Mathcad sheet for computing U of SAW and SW for no errors and error cases

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$L := 500$ Frame length in bytes

$R := 1.0 \cdot 10^6$ Bandwith in bits per second

$D := 3000$ Distance in miles

$P := 0.05$ Probability of a frame being in error

$W := 10$ Window size for SW case

$t_{fr} := \dfrac{8L}{R}$ $t_{fr} = 0.004$ Compute transmit time of a frame

$t_{pr} := D \cdot 5 \cdot 10^{-6}$ $t_{pr} = 0.015$ Compute propagation delay (assume 5 μs per mile)

Case of no errors...

$U_{SAW} := \dfrac{t_{fr}}{2 \cdot t_{pr} + t_{fr}}$ $U_{SAW} = 0.118$

$U_{SW} := \begin{vmatrix} \dfrac{W \cdot t_{fr}}{2 \cdot t_{pr} + t_{fr}} & \text{if } W \cdot t_{fr} < 2 \cdot t_{pr} + t_{fr} \\[2ex] 1 & \text{if } W \cdot t_{fr} \geq 2 \cdot t_{pr} + t_{fr} \end{vmatrix}$ $U_{SW} = 1$

Case of errors...

$U_{SAW} := \dfrac{(1 - P) \cdot t_{fr}}{2 \cdot t_{pr} + t_{fr}}$ $U_{SAW} = 0.112$

$U_{SW} := \begin{vmatrix} \dfrac{W \cdot t_{fr} \cdot (1 - P)}{(1 - P + W \cdot P) \cdot (2 \cdot t_{pr} + t_{fr})} & \text{if } W \cdot t_{fr} < 2 \cdot t_{pr} + t_{fr} \\[3ex] \dfrac{t_{fr} \cdot (1 - P)}{t_{fr} + 2 \cdot t_{pr} \cdot P} & \text{if } W \cdot t_{fr} \geq 2 \cdot t_{pr} + t_{fr} \end{vmatrix}$ $U_{SW} = 0.691$