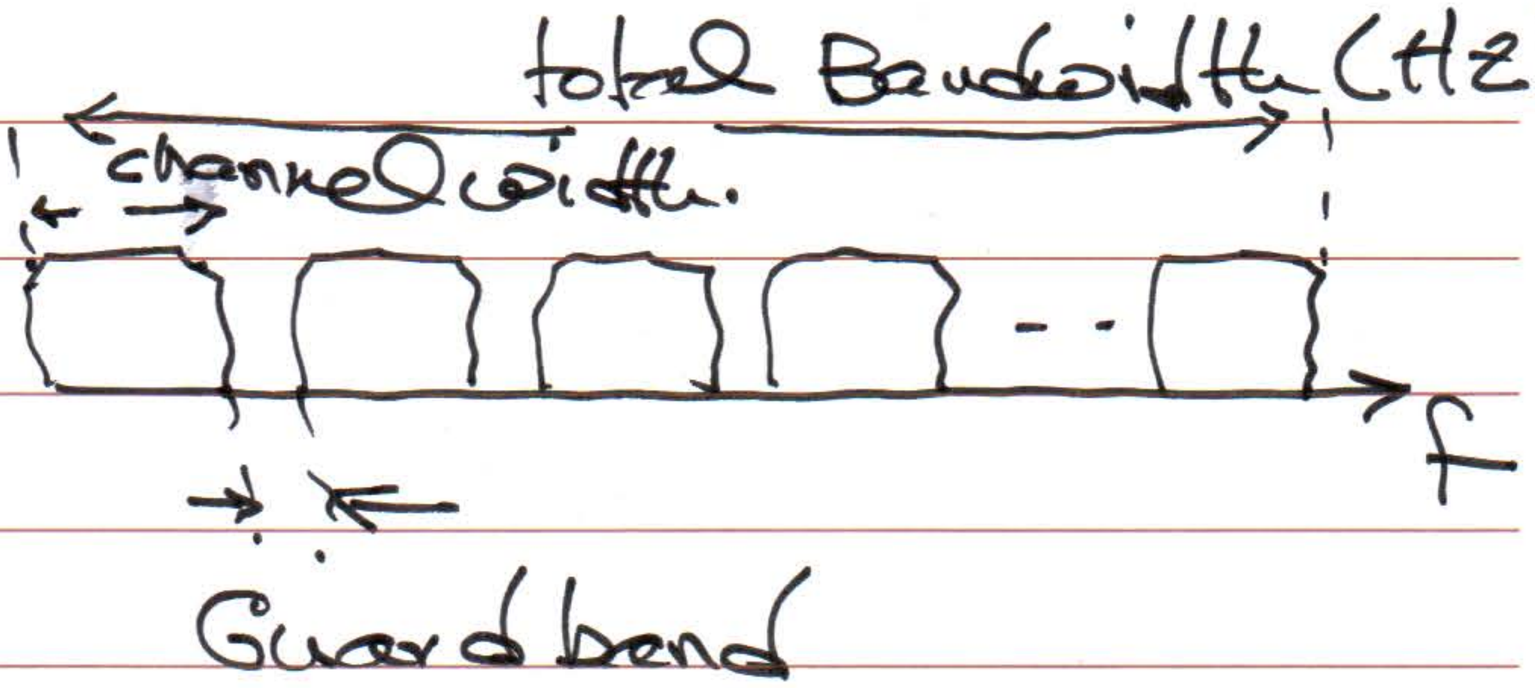
FDM



Ex: AM radio

range BW = 600KHz ~ 1600KHz

BW = 1000 KHz = 1 MHz.

ignore the guard band

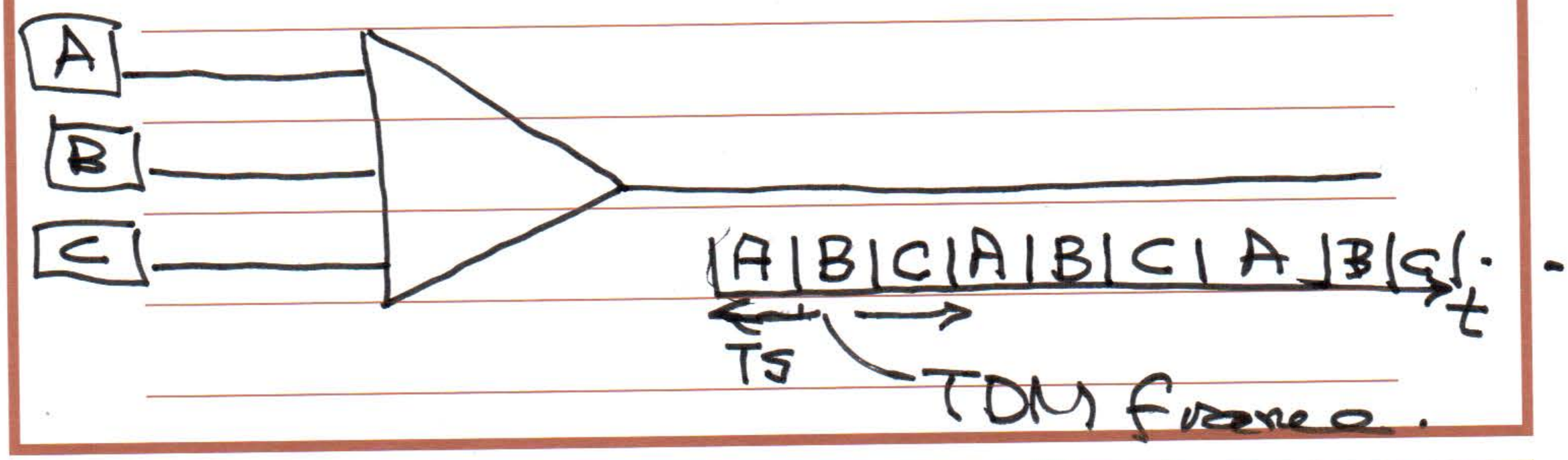
channel width = 10KHz

# of channels that can be supported in AM radio

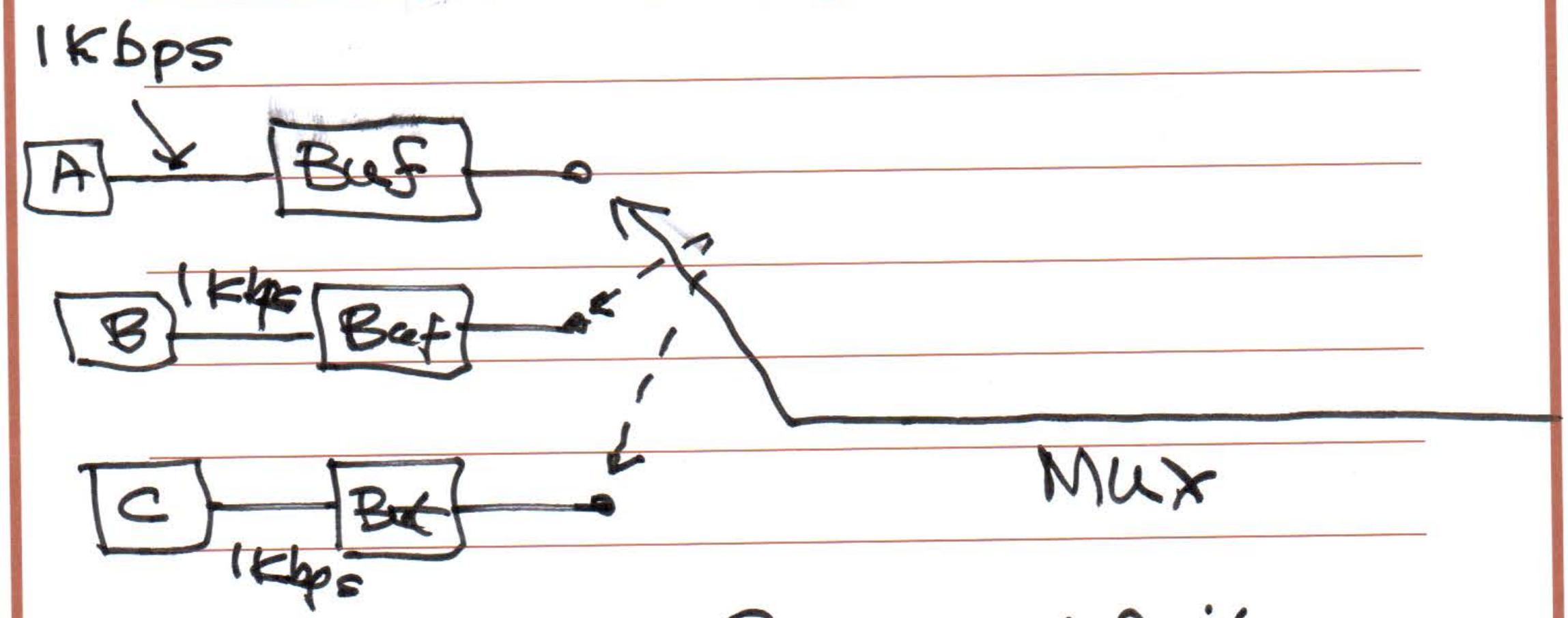
$\frac{1000K}{10K}$ = (100) channels.

Synchronous TDM

This tech is used in Telephone networks (associated with circuit switching)



TS : Time slot



R_M = multiplexed rate

$$\text{rate} \geq \sum_{i=1}^{n} R_i$$

n = # of sources.

Ex:

Suppose we have 3 sources generating traffic at 1, 2 & 3 Kbps

the first source is active 20%

" second " " " 50%

" third " " " 30%

Synch TDM is used. Every TS supports 2 bits.

a) Min # of TS per frame

b) Multiplexor rate R_{MUX} (bps)

c) frame rate (Frame/sec)

d) frame duration (sec).

e) slot rate (slot/sec).

a) Min of Time slots = 6

# of bits per frame = 12 bits/frame

b) Min bit rate

$R_M \geq 1 + 2 \times 3 = 6$ Kbps

c) Frame rate (frames/sec)

$= \frac{\text{frames}}{\text{bits}} \cdot \frac{\text{bits}}{\text{sec}}$

$\left(\frac{1}{12} \times 6\right) \uparrow K = 0.5 \uparrow K$ frames/sec

d) Frame duration (sec/frame)

$= \frac{1}{0.5K} = 2 \uparrow m$ sec

e) Slot rate (slots/sec)

$\frac{6 \text{ slots}}{\text{frame}} \cdot \frac{(0.5)K \text{ frames}}{\text{sec}} = 3 \uparrow K$ slots/sec.

In STDM

$$R_M \leq \sum_{i=1}^{n} R_i$$

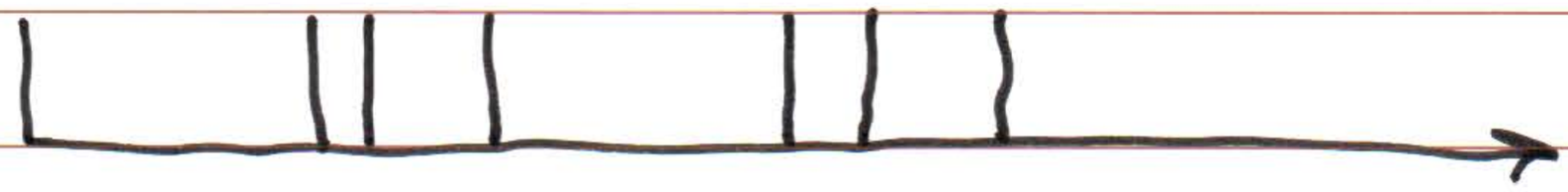
Back to our example:

Suppose 10% of available capacity is used to support headers.

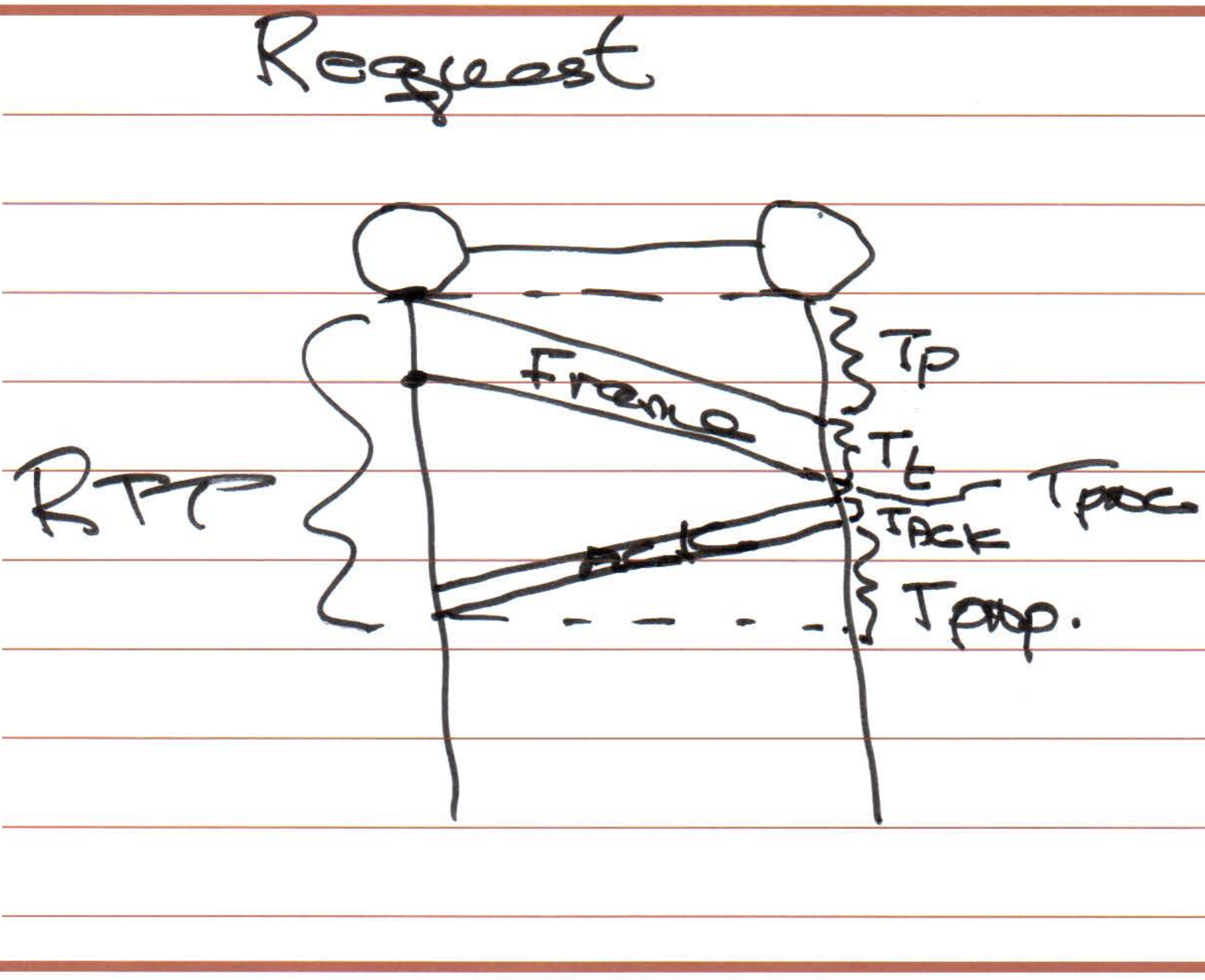
What is the MUX rate in this case?

$$R_M = \frac{(1K)(0.2) + (2K)(0.5) + (3K)(0.3)}{0.9}$$

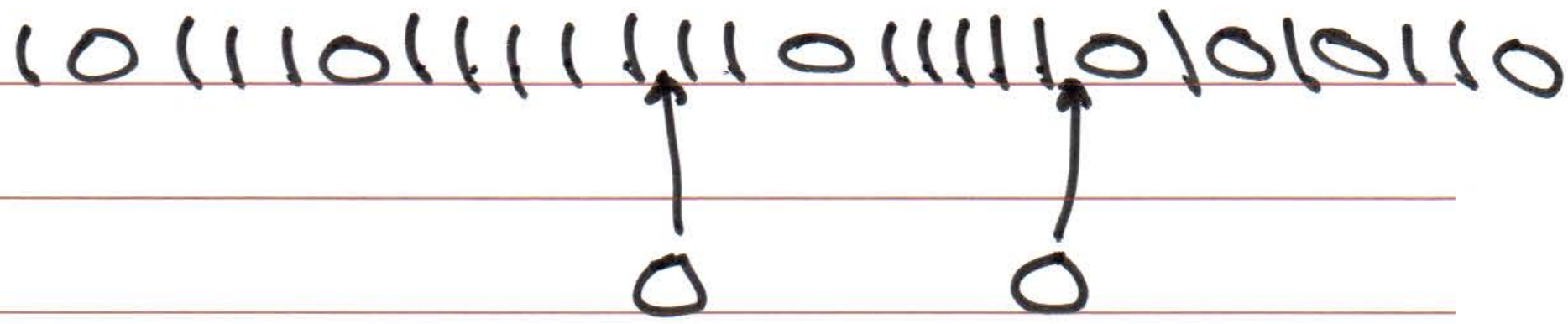
in STDM, time slots need not be of same duration



ARQ: Automatic Repeat Request



Zero stuffing



Errors