Mathematically formulated the **"knapsack problem"** is expressed as:

maximize $\text{FillRate}_{sys} = \sum_{i=1}^{k} \frac{\lambda_i}{\lambda} \sum_{j=0}^{x_i - 1} \frac{(\lambda_i \nu_i)^j}{j!} e^{-\lambda_i \nu_i}$ where $\lambda = \sum_{i=1}^{k} \lambda_i$

subject to $\sum_{i=1}^{k} x_i * c_i \leq c_0$

λ_i = demande rate ν_i = repair time c_i = cost $x_i \in \{1,2,3,4,..........,n_i\}$ i = 1, 2, 3,…, k c_0 = budget

Part type 1 ………… $\lambda_1, \nu_1, c_1, x_1$ $\text{FillRate}_1 = \sum_{j=0}^{x_1 - 1} \frac{(\lambda_1 \nu_1)^j}{j!} e^{-\lambda_1 \nu_1}$

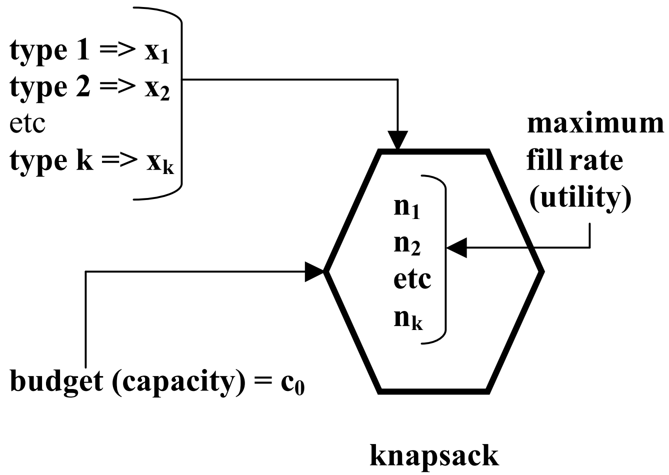
Part type 2 ………… $\lambda_2, \nu_2, c_2, x_2$ $\text{FillRate}_2 = \sum_{j=0}^{x_2 - 1} \frac{(\lambda_2 \nu_2)^j}{j!} e^{-\lambda_2 \nu_2}$

………………………………………………………………………………………………

Part type i ………… $\lambda_i, \nu_i, c_i, x_i$ $\text{FillRate}_i = \sum_{j=0}^{x_i - 1} \frac{(\lambda_i \nu_i)^j}{j!} e^{-\lambda_i \nu_i}$

………………………………………………………………………………………

Part type k ………… $\lambda_k, \nu_k, c_k, x_k$ $\text{FillRate}_k = \sum_{j=0}^{x_k - 1} \frac{(\lambda_k \nu_k)^j}{j!} e^{-\lambda_k \nu_k}$



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