Test in Port Environment

Final Version of 30/08/2019

Deliverable Number D.4.2.4.

DISCLAIMER

This document reflects the author's views; the Programme authorities are not liable for any use that may be made of the information contained therein.

Document Control Sheet

Project number:	10043002
Project acronym	TRANSPOGOOD
Project Title	Transport of Goods Platform
Start of the project	January 2018
Duration	21 months
Related activity:	WP4 D. 4.2. – Test in port environment
Deliverable name:	D. 4.2.4. Test in port environment
Type of deliverable	Report
Language	English
Work Package Title	Smart logistics pilot and test of profiles calculators
Work Package number	4
Work Package Leader	Elevante srl
Status	Final
Author (s)	Ploče Port Authority
Version	1
Due date of deliverable	August 2019
Delivery date	30th August, 2019

Summary

1. Introduction 4

2. Methodology used to test the platform in a port environment 10

3. Key performance indicators 16

4. Results of the TRANSPOGOOD platform test 18

Conclusion 32

1. Introduction

TRANSPOGOOD platform, as an IT platform enhanced by online applications for intermodal traffic, should enable transport operators, SMEs, port authorities, terminals, logistic stakeholders, users, shippers, freight forwarders, to increase efficiency in operations and administrative functions, decrease costs and optimize transport route maximizes space utilization and reduce congestion on streets and nodes.

The platform is enriched by innovative profile calculators to allow logistics and transport stakeholders and users to optimize and select the best option very quickly and easily in terms of best price of the combined transport, lower emissions of the entire chain, higher load factor in both directions and total transit time.

The Platform intends to facilitate forwarders and truck transportation companies in identifying the best trip solution, considering mainly intermodal opportunities.

The general approach is to create an “umbrella tool” that will be able in the future to connect and share information with existing business platform and providers. It is like a “Trivago” or “Kayak” portal that on the basis of specific request will look up in different existing platform.

In this way the TRSNDPOGOOD platform, overcome all the issues related with state aids, business, incomes, and so on.

Port of Ploče Authority (PPA) strives to increase in savings and efficiency in administrative and physical logistics. This can be realized by collaboration between the port stakeholders where the following aspects are relevant:

- focused investment in technology (as enabler) and in the organization (changed processes);
- trust and commitment in the development of a Port Community System (PCS) and a Coordination Application (CA) aiming at efficient and effective exchange of relevant information.

The term PCS is widely spread and in use in different port environments. Although several specific definitions exist, a PCS can be considered to serve to exchange data between different stakeholders in a port. In this case the PCS focuses on the exchange of data, while the Coordination Application (CA) is focusing on gathering and making visible operational data for planning purposes.

The “As is” situation described in the Inception Report learned that the Port of Ploče has its own specific procedures. Stakeholders communicate currently with other members of the community mainly via written and verbal communication and to a lesser extent via email interchange.

This Interim Report describes the “To be” situation, aiming at the introduction of streamlined processes regarding the interaction between stakeholders and the related exchange of information by means of EDI (Electronic Data Interchange).

The Port Community System (PCS) is intended to integrate the electronic flow of information across the trading partners involved in the maritime transport chain through a common interface.

The objective of the Port Community System (PCS) is to:

- Develop a centralized, web-based and intelligent electronic message switching facility between the port community members including the Ploče Port Authority (PPA), Luka

Ploče, Shipping Lines and their Agents, Customs, Railways, Forwarders, Customs Agents, Surveyors, Road Transport Operators, Pilots, Border Police, etc.

The CA should:

- Maintain a centralized database to improve track and trace efficiency and shipment and service visibility.
- Enable to use the centralized database as a repository for operational planning, research and analysis.
- Allow a web-based application to access and support the information of this centralized database and common processes in secure fashion. This would provide a single source and an integrated standardized process for information exchange with links to the systems of port stakeholders.

The stakeholders are able to use the CA as a single window for their information needs to plan cargo handling and vessel operations. The system will facilitate the stakeholders in exchanging electronic documents with respect to the maritime chain fast and in a secure way. The message exchange will be based on EDIFACT / XML formats. The system will have the capability of translating messages from one format to another according to the requirements of the stakeholders. This way the electronic messages received can be integrated with the back-office applications of the stakeholders.

A web portal is provided for all stakeholders to provide access to the PCS and the CA. Access to the PCS allows reading received messages from port community members and to compose and send messages to them. Access to the CA will give access to the maintained up-to-date information regarding cargo handling and vessel operations.

With the PCS in place, the stakeholders are ensured that the data they need to manage regarding their respective operations is up-to-date, accurate and consistent across all parties and available 24 hours a day.

Main benefits derived from the system are:

- The exchanged information is much more error proof;
- The exchanged information is quicker available enabling to take the right decisions;
- Stakeholders have one mutual place and one program that they can use to send information to other parties;
- Stakeholders can submit documents and data at any time and from any location by using any internet-connected PC;
- Stakeholders often do not have to retype the same data and have the benefit of less paperwork;
- Stakeholders have the opportunity to realize an interface between their in-house back-office systems and the PCS for further integration of data processing;
- The data stored in the Coordination Application can be used for statistical analysis.
- The system will result in enhancing the trade by making related information timely available for stakeholders.

Within TRANSPOGOOD ICT Platform Port Community System in Ploče will be integrated with developed platform and share information regarding parking space availability. Based on this information users can calculate best traffic routs and plan their activities.

Figure 1 Port of Ploče Entrance terminal

Port of Ploče Entrance terminal is new opened entrance terminal to Port of Ploče with available space for trucks and other vehicles which transport different type of cargo. At the moment there are 24 places for trucks that transport liquid cargo and 24 places for trucks which transport other type of cargo (containers etc.)

All truck which enter port of Ploče must park on entrance terminal and based on truck announcements enter the port. Truck announcements are entered by stakeholders and without truck announcement trucks cannot enter port area.

In real time many truck announcements have been updated on hourly base which have impact on space availability. In real time scenario Port Community System deliver data regarding truck announcements and parking availability.

New entrance terminal has direct road connection from highway and truck are entering parking directly from highway without entering City of Ploče. Entrance Terminal has been built in port of Ploče area, and it is fully automated.

Figure 2 Port of Ploče Entrance terminal

2. Methodology used to test the platform in a port environment

Document is qualitative and explorative in nature; it uses a variety of secondary resources that allows to get a pretty precise overview testing scenario. Existing tests are based on KPI-s defined through project within Port of Ploče Authority and are made on real existing scenarios in Port of Ploče.

The growth of e-platforms in the ten last years has resulted in a variety of initiatives that refer to several different types of functions to address the need to adopt ICT to boost intermodal and multimodal transport on the project area and collect information on the cutting edge developments in this field.

To ensure the highest level of software functionality and operability the test team will adopt following test method and workflow. Testing team will work to ensure the usability, interoperability and performance of the software.

Figure 3 Test workflow

2.1 Test environment

The overall environment for developing system consists of:

1. **Testing environment –** used by developers and test team for testing and internal quality assurance
2. **UAT environment –** user acceptance test environment
3. **Production environment -** used by all end users to work with system in everyday life

Test environment must be as similar as possible to production environment. After successful implementation system in production environment the testing system must remain operational for further development and testing purpose.

2.2 Test levels

According to each test methods, various test levels shall be applied in order to minimize unwanted errors in pilot version of software.

Unit testing

Working with the functional specification, the test engineers shall analyse every aspect of the application's operations, including those generally hidden from the end user.

The following areas of the project must be unit-tested and signed-off before being passed on to testing team:

Test must cover:

1. Compliance with the designs and specifications,

2. Performance,
3. Database verification (correct inserting and updating of rows),
4. Correct functioning of all components.

Integration testing

During this phase of testing, the testing team shall test the software in specific settings and evaluates the performance of module interactions or screens within the applications.

This is a standard testing procedure and requires that coherent sets of information are processed through the whole system. At this point it is not the individual program or function that is evaluated, but the flow of information through the system. The criteria here are:

1. Correct hand over of information (and pick up of that information) to next modules or functions.
2. System allows for correction to previous stages in the process.
3. Information remains unchanged during (re) use in other modules.
4. Interfaces work
5. The whole workflow can be processed with the system

System testing

This is a simulation test comprising the testing of the software and all interfaces in a semi-production environment. This will require simulation or duplication of operational information, procedures, accepted workflows, and audits and checks on the system. This final step in the testing process will ensure that the new software and all interfaces will perform according to specification in a production environment.

Regression testing

Regression testing involves retesting of all modules of the application after a change is made to the application. This is a standard testing procedure. The testing team shall carefully recreate the environment and steps involved when a bug was originally reported to verify or deny the success of the changes. The team will also take great care in reviewing the other areas of the application to ensure nothing was inadvertently affected, thereby causing new problems to be introduced.

User acceptance test

UAT is the testing of the system by business users. For efficient testing it is required that the user test group has received training about the correct use of the system. Test cases for the UAT must cover principal daily business cases.

2.3 Bug regression

Bug Regression will be a central tenant throughout all testing phases. All bugs that are resolved as “Fixed, Needs Re-Testing” will be regressed when testing team is notified of the new drop containing the fixes. When a bug passes regression it will be considered “Closed, Fixed”. If a bug fails regression, testing team will notify development team by entering notes into Bug Tracking System.

When a Severity 1 bug fails regression, testing team will beside entering notes into bug tracking system, also put out an immediate email to development team. The Test Lead will be responsible for tracking and reporting to development and product management the status of regression testing.

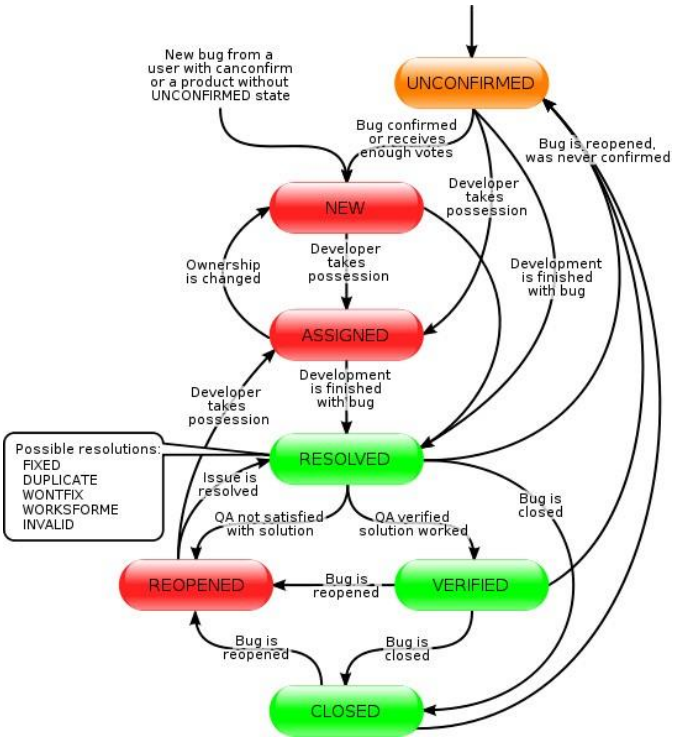

Figure 4 Life-cycle of a bug

At the end of each phase in roll out plan a separate cycle of regression testing will occur to confirm the resolution of Severity 1 and 2 bugs.

2.4 Test completeness

Testing will be considered complete when the following conditions have been met:

Standard Conditions:

When Testing Team, Development Team, Project Management, and Technical Management agree that testing is complete, the application is stable, and agrees that the application meets functional requirements.

All priority 1 and 2 bugs have been resolved and closed. Each test area has been signed off as completed by the Test Lead. 50% of all resolved severity 1 and 2 bugs have been successfully re-regressed as final validation. Ad hoc testing in all areas has been completed.

Bug Reporting:

Bug find rate indicates a decreasing trend prior to Zero Bug Rate (no new Sev. 1/2/3 bugs found). Bug find rate remains at 0 new bugs found (Sev. 1/2/3) despite a constant test effort across 3 or more days. Bug severity distribution has changed to a steady decrease in Sev. 1 and 2 bugs discovered.

No 'Must Fix' bugs remaining prior despite sustained testing.

Test deliverables

Testing will provide specific deliverables during the project. These deliverables fall into three basic categories: Documents, Test Cases / Bug Write-ups, and Reports.

3. Key performance indicators

All KPIs are related also to port security and all KPIs have impact on truck ques and can be used for solving bottlenecks on port gate. Bottleneck could be caused by many factors in logistic chain within port and these KPI can be used for measuring values and also could be checkpoints in a way to solve bottlenecks

- **Time interval spend on terminal**

Based on time interval which is calculated by status of trucks Port of Ploče Authority has information needed for planning of resources. Time interval is also important for clients so that they can prepare needed action for cargo transport and delivery. Also based on this information fee can be calculated which has to be payed when truck enters port. This information can also be used to predict time for parking occupation by specific truck.

- **How many trucks are parked over night?**

Information is needed for trucks so that they can plan they trip and time when to come on gate parking. If parking is full time can be calculated to enter port gate all trucks must first come to parking before entering port.

Also based on this information fee can be calculated which has to be payed when truck enters port.

- **How many trucks enter and leave port by hour?**

This KPI gives information regarding number of trucks which enters/leaves port by hour and have impact on port authority income from port dues and fees. It has also planning purpose.

- **Truck turn time**

This KPI gives information regarding time needed for trucks operations within port. If this turnover is higher operation in port are done quick and port is more effective. If port is more effective transport of cargo with cargo operation can be higher. It has also planning purpose.

- **Time when truck has entered and time when truck has leave port**

This KPI gives information regarding time spend in port for trucks. It can be used for planning purposes and have impact on port operations.

4. Results of the TRANSPOGOOD platform test

TRANSPOGOOD ICT Platform has been implemented on ICT infrastructure of Port of Ploče Authority and has been integrated with Port of Ploče Authority Port Community System. Port Community System has been integrated with needed subsystems of technical security. On next figure is shown new Port of Ploče entrance terminal where all pilot actions have been done.

Figure 5 Testing environment of entrance terminal

	Direct access to port from highway
	External parking space
	Internal parking space
	Main building
	Control and main gate

4.1 User Case – Port of Ploče Entrance Terminal

In **Figure 5** map of Port of Ploče Authority Entrance Terminal has been shown. All cargo vehicles must enter external parking for check in before they enter port area. When they enter external parking plate recognition system capture truck plate numbers and send data to technical security subsystem. This subsystem maintenance data regarding vehicles and it is crucial for issuing ID badge for truck driver. Data which are captured are sent to message bus of Port Community System where data from plate recognition system are paired with data from Truck announcements.

All users within Port Community System have obligation to deliver truck announcement in Port Community System. In module Truck Announcements there is submodule for uploading truck announcements where they have generated forms for uploading data. They are using .xls file format for uploading this data which is generated from their system. This is a first phase and is crucial because data must be standardized for exchange in port area. Many users have systems which have different outputs and for all there is a need for development of standards in message exchange if we want machine to machine message exchange.

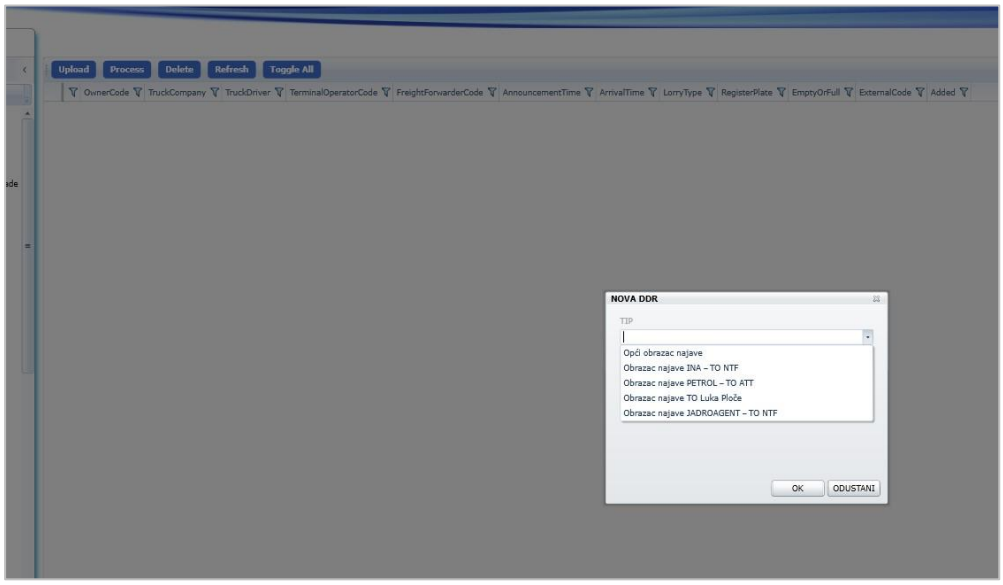

Figure 6 Upload forms for Truck announcements

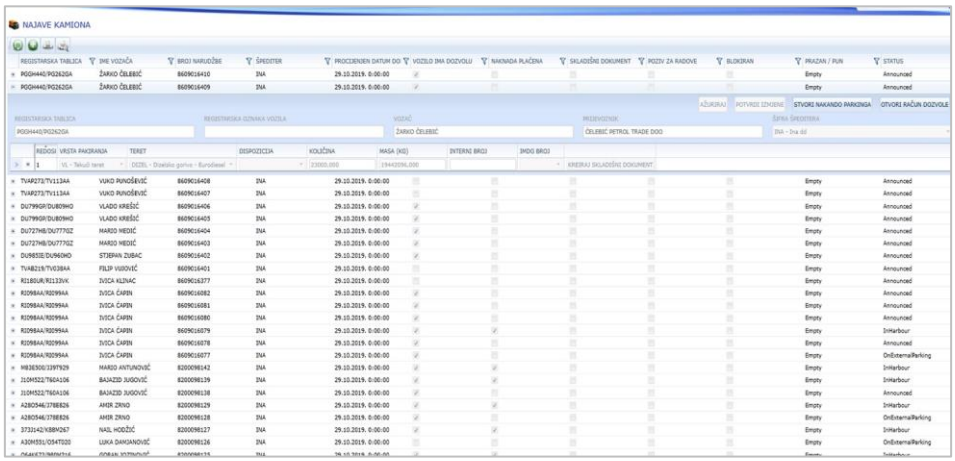

Figure 7 PCS Truck Announcements and Visit Screen

If user selects one of the truck announcements, selected truck announcement screen will appear. Truck announcement screen contains all necessary information about truck.

Every truck announcement has status. When trucks are announced announcement has status ‘announced’. When trucks enter external parking, plate recognition system capture truck plate numbers and send data to technical security subsystem. Truck announcement then change status to ‘OnExternalParking’. Status changes when trucks are passing check points. This subsystem maintenance data regarding vehicles and it is crucial for issuing ID badge for truck driver. Data which are captured are sent to message bus of Port Community System where data from plate recognition system are paired with data from Truck announcements.

Porth Authority has department which are issuing invoice for permits used for port enter and based on truck permit invoice for parking will be issued.

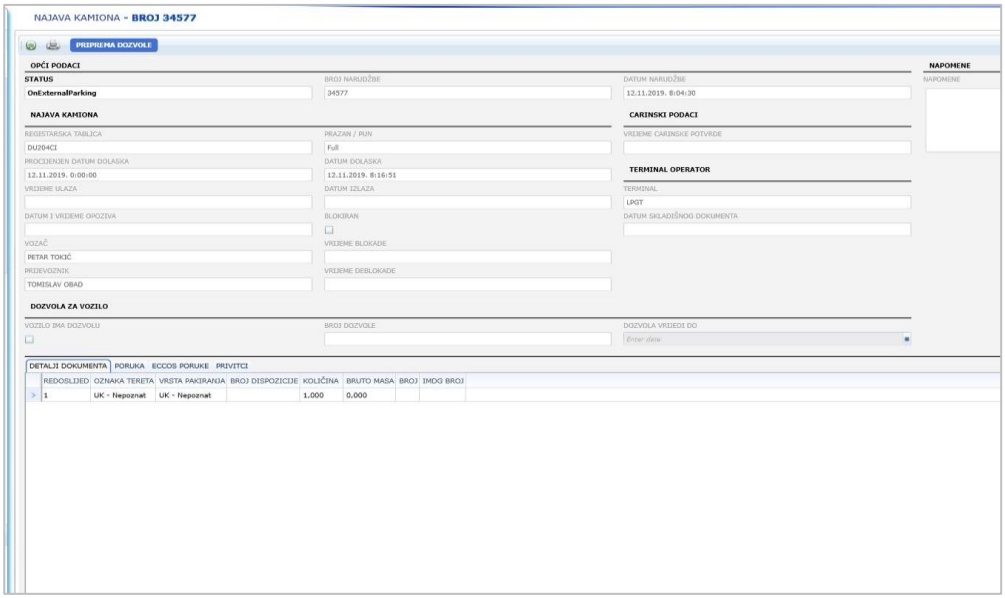

Figure 8 Detials of Truck announcements

As shown in **Figure 8** there is a detailed window for truck announcement. Within this window Port Authority user can issue truck permit which is needed for port enter.

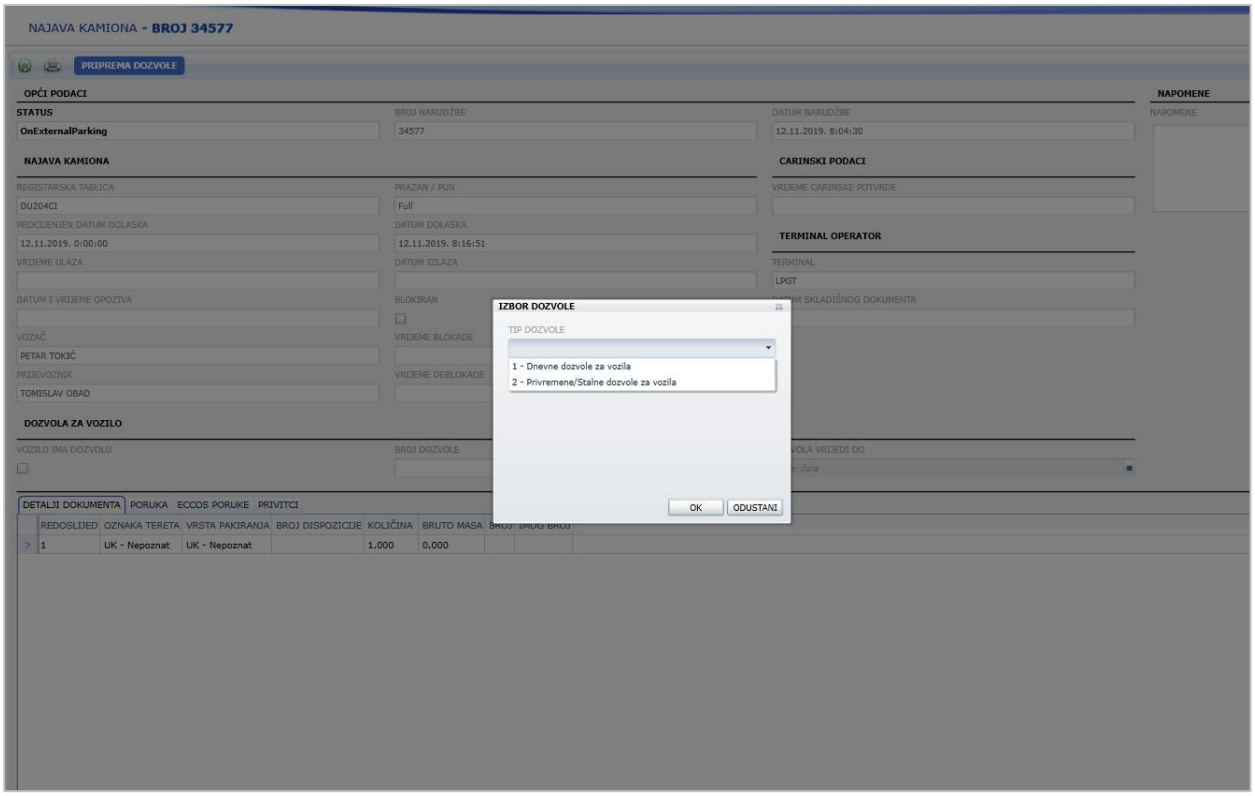

Figure 9 Issuing truck permits

As shown in **Figure 9** there are two types of permit which can be issued for port enter. There are daily permits and permits for longer period. This is crucial because this action have impact on time frames which are used for KPIs.

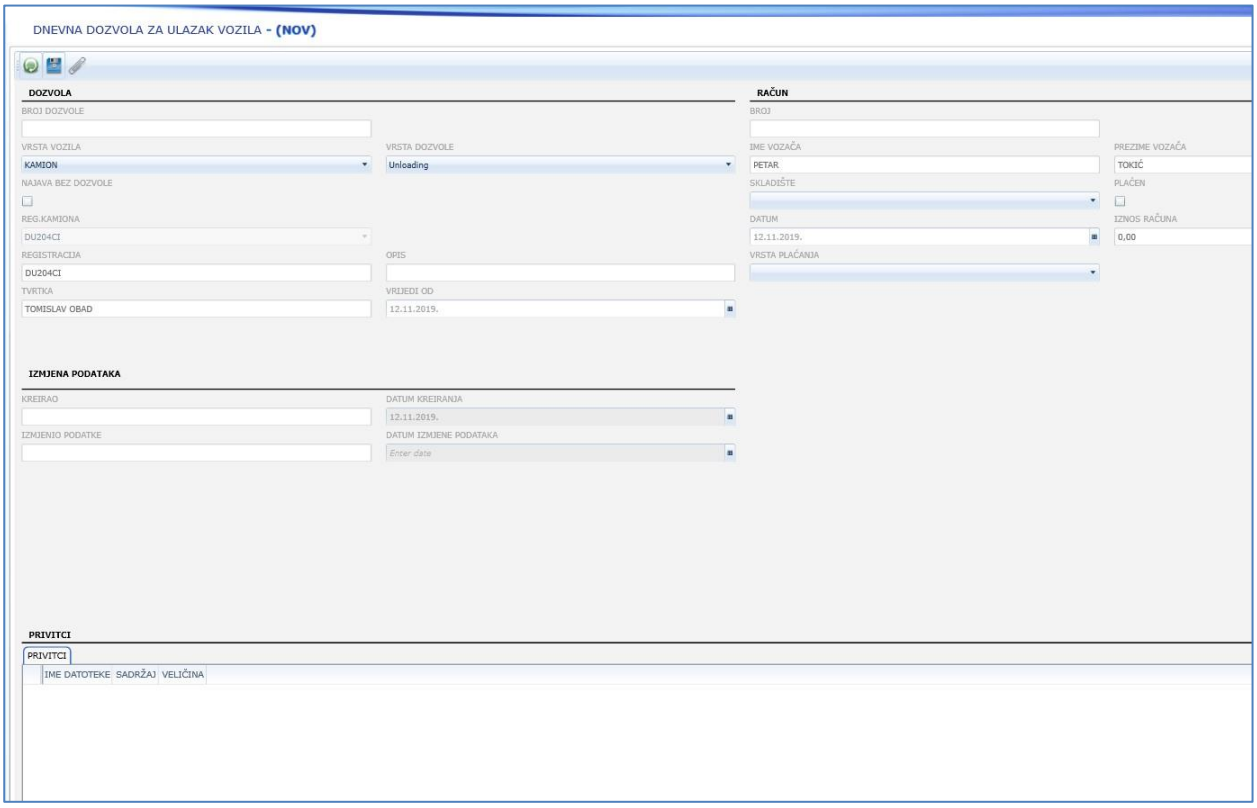

Figure 10 Issuing Permit for Daily access

As shown in **Figure 10** daily permit s has many data to be entered which are relevant for port enter. These data are regarding truck plates, type of truck, type of cargo delivery, data regarding

truck driver and company. These data for port enter based on daily permits are valid for one day. After this permit expire, data are stored in archive. Based on previous entered data all other data could be automatically generated. These data are changed by Port Authority officer.

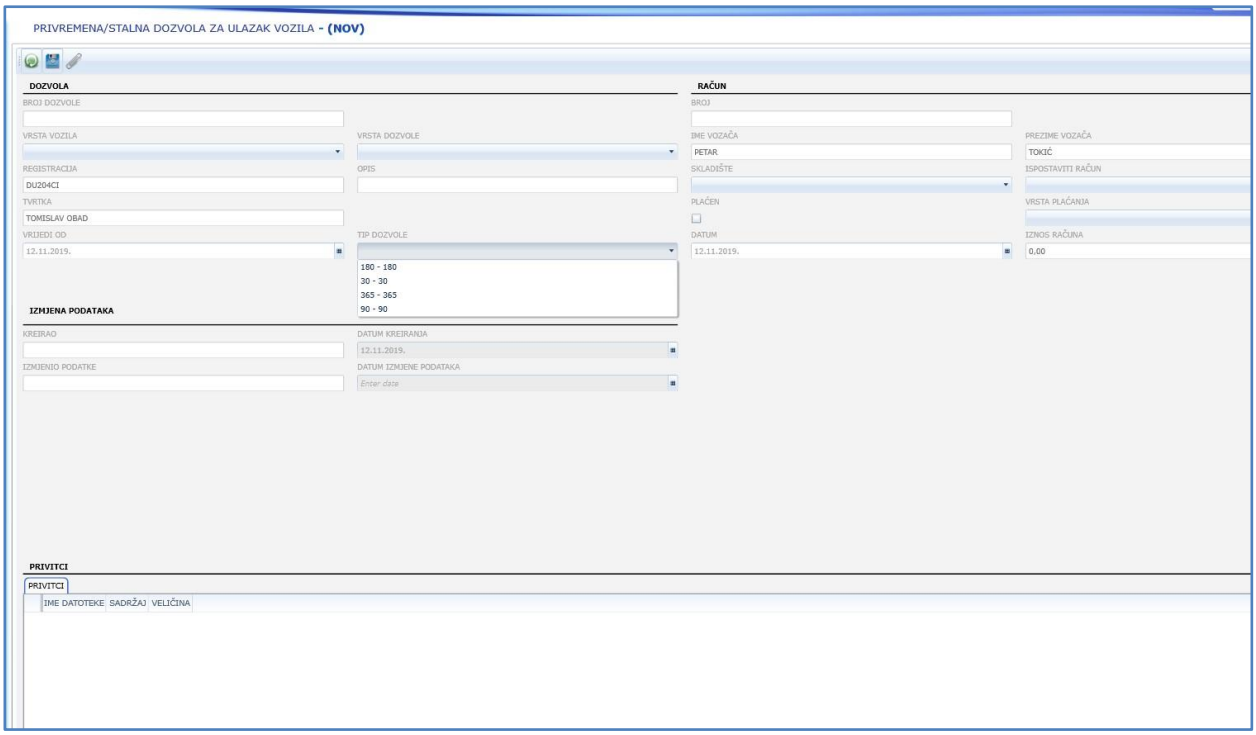

Figure 11 Issuing Permit for longer period

As shown in **Figure 11** permits can be issued for longer period. These data are regarding truck plates, type of truck, type of cargo delivery, data regarding truck driver and company. These data for port enter based on daily permits are valid for one day. After this permit exceeds, data are stored in archive. Based on previous entered data all other data could be automatically

generated. These data are changed by Port Authority officer and permits for longer period must be issued by Port Authority officer when this permit expired.

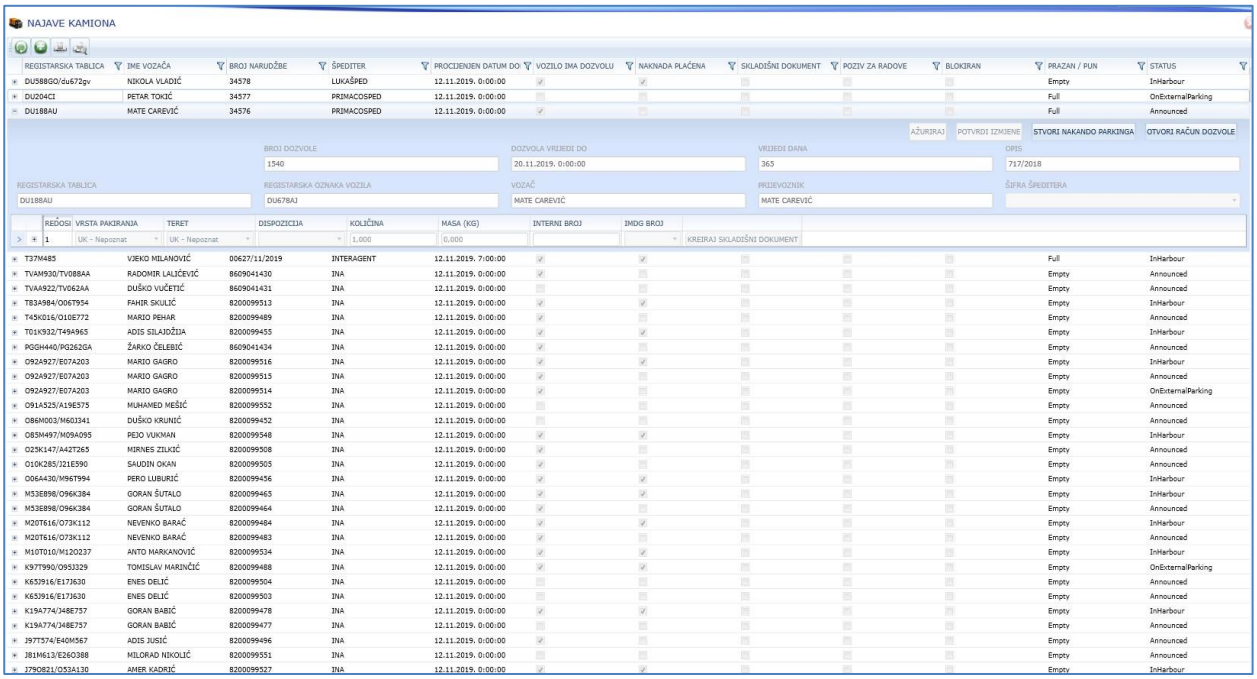

Figure 12 Truck announcements after issuing permits and parking invoices

After permit for port enter is issued, ss shown in **Figure 12** parking invoice can be issued for trucks which are on externa parking. Parking invoice can be issued only if truck has permit for port enter. Parking invoice is issued by Port Authority officer when after all necessary data regarding permit for port access are issued.

Figure 13 and **Figure 14** shows parking periods and tariffs which are needed for parking invoices.

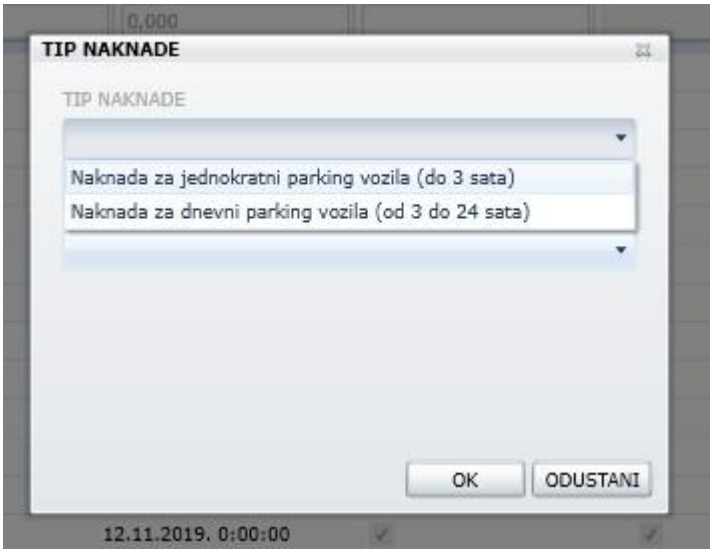

Figure 13 Issuing parking ticket

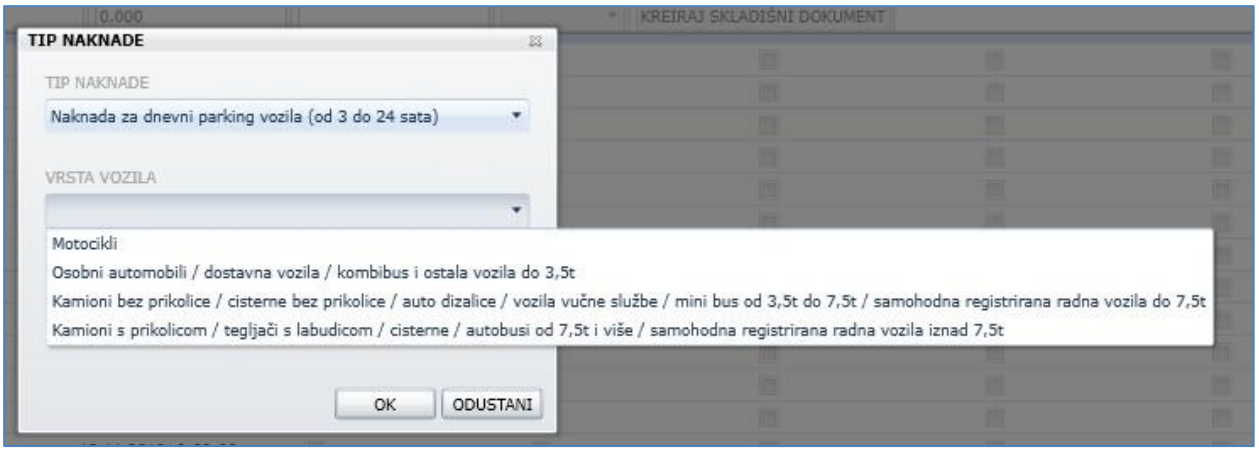

Figure 14 Issuing parking ticket – Tariffs

4.2 KPIs and truck statuses

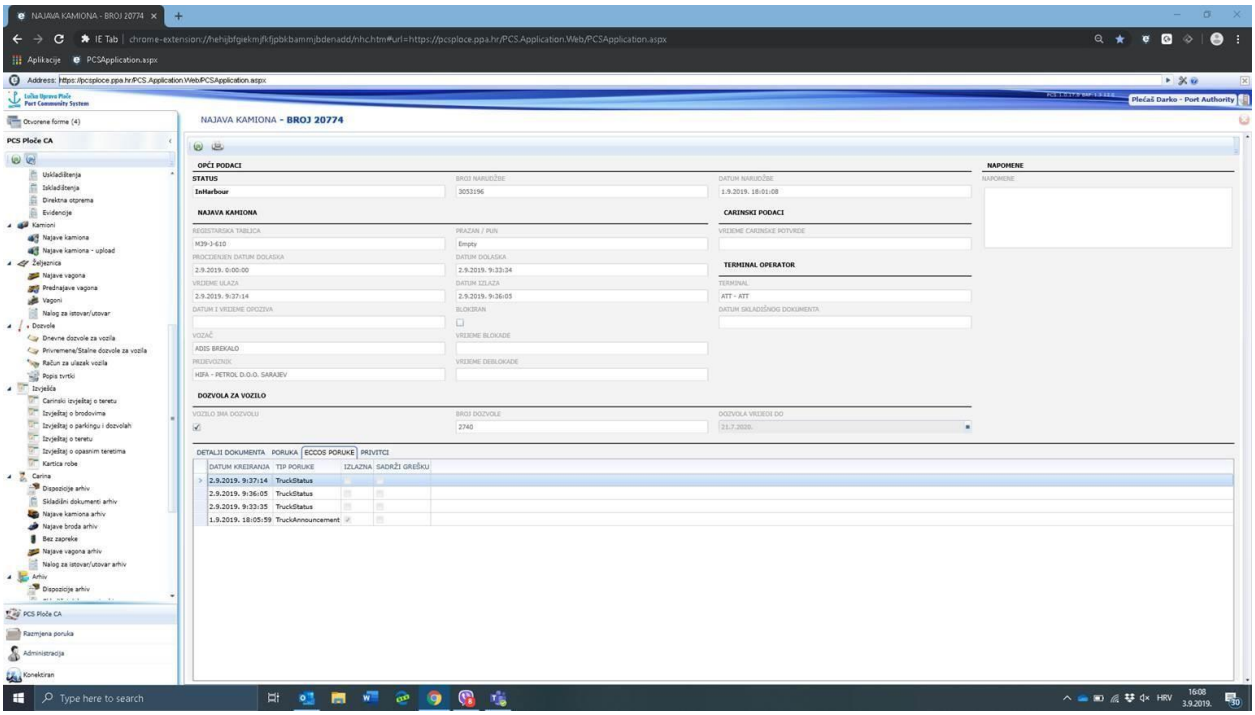

Figure 15 Statuses of truck announcements

All truck announcements have data regarding messages which are exchanged with other systems. As mentioned earlier, all cargo vehicles must enter external parking for check in before they enter port area. When they enter external parking, plate recognition system capture truck plate numbers and send data to technical security subsystem. This subsystem maintenance data regarding vehicles and it is crucial for issuing ID badge for truck driver. Data which are captured are sent to message bus of Port Community System where data from plate recognition system

are paired with data from Truck announcements. Status of Truck announcements is updated and changed.

Time stamp of update has been recorded within exchanged message which is crucial for information regarding available resources on external parking needed to plan business activities. Based on status and time stamp when have truck arrived on parking and based on time spent on parking financial parameter or parking is calculated. This is for business relevance because if truck stays on parking longer, higher parking tariff will be calculated.

Status is changed based on entered data also from Freight forwarder and terminal operator which is relevant for time needed for truck or company regarding cargo transport and delivery.

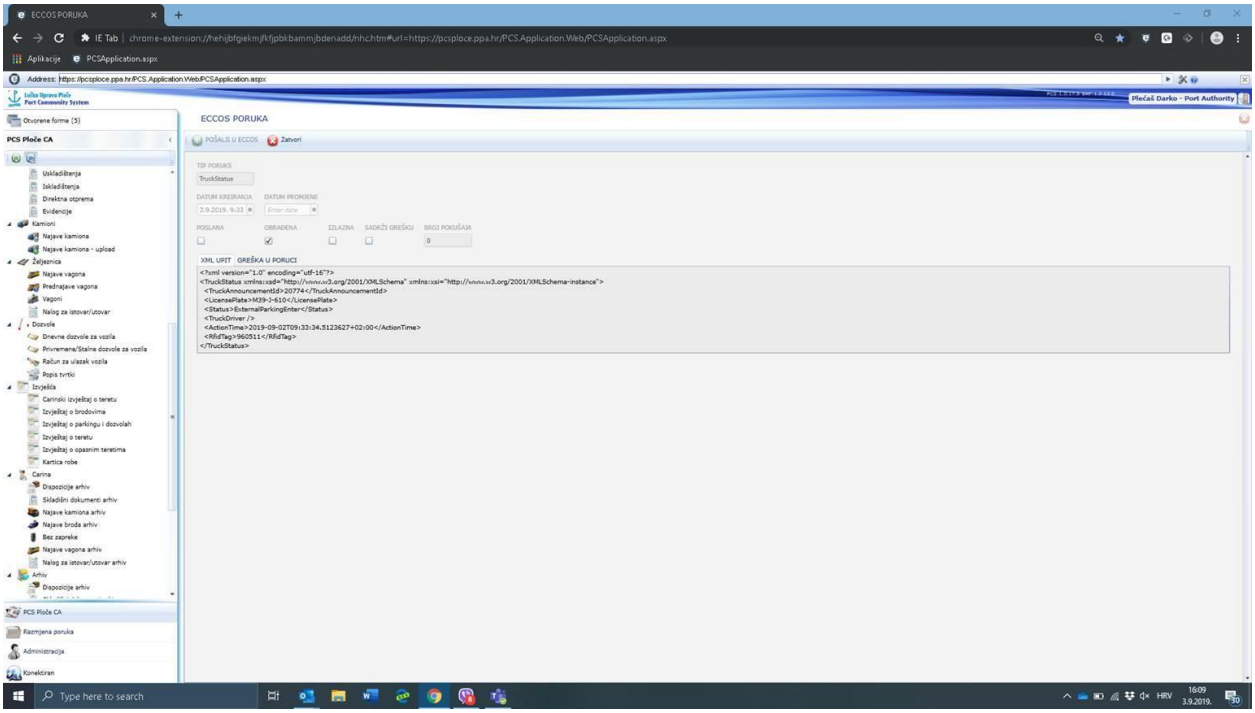

Figure 16 Detailed view of truck announcement status 'ExternaParkingEnter'

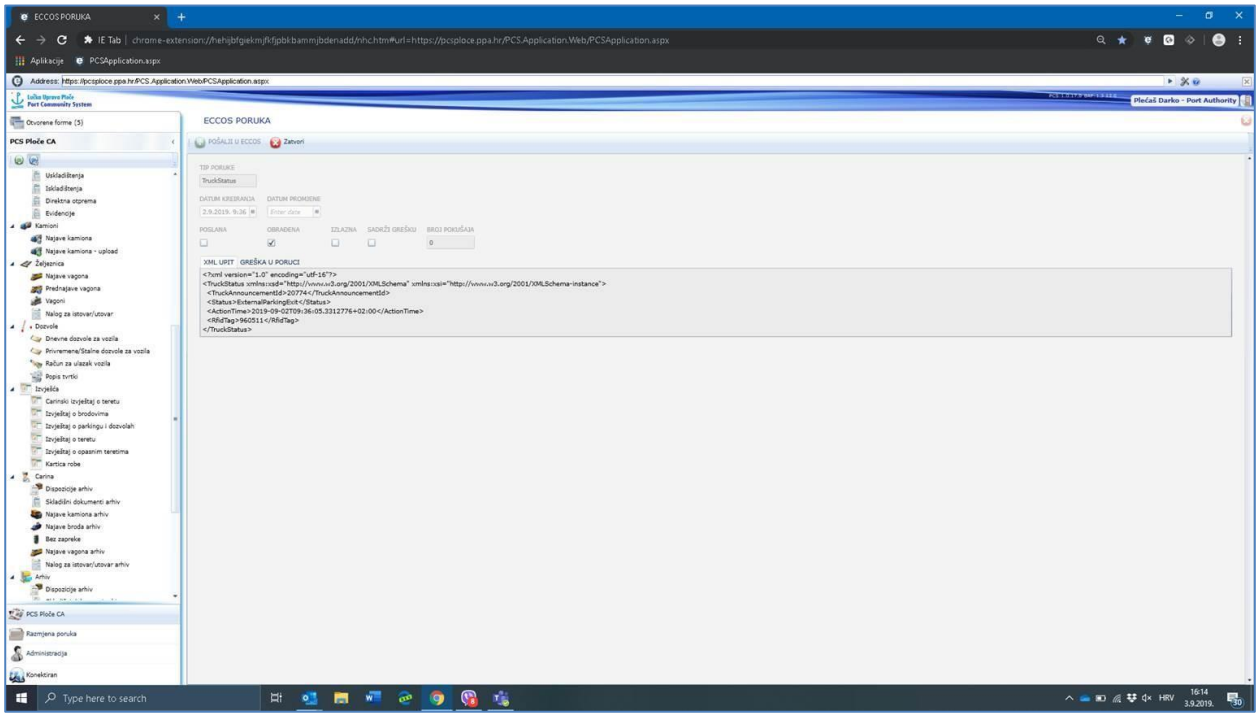

Figure 17 Detailed view of truck announcement status 'ExternaParkingExit'

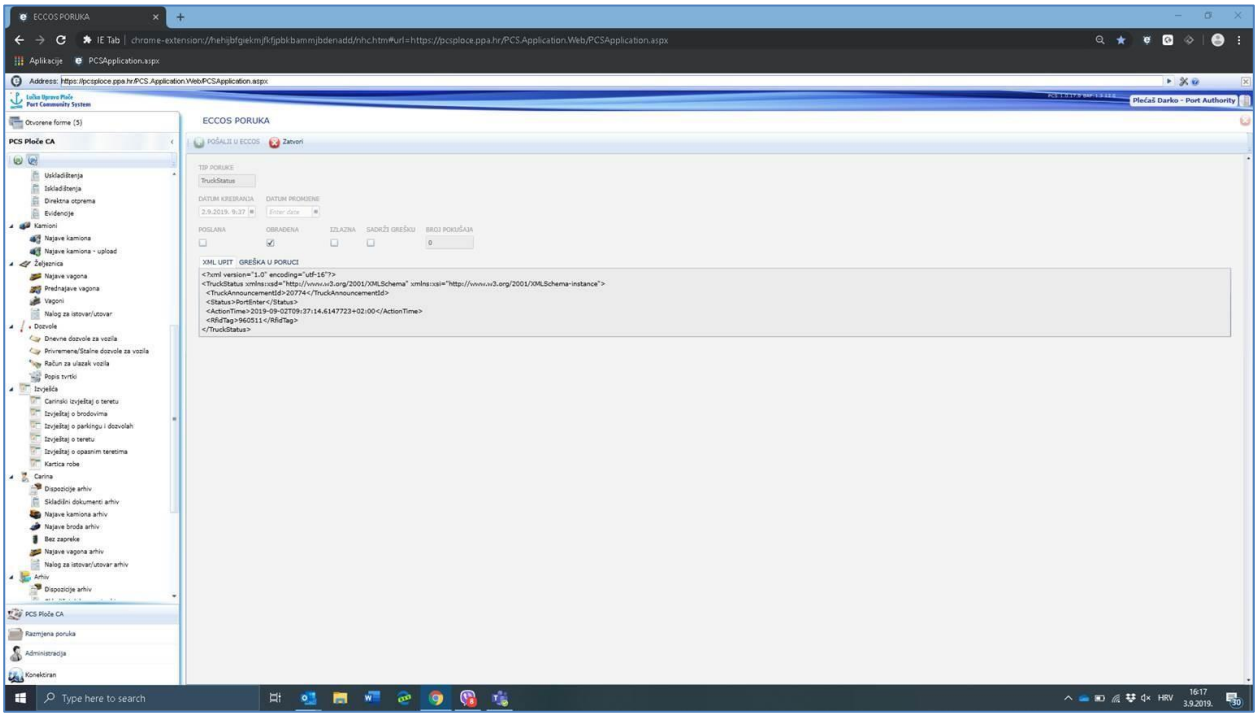

Figure 18 Detailed view of truck announcement status ‘PortEnter’

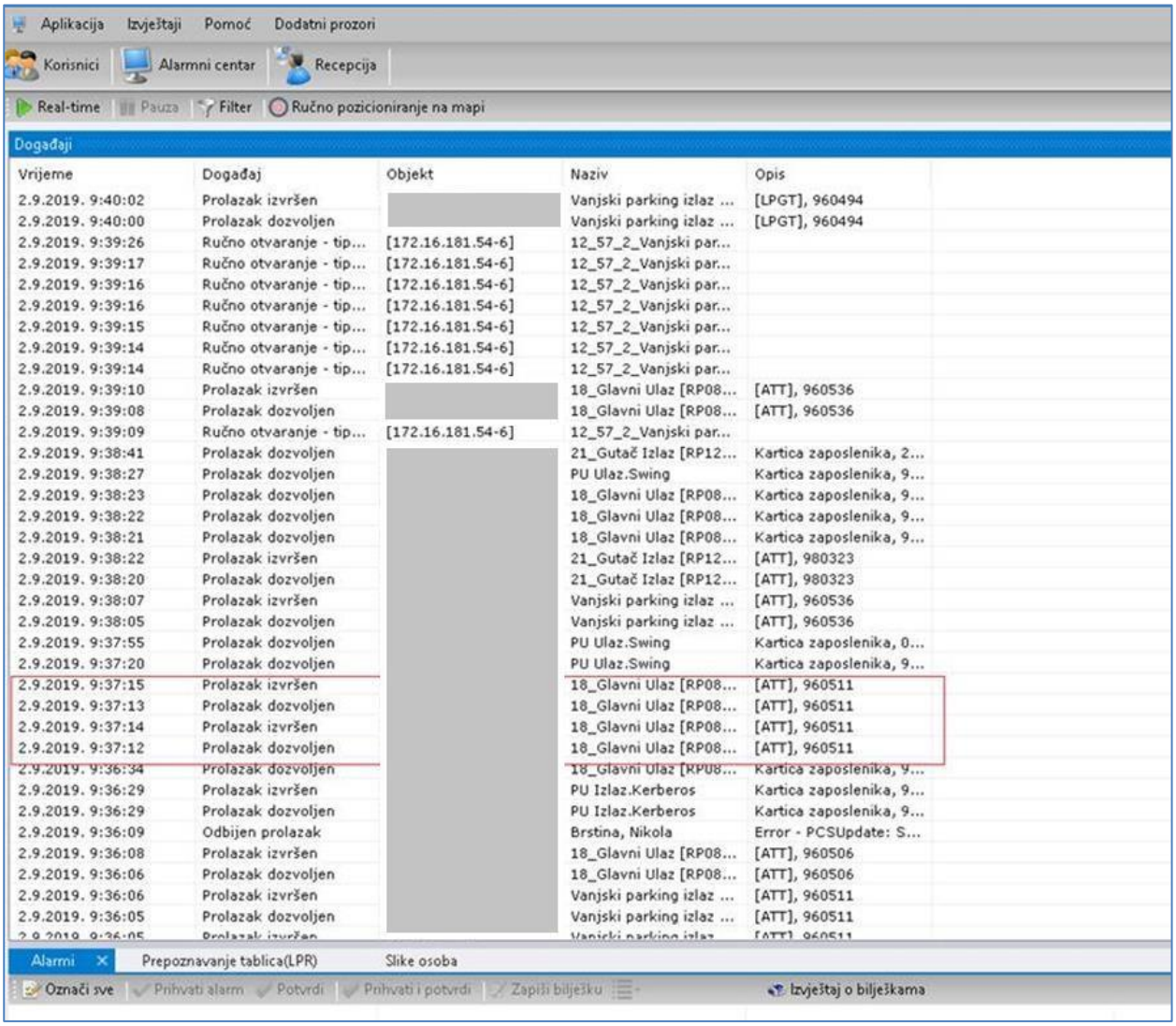

Figure 19 Details in Technical security system

Conclusion

The PCS (Port Community System) and Technical security system in integrated on actual business process regarding entrance and exit point. Technical security system is used to control all persons entering and exiting the port area (truck drivers, employees, visitors…). Technical security system is also used to control all vehicle (with and without cargo), entering and exiting port area, because vehicle permit is linked with permit for persons. When a permit for person is issued, it is linked with vehicle´s registration plate. This functionality of binding permit for person with vehicle permit will be resolved by PCS system.

Integration between systems is made by exchange messages (messaging system) in XLM data format with Web Services.

Truck announcement should be made in Port Community System. Announcement update can be done in Technical security system and updated in PCS system. Truck arrival, truck enter, and truck exit is made in Technical security system and updated in PCS system.

All KPIs are related to all port stakeholders which are part of Port Community System and all KPIs have impact on truck ques and can be used for solving bottlenecks on port gate. Bottleneck could be caused by many factors in logistic chain within port and these KPI can be used for measuring values and could be checkpoints in a way to solve bottlenecks.

Within pilot actions and PCS upgrade we have considered following KPIs

- **Time interval spend on terminal**
- **How many trucks are parked over night?**
- **How many trucks enter and leave port by hour?**
- **Truck turn time**
- **Time when truck has entered and time when truck has leave port**

Due to the lack of port resources, truck announcement should be sent prior of truck arrival.

To overcome the multiple existing barriers of efficient intermodal and multimodal transport and to overcome problems regarding transport of cargo intention is to use smart ICT tools. Data should be exchanged within port eco system and to system which exist within port area.

Port of Ploče Entrance terminal is new opened entrance terminal to Port of Ploče with available space for trucks and other vehicles which transport different type of cargo. Now there are 24 places for trucks that transport liquid cargo and 24 places for trucks which transport other type of cargo (containers etc.)

All truck which enter port of Ploče must park on entrance terminal and based on truck announcements enter the port. Truck announcements must be entered by stakeholders and without truck announcement trucks cannot enter port area.

In real time many truck announcements have to be updated on hourly base which have impact on space availability. In real time scenario Port Community System deliver data regarding truck announcements and parking availability.

New entrance terminal has direct road connection from highway and truck are entering parking directly from highway without entering City of Ploče. Entrance Terminal has been built in port of Ploče area, and it is fully automated.

Data regarding resources which are crucial for cargo transport and for planning activities should be exchange on public platform from planning activities and planning daily business resources.

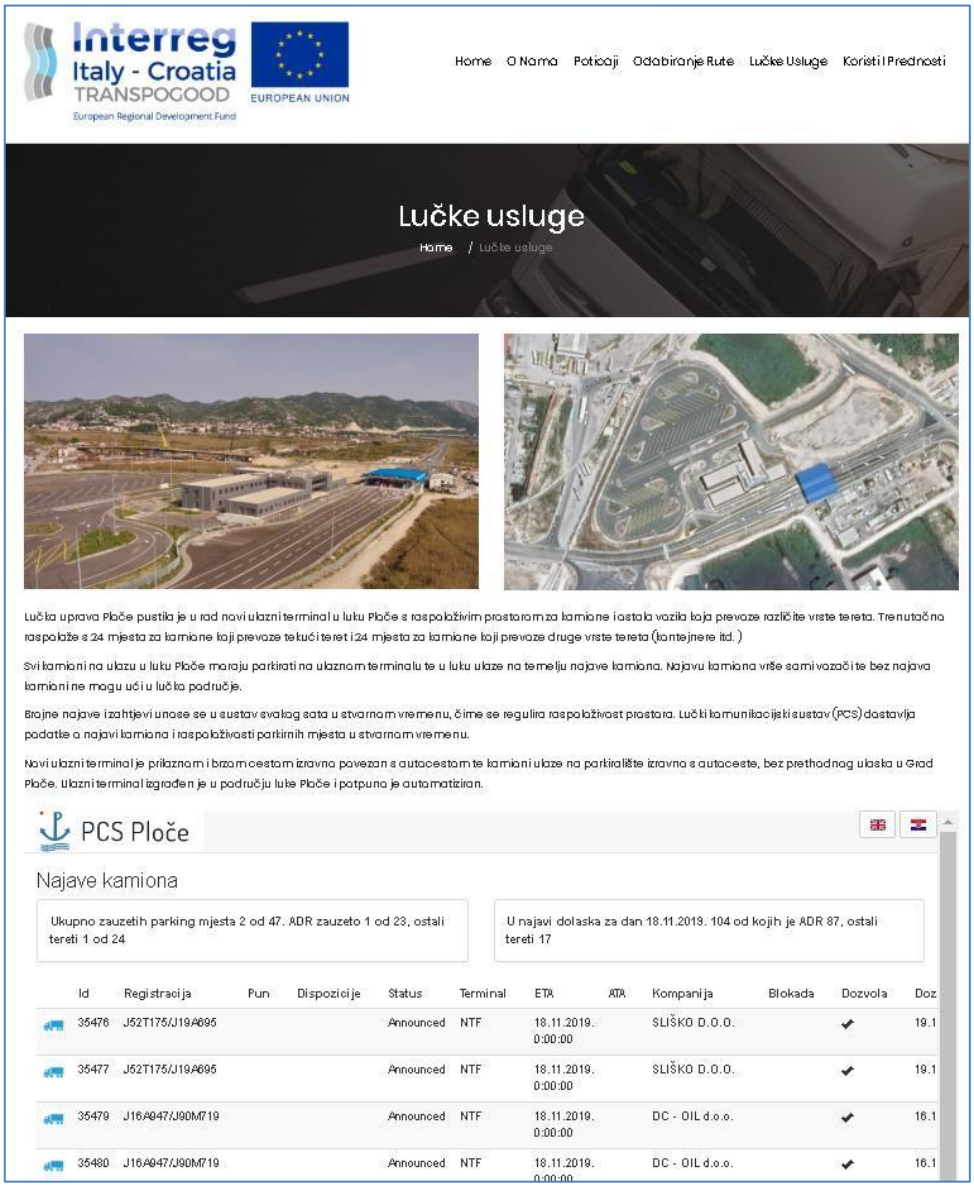

Figure 20 TRANSPOGOOD ICT Platform integrated with PCS Ploče

To overcome the multiple existing barriers of efficient intermodal and multimodal transport on the Adriatic
Sea, **TRANSPOGOOD** intends to use smart ICT tools and capitalize on existing practice. Within TRANSPOGOOD Project Port of Ploče Authority has integrate PCS system to share data with developed platform to find the best solutions for transport services (e.g., best price of combined transport, lower emissions of entire chain, e- procurement tools for maritime transport services, higher bi-directional load factor), to deliver guidelines and requirements for migrating from current systems and architectures to the **TRANSPOGOOD** platform also using previous solutions (INTERMODADRIA and other past initiatives carried out on European level) and training for operators to achieve cross-border competences alignment and to develop profile calculator solutions to monitor logistics and environmental performances, involving cargo flows and operational processes from the point of view of public authorities, e.g.,port authorities, and private intermodal transport operators