# INF2010S: Networking

**Assignment 2**Computer Networks

Due Date: Wednesday 8th September 2021 @ 11:55PM.   
Version: 0.1, revised 27 August 2021   
Instructor: Grant Oosterwyk

**Instructions**

This assignment is made up of 5 sections. Go through each section carefully reading and following all instructions. The end of each task specifies what should be submitted. It is highly recommended that you do this assignment using a PC that can access the internet. It is important that you have studied all of Week 1 to 3 material as the concepts have been covered in those lectures. The assignment is out of **65 marks**. ***Start working on it as soon as possible. Some questions will require research. Leaving it for the last moment will not work.***

**Deadline**:

**Wednesday 8th September 2021 @ 11:55PM**. A 5% penalty per day after the deadline will be applied. If you choose to resubmit your assignment after the deadline, the automatic extension rule will apply. Your final submission should contain: A neat Word document with clearly reasoned answers. Remember to include

* First page: specifying key info – full name, student number, assignment title;
* Second page: Plagiarism declaration;
* 2 text files
  + myipconfig.txt
  + mytracert.txt

# **Question 1: Network Configuration** **[12]**

This task makes use of a command line utility, ‘ipconfig’ (Windows) OR ‘ifconfig’ (MacOS), which displays all current TCP/IP network configuration values and can be used to refresh and modify Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings. You can go to Microsoft documentation page to learn more about ipconfig syntax (<https://docs.microsoft.com/en-us/windows-server/administration/windows-commands/ipconfig>). For Mac users, go to <https://ithelp.brown.edu/kb/articles/find-the-mac-address-of-a-computer-or-device>

To complete this task, execute the ipconfig command by typing the ipconfig /all on your command prompt screen or terminal (Mac). (**\*Hint: Read the Week 3 notes entitled “The Internet”**). This will display all TCP/ IP protocol information on the command prompt screen. You can select and copy all details to a text file and name the file as ipconfig.txt. Alternatively, you can run the ipconfig command and, at the same time, instruct it to write the output to a text file (instead of displaying it). To do so type ipconfig /all >documents\myipconfig.txt. The myipconfig.txt is the file name to be created and ‘documents’ the folder where the file will be opened. Note that you can direct the output to any file of your choice by specifying correct path.

Now, inspect your ipconfig output and use it to answer the following questions:

1. How many network interfaces/adapters does your device have? Name and briefly describe the role of each of the interfaces/adapters. [3 marks]
2. Which of your network interfaces is currently active/connected? [1 Mark]
3. Briefly describe (their functions) and provide values (according to your network) of the following:
   1. Subnet Mask [2 Marks]
   2. (Default) Gateway [2 Marks]
4. Given the subnet mask value you have provided in the question above, determine the following (and briefly describe how you have obtained your answers)
   1. Network address/prefix [2 Marks]
   2. The number of hosts that the network can accommodate [2 Marks]

# **Question 2: Reachability and Availability [10]**

This task uses the tracert command to find the router level path from your computer to a remote Internet host. The tracert command is a standard command-line utility for discovering the Internet paths that your computer uses. It is widely used for network troubleshooting. It comes pre-installed on Window and Mac, and can be installed using your package manager on Linux. On Windows, it is called “tracert”. It has various options, but simply issuing the command tracert www.uct.ac.za will cause your computer to find and print the path to the remote computer (here [www.uct.ac.za](http://www.uct.ac.za)). (**\*Hint: Read the Week 3 notes entitled “The Internet”**)

To write tracert output to a file, on the command prompt type: tracert en.wikipedia.org > documents\mytracert.txt and press Enter. The mytracert.txt file is to be created

and ‘documents’ simply refers to the folder where the file will be saved. You can direct the output to any file of your choice by specifying correct path.

Now, inspect your tracert output and use it to answer the following questions:

1. How many network hops did it take from your machine to the wikihow.com web server? [3 Marks]
2. What is the IP address of wikihow.com, based on your output? [1 Mark]
3. Use another network command, ping, to uncover the IP address of wikihow.com
   1. What is the IP address? Is it the same as the one in the question above, or not? [1 Mark]
   2. How many packets of data were sent and received? [1 Mark]
4. Use the network command, ping, to find the IP addresses of the following sites:
   1. [www.mit.edu](http://www.mit.edu) [1 Mark]
   2. [www.ted.com](http://www.ted.com) [1 Mark]
   3. localhost – what does this transaction tell you? [2 Marks]

# **Question 3: Study of LAN environment [10]**

Find out information about the network in your current environment (residence, at home, library or in a coffee machine).

1. Using the “arp -a” command in terminal/cmd show the total connected devices.

[3 Marks]

1. Are the IP addresses assigned to the devices/machines statically or dynamically?

[2 Marks]

1. Does the network have a DHCP server? (a network server that automatically provides and assigns IP addresses, default gateways and other network parameters to client devices-Wiki). [2 Marks]
2. If yes, what is the address of the server? Provide the full command and output (i.e., using a screenshot). [3 Marks]

# **Question 4: Networking Fundamentals [15]**

1. Write functions of each layer of OSI reference model, also differentiate between hardware and software layers. Explain in your own words why the Network layer of OSI model is called Internet layer in TCP/IP networking model? [5 marks]
2. Compare and describe the OSI protocol suite with the TCP/IP protocol suite.   
    [5 marks]
3. Many LANs requires both wired and wireless connectivity. Compare the appropriateness of different media types which may be used to enable network connectivity. [5 marks]

# **Question 5: Networking Troubleshooting [18]**

You were recently employed as a Network Engineer at UCT in the ICTS department and received a complaint from a student transferring data between two sites directly connected to the UCT network saying that his/her data is taking forever to transfer. The student is blaming the "slow" network for this although both sites have 10Gbps connections.

The endpoint at Site A is a server maintained by the student.

The endpoint at Site B is a high-performance computing cluster.

You have been tasked to investigate.

1. What could the possible causes for slow data transfer be? (list at least 3) [3 marks]
2. How would you identify the cause in this case? [4 marks]
3. What information would you request from the student? [3 marks]
4. What information would you request from the sites (endpoint administrators)? [4 marks]
5. Assuming that there are no problems on the UCT network (it is measurably delivering close to 10Gbps throughput) what would your recommendation to the student be? [4 marks]

-------oo000oo--------