Exercise 3

Florian Tegeler

Switch tables

- Why does the switch table have a TTL?
  - Needs to remove MACs after a while to prevent overflows
  - Attention: If the switch interconnects other switches, the table quickly fills with MAC-port bindings (modern Cisco 48 port switch: MAC-table size 8000)
- TTL has to balance the advantage of fast forwarding with the need for a small switching table

How does a switch learn?

- The switch is learning by observing the traffic:
  - It has a forwarding table mapping MAC addresses to ports.
  - If it does not know where to forward to, it sends the packet to all ports. (Broadcast)
  - If it observes an answer on one port, it updates the forwarding table.
- Therefore: ARP only works inside a broadcast domain

Hubs, Switches… (a bit vague)

- Hub: Dump device, operates as a broadcaster (no collision analysis -> has to be done at NICs of attached hosts)
- Bridge: can connect different technologies like Ethernet, Token-Ring… (not deployed explicitly as bridges anymore)
- Switch: Transparent bridge. Has forwarding table, connects hosts inside one broadcasting domain. If port A sends to port B, C and D can also send at full speed (no collisions inside the switch). Uses CSMA/CD for collision detection when running 802.3 Ethernet.
- Router: Layer 3. Connects different broadcast domains. (ARP can only work inside one broadcast domain, if the host is not in that domain, routing is required).

SNR and BER

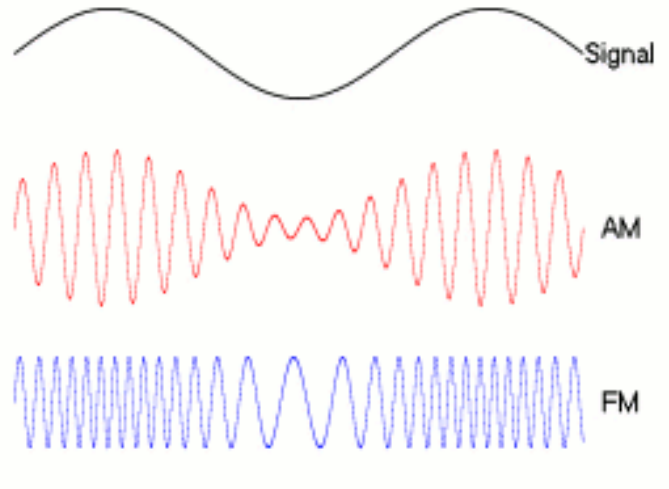
- How are SNR and BER connected? How can decreasing the transmission rate increase the throughput? Why is the slowest transmission rate BPSK not using amplitude modulation anymore?

- If the signal is good, the bit error rate is low (the signal is clear so it is easy to understand). If the signal quality is decreasing, BER is going up. The mathematical connection is based on the algorithm.

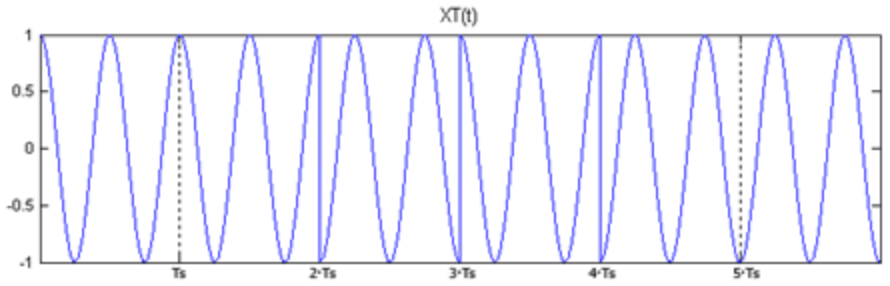
- If the signal is getting worse, it can be beneficial to switch to a clearer modulation allowing less max throughput but with the SNR a better throughput.

QAM & BPSK

- Amplitude modulation is much more error prone
- Quadratic amplitude modulation (QAM): Two, 90° phase-shifted (PSK), waves are amplitude modulated -> you can imagine two orthogonal waves



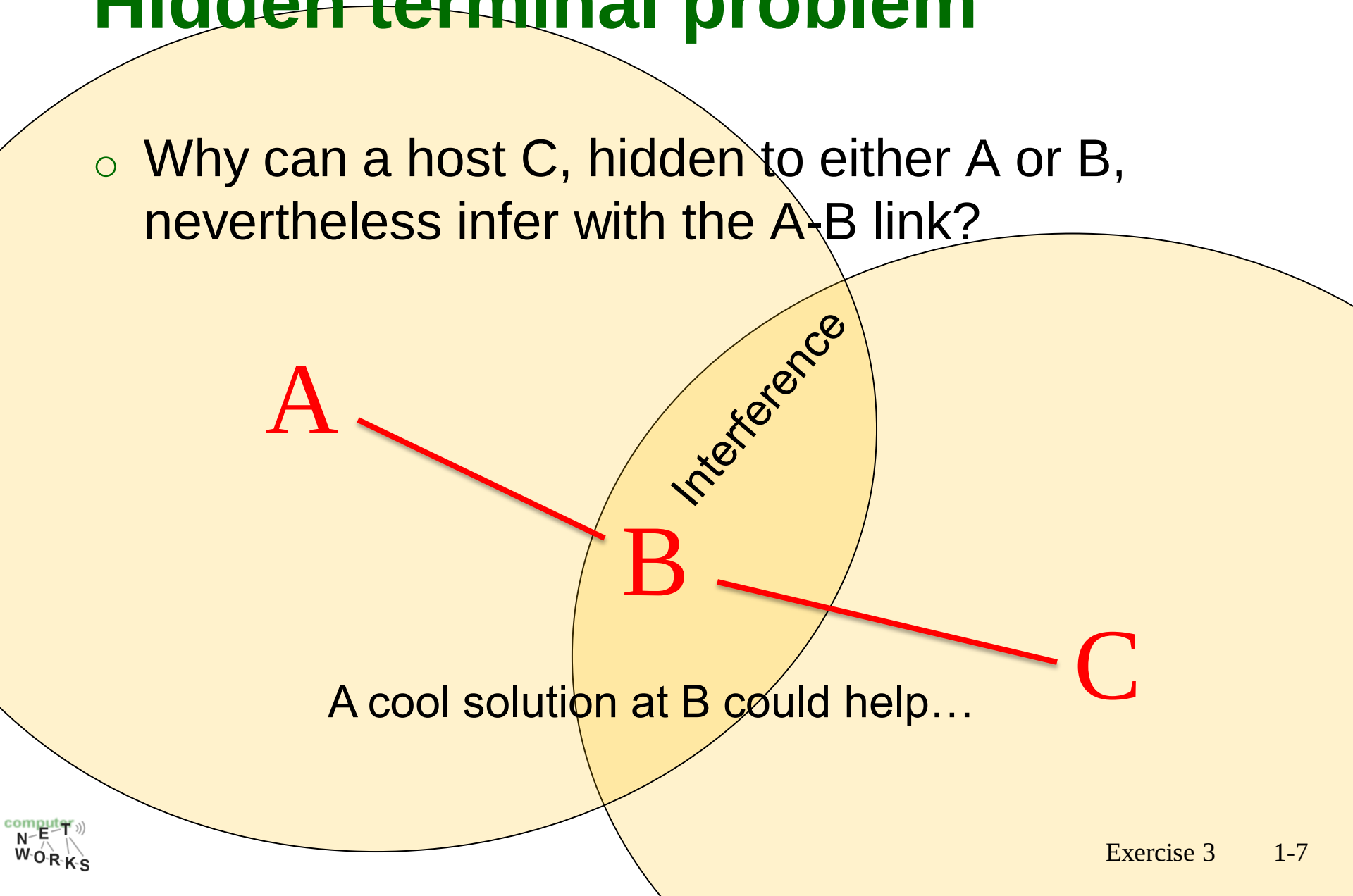
Binary phase shift keying (BPSK): phase shifts indicate signal



0 0 1 0 1 1

Hidden terminal problem

- Why can a host C, hidden to either A or B, nevertheless infer with the A-B link?



A cool solution at B could help…

PPP byte stuffing

- Draw a general PPP frame. How does the binary data “0011 1001 1111 1001 0101” change if it is add to the frame.