

BULK ARRIVALS



author



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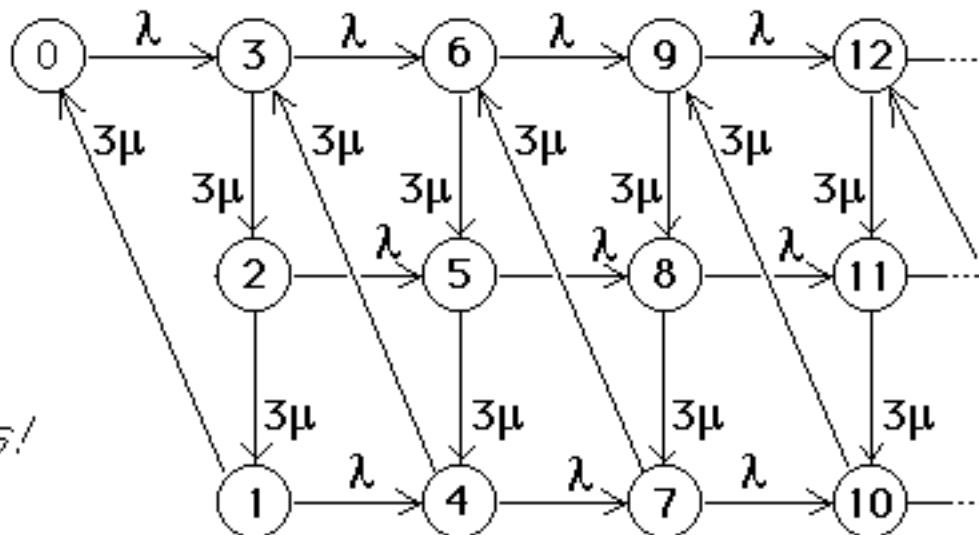
"Customers" arrive in batches of size K ,
with batch arrivals forming a Poisson
process with rate λ

Service time for each customer has
exponential distribution with mean $\frac{1}{K\mu}$
i.e., time to process the batch has mean $\frac{1}{\mu}$

Continuous-Time Markov Chain

$K=3$

Not a birth-death process!

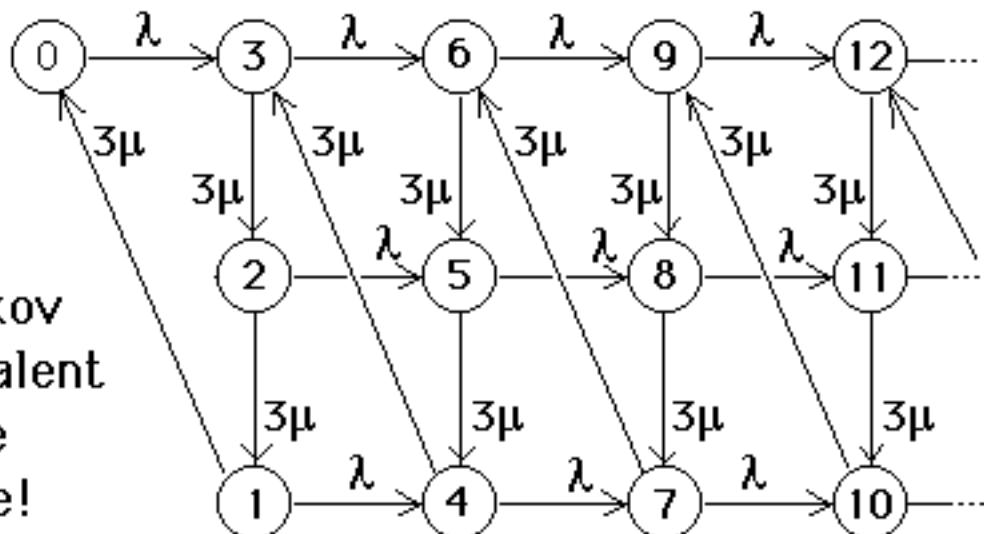


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Continuous-Time Markov Chain

$K=3$

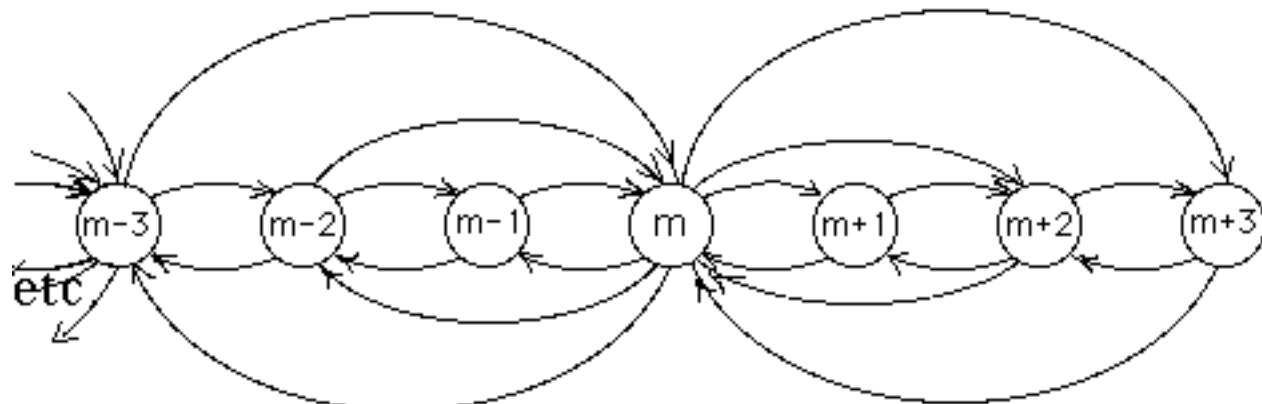
This C-T Markov chain is equivalent to that for the $M/E_K/1$ queue!



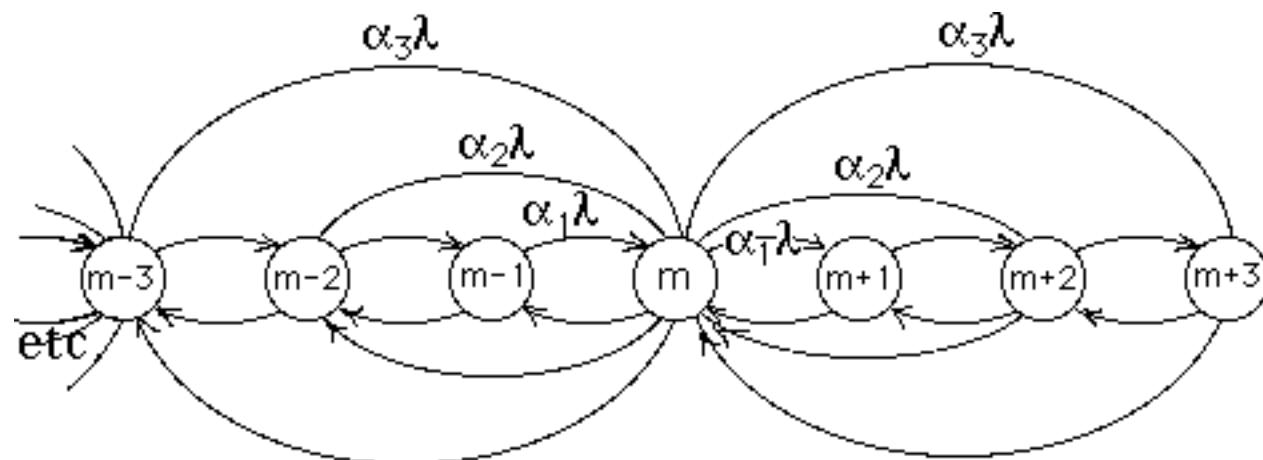
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Bulk Arrivals, with Random-Sized Batches

Let λ = arrival rate of batches
 α_k = probability that batch contains
 k customers, $k=1,2,3, \dots K$
 μ = service rate for each customer



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Balance
Equations

$$\lambda \pi_0 = \mu \pi_1$$

$$\vdots$$

$$[(\alpha_1 + \alpha_2 + \dots + \alpha_{m-1})\lambda + \mu] \pi_m = \mu \pi_{m+1} + \sum_{k=1}^{m-1} \alpha_k \lambda \pi_{m-k}$$

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