

DigLogs

Functional and Technical Requirements for Pilot Project WMS4.0

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1 General information

1.1 Purpose

WMS 4.0 foresees a Decision Support System, the so called DSS, that will be linked to SDAG Warehouse Management System (WMS), to enable the interconnection between Multimodal Transport Operators (MTO), terminal operators and carriers in one single digital access platform allowing them to be timely informed and synchronise their delivery schedules, thus optimising the final leg of the intermodal transport chain (i.e. from the SDAG terminal to the final destination) from both operational, economic and environmental perspectives.

The purpose of this document is to provide sufficient information to allow the development, maintenance, hosting and use of the on-line WMS 4.0 application. This document explains its high-level technical and functional requirements and provides information about the roles and responsibilities needed to support the platform.

1.2 Scope

Whilst the pilot project-level goals and desired functions are fully detailed within the *Deliverable 5.1.1 WMS4.0*, which the reader should refer to, this document outlines the specific functional, performance, security and other system requirements to be complied with to ensure an efficient and smooth deliver of the WMS 4.0 web application.

WMS 4.0 pilot will:

- deliver an interface platform among key actors, such as MTOs, Inland terminal and truck drivers
- Import data records from MTOs to monitor and update on goods delivery statuses
- Import data records from Inland terminal to monitor and update on storage levels
- Develop a DSS making use of a purposely developed **Truck Appointment System (TAS)**, implemented in the form of an open-source platform providing optimised transport arrangements for last mile transport segments by making use of specific algorithms and coordinated data – as outlined above – gathered from multiple stakeholders; the DSS will also enable a continuous communication exchange between the MTO, inland terminal and truck operators, and will therefore also be pivotal in supporting the terminal manager in the optimum scheduling of their operations.

1.3 Acronyms and/or definitions

API	Application Programming Interface, a set of protocols or standards for communicating with web-based applications
WMS	Warehouse Management System
SDI	Spatial Data Infrastructure
DSS	Decision Support System
CSS	Cascading Style Sheets; language used to describe the presentation of a document written in markup language, e.g., HTML
Git version control	Free and open-source version control system
HTML 5	Hypertext Markup Language the fifth and current version of the HTML standard
ISP	Internet Service Provider
JavaScript	Programming language used extensively in website development
jQuery for JavaScript	JavaScript library
JSON format	Data-interchange format
XML	Extensible Markup Language
MySQL	Open-source database management system
RESTful API	An API that uses a standard set of HTTP requests
TAS	Truck Appointment System

2 Existing state of the art

Currently, there is no common Spatial Data Infrastructure (SDI) and on-line electronic database containing all information needed to improve intermodal freight transport operations, nor to plan, schedule, report and analyse last mile freight deliveries via using a common integrated DSS. WMS 4.0 aims to reduce the redundancy and the lack of data and data dispersion by executing a common data collection exercise and using a DSS to improve the operational efficiency of the whole intermodal transportation chain. Within this context, the development of the TAS will be critical functionality to avoid congestion issues at inland terminals and reduce waiting times for incoming truck drivers.

3 Functional requirements and user impacts

3.1 Summary of Functions

WMS 4.0 requires a technology-based solution for a wide data collection management system whose primary functions include:

- Data Accessibility
- Entity Profile Administration
- User Accounts Management
- Data Integrity
- WMS 4.0 Administration Panel
- DSS (Decision Support System)
- System Security
- Links to related systems/external compliance database
- Entities and related data

To accomplish the above articulated needs, WMS 4.0 requires a wide data collection and management effort including the execution of the following base functionalities:

1. Data Accessibility

- Entity profile (MTO, Inland Terminal or track vehicle) will be password protected
- Profile's data will be available for direct system to system access via HTTP API
- System will track the date and time of last API data pull

2. Entity Profile Administration

- Entities (MTO, Inland Terminal or track vehicle) will be able to submit online request to have their profile added to WMS 4.0
- Authorized users will be able to update the entity's profile directly on the website

3. User Accounts

- User accounts will be password protected
- Password reminders and resets will be handled by the website
- Accounts will be tied to MTOs, Inland terminal managers or truck drivers, with the exception of those belonging to system administrators

4. WMS 4.0 Administration Panel

- System will provide designated WMS 4.0 administrators with additional rights
- Administrators will be able to create new entities and approve new profiles
- Administrators will be able to create, edit and disable user accounts
- Administrators will be able to create, edit and delete truck appointment slots

5. DSS - Decision Support System

- It will identify and locate free slots – serving the needs of MTOs to connect with available truck drivers – also according to previously scheduled appointments
- MTOs will be able to view an elaborated list of truck vehicles available for the last mile delivery segment based on freight volumes and destinations, while taking into account results from previous bullet
- It will allow monitoring and updating of residual storage capacity at the SDAG inland terminal and manage its process information

6. System Security

- Public will have read-only access to the website
- API will provide read-only data access
- Profile editing will require password-protected user account with manually assigned rights
- Consideration will be given to potentially hiding email address from public view to avoid spam senders

7. Links to related systems/external compliance database

- MTOs will be able to update their data using JSON/XML
- Truck drivers will be able to update their location data and/or communicate their expected arrival time to the SDAG inland terminal
- Inland terminal will be able to update their stocked volumes

8. Entities

The involved entities and their attributes will be as follows.

MTO:

- Identification nr
- Name
- Address/Headquarter
- Email
- Phone
- Origin
- Destination
- ETD
- ETA
- Type of goods
- Freight volumes
- Policies

Truck vehicles:

- License plate nr
- Description
- Type of vehicle
- (Residual) load capacity
- Pre-scheduled destinations
- Average and/or unit costs

Inland Terminal

- Name

- Address
- Volume storage
- Incoming vehicles
- Outgoing vehicles

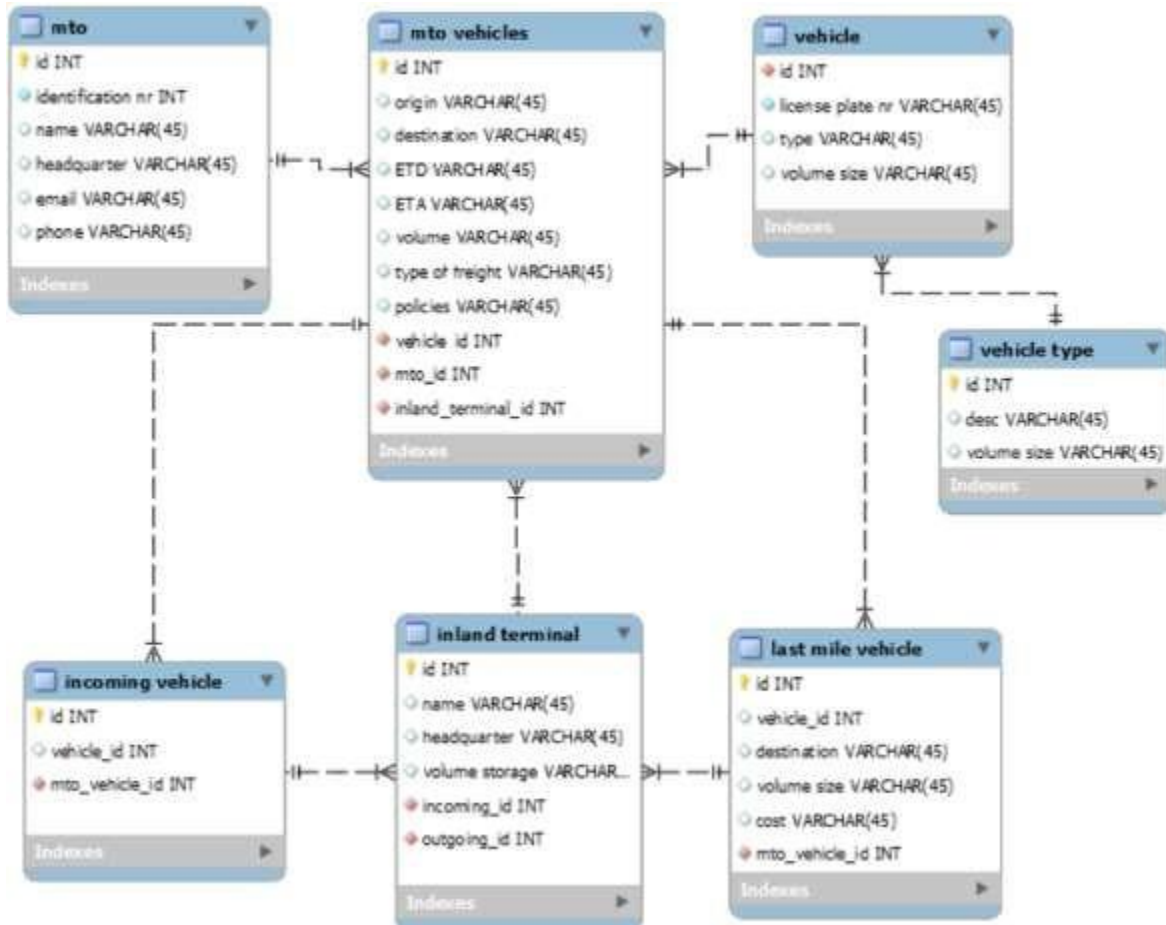


Figure 1. Database design schematisation

3.2 Truck Appointment System (TAS)

Booking systems have been long used for many activities and business sectors. By allocating specific time slots to trucks via a booking system, the terminal operator will be able to optimize the flows of incoming vehicles (specifying the gate, vehicle inspection, potential parking spot

where to wait, etc.); resources utilisation and operations management; communication between the terminal and the drivers informing on ETA/ETD/delays.

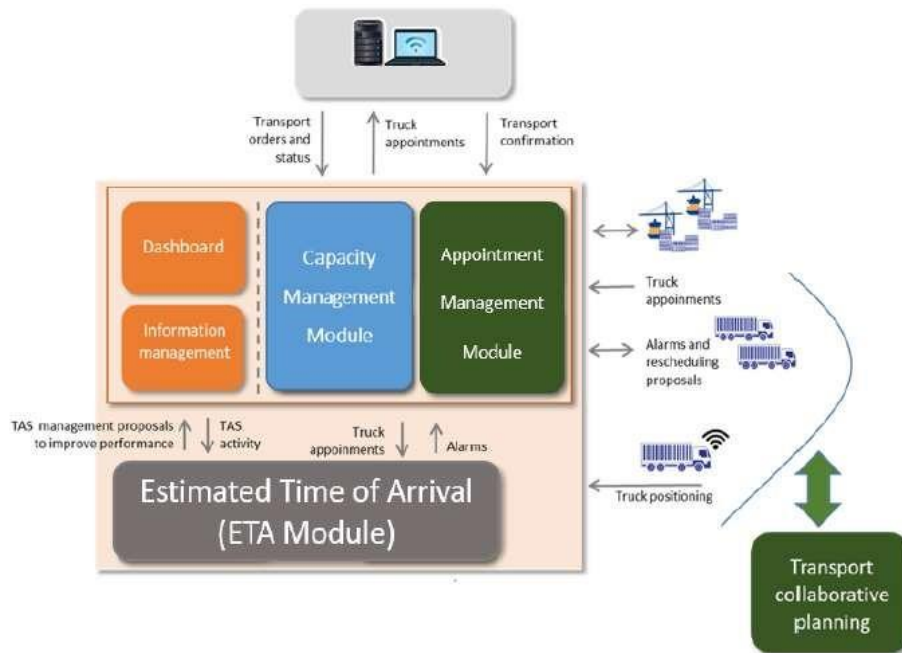


Figure 2. Schematisation of the TAS functionality

Once all required arrangements between MTO and truck drivers have been solved, the following booking creation operations can be executed on the WMS4.0 website:

1. Select terminal (scroll-down menu)
2. Select queue (scroll-down menu)
3. Select timeslot (date, time from calendar)
4. Uploading of truck data (manual feed/pre-select saved vehicles as scroll-down list)
 - Transport order number
 - Vehicle plate number
 - Vehicle country
5. Uploading of driver's data (manual feed/preselect saved vehicles as scroll down list)
 - First Name and Last Name
 - Phone number
 - E-mail

4 Performance requirements

4.1 Accuracy and validity

The system will employ numerous data quality techniques, including but not limited to:

- Input masks
- Dropdown lists with standard response
- Record data completeness responses
- Basic data logic warning
- Manual review and validation of new draft entity profiles by a designated WMS 4.0 administrator prior to profiles being added to the system
- Booking system
- Validation error if the user entry doesn't match the mask

4.2 Timing and capacity

The system is intended to be available online 24 hours per day, 365 days per year with the exception of scheduled and parentified system downtimes, if needed.

Data will become immediately available for use, except for new profiles, which will be pending in queue for validation by an WMS 4.0 administrator; for instance, if a new MTO have to register, the profile will be validated before using the system.

4.3 Failure contingencies

The system is non-critical. Temporary inaccessibility, even up to several days, will not create congestion of traffic flows. The host site for the platform will be chosen so as to include data backup capabilities and protocols. It is expected that with the use of an IPS/hosting provider the downtime will be minimal or non-existent.

5 Additional system requirements

5.1 System description

WMS 4.0 platform will consist of a web-based, centralized database of a booking system, entity profile and DSS to be utilized in the support of ongoing entity monitoring activities.

Generally, all users will provide direct input into the system and output reports will also generated directly by the system. However, to ensure growth ability, flexibility is also required for both input and output modes.

5.2 Systems integrations

An additional desired functionality is to integrate with other external systems. WMS 4.0 platform will be desired to have the capacity to import and export data without ongoing support by MTOs or Inland terminal. To this end, the system will expose a REST- FUL API via HTTP to provide data in JSON/XML format for external consumer access.

5.3 Customization and flexibility

The system will be flexible and customizable to suit stakeholders' needs. The complexity of the system will limit the customizations available via the administrative interface. However, the programming code should be structured to make customization a reasonably accessible task for programmers. PP2 will have access to the code repository to make such changes as desired.

5.4 Sustainability and open-source plans

The platform will be developed using industry standard web development tools and practices. PP2 will have access to the source code for the software and may work with other parties to extend, enhance, or edit the system collaboration with SDAG provided the changes and enhancement are committed to the GitHub repository or in another mutually convenient repository.

6 Software aspects

WMS 4.0 web application will be built using an open-source web scripting language. Data will be stored in MySQL database, also open source. The user interface will be developed in HTML5, CSS3, and JavaScript, however this will be also validated with the external supplier.

The application code will use Git version control, and all commits will be archived in a designated repository. Source code will be stored on a mutually agreed platform.



Figure 3. Example of login page

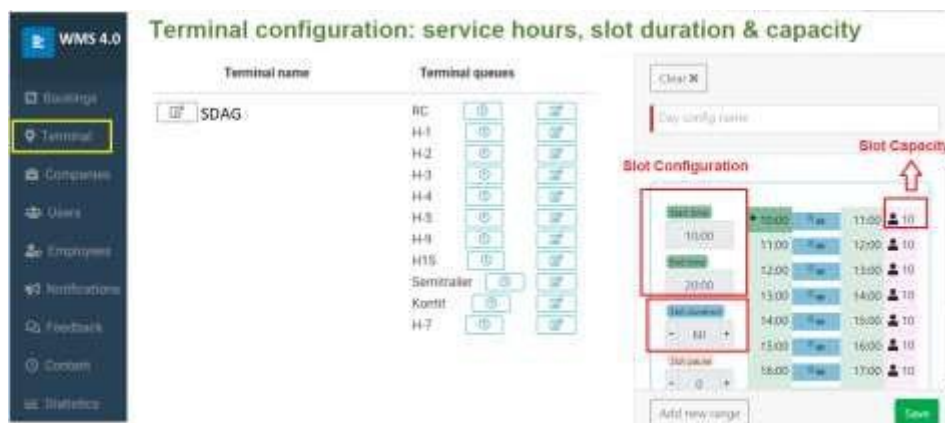


Figure 4. Example of slot configuration page



Figure 5. Example of MTO profile page

WMS 4.0 Truck Appointment System (TAS)

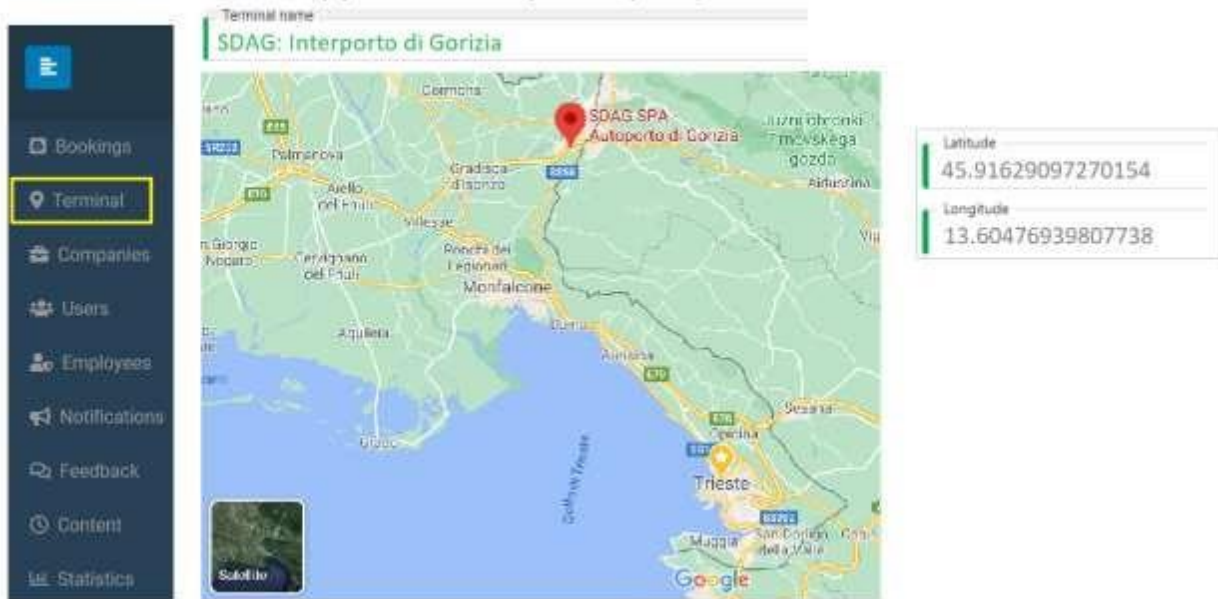


Figure 6. Example of Truck Appointment System page