



School of Computer Science and Software Engineering

CSE3020 Network Technology Semester 2, 2003

Tutorial 4 - Week 5

Question T4.1 - Briefly discuss the physical and transmission characteristics of the following types of guided transmission media:

- (a) Twisted-pair.
- (b) Coaxial Cable.
- (c) Optical Fiber.

Question T4.2 - Briefly discuss the following wireless transmission techniques and their applications:

- (a) Terrestrial Microwave.
- (b) Satellite Microwave.
- (c) Broadcast Radio.
- (d) Infrared.

Question T4.3 - Suppose that a sender and receiver use asynchronous transmission and agree not to use any stop elements. Could this work? If so, explain any necessary conditions.

- *No. The stop bit is needed so that the start bit can be recognized.*
- *The start bit is the synchronization event, and it must be recognizable. The start bit is always a 0, and the stop bit is always a 1, which is also the idle state of the line.*
- *When a start bit occurs, it is guaranteed to be different from the current state of the line.*

Question T4.4 - A data source produces 7-bit IRA characters. Calculate the percentage of overhead and the maximum effective data rate (rate of IRA data bits) over a 2400 bps line for the following:

- (a) Asynchronous transmission, with a 1.5-unit stop element and a parity bit.

Maximum effective data rate $R = gB$, where B is the data rate on the line, and g is the fraction of transmitted bits that are data bits.

There are 7 data bits, 1 start bit, 1.5 stop bits, and 1 parity bit.

$$\text{Percentage overhead} = (1 + 1 + 1.5)/(1 + 7 + 1 + 1.5) \times 100\% \quad (1)$$

$$= 3.5/10.5 \times 100\% \quad (2)$$

$$= 33.3\% \quad (3)$$

$$g = 7/(1 + 7 + 1 + 1.5) \quad (4)$$

$$= 7/10.5 \quad (5)$$

$$= 0.67 \quad (6)$$

$$\text{Maximum effective data rate (R)} = 0.67 \times (2400) \quad (7)$$

$$= 1608 \text{ bps} \quad (8)$$

- (b) Synchronous transmission, with a frame consisting of 48 control bits and 128 information bits. The information field contains 8-bit (parity included) IRA characters.

Each frame contains 48 control bits + 128 information bits = 176 bits.

The number of characters is $128/8 = 16$,

and the number of parity bits is 16,

and the number of data bits is $16 \times 7 = 112$.

$$\text{Percentage overhead} = (48 + 16)/(48 + 128) \times 100\% \quad (9)$$

$$= 64/176 \times 100\% \quad (10)$$

$$= 36.4\% \quad (11)$$

$$\text{Maximum effective data rate (R)} = 112/176 \times (2400) \quad (12)$$

$$= 1527 \text{ bps} \quad (13)$$

- (c) Same as part (b), except that the information field is 1024 bits.

Each frame contains 48 control bits + 1024 information bits = 1072 bits.

The number of characters is $1024/8 = 128$,

and the number of parity bits is 128,

and the number of data bits is $128 \times 7 = 896$.

$$\text{Percentage overhead} = (48 + 128)/(48 + 1024) \times 100\% \quad (14)$$

$$= 176/1072 \times 100\% \quad (15)$$

$$= 16.4\% \text{ * overhead is reduced compared to part (b) } \quad (16)$$

$$\text{Maximum effective data rate (R)} = 896/1072 \times (2400) \quad (17)$$

$$= 2006 \text{ bps} \quad (18)$$

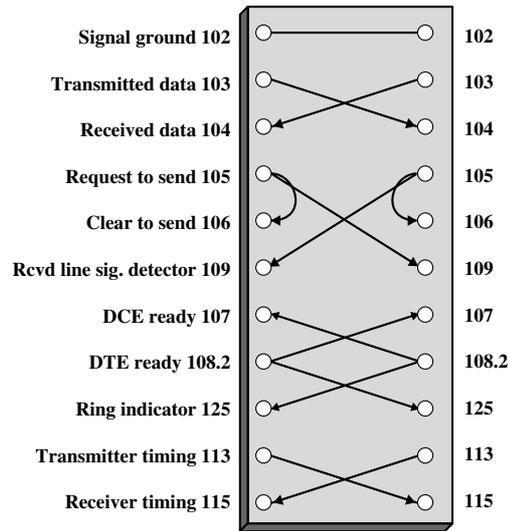


Figure 1: Example of a null modem for **Question T4.5**.

Question T4.5 - Why we need a null modem when providing a DTE-DTE interface without DCEs? Explain the operation of each null modem connection in Figure 1.

- Part 1 Forouzan 2nd Edition Page 151.

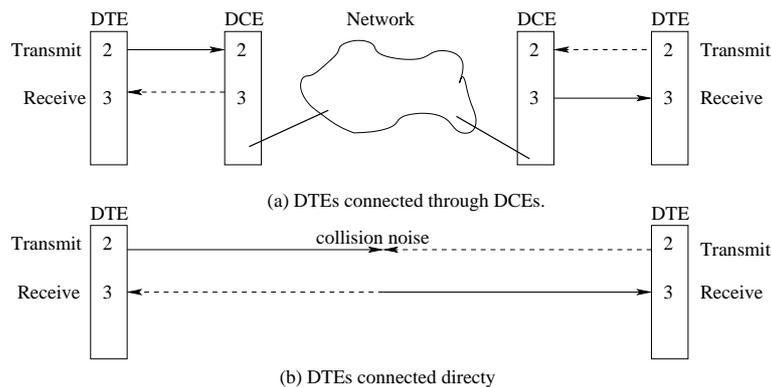


Figure 2: Answer for **Question T4.5**: Using regular data pin connections with and without DCEs.

- Part 2:
 - If a device asserts Request to Send, it will get back a Clear to Send and the other device will get a Carrier Detect.
 - If a device asserts Data Terminal Ready, the other device is alerted with a Data Set Ready and a Ring Indicator.
 - Data transmitted by one side is received by the other. Cross-connect the Transmitted Data and Received Data leads.
 - In order to operate a synchronous data link without a modem, clock signals need to be supplied. The Transmitter and Receiver Timing leads are cross-connected for this purpose.

Question T4.6 - With the aid of sketches, briefly explain how faults can be isolated in V.24/EIA-232 on a transmission link.