ABSTRACT

Multimedia includes a combination of text, audio, still images, animation, video and interactivity content forms. Streaming multimedia content has become increasingly important because of the media content proliferation in many application areas, such as education, medical treatment and entertainment. Although proxy caching has been successful in delivering static text based content, it has difficulties in delivering streaming media contents due to two reasons. First, the size of a media object is generally much larger than a text-based object. Thus, caching entire media objects as static objects can quickly exhaust the proxy cache, making it infeasible. Second, the client requesting a media object demands continuous streaming delivery.

Due to the tremendous growth of the web, the caching technique is given special attention to maintain the QoS parameters such as network bandwidth, server load, delayed starts, etc. A caching proxy server accelerates service requests by retrieving the content saved from a previous request made by the same client or even other clients. Thus perfect caching of the multimedia objects was necessitated to deliver the objects smoothly towards the user. The main objective of this work is to reduce the latency perceived by the user while accessing the multimedia object online by employing better proxy caching mechanism.
The proposed multimedia streaming framework consists of three new caching mechanisms. The first proposed mechanism namely the Fragment-Based Caching System allows effective cache replacement by providing finer granularity caching units namely fragments. Further the cache space management for streaming multimedia objects is based on the new decision parameter called ATPR (Average-arrival Time to aPR ratio) which takes into account the average user request arrival time and the APR, where APR is the Average request arrival rate to Playback rate Ratio of the objects.

The system has been analyzed with different cache sizes, different average object sizes and different number of distinct multimedia objects. The proposed ATPR method gave an improvement of 14% in terms of Byte Hit Ratio (BHR) and 4% in terms of delayed starts when compared to the existing APR algorithm when the cache size was 20,000 blocks, where each block is of size 512 KB.

The second proposed mechanism namely the Metafile-Order Caching System is a frame wise caching mechanism. The novelty of this proposed work is the Metafile-Order caching which is based on the metafile structure. The metafile is used by the caching algorithm to minimize the client’s buffer size and channel bandwidth under the general video traffic condition.

The performance of the Metafile-Order Caching System has been compared with the Frame-Order caching mechanism. The proposed method shows around 11% of improvement in terms of the BHR. It has been observed
that there is a minimum of 2% improvement in BHR with respect to individual object.

The third proposed mechanism namely the Modified-MPR Caching System performs the caching of transcoded versions of objects. It uses the Dynamic Cache Categories (DCC) procedure to identify the set of object versions that can be given preference for caching. These set of versions that are selected for caching forms the Caching Candidate Set (CCS). The objects which are not in the CCS are called Non Candidate Set (NCS).

The proposed system has been analyzed in terms of reduction in Communication Delay Ratio (CDR) and it was found that the proposed method reduces the CDR by 4% when compared to the existing method. There was an improvement of 2% in terms of BHR when the NCS versions were considered for caching.

The three proposed proxy caching schemes showed an average improvement of 17%, 12% and 5% respectively in terms of the BHR.