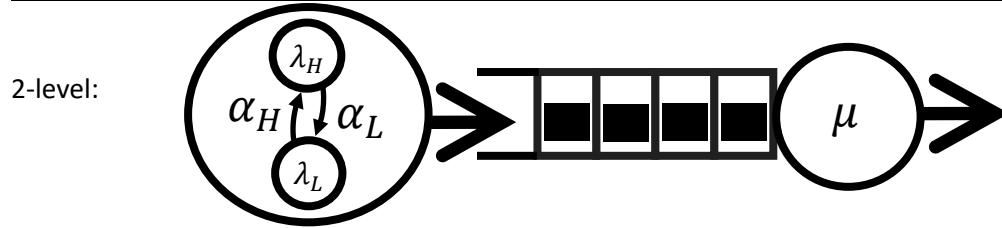
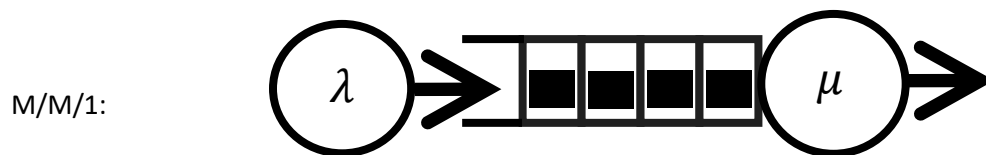


Analyzing Queues with Markovian Arrivals and Markovian Service: Worksheet



Q1: Fraction of time spent in high-arrival-rate state, $P(H)$? In low-arrival-rate state, $P(L)$?

Q2: Long-term arrival rate λ ?



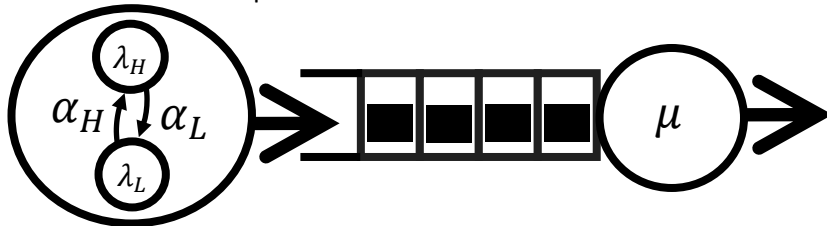
State: $Q(t) = q$ jobs in queue. Random variable: Q^2

Q3: Rate of arrivals? Change in Q^2 from arrival?

Q4: Rate of completions? Change in Q^2 from completion?

Q5: Expected increase, in stationarity? Expected decrease, in stationarity?

Q6: The expected increase and expected decrease sum to 0. Use this to solve for $E[Q]$.



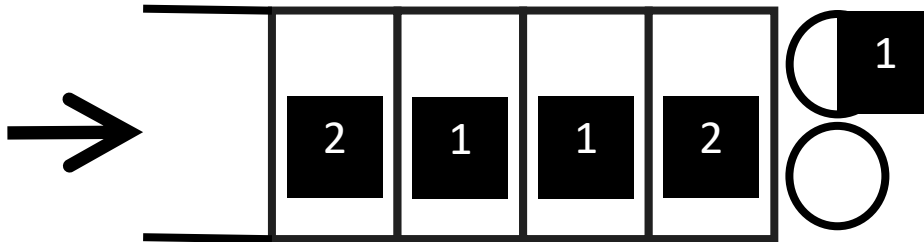
Q7: Returning to the 2-level system, which element of Q4 & Q5 is different than in the M/M/1?

Q8: What is the expected drift due to arrivals, in stationarity?

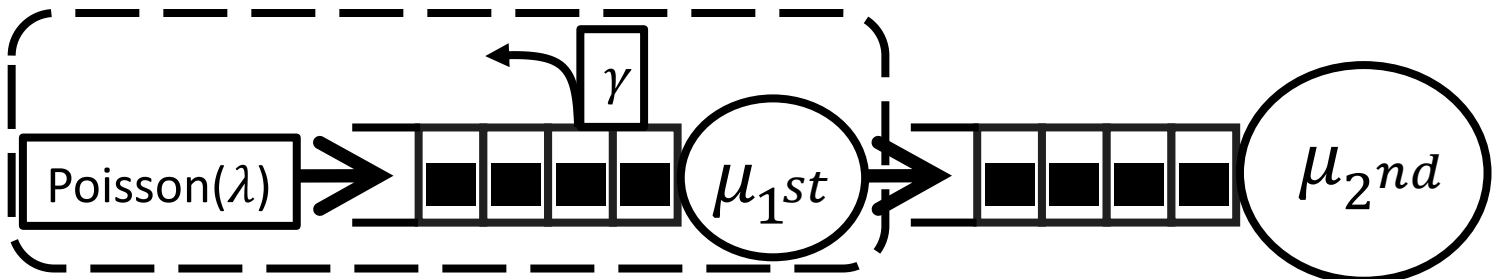
Q9: What makes y change? Q10: At what rate does it change?

Q11: By how much does $\Delta(y)$ change? Q12: What is the drift, $G \circ \Delta(y)$?

After Break



Q13: In the two-server Multiserver-Job model, with durations of $Exp(\mu_1)$ and $Exp(\mu_2)$, what service rates are possible?



Q14: In the tandem queue with abandonment, draw the Markov Chain for the arrival process to the second queue.