Objectives of this assignment:

* to trace packets over a network with multiple bridges and routers.

Grading Guidelines:

(Exceptionally, you will not have to justify your answers for THIS assignment)

A right answer will get full credit when:

1. It is right (worth 90%)
2. It is right **AND** neatly presented making it easy and pleasant to read. (worth an **extra** 10%)
3. (Not applicable for THIS assignment) There is an **obvious and clear link** between 1) the information provided in the exercise and in class and 2) the final answer. A clear link is built by properly writing, justifying, and documenting an answer (worth an **extra** 00%).
4. (Not applicable for THIS assignment) Calculation mistakes will be minimally penalized (2 to 5% of full credit) while errors on units will be more heavily penalized.

**Late Submission** : as specified in the syllabus. Days counting starts one minute after the deadline.

You are welcome/encouraged to discuss exercises with other students or the instructor. But, ultimately, **personal** writing is expected.

* USE THE HOMEWORK ASSIGNMENT AS THE STARTING DOCUMENT YOU WILL TURN IN. **DO NOT DELETE ANYTHING FROM THIS FILE:** JUST **INSERT** YOUR ANSWERS.
* IF USING HAND WRITING (STRONGLY DISCOURAGED), **USE THIS FILE** BY CREATING SUFFICIENT SPACE AND WRITE IN YOUR ANSWERS.
* FAILING TO FOLLOW TURN IN DIRECTIONS /GUIDELINES WILL COST **A 30% PENALTY.**

What you need to do:

Answer the questions described below.

Packet Tracing Exercise (100 points)

Use the data and diagram to show the frames resulting from the command "**Telnet B**" being executed on host A. Use the answer sheet. There may be more lines than frames. You must also update the ARP caches and bridges' tables as you trace frames. Do not forget to update these caches while packet tracing.

**Assumptions**: the diagram consists of 5 numbered Ethernet segments (1 to 5), 2 bridges (B1 and B2), three routers (X,Y,Z) and hosts A, B, C, and D. **Host C is the DNS** server and its IP address is known to all machines. ARP and bridges caches are initially empty. For each bridge, top port is labeled P1 and bottom port is labeled P2. Tables on bridges are empty. Routing entries are as shown below.. There are two questions **a)** and **b).**

**Host A** : 131.204.99.1/24, Ethernet address is EA.

**Host B** : 131.204.12.2/24, Ethernet address is EB.

**Host C** : 131.204.15.3/24, Ethernet address is EC. **Host C is the DNS**

**Host D** : 131.204.15.6/24, Ethernet address is ED.

**Router X** : seg. 1: 131.204.99.100/24, Ethernet address is EX1.

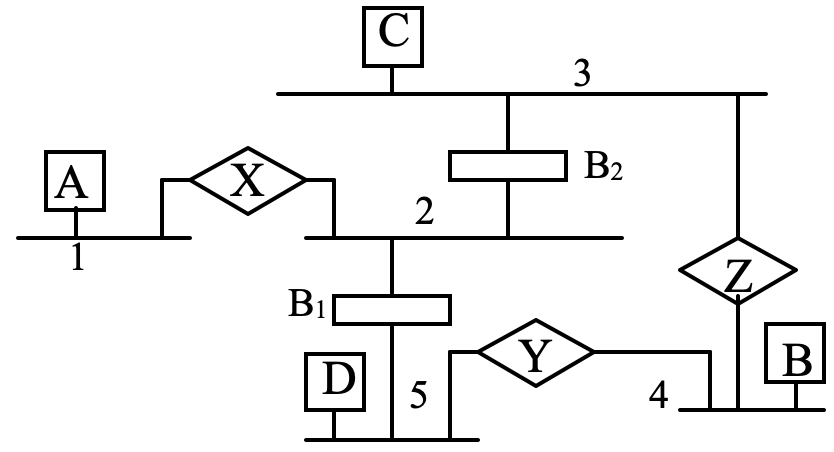
seg. 2: 131.204.15.100/24, Ethernet address is EX2.

**Router Y** : seg. 4: 131.204.12.101/24, Ethernet address is EY4.

seg. 5: 131.204.15.101/24, Ethernet address is EY5.

**Router Z** : seg. 3 131.204.15.144/24, Ethernet address is EZ3.

seg. 4: 131.204.12.144/24, Ethernet address is EZ4.



**Routing Tables: (Route based on these tables, NOT based on visual examination of the topology of the network. Read the routing tables whenever required by IP to route correctly. Responses and take different routes than the requests.)**

**Host A**

|  |  |  |
| --- | --- | --- |
| Destination | Netmask | Router |
| 0.0.0.0 | 255.255.255.0 | 131.204.99.100 |

**Host B**

|  |  |  |
| --- | --- | --- |
| Destination | Netmask | Router |
| 0.0.0.0 | 255.255.255.0 | 131.204.12.144 |

**Host C**

|  |  |  |
| --- | --- | --- |
| Destination | Netmask | Router |
| 131.204.99.0 | 255.255.255.0 | 131.204.15.100 |
| 0.0.0.0 | 255.255.255.0 | 131.204.15.144 |

**Host D**

|  |  |  |
| --- | --- | --- |
| Destination | Netmask | Router |
| 0.0.0.0 | 255.255.255.0 | 131.204.15.101 |

**Router X**

|  |  |  |
| --- | --- | --- |
| Destination | Netmask | Router |
| 131.204.12.0 | 255.255.255.0 | 131.204.15.101 |
| 0.0.0.0 | 255.255.255.0 | 131.204.15.144 |

**Routers Y and Z**

|  |  |  |
| --- | --- | --- |
| Destination | Netmask | Router |
| 131.204.99.0 | 255.255.255.0 | 131.204.15.100 |
| 0.0.0.0 | 255.255.255.0 | 131.204.15.100 |

Fill in the answer sheet below until the third TCP handshake segment is received. In question b), below, you must update the ARP caches and bridges' tables. Therefore, do not forget to update these while answering Question a). Stop when the third TCP handshake segment is received by the server.

a) **(80 Points**) Fill in the packet tracing table below

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Phy.** | **Data Link Layer** | | | **Network Layer** | | | **Transport Layer** | | | **Application/Comment** |
| Seg. | Dst. | Src | Type | Dest. | Src | Prot. # | Dst. | Src | Flags |  |
| 1 | 0xffffffff | EA | Arp request | 131.204.99.100 | 131.204.99.1 | N/A | N/A | N/A | N/A |  |
| 1 | EA | EX1 | Arp response | 131.204.99.1 | 131.204.99.100 | N/A | N/A | N/A | N/A |  |
| 1 | EX1 | EA | IP | 131.204.15.3 | 131.204.99.1 | 17 | 53 | X | N/A | DNS request |
| 2,3,5 | 0xffffffff | EX2 | Arp request | 131.204.15.3 | 131.204.15.100 | N/A | N/A | N/A | N/A |  |
| 3,2 | EX2 | EC | Arp response | 131.204.15.100 | 131.204.15.3 | N/A | N/A | N/A | N/A |  |
| 2,3 | EC | EX2 | IP | 131.204.15.3 | 131.204.99.1 | 17 | 53 | X | N/A | DNS request |
| 3,2 | EX2 | EC | IP | 131.204.99.1 | 131.204.15.3 | 17 | X | 53 | N/A | DNS response |
| 1 | EA | EX1 | IP | 131.204.99.1 | 131.204.15.3 | 17 | X | 53 | N/A | DNS response |
| 1 | EX1 | EA | IP | 131.204.12.2 | 131.204.99.1 | 6 | 23 | Y | SYN | SYN 2 open TCP |
| 2,3,5 | 0xffffffff | EX2 | Arp request | 131.204.15.101 | 131.204.15.100 | N/A | N/A | N/A | N/A |  |
| 5,2 | EX2 | EY5 | Arp response | 131.204.15.100 | 131.204.15.101 | N/A | N/A | N/A | N/A |  |
| 2,5 | EY5 | EX2 | IP | 131.204.12.2 | 131.204.99.1 | 6 | 23 | Y | SYN | SYN 2 open TCP |
| 4 | 0xffffffff | EY4 | Arp request | 131.204.12.2 | 131.204.12.101 | N/A | N/A | N/A | N/A |  |
| 4 | EY4 | EB | Arp response | 131.204.12.101 | 131.204.12.2 | N/A | N/A | N/A | N/A |  |
| 4 | EB | EY4 | IP | 131.204.12.2 | 131.204.99.1 | 6 | 23 | Y | SYN | SYN 2 open TCP |
| 4 | 0xffffffff | EB | Arp request | 131.204.12.144 | 131.204.12.2 | N/A | N/A | N/A | N/A |  |
| 4 | EB | EZ4 | Arp response | 131.204.12.2 | 131.204.12.144 | N/A | N/A | N/A | N/A |  |
| 4 | EZ4 | EB | IP | 131.204.99.1 | 131.204.12.2 | 6 | Y | 23 | SYN/ACK | SYN/ACK handshake |
| 3,2 | 0xffffffff | EZ3 | Arp request | 131.204.15.100 | 131.204.15.144 | N/A | N/A | N/A | N/A |  |
| 2,3 | EZ3 | EX2 | Arp response | 131.204.144 | 131.204.15.100 | N/A | N/A | N/A | N/A |  |
| 3,2 | EX2 | EZ3 | IP | 131.204.99.1 | 131.204.12.2 | 6 | Y | 23 | SYN/ACK | SYN/ACK handshake |
| 1 | EA | EX1 | IP | 131.204.99.1 | 131.204.12.2 | 6 | Y | 23 | SYN/ACK | SYN/ACK handshake |
| 1 | EX1 | EA | IP | 131.204.12.2 | 131.204.99.1 | 6 | 23 | Y | ACK | ACK handshake |
| 2,5 | EY5 | EX2 | IP | 131.204.12.2 | 131.204.99.1 | 6 | 23 | Y | ACK | ACK handshake |
| 4 | EB | EY4 | IP | 131.204.12.2 | 131.204.99.1 | 6 | 23 | Y | ACK | ACK handshake |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |

b) **(20 Points**) Provide the contents of all ARP and bridges caches after the third TCP handshake segment is received by the server. Describe the caches using the same format used in the lectures.

ARP Cache

Host A

|  |  |
| --- | --- |
| IP Address | MAC Address |
| 131.204.99.100 | EX1 |

Host B

|  |  |
| --- | --- |
| IP Address | MAC Address |
| 131.204.12.101 | EY4 |
| 131.204.12.144 | EZ4 |

Host C

|  |  |
| --- | --- |
| IP Address | MAC Address |
| 131.204.15.100 | EX2 |

Host D

|  |  |
| --- | --- |
| IP Address | MAC Address |
|  |  |

Router X

|  |  |
| --- | --- |
| IP Address | MAC Address |
| 131.204.99.1 | EA |
| 131.204.15.3 | EC |
| 131.204.15.101 | EY5 |
| 131.204.15.144 | EZ3 |

Router Y

|  |  |
| --- | --- |
| IP Address | MAC Address |
| 131.204.15.100 | EX2 |
| 131.204.12.2 | EB |

Router Z

|  |  |
| --- | --- |
| IP Address | MAC Address |
| 131.204.12.2 | EB |
| 131.204.15.100 | EX2 |

Bridge Cache 1

|  |  |
| --- | --- |
| MAC Address | Port # |
| EX2 | P1 |
| EC | P1 |
| EY5 | P2 |
| EZ3 | P1 |

Bridge Cache 2

|  |  |
| --- | --- |
| MAC Address | Port # |
| EX2 | P2 |
| EC | P1 |
| EY5 | P2 |
| EZ3 | P1 |

**What you need to turn in**:

* Electronic copy of this file (including your answers) (standalone).
* You are welcome/encouraged to discuss exercises with other students or the instructor. But, ultimately, personal writing is expected.