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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-61-D7-8F
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> } : They are special use addresses for use as internet host loopback address.
{ 172.21, <any> } : They are private IP addresses used in private network, usually used for LANs and enterprise environments.

EXERCISE 1E: DYNAMIC HOST CONFIGURATION PROTOCOL (DHCP)

Determine the following for your laboratory PC:

DHCP Enabled : Yes
DHCP Server : 155.69.3.8
Network/Subnet Mask : 255.255.240.0

What is your IP address(from Ipconfig) : 10.96.181.165
What is the reported IP address from website (try https://whatismyipaddress.com/) : 155.69.192.63

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

EXERCISE 1G: DOMAIN NAMES

How do you register/buy a domain name under .sg, e.g. myweb.per.sg?
First, check the availability of the domain name you intend to register. By visiting www.sgnic.sg and keying in the domain name, you can check whether the domain name is available. Second, if the domain name is available, you can register your .sg domain name with any of registrars accredited by SGNIC. Third, pay registration price to the registrar for the registration. SGNIC will not be charging directly for the registration.

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 and 155.69.3.9

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

IP address of domain name www.ntu.edu.sg : 104.16.4.14

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-va33
Primary WINS server	: 155.69.5.154
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

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?
Yes. Because both IP addresses are on the same subnet and an ARP request is made. If IP is found in ARP cache, then it can be directly used and my neighbours's PC is already listed.

If not, then a broadcast is performed until my PC receives the reply containing its IP address and the corresponding physical address. Then the ARP cache would record the physical address and its corresponding IP address of my neighbour's PC for efficiency use. In both situations, my neighbour's PC is listed in ARP cache entries.

Physical address of neighbour's PC : a4-bb-6d-5f-cb-68

EXERCISE 1N: TRACE ROUTE - *TRACERT* COMMAND

How many routers are separating your laboratory PC and the local DNS servers? 3

Run ***arp*** command again. Can you find the MAC address of the DNS servers? Why?
No. Because the DNS servers do not use the same subnet as my PC. They use different local subnets. They only communicate through the gateway and cannot use the ARP request which is only used in the local subnet. Therefore, the MAC address will not be recorded in the ARP cache table.