Computer Networks 2021 Exercises - Unit 5

FAN: mcgh0008

NOTE: Each student's work unit is unique. You must use the work that has been generated for your FAN. If you do not, then you will fail this work unit.

NOTE: You must record your answers in the answer file EXACTLY as required, and commit and make sure your changes have been pushed to the github server, as they will otherwise not be counted.

NOTE: The topic coordinator will periodically run the automatic marking script, which will cause a file called unit5-results.pdf to be updated in your repository. You should check this file to make sure that your answers have been correctly counted. That file will contain the time and date that the marking script was last run, so that you can work out if it has been run since you last changed your answers. You are free to update your answers as often as you wish, until the deadline for the particular work unit.

1 TCP/IP And Related Protocol Packet Formats and Header Fields

For each question, you must record your answer in the unit5-answers.txt file in your git repository. Templates for each answer are provided in unit5-answers.txt for your convenience.

You will find information on the packet header formats in many places, including:

- $\bullet \ https://en.wikipedia.org/wiki/Ethernet_frame\#Header$
- https://en.wikipedia.org/wiki/IPv4#Header
- $\bullet \ \ https://en.wikipedia.org/wiki/Address_Resolution_Protocol$
- https://en.wikipedia.org/wiki/Transmission_Control_Protocol#TCP_segment_structure
- https://en.wikipedia.org/wiki/User_Datagram_Protocol#UDP_datagram_structure

```
# 0x0000: 1a9d af6f 9090 5ae7 334f 00ff 8100 5125 ...o..Z.30....Q%
# 0x0010: 0800 4500 0063 0000 4000 0806 0000 bab3 ..E..c..@......
# 0x0020: 7e6d 906f ea5c 9637 9f8e 3f07 b7fe 327f ~m.o.\.7..?...2.
# 0x0030: 83e3 50b7 031c 0000 0008 39c6 68a8 0c5d ..P......9.h..]
# 0x0040: 4d58 3856 e575 1b21 8615 b5dd b259 088f MX8V.u.!....Y..
# 0x0050: 04fa 345a a39e 7eb9 1c91 ba0b 5bb3 25f6 ..4Z..~....[.%.
# 0x0060: 73c2 3bc3 ef06 6ca9 625c d523 540e 5baa s.;...1.b\.#T.[.
```

Question	Field	Туре
ID		
ab	TCP RST	Boolean: Answer Y or N
ac	ETH destina- tion address	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
ad	IP ToS	Integer: Answer with the decimal value of the field.
ae	TCP FIN	Boolean: Answer Y or N
af	IP FLAGS	Integer: Answer with the decimal value of the field.
ag	Frame is MPLS	Boolean: Answer Y or N

0x0000: 59f5 de08 4a46 d459 2038 be27 8847 0000 Y...JF.Y.8.'.G..

0x0010: 61d7 4500 007f 0000 4000 1206 0000 9e46 a.E....@.....F

0x0020: 5fae b6dd d08e 2083 1439 0b11 fc45 4f91 _.....9...E0.

0x0030: c883 50ab 4672 0000 0001 69de f8da 92c5 ..P.Fr...i....

0x0040: f9b6 51e0 8f01 dab9 98a6 31b4 2358 f69d ..Q.....1.#X..

0x0050: 18c5 b22c 15e0 c996 b88f 4b33 e1dc 7419 ...,....K3..t.

0x0060: 2750 06d6 6933 88e3 83d9 be86 3f31 ebec 'P..i3....?1..

0x0070: b0d2 627f 283a 4a85 ae6f bec8 b524 1350 ..b.(:J..o...\$.P

0x0080: e7d2 4e85 b0af 25fd 998c 9b53 8119 8a31 ..N...%...S...1

Question	Field	Туре
ID		
ah	TCP window size	Integer: Answer with the decimal value of the field.
ai	IP DSCP	Integer: Answer with the decimal value of the field.
aj	TCP SYN	Boolean: Answer Y or N
ak	TCP sequence	Integer: Answer with the decimal value of the field.
al	Frame is 802.1ad	Boolean: Answer Y or N
am	ETH source ad- dress	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00

Question	Field	Туре
ID		
an	IP destination	IPv4 address. Answer in dotted quad notation, e.g., 129.96.1.21
ao	UDP source port	Integer: Answer with the decimal value of the field.
ap	IP length	Integer: Answer with the decimal value of the field.
aq	IP DSCP	Integer: Answer with the decimal value of the field.
ar	IP Protocol of payload	Integer: Answer with the decimal value of the field.
as	IP Don't Frag	Boolean: Answer Y or N

0x0000: cfb0 b650 258c 48f9 31b1 6f1d 8848 0000 ...P%.H.1.o..H..

0x0010: f11d 4500 008f 0000 4000 3b06 0000 4651 ..E....@.;...FQ

0x0020: bbec 1ef7 5f57 1d0e 26ae 1819 b0f0 5d9c ..._W..&....].

0x0030: 32d7 5093 549d 0000 000c aab8 d4ad 3858 2.P.T......8X

0x0040: 8ca2 8aca 4cf0 ef3e 442a 2cf3 ec62 5961L..>D*,..bYa

0x0050: 74bc 3fe8 6273 bea0 62fd 807c 2096 cdc2 t.?.bs..b..|....

0x0060: 559a db0e abc5 1151 3dca 9a8b ed9c 228c U.....Q=....".

0x0070: 5acc 2ac2 10c1 1fe6 ddea af5e 4033 e647 Z.*.....^@3.G

0x0080: ef16 fd5a 8747 b7b2 ddfd 6861 4256 6297 ...Z.G...haBVb.

0x0090: bb69 a32a e435 377e aa7c 78f9 44d0 4a95 .i.*.57~.|x.D.J.

Question	Field	Туре
ID		
at	IP ECN	Integer: Answer with the decimal value of the field.
au	ETH destina- tion address	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
av	Frame is 802.1q	Boolean: Answer Y or N
aw	TCP URG	Boolean: Answer Y or N
ax	IP More Frag- ments	Boolean: Answer Y or N
ay	TCP FIN	Boolean: Answer Y or N

```
# 0x0000: b6df ec24 b01d 14bf 6467 b9ee 8100 288a ...$....dg....(.
# 0x0010: 0806 0001 0800 0604 0002 3368 128f 986c .......3h...1
# 0x0020: 2085 7385 938b 5b42 7a70 55f2 7173 d6ce ..s...[BzpU.qs..
# 0x0030: f1a6 9dcd b007 1772 f182 88b1 b31d c489 .....r.....
# 0x0040: a1b3 a339 47db 6bbb 4595 9ba4 4830 3123 ...9G.k.E...H01#
# 0x0050: f695 b63e 16 ....>.
```

Question	Field	Туре
ID		
az	ETH destina- tion address	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
ba	ARP reply	Boolean: Answer Y or N
bb	ARP request	Boolean: Answer Y or N
bc	ARP target IP	IPv4 address. Answer in dotted quad notation, e.g., 129.96.1.21
bd	ETH frame type	Four-digit Hex: Answer with the four digit hexadecimal value of the field, e.g., 02AF. Do not put a leading 0x or \$ on the front of the hexadecimal number.
be	ARP HTYPE	Integer: Answer with the decimal value of the field.

Question	Field	Туре
ID		
bf	ETH source ad- dress	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
bg	IP Protocol of payload	Integer: Answer with the decimal value of the field.
bh	Frame is 802.1q	Boolean: Answer Y or N
bi	IP FLAGS	Integer: Answer with the decimal value of the field.
bj	TCP sequence	Integer: Answer with the decimal value of the field.
bk	TCP ACK	Boolean: Answer Y or N

Question	Field	Туре
ID		
bl	Frame is 802.1q	Boolean: Answer Y or N
bm	TCP source port	Integer: Answer with the decimal value of the field.
bn	ETH frame type	Four-digit Hex: Answer with the four digit hexadecimal value of the field, e.g., 02AF. Do not put a leading 0x or \$ on the front of the hexadecimal number.
bo	MPLS label	Integer: Answer with the decimal value of the field.
bp	IP DSCP	Integer: Answer with the decimal value of the field.
bq	Frame is	Boolean: Answer Y or N

Question	Field	Туре
ID		
br	IP TTL	Integer: Answer with the decimal value of the field.
bs	TCP destination	Integer: Answer with the decimal value of the field.
bt	TCP PSH	Boolean: Answer Y or N
bu	MPLS TTL	Integer: Answer with the decimal value of the field.
bv	TCP CWR	Boolean: Answer Y or N
bw	IP Protocol of payload	Integer: Answer with the decimal value of the field.

```
# 0x0000: 313a 26f6 e8a7 e472 b7eb 1201 8848 0000 1:&...r...H...

# 0x0010: c55b 4500 004e 0000 4000 1706 0000 7eb7 .[E..N..@....~.

# 0x0020: cea0 1b19 44bb b621 8d41 253d f329 05e0 ....D..!.A%=.)..

# 0x0030: 88fd 508b c6a4 0000 000d 3b03 d2c2 7ed1 ..P.....;..~.

# 0x0040: 4aca b68f 31cc 8781 cd2f 58ac 2c7f 9467 J...1.../X.,..g

# 0x0050: 44bb dbab d174 cea2 0379 8501 78b4 1bbb D...t..y.x...
```

Question	Field	Туре
ID		
bx	IP source ad- dress	IPv4 address. Answer in dotted quad notation, e.g., 129.96.1.21
by	MPLS TTL	Integer: Answer with the decimal value of the field.
bz	ETH source ad- dress	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
ca	TCP ACK sequence number	Integer: Answer with the decimal value of the field.
cb	TCP sequence	Integer: Answer with the decimal value of the field.
сс	Frame is	Boolean: Answer Y or N

```
# 0x0000: a4bc 95d8 8250 73ea 12e7 1959 88a8 5b48 .....Ps....Y..[H
# 0x0010: 0800 4500 0040 0000 4000 3911 0000 4898 ..E..@..@.9...H.
# 0x0020: 2bdd 41d7 ea9f 82c5 2052 0097 92bc 17c4 +.A.....R......
# 0x0030: 9589 7dd7 020c 97ba c600 a5bf d76e 0c23 ..}....n.#
# 0x0040: 6f95 e603 6d5c 233c 8c8d 7a8e e58e 47bd o...m\#<..z...G.
# 0x0050: 8771
```

Question	Field	Туре
ID		
cd	IP Don't Frag	Boolean: Answer Y or N
се	IP ToS	Integer: Answer with the decimal value of the field.
cf	ETH source ad- dress	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
cg	Frame is	Boolean: Answer Y or N
ch	ETH frame type	Four-digit Hex: Answer with the four digit hexadecimal value of the field, e.g., 02AF. Do not put a leading 0x or \$ on the front of the hexadecimal number.
ci	IP source ad- dress	IPv4 address. Answer in dotted quad notation, e.g., 129.96.1.21

Question	Field	Туре
ID		
cj	IP FLAGS	Integer: Answer with the decimal value of the field.
ck	IP ToS	Integer: Answer with the decimal value of the field.
cl	MPLS TTL	Integer: Answer with the decimal value of the field.
cm	MPLS last la- bel?	Boolean: Answer Y or N
cn	ETH destina- tion address	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
со	UDP destination	Integer: Answer with the decimal value of the field.

Question	Field	Туре
ID		
ср	IP DSCP	Integer: Answer with the decimal value of the field.
cq	IP FLAGS	Integer: Answer with the decimal value of the field.
cr	Frame is MPLS	Boolean: Answer Y or N
CS	ETH source ad- dress	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
ct	TCP RST	Boolean: Answer Y or N
cu	TCP destination	Integer: Answer with the decimal value of the field.

```
# 0x0000: a1c0 c2f4 351e b02c a0b3 4a34 8100 5b26 ....5..,..J4..[&
# 0x0010: 0806 0001 0800 0604 0001 d8f5 a82d 26f0 ......-&.
# 0x0020: 07f8 262b c583 6dfa ccc3 2c23 b1d6 b4be ..&+..m..,#...
# 0x0030: e614 7b3b 04dc b7a3 135e 16bd ae46 af5d ..{;....^..F.]
# 0x0040: b184 af8a 0150 5ed6 98c5 6fa8 78a0 43aa .....P^...o.x.C.
# 0x0050: 109f 8461 c859 8c56 b0d0 0e50 952b ae27 ...a.Y.V...P.+.'
# 0x0060: 835e 2c2a b899 67ef 4dcf 65cd 90a4 26ae .^,*..g.M.e...&.
# 0x0070: d62b d572 a9bc 485f 3be3 a26e a850 fa58 .+.r..H_;..n.P.X
# 0x0080: a693 c3c9 4c97 8a7f 3fc0 a7e1 cefa d964 ...L..?....d
# 0x0090: 8218 2949 8165 bdcd 3b52 734f ...)I.e..;Rs0
```

Question	Field	Туре
ID		
cv	Frame is 802.1ad	Boolean: Answer Y or N
cw	ETH destina- tion address	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
cx	ETH source ad- dress	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
су	ARP target MAC	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
cz	Frame is MPLS	Boolean: Answer Y or N
da	ARP source	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00

0x0000: f19c 1521 27dd 0d89 0e3d f973 8847 0000 ...!'....=.s.G..

0x0010: 879f 4500 0086 0000 4000 1711 0000 0570 ..E......@.....p

0x0020: 43b6 d74c 4379 3d6d fa28 00f7 a528 64ea C..LCy=m.(...(d.

0x0030: 970e 59af 00de 594e ada8 6b5d 8993 4a1a ..Y...YN..k]..J.

0x0040: 1c9e fe1f 5d68 9250 8da6 4512 f656 91e7]h.P..E..V..

0x0050: 0d7b 56b2 31b0 e350 1fd8 136f 77ac 1cfc .{V.1..P...ow...}

0x0060: 4096 8d0d daec 0b7b b0ee 810f 4916 915b @.....{...I..[}

0x0070: 4aa6 cfe1 910b 3db0 6166 537a 6c86 6f33 J....=.afSzl.o3

0x0080: bba1 015f 3c1d f9a1 a56b 7eee cceb 8b69 ..._<....k~...i

0x0090: 15c4 a4e0 aad6 5de6].

Question	Field	Туре
ID		
db	Frame is 802.1q	Boolean: Answer Y or N
dc	IP FLAGS	Integer: Answer with the decimal value of the field.
dd	Frame is MPLS	Boolean: Answer Y or N
de	MPLS last la- bel?	Boolean: Answer Y or N
df	UDP source port	Integer: Answer with the decimal value of the field.
dg	ETH destina- tion address	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00

```
# 0x0000: d159 653c 7dcf 3b62 f58d 1500 8100 367c .Ye<}.;b.....6|

# 0x0010: 0800 4500 004d 0000 4000 2506 0000 2e3e ..E..M..@.%....>

# 0x0020: 0d5e d883 0492 60ec b5cd 5cb7 89a9 7c62 .^...\..\..|b

# 0x0030: 9e54 501e 60bf 0000 000b 5891 8b22 99f7 .TP.\...X..\..\

# 0x0040: f9ac dd22 97f1 35a3 6335 eecb cb45 c2aa ...\..5.c5...E..

# 0x0050: 8f71 19bb a257 e4bc 5535 f793 29ed 1a .q...W..U5..).
```

Find the value of the following fields:

Question	Field	Туре
ID		
dh	TCP CWR	Boolean: Answer Y or N
di	IP length	Integer: Answer with the decimal value of the field.
dj	ETH destina- tion address	Ethernet MAC Address. Answer in the customary format, retaining leading zeroes, e.g., 02:ca:fe:f0:0d:00
dk	IP source ad- dress	IPv4 address. Answer in dotted quad notation, e.g., 129.96.1.21
dl	IP DSCP	Integer: Answer with the decimal value of the field.
dm	IP FLAGS	Integer: Answer with the decimal value of the field.

2 Lecture Material Comprehension

The following questions are designed with two purposes in mind:

1. To help you engage with the lecture materials; and

2. To help generate a wide range of questions for the quizzes in this topic.

The second goal is not mandatory for you. However, if you are willing for the answers you provide to the questions in this section to be used in future quizzes in this topic, you are requested to answer the following question as follows you will not be penalised if you do not give this permission

Question#	Description
dn	Are you willing to release your following answers in
	this section from all copyrights, i.e., release them
	into the public domain, including so that they can be
	included in quizzes in this topic? you will not be
	penalised or treated any differently if you do not
	choose to give this permission

It is important that you answer this question with 'y', if you do decide that you would like to do this (but again, you have no obligation to do so, and you will not be treated differently whether or not you give permission).

The entry in unit5-answers.txt would thus look like:

```
# Question 'dn': Do you commit the following answers to the public domain
# and disclaim all copyrights in them?
dn=y
```

For each question, you must record your answer in the unit5-answers.txt file in your git repository. For each question, you are required to write a statement that is either true or false about the material in the indicated lecture slide.

For example, if you were asked 'write a **true** statement about the content of Slide 2 of Chapter 1', you would put the statement at the end of the rj= line in the file unit5-answers.txt. For example, if your statement was 'One of the problems addressed in this chapter is how to build scalable networks', you would write:

Question#	Description
pz	Write a true statement about the content of Slide 2
	of Chapter 1

The entry in unit5-answers.txt would thus look like:

Question 'pz': Write a true statement about the content of Slide 2 of Chapter 1

pz=One of the problems addressed in this chapter is how to build scalable networks

Templates for each answer are provided in unit5-answers.txt for your convenience.

If you are asked to write a statement that is false, i.e., untrue, think about statements that someone who has not worked through the material might think would be true. Be creative! Be devious!

Question#	Description
do	Write a false statement about the content of Slide 90
	of Chapter 3
dp	Write a false statement about the content of Slide
	112 of Chapter 6
dq	Write a false statement about the content of Slide
	101 of Chapter 6
dr	Write a true statement about the content of Slide 12
	of Chapter 3
ds	Write a true statement about the content of Slide 14
	of Chapter 4
dt	Write a false statement about the content of Slide 20
	of Chapter 2
du	Write a false statement about the content of Slide 1
	of Chapter 5
dv	Write a true statement about the content of Slide 23
	of Chapter 8
dw	Write a false statement about the content of Slide 30
	of Chapter 5
dx	Write a false statement about the content of Slide 83
	of Chapter 6