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Output 5.2 – Model architecture for Port Community System (PCS)

Work Package 5

Activity 5.3. Port IT Community System

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Table of abbreviations

Abbreviation	Meaning
AIS	Automatic Identification System
API	Application program interface
AtoN	Aid to Navigation
ECDIS	Electronic Chart Display and Information System
ENI	European Number of Identification
ERDMS	European Reference Data Management System
ERI	Electronic Reporting International
ERINOT	Electronic Reporting International Notification
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
GUI	Graphical user interface
ID	Identification
MMSI	Maritime Mobile Service Identity
PCS	Port community system
PDF	Portable Document Format
TCP	Transmission Control Protocol
URL	Uniform Resource Locator
VAT	Value Added Tax
WMS	Web Map Service

1 Introduction

Port Community System (PCS) is an innovative electronic platform that connects multiple systems operated by a variety of organizations within a port area. PCS manages, optimizes and automates port and logistics processes through a single submission of data and connecting transport and logistics chains. It enables intelligent and secure exchange of information between port community members. The model architecture displays the technical features of the PCS and it can easily be transferred across the Danube region.

A modular Port Community System is being implemented within the framework of Activity 5.3 of the DAPhNE project and several modules shall be developed and tested within the pilot action. For the participating Danube ports, this shall provide an affordable alternative to commercial Port Community Systems, normally designed for large maritime ports.

The system shall optimize port processes by digitalizing them (instant delivery of necessary information), reusing the data already available within the system (to avoid unnecessary repetitive filling of forms) and smart and secure data exchange (where only the appropriate port actors have access to each of the available data fields).

Eight modules are specified, whereas three of those shall be developed within the scope of the pilot action:

- Core module (user management & data layer),
- Cargo module,
- Tracking and tracing module.

For the rest of the five modules, functional and technical specifications is provided in chapters 5 – 9.

Security of data shall be a high priority and includes protection of data from unauthorized access by implementing a high quality user management system and using secure communication protocols (HTTPS/SSL). These security measures and principles shall be specified and implemented throughout the Port Community System and all future modules.

The pilot action will be ongoing during September - December 2018 in ports of Enns (EHOO), Bratislava (Public Ports, jsc), Novi Sad and Smederevo (Port Governance Agency). After project lifetime, the application will be running should the ports decide they want to, however, the application will be located on their servers, rather than on the developer's server.

2 Core module (User management & data layer)

User management

A centralized user management system that allows a single point of managing user accounts, roles and access rights.

User shall have a single account for all modules (single sign-on).

All modules shall use the services provided by this module to perform authorization and authentication of the users as well as retrieval of user access rights and user roles.

A preliminary list of user groups for each PCS (in case there is no need for the user or admin account for an entity it shall be removed during the specification writing process):

- System administrator
- Port authority user
- Port authority administrator
- Shipping company user
- Shipping company administrator
- Port operator user
- Port operator administrator
- Shipping agent
- Consignee
- Ship representative (captain, etc.)

Data layer

The data layer shall take care of gathering and distribution of data between the layers. It shall be able to decode incoming messages, store the decoded data (i.e. data contained in AIS and ERINOT messages) and make this data available to authorized users.

The functionality includes writing of the data and retrieving existing data from the system, for use within specific modules by various types of users. This means that only certain types of users shall be able to submit and/or retrieve certain sets of data (i.e. only the ship owner can submit certain ship related data and the port authority can only access a specified subset of available data).

Other PCS modules shall send requests to the data layer in order to get the required data. They shall include user authentication and shall receive only the data the user making the request is authorized to receive within the response.

An update of the data layer would be required to add support for new data sets, external message types, etc.

2.1 Backend

The solution shall use the OpenID Connect for user authentication, with an own implementation of the OpenID Provider. The full specification of the OpenID Connect standard can be found at http://openid.net/specs/openid-connect-core-1_0.html.

The following backend functionalities shall be implemented:

1. Authentication request – the function allows the client to receive a valid token from the OpenID provider, which is required to access the system and the data.
2. UserInfo request – the function allows the client to request and receive some basic information about the user from the OpenID provider
3. Get data (API method set) – general requirements for API (application program interface) methods that are used to retrieve data.
4. Filtering data – the process which takes the data set and removes any data fields for which the user doesn't have sufficient access rights, before sending the data back to the user or storing data sent by the user within the database.
5. Post data (API method set) – general requirements for API methods that are used for inserting new data, updating existing data or deleting existing data.

PCS_FUNC_201 - Authentication Request

Precondition	• OpenID provider is functional and accessible
Requirement/Description Main Success Scenario	1. The client (relying party) sends the authentication request to the OpenID provider. 2. The OpenID provider checks the authentication request data. 3. If the check is successful the OpenID provider obtains authorization and sends the ID Token/Access Token to the client.
Postconditions	The client can receive the Access/ID Token from the OpenID provider.
Alternate scenarios	3a. If the check is not successful, the authentication fails, the client is unable to get a token and obtain any data.
Error scenarios	

PCS_FUNC_202 - UserInfo Request

Precondition	• OpenID provider is functional and accessible
Requirement/Description Main Success Scenario	1. The client sends the UserInfo request, containing the ID token/Access token to the OpenID provider. 2. The OpenID provider checks the validity of the token. 3. If the token is valid the OpenID provider sends the UserInfo response containing the requested data. 4. The received UserInfo contains a subset of the following dataset, depending on the data requested: a. Email – user's email, used as a username b. Name – user's full name

	c. Organisation – name of the organisation the user belongs to d. User roles list – a list of assigned user roles e. Vessels list – a list of vessels for which the user has received access rights
Postconditions	The client can request and receive the UserInfo data contained within the OpenID provider.
Alternate scenarios	3a. If the token is not valid, a response is sent to notify the client that the token is no longer valid.
Error scenarios	

PCS_FUNC_203 – Get data (API method set)

Precondition	• User's token is available • A valid request has been made using the application program interface
Requirement/Description Main Success Scenario	1. The system checks the validity of the user's token. 2. If the user's token is valid, the system performs the query on the database for the requested data entity (i.e. user, cargo report, etc.). 3. The resulting entity dataset is filtered according to the user's access rights (PCS_FUNC_204) 4. The filtered dataset is sent back in a response.
Postconditions	PCS modules can retrieve appropriate data, filtered according to the user's access rights, to display to the users.
Alternate scenarios	2a. If the token is invalid, an error response is sent.
Error scenarios	

PCS_FUNC_204 – Filtering data

Precondition	• A request is being processed
Requirement/Description Main Success Scenario	1. For each data field, the system checks if the user which is trying to access data has read access rights according to any of the following: a. Read or write access right (depending on the type of method, i.e. get needs read, update need write) obtained by the assigned user role(s) b. Read or write access right (depending on the type of method, i.e. get needs read, update need write) obtained through owning a vessel or permission granted by the owner directly 2. If the user has read access rights for the data field it is included in the resulting data set.
Postconditions	A dataset containing only the data fields which the user has access rights to is returned.
Alternate scenarios	2a. If the user doesn't have the access rights for the data field it is excluded from the resulting data set.
Error scenarios	

PCS_FUNC_205 – Post data (API method set)

Precondition	• User's token is available • A valid request has been made using the application program interface
Requirement/Description Main Success Scenario	1. The system checks the validity of the user's token. 2. If the user's token is valid, the system checks each of the data fields of the dataset the user is trying to update (insert, update or delete) and filters the data according to the user's access rights (PCS_FUNC_204). 3. The system performs the update of the entity within the database. 4. The response is sent, containing the status code.
Postconditions	Users can update the data fields for which they have access rights.
Alternate scenarios	2a. If the token is invalid, an error response is sent.
Error scenarios	

2.2 Application program interface

The following API functions shall be implemented:

1. Post arrival/departure – an API method which allows the Tracking and tracing module to store arrivals/departures in the port area that are automatically detected via the AIS system
2. Get arrival/departure – an API method that allows PCS modules to retrieve arrival/departure data from the database (i.e. Cargo module to generate arrival/departure report drafts)
3. Entity change – an API method used to modify any supported entity within the database. The data is first filtered according to the user's rights and then stored in the database.
4. Entity search – an API method used to retrieve any supported entity within the database which corresponds with the user's search request. The data is first filtered according to the user's rights and then sent back to the user that requested it.
5. Entity delete – an API method used to mark the selected entity as deleted within the database.
6. Reference data search – an API method that allows PCS modules to retrieve a list of reference data (i.e. cargo types). The user can then select cargo types from this list.

PCS_FUNC_206– Post arrival/departure

Precondition	• The module that is calling the API method is logged in and authenticated

Requirement/Description Main Success Scenario	1. The PCS module calls the postArrivalDeparture API method with the following parameters: a. type: set to either 'arrival' or 'departure' depending if the vessel has been registered to enter or exit the port area b. dateTime – date and time of arrival/departure c. mmsi – vessel's MMSI number 2. The arrival/departure data of the vessel is stored in the database. 3. An event is fired inside the Core module to notify all subscribed modules (i.e. Cargo module for creation of automatic arrival/departure report drafts - PCS_FUNC_310)
Postconditions	Arrival and departure of a vessel is recorded in the database and can be accessed by authorized applications using the getArrivalDeparture (PCS_FUNC_207)
Alternate scenarios	
Error scenarios	

PCS_FUNC_207 – Get arrival/departure

Precondition	• The module that is calling the API method is logged in and authenticated
Requirement/Description Main Success Scenario	1. The PCS module calls the getArrivalDeparture API method with the following parameters: a. type – 'arrival' or 'departure', if not provided both shall be returned b. mmsi – vessel's MMSI number, if not provided the result set shall contain data sets for all recorded vessels c. dateFrom – date and time that marks the beginning of the time period for which requested data sets. d. dateTo – date and time that marks the end of the time period for which requested data sets. Optional, if not provided it shall be set to current date and time (now). 2. The response contains all data sets that conform to the filtering parameters provided in the request.
Postconditions	Authorized PCS modules can acquire data on recorded arrivals/departures and further process that data.
Alternate scenarios	
Error scenarios	

PCS_FUNC_208– Entity change

Precondition	• The user's token that the PCS module shall use for authorization is valid • The user has performed an action that call this specific API method
Requirement/Description Main Success Scenario	1. A PCS module calls the entityChange API method with the token from the user that made the request in the header and the following parameters:

	a. entityType – lets the system know which database table it needs to update, i.e. vessel, arrival/departure report, etc. Mandatory parameter. b. entityData – object containing key: value pairs for all the columns the entity contains 2. The provided data set is filtered according to the user's access rights (PCS_FUNC_204) 3. The filtered data set is stored in the database (an existing entity is updated, the fields for which the user didn't have access rights remain unchanged).
Postconditions	The PCS modules can modify existing entities and create new ones, according to the user's access rights.
Alternate scenarios	
Error scenarios	

PCS_FUNC_209 – Entity search

Precondition	• The user's token that the PCS module shall use for authorization is valid • The user has performed an action that call this specific API method
Requirement/Description Main Success Scenario	1. A PCS module calls the entitySearch API method with the token from the user that made the request in the header and the following parameters: a. entityType – lets the system know which database table it needs to query, i.e. vessel, arrival/departure report, etc. Mandatory parameter. b. filter – an array of conditions by which the result set is to be filtered. Each element of the array represents a single condition, implemented as an array of either two or three elements: i. equals – a condition that uses the equals operator doesn't need the operator to be provided, instead only the columnName and value are provided as a two elements array. ii. other – a condition that uses any operator, provided using a three element array in the following order: 1. columnName 2. operator – common SQL operators: '==', '<=', '>=', '<', '>', 'LIKE' and 'IN' 3. value – single value, IN operator is an exception where an array needs to be provided. c. orderBy – array where each element is formated as "columnName direction". The column name is mandatory and can be followed by a space and the "asc" or "desc" keywords to indicate the direction of the sorting.

	2. The system queries the database using the provided parameters. 3. The resulting data set is filtered according to the user's access rights (PCS_FUNC_204) 4. The response containing a filtered resulting data set is sent back to the requesting party.
Postconditions	The result set which contains only the entities of the requested type that match the other parameters is sent in a response.
Alternate scenarios	
Error scenarios	

PCS_FUNC_210 – Entity delete

Precondition	• The user's token that the PCS module shall use for authorization is valid • The user has performed an action that call this specific API method
Requirement/Description Main Success Scenario	1. A PCS module calls the entitySearch API method with the token from the user that made the request in the header and the following parameters: a. entityType – lets the system know which database table it needs to query, i.e. vessel, arrival/departure report, etc. Mandatory parameter. b. entityId – ID of the entity that is to be deleted 2. The system checks if the user has sufficient access rights to delete the provided entity (PCS_FUNC_204). 3. If yes, the entity record is marked as deleted in the database.
Postconditions	Entities can be marked as deleted in the database in case of sufficient access rights.
Alternate scenarios	3a If no, no changes are made and an error response is sent.
Error scenarios	

PCS_FUNC_211 – Reference data search

Precondition	• The core module is loaded with the requested reference data
Requirement/Description Main Success Scenario	1. A PCS module calls the referenceSearch API method with the following parameters: a. referenceType – name of the reference data type b. language – for reference data with multiple translations 2. A reply containing all the relevant reference data is sent back to the party that requested it.
Postconditions	PCS modules can access relevant reference data.
Alternate scenarios	
Error scenarios	

2.3 GUI functionality

The following GUI functions shall be implemented:

1. Login – login page of the module. Users cannot access any other functionality before properly authenticating themselves.
2. Core module header – header of the application, displayed on top of every page, allowing navigation through the Core module GUI, changing the language and logging out of the application.
3. Users page – user management page, where the administrator can search for users, create new users and modify or delete existing users.
4. Edit user page – the page where the administrator can input new or change existing data related to the user.
   4.1. User roles management section – the section of the Edit user page, where the administrator can add/remove user roles for the selected user.
   4.2. Vessels section – the section of the Edit user page, where the administrator can manage vessels which are owned by the selected user by adding new vessels, or removing already assigned vessels.
5. User profile page – a page where the user can modify his personal information, modify data for the vessels that he owns, assign access rights to other users for each of the vessels he owns and change his password.
   5.1. Edit vessel – allows the user that is an owner of the vessel to enter all the vessel's details. These details are then filled in automatically when authorized users are creating reports.
   5.2. Change password – allows the user to change his password
   5.3. Authorized users – allows the owner of a vessel to assign read and/or write access rights to other users.
6. Roles page – the page provides the administrator the tools to manage user roles that exist within the system. This is simply a place where new user roles can be created, existing ones edited or completely removed.
7. Data matrix page – the page allows the administrator to define which data fields are available to which user roles.
   7.1. Data matrix filter – allows the administrator to filter out the Data matrix table located below this filter. I.e. if he wants to change the access rights for a specific role, he can use the filter to only display that user role and make it easier to change the access rights.
   7.2. Data matrix table – a table where each row represents the access rights for a specific data field. Each column is a different user role, so if the administrator wants to change the access right to the Vessel's ENI number for the Port authority user, he'd find the Vessel ENI row and modify the Port authority user column within that row to have Read access rights.

PCS_FUNC_212 - Login

Precondition	• A user account is registered within the system
Requirement/Description Main Success Scenario	1. The user goes to the user administration module address using a modern internet browser. 2. A login form is displayed containing the following components: 3. Clicking the Login button initiates the login procedure – the system checks the user's credentials (PCS_FUNC_201). 4. If the username/password combination is correct, the user is logged in and is redirected to the page he was originally trying to access.
Postconditions	The user is logged in and authorized.
Alternate scenarios	4a. If the username/password combination is incorrect, a message is displayed, informing the user of the error.
Error scenarios	

PCS_FUNC_213 – Core module header

Precondition	• The user is logged in and authenticated into the Core module
Requirement/Description Main Success Scenario	The following links and data is displayed within the header: 1. Navigation links (visibility of each of these depends on the user's access rights for the core module): a. Users (PCS_FUNC_214) b. Roles (PCS_FUNC_217) c. Profile (PCS_FUNC_216) d. Data Matrix (PCS_FUNC_218) 2. Language flag icons – clicking the flag changes the GUI language to the appropriate language. Only the flag of languages configured within the application configuration are displayed here. All translations shall be contained in a single text file, easily translatable to any language. 3. Username – displays the username of the user currently logged into the Core module. 4. Logout link – clicking the link terminates the currently active session and the user is logged out of the Core module.
Postconditions	The user has access to the navigation links to pages he's authorized to see, can change the GUI display language and log out of the application.
Alternate scenarios	
Error scenarios	

PCS_FUNC_214 – Users page

Precondition	• A user with administrator privileges for the user management module is logged in and authenticated • The user has just logged in or has clicked the User management link within the applications header

Requirement/Description Main Success Scenario	1. The Users filter form is displayed on top of the page containing the following input fields: a. Search input box – free text input which upon detecting a changes filters the Users table to display only the rows containing the entered text. b. User role autocomplete box – dropdown select box containing all user roles defined within the system with an implemented autocomplete feature (the user can start typing to filter the list of options). Selecting a user role immediately filters the Users table to include only the users which have this role within the PCS. c. Clear button – clicking the button clears the filter by deleting the text from the Search input box and deselects the user roles selected within the User role autocomplete box. 2. The Users table is displayed below the filter, where each row represents a single user and contains the following data and actions: a. Email – user's email, used as a username within the system b. Name – user's full name c. Organisation – name of the organization the user belongs to d. User roles list – a list of user roles assigned to the user e. Edit user icon - opens the Edit user page, prefilled with the associated user's data (PCS_FUNC_215) f. Delete user icon – marks the user as deleted within the database. Any personal data is deleted, but other data is kept for statistical purposes. The user cannot log in and use the PCS. 3. New user button is displayed below the User's table. Clicking the button a blank Edit user page is displayed (PCS_FUNC_215).
Postconditions	The user has an overview of users within the system, can filter out the table using the filter and can create new users and edit/delete existing ones.
Alternate scenarios	
Error scenarios	

PCS_FUNC_215 – Edit user page

Precondition	• A user with administrator privileges is logged in and authenticated within the application. • The user has clicked the New user button or the Edit user icon for an existing user within the Users page.
Requirement/Description Main Success Scenario	1. A form containing input fields for the following data is displayed and prefilled with existing data (in case of modification of existing user): a. Email – input box with checks for validity of the provided email address. The email address is used as the user's username for login purposes.

	b. Name – input box for text c. Organisation – input box for text d. User roles management section (PCS_FUNC_215_1) e. Vessels section (PCS_FUNC_215_2) 2. The following buttons are available to the user under the input form: a. Save – stores any changes made into the database in case all mandatory fields are filled in and navigates the user to the Users page. b. Cancel – discards and changes and navigates the user to the Users page. c. Delete – marks the user as deleted within the database. Any personal data is deleted, but other data is kept for statistical purposes. The user cannot log in and use the PCS.
Postconditions	The administrator can create a new user account or modify an existing one, by changing details, assigning user roles and vessels owned by the user.
Alternate scenarios	1a. A form containing blank input fields is displayed. 2a. In case that not all mandatory fields are filled, and the user has clicked the Save button, he is warned that changes cannot be saved until all mandatory fields are filled in.
Error scenarios	

PCS_FUNC_215_1 – User roles management section

Precondition	• The user has visited the Edit user page
Requirement/Description Main Success Scenario	1. A box containing a list of all available user roles is displayed and is labelled by “Available user roles”. 2. The “Add >>” button – clicking it the selected “available user role” is moved to the assigned user roles list. 3. The “Remove <<” button – clicking it the selected “assigned user role” is moved to the available user roles list. 4. A box containing a list of all user roles assigned to the user being modified is displayed and is labelled by “Assigned user roles”
Postconditions	The administrator can assign/unassign roles for this specific user.
Alternate scenarios	
Error scenarios	

PCS_FUNC_215_2– Vessels section

Precondition	• The user has visited the Edit user page
Requirement/Description Main Success Scenario	The section contains: 1. A list of vessels which the user owns or has access rights to. Each table row contains the following columns and available actions: a. Vessel ID type b. Vessel ID number c. Vessel name d. Delete icon

	2. An input form to add a new vessel to the list: a. Vessel ID type dropdown menu – contains all supported vessel ID types (ENI, MMSI) b. Vessel ID number input box – contains validation for the selected vessel ID type. c. Vessel name – text input box d. Add button – adds the vessel to the list of user's owned vessels
Postconditions	The administrator can add/remove vessels to the list of vessels owned by the associated user.
Alternate scenarios	
Error scenarios	

PCS_FUNC_216 – User profile page

Precondition	• The user is successfully logged in and authenticated • The user has clicked the Profile link within the navigation bar in the application header
Requirement/Description Main Success Scenario	1. An input form is displayed, prefilled with user's data from the database, with the following input fields: a. First name – text input box b. Last name – text input box c. Organisation – text input box d. Vessels table – a list of all the vessels that the user owns is displayed with the following data fields and available actions: i. Vessel name (ENI) ii. Edit button – opens the Edit vessel form (PCS_FUNC_216_1) e. Authorized users table (PCS_FUNC_216_3) f. Save g. Cancel h. Change password link (PCS_FUNC_216_2)
Postconditions	The user can modify his information, add or remove users who have authorized for read/write privileges for the vessels they own or invoke changing their password.
Alternate scenarios	
Error scenarios	

PCS_FUNC_216_1 – Edit vessel

Precondition	• The user has clicked the Edit button next to a vessel in the Vessels table on the User profile page
Requirement/Description Main Success Scenario	1. A form with the following fields and buttons is displayed: a. Vessel name – text input b. ENI – text input with validation for ENI numbers

	c. MMSI – text input with validation for MMSI numbers d. Flag – autocomplete select box e. Vessel type – dropdown select box f. Power (KW) – text input (numbers only) g. Width – text input (numbers only) h. Length – text input (numbers only) i. Max Draught – text input (numbers only) j. Certificate valid until – date input with calendar widget k. Speed (km/h) – text input (numbers only) l. Save button m. Cancel button 2. The user can Store any changes he made using the Save button or discard them using the Cancel button.
Postconditions	The owner of the vessel can modify data about his vessel. This data can then be used by authorized users within other modules (autofill functionality, etc.).
Alternate scenarios	
Error scenarios	

PCS_FUNC_216_2 – Change password

Precondition	• The user is logged in and authenticated • The user has clicked the Change password link within his Profile page
Requirement/Description Main Success Scenario	1. A change password input form is displayed with the following 3 input boxes and appropriate buttons: a. Current password – password input box b. New password – password input box c. Confirm new password – password input box d. Save button e. Cancel button 2. The user can save the changes and change their password by clicking the Save button or discard any changes by clicking the Cancel button.
Postconditions	The user can change the password for their account.
Alternate scenarios	
Error scenarios	

PCS_FUNC_216_3 – Authorized users

Precondition	• The user is logged in and authenticated • The user has clicked the Profile link within the navigation bar in the application header
Requirement/Description Main Success Scenario	1. In case the user has at least one vessel he owns within the system, this section is displayed within the Profile page, containing a table of all users authorized for his own vessels and the Add button which displays the input form for a new authorization.

	2. The authorized users table allows the user to see which users are authorized for read/write permissions on data from the vessels he owns. The table contains the following columns and buttons: a. Username – email used as the username within the PCS b. Vessel – vessel(s) for which the user has received authorization c. Access rights level – level of authorization the user has received. d. Delete button – deletes the entry from the table and the database. 3. The input row, shown once the user clicks the Add button, allows the user to fill in all the data for a new authorization with the following input boxes and buttons: a. Username autocomplete select box – email of the user that is to receive the access rights. b. Vessel autocomplete select box – either a single vessel is selected or the option "all" which indicates a rule that is being created is for all vessels owned by the user. c. Access rights level – the level of authorization (read/write) d. Save button – stores the authorization in the database and it is immediately shown inside the table. e. Cancel button – changes are discarded
Postconditions	The user can manage read/write permissions of other users for data related to the vessels he owns.
Alternate scenarios	1a The section is not displayed in case the user is not marked as an owner of any vessels within the system.
Error scenarios	

PCS_FUNC_217– Roles page

Precondition	• The user is logged in and authenticated • The user has administrator rights • The user has clicked the Roles link within the navigation menu in the application header
Requirement/Description Main Success Scenario	1. A User roles table is displayed, containing the following data and action related to the user roles within the PCS application: a. User role full name – the full name of the user role. b. User role short name – shortened name of the user role, used as the user role's ID. c. Edit button – exchanges the table row with the input row (as described in 2.) prefilled with the associated row's data. d. Delete button – delete's the user role from the database and removes the row from the table. 2. The Add button is displayed. Clicking the button adds a new row to the table containing the following input fields and buttons: a. User role full name input box – the full name of the user role.

	b. User role short name – shortened name of the user role, used as the user role's ID. c. Save button – clicking the button stores the provided data within the database and the user role is displayed in the User roles table. d. Cancel button – the provided data is discarded and the input row is hidden from the GUI.
Postconditions	The administrator can manage all the user roles that can be assigned to users of the PCS, which are then used to determine the access rights for the data.
Alternate scenarios	
Error scenarios	

PCS_FUNC_218 – Data matrix

Precondition	• The user is logged in and authenticated • The user has administrator rights • The user has clicked the Data matrix link within the navigation menu in the application header
Requirement/Description Main Success Scenario	The Data matrix page contains of the following: 1. Data matrix filter – filters the contents of the Data matrix table (PCS_FUNC_218_1) 2. Data matrix table – matrix containing all the access rights of each user role defined within the system (PCS_FUNC_218_2) 3. Save button – in case the user has not applied any filters, clicking this button stores all changes made to the database and marks all cells as "unchanged". 4. Cancel button – discards all the changes made by the user to the Data matrix.
Postconditions	The administrator can manage access rights to all of data fields for all user roles defined in the system.
Alternate scenarios	3a In case the user has a filter applied, the filter is cleared so the user has an overview of all the changes that are going to be applied and is then asked to confirm saving the changes.
Error scenarios	

PCS_FUNC_218_1 – Data matrix filter

Precondition	• The user is logged in and authenticated • The user has administrator rights • The user has clicked the Data matrix link within the navigation menu in the application header
Requirement/Description Main Success Scenario	1. The autocomplete input box for user roles allows the administrator to only display the desired user roles within the Data matrix table. 2. Typing into the autocomplete input box immediately affects the Data matrix table

	3. Clicking the Clear button clears the Data matrix filter, making all the user roles visible at once.
Postconditions	The user can use the Data matrix filter to show only the user roles that he wants within the Data matrix table
Alternate scenarios	
Error scenarios	

PCS_FUNC_218_2 – Data matrix table

Precondition	• The user is logged in and authenticated • The user has administrator rights • The user has clicked the Data matrix link within the navigation menu in the application header
Requirement/Description Main Success Scenario	1. The Data matrix table has all data fields listed as labels in the first column of the table, while all user roles which conform to the applied Data matrix filter are listed as labels in the first table row (starting from the second column). 2. Each table cell (outside first row and column which represent labels) defines the access rights of the corresponding user role to the associated data field. The possible values shall be: a. Not available (N/A, the default value) b. Read access (R) c. Read and write access (RW) 3. Clicking on the table cell which defines an access right, changes the associated access right (by cycling through the possible values, i.e. from N/A to R). 4. Changes made by the user that have not yet been stored and applied (by clicking the Save button) are clearly marked by different styling, so the user has an overview of changes that are to be applied.
Postconditions	The user can review and manage access rights to all data fields for the user roles that are filtered using the Data matrix filter
Alternate scenarios	
Error scenarios	

3 Cargo module

Enables all the port actors to provide details of the cargo and ship data required to pass through the port with a single point of data entry and reusing the data whenever possible. The module shall enable acquisition of the following data sets:

- Entrance report (entrance time)
- Vessel & voyage details (vessel name, length, width, draught, departure port, destination port, etc.)
- Cargo Manifest / Bill of Lading (type and amount of cargo, owner of cargo, etc.)
- Exit report (exit time).

The cargo module shall be connected to the national ERI System so all applicable data already available in the ERINOT messages shall be taken automatically from these messages. In case there is no ERI data available, the system shall allow manual data entry.

A connection to the AIS system shall be used for automatic detection of entrance and exit of vessel from/to the port area.

List of data fields

	Arrival & departure report data	
Data field	**Available automatically**	**Access rights**
Vessel name	Vessel name (AIS) ERINOT.Transport. TransportDetails.VesselName	
ENI	ENI (AIS) ERINOT.Transport. TransportDetails.Vessel.VesselId (VesselIdType == ENI)	
MMSI	MMSI (AIS) ERINOT.Transport. TransportDetails.Vessel.VesselId (VesselIdType == MMSI)	
Name of captain	N/A	
Passport number (captain)	N/A	
Flag	ERINOT.Transport. TransportDetails.Nationality	
ShipType	ERINOT.Transport. TransportDetails.TransportMeans (enumeration)	
Company name	MessageSenderAddress.PartyName	
Arrival port	The port where the PCS is installed - hardcoded	
Departure port	ERINOT.Transport.TransportLocations.	

	PortOfDeparture.LocationName
Date and time of arrival	Automatic from a dedicated alarm zone (AIS)
Date and time of departure	Automatic from a dedicated alarm zone (AIS)
No. crew members	ERINOT.SafetyExplanation.PersonsOnBoard AIS Msg 200/55 (only sent on request)
Power in KW	available in Hull DB (no connection foreseen so far)
Max. draft	available in Hull DB (no connection foreseen so far)
Certificate valid until	available in Hull DB (no connection foreseen so far)
Speed (km/h)	N/A

Cargo data

Data field	**Available automatically**	**Access rights**
Vessel name	ERINOT.Barges.BargeName (where ERINOT.Barges.BargeId.VesselId == GoodSplitGoodsPlacements. Placement.VesselId)	
Departure port	ERINOT.Consignments. PortOfLoading.LocationName	
Destination port	ERINOT.Consignments. PortOfDischarge.LocationName	
Draft	ERINOT.Barges. BargeDimensions.Draught (where ERINOT.Barges.BargeId.VesselId == GoodSplitGoodsPlacements. Placement.VesselId)	
Certificate valid until	available in Hull DB (no connection foreseen so far)	
Length	ERINOT.Barges.BargeDimensions.Length (where ERINOT.Barges.BargeId.VesselId == GoodSplitGoodsPlacements. Placement.VesselId)	
Width	ERINOT.Barges.BargeDimensions.Width (where ERINOT.Barges.BargeId.VesselId == GoodSplitGoodsPlacements. Placement.VesselId)	
Max. tonnage	ERINOT.Barges.BargeDimensions.Tonnage (where ERINOT.Barges.BargeId.VesselId == GoodSplitGoodsPlacements. Placement.VesselId)	
Name of cargo	ERINOT.Consignments.GoodsItems.	

Quantity of cargo (kg)	GoodsDescription.GoodsName ERINOT.Consignments.GoodsItems. GoodSplitGoodsPlacements.Weight

Bill of lading

Data field	Available automatically	Access rights
Shipper	ERINOT.Consignments. CargoSender.PartyName	
Shipper address	ERINOT.Consignments. CargoSender.Street ERINOT.Consignments. CargoSender.City ERINOT.Consignments. CargoSender.PostalCode ERINOT.Consignments. CargoSender.Country	
Consignee	ERINOT.Consignments. CargoReceiver.PartyName	
Consignee address	ERINOT.Consignments. CargoReceiver.Street ERINOT.Consignments. CargoReceiver.City ERINOT.Consignments. CargoReceiver.PostalCode ERINOT.Consignments. CargoReceiver.Country	
Notify address (contact name, company, address, contact information)	ERINOT.AgentInvoiceAddress. NameAddress ERINOT.AgentInvoiceAddress. Contact	
Vessel	ERINOT.Transport. TransportDetails.VesselName	
Ship owner		
Port of loading	ERINOT.Transport. TransportLocations. PortOfDeparture	
Port of discharge	ERINOT.Transport. TransportLocations. PortOfDestination	
Consignment note No.	ERINOT.TransportDocRef	
Reference No.	ERINOT.MessageRef	
Shipping company name	N/A	
Marks and numbers		
Kind of packages and description of goods	ERINOT.Consignments. GoodsItems.	

	GoodsDescription.GoodsName
Number of pieces	ERINOT.Consignments. GoodsItems. NumberOfPackages
Gross weight (kg)	ERINOT.Consignments.GoodsItems. GoodSplitGoodsPlacements.Weight
Measurement (cbm)	ERINOT.Consignments.GoodsItems. GoodSplitGoodsPlacements.Volume
Freight and charges	
Draft	ERINOT.Transport. TransportDimensions.Draught
Payment instructions	
Weight as per draft	
Enclosure/seals	
Place and date of issue	

3.1 Cargo module GUI

The following GUI functions shall be implemented:

1. Cargo module main page – the main page of the cargo module
2. Reports filter – a filter which enables the user to filter the two report sections contained in the main page.
3. Arrival/departure reports section – a list of arrival/departure reports, the contents of the table are affected by the applied filter
4. Cargo reports section – a list of cargo reports, the contents of the table are affected by the applied filter
5. View arrival/departure report page – display of the arrival/departure report, with all of the details displayed on the page.
6. Edit arrival/departure report page – the page is displayed when the user is modifying an existing arrival/departure report or creating a new one.
7. View cargo report page – display of the cargo report, with all of the details displayed on the page.
8. Edit cargo report page – the page is displayed when the user is modifying an existing cargo report or creating a new one.

PCS_FUNC_301 – Cargo module main page

Precondition	• The user is logged in and authenticated • The user's role has access rights for the cargo module
Requirement/Description Main Success Scenario	1. Depending on the user's role, some of the following features are shown or hidden:

	a. New arrival/departure report button – opens a blank Arrival/departure report form (PCS_FUNC_306) and can be used to create announcements or actual report (depending if the user fills in the estimated time of arrival/departure or actual time) b. New Cargo report button – opens a blank Cargo report form (PCS_FUNC_308) c. Reports filter (PCS_FUNC_302) d. Arrival/departure reports section (PCS_FUNC_303) e. Cargo report section (PCS_FUNC_304)
Postconditions	The user can view and manage the arrival/departure reports, ship registration and the cargo reports according to his user role and access rights.
Alternate scenarios	
Error scenarios	

PCS_FUNC_302 – Reports filter

Precondition	• The user is logged in and authenticated • The user's role has access rights for the cargo module
Requirement/Description Main Success Scenario	1. The Reports filters, allows users of the Cargo module to filter the reports sections by the following parameters: a. Vessel – an autocomplete select box, where the user can select a vessel. By applying the filter only the reports for the selected vessel will be shown in the reports sections. b. Date from – calendar widget input where the user can define the starting point of the period from which he wants to retrieve the reports. c. Date to – calendar widget input where the user can define the starting point of the period from which he wants to retrieve the reports. 2. The Apply button is located at the bottom of the Reports filter form, clicking it applies the filter to all reports sections. 3. The Clear button is located next to the Apply button on the bottom of the Reports filter form, clicking it removes any previously applied filter.
Postconditions	The user can define which filters he wishes to apply and therefore control which reports are shown in the appropriate reports sections.
Alternate scenarios	
Error scenarios	

PCS_FUNC_303 – Arrival/departure reports section

Precondition	• The user is logged in and authenticated • The user's role has read and/or write access rights for the arrival/departure reports

Requirement/Description Main Success Scenario	1. The arrival/departure reports section contains a table with all entrance and exit reports that the user has read or write access rights for and that conform to the currently applied reports filter. 2. Each report is represented by a single table row. For each report the following columns are displayed: a. Vessel name b. Vessel ID number (number and type, ENI by default) c. Arrival/departure indication – indication if the report covers the arrival of the vessel or its departure d. Estimated time of arrival/departure (only used if the report is an announcement e. Date and time of arrival/departure (empty in case of announcement) f. Last modification date and time g. Username of the user who made the last modification – most arrival/departure reports shall be created automatically by the system, these reports shall have "system" stated here h. View icon – clicking the icon opens the View arrival/departure report page (PCS_FUNC_305) i. Edit icon – clicking the icon opens the Edit arrival/departure report page, prefilled with all existing data stored in the database (PCS_FUNC_306) j. Delete icon – only available for draft reports and to the user who created them. Clicking the icon deletes the report after getting confirmation from the user.
Postconditions	The user has an overview of the arrival/departure reports that conform to the currently applied reports filter and can view, edit and/or delete the arrival/departure reports, depending on his access rights.
Alternate scenarios	
Error scenarios	

PCS_FUNC_304 – Cargo reports section

Precondition	• The user is logged in and authenticated • The user's role has read and/or write access rights for the cargo reports
Requirement/Description Main Success Scenario	1. The cargo reports section contains a table with all cargo reports that the user has read or write access rights for and that conform to the currently applied reports filter. 2. Each report is represented by a single table row. For each report the following columns are displayed: a. Vessel name (ENI) b. Total amount of cargo (in metric tons) c. Dangerous cargo indicator d. Last modification date and time e. Username of the user who made the last modification

	f. Approved by – username of the user who approved the cargo report g. View icon – clicking the icon opens the View cargo report page (PCS_FUNC_307) h. Edit icon – clicking the icon opens the Edit cargo report page, prefilled with all existing data stored in the database (PCS_FUNC_308) i. Delete icon – only available for draft reports and to the user who created them. Clicking the icon deletes the report after getting confirmation from the user.
Postconditions	The user has an overview of the cargo reports that conform to the currently applied reports filter and can view, edit and/or delete the cargo reports, depending on his access rights.
Alternate scenarios	
Error scenarios	

PCS_FUNC_305– View arrival/departure report page

Precondition	• The user is logged in and authenticated • The user's role has read access rights for the arrival/departure reports
Requirement/Description Main Success Scenario	1. On top of the View arrival/departure report page there are a few actions available for the user: a. Print button – prepares the report to be printed from the browser b. Export to PDF – creates a file of the report in PDF format c. Version history links – a whole section where any previously published versions of the same report are linked. Clicking the link opens that particular version of the report. 2. The system checks the configuration file containing the list of data fields that should be used (PCS_FUNC_311) 3. The contents of the report are displayed, below the user actions section, containing the following data fields (depending on the configuration file, a subset of the following list shall be displayed): a. Vessel i. Vessel name ii. ENI iii. MMSI iv. Flag v. Vessel type vi. Power (KW) vii. Width viii. Length ix. Draught x. Certificate valid until xi. Speed (km/h) b. Report type (indicator determining if the vessel is entering or leaving the port – entrance or exit)

	c. Estimated date and time (of arrival/departure) d. Date and time (of arrival/departure) e. Name of the captain f. Shipping company i. Shipping company name ii. Address iii. City iv. Postal code v. Country vi. VAT number vii. Email viii. Phone g. Port of departure h. Port of destination i. No. of crew members j. Barges table – each barge is represented by a table row containing the following columns: i. ENI number of the barge ii. Name of the barge iii. Departure port iv. Destination port v. Draught vi. Certificate valid until vii. Maximum tonnage viii. Cargo – represented by a nested table containing a row for each cargo type and the following two columns: 1. Cargo name 2. Cargo tonnage ix. Maximum draught k. Total amount of cargo 4. The Back button is located at the bottom of the page and takes the user back to the previous page.
Postconditions	The user can view all the data contained in the arrival/departure report, has the option to print out the report and review the changes made to the report.
Alternate scenarios	
Error scenarios	

PCS_FUNC_306 – Edit arrival/departure report page

Precondition	• The user is logged in and authenticated • The user's role has write access rights for the arrival/departure reports
Requirement/Description Main Success Scenario	1. The system checks the configuration file containing the list of data fields that should be used and their optionality (PCS_FUNC_311) 2. The Edit arrival/departure report page consists of a single form containing all the fields contained within the report (depending on

	the configuration file, a subset of the following list shall be displayed): a. Vessel – autocomplete select box offering the user a list of vessels for which he has sufficient access rights (write access for creation of the report). By selecting the vessel from the list, the following input fields are automatically filled in (data and management of this data is a part of the Core module - PCS_FUNC_216_1): i. Vessel name – text input ii. ENI – text input with validation for ENI numbers iii. MMSI – text input with validation for MMSI numbers iv. Flag – autocomplete select box v. Vessel type – dropdown select box vi. Power (KW) – text input (numbers only) vii. Width – text input (numbers only) viii. Length – text input (numbers only) ix. Max Draught – text input (numbers only) x. Certificate valid until – date input with calendar widget xi. Speed (km/h) – text input (numbers only) b. ERINOT voyage number – text input box i. Get data from ERINOT button – clicking the button invokes the function that tries to fetch the ERINOT and automatically fill in the appropriate fields in the report (PCS_FUNC_317) c. Draught – text input (numbers only), current draught of the vessel/convoy d. Convoy length – text input box (numbers only) e. Convoy width – text input box (numbers only) f. Report type (indicator determining if the vessel is entering or leaving the port – entrance or exit) g. Estimated date and time (of arrival/departure) – an estimation, given at the time of announcement, filled in only if the user wants to announce coming of the vessel to the port in future. h. Date and time (of arrival/departure) – actual time of arrival, mostly logged automatically using the AIS system. If no announcement is present at the time of arrival, the system shall create a new draft report automatically and fill in the basic data (PCS_FUNC_310) i. Name of the captain j. Shipping company – autocomplete select box offering the user a list of shipping companies previously used by this organization/user. If selected from a list the following fields in this section are automatically filled in: i. Shipping company name – text input box ii. Address – text input box

	iii. City – text input box iv. Postal code – text input box (numbers only) v. Country – dropdown select box vi. VAT number – text input box vii. Email – text input box viii. Phone – text input box k. Port of departure – text input box l. Port of destination – text input box m. No. of crew members – text input box (numbers only) n. Barges table – each barge is represented by a table row containing the following columns: i. ENI number of the barge – text input box (numbers only) with validation for the ENI number format ii. Name of the barge – text input box iii. Departure port – text input box iv. Destination port – text input box v. Draught – text input box (numbers only) vi. Certificate valid until – date input with calendar widget vii. Maximum tonnage – text input box (numbers only) viii. Maximum draught – text input box (numbers only) ix. Cargo – represented by a nested table containing a row for each cargo type and the following two columns: 1. Cargo name – autocomplete select box, holding the cargo reference data loaded from the ERDMS (European Reference Data Management System) 2. Cargo tonnage – text input box (numbers only) o. Total amount of cargo – text input box (numbers only) 3. Changes can be saved using the Save button (PCS_FUNC_312), located on the bottom of the page, or they can be discarded using the Cancel button.
Postconditions	The user can fill in or make changes to all the data fields contained in the arrival/departure report. The user can publish draft reports with all the mandatory fields filled in.
Alternate scenarios	
Error scenarios	

PCS_FUNC_307 – View cargo report page

Precondition	• The user is logged in and authenticated • The user's role has read access rights for the cargo reports

Requirement/Description Main Success Scenario	1. On top of the View cargo report page there are a few actions available for the user: a. Approve button – available only to user with write access for the vessel associated with the report. The user can approve the report that the cargo handling company has created. b. Print button – prepares the report to be printed from the browser c. Export to PDF – creates a file of the report in PDF format d. Version history links – a section where any previously published versions of the same report are displayed as links. Clicking the link opens that particular version of the report. 2. The system checks the configuration file containing the list of data fields that should be used (PCS_FUNC_311) 3. The contents of the report are displayed, below the user actions section, containing the following data fields (depending on the configuration file, a subset of the following list shall be displayed): a. Approved by – if the report is approved this field contains the username of the user who has approved it b. Receiver i. Company name ii. Address iii. City iv. Postal code v. Country vi. VAT number vii. Email viii. Phone c. Sender i. Company name ii. Address iii. City iv. Postal code v. Country vi. VAT number vii. Email viii. Phone d. Port of departure e. Port of destination f. Vessel name (ENI) g. Shipping company i. Company name ii. Address iii. City iv. Postal code v. Country vi. VAT number

	vii. Email viii. Phone h. Ship captain i. Registered on j. Flag k. Cargo i. Type of goods (category of goods) – the type of goods and the corresponding category of goods are displayed (taken from the European Reference Data Management System) ii. Goods condition iii. Loading/unloading schedule – for each loading/unloading session the exact start and end time of the loading/unloading activities are displayed: 1. Beginning date and time 2. End date and time 3. Duration iv. Total duration of loading/unloading activities for cargo type (automatically calculated) v. Reported weight vi. Loading/unloading weight (per draft survey) vii. Remarks l. Total duration of loading/unloading activities (automatically calculated) m. Remarks 4. The Back button is located at the bottom of the page and takes the user back to the previous page.
Postconditions	The user can view all the data contained in the cargo report, has the option to print out the report and review the changes made to the report.
Alternate scenarios	
Error scenarios	

PCS_FUNC_308 – Edit cargo report page

Precondition	• The user is logged in and authenticated • The user's role has write access rights for the cargo reports
Requirement/Description Main Success Scenario	1. The system checks the configuration file containing the list of data fields that should be used and their optionality (PCS_FUNC_311) 2. The Edit cargo report page consists of a single form containing all the fields contained within the report (depending on the configuration file, a subset of the following list shall be displayed): a. Receiver – autocomplete select box offering the user a list of companies previously used by this organization/user. If selected from a list the following fields in this section are automatically filled in: i. Shipping company name – text input box

	ii. Address – text input box iii. City – text input box iv. Postal code – text input box (numbers only) v. Country – dropdown select box vi. VAT number – text input box vii. Email – text input box viii. Phone – text input box b. Sender – autocomplete select box offering the user a list of companies previously used by this organization/user. If selected from a list the following fields in this section are automatically filled in: i. Shipping company name – text input box ii. Address – text input box iii. City – text input box iv. Postal code – text input box (numbers only) v. Country – dropdown select box vi. VAT number – text input box vii. Email – text input box viii. Phone – text input box c. Port of departure – text input box d. Port of destination – text input box e. Vessel i. Vessel name ii. ENI f. Shipping company – autocomplete select box offering the user a list of companies previously used by this organization/user. If selected from a list the following fields in this section are automatically filled in: i. Shipping company name – text input box ii. Address – text input box iii. City – text input box iv. Postal code – text input box (numbers only) v. Country – dropdown select box vi. VAT number – text input box vii. Email – text input box viii. Phone – text input box g. Ship captain – text input box h. Registered on – date input box with calendar widget, date stated on the Bill of lading i. Flag – dropdown select box j. Cargo – data is entered per cargo type and presented as a table: i. Type of goods (category of goods) – autocomplete select box ii. Loading/unloading schedule – for each loading/unloading session the exact start and end time of the loading/unloading activities are displayed:

	1. Beginning date and time – date and time input box with calendar widget 2. End date and time – date and time input box with calendar widget 3. Delete period button – displayed next to each Loading/unloading schedule table row, deletes the associated row 4. New period button – adds another row into the Loading/unloading schedule table iii. Reported weight – text input box iv. Loading/unloading weight (per draft survey) – text input box v. Goods condition – text input box vi. Remarks – text input box vii. Delete cargo type button – displayed next to each Cargo table row, deletes the associated row viii. Add cargo type button – adds another row into the Cargo table k. Remarks – text input box 3. Changes can be saved using the Save button (PCS_FUNC_312), located on the bottom of the page, or they can be discarded using the Cancel button.
Postconditions	The user can fill in or make changes to all the data fields contained in the cargo report. The user can publish draft reports with all the mandatory fields filled in.
Alternate scenarios	
Error scenarios	

3.2 Backend

The following backend function shall be implemented:

1. Login – checking if the user is already logged in, if not, the user is redirected to the login page of the Core module.
2. Automatic arrival/departure report – the Cargo module gets notified that a vessel has entered the port area and either fills in the time of departure/arrival in the announcement report (if it exists) or creates a new draft arrival/departure report, that the user shall complete.
3. Report forms configuration – enables customization of the reports to fit the needs of the port where the PCS is installed. Using a configuration file, the system administrator can set which fields are used and which of those that should be used are mandatory. Each time the system is loading a report, it checks which fields should be included and which not.

4. Store draft report – determines the rules which the system follows when saving a draft report, depending on if a new report is being saved or an existing is being modified.
5. Publishing reports – the user initiates a request for publication and the system checks the draft report and if all mandatory data is filled in publishes the report.
6. Logging relevant changes – previous versions of reports and other entities are stored in a database table, along with the timestamp and username of the user who has performed a change.
7. Storing reusable entities – reusable entities, like company data are stored in the database and accessible to all the users of the same organization. These stored entities can then be reused for automatic population of data during future report creation.
8. Get associated ERINOT – the function which defines how the Cargo module retrieves the appropriate ERINOT which can then be used to automatically populate most of the arrival/departure report.
9. Fill arrival/departure report with ERINOT data – definition which field of the arrival report is populated by which field from the ERINOT.

PCS_FUNC_309 – Login

Precondition	• The user is trying to access the Cargo module
Requirement/Description Main Success Scenario	1. The system checks if the user has an active session, has provided a token and is logged in. 2. If not, the user is redirected to the login page of the Core module (PCS_FUNC_212)
Postconditions	Only authorized user can access all of the Cargo module's pages, unauthorized users are redirected to the Core module's Login page.
Alternate scenarios	2a If yes, the requested page is displayed.
Error scenarios	

PCS_FUNC_310 – Automatic arrival/departure report

Precondition	• The Core module has fired an event indication that a vessel equipped with an AIS transponder has entered/left the configured port area (PCS_FUNC_206)
Requirement/Description Main Success Scenario	1. If an announcement arrival/departure report does not exist for vessel in question on the same date, a new report draft is automatically created as soon as the entry of a ship is detected. 2. The following data is filled in automatically from available AIS data: a. Vessel i. Vessel name ii. ENI iii. MMSI

	b. Type (arrival or departure) c. Date and time of arriving/departing the port d. Port of arrival/departure (depending if the vessel arrived or is departing the port area) 3. The report is stored into the database as a draft and can be filled in with the rest of the data by authorized users.
Postconditions	Entering and leaving of ships equipped with AIS transponders is automatically stored within an arrival/departure report draft.
Alternate scenarios	1a. If an announcement is present in the system, the system only fills in the date and time (of arrival/departure).
Error scenarios	

PCS_FUNC_311 – Report forms configuration

Precondition	• A valid configuration file is available at the expected location • An Edit report page is being loaded
Requirement/Description Main Success Scenario	1. The system begins the loading process of a specific Edit report page. 2. A configuration file is used to configure data fields included in each report and each data field's optionality (an indicator if the field is mandatory or optional). 3. The system only displays the data fields marked in the configuration file as visible. 4. When the form check shall be made, the function which checks if all the mandatory fields are available, shall use the list of all mandatory fields within the configuration file.
Postconditions	Each PCS installation can choose which data fields shall be used in which reports and decide which data fields shall be mandatory for publishing the reports.
Alternate scenarios	
Error scenarios	

PCS_FUNC_312 – Store draft report

Precondition	• The user tries to save a report clicking the Save button
Requirement/Description Main Success Scenario	1. The system checks if all the populated fields contain data in the appropriate format and with valid values. 2. If yes, the system checks if this is a new draft report or if the user is modifying an existing one. 3. If the draft of this report exists (modifying an existing report) the system stores the original report within a specialized log table in the database (PCS_FUNC_314). The system then automatically changes the Last modified by and Last modified date and time fields to the user's username and current date and time. 4. The report is stored in the database and available only to the users which have write access for this type of the report for the vessel in question.
Postconditions	Provided data is stored as a draft report within the database.

Alternate scenarios	2a. If some data is invalid, an error is displayed to the user and the report is not stored in the database. 3a. If the draft of this report doesn't exist in the database (creation of a new report) the system automatically fills in the Created by and Created date and time fields with the user's username and current date and time.
Error scenarios	

PCS_FUNC_313 – Publishing reports

Precondition	• An authorized user tries to publish a draft report of any type • The user has sufficient rights to publish this report
Requirement/Description Main Success Scenario	1. The system checks if all the mandatory fields have been filled in. 2. If yes, the system validates all data fields to check if they are of appropriate type and length. 3. If yes, the system marks the report as published and it is available to the appropriate users with sufficient access rights.
Postconditions	The system checks the draft report and marks it as published if all conditions are met.
Alternate scenarios	2a. If not all mandatory fields are filled in, an error is displayed to the user and the report is not published. 3a. If not all validation checks pass successfully, an error is displayed to the user and the report is not published.
Error scenarios	

PCS_FUNC_314 – Logging relevant changes

Precondition	• The user is making a change to an existing entity within the database
Requirement/Description Main Success Scenario	1. The system stores the basic information about the entity in question: a. Database table ID b. Entity ID c. Last modified by d. Last modified date and time e. Entity record – containing all the data fields of the entity (i.e. complete report) in a single field (i.e. in JSON), not queryable.
Postconditions	A log of all the changes for various types of entities (reports, user, etc.) is created.
Alternate scenarios	
Error scenarios	

PCS_FUNC_315 – Storing reusable entities

Precondition	• The user has initiated storing of a report
Requirement/Description Main Success Scenario	1. The reusable entities within the report are stored within the database in a dedicated table, with a reference to the user's organisation.

Postconditions	Reusable entities are stored within the database and can be reused by all users from the user's organization when filling in reports.
Alternate scenarios	1a. In case the entity already exists, an update to the entity record is made.
Error scenarios	

PCS_FUNC_316 – Get associated ERINOT

Precondition	• The user has requested to fill the report with ERINOT data • The user has provided the vessel's ENI number
Requirement/Description Main Success Scenario	1. The system checks if a voyage number has been provided 2. If yes, the system queries the ERI interface for an active published ERINOT with the provided voyage number and vessel's ENI number. 3. If there is a match the system retrieves the ERINOT and provides it to the function that requested it.
Postconditions	If there is an appropriate ERINOT it is retrieved and used to populate the report fields automatically.
Alternate scenarios	2a. If there is no voyage number the system performs the query using the vessel's ENI and the time of arrival/departure. There can be only one active ERINOT at a time. If there are no matches the system tries to find an ERINOT in the recent past with the "Port of destination" set to the port where the PCS is installed (in case of the arrival report), or the ERINOT in the recent future with the "Port of departure" set to the port where the PCS is installed (in case of the departure report). The time used for this purpose is the "Time of arrival/departure" or if it is not available then the "Estimated time of arrival/departure" is used.
Error scenarios	

PCS_FUNC_317 – Fill arrival/departure report with ERINOT data

Precondition	• The user has clicked the "Get data from ERINOT" button on the edit Arrival/departure report page
Requirement/Description Main Success Scenario	1. The system tries to find and retrieve the appropriate ERINOT (PCS_FUNC_316) 2. If an appropriate ERINOT is found, the following data fields are filled in automatically with the data available in the ERINOT: a. Draught – ERINOT.Barges.BargeDimensions.Draught (where ERINOT.Barges.BargeId.VesselId == GoodSplitGoodsPlacements.Placement.VesselId) b. Convoy length – ERINOT.Transport.TransportDimensions.Length c. Convoy width – ERINOT.Transport.TransportDimensions.Width d. Report type – if an arrival report exists without a departure report it is departure report, otherwise it is arrival e. Estimated date and time (of arrival/departure) – ERINOT.Transport.TransportLocations (whichever equals the port where PCS is installed).ETD/PassageTime/ETA (whichever is appropriate)

	f. Date and time (of arrival/departure) – not taken from ERINOT g. Name of the captain – not available in ERINOT has to be filled in automatically h. Shipping company – ERINOT.AgentInvoiceAddress or if this field is empty ERINOT.MessageSenderAddress is used: i. Shipping company name – .PartyName ii. Address – .Street iii. City – .City iv. Postal code – .PostalCode v. Country – .Country vi. VAT number – not available in ERINOT vii. Email – .Contact.CommsContact.CommsNo (where Contact.CommsContact.CommsChannel == 'EM') viii. Phone – .Contact.CommsContact.CommsNo (where Contact.CommsContact.CommsChannel == 'TE') i. Port of departure – ERINOT.Transport.TransportLocations.PortOfDeparture.LocationName j. Port of destination – ERINOT.Transport.TransportLocations.PortOfDestination.LocationName k. No. of crew members – ERINOT.SafetyExplanation.PersonsOnBoard l. Barges table – each barge is represented by a table row containing the following columns: i. ENI number of the barge – ERINOT.Barges.BargeId.VesselId ii. Name of the barge – ERINOT.Barges.BargeName iii. Departure port – ERINOT.Consignments.PortOfLoading.LocationName iv. Destination port – ERINOT.Consignments.PortOfDischarge.LocationName v. Draught – ERINOT.Barges.BargeDimensions.Draught vi. Certificate valid until – not available in ERINOT (data taken from database if available) vii. Maximum tonnage – ERINOT.Barges.BargeDimensions.Tonnage viii. Maximum draught – text input box (numbers only) ix. Cargo: 1. Cargo name – ERINOT.Consignments.GoodsItems.

	GoodsDescription.GoodsName (for each cargo type on this barge) 2. Cargo tonnage – ERINOT.Consignments.GoodsItems. GoodSplitGoodsPlacements.Weight m. Total amount of cargo – automatically calculated
Postconditions	The appropriate fields are automatically retrieved from the data contained in the associated ERINOT message.
Alternate scenarios	2a. If an appropriate ERINOT is not found the user is notified that no matches were found in the ERI system.
Error scenarios	

4 Tracking and tracing module

A web application that will allow a user to view AIS data from the connected AIS source. It shall provide an overview of the traffic situation within the port area. The following functionalities shall be supported:

- Display of AIS targets on map (e.g. ECDIS, world map)
- List of vessels – basic data displayed for each target, clicking on it centers the map on the AIS target
- Display all AIS data – clicking on the vessel opens a bubble containing all available AIS data for the selected target
- Arrival/departure detection and logging – detection of AIS equipped vessels entering or leaving the port area.
- Support for retrieval of relevant AIS data to pre-fill other input forms by existing data
- Integration of IP CCTV system into the application.

4.1 Backend

The following backend functions shall be implemented:

1. Login – checking if the user is already logged in, if not, the user is redirected to the login page of the Core module.
2. Data collector configuration – definition of the data sources (where the data is coming from) and the postprocessors (what is being done with the data once it is received).
3. Data collector – part of the tracking and tracing module that receives the AIS messages and stores them in the memory so that the AIS data can be displayed to the user.
4. Port arrival/departure check – received message is being checked for instances where a new vessel enters the port area, or a vessel that has last reported from the port area has now left it. If a vessel has arrived/departed the port area, this data is stored using the appropriate API method within the Core module.

PCS_FUNC_401– Data collector configuration

Precondition	• The administrator has access to the data_collector.conf configuration file
Requirement/Description Main Success Scenario	The data collector configuration file is a plain text file where the following sub-modules are available for configuration: 1. Configuration of postprocessors: a. Store AIS information to database (in case no data needs to be stored, this is removed from the configuration file) b. Register entry and exit of ships from the port area 2. Configuration of data sources:

	a. Serial RS232 port – for a direct connection to an AIS receiver b. TCP – for a remote AIS source
Postconditions	The administrator can configure the Data collector's AIS source and post processors for the data.
Alternate scenarios	
Error scenarios	

PCS_FUNC_402 – Data collector

Precondition	• The Data collector configuration file contains all the necessary AIS source data • The configured AIS source is available and sending data
Requirement/Description Main Success Scenario	1. Receives AIS messages from the configured AIS source 2. Stores the AIS messages within the memory so that the tracking & tracing web application can use the AIS data to display AIS targets and all available vessel data (position, static, dynamic) 3. Port arrival/departure check (PCS_FUNC_402_1)
Postconditions	Data contained in the AIS messages is stored in the memory and available for use in the Tracking and tracing web application.
Alternate scenarios	
Error scenarios	

PCS_FUNC_402_1 – Port arrival/departure check

Precondition	• Tracking and tracing module is running • Data collector has received a new AIS message • Port area is configured properly
Requirement/Description Main Success Scenario	1. The system checks if the received AIS message contains positional data which indicates a vessels position inside the configured port area or if it outside it. 2. If the position is inside configured port area, the system checks if the vessel is already listed in the "Vessels currently in port" list. 3. If it is not, it is added to the "Vessels currently in port" list and the time of entrance in the port area is logged by calling the appropriate API method (PCS_FUNC_206).
Postconditions	Entrance and exit of vessels from the port area are logged and sent to the core module along with the time of entering/leaving the port area.
Alternate scenarios	2a If the position is outside the configured port area, the system checks if the vessel is listed in the "Vessels currently in port" list. 3a If the vessel in located outside the port area and is inside the "Vessels currently in port" list, the vessel is removed from this list and the exit time is logged by calling the appropriate API method (PCS_FUNC_206). 3b If it is, no changes are made as the vessel is still inside the port area. 3c If the vessel is positioned outside of port area and is not in the list, no changes are made.
Error scenarios	

4.2 GUI

The following GUI functions shall be implemented:

1. Tracking and tracing main page – definition of the graphical user interface of the main page and all the required elements on the page.
   1.1. AIS data visualization on chart – function that deals with visualization of the ship, base station and AtoN AIS data on the chart.
   1.2. Follow AIS target – a function that allows the user to automatically keep the followed AIS target in the center of the screen.
   1.3. AIS data table display – definition of which data should be listed for each of the AIS targets in the AIS data table and how the targets can be filtered.
   1.4. CCTV video stream display – integration with the camera system. An icon is placed on the map and clicking on it opens the video stream of the associated camera.
2. Chart control – specifies how the user can control the chart (panning and zooming)
3. Configuration window – contains description of configurable parameters and their application.

PCS_FUNC_403 – Tracking and tracing main page

Precondition	• The user is successfully logged in • The user has sufficient access rights to use the application
Requirement/Description Main Success Scenario	1. Main page holds web elements for visualization of AIS data displayed on web map solutions (e.g. Open StreetMap, ECDIS WMS, etc.) and control of visualization 2. Most of the page is covered by a chart (PCS_FUNC_404) and AIS data (PCS_FUNC_403_1) overlays a. The starting position of the map should be configured so that it is centred on the port area with the appropriate zoom level 3. The configuration window can be opened by clicking a dedicated menu item, icon or link (PCS_FUNC_405). 4. Links for changing languages will be displayed on the top border of the chart a. Available languages will be English, German, Slovakian, Romanian, Serbian and Croatian 5. Username of currently logged in user will display on the top border of the chart 6. Next to the username will be a Logout link a. When the Logout link is clicked user is logged out and login form is displayed 7. Overlays control section shall be available to the users and it will allow them to show/hide the following layers:

	a. Background map b. Ships c. Base stations d. AtoNs 8. Zoom in and Zoom out buttons shall be available to the user. Clicking the buttons zoom in and zoom out on the chart respectively 9. The sidebar shall be used for control of views and textual display of AIS data (PCS_FUNC_403_3)
Postconditions	The main page of the traffic module is displayed with all required elements.
Alternate scenarios	
Error scenarios	

PCS_FUNC_403_1 – AIS data visualization on chart

Precondition	• Main page is displayed and at least some AIS data overlays are turned on • AIS data is continuously received via a configured AIS source
Requirement/Description Main Success Scenario	1. Ships (AIS message 1, 2, 3), base stations (AIS message 4) and AtoNs (AIS message 21) are displayed on the screen with dedicated icons and labels 2. AIS data visualization is constantly updated with new AIS data without a need for a page refresh 3. Ships are displayed using a dedicated ship icon per ship type. Supported ship types are: a. Passenger ships b. Cargo ships c. Ships carrying dangerous cargo d. Other ships 4. A clear visual indication shall be used when a vessel is standing still 5. Vessel label that shows the vessel's name and/or MMSI number shall be visible and clearly associated with the vessel's icon. 6. Clicking on a ship icon or a label shall provide additional ship information a. Name b. MMSI number c. ENI number d. Call sign e. Timestamp of last sent message f. Speed over ground g. Course over ground h. Fairway section i. River kilometre j. Downstream/upstream indication k. Display of all AIS data can be shown by expanding the pop-up box using down arrow icon l. Display of all AIS data can be hidden using the up arrow icon

	m. Start/stop following link is displayed below the vessel name which enables /disables vessel following (PCS_FUNC_403_2) n. Opening of pop-box for a vessel that is not being followed will stop following any other vessel 7. The base station label should contain the base station's MMSI number 8. Clicking on a base station icon or a label will open a pop-up box with additional base station information a. MMSI number b. Timestamp of last sent message 9. AtoNs are displayed with a dedicated icon 10. An AtoN label that shows the AtoN's name and MMSI number should be displayed and associated with the icon 11. Clicking on an AtoN icon or a label shall provide additional AtoN information a. Name b. MMSI number c. Virtual flag d. Off-position indicator
Postconditions	AIS data for ships, base stations and AtoNs is visualized on the chart with icons and labels.
Alternate scenarios	3a 4a Ship icons and labels are not displayed when ships overlay is disabled in layers control. 6a 7a Base station icons and labels are not displayed when base stations overlay is disabled in layers control. 9a 10a AtoN icons and labels are not displayed when AtoNs overlay is disabled in layers control.
Error scenarios	

PCS_FUNC_403_2 – Follow AIS target

Precondition	• The user is logged in and authenticated • The user has clicked the "Start following" link associated with an AIS target
Requirement/Description Main Success Scenario	1. The chart is positioned so that the vessel that is being followed is in the center of the screen after each update of AIS data. 2. The following of the vessel is canceled by clicking on another target or clicking the "Stop following" link within the target's AIS data pop-up window.
Postconditions	The chart is recentred after each AIS data update so that the selected AIS target in located in the centre of the screen
Alternate scenarios	
Error scenarios	

PCS_FUNC_403_3 – AIS data table display

Precondition	• Main page is displayed • AIS data is continuously received from AIS centre
Requirement/Description Main Success Scenario	1. AIS data table display consists of filter form and a scrollable list of AIS targets 2. Filter form allows a. Showing/hiding of each of the AIS target types (ships, base stations and AtoNs) b. Filter by speed over ground range (min to max) c. General filter text box that shows targets that contain entered text in name, MMSI or ENI 3. List items are displayed depending on the type of the AIS target and the list is constantly updated with new AIS data without a need for a page refresh 4. The following information should be displayed for each ship AIS target – name, MMSI, ENI, speed over ground, course over ground, fairway section, river kilometre, downstream/upstream indication and timestamp of last sent AIS message 5. The following information should be displayed for each base station – MMSI and timestamp of last sent AIS message 6. The following information should be displayed for each AtoN – name, MMSI, virtual flag, off-position indicator and timestamp of last sent AIS message 7. Clicking on any AIS target in the list will position the chart with AIS target in the centre of the screen and provide additional information on the selected AIS target (PCS_FUNC_403_1) 8. The list can be sorted ascending and descending by different values using an “order” select box above the list: a. Name b. Speed c. River position d. MMSI e. ENI f. Last updated timestamp
Postconditions	AIS targets are displayed in the scrollable list that can be filtered.
Alternate scenarios	
Error scenarios	

PCS_FUNC_403_4 – CCTV video stream display

Precondition	• Main page is displayed • Url for the video stream and geographic coordinates for each camera are listed within the configuration file.
Requirement/Description Main Success Scenario	1. Each camera is represented as a single icon on the map, placed at the geographic coordinates provided in the configuration file. 2. Clicking the camera icon opens the video stream in a pop-up.

Postconditions	The user can check the live video feed from the configured cameras by clicking the icon on the map.
Alternate scenarios	
Error scenarios	

PCS_FUNC_404 – Chart control

Precondition	• Main page is displayed
Requirement/Description Main Success Scenario	1. Chart can be controlled with a mouse a. Dragging the chart with a mouse will move the chart position b. Scroll up with a mouse will zoom in on the chart c. Scroll down with a mouse will zoom out on the chart 2. Chart can be controlled with a keyboard a. Direction keys (up, down, left and right) will move the chart position b. Plus and minus keys will zoom in and out on the chart respectively 3. Chart can be controlled from the Saved locations section 4. When following of vessel is enabled chart will automatically move to vessel's position when followed vessel's position is updated (PCS_FUNC_403_2)
Postconditions	Chart can be controlled with mouse, keyboard and chart positions form.
Alternate scenarios	
Error scenarios	

PCS_FUNC_405 – Configuration window

Precondition	• The user has opened the Configuration window by clicking the appropriate icon/menu item
Requirement/Description Main Success Scenario	1. The Saved locations section allow the users to jump to a configured location on the map (either set-up by the user per user or configured on the server in cooperation with the users of the PCS) 2. The Configuration section is displayed containing the input boxes for the following configuration parameters: a. Lost target display duration – number input box, determining how many seconds the lost target is still visualized on the chart b. Show track for selected vessel – checkbox determining if a track of the vessel should be shown when the vessel is selected. The vessel track shall display all the reported positions from the last X minutes, where X is configured as a parameter below. c. Tracking time – input box where the time in minutes is configured (how long should the vessel track be) d. Vector length – input box where the time in minutes should be provided. The AIS targets speed and course vector shall

	point toward the point where the vessel would be in X minutes if it continued on that course at the same speed. e. Speed in km/h – checkbox that determines if the speed is displayed in kilometres per hour or knots. 3. Changes can be saved and applied by clicking the Save button or discarded by closing the configuration window.
Postconditions	The user can configure basic parameters of the application and manage saved locations.
Alternate scenarios	
Error scenarios	

5 Statistics module

The users of the statistics module, shall have access to various numbers and reports. The statistics module shall take all the data from the data layer and calculate the relevant statistical information. The data available to each user shall depend on the user's access rights and their role. A port authority user shall not have access to the same data as a ship owner.

The data calculated from available data shall include the following parameters:

- Total number of ships that visited the port
- Average duration of ship visit
- Total tonnage of cargo that went through the port
- Total tonnage of cargo unloaded in the port
- Total tonnage of cargo loaded in the port
- Total tonnage of specific cargo /cargo type that went through the port
- Total tonnage of specific cargo /cargo type unloaded in the port
- Total tonnage of specific cargo /cargo type loaded in the port
- Number of ships from a specific country
- Total tonnage of dangerous cargo that went through the port
- Total tonnage of dangerous cargo unloaded in the port
- Total tonnage of dangerous cargo loaded in the port
- Percentage of occupied available berths within the port (during working hours)
- Total time spent with over 75% berth occupied
- Total provided water to ships
- Total provided electricity to ships
- Total railroad cargo tonnage
- Total road cargo tonnage
- Total water-rail tonnage
- Total water-road tonnage
- Total water-water tonnage.

Daily/Weekly/Monthly/Annual reports with the listed parameters can be made. The user can make reports by selecting data parameters that are available to him (to which he has access rights) and by selecting a period for which the report should be made. The reports shall be exportable to PDF, XLS and CSV formats.

5.1 Backend

5.1.1 User authentication

Check if the user is logged in and authenticated, if not initiate the login procedure.

5.1.2 Login procedure

Redirect to the login page of the Core module and integration with the authentication and authorization specified there.

5.1.3 Periodical updates from the core module

Scheduled task to call the EntitySearch API method of the core module for each of the relevant entities (for statistics purposes). Date and time of the last update should be sent as the filter (Last modified column should be greater than time of last update).

5.1.4 Store updates from the core module

Data received from the core module is stored in the statistical module's database and are available for calculations of supported parameters.

5.1.5 Retrieve specific entities from core module

For users whose roles don't provide insight into all statistical data (i.e. ship owners wanting statistics for their own vessels), call the EntitySearch API method with the user's token to ensure only the data the user has access to are retrieved. This data doesn't need to be stored in the Statistical module's database.

5.2 Frontend

5.2.1 Statistics module header

The header of the statistical module shall contain the following elements:

- language selection functionality
- link to the user profile
- logout link

5.2.2 Main page

The contents of the main page shall display the Statistical reports filter, Statistical reports table as well as the button for creating a new report.

5.2.2.1 Statistical report filter

Allows filtering the contents of the Statistical reports table by the following criteria:

- Time period – defined by the start and end dates (reports that contain data for this time period are shown in the Statistical reports table)
- Parameters table – select statistical parameters that should be present in the reports to be displayed in the Statistical reports table

A button to apply the filter and a button to clear/reset the filter shall be available.

5.2.2.2 Statistical reports table

Each row of the table represents a single statistical report. Only reports that conform to the Statistical reports filter and the user's access rights are displayed. A paging or scrolling

feature should be implemented to ensure simple navigation through the table and accessing the desired report. For each report the following data should be displayed as table columns:

- Time period (starting and end date)
- Scope – indication what is the scope of the report (i.e. the whole port or just a single shipping company)
- List of included parameters within the report (limited to not clutter the screen)
- Username of the user who created the report
- Date and time of report creation
- View report link/button – clicking the button opens the page for viewing reports, displaying the associated statistical report.
- Edit link/button – opens the page for editing the report with all the data preloaded in the input boxes.
- Delete link/button – after confirmation deletes the report from the database.

5.2.2.3 View statistical report

A page where the user can view an existing statistical report. All data contained in the report is displayed to the user. The following actions are available to the user:

- Delete report (only available to the creator of the report)
- Modify report (only available to the creator of the report)
- Print report
- Export to XLS (Excel format)
- Export to PDF
- Export to CSV (comma separated values)

5.2.2.4 New report creation

After clicking a dedicated button, a blank Edit statistical report form is displayed.

5.2.2.5 Edit statistical report

By clicking the associated Edit button, the user opens the Edit statistical report form prefilled with the report parameters stored in the database.

5.2.2.6 Edit statistical report form

A form used to define a new report or modify an existing one. The user picks the desired parameters and defines all provided inputs before clicking the button to initiate report creation. The following fields shall be available on the page:

- Start date
- End date
- Scope – if the selected parameters should be calculated for the whole port, single shipping company or a specific vessel

- Statistical parameter table – a table where each row represents a selected statistical parameter to be included into the report. The first column contains an input box where the user selects the parameter type from a predefined list:
    - Total number of ships that visited the port
    - Average duration of ship visit
    - Total tonnage of cargo that went through the port
    - Total tonnage of cargo unloaded in the port
    - Total tonnage of cargo loaded in the port
    - Total tonnage of specific cargo /cargo type that went through the port
    - Total tonnage of specific cargo /cargo type unloaded in the port
    - Total tonnage of specific cargo /cargo type loaded in the port
    - Number of ships from a specific country
    - Total tonnage of dangerous cargo that went through the port
    - Total tonnage of dangerous cargo unloaded in the port
    - Total tonnage of dangerous cargo loaded in the port
    - Percentage of occupied available berths within the port (during working hours)
    - Total time spent with over 75% berth occupied
    - Total provided water to ships
    - Total provided electricity to ships
    - Total railroad cargo tonnage
    - Total road cargo tonnage
    - Total water-rail tonnage
    - Total water-road tonnage
    - Total water-water tonnage.

  The rest of the table row is reserved for input boxes used to define auxiliary information required to calculate parameters (i.e. defining the cargo type for the Total tonnage of specific cargo type). This part of the row is changed dynamically depending on the selected statistical parameter type.

- Save button – stores the report parameters within the database and creates/modifies the report using the input data defined by the user. All required data is obtained from the module's database and/or directly through the Core module's application program interface and calculated values are then stored in the statistical module's database so the users can quickly access the contents of the report.
- Preview report – using the provided report parameters, the necessary data is retrieved from the module's database and/or API and the results are displayed but nothing is stored in the database.
- Cancel button – discards all the changes and returns to the previous page

6 Berth management module

The berth management module shall provide the utility of a berthing diary and automated berthing planning/allocation.

The berths shall be configurable within a configuration file and the dimensions, number of berthing places and berths would be contained in this configuration file. The berths would be visually represented within the graphical user interface to aid the users by showing him graphically the occupied and free berthing places within the port.

One axis would represent the spatial component of the berth (from left to right), while the temporal component would be represented vertically. The whole berthing plan representation would be table like where the user shall instantly know which berths are occupied at which times.

The berthing plan shall be modifiable by authorized users (port operator), but the simplest solution shall be to simply allow the algorithm to create an optimal berthing plan.

All users shall be able to see the status of the berthing places (occupied or vacant), but only users with sufficient access rights shall be able to view the ship identification and other details available from other modules (retrieved from the data layer). The access rights to specific data sets is the same across the PCS and depends only on the core module, so all users shall have the same access rights for the available data regardless of the module. Ship owners shall only be able to see their own ship, while the port authority would be able to see data for all vessels.

The algorithm shall be made in close cooperation with people managing berth allocation in the participating ports and should quickly find the optimal berthing spot for all ships coming to the port and needing a place to berth.

Actual berthing times (arrival and departure times) shall be recorded automatically using the AIS data. Authorized users shall be able to modify and enter these times manually (for cases of failure of AIS system or on-board equipment).

6.1 Backend

6.1.1 User authentication

Check if the user is logged in and authenticated, if not initiate the login procedure.

6.1.2 Login procedure

Redirect to the login page of the Core module and integration with the authentication and authorization specified there.

6.1.3 Retrieve announced and registered vessels

Call the appropriate Core module's API method to retrieve all Entrance reports (announcements or vessels that are in the port area but have not yet been allocated a berthing spot).

6.1.4 Retrieve current AIS data

Retrieve a data set containing all available AIS data for all vessels within the port area (others are filtered out).

6.1.5 Automatic berthing plan algorithm

The algorithm shall find an optimal berthing plan (for the current calendar day) taking the following data as input:

- Vessels that are within the port area and those announced to arrive at the current date that do not yet have a berth allocated. Vessels that already have a berth allocated remain unchanged, to include them into an automatic plan, delete their berthing plan entry.
- Vessel type, vessel length and cargo on board (taken from the arrival report from the Cargo module)
- Berth configuration data (from the configuration file or the module's database)
- Unavailable berths (occupied berths (from existing berthing plan) or unavailable berths because of their status (i.e. maintenance))

The algorithm shall ensure optimal placement of vessels (maximum available remaining berthing places) in such a way that all loading/unloading operations can be fulfilled. The time required on berth shall depend on the amount and type of cargo.

6.1.6 Learning loading/unloading times

A configuration file containing the loading/unloading times for specific cargo category shall be used as a starting point. The system shall record actual durations of all loading/unloading processes with the following data recorded:

- Amount of cargo
- Type of cargo
- Type of action (loading or unloading)
- Duration of action
- Date and time
- Berth ID

The algorithm shall take this data into account and calculate periodically new durations that shall be used for approximations of loading/unloading times.

6.1.7 Berth configuration

Berths need to be configurable using a configuration file or through the GUI. Each berth needs to have the following parameters defined:

- Quay ID - a unique identifier
- Berth ID – a unique identifier of the berth within the quay

- Supported cargo type – a list of cargo types that can be handled on this berth. Multiple options can be selected:
  - Bulk
  - General
  - Liquid
  - Container
- Geographical area - two geographical coordinates that define a rectangle that covers the berth area

6.1.8 Send actual berthing data

When the actual berthing times (arrival and departure from berth) are recorded within the system, the data is sent to the Core module by calling the appropriate API method.

6.1.9 Logging

Each user action that performs a change in the system (i.e. adding a new berth plan entry, changing the status of a berth, etc.) is logged. The action, timestamp, username of the user who made the change are logged in the database.

6.2 Frontend

6.2.1 Berth management module header

The header of the berth management module shall allow access to the following functionality:

- language selection
- link to the user profile
- logout link

6.2.2 Berth allocation page

The Berth allocation page shall be available only to users who are authorized to perform berth allocation and shall contain the Berth management table, a graphical representation of the quays and berths and functionality that offers the user the ability to:

- Add berthing plan entry – a blank Edit berthing plan entry form is displayed and the user fills in the data to define a new entry.
- Edit berthing plan entry – the Edit berthing plan entry form is displayed, prefilled with existing data. The user can modify the data.
- Remove berthing plan entry – after confirmation, the entry is deleted from the berthing plan.
- Change berth status – allows authorized users to change the status of the berth.
- Start the algorithm for automatic berth allocation

6.2.2.1 Edit berthing plan entry form

A form that allows the users to modify all relevant information for the berthing process for this particular entry:

- Vessel – autocomplete select box, which offers the user all vessels for which they have sufficient access rights (i.e. port authority can add any vessel registered within the system). Vessels that have been announced for arrival within the port or that are within the port area and don't have their berth already planned, are listed on top of the list.
- Time of arrival – date and time when the vessel is expected to come to the berthing spot.
- Actual time of arrival – date and time when the vessel has actually arrived at the berth. Recorded automatically in case the vessel is equipped with an AIS transponder.
- Time of departure – date and time when the vessel is expected to leave the berth
- Actual time of departure – date and time when the vessel has actually left the berth. Recorded automatically in case the vessel is equipped with an AIS transponder.
- Berth number – a unique identifier of the berth number (dock number + berth number if necessary)

The user can store the changes by clicking the Save button or discard them using the cancel button. During the saving process, the system retrieves the vessel data (vessel length) and the reports from the Cargo module (for the cargo type which can be used to automatically determine the appropriate berth). In case the user has manually selected a berth which doesn't contain the required equipment for the cargo to be loaded/unloaded listed within the arrival and cargo reports, a warning is displayed to the user. Storing changes to the actual times of arrival and departure, also initiates the background process where this data is sent to the Core module.

6.2.2.2 Generate automatic berthing plan button

The button initiates the algorithm which determines the optimal berthing plan for the parameters provided by the user and other modules of the PCS.

6.2.2.3 Graphical representation of the berths

Graphical representation of the berths:

- The berths should be depicted linearly.
- Each berth should be clearly marked by their identifiers.
- The vessels planned to be berthed should be placed accurately on their planned berth.
- The berths and vessels shall be scaled using the same scale ratio so the user has a complete and accurate overview of the planned situation.

- The vessels shall be represented using a simple geometric shape (length of the shape shall be vessel length * scale factor) and vessel name, ENI number and planned time period on the berth shall be displayed within the rectangle. The colour of the rectangle shall depend on the type of vessel/cargo on board.
- The berth graphical representation displays the situation at a given point in time. This time can be selected by clicking on any cell in the Berth management table.
- Double clicking a berth graphical representation load the form to change the status of it – default status is available, but can be marked as unavailable indefinitely (i.e. when repairs are being made, or construction work)

6.2.2.4 Berth management table

Provides the user with an overview of the berthing plan and allows the user to modify the plan:

- Each row represents a point in time
- Each column represents a berth
- When an entry is added at a specific berth at a specific time a rectangle is created with the following characteristics:
    - The rectangle covers a number of rows that corresponds to the duration the vessel is expected to spend at the berth.
    - The rectangle covers a number of rows which corresponds to the vessels length
    - The colour of the rectangle depends on the vessel/cargo type
    - The rectangle contains textual information for the following:
        - Vessel name
        - Vessel ENI number
- Users can easily add a new berthing plan entry at a specific berthing place and time by double clicking a specific cell within this table. This opens the Edit berthing plan entry form with these data filled automatically.
- Users can easily modify an existing berthing plan entry by double clicking it.

6.2.3 Berth allocation overview page

The Berth allocation overview page shall be available to all users, even those who are not authorized to perform berth allocation. In contents it is similar to the Berth allocation page, but to ensure privacy, only data for vessels for which the users is authorized to view are displayed:

- Berth graphical representation –vessels are displayed without any data except for the vessels for which the user has access rights for.

- Berth management table – all rectangles are displayed, so the user knows which berths are occupied, but only the berths that are associated with vessels for which the user possesses access rights are displayed with the data displayed inside of them.

7 Billing module

The billing module shall be able to take the relevant information from the data layer (time spent on berth, type of cargo, type of vessel, total electricity and water used) and create invoices automatically and send them to the appropriate users.

The prices for each commodity (berth place time, electricity, energy), shall be configurable so each port can input their prices.

7.1 Backend

7.1.1 User authentication

Check if the user is logged in and authenticated, if not initiate the login procedure. If the user is successfully authenticated, check if he has a user role assigned that contains read or write access rights for the invoices. If not, display an informative message that access is denied because of insufficient access rights and restrict the user's access to any content of the module.

7.1.2 Login procedure

Redirect to the login page of the Core module and integration with the authentication and authorization specified there.

7.1.3 Configuration

The following parameters need to be configurable by the administrator (configuration file or through the GUI):

- electricity flat rate price
- electricity price per kW/h
- water flat rate price
- water price per m^3
- berthing flat rate price
- berthing price per meter of vessel length
- berthing price per kW
- berthing price per metric ton of carrying capacity
- quay dues per ton or cubic meter
- barge manouvering per hour of pusher tug operation
- barge/vessel cargo holds cleaning
- opening/closing vessel hatch covers
- pilot services
- fuel – bunkering per ton of fuel
- handling fee per ton of cargo
- storage fee per ton or cubic meter of cargo
- cargo weight measurement
- demurrage price per meter per day

- value added tax (VAT)

7.1.4 Retrieve berthing data

Call the appropriate Core module's API method to retrieve unbilled berth duration. A vessel can be provided as a parameter to only retrieve the unbilled berthing data associated with that vessel.

7.1.5 Retrieve electricity consumption

Call the appropriate API method to retrieve electricity consumption providing the berth number and arrival and departure times to/from the berth.

7.1.6 Retrieve water consumption

Call the appropriate API method to retrieve water consumption providing the berth number and arrival and departure times to/from the berth.

7.1.7 Logging

Each user action that performs a change in the system (i.e. adding a new berth plan entry, changing the status of a berth, etc.) is logged. The action, timestamp, username of the user who made the change are logged in the database.

7.2 Frontend

7.2.1 Billing module header

The header of the berth management module shall allow navigation through the module and contain the following elements:

- tabs used for navigation between the module's pages:
  - Billing
  - Company details
- language selection functionality
- link to the user profile
- logout link

7.2.2 Billing page

The main page of the billing module is loaded as soon as the user access the module. It can also be accessed at any time by clicking the Billing tab within the header. It contains the following content:

- Invoices filter
- Received invoices table
- Created invoices table
- New invoice button – opens a blank Edit invoice form, allowing the user to create a new invoice. Available only to users with roles that have write access rights for invoices.

7.2.2.1 Invoices filter

Allows the user to filter the invoices displayed in the Received and Created invoices tables by the following parameters:

- Date from – only invoices created after this date are displayed (inclusive)
- Date to – only invoices created before this date are displayed (inclusive)
- Issued by – an autocomplete select box which allows the user to pick the company or user that created the invoices he is looking for.
- Invoice status – select the statuses of invoices that are to be displayed (not payed, payed, payment received)

7.2.2.2 Received invoices

A table containing received invoices. Each invoice is represented by a single table row, while the following data and actions are available:

- Issued by – company which has issued the invoice
- Date – date when the invoice was issued
- Total – the total amount that needs/needed to be payed
- Payed – indicator if the invoice has been payed yet
- Payment confirmed – indicator that the issuer of the invoice has received the funds, making the transaction complete
- View link/button – clicking it opens the View invoice page for the associated invoice

7.2.2.3 Created invoices

A table containing created invoices. Each invoice is represented by a single table row, while the following data and actions are available:

- Company – the company to which the invoice is being issued
- Date – date when the invoice was issued
- Total – the total amount that needs/needed to be payed
- Published – indicator if the invoice has been published
- Payed – indicator if the invoice has been payed yet
- Payment confirmed – indicator that the issuer of the invoice has received the funds, making the transaction complete
- View link/button – clicking it opens the View invoice page for the associated invoice.
- Edit link/button – clicking it opens the Edit invoice form with all the data from the associated invoice preloaded.
- Delete link/button – available only for invoices that have not yet been published. After providing confirmation, the invoice draft is deleted from the database.

7.2.2.3.1 View invoice page

All the invoice details are displayed on this page:

- Draft indicator – in case the user is viewing his draft invoice it should be clearly visible that the invoice is in fact a draft.
- Payment indicator – the exact status of the invoice should clearly be visible. The possible statuses are:
    - Not payed
    - Payed
    - Payment confirmed
- Issued by – company that issued the invoice, along with all relevant company data like address, VAT number, etc.
- Issued to – company that the invoice is issued to, along with all relevant company data like address, VAT number, etc.
- Services table – a list of services for which the invoice is being issued, containing the following columns:
    - Item name
    - Unit price
    - Amount
    - Discount
    - Amount without tax
    - Amount with tax
- At the end of the table, the invoice total amount without tax, total tax amount and invoice total are displayed.
- Date of issue – date of issuing the invoice
- Due by – date until which the invoice need to be payed
- Attached documents – a list of attached documents. Clicking a document downloads it.

The following actions are available to the user depending on their access rights and roles:

- Print invoice – prepares the document to be printed.
- Download as PDF document – prepares the document to be downloaded in PDF format
- Mark as payed – available only to the recipient of the invoice, marks the invoice as payed.
- Confirm payment – available only to the issuer of the invoice, confirming that the payment was received and the transaction was successful.

7.2.2.3.2 Edit invoice form

The form where users can fill in all the data the invoice requires. The form is prefilled with existing data in case the user is editing an existing invoice or blank in case of creation of a new invoice. The following data input fields shall be available:

- Issuing company name and details – this information is read only and is modified within the Company details page.
- Receiving company name – autocomplete select box where the user can select the name of any of the companies for which his organisation has already issued an invoice. Selecting an entry from the list automatically fills in the rest of the data related to the company:
    - Receiving company address
    - Receiving company postal number
    - Receiving company city
    - Receiving company country
    - Receiving company VAT number
- Vessel – auto complete select box, vessel list is taken from the core module using the core module's API. This data is used for automated invoice creation, by searching the unbilled berthing, electricity and water consumption related to the latest berth usage of the selected vessel.
- Services table – a table of services for which the invoice is being issued. By default one row with empty input fields is displayed. The user can add new rows by clicking a dedicated button. The rows containing the following input fields and buttons:
    - Item name – several predefined entries shall exist (i.e., water, electricity, berth usage, loading and unloading of cargo). The list shall also include unbilled berth usage, water and electricity consumption linked to the selected vessel.
    - Unit price – in case the price of the selected item is available in the configuration of the module, it is automatically filled in when the item is selected.
    - Amount – in case an unbilled entry is selected from the item list, the amount is automatically filled in (i.e. berth usage duration or consumption amount of electricity/water)
    - Discount – default value is 0
    - Tax – automatically filled in with the configured value
    - Delete button – deletes the table row
- Due by – calendar input box where the user can provide the due date.
- Attached documents table – a table containing already attached documents. For each document the filename is displayed and a dedicated Remove link/button is available. Clicking the Remove button removes the attached document from the invoice.
    - Upload document form – contains the following:
        - Browse file component – used to select the document a user wants to attach to the invoice.

    - Add button – uploads the selected file to the server and adds the document to the Attached documents table. This also clears the Browse file component to avoid uploading the same document twice.
- Save button – stores the invoice as a draft in the database. The receiving company data is stored (in case any changes have been made or in case of a new entry) into a dedicated database table so they can later be reused by other users from the same organisation.
- Cancel button – discards all the changes.
- Publish button – performs a save and if the save is successful, the invoice is marked as published and becomes available to the receiving company's users.

7.2.3 Company details page

The company details page can only be access by users with write access rights. Here the user can edit the company data that shall be used when creating invoices. The page consists of a form with the following input fields and buttons:

- Name
- Address
- Postal number
- City
- Country
- VAT number
- Save button – clicking this button stores the data currently available in the input fields. This data is shared between all users from this company/organisation.
- Cancel button – clicking this button discards all the changes.

The input fields are prefilled with existing company data.

8 Storage allocation

Each port shall be able to define multiple storage areas, each with its own identification. Cargo can be added to each of the storage areas with an assigned storage lot number. Authorized users (storage area operator) shall be able to see an overview of the complete storage area as a table of storage lots with all cargo listed in it. Owner of the cargo shall be able to view only their own cargo here.

Each item shall have the cargo type, quantity (tonnage, number of units, etc.) and shipment ID.

8.1 Backend

8.1.1 User authentication

Check if the user is logged in and authenticated, if not initiate the login procedure.

8.1.2 Login procedure

Redirect to the login page of the Core module and integration with the authentication and authorization specified there.

8.1.3 Logging

Each user action that performs a change in the system (i.e. adding a new package entry, changing the status a stored package, etc.) is logged. The action, timestamp and username of the user who made the change are logged in the database.

8.2 Frontend

8.2.1 Storage allocation module header

The header of the storage allocation module shall allow navigation through the module and contain the following elements:

- navigation tabs
  - Storage allocation management page
  - Storage allocation overview page
  - Inventory page
- language selection functionality
- link to the user profile
- logout link

8.2.2 Storage allocation management page

The Storage allocation management page shall be available only to users authorized to perform storage allocation and shall contain the Storage allocation table, a graphical representation of the warehouse layout (not in scale) and the functionality that offers the user the ability to:

- Add package – a blank Edit package form is displayed and the user fills in the data to define a new entry.

- Edit package – the Edit package form is displayed, prefilled with existing data of the package the user is trying to edit. The user can modify the data.
- Remove package – after confirmation, the entry is deleted from the storage allocation plan.

8.2.2.1 Edit package form

A form used for adding new packages to the system as well as modifying existing ones. The form consists of the following input fields and actions:

- Cargo type – autocomplete select box where the user can select the type of cargo that is being stored in the warehouse (if available). If the type of cargo is unavailable, "Mixed" or "Unknown" options shall be available.
- Quantity – a number representing the quantity of cargo being stored within this package.
- Quantity measurement unit – dropdown select box where the user can select the measurement unit for the quantity entered in the previously described input box. Available units could be:
  - kg
  - coils
  - cases
  - pieces
- Weight – optional field for instances where the quantity is determined by other means.
- Storage location identification number – identification number of the storage location where the package is stored within the warehouse.
- Entrance date – calendar widget for entering the date when the package has arrived in the warehouse.
- Exit date – calendar widget for entering the date when the package left the warehouse.
- Sender – autocomplete select box containing names of all companies previously stored within the module. The sender of the package is the company that has provided the package to the warehouse. By selecting a company all other company data is automatically filled in (if available). If not the user can fill in the following company data manually:
  - Name
  - Address
  - Postal number
  - City
  - Country
  - VAT number

- Receiver – autocomplete select box containing names of all companies previously stored within the module. The receiver of the package is the company that is authorized to pick up the package from the warehouse (can be the same as Sender). By selecting a company all other company data is automatically filled in (if available). If not the user can fill in the following company data manually:
    - Name
    - Address
    - Postal number
    - City
    - Country
    - VAT number
- Cancel button – discards all the changes and returns to the previous page.
- Save button – stores the package and all the associated data. Sender and Receiver companies are also stored in an internal database table so that it can be reused by all users from the same organisation.

8.2.2.2 View package page

Gives the user an overview of all data related to that package. The following data is displayed along with the actions available to the user:

- Package ID – identification number of the package (parcel)
- Cargo type – type of cargo that is being stored in the warehouse.
- Quantity – quantity of cargo being stored within this package.
- Quantity measurement unit – measurement unit for the quantity of cargo.
- Weight – used in instances where the quantity is determined by other means.
- Storage location identification number – identification number of the storage location within the warehouse where the package is stored.
- Entrance date – date when the package has arrived in the warehouse.
- Exit date – date when the package left the warehouse.
- Sender – autocomplete select box containing names of all companies previously stored within the module. The sender of the package is the company that has provided the package to the warehouse. By selecting a company all other company data is automatically filled in (if available). If not the user can fill in the following company data manually:
    - Name
    - Address
    - Postal number
    - City
    - Country
    - VAT number

- Receiver – autocomplete select box containing names of all companies previously stored within the module. The receiver of the package is the company that is authorized to pick up the package from the warehouse (can be the same as Sender). By selecting a company all other company data is automatically filled in (if available). If not the user can fill in the following company data manually:
  - Name
  - Address
  - Postal number
  - City
  - Country
  - VAT number
- Edit button – opens the Edit package form with this package's data prefilled.
- Back button – returns to the previous page.

8.2.2.3 Graphical representation of the warehouse

Graphically the warehouse floorplan is represented in a manner similar to a checkboard where each cell represents a single storage location. Clicking on a storage location opens the View package page. Cargo type and amount are displayed in a shortened manner over each storage location representation. Status of each storage location is indicated graphically (i.e. background colour):

- Free
- Used
- Unavailable

8.2.2.4 Storage allocation table

All package related actions (incoming or outgoing packages) are displayed within this table. Each row represents coming or going of a single package. For each action the following data and actions are displayed:

- Package ID
- Cargo type
- Quantity
- Direction – incoming (just came to the warehouse) or outgoing (leaving the warehouse)
- Storage location identification number
- Receiver – name of the company that has taken the package from the warehouse
- Sender – name of the company that has brought the package to the warehouse
- Date – entrance or exit date (depending on the direction).

Pagination shall be used and the table shall be sortable by any column (ascending or descending).

8.2.3 Storage allocation overview page

A page where users without write access rights for the storage module can get an overview of all packages related to their organisation (i.e. packages that have their organisation as a sender or receiver). The page contains:

- A graphical representation of a warehouse – only the storage locations containing packages related to the user's organisation contain any data, other storage locations are greyed out and no data is available.
- Storage allocation table – only the transactions related to the user's organisation are displayed and no action buttons are displayed.

8.2.4 Inventory page

Provides an overview of the goods currently stored in the warehouse. The page can only be accessed by authorized user that have sufficient access rights (i.e. employees of the company that manages the warehouse). The page contains a single table with the following data listed for each cargo type stored in the warehouse:

- Cargo type
- Tonnage

9 Interface towards other transport modes

An interface where users from road and railroad transport modes can input information about their incoming and outgoing cargo:

- type of cargo
- mode of transport
- quantity (tonnage, number of units, etc.)

This data is stored within the data layer and is then compared to the numbers from the inland navigation and generally used for statistical purposes within the statistical module.

9.1 Backend

9.1.1 User authentication

Check if the user is logged in and authenticated, if not initiate the login procedure. If the user is successfully authenticated, check if he has a user role assigned that contains read or write access rights for any other transport modes. If not, display an informative message that access is denied because of insufficient access rights and restrict the user's access to any content of the module.

9.1.2 Login procedure

Redirect to the login page of the Core module and integration with the authentication and authorization specified there.

9.1.3 Store shipment

Function called when storing of a shipment is initiated. Calls the Core module's entityChange API method with the entityType set to 'shipment'. The shipment data is stored within the core module where it is accessible to the Statistics module.

9.1.4 Get shipments

Calls the Core modules API method to retrieve all shipments for the provided parameters. Used to populate the shipments tables.

9.2 Frontend

9.2.1 Interface towards other transport modes header

The header of this module shall allow navigation through the module and contain the following elements:

- tabs used for navigation between the module's pages:
  - Railroad
  - Road
- language selection functionality
- link to the user profile

- logout link

9.2.2 Railroads page

The page can be accessed only by users who have access rights for the Railroads transport mode assigned in the Core module. Here these users have an overview of all cargo shipments over railroads and can add new shipments, or modify existing ones. The page contains of the following elements:

- Railroad shipments filter
- Railroad shipments table
- New shipment button

9.2.3 Roads page

The page can be accessed only by users who have access rights for the Roads transport mode assigned in the Core module. Here these users have an overview of all cargo shipments over roads and can add new shipments, or modify existing ones. The page contains of the following elements:

- Road shipments filter
- Road shipments table
- New shipment button

9.2.3.1 Shipments filter

This covers the Railroad and Road shipment filters on their respective pages and allow the users to filter the shipments that are displayed in the tables below it by the following parameters:

- From date – calendar widget input to select the start date of the period from which the user wants to display the shipments.
- To date – calendar widget input to select the end date of the period from which the user wants to display the shipments.
- Cargo type – autocomplete select box where the user can select a specific cargo type for which he wants to see the shipments
- Direction – incoming or outgoing

The user can clear the filter with a single click.

9.2.3.2 Shipments table

This covers the functionality of the Road shipments table and the Railroad shipments table. The table shows all the shipments entered in the system for the appropriate transport mode that correspond to the applied shipments filter. Each shipment is displayed as a row in the table and the following parameters and actions are displayed per shipment:

- Cargo type
- Shipment number

- Date
- Direction
- Quantity (in metric tons)
- Edit
- Delete

9.2.3.3 Edit shipment form

The form allows the user to create a new shipment or modify an existing one. The form contains the following input fields and buttons:

- Cargo type – autocomplete select box where the type of cargo is selected
- Shipment number – identification number of the shipment, used as a reference
- Date – date of the shipment
- Direction – dropdown select box indicating if the cargo is incoming or outgoing (incoming = shipment coming to the port, outgoing = shipment going from the port)
- Quantity – amount of this cargo transported within this transport mode within this shipment.
- Transport mode – read only, transport mode depends on the already set value in case of an existing shipment, or is predetermined depending on the page where the New shipment button has been clicked (road or railroad).
- Save button – stores the changes made within the Core module's data base.
- Cancel button – discards all the changes