BIG DATA

1. What is Bigdata? & vs RDBMS ?

→ It is a collection of data that is huge in volume (in petabytes) & growing exponentially

→ Traditional DBs can not handle & process these large amount because:

- DBs are based on fixed schema (static in nature).
- Only works with structured data. Can not store unstructured data (movies, images, sound files, documents etc).
- Performs analytics on historical data
- Have centralized db architecture.

→ - Big data works on structured, unstructured & semistructured data.
- Has dynamic nature. (scalability) {Resources available real-time}
- Real time analytics (eg. medical, safety, smartcities, manufacturing etc. domains)
- Distributed architecture.

As Gartner said:

Big data is data that contains greater variety arriving in increasing volumes & with ever-higher velocity.

Companies using

→ Facebook (500+ TB data generated every day)

→ Twitter (Generating 21+ million tweets per hour).

→ Youtube

→ Benefits of Using Big Data

- Better decision making. (customer centric)
- Greater innovations. (future needs)
- Product price optimization (Optimal price)
- Recommendation engines (Better online exp.)
- Life -Saving application in health sector. (electronic devices, diagnosis)

→ challenges include capture, storage, search, sharing, transfer, analysis.

2. 5 V's of Big data

a. Volume :- Enormous amount of data
- of the size of Petabytes
- eg. FB, twitter, Youtube

b. Velocity :- Refers to rate of generation of data
- eg. Google searches, FB users increasing.

c. Variety :- Refers to diff. types of data i.e structured, unstructured & semi structured
eg. Excel, SQL | Images, videos | Log files

d. Varacity :- Refers to inconsistencies & uncertainty in data i.e messy, quality & accuracy are difficult to control.

e. Value :- Refers to the value that the data can provide

★ Hadoop

→ Open source software framework used to develop data processing applications which are executed in distributed computing environment across clusters of commodity computers.

OR – Storage of large Datasets (scalability)
– Handling data in different formats.
– Real-time processing on commodity hardwares
– fault tolerant.
– Adds nodes on fly.

Features

→ Reliability → if node goes down, it does not disable the whole cluster, instead another node takes the place of failed node.

→ Scalable – Integrated with cloud-based services, so nodes are added on fly.

→ Economical → use of commodity hardware which are cheap.

→ Distributed Processing – Job submitted by user/client gets divided into sub-tasks which are independent of each other & execute in ||el giving high throughput.

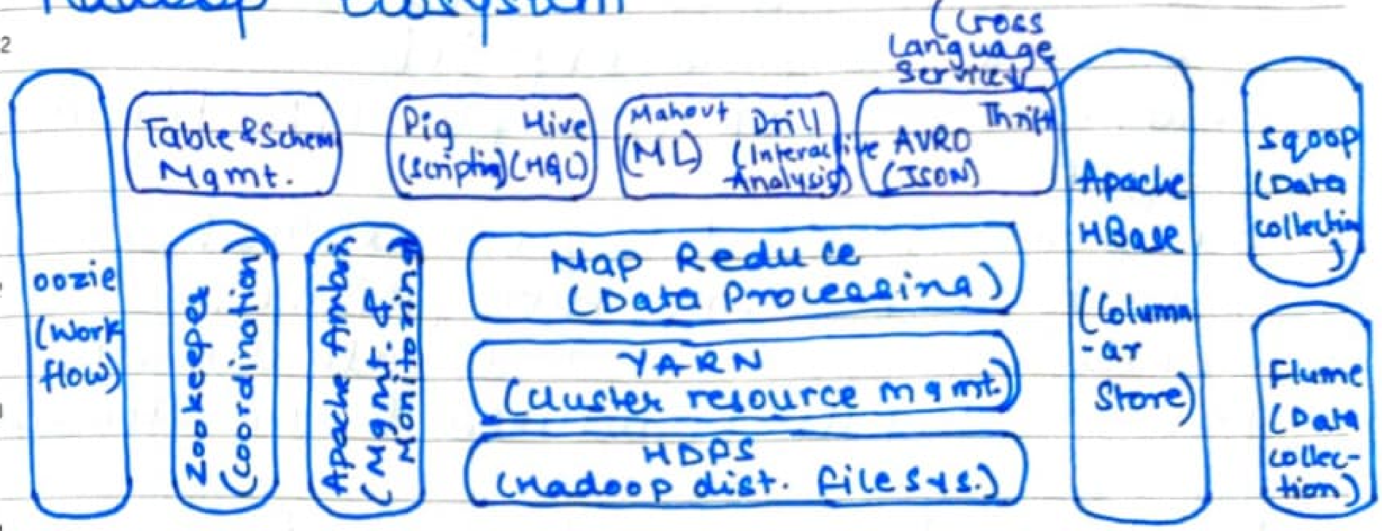
→ Distributed Storage – Hadoop splits each file into no. of blocks which get stored distributedly on cluster of machines.

→ Fault-tolerance – Because of replication of blocks, the data is never lost. Always available in diff. nodes.

→ High availability - ~~Had~~ Hadoop consists of 2 or more running Name Nodes. If one goes down then the passive NN takes active's place.

→ Data locality - It takes computation logic to the data, it reduces bandwidth utilization in system.

* Hadoop Ecosystem


Oozie (Work flow)
Table & Schema Mgmt.
Pig (scripting)
Hive (HQL)
Mahout (ML)
Drill (Interactive Analysis)
AVRO (JSON)
Thrift
((Cross Language Services))
Apache HBase (Column-ar Store)
Sqoop (Data collection)
Zookeeper (Coordination)
Apache Ambari (Mgmt. & Monitoring)
Map Reduce (Data Processing)
YARN (cluster resource mgmt.)
HDFS (Hadoop dist. file sys.)
Flume (Data collection)

1. HDFS → Providing robust distributed data storage
2. Map Reduce → Data processing component.
3. YARN → Monitors & manages the resources.
   - Handling workloads like stream processing, interactive processing, batch processing.
   - Monitors resources like CPU, memory etc.
4. Hive → Data warehouse project which provides data query & analysis. on top of HDFS.
5. Pig → SQL like language used for querying & analyzing. It is a scripting language.
6. HBase → NoSQL, columnar based DB on top of HDFS.

7. Mahout → Provides platform for creating ML applications which are scalable.

8. Zookeeper → coordinates with various services in hadoop ecosystem.
   - saves time req. for synchronization, config. maintenance, grouping & naming.
   - Prevents deadlock (occurs when two or more tasks fight for the same resources).

9. Oozie → It is a workflow schedular system for managing hadoop jobs.
   - supports hadoop jobs for M-R, Pig, Hive, sqoop.

10. Sqoop → Imports data from external sources into hadoop HDFS, HIVE, HBase.
    - Deals with structured as well as unstructured.

11. Flume → Ingests structured & semi-structured data into HDFS.

12. Spark → Unifies all kinds of Big data processing
    - Has built-in lib. for streaming, SQL, ML & graph processing.