



Understanding the OSI Model



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CCIE Routing & Switching



Video Overview

- Use the OSI and TCP/IP models and their associated protocols to explain how data flows through a network.

OSI Reference Model

- ▶ Comprised of seven layers
- ▶ The benefits of using a layered approach are:
 - Provides easier troubleshooting
 - Standardizes the networking architecture
 - Allows vendor interoperability

OSI Layers at a glance

Application
Presentation
Session
Transport
Network
Data Link
Physical

Application Layer

▶ Features

- Interacts with the user applications (Firefox, Outlook, etc.)
- Provides initial network connection for user applications
- Manages the application connections between hosts

Presentation Layer

- ▶ Performs encryption within an application
- ▶ Ensures that data is presented correctly to the application used
- ▶ Performs translation of cross-platform standards that may be understood by the local machine:
 - Pict. into .jpg file translation
 - .wav into .mp3

Session Layer

- ▶ Helps establish session with reserved port numbers
- ▶ Session identifier is assigned
- ▶ Tracks connections between hosts and remote computers/servers

Session Layer

▶ Well-known ports

- Ranges from 0 to 1023
- Port numbers used by well-known services
- Examples: HTTP(80), HTTPS(443), DNS(53), FTP(20,21), TELNET(23), etc.

▶ Ephemeral ports

- Ranges from 1024 to 65535

Transport Layer

- ▶ Multiplexing and de-multiplexing
- ▶ Sequencing and reassembling
- ▶ Windowing, buffering, congestion avoidance
- ▶ Error detection and re-transmission

▶ Identifying services

- TCP

- Connection oriented
- Reliable
- Protocol number 6

- UDP

- Connectionless
- Unreliable
- Protocol number 17

Network Layer

- ▶ Protocols that help to identify unique, separate networks (or Broadcast Domains)
- ▶ Provide mechanisms for Fragmentation and Reassembly of data, if necessary.
- ▶ Protocols that provide Layer-Management such as:
 - Network domain/ID discovery
 - Network path determination
 - Network status updates

Data Link Layer

- ▶ Provides node-to-node data transfer—a link between two directly connected nodes.
- ▶ Defines the protocol to establish and terminate a connection between two physically connected devices.
- ▶ Defines the protocol for flow control between physically connected devices.
- ▶ Detects, and possibly corrects, errors that may occur in the physical layer.

Data Link Layer

- ▶ IEEE 802 provides two sub-layers of the Data Link Layer
 - MAC (Media Access Control) Sublayer
 - LLC (Logical Link Control) Sublayer
- ▶ MAC Sublayer
 - Defines addressing structure
 - Protocols for accessing the link
 - Rules about data transfer
- ▶ LLC Sublayer
 - Responsible for identifying and encapsulating network layer protocols

Physical Layer

- ▶ Protocols that define electrical or light signals for the transmission of data.
- ▶ Cable specifications
- ▶ Physical shape and format of NIC connectors.
- ▶ Power regulations and usage.

PDU's

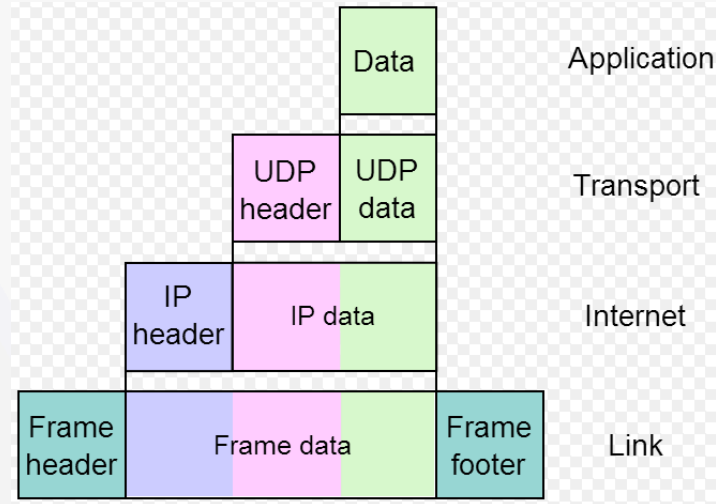
▶ PDU = Protocol Data Unit

- The final, structured data unit created by an OSI Layer

▶ PDU's created at one layer are meant to be read by the same layer on receiving device

Encapsulation / Decapsulation

- ▶ Encapsulation: As each layer receives a PDU from the layer above it, headers are added.
- ▶ Decapsulation: As each layer receives a PDU from the layer below it, headers are inspected and then removed.





Explaining Data Flows Using the OSI & TCP/IP Models



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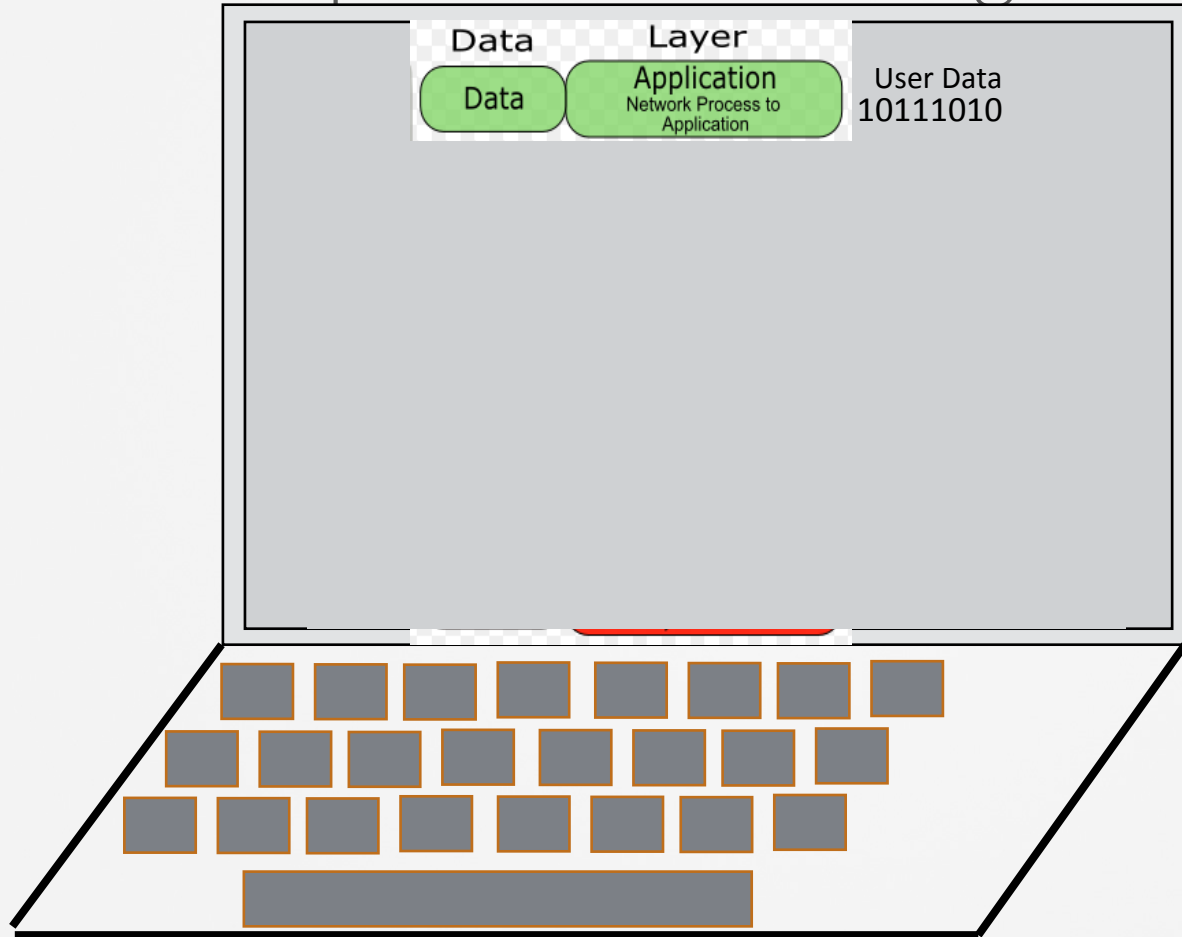
CCIE Routing & Switching



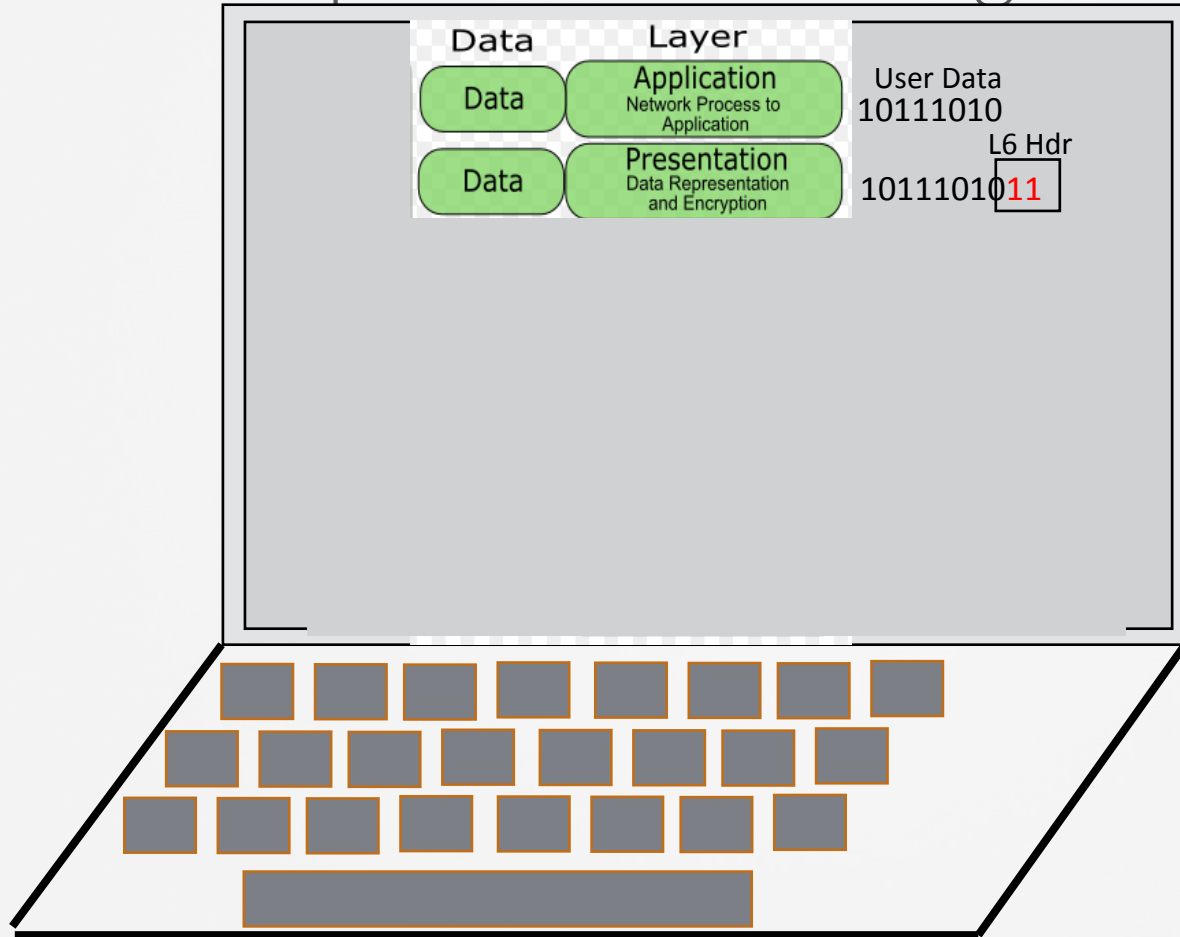
Video Overview

- Use the OSI and TCP/IP models and their associated protocols to explain how data flows through a network.

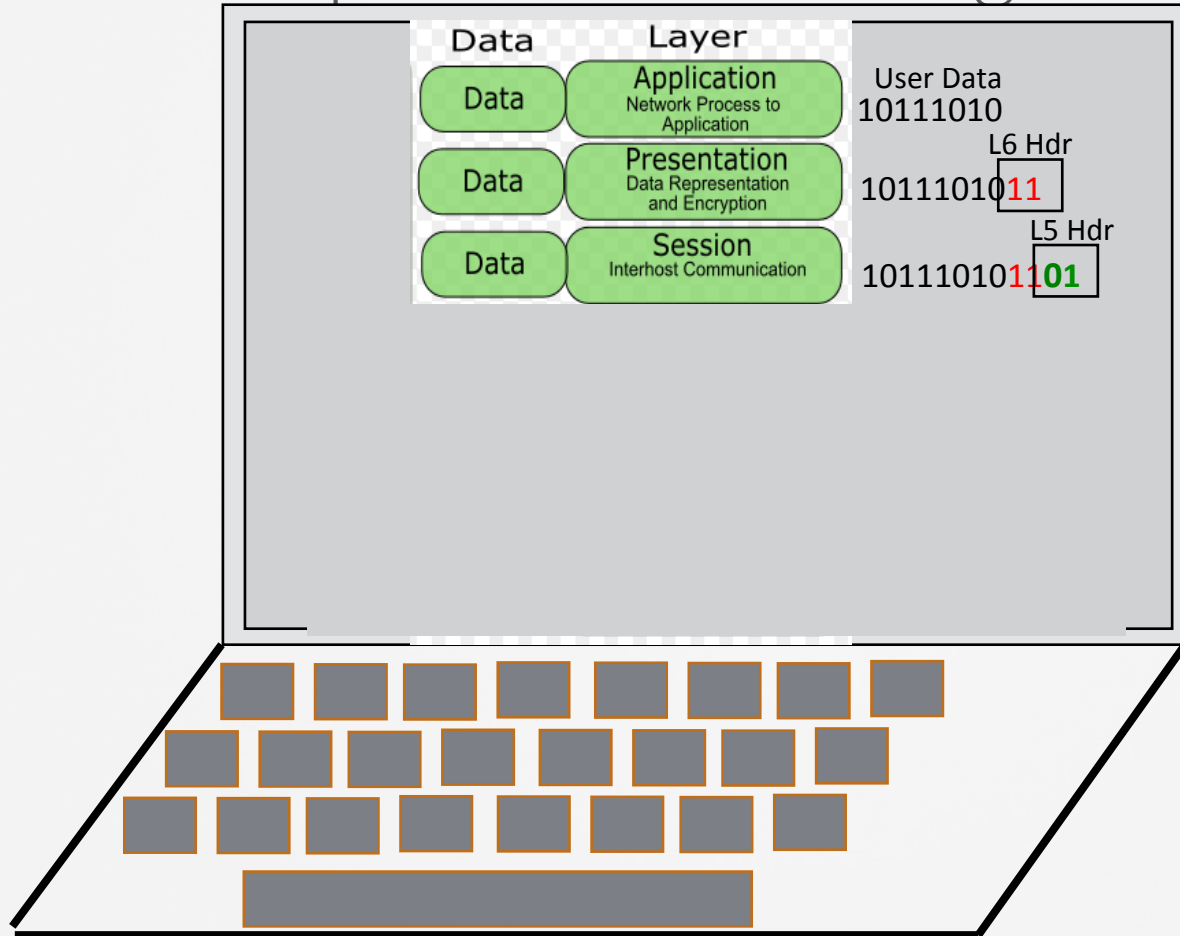
PDU Transportation & Recognition



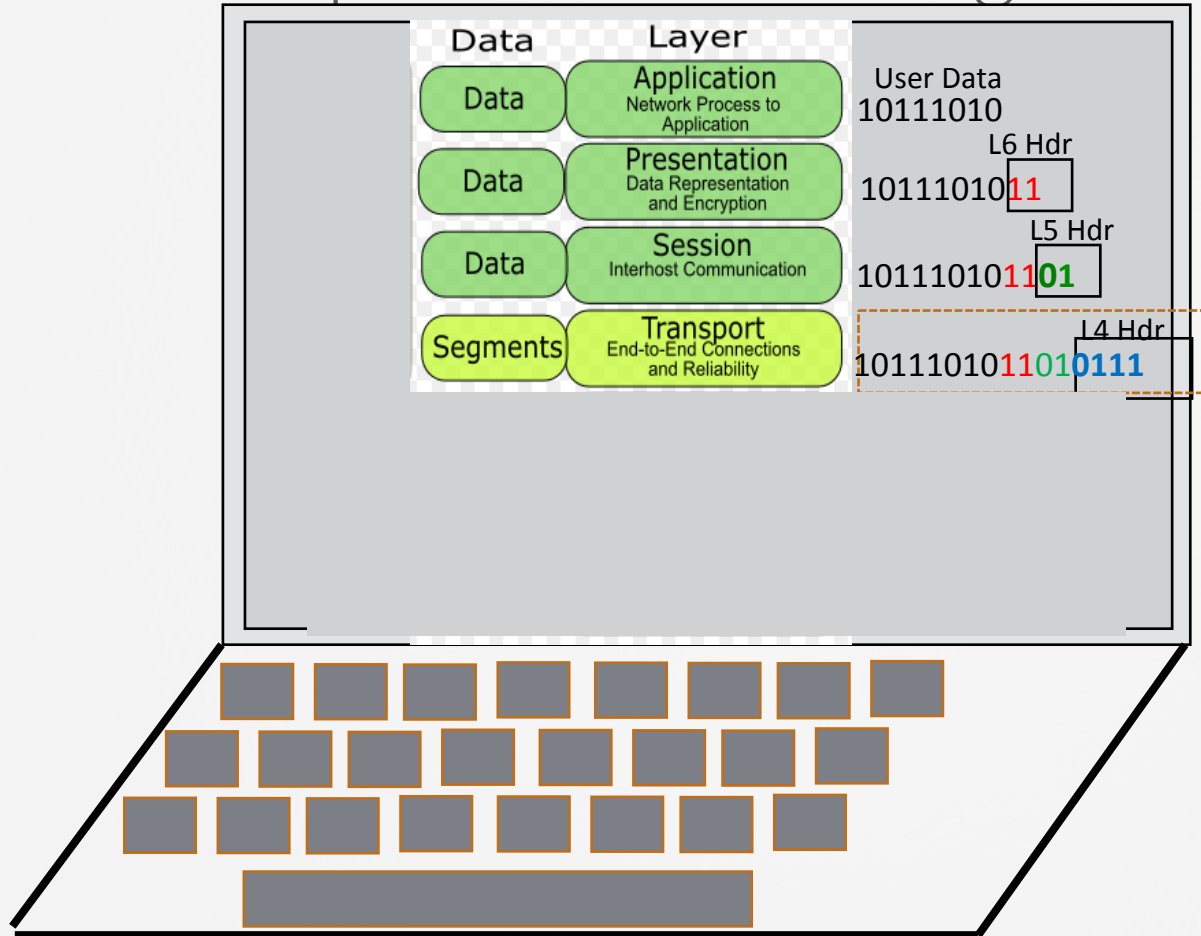
PDU Transportation & Recognition



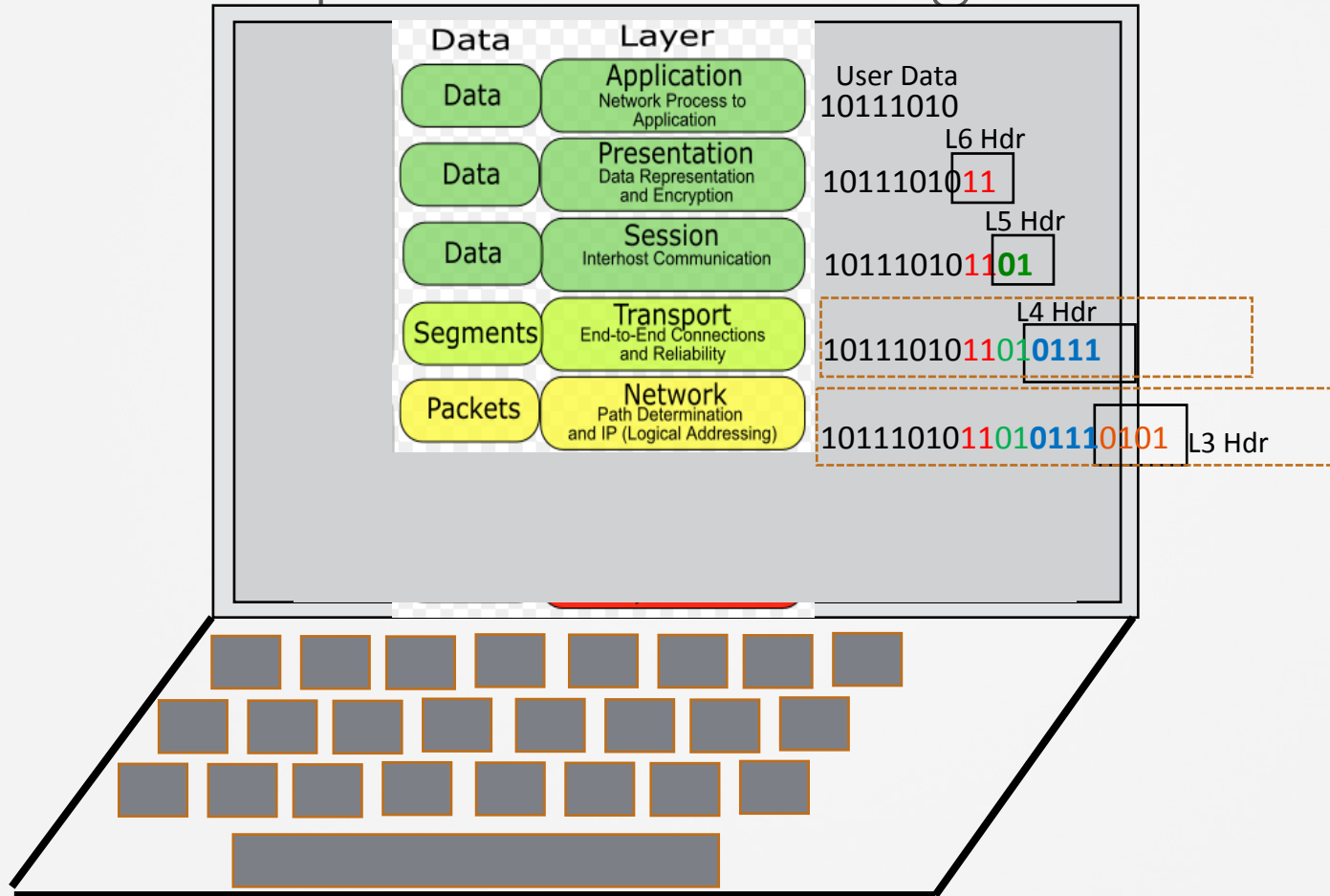
PDU Transportation & Recognition



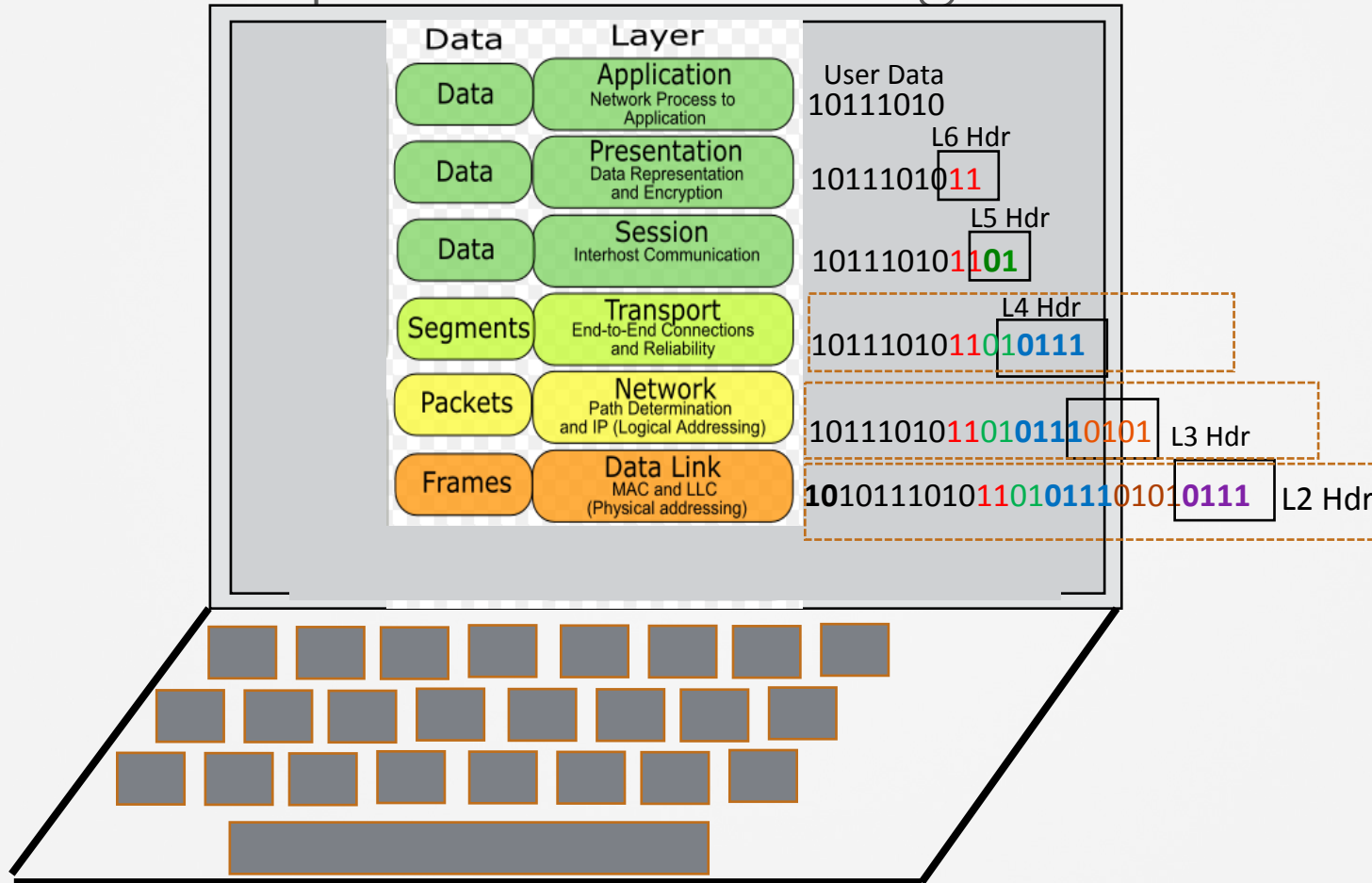
PDU Transportation & Recognition



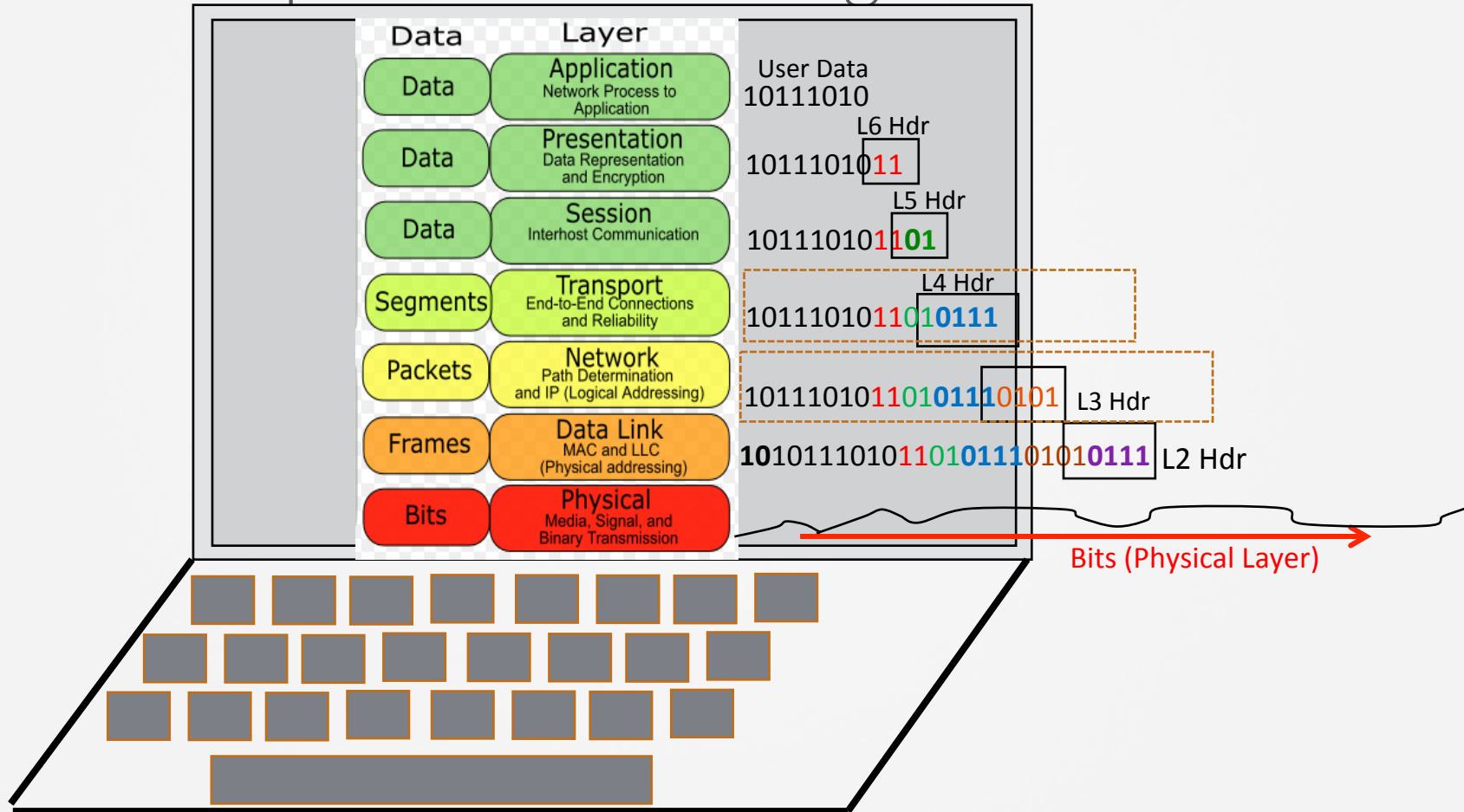
PDU Transportation & Recognition



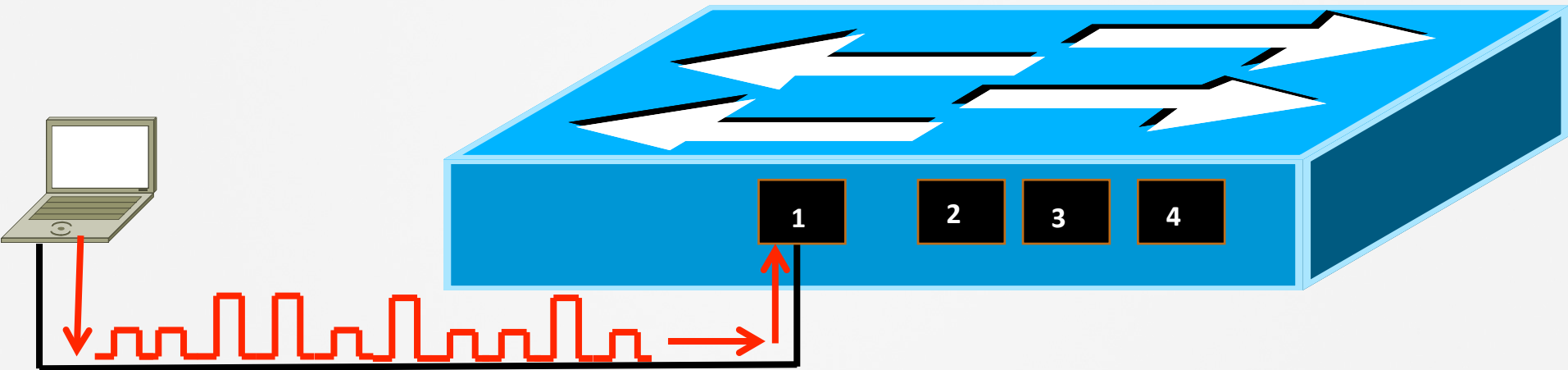
PDU Transportation & Recognition



PDU Transportation & Recognition



From PC to Switch (1)



From PC to Switch (2)

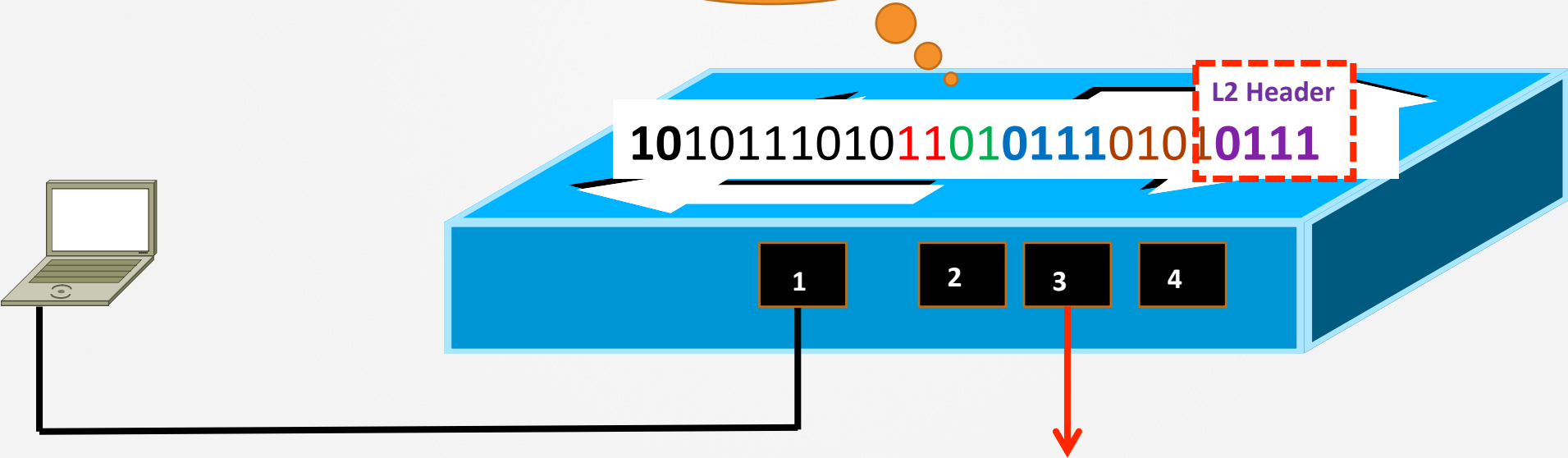
SWITCHING TABLE

0101 = Port-2

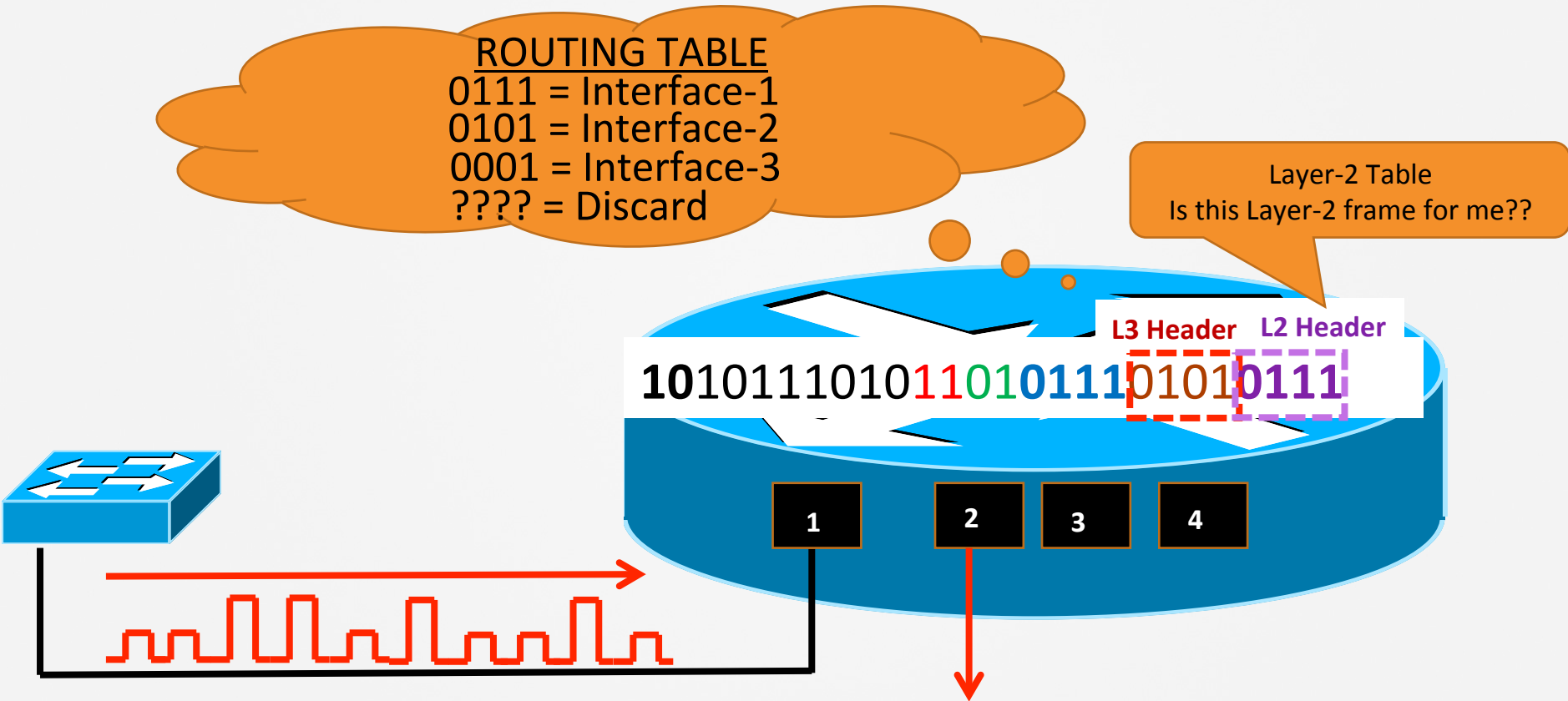
0111 = Port-3

0011 = Port-4

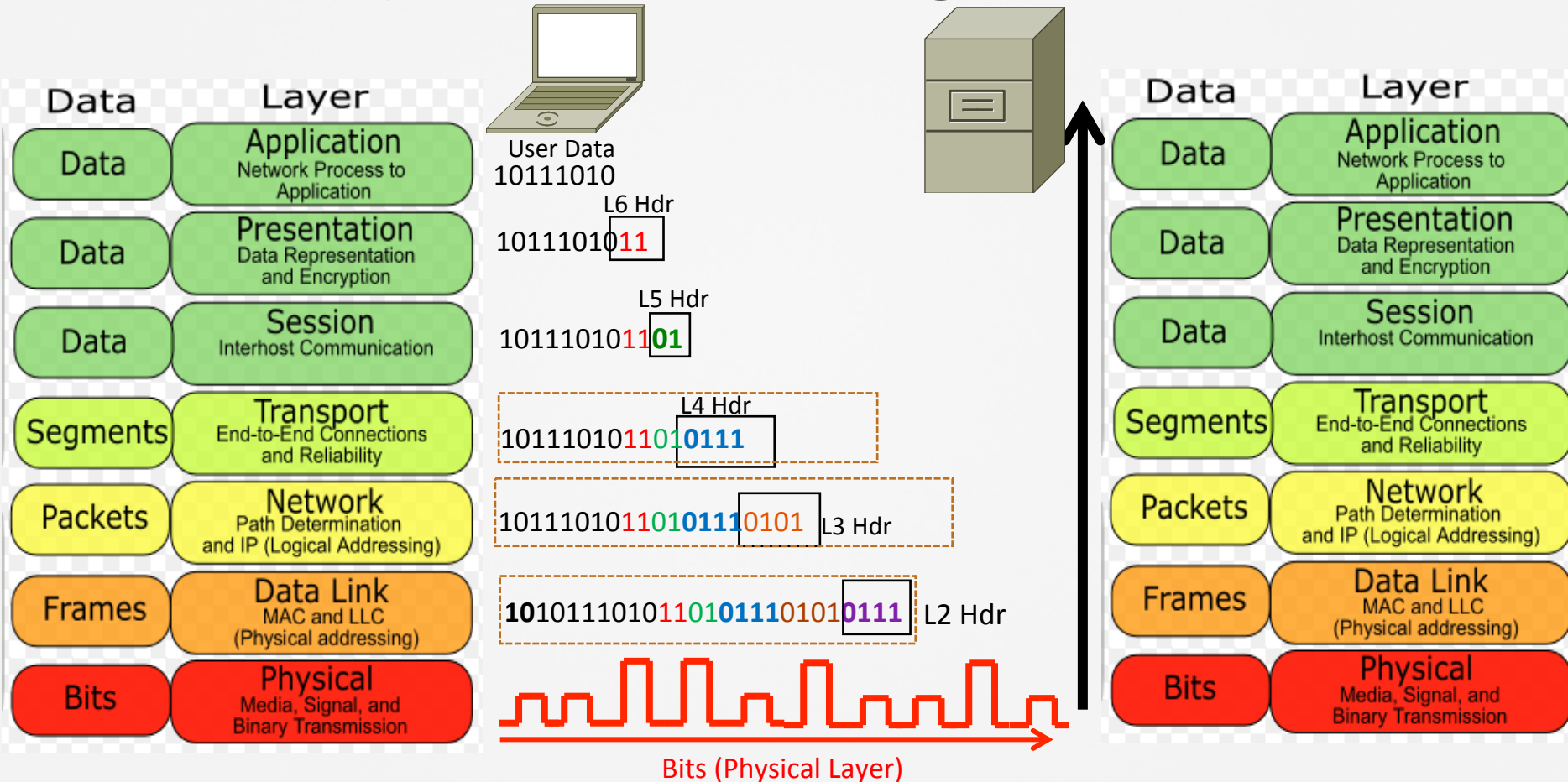
???? = Flood



From Switch to Router



PDU Transportation & Recognition



TCP/IP Reference Model

