COMP202-08B
Computer Communications

Lecture 13

Test Review

TCP part 1

Test Review

- On the whole, the test was done well
  - Test can be collected from school reception, ground floor of G block

Question 1:

0	1	0	1	1	0	1	0
1	1	1	0	0	0	1	0
1	1	0	0	1	1	1	1
0	0	1	0	1	0	0	1
1	1	0	1	1	0	0	0
0	0	0	0	0	0	1	1
1	1	1	1	1	1	0	0
0	1	1	1	1	0	1	1

The number of '1' bits in each row and column should add up to an even number. On this column and row, it does not. The row and column intersects on this bit, so it is in error.

Question 2

- What is the main purpose of the DNS?
  - Map friendly names to IP addresses. Names are easier for us to remember than IP addresses.

Question 3

- ServerSocket ss = new ServerSocket(1234);
  - Create a socket, bound to port 1234, which listens for new connections
- Socket client = ss.accept();
  - accept a new connection using the server socket. the new connected socket is referenced using the client variable
- BufferedReader reader = new BufferedReader(new InputStreamReader(client.getInputStream()));
  - Using the input stream from the client socket, wrap a buffered reader around it. This allows for easier programming using the socket.

Question 3

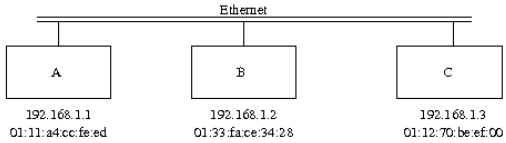
- String line = reader.readLine();
  - read a single line from the connected socket.
- client.close();
  - close the client's socket connection.

Question 4

- Why are regular voltage transitions useful in computer communications?
  - Allows the receiver to keep its clock synchronised with the clock used to transmit the information with. An unsynchronised clock can lead to errors in receiving information.
- In 10baseT, what does the 10 mean? What does the T mean?
  - 10Mbps – unit of speed
  - Twisted Pair – medium type

- Using the following symbols, encode the message 0100110 using Manchester encoding.

Question 5



- With reference to the above diagram, say how A goes about finding out how to send a message to C. Note: there are two messages involved. For each message, say what addresses are used in the Ethernet header, and what information the payload contains.
  - Message 1: A broadcasts (ff:ff:ff:ff:ff:ff) an ARP 'who-has 192.168.1.3' message. source mac: 01:11:a4:cc:fe:ed
  - Message 2: C receives message 1, replies with ARP message '192.168.1.3 is-at 01:12:70:be:ef:00. destination mac: 01:11:a4:cc:fe:ed

Question 5

- What is the purpose of an ARP cache?
  - Remember previous ARP lookups so an ARP sequence is not needed each time a message has to be sent to a particular destination
- Identify three pieces of information that are stored in each entry in an ARP cache.
  - IP address
  - Ethernet MAC address
  - Interface
  - Expiry time

Question 6

- An IP address consists of a network prefix and a host-id suffix. Suppose an end system with an IP address of 192.168.55.19 and the following routing table:

Destination	Gateway	Interface
192.168.48.0/20	link #1	eth0
0.0.0.0/0	192.168.48.1	eth0

- Write out the subnet mask, in dotted-quad format, associated with the first entry in the table.
  - First 20 bits are '1' bits. 11111111 11111111 11110000 00000000
  - 255.255.240.0 128+64+32+16 = 240

Question 6

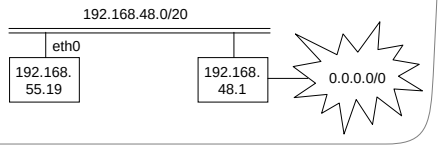
- Is 192.168.60.148 in the same network as 192.168.55.19? Show how you prove it is or is not.
  - First 16 bits are the same. So it will depend on the next 4 bits

```
  192   .    168   .    60     .   148
1100 0000  1010 1000  0011 1100  1001 0100

      The first 20 bits are identical,
      so in the same network

  192   .    168   .    55     .   19
1100 0000  1010 1000  0011 0111  0001 0011
```

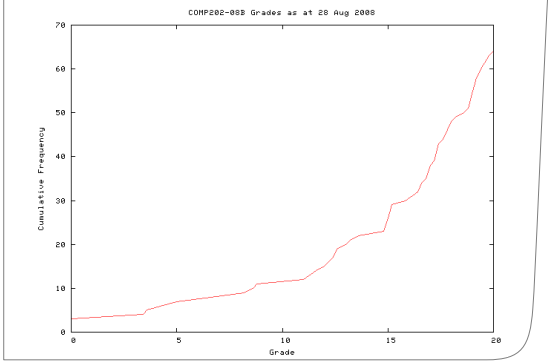

Question 6

- Draw a diagram illustrating the network topology as seen by 192.168.55.19.

Destination	Gateway	Interface
192.168.48.0/20	link #1	eth0
0.0.0.0/0	192.168.48.1	eth0



Mid-point of the course



Mid-point of the course

- 3 labs remaining
  - 3 at 5% each
- Student-selected questions still planned
  - 5%
- Exam: 50%

Material covered so far

- Physical Layer (Ethernet, switches, hubs, twisted pair)
- Link Layer (Ethernet, MAC addresses)
- Network Layer (IP addressing, ARP, routing + BGP)
- Java sockets (Client/Server programming, Threads)

Plan for the next 5 weeks

- TCP
- DNS
- Dynamic routing
- Elementary network operation and debugging
- Java: Asynchronous I/O

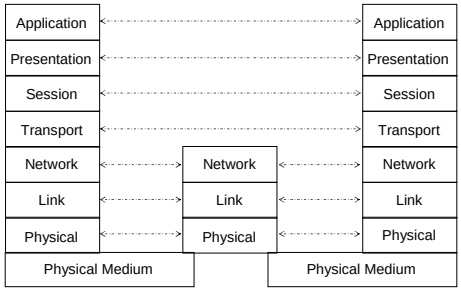
TCP

- Transmission control protocol (TCP)
- TCP is known as a *transport protocol* that is:
  - reliable,
  - connection-oriented,
  - stream-based
- When you use Socket / ServerSocket in Java, you use TCP as your transport protocol.
- TCP is implemented in the operating system kernel, not the application software.

Transport protocols in the Internet

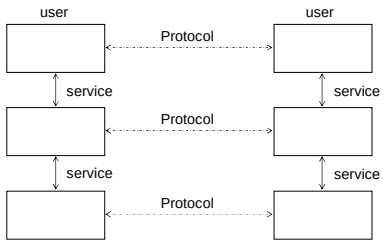
- There are other transport protocols in the Internet
  - UDP
  - SCTP
  - DCCP
- They have different features

Open Systems Interconnection (OSI)

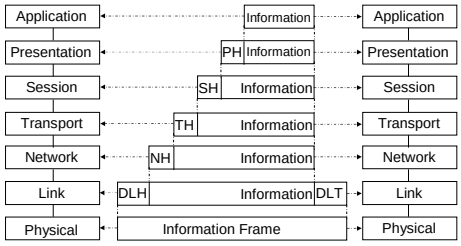


OSI layers

- Each OSI layer provides a service

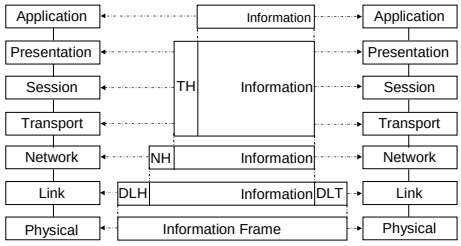


Encapsulation: OSI Model



- Information is encapsulated inside of headers
- Kind of like how a sub-class extends features of another class by adding something to the class
- Product is a 'Frame'

Encapsulation: TCP + Internet model



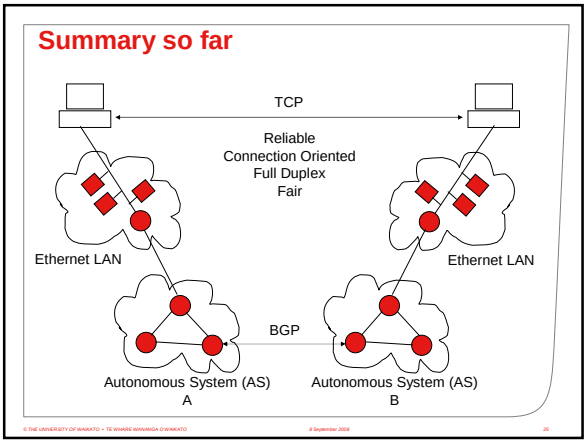
- TCP + Sockets cover the presentation, session, and transport layers
- Difficult to build an efficient network stack using the 7-layer model

TCP features

- Connection-oriented
  - Applications establish connections between computers using TCP (port numbers)
  - No broadcast or multicast mechanism
- Full duplex
  - Both client and server can send information to each other
- Reliable
  - Lost messages get retransmitted
  - Messages are protected using a (weak) checksum
- Network friendly
  - Avoids overwhelming the network's ability to forward information
  - Tries to be fair to others using the network at the same time

TCP features

- Technical protocol specification provides for:
  - Connection oriented
  - Full duplex
  - Reliability
- Logic implemented in your operating system
  - Network friendly
  - Relies on every implementation being fair


Summary so far
TCP
Reliable
Connection Oriented
Full Duplex
Fair
Ethernet LAN
Ethernet LAN
BGP
Autonomous System (AS)
A
Autonomous System (AS)
B