LAN PROTOCOL ARCHITECTURE

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LAN PROTOCOL ARCHITECTURE

- The basic functions of a LAN is organized by set of layering protocols.
- **IEEE 802 Reference Model**

  Protocols defined specifically for LAN and MAN transmission address issues relating to the transmission of blocks of data over the network
- In **OSI** (Open System Interconnection), higher layer protocols (layer 3 or 4 and above) are independent of network architecture and are applicable to LANs , MANs, and WANs .

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- A discussion of LAN protocols is concerned principally with lower layers of the OSI model.
- This architecture was developed by the IEEE 802 LAN standards committee
- It is generally referred to as the IEEE 802 reference model.

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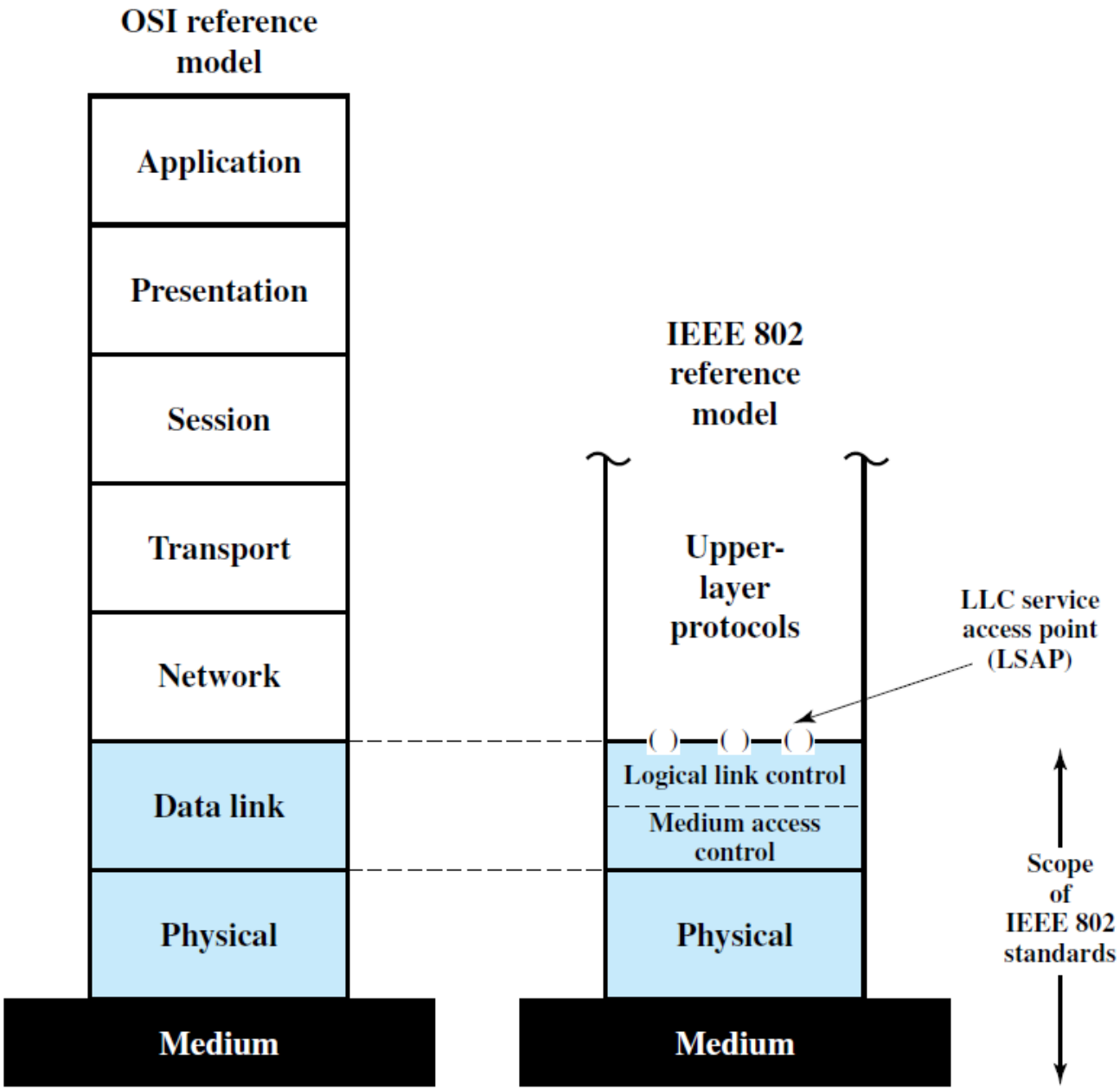
- Working from the bottom up, the lowest layer of the IEEE 802 reference model corresponds to the **physical layer** of the OSI model and includes such functions as :
  - Encoding / decoding of signals
  - Preamble generation/removal
  - Bit transmission / reception
- In addition, the physical layer of the 802 model includes a specification of the transmission medium and the topology.



IEEE 802 Protocol Layers Compared to OSI Model

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- Above the physical layer are the functions associated with providing service to LAN users. These include the following:

1. **On transmission**, assemble data into a frame with address and error-detection fields.
2. **On reception**, disassemble frame and perform address recognition and error detection.
3. Govern access to the LAN transmission medium .
4. Provide an interface to higher layers and perform flow and error control .

- These are functions typically associated with OSI layer 2 (Data Link Layer) .

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- The set of functions in the last point are grouped into a **logical link control (LLC) layer.**
- The functions in the first three points are treated as a separate layer, called **medium access control (MAC).**
- **The separation** is done for the following reasons:

1. The logic required to manage access to a shared access medium is not found in traditional layer 2 data link layer .
2. For the same LLC, several MAC options may be provided .

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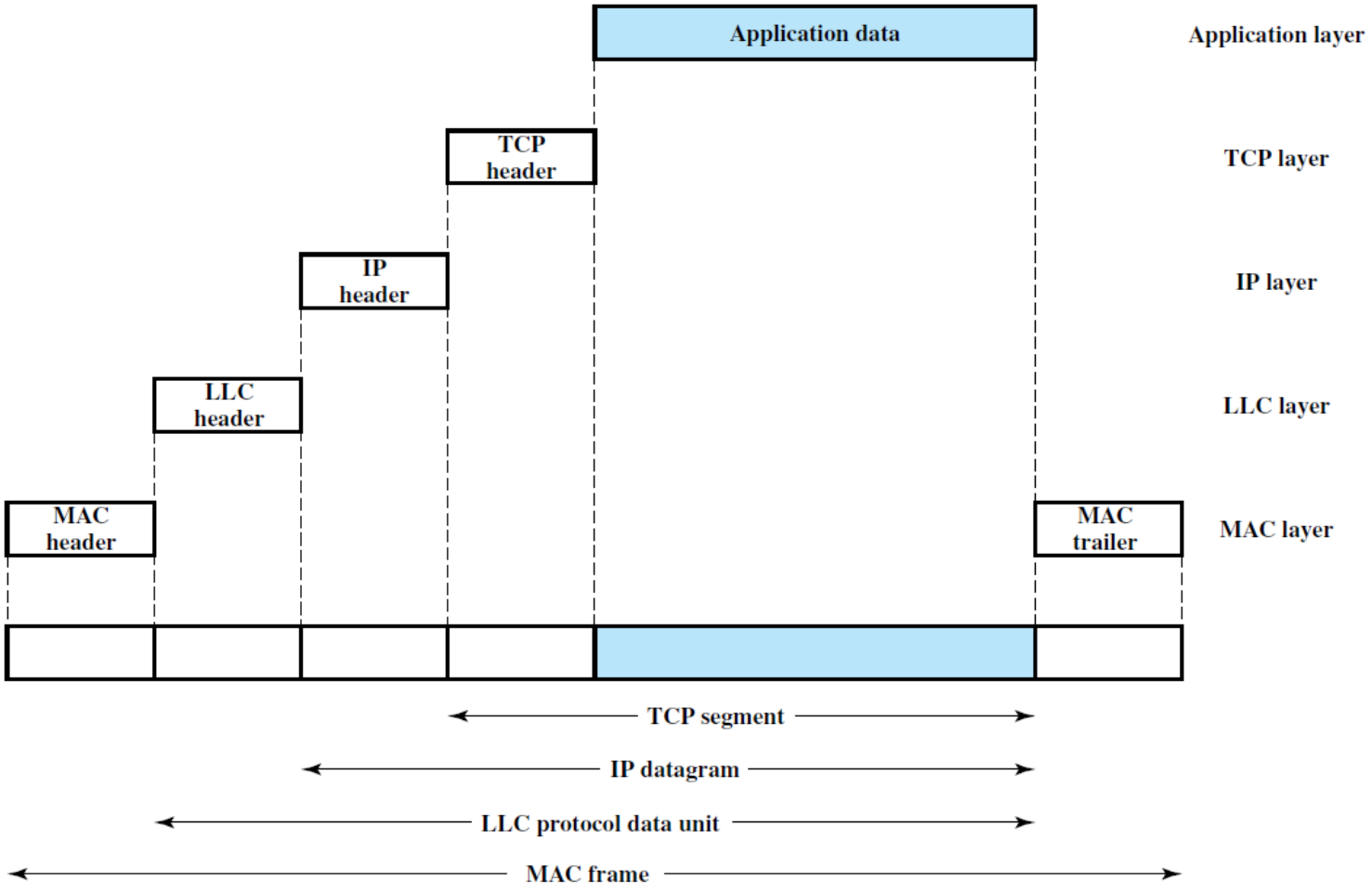

Figure illustrates the relationship between the levels of the architecture

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Logical Link Control (LLC)

- Its main function :
  - ✓ Interface to higher levels .
  - ✓ Flow and error control .
- LLC is concerned with the transmission of a link-level PDU .
- Must support multi-access, shared-medium .
- Relieved of some link access details by MAC layer .

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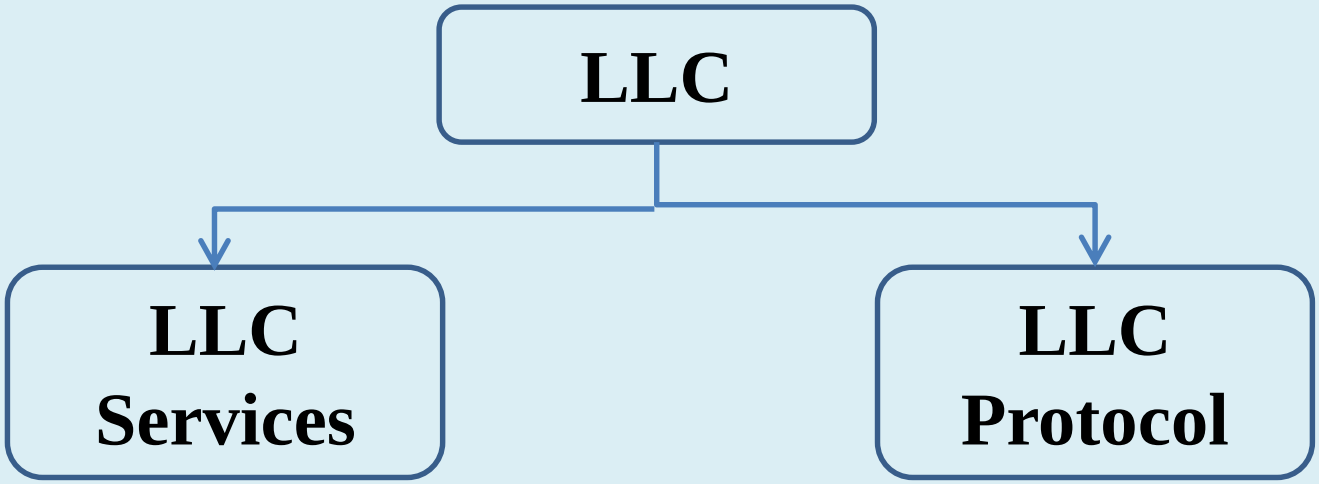
- Addressing in LLC involves specifying the source and destination LLC users :
  - Referred to as service access points (SAPs) .
  - Typically higher level protocols .



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LLC Services :

- The operation and format of this standard is based on **HDLC** (High-level Data Link Control) .
- Three services are provided as using LLC :
  1. Unacknowledged connectionless service .
  2. Connection-mode service .
  3. Acknowledged connectionless service .

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LLC Protocol :

- The basic LLC protocol is modeled after **HDLC** and has similar functions and formats .
- The differences between the two protocols can summarized as :

1. Asynchronous balanced mode to support connection mode LLC service (Type 2) .
2. Unnumbered information PDUs to support acknowledged connectionless service (Type 1) .
3. Multiplexing using LLC service access points (LSAPs) .

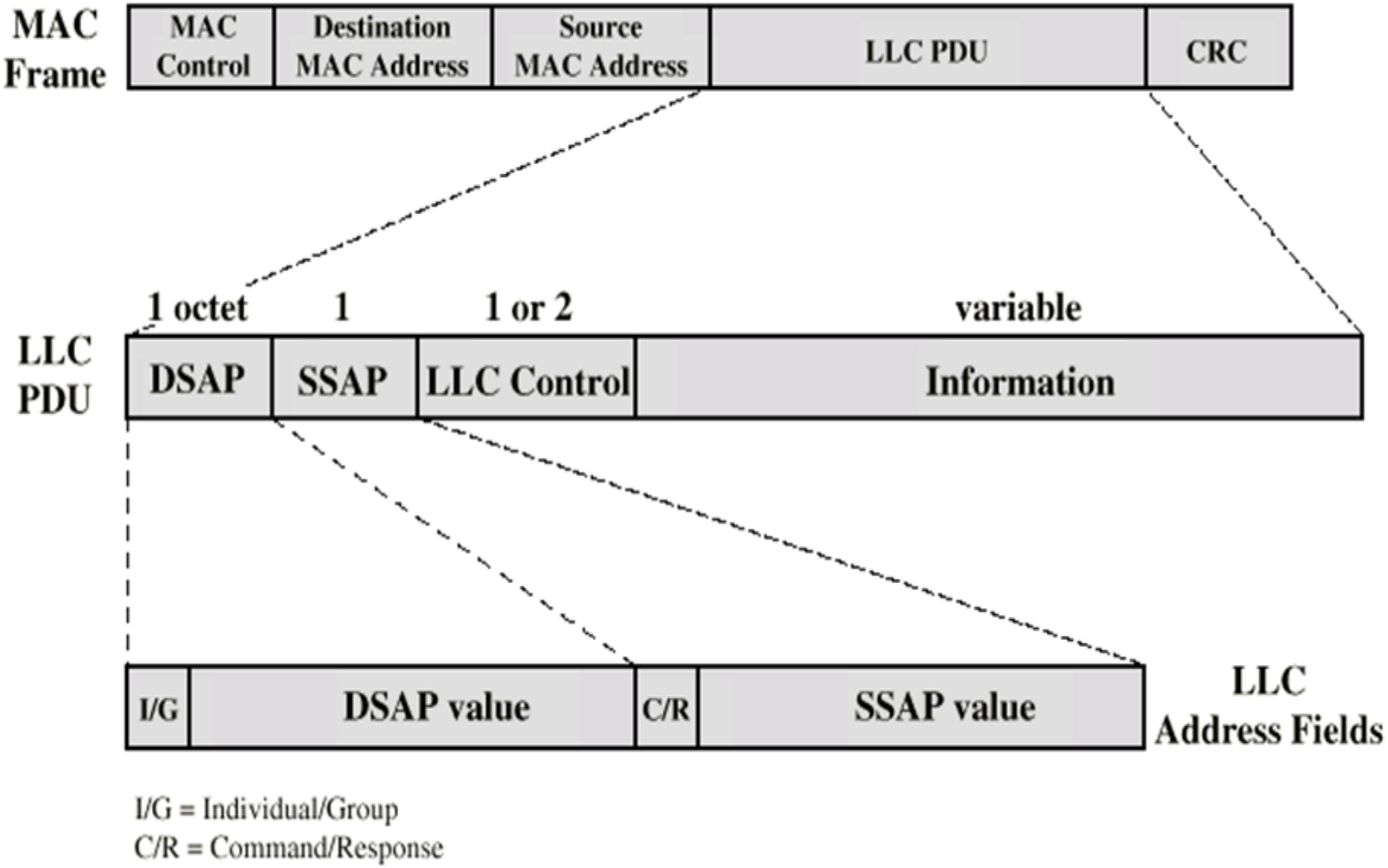

Figure : LLC PDU in a generic MAC Frame Format

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- **Medium Access Control**
- Controlling access to the transmission medium by providing an orderly and efficient use of the transmission capacity .

- The key parameters in any medium access control technique are **where** and **how**

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- **Where**
  - **Central**
    - ✓ Greater control .
    - ✓ Simple access logic at station .
    - ✓ Avoids problems of co-ordination .
    - ✓ Single point of failure .
    - ✓ Potential bottleneck .
  - **Distributed**
- **How**
  - **Synchronous**
    - ✓ Specific capacity dedicated to connection .
  - **Asynchronous**
    - ✓ In response to demand .

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Asynchronous systems

- **Round robin**
  - ✓Good if many stations have data to transmit over extended period .
- **Reservation**
  - ✓Good for stream traffic .
- **Contention**
  - ✓Good for bursty traffic .
  - ✓All stations contend for time .
  - ✓Distributed .
  - ✓Simple to implement .
  - ✓Efficient under moderate load .
  - ✓Tend to collapse under heavy load .

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- MAC layer receives data from LLC layer .
- MAC layer detect errors and discards frames .
- LLC optionally retransmits unsuccessful frames .
- **MAC frame format**
  - MAC control
  - Destination MAC address .
  - Source MAC address .
  - LLC
  - CRC

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Summary

- In most **data link control protocols**, the data link protocol entity is responsible not only for detecting errors using the CRC, but for recovering from those errors by retransmitting damaged frames.
- In the **LAN protocol architecture**, these two functions are **split** between the **MAC** and **LLC** layers.

1. **The MAC layer** is responsible for detecting errors and discarding any frames that are in error.
2. **The LLC layer** optionally keeps track of which frames have been successfully received and retransmits unsuccessful frames.

Thank You

ÖNEMLİ

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