MONASH UNIVERSITY

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.

$$\begin{aligned} \textit{Percentage overhead} &= (1+1+1.5)/(1+7+1+1.5) \times 100\% && (1)\\ &= 3.5/10.5 \times 100\% && (2)\\ &= 33.3\% && (3)\\ g &= 7/(1+7+1+1.5) && (4)\\ &= 7/10.5 && (5)\\ &= 0.67 && (6)\\ \textit{Maximum effective data rate (R)} &= 0.67 \times (2400) && (7)\\ &= 1608\ bps && (8) \end{aligned}$$

(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 × 7 = 112.

$$\begin{aligned} \textit{Percentage overhead} &= (48+16)/(48+128) \times 100\% && (9)\\ &= 64/176 \times 100\% && (10)\\ &= 36.4\% && (11) \end{aligned}$$

$$\begin{aligned} \textit{Maximum effective data rate (R)} &= 112/176 \times (2400) && (12)\\ &= 1527\ bps && (13) \end{aligned}$$

(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 × 7 = 896.

$$\begin{aligned} \textit{Percentage overhead} &= (48+128)/(48+1024) \times 100\% && (14)\\ &= 176/1072 \times 100\% && (15)\\ &= 16.4\%\ \textit{* overhead is reduced compared to part (b)} && (16) \end{aligned}$$

$$\begin{aligned} \textit{Maximum effective data rate (R)} &= 896/1072 \times (2400) && (17)\\ &= 2006\ bps && (18) \end{aligned}$$

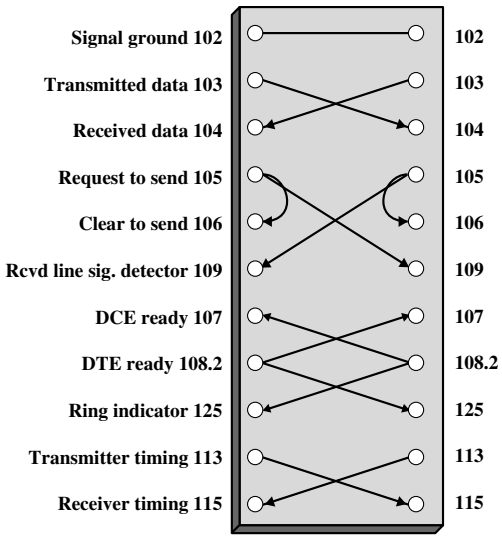

Figure 1: Example of a null modem for **Question T4.5**.

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.*

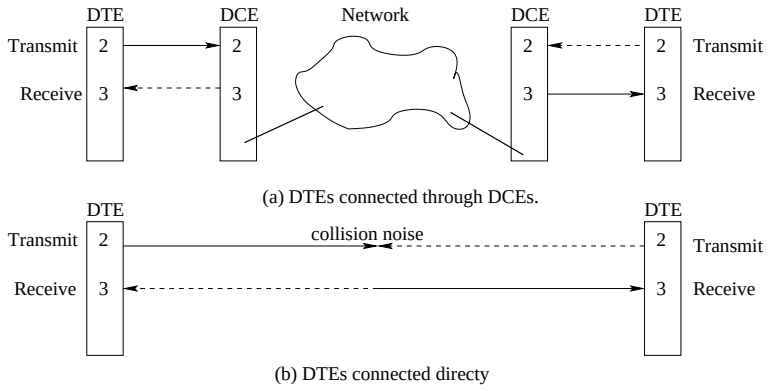

Figure 2: Answer for **Question T4.5**: Using regular data pin connections with and without DCEs.

- *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.