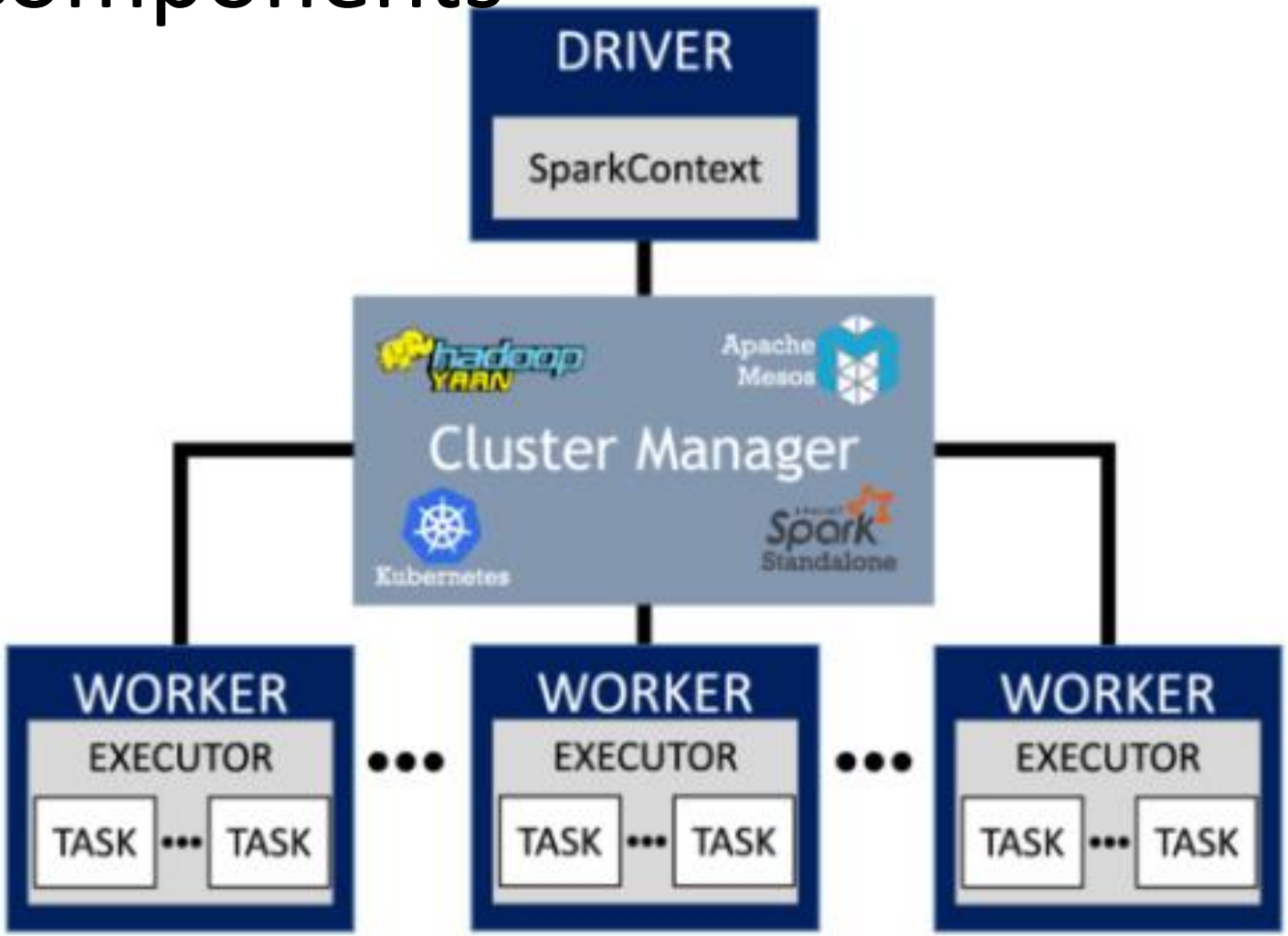
Why Spark ?

- Support iterative algorithms, like gradient descent
  - In memory processing
  - Built-in broadcast
- Make it easier to explore data interactively
  - Developer friendly, no need to create tons of classes and jobs…
  - Repl mode
  - Scala/Python API similar to functional programming

Main Components



How to run it

- Repl : Spark-shell, notebooks → exploratory mode
- Spark-submit : runs a script → scheduled job
- Api for Java, Scala, Python.

Dependencies

- Depends on Hadoop Libraries (HDFS and Yarn)
- Requires a Java Runtime Environment (need Java in your system path)

RDD

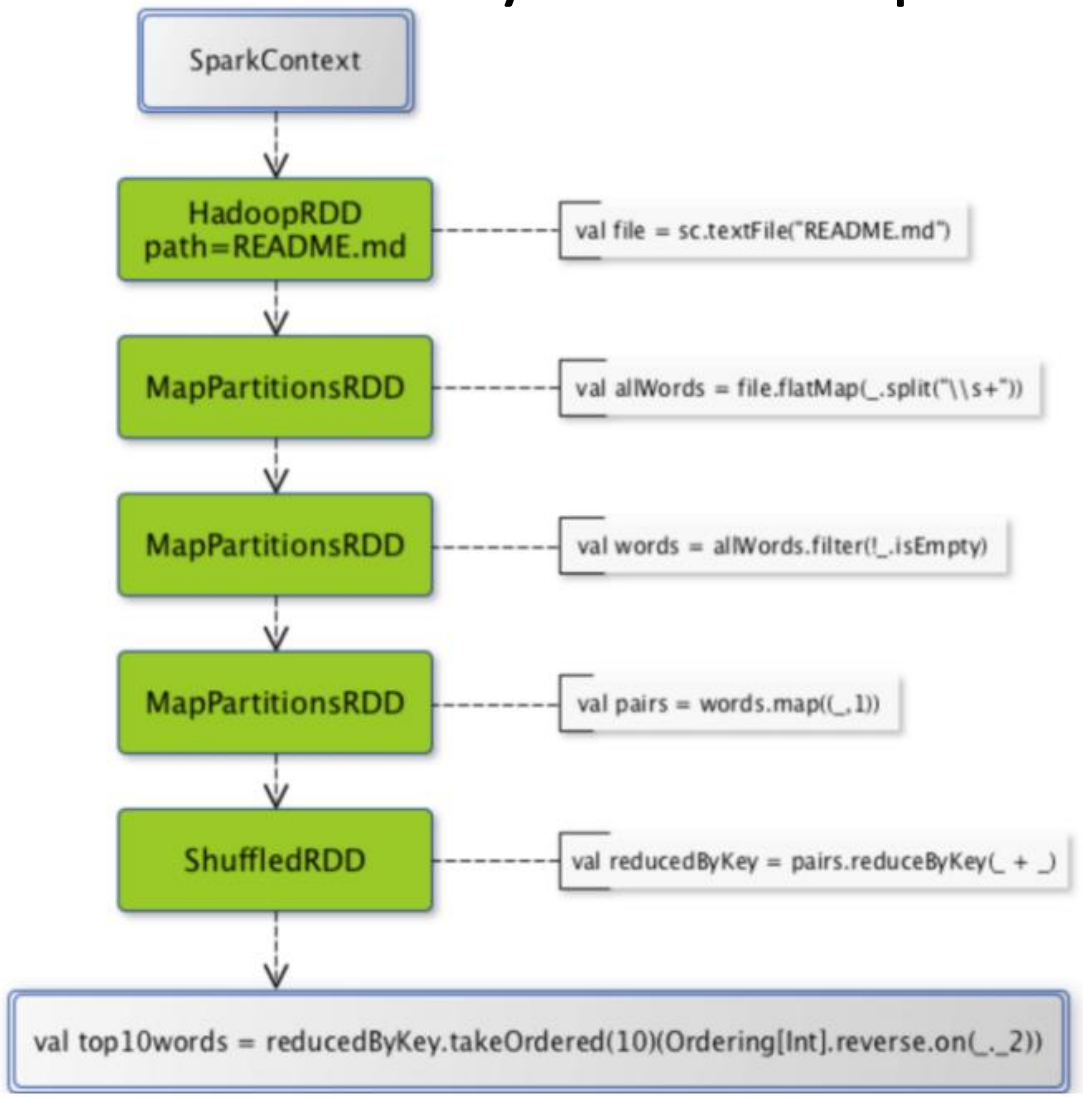
- **Resilient Distributed Dataset**
- The base building block of your application
- Lazy : doesn’t compute anything before it really needs to do so.
- Immutable : a transformation doesn’t change the data set, it returns a new RDD.
- Fault Tolerant : partition can be recomputed in case of failure

- Conceptually, an RDD is a graph a function.
- API is pretty much similar with **Functional Programming. Forget the for-loop.**

Inside the RDD:

- Knows the partitions he is working-on, how data is partitionned
- Knows how to iterate over each partition to yield records
- Know RDD’s it depends-on

RDD as a Directed Acyclic Graph

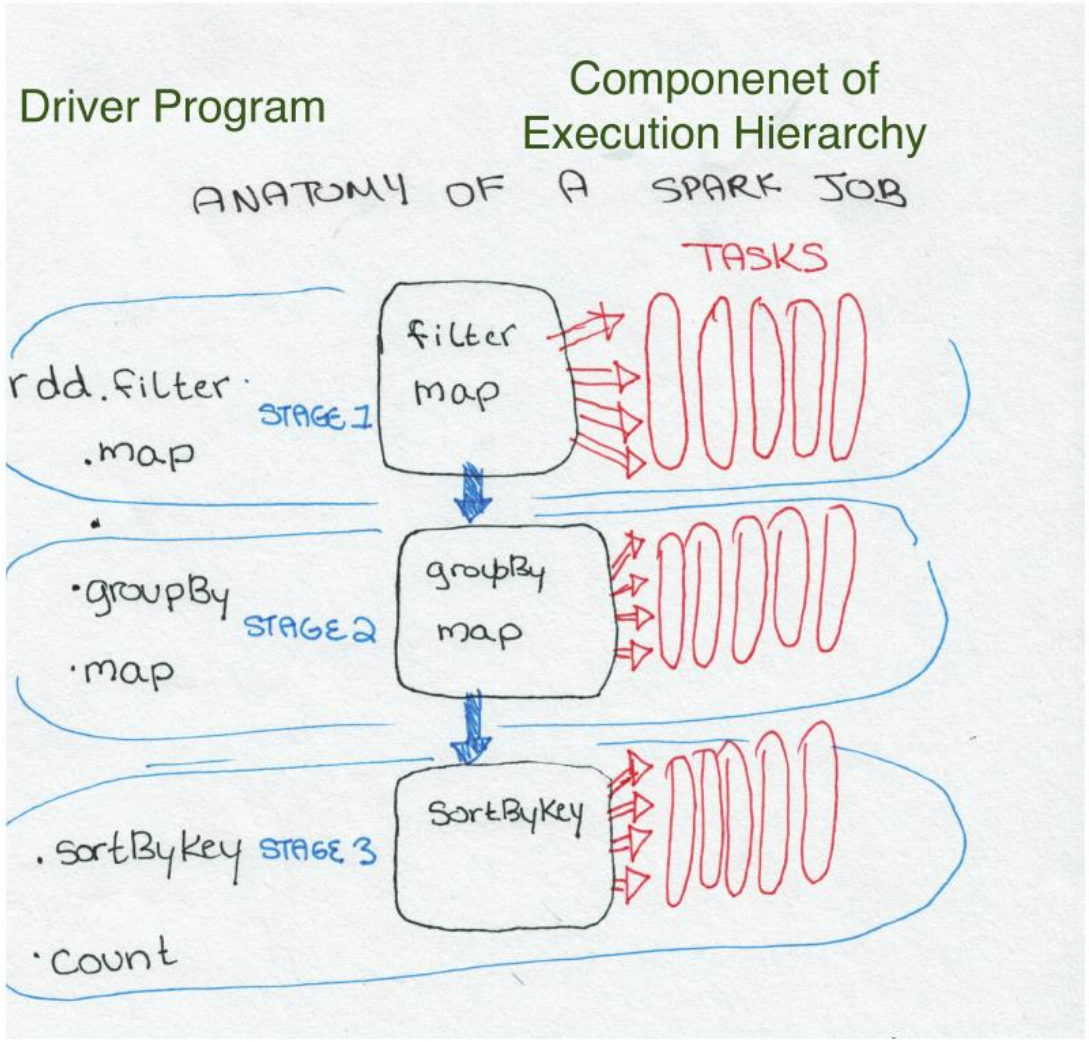


New RDD is created after every transformation.(DAG graph)

MAP

REDUCE

Jobs, Stages, Tasks



Source : high performance Spark

RDD API - Actions

Row
{"user":"John", "movie":"Blade Runner", "rating":5.0}
{"user":"Louise", "movie":"Dirty dancing", "rating":5.0}
{"user":“Sam", "movie":“Blade Runner", "rating":3.5}

3

Row
{"user":"John“}
{"user":"Louise“}
{"user":“Sam“}

Row
{"user":"John“}
{"user":"Louise“}

Row
{"user":"John“}
….
{"user":“Sam“}

Row
{"user":"John“}
….
{"user":“Sam“}

RDD API

Row
{"user":"John", "movie":"Blade Runner", "rating":5.0}
{"user":"Louise", "movie":"Dirty dancing", "rating":5.0}
{"user":“Sam", "movie":“Blade Runner", "rating":3.5}

map(x → x[‘movie’])

Row
Blade Runner
Dirty Dancing
Blade Runner

Row
{"user":"John", "movie":"Blade Runner", "rating":5.0}
{"user":"Louise", "movie":"Dirty dancing", "rating":5.0}
{"user":“Sam", "movie":“Blade Runner", "rating":3.5}

keyBy(x → x[‘user’])

Row
("John“, …)
(“Louise“, …)
(“Sam“, …)

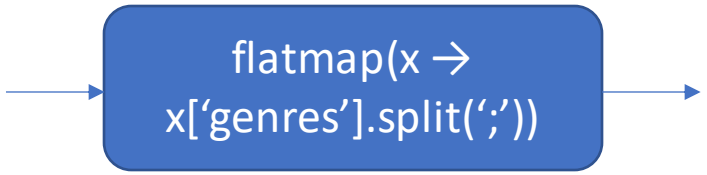
Row
("John", "Blade Runner")
("Louise“, "Dirty dancing")
(“Sam“, “Blade Runner")

mapValues(x → len(x[1]))

Row
("John“, 12)
(“Louise“, 13)
(“Sam“, 12)

RDD API

Row
{"movie":"Blade Runner", “genres":”cyberpunk;scifi;action”}
{"movie":"Dirty dancing", “genres":”music;danse;romance”}



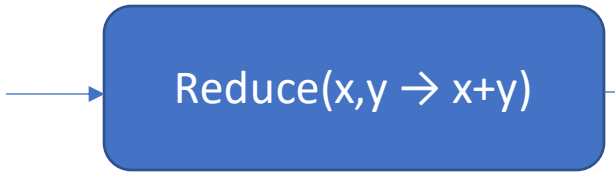
Row
cyberpunk
scifi
action
music
danse
romance

Row
{"user":"John", "movie":"Blade Runner", "rating":5.0}
{"user":"Louise", "movie":"Dirty dancing", "rating":5.0}
{"user":“Sam", "movie":“Blade Runner", "rating":3.5}

Row
{"user":"John", "movie":"Bl…
{"user":"Louise", "movie":"Dir…

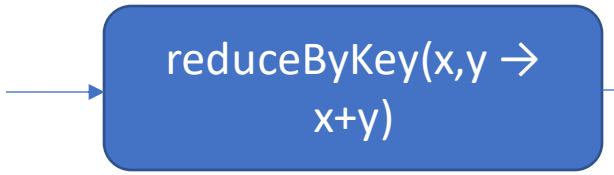
RDD API - Aggregations

Row
5.0
5.0
3.5



Row
13.5

Row
(“Blade Runner", 5.0)
("Dirty dancing", 5.0)
(“Blade Runner“, 3.5)



Row
(“Blade Runner", 8.5)
("Dirty dancing", 5.0)

Other useful functions

- **Join (shuffle ? Lazy ?)**
- **Sample**
- **mappartitions**
- **zippartitions**

Links

- https://spark.apache.org/docs/latest/api/scala/org/apache/spark/api/java/JavaPairRDD.html
- https://0x0fff.com/hadoop-mapreduce-comprehensive-description/