Dependable Systems SS 2014
Assignment 3

The **Hadoop Distributed File system (HDFS)** is designed to operate on commonly available servers in a *scalable* and *fault tolerant* manner. The recent addition of a **High Availability (HA)** feature further increases HDFS fault tolerance by introducing an Active/Passive redundant *NameNode* for more fault tolerant metadata management.

Structural Modelling of HA HDFS

In this exercise, you are required to build **a dynamic fault tree model of HA HDFS** (using the Quorum Journal Manager configuration). Consult the following websites to learn about the failure behaviour of such a HA HDFS setup.

- Overall HDFS design: https://hadoop.apache.org/docs/current/hadoop-project-dist/hadoop-hdfs/HdfsDesign.html
- HDFS with Quorum Journal Manager: https://hadoop.apache.org/docs/current/hadoop-yarn/hadoop-yarn-site/HDFSHighAvailabilityWithQJM.html
- HA HDFS overview: http://hortonworks.com/blog/namenode-high-availability-in-hdp-2-0/

Assume the following setup:

- 5 *JournalNodes*
- A replication factor of 3 for the *DataNodes*
- 15 *DataNodes* in total

The undesired Top Event should be the general failure of HDFS to deliver its service: that is, the failure to read or write data to HDFS. The model is intended for *qualitative* analyses only. Therefore, you do not have to include any failure probabilities.

In order to understand non-documented parts of the described architecture (e.g. Zookeeper), please try to consult secondary literature by yourself. For still undocumented parts, you should make reasonable assumptions and state them in your report.

You are encouraged to use the *FuzzEd* Tool for building the dynamic fault tree: https://fuzzed.org/ Submit a pdf document containing a link to the FuzzEd model, or a picture of the fault tree. Your submission should also contain textual description of any problems or design decisions encountered during modelling.

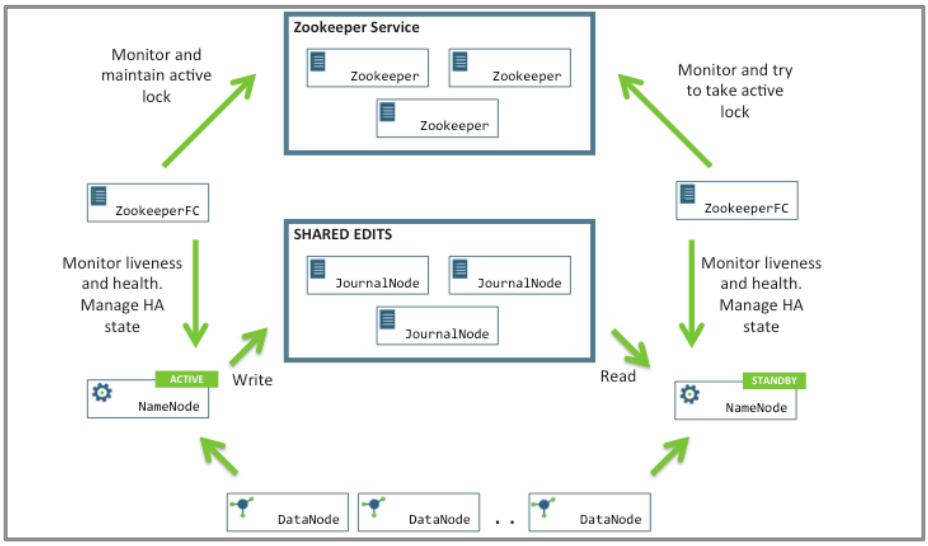

Figure 1 http://hortonworks.com/wp-content/uploads/2013/10/namenodeha.png

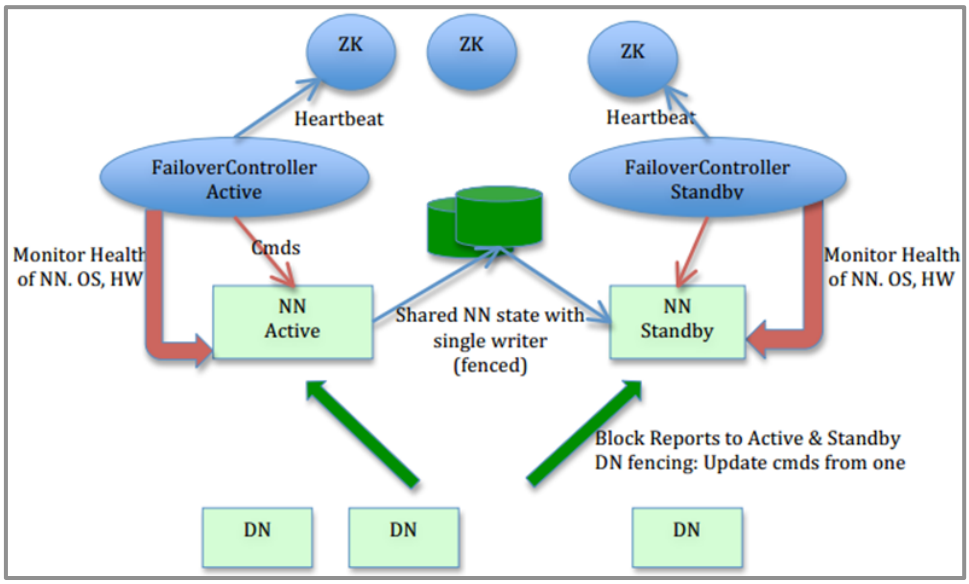

Figure 2 http://www.sizeofvoid.net/wp-content/uploads/HDFS_HA_arch.png

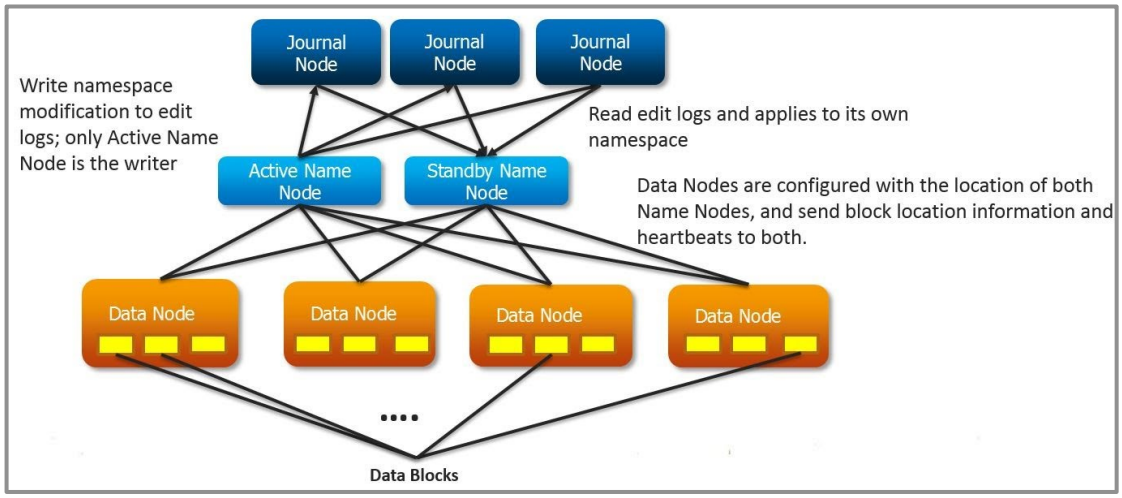

Figure 3 http://i1.ytimg.com/vi/2vpibTZXNdQ/maxresdefault.jpg