**Introduction to QUEUEING:**

- **M/G/1**
  - Arrival process is **Memoryless**, i.e., interarrival times have **Exponential** distribution with mean $1/\lambda$.
  - 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

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**Steadystate Characteristics**

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

- $\pi_0 = 1 - \rho$ = probability that server is idle
- $1 - \pi_0 = \rho$ = probability that server is busy

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

**M/G/1**

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

average number of customers waiting

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

$$W_q = \frac{L_q}{\lambda}, \quad W = W_q + \frac{1}{\mu}$$

$$& L = \lambda W = L_q + \rho$$

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

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