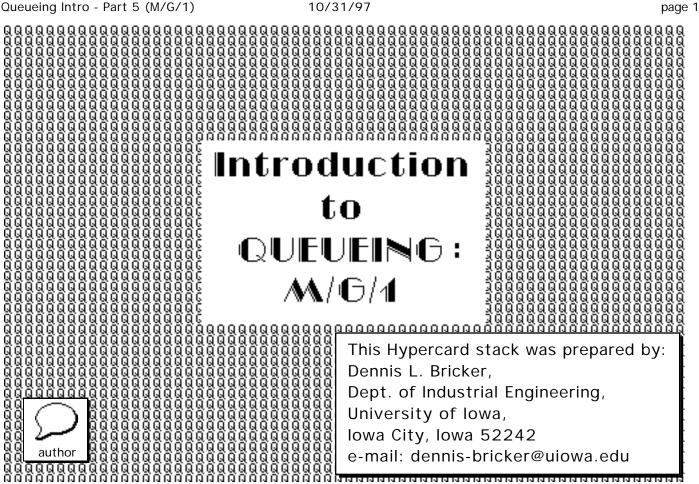
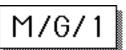
Queueing Intro - Part 5 (M/G/1)



10/31/97



- Arrival process is Memoryless, i.e., interarrival times have Exponential distribution with mean 1/2
- Single server
- Service times are independent, identically distributed, but not necessarily exponential. Mean service time is  $1/\mu$  with variance  $\sigma^2$
- Queue capacity is infinite

## M/G/1

M/G/1

Steadystate Characteristics

A steadystate distribution exists if  $\rho = \frac{\lambda}{\mu} < 1$ i.e., if service rate exceeds the arrival rate.

 $\begin{array}{ll} \pi_0 = 1 - \rho & = \textit{probability that server is idle} \\ 1 - \pi_0 = \rho & = \textit{probability that server is busy} \\ & i.e., \textit{utilization of server} \end{array}$ 

There is no convenient formula for the probability of j customers in system when j > 0.

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Steadystate Characteristics

$$L_q = \frac{\lambda^2 \sigma^2 + \rho^2}{2 (1 - \rho)}$$

average number of customers waiting

After calculating  $L_q$ , Little's Formula allows us to compute:  $L_q$ 

$$W_{q} = \frac{L_{q}}{\lambda} , \quad W = W_{q} + \frac{1}{\mu} ,$$
$$\& \quad L = \lambda W = L_{q} + \rho$$

For the M/M/1 queue, the standard deviation equals the mean service time, i.e.,  $\sigma$  = 1/ $\mu$ 

Using these formulae for the M/G/1 queueing system with  $\sigma^2 = 1/\mu^2$  will give results consistent with the formulae for M/M/1.

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