A 3-player game theoretic model of a choice between two queueing systems with strategic managerial decision making

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EURO 2021 Athens

About me

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Queues - Examples

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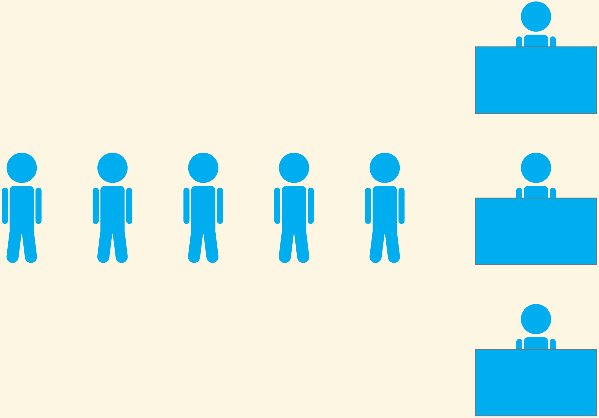
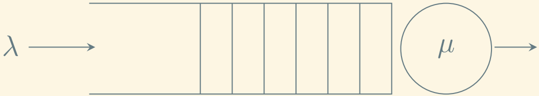
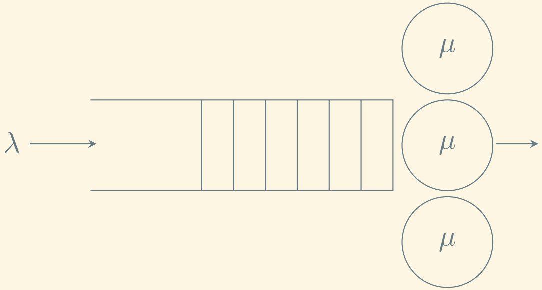


Queues - Examples

Queues - Discrete Event Simulation



Queues - Discrete Event Simulation



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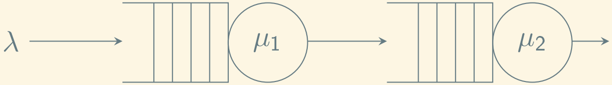

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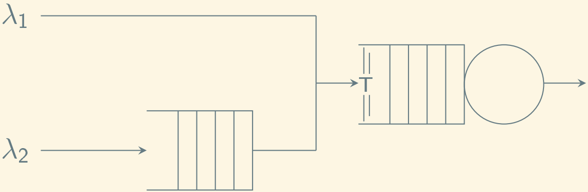
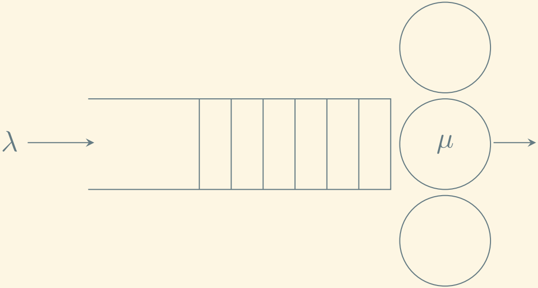
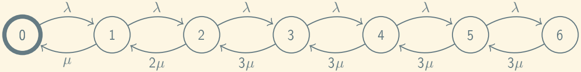


Queues - Markov Chain





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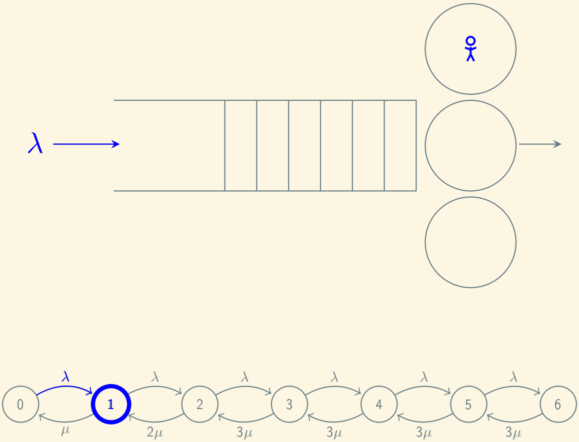

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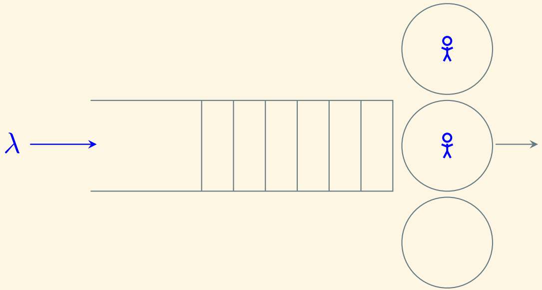

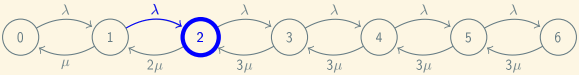

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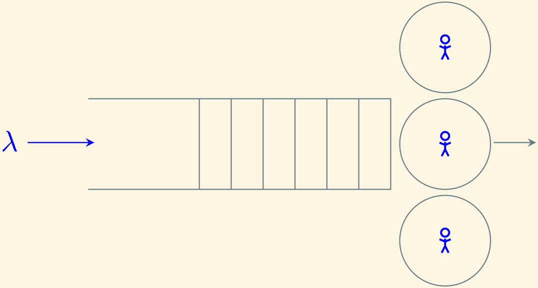

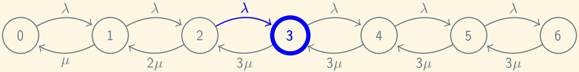

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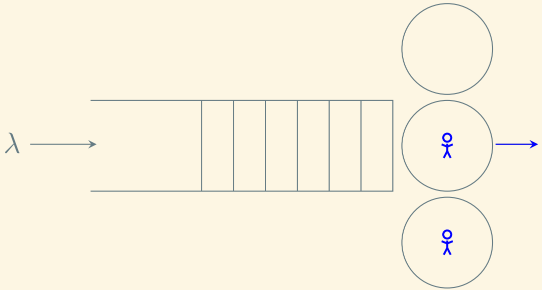
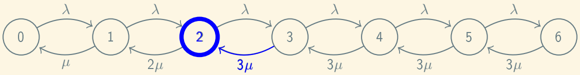
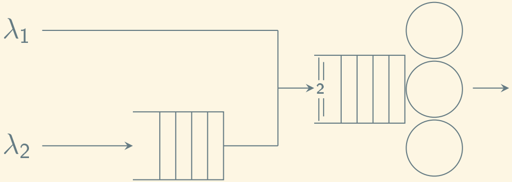
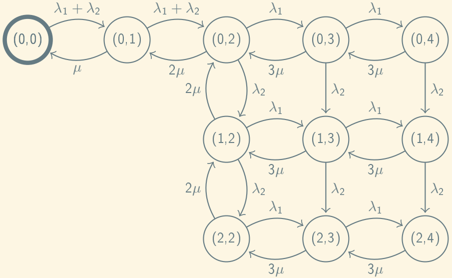




Analytical formulation - Custom Queue





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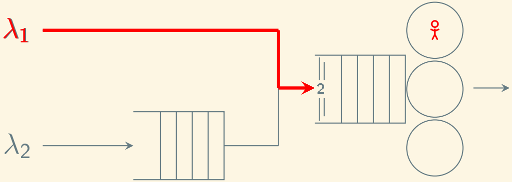

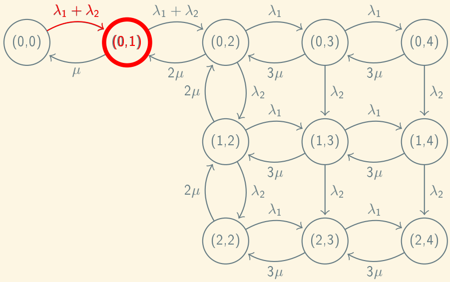

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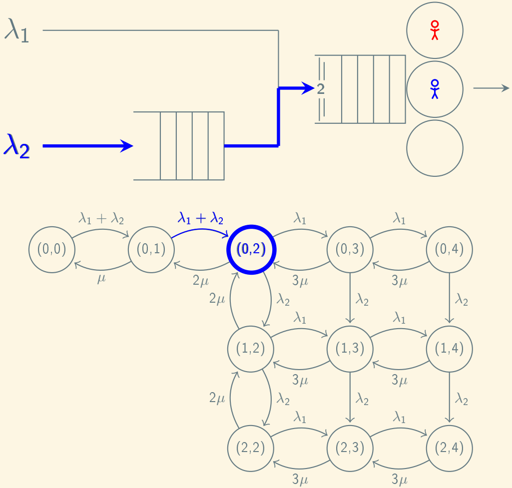

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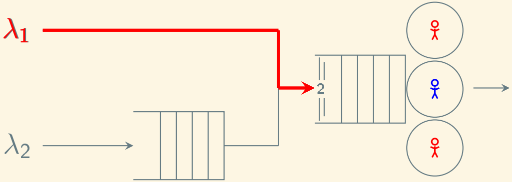

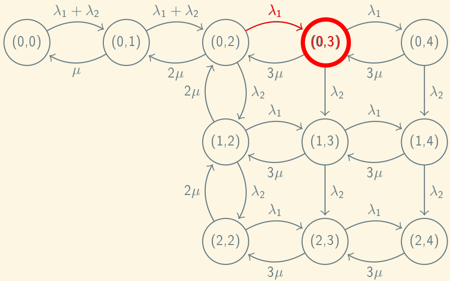

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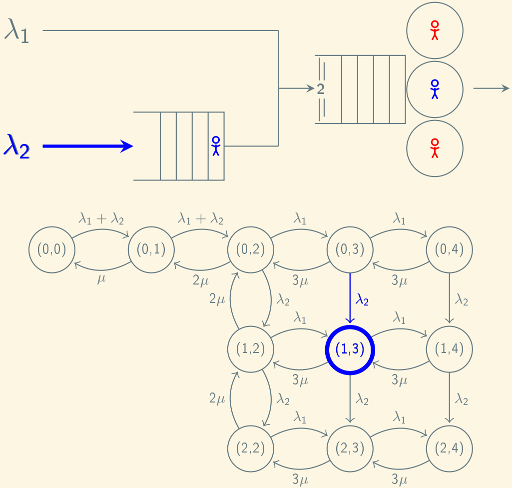

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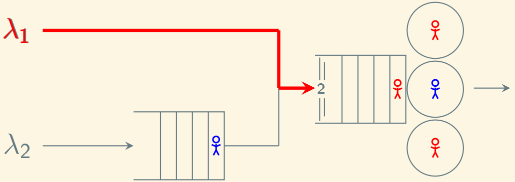

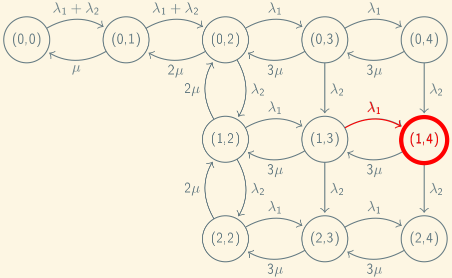

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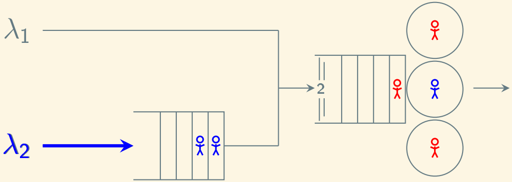

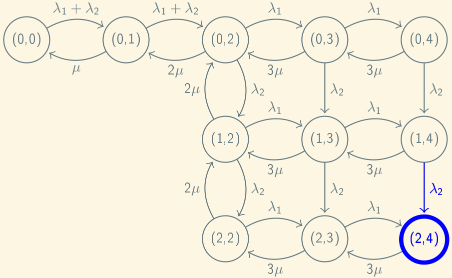

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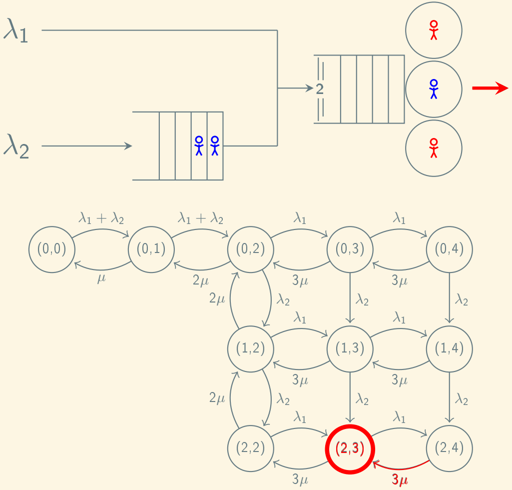

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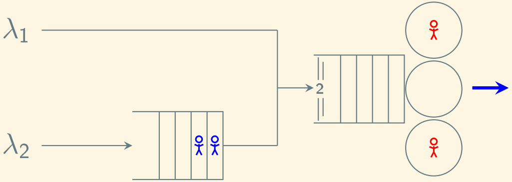

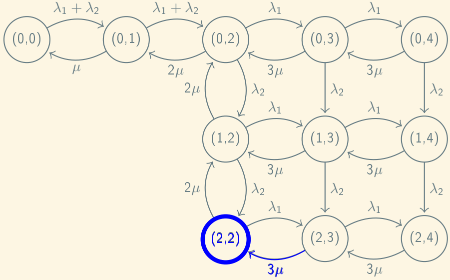

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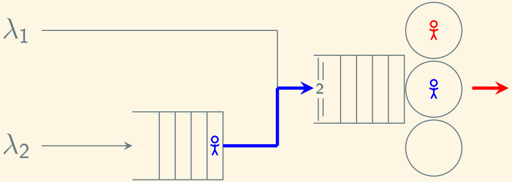
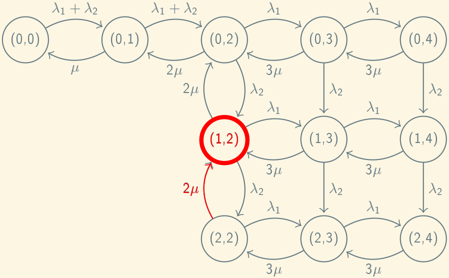
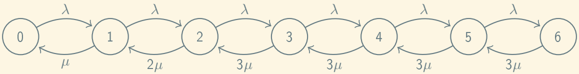




Steady state probabilities - M|M|3 queue



$$Q = \begin{array}{c} \begin{array}{ccccccc} (0) & (1) & (2) & (3) & (4) & (5) & (6) \end{array} \\ \begin{pmatrix} -\lambda & \lambda & 0 & 0 & 0 & 0 & 0 \\ \mu & -\mu-\lambda & \lambda & 0 & 0 & 0 & 0 \\ 0 & 2\mu & -2\mu-\lambda & \lambda & 0 & 0 & 0 \\ 0 & 0 & 3\mu & -3\mu-\lambda & \lambda & 0 & 0 \\ 0 & 0 & 0 & 3\mu & -3\mu-\lambda & \lambda & 0 \\ 0 & 0 & 0 & 0 & 3\mu & -3\mu-\lambda & \lambda \\ 0 & 0 & 0 & 0 & 0 & 3\mu & -3\mu \end{pmatrix} \end{array} \begin{array}{c} \\ (0) \\ (1) \\ (2) \\ (3) \\ (4) \\ (5) \\ (6) \end{array}$$

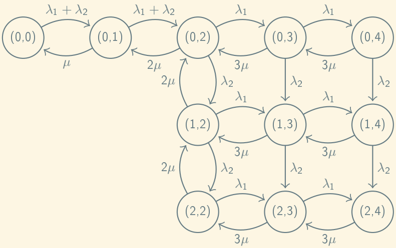
$$\frac{d\pi}{dt} = \pi Q = 0$$

$$\sum \pi_i = 1$$

$$\pi = \begin{pmatrix} \pi_0 \\ \pi_1 \\ \pi_2 \\ \pi_3 \\ \pi_4 \\ \pi_5 \\ \pi_6 \end{pmatrix}$$

Steady state probabilities - Custom queue

$$
Q = \begin{array}{c}
\begin{array}{cccccc} (0,0) & (0,1) & (0,2) & & (2,3) & (2,4) \end{array} \\
\begin{pmatrix}
-\lambda_1 - \lambda_2 & \lambda_1 + \lambda_2 & 0 & \dots & 0 & 0 \\
\mu & -\mu - \lambda_1 - \lambda_2 & \lambda_1 + \lambda_2 & \dots & 0 & 0 \\
0 & 2\mu & -2\mu - \lambda_1 - \lambda_2 & \dots & 0 & 0 \\
\vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\
0 & 0 & 0 & \dots & -\lambda_1 - 3\mu & \lambda_1 \\
0 & 0 & 0 & \dots & 3\mu & -3\mu
\end{pmatrix}
\end{array}
\begin{array}{c} (0,0) \\ (0,1) \\ (0,2) \\ \\ (2,3) \\ (2,4) \end{array}
$$



$$
\frac{d\pi}{dt} = \pi Q = 0, \qquad \sum \pi_{(u,v)} = 1
$$

$$
\pi = \begin{bmatrix} \pi_{(0,0)} \\ \pi_{(0,1)} \\ \pi_{(0,2)} \\ \vdots \\ \pi_{(2,3)} \\ \pi_{(2,4)} \end{bmatrix}
$$

Steady state probabilities - Comparison