

(1)

Network	Simulation Results			Analytical Results	
	Msg. correctly delivered	KBytes correctly delivered	Avg. throughput	Estimate	Estimated Thg
W24-Top a	131	458.5 KBytes	0.262	1.007633	0.440325
W24-Top b	72	504 KBytes	0.144	1.001389	0.3602041
W24-Top c	98	171.5 KBytes	0.196	1.001026	0.270860
W24-Top d	54	94.5 KBytes	0.108	1	0.207389

(2)

W24-Top a :-

$$\begin{aligned} \text{Bytes correctly delivered} &= 131 \times 3500 \text{ bytes} \\ &= 458,500 \text{ bytes} \\ &= 458.5 \text{ KBytes} \end{aligned}$$

$$\text{Avg. throughput} = (\text{msg. delivered}) / \text{Sim. time}$$

$$\begin{aligned} &= 131 / 500 = 0.262 \\ \text{estimated } \bar{N}_d &= \frac{\text{total messages delivered}}{\text{messages generated}} \\ &= 131 / 131 = 1.00763389 \end{aligned}$$

$$\begin{aligned} \text{The wire error} &= \frac{\text{The error-free}}{\bar{N}_d} = \frac{1}{\text{RTT + Handshake}} \bar{N}_d \\ &= \frac{1}{0.26385731} = 0.44368381 \end{aligned}$$

$$\text{The wire error} = \frac{0.44368381}{1.00763389} = 0.4403257$$

W24-Top b

Msg. correctly delivered = 72

$$\begin{aligned} \text{Kbytes correctly delivered} &= 72 \times 7000 \\ &= 72 \times 7 \text{kbytes} \\ &= 504 \text{kbytes} \end{aligned}$$

$$\text{Avg. Throughput} = 72 / 800 = 0.144$$

$$T_{\text{avg}} = 73 / 72 = 1.013888 \dots$$

$$T_{\text{avg}} = \frac{1}{(2.803428 + \cancel{7000} / 22369)}$$

$$= \frac{1}{8.81636108} = 0.35506811$$

$$T_{\text{avg}} = \frac{0.35506811}{1.01388883} = 0.3524016$$

W24-Top c

Msg. delivered = 98

$$\begin{aligned} \text{Kbytes correctly delivered} &= 171500 \text{ bytes} \\ &= 171.5 \text{kbytes} \end{aligned}$$

given msg. size = 1000 bytes

given msg. size = 2800 bytes

$$\text{avg. msg. size} = \frac{2800 + 1000}{2} = \frac{3800}{2} = 1750$$

$$\Rightarrow 1750 \times 98 = 171,500$$

$$T_{\text{avg}} = 991 / 98 = 1.01220408$$

$$\text{Avg. throughput} \Rightarrow 981800 = 0.196$$

$$\text{Throughput}_{\text{extreme}} = \frac{1}{(3.262974 + (1750/4968))}$$
$$= \frac{1}{3.654648127}$$

$$\text{Throughput}_{\text{min}} = \frac{1}{(3.654648127 \times 1.0120408)}$$
$$= 0.270860273$$

W24 Top d

$$\text{Kbytes delivered} = 54 \times \frac{(1000 + 260)}{2}$$
$$= 54 \times 1760$$
$$\approx 94800$$

$$\text{Avg. throughput} = 94800 = 0.108$$

$$N_d = \frac{1}{(4.289447 + (1750/3287))}$$
$$= \frac{1}{4.82184737}$$
$$= 0.20738939$$

(2)

As we can see there is some diff. in b/w analytical results & the simulation results.
The diff. in throughput of the channel is because if τ_0 as given in the description of part (a) there is some delay of we can say that the Application layer is generating message because of that maybe the physical layer stay idle & this will affect the throughput of the results.