Amit, Mr. Shamsher Singh / International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com
Vol. 2, Issue 5, September- October 2012, pp.112-115

A Path Distribution Approach For Reliable Data Transmission In MPLS Ring Network

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Abstract

In a high speed network, any disturbance over the network cause heavy data loss. When data is transferring a topology like bus or ring. The chance of data loss increases more in same ratio. In this present the discussion is being performed on high speed MPLS Ring network. As some fault occurs over the network it will return heavy data loss. In this work we are defining some new low cost hardware called save points. Save points are placed at equal distance between two nodes. The network will maintain two paths for reliable data transmission. One path is the actual data path and other is backup path. As the signal disruption detected, it will inform the nearest save point and the save point will direct the communication to the backup path.

Keywords: MPLS, Reliable, Save Point, Broken Link, Recovery

I INTRODUCTION

MPLS stands for Multiprotocol Label Switching, Multiprotocol because it can be used for any Layer 3 protocol. MPLS is about glueing connectionless IP to a connection oriented Network. MPLS is something between L2 and L3. MPLS is also called Tag Switching MPLS provides a mechanism to avoid hop-by-hop routing decision making (Notice that IP makes a hop-by-hop routing decisions) by setting up a Layer 2 fast path using Labels (hence the name Label Switching) to move the packets quickly along pre-established paths without examining each packet at the IP level at each router. This is very similar to ATM and FR Layer 2 routing and switching operations. Remember VPs and VCs in ATM and DLCI #s in FR operate at Layer 2, have only local significance and established before hand. In MPLS enabled Network, the packet needs to be examined only once at the edge of the MPLS Network (Network entry point). After that, the packet forwarding is based on simple tagging scheme rather than on more complex and variable IP header. The most important advantage of MPLS is that it is independent of L2 and L3 protocols, and so it can be adopted any where in the world to any L2 or L3 infrastructure. The Canadian Post Office seems to work on this principle. MPLS is now increasingly being deployed in Optical Networking as well. Here figure 1 represents the MPLS network.

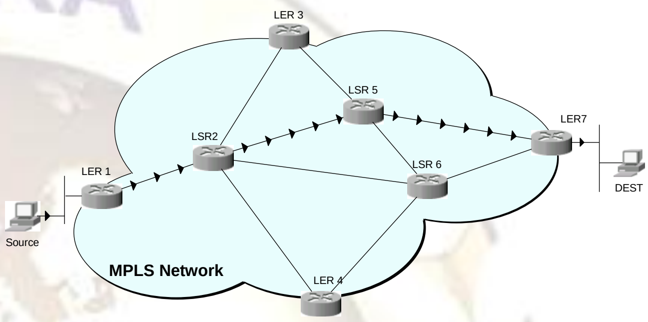

Figure 1 : MPLS Network

A) Route Selection: In MPLS network the route selection is done using basic 2 approaches

I) Hop-by-Hop Routing: In this case each LSR independently chooses the next hop for each FEC. The LSRs use existing OSPF protocol to make the routing decisions. This method allows rapid switching by labels and support for differentiated service. How ever it does not support traffic Engineering and policy Routing (Policy Routing refers to defining Routes on some policy related to QoS, Security, Queuing and discard mechanisms etc).

II) Explicit Routing: In this kind of Routing, a single LSR, usually the ingress or egress LSR, specifies some or all of the LSRs in the LSP for a given FEC. Explicit Routing provides all the benefits of MPLS, including Traffic Engineering and policy Routing. Explicit Routing can be of 2 types.
a) Static Explicit Routing: The Ingress or Egress LSRs are preconfigured to analyze the packets as they entered the MPLS domain, in other words, the LSPs are setup ahead of time for all kinds of FECs.

b) Dynamic Explicit Routing: The LSPs are determined dynamically at the time of arrival of each packet. In this case, the LSR setting up the LSP would require information about the topology of the MPLS domain and the QoS related information pertaining to the given FEC.

B) **MPLS Header:**

- MPLS sticks a 32 bit Header as shown below:
- Label (20 Bits): Carries information about setting up the LSP based on a given FEC. Either Manual configuration or inserted on the basis of static or dynamic routing protocol
- COS (3 bits):Defines the required Class of Service. With 3 bits, 8 possible classes. Affects the Queuing and discard algorithms as the packet travels through the Network. Some times it is copied from the IP Header TOS field.
- S (STACK) (1 BIT): MPLS supports multiple Labels. The processing of labelled stack is always based on the top stack. We shall study this feature of MPLS in more detail shortly.
- TTL (Time To Live) (8 bits): Same function as TTL in the IP Header. The packet is killed after travelling the specified number of hops and if the packet has still not reached is destination.

In today's network world the advancement of the network infrastructure is the sound base that networks must rely on to compete in society. MPLS offers that sound base at a lower cost and with enhanced flexibility. It not only can use pre-existing equipment used for technologies such as ATM and Frame Relay, but it allows the fine tuning of more advanced technologies such as VoIP or video conferencing. Versatility and redundancy is what makes a network reliable and flexible, and MPLS can offer those solutions. It is not a matter of consideration; it is a matter of time and necessity in world today.

C) **MPLS-TP**

Tomorrow's network will mostly carry packets. As a result, an evolution of existing time-division multiplexing (TDM)-based transport networks is taking place, and new architectures optimized to carry packets are being defined. The function of a transport network is to carry information between service edge devices. These devices could be Digital Subscriber Line Access Multiplexers (DSLAMs), gateways, T1/E1 aggregators, broadband remote access servers (BRAS), etc. Traditional transport systems based on SDH/SONET platforms provide low-speed bandwidth granularity network services as well as high-speed long-haul transmission services. Circuit-switched transport network services with fixed bandwidth granularity (64 Kbps, 1.5 Mbps, 2 Mbps, 50 Mbps, 150 Mbps, 600 Mbps, etc.) were emulated using connection-oriented, packet-switched (CO-PS) technologies and similar managed-bandwidth services. However, in the access/aggregation and metro domains, there is a desire by carriers to simplify packet transport networking in order to reduce capital expenditures (CapEx) and operational expenses (OpEx) in their next-generation networks.[5]

II LITERATURE SURVEY

MPLS-TP ring protection mechanisms as a novel protection mechanism, which aggregates merits of both wrapping and steering approaches, and which reduces packet loss significantly in case of in order delivery. The present article describes the implementation in detail and shows that the new approach highly reduces packet loss compared to the current mechanism[1]. A new architecture for MPLS-based micro mobility management. Presented proposal called Optimized Integrated-Multi-Protocol Label Switching (Optimized I-NMLPLS). Optimized I-NMPLS is a hierarchical approach to support micro-mobility. This approach integrates the traffic engineering and QoS capabilities of MPLS with Mobile IP Fast Authentication protocol (MIFA) as a mobility management framework. The integration between N1LPLS and MIFA is achieved through integration of MIFA control messages with MPLS signalling traffic[2]. MPLS is a next generation backbone architecture, it can speed up packet forwarding to destination by label switching. However, if there exists no backup LSP when the primary LSP fails, MPLS frames cannot be forwarded to destination. Therefore, fault recovery has become an important research area in MPLS Traffic Engineering[3]. A MPLS based routing algorithm is present for reducing the number of MPLS labels to N + M without increasing any link load. Presented explicit N + M bound makes it easy to limit the table size requirement for a planed network, and the linearity allows for tables implemented in fast memory. For differentiated services with K traffic classes with different load constraints, Presented bound increases to K(N+M). Presented stack-depth is only one, justifying implementations of MPLS with limited stack-depth[4].

This paper describes design, implementation, and capability of a MPLS simulator, which suppaas label swapping operation, LDP, CR-LDP, and various sorts of label distribution function. It enables researchers to simulate how a U P is established and terminated, and how the labelled packets act on the LSP. In order to show MPLS simulator's capability, the basic MPLS function defined in MPLS standards is simulated; label distribution schemes, flow aggregation, ER-LSP, and LSP Tunnel[5]. They introduces a T-MPLS simulation tool developed using OPNET modeler 11.5. Author proposed a simulation node structure including four layers, i.e. Client Layer, Adaptation Layer, Control Layer and the Switching & Forwarding Layer. All the L2 (PDH, SONET/SDH, ETH, FR, ATM, etc) and L3 (IP) payload could be mapped into T-MPLS tunnel through either MPLS encapsulated method or pseudo wire mechanism[6]. Author provide some performance measurements comparing the prototype to software routers. The measurements indicate that the prototype is an appropriate tool for achieving line speed forwarding in testbeds and other experimental networks[7] A work on Mobile MPLS with Route Optimization is presented by the author and proposes a route optimization protocol to overcome this problem in Mobile MPLS. By adding a correspondent agent function to Mobile MPLS's edge routers, the mobility binding of a mobile node can be cached by the edge routers and the packet routing to the mobile node can be route-optimized[8]. Another work present an innovative multi-service testbed for MPLS-TP networks to demonstrate the transport performance of interconnected rings. By validating dual-label and two extended protection schemes, hardware experimental results are given to show their influences on transport[9].

III RESEARCH METHODOLOGY

The proposed work is about to analyze the network for the network fault and provide the network restoration scheme by defining the alternative path. The work also includes the distribution of substituted path notification among all nodes over the network. The network reliability depends on how accurately the fault information is defined and the QOS depends on the efficient distribution of notification over the network.

In the existing methodology as the packet loss is detected in such network it is detected by the last save point that the information is lost. Now the save point will regenerate the packet and send it in the opposite direction and from the other path the communication will be performed. But the main drawback of this approach is the complete re-routing process in worst case. It means if the data will be lost near to the destination node and save point performs the communication from reverse direction. Now the packet has to travel the complete cycle again. The overall algorithm for the proposed work is presented in the form of a flowchart given as under.

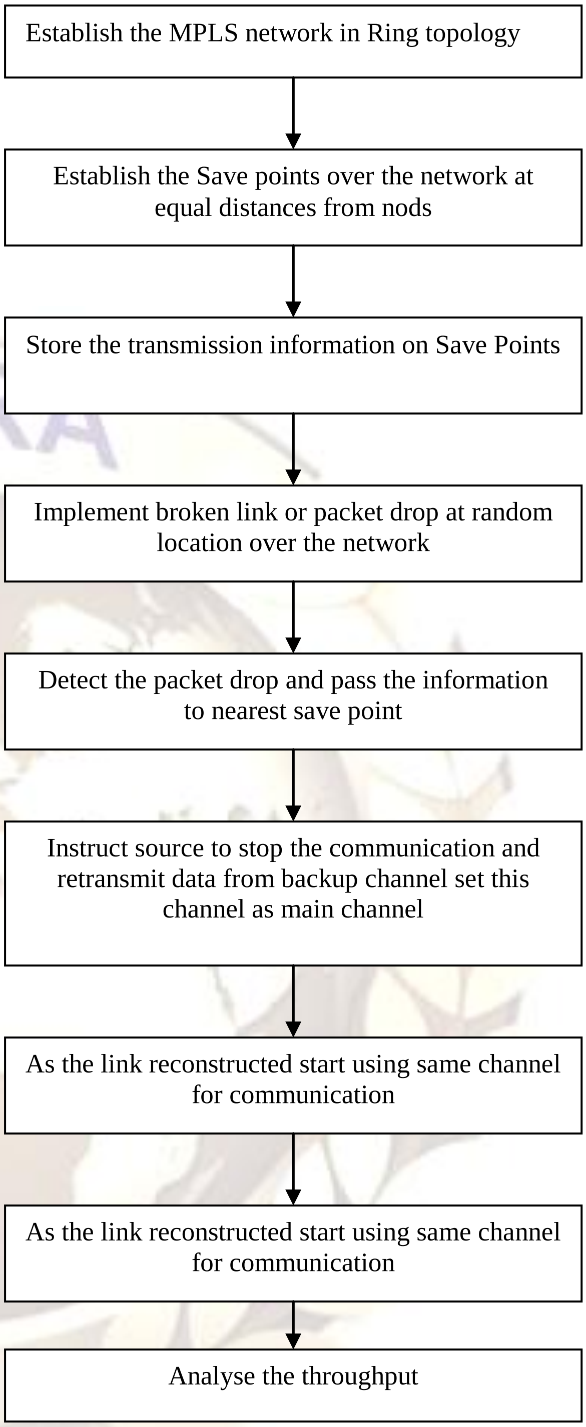

Figure 2: Proposed Methodology

Figure 2 shows the complete architecture of MPLS network. In this proposed work we are defining a 2 Lane System for the network communication. The properties of proposed system are

- The proposed system is a 2 Lane system.
- Each Channel can send or receive data.
- Both channels are independent to the communication.

- Second channel is defined as the backup channel.
- The main communication will be performed using main channel.
- As the packet loss detected by the save point. Channel 2 will be selected for the data communication.
- Same Save point will control both channel.
- If the packet loss occur in second channel also then it will chose the traditional approach to move in opposite direction and perform the communication

IV CONCLUSION

The proposed work is the improvement over the existing MPLS network with an alternate path path approach. The system will use extra hardware as well as extra backup path and gives the better reliability over the network. The proposed system is an intelligent system that will work on ring based high speed networks.

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