ABSTRACT

Internet, the global data communication network is nowadays being used to transmit various types of data. This simple and efficient best-effort Internet was designed to transport only time-insensitive data which mainly comprised of file transfers. However, many of the current applications are real-time (time-sensitive) applications with stringent Quality of Service (QoS) requirements. The present best-effort Internet, without absolute QoS guarantee, often fails to meet the requirements of time-sensitive applications. The need for improvement to the basic best-effort infrastructure has resulted in various QoS models. Integrated Services (IntServ) and Differentiated Services (DiffServ) are the two Internet QoS models standardized by Internet Engineering Task Force (IETF) to augment the traditional best-effort service model. IntServ offers absolute QoS guarantee, but it is not scalable. DiffServ is scalable without any absolute QoS guarantee.

Endpoint admission control combines the QoS guarantee of IntServ and scalability of DiffServ using probes. This supports soft real-time service similar to controlled load. With endpoint admission control (probe based admission control), an end-host sends probe packets before starting a new session and decides about the session admission based on the statistics of probe-packet loss or delay or delay variations or their combination.

Probe Based Admission Control (PBAC) was extended to Probe Based Multicast Admission Control (PBMAC) for supporting multicast services. However, there is a problem related to PBMAC, called subsequent request problem, in which when a receiver is receiving multicast data, a new receiver sends a request for probing to receive the same multicast data. This new request is called subsequent request. This subsequent request increases the blocking probability of new receivers when the network is nearly overloaded and this is called as subsequent request problem. The main cause
of this problem is that the probe traffic of a later request for a multicast session is not aware of the co-existing data traffic for the same multicast session. Enhanced Probe Based Multicast Admission Control (EPBMAC) uses complementary probes to overcome this problem. During nearly overloaded condition, the complementary probe also becomes an additional overhead on the network.

The proposed Improved Probe Based Multicast Admission Control (IPBMAC) aims to reduce the blocking probability of the subsequent requests of a new receiver, B, by avoiding unnecessary probing. Let Receiver, A, that receives the data have a common branching node with B. The probes to B are sent from the common branching node instead of from the root, thus avoiding the bottleneck link. From the common branching node, data is sent after successful probing. IPBMAC uses two groups: probe groups and data groups. IPBMAC requires the receivers to be informed about the one to one relationship between a probe group and the corresponding data group.

Enhanced Admission Control for Multicast (EACM) employs just one group, data group only, consequently avoiding the mapping complexities. The data packets are initially sent with lower priority as probe packets at a constant bit rate to the receiver by padding off the data flow to the required peak rate of the data flow. The unproductive probe traffic gets eliminated completely now. This is because all transmissions are data transmissions only.

The subsequent request problem which caused substantial inefficiency in multicast communication was deeply analyzed. As a result of the deep analysis, the subsequent request problem has been completely eliminated resulting in all transmissions in a network being productive data transmissions.
The monitoring of the packet loss ratio in the probe stream provides a better solution for QoS provisioning in time-sensitive applications, without extensive support from the routers. In real life, network operators would like to maximize the ROI (Return On Investment), while offering acceptable QoS. An investigation into the relationship between the packet loss threshold and the ROI is required. The developed IPBMAC and EACM could form a stepping stone for this future research.