Q. Interview Question:

Let me Know the configuration of Hadoop cluster:

Configuration of one m/c:

40TB (HDD)
512GB (RAM)
256 Cores (CPU)

What will be the total capacity/configuration of 12000 m/c.

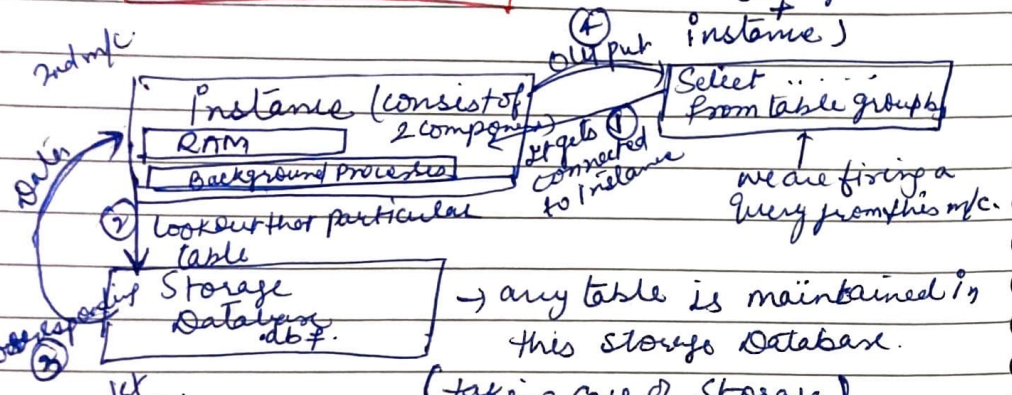
It will be

40TB (HDD)
512 GB (RAM)
256 Cores (CPU)

} X 12000.

IInd Problem

Database Server → consist of 2 Physical m/c (Storage Database + instance)



→ any table is maintained in this storage Database. (taking care of storage).

High level of overview of Database

Instance works on your behalf which ~~over~~ Over table you are looking for. This instance is going to lookout for the particular table in storage Database. Once the table is searched corresponding Data of table is going to RAM of the instance where process is going to happen. Final O/P goes to the m/c asking that query.

⑧ What could be the possible problem:

DBA coming to you asking for please remove archival table, temp data.

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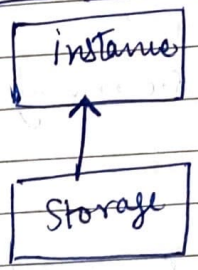
Problem :→ Complete Data is Travelling from Storage Database m/c to Instance m/c Over network

Lets Look with example



1TB
100 mb/sec

How long it will take to transfer 1TB of data with 100 Mb/s

$$\frac{1024 \times 1024}{100} \Rightarrow 10485.76 \text{ sec.}$$

$\Rightarrow$ ~~174762 Min~~

(174 min)

$= 291$ ~~Hours~~.

$= 2.91$ hours.

$= 12$ ~~days~~.

It is going to take almost 3 hours. Just to transfer the data from Storage m/c to instance we are not talking about processing right now. Now if we talk about :→ 1PB of data

124 days [It is going to take 124 days just to transfer of data].

$$\frac{1024 \times 1024 \times 1024}{100} \Rightarrow 124 \text{ days.}$$

Problem/ Data getting transferred over the n/w.

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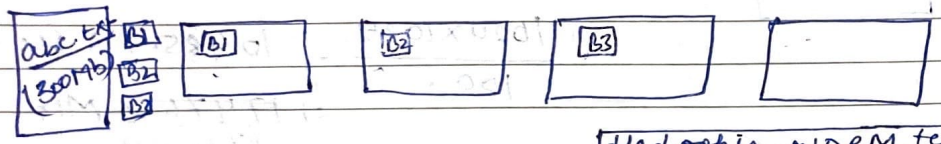
Solution :

That takes much time which is not acceptable so the solution provided by Hadoop is :-

How hadoop is solving a problem :- which uses a horizontal scaling

Before talking about soln we have to see many things

Data Blocks
Size : 128 MB.



Hadoop is WORM tech
Write once Read/many times
Multiple

File is going to be divided into small-2 blocks

Size of every block = 128 MB.

So ABC.txt will be divided into 3 blocks

B1 — 128 MB.

B2 — 128 MB.

B3 — 44 MB.

Once data comes to hadoop it remains there forever because Hadoop is horizontal scaling System. You donot remove/delete the data whenever you are shortage of data we just add more System.

CDR :
- → Data is processed for different purpose.
- → increasing revenue
- → Churn prediction

} to get different insight/diff meaning & data

When you process the data we write SQL query.

What is higher line of Query that anyone can written :-

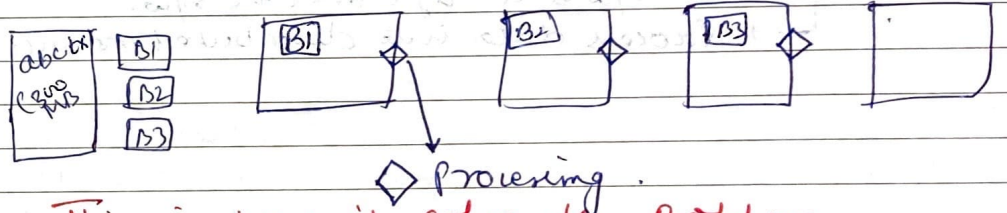
(SQL query) (higher line of query) → (150 lines of huge Query) — If i store 150 line of Query into any file.

What would be the size of any file query :- it would be. :- it would be few KB of data

Important Point : Processing ◇

Hadoop says In hadoop, here it writes the data only once. whenany point of time in case of Processing :→

Instead of transfering the data it transfer the processing logic over the n/w which is of very small size. where block processing is going to happen.



This is how it solve the problem

There is important feet that hadoop achieves:
B1 is processed at 1 machine
B2 is " " 2 machine
B3 " " " 3 machine
at the same time
So we are achieving at the same time distributed Processing & Parallel processing of data.

So It not only achieve the solution of ~~At~~ 2nd problem But it also achieve a very important thing that is distributed processing

At the end we say (Definition)

Hadoop
- → software
- → Free of cost (dont have to pay for licence. not only academic, community driven tool, developer point of view)
- → solving the Problem of existing system (vertical scaling by horizontal ")
- → infinitely Scalable
- → Solving problem of transferring not data on h/w but logic over the n/w.
- → Process data into distributed manner

Q. If you go to the office with new solution (Hadoop) what do you think ~~tha~~ your company will accept the new sol. or they will ask some more question

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What will be their concern: ? (costing)
Are these machines (in horizontal scaling) free of cost means their concern will be regarding hardware cost.

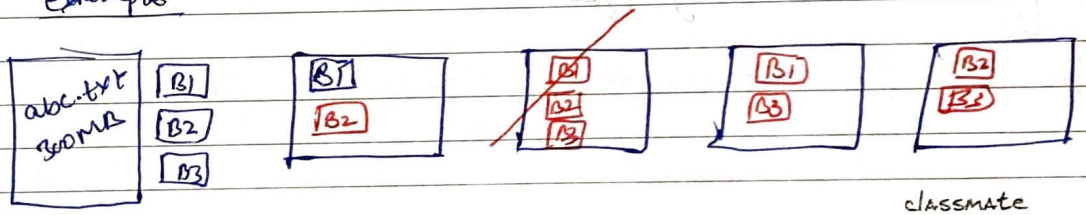
In case of HADOOP advance.
It is not neccessary to have higher end machine commodity hardware is sufficient for with hardware installation.
costing of commodity is almost nominal for company point of view.

So Definition :-

Fixed cost → It is not only s/w but h/w aspect point of view also
→ Parallel processing
→ infinitely Scalable.

Q what will happen if commodity h/w fails ?
Because we are storing the data on the commodity. ~~are my data~~ what happens if commodity h/w fails goes down.

example



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Hadoop

~~I will~~ Keeps multiple copies of block on different machine. (By default it replicates at 3 times) This process is called **Data Replication**

We can increase/decrease this replication factor as per my requirement.

So if Machine (two) fails it will be lost of B1, B2, B3 Block only but still 2 Replications are already present.

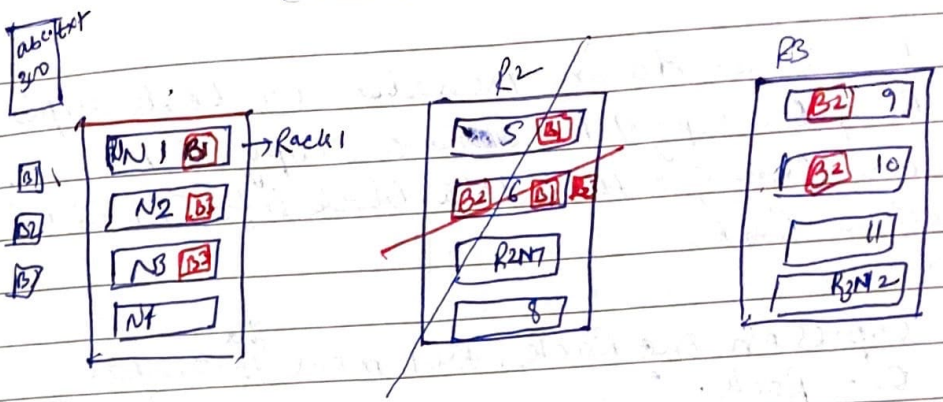
Incase of Google - Google never says i have lost your Email. Reason is Google is maintaining a replication factor 5. Even in the worst case scenario, Data doesn't get lost.

Although data gets replicated 3 times but because of commodity m/c we are using ~~we focus on~~ On reliability

It is economical also as we are using ~~co~~ commodity h/w.

RACK AWARENESS AND REPLICATION

Rackawareness



Q. what happens when you store any file ?

This is 3 ~~Rack~~, 12 Node hadoop cluster.

we are making first copy of B1 available at R1N1 m/c.

Rackawareness say 2nd will go to 0 Other Rack 3rd will go to same but on different m/c.

2 copies on the same Rack, 1 on other Rack

3 machines will be consumed.

Let's talk about [B2]. First copy is available on R2N6 and 2nd one R3N9, 3rd copy on ~~R3~~ R3N10

Next is B3 block, first copy we place at ~~R2 R6~~ R2N6, 2nd will go to R1N2 3rd copy is going to R1N3.

Loosing one m/c [R2N6] is not a problem because we can get the info/data from other rack or m/c.

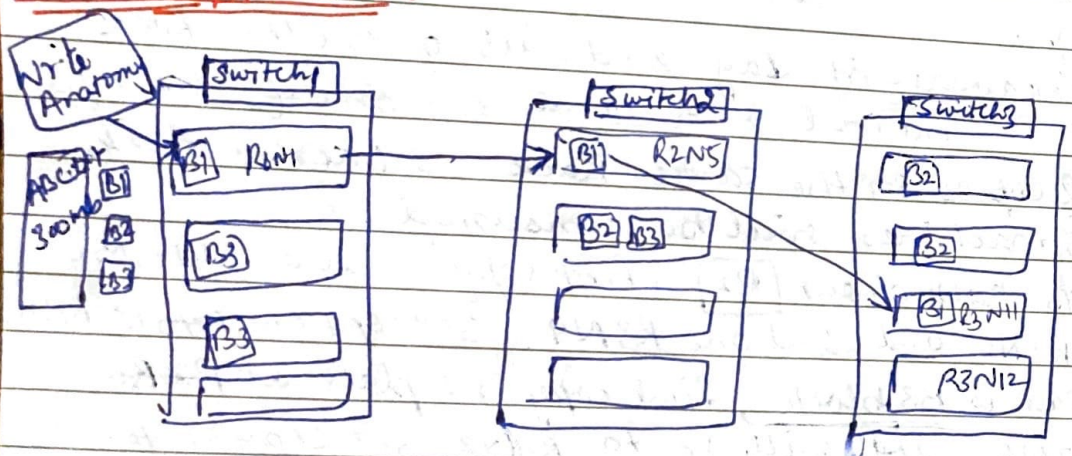
Loosing Rack is also no problem but chances of loosing Rack is very-2 minimal

If Rack 2 goes down then also we can get 2 copies of B1, one copy of B2, and one copy of B3. Still we can get the data Block info [B1, B2, B3] from other Racks.

Two copies on one Rack. Not more than two copies on one Rack.

Q. Why it is not happened? Keeping First copy on Rack 1 and 2nd on Rack 2 & 3rd copy on Rack 3. Is this not a reliable solution?

Solution / Answer:



Whenever we want to write data there is a process called write Anatomy.

Write Anatomy will write into 1st m/c then it will write into 2nd m/c then it will write into 3rd m/c.

If two m/c on the same Rack talk to each other this is called Intra Rack m/c.

If two m/c on the diff. Rack wants to talk then m/c of first Rack will talk to the switch of that Rack. then switch of R1 will talk to switch of second Rack then switch of 2nd Rack connect to m/c. Particular m/c

Communication:

R1N1 - R1N2 (IntraRack)
R1N1 - R2N5 (InterRack).

(InterRack is less expensive than IntraRack)

Scenario

Now for write Anatomy process if B1 at R1N1 wants to communicate to R2N5 (for replication) then R2N5 wants to replicate at R3N11 All are Inter Rack communication

Whereas Scenario-2

If two copies is stored at one Rack this time there is only one InterRack communication whereas in Scenario-1: 2 interRack Communications were there. Which was costly.

Q. Shasank is writing a file ABC.txt into HDFS now Abhijeet wants to read this file today which was written by Shasank yesterday. How Abhijeet will be able to read?

Is this a data which Abhijeet wants to read

Q: This info

abc.txt

data :→ B1, B2, B3

information is data about data. It is called METADATA

abc.txt
B1, B2, B3
B1 : 1, 2, 3
B2 : 2, 3, 4
B3 : 1, 2, 4

(This info has to be available somewhere)

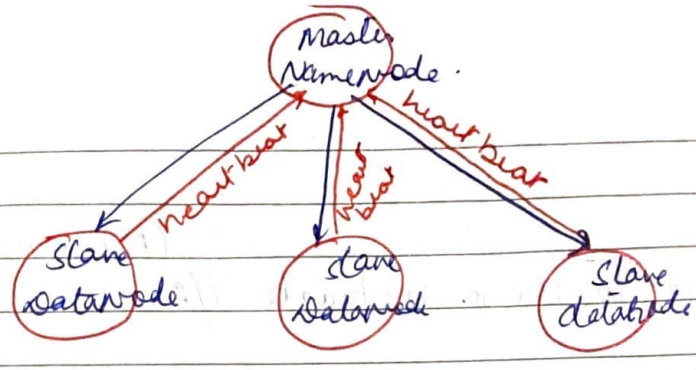
Then only you will be able to read B1, B2, B3 absolutely

Imp Point : This metadata is a critical info and where it will be kept. If It is not there you will not be able to read the data, reconstruct data ~~this~~ so this metadata is highly critical.

eg : If you deposite money (AccNo, Bankname, Branch address) If you loose this info ~~thes~~ is equivalent to your lost money. This info is highly critical.

So in hadoop what happens is this highly critical i/f metadata is stored in ~~in~~ RAM of that m/c That m/c is refered as NameNode

Hadoop is something which works as master slave architecture.



All the m/c coming under this master. All the slave m/c coming under master.

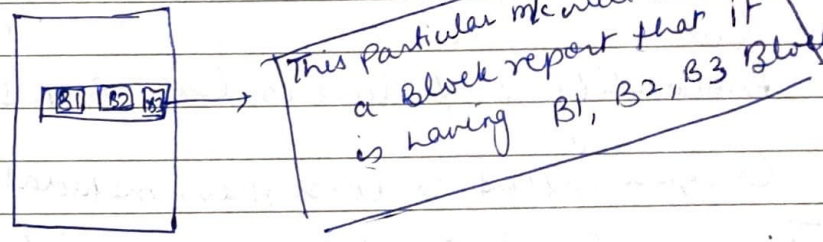
All the slave m/c are separate and they continously sending signals [acknowledgment] to the master m/c after 3 sec.

⇒ Hey master, i am alive and you can give me command

This signal is called heartbeat

This heartbeat is sent after 3 sec. After every 10 heartbeat means interval of 30 sec. What is going to happen is :

These slave m/c send block report to the master



Block Report from slave to master.

Whenever you are keeping any data a metadata is generated. That metadata is kept in the RAM of master m/c (Namenode)

CAN I afford to loose metadata i/f.

METADATA is highly critical I/f.

Q Can I afford to store this metadata I/f on commodity m/c

It should not happen - It should be high end m/c.

Commodity h/w is not appleciable for master m/c because Master m/c keep critical i/f.

NameNode - BMW, Lamborgini

DataNode - TATA NANO

Master m/c has to be high end m/c and slave m/c should be commodity m/c.

Q. Does my master m/c ever breakdown

Probability of failure is less. But still

Can you afford to loose this metadata I/f.

There is a big requirement for the backup of Namenode :)

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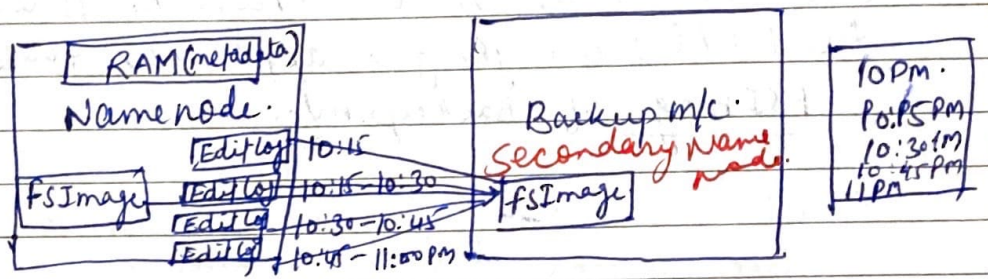
Backup of Namenode in Hadoop Generation 1

first version of hadoop that was released called Hadoop 1.0

1. Add a new file
2. delete an existing file



Namenode having huge amount of RAM for keeping metadata i/f

In hadoop you can do these 2 activity

1) Add a new file
2) delete an existing file.

You cannot append, update the file.

✓ FSImage : you create a hard copy of this and keep it in hard disk it is called FSImage same FSImage is made available in Backup m/c.

Now at 10:15 PM, all the changes which

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happen to cluster are captured on Edit log. means either you added / or deleted a file those changes were captured and made available to Edit log.

Finally at 11:00 PM. all changes were made available to one more Edit log. At 11 all the Edit log are going to applied on these FSImage of Backup m/c

Q = If all the Edit log changes are applied on top of FSImage. what will be o/p. ?

If we apply all Edit log on top of FSImage then this FSImage will be in proper Sync with the metadata present in the RAM of Namenode.
(Master m/c)

At 11 both metadata (in RAM) & FSImage (of Backup) both will be same. This is how backup is maintained.

This Backup m/c is called Secondary NameNode.

Q = ~~Whenever~~ & what happens ~~if at 10:15~~ just before 11 if name node fails then what will happen.

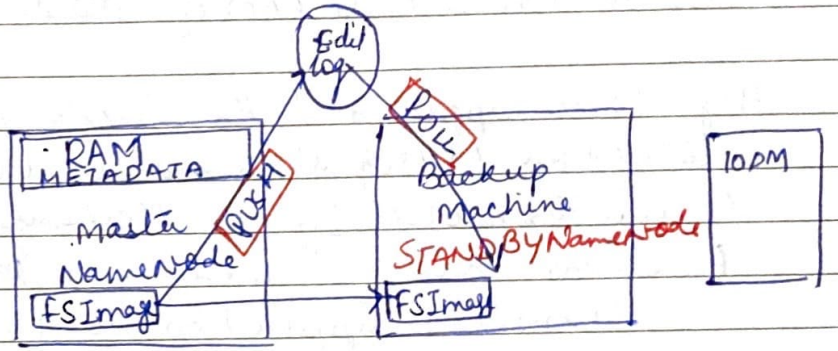
As all the Edit log are on NameNode. If it will fail then it will loose some i/f (Lose of some data) is there in Hadoop 1.

This was problem in Hadoop generation 1.

In Hadoop 2 solution to this problem is given

Solution :→ By Hadoop Generation 2

BACKUP in Hadoop Generation 2.0



I started doing backup at 10 PM & Complete Metadata i/f hardcopy is available as FSImage in harddisk of master m/c.

This FSImage is made available to Backup m/c. at 10 PM. This is one time activity

after that any of the change which is going to happen to cluster those changes are being captured in terms of Edit log

Those Edit log are placed at Shared location

Editlog made available at shared location, any changes are going to made available in Edit log at shared location into the real time basis and again on the Real time basies those changes are captured and directly being applied to FSImage of Backup machine. It is called PULL mechanism

It works as PUSH & PULL mechanism.

PUSH

At any time fsImage is sync with metadata present at RAM of master machine

Any change happening to the cluster that change is captured on Editlog at shared location On the real time basis by Push Mechanism and Once again with PULL mechanism where real time changes are applied on the FSImage of Backup m/c

This procedure is called the Backup Mechanism of Hadoop 2.0.

Backup m/c is called StandBy namenode

At any given point of time there are 2 node one is active namenode & Standby namenode Both of them having are having the real time Metadata information available at any point of time

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There are 2 masters: (At any given point of time there are 2 masters)

Q. What will happen if there is conflict between 2 managers.

Ans If there is conflict between 2, whom to follow, not to follow.

if this is the case

Now this problem is sorted out: There is always a Super manager. Super manager will resolve the conflict

Same way we have Super Manager available in Hadoop 2.0

Zookeeper :→ Zookeeper ensure at any given point of time all the Slave machine are reporting to One master. ie. active namenode.

If there is any problem comes to Master (active Namenode) Zookeeper immediately will communicate to all slave m/c that to report to new master (slave m/c)

The whole process doesnot require any downtime. This is called High availabily

High Availability : So we achieved HA in Hadoop 2.0.

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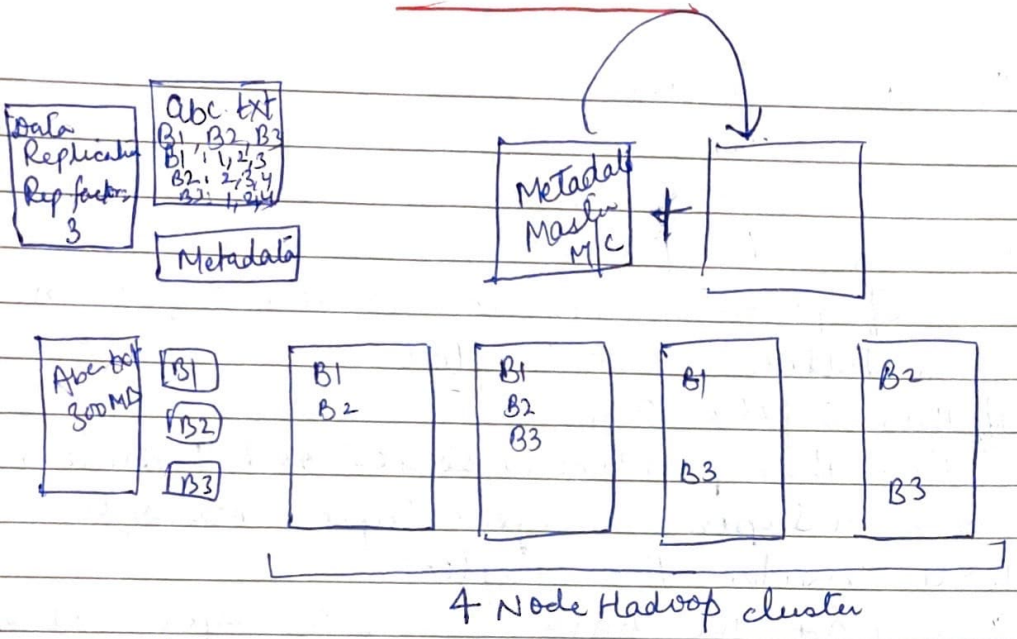
FEDERATION



If we are Running short of RAM, Harddisk then we add more Slave (commodity m/c) because of Horizontal Scalability.

Similarly in case of Master m/c, corresponding metadata is stored on RAM of master m/c (~~RAM~~)

Q. What if RAM of master m/c gets filled up.

→ will you be able to store any file on hadoop ~~#~~ - No.

If no space available in the RAM of master m/c we will not be able to store any file in hadoop. we will never be able to reconstruct the data.

If RAM of master m/c gets filled up ~~we will increase the RAM~~ with the help of horizontal scalability

and add 2nd m/c as master. Once again there is no limit for Adding master ~~also~~ machine also. This concept is called as Federation

This only comes with hadoop Gen 2.0

Hadoop became truely infinitely scalable system only in generation 2.0.

When you have multiple m/c one master and others slave. This is called Fully distributed mode hadoop cluster.

Access of one m/c

If we are able to login to one m/c, we are connected to complete hadoop cluster that is what

all Linux command are applicable with prefix hdfs in Hadoop.

hdfs dfs -

Hdfs

/usr/username

/user/edureka

Federation: is to apply horizontal Scalability for namenode - Master machine.

Create One Folder

To create directory

Command:

hdfs dfs - mkdir

There is no command CD available in HDFS.

HDFS: is virtual file System. You can imagine it, think of it you cannot live it. You cannot go to virtual location.

WRITE ANATOMY: Transferring some data from local file system to HDFS. You want to write data to HDFS.

WRITE Anatomy

HDFS dfs -Put LocalFilePath HDFSFilePath.

When you fire this command you can login to any machine & from there you fire the Command.

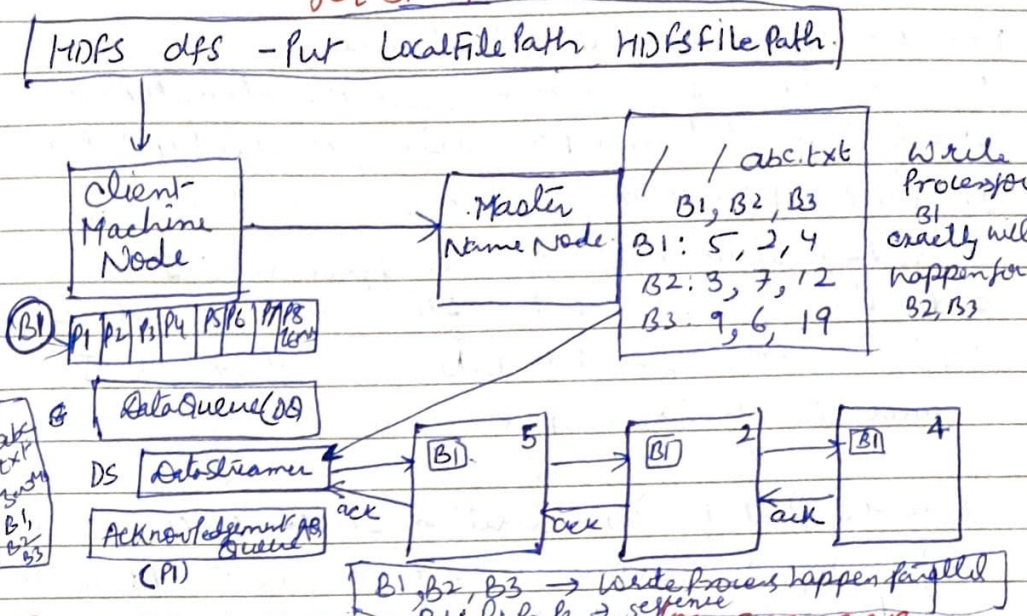
first point of contact is master node. This master node is going to prepare Metadata info for this file.

Ans: 3 Concept of Rackawareness will decide where the Block information will go.

Q. Who is taking the decision of Metadata: (Master)

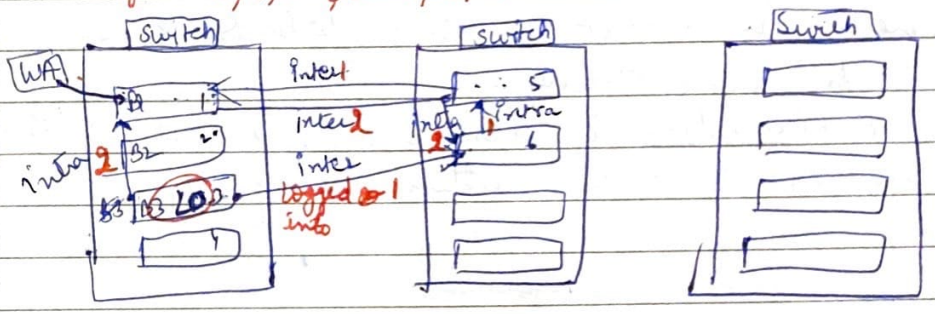
Q. No. of Blocks will be decided on which basis? on the basis of BlockSize and size of file

Q. what would be the Criteria for Selection of 3 machines for B1: 5, 2, 4



Q. What could be the reason for sequence

Why it is 5, 2, 4 only why not any other seq. 2, 4, 5 or 2, 5, 4 etc.



WA says

Interrack communication

Path 1: 2 inter + 1 intra

Path 2: 1 inter + 2 intra

} inter rack is far way expensive then intra

This sequence is decided on the basis of inter or intra rack communication

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Name Node connected with data Streamer.
What DS does Data Streamer further divide B1 to Small -2 Packets of 16 MB = Total of 8 Packets (P_1, P_2, P_3, P_4 — All the Packet become part of Data Queue.
It will set first Packet to Acknowledgement Queue
then Data Streamer Connect to first m/c 5
and It is going to create a file in the Local file System of m/c name it as B1 after that m/c 5 Connect to 2 Same Procedure.

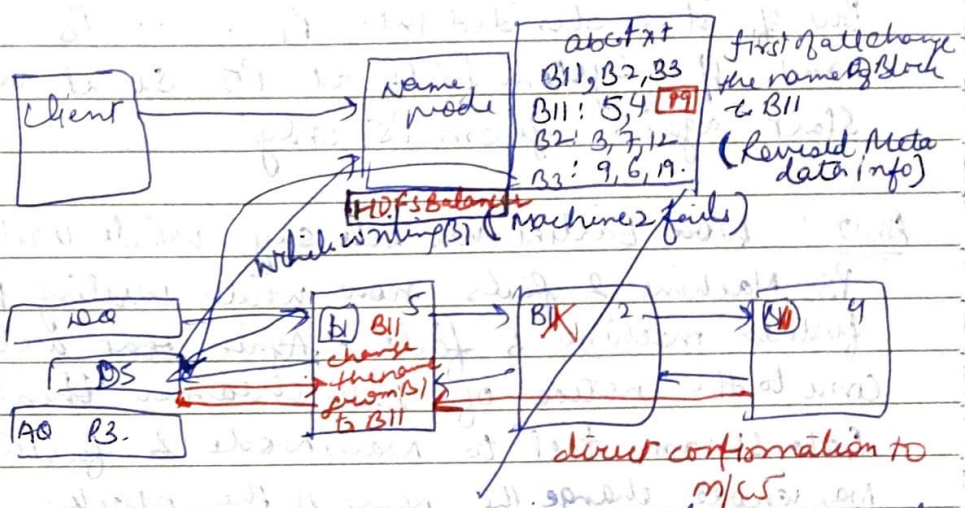
Once the Packet (P) is written succesfully on all m/c m/c 4 send ack to 2 then 2 to 5 it will Send confirmation to Data Streamer Yes Packet (P) is written Succesfully on all the m/c's.
Data Streamer remove P1 from Acknowledgement Queue & Put Packet 2 from data Queue to Acknowledgement Queue.
Same Procedure is done for all the Packets (P_{1-8})
In this way Block B1 written succesfully.

In Not-happy path Scenario:

Q How the detection of failed machine is done?
AS the machine which is getting fail will not send acknowledgment Packet from the receiving m/c becoz of not getting

acknowledgment understand that something happen to m/c [failure occur]

this information is passed to Data Streamer
Once data Streamer get to know it will Put Packet P_3 back to Data Queue then it will Connect to namenode.



While writing Block B1 Node 2 fails. So namenode Chang the Block B1 to B11

Question: 1 Why Block B1 is divided to $P_1, P_2, P_3 - P_8$
Q 2. what happen if further m/c fails.
Q.3. Block B11 is only replicated to 2 m/c now the problem of under replication is solved
Q.4 Why B1 name Changes to B11
Q.5. What will happened to failed m/c

What will happen to
Q.S. m/c No. 2 and about the corrupted Block

Ans1: Packets $P_1, P_2 \dots P_8$
Let's we have not divided it & we have written 100 MB of data when we start again we have to start with 0.
But if it is divided into $P_1 \dots P_8$
and if system fails at P_5 so it will start again from P_5 only.

Ans2: ~~Also~~ Earlier ~~with~~ lets say while writing P3 Machine 2 fails now while writing P6 further machine 5 fails. Again that will come to the notice of Data streamer then same Data stream tell to Namenode & further Namenode change the name of the block.

If you are able to write Successfully a block even on a single machine. That is called a Successful write

It will be underreplicated But still it is called successful write.

Ans:3 Under Replicated

Write Anatomy complete even if the block I/f is written even on one machine

After failure we are writing one 2 or 1 machine But it is called underreplicated. How to Solve it there is one more ~~safe~~ Process running with the name HDFS Balancer running under Namenode

Q. What does HDFS Balancer do?

HDFS Balancer check metadata information on Point of time at regular interval then it will come to know that Block 11 is under replicated then it will inform to master node. Then master node decide that it should be placed at 89 Machine. So third copy will be replicated to 89 m/c hence problem of under replication will be solved.

Ans:4 Why the name of the block B1 is changed to B11

After Coming back HDFS Balancer will never come to Know that this Block B1 is corrupted Block.

Ans:5 what happend to Machine 2 and Corrupted Block.

As we are using commodity m/c any m/c can go out we don't have any control it cannot come back its own. Its the hadoop administration is going to induct the m/c again to cluster.

Machine 2 after coming back will send heartbeat after 3 sec: to hadoop master. If 10 heartbeat m/c 2 will say that it is containing Block B1.

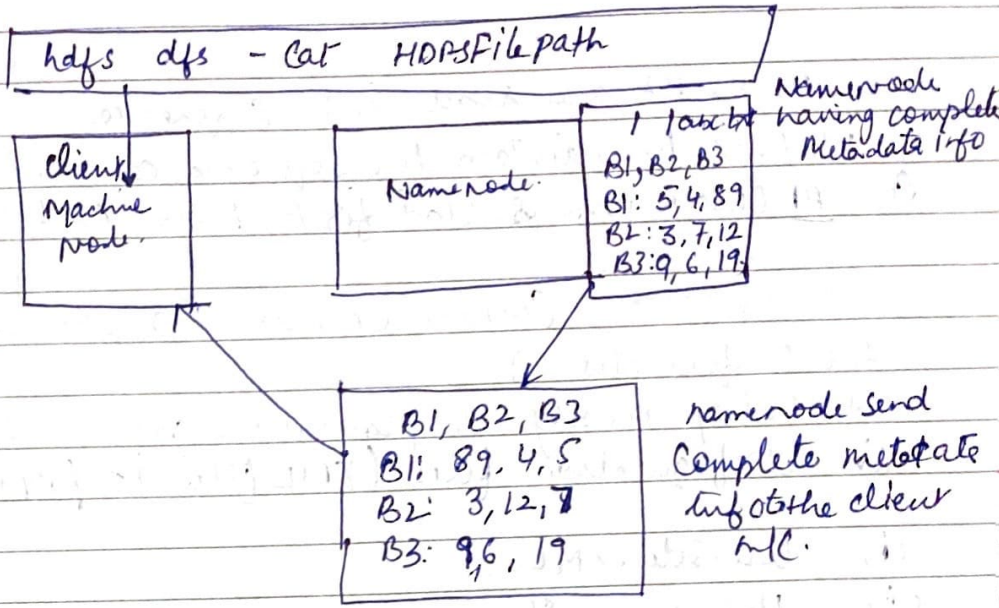
then HDFS Balancer will check the complete ~~inf~~ metadata information & check the entry for B1. After checking it will come to know that it is half written block a Corrupted Block. (HDFS Balancer delete the Block B1 from machine 2)

Intrarack communication is less expensive then interrack communication.

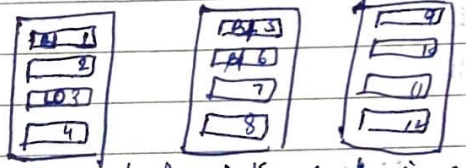
nearest block is selected for reading

B1 is read from 89
B2 : is read from 3
B3 : is read from 9

READ ANATOMY: Read the data from HDFS



Q.4. what is reason for changing of sequence?



B1 is present on m/c 1, 5, 6. and you are logged into m/c 3 from which m/c you will read :→ m/c = 1

As cost of intra rack is small as compare to cost of inter rack

Q.1 Who you think the first point of contact? NameNode Block are available on diff. m/c.

Q.2 If I want to read B1, I should read from all the m/c or One is enough. → One is enough.

Q.3. Why namenode send complete metadata info

B1: if you are reading B1 from 89 at that point machine 89 goes down to avoid roundtrip so that it can read from nearest machine

Write is parallel & Read is in Sequence

Q. B1, B2, B3 are read in parallel or in sequence

B1, B2, B3 are read into sequence
We have to maintain the sequence as well
So B1 (Block info is read first then B2 & then B3

CONFIGURATION : (where you will go change the configuration)
In Hadoop mostly configuration are maintained in configuration files (XML file) in properly

(i) Core-Site.xml
(ii) Hadoop-env.sh
(iii) Hdfs-Site.xml
(iv) Mapred-Site.xml
(v) YARN-site.xml

Any configurable properties are maintained in these files

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CLASS-4

PROCESSING IN HADOOP GEN-I

commands

Hadoop jar JarfileName className InputfilePath OutputPath

Q. what is jar file.

Jar File : (Java archival file) compiled versions of your program written in Java Programming language. With the help of java compiler it get compiled and converted into Byte code (jar file) This Byte code is given to JVM This JVM convert into machine level code which is understoop by m/c operating System.
JAVA is platform independent Language.

We have three file over here : where these files should be placed?

	LocalFileSystem	HDFS.
Jar File	✓ (not clear)	
InputFile Path		✓
Output file path		✓

IAR explanation : Processing logic (If I want to process ABC.txt / If want to process B1, B2, B3)
If Input file path is put in local file system it will be single file. But for distributed processing it should be present in HDFS.

Output file path : Meaningful info should be available on highly reliable hardware. HDFS is reliable storage.

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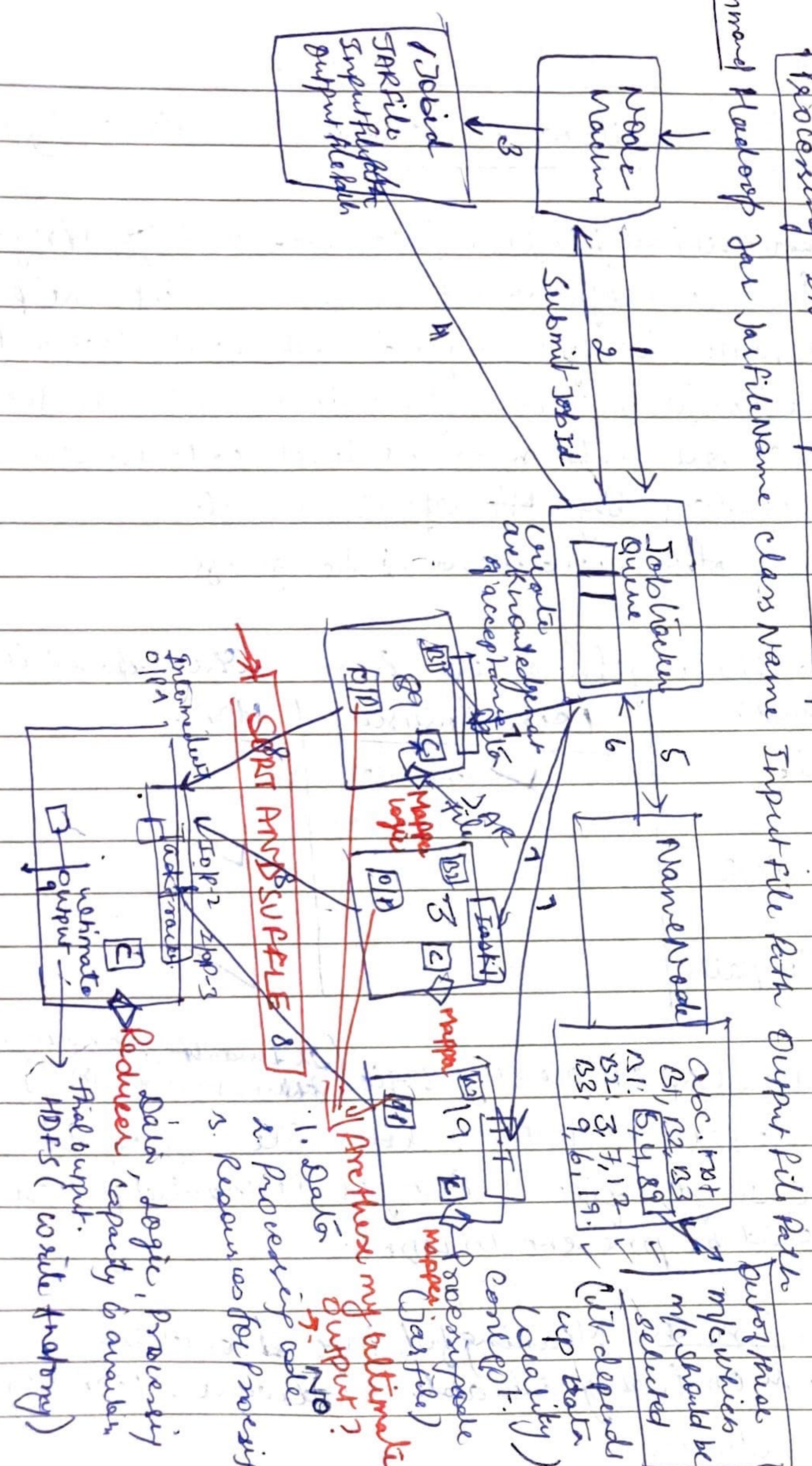
Q Who is going to be the first point of contact ?

Processing in Hadoop Generation 1

Command Hadoop Jar JarFileName className InputFile Path OutputFile Path



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B1, B2, B3 : are processed in parall with the help of Mapper logic

Reducer Logic : is applied to consolidated intermediate O/P.
The Op of Mapper Logic is stored in Local filesystem (temp directory) of Local File System.

Mapper + Sort and Suffle + Reducer
↓
Map-Reduce Framework.

Failure Scenario mapper can fail reasons

1) Mapper failure → becoz of Networking issue socket issue, coding issue, Programming data issue (Name instead of it is getting id) whatever may be the issue if mapper fails
mapper failure is reported to job tracker through task tracker.

Job tracker when come to know. JT take very simple approach to run it again

If Mapper fails :→ Then Task Tracker runs again & it start processing block again from scratch.

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Sort & Shuffle cannot start till the time o/p of all the mappers will be available. So Sort & Shuffle will wait for the o/p from failure mapper machine.

⇒ Mapper failure result into delay of Job

#2) Reducer failure : once again it is a logic. Reducers can also fail because of same reasons. (Programming issue, network issue, data issue)
Then Task Tracker Report to JT that Reducer has failed.
JT again will take same simple approach to ask (TT) to run reducer program again

⇒ Reducer failure result into delay of Job

Q What will happen if mapper & Reducer fail again
Same procedure happen

TT —tell about failure→ JT —start again Mapper/Reducer→ TT —Runagain (Mapper/Reducer)→ Delay of Job

(It will try to 4 times) Terminated

#3rd scenario Task tracker failure:
It will come to know to JT. ~~becoz of JT knows~~ that Task tracker is not working. so BI processing is not going on. So it will contact to Namenode where metadata info of BI is present so if one m/c fails it knows that where on the other machine BI is present so earlier BI was running on 89 machine (no (now failing of 89) One more m/c is going to be selected & that job process starts from scratching on the new selected machine.

⇒ Task tracker will also result into the delay of Job.

#4th Scenario Job Tracker failure: All the Jobs will be Terminated. All the System resources will be released.
Complete Cluster become stand still.
Master failure result into comprehensive failure.
Job tracker is a single point of contact. In and out failure.

Q What is the Biggest Problem or drawback in hadoop Gen1. Processing : Single point of failure

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Job tracker is the biggest Problem (single point of failure) in Hadoop 1.0 Gen.

Q Why the Job Tracker is failing ? How that Problem can be sorted out.

Ans Job tracker is heavily engaged doing almost all things

1) Its the Job tracker → First (single) point of contact
2) Its Job tracker who is maintaining the queue
3) Job tracker is looking to the ~~Queue~~ folder of client
4) It is the job tracker who contact to name node for looking to the complete metadata information
5) Job tracker who select the m/c on the basis of data locality
6) ~~All the task tracker to ask~~ Job tracker connecting to TT asking for giving allocate resources for data processing
7) ~~Job tracker~~ Any failure scenario (mapper, Reducer, task tracker) job tracker is contacted.

J.T is not only handing one job ~~at a~~ but handling many jobs parallely

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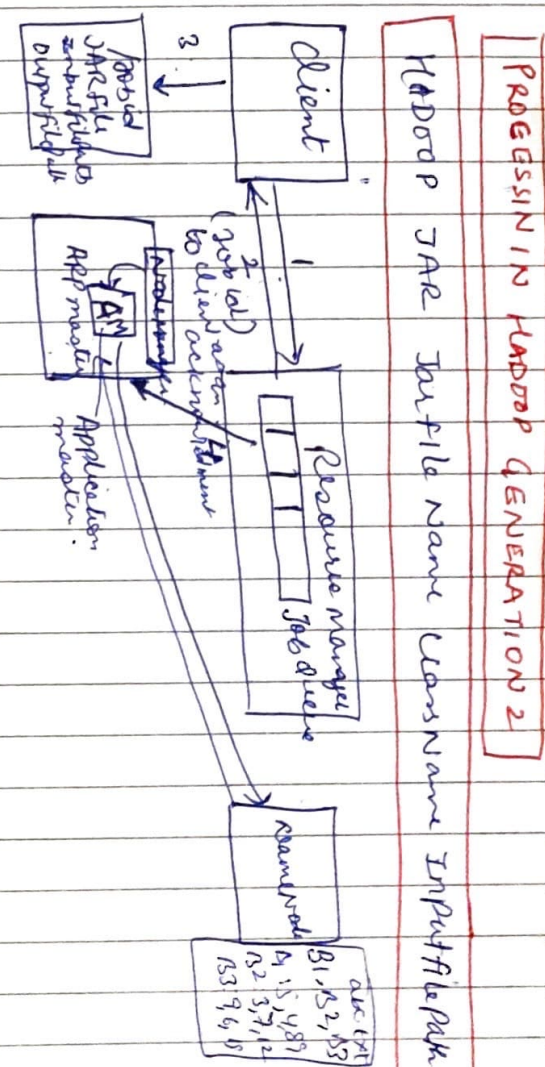
Who is going to be the first point of contact
→ Resource Manager

It is the heavy engagement of Job tracker which become the reason for its failure.



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Map-Reduce Framework

Mapper :

Takes input : Key, Value
Key : line number
Value : complete line
Output : Key, value

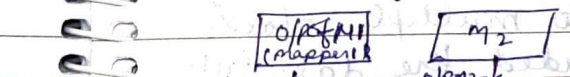
Sort and Shuffle :

Input : Key, value (output of mapper)
output : Key, List of values.

Reducer :

Input : Key, List of values.
Output : Key, value

Sort & Shuffle does two working



O/P M1 → Name: Supriya.
Age : 19

O/P M2 → Name: Kaushik
Age : 21

① Sort & Shuffle is done on the basis of Key → ② Shuffle the values

AGE : {19, 21}
NAME : {Supriya, Kaushik}

O/P of Shuffle : List of values.

How the requirement is solved using simple map-Reduce:

Example :→

Cid, temp, date

1, 23, 1
2, 31, 1
3, 44, 1 → B1
4, 19, 1

1, 25, 2
2, 30, 2
3, 43, 2 → B2
4, 18, 2

1, 24, 3
2, 34, 3 → B3
3, 44, 3
4, 19, 3

Likewise we have all the cities across the globe. we have data of last 5 or 5 days.

Process this particular file
O/P - Look forward city wise max. temperature so far
we want to explore max-temp. city wise so far.

① Put this file in HDFS. (Distributed storage) Data will get divided into multiple Blocks. Let's say it has divided the data into 3 Blocks.

② If there are 3 Blocks how many mapper Required (3 mappers)

③ I/P format → mapper
Key
value

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Q. Can i get the max temp for city from the mapper? for Aggregate values (sum, max, avg), we can not get from mapper.

Input to mapper

1, 23, 1
2, 31, 1
3, 44, 1
4, 19, 1

K	value
1	(1, 23, 1)
2	(2, 31, 1)
3	(3, 44, 1)
4	(4, 19, 1)

1, 25, 2
2, 30, 2
3, 43, 2
4, 18, 2

K	value
1	(1, 25, 2)
2	(2, 30, 2)
3	(3, 43, 2)
4	(4, 18, 2)

1, 24, 3
2, 34, 3
3, 44, 3
4, 19, 3

K	V
1	1, 24, 3
2	2, 34, 3
3	3, 44, 3
4	4, 19, 3

Output to mapper (split of the same)

Key value (cid, temp)
1, 23
2, 31
3, 44
4, 19

K	V
1, 25	
2, 30	
3, 43	
4, 19	

K	V
1, 24	
2, 34	
3, 44	
4, 19.	

Reducer

Key	list of values
1	{23, 25, 24}
2	{31, 30, 34}
3	{44, 43, 44}
4	{19, 18, 19}

O/P of Reducer

K, Value
1, 25
2, 34
3, 44
4, 19

Loop through values. and find max temp.

Example 2: Word Count

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Description about word count program.

Program starts with main method.

Q why the object of configuration is required ?
We discussed about the configuration files, their properties & values
Either we give the value of the properties.
we don't want to give each & every properties of the configuration files..

Input output

⇒ 'mapper' (long writable Text Text, IntWritable)
(LineNumber) complete word value
line

Public class mapclass extends Mapper < Longwritable, Text, Text, IntWritable > {

Public void map (Longwritable key, Text value, Context context) throws IO Exception, InterruptException

{

String s1 = value.toString();
String arr[] = s1.split(" ");

for (String x : arr)

{

Text word = new Text(x);