

→ LINUX environment

→ JAVA

HADOOP

→ one can't run Hadoop on
Windows

As hadoop is
written in Java,
we Need to install Oracle
JDK too.

We need VMWare to run
it on LINUX environment

Hadoop runs on both Windows and Linux, however,
LINUX IS THE ONLY SUPPORTED PRODUCTION PLATFORM,
Windows is only supported as a development platform.

TYPES OF DATA:

① Structured Data:

→ Easy to search and organize, as it is contained
into rows and fields

THE DATA YOU MIGHT STORE IN AN
EXCEL SHEET IS CALLED STRUCTURED DATA

This data is managed using Structured Query Language (SQL)

e.g.: Tables, excel spreadsheet.

- Has a defined SCHEMA

② Semi Structured Data:

This type of data is having some consistent
characteristics but doesn't conform to a structure
as rigid as is expected with relational database.

e.g.: E-Mail, though the actual content is unstructured, it still contains structured data as Name & Email Address of sender & recipient.

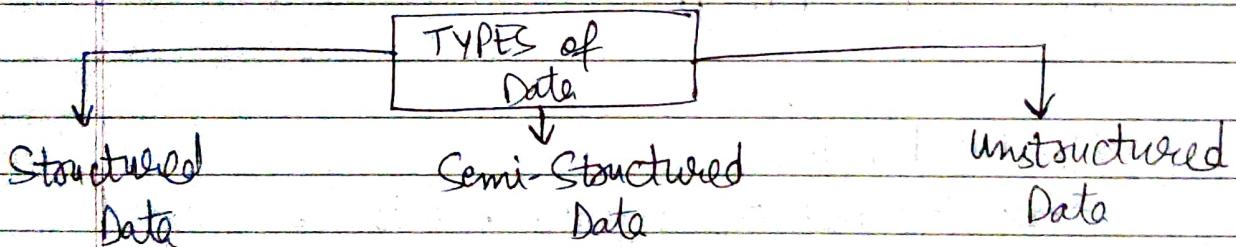
Other examples are: JSON, XML, CSV files

③ Unstructured Data:

This data can't be contained into a row-column database & doesn't have an associated DATA Model + No Defined Schema is there

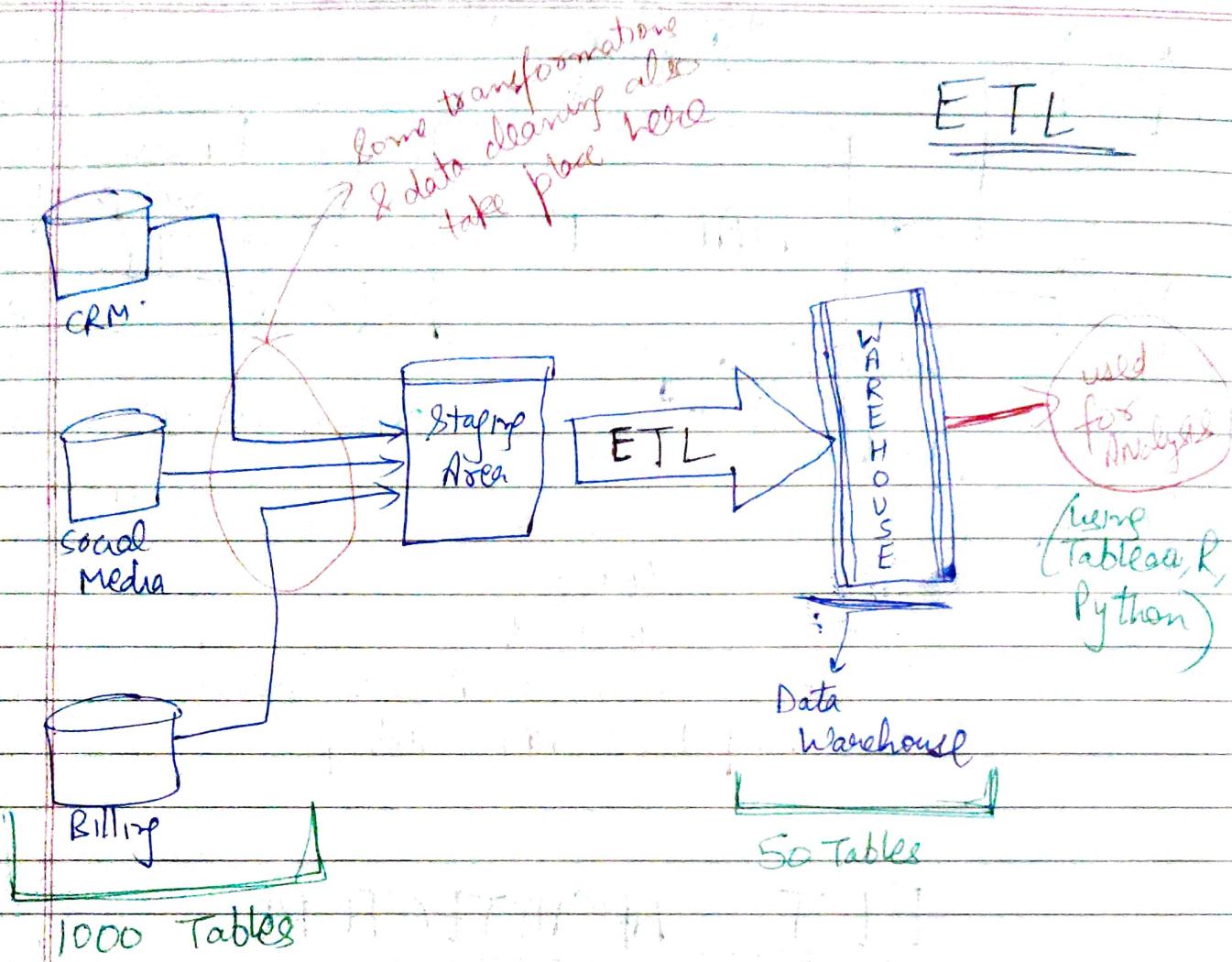
- It's queried using NoSQL
- e.g:-

• .JPG, .mp3, .mp4, docfiles, ppt etc.



Data Warehouse (ETL)

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If the data becomes very big, one can't handle it on a data warehouse.

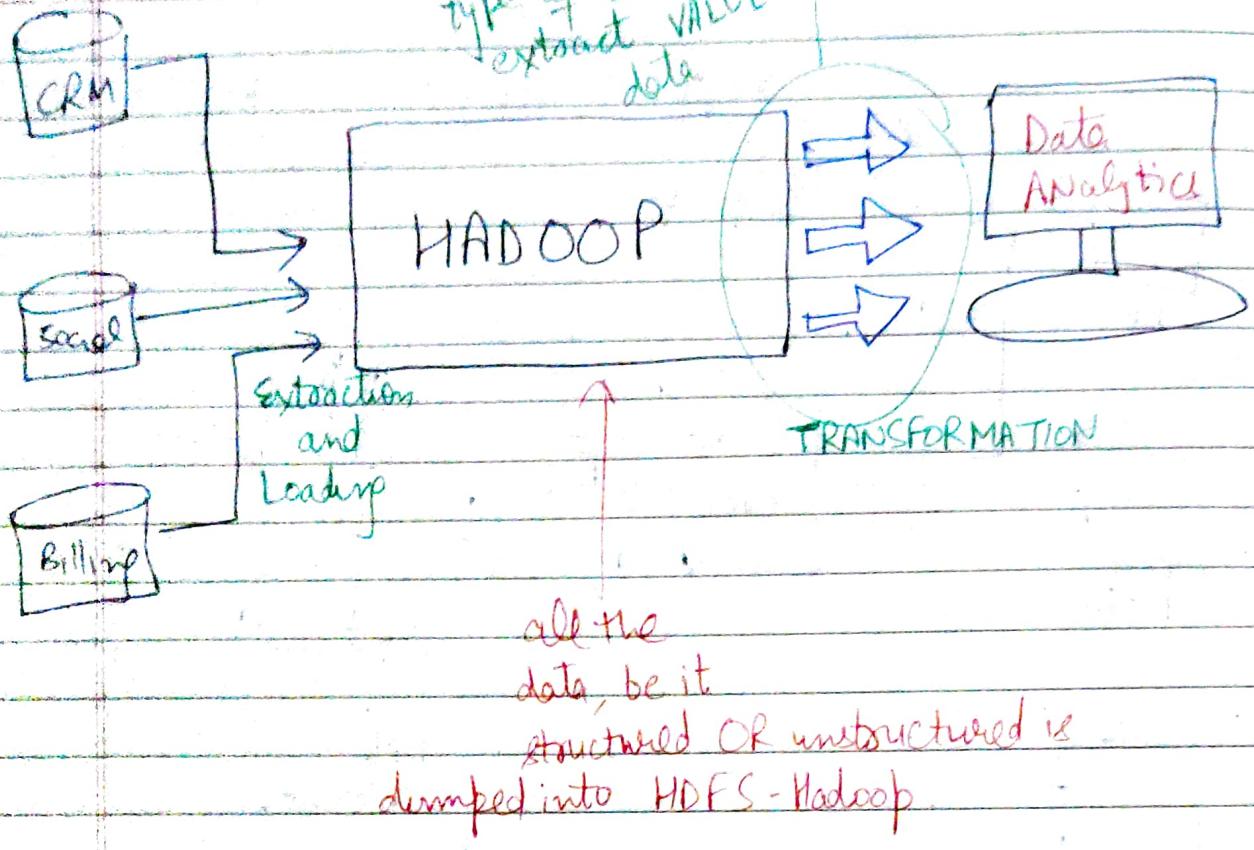
∴ We need a separate framework called Hadoop.

Also, as nowadays data becomes big, the transformation takes a lot of time. Thus the ANALYST are tended to wait for hours.

Rather than ETL, we introduced ELT.

Various jobs
are run, depending upon the
type of data to
extract VALUE out of
data

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ELT ARCHITECTURE

→ Hadoop is basically a platform used for storing BIG DATA in a cluster, and is an OPEN SOURCE, DISTRIBUTED platform for Big Data STORING & PROCESSING.

★ Hadoop's Storing Way: (HDFS)

→ Hadoop Distributed File System

★ For Processing, we have MapReduce

→ used for data processing

★ YARN (Yet Another Resource Negotiator)

→ Resource Management

History:-

The Name Hadoop is Not an acronym, it's creator Doug Cutting, explains:

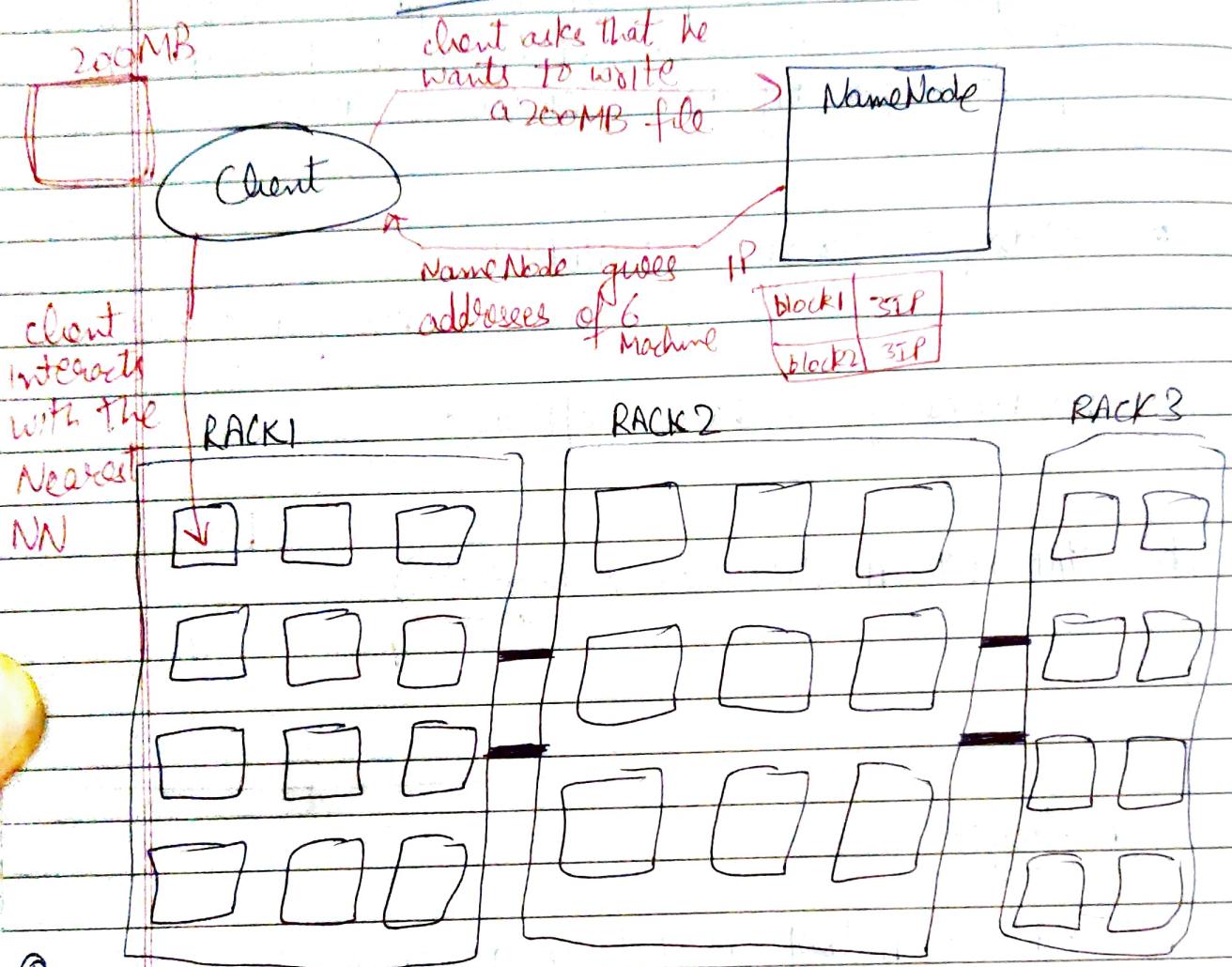
"It is the name my kid gave a stuffed yellow elephant. Short, easy to pronounce & "mangable".

Also, other projects in Hadoop system are also having names which were completely unrelated to their function, often with an elephant or other animal (eg :- PIG).

IT WAS INVENTED IN 2006 BY TWO PEOPLE:

MIKE CAFFARELLA & DOUG CUTTING

Writing Data in HDFS



These racks are placed in different geographical regions so that if one goes down, due to some natural calamity or something, we can get data from

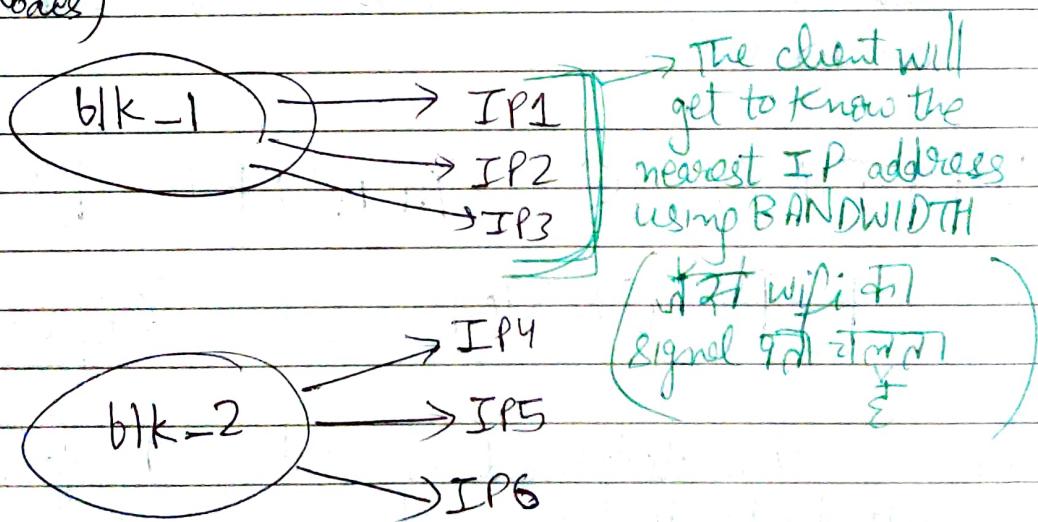
★ Data in all the datanodes is not SKewed, every NODE HAS EQUIVALENT DATA

NameNode is having a block size:

if for a 200MB file, the block size is 128MB,
the block will get split into 128MB + 72 MB

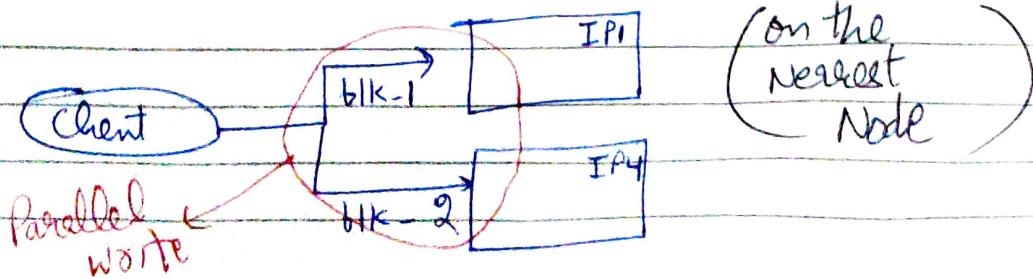


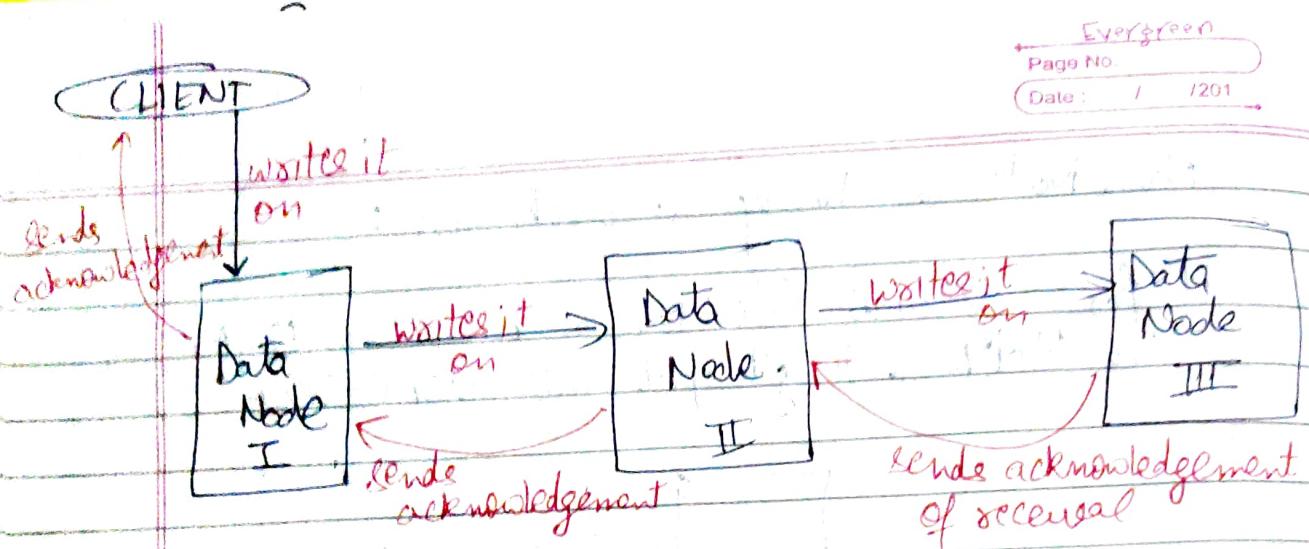
Two blocks on the client's machine will be made & NameNode will send the Number of IP addresses of Data Nodes based on the replication factor (to store it on DataNodes)



Then for each block, the client will check the Nearest IP to it. e.g.: for blk-1 the nearest is IP1 & for blk-2 the nearest is IP4

 THEN WRITING WILL BE DONE PARALLELLY





THIS IS BASICALLY WHAT WE CALL

PIPELINE OF DATA NODES

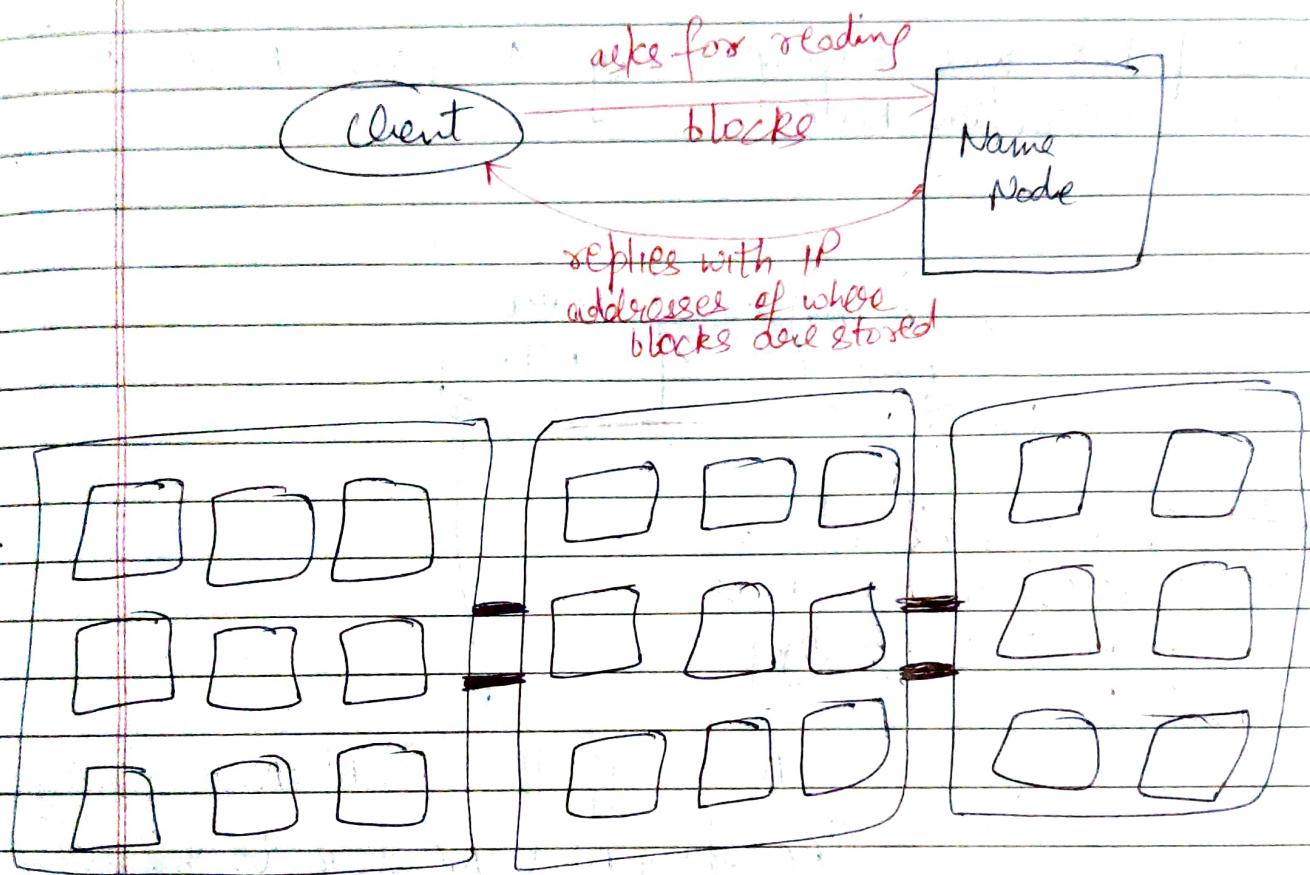
- The Client writes on one Data Node only. Then that Data Node writes on the Next sequentially (replicas are formed)

WRITING IS PARALLEL BUT

REPLICATION IS SEQUENTIAL

Reverse acknowledgement is sent back from one data node to others when it receives the data.

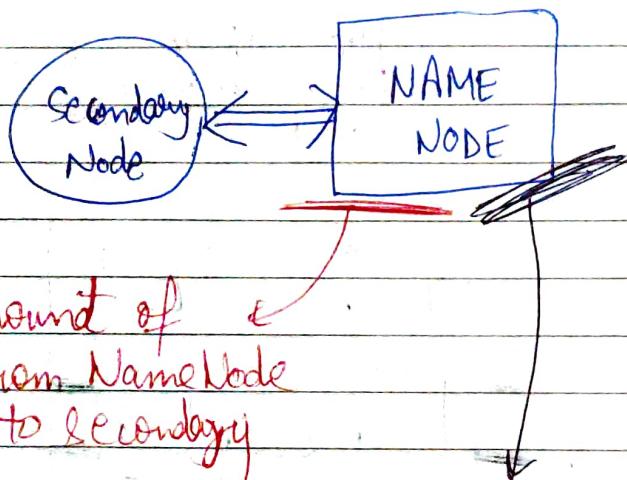
Reading Data in HDFS



READING IS DONE SEQUENTIALLY

HADOOP 1.X VS HADOOP 2.X

Hadoop 1.X was having only 1 Active Node (^{Name}_{Node}) & one Secondary Node.

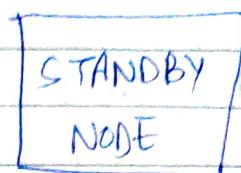
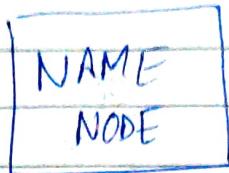


After small amount of time data from NameNode was copied to Secondary Node.

ALSO, if the NAMENODE failed, Secondary Node needs to be manually replaced with NameNode & till then the complete cluster went down.

THUS, IN HADOOP 1.X, NAMENODE WAS THE SINGLE POINT OF FAILURE IN CASE OF HADOOP.

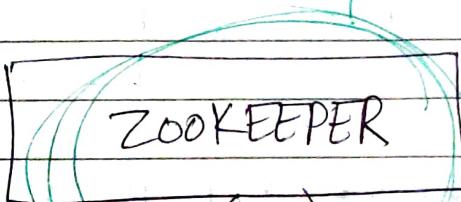
IN HADOOP 2.X, WE INTRODUCED THE CONCEPT OF STANDBY NODE



When NameNode Crashes down in Hadoop 2.x, the Standby Node immediately replaces it (without any lag)
 (that UPS replace staff & Computer Power off)

★ How THIS HAPPENS?

Both NameNode &
 StandBy NameNode
 used to send heartbeat
 signals to



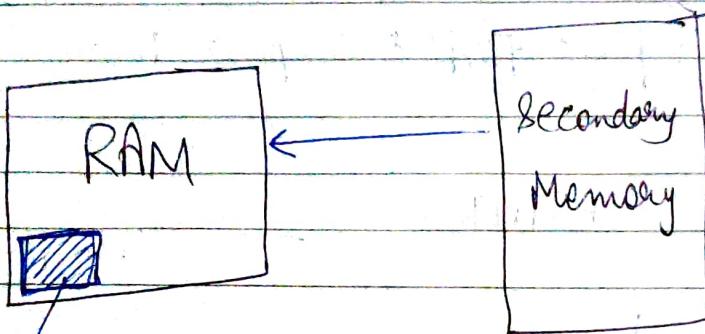
Even the zookeeper
 has ONE ACTIVE &
 other PASSIVE NODES,
 such that if one goes
 down, other gets
 alive.

If the Zookeeper didn't receive any signals from NameNode, then it will activate STANDBY node at that instant.

★ THE METADATA OF NAMENODE WAS ALSO EXACTLY SAME AT STANDBY NODE.
 HOW DID THEY MAINTAINED THE EXACT SAME COPY ALWAYS

So, NameNode contains 2 things:

- (1) FSImage
- (2) Edit Log



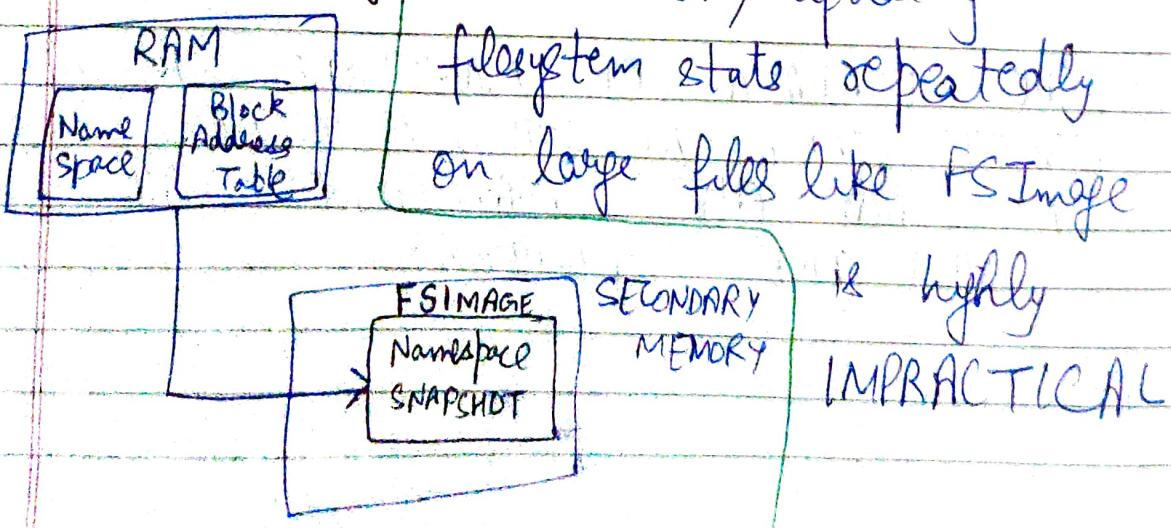
* FSImage: ~~secondary~~ RAM it has edit log file

System of complete information (so that the user may have faster access).

But, as RAM is volatile; A snapshot of the File System is also saved in the Secondary Memory.

called FSImage.

HOWEVER, updating filesystem state repeatedly on large files like FSImage



is highly IMPRACTICAL