**Assignment Data Science 4**

**(Understanding the Architecture of Hadoop & Map-reduce)**

1. **Difference between Hadoop v1 and Hadoop v2.**

Ans: Difference:

|  |  |
| --- | --- |
| **Hadoop 1** | **Hadoop 2** |
| 1. Only supports MapReduce processing model in its architecture and it does not support non-MapReduce tools. | 1. It allows to works in MapReduce model as well as other distributed computing models like Spark, Giraph, MPI and HBase coprocessors. |
| 2. Map reducer is responsible for processing for processing and cluster-resources management. | 2. For cluster resource management YARN is used while processing management is done using different processing models. |
| 3. Less scalable, in context of scaling of nodes it is limited to 4000 nodes per cluster | 3. Better scalable as it is scalable up to 10000 nodes per cluster. |
| 4. It is implemented as it follows the concepts of slots which can be used to run a Map task or a Reduce task only. | 4. It follows concepts of containers that can be used to run generic tasks. |
| 5. Initially in Hadoop 1 there is no support for Microsoft Windows provided by Apache. | 5. On other hand with an advancement in version of Hadoop Apache provided support for Microsoft windows in Hadoop 2. |

1. **Why is HDFS Block size is 128MB in Hadoop?**

Ans: Hadoop is designed to process large volumes of data. As each block’s information is placed in name-node. So, if the block size is too small, then there will be a large no. of blocks to be stored on data nodes as well as a large amount of metadata information needs to be stored on name-node, Also each block of data is processed by a Mapper task. If there are large no. of small blocks, a lot of mapper tasks will be required. So, having small block size is not very efficient.

Also, the block size should not be very large such that, parallelism can’t be achieved. It should not be such that the system is waiting a very long time for one unit of data processing to finish its work.

A balance needs to be maintained. That’s why the default block size is 128 MB. It can be changed as well depending on the size of input files.

1. **Why Name-node is given/relay on memory rather than Data-node?**

Ans: Name node is used to store metadata which is related to the different blocks and because of this reason it needs high memory space. Data Nodes don’t need large memory space. Also, name node is use to manage other nodes as well, therefore it relies more on memory.

1. **What will you retrieve first, if at the same time name-node and data-node fails in your cluster?**
   1. **Data-node**
   2. **Name-node**
   3. **Both**
   4. **None**

Ans: Name node should be retrieved first as it contains all the information about the data nodes. After which according to the log data nodes should be retrieved to content the information.

1. **How much RAM/Memory you need for name-node in a cluster to manage the metadata, if the following is given?**
   * Size of data-node=10PB
   * Note: Metadate is actually store object of file and folders (for each object 200 bytes)

Ans: As we know, (From the above)

Block size = 128MB

Replication = 3

Cluster capacity in MB: 10PB = 10\*1024^3MB = 10,737,418,240‬MB

Disk space needed per block: 128MB \* 3 = 384MB

Therefore, Cluster capacity in blocks: 10,737,418,240MB /384MB = 27,962,027 Blocks

If considering 1 file inode,

Total heap memory required = 1\*27,962,027\*150 bytes = 4,194,304,050‬ bytes of heap memory