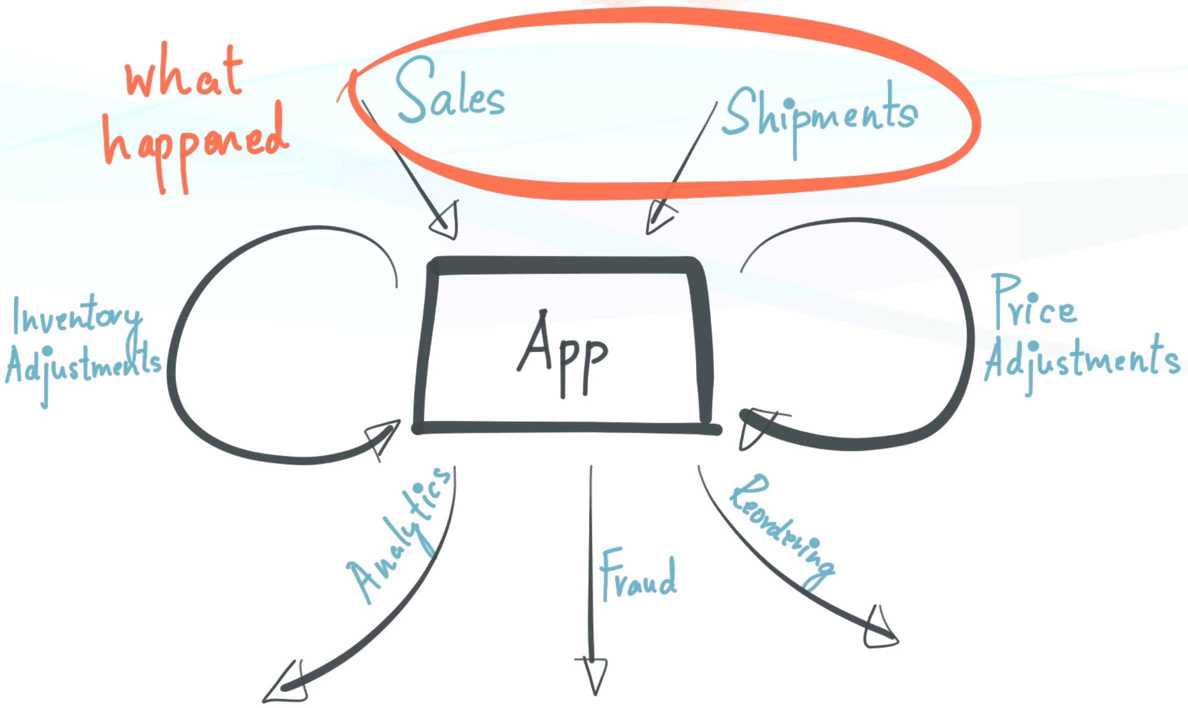
RETAIL



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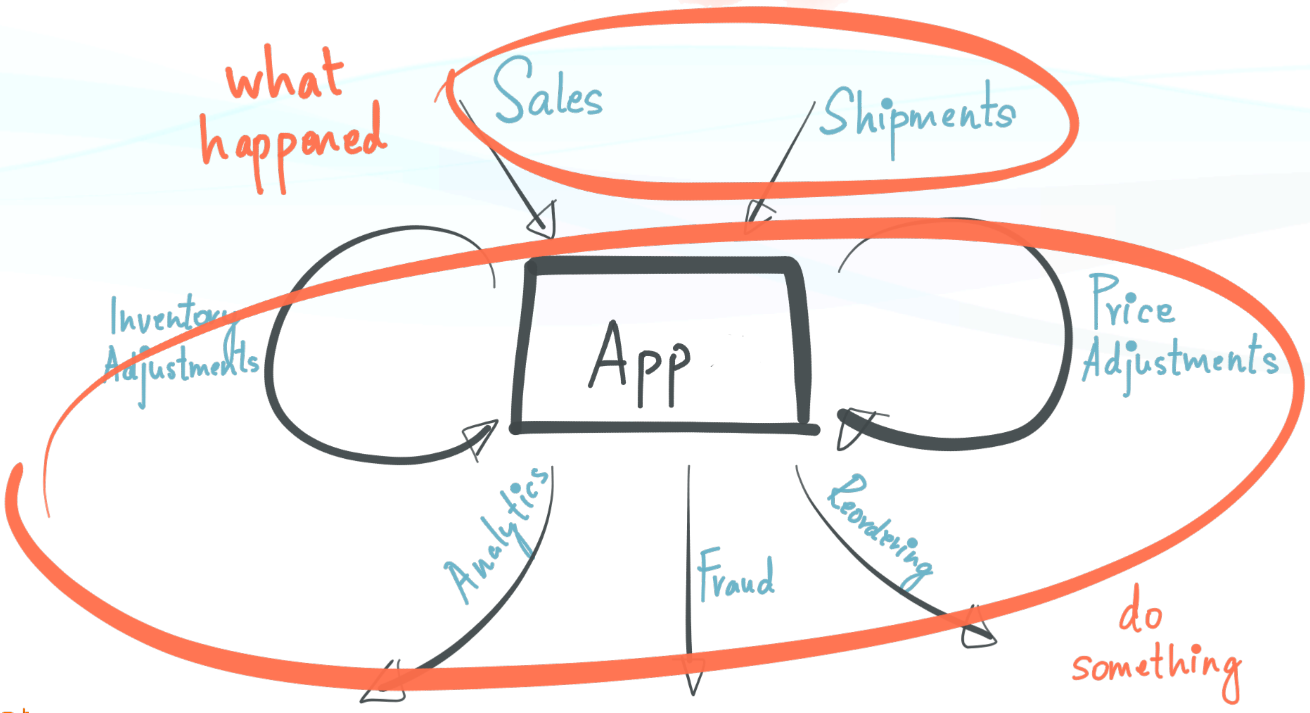
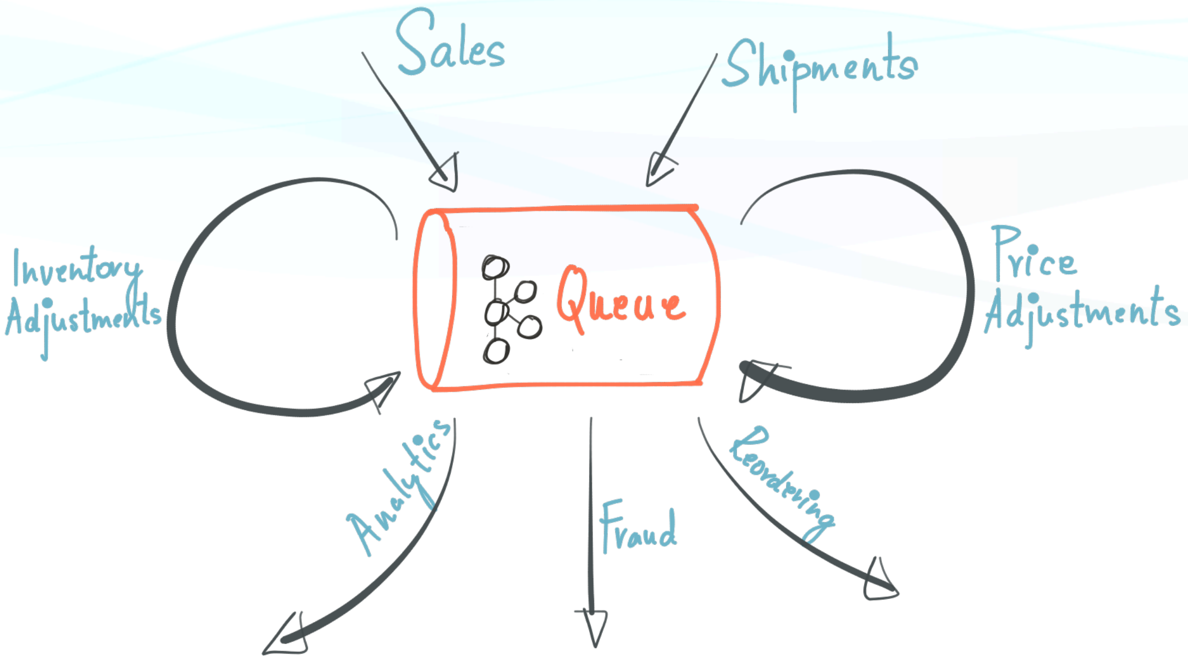
RETAIL


what happened
Sales
Shipments
Inventory Adjustments
App
Price Adjustments
Analytics
Fraud
Reordering
do something

RETAIL



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stream processing

$$= f(\text{“what happened”})$$

↑

events

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stream processing

=

f ("what happened")

↑

events

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Stream Processing with Kafka

2 approaches

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Approach #1

DIY!

stream processing

PROBLEM: STREAM PROCESSING HAS SOME hard parts

- partitioning & scalability
- semantics & fault tolerance
- state
- windowing & time
- reprocessing

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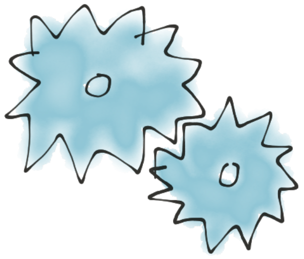
APPROACH #2

Use a stream processing framework

- SPARK
- STORM
- SAMZA
- FLINK

ET AL

PROBLEM : LOTS OF moving parts!



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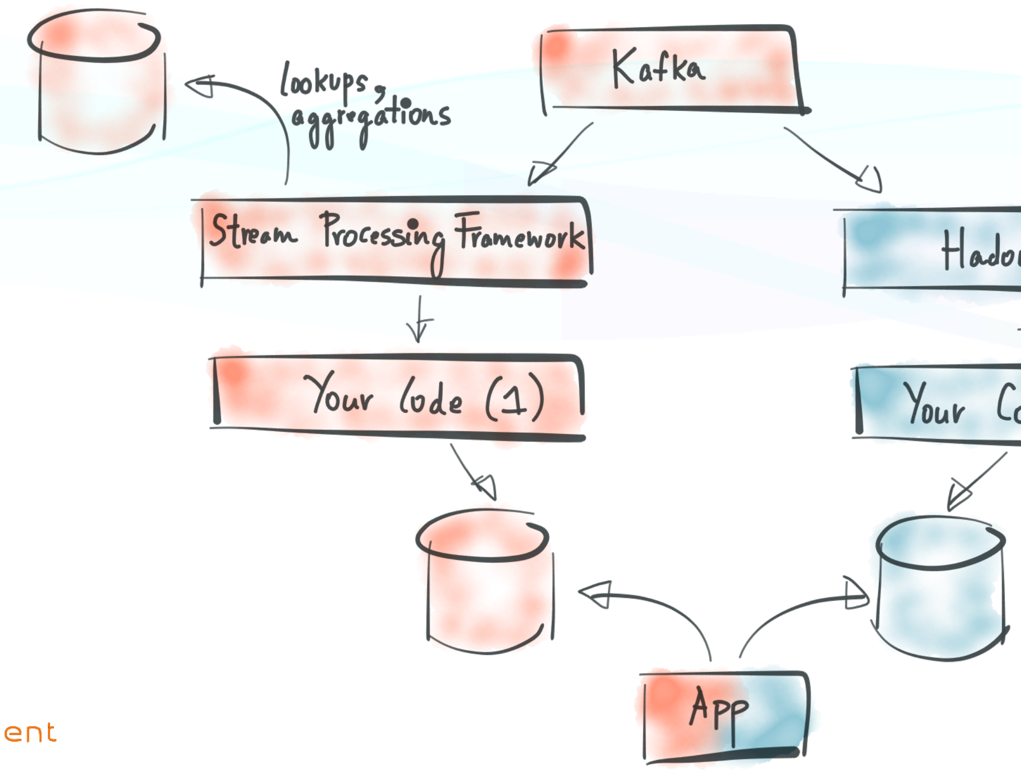
Example Architecture

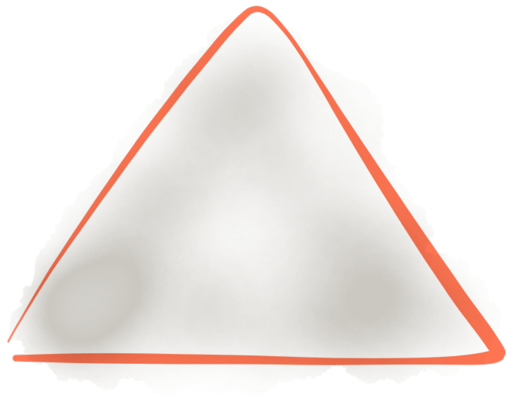


The Hard Part Of Distributed Systems

Coding < Debugging < Operations

Is There A better WAY?

Kafka Provides primitives



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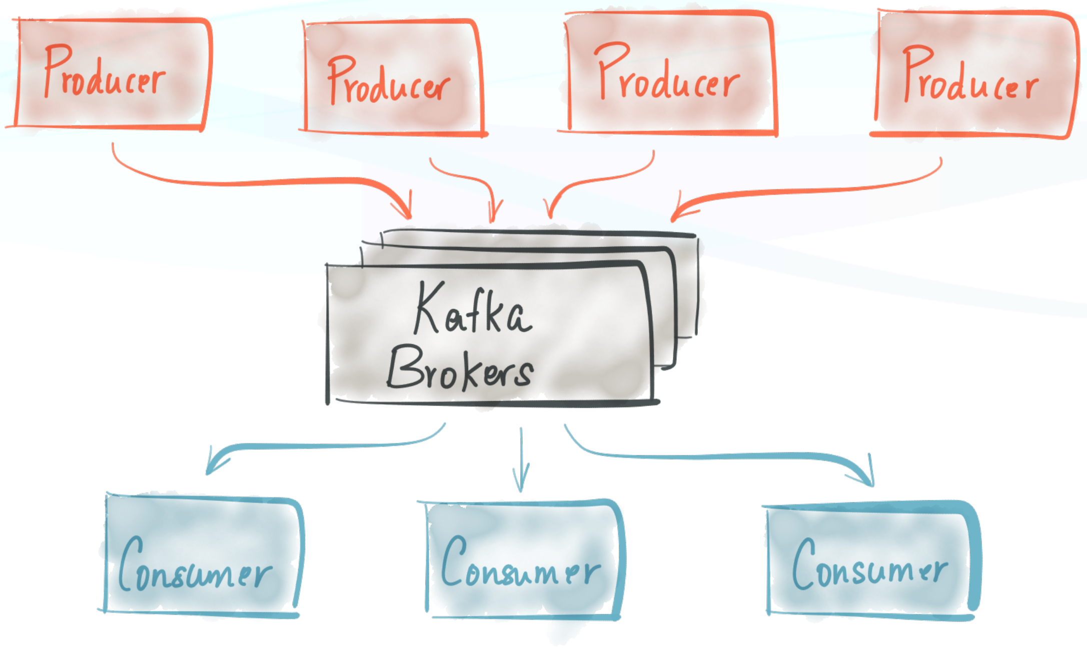
Apache Kafka : 10,000 FT View



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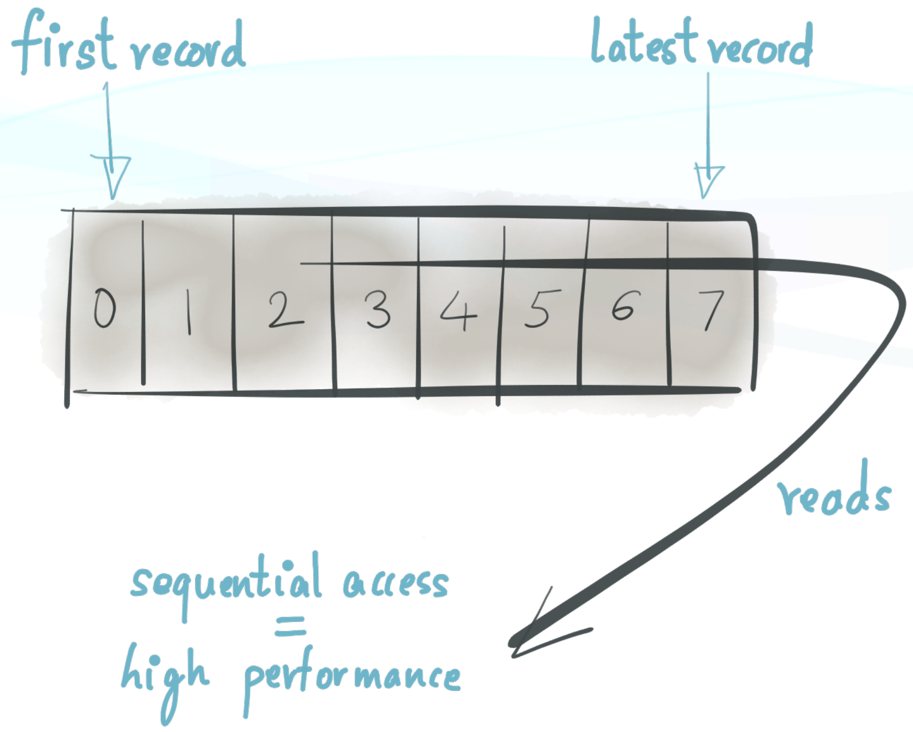
Kafka Key Idea : Log



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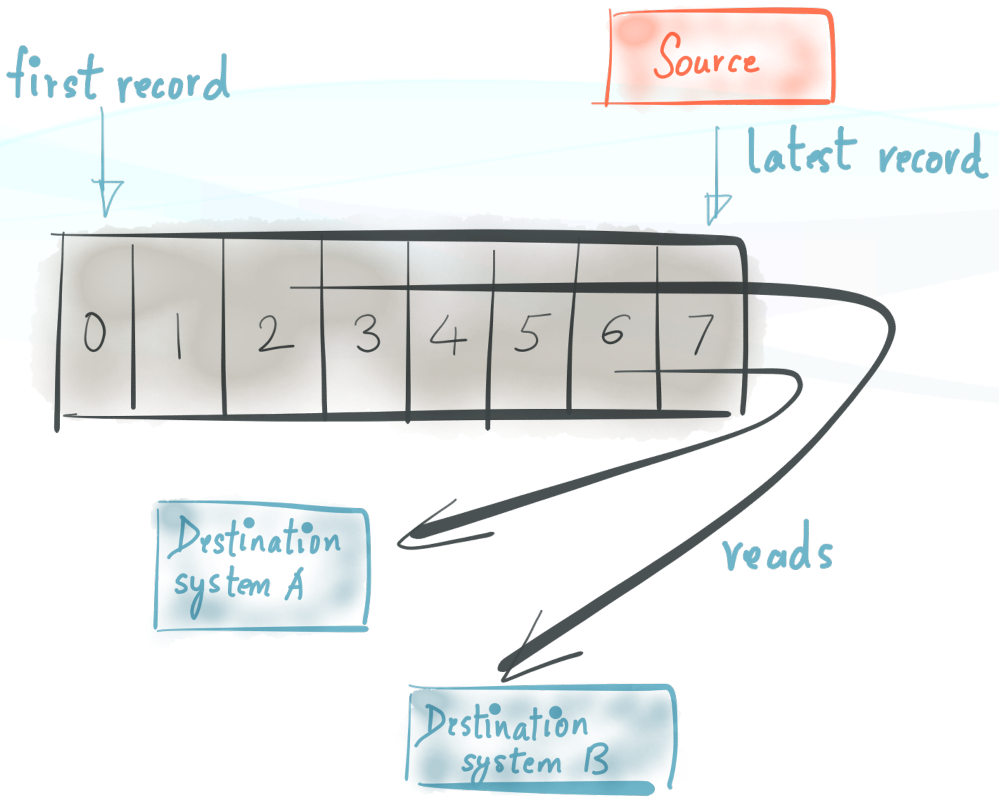
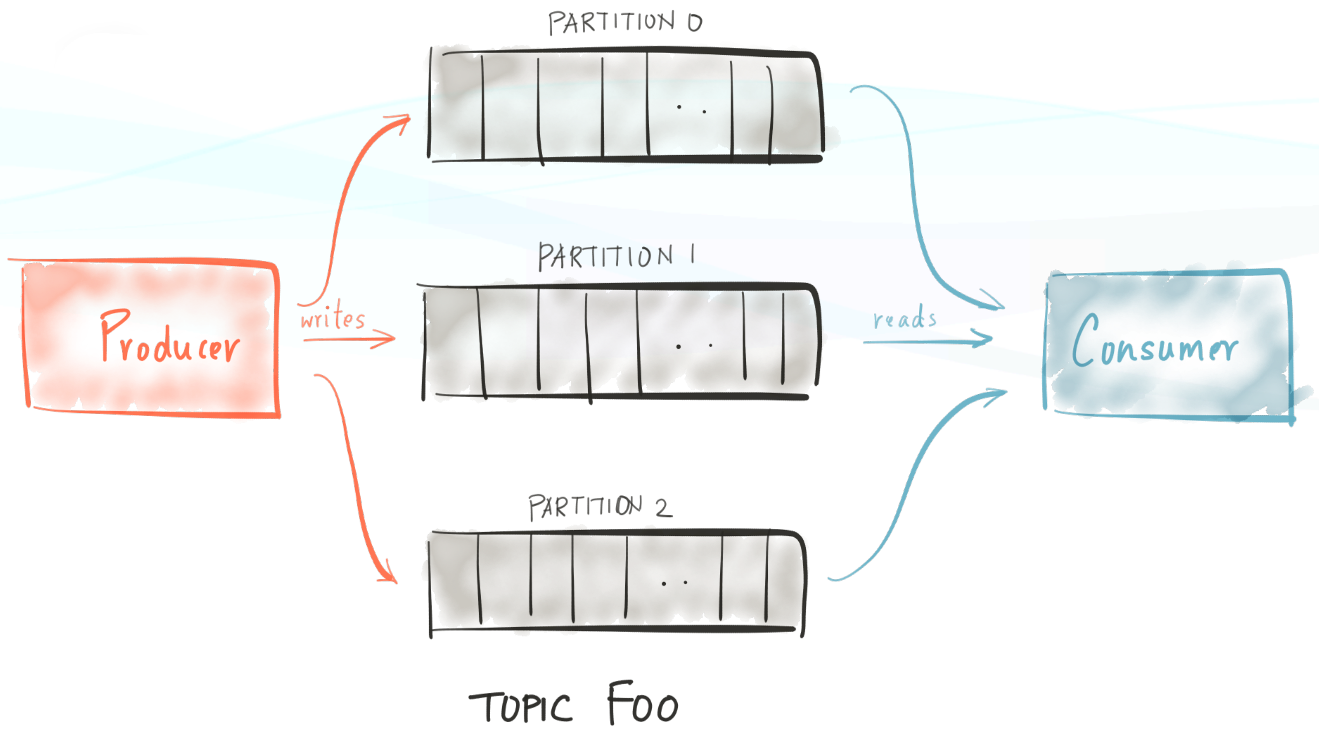
Logs & Pub-Sub



first record
Source
latest record
0
1
2
3
4
5
6
7
reads
Destination system A
Destination system B

Topic ≈ Partitioned Log



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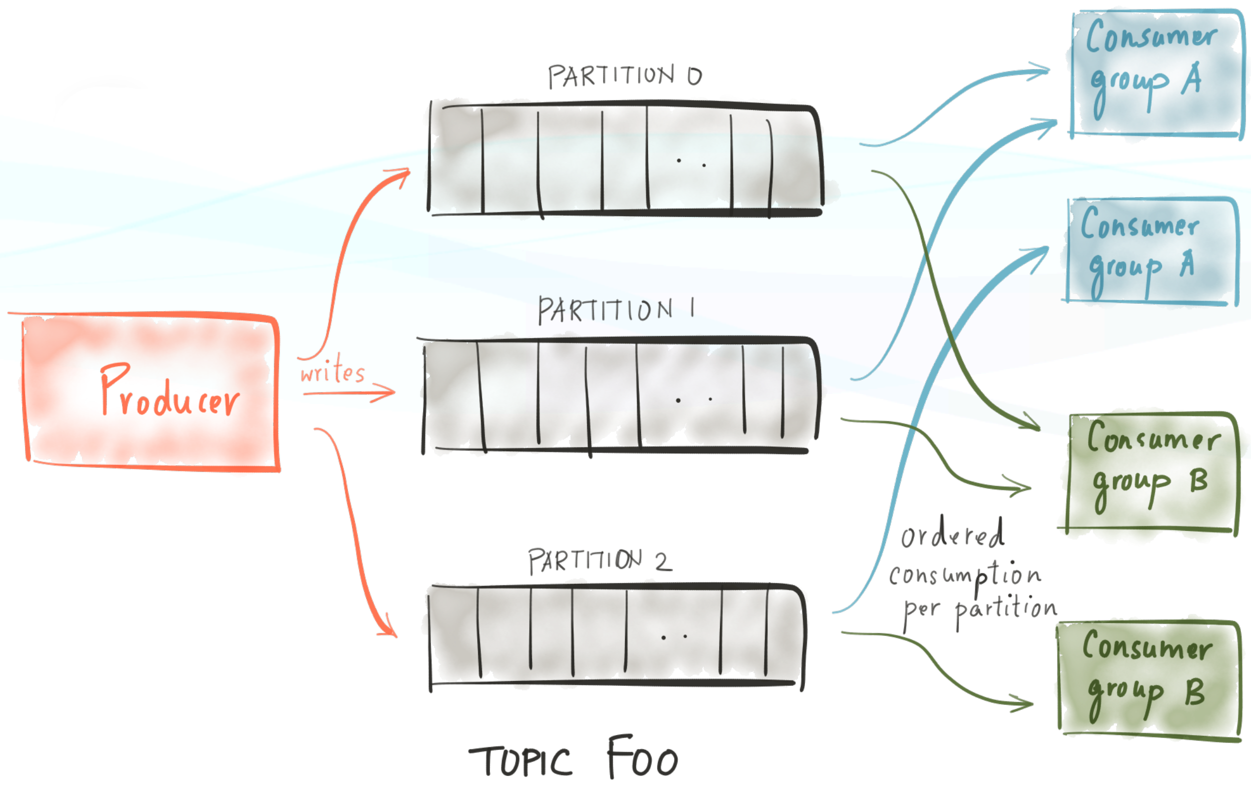
SCALABLE CONSUMPTION



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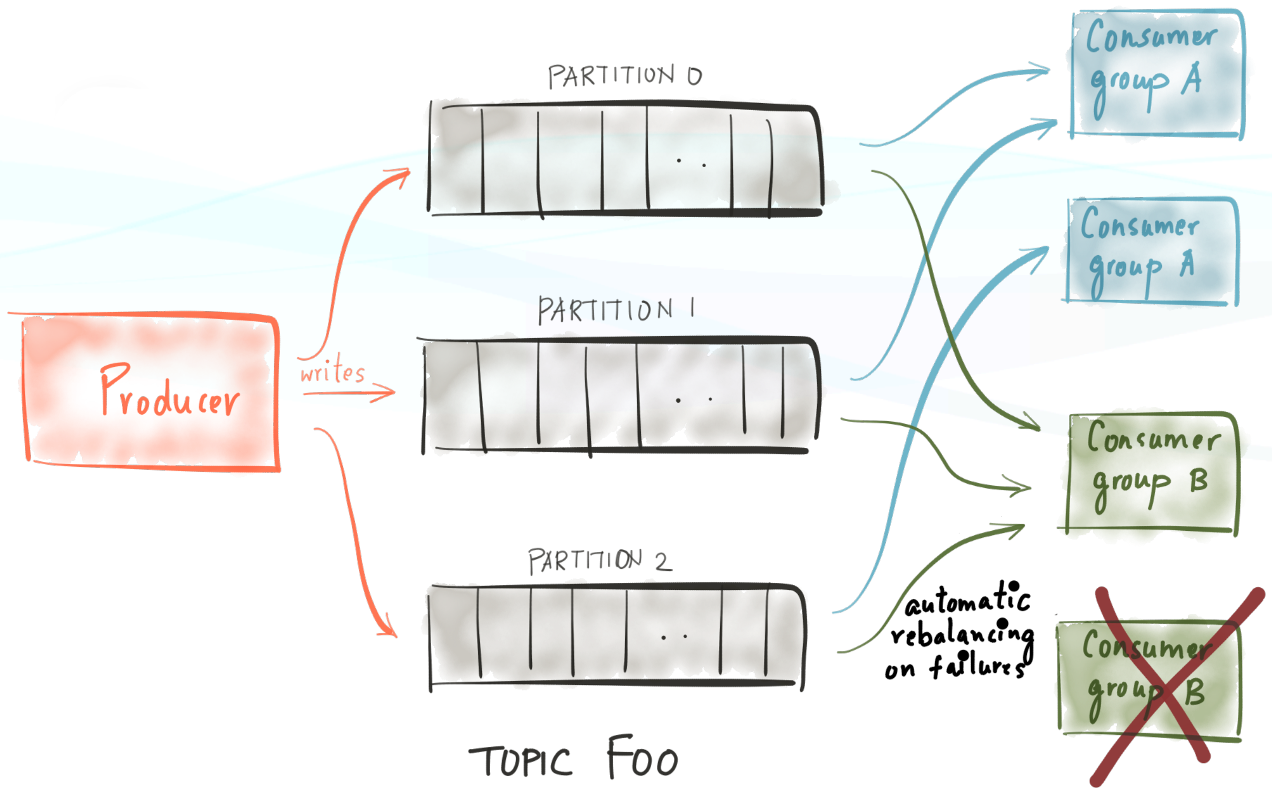
Fault Tolerant Consumption



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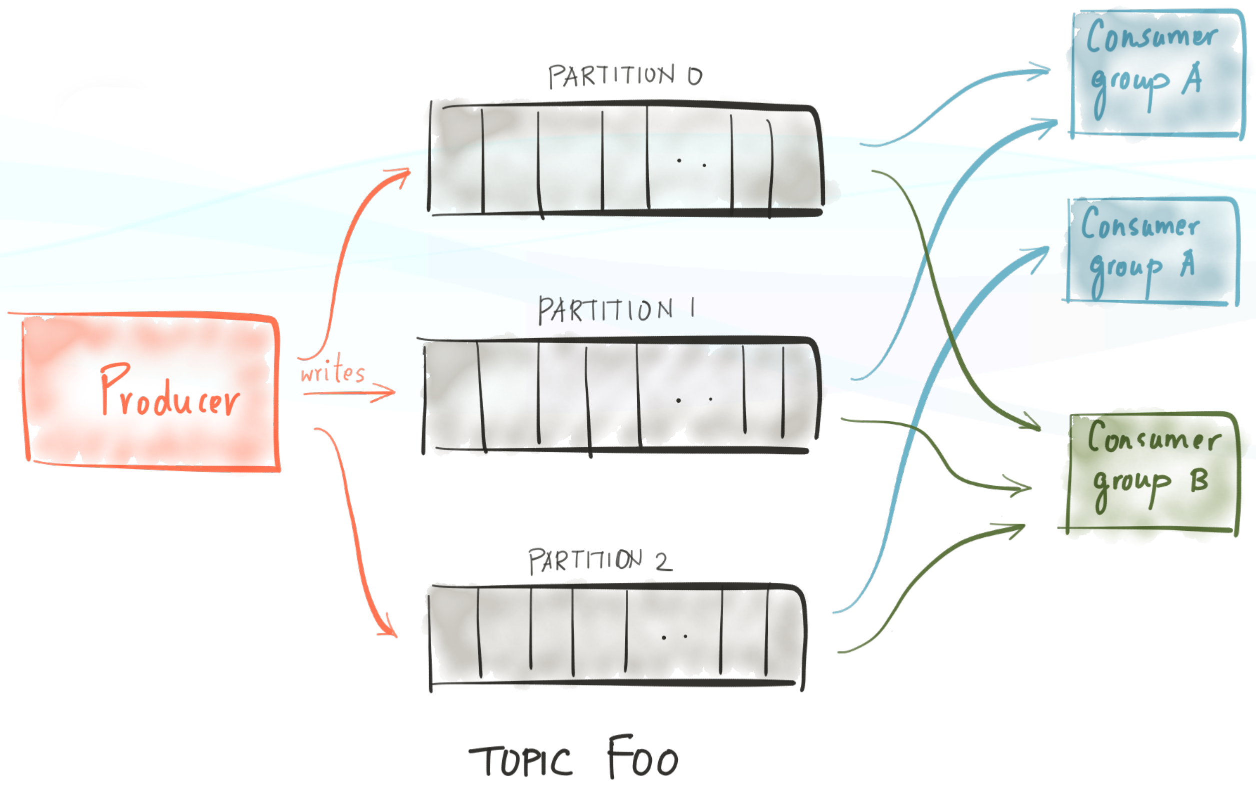
FAULT TOLERANT CONSUMPTION



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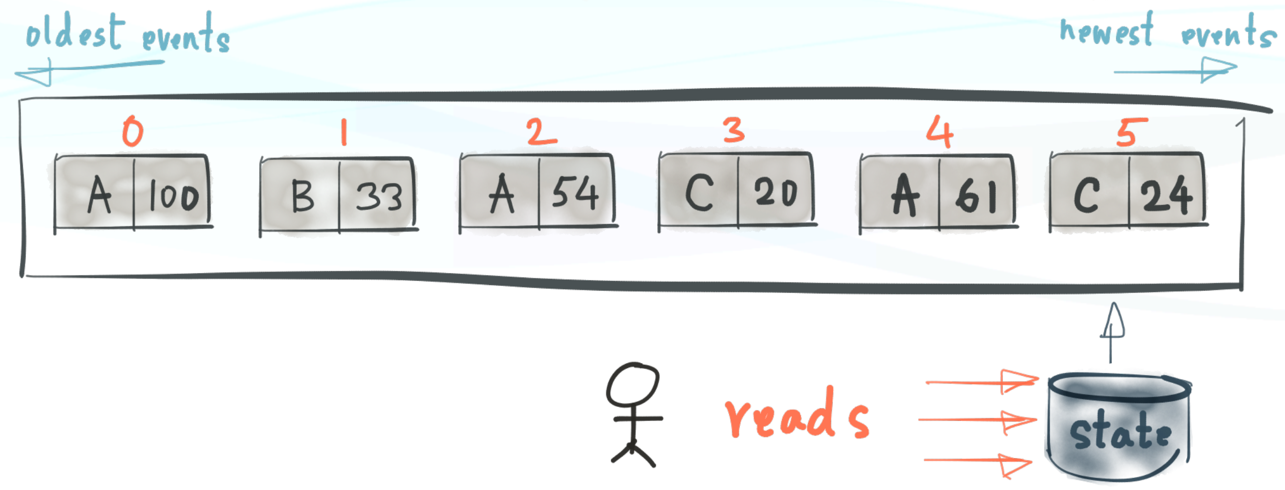
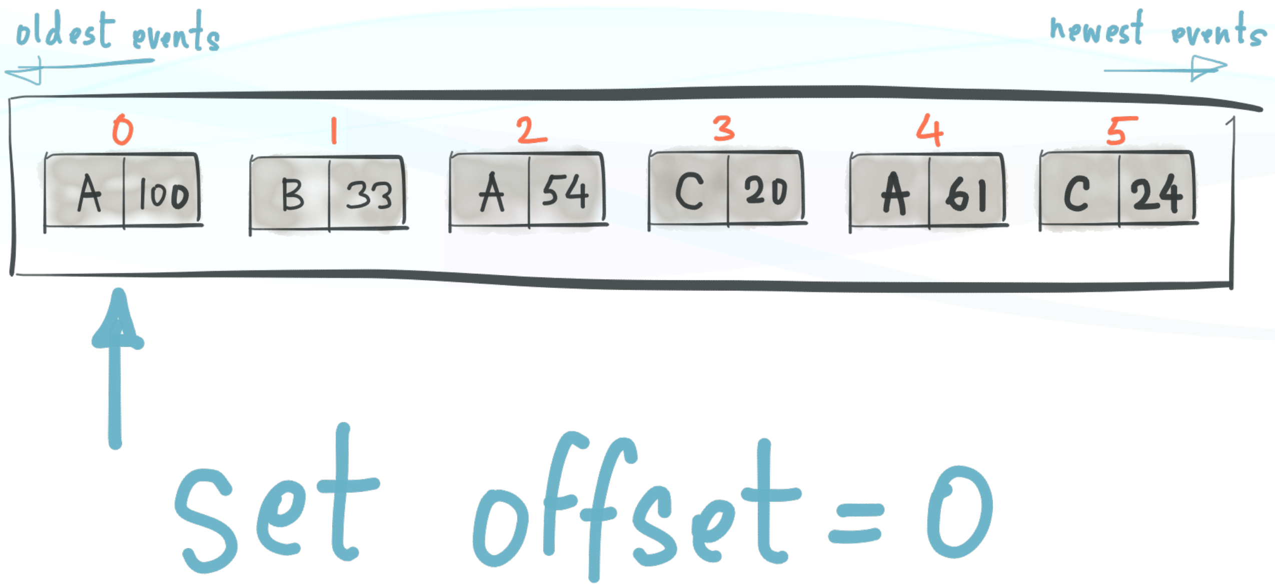
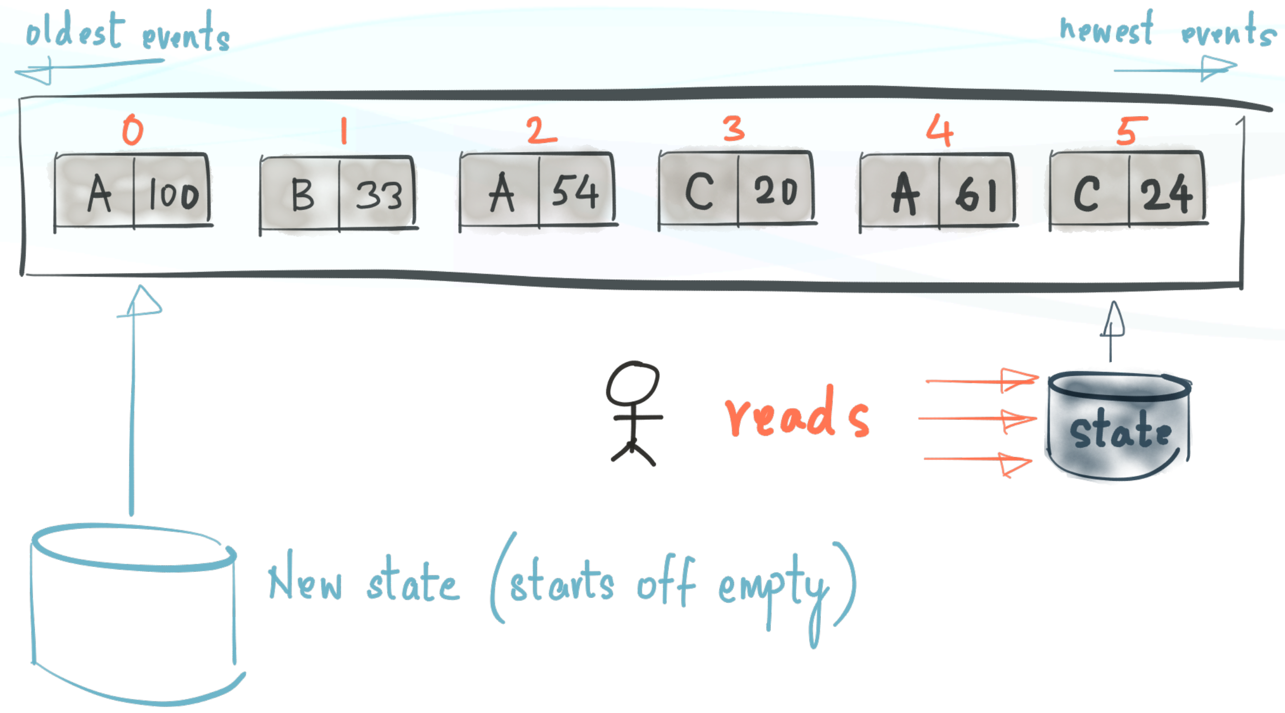
REPROCESSING



REPROCESSING



REPROCESSING



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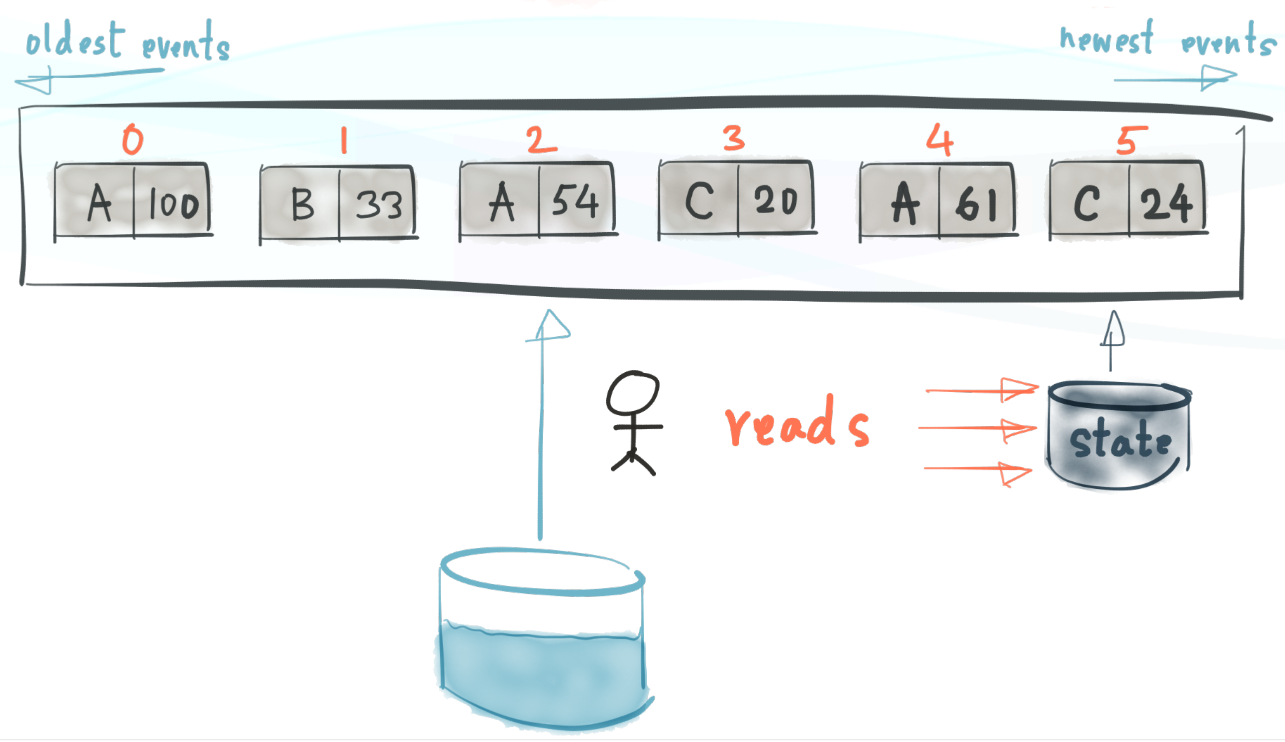
REPROCESSING



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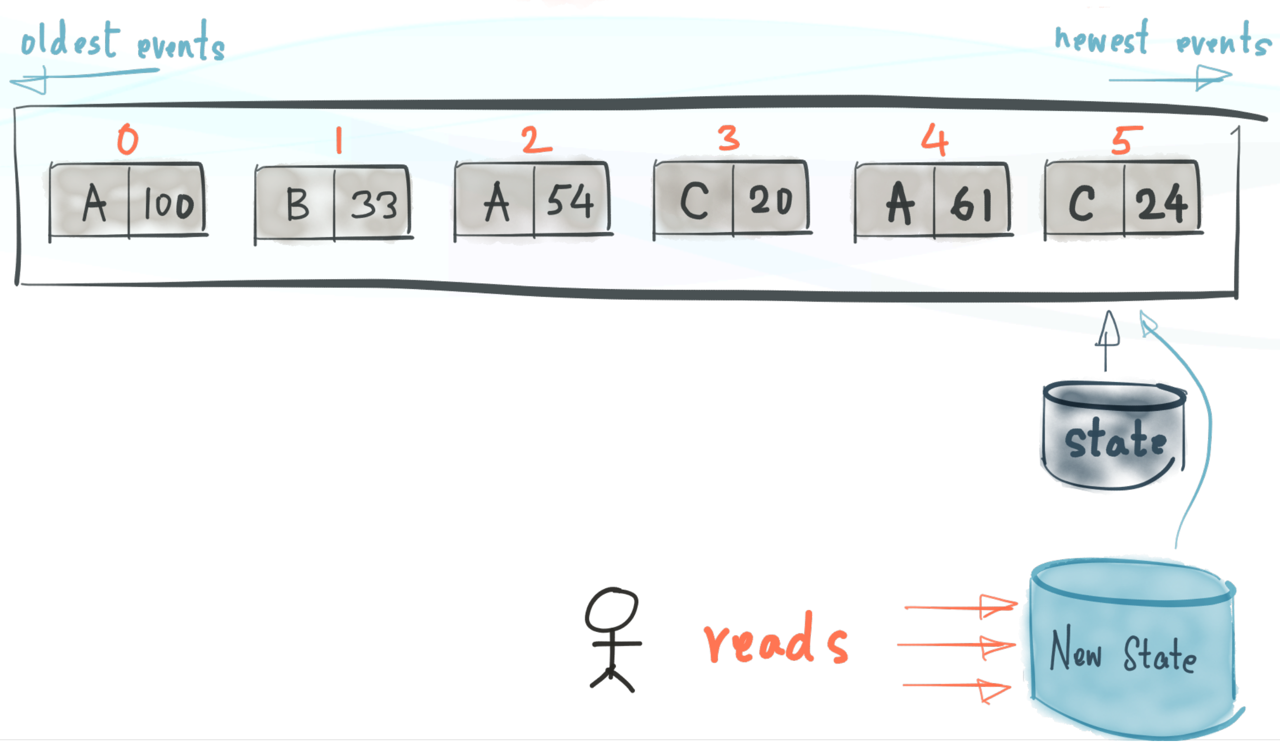
Reprocessing



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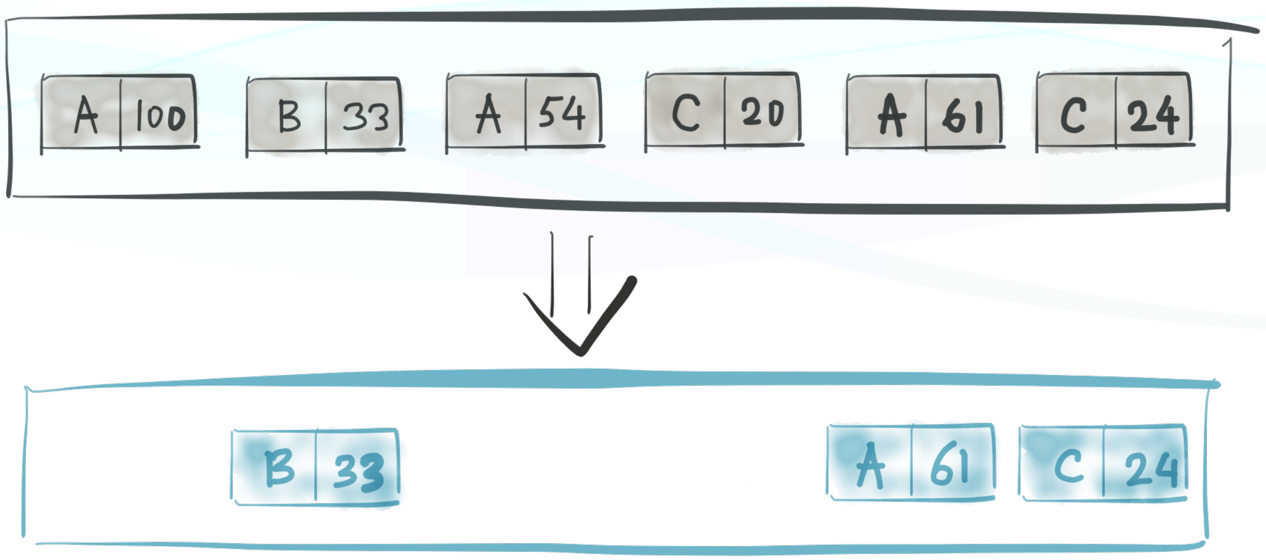
Log Compaction



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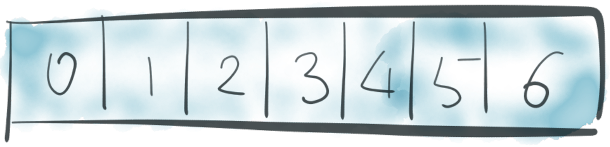
Logs unify Batch & Stream Processing



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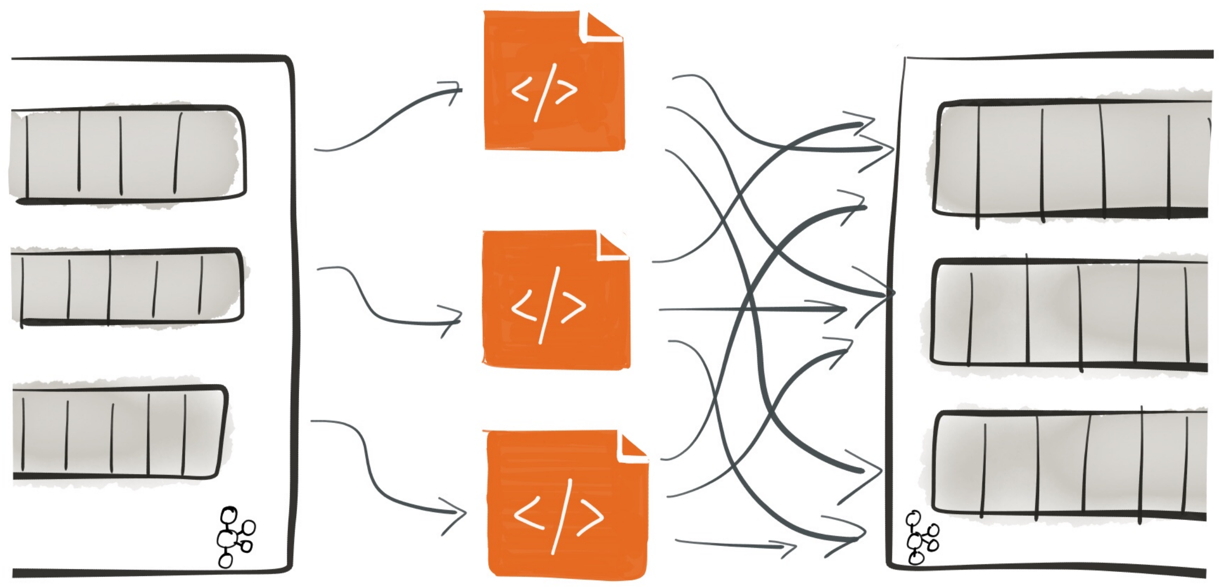
STREAM PROCESSING



CONSUMER + CUSTOM CODE + PRODUCER

Kafka Streams

- library
- 2 interfaces
  1. processor API
  2. kstream DSL

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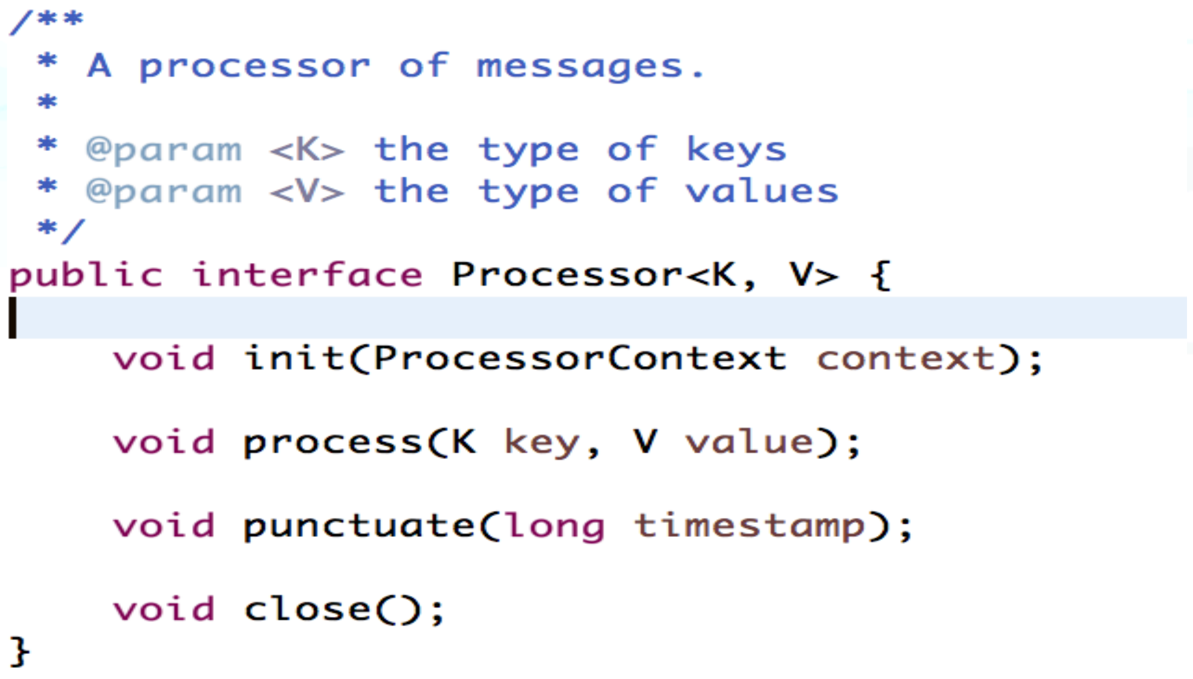
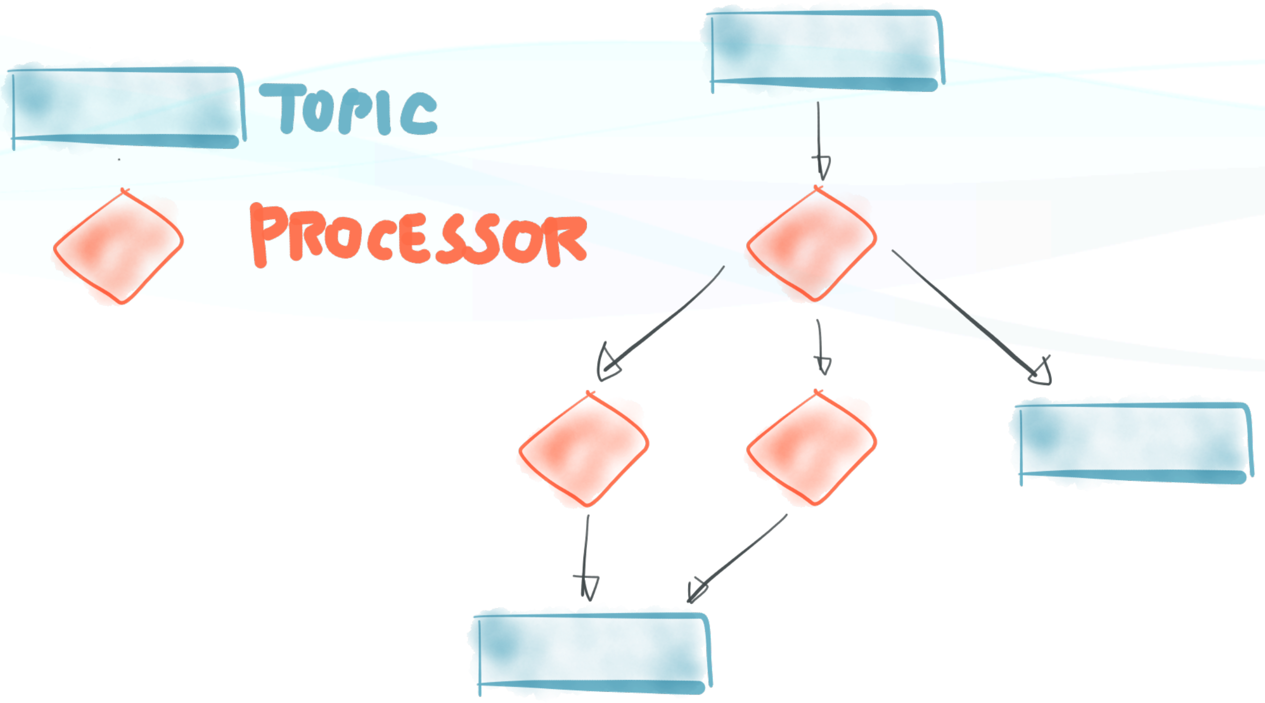
LIBRARIES VS FRAMEWORKS

Processor API



```java
/**
 * A processor of messages.
 *
 * @param <K> the type of keys
 * @param <V> the type of values
 */
public interface Processor<K, V> {

    void init(ProcessorContext context);

    void process(K key, V value);

    void punctuate(long timestamp);

    void close();
}
```

DAGS



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Processor Api

```java
public static void main(String[] args) throws Exception {
    Properties props = new Properties();
    props.put(StreamingConfig.CLIENT_ID_CONFIG, "Example-Processor-Job");
    props.put(StreamingConfig.BOOTSTRAP_SERVERS_CONFIG, "localhost:9092");
    props.put(StreamingConfig.TIMESTAMP_EXTRACTOR_CLASS_CONFIG, WallclockTimestampExtractor.class);
    StreamingConfig config = new StreamingConfig(props);

    TopologyBuilder builder = new TopologyBuilder();
    builder.addSource("SOURCE", new StringDeserializer(), new StringDeserializer(), "topic-source");
    builder.addProcessor("PROCESS", new MyProcessorDef(), "SOURCE");
    builder.addSink("SINK", "topic-sink", new StringSerializer(), new IntegerSerializer(), "PROCESS");
    KafkaStreaming streaming = new KafkaStreaming(builder, config);
    streaming.start();
}
```

KSTREAMS

```
StreamingConfig config = new StreamingConfig(props);

// build the topology
KStreamBuilder builder = new KStreamBuilder();
KStream<String, String> stream1 = builder.from("topic1");

KStream<String, Integer> stream2 =
    stream1.map((key, value) -> new KeyValue<>(key, value.cost()))
           .aggregate(0, (oldval, newval) -> oldval + newval);

KStream<String, Integer>[] streams = stream2
    .filter((key, value) -> value > 10);

streams[0].sendTo("topic2");
streams[1].sendTo("topic3");

// start the process
KafkaStreaming kstream = new KafkaStreaming(builder, config);
kstream.start();
```

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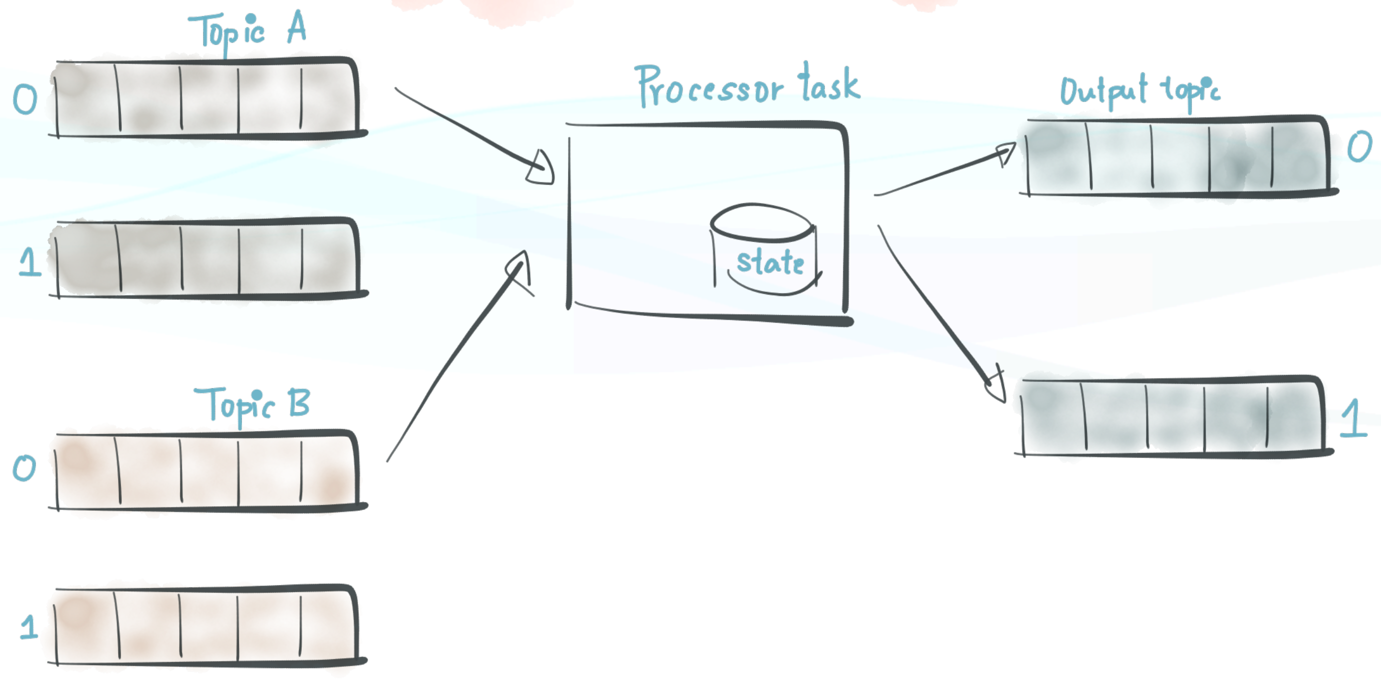
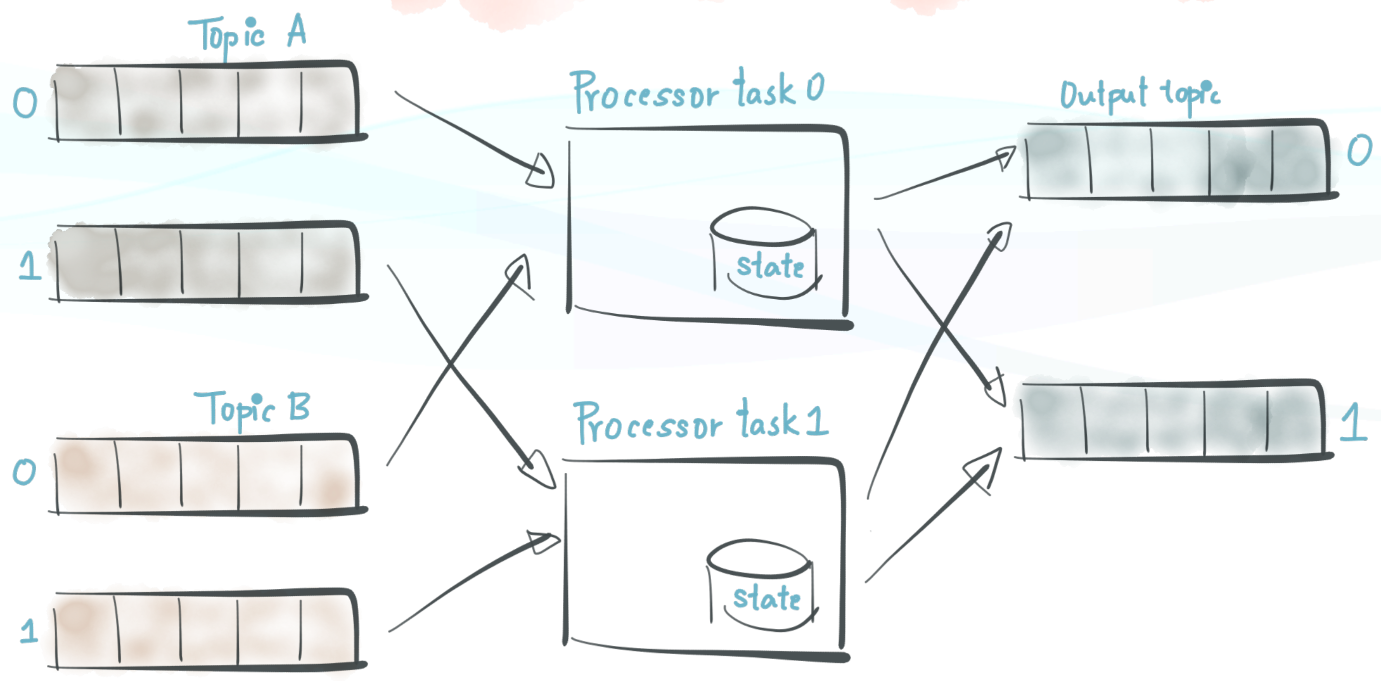
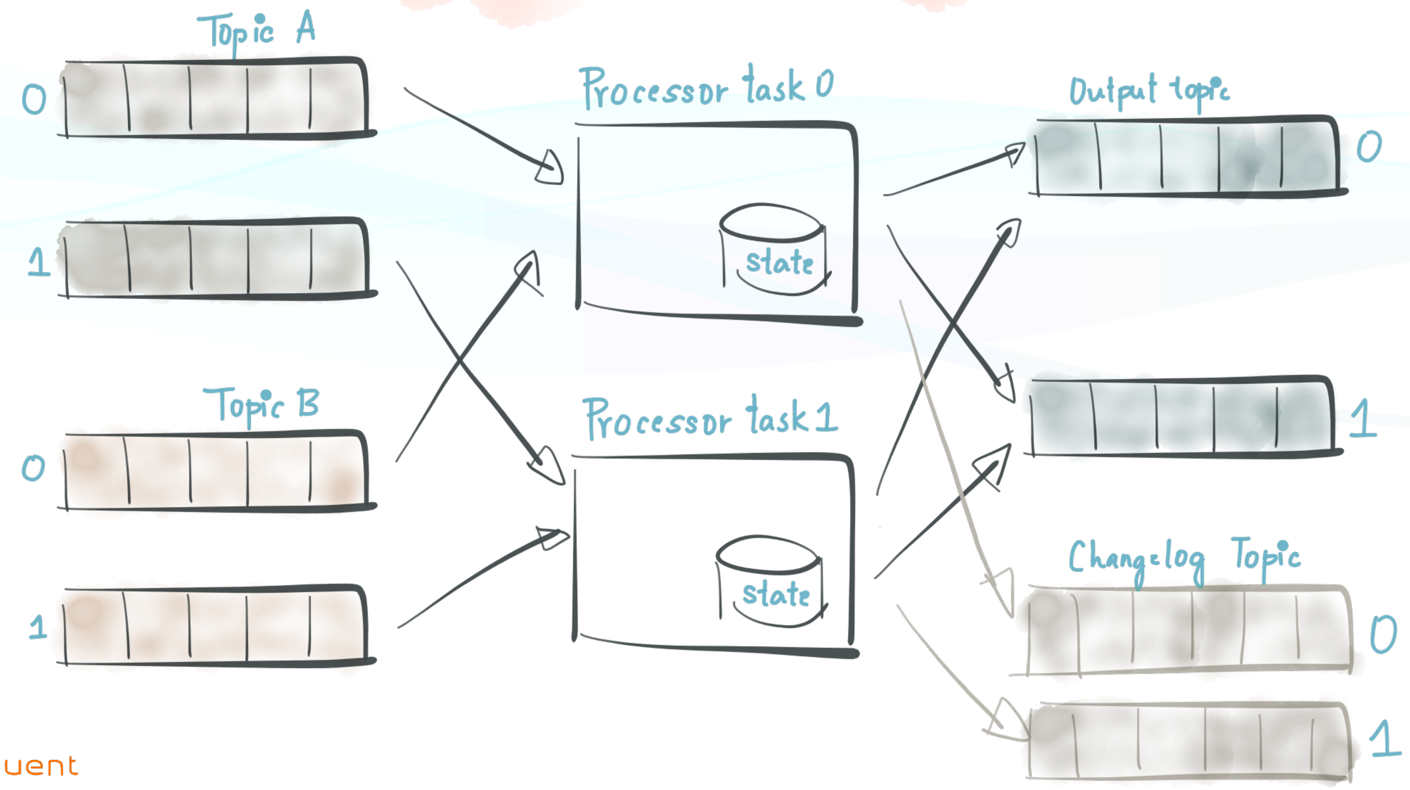
Execution Model



Execution Model



Execution Model



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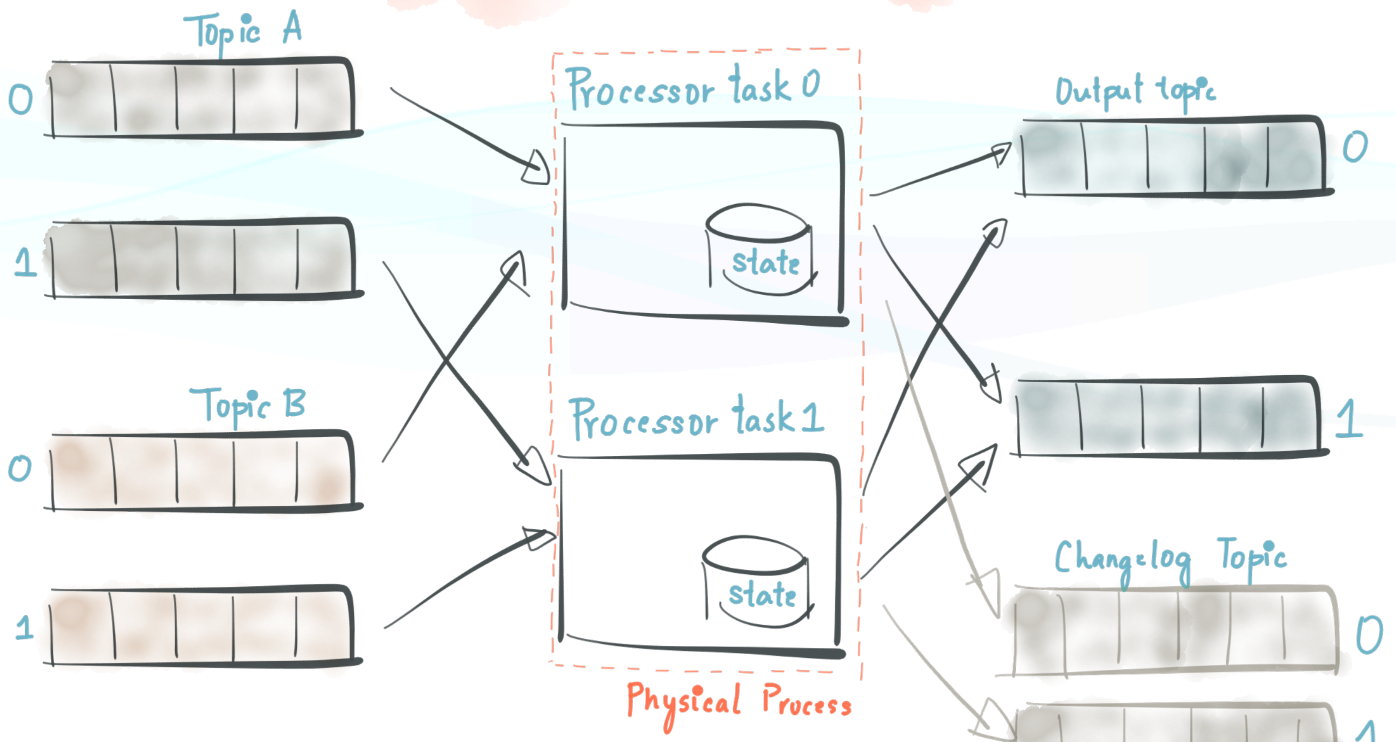
Execution Model



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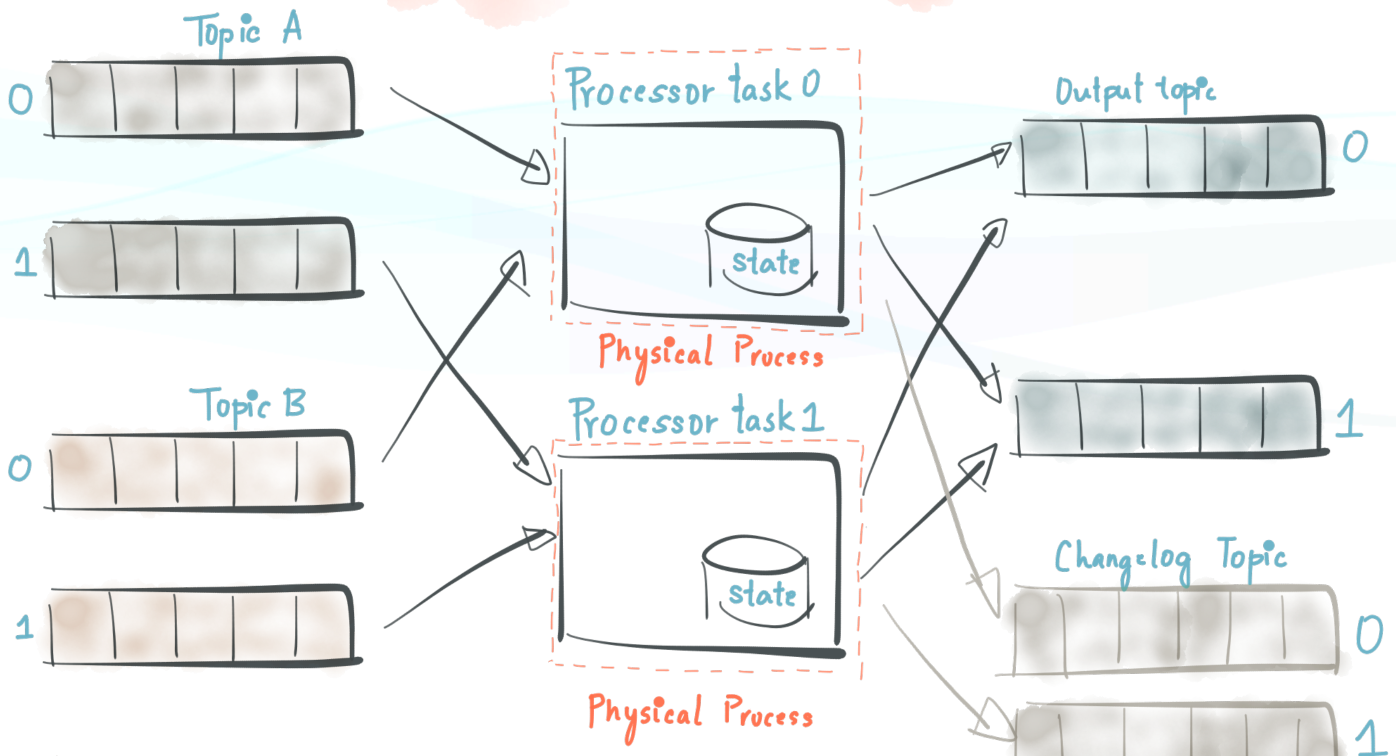
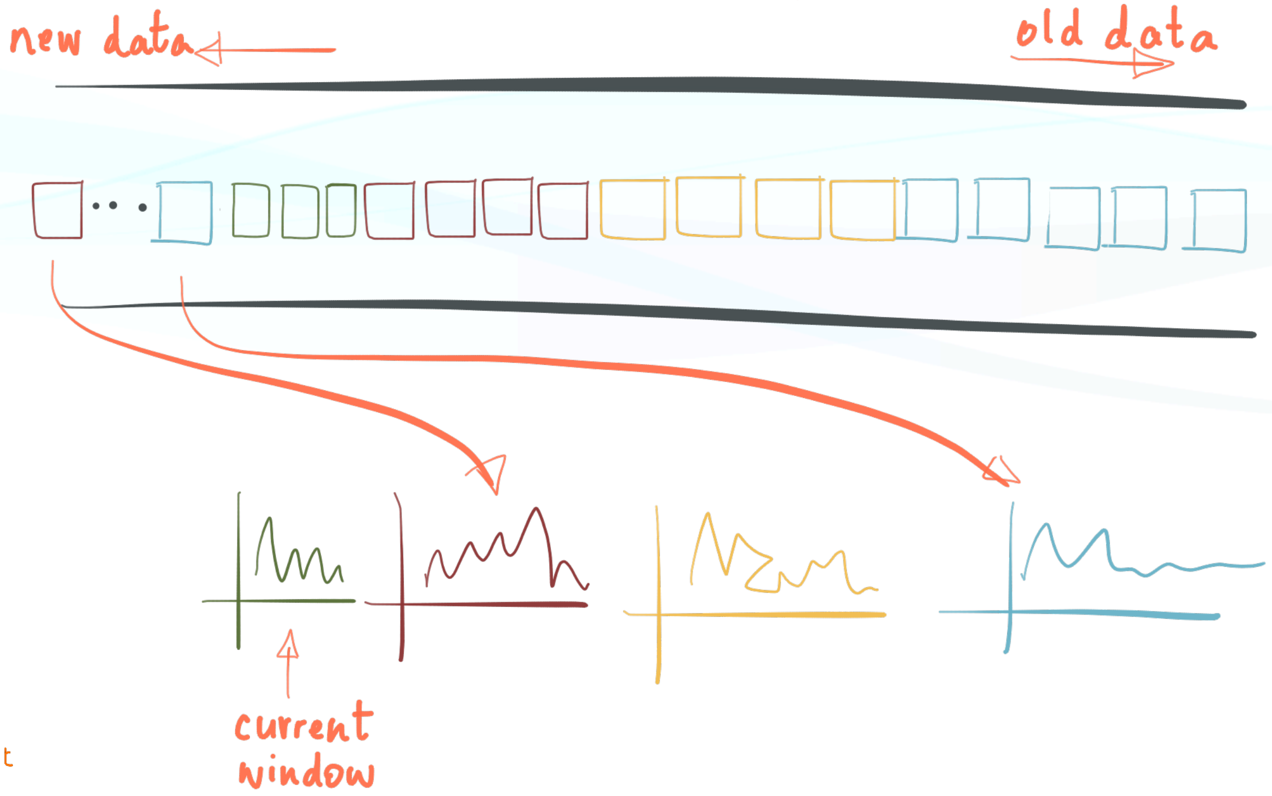
Execution Model



TIME

WINDOWING



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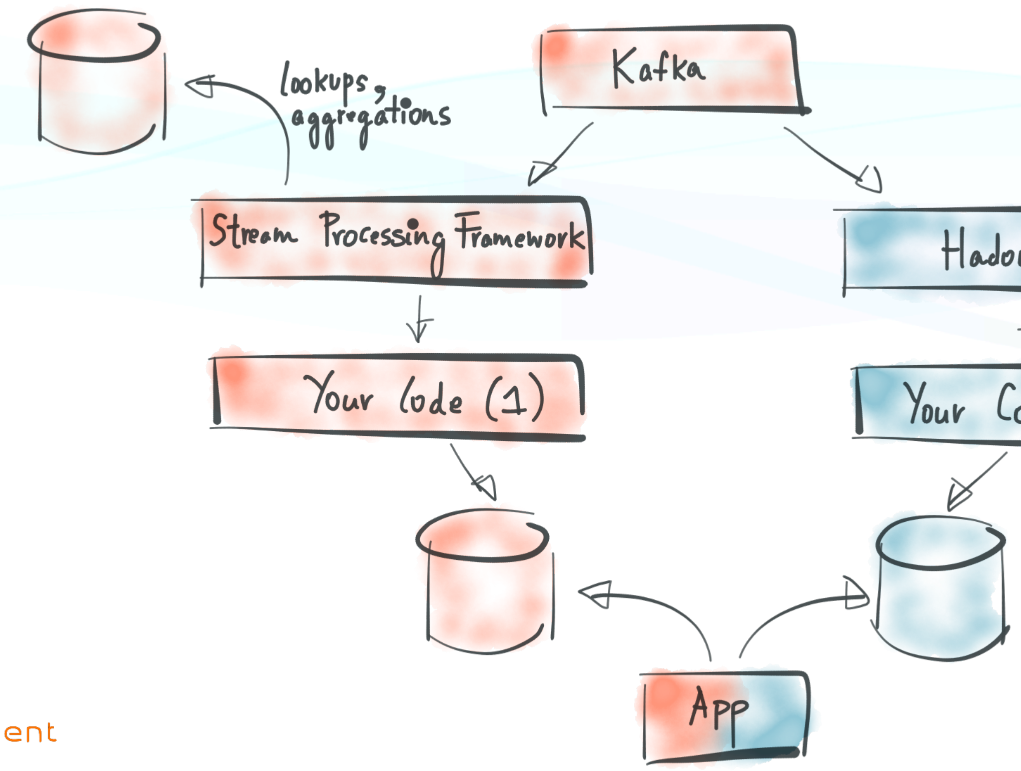
EXAMPLE ARCHITECTURE



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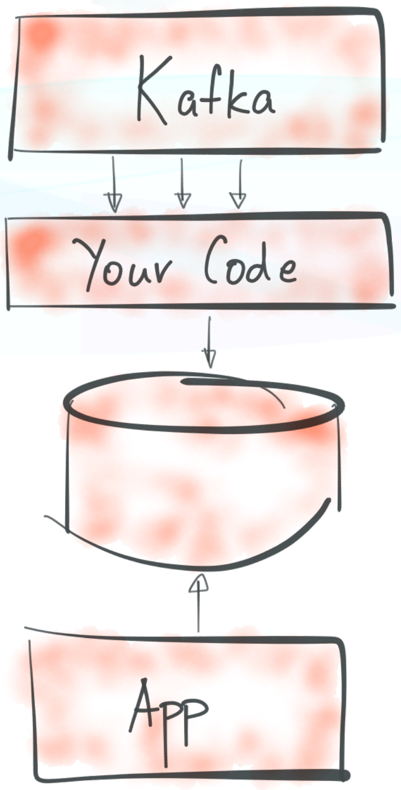
Kafka Streams



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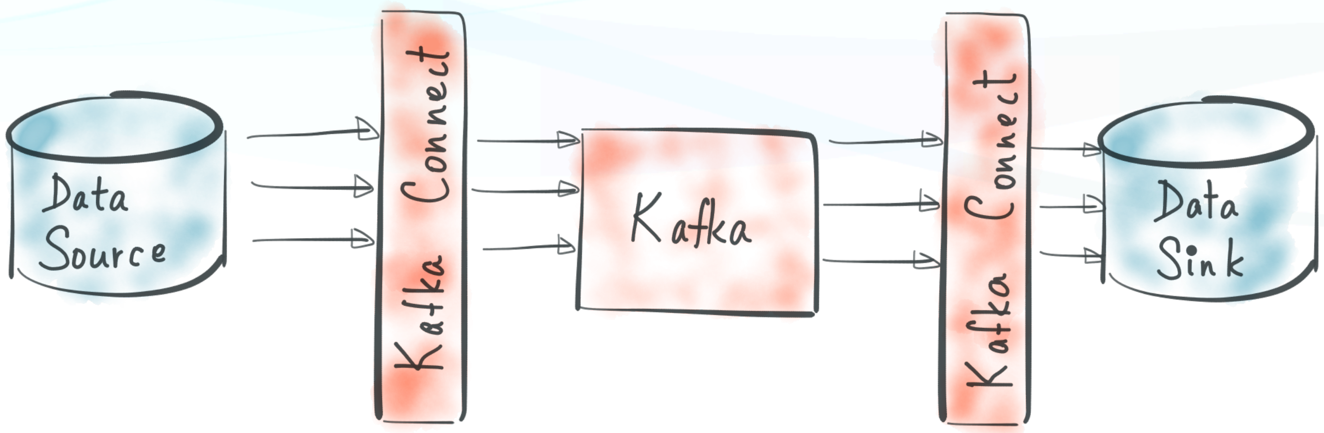
Kafka Connect



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Kafka Connect Does The Hard Work

1. Scale out
2. Fault tolerance
3. Central management

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Timeline

- Kafka Connect
- Kafka Streams

Next Steps

- Expanded DSL
- Exactly-once

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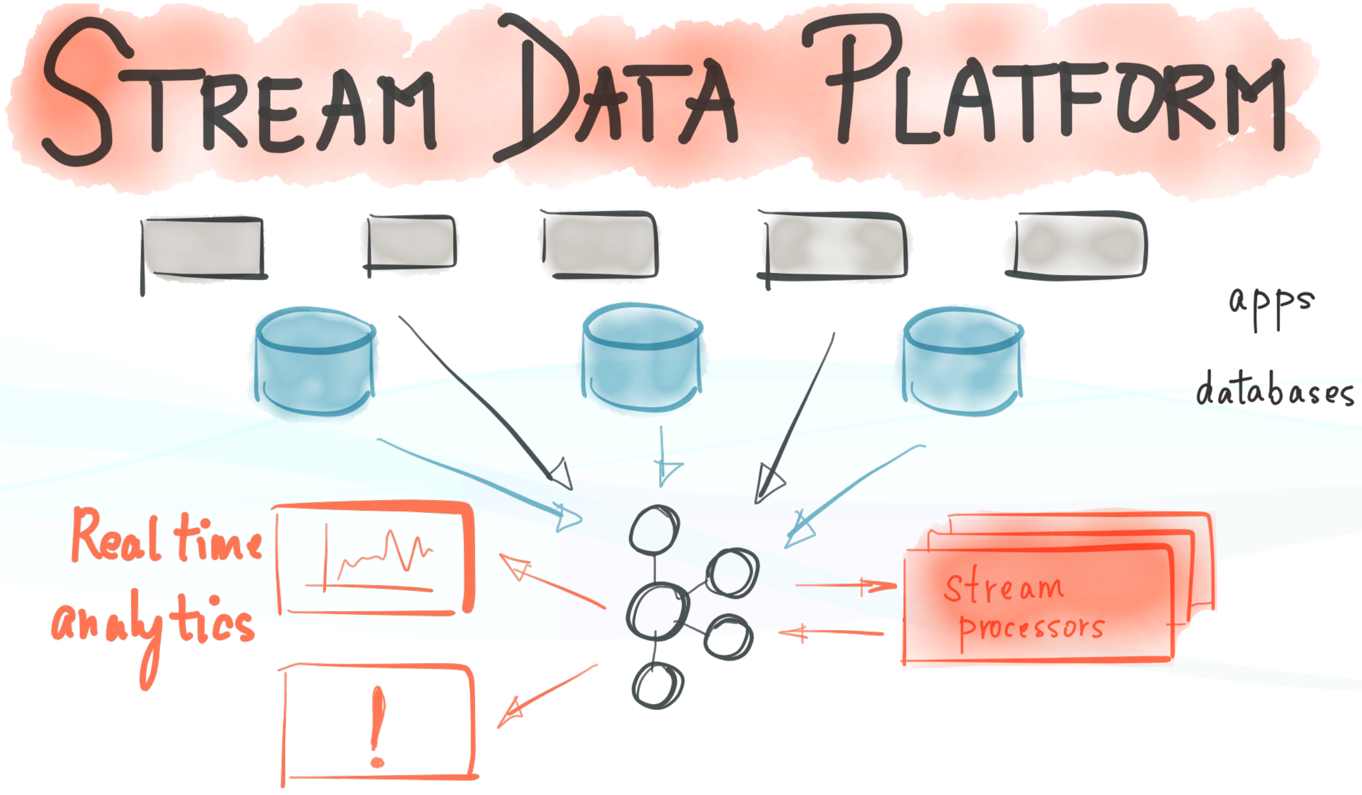
Stream Data Platform
apps
databases
Real time analytics
!
Stream processors

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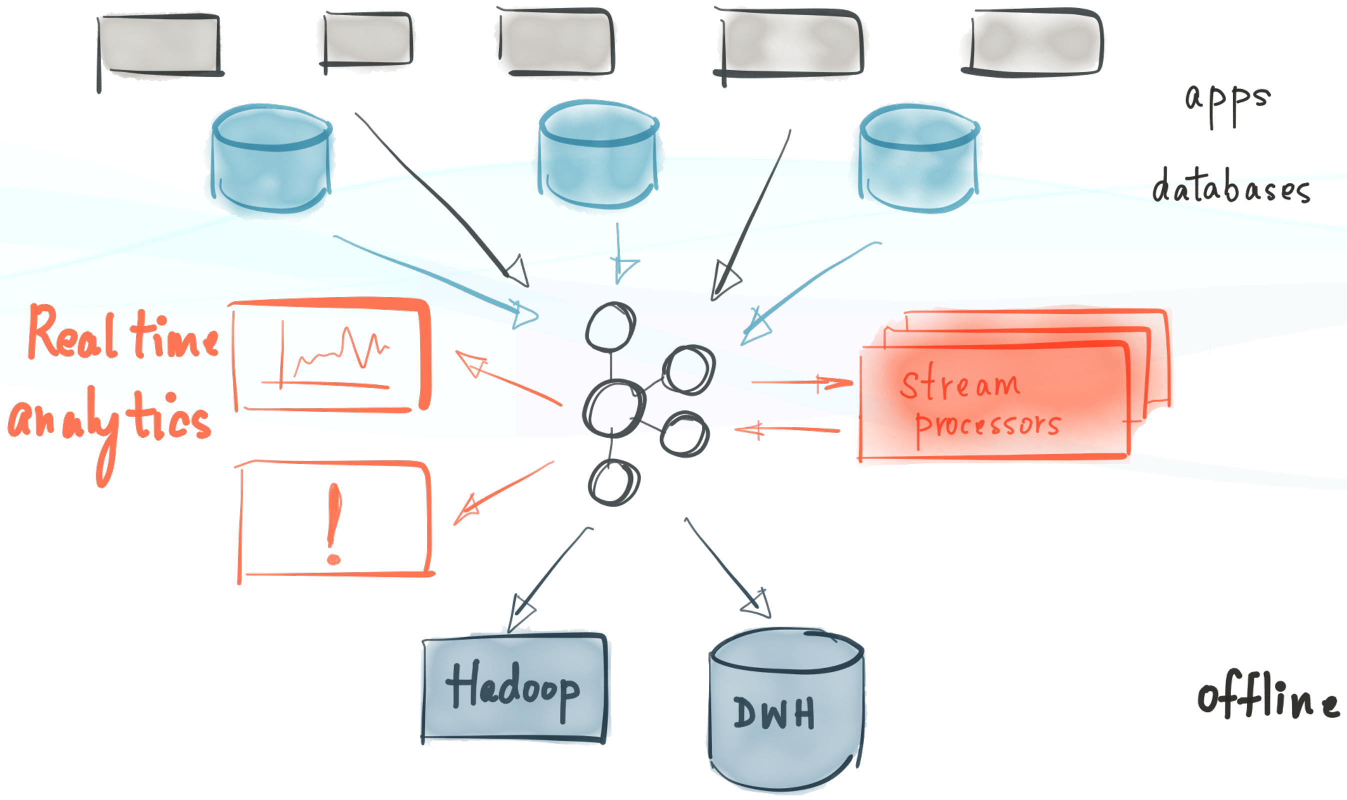
Stream Data Platform



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CONFLUENT PLATFORM = KAFKA++

Confluent Platform

- Schemas
- Clients
- REST
- Connectors
- Management tools

. . .

kafkasummit

April 26, 2016
San Francisco, CA

www.kafka-summit.org

Organized by confluent

THE END

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and Confluent Platform

apache kafka

www.confluent.io/download

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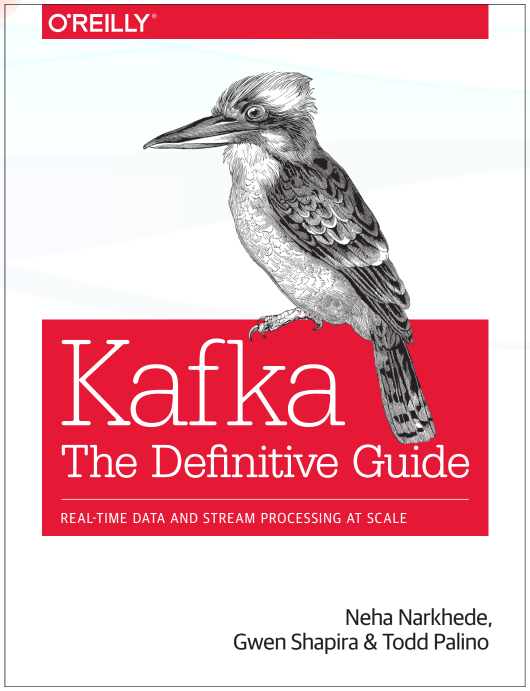
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Kafka
The Definitive Guide
REAL-TIME DATA AND STREAM PROCESSING AT SCALE
Neha Narkhede,
Gwen Shapira & Todd Palino