5.3-42

Christopher Zúñiga C28730

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Token Bucket Exercise Solution

Given:

- Initial token bucket capacity (C): 8 megabits
- Token replenishment rate (r): 1 Mbps
- Transmission rate (R): 6 Mbps

The net token consumption rate is:

$$R - r = 6\,Mbps - 1\,Mbps = 5\,Mbps$$

The time (t) the computer can transmit at full speed before the bucket is empty:

$$t = \frac{C}{R - r} = \frac{8\,Mb}{5\,Mbps} = \frac{8}{5} = 1.6\,seconds$$

Verification: The token depletion equation is:

$$Tokens(t) = C + r \cdot t - R \cdot t$$

Setting $Tokens(t) = 0$:

$$0 = 8 + t(1 - 6)0 = 8 - 5tt = \frac{8}{5} = 1.6\,seconds$$

1.6 seconds