

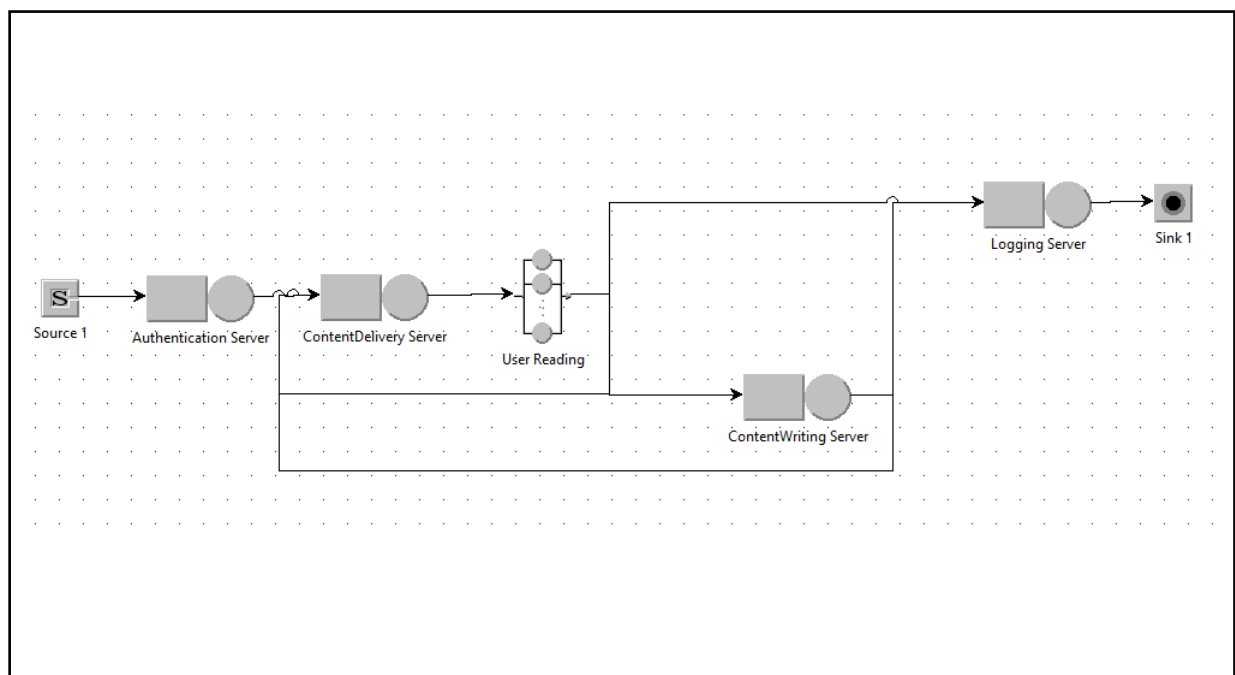
Name:

A) Service times

| Name of service center | Service Time (S_k) |
|-----------------------------|------------------------|
| <i>AuthenticationServer</i> | 0.02 |
| <i>ContentWritingServer</i> | 0.4 |
| <i>LoggingServer</i> | 0.09995 |

B) Simulation results

Screenshot:



| Name of service center | Utilization | Throughput |
|------------------------------|----------------|---------------|
| <i>AuthenticationServer</i> | 0.00789 | 0.3965 |
| <i>ContentDeliveryServer</i> | 0.40 | 1.3495 |
| <i>ContentWritingServer</i> | 0.04 | 0.1116 |
| <i>LoggingServer</i> | 0.0393 | 0.3933 |

Average System Response Time:

Average time that a student is waiting for a reply from the system during a learning session:

C) System upgrade

| Name of service center | Minimum number of resources | Utilization | Throughput |
|------------------------------|-----------------------------|----------------|---------------|
| <i>AuthenticationServer</i> | 1 | 0.00807 | 0.3960 |
| <i>ContentDeliveryServer</i> | 1 | 0.6752 | 2.3035 |
| <i>ContentWritingServer</i> | 1 | 0.0453 | 0.1139 |
| <i>LoggingServer</i> | 1 | 0.0396 | 0.3950 |

Average System Response Time:

1710

Bonus points:

$$D_4 = 0.48 \text{ s} = V_4 \times S_4 = \frac{C_4}{C} \times \frac{B_4}{C_4} = \frac{B_4}{C} = \frac{B_4}{X \times T} = \frac{U_4}{X}$$

$$U_4 = D_4 \times X = 0.48 \text{ s} \times 0.3956 = 0.189888$$

$$X_4 = \frac{U_4}{S_4} = \frac{0.189888}{0.4} = 0.189888$$