Unit 2 - The Physical and Data Link Layers

Outline

This unit will help in understanding the importance and characteristics of the physical and data link layers of the OSI model. We will learn about the different media used at the physical layer and their characteristics. We will also explore the MAC address and learn about how a layer 2 switch works.

Learning Outcomes

- Describe the purpose and characteristics of the physical layer.
- Distinguish among Copper, UTP, Fiber Optics cabling and Wireless media.
- Describe the purpose of the Data Link Layer.
- Analyze the structure of a MAC address.
- Explain the learning and forwarding methods of a switch and descried the MAC address table.

Week 3: Pre-class activity on The Physical Layer

Make sure to watch full video on the physical layer before coming to class for further discussions.

https://youtu.be/QHSRxw0PVd0

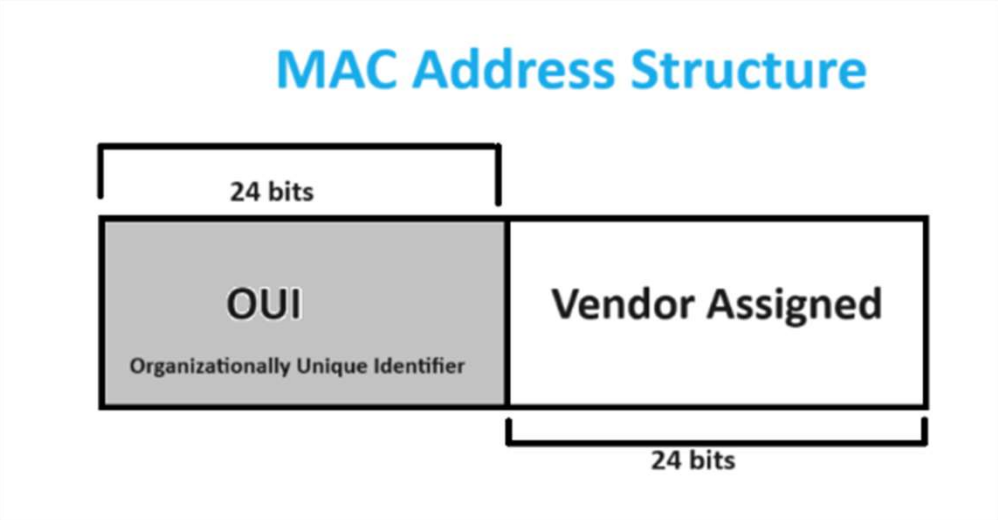
Additional reading on the physical layer

- https://link.springer.com/chapter/10.1007/978-981-19-3069-0_2#Sec8

Week 4 – The Data Link Layer

Week 4: In-class presentation on The Data Link layer

https://www.youtube.com/watch?v=urxx7b0bDz4



The MAC address is composed of 48 bits and is represented in Hexadecimal characters. The first 6 Hex characters represent the OUI and the last 6 chanracters uniquely represent the device.

Switch Learn and Forward Method

- Switches dynamically learn the MAC addresses in the network to build its MAC address table. With a full, accurate MAC address table, the switch can make accurate forwarding decisions.
- Switches build the MAC address table by listening to incoming frames and examining the frame's source MAC address.
- If a frame enters the switch, and the source MAC address is not in the address table, the switch creates an entry in the table, whereby the MAC address is placed in the table, along with the interface in which the frame arrived.

Switch Learn and Forward Method

- For Destination MAC address that are not present in the table, the switch will forward the unknown unicast frames (which are frames whose destination MAC addresses are not yet in the MAC address table) out all ports (broadcast).
- The switch floods the frame with the hope that the unknown device will be on some other Ethernet segment and it will reply, allowing the switch to build a correct entry in the address table.

Switch Learn and Forward Method

The following list provides a quick review of the basic logic a switch uses:

1. A frame is received.
2. If the destination is a broadcast, forward on all ports except the port on which the frame was received.
3. If the destination is a unicast, and the address is not in the address table, forward on all ports except the port on which the frame was received.
4. If the destination is a unicast, and the address is in the address table, and if the associated interface is not the interface on which the frame arrived, forward the frame out the one correct port.
5. Otherwise, filter (do not forward) the frame.