

S-38.3192 Network Service Provisioning, Spring 2006

Model answers for the VPN homework

What are the sites that you want to connect with VPNs?

- MPLS/BGP VPN [Lisbon, Rome, Berlin]
- IP VPN Tunnel [Paris, Athens, Berlin]

What are the corresponding Provider Edge (PE) routers?

- Lisbon LER, Rome LER and Berlin LER

Which autonomous system does the core network and the access networks belong to?

Lisbon [AS 100], Paris [AS 200], Berlin [AS 300], Athens [AS 400], Rome [AS 500]
Core [AS 1]. These are just example AS numbers and you can choose them as you wish as long as the numbers are unique.

What routing protocols will be used? Hint: In this exercise it is probably wise to run OSPF in the core and in the access networks and BGP in the PEs (iBGP) and between CE and PE (eBGP)

IGP – OSPF

CE to PE – eBGP

PE to PE - iBGP

What interfaces must be configured as OSPF enabled?

All, except CE-PE

How and where should the routing information be redistributed? (important!)

Route redistribution allows different routing protocols to exchange routing information. In our case we need to redistribute OSPF into BGP at the CEs, so that eBGP peering node (the PE) will learn the route to the LAN subnet. In that way the routing information will be included in to the iBGP route updates, allowing all iBGP peers to learn that route. However, in the Berlin subnet, BGP redistribution for only directly connected nodes should be used, because in the same subnet we have a gateway (IP VPN gateway), with a complete view of the core network (it exchanges routing information via OSPF with the PE). This means that if OSPF is redistributed in to BGP at the MPLS VPN gateway, all core routes will be injected in the VRFs. As a result routing loops might occur.

What interfaces must be configured as iBGP and what as eBGP?

iBGP [PE to PE]

eBGP [CE to PE]

What routers must be configured as BGP peers?

- Lisbon LER, Rome LER and Berlin LER are iBGP peers
- PEs and CEs are eBGP peers.

Are you using static routes in some interfaces? Why?

No. Generally speaking you shouldn't use static routes in this exercise (you can use them if you want to; they just tend to make things more difficult).

If you want to add 'realism' into the exercise you may configure a static route from the ADSL site towards internet (default gateway) but make sure that you are able to connect to the LAN from the other ADSL LAN (this means a lot more configuring).

Where and how should Virtual Routing Functions (VRFs) be configured?

The VPN Routing and Forwarding (VRF) table is assigned to a specified interface on a PE router, so that packets coming on that interface are routed to different VPN based on the source IP address. In ITGuru, the VPN wizard automatically configures each interface binding.

Where should Label Switched Paths (LSPs) be configured?

Between the PEs (done automatically).

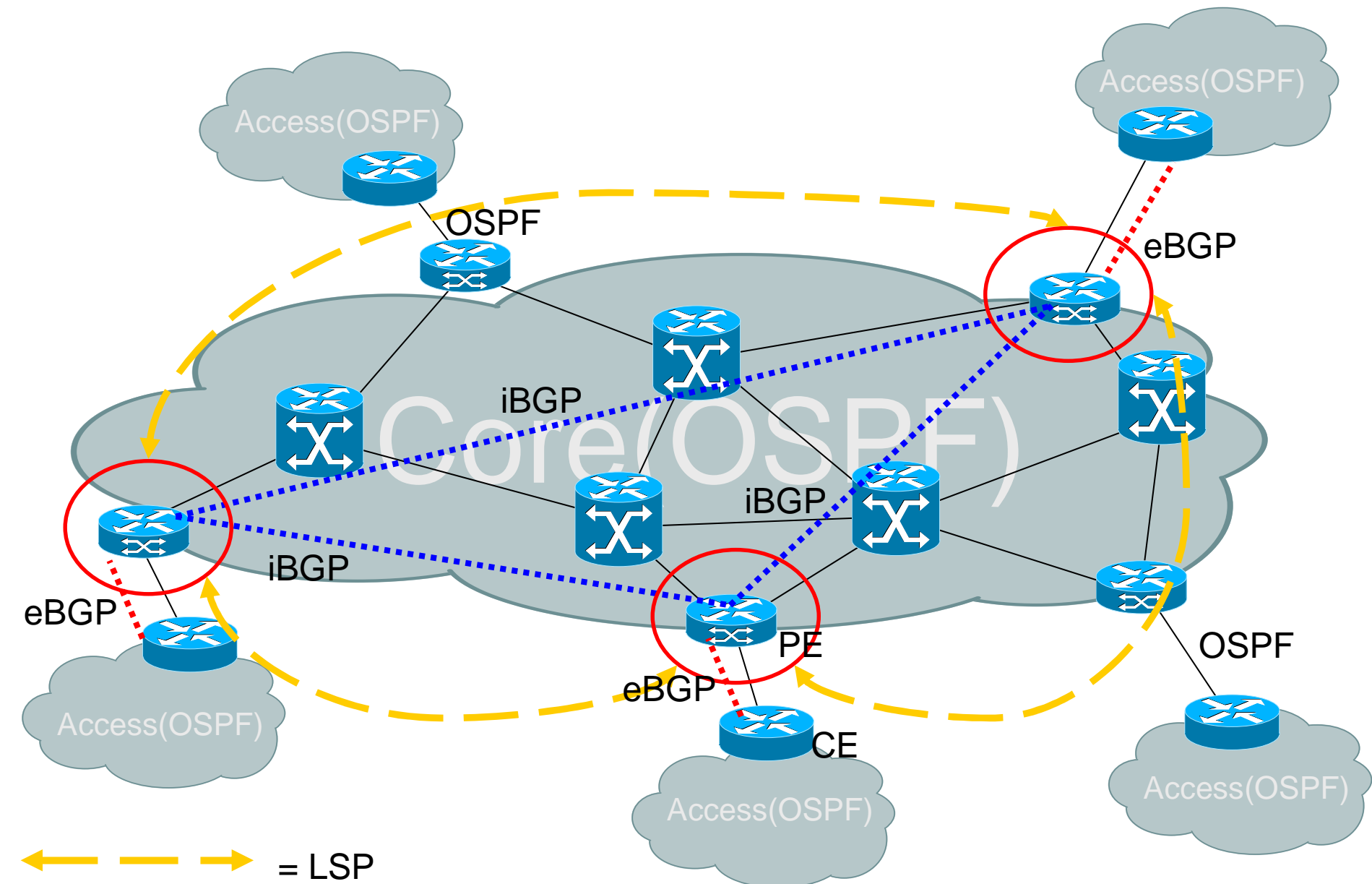
What are FECs and Traffic Trunks and how are they used?

Forwarding Equivalency Class (FEC) is a set of packets which will be forwarded in the same manner (e.g., over the same path with the same forwarding treatment). Typically packets belonging to the same FEC will follow the same path in the MPLS domain.

[<http://www.mplsrc.com/faq2.shtml#MPLS%20Components>]

A traffic trunk is an "aggregate" of traffic flows belonging to the same class.

[<http://www.faqs.org/rfcs/rfc2702.html>]



← — — — — — → = LSP
 ○ = iBGP peers