Lab Report 5

PART 1

Exercise 2

1- Total numbers packets :
Total number UDP
2- 10*1024 bytes and 4*4 bytes
3-total = 12387, payload = 10256 -> ratio ~ 0.83
ratio of the biggest UDP 1024 /1066 = 0.96
4- 1. Checksumm, length
2. Checksum and length
5- Source port number seems to be a random since it is not specified in the nttcp command.

Exercise 3

1- total 30 packets.
Packet sends by pc2: 15
Packet sends by pc1: 15
No of Packets for each TCP segments: 2
No of packets do not carry a payload: 21
2 - 2962, 74, 66, 151, 81, 1090, 1442, 145
3- Total= 12432, payload=10240, ratio= 0.82
Biggest ratio = 0.97
Overall the ratio is lower but it is higher for the biggest packet.
4- Ack : acknowledge
PSH : push buffered data to the receiving application
FIN : No more data from sender
SYN : Synchronize sequence numbers

Exercise 4

1**-** FTP requests file at 77.16 s.
Data packets sent at 78.05 s .
Transfer time approximately 0.89 s.
TFTP read request sent at 15.90s
Data packets sent at 20.47 s.
Transfer time approx 4 s.
2-Two TCP-connections.One for FTP (as in, establishing the connection with the remote PC) and one for FTP-data (as in, transferring the requested data itself)

Exercise 5

1- before fragmentation.
after fragmentation
2- Because socket can´t have unlimited buffer size.
3- Fragmented:

`See files`

Exercise 6

1-a- We have no fragmentation. Because MTU size is big enough.
2-a No ICMP error message because the destination port is reachable. All data are transmitted. Normally to indicate that the destination port is not reachable.
3- a DF flag is set
1-b Sometines DF-fragment is set

2-b Yes we have ICMP error message : Fragmentation is needed.
ICMP error message:

See File: ex6_wiresharkPC3.

Exercise 7

1.
1- The packets are telnet[ACK] : Syn is set
telnet[SYN, ACK] : Syn is set
2- SYN is interpreted as request or acknowlegment.
ACK is interpreted as acknowlegement.
3-Initial SEQ numbers ist 0.
4-The SEQ Number from PC1 to PC2 is 1.
5-Initial window size: PC1 to PC2 5888 and 5824 from PC2 to PC1
6- MSS value is 1460.
7- First SYN sends at 32.539222 and connection etablishes at 32.539387.
Time = 0.00165 s.
8-telnet[FIN,ACK] , telnet [FIN,ACK], telnet [ACK].
9- telnet[FIN,ACK] from client to server: server interprets as request to terminate connection and sends FIN ACK of its own. Client receives this as confirmation of termination of connection and ACKS it. Connection is now terminated.
2.
1- Terminated by server.
2- Timeout until 60 s.

Exercise 8

1- The time between attempts to connect is increasingly long.
2- No.
3- Non static routing.

Exercise 9

Two ARP packets were first exchanged for PC1 to obtain the address of PC2. Then PC1 sent a telnet SYN packet to which PC2 responded with a telnet RST, SYN which reset the connection and effectively stopped PC1 from establishing a telnet connection with PC2.
Request at 0.000060, reset sent at 0.000153. Time to fail 0.000093.

PART 2

Pre-Module Questions

1-
1-Nagle´s algorithm : works by combining a number of small outgoing messages, and sending them all at once. as long as there is a sent packet for which the sender has received no acknowledgment, the sender should keep buffering its output until it has a full packet's worth of output, so that output can be sent all at once.
Improves efficiency of TCP/IP networks by reducing number of packets that need to be sent over the network.
2- Karn's Algorithm: Addresses the problem of getting accurate estimates of the round-trip time for messages when using TCP. Karn's algorithm ignores retransmitted segments wen updating the round trip time estimate.
2-

1- TCP delayed ACK is a technique to improve network performance. several ACKs may be combined together into a single response, reducing protocol overhead.
2- Piggybacked ACK- instead of sending an acknowledgement in an individual frame it is piggybacked on a data frame.
3- Based on estimated RTT plus a safety margin based on variation in estimated RTT
4-
1-Sender has a window consisting of unacknowleged packets. As soon as one of those packets are acknowledged the sender can move the window by sending more packet(s) so that it no longer contains this packet.
2-In slow start phase the window is initially small and increased exponentially. Once congestion is detected congestion-avoidance is used in which the window only grows linearly.
3-Fast Retransmit - if the sender receives 3 ACKs for the same data, it supposes that the segment after the ACKed data was lost and resends it before the timer expires
Fast recovery - Multiplicative decrease of the window after detection of a loss by receipt of a triple duplicate ACK.

Exercise 10

1-
1- 1 packet for each character.
2- PC1 sends data to PC2. PC2 sends the data back and PC1 acknowledges with ACK.
3- To reduce network congestion. The delay is 0.000032s.
4- The time delay is 0.00028 s.
5- PSH, ACK.
6- If the SYN flag is set (1), then this is the initial sequence number. The sequence number of the actual first data byte and the acknowledged number in the corresponding ACK are then this sequence number plus 1.
If the SYN flag is clear (0), then this is the accumulated sequence number of the first data byte of this segment for the current session.
7- Window size = 6912
2- PC1 waits with ACK of PC2 echo and sends 1 ACK for several keys.
3-
PC1 → 1 keystroke → PC2
PC2 → repeats keystroke back → PC1
PC1 → ACKs echoed keystroke → PC2

Exercise 11

Packets travel from PC1 to router 3 to router 4 and then to PC2.
1- 3 packets.
2- More packets are exchanged before PC1 sends ACK on PC2 echo.
3-When typing faster.
4-Yes, for example one packet contains 5 characters "asdkf".

Exercise 12

1.Several ACKS for 1 packet.
2- 1500 bytes per ACK.
3-1448 bytes.
4-Its initially increases linearly by approximately 2880 bytes each time, sometimes not increasing at all, then starts to increase exponentially.
5- Packets 18 and 19. Time difference is 0.000015s
6- PC1 does not increase window size, remaining at 5888 for the transmission.
7-PC1 sends [FIN,PSH,ACK] and PC2 sends ACK for all sends data then PC2 sends [FIN,ACK] PC1 responds with [FIN,ACK] and PC2 responds with ACK. PC2 resends [FIN,ACK] ;PC1 sends ACK, connection is closed.

Exercise 13

1- The pattern now contains TCP dup ACK

2- Frequency is not different.
3-Only linear progression.
4-Sender not used the full advertised window because window limited to 5888 bytes.

Exercise 14

1- Yes.
2-
1- 1 ACK per packet send.
2- 17 s.
3- 3 per segment
3-
1- Transmission continues, missed packets are resent.
2- Yes.

Exercise 15

1. ssthresh is reduced to half the window size
2**.** slow start was not observed since the sender stopped transmitting with disconnection and did not restart even though we only disconnected for short amounts of time.
3. could not be determined with the capture we made since transmission did not pick up again after disconnection.