

# Handout #5 — CS 471

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# 1 Questions

1. Describe the function of each layer in the TCP/IP model

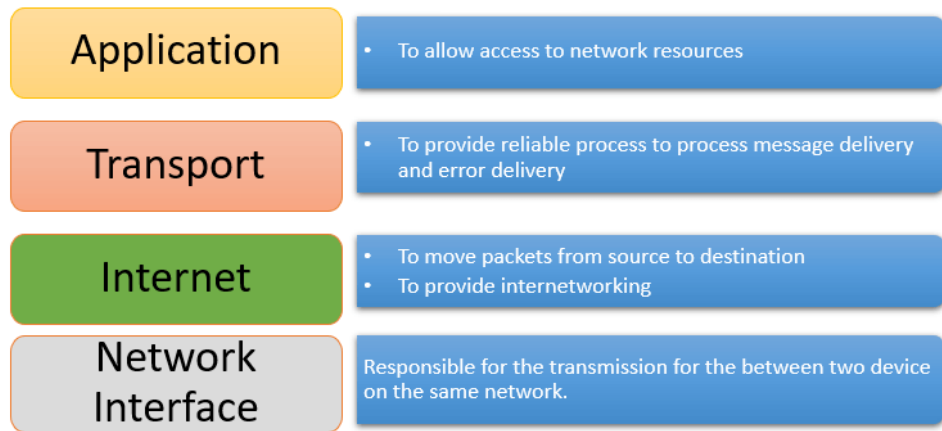


Figure 1: Four Layers of the TCP/IP Model

- Source to the original article can be found [here](#).
2. What are the advantages of layering network protocols? What are the disadvantages?
    - **Advantages:**
      - It can be used to connect many different devices
      - Supports several different protocols
      - Operated independently (not OS specific)
    - **Disadvantages:**
      - Complicated to setup and maintain
      - Replacing protocols is complex
      - Not entirely modular
  3. Does the application layer reside in the network edge, core, or both?
    - It only resides in the network edge, not needed in core, only used at edge to decode messages, etc.
  4. From the point of view of the application layer, what are the two fundamental approaches for structuring an application?
    - **Client-server:** one centralized system (server) that allows for multiple connections (clients)
    - **Peer-to-peer:** decentralized network that scales with the number of nodes on the network (linked list)

5. What is the advantage of the peer-to-peer model when compared to the client-server model? What are the disadvantages?

- **Advantages:**

- Less infrastructure (cost decreases)
- Decentralized (reliability increases)
- Easy file sharing (torrents)

- **Disadvantages:**

- Security concerns (new nodes can be added without centralized approval)
- Backups cannot be easily performed (no central server)
- Scalability (new nodes added cannot guarantee performance increase)

6. Is the IP address all we need to communicate with the process on the remote system?

- If multiple processes are running on the remote machine, you would need the intended port number to properly connect to the process.

7. In order to send a message over the network, the process places the message into the:

- Socket

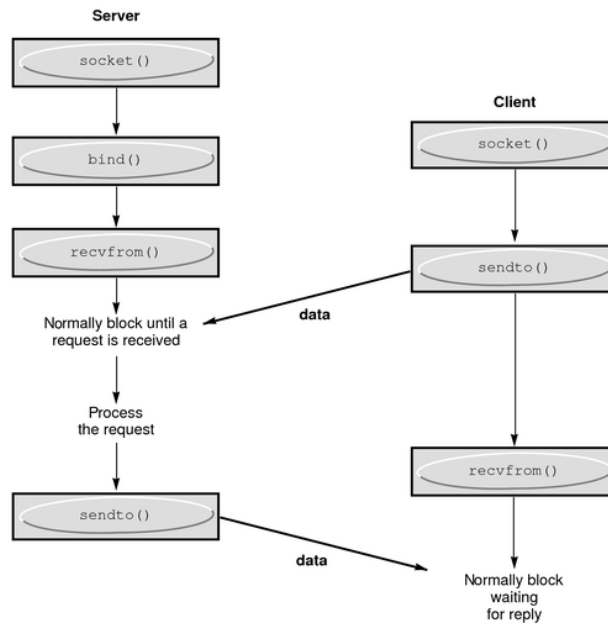


Figure 2: Socket programming

8. Does the transport layer of the Internet provide timing and throughput guarantees? If so, then explain how. Else, explain why not.

- Both the TCP and UDP protocols do not provide any timing and throughput guarantees.

9. What is the fundamental difference between the TCP and UDP? What are the advantages and disadvantages of each? Give examples of applications for which each would be best suited.

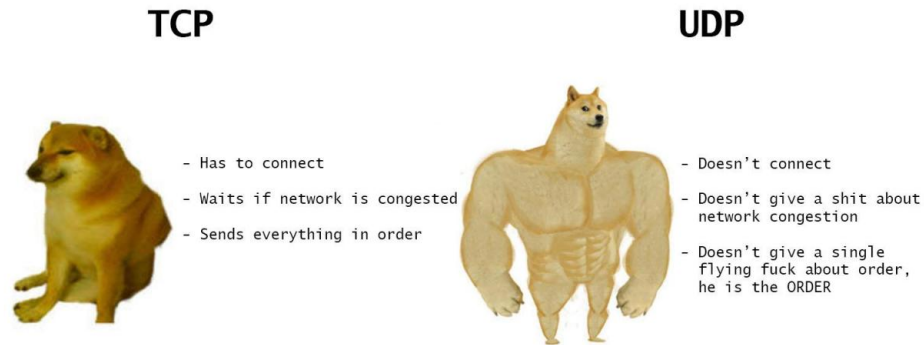


Figure 3: Key difference: speed

- **TCP:**
  - Requires connection to destination
  - Congestion control
  - In order delivery
  - Error detection
  - **Application usage:** FTP servers, SSH connections
- **UDP:**
  - Small packet size with a small header
  - Does not require a connection to be established or maintained
  - **Application usage:** DNS lookups, VoIP (voice over Internet). Anything that requires speed and can manage with packet loss.