COMP30650 Networks and Internet Systems Practical Sessions Suggested Solutions

LAB 4 - Slide 11

List the MAC Address of Linux-ToolBoxes

1. Running *ifconfig on each Toolbox* gives the answers
2. ____________________
3. ____________________

Are the MAC Addresses Unique? Yes

Why? MAC Addresses are the basis for all communication on Networks and so must be unique to ensure delivery to the correct node.

Where do the MAC Addresses come from? MAC addresses are most often assigned by the manufacturer of network interface cards. Each is stored in hardware of the NIC. The distribution and use of MAC addresses is managed by managed by the Institute of Electrical and Electronics Engineers (IEEE)

What is size of MAC Address (in bits)? 48 bits

LAB 4 - Slide 16

Using the output of the *arp* command, answer the following questions

What is the MAC address of Linux-ToolBox-2? Running *arp on the Toolbox* gives the answer.

What interface is it attached to? eth0

Why do we need to know interface information? There can be more than one interface on a single node (e.g. wireless and wired interface). As each interface has a separate MAC address we need to know which interface has the which address.

What other information is the arp table storing? The possible fields in the arp table are the IP Address, the Hardware Type (ethernet, wifi, etc), the MAC

Address corresponding to the IP Address, flags which indicate if the record is permanent (m) or cached (c), the subnet mask and the interface name.

LAB 4 - Slide 21

How many types of arp message are there, and what are they? 2 - request and reply.

What are the 4 address fields of an ARP messages? Sender IP and MAC Addresses and Destination IP and MAC Addresses

What size (in bits) is each of these fields? MAC Address is 48 bits, IP Address is 32 bits

How do these fields differ between the the different types of ARP message? The Target MAC Address is all 0s in the request - it is broadcast. Teh reply contains the correct MAC addresses for each device/node.

How does an ARP message get delivered to the correct target node to find its MAC address?the request is broadcast to all nodes on the network. The node with the specified IP address replies.

LAB 5 - Slide 14

List the protocols that are being captured by wireshark ARP and ICMP

What MAC addresses are detectable in the trace? Source and Destination MAC Addresses

Which devices do these correspond to? Toolbox-1 and Toolbox-2

Are MAC addresses used for forwarding messages? No, it is broadcast to all nodes

What are the weaknesses of using hubs? Broadcasting is a weakness as all nodes can listen to packets destined for other nodes.

LAB 5 - Slide 17

List the Protocols that are being captured by wireshark DNS, ARP, HTTP, TCP

What is the destination ip address of the http requests by the browser? Destination - the website that you requested

Would Linux-Toolbox-3 be able see what websites the *webterm* is visiting? Yes

What about the content of the websites? Yes. Wireshark captures the header and content of the transfer data.

LAB 5 - Slide 17

What protocols are captured by wireshark now? ARP

Why are these protocols needed? To determine the MAC address of where to send to ping message

What does this tell us about how switches work? Unlike Hubs, switches do not broadcast messages. They use addresses to get to the receiver based on an address table which they build using backwards learning.

LAB 5 - Slide 37

What is the contents of SW1’s MAC Table before any network activity is performed?   The table may contain vlan1 which is the mac address of the switch. Importantly, there are no other host mac addresses at this stage as no traffic has been seen.

What is the contents of SW1’s MAC Table after you ping a remote node? The table now contains the a mapping between the physical port number of the switch and the mac addresses of the node connected to those physical ports.

What has happened and how? Backwards learning has been used to build the table. In practice, ARP was used by the sender node to find the mac address of the destination (a remote node in this case). The switch sees this message which contains the sender's mac address to learn the which of its physical ports the sender node is connected to.

What is the contents of SW1’s MAC Table after you ping a local node? The mac address and associated physical port of the sender and receiver nodes.

What has happened and how? After a sender broadcasts ARP to get the MAC address of the destination, the switch sees the reply from the destination and populates its MAC address table with physical port mac address mapping.

LAB 6 - Slide 11

Using the consoles, query the switches to determine which ports are forwarding and blocking. Use the information to draw the spanning tree for the topology.

List the mac addresses for each switch.

1. Running *ifconfig* command in each console will return these results
2. ______________________
3. ______________________
4. ______________________
5. ______________________

Does the lowest address correspond to the root node? Yes it should

LAB 6 - Slide 21

Verify the following:

Can the Accounts PCs access the internet? Yes - test with ping

Can the Accounts PCs communicate with each other? Yes - test with *ping* command

Can the Accounts PCs communicate with Sales PCs? Yes - test with *ping command*

List the IP addresses for each Account PC.

1. Running *ifconfig* command in each console will return these results
2. ______________________

LAB 6 - Slide 23

What VLAN should port connected to the Internet be set to? The Sales VLAN (Vlan10 if following instructions directly) *

Can the Accounts PCs communicate with each other? Yes - test with *ping* command

Can the Accounts PCs communicate with Sales PCs? No - test with *ping* command

Has the objective been achieved? Yes

Why not create two disjoint topologies to model the desired scenario?

It is more costly to have two separate networks. It is better to share infrastructure but to logically divide the topology.

Lab 7 - Slide 10

Which of following are correct IP Addresses?

1. **127.0.0.1 -** Correct
2. **182.381.1.2 -** Incorrect
3. **10.1.1.0 -** Correct
4. **192.168.0.255 -** Correct
5. **96.64.32.0.1 -** Incorrect

Lab 7 - Slide 11

1. For each of the subnet masks shown below, list
   a. The equivalent prefix.
   b. The number of hosts represented by the subnet mask.
   c. The binary of the subnet mask.

255.255.255.0

Prefix= /24
Number of Hosts: 254
Binary: 11111111.11111111.11111111.00000000

255.255.255.128

Prefix= /25
Number of Hosts: 128
Binary: 11111111.11111111.1111111.10000000

255.255.0.0

Prefix= /16
Number of Hosts: 65534
Binary: 11111111.11111111.00000000.00000000

Lab 7 - Slide 12

1. For each of the prefixes shown below, list
   a. The equivalent subnet mask.
   b. The number of hosts represented by the prefix.
   c. The binary of the subnet mask represented by the prefix.

/24

Subnet Mask= 255.255.255.0
Number of Hosts: 254
Binary: 11111111.11111111.11111111.00000000

/25

Subnet Mask= 255.255.255.192
Number of Hosts: 126
Binary: 11111111.11111111.11111111.100000000

/28

Subnet Mask= 255.255.255.240
Number of Hosts: 14
Binary: 11111111.11111111.11111111.11110000

/26

Subnet Mask= 255.255.255.192
Number of Hosts: 62
Binary: 11111111.11111111.11111111.11000000

Lab 7 - Slide 12

1. Given the following network id and subnet mask or prefix length, what is the first host ip address, the last host ip address and the broadcast ip address.

10.10.0.0 255.255.255.0

First: 10.10.0.1
Last: 10.10.0.254
Broadcast:10.10.0.255

10.10.10.0/28

First: 10.10.10.1
Last: 10.10.10.14
Broadcast:10.10.10.15

10.10.10.4 255.255.255.252

First: 10.10.10.5
Last: 10.10.10.6
Broadcast:10.10.10.7

192.168.0.128/25

First: 192.168.0.129
Last: 192.168.0.254
Broadcast:192.168.0.255