Partitioners

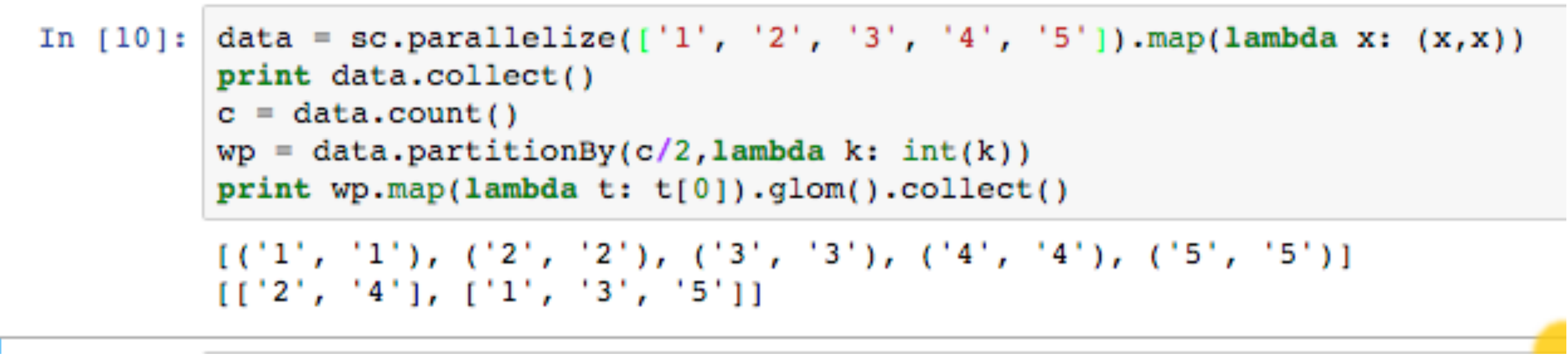
Spark Partitioners

- Each RDD is divided into partitions.
    - One partition per worker (core)
- After manipulations (such as **filter()**) some partitions can shrink to zero and some might be very large
    - This means that future work is not balanced across the workers.
- If RDD consists of (key,value) pairs we can use a **partitioner** to redistribute the items among the workers

Types of partitioners

- **HashPartitioner(n):** divide the keys into **n** groups at random. Divide the pairs according to their keys
- **RangePartitioner(n):** each partition corresponds to a range of key values, so that each range contains approximately the same number of items (keys).
- **Custom Partitioner:**
  define a partitioner that maps key **K** to integer **I**.
  n= number of partitions.
  pair with key **K** placed in partition **I mod n**

Custom Partition Example



```
In [10]: data = sc.parallelize(['1', '2', '3', '4', '5']).map(lambda x: (x,x))
         print data.collect()
         c = data.count()
         wp = data.partitionBy(c/2,lambda k: int(k))
         print wp.map(lambda t: t[0]).glom().collect()

         [('1', '1'), ('2', '2'), ('3', '3'), ('4', '4'), ('5', '5')]
         [['2', '4'], ['1', '3', '5']]
```

glom()

- The RDD abstraction does not allow direct access to subcollections of an RDD.
- glom() **breaks the abstraction.** It transforms the local partition into a list which can be operated on by standard python operations.
- A single partition can be operated on as a regular python list.

- RDD.glom() returns a new RDD in which each element is a list containing all of the elements in a single partition.

glom() : returns an RDD with one array per partition.

Allows the worker to access all data in it's partition.

```
A=sc.parallelize(range(1000000))\
    .map(lambda x: (2*x,x)) \
    .partitionBy(10) \
    .glom() # One list per key \

print A.getNumPartitions()

def variation(B):
    d=0
    if len(B)>1:
        for i in range(len(B)-1):
            d+=abs(B[i+1][1]-B[i][1]) # access the glo
        return (B[0][0],len(B),d)
    else:
        return(None)
```

```
10
[(0, 200000, 999995), None, (2, 200000, 999995), None,
 (4, 200000, 999995), None, (6, 200000, 999995), None,
 (8, 200000, 999995), None]
```