

**S-38.3192**  
**ITGuru Excercise 3: BGP/MPLS VPN**

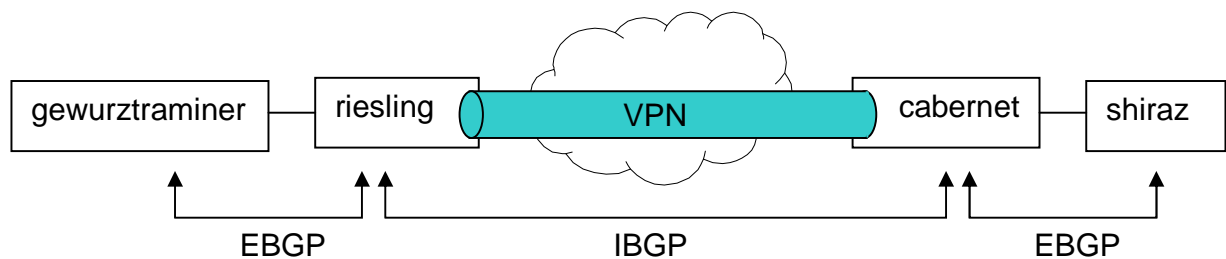
**Spring 2007**

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## Task Description

### Overview

The exercise 3 is about BGP/MPLS VPNs. The MPLS/LDP network from the last exercise is used as a starting point and the aim is to build a VPN connection between the PE routers as well as stretch the routing to reach the CE routers. This is done by configuring BGP into the network as shown in the picture below. This document gives you a checklist of things that you should go through when configuring the network.



### Testing the Network

- Protocol starting times should not be too close to each other. Keep the gap between the starting times e.g. in 50 seconds. The starting order should be IS-IS, LDP and BGP.
- When running tests, remember to give enough time for the network to converge before starting the test traffic.
- Run traffic from CE to CE, preferably from loopback to loopback.
- Use IP traffic flow to debug the network if necessary (IP flow shows the route traffic takes across the network)

### Preparing for the Exercise

Before starting to configure anything, **read this document carefully**. Ask if there is something you do not understand. If you are not familiar with BGP and VPNs, it is useful to **take a look at the lecture slides** on the course web page. However, the slides do not cover the configuration of Juniper routers.

Open ITGuru and the MPLS/LDP scenario. **Duplicate the scenario** and name it so that you can remember it is about BGP and VPNs. Use this new scenario when you start configuring BGP and VPNs. The MPLS/LDP scenario might be needed later, so do not tamper with it.

## **Configuring VRFs**

Configure VRFs on both PEs. Make sure that you configure VRFs before you start configuring BGP processes: close all menus by pressing OK before continuing, otherwise the VRFs won't show up on the BGP menu. Assign the VRFs to correct interfaces. Use *vpn\_<your\_group\_number>* as a name.

For some reason ITGuru doesn't seem to like some values in the router distinguisher's administratively assigned part, so it's recommended to use the value 10.

## **Configuring BGP**

BGP is configured under the *IP Routing Parameters > BGP Parameters* menu. Enable BGP in all CE and PE routers. Set up all required iBGP and eBGP neighborhoods. Configure (at least) the following parameters:

- Status
- Start time
- Address family parameters
- Neighbors
  - Address family parameters

Notice that the neighbor *Address family parameters* should include everything the *...BGP Parameters > Address family parameters* include. This means that if you have a VRF attached to an address family in the *Address family parameters* you should also have it under the neighbors address family parameters.

Configure route redistribution in BGP. Be careful when redistributing routes: there shouldn't be any core routes in the customer's routing tables or vice versa.

## **Configuring MPLS-TE parameters**

Change *MPLS > MPLS Parameters > Traffic Engineering* from *bgp* to *bgp-igp-both-ribs*. This should be done only on the PE routers.

## **DES**

Before the actual testing, the DES parameters have to be set correctly. From the MPLS menu:

- LDP Discovery End Time: <the duration of your simulation>
- LDP Discovery Start Time: 50
- LSP Signaling Protocol: CR-LDP

The *Simulation Efficiency* parameters should be like this:

- ARP Sim Efficiency: Disabled
- ISIS Sim Efficiency: Disabled

- ISIS Stop Time: <the duration of your simulation>
- **BGP Sim Efficiency Mode: Disabled**

It is also recommended that from the *IP* menu you change the following parameters:

- IP Interface Addressing Mode : Manually Addressed
- IP Version Preference: IPv4
- IPv6 Configuration: Ignore

## ***Running the Tests***

The network is tested by running a ping **from CE loopback to CE loopback** with the *Record Route* option. Set the ping starting time large enough (e.g. 200 s) so that the network has time to converge first. When you look at the ping report, you should see the MPLS labels marked next to the routers. If the number of labels is not correct, there is something wrong with the network configuration.

## **Exercise Sessions**

The exercise session for this task will be arranged on February 8<sup>st</sup> at 14 o'clock in computer class Maari-A.

## **Feedback Questions**

Return your feedback before February 16<sup>th</sup> 12:00. Each student writes and returns the feedback separately (this part of the exercise is not a group work). Return your feedback to **ttheikk2@netlab.tkk.fi**. Attach the feedback to your mail as a PDF file. Name the file as follows:

FB\_T3\_Ggroupnumber\_studentID.pdf

for example *FB\_T3\_G2\_56256T.pdf*.

The feedback questions are:

1. What kind of sources of information did you use during this exercise? For example Google, other groups, the course personnel...
2. If you participated in this exercise session, what is your opinion about this teaching method? Can it be used for all the exercise sessions of this course?
3. How long did it take to finish this exercise? Did it take longer than you thought it would?
4. What was the most challenging part of this exercise? How did you manage to solve the problem?

# Exercise report

## Requirements

Include the following data in your report:

- IP-forwarding tables from Chardonnay and PE routers
- VRF and BGP-tables from PEs
- BGP tables from CEs
- A complete Ping report between the CE routers (loopback-loopback) generated with the *Record Route* option

**The report you return should be clearly written.** Use a spreadsheet program (e.g. Excel) and/or a word processing program (e.g. Word) when writing the report. Tables can be exported from ITGuru as CSV files or by using the *Export to spreadsheet* function. Place the exported data into **proper, well readable tables** (CSV file without any editing is not like that) and do not forget to give titles to the tables.

## How to return the report

The exercise report should be returned before the beginning of the next exercise session (February 15<sup>th</sup>, 14 o'clock). Return your exercise report to **ttheikk2@netlab.tkk.fi**. Attach your report to your mail as a PDF file. Name your file as follows:

T3\_Ggroupnumber.pdf

for example *T3\_G2.pdf*.