Arquitecturas Big Data

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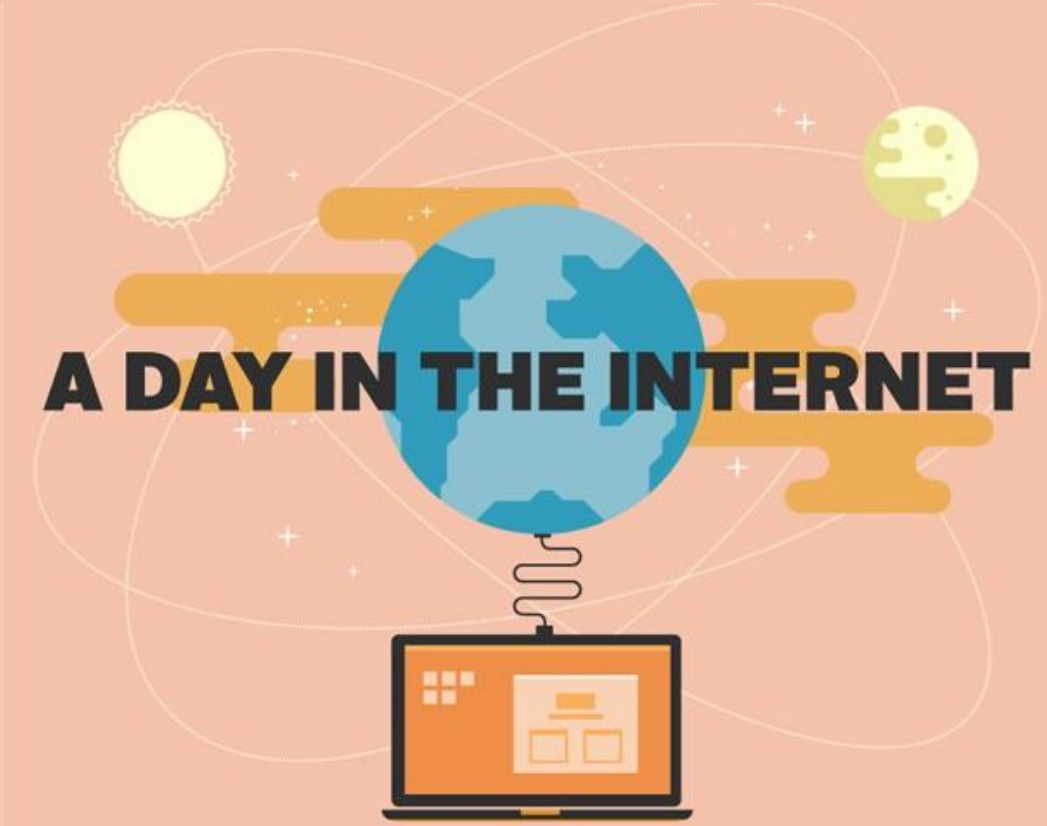
BIG DATA



In one day, enough information is consumed by internet traffic to fill

168 MILLION DVDS.

294 BILLION

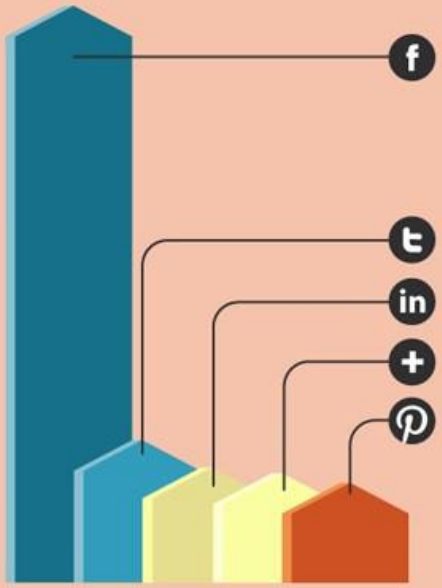
emails are sent.

It would take
2 years to process
that many pieces
of mail in the US.

2 MILLION BLOG POSTS

are written.

Enough posts to fill
Time Magazine for 770 years.



172 MILLION

different people
visit Facebook.

Twitter: **40 MILLION**

LinkedIn: **22 MILLION**

Google+: **20 MILLION**

Pinterest: **17 MILLION**

864,000 HOURS OF VIDEO

are uploaded to YouTube.

That's 98 years of
non-stop cat videos.

Internet users spend

14.6 MINUTES

viewing porn online.

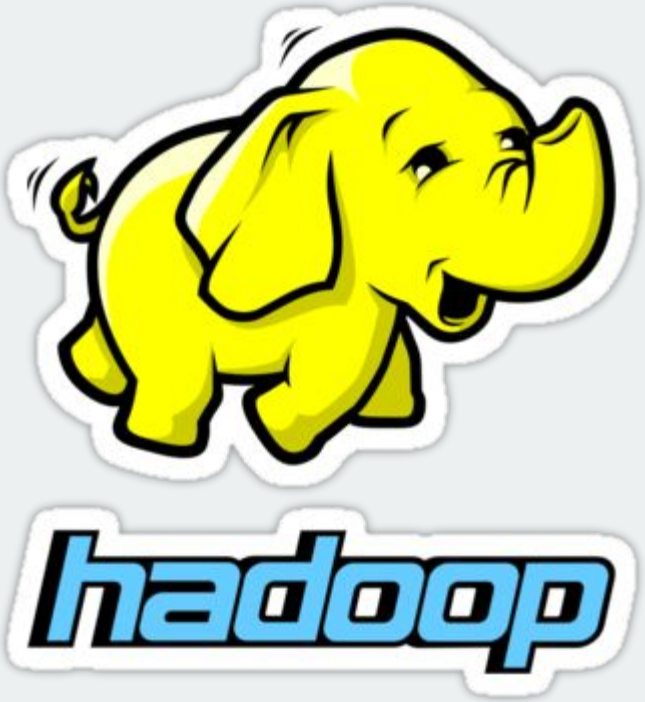
The average fap session
is 12 minutes.

378,000

Number of iPhones Sold

371,000

Number of babies born


hadoop


Spark

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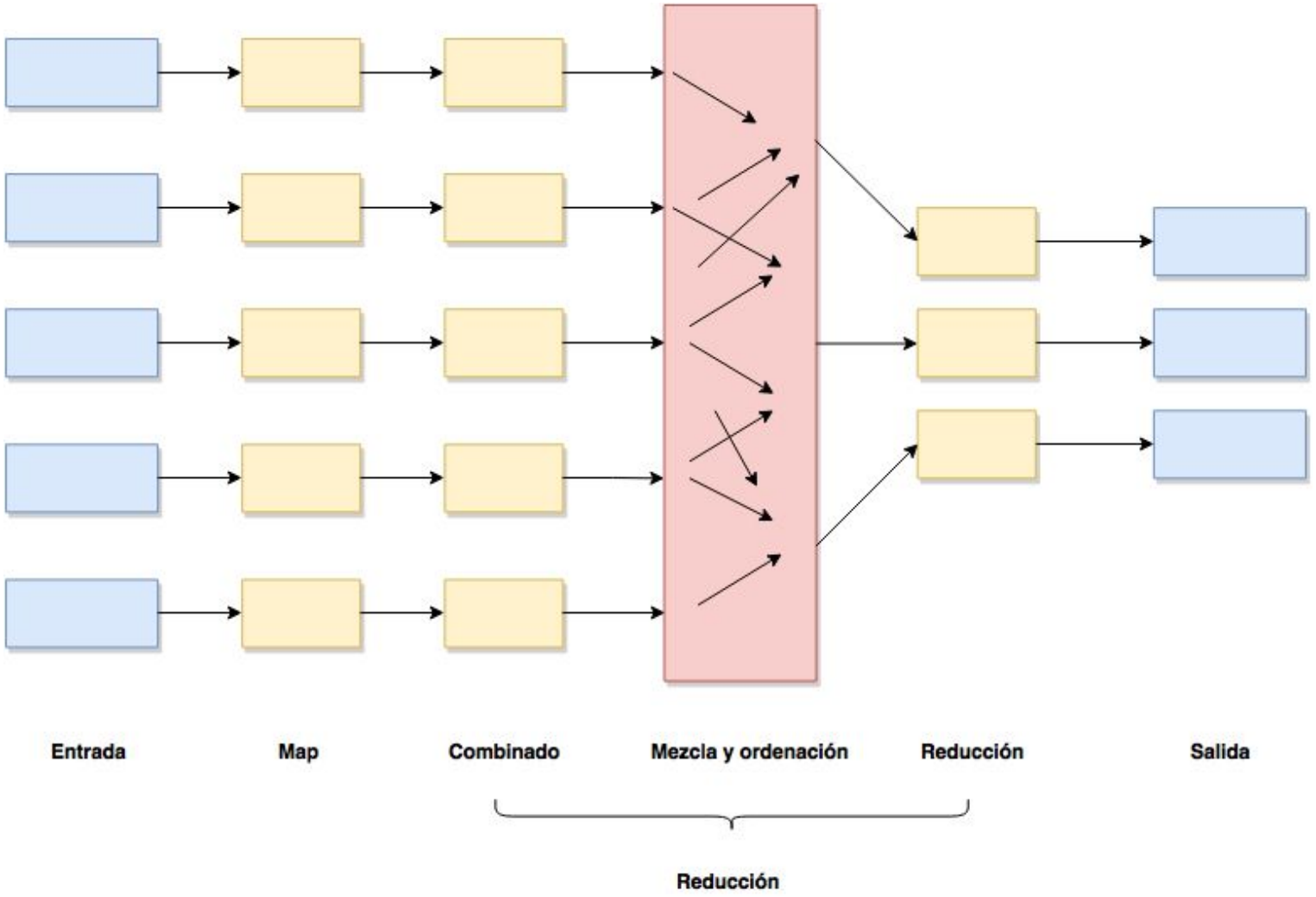
Apache Hadoop

Hadoop está formado por los siguientes módulos:

- Hadoop Common.
- Hadoop Distributed Filesystem (HDFS).
- Hadoop YARN (Yet Another Resource Negociator).
- MapReduce.

Apache Hadoop MapReduce



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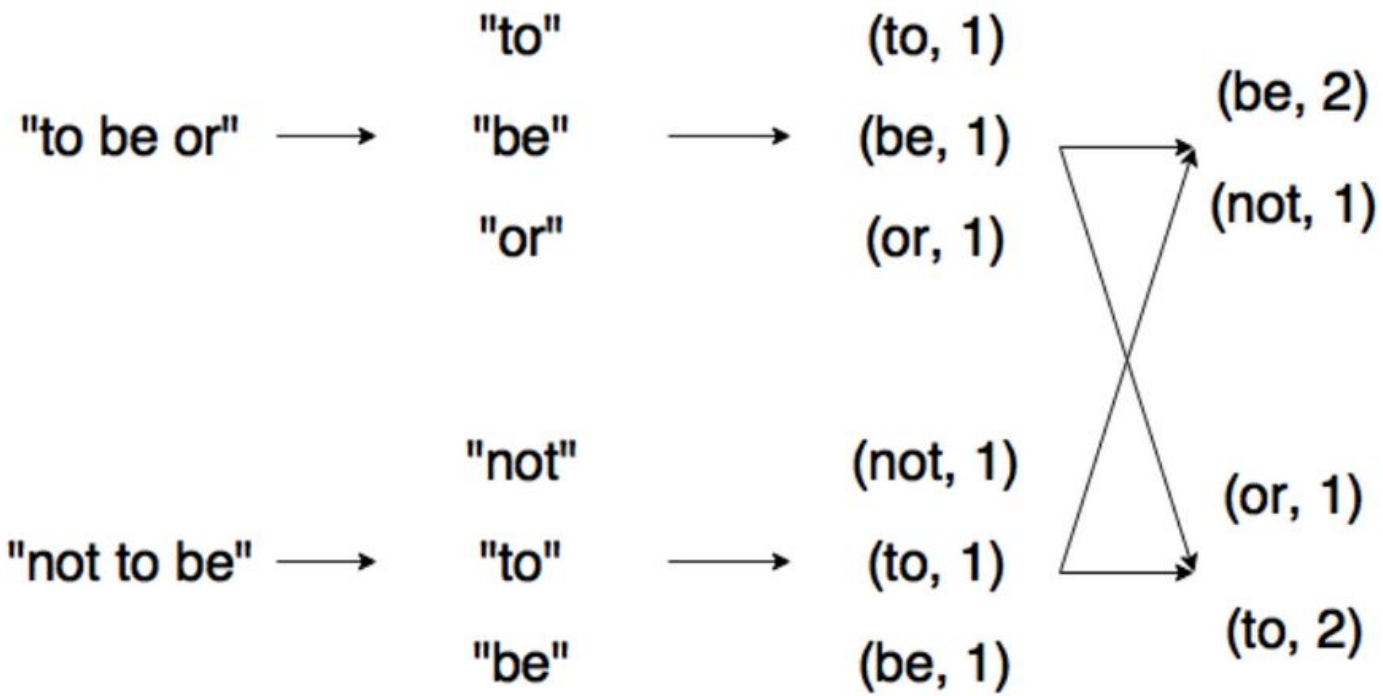
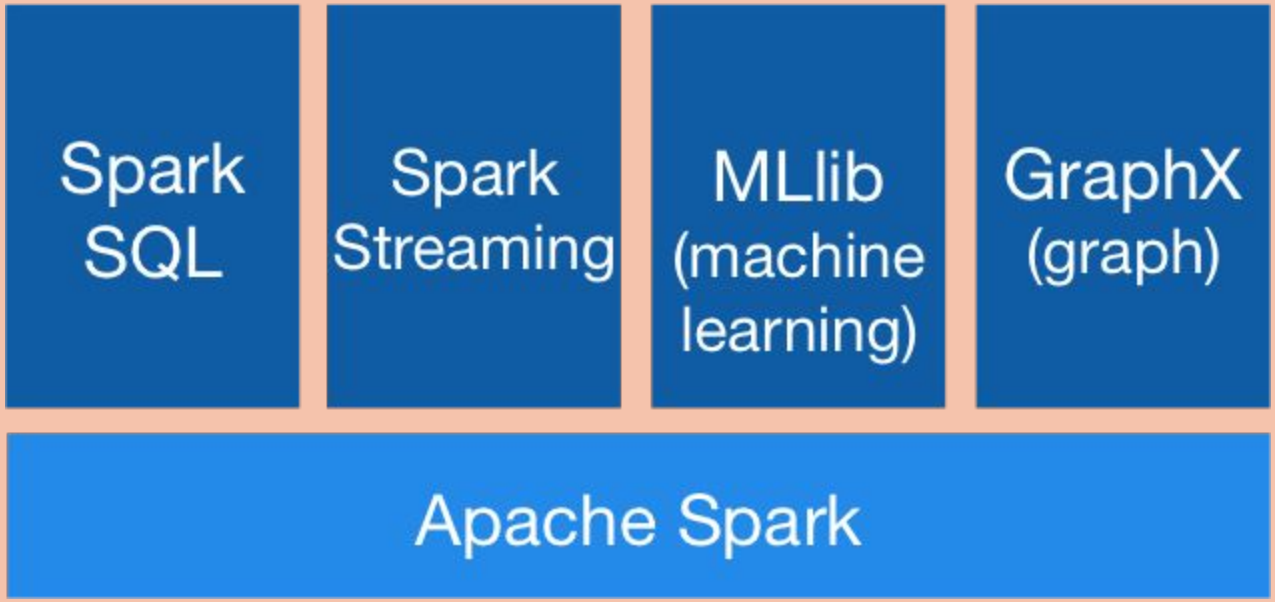
Apache Hadoop MapReduce



Apache Spark

Es considerado el primer software de código abierto que hace la programación distribuida realmente accesible a los científicos de datos.

Spark mantiene la escalabilidad lineal y la tolerancia a fallos de MapReduce, pero amplía sus bondades gracias a varias funcionalidades: **DAG** y **RDD**.


Spark SQL
Spark Streaming
MLlib (machine learning)
GraphX (graph)
Apache Spark

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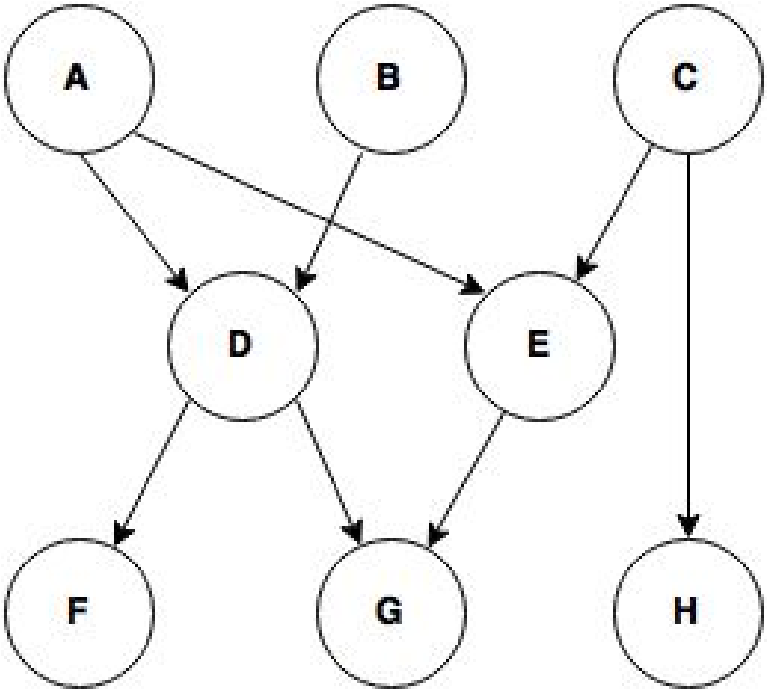
Apache Spark - DAG (Directed Acyclic Graph)



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Apache Spark - RDD (Resilient Distributed Dataset)

Un objeto RDD permite a los programadores realizar operaciones sobre grandes cantidades de datos en clusters de una manera rápida y tolerante a fallos.

Mantener los datos en memoria puede mejorar el rendimiento de una aplicación considerablemente.

Sistemas de streaming

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Apache Kafka

Sistema de mensajería distribuido basado en publicación-suscripción.

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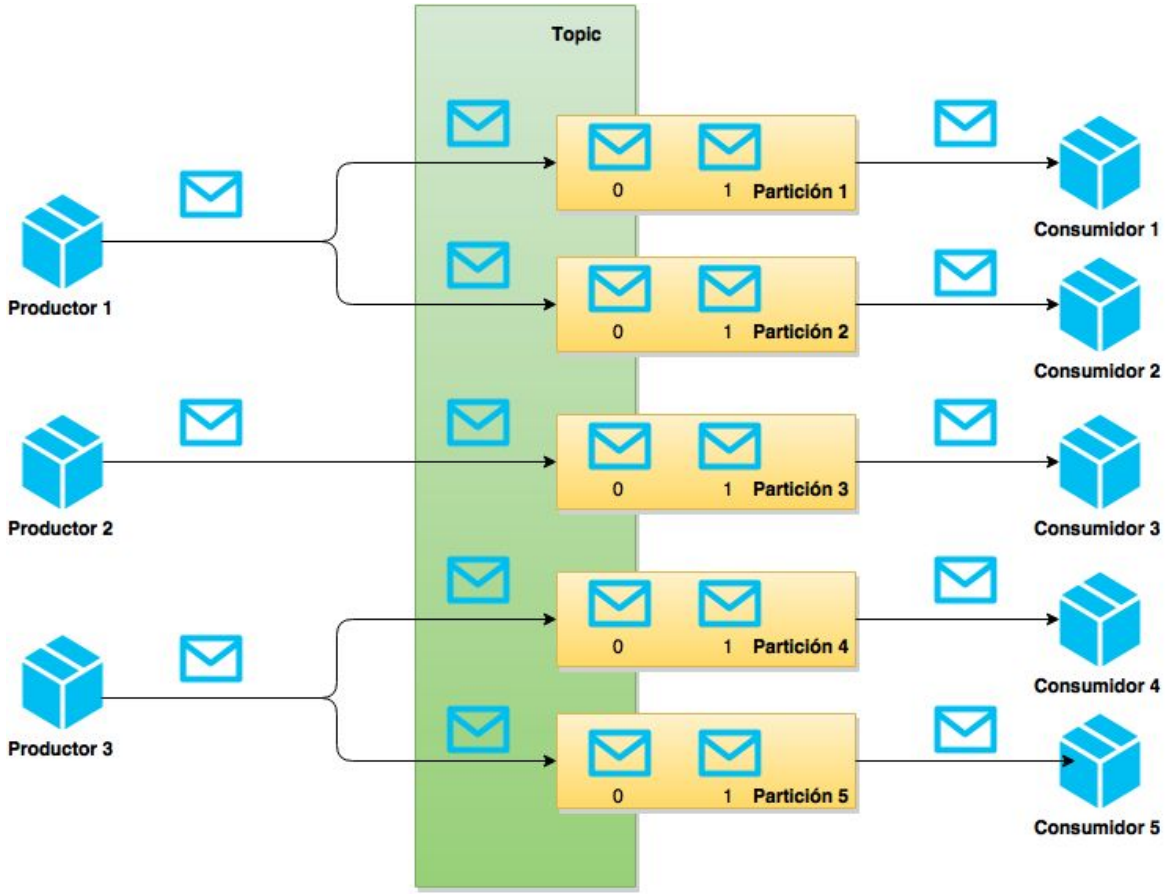
Apache Kafka



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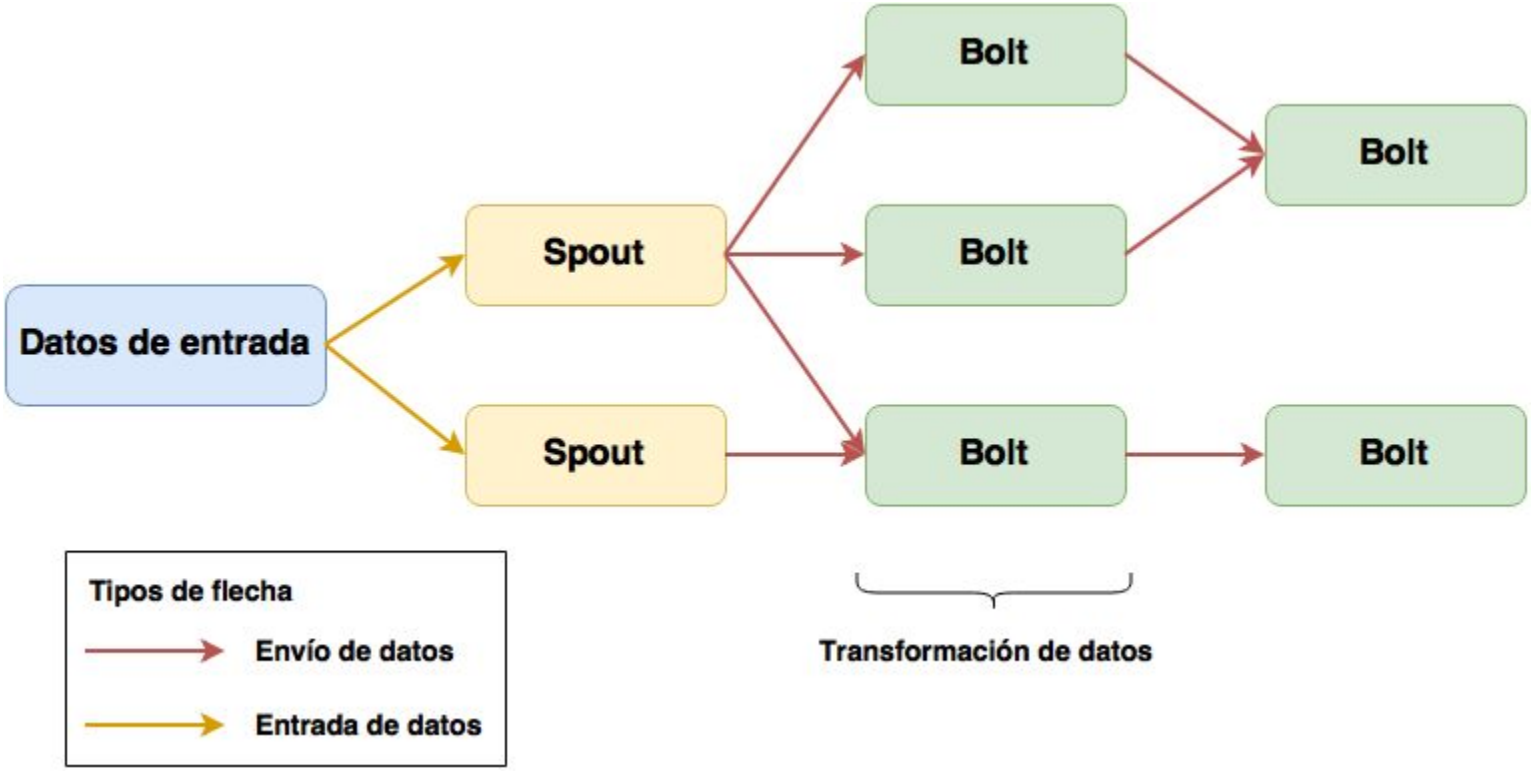
Apache Storm

Se basa en una arquitectura maestro-esclavo y su objetivo es procesar datos en tiempo real.

Se compone de dos partes principales:

- Spout
- Bold

Apache Storm



Spark Streaming

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Spark Streaming


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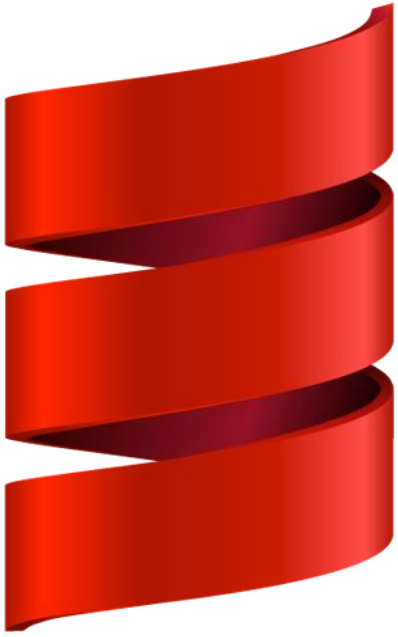
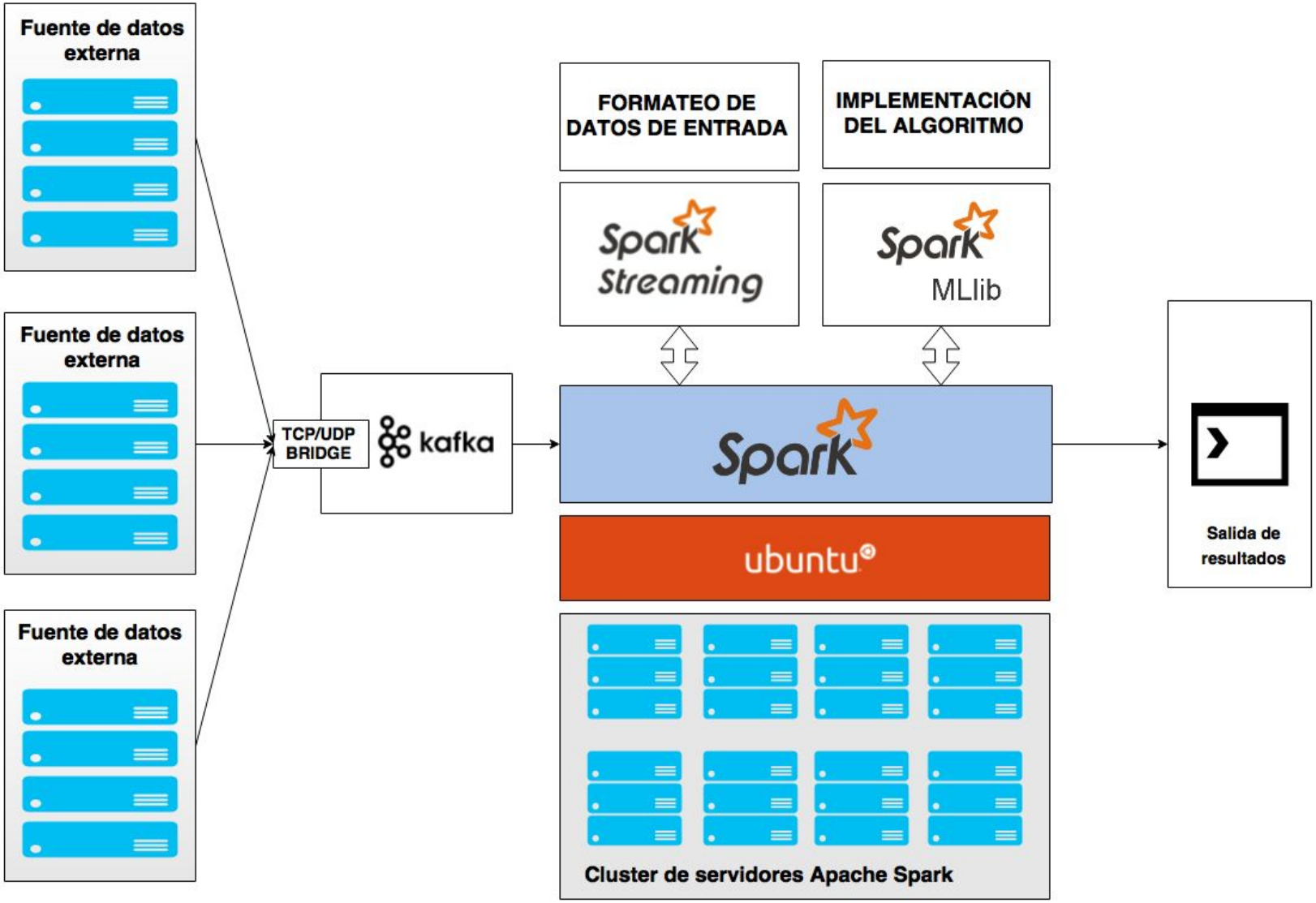



Java™

Arquitectura

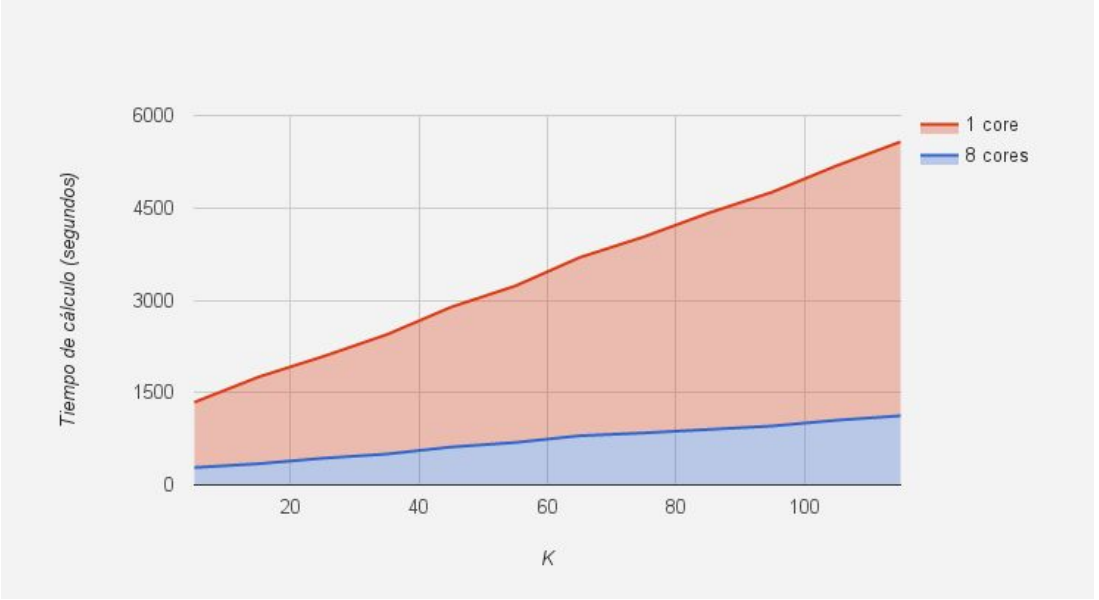


Detección de anomalías en redes

Caso de estudio - Detección de anomalías

Conjunto de datos:
4.9 millones de registros.

Algoritmo:
KMeans Clustering.




```
from pyspark.mllib.clustering import KMeans
model = KMeans.train(data,
                     k,
                     maxIterations=10,
                     runs=5,
                     initializationMode="random")
```

Predicción de fallos online

Caso de estudio - Predicción de fallos online

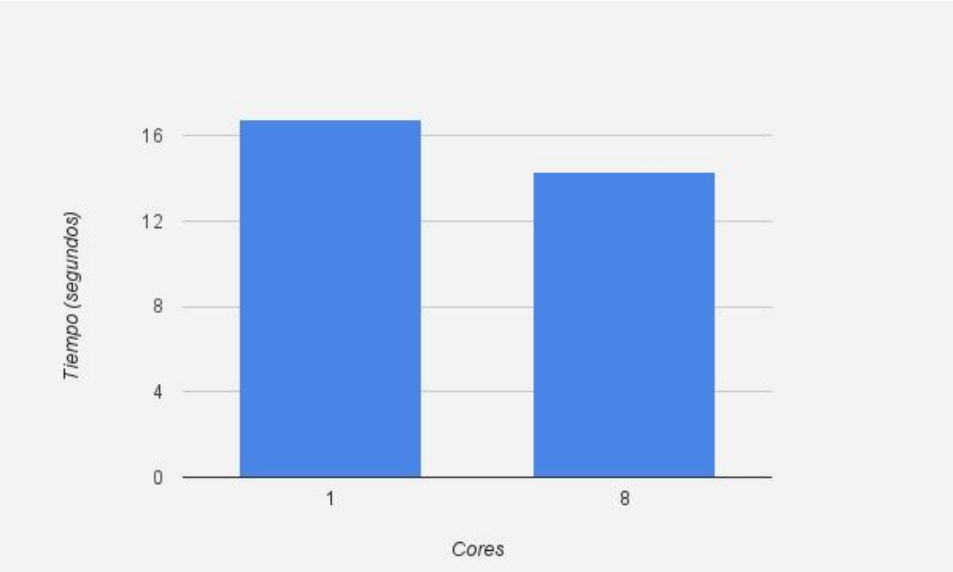
Conjunto de datos:

10661 líneas

88 columnas

Algoritmo:

Random Forests.




```
model = RandomForest.trainClassifier(
                        trainingData,
                        numClasses=10,
                        categoricalFeaturesInfo={},
                        numTrees=5,
                        featureSubsetStrategy="auto",
                        impurity='gini',
                        maxDepth=5,
                        maxBins=32)
```

Análisis de sentimientos en Twitter

Caso de estudio - Análisis de sentimientos

Conjunto de datos:
Mensajes en Twitter.

```
oauth.consumerKey = XXXXXXXXXXXXXXX
oauth.consumerSecret = XXXXXXXXXXX
oauth.accessToken = XXXXXXXXXXXXXXX
oauth.accessTokenSecret = XXXXXXXXX
```

Algoritmo:
Recuento de palabras positivas y negativas.

```
val sc = new SparkContext(conf)
val ssc = new StreamingContext(sc, Seconds(5))
val filters = new Array[String](1)
filters(0) = "greece"
val twitterStream = TwitterUtils.createStream(ssc,
                                              None,
                                              filters)
```

Análisis de sentimientos en Twitter

Puntuación de mensajes

```
Time: 1436353630000 ms
---------------------
(6187380632,RT @IvanaKottasova: Tried to buy a train ticket in
Athens. Ït's free", I am told. "The banks are closed."#Greece)
(6187380678,Greece has the opportunity to repudiate a lot of
inconvenient foreign debt.)
```

```
1 twitterStream.
2    map{tweet => (tweet.getId(), tweet.getText())}.
3    map{case (id, text) => (id, clean(text))}.
4    map{case (id, words) => (id, rateWordList(words))}.
5    print()
```

```
Time: 1436361275000 ms
----------------------
(618770130890133505,1)
(618770131334918144,0)
(618770132014362624,0)
(618770132144377856,0)
(618770133599825920,1)
(618770135097192448,0)
(618770136187727873,-1)
(618770136149790720,0)
(618770137676517376,1)
(618770138267914240,-2)
```

Conclusiones

Apache Spark es entre 10 y 100 veces más rápido que Hadoop MapReduce.

La programación es muy similar en Scala, Java y Python.

La arquitectura propuesta es válida para cualquier caso de estudio.

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