

CHAPTER 3: DHCP

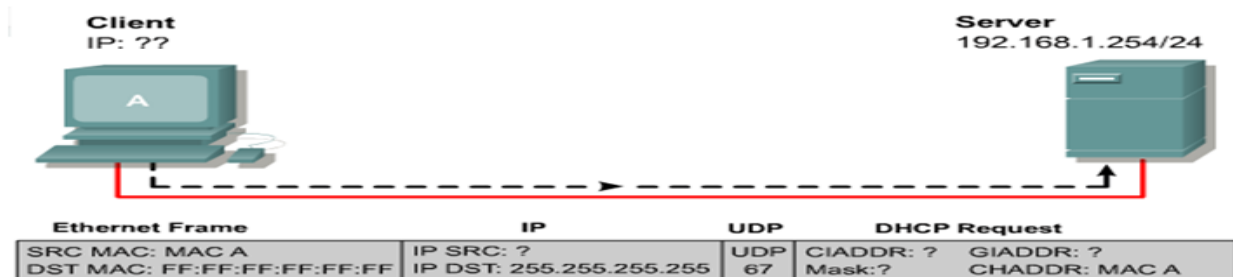
3.1 Introduction

Dynamic Host Configuration Protocol (DHCP) is a core infrastructure service on any network that provides IP addressing and DNS server information to PC clients and any other device. DHCP is used so that you do not have to statically assign IP addresses to every device on your network and manage the issues that static IP addressing can create.

Dynamic Host Configuration Protocol (DHCP) works in a client/server mode. DHCP enables DHCP clients on an IP network to obtain their configurations from a DHCP server.

System administrators set up DHCP servers to assign addresses from predefined pools. DHCP servers can offer IP address, subnet mask, gateway, DNS server addresses, WINS server addresses, and domain names. Most DHCP servers also allow the administrator to define specifically what client MAC addresses can be serviced and automatically assign them the same IP address each time.

DHCP uses User Datagram Protocol (UDP) as its transport protocol. The client sends messages to the server on port 67. The server sends messages to the client on port 68 as below.

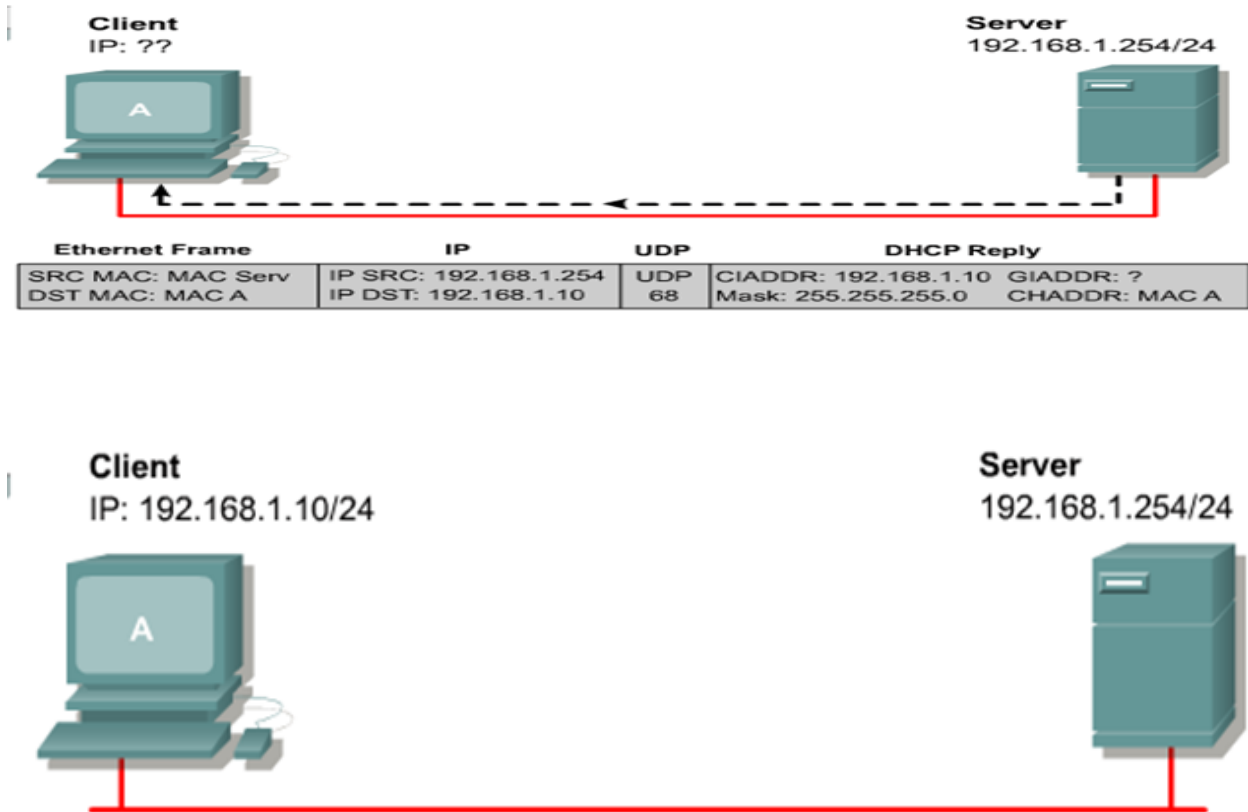


MAC: Media Access Control Address

CIADDR: Client IP address

GIADDR: Gateway IP address

CHADDR: Client hardware address



The DHCP client operating system uses the values in the DHCP reply to configure the IP protocol stack of that client.

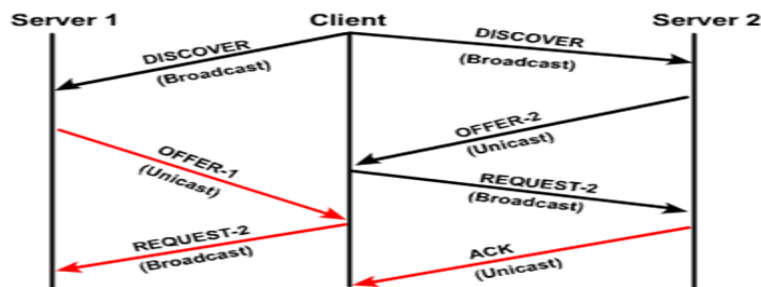
3.2 DHCP operation

The DHCP client configuration process uses the following steps:

1. A client must have DHCP configured when starting the network membership process. The client sends a request to a server requesting an IP configuration. Sometimes the client may suggest the IP address it wants, such as when requesting an extension to a DHCP lease. The client locates a DHCP server by sending a broadcast called a DHCPDISCOVER.
2. When the server receives the broadcast, it determines whether it can service the request from its own database. If it cannot, the server may forward the request on to another DHCP server. If it can, the DHCP server offers the client IP configuration information in the form of a unicast DHCPOFFER. The DHCPOFFER is a proposed configuration that may include IP address, DNS server address, and lease time.
3. If the client finds the offer agreeable, it will send another broadcast, a DHCPREQUEST,

specifically requesting those particular IP parameters. Why does the client broadcast the request instead of unicasting it to the server? A broadcast is used because the first message, the DHCPDISCOVER, may have reached more than one DHCP server. If more than one server makes an offer, the broadcasted DHCPREQUEST allows the other servers to know which offer was accepted. The offer accepted is usually the first offer received.

4. The server that receives the DHCPREQUEST makes the configuration official by sending a unicast acknowledgment, the DHCPACK. It is possible, but highly unlikely, that the server will not send the DHCPACK. This may happen because the server may have leased that information to another client in the interim. Receipt of the DHCPACK message enables the client to begin using the assigned address immediately.
5. If the client detects that the address is already in use on the local segment it will send a DHCPDECLINE message and the process starts again. If the client received a DHCPNACK from the server after sending the DHCPREQUEST, then it will restart the process again.
6. If the client no longer needs the IP address, the client sends a DHCPRELEASE message to the server.

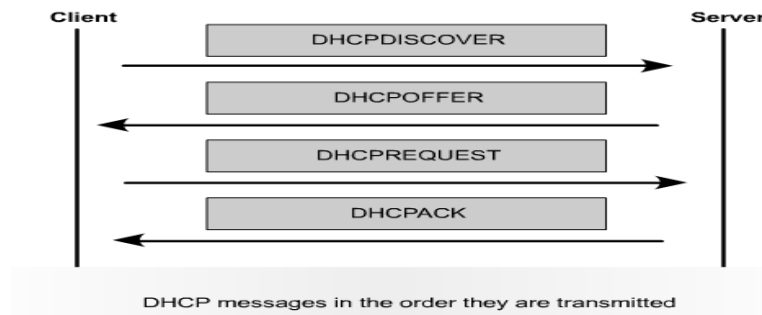


DHCP client broadcast a DHCPDISCOVER packet on a local subnet.

DHCP servers send a OFFER packet with lease information.

DHCP client select the lease and broadcast a DHCPREQUEST packet.

Selected DHCP server sent a DHCPACK packet.



3.3 Installing Windows 2008 DHCP Server

To do this, you will need a Windows Server 2008 system already installed and configured with a static IP address. You will need to know your network's IP address range, the range of IP addresses you will want to hand out to your PC clients, your DNS server IP addresses, and your default gateway. Additionally, you will want to have a plan for all subnets involved, what scopes you will want to define, and what exclusions you will want to create.

To start the DHCP installation process, you can click **Add Roles** from the **Initial Configuration Tasks** window or from **Server Manager > Roles > Add Roles**.

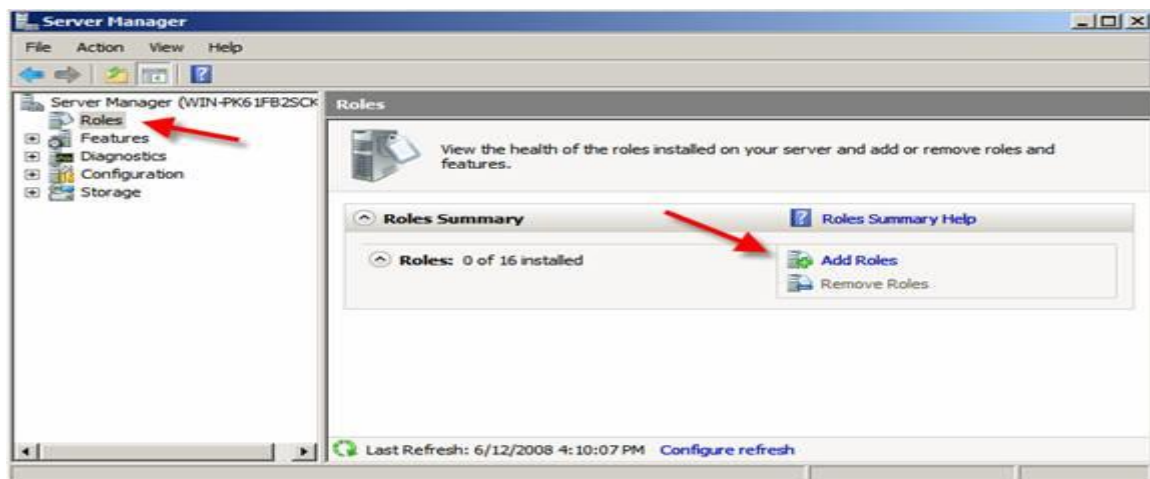


Figure 1: Adding a new Role in Windows Server 2008

When the Add Roles Wizard comes up, you can click Next on that screen.

Next, select that you want to add the DHCP Server Role, and click Next.

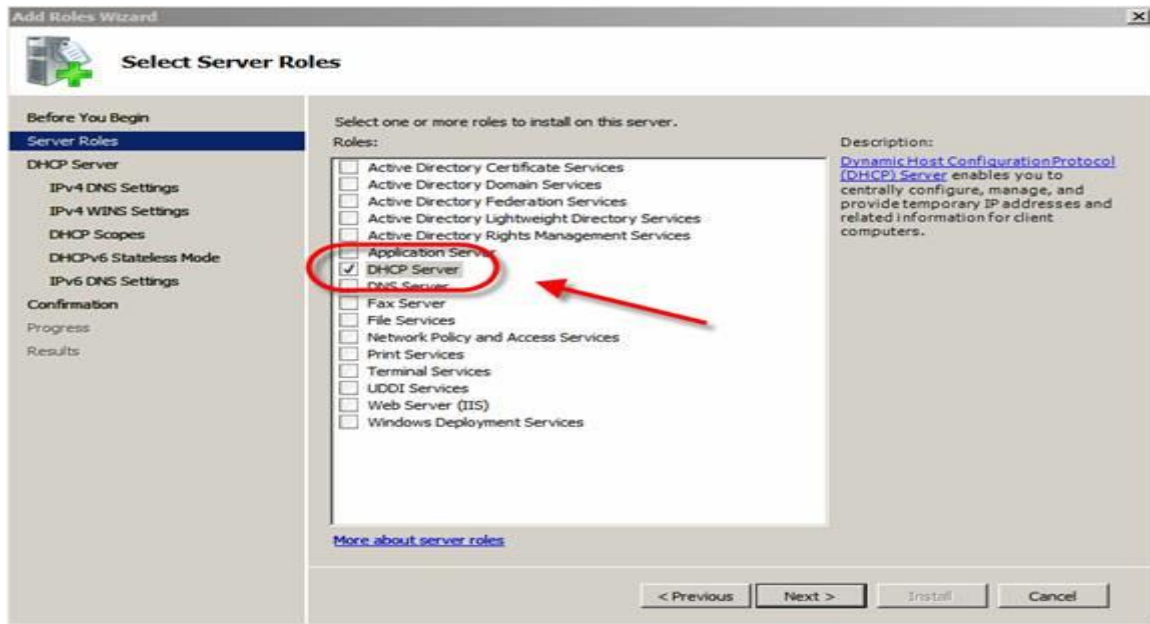


Figure 2: Selecting the DHCP Server Role

If you do not have a static IP address assigned on your server, you will get a warning that you should not install DHCP with a dynamic IP address.

At this point, you will begin being prompted for IP network information, scope information, and DNS information. If you only want to install DHCP server with no configured scopes or settings, you can just click **Next** through these questions and proceed with the installation.

On the other hand, you can optionally configure your DHCP Server during this part of the installation. In this case, let us chose to configure some basic IP settings and configure our first DHCP Scope. The network connection binding is displayed so as to be verified, like this:

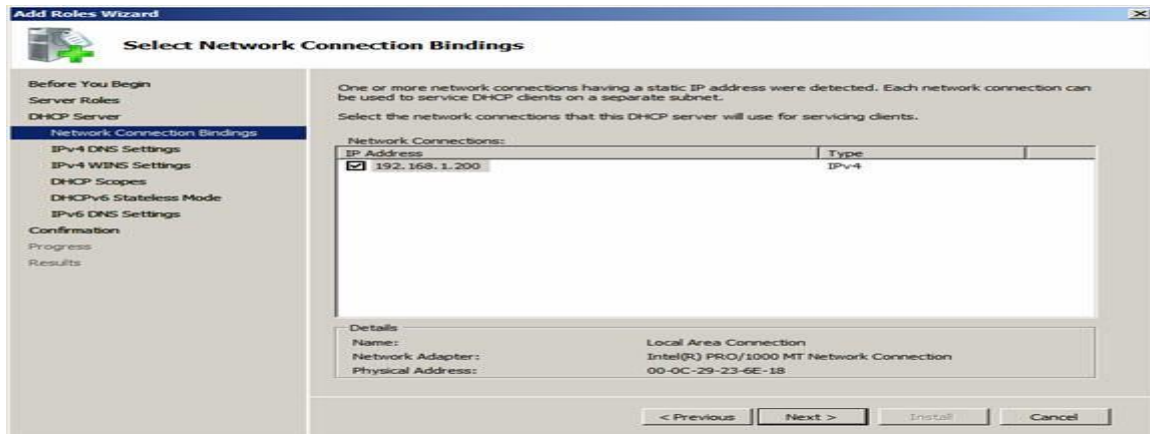


Figure 3: Network connection binding

What the wizard is asking is, “what interface do you want to provide DHCP services on?” take the default and click **Next**. Next, enter your **Parent Domain**, **Primary DNS Server**, and **Alternate DNS Server** (as you see below) and click **Next**.

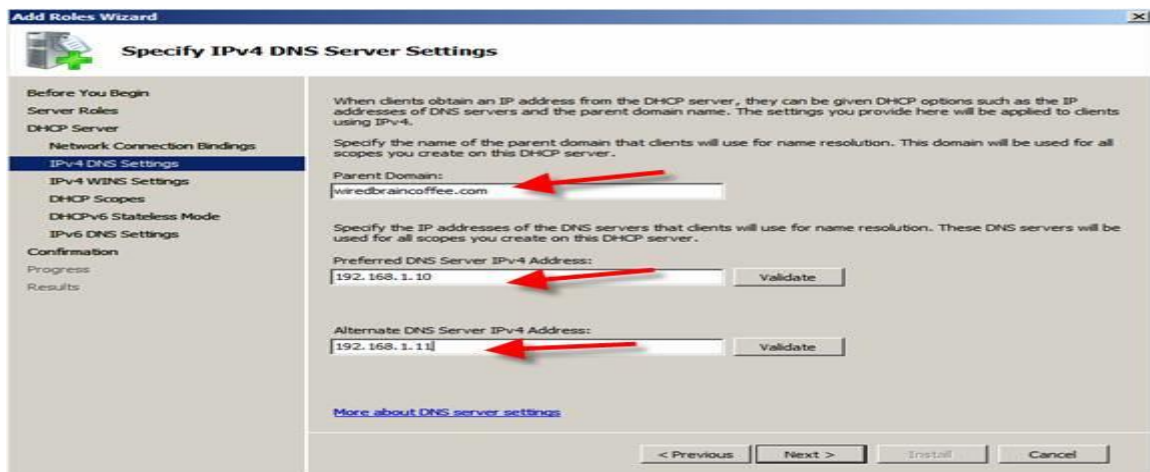


Figure 4: Entering domain and DNS information

Here opt NOT to use WINS on your network if you do not have WINS server ,otherwise specify its IP address and clicked **Next**.

Then, you will be prompted to configure a DHCP scope for the new DHCP Server. Here we opt to configure an IP address range of 192.168.1.50-100 to cover the 25+ PC Clients on our local network. To do this, click **Add** to add a new scope. As you see below, we named the Scope **WBC-Local**, configured the **starting** and **ending IP addresses** of 192.168.1.50-192.168.1.100, **subnet mask** of 255.255.255.0, **default gateway** of 192.168.1.1, **type of subnet** (wired), and **activated** the scope.

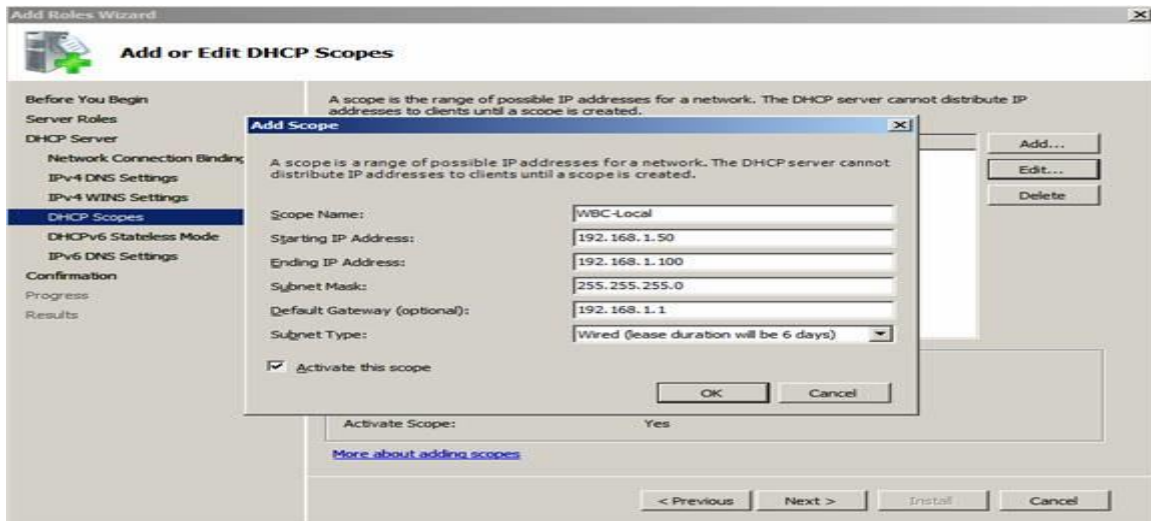


Figure 5: Adding a new DHCP Scope

Back in the Add Scope screen, click Next to add the new scope (once the DHCP Server is installed). Chose to **Disable DHCPv6 stateless mode** for this server and clicked **Next**. Then, Confirm your DHCP Installation Selections (on the screen below) and click **Install**.

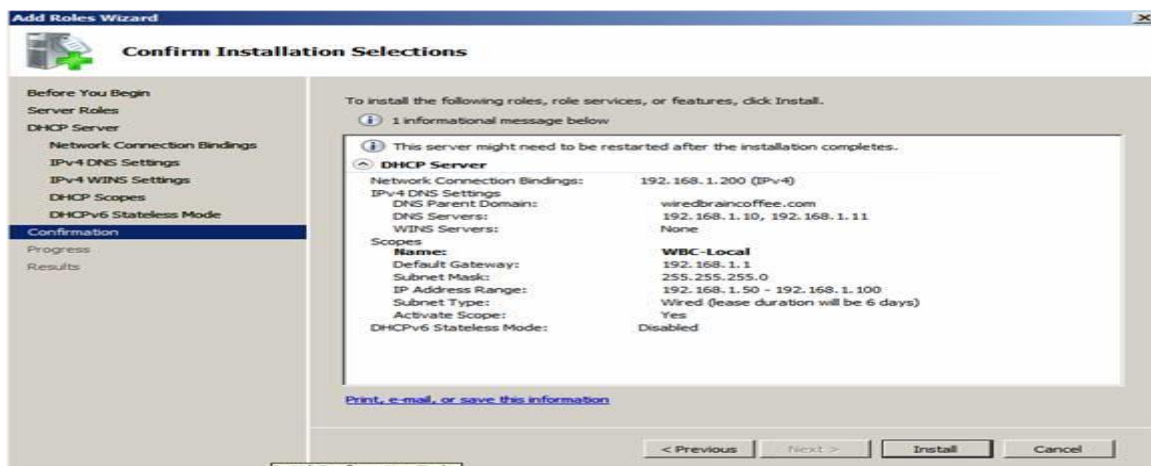


Figure 6: Confirm Installation Selections

After only a few seconds, the DHCP Server will installed and you can see the window, below:

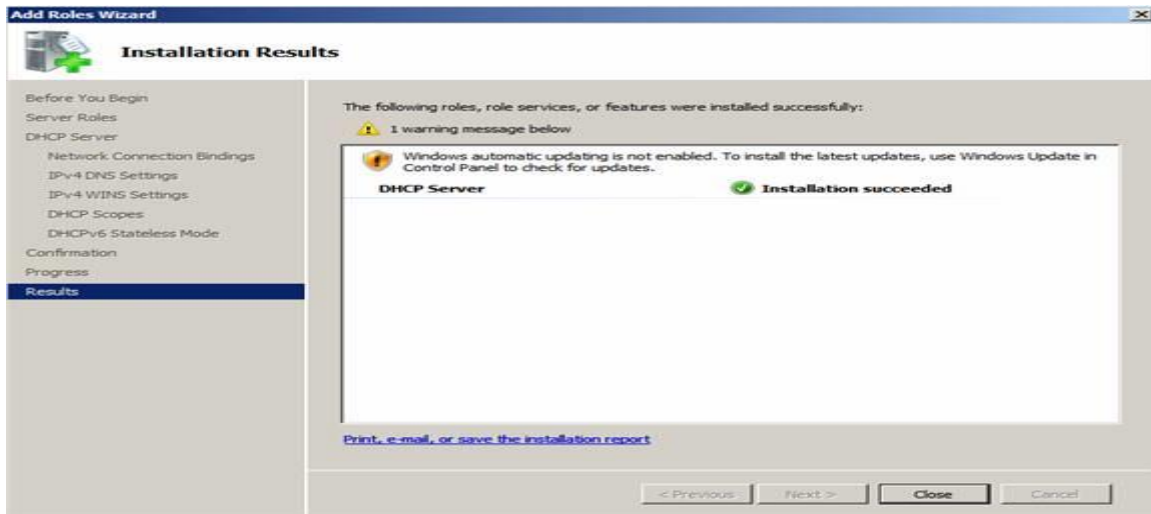


Figure above shows that Windows 2008 DHCP Server Installation succeeded. Click Close to close the installer window then moved on to how to manage my new DHCP Server.

3.4 Managing your new Windows Server 2008 DHCP Server

Like the installation, managing Windows Server 2008 DHCP Server is also easy. Back in my Windows Server 2008 **Server Manager**, under **Roles**, click on the new **DHCP Server** entry.

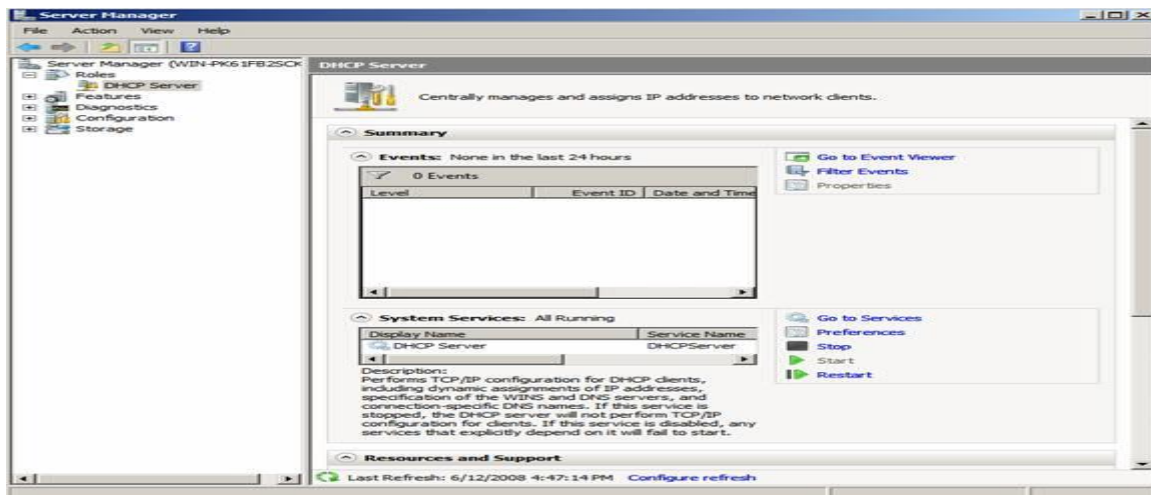


Figure 8: DHCP Server management in Server Manager

While we cannot manage the DHCP Server scopes and clients from here, what we can do is to manage what events, services, and resources are related to the DHCP Server installation. Thus, this is a good place to go to check the status of the DHCP Server and what events have happened around it.

However, to really configure the DHCP Server and see what clients have obtained IP addresses, you need to go to the DHCP Server MMC. To do this, Go to **Start > Administrative Tools > DHCP Server**, like this:

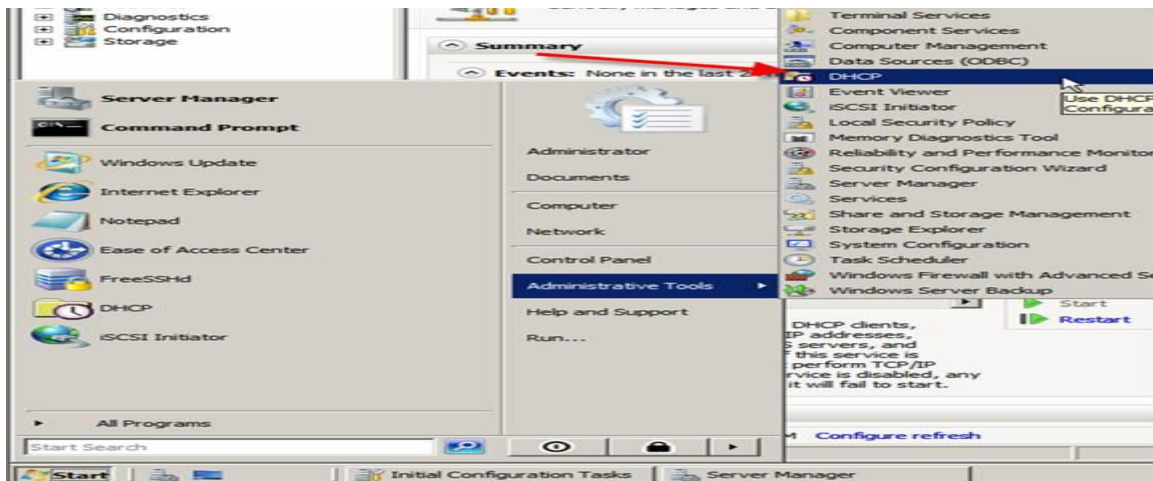


Figure 9: Starting the DHCP Server MMC

When expanded out, the MMC offers a lot of features. Here is what it looks like:

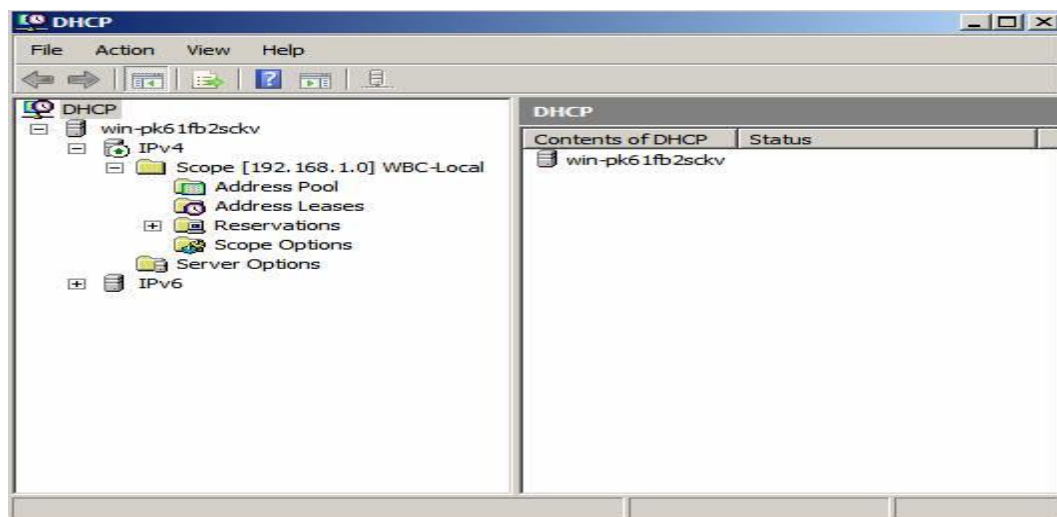


Figure 10: The Windows Server 2008 DHCP Server MMC

The DHCP Server MMC offers IPv4 & IPv6 DHCP Server info including all scopes, pools, leases, reservations, scope options, and server options.

If you go into the address pool and the scope options, you can see that the configuration we made when we installed the DHCP Server did, indeed, work. The scope IP address range is there, and so is the DNS Server & default gateway.

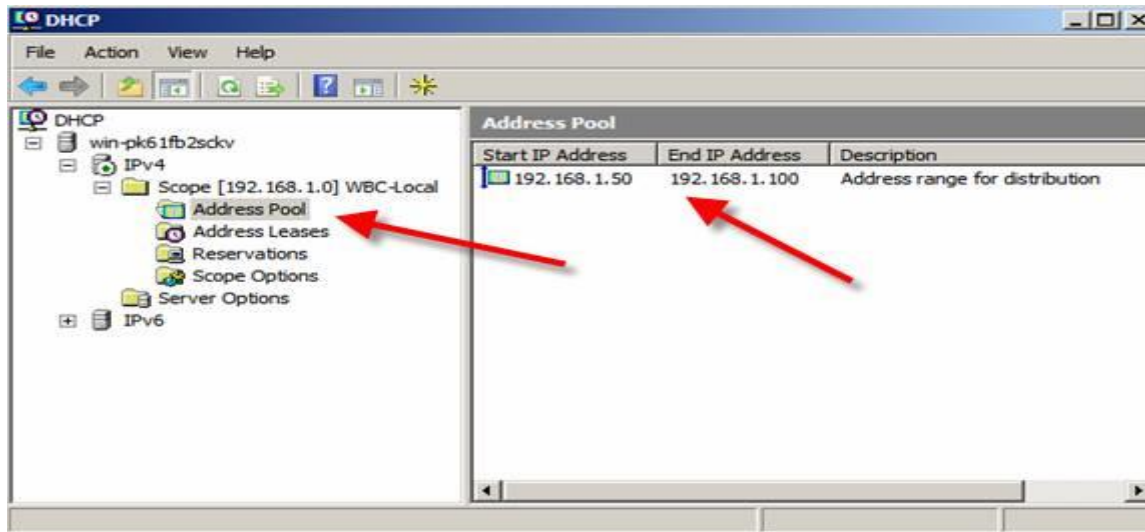


Figure 11: DHCP Server Address Pool

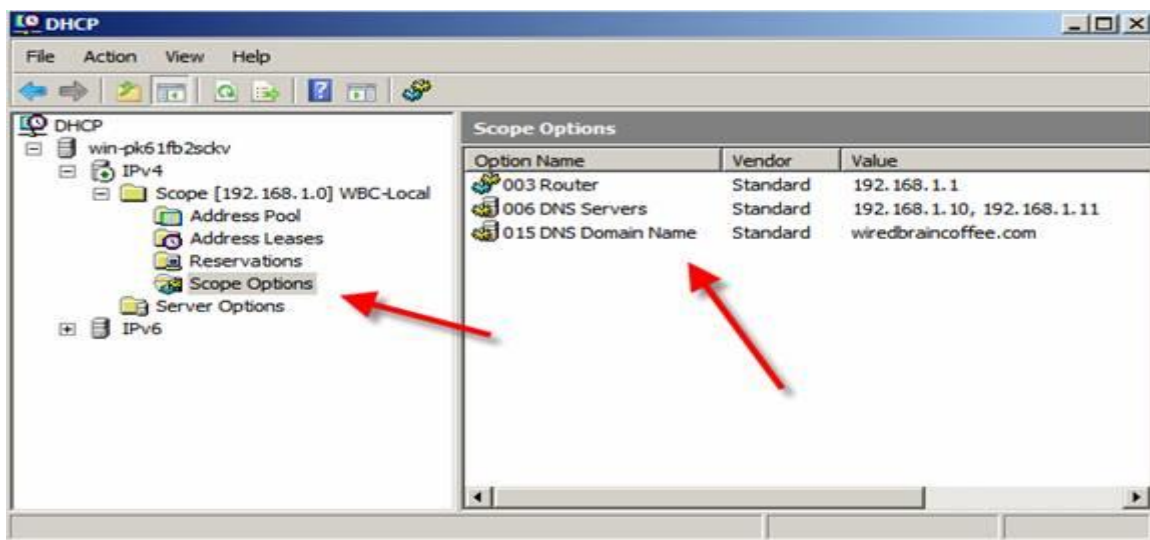


Figure 12: DHCP Server Scope Options

So how do we know that this really works if we do not test it? The answer is that we do not. Now, let's test to make sure it works.

3.5 Testing Windows 2008 DHCP Server

To test this, take a Windows 7 PC Client on the same network segment as the Windows 2008 DHCP server. At the command prompt issue the command **IPCONFIG /RELEASE** then **IPCONFIG /RENEW** and verify that you receive an IP address from the new DHCP server, as you can see below:

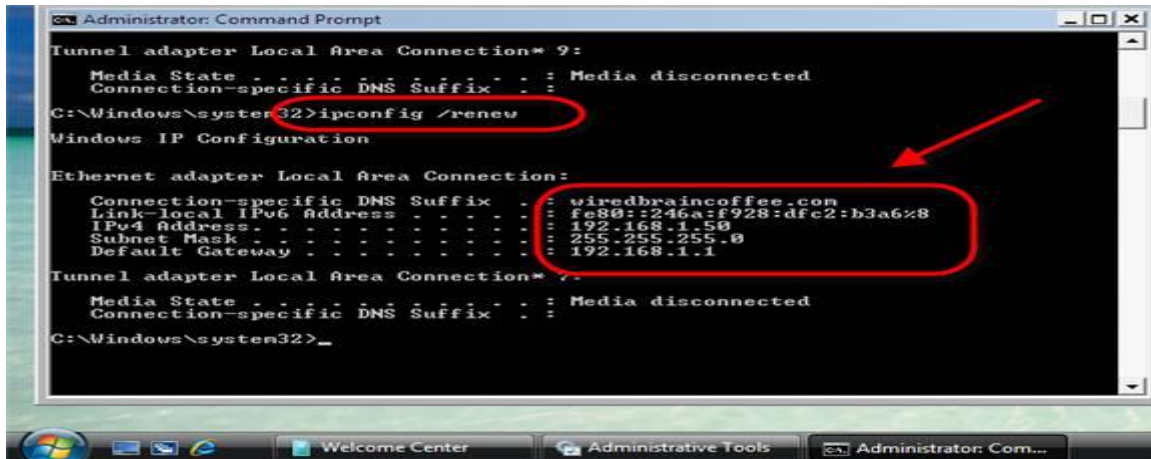


Figure 13: Vista client received IP address from new DHCP Server

Also, go to your Windows 2008 Server and verify that the new windows 7 client was listed as a client on the DHCP server. This did indeed check out, as you can see below:

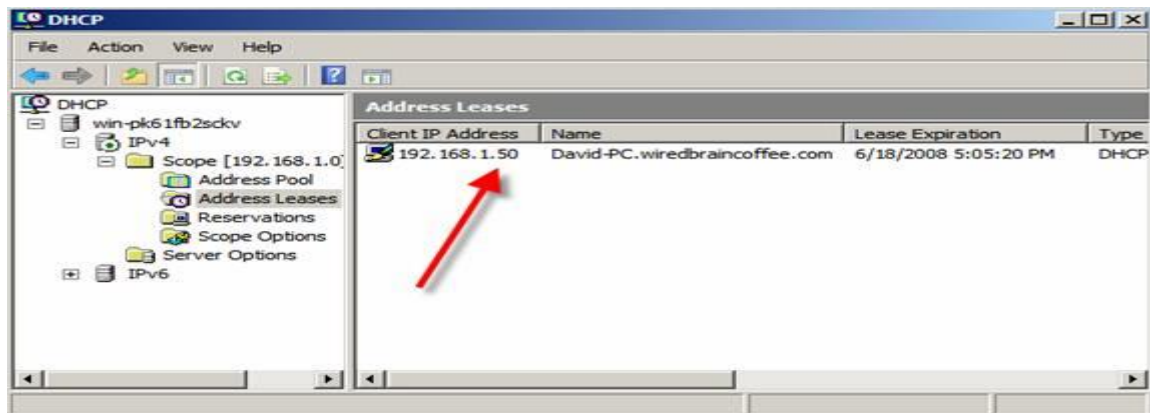


Figure 14: Win 2008 DHCP Server has the Windows 7 client listed under Address Leases

With that, know that you have a working DHCP configuration.