Topic : Data link layer

- Data Link layer
  - The Data Link layer tends to transfer Data through connected nodes. These nodes can consist of calculators, routers, or switches.
- Media Access Control
  - By converting wired, optical, or wireless data into signals
  - After receiving the signal at the physical layer, the signal is converted into bits and arranged
  - If transmission is required, the bits are also converted into a final signal
- Logical Link Control
  - LLC is higher than the media Access control sub-layer and also acts as an interface between the media access control and the network layer. After receiving upper-layer messages, the LLC sends the data to the corresponding network interface. Where necessary, it will use multiplexing to ensure the coexistence of network layer protocols. Finally, the header is wrapped and sent to the MAC. The MAC executes backwards when it receives a frame.
  - A frame is a packaged packet of data.
  - There are two main protocol families: 802.3 and 802.11. These protocols are updated with one or two letter suffixes.
- Ethernet (IEEE802.3)
  - Ethernet uses copper cables and optical fiber connections. Frames contain six or seven fields. Each frame uses a 12-byte interval separation to facilitate synchronization
  - Leading code (8 bytes)
    - The first eight bytes are the leading codes, which alternate ones and zeros to synchronize the clock. The last byte of the 8 bytes will be changed to 1 to indicate the beginning of the next section.
- The MAC address
  - MAC addresses are used to help the data link layer find them. MAC address is the only field that represents all devices. MAC addresses have 48 digits that make up 281 trillion combinations. Each network device has its own unique MAC address. The first 24 bits are unique to the organization and the second 24 bits are assigned to the supplier. One can determine the source of a device's manufacture by looking up its OUI.
  - Special MAC Address
    - Most routes are one-way. Only sender and receiver. But broadcast addresses allow messages to be sent to the entire local network. Some MAC addresses are multicast addresses.
- IEEE 802.1Q(4 bytes)

    - Provides VLAN and quality of service support. VLAN means virtual LOCAL area network. It solves the mismatch between physical topology and virtual topology. VlAN allow multiple private networks to be created on a physical device to work for a large number of people.
    - Quality of service (QOS) allows the network to queue frames under specified circumstances or discard them altogether to give priority to software such as voice over IP, competitive games or stock trading.
- Frame check sequence (4 bytes)
    - It uses a 32-bit cyclic redundancy check algorithm to generate a summary of the obtained data and add it to the frame.
    - After receiving the data, the receiver will use the cyclic redundancy check algorithm to calculate the digest and compare it with the original digest. If they do not match, they are considered corrupted and discarded.
- Switch
    - A network switch is a network device that connects data. It checks each frame and sends the information to a physical port at the appropriate target MAC address.
    - For example, if device 1 wants to send a message to device 3, it will also send the message to device 2, but device 2 will clear the message.
    - The switch records known devices and stores them on the local network. When a device wants to reply to a message, the switch knows which port to send it to.
- Wifi Frame
    - The main categories of frameworks are management, control and data. Management frames have beacons, probes, authentication, and associations. Controls include ACK, block-acks, RTS, and CTS