TNE20002/TNE70003 - Network Routing Principles

Portfolio Task – Scenario 4
Distinction Task

Introduction

This Network Routing Principles **Scenarios** are a scaffolded approach to preparing you to succeed in your ultimate **Final Skills Assessments**. The **Scenarios** build on skills from previous **Scenarios** until all required components are covered. **Scenario 4-D** expands on your work on deployment of OSPF by converting your existing **Single-Area OSPF Deployment** to a **Multi-Area OSPF Deployment**.

Purpose

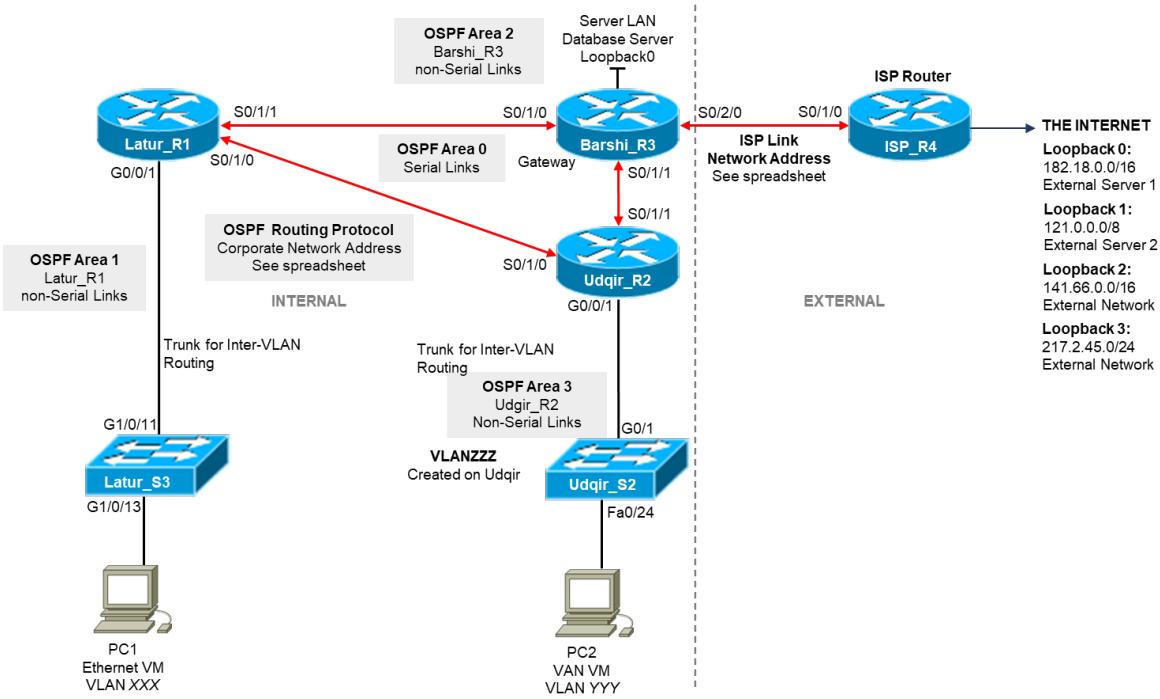
In this **Scenario** you will convert your existing network consisting of four routers and two switches to support a **Multi-Area OSPF** Deployment. Unless starting from scratch, you will not repeat any existing skills, rather you will be modifying your network constructed in **Scenario 4-P**. In this Scenario you will be introduced to the **new skill** in the design and deployment of **Multi-Area OSPF**.

Methodology

This portion of the handout contains the necessary information to design and build your network. Information on the assessment is at the end of the handout.

Network Topology

The Network topology is displayed in the figure below.



Network Information

As this is an extension of the **Pass Task**, you will not need to recalculate any network addresses or change the basic configuration of your network, you are extending the existing configuration only.

NOTE: Do NOT attempt the Distinction Task until you complete the Pass Task

Multi Area OSPF

As the size of our internal network increases, we may want to shift our design to utilize **Multi-Area OSPF**. OSPF is typically very efficient in terms of network usage due to only sending link state updates when a change in topology occurs. It is also typically fast to recalculate paths due to the SPF algorithm. However, as the network gets larger, a change in topology due to link failure can cause a temporary network flood and wasted resources in recalculating paths.

This issue can be resolved by breaking up the network into multiple areas where area 0 becomes the backbone area of the network and other areas cover smaller network segments. Then multiple areas are used, link state updates are confined only to routers and networks contained within that area, as updates do not propagate further, this can result in reduced data transmission when a topology state change occurs. This also limits routers needing to recalculate paths only if a state change occurs within their designated area. Routes to other areas are typically summarised.

Within a **Multi-Area OSPF** network, routers can undertake a number of different tasks, including more than one of the tasks listed below:

- **Internal Router**: A router that is only connected to one area
- **Backbone Router**: A router connected to the backbone (Area 0) area
- **Area Border Router**: A router connected to multiple areas
- **AS Boundary Router**: A router connected to an external network such as the Internet

In this scenario, we will be converting all three internal routers to be both Backbone and Area Border Routers. The serial links in our internal network will form the backbone on **Area 0**, while all LAN networks (and loopback simulated LANs) on each router will be confined to a **unique area** (areas 1, 2 and 3 as per the network topology diagram)

Note: all Multi-Area OSPF deployments must have at least one interface on the backbone area (Area 0)

Configuring Multi Area

There are no new commands needed to configure **Multi-Area OSPF**, the existing `network` command already specifies which area each network is attached to. As such, it is typically best practice for you to layout and design your network prior to deployment.

Converting Scenario 4-P to Multi Area OSPF

The conversion task for this Scenario is relatively straightforward. The more important task for you as a student is to verify the network configuration and confirm that the **Multi-Area OSPF** deployment has been correctly configured.

In order to convert your existing network to a Multi-Area network, you need to re-advertise the appropriate subnets in their new areas. For an existing network, this involves two steps.

1. First we need to remove any existing network commands by using the `no network` command within the OSPF configuration. This will stop these networks from being advertised with OSPF and therefore result in these subnets disappearing from all routing tables in routers they are not connected to. You should confirm removal of the network from all routing tables prior to proceeding to step 2.
2. We then need to re-advertise these networks by re-issuing the OSPF `network` command containing the new area. Your first verification step should be to confirm that the readvertised network reappears in all routing tables.

Once you have confirmed that the network has been readvertised, you can move on to the next step of confirming that all networks have been advertised in the correct OSPF areas.

Verifying Multi-Area OSPF Configuration

There are a number of steps you need to complete to confirm that you have correctly configured your **Multi-Area OSPF** network.

Firstly, you need to check that all the routing tables on all the routers are complete. You need to display all the routing tables and ensure that a route entry exists for all subnets in the network.

Next you should use the OSPF debugging commands to ensure that all aspects of the OSPF network are correctly established

`show ip ospf neighbours`

Confirm that all OSPF associations are correctly established in your network and that all neighbours routers are properly listed and recognized.

`show ip ospf database`

Display the link database on each of your internal routers. Remember that each routers database should only contain links of subnets participating in the same area the router is currently attached to.

`show ip ospf`

Display information about each current OSPF process ID. Confirm that all interfaces are correctly to the required OSPF Area and that the router IDs match with your configuration.

Once you confirm that the network is properly configured, you should complete the scenario by confirming that OSPF is behaving correctly upon changes to the network topology

Changes to LANs – LAN network going down

Unplug one of the ethernet cables on **Latur_R1** or **Udgir_R2** routers. Confirm that the corresponding LAN subnets no longer exist on the directly connected router **AND** that they have been remove from the routing tables on the other routers.

Re-attach the ethernet cable and confirm that the network correctly self heals

Serial Network Failure

Serial connections are hard to unplug, you can simulate a failure by issuing the shutdown command on one end of a serial link. This will break that link and potentially force OSPF to recalculate routing table

The routing table on **Latur_R1** should confirm that the best pathway to **VLANYYY** is directly via **Udgir_R2** on **Serial0/1/0**. Remove this pathway by shutting down this interface.

Confirm that routing table entries for this serial network have been removed form all routers and that the routing table entry for **VLANYYY** has been updated via **Barshi_R3**. Also confirm that the routing table entry for **VLANXXX** on **Udgir_R2** has been changed to go via **Barshi_R3**. Confirm that all devices can still ping each other.

Reestablish the connection by reenabling the serial interface. Confirm that all routing table entries return to their original values and that all devices can still ping each other.

Multi-Area OSPF Requirements for Scenario

For the purposes of the Scenario, you must complete the following requirements:

- All existing configuration from **Scenario 4-P** regarding network addresses, OSPF bandwidth configuration, and ACLs is **unchanged**
- Leave all internal Serial Point-to-Point links in the Internal network on the Backbone Area (Area 0)
- All LAN subnets connected to the **Latur** Router must be advertised in Area 1
- All Loopback subnets connected to the **Barshi** Router must be advertised in Area 2
- All LAN subnets connected to the **Udgir** Router must be advertised in Area 3

Assessment

The Scenario is assessed in class by your Lab Supervisor. When you have successfully configured and tested the Scenario, you will need to demonstrate functionality to your Supervisor. Upon successful demonstration, the Supervisor will ask you 1 or 2 questions about the Scenario in order to confirm that you completed the work and not another student. Upon successfully answering these questions, the Scenario will be marked as complete.

The due date for Scenario 4-D is at the start of the Lab in Week 8. As a distinction task, you are expected to complete this task on time unless you have a valid extension.

What Happens if I Fail

Failure in this task will result in the maximum possible Base Mark for your Portfolio being 36. Coupled with possible Bonus Marks, non completion will result in an absolute maximum Portfolio mark of 42/60.