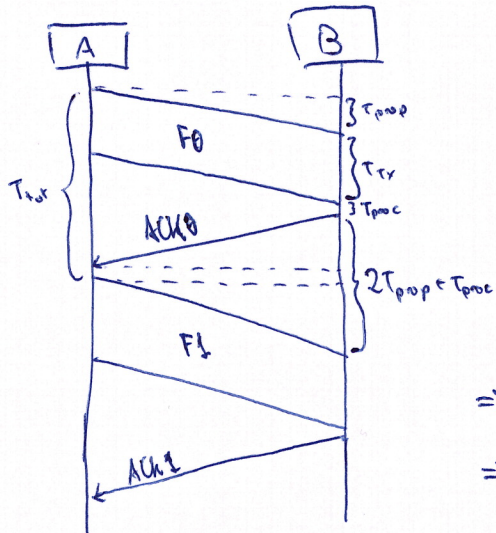


4.1.2.

A 128 kbps physical channel has 10ms T_{prop} . Determine the frame size range that yields $\geq 40\%$ efficiency using S&W protocols without considering errors. Consider a 100 μ s frame & processing and control delay in each system, and negligible ACK size.



$$T_{rx} = \frac{F_s}{C} \Rightarrow F_s = C T_{rx} \quad \eta_{req} = 40\%$$

$$T_{avg} = T_{tot} =$$

$$= 2T_{prop} + 2T_{proc} + T_{rx} = 2T_{prop} + 2T_{proc} + \frac{F_s}{C}$$

$$\eta = \frac{T_{rx}}{T_{avg}} = \frac{F_s}{C} \frac{1}{2T_{prop} + 2T_{proc} + \frac{F_s}{C}} \geq \eta_{req} \Rightarrow$$

$$\Rightarrow F_s \geq \eta_{req} \cdot C (2T_{prop} + 2T_{proc}) + \eta_{req} \cdot F_s \Rightarrow$$

$$\Rightarrow F_s \geq \frac{2C\eta_{req}(T_{prop} + T_{proc})}{1 - \eta_{req}} =$$

$$= \frac{2 \cdot 128 \cdot 10^3 \cdot 0.4 (10 \cdot 10^{-3} + 100 \cdot 10^{-6})}{1 - 0.4} =$$

$$= 1723.734 \Rightarrow$$

$$\Rightarrow F_s \geq 1724 \text{ b}$$