Based on Functional Programming

Map = apply operation to all elements

Reduce = summarize operation on elements

f (x) = y

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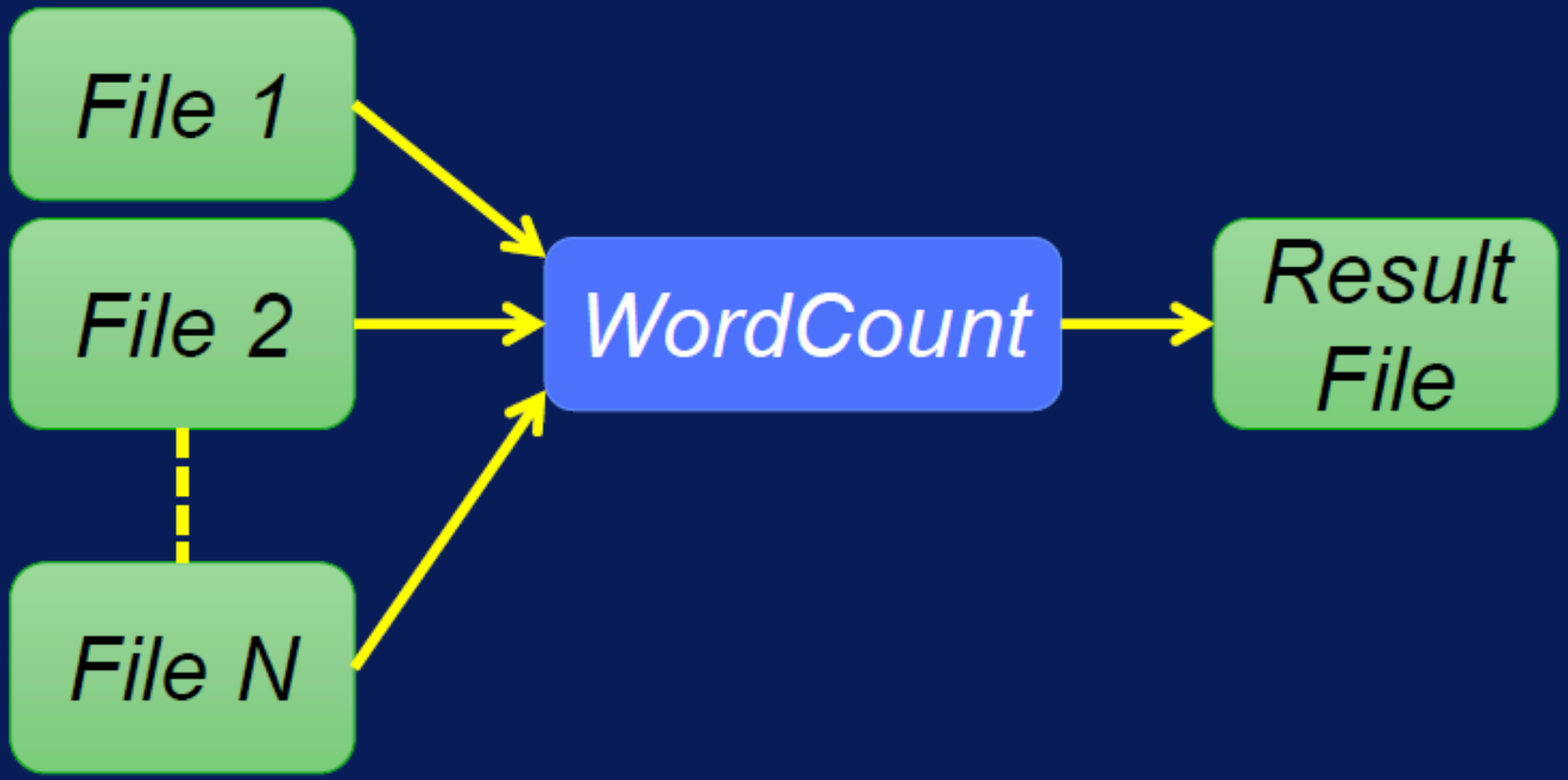
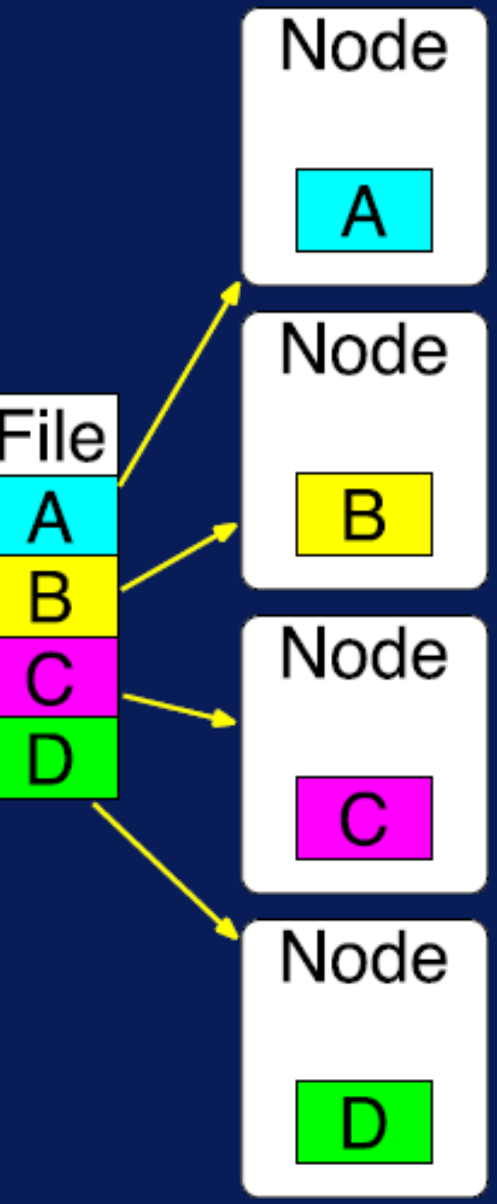
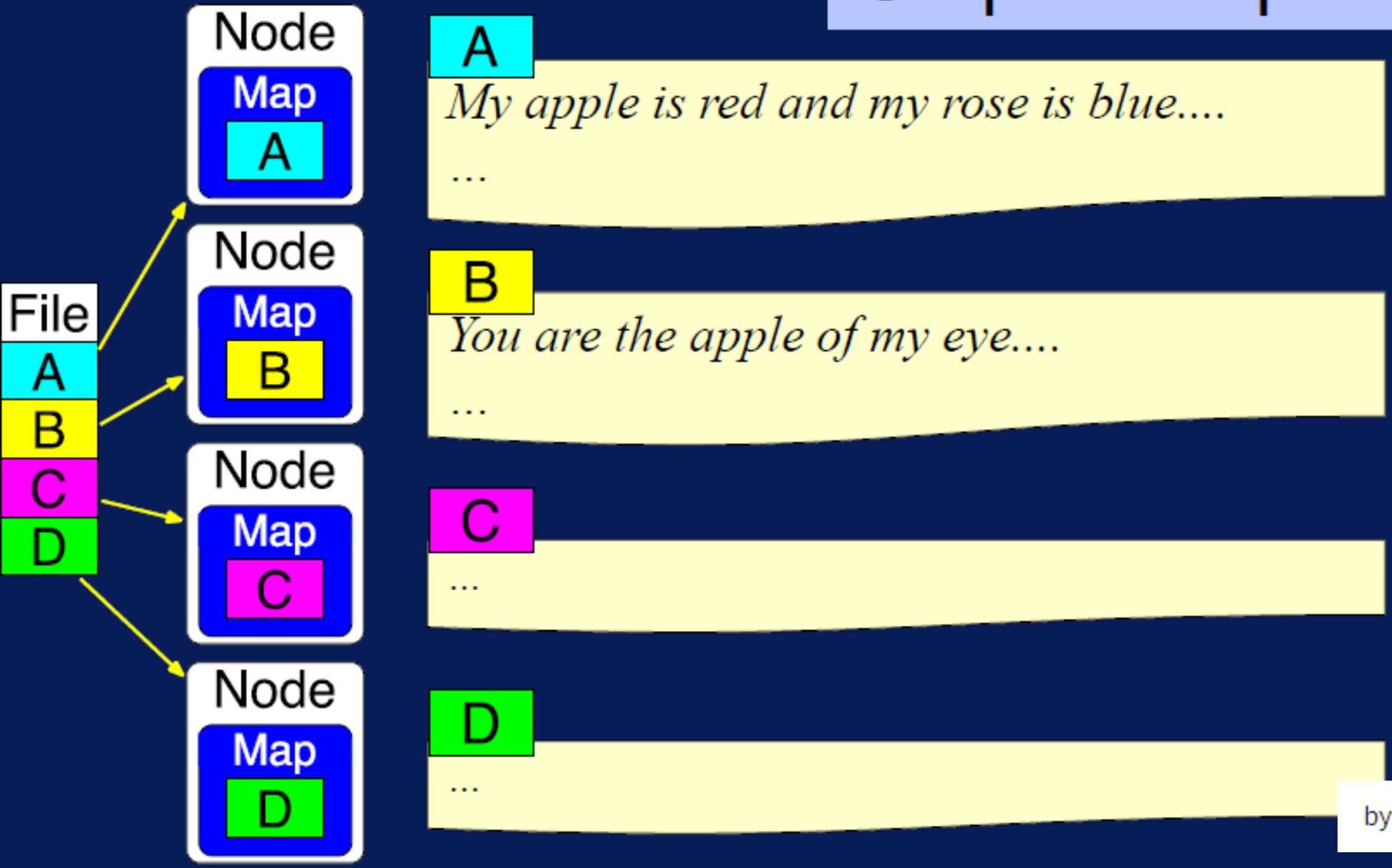
Example MapReduce Application: WordCount



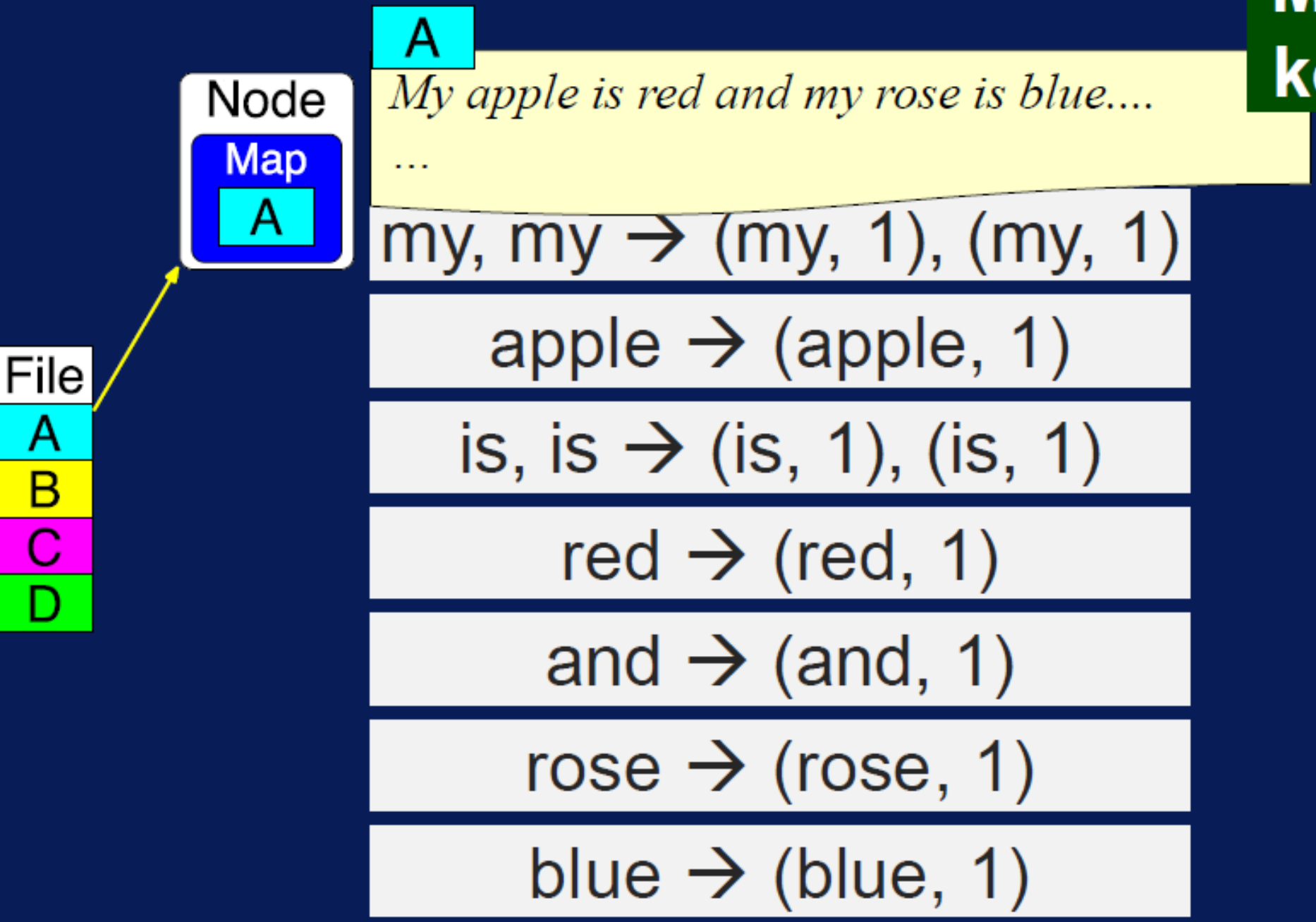
Step 0: File is stored in HDFS



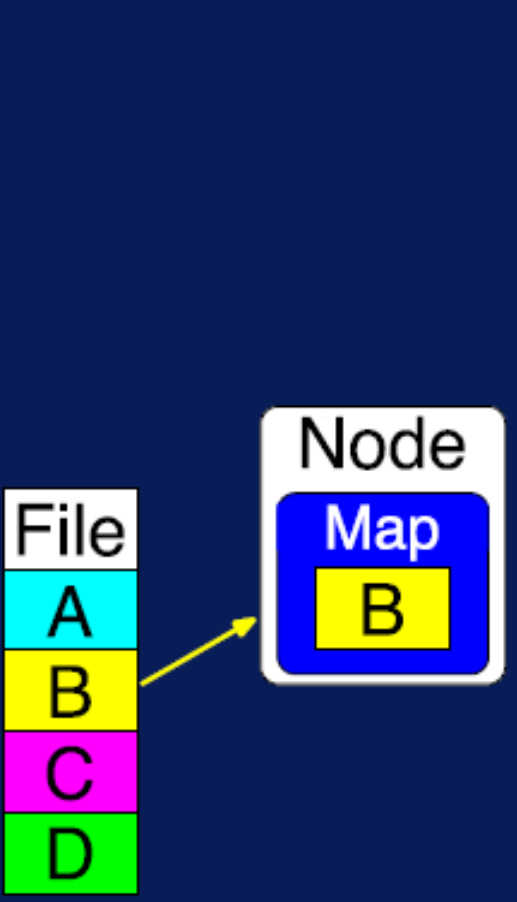
Step 1: Map on each node



Map generates key-value pairs



Map generates key-value pairs



B

You are the apple of my eye....

...

You → (You, 1)

are → (are, 1)

the → (the, 1)

apple → (apple, 1)

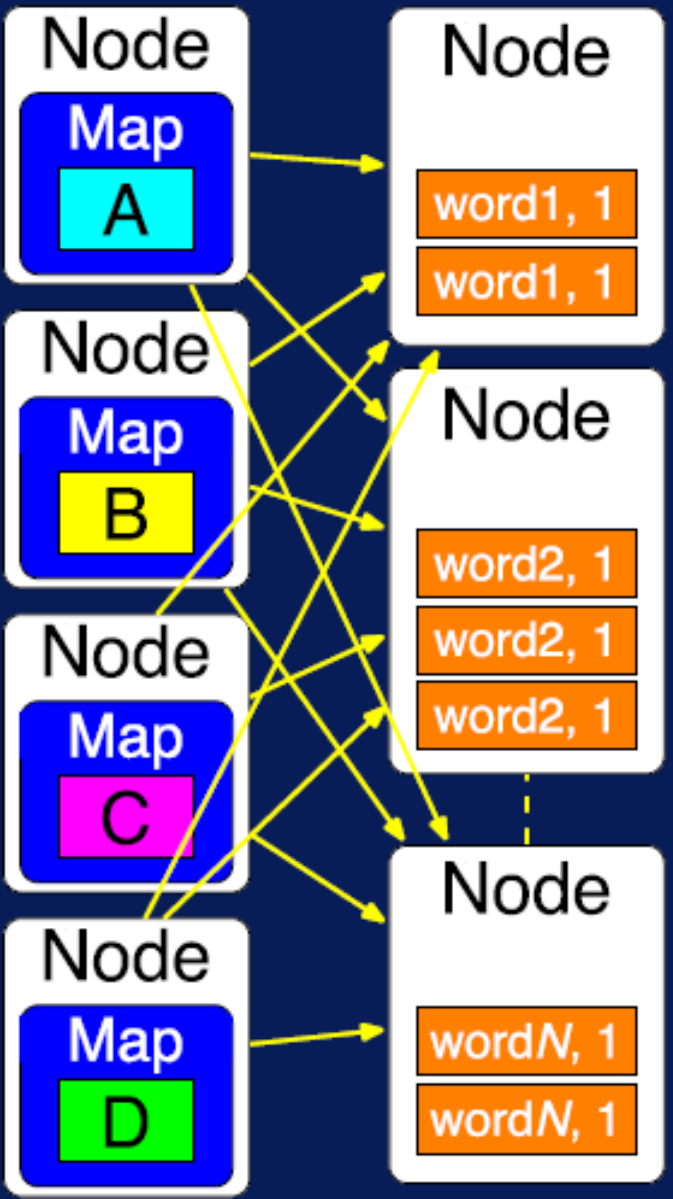
of → (of, 1)

my → (my, 1)

eye → (eye, 1)

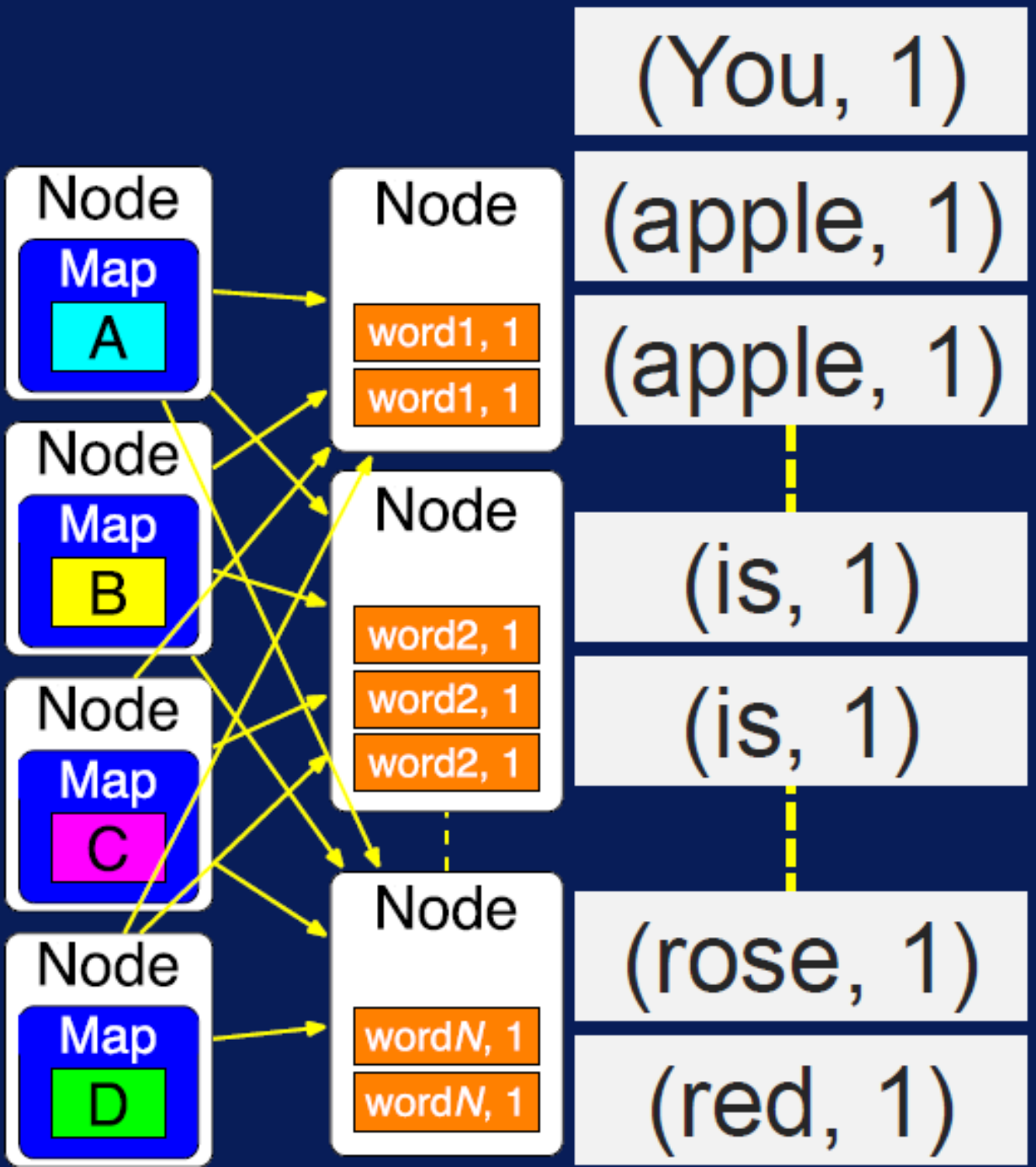
Step 2: Sort and Shuffle

Pairs with same key moved to same node



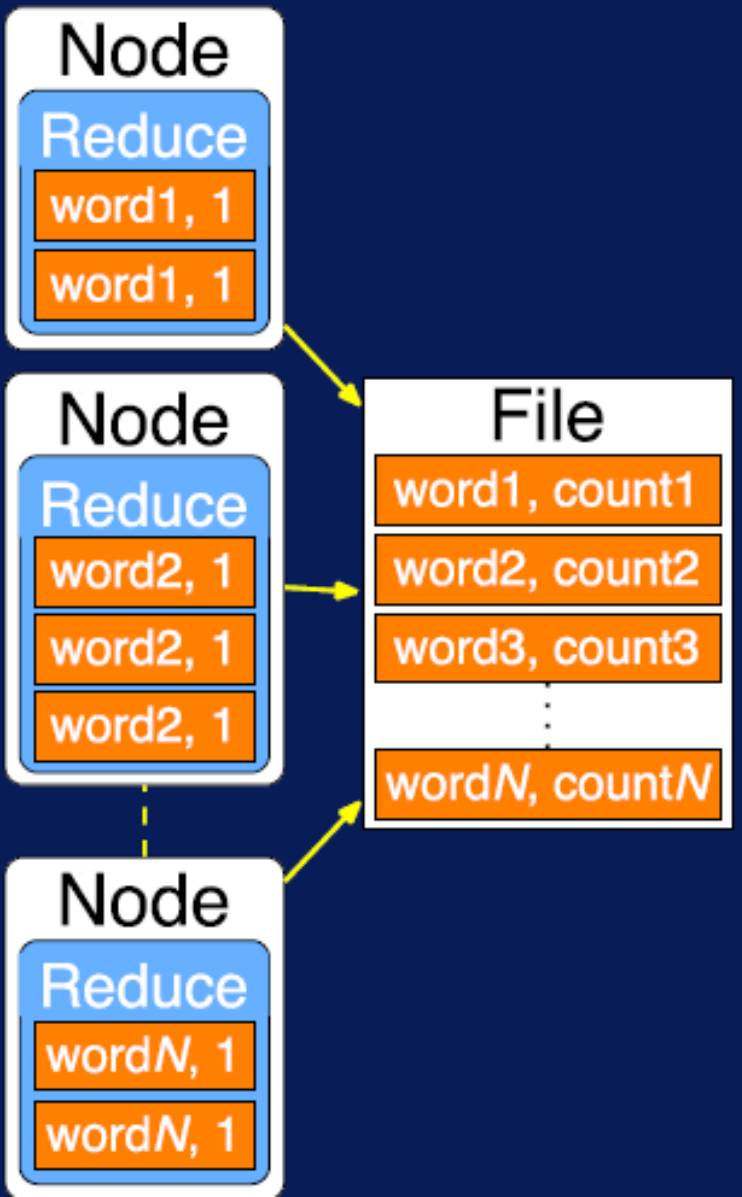
Step 2: Sort and Shuffle

Pairs with same key moved to same node



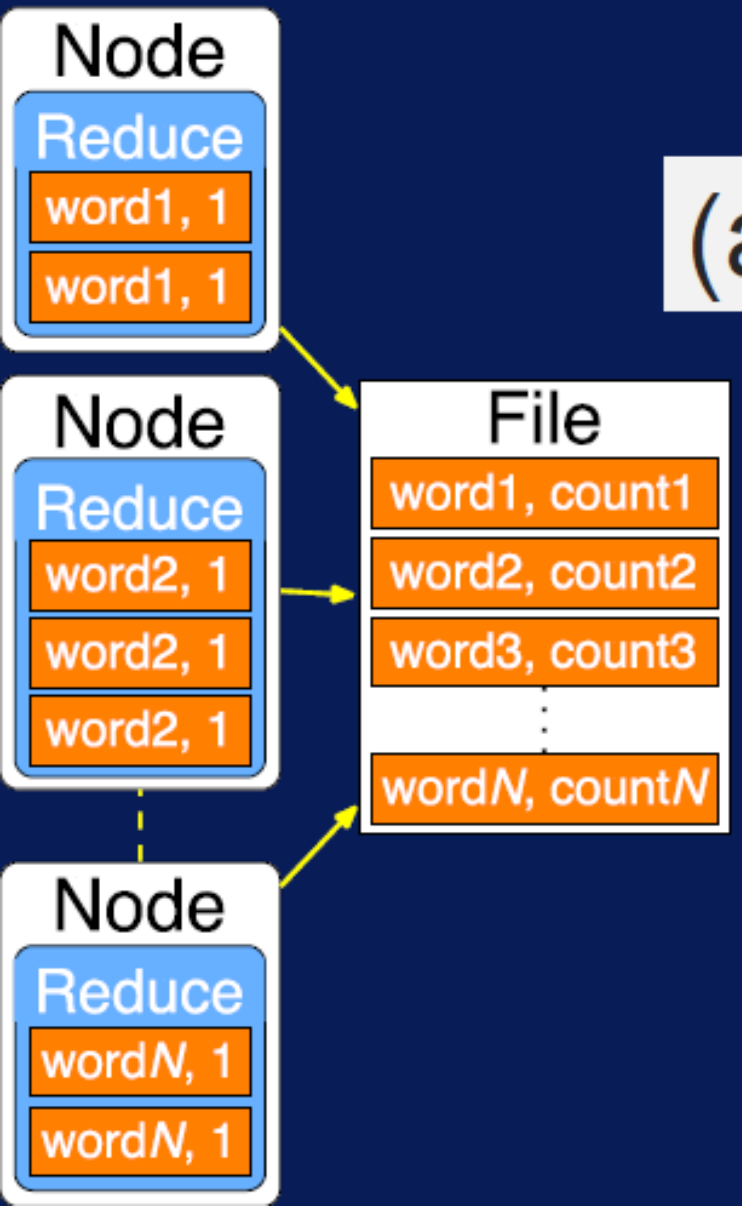
Step 3: Reduce

Add values for same keys



Step 3: Reduce

Add values for same keys



(You, 1) → (You, 1)

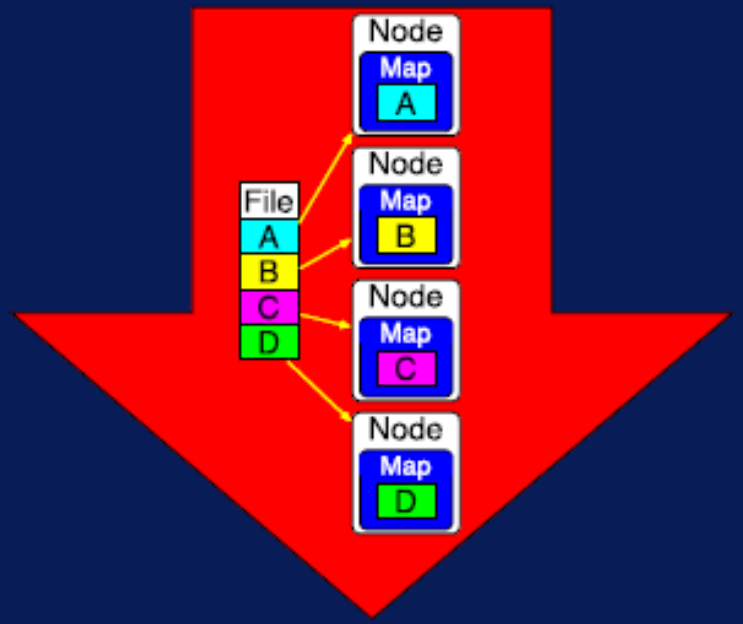
(apple, 1), (apple, 1) → (apple, 2)

(my, 1), (my, 1), (my, 1) → (my, 3)

(red, 1) → (red, 1)

(rose, 1) → (rose, 1)

Map → Shuffle and Sort → Reduce



Parallelization over the input

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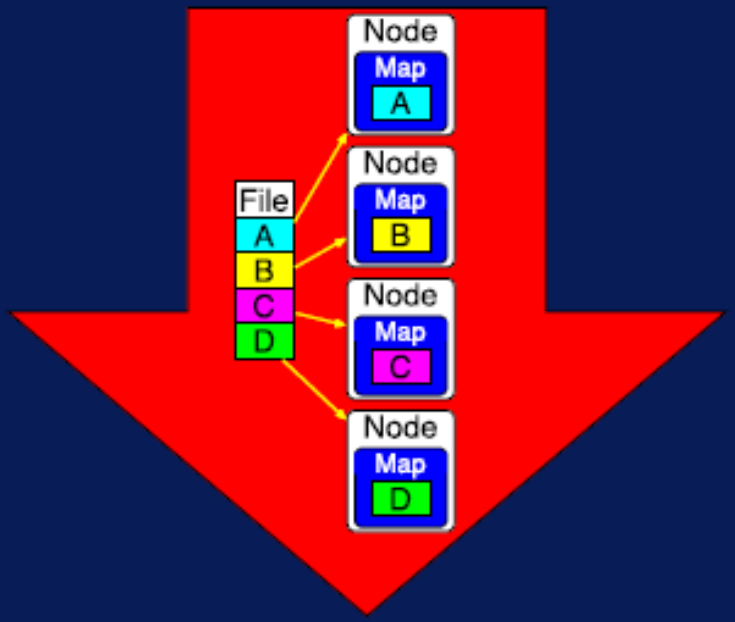
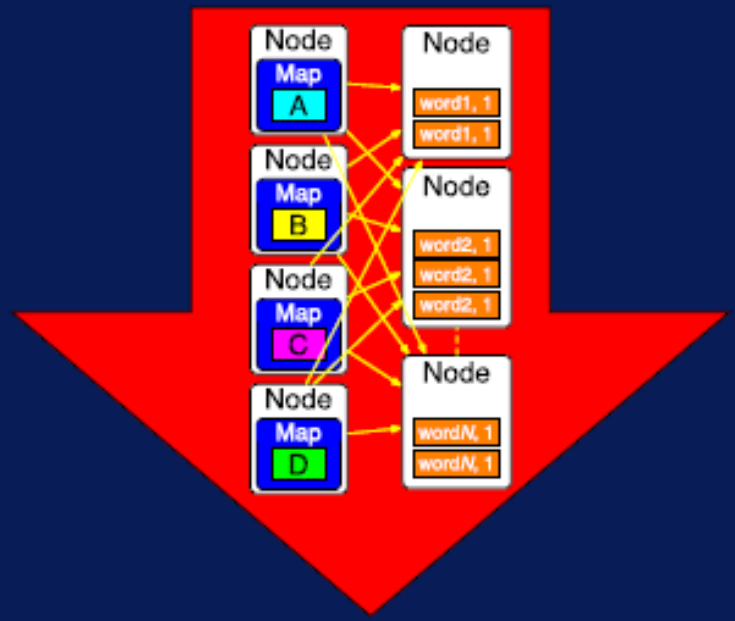
Map → Shuffle and Sort → Reduce



Parallelization over the input



Parallelization data sorting

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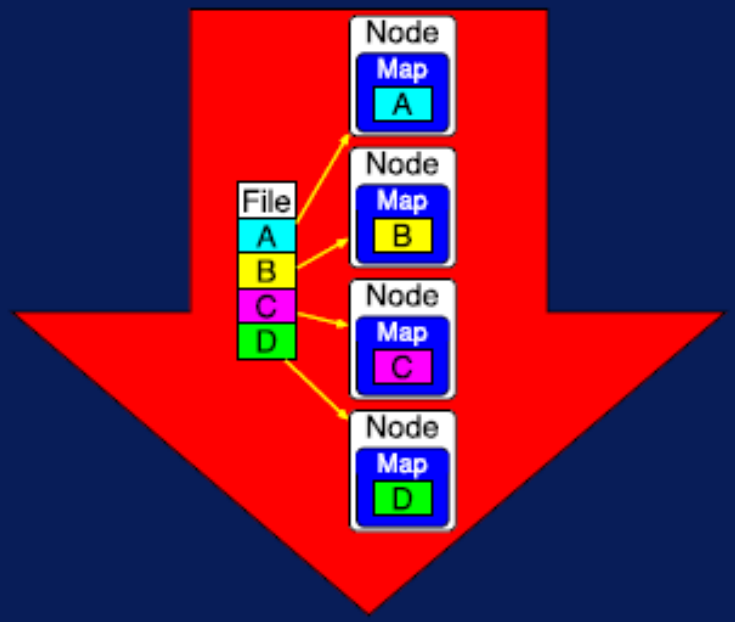
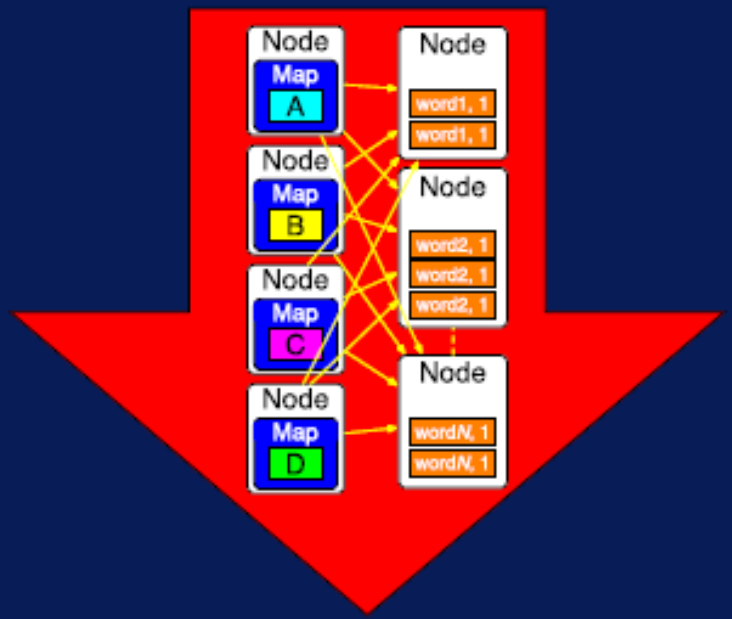
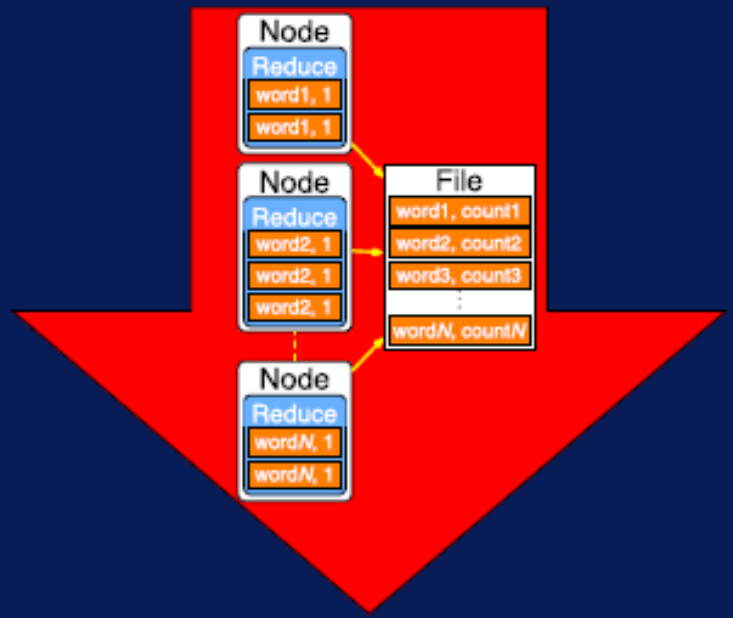
Map

Shuffle and Sort

Reduce







Parallelization over the input

Parallelization over intermediate data

Parallelization over data groups

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