# Understanding basic network terms like IP, TCP/IP, DNS, DHCP, and more.

Questions;

## What is your public IP address right now, and how did you find it?

There are several ways to find your own public IP address.

One of the easier ways is to use a webpage that is made for it. Go to google and find the page named; “ip-lookup.net”.

You could also do it with the terminal:

Windows CMD; “nslookup myip.opendns.com resolver1.opendns.com”

Linux; “dig +short myip.opendns.com @resolver1.opendns.com”

**Home - My public IP is the following; “5.186.122.190”.**

**School - My public IP is the following; “5.179.80.205”.**

That is at least for now, ever so often the public IP address changes for your devices that are connected to the internet. This is due to the way of how ISP’s(Internet Service Providers) use a DHCP(Dynamic Host Configuration Protocol) to assign IP addresses to your devices. That is at least the case with “Fiber network”, as far as I could researched.

Some routers have their own DHCP servers and are able to provide all the machines connected to that internet with a IP address if needed.

A server(Local NAS), or online server would be nice to have a static IP address. Always the same place to connect to. However if you aren’t a sort of server maybe a printer it would be inefficient to provide a static IP address, since it would “block” other users from using that IP address on the network. It’s inefficient since there only are a certain amount of IP addresses.

## What is your private IP address right now (do this both at home and in school), and who/what gave you that address?

Yet again there are several ways to find your own private IP address.

Windows CMD; “ipconfig”

Linux; “ifconfig”

On windows you also could go through the following steps.

[Win-key] -> [Network status] -> [WiFi or Ethernet] -> [Hardware Properties]

**Home - My current private IP is the following; “192.168.1.175”.**

**School - My current private IP is the following; “10.50.138.75”.**

Second part of the question is, “Who/What gave you the private IP address?

**The thing that provides us with a private IP address is our router**. The router redirects your devices request for an IP address to the correct DHCP(Dynamic Host Configuration Protocol) server. Then the DHCP server sends a package to your device with an offer. Then your device sends back a request to let the DHCP server know that you intend to use that IP address and then at last the DHCP server sends a Acknowledgement packet back confirming that your device has ben given a lease on the address for a server-specified period of time.

## What’s special about these address ranges?

The following IPv4 address ranges are reserved by IANA(Internet Assigned Numbers Authority) for private internets, and are not publicly routable on the global internet.

* 10.0.0.0 – 10.255.255.255 (10.0.0.0/8 IP addresses)
* 172.16.0.0 – 172.31.255.255 (172.16.0.0/12 IP addresses)
* 192.168.0.0 – 192.168.255.255 (192.168.0.0/16 IP addresses)

However only a portion of the 172 and 192 ranges are designed for private use. The remaining addresses are considered public and therefore are routable on the global internet.

## What’s special about this ip-address: 127.0.0.1?

**The address 127.0.0.1 is a special purpose IP address called “*localhost*” or “*loopback address*”.** It is a reserved IP address that all computer use as their own but it doesn’t let them communicate with other devices as a real IP address does.

Technically the entire range from 127.0.0.0 to 127.255.255.255 is reserved for loopback purposes, but you’ll almost never see anything but 127.0.0.1 used in the real world.

## What kind of service would you expect to find on a server using these ports: 22, 23, 25, 53, 80, 443?

* 22

SSH remote login protocol.

* 23

Telnet application protocol.

* 25

Simple mail transfer protocol.

* 53

Domain Name System (DNS).

* 80

HTTP, Hyper Text Transfer Protocol.

* 443

HTTPS, Hyper Text Transfer Protocol Secure.

## What is the IP address of https://studypoints.info and how did you find it?

We can find the IP address in multiple ways again.

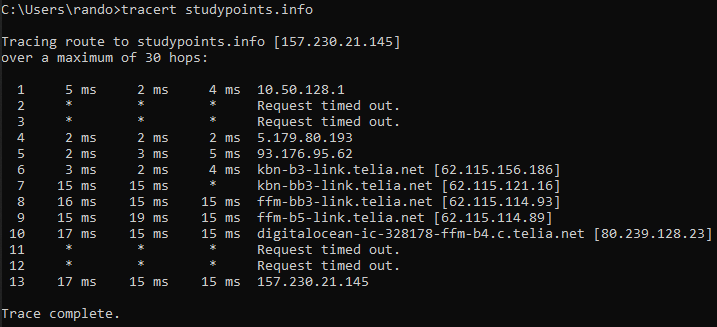
We can find the IP address by using a DNS lookup tool on the internet, we could use the tracert CMD function and we could ping the address from CMD.

I used mxtoolbox.com and their DNS lookup tool. There I typed in the URL from the question and got the result down below;

**Mxtoolbox.com; 157.230.21.145**

**Windows CMD; “tracert studypoints.dk” 157.230.21.145**

**Windows CMD; “ping www.studypoints.dk” 157.230.21.145**



## If you write https://studypoints.info in your browser, how did “it” figure out that it should go to the IP address you discovered above?

**The short answer is that the browser checks the cache for a DNS record to find the corresponding IP address of the URL typed into the search bar.**

To find the DNS record, the browser checks four caches;

First, it checks the browser cache. Second, the browser checks the OS cache. Third, it checks the router cache and fourth it checks the ISP’s own DNS cache.

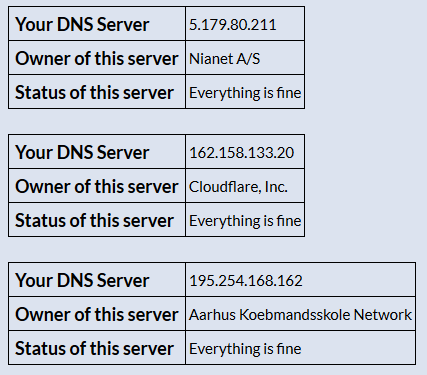
If the ISP’s DNS cache doesn’t have the IP in their server, then they initiate a query to find the server that hosts the webpage(URL) in order to find the IP.

## Explain shortly the purpose of an ip-address and a port-number and why we need both

**To put it simply and short, IP addresses are to identify the hosts and port numbers are to identify/differentiate type of services on the hosts.**

## What is your (nearest) DNS server?

<http://www.whatsmydnsserver.com/>



We can look up our DNS server through the link up above and find the information like shown in the picture.

## What is (conceptually) the DNS system and the purpose with a DNS Server?

**What I believe a great analogy to a DNS system and Server would be like having a Phone book.**

**It is basically a big collection of names that are connecting numbers.**

## What is your current Gateway, and how did you find it?

Home - Windows CMD; “ipconfig” Look for Default Gateway – **“10.50.128.1”**

## What is the address of your current DHCP-Server, and how did you find it?

Home - Windows CMD; “ipconfig /all” Look for DHCP Server – **“10.255.1.10”**

## Explain (conceptually) about the TCP/IP-protocol stack

TCP/IP (Transmission Control Protocol/Internet Protocol).

The TCP/IP is best explained in layers; “Application, Transport, Internet, Network”.

Application;

This layer is what programs like our web browser directly interact with. This layer has protocols like; “HTTP, HTTPS, SMTP(Simple Mail Transfer Protocol)”.

Transport;

This layer is where TCP lives. After the Application Layers receives the data from whatever program you’re using, it talks to the Transport Layer through certain ports depending on what type of data we are dealing with. This also allows the TCP to know where the data is coming from. Then what TCP does is it packs the data into multiple smaller packets. Then the packets can individually take the quickest route over the internet, to get where ever it is they are going.

The ports I’m mentioning here are the ones we see as an example from question 6.

What kind of service would you expect to find on a server using these ports: 22, 23, 25, 53, 80, 443?

To make sure that the receiving computer can put the packets back together properly, TCP adds a “Header” to each packet that contains instructions on what order to reassemble the packets into, as well as error checking information, so the receiving computer knows if the packets arrived without any problems. After this is done the packets are pushed onto the Internet Layer.

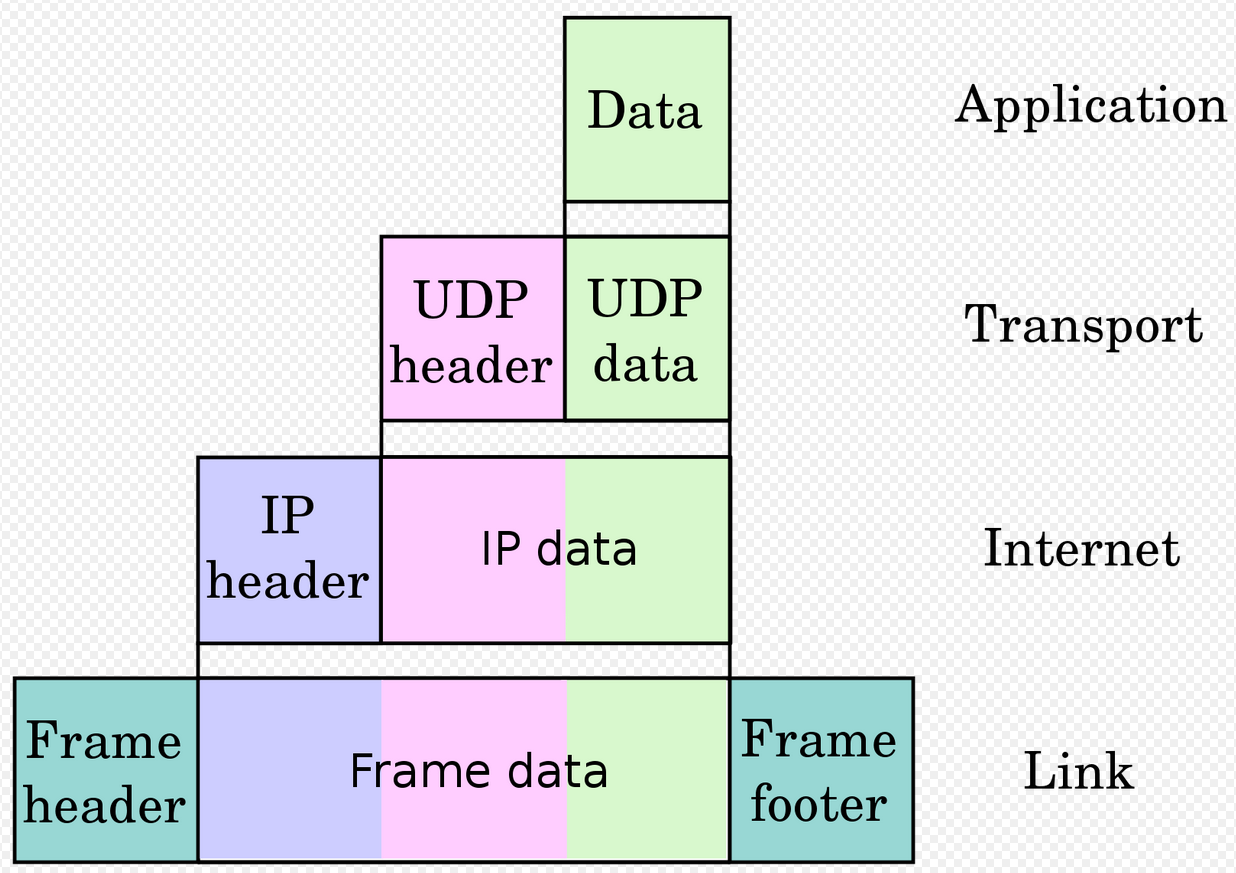
Internet;

This layer uses the Internet Protocol to attach both the “Origin” and “Destination” IP addresses. This makes the packet know where it came from and where it’s going. The data is then sent through the final layer.

Network;

This layer handles things like “MAC addressing” so that the packet goes to the right physical machine, as well as converting the data to electrical impulses that will pass through the network cables.

Example model picture down below.



## Explain about the HTTP Protocol (the following exercises will go much deeper into this protocol)

(Hyper Text Transfer Protocol) HTTP. HTTP is the underlying protocol used by the World Wide Web(WWW) and this protocol defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands.

HTTP is a pull protocol, the client pulls information from the server (instead of server pushes information down to the client).

For example, when you enter a URL in your browser, this actually sends an HTTP command to the Web server directing it to fetch and transmit the requested Web page. The other main standard that controls how the World Wide Web works is HTML, which covers how Web pages are formatted and displayed.

## Explain (conceptually) how HTTP and TCP/IP are connected (what can HTTP do, and where does it fit into TCP/IP)

The HTTP protocol belongs to the Application layer as explained up above.

An example could be as the following. When you enter a URL in your browser, this actually sends an HTTP command to the Web server directing it to fetch and transmit the requested Web page.