

Lab 9 Postlab: VPLS

Or. Spoke termination to a VPLS

What you will do:

1. *PLEASE* read the following: SA module 3, slides 40-44 on spoke-terminated VPLS
2. Complete the material from SA Lab 4 on MySRLab:
 - create a distributed VPLS with a spoke-terminated ePipe (no SAPs!)
 - create a local VPLS with multiple spoke-terminated ePipes (no SAPs!)
3. Use additional commands to examine the VPLS operation
4. Save configs and enter your answers for each task on BrightSpace

Things that you will need to know or learn:

1. All CLI commands needed for SA Lab 2 (Epipes) and SA Lab 3 (VPLS)

What you need to submit and when:

1. Complete the “Lab 9 Post-lab” exercise on BrightSpace with answers from your work, before your lab section's assigned due date.

Required Equipment:

- Credentials for booking a MySRLab session
- An actual MySRLab booking
- PC with internet access, a browser, and terminal program (Provided by you)

Post-Lab Marks:

This post-lab is worth 1/2 of the overall lab mark for Lab 9.

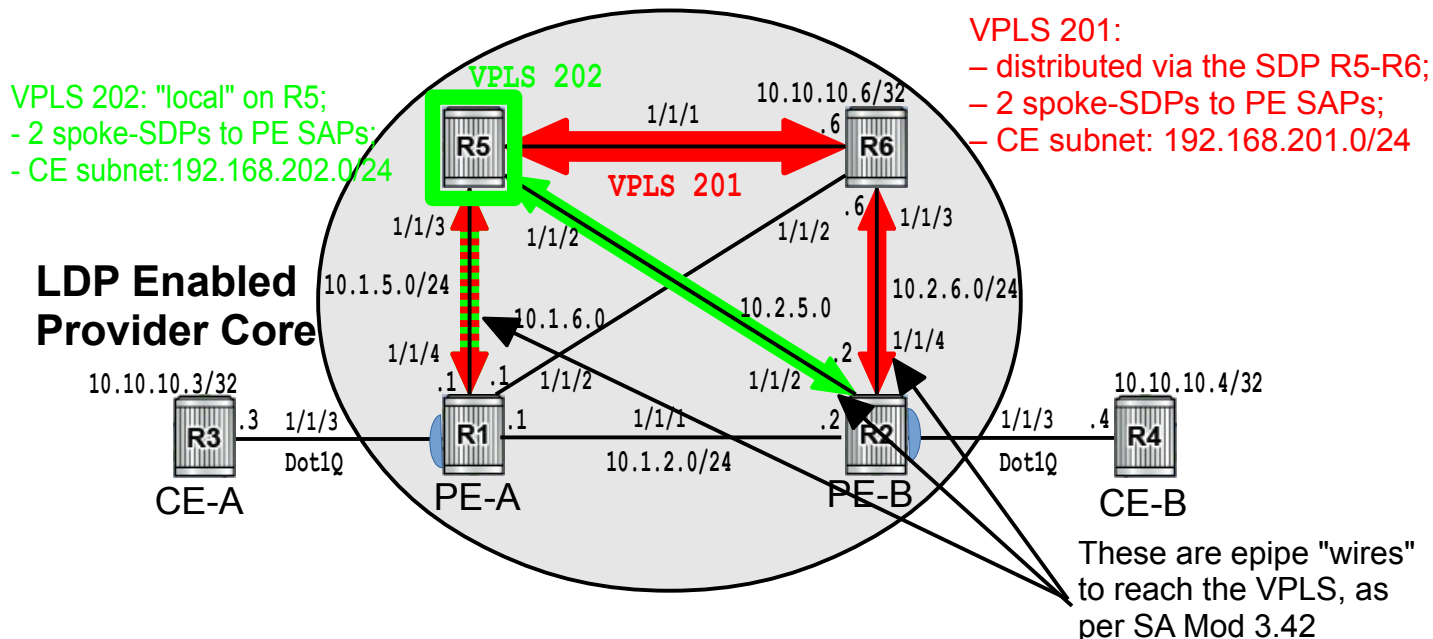
10% of your final mark is for labs done during the course of the semester.

References and Resources:

- Lab 8 – Epipe
- Lab 9 – VPLS
- SA Modules 2 – 3 on L2 services
- MySRLab: remote-access lab facility hosted at Nokia's campus
- NRS-II section 18.2 p. 1018-1030
- NRS-II Ch 19

Topology

This is the MySRLab network topology that is used for this lab. It is similar to the **bottom** half of the Edu topology from the weekly in-lab. **NOTE: only some** links are configured and activated!



Addressing Table for MySRLab Practice Labs

ALL routers are IPv4 addresses in the range **192.168.X.Y** with X.Y as given in the table below.

	PL3	PL4	PL5	PL6	PL7	PL8
R1	188.4	188.36	188.68	188.100	188.132	188.164
R2	188.5	188.37	188.69	188.101	188.133	188.165
R3	188.6	188.38	188.70	188.102	188.134	188.166
R4	188.7	188.39	188.71	188.103	188.135	188.167
R5	188.8	188.40	188.72	188.104	188.136	188.168
R6	188.9	188.41	188.73	188.105	188.137	188.169
PC1	188.10	188.42	188.74	188.106	188.138	188.170

The Ixia tester PC is accessed via the Remote Desktop Protocol (RDP), with clients available for Windows (built-in as "mstsc.exe"), Linux (rdesktop), and OSX (<http://cord.sourceforge.net/>)

Practice Lab	User ID	Password
PL3	See pages 4-5 of the <i>MySRLab Technical Primer</i> and page 8 of the <i>MySRLab Getting Started Guide</i> (available on BrightSpace) for connectivity & login details.	
PL4		
PL5		
PL6		
PL7		
PL8		



Command Reference (see SA Labs 3-4 for additional commands)

no shutdown

Don't forget this!! Everywhere!

```
exec • ftp://{mySRLabAlphaLogin}:{assignedPswd}@mysrlab/{dirName}/{cfg-file}
show • router • ldp • interface # Does an LDP binding exist for all PEs?
show • router • ldp • peer # Show targeted LDP sessions
show • router • ldp • bindings [active] # Does an LDP binding exist for all PEs?
show • service • sap # Is the SAP Up/Up? Correct encap Vlan?
show • service • sdp # Is the SDP Up/Up? (regardless of svc!)
show • service • id {svc-ID} • base # Svc is Up/Up? All components Up/Up?

oam lsp-ping { <lsp-name> | prefix {PE-ip-addr}/32 } # Test the LSP(s)
oam sdp-ping {sdp-number} • [resp-sdp {far-end-return-sdp} ] # Test the SDP(s)
oam svc-ping {PE-IP} service {svc-num} • [local-sdp] • [remote-sdp] # Test the svc PE-PE
oam cpe-ping service {num} destination {subscriber-IP} source 0.0.0.0 # Top level ping to CE
ping {ip-addr} # CE-CE ping via VPN

show • router • arp # Similar to other OS's
```

Task 1: Configure base topology

As with all services, you'll need the base configuration. You have two choices: either copy & paste the configs provided at the end of the lab, or simply re-load the configs you saved from Lab 8 post-lab. Be sure to verify each step before going to the next!

Step 1. Either re-load saved configs, copy and paste from the end of the lab. Note that if you copy & paste, you'll need to add the LDP config! If you re-load, use a command like:

```
ftp://{mySRLabAlphaLogin}:{assignedPswd}@mysrlab/L8/R1.cfg
```

Step 2. Configure VPLS 201 and VPLS 202 as shown topology diagram for this lab.

Configure interfaces on R3 and R4 in corresponding subnets (192.168.**201**.x/24 and 192.168.**202**.x/24). Be sure you understand the difference between using SDPs in *mesh* mode vs *spoke* mode, and which type should typically be used for a distributed VPLS, so you know which to use between each pair of routers.

Step 3. Verify that both VPLS's are working by pinging from CE to CE on both the '201 and '202 subnets. Troubleshoot as necessary using the commands in the reference above.

Step 4. Display and record the base service information for both VPLS services on both R5 and R6. You'll need it for the questions below.

Step 5. Display and record the LDP bindings for R1, R2, R5, R6. Be sure you can correlate *your* values with those values given in SA Lab 4. You'll need to answer questions in the post-lab about the bindings.

Questions to answer:

- As far as the CE devices are concerned, how many routers exist between them?
- On R5, the SDP to R1 for VPLS **201** is used in which mode: spoke or mesh?
- On R5, the SDP to R6 for VPLS **201** is used in which mode: spoke or mesh?
- On R6, the SDP to R5 for VPLS **201** is used in which mode: spoke or mesh?
- On R6, the SDP to R2 for VPLS **201** is used in which mode: spoke or mesh?
- On R5, the SDP to R1 for VPLS **202** is used in which mode: spoke or mesh?
- On R5, the SDP to R2 for VPLS **202** is used in which mode: spoke or mesh?

Task 2: Explore Epipe and VPLS services

In this task you explore the operating parameters of spoke-terminated VPLS, and the SR OS in general, using a few basic commands and experiments. Do your best to understand the inner workings!

Step 1. Look for hidden services: **show service service-using**

Display and record the output for all six routers in the topology. What do you see?

Step 2. On R1, navigate to the configuration for the VPLS 201 ePipe to R5. Shutdown and delete its spoke SDP. Replace it with a mesh-sdp using identical SDP and VC-ID values. What success do you have?

Step 3. Re-create the spoke-sdp for the ePipe from R1 to R5.

Step 4. On R5, navigate to the configuration for the VPLS 201 ePipe to R1. Shutdown and delete its spoke-sdp. Replace it with a mesh-sdp using identical SDP and VC-ID values, so that all SDPs are used in mesh mode on R5. What success do you have? On both R1 and R5, check the status of the service (sh service id xxx base) and whether T-LDP labels have been exchanged (sh service id xxx sdp).

Step 5. Try pinging from CE – CE on the modified VPLS 201. Does the ping work? Why or why not? (Confirm that VPLS 202 is still functioning perfectly by pinging across it.)

Step 6. Restore the spoke-sdp for the ePipe from R5 to R1. Verify the service by pinging.

Step 7. Check the ability of the "oam cpe-ping ..." command to traverse across the spoke-termination of a VPLS. Remember to match the service ID (eg. 202) with the corresponding subnet (eg. 192.168.202.x/24). How well does it work?

Step 8. [Bonus] Verify that you still have a simple ePipe service from your previous post-lab. If not, re-create a simple ePipe to connect the two CE devices on VLAN 10. Confirm everything is working properly by pinging from CE to CE on 192.168.10.x/24.

Step 9. From either PE for the ePipe (ie. R1 or R2), repeat your tests of the "oam cpe-ping" for subnet 192.168.10.x/24. How well does it work?

Questions to answer:

- How many "hidden" services exist?
- Is the service ID for the hidden services identical across all routers?
- What is the service ID in hex for the first hidden service?
- Does the CLI allow the possibility of creating a mesh-sdp for an ePipe?
- Does the CLI allow a mesh-sdp for the VPLS-side of a ePipe spoke-sdp?
- Does everything look normal when the VPLS side for an ePipe is a mesh-sdp?
- Does VPLS 201 work properly with all mesh-sdp's on R5 (incl ePipe)? Why or why not?
- Does "oam cpe-ping" work across the spoke-termination of a VPLS?
- Does "oam cpe-ping" work across an ordinary ePipe service?
- What are the last 4 words of the status message for cpe-ping on an ePipe?

Task 3: Save your configs

As always, **save your final configs** so that you can refer to them later for practice and study.

save: admin save ftp://{mySRLabAlphaLogin}:{assignedPswd}@mysrlab/STD/Rx/Lab9.cfg

verify: file dir ftp://{mySRLabAlphaLogin}:{assignedPswd}@mysrlab/STD/Rx/

Sample starting config to bring up all required ports

```
exit all
environment no more
configure system login-control idle-timeout disable
configure port 1/1/[1..4] no shut
```

R1 Base Configuration

```
configure system name Lab9-VPLS-R1
configure router
```

```
#-----
```

```
echo "IP Configuration"
```

```
#-----
```

```
    interface "system"
        address 10.10.10.1/32
    exit
    interface "toR2"
        address 10.1.2.1/24
        port 1/1/1
    exit
    interface "toR5"
        address 10.1.5.1/24
        port 1/1/4
    exit
    interface "toR6"
        address 10.1.6.1/24
        port 1/1/2
    exit
    router-id 10.10.10.1
```

```
#-----
```

```
echo "OSPFv2 Configuration"
```

```
#-----
```

```
    ospf
        area 0.0.0.0
            interface "system"
                exit
            interface "toR2"
                interface-type point-to-point
            exit
            interface "toR5"
                interface-type point-to-point
            exit
            interface "toR6"
                interface-type point-to-point
            exit
        exit
    exit
```

R2 Base Configuration

configure system name Lab9-VPLS-R2

configure router

#-----

echo "IP Configuration"

#-----

```
interface "system"
  address 10.10.10.2/32
exit
interface "toR1"
  address 10.1.2.2/24
  port 1/1/1
exit
interface "toR5"
  address 10.2.5.2/24
  port 1/1/2
exit
interface "toR6"
  address 10.2.6.2/24
  port 1/1/4
exit
router-id 10.10.10.2
```

#-----

echo "OSPFv2 Configuration"

#-----

```
ospf
  area 0.0.0.0
    interface "system"
      exit
    interface "toR1"
      interface-type point-to-point
      exit
    interface "toR5"
      interface-type point-to-point
      exit
    interface "toR6"
      interface-type point-to-point
      exit
  exit
exit
```

R3 Base Configuration

```
configure system name Lab9-VPLS-R3
configure router
#-----
echo "IP Configuration"
#-----
    interface "system"
        address 10.10.10.3/32
        no shutdown
    exit
    router-id 10.10.10.3
    exit
```

R4 Base Configuration

```
configure system name Lab9-VPLS-R4
configure router
#-----
echo "IP Configuration"
#-----
    interface "system"
        address 10.10.10.4/32
        no shutdown
    exit
    router-id 10.10.10.4
    exit
```

R5 Base Configuration

configure system name Lab9-VPLS-R5

configure router

#-----

echo "IP Configuration"

#-----

```
interface "system"
  address 10.10.10.5/32
exit
interface "toR1"
  address 10.1.5.5/24
  port 1/1/3
exit
interface "toR2"
  address 10.2.5.5/24
  port 1/1/2
exit
interface "toR6"
  address 10.5.6.5/24
  port 1/1/1
exit
router-id 10.10.10.5
```

#-----

echo "OSPFv2 Configuration"

#-----

```
ospf
  area 0.0.0.0
    interface "system"
      exit
    interface "toR1"
      interface-type point-to-point
      exit
    interface "toR2"
      interface-type point-to-point
      exit
    interface "toR6"
      interface-type point-to-point
      exit
  exit
exit
```


R6 Base Configuration

configure system name Lab9-VPLS-R6

configure router

#-----

echo "IP Configuration"

#-----

```
interface "system"
  address 10.10.10.6/32
exit
interface "toR1"
  address 10.1.6.6/24
  port 1/1/2
exit
interface "toR2"
  address 10.2.6.6/24
  port 1/1/3
exit
interface "toR5"
  address 10.5.6.6/24
  port 1/1/1
exit
router-id 10.10.10.6
```

#-----

echo "OSPFv2 Configuration"

#-----

```
ospf
  area 0.0.0.0
    interface "system"
      exit
    interface "toR1"
      interface-type point-to-point
      exit
    interface "toR2"
      interface-type point-to-point
      exit
    interface "toR5"
      interface-type point-to-point
      exit
  exit
exit
```