Spark Ecosystem

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Spark Meetup @Hangzhou
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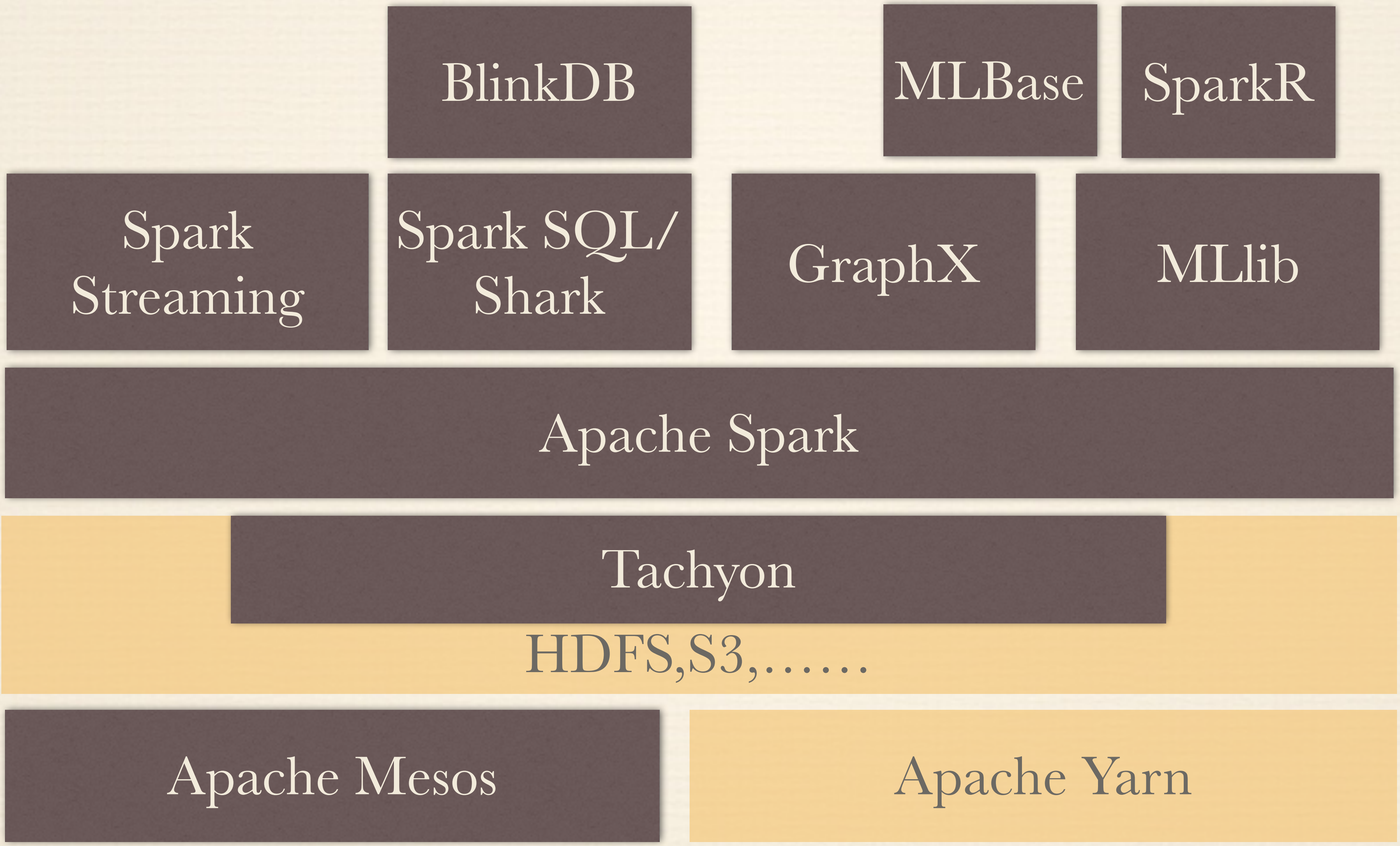
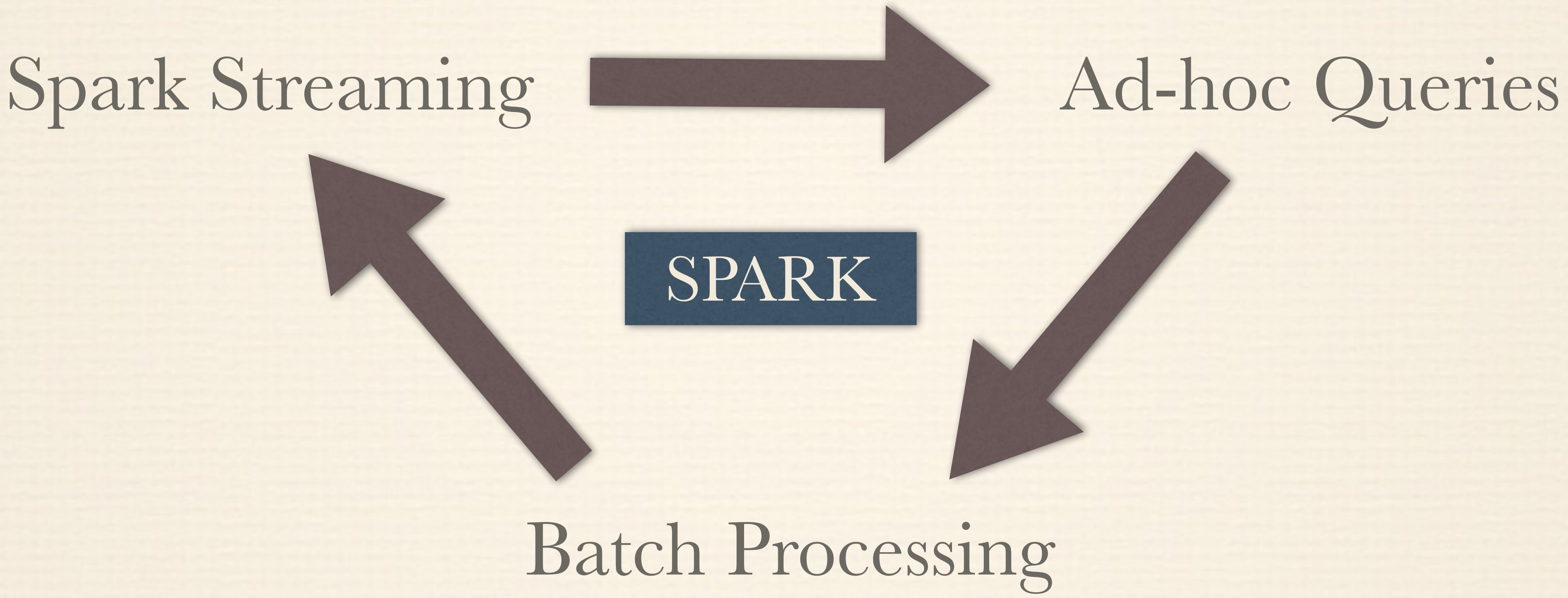
What is Spark

- Apache Spark is a fast and general engine for large-scale data processing.
- Speed
- Ease of Use
- Generality
- Integrated with Hadoop

BDAS


BlinkDB
MLBase
SparkR
Spark Streaming
Spark SQL/ Shark
GraphX
MLlib
Apache Spark
Tachyon
HDFS,S3,……
Apache Mesos
Apache Yarn

one stack to rule them all



Spark Streaming

Ad-hoc Queries

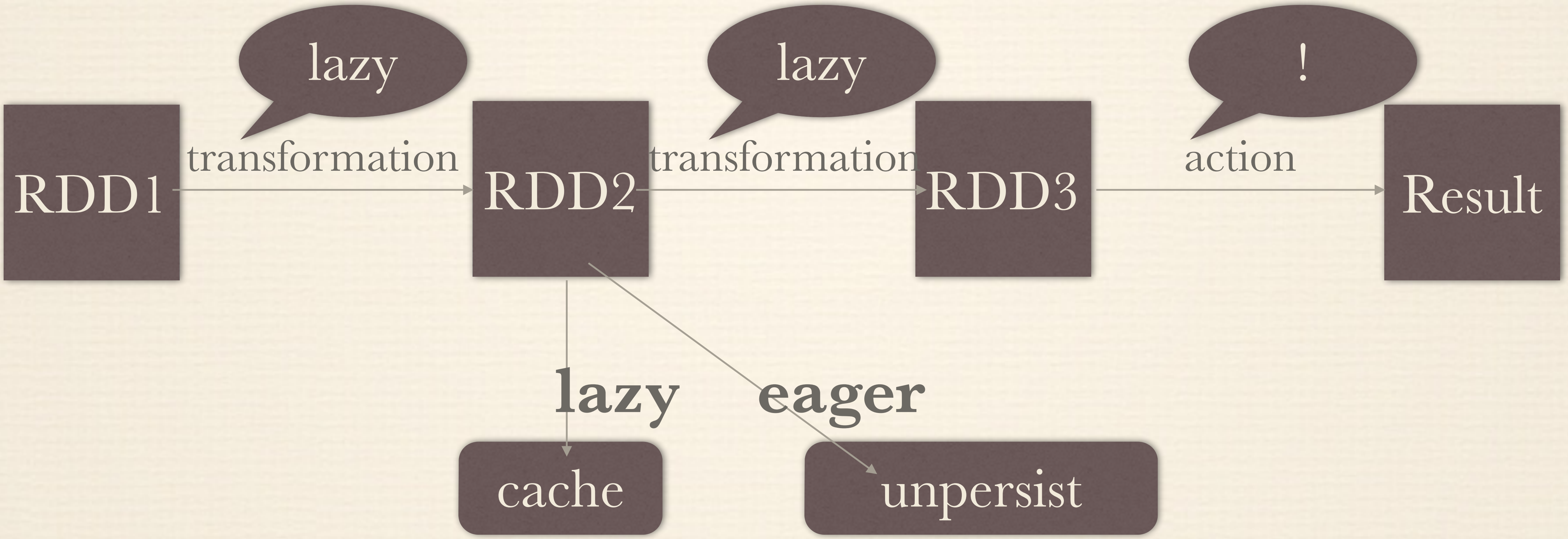
SPARK

Batch Processing

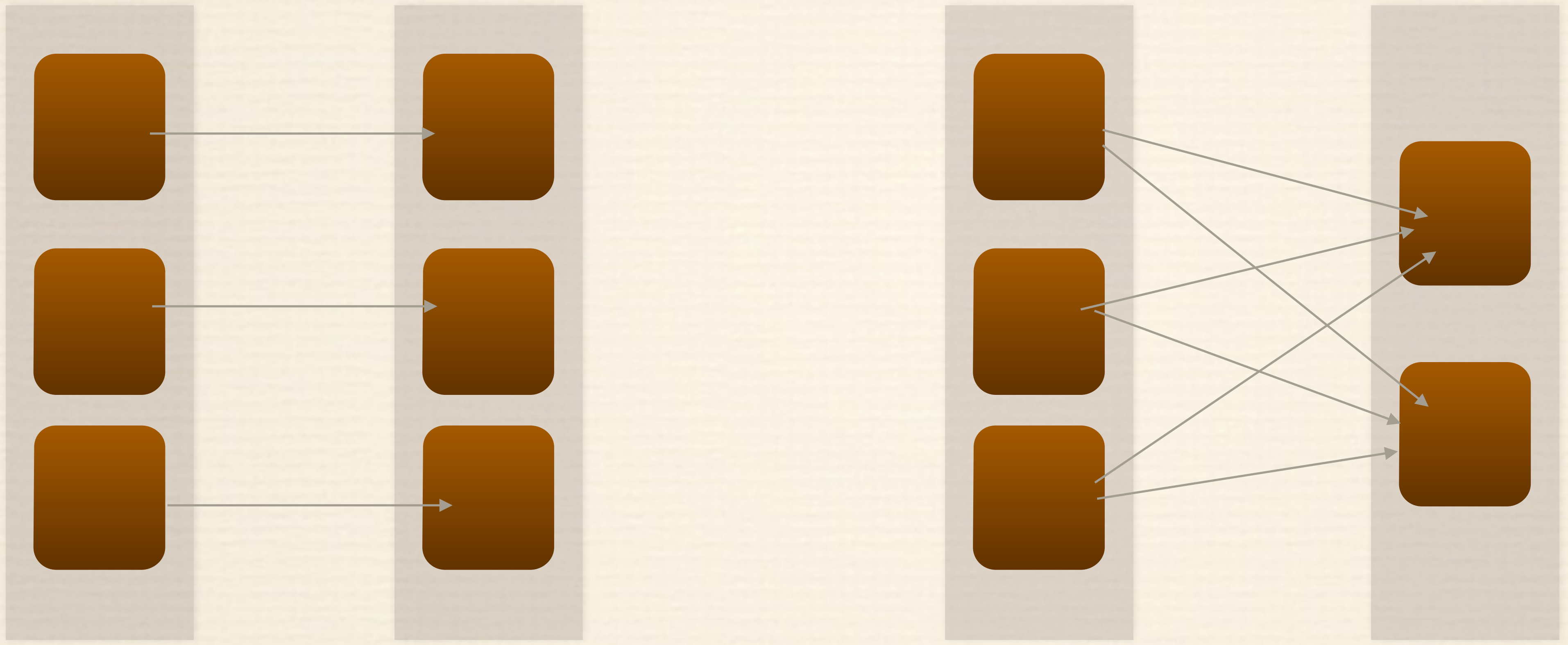
Key Concept-RDD

- A list of partitions
- A function for computing each split
- A list of dependencies on other RDDs
- Optionally, a Partitioner for key-value RDDs
- Optionally, a list of preferred locations to compute each split on

Key Concept-Lineage



Key Concept-Dependency



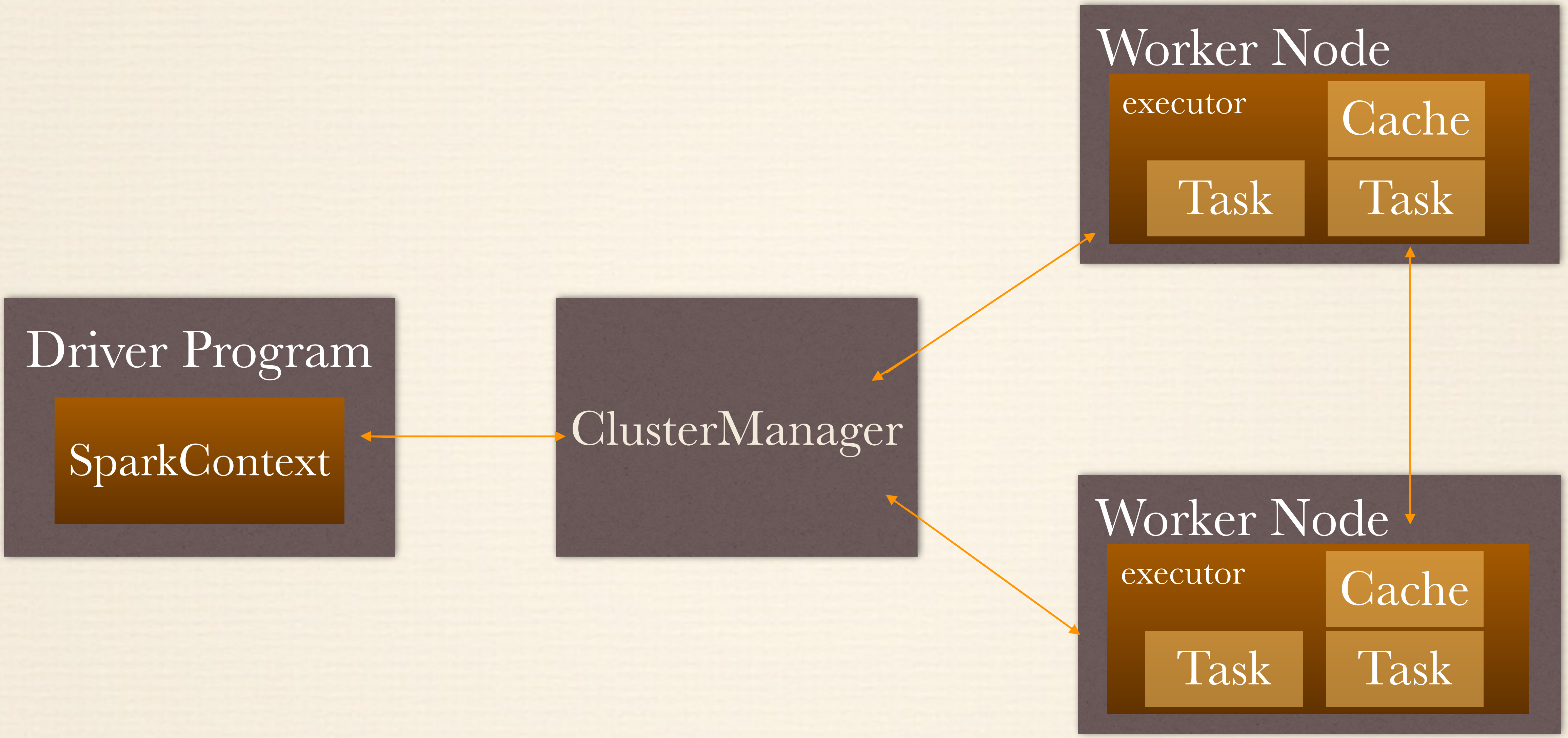
Narrow Dependency

Wide Dependency

Key Concept-ClusterManager

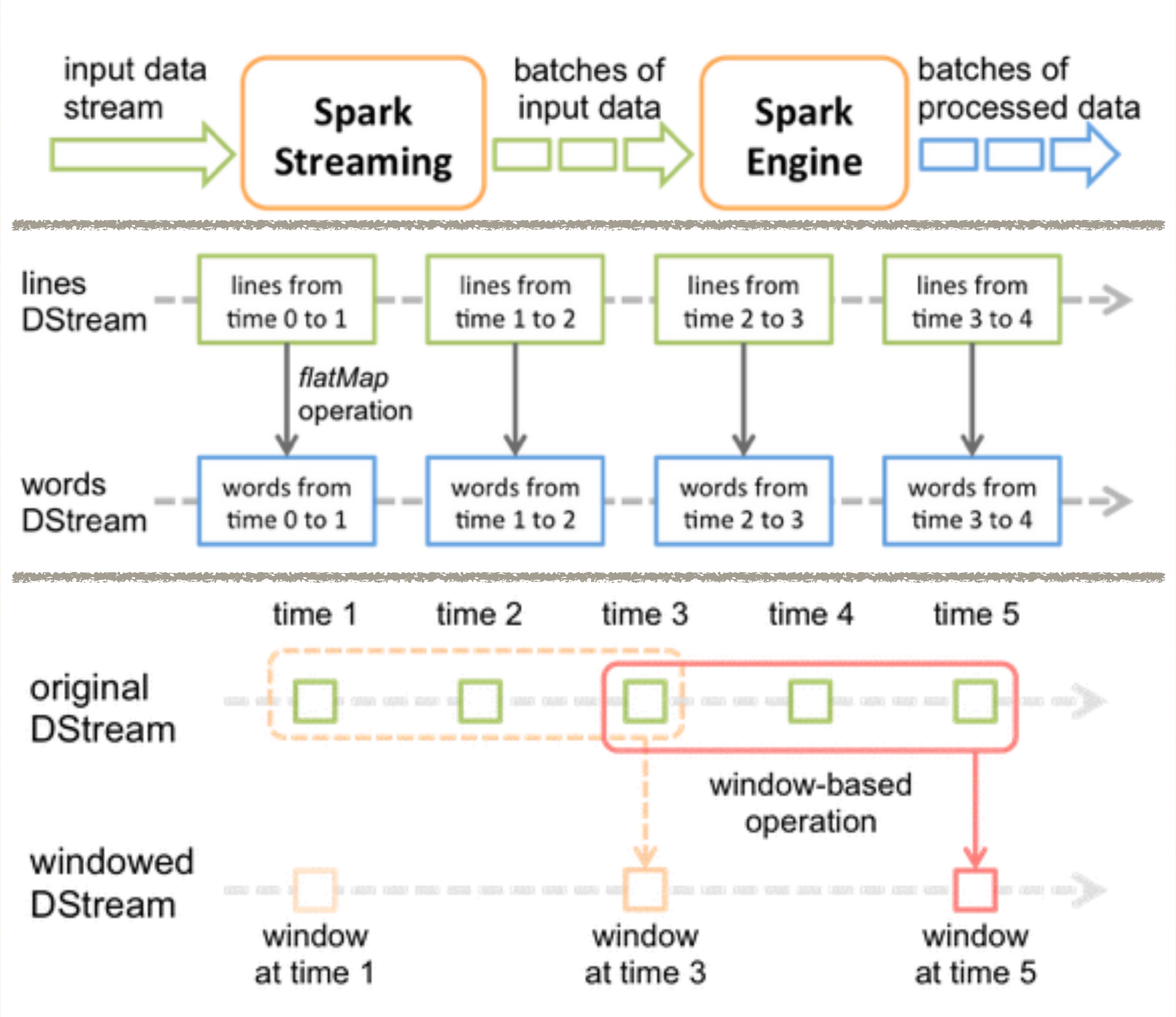
- Local
- Standalone
- Yarn
- Mesos

Cluster Overview



Spark Streaming

- mini-batch

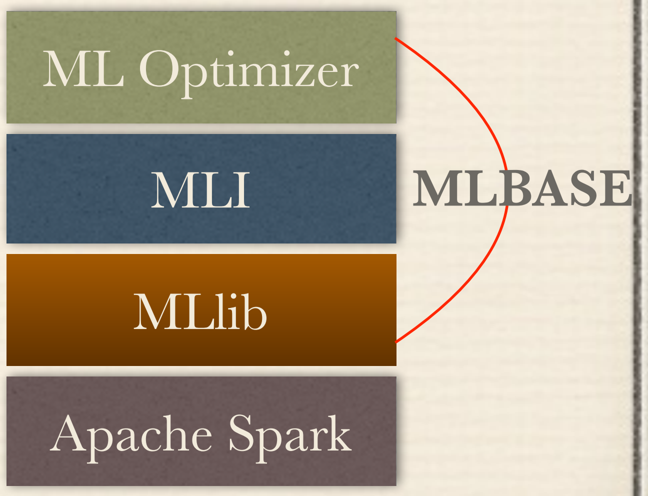


MLlib

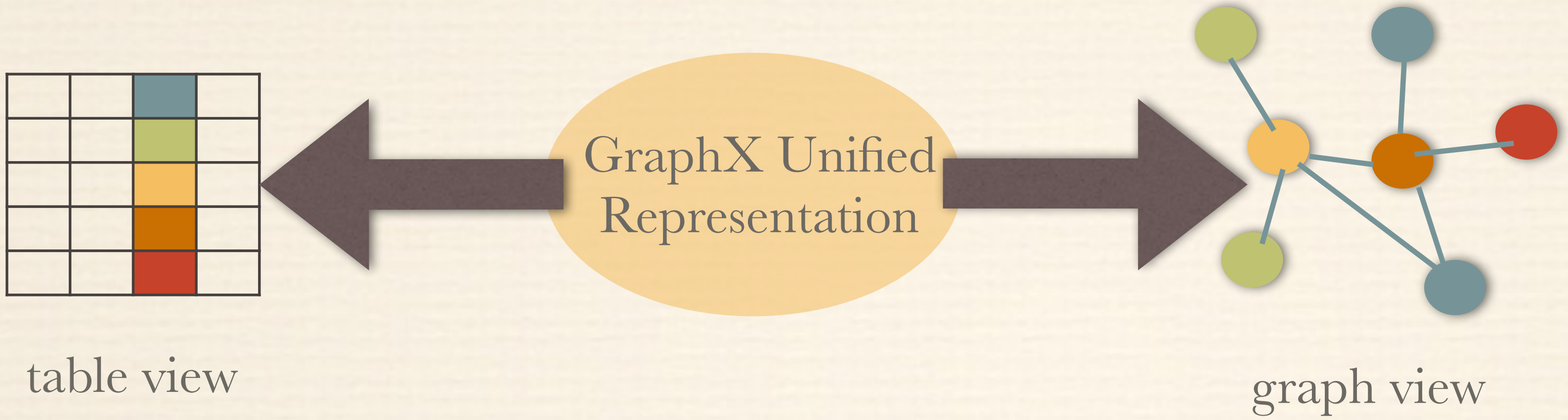
- Spark implementation of some common machine learning algorithms and utilities
- classification
- regression
- clustering
- collaborative filtering
- dimensionality reduction

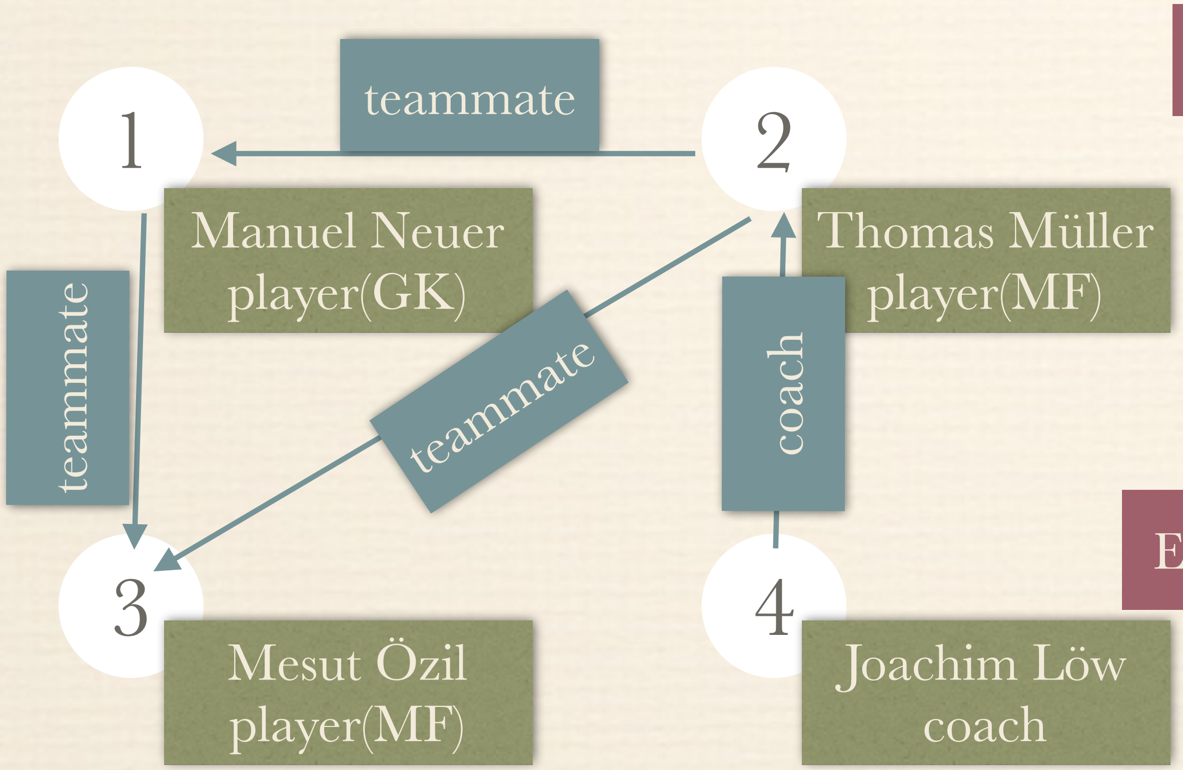
Sparse vector support

Evaluation support



GraphX





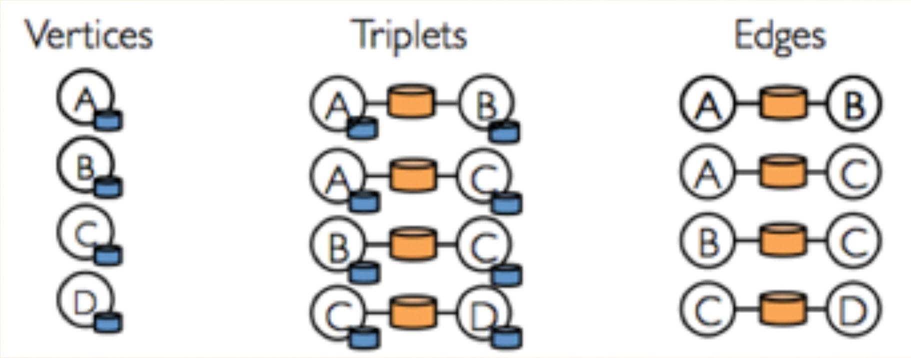
Vertex Table

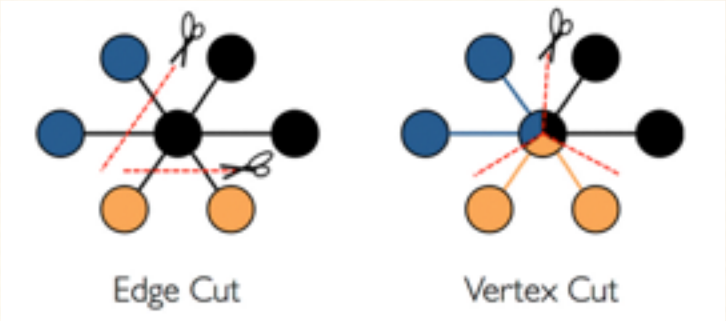
id	
1	(Manuel Neuer,player)
2	(Thomas Müller,player)
3	(Mesut Özil,player)
4	(Joachim Löw,coach)

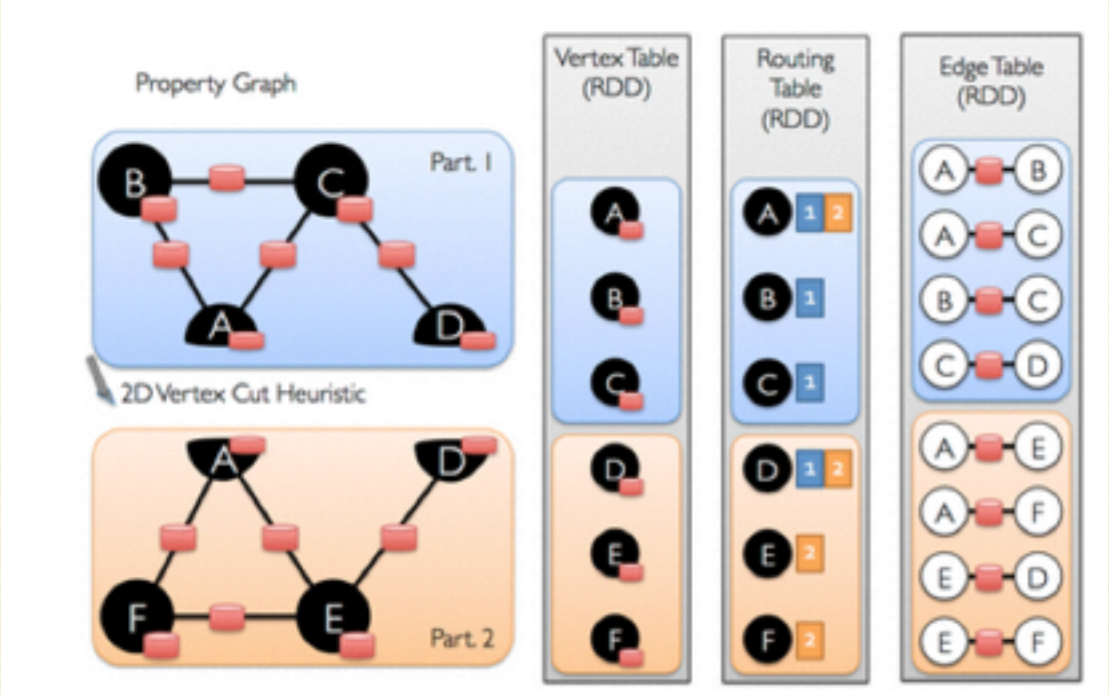
Edge Table

SrcId	DstId	Property(E)
2	1	teammate
2	3	teammate
1	3	teammate
4	2	coach

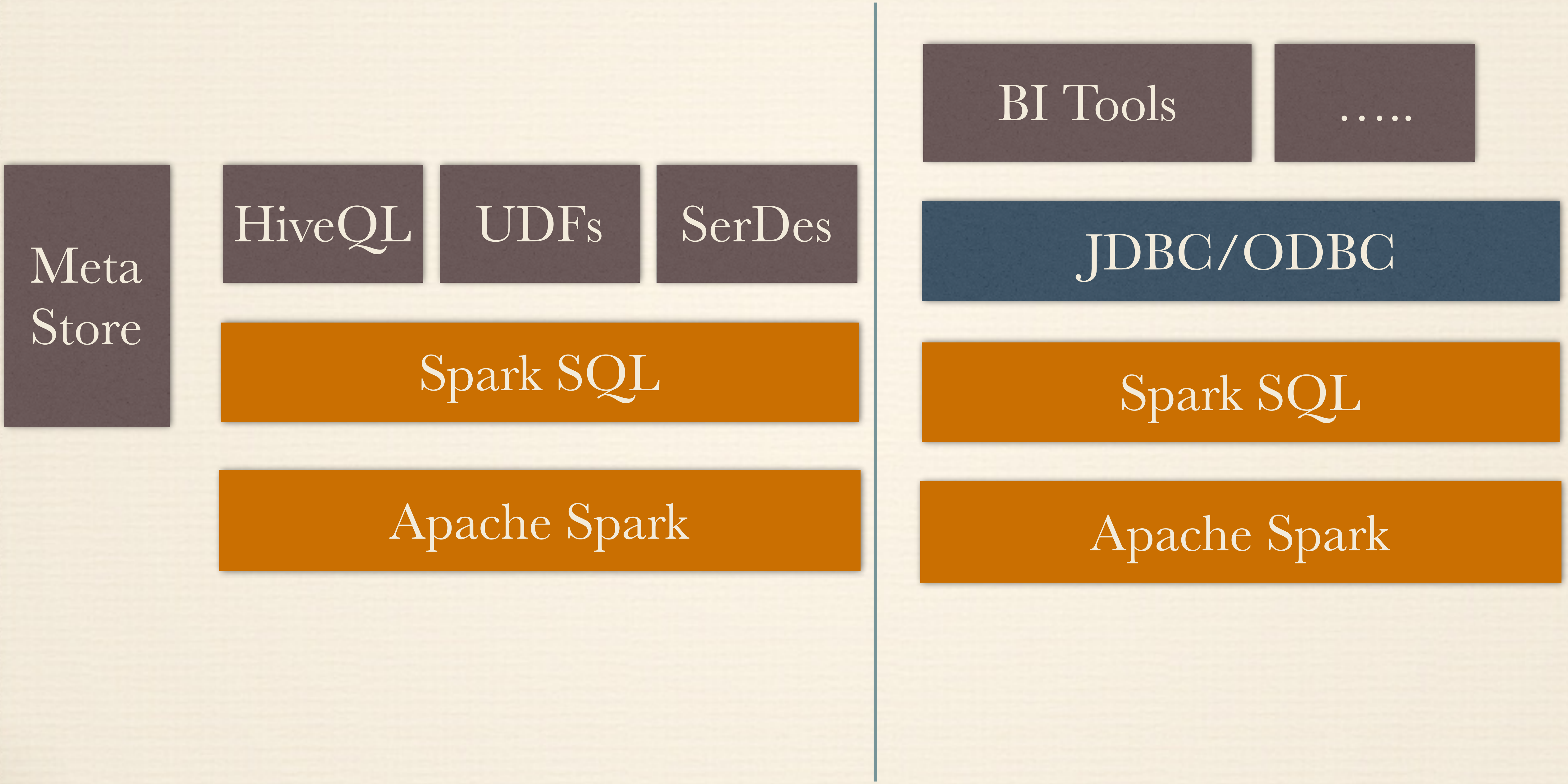
GraphX


Vertices
Triplets
Edges
A
B
C
D


Edge Cut
Vertex Cut


Property Graph
Part. 1
B
C
A
D
2D Vertex Cut Heuristic
Part. 2
F
E
Vertex Table (RDD)
Routing Table (RDD)
Edge Table (RDD)
1
2

Spark SQL



Meta Store

HiveQL

UDFs

SerDes

Spark SQL

Apache Spark

BI Tools

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JDBC/ODBC

Spark SQL

Apache Spark

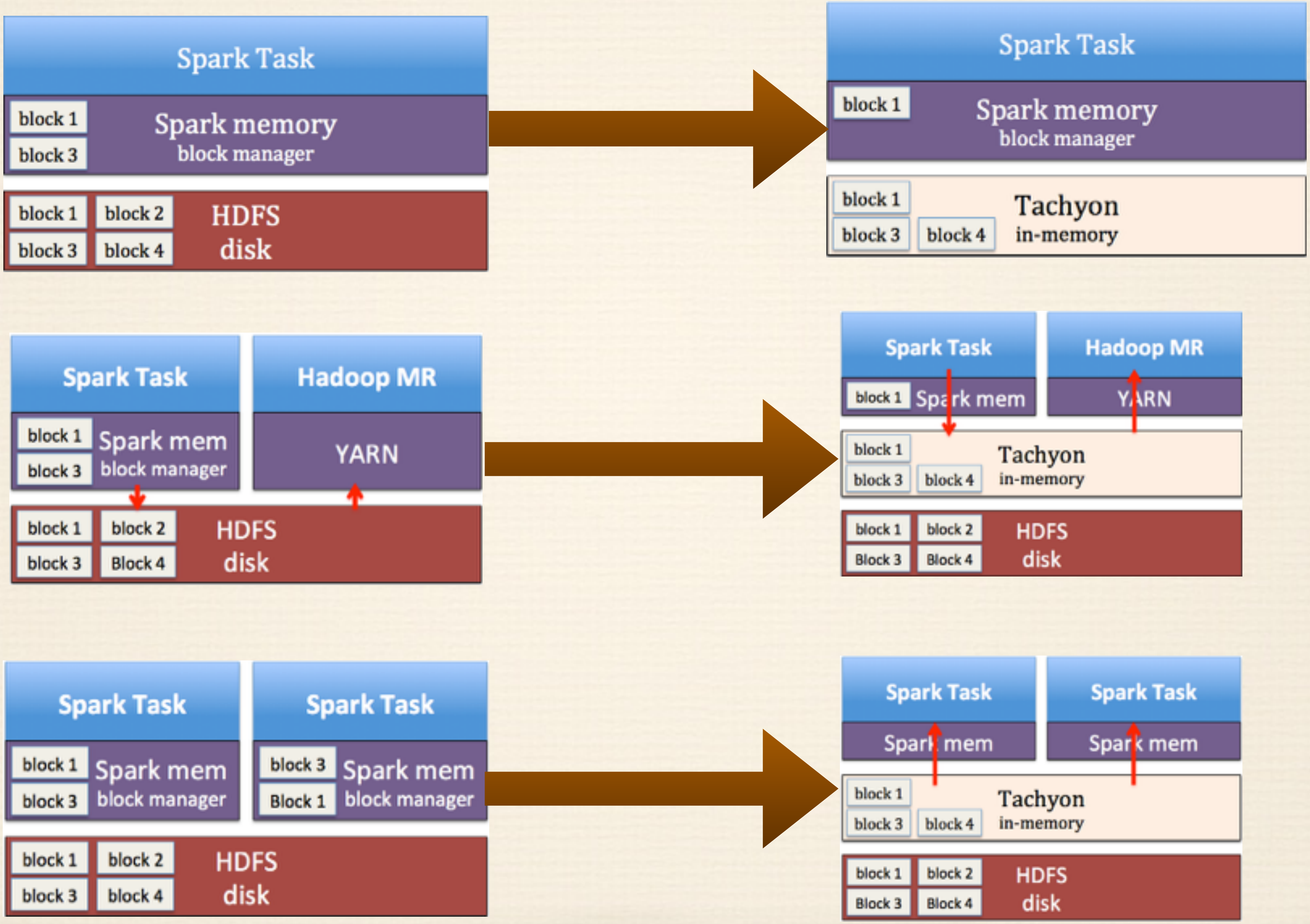
Spark SQL

- Data Sources
  - RDDs/Parquet Files/JSON Datasets/Hive Table
- DSL
- JDBC Server

Shark

- Mission Completed!!!

Tachyon



Spark Task

block 1
block 3
Spark memory
block manager

block 1
block 2
block 3
block 4
HDFS
disk

Spark Task

block 1
Spark memory
block manager

block 1
block 3
block 4
Tachyon
in-memory

Spark Task
Hadoop MR

block 1
block 3
Spark mem
block manager

YARN

block 1
block 2
block 3
Block 4
HDFS
disk

Spark Task
Hadoop MR

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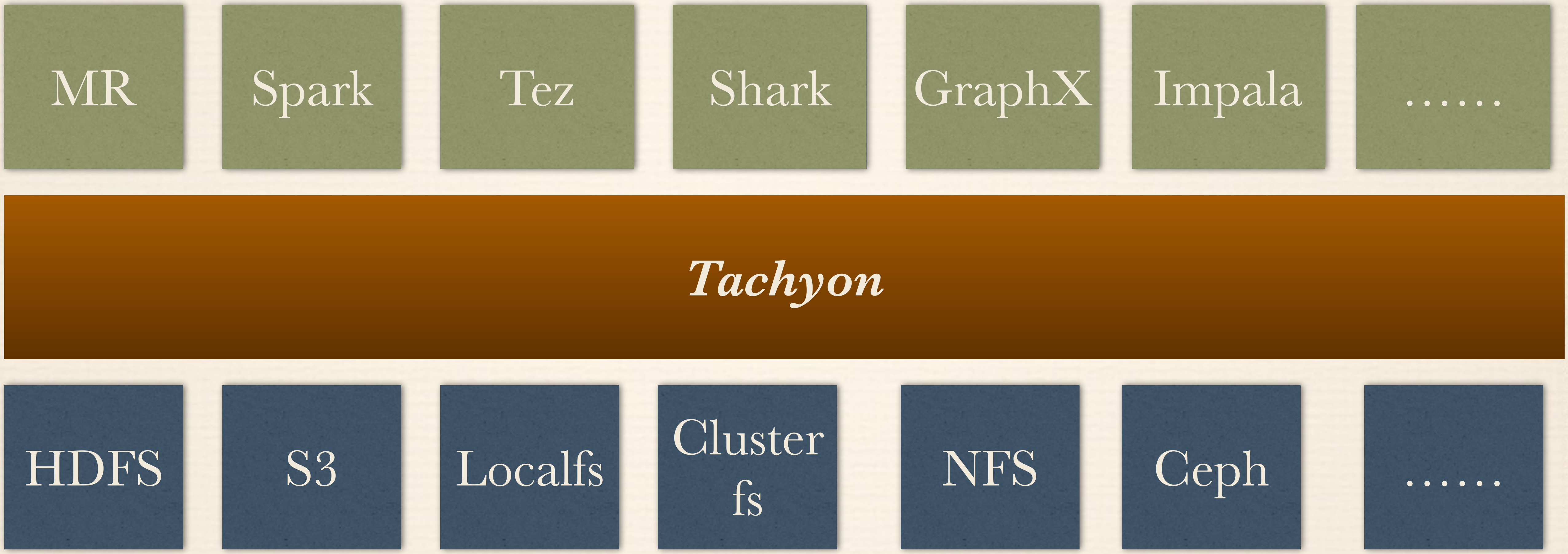
Tachyon



MR Spark Tez Shark GraphX Impala ……

Tachyon

HDFS S3 Localfs Cluster fs NFS Ceph ……

SparkR

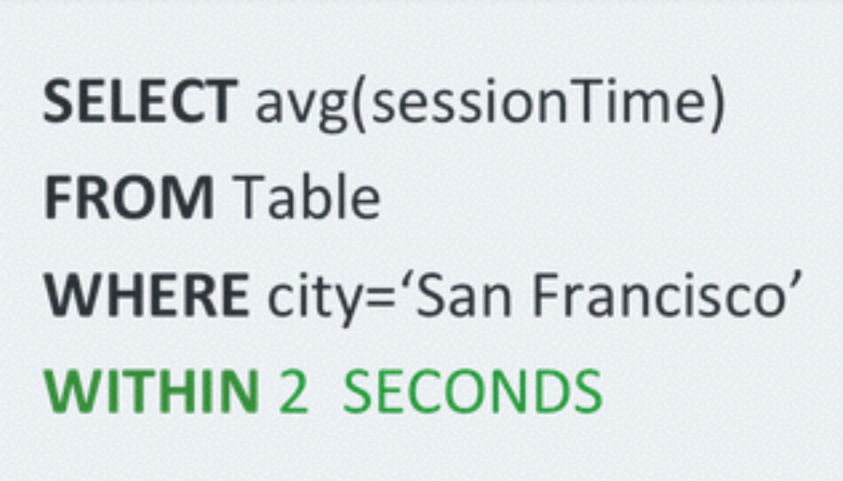
R + RDD = RRDD

RDDs as Distributed Lists

```
sc <- sparkR.init(“local")
lines <- textFile(sc, “hdfs://data.txt")
wordsPerLine <- lapply(lines, function(line) { length(unlist(strsplit(line, " "))) })
```

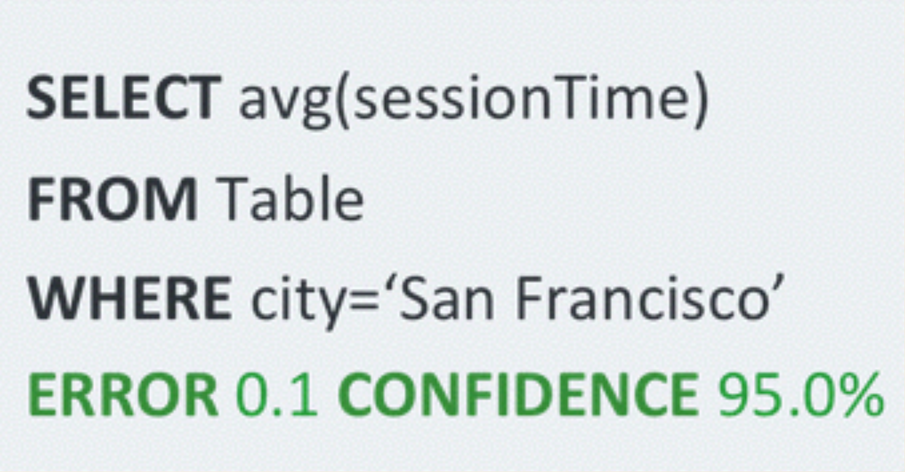
BlinkDB

- Queries with Bounded Errors and Bounded Response Times on Very Large Data



```
SELECT avg(sessionTime)
FROM Table
WHERE city='San Francisco'
WITHIN 2  SECONDS
```

Queries with Time Bounds



```
SELECT avg(sessionTime)
FROM Table
WHERE city='San Francisco'
ERROR 0.1 CONFIDENCE 95.0%
```

Queries with Error Bounds

QA & Thanks

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