Tactical planning

Introduction

At a tactical decision-making level, in a logistic network, we must decide which demand to serve using which infrastructure.

Specifically:

- terminal management policies, in particular the distribution of workloads, opening hours, ...
- the itinerary that must follow the flow that satisfies a given question
- the service that is implemented for the connection between terminals
- frequency and scheduling of services
- empty vehicle management policies, i.e., management of empty returns, redistribution in the territory, ...

Terminal management policies

The main tactical decision-making problems with regard to logistical nodes are:

- inventory management
- allocation of the various products to the storage points
- batch sizing

Storage location assignment problem

The problem of assigning the spaces (slots) of a storage area to the different product families is the so-called Storage location assignment problem.

The solution to the problem is generally based on the principle that frequently requested items must be placed in the spaces closest to the shipping preparation area in order to minimize the total time required for handling operations.

Storage location assignment problem

In a fixed position system, indicating with:

- m_{pf} number of slots for stocking;
- n types of product to be stocked;
- m_j, $j=1,\ldots,n$, number of slots assigned to product type j;
- R number of quays;
- p_{jr}, $j=1,\ldots,n$, $r=1,\ldots,R$, average number of daily import/export operations on quay r for product type j
- t_{rk}, $r=1,\ldots,R$, $k=1,\ldots, m_{pf}$, average transport time from quay r to slot k, or viceversa;

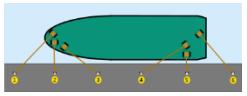
R quays import/export

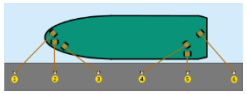
products

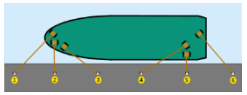
n=3

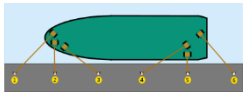
slots

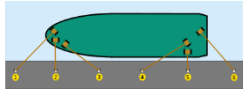
m_{pf}=5

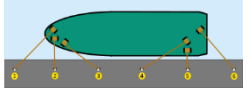












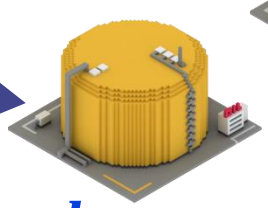
1

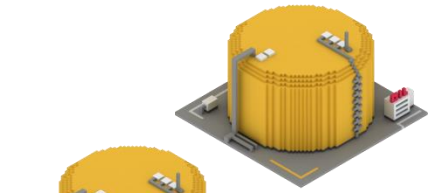
t_{rk} average time from quay r to slot k

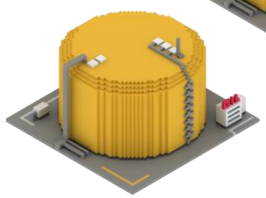
r

2

k







p_{jr} logistic movements of product j on quay r

3

m_1=3 pear

m_2=1 apple

m_3=1 banana

m_j

Storage location assignment problem

The cost of assigning the storage position k to the product j can be calculated as:

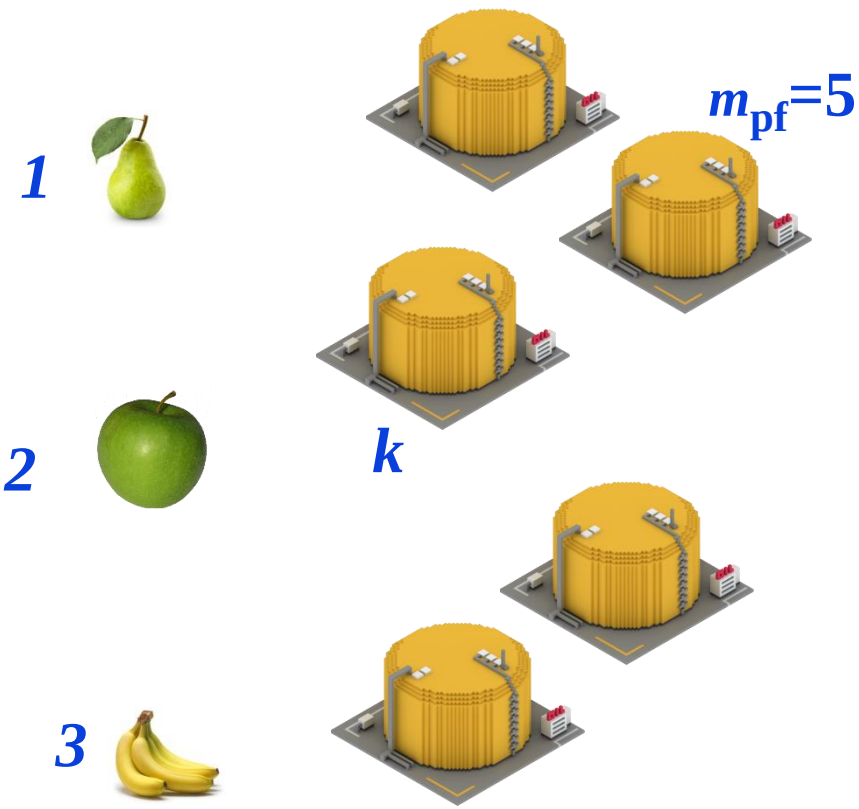
$$c_{\mathrm{jk}} = \sum_{r=1}^{R} \frac{p_{\mathrm{jr}}}{m_{\mathrm{j}}} t_{\mathrm{rk}}$$

We introduce

x_{jk}, $j=1,\ldots,n$, $k=1,\ldots,m_{pf}$,

the binary decision variables having value 1 if the storage point k is assigned to the product j and 0 otherwise.

The problem becomes an “assignment”: assigning products to silos



m_1=3 pear

m_2=1 apple

m_3=1 banana

Storage location assignment problem

$$\min \sum_{j=1}^{n} \sum_{k=1}^{m_{\mathrm{pf}}} c_{\mathrm{jk}} x_{\mathrm{jk}}$$

subject to

$$\sum_{k=1}^{m_{\mathrm{pf}}} x_{\mathrm{jk}} = m_{\mathrm{j}}, \qquad j = 1,\ldots,n$$

$$\sum_{j=1}^{n} x_{\mathrm{jk}} \le 1, \qquad k = 1,\ldots,m_{\mathrm{pf}}$$

$$x_{\mathrm{jk}} \in \{0,1\}, \qquad j = 1,\ldots,n, k = 1,\ldots,m_{\mathrm{pf}}.$$

Creating storing locations in SAP

https://www.youtube.com/watch?v=Js7KqRFQEX8