



Traffic Sensitive Active Queue Management for Improving QoS of the System

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Abstract— Now a days, use of Internet is increasing tremendously. This results in the increase of use of multimedia applications such as IP telephony, video conferencing and online games. These new genres of applications have different requirements in terms of throughput and delay than traditional applications. Traditional applications such as FTP and email are throughput sensitive since their quality is primarily affected by the throughput they receive. There are delay sensitive applications such as streaming audio, video and IP telephony, whose quality is more affected by the delay. The current Internet however does not provide QoS support to the applications and treats the packets from all applications as primarily throughput sensitive. Delay sensitive applications can however sacrifice throughput for delay to obtain better quality. Here is Traffic Sensitive Active queue Management which can be used in conjunction with many existing Active Queue Management (AQM) techniques at the router. The applications inform the TSAQM enabled router about their delay sensitivity by embedding a protocol type in the packet header. The protocol type is a measure of traffic type. In TSAQM we are using a various queues depending on the various types of traffic. Once the queues are assigned, traffic is classified and enqueued in respective queue. Depending on the priority of the quality of service, the queues are dequeued and data is transmitted accordingly. Thus the unfairness problem is overcome. We evaluate our approach using NS-2 and present results showing the amount of improvement in QoS achieved by our mechanism.

Keywords: Active Queue Management, traffic sensitive QoS, Multimedia, Congestion Control

I. INTRODUCTION

Multimedia:

Multimedia technology has already been around for some time, but with the increase speed of development that it has enjoyed in the last few years it can be now safely said to be a part of our daily lives, both in professional and personal life. It finds application in fields ranging from encyclopedias to catalogues, from games to video clips, allowing computers to display to users information in a form that can be textual, sound, moving pictures, or both. The applications of multimedia in the field of mobiles are video mail, video color ring, video caller ID, video portals, contact center enhancements, video share, and Mobile TV.

Internet:

In the same few years, another phenomenon has drastically changed the way in which information is distributed, namely the development of digital data networks, and particularly the extraordinary expansion of the Internet, "the network of all networks". This expansion, which can be attributed mainly to the appearance of the World Wide Web with its "browsers", has spawned the new range of communication technique, all of which are characterized by:

- The ease with which information can be accessed.
- The possibility to "navigate" from one document or item to related ones, following so-called "hyperlinks"(predefined Connections between related information items)
- The ease with which information can be published.

The use of multimedia services applications is increasing rapidly over the Internet. These applications are generating a large volume of network traffic, which has a great impact on network performance and scheduling. For various reasons, obtaining information on multimedia service traffic is important. However, traditional analysis methods based on well-known ports cannot be used to analyze such traffic. Because the majority of multimedia service applications use dynamically allocated port numbers, the traditional methods misidentify multimedia service traffic as unknown traffic. Also with the increasing volume of traffic from both traditional and multimedia applications, a serious problem, called congestion collapse, arises. This problem leads to performance degradation particularly for real-time applications.

The traffic characteristics of real-time and non real-time applications require a certain Quality of Service (QoS) from the Internet in terms of bandwidth, delay, packet loss, fairness and jitter. However, most of the current Active Queue Management (AQM) algorithms at the internet routers do not guarantee QoS for real time traffics such as video and audio. This is because; most of the algorithms handle different packets of different

traffics by the same strategy. To improve the congestion collapse problem, the early TCP protocol prompted the study of end-to-end congestion avoidance and control algorithms. Recently, several applications, such as IPTV and VoIP, using User Datagram Protocol (UDP) without employing end-to-end flow and congestion control, are increasingly being deployed over the Internet. When UDP coexists with TCP, it induces not only a congestion collapse problem but also an unfairness problem that each flow cannot get the same treatment, causing an unstable Internet and lower link utilization.

II. Problems with Multimedia:

Multimedia applications have different performance constraints than do traditional applications. Traditional applications are very sensitive to lost packets. Multimedia applications, on the other hand, can tolerate some data loss, but are very sensitive to variance in packet delivery, called jitter. In the absence of jitter and packet loss, video frames can be played as they are received, resulting in a smooth play-out. However, in the presence of jitter, the user would see the frozen image of the most recently delivered frame until the tardy frame arrived. The tardy frame would then be played only briefly in order to preserve the timing for the subsequent frame.

Traditional applications use TCP to guarantee that lost packets are retransmitted. Unfortunately, detecting and retransmitting lost packets causes considerable jitter, making TCP unattractive to multimedia applications. So, most non-TCP flows (real time traffics) use User Datagram Protocol (UDP) without employing end-to-end flow and congestion control. But, UDP get an unfair share of network bandwidth when there is congestion. This unfairness occurs because many non-TCP flows do not reduce transmission rates while the TCP flows are forced to transmit data at their minimum rates. Even worse, typical active queue management policies apply the same drop rate to each flow.

All the proposed active queue management mechanisms do not consider the vbr services, and the proposed algorithms assume the same weight for cbr and vbr connections. However, this is unfair for the vbr traffic connection, which will cause poor system performance in light of the entire network average video quality. Therefore, in this paper, we will propose a QoS-aware active queue management method with multiqueues multithresholds, in which the property of video coding is taken into account in one shot. In summary, current AQM algorithms have the following problems: (1) most algorithms cannot achieve the delay and throughput requirements simultaneously. On the other hand, some AQM algorithms can satisfy each traffic type's requirement, but those algorithms are too complex and unsuitable for high traffic load, causing heavy computing overhead. (2) The above mentioned algorithms barely consider the video traffic characteristics that only adopt the homogeneous fairness bandwidth allocation policy. (3) Current AQM algorithms only utilize the adjusting packet dropping rate to overcome the congestion problem. However, it should not only adjust the packet dropping rate but also consider the congestion level, and the AQM will be more efficient in reacting to various traffic loads. (4) Most AQM algorithms do not have the adaptability, and those algorithms have to be trained or adjust a set of parameters to meet the diverse traffic load and router link capacity. It is a challenge to overcome the congestion problem to consider the video coding technique, bandwidth efficiency, and different traffic's QoS requirements for more outstanding performance.

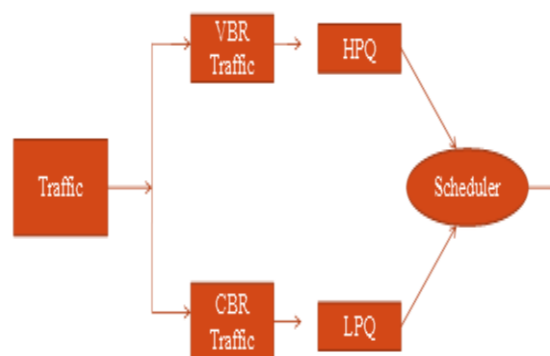


Fig. 1 system design

III. Traffic Sensitive Active Queue Management (TSAQM):

The basic principal of TSAQM is based on the fact that the multimedia traffic can be audio, video or text type. Out of these different type of incoming traffic the video and audio is having variable bit rate while text message is having constant bit rate. So the whole wireless network consist of two types of traffic CBR and

VBR. As explained in section 1 audio and video are delay sensitive applications thus it has given a high priority on the other hand FTP or text is more sensitive to throughput than delay and have given second priority.

The basic functioning of TSAQM can be explained by dividing the working in two parts.

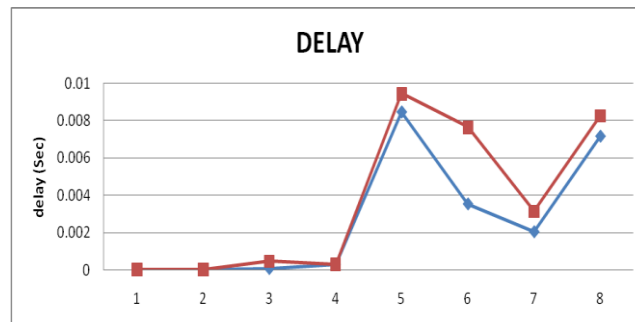
- i. Classification of incoming traffic as CBR and VBR.
- ii. Transferring these incoming packets into appropriate queue and then scheduling it.
- iii.

IV. Classification of Traffic

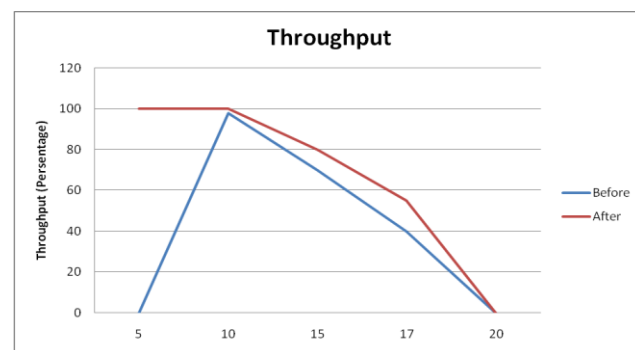
The type of traffic can be decided by verifying the header format of the packet. In the frame format there is specific field called Ptype which gives the idea about packet type.

V. Conclusions:

In this paper, the proposed Traffic Sensitive Active Queue Management (TSAQM) is implemented in routers to over-come problems of current AQM algorithms. Based on the simulation results for various QoS parameter, the TSAQM can achieve the QoS requirement in a time-varying Internet by adaptively adjusting the thresholds based on the traffic situations. Following are the results for delay and threshold.



Red line – Before application of TSAQM
Blue line - After application of TSAQM



Red line – After application of TSAQM
Blue line – Before application of TSAQM

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