M1 RISE TP2 - MPLS

Réseaux d'OpÃ©rateurs

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MPLS-TE Routing

Objectif : Understand and Configure MPLS tunnels: LDP, RSVP-TE

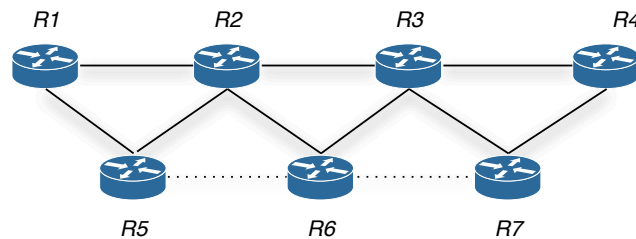*Notions* : MPLS, OSPF-TE, LDP, RVSP-TE & Explicit FEC Configurations

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FIGURE 1 – Deploy MPLS on a small tesbed

The report and the configurations should be delivered Monday, April 2nd (per group of 2/3 students at maximum – the report should not exceed 10-15 pages).

Basic Configurations (8 pts)

1. Using dynamips/dynagen or GNS3, build the following network (with links R5-R6 and R6-R7 having a lower capacity than the other links). Configure the IP address plan and the OSPF routing (or IS-IS if you prefer). Add a loopback address on each router. Check if your network is operationnal.

2. Activate MPLS on each link and observe the tables of labels on each router : comment the tunnels in use in the network (in particular, insist on the interaction with the IP routing).

3. For the *loopback* prefix from R7, provide the content of the IP routing and MPLS forwarding tables of each uptream router. Deduce the tunnels (and the labels) that will be used from R1 towards R7 (in both direction) if using the command `ping` between those two routers. Check this behavior with `tcpdump` and `traceroute`.

4. Illustrate with the destination prefix of your choice the notion of LSP merging.

5. Do the labels in use on R6 depend from the incoming interface (justify it practically) ? May the same label value be used in both direction of the same link ? Why ? What is the scope of the labels in use at this stage ?

Signalization (6 pts)

1. A new prefix is added on R6 (e.g. an interface *lo2* on R6). Describe all message exchanges triggered by this modification for each protocol (OSPF or IS-IS, LDP, etc) How are the labels distributed ?

2. Favor the use of ECMP towards this prefix. Comment and explain the inter-action with MPLS.

3. If the link R2-R6 fails, justify all message exchanges for each protocol.

Traffic Engineering (5 pts)

1. Illustrate the use of the CSPF algorithm and the RSVP-TE label distribution mechanism with at least three tunnel reservations (At least one of these reservations should fail) towards the second loopback of R6. Comment the signalization in use at each reservation attempt.
2. Play with two levels of priority to highlight what happens when a prioritary tunnel steals the bandwitdh of another already established tunnel (having a lower level of priority).

Several tunnel types (1 pts)

1. Build an explicit tunnel from R1 towards R4 going trough all routers in the network.
2. What is the effect of this command applied on R1 : `[no] mpls ip propagate-ttl`
3. What is the effect of this command applied on R2 : `[no] mpls ip ttl-expiration pop labels`