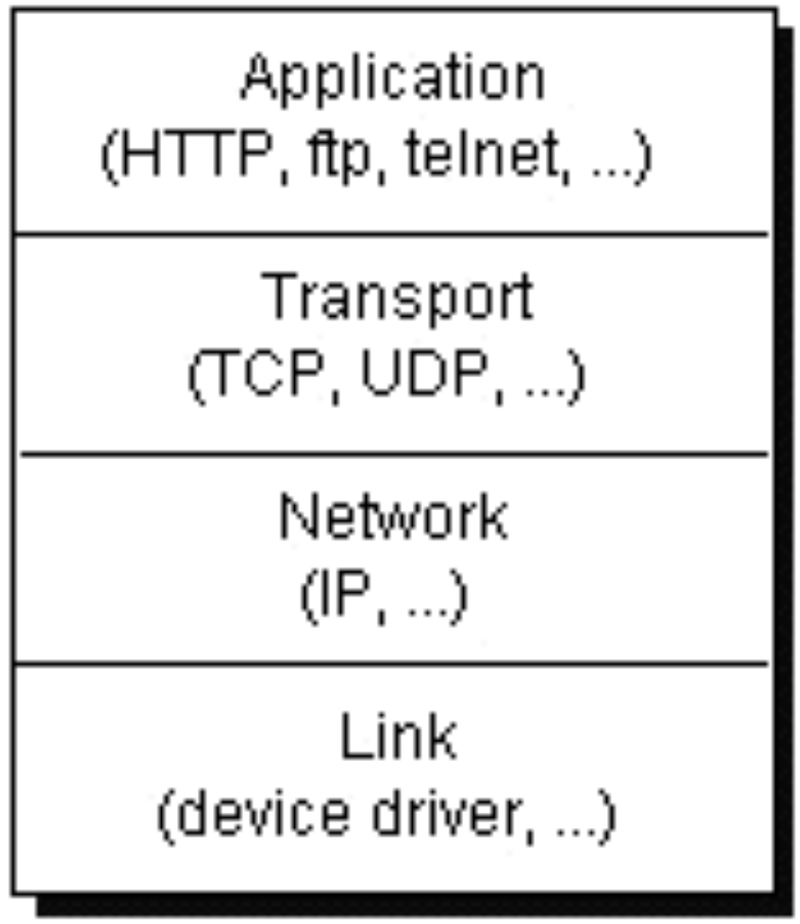
Networking

Network Protocol Stack

- Many parts working together
- Layers are abstracted
- Standardized by the Internet Engineering Task Force (IETF)



TCP

- Transmission Control Protocol
- Reliable host-to-host protocol
- Data can be damaged, lost, duplicated, or delivered out of order
- Each packet sent must be acknowledged within a timeout period

Three-way Handshake

- Establishes a TCP connection
- Server binds to a port and listens (passive open)
- Client sends an ACK
    - Random sequence number, A
- Server sends a SYN-ACK
    - Acknowledgement number (A + 1) and its own random sequence number, B
- Client sends an ACK
    - Sequence number = acknowledgement number
    - Acknowledgement number = B + 1

UDP

- User Datagram Protocol
- Not connection-based. Not reliable.
    - Arrival, arrival time, and content not guaranteed
- Why use it?
    - Speed
- See java.net.
    - DatagramPacket, DatagramSocket, MulticastSocket

UDP Client (Example)

```
DatagramSocket socket = new DatagramSocket(4445);
…
byte[] buf = new byte[256];
DatagramPacket packet = new DatagramPacket(buf, buf.length);
socket.receive(packet);
…
socket.close();
```

ifconfig

- Interface Config
- Tests if local machine is on network
- In the Windows world, see ipconfig
- Deprecated. Due to
  - Kernel improvements
  - Maintainability issues

ip

- A replacement for ifconfig
    - May not be installed on your system
    - A little more complicated
        - Broader functionality
- Displays/Modifies interface properties
- Adds, Removes ARP cache entries
- Displays MAC addresses
- Displays/Modifies kernel routing tables

ping

- Packet INternet Groper
- Tests if a host is alive on the network
- Sends a echo request to a target. Target responds.

nc or ncat

- Netcat - a network command line utility
- Reads or Writes data across a network
- Works with
    - TCP or UDP connections
    - IPv4 or IPv6
- Common uses
    - simple TCP proxy
    - shell-script based HTTP client
    - network client or server tester