LEBANESE AMERICAN UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND MATHEMATICS

CSC 430 – Computer Networks

Homework III

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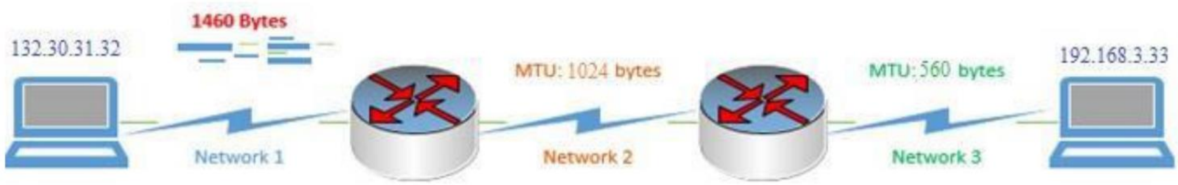
Table of Contents

Problem 1: X=55439



Show the values, in decimal, of all header fields of all datagrams that arrive at host B as a result of the above.

1. Original Datagram from Host A:

- Size: 1460 Bytes
- Payload: 1440 Bytes
- Header: 20 Bytes
- TTL: 64
- DSCP+ECN (ToS): 0
- Identification Field: X = 55439
- Source Address: 132.30.31.32
- Destination Address: 192.168.3.33
- Protocol: UDP (17)

2. Fragmentation at Network-2:

- Fragment A:
- Payload: 1000 Bytes
- Size: 1020 Bytes
- Fragment Offset: 0
- More Fragments bit: 1
- TTL: 63
- Fragment B:
- Payload: 440 Bytes
- Size: 460 Bytes
- Fragment Offset: 125 (1000/8)
- More Fragments bit: 0
- TTL: 63

3. Fragmentation at Network-3:

- Fragment A1 (from network 2 first frag):
- Payload: 536 Bytes
- Size: 556 Bytes
- Fragment Offset: 0
- More Fragments bit: 1
- TTL: 62
- Fragment A2:
- Payload: 464 Bytes
- Size: 484 Bytes
- Fragment Offset: 67 (536/8)
- More Fragments bit: 1
- TTL: 62
- Fragment B (unchanged):
- Payload: 440 Bytes
- Size: 460 Bytes
- Fragment Offset: 0
- More Fragments bit: 0
- TTL: 62

4. Datagrams at Host B:

- Fragment A1:
  - Size: 556 Bytes (with header)

- Payload: 536 Bytes

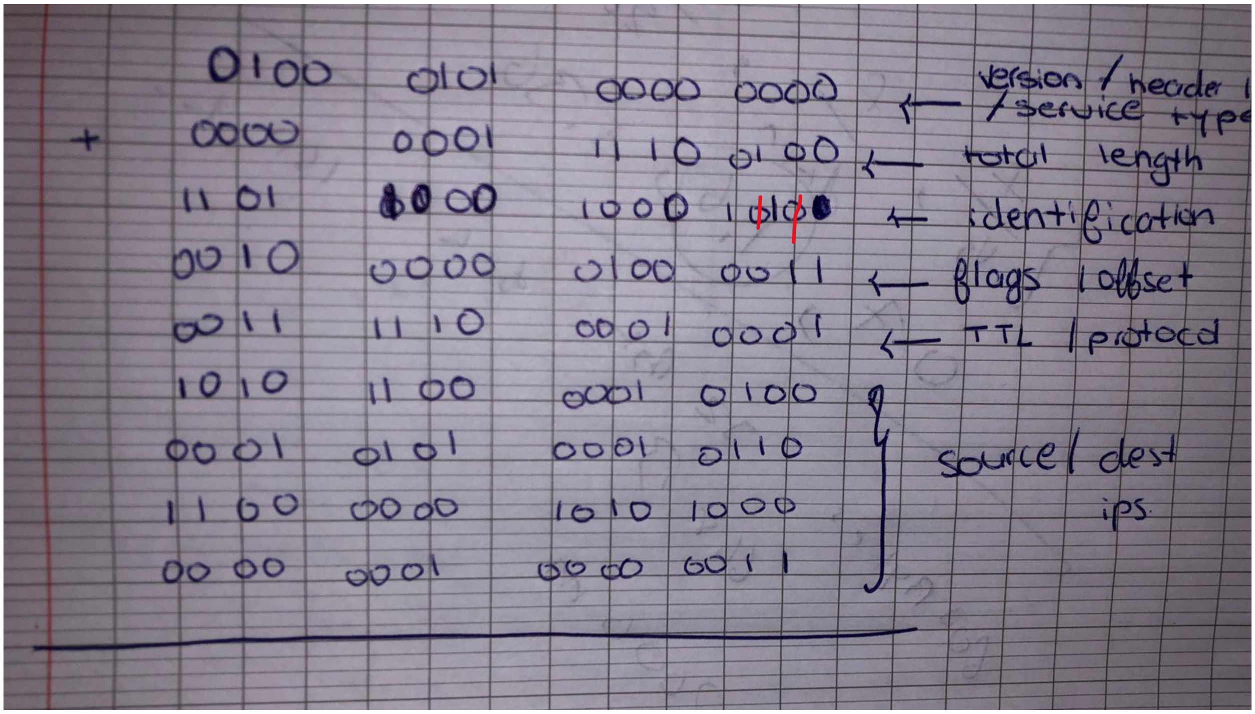
- Fragment A2:
  - Size: 484 Bytes (with header)
  - Payload: 464 Bytes
- Fragment B:
  - Size: 460 Bytes (with header)
  - Payload: 440 Bytes

The header fields of each datagram at host B will include:

- Identification Field: 55439
- TTL: Decreased by 1 from the previous network
- DSCP+ECN (ToS): Unchanged 0
- Source Address: 132.30.31.32
- Destination Address: 192.168.3.33
- Protocol: UDP (17)
- Header Checksum: Calculated based on the updated header values

FOR A1:

<table>
<tr><td>4</td><td>5</td><td>0</td><td colspan="2">556</td></tr>
<tr><td colspan="3">55439</td><td>1</td><td>0</td></tr>
<tr><td colspan="2">62</td><td>17</td><td colspan="2">checksum</td></tr>
<tr><td colspan="5">132.30.31.32</td></tr>
<tr><td colspan="5">192.168.3.33</td></tr>
</table>


0100 0101 0000 0000 ← version / header l / service type
+ 0000 0001 1110 0100 ← total length
1101 1000 1000 1010 ← identification
0010 0000 0100 0011 ← flags / offset
0011 1110 0001 0001 ← TTL / protocol
1010 1100 0001 0100
0001 0101 0001 0110 source / dest
1100 0000 1010 1000 ips.
0000 0001 0000 0011

As this was a lengthy computation to do I changed every 16 bit number to decimal and then added those and converted the sum to binary

17664+484+55439+8259+15889+44052+5398+49320+259 = 196764

In binary: 1100 0000 0010 0111 00 by taking the lead bit and adding it (repeating twice) we obtain the 16 bit checksum: 0000 0000 1001 1110

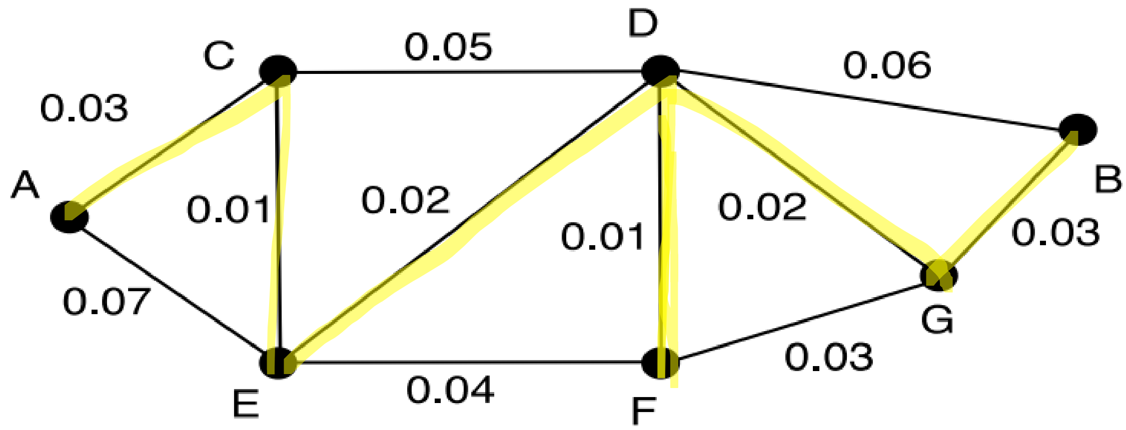
FOR A2:

4	5	0	484	
55439			1	67
62		17	checksum	
132.30.31.32				
192.168.3.33				

FOR A3:

4	5	0	460	
55439			0	125
62		17	1 checksum	
132.30.31.32				
192.168.3.33				

Problem 2:



For node A, preform the Dijkstra's algorithm and show the table. When done draw the resulting least-cost-path tree from A and show the resulting forwarding table in A.

Step	N'	D(B),p(B)	D(C),p(C)	D(D),p(D)	D(E),p(E)	D(F),p(F)	D(G),p(G)
0	A	∞	0.03, A	∞	0.07, A	∞	∞
1	AC	∞		0.08, C	0.04, C	∞	∞
2	ACE	∞		0.06, E		0.08, E	∞
3	ACED	0.12, D				0.07, D	0.08, D
4	ACEDF						
5	ACEDFG	0.11, D					

B	(A, C)
C	(A, C)
D	(A, C)
E	(A, C)
F	(A, C)
G	(A, C)

The shortest path is highlighted in the figure above **ACEDFGB**.

Problem 3:

Design a network for a small company with IP address 192.168.10.0/23. The company has five departments, with varying sizes: 200 employees, 100 employees, 40 employees, 20 employees, and 5 employees respectively. Each subnetwork must support at least 10% additional devices in for future expansion. Keep the remaining IP addresses in one subnet for guests. Design this network and give the subnet address of each department that will meet the requirements. For each subnet, including the "Guests" subnet, show the subnet address, the broadcast address, the subnet mask, and the maximum number of possible hosts.

192.168.10.0/23

11000000 10101000 00001010 00000000

For 200 employees:

- We need 200 + 20 = 220 hosts => it needs 2^8 for the host part.
- 32-8 = 24 => subnet suffix will be /24
- Subnet address is: 11000000 10101000 00001010 00000000 192.168.10.0/24
- Broadcast address is: 11000000 10101000 00001010 11111111 => 192.168.10.255
- Subnet mask is: 11111111 11111111 11111111 00000000 => 255.255.255.0
- Maximum number of possible hosts: 2^8 – 2 = 254

For 100 employees:

- We need 100 + 10 = 110 hosts => it needs 2^7 for the host part.
- 32 - 7 = 25 => subnet suffix will be /25
- Subnet address is: 11000000 10101000 00001011 00000000 192.168.11.0/25
- Broadcast address is: 11000000 10101000 00001011 01111111 => 192.168.11.127
- Subnet mask is: 11111111 11111111 11111111 10000000 => 255.255.255.128
- Maximum number of possible hosts: 2^7 - 2 = 126

For 40 employees:

- We need 40 + 4 = 44 hosts => it needs 2^6 for the host part.
- 32 - 6 = 26 => subnet suffix will be /26
- Subnet address is: 11000000 10101000 00001011 10000000 => 192.168.11.128/26
- Broadcast address is: 11000000 10101000 00001011 10111111 => 192.168.11.191
- Subnet mask is: 11111111 11111111 11111111 11000000 => 255.255.255.192
- Maximum number of possible hosts: 2^6 - 2 = 62

For 20 employees:

- We need 20 + 2 = 22 hosts => it needs 2^5 for the host part.
- 32 - 5 = 27 => subnet suffix will be /27
- Subnet address is: 11000000 10101000 00001011 11000000 => 192.168.11.192/27
- Broadcast address is: 11000000 10101000 00001011 11011111 => 192.168.11.223
- Subnet mask is: 11111111 11111111 11111111 11100000 => 255.255.255.224
- Maximum number of possible hosts: 2^5 - 2 = 30

For 5 employees:

- We need 5 + 1 = 6 hosts => it needs 2^4 for the host part.
- 32 - 4 = 28 => subnet suffix will be /28
- Subnet address is: 11000000 10101000 00001011 11100000=> 192.168.11.224/28
- Broadcast address is: 11000000 10101000 00001011 11101111=> 192.168.11.239
- Subnet mask is: 11111111 11111111 11111111 11110000=> 255.255.255.240
- Maximum number of possible hosts: 2^4 - 2 = 14

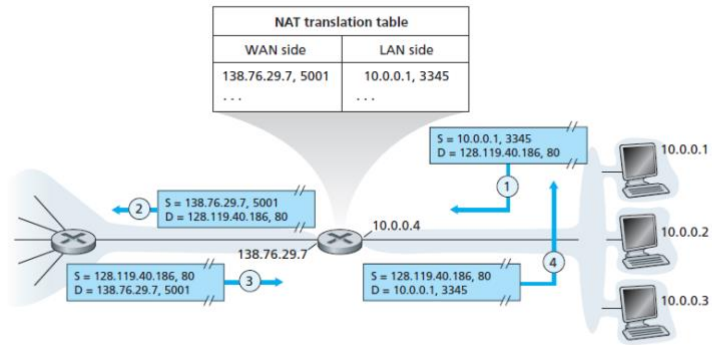
For the guests:

- We can use the remaining half of the /28 subnet.
- subnet suffix will be /28
- Subnet address is: 11000000 10101000 00001011 11110000=> 192.168.11.240/28

- Broadcast address is: 11000000 10101000 00001011 11111111=> 192.168.11.255
- Subnet mask is: 11111111 11111111 11111111 11110000=> 255.255.255.240
- Maximum number of possible hosts: 2^4 - 2 = 14

Problem 4:

a. **Assign addresses to all interfaces in the home network.**
b. **Suppose each host has two ongoing TCP connections, all to port 80 at host 128.119.40.86. Provide the six corresponding entries in the NAT translation table.**



a.

10.0.0.1 -> 192.168.1.1

10.0.0.2 -> 192.168.1.2

10.0.0.3 -> 192.168.1.3

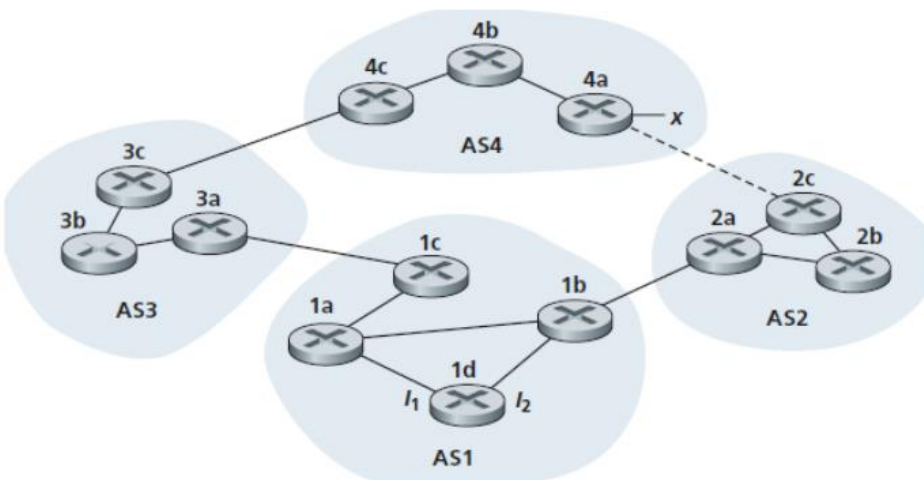
10.0.0.4 -> 192.168.1.4 (router interface)

b.

WAN Side	LAN Side
24.34.112.235, 5001	192.168.1.1, 3345
24.34.112.235, 5002	192.168.1.1, 3346
24.34.112.235, 5003	192.168.1.2, 3395
24.34.112.235, 5004	192.168.1.2, 3396
24.34.112.235, 5005	192.168.1.3, 3445
24.34.112.235, 5006	192.168.1.3, 3446

Problem 5:

a) Router 3c learns about prefix x from which routing protocol: OSPF, RIP, eBGP, or iBGP?
a) Router 3a learns about x from which routing protocol?
b) Router 1c learns about x from which routing protocol?
c) Router 1d learns about x from which routing protocol?



b) eBGP
c) iBGP
d) eBGP
e) iBGP