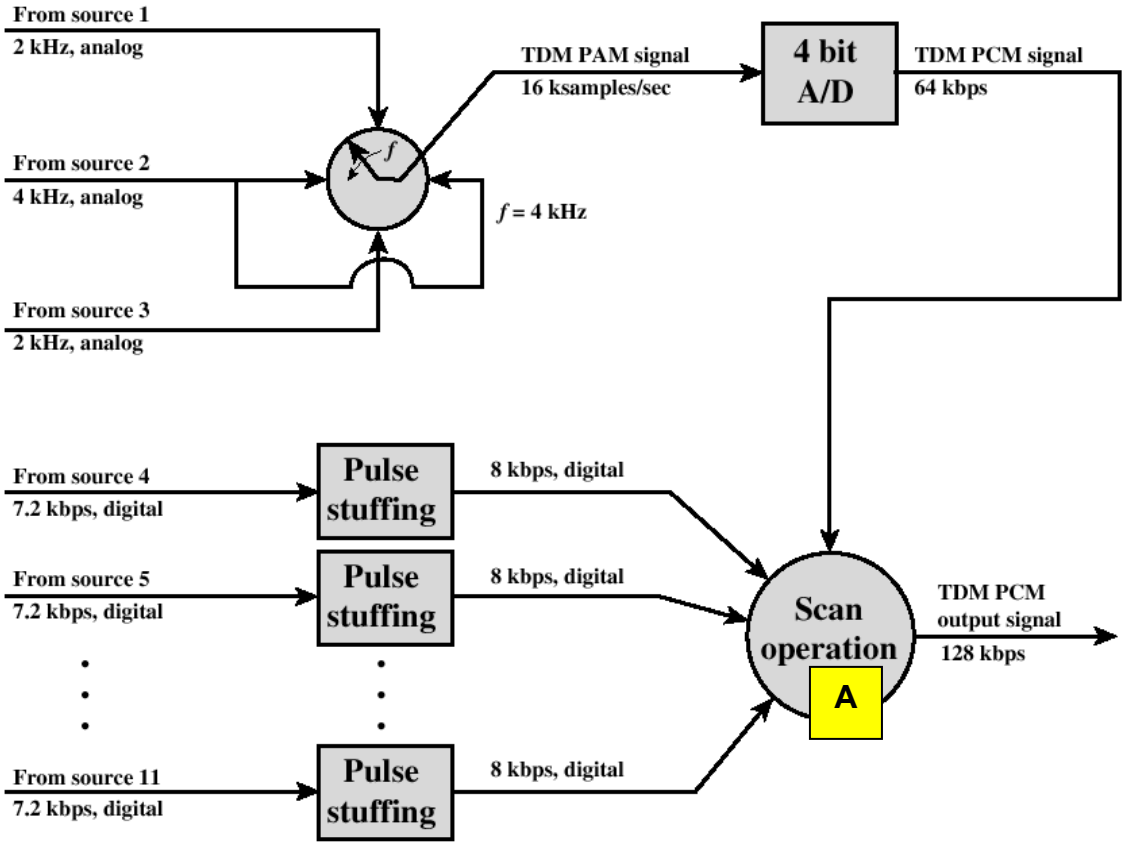
KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
KFUPM – COLLEGE OF COMPUTER SCIENCES & ENGINEERING

COMPUTER ENGINEERING DEPARTMENT

COE-342 – Data and Computer Communication

Answers to the three questions in relation to the TDM example (on slide 16 of lecture_8.pdf file):



Q1: How does the pulse stuffing work to increase the bit rate of each digital source from 7.2 kb/s to 8 kb/s?

A1: Let $R_{original}$ = 7.2 kb/s, R_{target} = 8 kb/s

The digital stream comprising $R_{original}$ has to be inflated by

$R_{target}/R_{original}$ = 8/7.2 = 1.11 times

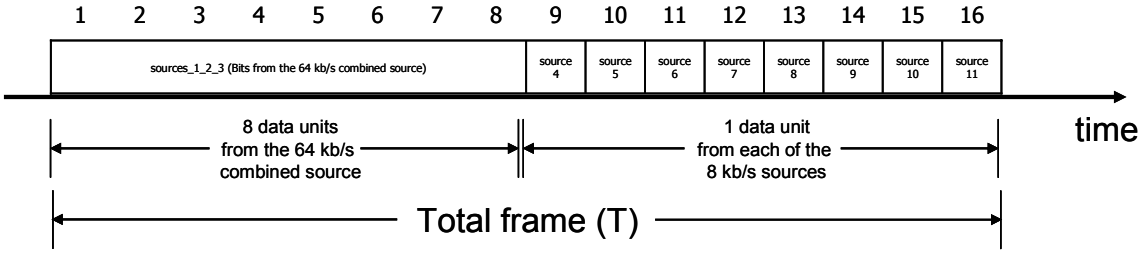
= 10 / 9 times

Therefore, the inflation can be done by inserting one dummy bit every 9 bits of the original source. This ensures the final rate is equal to the target rate.

Note, the target rate can be obtained by inserting one dummy byte for every 9 bytes of the original source as well. The important issue to use the same inflation ratio (i.e. 10 / 9).

Q2: What is the time for scanner A to make a full cycle?

The scanner A takes one complete TDM frame duration to make one complete cycle. The duration of the TDM frame is a design issue. However, the frame should carry 16 data units (bit, nipples, bytes, etc.) where 8 of these units are taken from the 64 kb/s source, while each of the remaining 8 data units will be taken from each of the remaining 8 kb/s sources. The frame structure is shown in the next figure.



Digital TDM frame structure

If the data unit copied from the digital source is a "BIT" – then the length of the frame is equal to 16 bits. Since the frame rate is 128 kb/s

➔ frame duration (scanner A cycle time) = (16 bits) /(128 kb/s)
= 125 μsec

If the data unit copied from the digital source is a "BYTE" – then the length of the frame is equal to 16X8 bits. Since the frame rate is 128 kb/s

➔ frame duration (scanner A cycle time) = (12X8 bits) / (128 kb/s)
= 1 msec

If the data unit copied from the digital source is M bits – then the length of the frame is equal to 16XM bits. Since the frame duration is 128 kb/s

➔ frame duration (scanner A cycle time) = (12XM bits) / (128 kb/s)
= 125XM μsec

Q3: What is the contact time scanner A makes with every source?

The contact time with each of the 8kb/s sources is equal to 1/16 X T, where T is the frame duration or the scanner A cycle time.

The contact time with the 64 kb/s is equal to 8/16 X T or T/2, where T is the frame duration or the scanner A cycle time.