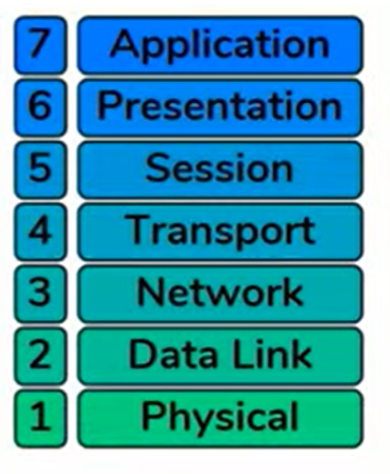
2- OSI model

Table of contents

Purpose of Networking

Allow two hosts to share data with one another.

- Hosts must follow a set of rules
- The rules for networking are divided into 7 layers:‘
  - OSI model



  -
  - if all these layers are functioning, hosts can share data

---

Layer 1 - Physical layer (Transporting Bits)

- Computer data exists in the form of bits.

- Something has to transport those bits between hosts
- L1 Technologies:
  1. Cables
  2. Wifi
  3. Repeaters
  4. Hubs

Layer 2 - Data Link (Hop to Hop delivery)

- Interacts with Wire (i.e., Physical layer)
  - NIC - Network Interface Cards / Wifi Access Cards.
- **Addressing Scheme - MAC addresses**
  - 48 bits, represented as 12 hex digits
  - 94-65-9C-3B-8A-E5 / 94:65:9C:3B:8A:E5 / 9465.9C3B.8AE5
  - Every NIC has a unique MAC address.
- Often communication between hosts require multiple hops.
- L2 Technologies: NICs, Switches

- ! If Layer 2 Layer is taking care of every hop. what ensures of data from one end point to another endpoint.

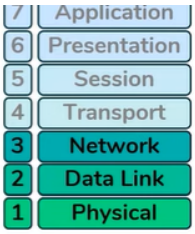
Layer 3 - Network Layer (end to end delivery)

- **Addressing Scheme - IP addresses**
  - 32 bits, represented as 4 octets, each 0-255
- L3 Technologies: Routers, Hosts, (anything with an IP)

Layer 2 MAC Address vs Layer 3 IP addresses

- ! There is a protocol which ties or links the two layers (2 and 3) called ARP Address Resolution Protocol.

OSI Model



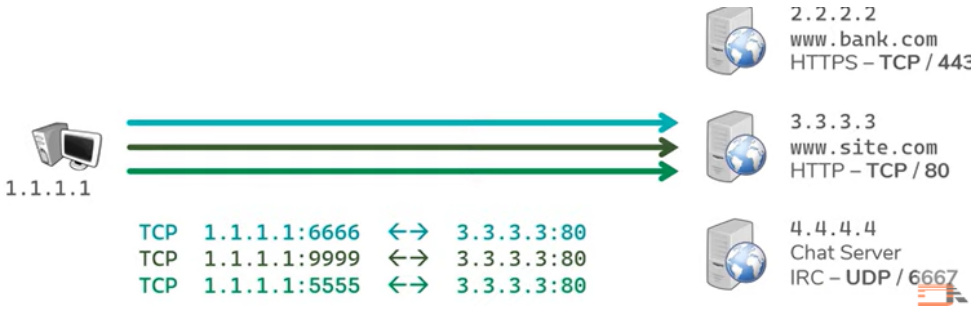
- Part 1:
  - Layer 1 – **Physical Layer** – *Transporting Bits*
    - Wires, Cables, Wi-Fi, Repeaters, Hubs
  - Layer 2 – **Data Link Layer** – *Hop to Hop*
    - MAC Addresses, Switches
  - Layer 3 – **Network Layer** – *End to End*
    - IP Addresses, Routers, any device with an IP address
  - How Layer 2 + Layer 3 work together to move data across the Internet

Layer 4 - Transport Layer (Service to Service delivery)

- ! How do we make sure that right programs receives the right packets.
- Distinguish data streams
- **Addressing Scheme - ports**
- TCP and UDP are 2 different strategies to distinguish data streames.

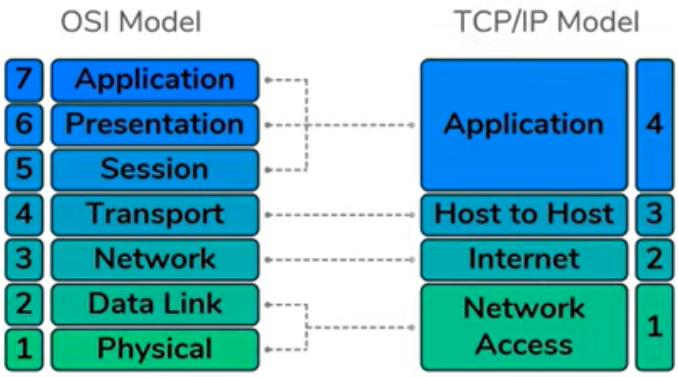
TCP	UDP
for reliability	for efficiency

UDP / 6667
TCP / 80
TCP / 25565



Layer 5, 6, 7 - Session, Presentation, Application

- three layers are Considered as single universal Application Layer.
- TCP/IP combines all the 3 layers into a single layer.



Data flow through all the layers

Sending - Encapsulation process

1. Application - Transport Layer (L4) ⟹ TCP + DATA (Segment)

   TCP header for service to service delivery, is added to the data.
   includes src port and dst port with the particular data.

2. Transport Layer - Network Layer (L3) ⟹ IP + TCP + DATA (Packet)

   goal of L3 Layer which is adding IP header for end to end delivery which includes src IP and dst IP

3. Network Layer - Data Link Layer (L2) ⟹ MAC + IP + TCP + DATA (Frame)

goal of L2 Layer which is adding MAC header for hop to hop delivery which includes src MAC and dst MAC

4. Data Link Layer - Physical Layer (L1) ⟹ converts frame to binary

receiving host will do de-Encapsulation - Receiving process. The opposite work is done here.