ABSTRACT

Thanks to widespread applications of Multimedia Computing, there is considerable interest in the issues related to media creation, storage, indexing, retrieval, management and transmission. Of all these, developing distributed and streaming models for media applications prove to be the most formidable. This problem is investigated by the encapsulation of the communication mechanism between the client and server technologies by maintaining compliance with open distributed standards such as RMI, CORBA and .NET Remoting. Among other issues, this thesis addresses the problems of end-to-end congestion control, content-based retrieval, Digital Rights Management, performance evaluation of distributed models and secure transmission.

The implementation issues of Media on Demand models are first examined. The major factors that influence the performance of media on demand implementation – Round Trip Time, Data Throughput, Scalability, Reliability and Security are subsequently considered. A dynamic re-routing model is proposed to enhance reliability in media transmission. To increase the reusability and scalability of the media on demand system component model has been deployed. An agent-based model with distributed caching is contributed to reduce the network latency and to provide an uninterruptible service for media on demand. A prefetch caching model has been implemented by incorporating a proxy in the distributed environment that achieves a quicker response and faster transmission. A multicast model has been developed to achieve reduction in the bandwidth consumed by the media application. Secure
transmission of multimedia data is achieved by XMLising the media data and encrypting it with Advanced Encryption Standard.

In the context of end-to-end congestion control for unicast real-time multimedia traffic, a congestion avoidance scheme namely Application Priority Based Random Early Detection is proposed and implemented. The end-to-end congestion control is achieved by the implementation of a rate adaptive multimedia transmitter that varies its streaming parameters during congestion, based on the feedback from the multimedia receiver, preserving fairness and TCP friendliness.

A content based video retrieval model, which combines the motion activities with color descriptors standardized by MPEG-7, is achieved that augments retrieval of video. A Digital Rights Management scheme has been developed to address the security issues of the media on demand applications that achieves copyright protection, violation detection and secured transmission. The proposed digital rights management architecture achieves a mutual authentication of content distributors and customers by the execution of an interactive protocol and eliminates the false implication concerns by embedding watermarks in the media data enabling copyright protection and violation detection. The media is encrypted and masked by an opaque frame to achieve confidentiality in transmission.