DATA LINK LAYER & MEDIUM ACCESS SUBLAYER

COMPREHENSIVE PRESENTATION ON DLL, ERROR CONTROL, FLOW CONTROL, AND MAC PROTOCOLS

INTRODUCTION TO DATA LINK LAYER

- • Second layer of OSI model
- • Provides node-to-node delivery
- • Responsible for framing, flow control, and error control
- • Ensures reliable communication

FUNCTIONS OF DATA LINK LAYER

- • Framing
- • Physical addressing
- • Flow control
- • Error control
- • Access control

FRAMING

- • Divides stream of bits into frames
- • Enables synchronization

- Methods:
- • Character count
- • Byte stuffing
- • Bit stuffing

ERROR DETECTION AND CORRECTION

- • Detects transmission errors
- • Corrects corrupted data
- • Improves communication reliability

PARITY CHECK

- • Simplest error detection technique
- • Even parity
- • Odd parity
- • Detects single-bit errors

LRC – LONGITUDINAL REDUNDANCY CHECK

- • Block-based error detection
- • Uses parity bits for rows and columns
- • Detects burst errors

CRC – CYCLIC REDUNDANCY CHECK

- • Powerful error detection method
- • Uses polynomial division
- • Widely used in networks

HAMMING CODE

- • Error detection and correction technique
- • Corrects single-bit errors
- • Uses redundant bits

FLOW CONTROL

- • Controls speed of data transfer
- • Prevents receiver overflow

- Methods:
- • Stop-and-Wait
- • Sliding Window

ERROR CONTROL

- • Ensures reliable delivery
- • Uses acknowledgements and retransmissions

NOISELESS CHANNELS

- • Ideal communication channels
- • No errors during transmission
- • Simple protocols used

PROTOCOLS FOR NOISELESS CHANNELS

- • Simplified protocol
- • Stop-and-Wait protocol

NOISY CHANNELS

- • Errors may occur during transmission
- • Requires error control mechanisms

PROTOCOLS FOR NOISY CHANNELS

- • Stop-and-Wait ARQ
- • Go-Back-N ARQ
- • Selective Repeat ARQ

HDLC

- High-Level Data Link Control:
- • Bit-oriented protocol
- • Reliable communication
- • Supports full duplex

PPP – POINT TO POINT PROTOCOL

- • Used for direct communication
- • Supports authentication
- • Common in Internet connections

MEDIUM ACCESS SUBLAYER

- • Sub-layer of Data Link Layer
- • Controls access to transmission medium
- • Prevents collisions

RANDOM ACCESS PROTOCOLS

- • Stations compete for channel
- • Examples:
- • ALOHA
- • CSMA/CD

ALOHA

- • Earliest random access protocol
- • Pure ALOHA
- • Slotted ALOHA
- • Simple but collision-prone

CSMA/CD

- Carrier Sense Multiple Access with Collision Detection:
- • Listens before transmitting
- • Detects collisions
- • Used in Ethernet

CONTROLLED ACCESS

- • Stations access channel in orderly manner

- Methods:
- • Reservation
- • Polling
- • Token Passing

CHANNELIZATION

- • Divides channel among users

- Methods:
- • FDMA
- • TDMA
- • CDMA

LAN – LOCAL AREA NETWORK

- • Connects devices in small area
- • High speed communication
- • Uses Ethernet and Wi-Fi

ETHERNET IEEE 802.3

- • Most widely used LAN technology
- • Uses CSMA/CD
- • Supports high-speed communication

IEEE 802.5 – TOKEN RING

- • Uses token passing
- • Collision-free communication
- • Ring topology

IEEE 802.11 – WIRELESS LAN

- • Standard for Wi-Fi networks
- • Wireless communication
- • Supports mobility

COMPARISON OF IEEE STANDARDS

- IEEE 802.3 – Ethernet
- IEEE 802.5 – Token Ring
- IEEE 802.11 – Wi-Fi

ADVANTAGES OF DLL AND MAC

- • Reliable communication
- • Efficient medium sharing
- • Error handling
- • Improved performance

APPLICATIONS

- • Internet communication
- • LAN networks
- • Wireless communication
- • Data transmission systems

CONCLUSION

- • Data Link Layer ensures reliable transfer
- • MAC sublayer manages channel access
- • Ethernet and Wi-Fi dominate modern networking