Datakommunikation Lab 1 - assignments

Axel Alvin, Lukas Axelborn

1. Delay components:
   - Processing delay, constant
   - Transmission delay, constant
   - Propagation delay, constant
   - Queueing delay, variable
2. Total time = transmission delay + propagation delay
   Transmission delay $\frac{L}{R}$ where L = 8 * 1000 bits and R = 2000000 bps
   → $\frac{8000}{2000000}$ = 4 ms
   Propagation delay $\frac{d}{s}$ where d = 2500 m and s = 2.5 * 105
   → $\frac{2500}{2.5 * 105}$ = 10 ms
   Total time = 4 ms + 10 ms = **14 ms**
   The delay does **not** depend on package length **nor** the transmission rate.
3. a) Throughput given by the smallest rate amongst the three, given there's no other traffic.
      → 500 kbps < 1 mbps < 2 mbps → **500 kbps**
   b) 4 million bytes in bits = 4 million * 8 = 32 million bits
      A → B, throughput = 500 kbps
      Time = $\frac{file\ size}{throughput}$ = $\frac{32000000}{500000}$ = **64 s**
   c) R2 now has the smallest throughput (100 kbps) → a) **100 kbps**
      Time = $\frac{file\ size}{thorughput}$ = $\frac{32000000}{100000}$ = **320 s** (b)
4. **Application layer message -** Where the application choses the appropriated protocol to send the message tex HTTP or FTP
   Transport layer segment - transport the application layer message, between the clients and server. Transport layer utilizes the protocol TCP or UDP for transfor
   Network layer datagram - sends the packages containing the message to the network.
   Link-layer frame - provides the mean of transferring data packages between nodes on a network.
5. a) Propagation delay = $\frac{d}{s}$ where d = distance (m) = 3600 * 1000 = 36 000 000 m and s = speed (m/s) = 240 000 000 m/s → $\frac{36000000}{240000000}$ = **0,15 s**

b) R = transmission rate = 10 Mbps → convert to bits → $10 * 10^6 = 10^7$ bits
   Propagation delay = 0,15 s (from a)
   R * propagation delay = $10^7 * 0,15$ = **1 500 000 bits**
c) Interval = 60 sec
   Transmission rate = 10^7
   Min value of x = transmission rate * interval = $10^7 * 60$ =
   600 000 000 bits