# SPC DEPOT – Smart Parking Container Depot

## Summary

The project aims to develop an innovative modular information system for container depots management. It is intended that the technology is accessible via web and multi-location support. Another area to explore is the customer portal, and integrate it into the platform, with visibility in the operation of their equipment and cargo, and monitoring of process performance.

The project foresees the production of a software prototype, using sophisticated, complex and innovative algorithms that will serve as demonstrator of the potential of this product in the advanced management of container depots.

This pioneering system will allow the detailed treatment and the most modern management, automatic, intelligent and efficient different data, whether operational or accounting, promoting more automated operations, in real time, and cost rationalization.

A container depot performs several tasks, namely: Washing and repair of empty containers, Service of refrigerated shipping containers, Storage of empty containers, Rail / truck intermodal services, Cargo deconsolidation or Cross-docking.

## Vision and Objectives

The platform has three main pillars:

- Client Interface - Aimed at facilitating the way clients schedule the inbound and outbound of empty containers and how they can track movements and approve their repairing and cleaning.

- Management Interface - The centralized information, via cloud, allows a wide and immediate knowledge of the state of the depot and of the individual containers; different stakeholders (clients, managers, operational personnel, and back office personnel) have different editing and information clearance.

- Optimisation module - With the objective of minimizing the costs of the operations through finding a consistent container storage policy, aided by algorithms adequate to the depot characteristics.

## Optimisation Problem

The key problems found in a container depot were containers' large dwell time uncertainty, unforeseeable costumers' needs, space constraints with non-flexible storage arrangements, large number of unproductive movements due largely to customs' peculiar circumstances and costumers' compliance, or machines' movements lacking systematic optimization.

Hence, IST is developing an optimisation problem whose objectives are:

- Decrease the overall operational costs.

- Increase the service level.

- Decrease the number of unproductive movements, by predicting containers' dwell time, improving storage policies, heuristic parameters optimization through simulation (possible application of metaheuristics).

- Decrease the overall distance travelled by the machines.

- Order the operations to be performed by the machines in the most efficient way.

The following scheme (Figure 1) presents the overall approach on the ongoing development of the optimisation problem.

## Next Steps

The on-going and next steps include the following actions:

- Development of a simulator to provide a platform for optimization of the weights (w) in the attractiveness function.

- Parameter analysis in practical environment (to obtain feedback from operational personnel in the depot).

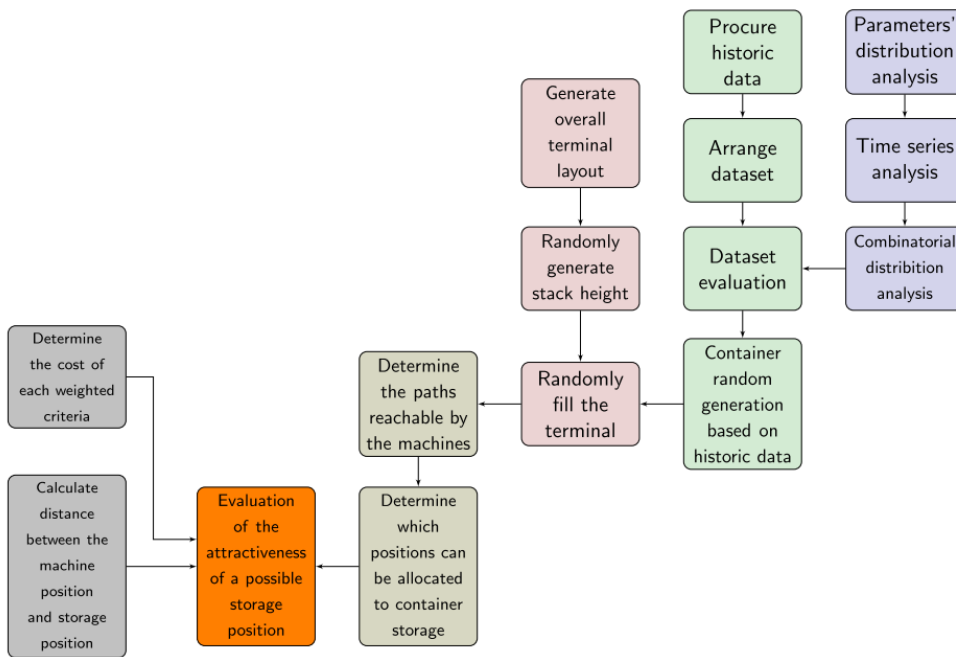- Development of an easier to use R-based tool for testing in a practical environment.

*Figure 1. High level approach to the development of the otimisation problem.*