

TNE20002/TNE70003 - Network Routing Principles

Portfolio Task – Scenario 5 Credit 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 5-C** expands your work to cover deployment of **DHCP** on the Internal Network. For **Scenario 5-C**, you will extend the network you built in **Scenario 5-P** to provide support for DHCP. This knowledge will be consolidated in **Scenario 6-P**.

Purpose

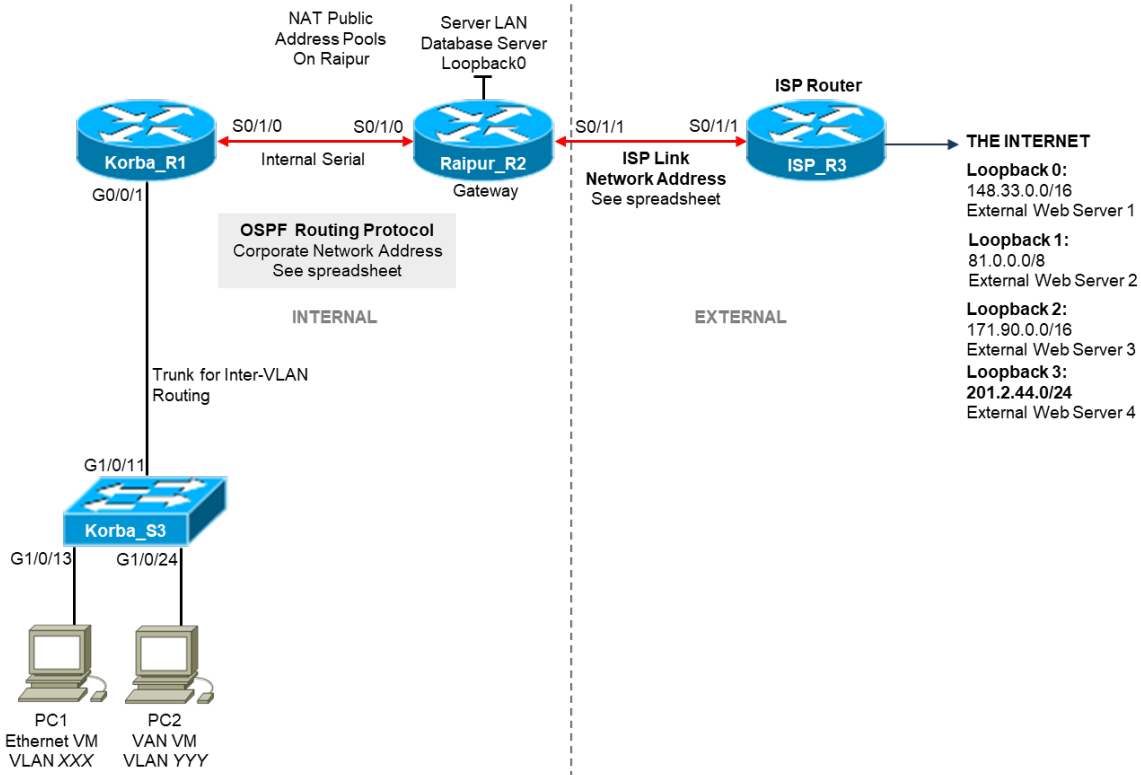
In this **Scenario** you will extend your work from the **Pass Task** by adding support for DHCP on the Internal Network. In this Scenario you will be introduced to the **new skill** in the deployment of networks running DHCP for automatic network configuration of internal PCs. This means that PCs within your network will automatically acquire network configuration via DHCP instead of being manually configured.

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 and is unchanged from **Scenario 5-P**.



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 Credit Task until you complete the Pass Task

Dynamic Host Configuration Protocol – DHCP

New tasks in this Scenario include configuring the **Dynamic Host Configuration Protocol (DHCP)** to automatically assign network configuration to devices within the network. This releases ongoing work by system administrators as they no longer need to maintain network configuration on individual PCs, and network re-configuration is propagated via the DHCP server instead of having to reconfigure all end devices.

DHCP is a server that is attached to the network containing hosts to be auto-allocated network configuration. Very large networks will often have a dedicated server running DHCP for multiple subnets simultaneously. Small and medium sized networks can get away with running DHCP services on the router servicing individual subnets. In this case, as all the VLANs are attached to the **Korba** router, we will be running the DHCP server directly on the **Korba** router.

The main steps involved in running a DHCP server are:

1. Enabling DHCP on the router
2. Create a DHCP pool to service a particular subnet/VLAN
3. Allocate the IP address ranges and subnet masks for each pool
4. Configure the default gateway for devices within the subnet to use

DHCP Configuration Information

In order to enable the DHCP service on a Cisco router, you need to issue the command:

```
service dhcp
```

DHCP can be disabled using the command

```
no service dhcp
```

Once the service is activated, you need to create a series of DHCP pools for each subnet you wish to automatically allocate IP addresses to. A pool is defined as a set of IP addresses managed by the DHCP server. Each DHCP pool is identified by its name. You can create a DHCP pool using the command:

```
ip dhcp pool <pool_name>
```

The example below will create a pool with the name VLANBlue

```
ip dhcp pool VLANBlue
```

You can create as many DHCP pools as you require, typically it will be one for each subnet. The pool name does not need to encompass the VLAN number/name, however it is good practice to use a name that matches the use of the subnet. A good example of a pool name would be accounting or sales > command to enable select interfaces. The pool information is configured within the pool sub-configuration option. If you leave the pool configuration menu, you need to re-enter the `ip dhcp pool <pool_name>` command to modify the pool configuration.

Within the pool sub-configuration, you must at a minimum specify the subnet information and the default gateway address to use. The DHCP server will select an unused IP address from the range of IP addresses in the subnet and provide the selected IP address, the subnet mask, and the nominated default gateway address to allow the end PC to self-configure its network configuration.

To specify the subnet information for the pool, use the following command within the pool sub-configuration mode.

```
network <network_address> <subnet_mask>
```

As the router is aware of which subnets are connected to which interfaces, it will automatically assign this pool to the relevant interface. Take care that the netadd and submask must exactly match the network configuration on the router interface for the nominated subnet.

You also need to specify the default gateway to be provided to all PCs within the subnet. Use the following command within the pool sub-configuration mode

```
default-router <gateway_ip_address>
```

While not used in this Unit, DHCP also provides for other automatic configuration options that can be attached to the pool. Two common options include the DNS server (using the `dns-server <ip address>` command), the the domain name (PCs will append the domain after their hostname to configure their full URL) (using the `domain-name <url>` command).

Finally, we will often wish to exclude IP addresses from the pool managed by DHCP. At the very least we will want to exclude the gateway address from being allocated to PCs. In the real world, a subset of available IP addresses are often reserved for static allocation to servers in the LAN. In this case, we also do not want these IP addresses being managed by DHCP. IP Addresses are excluded outside of the pool in the global configuration, each exclusion provides a range of addresses that will NOT be allocated by the DHCP server. The command to do so is:

```
ip dhcp excluded-address <lowest_ip_address> <highest_ip_address>
```

The example below will ensure that the DHCP server never allocates the IP addresses 192.168.0.1, 192.168.0.2 or 192.168.0.3 to any PCs via DHCP, likely because they belong to the gateway router OR to static allocations within the subnet

```
ip dhcp excluded-address 192.168.0.1 192.168.0.3
```

NOTE: There is no need to exclude the network or broadcast address as they can never be allocated by the DHCP server.

Troubleshooting DHCP Configuration

One of the most common mistakes people make is that the PCs have been configured statically. You will need to modify the PCs to use DHCP to obtain an IP address. On first change, the PC will attempt to get an IP address from the DHCP server. This could fail if you have not properly configured your DHCP. If this occurs, the DHCP allocation may not occur and you will need to manually force it to occur later on.

Alternatively, you may have incorrectly configured DHCP and need to modify it. In this case, you will need to force the PC to release the current DHCP allocation and request a new one. If you do not do this, the PC will persist with an old IP configuration and you will not be sure why it is not working.

To force a Windows PC to release and renew its DHCP allocation, open a DOS cmd window and execute the following commands:

```
ipconfig /release
```

```
ipconfig /renew
```

Alternatively, you would like to check the DHCP allocations at the router running DHCP. The most useful commands are as below

`show ip dhcp binding` – This command will list all the currently allocated IP addresses in the DHCP pools managed by this router. Each IP address will be listed along with the Ethernet MAC address of the PC with the allocated address, and the date the allocation was made

`show ip dhcp pool` – This command will list information about each pool configured on the router and the the current status of pool usage

DHCP Requirements for Scenario

For the purposes of the Scenario, you must:

- Run DHCP to provide IP addresses for all devices on VLANXXX and VLANYYY (two DHCP pools)
- The DHCP service should be run on Korba
- The DHCP pools should cover the range of IP addresses for those two VLANs
- You must exclude the first three IP addresses from being allocated by DHCP

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 5-C is at the start of the Lab in Week 10. As a credit 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 30. Coupled with possible Bonus Marks, non completion will result in an absolute maximum Portfolio mark of 36/60.