Computer Network Theory
CMSC 360

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The 5 layers of the OSI Model

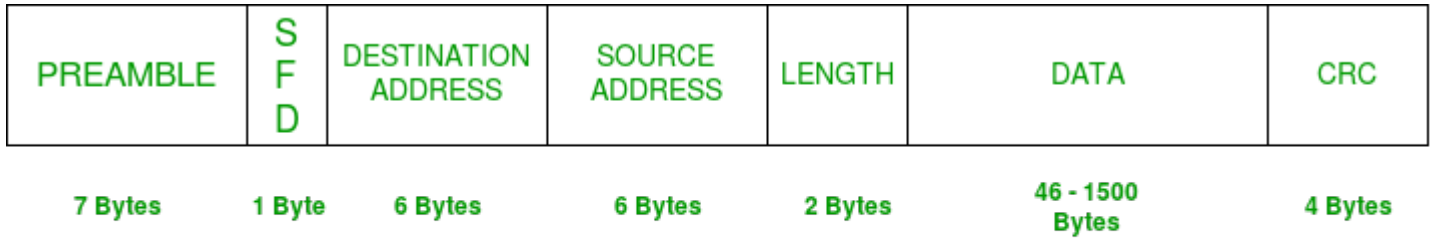
- Physical
- Data Link
- Network
- Transport
- Application

Physical Layer

- Defines the means of transmitting raw bits
- Protocol: 4B/5B
  - Encode 4 bits as 5 bits
- Data Structure: Bits/ Bytes
  - Bit: either a 1 or 0
  - Byte: 8 bits
- Algorithm: Time Division Multiplexing
  - Full bandwidth
  - Limited time
  - Round Robin

Data Link

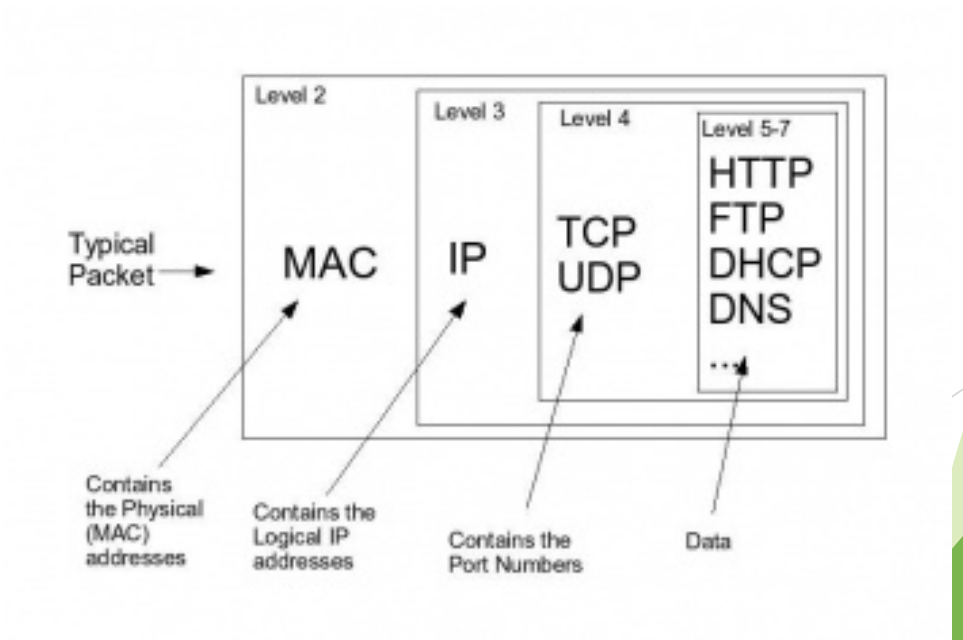
- Handles the moving of data into and out of a physical link in a network.
- Protocol: Ethernet
  - MAC address, 6 bytes long, Frame Format
- Data Structure: Frames
- Algorithm: Aloha
  - Send when you want
  - Collision – wait random time and resend
  - 18 % utilization



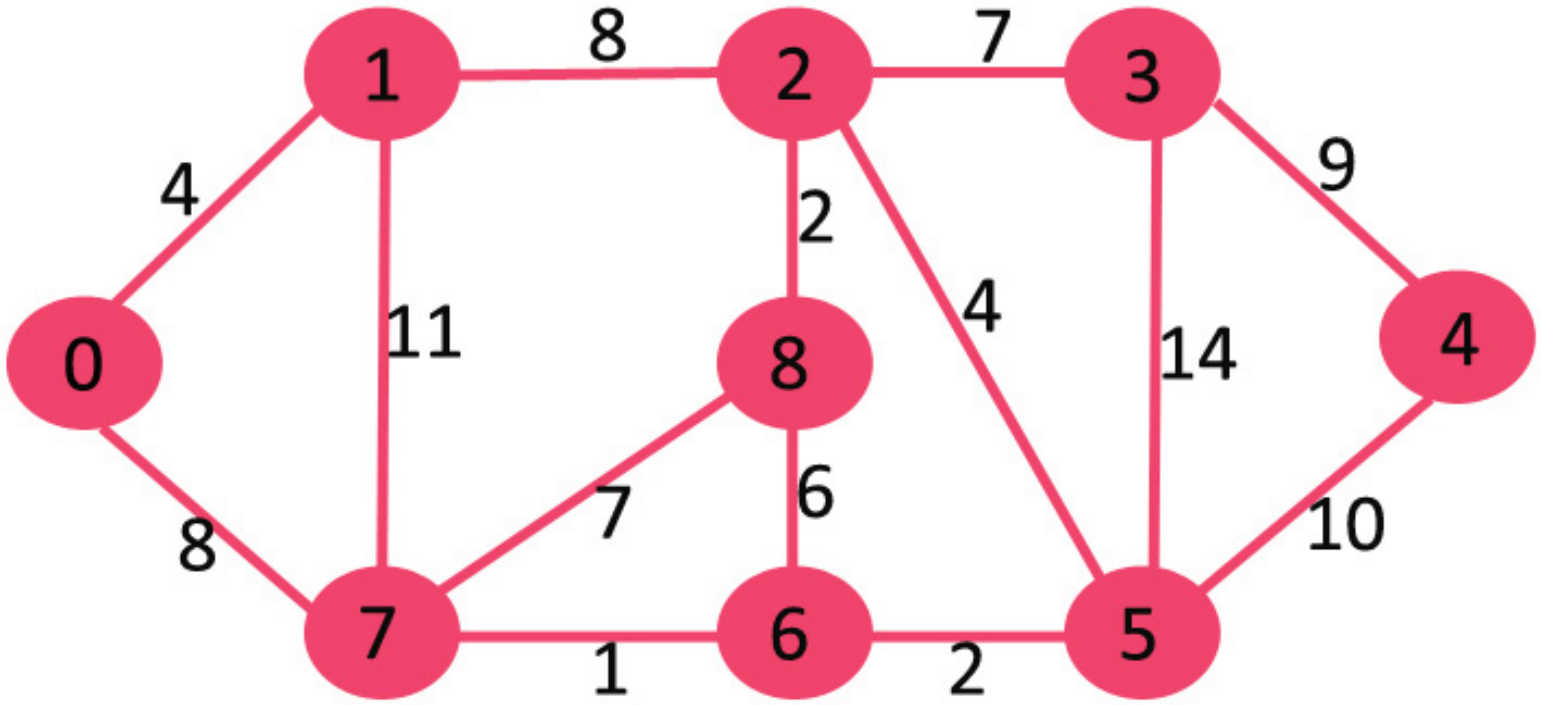
IEEE 802.3 ETHERNET Frame Format

Network

- Responsible for packet forwarding
- Protocol: IP
  - Addresses host interfaces, encapsulating data into datagrams and routing datagrams from a source to a destination.
- Data Structure: Packets
- Algorithm: Dijkstra's
  - Single source shortest path

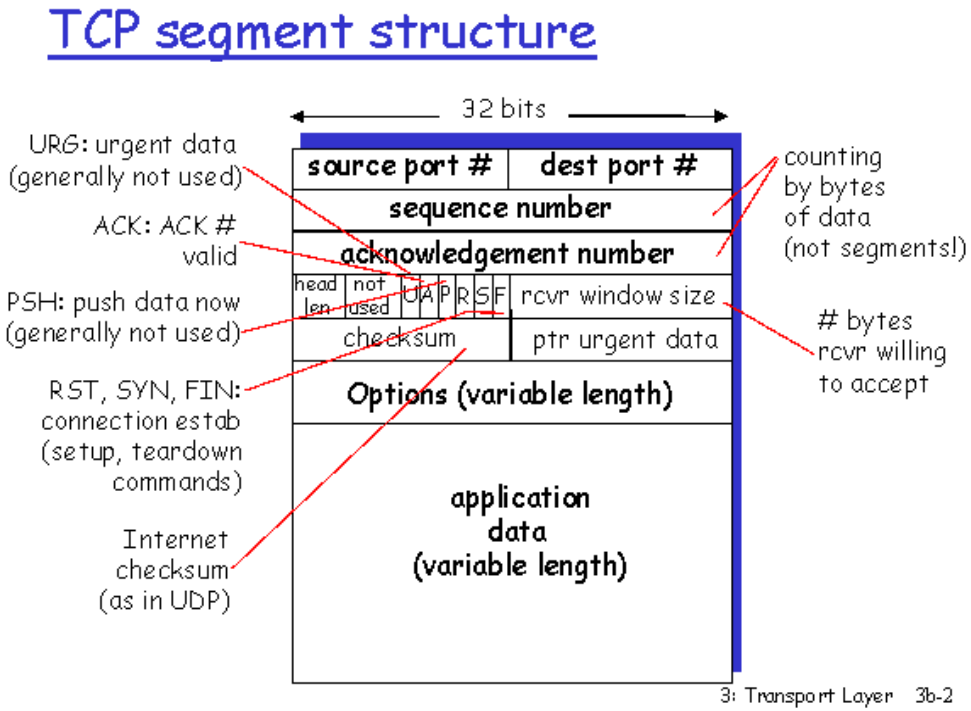


Dijkstra's Algorithm



Transport

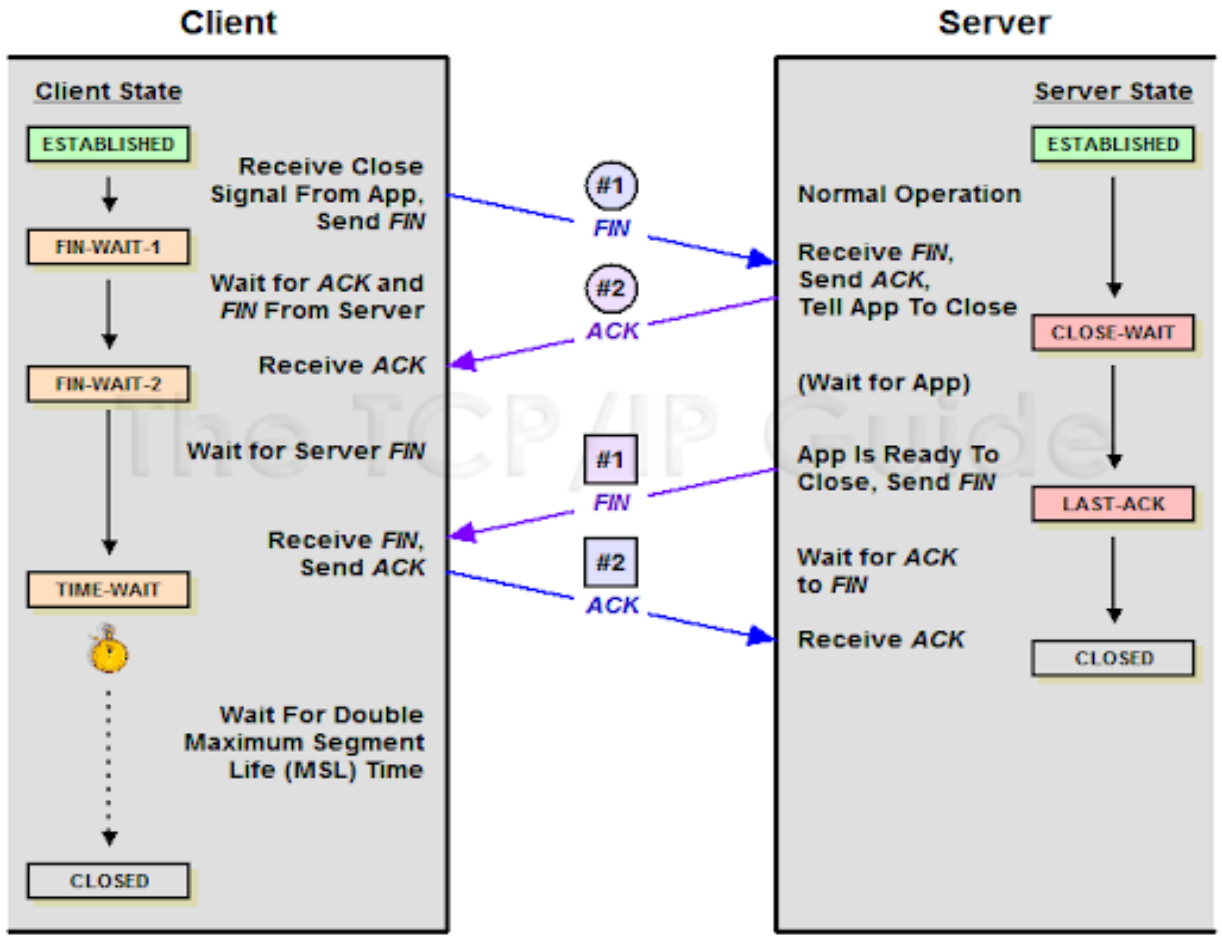
- Responsible for end-to-end communication
- Protocol: Transmission Control Protocol (TCP)
  - provides reliable, ordered, and error-checked delivery of a stream of octets
- Data Structure: Segments
- Algorithm: Leaky Bucket
  - Constant Outflow
  - Inflow maybe bursty
  - Finite queue that outputs at a finite rate



Application

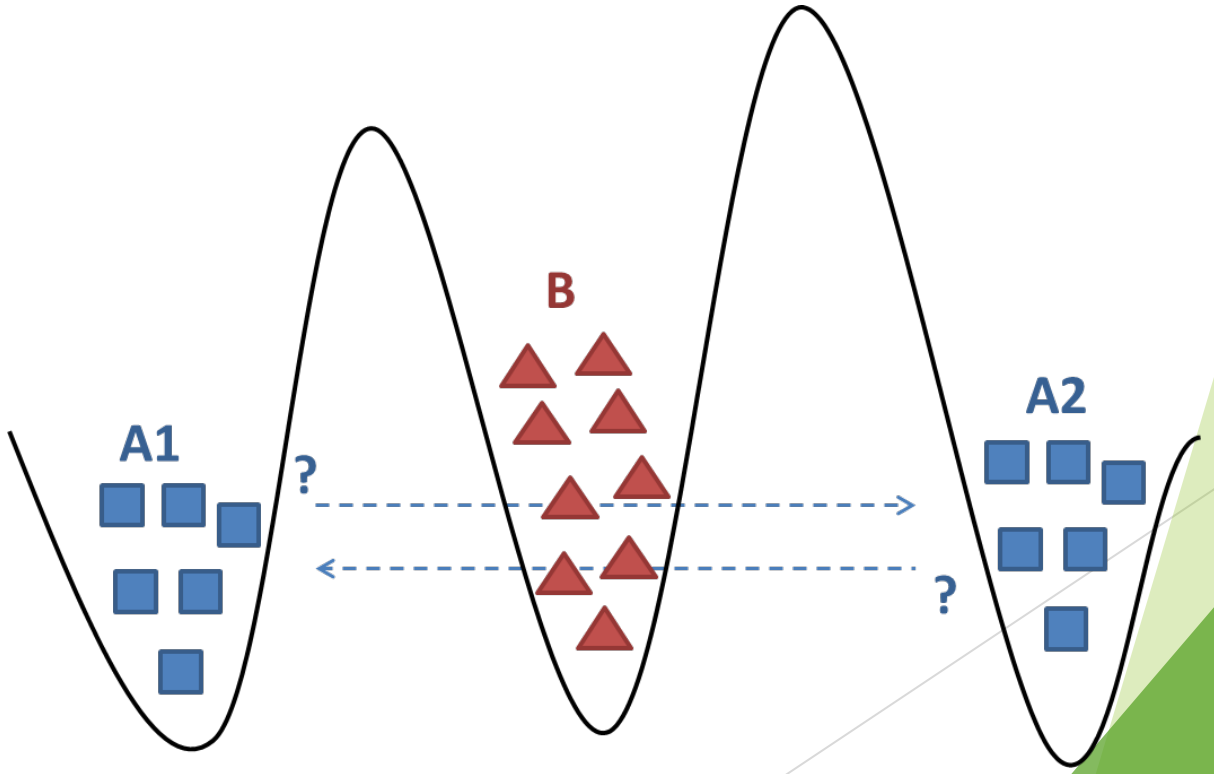
- specifies the shared communications protocols and interface methods
  Protocol: N/A
  Data Structure: RFC's (Request for Comments)
- Algorithm:
  - Ex) POP3
    - a protocol for receiving email by downloading it to your computer from a mailbox on the server of an Internet service provider

4 Way - Handshake



2 Generals Problem

- Unsolvable problem that explores two-party communication over an unreliable channel.



Sources

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- 360 notes
- https://www.geeksforgeeks.org/dijkstras-shortest-path-algorithm-greedy-algo-7/
- http://slideplayer.com/slide/4854172/