**Name: Nikhil Jadhav**

**Student ID: 801075504**

**Cloud Computing for Data Analysis**

**VIDEO CASE 02 : Hadoop HDFS**

Watch following videos:

**Video 1**: <https://youtu.be/cC6sS80sZYQ>

**Video 2:** <https://youtu.be/yDV0EE9DCJ0>

**Video 3:** <https://youtu.be/nbOagGnIMiY>

Video 1 introduces you to HDFS

Video 2 describes about Name Node in HDFS

Video 3 provides knowledge about file read and write operations in HDFS

**Video Case Questions:**

1. Give some description about data nodes and name node
2. What is the main purpose of secondary name node?
3. What are all the steps followed by HDFS for write operation?
4. Explain the steps that Hadoop follows for reading the data during a data node failure.

**Answer 1:**

**Namenode**

1. NameNode is the centerpiece of HDFS and is also known as the Master.
2. NameNode executes file system namespace operations like opening, closing, and renaming files and directories. It also determines the mapping of blocks to DataNodes.
3. NameNode does not store the actual data or the dataset. The data itself is actually stored in the DataNodes.
4. NameNode knows the list of the blocks and its location for any given file in HDFS. With this information NameNode knows how to construct the file from blocks.
5. NameNode is very critical to HDFS and when the NameNode is down, HDFS/Hadoop cluster is inaccessible and considered down.
6. NameNode is a single point of failure in Hadoop cluster.
7. NameNode is usually configured with a lot of memory (RAM).

**DataNode**

1. DataNode is responsible for storing the actual data in HDFS and is known as the Slave
2. DataNodes are responsible for serving read and write requests from the file system’s clients. The DataNodes also perform block creation, deletion, and replication upon instruction from the NameNode.
3. NameNode and DataNode are in constant communication.
4. When a DataNode starts up it announce itself to the NameNode along with the list of blocks it is responsible for.
5. When a DataNode is down, it does not affect the availability of data or the cluster.
6. NameNode will arrange for replication for the blocks managed by the DataNode that is not available.
7. DataNode is usually configured with a lot of hard disk space. Because the actual data is stored in the DataNode.

**Answer 2:**

1. Secondary NameNode in hadoop is a specially dedicated node in HDFS cluster whose main function is to take checkpoints of the file system metadata present on namenode. It is not a backup namenode.
2. The Secondary NameNode is a helper to the primary NameNode but not replace for primary namenode.
3. As the NameNode is the single point of failure in HDFS, if NameNode fails entire HDFS file system is lost. So, in order to overcome this, Hadoop implemented Secondary NameNode whose main function is to store a copy of FsImage file and edits log file.
4. FsImage is a snapshot of the HDFS file system metadata at a certain point of time and EditLog is a transaction log which contains records for every change that occurs to file system metadata.
5. Secondary NameNode is not a true backup Namenode and can’t serve primary NameNode’s operations.

**Answer 3:**

Step 1: HDFS client sends communicates request to Namenode to perform write operation.

Step 2: The namenode performs various checks to make sure the file doesn't already exist and that the client has the right permissions to create the file.

Step 3: If these checks pass, the namenode replies back with list of data nodes on which the data has to be copied on; otherwise, file creation fails, and the client is thrown an IOException.

Step 4: After this the HDFS client will connect to first data node in the provided data node list and ask it to create subsequent data pipeline to copy data to other nodes in the given list.

Step 5: Once, the data has been copied to all the data nodes in the data node list provided by name node, the data node replies back with an acknowledgement message to HDFS client.

Step 6: After the HDFS receives the acknowledgement message from the data node. The HDFS client sends a success message to Namenode and the write process stops.

**Answer 4:**

There are two steps that Hadoop follows for reading the data during a data node failure they are as follows:

1. If the data block which is to be read is corrupted, it picks the next data node in the list.
2. If the data node itself fails while reading it would pick the next data node in the list and client will make a note that the failed data node is bad node or corrupted data node and would not be considered for future read operations.