

DHCP

and

DNS

DHCP

Dynamic Host Configuration Protocol

- used to assign IP addresses to devices on a network
- devices have either a static or dynamic ip address

Static IP

- user assigned IP address
- manual assignment
- does not change when device restarts

Dynamic IP

is an automatically assigned IP address from a DHCP server

- assigns subnet mask, default gateway and a DNS server

- simple to set up

- when your computer turns on it sends a request to the server to ask for the IP address along with the other listed info

Assigning a Static IP



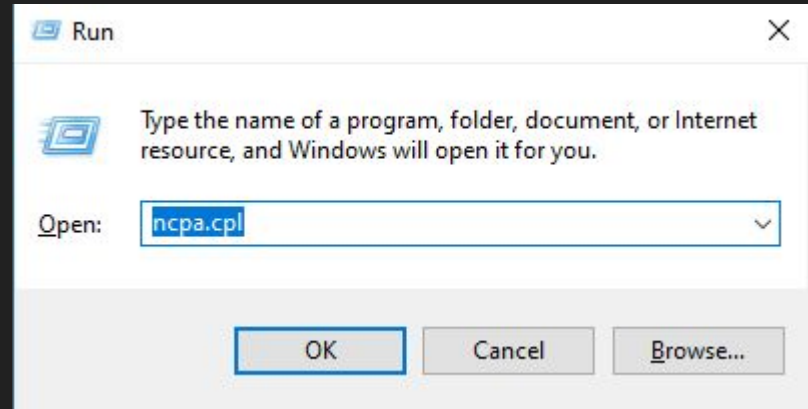
1. Access the Control Panel

In the Windows search bar, type in “ncpa.cpl” and then press enter.

If you are not using Windows 10, follow the steps below instead.

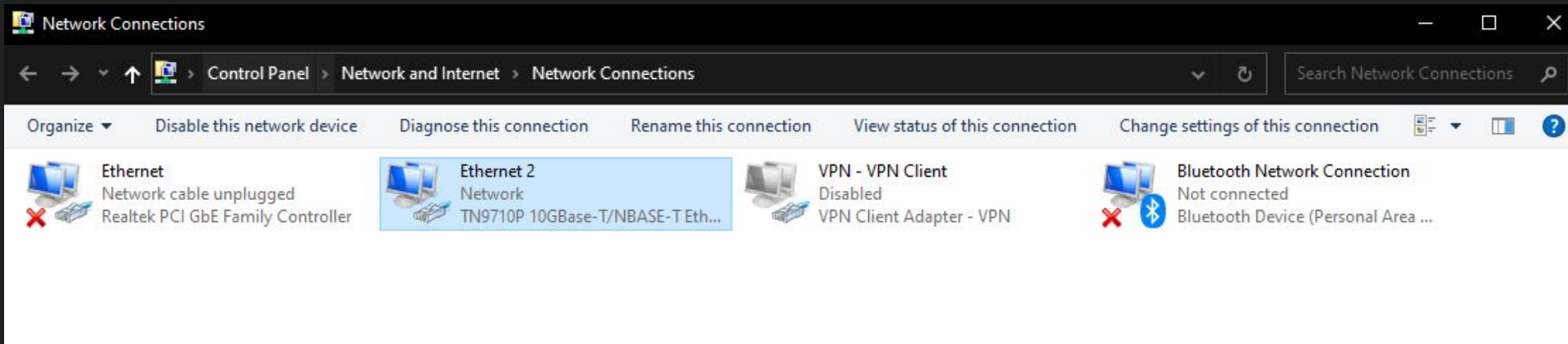
1. On your keyboard, press the “Windows” and “R” keys at the same time.
2. Enter “ncpa.cpl” in the window that pops up.

Note: Network connections will display the network adapters that are currently connected to your computer.



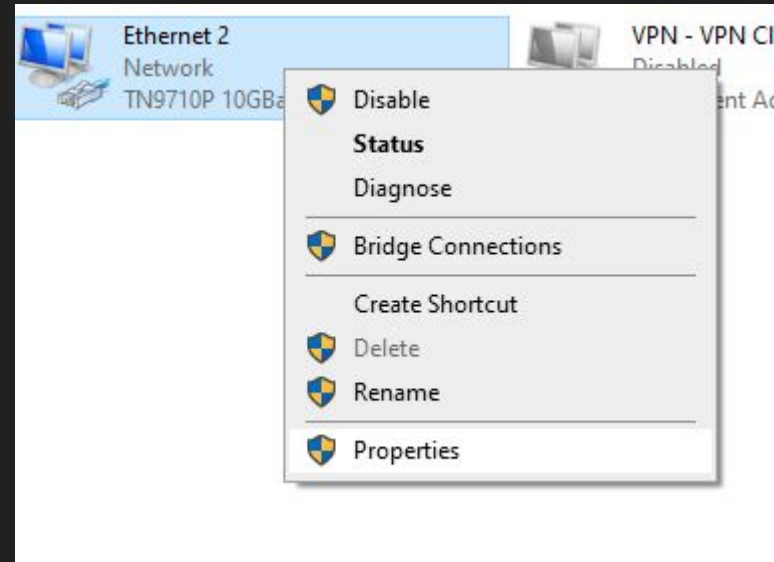
2. Select the Network Adapter

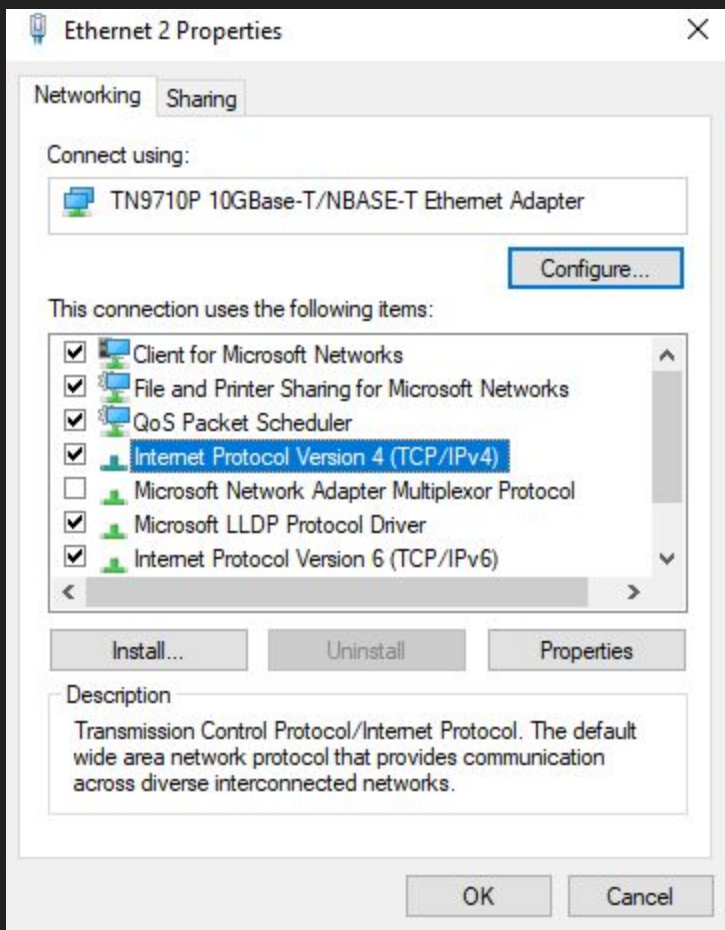
Right click on the network adapter that is currently connected to the device that you are trying to configure. Usually, it will be the adapter with the word "Ethernet" in the name.



3. Select Properties

Select "Properties" from the drop-down menu.





4. Select Internet Protocol Version 4 (TCP/IPv4)

Double-click on “Internet Protocol Version 4 (TCP/IPv4)”.

5. Manually enter IP address and subnet mask

Select "Use the following IP Address" and then input the following information in the corresponding fields:

IP address: Check the device that you are connected to in order to locate the IP address. The first three sets of digits should match. For this tutorial, we will use IP address 192.168.10.10.

Subnet mask: The subnet mask between the device that you are trying to connect to needs to be the same as your PC. For this tutorial, we will use subnet mask 255.255.255.0

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address: 192 . 168 . 10 . 10

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

☐ Validate settings upon exit

Advanced...

OK Cancel

6. Save Settings

Click the OK button on “Internet Protocol Version 4 (TCP/IPv4) Properties” window, and also click the OK button on “Ethernet Properties” window.

Note: The OK buttons must be clicked in both instances or your settings will not be saved.

Internet Protocol Version 4 (TCP/IPv4) Properties

General Alternate Configuration

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☒ Obtain an IP address automatically

☐ Use the following IP address:

IP address: . . .

Subnet mask: . . .

Default gateway: . . .

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

☐ Validate settings upon exit

Advanced...

OK Cancel

7. Revert Back to DHCP

To set your computer back to DHCP, repeat steps 1-4 again. When you get to the "Internet Protocol Version 4 (TCP/IPv4) Properties" window, click "Obtain an IP address automatically". This will allow your PC to be assigned a random IP address on your network.

Note: The OK buttons must be clicked in both instances or your settings will not be saved.

DNS

It stands for Domain Name System.

It is used to help identify a device by using names.

Normally the location of a device is identified by IP address.

IP addresses are difficult to remember.

In place of this we use domain names i.e. `ibm.com` or `microsoft.com`

Computers however don't understand domain names so we have to have a way to convert the name to an IP address.

Proof?

You can actually just type in an IP address into the URL address bar of a browser and it will work.

Try 204.146.30.17

What is the domain name that is attached to this IP?

ibm.com

Which is easier to remember and use?

Obviously ibm.com!

How does it work?

When you type a domain name in the URL address bar, the DNS server that was assigned to your computer will search through its database to find the IP address that matches with the domain name you entered.

For example, what would the DNS server return

If games.com was entered into the address bar?

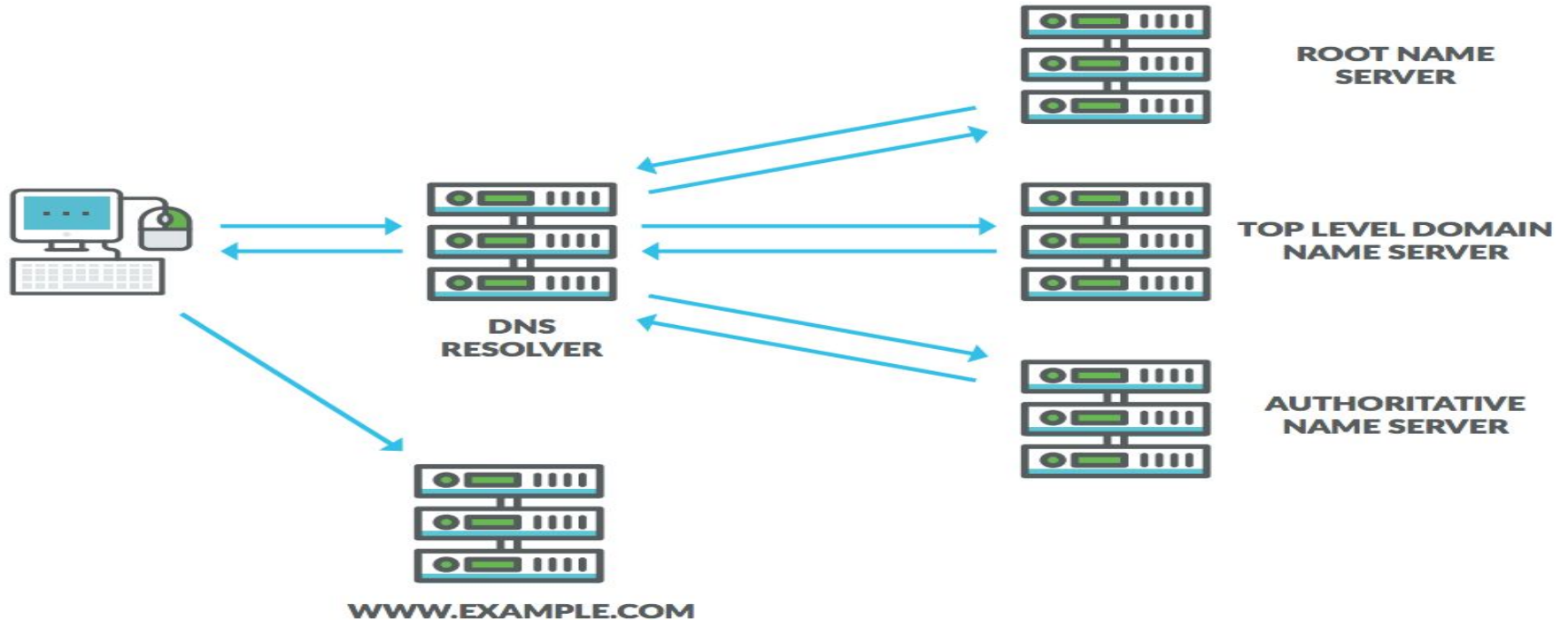
134.58.25.220!

DOMAIN NAME	I.P. ADDRESS
GOOGLE.COM	194.74.18.28
NEWS.COM	224.16.44.59
GAMES.COM	134.58.25.220
NETWORK.COM	25.45.248.78

Specific Steps

1. Enter domain name
2. Computer checks its own cache memory for the IP address
3. Can't find there...then it sends a request to the **Resolver Server** (usually found at your ISP)
4. Can't find there....send its onwards to the **Root Server** (top of the DNS hierarchy....13 of them around the world)
5. The Root Server directs the Resolver to where it can find the IP address.
6. It directs the Resolver to TLD Server based on the end part(top level domain) of the domain i.e. com,org,ca etc
7. The TLD server then redirects the Resolver to the Authoritative Name Servers (final server to query) that have the info on the rest of the domain name i.e. ibm
8. 8. Resolver then stores the IP in its cache memory in case another request is made later on!

Visual Representation



QnE

1. What does DNS stand for?

Domain Name System

2. List the names of the different server used in resolving the IP address of a domain name.

Resolver Server, Root Server, TLD (Top-Level Domain) Server, Authoritative Name Server

3. Do some research and list at least 5 different top level domain names.

.com, .org, .net, .edu, .gov

4. Go to <https://dnschecker.org/all-dns-records-of-domain.php?query=ibm.com&rtype=ALL&dns=google> and use the tool to find the IP address of 5 different domain names. List each domain next to their IP address.

google.com → 142.250.72.206, yahoo.com → 98.137.11.163, microsoft.com → 40.76.4.15, cnn.com → 151.101.1.67, amazon.com → 205.251.242.103

5. Do some research and find the IP address of Google public DNS servers.

8.8.8.8 and 8.8.4.4

6. Find and list the names and IP address of at least 2 other DNS servers.

Cloudflare DNS → 1.1.1.1, OpenDNS → 208.67.222.222

7. nslookup is a command line utility in windows that allows you to check for the IP address of a domain name. Do some research into how to use this utility and then using it list the IP address and aliases of at least 3 domain names.

nslookup google.com → 142.250.72.206, nslookup yahoo.com → 98.137.11.163, nslookup microsoft.com → 40.76.4.15

8. Using nslookup and performing some research, find the authoritative DNS servers for godaddy.com.

NS75.DOMAINCONTROL.COM

9. Most computers and devices connect to a local network using DHCP and DNS servers that are automatically configured in Windows. DNS servers are sometimes the cause of certain types of internet problems, and changing them can help troubleshoot the problem.. Do some research and describe how you can manually set the DNS servers your computer will use. Include screenshots. Enter 8.8.8.8 and 8.8.4.4

10. Explain how you can do the same using the windows command line prompt. Include screenshots.

netsh interface ip set dns name="Ethernet" static 8.8.8.8

netsh interface ip add dns name="Ethernet" 8.8.4.4 index=2

11. Connect your computer to a router. Find the settings page on your windows machine and assign yourself a static IP. Restart your computer. Using `ipconfig/all` verify the information.

Set manually via adapter settings; restart computer; run `ipconfig /all` to confirm static IP.

12. Make the necessary changes so that your computer will obtain a dynamic IP address. Restart the computer again and use `ipconfig/all` to verify.

Set IPv4 to obtain IP address automatically; restart; confirm with `ipconfig /all`.

13. Test a network with 2 computers. Assign each a static IP address, using the same subnet mask. Restart both computers and try pinging each other. Make sure to turn off your firewall. If the firewall is off and you still can not ping each other than check your settings i.e. IP address and, network address and host address.

Assign static IPs on same subnet (e.g., 192.168.1.2 and 192.168.1.3); disable firewall; use ping command.

14. How can you determine that DHCP is being used through the use of the `ipconfig/all` command?

Look for "DHCP Enabled: Yes" in the output.

15. Why is using DHCP better than manual assignments?

It's automatic, avoids conflicts, and is easier to manage in large networks

16. Set up your two computers to use DHCP. This time find the setting on your router that allows you to specify the range of allowable assigned addresses. Set the range to be within 10 host IP addresses of each other. Restart each computer and check if their IP addresses are in the given range.

Set range (e.g., 192.168.1.100 to 192.168.1.110); restart devices; check with `ipconfig /all`.

17. What is a lease on a DHCP assigned IP address?

It is a time period that an IP is assigned to a device before renewal is needed.

18. What is the purpose of a lease?

To allow reuse of IPs when devices disconnect or shut down.

19. What could happen if there were no leases in IP assignments?

IP addresses could become exhausted or cause conflicts.

20. What are reservations on a DHCP server? Explain using the following image:

It ensures a device always gets the same IP based on its MAC address.



ADDRESS RESERVATION		
IP Address	Device Name	MAC Address
10.0.0.1	MY-PC	00:17:30:46:72:04

21. Open the following document and go through it to learn how to set up a network using a DHCP and DNS server:

<https://docs.google.com/document/d/1xrh9J9PYjP6FcQCsXjmTvGVLatkcVvmXEFJMIY9FpcA/edit?usp=sharing>