WP4 - Pilot action final report

Port of Ravenna

D.4.2.5

DISCLAIMER

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1. Ex-ante situation – Background of the pilot action

As described in the TNA, one of the main objective for the Port of Ravenna is to optimize and improve the rail infrastructure. In the next years are foreseen seven main interventions as described in the table below (for a detailed description see D.3.2.5 Territorial needs assessment for the port of Ravenna - Subsection A.3 – Tools and measures supporting multimodal transport (policies, plans, etc.)).

Logistic node	Project ID	Interventions
Port of Ravenna	P142A	1. Rails extension on the right side of the Candiano Canal
		2. Suppression of the level crossing in via Canale Molinetto
		3. Adjustment of the silhouette of the overpass Teodorico
	P142B	A new station at the base rail track
	Other interventions	1. Activation of junction on the left side of the Candiano Canal
		2. Realization of other seven tracks and their electrification
		3. Transformation of the base rail track into tracks for arrivals and departures

The investment in physical infrastructures must be supported by the implementation of adequate digital infrastructure in terms of digital services gave to the port operators in order to improve the efficiency of the logistic processes and, specifically, of the processes related to the transportation of goods by rail.
The Port Community System of Ravenna (for a detailed description, see D.3.2.5 Territorial needs assessment for the port of Ravenna - Section D – Analysis of IT systems) need to be implemented with a function devoted to share information about the train circulation and to give to the stakeholders (terminals, freight forwarders, ship agents, MTOs, …) all the data necessary to optimize the timing in the see-rail intermodal transportation.
The realization of the pilot will allow to show how ICT implementations can have positive effects on the multimodal logistics within a port system.

2. Pilot action description

The object of the pilot is to develop a new “Rail Module” for the PCS of the port of Ravenna. The module must respect the following main characteristics:

- interoperability with the IT system of RFI (the rail infrastructure managing company)

- interoperability with the IT system of the railway shunting operators
- interoperability with the other PCS's modules in order to acquire the information about the customs clearance and, in general, about the status of the goods
- interoperability with the MTOs
- interoperability with the Terminal Operator Systems

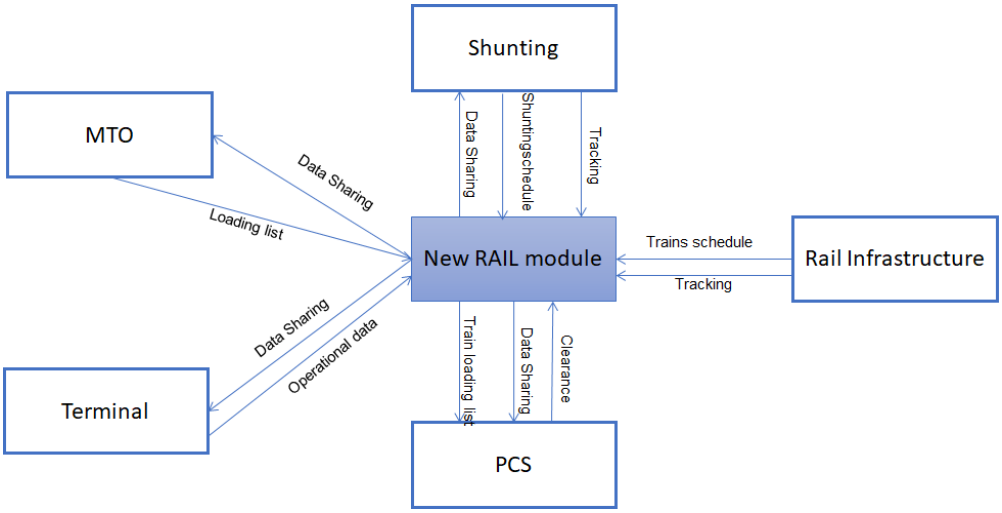
The pilot will be tested on a scenario related to the container traffic even if the module must be ready for the management of all the types of package of the goods (containers, general cargo, solid or liquid bulk, …).

The next Section provides a detailed list of the Messages exchanged between the Rail Management Platform and the different stakeholders of the Project, in order to provide a better vision of the strong impact of the Platform implementation on the Port Rail processes.

The module must support the following processes:

- train schedule
- shunting schedule
- goods status querying
- gate verification
- train tracking

The following schema show the interconnection of the new module with the other systems.



3. Stakeholders

The stakeholders – freight forwarders, terminal operators, rail operators, MTOs, and shunting operators – participated in the testing phase verifying the quality of the data exchange made by the messages sent and received by the platform.

The messages tested with the various stakeholders are detailed below:

IMPORT Flow

1. Multimodal Transport Operators (MTOs)

Messages received by the Platform (sender: MTO; receiver: Rail Management Platform)

- Train Loading List + Scheduled Trace
- Train Definition
- Railway Bill information

Messages sent by the Platform (sender: Rail Management Platform; receiver: MTO)

- UTI State (included Customs state)
- Train Composition
- Train Ready
- Start / End of Shunting Operations
- Train Departure

- Train Arrival

2. Port Terminals

Messages received by the Platform (sender: Port Terminal; receiver: Rail Management Platform)
- Train Composition
- Train Ready
- Train Gate-Out

Messages sent by the Platform (sender: Rail Management Platform; receiver: Port Terminal)
- Loading List + UTI State
- Train Manifest acceptance

3. Railway Companies

Messages received by the Platform (sender: Railway Company; receiver: Rail Management Platform)
- Train Trace / Train Code association update
- RailWay Bill
- Train wagons' list
- End of Train verification activity
- Train Departure
- Train Arrival

Messages sent by the Platform (sender: Rail Management Platform; receiver: Railway Company)
- Train Trace / Train Code association
- Train Definition
- RailWay Bill information
- Train Ready
- Start / End of Shunting Operations

4. Shunting Company

Messages received by the Platform (sender: Shunting Company; receiver: Rail Management Platform)
- Train Station of Departure
- Start / End of Shunting Operations
- Train ready

Messages sent by the Platform (sender: Rail Management Platform; receiver: Shunting Company)

- Train Trace / Train Code association
- Train Wagons' list
- Train Ready

EXPORT Flow

1. Multimodal Transport Operators (MTOs)

Messages received by the Platform (sender: MTO; receiver: Rail Management Platform)

- Train Loading List
- Train Definition

Messages sent by the Platform (sender: Rail Management Platform; receiver: MTO)

- Train Composition
- Train Gate-Out
- Train Departure
- Train Arrival
- Start / End of Shunting Operations
- Train Unloading

2. Port Terminals

Messages received by the Platform (sender: Port Terminal; receiver: Rail Management Platform)

- Train Gate-Out
- Train Unloading

Messages sent by the Platform (sender: Rail Management Platform; receiver: Port Terminal)

- Train Definition
- Train Gate-Out
- Train Departure
- Train Arrival
- Start / End of Shunting Operations
- Train Ready

3. Railway Companies

Messages received by the Platform (sender: Railway Company; receiver: Rail Management Platform)

- Train Trace + Train Composition
- Train wagons' list
- Train Departure
- Train Arrival
- Train Ready

Messages sent by the Platform (sender: Rail Management Platform; receiver: Railway Company)

- Train Definition
- Start / End of Shunting Operations

4. Shunting Company

Messages received by the Platform (sender: Shunting Company; receiver: Rail Management Platform)

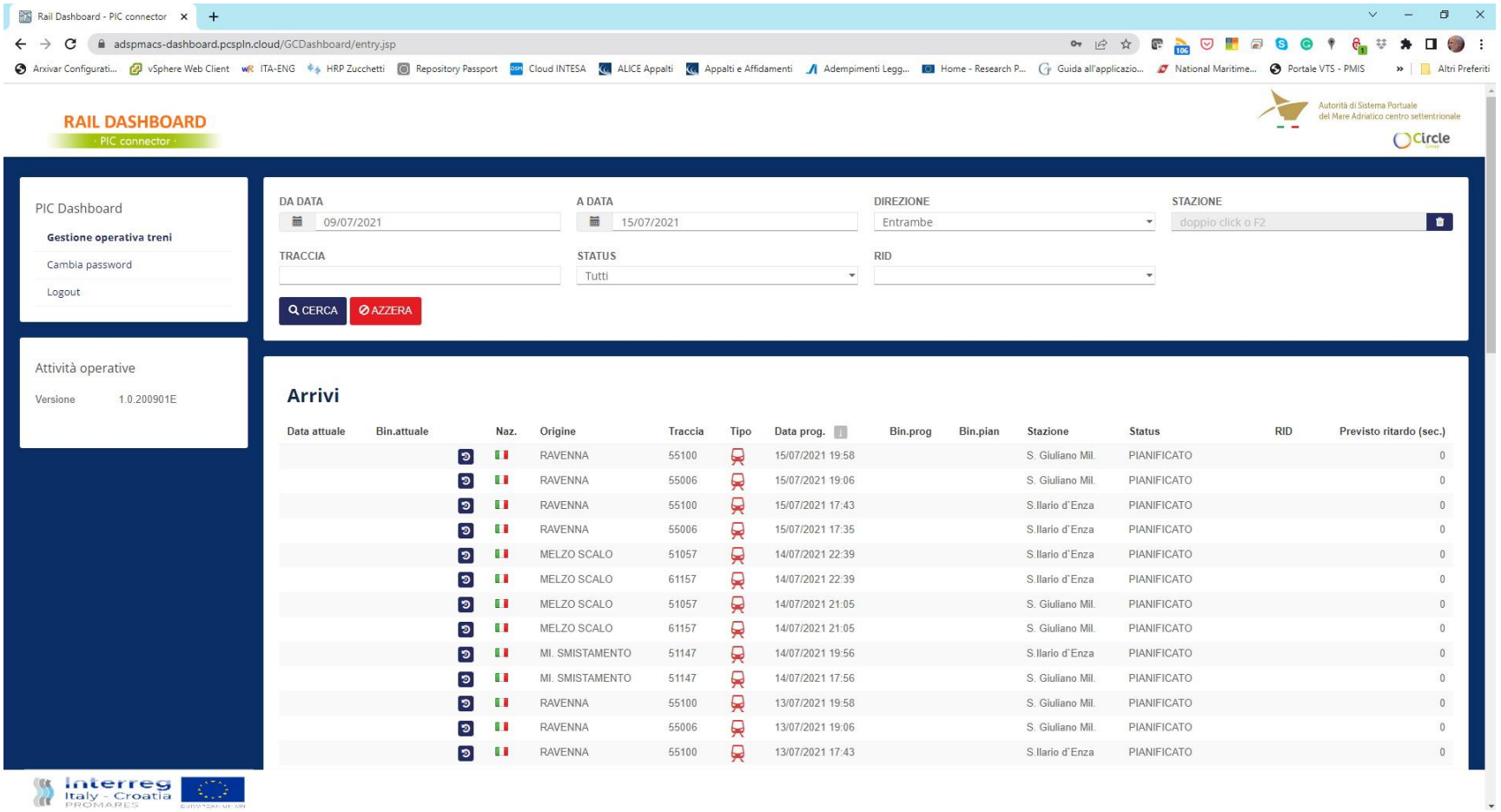
- Start / End of Shunting Operations
- Train ready

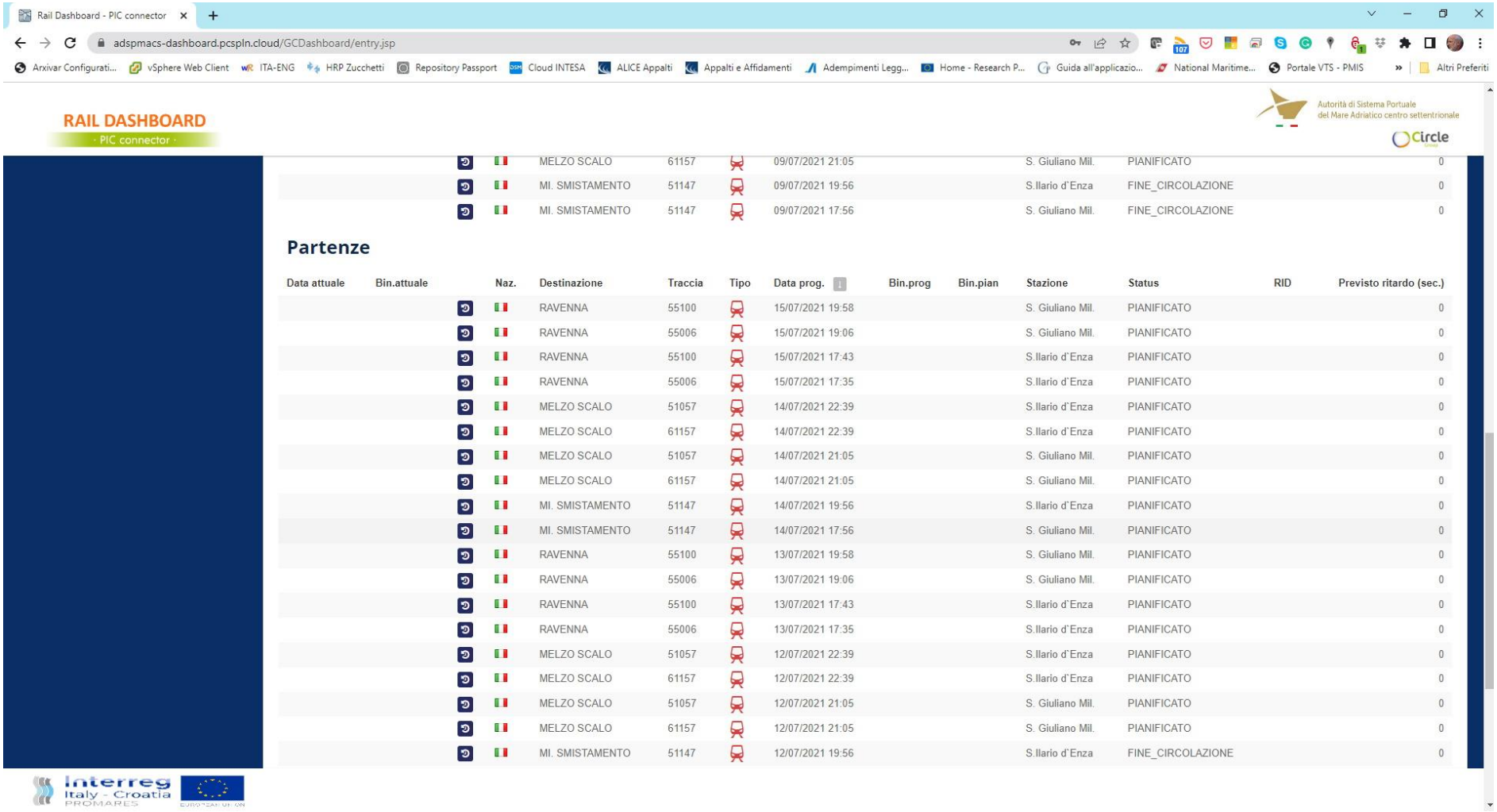
Messages sent by the Platform (sender: Rail Management Platform; receiver: Shunting Company)

- Train Wagons' list
- Train Departure
- Train Arrival
- Train Ready

Technical details & Integration Tests

The first module of the Platform is devoted to receiving and sharing the data related to the train traces and circulation from RFI, the Italian national company that manages the rail infrastructure. The information is shared via specific messages but the users can also access a dashboard for visualization like in a rail station board. The following figures show an example of the dashboard.


Rail Dashboard - PIC connector
adspmacs-dashboard.pcspln.cloud/GCDashboard/entry.jsp
RAIL DASHBOARD
PIC connector
Autorità di Sistema Portuale del Mare Adriatico centro settentrionale
Circle
PIC Dashboard
Gestione operativa treni
Cambia password
Logout
Attività operative
Versione 1.0.200901E
DA DATA
09/07/2021
A DATA
15/07/2021
DIREZIONE
Entrambe
STAZIONE
doppio click o F2
TRACCIA
STATUS
Tutti
RID
CERCA
AZZERA
Arrivi
Data attuale
Bin.attuale
Naz.
Origine
Traccia
Tipo
Data prog.
Bin.prog
Bin.pian
Stazione
Status
RID
Previsto ritardo (sec.)
RAVENNA 55100 15/07/2021 19:58 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55006 15/07/2021 19:06 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55100 15/07/2021 17:43 S.Ilario d'Enza PIANIFICATO 0
RAVENNA 55006 15/07/2021 17:35 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 51057 14/07/2021 22:39 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 61157 14/07/2021 22:39 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 51057 14/07/2021 21:05 S. Giuliano Mil. PIANIFICATO 0
MELZO SCALO 61157 14/07/2021 21:05 S. Giuliano Mil. PIANIFICATO 0
MI. SMISTAMENTO 51147 14/07/2021 19:56 S.Ilario d'Enza PIANIFICATO 0
MI. SMISTAMENTO 51147 14/07/2021 17:56 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55100 13/07/2021 19:58 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55006 13/07/2021 19:06 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55100 13/07/2021 17:43 S.Ilario d'Enza PIANIFICATO 0


Rail Dashboard - PIC connector
adspmacs-dashboard.pcspln.cloud/GCDashboard/entry.jsp
RAIL DASHBOARD
PIC connector
Autorità di Sistema Portuale del Mare Adriatico centro settentrionale
Circle
MELZO SCALO 61157 09/07/2021 21:05 S. Giuliano Mil. PIANIFICATO 0
MI. SMISTAMENTO 51147 09/07/2021 19:56 S.Ilario d'Enza FINE_CIRCOLAZIONE 0
MI. SMISTAMENTO 51147 09/07/2021 17:56 S. Giuliano Mil. FINE_CIRCOLAZIONE 0
Partenze
Data attuale Bin.attuale Naz. Destinazione Traccia Tipo Data prog. Bin.prog Bin.pian Stazione Status RID Previsto ritardo (sec.)
RAVENNA 55100 15/07/2021 19:58 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55006 15/07/2021 19:06 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55100 15/07/2021 17:43 S.Ilario d'Enza PIANIFICATO 0
RAVENNA 55006 15/07/2021 17:35 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 51057 14/07/2021 22:39 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 61157 14/07/2021 22:39 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 51057 14/07/2021 21:05 S. Giuliano Mil. PIANIFICATO 0
MELZO SCALO 61157 14/07/2021 21:05 S. Giuliano Mil. PIANIFICATO 0
MI. SMISTAMENTO 51147 14/07/2021 19:56 S.Ilario d'Enza PIANIFICATO 0
MI. SMISTAMENTO 51147 14/07/2021 17:56 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55100 13/07/2021 19:58 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55006 13/07/2021 19:06 S. Giuliano Mil. PIANIFICATO 0
RAVENNA 55100 13/07/2021 17:43 S.Ilario d'Enza PIANIFICATO 0
RAVENNA 55006 13/07/2021 17:35 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 51057 12/07/2021 22:39 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 61157 12/07/2021 22:39 S.Ilario d'Enza PIANIFICATO 0
MELZO SCALO 51057 12/07/2021 21:05 S. Giuliano Mil. PIANIFICATO 0
MELZO SCALO 61157 12/07/2021 21:05 S. Giuliano Mil. PIANIFICATO 0
MI. SMISTAMENTO 51147 12/07/2021 19:56 S.Ilario d'Enza FINE_CIRCOLAZIONE 0

Data exchange between the Rail Management Platform and the actors is implemented through a SOAP Webservice. Messages representing atomic events are implemented with the “SendEvent” element while more structured data is implemented with the “TransportList” element.

The SendEvent message relates an object with an event type, a location and a timestamp.

The TransportList message is composed by a header and a list of details. The header contains an identification of the message, the message type, identification of the sender and of the recipients and the common data of the message.

Each detail element refers to a specific object and can contain a generic list of key-value pairs.

Through the systems implemented, the Railway Corridors can be managed in an automated and full digital way, pursuing criteria of interoperability between the actors, digitalization and standardization of flows, security of information and procedures, full visibility and monitoring of processes.

The exchange of messages in *System to System* mode between the Platform and the different stakeholders required a test phase: first of all, internal tests were implemented with positive results; secondly, specific operators of the Ravenna Railway Community were chosen for the execution of a pilot test capable of demonstrating the effective functioning of the Platform and the impact on the operations carried out by the stakeholders.

4. Impacts and replicability

The new “Rail Management Platform” is an IT system that allows the share and exchange of data and documents related to the multimodal transport sea-rail/rail-sea. The implementation entails the following main advantages:

Processes standardization: The first benefit was to have brought all the stakeholders together to analyze and assess the processes in order to define exactly the role of each actor and the data and documents that each one can/must share. In our experience, this is a very important goal because the awareness of the process and of the role that each one plays is the first key to the removal of inefficiencies and the optimization of the process in general.

Data availability: From the operative point of view, a first concrete advantage is to have the opportunity to know in advance the train’s timetable and to track a specific train in order to estimate the time of arrival at the station. This information is very important as is the key to organizing the next activities in the process mainly for the export of containerized goods that need the VGM certificates and customs clearance before embarkation and often there is few time to conclude all the formalities. In general, the availability of operative data such as time of begin/end of operations, time of arrival/departure, train composition, shunting operations timetable, … are crucial for the efficiency of the process and is the starting point for other implementations (for example, for the support for the decisions about the schedule of the operations). Furthermore, all data are stored and can be reused for statistical purposes and for the growth of awareness about rail traffic and the use of infrastructures.

Involvement of shunting operators: Another important goal was the involvement of the shunting operators that have a low level of digitalization. For the use and sharing of data, they are “obliged” to adopt some IT functions and to “standardize” the process. This is an advantage for all the stakeholders that can obtain more real-time data about shunting operations and can track easily the trains from the rail station to the terminal and vice-versa.

Interoperability with Customs: Moreover, the functionality of interoperability with the AIDA system (Italian Customs Agency) contributes to realize the project of digitalization of the customs procedures, launched by the Italian Customs Agency, that require the automatic data exchange in order to trace the goods entering/exiting to/from the port. This is a very important goal for the improvement of the security and traceability of import/export operations and for the automation of the customs controls.

The “Rail Management Platform” is an IT system that can be implemented in every maritime or dry port, in each logistic infrastructure where the stakeholders need more data in order to improve the organization and coordination of their operations and when the primary goal is the efficiency of the processes.

The platform is fully configurable and customizable, the key to success for the implementation is the availability of the stakeholders to come together and standardize the process and share data and documents.

ANNEX A - Examples of the Messages exchanged

Import

1. Loading List – sent by MTO


```
{
    "id": null,
    "voyage": " mto123",
    "trainNumber": "12345",
    "trainDate": "2022-07-28",
    "mto": "IT1111111",
    "departureTerminal": "dep1",
    "arrivalTerminal": "arr1",
    "railwayCompany": "IT33333",
    "itus": [
        {
            "id": null,
            "number": "145",
            "isoType": "iso",
            "type": "TR",
            "isEmpty": false,
            "seals": [
                {
                    "number": "1",
                    "type": "ESEAL"
                }
            ],
            "dangerousGoods": [
                {
                    "unNumber": 101,
                    "ridClass": "test101",
                    "packagingGroup": "I",
                    "limitedQuantityIndicator": false
                },
                {
                    "unNumber": 1869,
                    "ridClass": "test1868",
                    "packagingGroup": "II",
                    "limitedQuantityIndicator": false
                }
            ]
        }
    ],
    "msgRef": null,
    "isFinal": false
```

```
}
```


2. Train Number Notification – Railway Company


```
{
  "id": null,
  "voyageNumber": "mto123",
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "mto": {
    "id": 2,
    "name": "MTO Company",
    "vatNumber": "IT1111111",
    "roles": [
        "MTO"
    ]
  },
  "railwayCompany": {
    "id": 4,
    "name": "RC Company",
    "vatNumber": "IT33333",
    "roles": [
        "RC"
    ]
  }
}
```


3. Train Composition – Port Terminal


```
{
    "voyage": "mto123",
    "trainNumber": "12345",
    "trainDate": "2022-07-28",
    "mto": "IT1111111",
    "part": 1,
    "wagons": [
        {
            "number": "1",
            "type": "big",
            "isoType": "TR",
            "sequence": 1,
            "itus": [
                {
                    "number": "145",
                    "type": "SW",
                    "isoType": "SW",
                    "seals": [
```

```
                        {
                            "number": "854",
                            "type": "ESEAL"
                        }
                    ],
                    "loadingType": "WASTE"
                }
            ],
            "loadingType": "EMPTY"
        }
    ],
    "msgRef": null
}
```


4. Train Ready – Port Terminal


```
{
  "voyage": "mto123",
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "part": 0,
  "mto": "IT1111111",
  "eventTime": "2022-05-06T19:30:59.923Z",
  "location": "locReady"
}
```


5. Secondary Manoeuvre Start – Shunting Operator


```
{
  "voyage": "mto123",
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "part": 0,
  "mto": "IT1111111",
  "shuntingOperator": "IT44444",
  "eventTime": "2022-07-26T20:36:43",
  "location": "secManStart"
}
```


6. Train Gate Out – Port Terminal


```
{
  "voyage": "mto123",
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "mto": "IT1111111",
  "part": 0,
```

```
  "railwayCompany": "IT33333",
  "terminal": "dep1",
  "gate": "depGate",
  "eventTime": "2022-05-06T19:49:51.261Z"
}
```


7. Secondary manoeuvre End – Shunting Operator


```
{
"voyage": "mto123",
"trainNumber": "12345",
"trainDate": "2022-07-28",
"part": 0,
"mto": "IT1111111",
"shuntingOperator": "IT44444",
"eventTime": "2022-07-26T20:36:43",
"location": "secManEND"
}
```


8. Primary manoeuvre Start – Shunting Operator


```
{
  "voyage": "mto123",
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "part": 0,
  "mto": "IT1111111",
  "shuntingOperator": "IT44444",
  "eventTime": "2022-07-26T20:36:43",
  "location": "priMaStart"
}
```


9. Primary manoeuvre End – Shunting Operator


```
{
  "voyage": "mto123",
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "part": 0,
  "mto": "IT1111111",
  "shuntingOperator": "IT44444",
  "eventTime": "2022-07-26T20:36:43",
  "location": "priManEnd"
}
```


10. Train Departure – Railway Company


```
{
```

```
  "id": null,
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "railwayCompany": "IT33333",
  "station": "STATION",
  "eventTime": "2022-05-05T10:52:06.428Z"
}
```


11. Train Arrival – Railway Company


```
{
  "id": null,
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "railwayCompany": "IT33333",
  "station": "STATION2",
  "eventTime": "2022-05-06T10:55:07.438Z"
}
```


12. Train Gate In – Inland Terminal


```
{
  "voyage": "mto123",
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "mto": "IT1111111",
  "part": 0,
  "railwayCompany": "IT33333",
  "terminal": "arr1",
  "gate": "arrGate",
  "eventTime": "2022-07-28T19:47:51.261Z"
}
```


Export

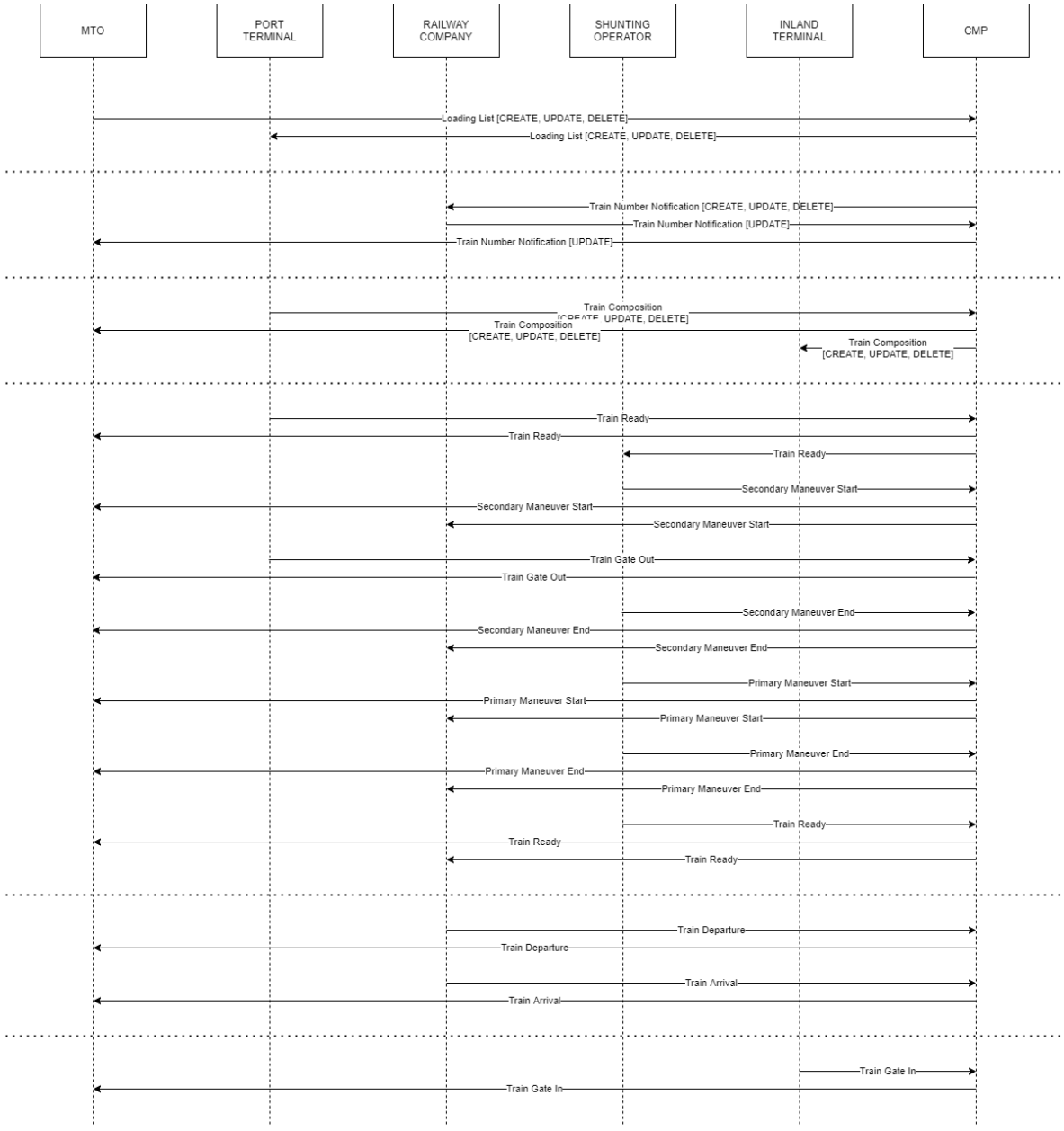
13. Train Definition – sent by MTO


```
{
  "id": null,
  "voyage": "mto123",
  "trainNumber": "12345",
  "trainDate": "2022-07-28",
  "mto": "IT1111111",
  "railwayCompany": "IT33333",
  "origin": "dep1",
  "destination": "arr1",
  "isFinal": false,
```

```
  "wagons": [
    {
      "number": "1",
      "type": "wagonType",
      "sequence": 0,
      "itus": [
        {
          "number": "12356",
          "isoType": "isoType",
          "type": "CN",
          "isEmpty":false,
          "grossWeight":24.8,
          "tare":34.5,
          "seals": [
            {
                "number": "222",
                "type": "ESEAL"
            }
          ],
          "loadingType": "EMPTY",
          "dangerousGoods": [
            {
                "limitedQuantityIndicator": true
            }
          ],
          "departureTerminal": "dep1",
          "arrivalTerminal": "arr1"
        }
      ]
    }
  ],
  "msgRef":  null
}
```

ANNEX B – Data flow

IMPORT – Stage 1



EXPORT – Stage 1