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Date : 30/8/21

Location (On/Off campus) when you did the experiment: On

# 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) : Layer 3 Network Layer

Network controller card

(eg. Realtek PCIe GBE Family Controller) : Layer 2 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 1.1):

Port number : Layer 4 Transport Layer

IP address : Layer 3 Network Layer

MAC address : Layer 2 Data Link Layer

# EXERCISE 1C: PHYSICAL/MAC/ETHERNET ADDRESSES

Determine the MAC address of your PC:

MAC Address : 00-4E-01-BD-AB-CE

Manufacturer : Dell Inc., Intel(R) Ethernet Connection (7) I219-LM

# 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> } : Local Loopback Address is used to let a system send a message to itself to make sure that TCP/IP stack is installed correctly on the machine. (Localhost)

{ 172.21, <any> } : IP address ranges owned by and located at private network (Private IP)

# EXERCISE 1E: DYNAMIC HOST CONFIGURATION PROTOCOL (DHCP)

Determine the following for your laboratory PC:

DHCP Enabled : yes

DHCP Server : 155.69.3.8

IP Address : 172.21.144.175

Network/Subnet Mask : 255.255.248.0

What is your IP address(from Ipconfig) : 172.21.144.175 (Preferred)

What is the reported IP address from website(try https[://w](http://www.apnic.net/))ww[.a](http://www.apnic.net/))p[nic.net/)](http://www.apnic.net/)) :

155.69.177.9

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

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Page 1-1

# EXERCISE 1F: PORT NUMBERS

Determine the well-known ports for the following services:

TELNET :

23

Simple Mail Transfer Protocol (SMTP) : 25 Plain Text

587 Encrypted Communications

Domain Name Service (DNS) :

53

Hyper-Text Transfer Protocol (HTTP) :

80

Hyper-Text Transfer Protocol Secure (HTTPS) :

443

# EXERCISE 1G: DOMAIN NAMES

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

The term "http://www.mycompany.com.sg" is a URL (Universal Resource Locator). SGNIC registers only third level domain names (e.g. mycompany.com.sg) and not URLs nor hostnames (e.g. [www.mycompany.com.sg](http://www.mycompany.com.sg/)).

You can register your '.sg', '.com.sg', '.org.sg', '.net.sg' and '.edu.sg' domain names with any of the registrars accredited by SGNIC.

For '.gov.sg' applicants, please send your queries to [govsgreg\_opn@tech.gov.sg](mailto:govsgreg_opn@tech.gov.sg)

1. Go to any of the registrars accredited by SGNIC
2. Check availability of domain names
3. If domain names are available, purchase it. Else, use another domain name

# 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](http://www.ntu.edu.sg/) :

155.69.7.173

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 : swl2-r2-v045

Primary WINS server : 155.69.5.154

Secondary WINS server : 155.69.5.54

# EXERCISE 1K: DEFAULT GATEWAY

IP address of default gateway : 172.21.151.254

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

Physical MAC address of default gateway : 00-08-e3-ff-fc-a0

# 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?

Physical address of neighbour's PC : ac-e2-d3-46-9e-8d

Yes. The neighbour’s PC sits in the same LAN. When the neighbor;s PC is pinged, ARP sends a broadcast to every host on the network, including the neighbour’s PC. The neighbour’s ARP receives this broadcast and replies with an ARP reply. This record is then maintained in the ARP cahce for 2 minutes since the time that the entry is created. Since we check ARP cache immediately after pinging, the record is maintained.

# EXERCISE 1N: TRACE ROUTE - *TRACERT* COMMAND

How many routers are separating your laboratory PC and the local DNS servers (insert the output in your answer)?

  3 routers (don’t count the last one, hence 3). Output is attached below:

  Tracing route to dns-cits-02.ntu.edu.sg [155.69.3.8]

  over a maximum of 30 hops:

  1    40 ms    10 ms    <1 ms  172.21.151.254

  2     1 ms     1 ms    <1 ms  172.30.143.194

  3     1 ms    <1 ms     5 ms  172.30.2.189

  4     1 ms    <1 ms    <1 ms  dns-cits-02.ntu.edu.sg [155.69.3.8]

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

No. We cannot find the MAC address of the DNS servers as these servers are not within our local network as seen by how the route is first directed to the default gateway. Hence, we will not be able to find their IP addresses with ARP since ARP only converts IP addresses to 48-bit Ethernet address for transmission on the Ethernet LAN