

Response time of an e-commerce site

An e-commerce system has four types of requests: *browsing clients (B)*, who read the catalog; *purchasing clients (P)*, who perform transactions to buy goods; *administration employees (A)*, who perform customer relations; and *warehouse employees (W)*, who take care of packing and delivery goods. The arrival rates of clients, and the number and think times of employees are the following:

$$\begin{aligned}\lambda_B &= 10 \text{ req./m.} & \lambda_P &= 3 \text{ req./m.} \\ N_A &= 10 & Z_A &= 5\text{m} & N_W &= 15 & Z_W &= 10\text{m}\end{aligned}$$

Each request accesses the application server (1), the database (2) and the storage server (3), with the following demands:

$$\begin{aligned}D_{1B} &= 2 \text{ s.} & D_{1P} &= 5 \text{ s.} & D_{1A} &= 1 \text{ s.} & D_{1W} &= 1.5 \text{ s.} \\ D_{2B} &= 3 \text{ s.} & D_{2P} &= 1 \text{ s.} & D_{2A} &= 2 \text{ s.} & D_{2W} &= 2 \text{ s.} \\ D_{3B} &= 1 \text{ s.} & D_{3P} &= 1.5 \text{ s.} & D_{3A} &= 2 \text{ s.} & D_{3W} &= 2.5 \text{ s.}\end{aligned}$$

Using JMVA and direct computation, determine:

1. If the considered system is stable
2. The average system response time per class
3. The throughput of the closed classes
4. The average number of jobs of the open classes

Take screen captures of the steps you performed in JMT.