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LAB 1: UNDERSTANDING NETWORKING WITH INTERNET TECHNOLOGIES
EXERCISE 1A: COMMUNICATION ARCHITECTURES

Classify the following installed communication modules into their appropriate layers in the TCP/IP architecture(ie protocol stack in figure 1.1):

Internet Protocol (IP) :Network Layer
Network controller card
(eg. Realtek PCIe GBE Family Controller) : Data Link Layer

EXERCISE 1B: ADDRESSING

Classify the use of the following addresses into their appropriate layers in the TCP/IP architecture(protocol stack in figure figure 1.1):

Port number : Transport Layer
IP address : Network Layer
MAC address : Data Link Layer

EXERCISE 1C: PHYSICAL/MAC/ETHERNET ADDRESSES

Determine the MAC address of your laboratory PC:

MAC Address : A4-BB-6D-5F-9E-7E
Manufacturer : Dell Inc.

EXERCISE 1D: IP ADDRESSES

NTU IP address range(**NOT** your PC IP address) : 155.69.0.0 - 155.69.255.255

Determine the special uses of the following IP addresses:

{ 127, <any> } : This IP address falls within the range of the loopback addresses which are used for internal testing and communication within a device.
{ 172.21, <any> } : This IP address falls within the private IP address range which is reserved for use within private networks and is not routable over the public Internet. They are commonly used for internal network addressing within organizations.

EXERCISE 1E: DYNAMIC HOST CONFIGURATION PROTOCOL (DHCP)

Determine the following for your laboratory PC:

DHCP Enabled : Yes
DHCP Server : 155.69.3.7
Network/Subnet Mask : 255.255.240.0

What is your IP address(from Ipconfig) : 10.96.177.131
What is the reported IP address from website (try https://whatismyipaddress.com/) : 155.69.194.63

Who is the owner of the IP address reported by the website? NTU

EXERCISE 1F: PORT NUMBERS

Determine the well-known ports for the following services:

TELNET : Port 23
Simple Mail Transfer Protocol (SMTP) : Port 25
Quote of the Day Protocol : Port 17
Domain Name Service (DNS) : Port 53
Hyper-Text Transfer Protocol (HTTP) : Port 80

EXERCISE 1G: DOMAIN NAMES

How do you register/buy a domain name under .sg, e.g. myweb.per.sg?

1. Choose an accredited domain registrar listed on the SGNIC website.
2. Check the availability of your desired domain name.
3. Provide your personal or organizational information.
4. Select the registration period (usually 1 to 10 years).
5. Make the payment for the registration fee.
6. Receive confirmation of your domain registration.
7. Manage your domain settings through the registrar's website.

EXERCISE 1H: DOMAIN NAMES/IP ADDRESSES TRANSLATION - DOMAIN NAME SYSTEM (DNS)

Determine the followings:

Local DNS servers for your laboratory PC : 155.69.3.8
155.69.3.9

Authoritative DNS servers for ntu.edu.sg : DNSTEX.NTU.EDU.SG(155.69.254.5)
DNSTEX1.NTU.EDU.SG(155.69.254.230)

IP address of domain name www.ntu.edu.sg : 155.69.3.8

What is the command to show the entries in the DNS cache? ipconfig /displaydns
What is the command to clear the entries in the DNS cache? ipconfig /flushdns

EXERCISE 1J: PROPRIETARY MICROSOFT WINS

Determine the followings for your laboratory PC:

NetBIOS/Host name : hwl1-va02
Primary WINS server : 155.69.5154
Secondary WINS server : 155.69.5.54

EXERCISE 1K: DEFAULT GATEWAY

IP address of default gateway : 10.96.191.254

EXERCISE 1L: IP ADDRESS/PHYSICAL ADDRESS TRANSLATION - ADDRESS RESOLUTION PROTOCOL (ARP)

Physical MAC address of default gateway : 00-00-0c-9f-f0-f0 (using command arp -a)

EXERCISE 1M: NETWORK REACHABILITY - *PING* COMMAND

ping your neighbour's PC and run ***arp*** command again. Do you see your neighbour's PC listed? Why?
When I ping my neighbor's PC, my device learns its MAC address and stores it in the ARP cache. So, if I run the ARP command again, I will see my neighbor's PC listed.

Physical address of neighbour's PC : a4-bb-6d-61-d1-87

EXERCISE 1N: TRACE ROUTE - *TRACERT* COMMAND

How many routers are separating your laboratory PC and the local DNS servers?
1 <1ms <1ms <1ms 10.96.191.252

2 1ms <1ms <1ms 172.30.146.194

3 <1ms <1ms <1ms 172.30.2.189

4 <1ms <1ms <1ms ndc-dns-dhcp-01.ntu.edu.sg [155.69.3.8]

So, 4 intermediate routers. As the packets travel from my laboratory PC to the first hop (10.96.191.252), then to the second hop (172.30.146.194), then to the third hop (172.30.2.189), and finally to the local DNS servers (ndc-dns-dhcp-01.ntu.edu.sg, IP address 155.69.3.8).

Run ***arp*** command again. Can you find the MAC address of the DNS servers? Why?
No, I cannot, because my DNS server is not directly connected to my device, the arp -a command only provides information about the devices that are directly connected to my device. In other words, this is because ARP resolves MAC addresses only for devices within the same local network segment, and the DNS servers are likely in a different segment.