

Protection Mechanisms for LDP P₂MP/MP₂MP LSP

draft-zhao-mpls-mldp-protections-02.txt

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Updates for Version 02

- Since IETF82, We have received a number of comments and suggestions both from the Taipei meeting and after the meeting. Notable thanks to Ijsbrand Wijnands and Alia Atlas for their comments.
- Using the aforementioned feedback. The major updates in the new version include:
 1. Protocol extension and procedure details have been added for:
 - The backup p2p LSP's cleanup for p2p based mLDP node protection.
 - P2MP based mLDP node protection.
 2. Two switchover modes for backup path forwarding have been added:
 - One mode is for the case when node failure detection from the PLR node is not available
 - Second mode is for the case when the node failure detection from the PLR node is available;
 3. Further Examples for p2p based mLDP node protection and p2mp based mLDP node, providing emphasis on procedures.

Solution 1: Node protection using P2P backup LSP

Two Options Exist for Cleanup of Backup Path:

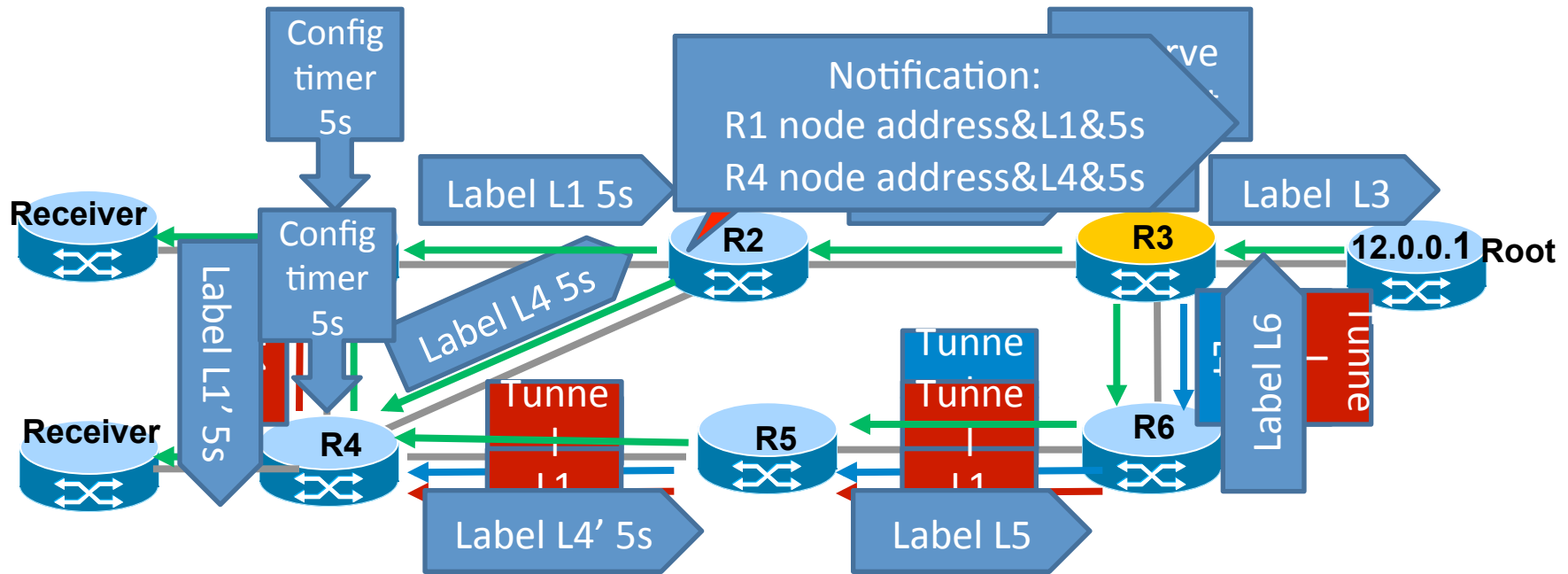
Method 1, timer based cleanup of the backup path:

- ① A label reserve timer on both Merge Point (MP) and Point of Local Repair (PLR) is synched during the LSP setup through the node being protected;
- ② MPT will set up this timer after network convergence, and delete the old forwarding entry after MBB finished or reserve timer timeout. **Note** that MPT MUST keep the old label resource until reserve timer expire, this is a local behavior.
- ③ After the failure is detected, PLR: removes the backup path after a reserve timer timeout.

Method 2, T-LDP cleanup of the backup path:

- ① A T-LDP session between MP and PLR is setup during the LSP setup;
- ② MPT will delete the old label if: session down, network convergence, or MBB has finished. The MP will send the notification message, with withdraw flag, to the PLR MPT using T-LDP.
- ③ The PLR will cleanup the backup path after it receives this notification message from MPT via the T-LDP session.

Example for Timer Based Node Protection using P2P LDP Backup LSP



optional parameters respectively.

and R4 :

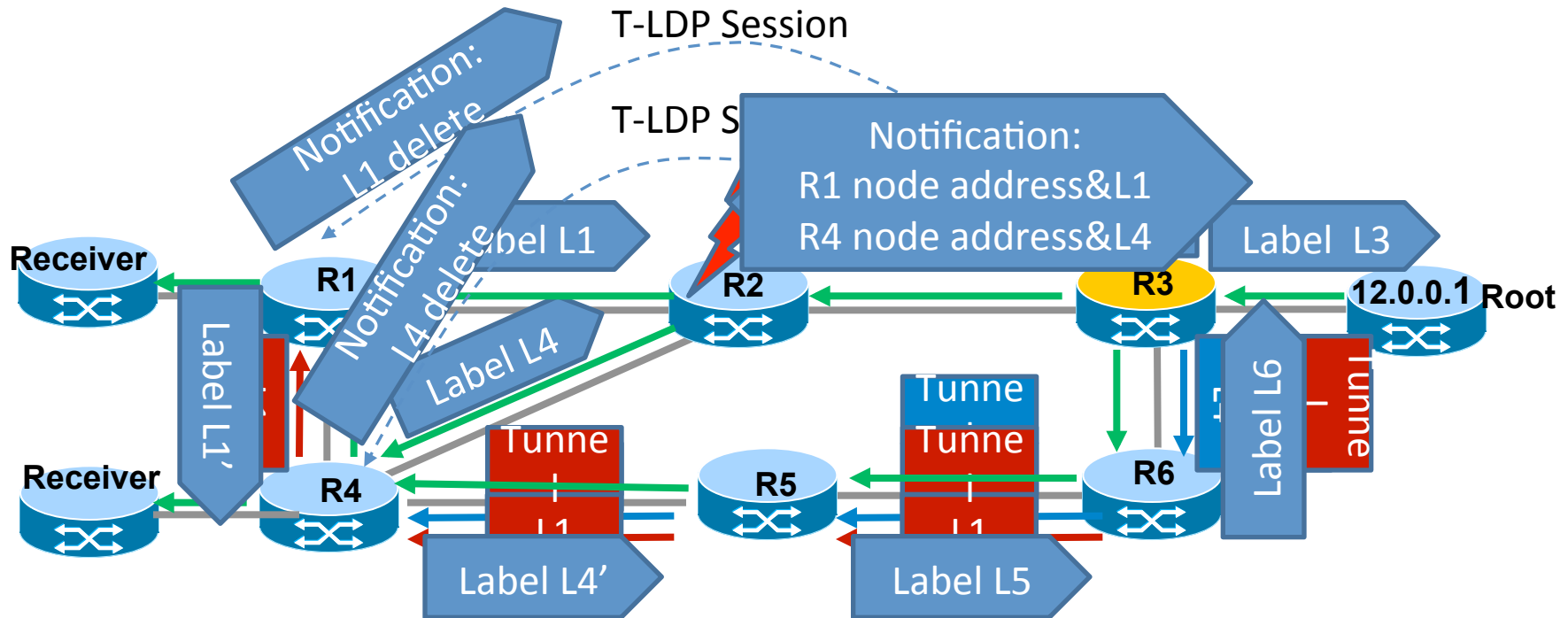
- a) Tunnel Red : R3->R6->R5->R4 using inner label L1;
- b) Tunnel Blue: R3->R6->R5->R4->R1 using Inner label L4;

3. R1 and R4 will process the packets just as they receive from the R2 after they pop the tunnel label;

Label: The backup traffic will be stopped when PLR's reserve timer timeout.

4. The backup traffic will be stopped when PLR's reserve timer timeout.

T-LDP Based Node Protection by P2P LDP Backup LSP with T-LDP

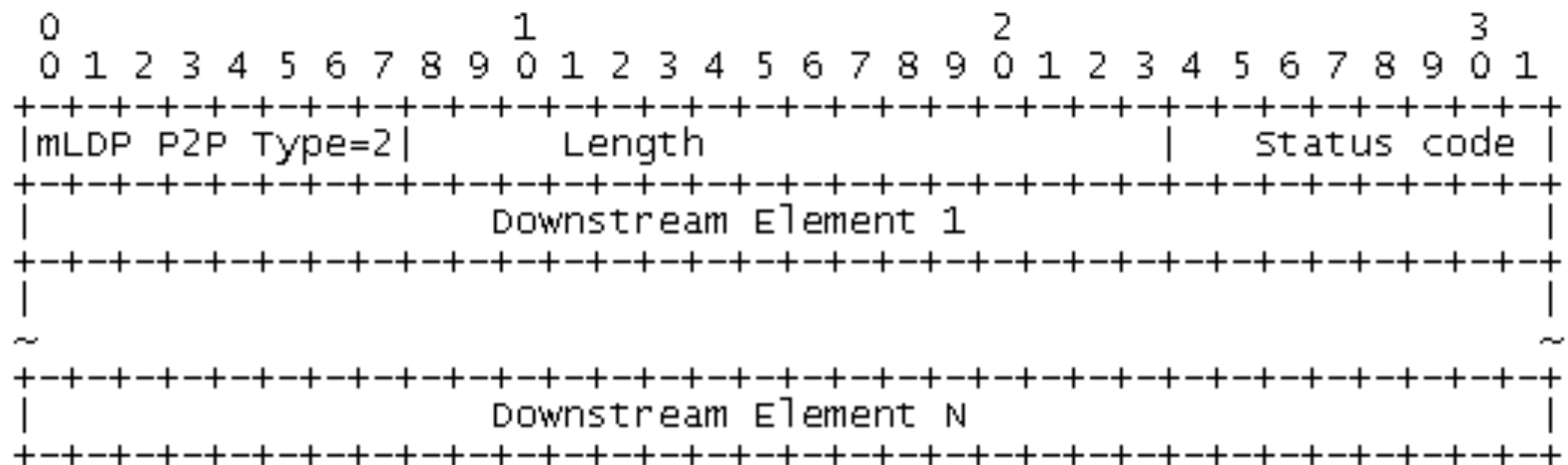


2. MP will send notification message to PLR when it finish the procedure of MBB or convergence.
 PLR will delete its backup path when receives this notification message.
 PLR will delete its backup path when receives this notification message.

Note: Ice and Alia will present another alternative to this next using the T-LDP to setting up and cleanup of the backup LSP.

Protocol Extensions for P2P Based Solution (1)

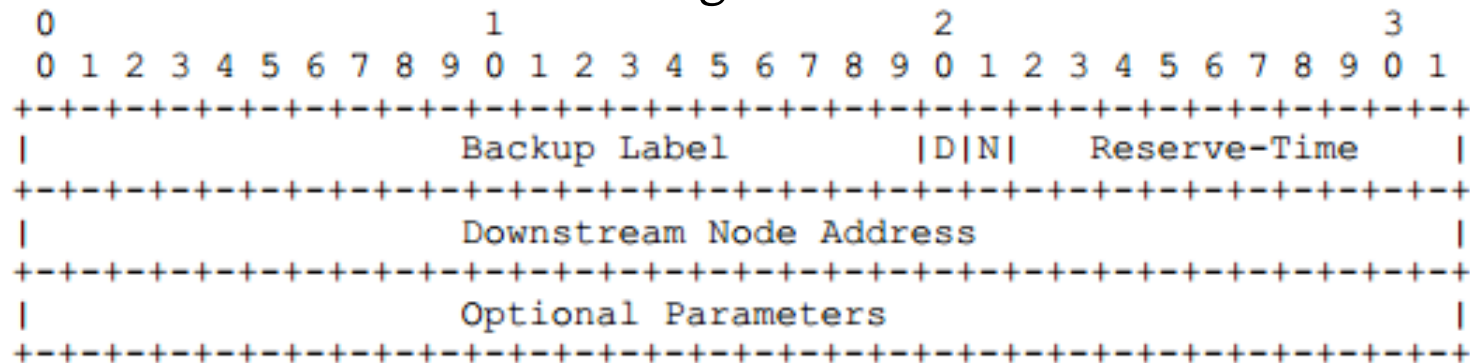
A new type of LDP MP Status Value Element is introduced for notifying downstream LSRs and respective labels. **The encoding is as follows:**



Status code: 1 = Advertise the existing downstream LSRs
 2 = Withdraw the deleted downstream LSRs

Protocol Extensions for P2P Based Solution (2)

The Downstream Element encoding is:



Backup Label: The label assigned by MP for PLR

Downstream Node Address: Downstream node's LSR-ID address

D Bit: Delete Flag, The type of delete by MP's backup update message

D Bit: Delete Flag, The type of delete by MP's backup update message

0 = 'explicit-delete', delete by MP's notification message through T-LDP

N Bit: Node Failure Required Flag, the occasion of switching traffic's on PLR

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1 = 'Y', switch traffic to backup path only when PLR detects the node failure

0 = 'N', switch traffic to backup path when PLR detects failure

Res-time: The time of MP's reserve-timer, synchronizing to PLR.
when D bit set as 'explicit-delete'.

Solution2: Node Protection Using P2MP LDP Backup LSP

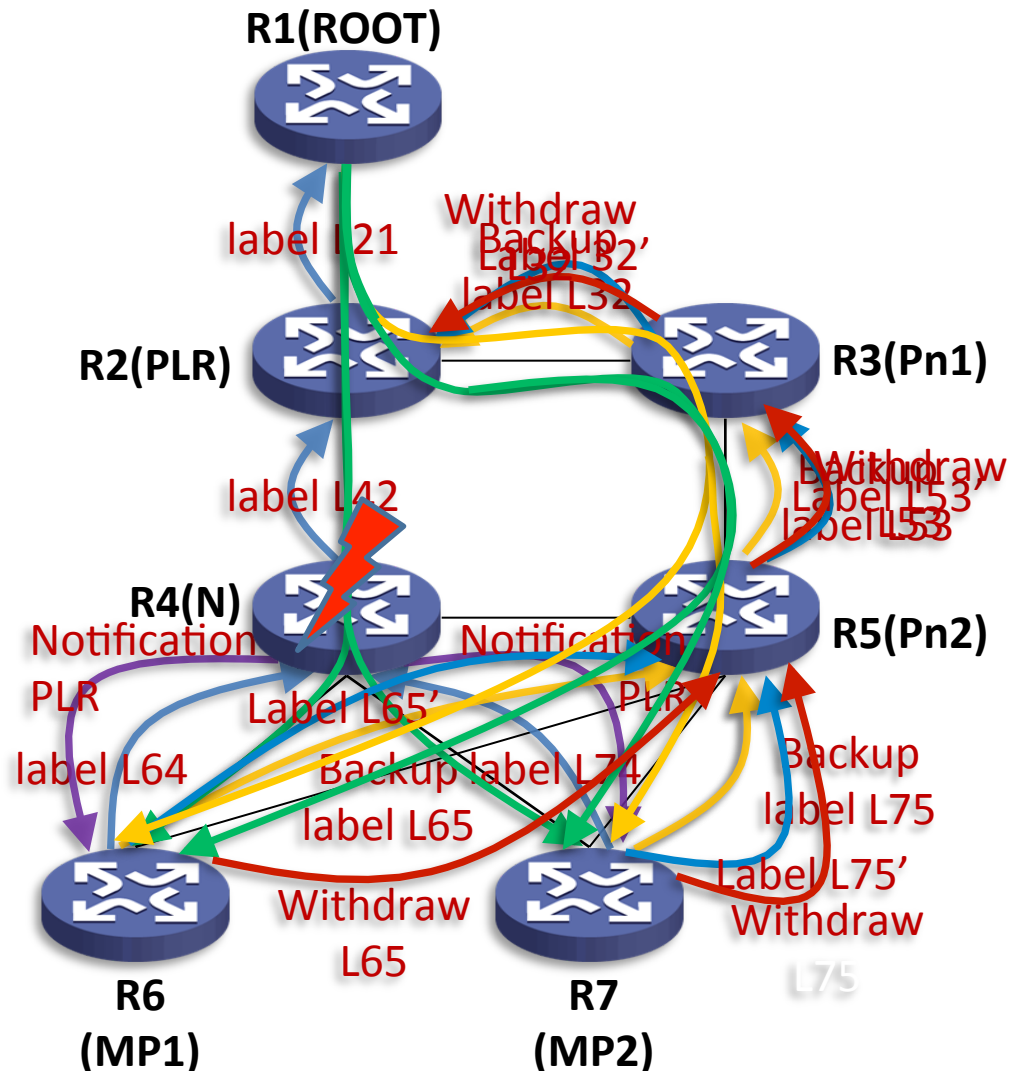
1. N sends its up-stream's(PLR) information in notification message to its downstream LSRs(MPs) .This message triggers MP setting up a backup P2MP LSP toward PLR. **PLR's address, P2MP FEC key, N's address** is the key of this backup path. This

backup path will avoid N if possible.

2. When PLR detects N failure, it switches the traffic to backup P2MP

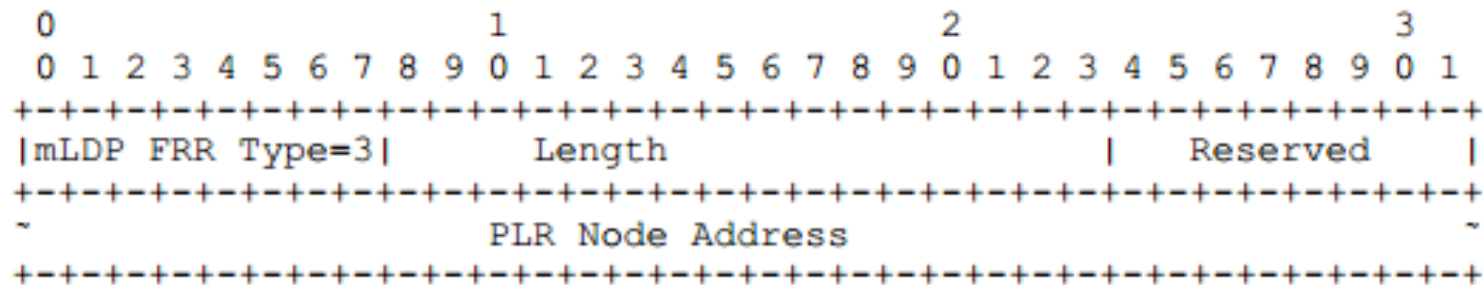
LSP path.

3. This backup P2MP LSP will be destroyed by label mapping withdraw



Protocol Extensions for P2MP Based Solution (1)

A new type of LDP MP Status Value Element is introduced, for notifying upstream LSR information. It is encoded as:



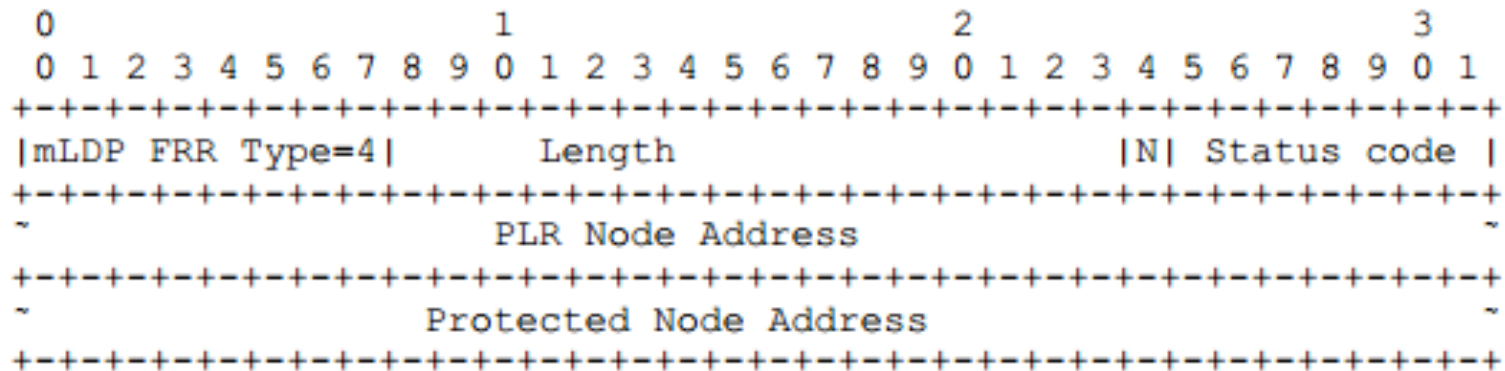
mLDP FRR Type: Type 3 (to be assigned by IANA)

Length: If the Address Family is IPv4, the Length MUST be 5;
If the Address Family is IPv6, the Length MUST be 17.

PLR Node Address: The host address of the PLR Node.

Protocol Extensions for P2MP Based Solution (2)

A new type of LDP MP Status Value Element is introduced, for setting up secondary mLDP LSP. It is encoded as:



mLDP FRR Type: Type 4 (to be assigned by IANA)

Length: If the Address Family is IPv4, the Address Length MUST be 9;
if the Address Family is IPv6, the Address Length MUST be 33.

Status code: 1 = Primary path for traffic forwarding
2 = Secondary path for traffic forwarding

PLR Node Address: The host address of the PLR Node.

Protected Node Address: The host address of the Protected Node.

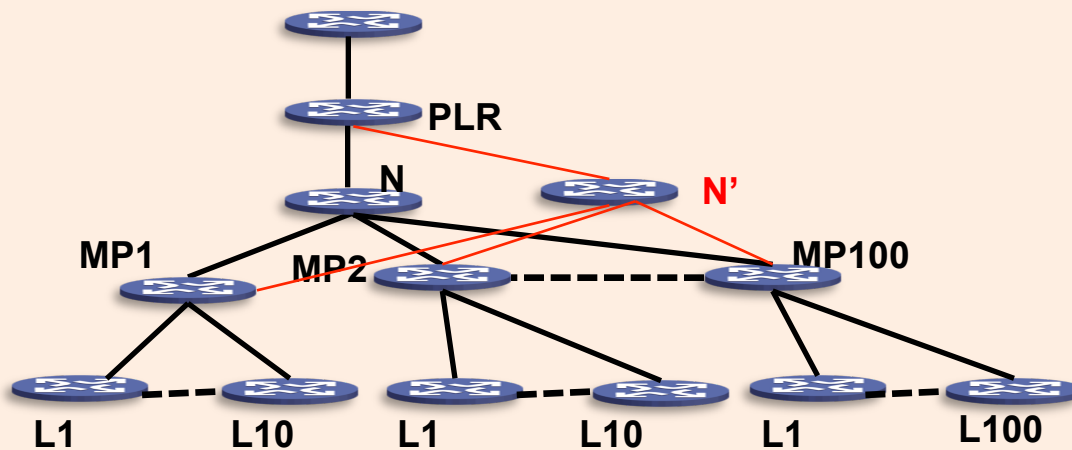
N Bit: Node Failure Required Flag, which indicates the switchover timing on PLR.

1 = 'Y', switch traffic to backup path only when PLR detects the node failure.

0 = 'N', switch traffic to backup path when PLR detects failure.

Analysis for An Example Scenario

Scenario: The Protection of Node N with 100 Merge Point (MP) and each Merge Point with 10 leaves.



**Backup path Bandwidth
Cost on Path Per PLR
(LSP Bandwidth is M)**

**T-LDP
Sessions
(for the
whole tree)**

P2P Based Solution

Cleanup by timer

1 00M

0

Cleanup by T-LDP

100M

>100*10

P2MP Based Solution

1 M
(assuming that MPs
Share the same alternate N)

0

Summary & Next Steps

- The authors will update the draft to include the following points raised during IETF83 discussions:
 - No additional effort required for MP2MP since the solution is defined based on the PLR and N and MP; Any node, including root, leaf, transit or branch in the MP2MP or P2MP, will function as either PLR, N or MP;
 - Backward compatibility: all other features such as GR, MBB and Wildcard features should work “as is” now; we will explain this more in the next version of the draft.
- A need for further evaluation of Timer and T-LDP mechanisms, via more topology, scalability analysis and continued prototyping. Use Cases and input from users would also be welcome;
- We will continue to work with Ice and Alia (draft-wijnands-mpls-mldp-node-protection), merging drafts is a potential option.

Thanks!
Questions & Comments?