CS6006 - CLOUD COMPUTING

Module 7 - CLOUD PLATFORMS IN INDUSTRY

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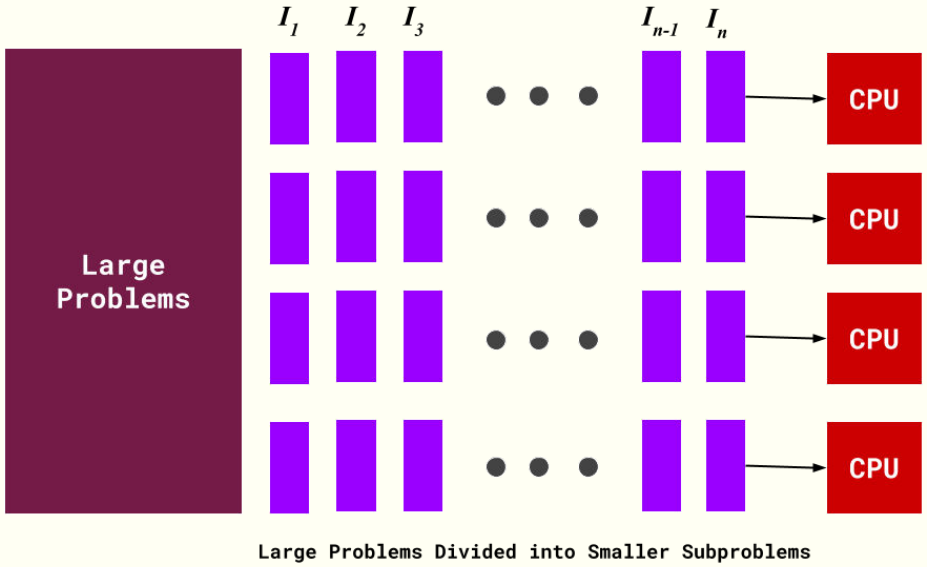
CLOUD PLATFORMS IN INDUSTRY

- Parallel Programming Paradigm
- Apache Hadoop and Map-Reduce
- MapReduce Programming Model
- Major MapReduce Implementations for the Cloud
- Public Cloud Platforms: GAE, AWS, and Azure – **TOOLS PPT**
- Programming Google App Engine
- Programming on EC2, S3
- Best Practices in Architecting Cloud Applications in the AWS Cloud

PARALLEL PROGRAMMING PARADIGM

- Processing multiple tasks simultaneously in multiple processors is called parallel processing.
- Parallel program consists of multiple processes (tasks) simultaneously solving a given problem.
- Divide-and-Conquer technique is used.



APPLICATIONS OF PARALLEL PROGRAMMING PARADIGM

- **Science and Engineering**
  - Atmospheric Analysis
  - Earth Sciences
  - Electrical Circuit Design
- **Industrial and Commercial**
  - Data Mining
  - Web Search Engine
  - Graphics Processing

PARALLEL COMPUTING MEMORY ARCHITECTURE TYPES

- Shared memory architecture
- Distributed memory architecture
- Hybrid distributed shared memory architecture

PARALLEL COMPUTING MEMORY ARCHITECTURE TYPES

S. No	Parallel Computing	Distributed Computing
1	Many operations are performed simultaneously	System components are located at different locations
2	Single computer is required	Uses multiple computers
3	Multiple processors perform multiple operations	Multiple computers perform multiple operations
4	It may have shared or distributed memory	It have only distributed memory
5	Processors communicate with each other through bus	Computer communicate with each other through message passing
6	Improves the system performance	Improves system scalability, fault tolerance and resource sharing capabilities

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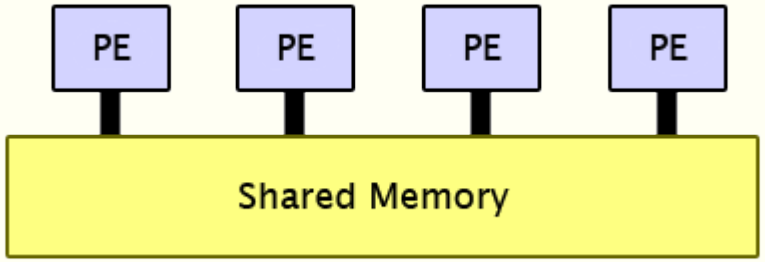
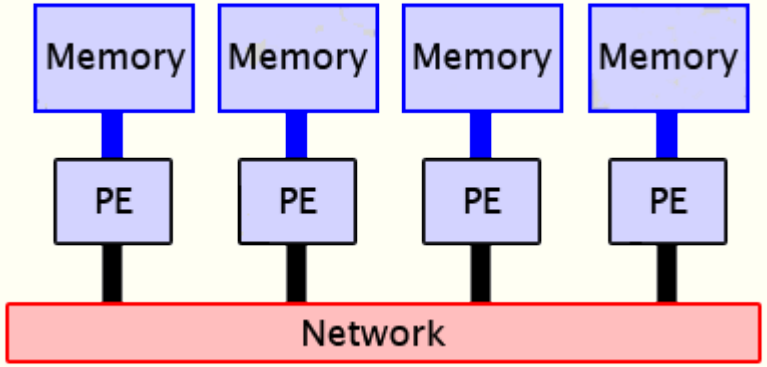
PARALLEL COMPUTING MEMORY ARCHITECTURE TYPES

- Shared memory architecture



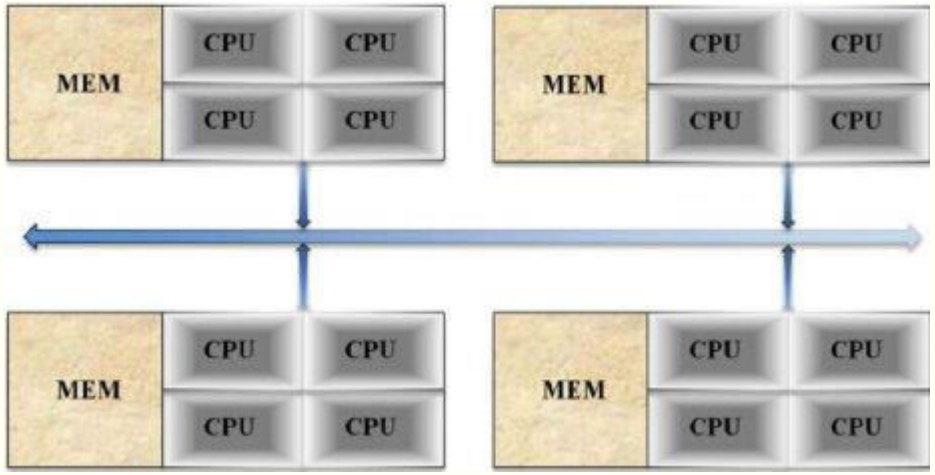
PARALLEL COMPUTING MEMORY ARCHITECTURE TYPES

- Distributed memory architecture



PARALLEL COMPUTING MEMORY ARCHITECTURE TYPES

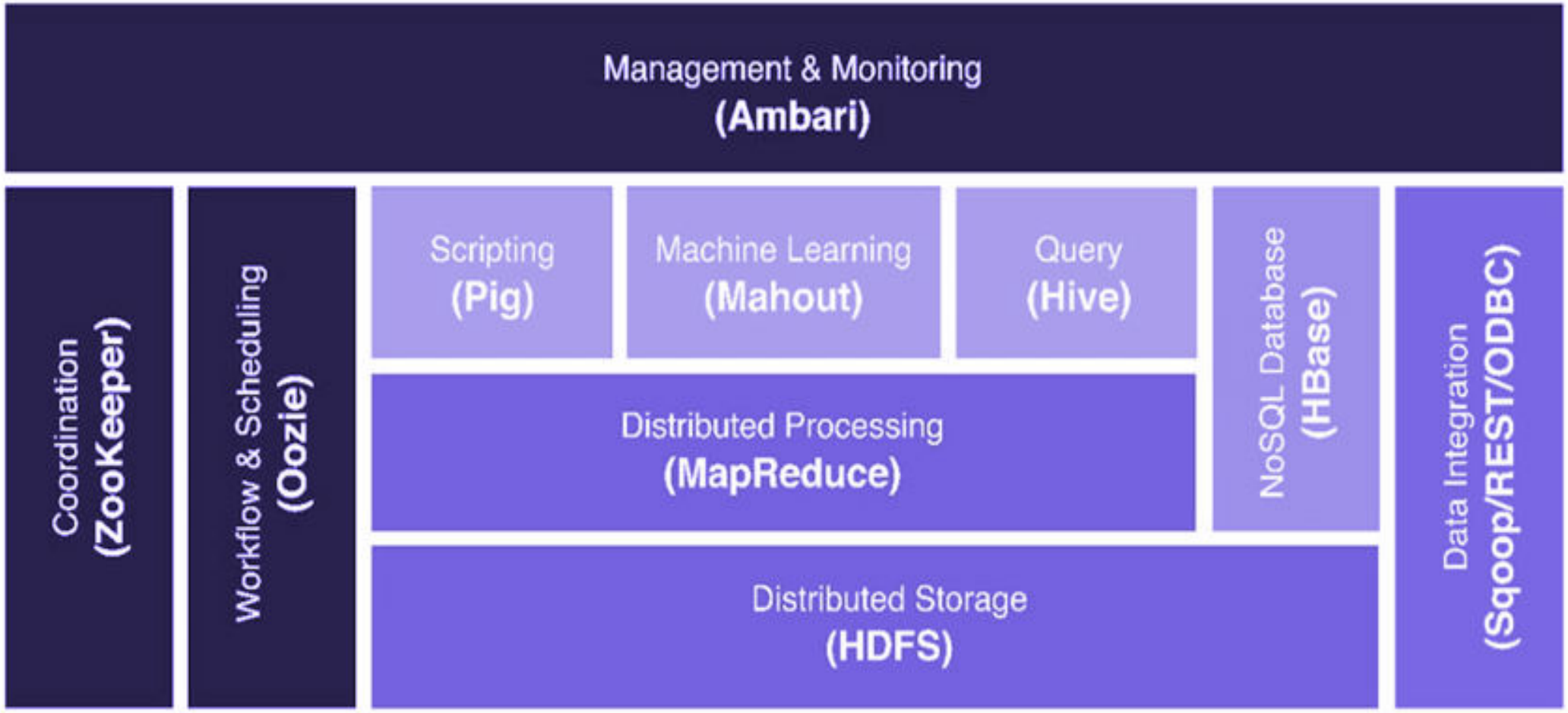
- Hybrid distributed shared memory architecture



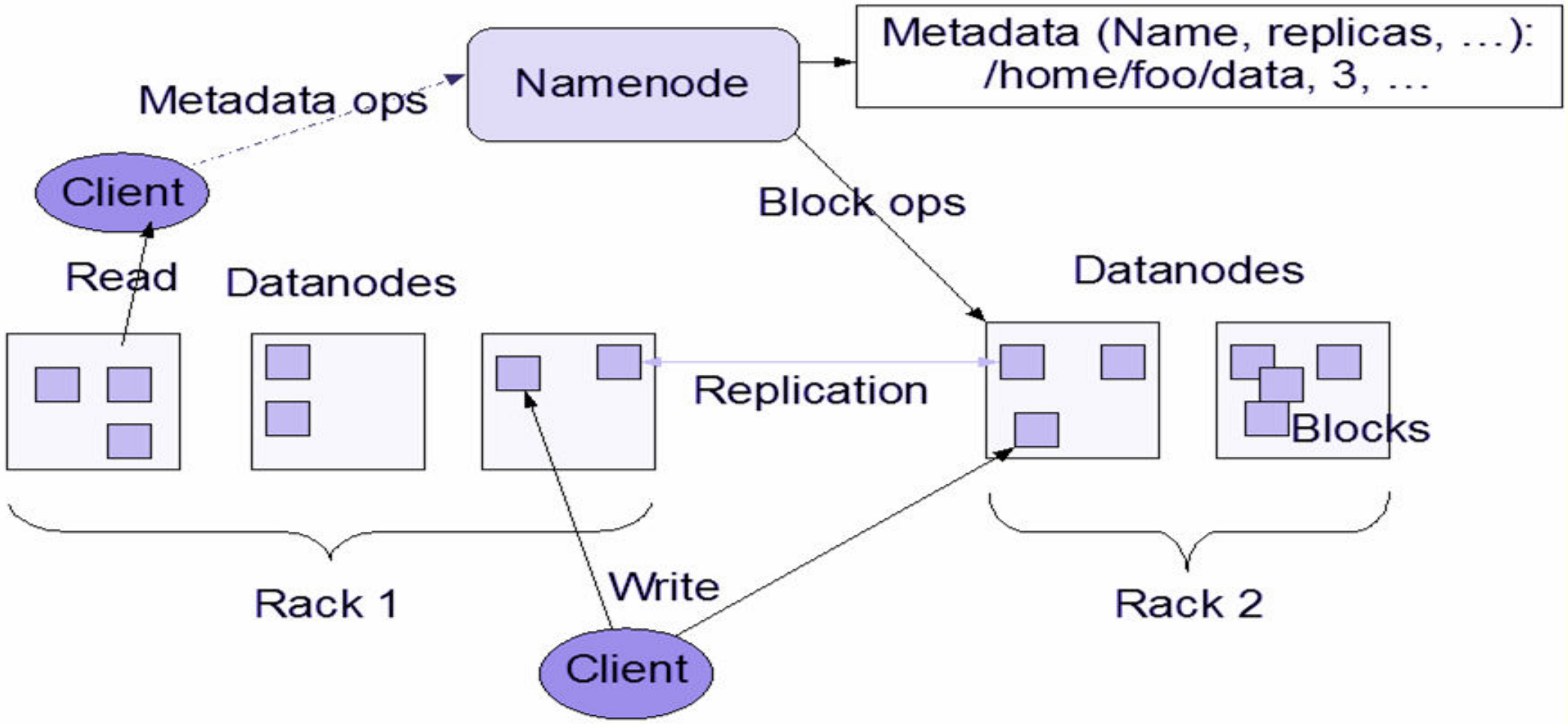
APACHE HADOOP : OVERVIEW

- A scalable, fault-tolerant, open-source and cost effective software that handles large data in a distributed system
- Framework that allows for the distributed processing of large data sets across clusters of computers
- There are three parts in Hadoop, they are
  - Hadoop Distributed File System (storage)
  - Yet Another Resource Negotiator (processing)
  - Map Reduce

HADOOP ECOSYSTEM



HADOOP DISTRIBUTED FILE SYSTEM : ARCHITECTURE



HDFS : Namenode

01

Master Daemon

Main component of Hadoop's HDFS

02

Metadata

Includes size, permission and location of file

03

Heartbeat

Receives a heartbeat from datanode

HDFS : Datanode

Second part of HDFS

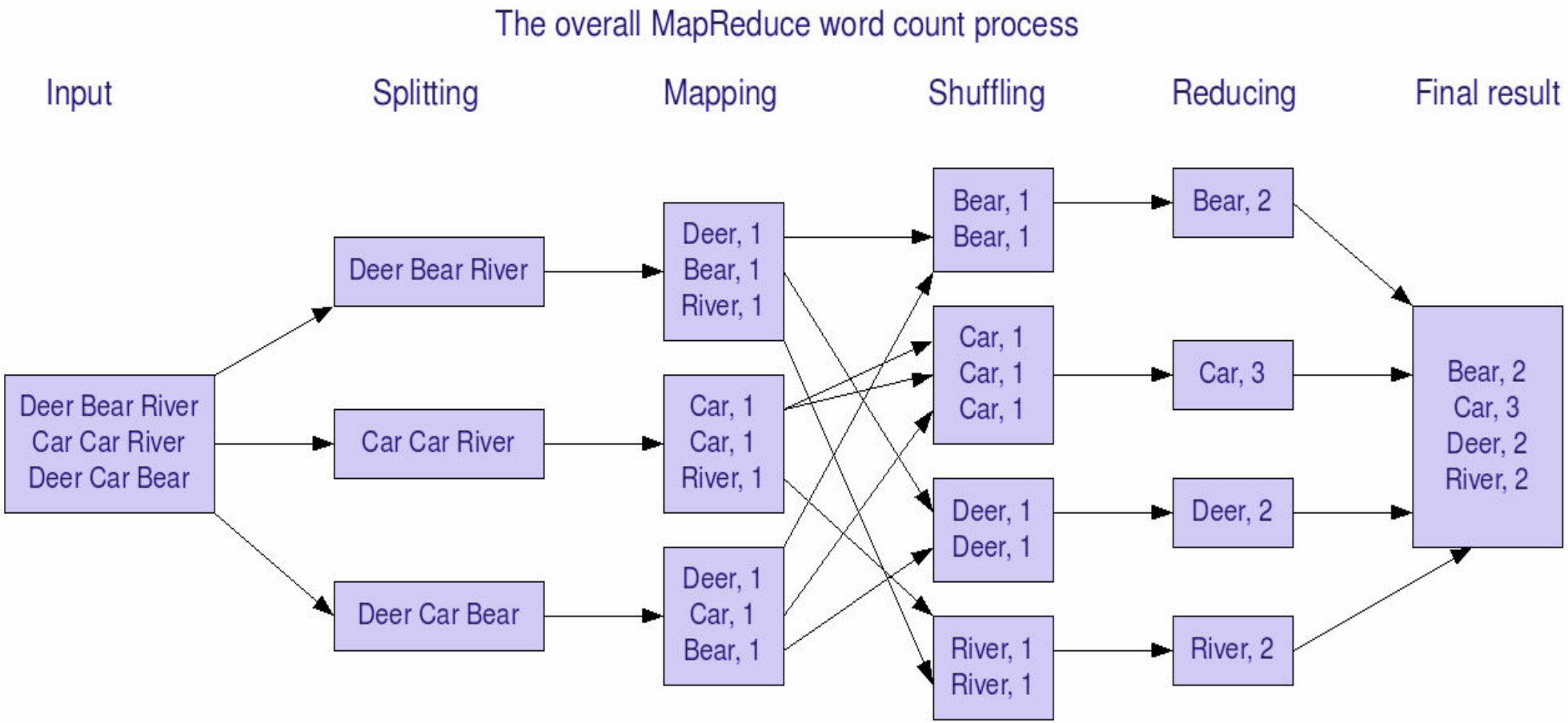
Serves read and write requests from the client and actual data is stored here

- Heartbeat
- Blocks
- Racks
- Replication

Word Count - Example

- Task: Counting the word occurrences (frequencies) in a text le (or set of les).
- < word, count > as < key, value > pair
- Mapper: Emits < word, 1 > for each word (no counting at this part).
- Shuffle in between: pairs with same keys grouped together and passed to a single machine.
- Reducer: Sums up the values (1s) with the same key value.

Map Reduce (Processing in Hadoop)



Job Tracker

130 Hadoop Map/Reduce Administration

State: RUNNING
Started: Mon Nov 17 22:41:46 PST 2014
Version: 0.18.0, r686010
Compiled: Thu Aug 14 19:48:33 UTC 2008 by hadoopqa
Identifier: 201411172241

Cluster Summary

Maps	Reduces	Total Submissions	Nodes	Map Task Capacity	Reduce Task Capacity	Avg. Tasks/Node
0	0	3	1	2	2	4.00

Running Jobs

Running Jobs
none

Completed Jobs

Completed Jobs								
Jobid	User	Name	Map % Complete	Map Total	Maps Completed	Reduce % Complete	Reduce Total	Reduces Completed
job_201411172241_0003	hadoop-user	streamjob16751.jar	100.00%	2	2	100.00%	1	1
job_201411172241_0004	hadoop-user	streamjob28967.jar	100.00%	2	2	100.00%	1	1

Failed Jobs

Failed Jobs								
Jobid	User	Name	Map % Complete	Map Total	Maps Completed	Reduce % Complete	Reduce Total	Reduces Completed
job_201411172241_0001	hadoop-user	streamjob64235.jar	100.00%	2	2	100.00%	1	0

Local logs

Log directory, Job Tracker History

Hadoop, 2014.

Tasks

Hadoop map task list for job_200904110811_0003 on ip-10-250-110-47

Completed Tasks

Task	Complete	Status	Start Time	Finish Time	Errors	Counters
task_200904110811_0003_m_000043	100.00%	hdfs://ip-10-250-110-47.ec2.internal/user/root/input/ncdc/all/1949.gz:0+220338475	11-Apr-2009 09:00:06	11-Apr-2009 09:01:25 (1mins, 18sec)		10
task_200904110811_0003_m_000044	100.00%	Detected possibly corrupt record: see logs.	11-Apr-2009 09:00:06	11-Apr-2009 09:01:28 (1mins, 21sec)		11
task_200904110811_0003_m_000045	100.00%	hdfs://ip-10-250-110-47.ec2.internal/user/root/input/ncdc/all/1970.gz:0+208374610	11-Apr-2009 09:00:06	11-Apr-2009 09:01:28 (1mins, 21sec)		10

Name Node

NameNode '130.230.16.37:9000'

Started: Tue Nov 18 18:09:31 PST 2014
Version: 0.18.0, r686010
Compiled: Thu Aug 14 19:48:33 UTC 2008 by hadoopqa
Upgrades: There are no upgrades in progress.

Browse the filesystem

Cluster Summary

25 files and directories, 28 blocks = 53 total. Heap Size is 5.98 MB / 992.31 MB (0%)

Capacity	:	23.73 GB
DFS Remaining	:	21.42 GB
DFS Used	:	529.41 KB
DFS Used%	:	0 %
Live Nodes	:	1
Dead Nodes	:	0

Live Datanodes : 1

Node	Last Contact	Admin State	Size (GB)	Used (%)	Used (%)	Remaining (GB)	Blocks
hadoop-desk	2	In Service	23.73	0		21.42	28

Dead Datanodes : 0

Local logs

Log directory

Hadoop, 2014.

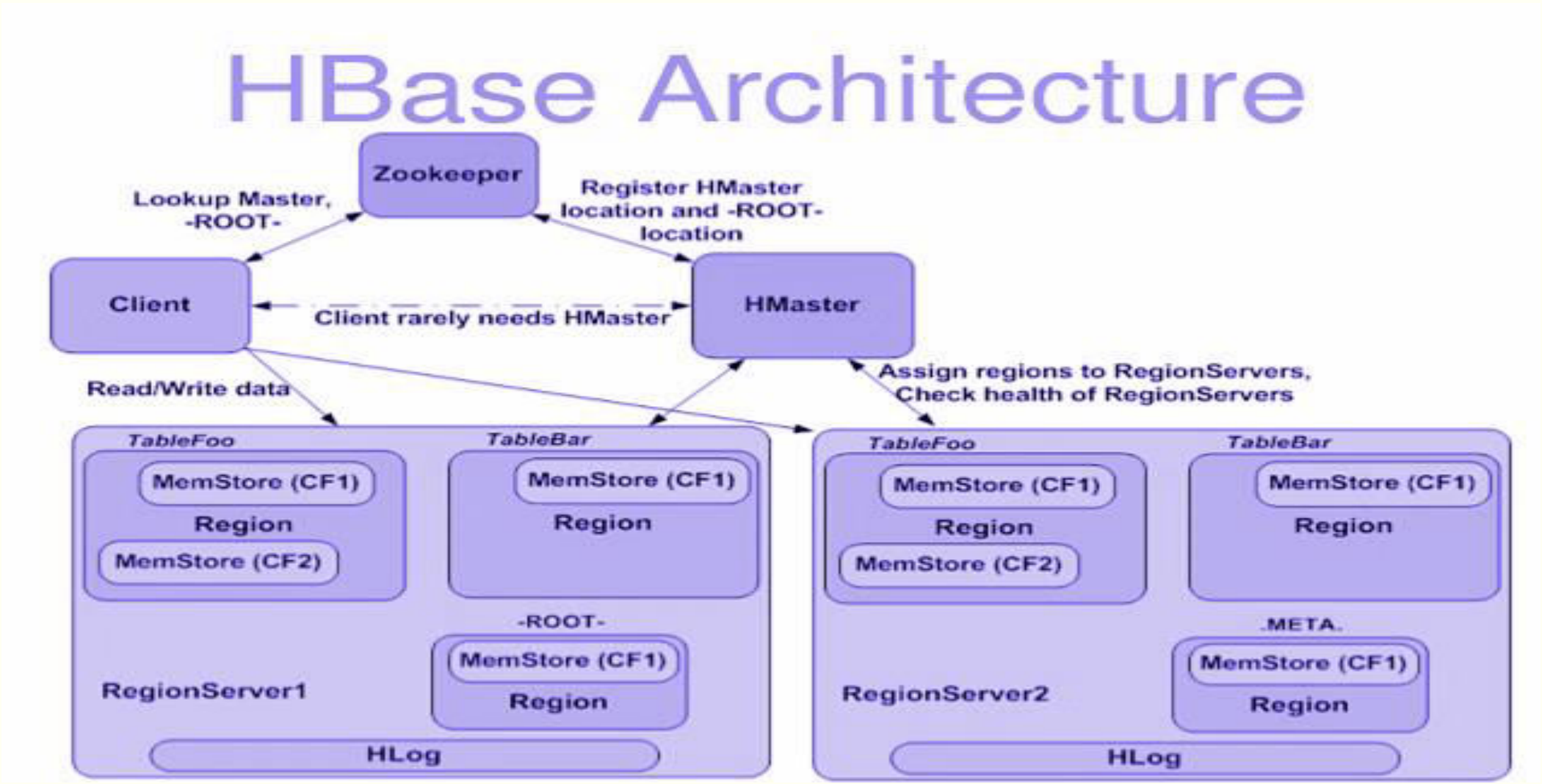
HBase

NoSQL Database

Open Source

Distributed Big Data store

HBase


HBase Architecture
Zookeeper
Lookup Master, -ROOT-
Register HMaster location and -ROOT- location
Client
Client rarely needs HMaster
HMaster
Read/Write data
Assign regions to RegionServers, Check health of RegionServers
TableFoo
MemStore (CF1)
Region
MemStore (CF2)
TableBar
MemStore (CF1)
Region
-ROOT-
MemStore (CF1)
Region
RegionServer1
HLog
TableFoo
MemStore (CF1)
Region
MemStore (CF2)
TableBar
MemStore (CF1)
Region
.META.
MemStore (CF1)
Region
RegionServer2
HLog

REFERENCES

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Thank You…