

# Apache Flink® Training

## System Overview



Apache Flink® Training

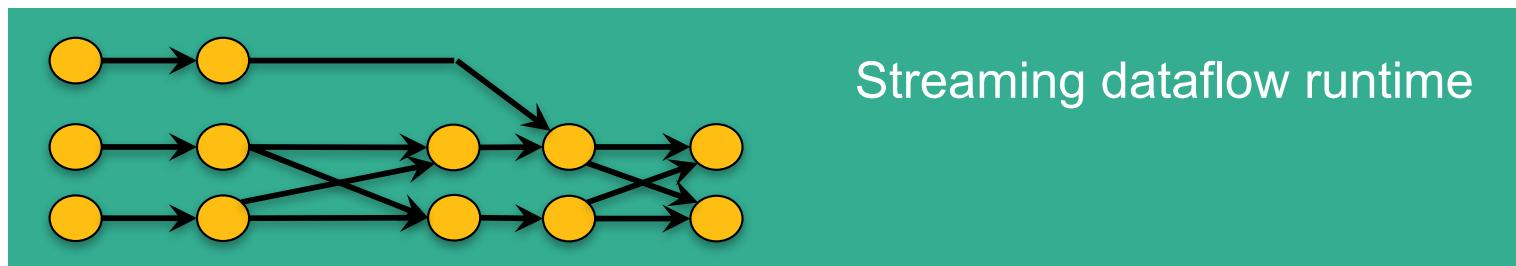
**dataArtisans**

Flink v1.3 – 06.06.2017



Apache Flink®

*A stream processor  
with many applications*



# What is Stream Processing?

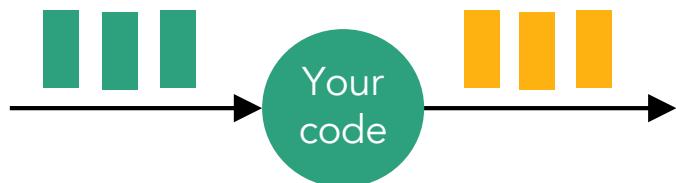
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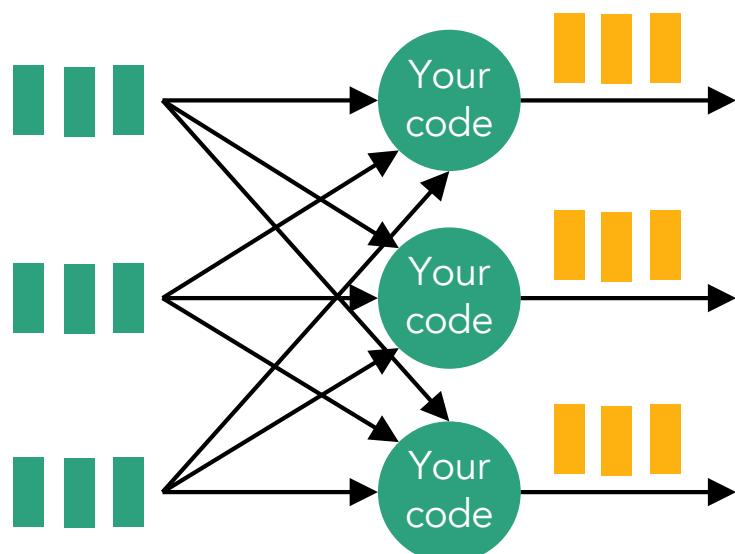
- Today, most data is continuously produced
  - web logs, sensors, database transactions, ...
- The common approach so far
  - Record stream to stable storage (DBMS, HDFS, ...)
  - Analyze data with periodic batch jobs
- Stream processors analyze data as it arrives



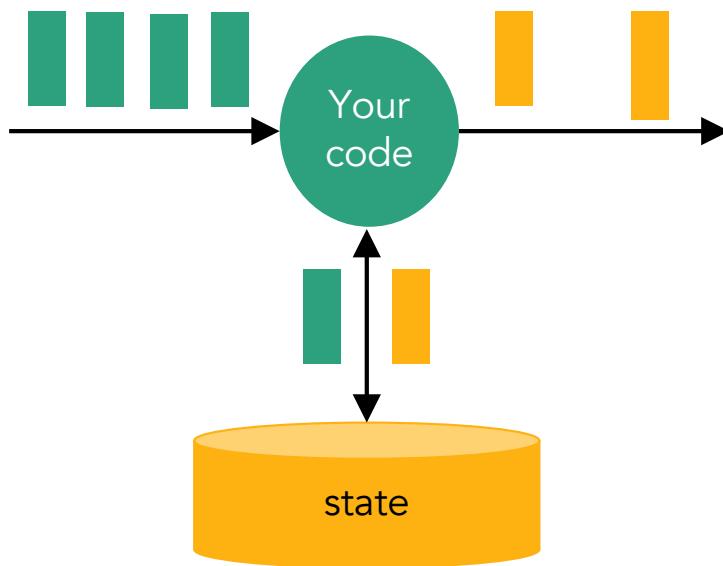
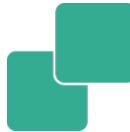
# Distributed streaming



- Computations on never-ending “streams” of data records (“events”)
- A stream processor distributes the computation in a cluster
- Low latency, high throughput

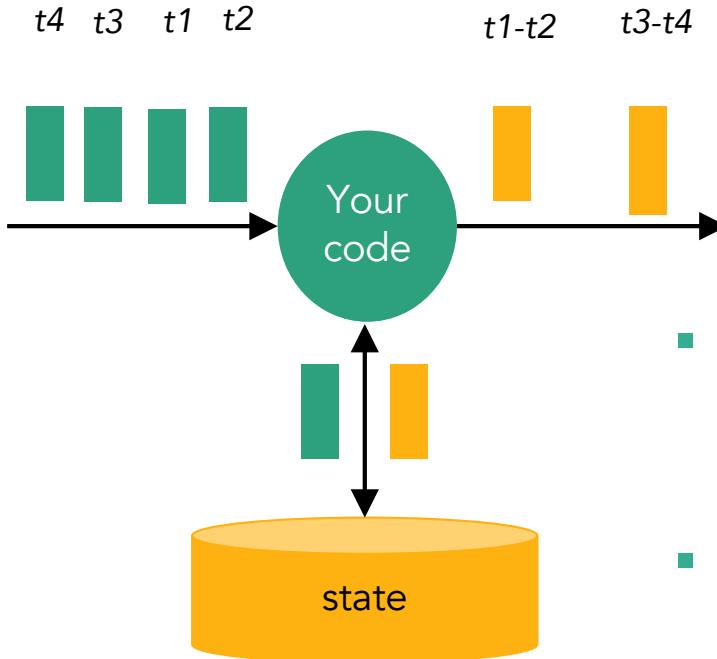


# Stateful streaming

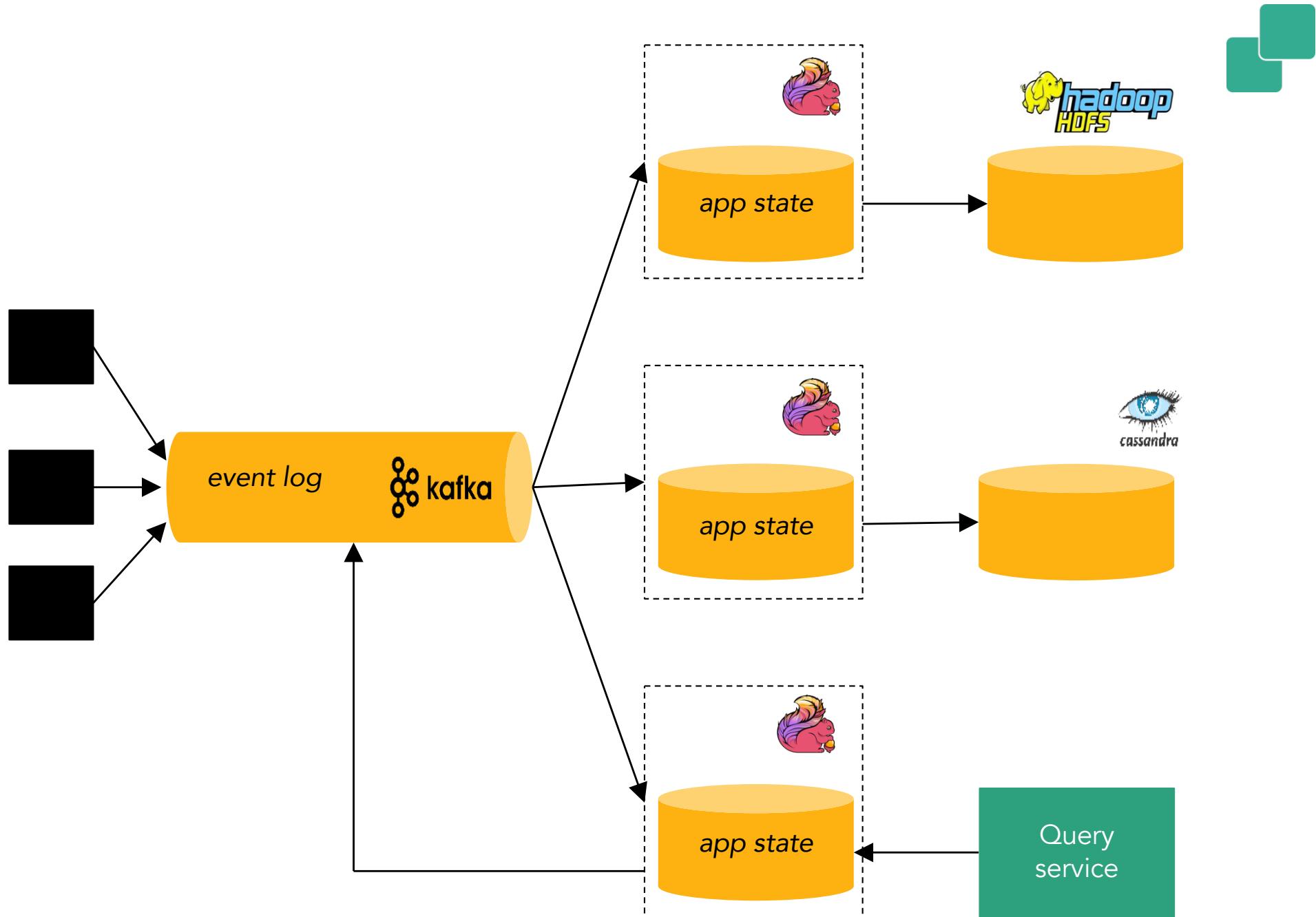


- Computation *and* state
  - E.g., counters, windows of past events, state machines, trained ML models
  - Results depend on history of stream
- Fault-tolerant, with exactly-once consistency
- A stateful stream processor provides tools to manage state
  - Recover, roll back, version, upgrade, ...

# Event-time streaming

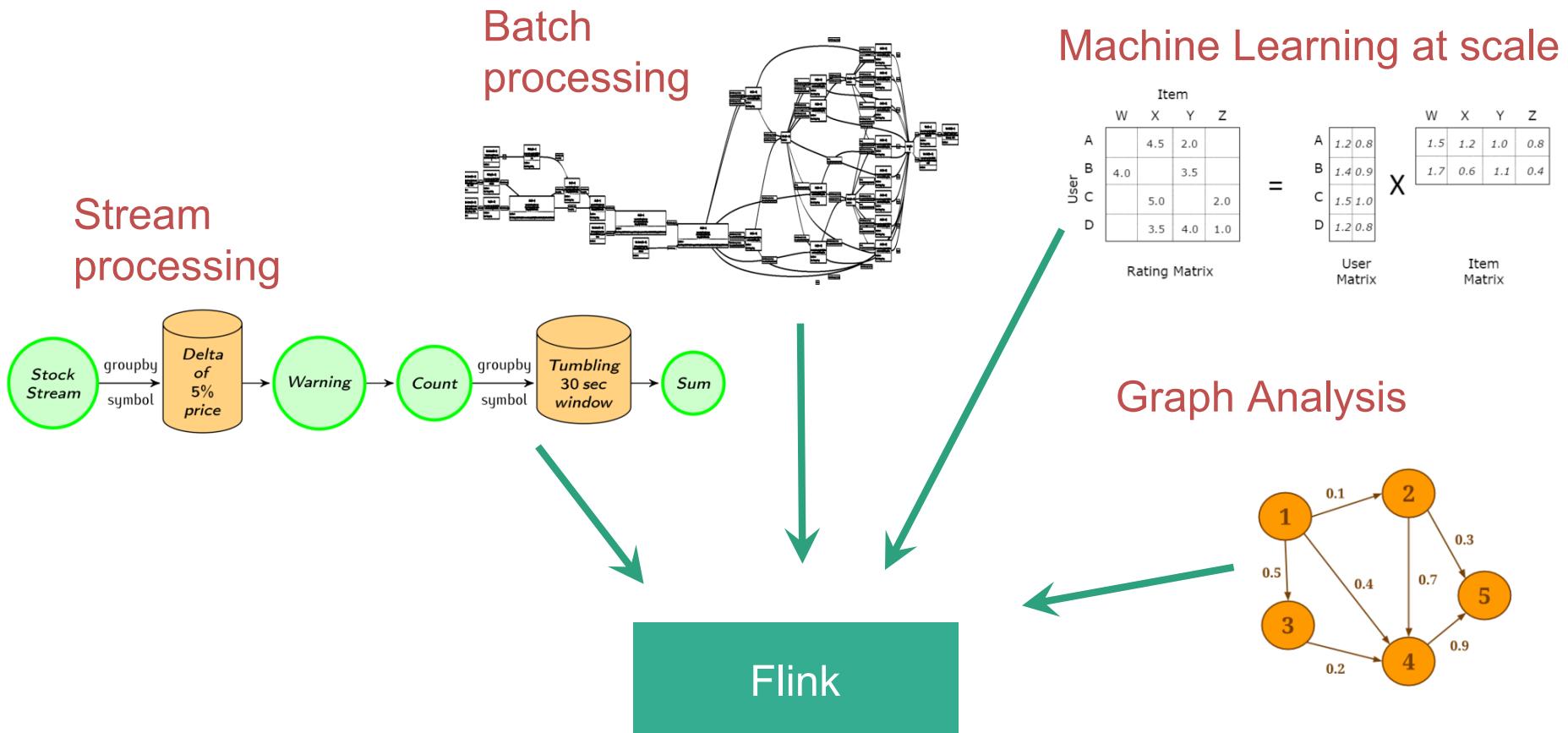


- Makes the time dimension of data explicit
- Processing depends on timestamps
- An event-time stream processor gives you the tools to reason about time
  - E.g., handle streams that are out of order





# Native support for various workloads





# Benefits of a streaming architecture

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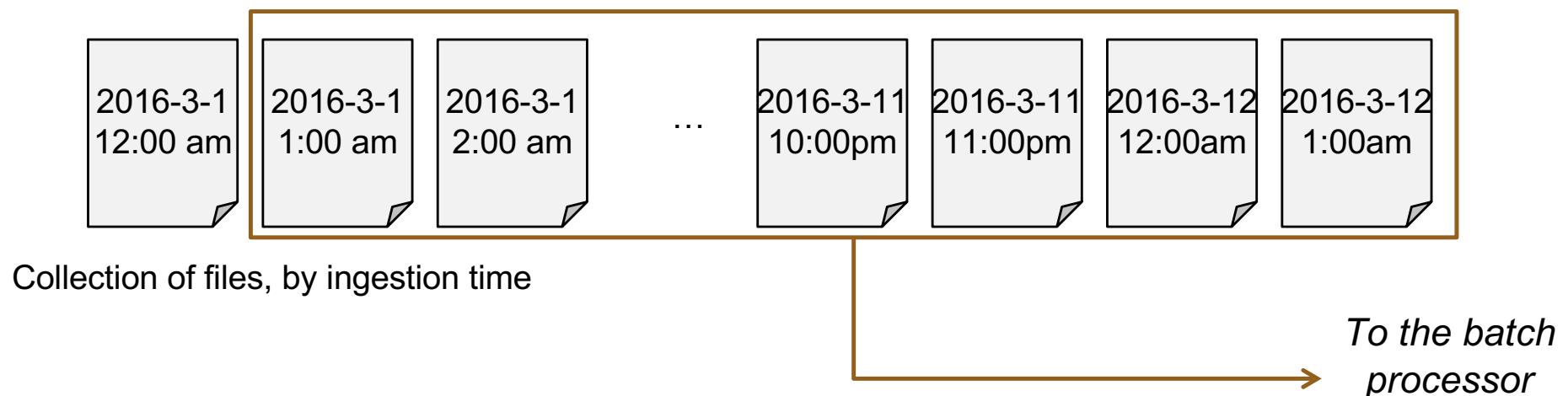
- More real-time reaction to events
- Robust continuous applications
  - Continuous batch apps are duck-taped together from many tools
- Process both real-time and historical data
  - Using exactly the same application



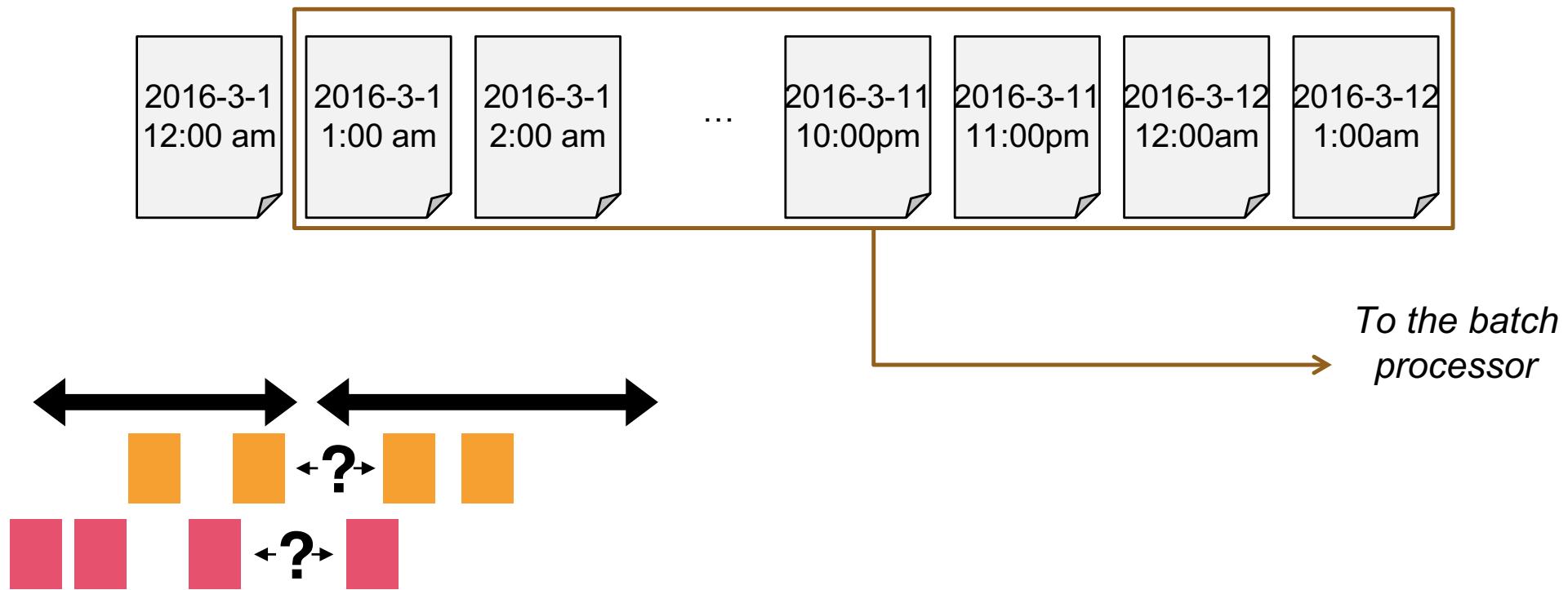
# (Re)processing data (in batch)

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- Re-processing data (what-if exploration, to correct bugs, etc.)
- Usually by running a batch job with a set of old files
- Tools that map files to times



# Unclear Batch Boundaries

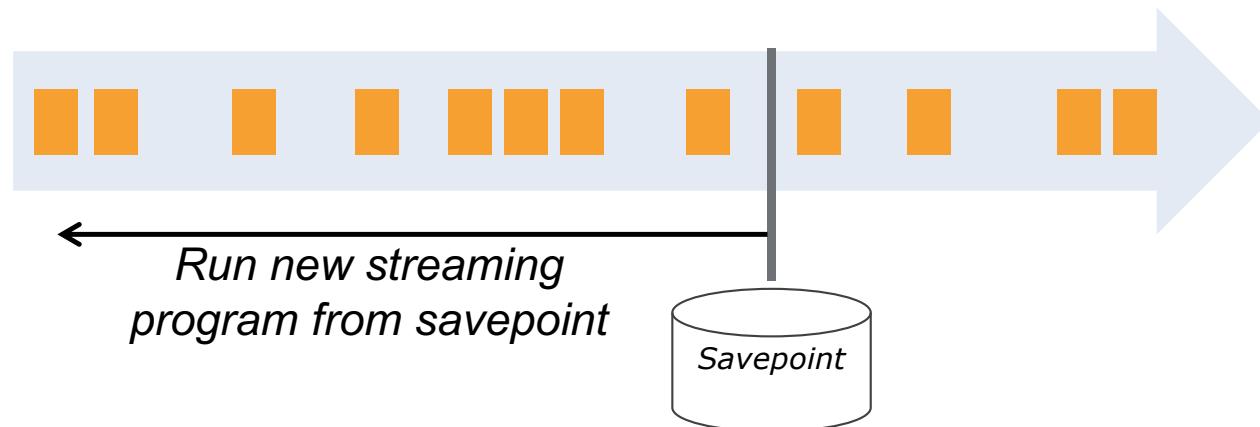


What about **sessions** across batches?

# (Re)processing data (streaming)



- Draw savepoints at times that you will want to start new jobs from (daily, hourly, ...)
- Reprocess by starting a new job from a savepoint
  - Defines start position in stream (for example Kafka offsets)
  - Initializes pending state (like partial sessions)





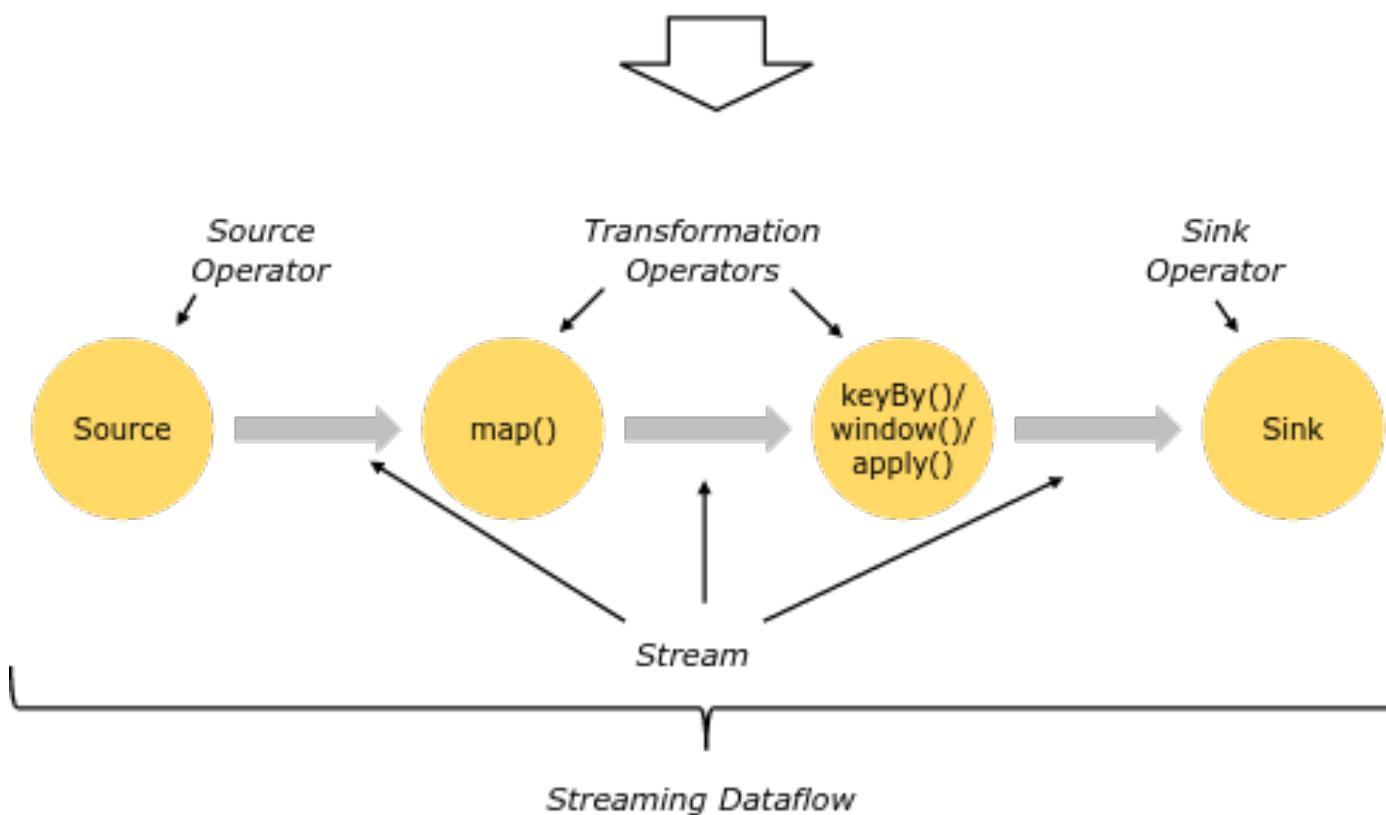
# Accurate computation

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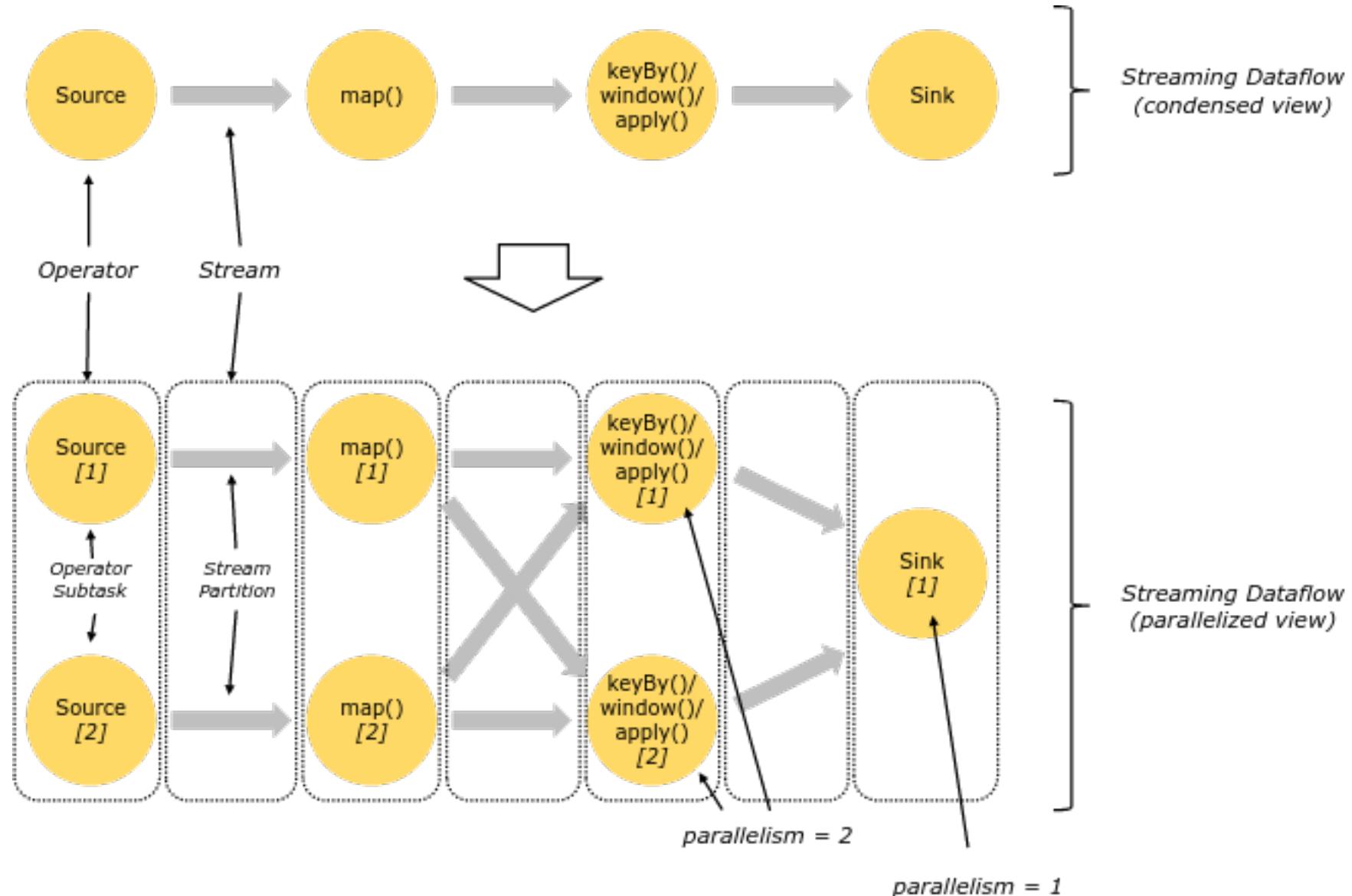
- Batch processing is not an accurate computation model for continuous data
  - Misses the right concepts and primitives
  - Time handling, state across batch boundaries
- Stateful stream processing a better model
  - Can achieve high throughput and low latency while robustly delivering accurate results
  - Real-time/low-latency is the **icing on the cake**

# How does Flink execute my application?

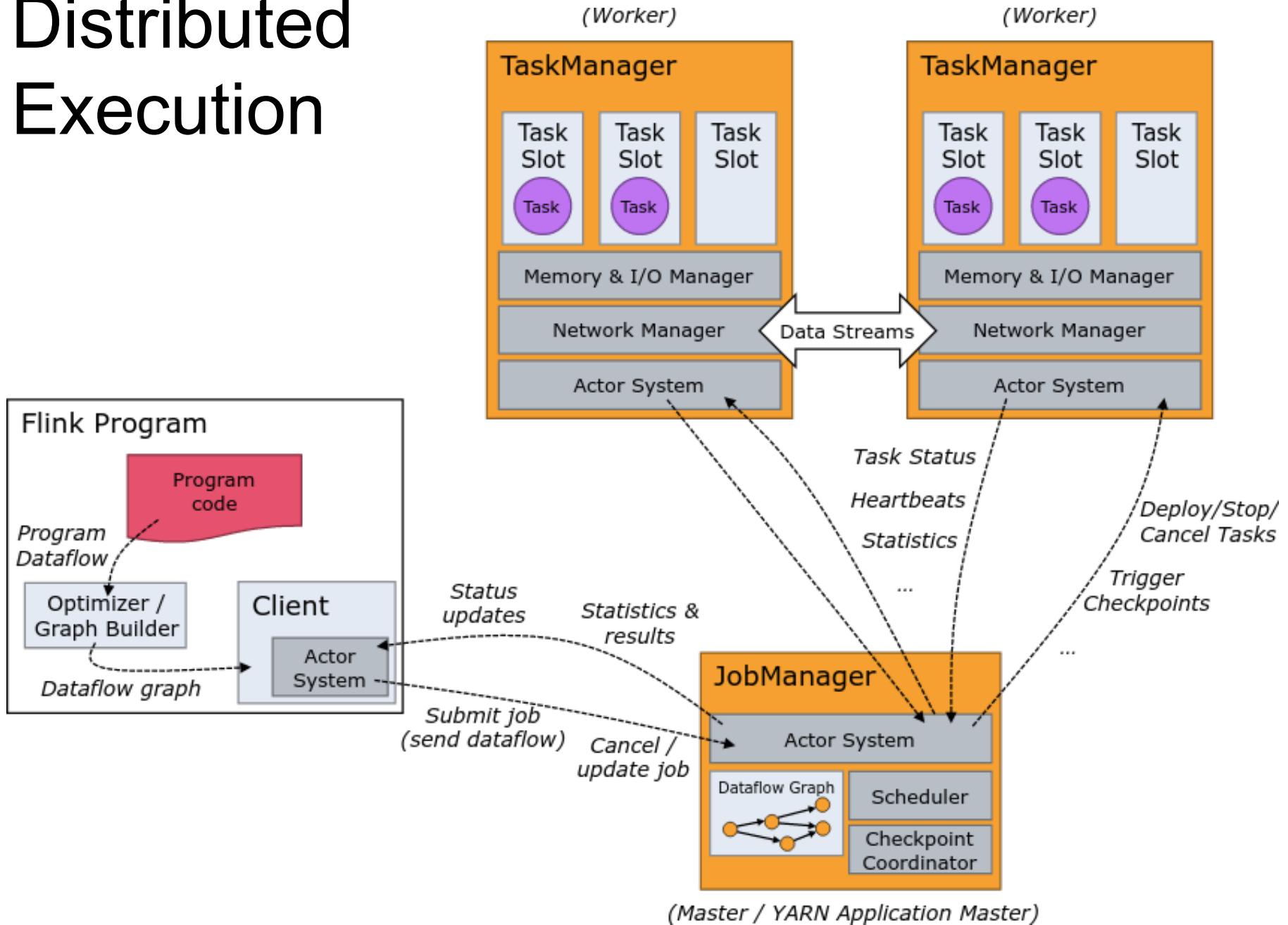
```
DataStream<String> lines = env.addSource(  
    new FlinkKafkaConsumer<>(...)); } Source  
  
DataStream<Event> events = lines.map((line) -> parse(line)); } Transformation  
  
DataStream<Statistics> stats = events  
    .keyBy("id")  
    .timeWindow(Time.seconds(10))  
    .apply(new MyWindowAggregationFunction()); } Transformation  
  
stats.addSink(new RollingSink(path)); } Sink
```



# Parallelism



# Distributed Execution

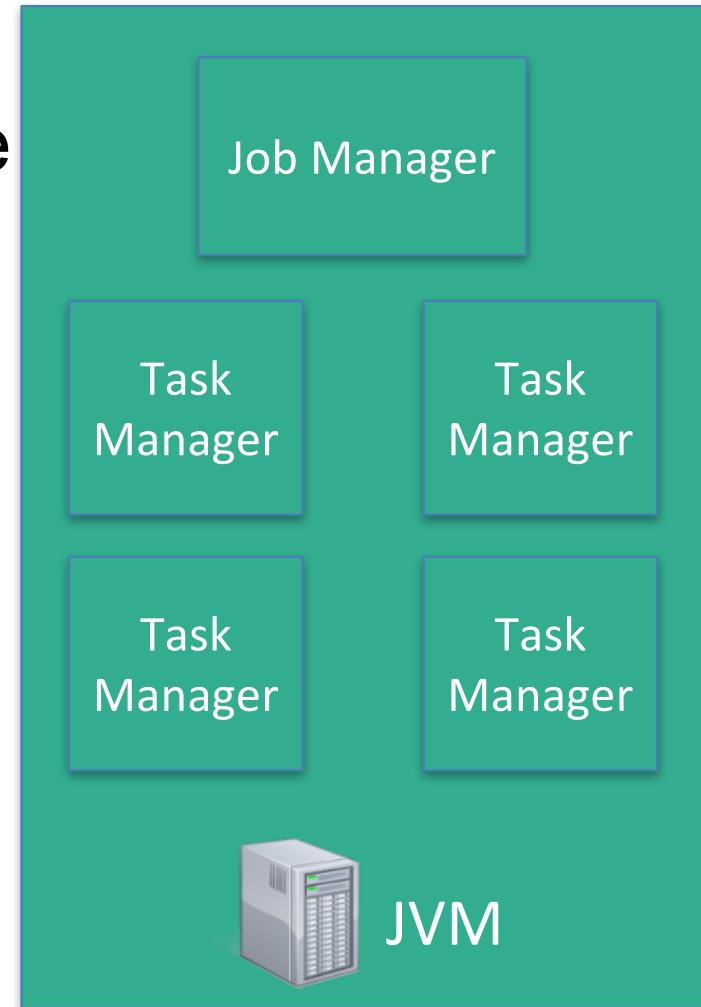


# Deployment Options

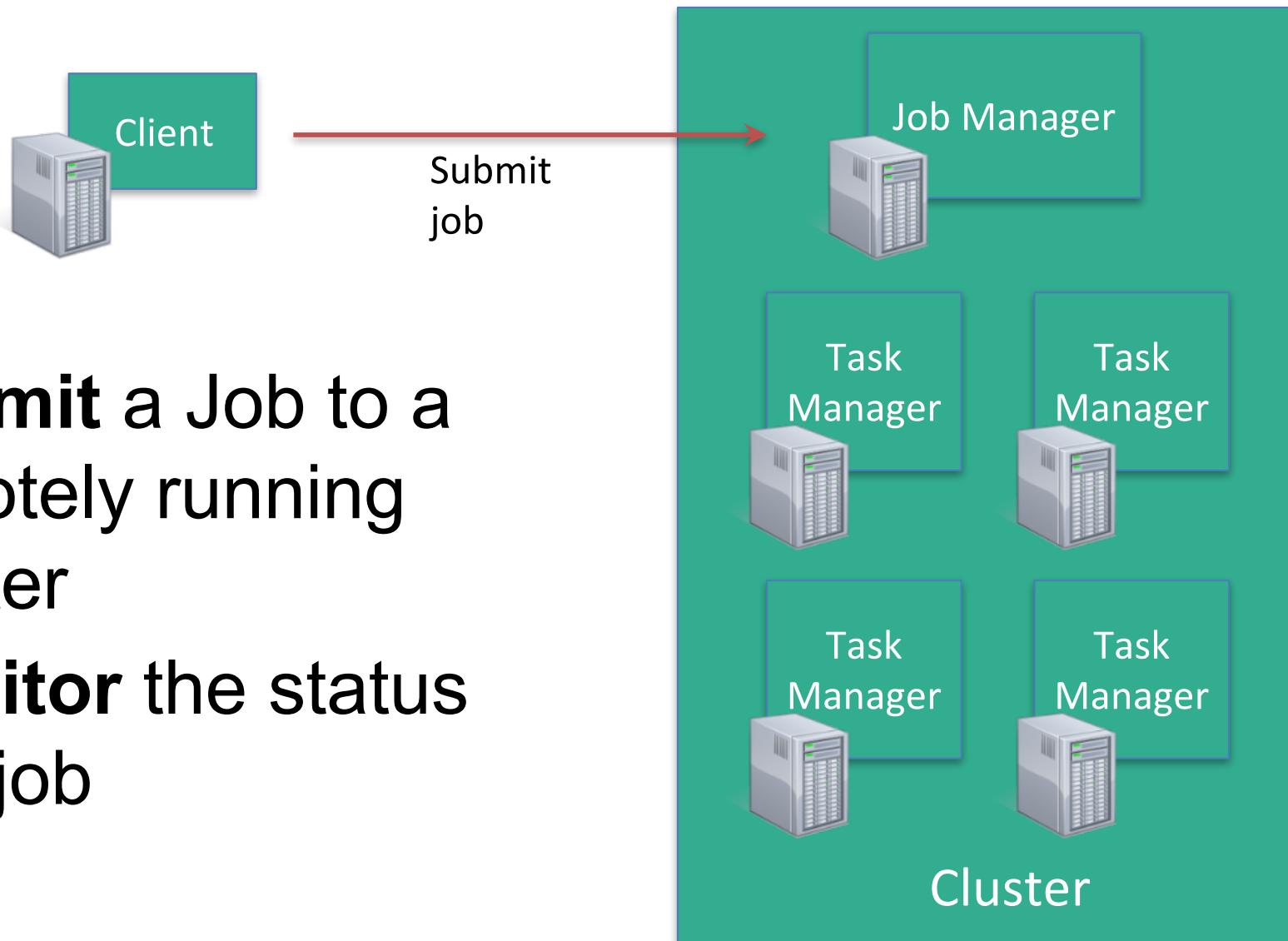
# Local Execution



- Starts local Flink cluster
- All processes run in the same JVM
- Behaves just like a regular Cluster
- Local cluster can be started in your IDE!
- Very useful for developing and debugging



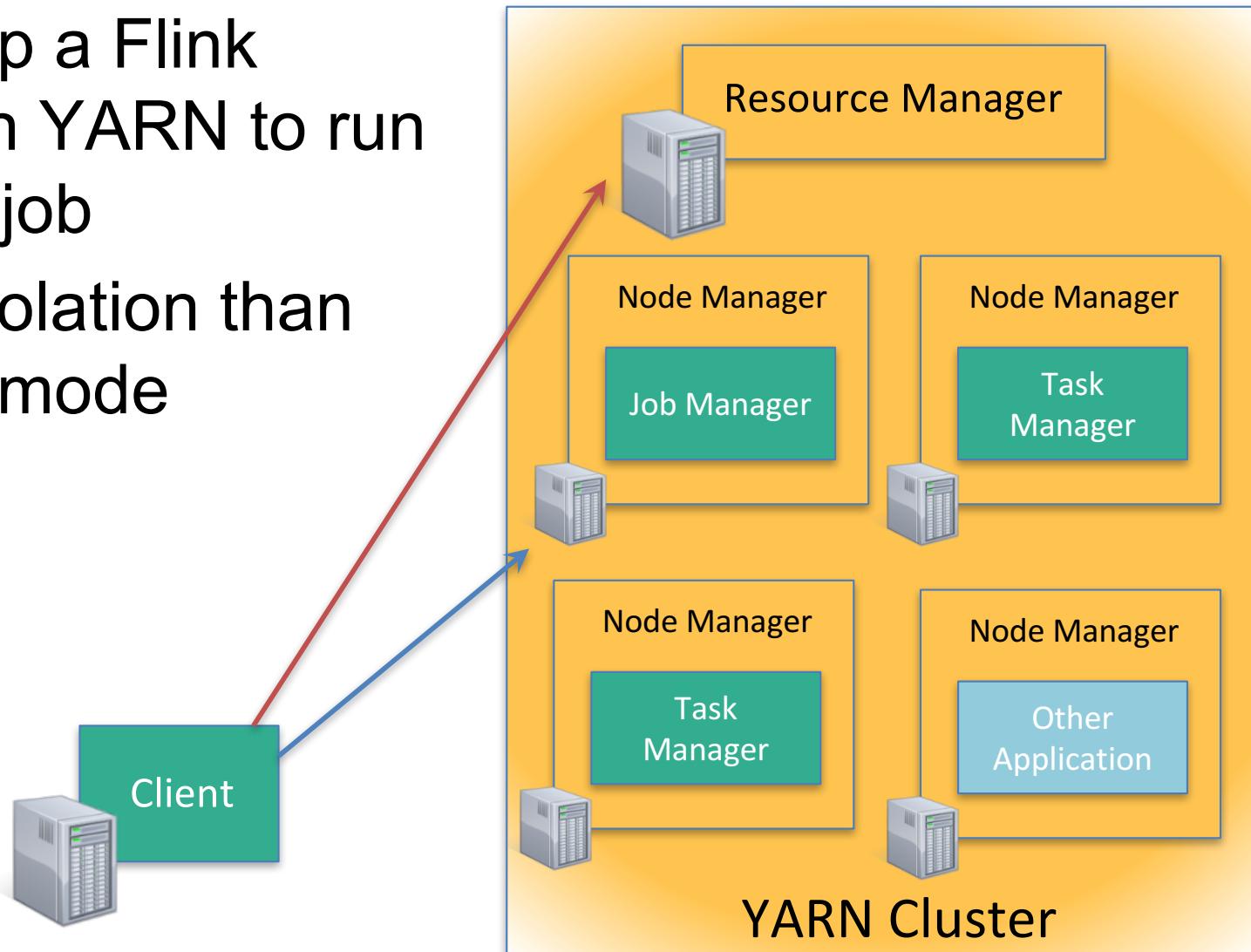
# Remote Execution



# YARN Job Mode



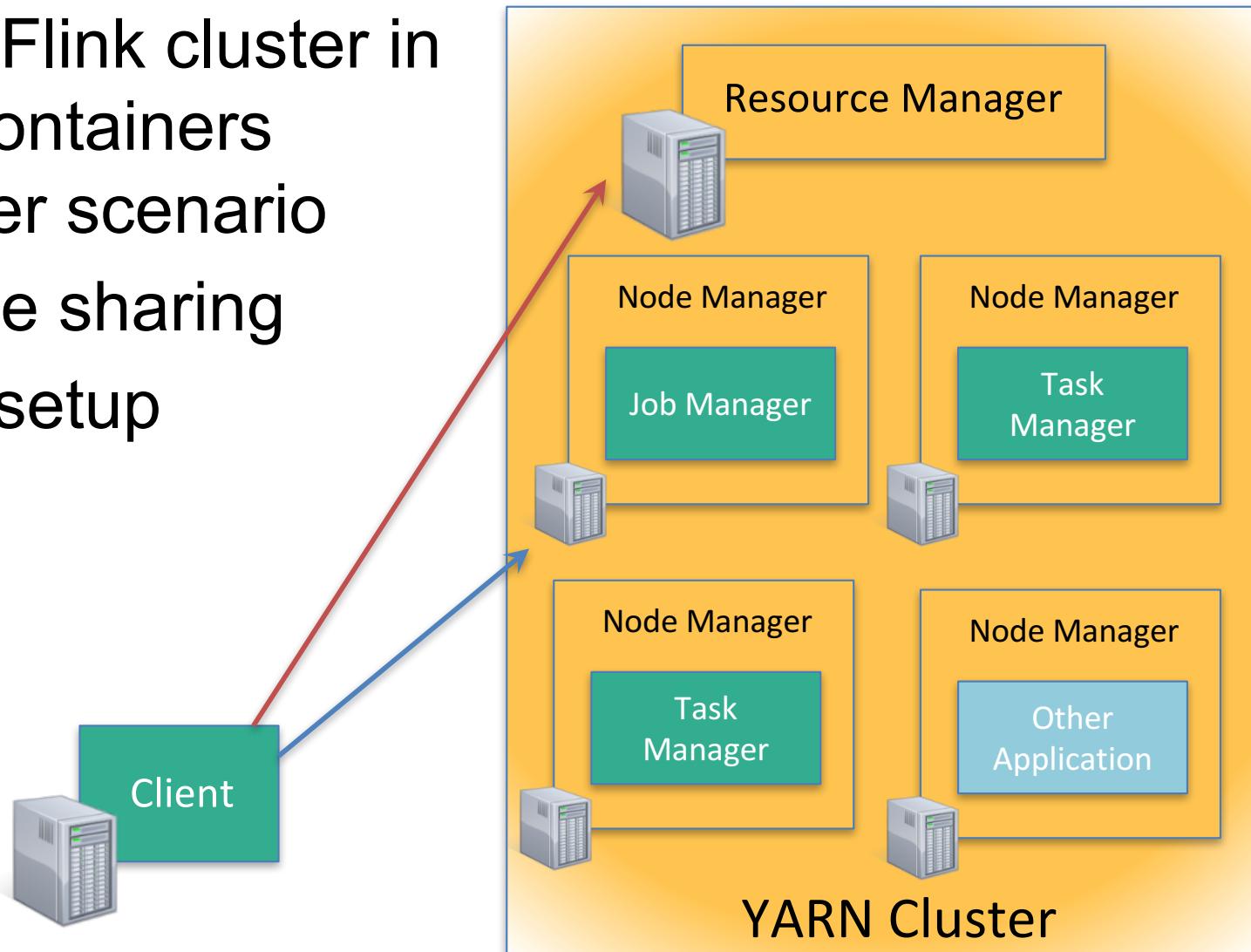
- Brings up a Flink cluster in YARN to run a single job
- Better isolation than session mode



# YARN Session Mode



- Starts a Flink cluster in YARN containers
- Multi-user scenario
- Resource sharing
- Easy to setup





# Other Deployment Options

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- Apache Mesos
  - Either with or without DC/OS
- Amazon Elastic MapReduce
  - Available in EMR 5.1.0
- Google Compute Engine
  - Available via bdutil
- Docker / Kubernetes

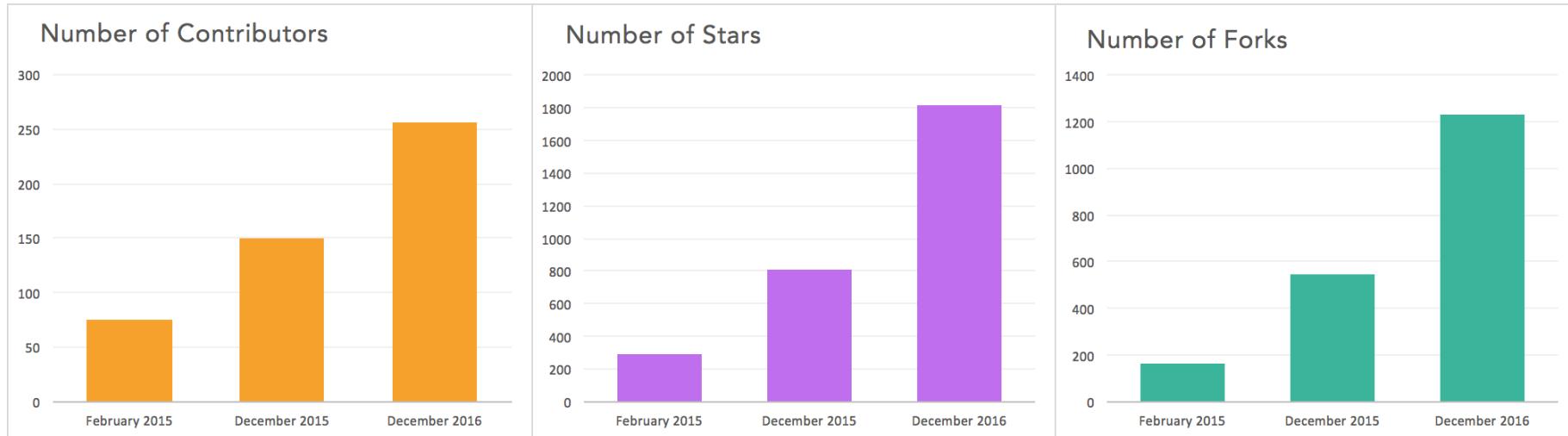


# Flink in the real world



# Flink community

## Github



41 meetups  
16,544 members



# Powered by Flink

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Zalando, one of the largest ecommerce companies in Europe, uses Flink for real-time business process monitoring.



King, the creators of Candy Crush Saga, uses Flink to provide data science teams with real-time analytics.



Alibaba, the world's largest retailer, built a Flink-based system (Blink) to optimize search rankings in real time.



Bouygues Telecom uses Flink for real-time event processing over billions of Kafka messages per day.

See more at [flink.apache.org/powerdby.html](http://flink.apache.org/powerdby.html)





Largest job has > 20 operators, runs on > 5000 vCores in 1000-node cluster, processes millions of events per second



Complex jobs of > 30 operators running 24/7, processing 30 billion events daily, maintaining state of 100s of GB with exactly-once guarantees



30 Flink applications in production for more than one year. 10 billion events (2TB) processed daily



# Flink Forward 2016

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**dataArtisans**

**EMC<sup>2</sup>**

**Google**

**King**

**New Relic.**

**U B E R**

**zalando**

**otto group**



**redhat.**

**Hortonworks**

**ResearchGate**

**Alibaba Group**

**NETFLIX**

**bouygues  
TELECOM**

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web services**

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**MAPR**

**TNG** TECHNOLOGY  
CONSULTING

**SICS**

**MTA  
SZTAKI**

**AALBORG  
UNIVERSITET**

**mgm**

**people  
pattern**

**CRS4**  
IDEAS BECOME LIFE

**ScaDS**  
DRESDEN LEIPZIG

# Flink Forward 2017



## San Francisco

- 10-11 April 2017
- The first Flink Forward event outside of Berlin
- Talks are online at [sf.flink-forward.org/](http://sf.flink-forward.org/)

## Berlin

- 11-13 September 2017
- Over 350 attendees at the last event
- Registration opening soon!



<http://dataartisans.github.io/flink-training/>