

Mean throughput

question posted about a month ago by [alexanderwiguna](#)



hi there! I was wondering, why is the mean throughput a function of lambda only and not mu? as an extreme example, if mu were infinitesimally small and customers spent an infinite time in the queue, would the throughput not be 0? or is the thinking that eventually, as time also goes to infinity, what goes in must come out?

thanks!

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1 response

Sandrine_VATON(Staff)

about a month ago



Hi Alexander,

The M/M/1 queue is a pure waiting system. No customers are blocked since the buffer is infinite. If the system is stable (which is true if $\lambda < \mu$) then any customer that enters the system will eventually leave the system. Whether you consider arrivals or departures the throughput is, on average, equal to λ .

What is probably misleading is that the service rate is μ , and not λ ! But the output rate is μ when the server is busy. And when the server is idle the output rate is 0. So, on average, the output rate (or throughput) is $\mu \times \text{Prob}(\text{server busy})$. As the probability that the server is busy is $\rho = \lambda/\mu$ the output throughput is $\rho \times \mu = (\lambda/\mu) \times \mu = \lambda$. The input throughput is equal to the output throughput at equilibrium!

This is a question that learners ask very frequently. Thank you!

Hi Sandrine,



Thanks for the great explanation! I guess my wondering is - what if the system is not stable and $\lambda > \mu$?

posted about a month ago by [alexanderwiguna](#)

Hi,



If $\lambda \geq \mu$ then the system is not stable any longer. The number of clients in the system goes to infinity. There is no steady state distribution. In that case it does not make sense to talk about average performance measures.

Regards,

posted about a month ago by [Sandrine_VATON](#) (Staff)