Day:06 23/10/2024

MAC ADRESS

A **MAC address** (Media Access Control address) is a unique identifier assigned to network interfaces for communications on a physical network segment. It is used at the data link layer of the OSI model. A MAC address is typically represented as a 48-bit hexadecimal number, often displayed in six pairs of two hexadecimal digits (e.g., 00: 1A:2B:3C:4D:5E). Each network device, such as a computer or router, has its own MAC address, which helps in identifying devices within the same local network.

We can get the mac address by using command

```
Switch#
Switch#
Switch#
Switch#sh mac address-table dy
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0000.0c58.7973    DYNAMIC      Fa0/2
   1    0000.0c9a.1d93    DYNAMIC      Fa0/3
   1    000a.f380.e93c    DYNAMIC      Fa0/4
   1    00e0.b0dc.e9db    DYNAMIC      Fa0/1
Switch#
```

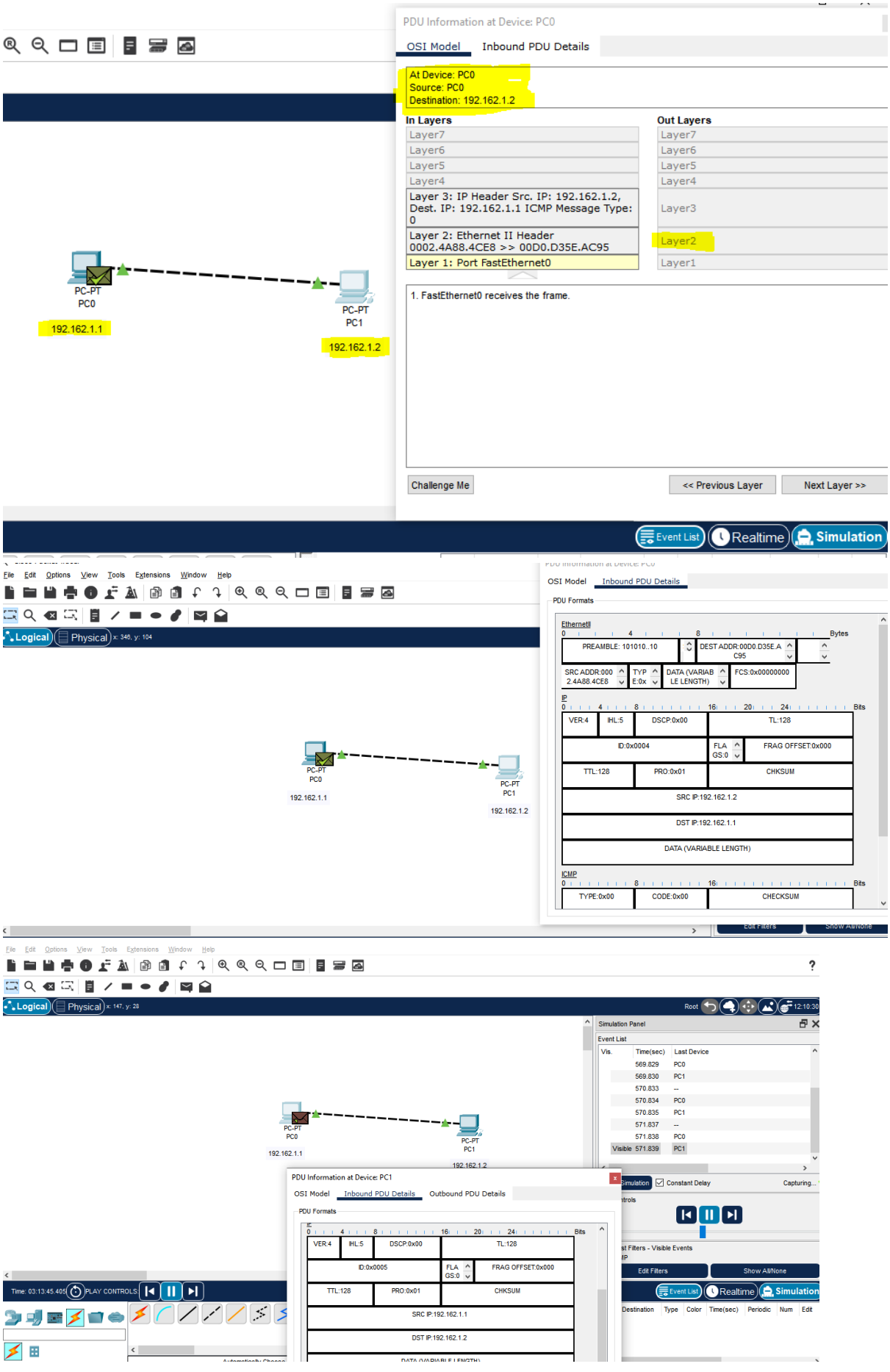
APR (Address Resolution Protocol)

ARP (Address Resolution Protocol) is a network protocol used to map an IP address to a MAC address on a local area network. When a device wants to communicate with another device on the same network, it needs to know the MAC address associated with the IP address. Here's how ARP works:

1. ARP Request: The sending device broadcasts an ARP request to the local network, asking, "Who has this IP address? Please send me your MAC address."
2. ARP Reply: The device with the matching IP address responds with its MAC address.

This process allows devices to communicate effectively over a network, as data packets are routed using MAC addresses at the data link layer while IP addresses are used at the network layer.

In summary, a MAC address identifies devices on a local network, while ARP is the protocol used to find a device's MAC address based on its IP address.


PDU Information at Device: PC0
OSI Model
Inbound PDU Details
At Device: PC0
Source: PC0
Destination: 192.162.1.2
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer 3: IP Header Src. IP: 192.162.1.2, Dest. IP: 192.162.1.1 ICMP Message Type: 0
Layer 2: Ethernet II Header 0002.4A88.4CE8 >> 00D0.D35E.AC95
Layer 1: Port FastEthernet0
Layer3
Layer2
Layer1
1. FastEthernet0 receives the frame.
Challenge Me
<< Previous Layer
Next Layer >>
PC-PT PC0
192.162.1.1
PC-PT PC1
192.162.1.2
Event List
Realtime
Simulation
File Edit Options View Tools Extensions Window Help
Logical
Physical
PDU Formats
Ethernetll
PREAMBLE: 101010..10
DEST ADDR:00D0.D35E.AC95
SRC ADDR:0002.4A88.4CE8
TYP E:0x
DATA (VARIABLE LENGTH)
FCS:0x00000000
IP
VER:4
IHL:5
DSCP:0x00
TL:128
ID:0x0004
FLAGS:0
FRAG OFFSET:0x000
TTL:128
PRO:0x01
CHKSUM
SRC IP:192.162.1.2
DST IP:192.162.1.1
DATA (VARIABLE LENGTH)
ICMP
TYPE:0x00
CODE:0x00
CHECKSUM
Simulation Panel
Event List
Vis.
Time(sec)
Last Device
569.829 PC0
569.830 PC1
570.833 --
570.834 PC0
570.835 PC1
571.837 --
571.838 PC0
Visible 571.839 PC1
PDU Information at Device: PC1
OSI Model
Inbound PDU Details
Outbound PDU Details
ID:0x0005
Edit Filters
Show All/None
Constant Delay
Capturing...

Let's understand the difference between HUB and SWITCH

Feature	Hub	Switch
Functionality	Broadcasts data to all connected devices	Forwards data only to the intended device
Data Transmission	Operates in half-duplex mode (data can flow in only one direction at a time)	Operates in full-duplex mode (data can flow in both directions simultaneously)
Layer of Operation	Layer 1 (Physical Layer)	Layer 2 (Data Link Layer) and sometimes Layer 3 (Network Layer)
Traffic Management	No management; leads to congestion and collisions	Manages traffic efficiently, reducing collisions
Performance	Lower performance due to broadcasting	Higher performance due to targeted data transmission
Addressing	Does not recognize MAC addresses; sends data to all ports	Uses MAC addresses to send data to the correct port
Network Size	Suitable for small, simple networks	Suitable for larger, more complex networks

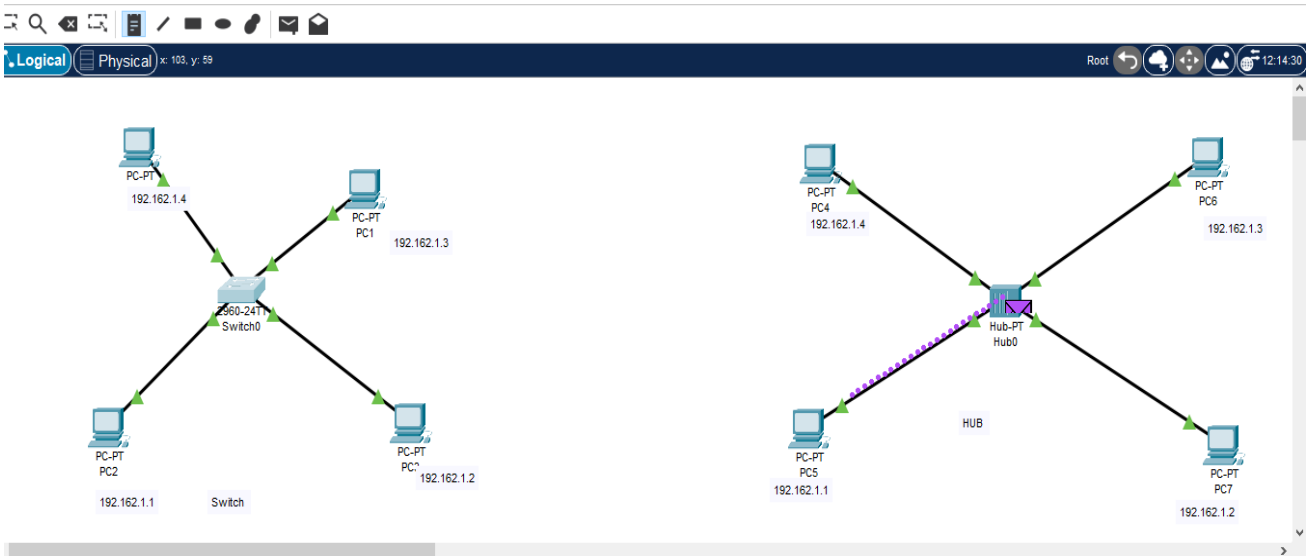
A switch and a hub are both networking devices used to connect multiple devices within a network, but they operate differently:

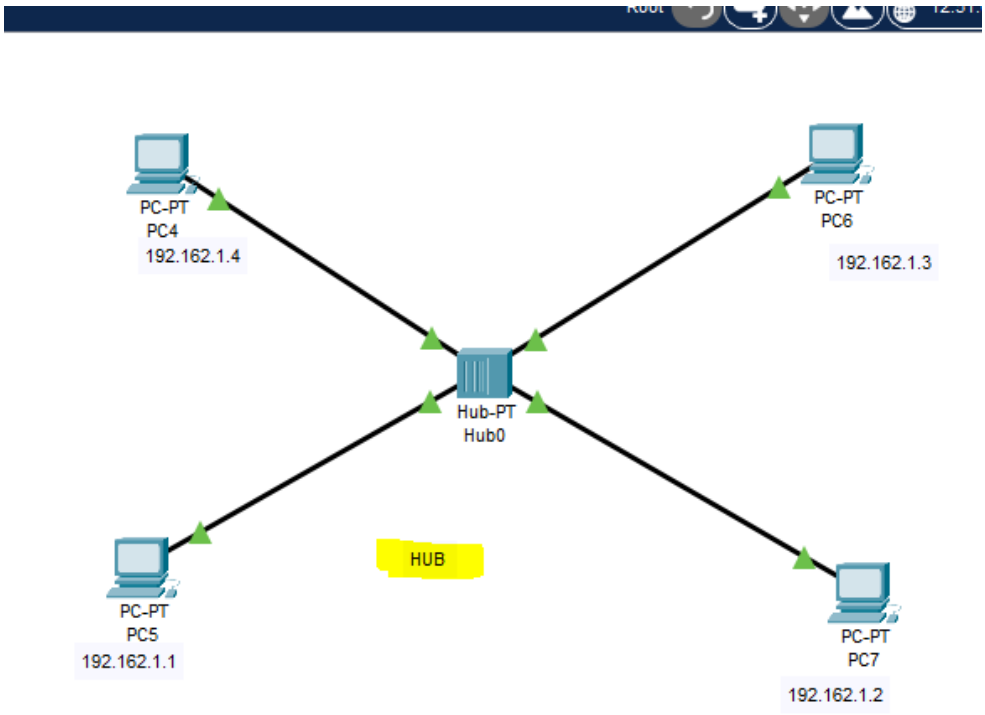
1. **Functionality:**
    - Hub: A hub is a basic device that connects multiple Ethernet devices, making them act as a single network segment. It broadcasts incoming data packets to all ports, regardless of the destination.
    - Switch: A switch is more intelligent. It learns the MAC addresses of connected devices and forwards data only to the specific device for which the data is intended, reducing unnecessary traffic.
2. **Efficiency:**

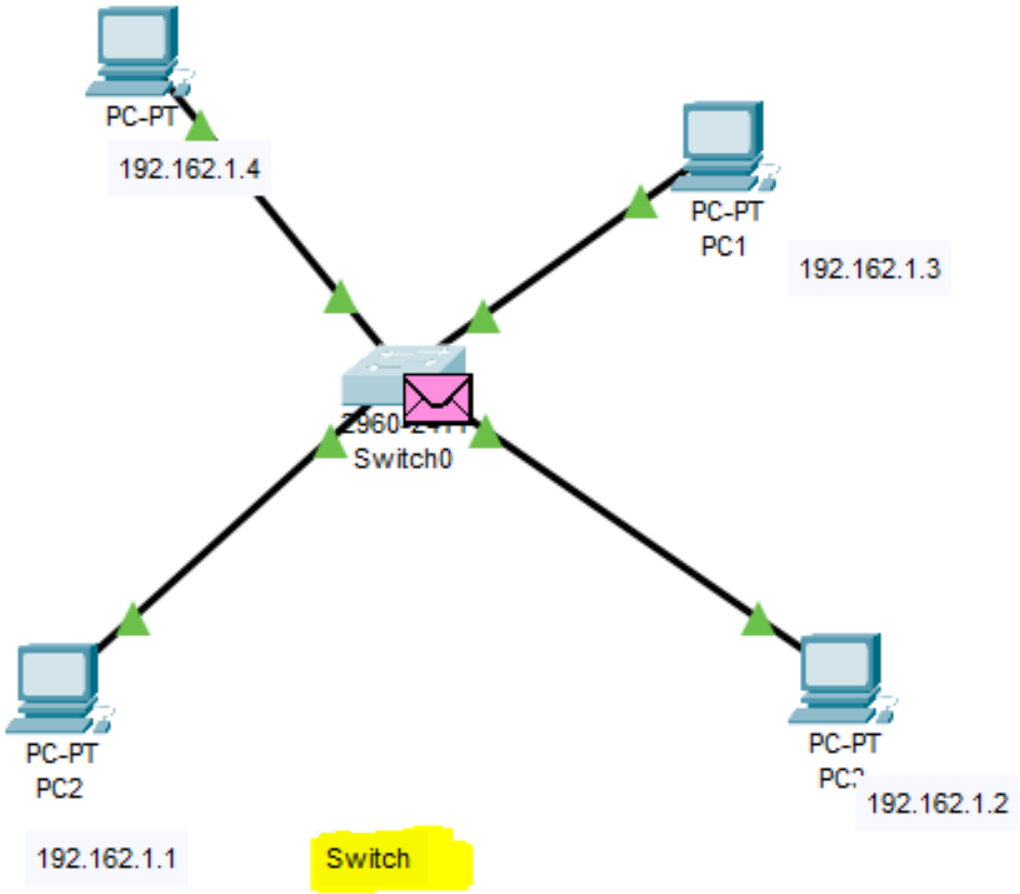
- Hub: Because it sends data to all connected devices, hubs can lead to network congestion and collisions, reducing overall network efficiency.
- Switch: By directing data specifically, switches minimize collisions and enhance network performance.

3. **Layer of Operation:**
   - Hub: Operates at the physical layer (Layer 1) of the OSI model.
   - Switch: Operates at the data link layer (Layer 2) and can also function at higher layers (Layer 3 and beyond) in more advanced models.
4. **Traffic Management:**
   - Hub: No traffic management; all devices receive all data packets.
   - Switch: Manages traffic more effectively, improving bandwidth and reducing data collisions.

In summary, while both devices serve to connect multiple network devices, switches offer enhanced performance, efficiency, and data management compared to hubs.







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Thanking you !!