Categories of Networks

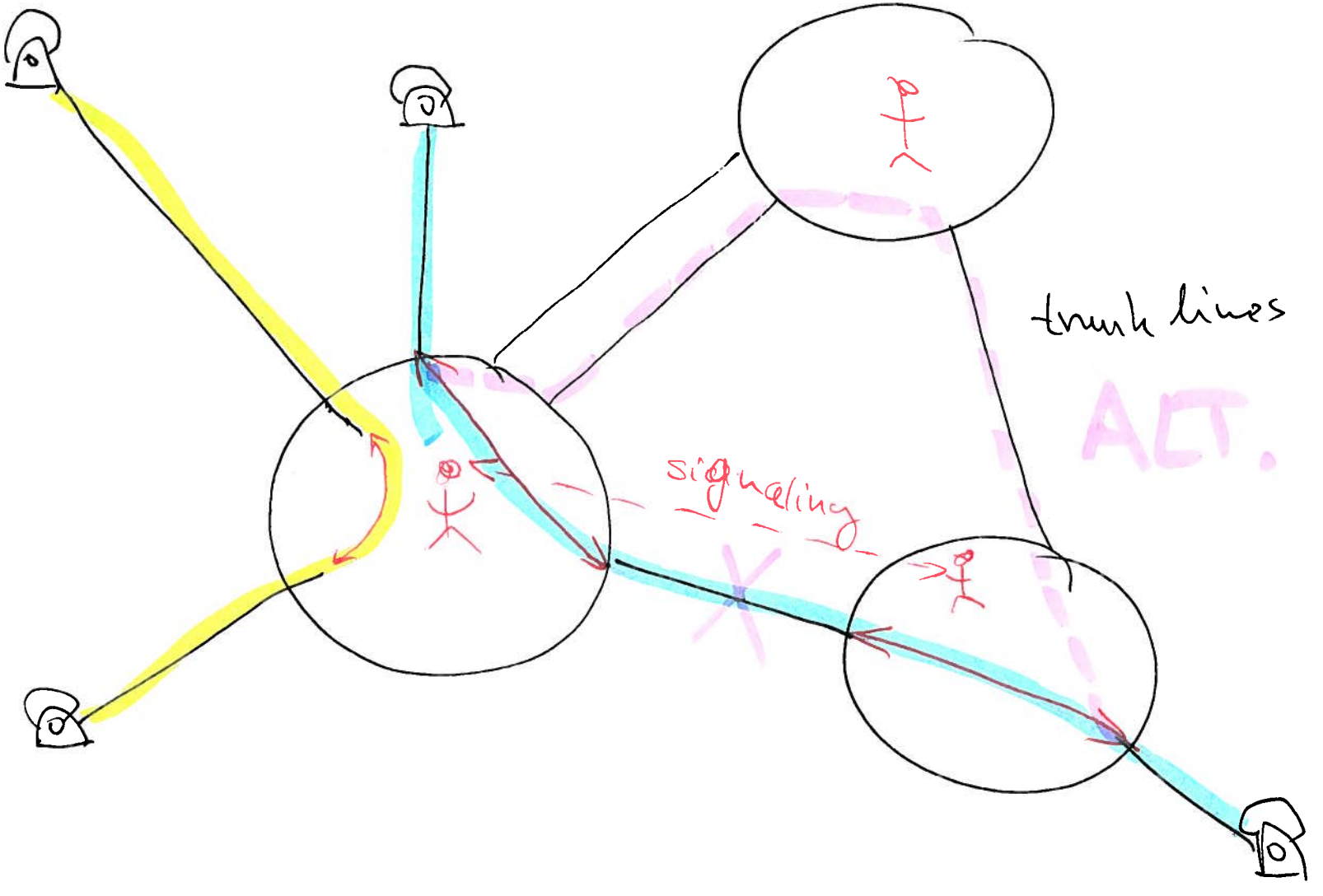
- Circuit switched

- Packet switched

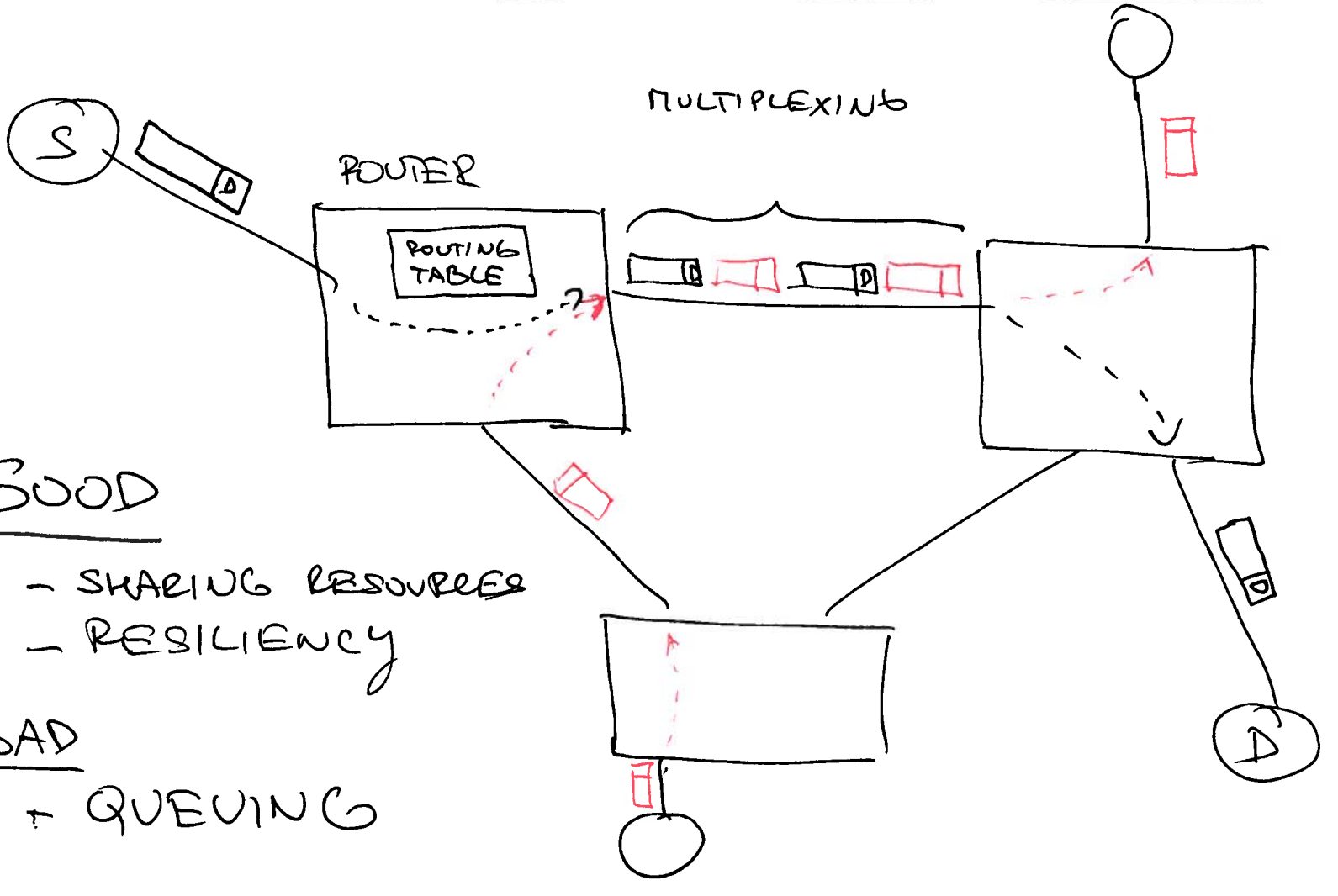
- Compromise: virtual packet switched

Images from Wikimedia Commons

CIRCUIT SWITCHING



PACKET SWITCHING



GOOD

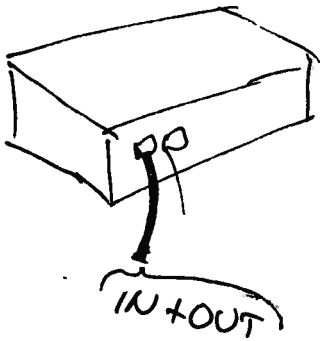
- SHARING RESOURCES
- RESILIENCY

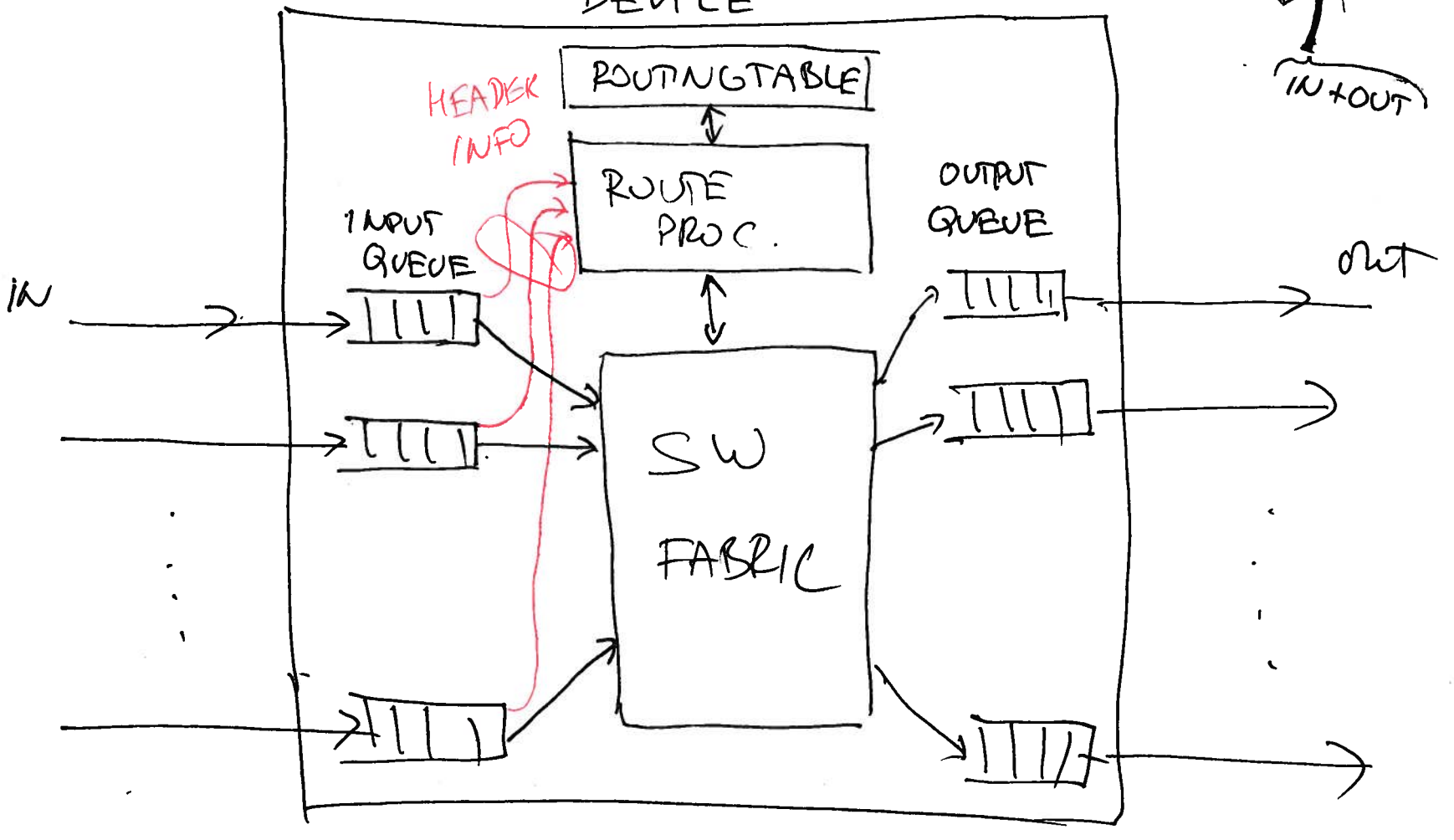
BAD

- QUEUING

STORE & FORWARD

ROUTING OR SWITCHING DEVICE

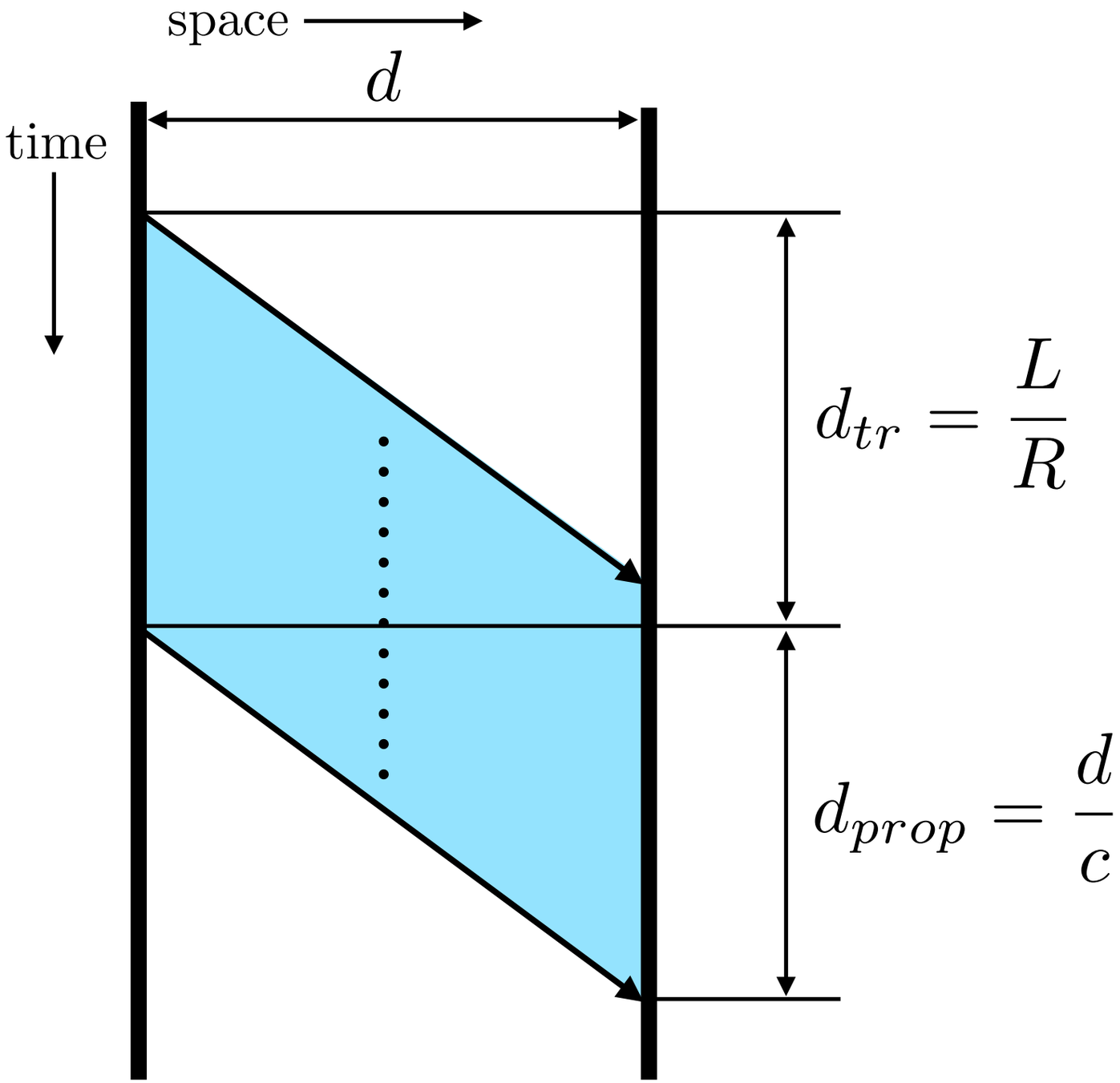




Which one is better?

- Overhead
- Resource utilization
- Resiliency
- Service guarantees
- ... it depends.

Time-Space Diagram



d_{tr} - time to transmit

d_{prop} - propagation time

L - packet length

R - transmission rate

d - distance

c - propagation speed

Objectives

- "Faster" networks
  - Higher transmission rate
  - Lower latency
- Lower error rate (bit error rate, packet loss probability)
- Higher availability (reliability)
- Ubiquity
- Lower monetary cost
- Improved user experience (lower complexity)

Performance Measures

- *Throughput* - number of bits/bytes/packets delivered per second
  - *Goodput* - measures “useful” packets/bytes/bits
- *Latency* - time to deliver a packet
  - typically measured from first bit transmission to the last bit reception
  - *RTT* (round-trip-time) - two-way latency
  - *Jitter* - latency variation
- *Packet Loos Rate*