ASAP Cab

Umesh Shukla

Why use ASAP Cab?

Ever found yourself at an intersection of Downtown, and trying to book a yellow cab?

Try ASAP Cab, the Uber for Yellow Cabs

How does it work?

See it in action

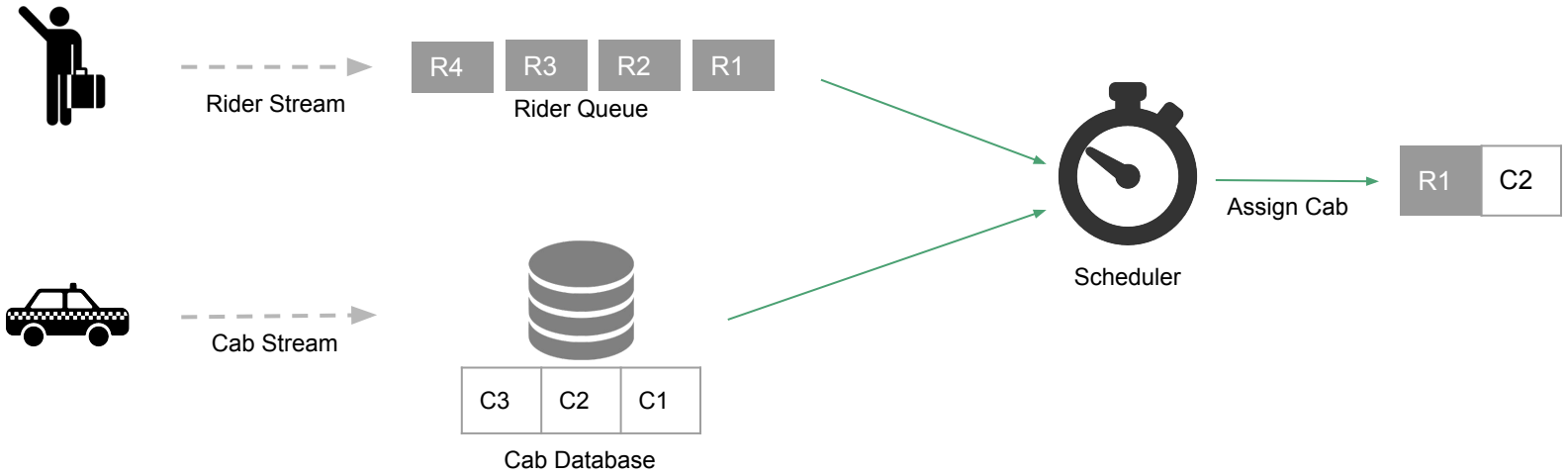
Overview

The ASAP Cab reservation system assigns the nearest cab to the rider where:

- Reservation is done in real-time
- Two real-time streams: cab stream and rider stream are taken into account

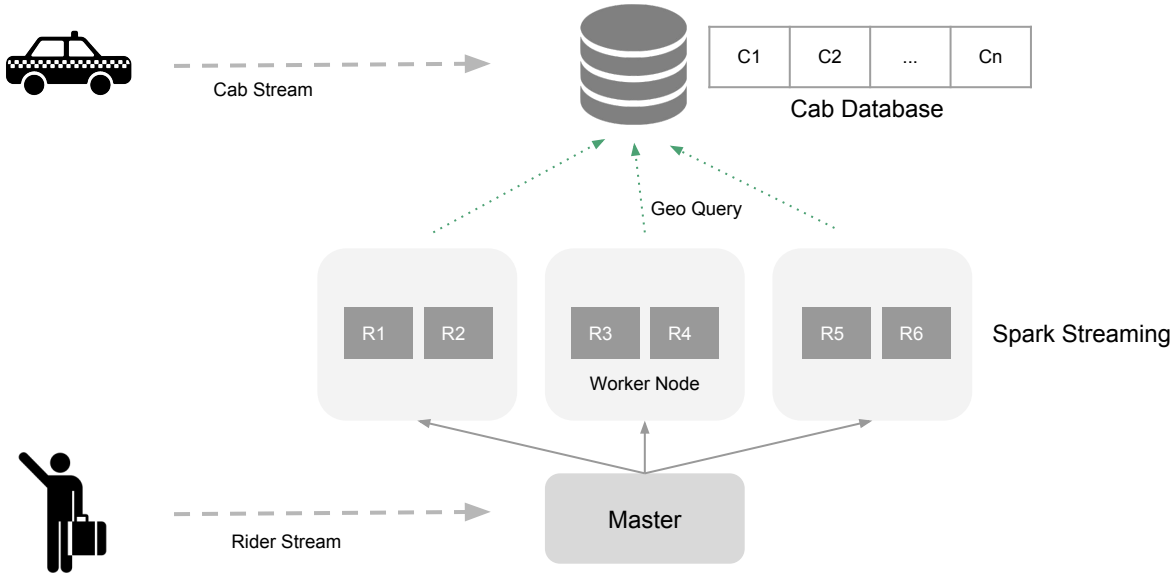
Traditional Algorithm

Assigns cab to the riders in a first come first serve order.



Scalable Algorithm for ASAP Cab

Uses distributed systems and parallel processing for simultaneous execution.



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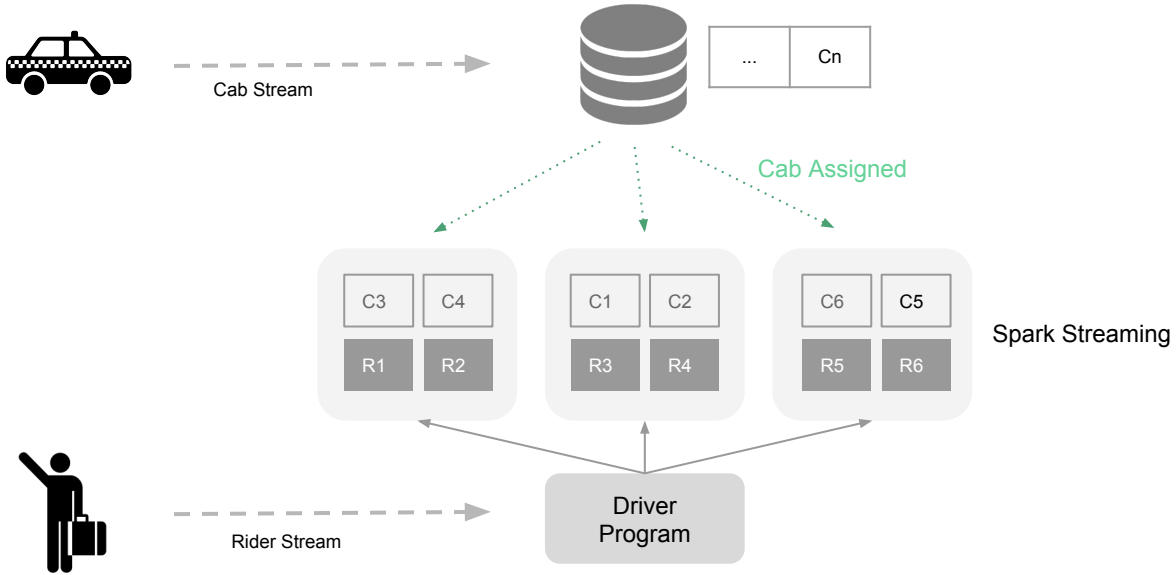
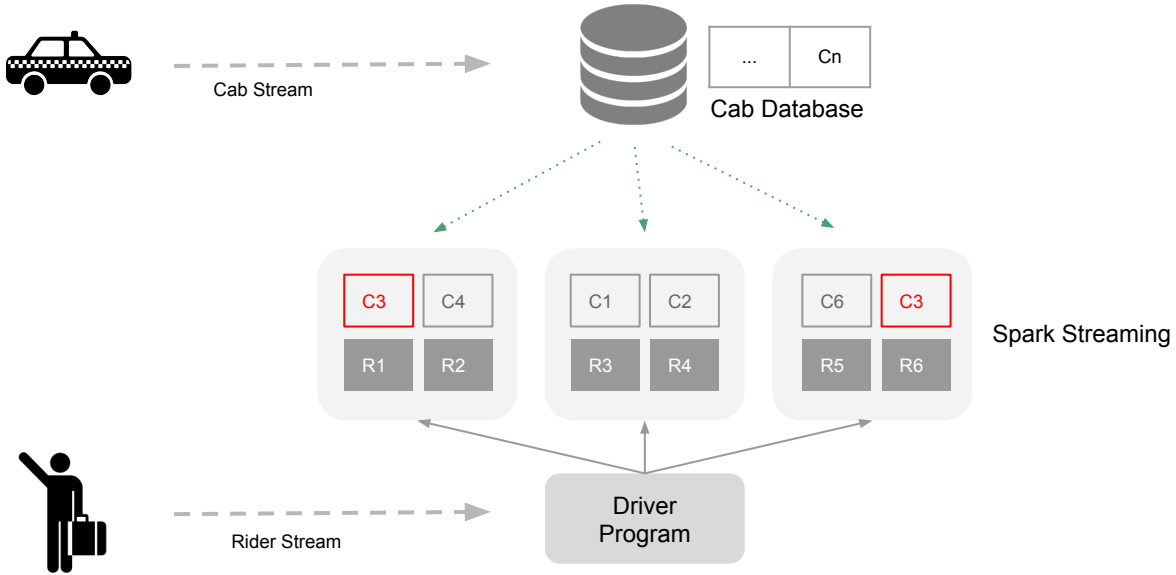


However, parallel processing may lead to Resource Overbooking.

An Overbooking Scenario

Where a cab could be double booked for multiple riders.



Handling Overbooking

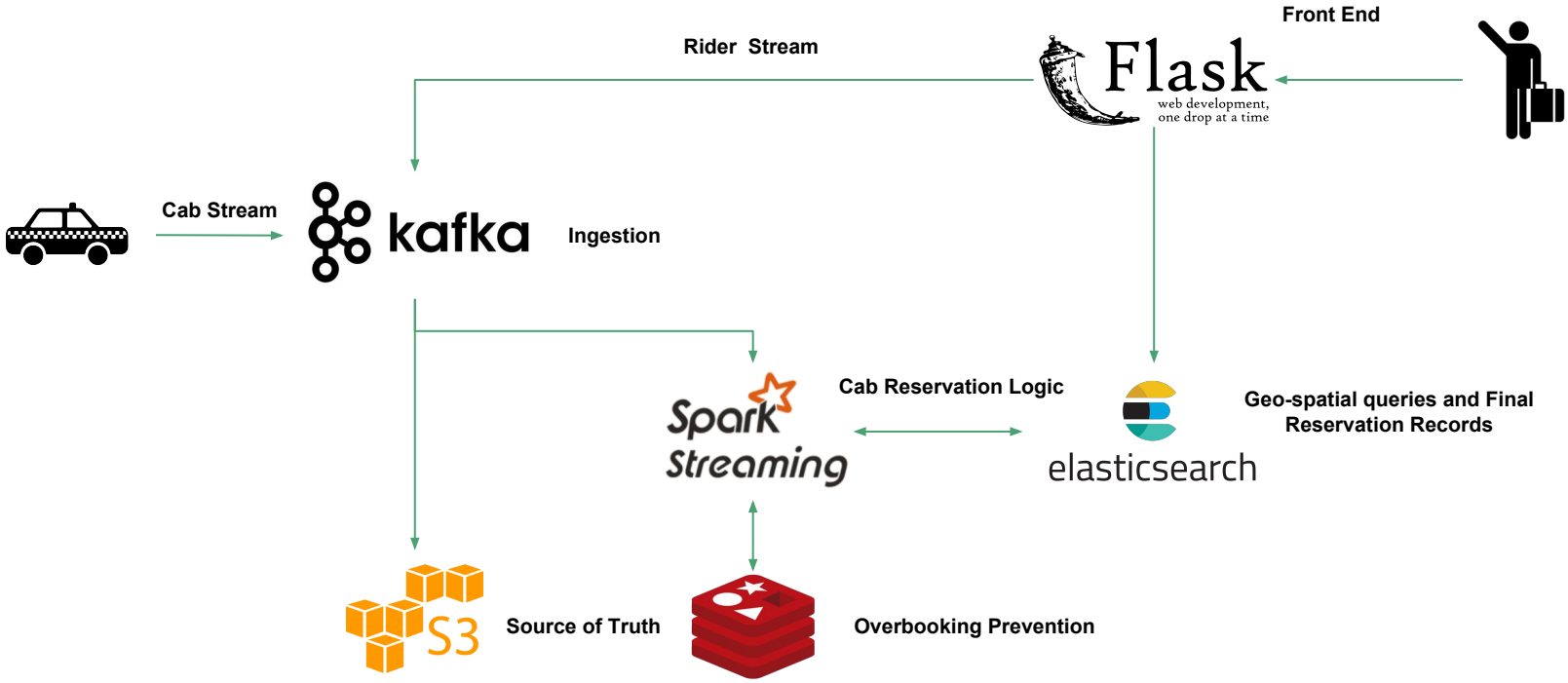
Using centralized cache or an in-memory database such as Redis.

Cab Database

Transaction State

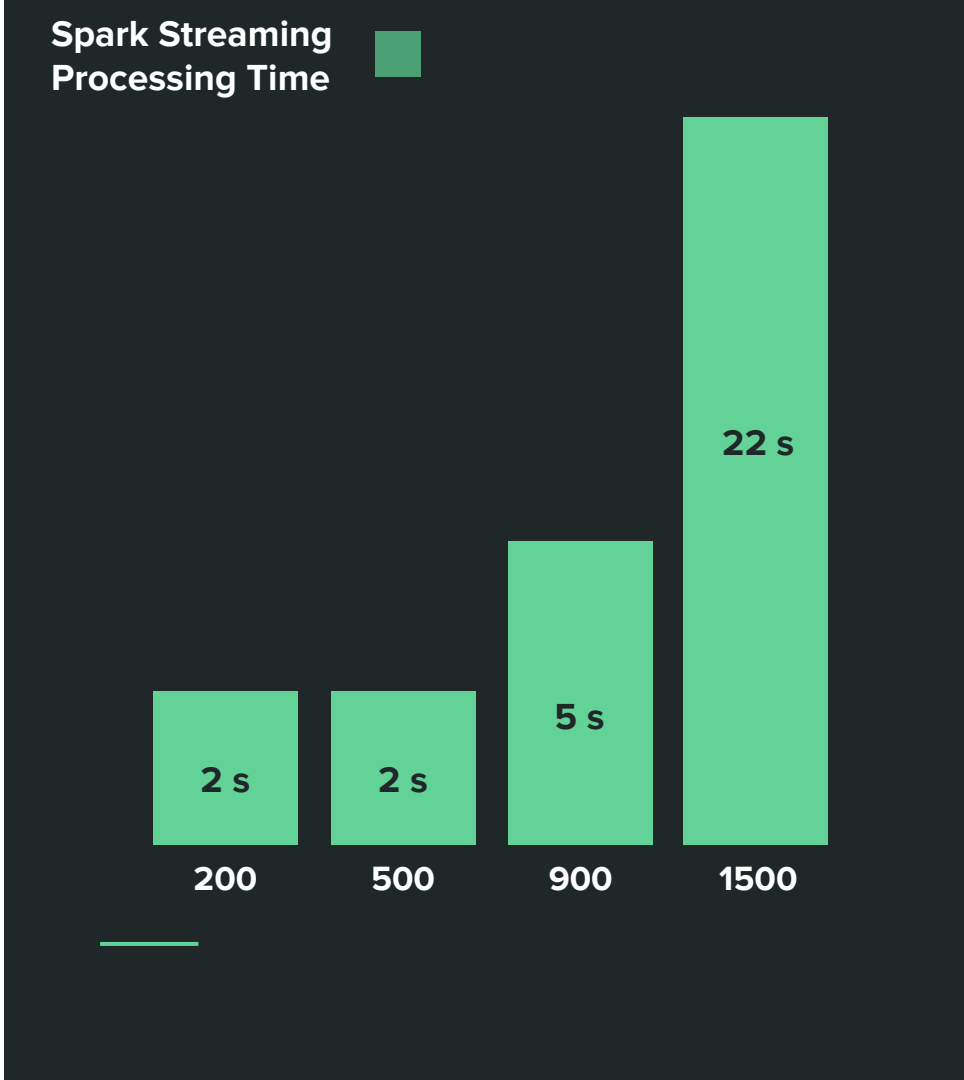
C1	Booked
C2	Booked
C3	Booked
C4	Booked
C5	Booked
C6	Available
...	...
Cn	Available

Data Pipeline for ASAP Cab



Performance

- Stress Test: NYC Yellow Cab Data
- 4-node AWS cluster
- ~ 900 events/sec without a backlog
- Spark Streaming Window Size of 5 s



About Me

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“Every day I remind myself that my inner and outer life are based on the labors of other men, living and dead, and that I must exert myself in order to give in the same measure as I have received and am still receiving.” - Albert Einstein

Q&A

- Where’s the bottleneck in your system?
- How would you scale Redis?
- Why Spark Streaming and not Kafka Streaming or Apache Storm?
- What happens to cab drivers that are not assigned any rider in a micro-batch?
- What happens to riders that are not assigned any cab in micro-batch?
- How do you create atomic operations in Redis?
- How do manage consistency of your system since it’s a booking platform?
- What challenges do you need to face in building a booking platform
- Which optimal scheduling do you want to use in each micro-batch? More details?
    - Take the full advantage of a micro-batch to come up with even more optimal cab assignment algorithm to improve cab utilization e.g. Maximal Weight Matching But it’s computationally intensive O(N^3) vs O(N^2)