

Mathcad sheet for computing U for SAW and SW with no errors

$L := 500$ Frame length in bytes
 $R := 1.0 \cdot 10^6$ Bandwidth in bits per second
 $D := 3000$ Distance in miles
 $W := 10$ Window size for SW case

$t_{fr} := \frac{8L}{R}$ $t_{fr} = 0.004$ Compute transmit time of a frame
 $t_{pr} := D \cdot 5 \cdot 10^{-6}$ $t_{pr} = 0.015$ Compute propagation delay (assume 5 μ s per mile)

SAW case...

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

SW case...

$$W \cdot t_{fr} = 0.04 \quad 2 \cdot t_{pr} + t_{fr} = 0.034$$

$$U_{SW} := \begin{cases} \frac{W \cdot t_{fr}}{2 \cdot t_{pr} + t_{fr}} & \text{if } W \cdot t_{fr} < 2 \cdot t_{pr} + t_{fr} \\ 1 & \text{if } W \cdot t_{fr} \geq 2 \cdot t_{pr} + t_{fr} \end{cases} \quad U_{SW} = 1$$
