

CASE LOGISTICS

Transportation of items from the company's Distribution Center to redispach points. There are numerous possibilities of hiring / allocation of trucks considering the delivery capacity and other parameters.





Scenario

Transportation of items from the company's Distribution Center to redispatch points. There are numerous possibilities of hiring / allocation of trucks considering delivery capacity (volume and weight of cargo)



Challenge

Find the best combination for truck type (size, cost, maximum load, availability) to meet deliveries from the Distribution Center to Redispatch



Variables

- Cargo volume
- Load weight
- Distance
- Days for delivery
- Truck availability
- Possible itineraries
- Tolls and costs
- Space in Redispatch Points

Case

MATHEMATICAL MODELS – LOGISTICS



Action

A mathematical model and software were built.

Modelo de otimização

$$\begin{aligned} \min \quad & \sum_{t=1}^T \sum_{c=1}^C \sum_{f=1}^F \sum_{i=1}^N CT_{cft} x_{cfti} + \sum_{i=1}^N CT_{max} s_i \\ \text{s.t.} \quad & \sum_{t=1}^T \sum_{c=1}^C \sum_{f=1}^F x_{cfti} + s_i = 1; \forall i = 1, \dots, N; \\ & \sum_{f=1}^F u_{cft} \leq 1; \forall c = 1, \dots, B; t = 1, \dots, T; \\ & \sum_{c=1}^C \sum_{f=1}^F w_{cft} x_{cfti} \leq CP_{mi}; \forall i = 1, \dots, T; \\ & \sum_{c=1}^C \sum_{f=1}^F w_{cft} x_{cfti} \leq CP_{mfj}; \forall j = 1, \dots, m; t = 1, \dots, T; \\ & u_{cft} - OC_{CGH} \leq \sum_{i=1}^N w_{cfti} x_{cfti} \leq CGH_{cft} u_{cft}; \forall f \in F_2; c = 1, \dots, B; t = 1, \dots, T; \\ & x_{cfti} \leq z_{cfti}; \forall i \in I_j; j \in F_2; c = 1, \dots, B; t = 1, \dots, T; \\ & z_{cfti} \leq \sum_{m=1}^m x_{cfti}; \forall j = 1, \dots, m; f \in F_2; c = 1, \dots, B; t = 1, \dots, T; \\ & u_{cft} - EL_f \leq \sum_{i=1}^N z_{cfti} \leq EU_f; \forall f \in F_2; c = 1, \dots, B; t = 1, \dots, T; \\ & \sum_{c=1}^C \sum_{f=1}^F w_{cft} x_{cfti-1} \geq \sum_{c=1}^C \sum_{f=1}^F w_{cft} x_{cfti}; \forall 1 < i \leq T; \\ & x_{cfti} = 0; \forall i = 1, \dots, n; f \in F_2; c = 1, \dots, B; t = 1, \dots, T \mid t > DT_{im}; \\ & s_i = 0; \forall i = 1, \dots, n \mid i \in NR; \\ & x_{cfti} \in [0, 1]; \forall i = 1, \dots, n; f \in F_2; c = 1, \dots, B; t = 1, \dots, T; \\ & u_{cft} \in [0, 1]; \forall f \in F_2; c = 1, \dots, B; t = 1, \dots, T; \\ & z_{cfti} \in [0, 1]; \forall j = 1, \dots, m; f \in F_2; c = 1, \dots, B; t = 1, \dots, T; \\ & s_i \geq 0; \forall i = 1, \dots, n. \end{aligned}$$



Software de otimização



Romaneios otimizados



Results

- Reduction of about 40% of transportation cost
- Payment of the project in less than one month of the operational projects

Results

MATHEMATICAL MODELS – LOGISTICS