Student Name : __Tuan Ding Ren_____

Group : ____SCEX_____

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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) :
Intel(R) Ethernet Connection (11) I219-LM: Data Link Layer
Intel(R) Wi-Fi 6 AX201 160MHz: Physical Layer
Microsoft Wi-Fi Direct Virtual Adapter: Data Link Layer
VMware Virtual Ethernet Adapter for VMnet: Data Link Layer
ASIX AX88179 USB 3.0 to Gigabit Ethernet Adapter: Physical 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 : B4-0E-DE-2E-2F-C0
Manufacturer : Intel Corporation

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> } : Used for loopback or localhost address for a computer to refer to itself and use it as its own IP address. It is not used to communicate with other devices.
{ 172.21, <any> } : It's a range of IP address used for communication in the private network only.

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) : 10.96.184.45
What is the reported IP address from website (try https://whatismyipaddress.com/) : 155.69.192.3

Who is the owner of the IP address reported by the website? Nanyang Technological University

EXERCISE 1F: PORT NUMBERS

Determine the well-known ports for the following services:

TELNET : 23
Simple Mail Transfer Protocol (SMTP) : 587
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?
Can register our .sg domain names with any of the registars accredited by SGNIC, Singapore Network Info Centre

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-vb25
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 neighbours PC w IP address is shown there since neighbour's PC is on same LAN and thus uses

Physical address of neighbour's PC : IP addr : 10.96.179.178 maps to a4-bb-6d-5f-ca-55

EXERCISE 1N: TRACE ROUTE - *TRACERT* COMMAND

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

Run ***arp*** command again. Can you find the MAC address of the DNS servers? Why?

No. ARP only maps local IP addresses on the same LAN to MAC addresses. Neighbours PC is on the same LAN thus the mappings are stored in the ARP cache, but the DNS server is not on the same LAN thus ARP is not used at all when communicating with the DNS server.