**Assignment 2 – Day 2 (Tuesday)**

1. **For NameNode, why it’s not necessary to store block locations persistently?**

it’s not necessary to store block locations persistently because DataNode every 3second send I’m alive to Name Node.

1. **Why is it important to make the NameNode resilient to failures?**

it is very important to make the namenode resilient to failures. Hadoop provides various approaches to safeguard the namenode.

The first approach is to maintain a copy of the metadata on NFS - Network File System. Hadoop can be configured to do this. These modifications to the metadata happen either both on NFS and Locally or nowhere.

In the second approach to making the namenode resilient, we run a secondary namenode on a different machine.

The main role of the secondary namenode is to periodically merge the namespace image with edit logs to prevent the edit logs from becoming too large.

When a namenode fails, we have to first prepare the latest namespace image and then bring up the secondary namenode.

1. **What details are there in the FsImage file?**

Details of FsImage file (Filesystem metadata) list of files (including path), size, owner, group, permissions, access times, list of blocks for each file, list of DataNodes for each block, block size, replication factor.

1. **What is the purpose of the secondary name-node?**

secondary name-node merges the FsImage and edit log file periodically and keeps edits log size within a limit

1. **Does the NameNode stay in the safe mode until all under-replicated files are fully replicated? Why or why not?**

Safemode is a state where no changes can be made to the blocks. HDFS cluster is in safemode state during start up because the cluster needs to validate all the blocks and their locations. Once validated, safemode is then disabled.

1. **What are the core changes in Hadoop 2.x compared to Hadoop 1.x? In other words, state the major differences between Hadoop 1 and Hadoop 2.**

**Hadoop 1.x:-**

* 1. **Too much dependency on NameNode** – Single point of failure (SPOF).
  2. **Single JobTracker** – as the processing becomes huge, JobTracker gets overloaded - Single point of failure.
  3. **No multitenancy** – Only MapReduce jobs can be run.
  4. **Scalability issue** – Scales to only

~ 4000 nodes cluster, ~ 40,000 concurrent tasks

* 1. **Use of static slots** - It has static Map and Reduce Slots for allocating Resources (Memory, CPU). That means once it assigns resources to Map/Reduce jobs, it cannot re-use them even though some slots are idle.

**Hadoop 2.x:-**

* + 1. **High** **Availability** – Taking care of NameNode SPOF problem
    2. **YARN** - Taking care of JobTracker SPOF and added support for non-mapreduce type of processing (multitenancy) making MapReduce as a user library, or one of the applications residing in Hadoop.
    3. **HDFS** **Federation** - Added support for multiple namespaces with multiple NameNodes.
    4. High Cluster Utilization - Use of variable-sized Containers instead of fixed-size Slots mechanism
    5. **Improved** **Scalability** - Hadoop 2.x supports more than 10,000 nodes per cluster.
    6. **MRv2** (simply MRv1 rewritten to run on top of YARN) – no need to rewrite existing MapReduce jobs.
    7. **Beyond** **Java**

1. **What is the difference between MR1 in Hadoop 1.0 and MR2 in Hadoop2.0?**

The new model is more isolated and scalable as compared to the earlier MR1 system. MR2 is one kind of distributed application that run MapReduce framework on top of YARN. MapReduce perform data processing via YARN. Other tools can also perform data processing via YARN. Hence Yarn execution model is more generic than earlier MapReduce model.

1. **What is HDFS Federation? What advantage does it provide?**

HDFS Federation Added support for multiple namespaces with multiple NameNodes.

**Advantage:**

1. Namespace Scalability - With federation, we can horizontally scale the namespace. This benefits the large clusters or cluster with too many small files because of more NameNode addition to the cluster.

2. Performance - It improves the performance of the filesystem as the filesystem operations are not limited by the throughput of a single NameNode.

3. Isolation - Due to multiple namespaces, it can provide isolation to the occupant organizations that are using the cluster.

1. **What is NameNode High Availability and how is it achieved in Hadoop 2?**

Name Node high availability feature is to overcome the SPOF problem by providing the option of running a redundant Name Node in the same cluster in as Active/Passive configuration with a hot stand by.

The Active Name Node responsible for all client operations in the cluster, while the Standby is simply acting as a slave, maintaining enough state to provide a fast failover if necessary.

1. **What is the role of Application Master in YARN application execution?**

Application Master: - To manage life cycle of applications like MapReduce, Spark etc.

- Application Master is one per application.

- Task level scheduling and monitoring