Every operating system contains numerous built-in command line networking utilities. These tools range from the obscure to the commonplace. We will not visit all of them but the ones who are closely related to this week’s lecture topic on Network Services. The two services will be focusing on are the DNS (Domain Name System) and DHCP (Dynamic Host Configuration Protocol). The following tasks aim to help you familiarise yourselves with the concepts of IP addresses, networks, routing, and hostnames.

Hints:

* You can perform all the tasks above by connecting remotely to a university computer, like you are physically on campus. Read below how.
* If you want to connect to the university network, follow [the instructions provided on myport.ac.uk](https://kb.myport.ac.uk/Article/Index/12/4?id=2669)
* You can connect remotely to a Windows university computer by [following the instructions found on myport.ac.uk](https://kb.myport.ac.uk/Article/Index/12/4?id=3982)
* You can connect remotely to a Linux university computer by [following the instructions found on myport.ac.uk](https://myport.port.ac.uk/guidance-and-support/pc-availability-it-support/using-university-computers-and-laptops/remote-access-to-lab-computers)

**Task 1:**

Network information about your network connection. Complete one of the following depending your current location.

1. **If you are using one of the university computers** and have booted up with Windows, click the windows symbol on the bottom left corner and search for CMD (Command Prompt).
   * Then type **ipconfig /all** to find out information about your current network configuration for the adapter you are using.
   * You might want to repeat the same task by booting with **Linux** and using the **ifconfig** command.
2. **If you are trying to complete the task remotely:**
   * Follow the same steps as above and identify the network adapter you are using to access Internet, in case more than one adapter appear.
   * Try to complete the above task by connecting to the [university VPN network](https://kb.myport.ac.uk/Article/Index/12/4?id=2669). Are you collecting different information now?

Record below the following information:

|  |  |
| --- | --- |
| Parameters | Value |
| Physical (MAC) Address | 80-B6-55-BA-82-19 |
| DHCP Enabled? | Yes |
| IPv4 Address | 10.128.11.214(Preferred) |
| Ipv6 Address |  |
| Subnet mask | 255.255.254.0 |
| Lease obtained | 28 September 2023 09:55:21 |
| Lease expires | 28 September 2023 10:55:21 |
| Default Gateway | 10.128.11.254 |
| DHCP Server(s) | 148.197.10.226 |
| DNS Server | 148.197.3.39 |

Can you check with the person next to you if you get any similar results? If yes, which parameters are common? Why do you think this is happening?

If you have a laptop that is connected to the university Wireless (802.11) network, try to collect the same information as above.

**Task 2:**

All network communications take place with the use of IP addresses. Humans find it easier to remember words than numbers so the Domain Name System (DNS) is a network service that allows the translation between IP addresses and domains. Every DNS server keep a register of several IP addresses and related domains.

Can you find the IP addresses (IPv4 & Ipv6) that correspond to the following domains? You can use the command prompt. Try to find them by using the **nslookup** command through the command prompt**.** For example, type: **nslookup 8.9.10.11** or **nslookup www.abc.xyz**

|  |  |  |
| --- | --- | --- |
| Domain | Ipv4 format | Ipv6 format |
| www.google.co.uk | 216.58.201.99 | 2a00:1450:4009:826::2003 |
| www.bbc.co.uk | 212.58.236.129  212.58.237.1  212.58.237.129  212.58.235.1  212.58.236.1  212.58.235.129 |  |
| www.bbc.com | 212.58.235.130  212.58.237.2  212.58.237.130  212.58.235.2  212.58.236.2  212.58.236.130 |  |
| www.iana.org | 192.0.46.8 | 2620:0:2830:200::b:8 |
| mail.port.ac.uk | 142.250.200.19 | 2a00:1450:4009:822::2013 |
| www.port.ac.uk | 96.17.178.77  96.17.178.46 |  |
| www.fbi.com | timeout |  |
| www.fbi.gov | 104.16.149.244  104.16.148.244 | 2606:4700::6810:94f4  2606:4700::6810:95f4 |

Try using the **nslookup** to identify the hostnames for the following IP addresses.

|  |  |
| --- | --- |
| IP address | Hostname |
| 8.8.4.4 | google |
| 208.67.222.222 | opendns |
| 208.67.220.220 | umbrella |
| 157.240.1.35 | facebook |
| 199.59.149.230 | twitter |
| 198.41.0.4 | Root server |
| 193.0.14.129 | Root servers |
| 192.168.14.12 | Non existent |

Are you able to map all IP addresses to a hostname? If no, could you explain why?

**If you are working remotely**, try to perform the above tasks using your home connection initially and then connect to the university VPN. Do you identify any differences to the answers between the two methods? If yes, what are the differences? Any thoughts why?

**Task 3:**

The TRACERT utility determines the route to a destination by sending an Internet Control Message Protocol (ICMP) echo packet to the destination. TRACERT prints an ordered list of all the intermediate routers (**hops**) a data packet needs to travel through in order to get to the destination e.g. the Facebook web server.

Try to run the **tracert** command for the following IP addresses/hostnames and check how many hops (routers) exist between your computer and the destination.

|  |  |
| --- | --- |
| Destination | Number of hops |
| 8.8.8.8 | 8 |
| www.iana.org | 10 |
| 148.197.20.140 | 4 |
| 1.0.0.19 (Australia) | 8 |
| 213.128.159.10 (Hamburg-Germany) | 12 |

Why the difference in the number of hops between the various destinations?

Do you observe any commonalities in the produced results for the above destinations?

Is Australia closer than Germany?

**If you are working remotely**, try to perform the above tasks using your home connection initially and then connect to the university VPN. Do you identify any differences to the answers between the two methods? Any idea why?

**Task 4:**

IP networks use routing tables to direct packets from one network (subnet) to another. The Windows Route utility allows you to view the device’s routing tables. To identify the routing table of your devices you simply type **ROUTE PRINT** on Command Prompt. Take a screenshot of the produced table(s) and attach on this document. What information can you get from the produced routing table?

We will be revisiting the term routing table in the following weeks.

A screenshot of a computer

Description automatically generated

**Task 5:**

Have we missed to mention a specific networking command that you have used during the NETWORKS module? If you haven’t attended the NETWORKS module from last year, can you think of the simplest networking command that exist out there? Ping and hostname