

# Resilient Distributed Datasets (RDDs)

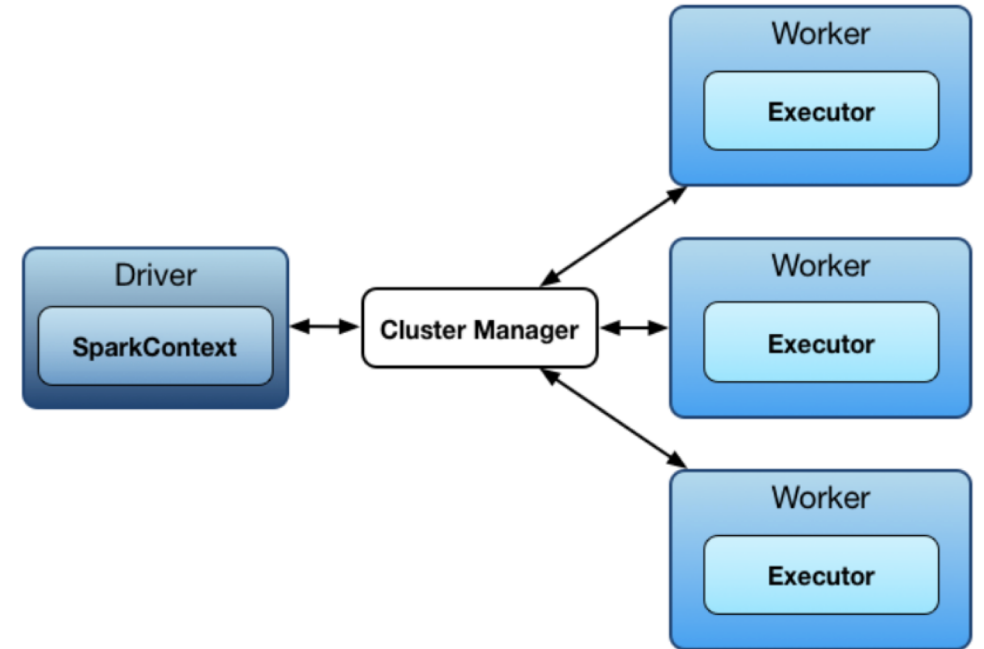
A brief Introduction

# Resilient Distributed Datasets (RDDs)

- Primary abstraction that allow Spark to distribute data
- Fault tolerant – if they are destroyed they can be recreated by the driver and sent to a new worker
- Immutable – once created you cannot change them. Instead you perform transformations on them and create new RDDs.
- Unstructured and semi-structured data
- Remain in memory
- Many input sources : HDFS, S3, csv, json

# RDD operations

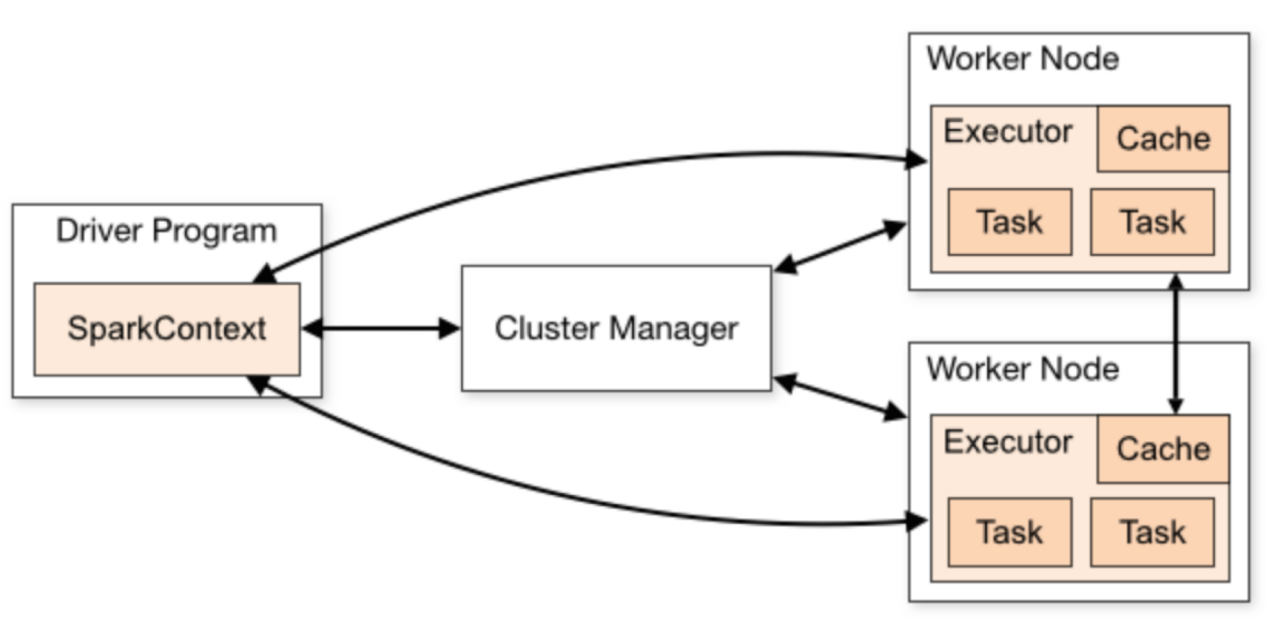
- Transformations – map, flatmap, join
  - Lazy operations
  - Take place on the worker nodes
- Actions – count, distinct, reduce
  - Eager operations
  - Results returned to the driver and summarized or written to storage



[Reference](#)

# Your entry point into Spark is the Spark Context

```
: import pyspark  
sc = pyspark.SparkContext('local[*]')
```



# Creating RDDs

You can create an RDD in one of three ways:

- ***Parallelizing*** an existing collection in your driver program
- ***Referencing a dataset*** in an external storage system, such as a shared filesystem, HDFS, HBase, or any data source offering a Hadoop InputFormat
- By ***transformations*** on another RDD

# Resilient Distributed Datasets (RDDs)

***Parallelizing*** an existing collection in your driver program

```
>>> data = [1, 2, 3, 4, 5]           //Python List  
>>> distData = sc.parallelize(data)  // RDD
```

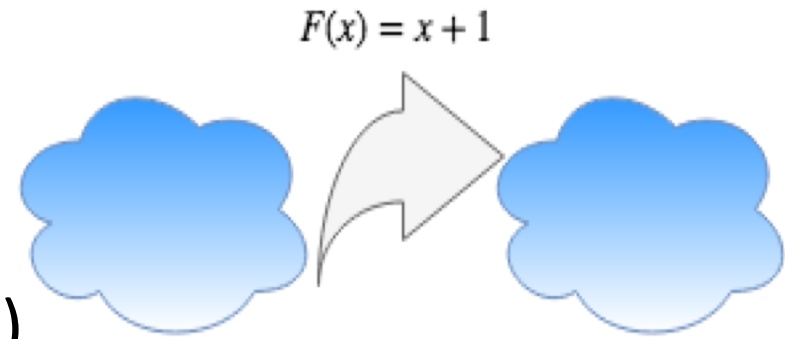
***Referencing a dataset***

```
>>> distFile = sc.textFile("data.txt") //RDD
```

# Resilient Distributed Datasets (RDDs)

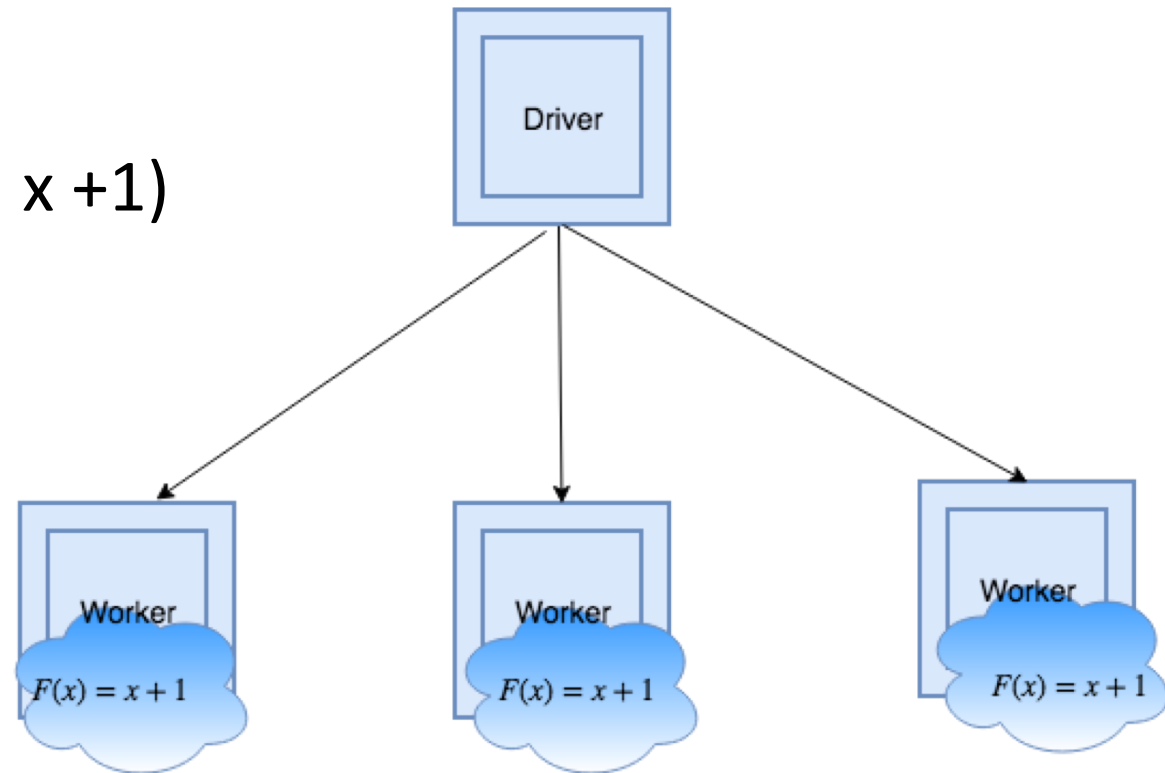
Given an RDD you can create a new RDD using ***transformations***.

```
>>> data = [1, 2, 3, 4, 5]
>>> rdd1 = sc.parallelize(data)
>>> rdd2 = rdd1.map(lambda x : x + 1)
```



# Resilient Distributed Datasets (RDDs)

```
rdd2 = rdd1.map(lambda x : x + 1)
```





# Transformations on RDDs

Transform one RDD to another

map

flatMap

filter

fold

aggregate



[Reference](#)

# Basic Transformations

```
nums = sc.parallelize([1, 2, 3])
```

```
# Pass each element through a function
```

```
squares = nums.map(lambda x: x*x)    # => {1, 4, 9}
```

```
# Keep elements passing a predicate
```

```
even = squares.filter(lambda x: x % 2 == 0) # => {4}
```

```
# Map each element to zero or more others
```

```
nums.flatMap(lambda x: range(0, x)) # => {0, 0, 1,  
0, 1, 2}
```

# *Transformations are lazy*

To get the results of ***a transformation*** back to the driver, you must issue an ***action***

```
>>> data = [1, 2, 3, 4, 5]
```

```
>>> rdd1 = sc.parallelize(data)
```

```
>>> rdd2 = rdd1.map(lambda x : x + 1)
```

***### Nothing happens until »collect« is executed***

```
>>> rdd2.collect()
```

# Resilient Distributed Datasets (RDDs)

- Actions
  - collect
  - count
  - reduce
  - take(n)

[Reference](#)

# Basic Actions - Eager

```
nums = sc.parallelize([1, 2, 3])
```

```
# Retrieve RDD contents as a local collection  
nums.collect() # => [1, 2, 3]
```

```
# Return first K elements  
nums.take(2)    # => [1, 2]
```

```
# Count number of elements  
nums.count()    # => 3
```

```
# Merge elements with an associative function  
nums.reduce(lambda x, y: x + y) # => 6
```

```
# Write elements to a text file  
nums.saveAsTextFile("hdfs://file.txt")
```

# Resilient Distributed Datasets (RDDs)

```
In [1]: import pyspark
sc = pyspark.SparkContext('local[*]')
```

```
In [2]: data = [1, 2, 3, 4, 5]
rdd1 = sc.parallelize(data)
rdd2 = rdd1.map(lambda x : x + 1)
print(type(rdd2))
```

```
<class 'pyspark.rdd.PipelinedRDD'>
```

```
In [3]: mylist = rdd2.collect()
print(type(mylist))
```

```
<class 'list'>
```

```
In [5]: print(mylist)
```

```
[2, 3, 4, 5, 6]
```

Lazy Evaluation - An execution plan, a DAG (directed acyclic graph) of tasks is sent to the workers. It is not executed until an action is run

