

EL5373

INTERNET ARCHITECTURE AND PROTOCOLS

48/50

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Workstation: APAH Othello_I

MAC: f8:0f:41:c4:7f:aa

Lab Report 4

Due Oct 14, 2014

Exercise 1

Configure the IP addresses of my workstations and the router as following

Router 3	eth0 (123.238.63.3)	eth1 (128.238.64.3)
Host	Yachi(Me) (128.238.63.103)	Fenchi (Partner) (128.238.64.103)

When a packet was sent to a workstation in the other subnet, explain how the source and destination Ethernet addresses were changed.

- 1). when the packet was sent from transmitter to the router, source Ethernet address is transmitter address, destination Ethernet address is router Ethernet interface address connected to the transmitter subnet.
- 2.) When the packet go through the router to the receiver, source Ethernet address is router Ethernet interface address connected to the receiver subnet, destination address is receiver address.

What are the source and destination addresses in the IP and Ethernet headers of a packet that went from your machine to the router?

Ethernet Header Source: f8:0f:41:c4:7f:aa (My workstation MAC)

Destination: 00:05:9b:bf:45:a0 (Router 3 eth0 MAC)

IP Header Source: 128.238.63.103

Destination: 128.238.64.103

What are the source and destination addresses in the IP and Ethernet headers of a packet that went from the router to your partner's machine?

Ethernet Header Source: 00:05:9b:bf:45:a1 (Router 3 eth1 MAC)

Destination: f8:0f:41:c4:7f:a8 (Partner MAC)

IP Header Source: 128.238.63.103

Destination: 128.238.64.103

What are the source and destination addresses in the IP and Ethernet headers of a packet that went from your partner's workstation to the router?

Ethernet Header Source: f8:0f:41:c4:7f:a8 (Partner MAC)

Destination: 00:05:9b:bf:45:a1 (Router 3 eth1 MAC)

IP Header Source: 128.238.64.103

Destination: 128.238.63.103

What are the source and destination addresses in the IP and Ethernet headers

of a packet that went from the router to your machine?

Ethernet Header Source: 00:05:9b:bf:45:a0 (Router 3 eth0 MAC)

Destination: f8:0f:41:c4:7f:aa (My workstation MAC)

IP Header Source: 128.238.64.103

Destination: 128.238.63.103

calculate the average delay that a packet experienced in the router.

When I ping my partner, an ICMP message is sent from my workstation and I can find the send time of this ICMP request (1.001813) in my tcpdump output. From my partner tcpdump output, he can also find the send time of this same request (1.001827). So the subtraction of these two time is the delay of the packet through the router.

(1.001827, 1.001813) (2.003419, 2.003473) (3.005179, 3.005167) (4.006926, 4.006890)

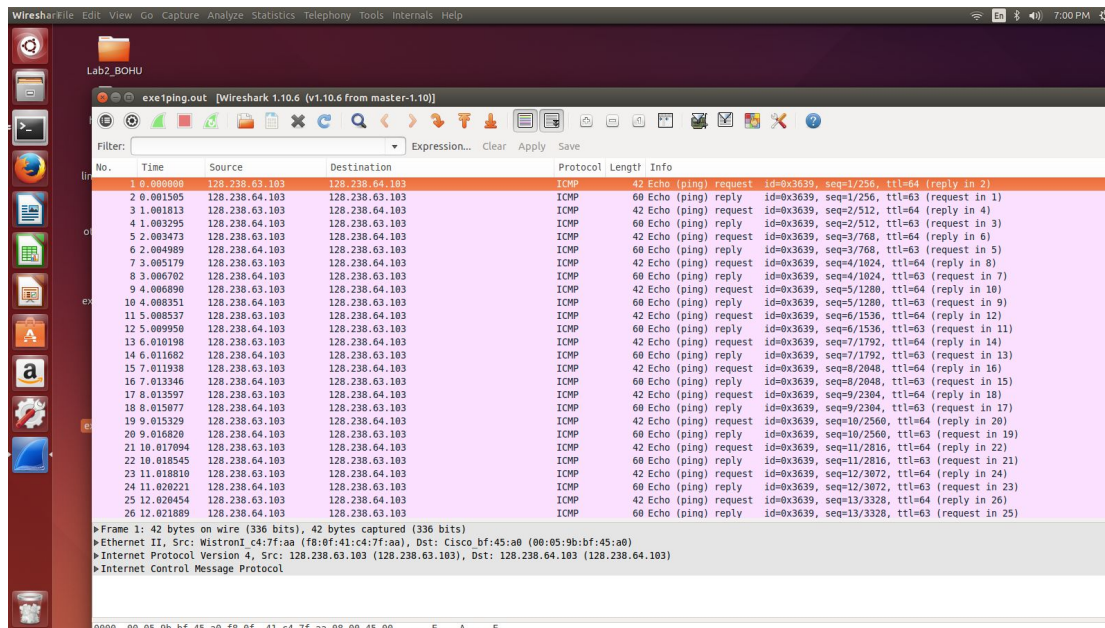
-2

The average delay is 0.000028 s and Router is faster than bridge

Wireshark packet capture showing ICMP ping requests and replies between 128.238.64.103 and 128.238.63.103. The packet list shows 26 frames, with the 12th frame highlighted. The packet details pane shows the Ethernet II header and the ICMP Echo (ping) request.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=1/256, ttl=63 (reply in 2)
2	0.000048	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=1/256, ttl=64 (request in 1)
3	1.001535	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=2/512, ttl=63 (reply in 4)
4	1.001580	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=2/512, ttl=64 (request in 3)
5	2.002749	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=3/768, ttl=63 (reply in 6)
6	2.002795	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=3/768, ttl=64 (request in 5)
7	3.004384	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=4/1024, ttl=63 (reply in 8)
8	3.004429	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=4/1024, ttl=64 (request in 7)
9	4.006218	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=5/1280, ttl=63 (reply in 10)
10	4.006263	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=5/1280, ttl=64 (request in 9)
11	5.008161	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=6/1536, ttl=63 (reply in 12)
12	5.008205	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=6/1536, ttl=64 (request in 11)
13	6.018118	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=7/1792, ttl=63 (reply in 14)
14	6.018163	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=7/1792, ttl=64 (request in 13)
15	7.012123	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=8/2048, ttl=63 (reply in 16)
16	7.012168	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=8/2048, ttl=64 (request in 15)
17	8.014101	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=9/2304, ttl=63 (reply in 18)
18	8.014146	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=9/2304, ttl=64 (request in 17)
19	9.015995	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=10/2560, ttl=63 (reply in 20)
20	9.016039	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=10/2560, ttl=64 (request in 19)
21	10.017976	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=11/2816, ttl=63 (reply in 22)
22	10.018020	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=11/2816, ttl=64 (request in 21)
23	11.019917	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=12/3072, ttl=63 (reply in 24)
24	11.019935	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=12/3072, ttl=64 (request in 23)
25	12.021807	128.238.64.103	128.238.63.103	ICMP	98	Echo (ping) request id=0x2e8e, seq=13/3328, ttl=63 (reply in 26)
26	12.021852	128.238.63.103	128.238.64.103	ICMP	98	Echo (ping) reply id=0x2e8e, seq=13/3328, ttl=64 (request in 25)

Frame 12: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface eth0
Encapsulation type: Ethernet (1)
Arrival Time: Oct 7, 2014 18:53:03.607186000 EDT
[Time shift for this packet: 0.000000000 seconds]
Epoch Time: 1412722383.607186000 seconds



Exercise 2

Explain why you can only get two different RIP messages in your subnet. Was a RIP packet forwarded by the routers? Why?

RIP response packets are only received by directly connected routers and are not forwarded. Each router only speaks to its neighbors. Networks are learned only from neighbors, not necessarily from the router that is directly connected to the network. Each route sent in response packets includes the network address and the metric associated with the network address.

*RIP Packet from 128.238.63.3, (63.100/ yach)i

IP header

IP Version 4.0	Hdr Len 20 bytes	0xc0(DSCP 0x30, ECN 0x00)	Total Len 72 bytes
0x0000		0x00	0
2	UDP(17)	0xf7f4	
128.238.63.3			
255.255.255.255			
options			
data			

UDP header

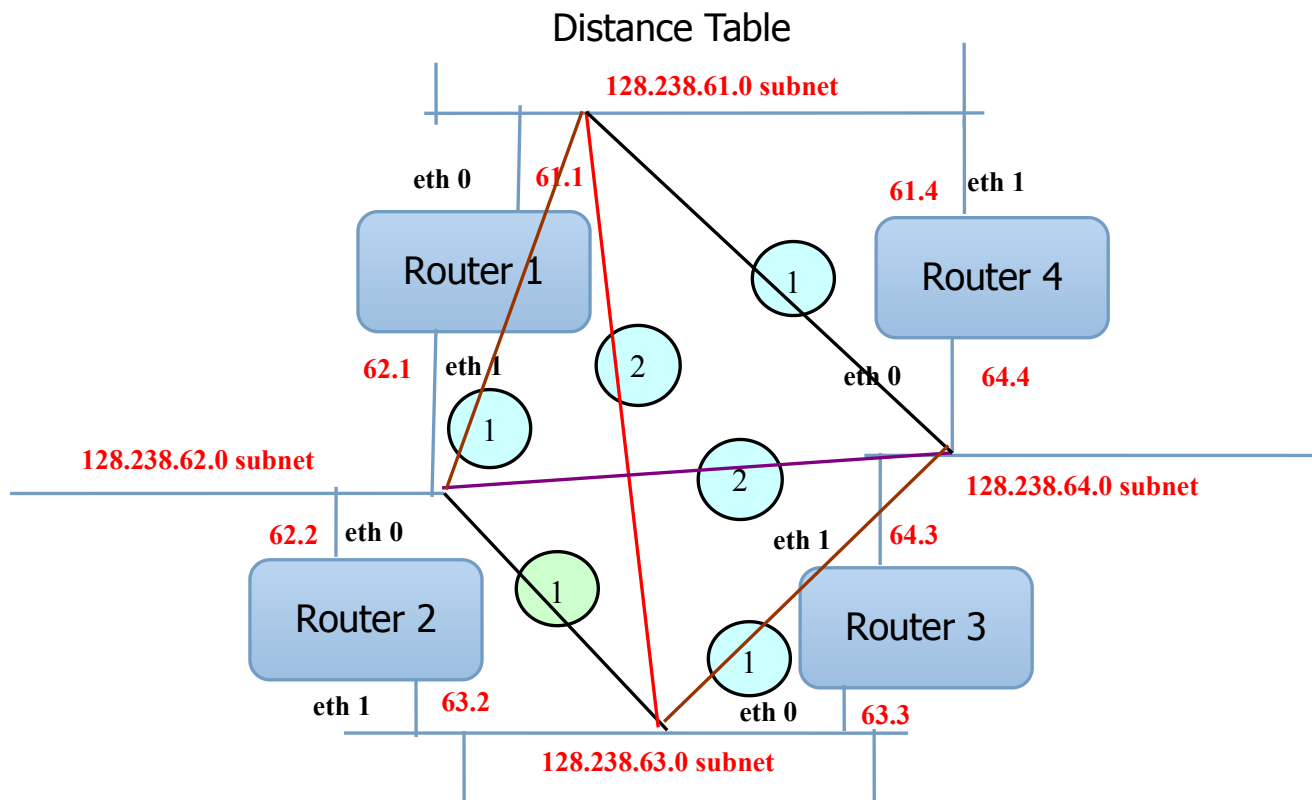
520	520
Len 52 bytes	0xba9f

RIP message

Command (2)	Version (1)	0
Address Family IP (2)	0	
128.238.61.0		
0		
0		
Metric (2)		
Address Family IP (2)	0	
128.238.64.0		
0		
0		
Metric (1)		

Other seven RIP messages

123.238.63.2 IP address 128.238.61.0 Metric 2 IP address 128.238.62.0 Metric 1	
123.238.62.2 IP address 128.238.63.0 Metric 1 IP address 128.238.64.0 Metric 2	123.238.62.1 IP address 128.238.61.0 Metric 1 IP address 128.238.64.0 Metric 2
123.238.61.4 IP address 128.238.63.0 Metric 2 IP address 128.238.64.0 Metric 1	123.238.61.1 IP address 128.238.62.0 Metric 1 IP address 128.238.63.0 Metric 2
123.238.64.4 IP address 128.238.61.0 Metric 1 IP address 128.238.62.0 Metric 2	123.238.64.3 IP address 128.238.62.0 Metric 2 IP address 128.238.63.0 Metric 1



For example, A routing table can be formed at 128.238.62.0 subnet

Destination	Next hop	Cost
128.238.61.0	Router 1	1
128.238.63.0	Router 2	1
128.238.64.0	Router 1	2

Exercise 4

When I (128.238.63.100) ping 128.238.64.100, which is three hops away from my host.

The first IP datagram to host 64.100 is forwarded through router 2 gateway 128.238.63.2.

And then I receive ICMP redirect from 63.2

70	21.0721210	128.238.64.100	128.238.63.101	ICMP	98 Echo (ping) request	id=0x1355, seq=142/3635
71	21.0726320	128.238.63.101	128.238.64.100	ICMP	98 Echo (ping) reply	id=0x1355, seq=142/3635
72	22.0040240	128.238.63.100	128.238.64.100	ICMP	98 Echo (ping) request	id=0x46c3, seq=1/256, t
73	22.0053320	128.238.63.2	128.238.63.100	ICMP	70 Redirect	(Redirect for network)
74	22.0054040	128.238.63.100	128.238.64.100	ICMP	98 Echo (ping) request	id=0x46c3, seq=1/256, t
75	22.0071290	128.238.64.100	128.238.63.100	ICMP	98 Echo (ping) reply	id=0x46c3, seq=1/256, t
76	22.0248020	Cisco_bf:44:81	Spanning-tree-(for-STP	60 Conf.	Root = 32768/0/00:05:9b:bf:44:80	Cost
77	22.0717750	128.238.64.100	128.238.63.101	ICMP	98 Echo (ping) request	id=0x1355, seq=143/3660

It adds a new entry which is directed to host 64.100 through router 3 gateway 128.238.63.3

```

Internet Protocol Version 4, Src: 128.238.63.2 (128.238.63.2), Dst: 128.238.63.100 (128.238.63.100)
  Version: 4
  Header Length: 20 bytes
  Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00: Not-ECT (Not ECN-Congestion))
  Total Length: 56
  Identification: 0x0237 (567)
  Flags: 0x00
  Fragment offset: 0
  Time to live: 255
  Protocol: ICMP (1)
  Header checksum: 0x394b [validation disabled]
    Source: 128.238.63.2 (128.238.63.2)
    Destination: 128.238.63.100 (128.238.63.100)
    [Source GeoIP: Unknown]
    [Destination GeoIP: Unknown]
Internet Control Message Protocol
  Type: 5 (Redirect)
  Code: 0 (Redirect for network)
  Checksum: 0x7f90 [correct]
  Gateway address: 128.238.63.3 (128.238.63.3)
Internet Protocol Version 4, Src: 128.238.63.100 (128.238.63.100), Dst: 128.238.64.100 (128.238.64.100)
  Version: 4
  Header Length: 20 bytes
  Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00: Not-ECT (Not ECN-Congestion))
  Total Length: 84
  Identification: 0x94f9 (38137)
  Flags: 0x02 (Don't Fragment)
  Fragment offset: 0
  Time to live: 63
  Protocol: ICMP (1)

```

From the experiment, the routing table haven't changed actually.
But from textbook, we find Routing table Flags index meaning as following:
There are five flags which can be used for a given route.

- U. The route is up.
- G. The route is to a router (gateway).
- H. The route is to a host.
- D. The route was created by a redirect (see Section 4.2.3).
- M. The route was modified by a redirect.


```
guest@othello1: ~  
guest@othello1:~$ netstat -rn  
Kernel IP routing table  
Destination      Gateway          Genmask          Flags   MSS Window  irtt Iface  
0.0.0.0          128.238.63.3    0.0.0.0          UG      0 0        0 eth0  
128.238.63.0    0.0.0.0         255.255.255.0    U        0 0        0 eth0  
guest@othello1:~$ sudo route del default gw 128.238.63.3 dev eth0  
[sudo] password for guest:  
guest@othello1:~$ netstat -rn  
Kernel IP routing table  
Destination      Gateway          Genmask          Flags   MSS Window  irtt Iface  
128.238.63.0    0.0.0.0         255.255.255.0    U        0 0        0 eth0  
guest@othello1:~$ sudo route add default gw 128.238.63.2 dev eth0  
guest@othello1:~$ guest1  
guest1: command not found  
guest@othello1:~$ netstat -rn  
Kernel IP routing table  
Destination      Gateway          Genmask          Flags   MSS Window  irtt Iface  
0.0.0.0          128.238.63.2    0.0.0.0          UG      0 0        0 eth0  
128.238.63.0    0.0.0.0         255.255.255.0    U        0 0        0 eth0  
guest@othello1:~$
```