Map Reduce 介紹

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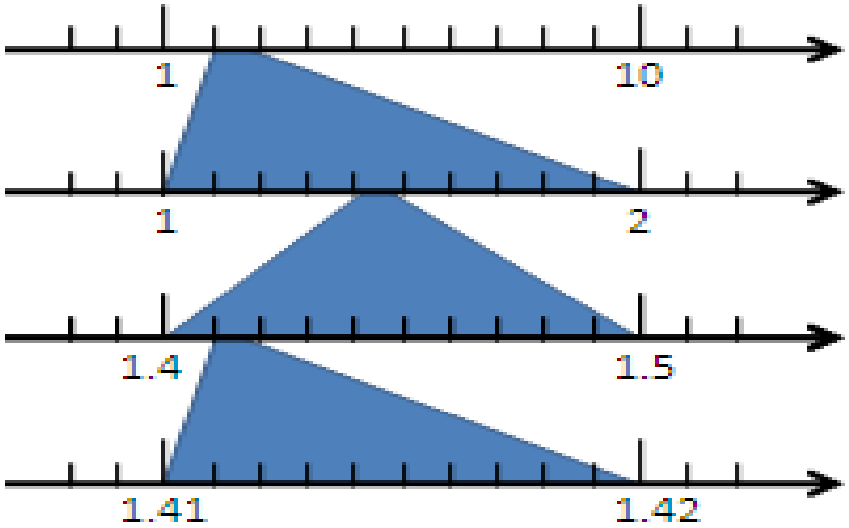
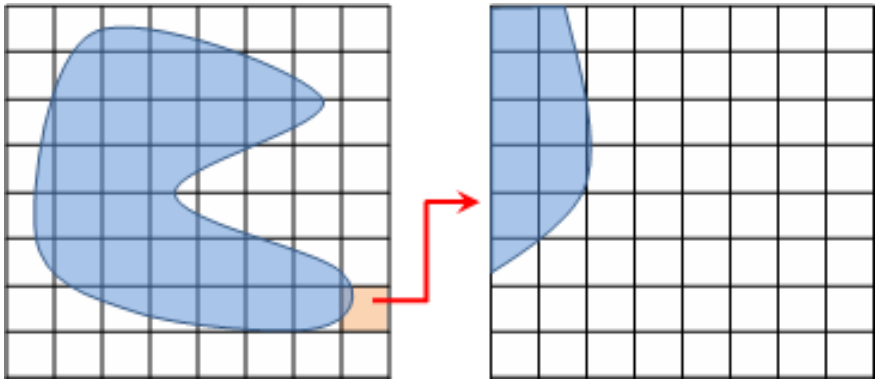
Divide and Conquer

範例一：十分逼近法

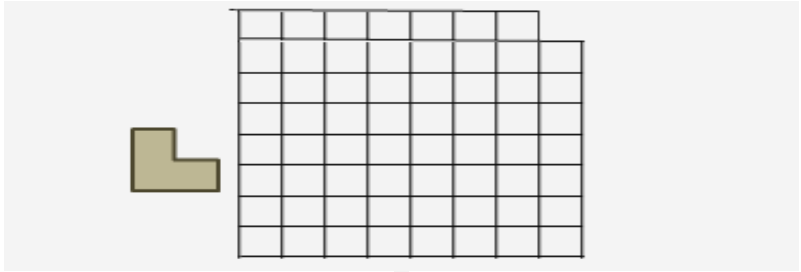


sqrt(2)

範例二：方格法求面積



範例三：鋪滿 L 形磁磚



範例四：

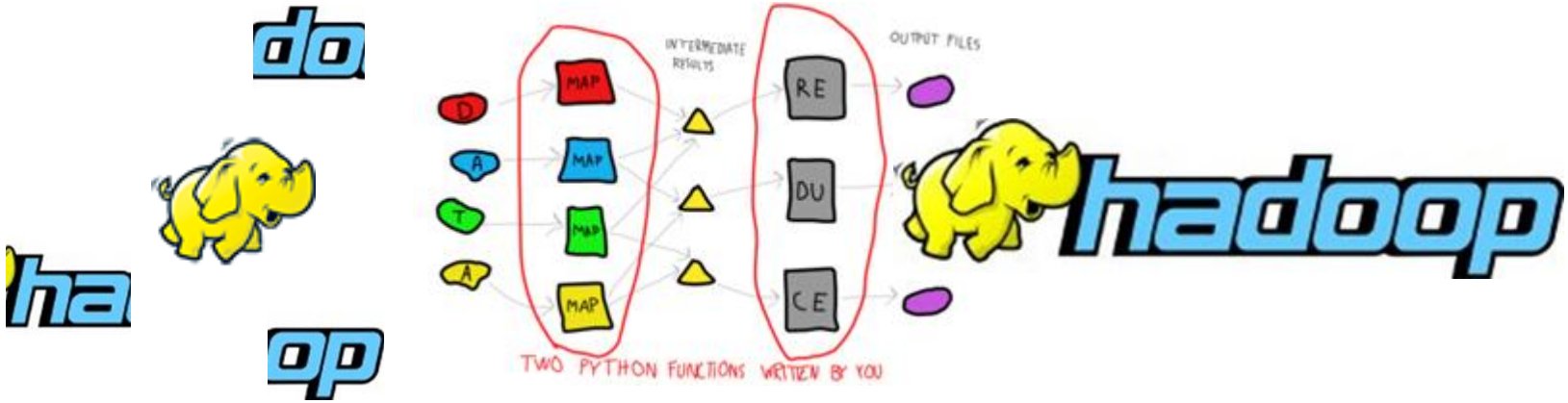
眼前有五階樓梯，每次可踏上一階或踏上兩階，那麼爬完五階共有幾種踏法？

Ex：(1,1,1,1,1) or (1,2,1,1)

Map Reduce 起源

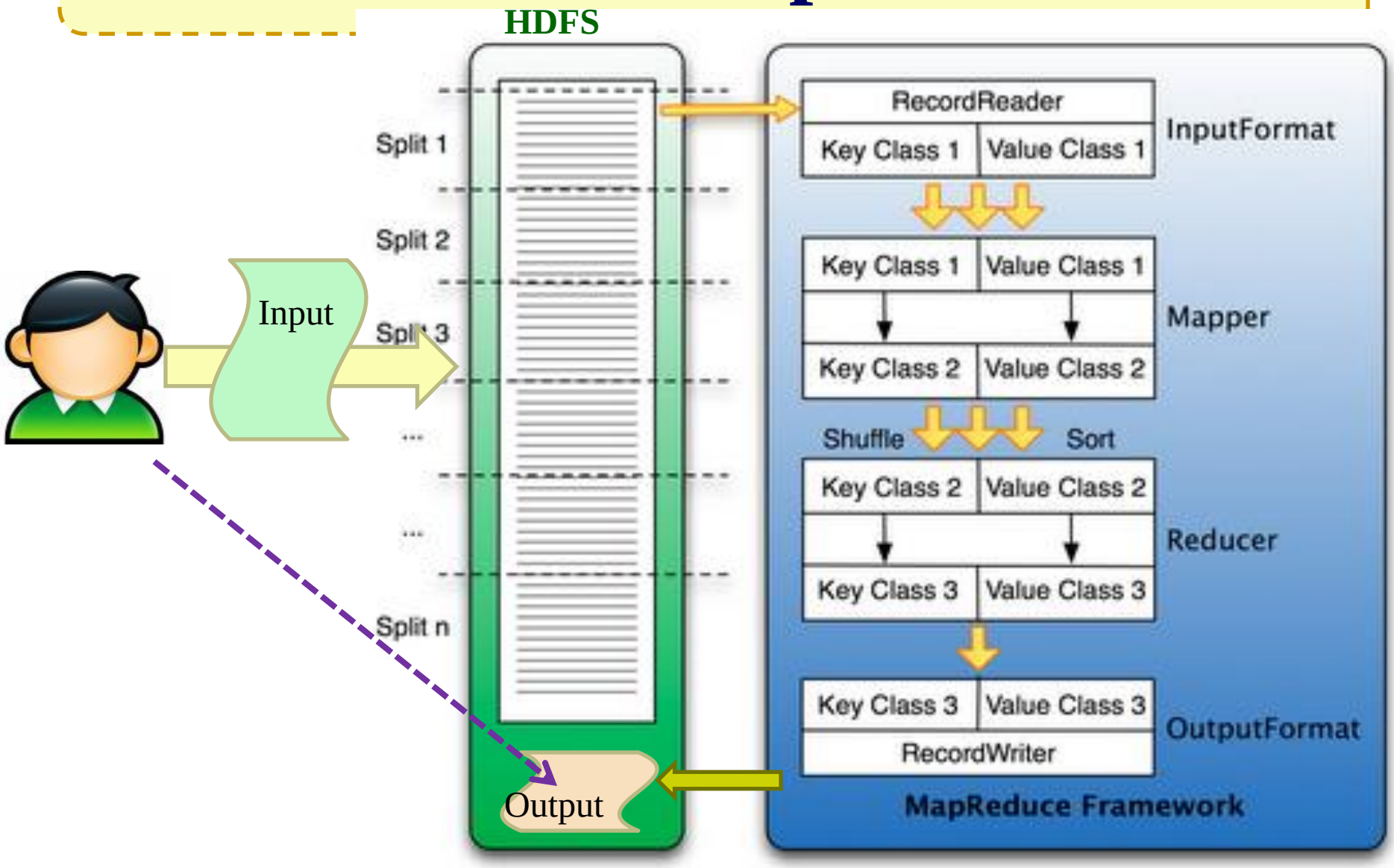
- Functional Programming : Map Reduce
  - map(...) :
    - [1,2,3,4] – (*2) -> [2,4,6,8]
  - reduce(...):
    - [1,2,3,4] - (sum) -> 10
- 演算法（Algorithms）：
  - Divide and Conquer
  - 分而治之
- 在程式設計的軟體架構內，適合使用在大規模數據的運算中

Hadoop MapReduce定義



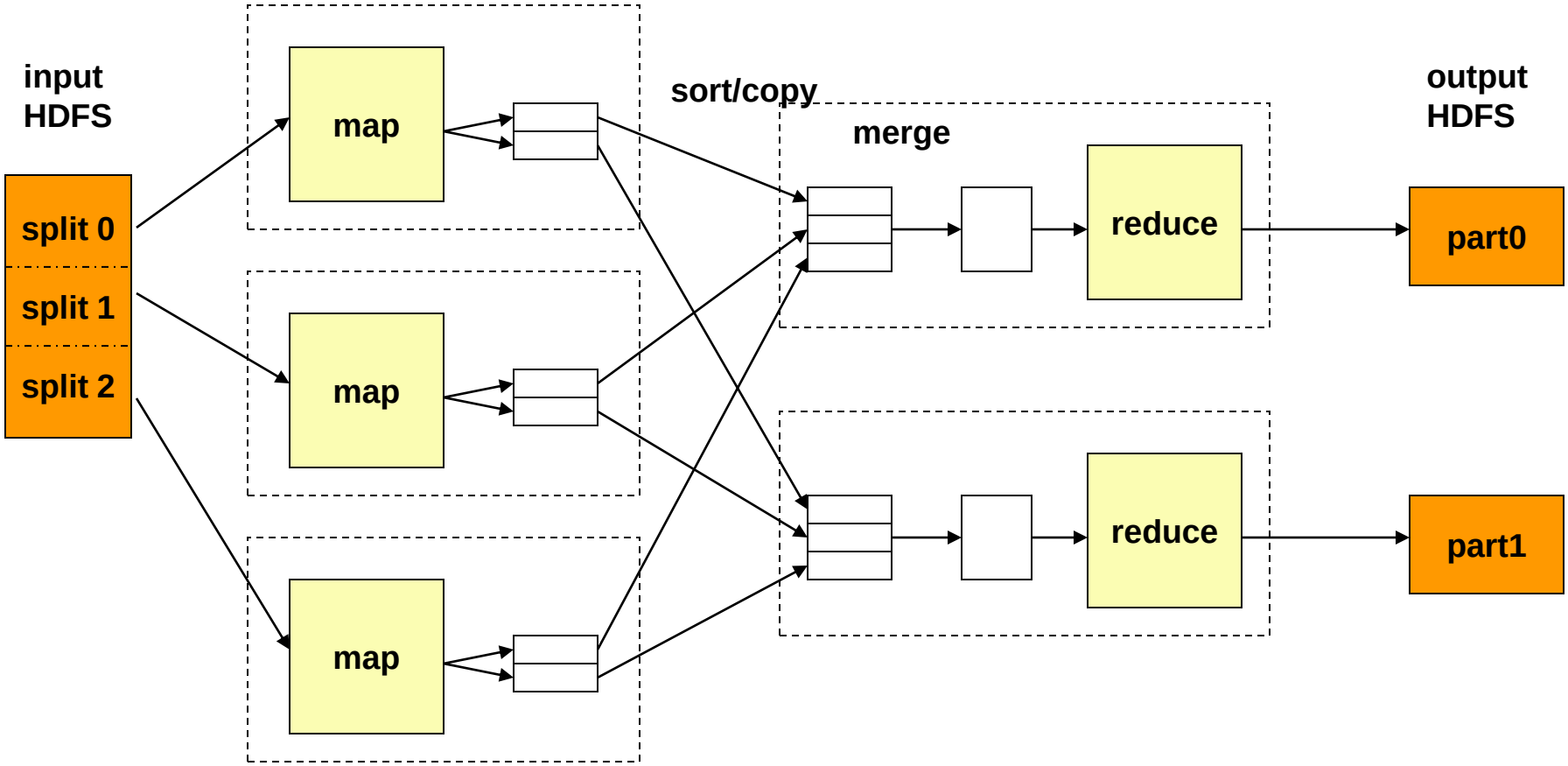
Hadoop Map/Reduce是一個易於使用的軟體平台，以MapReduce為基礎的應用程序，能夠運作在由上千台PC所組成的大型叢集上，並以一種可靠容錯的方式平行處理上P級別的資料集。

HDFS & MapReduce



部份圖片來源：http://www.larsgeorge.com/2009/05/hbase-mapreduce-101-part-i.html

Hadoop-MapReduce 運作流程



JobTracker跟NameNode取得需要運算的blocks

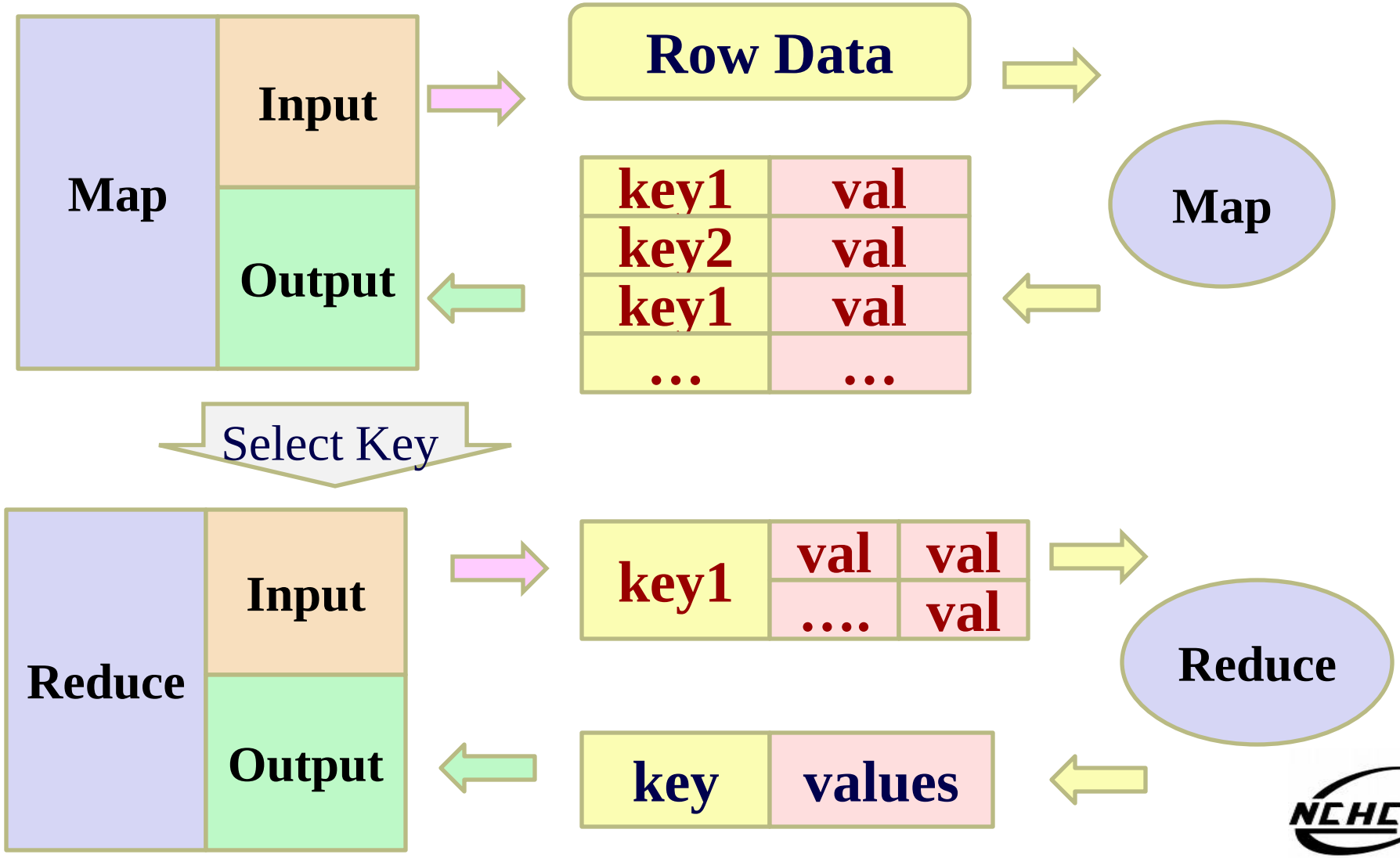
JobTracker選數個TaskTracker來作Map運算，產生些中間檔案

JobTracker將中間檔案整合排序後，複製到需要的TaskTracker去

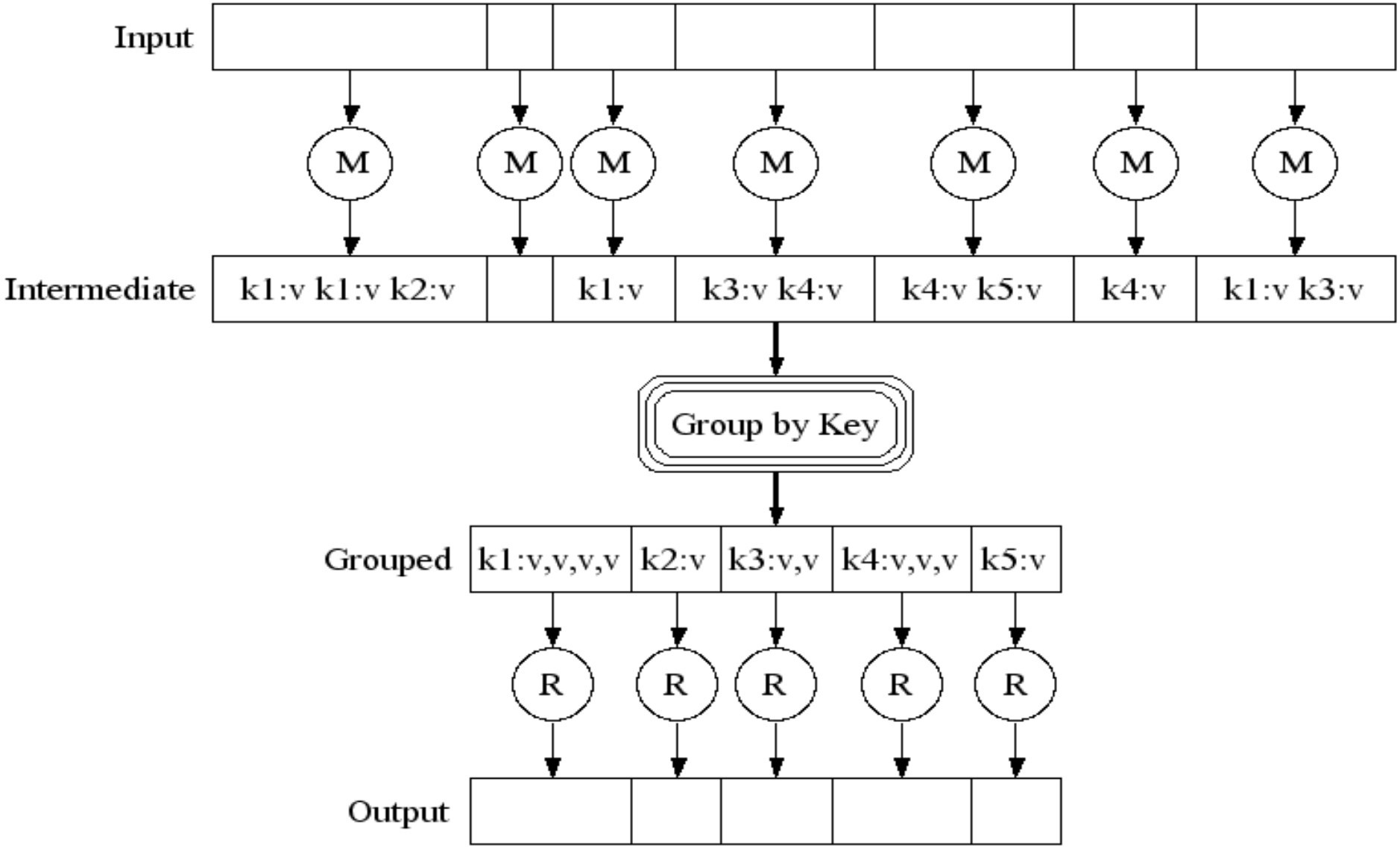
JobTracker派遣TaskTracker作reduce

reduce完後通知JobTracker與Namenode以產生output

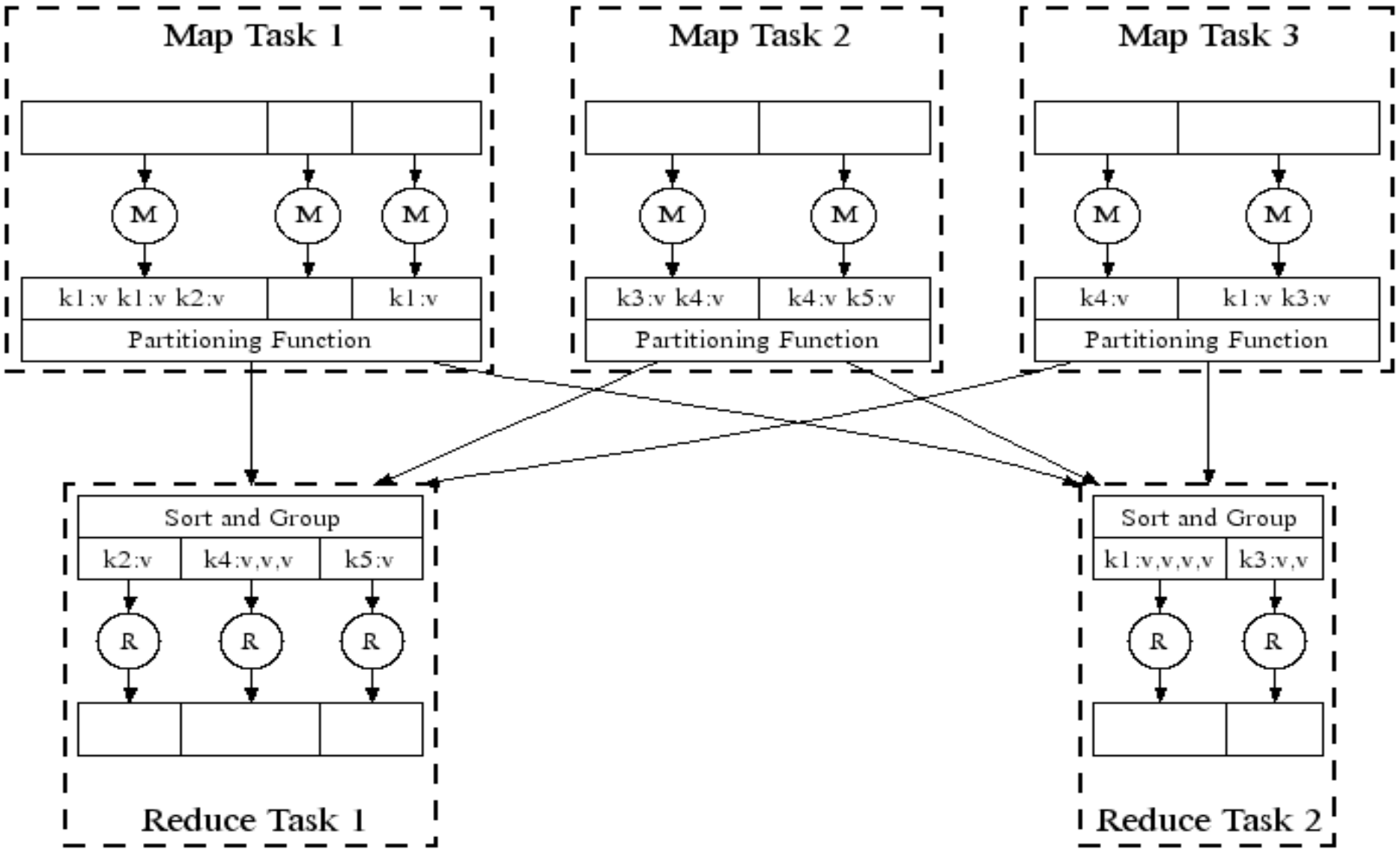
MapReduce 與 <Key, Value>



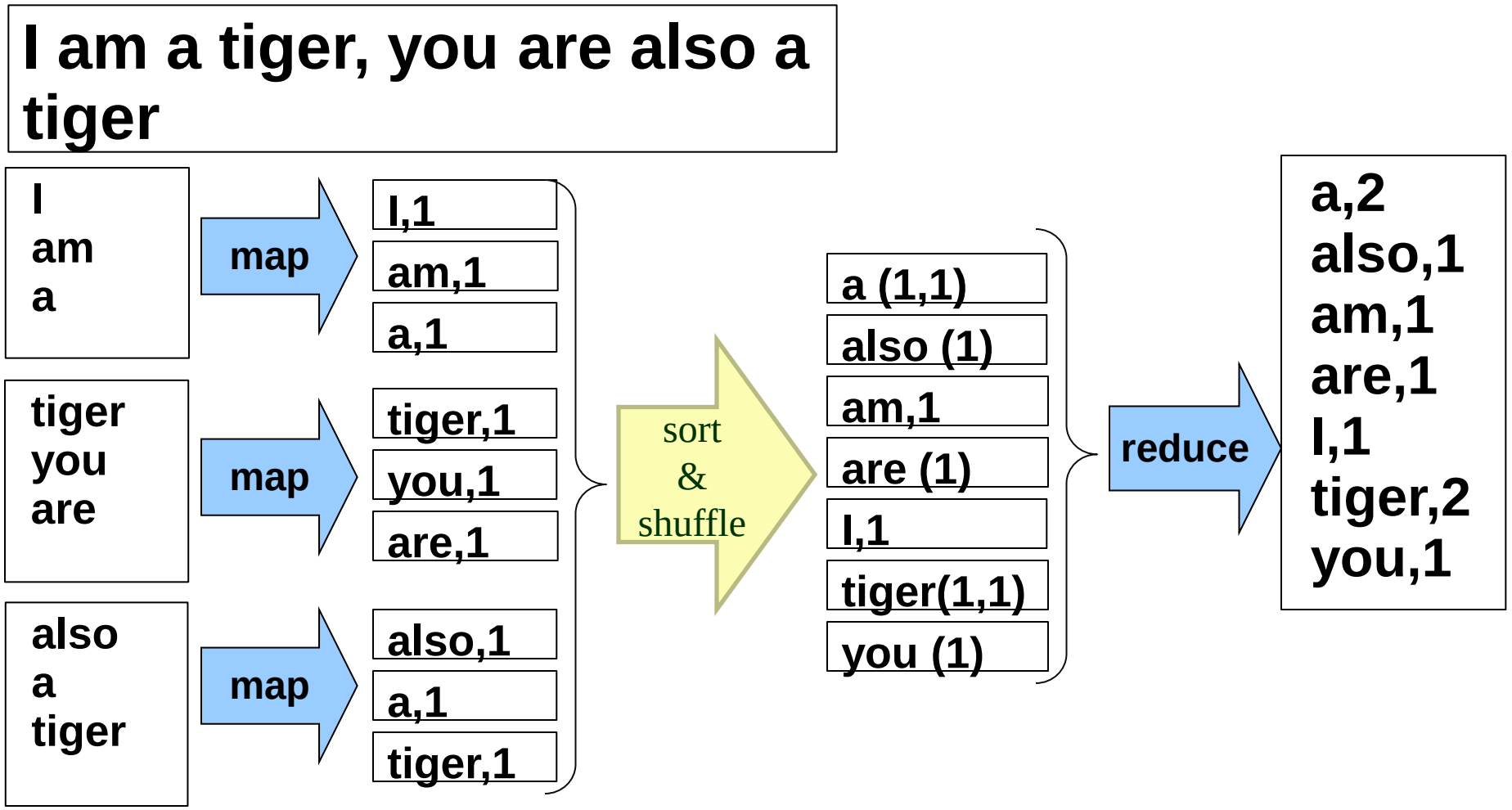
MapReduce 圖解



MapReduce in Parallel



範例



JobTracker先選了三個Tracker做map

Map結束後，hadoop進行中間資料的重組與排序

JobTracker再選一個TaskTracker作reduce

Hadoop適用於..

- 大規模資料集
- 可拆解的運算
- 批次處理
- 預先運算

- Text tokenization
- Indexing and Search
- Data mining
- machine learning
- …

- http://www.dbms2.com/2008/08/26/known-applications-of-mapreduce/
- http://wiki.apache.org/hadoop/PoweredBy

Hadoop Applications (1)

- Adobe
  - use Hadoop and HBase in several areas from social services to structured data storage and processing for internal use.
- Adknowledge - Ad network
  - used to build the recommender system for behavioral targeting, plus other clickstream analytics
- Alibaba
  - processing sorts of business data dumped out of database and joining them together. These data will then be fed into iSearch, our vertical search engine.
- AOL
  - We use hadoop for variety of things ranging from ETL style processing and statistics generation to running advanced algorithms for doing behavioral analysis

Hadoop Applications (2)

- Baidu - the leading Chinese language search engine
  - Hadoop used to analyze the log of search and do some mining work on web page database
- Contextweb - ADSDAQ Ad Excange
  - use Hadoop to store ad serving log and use it as a source for Ad optimizations/Analytics/reporting/machine learning.
- Detikcom - Indonesia's largest news portal
  - use hadoop, pig and hbase to analyze search log, generate Most View News,
  - generate top wordcloud, and analyze all of our logs

Hadoop Applications (3)

- DropFire
  - generate Pig Latin scripts that describe structural and semantic conversions between data contexts
  - use Hadoop to execute these scripts for production-level deployments
- Facebook
  - use Hadoop to store copies of internal log and dimension data sources
  - use it as a source for reporting/analytics and machine learning.
- Freestylers - Image retrieval engine
  - use Hadoop 影像處理
- Hosting Habitat
  - 取得所有clients的軟體資訊
  - 分析並告知clients 未安裝或未更新的軟體

Hadoop Applications (4)

- IBM
  - Blue Cloud Computing Clusters
- ICCS
  - 用 Hadoop and Nutch to crawl Blog posts 並分析之
- IIIT, Hyderabad
  - We use hadoop 資訊檢索與提取
- Journey Dynamics
  - 用 Hadoop MapReduce 分析 billions of lines of GPS data 並產生交通路線資訊.
- Krugle
  - 用 Hadoop and Nutch 建構 原始碼搜尋引擎

Hadoop Applications (5)

- SEDNS - Security Enhanced DNS Group
  - 收集全世界的 DNS 以探索網路分散式內容.
- Technical analysis and Stock Research
  - 分析股票資訊
- University of Maryland
  - 用Hadoop 執行 machine translation, language modeling, bioinformatics, email analysis, and image processing 相關研究
- University of Nebraska Lincoln, Research Computing Facility
  - 用Hadoop跑約200TB的CMS經驗分析
  - **緊湊渺子線圈**（**CMS**，**C**ompact **M**uon **S**olenoid）為瑞士歐洲核子研究組織CERN的大型強子對撞器計劃的兩大通用型粒子偵測器中的一個。

Hadoop Applications (6)

- PARC
  - Used Hadoop to analyze Wikipedia conflicts
- Search Wikia
  - A project to help develop open source social search tools
- Yahoo!
  - Used to support research for Ad Systems and Web Search
  - 使用Hadoop平台來發現發送垃圾郵件的殭屍網絡
- 趨勢科技
  - 過濾像是釣魚網站或惡意連結的網頁內容

結論

- 目前已經有許多大公司利用Hadoop，呈現其高效與廣泛性
- 適合於：複雜但可拆解的計算，大量且獨立的資料
- 問題
  - HDFS 可否不搭配MapReduce而獨立運作？
  - 承上，MapReduce 呢？