Protocols — format, order → messages → actions taken?

- email
- web: HTTP
- VoIP

} follow protocols.

Protocols @ application layer

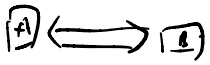
Models — C/S, P2P

requirements:
- data integrity — i.e. no corruption
- throughput — eg. zoom — screen freeze
  - not guaranteed
- timing — games
- security — purchases

Web server: stores webpage

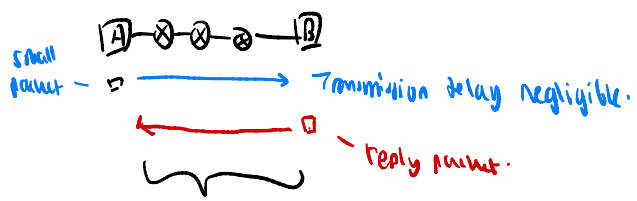
Client: wants to download webpage + all objects

Communicate with HTTP: HyperText Transfer Protocol
↳ rides on TCP
(underlying Transport layer protocol)



TCP: Create virtual "channel" between 2 ⇒ send HTTP request / response

RTT: Round Trip Delay



RTT: time spent in network of packet (round trip)
- propagation delay of all links
- processing + queueing delays

if big packet (HTTP)

eg. ping

↓

end to end

needs transmission delay

to be in calculation.

HTTP 1.0 vs HTTP 1.1 → fundamental.

↓ parallel TCP

↓ persistent w pipelining

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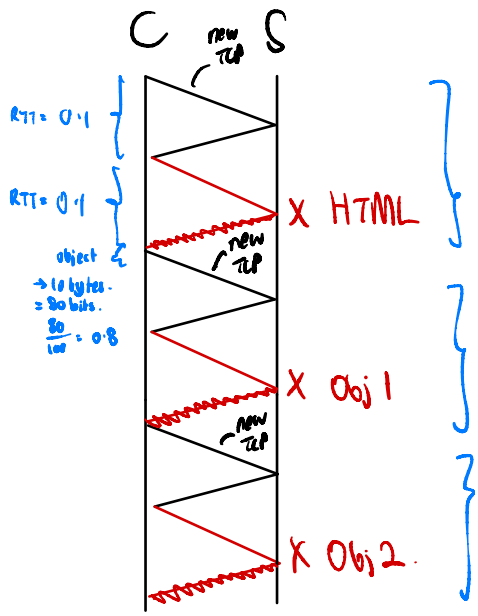
100 bps, non-parallel HTTP.

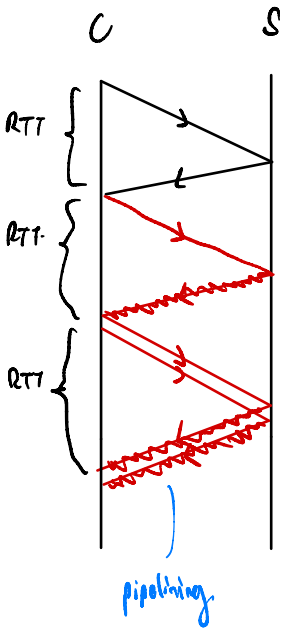


$t_{html\_file} = 0.1 + 0.1 + 0.8$
$= 1s.$

$t_{obj\_1} = 0.1 + 0.1 + \frac{160}{100}$
$= 1.8s.$

$t_{obj\_2} = 1.8s.$

$\therefore$ Total time $= 1 + 1.8 + 1.8$
$= 4.6s$



$t_{html} = 0.1 + 0.1 + \frac{80}{100} = 1s.$

$t_{2\,imgs} = 0.1 + \frac{160}{100} + \frac{160}{100} = 2.3s.$

img1 img2.

} 4.3s.

→ proceed to send 2nd img after sending 1st img.