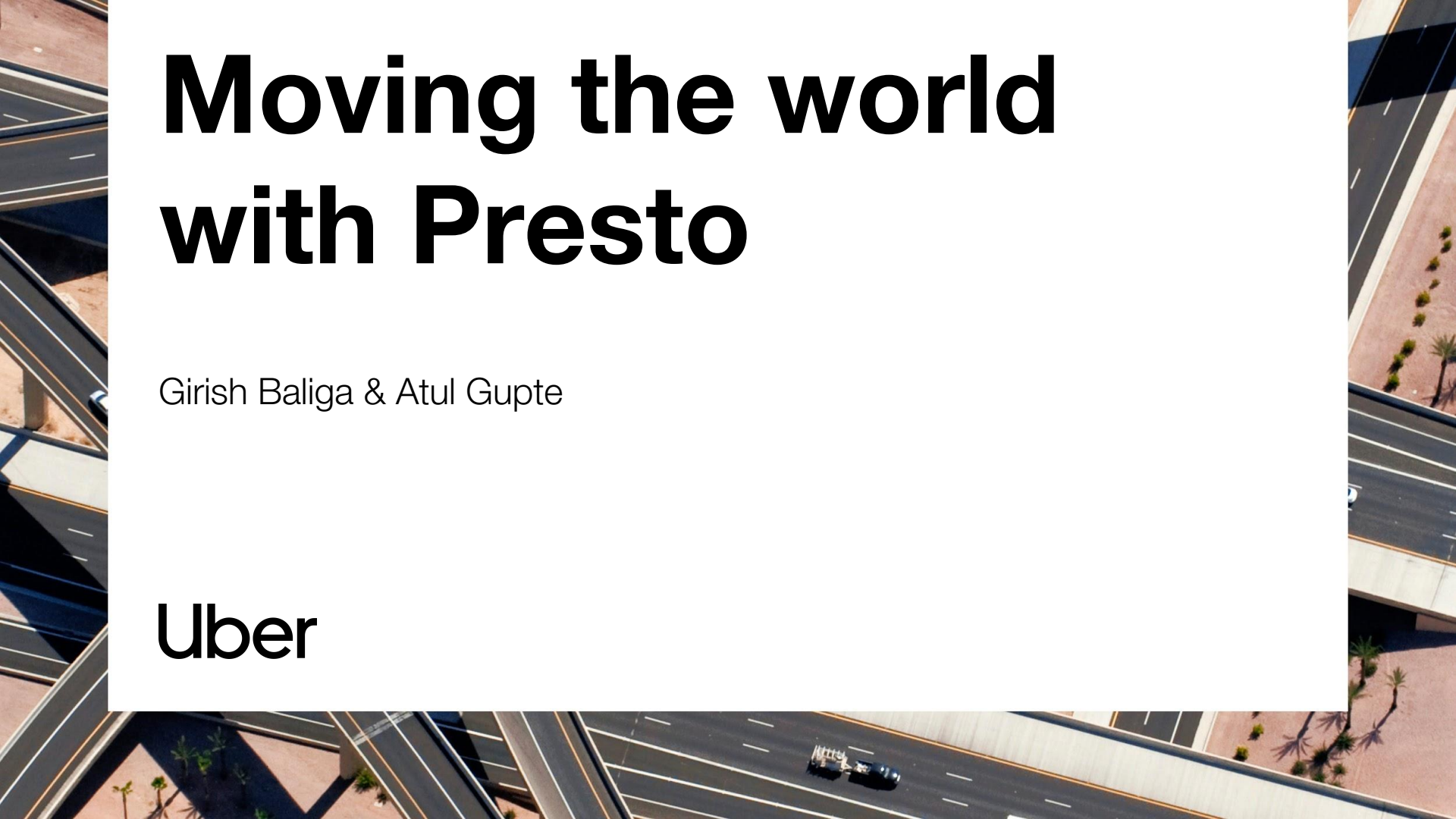


Moving the world with Presto

Girish Baliga & Atul Gupte

Uber

About us

Girish Baliga

Engineering Manager, Interactive Analytics

Atul Gupte

Product Manager, Product Platform

Uber's mission is to **ignite opportunity** by setting the world in **motion.**

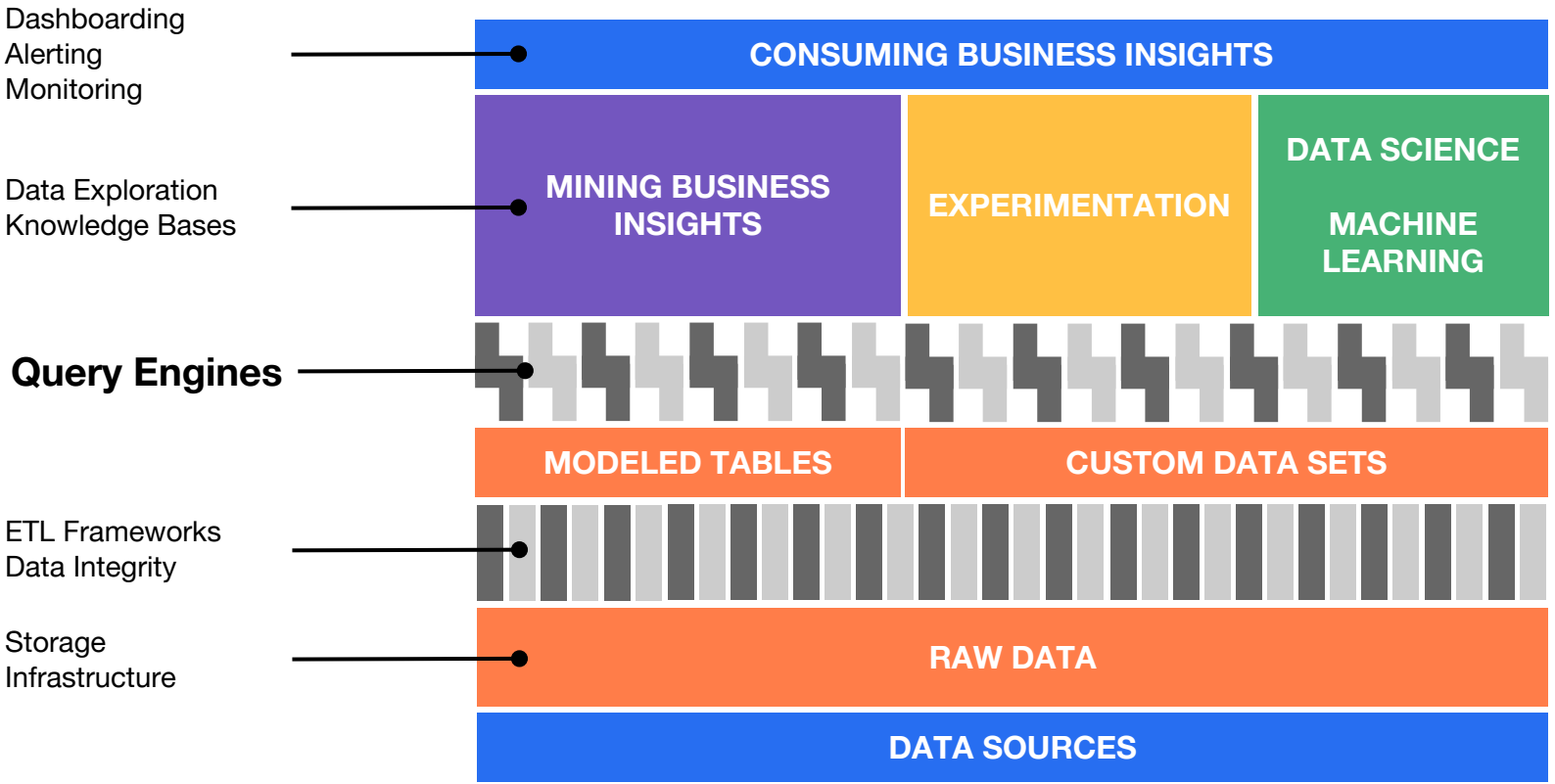
600+
Cities

75M
Monthly Riders

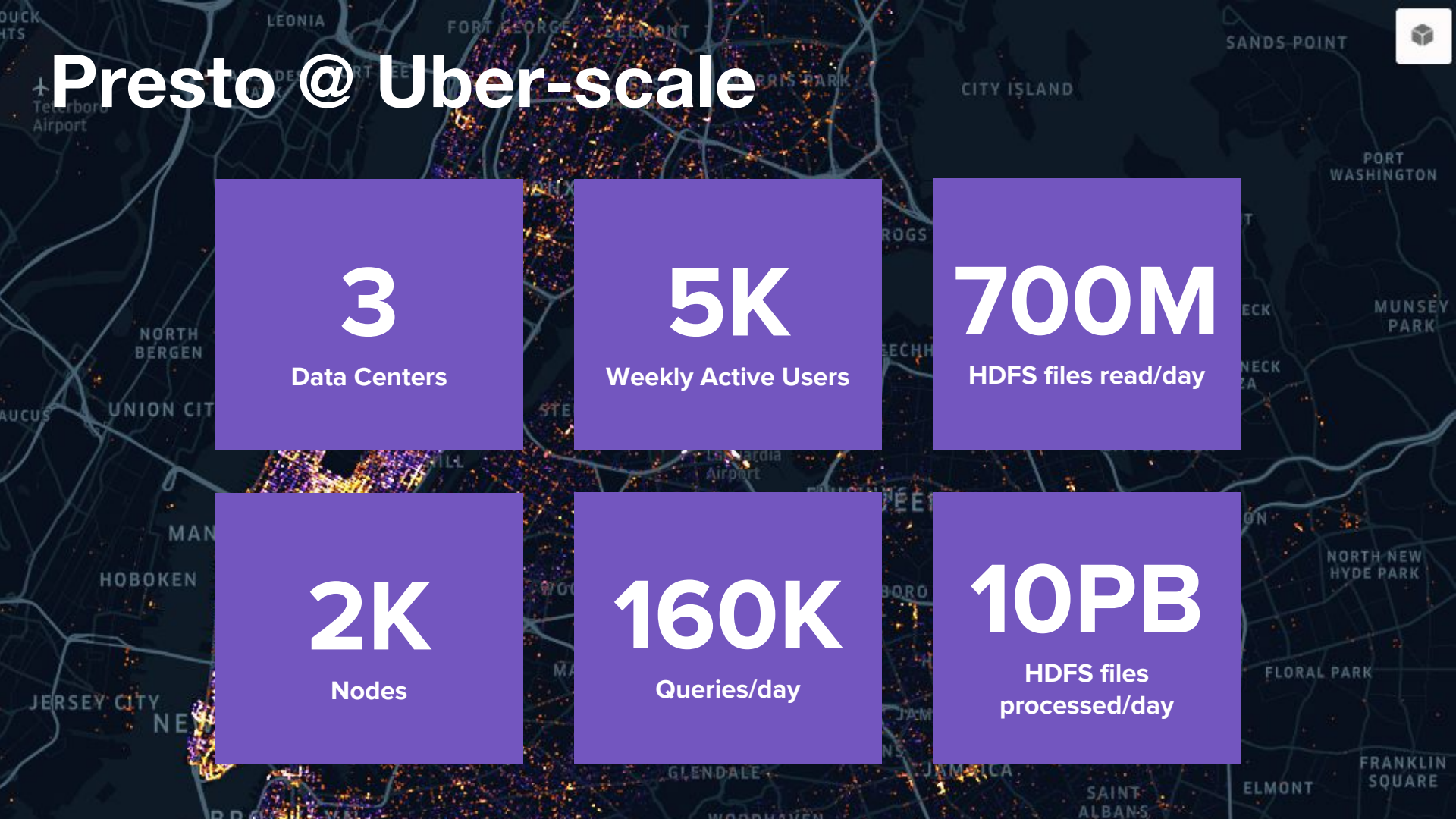
15M
Trips/Day

Data informs **every decision** at the company

Overview of Uber's Data Platform



Presto @ Uber-scale



Presto use cases at Uber

Marketplace Pricing

Growth Marketing

Data Quality

Community Operations

Data Science

Ad-hoc Querying

The people who rely on us

Reliant Rebecca

Limited SQL
Spreadsheets

Marketing Managers
Entry-level Analysts
General Managers
Product Managers

Monitoring Matt

Intermediate SQL
Spreadsheets
Dashboarding

City Operations
Regional Managers

Analyst Anna

Advanced SQL
Spreadsheets
Limited Statistics
Limited Python/R

Operations Managers
Data Analysts
Product Analysts

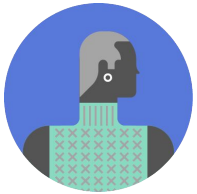
Inventor Ivan

Advanced SQL
Advanced Statistics
Scala/Spark, Python/R
Data Modeling

Data Scientists
Software Engineers
ML/AI Researchers

Technical Skills

Exploratory ML & model-training

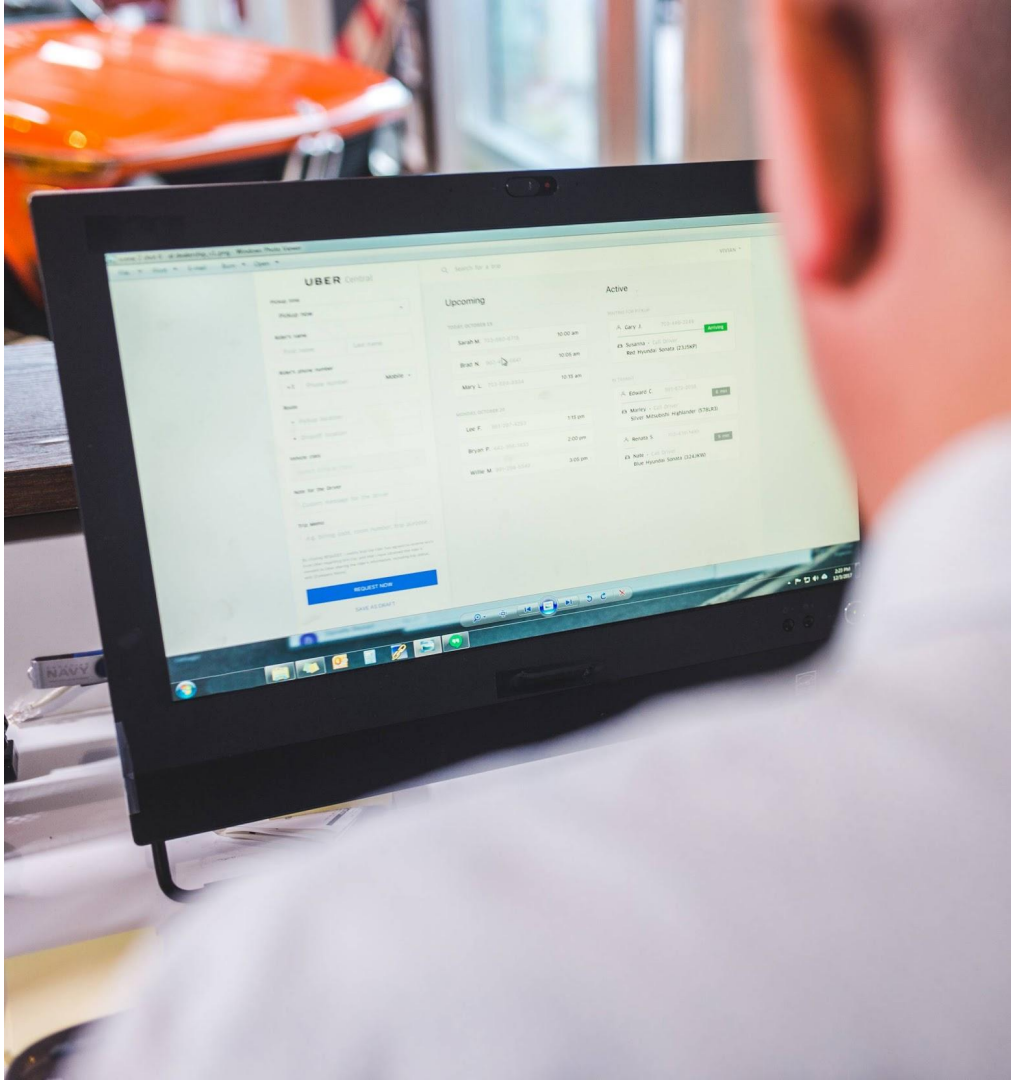


Engineers

Data Scientists

ML Researchers

Using ML to ensure data security and compliance



Advanced data science & complex analytics

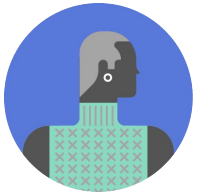
Data Scientists

Ops Analysts

Support Agents

Surfacing hidden insights to empower restaurants

Business process automation


Ops Managers


S&P Analysts


Contractors

Using technology to make transportation safer

Uber Contributions

Contributions

Connectors

- Parquet reader
- Elasticsearch connector (release 217)
- Pinot connector enhancements (in-house)

Optimizations

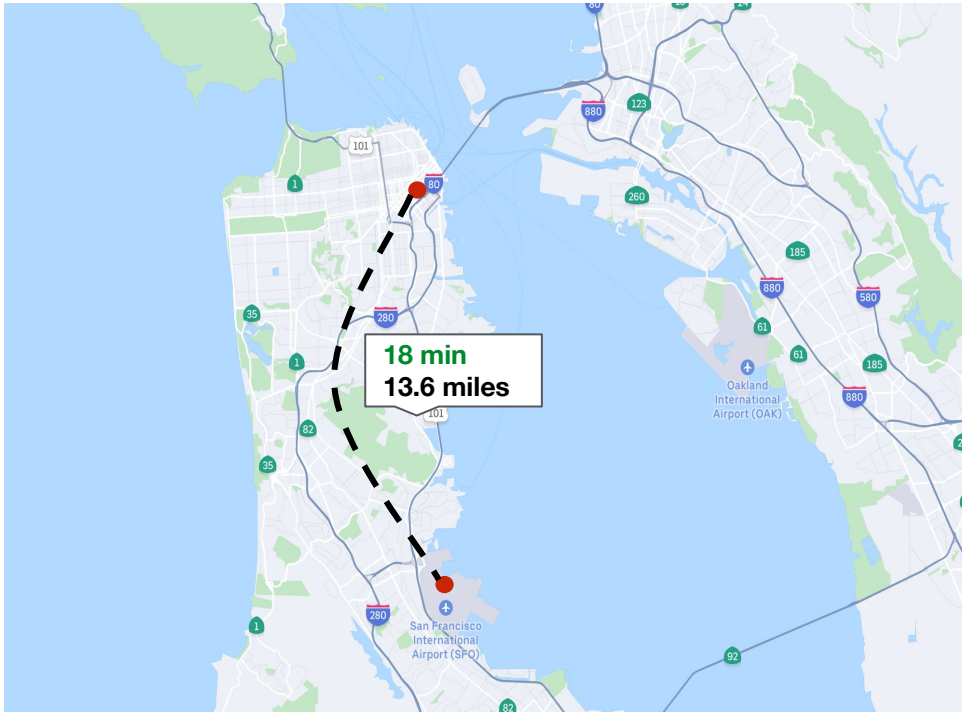
- Geospatial indexing and operations - 10x or more speedup
- Parquet nested column pushdowns (project, predicate) - 5x speedup

Production

- Metastore authentication support for Kerberos deployments
- Dispatch Proxy using HTTP redirect for multi-cluster operation


How many people took an Uber to an airport last week?

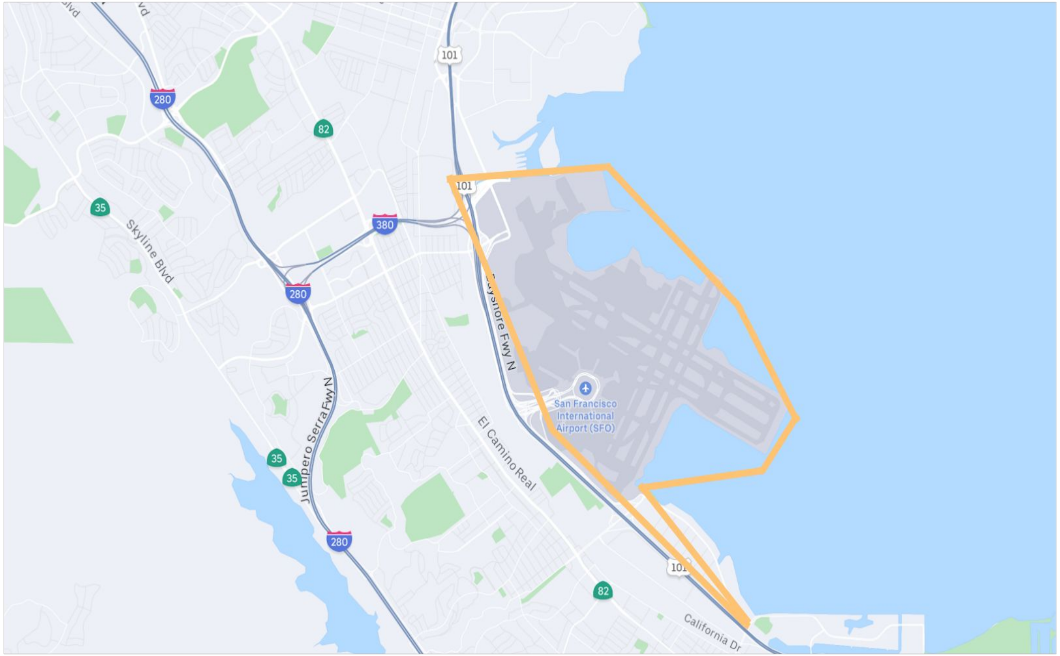
What does a trip to SFO look like?



POLYLINE

POINT(-73.977540378232 40.756634232442)
POINT(-77.012723937220 38.984620925742)
POINT(-112.326839 33.75663)
POINT(-70.27646950057 -33.63744488957)
POINT(-103.1284970562 20.78652)
(5 rows)

Identifying an "airport"



presto:default> select airport_code, simplified_shape from dwh.dim_airport where airport_code = 'SFO';

airport_code | simplified_shape

SFO | POLYGON ((-122.3835454 37.609474654, -122.362637362 37.591782927, -122.454646 37.59

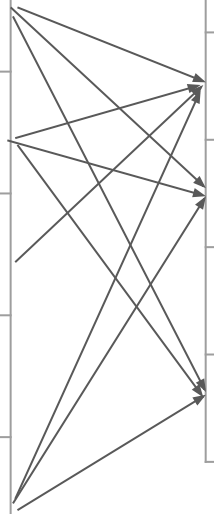
(1 row)

Geofence (Polygon) - Cross Join

```
SELECT airport_code,
       COUNT(*)

FROM   rider_events
JOIN   airport
ON     st_contains (geofence,
       st_point (lng, lat))

WHERE  datestr = '2019-03-11'
GROUP  BY 1
```

O(N * M)

event_id	request_lng	request_lat
1	-96.43246	-19.89763
2	-43.9243121	29.084784
3	116.52432433	39.98746
...		
n	-70.3422344	-33.562123

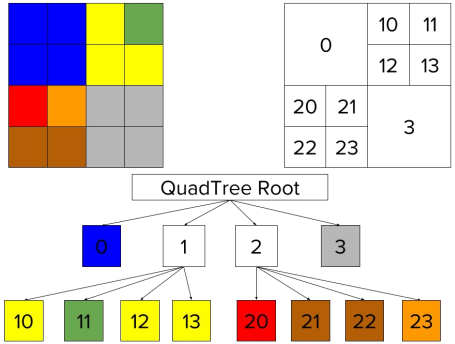


airport	simplified_shape
1. SFO	POLYGON((-122.0..)
2. PEK	POLYGON((3.49…)
...	
m. DMK	POLYGON((-81.7…)

Geo Index Optimization

event_id	request_lng	request_lat
1	-96.43246	-19.89763
2	-43.9243121	29.084784
3	116.52432433	39.98746
...		
n	-70.3422344	-33.562123

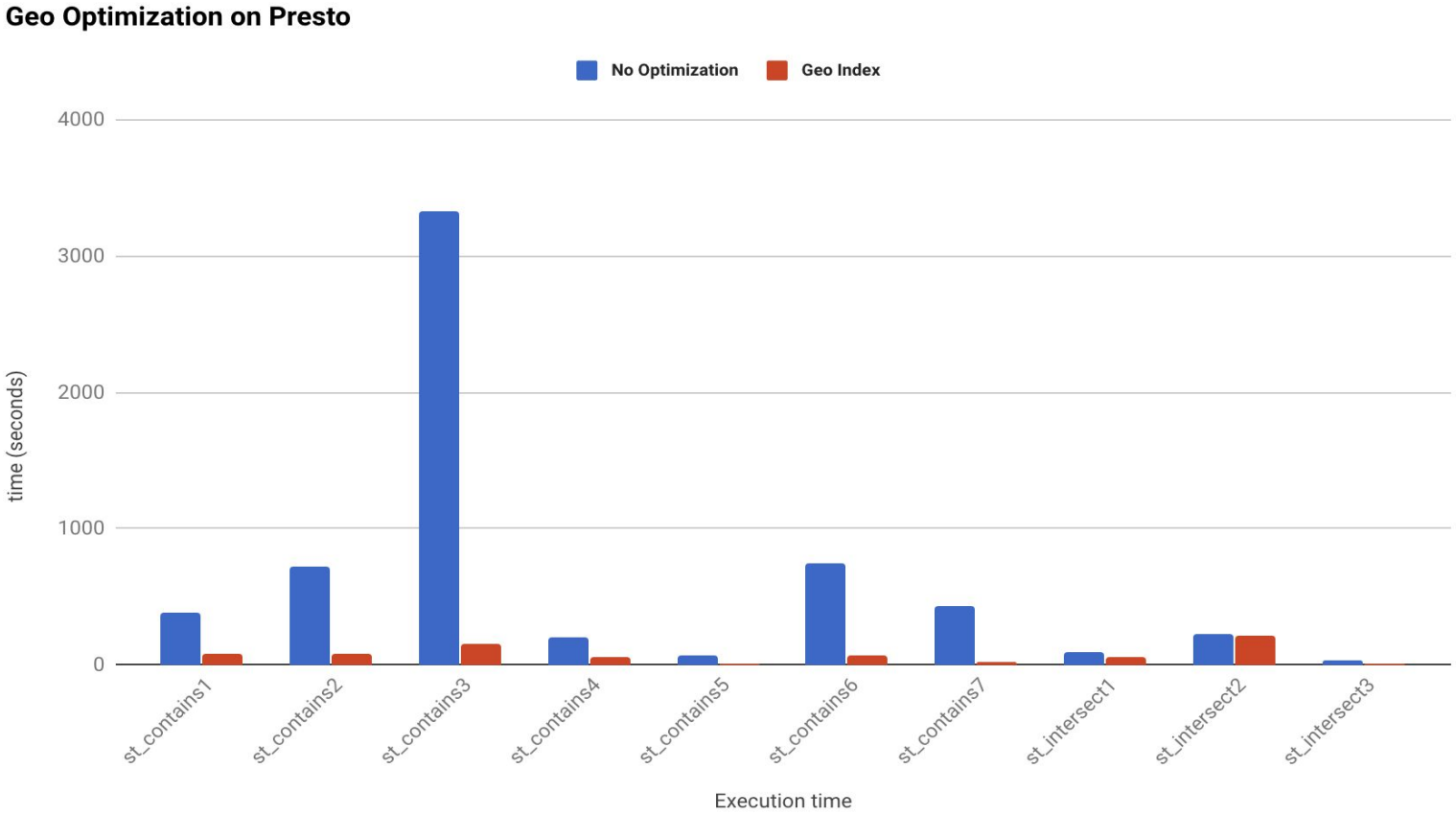
O(N * Log(M))

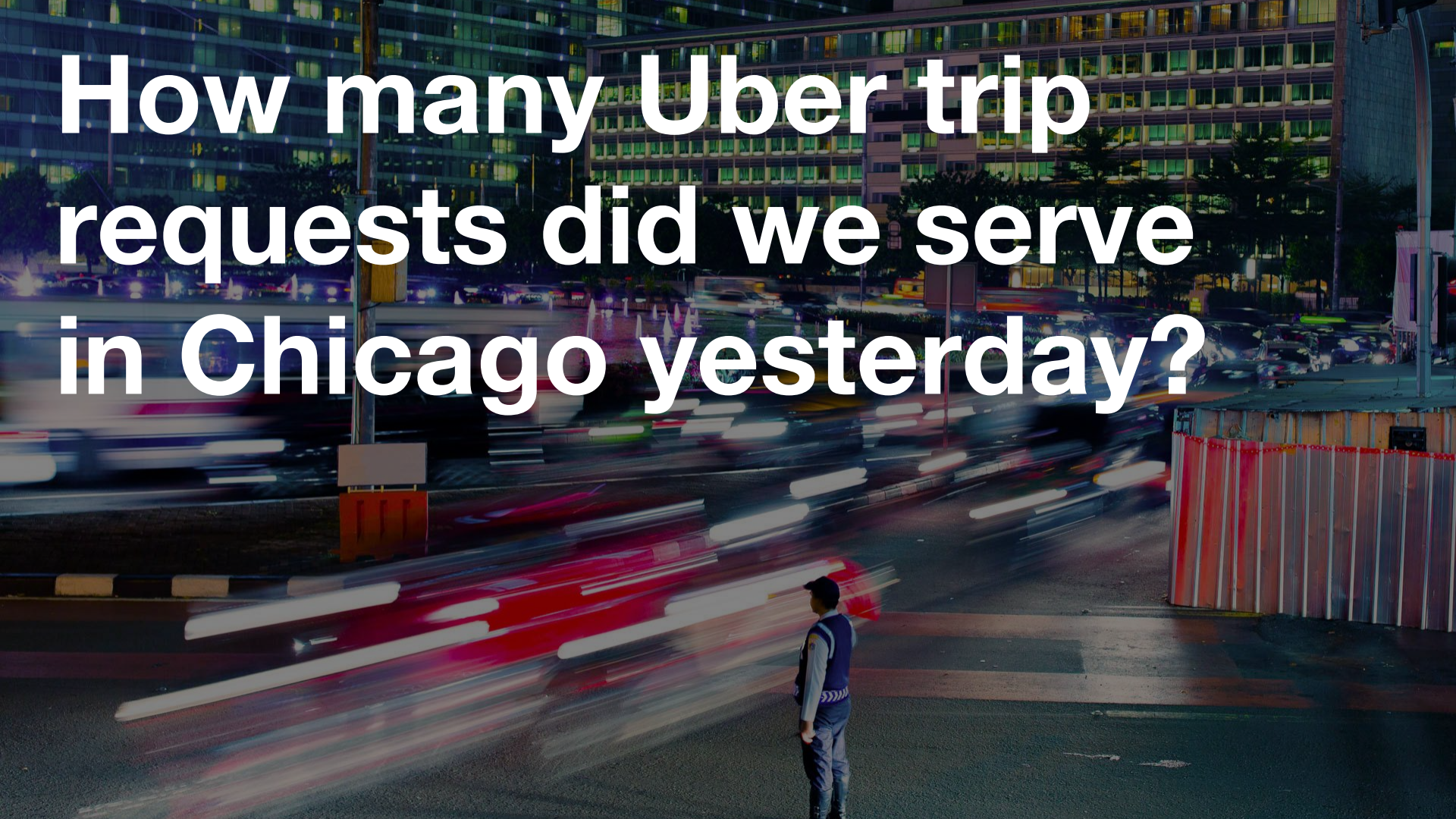


airport	simplified_shape
1.SFO	POLYGON(((-122.02..))
2.PEK	POLYGON((3.49…)
Fixed number	

airport	simplified_shape
1. SFO	POLYGON(((-122.02..))
2. PEK	POLYGON((3.49…)
...	
m. DMK	POLYGON((-81.7…)

Results

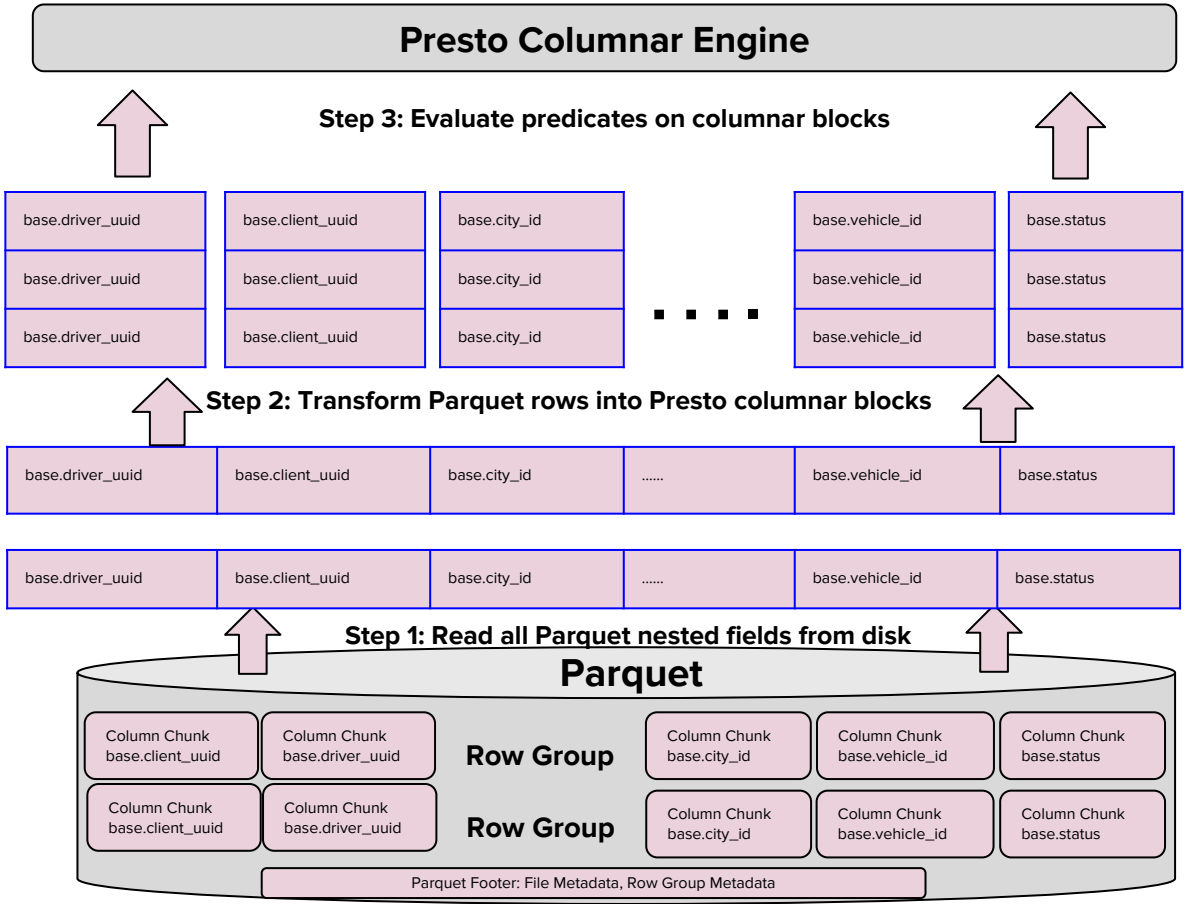

Geo Optimization on Presto
No Optimization
Geo Index
4000
3000
2000
1000
0
time (seconds)
st_contains1
st_contains2
st_contains3
st_contains4
st_contains5
st_contains6
st_contains7
st_intersect1
st_intersect2
st_intersect3
Execution time


How many Uber trip requests did we serve in Chicago yesterday?

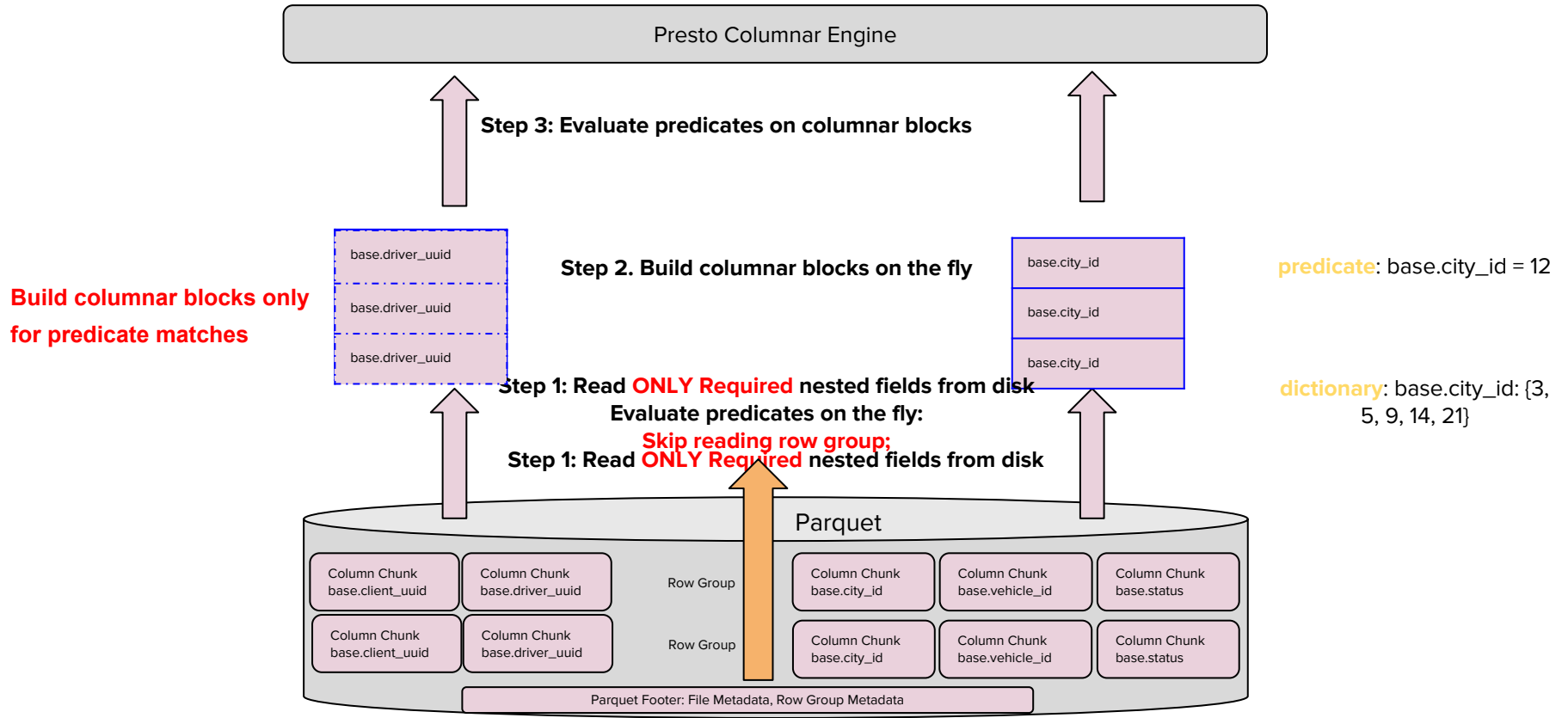
Fetch daily trip count in seconds

```
SELECT T.base.city_id AS cid,
       Count(CASE WHEN T.base.status = 'completed' THEN 1 END) AS
       completed_trips,
       Count(CASE WHEN T.base.status = 'canceled' THEN 1 END) AS
       rider_canceled_trips

FROM   trips AS T
       LEFT JOIN users ON U.id = T.base.id

WHERE  T.datestr = '2019-03-11'
GROUP  BY 1
```

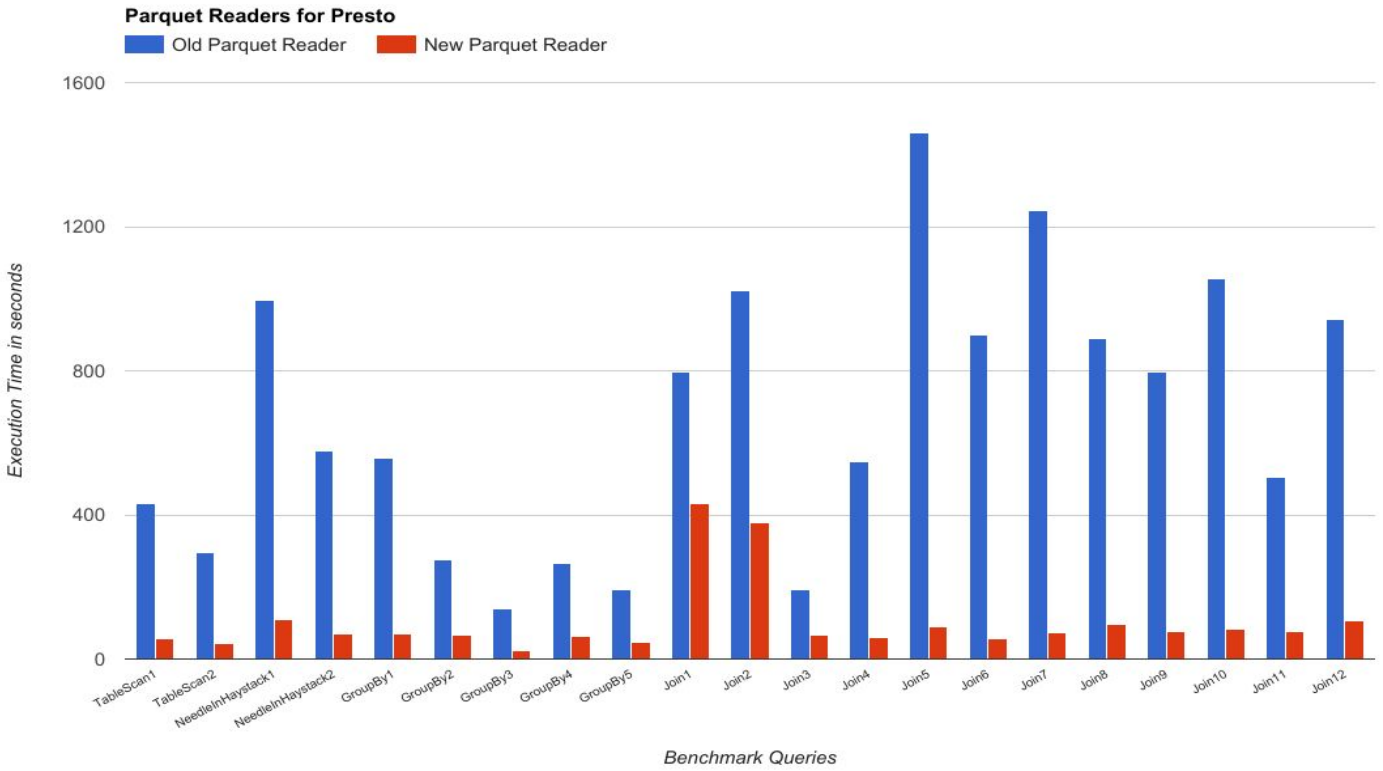
Default Apache Parquet Reader



Apache Parquet Reader Optimization

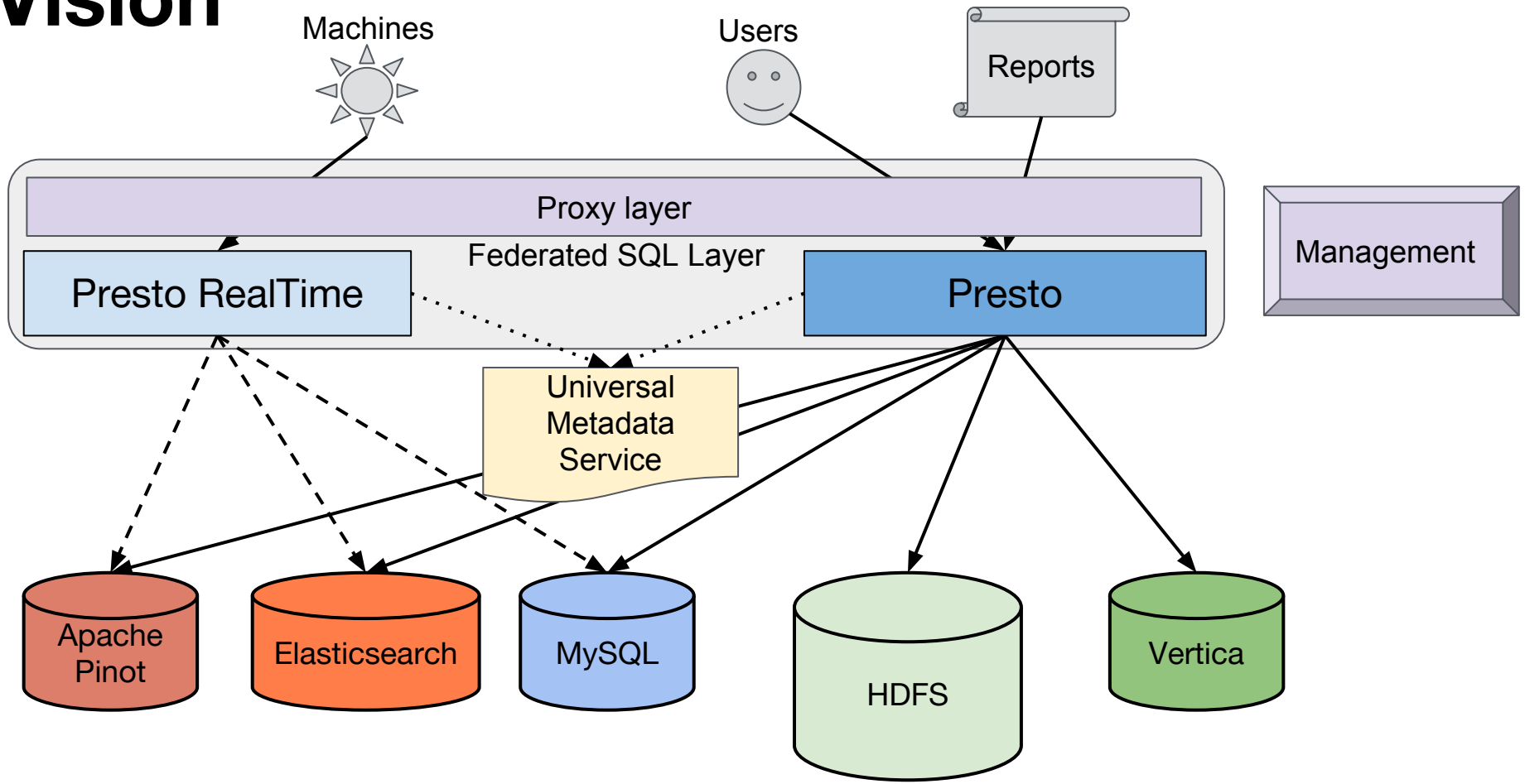


Results


Parquet Readers for Presto
Old Parquet Reader
New Parquet Reader
1600
1200
800
400
0
Execution Time in seconds
TableScan1
TableScan2
NeedleInHaystack1
NeedleInHaystack2
GroupBy1
GroupBy2
GroupBy3
GroupBy4
GroupBy5
Join1
Join2
Join3
Join4
Join5
Join6
Join7
Join8
Join9
Join10
Join11
Join12
Benchmark Queries

Looking forward

Vision


Machines
Users
Reports
Proxy layer
Federated SQL Layer
Presto RealTime
Presto
Management
Universal
Metadata
Service
Apache
Pinot
Elasticsearch
MySQL
HDFS
Vertica

Focus areas

Connectors

- Apache Hive, Apache Pinot, Elasticsearch, Apache Cassandra, Vertica, MySQL, etc
- Aggregation / Join pushdown
- Cross-connector optimizations (hybrid connectors)

Real-time

- Real-time mode with low latency pass through
- Query plan / result / data cache
- Time-series joins and stitching

Universal Metadata Service (UMS)

- Logical definitions / physical schemas
- Column stitching and joins
- Table and partition caching

What’s important?

Reliability

- Production ecosystem
- Deployment and testing @ scale

Engineering

- Leadership - long term perspective
- Velocity - stay close to head
- Integration hooks - logging, monitoring, security, etc

Community

- Continuity - multi-year plans
- Collaboration - focus groups & meetups

Thank you