Campsite Hot or Not

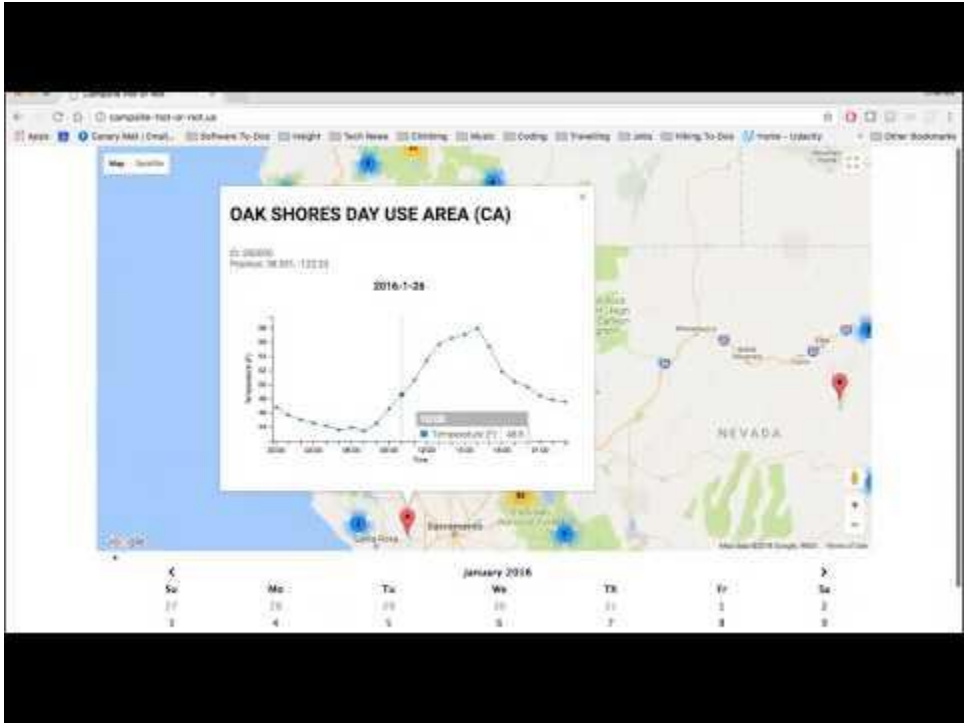
Blazing-fast weather, powered by Cassandra

Charles Chen

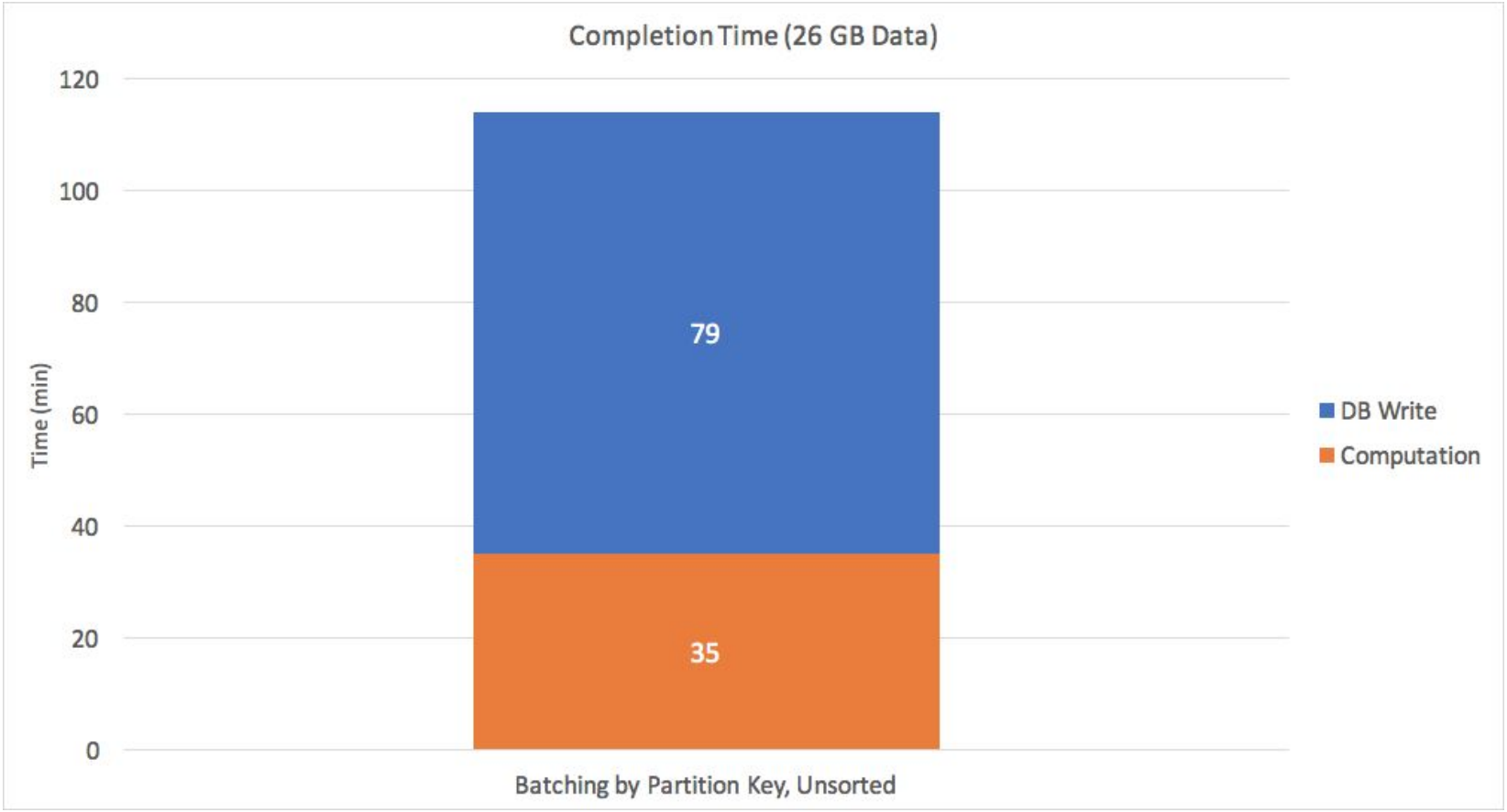
Data Engineering Fellow

Demo

http://campsite-hot-or-not.us/




DATASTAX
DataStax spark-cassandra-connector
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
S3
Spark
express
node

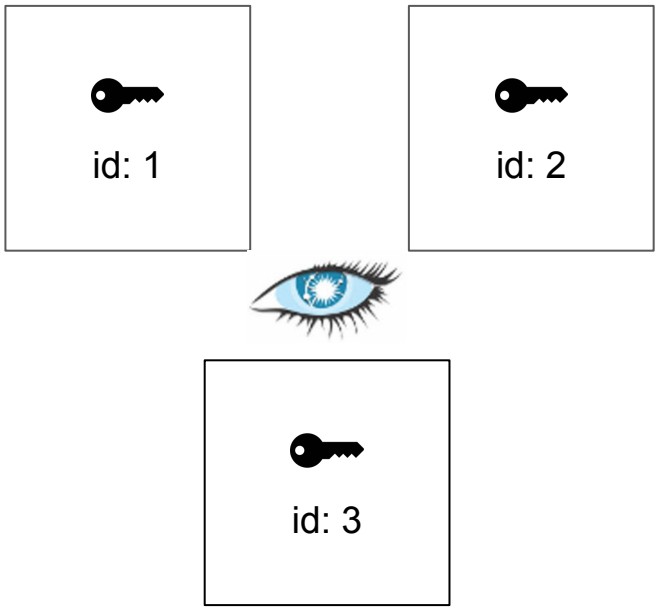


Writing to DB takes more than twice as long as the computation

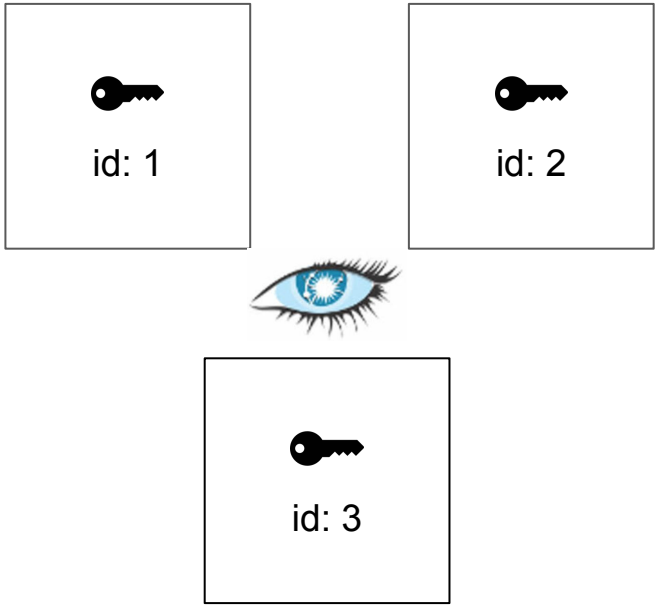
Cassandra Partition != Spark Partition

Cassandra Partition Key - Part of a row's unique key, determines which partition a row resides on

Cassandra Node - Contains one or more partitions



1. Write each row individually
2. Batch multiple rows together
   - Several ways to batch rows
   - Unintuitive batching technique yields best results



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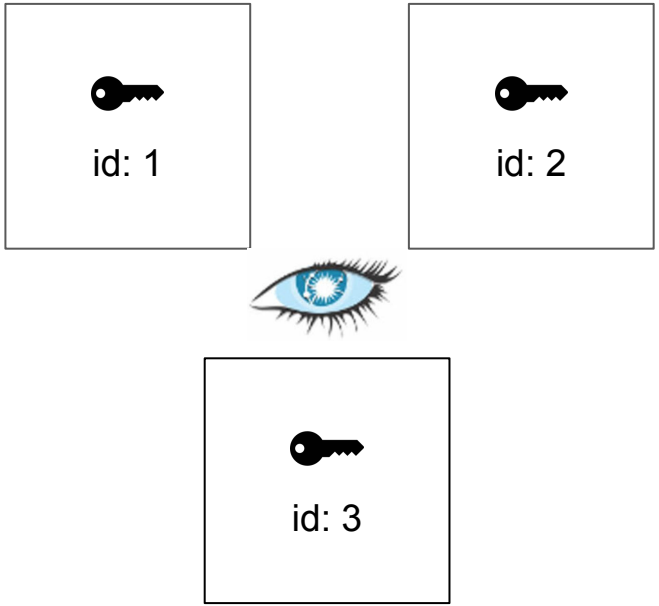
{id: 2, timestamp: 1029384642, temp: 30}
{id: 3, timestamp: 1023932852, temp: 23}
{id: 1, timestamp: 1302920492, temp: 33}



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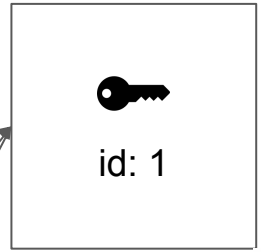

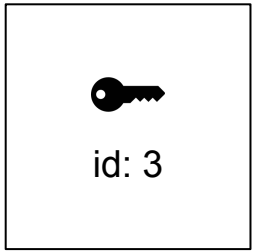

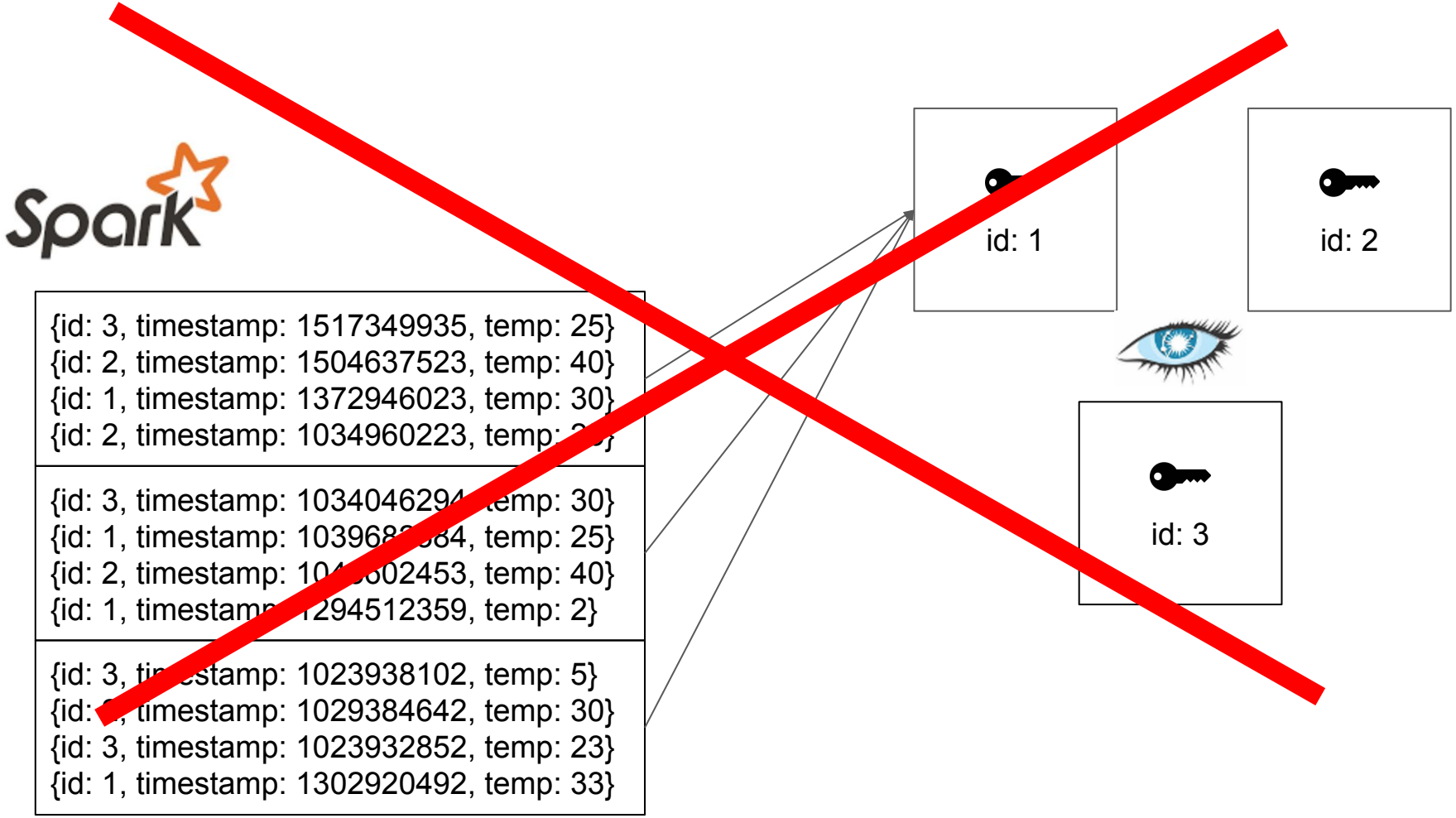
Spark
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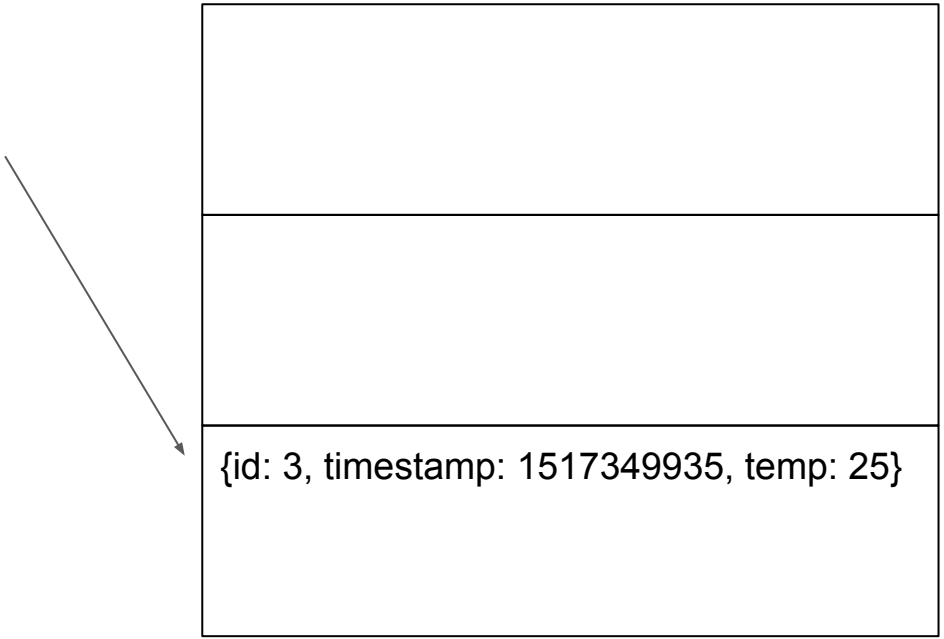

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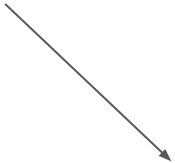

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```
stations_df = spark.createDataFrame(time_weighted_temp, station_schema)\
    .write\
    .format("org.apache.spark.sql.cassandra")\
    .mode('append')\
    .options(**station_save_options)\
    .save()
```

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stations_df = spark.createDataFrame(time_weighted_temp, station_schema)\
    .sort("id")\
    .write\
    .format("org.apache.spark.sql.cassandra")\
    .mode('append')\
    .options(**station_save_options)\
    .save()
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→ .sort("id") →

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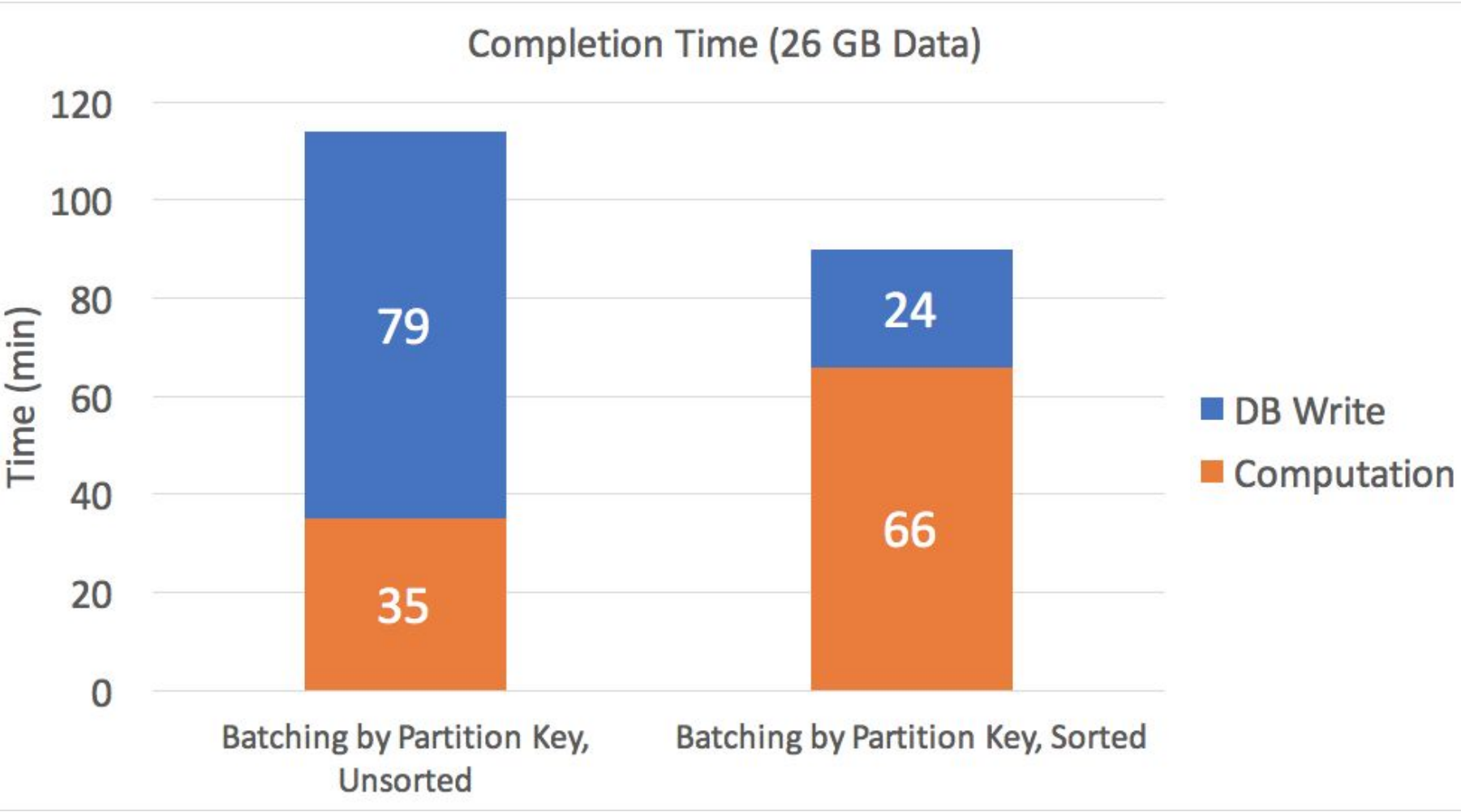
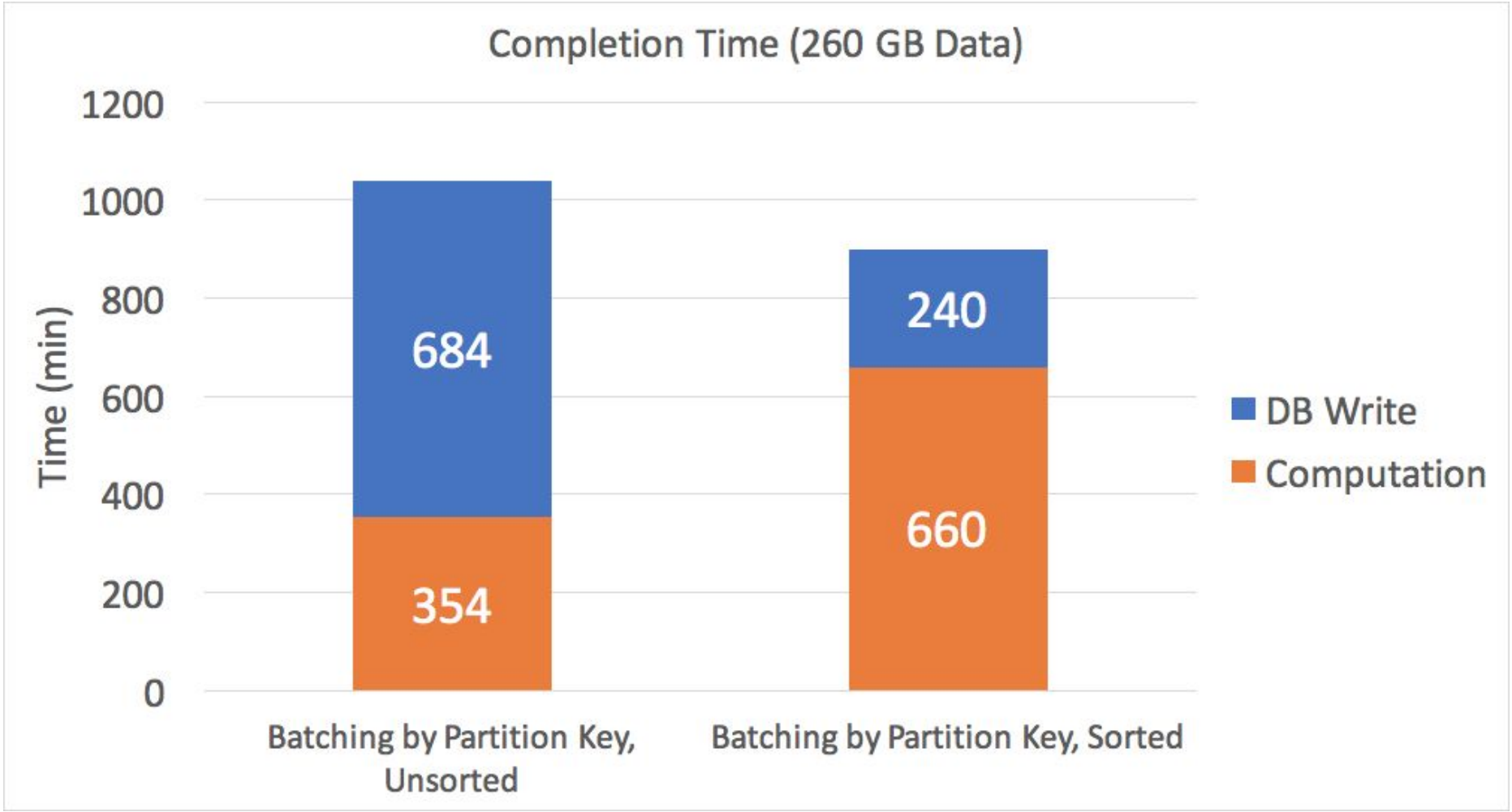
id: 3


Completion Time (26 GB Data)
120
100
80
60
40
20
0
Time (min)
79
35
24
66
DB Write
Computation
Batching by Partition Key, Unsorted
Batching by Partition Key, Sorted


Completion Time (260 GB Data)
1200
1000
800
600
400
200
0
Time (min)
684
354
240
660
DB Write
Computation
Batching by Partition Key, Unsorted
Batching by Partition Key, Sorted

Implement change to spark-cassandra-connector

- Looked at DataStax's JIRA, open issue regarding this
- Could add Catalyst rule to automatically sort on partition key prior to save
- Engaging with Russell Spitzer on DataStax Slack
  - DataStax employee, Spark contributor, speaker at Spark Summit

About Me - Charles Chen

B.S./M.S. Aerospace Engineering, USC

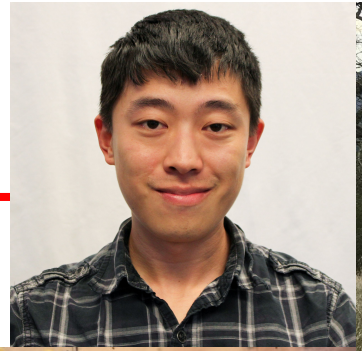
B.S. Computer Science, Oregon State

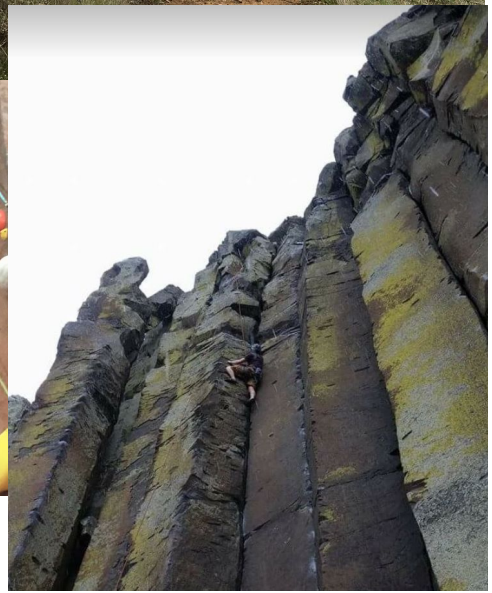
Aerodynamics Engineer @ Boeing

linkedin.com/in/charles-l-chen

github.com/CCInCharge

Interests: Rock Climbing, Hiking, Backpacking, Search and Rescue Volunteer





Q & A

Backup

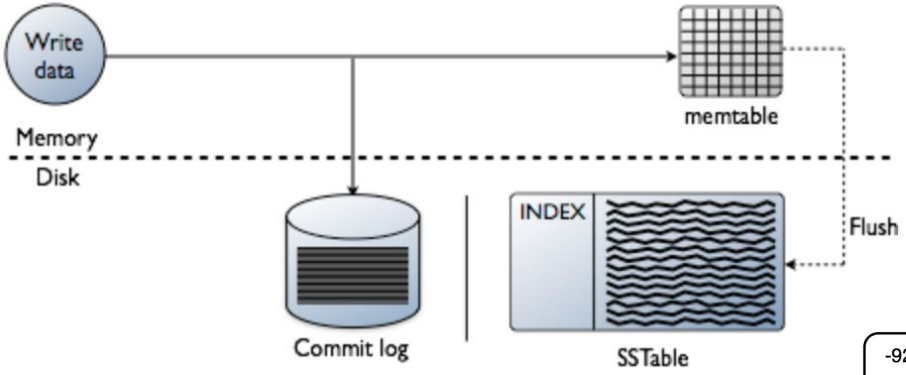
Algorithm

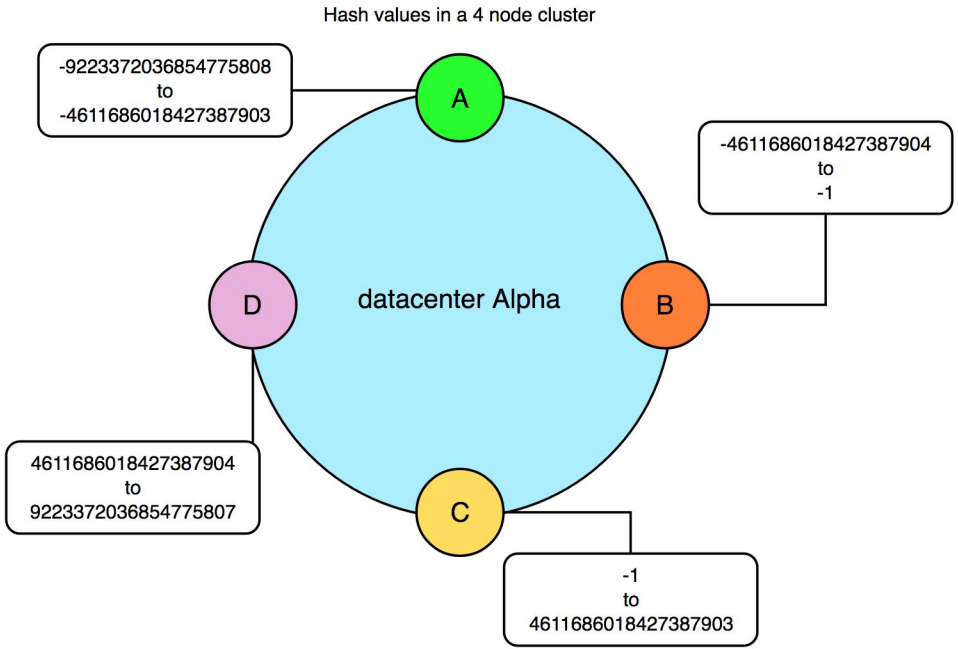
Inverse Weighted Average

$$u(\mathbf{x}) = \begin{cases} \dfrac{\sum_{i=1}^{N} w_i(\mathbf{x}) u_i}{\sum_{i=1}^{N} w_i(\mathbf{x})}, & \text{if } d(\mathbf{x}, \mathbf{x}_i) \neq 0 \text{ for all } i, \\ u_i, & \text{if } d(\mathbf{x}, \mathbf{x}_i) = 0 \text{ for some } i, \end{cases}$$

where

$$w_i(\mathbf{x}) = \frac{1}{d(\mathbf{x}, \mathbf{x}_i)^p}$$





*Images from DataStax


NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
S3
Spark
express
node
Implementation of distributed weighting algorithm
Storage of time-series data

Implementation Details for Connector Patch

- Create a Catalyst rule to automatically sort the DataFrame on partition key, prior to saving to database
  - Catalyst is a very low-level API

Motivation

Identify historical weather patterns at campsites

Consumer interest:

Identify good places to go camping, based on weather patterns

Trail impact:

100% increase in permit applications for JMT from 2011 - 2015