Thoughts after reading Google File System

It is the first time I read an academic paper, it is quite difficult though, specially when it is written in English. I felt that I’ve spend quite a lot of time reading it but I really think that I didn’t fully understand, so I just say something about what I feel.

The period of reading paper is quite boring at the beginning, because it is difficult and I have to search for so many difficult English words, and when the reading period getting to the middle, I gradually get into the state that I can understand some part of the paper. And I even find the paper a little interesting.

Although I know little about cloud computing, I have learned from the paper and tried to understood the general construction of GFS as well as possible. And bellow, I will share my thoughts after reading the aspects of the composition of GFS, how to read and write effectively, master server stability and data recovery.

When constructing GFS, a GFS cluster contains a single master node and several Chunk servers, which are accessed simultaneously by several clients. The files stored in GFS are divided into parts of fixed size. In order to facilitate the identification of the stored data, each Chunk is assigned a constant and unique 64-bit Chunk ID when creating it and stored on the local hard drive in the form of Linux files. A single master node will greatly simplify the design of GFS, as the client requests the Chunk server via the master. After storing these metadata for a period of time, the client will read the data directly with the Chunk server. Metadata are stored in the master's memory. There are three main types of metadata: the namespace of files and Chunks, the correspondence between files and Chunks and the location of each Chunkcopy. I understand that these metadata types are easy to read, keep the master server in sync with the Chunk and do not cause the master server to crash.

For the reading and writing efficiency of files, as the number of read and write clients increases, the likelihood of multiple clients reading and writing simultaneously increases, leading to a reduction in the total reading and writing efficiency. It feels like we're normally using a network cable. If several people use the same network cable, your network speed will be very slow. You can't stop playing videos and games. There are two operations to read in the GFS system. One is the large-scale streaming reading. Large-scale streaming usually reads hundreds of KB data at the same time or even more. The other is the small random reading and adding records to GFS by Chunk and Chunk copies to ensure that at least one atomic writing operation is carried out successfully.

Stability and data backup of the master server. To ensure the reliability of the master server, the state of the master server should also be copied. All operating protocols and control files of the master server are copied to several machines. The operating protocol is the only permanent record of metadata. During emergency recovery, the master server updates the file system by replaying the operating protocol. Checkpoint is the behavior of a snapshot of the database. The system can be restored by reading check files and playing a limited number of log files after the checkpoint. In addition, it can be learned on paper that Snapshot is a copy of a file or directory tree that can be closed in a moment and will not interfere in other operations at the same time. Therefore, users can use Snapshot to create a branch copy of a huge data set, just like backup, and can submit directly or return to the current copy state.

The above is the discussion of the JRC after reading the paper. Indeed, there are many aspects that cannot be fully understood with the current knowledge reserve, but I understand one or two, learn new knowledge and find it is quite charm.

Living in the era of the great data, I felt that in the era of the great data we were accustomed to the convenience which brought us all the scientific and technological development but never really understood its charm. As the teacher said, as students, we still have to try to read a professional academic newspaper.