GANDHINAGAR INSTITUTE OF TECHNOLGY

Information Technology Department

Data Mining & Business Intelligence (2170715)

HDFS

Prepared By:

Patel Maulik Satishkumar (150124116006)

Guided By: **Prof. Rahul A. Vaghela**

Content

- Introduction to Big Data - Hadoop
- What is HDFS ?
- Features of HDFS
- HDFS Architecture
- Elements of HDFS
- Goals of HDFS
- HDFS Operations (Commands)
- Reference

Introduction to **Big Data - Hadoop**

What is Big Data ?

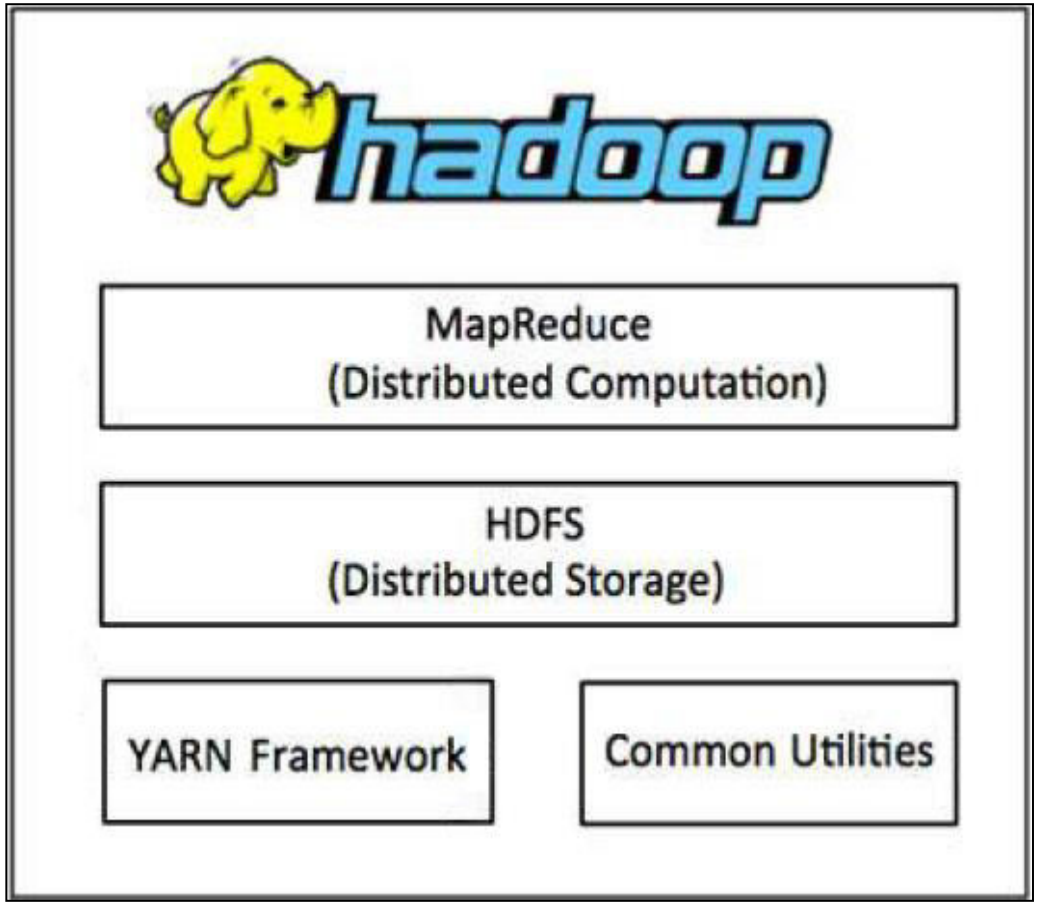
- ✓ Collection of **large datasets**.
- ✓ Produced by different devices and applications. →
- ✓ Can’t be processed using traditional computing techniques.
- ✓ The data in it will be of three types.

  (Structured , Semi Structured , Unstructured)

What is Hadoop ?

- ✓ Developed by **Doug Cutting** & **Mike Cafarella**.
- ✓ ***Apache*** *open source framework* for Linux/UNIX & written in ***java***.
- ✓ Hadoop is named after Cutting's son's yellow toy.
- ✓ Designed for storage & processing of large datasets across clusters of computers(Commodity hardware).

Introduction to **Big Data - Hadoop**



Hadoop Architecture

Hadoop MapReduce :

- This is YARN-based system for parallel processing of large data sets.

HDFS :

- A distributed file system that provides high throughput access to application data.

Hadoop YARN :

- This is a framework for job scheduling and cluster resource management.

Hadoop Common :

- These are Java libraries and utilities required by other Hadoop modules.

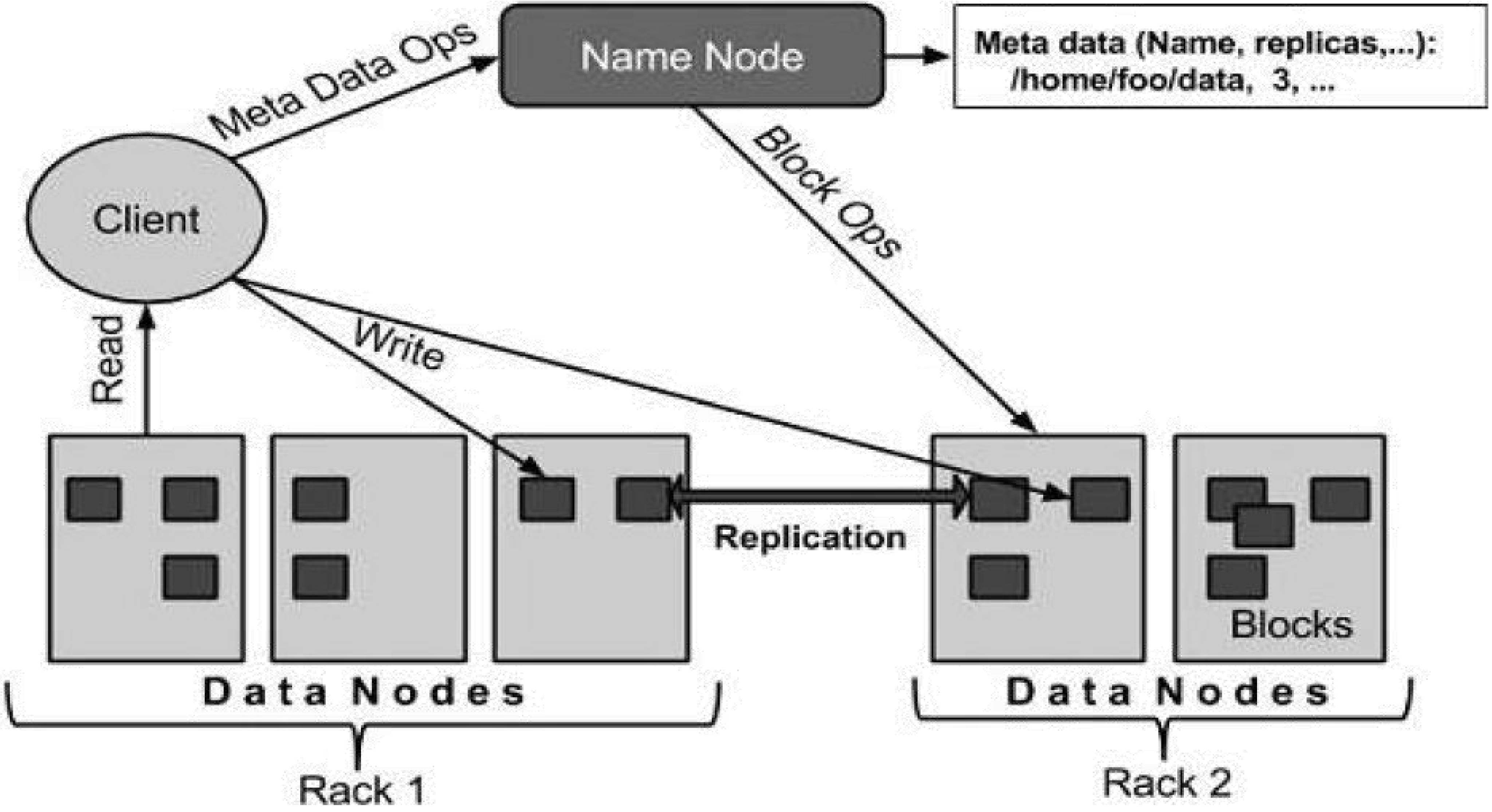
What is **HDFS** ?

- **H**adoop **D**istributed **F**ile **S**ystem.
- Developed using **D**istributed **F**ile **S**ystem design based on Google (GFS).
- Runs on **commodity hardware**.
- HDFS is highly **fault-tolerant** and designed using **low-cost** hardware.
- Holds very large amount of data and provides easier access.
- The files are stored across multiple machines.
- Rescue the system from possible **data losses** in case of failure by making **Replicas**.
- HDFS also makes applications available to **parallel processing**.

Features of HDFS

- Suitable for the **distributed storage** & **processing**.
- Hadoop provides a **command interface** to interact with HDFS.
- The built-in servers of **namenode** & **datanode**.
- **Fast access** to file system data.
- HDFS provides **file permissions** and **authentication**.
- HDFS is **Master-Slave architecture** , so **processing speed** is very ***high*** & **system failure** rate is very ***low***.

HDFS Architecture (master-slave architecture)



Elements of HDFS

1) Namenode:

- Commodity hardware that contains the GNU/Linux operating system and the namenode software.
- Run on commodity hardware.
- The system having the **namenode acts as the master server** and it does the following tasks:
  - ✓ Manages the file system namespace.
  - ✓ Regulates client's access to files.
  - ✓ It also executes file system operations such as renaming, closing , and opening files anddirectories.

Elements of HDFS

2) Datanode:

- Commodity hardware having the GNU/Linux operating system and datanode software.
- The system having the **datanode acts as the slave**.
- For every node **Commodity hardware/System in a cluster**, there will **be a datanode**. These nodes **manage the data storage** of their system.
  - ✓ Datanodes perform read-write operations on the file systems, as per client request.
  - ✓ They also perform operations such as block creation, deletion , and replication according to the instructions of the namenode.

Elements of HDFS

3) Block:

- Generally the user data is stored in the files of HDFS.
- The file in a file system will be **divided into one or more segments** and/or **stored in individual data nodes**. These file segments are called as blocks.
- In other words, the minimum amount of data that HDFS can read or write is called a Block.
- The default block size is **64MB**, but it can be increased as per the need to change in HDFS configuration. *(**128MB** in latest version)*

Goals of HDFS

- **Fault detection and recovery:** Since HDFS includes a large number of commodity hardware , failure of components is frequent. Therefore HDFS should have mechanism for quick and automatic fault detection and recovery.

- **Huge datasets:** HDFS should have hundreds of nodes per cluster to manage the applications having huge datasets.

- **Hardware at data:** A requested task can be done efficiently , when the computation takes place near the data. Especially where huge datasets are involved , it reduces the network traffic and increases the throughput.

HDFS Operations (Commands)

Starting HDFS

```
$ hadoop namenode –format
$ start-dfs.sh          or          $ start-all.sh
```

Listing files in HDFS

```
$ $ HADOOP_HOME/bin/hadoop  fs  -ls  <args>
```

Inserting Data into HDFS

```
$ $ HADOOP_HOME/bin/hadoop  fs –mkdir  /user/dir_name
$ $ HADOOP_HOME/bin/hadoop  fs -put  /home/file.txt  /user/dir_name
$ $ HADOOP_HOME/bin/hadoop  fs -ls  /user/dir_name
```

HDFS Operations (Commands)

Retrieving Data from HDFS

```
$ $ HADOOP_HOME/bin/hadoop  fs  -cat  /user/dir_name/file
$ $ HADOOP_HOME/bin/hadoop  fs  -get  /user/output/   /home/hadoop_tp/
```

Shutting Down the HDFS

```
$ stop-dfs.sh             or             $ stop-all.sh
```

Reference

- “Understanding Big Data” … McGraw Hill,2012.

  Author: Chris Eaton, Dirk Derooset.
- Accessed [05/08/2018]. Available : **https://www.tutorialspoint.com**
- Accessed [05/08/2018]. Available : **https://www.youtube.com**

- Source is available on my github site:

maulikpatel295.github.io/ALA/2160715_150124116006.pdf

THANK YOU