ALLUXIO

Best Practices for Using Alluxio with Spark

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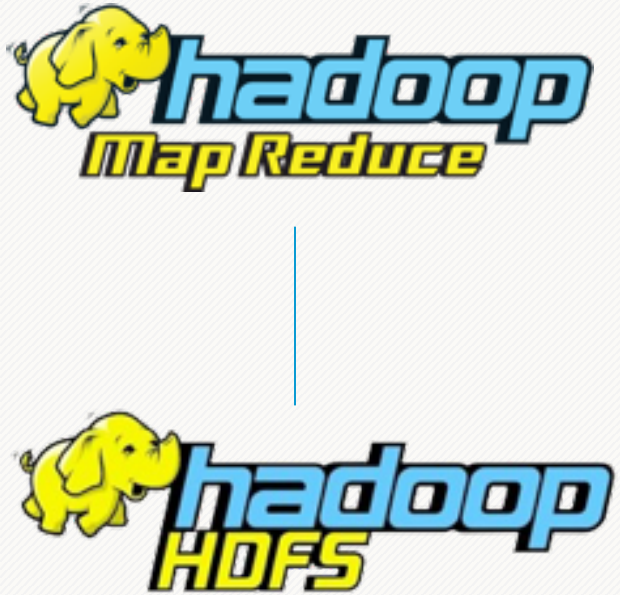
Spark Summit SF - June 2017

Outline

1. Alluxio Overview
2. Alluxio + Spark Use Cases
3. Using Spark with Alluxio
4. Performance Evaluation
5. Demo

Data Ecosystem Yesterday

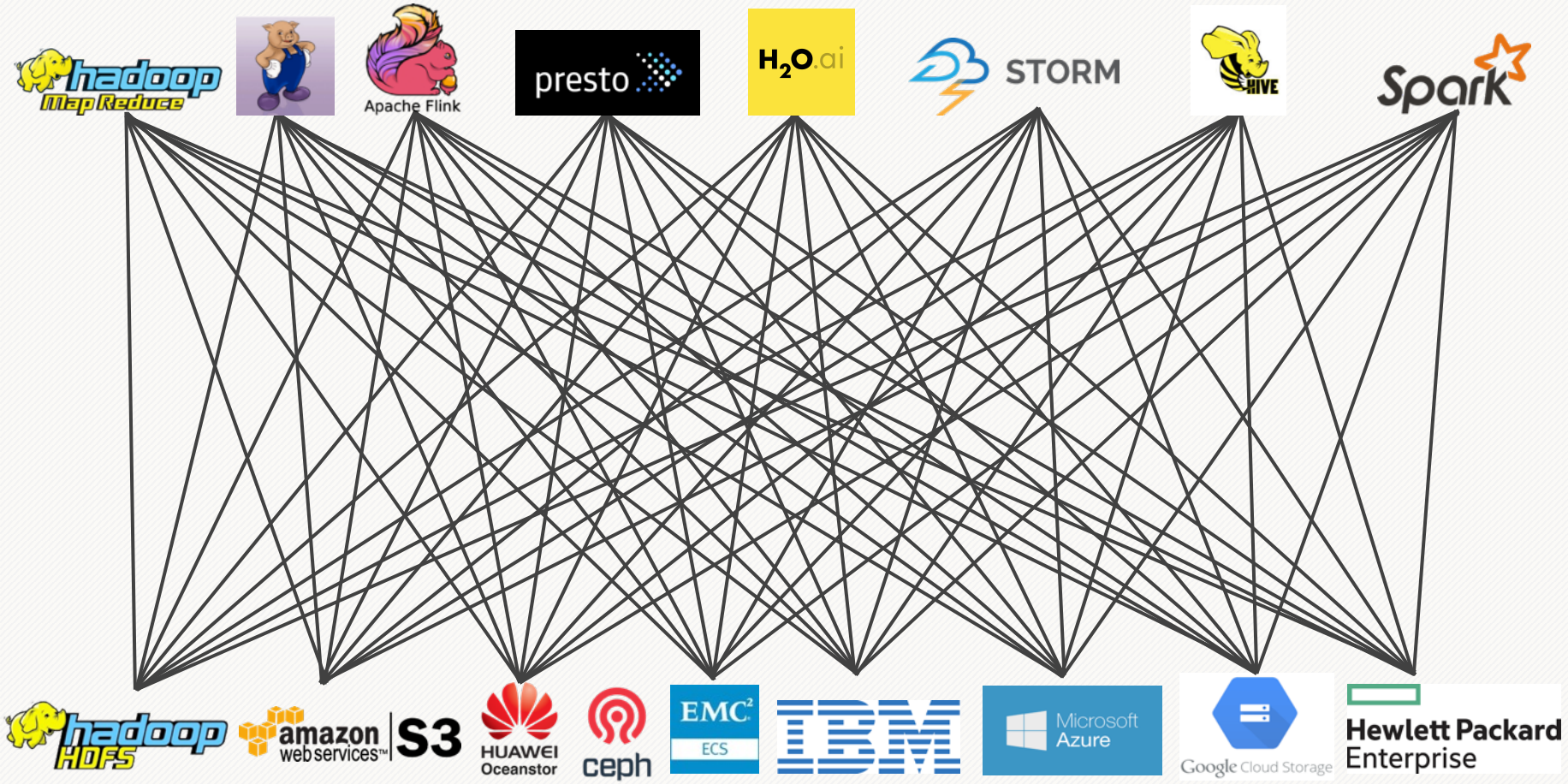


- One Compute Framework
- Single Storage System
- Co-located

Data Ecosystem Today

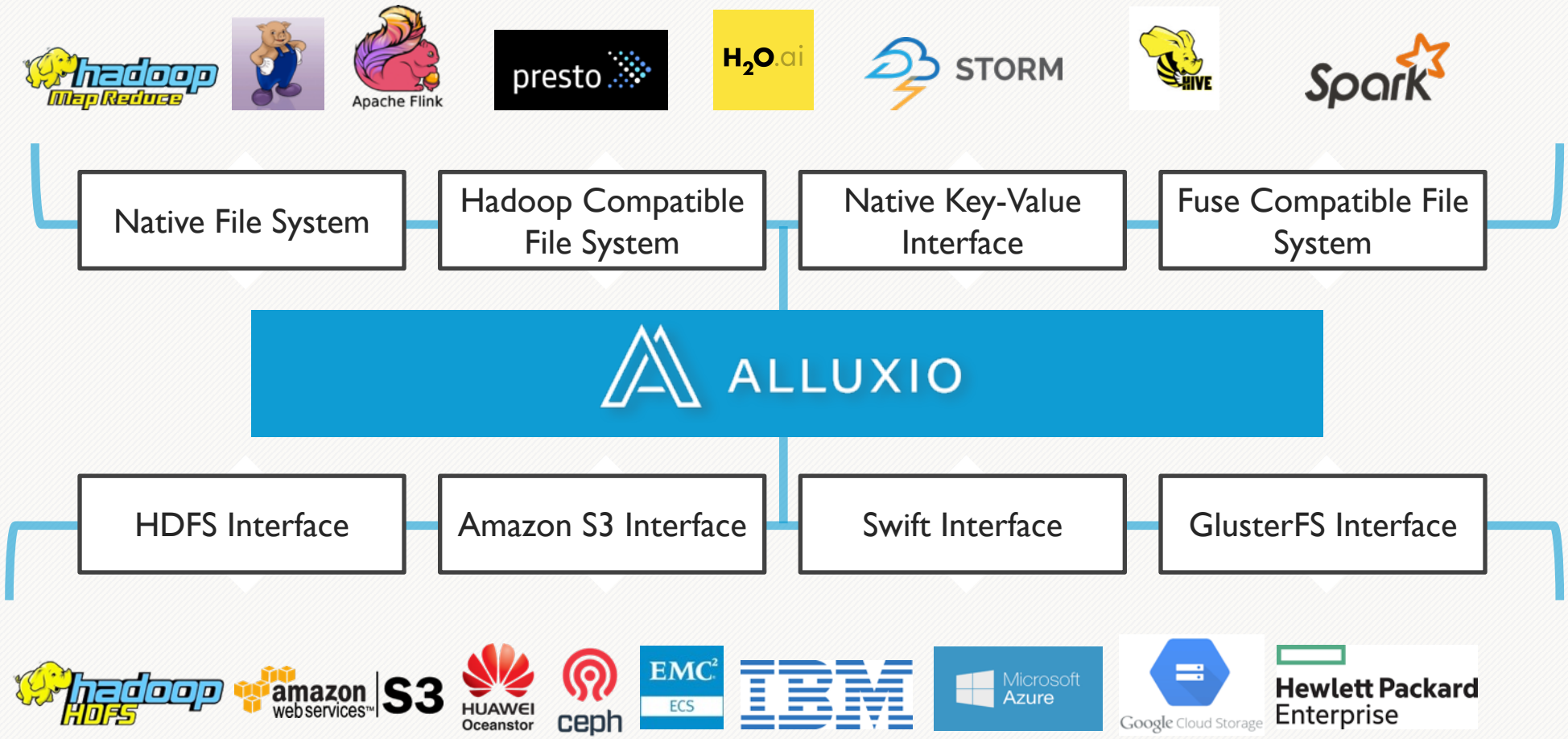
- Many Compute Frameworks
- Multiple Storage Systems
- Most not co-located

Data Ecosystem Issues



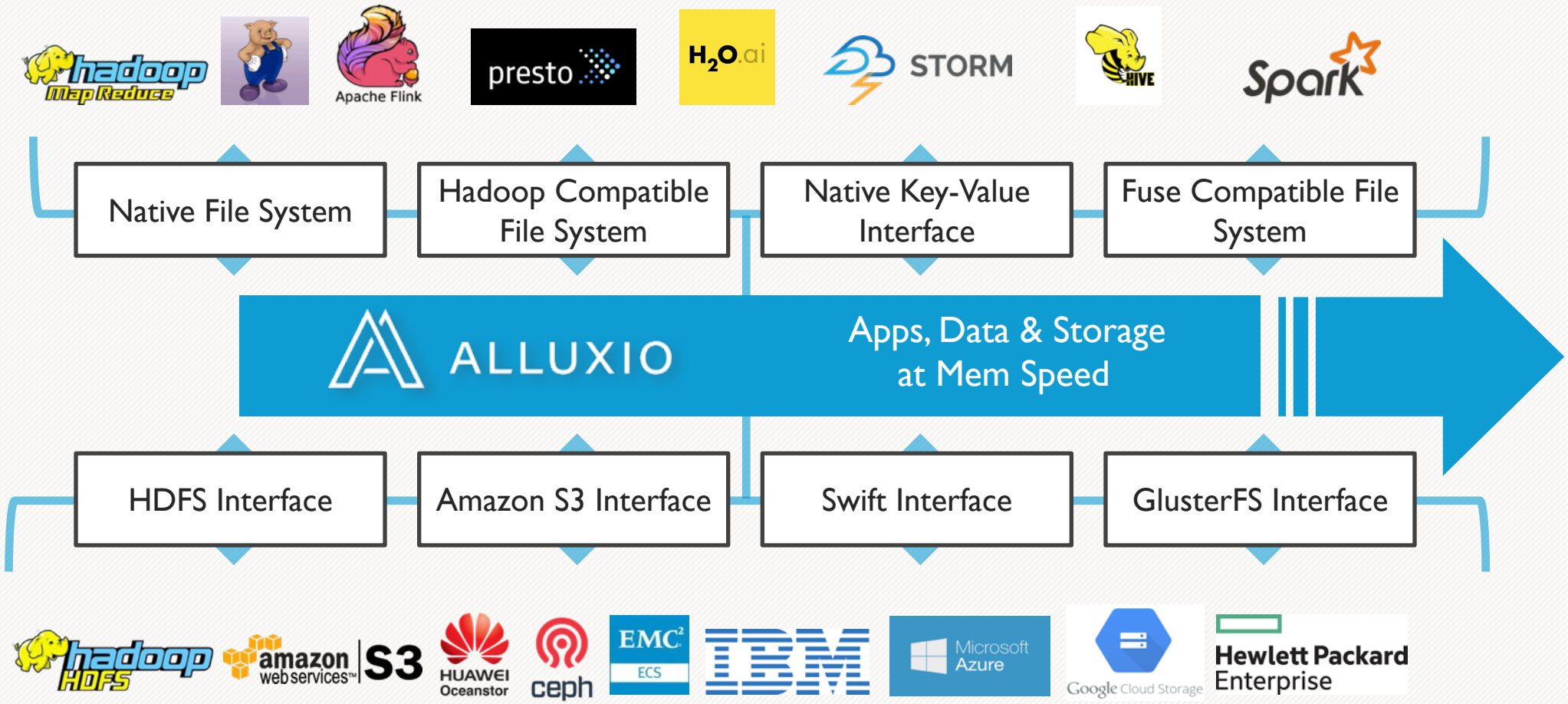
- Each application manage multiple data sources
- Add/Removing data sources require application changes
- Storage optimizations requires application change
- Lower performance due to lack of locality

Data Ecosystem with Alluxio



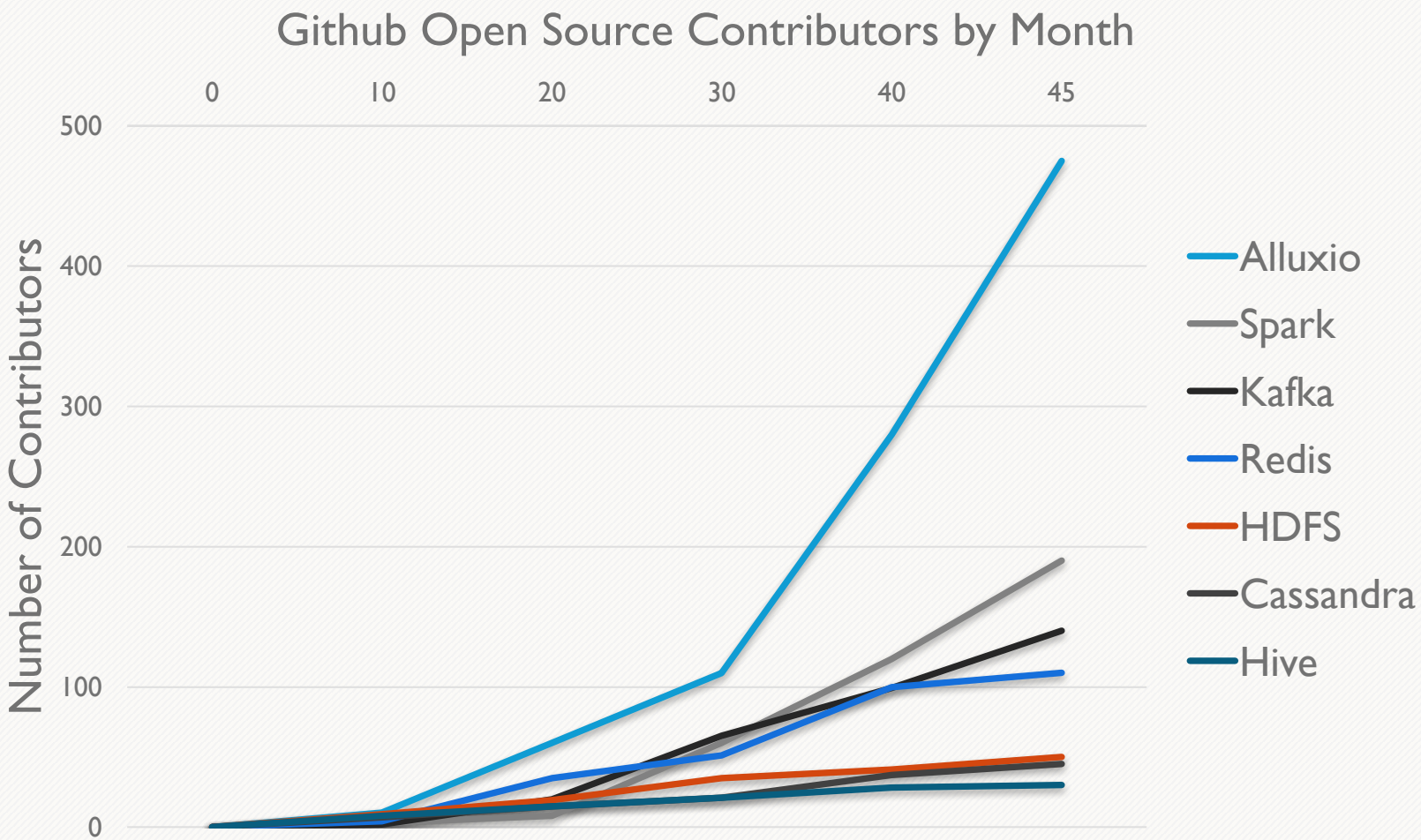
- Apps only talk to Alluxio
- Simple Add/Remove
- No App Changes
- Highest performance in Memory
- No Lock in

Next Gen Analytics with Alluxio



- ✓ Big Data/IoT
- ✓ AI/ML
- ✓ Deep Learning
- ✓ Cloud Migration
- ✓ Multi Platform
- ✓ Autonomous

Fastest Growing Big Data Open Source Projects



Fastest Growing open-source project in the big data ecosystem

Running in large production clusters

500+ Contributors from 100+ organizations

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Big Data Case Study – BARCLAYS

SPARK

TERADATA

Challenge –
Gain end to end view of business with large volume of data

Queries were slow / not interactive, resulting in operational inefficiency

SPARK

ALLUXIO

TERADATA

Solution –
ETL Data from Teradata to Alluxio

Impact –
Faster Time to Market – "Now we don't have to work Sundays"

http://bit.ly/2oMx95W

Big Data Case Study – Baidu 百度

SPARK

Baidu File System

Challenge –
Gain end to end view of business with large volume of data

Queries were slow / not interactive, resulting in operational inefficiency

SPARK

ALLUXIO

Baidu File System

Solution –
With Alluxio, data queries are 30X faster

Impact –
Higher operational efficiency

http://bit.ly/2pDHS3O

Big Data Case Study – Qunar.Com

SPARK | FLINK | HDFS | CEPH

Challenge –
Gain end to end view of business with large volume of data for $5B Travel Site

Queries were slow / not interactive, resulting in operational inefficiency

SPARK | FLINK | ALLUXIO | HDFS | CEPH

Solution –
With Alluxio, 300x improvement in performance

Impact –
Increased revenue from immediate response to user behavior
Use case: http://bit.ly/2pDJdrq

Machine Learning Case Study – GUARDANT HEALTH

ALLUXIO

SPARK

HDFS

Challenge –
Disparate Data both on-prem and Cloud. Heterogeneous types of data.

Scaling of Exabyte size data. Slow due to disk based approach.

SPARK

ALLUXIO

MINIO

MESOS

Solution –
Using Alluxio to prevent I/O bottlenecks

Impact –
Orders of magnitude higher performance than before.
http://bit.ly/2p18ds3

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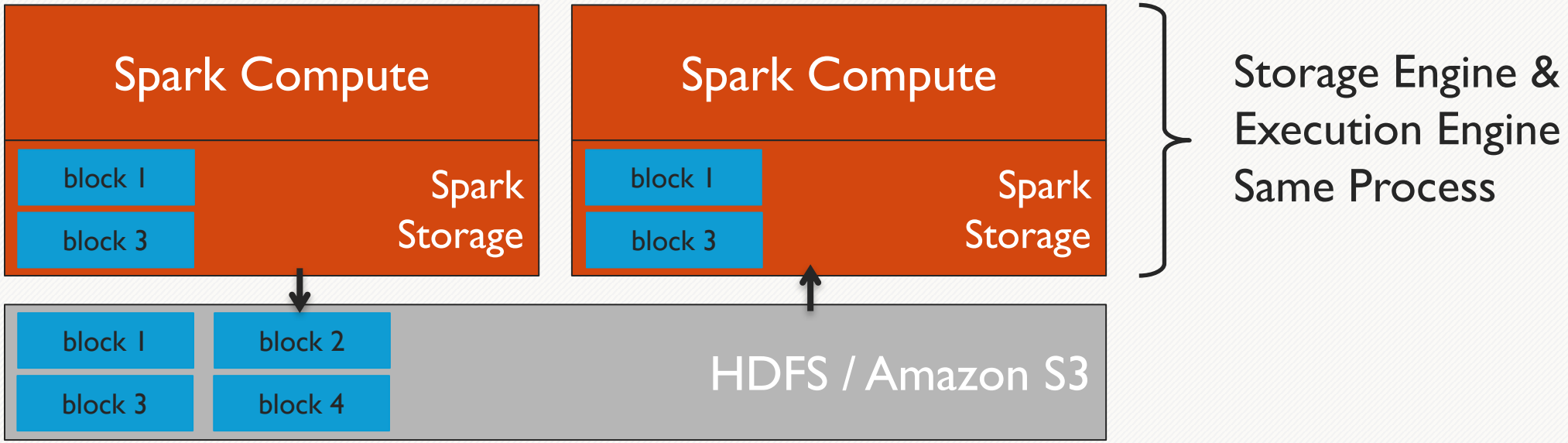
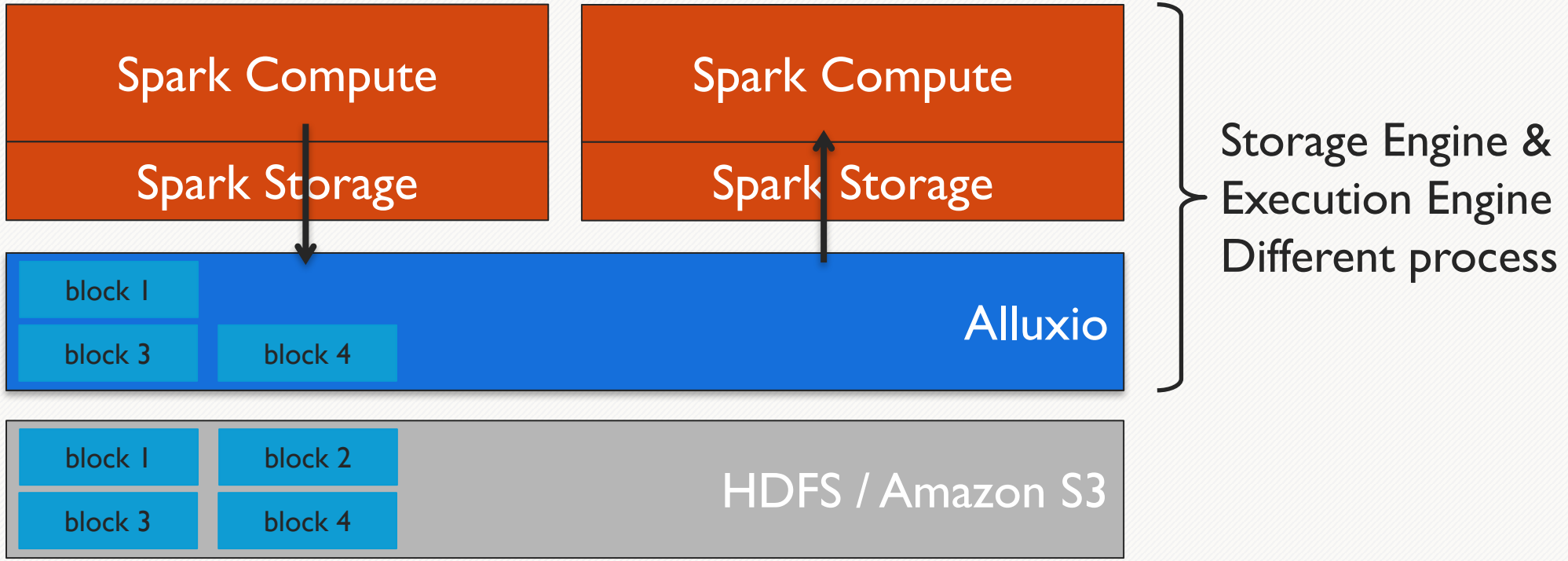
Consolidating Memory



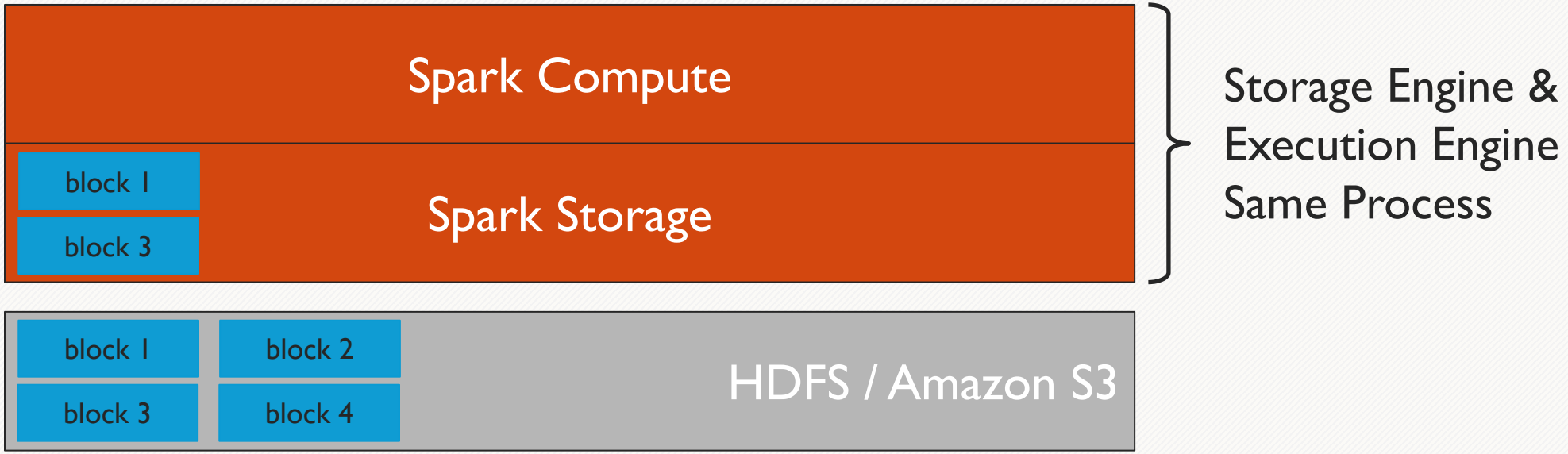
- Two copies of data in memory – double the memory used
- Inter-process Sharing Slowed Down by Network / Disk I/O

Consolidating Memory

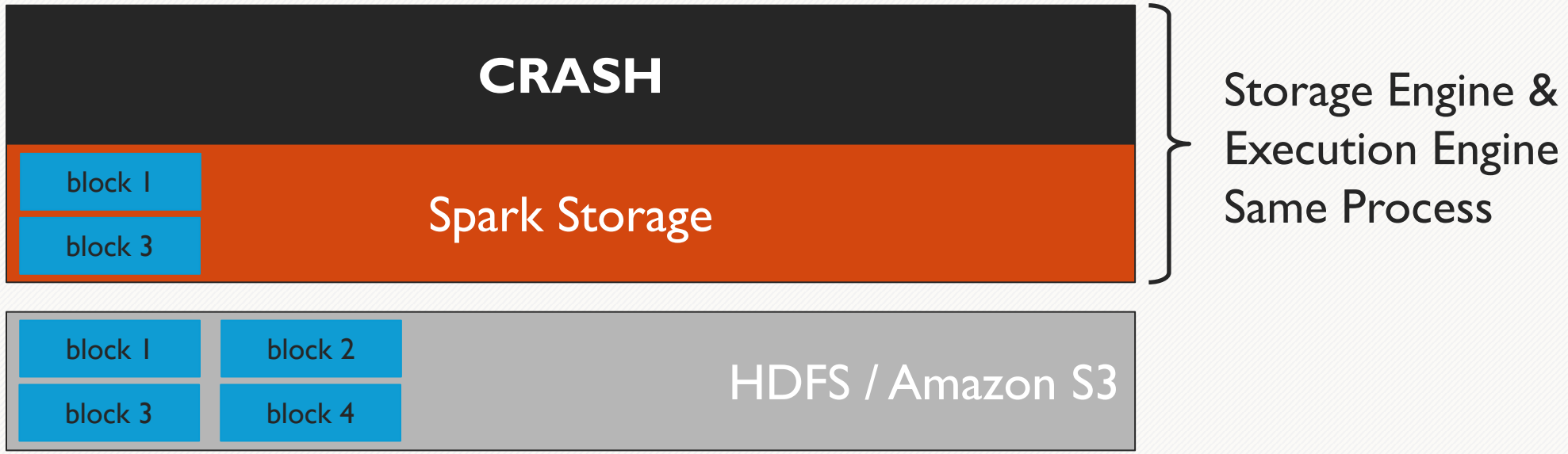


- Half the memory used
- Inter-process Sharing Happens at Memory Speed

Data Resilience During Crash

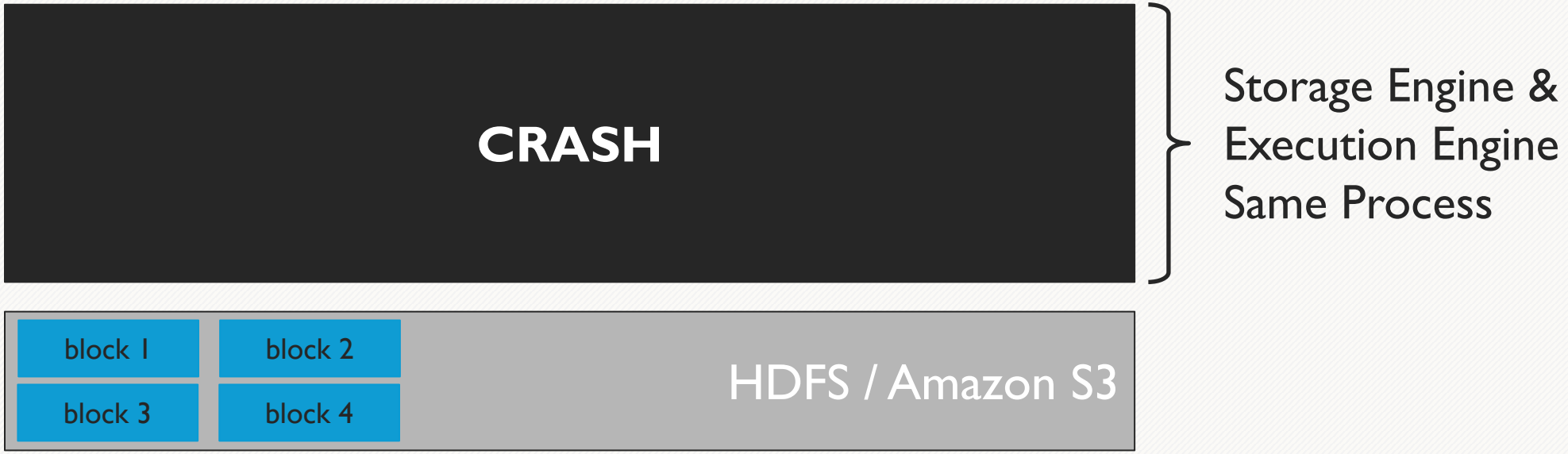


Data Resilience During Crash



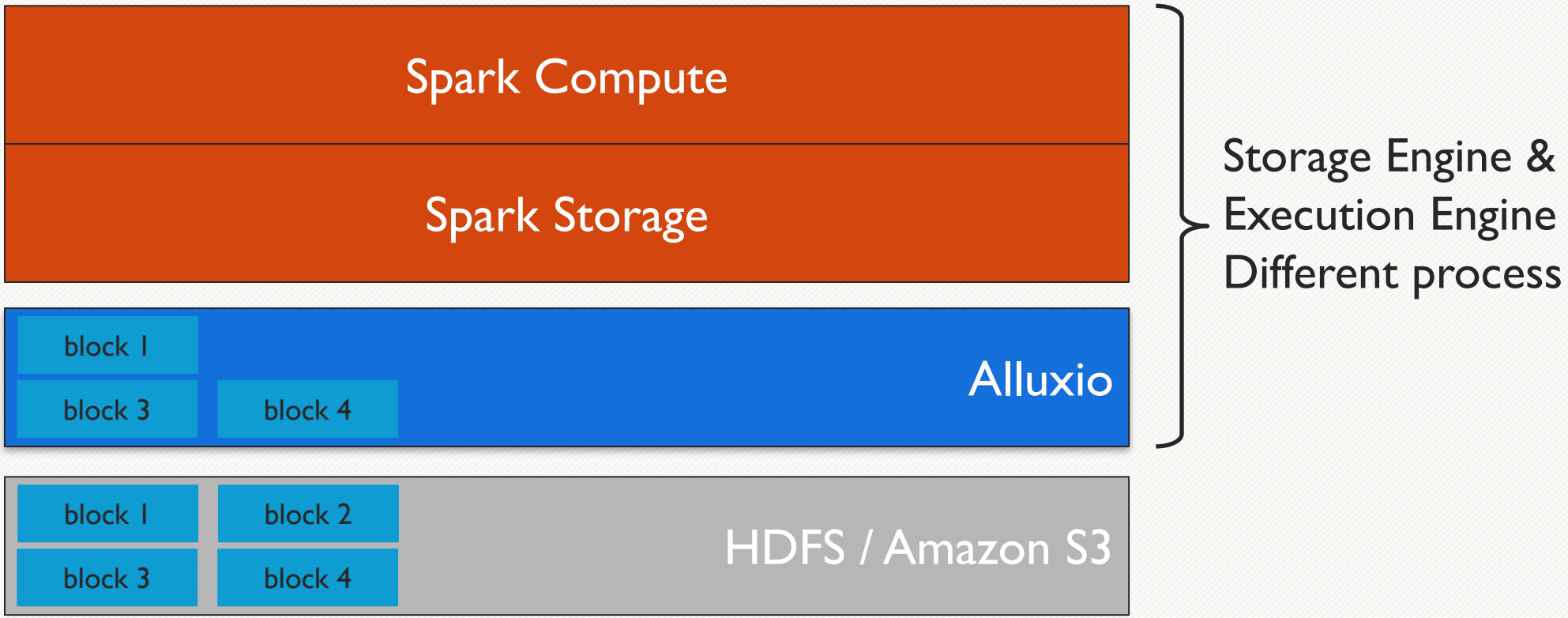
- Process Crash Requires Network and/or Disk I/O to Re-read Data

Data Resilience During Crash

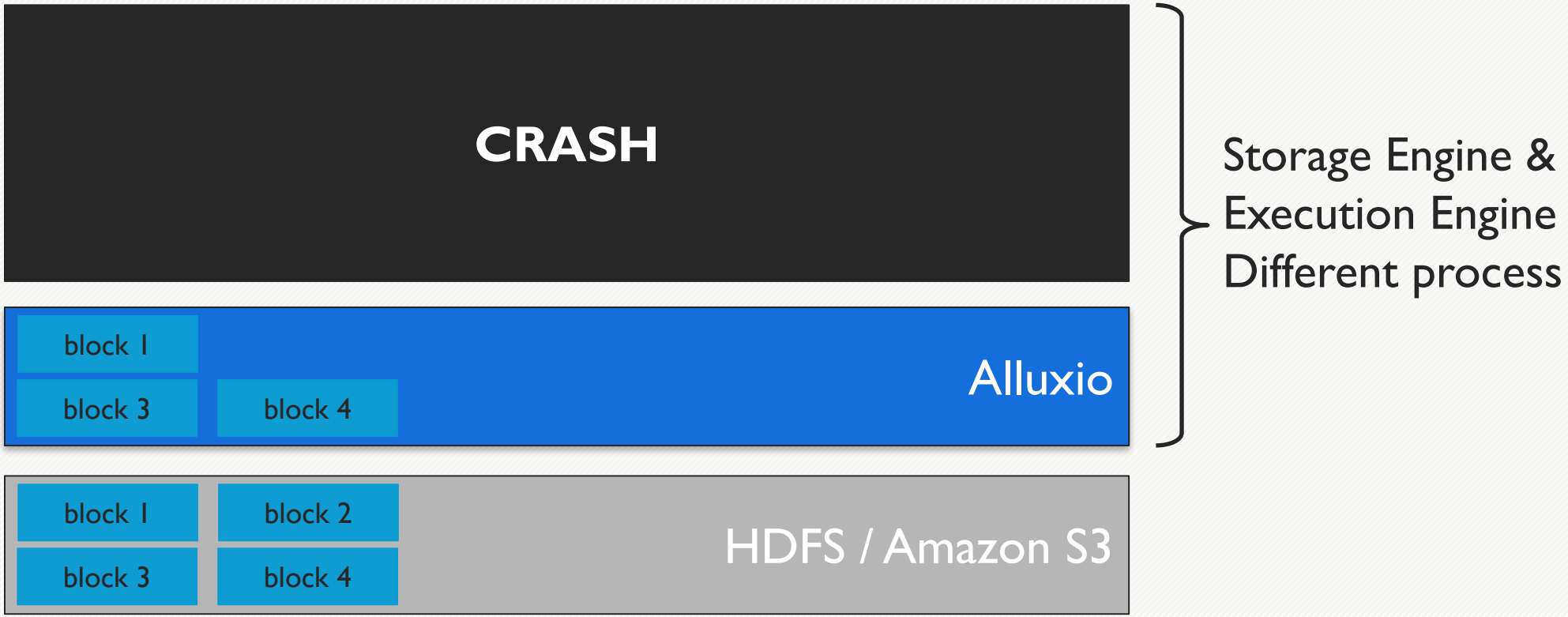


- Process Crash Requires Network and/or Disk I/O to Re-read Data

Data Resilience During Crash



Data Resilience During Crash



- Process Crash – Data is Re-read at Memory Speed

Accessing Alluxio Data From Spark

ALLUXIO

Writing Data	Write to an Alluxio file
Reading Data	Read from an Alluxio file

Code Example for Spark RDDs

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Writing RDD to Alluxio

```
rdd.saveAsTextFile(alluxioPath)
rdd.saveAsObjectFile(alluxioPath)
```

Reading RDD from Alluxio

```
rdd = sc.textFile(alluxioPath)
rdd = sc.objectFile(alluxioPath)
```

Code Example for Spark DataFrames

ALLUXIO

Writing to Alluxio

```
df.write.parquet(alluxioPath)
```

Reading from Alluxio

```
df = sc.read.parquet(alluxioPath)
```

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Experiments

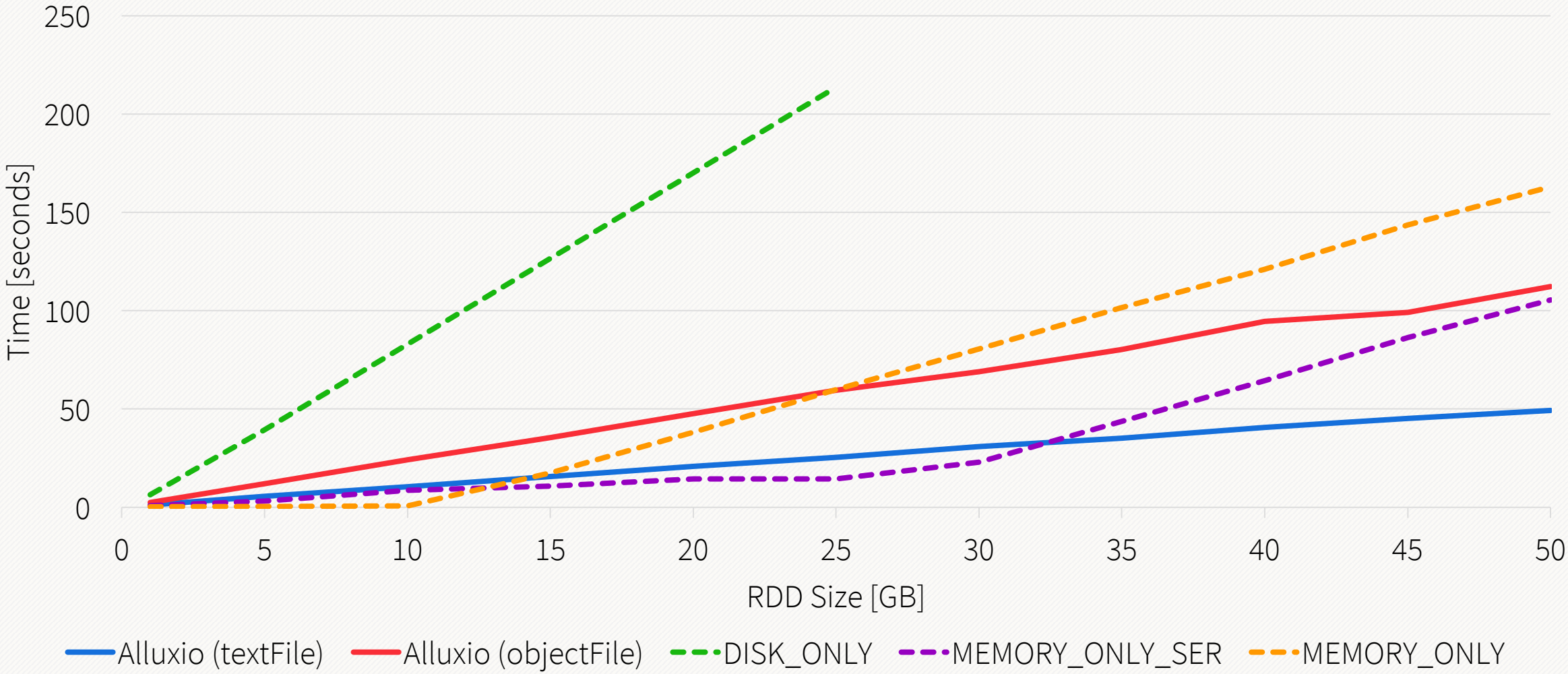
Spark 2.0.0 + Alluxio 1.2.0

Single worker: Amazon r3.2xlarge

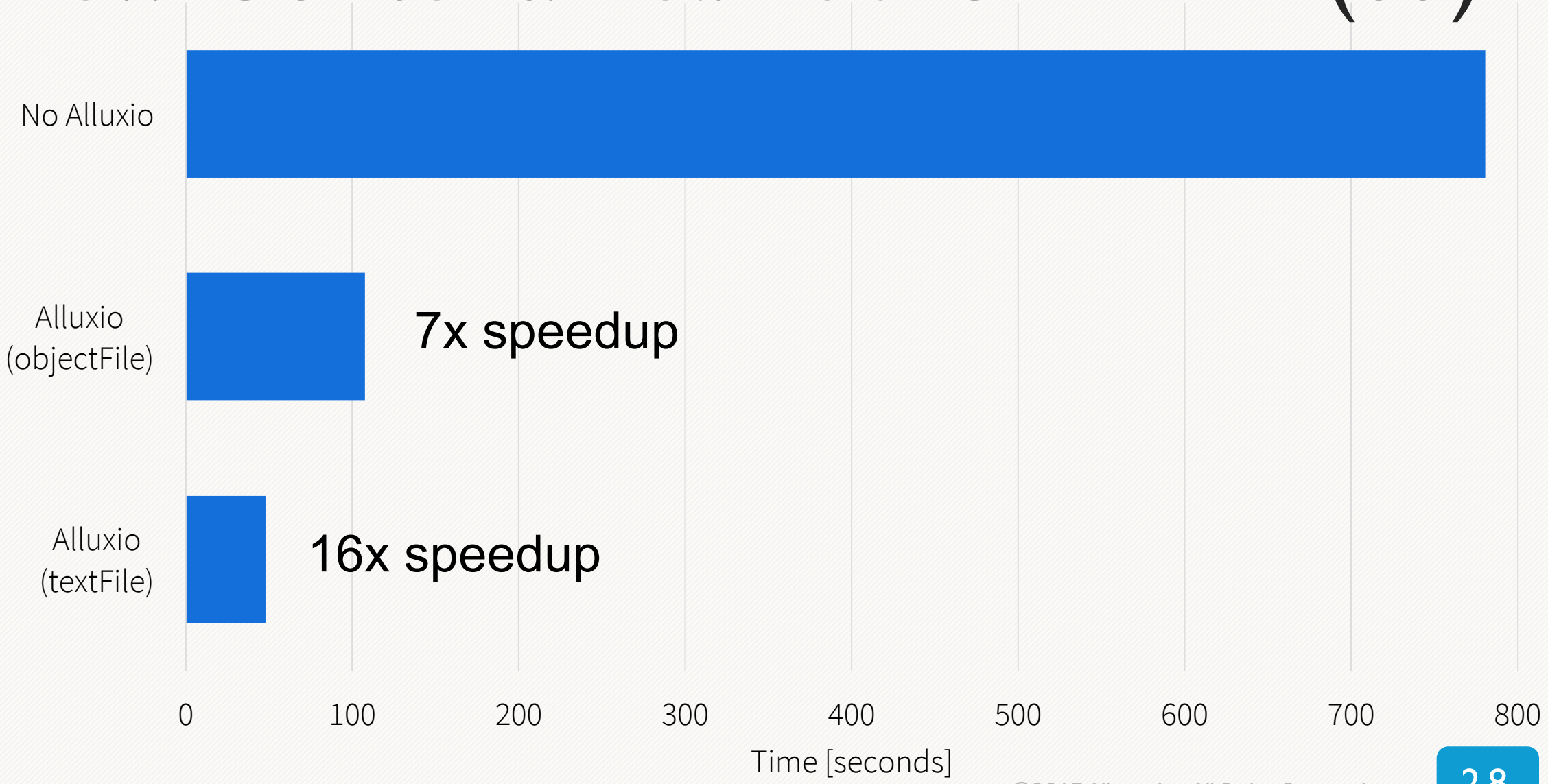
Comparisons:

- Alluxio
- Spark Storage Level: MEMORY_ONLY
- Spark Storage Level: MEMORY_ONLY_SER
- Spark Storage Level: DISK_ONLY

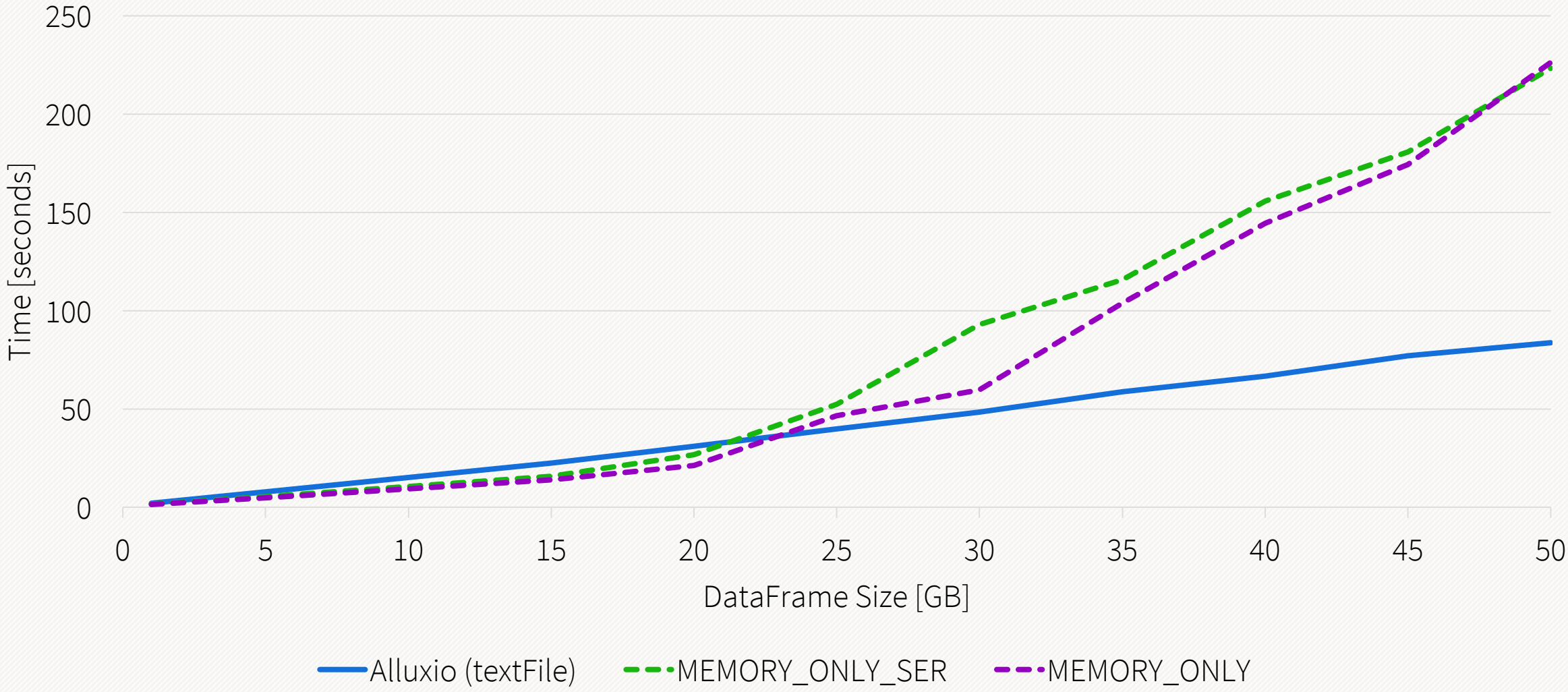
Reading Cached RDD



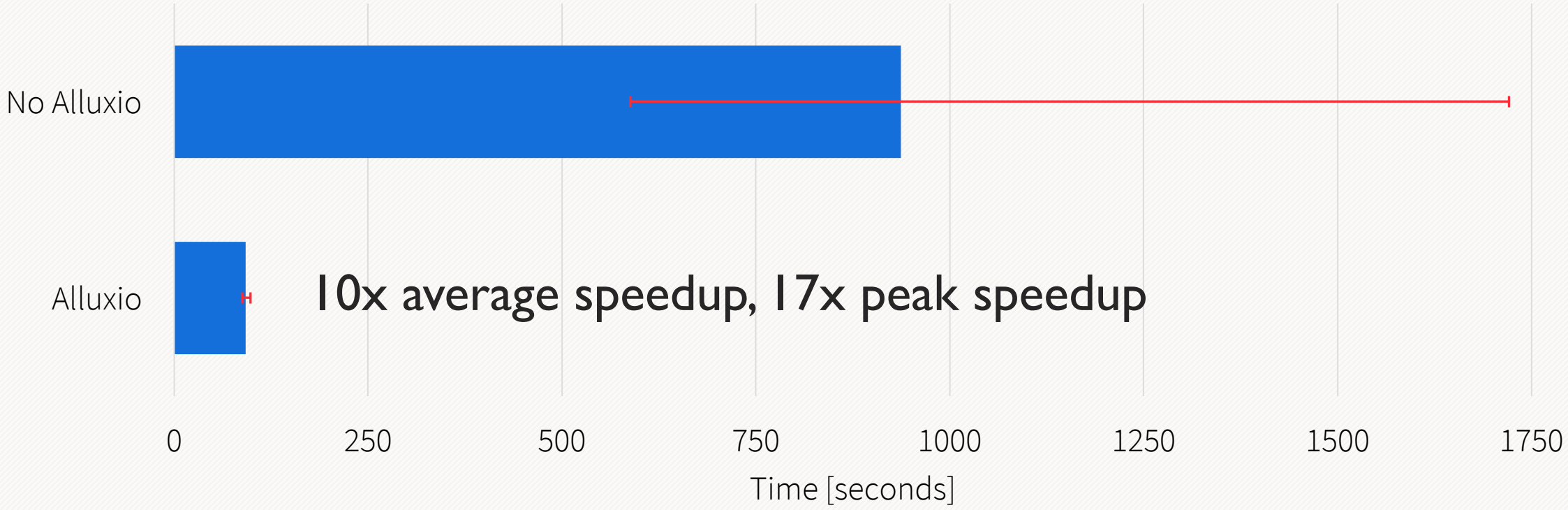
New Context: Read 50 GB RDD (S3)



Reading Cached DataFrame (parquet)



New Context: Read 50 GB DataFrame (S3)



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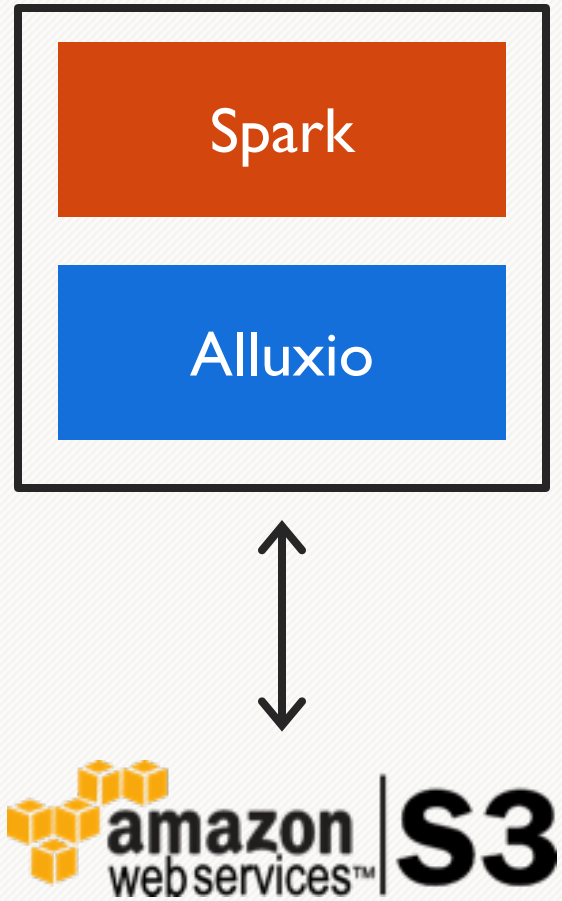
Demo Environment



Conclusion

Easy to use Alluxio with Spark

Predictable and improved performance

Easily connect to various storages

Thank you!

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