

INTRODUCTION TO TCP/IP PROTOCOL SUITE

PROTOCOL LAYERING

In data communication and networking, a Protocol defines the rules that both the sender and receiver and all intermediate devices need to follow to be able to communicate effectively.

When communication is simple, we may need only one simple protocol.

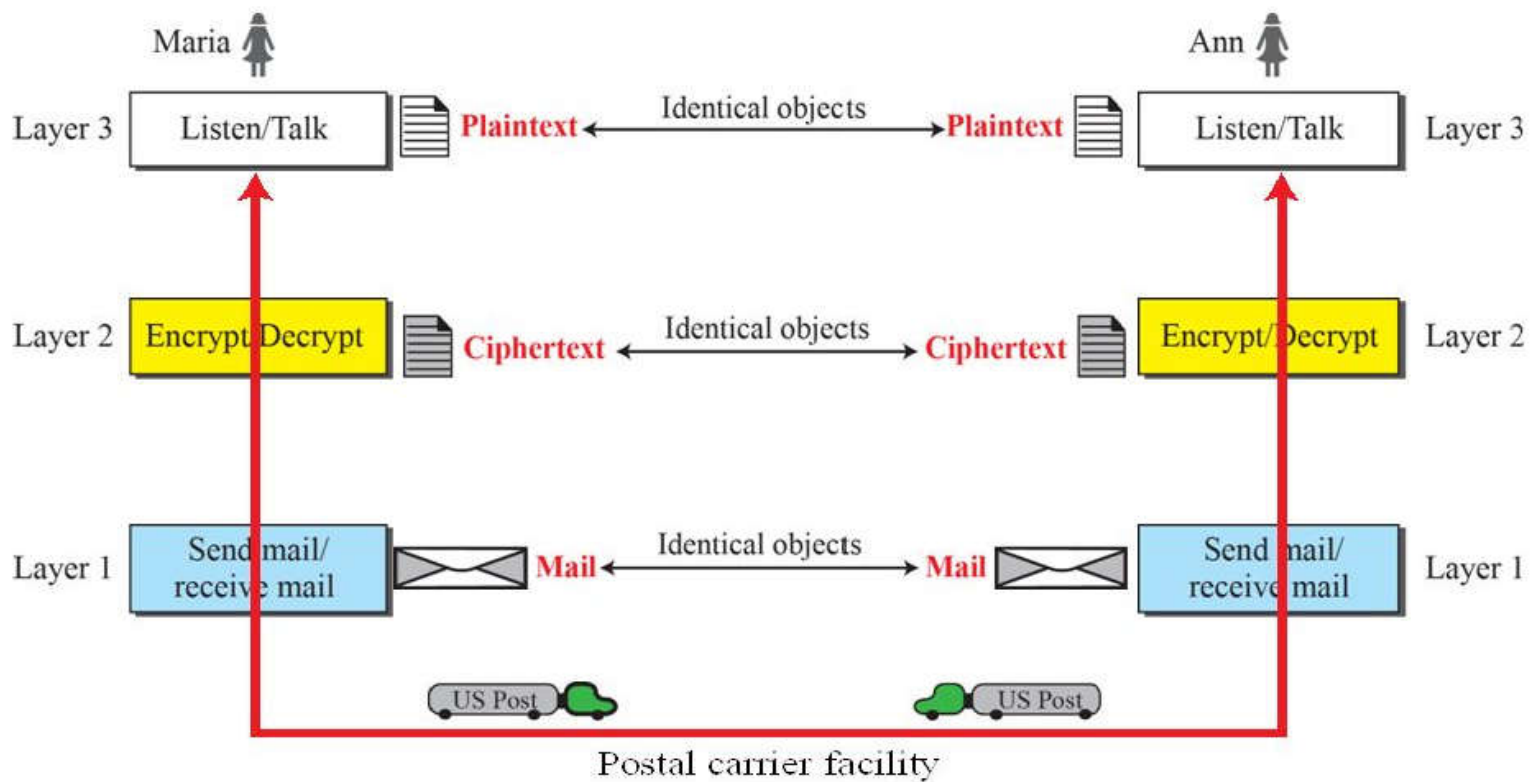
When communication is complex, we may need to divide the task between different layers, in which case we need a protocol at each layer, or **Protocol Layering**.

A SINGLE LAYER PROTOCOL



1. Greet each other when they meet
2. Confine the vocabulary to the level of friendship
3. Refrain from speaking if one is speaking
4. Opportunity to talk both on an issue (dialog / monolog)
5. Exchange nice words when departing

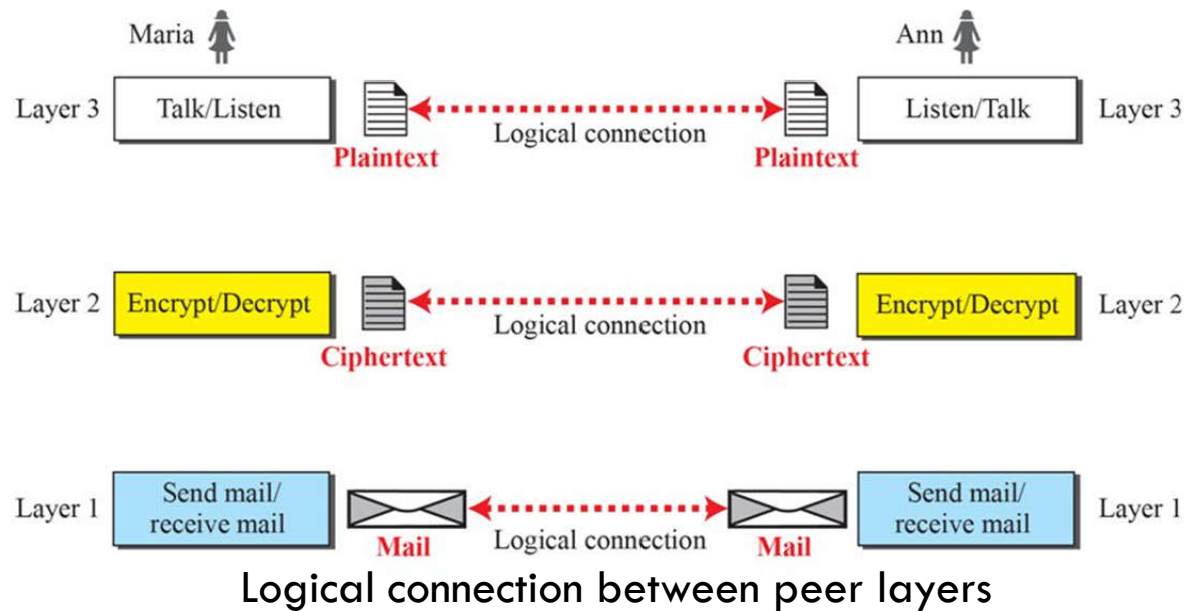
A THREE-LAYER PROTOCOL



PRINCIPLES OF PROTOCOL LAYERING

First principle: If we want bidirectional communications, we need to make each layer so that it is able to perform two opposite tasks, one in each direction.

Second Principle: Two objects under each layer at both side should be identical.



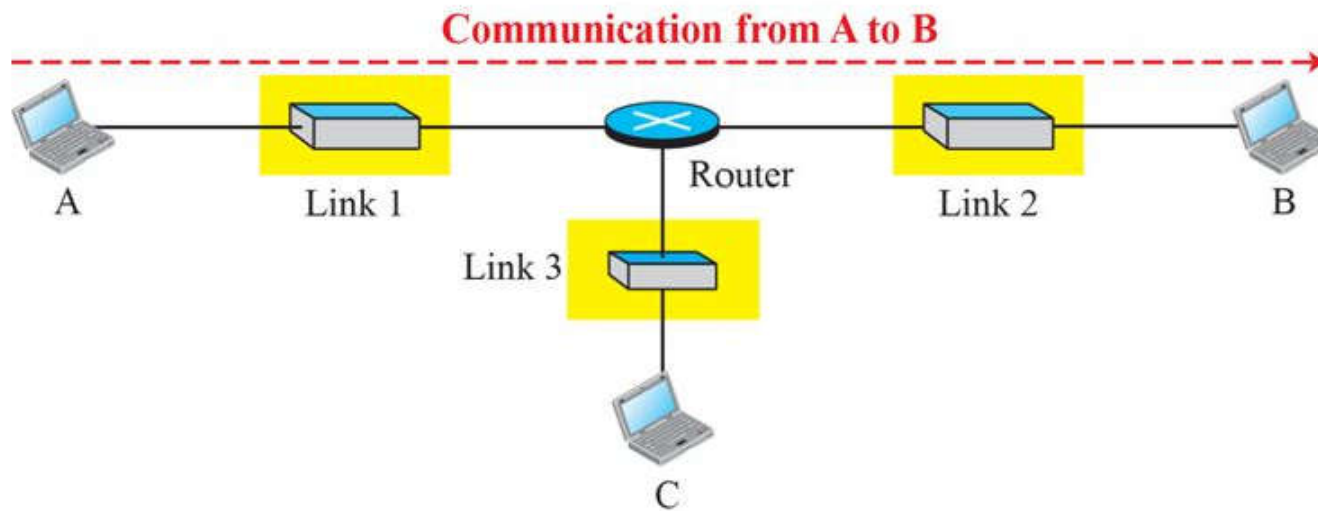
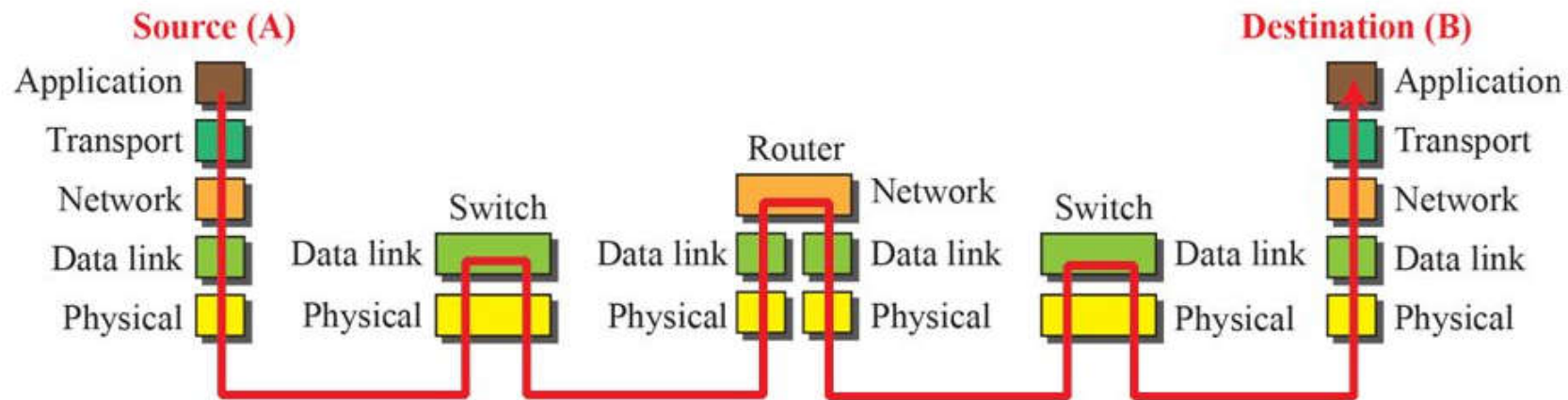
INTRODUCTION

TCP/IP is a protocol suite used in the Internet today. It's a hierarchical protocol made up of interactive modules, each of which provides a specific functionality.

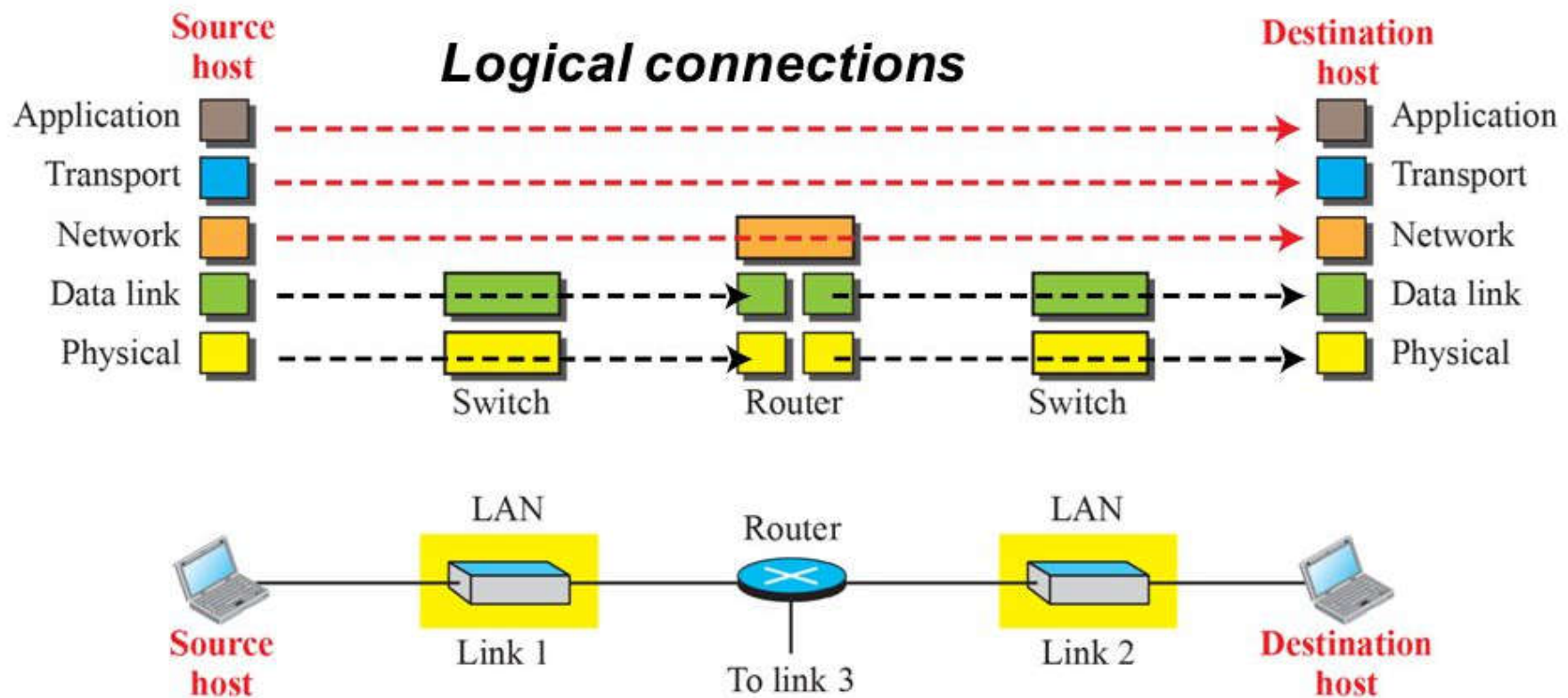
TCP/IP Model Architecture:

Layer #	Layer Name	Protocol	Protocol Data Unit	Addressing
5	Application	HTTP, SMTP, etc...	Messages	n/a
4	Transport	TCP/UDP	Segments/ Datagrams	Port #s
3	Network or Internet	IP	Packets	IP Address
2	Data Link	Ethernet, Wi-Fi	Frames	MAC Address
1	Physical	10 Base T, 802.11	Bits	n/a

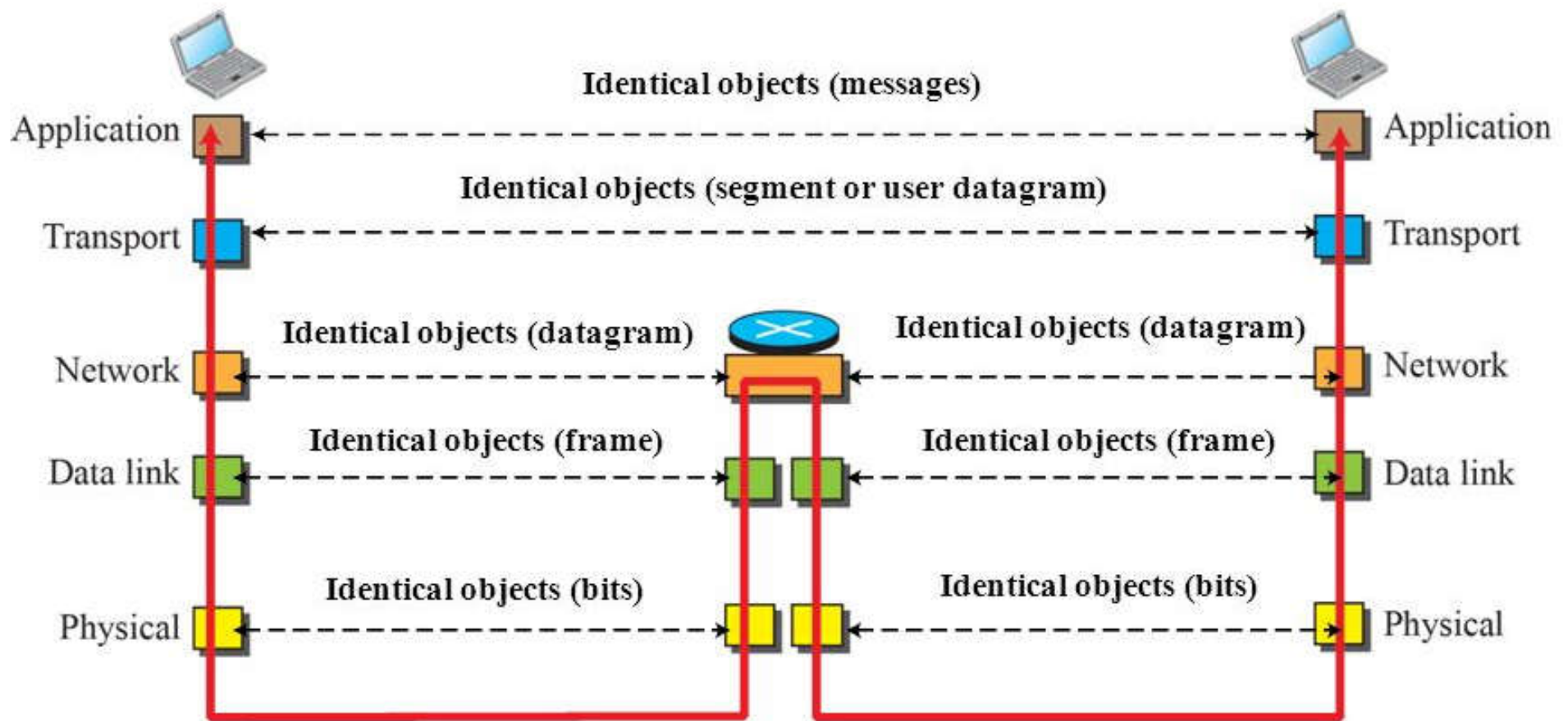
COMMUNICATION THROUGH AN INTERNET



LAYERS IN THE TCP/IP PROTOCOL SUITE



IDENTICAL OBJECTS IN THE TCP/IP PROTOCOL SUITE



PHYSICAL LAYER

Physical layer is responsible for movements of bits from one hop(node) to the next

Physical Characteristics of Interface and medium : Type of Transmission medium

Representation of Bits : Encoding Techniques ; Conversion of Bits to Electrical/Optical signals

Data rate: bits/sec

Synchronization: Clock Synchronization at Sender & receiver

Physical Topology: Star, Bus, Mesh, Ring etc

Line Configuration : Point to Point, Multipoint Configurations

Transmission Mode : Simplex , Half-Duplex, Full-Duplex

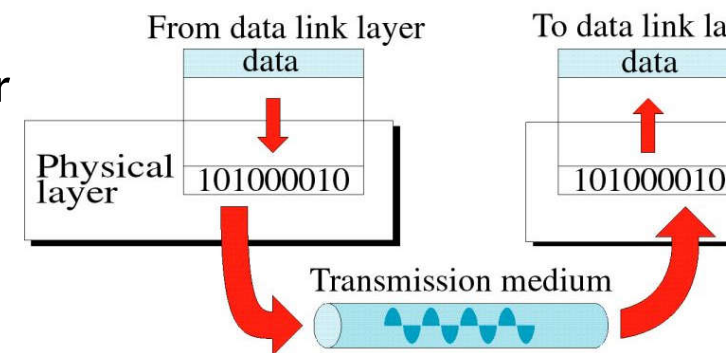


Image Source: <https://slideplayer.com/slide/9>

DATA LINK LAYER

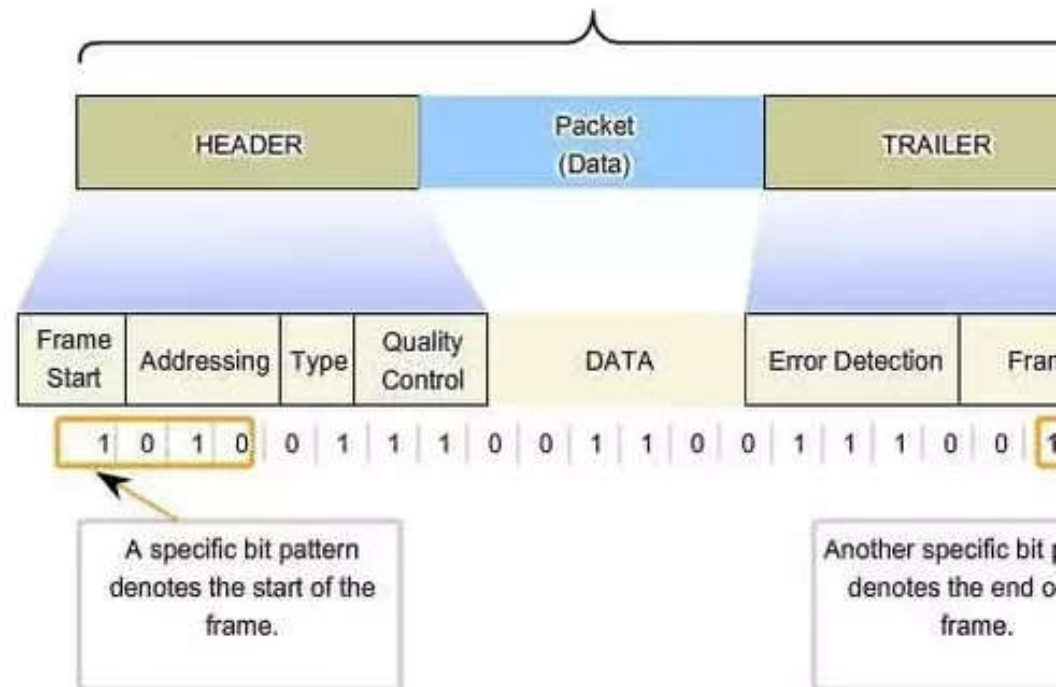
Data link layer is responsible for moving frames from one hop(node) to the next

Image Source:

<http://www.highteck.net/EN/DataLink/Data>

Formatting Data for Transmission

1. Framing
2. Physical Addressing
3. Flow control
4. Error Control: Detection & Correction
5. Access Control



g., ARP, IEEE 802.3 and IEEE 802.11

NETWORK LAYER

Network layer is responsible for delivery of individual packets from source host to destination host

1. Logical Addressing: IPv4, IPv6
2. Routing: Routing algorithms & table (traffic routing & control)

.g., IP, ICMP, IGMP, DHCP

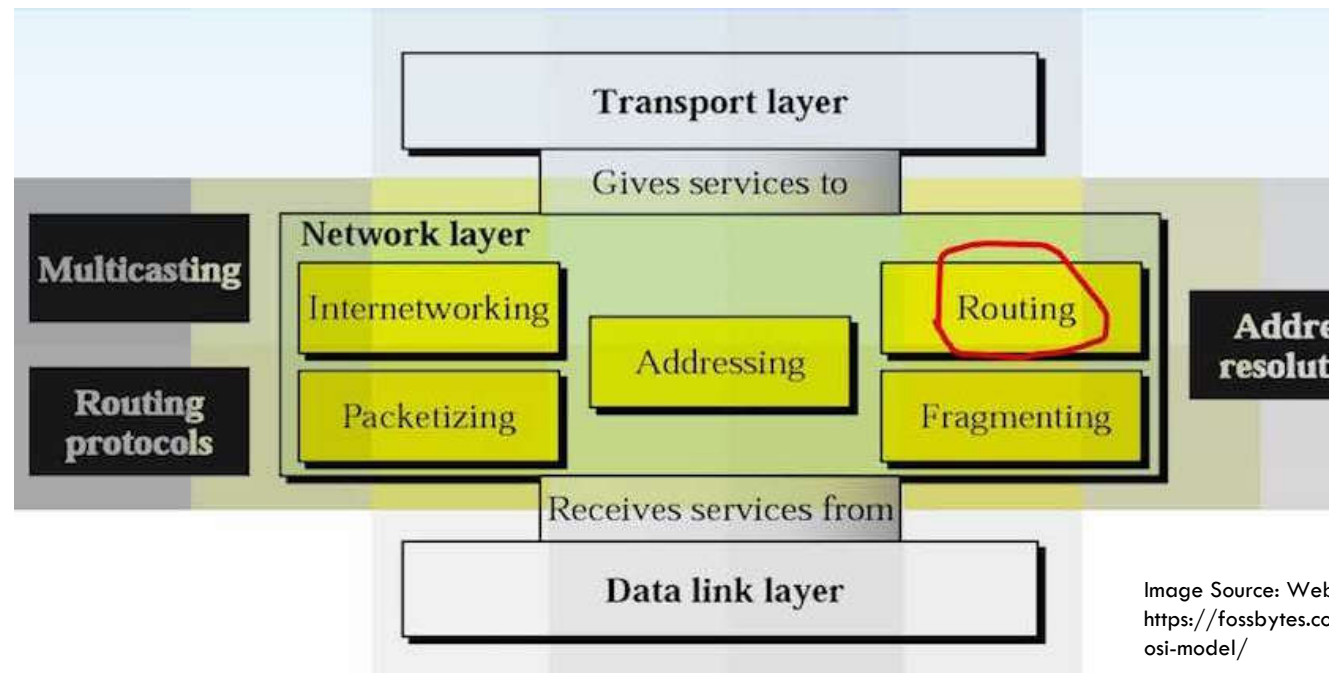


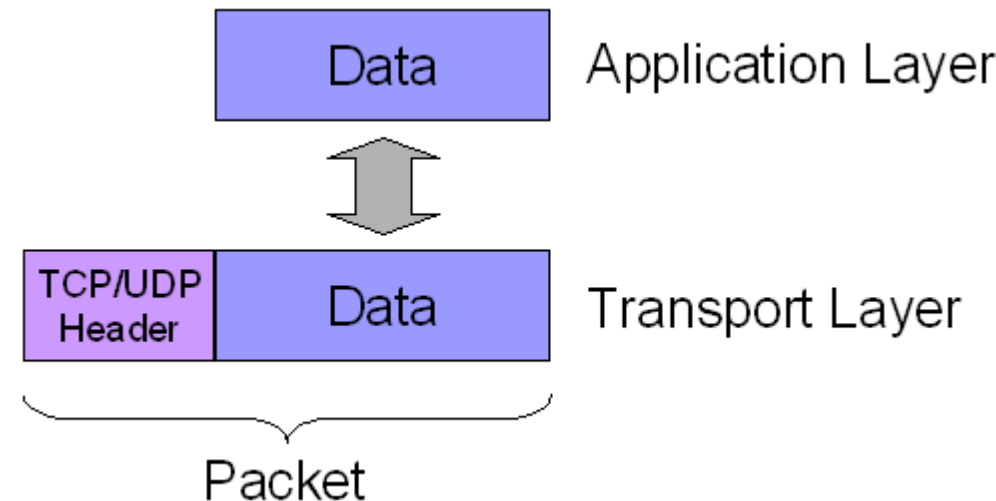
Image Source: Web
<https://fossbytes.com/osi-model/>

TRANSPORT LAYER

Transport layer is responsible for the delivery of the message from one process to another

1. Service point addressing: Port Address
2. Segmentation : Divided into transmittable segments with sequence numbers
3. Connection Control
4. Flow Control
5. Session Multiplexing
6. Error Detection & Correction (resends)
7. Message reordering (reassembly)

e.g., TCP, UDP



APPLICATION LAYER

Application layer is responsible for providing services to the user.

1. Network virtual terminal (e.g. usgs)
2. File transfer, access and management
3. Mail services
4. Directory services

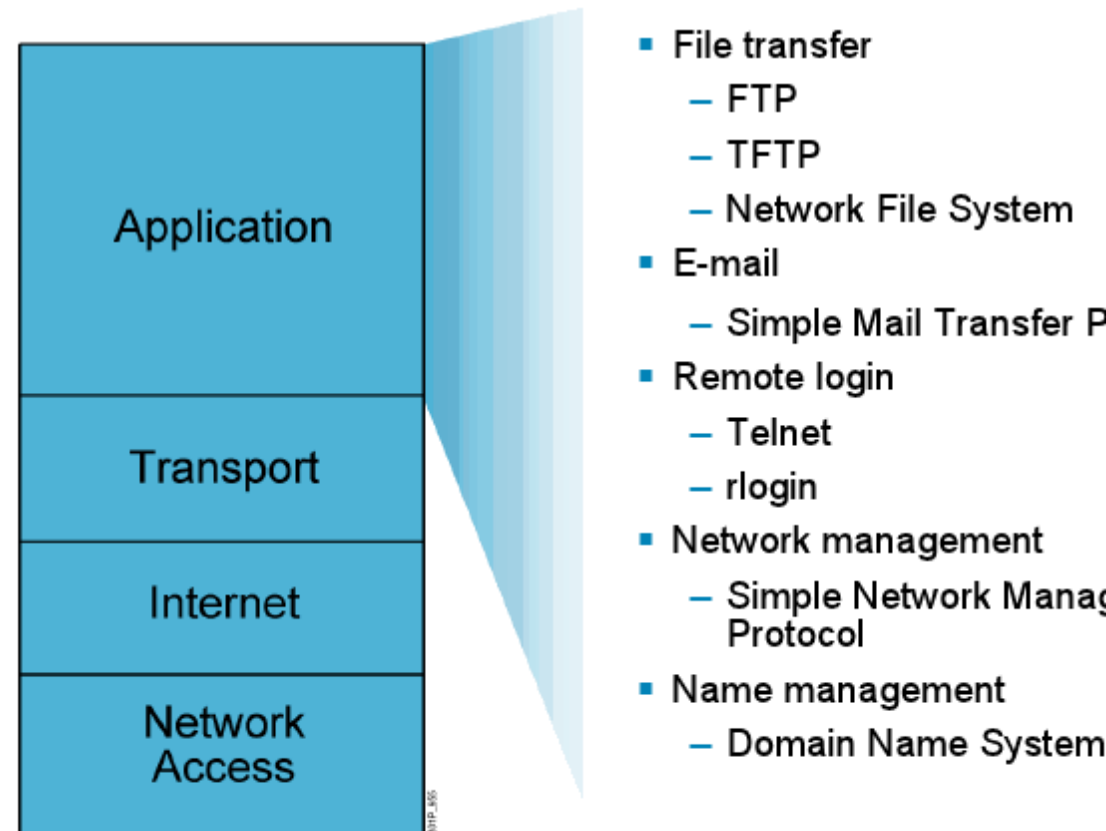
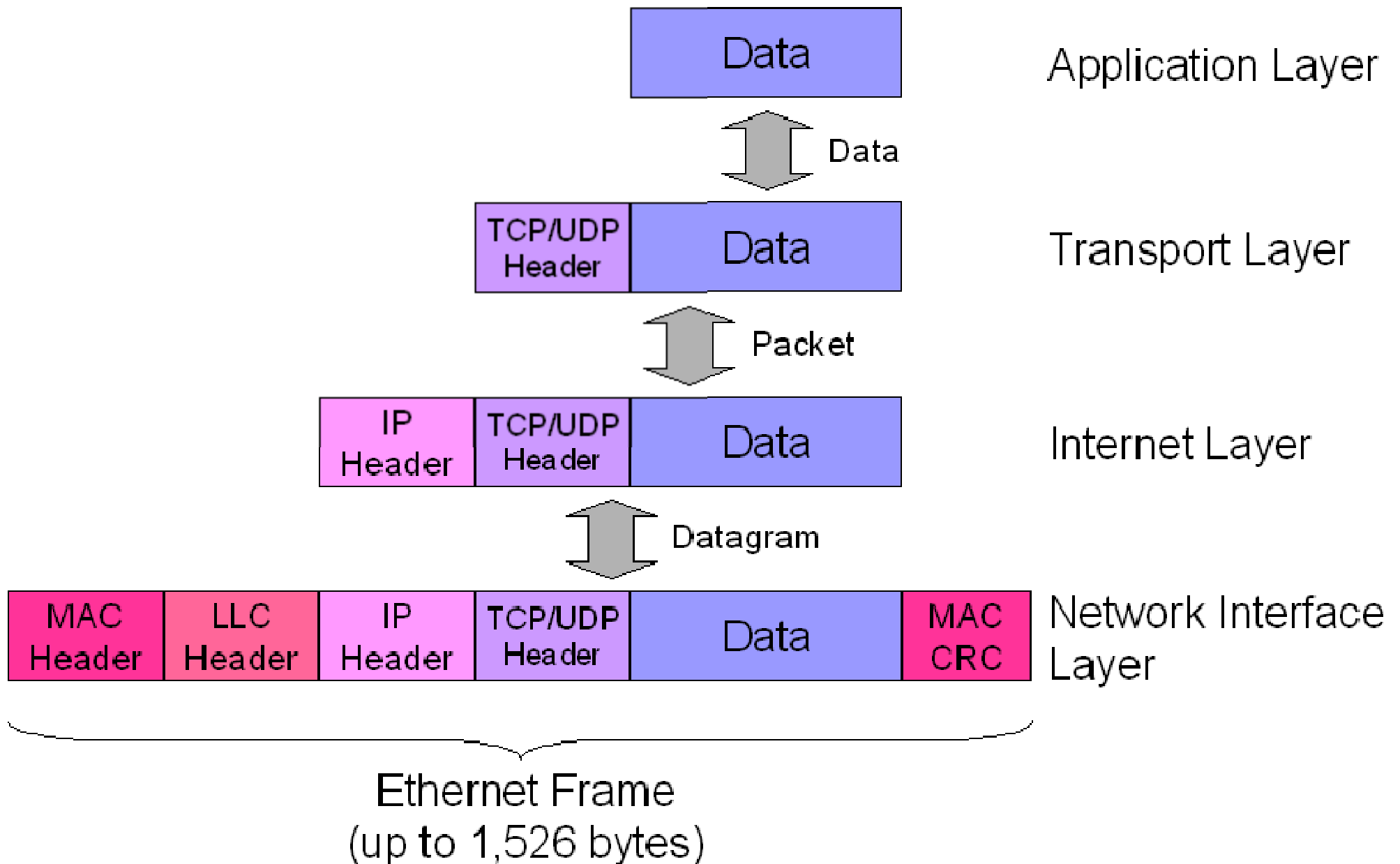
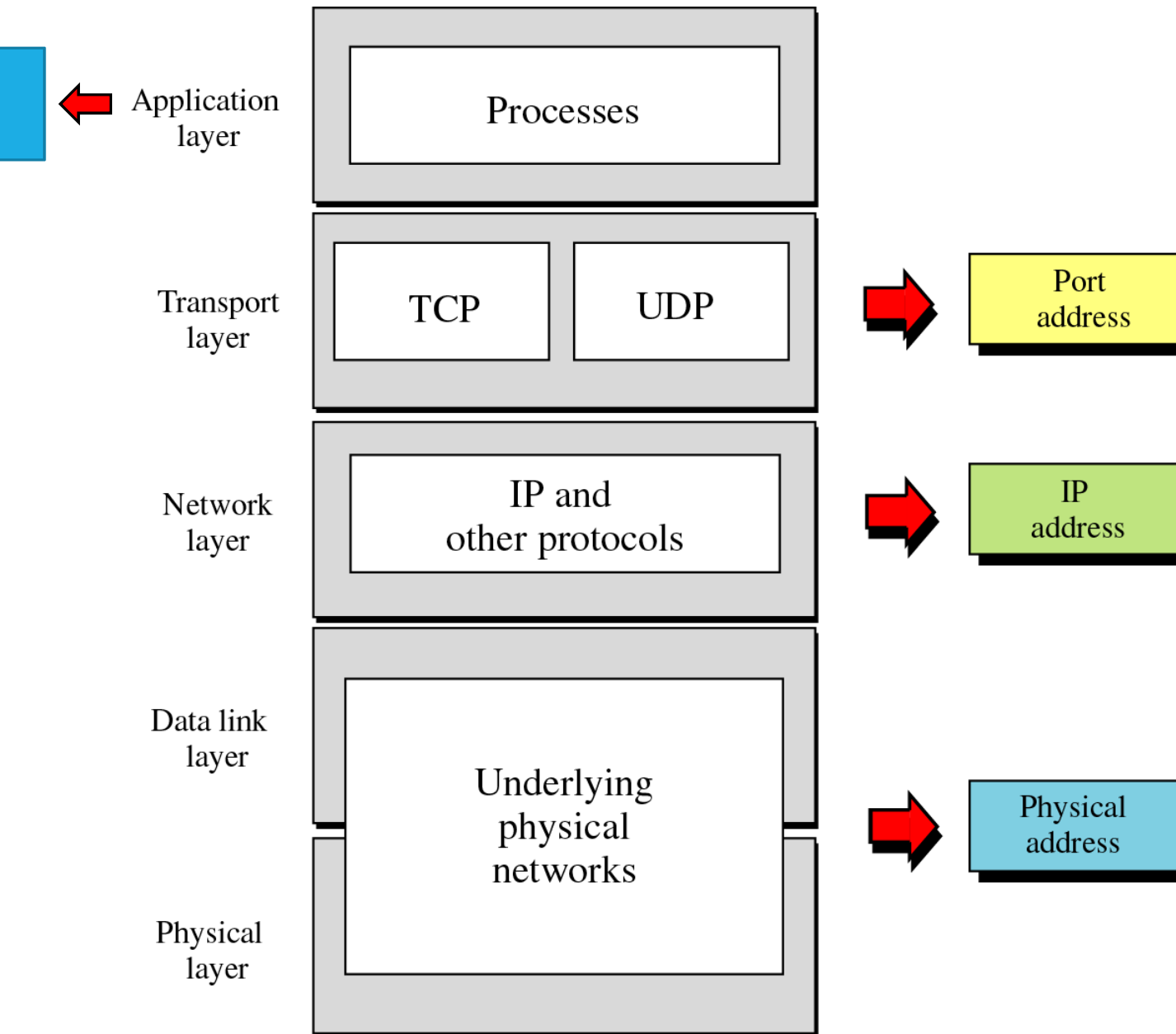


Image Source:

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Relationship of layers and Addresses in TCP/IP