(a) $P_{o\lambda}$ = πιθ επιτυχίας

$$P_{o\lambda} = a \cdot P(\underbrace{A\text{-}K_1\text{-}B}_{\text{data}}\underbrace{\text{-}K_1\text{-}A}_{\text{Ack}}) + \beta\, P(\underbrace{A\text{-}K_1\text{-}B}_{\text{data}}\underbrace{\text{-}K_2\text{-}A}_{\text{Ack}})$$

$$P(\underbrace{A\text{-}K_1\text{-}B}_{\text{data}}\underbrace{\text{-}K_1\text{-}A}_{\text{Ack}}) = P(\underbrace{A\text{-}K_1\text{-}B}_{\text{data}}) \cdot P(\underbrace{B\text{-}K_1\text{-}A}_{\text{Ack}}) \Rightarrow$$

$$\Rightarrow P(A\text{-}K_1\text{-}B) = 1 - PER_1 = 1 - 0{,}001$$

$$P(B\text{-}K_1\text{-}A) = 1 - PER_1 = 1 - 0{,}001.$$

$$P(\underbrace{A\text{-}K_1\text{-}B}_{\text{data}}\underbrace{\text{-}K_2\text{-}A}_{\text{Ack}}) = P(A\text{-}K_1\text{-}B) \cdot P(B\text{-}K_2\text{-}A)$$

$$P(B\text{-}K_2\text{-}A) = 1 - PER_2 = 1 - 0{,}0001.$$

Άρα

$$P_{o\lambda} = \underbrace{0{,}3 \cdot \underbrace{(1 - 0{,}001)}_{0{,}9980}^{2}}_{0{,}2994} + \underbrace{0{,}7 \cdot \underbrace{(1 - 0{,}001)(1 - 0{,}0001)}_{0{,}9989}}_{0{,}6992}$$

$$\Rightarrow P_{o\lambda} = 0{,}9986$$

(β)

$$RTT = \underbrace{TRANSP + PROP}_{data} + \underbrace{TRANSA + PROP}_{Ack}$$

$$RTT(A\text{-}K_1B\text{-}K_1\text{-}A) = TRANSP_1 + PROP_1 + TRANSA_1 + PROP_1.$$

$$TRANSP_1 = \frac{1000 \text{ bits}}{10^6 \frac{\text{bits}}{\text{sec}}} = 10^{-3} \text{ sec}$$

$$\underset{(data)}{PROP_1} = \frac{d}{v_1} = \frac{10^5 m}{3 \cdot 10^8 m/s} = \frac{10^{-3}}{3} \text{ sec} = \underset{(ack)}{PROP_1}$$

$$TRANSA_1 = \frac{100 \text{ bits}}{10^6 \text{ bits/sec}} = 10^{-4} \text{ sec}$$

$$RTT(A\text{-}K_1\text{-}B\text{-}K_1\text{-}A) = 10^{-3} + 2 \cdot \frac{10^{-3}}{3} + 10^{-4} \text{ sec.} = \frac{5 \cdot 10^{-3}}{3} + 10^{-4} \text{ sec}$$

$$= 10^{-3}\left[\frac{5}{3} + 0{,}1\right] = 1{,}76 \text{ msec}$$

$$RTT(A\text{-}K_1\text{-}B\text{-}K_2\text{-}A) = TRANSP_1 + PROP_1 + TRANSA_2 + PROP_2. \quad (\min RTT)$$

$$TRANSA_2 = \frac{100 \text{ bits}}{5 \cdot 10^6 \frac{\text{bits}}{\text{sec}}} = \frac{10^{-4}}{5} \text{ sec}$$

$$PROP_2 = \frac{d}{v_2} = \frac{10^5 m}{2 \cdot 10^8 m/s} = \frac{10^{-3}}{2} \text{ sec}$$

$$RTT(A\text{-}K_1\text{-}B\text{-}K_2\text{-}A) = 10^{-3} + \frac{10^{-3}}{3} + \frac{10^{-4}}{5} + \frac{10^{-3}}{2} = \frac{11}{6}10^{-3} + \frac{10^{-4}}{5}$$

$$= 10^{-3}\left[\underbrace{\frac{11}{6}}_{1{,}83} + \underbrace{\frac{10^{-1}}{5}}_{0{,}02}\right] = 1{,}85 \text{ ms} \quad (\max RTT)$$

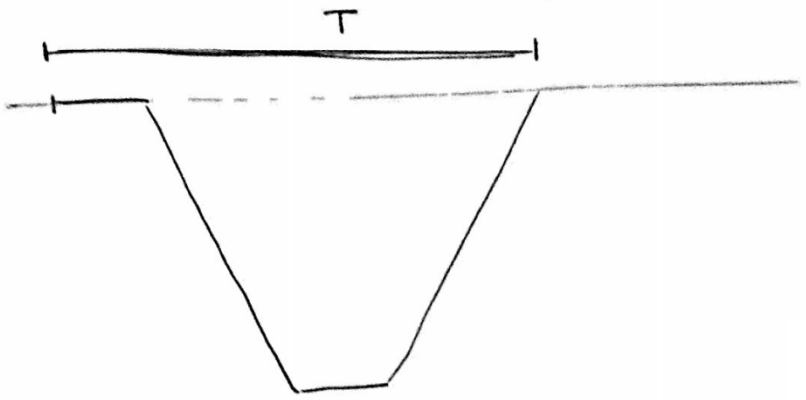
Μέσο $RTT = \alpha\, RTT(AK_1BK_1A) + \beta\, RTT(AK_1BK_2A) = 0{,}3 \cdot 1{,}76 + 0{,}7 \cdot 1{,}85 \text{ msec} =$

$= 1{,}893 \text{ msec}$

(γ)

ABP με σφάλματα.

$$\eta_{mean} = \frac{TRANSP}{E(x)} = \frac{\rho TRANSP}{\rho RTT + (1-\rho)T} = \frac{TRANSP}{RTT_{mean} + \frac{1-\rho}{\rho}T}$$



ρ: ολική πιθανότητα

(ερώτημα αi)

για η_{mean} = max πρέπει T = min.

όμως $T \geq RTT_{max} \Rightarrow T_{min} = RTT_{max} = 1,85ms$

(για να προλάβει το Ack να γυρίσει και από το αργό καναλί)

και $\eta_{mean} = \frac{TRANSP}{RTT_{mean} + \frac{1-\rho}{\rho} RTT_{max}} =$

$$= \frac{1\ ms}{1,823\ ms + 1,85ms \cdot \frac{1-0,9986}{0,9986}} = 0,547$$