TNE10005/TNE60002

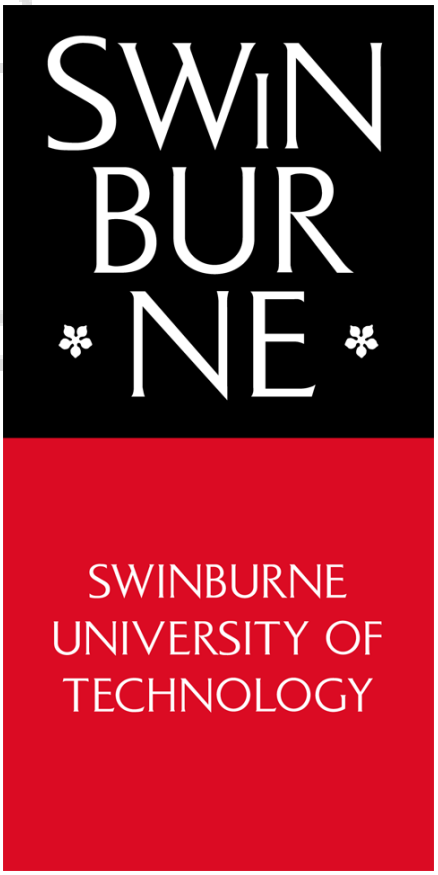
Network Administration

Lab 4

DHCP

in a

Windows Server 2022 Domain



Aims:

To install and configure DHCP

- Scopes
- Exclusions
- Reservations
- Options
- (High Availability)

Virtual Machines

sWin22DC1, sWin22SVR1, and sWin10CL101

Preliminary Settings

1. Ensure all guest VMs are reverted prior to starting.
2. Launch **sWin22DC1**. Log on as **sWin\Administrator** with the password **Pa55w.rd** *(the "sWin\" part is important!)*.
3. Repeat step 2 for **sWin22SVR1** and **sWin10CL101**.
4. On **sWin10CL101** right click on the **Start** button and run **Windows Powershell (Admin)**.
5. At the prompt type:

```
Set-NetIPInterface -InterfaceAlias Ethernet -dhcp enabled
```

Wait about 20 seconds, then type **`ipconfig /all`** and press **Enter**.

Record your IPv4 Address, Subnet Mask and Default Gateway here: **IPv4**

Address: _____

Subnet Mask:

_____

Default Gateway:

_____

What type of address is this? _____

Installing DHCP

6. On **sWin22SVR1**, in Server Manager, from the **Manage** menu select **Add Roles and Features.**
7. As we will be installing to the local server (i.e. the server we are currently logged on to) we can accept the defaults for the next three screens. So click **Next** three times and stop on the **Select server roles** page.
8. Click in the check box next to **DHCP Server.** You will be prompted to add features that are required. Click the **Add Features** button, and **Next,** three times.
9. On the **Confirm installation selections**, verify that you are adding the DHCP server tools and click the **Install** button.
10. When the text under the blue line reads **Configuration required. Installation succeeded on sWin22SVR1**, click the **Close** button.

Post-deployment configuration

Even though we have installed the DHCP server role, we need to now configure the role.

Server manager tells us this.

11. In **Server Manager**, notice that there is now a yellow triangle alert that appears.

Figure 1 - DHCP Post-deployment flag

12. Click on the alert, then click on **Complete DHCP configuration**.

    What you do next depends on your network environment. Since sWin22SVR1 is a Windows Domain sWin.Local, then you must **Authorize** your new DHCP server with the **Domain Controller** before any computer in the domain will accept a lease from it. To do this you would need to provide the account details of a user that has the rights to make this change, such as the domain Administrator.

    On the **DHCP Post-install configuration wizard**, click the **Next** button.

    On the Authorization page, accept the default section, and then click the **Commit** button. *(Note: If you have logged in with the wrong account [see step 2], you will need to select "Alternate Credentials" and enter the login name provided in step 2).*

    On the Summary page, click **Close.**

    We have now completed the post-deployment configuration, but our server is still not configured to offer IP addresses.

Creating a Scope

Remember, IPv4 addresses are **logical** addresses. Other than APIPA, administrators must configure them. Even though we use DHCP to automate the allocation of IP addresses, we still need to configure those addresses.

The first step is to configure a **Scope**.

13. In **Server Manager**, click the **Tools** menu, then select **DHCP**

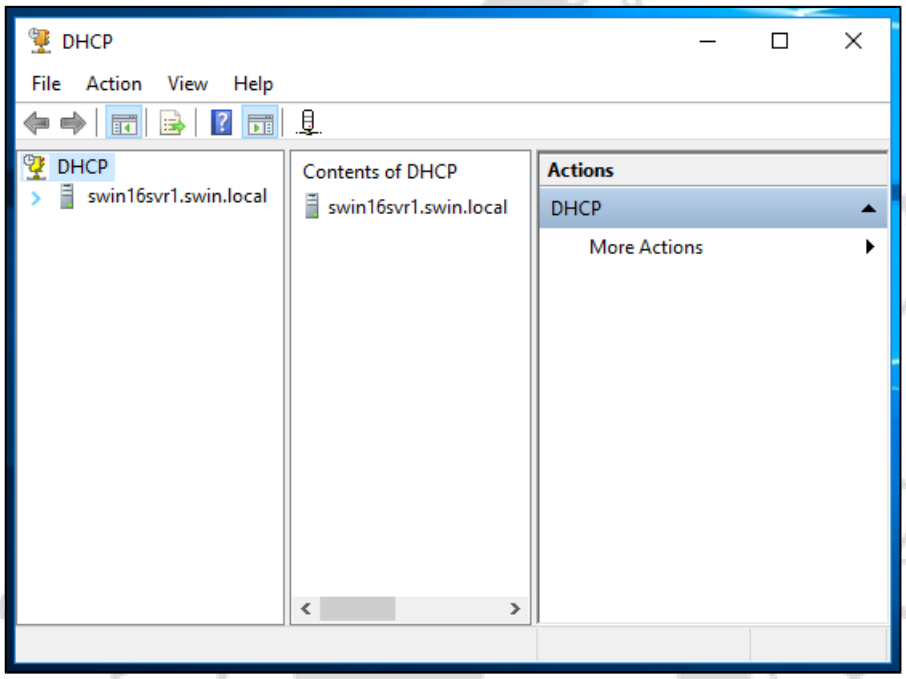


Figure 2 - A new installation of DHCP Server

Notes:

*The figures in this lab document are captured for DHCP Management console on **sWin-Server that running Windows Server 2016.** Hence, the server's name is sWin16SVR1. Students should check on sWin22SVR1 when practicing using the unit Azure lab VMs.*

14. If you have not configured step 12 correctly then a red arrow will appear on you server. If this has happened to you, consult with a fellow student, and if neither of you can resolve the problem call your supervisor over.
15. To create a **Scope**, click on the server name (sWin22SVR1) to expand the sub-containers **IPv4** and **IPv6**. We want **IPv4**.

    Now this is one of the peculiarities with Windows, you do not get a right click menu until you have clicked on an object.

    Click on **IPv4**, then right click on **IPv4** and select **New Scope...**

    This brings up the new scope wizard.

16. Click **Next** on the first page of the wizard, and enter the name **Hawthorn**. In the description you would normally briefly record the purpose and in a large organisation the job number so that who authorised it and who configured it can be retrieved. This can be vital for the security of your network as you need to shut down services that are no longer required. A good description allows you to do this.

    Click **Next**.

17. On the **IP Address Range** page of the wizard, enter the values as provided in Figure 3.

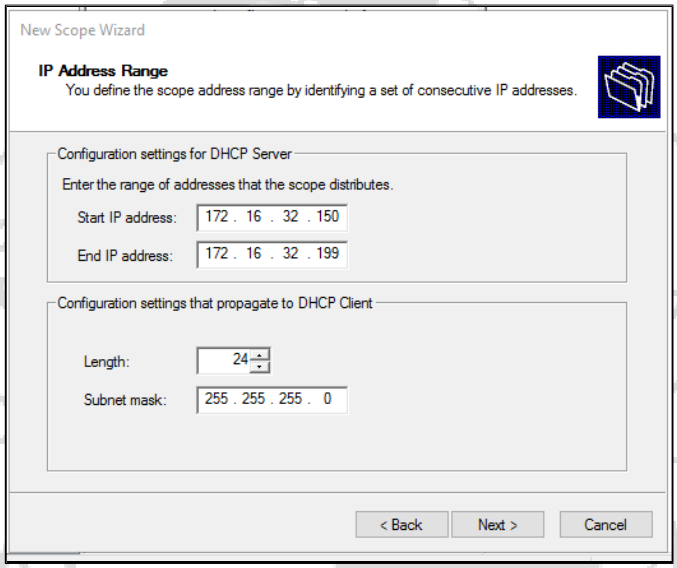


Figure 3 - DHCP New Scope IP Address Range

    Then click **Next**.

18. On the **Add Exclusions and Delay** page we will not configure Exclusions yet. But notice the **Subnet delay in milli second:** field. This allows you to delay how long the server waits before it sends out a **DHCP** offer packet. This is very useful when you want to have a backup DHCP server and you only want it to kick in when the primary DHCP server is down. The delay allows this to happen.

    Click **Next.**

19. You should now be on the **Lease Duration** page. Normally we would leave this at 8 days. But sometimes you may be running a conference or exhibition where many users will not be returning the next day. You do not want the DHCP server holding that IP address back and not offering it to any new devices for 8 days. In situations like this we would set the lease time to 8 hours.

    The rule of thumb is for devices on a cable you lease for 8 days, for devices on WiFi 8 hours.

    Choose a lease period between 8 hours and 8 days and click **Next**.

20. On the **Configure DHCP Options** page we will select **No**, and click **Next**.

    We will cover DHCP Options later in this laboratory.

21. Click **Finish**

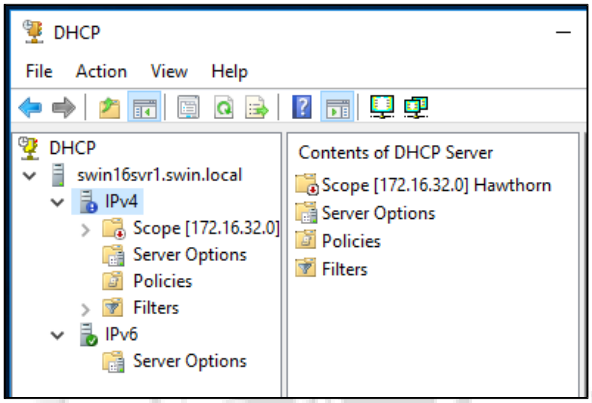


Figure 4 - An Inactive DHCP Scope

22. In the DHCP Management console you will notice that there is a red down arrow in the icon of the new scope we have just created (and a resultant blue exclamation mark with the IPv4 container).

    This means that the Scope has not been activated. Remembering that Windows has a frustrating quirk, **click** on the **Scope** icon, then **right click** the **Scope** icon and select **Activate** from the context menu. The red down arrow and blue exclamation mark should have now disappeared, and you DHCP server is now ready to send out offers.

23. Since sWin22DC1 is also a DHCP server, to ensure that this server will not lease out any IP addresses, we now need to stop its service

    On **sWin22DC1**, in Server Manager, click **Tools**, and then click **DHCP.**

    In the DHCP console, click on **sWin22dc1.swin.local.** Right click on **sWin22dc1.swin.local**, select **All Tasks**, and then click **Stop**.

    Now sWin22SVR1 is the only DHCP server.

24. To test if our DHCP server is now working change to **sWin10CL101** and go to **Powershell**.

    First, release the existing leased IP address
    Type:

    ```
    ipconfig /release
    ```

    and press **Enter.**

    Then, attempt to obtain a new IP address
    Type:

    ```
    ipconfig /renew
    ```

    and press **Enter.**

This triggers the computer to send out a **DHCP discover** packet.

Record your IPv4 Address, Subnet Mask and Default Gateway here:

IPv4 Address: _____

Subnet Mask: _____

Default Gateway: _____

This address should be from the scope you have just configured.

Configuring Exclusions

There are times when we need to remove addresses from a Scope's pool. A legacy application running on a computer might need a specific address, or you can't risk a device being given any other address and must be configured manually (Note: there is a better way to meet this requirement, we learn about it below with Reservations). In this situation you might want to **exclude** addresses from your pool. We will configure exclusions in this section and reservations in the next section.

25. On **sWin22SVR1** in the **DHCP management** console, make sure that the **Hawthorn** scope is expanded. **Right click** on the **Address Pool** container and select **New Exclusion Range…**
26. Enter the **Start IP address** as 172.16.32.150, and the **End IP address** as 172.16.32.159, and click the **Add** button.

We will now test to see if our exclusion range is being applied.

On sWin10CL101, type **`ipconfig /release`** press enter and type **`ipconfig /renew`**, (hint: you can press the up arrow to recall past commands) and press enter. Record the output here:

IPv4 Address: _____

Subnet Mask: _____

Default Gateway: _____

What has changed? _____

Configuring a Reservation

When the lease time expires, eventually the DHCP server will offer that IP address to another device. This can be a problem when need to host a resource that everyone needs access to. In those situations the device needs to only be given one address. If it has one address in one month and a different address in another month, then all the links to the resource may stop working. You could use a manually configured IP address (i.e. where you have to log on to the device and manually set the IP address), but if you need to change your addressing scheme, you will need to manually change the address of all of these devices.

In the section above, I stated there is a 'better' way to ensure that a device only ever has one address. You can use a **Reservation**. A reservation gives a device the same IP address, again and again. A reservation also has the advantage of keeping the configuration central, so if you need to change your addressing scheme you can do it all in the DHCP server.

Let's work through how to configure a Reservation

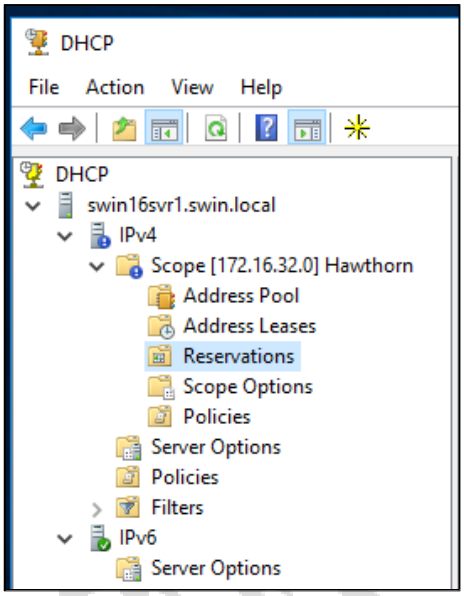


Figure 5 - DHCP Reservation Container

27. In DHCP Management, ensure that the IPv4 and Scope containers are expanded. **Right click** on **Reservations**, and choose **New Reservation...**

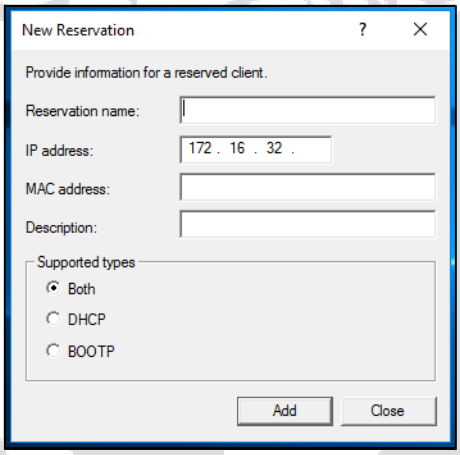


Figure 6 - Configuring a Reservation

28. In the **Reservation name** field enter the name **sWin10CL101** and the **IP address `172.16.32.199`.**

    We will now find the MAC address sWin10CL101 so we can complete configuring the reservation.

29. Change back to **sWin10CL101**, and in **Windows PowerShell (Admin)** type **`ipconfig /all`** and press **Enter.**

    You should see output similar to the following

```
PS C:\Users\administrator> ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : sWin10CL101
   Primary Dns Suffix  . . . . . . . : sWin.Local
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : sWin.Local

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Hyper-V Network Adapter
   Physical Address. . . . . . . . . : 00-15-5D-01-A3-55
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::583b:7cc9:ccdc:2f72%10(Preferred)
   IPv4 Address. . . . . . . . . . . : 172.16.32.160(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Saturday, 31 August 2019 2:29:21 PM
   Lease Expires . . . . . . . . . . : Sunday, 8 September 2019 2:29:21 PM
   Default Gateway . . . . . . . . . : 172.16.32.1
   DHCP Server . . . . . . . . . . . : 172.16.32.11
   DHCPv6 IAID . . . . . . . . . . . : 50337117
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-24-EB-27-24-00-15-5D-01-A3-55
   DNS Servers . . . . . . . . . . . : 172.16.32.10
   NetBIOS over Tcpip. . . . . . . . : Enabled
PS C:\Users\administrator>
```

Figure 7 - Finding a MAC Address

30. Locate the line **Physical Address** and record it here:

    _____

31. Change back to **sWin22SVR1** and in the **MAC address** field, without the hyphens (i.e. '-') enter the Physical Address in step 0.

    For example, in Figure 7 the address is presented as **00-15-5D-01-A3-55.** I would enter this as **00155D01A355**

32. Switch back to **sWin10CL101** and do an ipconfig /release followed by and ipconfig /renew

33. Record your address here:

    IPv4 Address: _____

    Subnet Mask: _____

    Default Gateway: _____

    What has changed? _____

DHCP Options

So far we have learned how to use automatic IP configuration via DHCP to configure Windows computers to receive an IP address and a subnet mask. But these settings only allow our devices to communicate with other devices that are in both the same subnet and same LAN.

A device needs a **Default gateway** address to be able to communicate outside its own subnet. A device needs a **DNS Server** to be a part of an Active Directory Domain, or browse the internet using URLs.

We can use DHCP to deploy these settings using **DHCP Options**.

Options can be applied at a number of levels: Server, Scope, Reservation and with policies. Policies will not be assessed in the skills exam, so we will not attempt them in this lab.

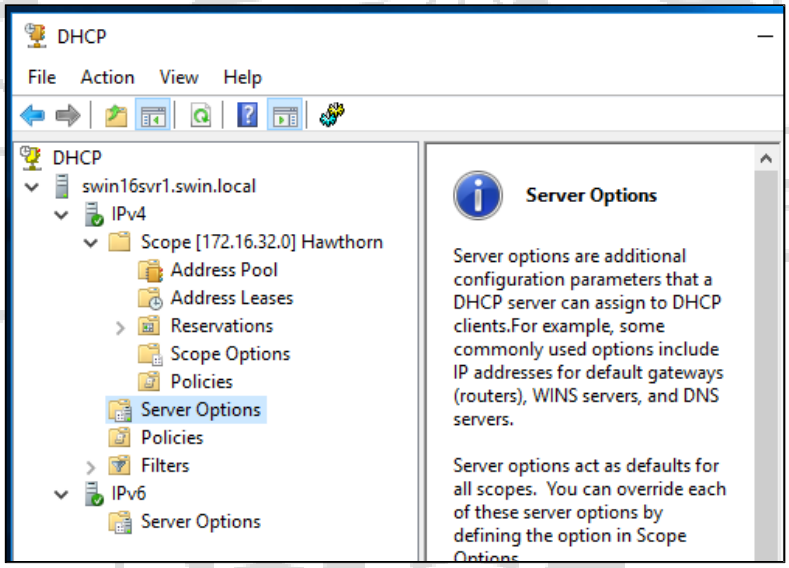


Figure 8 - Levels of DHCP Options

34. On **sWin22SVR1**, in **DHCP Management console**, expand the scope created in the section **IPv4** above.
    Click on the **Server Options** container, then **right click** to bring the **context menu**.

35. Select **Configure Options…**

    This brings up the **Options** dialog box

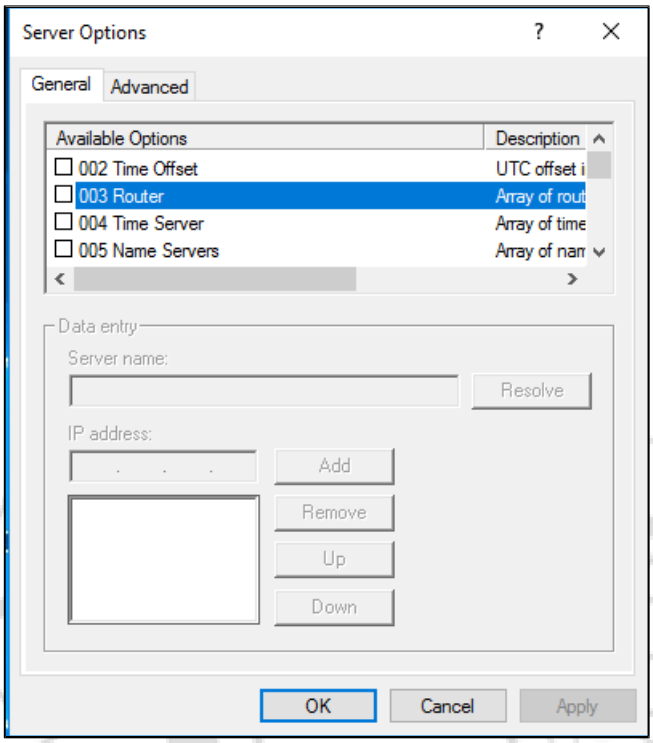


Figure 9 - Configuring Server Options

There are other options we can configure:

Option code	Name
003	Router
004	Time Server
005	Name Servers
006	DNS Servers
12	Hostname
015	DNS Domain Name
031	Perform Router Discovery

Server Options

Sometimes we want a setting to be the same for all devices from all scopes on the DHCP server. For example, a DNS server can be used by all subnets. As our network does not currently have a DNS server, we will configure some other options.

36. In the **Server Options** dialog configure:
    a. **003 Router** IP address setting to be `172.16.32.2`, and click **Add**.
    b. **015 DNS Domain Name** to be *NetAdmin.edu* and click **OK**.

37. Back on **sWin10CL101** release and renew your IP address.

    Verify that your new settings have been applied and record your new IP configuration here:

    DNS suffix: _____

    IPv4 Address: _____

    Subnet Mask: _____

    Default Gateway: _____

Scope Options

Scope options are identical to Server option, except for how widely they apply. While Server options apply to all scopes on a DHCP server, Scope options only apply to the pools in each scope.

Usually Scopes are associated with subnets. So it makes sense to configure default gateways using scope options, but use **Server Options** to configure those settings that need to apply to all scopes.

38. Back on **sWin22SVR1**, expand the Hawthorn scope, click on **Scope Options**, then, right click to bring up the context menu.

    Select **Configure Options…**, configure **003 Router** IP address setting to be `172.16.32.1`, and **015 DNS Domain Name** to be *ScopeSetDNS.com* and click **Add**.

39. Back on **sWin10CL101** release and renew your IP address.

    Verify that your new settings have been applied.

    What has changed? What has remained the same?

    _____

    _____

Reservation Options

We have already learned how to configure a **Reservation**. Once the initial configuration is completed you can go back in and set the options for that Reservation.

40. Back on **sWin22SVR1**, expand the Hawthorn scope, expand the Reservations container and click on the **172.16.32.199**, then, right click to bring up the context menu.

    Select **Configure Options…**, configure **015 DNS Domain Name** as *ResSetDNS.com*, and click **OK**.

Option Precedence

If the same configuration setting is set in Server, Scope, and Reservation options, which is the option to '*rule them all*'? This is what we will investigate in this section.

41. Using the steps outlined above, use DHCP management console on **sWin22SVR1** to ensure the option **015 DNS Domain Name** is configured according to the following table:

Option	**DNS Domain Name**
Server option:	*NetAdmin.edu*
Scope option:	*ScopeSetDNS.com*
Reservation:	*ResSetDNS.com*

42. On **sWin10CL101**, at a command prompt, release and renew your IP address.

    Type **`ipconfig /all`**, what is the **Hostname** that appears?

    _____

    Which option rules them all? _____

*If you finish your lab early, you can attempt the extension questions, otherwise please skip forward to **Pack up.***

Extension (Optional)

i. What are the risks of only using one DHCP server in an organisation?

ii. What are the issues of using two DHCP servers on a network offering the same scopes? How can these issues be addressed?

iii. When configuring DHCP we did not bind a scope to an interface. When a DHCP server has multiple interfaces, how does it know which interface to send offers on.
Install DHCP on sWin22RTR, create some pools that offer addresses in the same subnets as are currently configured on each Router interface.

Connect a PC to the different virtual switches and see what leases they give.

Pack up

1. Shut down all guest VMs.
2. **Sign out** from the Host virtual machine and make sure that it is **Stopped** otherwise it will run in the background and use up your quota.
3. If on campus, **log off from the ATC626 lab PC,** and push your chair in as you leave.

End of Lab