Introduction to Spark

Joe

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Introduction

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Morning Objectives

1. Understand why Spark *can* be much faster, and discuss important tips to optimize performance.

2. Do the ‘hello world’ of distributed computing - perform a word from a large corpus of documents.

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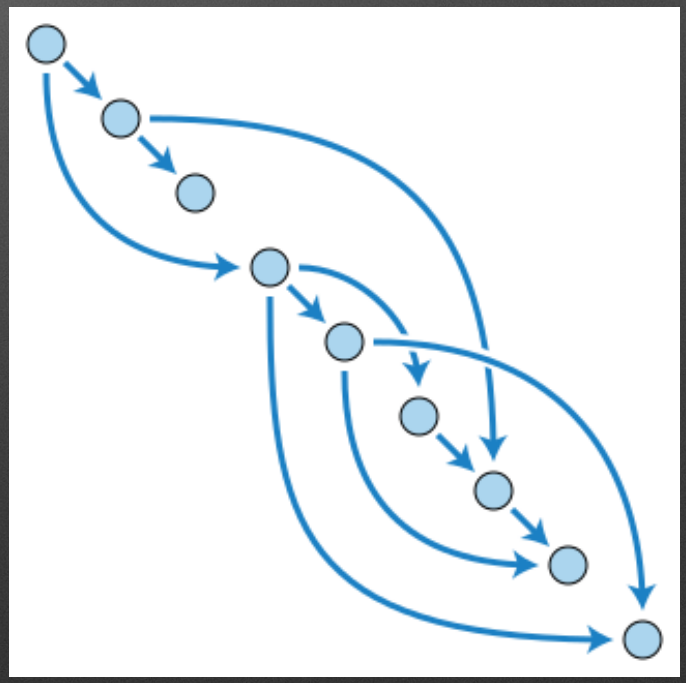
Apache Spark

- Apache Spark is a fast and general engine for large-scale data processing
- Spark runs extremely fast because it performs in memory computations
- Spark has interfaces for Scala, Java, R, and Python
- Spark is an engine for building a directed analytic graph



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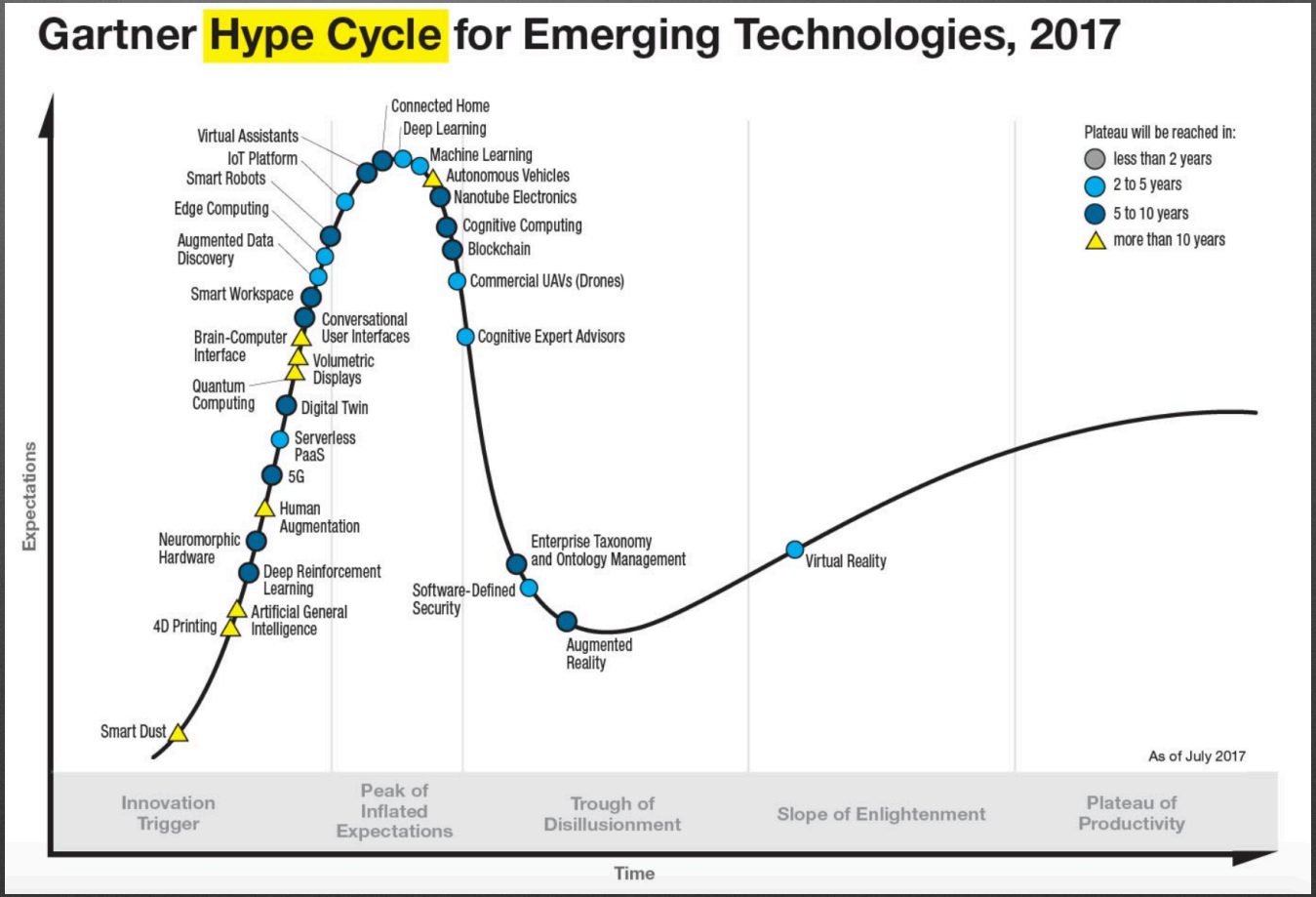
A Note of Caution

I love spark.

Strong fluency with pandas/numpy/ect are useful so do not become overly reliant on using spark for data manipulation!



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Mechanics

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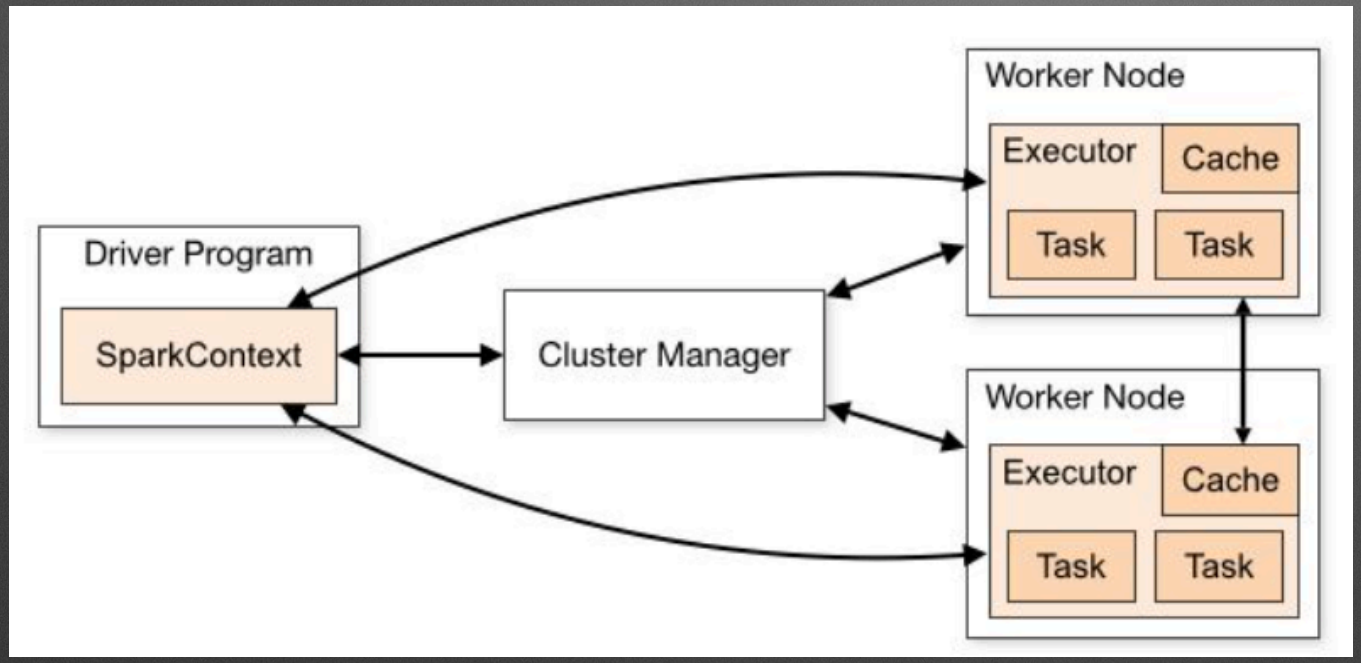
Drivers & Workers



Application Properties

Property Name	Default
spark.app.name	(none)
spark.driver.cores	1
spark.driver.maxResultSize	1g
spark.driver.memory	1g
spark.executor.memory	1g

https://spark.apache.org/docs/latest/configuration.html

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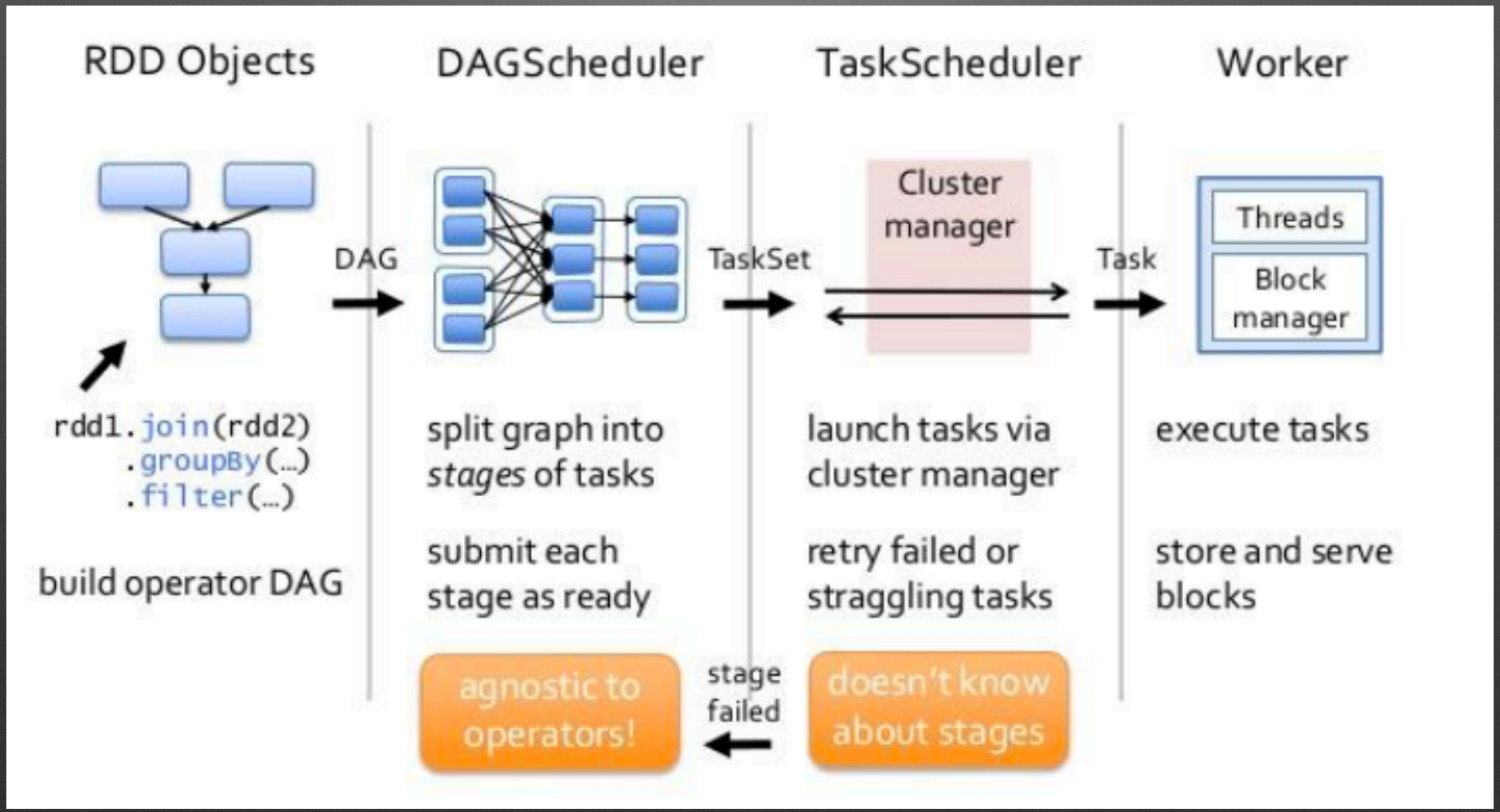
Scheduler Process



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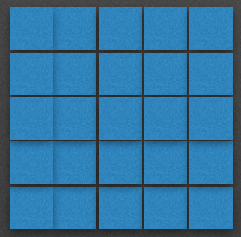
In Memory Computation

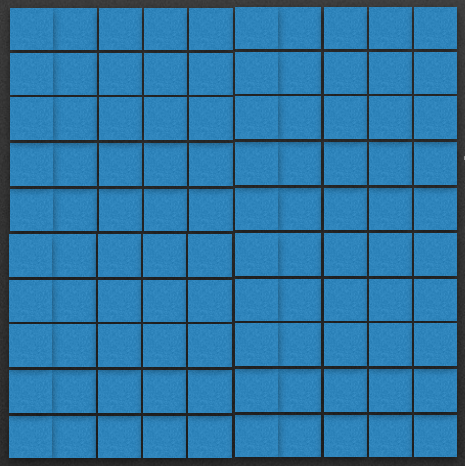
1 ns

1 floating point operation

mutex lock

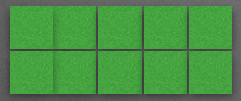


main memory ref

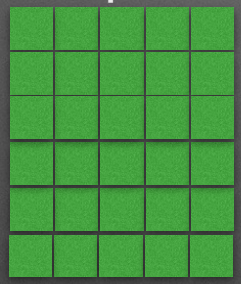


100 ns = 

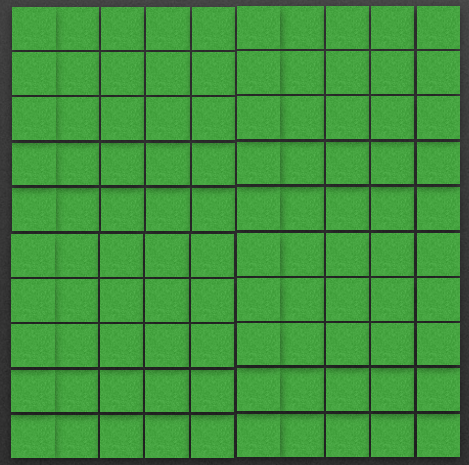
1µs



compress 1 KB

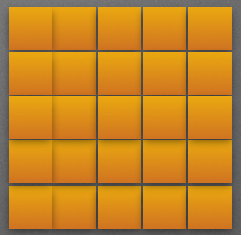


Send 1 KB over 1 Gbps network

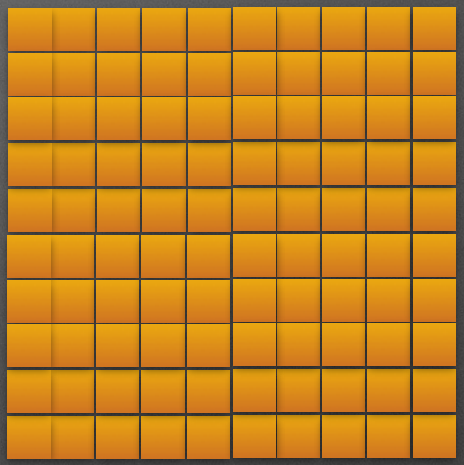


10 µs = 

Read 1 MB sequentially from memory

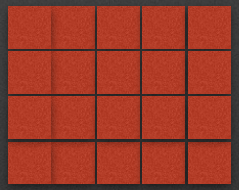


Read 1 MB sequentially from SSD



1 ms = 

Read 1 MB sequentially from disk



OK, time to get our hands dirty

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Using RDDs

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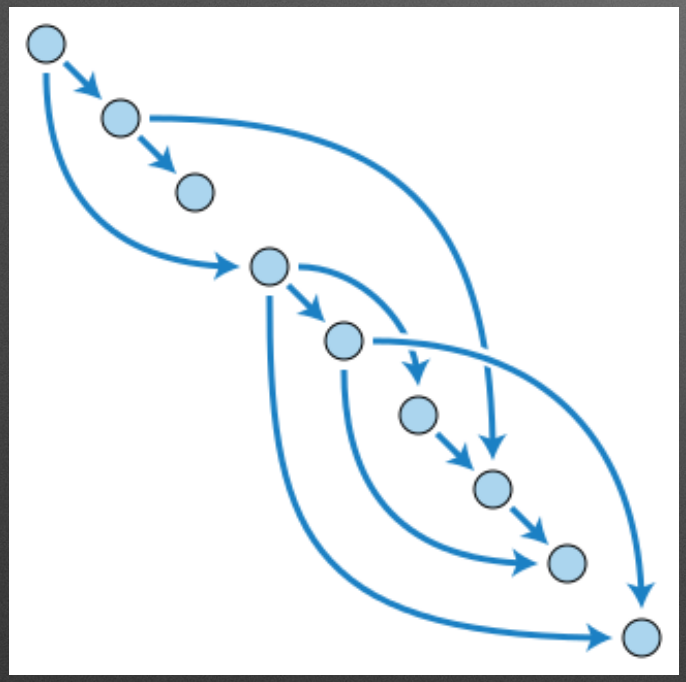
RDDs



RDDs are the primary class introduced by Spark. It is a data container that allows for the construction of RDDs.

RDDs have the following properties:
* Immutable
* Lazily Evaluated
* Cachable

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RDD - Methods

```
rdd.flatMap(lambda text: text.split())\
    .map(lambda word: (word.strip(".,-;?").lower(), 1))\
    .reduceByKey(lambda a, b: a+b)\
    .sortBy(lambda x: x[1], ascending=False)\
    .take(10)
```

it did seem biased.

flatMap - one to many

it did seem biased.

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RDD - Methods

```
rdd.flatMap(lambda text: text.split())\
    .map(lambda word: (word.strip(".,-;?").lower(), 1))\
    .reduceByKey(lambda a, b: a+b)\
    .sortBy(lambda x: x[1], ascending=False)\
    .take(10)
```

biased.

map - one to one

(biased, 1)

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RDD - Methods

```
rdd.flatMap(lambda text: text.split())\
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    .sortBy(lambda x: x[1], ascending=False)\
    .take(10)
```

(biased, 1)

reduceByKey - aggregate ordered, tuples with hashable lead values

(biased, 375)

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RDD - Methods

```
rdd.flatMap(lambda text: text.split())\
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    .take(10)
```

(biased, 375) (is, 2048) (yo, 12) (the, 3274)

sortBy - sort by a particular value

(the, 3274) (is, 2048) (biased, 375) (yo, 12)

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RDD - Methods

```
rdd.flatMap(lambda text: text.split())\
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```

(the, 3274) (is, 2048) (biased, 375) (yo, 12)

take(n) - create a local list of length n whose entries are the RDD members (ex -> take(2))

[(the, 3274), (is, 2048)]

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