

Deployment scenario

ARL Berthing Planner

Berthing Planner for Marine Container Terminals

Overview

The deployment scenario describes how a marine container terminal operator applies ARL's Berthing Planner in his planning function. The container terminal is a marine facility, where cargo containers are loaded onboard, and discharged from, container vessels using movable quay cranes on the berth, or using vessel mounted or barge mounted cranes. Cargo containers are transhipped to other vessels or transferred to or from barges, rail-cars or trucks. The operations planning group focus on high productivity, efficient operations and maintaining maximum flexibility for dealing with unforeseen operational events. A large part of the success lies in proper planning including berth planning and planning of physical and human terminal resources related to vessels' changing ETA/ETD.

Berth Planning

A busy container terminal with a long quay side operates around the clock. In the constantly changing environment they have to accommodate their plans to changing vessel schedules, agreements with vessel operators, and own technical procedures and limitations. The goals of the berthing planning group is to utilize the available berth space, meet all contractual commitments and minimised vessels' time in port by securing high productivity, whilst planning for work as efficiently and cost effective as possible.

The tool is setup and the planning horizon defined. The planning process runs in WYSIWYG (what-you-see-is-what-you-get) mode with a drag-and-drop interface. The tool supports fully automated mode, where all berthing positions are selected by the operator's single click, as well as semi-automated mode, where certain vessels are locked and the remaining vessels are planned automatically. If insufficient berthing space is available in certain time zones, the operator is prompted for action. The operator distributes the plans to other stakeholders by email in desired format.

Minimizing Yard Driving Distances

Efficient yard operation entails, that vessels are located as close as possible to the yard blocks containing the containers to be loaded, and blocks assigned for discharge containers, reducing the mileage driven by the yard equipment (prime movers or straddle carriers), saving time, fuel, human resources, and equipment wear and tear. Calculating the driving distance necessary in order to service all vessels in the planning horizon in an environment of changing ETA/ETDs, is impossible by human force only

Having reflected the yard driving rules in the Berthing Planner, and setup the TOS (Terminal Operating System) interface for receiving container yard locations, the optimization add-on's algorithm copes with this multi-dimensional non-linear optimization task. The tool distributes all vessels within a few seconds automatically resulting in an as low as possible yard mileage, whilst respecting all known planning constraints. In manual mode a live counter calculates the current mileage generated by the actual berthing plan.

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Managing Sea Side and Berth Constraints

The terminal operator plans for berthing while taking physical constraints into account, including sea side conditions like different draughts at various berthing ranges and tidal changes, and shore side constraints like berth repairs and scheduled or unscheduled crane repairs. The planning group needs to take these constraints into account when doing updating the berth plan, and need to re-plan in case of unscheduled constraints.

The berth configuration is reflected in the Berthing Planner setup with all characteristics like berth names, draught, bollards, tides and more. The Sea Side Constraints feature visually displays the draught available for all vessels within the planning horizon. Berth or cranes under repair are displayed as “berth unavailable zones” in time and space using the Berth Constraints feature. Berth planning takes the constraints into account, when automated re-planning takes place, as well as visually towards the operator for manual planning.

Quay Crane Planning

The availability of quay cranes impacts vessels’ load and discharge operation speed and therefore the duration of vessels’ port stay. The terminal planning group assign appropriate quay cranes to individual vessels in accordance with the physical characteristics of the cranes, like cranes reach as well as contractual agreements with the lines.

In the Quay Crane planner add-on the characteristics of the quay cranes are setup, both with limited berth mobility, and fully mobile or barge mounted cranes. The operator quickly assigns quay cranes to individual vessels in visual mode. The tool keeps track of cranes already assigned and only offers cranes, which are not assigned to another vessel within the same time slot. If a vessel is moved alongside the berth, only valid quay crane assignments are kept. The operator generates a quay crane assignment report for a specified time period, and distributes the report to his colleagues by email.

Berthing Planner Deployment Scenarios:

- Container Terminal
- Multi-purpose Terminals
- Bulk Terminal
- Oil & Gas Terminal
- General Cargo terminal
- Ro-Ro & Ferry Terminal
- Cruise Line Terminals

Re-plan when ETA/ETD changes

The berthing plan need to be re-worked as a consequence of vessels’ adjusted ETA/ETDs. The operator faces challenges re-working the plan frequently as each iteration of re-work requires many considerations.

The Berthing Planner imports the vessels schedules from existing data sources, like the terminal TOS or other sources, via a neutral XML file interface. All schedule changes are automatically read by the Berthing Planner and the berthing plan is refreshed any time by the operator by a single click automatically considering all the constraints known by the Berthing Planner, at choice evaluating multiple berthing scenarios in parallel. The re-planning function takes place as frequently as desired by the planning function with minimal manual effort applied.

Planning Terminal Resources

The terminal manage or plan for a number of physical and human resources prior to, or during vessels’ arrival and departure, or throughout the duration of the port-stay.

The Resource Planner Add-on contains a set of pre-defined container terminal resource types, as well as some generic resource types, ready for use. The pre-defined resources are easily extended by the operator. The container terminal resource types include RTGs, straddle carriers, prime movers and stevedores, and the generic terminal resource types include tugs, bunkers barges, inspectors and customs officers. The resources are visually assigned to vessels, related to the ETA/ETD, or organized in pre-set shifts. Resource assignment reports are distributed to stakeholders or exported in XML-format for detailed resource planning in an external system, f.ex. an LMS.

The ARL Berthing Planner supports the operations of a container terminal operator in the berthing and resources planning process, allowing the operator to automate the planning process, optimize yard operations and evaluate consequences of multiple berthing scenarios against constraints, and to collaborate electronically with external human functions and IT systems without retyping.