Lab 11: MPLS Resilience
Or: Experimenting with Secondary paths and FRR facility mode

<u>What you will do</u>:
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

<u>Things that you will need to know or learn</u>:
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

<u>What you need to submit and when</u>:
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 11 Post-lab" exercise on SRLG (MPLS lab 6.2) and FRR one-to-one (MPLS lab 6.4), **before** your lab section's assigned due date.

<u>Required Equipment</u>:
- 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)

<u>In-Lab Marks</u>:

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.

<u>References and Resources</u>:
- 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**	Edu **Lab 3**
R1	.164	.196	.228
R2	.165	.197	.229
R3	.166	.198	.230
R4	.167	.199	.231
R5	.168	.200	.232
R6	.169	.201	.233
R7	.170	.202	.234
R8	.171	.203	.235
R9	.172	.204	.236
R10	.173	.205	.237
R11	.174	.206	.238
R12	.175	.207	.239

	My specific login information
EDU Lab # (1, 2, or 3)	
Individual login ID	
Corresponding password	

See BrightSpace for a list of login IDs and passwords; write **yours** in the space above.

Base IP address is: **192.168.206.0/24**
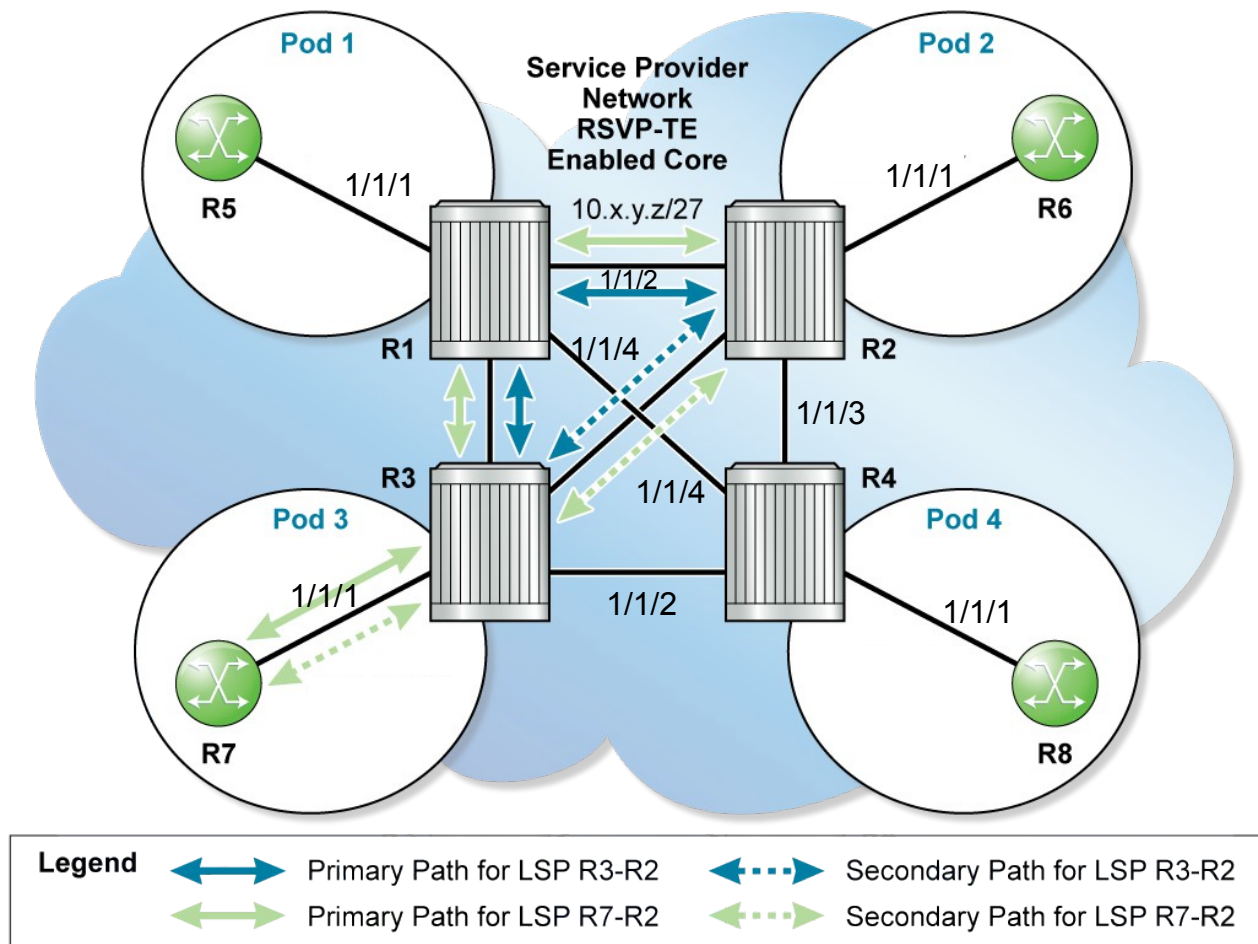
Topology Diagram

Image source: Nokia MPLS Lab Guide, p. 41

<u>Command Reference</u> (see MPLS Lab 6 for additional commands)

<mark>no shutdown</mark>   # 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

tools perform router mpls resignal lsp <lsp-name> path {path-name} # Force immediate resignal

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 <u>active</u>.

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}