

Probability question in an M/M/2/4 queue

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Consider the following scenario:

A queue with two servers in which service times are exponentially distributed with mean $1/m$. They're both currently servicing packets, and in addition there are two packets waiting in the queue (P_1 will be the first to be served, P_2 second.)

What's the probability that P_2 will finish its service before P_1 ? I have an answer, but is my reasoning okay?

There are two ways this can happen: (1) Server 1 can finish its job and get P_2 followed by Server 2 finishing its job and receiving P_2 , and then Server 2 can finish servicing P_2 before Server 1 finishes with P_1 . Or, (2) the same deal with Server 1 and 2 replaced.

Since both servers have exponentially distributed service times with the same mean, it's easy enough to show that there's a 50/50 chance that Server 1 will finish its original job before Server 2 does, and by the memoryless property of the exponential distribution it seems to me that the final answer should be $(1/2)^3 + (1/2)^3 = 1/4$, but this seems too easy.

Thanks,
Mark

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