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Apache Spark SQL

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Índice

¿Por qué?

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- Porque nos nutrimos de datos que están almacenados persistentemente
- Porque SQL es un estándar extendido y fácil de usar
- Porque recurrir a Hive implica depender de Hadoop
- Porque consideramos que se puede mejorar lo que tenemos…

Contextos SQL

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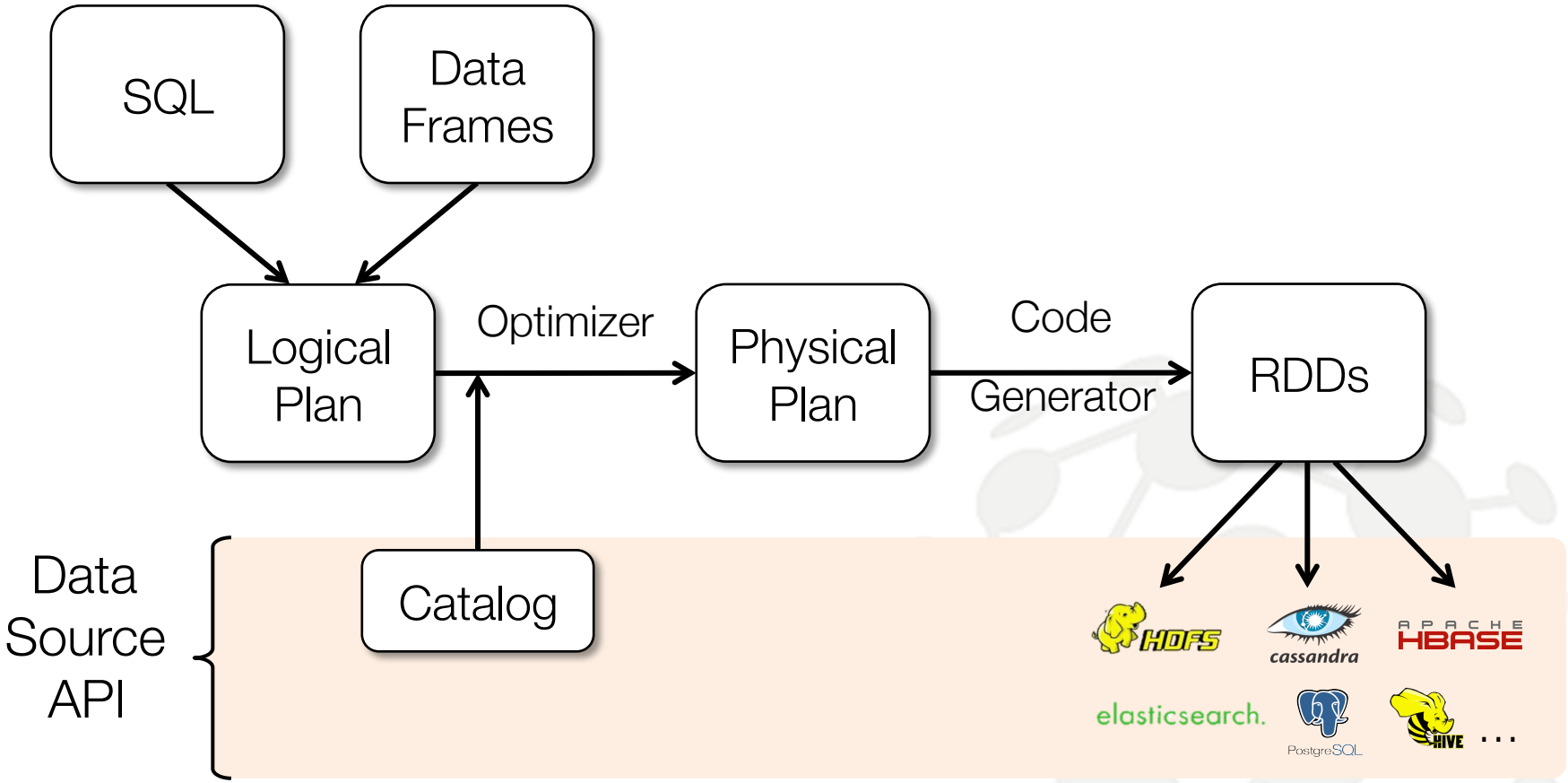
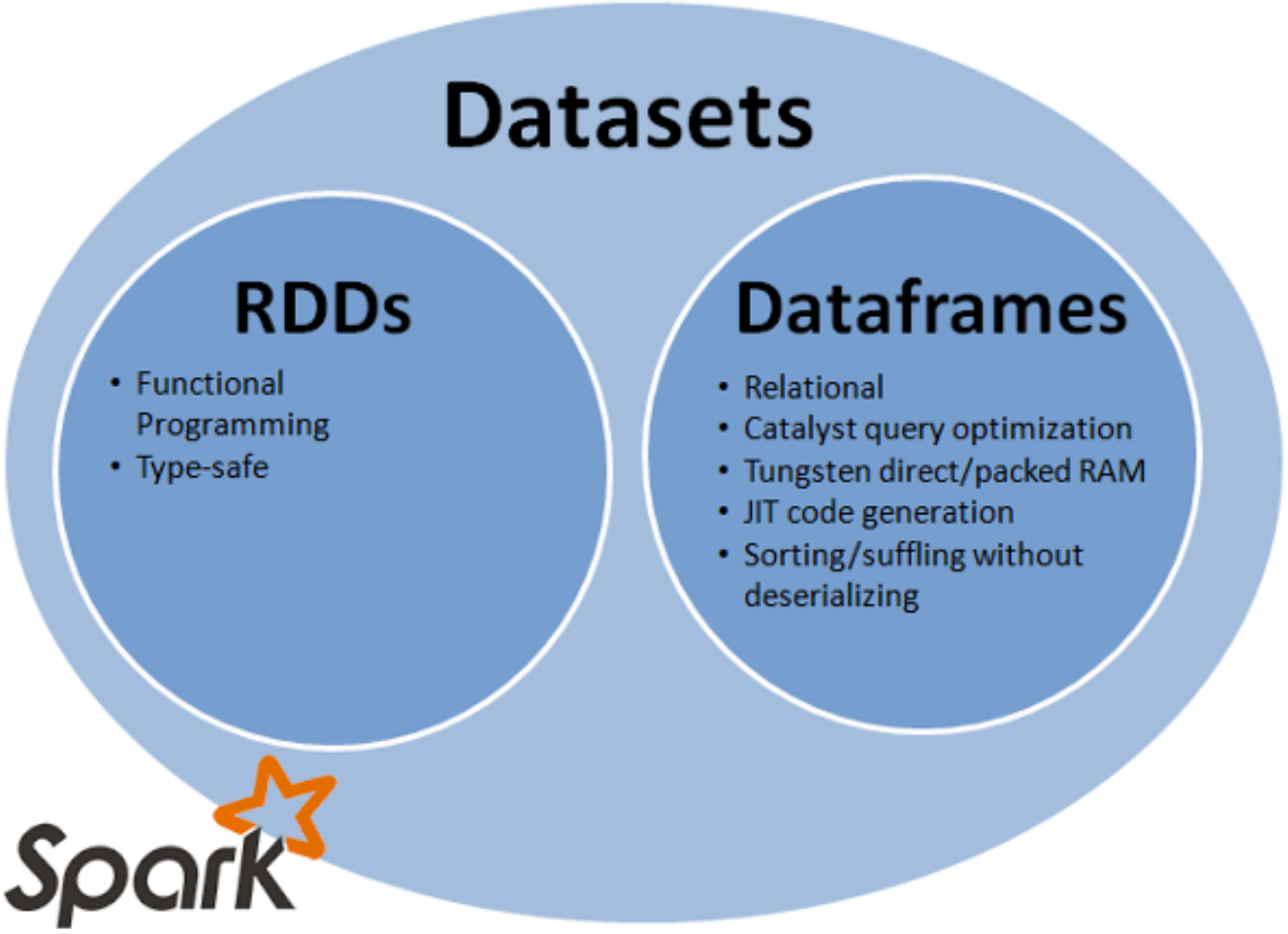
- Toda aplicación Spark depende de un contexto
- El contexto recoge toda la información necesaria para acceder al clúster y usar sus recursos
- El *master* es el encargado de gestionar el cluster
- En este caso, necesitamos un sqlContext
- Este contexto nos permite crear ***DataFrames***

Master Parameter	Description
`local`	run Spark locally with one worker thread (no parallelism)
`local[K]`	run Spark locally with K worker threads (ideally set to number of cores)
`spark://HOST:PORT`	connect to a Spark standalone cluster; PORT depends on config (7077 by default)
`mesos://HOST:PORT`	connect to a Mesos cluster; PORT depends on config (5050 by default)

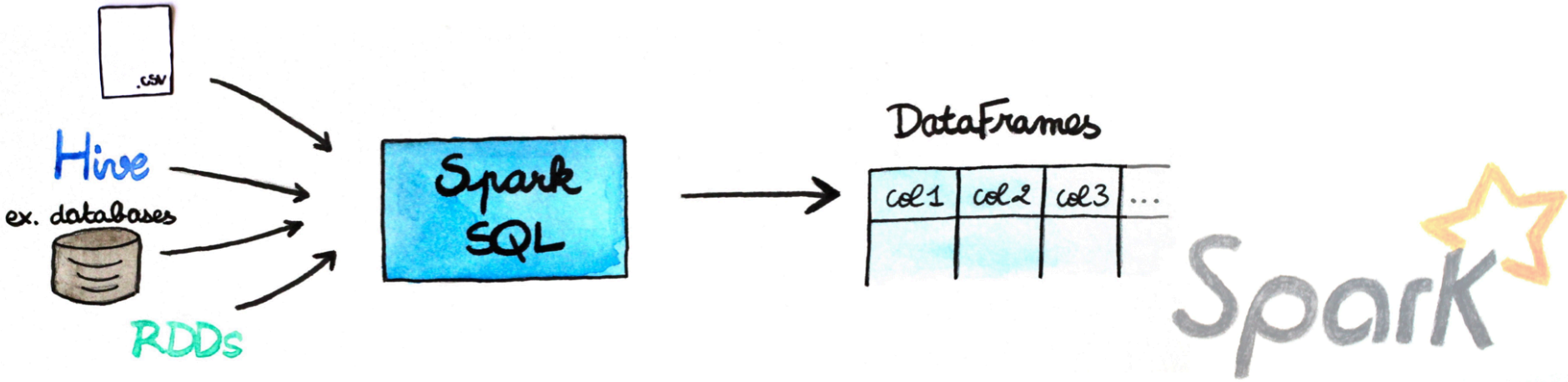
Arquitectura



Datasets


Datasets
RDDs
• Functional Programming
• Type-safe
Dataframes
• Relational
• Catalyst query optimization
• Tungsten direct/packed RAM
• JIT code generation
• Sorting/suffling without deserializing
Spark

DataFrames



Cada fila de un dataset es un objeto **Row**

DataFrames: transformations and actions

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Transformations	Actions
filter	count
select	collect
drop	show
join	take

Lazy evaluation

Transformed DF is executed when action runs on it

DataFrames: transformations and actions

show action causes **createDataFrame**, **filter**, and **select** transforms to be executed

result

Ejemplo

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```
>>> data = [('Alice', 1), ('Bob', 2)]
>>> data
[('Alice', 1), ('Bob', 2)]
>>> df = sqlContext.createDataFrame(data)
```

No computation occurs with `sqlContext.createDataFrame()`

- Spark only records how to create the DataFrame

```
[Row(_1=u'Alice', _2=1), Row(_1=u'Bob', _2=2)]
>>> sqlContext.createDataFrame(data, ['name', 'age'])
[Row(name=u'Alice', age=1), Row(name=u'Bob', age=2)]
```

Crear un DataFrame desde Pandas o R

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- No confundir DataFrames de Spark con DataFrames de Python o R

```
# Create a Spark DataFrame from Pandas
>>> spark_df = sqlContext.createDataFrame(pandas_df)
```

Leer y cargar datos en el DataFrame

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```
>>> df = sqlContext.read.text("README.txt")
>>> df.collect()
[Row(value=u'hello'), Row(value=u'this')]
```

Más datos

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- Persistencia de un DataFrame: **`cache()`**
- Nunca usar collect() (*todos*) en producción, en su lugar usar take(n)
- Lanzar una consulta es muy sencillo

```
# SQL can be run over SchemaRDDs that have been registered as a table.
results = sqlContext.sql("SELECT name FROM people")
```

- Pero primero se debe haber registrado como tabla

```
// Register the DataFrames as a table.
peopleDataFrame.registerTempTable("people")
```

Salvar y persistir

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```
# DataFrames can be saved as Parquet files, maintaining the schema information.
schemaPeople.write.parquet("people.parquet")
```

Simplifica el código

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Using RDDs

```
data = sc.textFile(...).split("\t")
data.map(lambda x: (x[0], [int(x[1]), 1])) \
    .reduceByKey(lambda x, y: [x[0] + y[0], x[1] + y[1]]) \
    .map(lambda x: [x[0], x[1][0] / x[1][1]]) \
    .collect()
```

Using SQL

```
SELECT name, avg(age)
FROM people
GROUP BY name
```

Using Pig

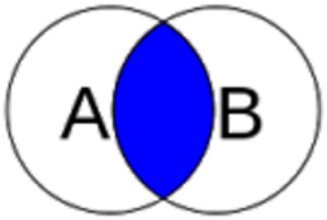
```
P = load '/people' as (name, name);
G = group P by name;
R = foreach G generate … AVG(G.age);
```

Using DataFrames

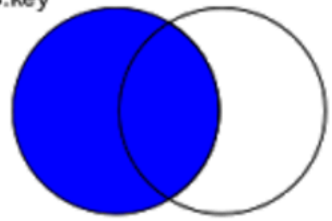
```
sqlCtx.table("people") \
    .groupBy("name") \
    .agg("name", avg("age")) \
    .collect()
```

SQL JOINS

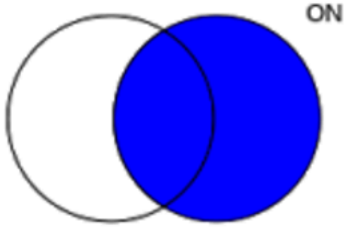
SELECT <fields>
FROM TableA A
INNER JOIN TableB B
ON A.key = B.key



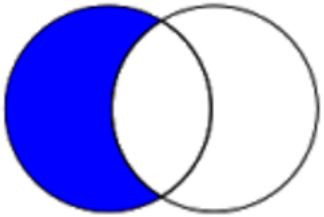
SELECT <fields>
FROM TableA A
LEFT JOIN TableB B
ON A.key = B.key



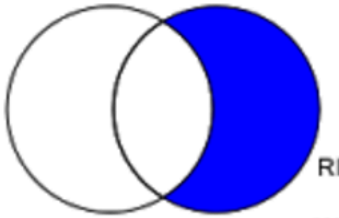
SELECT <fields>
FROM TableA A
RIGHT JOIN TableB B
ON A.key = B.key



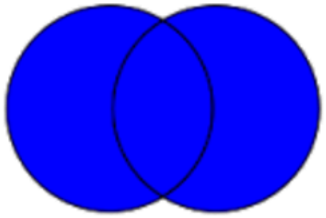
SELECT <fields>
FROM TableA A
LEFT JOIN TableB B
ON A.key = B.key
WHERE B.key IS NULL



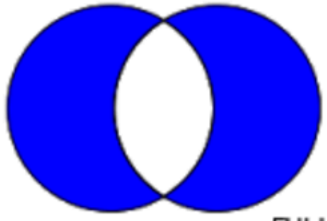
SELECT <fields>
FROM TableA A
RIGHT JOIN TableB B
ON A.key = B.key
WHERE a.key IS NULL



SELECT <fields>
FROM TableA A
FULL OUTER JOIN TableB B
ON A.key = B.key



SELECT <fields>
FROM TableA A
FULL OUTER JOIN TableB B
ON A.key = B.key
WHERE A.key IS NULL
OR B.kev iIS NULL



Your turn

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