COOPERATIVE SYSTEM FOR INTERMODAL RAILROAD OPERATIONS

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Abstract: The research project EURIDICE (European Inter-Disciplinary Research on Intelligent Cargo for Efficient, Safe and Environment-Friendly Logistics) focuses on the development of intelligent solutions for the transport sector. The basic concept of EURIDICE is an information services platform centered on the individual cargo item and its interaction with the surrounding environment and the user. EURIDICE has promoted the Intelligent Cargo concept as a future solution for transport sector information needs. The platform will be implemented and tested in eight industrial transport scenarios. This paper looks at one scenario related to intermodal railroad operations. The paper presents the functionalities of the developed cooperative system for intermodal railroad operations and the way end-users can use the system environment in their operations.

1 INTRODUCTION

Intermodal transport is defined as "the movement of goods in one and the same loading unit or vehicle which uses successively two or more modes of transport without handling of the goods themselves in changing modes." (United Nations, 2009) The intermodal operator pilot of the EURIDICE project deals with the transportation of goods in rail wagons by rail and sea. The core business for the intermodal operator is the effective utilization of the wagon fleet. The intermodal operator pilot idea is to enhance visibility of the wagon movements by realizing the Intelligent Cargo concept. Status information accompanies the cargo along the flow of goods and enables interaction with the surrounding environment and users. Intelligence is added from a cargo point of view of being self-aware, context-aware, and connected to reduce the operational effort of handling goods at the right time, in the right way. The final aim is a cargo-centric information chain that offers automated end-to-end information about the logistic supply chain based on existing technologies and standards combined with intermediating trusted third parties. The cargo intelligence is realized at the wagon level of the cargo hierarchy of the intermodal operator pilot.

2 METHODOLOGY

Research is based on the multiple case studies according to Yin (Yin, R., 2003). A concrete transport case is the basis for the analyses. The semi-structured interviews with the transport process stakeholders have been organized to collect information about the processes and system requirements. The system has been developed according to the end-user system requirements, and it will be implemented, tested, and evaluated according to a common methodology for all eight pilots. The final system environment will be published after findings from the test period.

3 INTERMODAL WAGON FLEET MANAGEMENT SYSTEM

An intermodal operator case is described by pilot scenario number 6 in the EURIDICE White Paper (EURIDICE White Paper, 2009). The main objective is to clarify how ICT services support efficient decision-making in intermodal wagon operations, and three sub-objectives have been defined as (Hemilä, J., 2010):

1. Facilitate the proposal of wagon selection (Sub-objective 1). Automation of the wagon

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selection proposal on the base of the order coming from legacy system and wagon status, condition, position and prediction of estimated time of arrival

2. Automated alerting and event information about the wagon situation (Sub-objective 2). Wagon sends the notification or alert if the conditions inside the wagon are not within the predefined limits, as well as to be able to check other necessary measures concerning the wagon.
3. Automated calculation of utilisation rates (Sub-objective 3). The goal is to monitor wagon utilization in order to have necessary data for decision-making to, e.g. increase the turnaround of the wagons.

In the development phase, we created the software workflow to link each pilot sub-objective to the software functions. The EURIDICE integrated platform will have Horizontal Services for common transport processes, such as cargo temperature recording, deviation notification service, route follow-up, etc. All the pilots then have several pilot-specific EURIDICE Platform services that are only used by individual end-users. The following business use case model (Fig. 1) is described as a proposal to increase the business performance of intermodal operator by providing information to optimise the utilisation of wagons. The following actors are identified in business case:

- Wagon; a participating wagon managed by intermodal operator
- Transport Manager; who manages/coordinates the usage of wagons
- ERP; the ERP system of intermodal operator
- EPSA; The EURIDICE Pilot System Application is developed over the EURIDICE platform combining horizontal components from the EURIDICE platform together with user specific components to realise user specific applications.

The first sub-objective deals with the automation of the wagon selection proposal based on the order coming from the legacy system and the wagon status (reserved/unreserved and loaded/unloaded), condition, position, and prediction of the estimated time of arrival. Sub-objective 1 is realized with Use Case 2 “Wagon selection” described in the public project Deliverable D24.1 (EURIDICE Deliverable D24.1, 2009). Wagons inform the Assisting Transport manager Agent (ATA), agents described in the public Deliverable D11.2 (EURIDICE

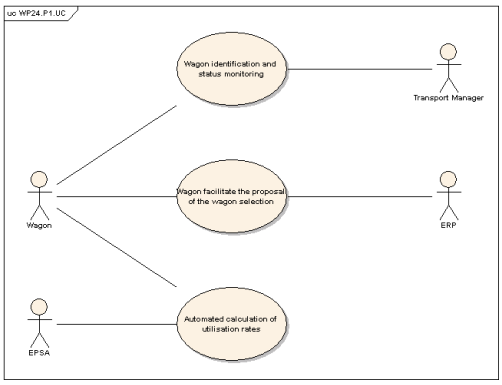

Figure 1: Business Use Case Model.

Deliverable D11.2, 2009), about their availability (status, location, suitability) for the open orders. The Assisting Transport manager Agent makes a proposal on suitable wagons for the specific orders. The transport coordinator confirms the proposed selection of the wagon for the order. Sub-objective 2 “Automated alerting and event information about the wagon situation” is realized with the use case “Wagon definition and status monitoring.” (EURIDICE Deliverable D24.1, 2009) With this use case, the wagons are identified, parameters for wagon and transport are set, and automated deviations notification manages deviations during the process. The wagon sends the notification or alert if the conditions inside the wagon are not within the predefined limits and to allow checking of other necessary measures concerning the wagon. The wagon also alerts when a wagon is off the predefined transportation route or the Estimated Time of Arrival (ETA) is going to be changed. The automated calculation of utilization rates, Sub-objective 3, aims to analyze how efficiently wagons have been used. The aim is to monitor wagon utilization in order to have the necessary data for decision-making, e.g., to increase the turnaround of the wagons.

Many actors other than the intermodal operator use the system environment. The actors in the pilot application are the consignor, consignee, railroad operators, port operators, and ferry operator. All the actors can have access to the pilot application, and the services available to them are wagon location information, wagon status updates, and ETA updates. The system aims to create full visibility of the wagon movement for all the stakeholders in the process.

4 CONCLUSIONS

The business impacts of EURIDICE are improved transport processes and new business opportunities. The improved transport processes can be measured and verified with, for example, KPI's turnaround of wagons, loading and unloading times, the haulage of empty/loaded wagons, delivery times, and some cost indicators. The new business opportunities are achieved by the possibility of measuring various types of real time information during the transport process and by the improved performance of the intermodal transport. An important factor of the EURIDICE system is that it allows the parties involved to analyze continuously the performance of different operators and links.

The next step is "Integration and deployment," which will integrate the pilot applications into the pilot users' existing ICT systems and deploy the adapted EURIDICE prototypes into a functioning demonstrator environment suitable for piloting, training, and dissemination purposes. The final demonstrator system will be realized according to the pilot validation and feedback.

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