Stream Processing As You've Never Seen Before (Seriously)

Apache Flink for Java Developers

Apache Flink

X/Bluesky: @gamussa

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Viktor

GAMOV

Principal Developer Advocate | **Confluent**
co-author of Manning's **Kafka in Action**
Java Champion

X/Bluesky: @gamussa

Slides and Video

https://speaking.gamov.io/

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What is
Apache Flink?

What is Flink?

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Apache Flink is a framework and distributed processing engine for stateful computations over unbounded and bounded data streams.

Streaming

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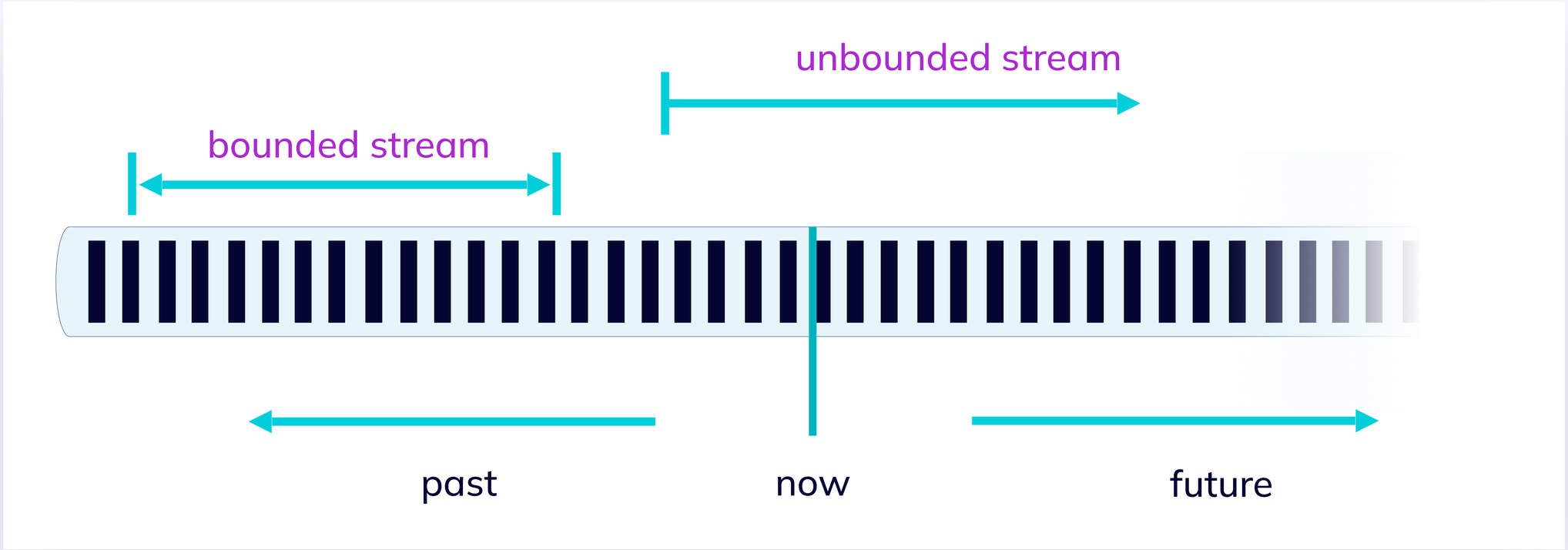

- A stream is a **sequence** of events
- Business data is always a stream: **bounded** or **unbounded**
- For Flink, batch processing is just a **special case** in the runtime


Key Features
of Flink

Stream processing with Flink

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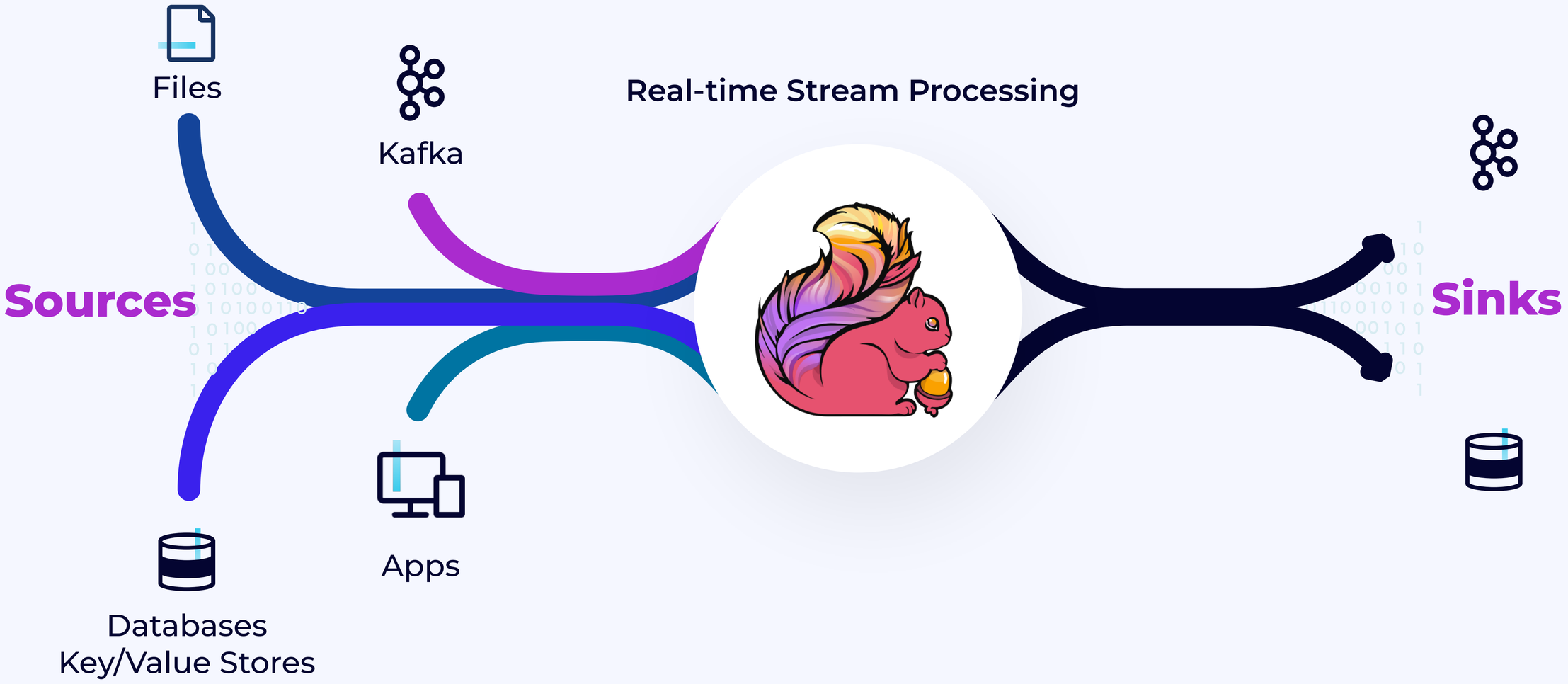

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Stream processing with Flink

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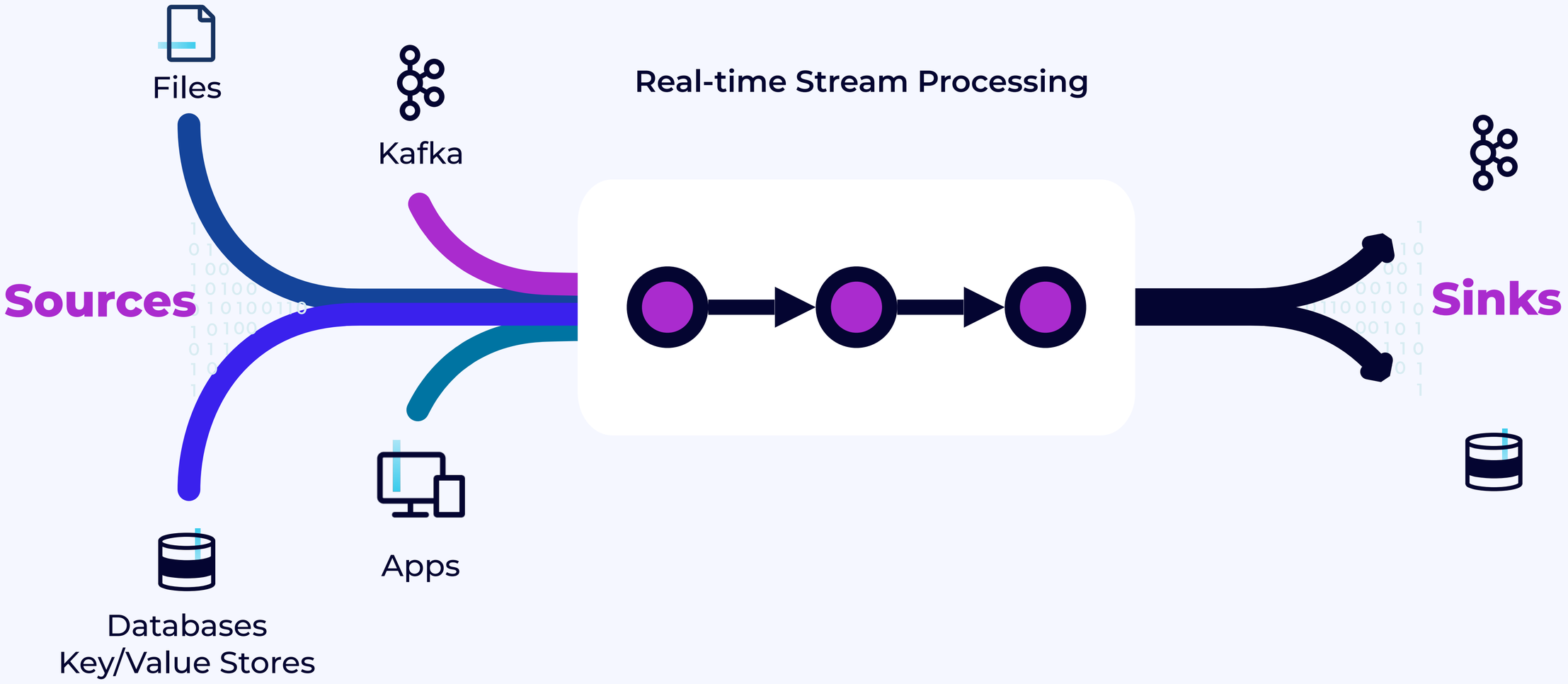

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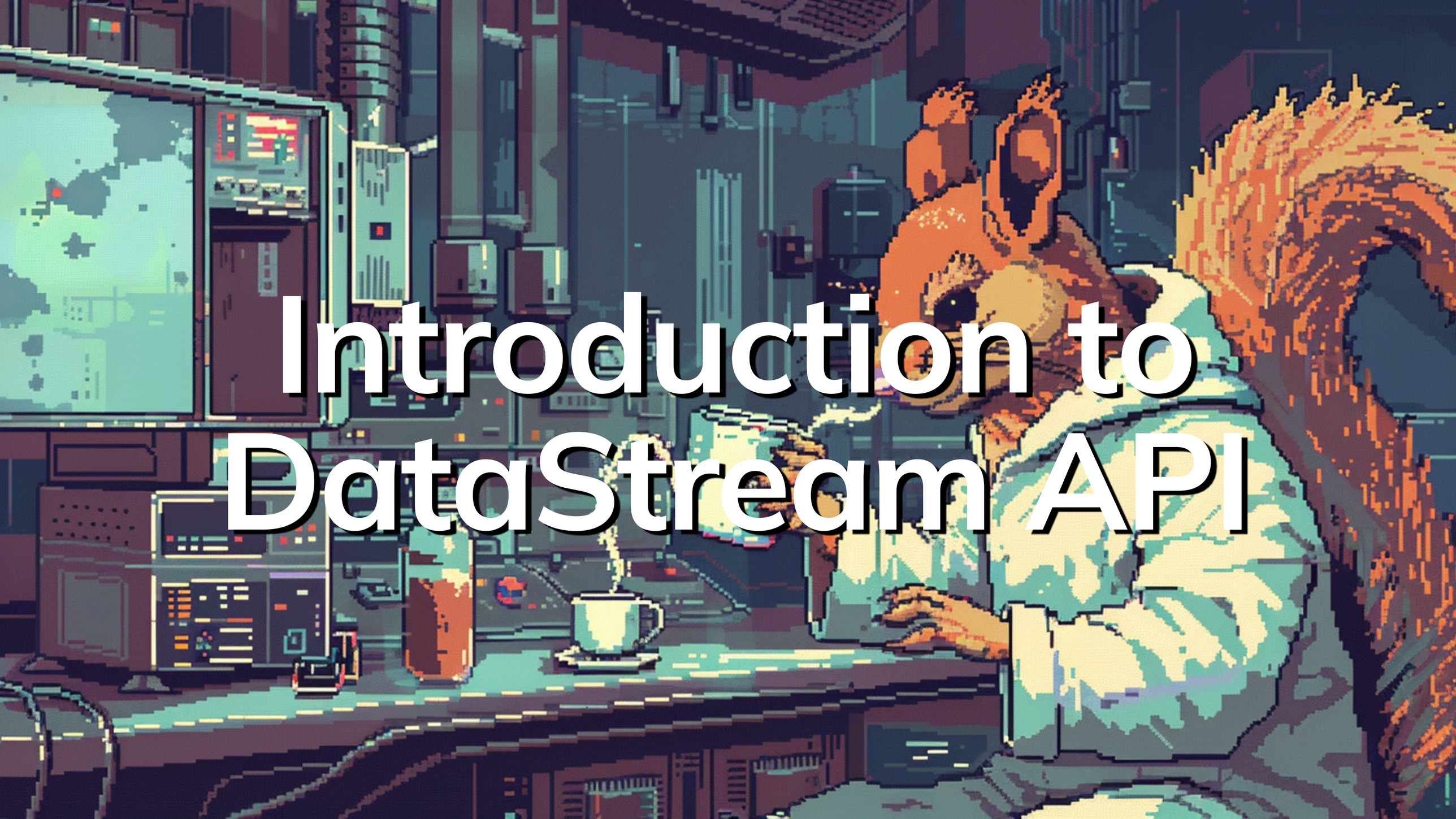
Introduction to
DataStream API

```
// Set up the execution environment
StreamExecutionEnvironment env = StreamExecutionEnvironment.getExecutionEnvironment();

// Create a DataStream from some elements
DataStream<String> inputStream = env.fromData("apple", "banana", "cherry", "date", "elderberry");

// Perform a transformation
DataStream<Tuple2<String, Integer>> resultStream = inputStream
    .map(value -> new Tuple2<>(value, value.length()))
    .returns(Types.TUPLE(Types.STRING, Types.INT));

// Print the results to the console
resultStream.print();

// Execute the Flink job
env.execute("Simple Flink Job");
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The JobGraph (or topology)

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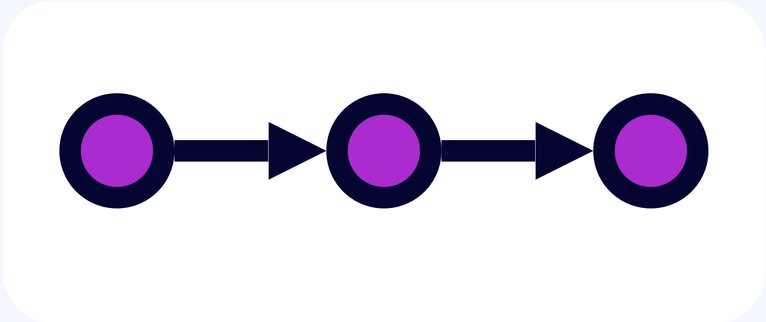

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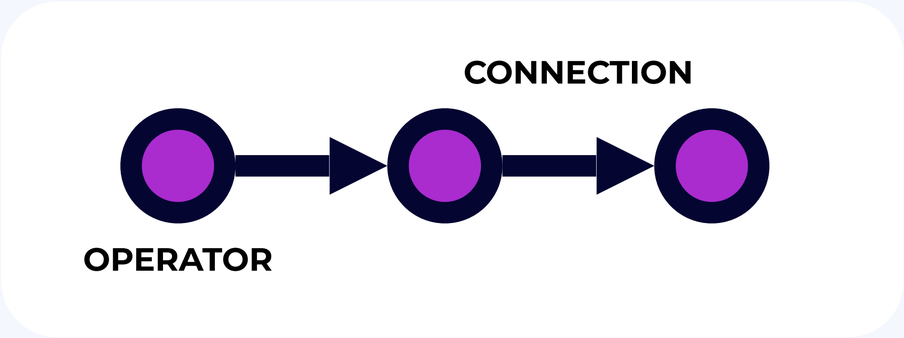

Stream processing

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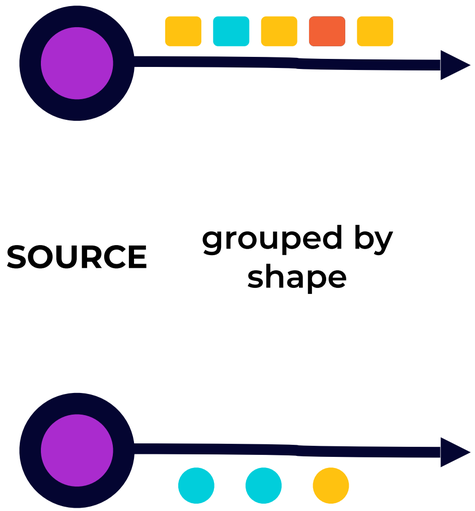
- Parallel
- Forward
- Repartition
- Rebalance



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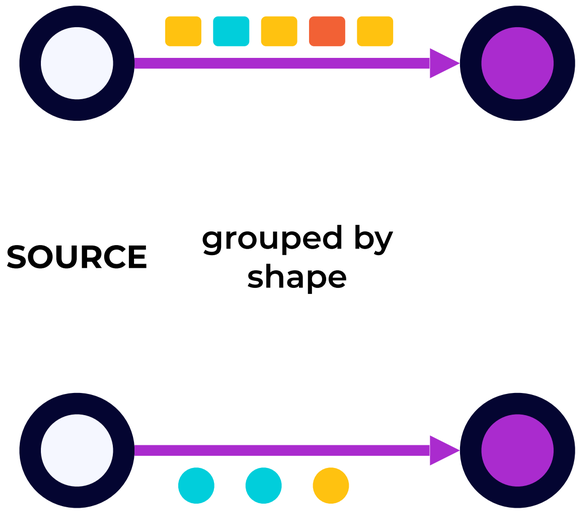

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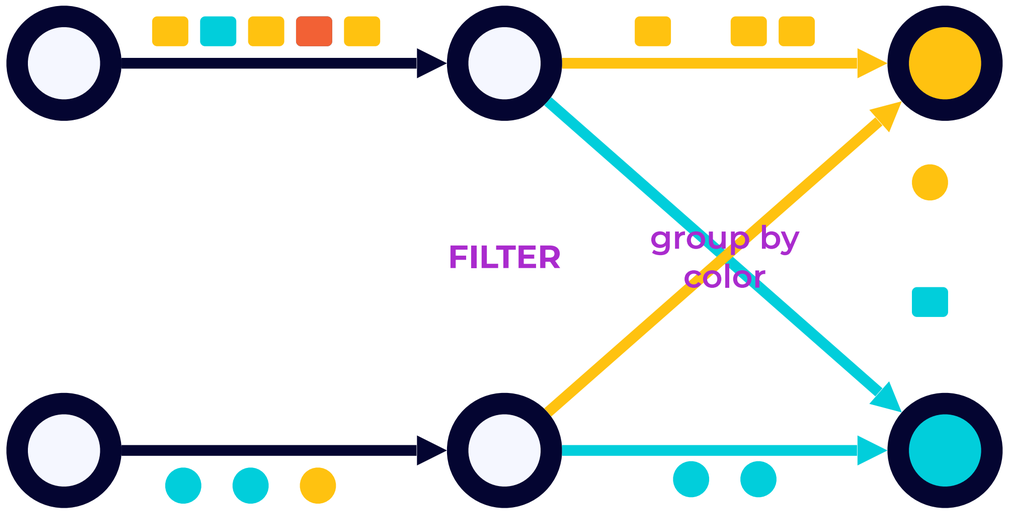

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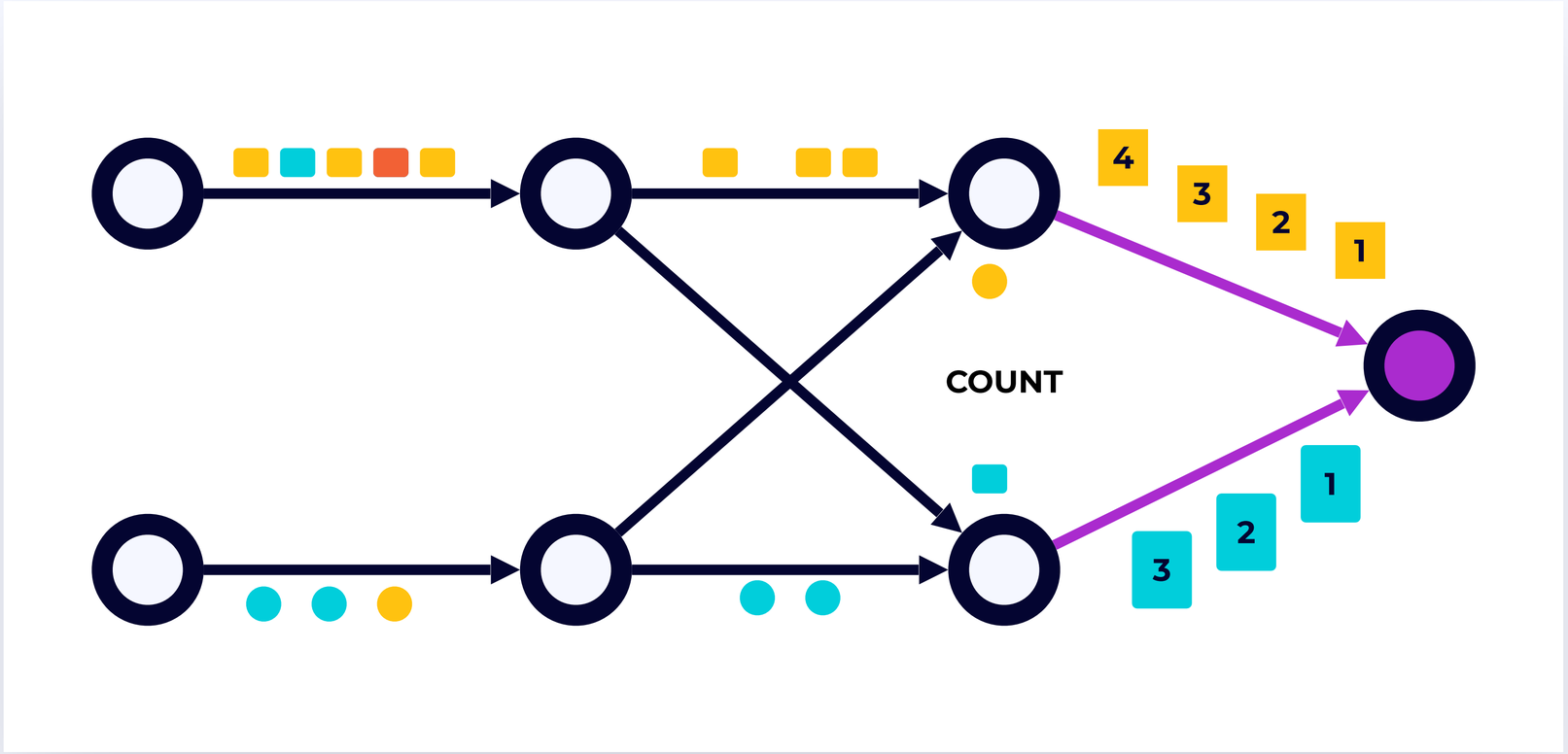

Stream processing with SQL

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INSERT INTO results
SELECT color, COUNT(*)
FROM events
WHERE color <> orange
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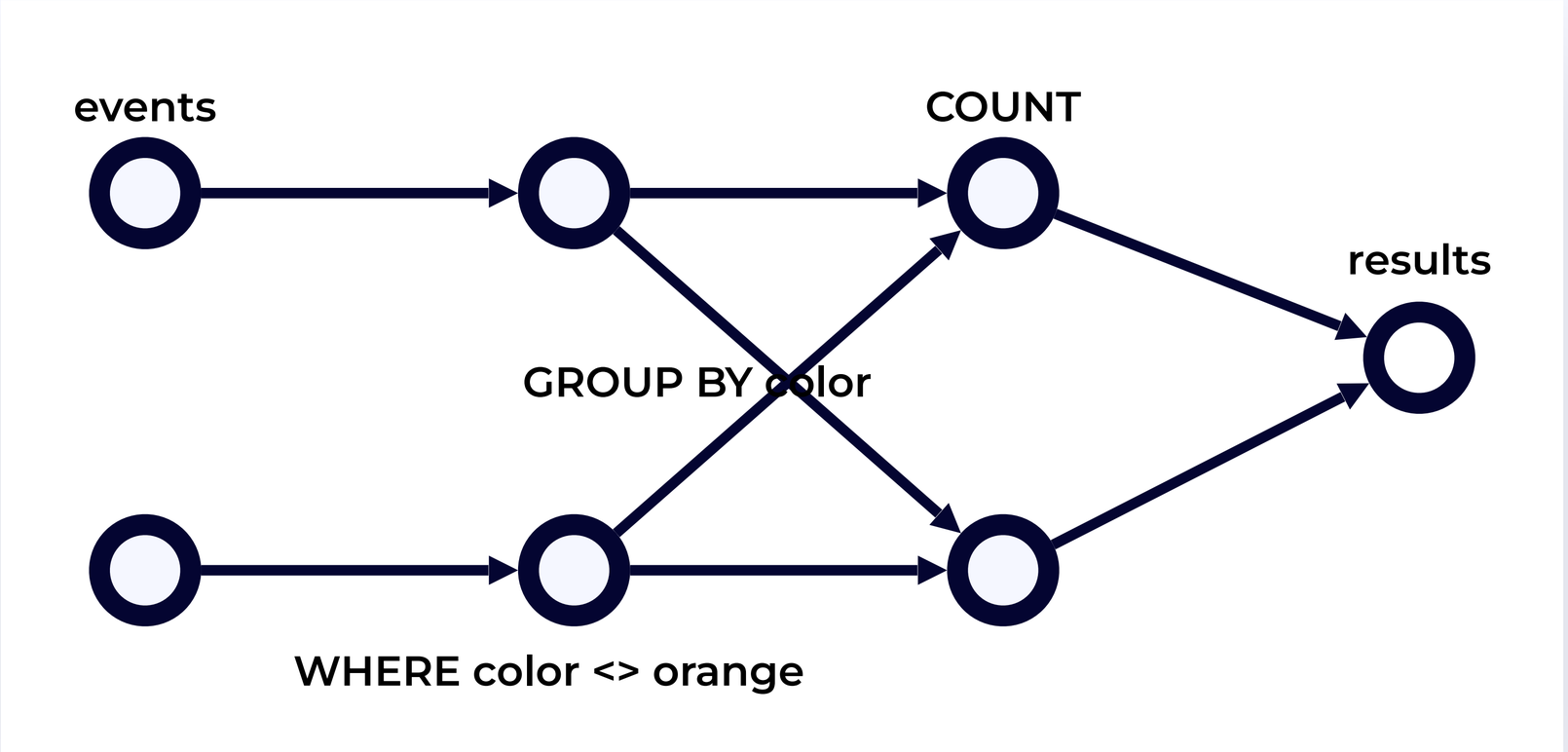

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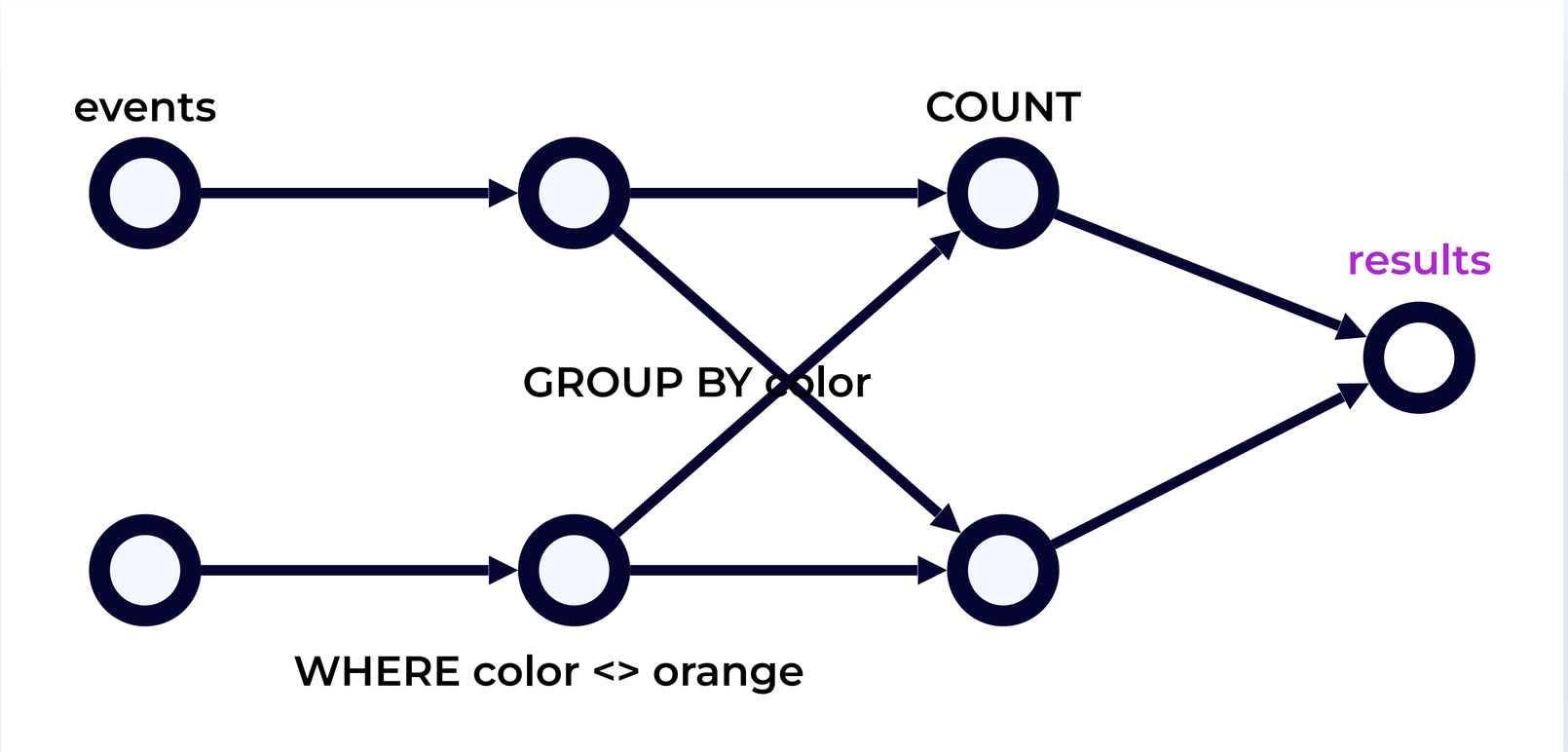

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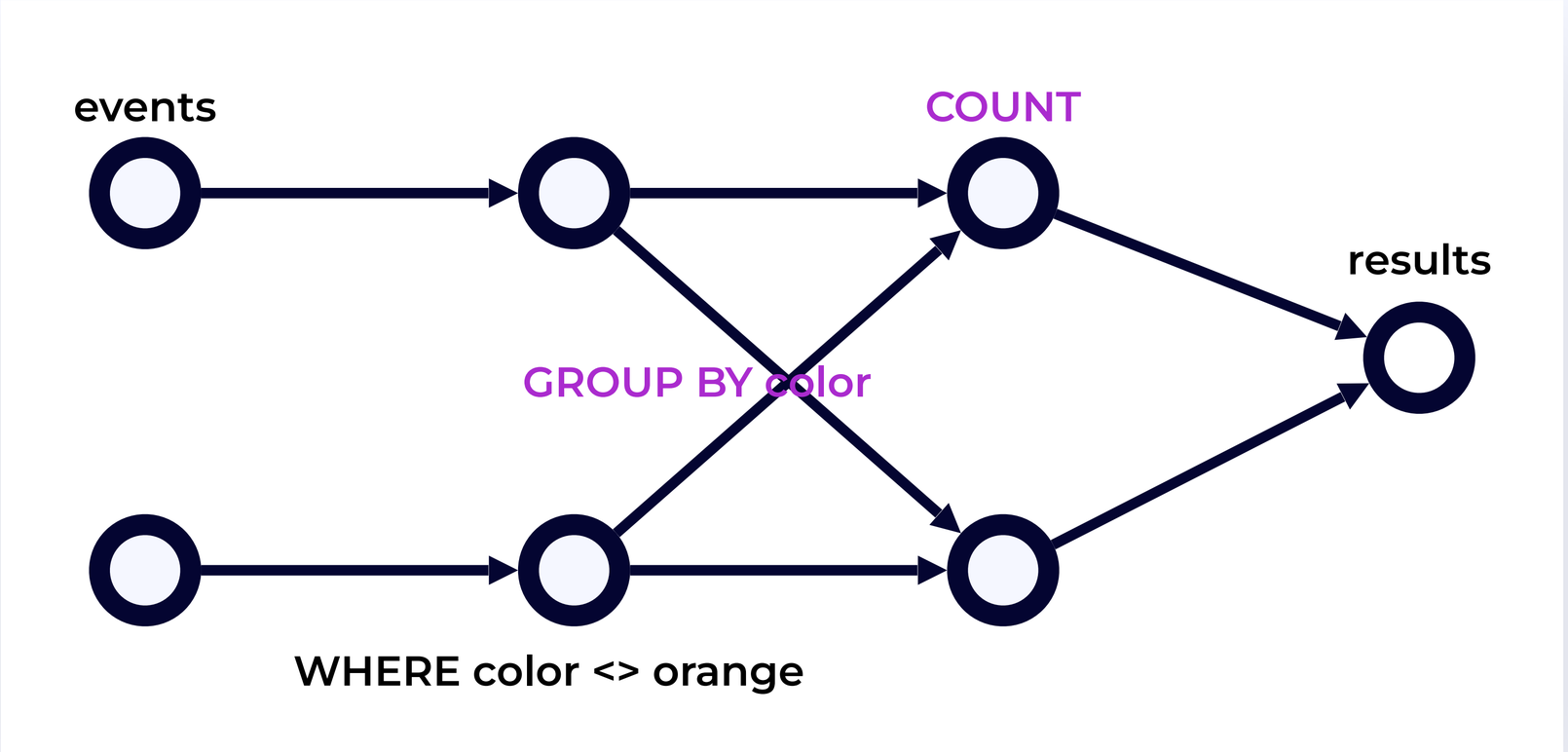

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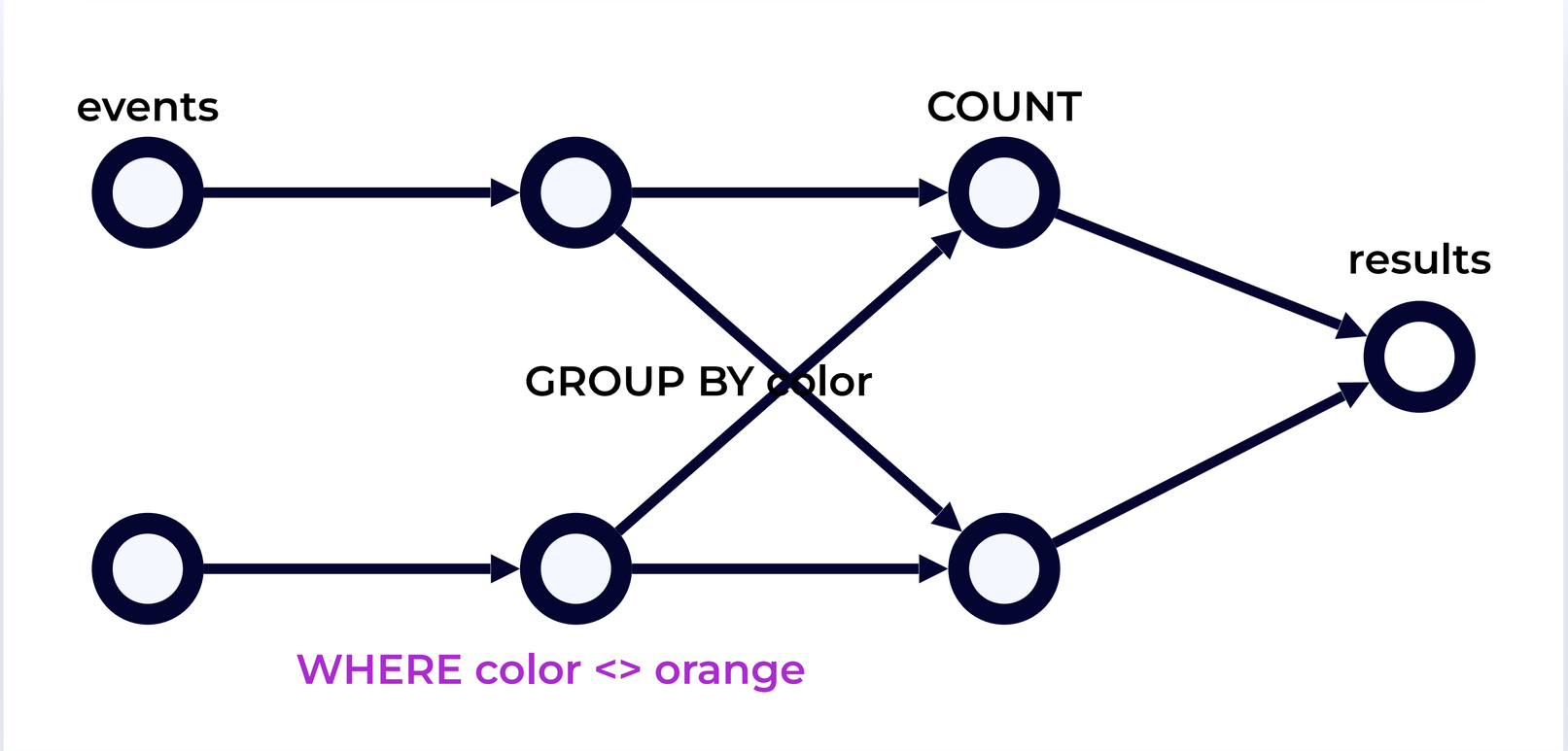

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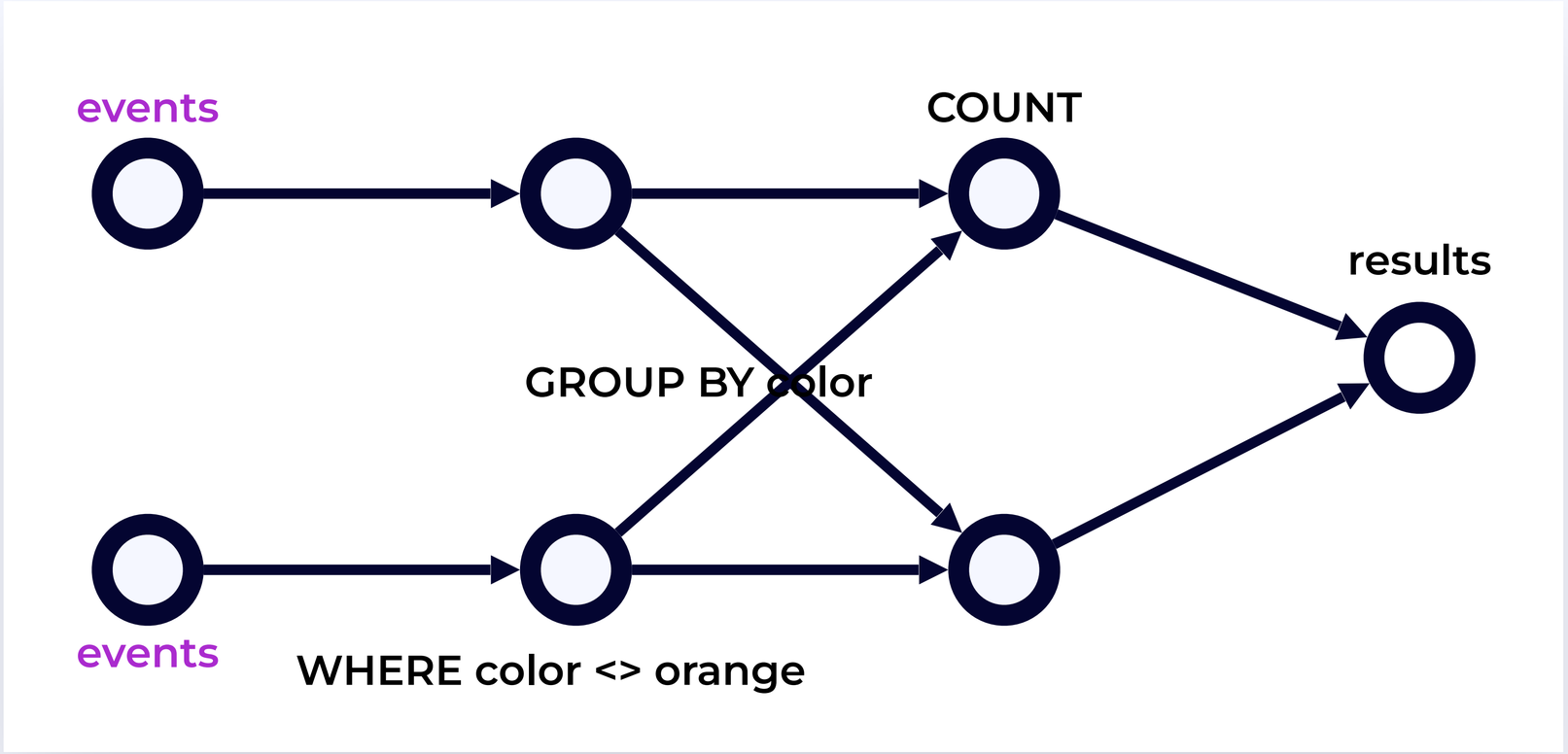

Flink's APIs

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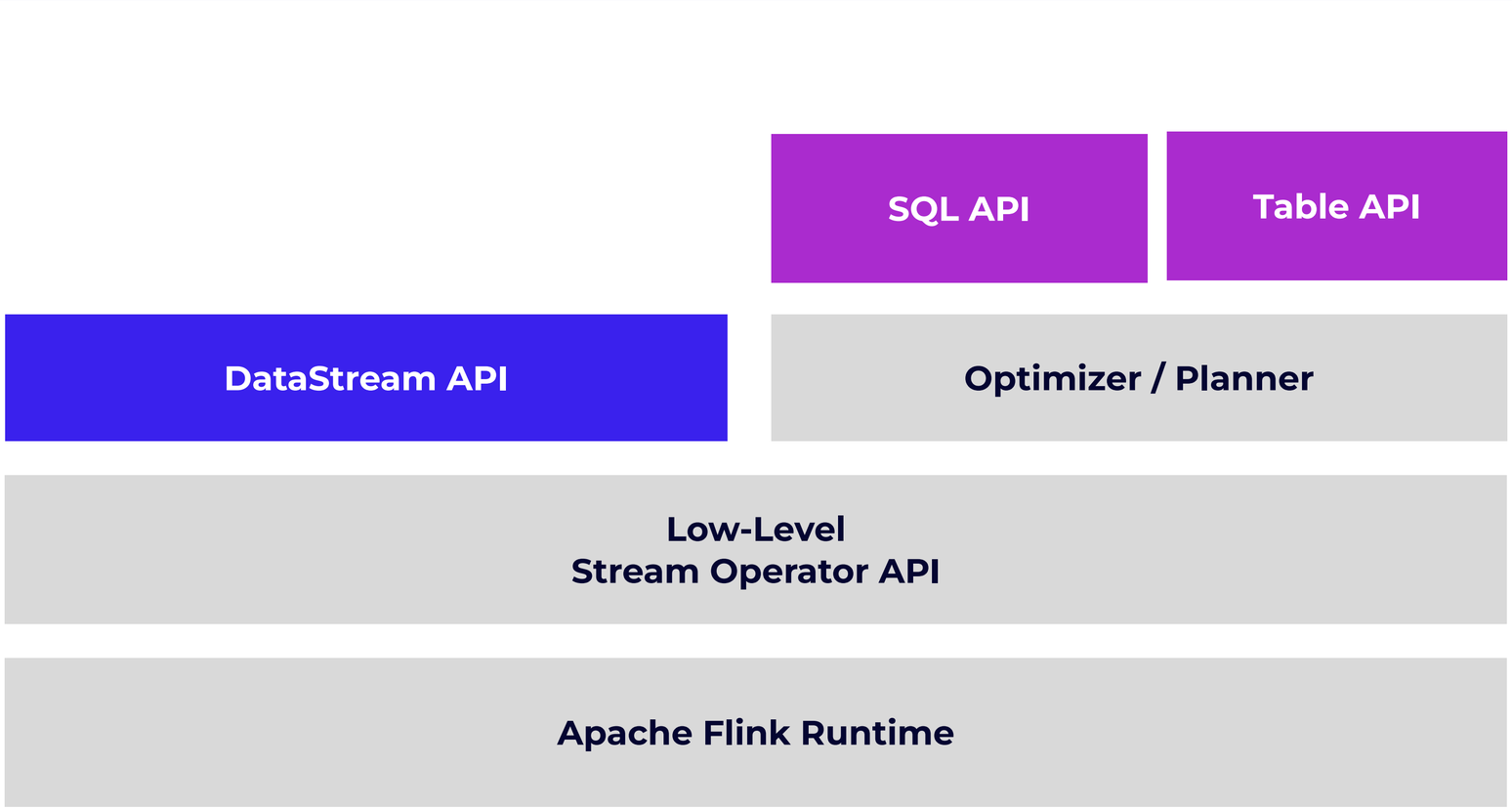

Flink's APIs: mix & match

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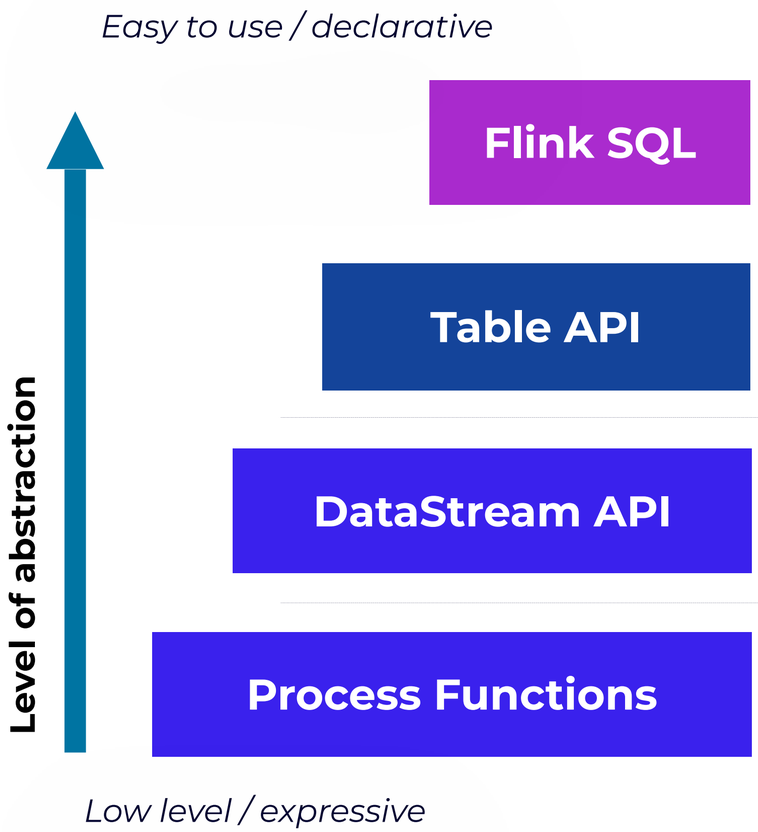

- Code Generation
- Efficient data types
- Cost-based optimizer
- Highly efficient operator implementations (joins, aggregations, deduplications, ...)

→ **Easy to write efficient code with low effort**

- Ready-made operators for Windowing: sliding, tumbling, session. Late event handling.
- CEP / Async IO operators
- Sources / Sinks / Flink Connectors

- Custom data types
- Raw, low level access to state, time

→ **A lot of potential to make mistakes :)**


State
Management

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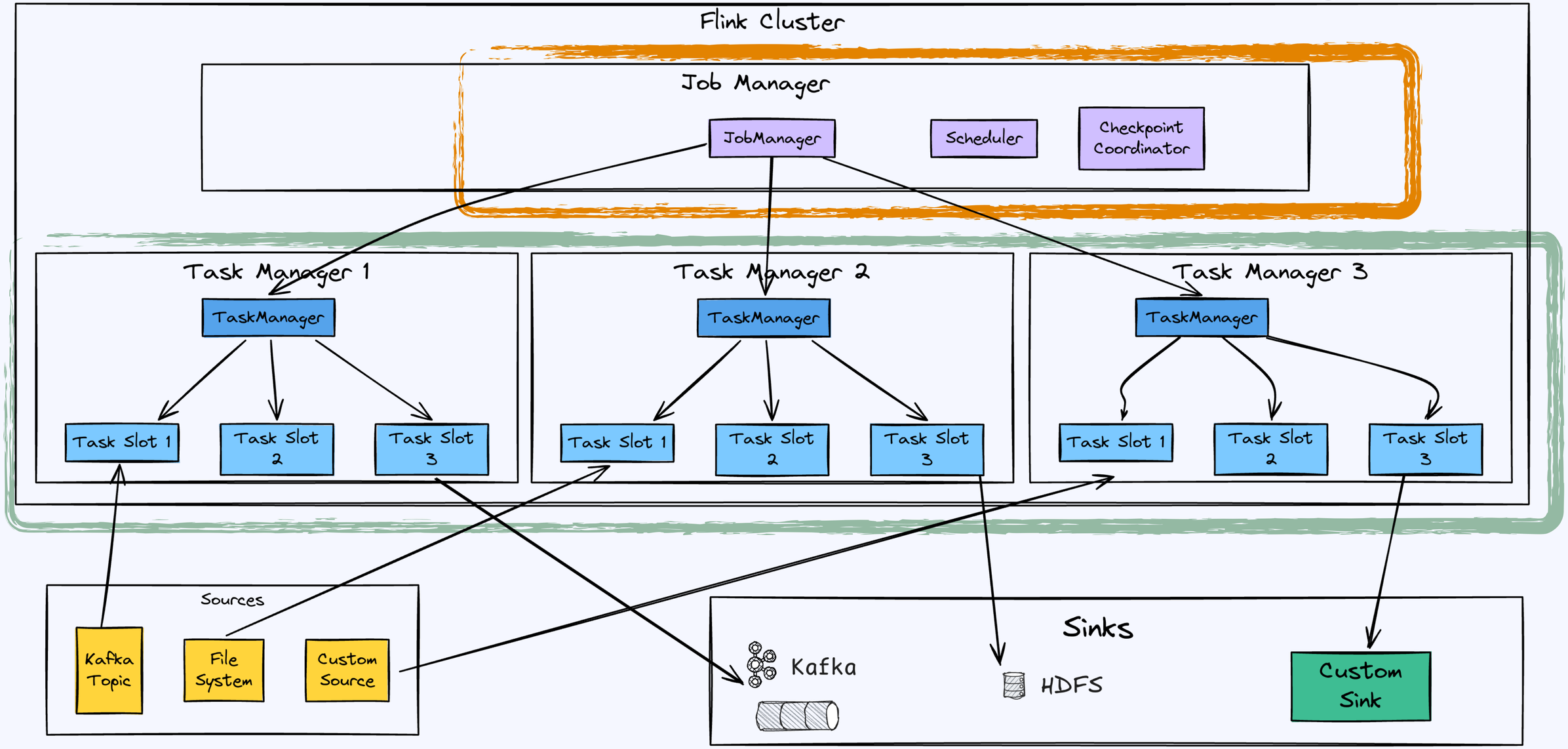

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Stateful stream processing with Flink SQL

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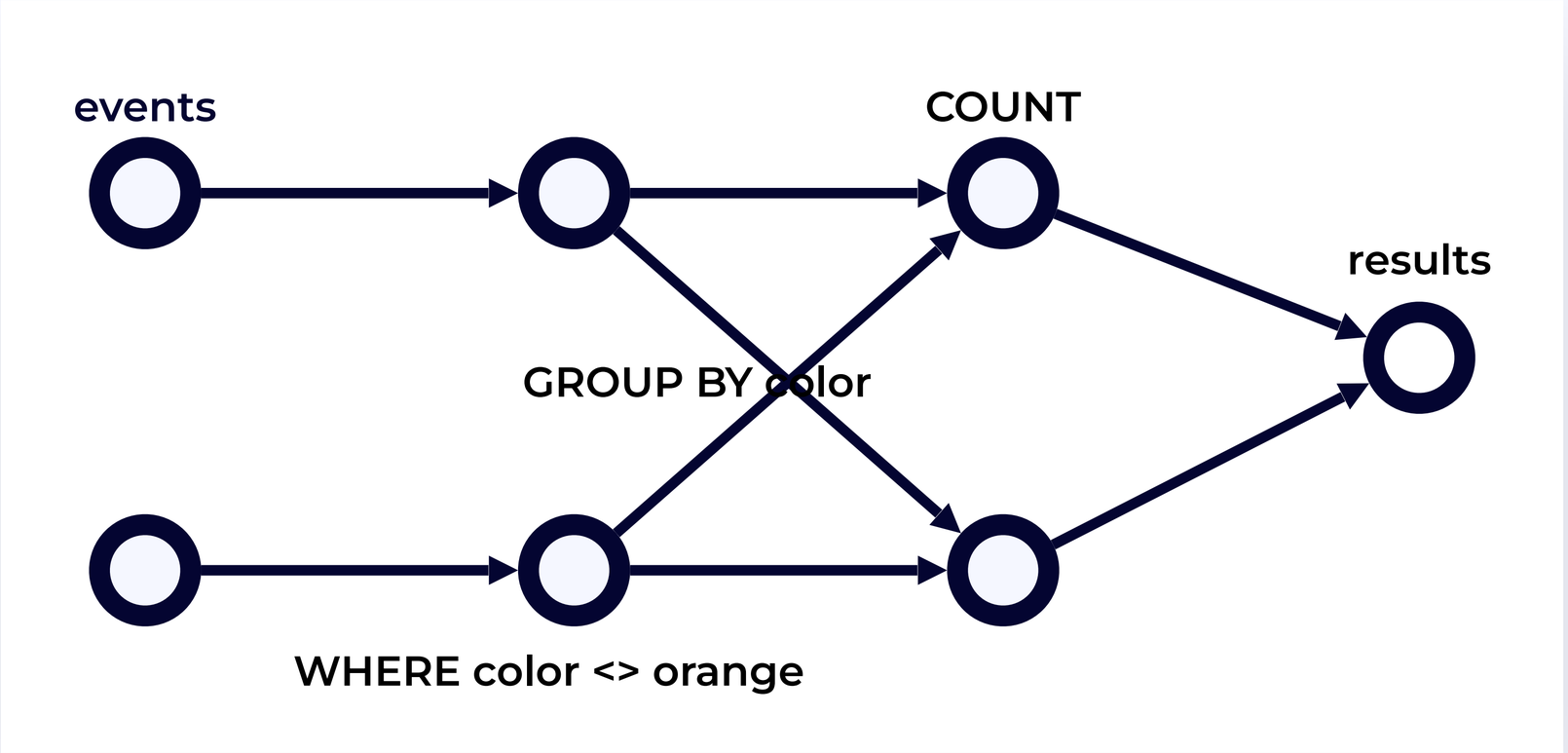

Stateful stream processing with Flink SQL

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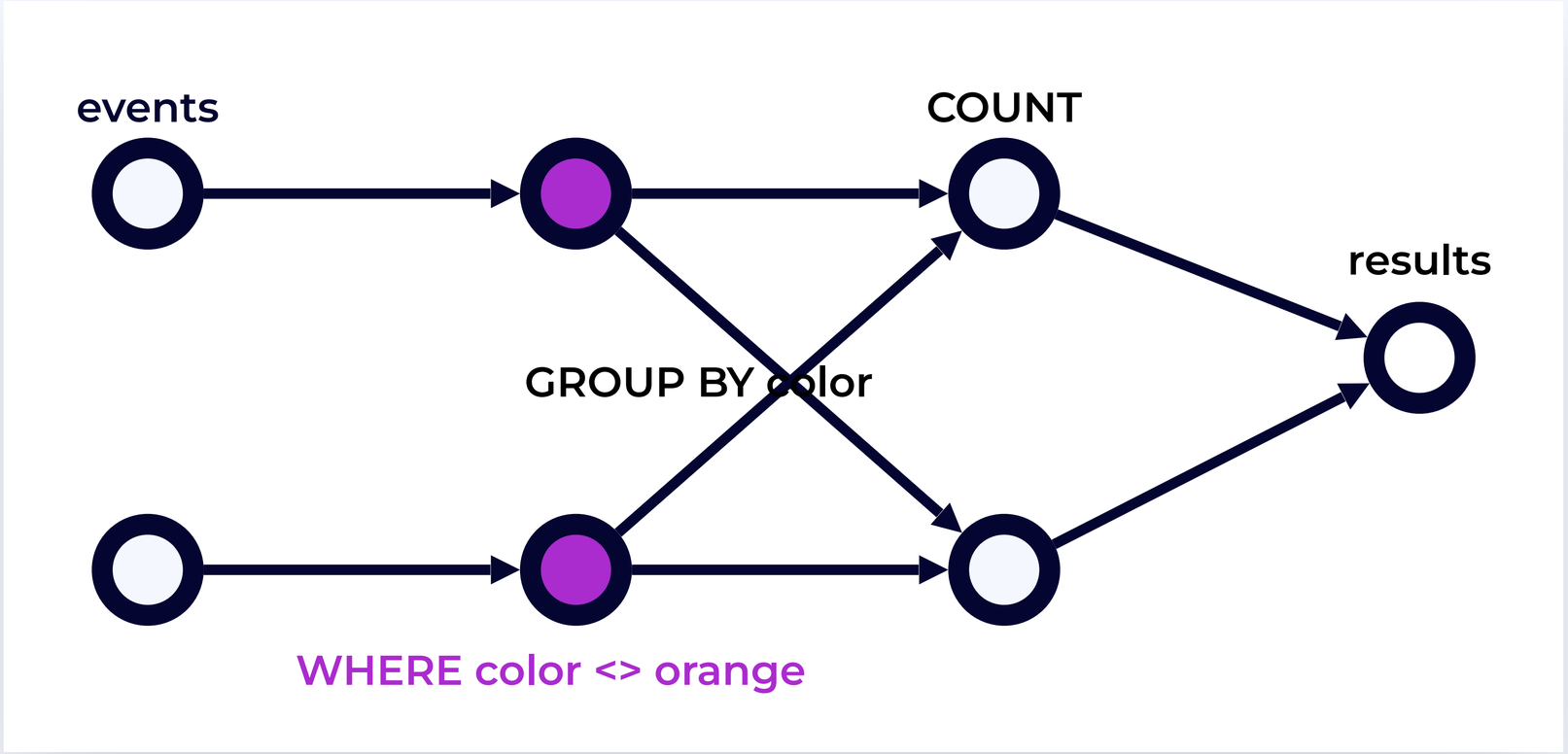
- Filtering is stateless



Stateful stream processing with FlinkSQL

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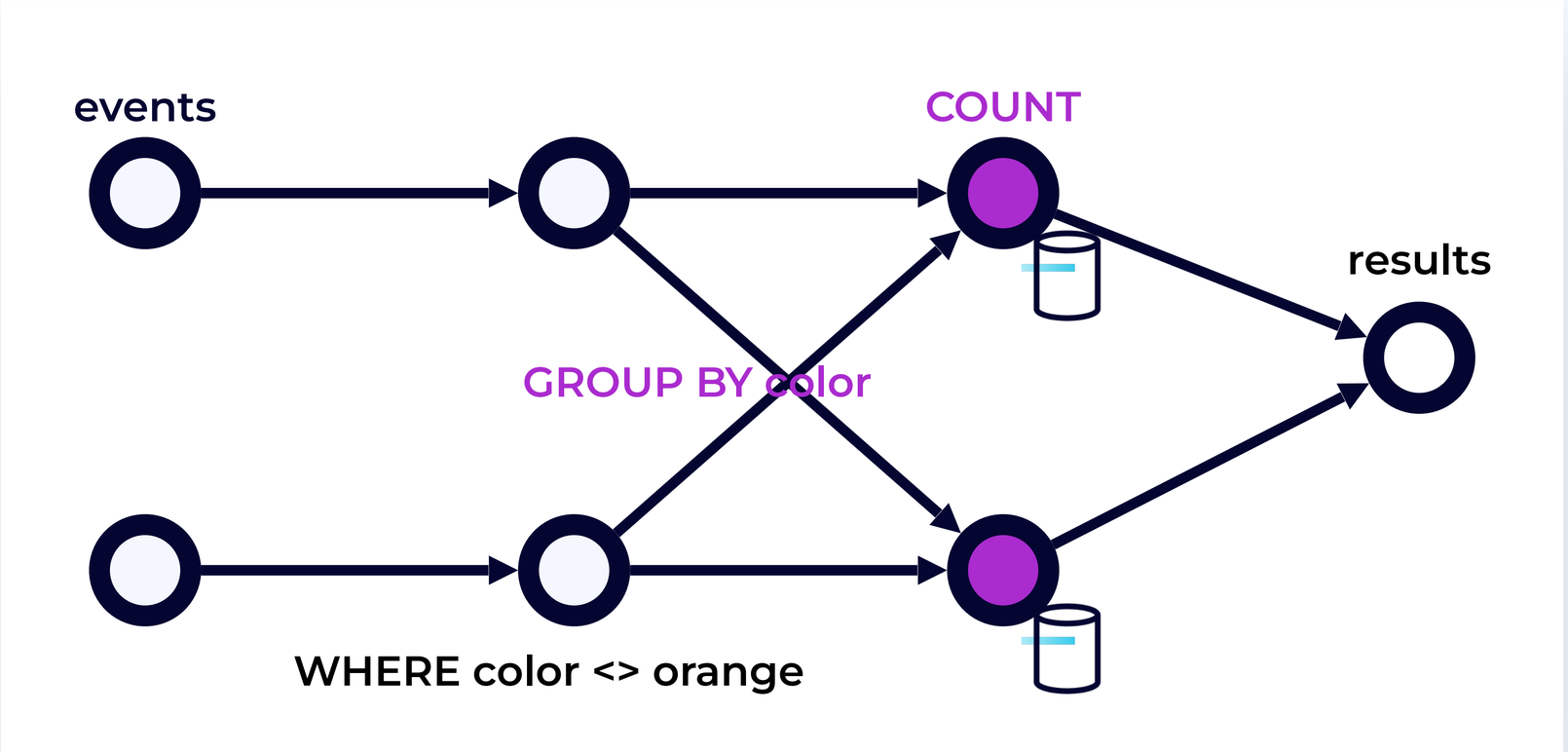
- Counting requires state



State

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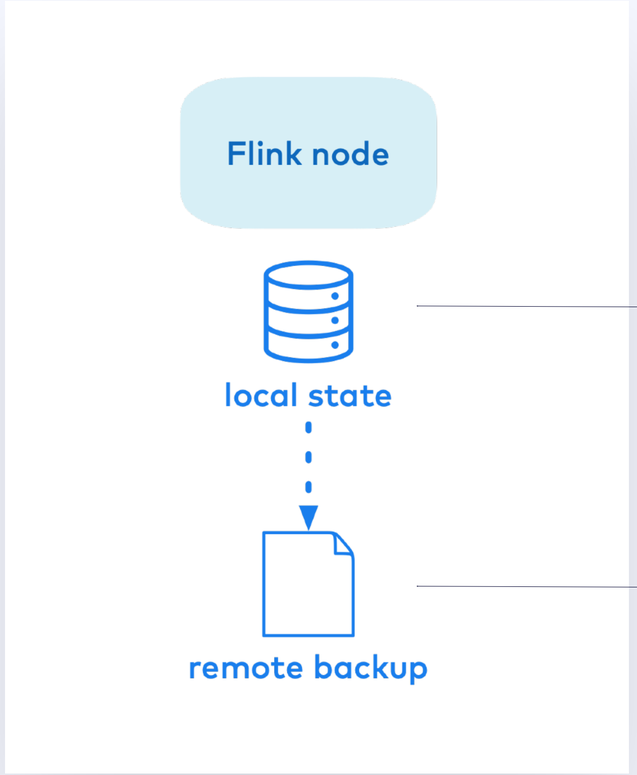
- **Local**
- **Fast**
- **Fault tolerant**



Stored on the heap or on disk using RocksDB (a KV store)

Distributed, reliable storage such as S3 or HDFS

Summary

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Streaming

A sequence of events.

Unfamiliar to many developers, but ultimately straightforward.

State

Delightfully simple
- local
- key/value
- single-threaded

Event time and watermarks

Watermarks indicate how much progress the time in the stream has made.

State snapshots for recovery

Transparent to application developers, enables correctness and operations.

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Developer

As Always
Have a Nice Day...

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