

Homework 4 Suggested Solutions

Question 1

a)

eBGP. 3c is a gateway router, and it learnt the route from 4C, in a different AS.

b)

iBGP. Gateway routers within the same AS use iBGP to exchange routes *learnt from other AS gateway routers*.

c)

eBGP. 1c is a gateway router, and it learnt the route from 4C, in a different AS.

d)

iBGP.

e)

It will be equal to l_1 because this link provides the shortest path to the gateway router 1c. 1c is chosen because BGP has decided that it has the lowest AS-path to x.

f)

It will be equal to l_2 . Although the two routes have same AS-path length, the tie is broken by choosing the route with the gateway router with lowest cost (closest next-hop).

g)

It will be equal to l_1 . The gateway routers in AS1 will recompute and agree that the best route to prefix x is now through AS3 because it has the shortest AS-path.

Question 2

a)

No, Host E will not ask Router R1 to help forward the datagram to F. Host E has a link-layer connection to F as they are connected to switch S3 and they belong to the same subnet.

Source IP	IP address of (interface of) host E
Destination IP	IP address of (interface of) host F
Source MAC	MAC address of interface of host E
Destination MAC	MAC address of interface of host F

b)

No, the ARP query is not sent. The IP layer understands that host B is outside its LAN subnet, so it will default route through R1 (by setting the destination MAC address to be that of R1).

Source IP	IP address of (interface of) host E
Destination IP	IP address of host B
Source MAC	MAC address of interface of host E
Destination MAC	MAC address of the interface of R1 facing S3

c)

Switch S1 will flood all its links with the ARP request message because it has a broadcast address.

R1 will also eventually receive the ARP request message because they are in the same subnet and the ARP request is a broadcast address, but it does not forward it to S3; because it understands from its interface addresses that the S3-facing interface belongs to a different subnet.

No, Host B does not need to send ARP query, because its ARP table already cached the entry for Host A when it received the initial query (the query contains Host A's address).

No, Switch S1 does not receive the ARP response message from Host B (propagated by S0). The ARP response message's destination is Host A - it is not a broadcast address. S0's switch table already has the entry for Host A that was known during the initial request.

Question 3

XOR method

Calculation	Verification
<pre> 11111001 ^1001 =01101001 ^ 1001 = 0100001 ^ 1001 = 0001010 ^ 1001 = 001100 ^ 1001 =0000000101 </pre>	<pre> 11111001101 ^1001 =01101001 ^ 1001 = 0100001 ^ 1001 = 0001011 ^ 1001 = 001001 ^ 1001 =0000000000 </pre>

Repeatedly XOR starting from the first non-zero bit of the previous result. Repeat until all bits from the original D has been XOR'd to 0 (also means you need to pad 0 r times). The answer is the least significant r bits of the final remainder.

To verify, repeat the process but pad with the CRC value instead of 0's.

Question 4

1)

These are trunk ports. They contain the 802.1Q header with the VLAN ID.

2)

Any combination works as long as the subnets for the two VLANS don't clash. Remember the first address (all 0 set for host bits) and the last address (all 1 set for host bits) cannot be used.

Following conventions, we set the first usable address to be the router's interface. In this solution, we use the first two /29 slices starting from 10.0.0.64/28: this gives us 10.0.0.64/29 (brown) and 10.0.0.72/29 (blue)

Device/Interface	IP address	Network mask
Host A	10.0.0.74	255.255.255.248
Host B	10.0.0.75	
Host C	10.0.0.66	
Host D	10.0.0.67	
Host E	10.0.0.76	
Host F	10.0.0.77	
Host G	10.0.0.68	
Host H	10.0.0.69	
R interface 1	10.0.0.65	
R interface 2	10.0.0.73	

3)

Host A ARP table

IP Address	MAC Address
R interface 2	R interface 2

Host H ARP table

IP Address	MAC Address
R interface 1	R interface 1

S1 Forwarding Table

Destination MAC	Outgoing Port
Host A	2
Host H	16
R interface 1	15
R interface 2	16

S2 Forwarding Table

Destination MAC	Outgoing Port
Host A	1
Host H	7
R interface 1	1
R interface 2	5

R Forwarding Table

Destination Prefix	Interface
10.0.0.64/29	1
10.0.0.72/29	2

4)

Syntax used here: Node.Interface

	From Port	To Port
First Link	A	S1.2
	S1.16	S2.1
	S2.5	R.2
	R.1	S1.15
	S1.16	S2.1
Last Link	S2.7	H