CHAPTER 5

CONCLUSION

5.1 INTRODUCTION

This chapter reviews the significance of the proposed distributed and streaming models for media on demand, the results obtained by the present work and to make suggestions for future research. Before proceeding with the review of the work done, the objectives of the thesis stated earlier in the introductory chapter are recalled.

The primary objective of this research is to investigate the provision of middleware to support various issues related to multimedia applications in a distributed environment maintaining compliance with distributed standards such as RMI, CORBA and .NET Remoting and to propose a dynamic re-routing model to increase the reliability of the media on demand system.

It is aimed at developing component models to increase the reusability and scalability of the media on demand system. To reduce the network latency and to provide an uninterruptible service for media on demand, it is proposed to develop an agent-based model with distributed caching. It is suggested to implement a multicasting model to reduce the bandwidth consumption of the media on demand applications. A secured transmission of media data has been achieved by encrypting the XMLised media data.
It is proposed to improve quality of service in media streaming by incorporating an end-to-end congestion control mechanism by way of active queue management. This thesis also investigates the efficient retrieval of multimedia data from huge databases and achieving reliable and secure transmission of media to the client addressing both content distributors’ and customers’ concern for digital video.

5.2 HIGHLIGHTS OF THE WORK DONE

This thesis offers innovative ideas for the development of media on demand applications, facilitates the performance evaluation of multimedia applications in standard distributed environments and provides an inherent support to adaptation and reconfiguration within middleware platform for performance enhancement ensuring a higher level of availability, reliability and security for media applications.

A brief survey of the literature pertaining to the topics of research considered in this thesis is reported and the motivation for the present work is also brought out in the introductory chapter.

Distributed models for media on demand have been implemented using RMI, CORBA and .NET remoting technologies. The models that have been developed are based on the concepts of platform, language and location independencies provided by the above core technologies and hence the deployment of media on demand applications has been achieved in a complete distributed environment. In RMI Model, runtime loading of proxy objects is achieved from a web server through code base that enables the remote media
objects to interact with each other. A location independent model has been implemented that facilitates the media application integration through heterogeneous environment, which merges RMI with CORBA standardized Internet Inter-ORB Protocol. The media on demand model has also been implemented in .NET Remoting framework that provides common language runtime for deployment.

A dynamic re-routing model has been implemented in .NET framework to overcome the issues related to channel failure, thereby improving the reliability of media transmission in the distributed environment. The .NET remoting framework ensures that the remote media object is connected through the correct route when a client attempts to connect to it or re-routes dynamically during execution.

The performance analysis of the media on demand models that are developed using the above distributed technologies has been carried out by measuring the Round Trip Time, data throughput and scalability, with and without considering the remote media object reference lookup time in a multi-client scenario. The performance evaluation method reported in this work is independent of the underlying distributed object models, whose results are comparable and does not pose much overhead on the model. Performance analysis has been carried out for different media files of various sizes and the results are reported.

Component model for media on demand applications has been successfully deployed to afford portability, strong reusability and increased productivity. An uninterruptible media on demand service with distributed
caching is achieved by using mobile agents on a network of workstations, which is envisioned to be a powerful paradigm for building distributed media applications, thereby reducing delays in the transmission and also providing access to the clients at any time.

A multicast model has been developed for a group of clients that achieves a reduction in the bandwidth consumed by the media application. A prefetch caching model has been implemented by incorporating a proxy in the distributed environment to achieve a quicker response and faster transmission. Secured transmission of media has been achieved by XMLising the media data and encrypting it with Advanced Encryption Standard.

An end-to-end congestion control for unicast real-time multimedia streaming by way of active queue management is implemented and the quality of service is enhanced. A new congestion avoidance scheme namely Application Priority Based Random Early Detection is introduced that extends RED by adding priorities based on the video frame type at the application level so that the drop probability of high priority multimedia packets are reduced considerably and hence a better quality of service is achieved for streaming media. The end-to-end congestion control is achieved by the implementation of the multimedia transmitter that varies its streaming parameters during congestion, based on the acknowledgement from the media receiver, preserving fairness and TCP friendliness.

An enhanced content based video retrieval model has been implemented that retrieves video by combining the motion activities with dominant color descriptors that are standardized by MPEG-7 for indexing and
retrieval of media. This enhanced model exploits the spatio-temporal information and improves the performance of the video retrieval system.

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 eliminates the false implication concern of content distributors and customers by the execution of an interactive protocol and achieves a mutual authentication. Copyright protection and violation detection are achieved by embedding watermarks in the media data. The media is encrypted and masked by an opaque frame to achieve confidentiality in transmission.

5.3 FUTURE RESEARCH

This research is not confined to a small group of followers. The performance issues of the media on demand models are obtained for various media files in a multi client scenario in a LAN. Understanding the performance of these models under different load conditions is helpful in developing global networked media applications. The dynamic re-routing technique introduced in this research deals with arbitrarily quantified data with informed opinions. As the reliability in dynamic re-routing depends upon UrlKnowledgeBase, which is affected by fluctuations in network traffic, monitoring and updating the routes frequently are confined to a smaller network. The author suggests further research in constructing suitable UrlKnowledgeBase when the performance of the channels is expressed in terms of an expert’s subjective opinion. The performance of this algorithm can be tested in a real Internet traffic.
In this thesis, the end-to-end congestion control for media streaming is achieved by incorporating active queue management in the router, where an intelligent device or an agent can be deployed for automatic traffic measurement and congestion avoidance. A fuzzy controller may also be incorporated at the router for the same. An attempt has been made to retrieve the media from a large database using motion intensity and dominant colors where the other content descriptors such as camera motion, shape and texture can be used. The digital rights management for media on demand can be extended for customized media broadcasting.

An attempt has been made to apply the concept of distributed computing for media on demand applications. This thesis explores various issues in deploying media applications in the web and will serve the purpose of stimulating interest among multimedia professionals and web technocrats.