Google Field Trip

Not Going: 31
ABES, NATHAN CRES
ALBRIGHT, ANDREW WILLIAM
AUYANG, AUDREY
BREST, JORDAN BARRY
BUI, DUONG PHAM THUY
CHANG, KYLIE (KYLE)
CHEUNG, ANNE
CHEW, JOSEPHINE KWOK LAN
DHUME, SHIBANI SUNIL
DO, ALLAN AN
DO, AN-ANDREW DUC
DUGGAN, JOEL GREGORY
ENSHAIE, RYAN ARMAN
ENVERGA, IGII (JUAN MIGUEL PARAISO)
GUAN, ADA
HERNANDEZ, KEVIN
JUNEJA, KEVIN RAHUL
KISOR-SMITH, TAYLOR FREDERIC
KUNITSKIY, DMITRIY
LAU, ANDREA
LELAS, WOJCIECH VICTOR
LESHER, BILLY (WILLIAM CORONA)
LIGHT, EUGENE MELVIN JR.
MONTEVERDE, BENIGNO CARAIG
PARSONS, JASON WILLIAM
STEPHENSON, IAN PATRICK
TAI, CARY
TRAN, DERICK ANTHONY
TRAN, KHA MINH
TRUONG, MELODY MINH
TSAY, AILEEN JACHI

Eligible: 51
ALKHATIB, ALI SHAMSUDDIN
AU, JACKSON
BANH, RYAN VI
CHAN, HERMAN ANDREW
CHANG, VICTORIA T.
CHEN, ALVIN C.
CHEN, CHIEH JUNG JEROME
CHEN, SHIHUI
CHHOUR, KEVIN N.
CHO, YOUNG WOO
CHOW, ALBERT YONG RUI
CHUNG, THUY TRANG THANH
DOWNS, ALAN CRAIG
EGGLETON, MATTHEW JAMES
HAREYAN, ASHOT
HE, FULING
HONG, JEFFREY MATTHEW
HUANG, LILLIAN YI-CHORNG
JAIN, ABHINAV
JAYARETHINAM, MAGDALENE SHEEBA
JONES, JOSHUA TIMOTHY
KLINE, KURT MATTHEW
KUNISAKI, MICHAEL JING
LAM, DANNY Q.
LE, VIVIAN DANG
LEE, PHILLIP JORDAN
LIN, JAMIE
MACINTOSH, BRIAN ANTHONY
MAJID, USMAN MAHMOOD
MALIK, SAMAH AISHA
MANCILLA, RODOLFO
MONJI, ARCHIE TAKESHI
MONTEBON, GERARDINE MARIE GARCIA
MORA, PATRICIA
NGUYEN, PATRICK TAN
OKA, KASSANDRA S.
PAI, GRACE YUN-TING
PANLASIGUI, JEREMY BLAKE
PATEL, YASH ATMARAMBHAI
PEREZ, URIEL
PETROV, DELIAN EMILOV
PHAM, JANE THAO
PHAM, MATTHEW
SOOHOO, ZACHARY TAYLOR
STRAMER, ANTHONY L.
TAN, TIANHONG TIM
THIESSEN, BLAKE WEI-HSI
WEI, ANDREW HENRY
WONG, CHRISTOPHER SEBASTIAN
YAN, HUGO
ZHAO, YAN

MapReduce

Introduction to Information Retrieval
INF 141/ CS 121
Donald J. Patterson

Content adapted from Hinrich Schütze
http://www.informationretrieval.org

Distributed Indexing - Architecture

- 'MapReduce' is a framework for processing parallelizable problems across huge datasets using a large number of computers (nodes), collectively referred to as a cluster.
- Computational processing can occur on data stored either in a filesystem (unstructured) or in a database (structured).
- MapReduce can take advantage of locality of data, processing data on or near the storage assets to decrease transmission of data.

wikipedia

Distributed Indexing - Architecture

- "Map" step: The master node takes the input, divides it into smaller sub-problems, and distributes them to worker nodes.
- The worker node processes the smaller problem, and passes the answer back to its master node.
- "Reduce" step: The master node then collects the answers to all the sub-problems and combines them in some way to form the output – the answer to the problem it was originally trying to solve.

wikipedia

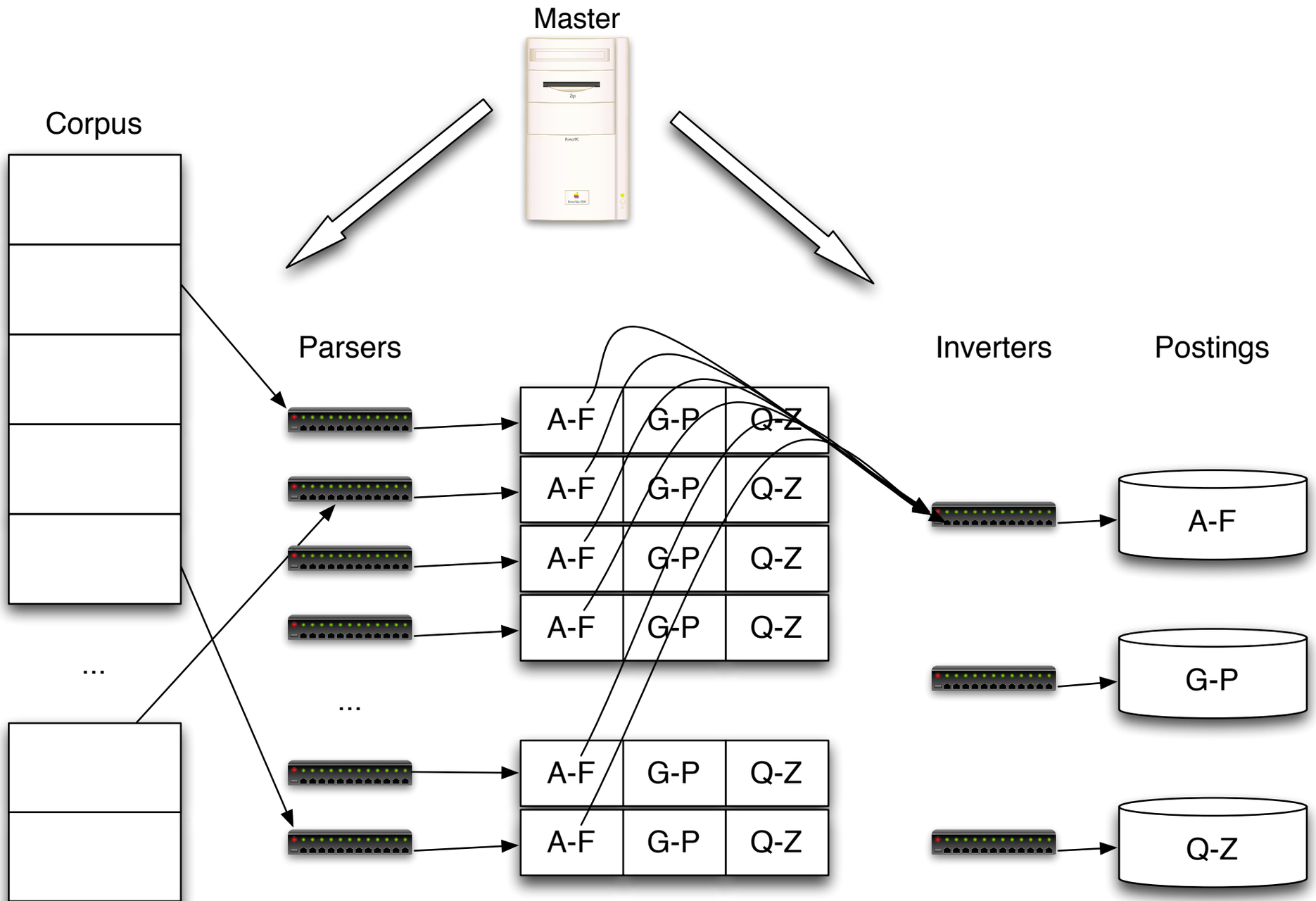
Distributed Indexing - Architecture

- Generally speaking in MapReduce
  - There is a map phase
    - This takes input and makes key-value pairs
    - this corresponds to the “parse” phase of BSBI and SPIMI
  - The map phase writes intermediate files
    - Results are bucketed into R buckets
- There is a reduce phase
  - This is the “invert” phase of BSBI and SPIMI
  - There are R inverters

Distributed Indexing - Architecture

- Use an instance of MapReduce
  - A general architecture for distributed computing jobs
  - Manages interactions among clusters of
    - cheap commodity compute servers
    - aka nodes
  - Uses Key-Value pairs as primary object of computation
  - An open-source implementation is “Hadoop” by apache.org

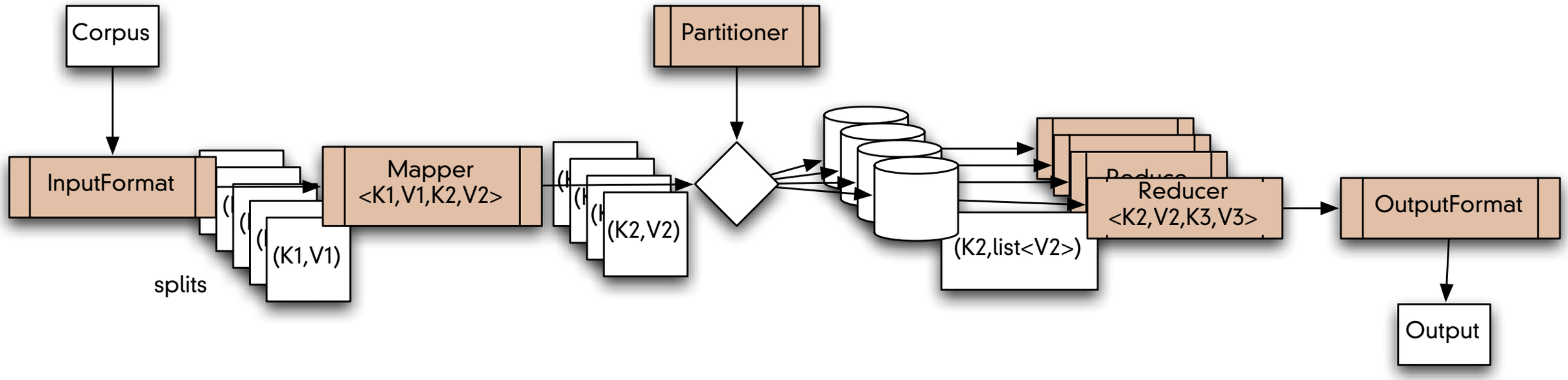
Distributed Indexing - Architecture



Distributed Indexing - Architecture

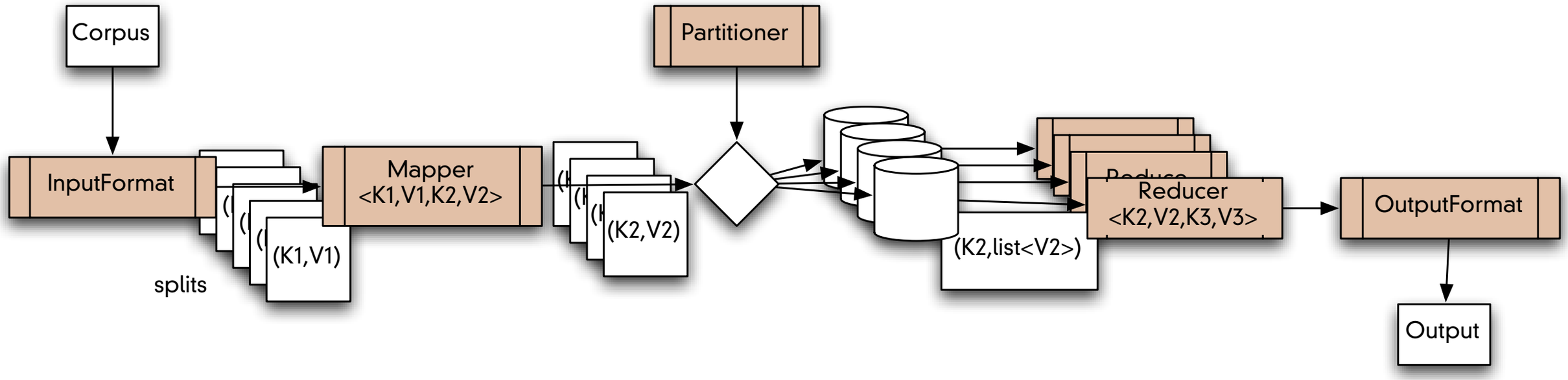
- Parsers and Inverters are not separate machines
  - They are both assigned from a pool
  - It is different code that gets executed
- Intermediate files are stored on a local disk
  - For efficiency
  - Part of the “invert” task is to talk to the parser machine and get the data.

Distributed Indexing - Hadoop



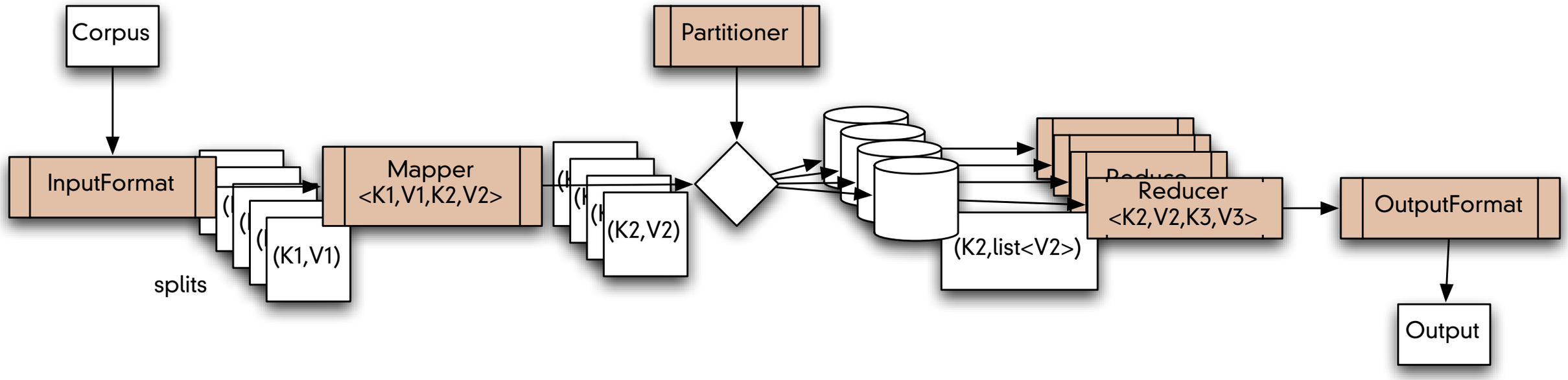
- InputFormat
  - Creates splits
  - One split is assigned to one mapper
  - A split is a collection of <K1,V1> pairs

Distributed Indexing - Hadoop



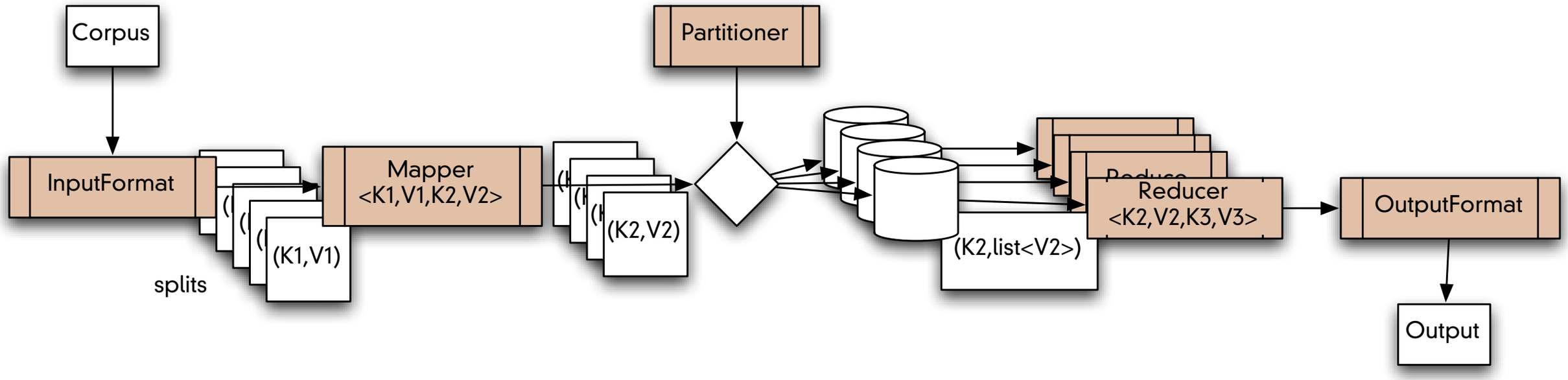
- InputFormat
  - Hadoop comes with NLineInputFormat which breaks text input into splits with N lines each
  - K1 = line number
  - V1 = text of line

Distributed Indexing - Hadoop



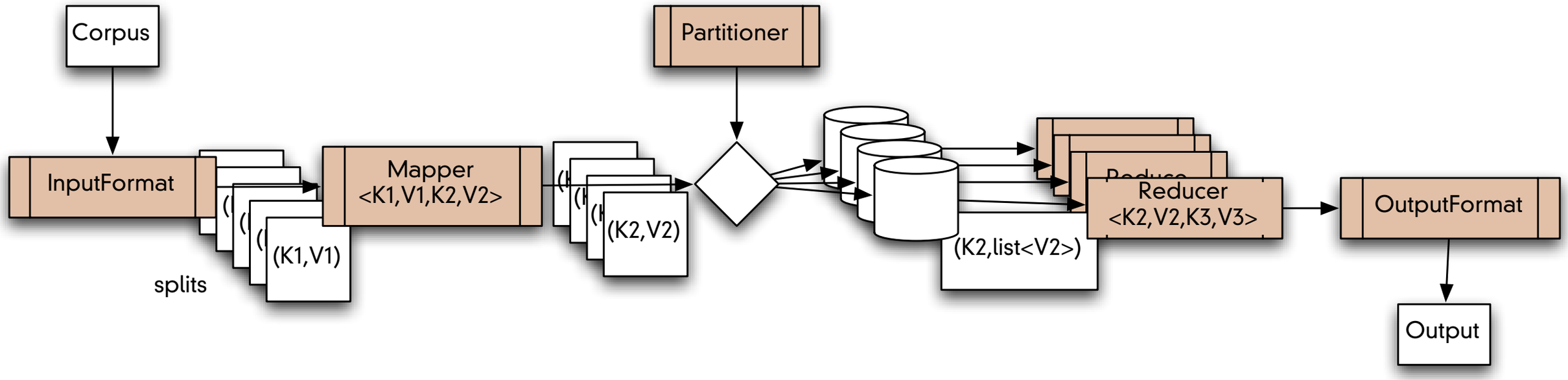
- Mapper<K1,V1,K2,V2>
  - Takes a <K1,V1> pair as input
  - Produces 0, 1 or more <K2,V2> pairs as output
  - Optionally it can report progress with a Reporter

Distributed Indexing - Hadoop



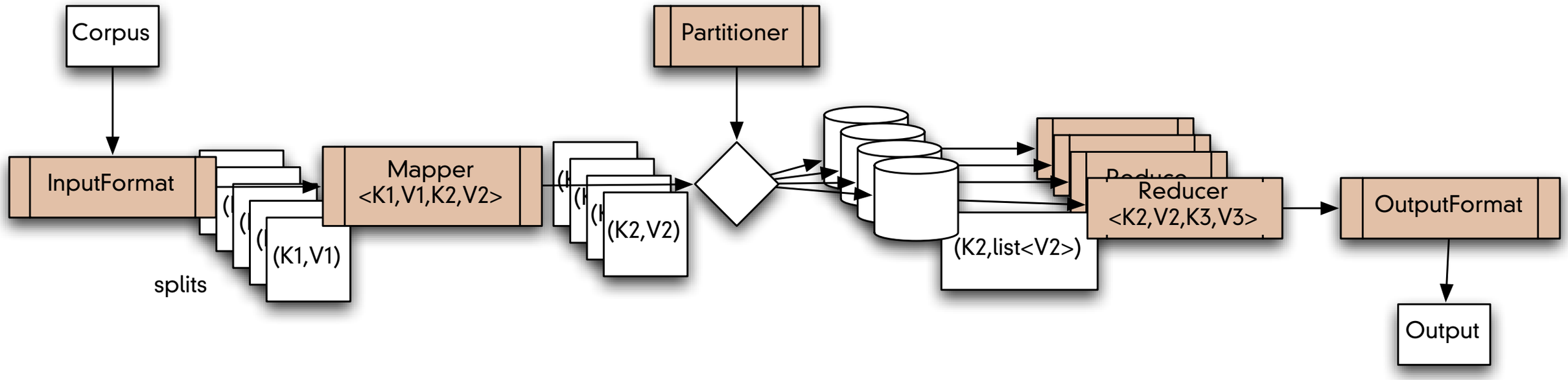
- Partitioner<K2,V2>
  - Takes a <K2,V2> pair as input
  - Produces a bucket number as output
  - Default is HashPartitioner

Distributed Indexing - Hadoop



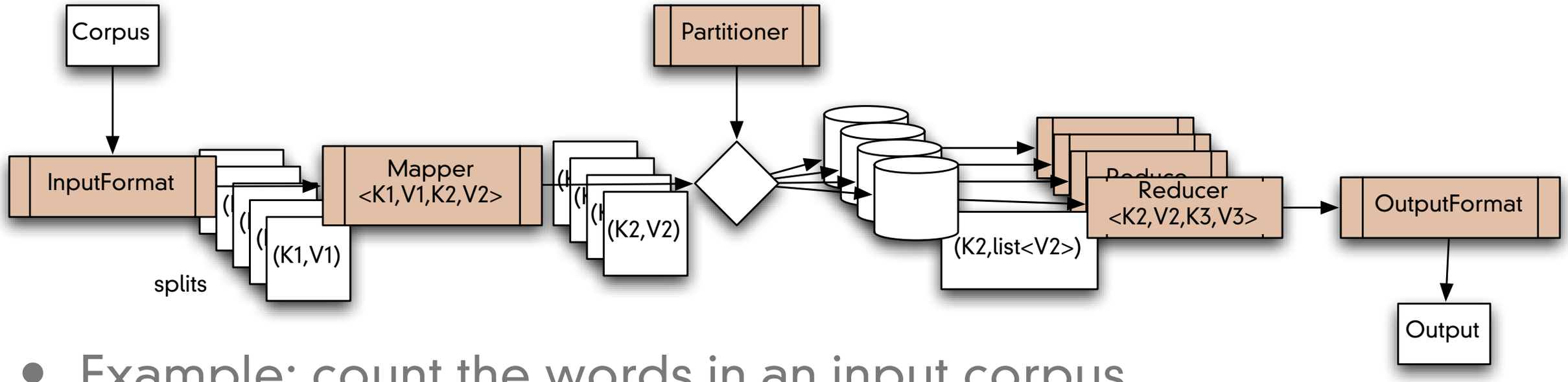
- Reducer<K2,V2,K3,V3>
  - Takes a <K2,list<V2>> pair as input
  - Produces <K3,V3> as output
  - Output is not resorted

Distributed Indexing - Hadoop



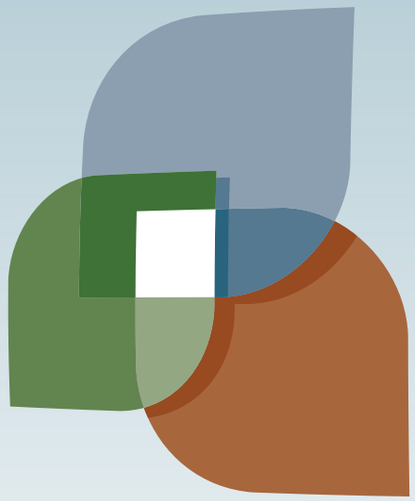
- OutputFormat
  - Does something with the output (like write it to disk)
  - TextOutputFormat<K3,V3> comes with Hadoop

Hadoop example: WordCount



- Example: count the words in an input corpus
  - InputFormat = TextInputFormat
  - Mapper: separates words, outputs <Word, 1>
  - Partitioner = HashPartitioner
  - Reducer: counts the length of list<V2>, outputs <Word,count>
  - OutputFormat = TextOutputFormat

End of Chapter 4



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