

Assignment 1

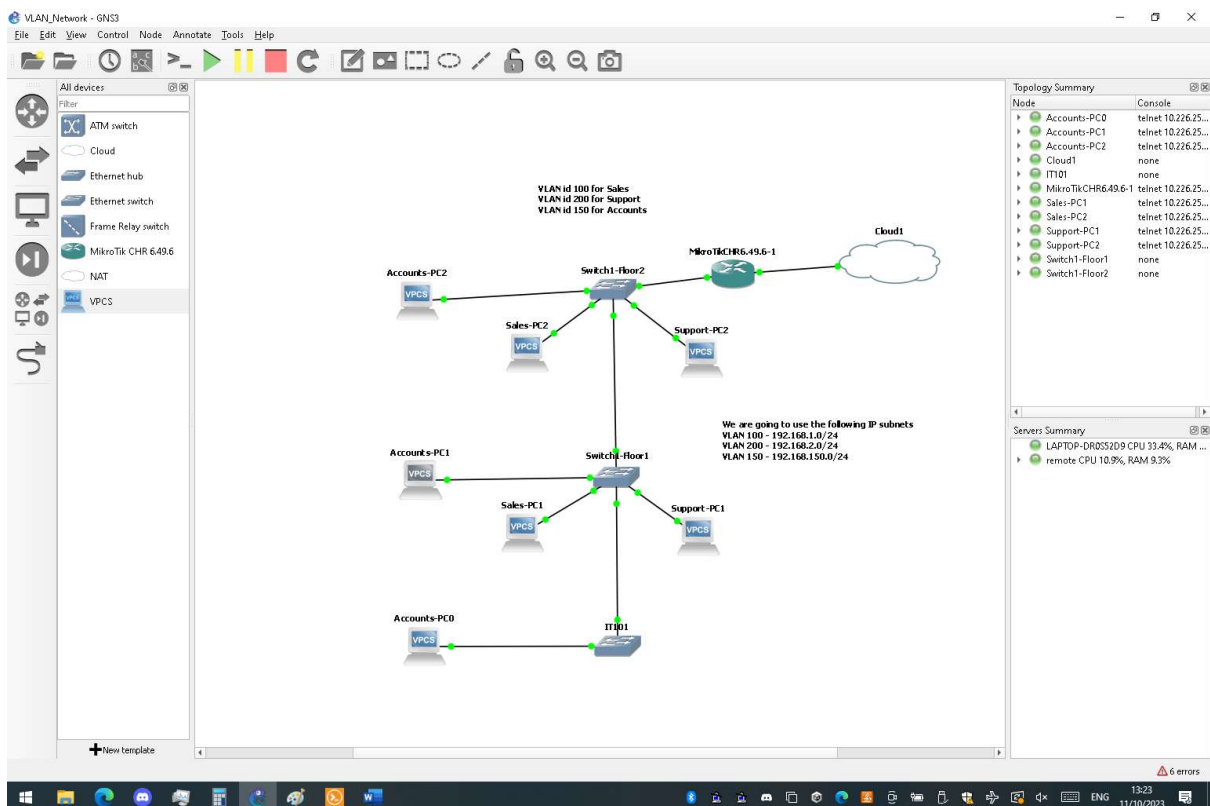
CT3531 Networks and Data Communications 2

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Step 1

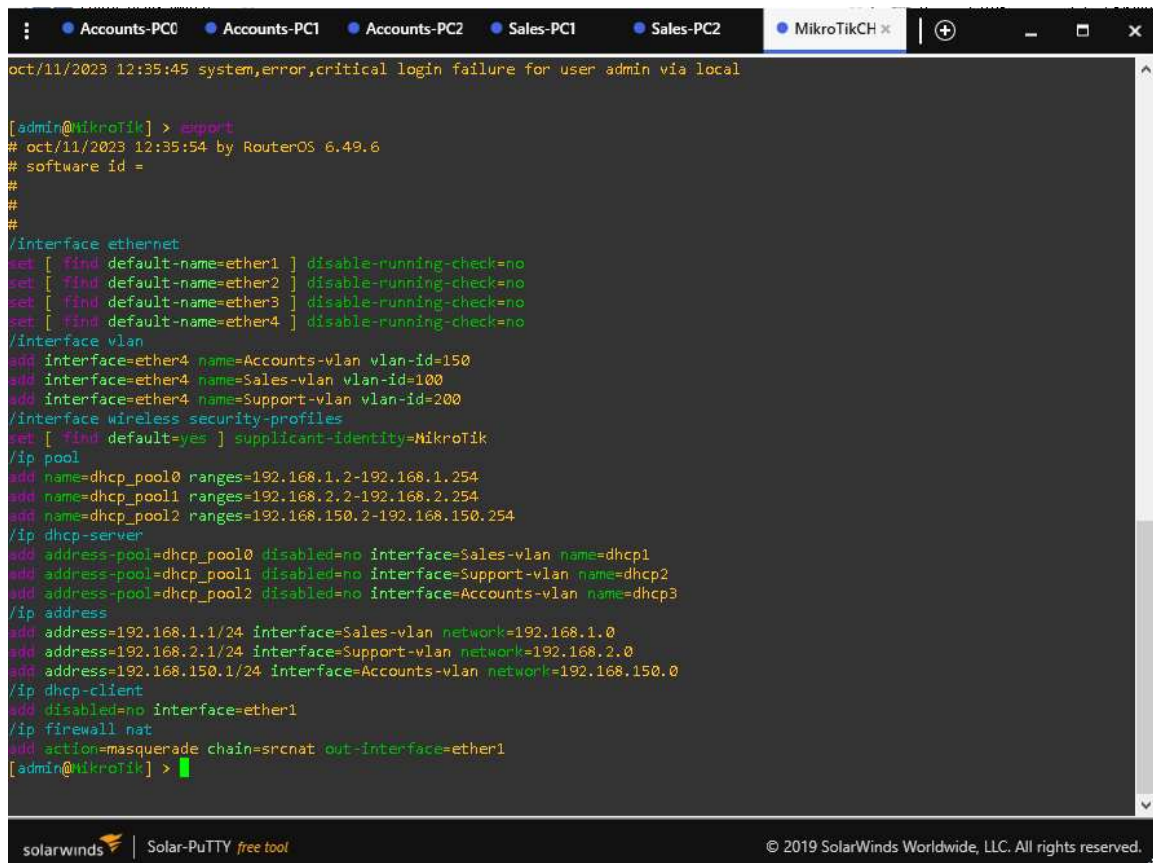
New switch, IT101, can be seen at the bottom of this screenshot from [Step 4](#)



Step 2 and Step 3

Added a new VLAN to the network, for the Accounts Dept, with VLAN ID 150

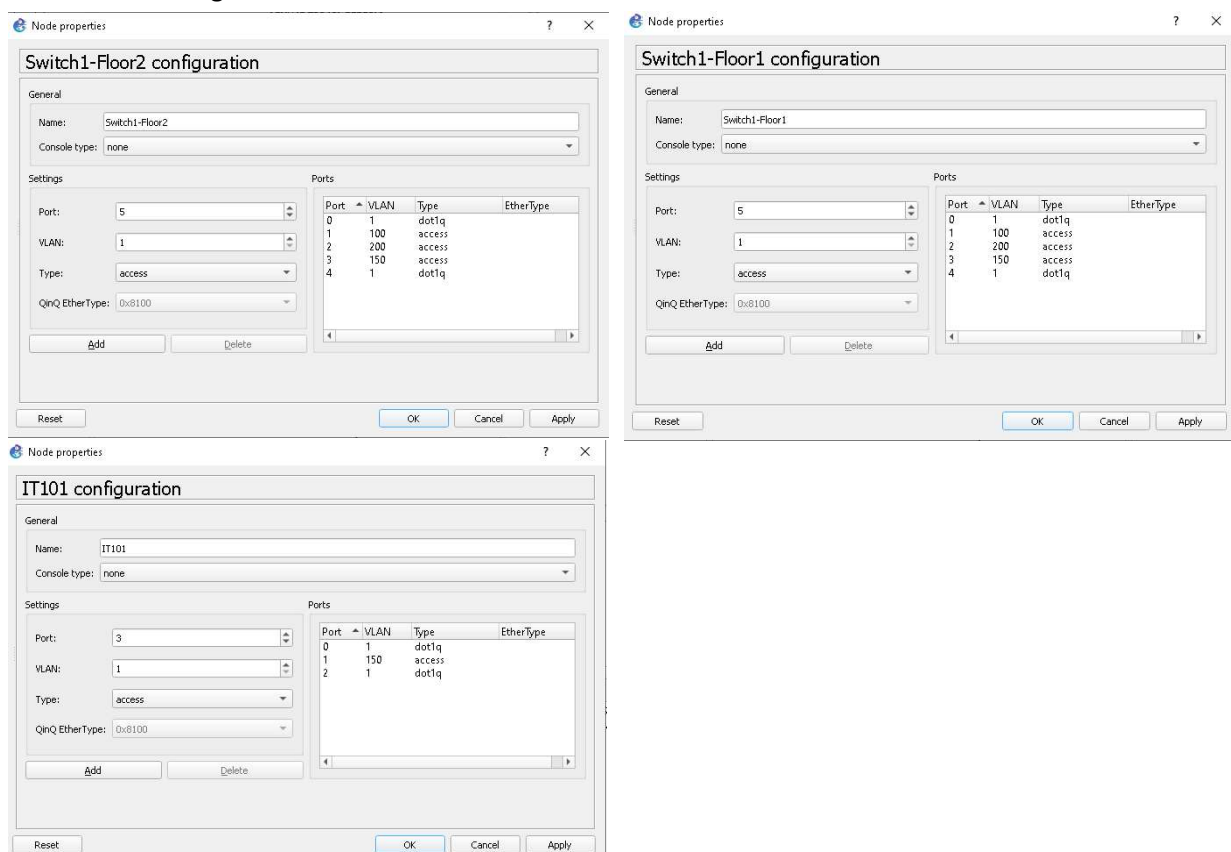
New Router configuration



```
oct/11/2023 12:35:45 system,error,critical login failure for user admin via local

[admin@MikroTik] > export
# oct/11/2023 12:35:54 by RouterOS 6.49.6
# software id =
#
#
#
/interface ethernet
set [ find default-name=ether1 ] disable-running-check=no
set [ find default-name=ether2 ] disable-running-check=no
set [ find default-name=ether3 ] disable-running-check=no
set [ find default-name=ether4 ] disable-running-check=no
/interface vlan
add interface=ether4 name=Accounts-vlan vlan-id=150
add interface=ether4 name=Sales-vlan vlan-id=100
add interface=ether4 name=Support-vlan vlan-id=200
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
/ip pool
add name=dhcp_pool0 ranges=192.168.1.2-192.168.1.254
add name=dhcp_pool1 ranges=192.168.2.2-192.168.2.254
add name=dhcp_pool2 ranges=192.168.150.2-192.168.150.254
/ip dhcp-server
add address-pool=dhcp_pool0 disabled=no interface=Sales-vlan name=dhcp1
add address-pool=dhcp_pool1 disabled=no interface=Support-vlan name=dhcp2
add address-pool=dhcp_pool2 disabled=no interface=Accounts-vlan name=dhcp3
/ip address
add address=192.168.1.1/24 interface=Sales-vlan network=192.168.1.0
add address=192.168.2.1/24 interface=Support-vlan network=192.168.2.0
add address=192.168.150.1/24 interface=Accounts-vlan network=192.168.150.0
/ip dhcp-client
add disabled=no interface=ether1
/ip firewall nat
add action=masquerade chain=srcnat out-interface=ether1
[admin@MikroTik] >
```

New switch configurations



Switch1-Floor2 configuration

General

Name: Switch1-Floor2

Console type: none

Settings

Port: 5

VLAN: 1

Type: access

QinQ EtherType: 0x8100

Ports

Port	VLAN	Type	EtherType
0	1	dot1q	
1	100	access	
2	200	access	
3	150	access	
4	1	dot1q	

Switch1-Floor1 configuration

General

Name: Switch1-Floor1

Console type: none

Settings

Port: 5

VLAN: 1

Type: access

QinQ EtherType: 0x8100

Ports

Port	VLAN	Type	EtherType
0	1	dot1q	
1	100	access	
2	200	access	
3	150	access	
4	1	dot1q	

IT101 configuration

General

Name: IT101

Console type: none

Settings

Port: 3

VLAN: 1

Type: access

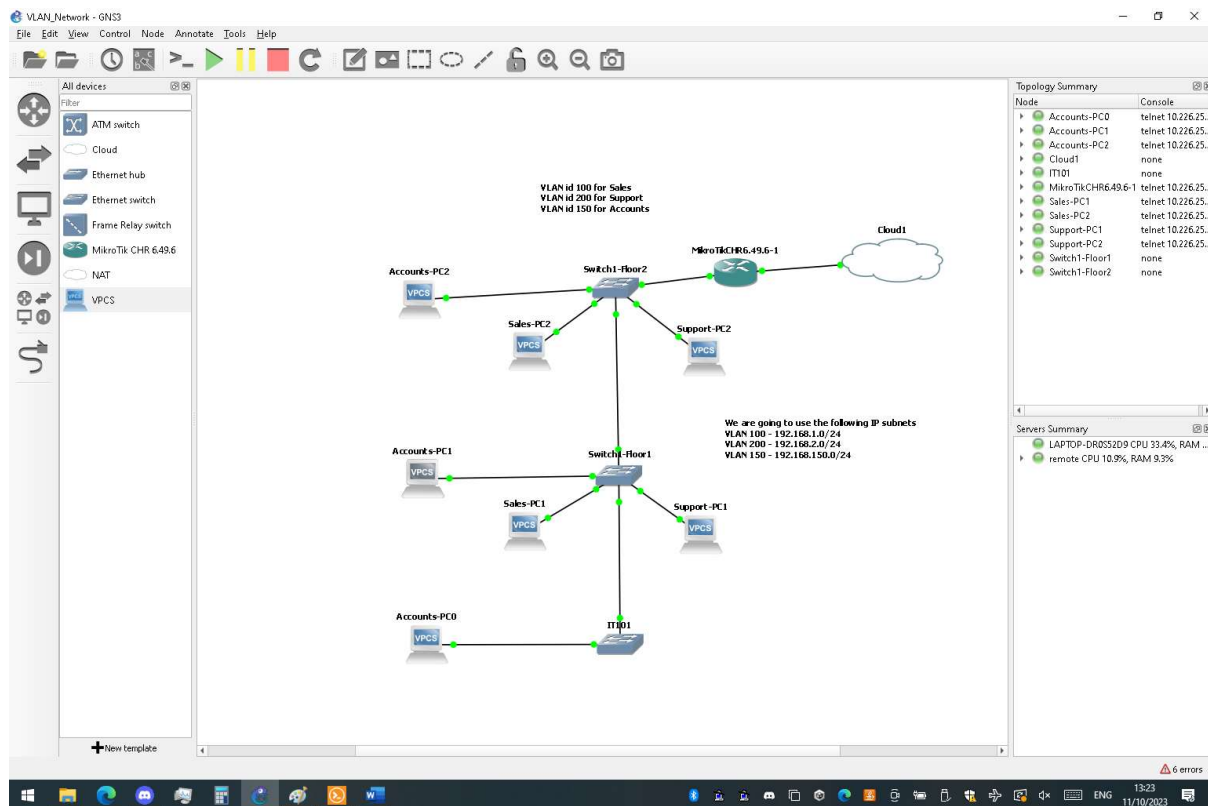
QinQ EtherType: 0x8100

Ports

Port	VLAN	Type	EtherType
0	1	dot1q	
1	150	access	
2	1	dot1q	

Step 4

Connected new Accounts VPCs for the new VLAN



Step 5

The New VPC devices in the Accounts VLAN can ping each other

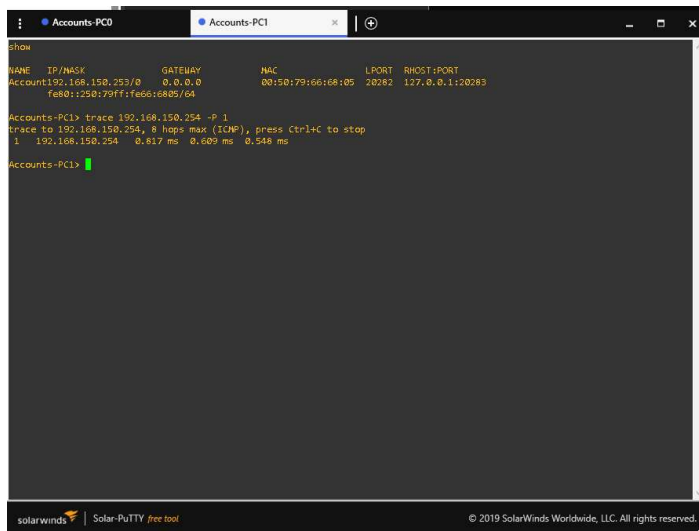
```
Accounts-PC0> show
NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
Account192.168.150.254/0 0.0.0.0 00:150:79:66:68:04 20272 127.0.0.1:20273
fe80::250:79ff:fe66:6804/64
Accounts-PC0>
```

```
Accounts-PC1> ping 192.168.150.254
84 bytes from 192.168.150.254 icmp_seq=1 ttl=64 time=0.561 ms
84 bytes from 192.168.150.254 icmp_seq=2 ttl=64 time=0.807 ms
84 bytes from 192.168.150.254 icmp_seq=3 ttl=64 time=0.827 ms
84 bytes from 192.168.150.254 icmp_seq=4 ttl=64 time=0.749 ms
84 bytes from 192.168.150.254 icmp_seq=5 ttl=64 time=0.845 ms

Accounts-PC1> show
NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
Account192.168.150.253/0 0.0.0.0 00:150:79:66:68:05 20262 127.0.0.1:20263
fe80::250:79ff:fe66:6805/64
Accounts-PC1>
```

Step 6

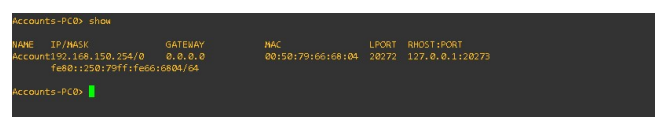
Trace a VPC in the same VLAN.



```
Accounts-PC0 Accounts-PC1
show
NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
Account192.168.150.253/0 0.0.0.0 00:50:79:66:68:05 20272 127.0.0.1:20273
fe80::250:79ff:fe66:6805/64

Accounts-PC1> trace 192.168.150.254 -P 1
Trace to 192.168.150.254, 8 hops max (ICMP), press Ctrl+C to stop
1 192.168.150.254 0.617 ms 0.609 ms 0.548 ms

Accounts-PC1>
```



```
Accounts-PC0> show
NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
Account192.168.150.254/0 0.0.0.0 00:50:79:66:68:04 20272 127.0.0.1:20273
fe80::250:79ff:fe66:6804/64

Accounts-PC0>
```

Trace route results:

Accounts-PC0 is reachable from Accounts-PC1.

There is only 1 hop because the destination is on the same LAN (VLAN). So only 1 hop is registered.

PC0 and PC1 are on different switches but are configured on the same VLAN so they are able to send packets to each other.

A VLAN is a virtualized connection that connects multiple devices and network nodes from different LANs into one logical network.

Step 7

Trace a VPC in a different VLAN

Sales-PC1 is on VLAN id = 100

```
Sales-PC1> show
NAME      IP/MASK      GATEWAY      MAC          LPORT  RHOST:PORT
Sales-PC1 192.168.1.254/24 0.0.0.0      00:50:79:66:68:03 20266  127.0.0.1:20267
fe80::250:79ff:fe56:6803/64
Sales-PC1>
```

Accounts-PC1 is on VLAN id = 150

```
Accounts-PC1> show
NAME      IP/MASK      GATEWAY      MAC          LPORT  RHOST:PORT
Account192.168.150.253/0 0.0.0.0      00:50:79:66:68:05 20282  127.0.0.1:20283
fe80::250:79ff:fe56:6805/64

Accounts-PC1> trace 192.168.1.254 -P 1
trace to 192.168.1.254, 8 hops max (ICMP), press Ctrl+C to stop
host (192.168.1.254) not reachable
Accounts-PC1>
```

Trace route results:

Sales-PC1 and Accounts-PC1 are on different VLAN so they are not able to send packets to each other.

Step 8

Ping a VPC on a different VLAN and take a packet capture of cable between switch and router.

Accounts-PC0

VLAN id = 150

```
Accounts-PC0> show
NAME      IP/MASK      GATEWAY      MAC          LPORT  RHOST:PORT
Account192.168.150.254/0 0.0.0.0      00:50:79:66:68:04 20272  127.0.0.1:20273
fe80::250:79ff:fe56:6804/64
Accounts-PC0>
```

Sales-PC1

VLAN id = 100

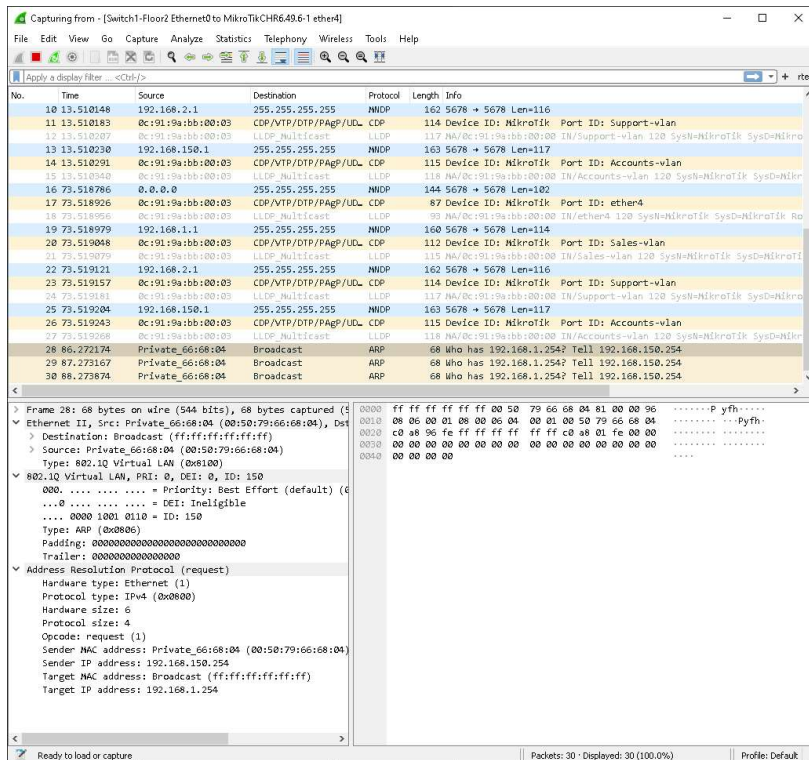
```
Sales-PC1> show
NAME      IP/MASK      GATEWAY      MAC          LPORT  RHOST:PORT
Sales-PC1 192.168.1.254/24 0.0.0.0      00:50:79:66:68:03 20266  127.0.0.1:20267
fe80::250:79ff:fe56:6803/64
Sales-PC1>
```

Result:

As we expect, PC's on different VLANs cannot reach each other.

```
Accounts-PC0> ping 192.168.1.254
host (192.168.1.254) not reachable
Accounts-PC0>
```

Packet capture



The 802.1Q tag is present in packets that go from switch to switch or (in this case) from switch to router.

```
802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 150
000. .... = Priority: Best Effort (default) (0)
...0 .... = DEI: Ineligible
.... 0000 1001 0110 = ID: 150
Type: ARP (0x0806)
Padding: 00000000000000000000000000000000
```

This ping created an ARP packet that contains this 802.1Q tag. It contains the ID (150) of the VLAN of the device that the packet was sent from. i.e. The Accounts-PC0. This information is used by the switches to know who to send this broadcast packet to: Only ports marked with VLAN id = 150.

The packet also contains an ARP request which is attempting to find the MAC address of the Sales-PC1.

```
Address Resolution Protocol (request)
Hardware type: Ethernet (1)
Protocol type: IPv4 (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: request (1)
Sender MAC address: Private_66:68:04 (00:50:79:66:68:04)
Sender IP address: 192.168.150.254
Target MAC address: Broadcast (ff:ff:ff:ff:ff:ff)
Target IP address: 192.168.1.254
```

Notable information here is the Sender and receiver's IP and MAC addresses. The target's MAC unknown and therefore the MAC address is all f's to indicate this message is being sent to every device. (Broadcast)