PROVIDING BETTER THAN BEST-EFFORT SERVICE IN THE INTERNET

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ABSTRACT

In this paper our aim is to protect adaptive TCP flows in the presence of non-adaptive UDP flows for providing better than best effort service in the Internet. This goal is achieved by isolating TCP and UDP flows . Two separate queues are maintained for TCP and UDP flows with RED active queue management scheme for achieving flow isolation. Since separate queues are maintained for TCP and UDP flows one flow cannot degrade the performance of other flow. Performance of Double Queue RED (DQRED) is better than RED with FIFO scheduling.

Keywords: Better than best effort service**,** Internet , flow protection, flow isolation, fair bandwidth allocation, Round robin scheduling , class based queuing.

1. INTRODUCTION

Historically, networks carried only predetermined types of traffic. For instance, the telephone network was able to transport voice, the Internet was able to transport data, and so on. Nowadays, networks want to integrate different kinds of traffic on the same physical infrastructure. An application that requires assured bandwidth (for example a video stream) might not require strict delays. Networks usually guarantee differentiation among traffic by means of properly configured schedulers that are able to forward traffic in different ways according to the service required. In this paper we are proposing DQRED for providing flow protection, through flow isolation, which enhances the today's best-effort service. Rest of this paper is organized as follows. Section 1.1 gives brief history of the existing fair buffer management and scheduling schemes and their drawbacks. Section 2 discusses Double queue RED algorithm proposed for providing flow protection and hence to provide better than best effort services in the Internet. Section 3 discusses the Implementation details of the proposed schemes which includes simulation Topology, simulation scenario and simulation results. Finally section 4 gives the conclusions.

1.1 Background

Random early detection [2] is an active queue management technique proposed by Sally Floyd and Van Jacobson. RED's goal is to drop packets from each flow in proportion to the amount of bandwidth the flow uses on the output link. RED gateways do not attempt to ensure fairness in terms of the Bandwidth. Dropping packets from flows in proportion to their bandwidths as done in RED does not always lead to fair bandwidth sharing. Fair queue management schemes such as FRED[6], RED-PD[9], CSFQ [13], have been proposed for achieving fair bandwidth allocation in best effort services networks. Fair schedules [7] such as Fair Queuing [5], Weighed Fair Queuing [1] (WFQ) or Weighted Round Robin (WRR) DRR[12] are excellent choices for the "guaranteed bandwidth service" because of their ability to guarantee a predetermined amount of bandwidth to each session. Since WFQ is able to guarantee also a maximum delay bound [8] to leaky bucket constrained sessions, it seems to be an excellent choice to satisfy bandwidth and delay requirements. Existing fair queue management schemes requires the routers to maintain state and perform operations on a per flow basis [3,4]. For each packet that arrives at the router, the routers needs to classify the packet into a flow, update per flow state variables, and perform certain operations based on the per flow state. Drawback of the existing scheduling algorithms is that, they are often too complex for high-speed implementations and do not scale well to a large number of users since they maintain separate queue for each flow.

2. DOUBLE QUEUE RED (DQRED) :

With Double queue RED flow protection is achieved by maintaining two separate queues for TCP and UDP flows. Since separate queues are maintained for TCP and UDP flows one flow cannot degrade the performance of other flow. Round Robin Scheduling is used to de-queue the packets. As a consequence throughput of TCP flows is not degraded in the presence of non-adaptive UDP flows. Performance of DQRED is better than simple FIFO scheduling schemes. Packets are de-queued in round robin fashion. The queue has two logical FIFO queue, say LQ1 and LQ2, of which the total size is equal to the size of the physical queue (PQ) i.e. LQ1 + LQ2 = PQ. When a packet is to be enqueued, the enqueue manager checks if size of LQ1 +LQ2 is less then maximum allowed PQ size. If so, the packet is enqeued to the appropriate logical queue. To implement round-robin

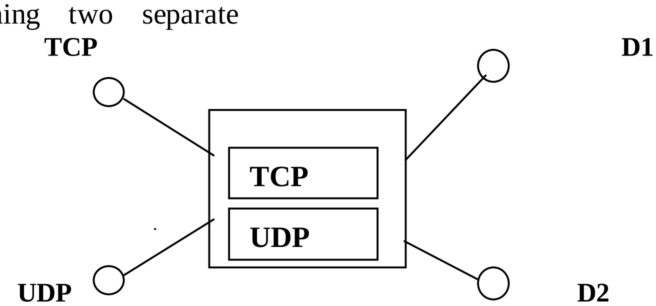

Figure. 1 . Double queue RED

dequeue scheduling, the dequeue manager tries to dequeue one packet from a logical queue and the next one from the other logical queue in tern i.e. packets in the two logical queues are dequeued at 1:1 ratio if both queues have packets. Model for this scheme is shown in Fig.1. In this model RED algorithm is implemented with two queues. Since two separate queues are used for TCP and UDP flows, these flows are essentially isolated from each other and one flow cannot degrade the quality of other flow. Performance of this algorithm is better than conventional single queue RED algorithm

3. SIMULATION

Simulation experiments for DQRED are conducted in ns-2. The parameter throughput of TCP and UDP flows is measured to evaluate the performance . Simulation results of DQRED are compared with conventional single queue FIFO algorithms. .

3.1 Simulation Results

Figure2 shows the tcp-udp throughput comparison of double queue RED algorithm with single queue RED and drop-tail and double queue drop tail (DTRR) algorithms. 1tcp and 1udp flow is used in this experiment with cbr rate =1.5 Mb and buffer size =3 packets. Results shows that the tcp throughput is very low in case of drop tail, RED and DTRR. Whereas tcp attains better throughput with DQRED. Results also indicates that the tcp throughput of DQRED is not affected by the presence of udp flows. But in case of conventional algorithms tcp throughput is reduced in the presence of unresponsive udp flows. Simulation experiment is repeated for 1tcp-2udp and 2tcp-2udp flows. Due to the space limitations results are shown only for 1tcp&2udp flows. Results are shown in figs.3. In all the above experiments tcp throughput of DQRED is better than that of conventional algorithms. Hence tcp flow is protected in DQRED. Performance of DQRED is independent of number of flows and the buffer size.

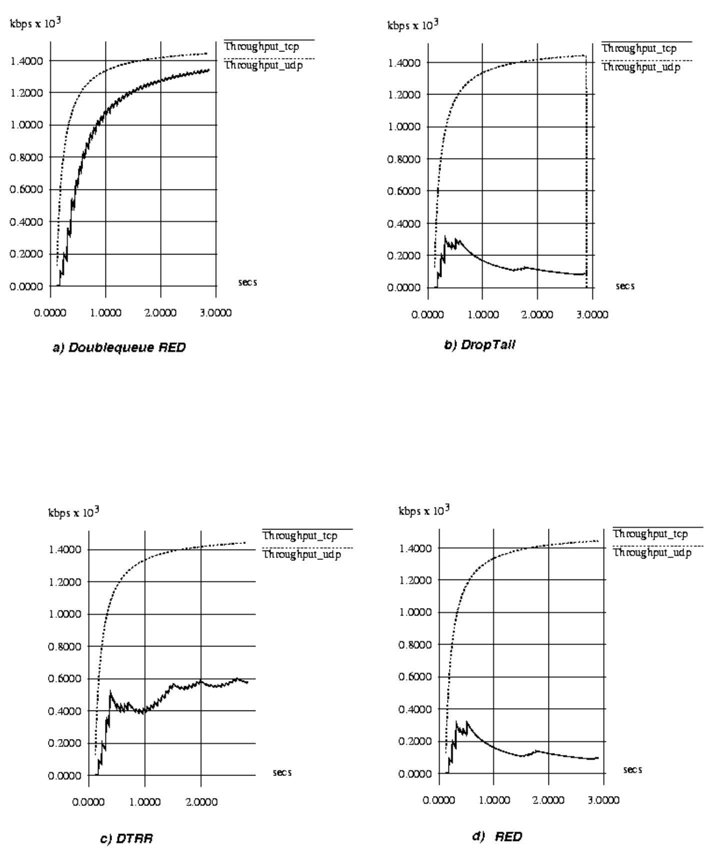

Figure 2 TCP –UDP throughput comparison for different queue management schemes With 1 tcp & 1udp flows with cbr rate = 1.5Mb and buffer size = 3 packets

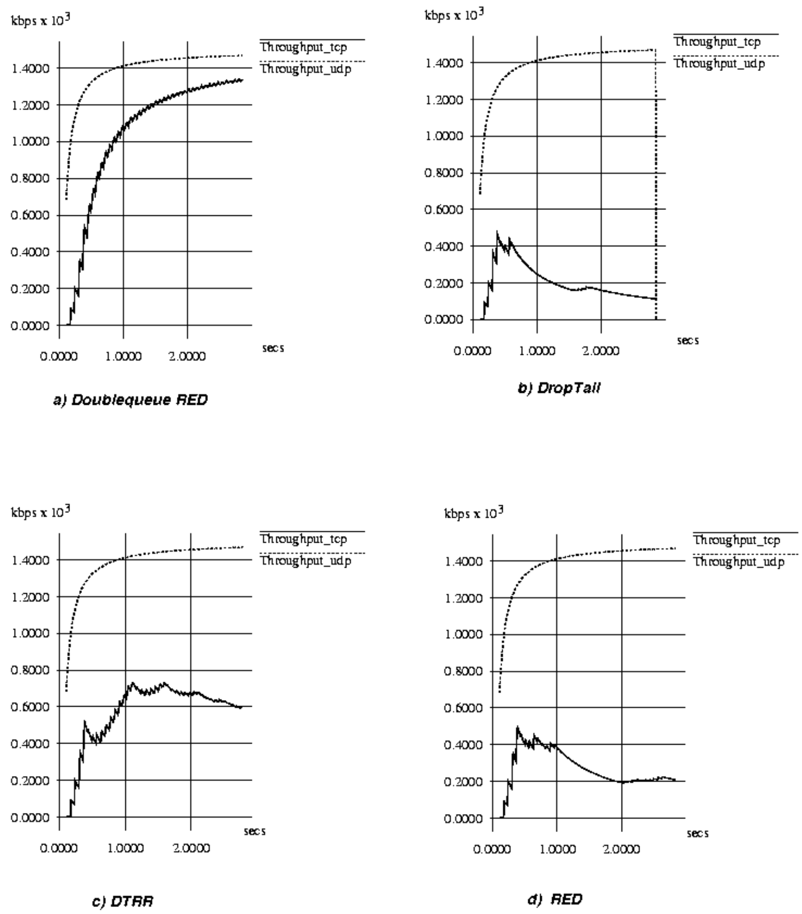

Figure. 3 TCP –UDP throughput comparison for different queue management schemes With 1 tcp & 2udp flows with cbr rate = 1.5Mb and buffer size = 3 packets

4. CONCLUSIONS

Double queue RED provides flow protection by maintaining two separate queues for TCP and UDP flows. Since separate queues are maintained for TCP and UDP flows one flow cannot degrade the performance of other flow. Round Robin Scheduling is used to de-queue the packets from the queue. As a consequence throughput of TCP flows is not degraded in the presence of non-adaptive UDP flows.

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