ACTIVITY 3.2 Pilot actions implementation

D.T. 3.2.3 – PA for multimodal nodes/teminals efficiency and optimization: ICT/ITS tools for rail traffic

PILOT ACTION FINAL REPORT
NASPA

Final Version
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1. BACKGROUND

Introduction

Technical Work Package 3 includes pilot actions and trainings for cooperation in multimodal transport chains and business activation. Within this WP, activity 3.2 involves the implementation of the pilot actions.

Each partner shall carry out its pilot (as it is specified in the application form) and prepare its pilot report. In all cases other partners are involved, too (assessment, capitalization etc).

Purpose of this document

In order to have a same quality level of pilot report, PP8 Freeport of Budapest as WP leader provides a series of reporting templates, including:

- the pilot action inception report,
- the pilot action mid-term report,
- and the pilot action final report.

This document – the template of the pilot action final report - is the third and last element of this series. The aim of this document is to provide methodological support to be used to summarise the implementation of each pilot action.

Which project partners are involved?

Each project partner who has a pilot is involved. The following table summarises the pilot actions and the responsible PPs.

Topic	Pilot action - Deliverable	Partner responsible
Last mile connections of multimodal nodes	D 3.2.1. PA for last mile connectivity of multimodal nodes: Feasibility Study for a new rail terminal	PP4 - ZAILOG
Multimodal terminals efficiency and optimisation	D 3.2.2. PA for multimodal nodes/terminals efficiency and optimization: innovative control shunting system	LP - NASPA

Topic	Pilot action - Deliverable	Partner responsible
Multimodal terminals efficiency and optimisation	D 3.2.3. PA for multimodal nodes/terminals efficiency and optimization: ICT/ITS tools for rail traffic	LP - NASPA
Multimodal terminals efficiency and optimisation	D 3.2.4. PA for multimodal nodes/terminals efficiency and optimization: ICT/ITS tools for rail traffic	PP6 – Port of Rijeka
Multimodal terminals efficiency and optimisation	D 3.2.5. PA for multimodal nodes/terminals efficiency and optimization: new WMS (warehouse management system) model	PP16 - CODOGNOTTO POLAND
Assessment of market opportunities to reinforce or activate new multimodal services	D 3.2.6. PA for activation/optimization of multimodal services: new services port gateway/freight village	PP4 – ZAILOG AND LP - NASPA
Assessment of market opportunities to reinforce or activate new multimodal services	D 3.2.7. PA for activation/optimization of multimodal services: modal shift form road to rail	PP16 - CODOGNOTTO POLAND AND LP - NASPA
Alternative fuels deployment	D 3.2.8. PA for ECO-innovations on alternative fuels deployment: development of new e-mobility	PP8 – FREEPORT OF BUDAPEST (WITH PP9 – PUBLIC PORTS JSC INVOLVEMENT)
Alternative fuels deployment	D 3.2.9. PA for ECO-innovations on LNG deployment as alternative fuels: logistic model for LNG	PP16- CODOGNOTTO POLAND
Energy efficiency solutions	D 3.2.10.	PP5 – LUKA KOPER

Topic	Pilot action - Deliverable	Partner responsible
	PA for ECO-innovations on energy efficiency deployment: test of energy efficiency in cargo handling	
Energy efficiency solutions	D 3.2.11. PA for ECO-innovations on energy efficiency deployment: tests on transport operations	PP14- LOKOMOTION (assessment by PP7 – RCH)
Trainings	D 3.2.12. Testing of training pathways for energy efficiency deployment in the rail sector – RCH (report is not needed)	PP7 – RAIL CARGO HUNGARY
Trainings	D 3.2.13. Testing of training pathways for energy efficiency deployment in the rail sector – Lokomotion (report is not needed)	PP14- LOKOMOTION

2. PILOT ACTION IMPLEMENTATION

PROJECT PARTNER	North Adriatic Sea Port Authority
PILOT PROJECT NAME:	PA for multimodal nodes/terminals efficiency and optimization: ICT/ITS tools for rail traffic
PILOT PROJECT ID:	OT3.3 - Optimization of railway traffic management: development of the second phase of the integrated system (SIMA) for the management of the shunting railway in the port of Venice.

3. DESCRIPTION OF THE PILOT ACTION

NEEDS AND CHALLENGES ADDRESSED BY THE PILOT ACTION (max. 2000 characters)

The use of the current SIMA1 application has brought out multiple constraints and points of low productivity in the procedures. This has resulted in the need to improve the effectiveness and efficiency of the entire information system, in addition to the introduction of new working methods.

In fact, the previous system SIMA1 does not fully meet the operational management needs and was used half of its possibilities. Most critical aspects: non-intuitive graphic interfaces, absence of wizards and of some useful correlations between the different modules of the system, presence of unused data and functions.

The redesign intervention involved the analysis of the current situation (AS IS) with the mapping of the primary process and the support processes, the identification of critical issues and points that could be improved, the study of solutions and the consequent redesign of the process in an organic way.

A radical, fundamental overhaul was made, the entire "Web App" and "Mobile App" was rethought from scratch, and not just simple adjustments, or calibrations, or operational improvements.

BEST PRACTICES AND ACTION PLANS SUPPORTING THE PILOT ACTION (max. 2000 characters)

A new work tool has been created that uses new technologies.

In particular, both the front-end (user interface) and the back-end (business functionality) have been completely redone.

a) Front-end:

The re-engineering of the existing modules and the creation of the new ones were done in Angular.

Applications developed in Angular are executed entirely by the web browser after being downloaded from the server (client side processing). This involves saving http traffic between server and client, every time there is a request for action from the user, therefore better performance in displaying the results of a page.

The maps are made in Angular:

- can be viewed on all major modern web browsers such as (Chrome, Microsoft Edge, Opera, Firefox, Safari);

- they work on any platform including smartphones and tablets;

- Angular equipped with Progressive Web App (PWA) extensions that allows the creation of a single interface that can be used both by classic web based systems (browser) and by mobile devices with the same experience as native apps.

b) Back-end:

The architecture on which the new features and new back-end services were based was that of microservices.

This type of solution guarantees a number of advantages compared to a monolithic architecture such as:

- shortening of development cycles;

- greater scalability;

- independent services not dependent on others;

- superior maintainability;

- ease of management and modification even of some parts of the software;

PURPOSE OF THE PILOT ACTION (max. 1000 characters)

The goal was the re-engineering of the SIMA software system and the removal of obstacles that affect the process.

The services, object of the tender, started from the "AS IS" context and evolved towards innovative technological standards that made it possible to overcome architectural constraints, taking into account, at the same time, all the need for continuity of service, regulatory compliance and innovation both functional and architectural.

A new software SIMA2 has been implemented and new functionalities allow the interfacing among SIMA2 and some IT systems used by other players involved into the process, such as the Infrastructure Manager, Railway Undertakings and Terminals.

SIMA2 system optimizes planning procedures efficiency through an optimization of train placement in railway yard and their relative movements using machine-learning techniques and logistic algorithms (i.e. reduction of the "double" shunt or avoiding the need to shunt more than once a single convoy).

In particular, SIMA IT system retrieves, processes and stores data during the manoeuvring procedures and the wagons positioning operations inside a port area or a railway hub, aiming to support management and real time monitoring of the operations. SIMA2 comprehends the following functional modules:

- Manoeuvres Management
- Manoeuvres Monitoring
- Reporting
- Account management
- Mobile and GPS infrastructure

Parallel positive aspects are the following:
- decongestion of the internal railway system
- optimization of locomotives use
- CO2 reduction
- increase of freight traffic by rail
- boosting further new investments in port facilities to increase the intermodal capacity

The knowledge gained and the related added value is related mostly to the process. In fact, what has changed is the approach, from the AS IS to a defined TO BE process, that allows optimization and effective management of railway shunting operations.

Moreover, the main point is the technology: this has implied a change in the way of working to manage the ralway shunting, upgrading the working performance in terms of capitalisation.

The software is used by ERF (Esercizio Raccordi Ferroviari), the holder of the service of general interest of rail shunting at the Port of Venice

CONTENT AND OUTPUT OF THE PILOT ACTION – DESCRIPTION OF THE DELIVERABLE (max. 15000 characters – please include here also images and graphics)

The main features developed and released were:
a) Annual planning
The Planner defines through the long-term planning (carried out in November / December of each year) a train scheduled on a daily / weekly basis until next year; define the single scheduled maneuver associated with this scheduled train.

The district m53 form must be available from the stakeholders involved (RFI, IF, ERF): ERF must have already integrated it with its own planning summarized in the track occupation diagrams.

b) Daily planning
The Planner defines all the Movements by scheduling them for the next working day
The following must be registered in the system:
- Shifts for the day must already be available (ex: T1M)
- at least one Service Request from the user scheduled for the next business day
- the System must have already prepared for each Request scheduled for the next working day:
- the Maneuver [GENERATED]
- the expected Movements, status [GENERATED], filling in the details on the basis of the information available

c) Order of Maneuver
The forecourt must give an order on a [PLANNED] Movement for today, making it [AVAILABLE] to the Chief Maneuver.
The following must be registered in the system:
- a [PLANNED] Movement for today's date
- the name of the Tirata, automatically obtained from the customer's request
- the Train affected by the Movement
- the tracks on which the train is located
- the maneuvering team that must be assigned to the Movement

d) Completion of Shipment
The forecourt completes the information of an Expedition (indicating some excess wagons to rearrange)
The following must be registered in the system:
- a Shipment [READY] (for which the terminal has already sent the MAR).
- a Withdrawal Request in [SCHEDULED] status with which the Shipment was also requested
- a Movement [FINISHED] relating to the weighing operation
- the Pull associated with that Movement

e) Weighing Completion
The forecourt completes the information of a Weighing
The following must be registered in the system:
- a Request in [PLANNED] state (with which the Weighing was requested).
- a Movement associated with the Request (through the relative Maneuver) in [FINISHED] state and having weighing flag = true

f) Completion of Maneuver (Module Z)
The forecourt completes the information of a Maneuver [ULTIMATA]
The following must be registered in the system:
- a [ULTIMATA] Maneuver (ie for which all the Movements associated with it have already been completed)

g) Execution of Movement and Maneuver
The Chief Maneuver completes the definition of a Movement planned for today and makes it available

The following must be registered in the system:
- a Movement for today's date in [AVAILABLE] status, it is therefore a Movement for which a Movement order has already been given by the Forecourt to which they are already associated:
- a Maneuver in [GENERATED] state (for which this single movement is present)
- the train affected by the maneuver
- the tracks on which the train is located
- the team (of which the leader of the maneuver is part)
the Locomotive assigned to the team

h) Request Entry
The Customer (employee of company x, works on behalf of company y) (can be a Connected / Terminal, Freight Forwarder, or RU) enters a service request
The Customer must have been authorized to operate on behalf of the company y

i) Shipment data entry
The Customer (employee of company x, works on behalf of company y) (can be a Connected / Terminal, Freight Forwarder, or RU) enters data relating to a Shipment
The Customer (primary actor) must have been authorized to operate on behalf of the company y
They must be present
- a Request in which the Shipping service has been specified
- the shipment in [INSERTED] status

WERE THERE ANY DEVIATIONS IN TERMS OF THE CONTENT OR PURPOSE OR ANY PART OF THE PILOT ACTION – IF YES, PLEASE DESCRIBE THE REASONS (max. 2000 characters)

With respect to the initial requirements, the reconstruction of the back-end services was also agreed
The architecture on which the new features and new back-end services will be based will be microservices. This type of solution guarantees a number of advantages compared to a monolithic architecture such as:
- shortening of development cycles;
- greater scalability;
- independent services not dependent on others;
- superior maintainability;
- ease of management and modification even of some parts of the software;
The advantages described are all decisive in a successful project.
The back-end technologies that will be used are tied to those currently in use on the gateway and other components already developed. Should it be necessary to create new microservices independent from the rest of the architecture, a solution based on spring boot will be opted for, eliminating the need to use application context.

New features have been introduced:
The new features compared to SIMA1 that have been analyzed are the following:
- Management of internal directories
- Automation of the census with time forecasts on maneuvers and movements
- Team shift management
- Push notifications
- Operational management through frontend of the movement of convoys

- Management of delegations between companies
- Management of security / generic documents
- Brackets management

4. STAKEHOLDER'S INVOLVEMENT

HOW THE STAKEHOLDERS WERE INVOLVED (max 2000 characters)

The stakeholders (RFI) have been involved from the earliest stages in the following activities:
- Functional analysis activities
- Verify detailed functionality, detailed analysis
- Project progress monitoring
- User test
- Acceptance of the solution

Third parties should interface with this system on a voluntary basis, using this technology on order to integrate their activities.

E.g., in the port of Venice, the interfacing with the railway system should be useful for:

- The possibility to interact with the PIC system of the national infrastructure manager RFI (Rete Ferroviaria Italiana) that allows real-time communication of changes to the general planning of arrivals and departures (e.g. deletion or changes in the schedule) and the insertion of unplanned trains through an XML protocol or similar one.

- The possibility of interfacing with the Mercitalia Rail SIM system that allows the management of waybills through an XML protocol.

The possibility of interfacing with the Railway Undertakings IT systems (such as SIR system of Mercitalia Rail) for the recovery of information regarding train composition (list of wagons and containers carried by each wagon), useful for the automatic management of wagon groups through an XML protocol or similar one.

5. TRANSFERABILITY OF PILOT ACTION RESULTS

TRANSFERABILITY OF THE PILOT ACTION RESULTS (max. 2000 characters)

This solution is transferable to all the realities that have to manage the railway maneuver. For example all ports in Italy.