CS144: applications I

Network applications

- DHCP
- DNS
- TLS
  - ByteStream -> encrypted ByteStream
- HTTP
  -

DHCP

- Getting started on the network
- Typically provides:
  - IP address
  - Simple forwarding table (netmask, next-hop router)
  - DNS servers
- (demo)

- Predecessor: Bootstrap Protocol (RFC 951, 1985)

DNS

- Distributed read-only key-value store
- Reliable queries, over ***either***
  - UDP (payload fits in one datagram) or
  - TCP (otherwise)
- Most popular use: convert domain name to IPv4 address
- But many other uses! IPv6, PTR, MX, …
- (demo)

TLS

- Transport Layer Security
- Converts ByteStream -> **confidential**, **authenticated** ByteStream

- Question: To whom?

- (demo)

HTTP

- Protocol for ***stateless*** requests/responses
  - GET, HEAD (idempotent)
  - POST/PUT/PATCH/DELETE (non-idempotent)

- Several versions:
  - HTTP/1.0 (one request/reply per TCP connection)
  - HTTP/1.1 (many requests/replies per TCP connection, both in order)
  - HTTP/2 (same, but allows out-of-order replies with concurrent streams)
    - eliminates “per-request” head-of-line blocking
  - HTTP/3 (over custom non-TCP transport)
    - eliminates “per-packet” head-of-line blocking

Web transaction
(reliable GET/POST of a URL)

HTTP

Internet stream socket (TCPSocket)
(reliable byte-stream between two programs anywhere in the world)

TCP

Internet datagrams
(unreliable packets between two computers anywhere in the world)

IP

Frames (unreliable packets within one network)

Ethernet

Reality
(electrons, photons, voltages)

Web transaction
(reliable GET/POST of a URL)

HTTP3

Reliable byte stream

QUIC

User datagrams
(unreliable packets between two programs anywhere in the world)

UDP

Internet datagrams
(unreliable packets between two computers anywhere in the world)

IP

Frames (unreliable packets within one network)

Ethernet

Reality
(electrons, photons, voltages)