

## Lab 9: Basic VPLS Service

Or: Creating Customer IDs, and full-mesh VPLS service definition

### What you will do:

1. Confirm operation of the IGP and LDP for MPLS paths, to support a VPLS
2. Create a full-mesh of SDPs, using LDP for the transport, between PE routers
3. Configure a VPLS service using SDPs in mesh-mode
4. Verify end-to-end connectivity using ping, and other commands, between CE routers
5. Experiment with a default SAP for specifying traffic from multiple CE VLANs

### Things that you will need to know or learn:

1. CLI commands for configuring & verifying interfaces, OSPF, and LDP
2. CLI commands for configuring & verifying 802.1Q encapsulated network and access ports
3. CLI command for configuring & verifying a SDP using LDP transport
4. CLI commands for configuring & verifying a VPLS service
5. CLI commands for verifying arp, and SDP connectivity

### What you need to submit and when:

1. There is no pre-lab for Lab 9.
2. Complete the in-lab part of the exercise (see below), **before** the end of your lab period.
3. Complete the “Lab 9 Post-lab” exercise on Spoke Termination to a VPLS (adapted from SA Lab 4), **before** your lab section's assigned due date.

### 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-connected VPLS service between CE routers

1 mark: Demo of showing MAC addresses for each of the services

1 mark: Demo of cpe-ping to at least two CE routers

1 mark (Bonus): Demo & explanation of multiple SAPs correctly using same port, even with default SAP

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:

- SA Modules 1, 2: for reviewing Epipe configuration implemented the previous lab
- SA Lab guide, Lab 3
- SA Module 3, slides 26, 27, 29
- NRS-II textbook, Ch 19 on VPLS
- EDU Lab: remote-access lab facility hosted at the Nokia Kanata campus  
<https://learningserviceslabs.nokia.com/>

## Addressing & Login Table

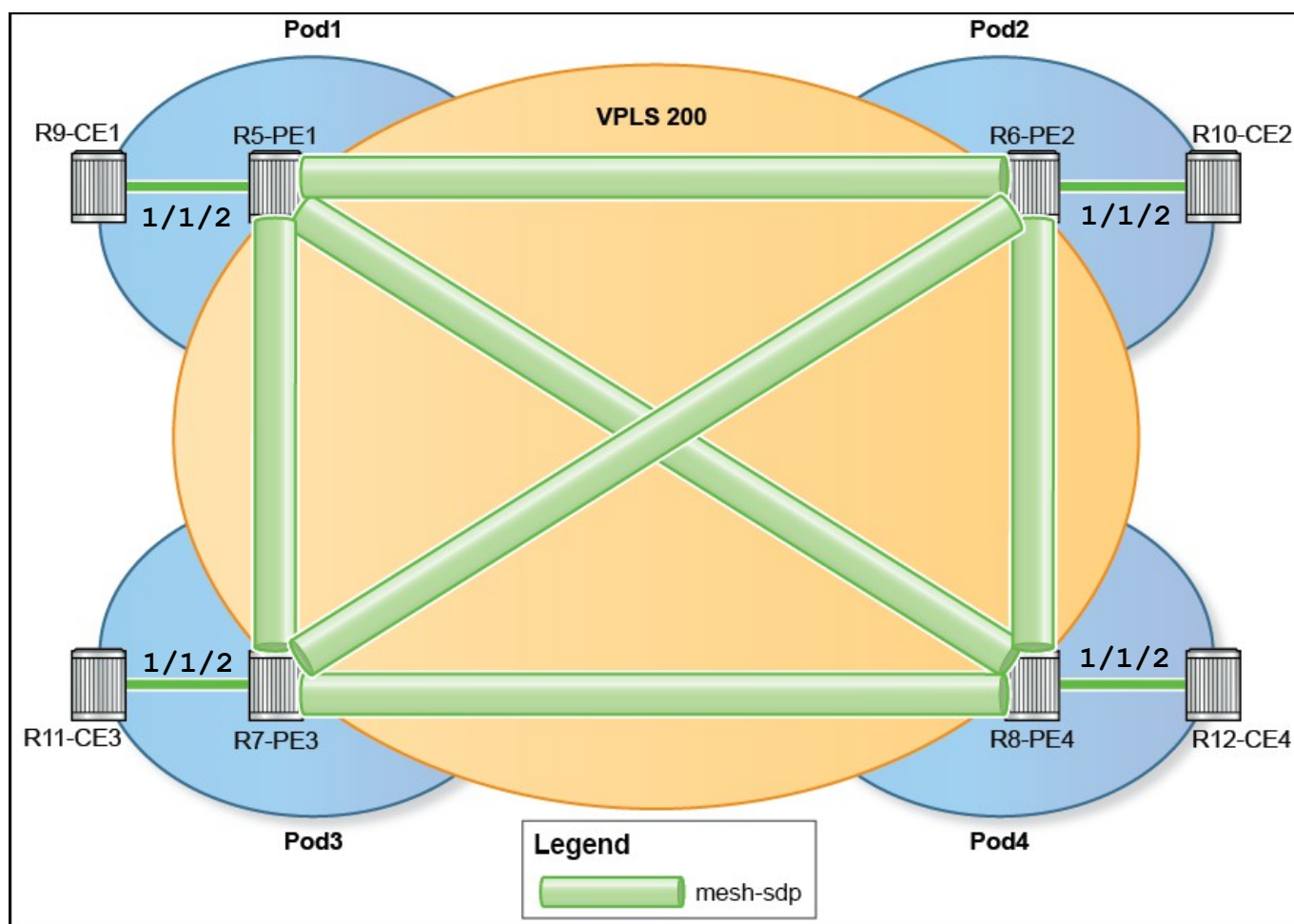
	Edu Lab 1	Edu Lab 2	Edu Lab 3
R1	.164	.196	.228
R2	.165	.197	.229
R3	.166	.198	.230
R4	.167	.199	.231
R5	.168	.200	.232
R6	.169	.201	.233
R7	.170	.202	.234
R8	.171	.203	.235
R9	.172	.204	.236
R10	.173	.205	.237
R11	.174	.206	.238
R12	.175	.207	.239

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

See Blackboard 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



SRC\_ASA3.1\_LG\_01\_030

Image source: Nokia Services Architecture Lab Guide, p. 24

## Command Reference (see SA Lab 3 for additional commands)

### no shutdown

```
# Don't forget this!! Everywhere!
configure • service • sdp {number} • mpls • create # Need a full mesh: 1 to every other router
configure • service • sdp {number} • ldp # Transport via LDP (if preferred over LSP)
configure • service • vpls • mesh-sdp {sdp-num} • create # Use SDPs in mesh-mode
show • service • fdb-mac # Compare before/after pinging CE devices
oam cpe-ping service {num} destination {subscriber-IP} source 0.0.0.0 # NOT in NRS-II book
clear • service • statistics • sap {sap-num} • all # Resets all stat counters for SAP
show • service id {id-num} • sap {sap-num} • stats # Shows counter stats for SAP
show • service id {id-num} • sap {sap-num} • detail # Alternative method for seeing SAP stats
```

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### Task 1: Verify configuration from previous lab

This week's VPLS lab uses the exact same topology and infrastructure as the previous lab on ePipes. Practice your using "show" commands to verify that all the configuration is correct.

- Step 1. Verify the IGP: routes in the routing table (exactly 18)  
Troubleshoot by checking for the correct OSPF neighbours.
- Step 2. Verify LDP operation: active link-LDP bindings (15 for P routers, 14 for PE routers)  
Troubleshoot by checking for the correct link-LDP neighbors
- Step 3. Verify ePipe operation for subnets 192.168.10.0/24 and 192.168.20.0/24  
Troubleshoot using the 5 + 3 commands given in the previous lab.

### Task 2: Complete all steps for VPLS configuration

This week's VPLS lab uses the exact same topology and infrastructure as the previous lab on ePipes. To create an additional service in the Service Provider core (ie. VPLS), you'll need to configure some extra SDPs (why only "some"?), the subscriber-facing SAPs, and then define the VPLS service itself. Follow the instructions in Exercise 1 of SA Lab 3, to create the VPLS for subnet 192.168.30.0/24.

**CHECK POINT #1:** Prove, with output on your screen, that your VPLS is **fully** functional.

**CHECK POINT #2:** The lab Professor wants to know which "show" commands display the CE MAC addresses in (a) the VPLS service, and (b) the ePipe service. Explain slowly & clearly!

### Task 3: Verify the operating parameters of all service components

SA Lab 2 provides **5** commands to examine and verify the operating status of any service and its components: show service **sdp {x}** show service **sap-using** show service **id {x} base**  
show service **id {x} labels** show **router ldp bindings**  
we added: oam **sdp-ping** {sdp-number} [resp-sdp {far-end-return-sdp} ]

**Two** additional verification commands are unique to VPLS (unique at least until SR OS ver ~12):  
show • service • fdb-mac  
oam cpe-ping service {num} destination {subscriber-IP} source 0.0.0.0

- Step 1. Ensure that you understand all the examples of "show service fdb-mac" in SA Lab 3
- Step 2. When it's necessary to absolutely prove connectivity of the **Customer Premises Equipment** (remember, a VPLS is a L2 service so doesn't usually use a CE router!), use: **oam cpe-ping service {num} destination {subscriber-IP} source 0.0.0.0**  
Use the command to ping all CE routers (which simply represent customer hosts).

**CHECK POINT #3:** Help the lab Professor understand the output of the *oam cpe-ping* command

#### Task 4: Experiment with SAP definitions

Exercise II provides an opportunity to explore the functioning of a default SAP. The steps below include all those from SA Lab 3, as well as important additional steps to improve your understanding of the default SAP.

**Note:** You will need to **coordinate** your configuration steps with (at least) one other pod!

- Step 1. Follow steps 1-3 of the original lab: configure **just** the 192.168.50.0/24 interfaces on the CE devices; do **not** change any of the configuration for the PE devices.
- Step 2. On a **single** PE, change the SAP definition to the default SAP eg. 1/1/2:\*  
Check whether you can ping between CE devices on VLAN 10, 20, 30, and 50.  
Be sure that all team members from both pods understand the results.
- Step 3. Have your partner pod change their SAP definition to default SAP eg. 1/1/2:\*  
Check whether you can ping between CE devices on VLAN 10, 20, 30, and 50.  
Be sure that all team members from both pods understand the results.
- Step 4. Check whether "oam cpe-ping ..." still works for VLAN 50!
- Step 5. Prove that frames are being carried correctly, even with multiple services (ePipe 10, ePipe 20, VPLS 30, VPLS 50) all using the same SAP:
  - (a) get successful & failed pings between all four CE devices using all four subnets; interpret the results to ensure that that ePipe traffic isn't "leaking" through the default SAP.
  - (b) make a plan using commands to clear, then show SAP stats (see cmd ref above) with successful pings using each of the four services. Pay particular attention to VPLS 50.

**CHECK POINT #4:** Provide a convincing explanation to the lab Professor that everything is still working correctly. Your explanation must refer to output on your screen!

#### Task 5: 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-L9.cfg

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

**restore:** exec ftp://{acct}:{pswd}@192.168.181.81/**Rxx**/ande0001-L9.cfg

To repeat this lab using MySRLab, use the routers according to the following topology:

R5(CE) — R1(PE) – [R3(P) – R4(P)]\* – R2(PE) — R6(CE) \*Can omit R3-R4 if desired