$L = \lambda w, \quad w = \lambda/\mu, \quad \rho = \lambda/c\mu$

$c - cost = \$ \times \lambda w_Q, s - cost = \$ \times c(2-\rho)$

M/G/1:

$$P_0 = 1-\rho, L = \rho + \frac{\rho^2(1+\sigma^2\mu^2)}{2(1-\rho)}$$

$$L_Q = \frac{\rho^2(1+\sigma^2\mu^2)}{2(1-\rho)} = \left(\frac{\rho^2}{1-\rho}\right)\left(\frac{1+(cv)^2}{2}\right)$$

$$w = \frac{1}{\mu} + \frac{\lambda(1/\mu^2 + \sigma^2)}{2(1-\rho)}, w_Q = \frac{\lambda(1/\mu^2 + \sigma^2)}{2(1-\rho)}$$

M/M/1:

$$P_n = (1-\rho)\rho^n, L = \frac{\lambda}{\mu-\lambda} = \frac{\rho}{1-\rho}$$

$$L_Q = \frac{\lambda^2}{\mu(\mu-\lambda)} = \frac{\rho^2}{1-\rho}$$

$$w = \frac{1}{\mu-\lambda} = \frac{1}{\mu(1-\rho)}, w_Q = \frac{\lambda}{\mu(\mu-\lambda)} = \frac{\rho}{\mu(1-\rho)}$$

G/G/c:

$$P_0 = \left\{\left[\sum_{n=0}^{c-1} \frac{\left(\frac{\lambda}{\mu}\right)^n}{n!}\right] + \left[\left(\frac{\lambda}{\mu}\right)^c \left(\frac{1}{c!}\right)\left(\frac{c\mu}{c\mu-\lambda}\right)\right]\right\}^{-1}$$

$$L = c\rho + \frac{(c\rho)^{c+1}P_0}{c(c!)(1-\rho)^2} = c\rho + \frac{\rho P(L(\infty) \geq c)}{1-\rho}$$

G/G/?/K/?:

$$P_0 = \left\{\sum_{n=0}^{c-1} \binom{K}{n}\left(\frac{\lambda}{\mu}\right)^n + \sum_{n=c}^{K} \frac{K!}{(K-n)!\,c!\,c^{n-c}}\left(\frac{\lambda}{\mu}\right)^n\right\}^{-1}$$

$$P_n = \begin{cases} \binom{K}{n}\left(\frac{\lambda}{\mu}\right)^n P_0, & n = 0,1,\dots,c-1 \\ \frac{K!}{(K-n)!\,c!\,c^{n-c}}\left(\frac{\lambda}{\mu}\right)^n, & n = c, c+1, \dots, K \end{cases}$$

$$L = \sum_{n=0}^{K} nP_n, \quad w = \frac{L}{\lambda_e}, \quad \rho = \frac{\lambda_e}{c\mu}$$

$$\lambda_e = \sum_{n=0}^{K} (K-n)\lambda P_n$$

$$\lambda_i = a_j + \sum_{all\ i} \lambda_i p_{ij}, \quad ar_{i,j} = \lambda_i P_{i,j}$$

$$X_i + 1 = (aX_i + c) \bmod m \Rightarrow R_i = \frac{X_i}{m}$$

$c \neq 0, m = 2^b, \gcd(c,m) = 1, a = 1+4k \Rightarrow P = m$

$c = 0, X_0 \% 2 = 1, m = 2^b, a = 3+8k \mid 5+8k, \Rightarrow P = \frac{m}{4}$

$m\ prime, a^k - 1 \% m = 0 \Rightarrow P = m-1$

$$X_i = \left(\sum_{j=1}^{k} (-1)^{j-1} X_{i,j}\right) mod\ (m_1 - 1)$$

$$P = \frac{(m_1-1)(m_2-1)\dots(m_k-1)}{2^{k-1}}$$

$$\alpha = P(Reject\ H0 \mid H0\ is\ True)$$

$$chi: X_0^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}, \quad E_i = np(x)$$

$$corr: \hat{\rho}_{im} = \frac{1}{M+1}\left[\sum_{k=0}^{M} R_{i+km}R_{i+(k+1)m}\right] - 0.25$$

$$\hat{\sigma}_{\rho_{im}} = \frac{\sqrt{13M+7}}{12(M+1)}, \quad Z_0 = \frac{\hat{\rho}_{im}}{\hat{\sigma}_{\hat{\rho}_{im}}}$$

$$inv: R_i \sim U[0,1] \Rightarrow R_i = F_X(x) \Rightarrow x = F_X^{-1}(R_i)$$

$$exp:\ x = -\frac{1}{\lambda}\ln(R)$$

$$uni(a,b):\ x = a + (b-a)R$$

$$wb:\ x = \alpha[-\ln(1-R)]^{\frac{1}{\beta}}$$

$$tri:\ x = \begin{cases} \sqrt{2R}, & 0 \leq R \leq \frac{1}{2} \\ 2 - \sqrt{2(1-R)}, & \frac{1}{2} < R \leq 1 \end{cases}$$

$$geo:\ X = q + \left\lceil \frac{\ln(1-R)}{\ln(1-p)} - 1 \right\rceil$$

$$acc\ poi: \prod_{i=1}^{n} R_i \geq e^{-\lambda} \geq \prod_{i=1}^{n+1} R_i$$

$$z_1 = (-2\ln R_1)^{\frac{1}{2}} \cos(2\pi R_2)$$
$$z_2 = (-2\ln R_1)^{\frac{1}{2}} \sin(2\pi R_2)$$
$$\Longrightarrow N_{poi} = \lceil \lambda + \sqrt{\lambda} Z - 0.5 \rceil$$

$$X_{erl} = \sum_{i=1}^{k} -\frac{1}{k\theta} \ln R_i$$

$$Q - Q: F^{-1}\left(\frac{j - 0.5}{n}\right)$$

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}, \qquad S^2 = \frac{\sum_{i=1}^{n} X_i^2 - n\bar{X}^2}{n-1}$$

$$\hat{\lambda}_{nspp}(t) = \frac{1}{n\Delta t} \sum_{j=1}^{n} C_{ij}$$

$$cov(X_1, X_2) = E(X_1 X_2) - \mu_1 \mu_2$$

$$\rho = corr(X_1, X_2) = \frac{cov(X_1, X_2)}{\sigma_1 \sigma_2}$$