Apache Flink® Training

System Overview

Apache Flink® Training

dataArtisans

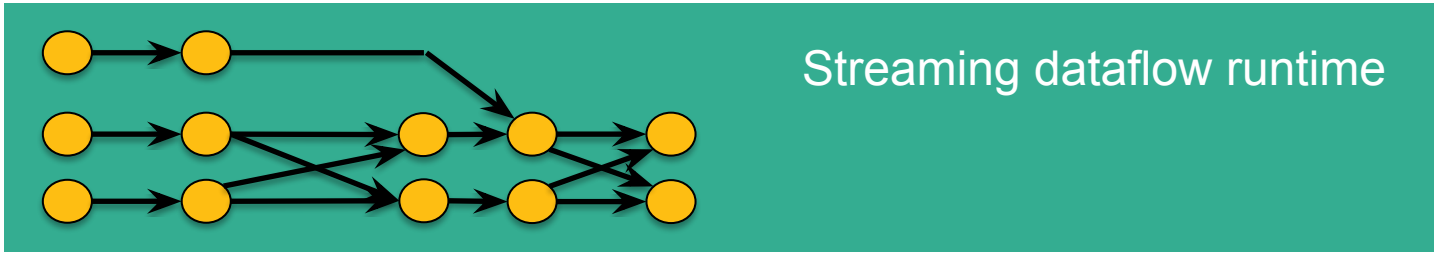
Flink v1.1.3 – 8.11.2016

What is Flink?

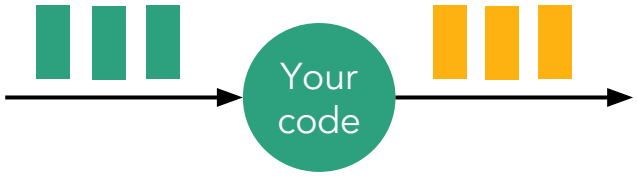
Apache Flink®

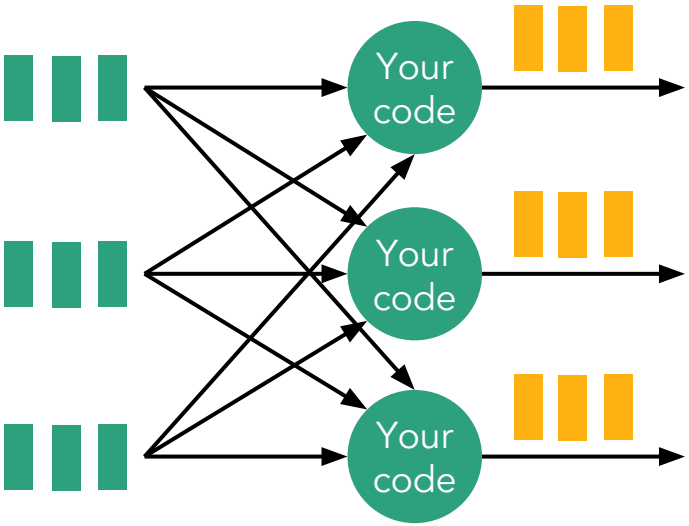
A stream processor

with many applications



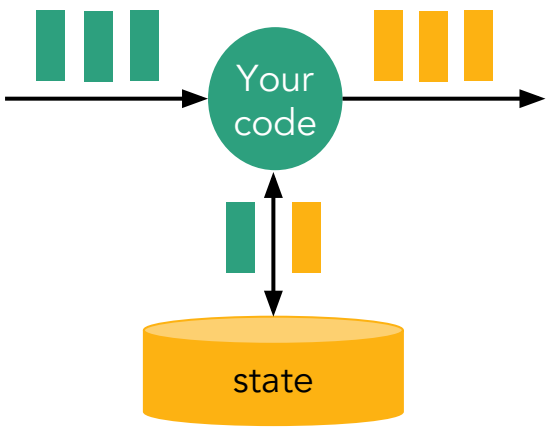
(Distributed) streaming





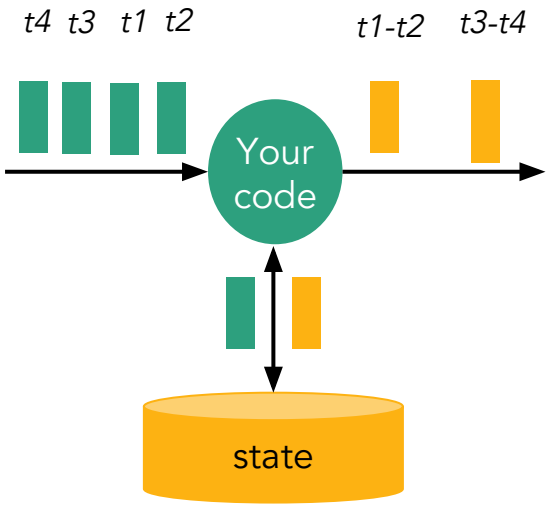
- Computations on never-ending “streams” of data records (“events”)
- A stream processor distributes the computation in a cluster

Stateful streaming

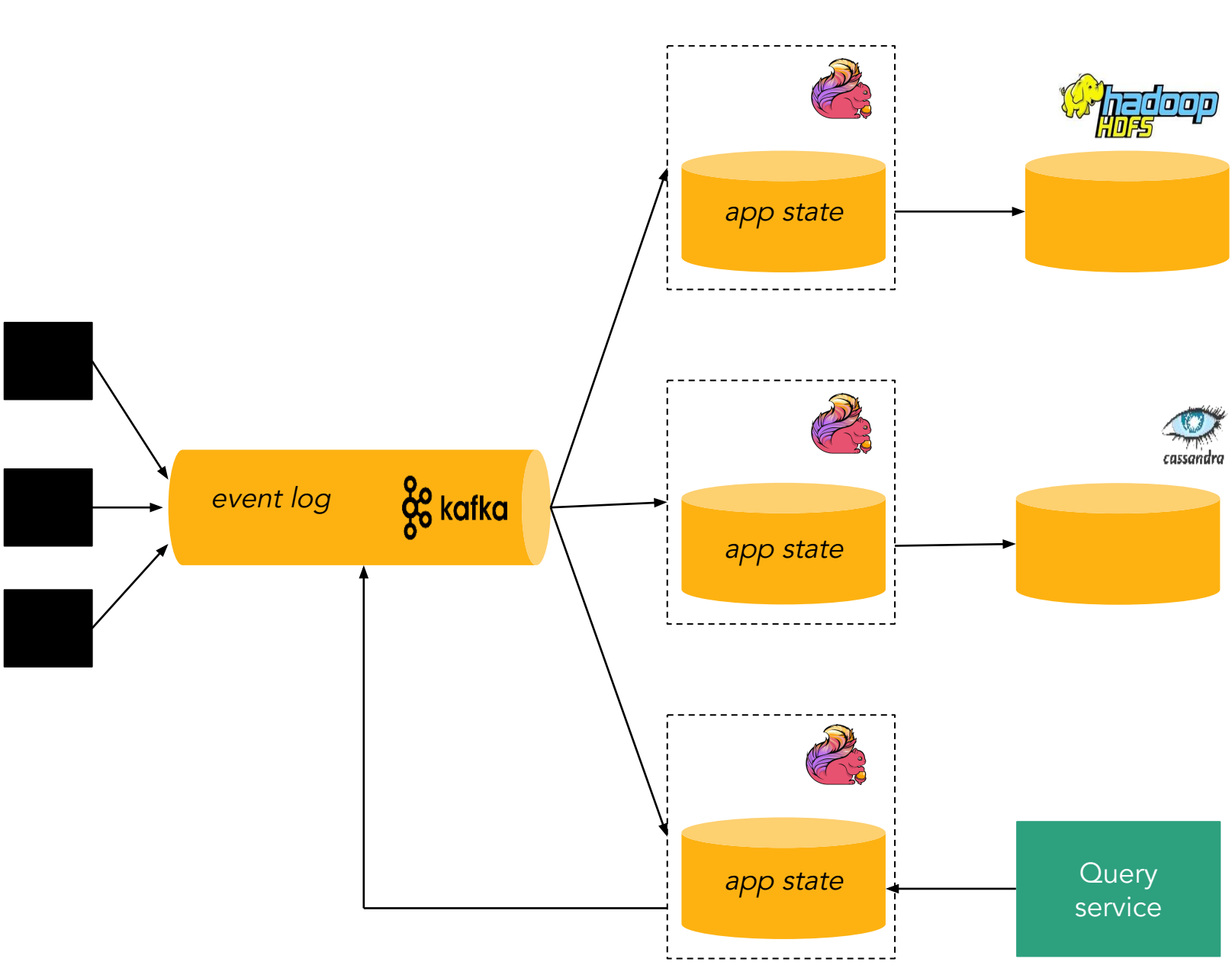


- Computation *and* state
  - E.g., counters, windows of past events, state machines, trained ML models
- Results depend on history of stream
- A stateful stream processor provides tools to manage state
  - Recover, roll back, version, upgrade, etc.

Event-time streaming

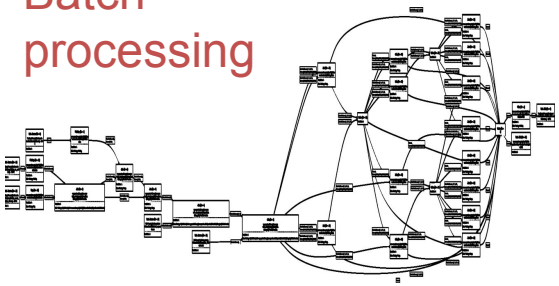


- Data records associated with timestamps (time series data)
- Processing depends on timestamps
- An event-time stream processor gives you the tools to reason about time
  - E.g., handle streams that are out of order

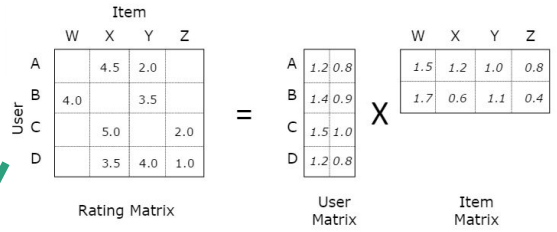

event log
kafka
app state
app state
app state
hadoop
HDFS
cassandra
Query
service

Native support for various workloads

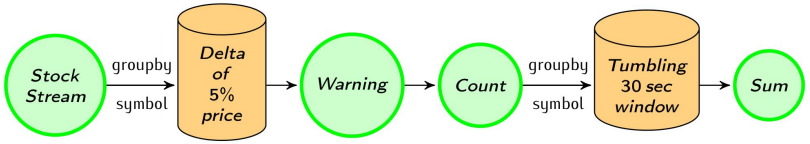
Batch processing



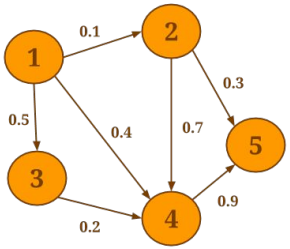
Machine Learning at scale



Stream processing



Graph Analysis



Flink

Benefits of a streaming architecture

- 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

Accurate computation

- 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?

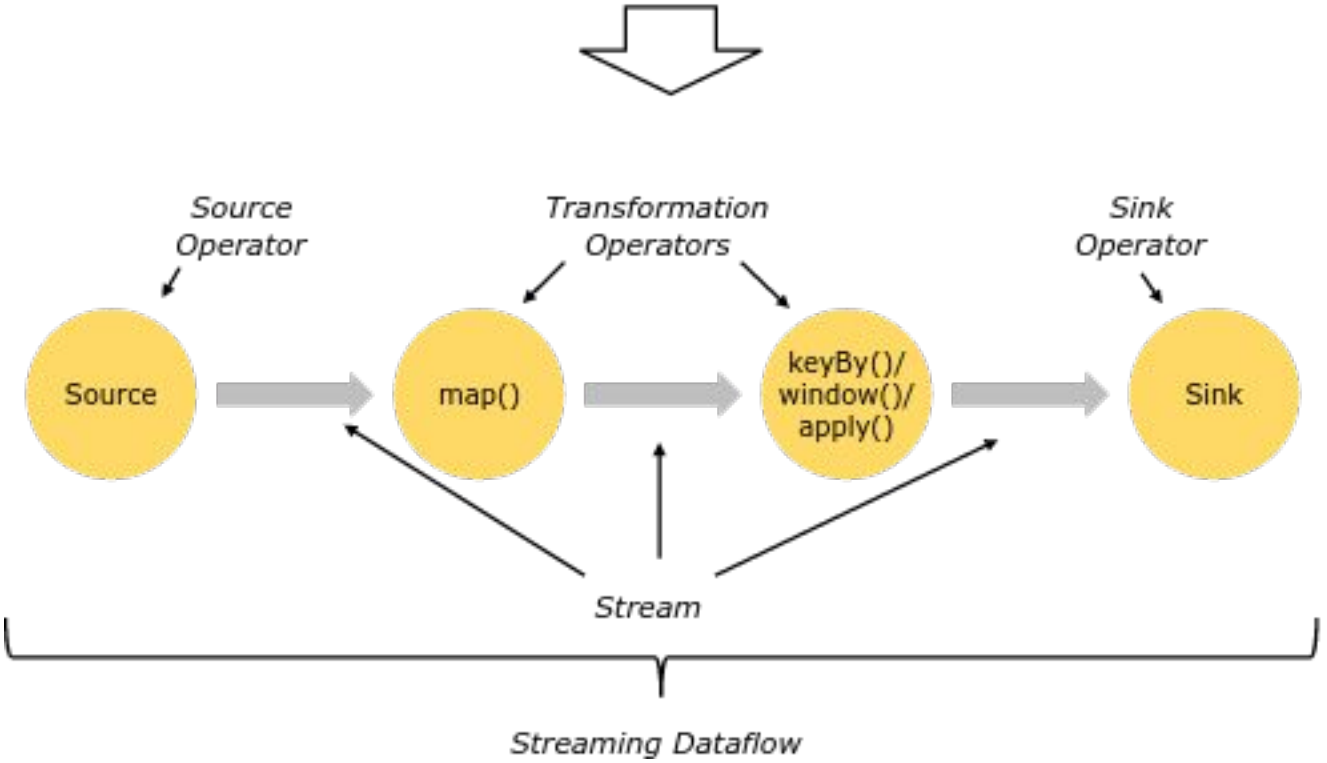
```
DataStream<String> lines = env.addSource(
                                new FlinkKafkaConsumer<>(…));

DataStream<Event> events = lines.map((line) -> parse(line));

DataStream<Statistics> stats = events
        .keyBy("id")
        .timeWindow(Time.seconds(10))
        .apply(new MyWindowAggregationFunction());

stats.addSink(new RollingSink(path));
```

Source

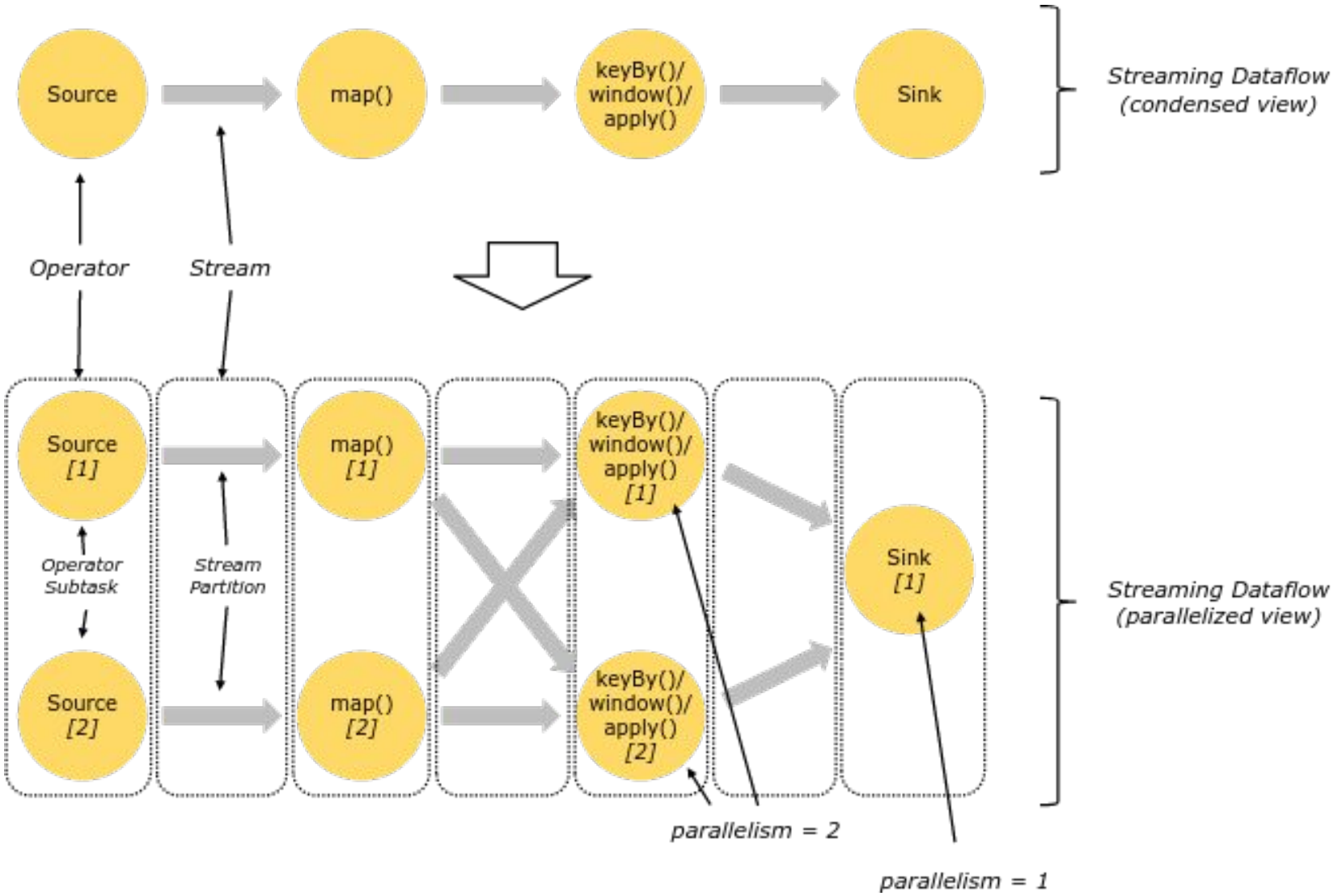
Transformation

Transformation

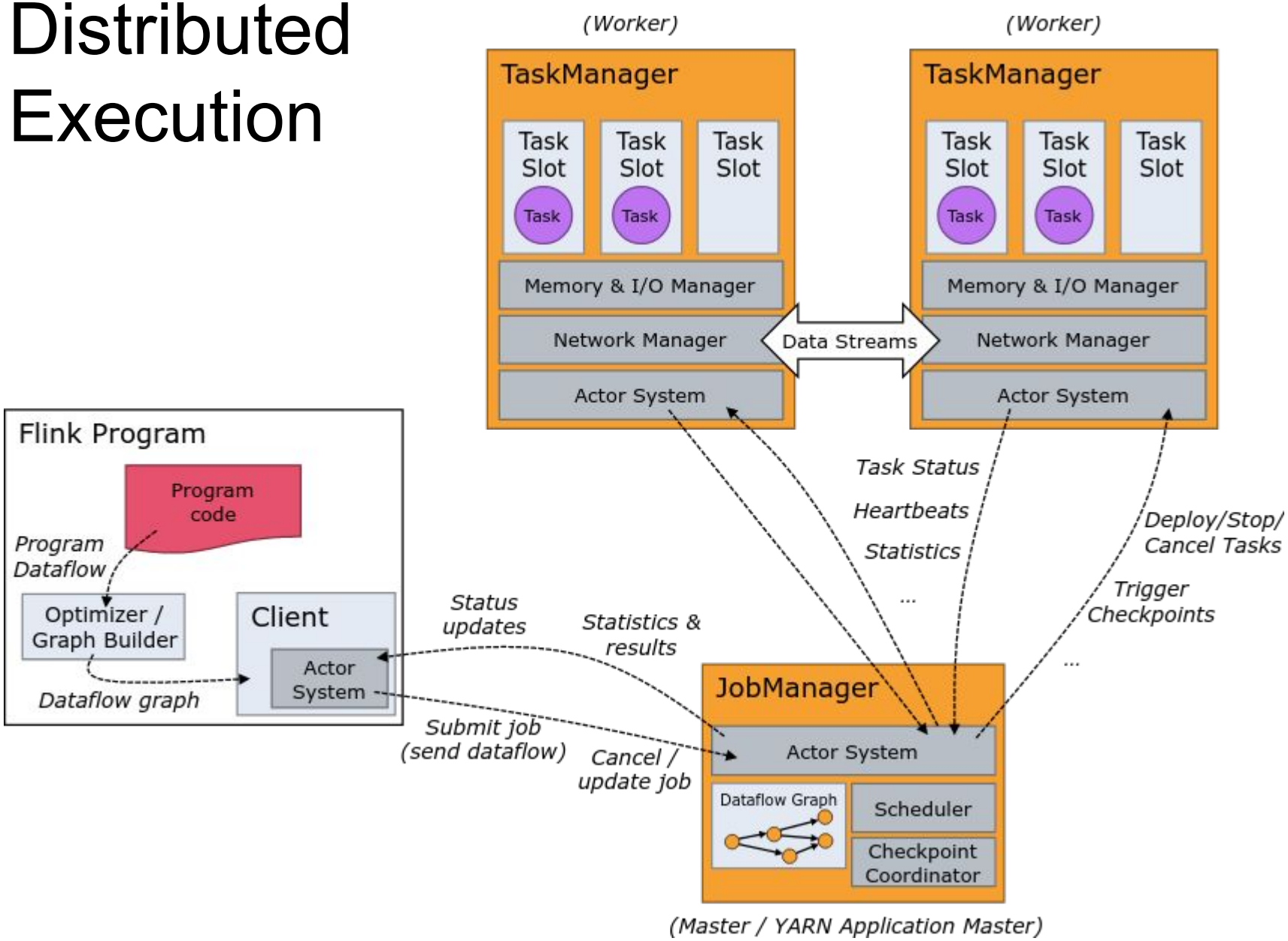
Sink



Parallelism



Distributed Execution

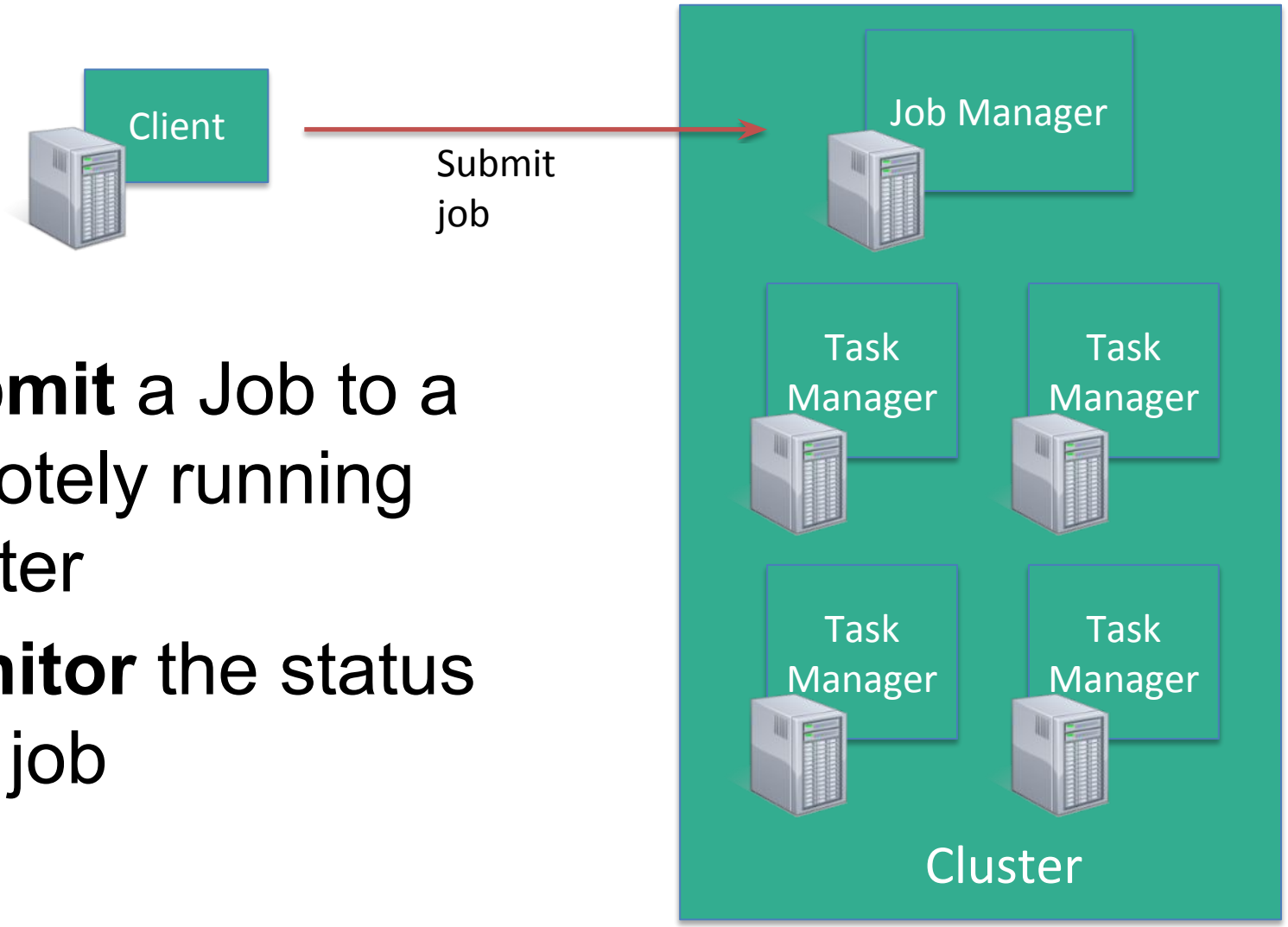


Deployment Options

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

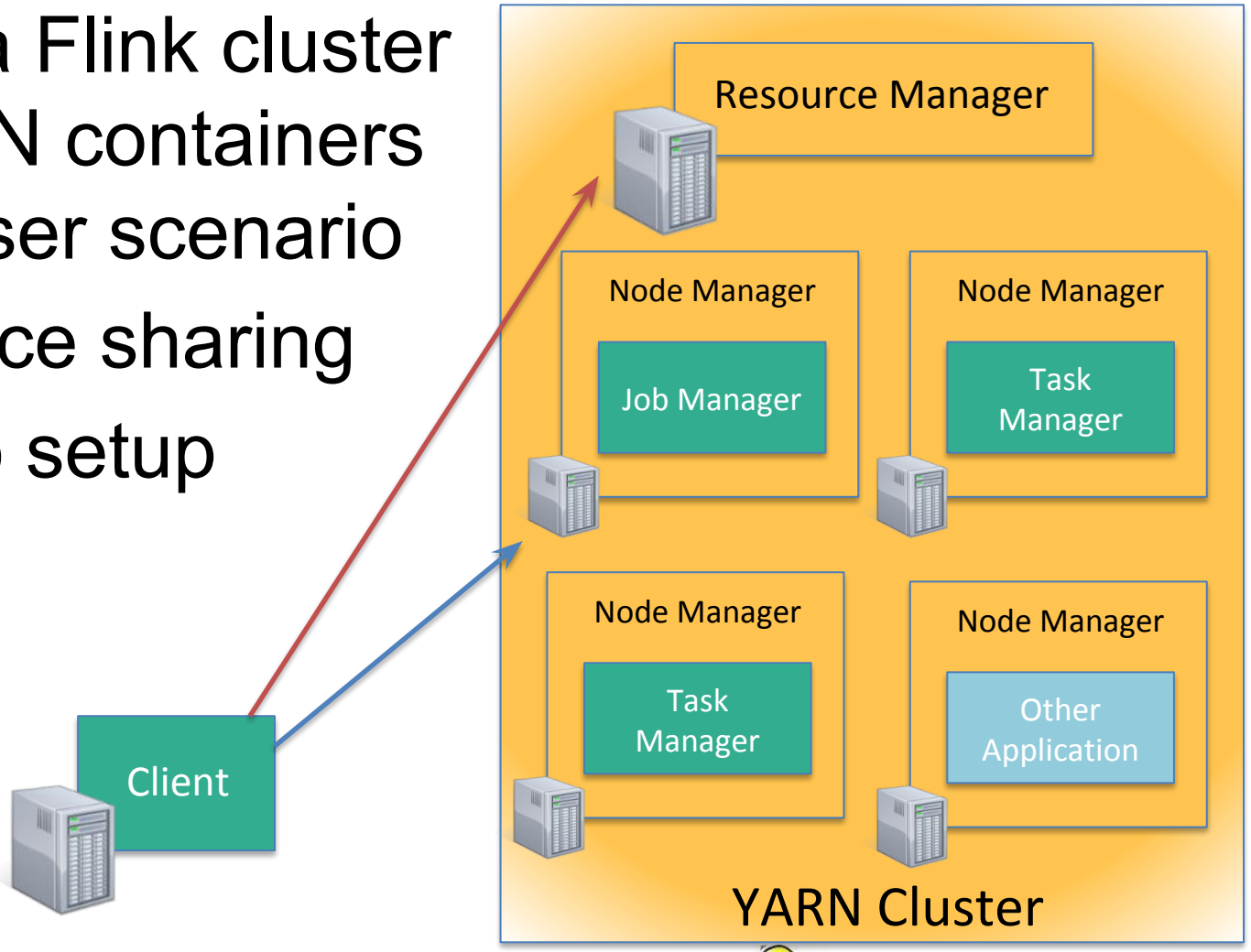
Remote Execution



- **Submit** a Job to a remotely running cluster
- **Monitor** the status of a job

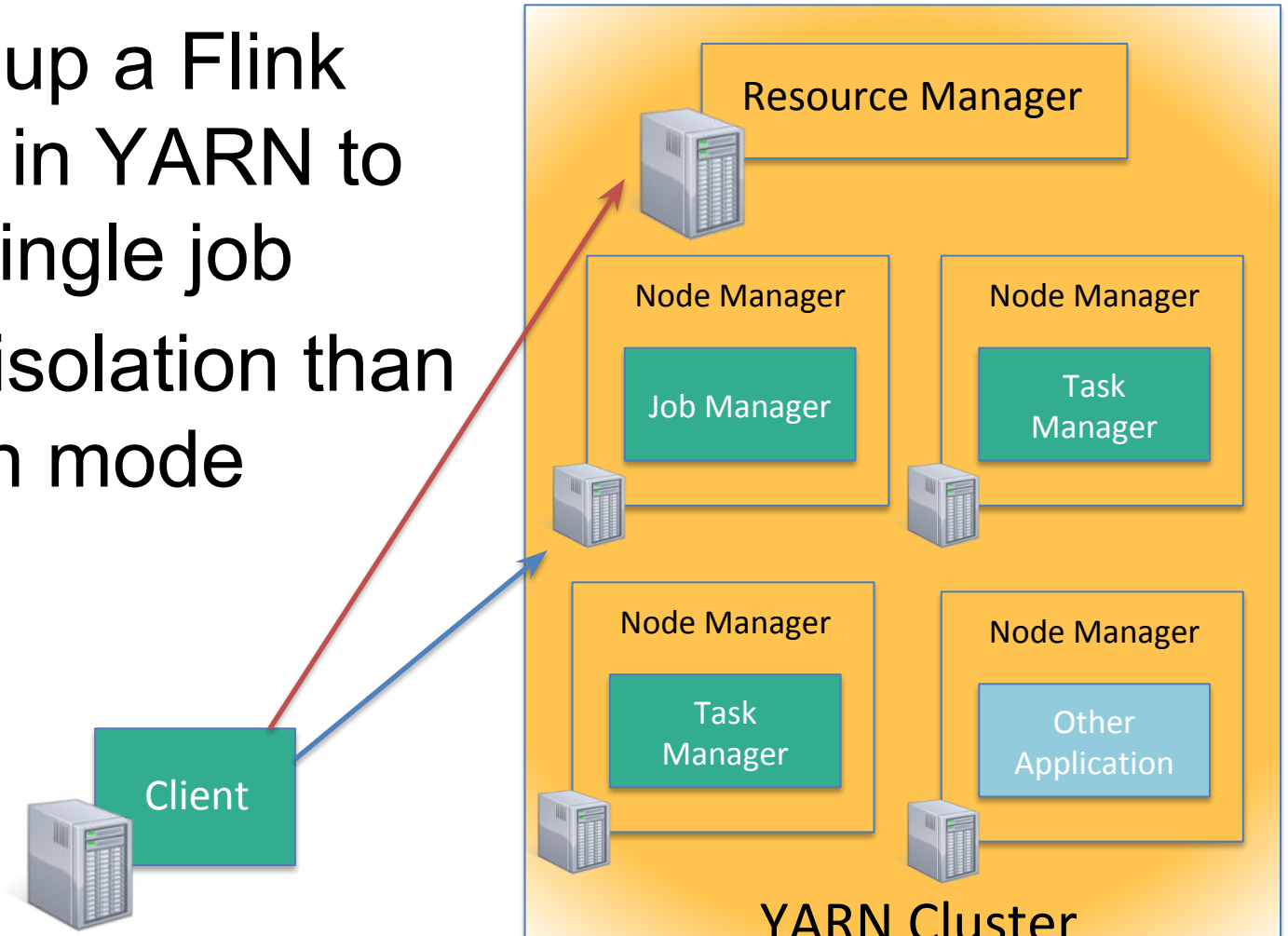
YARN Session Mode

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



YARN Job Mode

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



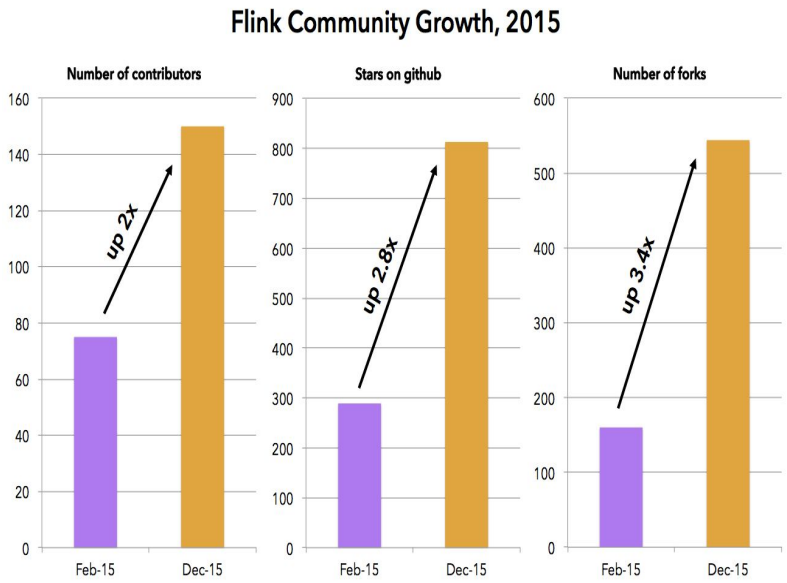
Other Deployment Options

- Amazon Elastic MapReduce
  - Available in EMR 5.1.0
- Google Compute Engine
  - Available via bdutil
- Apache Mesos
  - Coming in Flink 1.2.0

Flink in the real world

Flink community

- > 240 contributors, 95 contributors in Flink 1.1
- 42 meetups around the world with > 15,000 members
- 2x-3x growth in 2015, similar in 2016



Powered by Flink

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/poweredby.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