

Lab 11: MPLS Resilience

Or: Experimenting with Secondary paths and FRR facility mode

What you will do:

1. Reconfigure all routers (if needed) for end-to-end connectivity within a single OSPF domain
2. Configure a 2-hop LSP around a ring of Core routers, with a secondary path
3. Configure a 3-hop LSP from a PE, around a ring of Core routers, with a secondary path
4. Use "show" commands to examine & verify the LSP status in a normal and "failed" state
5. Use FRR facility mode to protect both LSP primary paths
6. Use "show" commands to examine & verify the LSP status in a normal and "failed" state

Things that you will need to know or learn:

1. CLI commands for configuring all required infrastructure, up to the level of a LSP
2. CLI commands for configuring LSP secondary paths, in normal & (hot) standby mode
3. CLI command for configuring FRR in facility bypass mode
4. CLI commands for showing the LSP status under both MPLS and RSVP

What you need to submit and when:

1. There is no pre-lab for Lab 10.
2. Complete the in-lab part of the exercise (see below), **before** the end of your lab period.
3. Complete the "Lab 10 Post-lab" exercise on SRLG (MPLS lab 6.2) and FRR one-to-one (MPLS lab 6.4), **before** your next lab period.

Required Equipment:

- USB memory stick to save results for post-lab questions
- Hard-cover lab notebook, for reference during SBA at the end of the course.
- PC with internet access, a browser, Java, and terminal program (Provided in T108)

In-Lab Marks:

- 1 mark: Demo of fully configured secondary paths (non-active) Prove it with suitable "show" cmd!
1 mark: Demo of fully configured secondary paths in (hot) standby (non-active). Prove it!
1 mark: Demo of secondary paths in active use. Prove it with a suitable "show" cmd!
1 mark: Demo of FRR facility backup in active use. Prove it with a suitable "show" cmd!

The in-lab is worth 1/2 of the overall lab mark; the post-lab is worth 1/2 of the overall lab mark.

10% of your final mark is for labs done during the course of the semester.

References and Resources:

- MPLS Module 6 on Resiliency
- MPLS Lab guide, labs 6.1 and 6.3
- EDU Lab: remote-access lab facility hosted at Nokia's Kanata campus

Addressing & Login Table

	Edu Lab 1	Edu Lab 2
R1	192.168.206.164	192.168.206.196
R2	192.168.206.165	192.168.206.197
R3	192.168.206.166	192.168.206.198
R4	192.168.206.167	192.168.206.199
R5	192.168.206.168	192.168.206.200
R6	192.168.206.169	192.168.206.201
R7	192.168.206.170	192.168.206.202
R8	192.168.206.171	192.168.206.203
R9	192.168.206.172	192.168.206.204
R10	192.168.206.173	192.168.206.205
R11	192.168.206.174	192.168.206.206
R12	192.168.206.175	192.168.206.207

Edu Lab 1 Login	Passwd	Edu Lab 2 Login	Passwd
aca001-328		aca002-318	
aca001-329		aca002-319	
aca001-330		aca002-320	
aca001-331		aca002-321	
aca001-332		aca002-322	
aca001-333		aca002-323	
aca001-334		aca002-324	
aca001-335		aca002-325	

See Blackboard for a list of passwords; write **yours** in the space above.

<https://learningserviceslabs.nokia.com/>

Topology Diagram

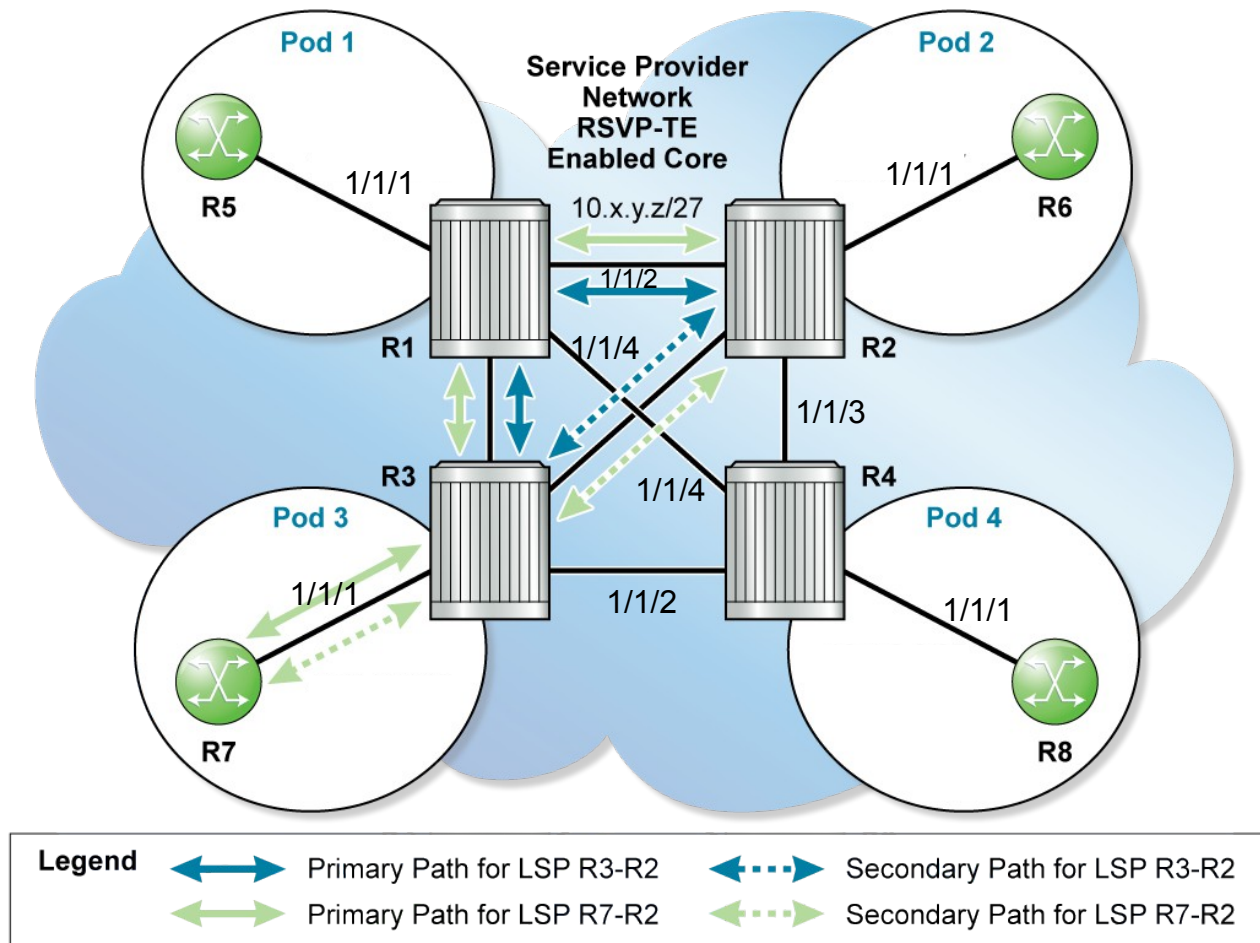


Image source: Nokia MPLS Lab Guide, p. 41

Command Reference (see MPLS Lab 6 for additional commands)

no shutdown

Don't forget this!! Everywhere!

```
configure • router • mpls • lsp {lsp-name} • secondary {path-name}           # Def'n of sec.
configure • router • mpls • lsp {lsp-name} • secondary {path-name} • standby # (hot) standby
configure • router • mpls • lsp {lsp-name} • fast-reroute facility           # Bypass tunnel

show • router • mpls • status                                             # Check # of orig, trans, term
show • router • mpls • path                                              # Check on path definitions
show • router • mpls • lsp • [<lsp-name> [detail]]                       # Listing of LSPs [with details]
show • router • mpls • lsp • [<lsp-name>] • activepath                   # Which prim/sec is truly active?
show • router • mpls • lsp • {transit | terminate} • [detail]           # Identify non-head end LSPs
show • router • mpls • lsp [<lsp-name>] • path • [detail]                # Good for real status
show • router • mpls • bypass-tunnel • [detail]                         # Selects only FRR LSPs
show • router • rsvp • session • bypass-tunnel • [detail]              # More specific info on FRR
show • router • mpls • bypass-tunnel • protected-lsp [<lsp::path>] • [detail] # What's protected?
```

Task 1: Re-build configuration to support LSPs

It may be best to start with a fresh configuration. If you need to configure everything again,

- interfaces, with IPv4 addresses
- OSPF throughout the single-area domain
- MPLS and RSVP configuration
- LSP-path definitions: both fully strict and totally loose (for this lab)

Ensure (ie. Prove!) that everything is working properly:

- How many routes should be in the routing table?
- How many OSPF neighbors should each router have?
- Check the status of the router to make sure MPLS & RSVP configured: show router status

Task 2: Complete MPLS Lab 6.1

Creating a secondary LSP is extremely easy, requiring less than a handful of commands. The focus of this lab is very much on the status and state of the LSP and supporting paths (primary and secondary) and how to access that information. Look carefully at the outputs of "show..."! You'll need this understanding to successfully complete the post-lab exercise (MPLS Lab 6.2).

To work well with a full class:

- work in teams consisting of **UPPER** and **LOWER** pods;
- **ONLY** take down the **HORIZONTAL** links, when both Upper & Lower pods are at Phase 3.

CHECK POINT #1: Demo, and prove with the output from a *single* command, that your secondary LSP is properly configured (non-standby, non-active)

CHECK POINT #2: Demo, and prove with the output from a *single* command, that your secondary LSP is properly configured as (hot) standby (non-active).

CHECK POINT #3: Demo, and prove with the output from a *single* command, that your secondary LSP is fully functional and active.

Task 3: Complete MPLS Lab 6.3

The next lab uses the exact same setup, and simply adds FRR Facility repair to the LSPs. Exactly one (1) command is used to select FRR and the mode. The real work is in examining and understanding the output of the "show ..." commands. You'll need this understanding to successfully complete the post-lab exercise (MPLS Lab 6.4).

Again, to work well with a full class:

- work in teams consisting of **UPPER** and **LOWER** pods;
- **ONLY** take down the **HORIZONTAL** links, when both Upper & Lower pods are at Step 4.

CHECK POINT #4: Demo, and prove with the output from a single command, that the FRR facility protection is active and fully functional.

Task 4: Save your configs

As always, save the configs for your P, PE, and CE routers on the EDU ftp server: use **edu1 / dEEtgx2Y** or **edu2 / dEEtgx2Y** for each 1/2 of the class; **Rxx = R01, R02, ...**

save: admin save ftp://{acct}:{pswd}@192.168.181.81/**Rxx**/ande0001-L11.cfg

check: file dir ftp://{acct}:{pswd}@192.168.181.81/**Rxx**/

restore: exec ftp://{acct}:{pswd}@192.168.181.81/**Rxx**/ande0001-L11.cfg

To repeat this lab using MySRLab, use the routers according to the following topology:
R3(PE) — [R1(P) – R5(P) – R6(P) – R2(P)]* — R6(PE) *fully-meshed CORE IGP

Reverting to a different configuration

Identify a configuration file, then revert to it:

```
configure system rollback rescue-location ftp://rollback:r0llback@192.168.181.81/13.0.R5/Initial  
admin rollback revert rescue now
```

```
show card [2017: card-type = iom3-xp]  
configure card 1 card-type {card-type-from-show-command}
```

```
show mda [2017: mda-type = m10-1gb-xp-sfp]  
configure card 1 mda 1 mda-type {mda-type-from-show-command}
```