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HW7

1.
 - a. There seems to be 2 subnets, each with one part of the router, a switch, and 2 end users. 2 possible subnet addresses (one for each), could be 111.111.111.112 for one address, and the other could be 222.222.222.220.
 - b. From host A to host B, the datagram needs to first go from router host A, through the switch, to router C, which then goes to the switch and host B. Host A has a MAC address of AA-AA-AA-AA-AA-AA and IP of 111.111.111.111, which sends to the MAC address of the router C of CC-CC-CC-CC-CC-CC and IP of 111.111.111.110. From router D (MAC is DD-DD-DD-DD-DD-DD and IP is 222.222.222.220), it hops to host B (Mac is BB-BB-BB-BB-BB-BB and IP is 222.222.222.222). The switch's job is to just check the destination MAC address given from the router and just forward the datagram to the correct host. The router checks the destination IP address, and forwards the datagram either to a switch or another router if necessary.
 - c. No it would not need to find out or even know the mac addresses of B anyway, since it is in a different subnet. A needs to find out the MAC of its own router, since it is the router that needs to deal with inter subnet communication.
2.
 - a. Since these are switches, there will be only one subnet. This is because if there are multiple subnets, a router is needed instead of a switch to be able to connect between subnets. A possible subnet address of this subnet could be 111.111.111.121.
 - b1. Due to the fact that our ARP table is empty, we must query all MACs. Since our host A is the source, its MAC is AA-AA-AA-AA-AA-AA, and we don't know our destination MAC, so we query each MAC to find a corresponding IP. Meaning our destination is FF-FF-FF-FF-FF-FF. For each entry, the MAC and IP is added that exists in the subnet.
 - b2. The response from host B would be its MAC address BB-BB-BB-BB-BB-BB and the destination of A with AA-AA-AA-AA-AA-AA. Host A will update its ARP table once it receives the datagram.
 - b3. The forwarding table becomes (A, 1) for all switches after the first switch receives a frame, where ARP replies with (B,2) for every switch at the forwarding table.
 - b4. Since each switch knows where to forward the datagram sent by A (because of their forwarding table), when the switch receives the data, it just forwards to the next switch or to host B. The source IP and MAC of host A is 111.111.111.111 and AA-AA-AA-AA-AA-AA, while the destination IP and MAC is 111.111.111.120 and BB-BB-BB-BB-BB-BB.

3. Answer the following questions, based on the contents of the Ethernet frame containing the HTTP GET message.

ethernet-ethereal-trace-1

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No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
6	13.542974	CnetTech_73:8d:ce	Broadcast	ARP	60	Who has 192.168.1.117? Tell 192.168.1.104
7	17.444423	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
8	17.465902	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	62	IPv4
9	17.465927	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	54	IPv4
10	17.466468	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	686	IPv4
11	17.494766	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	60	IPv4
12	17.498935	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4

> Frame 10: 686 bytes on wire (5488 bits), 686 bytes captured (5488 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)

▼ Destination: LinksysG_da:af:73 (00:06:25:da:af:73)

Address: LinksysG_da:af:73 (00:06:25:da:af:73)

....0. = LG bit: Globally unique address (factory default)

....0. = IG bit: Individual address (unicast)

▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

....0. = LG bit: Globally unique address (factory default)

....0. = IG bit: Individual address (unicast)

Type: IPv4 (0x0800)

> Data (672 bytes)

```

0000  00 06 25 da af 73 00 d0 59 a9 3d 68 08 00 45 00  --%..S..Y.=h..E.
0010  02 a0 00 fa 40 00 80 06 bf c8 c0 a8 01 69 80 77  ---@---i-w
0020  f5 0c 04 22 00 50 65 14 99 a7 ac a5 3f b4 50 18  ---"Pe-...?P.
0030  fa f0 7e 4f 00 00 47 45 54 20 2f 65 74 68 65 72  --~O..GE T /ether
0040  65 61 6c 2d 6c 61 62 73 2f 48 54 54 50 2d 65 74  eal-labs /HTTP-et
0050  68 65 72 65 61 6c 2d 6c 61 62 2d 66 69 6c 65 33  hereal-l ab-file3
0060  2e 68 74 6d 6c 20 48 54 54 50 2f 31 2e 31 0d 0a  .html HT TP/1.1..
0070  48 6f 73 74 3a 20 67 61 69 61 2e 63 73 2e 75 6d  Host: ga ia.cs.um
0080  61 73 73 2e 65 64 75 0d 0a 55 73 65 72 2d 41 67  ass.edu-User-Ag
0090  65 6e 74 3a 20 4d 6f 7a 69 6c 6c 61 2f 35 2e 30  ent: Moz illa/5.0
00a0  20 28 57 69 6e 64 6f 77 73 3b 20 55 3b 20 57 69  (Window s; U; Wi
00b0  6e 64 6f 77 73 20 4e 54 20 35 2e 31 3b 20 65 6e  ndows NT 5.1; en

```

Source Hardware Address (eth 0): 6 bytes

1. The source address of the ethernet trace of the computers happens to be 00:d0:59:a9:3d:68
2. The destination address happens to be 00:06:25:da:af:73 which is not the address of gaia.cs.umass.edu but in fact that address of a Linksys router. This is used in order to get off the local subnet of the system in order to send the data to the actual website destination.
3. The hex value for the Frame type field is 0x0800, which is also known as the IP protocol.
4. It appears 52 bytes from the start of the Ethernet frame, as there are 14 bytes of Ethernet frame, 20 bytes of IP header, then finally 20 bytes of TCP header before the HTTP data is encountered.