PROPOSED ALGORITHM FOR IMPROVING THE PERFORMANCE OF MPLS NETWORK USING DELAY & BANDWIDTH PARAMETERS

Shishir Sangal[1], Dr. Manoj Kumar[2]
[1]Assistant Professor, Quantum School of Technology, Roorkee (Uttarakhand)
[2]Associate Professor, Shamli PG College, Shamli,, Uttar Pradesh

Abstract
MPLS has proved to be a better protocol in the present scenario as compared to other traditional protocols. It is because it decreases the forwarding overhead on major routers. The stability of any network depends on the routing architecture which has been designed to direct the traffic from one node to other. Due to increase in network traffic the traditional devices i.e. routers are not able handle the heavy load due to their limited bandwidth and data processing capability. The major issue is to implement traffic engineering in the network for the efficient transmission of data. Major requirement for Traffic Engineering is that the available resources and links on the network should be taken into consideration so that a choice of LSP path can be made. The factors like bandwidth and delay will play a major role in the process. Finally we will show that in the new process due to traffic engineering the best path is selected to route the data using bandwidth and delay parameters.
Keywords: Traffic Engineering, LSP, QoS, IP, MPLS.

I. INTRODUCTION

MPLS[2][7] is a technology used for the optimization of traffic engineering[4] in a network. forwarding mechanism and High performance packet control is provided by MPLS. The packets are forwarded using the concept of labels[4].
MPLS[2] assign labels to packets for transport across the network. The labels are contained in a MPLS header inserted into a data packet. The short length fixed labels carry the information that tells the switching node about the process of processing and forwarding the packet from source to destination.
The labels have the significance of local node to node connection. As the packet gets forwarded from node the label is swapped for the appropriate label to route the packet to next node. MPLS operates on Ingress LSR[6][7] through which the packet enters into MPLS network and an Egress LSR through which the packet leave the network. Using Label Information Base (LIB)
the packet is forwarded. MPLS relies on traditional routing algorithm to establish the network topology.
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II. LITERATURE SURWAY

Let's analyze some of the popular algorithms which uses the topology of the ingress and egress routers.
a. Minimum Interference Routing Algorithm
Minimum-interference routing algorithm [8] is based on minimum interfacing of routers between source to destination. The path having the least number of interfaces will be selected for communication. The designing of Minimum interference routing algorithm is to reduce rejections for future requests for the establishment of Label Switched Paths (LSP). It do not make any type of assumption regarding specific patterns for the arrival request.
Critical paths are established which cannot satisfy the future demands of the incoming request. This algorithm can be beneficial but to make the path usable the path length can becomes very long.

b. Minimum Hop Algorithm

Minimum Hop Algorithm [10] is based on minimum hops i.e. data will be transferred on the network which has minimum number of hops. This approach can be useful in some ways but it may also lead to congesting the specific path while some of the path on the network will have lesser load.

c. Widest Shortest Path Algorithm

The widest shortest path algorithm [9] is an improvement to Minimum Hop algorithm. An attempt to balance the network load is made my widest shortest path algorithm.

A feasible path with minimum number of links is selected by WSP. If multiple such paths exist, then the one with the highest residual bandwidth is selected. This discourages use of existing heavily loaded links.

Before switching to feasible path which are longer a path selection is made amongst the feasible path that are used until saturation. This is the main drawback of widest shortest path over minimum hop algorithm.

III DESIGNING RQUIREMENTS

The nodes and links which do not satisfy the minimum resource criteria are removed from the network.

b. Using the Shortest Path Algorithm find the optimal path from the remaining ones.

c. If more than one route exist (which has the same available bandwidth) then select the route which has the minimum delay.

IV PROPOSED METHOD

Consider a network of m routers. Create a subset from these routers which will be called as ingress-egress router and then setup the path. The ingress router is required to handle the incoming connections. The egress router is responsible for moving the data packet to outside the network.

The links in any network has two specific properties

a. Residual Bandwidth which is

Link Bandwidth – Bandwidth assigned to the links

b. Delay which is a queuing delay at the starting node and then propagation delay. To collect the above required information it is assumed that the Link State Routing Protocol will be used. In this process the request from the node will be send to the Ingress router. The ingress router will setup the route to egress router reserving the resources on the links along the path. The information like residual bandwidth, delay and about network topology will help the ingress router to select the best powerful and detailed route.

Let's consider a network which uses the notations as:

NV = Set of Routers / Nodes

ED = Edges used to represent the path between nodes of routers.

FP = Feasible selected path.

Modeling these notations in form of a graph will be like GR(NV, ED, FP)

The incoming request can only be accepted if enough resources are available which can satisfy the bandwidth and delay parameters. For this we have to save the maximum resources which can only be accomplished by the network Ingress & Egress routers which will be responsible to determine the critical nature of the link.

If the value of the critical link is large it means more data can be routed from the specified path and due to this we will avoid this path to minimize the congestion on that path.

Following the above steps we will be able to fulfill the condition a. of designing requirements.

Also we can see that the value of critical link will be directly proportional to the number of requests been made.

CL(x) = Total request per link / Length of possible network connections

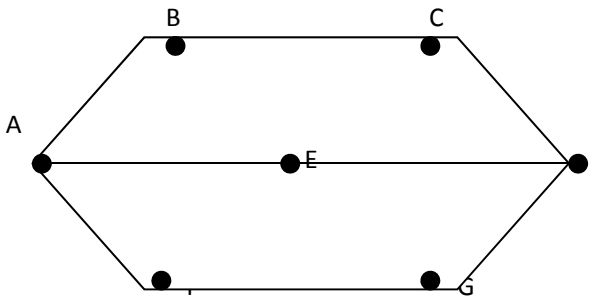
The link weight on link x is a combination of all the critical links between Source (S) and Destination (D) i.e. CL(S,D), Therefore

Weight on Link(x) = Critical Link / Residual Bandwidth on the link

After this the shortest path algorithm is invoked on the reduced network to find out those links whose weights are minimum.

If more than one path is found then the delay function play its role. The Delay from Source S to Destination D is calculated. This can be achieved easily as we have assumed that the ingress router have the information about the whole network.

Lets explain the above statements that if bandwidth on more than one path is same then how to find the best path according to Delay parameter.



Where,
x , y, z = Bandwidth on each link.
a,b,c,d,e,f,g,h = Delay on each link
The bandwidth and delay on the three links ABCD, AFGD & AED is as follows
ABCD = (x, a+b+c)
AFGD = (y, d+e+f)
AED = (z, g+h)
After performing all calculations the link with the minimum delay will chosen for the further transmission of data.

V PROPOSED ALGORITHM

Input: A network with n nodes having a residual bandwidth R and a connection request x which has to be routed over the path having minimum bandwidth requirement and minimum delay.
Output: A route between Source (S) and Destination (D) satisfying the output requirements has been established
Algorithm:
1. Calculate the allowed maximum flow on each pair from Source S to Destination D
2. Calculate the set of Critical Link for all source and destination pair.
3. Calculate the link weight.
4. Discard those set of part that do not satisfy the bandwidth requirement of the input data i.e. having residual bandwidth of less than required.
5. Using Shortest Path Algorithm calculate the shortest path using weight on each link.
6. If more than one path with the same weight exist then use delay parameter and select the path which has the minimum delay.
7. Afterward send the packet along the selected path and update the residual bandwidth.

VI CONCLUSION

From the above algorithm it is clear using the bandwidth and delay parameters we can route the data from Source S to destination D without any problem. Further we will try to implement this algorithm in MATLAB and show the results which will prove all the above given statements.

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