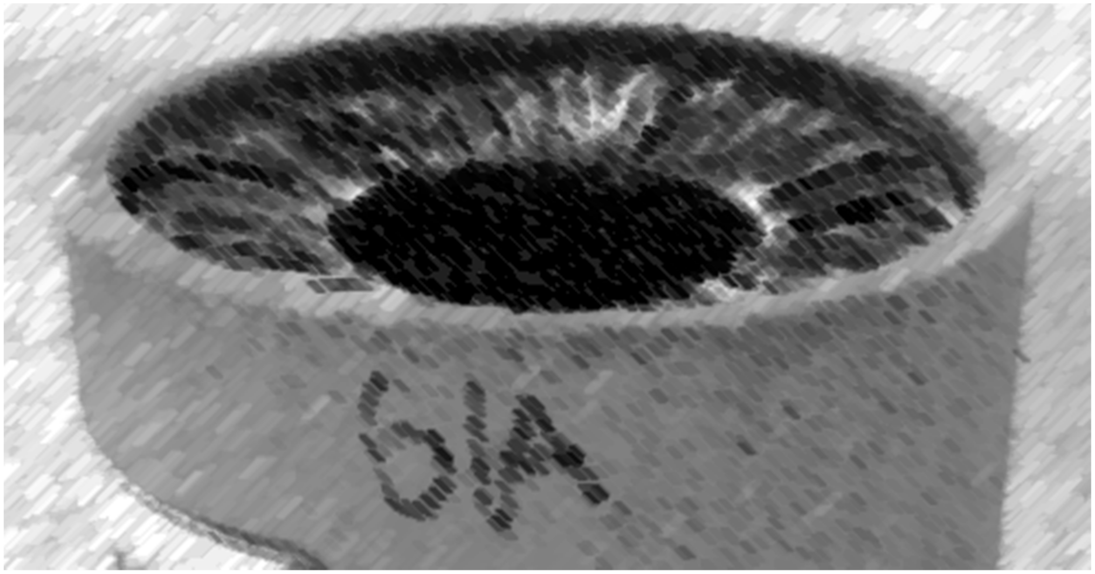

CS61A Lecture 41

Amir Kamil

UC Berkeley

April 26, 2013

Announcements

- HW13 due Wednesday
- Scheme project due Monday
- Scheme contest deadline extended to Friday

CPU Performance

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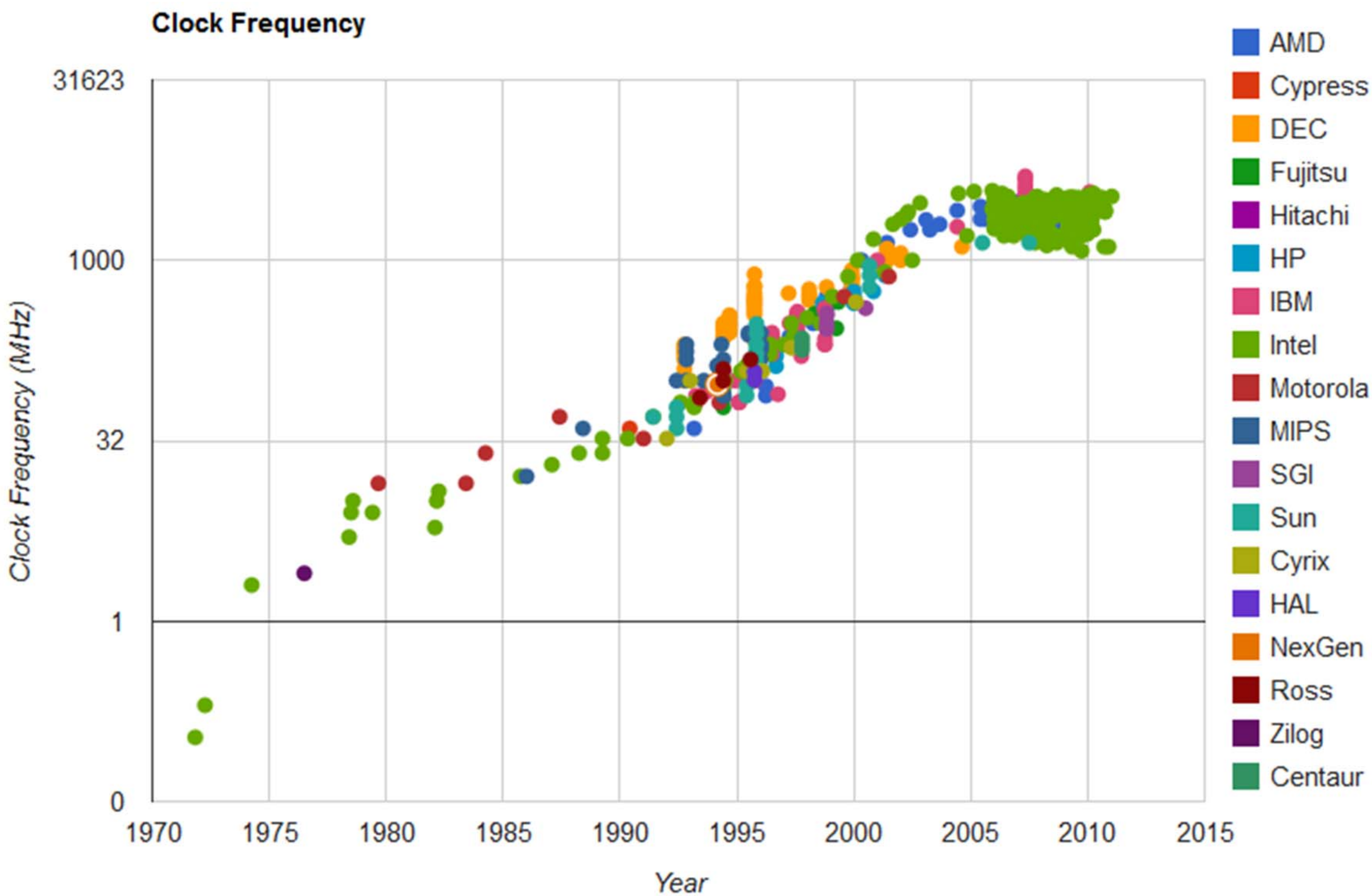

http://cpudb.stanford.edu

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Next time: the hard case, where shared data is required

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- Pure functions enable an abstraction barrier between data processing logic and distributed system administration

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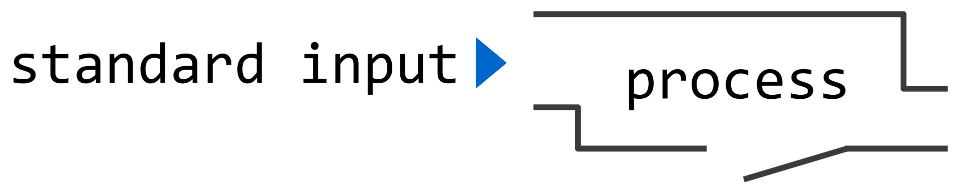

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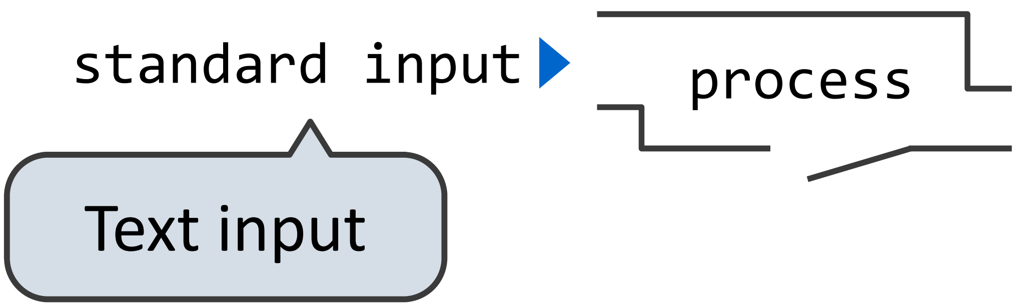

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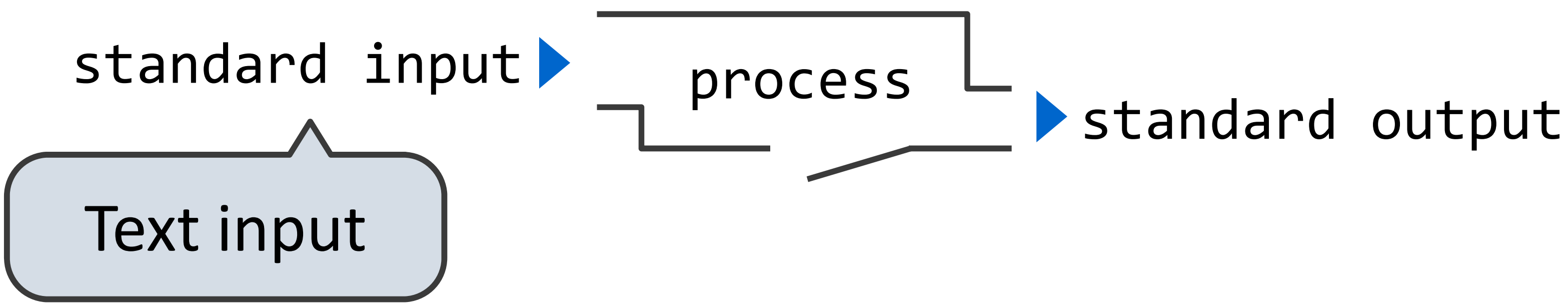

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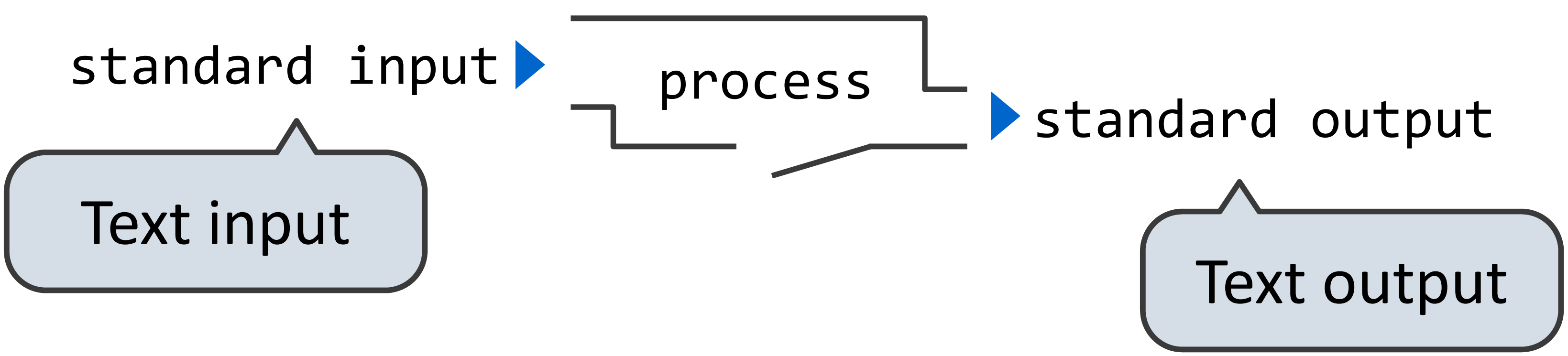

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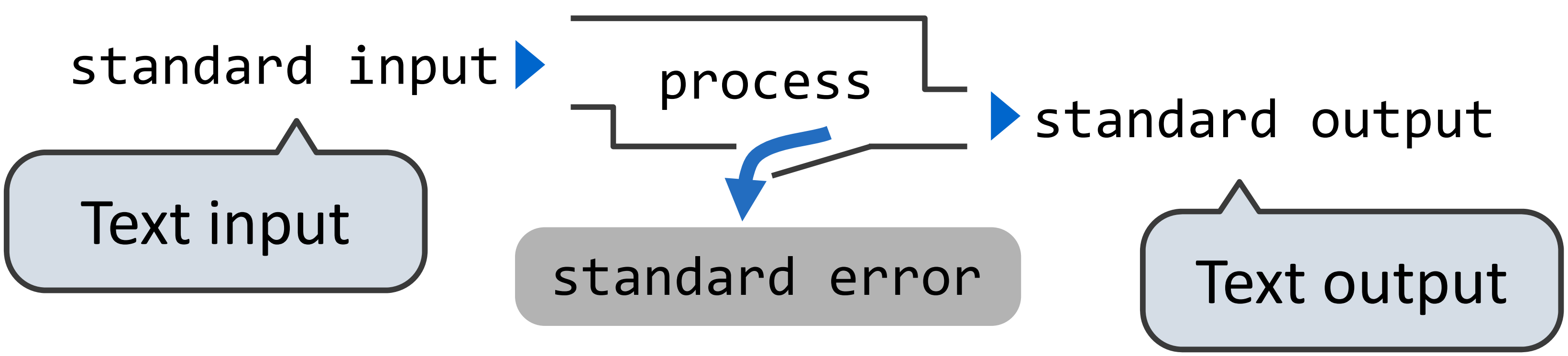

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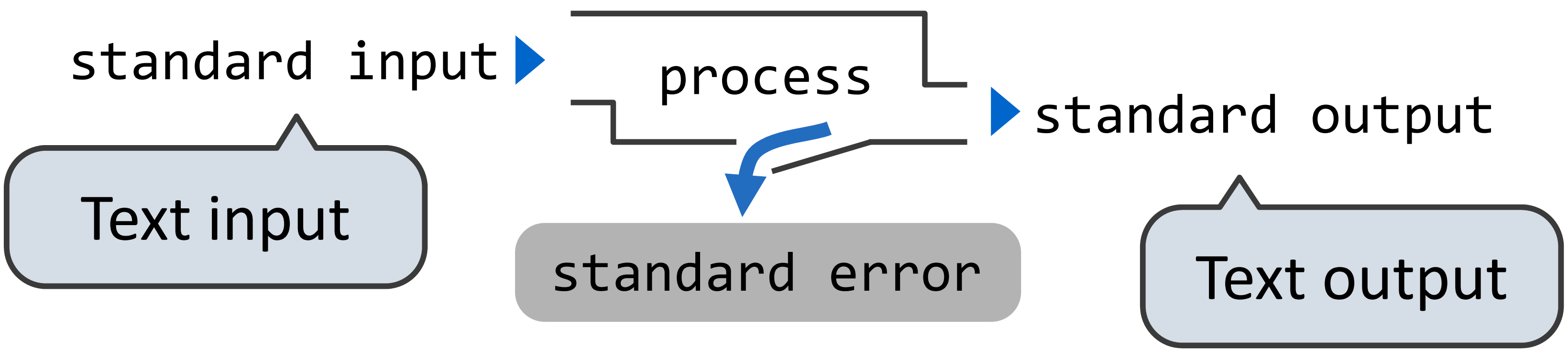

The ***standard streams*** in a Unix-like operating system are conceptually similar to Python iterators

Python Programs in a Unix Environment

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Using these "files" takes advantage of the operating system *standard stream* abstraction

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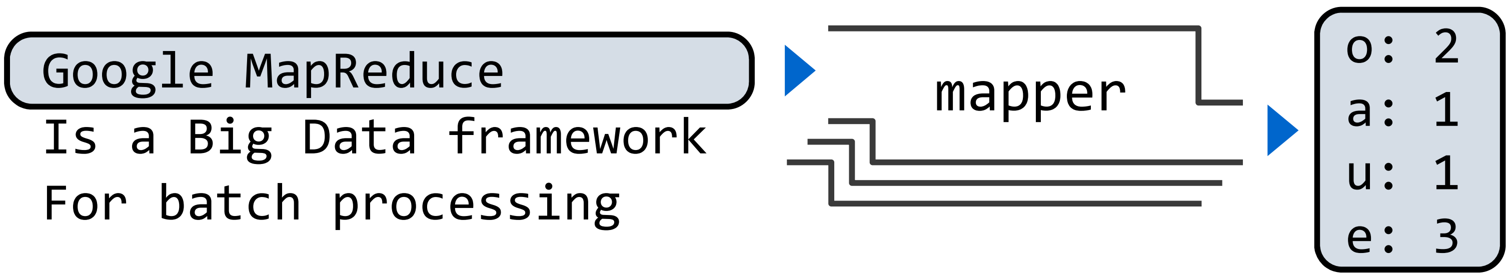

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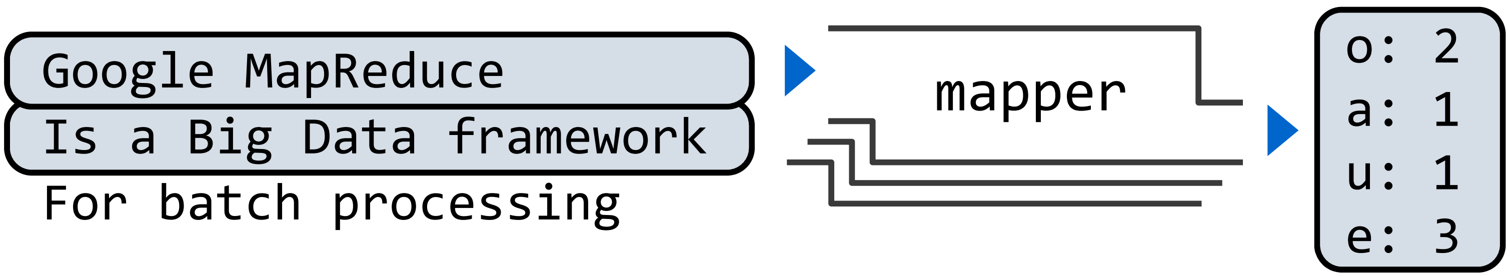

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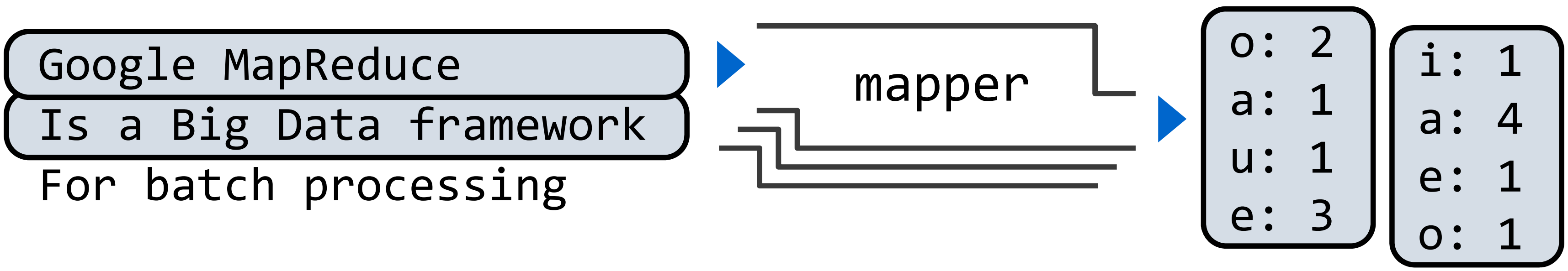

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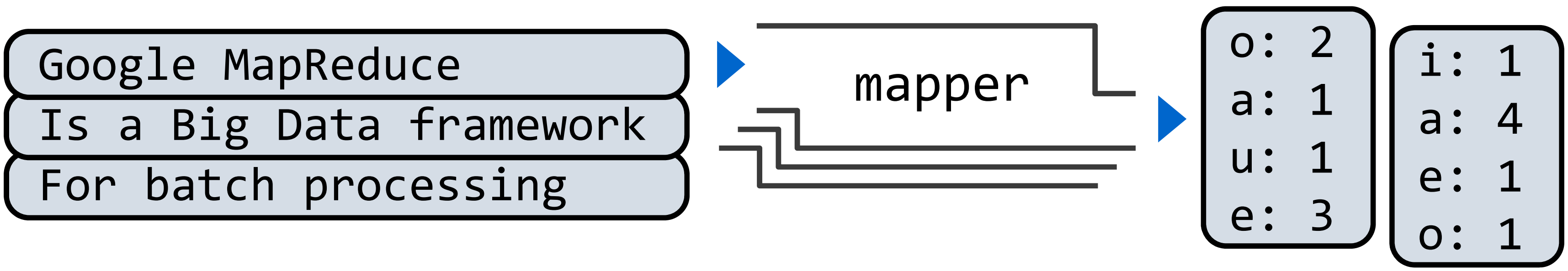

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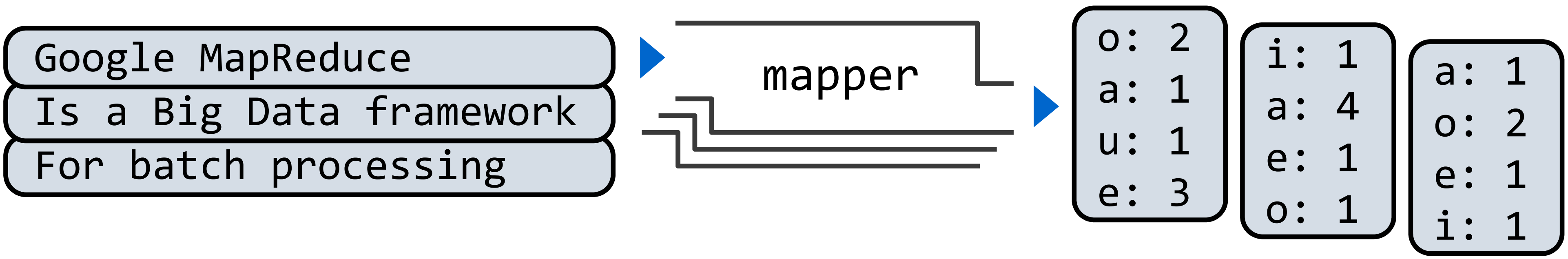

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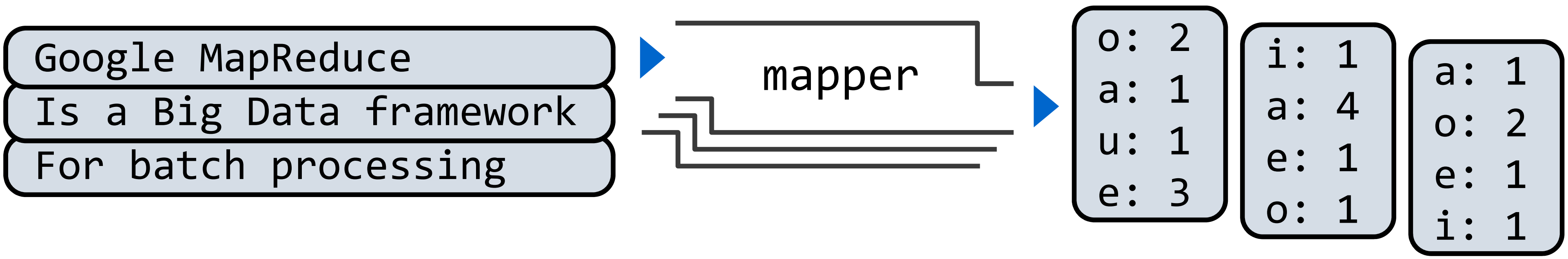

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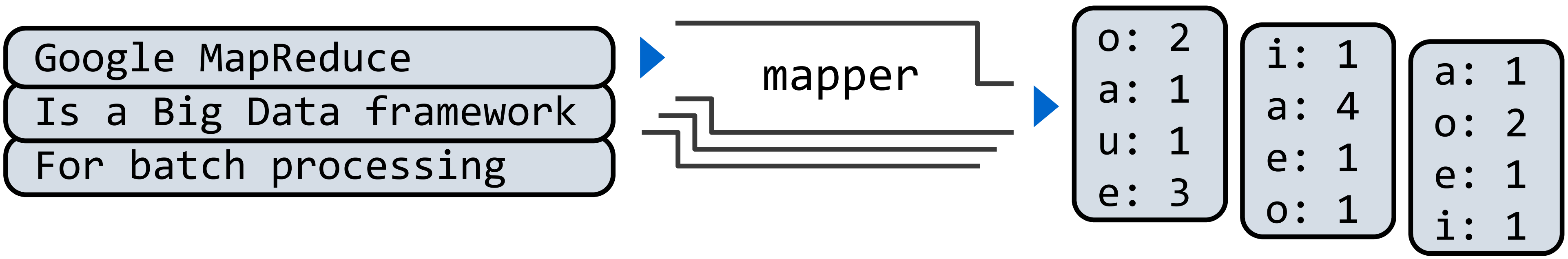

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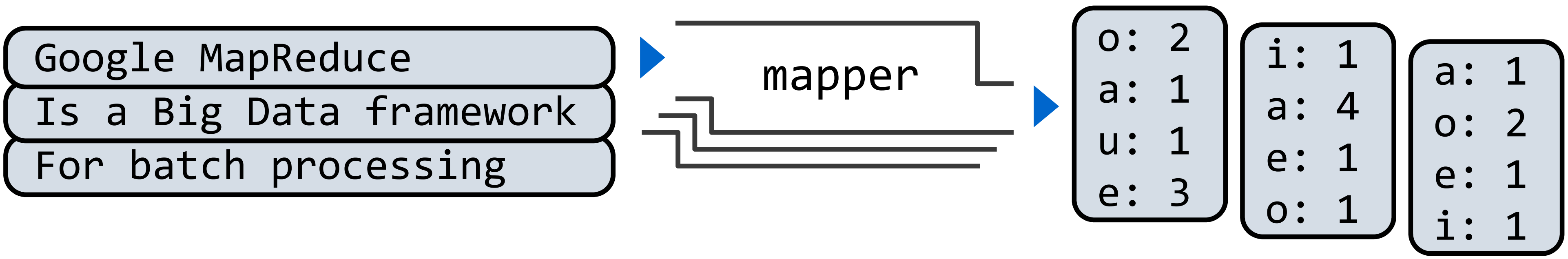

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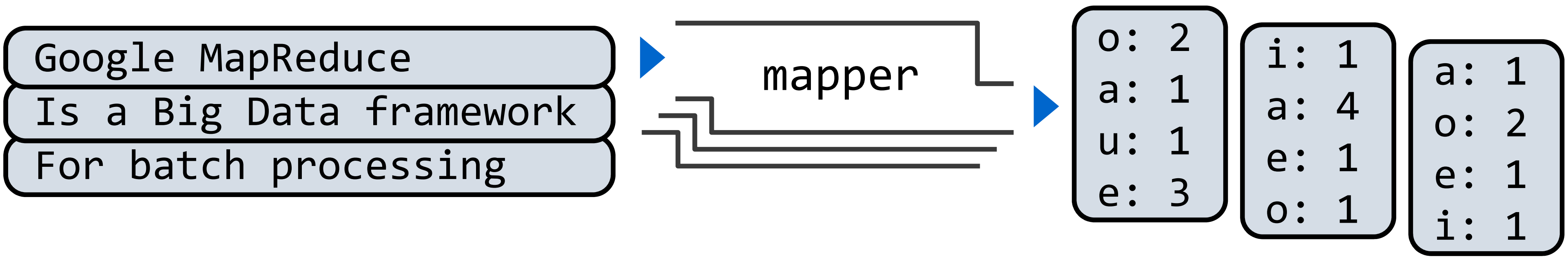

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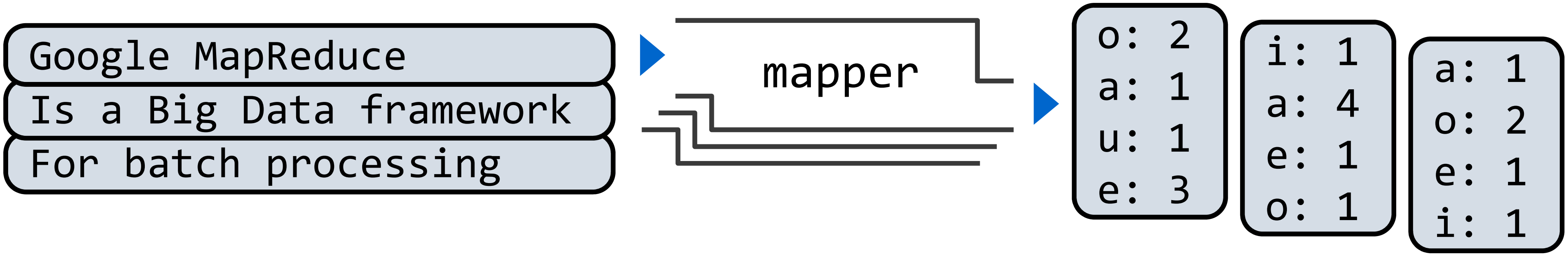

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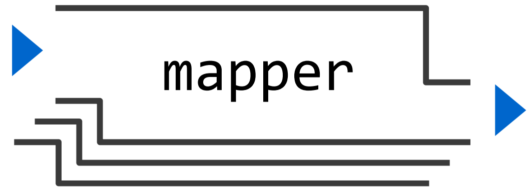


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a: 1
u: 1
e: 3
```

```
i: 1
a: 4
e: 1
o: 1
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o: 2
e: 1
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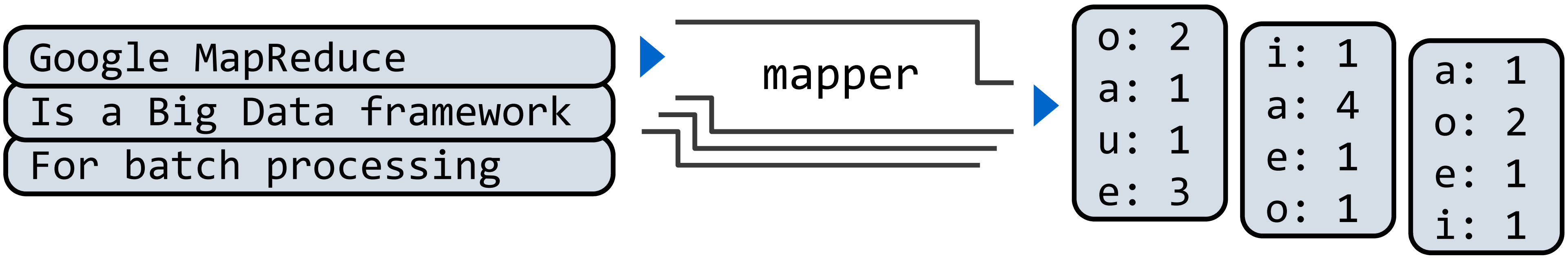

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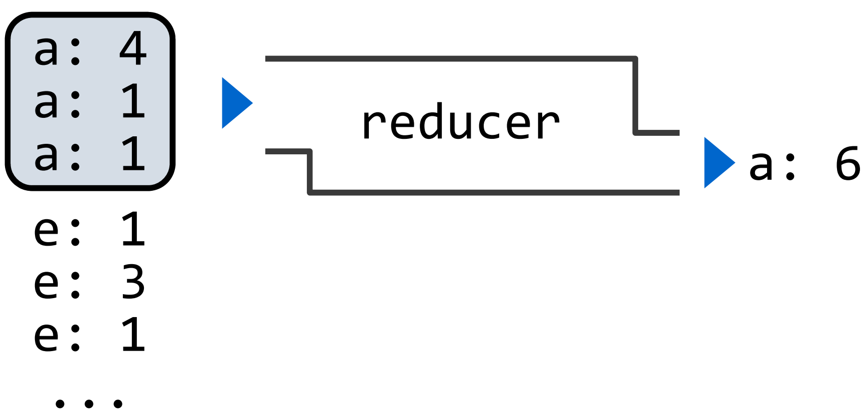

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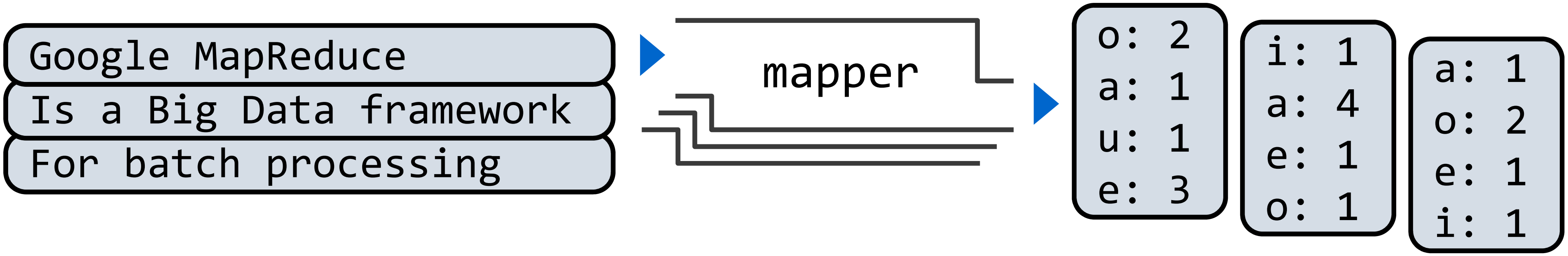

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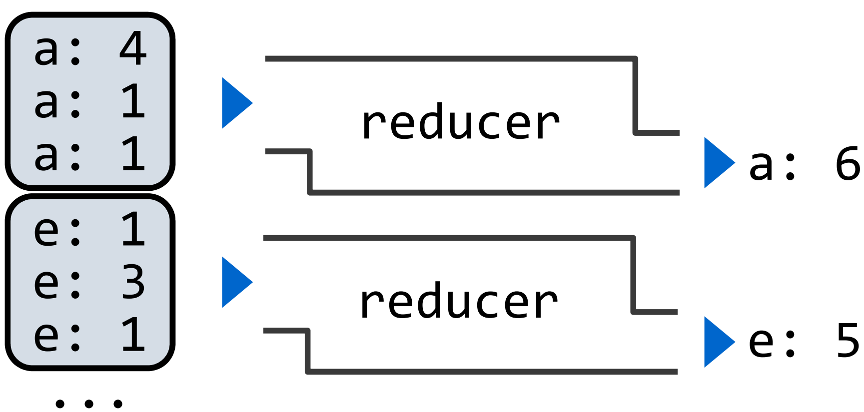

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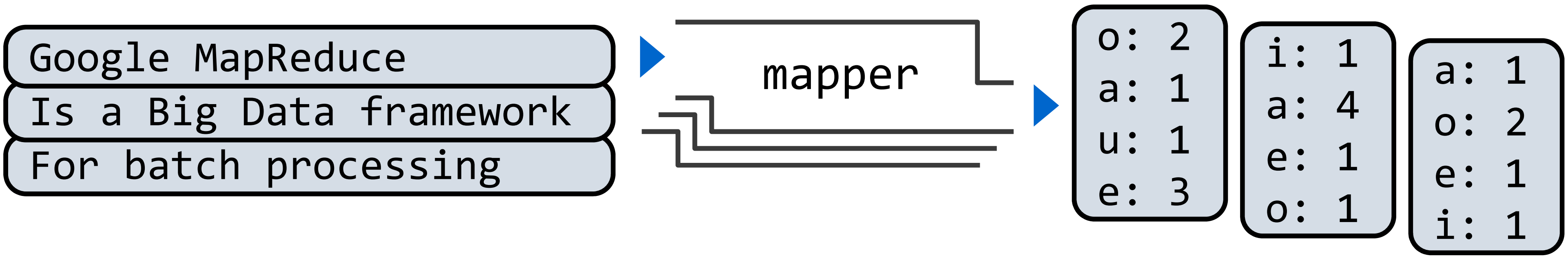

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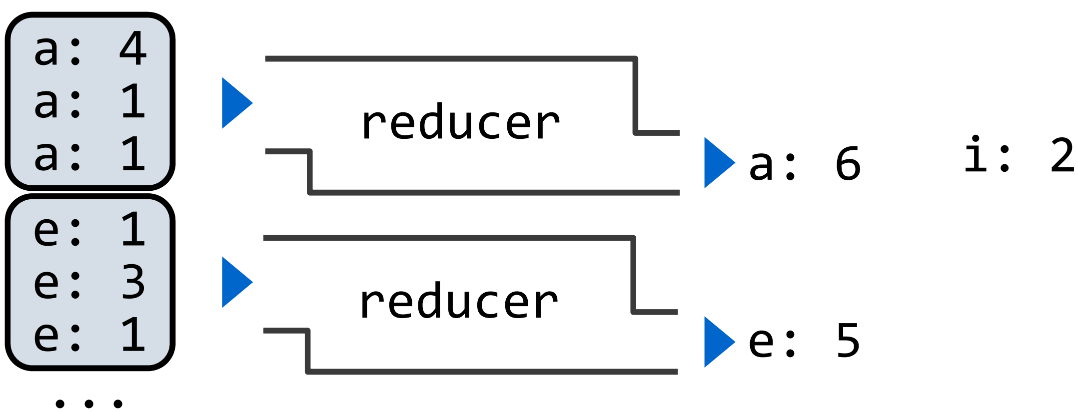

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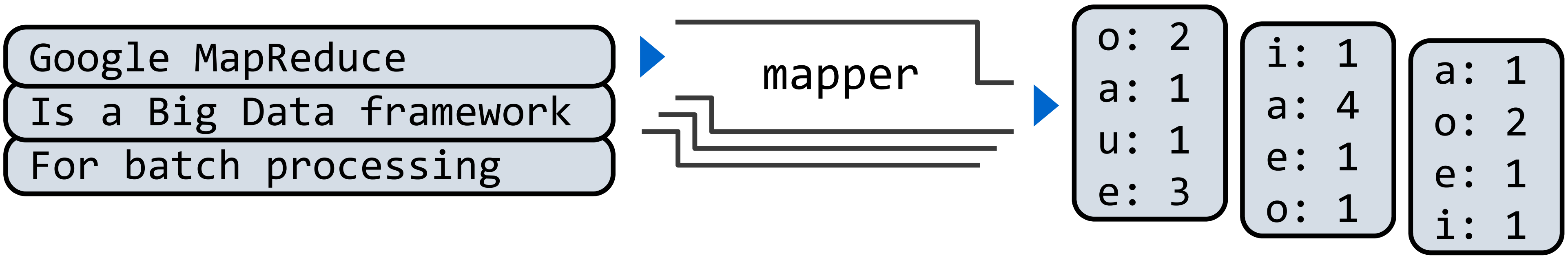
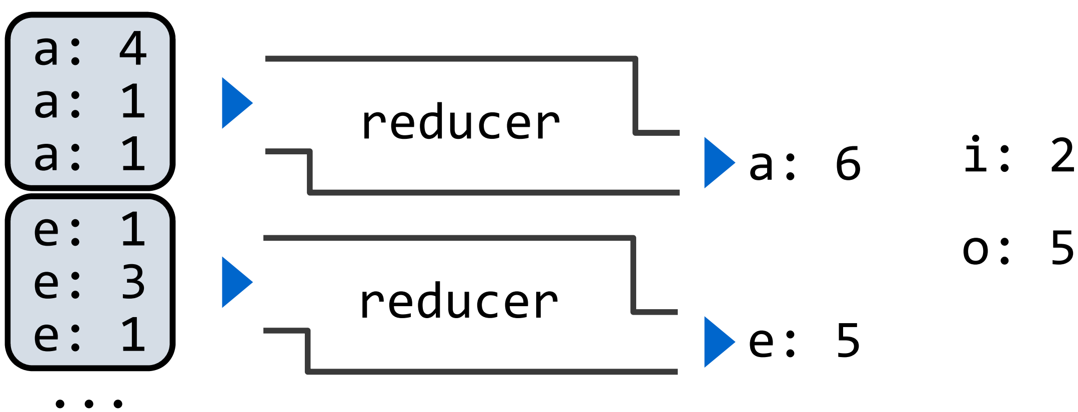


Reduce phase: For each intermediate key, apply a *reducer* function to accumulate all values associated with that key

- The *reducer* takes an iterator over key-value pairs
- All pairs with a given key are consecutive
- The *reducer* yields 0 or more values, each associated with that intermediate key



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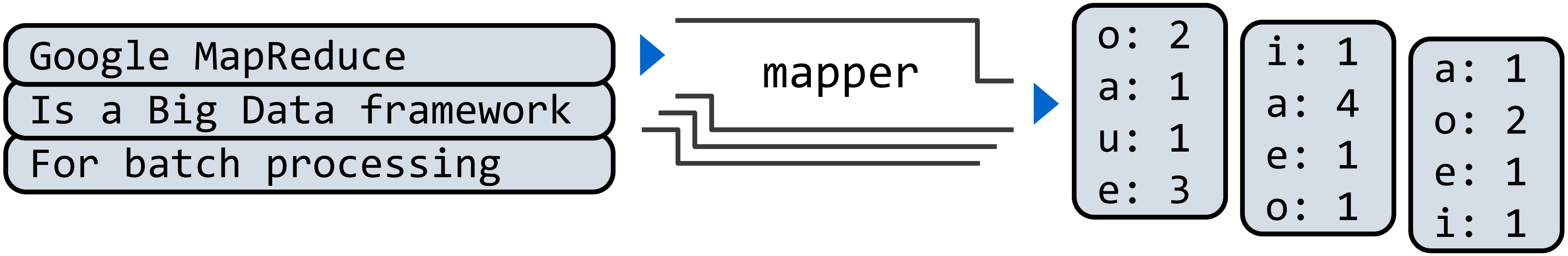

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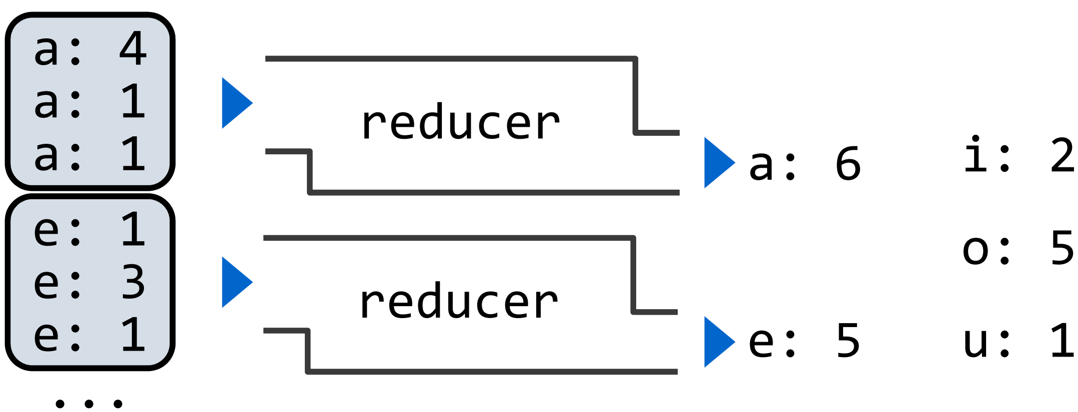
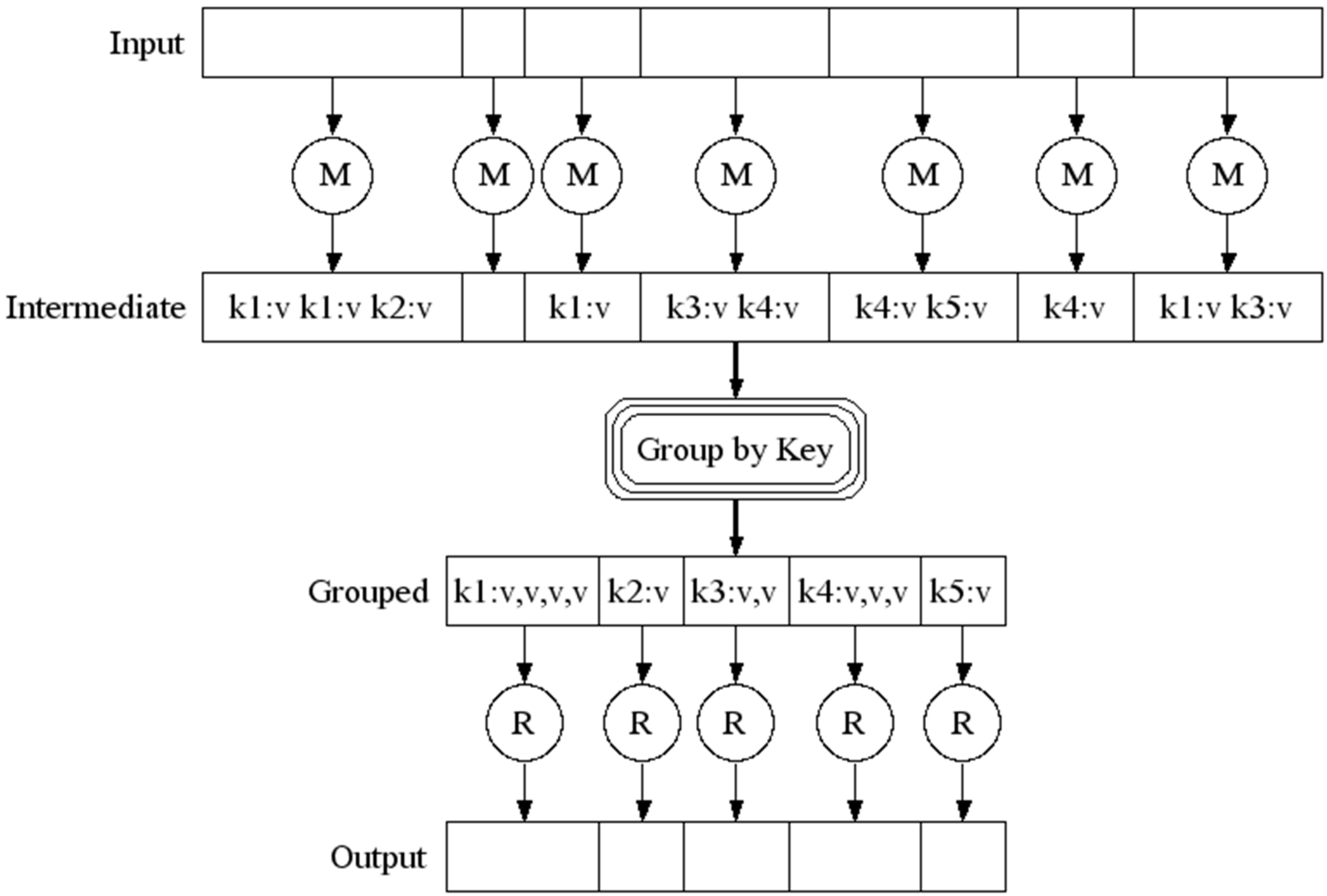
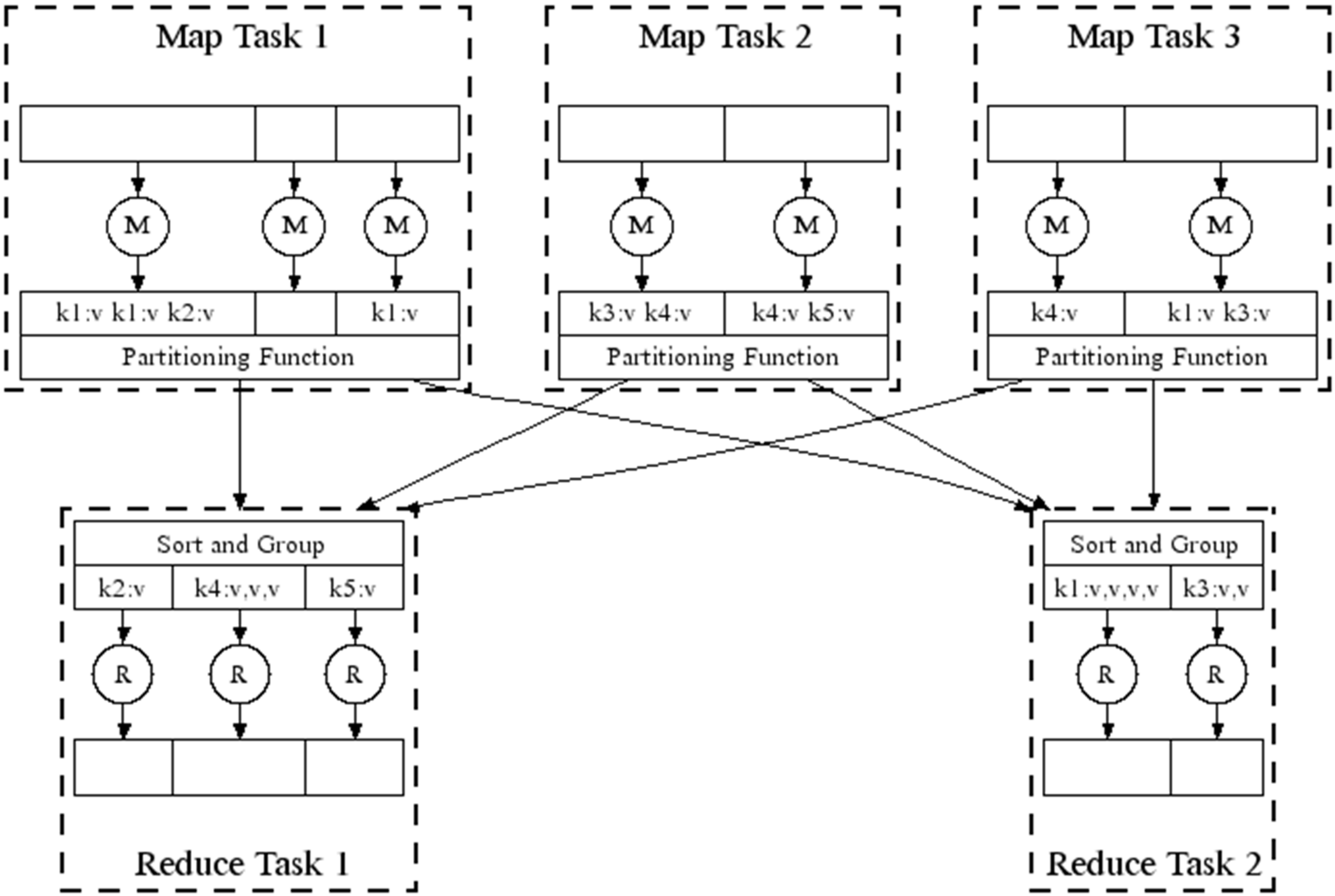


Above-the-Line: Execution Model



http://research.google.com/archive/mapreduce-osdi04-slides/index-auto-0007.html

Below-the-Line: Parallel Execution



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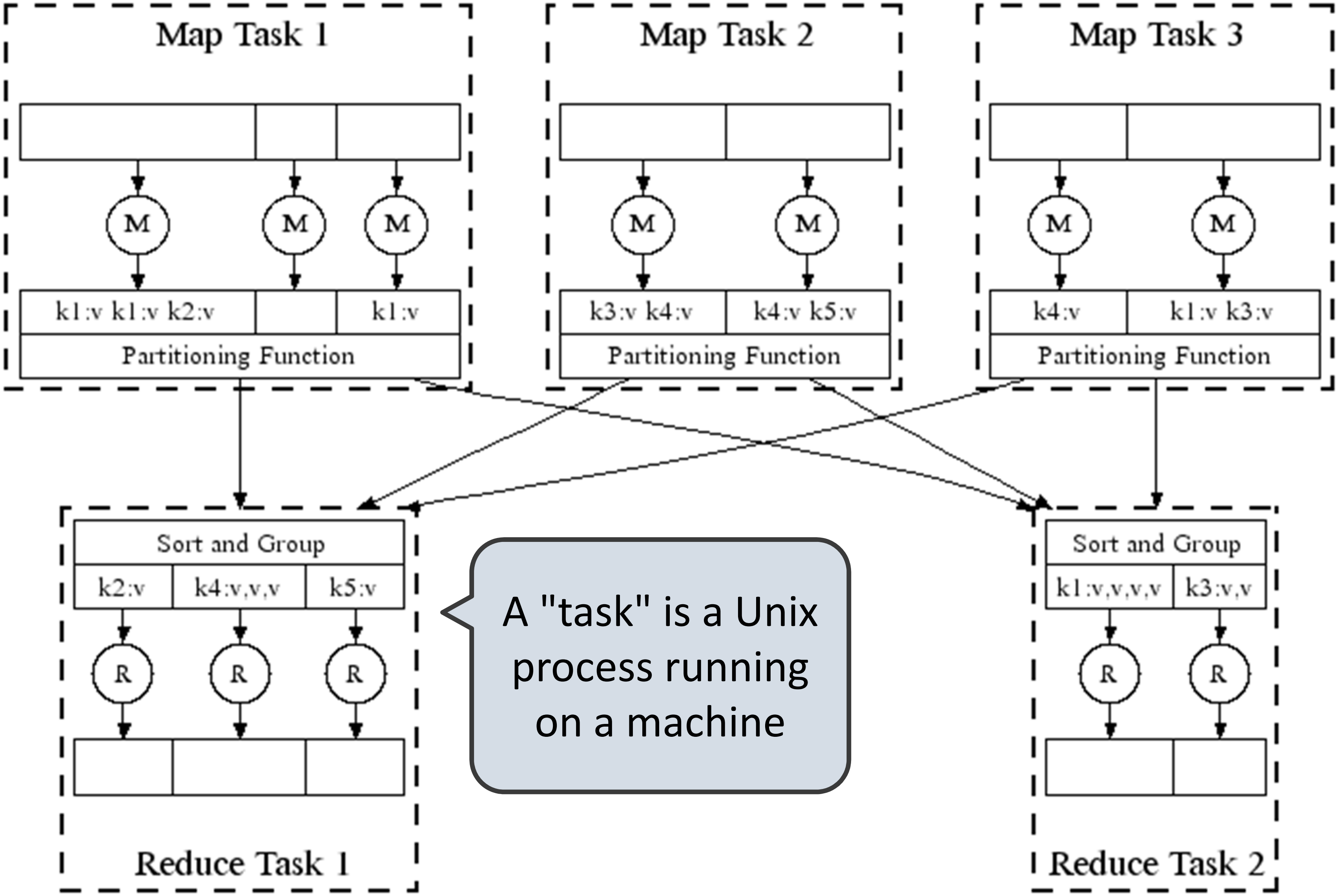

A "task" is a Unix process running on a machine

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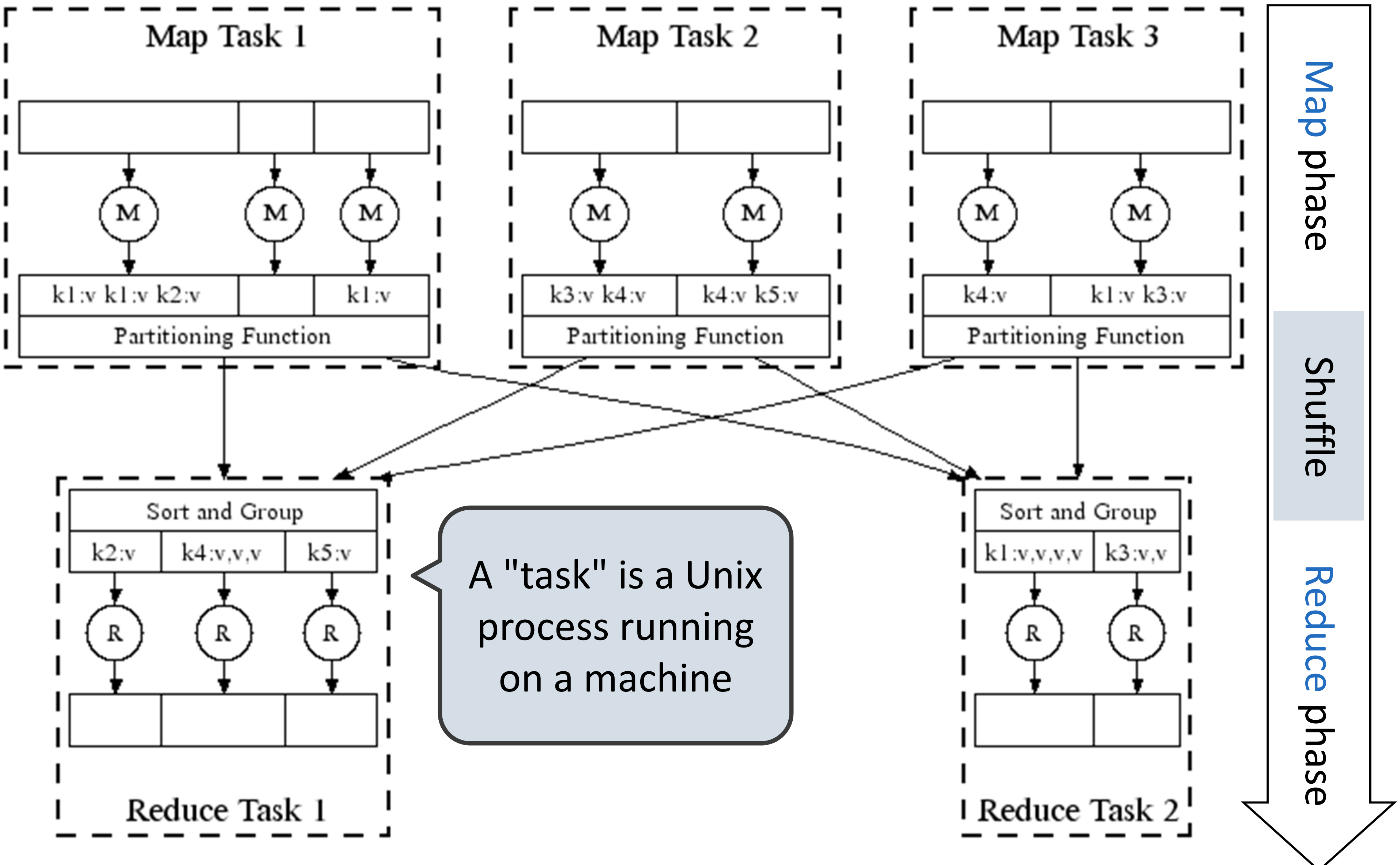

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- Consistent results, however computation is partitioned
- Re-computation and caching of results, as needed

Python Example of a MapReduce Application

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```
for key, value_iterator in group_values_by_key(sys.stdin):
    emit(key, sum(value_iterator))
```

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- The framework provides a web-based interface describing jobs