FIT9137 Applied Session
Week 9

Topics

- Network Layer: Addressing
  - Subnets
  - Address Resolution
  - Dynamic Addressing
- Transport Layer - Reliable Communication

Covered Learning Outcomes:

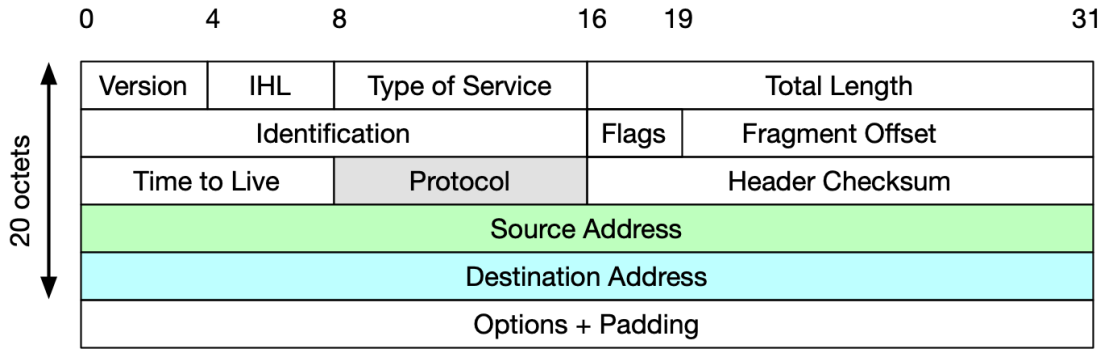
- Analyze and formulate the functions and architectures of local area networks, wide area networks and the Internet.
- Examine networks using the underlying fundamental theories, models, and protocols for data transmission.

Instructions

- One of the main purposes of an applied session is to build the learning community, create connections and include the learners. The other goal is to give and receive feedback from your peers and or your tutors.
- Form groups of 2 students (peers) to work through the exercises. If you meet a problem, try to solve it by asking direct questions to your peers. If the issue was not solved within peers, ask your tutor. If you did not get a chance to solve the problem during your applied session with your peer or tutor, jump into one of many consultation hours and ask any of the tutors to help you. Please visit the "Teaching Team and Unit Resources" tile in the FIT9137 Moodle site.

Activity 1: Network Layer – Addressing

Inspect the Internet Protocol Version 4 Header shown in Figure- and answer the questions. You can find a description of each field at:
https://tools.ietf.org/html/rfc791#page-10



Internet Protocol Version 4 Header

a) What is the purpose of an IP address?
b) What is the size of Source and Destination Address fields?
c) What is the total number of possible IPv4 Addresses?
d) If the binary representation of an IP address is as follows what is the dotted decimal notation of the address?

```
11001010000010010101111110111100
```

Activity 2: Answer the following questions regarding IPv4 addresses

a) Explain Classful addressing.
b) Explain Classless addressing.
c) Why is Classless addressing used instead of Classful addressing?
d) How is the network and host part of an IP address identified in Classless addressing?

Activity 3: IPv4 Addresses, Subnets and Subnet Masks

For each of the following Classless IPv4 addresses and their corresponding subnet masks, find out the network address, the subnet's broadcast address, and the number of usable addresses in that subnet.

a) IP address: 192.168.13.23, netmask: 255.255.0.0
b) **IP address: 130.194.77.37 netmask: `0xfffffe00`**
c) IP address 130.194.66.77 netmask: /26

Activity 4: Transport Layer: Transport Control Protocol

Open Wireshark in the VM and start capturing traffic on the enp0s3 interface. Open Firefox and clear the history and cache then visit the page:

www.bom.gov.au

After a few moments, when the webpage is loaded, stop the capture and answer the following questions.

a) Find the `GET` request for the page `HTTP GET` message (`GET HTTP/1.1`). and select the packet in the top pane. Is this the beginning of the communication between the client (VM) and the (Web server)? If not, find out the first datagram sent from the client to the server to start the communication.

   Hint: There are few ways to do this if there are too many captured packets.

   - One way is to right click on the selected packet and choose to follow the TCP stream. This will open a new window showing the communicated content between the client and server. You can close

this window. You should now see a filter added in the **Display Filter** bar as `tcp.stream eq x` (the last number may be different for you as it depends on the number of TCP connections at the time of capture).

- Another way is to put a display filter using the `ip.addr eq (ip address of the server)` to limit the traffic between the client and Monash web server. This also allows looking at the transmitted picture from the server.

b) For each of the datagrams from the TCP `SYN` request to `HTTP/1.1 200 OK` observe the values of `Sequence number` and `Acknowledgement number`. What values are highlighted in the raw section (third window pane) when you select the mentioned fields in the middle section? Explain why Wireshark shows `(relative sequence number)` and `(relative ack number)`.

c) Identify the `frame with` HTTP/1.1 200 OK. How many TCP segments are used to transfer this (requested) file? How is TCP able to put the file together? What is the size of this file?

Note: Each segment also between the request and the HTTP status shows the frame number of the reassembled PDU in the middle section.

d) Explain how the TCP connection is closed down?

Optional Questions - Routing

1. Discuss what is a router, routing, and routing protocol?
2. Discuss briefly the three components of routing protocol?
3. Discuss the Types of decentralized Routing.
4. Compare and contrast Distance Vector and Link state Routing protocol? Give an example of Distance Vector and Link state Routing protocols