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Lesson 4: Spark Internals

4.6 How Code Runs: Stages, Tasks, and the Shuffle

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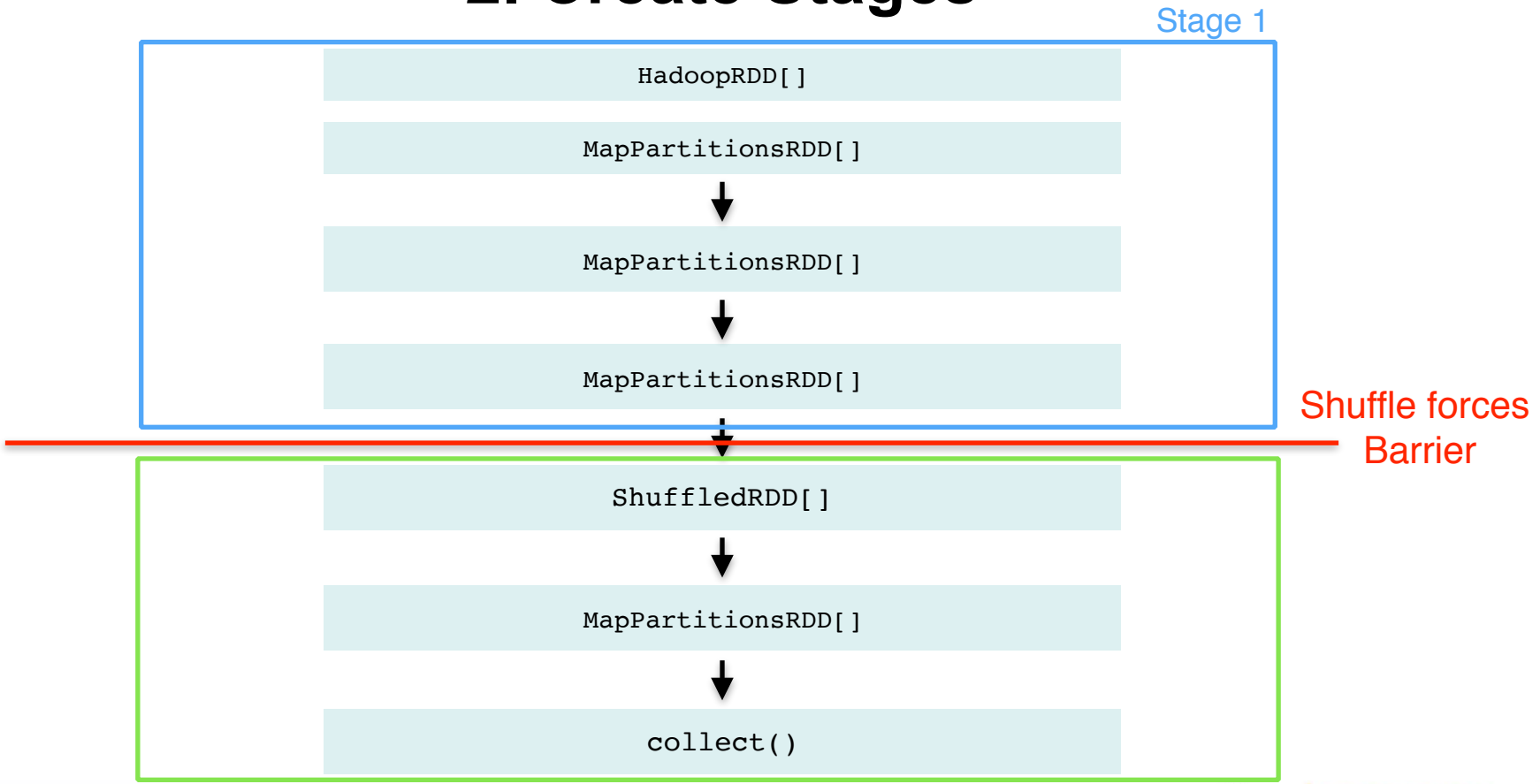
2. Create Stages



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3. Schedule Tasks

1. Split each stage into tasks to execute

2. Task is simply a partition (data) and computation (`lambda`)

3. Execute all tasks in a stage before continuing

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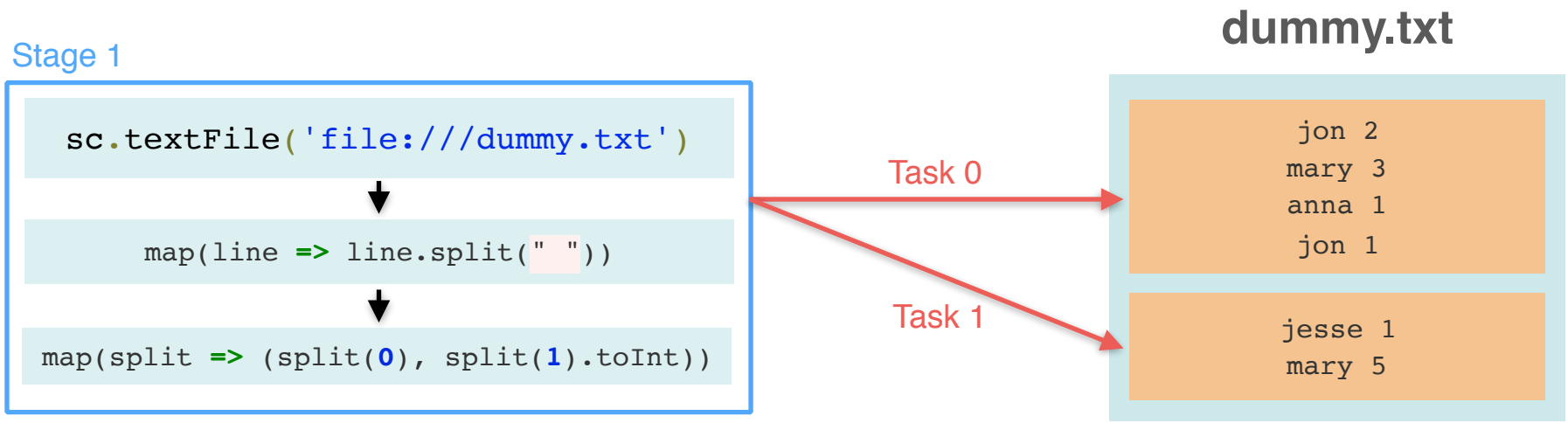
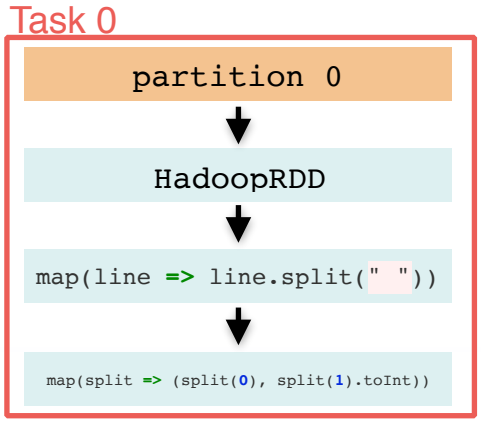
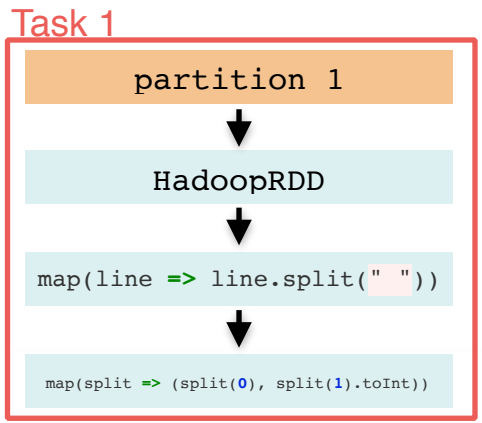
3. Schedule Tasks







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Aside: What's in a Shuffle?

- Redistribute data across partitions
- Hashes keys into buckets
- Pull rather than push
- Intermediate files written to disk of worker (like Hadoop)

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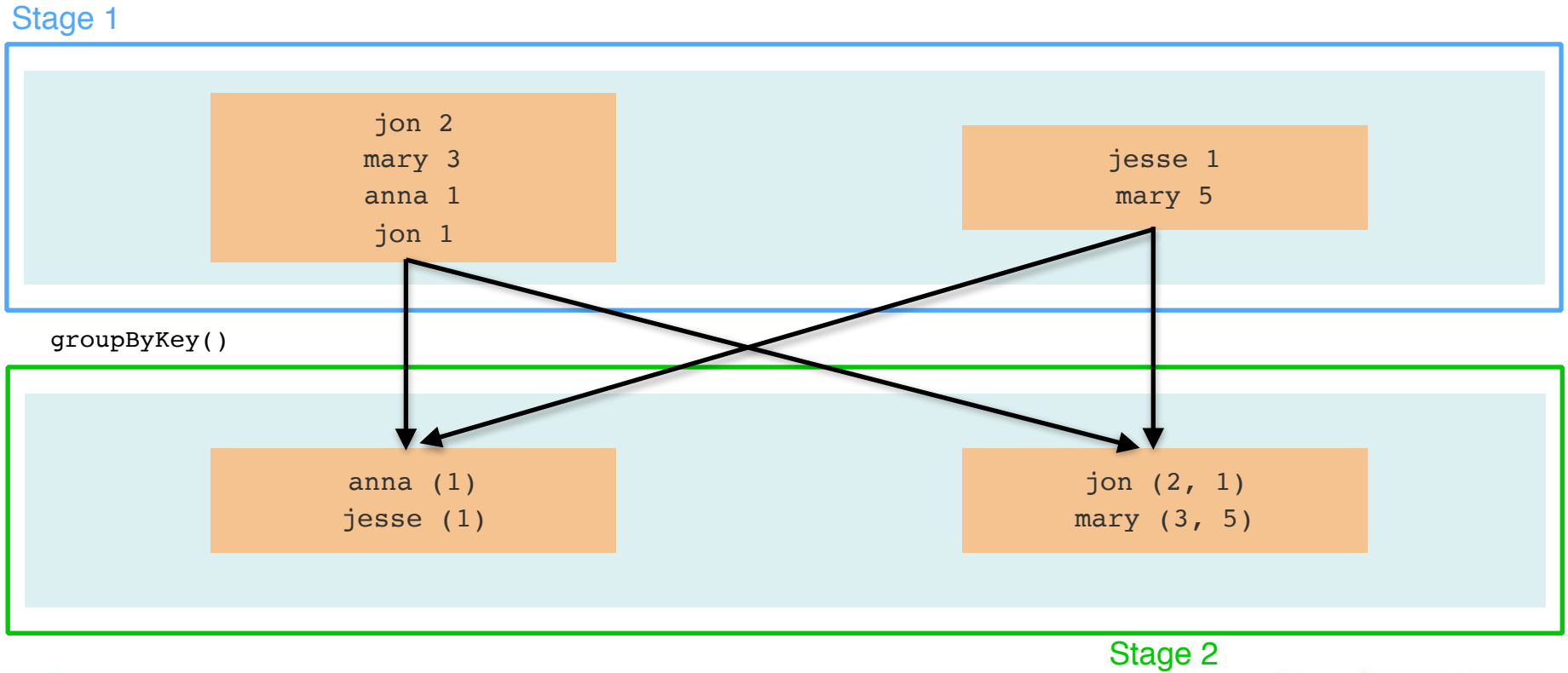
What's in a Shuffle?



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```
file_rdd = sc.textFile('file:///toy_data.txt')
file_rdd.take(2)
# => [u'{"Jane": "2"}', u'{"Jane": “1"}']

tup_rdd = file_rdd.map(lambda line: json.loads(line)) \
                  .map(lambda d: (d.keys()[0], int(d.values()[0])))

tup_rdd.groupByKey().mapValues(lambda tup: max(tup.data))
# => [(u'Jane', 2), (u'Pete', 20), (u'Tyler', 3), (u'Yuki', 5), (u'Duncan', 6)]
```

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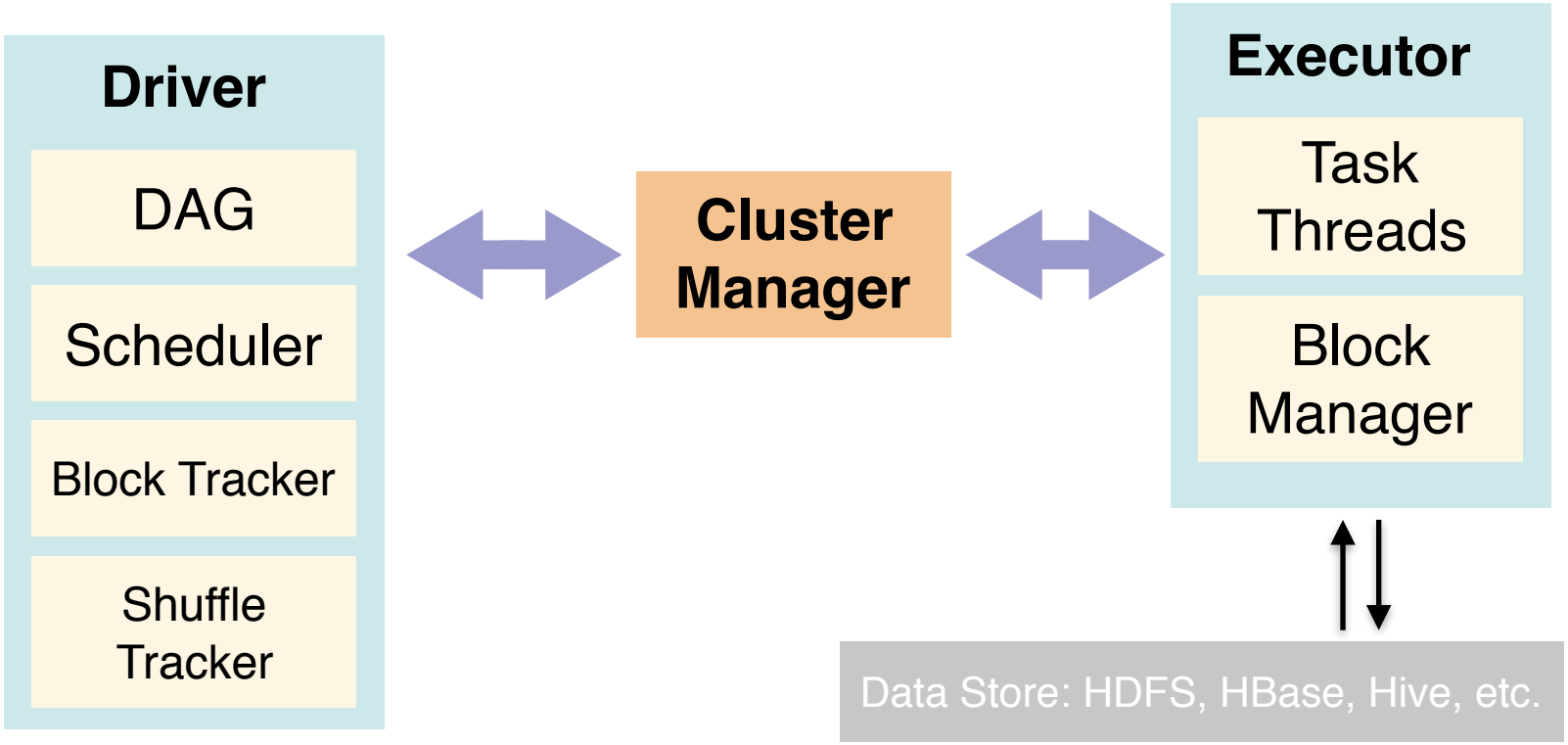
A Day in the Life of a Spark Application



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Scheduler

- RDD and partition DAG as input
- Tasks (within stages) to execute as output

Roles

- Builds stages to execute
- Submit stages to Cluster Manager
- Resubmit failed stages when output is lost

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Review

- The Spark driver sends transformations to cluster manager
- The Spark cluster manager sends computation to the appropriate data
- Spark intelligently pipelines tasks to batch computations to avoid sending data over the network
- Certain transformations force a wide dependency

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