CSE4352 IoT and Networking
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CSE6359 Systems and Architecture
Spring 2020 Test

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Printout, hand write your solution, scan, and submit to Canvas by 5:10pm. If you have no printer, you can use your paper in lieu of printouts of these pages. Be sure to scan all pages with text (including the backs of pages and the honor code). You must also attach the output of the number calculator spreadsheet. The variable letters A-Z in the exam refer to the number in the spreadsheet.

1. You need to renew your DHCP lease. Using the methods of your project submission, show the complete message from ethernet header through DHCP header and options, including a calculation of the IP and UDP checksums for this message.

   Please assume that your current IP address is 192.168.1.K and your MAC address is 02-03-04-05-06-07. The DHCP server that gave you the DHCP lease has an IP address of 192.168.1.200 and a MAC address of 04-05-06-07-R-S.

   Write your values of the following variables:

   K = 44 R = 18 S = 1F

   Write all the fields and their values for the message, including the IP and UDP checksums. Show all work for the checksum calculations.

- ether → destAddress = 04-05-06-07-18-1F
- ether → sourceAddress = ~~C0-A8-01-20~~ = 02-03-04-05-06-07
- IP → sourceIp = C0·A8·01·20
- ether → FrameType = 0x0800
- ip → destIp = C0·A8·01·C8
- ip → protocol = 11
- ip → flags&Offset = 00
- ip → typeOfService = 0x00
- ip → ttl = 80
- UDP → sourceport = 4400

UDP → destport : 4300

dhcp → OP = 01

dhcp → htype = 01

dhcp → hlen = 06

dhcp → hops = 00

dhcp → secs = 0000 (16 bit)

dhcp → flags = 0080

dhcp → ciaddr = C0·A8·01·20

dhcp → yiaddr = 00 00 00 00

dhcp → siaddr = C0·A8·01·C8

dhcp → giaddr = 00 00 00 00

dhcp → data = 192 Zero

dhcp → chaddr = 02-03-04-05-06-07

dhcp → xid = 0x34235345,

dhcp → magicookie = 0x6353 8263

↓

= 6382 5363

dhcp → options = 35;01-01 → 53

3D-A-7 01 02 03 04 05

06 07 32 4 C0·A8·01·

20 37 04 01 03 06 0F

FF

1. continued

IP → length = 352 = ~~0160~~ 6001

ip → checksum = B34C

UDP → Length = 316 = 3C01

UDP → checksum = A936

Steps to calculate checksum for UDP

first identify the pseudo header.

The pseudo header consist of

protocol + source ip + destination ip

Now add UDP length to this pseudo header.

Now identify the dhcp payload & add it to the pseudo header.

Now convert the hexa decimal value to Binary,

Now take 1's Compliment of Binary Value

& In end convert to hexa.

For Ip checksum → just add ether & Ip packet

Now convert the hexa into Binary

takes 1's compliment of it

& convert to hexa.

2. Answer the following questions about <u>your</u> project solution:
(if you did not complete the project code needed for the selected question, answer the question as best as possible and indicate your project was incomplete in the answers below)

a. Show the addresses (block and offset) in EEPROM and their usage in your project.

b. What DHCP server did you mainly use for testing your solution?

tFTPt Server.

c. What was the lease time you were given, in seconds by the DHCP server above?

The lea time was 7200 seconds.

d. If you send a DHCP discover message and receive no offer, what did you do?

when i received no offer, I sent a wrong client address.

e. What TCP-based server application did you code?

I tried using telnet, but it didnot work

f. What port number was used for your server?

Prot number was 23

g. In your TCP solution in project 1, suppose an SYN message was received from the client with a sequence number of G. When you send the SYN|ACK back to the client, what is the acknowledgement number?

G = 0xF1 Ack number = 0xF2

3. As a MQTT client, you actively open a TCP connection with a sequence number in SYN of B. The response from the broker has a sequence number in the SYN|ACK of C. Once established, you send a connect message.

Show the contents of the TCP header and payload (not the entire message) for an MQTT connect message (protocol v. 3.1.1) for a clean session with F second keep-alive, ID string equal to your last name, and no user name, password, or will. You do not have to calculate the TCP header checksum (leave values as blank).

B = 95190094 C = C1D9EF25 F = 3200

Last Name = Shankar (hint: ASCII codes: 'A' = 41h, 'a' = 61h, space = 20h)

B = 9519 0094

0094 9519

9400 · 1995

C = C1D9 EF25

~~D9C1~~ ~~25EF~~

EF25 C1D9

25EF D9C1

f = 003

TCP → source port = 53123 = CF83

Tcp → dest port = 1883 = 075B

tcp → sequence number. = 94001995

tcp → ack = 25 EF D9 C1

tcp → flag = 18

tcp → Window size = 10230 = 27 F6

3. continued

tcp → checksum = 0

tcp → urgent pointer = 0000

tcp → payload =

tcp → data = mqtt → headflag = 01

mqtt → msglen = 00 13

mqtt → namelen = 00 04

mqtt → protocolname = 4d 51 54 54

mqtt → version = 04

Mqtt → flag = 02

Mqtt → keepalive = 3260

Mqtt → clientIDlen = 7

mqtt → clientID = Shankar

53 68 61 6E 6B 61 72