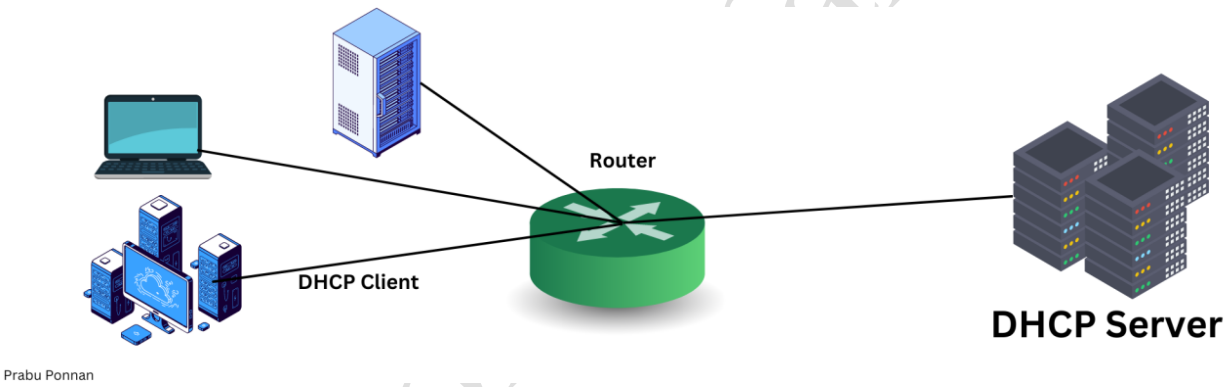
HOW TO ASSIGN A DHCP SCOPE: A PRACTICAL GUIDE



INIOBONG AFAHAKAN

INTRODUCTION

In the last three weeks, I have been designing a simple architecture for setting up an IP Addressing scheme for Myol Computer Ventures, with about 250 systems and devices. We realized that the process of statically assigning IP addresses to individual devices was time-consuming and could lead to mental exhaustion, and having more devices, just makes static IP assignment highly impractical.

My last post addressed the issue of dynamic or auto IP assignment using Dynamic Host Configuration Protocol (DHCP), where we looked into what DHCP is, its advantages, and the steps to configuring a server as a DHCP server.

The next step was to assign a scope – a range of IP addresses, from which the server can pick the IP addresses to assign to the devices.

WHAT IS A DHCP SCOPE?

A DHCP (Dynamic Host Configuration Protocol) scope is a range of IP addresses that a DHCP server can lease to clients on a specific subnet. This scope ensures that devices on the network receive unique IP addresses, avoiding conflicts and simplifying network management. It has the following key components:

1. IP Address Range: Defines the start and end IP addresses that can be assigned to clients.
2. Subnet Mask: Determines the network and host portions of the IP addresses.
3. Lease Duration: Specifies how long a client can use an IP address before it needs to be renewed.
4. Scope Options: Includes additional settings such as:
    a. Default Gateway: The IP address of the router that connects the local network to other networks.
    b. DNS Servers: IP addresses of the DNS servers that clients should use.
    c. WINS Servers: IP addresses of the WINS servers for NetBIOS name resolution.

PLANNING THE IP ADDRESS RANGE

One of the best practices for assigning a DHCP scope is to determine which devices need static IP and the ones that need dynamic IPs, then make sure that the dynamic IP range doesn't overlap with the static IP range.

Knowing that dynamic IPs are assigned to devices within a specified lease period, then, there are devices that can't be dynamically assigned IPs, such as servers, printers, IP Phone cameras, etc. So these devices should be given a static IP range.

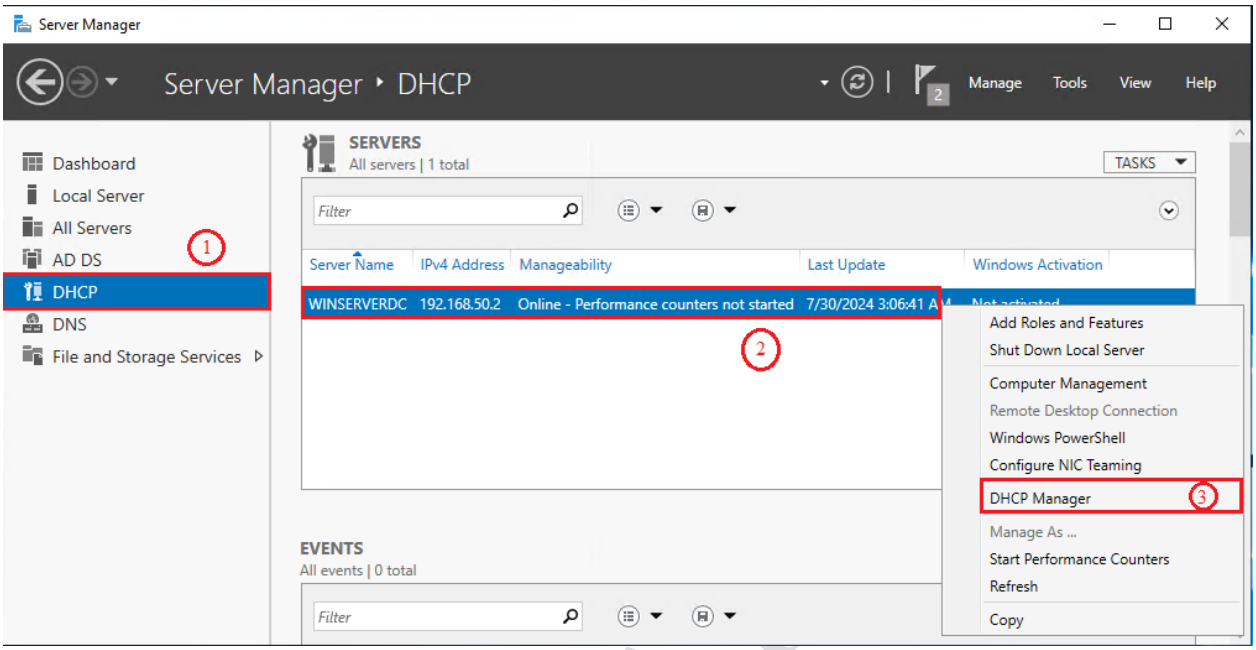
Going back to the Myol Computer Ventures IP Assignment Table as shown below, the mode of assignment has been added. Gateway, servers, and Printers will be statically assigned. The range is 172.16.24.1 - 172.16.24.20. The host devices will be dynamically assigned: The range is 172.16.24.21 - 172.16.25.64.

S/N	**Department/ Devices**	**Number of Devices**	**Network Address**	**Mode**
1.	Network	1	172.16.24.0	Reserved
2.	Broadcast	1	172.16.25.255	Reserved
3.	Gateway	1	172.16.24.1	Static
4	Servers (DNS, Core, RODC, etc.)	9	172.16.24.2 - 172.16.24.10	Static
5.	Printers	10	172.16.24.11 - 172.16.24.20	Static
6.	Administration	30	172.16.24.21 - 172.16.24.50	Dynamic
7.	Human Resources	40	172.16.24.51 - 172.16.24.90	Dynamic
8.	IT	30	172.16.24.91 - 172.16.24.120	Dynamic
9.	Engineering	100	172.16.24.121 - 172.16.24.220	Dynamic
10.	Material	100	172.16.24.221 - 172.16.24.255 172.16.25.0 - 172.16.25.64	Dynamic

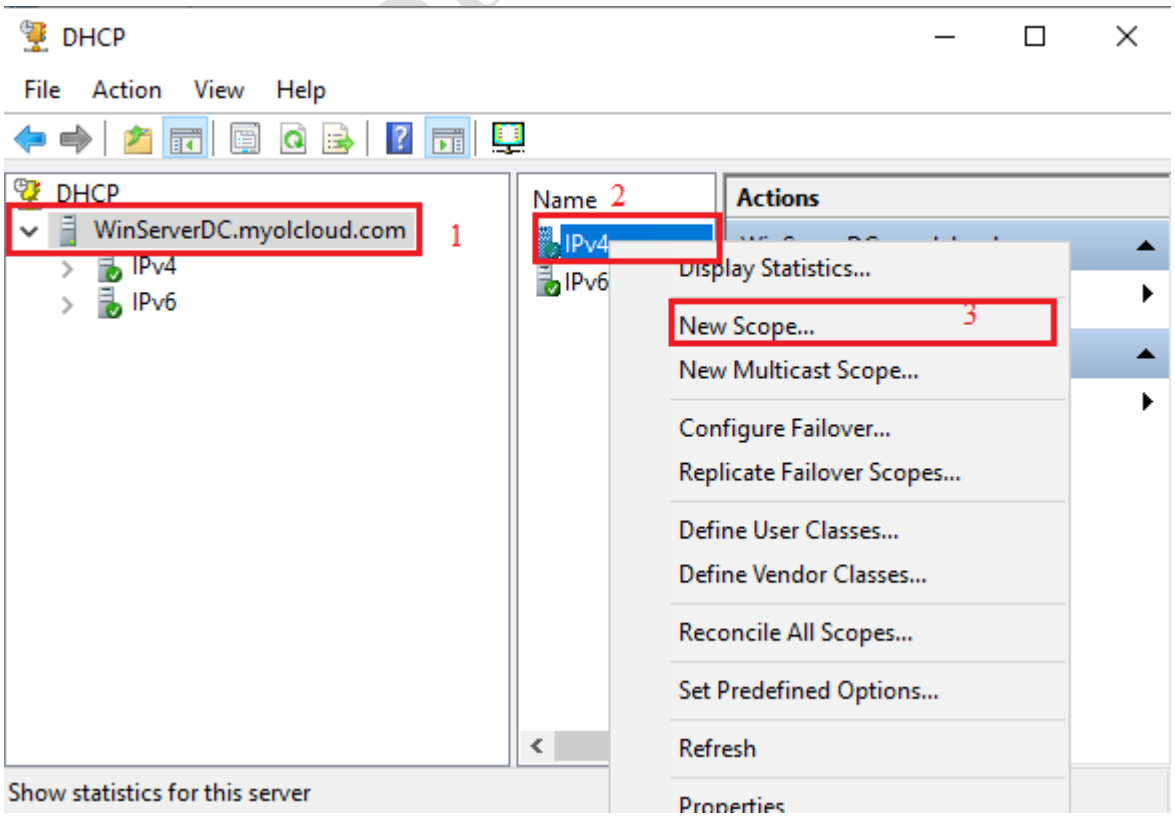
From the table, servers and Printers IP range must be statically assigned

HOW TO CREATE A DHCP SCOPE ON YOUR SERVER

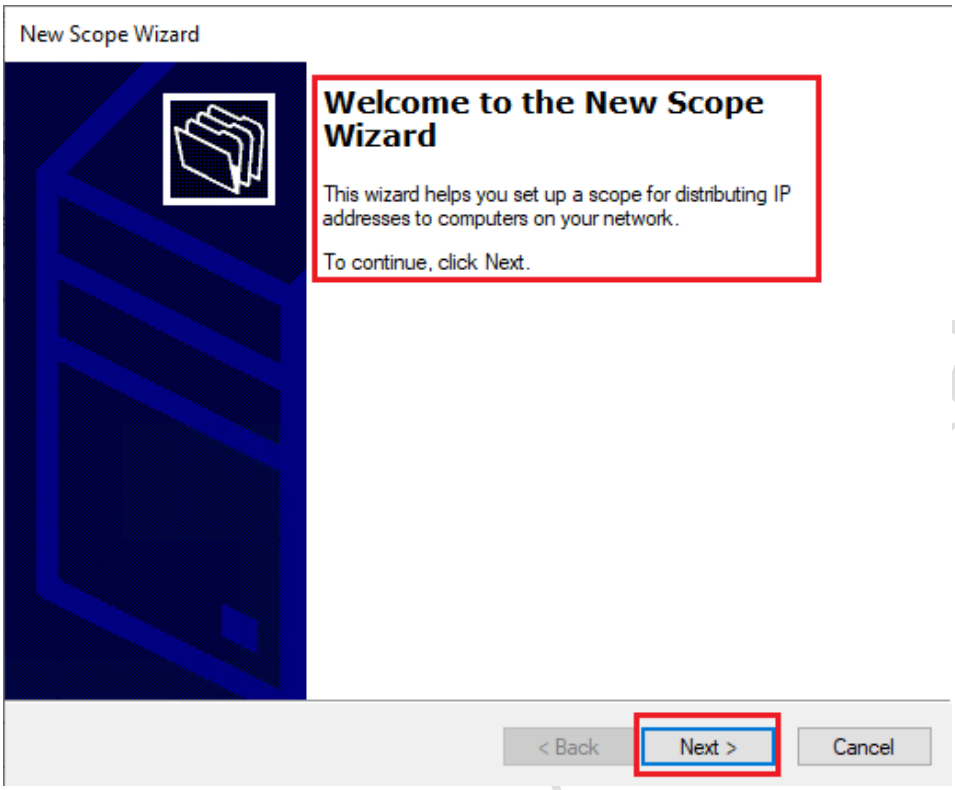
STEP1: From your Server Manager, Click on DHCP. Right Click on the Server and Select DHCP Manager



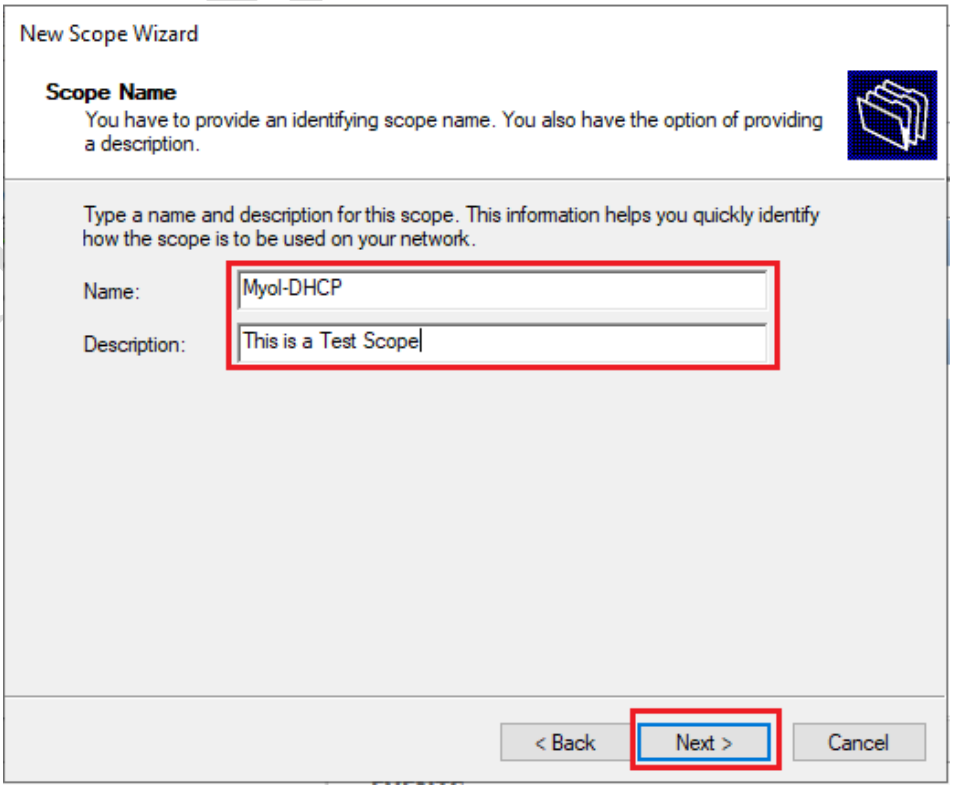
Step 2: On the DHCP window that opens, click the caret by the server to expose IPV4 and IPV6. The green ticks on them shows the DHCP is authorized (Remember authorization from the last post). Right Click on IPV4 and click New Scope to open the DHCP Scope Wizard.



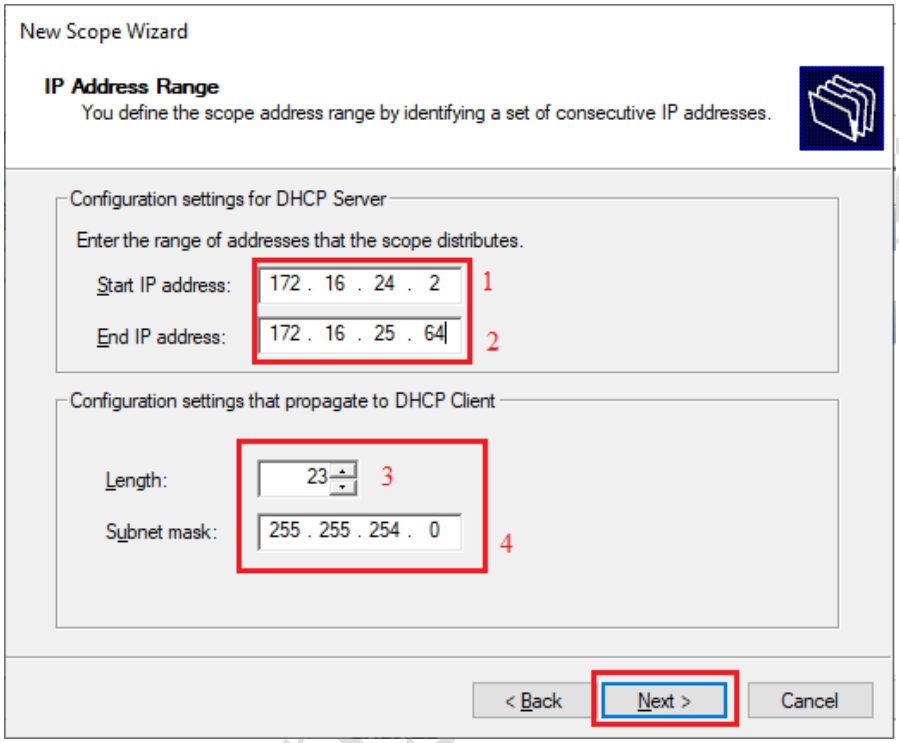
Step 3: On the Wizard that opens, read the introduction and click next (Best Practice to always read every thing)



Step 4: Assign a name and a description. The description is optional, however, it is good practice to always put a description wherever needed for future reference. Click Next.

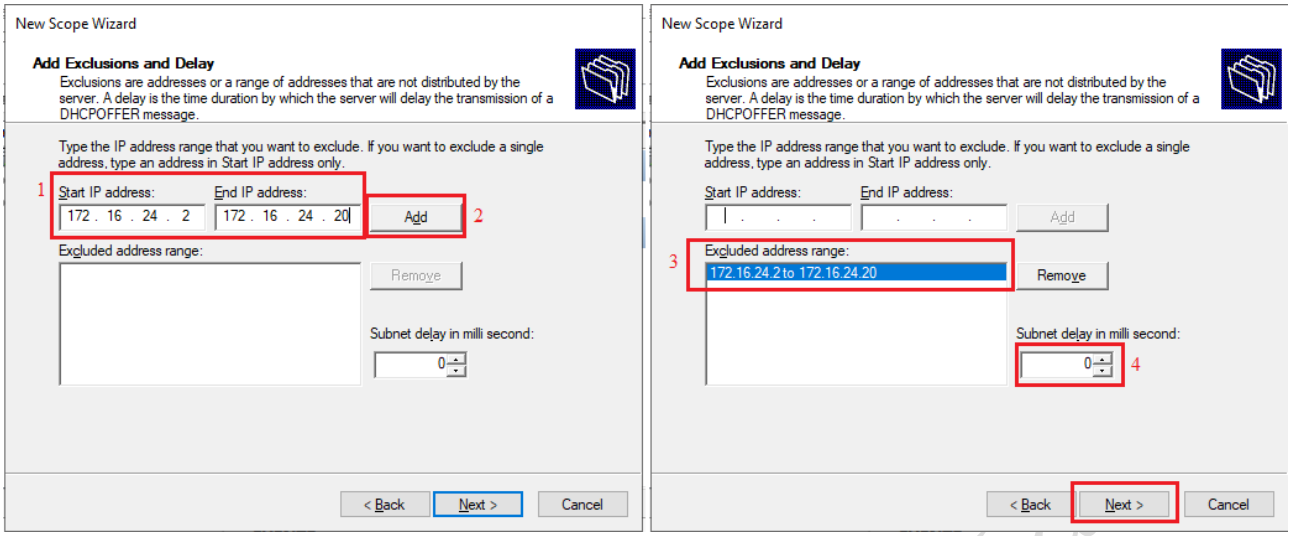


Step 5: Enter the range of IP addresses for this scope. This range includes both the static and dynamic IPs. You will be able to map out the exceptions later. Also, enter your correct length and your subnet mask will update. For this case study the range is 172.16.24.2 - 172.16.25.64. The subnet mask is 255.255.254.0 and the length for this mask is 23. (Remember this is a class B IP address). Click Next once you are through.

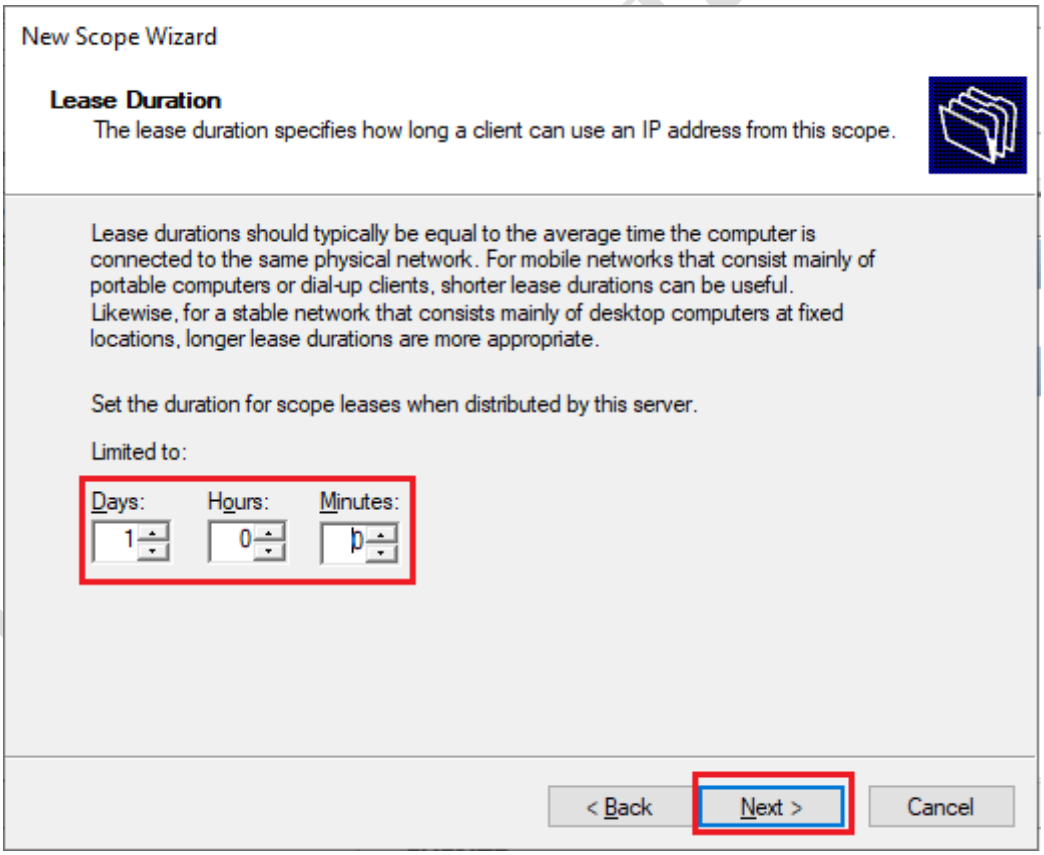


Step 6: This is where you add the exclusions – the IP address range or ranges that you want to exclude from DHCP or you want to assign statically such as servers, etc. Enter the address and click on Add. For Myol, the exclusion range is 172.16.24.2-172.16.24.20. You can leave the subnet delay at the default 0 seconds since this is the only DHCP server you are configuring. See the Note below for an explanation of subnet delay.

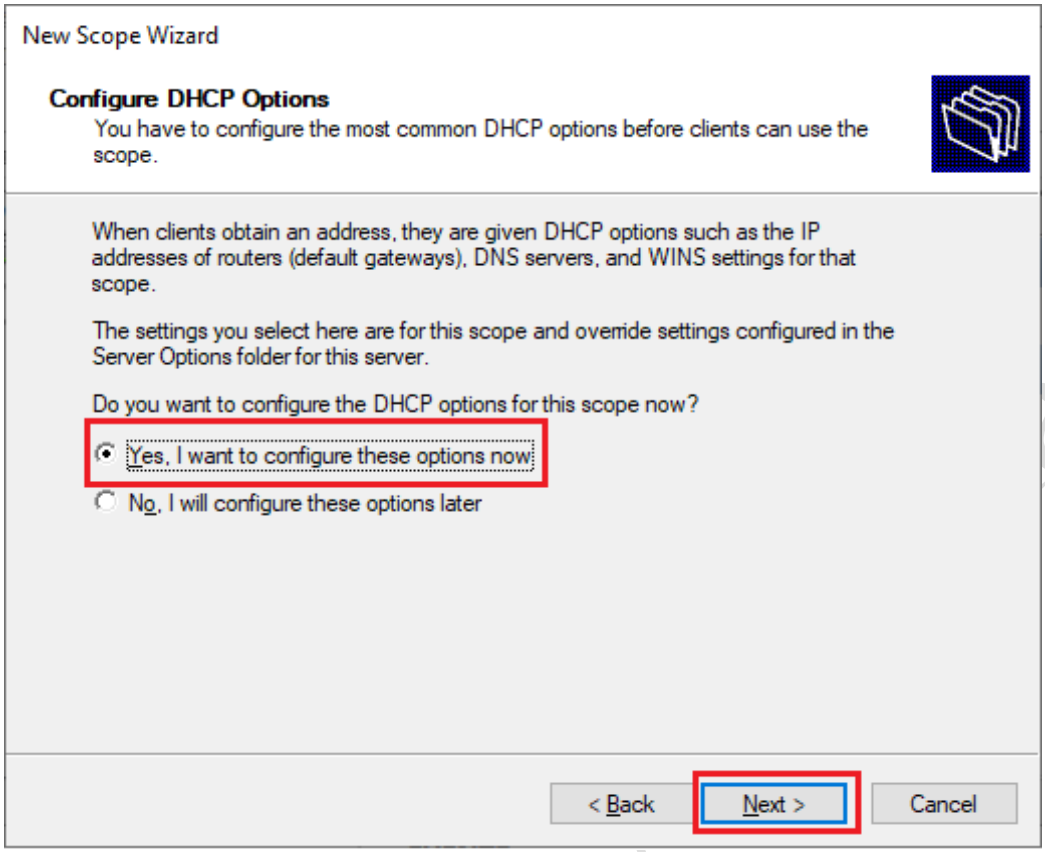
Note: The **Subnet delay** option is used to specify the amount of time (in milliseconds) that a DHCP server waits before sending a DHCPOFFER message to a client. This delay can be between 0 and 1000 milliseconds. This feature is particularly useful in environments with multiple DHCP servers servicing the same subnet. By configuring a delay on the lower-priority DHCP server, you can ensure that the higher-priority server has the first opportunity to respond to DHCP requests. This helps in load balancing and prioritizing servers.



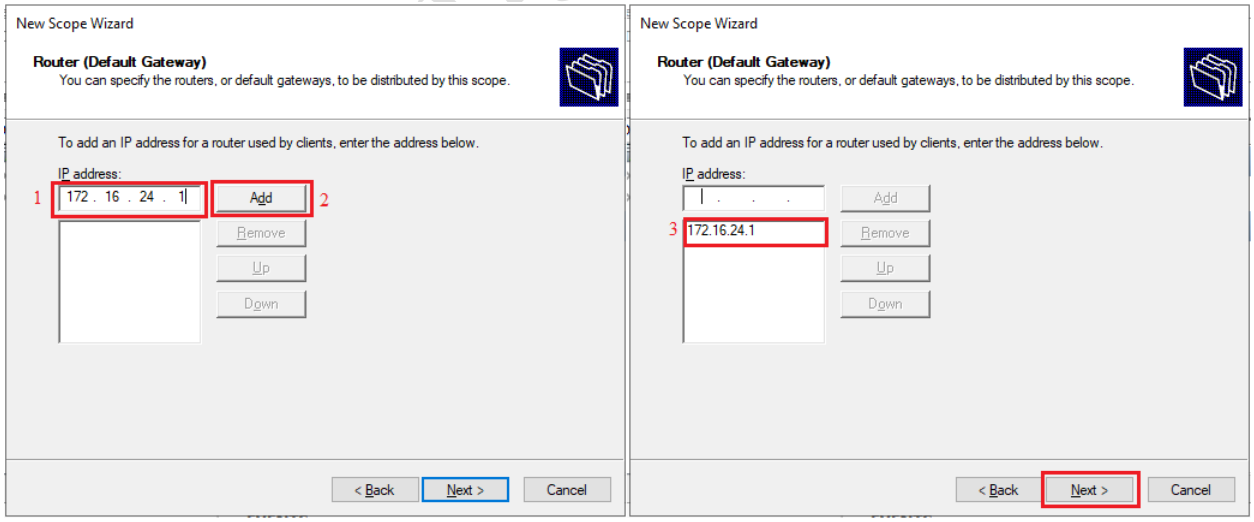
Step 7: Lease duration specifies how long an assigned IP addressed can be used by a client device. The default is 8 days. For this we assign 1 day. Click Next



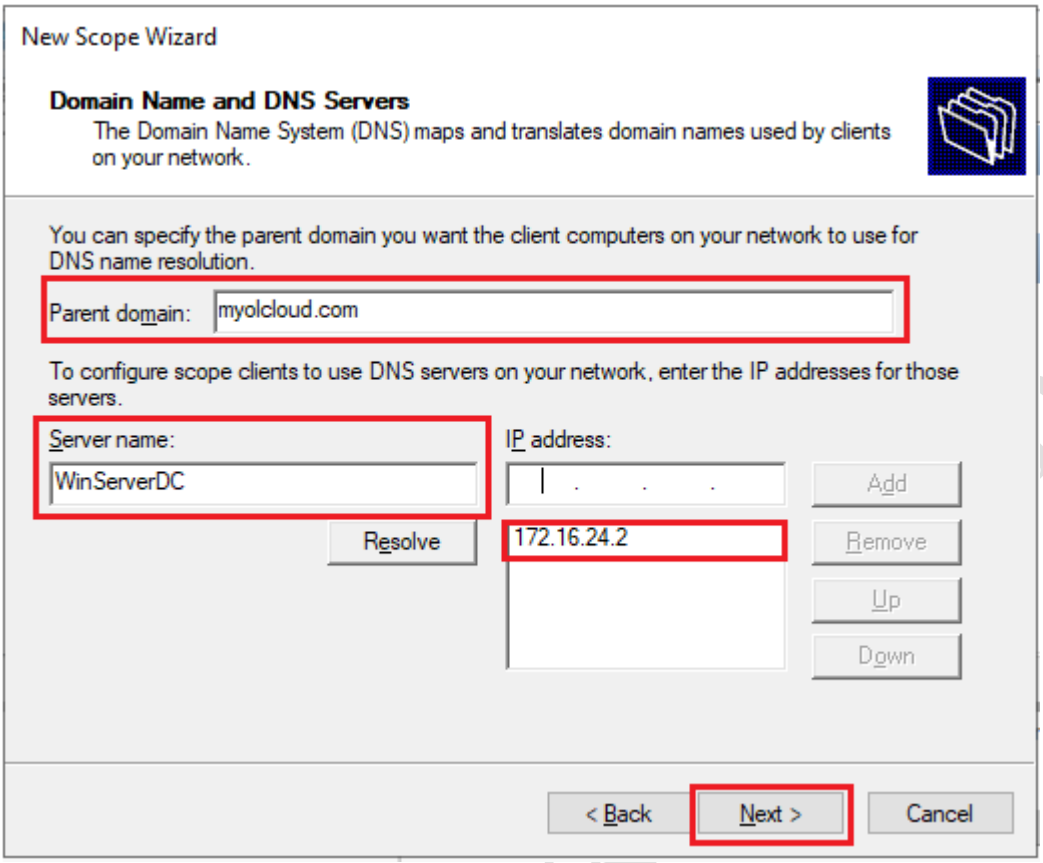
Step 8: Accept to configure the scope options now, and click next.



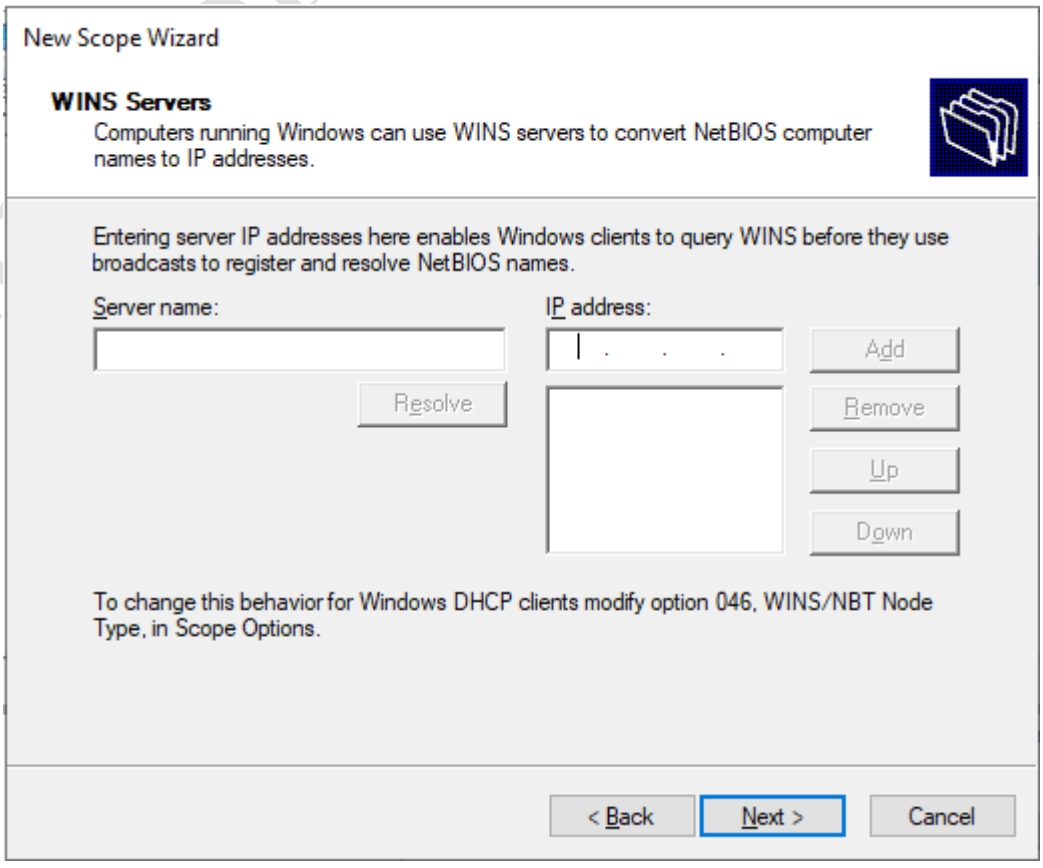
Step 9: Add your default gateway IP address, click add, then click next.



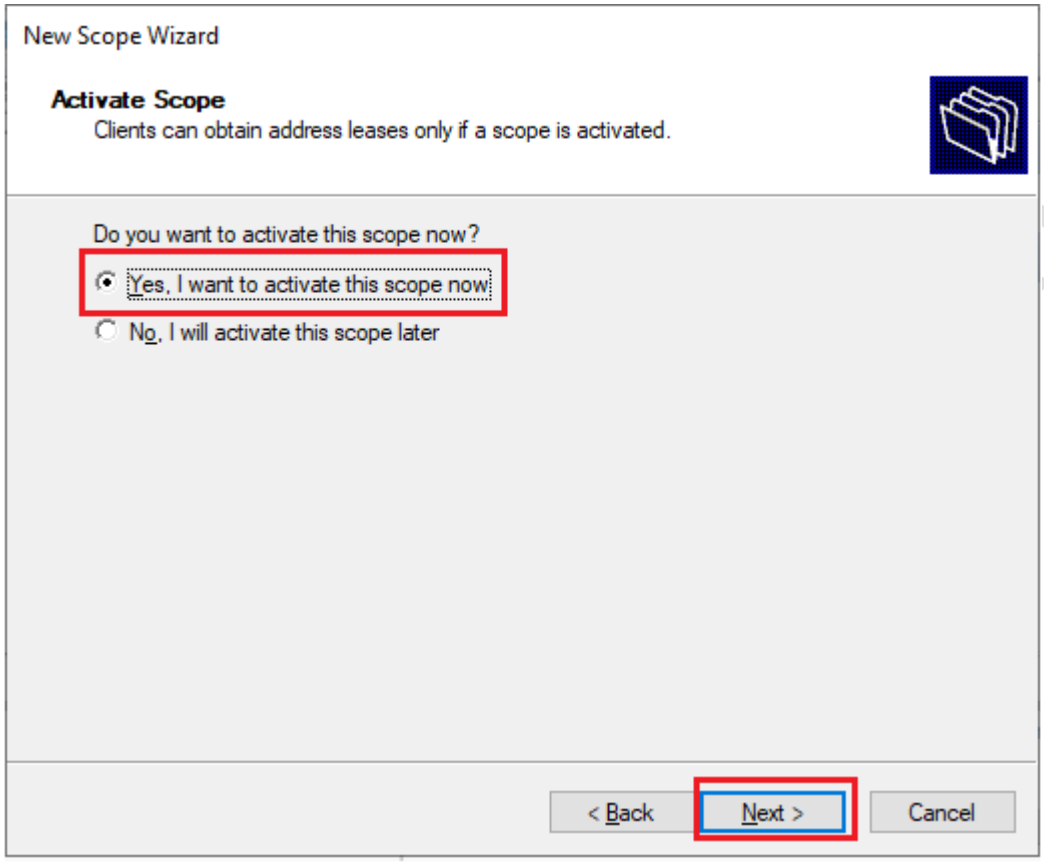
Step 10: Add your domain name or verify that the default domain name that appears is correct if your server is already on a domain. Add your DNS server IP, and click next.

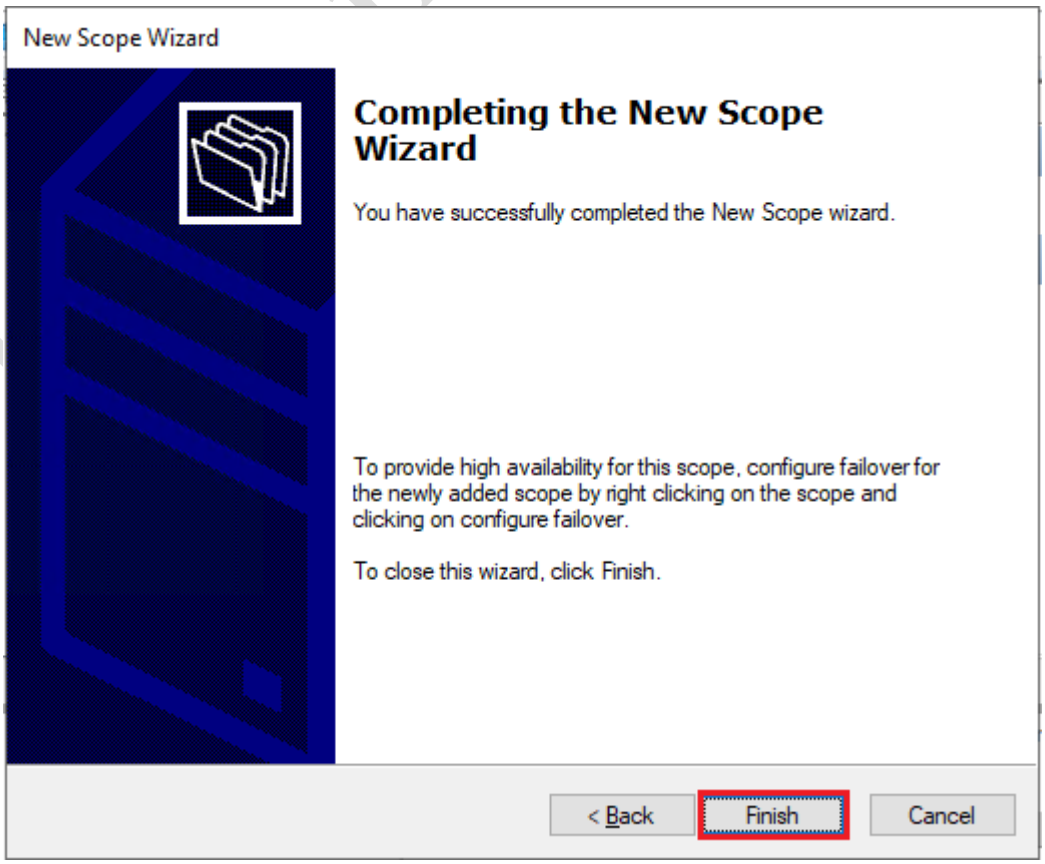


Step 11: The next page is WINS services which is no longer in use. You can just click next.

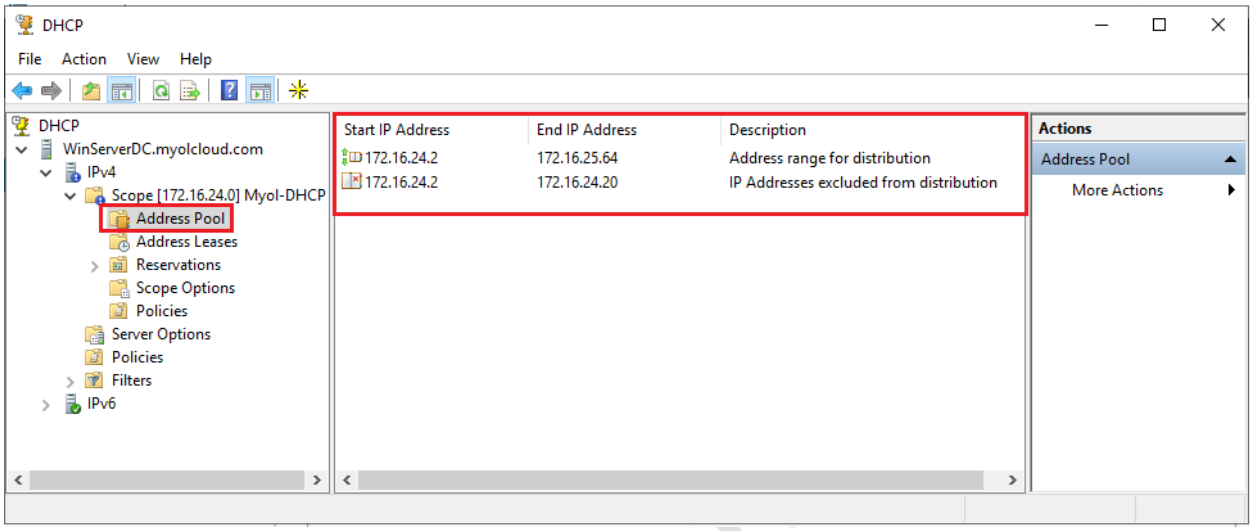


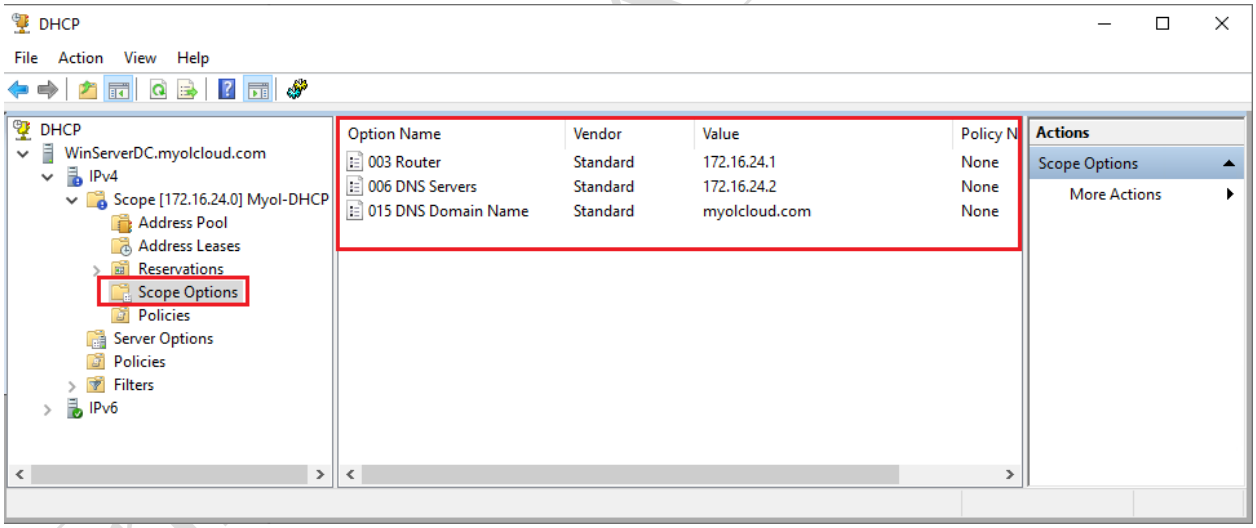
Step 12: Click Yes, I want to activate this scope and click next. The scope gets activated and the complete wizard appears. Click finish to end.



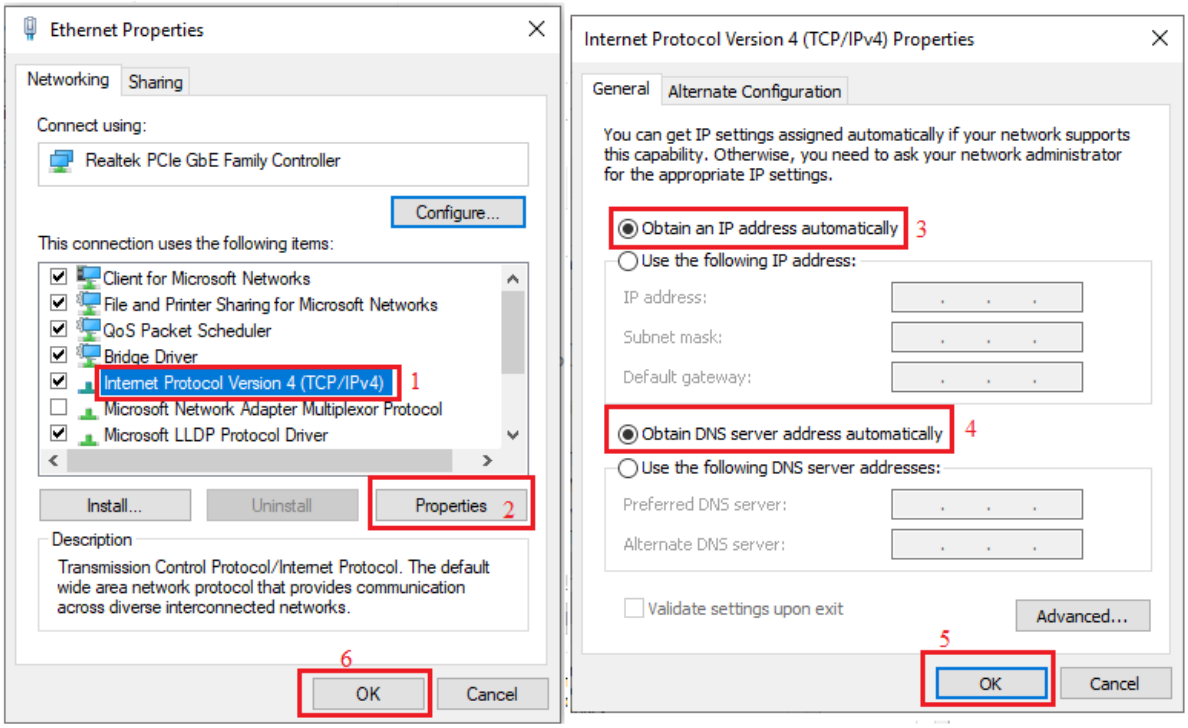


Once you finish, go back to the DHCP Management Console. Click on IPv4, select Scope and Click on Address Pool to see your start and end IP Address and also the IP Addresses excluded. The Address Leases will be empty at this time since no client computer has been assigned. Scope Options gives you the Router (Default Gateway), DNS Server and the Domain Name Values.





ASSIGNING A CLIENT COMPUTER



To assign a client computer, navigate to Ethernet Properties, select Internet Protocl version 4 (TCP/IPv4), then click on properties. On the Properties dialog that pops up, select Obtain IP address automatically and obtain DNS server address automatically. Click Ok and Click Ok. With this configuration, the DHCP server will assign an IP address from the address range you specified to the client computer.

CONCLUSION

DHCP offers a dynamic and automatic IP addressing scheme to devices on the network. This is made possible after a configuration scope is configured on the DHCP server. Going through this manual will place in the hands of the system administrator the stepwise process of configuring a DHCP scope. In my next post, we will be considering DHCP failover.