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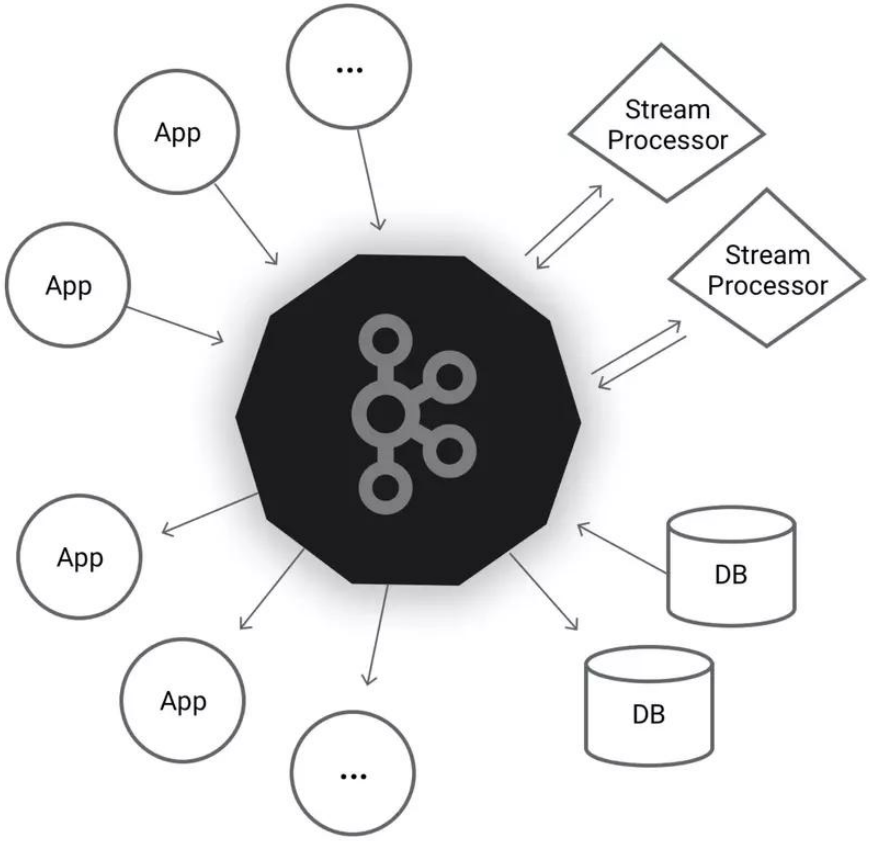
Kafka Streams: What it is, and how to use it?

Matthias J. Sax | Software Engineer | @MatthiasJSax
Apache Kafka PMC member

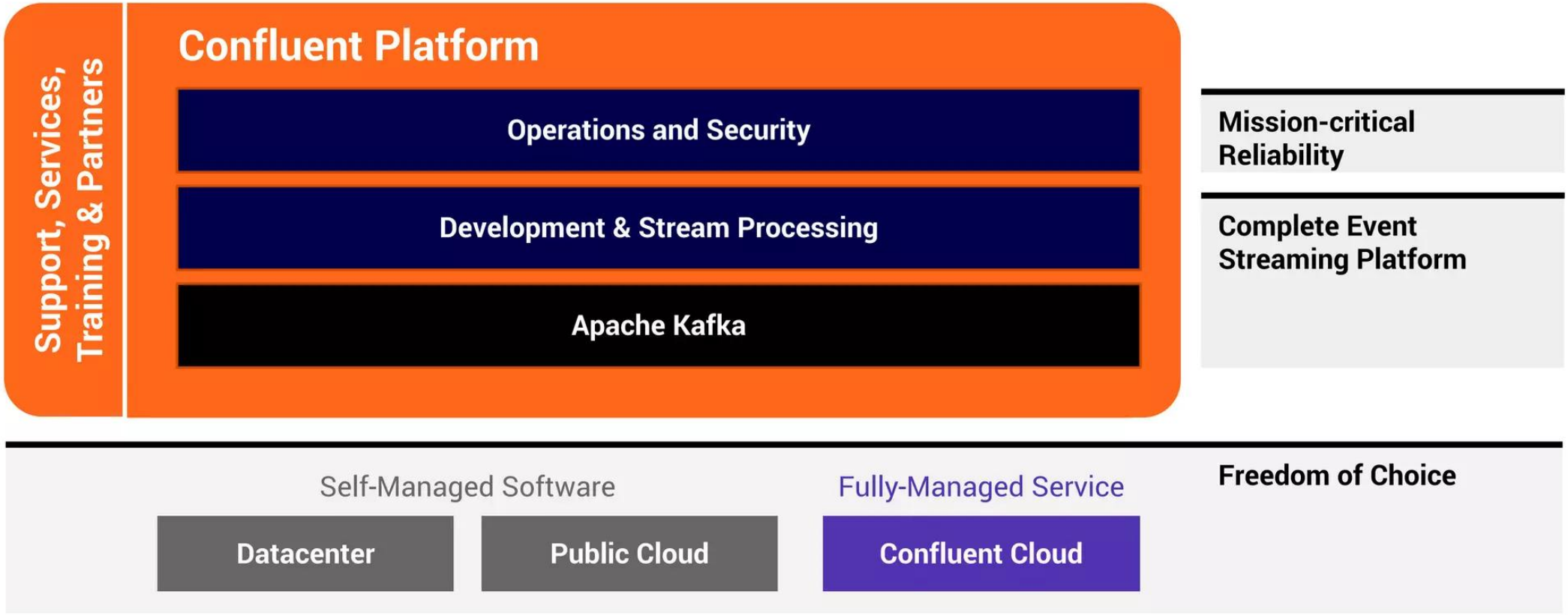

apache kafka

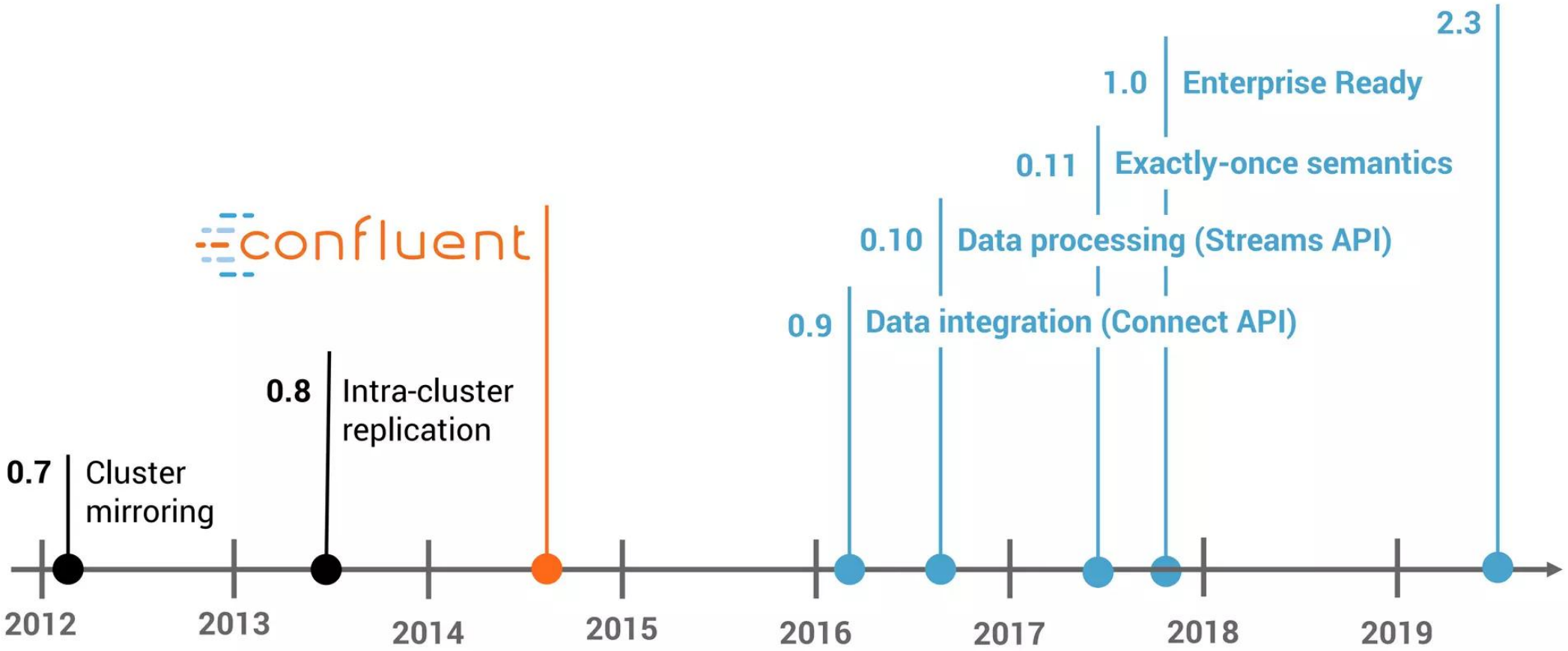
Apache Kafka®: A Distributed Streaming Platform



Confluent Platform

The Event Streaming Platform Built by the Original Creators of Apache Kafka®




2.3
1.0 Enterprise Ready
0.11 Exactly-once semantics
confluent
0.10 Data processing (Streams API)
0.9 Data integration (Connect API)
0.8 Intra-cluster replication
0.7 Cluster mirroring
2012
2013
2014
2015
2016
2017
2018
2019

Kafka Streams

(aka Streams API)

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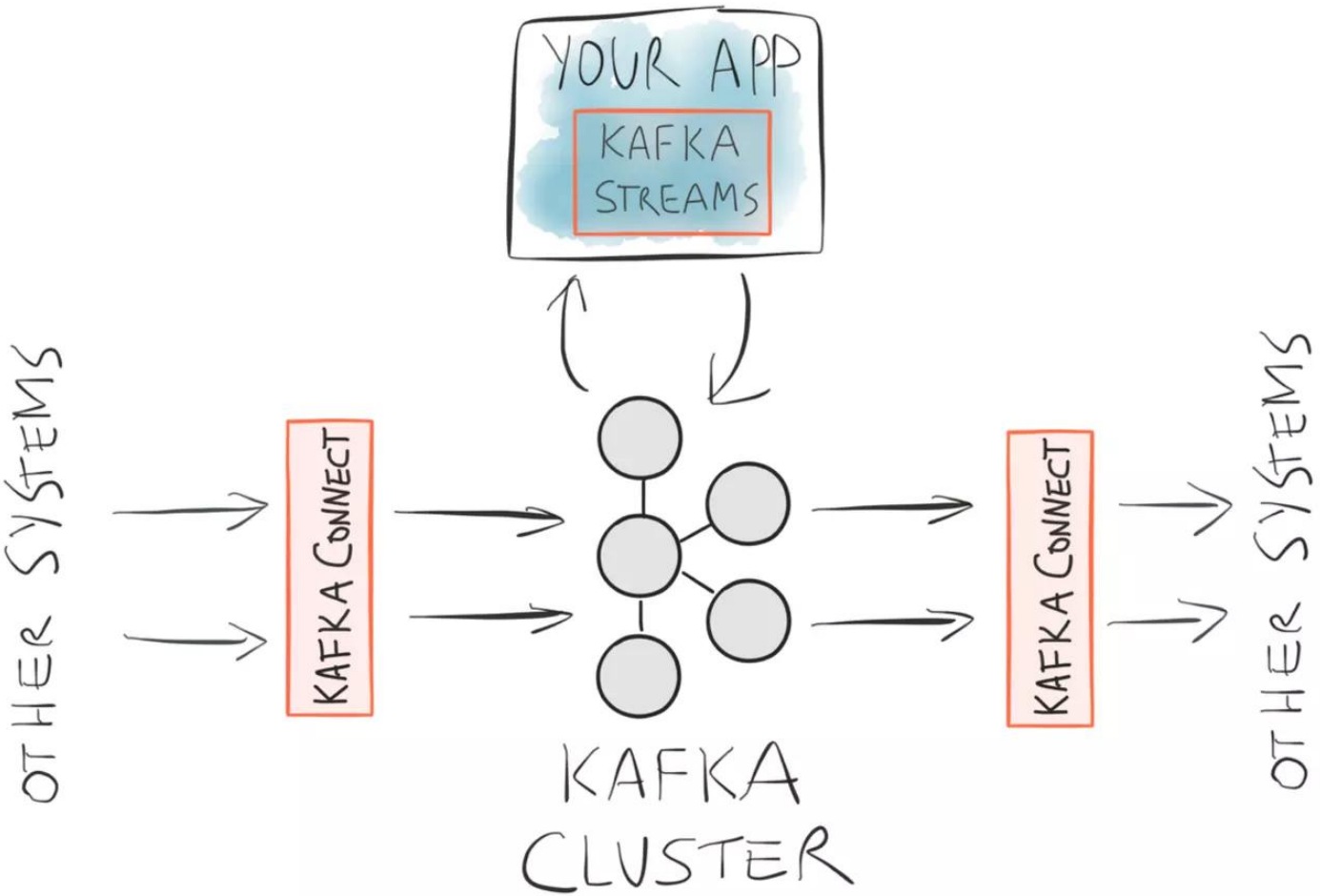
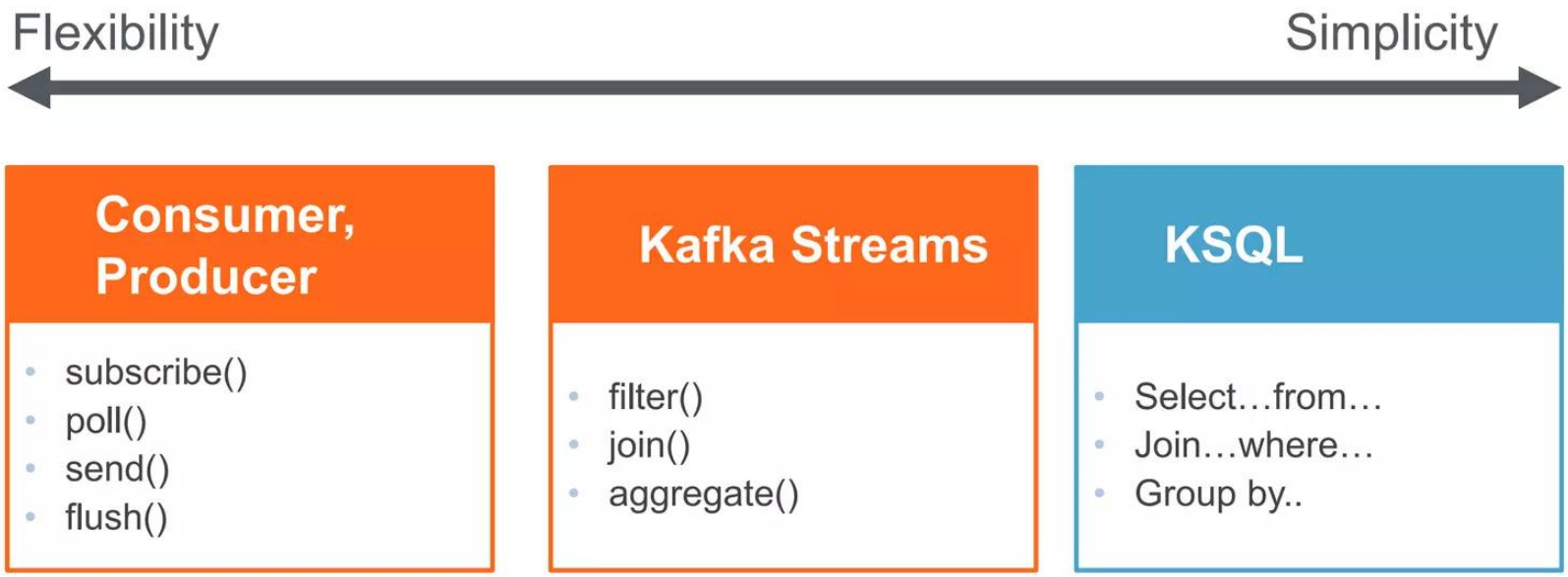
Streams API

- Java client library for building distributed apps
- Part of the Apache Kafka project
- Read-process-write pattern
- State handling, fault-tolerance, scaling


YOUR APP
KAFKA STREAMS
OTHER SYSTEMS
KAFKA CONNECT
KAFKA CLUSTER
KAFKA CONNECT
OTHER SYSTEMS

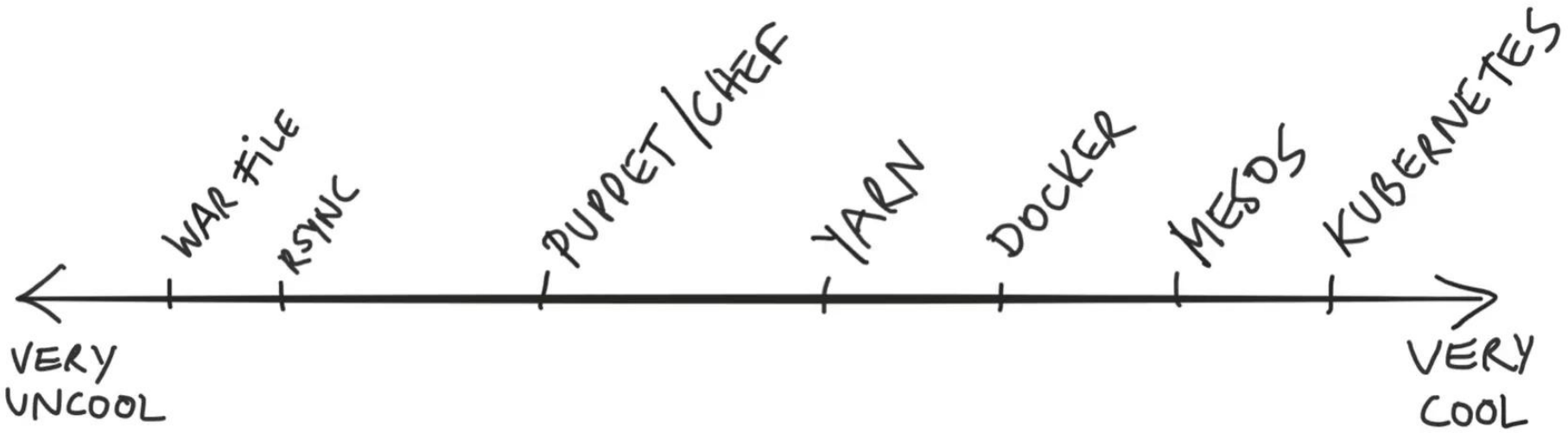
Why should I use it?



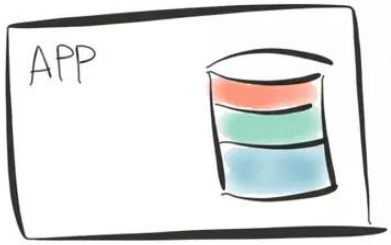
How can I use it?

```
<dependency>
  <groupId>org.apache.kafka</groupId>
  <artifactId>kafka-streams</artifactId>
  <version>2.3.0</version>
</dependency>
```

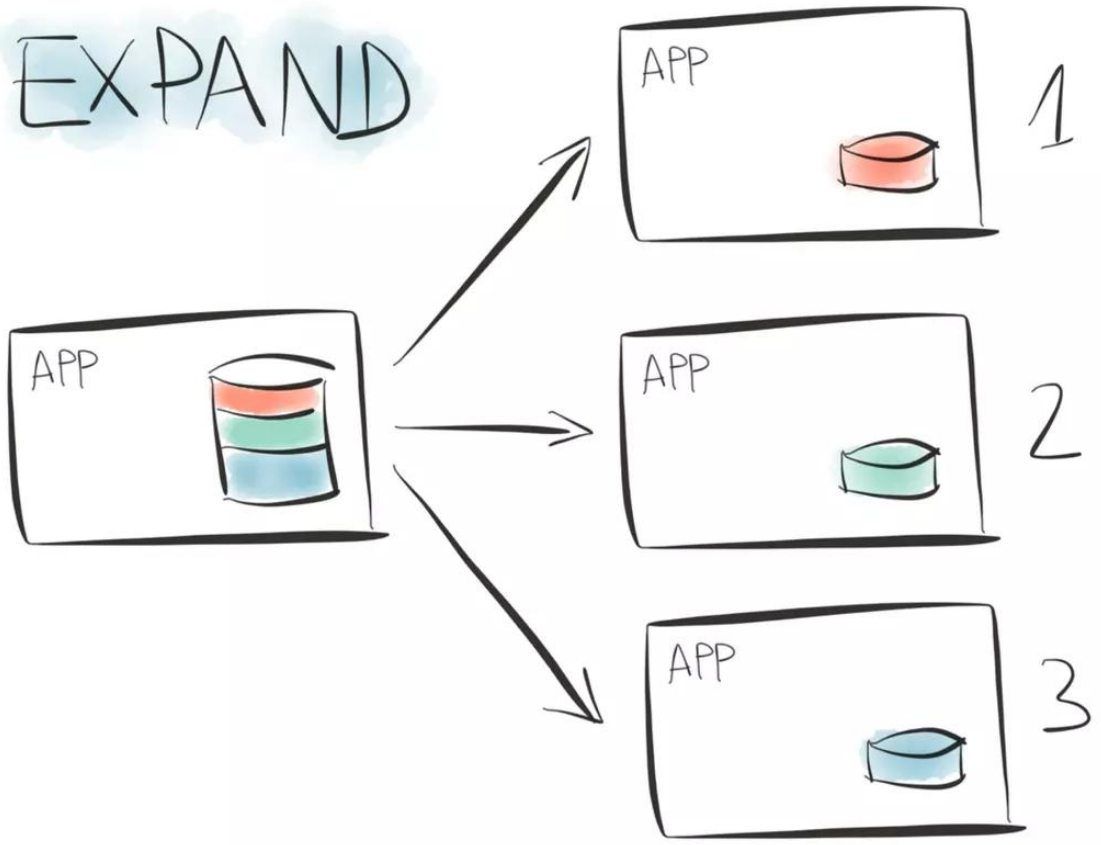
How do I deploy my application?



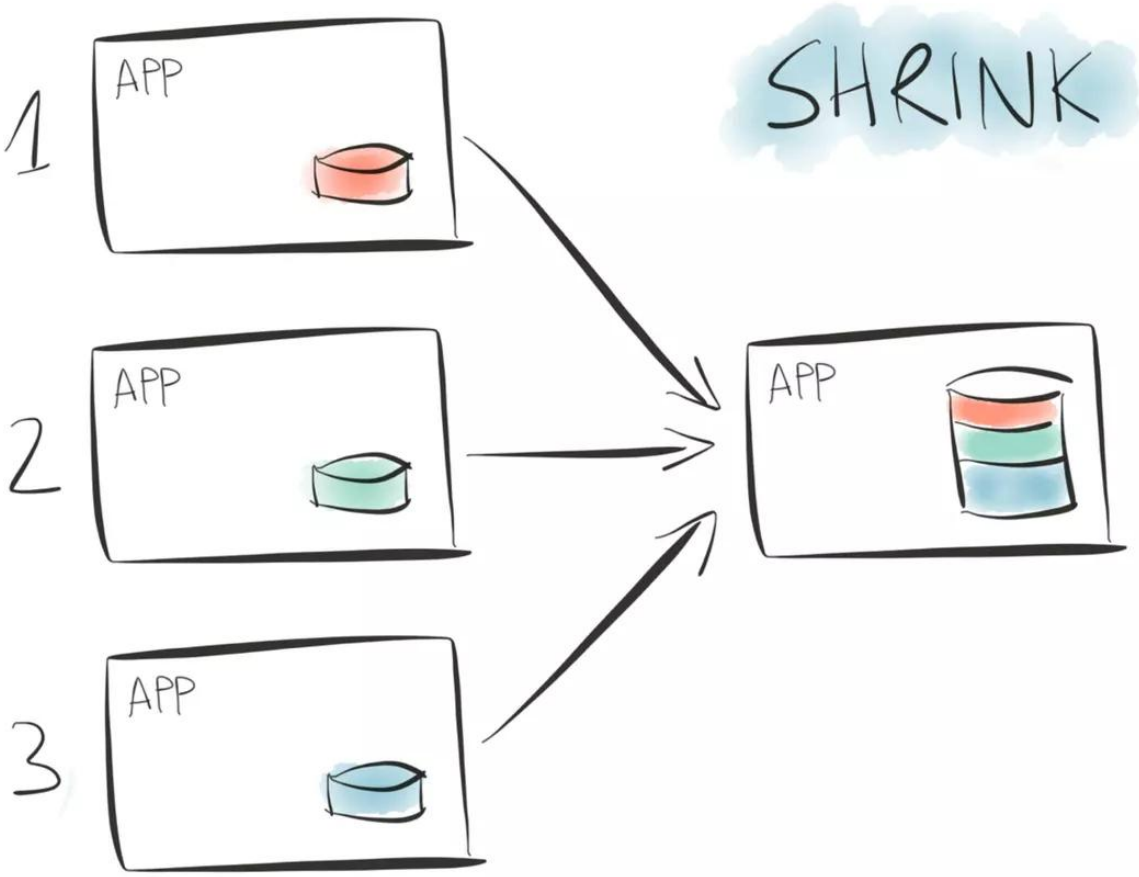
Scaling Your Application



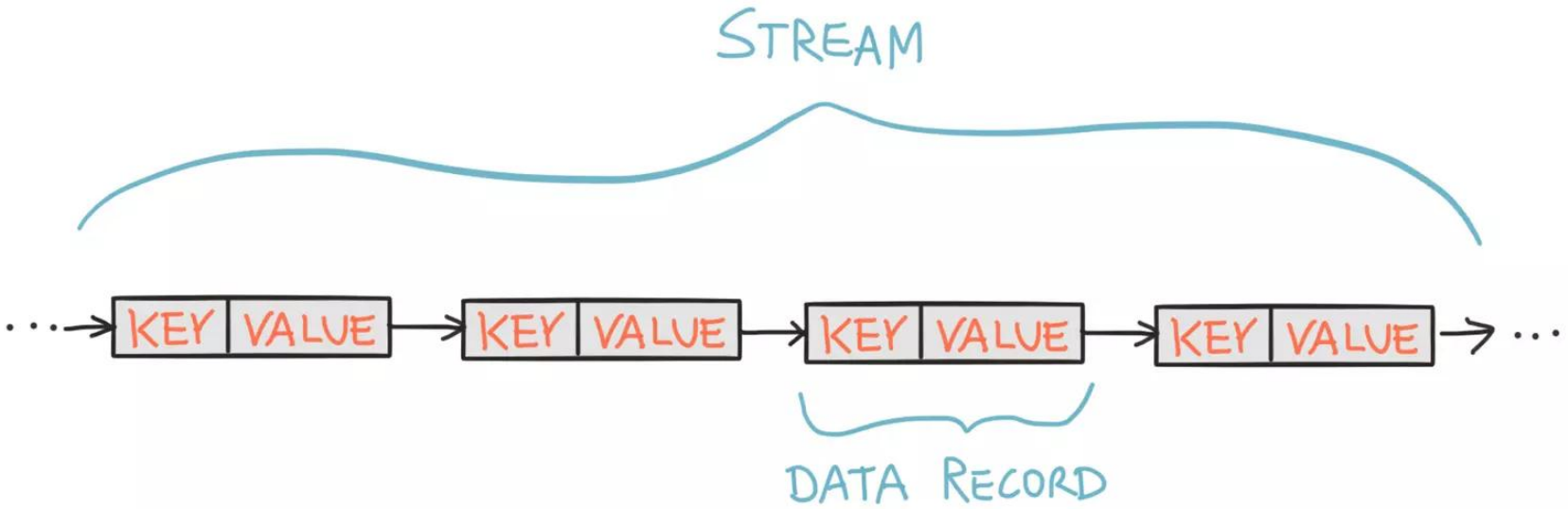
Scaling Your Application



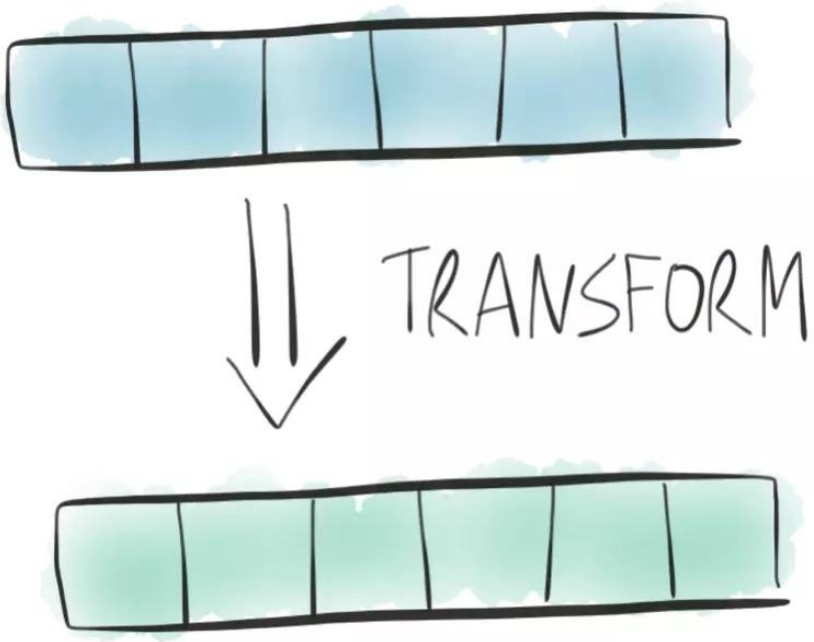
Scaling Your Application



Data Model



Transformations (map, filter, etc.)



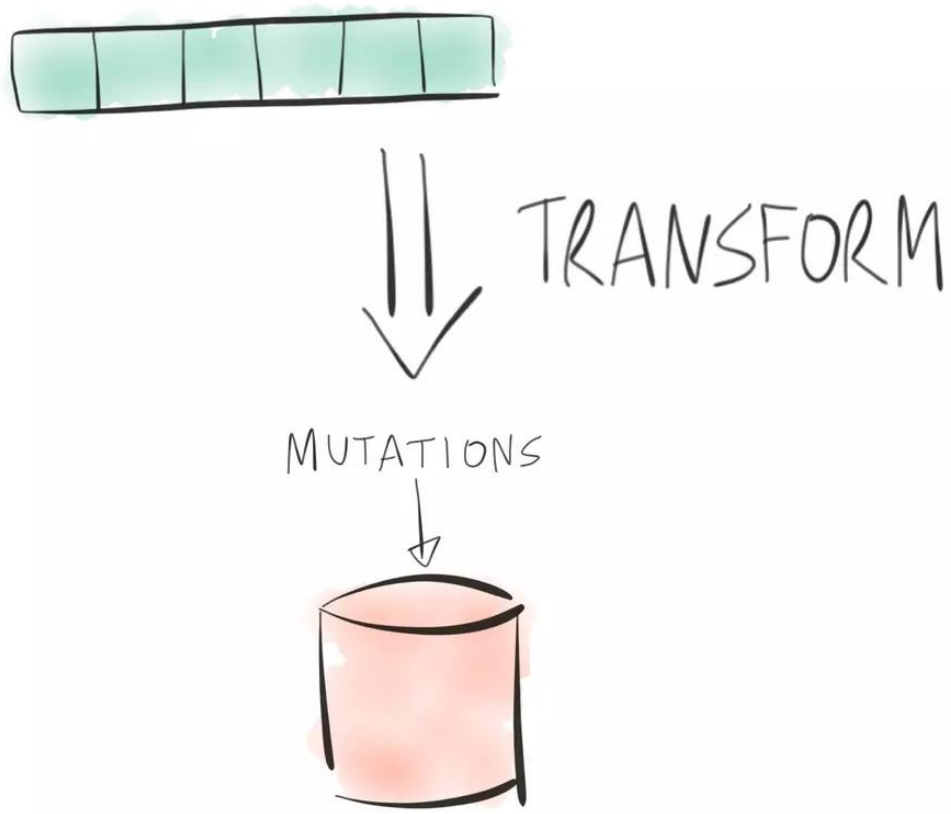

```
StreamsBuilder builder = new StreamsBuilder();
```

```
KStream<Long,String> inputStream =
    builder.stream("input-topic");
```

```
KStream<Long,String> outputStream =
    inputStream.mapValues(
        value -> value.toLowerCase());
```

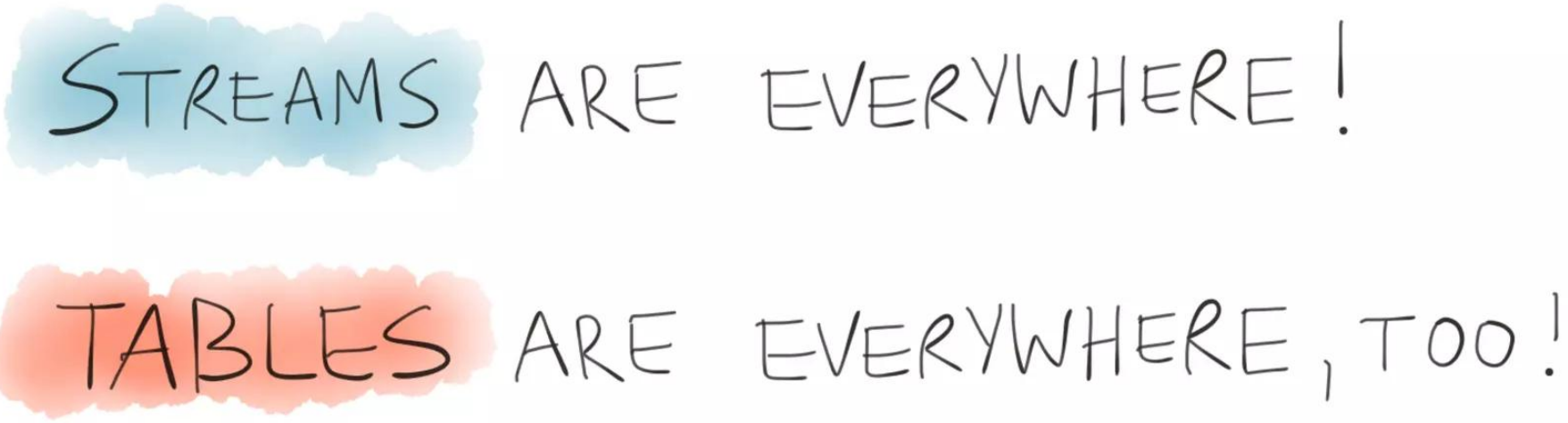
```
outputStream.to("output-topic");
```

Stream Aggregations




```
KTable<Long,Long> countPerKey
    = stream.groupByKey().count();
```

Data Model (cont.)



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Streams

- **Facts/events**
- **Infinite/unbounded**
- **Append-only**
- **Immutable**

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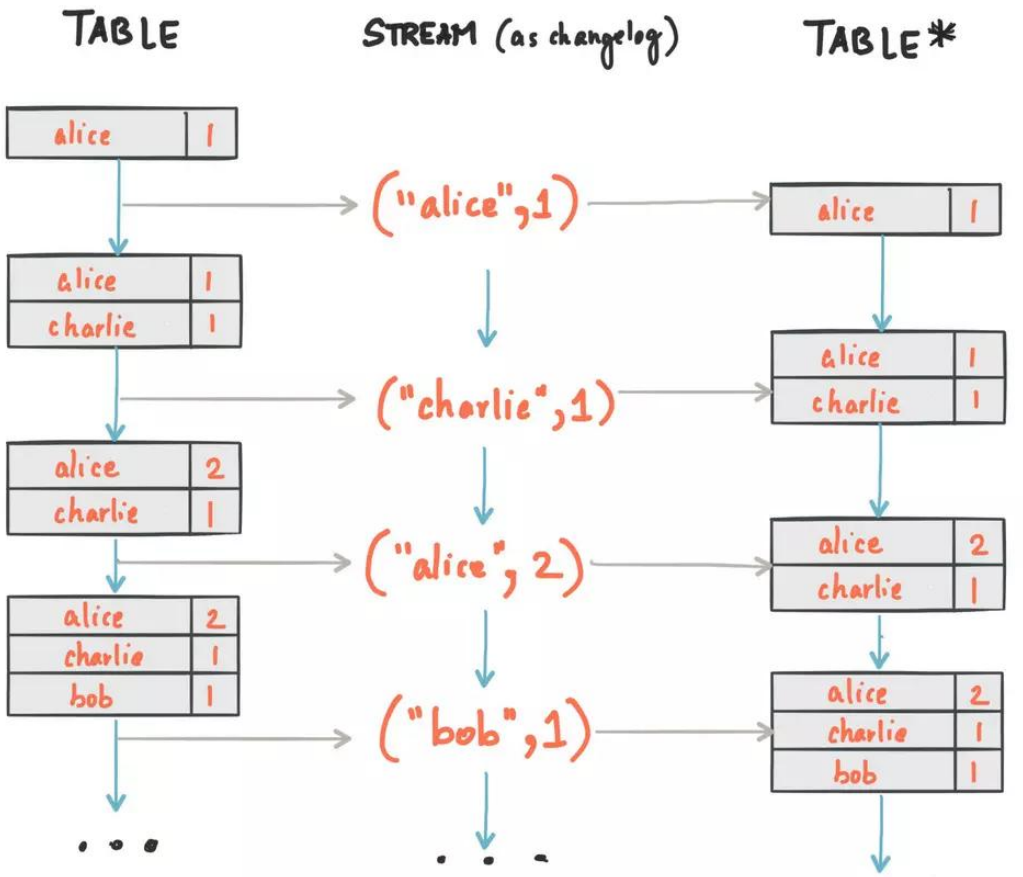
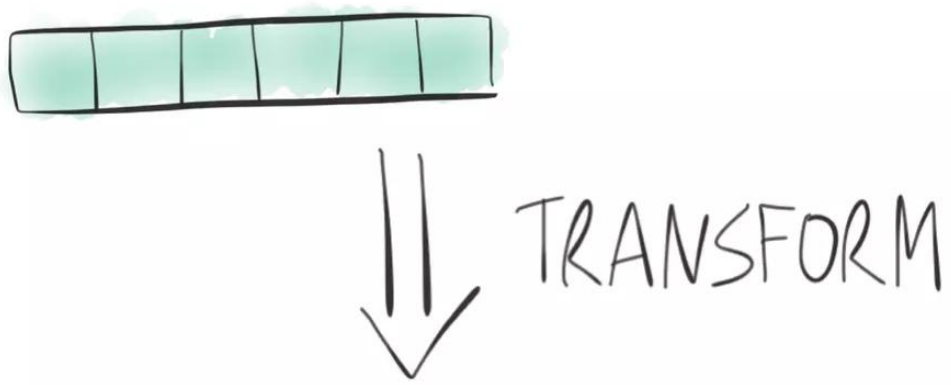
Tables

- Current state
- Finite/Bounded
- Insert, Update, Delete
- Mutable

Stream-Table Duality

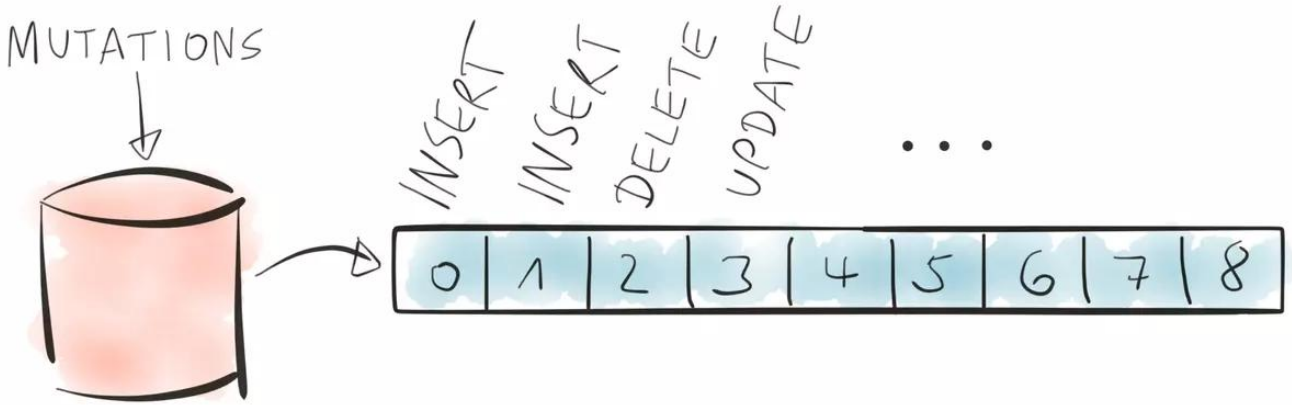


Stream Aggregations: The Changelog



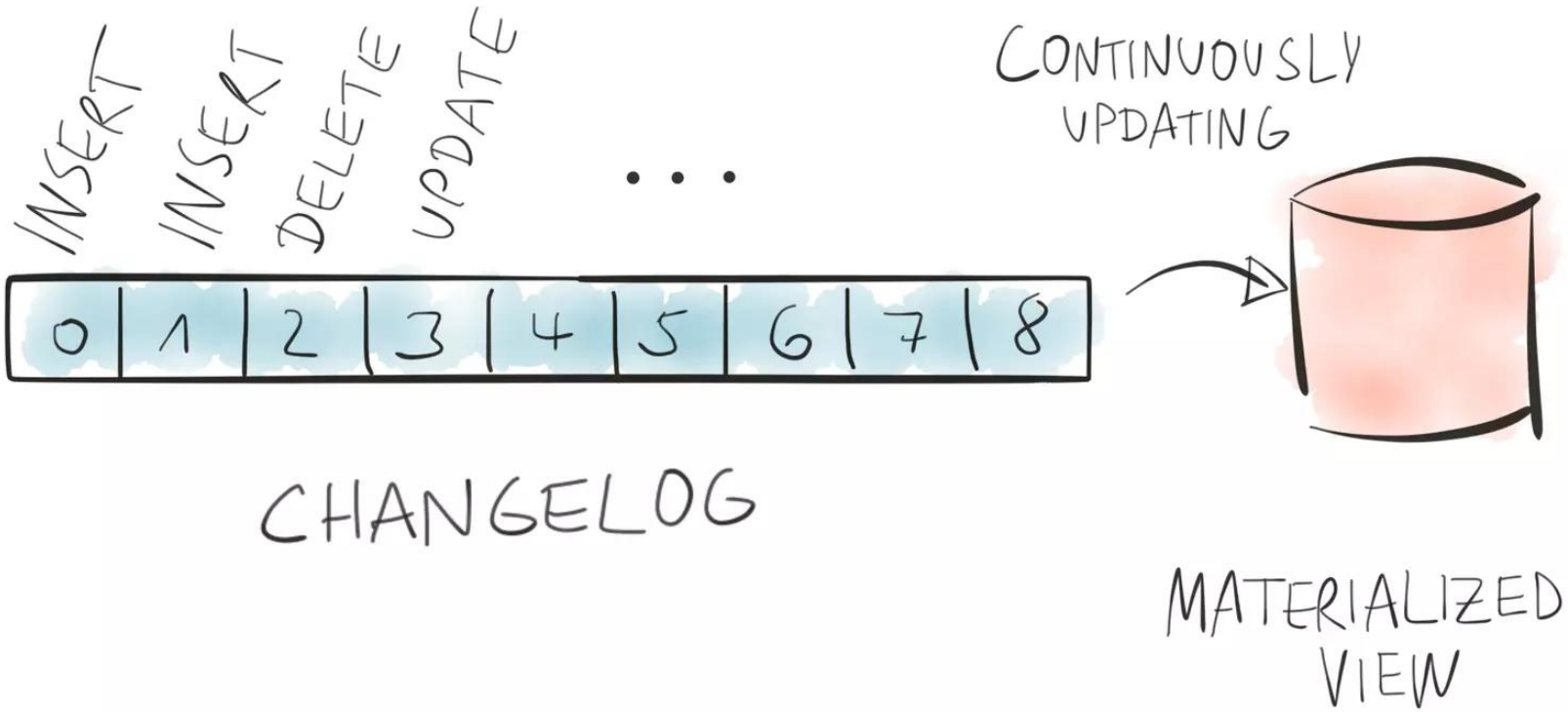

```
KTable<Long,Long> countPerKey
    = stream.groupByKey().count();

countPerKey.toStream().to(“topic”);
```



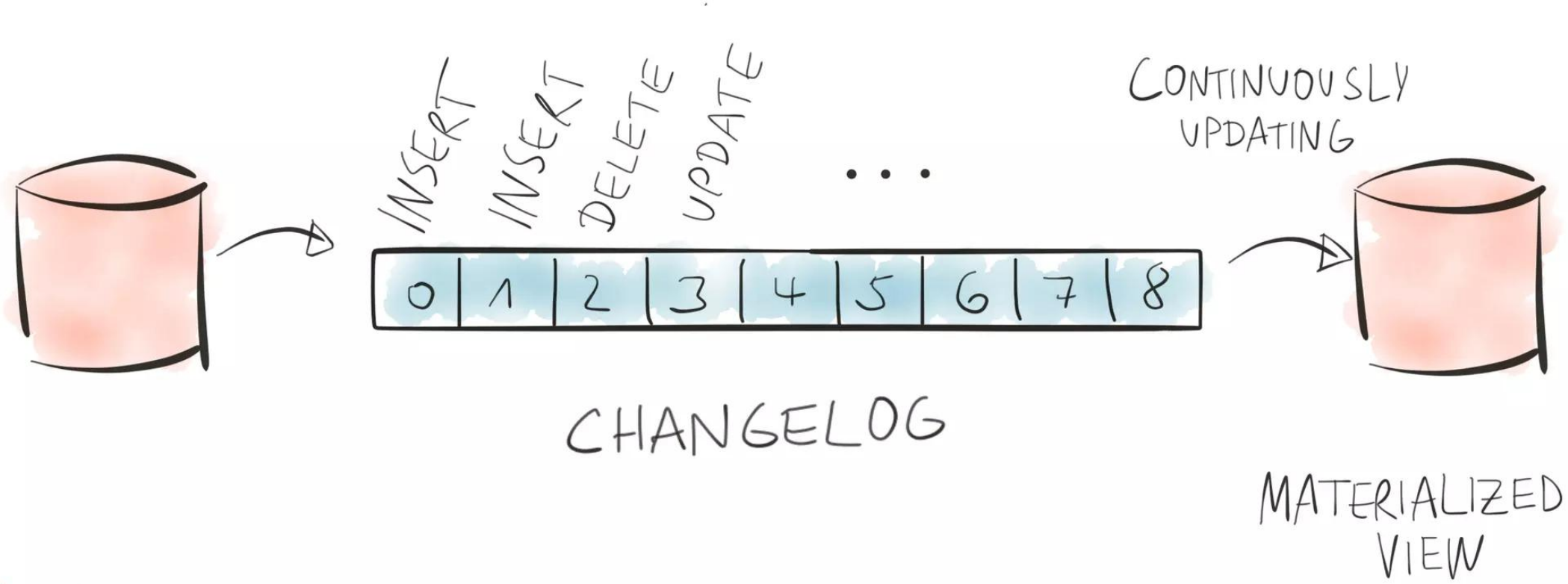
Creating Tables

```
KTable<Long,String> inputTable = builder.table("changelog-topic");
```

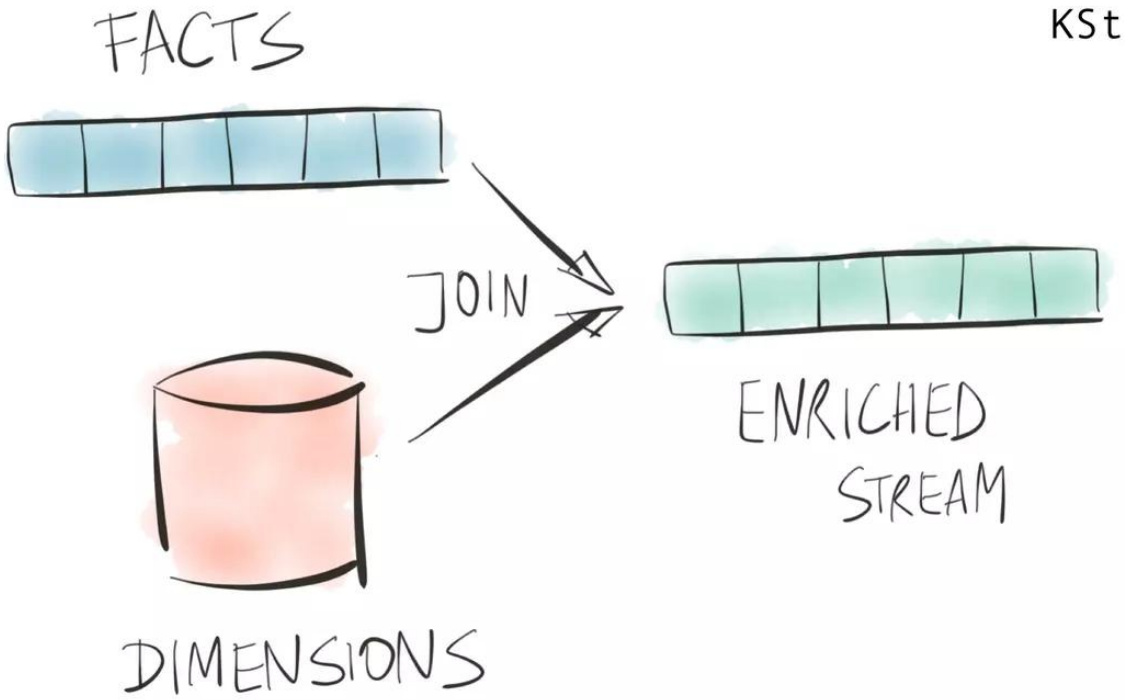


Transforming Tables

```
KTable<Long,String> outputTable = inputTable.filter();
```



Joining Streams and Tables




```
KStream<Long,String> enrichedStream =
    inputStream.join(inputTable, …);
```

groupBy

windowBy
(tumbling,
hopping,
session)

flatMap

filter

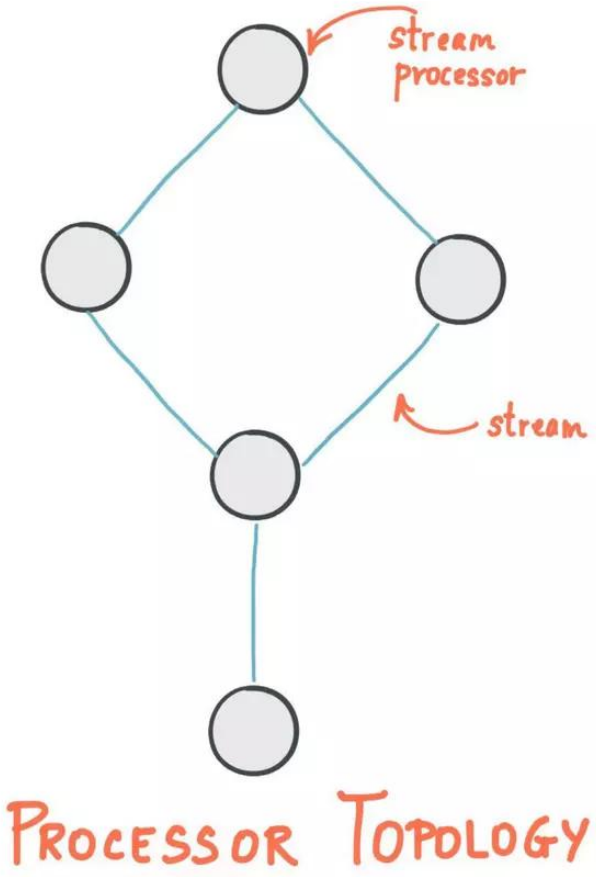
foreach

mapValues

join
(stream-stream,
stream-table,
table-table)

aggregate

Processor API




```
Topology topology = new Topology();

topology.addSource(…);
topology.addProcessor(…);
topology.addSink(…);

topology.addStateStore(…);

// DSL compiles down to a topology:
// StreamsBuilder builder = …
// Topology topology = builder.build();


KafkaStreams instance =
  new Kafka Streams(topology, config);
instance.start();
```

The Processor Interface

```
public class MyProcessor<K,V>
  implements Processor<K,V> {

  private ProcessorContext context;
  private KeyValueStore store;

  public void init(ProcessorContext c) {
    context = c;
    store = context.getStateStore(…);
  }

  public void process(K key, V value) {
    // business logic
    state.put(key, value);
    context.forward(key, value);
  }

  public void close() {}
}
```

- Full flexibility
- Emit zero of more output records
- Lookup or modify data in your state stores
- Access metadata (e.g., timestamp, headers, etc) via the `context`
- Schedule punctuations:
  - `context.schedule(…)`
  - Event or wall-clock time based
  - Regular callbacks


Flexibility
Simplicity
Consumer, Producer
subscribe()
poll()
send()
flush()
Kafka Streams
filter()
join()
aggregate()
KSQL
Select…from…
Join…where…
Group by..

Consumer, Producer

- subscribe()
- poll()
- send()
- flush()

Streams PAPI

- source / processor / sink
- state store
- process()
- punctuations

Streams DSL

- filter()
- join()
- aggregate()

KSQL

- Select…from…
- Join…where…
- Group by..

How to get started…

- https://docs.confluent.io/current/streams/index.html
- https://github.com/confluentinc/kafka-streams-examples
- https://www.confluent.io/resources/
  - Kafka Summit talk recording
  - White papers
  - Books
- https://www.manning.com/books/kafka-streams-in-action
  - By Bill Bejeck

Getting help:

- User mailing list: https://kafka.apache.org/contact
- Confluent Google Group: https://groups.google.com/forum/#!topic/confluent-platform
- Confluent Community Slack: https://launchpass.com/confluentcommunity
- StackOverflow

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matthias@confluent.io | mjsax@apache.org