

The role of coupling and the deviation matrix in calculating the value of capacity for queueing systems

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In queues with finite capacity C , customers are lost when they arrive to find C customers already present. Assuming that each arriving customer brings a certain amount of revenue, we are interested in calculating the value of an extra unit of capacity by deriving the expected amount of extra revenue earned over a finite time horizon $[0, T]$.

There are different ways of approaching this problem. One involves the derivation of Markov renewal equations by conditioning on the first instance at which the state of the queue changes. A second involves an elegant coupling argument. We shall describe both of these approaches and the role that the deviation matrix of the Markov chain plays in the analysis.

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