Comparison of Buffering in Manhattan Street Network in NS2

Ravinder Bahl (Author[1])
Information and Technology
M.M.E.C
Muallana, Ambala, Haryana, India
ravindra_ibm@yahoo.com

Rakesh Kumar (Author[2])
Information and Technology
M.M.E.C
Muallana, Ambala, Haryana, India
raakeshdhiman@gmail.com

Jatinder Pal Singh (Author[3])
Information and Technology
M.M.E.C
Muallana, Ambala, Haryana, India
jtpalsingh29@rediffmail.com

Abstract— **The paper presents the Comparison analysis of Manhattan Street Network (MSN). Improvement of performance at the destination node by applying different types of buffer at the routers is demonstrated. The results using NS2 simulator are produced. It can be concluded that the congestion and the packet drops can be reduced at the link node by appropriate selection of buffer type at the link node.**

Keywords— ***Performance Analysis, Packet Drops, MSN, Congestion, Buffering.***

I. INTRODUCTION

The selection of appropriate buffer is very important .It helps in balancing the load across the multipath networks like Manhattan Street Network (MSN). Application of multipath routing instead of single path routing is preferred. Manhattan Street network (MSN) topology is used for this purpose. In this approach traffic moves form two input links to two output links having equal bandwidth paths at the routers. A cell is routed to a buffer upon arrival. The cell has to be deflected on the other and can not be accommodated at a later stage even if the buffer allows admission to new arrivals at that stage. In this paper, attempt has been made make provision for reducing congestion and packet drops. Different type of buffers is provided at each node allowing each input and output nodes to have separate queues to reduce the deflections and as a result the delays in different simulation runs. Further, the buffering structure is so designed that the storage of cells in buffer slots takes place regardless of their destinations. Deflection occurs only when all the buffer slots are full. In today's internet the routing algorithms [1] play very important role. The link-state (OSPF) and distance vector routing (RIP) algorithms are few to mention. In large network topologies like Manhattan Street Network which involves large volume of data transaction. The comparison by simulation has proved that the link state routing is better than distance vector routing.

II. BACKGROUND OF ROUTING ALGORITHM

In case there are more than two paths from source to the destination. The selected path represents the outgoing link in a multohop network. The cost for each path is calculated using routing algorithm between source and destination nodes or routers. This depends upon the metric supported by different type of buffers. The cost may be defined in terms of number of hops or may be bandwidth, delay or links etc. Many different cost metrics [5] can be used to judge the shortest path, like number of links, distance in terms of hops, delay, bandwidth (bit-rates) .

III. CONCEPT OF MULTIPATH ROUTING ALGORITHM

In core networks where there is a huge amount of data transactions and there are more than one equal cost route possible from a source node to destination node with large volume of traffic, the multipath routing algorithm [6][7][9] may be used, which helps in improving the available resources utilization and helps in reducing congestion and packet drops and thus helps in shaping the traffic between equal cost multi paths. The links utilization [2] can be improved by having improper queues which in turn implies increasing delays, so sort of trade off is required for selection of appropriate queue. The simulation results help in deciding the type of queue at the link for better performance.
The selection of appropriate queue avoids congestion at a particular node including cross-traffic as given below.

(A) Departure of traffic at a node should be equal to the arrival of traffic at that node.
(B) It is necessary in case of multi hop networks that the load should be balanced in such a way so that none of the outgoing link of a router is over utilized.
(C) The appropriate queue with optimum storage may be maintained at the bottleneck links for better performance.

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IV. MANHATTAN STREET NETWORK (MSN) TOPOLOGY

The topology used in the paper for the purpose of demonstration has 16 nodes and 32 links of equal bandwidth and delays.

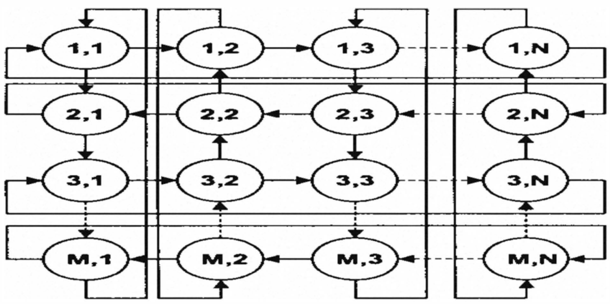

Fig.(1) : Experimental Topology (MxN) , Where (M=4,N=4)

V. SIMULATION RESULTS

The simulation study was performed and analysis were drawn using Network Simulator (NS2) [8]. The Simulation results are evaluated in different buffering disciplines using topology of Fig. (1)

VI. BOTTLENECK LINK CASES

The traffic from node n1 to n16 was observed where the link bandwidth was set to 1Mbps, delay of 10 ms, packet size of 64 bytes, two constant bite rate traffic sources with interval of 0.005 seconds and drop tail, SFQ, FQ queue was introduced at a time. Initially queue size was set to no packet and later was changed to the capacity of more packets and performance was analyzed. The simulation was run for 10 seconds and traffic was introduced for 5 Seconds and the Following Results were obtained.

TABLE I : SHOWING SIMULATION RESULT

Packet Size(bytes)	Queue Type	Total Packets	Non Dropped	Dropped Packets
64	Drop Tail	2002	0	2002
64	FQ	2002	2002	0
64	SFQ	2002	2002	0

All links set to type simplex having bandwidth (1Mbps), delay (10ms) the offered load was observed between n1 to n16 with two constant bit rate traffic sources starting at n1 and n16 as destination. The drop tail queue was attached between n1 and n16.

VII. PERFORMANCE GRAPHS

The performance graph for bottleneck link, when one drop tail queue with FIFO (First in First out) discipline , FQ (fair queue) , stochastic fair queue (SFQ) are maintained at the bottleneck link is shown in Fig.(2). , Fig.(3) and Fig.(4). respectively.

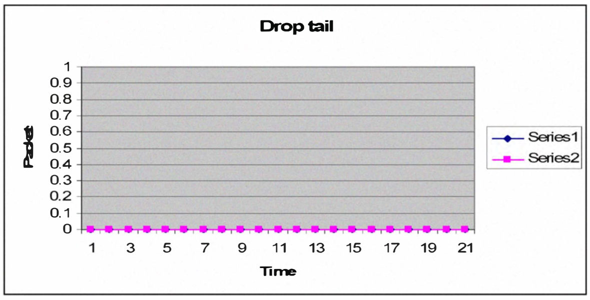

Fig.(2) : Traffic in Packets With Drop Tail Queue

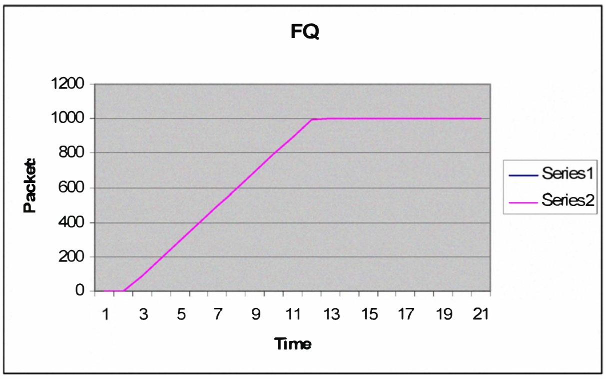

Fig.(3) : Traffic in Packets with fair queue

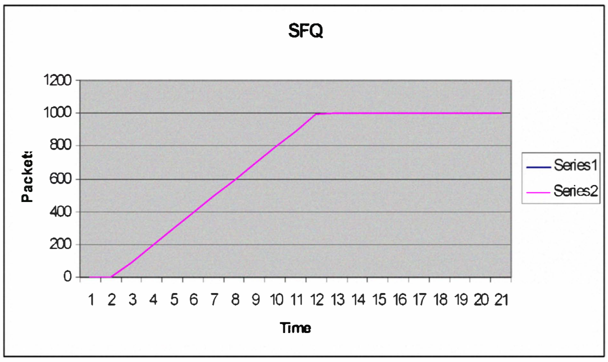

Fig.(4) : Traffic in Packets with fair queue

The simulation result helps in deciding the type of buffer at the bottleneck links. Case study of buffer types for a particular case is explained. The decision can be made based on the performance graph that the appropriate buffer is implemented at the bottleneck links for a particular case such that the congestion in the network may be reduced and performance may be improved.

VIII. CONCLUSION

The demonstration of buffer selection at bottleneck links in the Manhattan Street Network Topology is done.

The paper demonstrated with different types of buffer , packet size of 64 bytes and two constant bit rate (CBR) traffic sources starting form node n1 for destination n16 the following effects

Case (1) Simulation of multipath network topology (MSN) with drop tail node queue, two constant bit rate traffic Sources led to total packet drop.
Case (2) Simulation of multipath with fair queue led to no the packet drops.
Case (3) Simulation of multipath node with stochastic fair queue also led to no packet drop.

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