ABSTRACT

An analysis of QoS factors in multimedia protocols such as RTP (Real Time Protocol), RTCP (Real Time Control Protocol), RTSP (Real Time Streaming Protocol) and MGCP (Media Gateway Control Protocol), had identified that importance have not been provided to latency effects, throughput and fault tolerance issues. Real time media streaming applications such as Media Conferencing, Video On Demand, Audio Play-out on Demand, require high QoS factors. Multimedia protocols lack in adequate support for guarantee of performance measures of QoS metrics and to manage complex resource components involved in runtime for serving audio / video transfer over distributed IP networks.

This thesis aims to provide an effective and optimal QoS solution for media streaming applications over IP network. The resultant network parameters such as number of packets lost, jitter and end-to-end delay determine the quality of service (QoS) of media stream. These factors, which tamper the quality of streaming media leads to reduced throughput, increase in latency effect and worst MOS (Mean Opinion Score) value.

The work provides three different schemes, which focus on reducing media packet loss, minimize delay in media play-out, avoid congestion and provide an end-to-end QoS support. The first scheme **Me-PLM** (Media Packet Loss Minimization) is advancement over the existing RED and SF-BLUE congestion management schemes. Me-PLM scheme reduces media packet loss with considerable increase in the delay time at receiving end for packet play-out. The second scheme **Me-Trff-Schl** (Media Traffic Scheduler) controls

media traffic flow at gateways and routers thus managing the flow of media traffic. This method provides a minimal time delay for play-out of media packets at receiver end, thus handling jitter effectively.

The third scheme **Me-TRAP-Q** (Media Traffic Adaptive QoS Provider) is an advancement of Me-TrffSchl method. This scheme is heuristic, adopting adaptive scheduling strategy traffic scheduling approach, which works on complex policy management structure. This scheme reduces the delay time for media play out at receiver end, minimizes media packet loss and minimizes end-to-end delay.

Further, a novel object oriented engineering approach for providing an end–to–end QoS in media streaming network is proposed as **Me-ADO-Q** (Object Oriented Engineering and Distributed Approach of QoS approach for Media Stream). The object-oriented approach manages intermediate media call session resources and handles media traffic using any traffic management scheme such as Me-TRAP-Q, Me-TrffSchl, DiffServ, Best-Effort. Me-ADO-Q is object oriented and distributed in nature, which monitors and manages all components involved in setting up a call in a media transfer over network for an end–to-end setup. The architectural model has been explained using Video-On-Demand video transfer application, which demands maximum bandwidth and memory for transfer of video frames over network. Me-ADO-Q aims at providing coordinated functionality between various components involved in media transfer over network.

Me-ADO-Q uses the complex methodology of "rule" based Policy Manager and adaptive control mechanisms that can co-operate intelligently in large–scale networks to support QoS objectives. Me-ADO-Q approach also

incorporates predictive reservation methods, admission control at gateways for media packets and Traffic Policing methods to provide QoS for real time media streams for bandwidth sensitive applications over CDNs. The model has been developed using Object Oriented Methodology (using CORBA) controlling over network components in state-full or state-less type. Media packets transferred is assigned hierarchy based on policy management and servicing architectures.

The results have been obtained using various test–bed methods prepared with changing bandwidth values for worst-case conditions. The test beds used for investigating the various schemes developed have been prepared on simulation. All the proposed schemes developed have been tested with existing proved results in comparison. In general the dissertation work together provides support for differentiated network architecture of deterministic as well predictable quality of service of media transfer over IP networks.