21ES614 – Internet of Things

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Syllabus

Unit 1

Introduction to IoT - Definitions, frameworks and key technologies. Functional blocks of IoT systems: hardware and software elements- devices, communications, services, management, security, and application. Challenges to solve in IoT

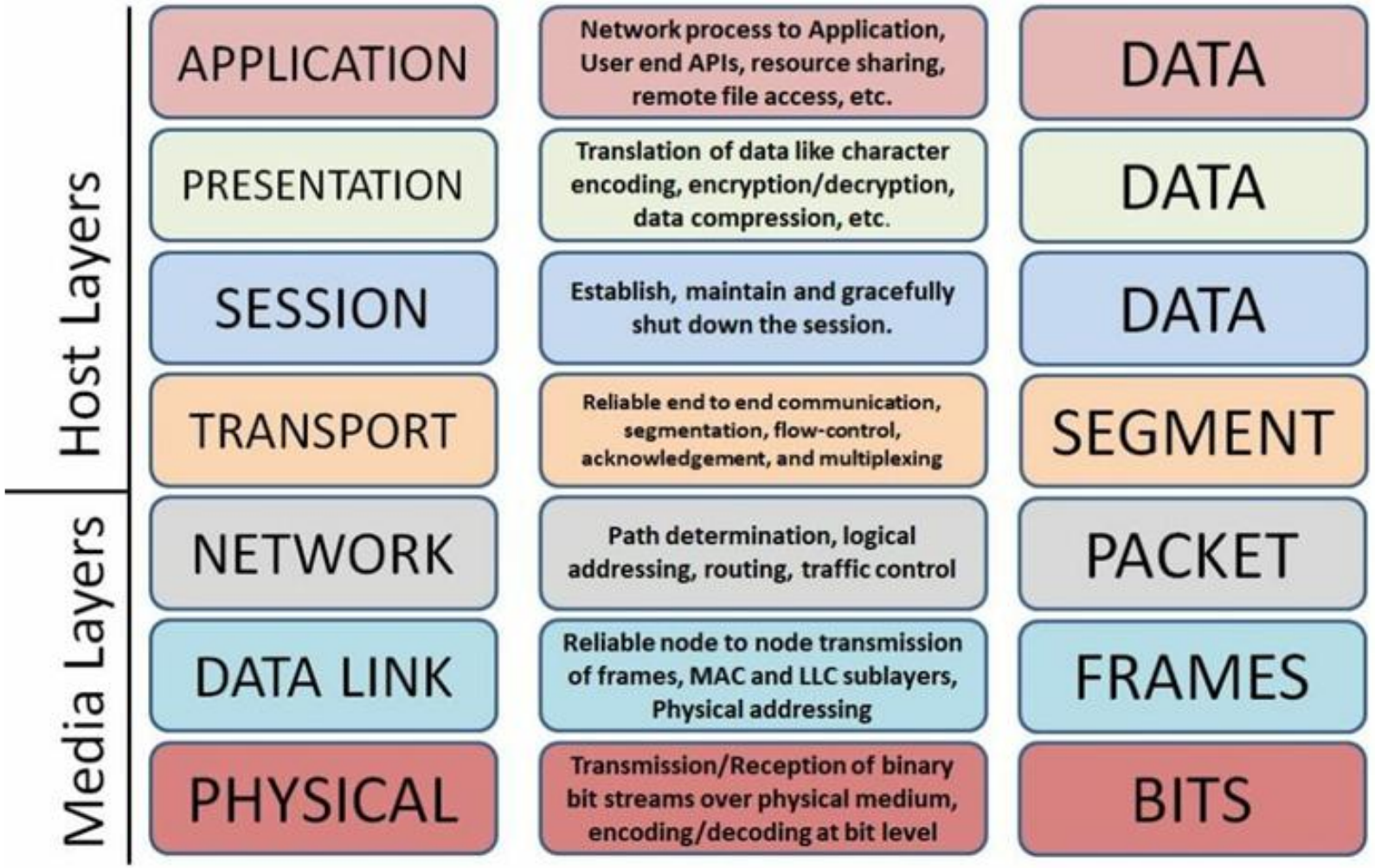
Unit 2

Basics of Networking & Sensor Networks - Applications, challenges - ISO/OSI Model, TCP/IP Model, Sensor network architecture and design principles, IoT technology stack, Communication models. Communication Protocols - Overview of protocols in each layer, Application protocols for the transfer of sensor data, Infrastructure for IoT: LoRa-Wan, 6LoWPAN, 5G and Sigfox.

Unit 3

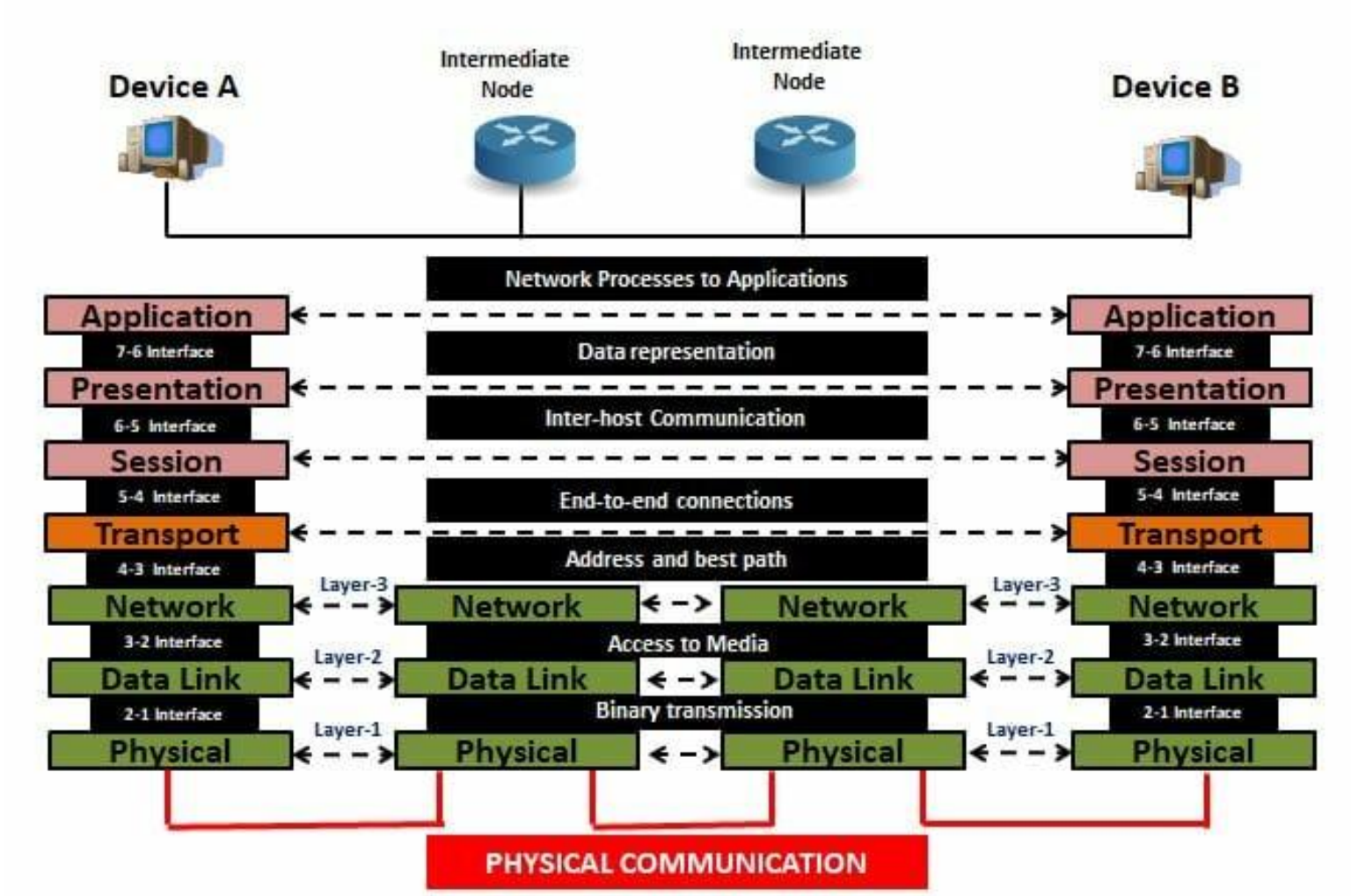
Introduction to Cloud, Fog and Edge Computing. Modern trends in IoT – Industrial IoT, Wearable. Applications of IoT - Smart Homes/Buildings, Smart Cities, Smart Industry, and Smart Medical care, Smart Automation etc.

ISO OSI



Ref: https://networkhope.in/iso-osi-basic-reference-model/

ISO OSI – Network Operation



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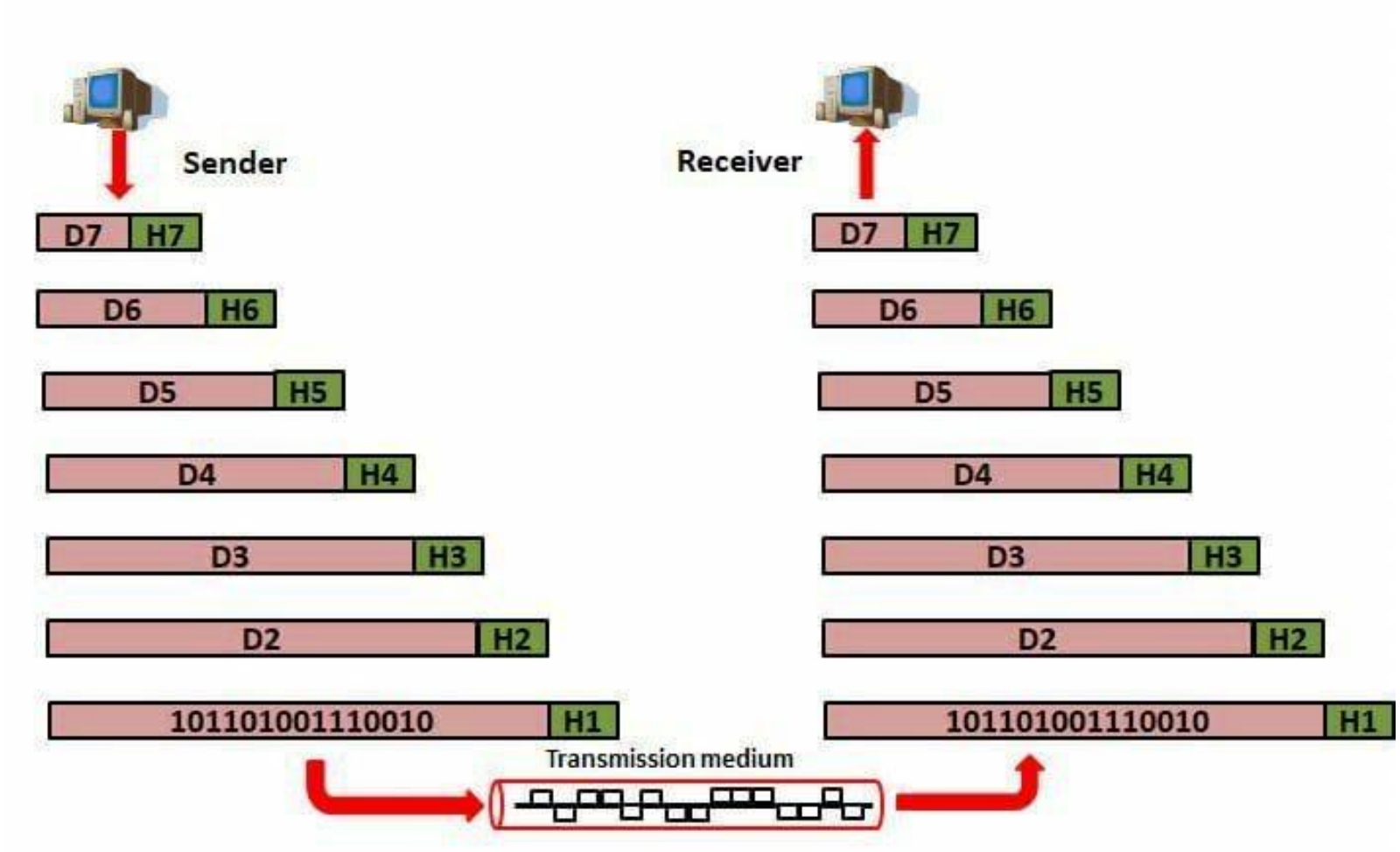
ISO OSI – Data Formatting



Ref: https://networkhope.in/iso-osi-basic-reference-model/

Physical Layer

- Physical characteristics of the interfaces & medium
- Representation of bits
- Data rate / Transmission rate
- Synchronization of bits
- Line configuration – Point-to-Point / Multipoint
- Physical Topology
- Transmission Mode - Simplex / Half-Duplex / Full-Duplex
- Physical Layer devices - Hub, Repeater, Modem, Cables, etc.

Ref: https://networkhope.in/iso-osi-basic-reference-model/
http://cs.uok.edu.in/Files/79755f07-9550-4aeb-bd6f-5d802d56b46d/Custom/ADC%20unit%202.pdf
https://www.studytonight.com/computer-networks/complete-osi-model
https://www.geeksforgeeks.org/layers-of-osi-model/

Data Link Layer

- Framing
- Link Management
- Physical addressing
- Flow control
- Error control
- Multiplexing of multiple protocols at a higher layer
- Access control of channel by the devices
- Data Link Layer devices - Switch & Bridge

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Network Layer

- Routing
- Logical Addressing
- Connectionless delivery
- Connection services are provided including network layer flow control, network layer error control and packet sequence control
- Network layer devices – Routers and Gateways

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Transport Layer

- Port addressing
- Segmentation and reassembly
- Connection control
- Flow control
- Error control
- Network Application & System Software

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Session Layer

- Session establishment, maintenance, and termination
- Synchronization
- Dialog Controller
- Network Application & System Software

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Presentation Layer

- Translation
- Encryption/ Decryption
- Compression
- Network Application & System Software

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Application Layer

- Mail Services
- Browsing services
- Network Virtual Terminal
- Directory Services
- File Transfer, Access and Management (FTAM)
- Application software

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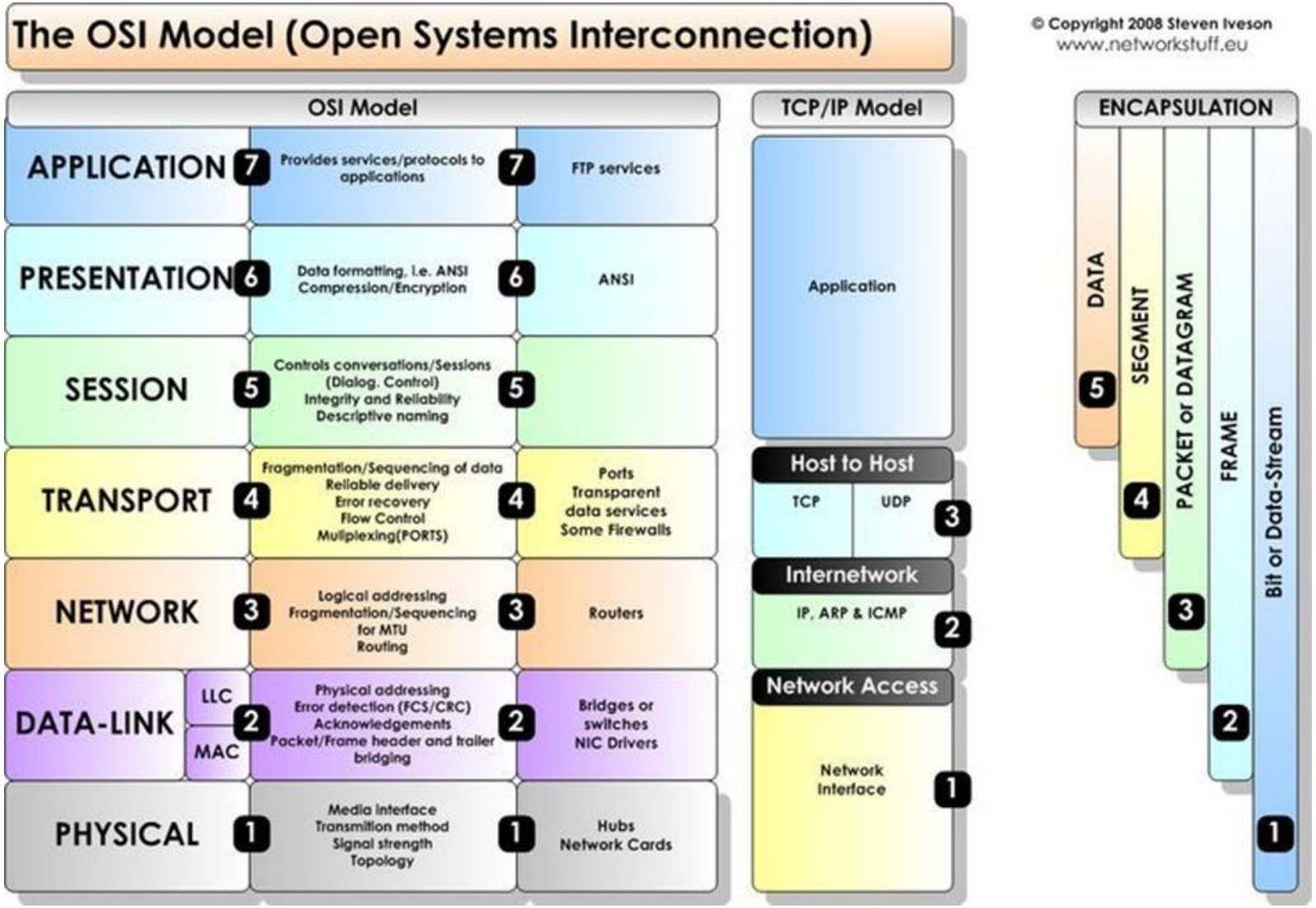
ISO OSI vs TCP/IP



Ref: https://docs.oracle.com/cd/E18752_01/html/816-4554/ipov-6.html

Network Access layer

- Corresponds to the combination of Data Link Layer and Physical Layer of the OSI model
- How data should be sent and handles the physical act of sending and receiving data
- Encapsulating the IP datagram into frames transmitted by the network and mapping of IP addresses into physical addresses

Ref: https://www.geeksforgeeks.org/tcp-ip-model/
https://www.javatpoint.com/computer-network-tcp-ip-model

Internetwork layer

- Corresponds to the network layer of the OSI model
- Controls the movement of packets around the network
- Defines the protocols which are responsible for logical transmission of data over the entire network
- IP Addressing

Ref: https://www.geeksforgeeks.org/tcp-ip-model/
https://www.javatpoint.com/computer-network-tcp-ip-model

Host to Host layer

- Corresponds to the transport layer of the OSI model
- Host-to-host communication
- Responsible for end-to-end communication and error-free delivery of data
- Shields the upper-layer applications from the complexities of data

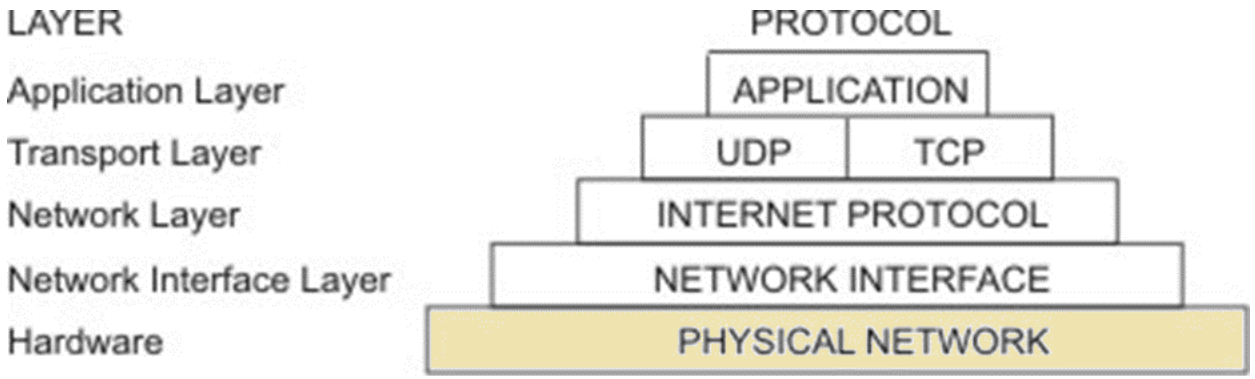
Ref: https://www.geeksforgeeks.org/tcp-ip-model/
https://www.javatpoint.com/computer-network-tcp-ip-model

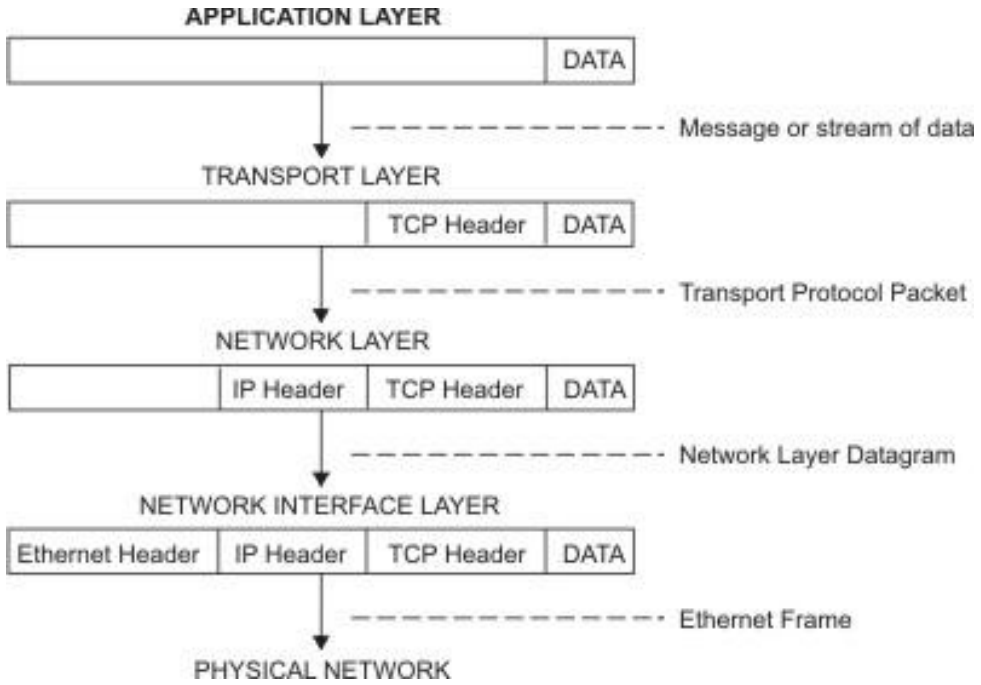
Application layer

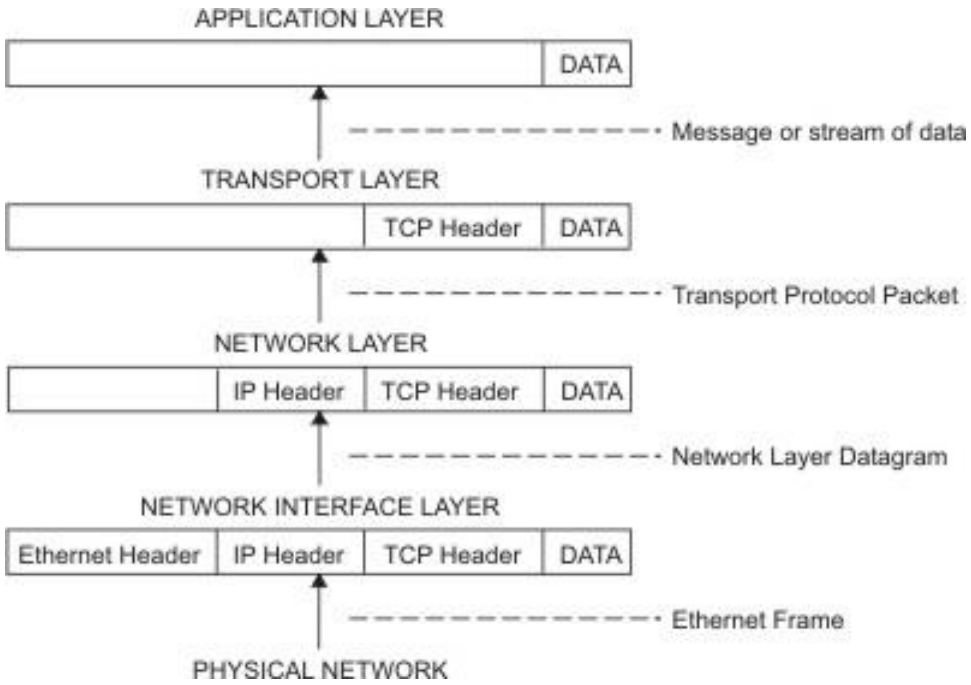
- Corresponds to the combination of application, presentation and session layers of the OSI model
- Responsible for node-to-node communication and controls user-interface specifications
- Defines standard Internet services and network applications that anyone can use

Ref: https://www.geeksforgeeks.org/tcp-ip-model/
https://www.javatpoint.com/computer-network-tcp-ip-model

TCP/IP







Ref: https://www.ibm.com/docs/en/aix/7.1?topic=protocol-tcpip-protocols

Thank You…

Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, 5th Edition, Pearson Education, 2011.