The Past, Present, and Future of Apache Flink®

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dataArtisans

Past

It all started in 2014

2009 - 2014

since 2014

- Batch processor on top of streaming runtime
- First Apache Flink 0.6.0 release August 2014

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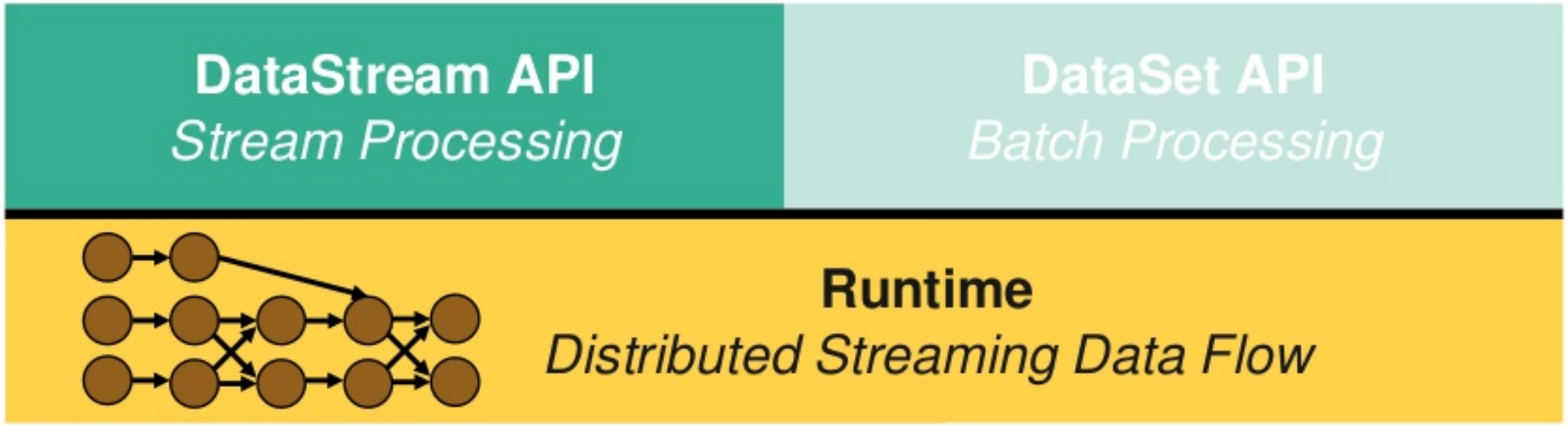
Batch processing

August 2014

Flink learns to stream in real time



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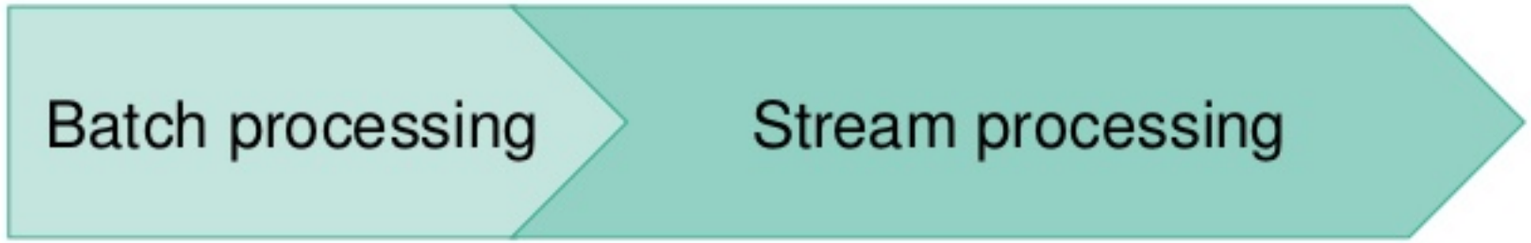

- Continuous & real-time

November 2014

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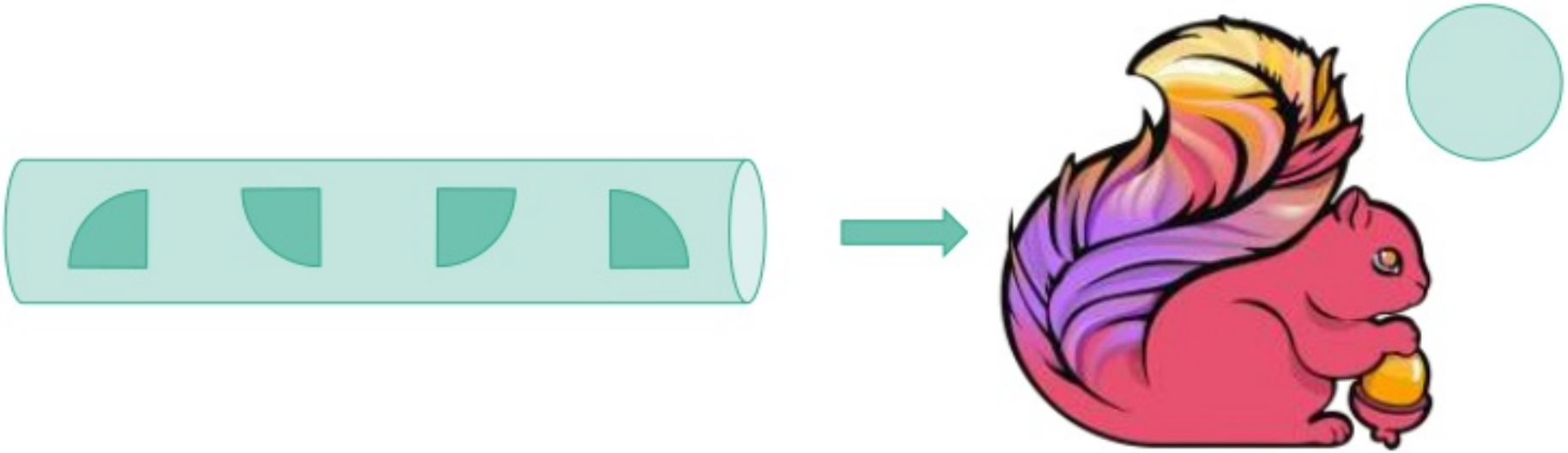
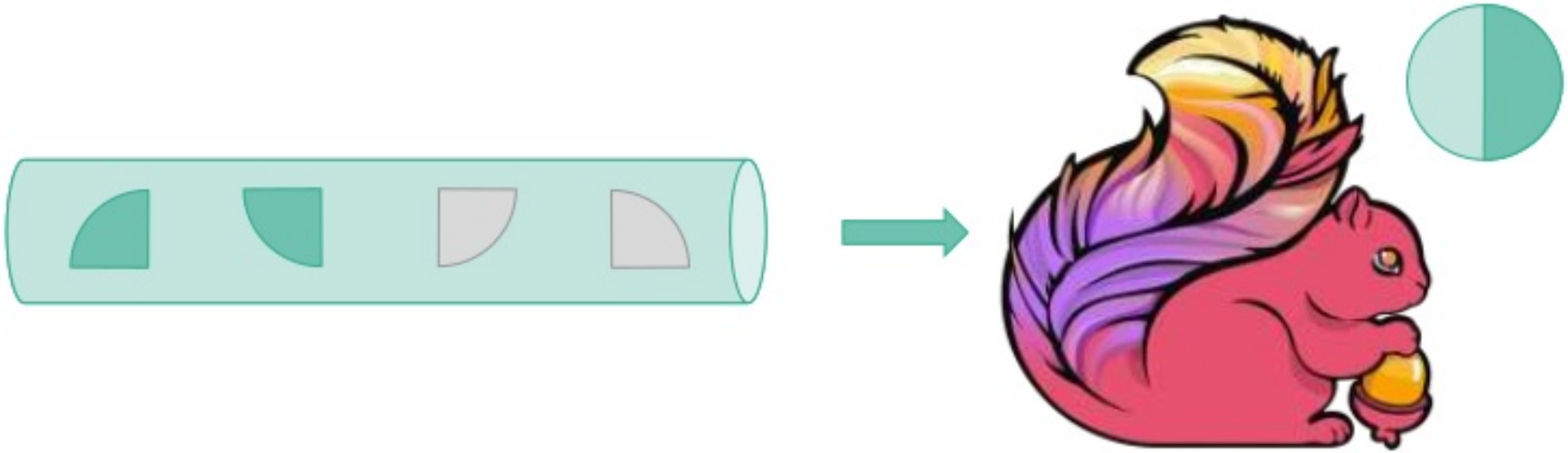
Flink learns to remember



Flink learns to remember



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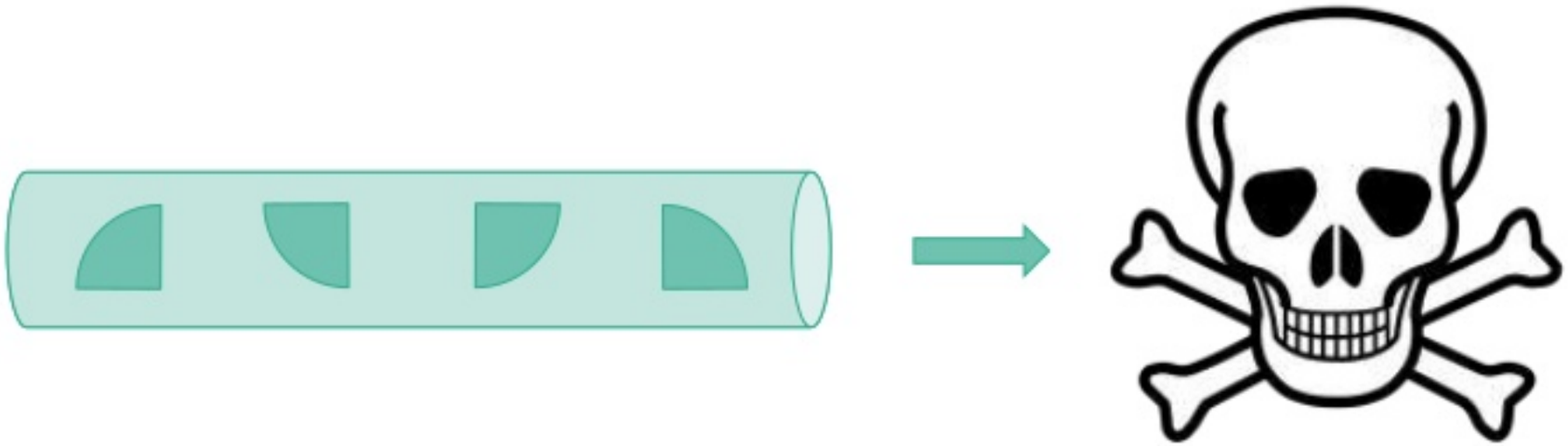
Flink learns to remember



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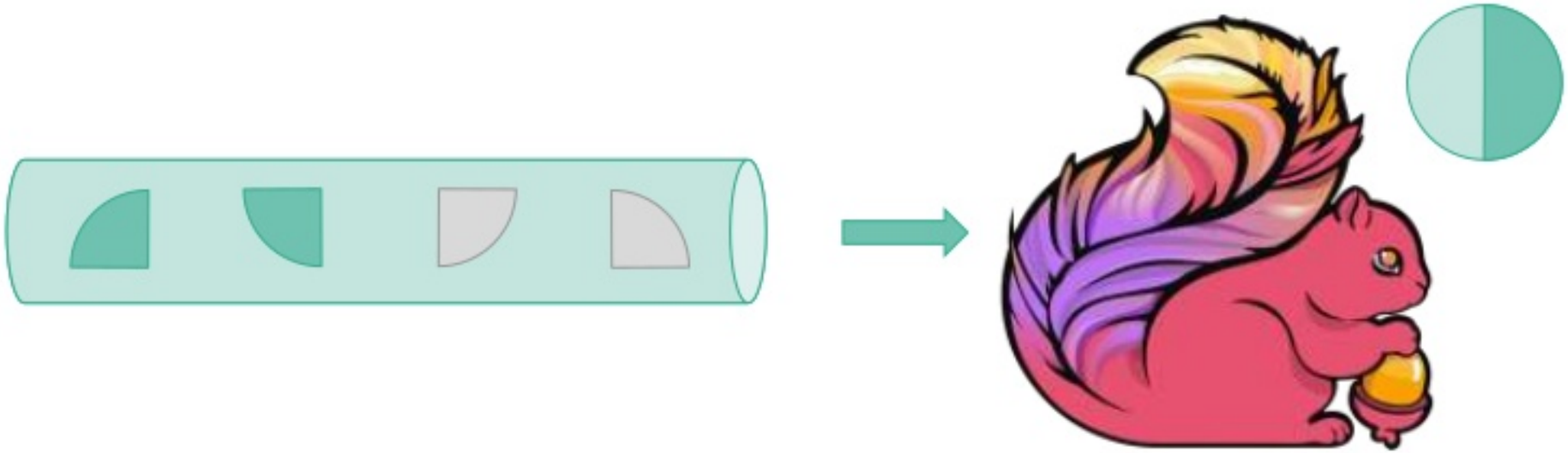
Flink learns to remember



Remember where we left off

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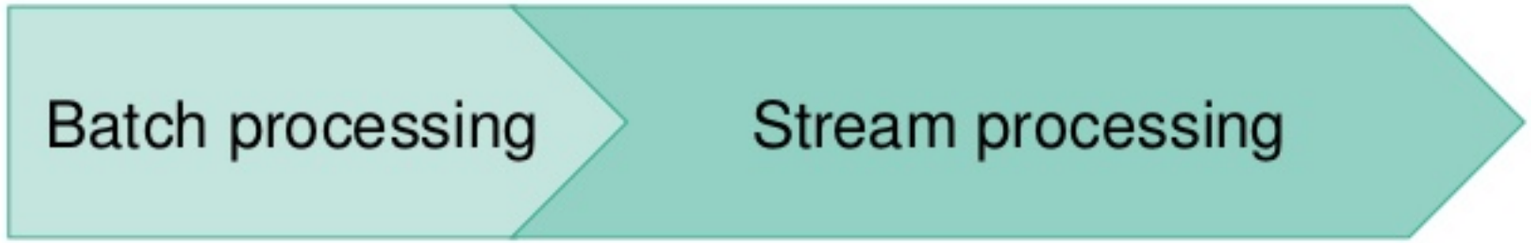

- Continuous & real-time
- Stateful & exactly once

June 2015

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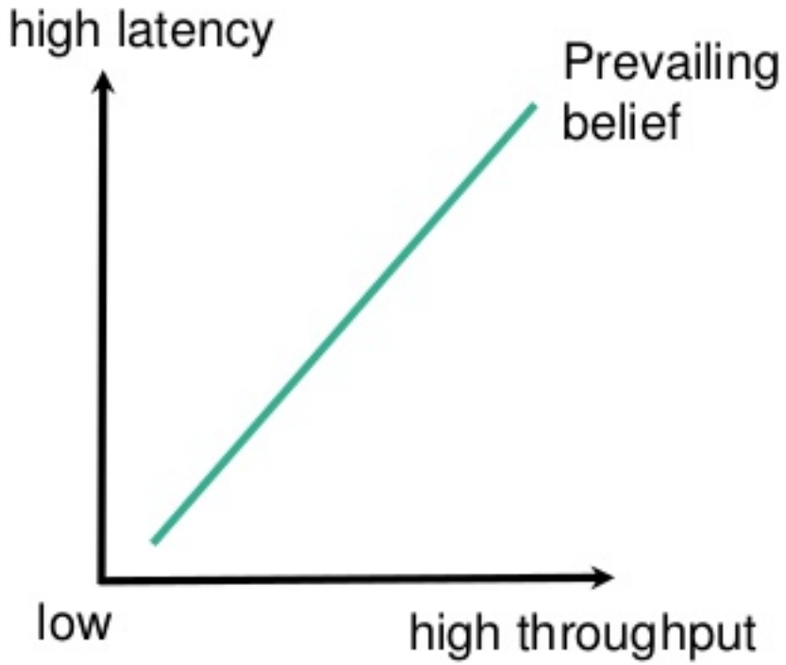
Latency vs. Throughput?



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- 10s of millions of events/s
- Latency down to 1 ms

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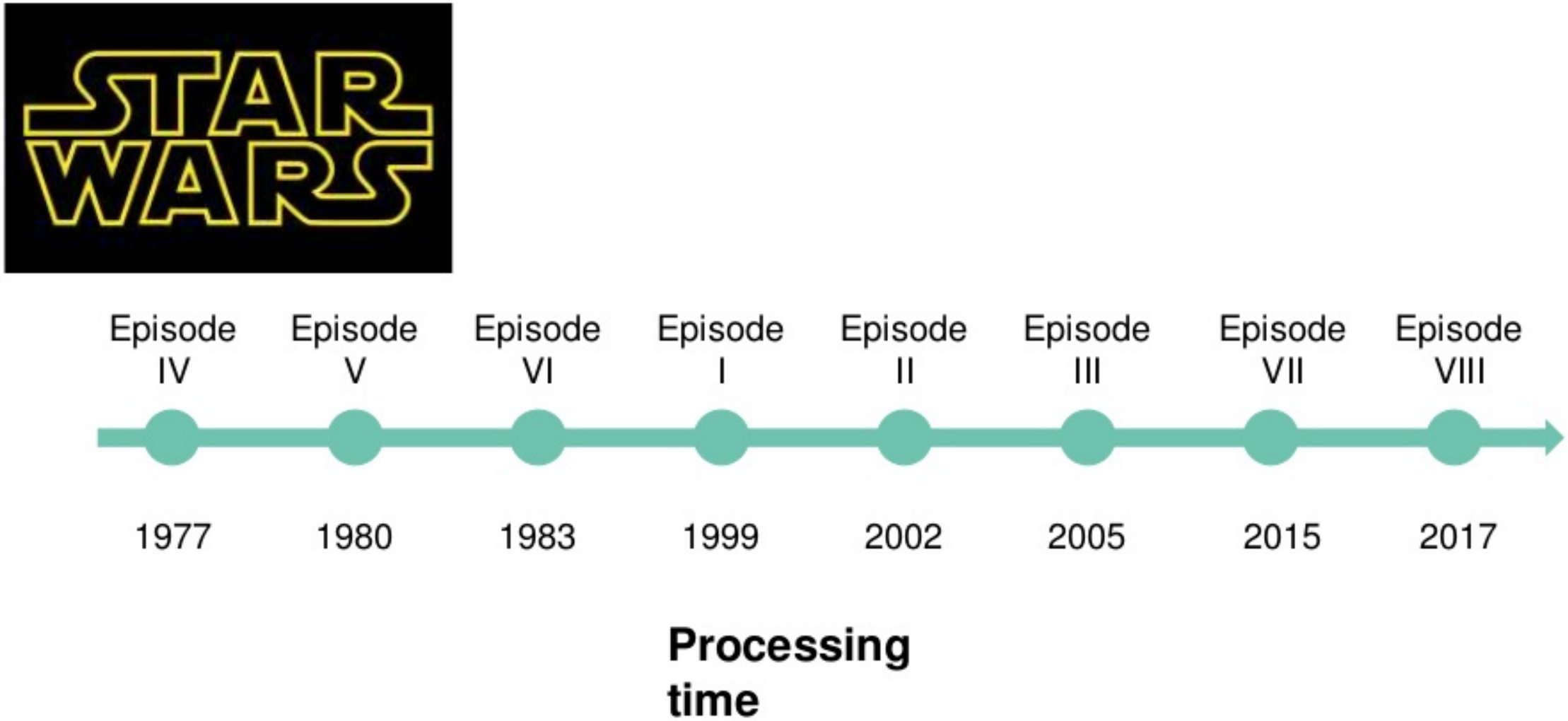
Flink becomes event-time aware



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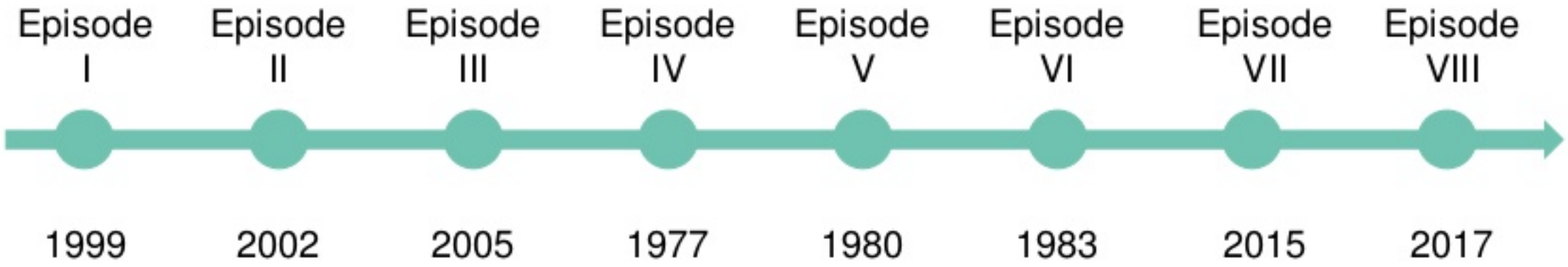
Flink becomes event-time aware

Event time



Processing time

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Batch processing → Stream processing

- Continuous & real-time
- Stateful & exactly once
- High throughput & low latency
- Event time

November 2015

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More than just analytics: ProcessFunction

```
class MyFunction extends ProcessFunction[MyEvent, Result] {

    // declare state to use in the program
    lazy val state: ValueState[CountWithTimestamp] = getRuntimeContext().getState(…)

    def processElement(event: MyEvent, ctx: Context, out: Collector[Result]): Unit = {
        // work with event and state and schedule timers
    }

    def onTimer(timestamp: Long, ctx: OnTimerContext, out: Collector[Result]): Unit = {
        // handle callback when event-/processing- time instant is reached
    }
}
```

- ProcessFunction gives access to state, time and events
- Low level API
- Enables data-driven applications

D_TRB

THE SOCIAL NETWORK FOR PETROLHEADS

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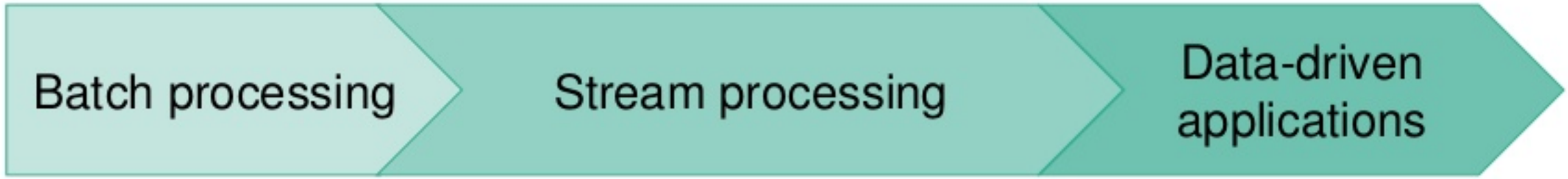

- Continuous & real-time
- Stateful & exactly once
- High throughput & low latency
- Event time

February 2017

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Present & Future

Present in a nutshell

Hardening

Faster network stack

Application level flow control

Resolving dependency hell

Scaling

Incremental snapshots

Local recovery

Scalable timers

Interoperability

Resource elasticity

REST client-server interface

Container entrypoint

Stream SQL

SQL client

User-defined functions

More powerful joins

Misc

State TTL

Broadcast state

Kafka exactly-once producer

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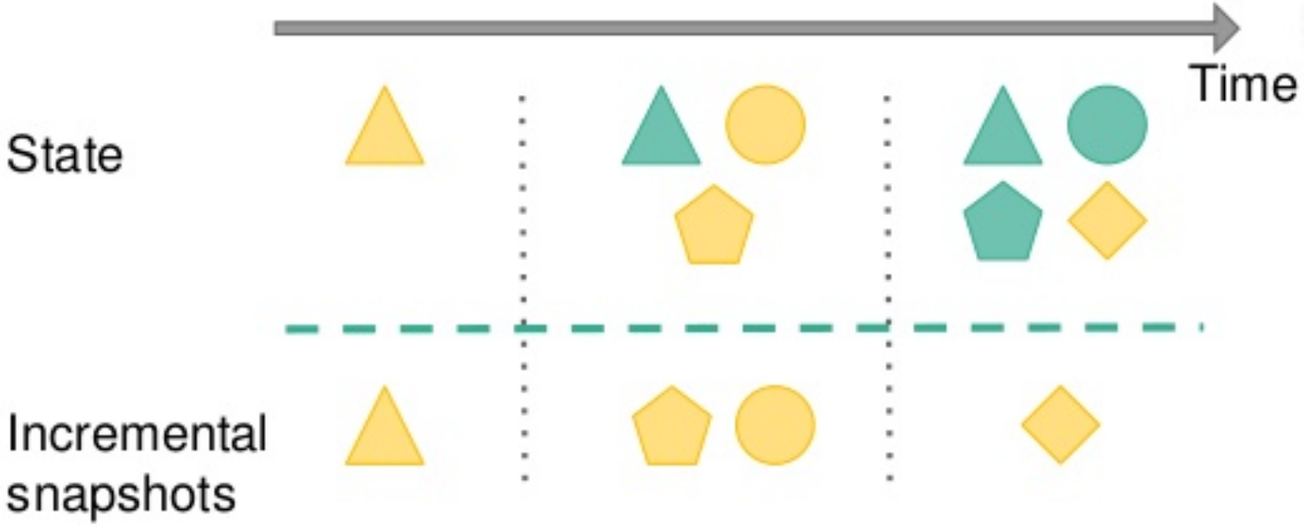
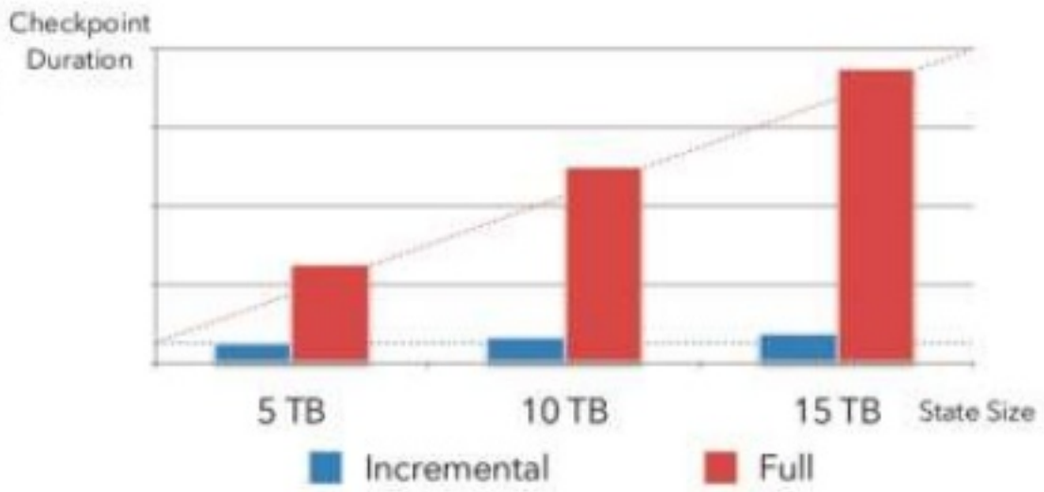
Large, larger, Flink





- Snapshot only state diff
- Incremental snapshots allow to handle very large state

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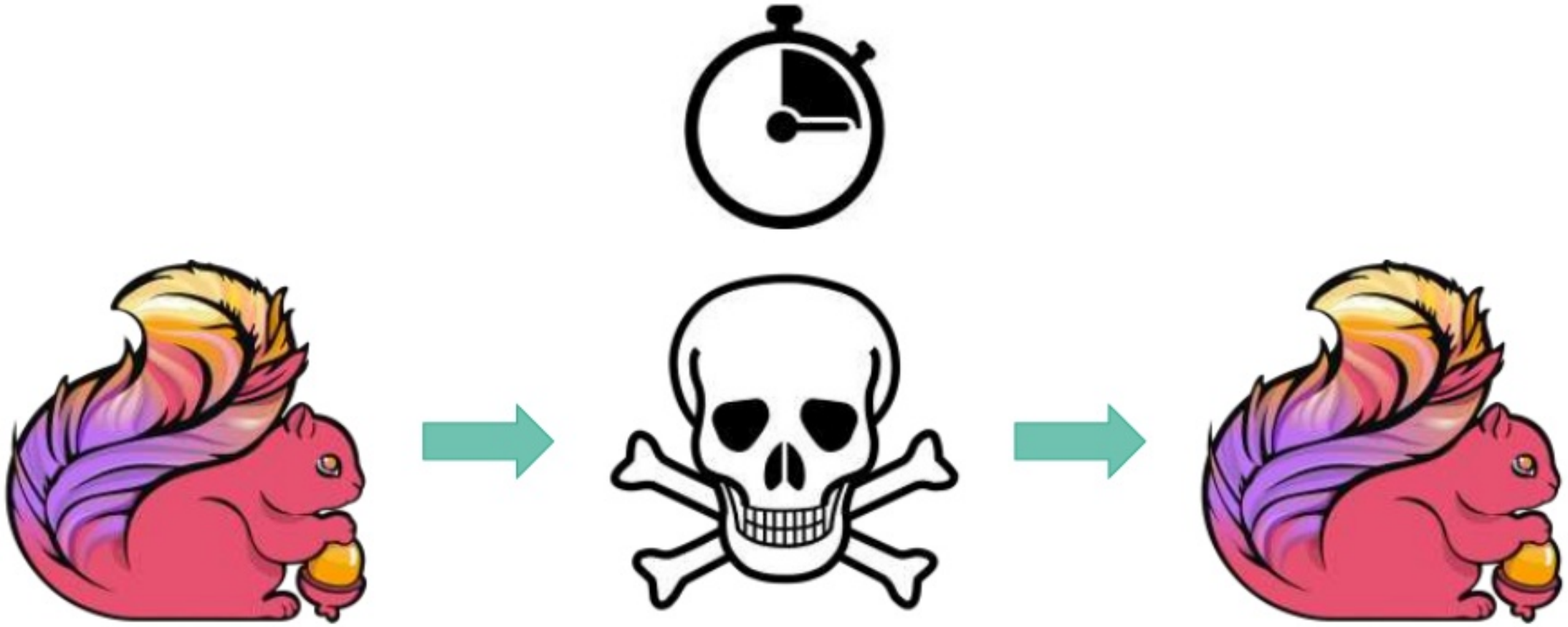
Faster failover is always better



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Varying workloads

- Violating SLAs vs. wasting money
- Varying workloads require to adapt resources

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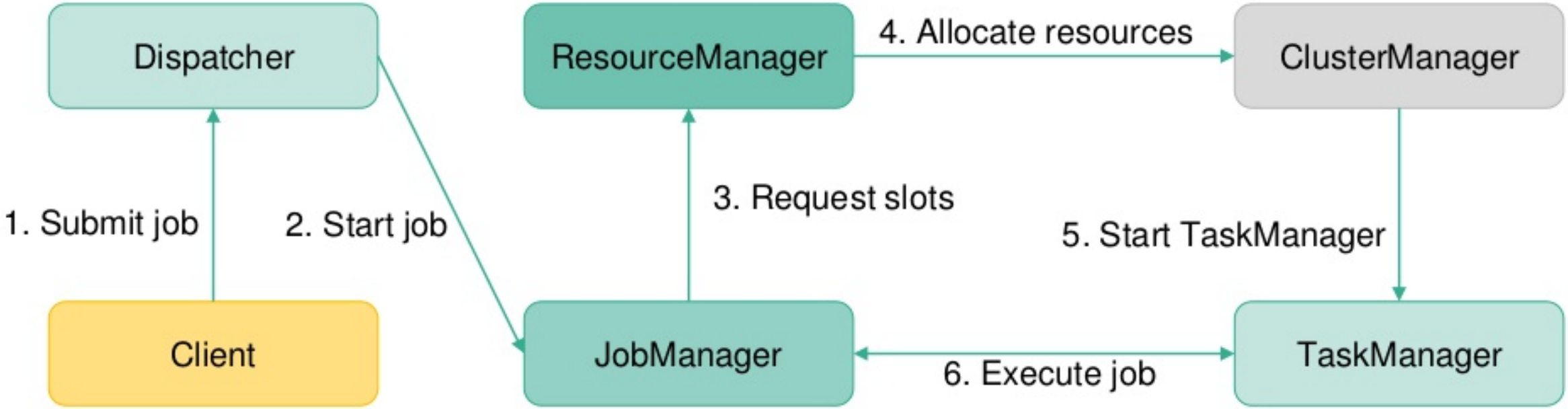
Revamped distributed architecture



- Support for full resource elasticity
- Application parallelism can be dynamically changed

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- Continuous & real-time
- Stateful & exactly once
- High throughput & low latency
- Event time

- Applications as first class citizens

Present & Future

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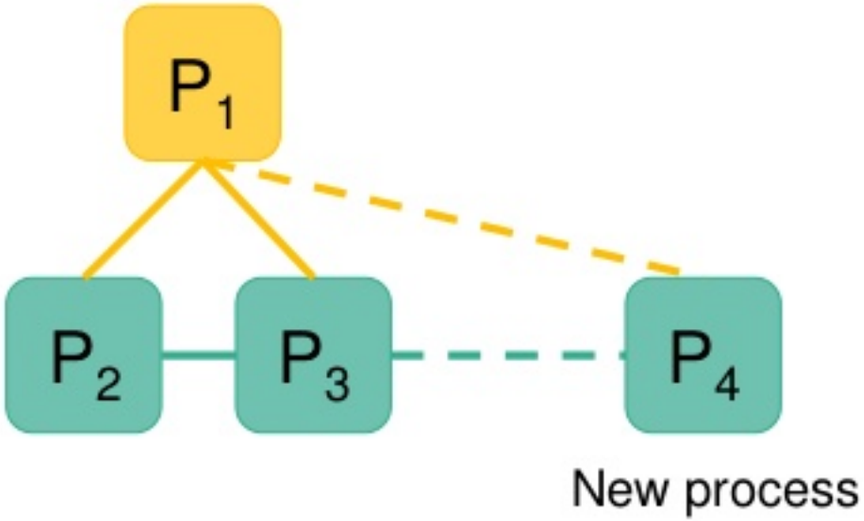
Flink as a library (and still as a framework)

- Deploying Flink applications should be as easy as starting a process
- Bundle application code and Flink into a single image
- Process connects to other application processes and figures out its role
- Removing the cluster out of the equation



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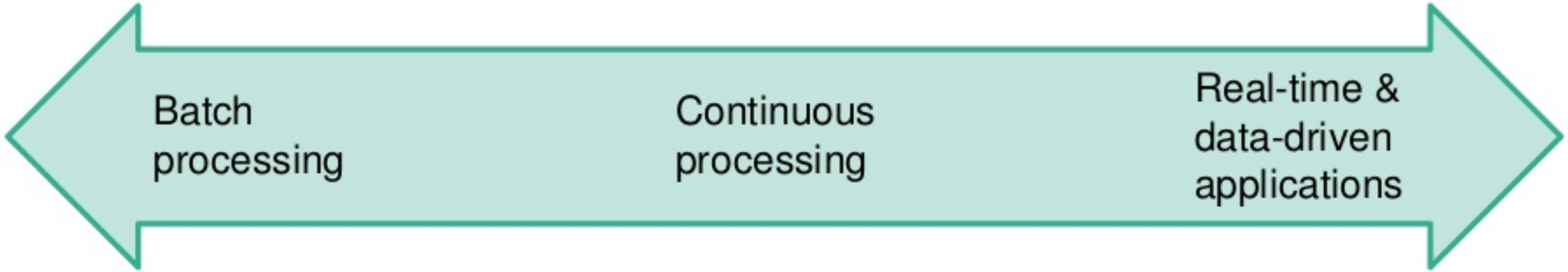
How much control do I need?



- Multiple short lived stages
- Different resource requirements per stage
- Efficient execution requires control over resources
- Flink allocates actively resources

- Continuously processing operators
- Constrained by external systems, SLAs and application logic
- External system can assign resources
- Flink reacts to available resources

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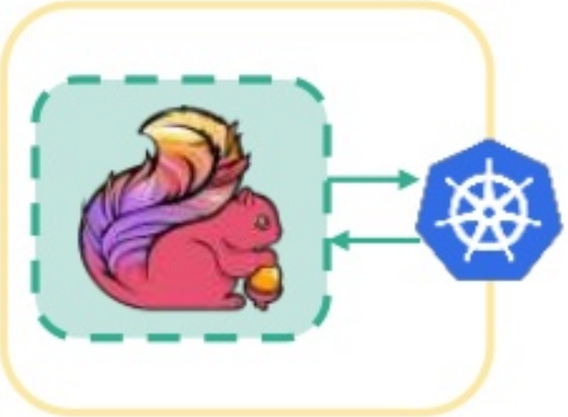
Active vs. reactive mode

- Active mode
  - Flink is aware of underlying cluster framework
  - Flink allocate resources
  - E.g. existing YARN and Mesos integration



- Reactive mode
  - Flink is oblivious to its runtime environment
  - External system allocates and releases resources
  - Flink scales with respect to available resources
  - Relevant for environments: Kubernetes, Docker, as a library

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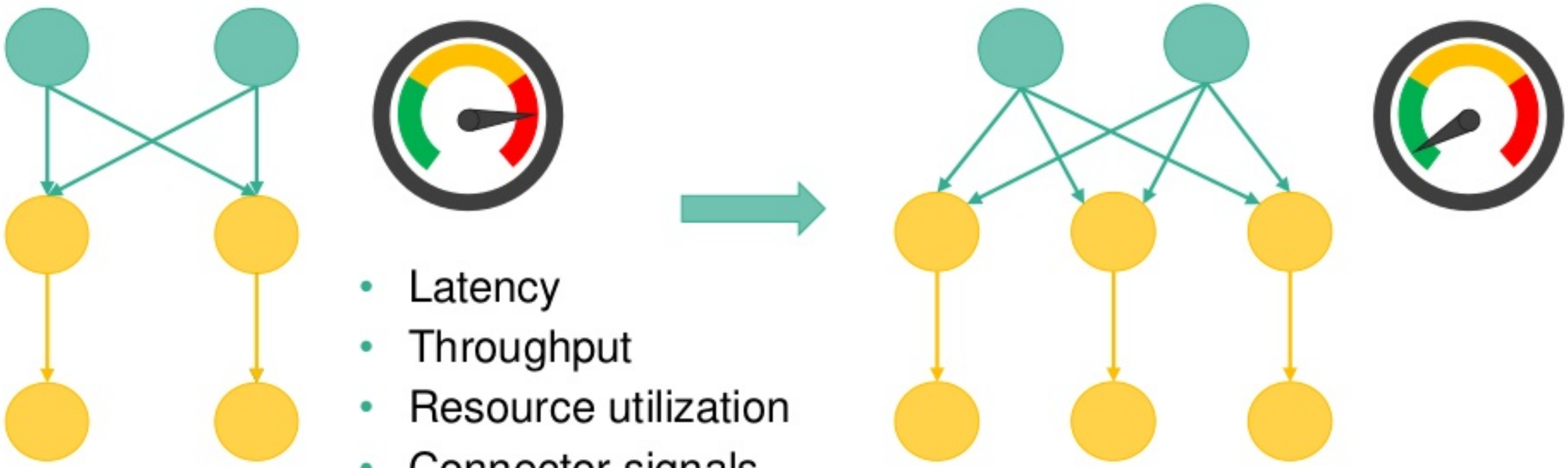
Scaling automatically



- Latency
- Throughput
- Resource utilization
- Connector signals

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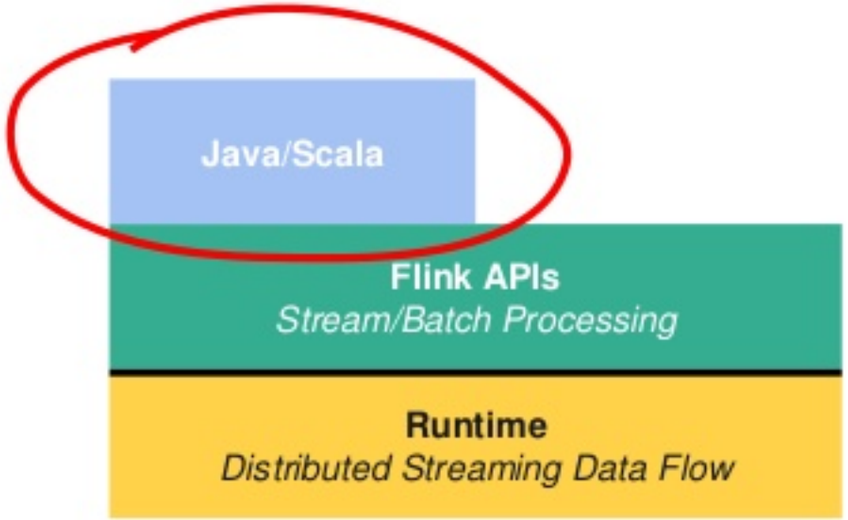
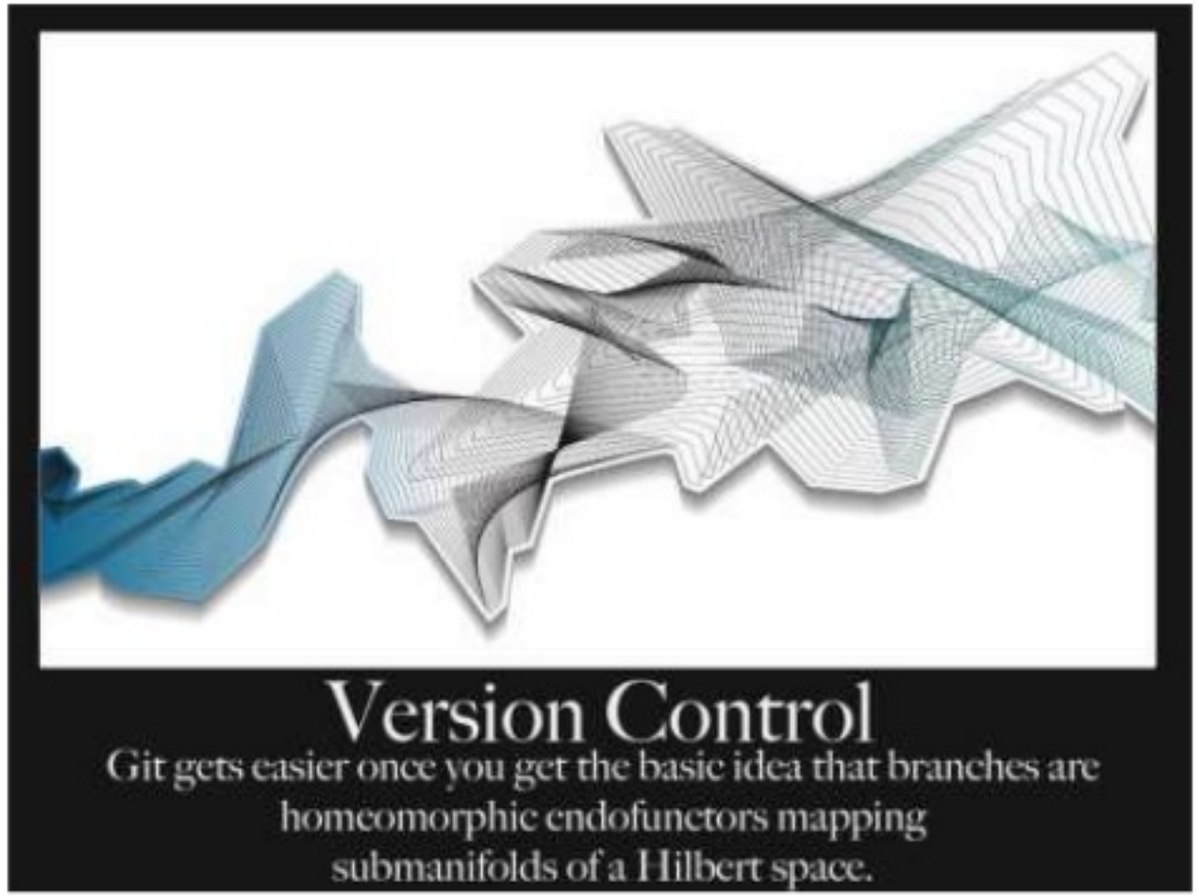
How we create Flink Jobs





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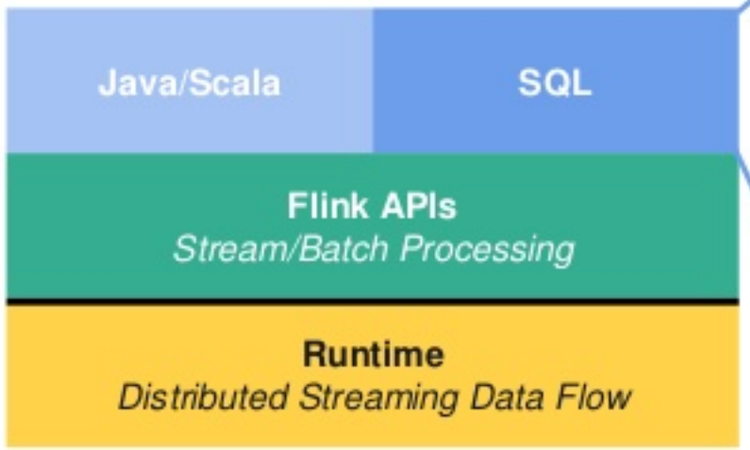
Flink SQL

*since Flink 0.9.0 (June 2015)



- SQL commandline
- Event time and processing time
- Configuration in YAML
- Streaming and Batch
- Source/Sink definition in YAML
- User-defined functions

"NO CODING REQUIRED"

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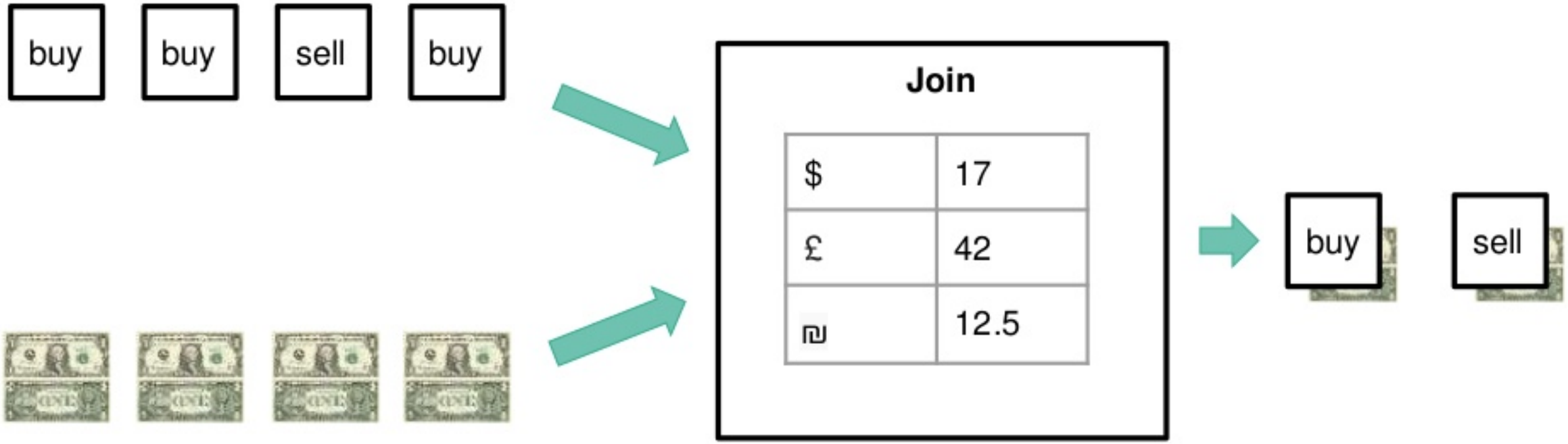
1. fish /Users/aljoscha/Dev/sql-demo (fish)

“Join” me for some trading



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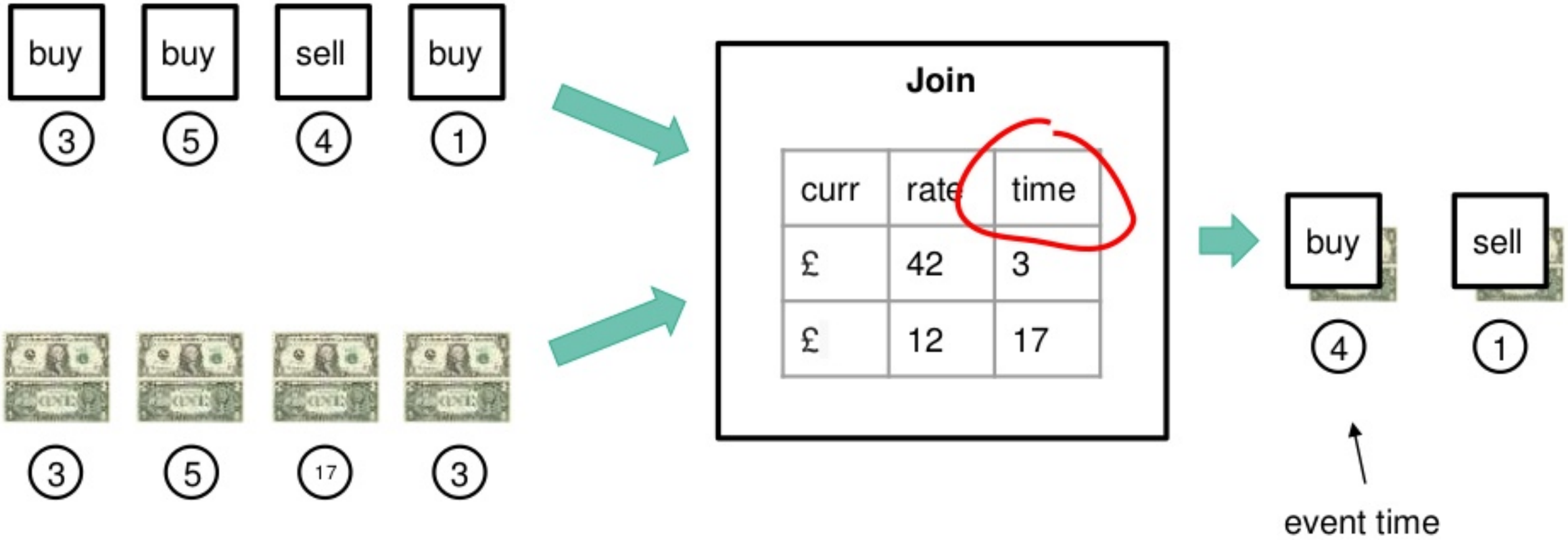
Introducing Time-versioned Table Joins



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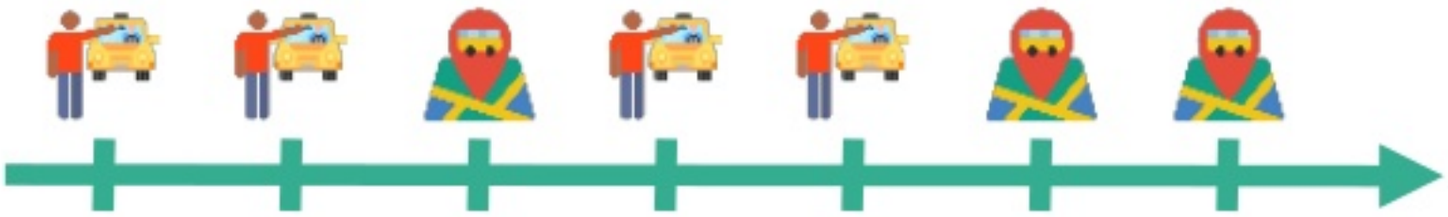
SQL for pattern analysis?



```
SELECT * from ?
```

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Introducing MATCH_RECOGNIZE

```
SELECT *
FROM TaxiRides
MATCH_RECOGNIZE (
    PARTITION BY driverId
    ORDER BY rideTime
    MEASURES
        S.rideId as sRideId
    AFTER MATCH SKIP PAST LAST ROW
    PATTERN (S M{2,} E)
    DEFINE
        S AS S.isStart = true,
        M AS M.rideId <> S.rideId,
        E AS E.isStart = false
            AND E.rideId = S.rideId
)
```

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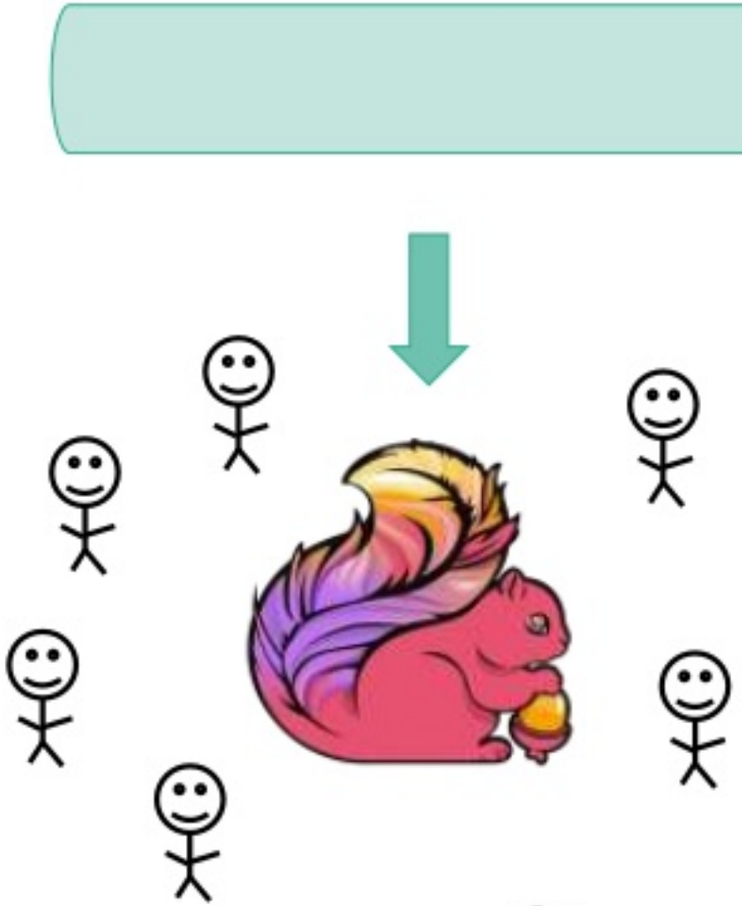
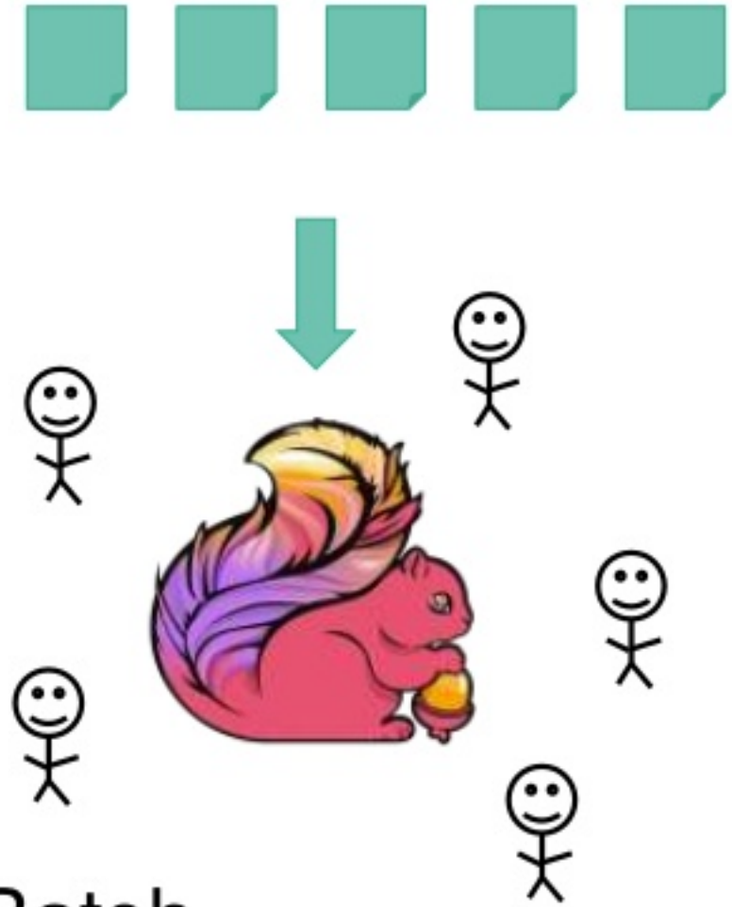
Todays processing landscape



Streaming



Batch

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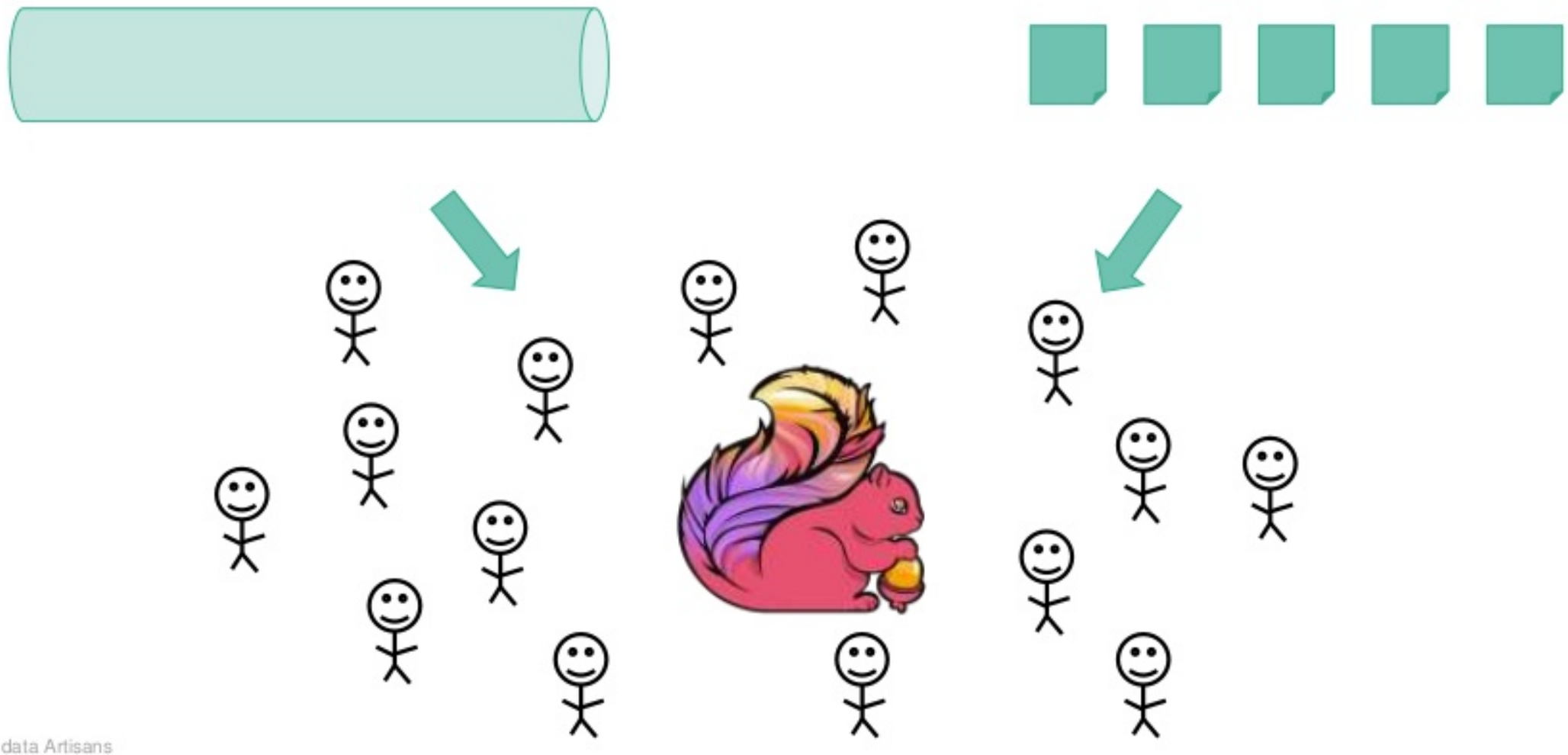
Batch/streaming unification



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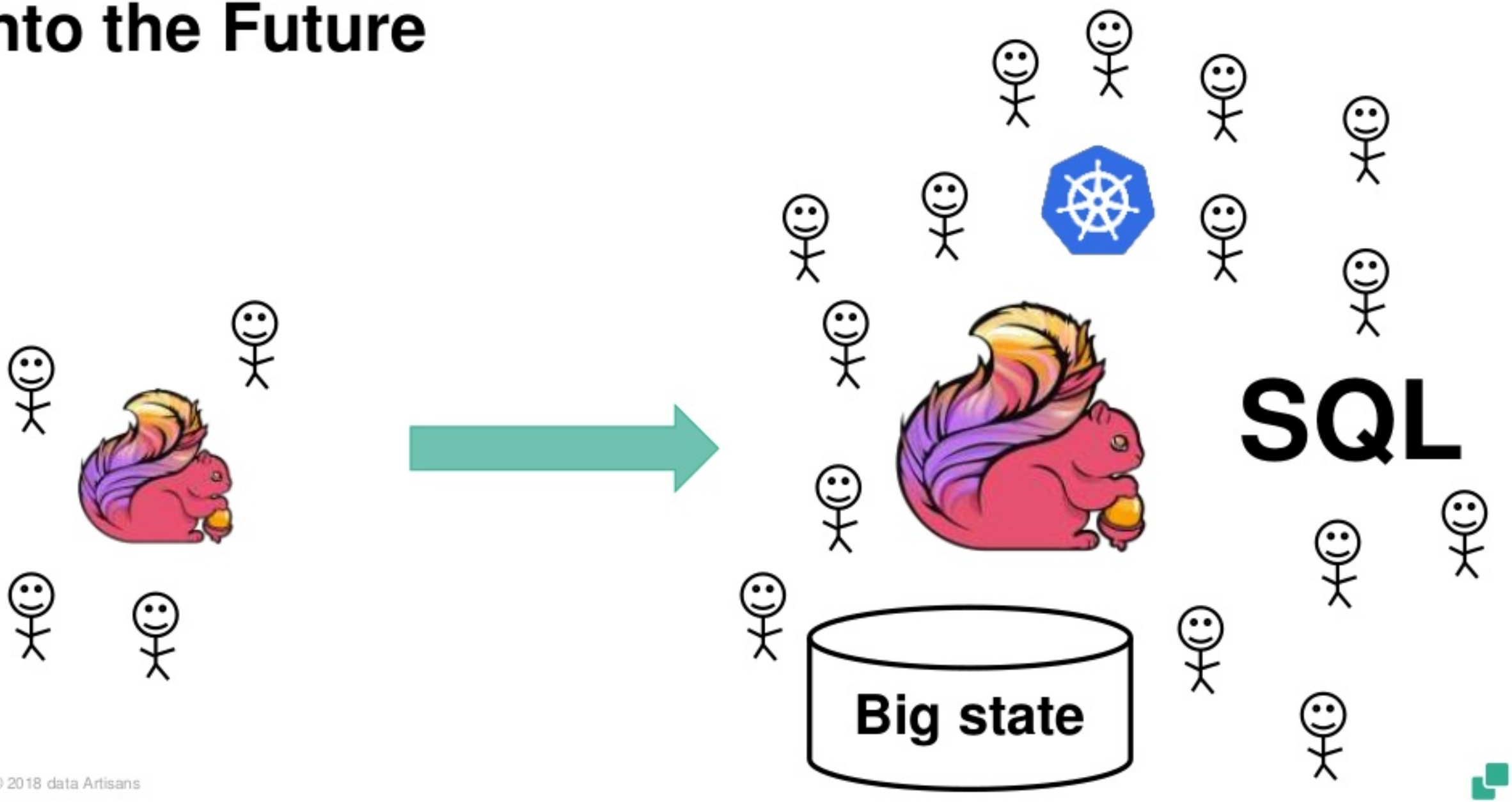
Into the Future



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Thank s!