

CS 744: FLINK

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Spring 2025

ADMINISTRIVIA

Grading

- Assignment 2 grading
- Course Project Proposal feedback
- Midterm

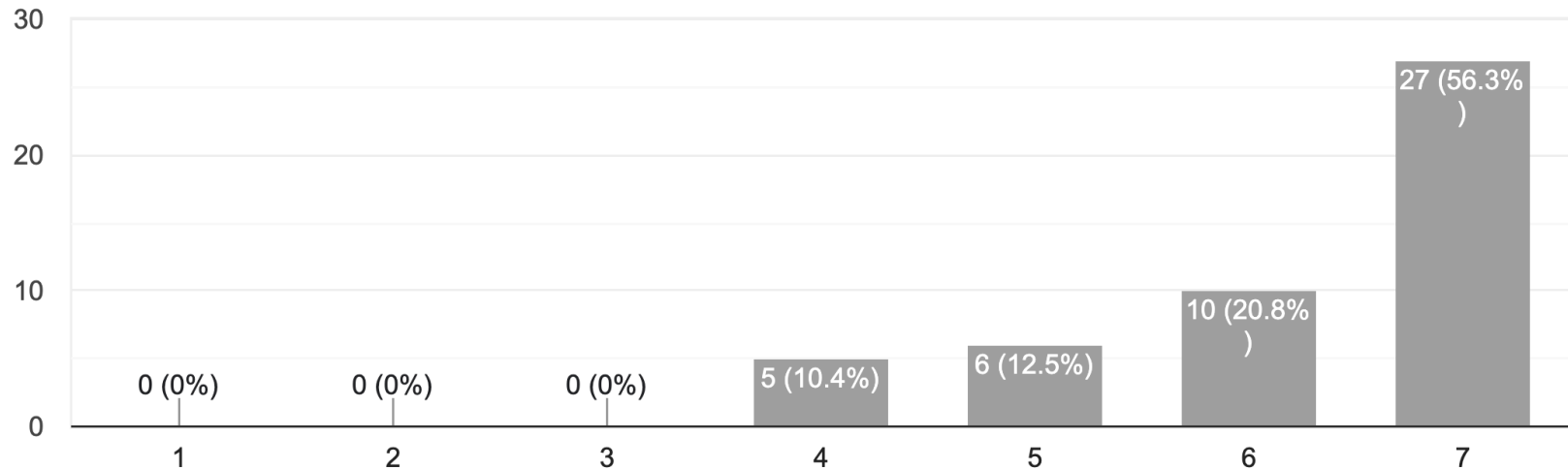
Resources for Course Projects

- Cloumlab (Reservations?)
- Azure credits

MID-SEMESTER SURVEY

Overall how useful are you finding the course so far?

48 responses



Hindrances

- ...not very familiar with the sys topics..*
- ... lack of background knowledge on some topics...*
- ... more time to read papers for the Thursday lecture...*

Suggestions

- ...expand the regions of our discussion...*
- ...more what-if and thought provoking questions for discussions...*
- ...discuss our findings from the reading reviews ...instead of answering new questions*

- ...I'd like a smaller paper reading group...*
- ...Paper reading group sounds great...*

- ... bring the papers to the next exam...*

Applications

Machine Learning

SQL

Streaming

Graph

Computational Engines

Scalable Storage Systems

Resource Management



Datacenter Architecture



DASHBOARDS

Sales Dashboard

Total Sales

\$3,256.8M

Number of Deals

17,164

Avg Deal Size

\$189,545

Rev. per Salesperson

\$20.5M

Week of Date Closed

December 6, 200 - December 25, 20



Region

(All)

Country

(All)

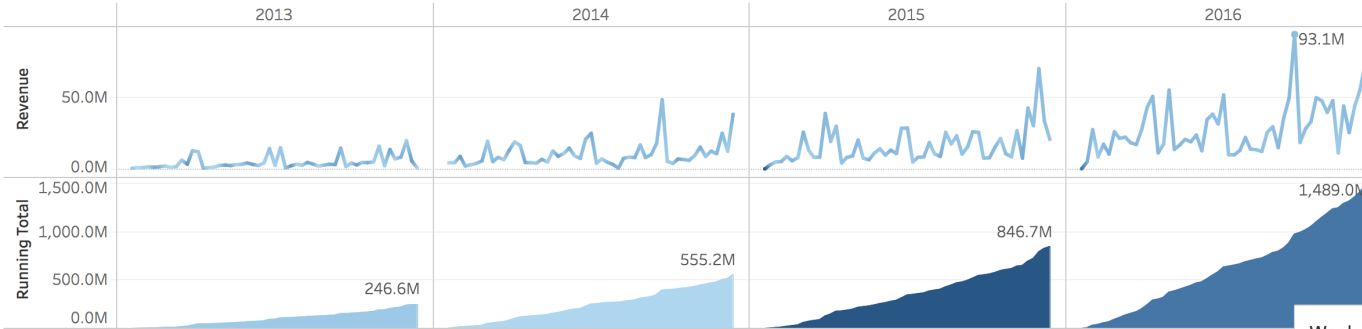
Sales Team

- (All)
- Small and Midmarket
- Enterprise

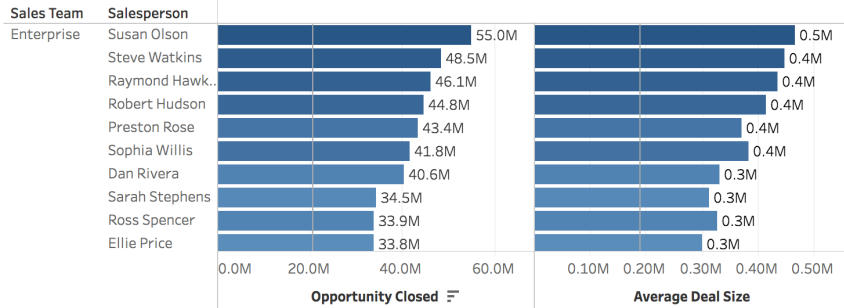
Avg Deal Size/Salesperson



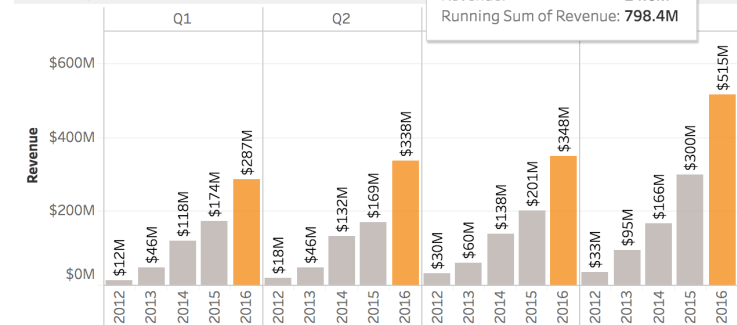
Revenue Over Time



Sales Team Performance



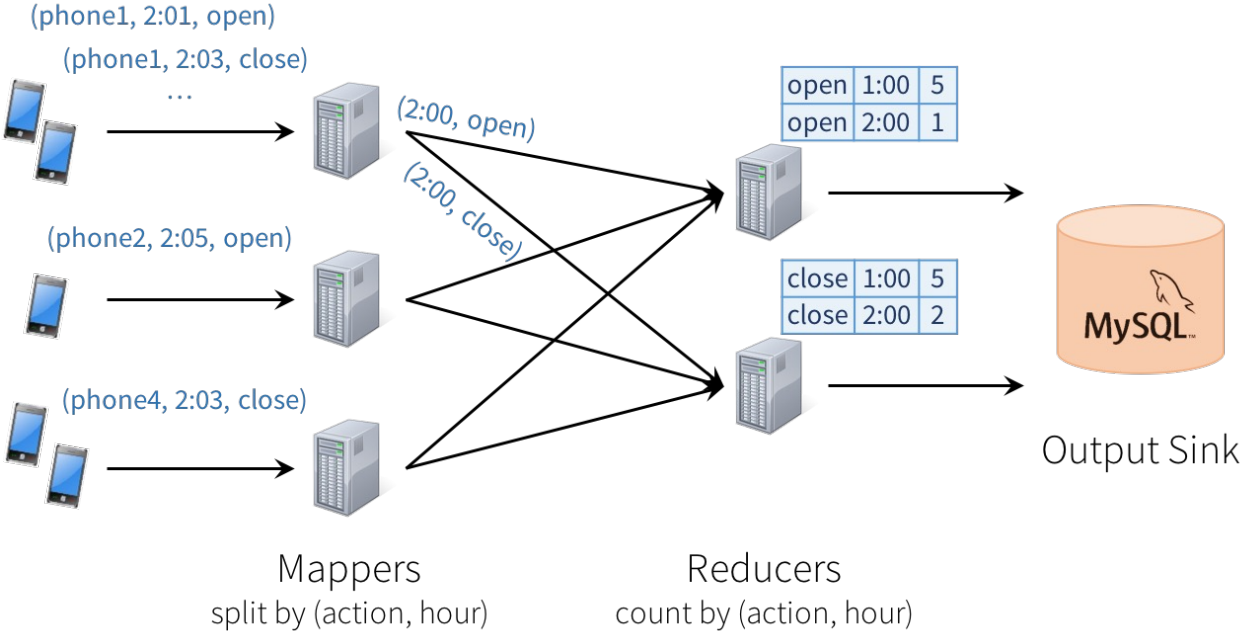
Revenue by Quarter



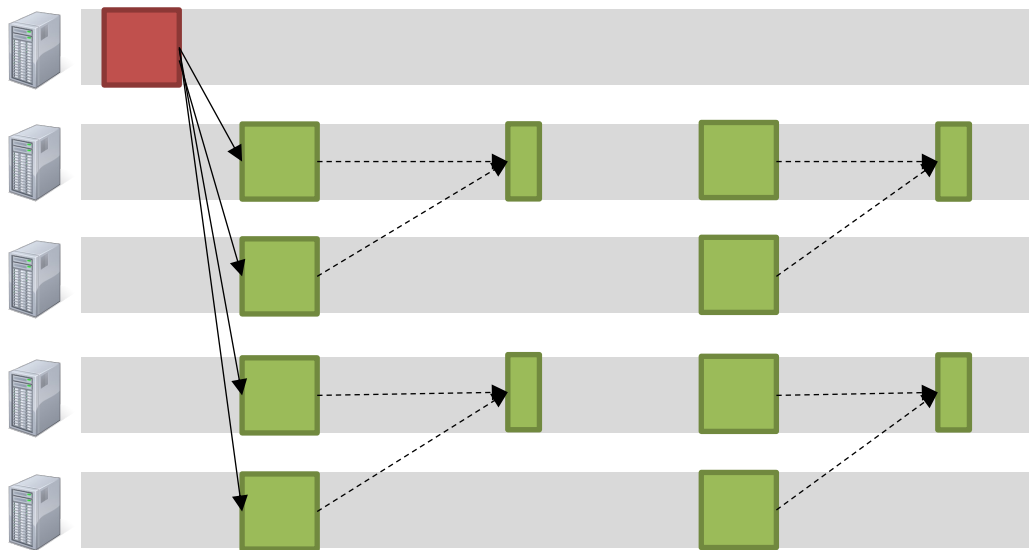
Week of September 4, 2016

Revenue: 14.6M
Running Sum of Revenue: 798.4M

STREAMING COMPUTATION

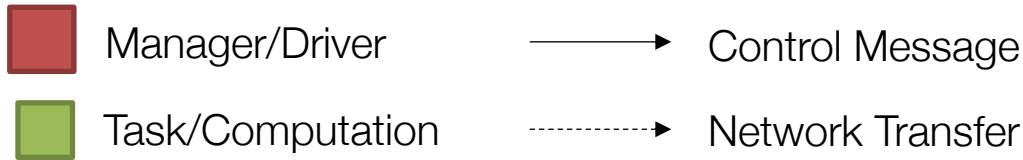


FLINK: COMPUTATION MODEL



Long-lived operators

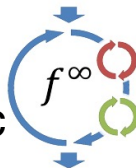
Mutable State



Google
MillWheel

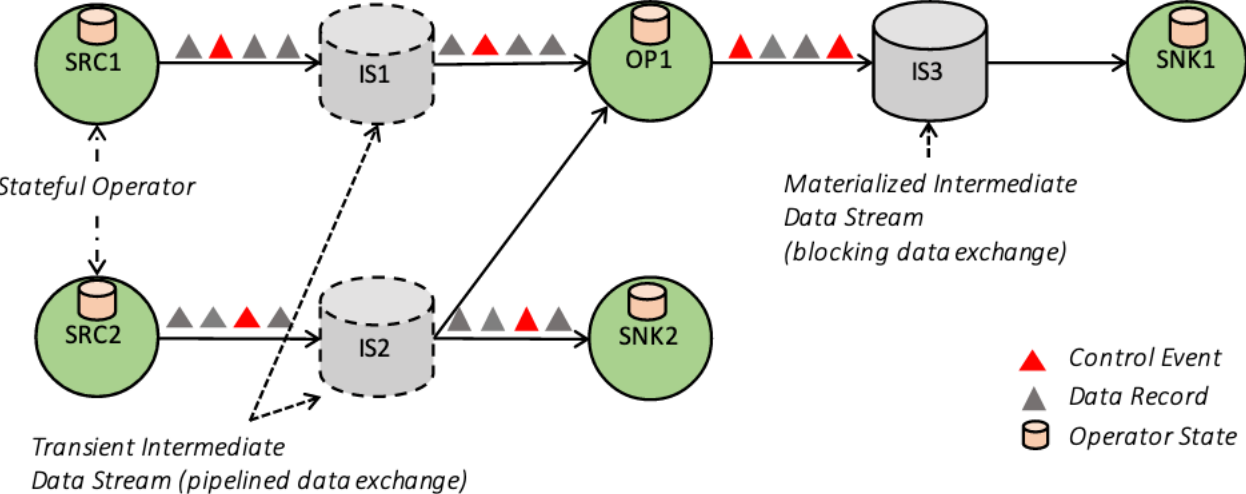


Streaming DBs:
Borealis, Flux etc



Naiad

INTERMEDIATE DATA STREAMS



STATEFUL OPERATORS

Examples?

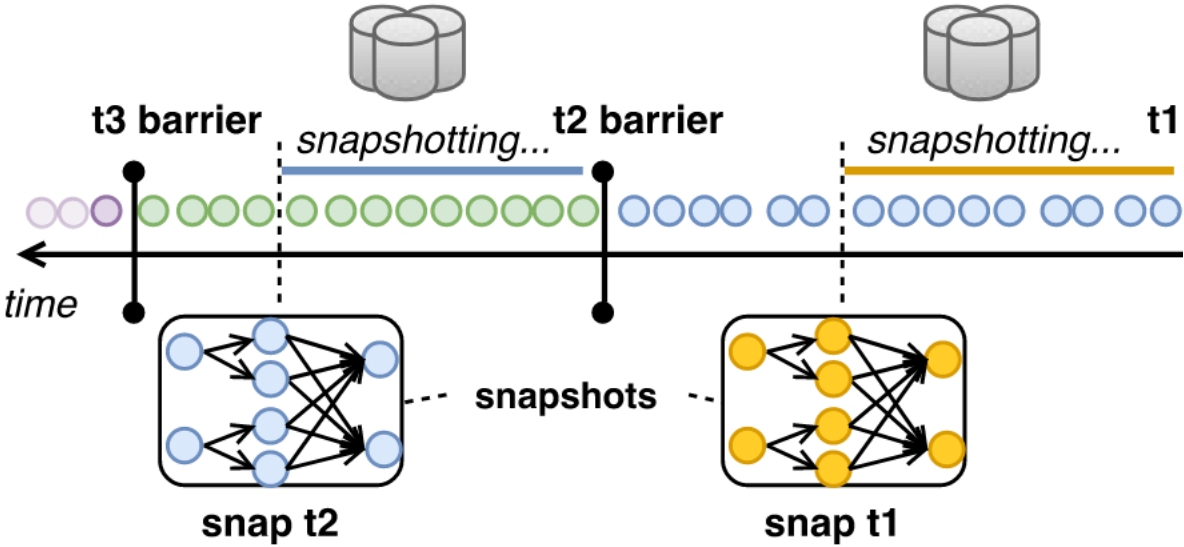
Challenge

How to ensure fault tolerance?

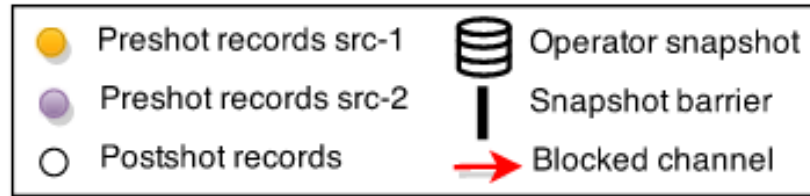
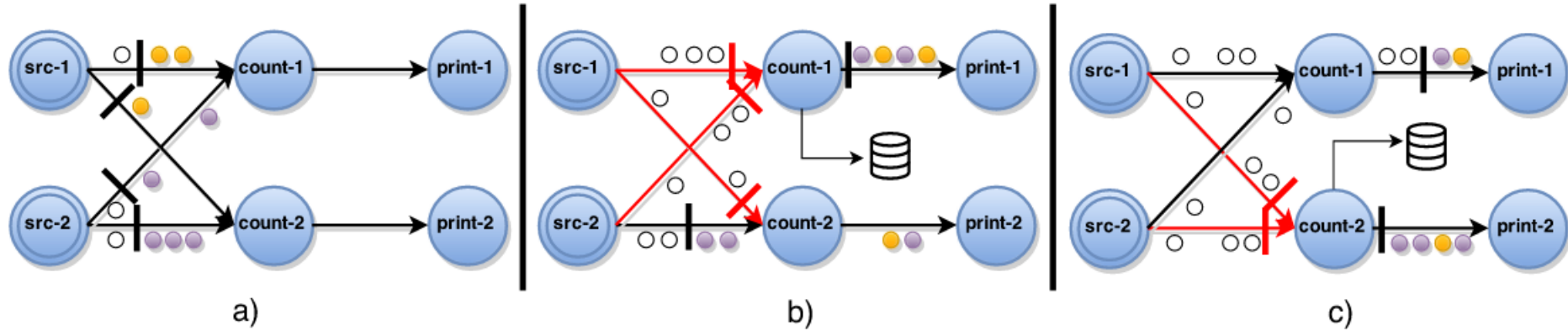
Explicitly register local variables

StateBackends that are automatically saved/recovered

FAULT TOLERANCE: CHECKPOINTING



ASYNCHRONOUS BARRIER SNAPSHOTTING



WATERMARKS, WINDOWS

Implements similar model as Dataflow

“Watermarks originate at the sources of a topology”

Propagate through the other operators of dataflow

Windows based on event-time, processing time, ingest time(?)

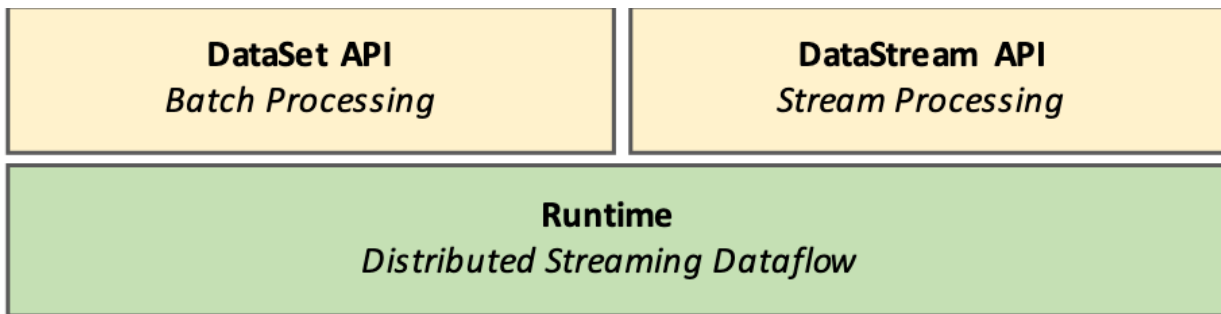
```
stream
    .window(SlidingTimeWindows.of(
        Time.of(6, SECONDS), Time.of(2, SECONDS))
    .trigger(EventTimeTrigger.create()))
```

COMBINING BATCH, STREAMING

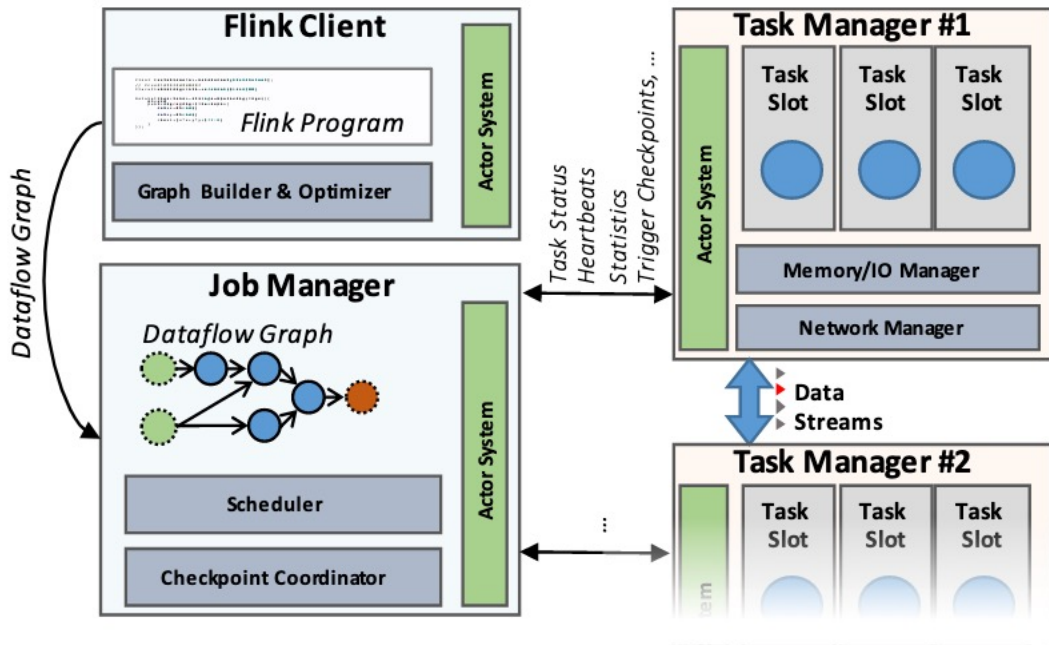
Blocked DataStreams

Turn off periodic snapshots

Blocking operators (e.g., sort)



OVERALL ARCHITECTURE



SUMMARY

Stream processing → Increasingly important workload trend

Flink: Distributed streaming dataflow to run streaming, batch, iterative

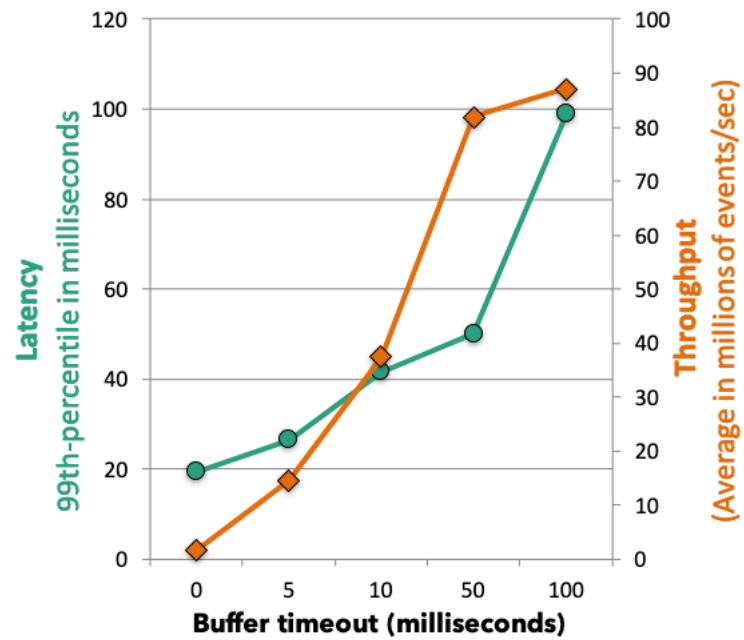
Distributed streaming dataflow

- Stateful operators
- Checkpointing based FT



DISCUSSION

<https://forms.gle/EbTYYYd63zf3BnuE8>



Consider you are implementing a micro-batch streaming API on top of Apache Spark. What are some of the bottlenecks/challenges you might have in building such a system?

SUMMARY

Next week: Spring break!!

Next class: Spark Streaming