

How to make video and voice less jittery?

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Emerging applications like voice-over-IP (VOIP), IPTV and network gaming require a guaranteed bound on many network parameters like bandwidth, packet delay, delay variation (jitter), and packet-loss ratio. The parameter bound delivery of content is referred as Quality of Service (QoS). We investigate QoS issues in an optical access network and in particular in an Ethernet Passive Optical Network (EPON).

Based on the required bound, we categorize the traffic into three classes: a) EF (Expedited Forwarding): highest priority traffic arising from VOIP applications like Skype b) AF (Assured Forwarding): medium priority traffic arising from video applications like YouTube c) BE (Best Effort): low priority traffic arising from web surfing like Gmail. The delay requirement for EF and AF traffic is in the range of 1.5 ms and 100 ms respectively. The BE traffic does not have any delay or jitter bound.

Several dynamic bandwidth allocation (DBA) algorithms have been proposed for QoS in EPON. Generally, users are served at a time interval dependent on the network load. These algorithms achieve a high throughput, but users experience a variable delay due to a variable service time. To provide fixed delay to the users, algorithms are proposed in which users are polled at a fixed time. Since the network traffic is highly bursty, fixed time polling algorithms do not achieve a high throughput. We propose a new online DBA algorithm for QoS in EPON, providing a constant delay and jitter performance to higher and medium priority traffic classes while maintaining a high throughput.

We propose the Delay Aware Window Sizing (DAWS) algorithm for EF traffic and the Delay Aware Grant Sizing (DAGS) algorithm for AF traffic. The algorithms allocate bandwidth while keeping into account the delay experienced by users. For example, if the service time of users is less, the DAWS algorithm allocates less bandwidth to EF traffic. For AF traffic, the bandwidth demand is stored in an array field and only bandwidth corresponding to a field for which the delay crosses a certain bound is granted. The average delay for EF traffic remains within the bound of 1.5 ms and the average delay for AF traffic remains constant at 2 ms for all loads. Delay spread or jitter is reduced significantly. We have a much higher throughput of 95.5 % compared to 83 % in previously proposed algorithms.