D.T2.3.7 – PILOT EVALUATION REPORT - PILOT ACTIO NO. 7 - TRIESTE

Operational model for the Port of Trieste

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INTRODUCTION

The aim of this pilot action is the identification of an operational model, suitable for the needs of railway traffic in the port of Trieste. Defining a proper operations model is really a crucial task because of the strong relationship between operations model and capacity of a given railway network. Indeed, capacity constraints may heavily affect traffic growth especially if no actions are planned to remove them.

This is of course true for any infrastructure configuration, and, in the specific situation of the port of Trieste, this configuration is going to be modified in next years during construction works (according to a development plan that should be fixed), thus creating a set of possible layouts to be analyzed.

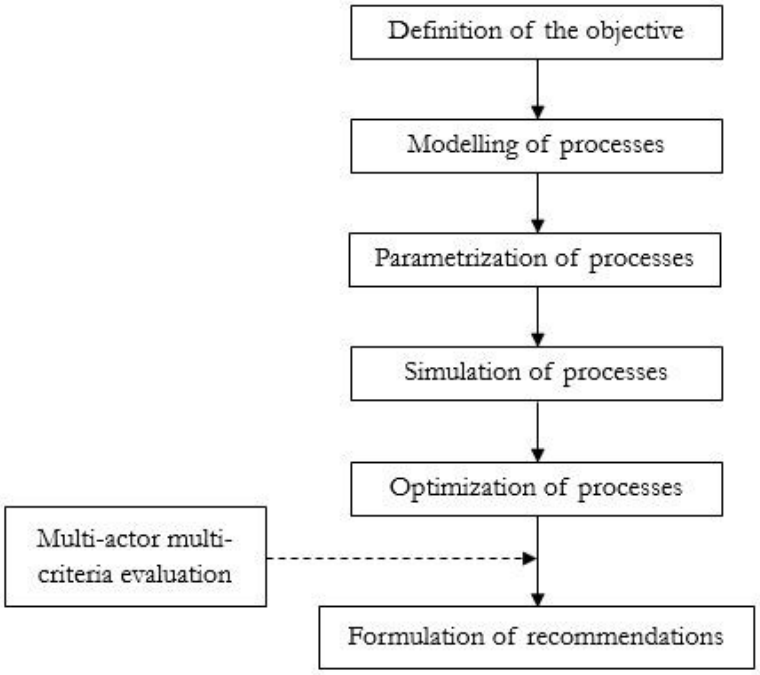
In this context, an integrated optimization approach has been used to estimate railway capacity based on the discrete event simulation of railway operations under different conditions in terms of infrastructure availability. Train departure and arrival in Trieste Campo Marzio station, shunting movements, terminal operations including administrative processes related to the free zone have been explicitly considered and the optimization procedure will lead to a possible operations model to maximize the corresponding capacity. Finally, a more detailed simulation of the identified solution has been performed to validate the results.

This document is organized as follows. First the methodology is presented, then the optimization results are discussed and the operation model is described. Finally, some conclusions are drawn and some suggestions for next steps are presented. The appendices include the description of all processes and of a multi-criteria and multi-stakeholder assessment of alternatives.

1. INTEGRATED METHODOLOGY TO OPTIMIZE PORT RAILWAY CAPACITY

As depicted in Picture 1, at a high level of detail, the developed methodology combines the modelling, simulation and optimization of railway processes, in order to estimate the maximum number of train flow under varying operational conditions. Based on a multi-faceted graphical representation of the considered processes, the creation of what-if scenarios using simulation and optimization instruments allows to examine the effects of possible infrastructural and organizational interventions on port railway capacity. The analysis definitely serves to sustain decision makers in the functional design and planning of the initiatives to be implemented. Furthermore, a multi-actor multi-criteria evaluation procedure accompanies the integrated methodology, so as to support optimization results with insights that come from a comprehensive and participatory appraisal process enabling to provide shared recommendations. Each step of the developed approach for the optimization and evaluation of port railway capacity has required the adoption of appropriate methods and tools, whose selection is motivated in the following sections.

Picture 1 – Workflow of the adopted approach



1.1. PROCESS MODELLING

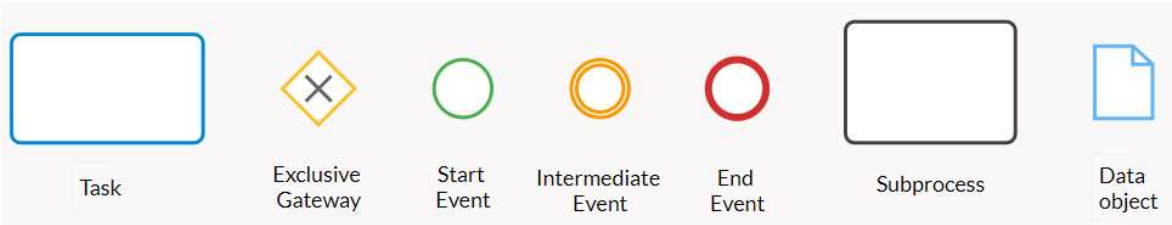
The modelling of railway processes in the Port of Trieste has been performed using the Business Process Model and Notation (BPMN) standard, provided by the Object Management Group. It represents the *de facto* modelling standard thanks to both its intuitive and expressive look, and to the provision of the base for process implementation. The flowchart-based graphical representation used in BPMN to model business processes considers the following main elements:

- Tasks, visualized as rectangles with rounded corners and indicating the activities to be carried out within business processes;

- Gateways, visualized as diamond shapes and representing decision points where the divergence or convergence of the business process flow is controlled;
- Events, visualized as circles and used to display different kinds of events (i.e. Start, Intermediate and End event) affecting the business process flow;
- Sequence flows, visualized as arrowed lines and used to order the execution of the activities modelled in the business process flow;
- Subprocesses, visualized similarly to single tasks but used to gather a collection of tasks, in order to facilitate the readability and understandability of the business process flow;
- Data objects, visualized as small rectangular sheets and providing information about the requirements to perform activities or about their produced results;
- Pools, visualized as big rectangles and serving the organization of the elements represented in the business process flow;
- Lanes, composing sub-parts of the pools and used to arrange the modelled elements according to specific criteria, e.g. on the basis of the responsible process stakeholders.

By way of example, some of the abovementioned BPMN graphical elements are reported in Picture 2.

Picture 2 - Example of some BPMN graphical elements



BPMN combines graphical representation with a rigorous XML encoding of processes by translating each graphical element into the corresponding XML one; both elements are accurately described in the standard. In addition, the XML code includes hidden attributes, in the form of technical details necessary for execution, that are not displayed in diagrams to preserve their readability. Therefore, BPMN models are deployed not only to communicate and interchange the requirements of business processes, but also to execute them on enterprise engines.

The graphical representation of BPMN models has been performed using the online editor called Cardanit, developed by Esteco S.p.A., which automatically provides the XML format of created models. Cardanit also offers the opportunity to generate a report containing descriptions, screenshots and links referred to each element represented in a workflow. Such documentation can be downloaded and shared, in order to dispose of a comprehensive offline overview of developed models.

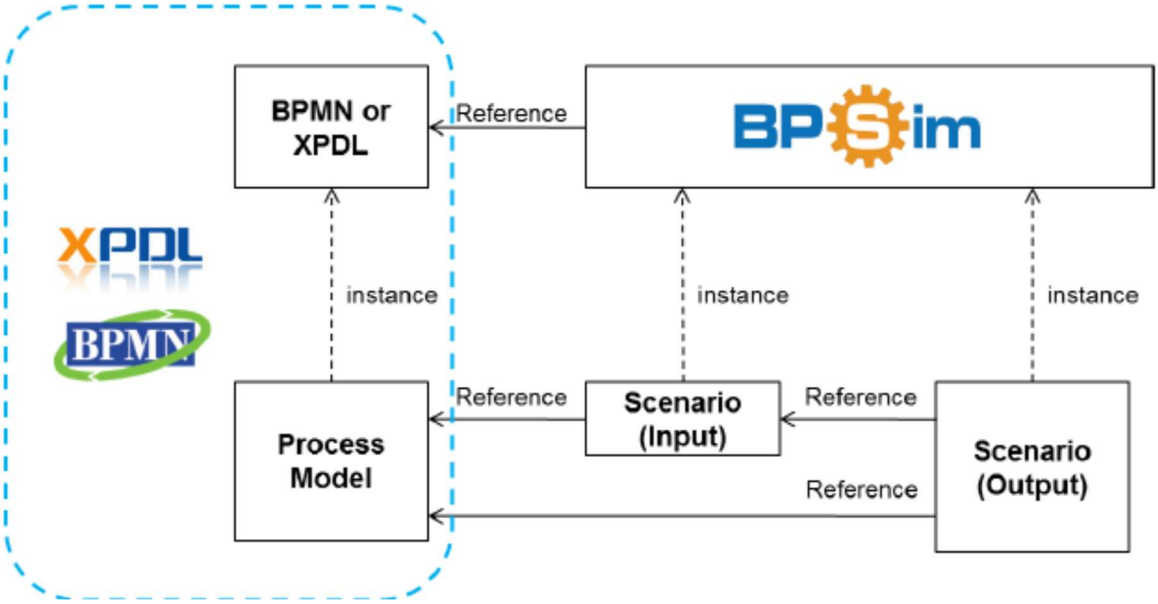
1.2. PROCESS PARAMETRIZATION

Prior to the actual simulation of processes, modelled elements have been parametrized in order to set their properties and, thus, to define the simulation scenario. This task has been accomplished using BPSim (Business Process Simulation), a standard developed by the Workflow Management Coalition (WfMC) which defines a specification for the parametrization and interchange of process analysis data. The specification is constituted by a meta-model, in the form of an underlying computer-interpretable representation, and by an interchange format, i.e. a coupled electronic file format for the protection and transfer of data

between different instruments (modelling tools, simulators, results analysis or representation tools). The meta model is captured by means of the UML, while the interchange format is defined via an XML Schema Definition (XSD). A drawing of the conceptual model of BPSim is reported in Picture 3.

More in detail, the standardized specification provided by the BPSim framework allows to augment with information the business process models created using BPMN. In this regard, one of the main objectives of the BPSim specification consists exactly in being complementary to already existing languages for business process modelling.

Picture 3 - Conceptual model of BPSim



In the BPSim specification, parametrization is faced according to the different following perspectives: property, time, control, resource, cost, and priority. All these points of view correspond to several parameters, that reference to a certain process element within the considered business process model and that can be in turn detailed by additional features. Besides, parameters can be set with different types of definitions included booleans, constants, calendars, and distribution values.

The collection of parameter values for the process elements of a single business process model composes a specific scenario, which is separately defined. As well as elements, each scenario may possess scenario parameters, to characterize, for instance, its time duration. As a matter of fact, BPMN business process models represent external sources that cannot be modified while their BPSim parameterization can vary thanks to different scenarios. Possible variations of the scenario setting can be performed based on an existing scenario, in order to assess the consequences of potential alterations. In that case, further specifications in the inheriting scenario are needed only to express the changes to the element parameter values, or to define the added parameters and their corresponding values.

Finally, the document concerning the BPSim specification delivers an overview of the BPSim parameters applicability, i.e. it illustrates the applicability of each parameter to the different kinds of BPMN-modelled elements. Moreover, BPSim enables users to request the desired result type of a specific BPSim parameter related to a certain process model element, selecting that feature from a defined attribute set.

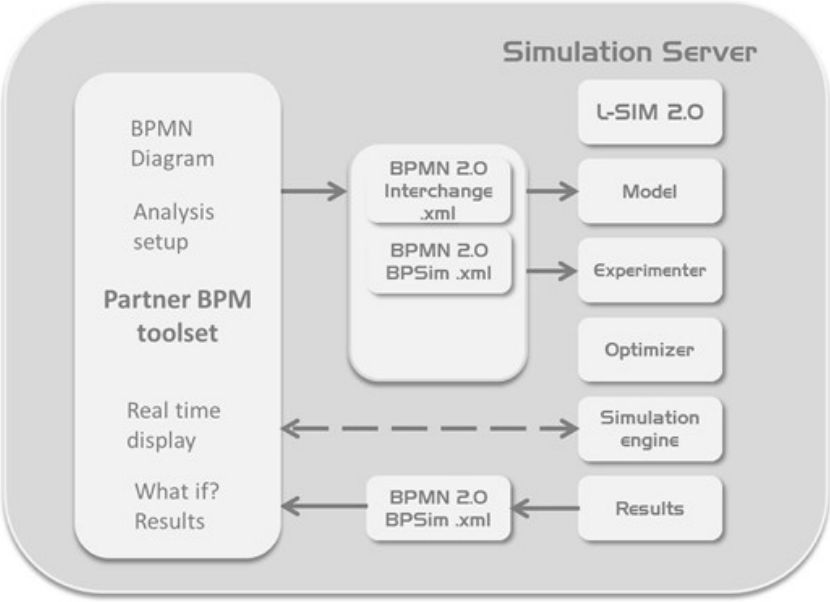
1.3. PROCESS SIMULATION

According to a methodological perspective, the operations of intermodal transport systems can be successfully modelled by the dynamics characterizing discrete event systems, which are based on the interaction of discrete events. The concurrent happening of events, like demands, departures and arrivals of means of transport at terminals, and the acquisition and release of resources, are all intended as discrete events reflecting decision-making processes in intermodal transport networks. Discrete-Event Simulation (DES) is adopted to visualize systems composed by discrete units of traffic that flow from one point to another of the network competing for the use of scarce resources. Such modelling approach is suitable to describe the running of queuing systems in general, in which even transport systems are included. As a matter of fact, DES systems are typically meant as networks of queues and servers, where changes in the states of modelled processes are considered to occur only at discrete time points, called event times.

For the pilot project regarding the Port of Trieste, DES has been adopted in order to estimate port railway capacity at strategic level, exploiting its ability of supporting not only the analysis of infrastructure utilization but also the assessment of the consequences of alternative interventions, thanks to the identification of potential bottlenecks. Besides, initial simulation results have been used to calibrate and validate the parametrization of the developed railway process models, so as to verify their adherence to reality.

In continuity with the first phase of the methodology, i.e. business process modelling, a tool belonging to the other category of simulation instruments has been preferred over simulation packages to animate the examined system. More particularly, a technology developed by the Lanner Group, called L-Sim, has been adopted. It consists of a comprehensive standard-based simulation engine that can be embedded within various BPM software platforms and solutions, facilitating the exchange of models and analysis data. It supports both the BPMN 2.0 Interchange format and the BPSim standard. L-Sim offers users an overall sustain to perform the simulation of BPMN based models and diagrams, thanks to an extensive Application Programming Interface (API), visualization options and the ability of operating entirely through the exchange of XML files. Furthermore, L-Sim provides structured statistical outcomes which enable the identification of the best KPIs (Key Performance Indicators) and other beneficial effects granted by the use of predictive simulation in BPM strategies, like effective process design and the prioritization of investments. A schematization of the L-Sim architecture is reported in Picture 4, highlighting its flexible and powerful BPMN 2.0 compliant simulation capabilities.

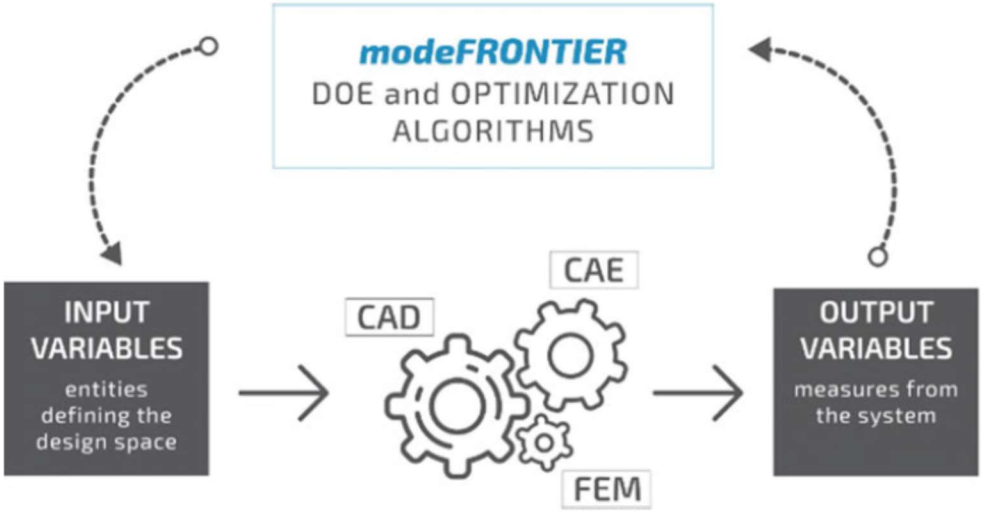
Picture 4 - L-Sim architecture



1.4. PROCESS OPTIMIZATION

According to the proposed methodology, the simulation of the examined railway process model has been followed by an optimization procedure, in order to determine the maximum port railway capacity. More in detail, the optimization procedure has been carried out by means of the multi-disciplinary software modeFRONTIER (mF in the following) developed by Esteco S.p.A.. mF optimizes the engineering design process through the use of innovative algorithms and integration with leading simulation tools. This software has become essential for increasing the understanding of cost and performance factors and for reducing product development time for many companies around the world. mF enables the definition of the details of engineering design processes through an intuitive interface. Picture 5 illustrates a schematization of the integration concept underlying the mF interface, which is represented in the form of a workflow.

Picture 5 - The modeFRONTIER framework integration concept



As far as the optimization exploration is concerned, DOE algorithms are techniques used for efficiently guiding the choice of experiments originated in 1920 by a British scientist, Sir R. A. Fisher. Among the several DOE algorithms, the Full Factorial DOE in particular is used to study interactions between variables by measuring the response of every possible combination of factors.

Regarding the actual optimization procedure, mF includes several iterative optimization algorithms for single- and multi-objective optimization problems. Some of them, like the one called Multi-Objective Genetic Algorithm - II (MOGA-II), belong to the family of Genetic Algorithms. They are inspired by Darwin's theory of evolution and they are iterative algorithms in which the iterations are usually called generations. Starting from an initial population, a genetic algorithm finds new individuals that represent the children population and are expected to be better than their parents. The reproduction happens by means of specific operators and it is repeated until the maximum number of generations is reached. The best individuals are selected according to their fitness: the more suitable they are, the more chances they have to reproduce. MOGA-II is an improved version of MOGA developed by Poloni and it has shown good performances for both single and multi-objective problems. The algorithm is based on the concept of Pareto optimality. Indeed, in the multi-objective field, the problems do not have a unique solution, but a set of trade-off optimal solutions called the Pareto front. The Pareto front is the set of all solutions for which the improvement of an objective should necessarily worsen the others. However, the optimization model considered here has a single objective, thus the optimal solution is only one and unique. More details on genetic algorithms and MOGA-II are reported in the following references:

- J. H. Holland. Adaptation in Natural and Artificial Systems: An Introductory Analysis with Applications to Biology, Control, and Artificial Intelligence. MIT Press Cambridge, MA, USA, 1992.

- C. Poloni and V. Pediroda. Ga coupled with computationally expensive simulations: tools to improve efficiency. Genetic Algorithms and Evolution Strategies in Engineering and Computer Science, pages 267–288,1997.

2. APPLICATION OF THE INTEGRATED METHODOLOGY

2.1. PROCESS MODELLING

Railway processes in the Port of Trieste have been modelled through BPMN considering different aspects, namely transport operations and administrative procedures. As a matter of fact, the developed model not only display the physical movements of trains and shunting locomotives during arrival and departure processes, but it also takes into account the information flow needed to manage freight and train transfers in the port. More in detail, the sequential order of railway activities has been combined with the production or modification of the required technical documents, i.e. the CH30 in its various evolutionary statuses and shunting instructions. Modelling has been made even more articulated by distinguishing the responsible actors for each represented task: such complexity is partially due to the presence of the Free Port regime, which entails the involvement of a larger number of stakeholders in the performing of intermodal services. The inclusion of documentary aspects in the created models has certainly contributed to shed light on possible and less evident procedural bottlenecks (see document on Bottlenecks analysis). Other than that, it has fostered the analysis of potential barriers in the transport processes.

The information necessary to build the process model has been gathered, on one hand, by consulting the official documentation provided by the Port Network Authority of the Eastern Adriatic Sea (PNAEAS in the following), and on the other hand, during frequent technical meetings with the Railway Infrastructure Department (RID – *Direzione Infrastrutture Ferroviarie*) of the PNAEAS. Especially the constant dialogue with the RID staff has facilitated the creation of process models, allowing the gradual refinement of such workflows and, thus, an in-depth comprehension of the investigated railway operations.

The graphical representation of railway processes obtained using the editor Cardanit is reported in the Annexes A.1 and A.2. Referring to BPMN notation, in both processes a single pool has been used to define in broad terms the context of the Port of Trieste and it has been divided into different lanes based on the various stakeholders involved in the examined processes. Each lane includes all the elements, in terms of events, tasks, gateways, and data objects, which the identified stakeholder is responsible for. More in detail, the following actors have been considered: Customs (*Dogana*), the Multimodal Transport Operator (MTO – *Agente treno*), the terminal operator (*Terminalista*), the railway company (*Impresa ferroviaria*), the shunting operations manager (*Gestore unico*), the Financial Police (*Guardia di Finanza*), and the national railway infrastructure manager RFI.

It is important to underline that the model processes reported in the Annexes A.1 and A.2 have been intentionally developed to describe train arrival and departure processes in the Port of Trieste only in general terms. No precise references to destination terminals and to the physical occupancy of railway infrastructural resources have been made, because the goal consisted in better understanding the integration between documentary procedures and railway operations. As a matter of fact, these latter have been represented in terms of macro-activities, whose detailed specification has been reported in the model created for simulation purposes.

2.2. PROCESS SIMULATION

Starting from the BPMN models created in the initial phase of the proposed integrated methodology, further developments have been accomplished to effectively and realistically mimic the railway processes described above. Notably, a refinement of the model has been made contextually to the definition of some assumptions with respect to both the simulation functioning and to the parametrization of modelled elements. As a consequence, proper adaptations in the execution code have been performed, together with the model validation.

As anticipated, in order to simulate railway processes taking place in the Port of Trieste, a few minor modifications of the developed BPMN model were first necessary. On one hand, variations have consisted in reducing the number of tasks by grouping the consecutive activities requiring the same resources, intended in terms of tracks and shunting locomotives. On the other hand, further changes were made to the BPMN model to represent the occurrence of the same portion of processes in different locations of the port railway network. More particularly, the performing of identical activities at the three considered terminals has required to triple some tasks.

According to a more detailed perspective as compared to the one adopted for the initial model, the physical railway operations performed during train arrival and departure processes have been specified at graphical level. To this end, railway operations have been modelled using tasks, each of them defining the distances covered by trains on the various parts of the port network infrastructure. The visualization of such activities has implicated the elaboration of other secondary models to display the transfers travelled by single shunting locomotives to reach different parts of the network. The need of integrating these processes with the main ones related to the arrival and departure process of composed trains has entailed the use of peculiar BPMN elements, i.e. signals, allowing the communication among the two. In this way, the actual railway traffic in the Port of Trieste has been modelled, taking into account the mutual interaction not only among trains, but also between trains and single shunting locomotives, which is generated by the sharing of common infrastructural resources.

The amended version of the model processes concerning train arrival and departure processes is reported, respectively, in Annexes B.1 and B.2, while the processes representing the release and recall processes of shunting locomotives are included in Annexes B.3 and B.4.

The labelling of the elements displayed in the revised BPMN models, and concerning specifical railway operations, has been based on a schematization of the port railway network, that is reported in Annex B.5. Such representation has been developed according to the current layout of the railway infrastructure in the Punto Franco Nuovo and has also served the parametrization phase of the models, suggesting clear reference to the various parts of the port railway node. Other than the national railway network, as indicated in the legend, the schematization considers the following main components of the port railway network: the Trieste Campo Marzio station, the set of tracks denominated “Parenzane”, the two gateways separating the Free Port zone from the external areas, the track called “Asta Lunga”, the collection of tracks named “Fascio dei Moli”, and the three terminals present in the Punto Franco Nuovo. In addition, some side but yet fundamental infrastructural resources have been taken into account and consist of the switches connecting with each other the abovementioned components, permitting the occurrence of train traffic. The developed overview of the port railway network has enabled also the identification of the itineraries that can be travelled by trains and, more in particular, the necessary shunting operations to enter/exit them in/from the port. This task has highlighted the existence of conflicting points due to the availability of some limited infrastructural resources (i.e. single tracks), anticipating the presence of potential bottlenecks that has been effectively proved by simulation runs at a later time.

Referring to the schematization of the port railway network configuration, trains heading to Piers V and VI leave the Trieste Campo Marzio station and passes back and forth over the switches connecting this latter infrastructural component and the Parenzane to reach the gateway crossroad. At that point, they transit through Gateway 3 and travel towards the Asta Lunga, from which their itinerary changes, also based on the occupancy of the respective terminal. Indeed, in the event that no available tracks are present at their relative terminal, trains directed both towards Pier V and Pier VI are transferred to Fascio dei Moli, where they stay for the necessary waiting time. On the contrary, trains are led to their destination terminal directly from the Asta Lunga, which still requires the passage through Fascio dei Moli only for trains heading to Pier V. Besides, due to the limited length of tracks present at both the mentioned piers, the entrance and the exit of trains to/from those terminals necessitate some additional shunting operations to, respectively, decompose and compose trains, so that their size can suit the one of the terminal tracks. Such supplementary operations implicate the transit over the switches used to access the

terminals, restricting the performing of arrival and departure processes of further trains. In case of trains destined to Pier VII, they travel along the same itinerary of those heading to Piers V and VI just until the gateway crossroad, where they are led towards Gateway 4 and then straight to the terminal. Although with a rare frequency, if irregularities during the check at the gateway are observed, before carrying out freight loading and unloading activities, trains are positioned onto the Fascio dei Moli by transiting over a specific junction and wait for document rectification. For all the analyzed piers, the same shunting operations are performed also to exit trains from the corresponding destination terminal, in order to reach again the Trieste Campo Marzio station.

In line with the need of transferring trains between the principal port railway station and the terminals, shunting locomotives can be released and recalled in/to different parts of the port network, i.e. in correspondence to the Trieste Campo Marzio station, the Fascio dei Moli and the piers. When they are not required to serve train arrival and departure processes, single locomotives travel along the whole port infrastructure in order to reach depot locations, which lie at the Trieste Campo Marzio station, the Parenzane and the Fascio dei Moli.

The simulation of the examined railway processes has required the definition of different categories of resources, in order to consider the use of both the infrastructure and of shunting vehicles. Indeed, single resources have been set to model tracks and locomotives. More specifically, based on the schematization of the port railway network described above, the following classes of tracks have been established:

- the tracks of the Campo Marzio station;
- the tracks of the Parenzane switches;
- the tracks at Parenzane;
- the tracks of the switches preceding the gateway crossroad;
- the tracks of the gateway crossroad switches;
- the tracks of Gate 3;
- the tracks of Gate 4;
- the tracks of Asta Lunga;
- the tracks composing Fascio dei Moli;
- the tracks of the switch on the junction connecting Pier VII and Fascio dei Moli;
- the tracks of the junction connecting Pier VII and Fascio dei Moli;
- the tracks of the switches at the entrance to Pier V;
- the tracks of Pier V;
- the tracks of the switches at the entrance to Pier VI;
- the tracks of Pier VI;
- the tracks of the switches at the entrance to Pier VII;
- the tracks of Pier VII.

For each modelled task, both the type and the number of resources necessary to carry out the activity have been set. Besides, every resource has been associated to a certain quantity, which denotes the number of units of the resource that the considered infrastructure has available. A more detailed indication of the entity of resources is provided in Section 3.2.1.3. The reported figures constitute some of the input values implemented in the mF workflow.

With the aim of reflecting the actual performing of the considered railway processes, a few conceptual requirements for the simulation model have been defined, specifically in reference to the use and management of both infrastructural and vehicle resources. Notably, the simulation model has been properly developed so as to capture the following operating principles:

- Waiting for shunting locomotives: once administrative formalities are completed, trains arriving from the national railway line are supposed to wait for the availability of the shunting locomotives on the set of tracks dedicated to train arrivals and departures at the Trieste Campo Marzio station;
- Continuous occupation and subsequent release of the locomotive resource: once a shunting locomotive is connected to a certain train, these vehicles constitute a single entity until the train reaches the point where the locomotive is to be released. After the shunting locomotive is detached by the train and it is officially made available, it can be requested by other trains;
- Exclusive occupation of tracks: while travelling along the port railway infrastructure, trains and single shunting locomotives occupy different parts of the network that are currently characterized for the most by single tracks and, thus, at times they constrain some infrastructure interlocks which consist of different portions of the considered itinerary;
- Two-way railway flows: to ensure the possibility for trains and locomotives to proceed in both directions, those parts of the railway infrastructure with multiple tracks are not intended to be completely occupied by vehicles heading in the same direction. In this manner, by reserving a certain number of tracks to travel in the opposite direction, the passage of vehicles in both ways is guaranteed and, thus, deadlocks are avoided.

Further arrangements to the BPSim standard have been made to realistically animate the analyzed railway processes, in particular with respect to the use of resources and the management of queues and gateways.

As regard the consequential use of infrastructural resources, in the event that a certain track is required for multiple consecutive tasks, it remains associated with the corresponding train from the first activity requiring its use until the last one. Only once the final task is completed, the resource is made available to other trains. Besides, the insertion of additional intermediate tasks has been needed to correctly simulate the functional occupancy of infrastructural resources. Such tasks, labelled as “Resource exchange” (“*Scambio risorse*”), have been introduced whenever the tasks entailing the release of a certain resource and the acquisition of a new one corresponded to contiguous activities in the models. By using these intermediate tasks, the release of the previous resource is permitted only when the following needed resource is available; this means that the release of the previous resource and the employ of the next one occur simultaneously. Representing fictitious activities, “Resource exchange” tasks have been associated to a null duration, just to prevent an infrastructural resource from being released before trains can occupy the next resource of the same type.

Concerning the use of vehicle resources, once locomotives are released, they cannot be considered straight available, since their readiness to perform shunting operations depends on whether and where the successive railway process is meant to take place. Indeed, as mentioned, based on the actual traffic situation, shunting locomotives can be required in different parts of the port railway network to enter/exit trains or, otherwise, they are stopped at a few depot locations. In any case, while travelling to reach destination, locomotives engage the necessary infrastructural resources for a certain time period, eventually impeding other contemporary train movements. Such dynamics have been displayed in a series of minor model processes, which are triggered by specific signals visualized in the main processes along the train path. These signals activate the relocation process of shunting locomotives, enabling them to assume the correct position on the port railway network. If a locomotive is already present where it is requested, the recall process ends instantly.

With respect to queue management, the logic for ordering trains assumed in the simulation model considers that, just like in reality, priority is given to trains that respect the scheduled timetable. Therefore, in case of queues, these latter are prioritized over the others in the deployment of resources. This means that, whenever the execution of a certain task requires the use of any unavailable resource, trains waiting to access the same resource will be processed in an order dictated by their priority.

Finally, the management of gateways regulating flow splits has been modelled according to the specific cases for which these elements have been used to. Indeed, some gateways operate on a probabilistic basis, which entails that the sorting of tokens passing through such decision points is governed by a probability. On the contrary, the functioning of other gateways depends on information, called "attribute", that is assigned to tokens a priori, as in the case of train destination terminals. Indeed, before entering the simulation, i.e. before their actual creation, tokens already own that information and, thus, once they reach this kind of gateways, their path is defined according to the predetermined attribute. Lastly, further gateways have been set so as to operate on a logical basis, which relates to the availability of specific resources or to the presence of waiting queues for certain resources. The logical condition underlying these gateways is read internally during the simulation and automatically regulates the tokens flow.

2.2.1. PARAMETRIZATION OF THE MODEL

The parametrization of the simulation model has concerned various aspects of the represented system, namely the scenario, the tokens, the resources, the tasks, and the gateways. An explanation of the different settings for those model features is reported in the following sections.

2.2.1.1. Simulation scenario

First of all, the parameters defining the duration of the simulation scenario have been set, choosing minutes as measurement unit and establishing a two-day duration for simulation runs, of which the first day has been considered the time necessary to warm up the model. Therefore, since in that time period the system is not fully operational, railway processes performed during such part of the simulation run have not been considered for the estimation of railway capacity. The definition of a warm-up time proves to be essential to reflect the context in which the examined processes unfold because, as a concept of general validity, neglecting contextual factors may limit the predictive value of simulation models. The setting of a fixed time to populate the developed simulation model has permitted to replicate the realistic functioning of the system, considering also the characteristics of the process context, intended in terms of workload and resource availability.

2.2.1.2. Tokens

Tokens have been actively generated in the simulation model only in the train arrival process, whose start event is triggered based on a random distribution. Besides, a table containing the number of train arrivals for each time slot has been implemented in order to regulate not only the amount of tokens entering the system, but also their arrival distribution throughout a simulated day. More in detail, the following four time slots have been defined, with reference to the potential capacity of the national railway network in an average-traffic weekday:

- an off-peak time slot, in which passenger railway flows are modest and, thus, a few freight rail services can be carried out;
- a peak time slot, in which passenger railway traffic almost saturates the capacity that the national network disposes of, so a very limited number of freight rail services can be performed;

- a time slot in which no passenger railway flows are present, allowing freight rail services to fully exploit the capacity of the national railway network;
- a time slot during which the circulation of any component of train traffic is not permitted, in order to execute maintenance works on the national railway line; such works are performed at night, during the time slots when the presence of railway traffic volumes is usually at the lowest.

Of course, not all the trains generated considering the potential capacity of the national railway network can enter the system, due to the infrastructural and organizational limitations characterizing the railway capacity at the Punto Franco Nuovo. The avoidance of such tokens has been modelled with a specific BPMN event, i.e. an error event, which interrupts their processing along the workflow. However, a counting of the number of discarded trains has been implemented in the execution code since, in view of future port development plans, it represents a useful information to quantitatively estimate the residual capacity for the railway stations of the industrial port.

Analogously, train departure processes are limited by capacity availability on the national railway network and, thus, the exit of tokens from the simulation model has been properly hindered in the diverse time slots of the day.

As mentioned, prior to their generation, tokens are attached to some attributes that determine how they are processed along the modelled workflow, particularly with respect to their priority and their destination. Regarding this latter information, trains have been assigned to destination terminals according to a stochastic basis, which considers the following split of train traffic: 50% of the total amount of railway flows is supposed to head towards Piers V and VI (of which 85% to Pier V and 15% to Pier VI), and the remaining 50% is destined to Pier VII. Such distribution approximately reflects the actual distribution of railway traffic volumes in the Port of Trieste, which can be deduced by the official statistics provided by PNAEAS.

2.2.1.3. Resources

Modelled resources fall into two categories: locomotives and tracks. On one hand, the former correspond to the shunting locomotives used to transfer trains between the Trieste Campo Marzio station and the terminals, and vice versa. They are are represented in the model by a single resource. On the other hand, tracks represent the infrastructural resources of the port railway network, which have been quantified according to the current physical and/or operational layout of the Punto Franco Nuovo. Notably, the following values have been assigned to the considered infrastructural components, each of them corresponding to a resource:

- 8 tracks to the Campo Marzio station;
- 1 track to the Parenzane switches;
- 1 track to Parenzane;
- 1 track to the switches preceding the gateway crossroad;
- 1 track to the gateway crossroad switches;
- 1 track to Gate 3;
- 1 track to Gate 4;
- 1 track to Asta Lunga;
- 11 tracks to Fascio dei Moli;
- 1 track to the switch on the junction connecting Pier VII and Fascio dei Moli;

- 1 track to the junction connecting Pier VII and Fascio dei Moli;
- 1 track to the switches at the entrance to Pier V;
- 2 tracks to Pier V;
- 1 track to the switches at the entrance to Pier VI;
- 2 tracks to Pier VI;
- 1 track to the switches at the entrance to Pier VII;
- 4 tracks to Pier VII.

Besides, for a few specific resources with multiple tracks, i.e. the Campo Marzio station and Fascio dei Moli, some tracks have been reserved for the transfer of trains heading from terminals to the national railway network, so as to guarantee the bi-directional flowing of tokens.

In addition, consistently with the future port development plans, the doubling of the tracks at Parenzane has been considered.

2.2.1.4. Tasks

A few parameters have been set up to regulate the processing of each task of the model, particularly with reference to its duration and use of resources. As far as duration is concerned, the processing time of activities has been established not only through estimations based on the length and transfer speed of vehicles (i.e. trains and single shunting locomotives), but also according to evidence gathered during some on-field data collection sessions on an elevated port location. Although collected data captures a time series which is neither sufficiently long nor statistically significant, the use of such information in parametrization has enabled the accomplishment of a twofold objective. On one hand, data has been used to verify the correctness of the order of magnitude characterizing the times of the analyzed tasks, thanks to the comparison with other available values. On the other hand, the gathered information has allowed to detect possible anomalies that can occur in the examined railway processes. In the event of poor visibility circumstances, further time estimations have been carried out resorting to real-time shooting of railway processes, which is recorded by various monitoring cameras owned by the RID.

Two different sets of tasks duration have been implemented in the simulation model, one considering the current layout of the port railway network (mainly for calibration and validation purposes) and the other one assuming the demolition of the wall that physically separates the Free Port zone from the surrounding port areas. Indeed, according to port development plans, such wall is meant to be removed in the future, entailing a possible decrease in the duration of some of the tasks included in the model.

2.2.1.5. Gateways

Gateways concerning decisional points for administrative procedure have been regulated using a statistical distribution of flows, whose percentage values have been determined based on notifications reported in the CH30 and on evidences observed by the RID during the performing of railway processes. On the contrary, in other situations the split of process flows exiting from gateways has been managed according to a logic functioning, in relation to the availability of resources or on the priority of tokens. In the former case, such approach has been adopted to govern the access of trains into certain infrastructural parts of the port railway network, i.e. based on the occupancy of terminals and of the Trieste Campo Marzio station. In the second case, priority rules have been used in release and recall processes of shunting locomotives, in order to assign that resource to trains intended to enter or exit the port.

Finally, as mentioned, other gateways work on the information of the token attributes, as for example, the terminal destination of individual trains regulates the outflow of different gateways: once it reaches the gateway, the train will follow the correct path depending on that attribute.

Initially, attention has been focused on simulating only the train arrival process because, since it is characterized by a lower complexity with respect to the train departure one, the verification of the correct functioning of the model resulted to be easier, allowing to detect possible anomalies straightforwardly. Then, bearing in mind the need of considering interactions among tokens to reflect the effective behaviour of the system, the same arrangements have been implemented to the other modelled processes, obtaining the animation of the actual railway traffic in the Port of Trieste. Finally, simulation results using the current infrastructure scenario have been used to validate the developed model, so as to ensure that its calibration had been performed adherent to reality. To this end, attention has been focused mainly on considering the lifelike duration of the entire train arrival and departure processes and, more in detail, of the travelling time covered by trains and shunting locomotives on specific infrastructural components or along significant partial itineraries. The accuracy of the timings arising from simulation runs has been tested through the comparison with data gathered on-field. Besides, given the presence of many single-track elements in the port railway network, the admissibility of possible contemporary operations has been checked by the confrontation with real-life ones, in order to ascertain the avoidance of conflicting circumstances. This latter condition has been verified based on random tests of simulation results.

2.3. PROCESS OPTIMIZATION

The adoption of mF has enabled to define the details of the engineering design process of optimizing port railway capacity through an intuitive interface, that in the mF's terminology is named workflow. It formulates all the logical steps composing the process, including the definition of its input and output variables. In a mF workflow, from top to bottom, it is possible to follow the optimization of the data flow: the input variables and its constraints are located at the top, while the output variables, its objectives and constraints are located at the bottom. The green squared icones represent the input variables, while the blue ones are the output variables. Each variable includes the range of variation when it is not constant. Otherwise, a symbol "k" is shown on the icon of the variable. Both input and output variables can be scalar or vector and they are recognised by the number of arrows on the icons. Precisely, a scalar variable has one arrow, while a vector variable has three arrows. The maximization objective of a scalar output variable, or one of the components of a vector output variable, is represented with an up arrow. Instead, when the maximization objective refers to all the components of an output variables vector it is represented by multiple up arrows. The constraints are described by two or four opposing blue arrows separated by a yellow line. In the first case, the constraint is defined by a single condition, in the second case, it is defined by multiple conditions. At the centre, from left to right, it is possible to follow the process flow: the Scheduling Start node defines the algorithms used for initialization and optimization, respectively. The central node is a Black Box (BB) that contains the procedures that should be used to compute the values of the output variables according to the input variables of the engineering design process. This BB could be a script, a specific external procedure or an external tool. At the end of the execution, the process ends with the Exit node.

For the pilot project concerning the Port of Trieste, a specific workflow has been created. More in detail, it is composed of two nested workflows: an external workflow (referred to infrastructural variables) calls an internal one (where operations variables are included), in which the optimization is actually performed. The interaction between the external and internal workflows occurs by means of a particular BB. These two workflows have the same output variables, objectives and constraints on them. Indeed, the

BB of the external workflow calls the internal workflow for the output variables calculation. The internal workflow calculates them in order to optimize the objectives by respecting the constraints. These values are externally saved by means of particular nodes described in the following.

The external workflow is reported in Picture 6. This workflow contains a constant input variable called "*Durata*", that indicates the duration of the chosen scenario simulation. Its value is 1440 minutes. Moreover, it contains five other input variables. All the six input variables are to be inherited as constant variables by the internal workflow, where the actual optimization is performed. Indeed, the goal of the external workflow is the exploration of all possible combinations for these variables of interest. Precisely, the following variables have been considered:

- *"Presenza_Muro"*: this variable can be 0 or 1 and represents the presence or the absence of the wall delimiting the Free Port zone. When it is 0, it indicates that the model considers the absence of the wall; otherwise, the model considers the presence of the wall;
- *"N_Locomotive"*: this variable can vary between from 2 and 7 and indicates the number of shunting locomotives used in the model;
- *"N_Campo Marzio"*: this variable can vary between 5 and 12 and indicates the number of tracks at the Trieste Campo Marzio station used in the model;
- *"N_Parenzane"*: this variable can be 1 or 2 and indicates the number of tracks at Parenzane used in the model;
- *"N_FascioDeiMoli"*: this variable can vary between 4 and 11 and indicates the number of tracks at Fascio dei Moli used in the model.

Regarding output variables, the following ones have been considered:

- *"Processi_Completati":* this variable contains the number of completed processes, that is, the number of trains that terminate the process during the considered scenario;
- *"Numero_Locomotive":* this variable contains the number of deployed locomotives;
- *"Numero_Treni_Esclusi"*: this variable contains the number of excluded trains. These trains do not find any available tracks at Campo Marzio when entering the infrastructures, therefore they conclude the process without being considered;
- *"Numero_Treni_Partiti"*: this variable contains the number of trains departing from the Trieste Campo Marzio station at each hour of the simulated day.

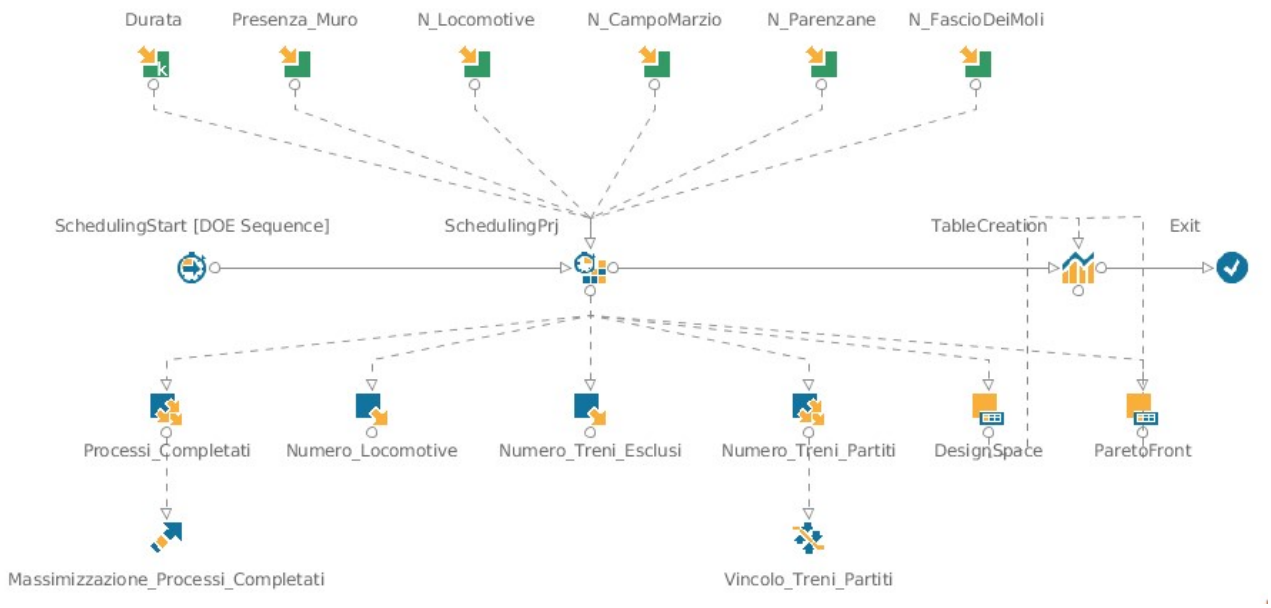
The only considered objective, called "*Massimizzazione_Processi_Completati*", is the maximization of completed processes, that is, the number of trains that complete the arrival or departure processes.

The only defined constraint, called "*Vincolo_Treni_Partiti*", allows that the number of trains departing from the Trieste Campo Marzio station respect the limitations given by the railway line capacity in the different time slots of the simulated day.

The external workflow also includes some particular nodes that allow to collect the output variables, the objectives and the constraints obtained in the internal workflow. Indeed, the second goal of the external objective is the exchange of the results obtained by the internal optimization. In particular, the "*DesignSpace*" node (first yellow squared icon) saves all input and output variables, objectives and constraints obtained in the internal workflow. The "*ParetoFront*" node (second yellow squared icon) saves only the values of the optimal solutions. Finally, the "*DesignSpaceNode*" (yellow icon with blue line on the top) creates two tables reporting these results.

The "*SchedulingPrj*" node (the icon at the center of the workflow) is the BB of the external workflow that calls the internal one.

Picture 6 - External Workflow in mF. It contains six input variables (green squared icons), one of which is constant, four output variables (blue square icons), one objective (arrows) and one constraint (four opposing blue arrows separated by a yellow line). At the center of the model the *SchedulingPrj* calls the internal workflow in which the optimization is made. The *TableCreation*, *DesignSpace* and *ParetoFront* nodes (yellow nodes) allow the exchange of the results obtained in the internal workflow.



The internal workflow is reported in Picture 7. This workflow contains some additional variables based on the consideration reported into the parametrization section of this deliverable. The goal of this workflow is the optimization of the modelled railway processes, given the input variables of the external workflow. These input variables are indeed inherited from the external workflow and herein considered constant during the optimization. The following input variables have been considered:

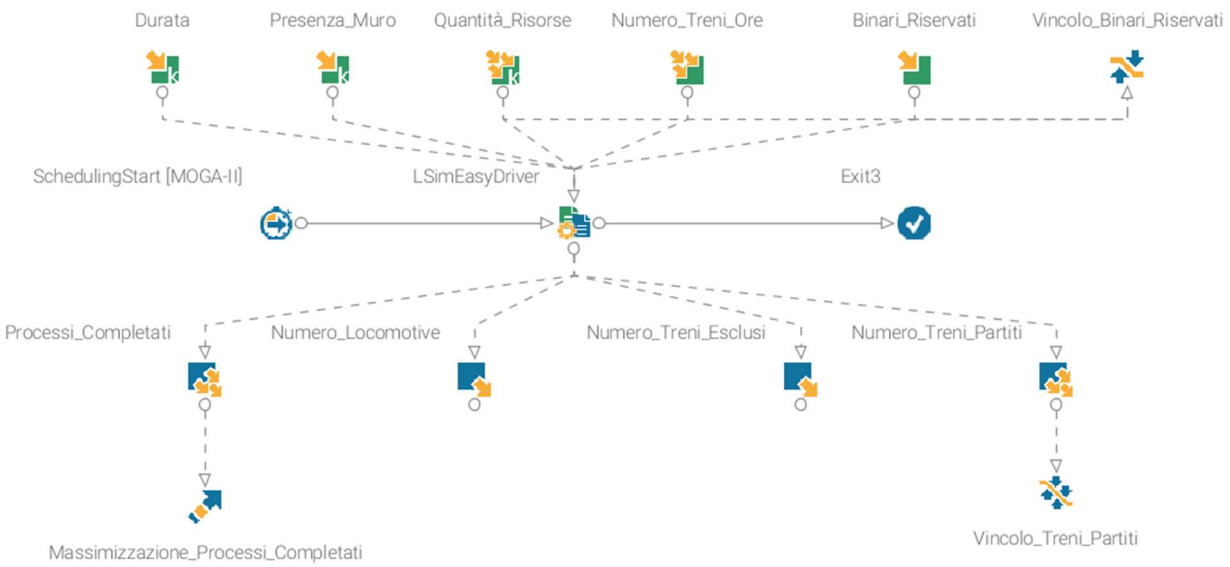
- *"Durata"*: inherited from the external workflow;
- *"Presenza_Muro"*: inherited from the external workflow;
- *"Quantita_Risorse"*: this vector variable represents the entity for each modelled resource. In particular, the number of locomotives, the number of tracks at Parenzane, Campo Marzio and Fascio dei Moli are inherited from the external workflow;
- *"Numero_Treni_Ore"*: this variable represents the number of trains entering the process at each hour of the simulated day;
- *"Binari_Riservati"*: this variable represents the number of tracks dedicated to for trains travelling from the terminals to the Trieste Campo Marzio station.

The output variables, its constraints and objectives are the same described above for the external workflow.

The constraint called "*Vincolo_Binari_Riservati*" is added on the input variable "*Binari_Riservati*". It allows that the number of dedicated tracks is always lower than the number of available tracks in the multiple resources.

The BB of this workflow is denominated "*LSimDriverNode*" (the icon at the center of the workflow). This node allows the interaction between mF and the L-Sim simulator, using a particular mF node called EasyDriver. At the end of the process, the workflow returns a file where the output provided by L-Sim is documented. The BPMN model is set inside the workflow and both the remaining BPSim parameters and the priorities of each individual token are constant. The priorities of tokens are previously established and cannot be changed during the simulation: they are used to handle queues, as explained in the previous sections of this deliverable.

Picture 7 - Internal Workflow in mF. It contains five input variables (green squared icons), three of which are constant, four output variables (blue square icons), one objective (arrows), two constraints (opposing blue arrows separated by a yellow line). At the center of the model the *LSimEasyDriver* calls L-Sim simulator.



For the optimization model included in the internal workflow, MOGA is configured thanks to ESTECO experience. In particular, the initial population was composed of 50 designs randomly chosen for the input variables that are not constant. Among the constant variables there are the input variables inherited by the external workflow. For these latter, the value was previously given by the Full Factorial algorithm. All constant variables do not change during the optimization process.

At each iteration, MOGA updates its population and interacts with the "*LSimEasyDriver*" node to calculate output variables. The algorithm stops when it reaches 10 iterations by generating a table that contains 500 designs. This optimization phase employs about 18 minutes exploiting a parallel execution of the process on 6 threads.

An optimization phase starts from each design of the external DOE table computed by the Full Factorial algorithm. Therefore, 1536 tables with 500 designs, for a total of 768000 designs analyzed, have been stored into a unique table called "*DesignSpace*". For each table obtained during an optimization phase,

the optimal values are extracted and saved into a table called "*ParetoFront*". These tables are saved by means of the "*DesignsSpace*" and "*ParetoFront*" nodes of the external workflow.

Note that MOGA, as all genetic algorithms, is a stochastic algorithm: it depends on a random seed that modifies the algorithm evolution. When the problem is too complicated due to a big number of input variables and constraints, as the one considered, the optimal search is not granted and a great number of iterations could be required. This, in turn, leads to a high computational time. Therefore, in this case a possible solution would be to do more evolutions of the algorithm by changing the seed value. In particular, the optimal solution would be the average of all optimal solutions found by each evolution. Convergence would be reached when all these values would result the same. However, this approach would involve a further increase of computational time. Moreover, in this model also the BB is stochastic. Indeed, *LSimEasyDriver* calls the internal simulator that depends on a random seed. By changing this value, the results change. Therefore, the optimal solution should be the average of the solutions found by changing this internal seed. This approach could require an outbreak of evaluations.

A good alternative to this approach is turning to the Response Surface Mode (RSM) to approximate the optimal values. Indeed, RSM is able to reduce the "noise", that is, the moving away of the optimal solution caused by the variation of both algorithm and simulator stochasticity.

For this reason, the "*ParetoFront*" table has been used for RSM approximation, as explained in the following.

The "*ParetoFront*" table contains the optimal values of the maximum number of completed processes found by MOGA. Precisely, each optimal value is given by one evolution of MOGA and corresponds to a particular configuration of the input variables of the internal workflow.

Starting from this table, another table with a subset of values has been created considering only the external workflow input variables and one solution per combination. Indeed, it is possible that different internal combinations reach the optimal number of completed processes. Only one of these solutions is kept in this subset. Moreover, a new column has been added to estimate the number of processes completed in one year, which resulted by multiplying the number of processes completed in one day by the number of actual working days (288 days).

This new table is used as a training table of a Response Surface Model (RSM) chosen among the ones provided by mF.

An RSM is a statistical or numerical model that defines the response of a system, that is, the value of an output as input variables vary. The train phase of an RSM defines a database that contains a sufficient and limited number of simulations. The train could be made by means of standard interpolation or approximation techniques. Precisely, an interpolation technique, like Radial Basis Function (RBF), requires that the response surface passes through each input value. Instead, the approximation technique, like polynomial Singular Value Decomposition (SVD), minimizes the prediction error. Moreover, there are powerful regression methods based on Bayesian inference, for example Gaussian Process (GP). These methods have a probabilistic interpretation, meaning that the prediction of the model in a test point is characterized by a (Gaussian) predictive probability distribution (defined by its mean and variance values). The full theoretical description of this algorithm is available in the following reference: C. E. Rasmussen and C. K. I. Williams. Gaussian Processes for Machine Learning. MIT Press, 2006. isbn: 0-262-18253-X.

The RSM could be considered as a simplified model of the real one and they allow a good approximation of the output values in small times. The train phase is usually followed by a validation phase, in which the RSM behaviour is validated on a table obtained from new values of the input variables.

As far as the pilot project of the Port of Trieste, the subset table of optimization results has been divided and 80% of it has been used as a training set, while the remaining 20% as validation set. Therefore, more RSM models have been compared and the RSM with the minor error validation has been chosen.

For example, Picture 8 reports the comparison between some of the RSMs available in mF and herein tested, precisely GP, RBF and SVD. Precisely, the first table shows the error between the actual values and the one calculated by RSM models. In particular, the following five error types are reported:

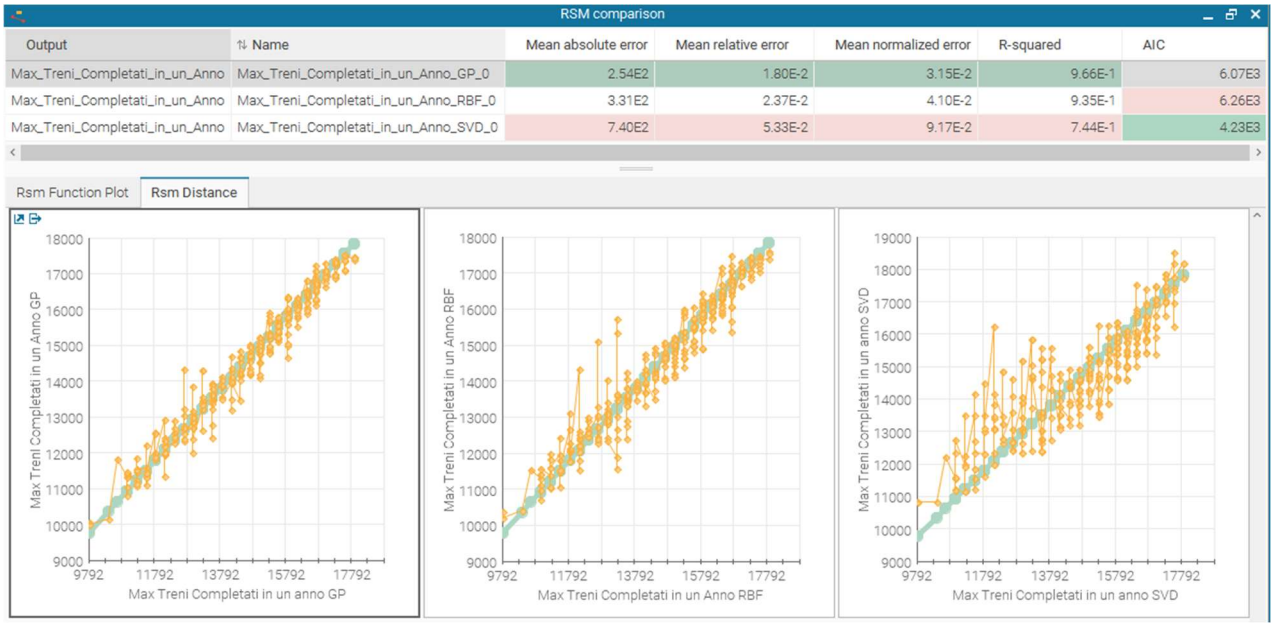
- Mean absolute error: actual average value of the difference between optimal values and the one computed by RSM. This value should be as low as possible;
- Mean relative error: average ratio between the mean absolute error and the real design values (expressed as %). This value should be as low as possible;
- Mean normalized error: mean absolute error rescaled according to the output variable range (% of the absolute value in the given range). This value should be as low as possible;
- R-squared: measures the quality of real data approximation. R-Squared is a value between 0 and 1. 0 indicates that the model explains none of the variability of the response data around its mean, whereas 1 indicates that the model explains all the variability of the response data around its mean;
- Akaike Information Criterion (AIC): measures of the relative quality of a statistical model, offering a relative estimate of the information lost when generating the model representing the real data. It does not give any absolute information on how well a model fits the data, but it makes sense only when compared with other candidate models trained using the same algorithm. The best model is the one with the lowest AIC.

Other than through the five error measures, the quality of the RSMs can be also appreciated graphically. The distance plots reported in Picture 8 show the distance between the optimal values (green) and the closest value computed by the RSM algorithm (orange).

Since GP presents the minimum mean absolute, relative and normalized errors, the R-squared closest to 1 and the lowest AIC, this RSM has been selected.

Therefore, GP is training on the entire table and the approximation of the values for each optimal value found by MOGA is shown in the table reported in the second sheet of the attached excel file (see Annex C). Since GP allows to find the prediction error, it is reported into the same sheet within a new column.

Picture 8 - RSM comparison. The table reports the errors obtained during the validation phase by RSM models. Each plot shows the distance between the optimal values (green) and the closest value computed by the RSM algorithm (orange).



Output	Name	Mean absolute error	Mean relative error	Mean normalized error	R-squared	AIC
Max_Treni_Completati_in_un_Anno	Max_Treni_Completati_in_un_Anno_GP_0	2.54E2	1.80E-2	3.15E-2	9.66E-1	6.07E3
Max_Treni_Completati_in_un_Anno	Max_Treni_Completati_in_un_Anno_RBF_0	3.31E2	2.37E-2	4.10E-2	9.35E-1	6.26E3
Max_Treni_Completati_in_un_Anno	Max_Treni_Completati_in_un_Anno_SVD_0	7.40E2	5.33E-2	9.17E-2	7.44E-1	4.23E3

3. OPTIMIZATION RESULTS

The following assumptions have been made for the estimation of the optimal number of trains at the Punto Franco Nuovo:

- the values obtained for port railway capacity are related to the growth of traffic demand which is expected to concern the Port of Trieste, according to the future macroeconomic tendencies (see Document on Market Potentials);
- results provided by the optimization procedure in terms of the split of train flows among the three considered terminals may not reflect the actual distribution of traffic volumes, due to the implementation of a specific mechanism to exclude further potential trains based on tracks availability at the Trieste Campo Marzio station;
- an ideal situation with no possible additional delay at the gateway check has been considered, because the occurrence of this phenomenon was not observed during on-field data collection sessions. However, although with imprecise frequency and duration, the occurrence of such delay depending on verification activities by the Financial Police has been noted by port operators.

Although the last two assumptions may seem to limit the simulation model, and thus the final optimization outcomes, they can actually offer useful insights for future developments. In regard to the first one, the approach adopted to split railway traffic flows among terminals has revealed to provide an indication to improve the definition of the train schedule on the national railway network. Indeed, the obtained results can suggest the railway companies serving the three examined terminals some helpful considerations to more efficiently evaluate the purchase of train time slots on the national railway network, based on tracks availability at the Trieste Campo Marzio station. Concerning the second assumption, a more accurate estimation of the entity and the real probability of occurrence of delays at the gateway check could be accomplished in the future thanks to the enrichment of the information content reported in the PCS of the Port of Trieste.

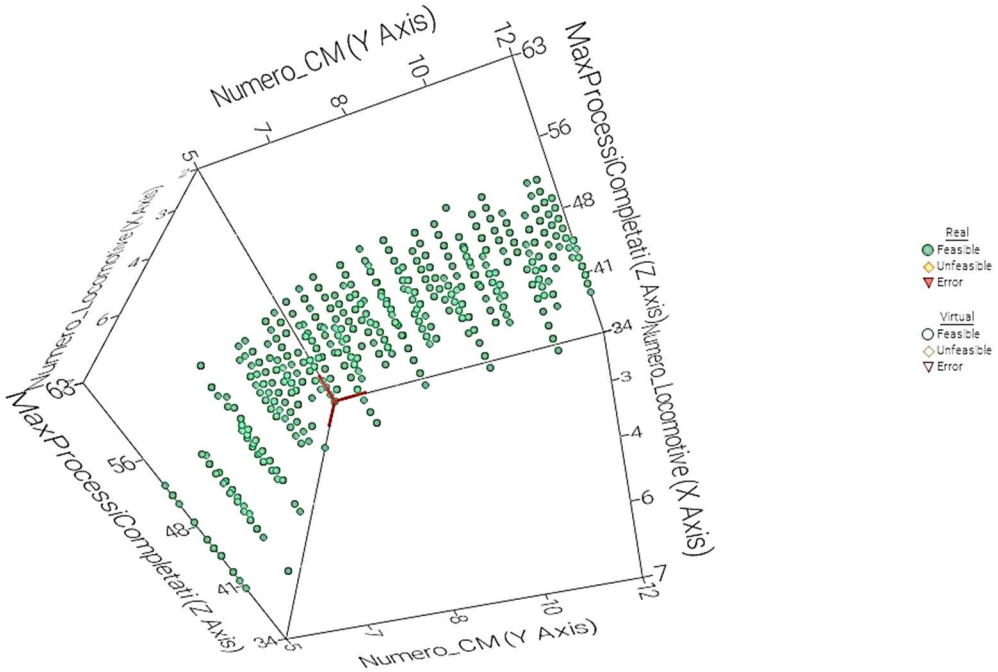
The set of exact optimization values obtained by mF has been trained using GP, providing a series of approximated data regarding the optimal port railway capacity that reflect different combinations of the considered infrastructural and operational parameters. The consultation of the values derived from the created RS has been facilitated by the development of an intuitive Microsoft Excel interface, which automatically queries the RS data and, thus, offers port decision makers a smart approach to elaborate a variety of what-if scenarios. Those outcomes have been also visualized using the graphical outputs provided by mF, in order to allow a more effective understanding of compromise solutions lying on the Pareto front. Considering all the possible combinations of levels of input variables computed by the Full Factorial DOE algorithm, each displayed solution has been obtained by means of 500 runs of MOGA-II.

According to an operational perspective, the optimal port railway capacity has been evaluated in terms of the maximum number of completed processes during simulation runs (cfr. the output variable "*Processi_Completati*") to varying of input parameters.

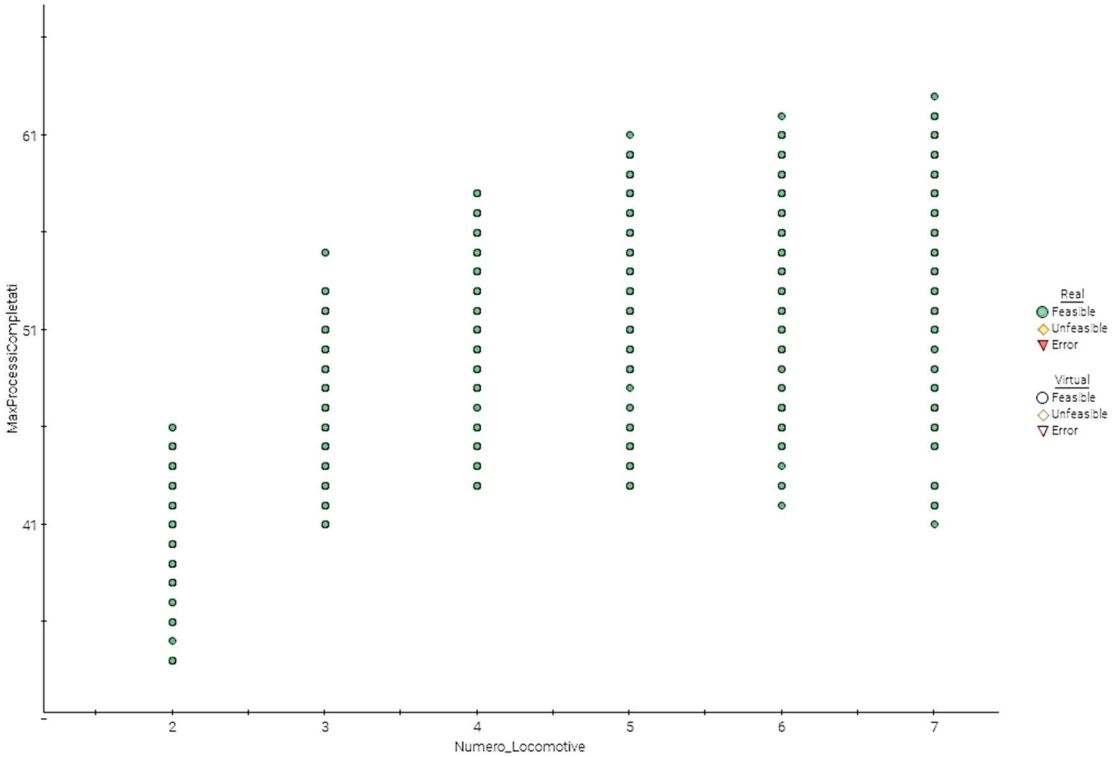
Picture 9 represents a 3D-scatter chart which illustrates the variation of the maximum number of completed processes ("*MaxProcessiCompletati*" – Z Axis), in function of the number of shunting locomotives ("Numero_Locomotive" – Y Axis) and of the tracks at the Trieste Campo Marzio station ("*Numero_CM*" – X Axis). It can be noted that a tendency for a growth of the optimal port railway capacity is related to the increase in the availability of both kinds of resources. A clearer examination of the individual contribution of those factors can be carried out referring to the 2D-scatter charts reported in Pictures 10 and 11, which depict, respectively, the influence of shunting locomotives and of the tracks at the main port railway station on the maximum number of train flows. In both pictures, the various points represented along the y axis correspond to the different trade-off solutions generated performing the multi-dimensional optimization procedure. Taking into account the maximum values, in Picture 10 it can

be observed that a significant rise in the entity of completed processes is attainable until the number of shunting locomotives employed for train transfers equals to 5. On the contrary, with the increasing of those operational resources, the marginal growth of the maximum amount of train flows decreases. Analogously, Picture 11 captures an increase in the number of completed processes when increasing the quantity of tracks at the Trieste Campo Marzio station.

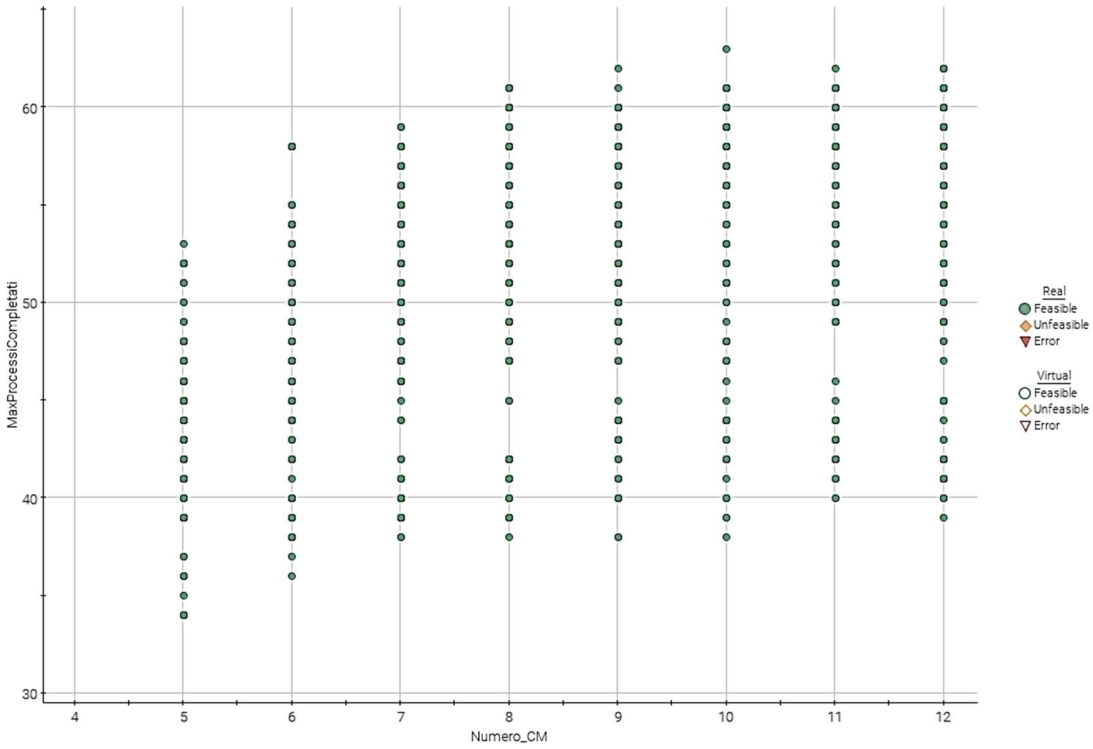
Picture 9 - Maximum number of completed processes in function of the number of shunting locomotives and of the tracks at the Trieste Campo Marzio station



Picture 10 - Maximum number of completed processes in function of the number of shunting locomotives

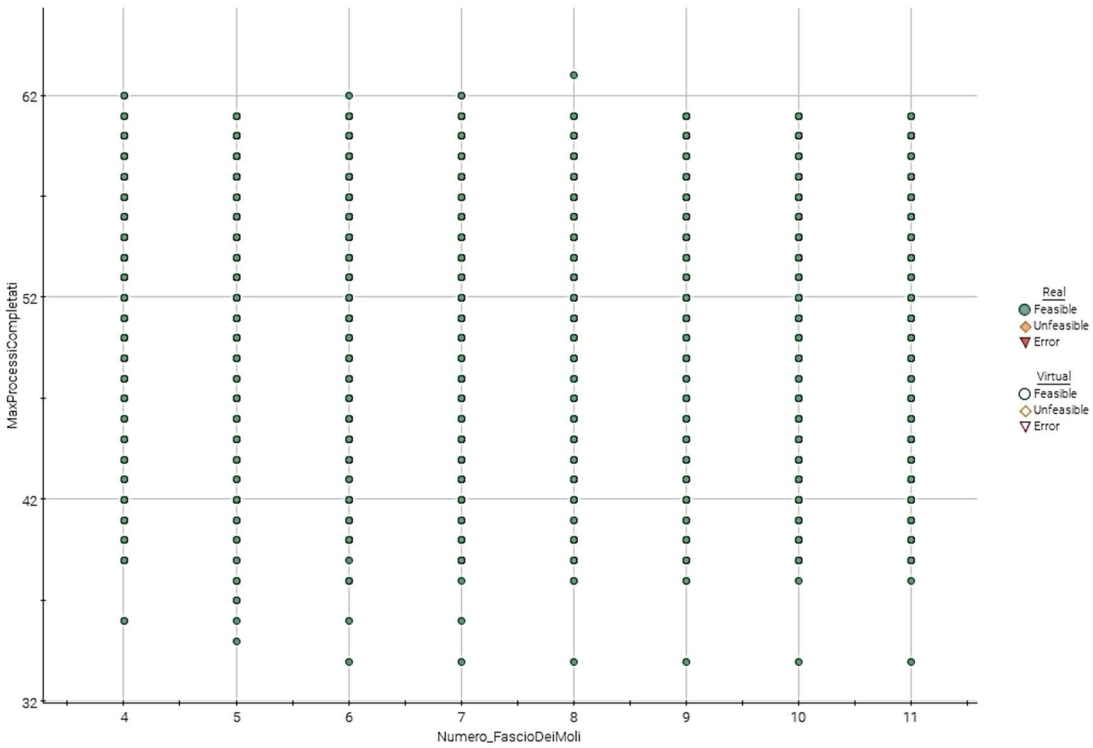


Picture 11 - Maximum number of completed processes in function of the number of tracks at the Trieste Campo Marzio station



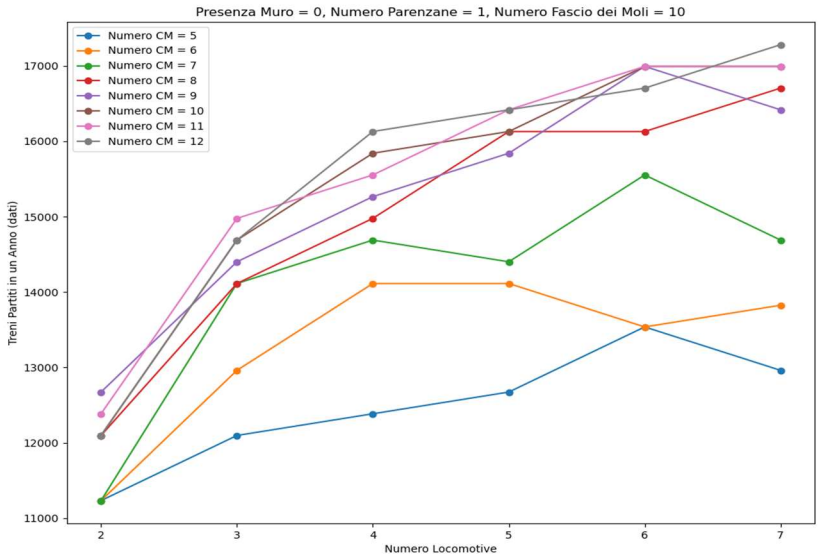
Conversely, as depicted in Picture 12, no relevant increases in the maximum number of completed processes is attainable as the amount of tracks at Fascio dei Moli varies.

Picture 12 - Maximum number of completed processes in function of the number of tracks at Fascio dei Moli

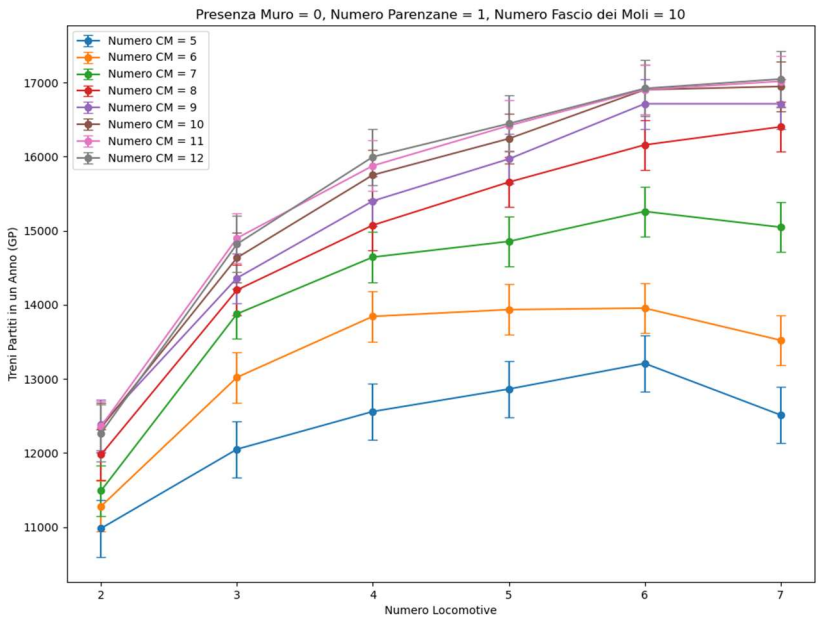


Pictures 13 and 14 allow to understand the advantages of the GP model. Indeed, in Pictures 13 and 14, the x axis reports the number of locomotives, the colour represents the number of tracks at the Trieste Campo Marzio station, while the other input variables are considered fixed. The y axis of Picture 13 reports the number of trains departing in a year found by optimization: these values are the objective values used for the GP train phase. Instead, the y axis of Picture 14 reports the number of trains departing in a year approximated by the GP model. Comparing these pictures, it is evident that the GP model reduces the “noise” due to the algorithm and simulator stochasticity, as explained in the previous section. In particular, when the number of tracks at the Trieste Campo Marzio station increases or the number of locomotives is between 3 and 6, the number of trains departures increases: this behaviour is shown for GP results, while it is not evident for values found by MOGA.

Picture 13. The number of processed trains in a year vs the number of locomotives in use (MOGA). The colors define the different number of tracks at Campo Marzio.



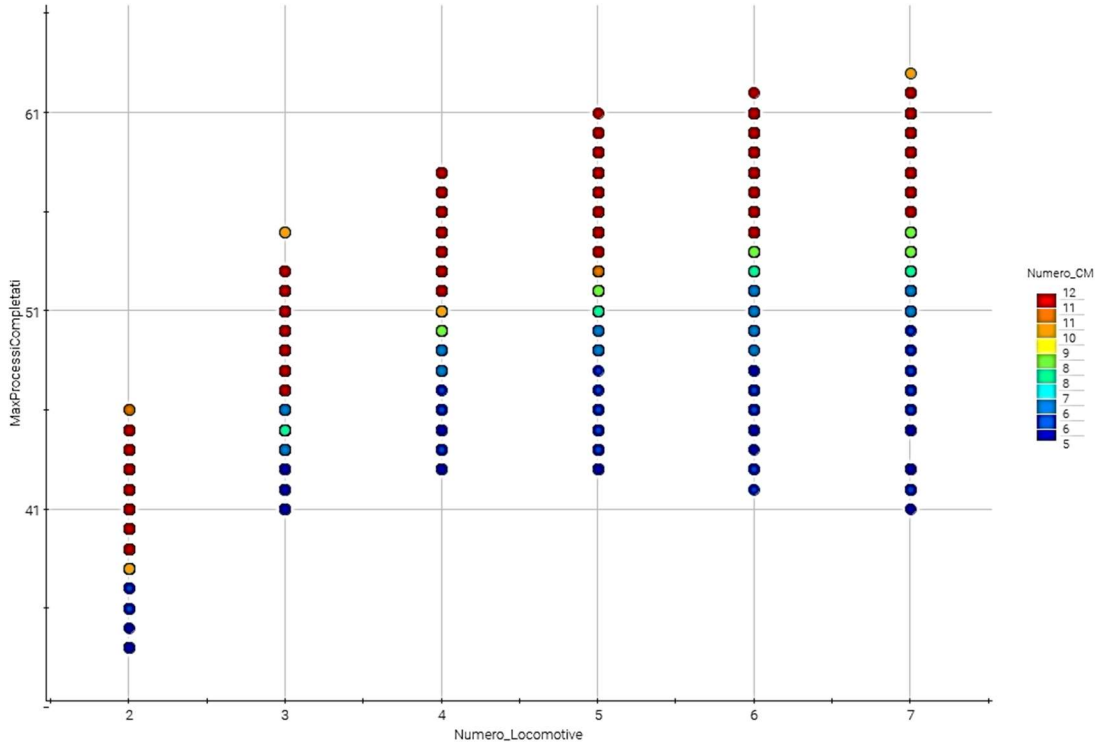
Picture 14. The number of processed trains in a year vs the number of locomotives in use (GP model). The colors define the different number of tracks at Campo Marzio.



Considering only influential input variables on the number of completed processes, the bubble chart reported in Picture 15 offers a graphical representation which combines all of them. Indeed, using a color scale to express changes in the number of tracks at the Trieste Campo Marzio station, Picture 15

illustrates the same tendency depicted separately in Pictures 10 and 11. The absence of blue-filled dots in the maximum values of this three-dimension chart suggests that no compensation is possible between operational and infrastructural resources. This means that, even in face of the availability of great amount of shunting locomotives, the lack of a high number of tracks at the Trieste Campo Marzio station definitely compromises the increase in the maximum number of trains flows.

Picture 15 - Maximum number of completed processes in function of influential input variables

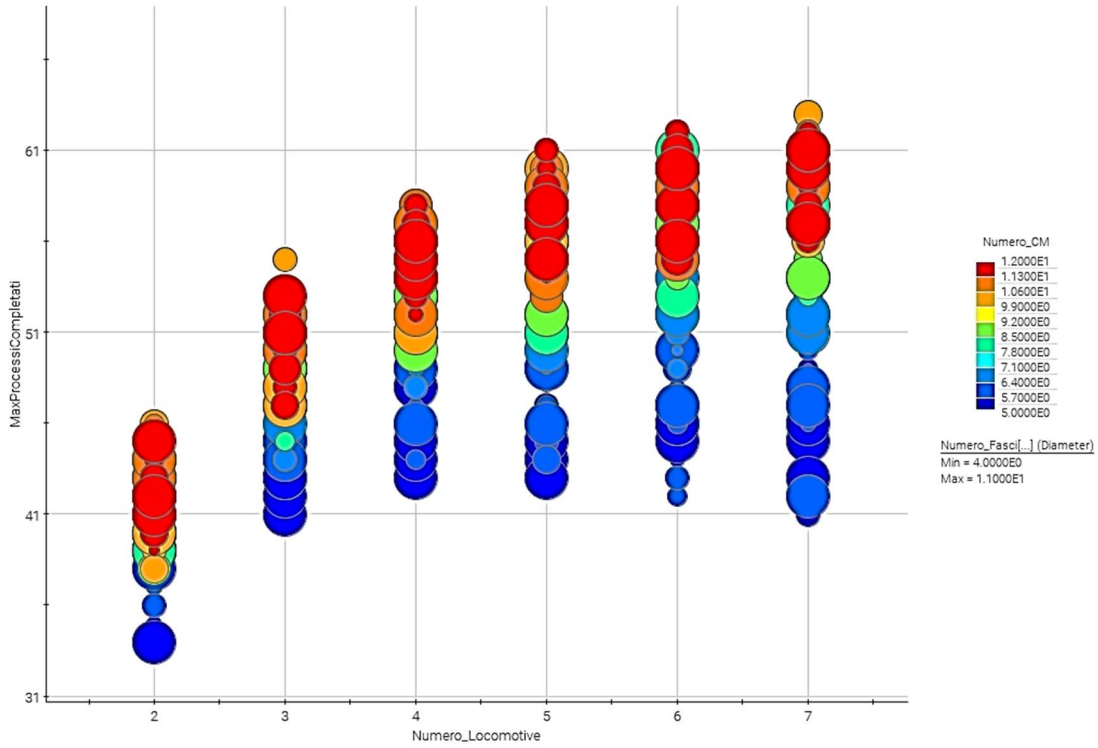


The four-dimension bubble chart reported in Picture 16 allows to analyse the growth of the maximum number of completed processes encompassing also the possible variations in the amount of the tracks at Fascio dei Moli, whose entity is expressed by the diameter size of bubbles. The minor influence of the availability of those infrastructural resources is confirmed by the fact that, in correspondence to high values of the optimal amount of train flows, also bubbles with a quite small circumference are present and they are mainly red-colored, which characterizes a large quantity of tracks at the Trieste Campo Marzio station.

Therefore, in general terms, it can be concluded that the increase in maximum number of completed processes at the Punto Franco Nuovo mostly depends on the number of tracks at the Trieste Campo Marzio station and, to a lesser extent, on those at Fascio dei Moli, while it proves to be almost constant beyond a certain amount of shunting locomotives. With regard to this latter parameter, the lower marginal rise of port railway capacity provides an indication of the number of locomotives which is actually necessary to perform shunting operations and, thus, it preliminarily suggests decision makers a line of action for the choice of investments.

When elaborating charts, more attention has been focused on input variables with a wider range, rather on binary parameters, in order to elaborate a greater variety of potential port configuration scenarios. Besides, the exclusion of investigations about the impact of the mentioned variables is in line with the aim of assessing the optimal port railway capacity at strategic level, since the future layout of the Port of Trieste will for sure encompass the absence of the separating wall and the availability of two tracks at Parenzane.

Picture 16 - Maximum number of completed processes in function of the number of shunting locomotives and of the tracks at the Trieste Campo Marzio station and at Fascio dei Moli



Further insights can be drawn evaluating possible increases in the optimal port railway capacity adopting a temporal perspective, which involves considering the implementation phases of works that have been planned to enhance such port feature. Like saying, the necessary works are not intended to be realized contemporarily, so as to not overly restrict railway operations in the whole Port of Trieste. Indeed, infrastructural arrangements are meant to be performed first at the Trieste Campo Marzio station and, at a later time, at Fascio dei Moli. Based on the different assets that could be assumed by those components of the port railway network, two scenarios with a different time horizon have been taken into account. On one hand, a mid-term scenario has been determined to appraise the potential rise in the optimal railway capacity in the time span between 2022 and 2028 and, on the other hand, a long-term scenario ending in 2030 has been defined to capture possible increases in railway traffic volumes after the completion of all work phases. In line with this high-level approach to assess the expected growth of port railway capacity, optimization results have been displayed in some additional pictures with respect to the optimal number of trains in a year. These values have been derived multiplying the maximum number of completed processes by the annual amount of working days, which corresponds to 288 days. Referring to the official statistics offered by PNAEAS, more than 9700 train movements have been carried out in the Port of Trieste in 2019: this information has been considered as the reference value for the appraisal of potential increases in port railway capacity in the developed scenarios of intervention.

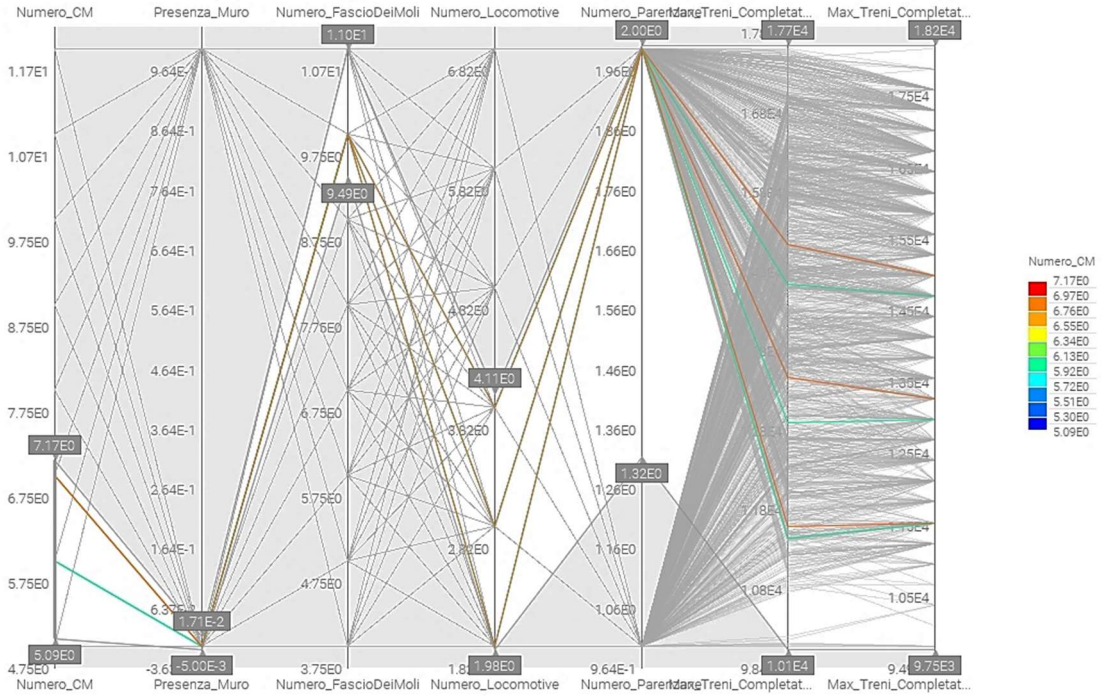
To this end, parallel charts provided by mF have been used to visualize both approximated and exact optimal values to changes in input parameters values. In this kind of charts, insights on the resulting amount of possible optimal solutions can be derived by the numerosity of depicted coloured lines for a specific solution, since the greater it is, the larger is the quantity of potential combinations of input variables. On the contrary, grey lines reported in the background indicate all the possible solutions that

can be obtained considering further combinations, for which the value of input parameters is not included in the selected range.

Bearing in mind evidence coming from previous charts, especially the one reported in Picture 15, the range of the number of locomotives has been supposed to vary only between 2 and 4, because a higher quantity of such resources has proved not to entail any remarkable beneficial effects on port railway capacity.

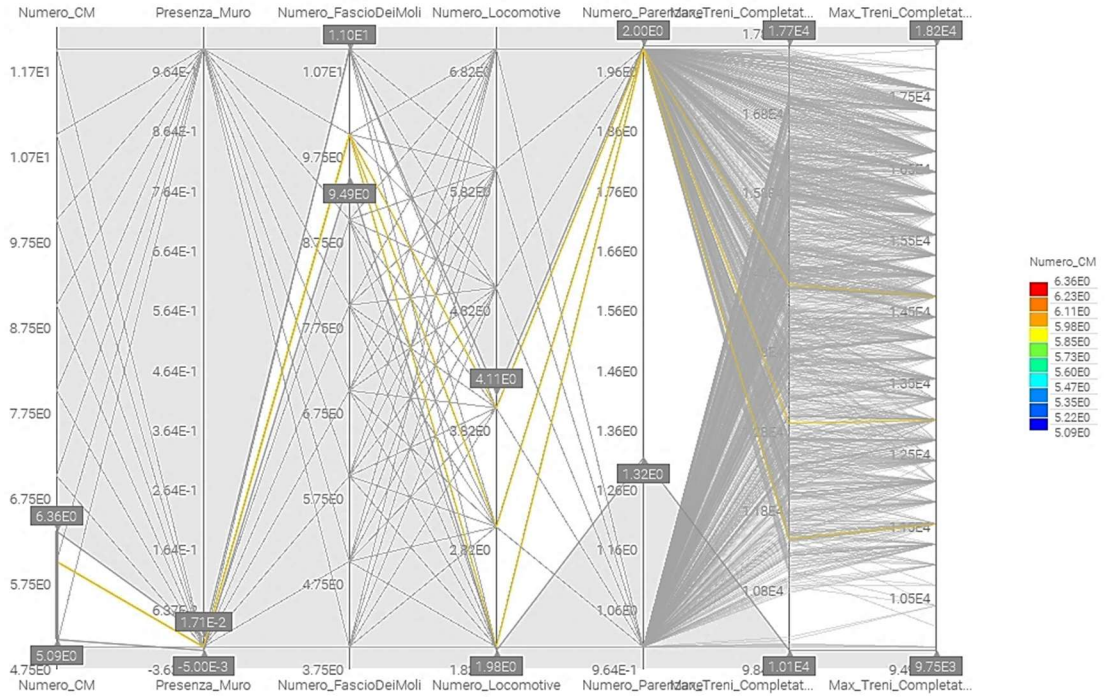
Picture 17 indicates the maximum amount of train flows attainable during infrastructural works at the Trieste Campo Marzio station assuming a reduction in its current track availability, while maintaining all the ones at Fascio dei Moli fully operational. It can be noticed that limiting the number of tracks at the main port railway station between 5 and 7 would severely affect the value of the optimal port railway capacity, which would not be larger than approximately 15500 trains per year.

Picture 17 - Optimal port railway capacity during infrastructural works at the Trieste Campo Marzio station



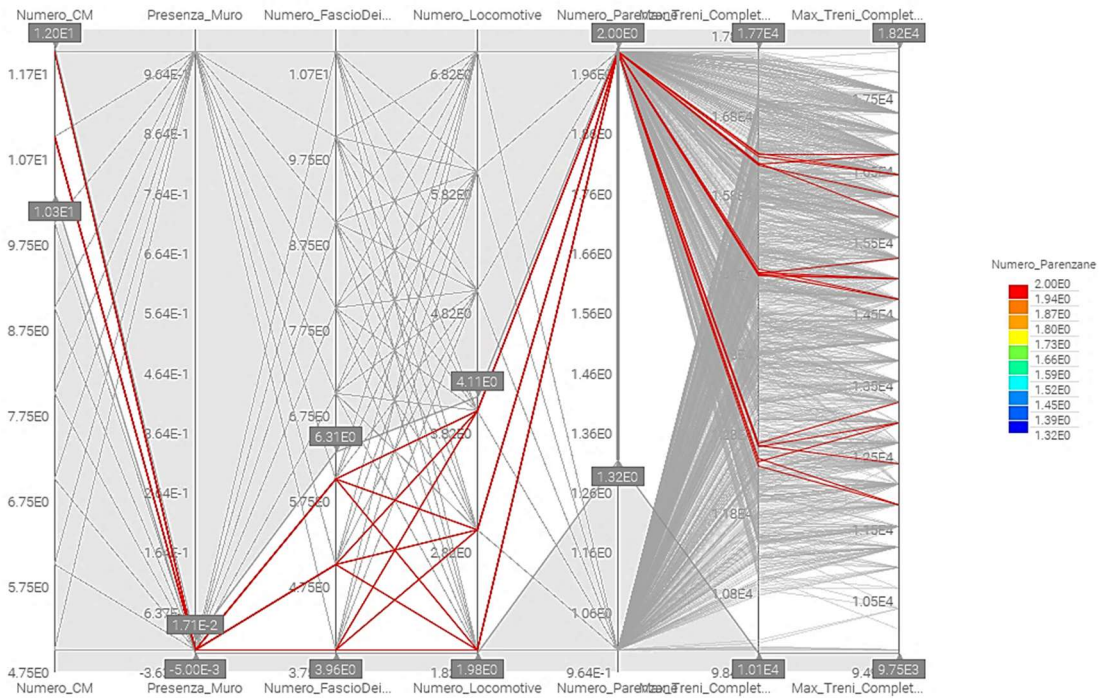
The important role covered by the Trieste Campo Marzio station with respect to the whole port railway capacity is even more evident in Picture 18, in which a lower number of available tracks at that infrastructural component has been considered. As a matter of fact, the reduction of possible optimal solutions resulting from this scenario suggests the need of preserving the operability of as many tracks as possible during work phases in such part of the port railway network. To that end, the most detrimental work activities should be realized in the lowest traffic days at the Trieste Campo Marzio station.

Picture 18 - Optimal port railway capacity during infrastructural works at the Trieste Campo Marzio station



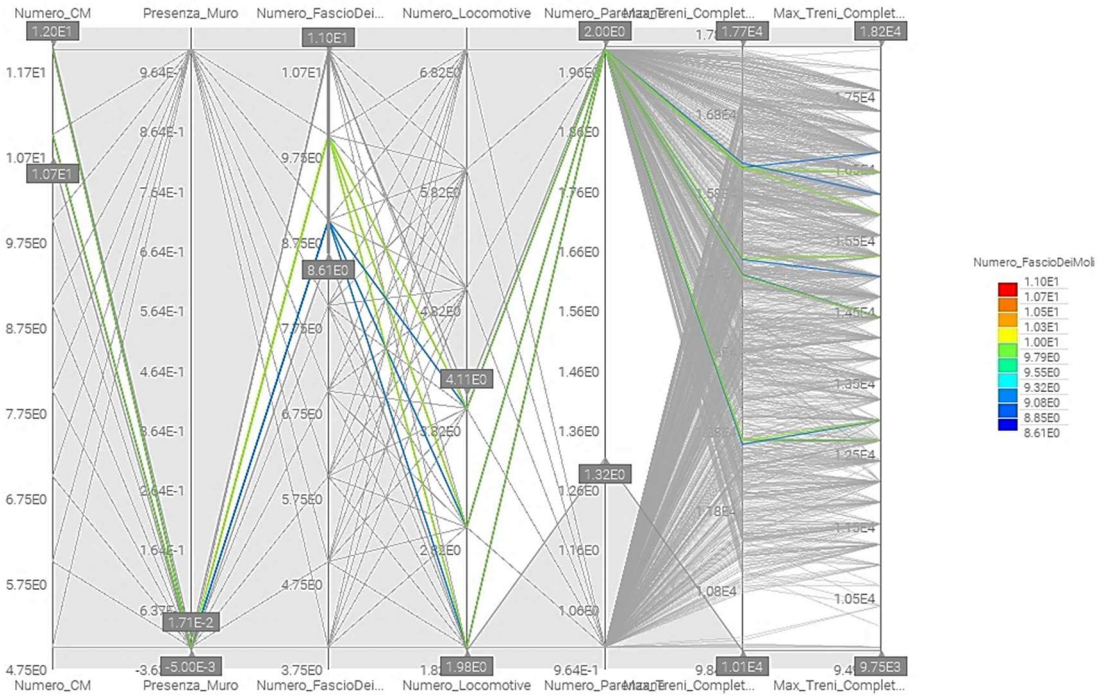
Reversely, Picture 19 illustrates the values of the optimal port railway capacity considering the implementation of infrastructural works at Fascio dei Moli, for which the number of available tracks has been restricted in a range between 4 and 6. Since work activities at the Trieste Campo Marzio station are supposed to be completed by that time, the number of its available tracks has been assumed equal to 12. In those operational circumstances, the maximum annual amount of railway volumes in the Port of Trieste would potentially exceed 16500 trains per year.

Picture 19 - Optimal port railway capacity during infrastructural works at Fascio dei Moli



Picture 20 depicts possible solutions for the optimal port railway capacity considering the completion of all infrastructural works, revealing similar values for the potential maximum amount of train flows if compared to results reported in previous Pictures. This fact confirms the minor relevance covered by the availability of a large number of tracks at Fascio dei Moli, suggesting that the realization of advancement activities on those resources mainly addresses the aim of having more buffer tracks at the Punto Franco Nuovo.

Picture 20 - Optimal port railway capacity after the completion of all infrastructural works



The mentioned infrastructural works are planned to be combined with some technological and organizational interventions, which consider mainly the implementation of a centralized traffic control system aimed at more efficiently managing railway traffic in the node of the Port of Trieste.

4. OPERATIONS MODEL

The approach described above produces a specific operations scenario for each specific configuration of the system. These solutions derive from the following set of basic assumptions, that have been described in detail in previous chapters and now are briefly summarized:

- The infrastructure configuration;
- Arrival and departure of trains in Trieste Campo Marzio station;
- Shunting movements in the system including all additional times that are needed;
- Tasks duration according to specific real-life measurements performed before July 2020.

Each solution produced by the optimization includes a sort of planned timetable of all movements in the system, which is compliant with the considered infrastructure layout and the corresponding constraints (a more detailed simulation has been performed for validation purposes by using OpenTrack)

Picture 21 shows a schematic representation of the basic considered infrastructure. The system includes on one side the Campo Marzio main station, which is connected to the main line. Its number of tracks is not fixed because it may change during construction works, but this station is anyway the connection between the port and the national network. On the other side three are the terminals, with given number of available tracks. The connection between main station and terminal is possible thanks to a shunting movement through “Parenzane” and the Free Zone gates where some custom activities and check take place. Some alternatives exist also in the configuration of intermediate infrastructure layout in terms for example of track numbers in Fascio dei Moli.

Regarding trains movements, the starting input for this study is the number of available slots arriving/departing in Trieste Campo Marzio station that have been estimated through simulation in the other pilot action (see document on Bottlenecks). A table containing the number of train arrivals for each time slot has been defined in the operations model, in order to regulate not only the amount of trains arriving at the Trieste Campo Marzio station from the national railway network, but also their arrival distribution throughout the day. More in detail, the following four time slots have been defined, with reference to the potential capacity of the national railway network in an average-traffic weekday:

- an off-peak time slot, in which passenger railway flows are modest and, thus, a few freight rail services can be carried out;
- a peak time slot, in which passenger railway traffic almost saturates the capacity that the national network disposes of, so a very limited number of freight rail services can be performed;
- a time slot in which no passenger railway flows are present, allowing freight rail services to fully exploit the capacity of the national railway network; and
- a time slot during which the circulation of any component of train traffic is not permitted, in order to execute maintenance works on the national railway line; such works are performed at night, during the time slots when the presence of railway traffic volumes is usually at the lowest.

Of course, not all the trains generated considering the potential capacity of the national railway network can enter the port, due to the infrastructural and organizational limitations characterizing the railway capacity at the Punto Franco Nuovo. The avoidance of such trains has been modelled with a feature, which interrupts their processing in the model. However, a counting of the number of eliminated trains has been implemented since, in view of future port development plans, it represents a useful information to quantitatively estimate the residual capacity for the railway stations of the industrial port (Servola and Aquilinia).

Since also train departure is limited by capacity availability on the national railway network, an analogous mechanism has been implemented in the operations model to properly hinder trains leaving the Trieste Campo Marzio station in the diverse time slots of the day.

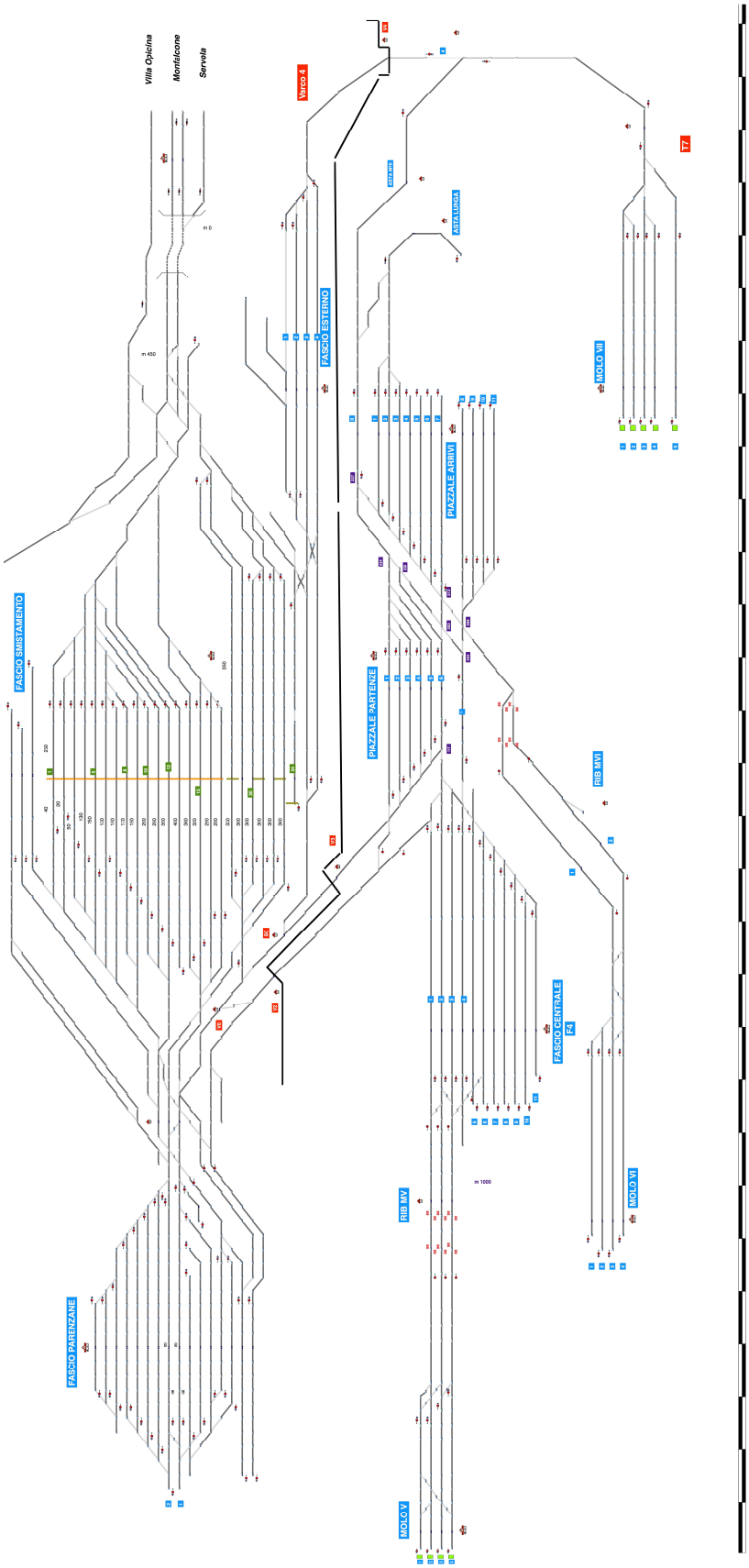
Notably, number of trains attracted or generated by the Trieste Campo Marzio station in the established time slots has been determined according to a random distribution, based on the ranges reported in Table 1.

Table 1 – Ranges for the time slots

Time slot	Range	
Peak	0	1
Off-peak	0	4
No passenger trains	0	10
No trains	0	0

Slots availability during the day may affect capacity and has an impact on the operations model because of the possible additional waiting times of trains in the system (buffer).

Picture 21 – Railway network

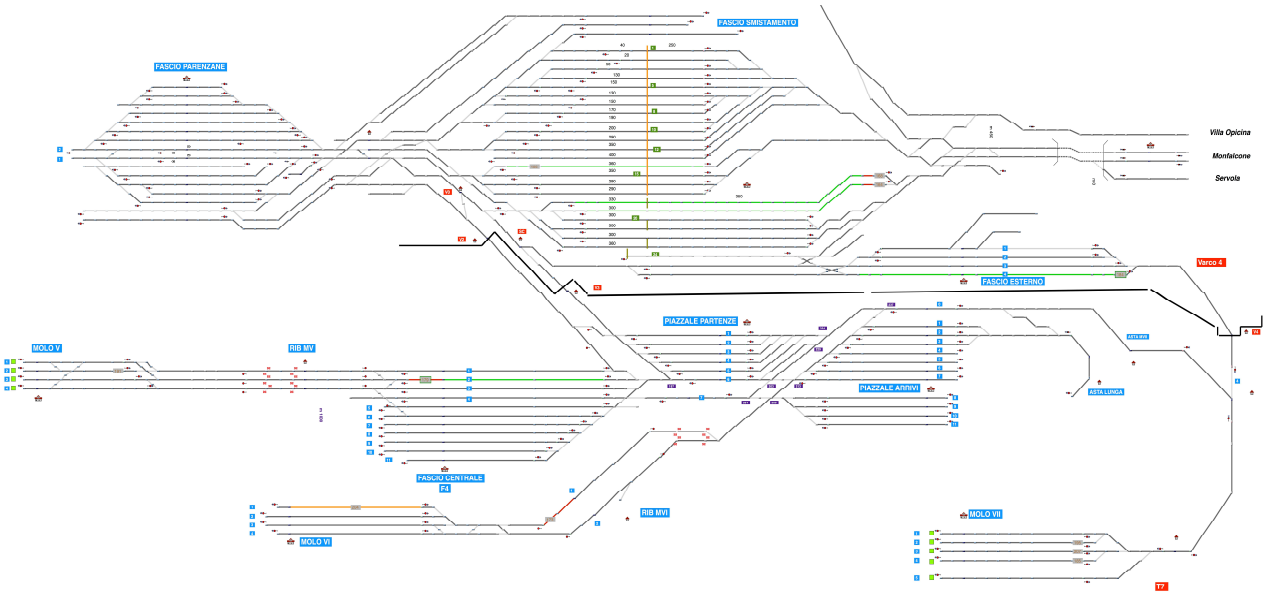


All shunting movements between station and terminals are performed thanks to diesel locomotives (this is one of the bottlenecks included in the specific Document), whose number may change both because new vehicles may be purchased and in case of failures. That's why it is a variable in the optimization. The operations rules are described in Chapter 3.2

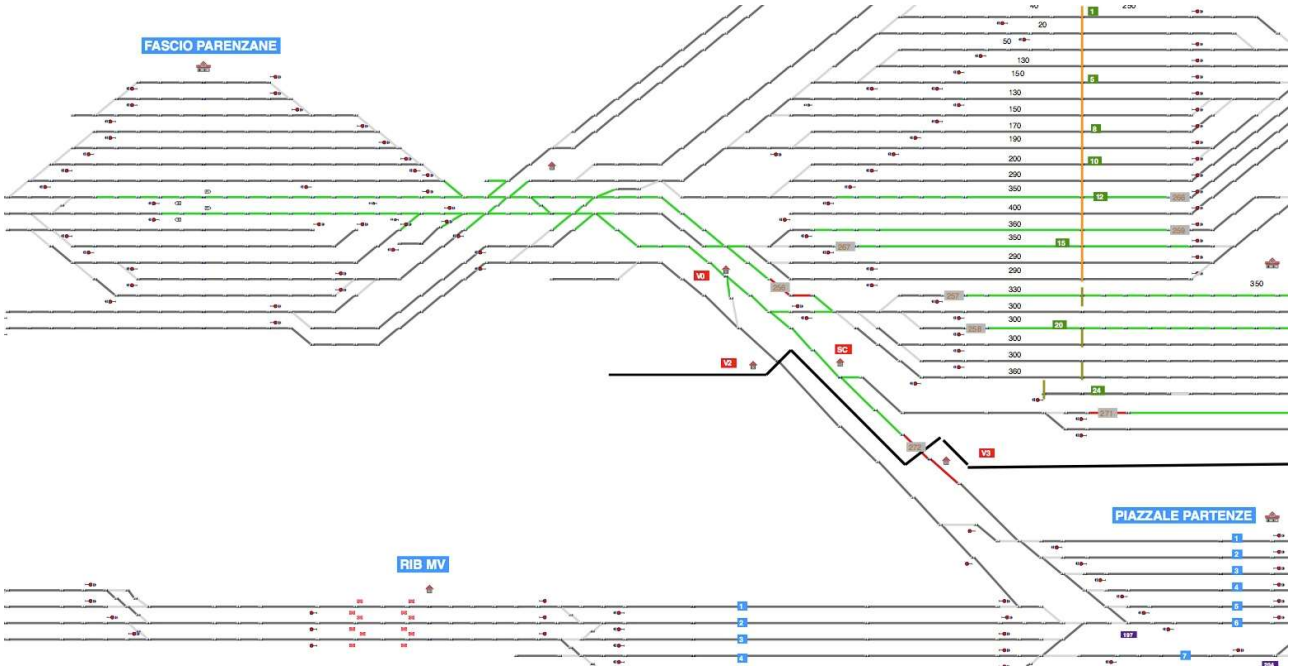
In line with the need of transferring trains between the Trieste Campo Marzio station and the terminals of the Punto Franco Nuovo, in the operations model shunting locomotives are assumed to be released and recalled in/to different parts of the port network, i.e. in correspondence to the Trieste Campo Marzio station, the Fascio dei Moli and the piers. The logic functioning governing the recall of shunting locomotives is based on a priority criterion, which depends on the starting time of train movements in case of multiple trains waiting to be processed. When they are not required to serve train arrival and departure processes, single locomotives travel along the whole port infrastructure in order to reach depot locations, which lie at the Trieste Campo Marzio station, the Parezane and the Fascio dei Moli. The selection of the depot location is managed by a statistical distribution, for which most of the times shunting locomotives are positioned near Fascio dei Moli (near Adriafer building). Such assumption has been defined according to the observations noted during the performed on-field data collection sessions.

The following pictures show some results coming from the micro-simulation of specific optimal scenarios, where coloured links refer to logically or physically occupied tracks.

Picture 22 – Example of operations simulation in the port

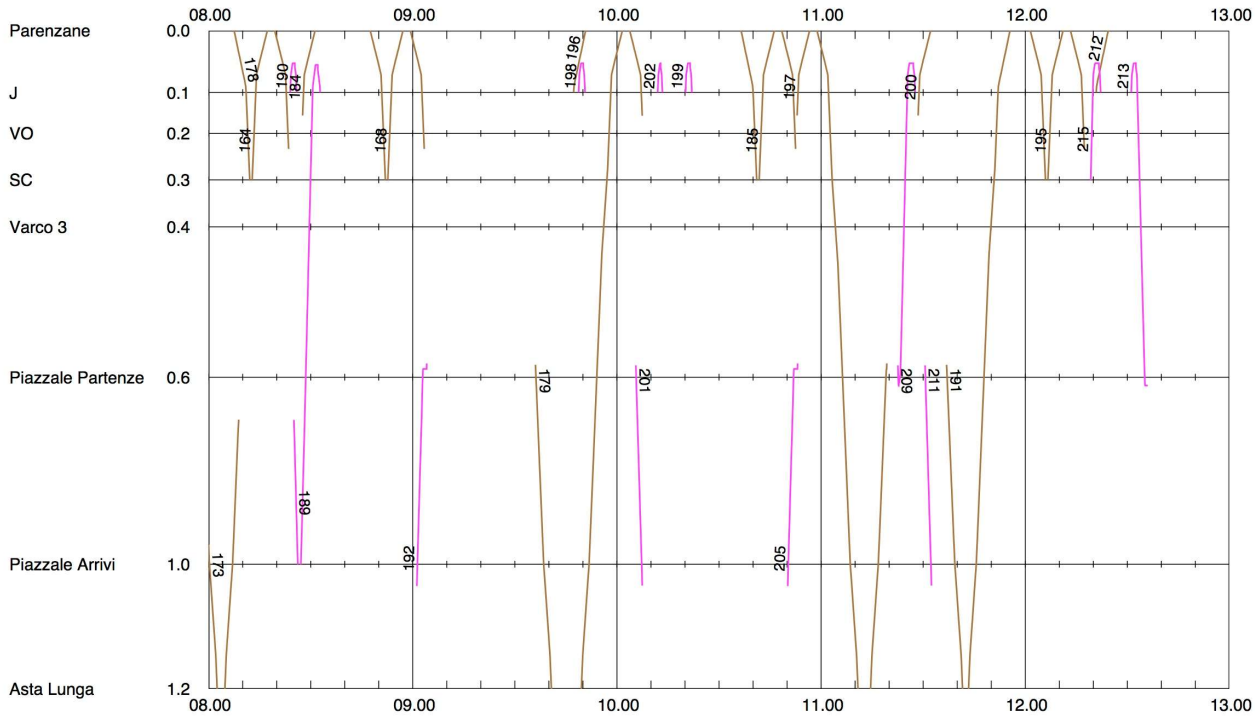


Picture 23 – Example of operations simulation with two trains at Parenzane tracks

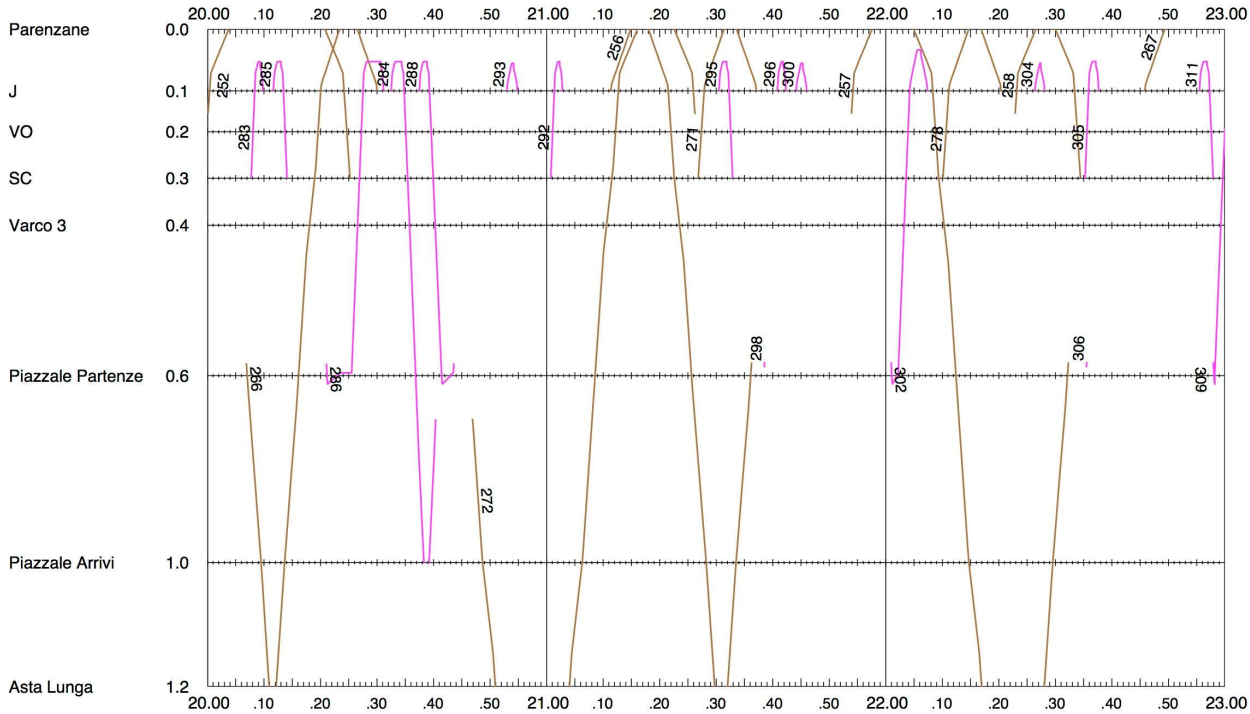


Pictures 24 and 25 show a graphic timetable on critical sections inside the port (Parenzane – Varco 3 – Asta lunga) in different time intervals over the day and allow to check the correct train movements according to existing constraints.

Picture 24 – Movement simulation on Parenzane – Varco 3 – Asta lunga section – 8:00-13:00

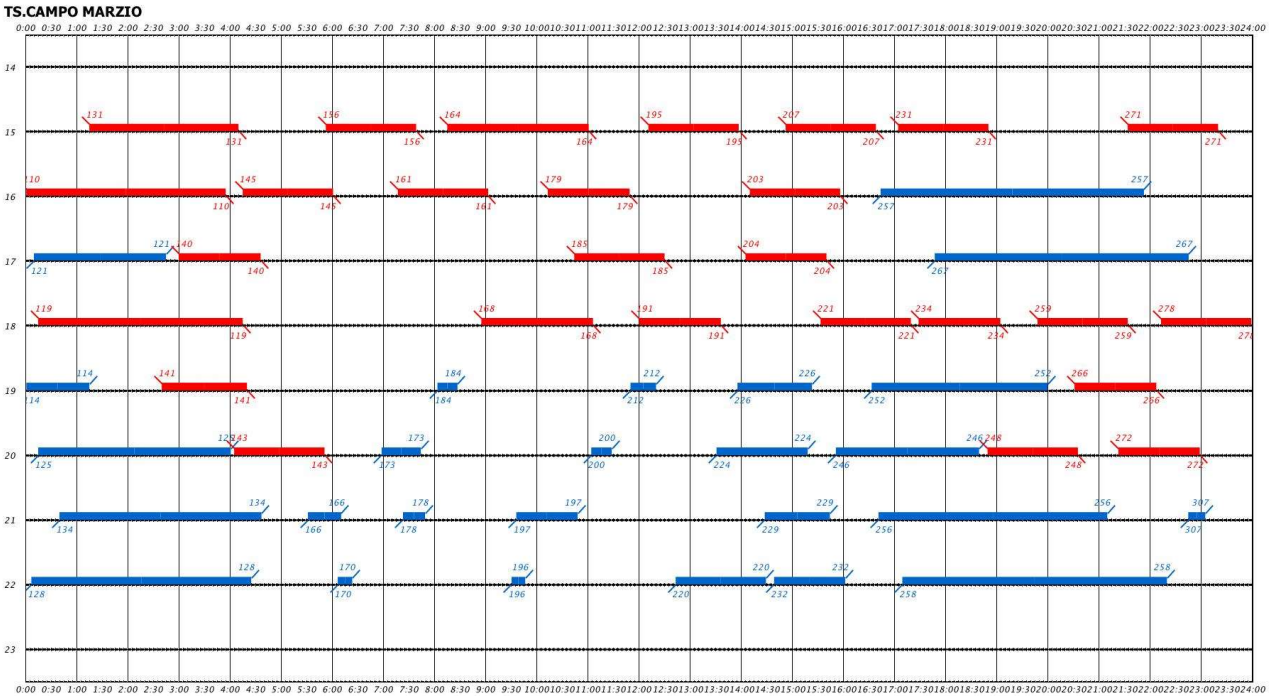


Picture 25 – Movement simulation on Parenzane – Varco 3 – Asta lunga section – 20:00-23:00

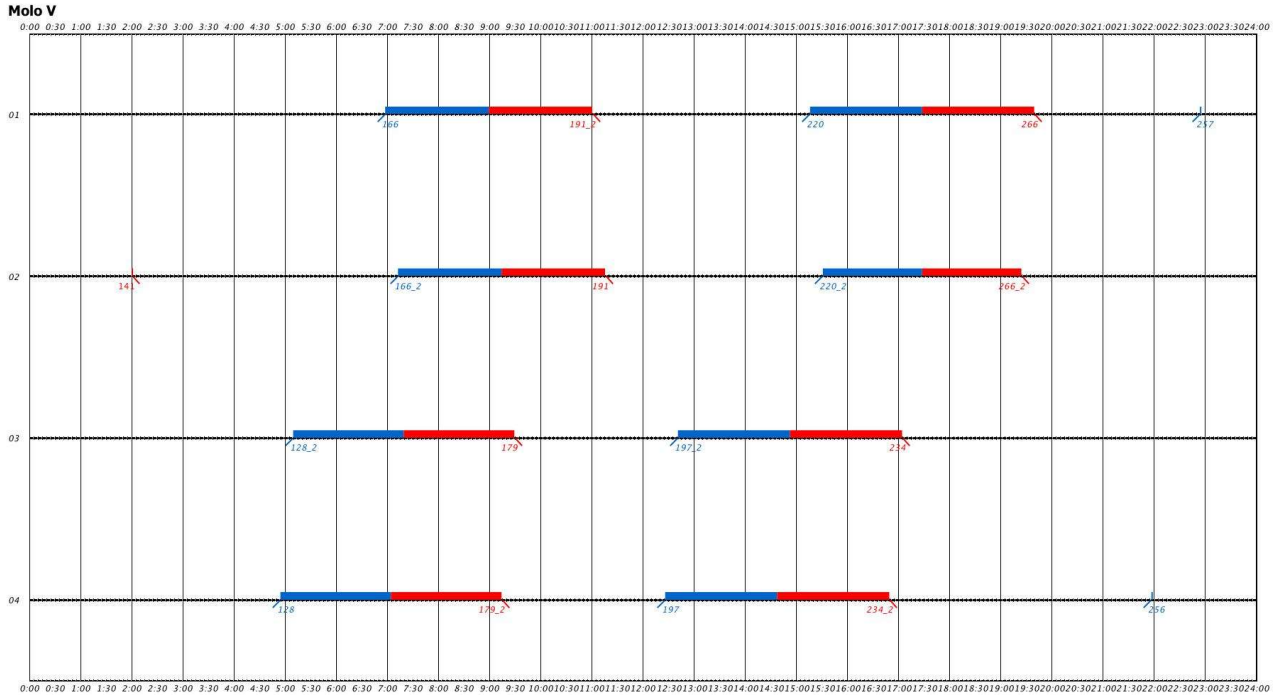


Next pictures show tracks occupation diagrams both in Campo Marzio station and in terminals. It can be noticed the full occupation of the station and a proper use of tracks in terminals.

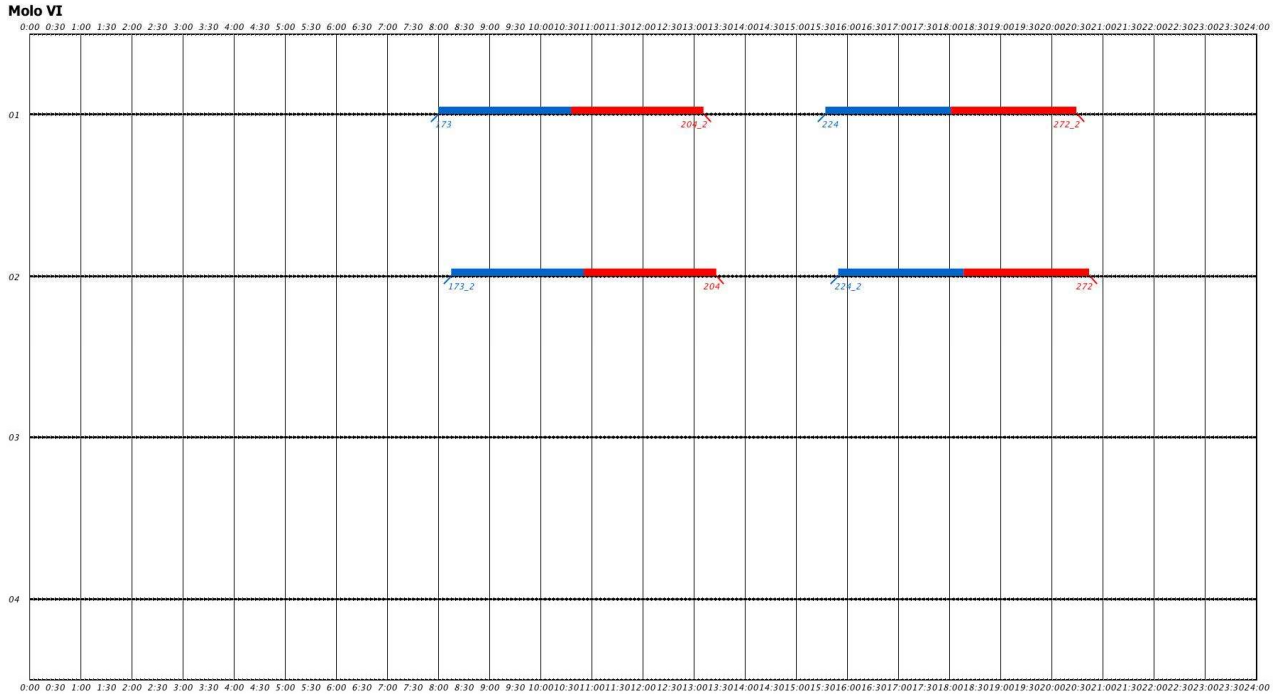
Picture 26 – Trieste Campo Marzio occupation.



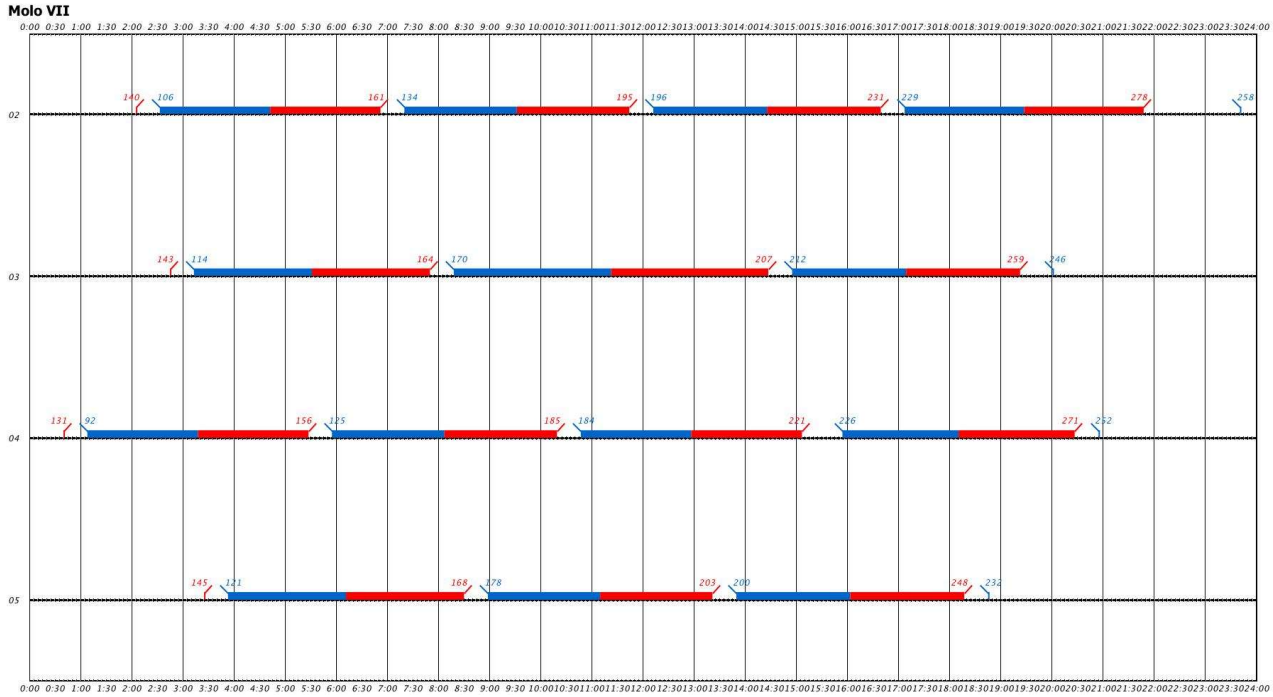
Picture 27 – Molo V occupation



Picture 28 – Molo VI occupation



Picture 29 – Molo VII occupation



4.1. Dashboard

Final estimations of the optimal port railway capacity are provided in a Microsoft Excel file, which contains an intuitive interface to determine both the approximated and the exact value to varying of a few operational and infrastructural variables. The former is calculated based on a specific approximation process of optimized capacity data and encompass a certain predictive error, which is also reported; on the contrary, the latter come directly from the optimization procedure of the possible combinations of investigated variables. In this regard, the following operational and infrastructural variables have been considered:

- the presence or the absence of the wall delimiting the Free Port zone;
- the number of deployed shunting locomotives;
- the number of tracks at the Trieste Campo Marzio station;
- the number of tracks at Parenzane;
- the number of tracks at Fascio dei Moli.

Each interface queries its corresponding table containing the list of possible optimal values for port railway capacity, which are also included in some additional sheets of the delivered Microsoft Excel file.

CONCLUSIONS AND FUTURE DEVELOPMENTS

The estimation of the optimal railway capacity in the Port of Trieste has been faced developing a methodology that integrates modelling, simulation and optimization techniques, with the aim of formulating suggestions that can help port decision makers in selecting the best strategy. More in detail, the first stage of the proposed methodology has consisted in the representation of railway processes through the BPMN modelling standard, considering both railway operations and documentary activities. This task has facilitated the comprehension of processes and it has enabled a preliminary analysis of potential bottlenecks. Prior to the actual simulation of processes, operational requirements have been defined and the parametrization of modelled elements has been performed via the BPSim standard, especially with reference to tasks, gateways and resources. Then, railway processes have been animated using L-Sim according to a discrete-event approach, which has permitted to identify the main factors hindering the execution of train transfers within the Port of Trieste. Finally, in the view of future port development works, an optimization procedure has been carried out by means of a multi-layer mF workflow, determining the maximum annual number of train flows under different possible combinations of infrastructural and operational resources. Results proved that the optimal value of port railway capacity largely depends on the number of available tracks at the Trieste Campo Marzio station, while it becomes almost stationary beyond a limited quantity of deployed shunting locomotives.

At last, the integrated optimization procedure has been combined with the application of a multi-actor multi-criteria evaluation process, that has served the prioritization of the main port railway operational features. Evidence derived by process optimization have been confirmed by evaluation outcomes, highlighting the significance of infrastructural resources for the enhancement of port railway capacity performances. This kind of evaluation approach proves to suit particularly well the transport intermodal sector, since it allows to capture the inherent complexity characterizing those systems and it allows to create a participatory decision-making process engaging various stakeholders.

Results in terms of optimized operations model have been presented in chapter 5. Once the scenario has been selected a very detailed timetable of trains and shunting movement is offered by the simulation in terms of xml file, that can be used to perform either the micro-simulation through OpenTrack or other possible applications in the future.

These results may be very useful both in the definition of all intermediate step of constructions works and in the identification of actual maximum capacity to be compared with traffic forecasts coming from the Market potentials study.

Future developments of the suggested methodology can regard both the optimization and the evaluation procedure. The former could be enhanced by implementing an alternative to the First-In-First-Out logic functioning used for the management of tasks, so as to simulate token processing at gateways in a more accurate way. Besides, the elaborated BPMN models could be advanced by adopting the Decision Model and Notation (DMN), which is a standard provided by the OMG to specify business decisions and rules. Indeed, it has been designed to complement BPMN in order to model decision-making aspects in business processes, supporting stakeholders in the understanding of complex decision domains. Allowing to define business rules in the form of decision tables, DMN could contribute to simplify the BPMN models of railway processes at hand and, thus, it could give the opportunity to easily analyze even more articulated and/or unconventional operational conditions.

Concerning evaluation, the methodological integration embraced for the optimization procedure could be further extended to include also assessment results and, therefore, to effectively take into account insights generated by the dynamics of group decision making. As a matter of fact, the implementation of these latter into the optimization workflow could suggest useful feedbacks and provide port decision makers a comprehensive tool to investigate on development lines of action.

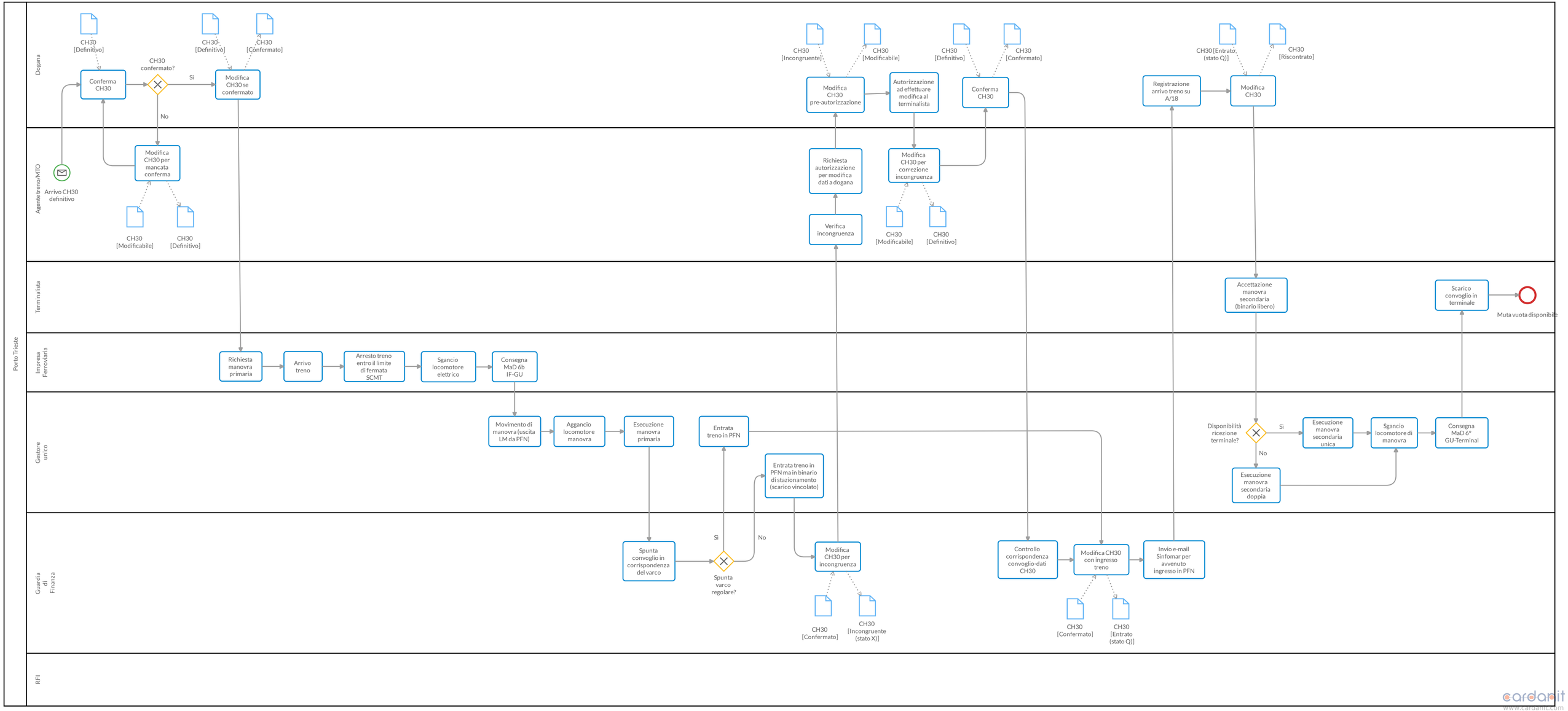
ANNEXES

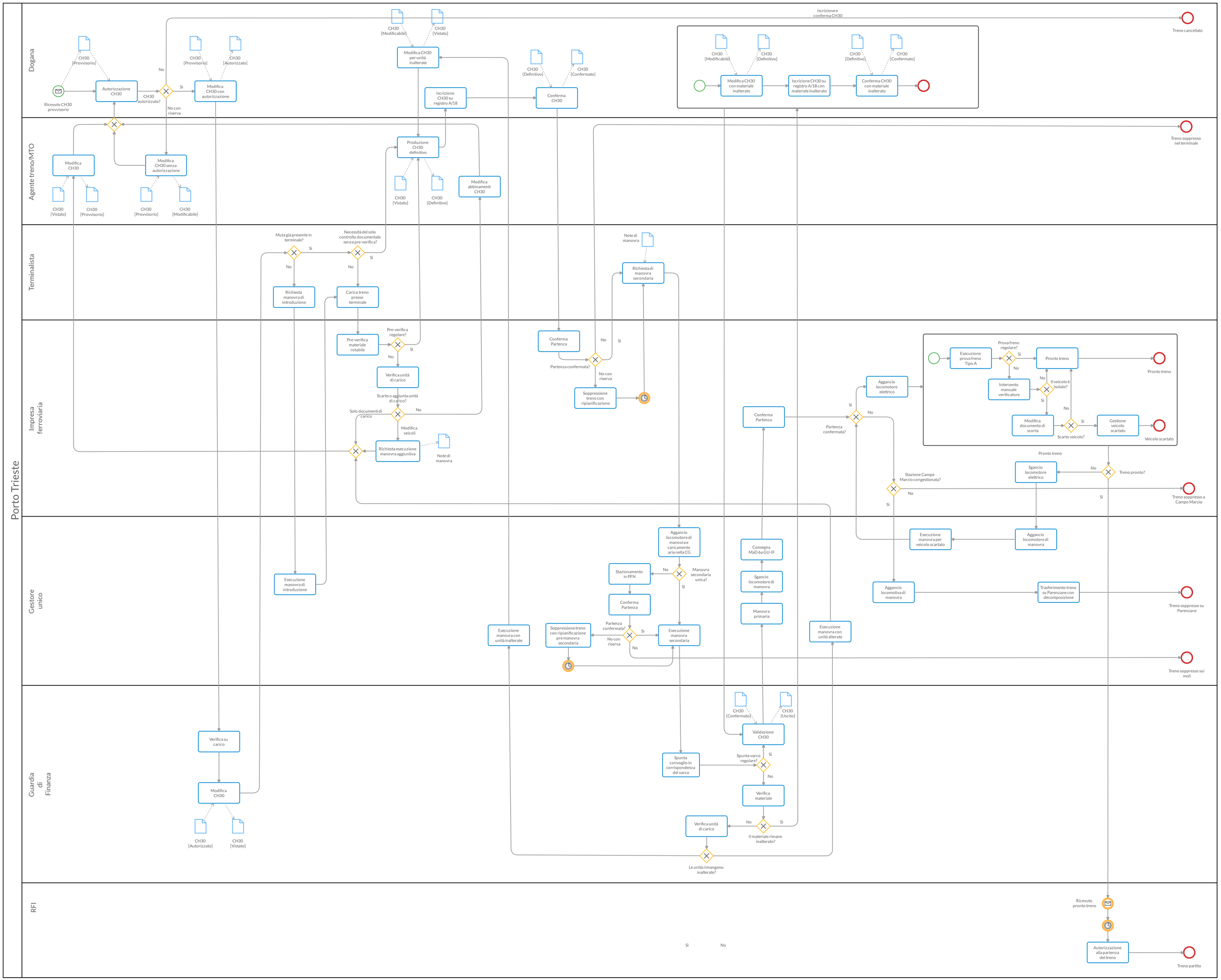
- **Annex A:**
  - Annex A.1 - Descriptive BPMN model: the train arrival process
  - Annex A.2 - Descriptive BPMN model: the train departure process

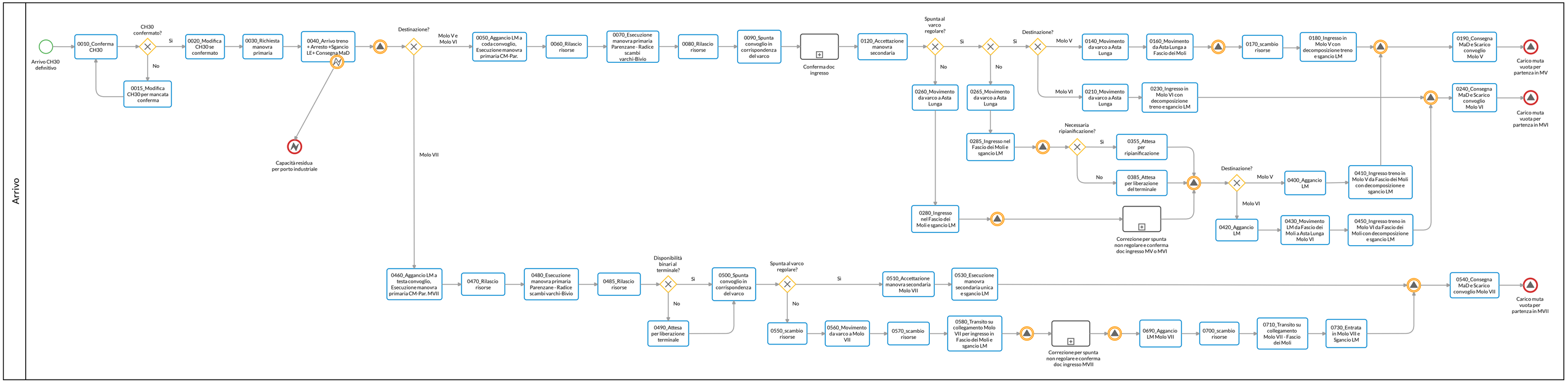
- **Annex B:**
  - Annex B.1 - Simulation BPMN model: the train arrival process
  - Annex B.2 - Simulation BPMN model: the train departure process
  - Annex B.3 - Simulation BPMN model: the shunting locomotive release processes
  - Annex B.4 - Simulation BPMN model: the shunting locomotive recall processes
  - Annex B.5 – Cardanit report

- **Annex C** – Excel file

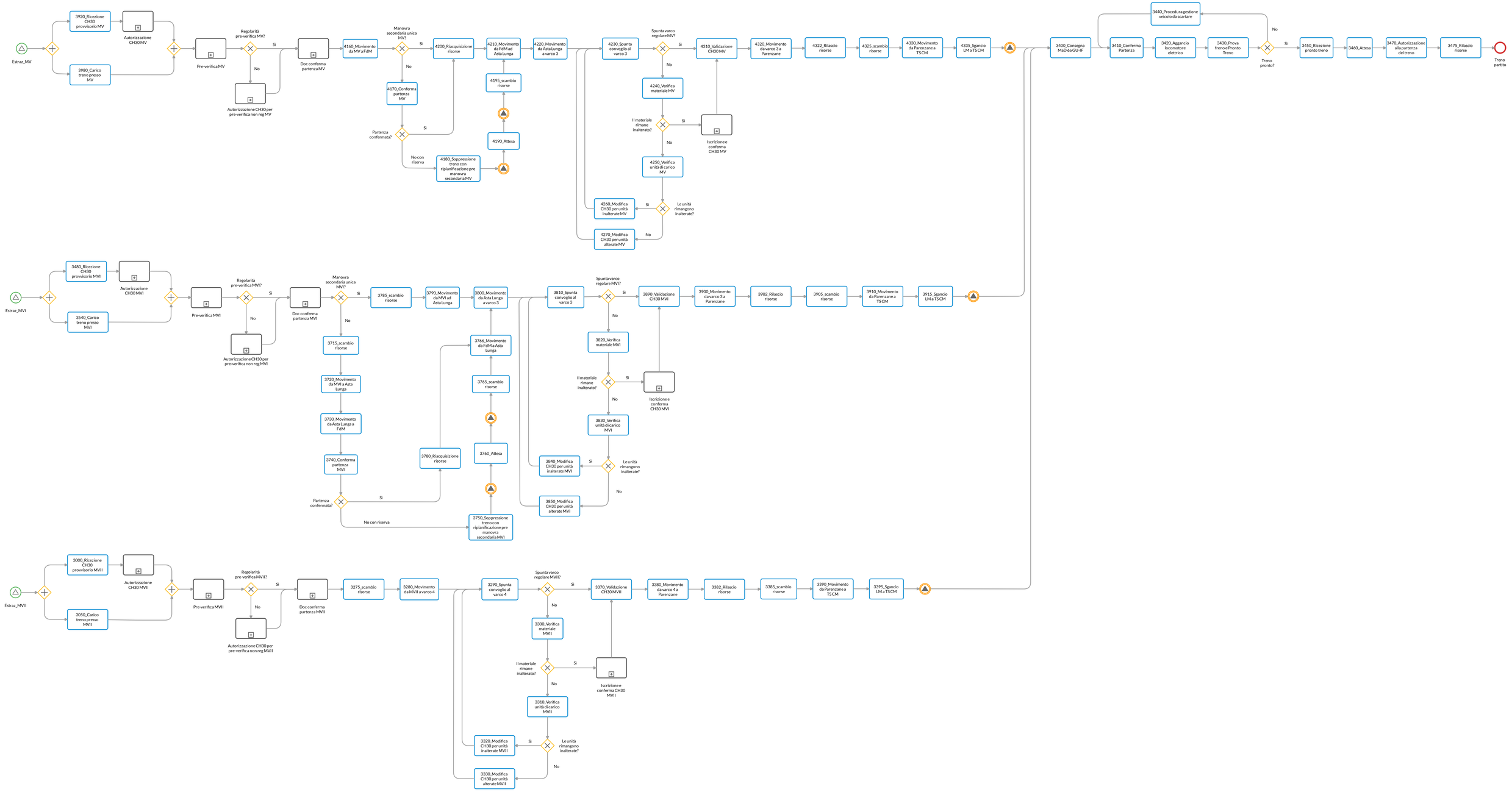
- **Annex D** - Multi-actor multi-criteria evaluation






Arrivo
Arrivo CH30 definitivo
0010_Conferma CH30
CH30 confermato?
Si
No
0015_Modifica CH30 per mancata conferma
0020_Modifica CH30 se confermato
0030_Richiesta manovra primaria
0040_Arrivo treno + Arresto +Sgancio LE+ Consegna MaD
Capacità residua per porto industriale
Destinazione?
Molo V e Molo VI
Molo VII
0050_Aggancio LM a coda convoglio, Esecuzione manovra primaria CM-Par.
0060_Rilascio risorse
0070_Esecuzione manovra primaria Parenzane - Radice scambi varchi-Bivio
0080_Rilascio risorse
0090_Spunta convoglio in corrispondenza del varco
Conferma doc ingresso
0120_Accettazione manovra secondaria
Spunta al varco regolare?
Si
No
0260_Movimento da varco a Asta Lunga
0265_Movimento da varco a Asta Lunga
Destinazione?
Si
No
Molo V
Molo VI
0140_Movimento da varco a Asta Lunga
0160_Movimento da Asta Lunga a Fascio dei Moli
0210_Movimento da varco a Asta Lunga
0230_Ingresso in Molo VI con decomposizione treno e sgancio LM
0170_scambio risorse
0180_Ingresso in Molo V con decomposizione treno e sgancio LM
0190_Consegna MaD e Scarico convoglio Molo V
Carico muta vuota per partenza in MV
0240_Consegna MaD e Scarico convoglio Molo VI
Carico muta vuota per partenza in MVI
0285_Ingresso nel Fascio dei Moli e sgancio LM
Necessaria ripianificazione?
Si
No
0355_Attesa per ripianificazione
0385_Attesa per liberazione del terminale
0280_Ingresso nel Fascio dei Moli e sgancio LM
Correzione per spunta non regolare e conferma doc ingresso MV o MVI
Destinazione?
Molo V
Molo VI
0400_Aggancio LM
0410_Ingresso treno in Molo V da Fascio dei Moli con decomposizione e sgancio LM
0420_Aggancio LM
0430_Movimento LM da Fascio dei Moli a Asta Lunga Molo VI
0450_Ingresso treno in Molo VI da Fascio dei Moli con decomposizione e sgancio LM
0460_Aggancio LM a testa convoglio, Esecuzione manovra primaria CM-Par. MVII
0470_Rilascio risorse
0480_Esecuzione manovra primaria Parenzane - Radice scambi varchi-Bivio
0485_Rilascio risorse
Disponibilità binari al terminale?
Si
No
0490_Attesa per liberazione terminale
0500_Spunta convoglio in corrispondenza del varco
Spunta al varco regolare?
Si
No
0510_Accettazione manovra secondaria Molo VII
0530_Esecuzione manovra secondaria unica e sgancio LM
0550_scambio risorse
0560_Movimento da varco a Molo VII
0570_scambio risorse
0580_Transito su collegamento Molo VII per ingresso in Fascio dei Moli e sgancio LM
Correzione per spunta non regolare e conferma doc ingresso MVII
0690_Aggancio LM Molo VII
0700_scambio risorse
0710_Transito su collegamento Molo VII - Fascio dei Moli
0730_Entrata in Molo VII e Sgancio LM
0540_Consegna MaD e Scarico convoglio Molo VII
Carico muta vuota per partenza in MVII

Partenza


Estraz_MV
3920_Ricezione CH30 provvisorio MV
3980_Carico treno presso MV
Autorizzazione CH30 MV
Pre-verifica MV
Regolarità pre-verifica MV?
Si
No
Autorizzazione CH30 per pre-verifica non reg MV
Doc conferma partenza MV
4160_Movimento da MV a FdM
Manovra secondaria unica MV?
4200_Riacquisizione risorse
4170_Conferma partenza MV
Partenza confermata?
No con riserva
4180_Soppressione treno con ripianificazione pre manovra secondaria MV
4210_Movimento da FdM ad Asta Lunga
4195_scambio risorse
4190_Attesa
4220_Movimento da Asta Lunga a varco 3
4230_Spunta convoglio al varco 3
Spunta varco regolare MV?
4240_Verifica materiale MV
Il materiale rimane inalterato?
Iscrizione e conferma CH30 MV
4250_Verifica unità di carico MV
Le unità rimangono inalterate?
4260_Modifica CH30 per unità inalterate MV
4270_Modifica CH30 per unità alterate MV
4310_Validazione CH30 MV
4320_Movimento da varco 3 a Parenzane
4322_Rilascio risorse
4325_scambio risorse
4330_Movimento da Parenzane a TS CM
4335_Sgancio LM a TS CM
3400_Consegna MaD 6a GU-IF
3410_Conferma Partenza
3440_Procedura gestione veicolo da scartare
3420_Aggancio locomotore elettrico
3430_Prova freno e Pronto Treno
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3450_Ricezione pronto treno
3460_Attesa
3470_Autorizzazione alla partenza del treno
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3715_scambio risorse
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3730_Movimento da Asta Lunga a FdM
3740_Conferma partenza MVI
Partenza confermata?
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3780_Riacquisizione risorse
3750_Soppressione treno con ripianificazione pre manovra secondaria MVI
3790_Movimento da MVI ad Asta Lunga
3800_Movimento da Asta Lunga a varco 3
3766_Movimento da FdM a Asta Lunga
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3385_scambio risorse
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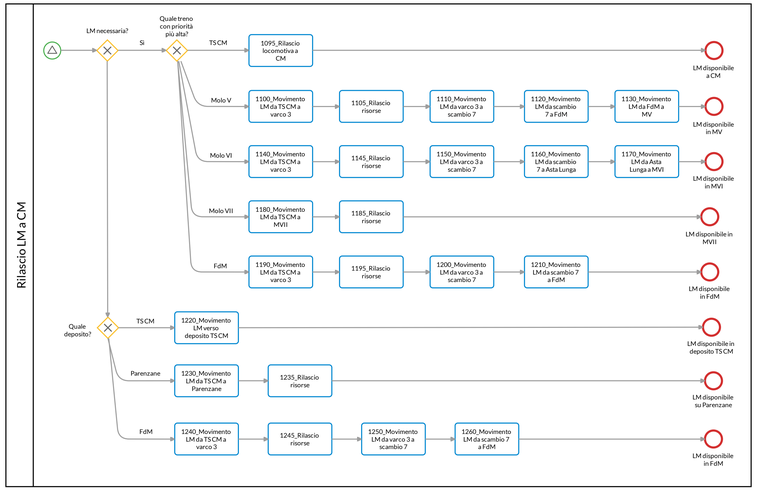
3395_Sgancio LM a TS CM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Si
Quale treno con priorità più alta?
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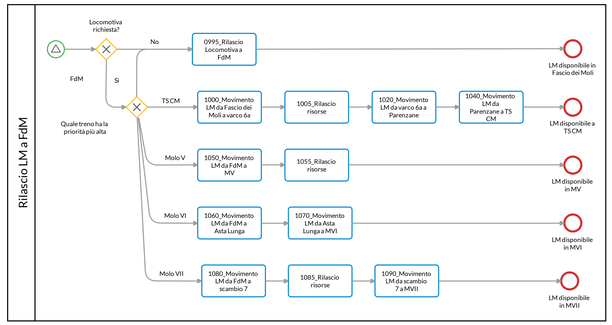
Rilascio LM a FdM
Locomotiva richiesta?
No
0995_Rilascio Locomotiva a FdM
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Quale treno ha la priorità più alta
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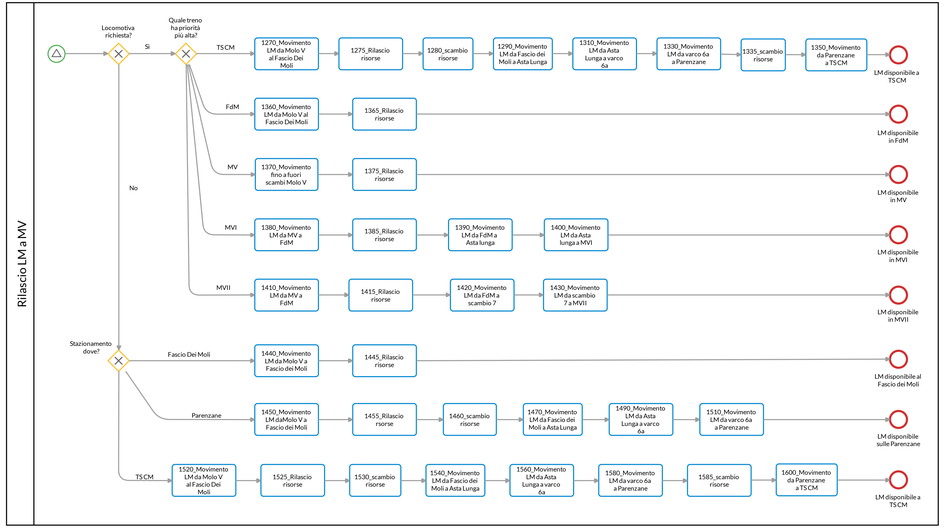
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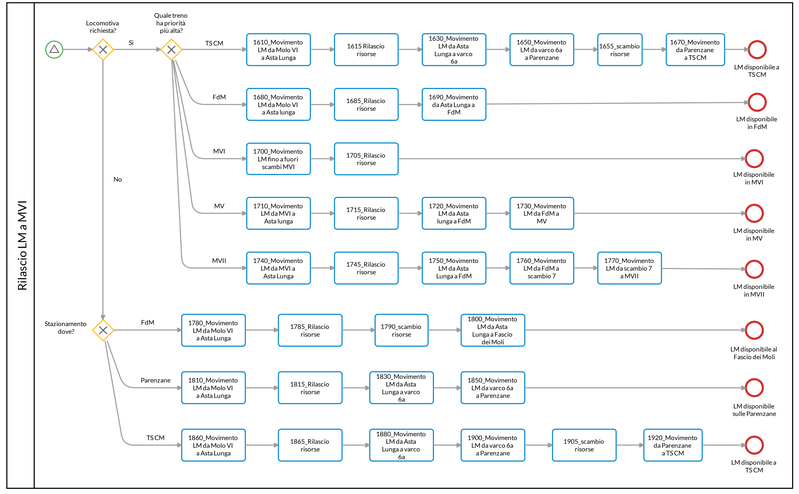
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Locomotiva richiesta?
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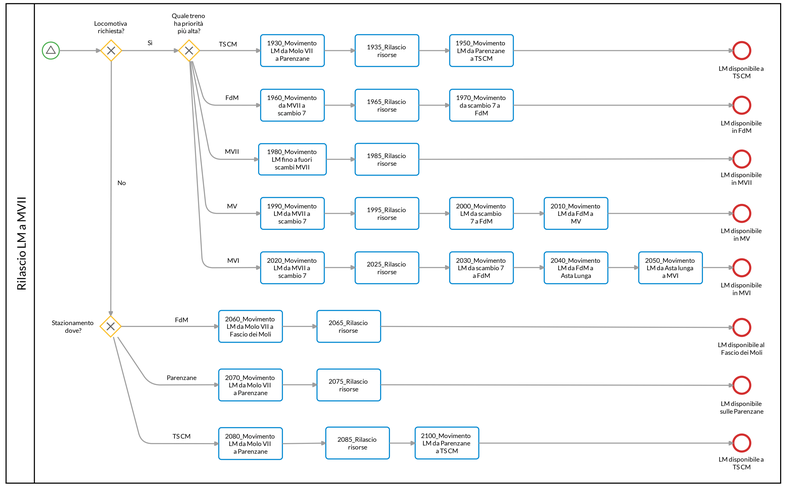
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Locomotiva richiesta?
Si
Quale treno ha priorità più alta?
TS CM
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2100_Movimento LM da Parenzane a TS CM
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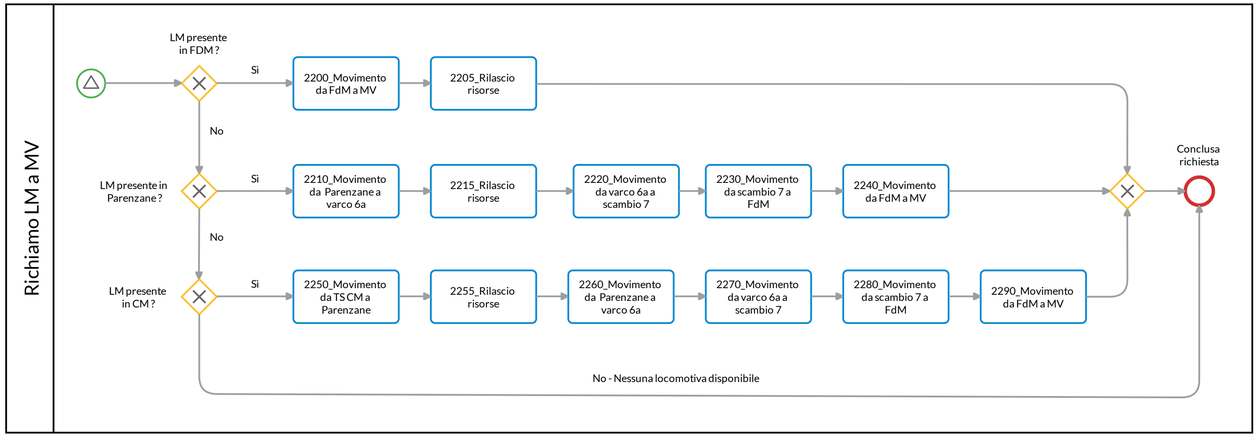
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LM presente in FDM ?
Si
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2205_Rilascio risorse
No
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Si
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2220_Movimento da varco 6a a scambio 7
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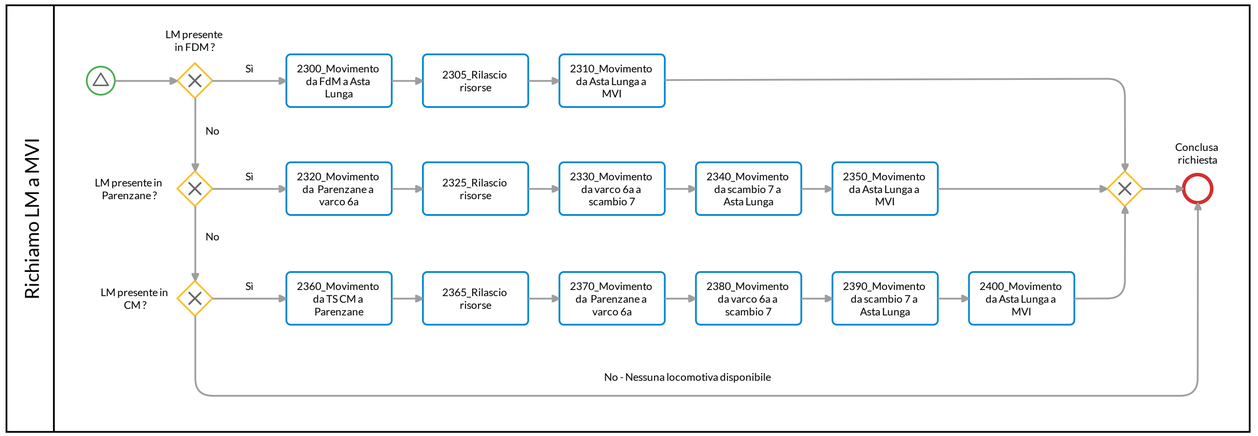
2280_Movimento da scambio 7 a FdM
2290_Movimento da FdM a MV
Conclusa richiesta
No - Nessuna locomotiva disponibile


Richiamo LM a MVI
LM presente in FDM ?
Si
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2305_Rilascio risorse
2310_Movimento da Asta Lunga a MVI
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LM presente in Parenzane ?
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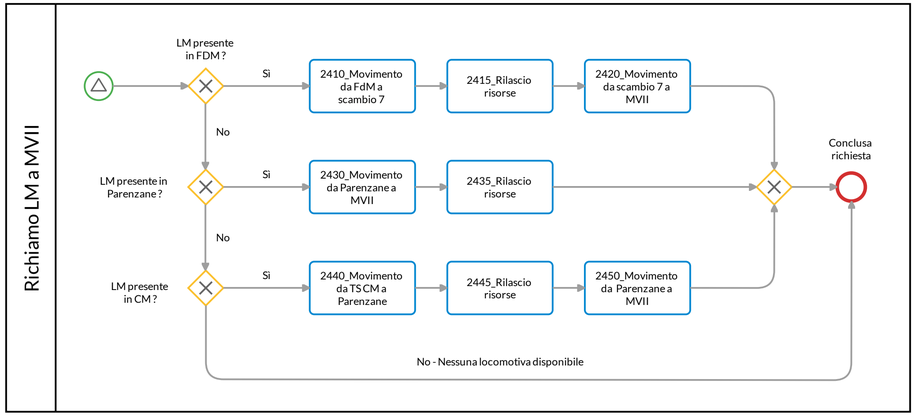
2380_Movimento da varco 6a a scambio 7
2390_Movimento da scambio 7 a Asta Lunga
2400_Movimento da Asta Lunga a MVI
Conclusa richiesta
No - Nessuna locomotiva disponibile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Si
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LM presente in CM ?
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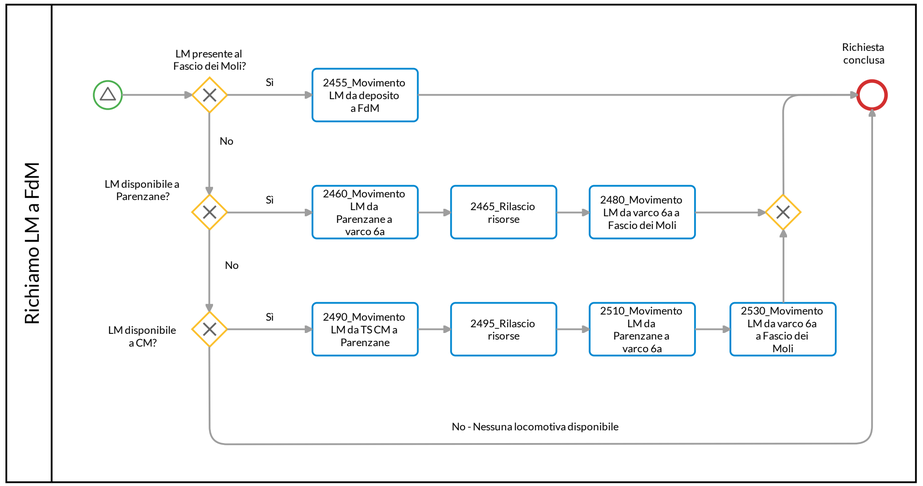
2445_Rilascio risorse
2450_Movimento da Parenzane a MVII
Conclusa richiesta
No - Nessuna locomotiva disponibile


Richiamo LM a FdM
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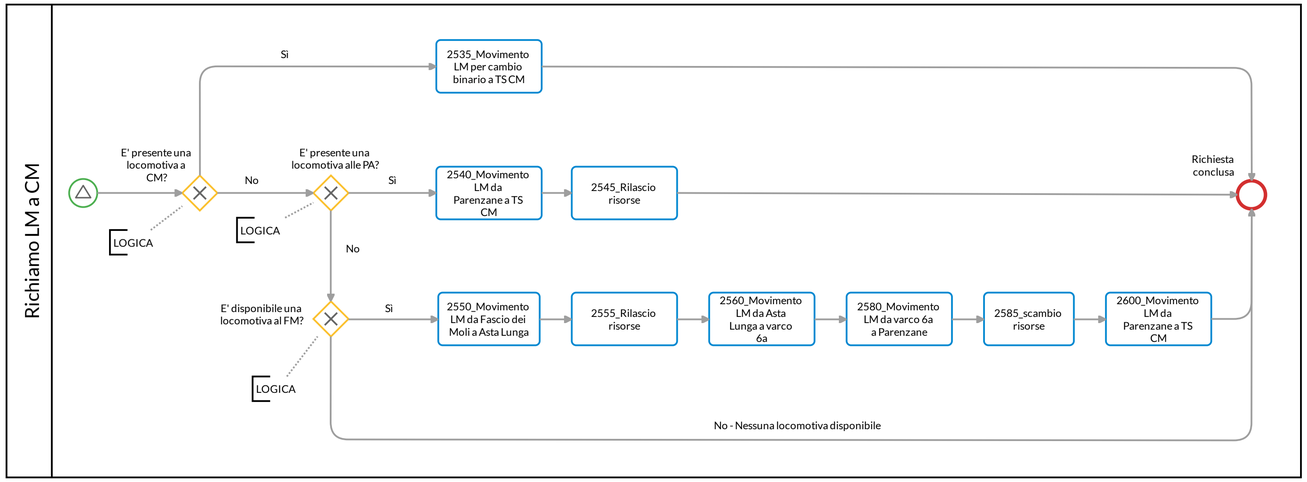
Richiesta conclusa
No - Nessuna locomotiva disponibile


Richiamo LM a CM
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E' presente una locomotiva a CM?
LOGICA
No
E' presente una locomotiva alle PA?
LOGICA
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LOGICA
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2585_scambio risorse
2600_Movimento LM da Parenzane a TS CM
Richiesta conclusa
No - Nessuna locomotiva disponibile

Railway processes - Port of Trieste

PROCESS REPORT

Created
January 28, 2021 - 10:33 AM

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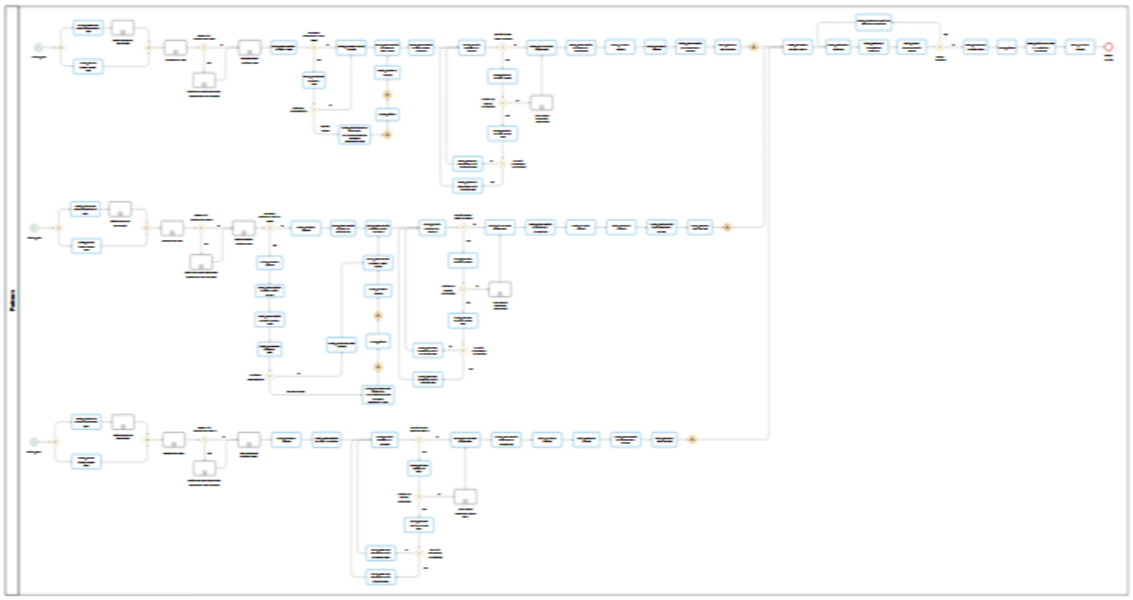
1. Diagram: Partenza

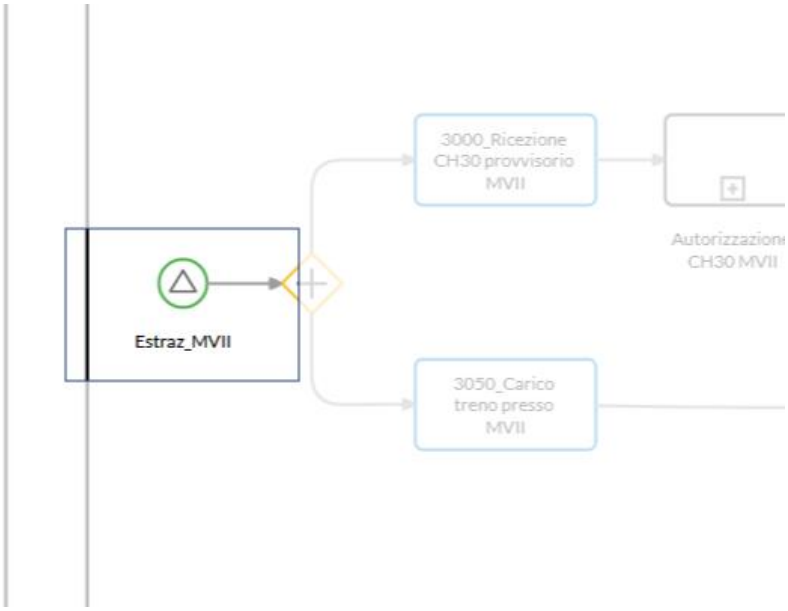
1.1. Process: Partenza



1.1.1. Process Elements

Estraz_MVII

SIGNAL START EVENT



Outgoing

Outgoing

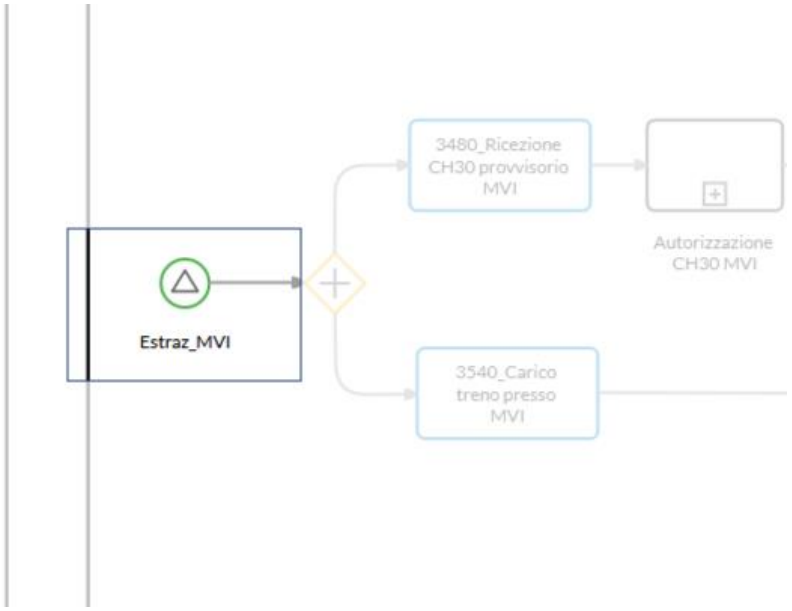
PARALLEL GATEWAY
Parallel Gateway_4050

Attributes

SIGNAL REFERENCE
Avvio partenza da MVII

Estraz_MVI

SIGNAL START EVENT



Outgoing

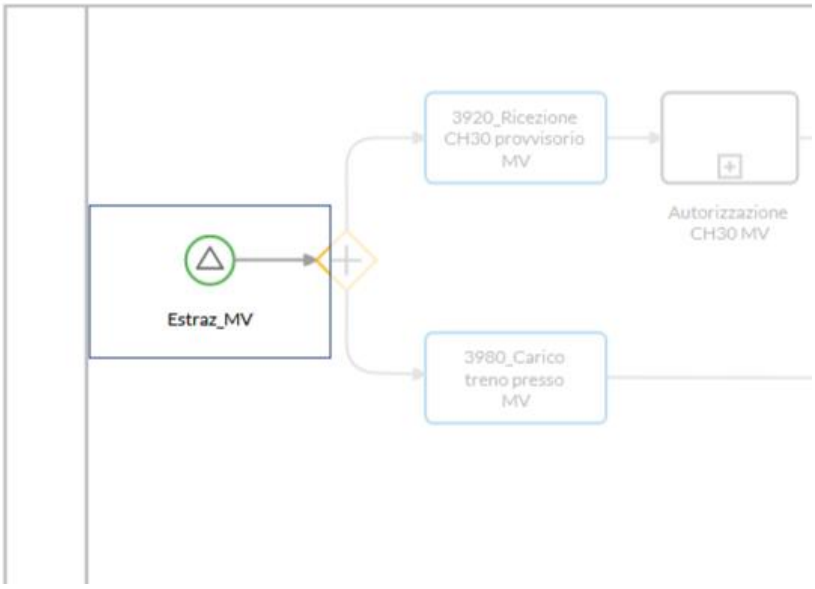
PARALLEL GATEWAY
Parallel Gateway_4050

Attributes

SIGNAL REFERENCE
Avvio partenza da MVI

Estraz_MV

SIGNAL START EVENT



Outgoing

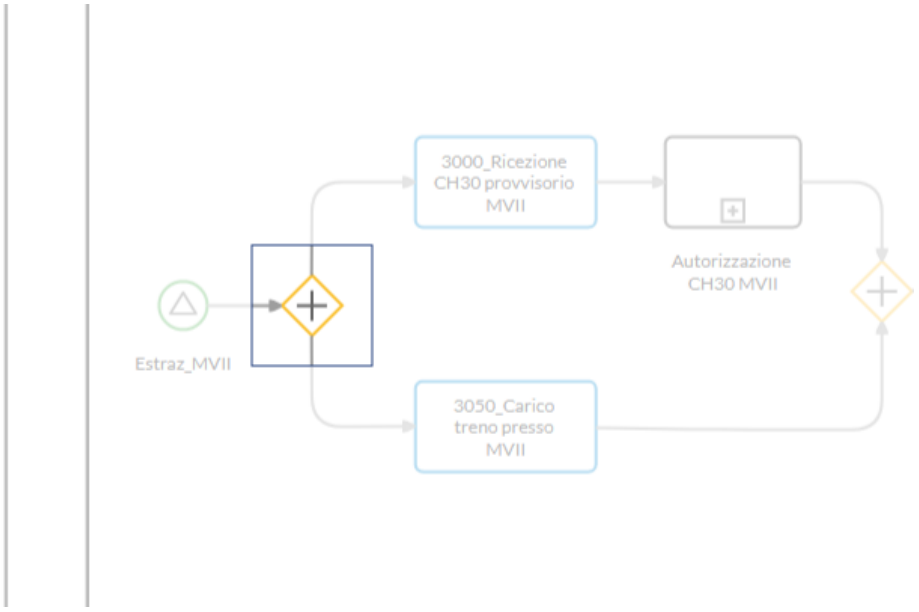
PARALLEL GATEWAY
Parallel Gateway_4050

Attributes

SIGNAL REFERENCE
Avvio partenza da MV

Parallel Gateway_4050

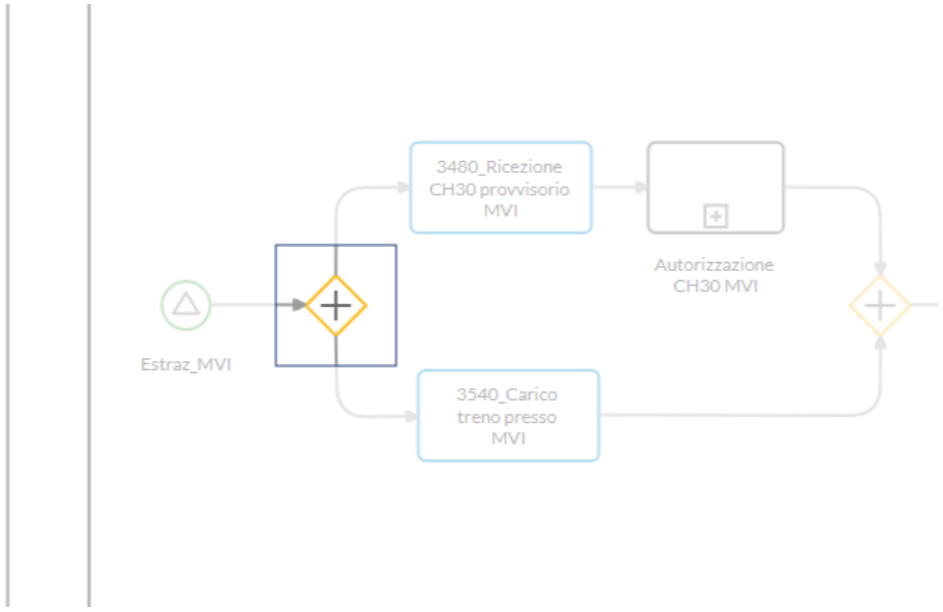
PARALLEL GATEWAY



Incoming	Outgoing
SIGNAL START EVENT Estraz_MVII	TASK 3050_Carico treno presso MVII
	TASK 3000_Ricezione CH30 provvisorio MVII

Parallel Gateway_4050

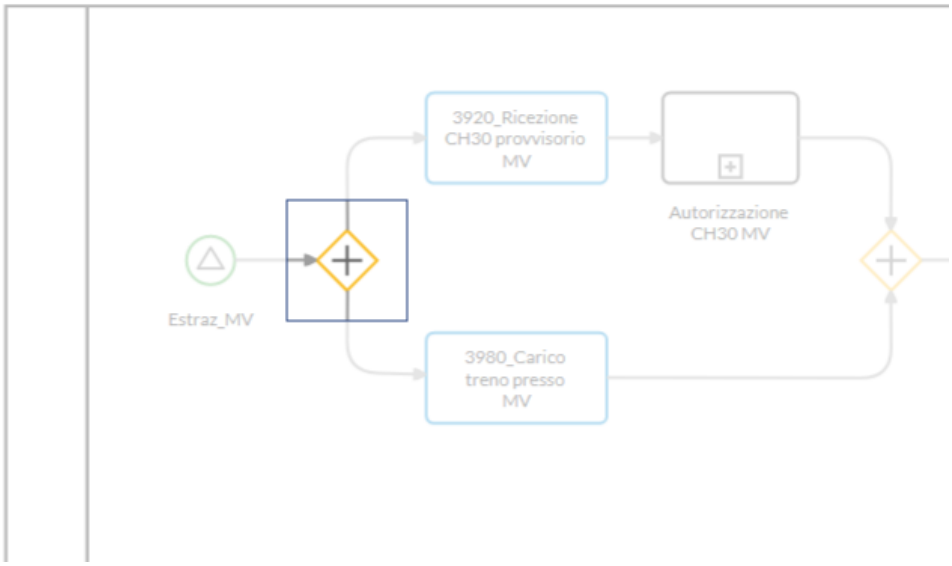
PARALLEL GATEWAY



Incoming	Outgoing
SIGNAL START EVENT Estraz_MVI	TASK 3540_Carico treno presso MVI
	TASK 3480_Ricezione CH30 provvisorio MVI

Parallel Gateway_4050

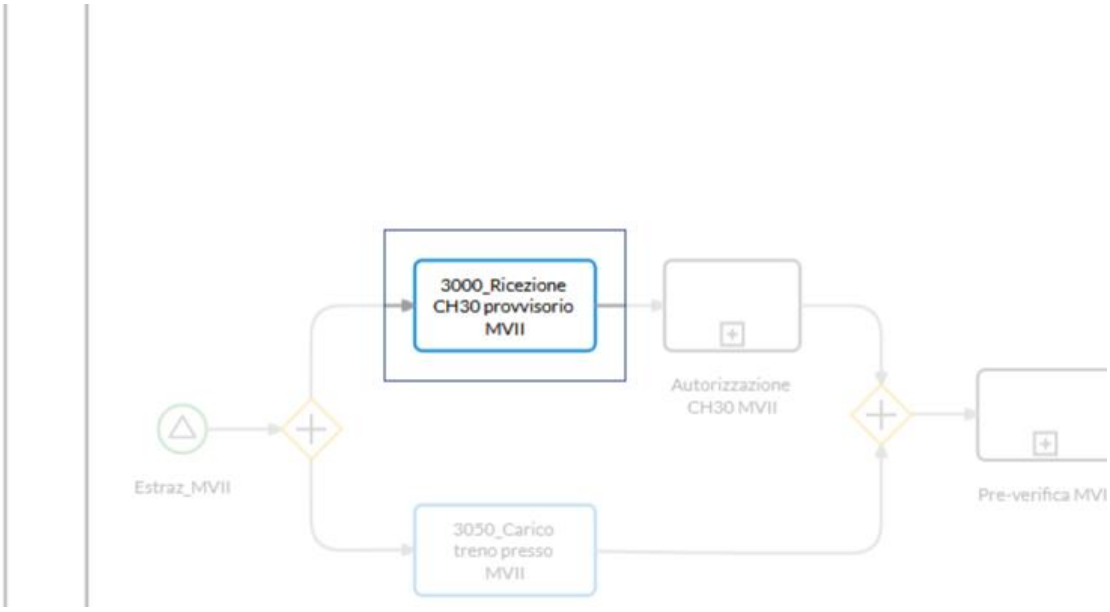
PARALLEL GATEWAY



Incoming	Outgoing
SIGNAL START EVENT Estraz_MV	TASK 3980_Carico treno presso MV
	TASK 3920_Ricezione CH30 provvisorio MV

3000_Ricezione CH30 provvisorio MVII

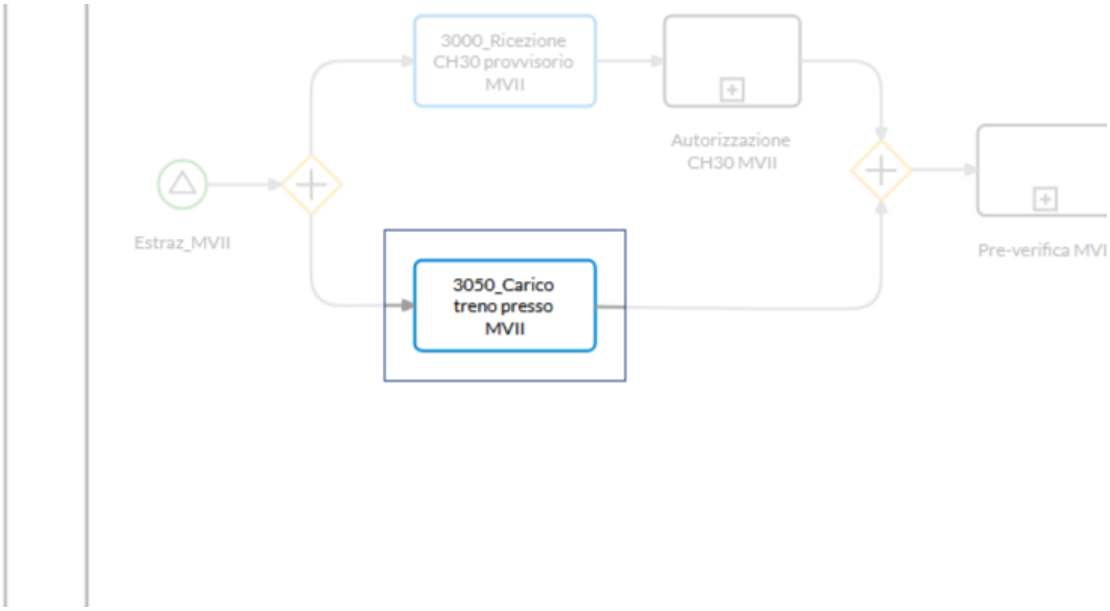
TASK



Incoming	Outgoing
PARALLEL GATEWAY Parallel Gateway_4050	SUBPROCESS Autorizzazione CH30 MVII

3050_Carico treno presso MVII

TASK

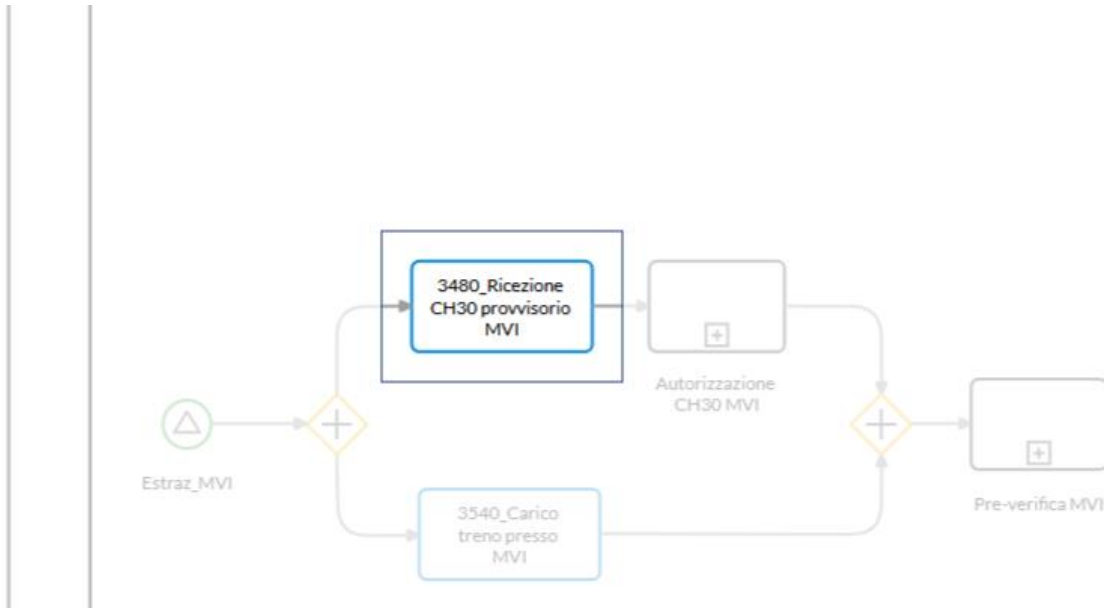


Il terminalista carica il treno presso il terminale.

Incoming	Outgoing
PARALLEL GATEWAY Parallel Gateway_4050	PARALLEL GATEWAY Exclusive Gateway_6283

3480_Ricezione CH30 provvisorio MVI

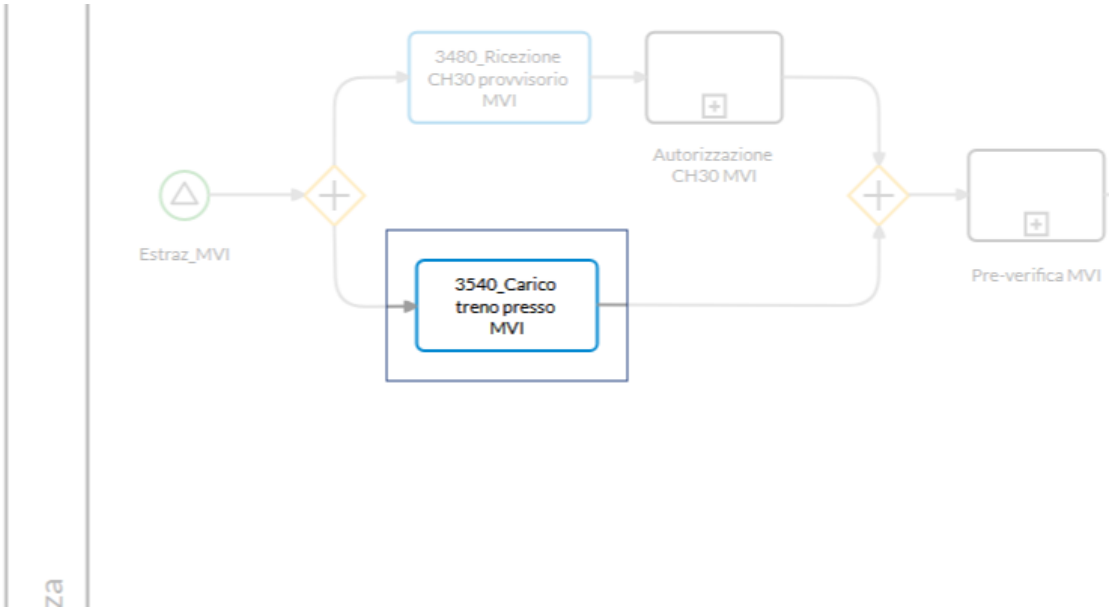
TASK



Incoming	Outgoing
PARALLEL GATEWAY Parallel Gateway_4050	SUBPROCESS Autorizzazione CH30 MVI

3540_Carico treno presso MVI

TASK

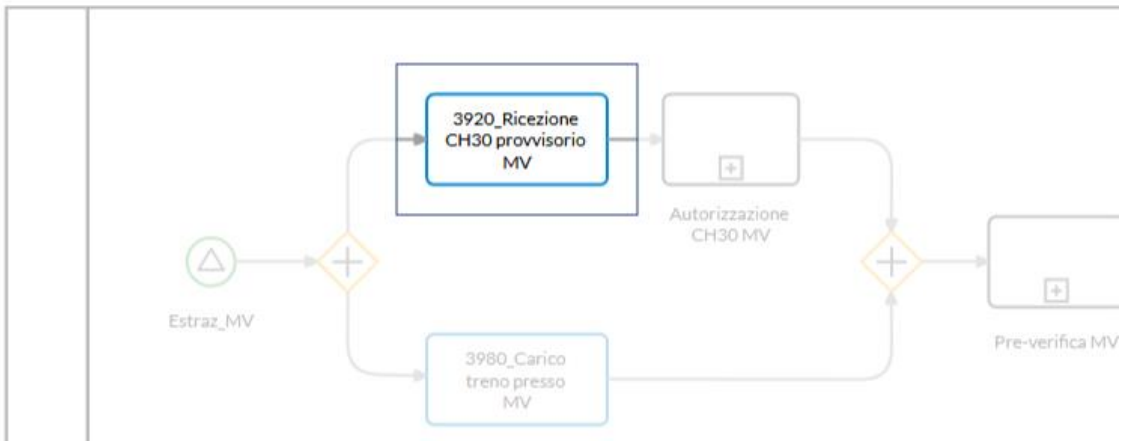


Il terminalista carica il treno presso il terminale.

Incoming	Outgoing
PARALLEL GATEWAY Parallel Gateway_4050	PARALLEL GATEWAY Exclusive Gateway_4086

3920_Ricezione CH30 provvisorio MV

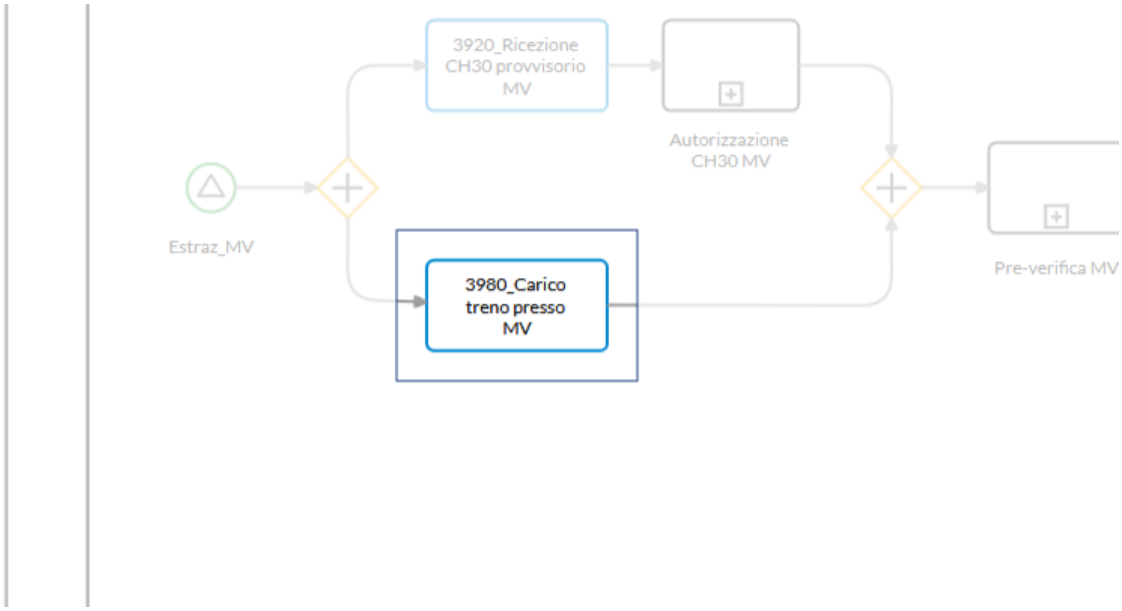
TASK



Incoming	Outgoing
PARALLEL GATEWAY Parallel Gateway_4050	SUBPROCESS Autorizzazione CH30 MV

3980_Carico treno presso MV

TASK

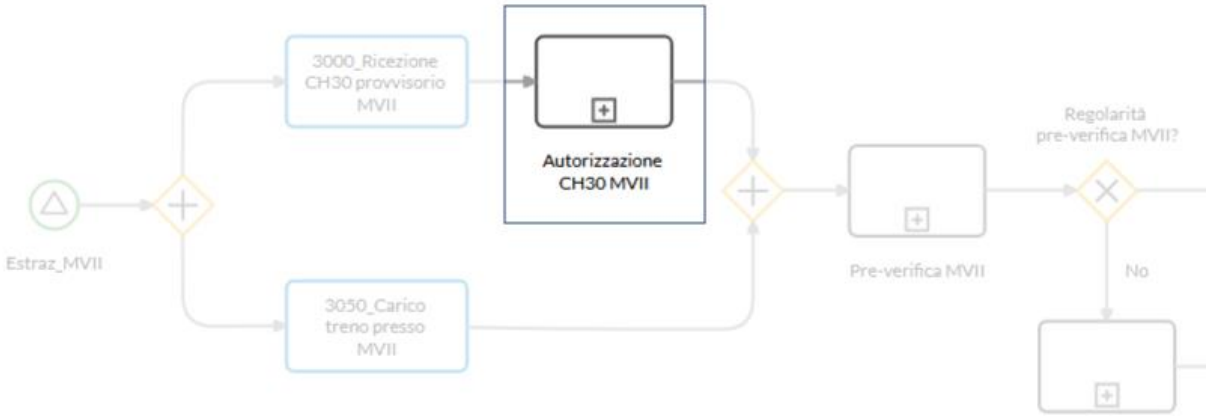


Il terminalista carica il treno presso il terminale.

Incoming	Outgoing
PARALLEL GATEWAY Parallel Gateway_4050	PARALLEL GATEWAY Exclusive Gateway_4086

Autorizzazione CH30 MVII

SUBPROCESS

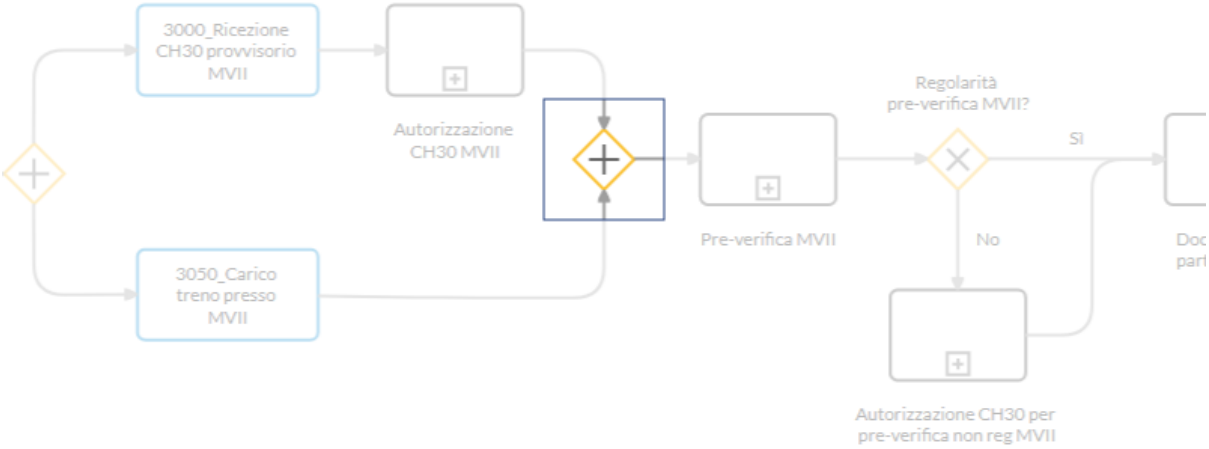


Incoming	Outgoing
TASK 3000_Ricezione CH30 provvisorio MVII	PARALLEL GATEWAY Exclusive Gateway_6283

For details on specific subprocess elements, go to the element chapter.

Exclusive Gateway_6283

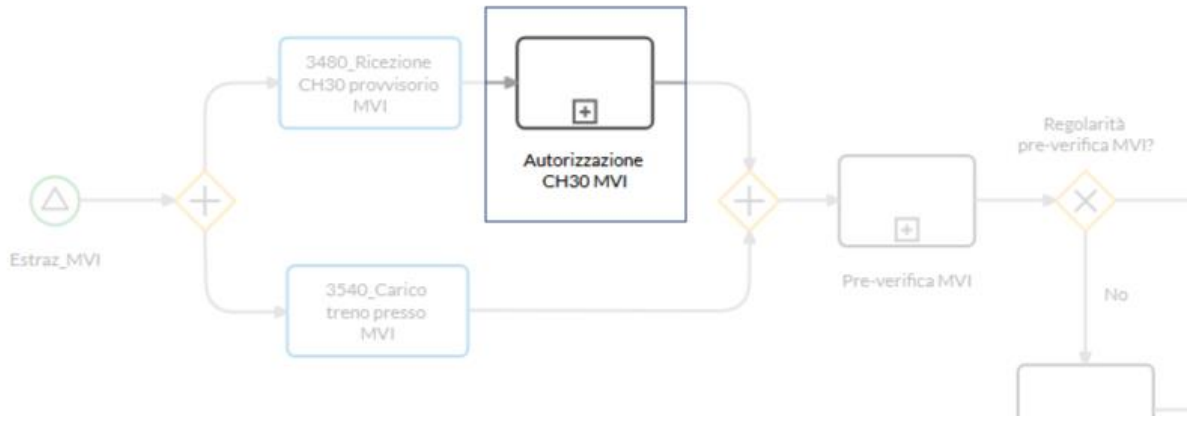
PARALLEL GATEWAY



Incoming	Outgoing
SUBPROCESS Autorizzazione CH30 MVII	SUBPROCESS Pre-verifica MVII
TASK 3050_Carico treno presso MVII	

Autorizzazione CH30 MVI

SUBPROCESS

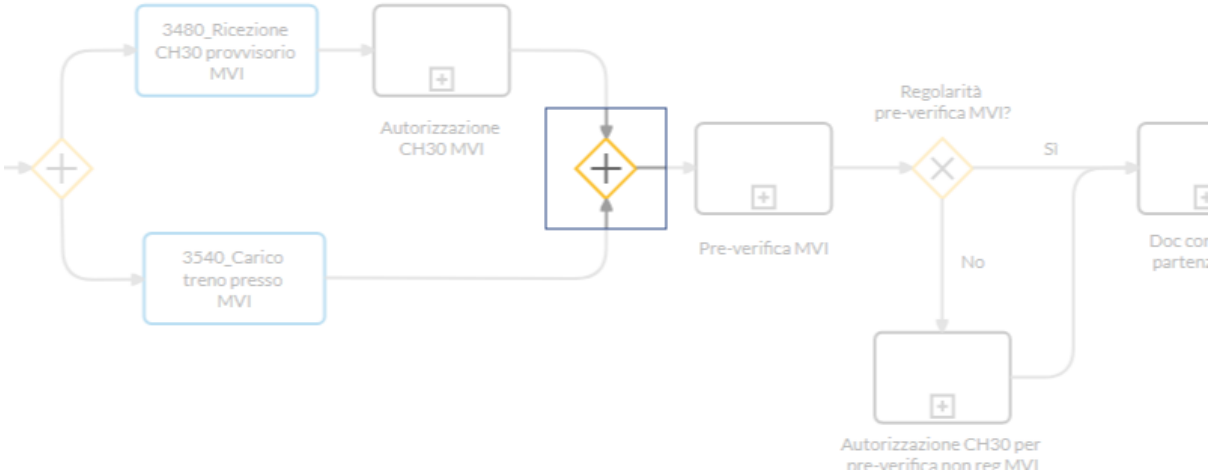


Incoming	Outgoing
TASK 3480_Ricezione CH30 provvisorio MVI	PARALLEL GATEWAY Exclusive Gateway_4086

For details on specific subprocess elements, go to the element chapter.

Exclusive Gateway_4086

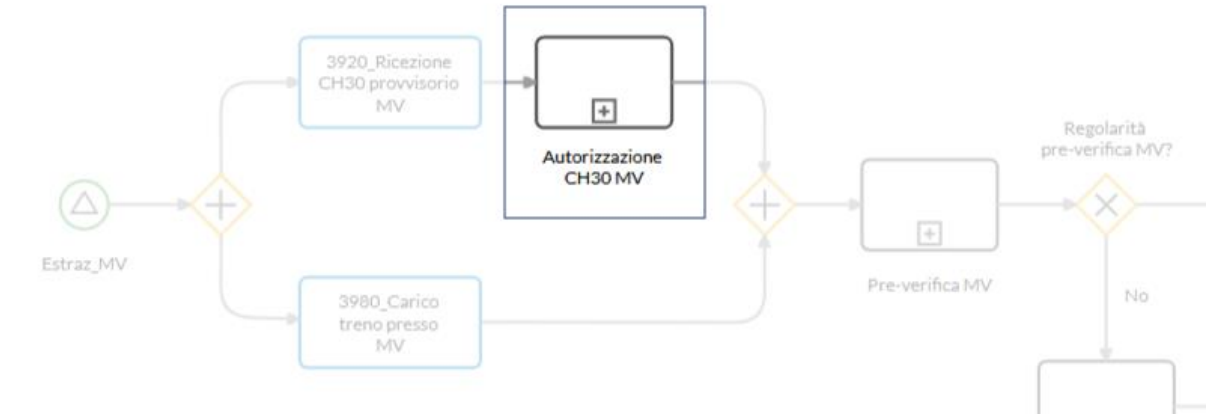
PARALLEL GATEWAY



Incoming	Outgoing
SUBPROCESS Autorizzazione CH30 MVI	SUBPROCESS Pre-verifica MVI
TASK 3540_Carico treno presso MVI	

Autorizzazione CH30 MV

SUBPROCESS

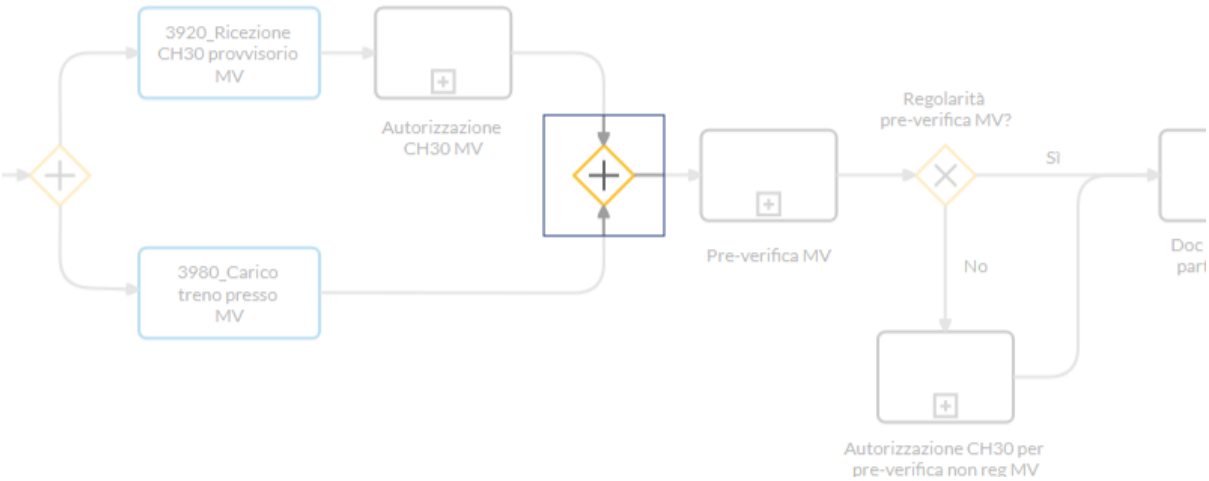


Incoming	Outgoing
TASK 3920_Ricezione CH30 provvisorio MV	PARALLEL GATEWAY Exclusive Gateway_4086

For details on specific subprocess elements, go to the element chapter.

Exclusive Gateway_4086

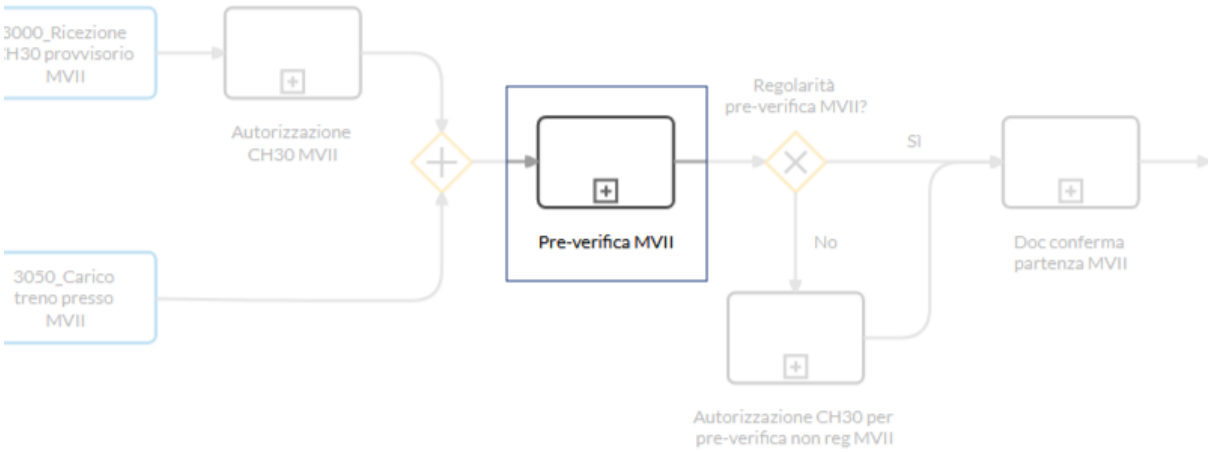
PARALLEL GATEWAY



Incoming	Outgoing
SUBPROCESS Autorizzazione CH30 MV	SUBPROCESS Pre-verifica MV
TASK 3980_Carico treno presso MV	

Pre-verifica MVII

SUBPROCESS

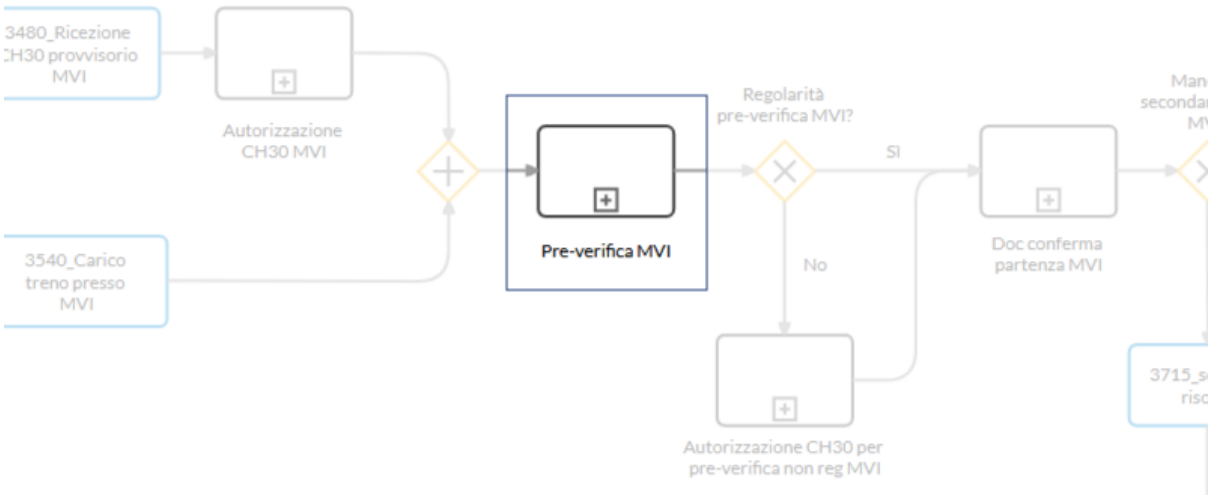


Incoming	Outgoing
PARALLEL GATEWAY Exclusive Gateway_6283	EXCLUSIVE GATEWAY Regolarità pre-verifica MVII?

For details on specific subprocess elements, go to the element chapter.

Pre-verifica MVI

SUBPROCESS

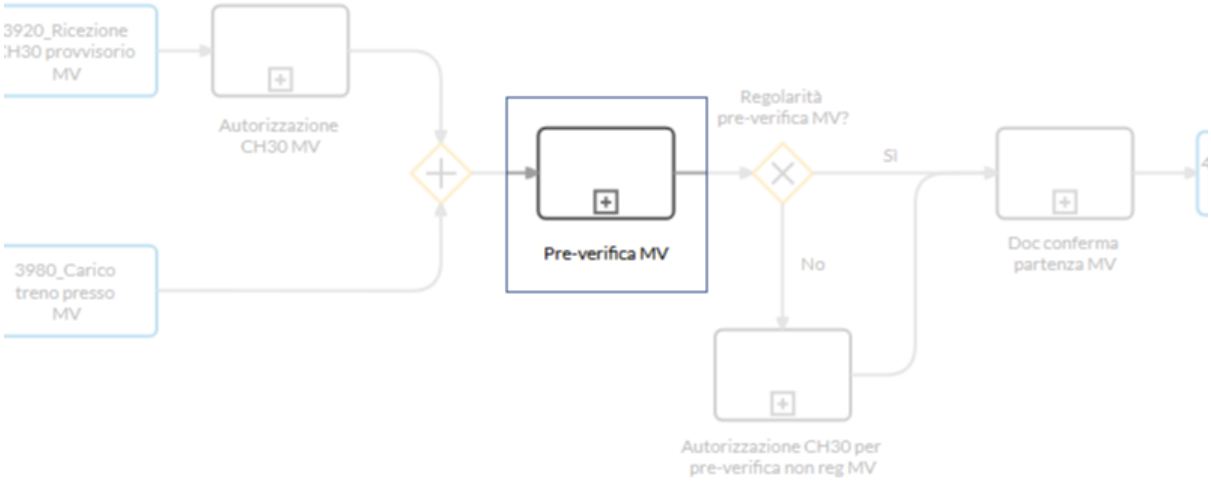


Incoming	Outgoing
PARALLEL GATEWAY Exclusive Gateway_4086	EXCLUSIVE GATEWAY Regolarità pre-verifica MVI?

For details on specific subprocess elements, go to the element chapter.

Pre-verifica MV

SUBPROCESS

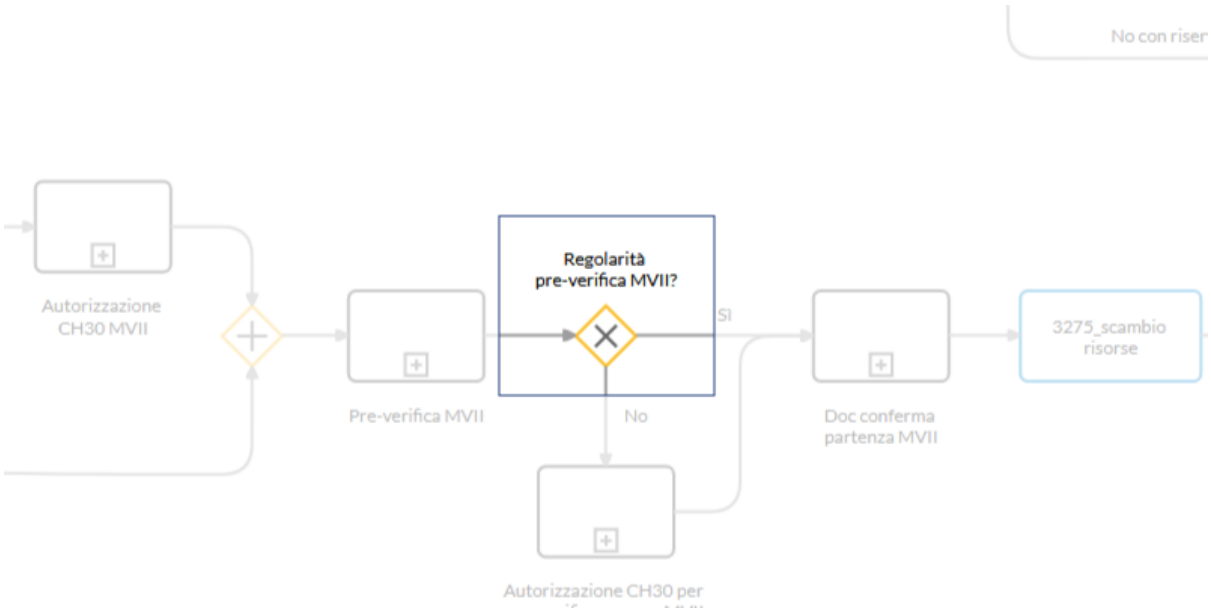


Incoming	Outgoing
PARALLEL GATEWAY Exclusive Gateway_4086	EXCLUSIVE GATEWAY Regolarità pre-verifica MV?

For details on specific subprocess elements, go to the element chapter.

Regolarità pre-verifica MVII?

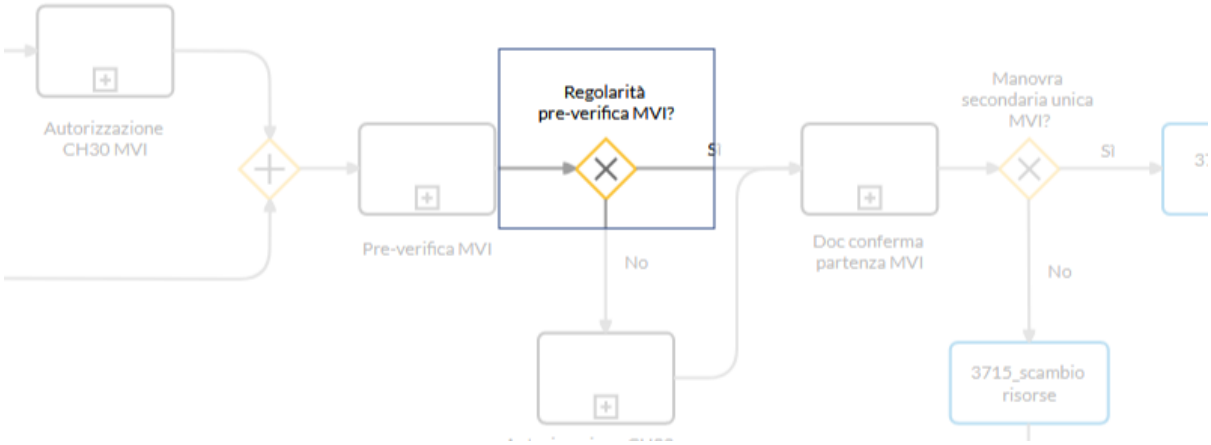
EXCLUSIVE GATEWAY



Incoming	Outgoing
SUBPROCESS Pre-verifica MVII	SUBPROCESS Doc conferma partenza MVII through Sì
	SUBPROCESS Autorizzazione CH30 per pre-verifica non reg MVII through No

Regolarità pre-verifica MVI?

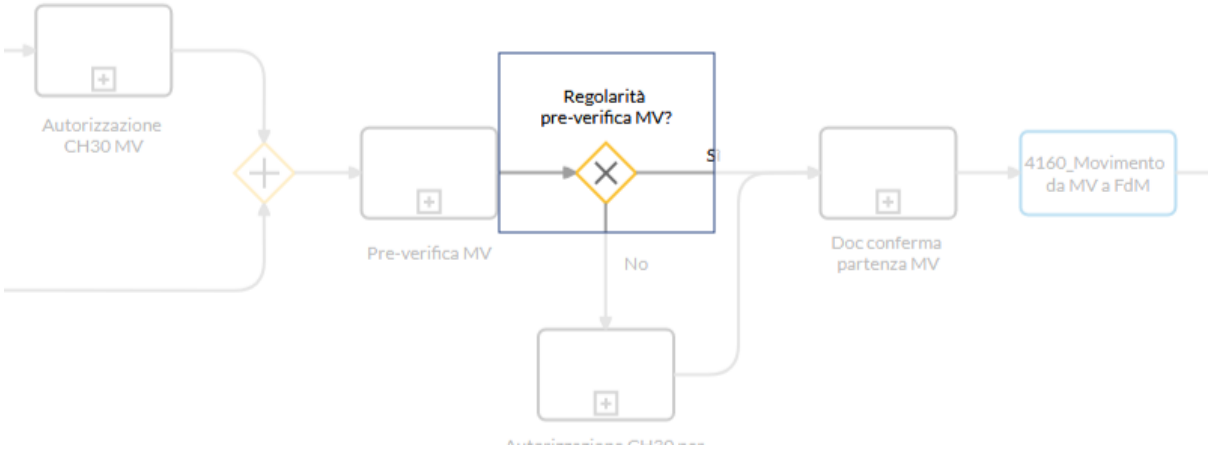
EXCLUSIVE GATEWAY



Incoming	Outgoing
SUBPROCESS Pre-verifica MVI	SUBPROCESS Doc conferma partenza MVI through Sì
	SUBPROCESS Autorizzazione CH30 per pre-verifica non reg MVI through No

Regolarità pre-verifica MV?

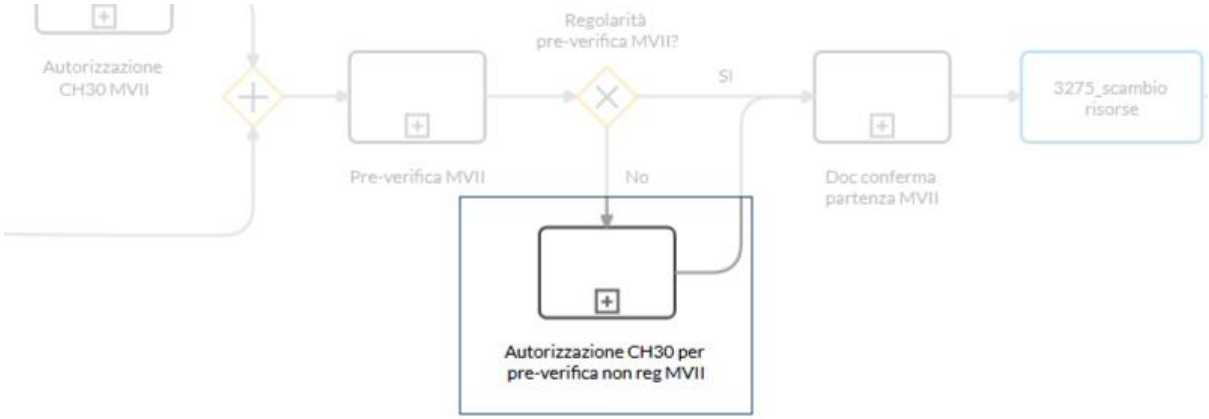
EXCLUSIVE GATEWAY



Incoming	Outgoing
SUBPROCESS Pre-verifica MV	SUBPROCESS Doc conferma partenza MV through Sì
	SUBPROCESS Autorizzazione CH30 per pre-verifica non reg MV through No

Autorizzazione CH30 per pre-verifica non reg MVII

SUBPROCESS

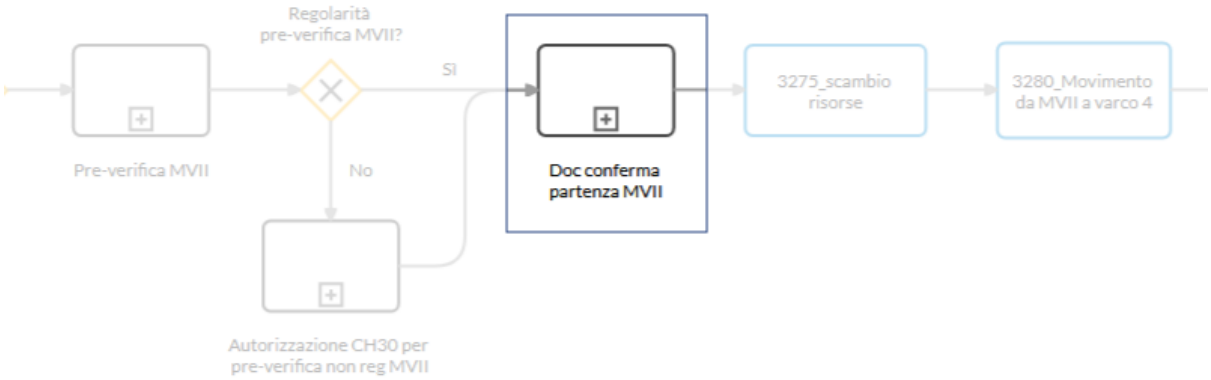


Incoming	Outgoing
EXCLUSIVE GATEWAY Regolarità pre-verifica MVII? through No	SUBPROCESS Doc conferma partenza MVII

For details on specific subprocess elements, go to the element chapter.

Doc conferma partenza MVII

SUBPROCESS

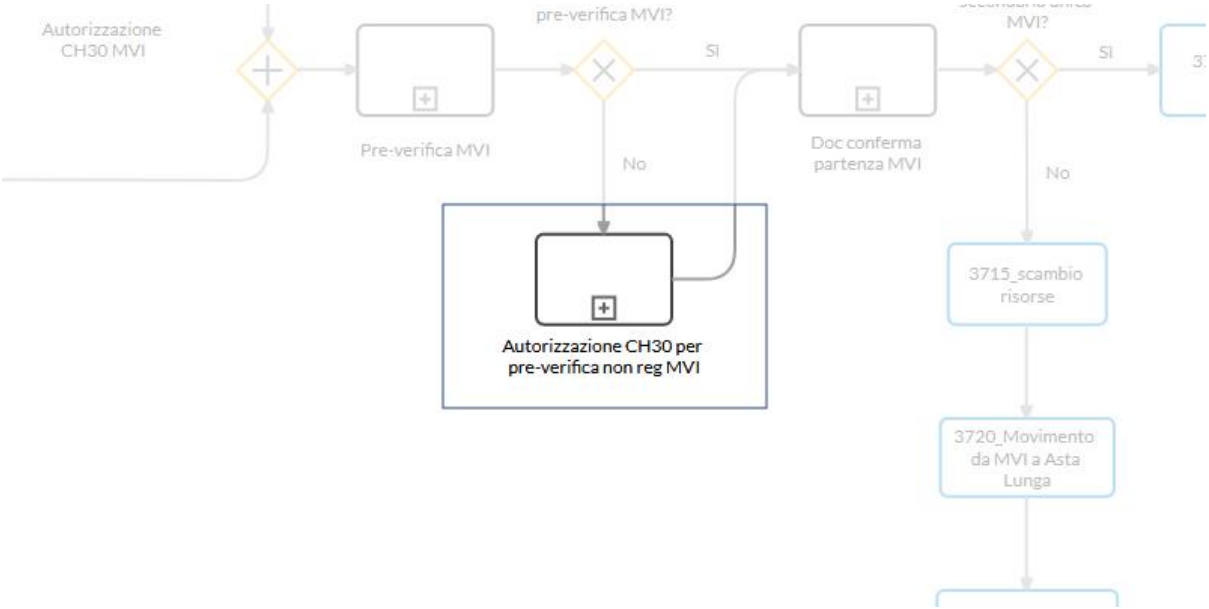


Incoming	Outgoing
EXCLUSIVE GATEWAY Regolarità pre-verifica MVII? through Sì	TASK 3275_scambio risorse
SUBPROCESS Autorizzazione CH30 per pre-verifica non reg MVII	

For details on specific subprocess elements, go to the element chapter.

Autorizzazione CH30 per pre-verifica non reg MVI

SUBPROCESS

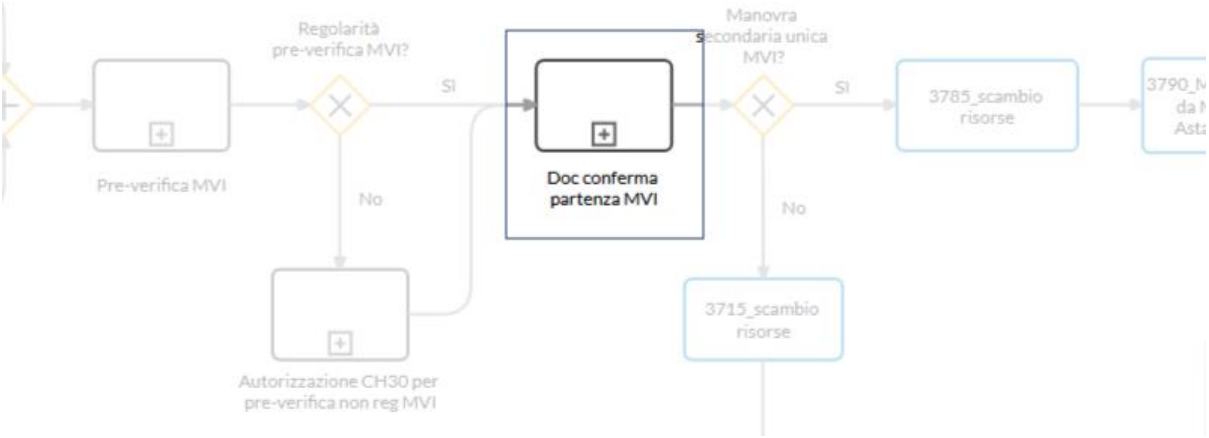


Incoming	Outgoing
EXCLUSIVE GATEWAY Regolarità pre-verifica MVI? through No	SUBPROCESS Doc conferma partenza MVI

For details on specific subprocess elements, go to the element chapter.

Doc conferma partenza MVI

SUBPROCESS

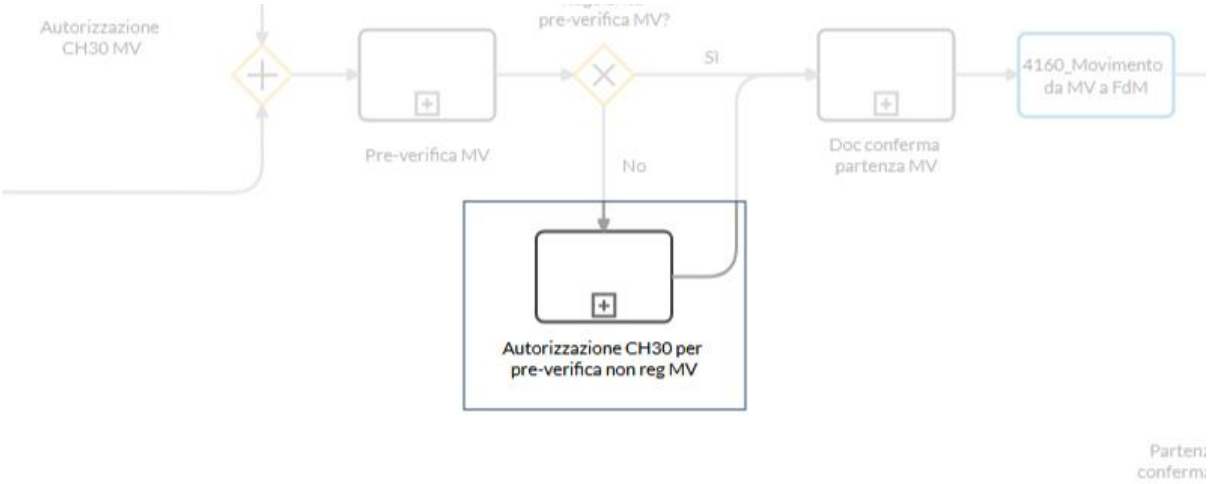


Incoming	Outgoing
EXCLUSIVE GATEWAY Regolarità pre-verifica MVI? through Sì	EXCLUSIVE GATEWAY Manovra secondaria unica MVI?
SUBPROCESS Autorizzazione CH30 per pre-verifica non reg MVI	

For details on specific subprocess elements, go to the element chapter.

Autorizzazione CH30 per pre-verifica non reg MV

SUBPROCESS

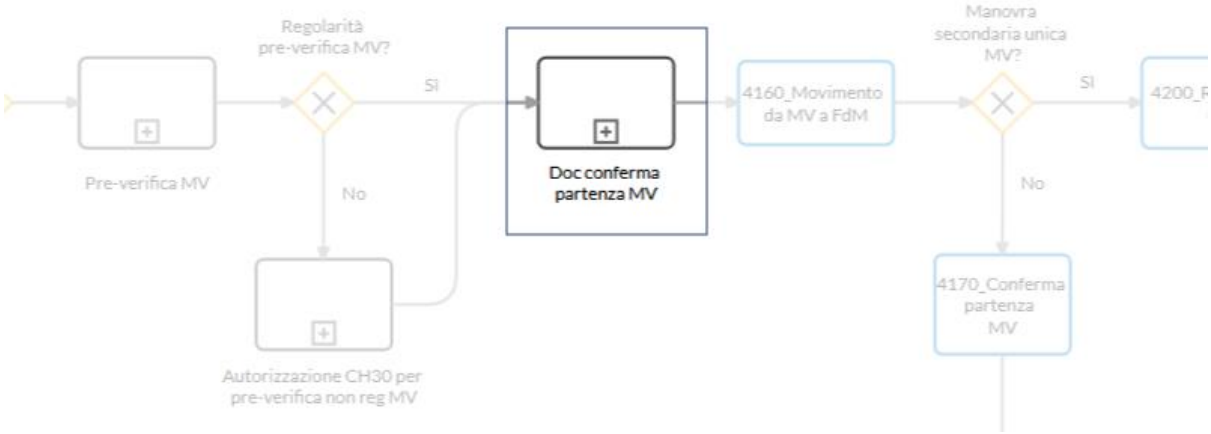


Incoming	Outgoing
EXCLUSIVE GATEWAY Regolarità pre-verifica MV? through No	SUBPROCESS Doc conferma partenza MV

For details on specific subprocess elements, go to the element chapter.

Doc conferma partenza MV

SUBPROCESS

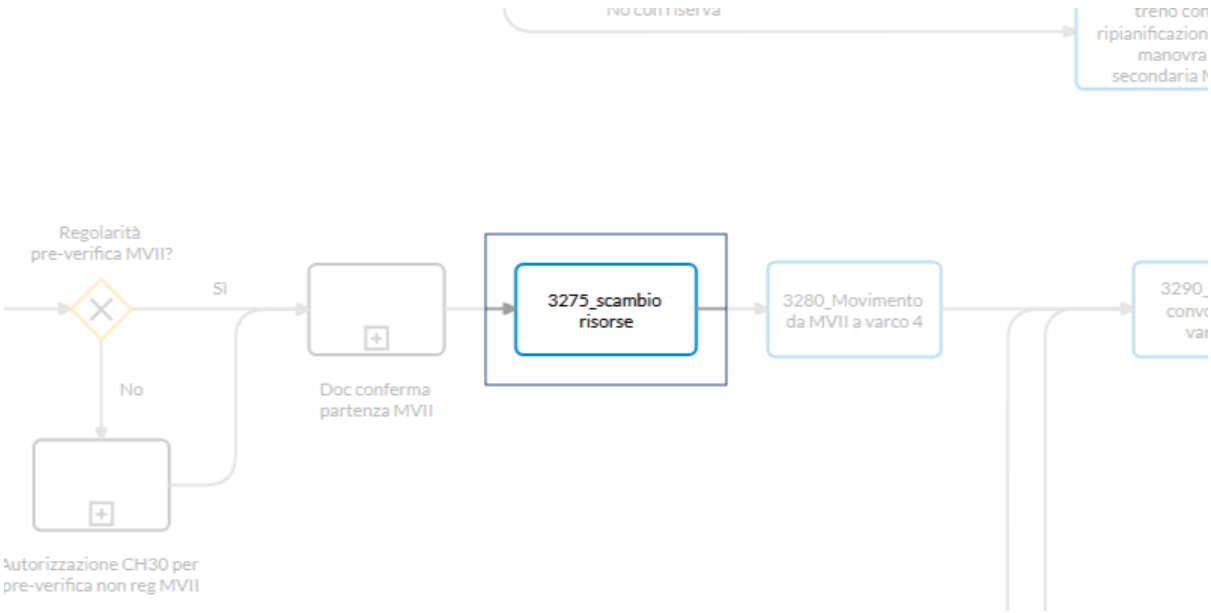


Incoming	Outgoing
EXCLUSIVE GATEWAY Regolarità pre-verifica MV? through Sì	TASK 4160_Movimento da MV a FdM
SUBPROCESS Autorizzazione CH30 per pre-verifica non reg MV	

For details on specific subprocess elements, go to the element chapter.

3275_scambio risorse

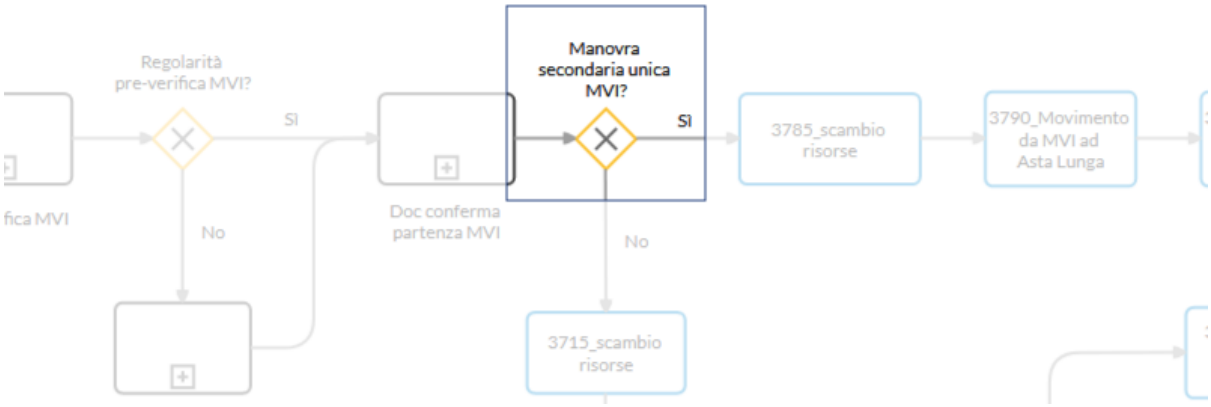
TASK



Incoming	Outgoing
SUBPROCESS Doc conferma partenza MVII	TASK 3280_Movimento da MVII a varco 4

Manovra secondaria unica MVI?

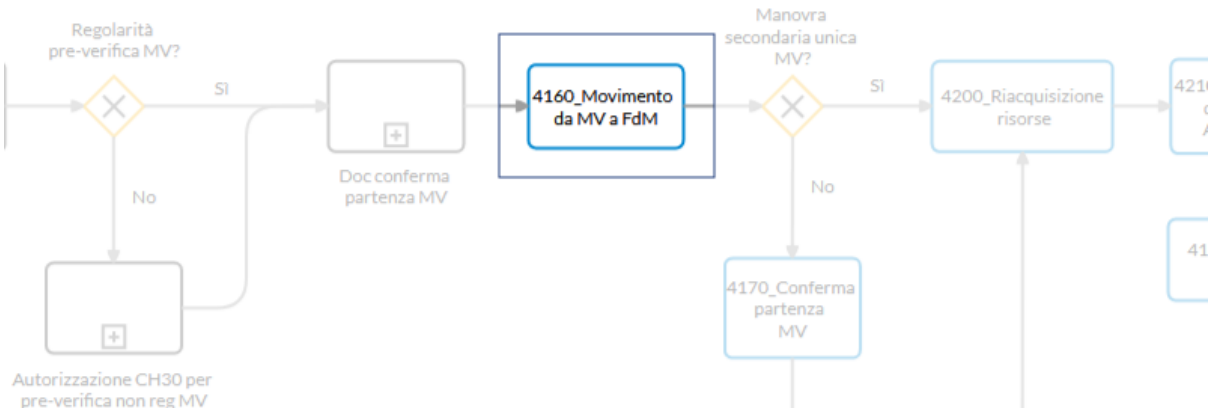
EXCLUSIVE GATEWAY



Incoming	Outgoing
SUBPROCESS Doc conferma partenza MVI	TASK 3715_scambio risorse through No
	TASK 3785_scambio risorse through Sì

4160_Movimento da MV a FdM

TASK

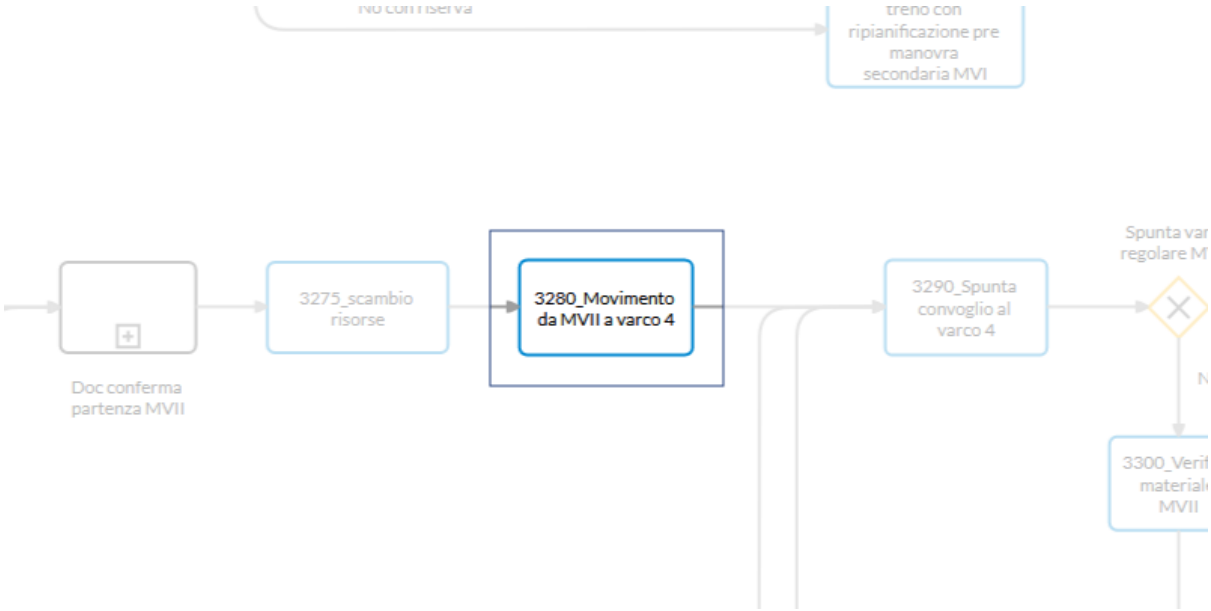


Se la manovra secondaria è doppia, il treno viene prima stazionato nel Punto Franco Nuovo in attesa della conferma della partenza. Questa manovra prevede: Manovra II° Terminal - Piazzale PFN + Manovra II° Piazzale PFN - TSCM.

Incoming	Outgoing
SUBPROCESS Doc conferma partenza MV	EXCLUSIVE GATEWAY Manovra secondaria unica MV?

3280_Movimento da MVII a varco 4

TASK

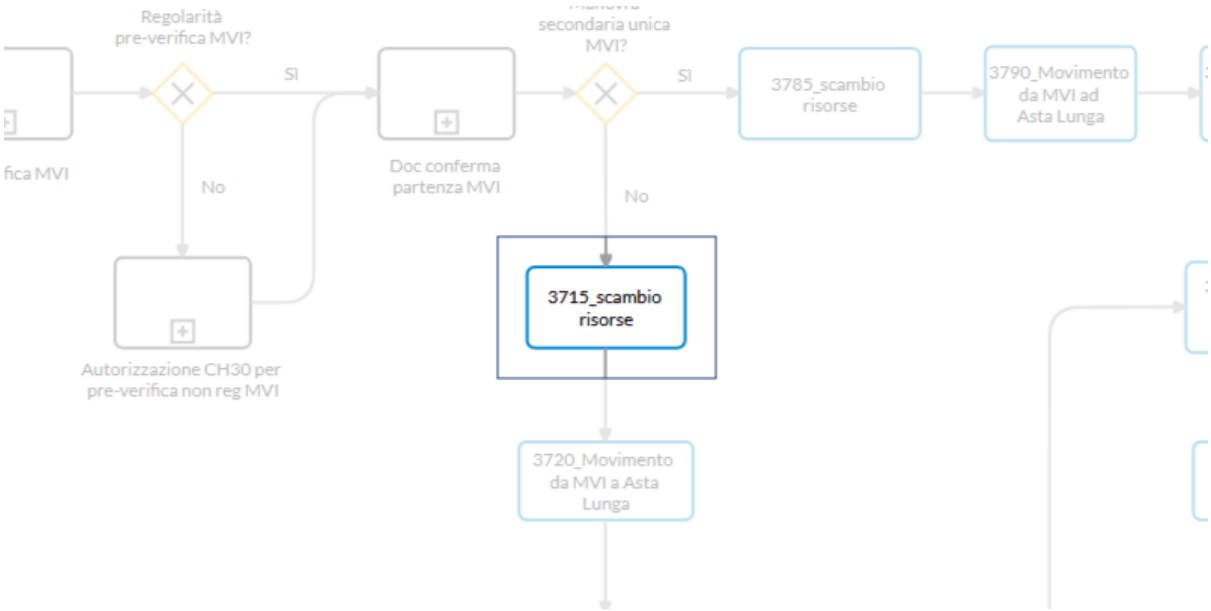


Se la manovra secondaria è unica, il Gestore Unico procede direttamente con la manovra secondaria.

Incoming	Outgoing
TASK 3275_scambio risorse	TASK 3290_Spunta convoglio al varco 4

3715_scambio risorse

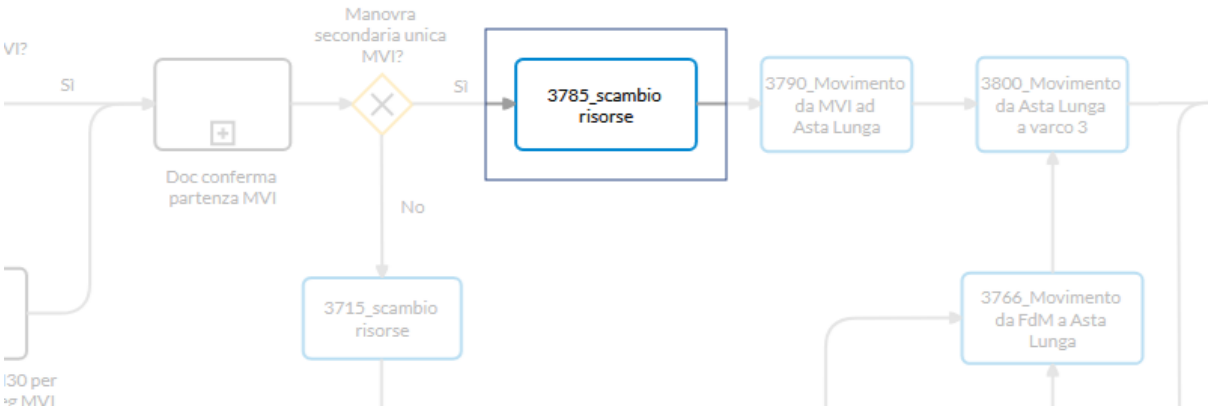
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Manovra secondaria unica MVI? through No	TASK 3720_Movimento da MVI a Asta Lunga

3785_scambio risorse

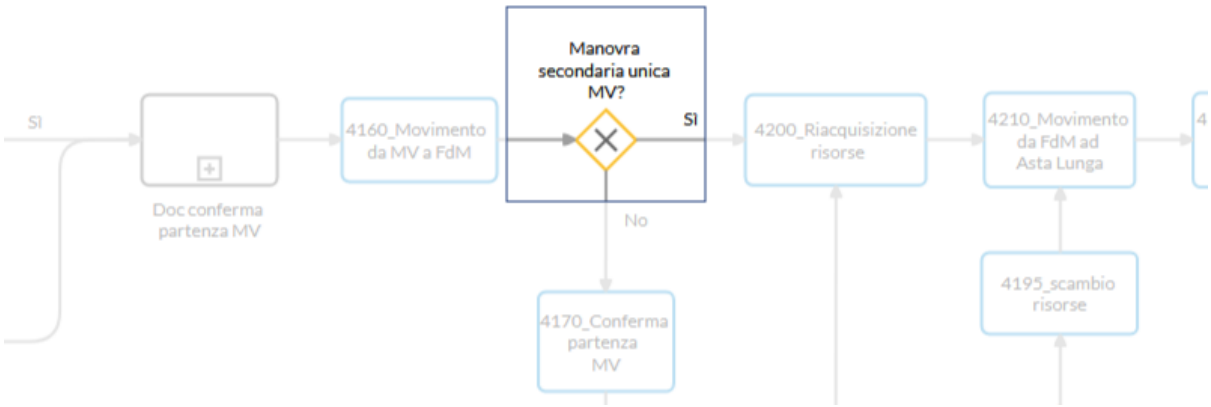
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Manovra secondaria unica MVI? through Sì	TASK 3790_Movimento da MVI ad Asta Lunga

Manovra secondaria unica MV?

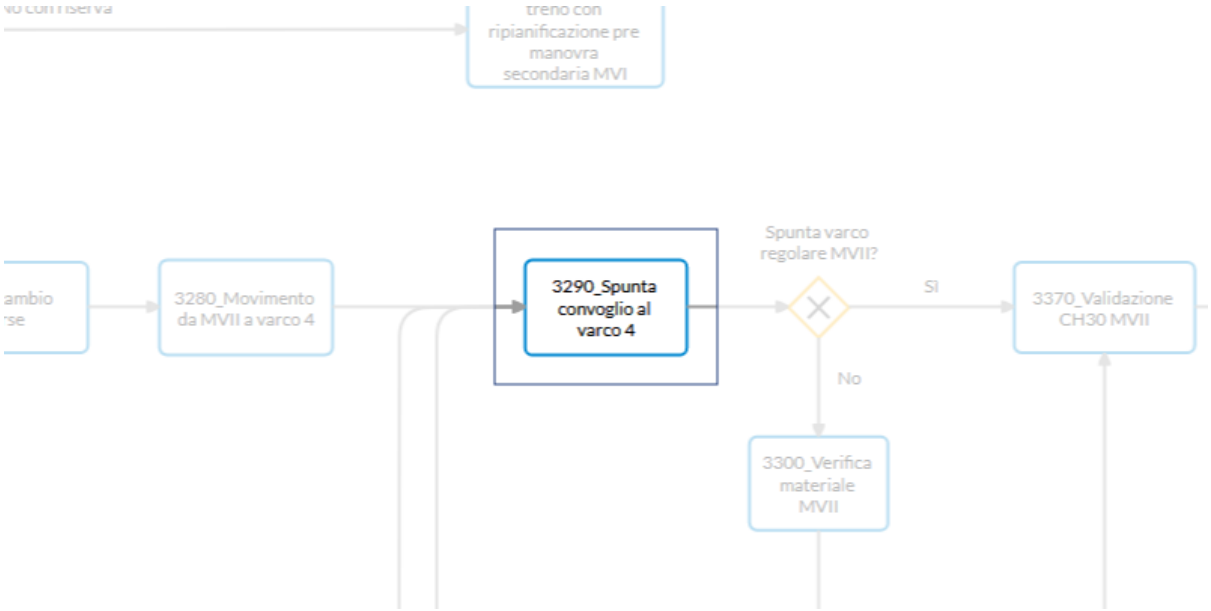
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 4160_Movimento da MV a FdM	TASK 4170_Conferma partenza MV through No
	TASK 4200_Riacquisizione risorse through Sì

3290_Spunta convoglio al varco 4

TASK

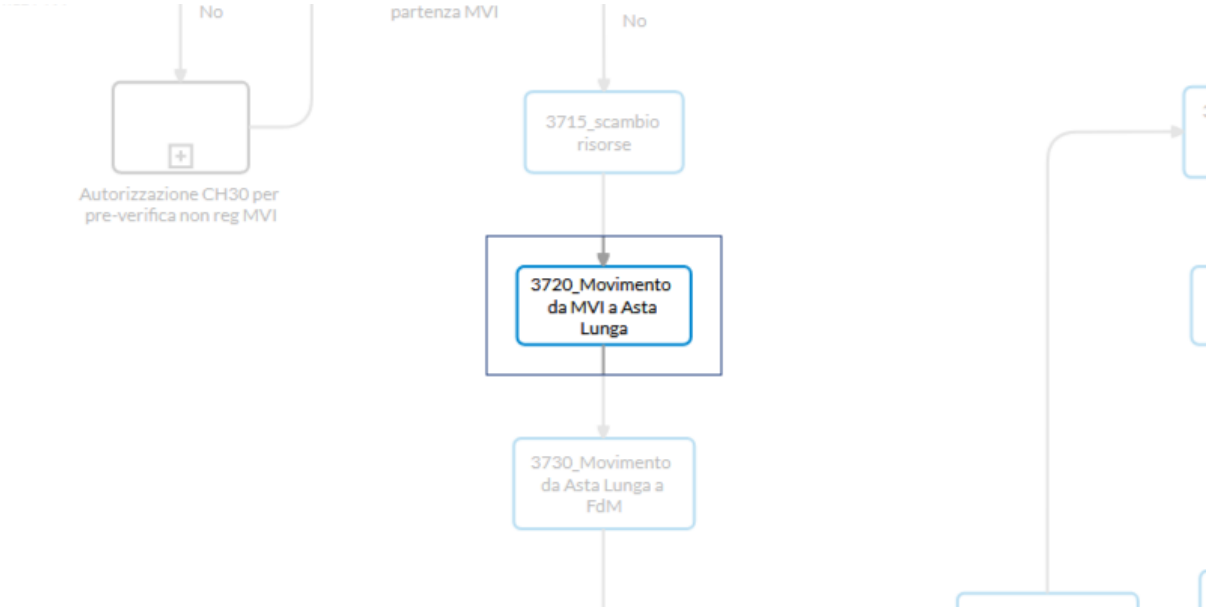


Una volta che il treno è giunto al varco, la Guardia di Finanza esegue la spunta del treno per verificare la regolarità del convoglio. Tempo, Varco, L

Incoming	Outgoing
TASK 3280_Movimento da MVII a varco 4	EXCLUSIVE GATEWAY Spunta varco regolare MVII?
TASK 3320_Modifica CH30 per unità inalterate MVII	
TASK 3330_Modifica CH30 per unità alterate MVII	

3720_Movimento da MVI a Asta Lunga

TASK

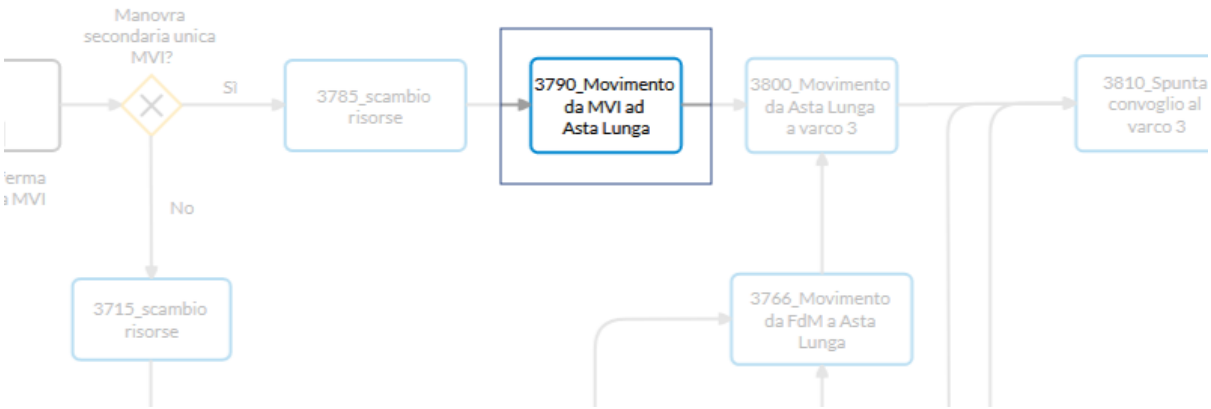


Se la manovra secondaria è doppia, il treno viene prima stazionato nel Punto Franco Nuovo in attesa della conferma della partenza. Questa manovra prevede: Manovra II° Terminal - Piazzale PFN + Manovra II° Piazzale PFN - TSCM.

Incoming	Outgoing
TASK 3715_scambio risorse	TASK 3730_Movimento da Asta Lunga a FdM

3790_Movimento da MVI ad Asta Lunga

TASK

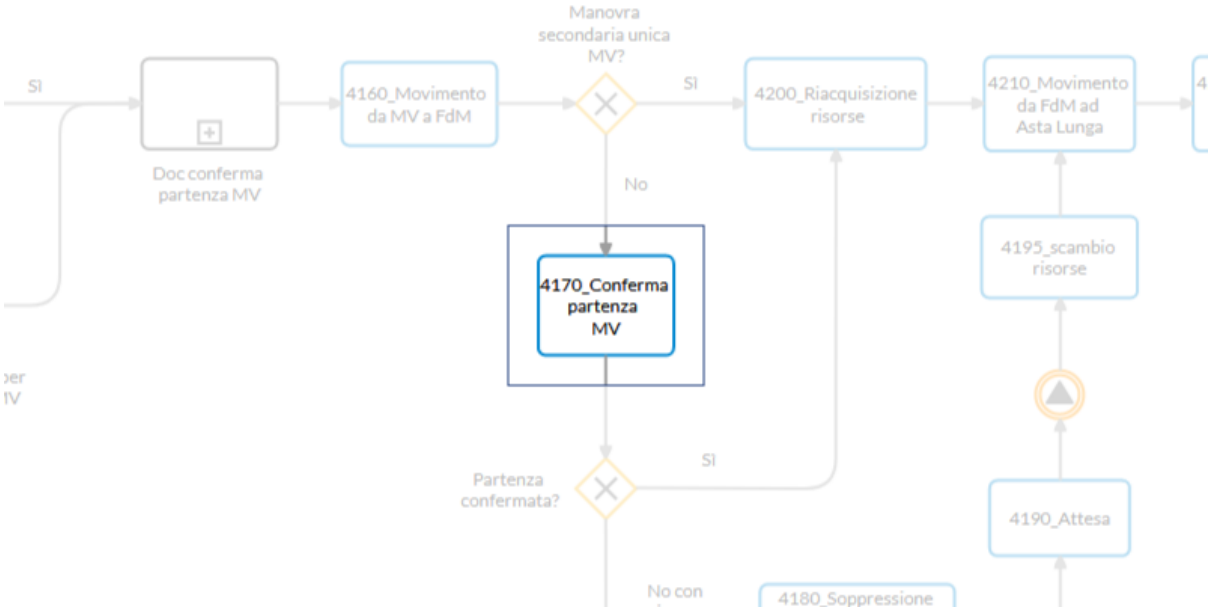


Se la manovra secondaria è unica, il Gestore Unico procede direttamente con la manovra secondaria.

Incoming	Outgoing
TASK 3785_scambio risorse	TASK 3800_Movimento da Asta Lunga a varco 3

4170_Conferma partenza MV

TASK

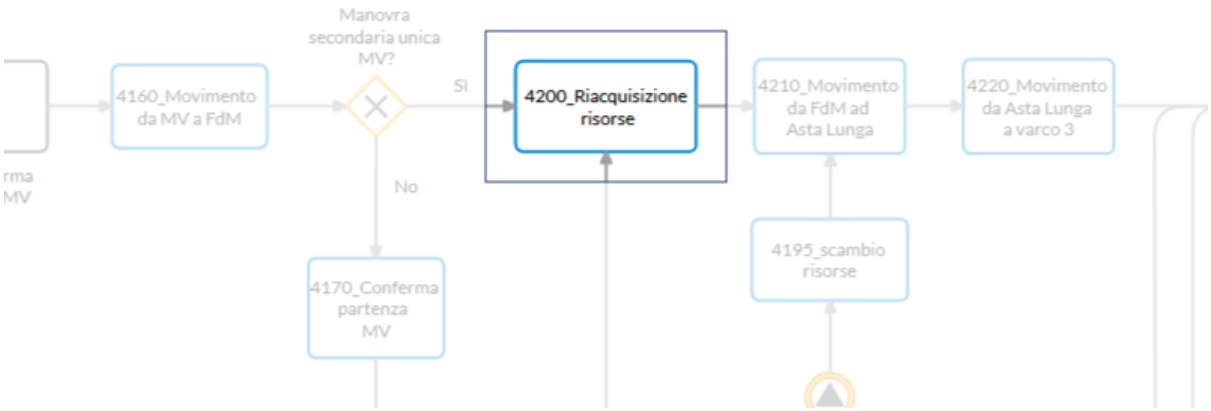


La partenza dev'essere confermata dal Gestore Unico.

Incoming	Outgoing
EXCLUSIVE GATEWAY Manovra secondaria unica MV? through No	EXCLUSIVE GATEWAY Partenza confermata?

4200_Riacquisizione risorse

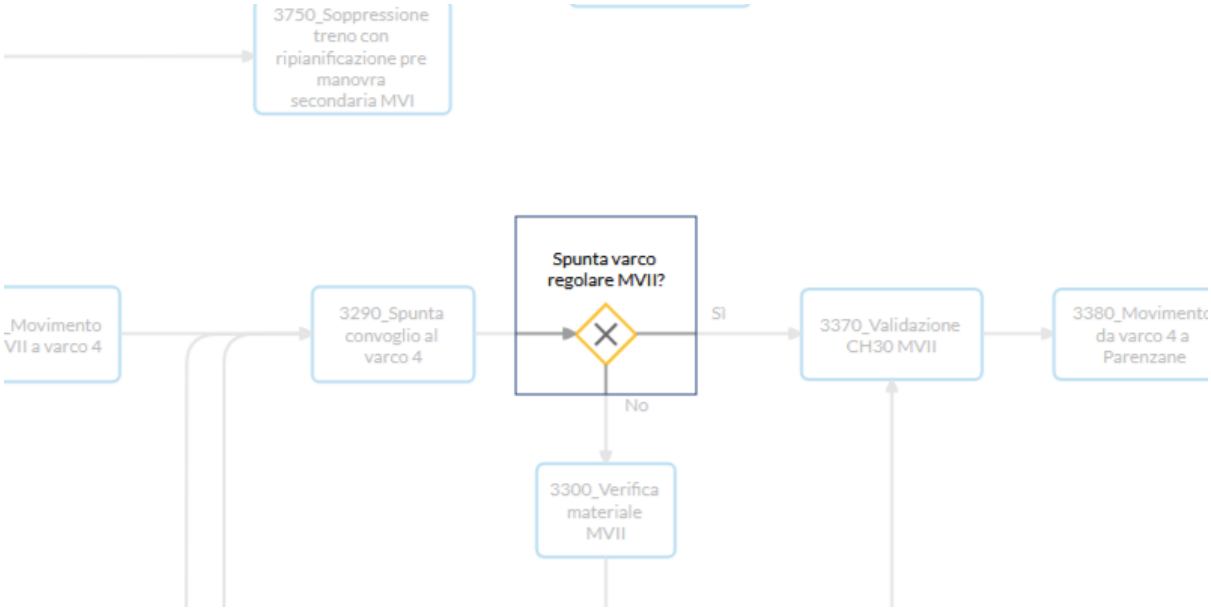
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through Sì	TASK 4210_Movimento da FdM ad Asta Lunga
EXCLUSIVE GATEWAY Manovra secondaria unica MV? through Sì	

Spunta varco regolare MVII?

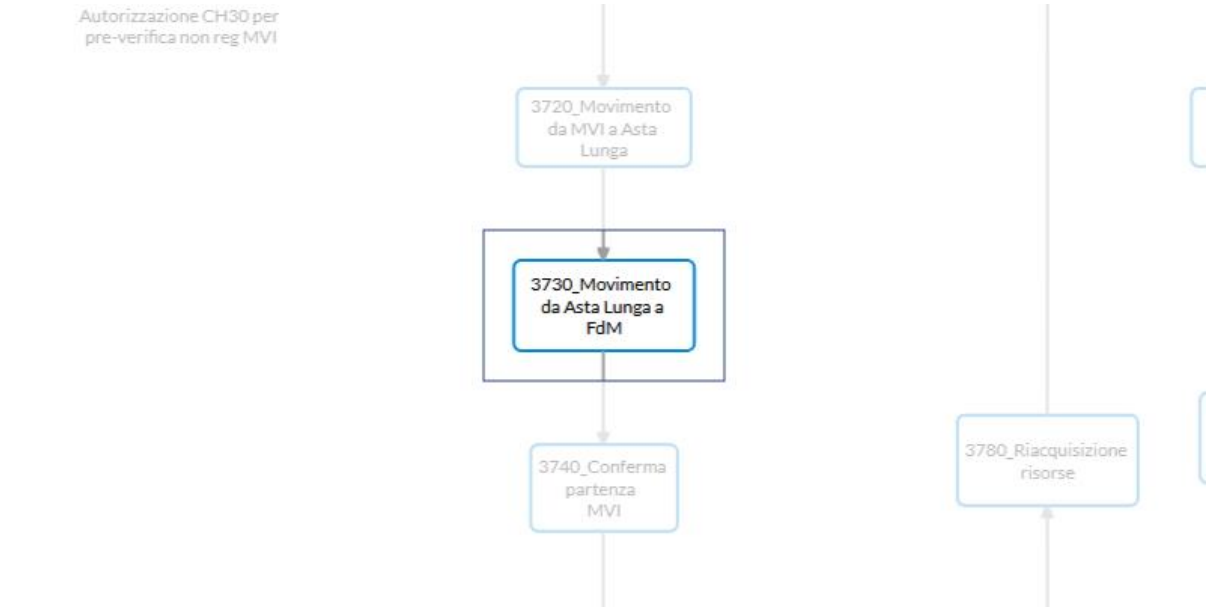
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3290_Spunta convoglio al varco 4	TASK 3370_Validazione CH30 MVII through Sì
	TASK 3300_Verifica materiale MVII through No

3730_Movimento da Asta Lunga a FdM

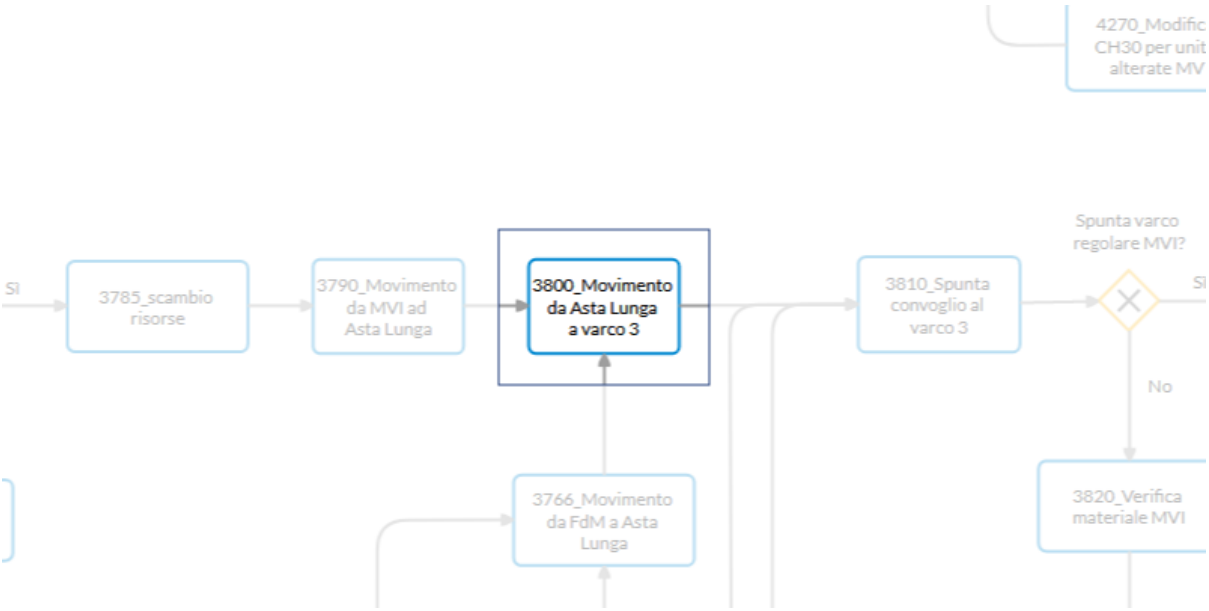
TASK



Incoming	Outgoing
TASK 3720_Movimento da MVI a Asta Lunga	TASK 3740_Conferma partenza MVI

3800_Movimento da Asta Lunga a varco 3

TASK

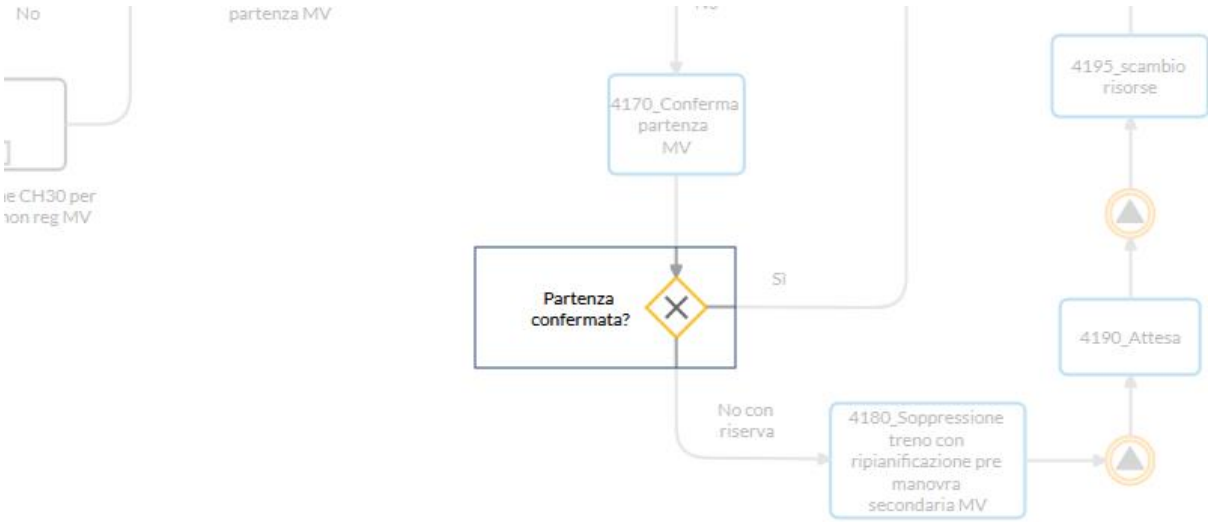


Se la manovra secondaria è unica, il Gestore Unico procede direttamente con la manovra secondaria.

Incoming	Outgoing
TASK 3790_Movimento da MVI ad Asta Lunga	TASK 3810_Spunta convoglio al varco 3
TASK 3766_Movimento da FdM a Asta Lunga	

Partenza confermata?

EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 4170_Conferma partenza MV	TASK 4180_Soppressione treno con ripianificazione pre manovra secondaria MV through No con riserva
	TASK 4200_Riacquisizione risorse through Sì

4210_Movimento da FdM ad Asta Lunga

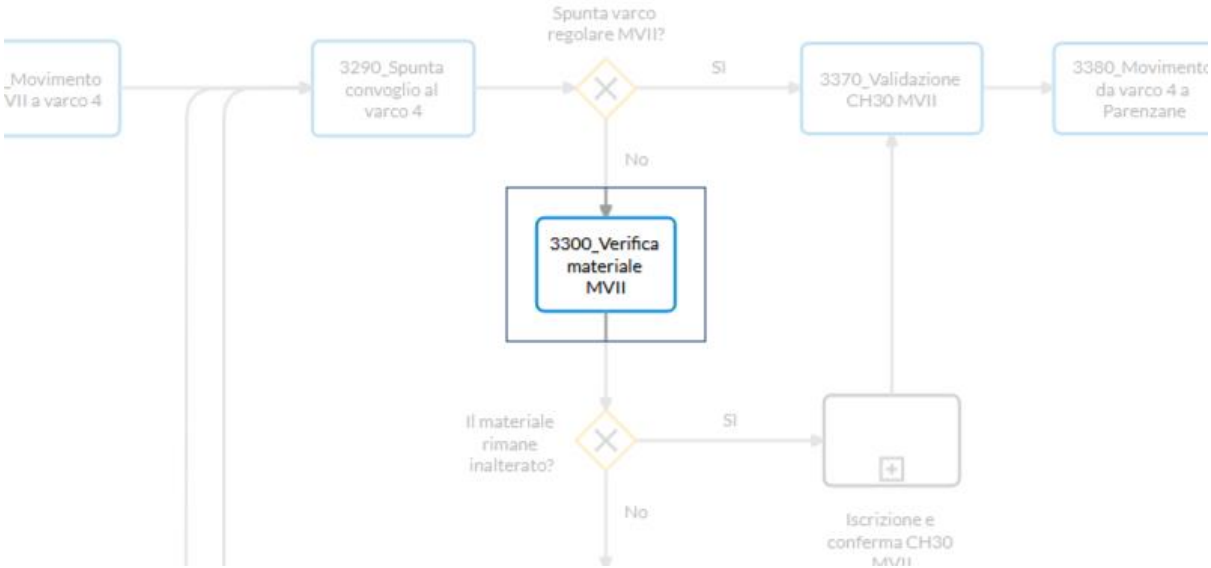
TASK

Se la manovra secondaria è unica, il Gestore Unico procede direttamente con la manovra secondaria.

Incoming	Outgoing
TASK 4200_Riacquisizione risorse	TASK 4220_Movimento da Asta Lunga a varco 3
TASK 4195_scambio risorse	

3300_Verifica materiale MVII

TASK

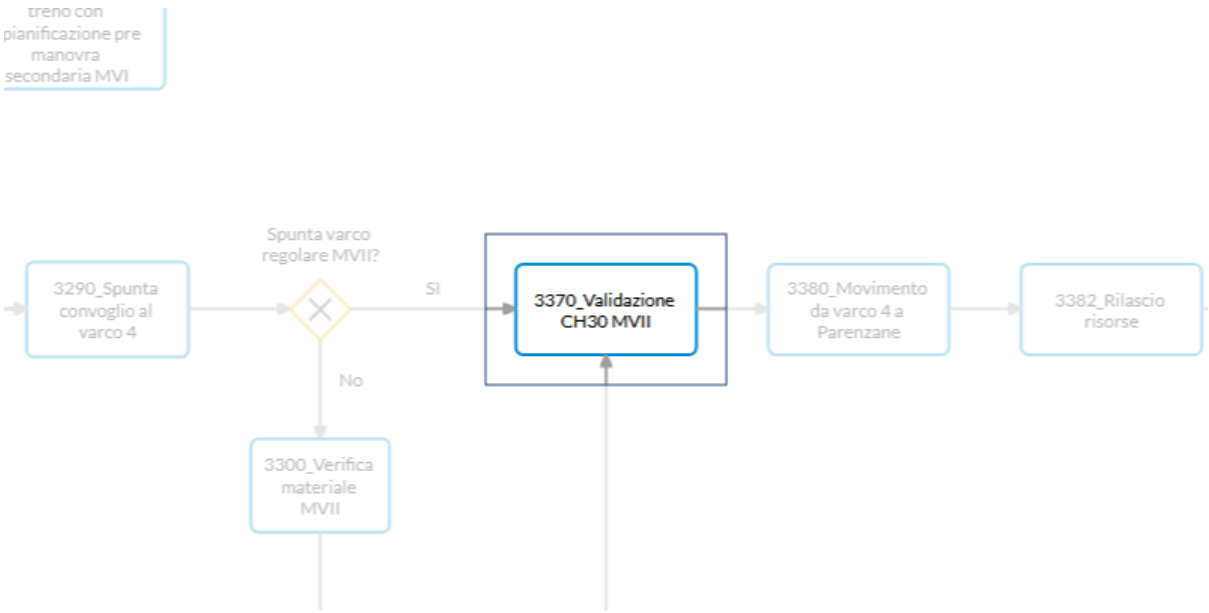


Se la spunta al varco non è regolare, la Guardia di Finanza deve proseguire con la verifica del materiale. Tempo, Varco, L

Incoming	Outgoing
EXCLUSIVE GATEWAY Spunta varco regolare MVII? through No	EXCLUSIVE GATEWAY Il materiale rimane inalterato?

3370_Validazione CH30 MVII

TASK

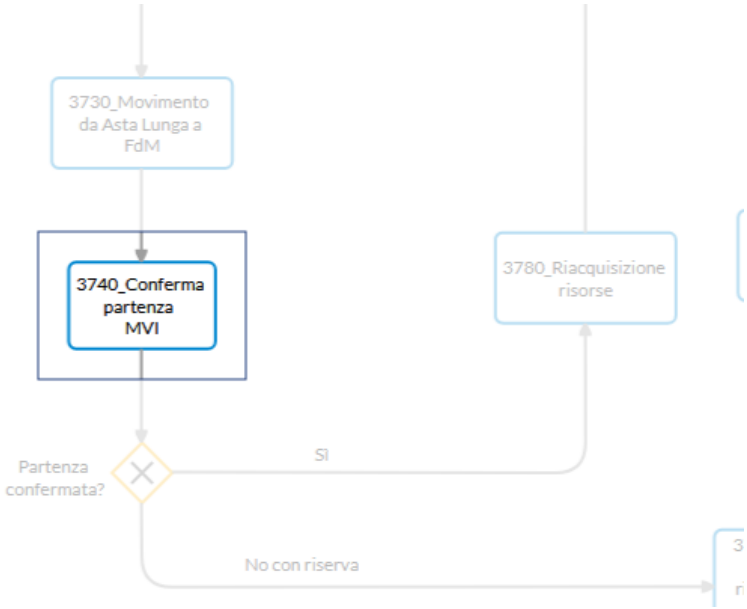


Se la spunta al varco è regolare, la Guardia di Finanza modifica il CH30 variandone lo stato da Confermato a Uscito. Tempo, Varco, L

Incoming	Outgoing
SUBPROCESS Iscrizione e conferma CH30 MVII	TASK 3380_Movimento da varco 4 a Parenzane
EXCLUSIVE GATEWAY Spunta varco regolare MVII? through Sì	

3740_Conferma partenza MVI

TASK

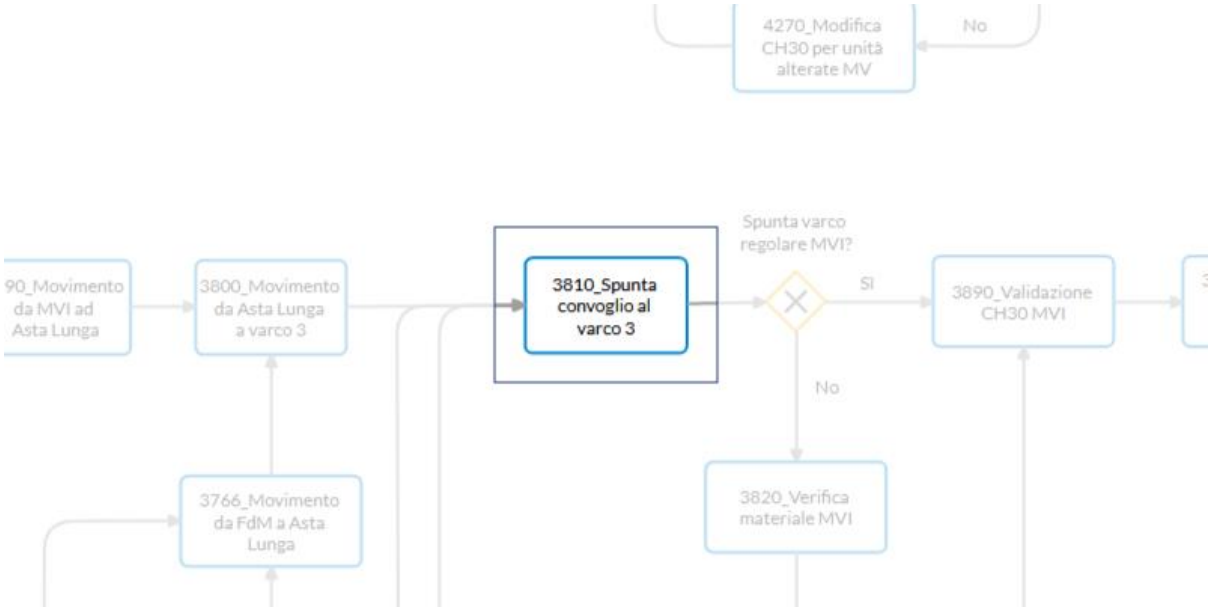


La partenza dev'essere confermata dal Gestore Unico.

Incoming	Outgoing
TASK 3730_Movimento da Asta Lunga a FdM	EXCLUSIVE GATEWAY Partenza confermata?

3810_Spunta convoglio al varco 3

TASK

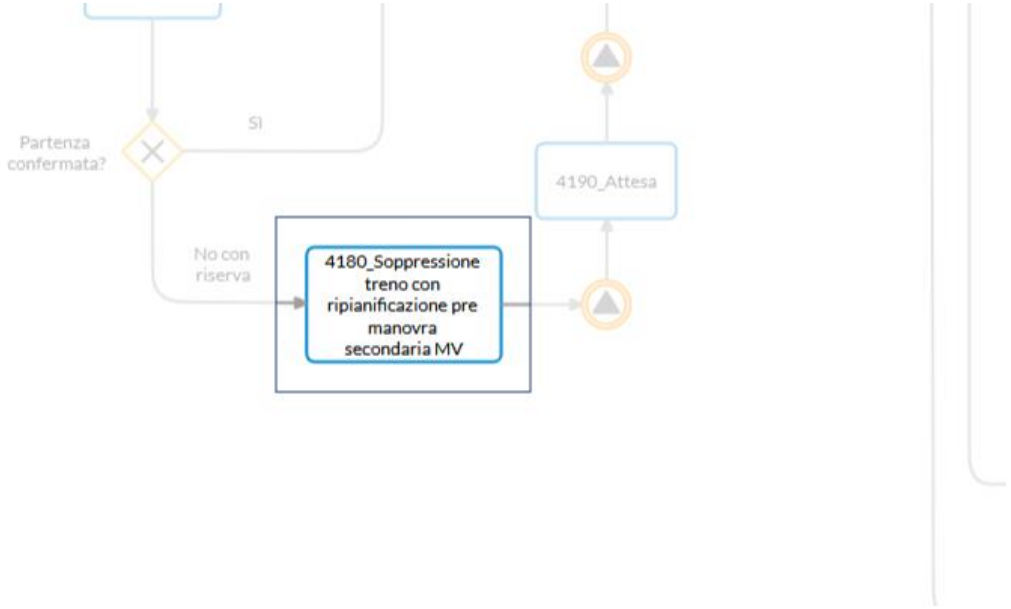


Una volta che il treno è giunto al varco, la Guardia di Finanza esegue la spunta del treno per verificare la regolarità del convoglio. Tempo, Varco, L

Incoming	Outgoing
TASK 3800_Movimento da Asta Lunga a varco 3	EXCLUSIVE GATEWAY Spunta varco regolare MVI?
TASK 3840_Modifica CH30 per unità inalterate MVI	
TASK 3850_Modifica CH30 per unità alterate MVI	

4180_Soppressione treno con ripianificazione pre manovra secondaria MV

TASK

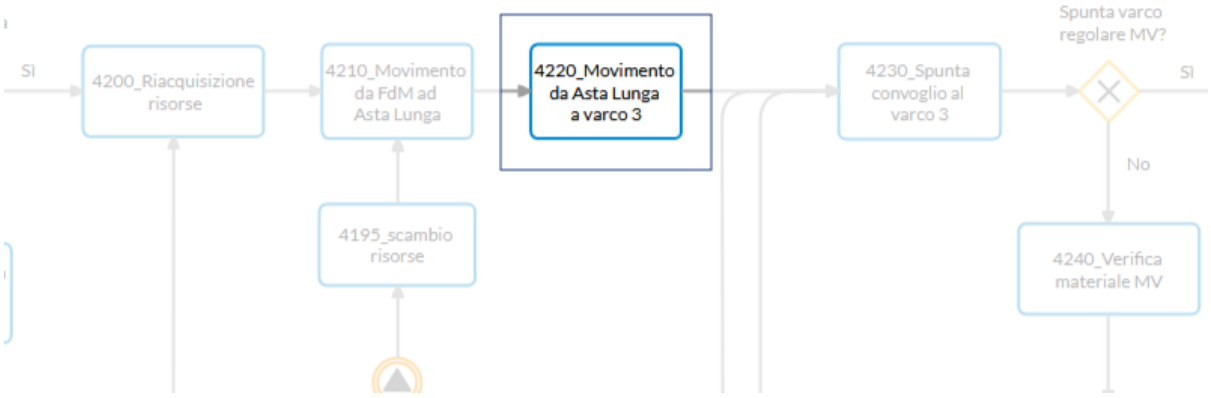


Se la partenza viene confermata con riserva, il treno viene soppresso e la sua partenza ripianificata.

Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through No con riserva	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_56a08414-225b-cfea-3e7d-ceef9d83f80e

4220_Movimento da Asta Lunga a varco 3

TASK

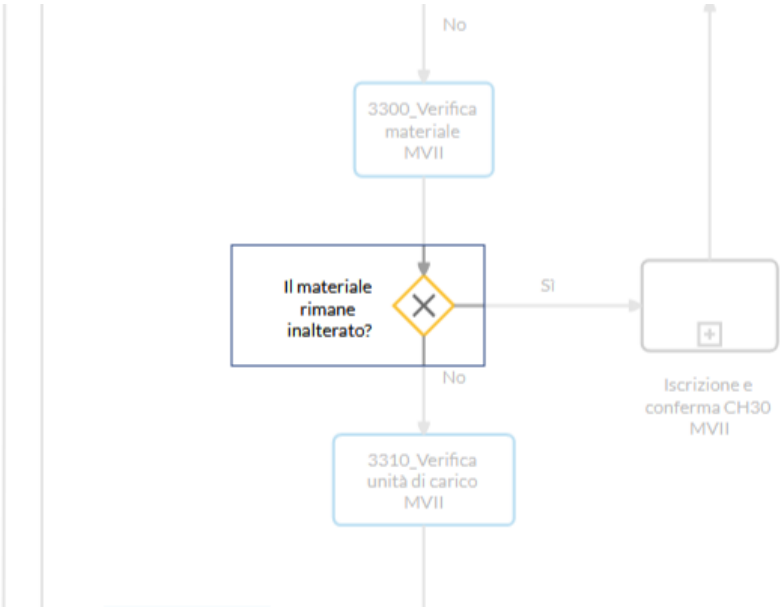


Se la manovra secondaria è unica, il Gestore Unico procede direttamente con la manovra secondaria.

Incoming	Outgoing
TASK 4210_Movimento da FdM ad Asta Lunga	TASK 4230_Spunta convoglio al varco 3

Il materiale rimane inalterato?

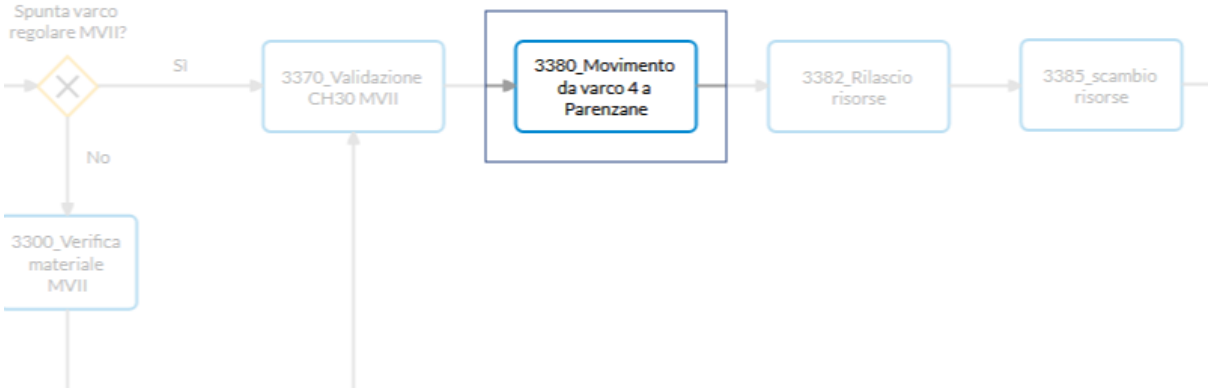
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3300_Verifica materiale MVII	SUBPROCESS Iscrizione e conferma CH30 MVII through Sì
	TASK 3310_Verifica unità di carico MVII through No

3380_Movimento da varco 4 a Parenzane

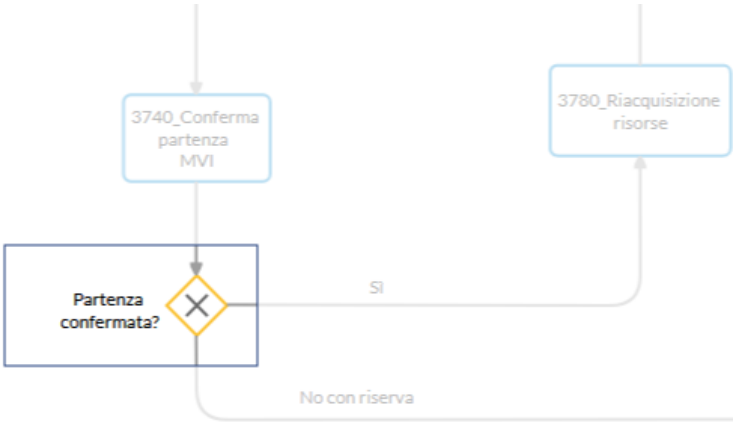
TASK



Incoming	Outgoing
TASK 3370_Validazione CH30 MVII	TASK 3382_Rilascio risorse

Partenza confermata?

EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3740_Conferma partenza MVI	TASK 3750_Soppressione treno con ripianificazione pre manovra secondaria MVI through No con riserva
	TASK 3780_Riacquisizione risorse through Sì

Spunta varco regolare MVI?

EXCLUSIVE GATEWAY

Incoming	Outgoing
TASK 3810_Spunta convoglio al varco 3	TASK 3820_Verifica materiale MVI through No
	TASK 3890_Validazione CH30 MVI through Sì

signalIntermediateThrowEvents_56a08414-225b-cfea-3e7d-ceef9d83f80e

SIGNAL INTERMEDIATE THROW EVENT

Incoming	Outgoing
TASK 4180_Soppressione treno con ripianificazione pre manovra secondaria MV	TASK 4190_Attesa

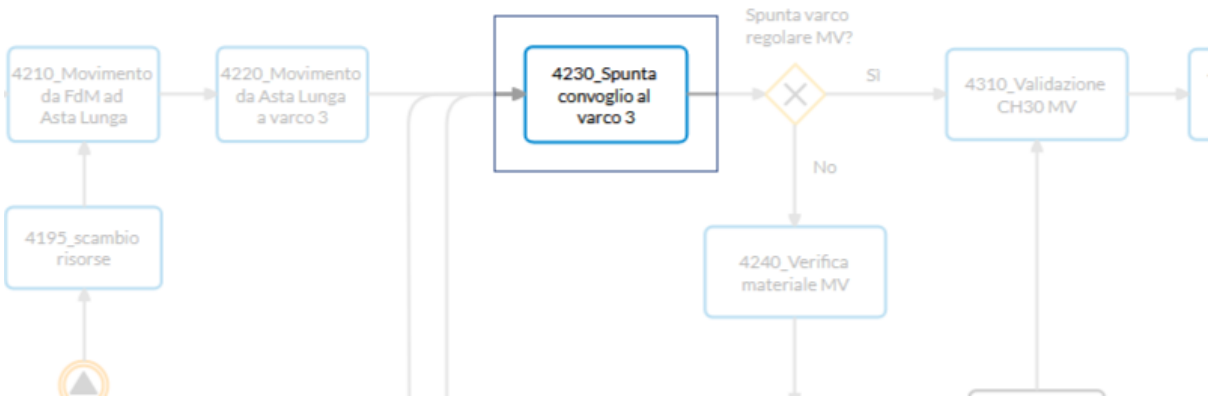
Attributes

SIGNAL REFERENCE

SgancioLM_ManovraSec_FdM

4230_Spunta convoglio al varco 3

TASK

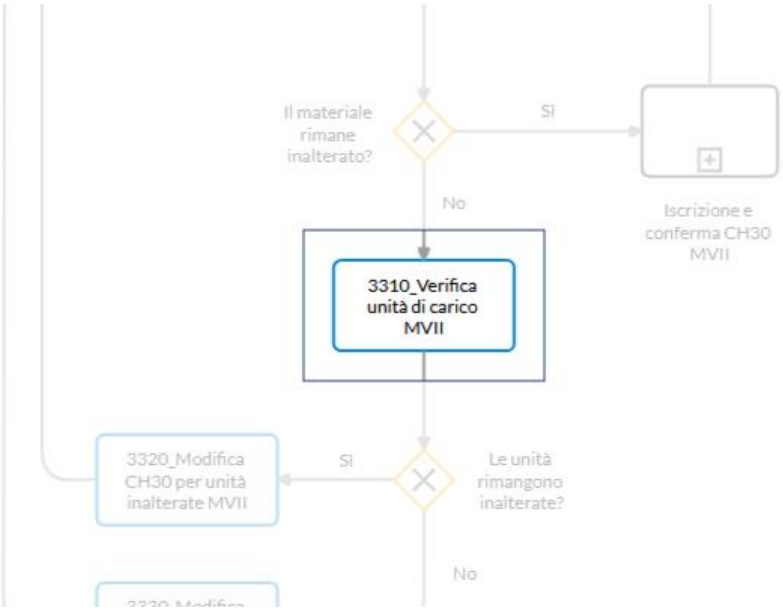


Una volta che il treno è giunto al varco, la Guardia di Finanza esegue la spunta del treno per verificare la regolarità del convoglio. Tempo, Varco, L

Incoming	Outgoing
TASK 4220_Movimento da Asta Lunga a varco 3	EXCLUSIVE GATEWAY Spunta varco regolare MV?
TASK 4260_Modifica CH30 per unità inalterate MV	
TASK 4270_Modifica CH30 per unità alterate MV	

3310_Verifica unità di carico MVII

TASK

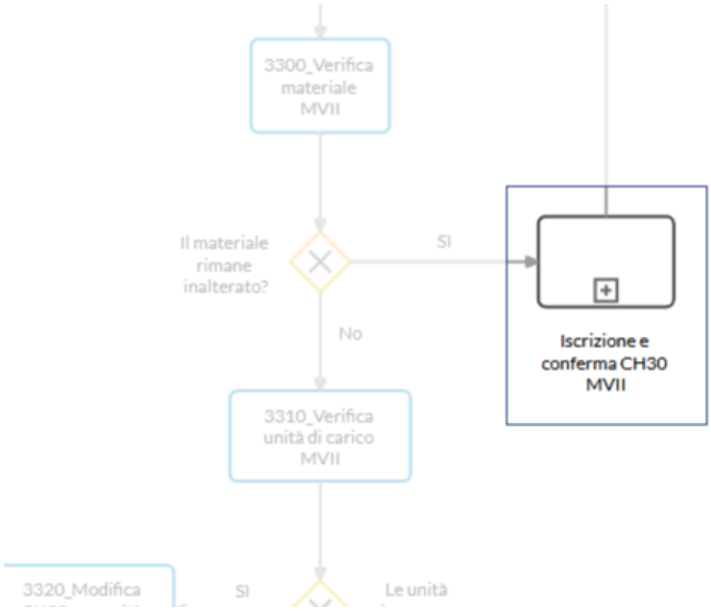


Nel caso in cui la verifica del materiale porti all'alterazione del materiale, la GdF prosegue con la verifica dell'unità di carico. Tempo, Varco, L

Incoming	Outgoing
EXCLUSIVE GATEWAY Il materiale rimane inalterato? through No	EXCLUSIVE GATEWAY Le unità rimangono inalterate?

Iscrizione e conferma CH30 MVII

SUBPROCESS



> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Il materiale rimane inalterato? through Sì	TASK 3370_Validazione CH30 MVII

For details on specific subprocess elements, go to the element chapter.

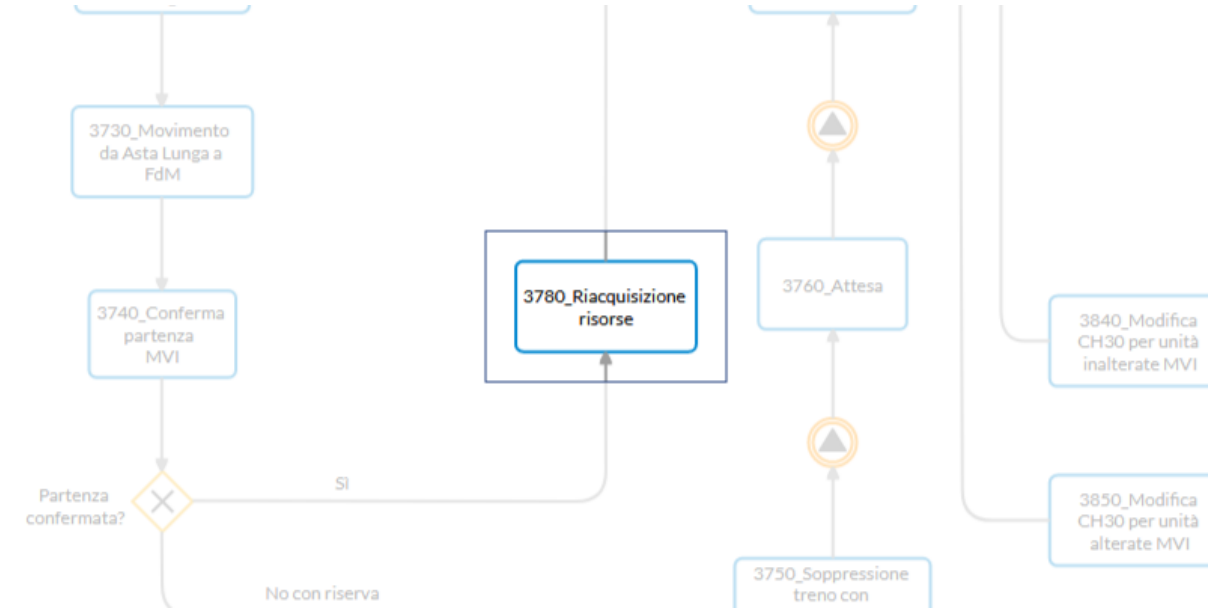
3382_Rilascio risorse

TASK

Incoming	Outgoing
TASK 3380_Movimento da varco 4 a Parenzane	TASK 3385_scambio risorse

3780_Riacquisizione risorse

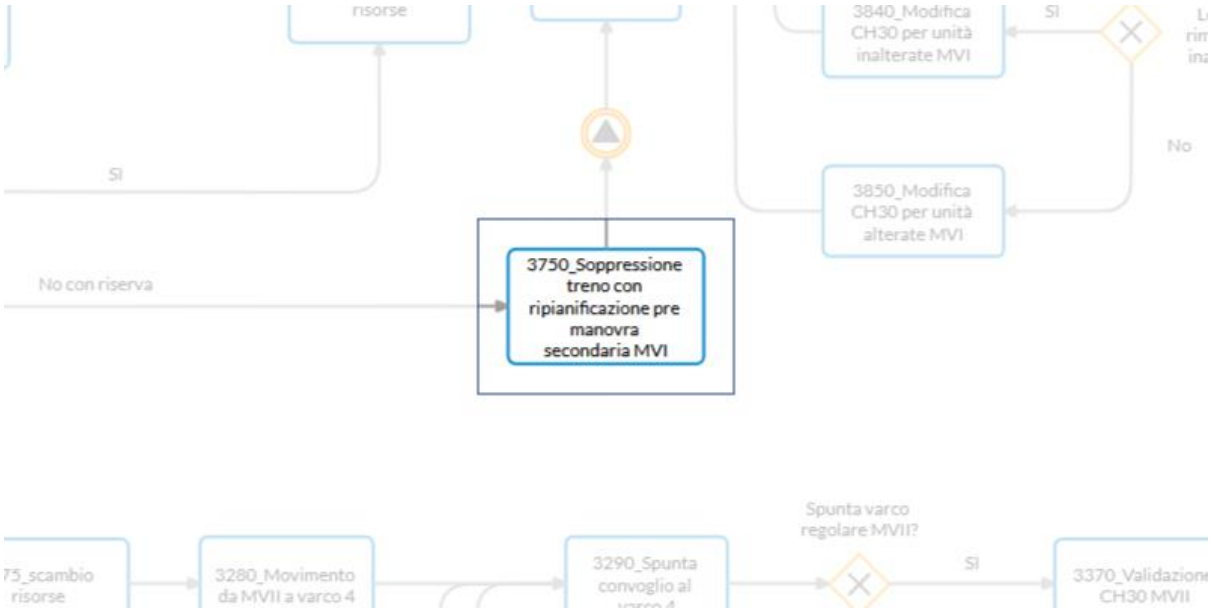
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through Sì	TASK 3766_Movimento da FdM a Asta Lunga

3750_Soppressione treno con ripianificazione pre manovra secondaria MVI

TASK

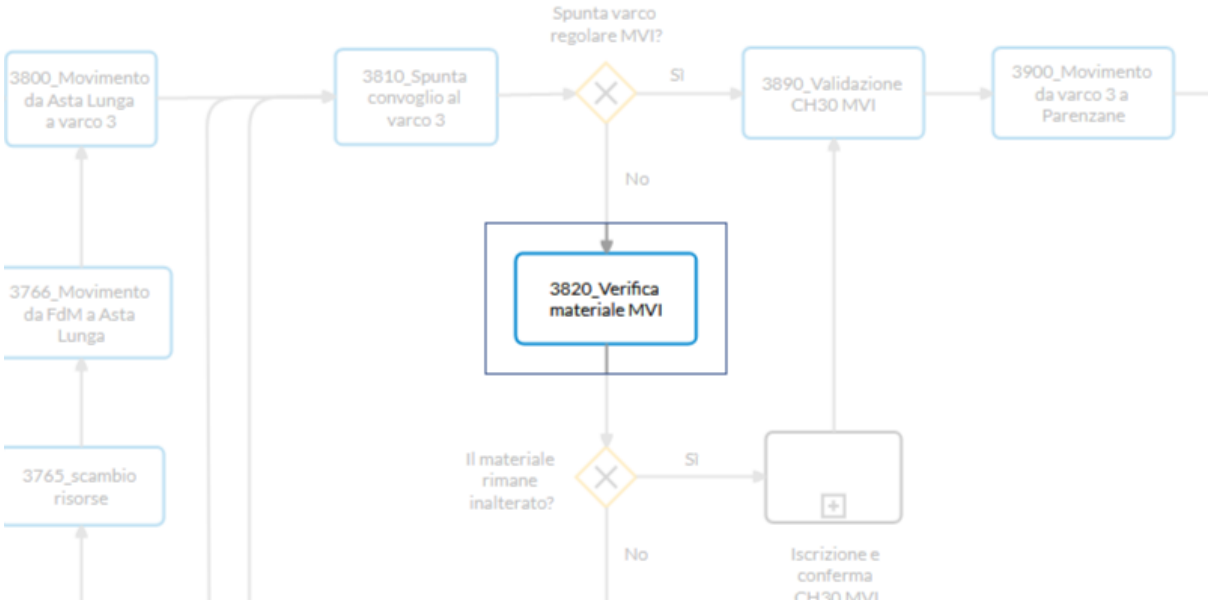


Se la partenza viene confermata con riserva, il treno viene soppresso e la sua partenza ripianificata.

Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through No con riserva	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_7c66150e-8583-634b-1abd-6cd5413c3c27

3820_Verifica materiale MVI

TASK

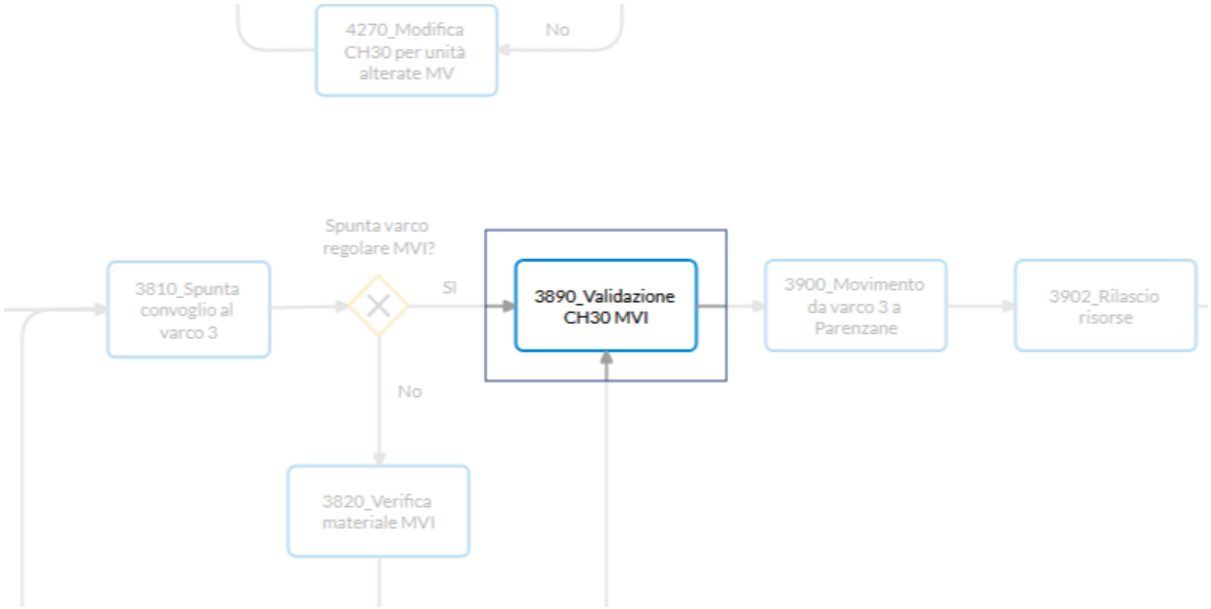


Se la spunta al varco non è regolare, la Guardia di Finanza deve proseguire con la verifica del materiale. Tempo, Varco, L

Incoming	Outgoing
EXCLUSIVE GATEWAY Spunta varco regolare MVI? through No	EXCLUSIVE GATEWAY Il materiale rimane inalterato?

3890_Validazione CH30 MVI

TASK



Se la spunta al varco è regolare, la Guardia di Finanza modifica il CH30 variandone lo stato da Confermato a Uscito. Tempo, Varco, L

Incoming	Outgoing
SUBPROCESS Iscrizione e conferma CH30 MVI	TASK 3900_Movimento da varco 3 a Parenzane
EXCLUSIVE GATEWAY Spunta varco regolare MVI? through Sì	

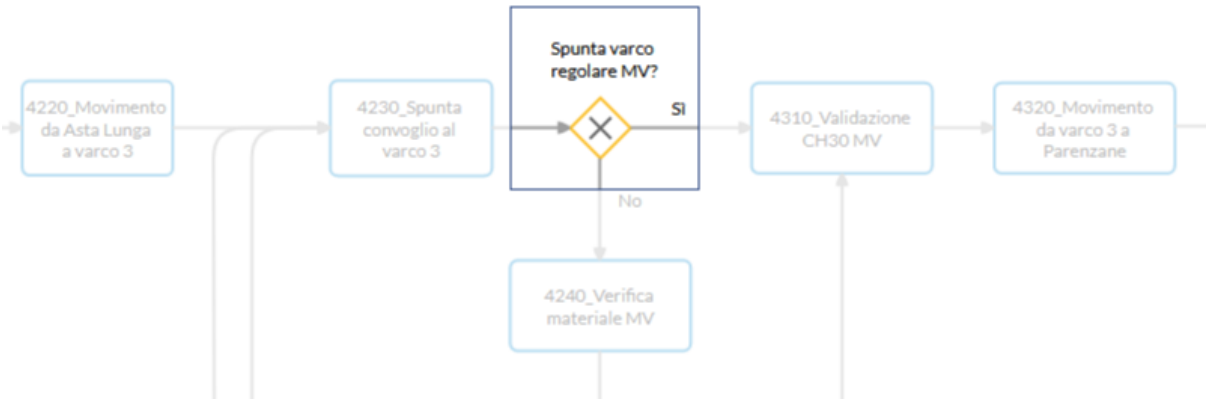
4190_Attesa

TASK

Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_56a08414-225b-cfea-3e7d-ceef9d83f80e	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_faf61ab8-b4c4-2b63-6640-064506199beb

Spunta varco regolare MV?

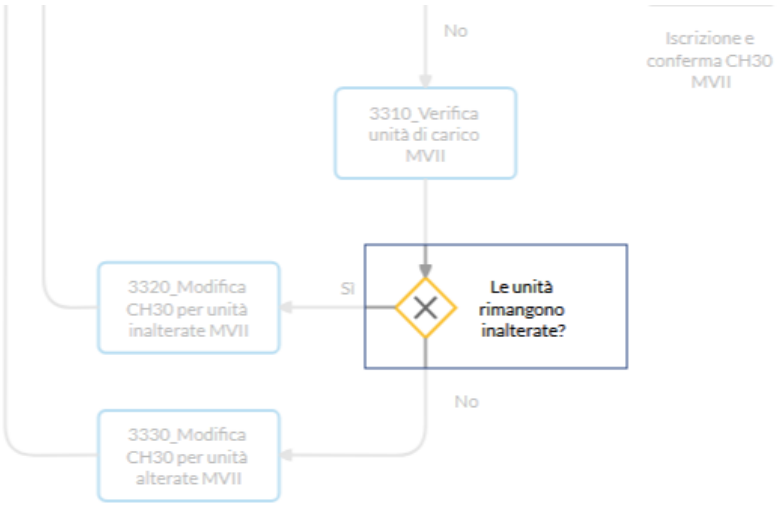
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 4230_Spunta convoglio al varco 3	TASK 4240_Verifica materiale MV through No
	TASK 4310_Validazione CH30 MV through Sì

Le unità rimangono inalterate?

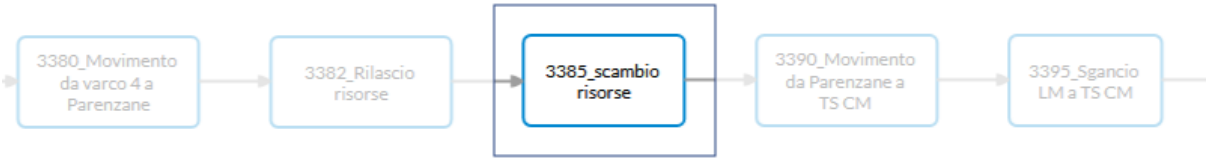
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3310_Verifica unità di carico MVII	TASK 3320_Modifica CH30 per unità inalterate MVII through Sì
	TASK 3330_Modifica CH30 per unità alterate MVII through No

3385_scambio risorse

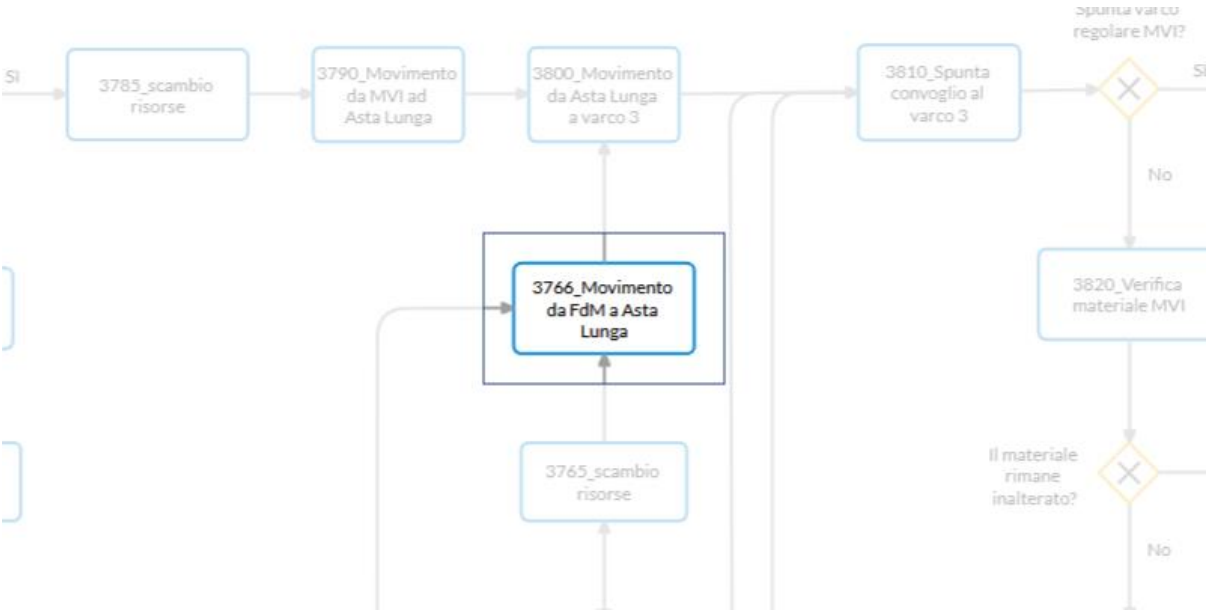
TASK



Incoming	Outgoing
TASK 3382_Rilascio risorse	TASK 3390_Movimento da Parenzane a TS CM

3766_Movimento da FdM a Asta Lunga

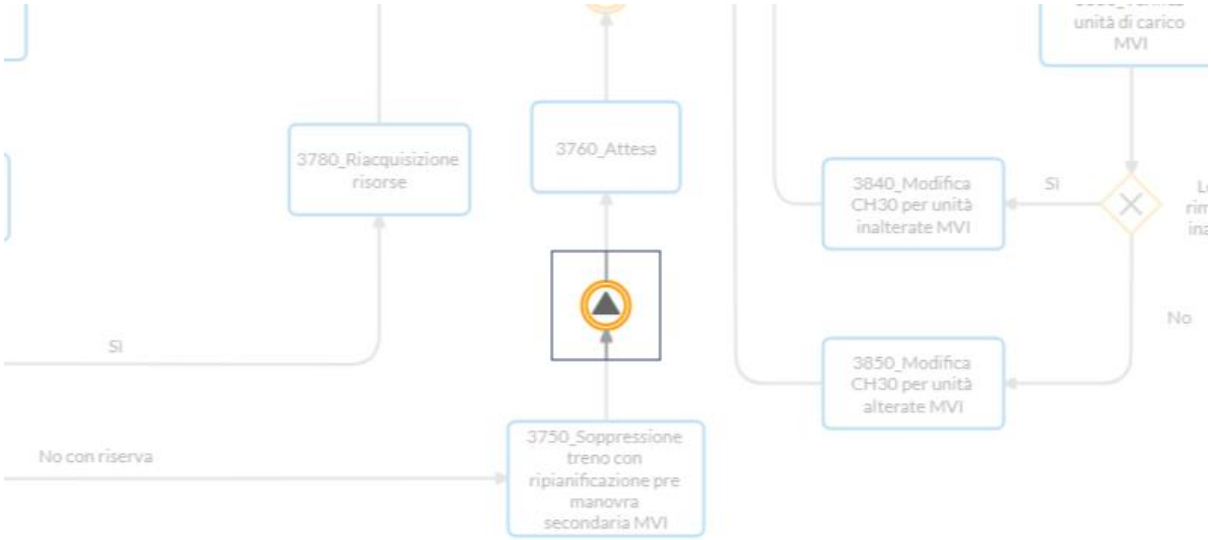
TASK



Incoming	Outgoing
TASK 3780_Riacquisizione risorse	TASK 3800_Movimento da Asta Lunga a varco 3
TASK 3765_scambio risorse	

signalIntermediateThrowEvents_7c66150e-8583-634b-1abd-6cd5413c3c27

SIGNAL INTERMEDIATE THROW EVENT



Incoming	Outgoing
TASK 3750_Soppressione treno con ripianificazione pre manovra secondaria MVI	TASK 3760_Attesa

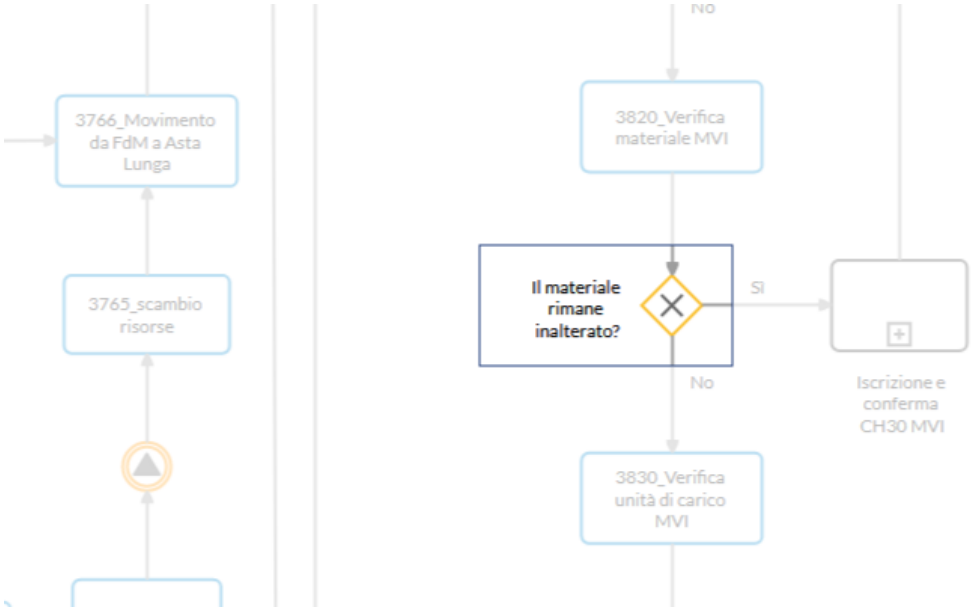
Attributes

SIGNAL REFERENCE

SgancioLM_ManovraSec_FdM

Il materiale rimane inalterato?

EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3820_Verifica materiale MVI	SUBPROCESS Iscrizione e conferma CH30 MVI through Sì
	TASK 3830_Verifica unità di carico MVI through No

3900_Movimento da varco 3 a Parenzane

TASK

Incoming	Outgoing
TASK 3890_Validazione CH30 MVI	TASK 3902_Rilascio risorse

signalIntermediateThrowEvents_faf61ab8-b4c4-2b63-6640-064506199beb

SIGNAL INTERMEDIATE THROW EVENT

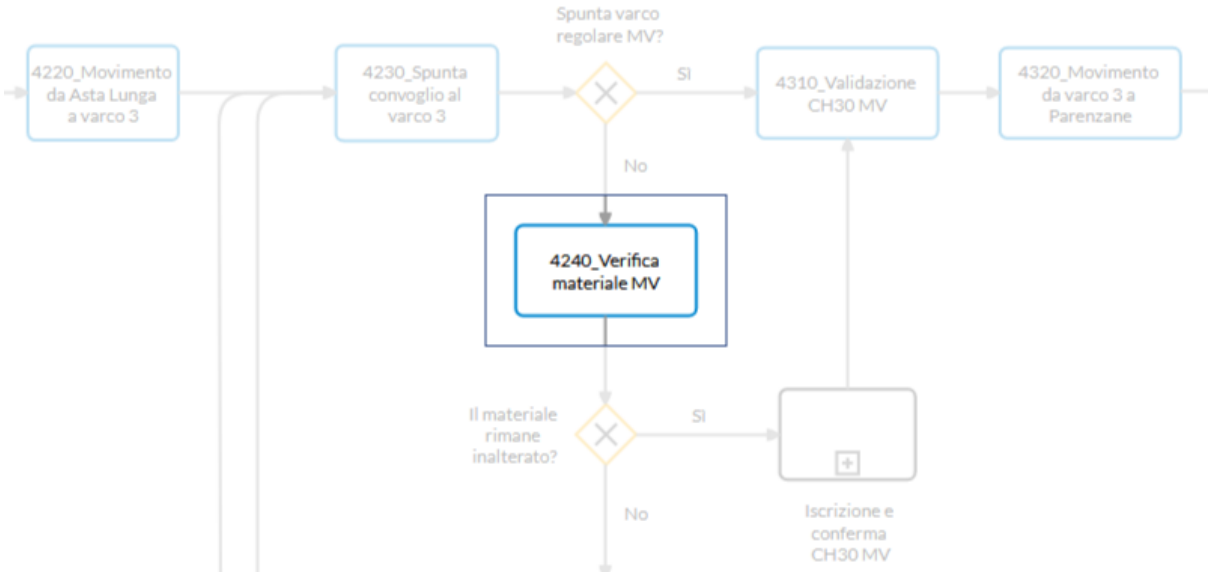
Incoming	Outgoing
TASK 4190_Attesa	TASK 4195_scambio risorse

Attributes

SIGNAL REFERENCE
RichiamoLM_ManovraSec_FdM

4240_Verifica materiale MV

TASK

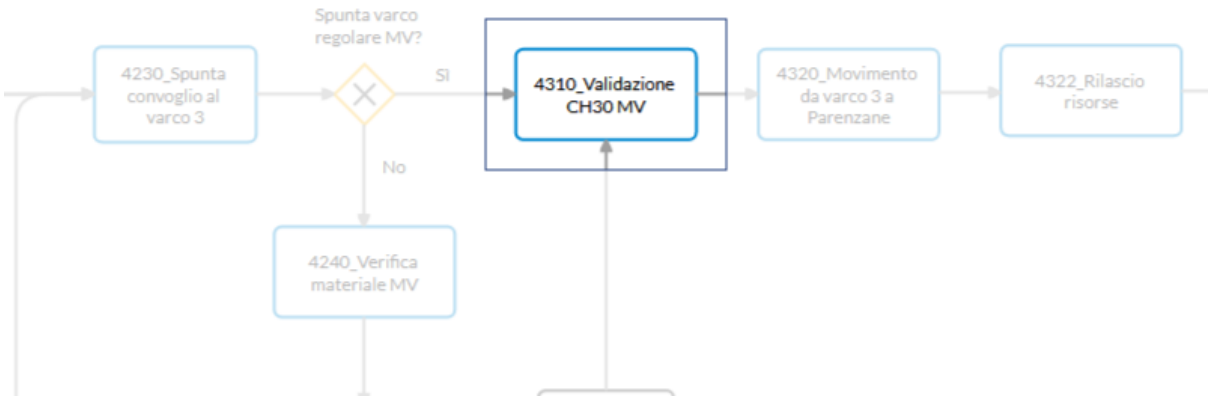


Se la spunta al varco non è regolare, la Guardia di Finanza deve proseguire con la verifica del materiale. Tempo, Varco, L

Incoming	Outgoing
EXCLUSIVE GATEWAY Spunta varco regolare MV? through No	EXCLUSIVE GATEWAY Il materiale rimane inalterato?

4310_Validazione CH30 MV

TASK

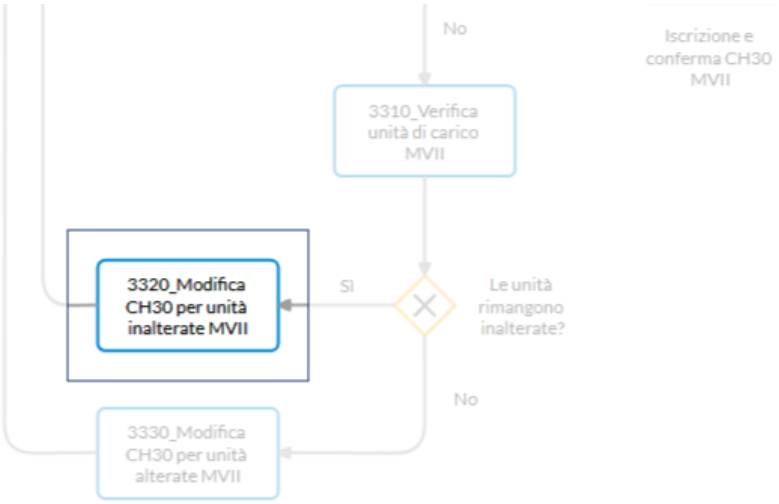


Se la spunta al varco è regolare, la Guardia di Finanza modifica il CH30 variandone lo stato da Confermato a Uscito. Tempo, Varco, L

Incoming	Outgoing
SUBPROCESS Iscrizione e conferma CH30 MV	TASK 4320_Movimento da varco 3 a Parenzane
EXCLUSIVE GATEWAY Spunta varco regolare MV? through Sì	

3320_Modifica CH30 per unità inalterate MVII

TASK

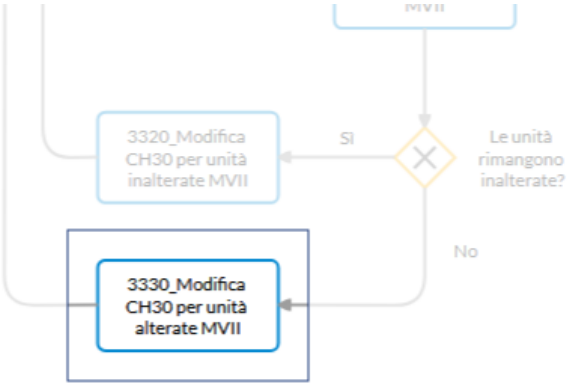


Nel caso di unità di carico inalterate, la dogana pone il CH30 nello stato Vistato.

Incoming	Outgoing
EXCLUSIVE GATEWAY Le unità rimangono inalterate? through Sì	TASK 3290_Spunta convoglio al varco 4

3330_Modifica CH30 per unità alterate MVII

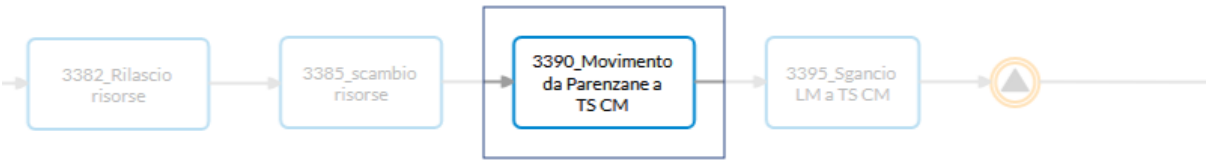
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Le unità rimangono inalterate? through No	TASK 3290_Spunta convoglio al varco 4

3390_Movimento da Parenzane a TS CM

TASK

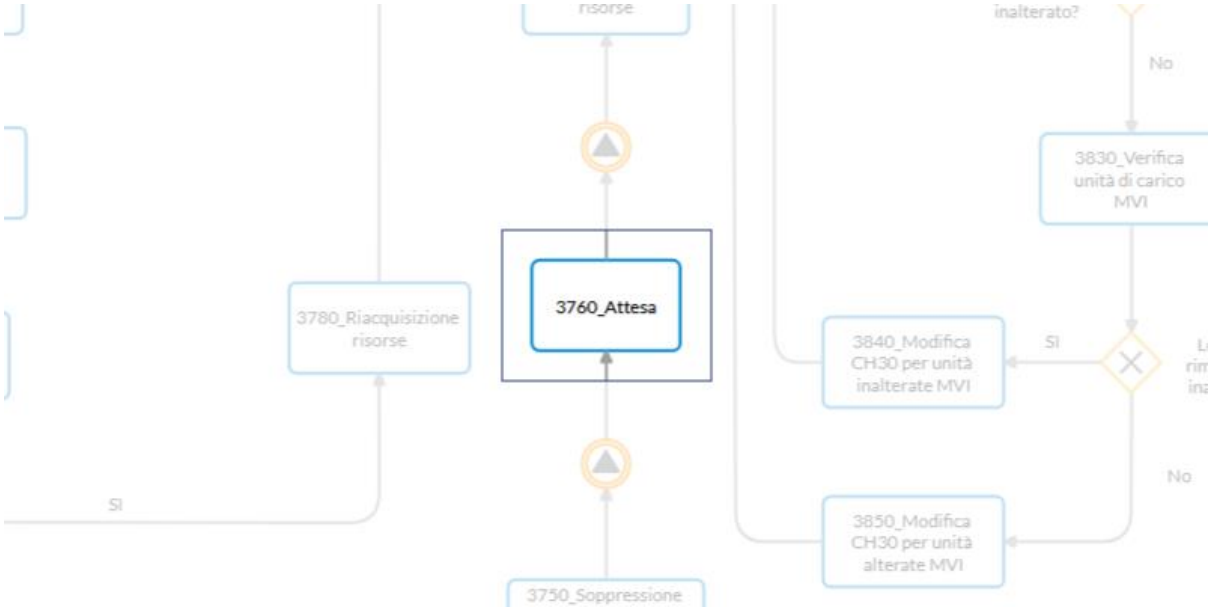


Una volta che la GdF pone il CH30 nello stato Uscito, il Gestore Unico può proseguire con la manovra primaria. Tempo, da Varco a Parenzane a CM, L

Incoming	Outgoing
TASK 3385_scambio risorse	TASK 3395_Sgancio LM a TS CM

3760_Attesa

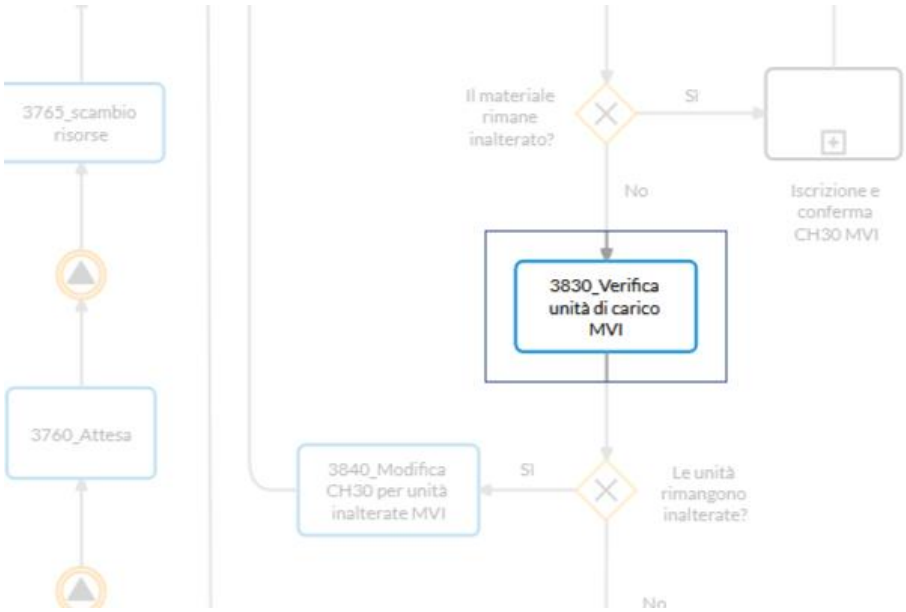
TASK



Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_7c66150e-8583-634b-1abd-6cd5413c3c27	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_c6ff1d9e-da63-333f-7185-d1af737ee83c

3830_Verifica unità di carico MVI

TASK

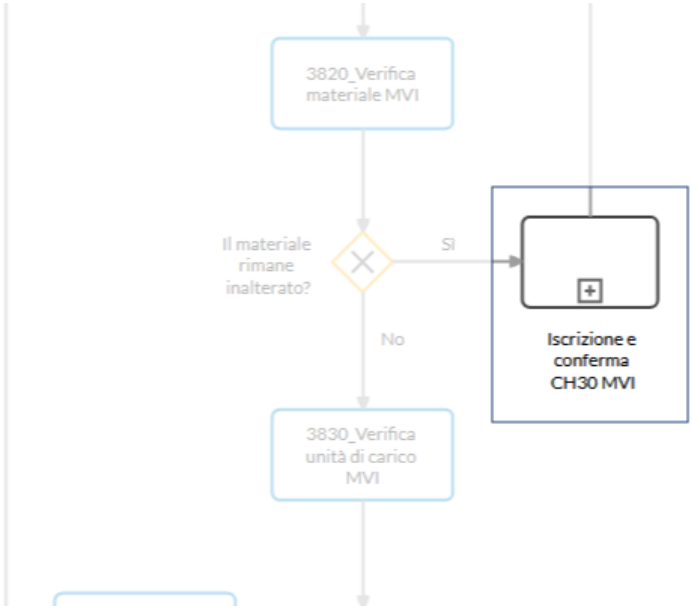


Nel caso in cui la verifica del materiale porti all'alterazione del materiale, la GdF prosegue con la verifica dell'unità di carico. Tempo, Varco, L

Incoming	Outgoing
EXCLUSIVE GATEWAY Il materiale rimane inalterato? through No	EXCLUSIVE GATEWAY Le unità rimangono inalterate?

Iscrizione e conferma CH30 MVI

SUBPROCESS



Se il materiale rimane inalterato l'autorità doganale prosegue con l'iscrizione e la conferma del CH30

Incoming	Outgoing
EXCLUSIVE GATEWAY Il materiale rimane inalterato? through Sì	TASK 3890_Validazione CH30 MVI

For details on specific subprocess elements, go to the element chapter.

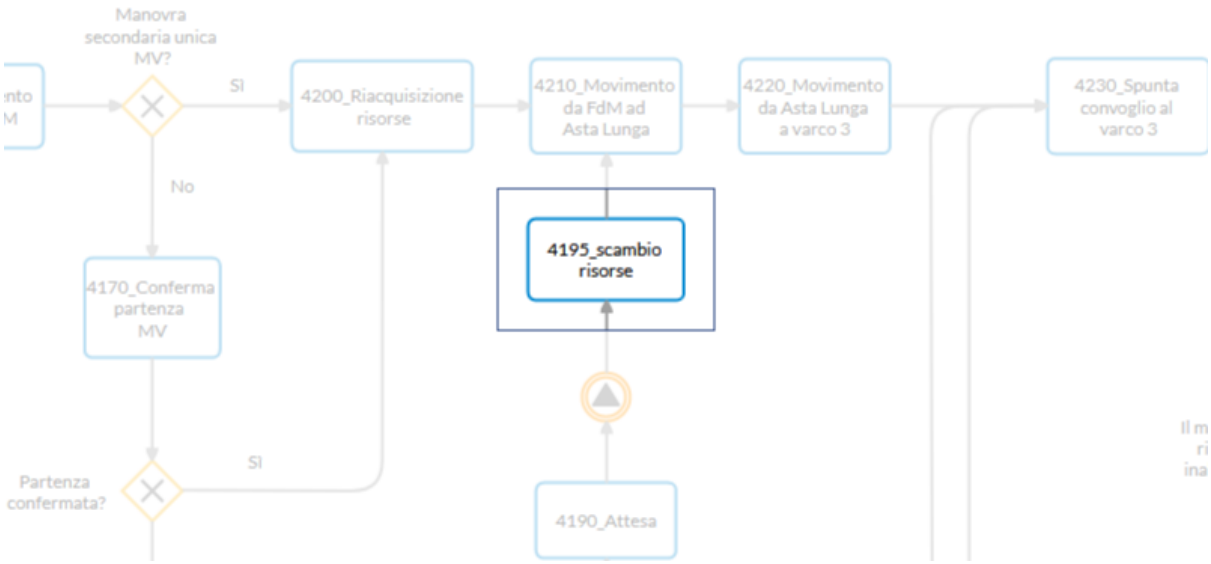
3902_Rilascio risorse

TASK

Incoming	Outgoing
TASK 3900_Movimento da varco 3 a Parenzane	TASK 3905_scambio risorse

4195_scambio risorse

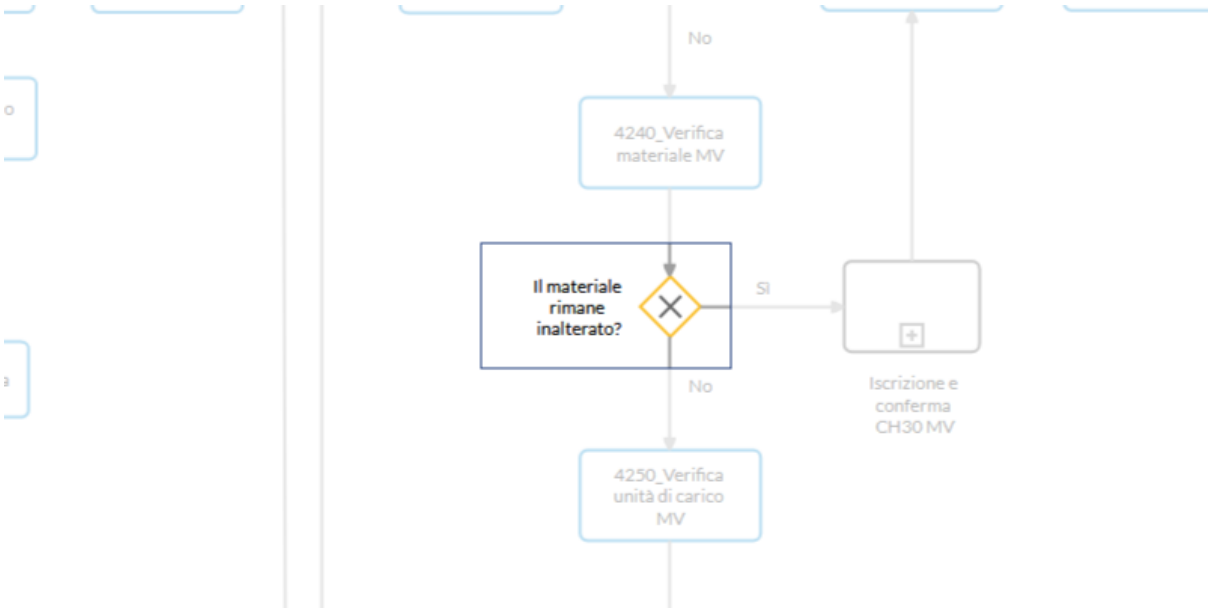
TASK



Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_faf61ab8-b4c4-2b63-6640-064506199beb	TASK 4210_Movimento da FdM ad Asta Lunga

Il materiale rimane inalterato?

EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 4240_Verifica materiale MV	SUBPROCESS Iscrizione e conferma CH30 MV through Sì
	TASK 4250_Verifica unità di carico MV through No

4320_Movimento da varco 3 a Parenzane

TASK

Incoming	Outgoing
TASK 4310_Validazione CH30 MV	TASK 4322_Rilascio risorse

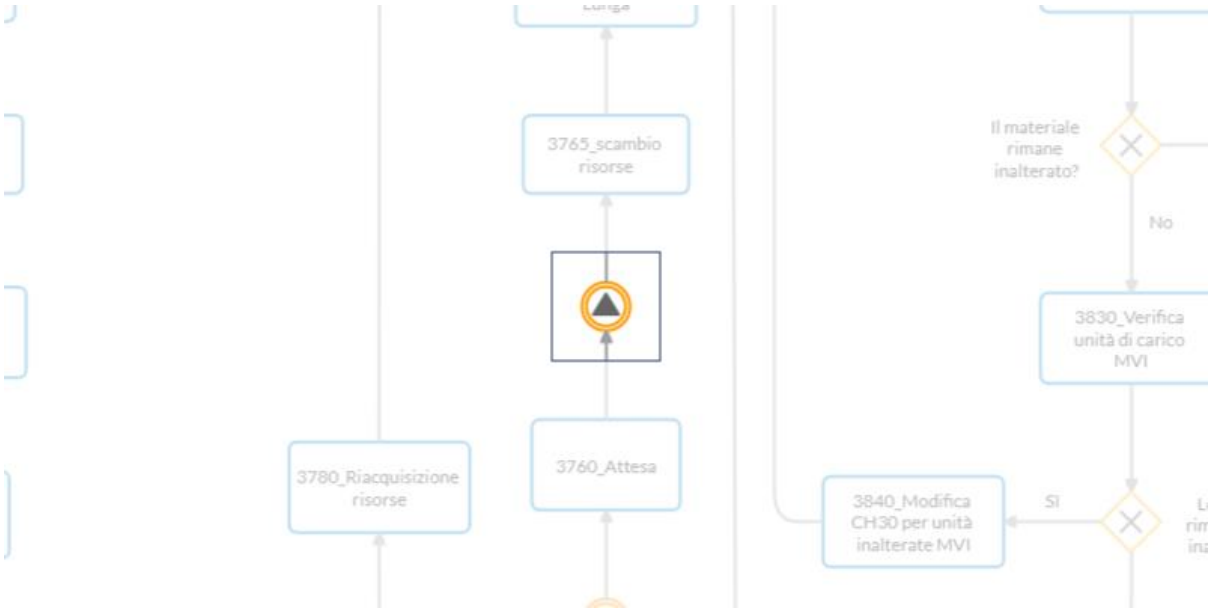
3395_Sgancio LM a TS CM

TASK

Incoming	Outgoing
TASK 3390_Movimento da Parenzane a TS CM	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_59c94689-279e-cef0-3390-46b91a0e834c

signalIntermediateThrowEvents_c6ff1d9e-da63-333f-7185-d1af737ee83c

SIGNAL INTERMEDIATE THROW EVENT



Incoming	Outgoing
TASK 3760_Attesa	TASK 3765_scambio risorse

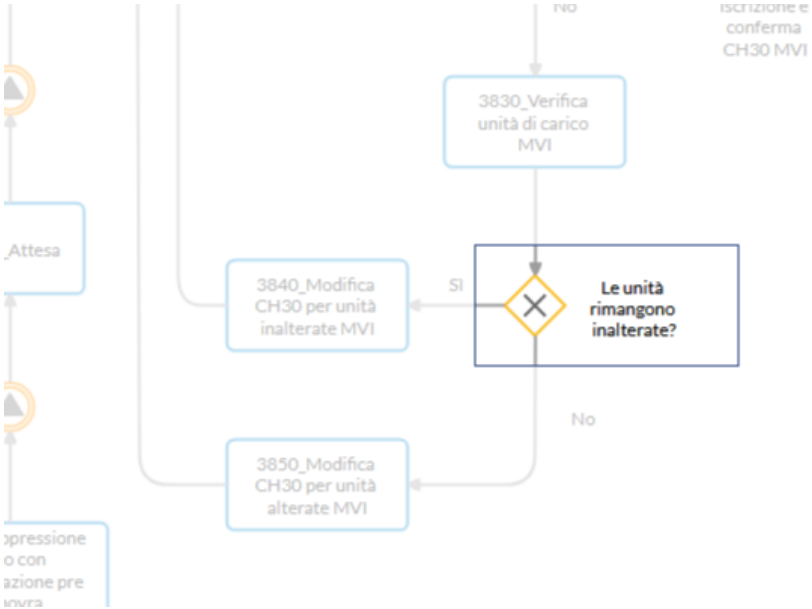
Attributes

SIGNAL REFERENCE

RichiamoLM_ManovraSec_FdM

Le unità rimangono inalterate?

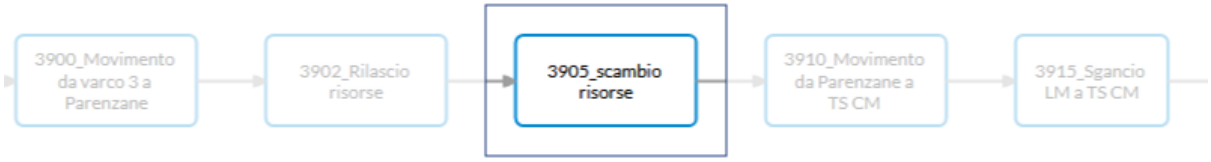
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3830_Verifica unità di carico MVI	TASK 3840_Modifica CH30 per unità inalterate MVI through Sì
	TASK 3850_Modifica CH30 per unità alterate MVI through No

3905_scambio risorse

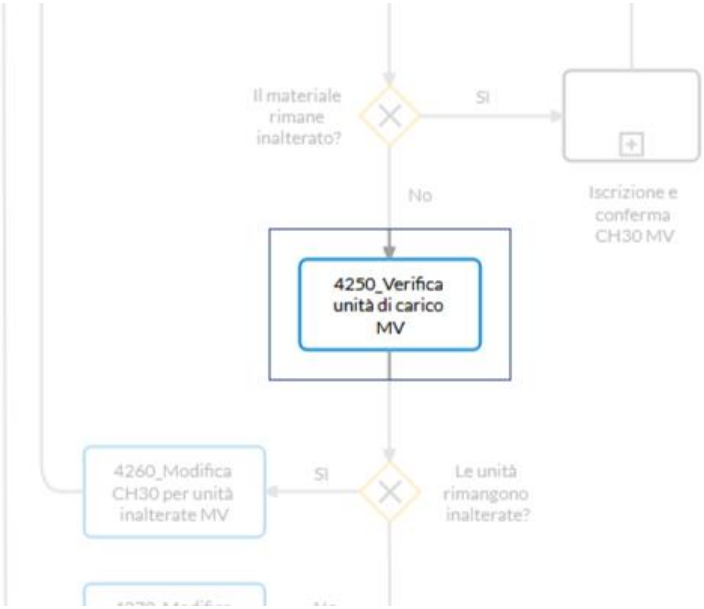
TASK



Incoming	Outgoing
TASK 3902_Rilascio risorse	TASK 3910_Movimento da Parenzane a TS CM

4250_Verifica unità di carico MV

TASK

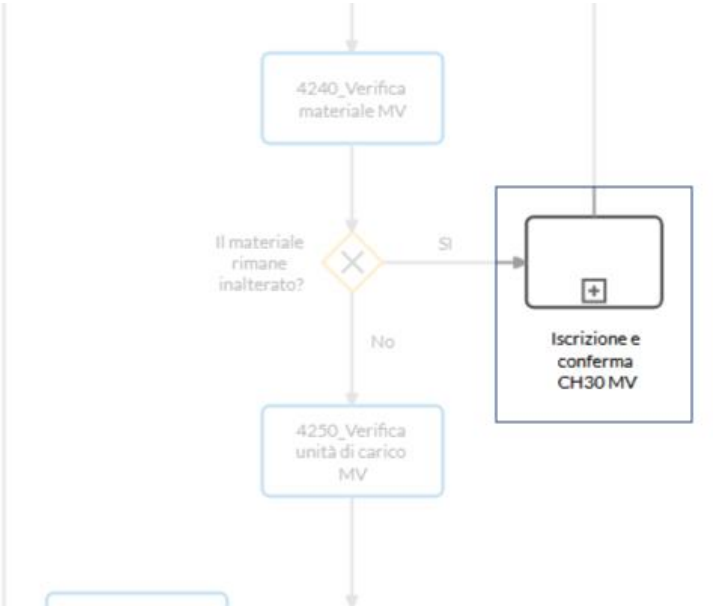


Nel caso in cui la verifica del materiale porti all'alterazione del materiale, la GdF prosegue con la verifica dell'unità di carico. Tempo, Varco, L

Incoming	Outgoing
EXCLUSIVE GATEWAY Il materiale rimane inalterato? through No	EXCLUSIVE GATEWAY Le unità rimangono inalterate?

Iscrizione e conferma CH30 MV

SUBPROCESS



Se il materiale rimane inalterato l'autorità doganale prosegue con l'iscrizione e la conferma del CH30

Incoming	Outgoing
EXCLUSIVE GATEWAY Il materiale rimane inalterato? through Sì	TASK 4310_Validazione CH30 MV

For details on specific subprocess elements, go to the element chapter.

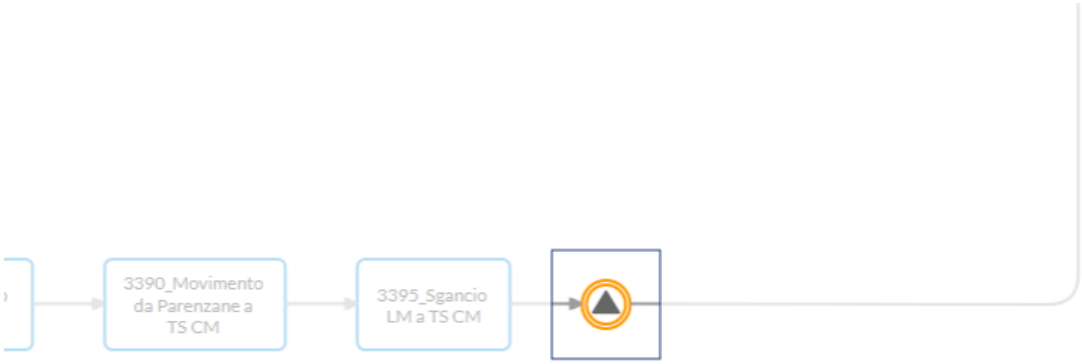
4322_Rilascio risorse

TASK

Incoming	Outgoing
TASK 4320_Movimento da varco 3 a Parenzane	TASK 4325_scambio risorse

signalIntermediateThrowEvents_59c94689-279e-cef0-3390-46b91a0e834c

SIGNAL INTERMEDIATE THROW EVENT



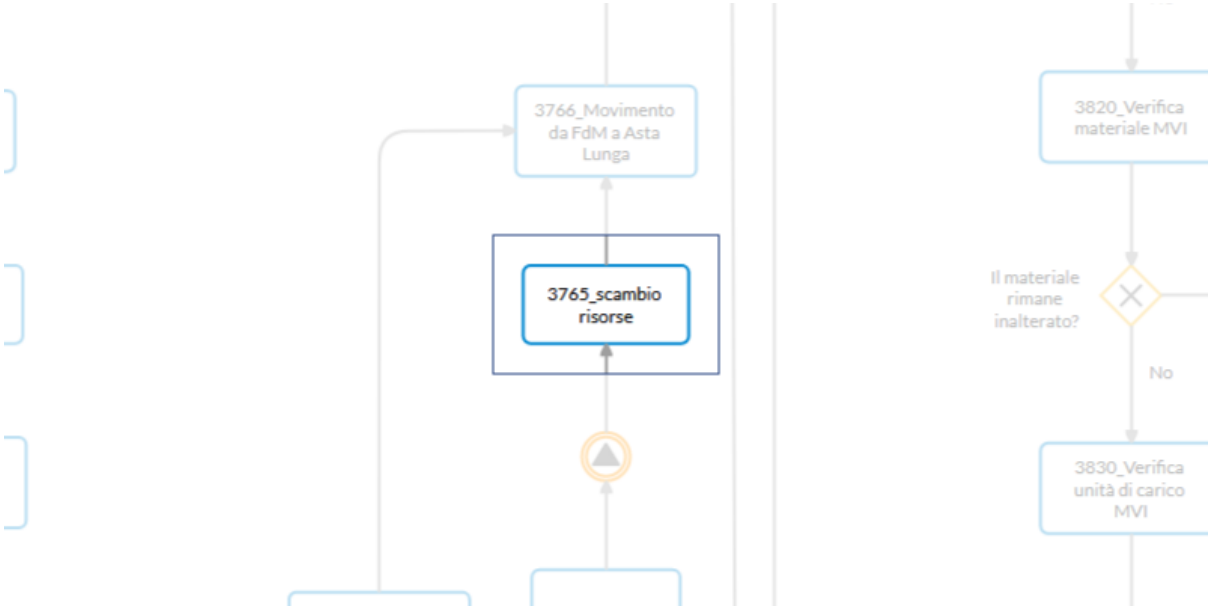
Incoming	Outgoing
TASK 3395_Sgancio LM a TS CM	TASK 3400_Consegna MaD 6a GU-IF

Attributes

SIGNAL REFERENCE
Sgancio_LM_CM

3765_scambio risorse

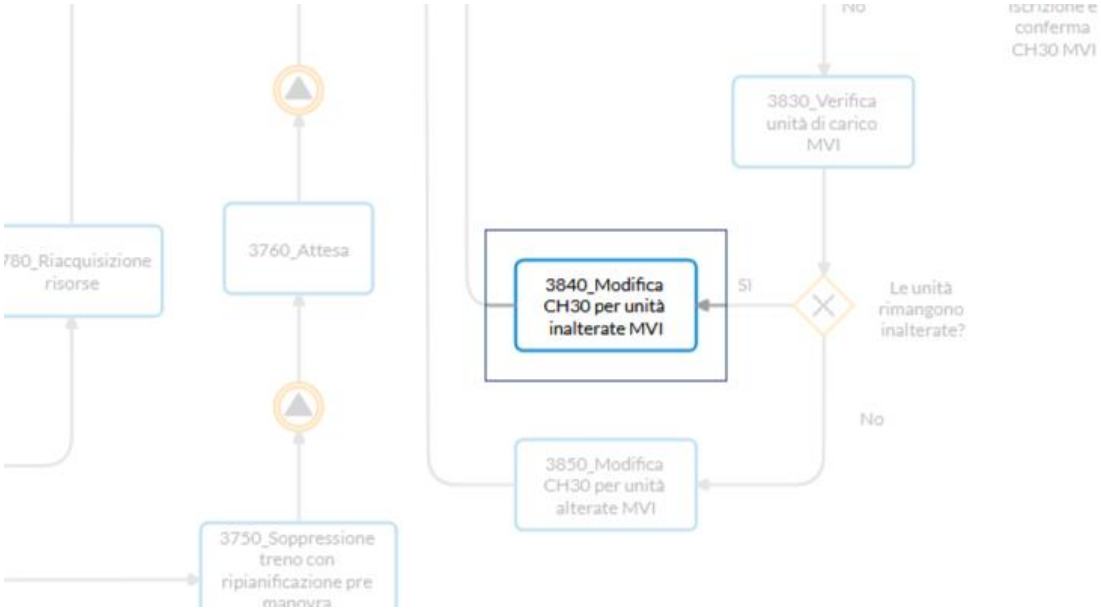
TASK



Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_c6ff1d9e-da63-333f-7185-d1af737ee83c	TASK 3766_Movimento da FdM a Asta Lunga

3840_Modifica CH30 per unità inalterate MVI

TASK

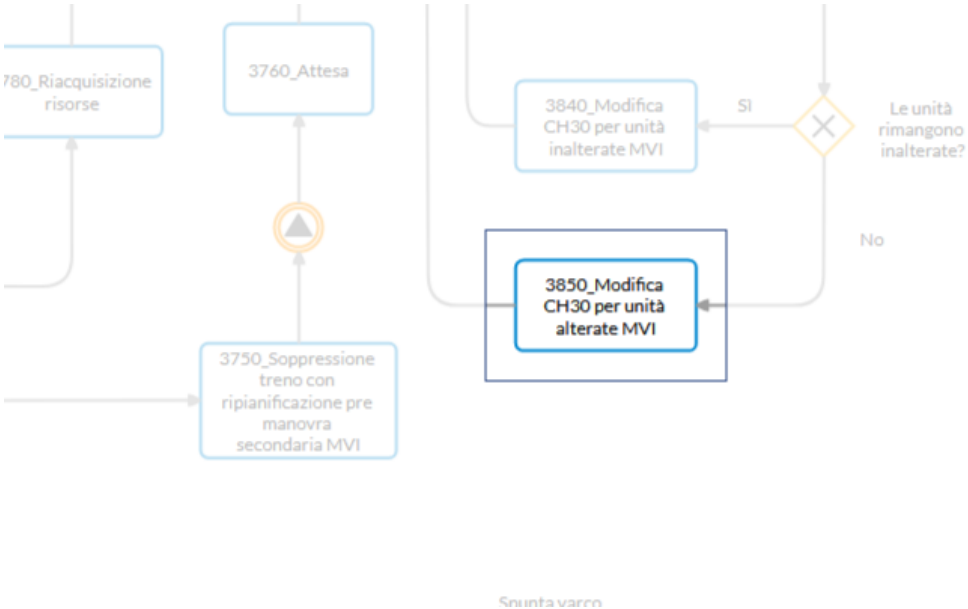


Nel caso di unità di carico inalterate, la dogana pone il CH30 nello stato Vistato.

Incoming	Outgoing
EXCLUSIVE GATEWAY Le unità rimangono inalterate? through Sì	TASK 3810_Spunta convoglio al varco 3

3850_Modifica CH30 per unità alterate MVI

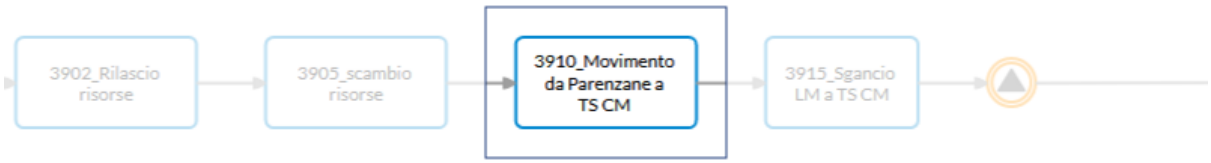
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Le unità rimangono inalterate? through No	TASK 3810_Spunta convoglio al varco 3

3910_Movimento da Parenzane a TS CM

TASK

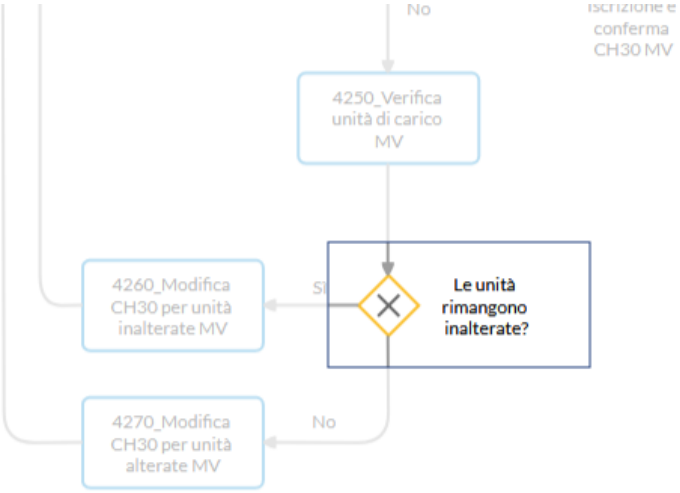


Una volta che la GdF pone il CH30 nello stato Uscito, il Gestore Unico può proseguire con la manovra primaria. Tempo, da Varco a Parenzane a CM, L

Incoming	Outgoing
TASK 3905_scambio risorse	TASK 3915_Sgancio LM a TS CM

Le unità rimangono inalterate?

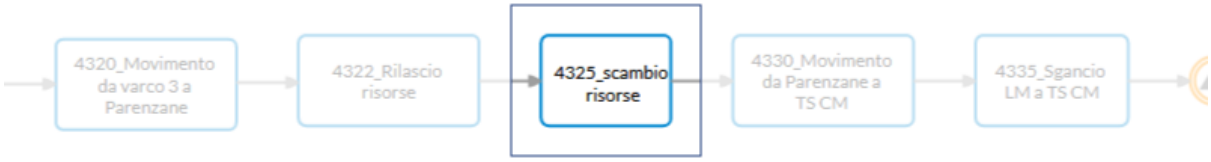
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 4250_Verifica unità di carico MV	TASK 4260_Modifica CH30 per unità inalterate MV through Sì
	TASK 4270_Modifica CH30 per unità alterate MV through No

4325_scambio risorse

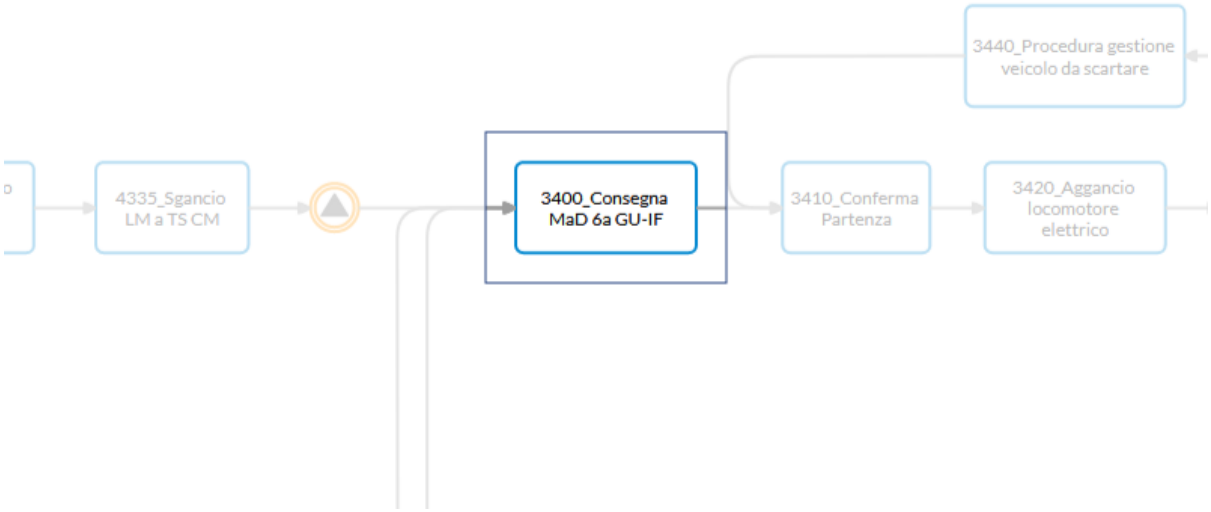
TASK



Incoming	Outgoing
TASK 4322_Rilascio risorse	TASK 4330_Movimento da Parenzane a TS CM

3400_Consegna MaD 6a GU-IF

TASK



Il Gestore Unico consegna la messa a disposizione (MaD 6a GU-IF). Tempo, CM

Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_59c94689-279e-cef0-3390-46b91a0e834c	TASK 3410_Conferma Partenza
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_ab16c17a-42de-9048-8ca8-2379b2565594	
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_599d8fcc-6d33-dbfc-3864-e0a3fdbafcdd	

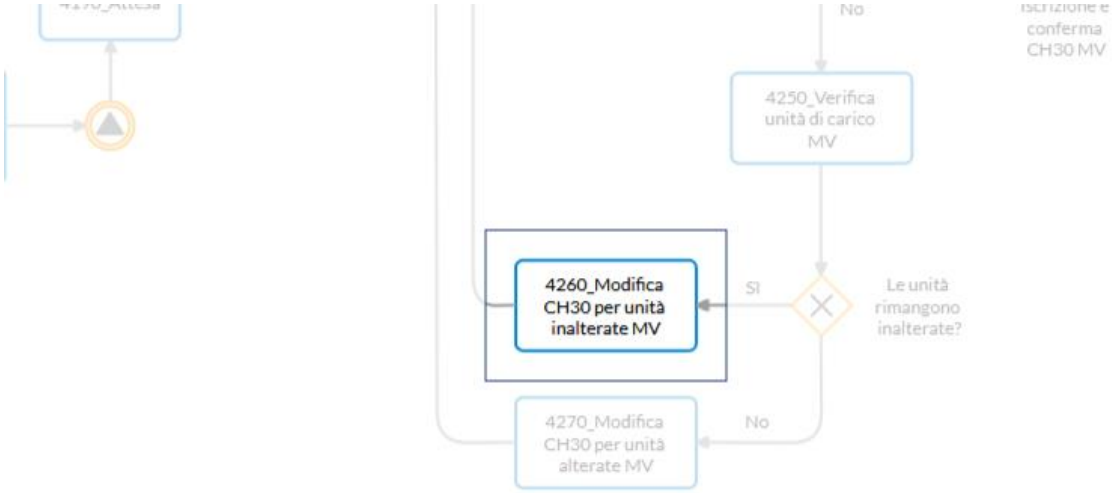
3915_Sgancio LM a TS CM

TASK

Incoming	Outgoing
TASK 3910_Movimento da Parenzane a TS CM	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_ab16c17a-42de-9048-8ca8-2379b2565594

4260_Modifica CH30 per unità inalterate MV

TASK

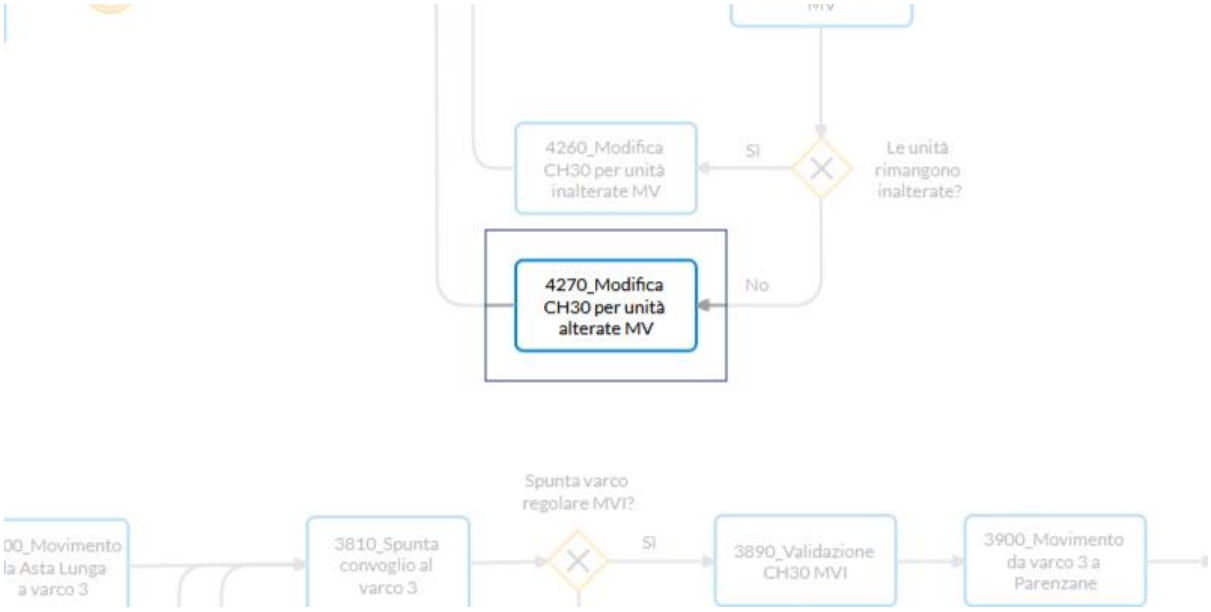


Nel caso di unità di carico inalterate, la dogana pone il CH30 nello stato Vistato.

Incoming	Outgoing
EXCLUSIVE GATEWAY Le unità rimangono inalterate? through Sì	TASK 4230_Spunta convoglio al varco 3

4270_Modifica CH30 per unità alterate MV

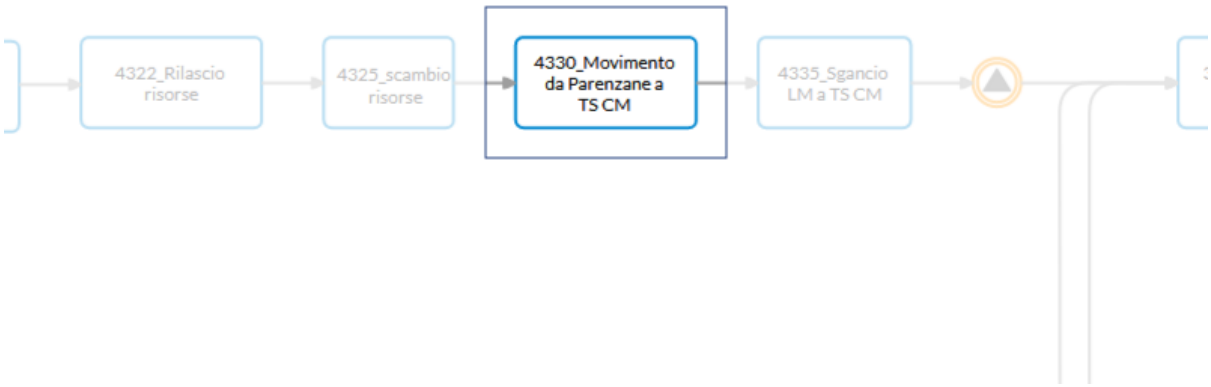
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Le unità rimangono inalterate? through No	TASK 4230_Spunta convoglio al varco 3

4330_Movimento da Parenzane a TS CM

TASK

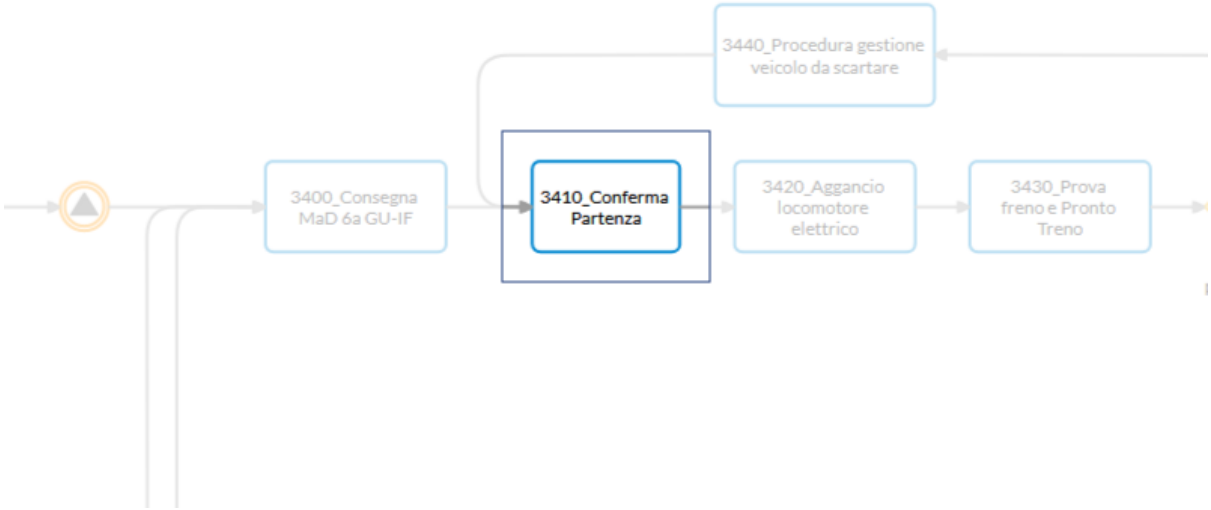


Una volta che la GdF pone il CH30 nello stato Uscito, il Gestore Unico può proseguire con la manovra primaria. Tempo, da Varco a Parenzane a CM, L

Incoming	Outgoing
TASK 4325_scambio risorse	TASK 4335_Sgancio LM a TS CM

3410_Conferma Partenza

TASK

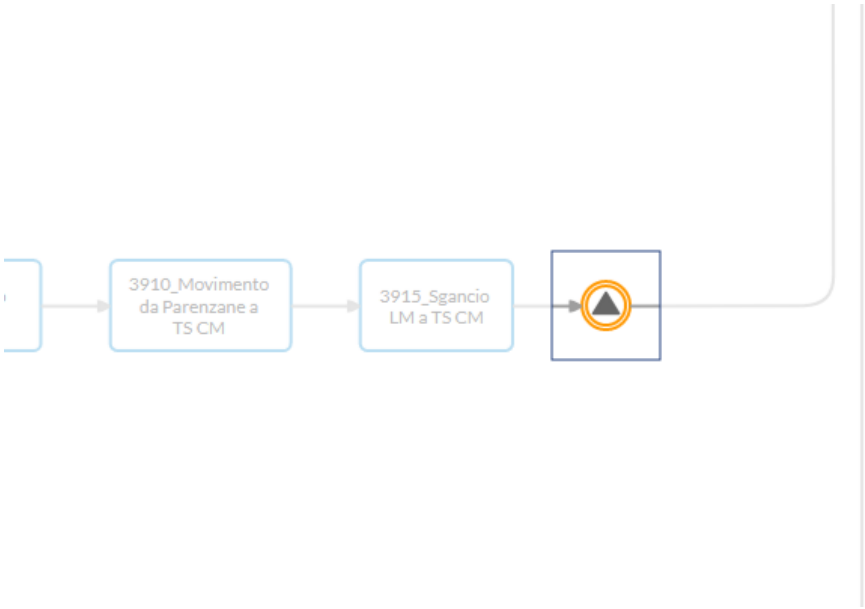


L'impresa ferroviaria deve confermare la partenza. Tempo, CM

Incoming	Outgoing
TASK 3400_Consegna MaD 6a GU-IF	TASK 3420_Aggancio locomotore elettrico
TASK 3440_Procedura gestione veicolo da scartare	

signalIntermediateThrowEvents_ab16c17a-42de-9048-8ca8-2379b2565594

SIGNAL INTERMEDIATE THROW EVENT



Incoming

TASK
3915_Sgancio LM a TS CM

Outgoing

TASK
3400_Consegna MaD 6a GU-IF

Attributes

SIGNAL REFERENCE
Sgancio_LM_CM

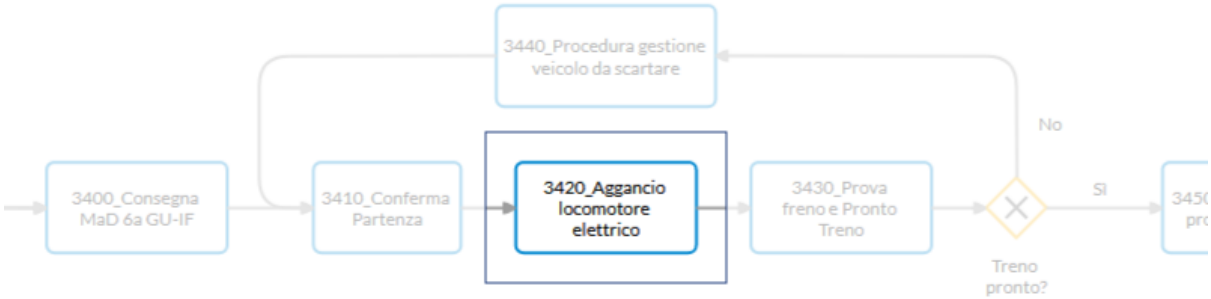
4335_Sgancio LM a TS CM

TASK

Incoming	Outgoing
TASK 4330_Movimento da Parenzane a TS CM	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_599d8fcc-6d33-dbfc-3864-e0a3fdbafcdd

3420_Aggancio locomotore elettrico

TASK

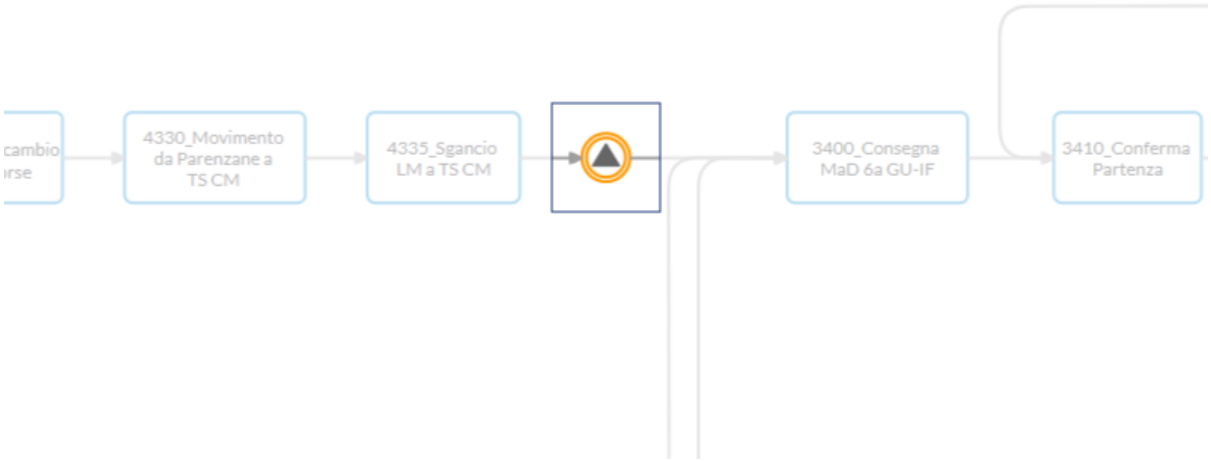


Se la partenza viene confermata dall'Impresa ferroviaria, la stessa aggancia il locomotore elettrico in testa. (Predisposizione istradamenti Adriafer ed IF) Tempo, CM

Incoming	Outgoing
TASK 3410_Conferma Partenza	TASK 3430_Prova freno e Pronto Treno

signalIntermediateThrowEvents_599d8fcc-6d33-dbfc-3864-e0a3fdbafcdd

SIGNAL INTERMEDIATE THROW EVENT



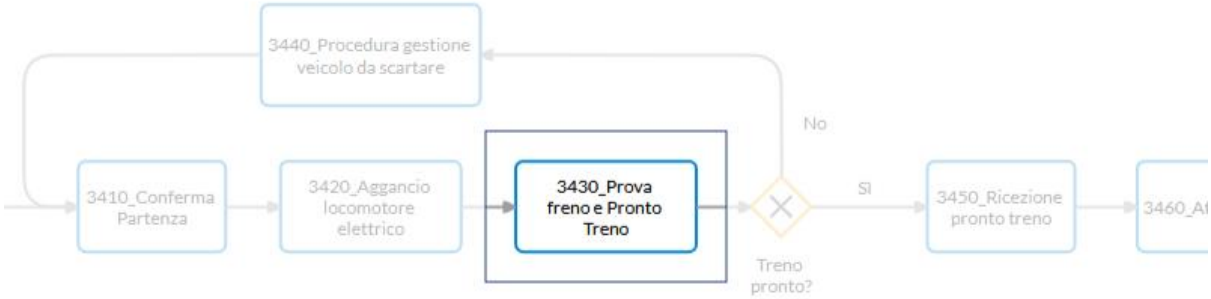
Incoming	Outgoing
TASK 4335_Sgancio LM a TS CM	TASK 3400_Consegna MaD 6a GU-IF

Attributes

SIGNAL REFERENCE
Sgancio_LM_CM

3430_Prova freno e Pronto Treno

TASK

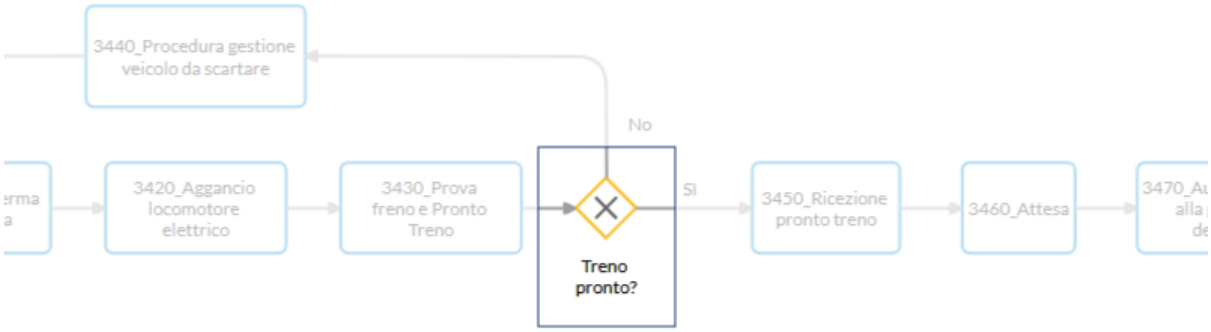


Vengono fatti i controlli dei freni tramite la prova freno Tipo A. In caso tutti i freni funzionino correttamente il treno è pronto; mentre se la prova freno da risultati negativi, i veicoli mal funzionanti vengono isolati e/o scartati. Tempo, CM

Incoming	Outgoing
TASK 3420_Aggancio locomotore elettrico	EXCLUSIVE GATEWAY Treno pronto?

Treno pronto?

EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3430_Prova freno e Pronto Treno	TASK 3450_Ricezione pronto treno through Sì
	TASK 3440_Procedura gestione veicolo da scartare through No

3440_Procedura gestione veicolo da scartare

TASK

Il Gestore Unico esegue la manovra per veicolo scartato.

Incoming	Outgoing
EXCLUSIVE GATEWAY Treno pronto? through No	TASK 3410_Conferma Partenza

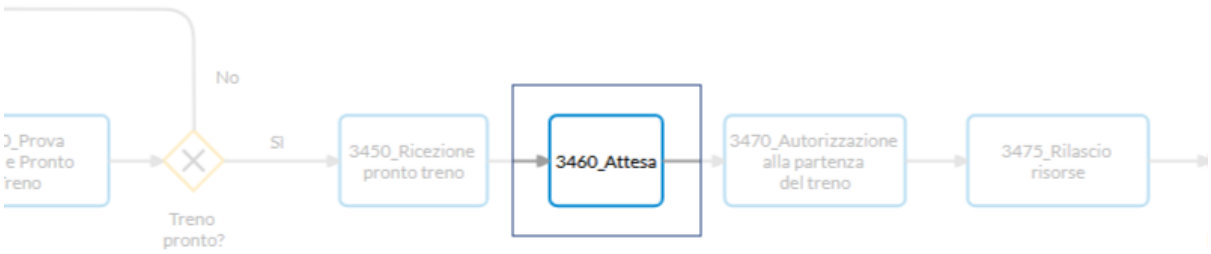
3450_Ricezione pronto treno

TASK

Incoming	Outgoing
EXCLUSIVE GATEWAY Treno pronto? through Sì	TASK 3460_Attesa

3460_Attesa

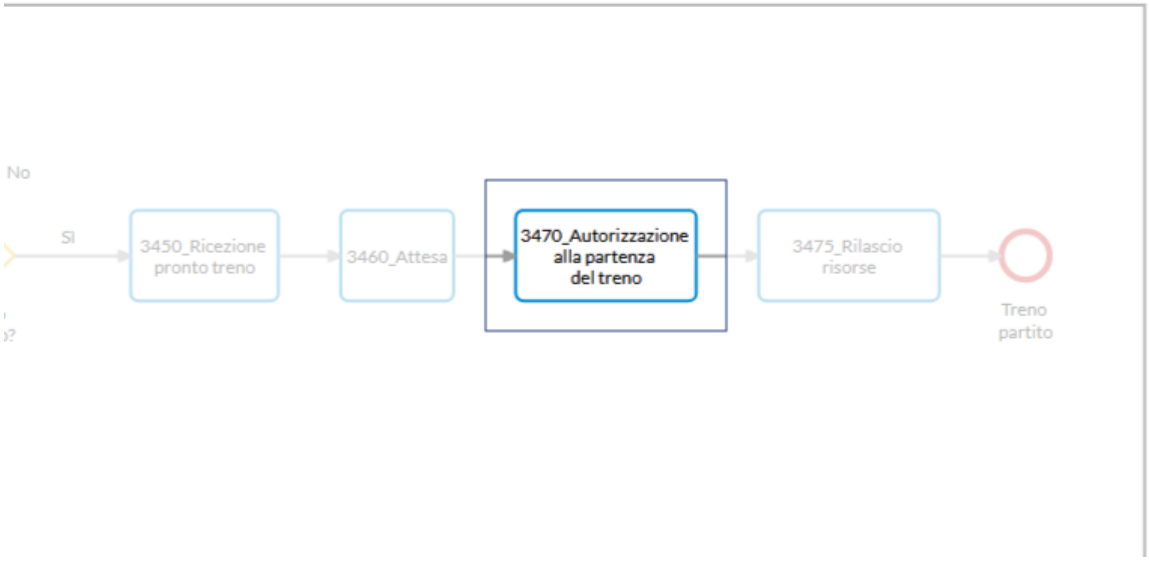
TASK



Incoming	Outgoing
TASK 3450_Ricezione pronto treno	TASK 3470_Autorizzazione alla partenza del treno

3470_Autorizzazione alla partenza del treno

TASK



Apertura Segnale Tempo, CM

Incoming	Outgoing
TASK 3460_Attesa	TASK 3475_Rilascio risorse

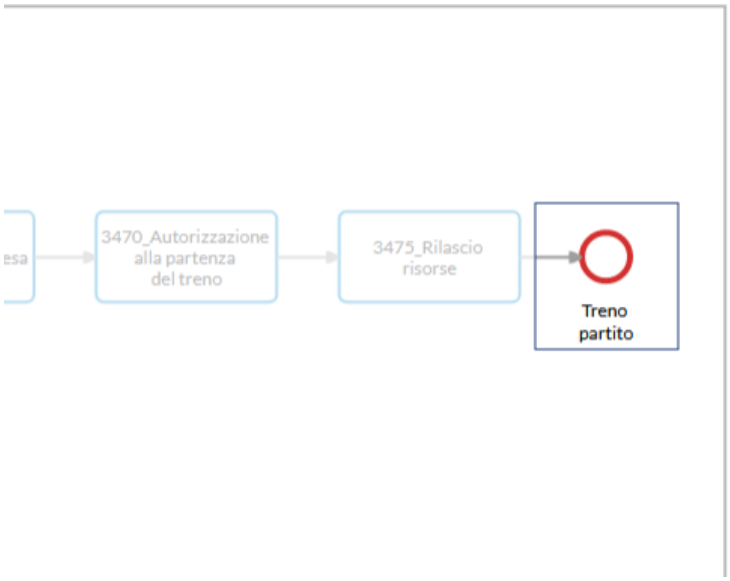
3475_Rilascio risorse

TASK

Incoming	Outgoing
TASK 3470_Autorizzazione alla partenza del treno	END EVENT Treno partito

Treno partito

END EVENT

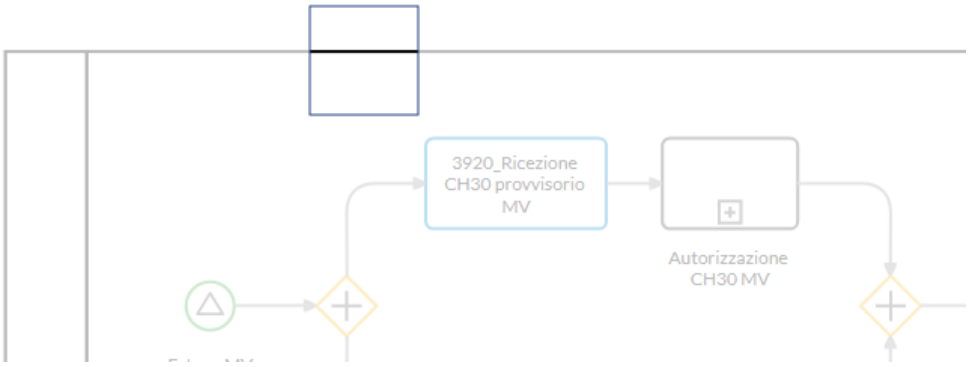


Incoming
TASK 3475_Rilascio risorse

1.1.1.1. Subprocess: Pre-verifica MV

startEvents_fd2a5f99-3db4-2dd2-c28a-554942a5379e

START EVENT

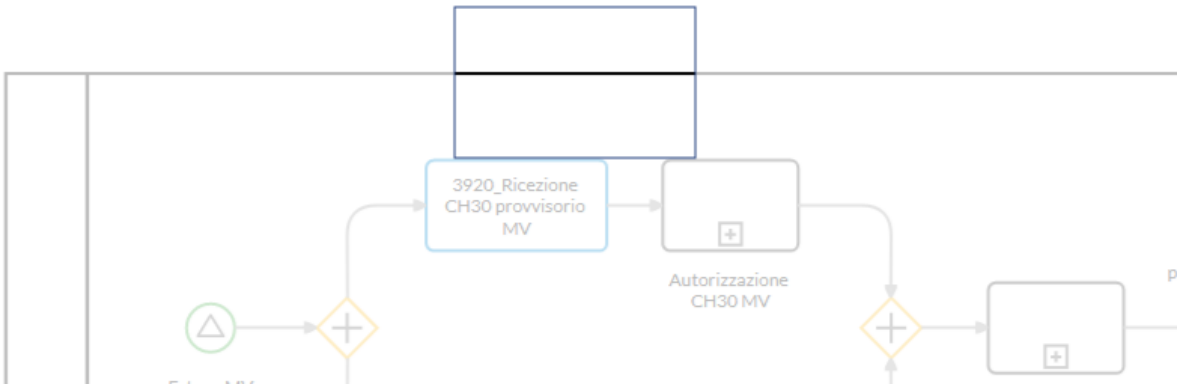


Outgoing

TASK
3990_Pre-verifica materiale rotabile

3990_Pre-verifica materiale rotabile

TASK



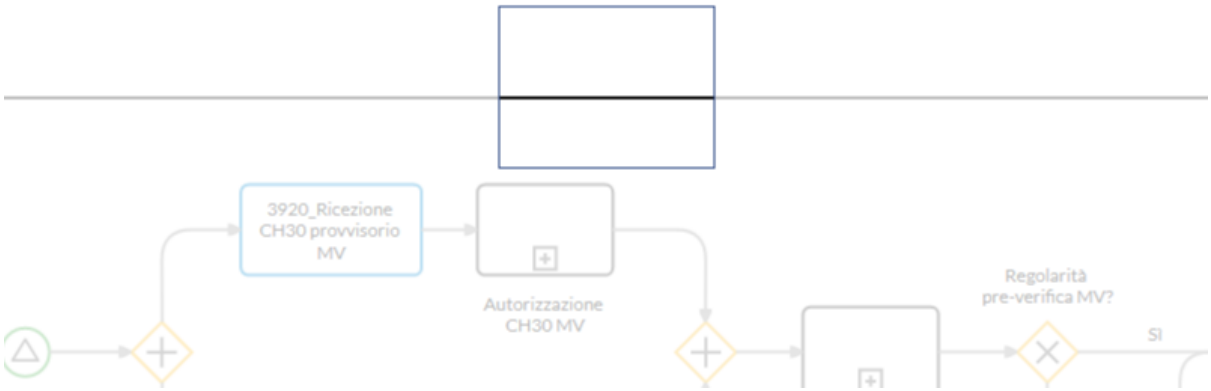
L’impresa ferroviaria prosegue con la pre-verifica del materiale rotabile.

> 1 min;

Incoming	Outgoing
START EVENT startEvents_fd2a5f99-3db4-2dd2-c28a-554942a5379e	EXCLUSIVE GATEWAY Pre-verifica regolare?

Pre-verifica regolare?

EXCLUSIVE GATEWAY

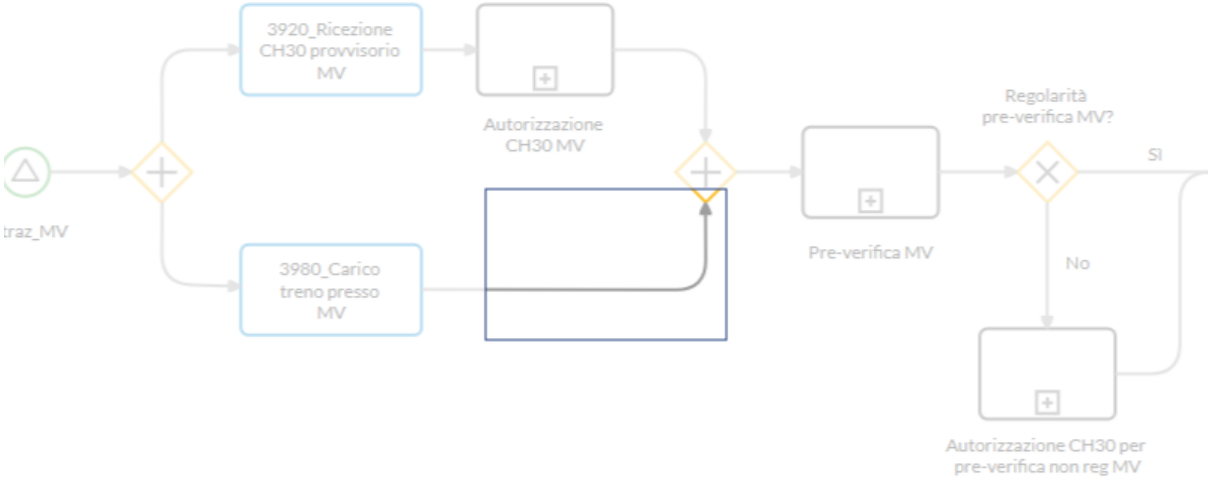


> Sì 100% - No 0%

Incoming	Outgoing
TASK 3990_Pre-verifica materiale rotabile	TASK 4000_Verifica unità di carico through No
	END EVENT Treno pronto per estrazione through Sì

4000_Verifica unità di carico

TASK



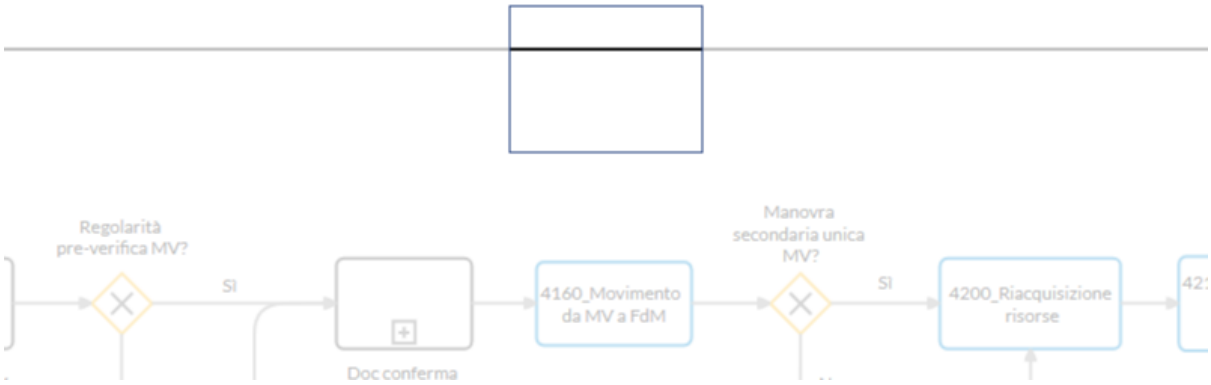
Qualora l'esito della pre-verifica non fosse regolare, l'impresa ferroviaria deve verificare le unità di carico.

> XXX min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Pre-verifica regolare? through No	EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico?

Treno pronto per estrazione

END EVENT

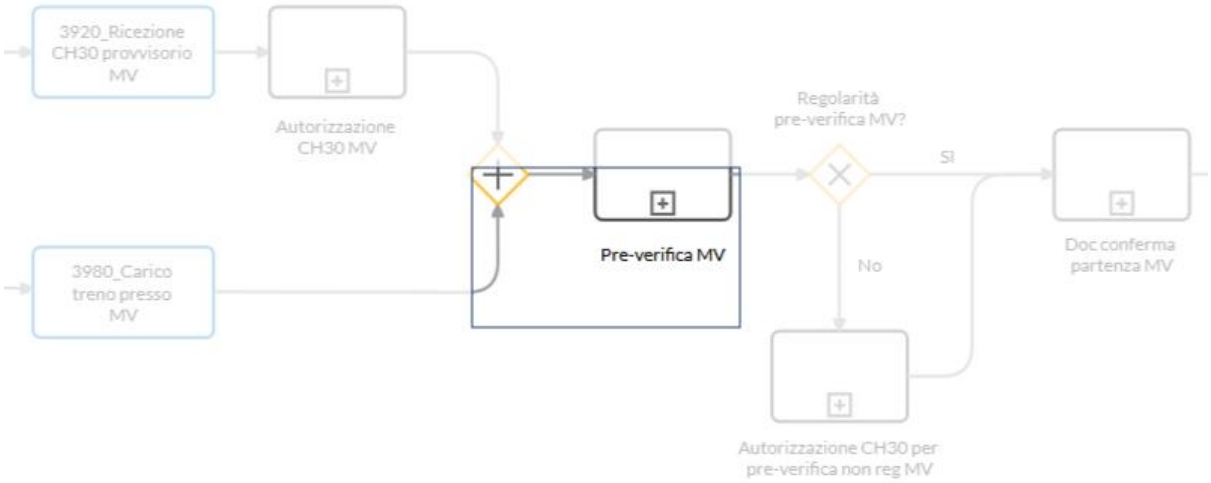


Incoming

EXCLUSIVE GATEWAY
Pre-verifica regolare?
through Sì

Scarto o aggiunta unità di carico?

EXCLUSIVE GATEWAY

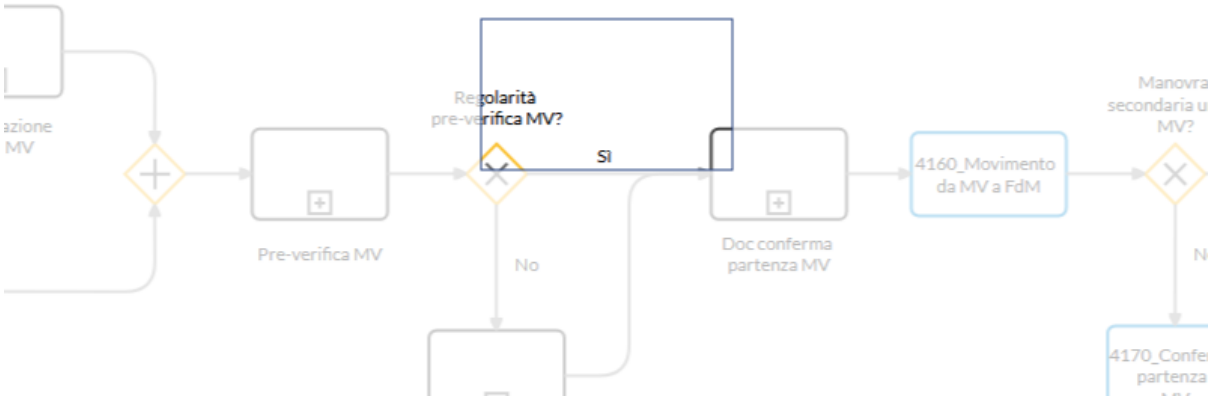


> %mv, %sddc, %no

Incoming	Outgoing
TASK 4000_Verifica unità di carico	TASK 4010_Richiesta esecuzione manovra aggiuntiva through Modifica veicoli
	TASK 4030_Modifica abbinamenti CH30 through No
	TASK 4020_Modifica CH30 through Solo documenti di carico

4010_Richiesta esecuzione manovra aggiuntiva

TASK



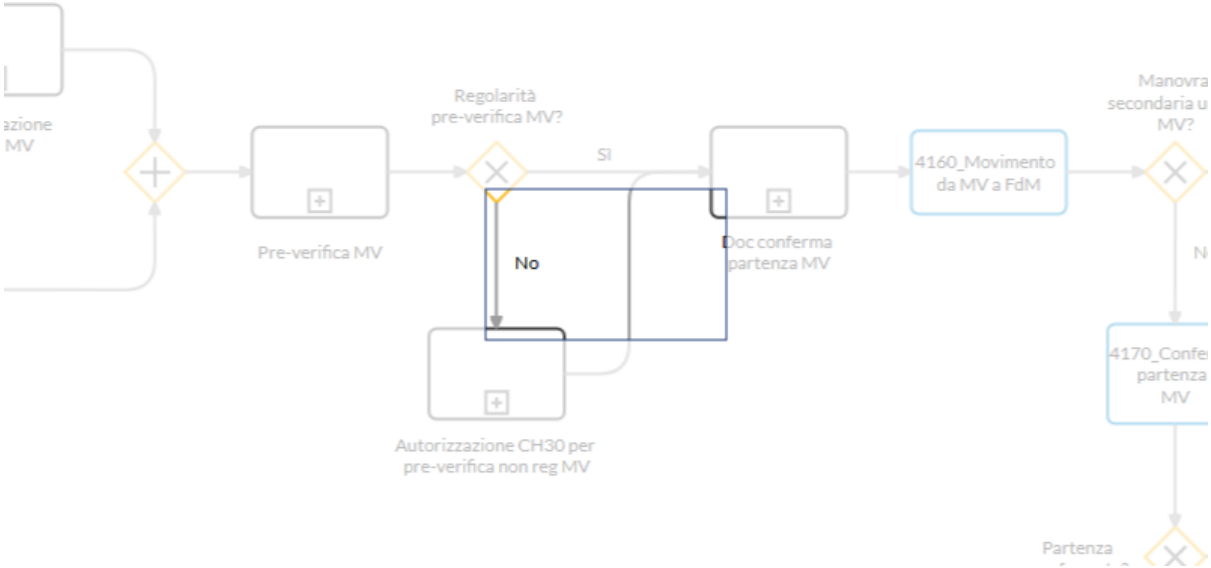
Se in seguito alla non regolarità della pre-verifica del treno è necessaria una modifica dei veicoli, l'impresa ferroviaria richiede l'esecuzione della manovra aggiuntiva e produce le note di manovra.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through Modifica veicoli	EXCLUSIVE GATEWAY Exclusive Gateway_4881

4020_Modifica CH30

TASK



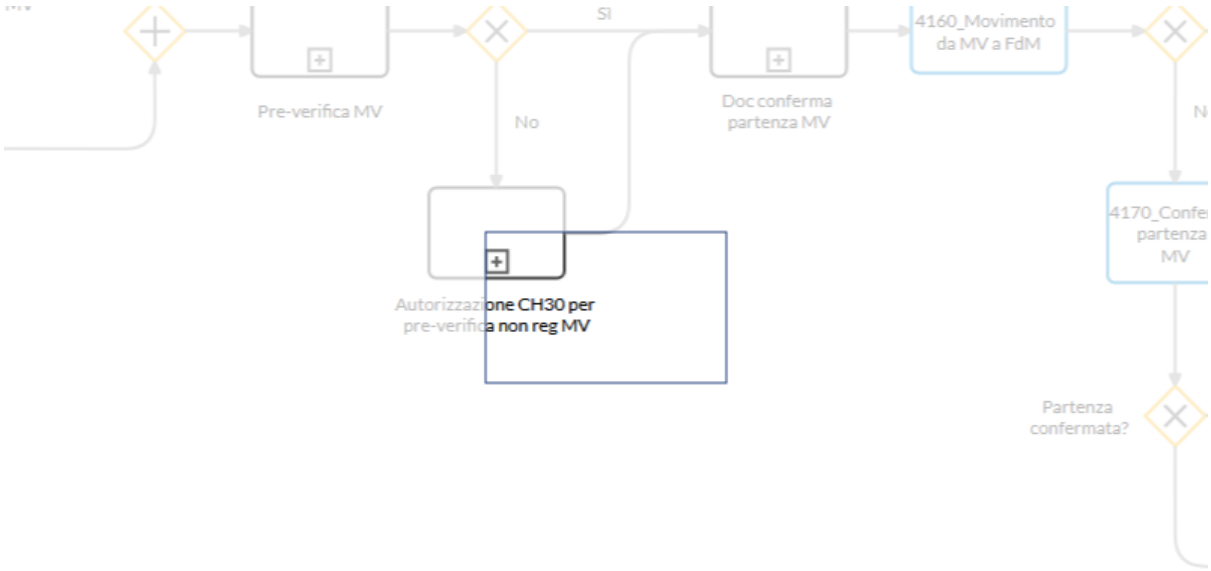
Il terminalista pone il CH30 nello stato Provvisorio per poi mandarlo all'autorità doganale.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through Solo documenti di carico	EXCLUSIVE GATEWAY Exclusive Gateway_4881

4030_Modifica abbinamenti CH30

TASK



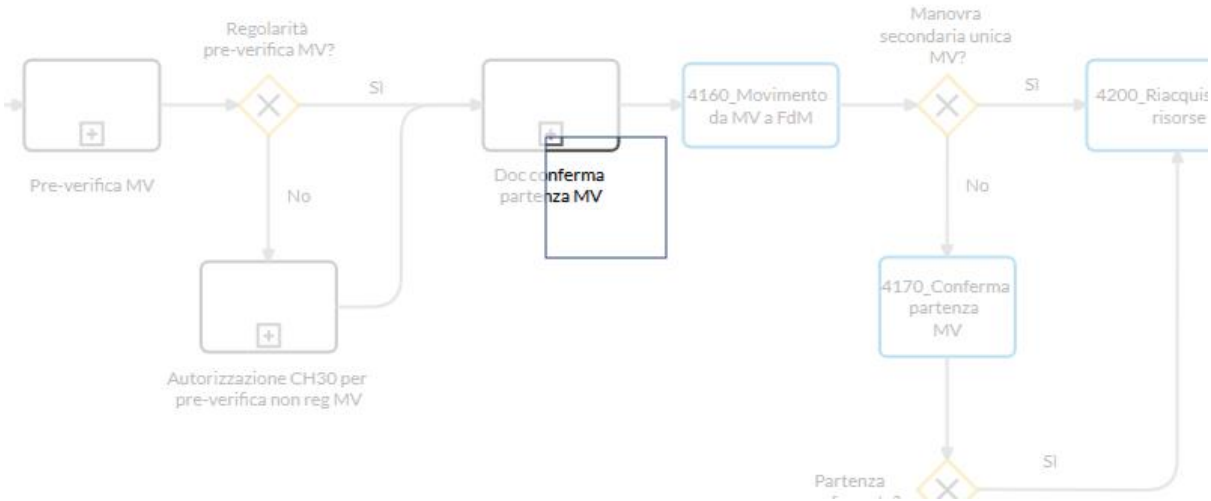
Se le pre-verifica non ha riscontrato scarti o aggiunte di unità di carico, il terminalista modifica gli abbinamenti nel CH30 e lo rimanda alla Dogana.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through No	EXCLUSIVE GATEWAY Exclusive Gateway_4881

Exclusive Gateway_4881

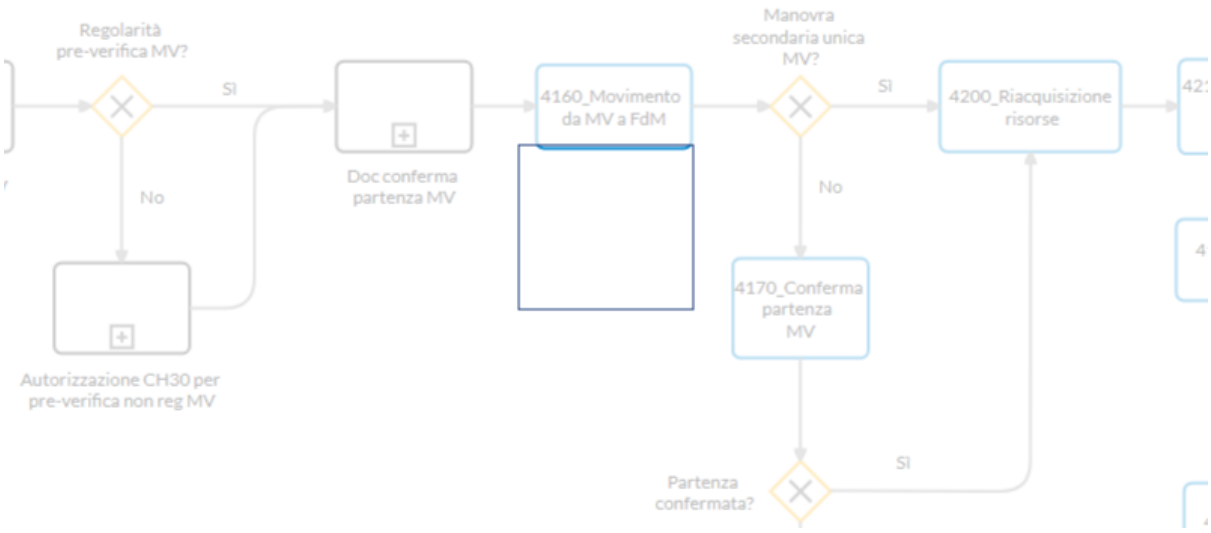
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 4010_Richiesta esecuzione manovra aggiuntiva	END EVENT Pre-verifica non regolare
TASK 4030_Modifica abbinamenti CH30	
TASK 4020_Modifica CH30	

Pre-verifica non regolare

END EVENT



Incoming

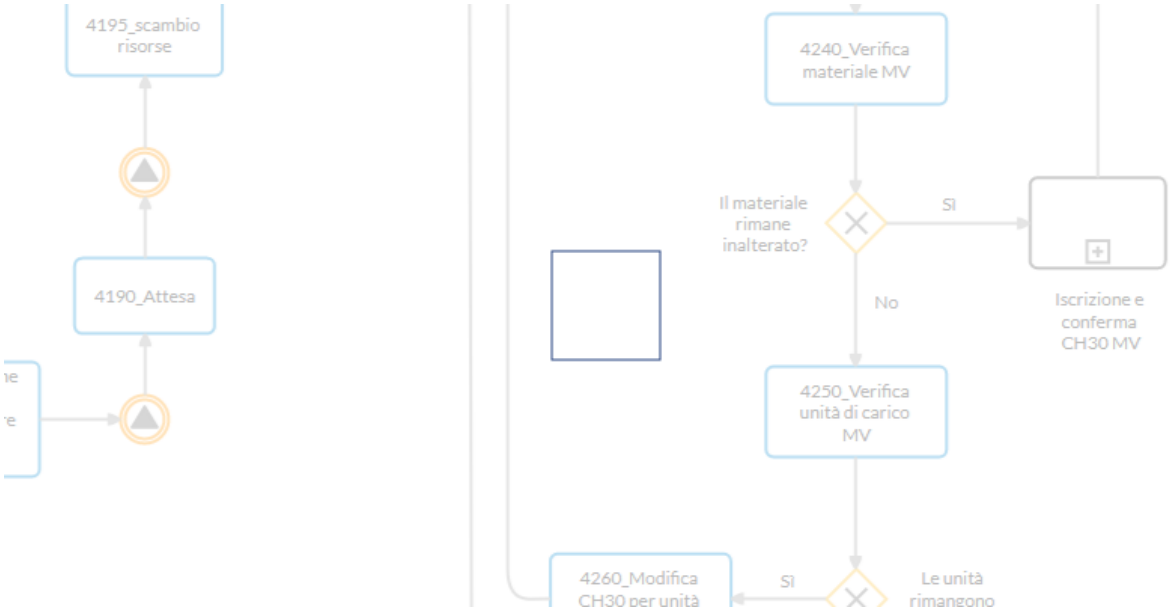
EXCLUSIVE GATEWAY
Exclusive Gateway_4881

1.1.1.2. Subprocess: Iscrizione e conferma CH30 MV

Se il materiale rimane inalterato l'autorità doganale prosegue con l'iscrizione e la conferma del CH30

startEvents_49247b77-ad23-41b6-eaa3-6ada740337ff

START EVENT

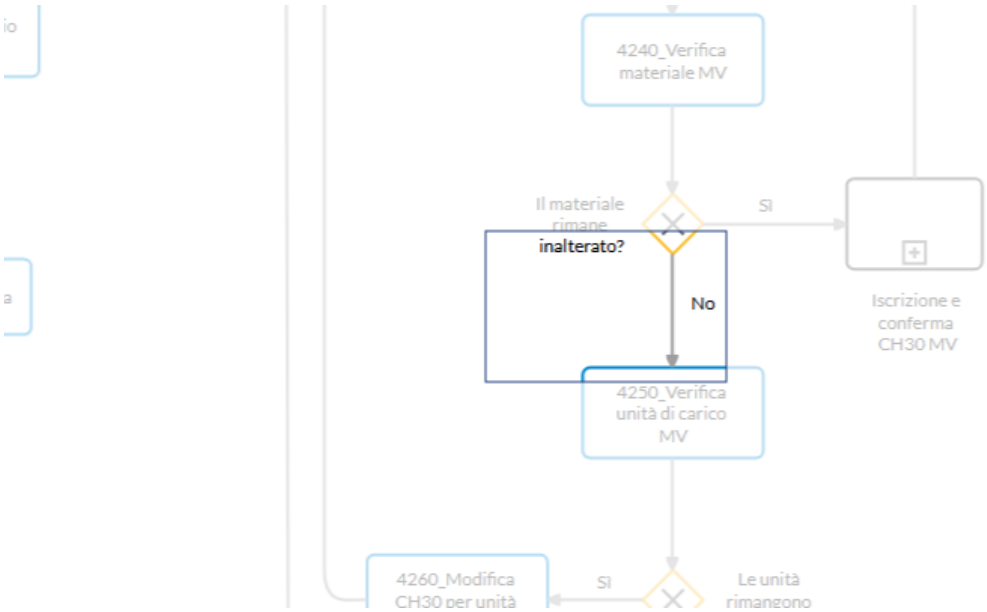


Outgoing

TASK
4280_Modifica CH30 con materiale inalterato

4280_Modifica CH30 con materiale inalterato

TASK



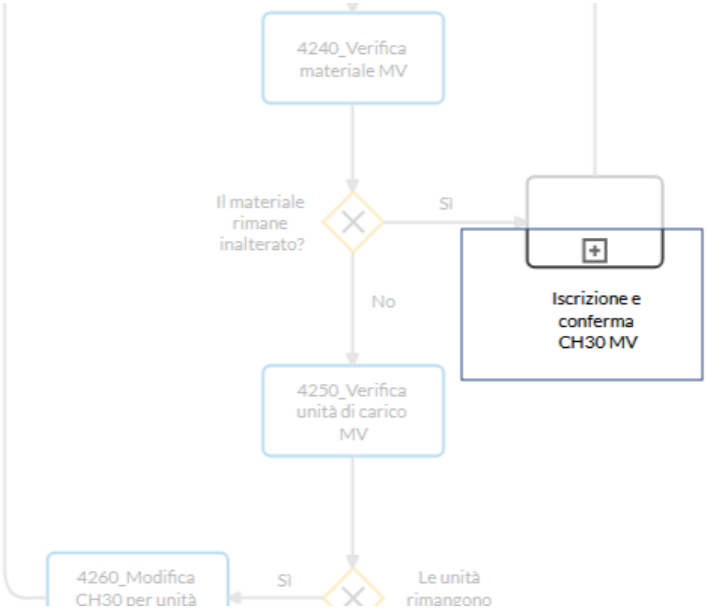
Nel caso di materiale inalterato, la Dogana modifica il CH30 variandone lo stato da Modificabile a Definitivo.

> 1 min;

Incoming	Outgoing
START EVENT startEvents_49247b77-ad23-41b6-eaa3-6ada740337ff	TASK 4290_Iscrizione CH30 su registro A/18 con materiale inalterato

4290_Iscrizione CH30 su registro A/18 con materiale inalterato

TASK



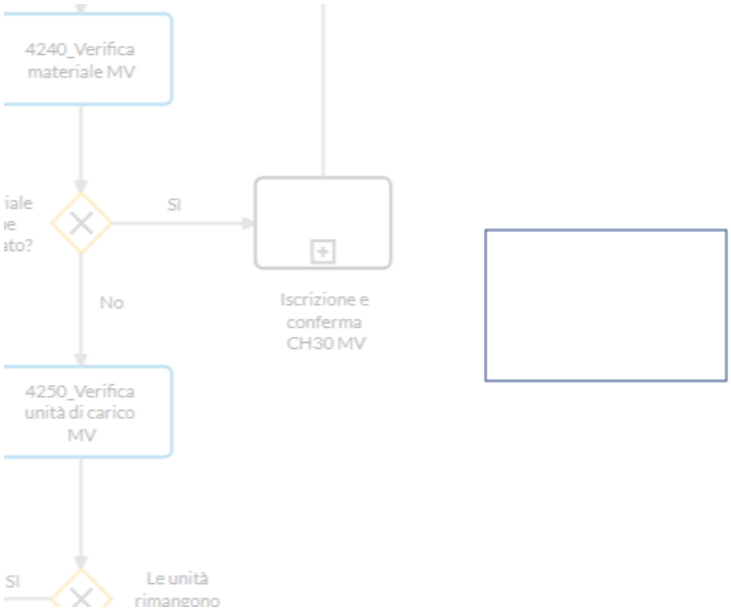
Nel caso di materiale inalterato, l'autorità doganale iscrive il CH30 sul registro A/18.

> 1 min;

Incoming	Outgoing
TASK 4280_Modifica CH30 con materiale inalterato	TASK 4300_Conferma CH30 con materiale inalterato

4300_Conferma CH30 con materiale inalterato

TASK



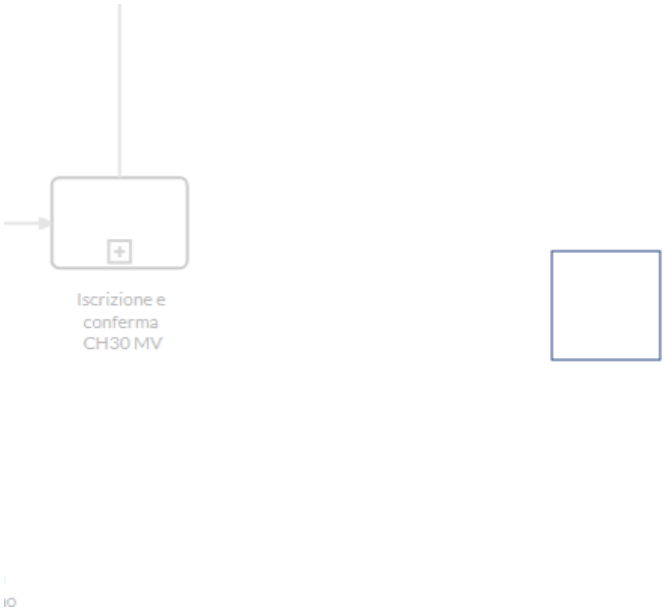
La Dogana conferma il CH30, variandone lo stato da Definitivo a Confermato.

> 1 min;

Incoming	Outgoing
TASK 4290_Iscrizione CH30 su registro A/18 con materiale inalterato	END EVENT endEvents_67d3a6b9-b285-1816-e74c-26913fc415f0

endEvents_67d3a6b9-b285-1816-e74c-26913fc415f0

END EVENT



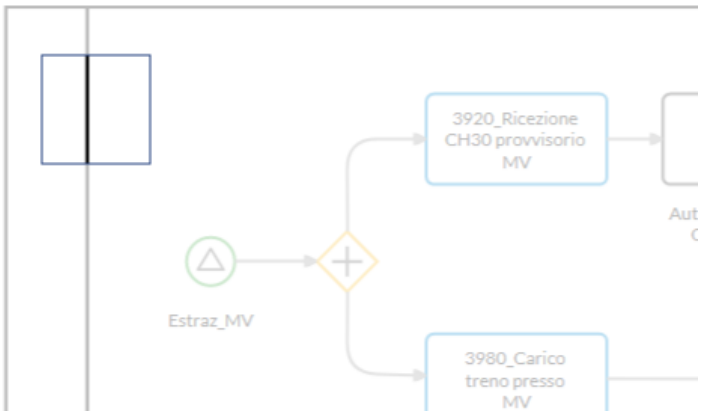
Incoming

TASK
4300_Conferma CH30 con materiale inalterato

1.1.1.3. Subprocess: Autorizzazione CH30 MV

startEvents_15e30cdb-41d9-b81b-4ffa-85859fd818f4

START EVENT

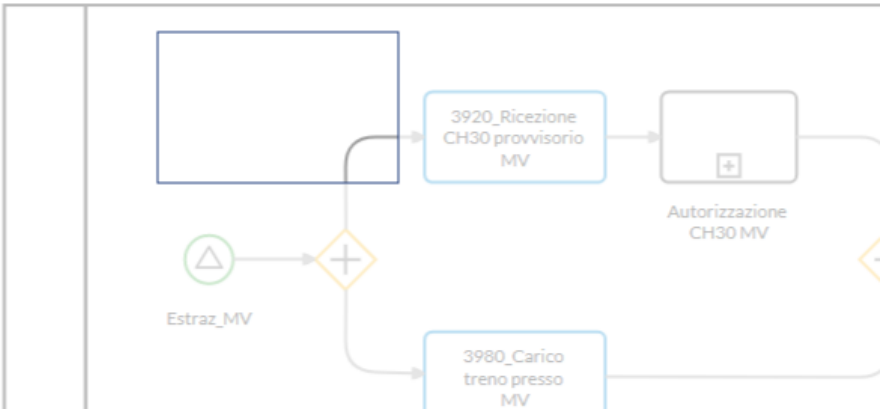


Outgoing

TASK
3930_Autorizzazione CH30

3930_Autorizzazione CH30

TASK



La Dogana procede quindi con la valutazione del CH30 per una sua possibile autorizzazione.

> 1 min;

Incoming

START EVENT
startEvents_15e30cdb-41d9-b81b-4ffa-85859fd818f4

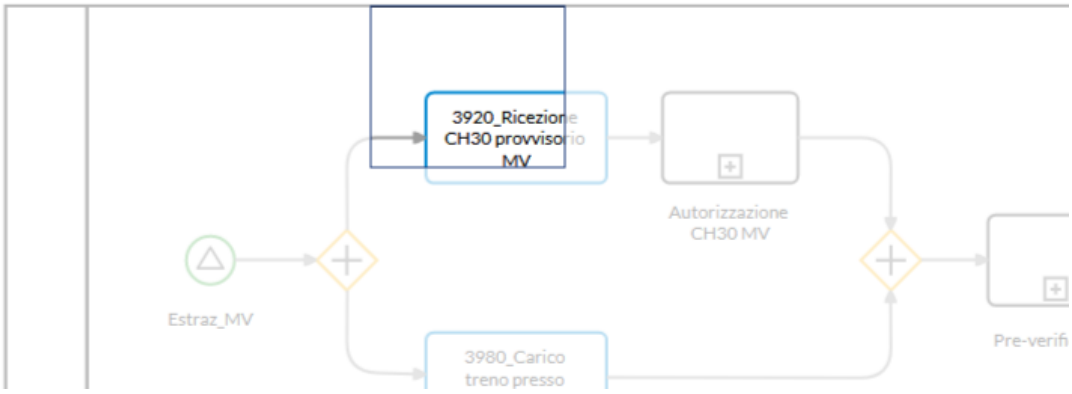
TASK
3940_Modifica CH30 senza autorizzazione

Outgoing

EXCLUSIVE GATEWAY
CH30 autorizzato?

CH30 autorizzato?

EXCLUSIVE GATEWAY

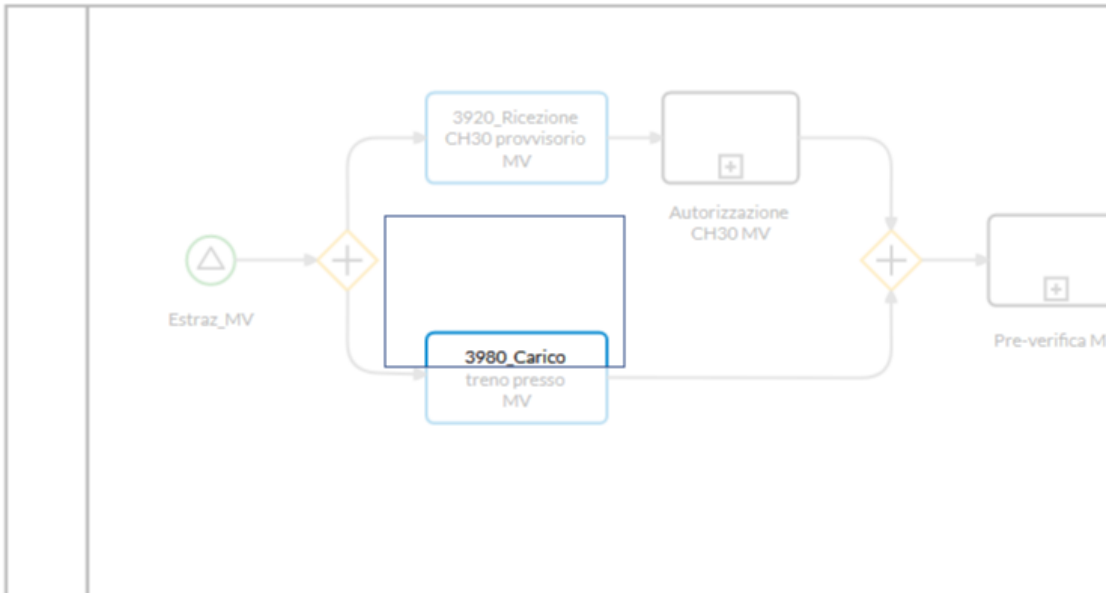


> 90%si, 10%no

Incoming	Outgoing
TASK 3930_Autorizzazione CH30	TASK 3940_Modifica CH30 senza autorizzazione through No con riserva
	TASK 3950_Modifica CH30 con autorizzazione through Sì

3940_Modifica CH30 senza autorizzazione

TASK



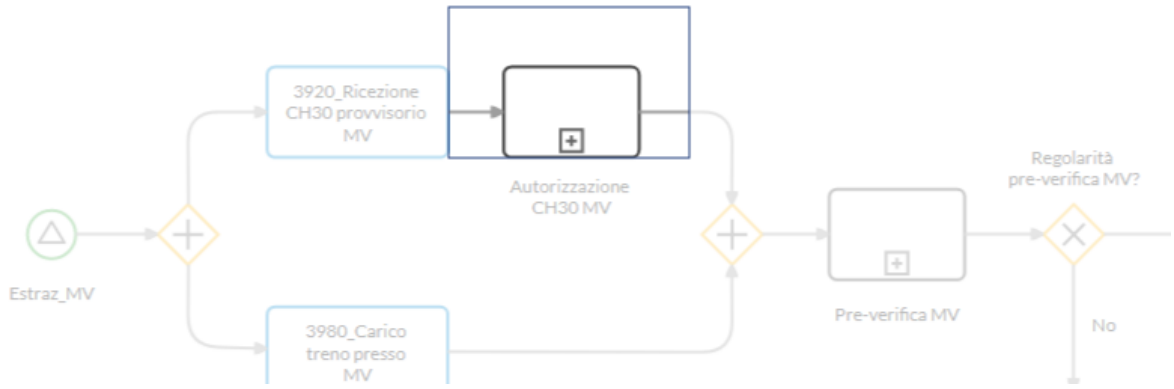
Se la Dogana autorizza con riserva il CH30, il terminalista è tenuto a modificare il CH30 e ripresentarlo alla dogana affinché venga nuovamente valutato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through No con riserva	TASK 3930_Autorizzazione CH30

3950_Modifica CH30 con autorizzazione

TASK



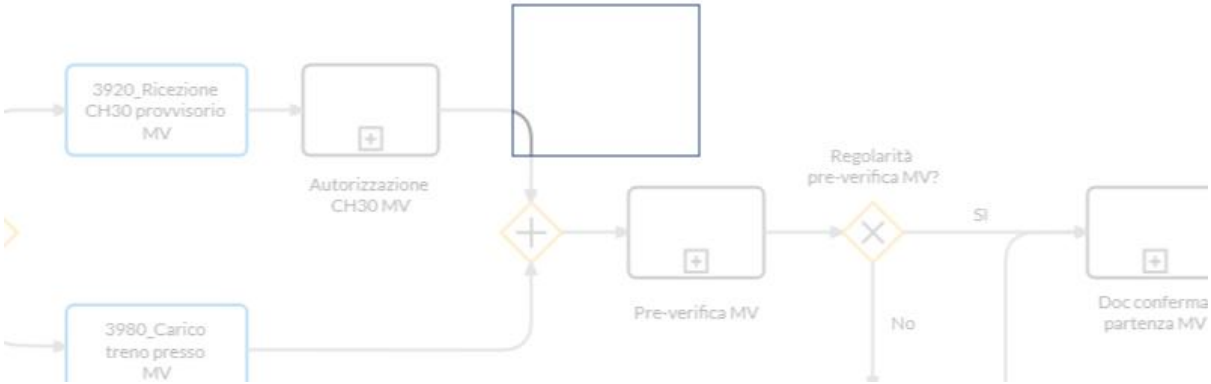
L'autorità doganale autorizza il CH30, variandone lo stato da Provvisorio a Confermato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through Sì	TASK 3960_Verifica su carico

3960_Verifica su carico

TASK



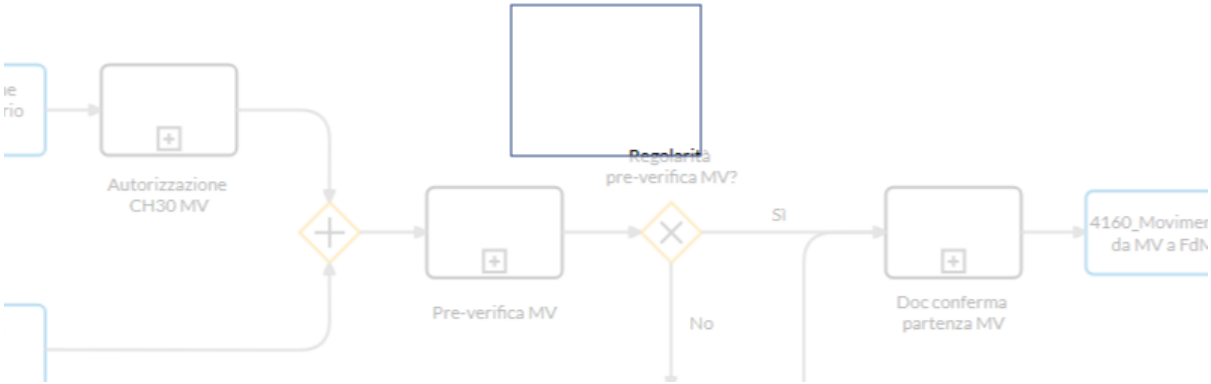
Una volta che il CH30 viene autorizzato dalla Dogana, la Guardia di Finanza può effettuare una verifica sul carico o parte del carico.

> 15 min;

Incoming	Outgoing
TASK 3950_Modifica CH30 con autorizzazione	TASK 3970_Modifica CH30

3970_Modifica CH30

TASK



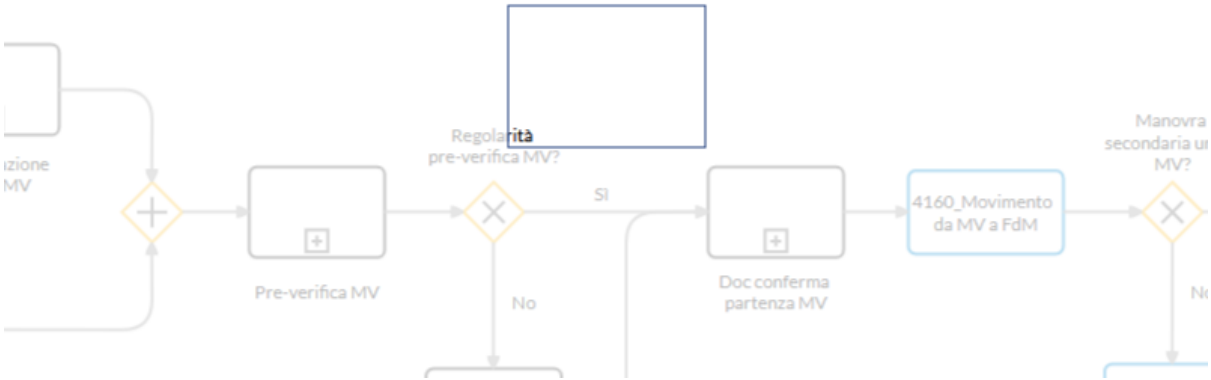
La Guardia di Finanza pone il CH30 nello stato Vistato, eventualmente annotando le partite di carico su cui verrà effettuato il riscontro.

> 1 min;

Incoming	Outgoing
TASK 3960_Verifica su carico	END EVENT CH30 autorizzato

CH30 autorizzato

END EVENT



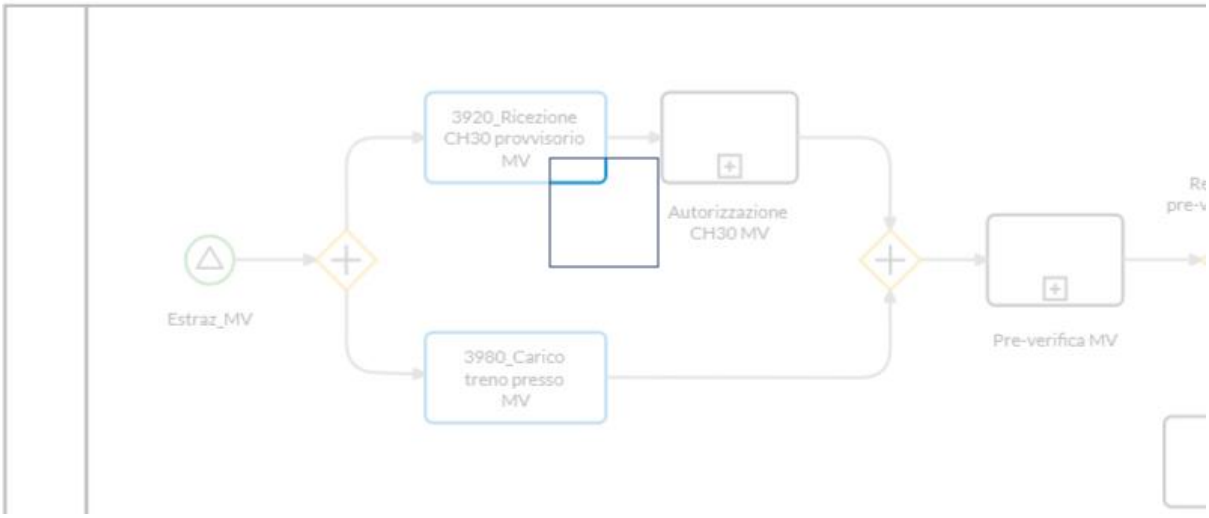
Incoming

TASK
3970_Modifica CH30

1.1.1.4. Subprocess: Doc conferma partenza MV

startEvents_e1763aa2-967a-0a2a-17a8-60e7e8284453

START EVENT

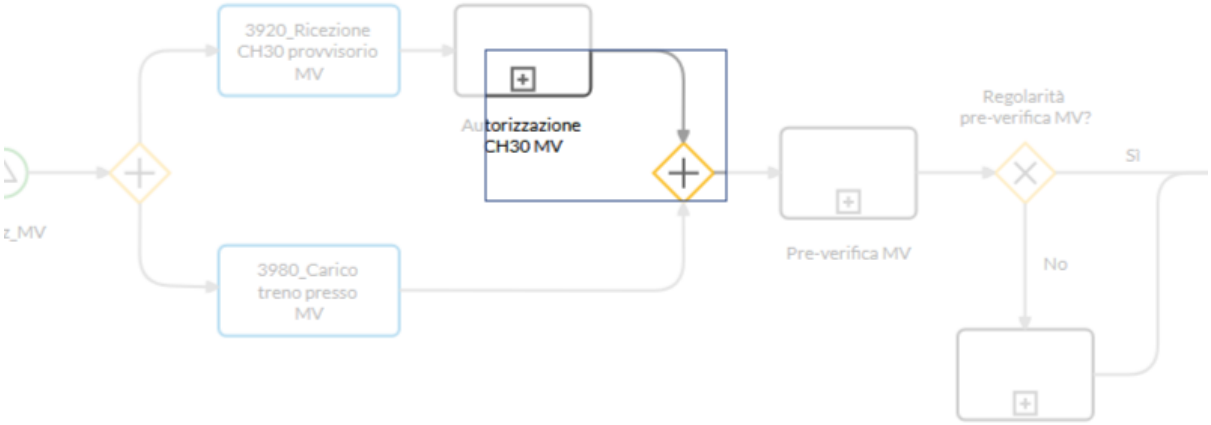


Outgoing

TASK
4090_Produzione CH30 definitivo

4090_Produzione CH30 definitivo

TASK



Se la muta è già presente nel terminale ed è necessario solo il controllo documentale dato che la pre-verifica è già stata effettuata, il terminalista pone il CH30 nello stato Definitivo e autorizza l'uscita del convoglio dal PFN.

> 1 min;

Incoming

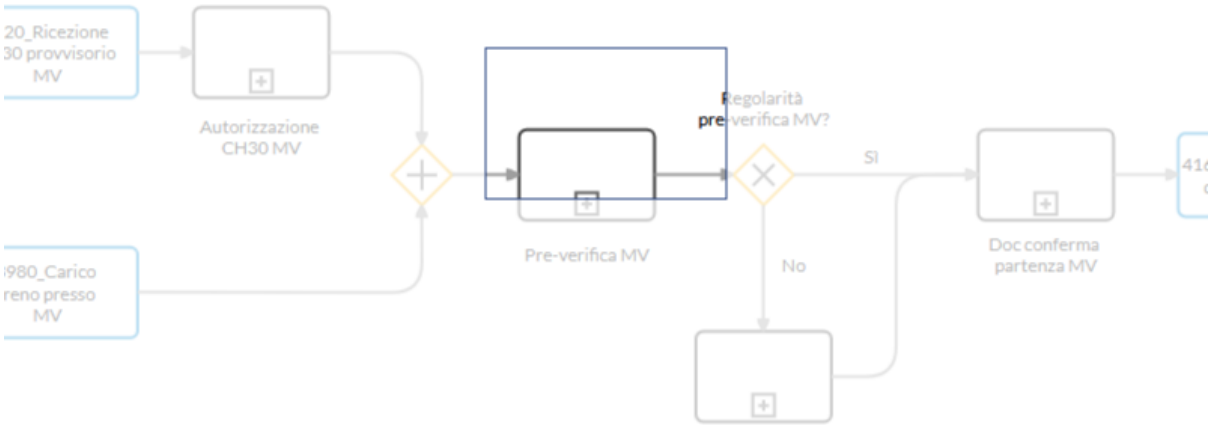
START EVENT
startEvents_e1763aa2-967a-0a2a-17a8-60e7e8284453

Outgoing

TASK
4100_Conferma CH30 e iscrizione su registro

4100_Conferma CH30 e iscrizione su registro

TASK



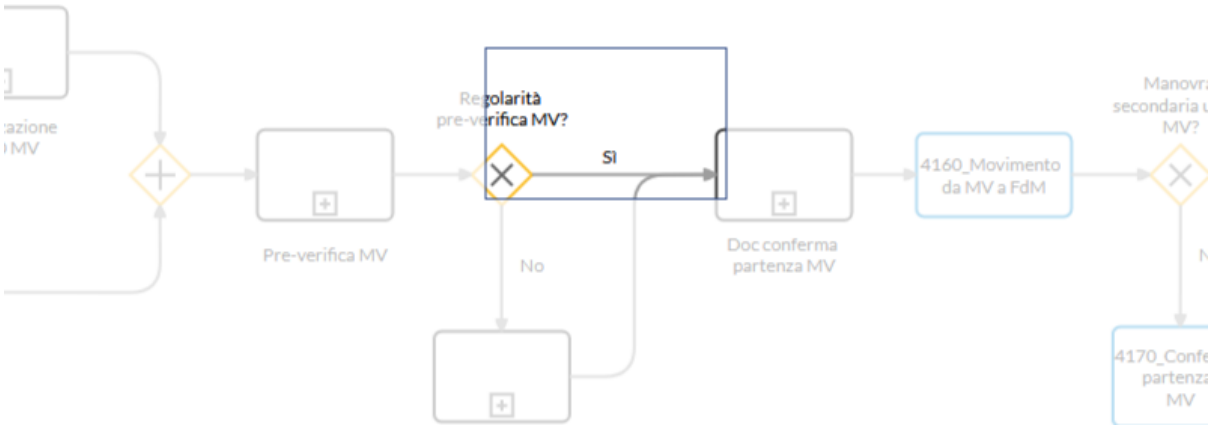
La Dogana conferma il CH30, variandone lo stato da Definitivo a Confermato.

> 1 min;

Incoming	Outgoing
TASK 4090_Produzione CH30 definitivo	TASK 4110_Conferma Partenza

4110_Conferma Partenza

TASK



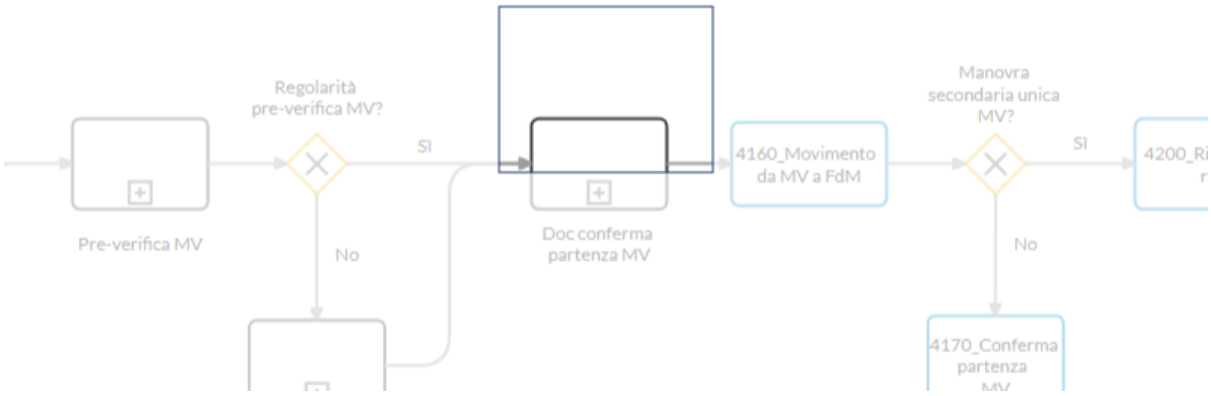
L'impresa ferroviaria deve confermare la partenza del treno.

> 1 min;

Incoming	Outgoing
TASK 4100_Conferma CH30 e iscrizione su registro	EXCLUSIVE GATEWAY Partenza confermata?

Partenza confermata?

EXCLUSIVE GATEWAY

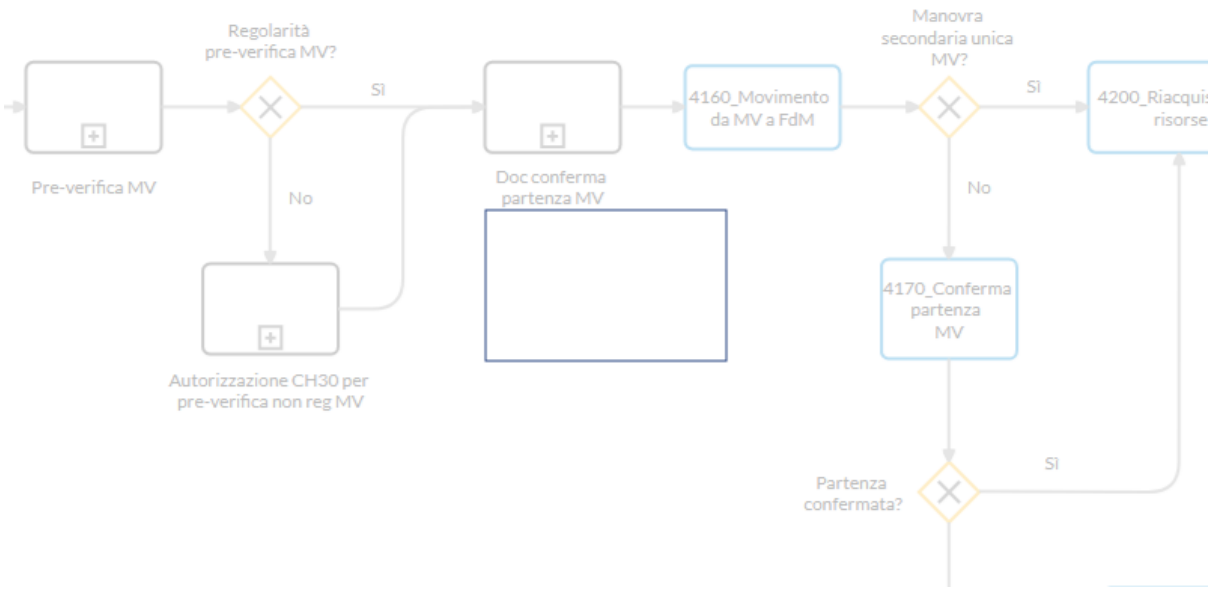


> 95%si, 5%no

Incoming	Outgoing
TASK 4110_Conferma Partenza	TASK 4140_Richiesta di manovra secondaria through Sì
	TASK 4120_Soppressione treno con ripianificazione through No con riserva

4120_Soppressione treno con ripianificazione

TASK



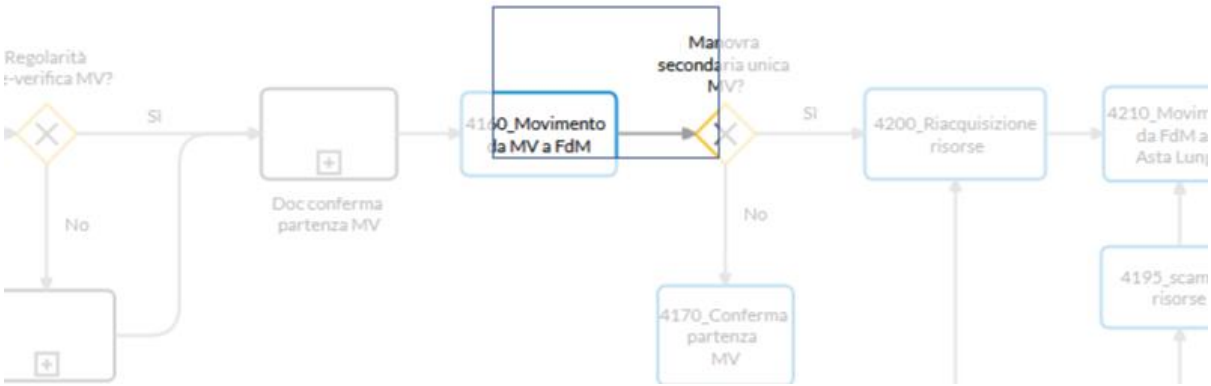
Se la partenza del treno è negata con riserva dall'IF, il treno viene soppresso e la sua partenza ripianificata.

> 5 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through No con riserva	TASK 4130_Attesa

4140_Richiesta di manovra secondaria

TASK



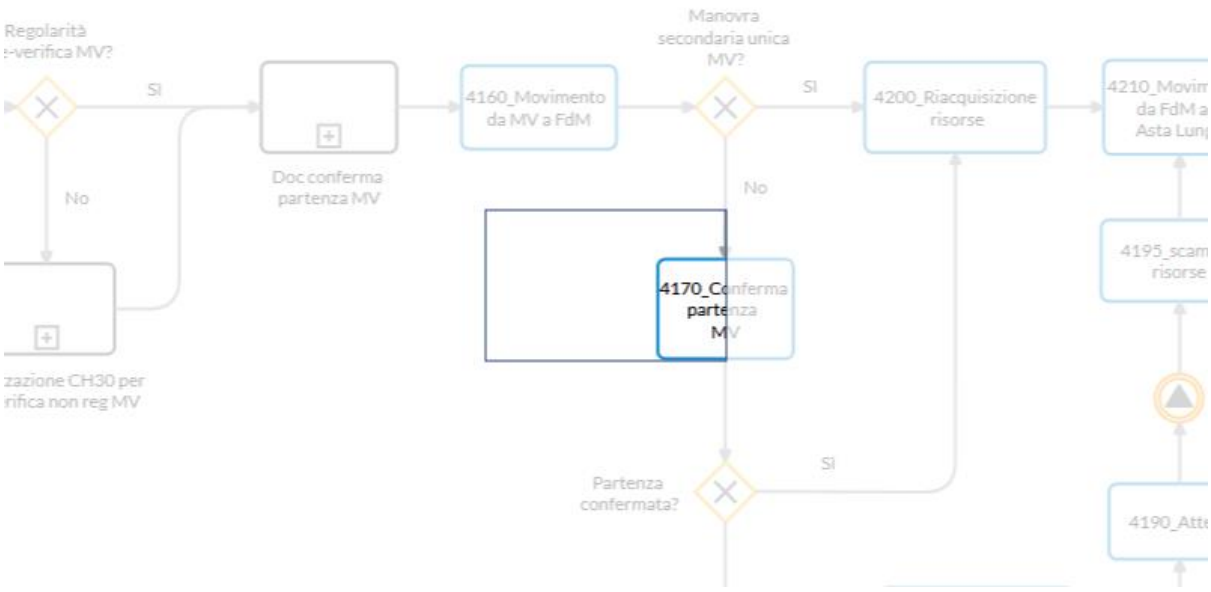
L’operatore richiede l'esecuzione della manovra secondaria.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through Sì	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_95f201d9-e5b7-01bd-f44a-a045429ebd8a
TASK 4130_Attesa	

4130_Attesa

TASK

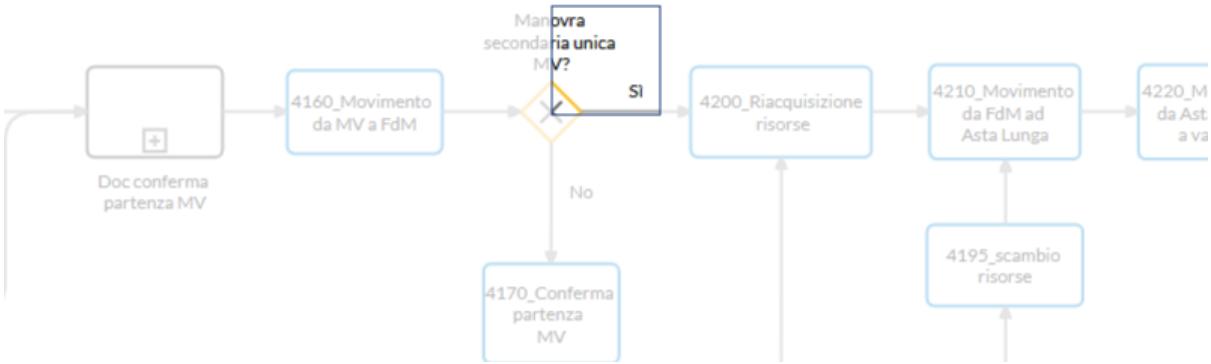


> 5 min;

Incoming	Outgoing
TASK 4120_Soppressione treno con ripianificazione	TASK 4140_Richiesta di manovra secondaria

signalIntermediateThrowEvents_95f201d9-e5b7-01bd-f44a-a045429ebd8a

SIGNAL INTERMEDIATE THROW EVENT



Incoming

TASK
4140_Richiesta di manovra secondaria

Outgoing

TASK
4150_Aggancio LM a treno carico in MV e caricamento aria

Attributes

SIGNAL REFERENCE
Richiamo_LM_estrazione_MV

4150_Aggancio LM a treno carico in MV e caricamento aria

TASK

> 10 min; Consumo: LocoM5, scambio MV, FascioDeiMoli; Produzione: binario MV

Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_95f201d9-e5b7-01bd-f44a-a045429ebd8a	END EVENT Treno pronto per estrazione da MV

Treno pronto per estrazione da MV

END EVENT

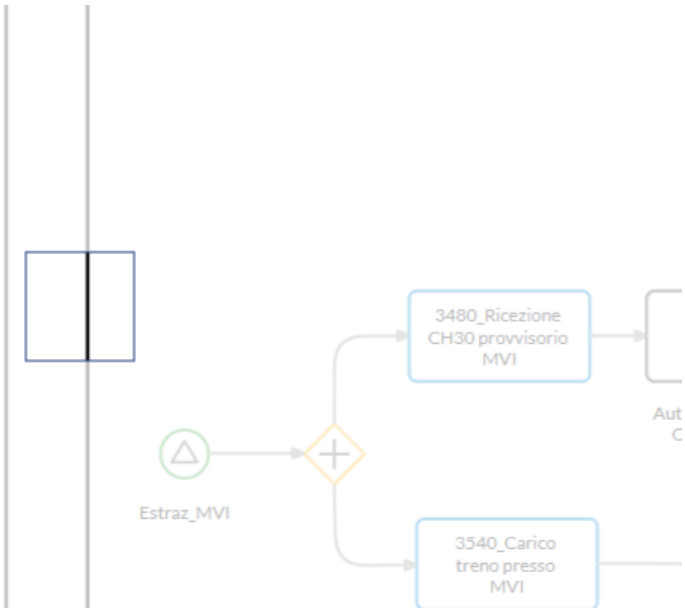
Incoming

TASK
4150_Aggancio LM a treno carico in MV e caricamento aria

1.1.1.5. Subprocess: Autorizzazione CH30 MVI

startEvents_88850577-eb27-562b-83f6-2106ba12ac50

START EVENT

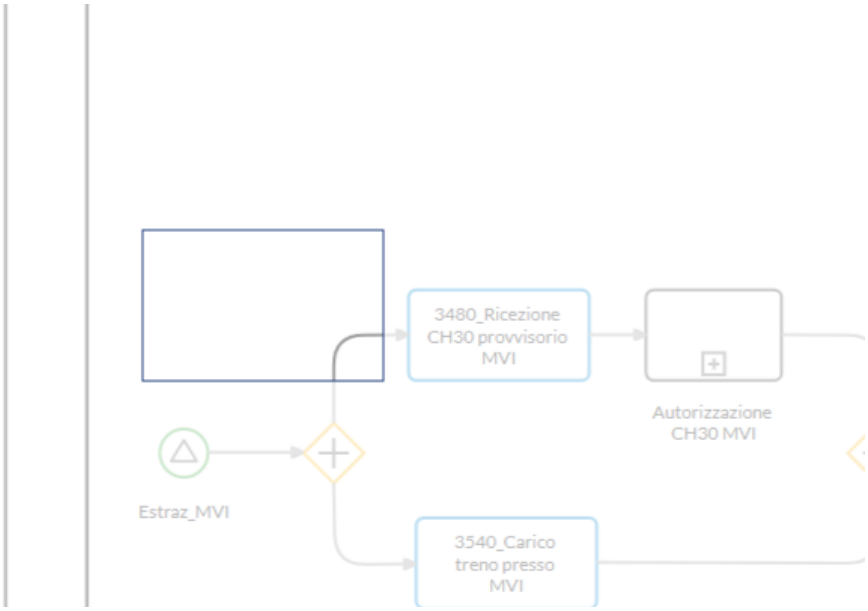


Outgoing

TASK
3490_Autorizzazione CH30

3490_Autorizzazione CH30

TASK



La Dogana procede quindi con la valutazione del CH30 per una sua possibile autorizzazione.

> 1 min;

Incoming

START EVENT
startEvents_88850577-eb27-562b-83f6-2106ba12ac50

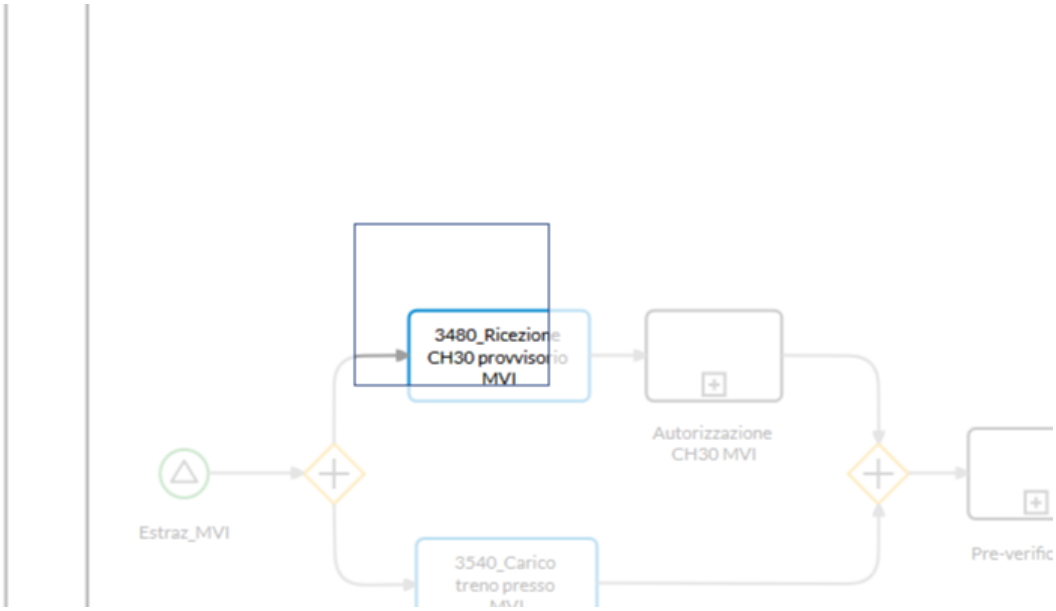
TASK
3500_Modifica CH30 senza autorizzazione

Outgoing

EXCLUSIVE GATEWAY
CH30 autorizzato?

CH30 autorizzato?

EXCLUSIVE GATEWAY

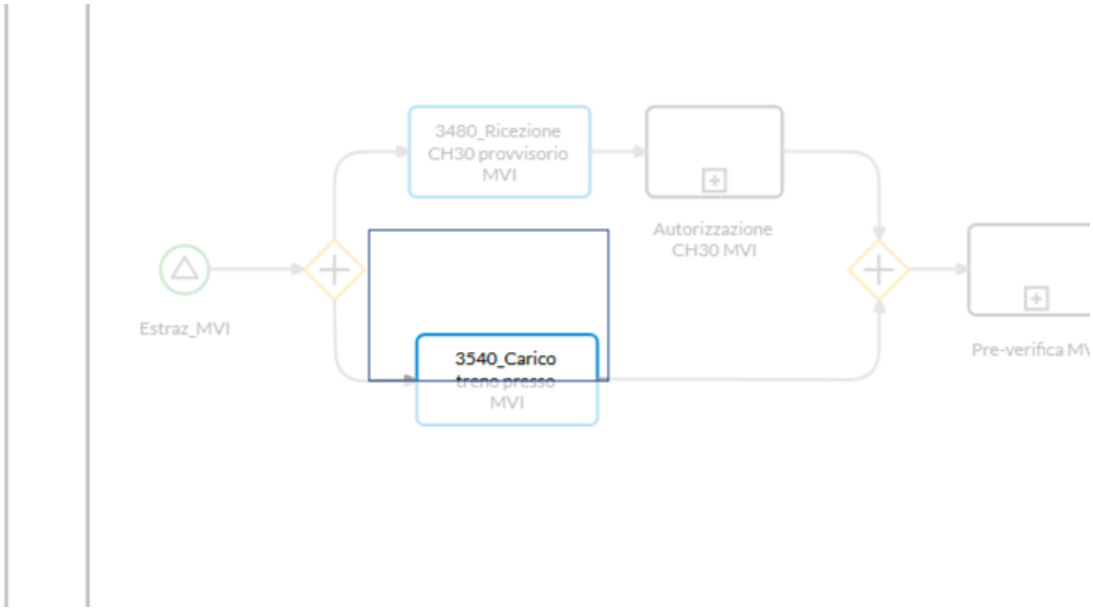


> 90%si, 10%no

Incoming	Outgoing
TASK 3490_Autorizzazione CH30	TASK 3510_Modifica CH30 con autorizzazione through Sì
	TASK 3500_Modifica CH30 senza autorizzazione through No con riserva

3500_Modifica CH30 senza autorizzazione

TASK



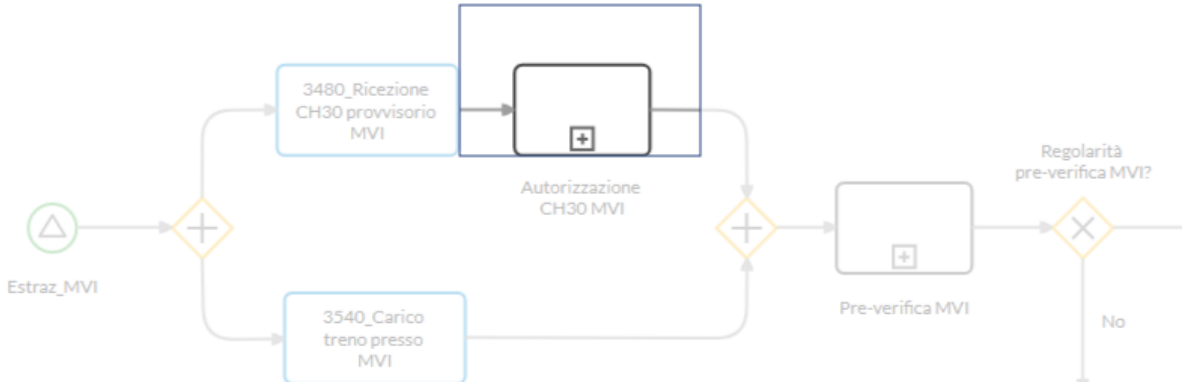
Se la Dogana autorizza con riserva il CH30, il terminalista è tenuto a modificare il CH30 e ripresentarlo alla dogana affinché venga nuovamente valutato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through No con riserva	TASK 3490_Autorizzazione CH30

3510_Modifica CH30 con autorizzazione

TASK



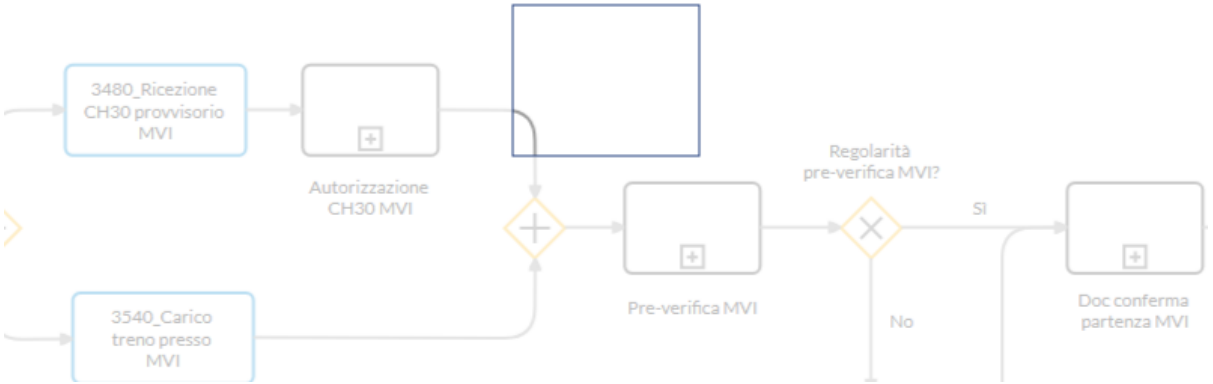
L'autorità doganale autorizza il CH30, variandone lo stato da Provvisorio a Confermato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through Sì	TASK 3520_Verifica su carico

3520_Verifica su carico

TASK



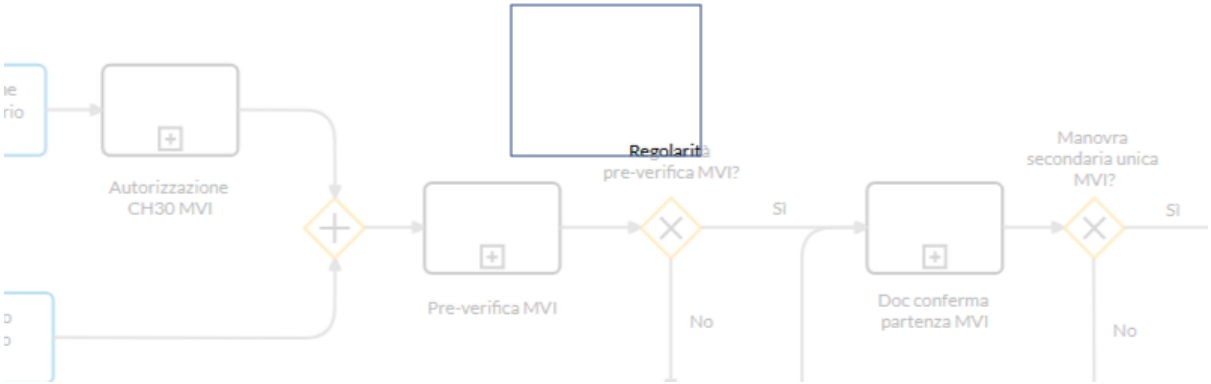
Una volta che il CH30 viene autorizzato dalla Dogana, la Guardia di Finanza può effettuare una verifica sul carico o parte del carico.

> 15 min;

Incoming	Outgoing
TASK 3510_Modifica CH30 con autorizzazione	TASK 3530_Modifica CH30

3530_Modifica CH30

TASK



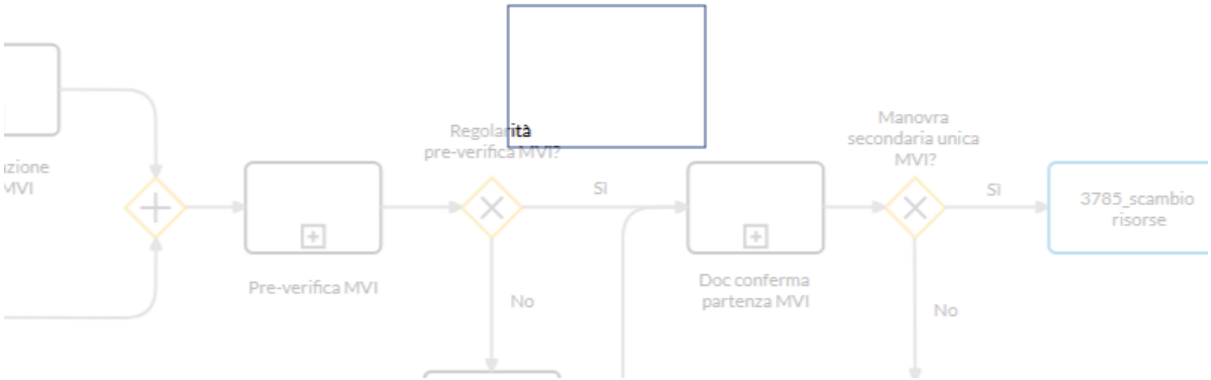
La Guardia di Finanza pone il CH30 nello stato Vistato, eventualmente annotando le partite di carico su cui verrà effettuato il riscontro.

> 1 min;

Incoming	Outgoing
TASK 3520_Verifica su carico	END EVENT CH30 autorizzato

CH30 autorizzato

END EVENT



Incoming

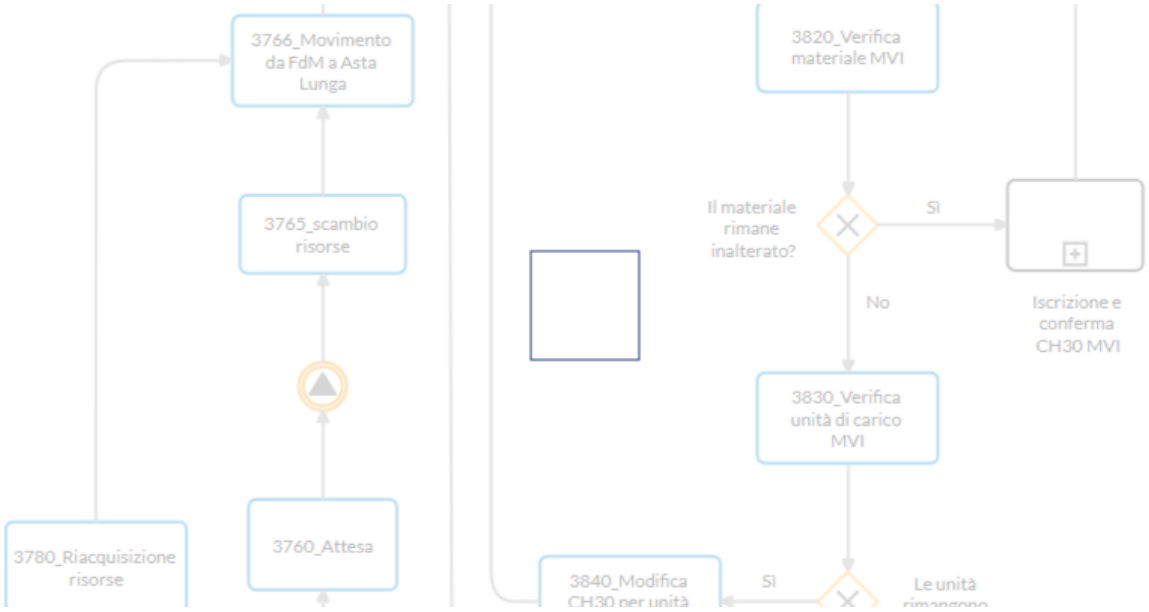
TASK
3530_Modifica CH30

1.1.1.6. Subprocess: Iscrizione e conferma CH30 MVI

Se il materiale rimane inalterato l'autorità doganale prosegue con l'iscrizione e la conferma del CH30

startEvents_f0be18b2-71ec-f74b-36b8-fe4a3ff721c7

START EVENT

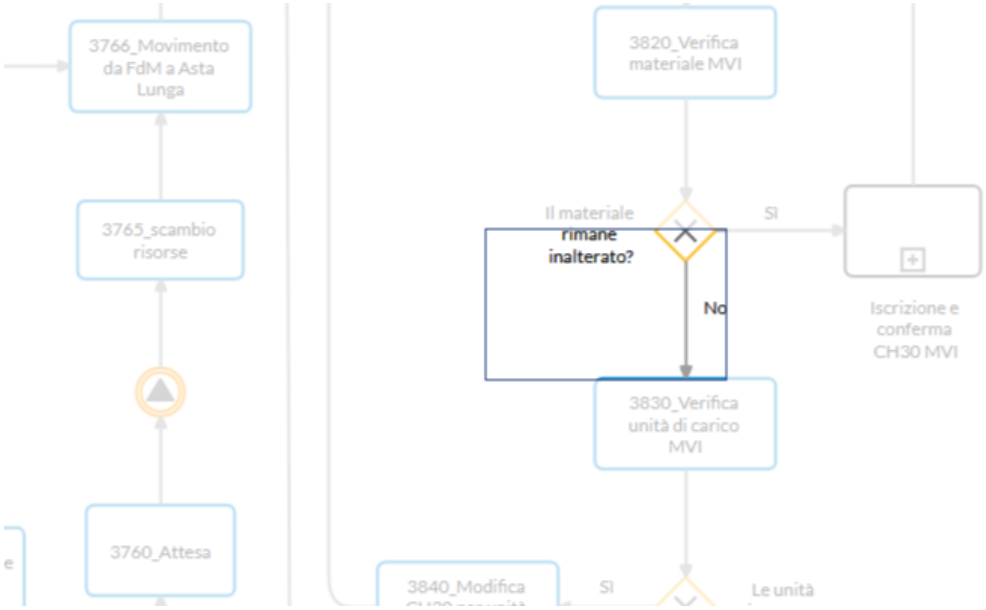


Outgoing

TASK
3860_Modifica CH30 con materiale inalterato

3860_Modifica CH30 con materiale inalterato

TASK



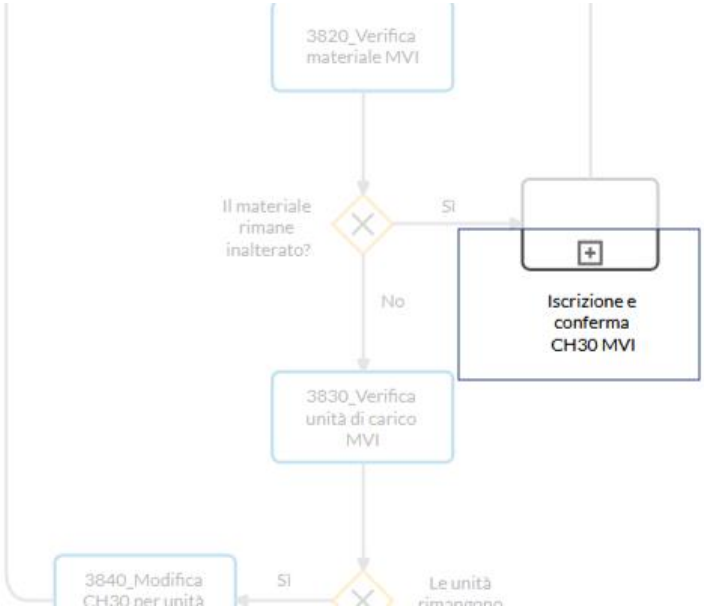
Nel caso di materiale inalterato, la Dogana modifica il CH30 variandone lo stato da Modificabile a Definitivo.

> 1 min;

Incoming	Outgoing
START EVENT startEvents_f0be18b2-71ec-f74b-36b8-fe4a3ff721c7	TASK 3870_Iscrizione CH30 su registro A/18 con materiale inalterato

3870_Iscrizione CH30 su registro A/18 con materiale inalterato

TASK



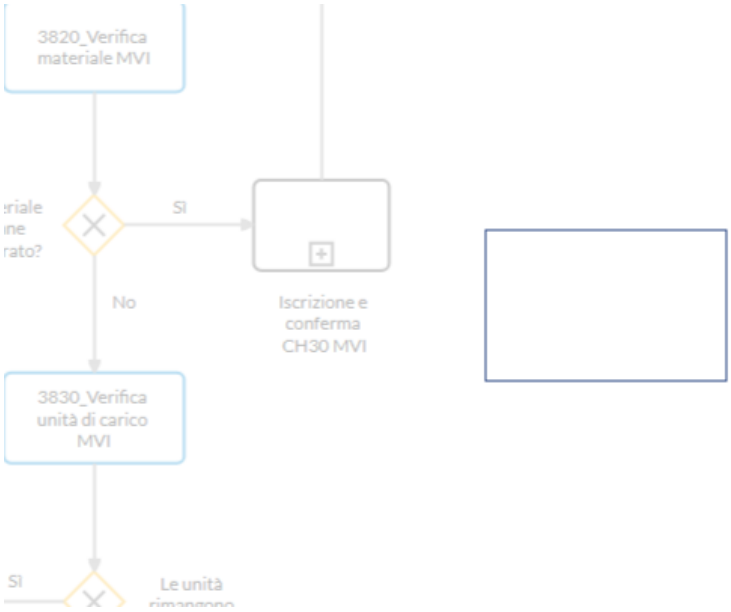
Nel caso di materiale inalterato, l'autorità doganale iscrive il CH30 sul registro A/18.

> 1 min;

Incoming	Outgoing
TASK 3860_Modifica CH30 con materiale inalterato	TASK 3880_Conferma CH30 con materiale inalterato

3880_Conferma CH30 con materiale inalterato

TASK



La Dogana conferma il CH30, variandone lo stato da Definitivo a Confermato.

> 1 min;

Incoming	Outgoing
TASK 3870_Iscrizione CH30 su registro A/18 con materiale inalterato	END EVENT endEvents_27330fea-ba24-8cf1-644e-fa7e4e697f2b

endEvents_27330fea-ba24-8cf1-644e-fa7e4e697f2b

END EVENT

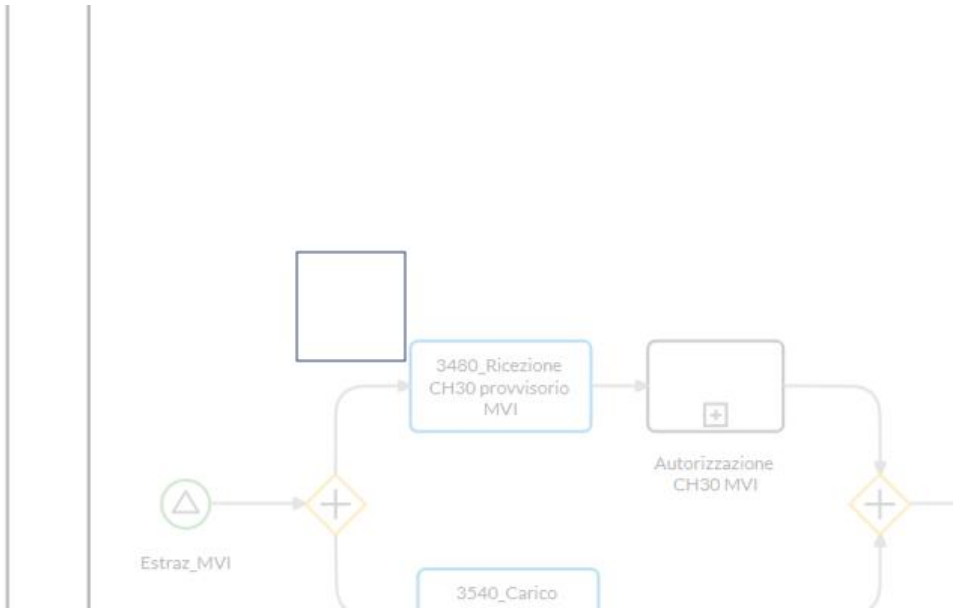
Incoming

TASK
3880_Conferma CH30 con materiale inalterato

1.1.1.7. Subprocess: Pre-verifica MVI

startEvents_ef9f14d2-c78d-bcac-998a-3d91aff46f27

START EVENT

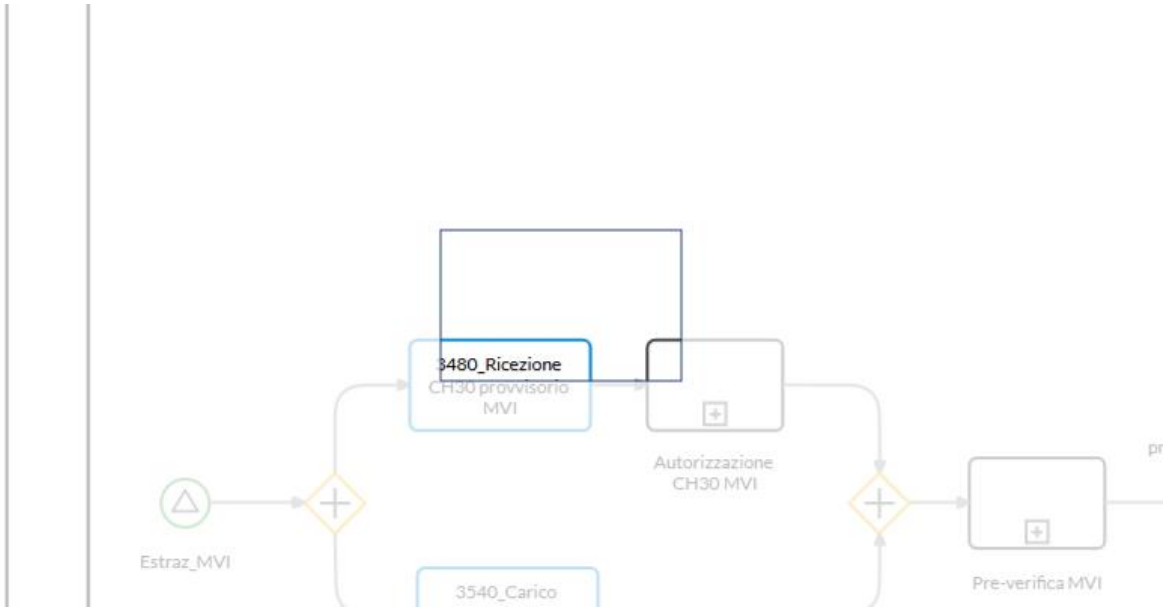


Outgoing

TASK
3550_Pre-verifica materiale rotabile

3550_Pre-verifica materiale rotabile

TASK



L'impresa ferroviaria prosegue con la pre-verifica del materiale rotabile.

> 1 min;

Incoming

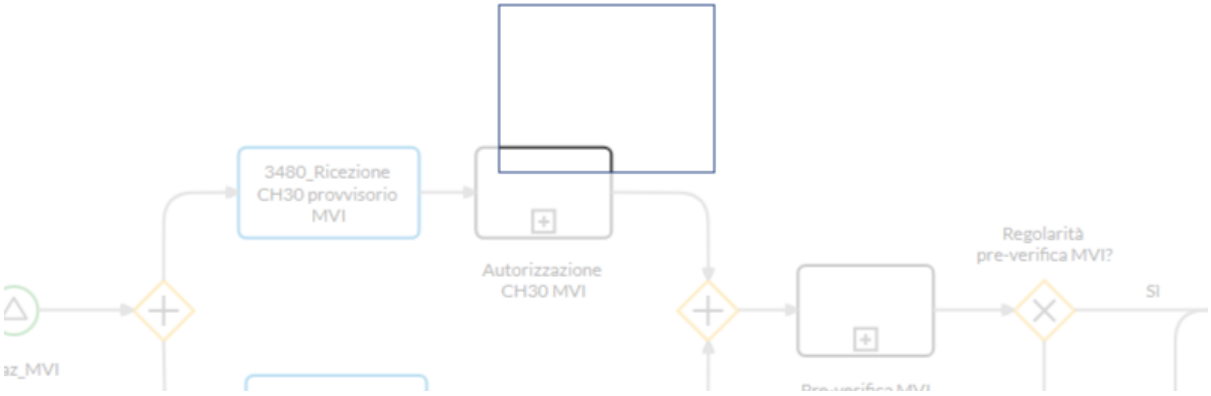
START EVENT
startEvents_ef9f14d2-c78d-bcac-998a-3d91aff46f27

Outgoing

EXCLUSIVE GATEWAY
Pre-verifica regolare?

Pre-verifica regolare?

EXCLUSIVE GATEWAY

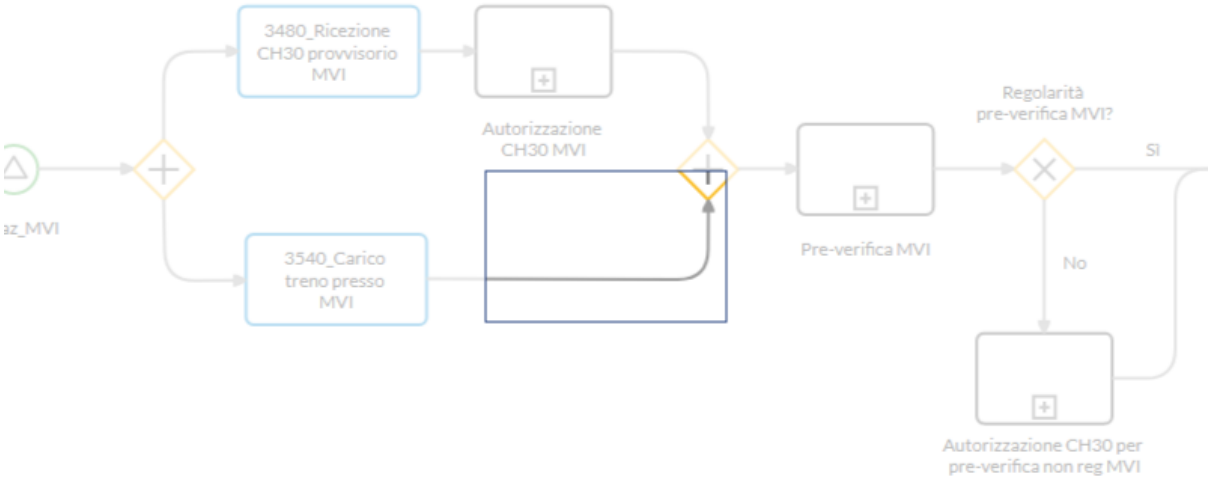


> Sì 100% - No 0%

Incoming	Outgoing
TASK 3550_Pre-verifica materiale rotabile	TASK 3560_Verifica unità di carico through No
	END EVENT Treno pronto per estrazione through Sì

3560_Verifica unità di carico

TASK



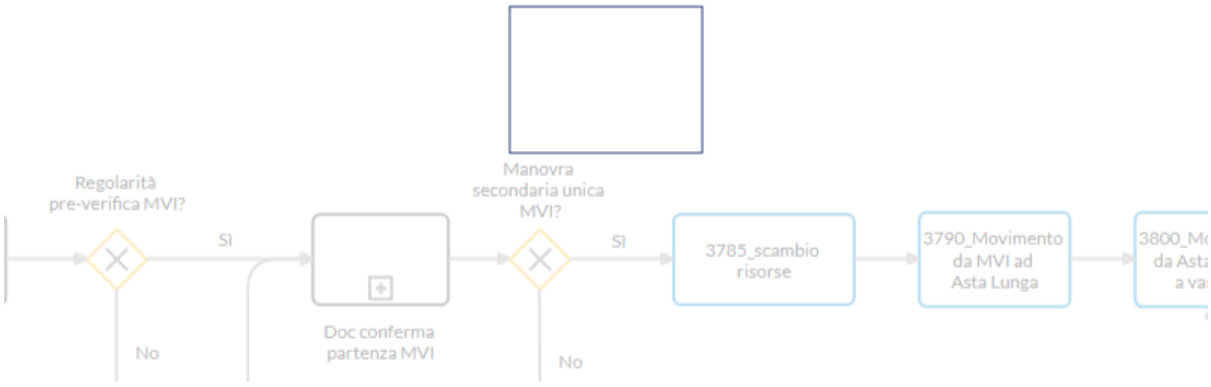
Qualora l'esito della pre-verifica non fosse regolare, l'impresa ferroviaria deve verificare le unità di carico.

> XXX min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Pre-verifica regolare? through No	EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico?

Treno pronto per estrazione

END EVENT

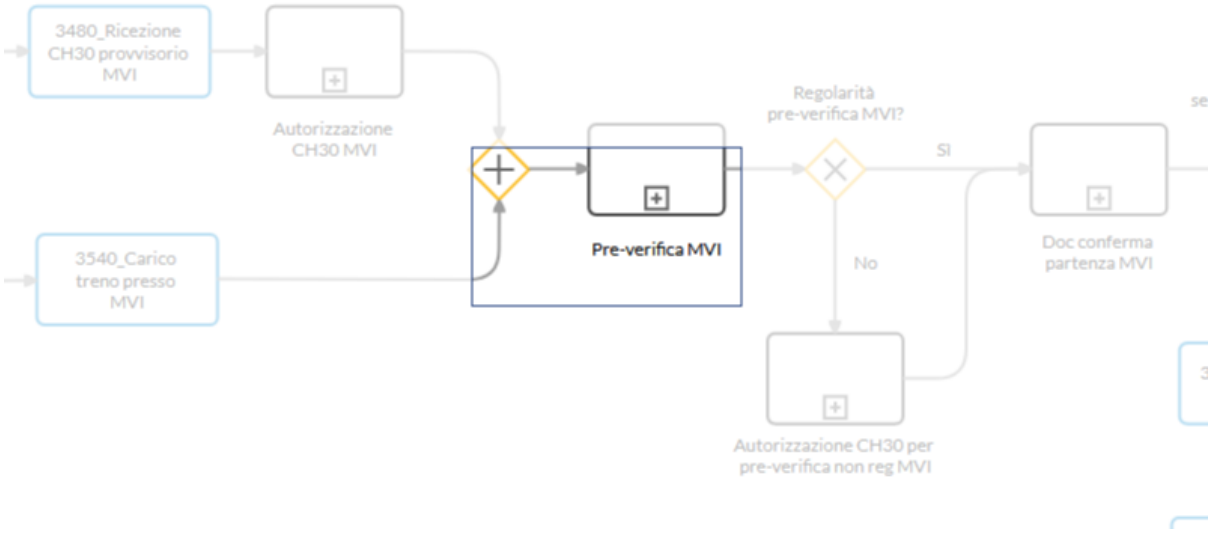


Incoming

EXCLUSIVE GATEWAY
Pre-verifica regolare?
through Sì

Scarto o aggiunta unità di carico?

EXCLUSIVE GATEWAY

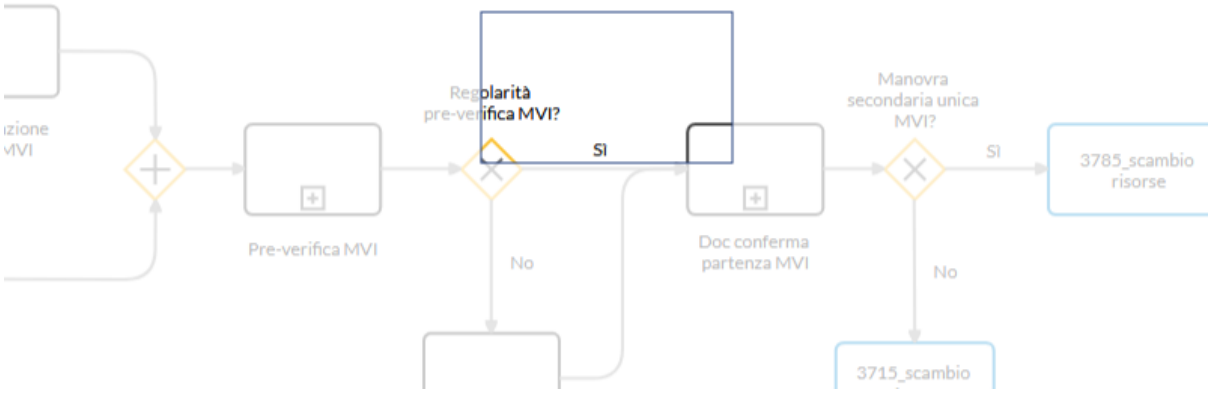


> %mv, %sddc, %no

Incoming	Outgoing
TASK 3560_Verifica unità di carico	TASK 3580_Modifica CH30 through Solo documenti di carico
	TASK 3590_Modifica abbinamenti CH30 through No
	TASK 3570_Richiesta esecuzione manovra aggiuntiva through Modifica veicoli

3570_Richiesta esecuzione manovra aggiuntiva

TASK



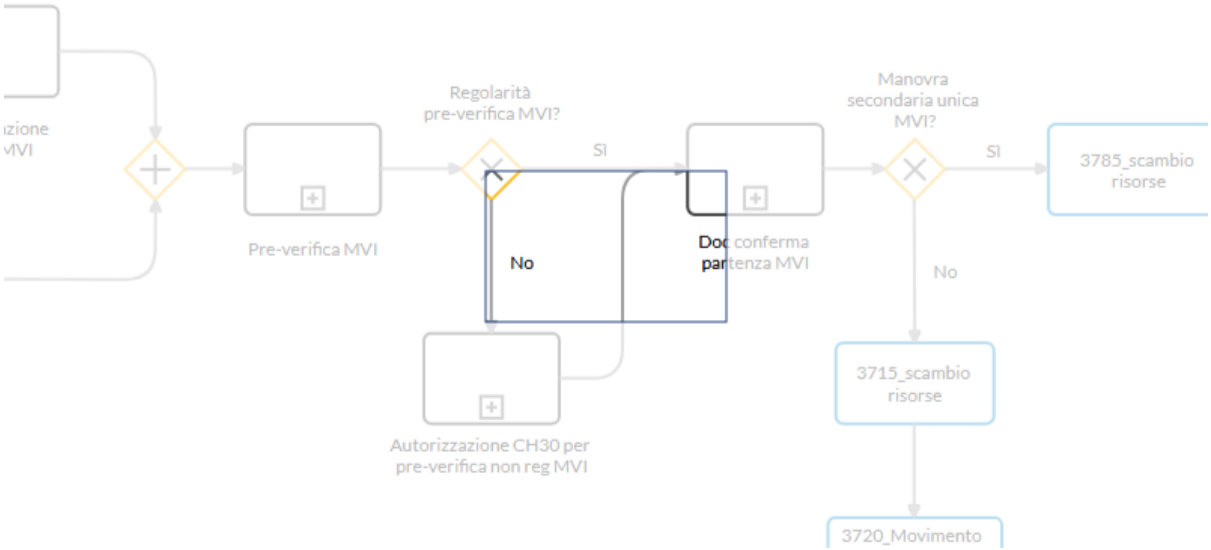
Se in seguito alla non regolarità della pre-verifica del treno è necessaria una modifica dei veicoli, l'impresa ferroviaria richiede l'esecuzione della manovra aggiuntiva e produce le note di manovra.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through Modifica veicoli	EXCLUSIVE GATEWAY Exclusive Gateway_4881

3580_Modifica CH30

TASK



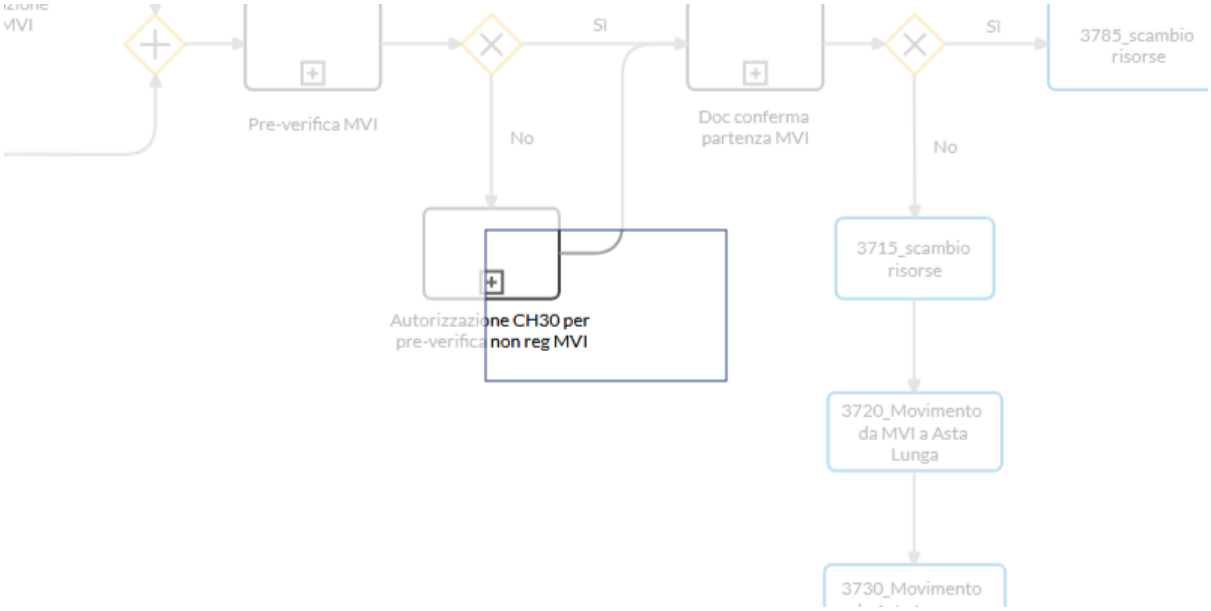
Il terminalista pone il CH30 nello stato Provvisorio per poi mandarlo all'autorità doganale.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through Solo documenti di carico	EXCLUSIVE GATEWAY Exclusive Gateway_4881

3590_Modifica abbinamenti CH30

TASK



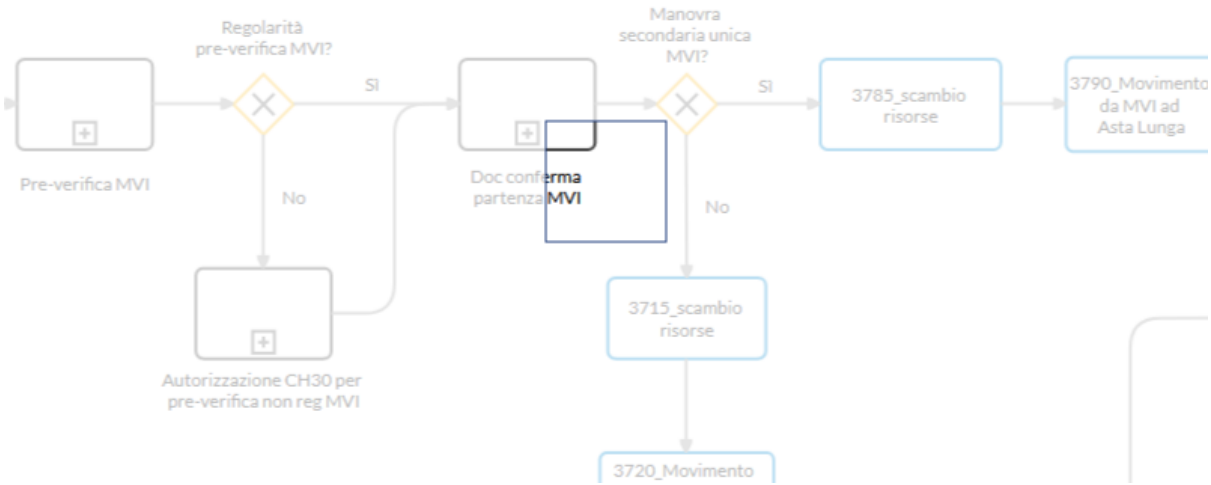
Se le pre-verifica non ha riscontrato scarti o aggiunte di unità di carico, il terminalista modifica gli abbinamenti nel CH30 e lo rimanda alla Dogana.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through No	EXCLUSIVE GATEWAY Exclusive Gateway_4881

Exclusive Gateway_4881

EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3590_Modifica abbinamenti CH30	END EVENT Pre-verifica non regolare
TASK 3580_Modifica CH30	
TASK 3570_Richiesta esecuzione manovra aggiuntiva	

Pre-verifica non regolare

END EVENT

Incoming

EXCLUSIVE GATEWAY
Exclusive Gateway_4881

1.1.1.8. Subprocess: Doc conferma partenza MVI

startEvents_edb10b07-c054-7e55-ce14-6f34e7f9e6b1

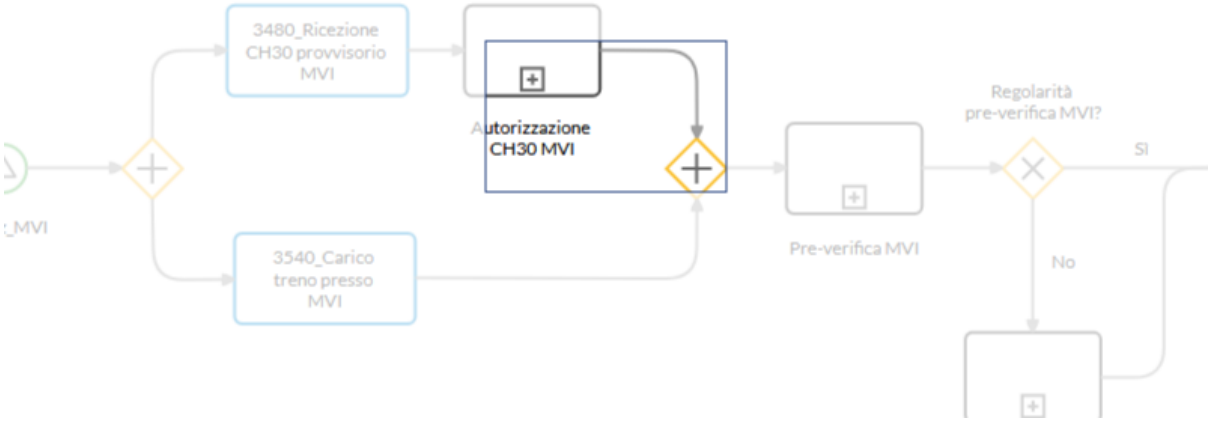
START EVENT

Outgoing

TASK
3650_Produzione CH30 definitivo

3650_Produzione CH30 definitivo

TASK



Se la muta è già presente nel terminale ed è necessario solo il controllo documentale dato che la pre-verifica è già stata effettuata, il terminalista pone il CH30 nello stato Definitivo e autorizza l'uscita del convoglio dal PFN.

> 1 min;

Incoming

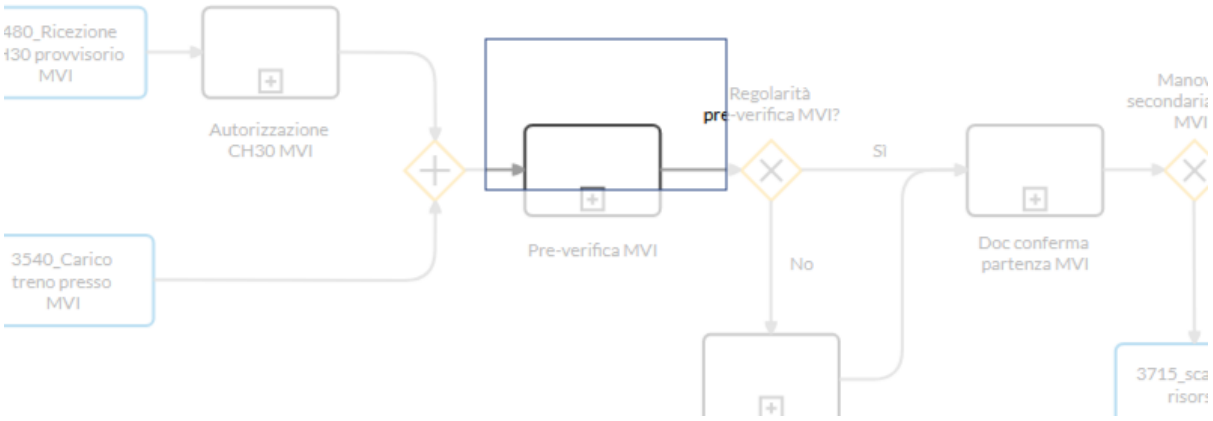
START EVENT
startEvents_edb10b07-c054-7e55-ce14-6f34e7f9e6b1

Outgoing

TASK
3660_Conferma CH30 e iscrizione su registro

3660_Conferma CH30 e iscrizione su registro

TASK



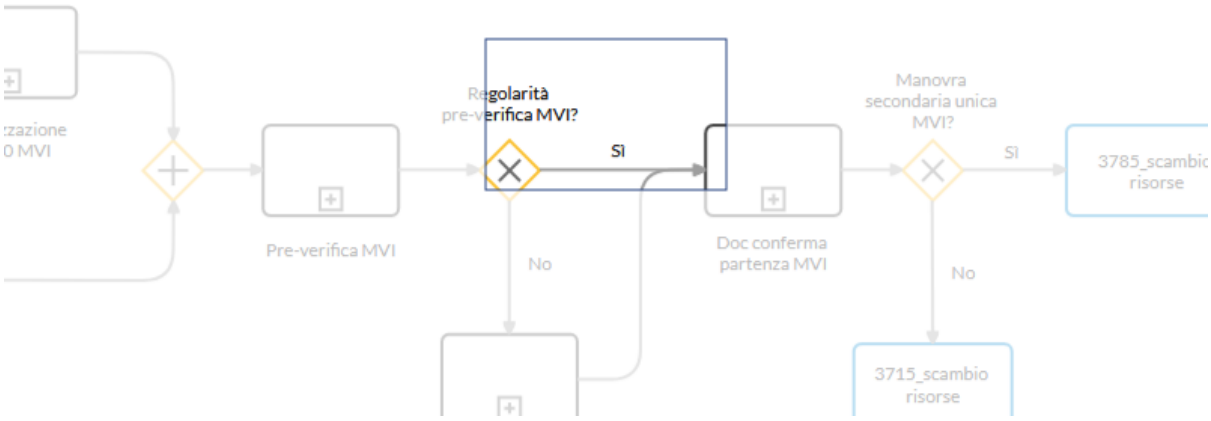
La Dogana conferma il CH30, variandone lo stato da Definitivo a Confermato.

> 1 min;

Incoming	Outgoing
TASK 3650_Produzione CH30 definitivo	TASK 3670_Conferma Partenza

3670_Conferma Partenza

TASK



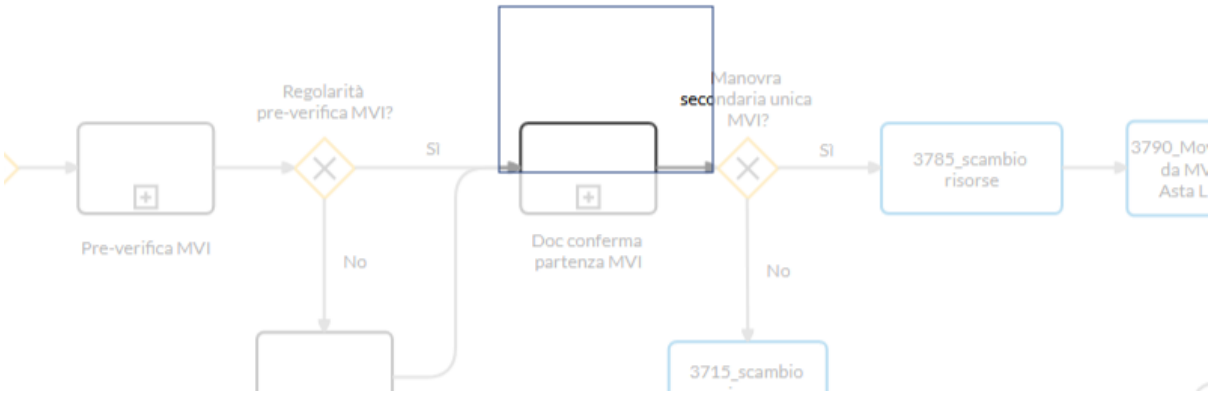
L'impresa ferroviaria deve confermare la partenza del treno.

> 1 min;

Incoming	Outgoing
TASK 3660_Conferma CH30 e iscrizione su registro	EXCLUSIVE GATEWAY Partenza confermata?

Partenza confermata?

EXCLUSIVE GATEWAY

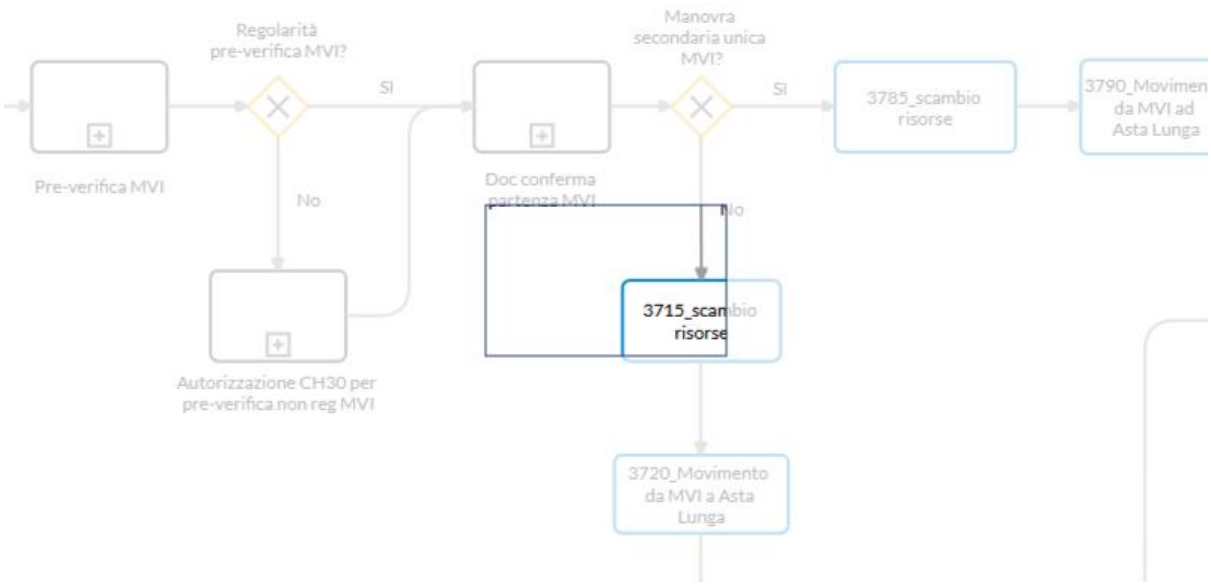


> 95%si, 5%no

Incoming	Outgoing
TASK 3670_Conferma Partenza	TASK 3680_Soppressione treno con ripianificazione through No con riserva
	TASK 3700_Richiesta di manovra secondaria through Sì

3680_Soppressione treno con ripianificazione

TASK



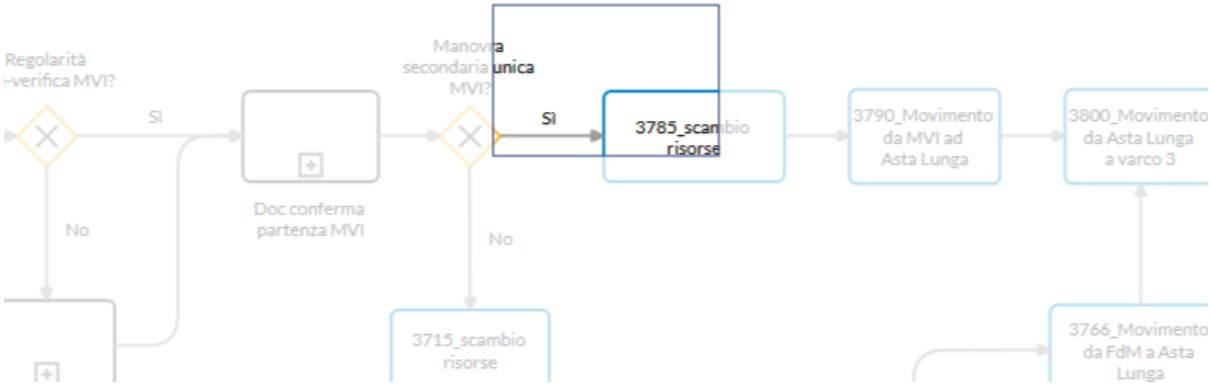
Se la partenza del treno è negata con riserva dall'IF, il treno viene soppresso e la sua partenza ripianificata.

> 5 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through No con riserva	TASK 3690_Attesa

3700_Richiesta di manovra secondaria

TASK



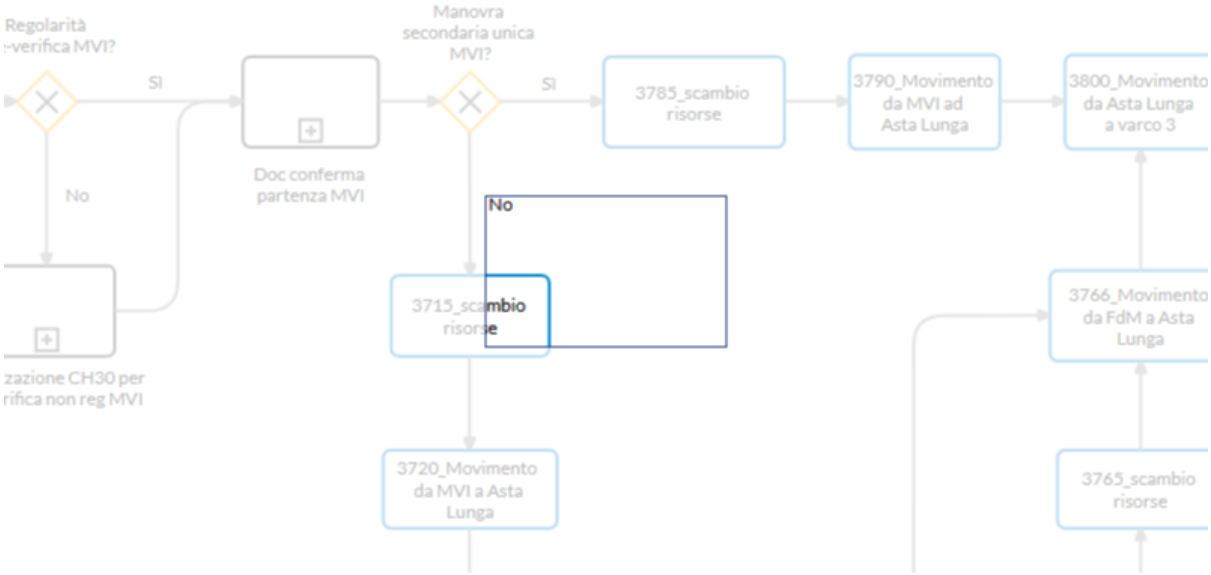
L’operatore richiede l'esecuzione della manovra secondaria.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through Sì	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_171bc855-000b-c74a-01c1-372f96c740b6
TASK 3690_Attesa	

3690_Attesa

TASK

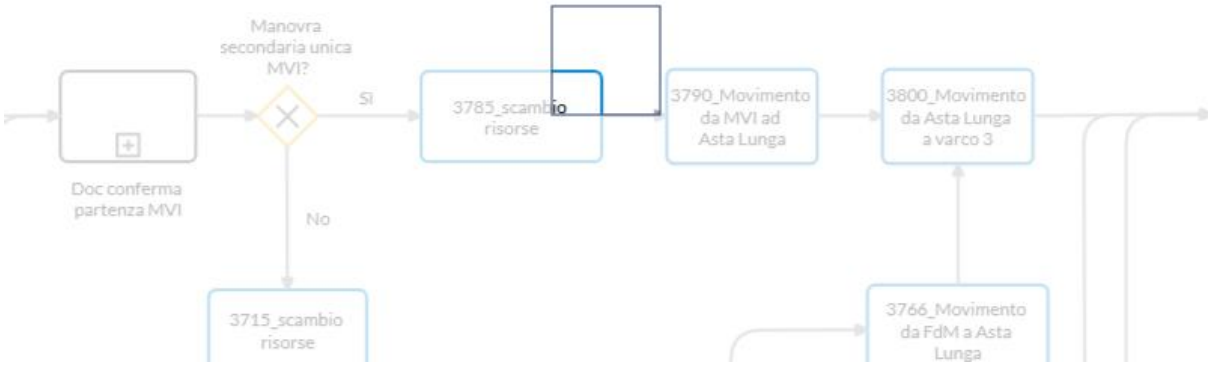


> 5 min;

Incoming	Outgoing
TASK 3680_Soppressione treno con ripianificazione	TASK 3700_Richiesta di manovra secondaria

signalIntermediateThrowEvents_171bc855-000b-c74a-01c1-372f96c740b6

SIGNAL INTERMEDIATE THROW EVENT



Incoming

TASK
3700_Richiesta di manovra secondaria

Outgoing

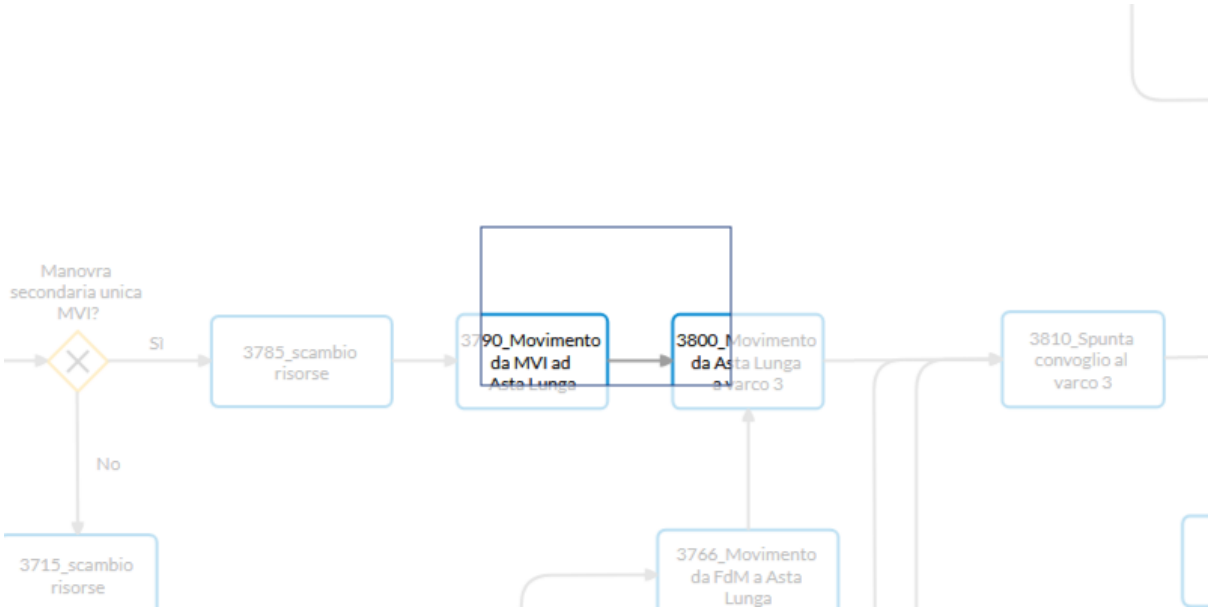
TASK
3710_Aggancio LM a treno carico in MVI e caricamento aria

Attributes

SIGNAL REFERENCE
Richiamo_LM_estrazione_MVI

3710_Aggancio LM a treno carico in MVI e caricamento aria

TASK

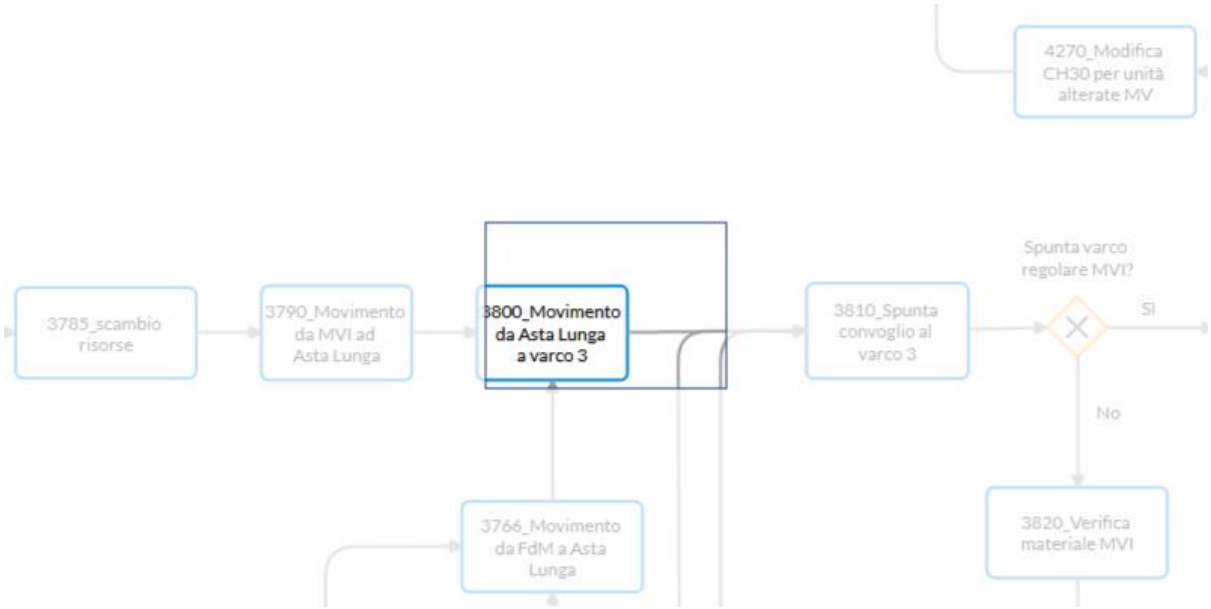


> 10 min; Consumo LocoM6,

Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_171bc855-000b-c74a-01c1-372f96c740b6	END EVENT Treno pronto per estrazione da MVI

Treno pronto per estrazione da MVI

END EVENT



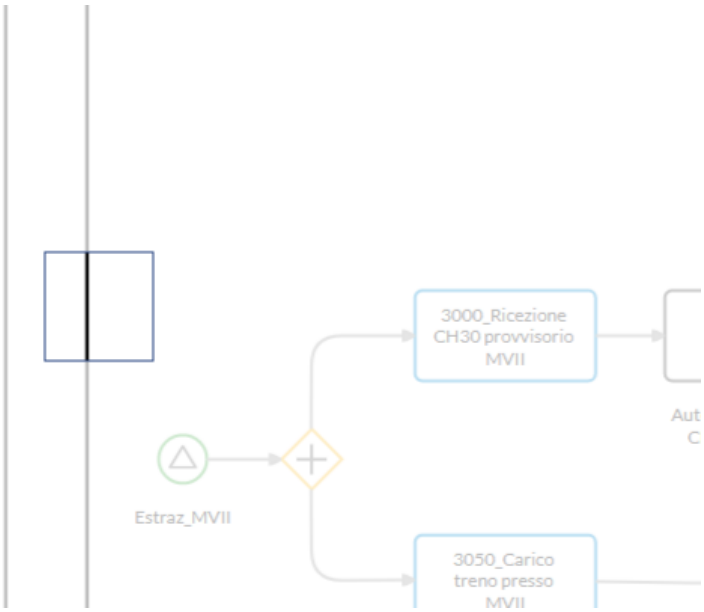
Incoming

TASK
3710_Aggancio LM a treno carico in MVI e caricamento aria

1.1.1.9. Subprocess: Autorizzazione CH30 MVII

startEvents_dbf07f54-d604-43c8-bfd6-f37ea04affb6

START EVENT

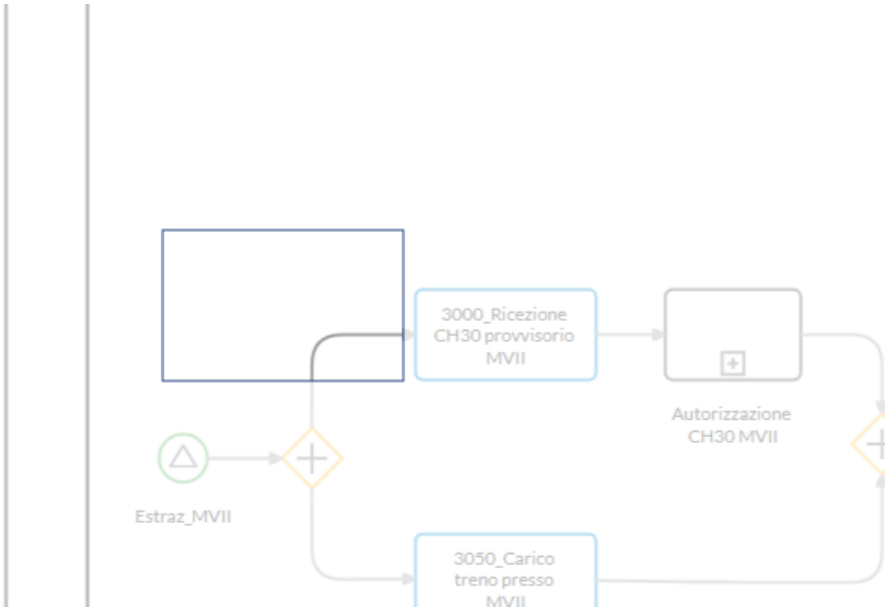


Outgoing

TASK
3010_Autorizzazione CH30

3010_Autorizzazione CH30

TASK



La Dogana procede quindi con la valutazione del CH30 per una sua possibile autorizzazione.

> 1 min;

Incoming

START EVENT
startEvents_dbf07f54-d604-43c8-bfd6-f37ea04affb6

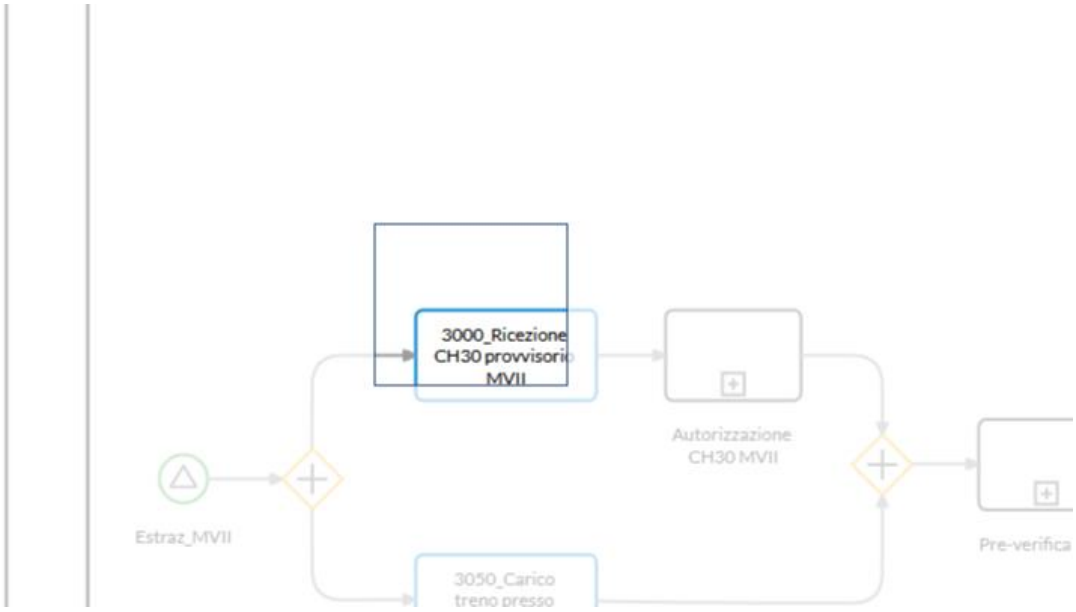
TASK
3040_Modifica CH30 senza autorizzazione

Outgoing

EXCLUSIVE GATEWAY
CH30 autorizzato?

CH30 autorizzato?

EXCLUSIVE GATEWAY

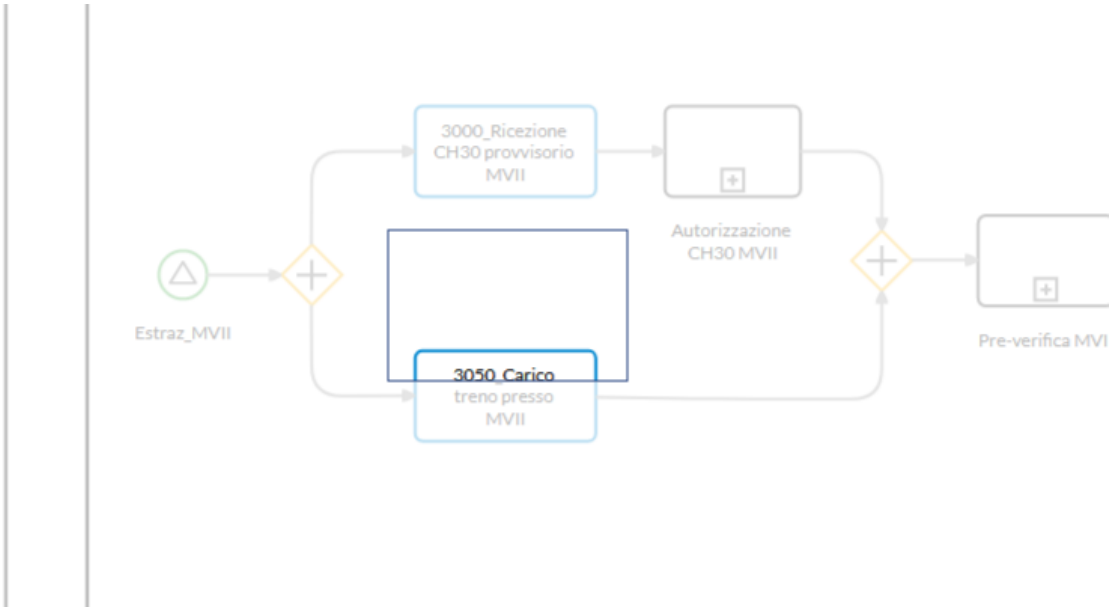


> 90%si, 10%no

Incoming	Outgoing
TASK 3010_Autorizzazione CH30	TASK 3040_Modifica CH30 senza autorizzazione through No con riserva
	TASK 3015_Modifica CH30 con autorizzazione through Sì

3040_Modifica CH30 senza autorizzazione

TASK



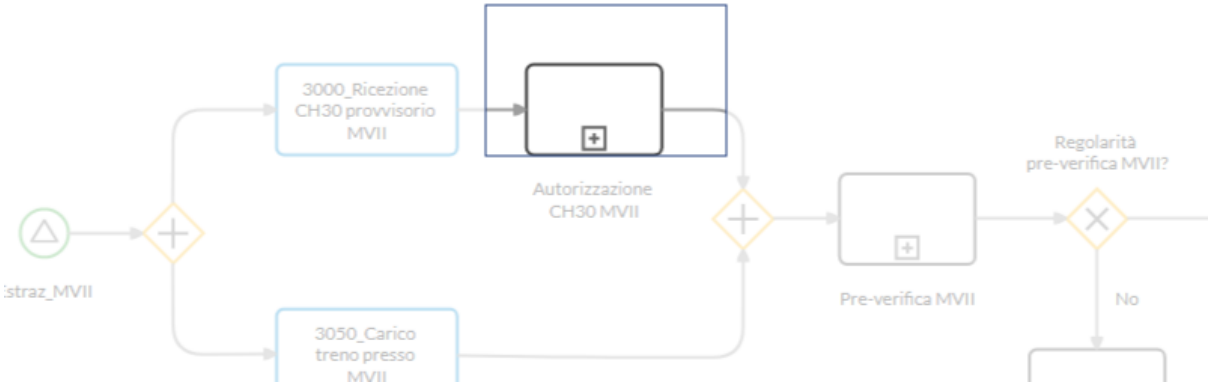
Se la Dogana autorizza con riserva il CH30, il terminalista è tenuto a modificare il CH30 e ripresentarlo alla dogana affinché venga nuovamente valutato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through No con riserva	TASK 3010_Autorizzazione CH30

3015_Modifica CH30 con autorizzazione

TASK



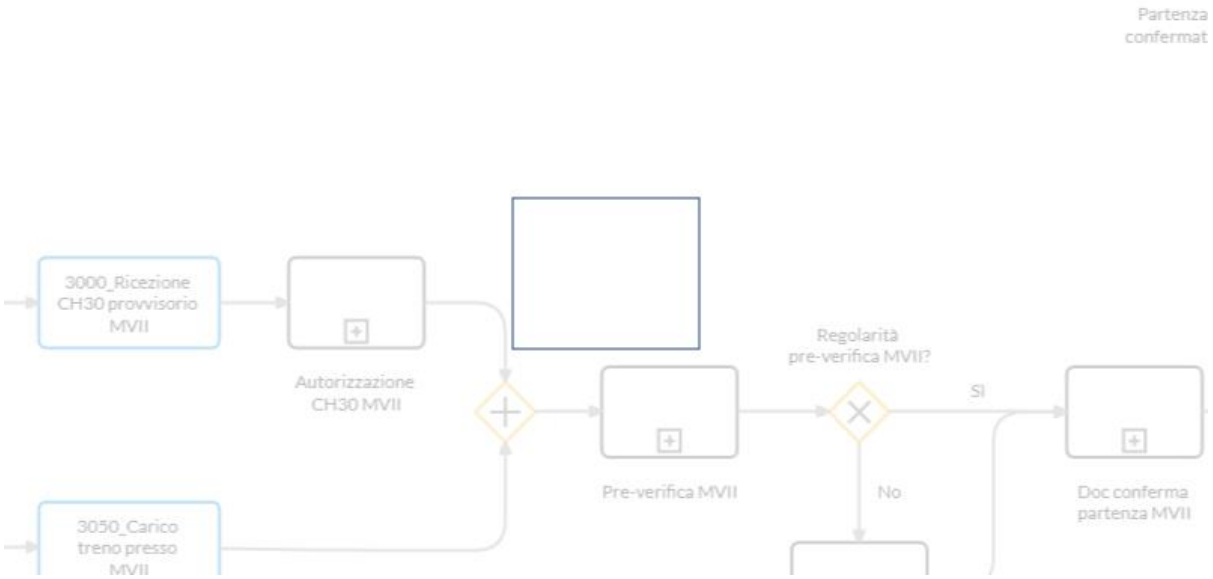
L'autorità doganale autorizza il CH30, variandone lo stato da Provvisorio a Confermato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through Sì	TASK 3020_Verifica su carico

3020_Verifica su carico

TASK



Una volta che il CH30 viene autorizzato dalla Dogana, la Guardia di Finanza può effettuare una verifica sul carico o parte del carico.

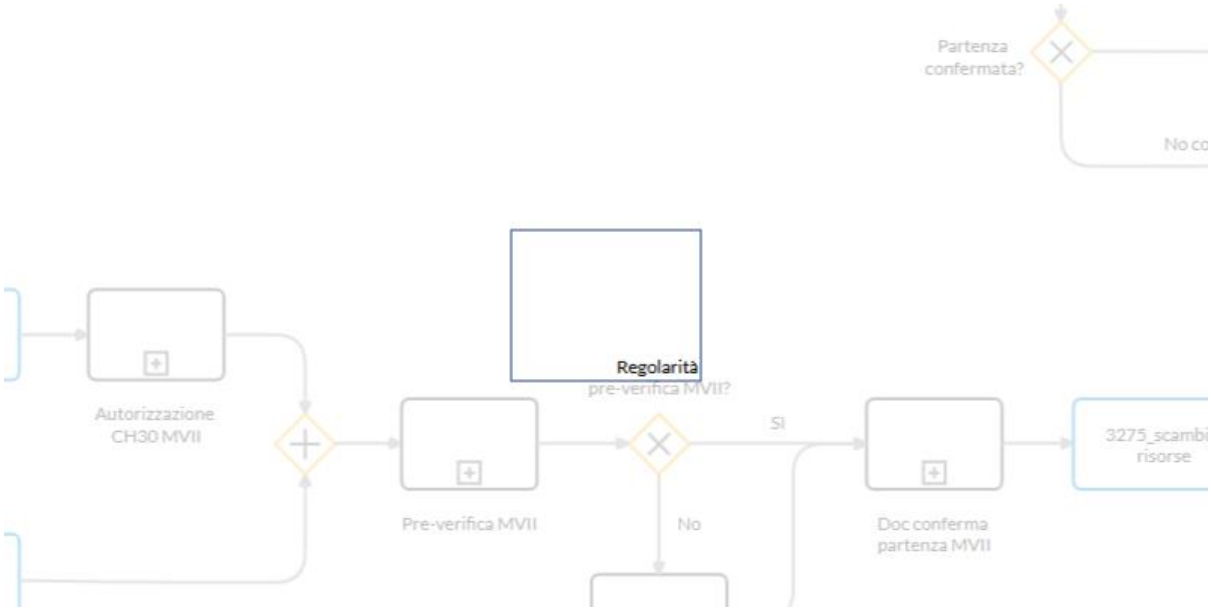
> 15 min;

> 15 min;

Incoming	Outgoing
TASK 3015_Modifica CH30 con autorizzazione	TASK 3030_Modifica CH30

3030_Modifica CH30

TASK



La Guardia di Finanza pone il CH30 nello stato Vistato, eventualmente annotando le partite di carico su cui verrà effettuato il riscontro.

> 1 min;

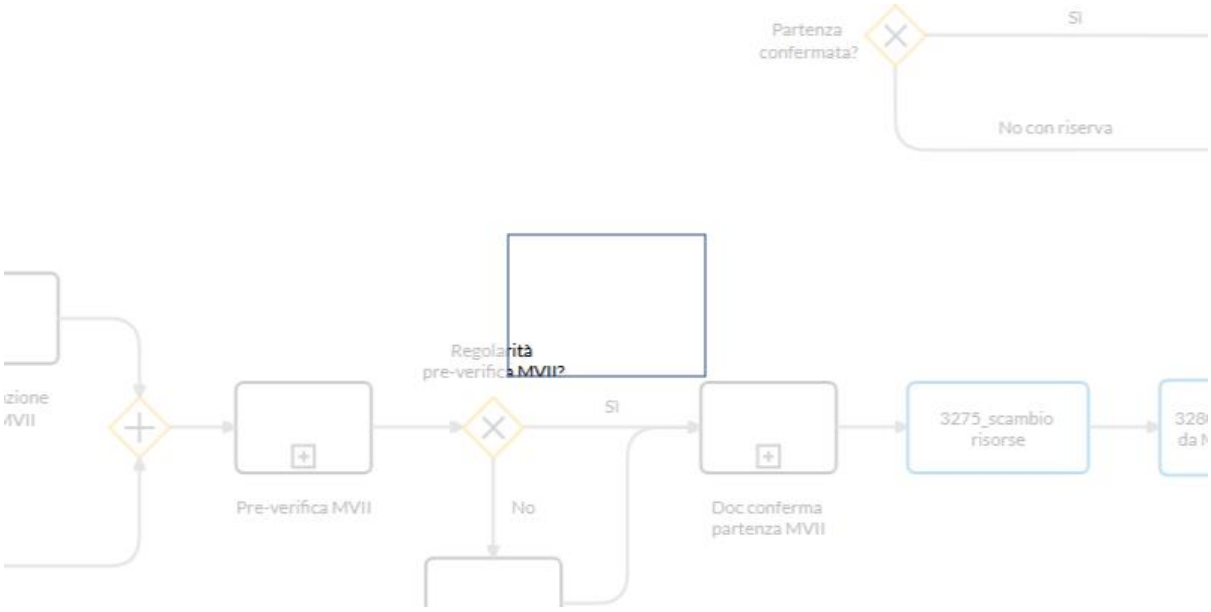
> 1 min;

> 1 min;

Incoming	Outgoing
TASK 3020_Verifica su carico	END EVENT CH30 autorizzato

CH30 autorizzato

END EVENT



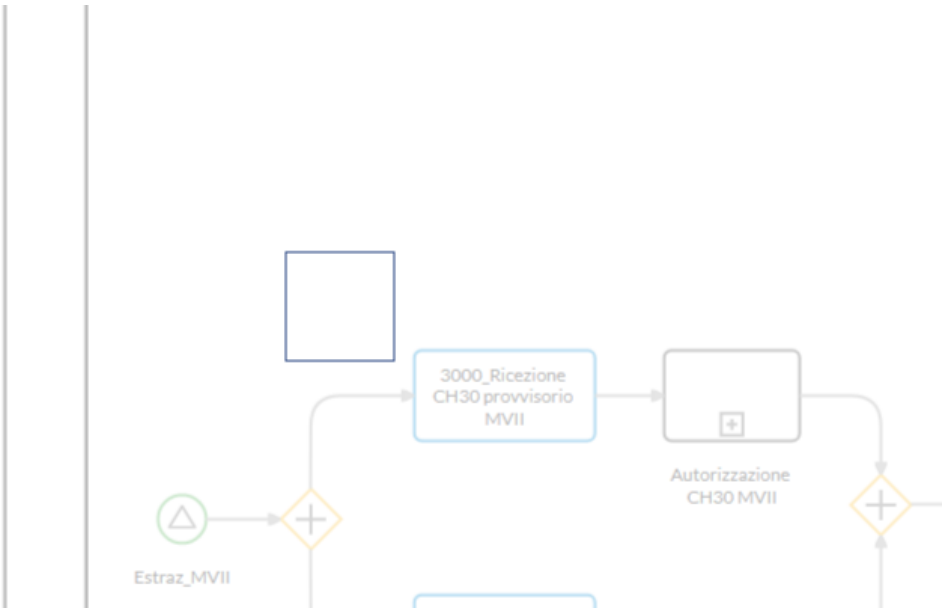
Incoming

TASK
3030_Modifica CH30

1.1.1.10. Subprocess: Pre-verifica MVII

startEvents_71ac4c5c-17b4-6b5d-abae-fb9edb97c679

START EVENT

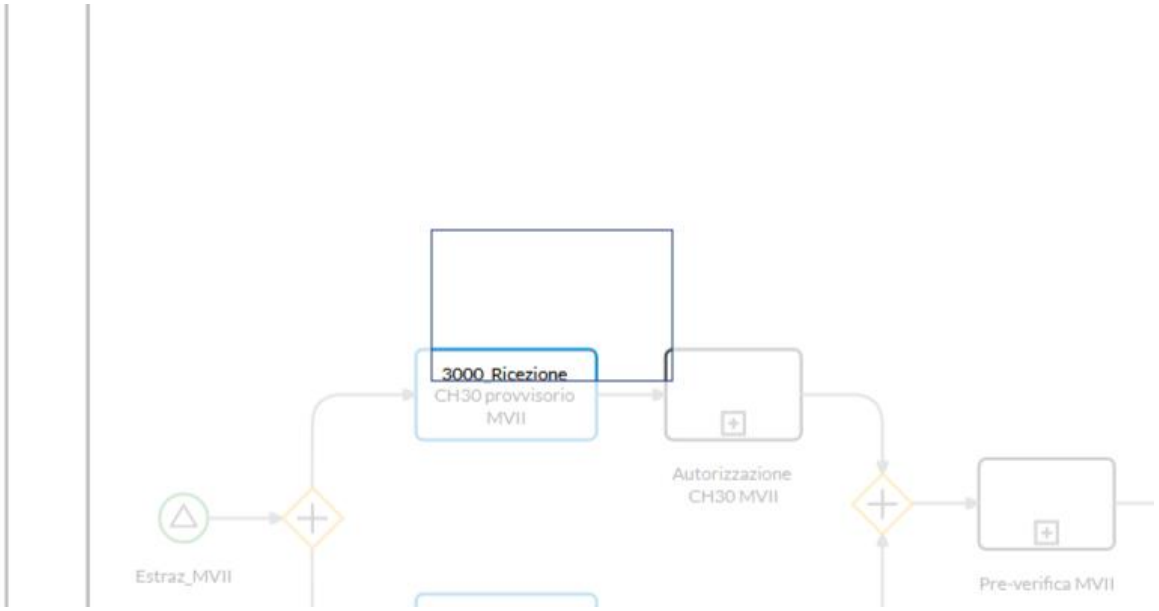


Outgoing

TASK
3060_Pre-verifica materiale rotabile

3060_Pre-verifica materiale rotabile

TASK



L'impresa ferroviaria prosegue con la pre-verifica del materiale rotabile.

> 1 min;

Incoming

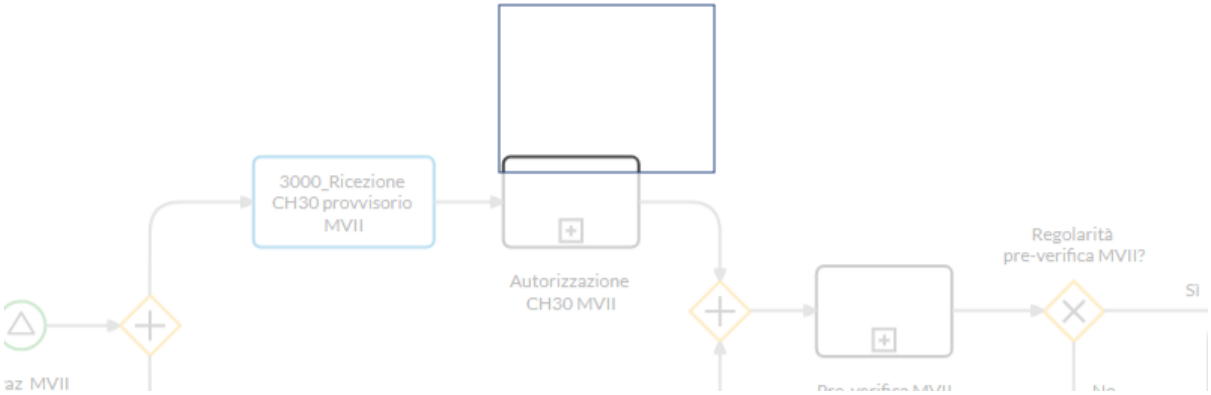
START EVENT
startEvents_71ac4c5c-17b4-6b5d-abae-fb9edb97c679

Outgoing

EXCLUSIVE GATEWAY
Pre-verifica regolare?

Pre-verifica regolare?

EXCLUSIVE GATEWAY

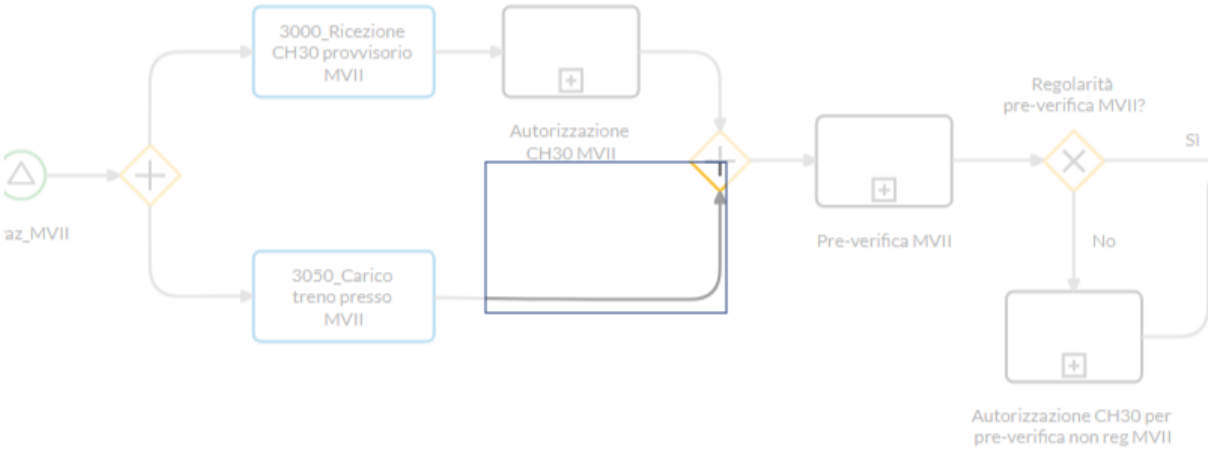


> Sì 100% - No 0%

Incoming	Outgoing
TASK 3060_Pre-verifica materiale rotabile	TASK 3070_Verifica unità di carico through No
	END EVENT Treno pronto per estrazione through Sì

3070_Verifica unità di carico

TASK



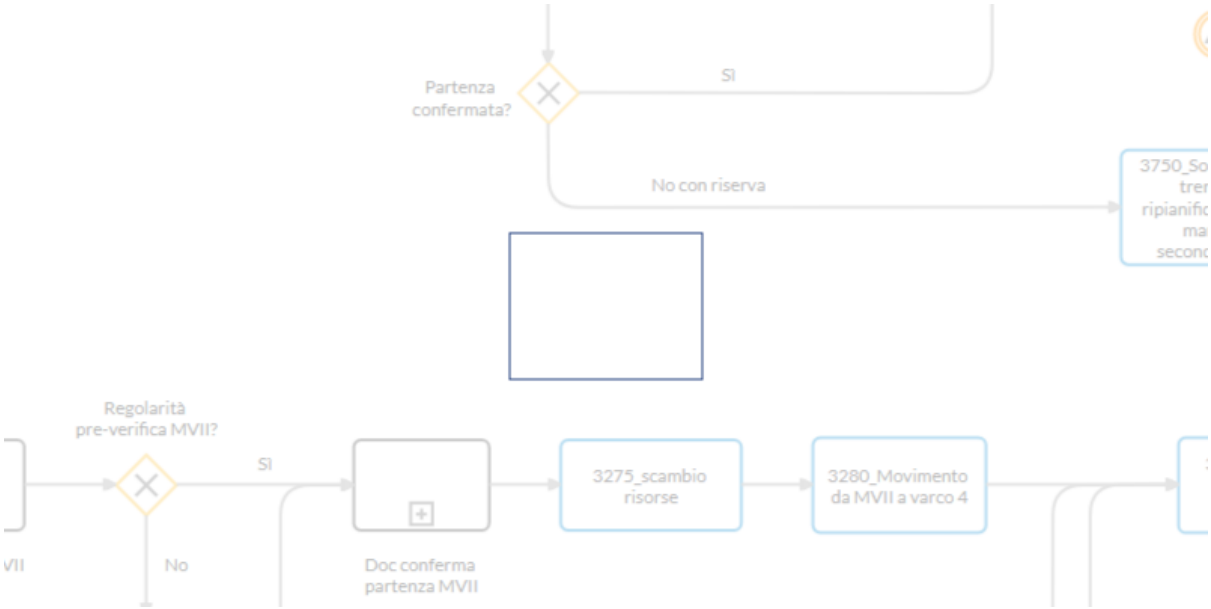
Qualora l'esito della pre-verifica non fosse regolare, l'impresa ferroviaria deve verificare le unità di carico.

> XXX min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Pre-verifica regolare? through No	EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico?

Treno pronto per estrazione

END EVENT

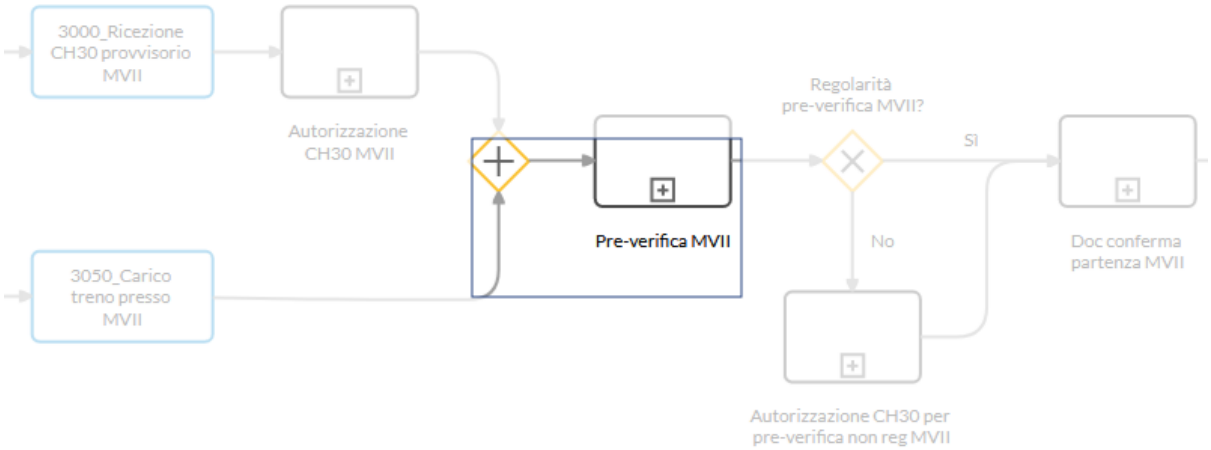


Incoming

EXCLUSIVE GATEWAY
Pre-verifica regolare?
through Sì

Scarto o aggiunta unità di carico?

EXCLUSIVE GATEWAY

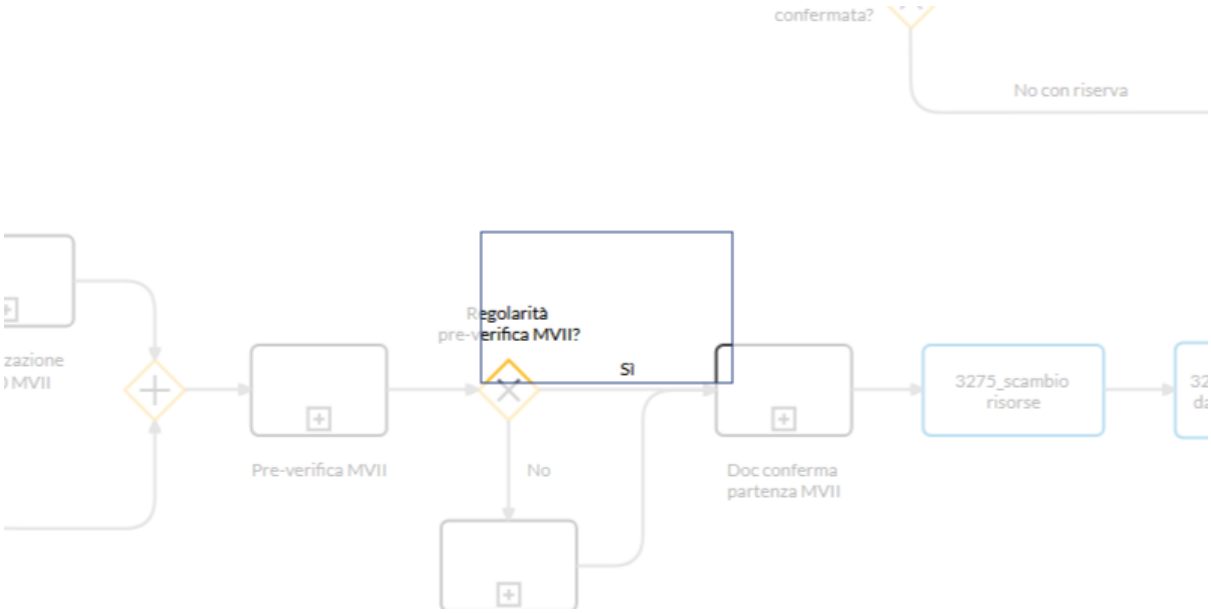


> %mv, %sddc, %no

Incoming	Outgoing
TASK 3070_Verifica unità di carico	TASK 3090_Modifica CH30 through Solo documenti di carico
	TASK 3100_Modifica abbinamenti CH30 through No
	TASK 3080_Richiesta esecuzione manovra aggiuntiva through Modifica veicoli

3080_Richiesta esecuzione manovra aggiuntiva

TASK



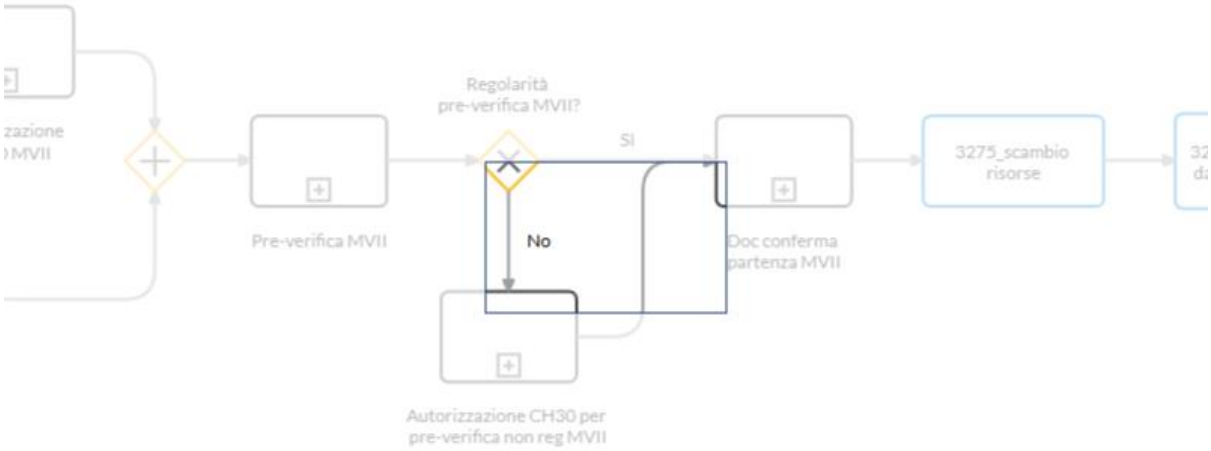
Se in seguito alla non regolarità della pre-verifica del treno è necessaria una modifica dei veicoli, l'impresa ferroviaria richiede l'esecuzione della manovra aggiuntiva e produce le note di manovra.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through Modifica veicoli	EXCLUSIVE GATEWAY Exclusive Gateway_4881

3090_Modifica CH30

TASK



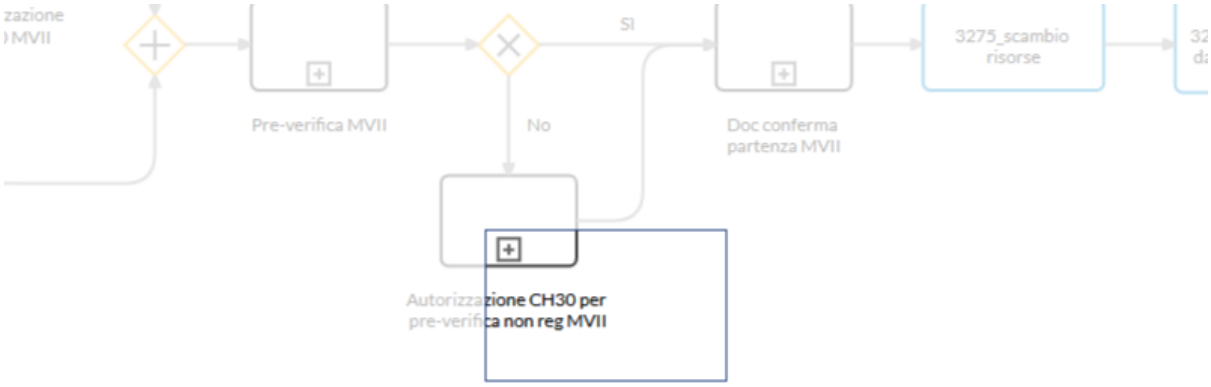
Il terminalista pone il CH30 nello stato Provvisorio per poi mandarlo all'autorità doganale.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through Solo documenti di carico	EXCLUSIVE GATEWAY Exclusive Gateway_4881

3100_Modifica abbinamenti CH30

TASK



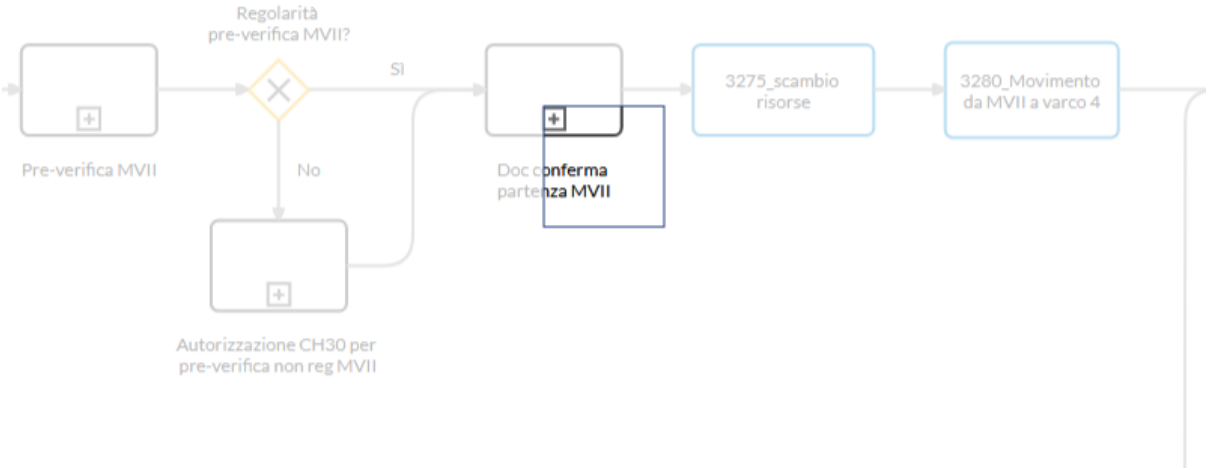
Se le pre-verifica non ha riscontrato scarti o aggiunte di unità di carico, il terminalista modifica gli abbinamenti nel CH30 e lo rimanda alla Dogana.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Scarto o aggiunta unità di carico? through No	EXCLUSIVE GATEWAY Exclusive Gateway_4881

Exclusive Gateway_4881

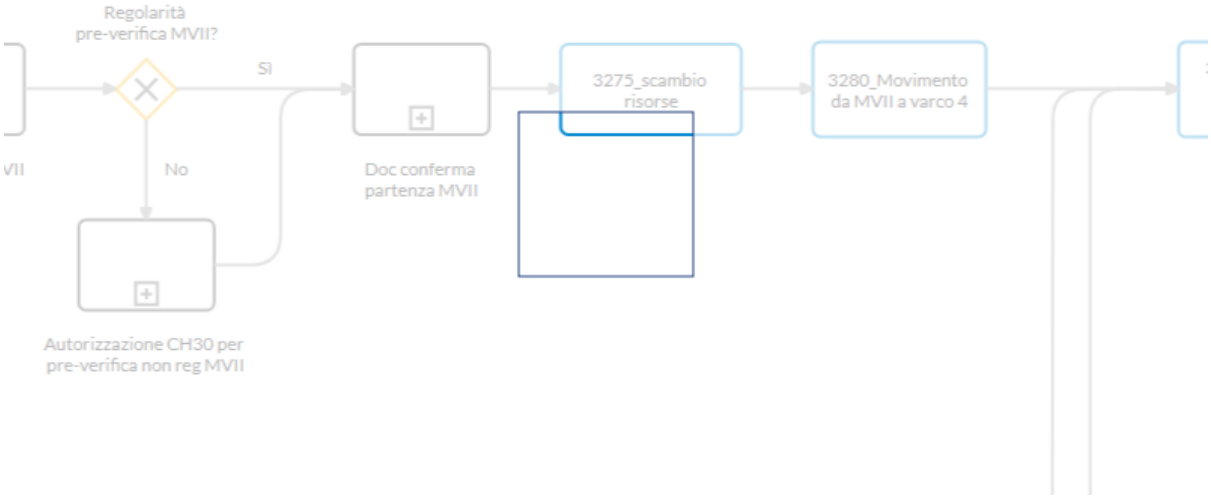
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 3100_Modifica abbinamenti CH30	END EVENT Pre-verifica non regolare
TASK 3090_Modifica CH30	
TASK 3080_Richiesta esecuzione manovra aggiuntiva	

Pre-verifica non regolare

END EVENT



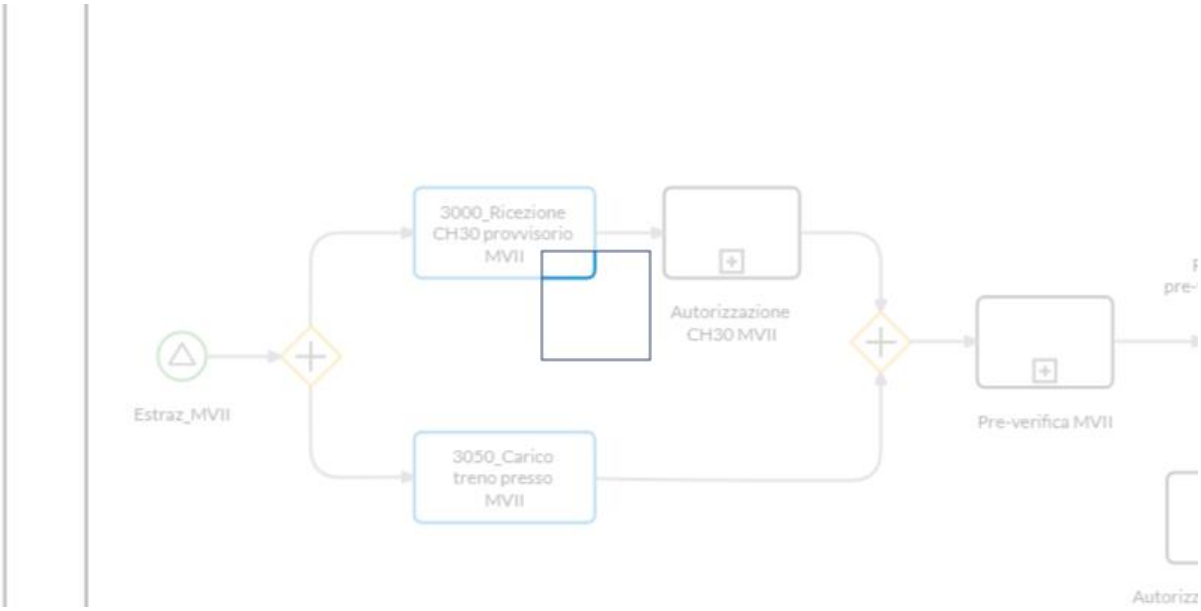
Incoming

EXCLUSIVE GATEWAY
Exclusive Gateway_4881

1.1.1.11. Subprocess: Doc conferma partenza MVII

startEvents_db4dcc67-29da-f7d6-2153-8c61a7f828e2

START EVENT

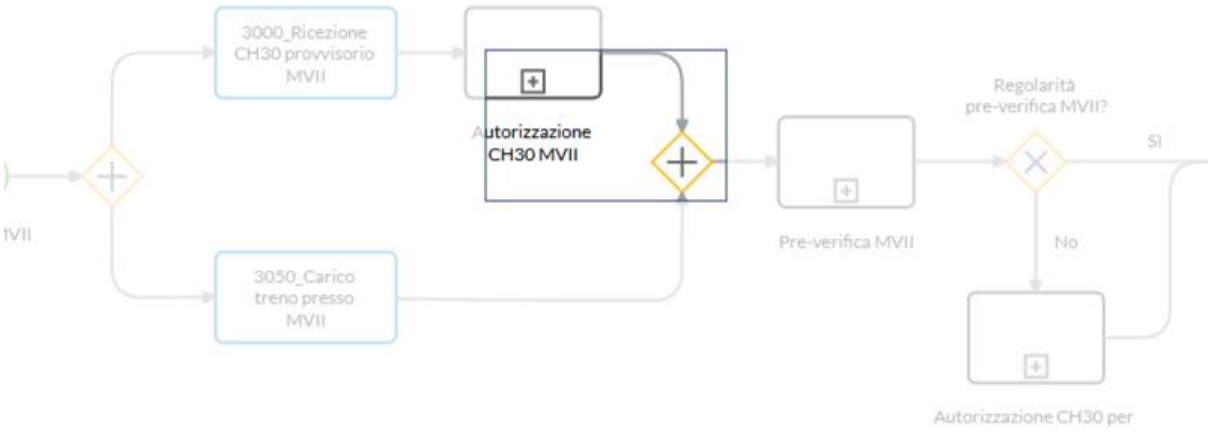


Outgoing

TASK
3160_Produzione CH30 definitivo

3160_Produzione CH30 definitivo

TASK



Se la muta è già presente nel terminale ed è necessario solo il controllo documentale dato che la pre-verifica è già stata effettuata, il terminalista pone il CH30 nello stato Definitivo e autorizza l'uscita del convoglio dal PFN.

> 1 min;

Incoming

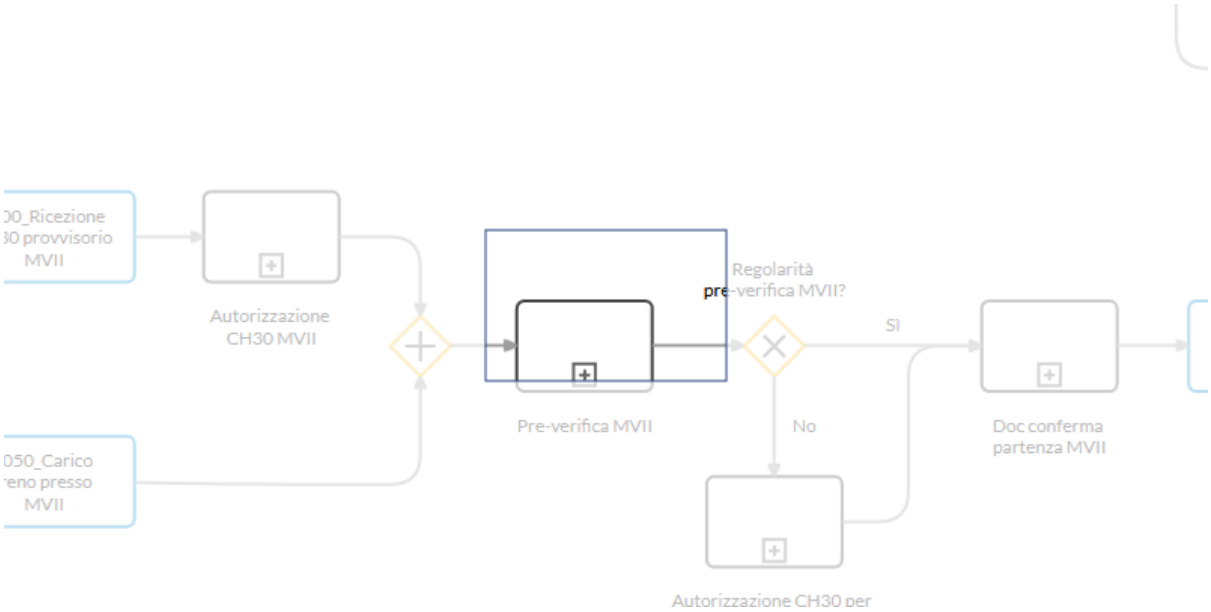
START EVENT
startEvents_db4dcc67-29da-f7d6-2153-8c61a7f828e2

Outgoing

TASK
3170_Conferma CH30 e iscrizione su registro

3170_Conferma CH30 e iscrizione su registro

TASK



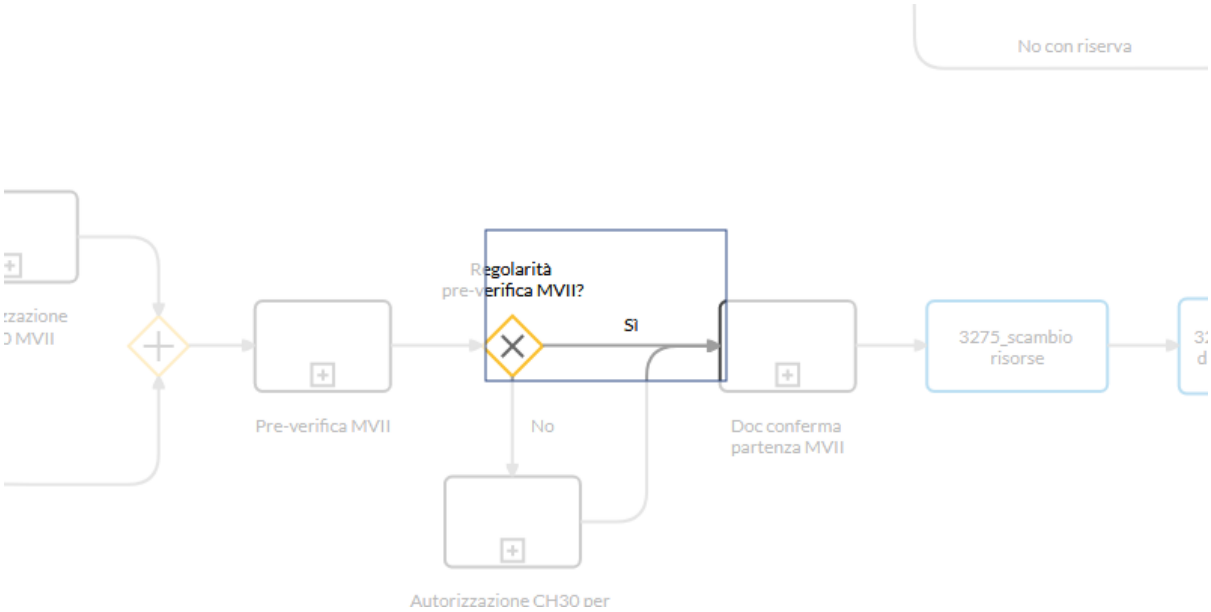
La Dogana conferma il CH30, variandone lo stato da Definitivo a Confermato.

> 1 min;

Incoming	Outgoing
TASK 3160_Produzione CH30 definitivo	TASK 3180_Conferma Partenza

3180_Conferma Partenza

TASK



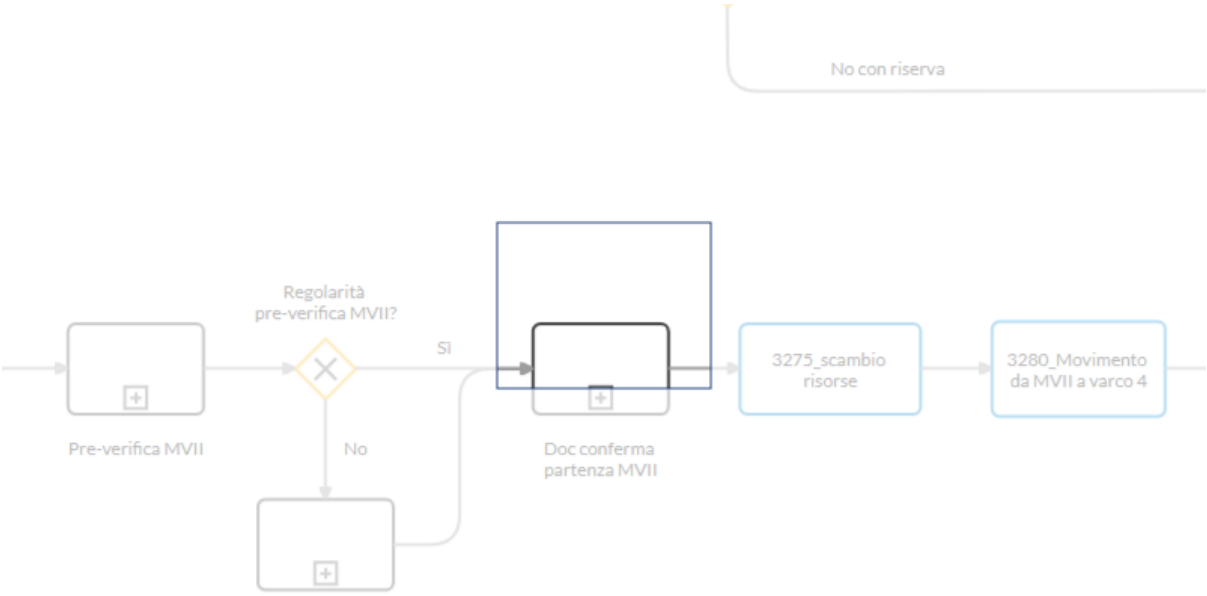
L'impresa ferroviaria deve confermare la partenza del treno.

> 1 min;

Incoming	Outgoing
TASK 3170_Conferma CH30 e iscrizione su registro	EXCLUSIVE GATEWAY Partenza confermata?

Partenza confermata?

EXCLUSIVE GATEWAY

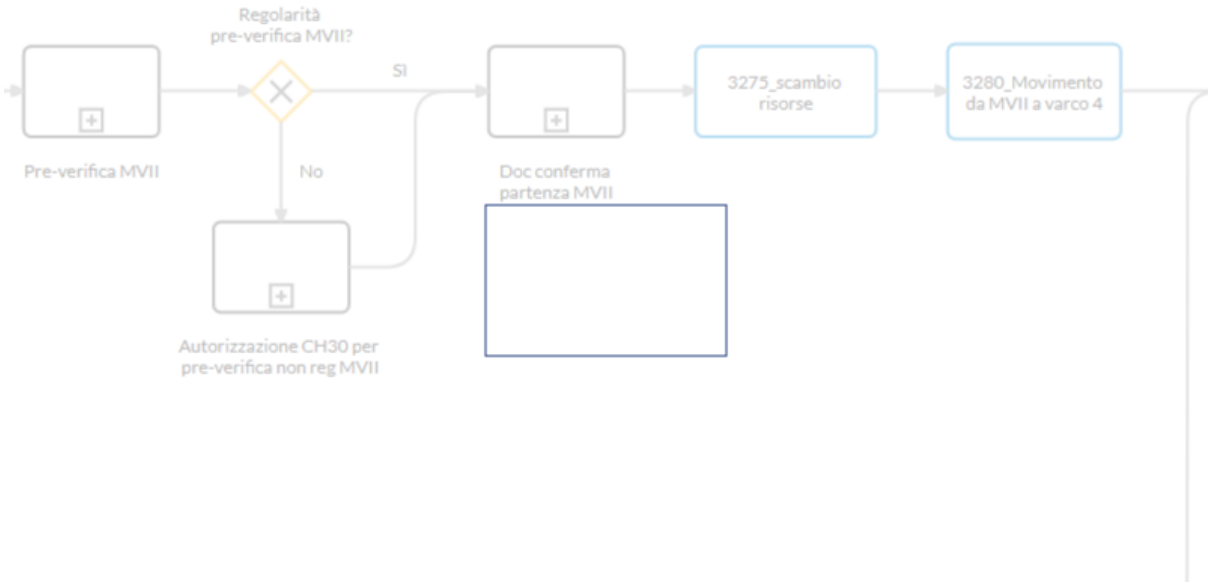


> 95%si, 5%no

Incoming	Outgoing
TASK 3180_Conferma Partenza	TASK 3190_Soppressione treno con ripianificazione through No con riserva
	TASK 3210_Richiesta di manovra secondaria through Sì

3190_Soppressione treno con ripianificazione

TASK



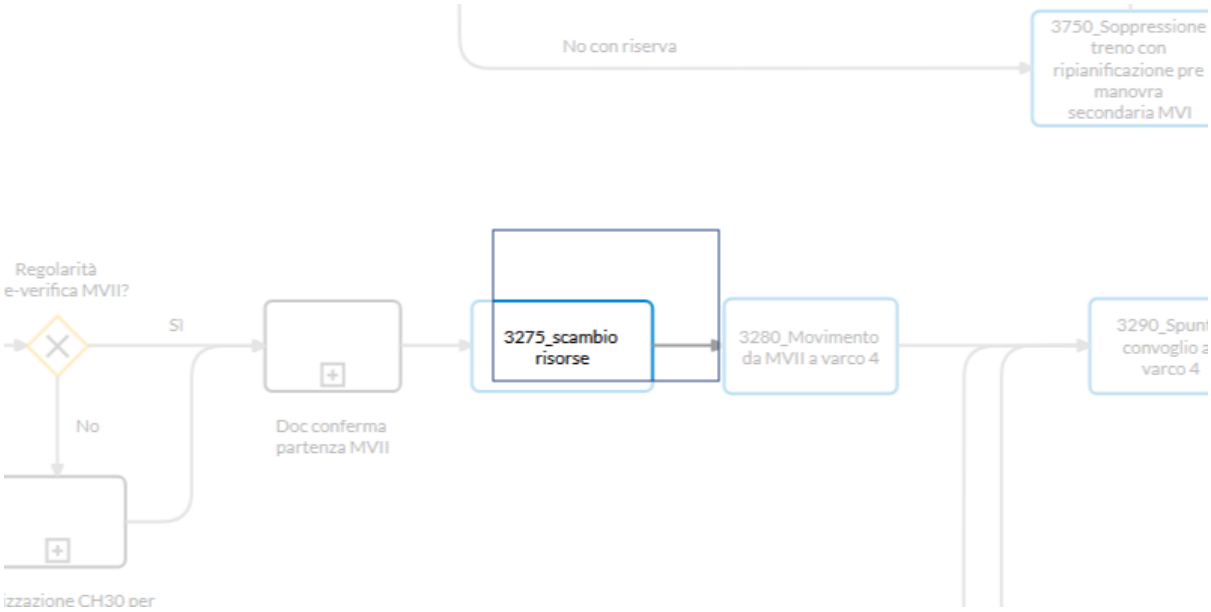
Se la partenza del treno è negata con riserva dall'IF, il treno viene soppresso e la sua partenza ripianificata.

> 5 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through No con riserva	TASK 3200_Attesa

3210_Richiesta di manovra secondaria

TASK



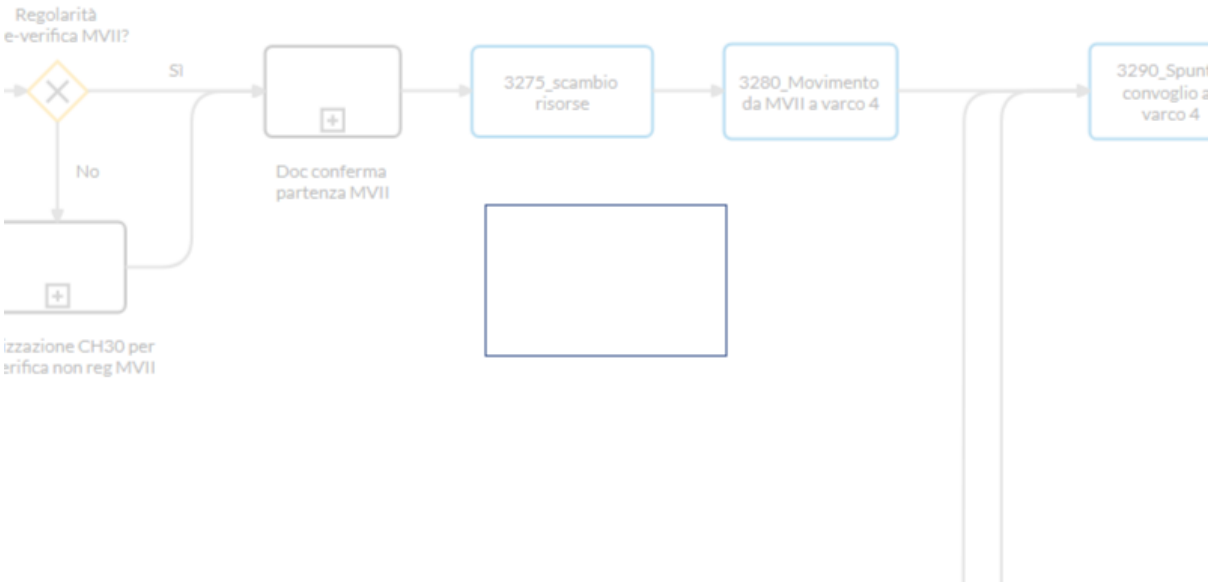
L’operatore richiede l'esecuzione della manovra secondaria.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY Partenza confermata? through Sì	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_ad714d29-0fa0-0ffa-9d56-771a6a0d703a
TASK 3200_Attesa	

3200_Attesa

TASK

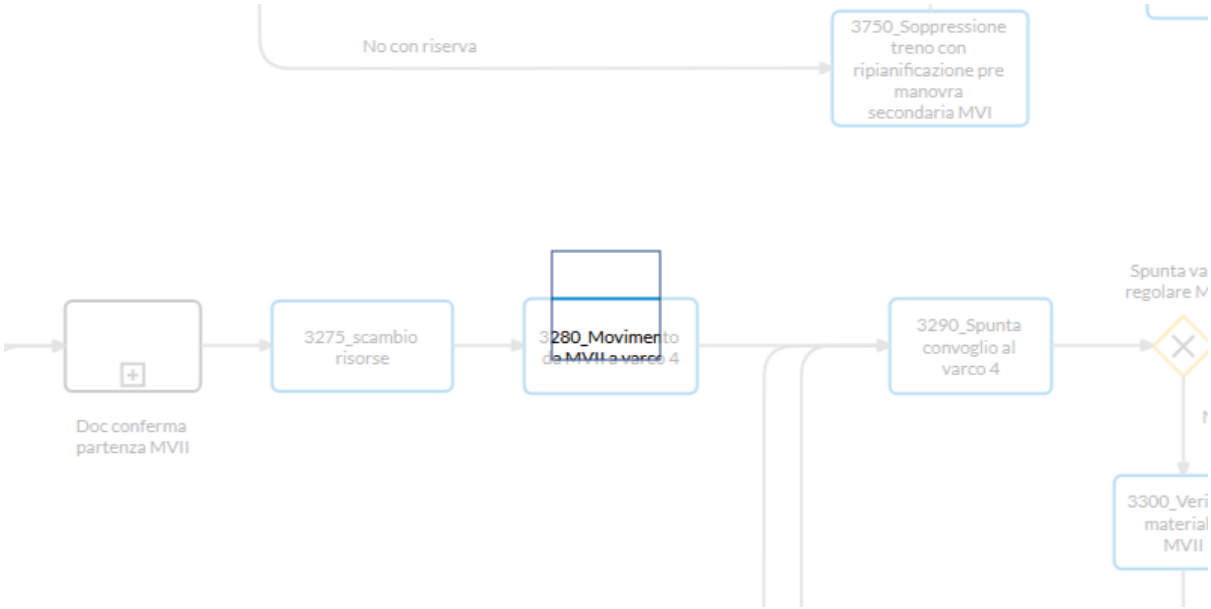


> 5 min;

Incoming	Outgoing
TASK 3190_Soppressione treno con ripianificazione	TASK 3210_Richiesta di manovra secondaria

signalIntermediateThrowEvents_ad714d29-0fa0-0ffa-9d56-771a6a0d703a

SIGNAL INTERMEDIATE THROW EVENT



Incoming

TASK
3210_Richiesta di manovra secondaria

Outgoing

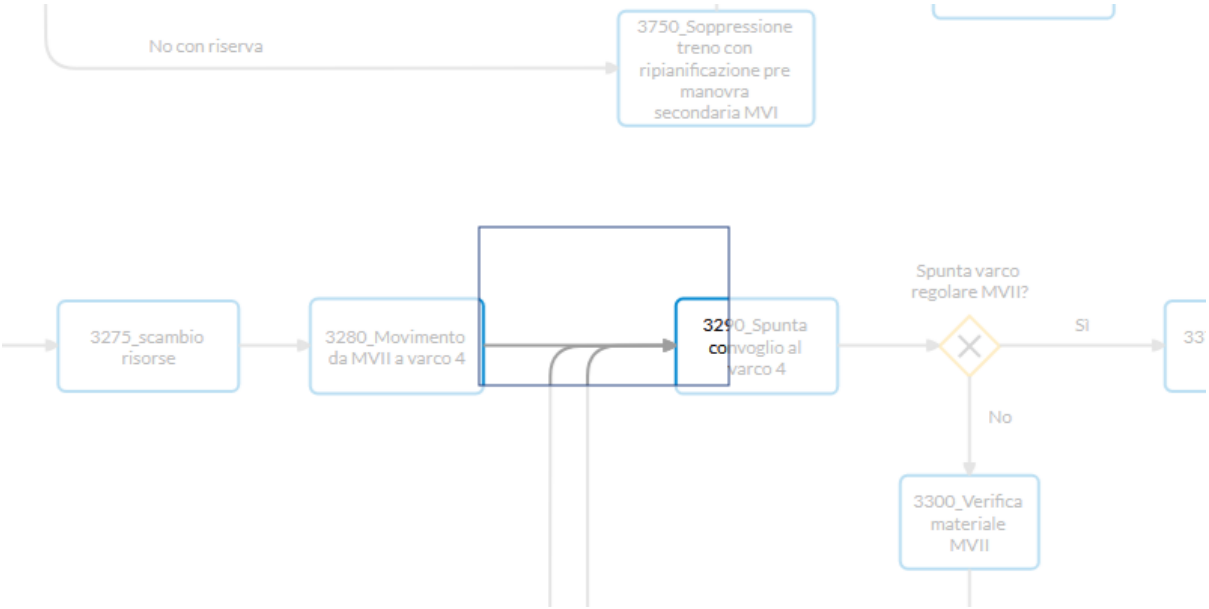
TASK
3220_Aggancio LM a treno carico in MVII e caricamento aria

Attributes

SIGNAL REFERENCE
Richiamo_LM_estrazione_MVII

3220_Aggancio LM a treno carico in MVII e caricamento aria

TASK

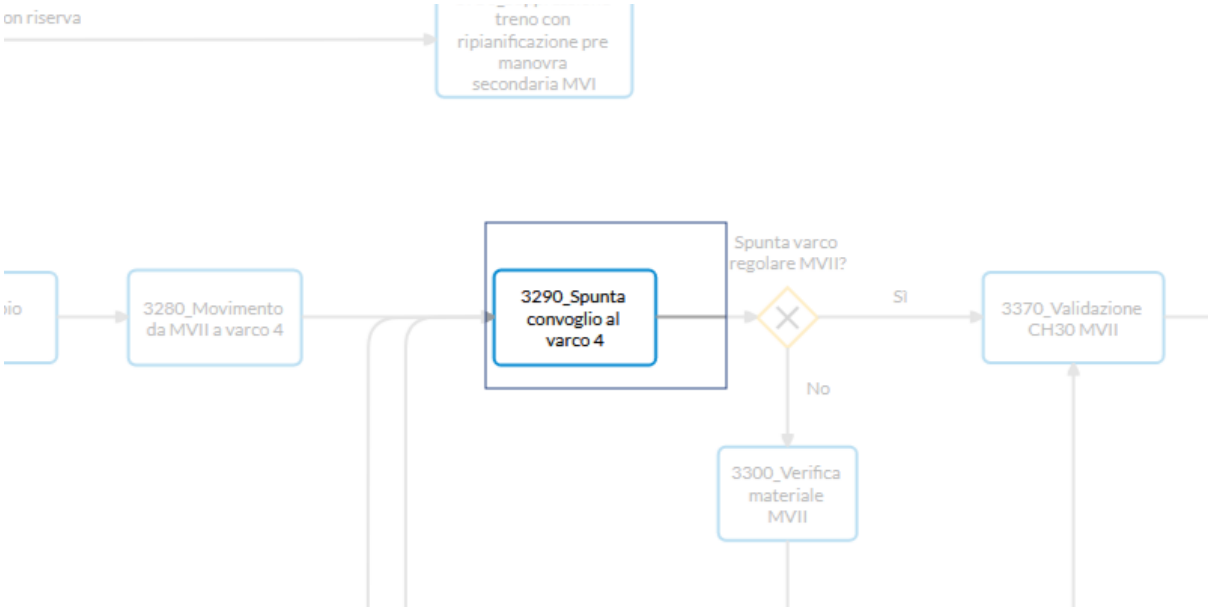


> 10 min; Consumo: LocoM7

Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_ad714d29-0fa0-0ffa-9d56-771a6a0d703a	END EVENT Treno pronto per estrazione da MVI

Treno pronto per estrazione da MVI

END EVENT



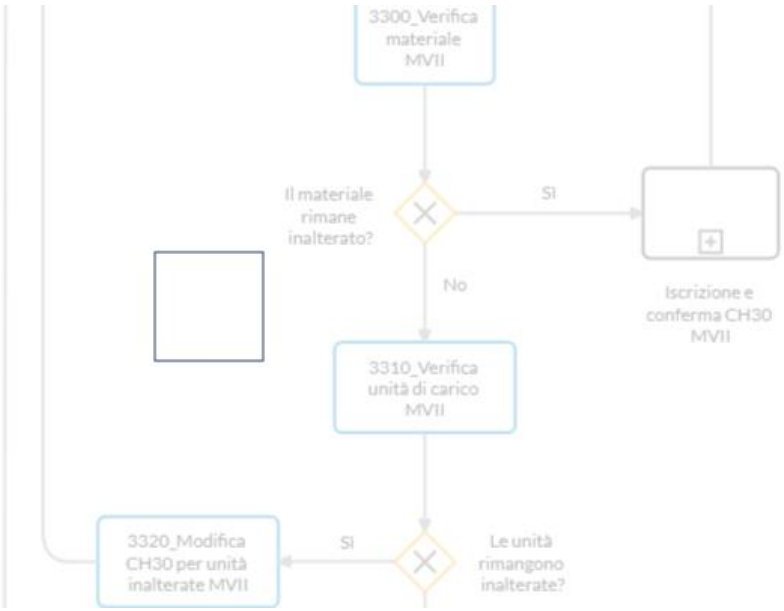
Incoming

TASK
3220_Aggancio LM a treno carico in MVII e caricamento aria

1.1.1.12. Subprocess: Iscrizione e conferma CH30 MVII

startEvents_3df446f0-7987-5ed6-d1ae-32895dbb746f

START EVENT

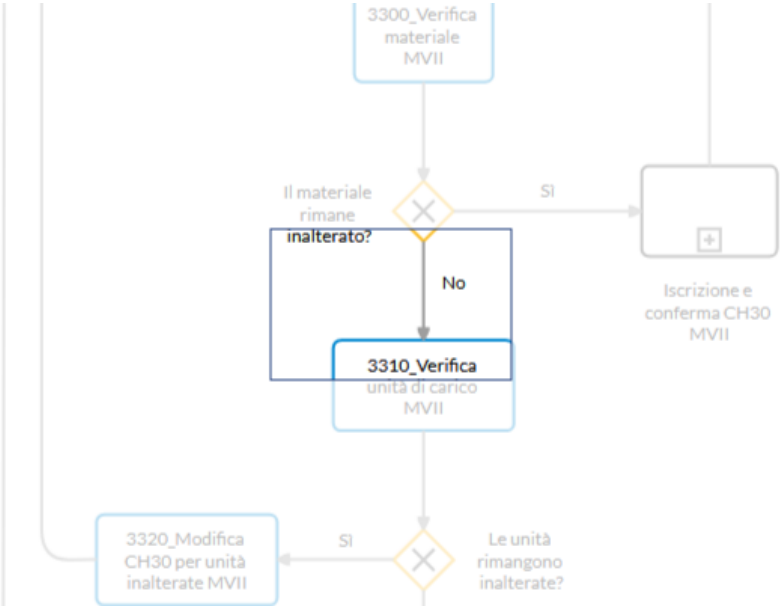


Outgoing

TASK
3340_Modifica CH30 con materiale inalterato

3340_Modifica CH30 con materiale inalterato

TASK



Nel caso di materiale inalterato, la Dogana modifica il CH30 variandone lo stato da Modificabile a Definitivo.

> 1 min;

> 1 min;

Incoming

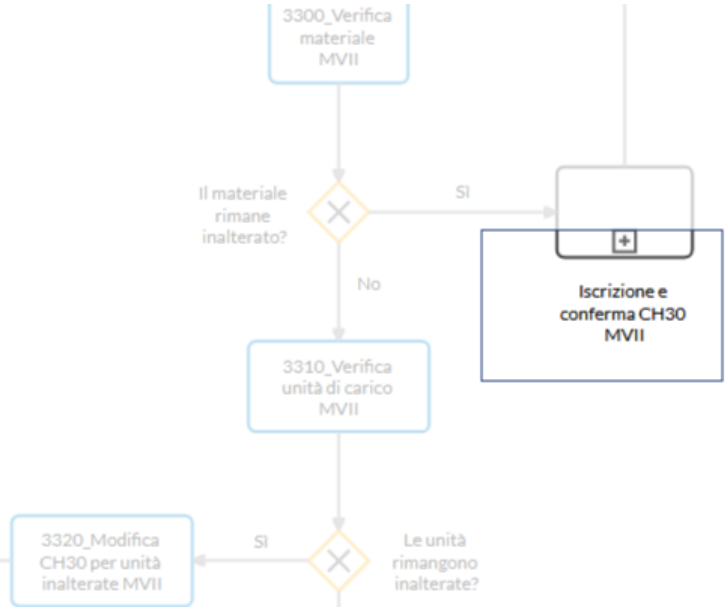
START EVENT
startEvents_3df446f0-7987-5ed6-d1ae-32895dbb746f

Outgoing

TASK
3350_Iscrizione CH30 su registro A/18 con materiale inalterato

3350_Iscrizione CH30 su registro A/18 con materiale inalterato

TASK

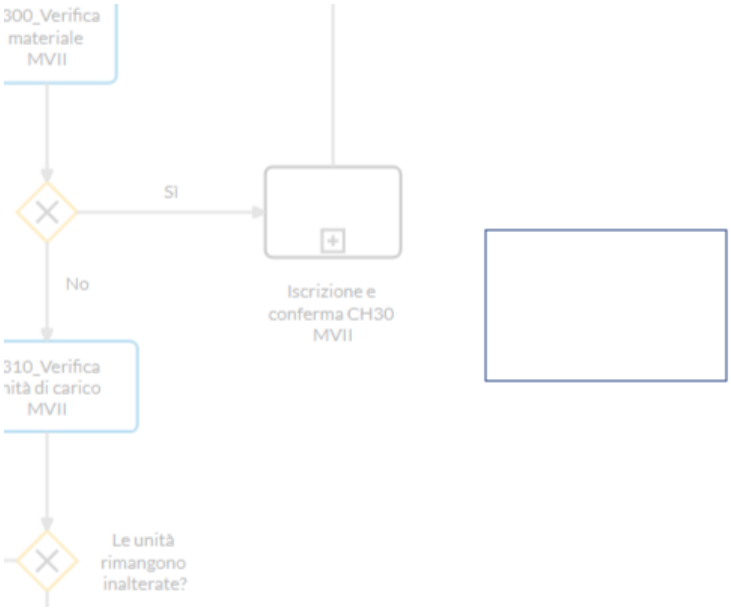


Nel caso di materiale inalterato, l'autorità doganale iscrive il CH30 sul registro A/18.

Incoming	Outgoing
TASK 3340_Modifica CH30 con materiale inalterato	TASK 3360_Conferma CH30 con materiale inalterato

3360_Conferma CH30 con materiale inalterato

TASK



La Dogana conferma il CH30, variandone lo stato da Definitivo a Confermato.

> 1 min;

Incoming	Outgoing
TASK 3350_Iscrizione CH30 su registro A/18 con materiale inalterato	END EVENT endEvents_19b2d80b-ef4d-7056-5d34-24cc14bdabe9

endEvents_19b2d80b-ef4d-7056-5d34-24cc14bdabe9

END EVENT

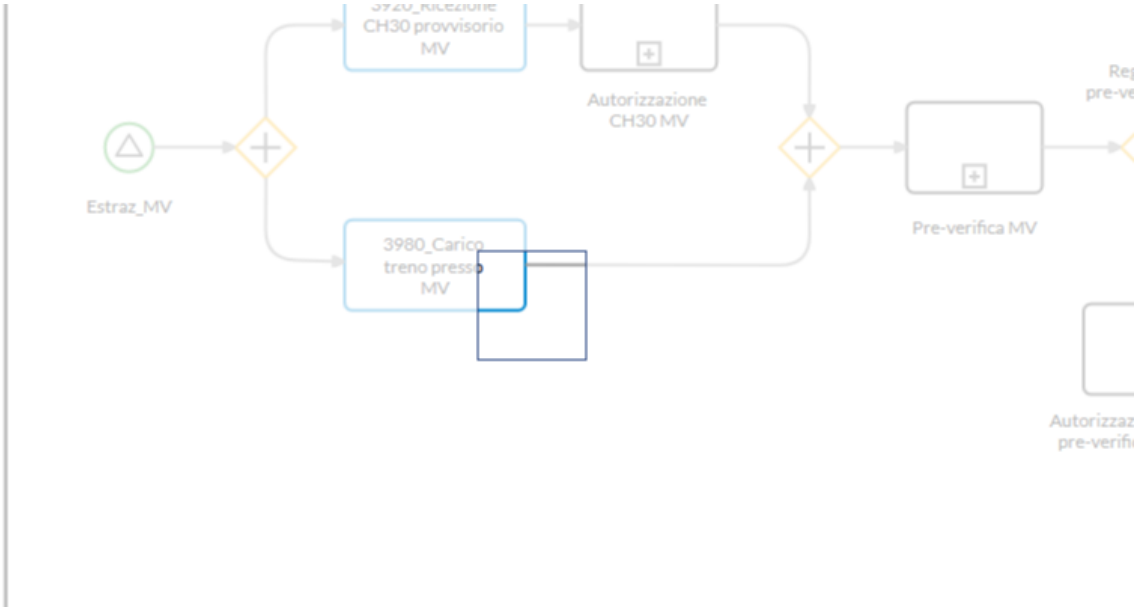
Incoming

TASK
3360_Conferma CH30 con materiale inalterato

1.1.1.13. Subprocess: Autorizzazione CH30 per pre-verifica non reg MV

startEvents_523a41c1-402a-26b5-ff2b-b14091ec663e

START EVENT

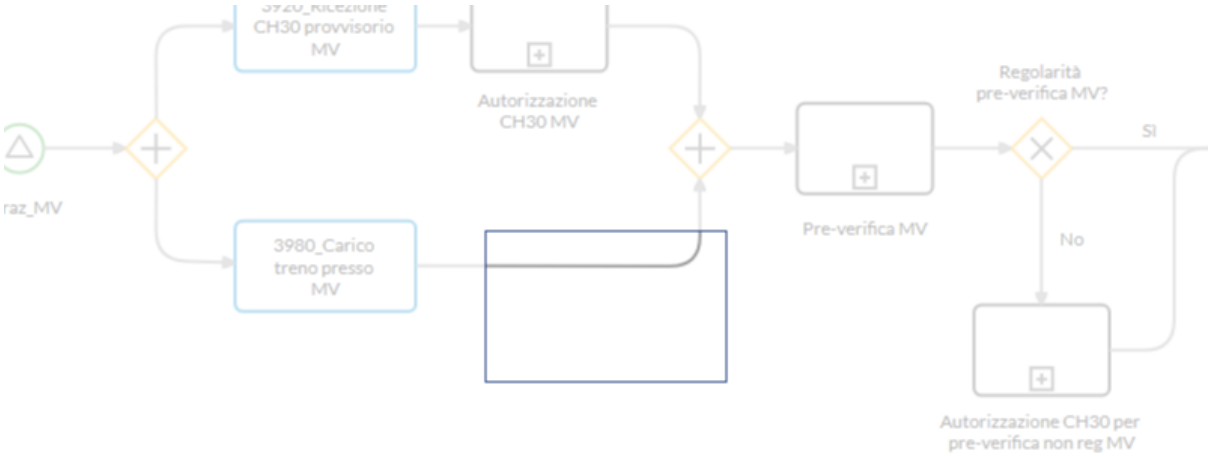


Outgoing

TASK
4040_Autorizzazione CH30

4040_Autorizzazione CH30

TASK



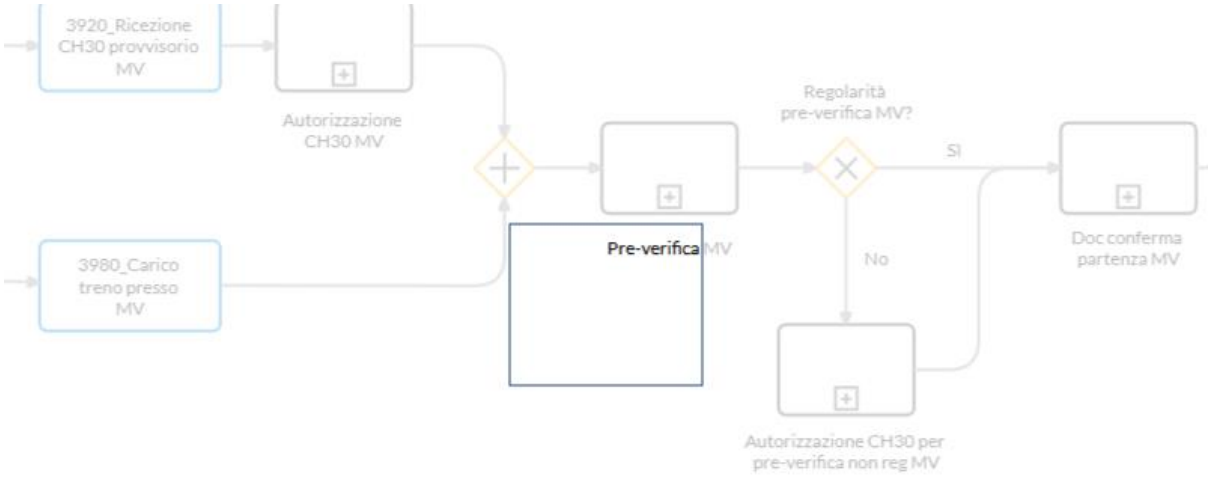
La Dogana procede quindi con la valutazione del CH30 per una sua possibile autorizzazione.

> 1 min;

Incoming	Outgoing
START EVENT startEvents_523a41c1-402a-26b5-ff2b-b14091ec663e	EXCLUSIVE GATEWAY CH30 autorizzato?
TASK 4050_Modifica CH30 senza autorizzazione	

CH30 autorizzato?

EXCLUSIVE GATEWAY



> 90%si, 10%no

Incoming	Outgoing
TASK 4040_Autorizzazione CH30	TASK 4050_Modifica CH30 senza autorizzazione through No con riserva
	TASK 4060_Modifica CH30 con autorizzazione through Sì

4050_Modifica CH30 senza autorizzazione

TASK

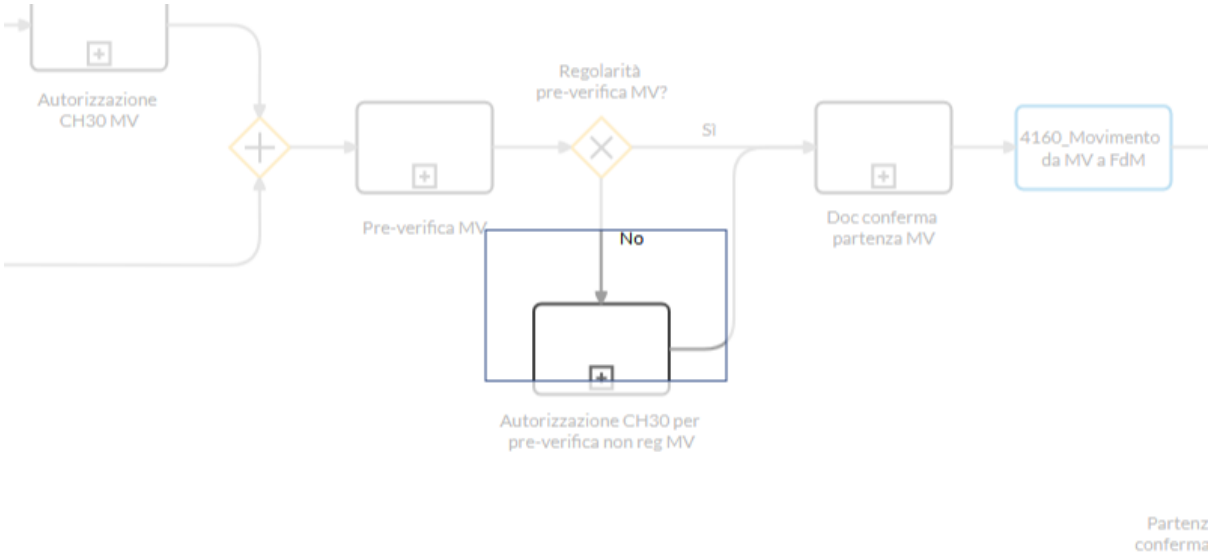
Se la Dogana autorizza con riserva il CH30, il terminalista è tenuto a modificare il CH30 e ripresentarlo alla dogana affinché venga nuovamente valutato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through No con riserva	TASK 4040_Autorizzazione CH30

4060_Modifica CH30 con autorizzazione

TASK



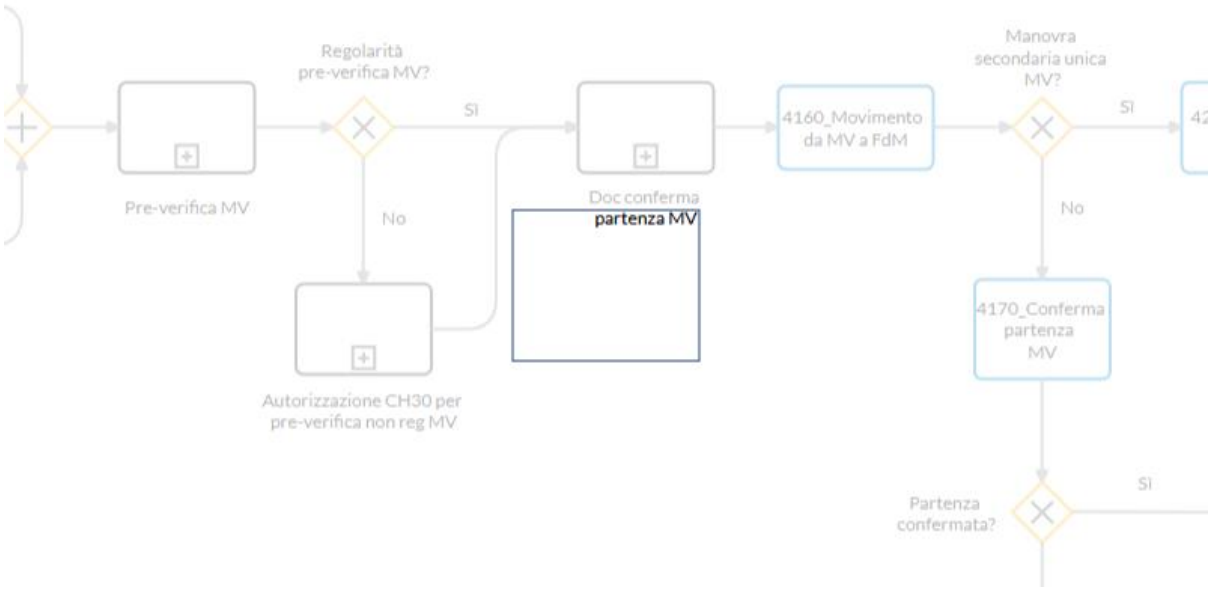
L'autorità doganale autorizza il CH30, variandone lo stato da Provvisorio a Confermato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through Sì	TASK 4070_Verifica su carico

4070_Verifica su carico

TASK



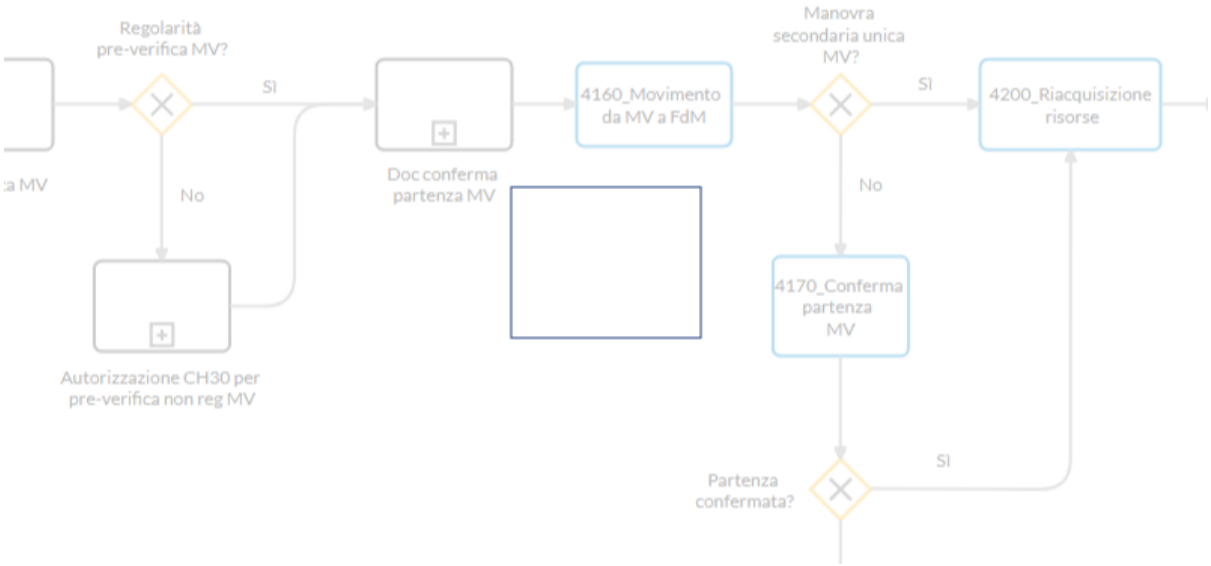
Una volta che il CH30 viene autorizzato dalla Dogana, la Guardia di Finanza può effettuare una verifica sul carico o parte del carico.

> 1 min;

Incoming	Outgoing
TASK 4060_Modifica CH30 con autorizzazione	TASK 4080_Modifica CH30

4080_Modifica CH30

TASK



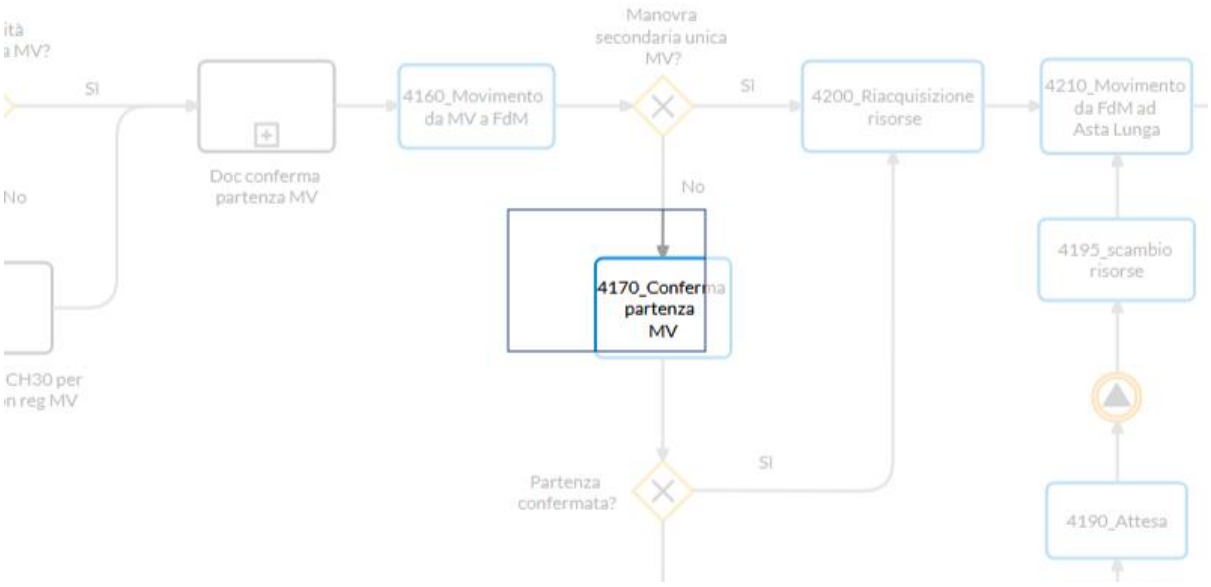
La Guardia di Finanza pone il CH30 nello stato Vistato, eventualmente annotando le partite di carico su cui verrà effettuato il riscontro.

> 1 min;

Incoming	Outgoing
TASK 4070_Verifica su carico	END EVENT CH30 autorizzato

CH30 autorizzato

END EVENT



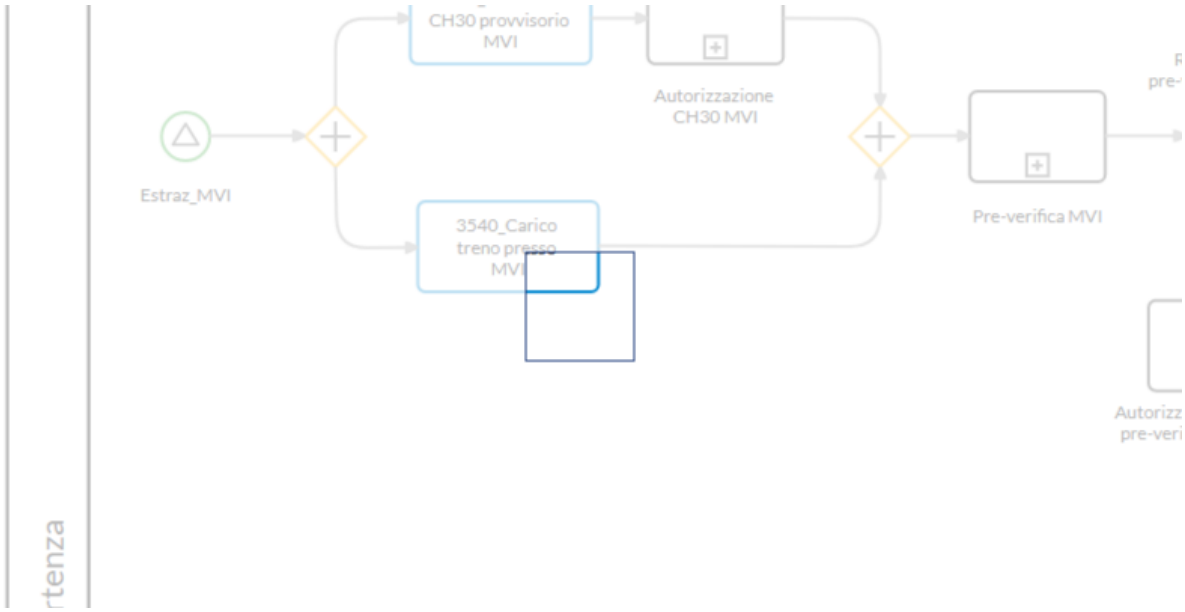
Incoming

TASK
4080_Modifica CH30

1.1.1.14. Subprocess: Autorizzazione CH30 per pre-verifica non reg MVI

startEvents_b0fd1c26-8765-ce30-77e8-c6994d489e79

START EVENT

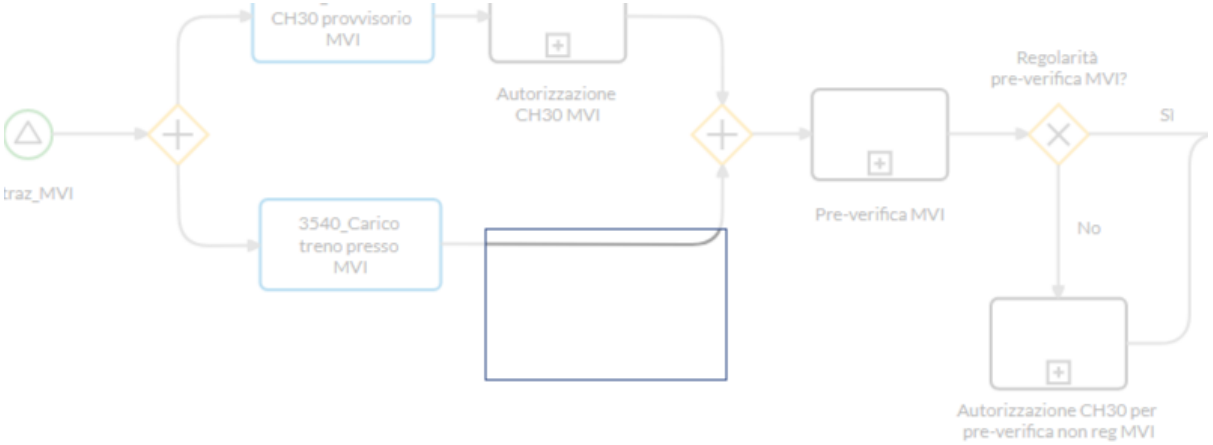


Outgoing

TASK
3600_Autorizzazione CH30

3600_Autorizzazione CH30

TASK



La Dogana procede quindi con la valutazione del CH30 per una sua possibile autorizzazione.

> 1 min;

Incoming

START EVENT
startEvents_b0fd1c26-8765-ce30-77e8-c6994d489e79

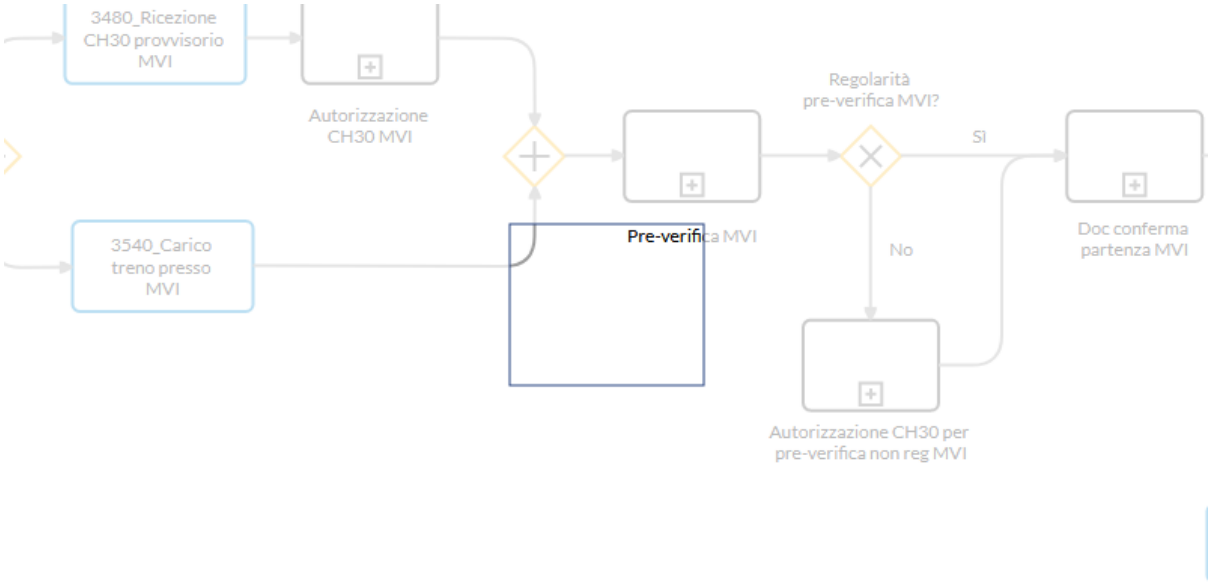
TASK
3640_Modifica CH30 senza autorizzazione

Outgoing

EXCLUSIVE GATEWAY
CH30 autorizzato?

CH30 autorizzato?

EXCLUSIVE GATEWAY

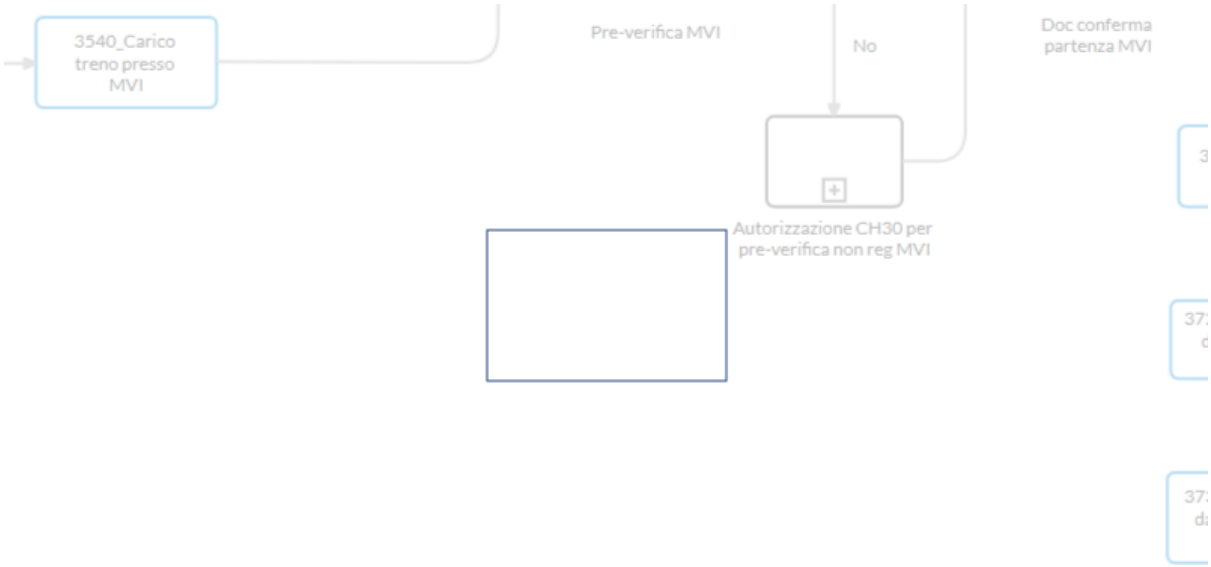


> 90%si, 10%no

Incoming	Outgoing
TASK 3600_Autorizzazione CH30	TASK 3640_Modifica CH30 senza autorizzazione through No con riserva
	TASK 3610_Modifica CH30 con autorizzazione through Sì

3640_Modifica CH30 senza autorizzazione

TASK



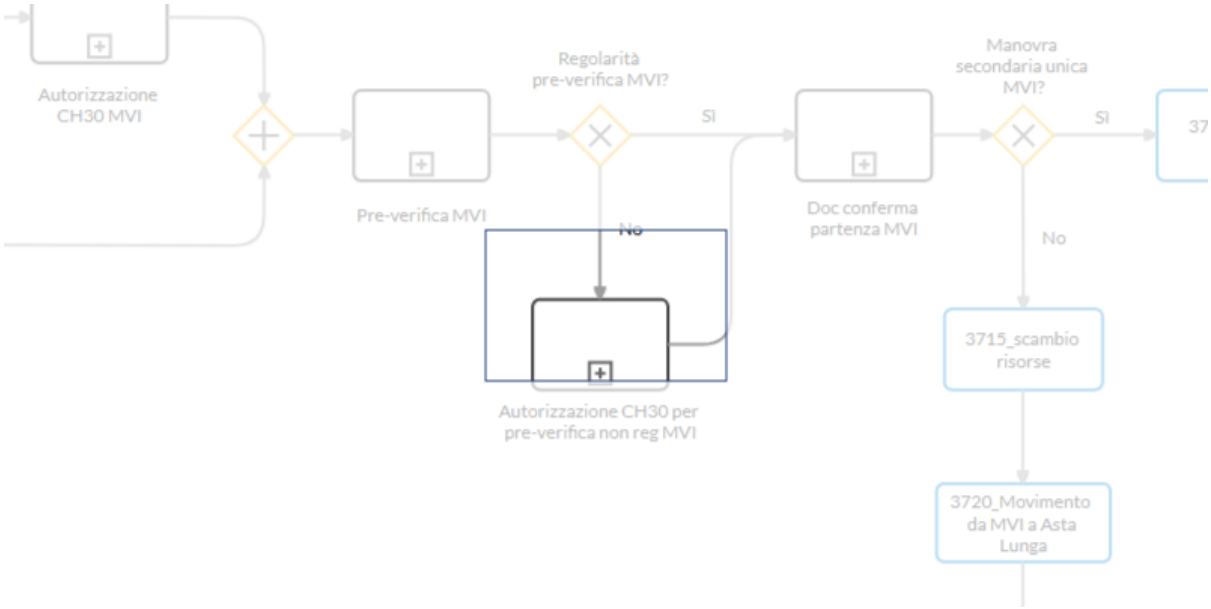
Se la Dogana autorizza con riserva il CH30, il terminalista è tenuto a modificare il CH30 e ripresentarlo alla dogana affinché venga nuovamente valutato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through No con riserva	TASK 3600_Autorizzazione CH30

3610_Modifica CH30 con autorizzazione

TASK



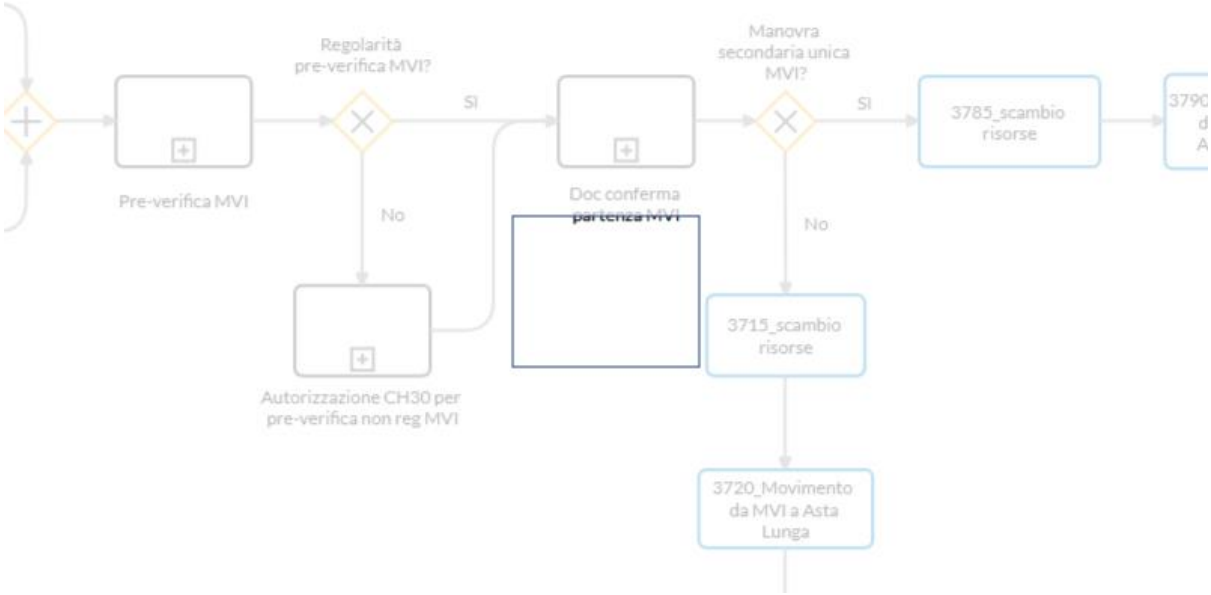
L'autorità doganale autorizza il CH30, variandone lo stato da Provvisorio a Confermato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through Sì	TASK 3620_Verifica su carico

3620_Verifica su carico

TASK



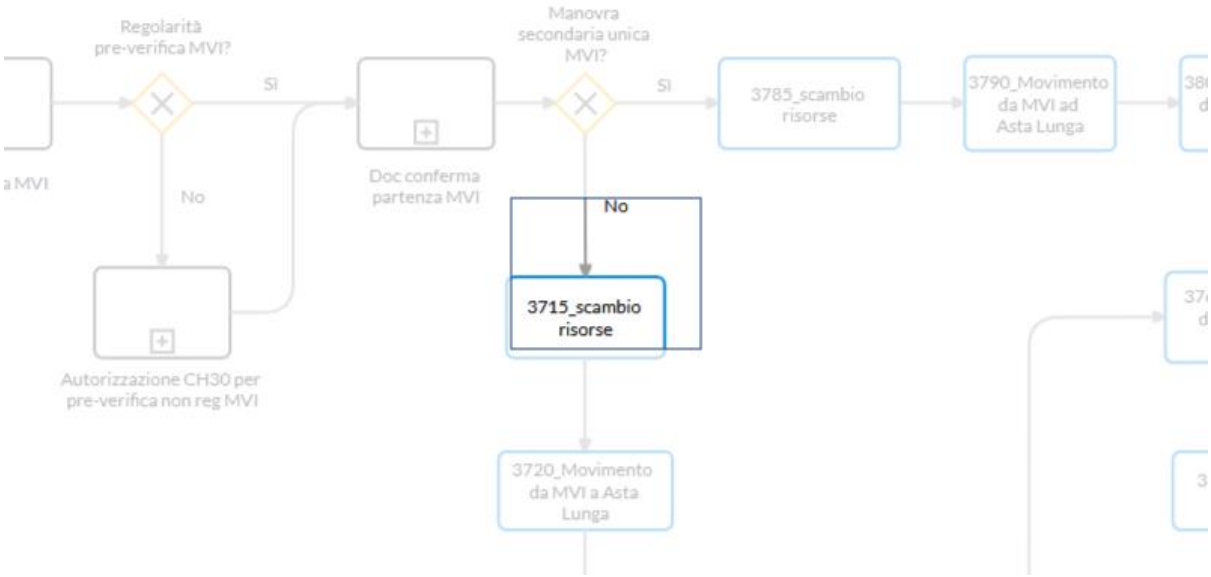
Una volta che il CH30 viene autorizzato dalla Dogana, la Guardia di Finanza può effettuare una verifica sul carico o parte del carico.

> 1 min;

Incoming	Outgoing
TASK 3610_Modifica CH30 con autorizzazione	TASK 3630_Modifica CH30

3630_Modifica CH30

TASK



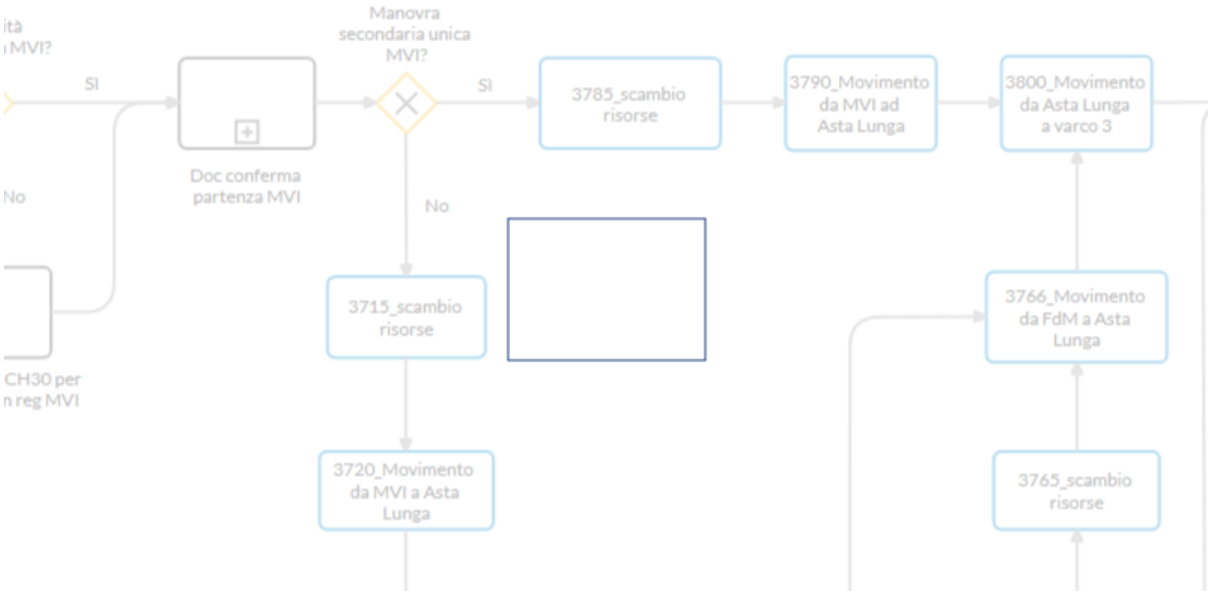
La Guardia di Finanza pone il CH30 nello stato Vistato, eventualmente annotando le partite di carico su cui verrà effettuato il riscontro.

> 1 min;

Incoming	Outgoing
TASK 3620_Verifica su carico	END EVENT CH30 autorizzato

CH30 autorizzato

END EVENT



Incoming

TASK
3630_Modifica CH30

1.1.1.15. Subprocess: Autorizzazione CH30 per pre-verifica non reg MVII

startEvents_48c367d8-00af-2bf8-9867-1da73d2723cf

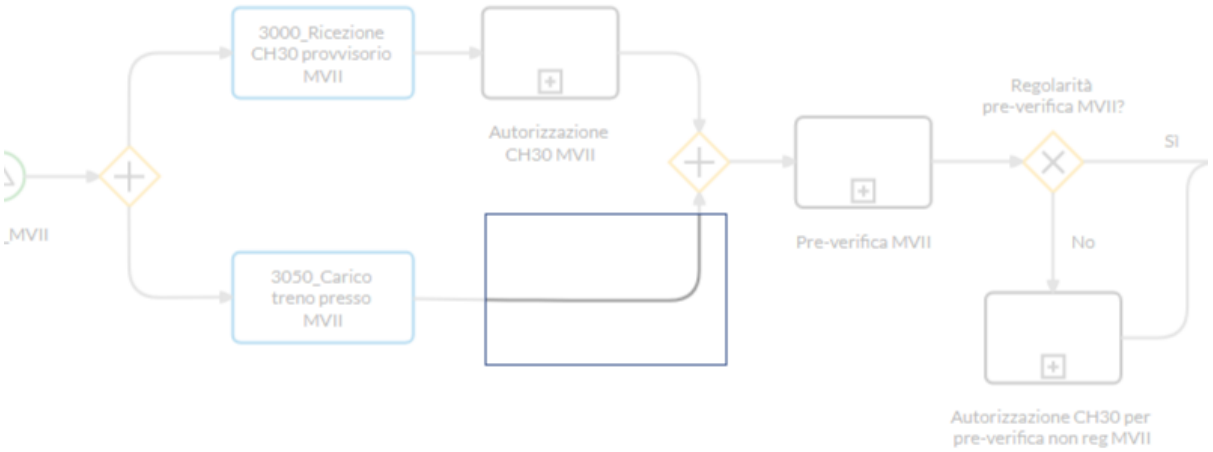
START EVENT

Outgoing

TASK
3110_Autorizzazione CH30

3110_Autorizzazione CH30

TASK



La Dogana procede quindi con la valutazione del CH30 per una sua possibile autorizzazione.

> 1 min;

Incoming

START EVENT
startEvents_48c367d8-00af-2bf8-9867-1da73d2723cf

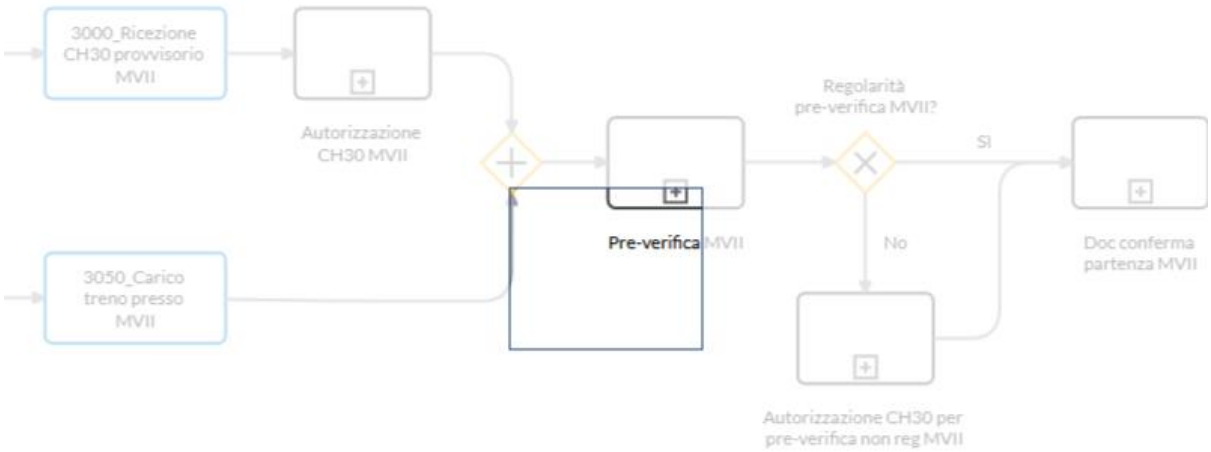
TASK
3120_Modifica CH30 senza autorizzazione

Outgoing

EXCLUSIVE GATEWAY
CH30 autorizzato?

CH30 autorizzato?

EXCLUSIVE GATEWAY

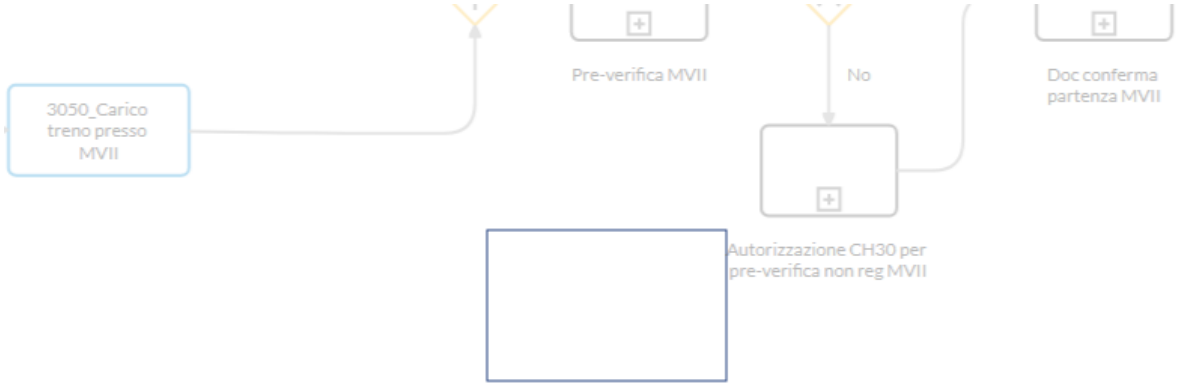


> 90%si, 10%no

Incoming	Outgoing
TASK 3110_Autorizzazione CH30	TASK 3120_Modifica CH30 senza autorizzazione through No con riserva
	TASK 3130_Modifica CH30 con autorizzazione through Sì

3120_Modifica CH30 senza autorizzazione

TASK

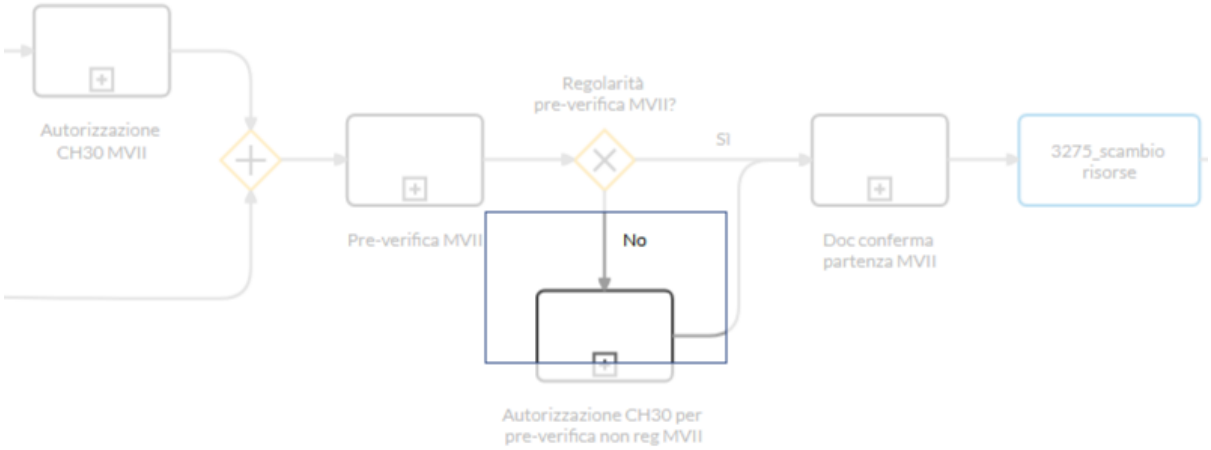


Se la Dogana autorizza con riserva il CH30, il terminalista è tenuto a modificare il CH30 e ripresentarlo alla dogana affinché venga nuovamente valutato.

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through No con riserva	TASK 3110_Autorizzazione CH30

3130_Modifica CH30 con autorizzazione

TASK



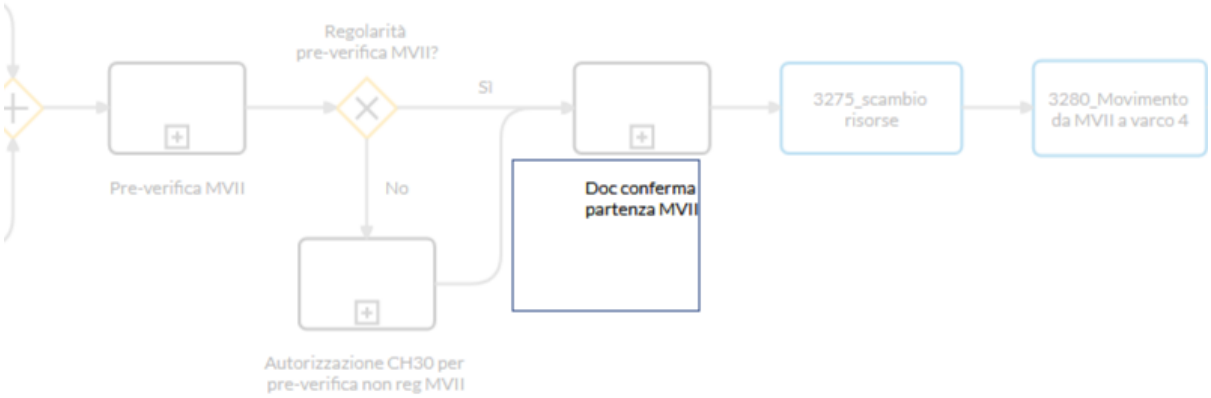
L'autorità doganale autorizza il CH30, variandone lo stato da Provvisorio a Confermato.

> 1 min;

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 autorizzato? through Sì	TASK 3140_Verifica su carico

3140_Verifica su carico

TASK



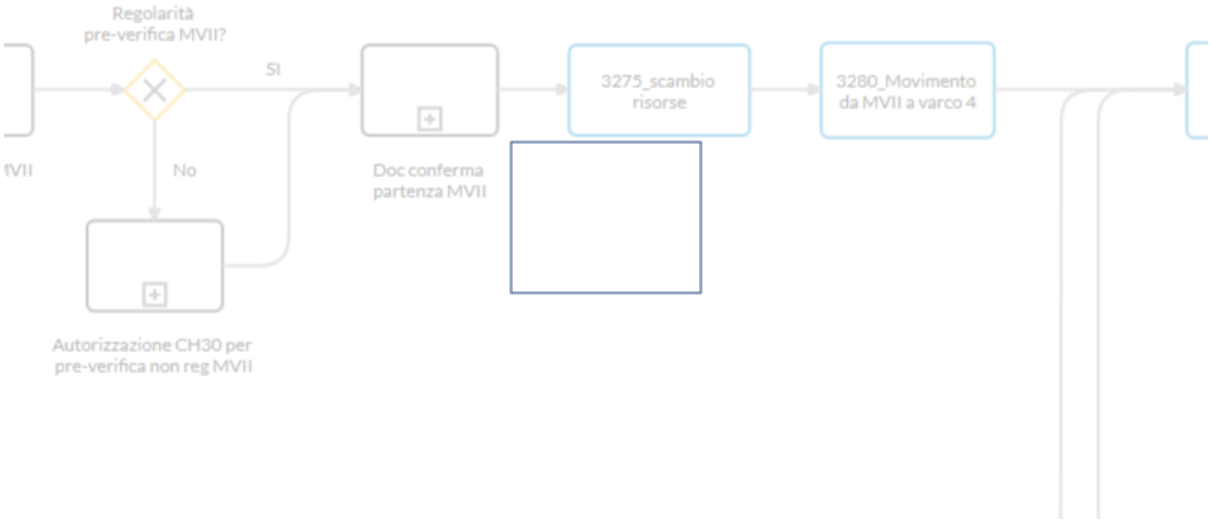
Una volta che il CH30 viene autorizzato dalla Dogana, la Guardia di Finanza può effettuare una verifica sul carico o parte del carico.

> 1 min;

Incoming	Outgoing
TASK 3130_Modifica CH30 con autorizzazione	TASK 3150_Modifica CH30

3150_Modifica CH30

TASK



La Guardia di Finanza pone il CH30 nello stato Vistato, eventualmente annotando le partite di carico su cui verrà effettuato il riscontro.

> 1 min;

Incoming	Outgoing
TASK 3140_Verifica su carico	END EVENT CH30 autorizzato

CH30 autorizzato

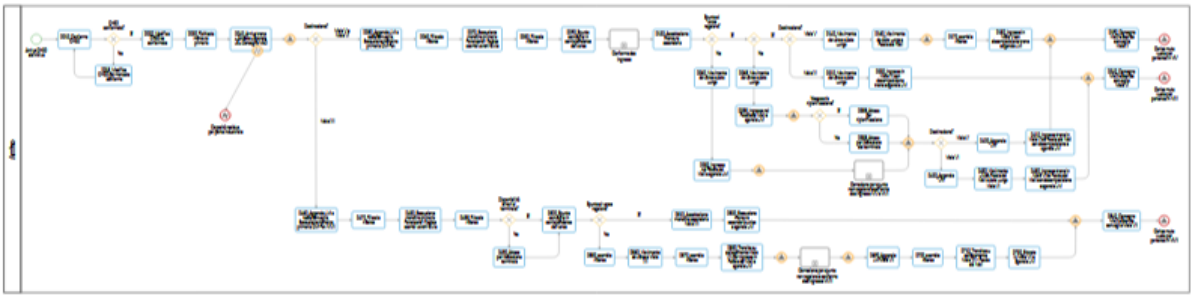
END EVENT

Incoming

TASK
3150_Modifica CH30

2. Diagram: Arrivo

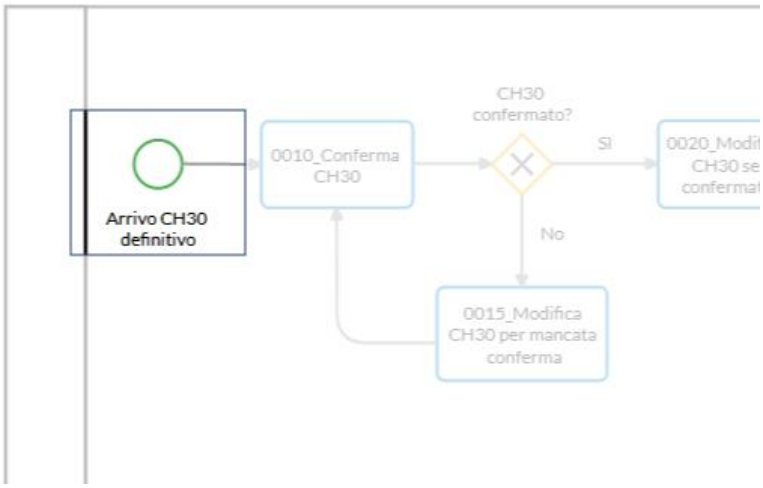
2.1. Process: Arrivo



2.1.1. Process Elements

Arrivo CH30 definitivo

START EVENT



Il processo ha inizio con la ricezione da parte del Terminalista del CH30 nello stato Definitivo.

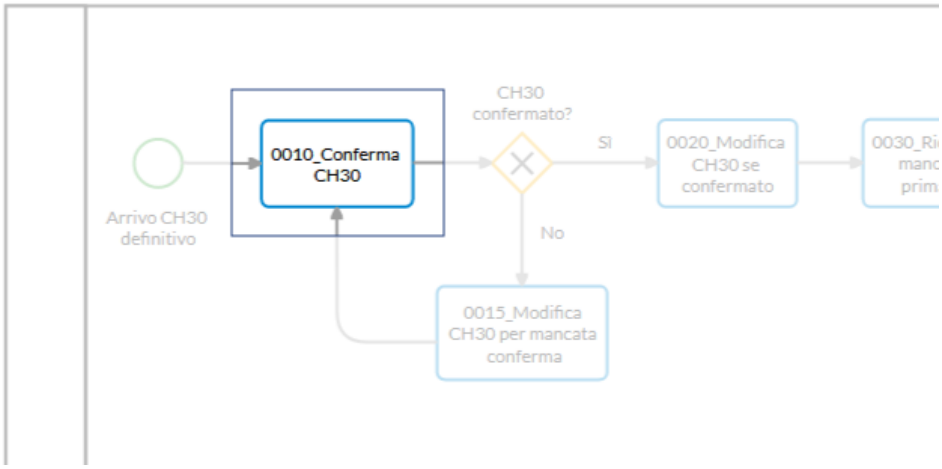
Outgoing

Outgoing

TASK
0010_Conferma CH30

0010_Conferma CH30

TASK

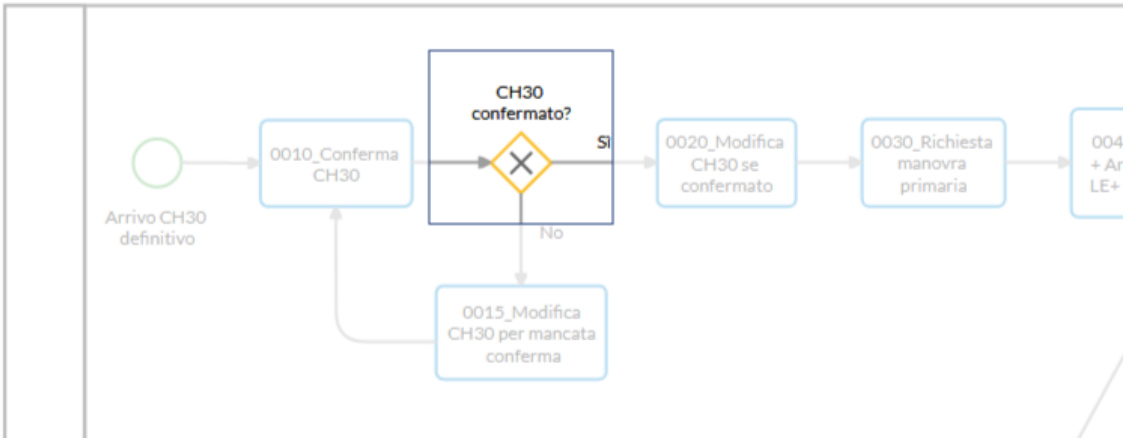


La dogana ha il compito di confermare il CH30.

Incoming	Outgoing
TASK 0015_Modifica CH30 per mancata conferma	EXCLUSIVE GATEWAY CH30 confermato?
START EVENT Arrivo CH30 definitivo	

CH30 confermato?

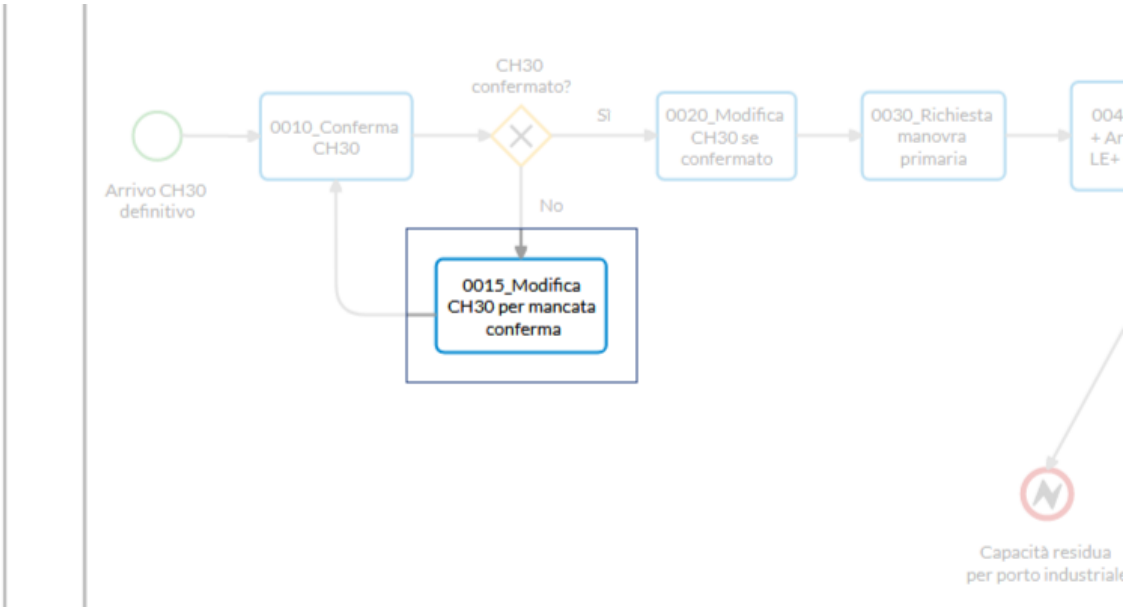
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 0010_Conferma CH30	TASK 0015_Modifica CH30 per mancata conferma through No
	TASK 0020_Modifica CH30 se confermato through Sì

0015_Modifica CH30 per mancata conferma

TASK

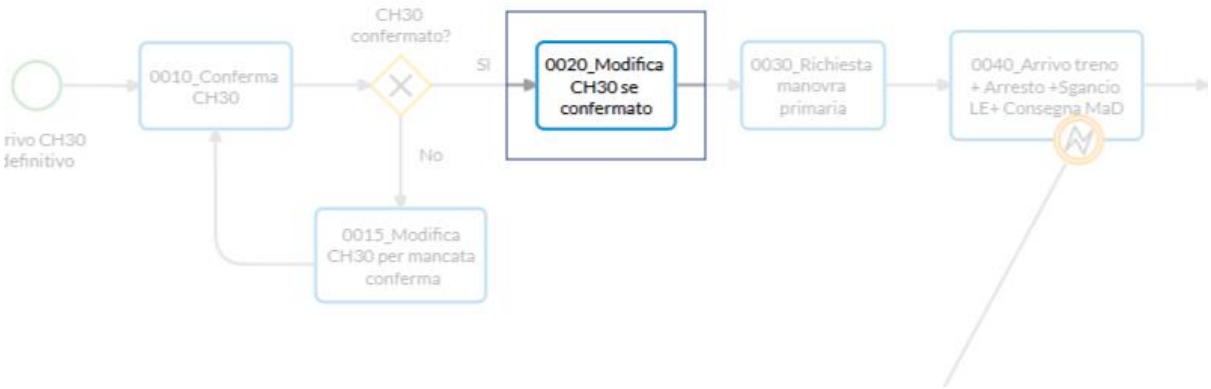


Nel caso in cui la dogana non confermi il CH30, il terminalista riceve il CH30 nello stato Modificabile e una volta modificato tale documento lo riconsegna alla Dogana nello stato Definitivo.

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 confermato? through No	TASK 0010_Conferma CH30

0020_Modifica CH30 se confermato

TASK

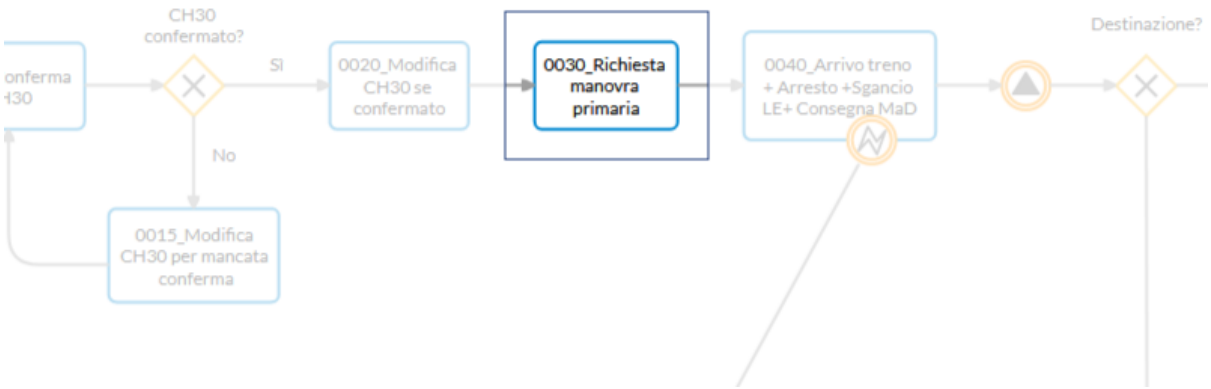


La dogana conferma il CH30 variandone lo stato da Definitivo a Confermato.

Incoming	Outgoing
EXCLUSIVE GATEWAY CH30 confermato? through Sì	TASK 0030_Richiesta manovra primaria

0030_Richiesta manovra primaria

TASK



L’Impresa Ferroviaria prosegue con la richiesta di manovra primaria. Tempo.

Incoming	Outgoing
TASK 0020_Modifica CH30 se confermato	TASK 0040_Arrivo treno + Arresto +Sgancio LE+ Consegna MaD

0040_Arrivo treno + Arresto +Sgancio LE+ Consegna MaD

TASK

1. l'arrivo del treno. 2. Il treno viene arrestato entro il limite di fermata oltre il quale il Sistema Controllo Marcia Treno (SCMT) varia da modalità treno a manovra. 3.Il locomotore elettrico viene sganciato e i fanali di coda rimossi. 4. L'impresa ferroviaria consegna la messa a disposizione (MaD 6b IF-GU) Tempo. CM.

Incoming	Outgoing
TASK 0030_Richiesta manovra primaria	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_f63f671f-db40-b82a-97d4-f68e4844ade3

errorBoundaryEvents_db7de796-3fab-b281-9861-0a4bdaf466b0

ERROR BOUNDARY EVENT

Outgoing

ERROR END EVENT
Capacità residua per porto industriale

Attributes

ATTACHED TO
0040_Arrivo treno + Arresto +Sgancio LE+ Consegna MaD

signalIntermediateThrowEvents_f63f671f-db40-b82a-97d4-f68e4844ade3

SIGNAL INTERMEDIATE THROW EVENT

Incoming

TASK
0040_Arrivo treno + Arresto +Sgancio LE+ Consegna MaD

Outgoing

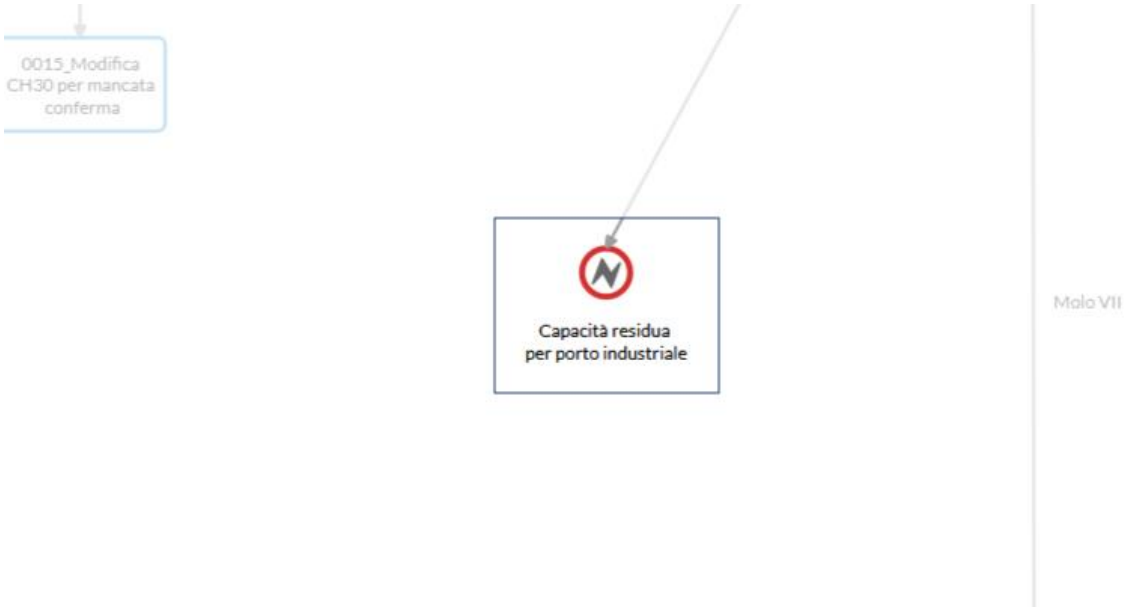
EXCLUSIVE GATEWAY
Destinazione?

Attributes

SIGNAL REFERENCE
richiamoLocomotiva

Capacità residua per porto industriale

ERROR END EVENT



Incoming

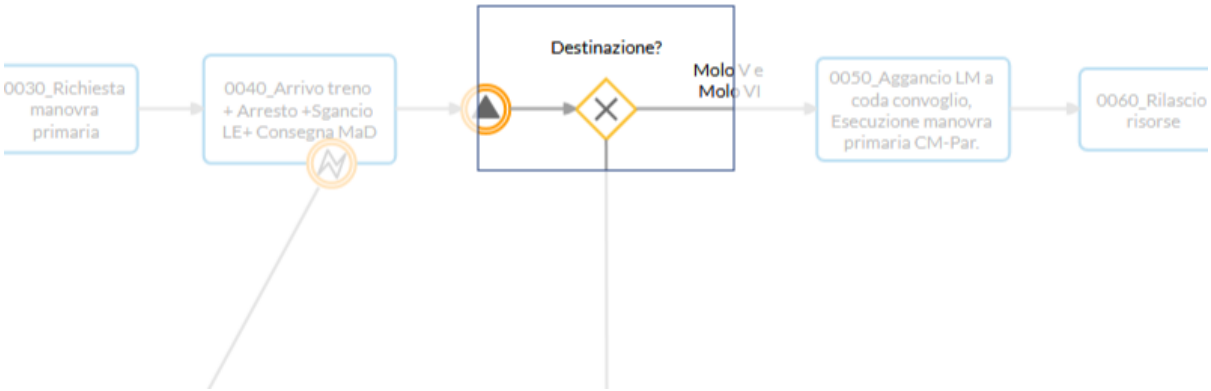
ERROR BOUNDARY EVENT
errorBoundaryEvents_db7de796-3fab-b281-9861-0a4bdaf466b0

Attributes

ERROR REFERENCE
Capacità residua per porto industriale

Destinazione?

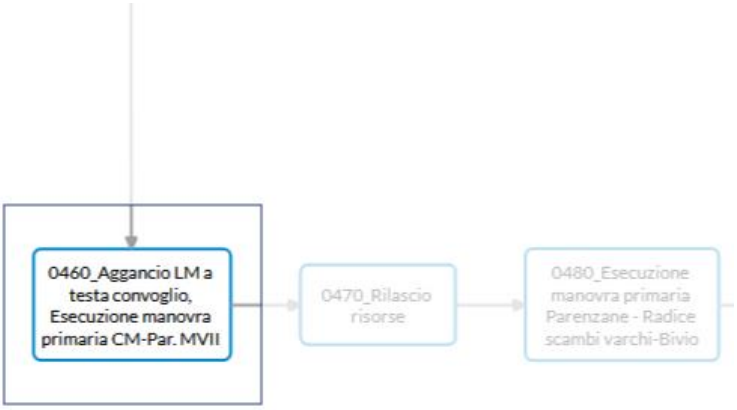
EXCLUSIVE GATEWAY



Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_f63f671f-db40-b82a-97d4-f68e4844ade3	TASK 0050_Aggancio LM a coda convoglio, Esecuzione manovra primaria CM-Par. through Molo V e Molo VI
	TASK 0460_Aggancio LM a testa convoglio, Esecuzione manovra primaria CM-Par. MVII through Molo VII

0460_Aggancio LM a testa convoglio, Esecuzione manovra primaria CM-Par. MVII

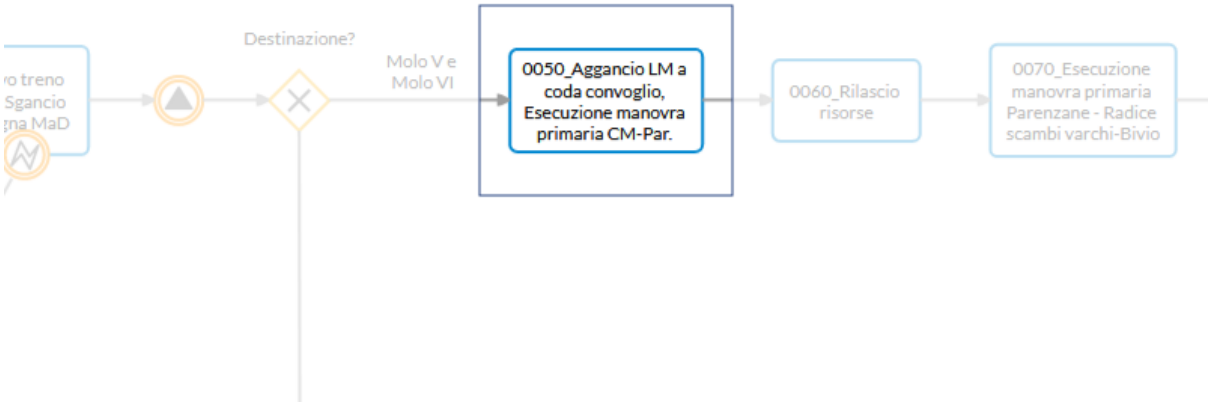
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Destinazione? through Molo VII	TASK 0470_Rilascio risorse

0050_Aggancio LM a coda convoglio, Esecuzione manovra primaria CM-Par.

TASK

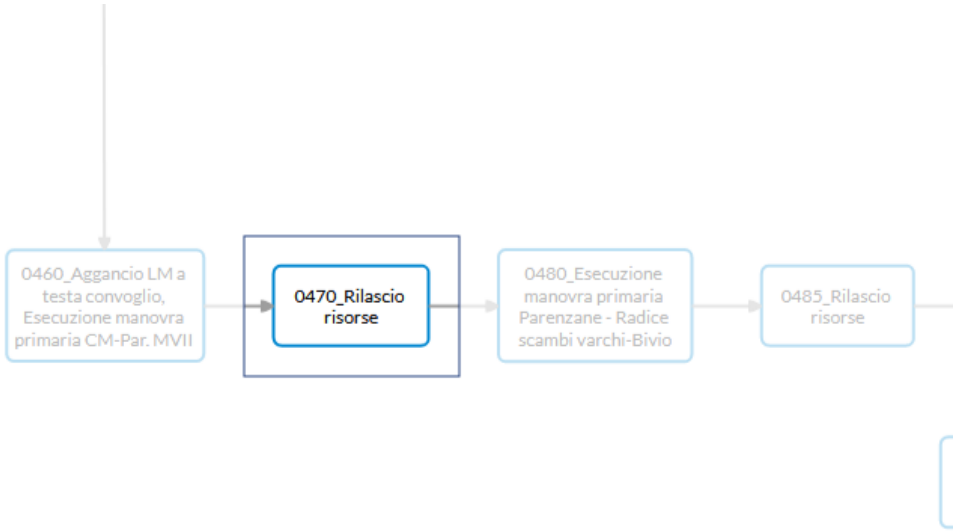


Il Gestore Unico esegue la manovra primaria. Tempo. CM+Parenzane. L.

Incoming	Outgoing
EXCLUSIVE GATEWAY Destinazione? through Molo V e Molo VI	TASK 0060_Rilascio risorse

0470_Rilascio risorse

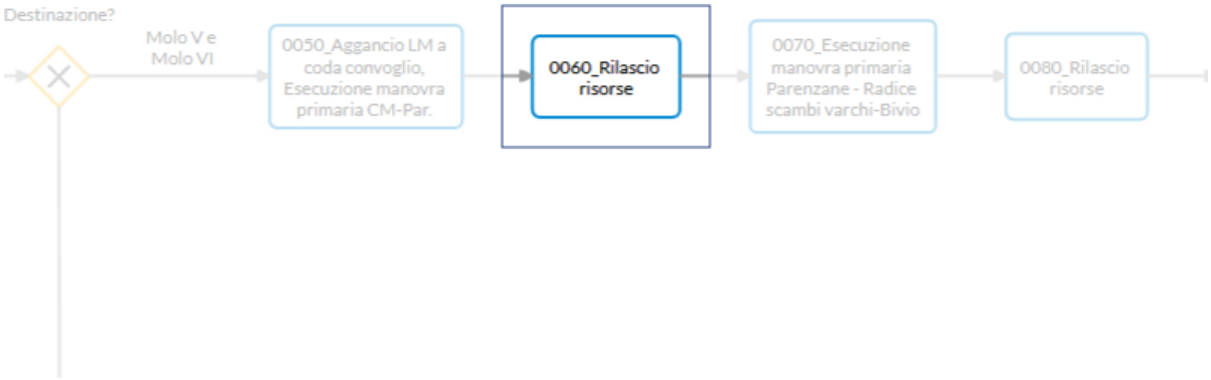
TASK



Incoming	Outgoing
TASK 0460_Aggancio LM a testa convoglio, Esecuzione manovra primaria CM-Par. MVII	TASK 0480_Esecuzione manovra primaria Parenzane - Radice scambi varchi-Bivio

0060_Rilascio risorse

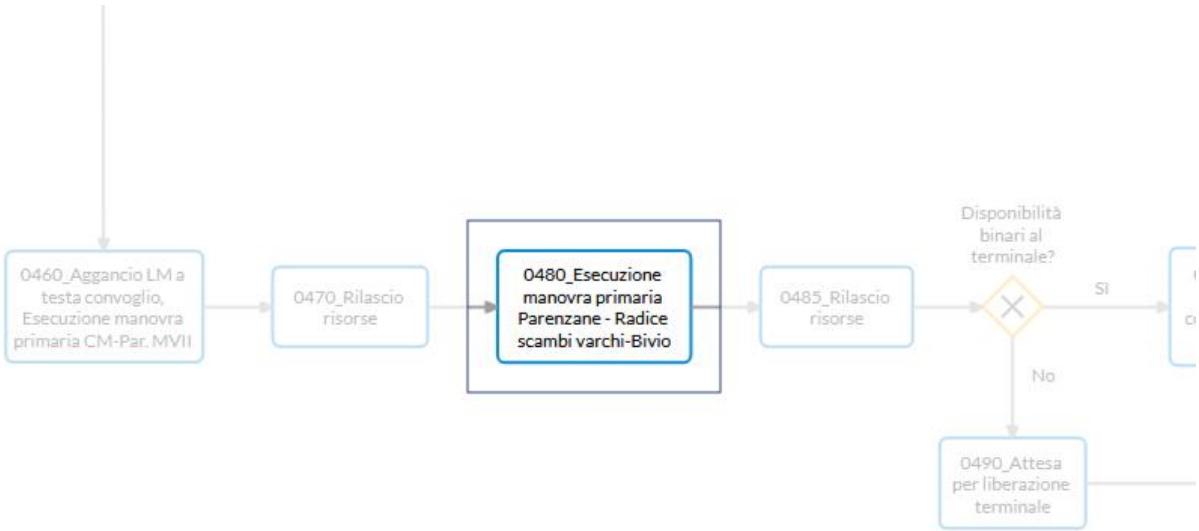
TASK



Incoming	Outgoing
TASK 0050_Aggancio LM a coda convoglio, Esecuzione manovra primaria CM-Par.	TASK 0070_Esecuzione manovra primaria Parenzane - Radice scambi varchi-Bivio

0480_Esecuzione manovra primaria Parenzane - Radice scambi varchi-Bivio

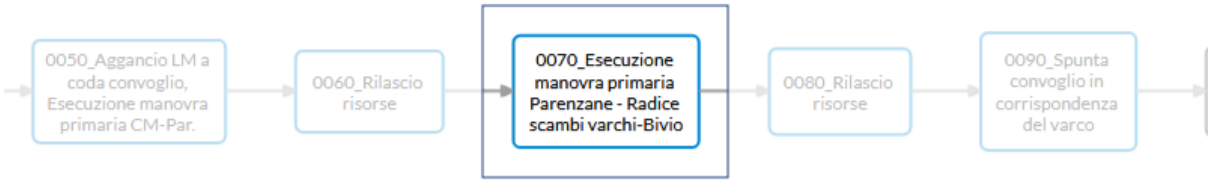
TASK



Incoming	Outgoing
TASK 0470_Rilascio risorse	TASK 0485_Rilascio risorse

0070_Esecuzione manovra primaria Parenzane - Radice scambi varchi-Bivio

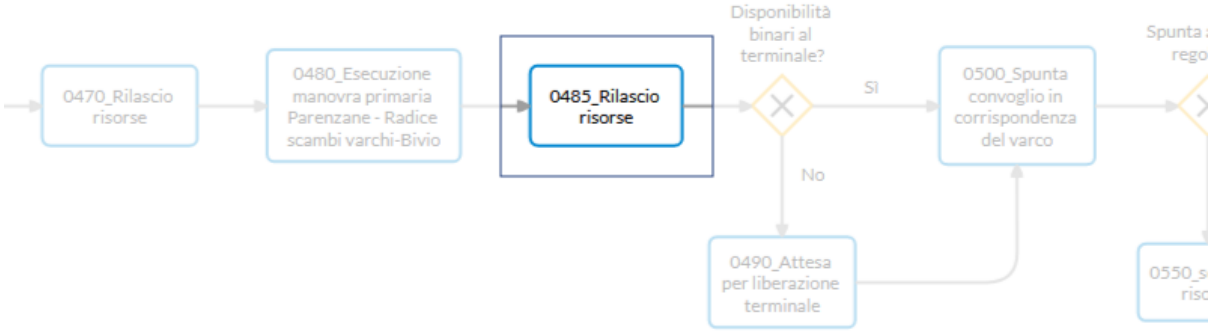
TASK



Incoming	Outgoing
TASK 0060_Rilascio risorse	TASK 0080_Rilascio risorse

0485_Rilascio risorse

TASK



Incoming	Outgoing
TASK 0480_Esecuzione manovra primaria Parenzane - Radice scambi varchi-Bivio	EXCLUSIVE GATEWAY Disponibilità binari al terminale?

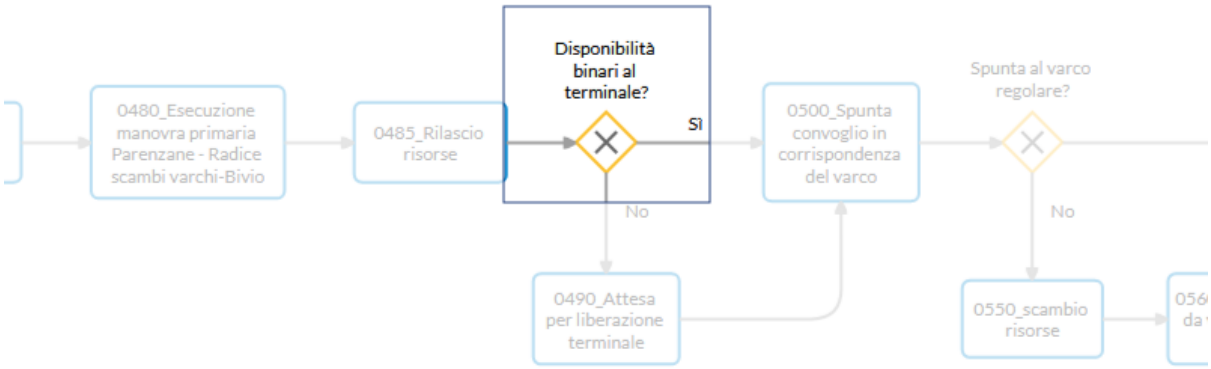
0080_Rilascio risorse

TASK

Incoming	Outgoing
TASK 0070_Esecuzione manovra primaria Parenzane - Radice scambi varchi-Bivio	TASK 0090_Spunta convoglio in corrispondenza del varco

Disponibilità binari al terminale?

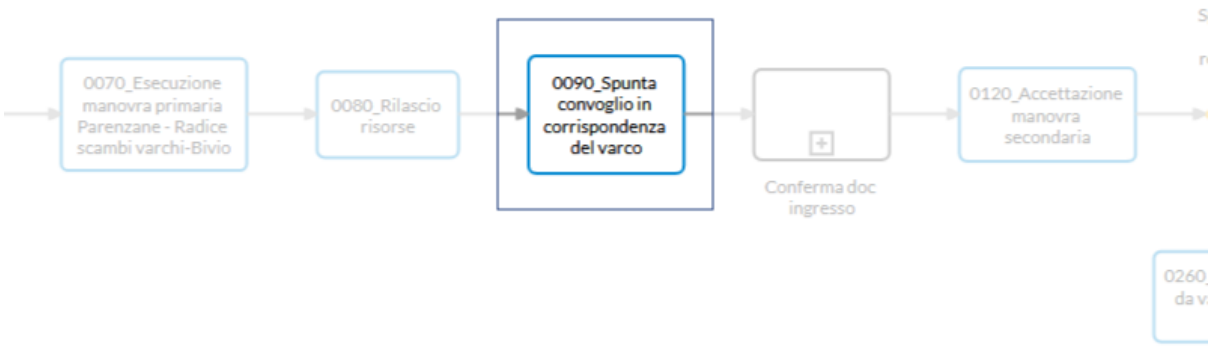
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 0485_Rilascio risorse	TASK 0500_Spunta convoglio in corrispondenza del varco through Sì
	TASK 0490_Attesa per liberazione terminale through No

0090_Spunta convoglio in corrispondenza del varco

TASK



Il treno giunge quindi al varco dove la Guardia di Finanza spunta il convoglio. Tempo. V. L.

Incoming	Outgoing
TASK 0080_Rilascio risorse	SUBPROCESS Conferma doc ingresso

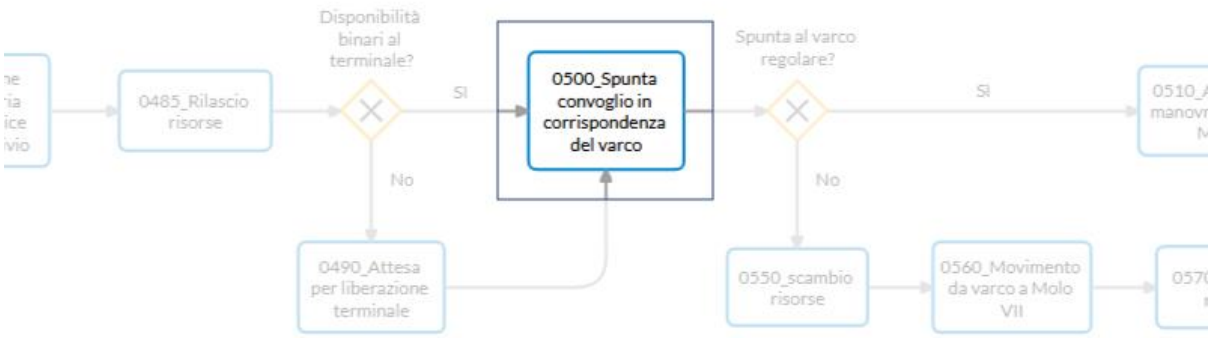
0490_Attesa per liberazione terminale

TASK

Incoming	Outgoing
EXCLUSIVE GATEWAY Disponibilità binari al terminale? through No	TASK 0500_Spunta convoglio in corrispondenza del varco through No

0500_Spunta convoglio in corrispondenza del varco

TASK

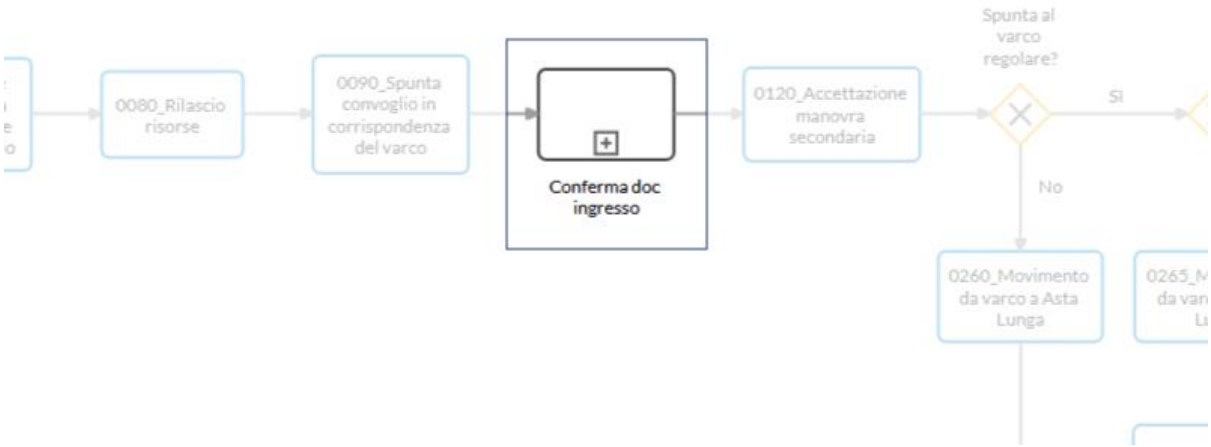


Il treno giunge quindi al varco dove la Guardia di Finanza spunta il convoglio. Tempo. V. L.

Incoming	Outgoing
EXCLUSIVE GATEWAY Disponibilità binari al terminale? through Sì	EXCLUSIVE GATEWAY Spunta al varco regolare?
TASK 0490_Attesa per liberazione terminale through No	

Conferma doc ingresso

SUBPROCESS

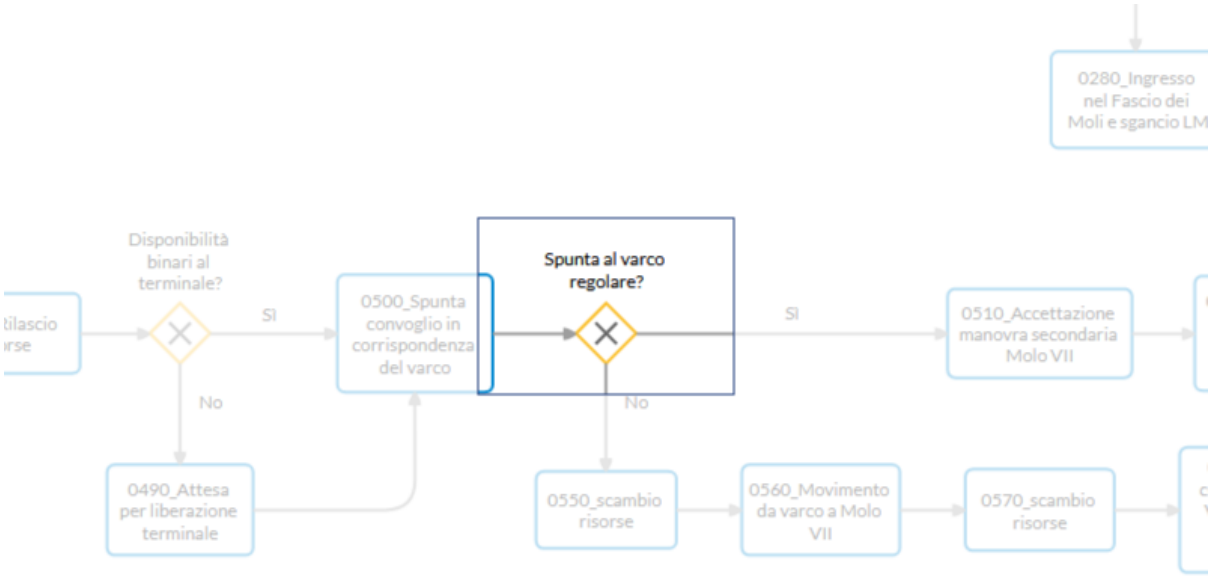


Incoming	Outgoing
TASK 0090_Spunta convoglio in corrispondenza del varco	TASK 0120_Accettazione manovra secondaria

For details on specific subprocess elements, go to the element chapter.

Spunta al varco regolare?

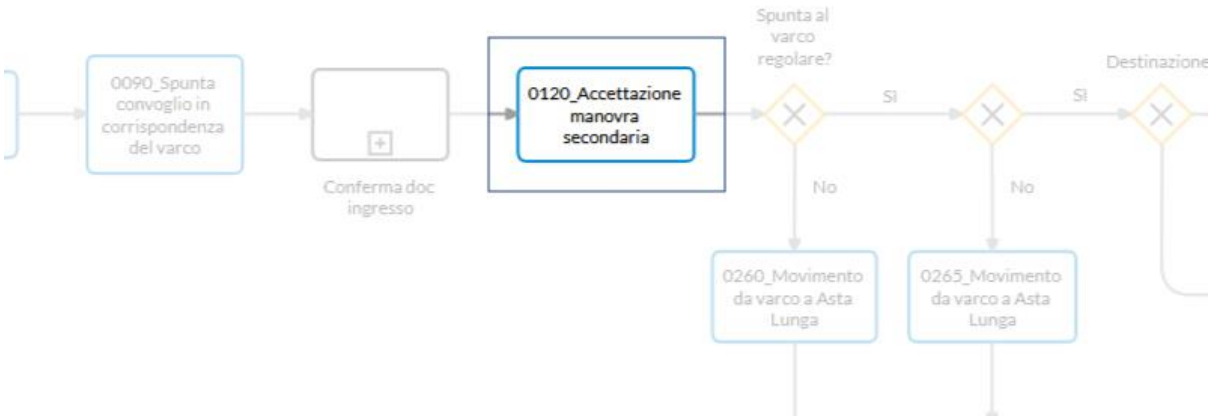
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 0500_Spunta convoglio in corrispondenza del varco	TASK 0510_Accettazione manovra secondaria Molo VII through Sì
	TASK 0550_scambio risorse through No

0120_Accettazione manovra secondaria

TASK

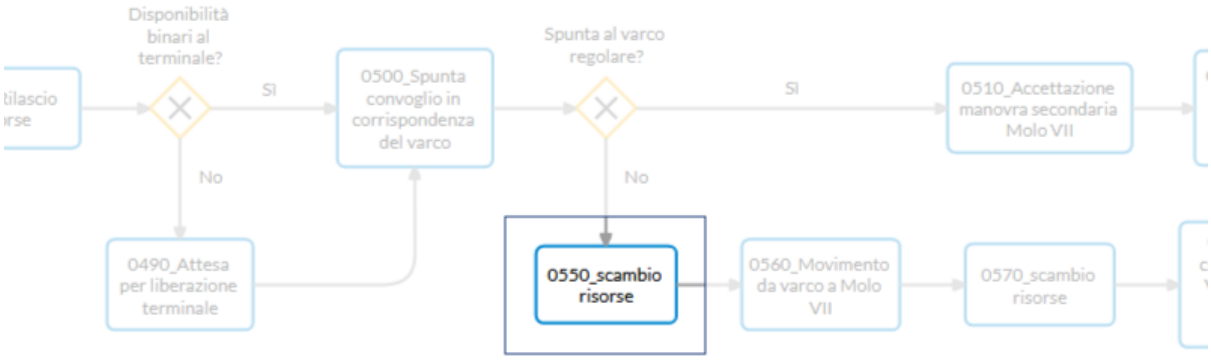


Il terminalista, verificata la disponibilità di ricezione nel terminale, accetta l'esecuzione della manovra secondaria (ovvero dal varco al terminale). TEMPO. PFN. L

Incoming	Outgoing
SUBPROCESS Conferma doc ingresso	EXCLUSIVE GATEWAY Spunta al varco regolare?

0550_scambio risorse

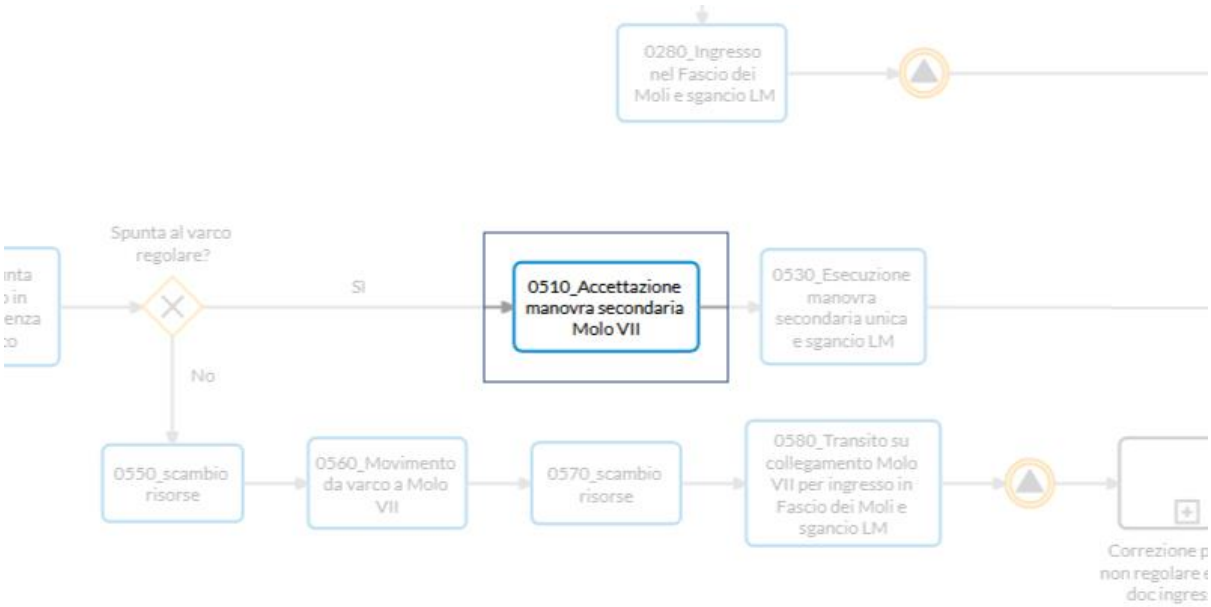
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Spunta al varco regolare? through No	TASK 0560_Movimento da varco a Molo VII

0510_Accettazione manovra secondaria Molo VII

TASK

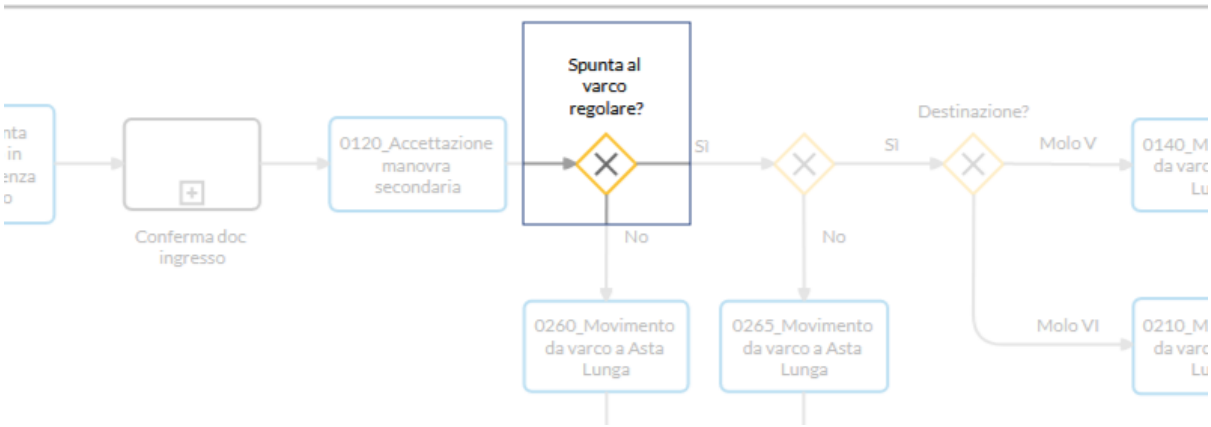


TEMPO. PFN. L

Incoming	Outgoing
EXCLUSIVE GATEWAY Spunta al varco regolare? through Sì	TASK 0530_Esecuzione manovra secondaria unica e sgancio LM

Spunta al varco regolare?

EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 0120_Accettazione manovra secondaria	EXCLUSIVE GATEWAY Esecuzione manovra secondaria unica? through Sì
	TASK 0260_Movimento da varco a Asta Lunga through No

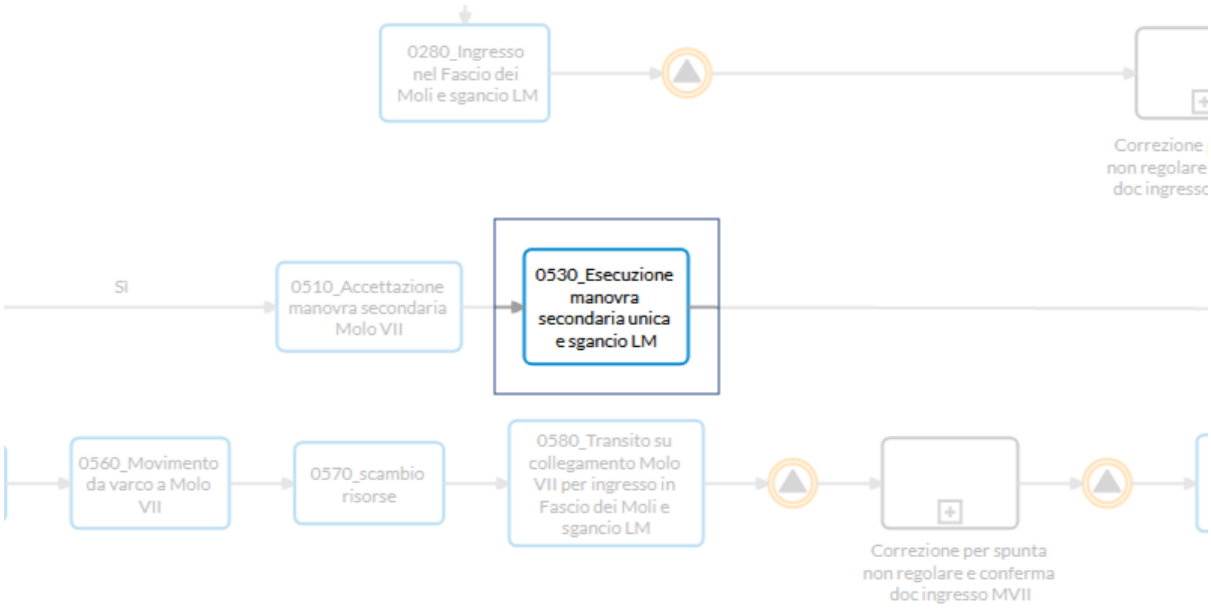
0560_Movimento da varco a Molo VII

TASK

Incoming	Outgoing
TASK 0550_scambio risorse	TASK 0570_scambio risorse

0530_Esecuzione manovra secondaria unica e sgancio LM

TASK

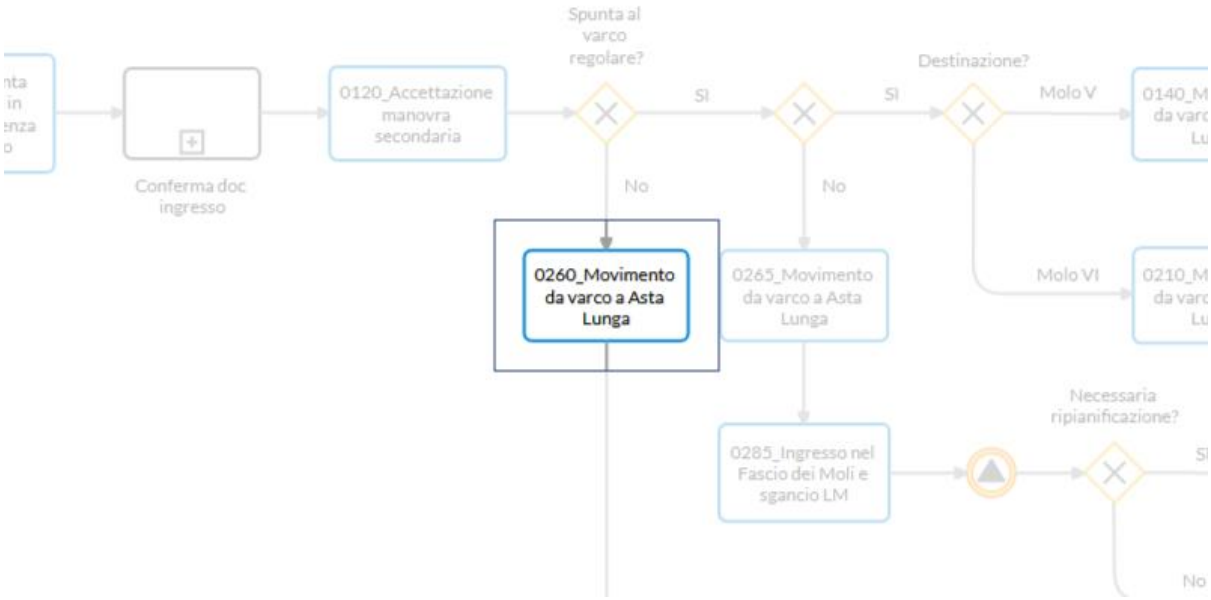


Il Gestore Unico esegue la manovra secondaria unica se c'è la disponibilità di ricezione nel terminale. TEMPO. M7. L

Incoming	Outgoing
TASK 0510_Accettazione manovra secondaria Molo VII	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_45b96777-4146-b81c-a5cc-22d7c348dc16

0260_Movimento da varco a Asta Lunga

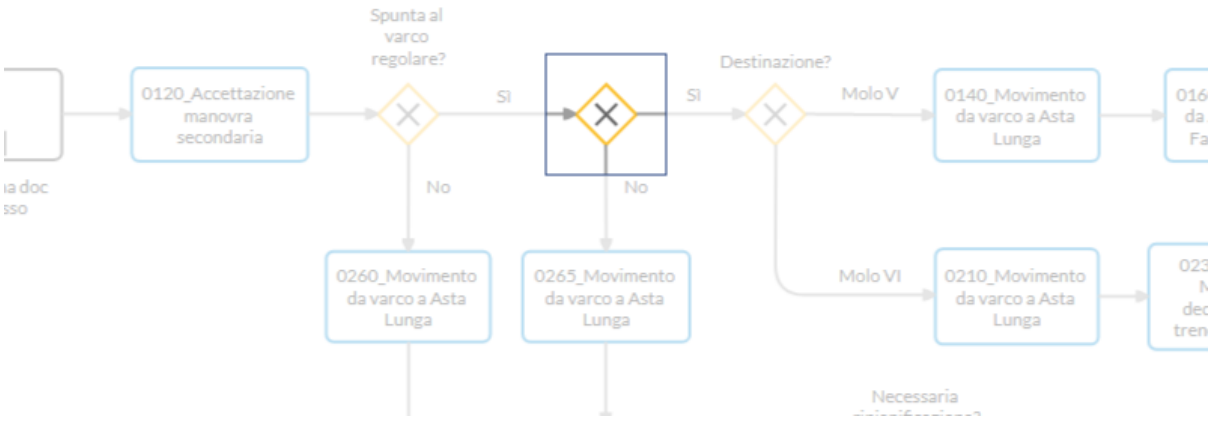
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Spunta al varco regolare? through No	TASK 0280_Ingresso nel Fascio dei Moli e sgancio LM

Esecuzione manovra secondaria unica?

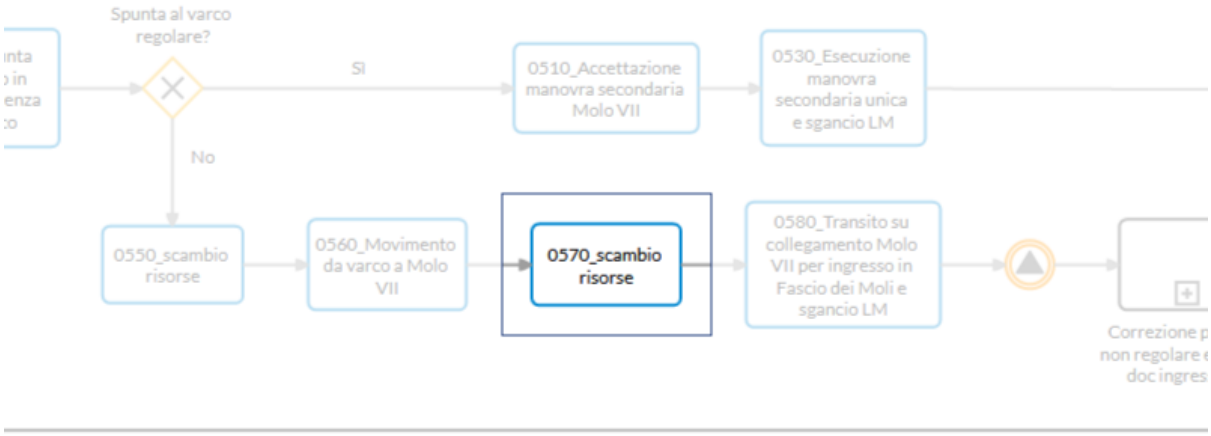
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY Spunta al varco regolare? through Sì	EXCLUSIVE GATEWAY Destinazione? through Sì
	TASK 0265_Movimento da varco a Asta Lunga through No

0570_scambio risorse

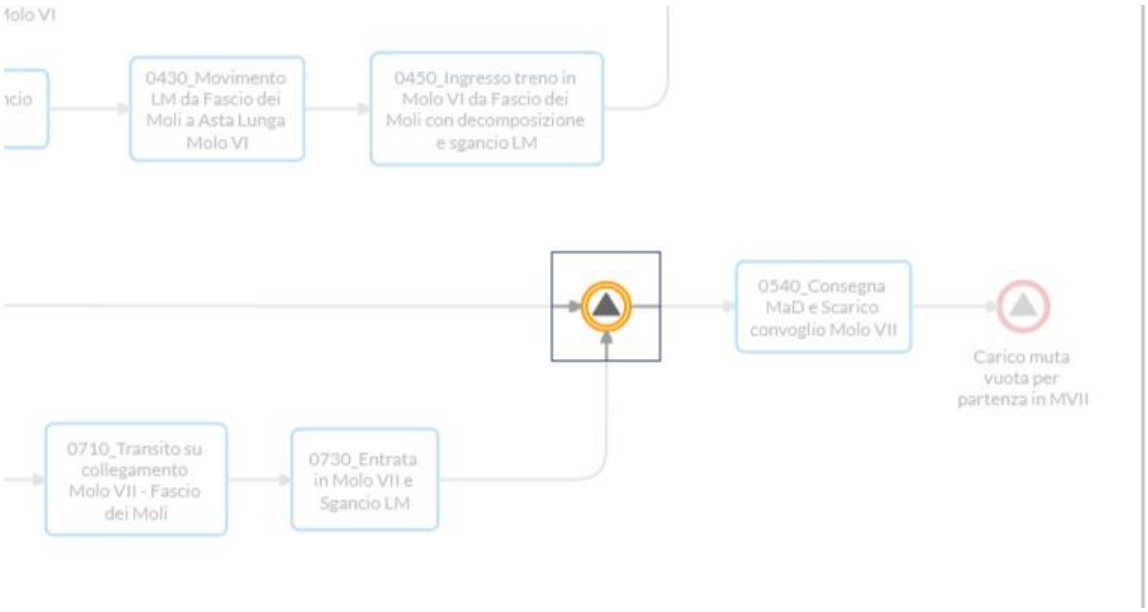
TASK



Incoming	Outgoing
TASK 0560_Movimento da varco a Molo VII	TASK 0580_Transito su collegamento Molo VII per ingresso in Fascio dei Moli e sgancio LM

signalIntermediateThrowEvents_45b96777-4146-b81c-a5cc-22d7c348dc16

SIGNAL INTERMEDIATE THROW EVENT



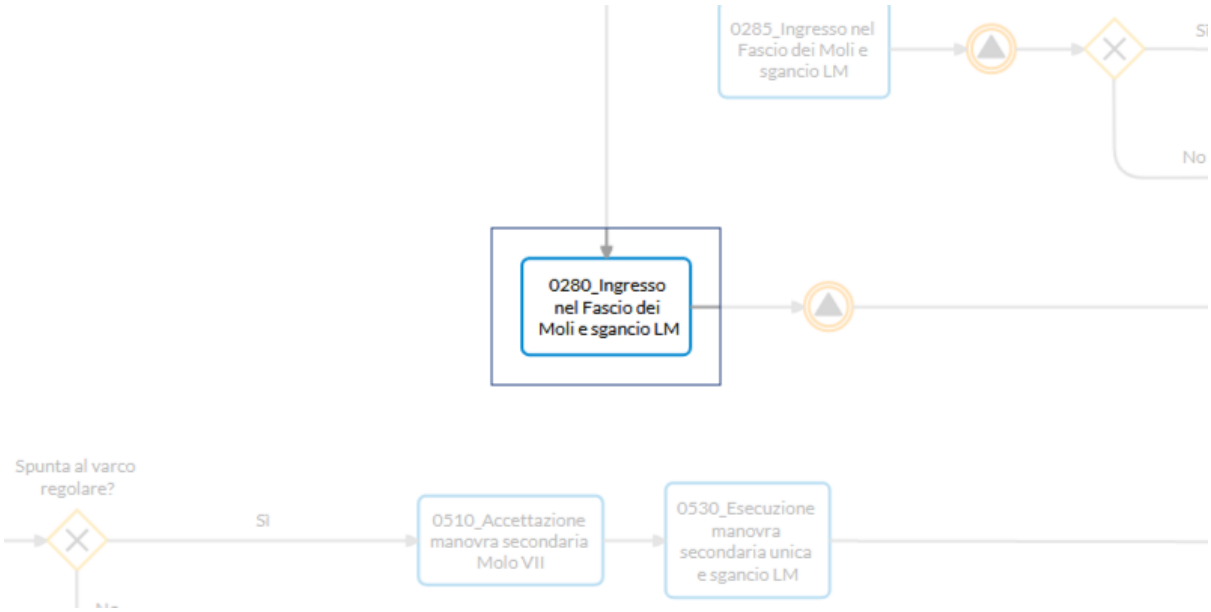
Incoming	Outgoing
TASK 0530_Esecuzione manovra secondaria unica e sgancio LM	TASK 0540_Consegna MaD e Scarico convoglio Molo VII
TASK 0730_Entrata in Molo VII e Sgancio LM	

Attributes

SIGNAL REFERENCE
Locomotiva_molo7

0280_Ingresso nel Fascio dei Moli e sgancio LM

TASK

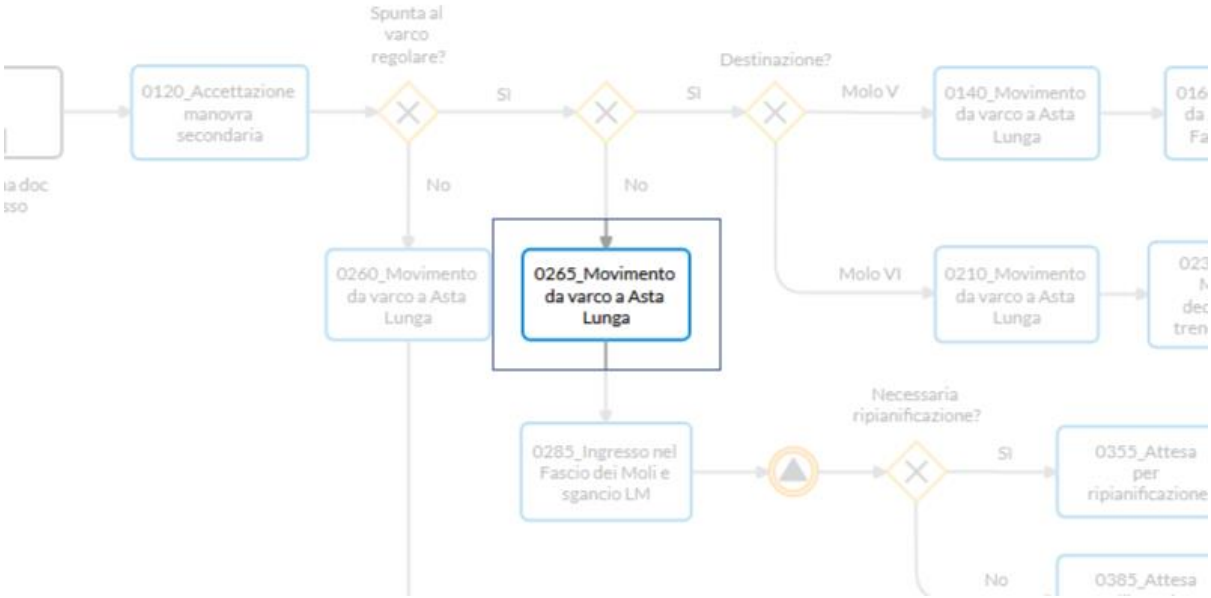


Se non c'è disponibilità di ricezione nel terminale, il Gestore Unico esegue una manovra secondaria doppia. TEMPO. Asta Lunga+FascioDeiMoli +M5. L

Incoming	Outgoing
TASK 0260_Movimento da varco a Asta Lunga	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_6e2fb061-4ecf-ab28-9699-3769686c2cac

0265_Movimento da varco a Asta Lunga

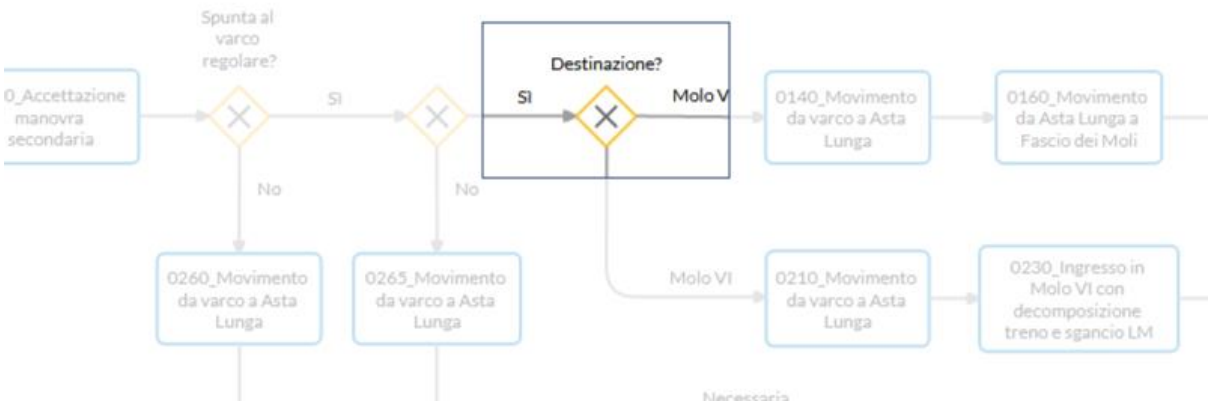
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Esecuzione manovra secondaria unica? through No	TASK 0285_Ingresso nel Fascio dei Moli e sgancio LM

Destinazione?

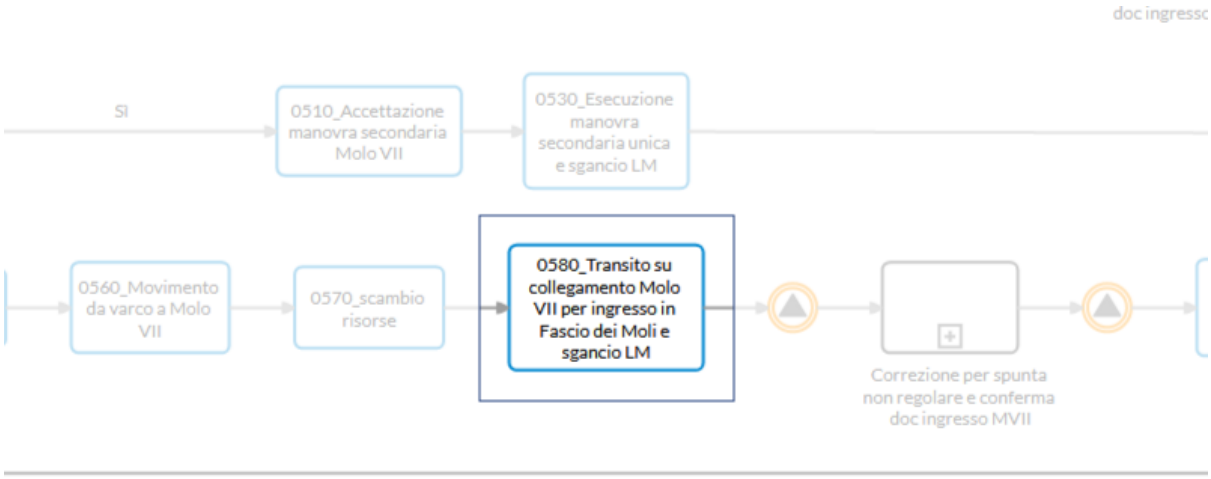
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY Esecuzione manovra secondaria unica? through Sì	TASK 0140_Movimento da varco a Asta Lunga through Molo V
	TASK 0210_Movimento da varco a Asta Lunga through Molo VI

0580_Transito su collegamento Molo VII per ingresso in Fascio dei Moli e sgancio LM

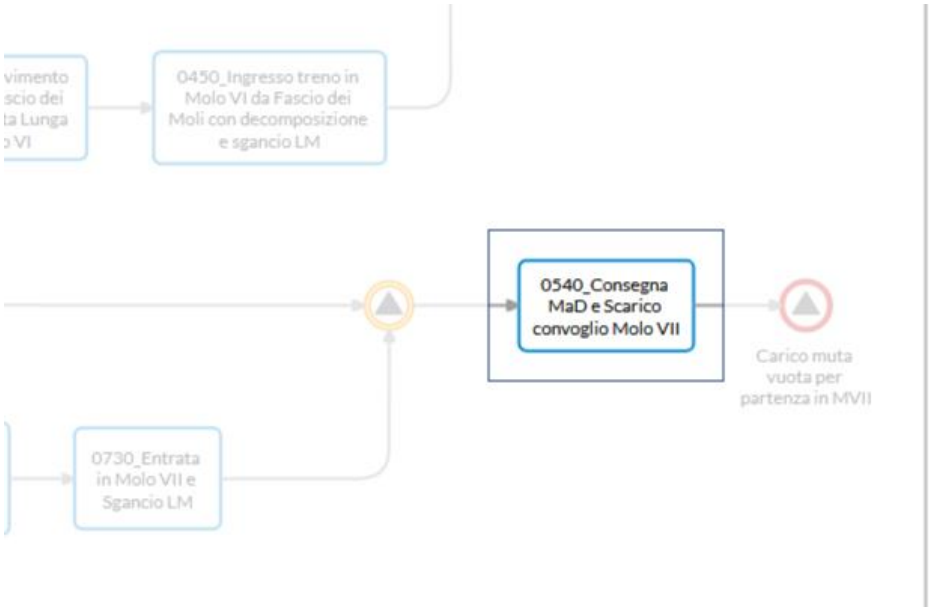
TASK



Incoming	Outgoing
TASK 0570_scambio risorse	SIGNAL INTERMEDIATE THROW EVENT Richiamo LM

0540_Consegna MaD e Scarico convoglio Molo VII

TASK

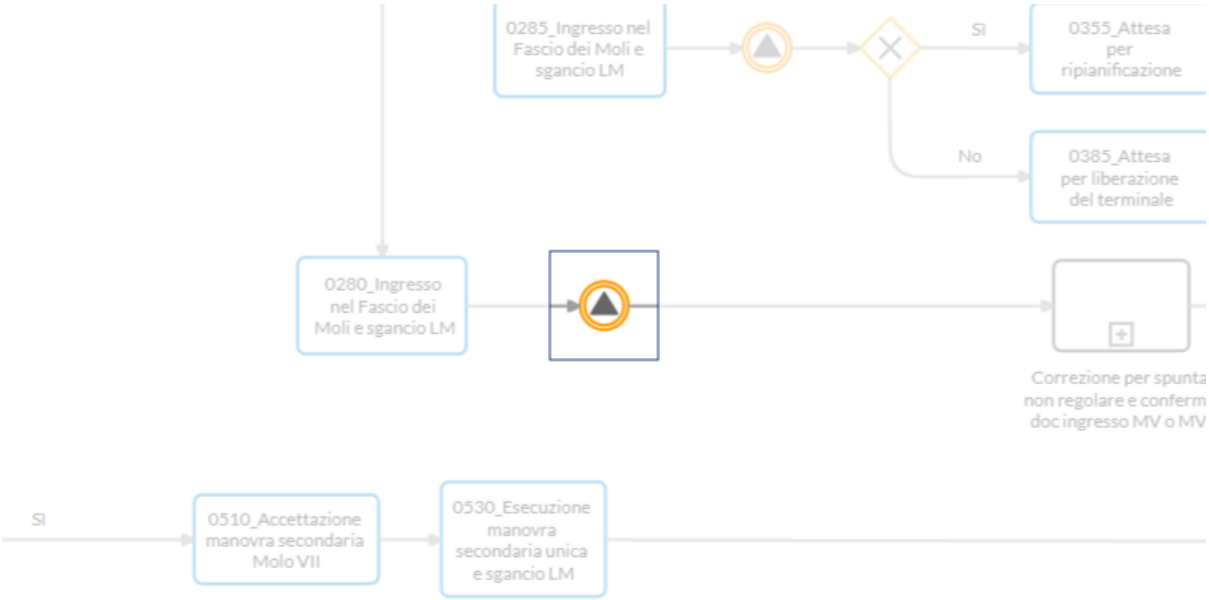


Il Gestore Unico consegna la Messa a Disposizione (MaD 6° GU-Terminal). Il terminalista scarica quindi il convoglio nel terminal TEMPO. M7.

Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_45b96777-4146-b81c-a5cc-22d7c348dc16	SIGNAL END EVENT Carico muta vuota per partenza in MVII

signalIntermediateThrowEvents_6e2fb061-4ecf-ab28-9699-3769686c2cac

SIGNAL INTERMEDIATE THROW EVENT



Incoming

TASK
0280_Ingresso nel Fascio dei Moli e sgancio LM

Outgoing

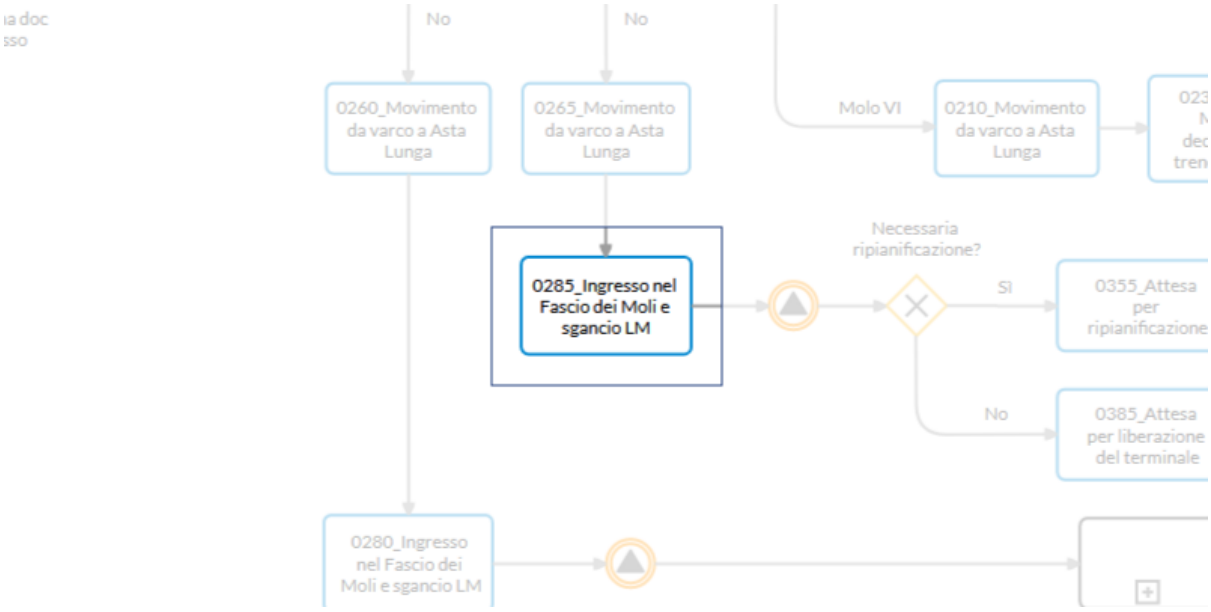
SUBPROCESS
Correzione per spunta non regolare e conferma doc ingresso MV o MVI

Attributes

SIGNAL REFERENCE
SgancioLM_ManovraSec_FdM

0285_Ingresso nel Fascio dei Moli e sgancio LM

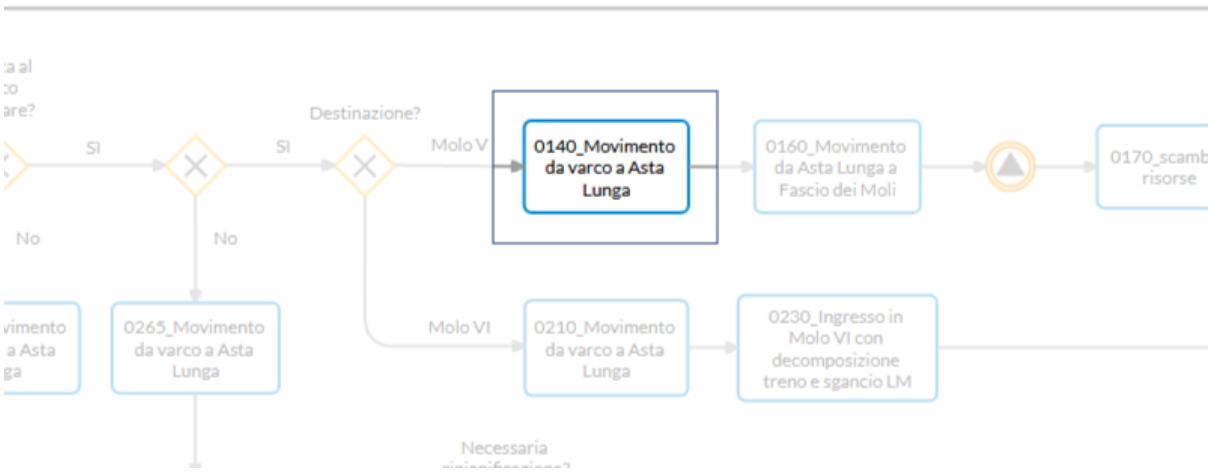
TASK



Incoming	Outgoing
TASK 0265_Movimento da varco a Asta Lunga	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_95523a7c-49f2-f86b-1618-4314ed5045e2

0140_Movimento da varco a Asta Lunga

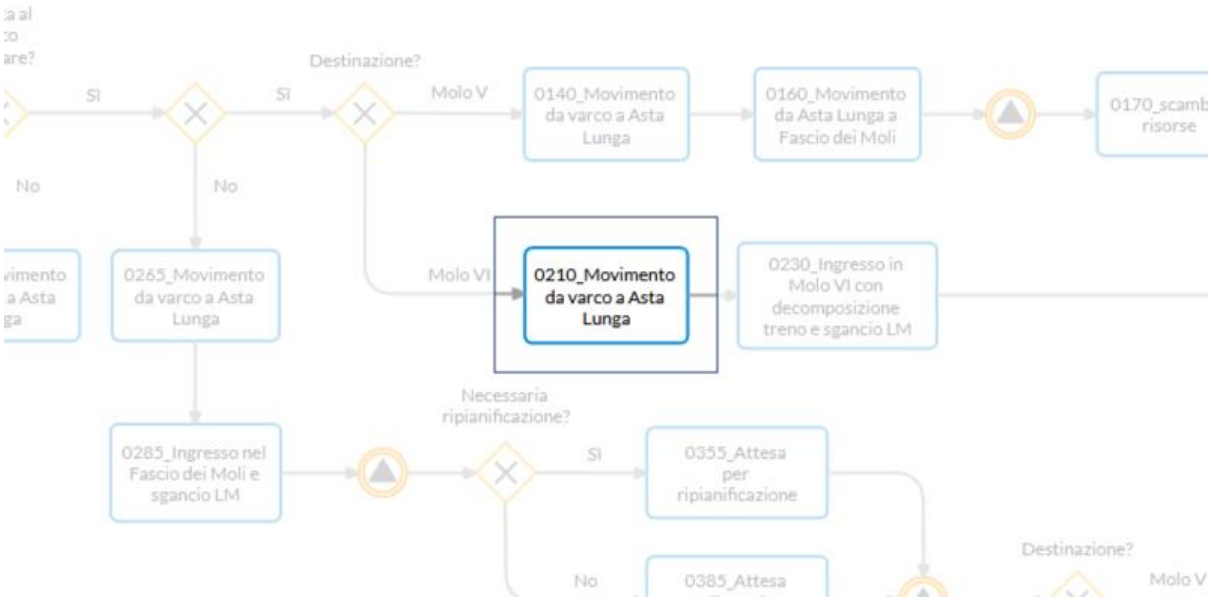
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Destinazione? through Molo V	TASK 0160_Movimento da Asta Lunga a Fascio dei Moli

0210_Movimento da varco a Asta Lunga

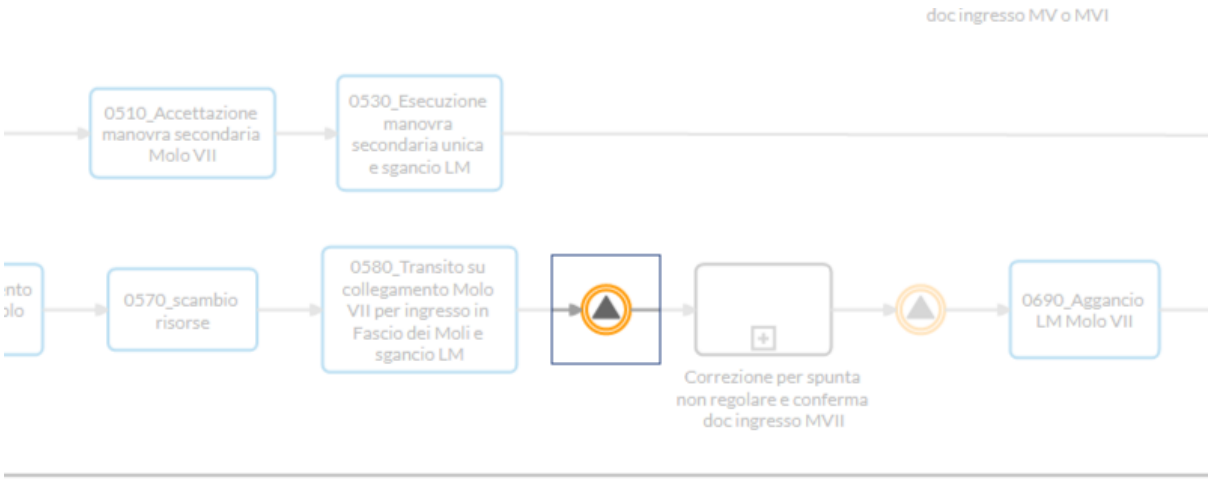
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Destinazione? through Molo VI	TASK 0230_Ingresso in Molo VI con decomposizione treno e sgancio LM

Richiamo LM

SIGNAL INTERMEDIATE THROW EVENT



Incoming

TASK
0580_Transito su collegamento Molo VII per ingresso in Fascio dei Moli e sgancio LM

Outgoing

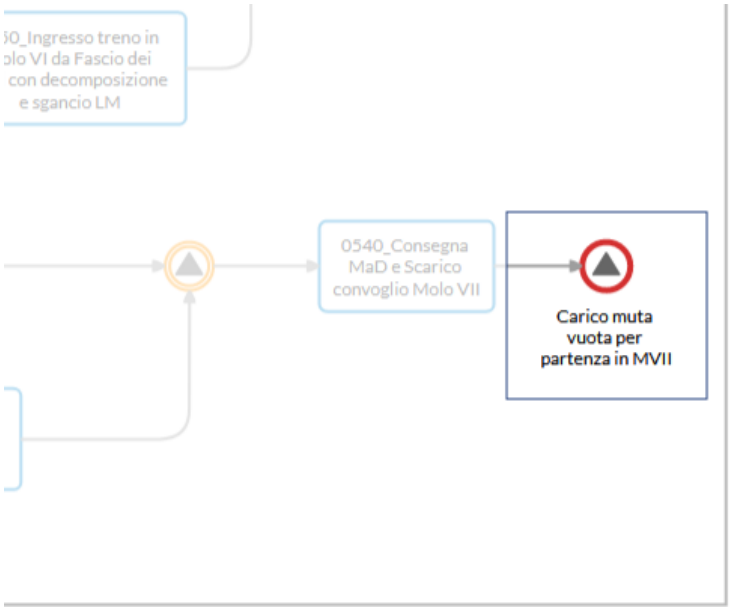
SUBPROCESS
Correzione per spunta non regolare e conferma doc ingresso MVII

Attributes

SIGNAL REFERENCE
SgancioLM_ManovraSec_FdM

Carico muta vuota per partenza in MVII

SIGNAL END EVENT



Incoming

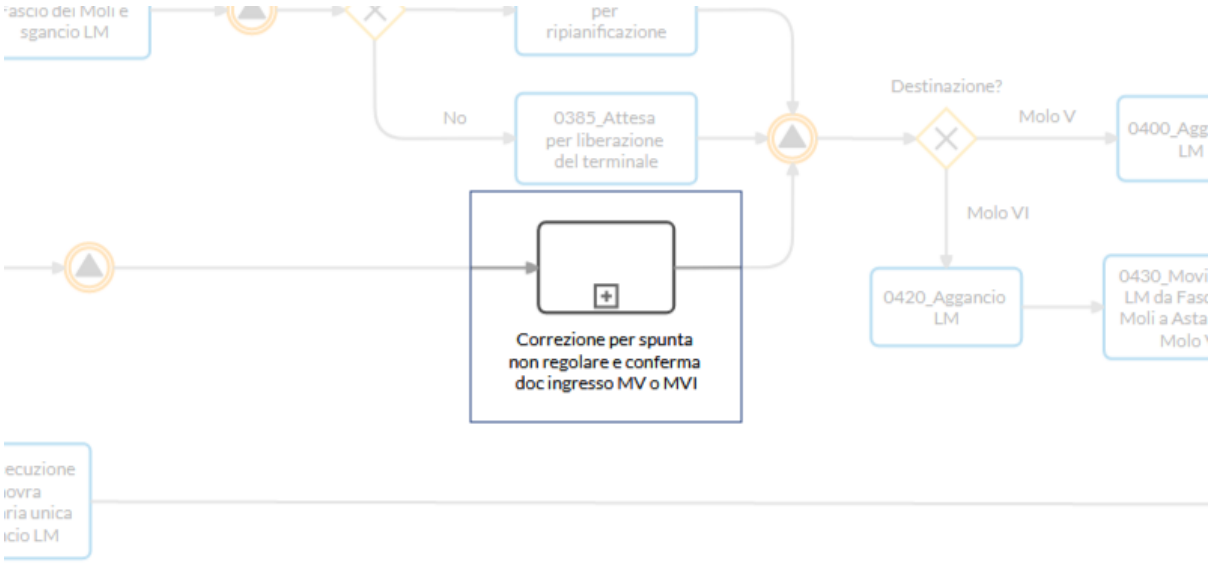
TASK
0540_Consegna MaD e Scarico convoglio Molo VII

Attributes

SIGNAL REFERENCE
Avvio partenza da MVII

Correzione per spunta non regolare e conferma doc ingresso MV o MVI

SUBPROCESS

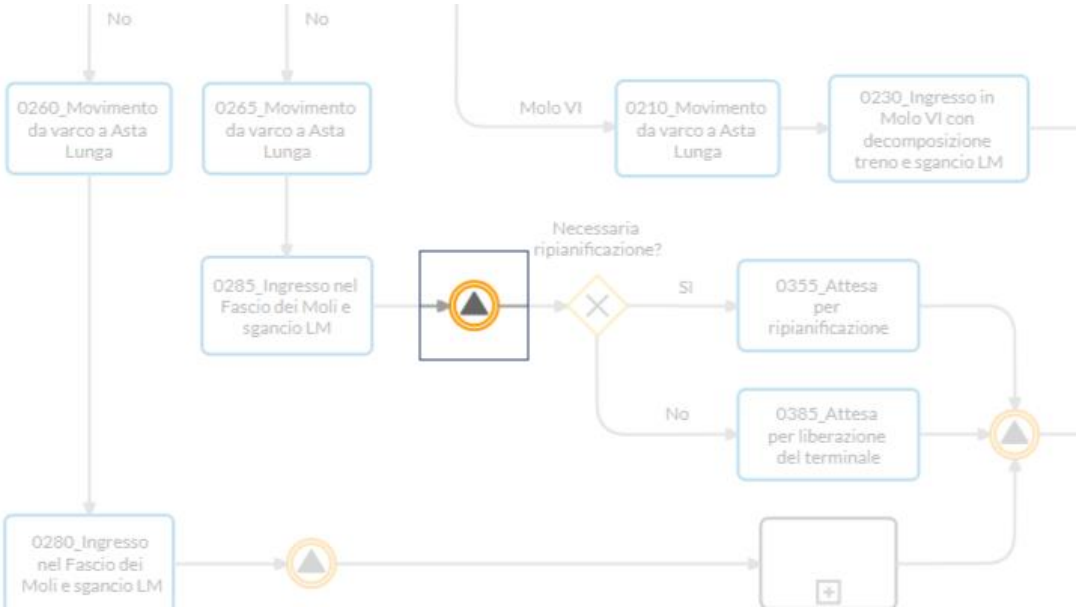


Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_6e2fb061-4ecf-ab28-9699-3769686c2cac	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_f905a240-733a-403f-1316-8584403b6e49

For details on specific subprocess elements, go to the element chapter.

signalIntermediateThrowEvents_95523a7c-49f2-f86b-1618-4314ed5045e2

SIGNAL INTERMEDIATE THROW EVENT



Incoming

TASK
0285_Ingresso nel Fascio dei Moli e sgancio LM

Outgoing

EXCLUSIVE GATEWAY
Necessaria ripianificazione?

Attributes

SIGNAL REFERENCE
SgancioLM_ManovraSec_FdM

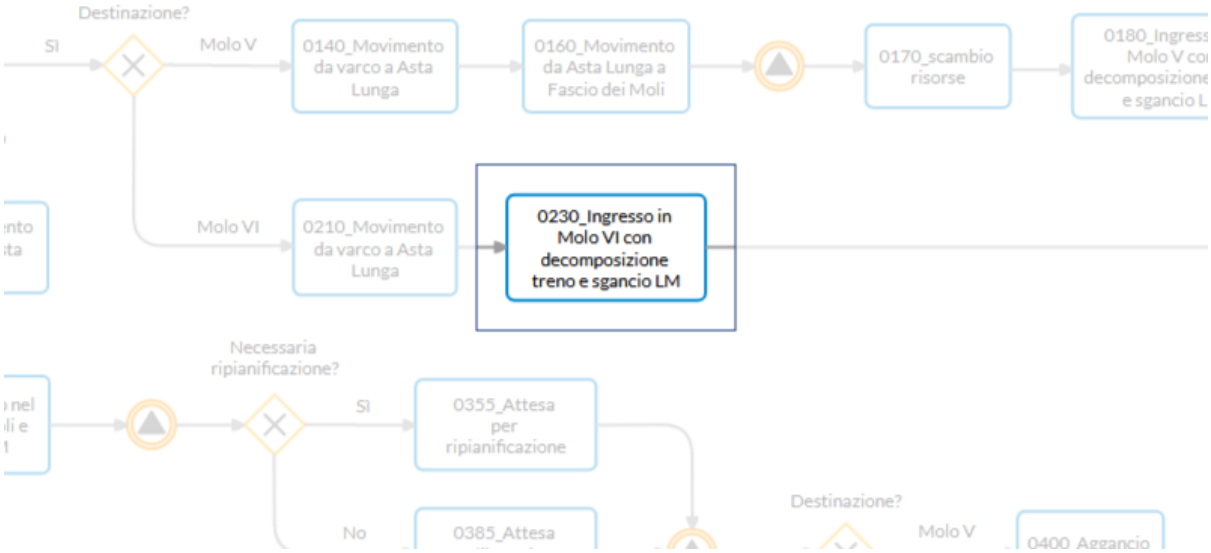
0160_Movimento da Asta Lunga a Fascio dei Moli

TASK

Incoming	Outgoing
TASK 0140_Movimento da varco a Asta Lunga	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_cb55183d-f3f6-5962-f289-04e45e583163

0230_Ingresso in Molo VI con decomposizione treno e sgancio LM

TASK

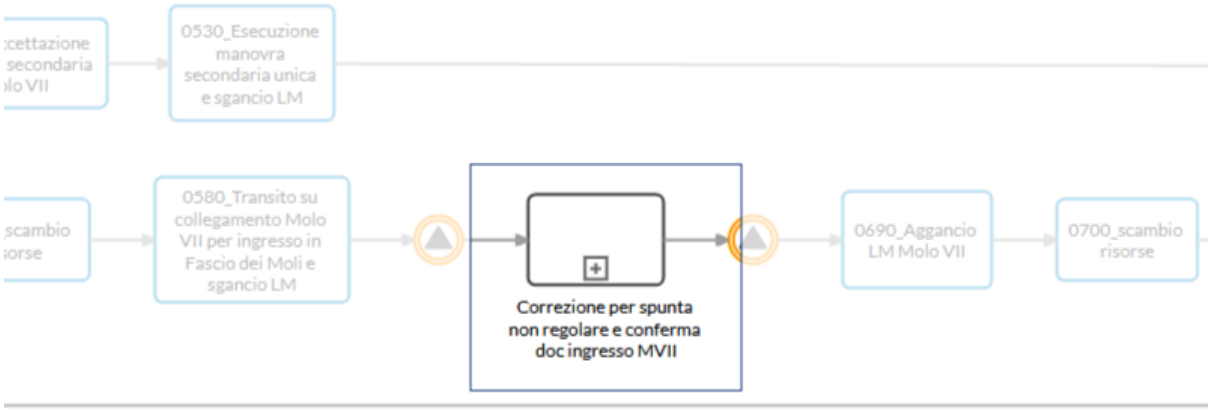


Il Gestore Unico esegue la manovra secondaria unica se c'è la disponibilità di ricezione nel terminale.TEMPO. M6. L

Incoming	Outgoing
TASK 0210_Movimento da varco a Asta Lunga	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_fb82e814-cf2f-a9ae-c5ff-e67f996df4b7

Correzione per spunta non regolare e conferma doc ingresso MVII

SUBPROCESS

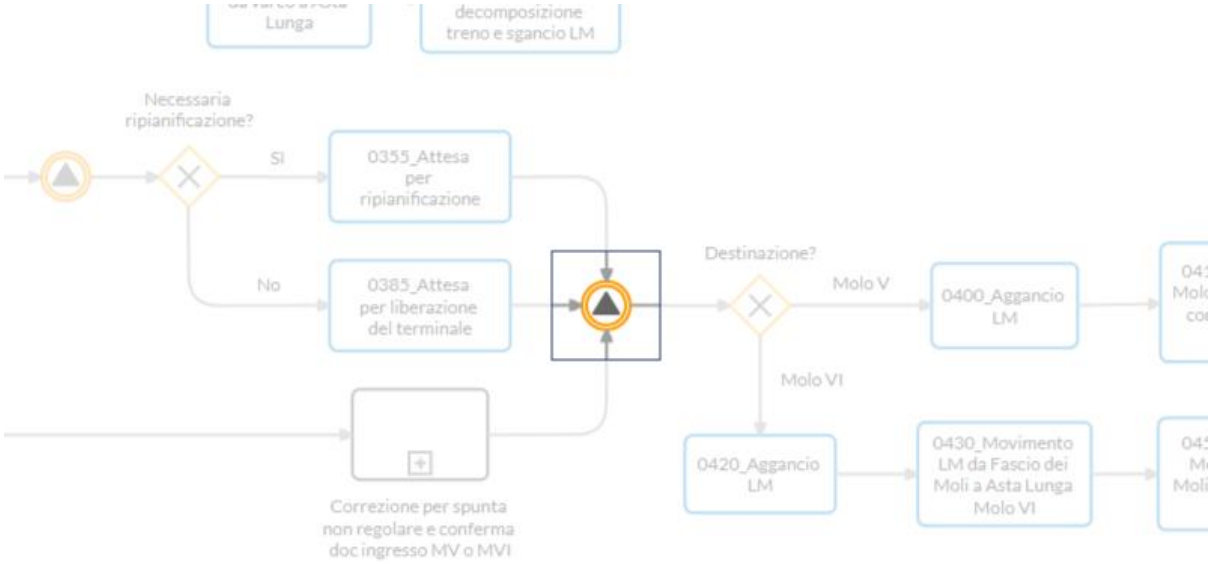


Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT Richiamo LM	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_b14cc466-8ffe-b680-44b5-7b4230970e1b

For details on specific subprocess elements, go to the element chapter.

signalIntermediateThrowEvents_f905a240-733a-403f-1316-8584403b6e49

SIGNAL INTERMEDIATE THROW EVENT



Incoming

SUBPROCESS
Correzione per spunta non regolare e conferma doc ingresso MV o MVI

TASK
0355_Attesa per ripianificazione

TASK
0385_Attesa per liberazione del terminale

Outgoing

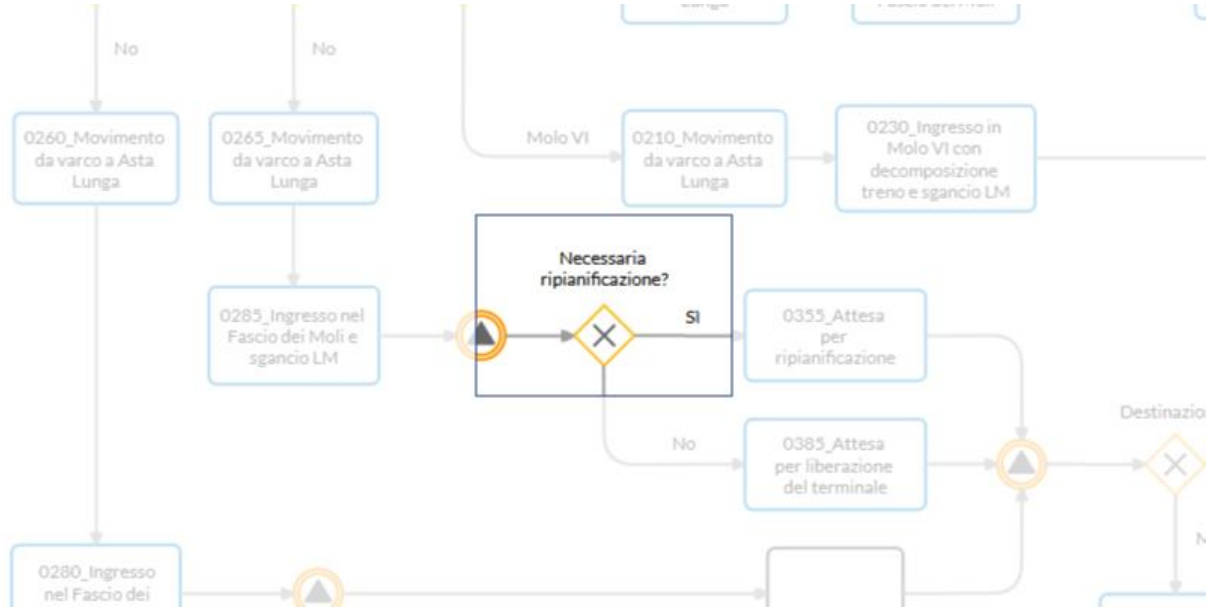
EXCLUSIVE GATEWAY
Destinazione?

Attributes

SIGNAL REFERENCE
RichiamoLM_ManovraSec_FdM

Necessaria ripianificazione?

EXCLUSIVE GATEWAY



Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_95523a7c-49f2-f86b-1618-4314ed5045e2	TASK 0355_Attesa per ripianificazione through Sì
	TASK 0385_Attesa per liberazione del terminale through No

signalIntermediateThrowEvents_cb55183d-f3f6-5962-f289-04e45e583163

SIGNAL INTERMEDIATE THROW EVENT

Incoming

TASK
0160_Movimento da Asta Lunga a Fascio dei Moli

Outgoing

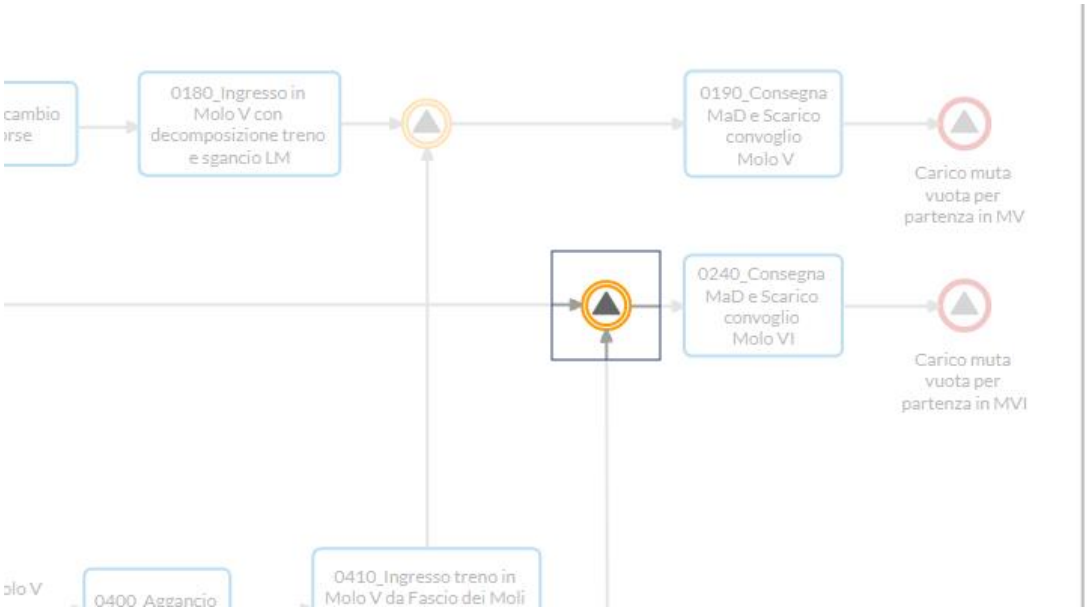
TASK
0170_scambio risorse

Attributes

SIGNAL REFERENCE
RichiamoLM_ManovraSec_FdM

signalIntermediateThrowEvents_fb82e814-cf2f-a9ae-c5ff-e67f996df4b7

SIGNAL INTERMEDIATE THROW EVENT



Incoming

TASK
0450_Ingresso treno in Molo VI da Fascio dei Moli con decomposizione e sgancio LM

TASK
0230_Ingresso in Molo VI con decomposizione treno e sgancio LM

Outgoing

TASK
0240_Consegna MaD e Scarico convoglio Molo VI

Attributes

SIGNAL REFERENCE
Locomotiva_molo6

signalIntermediateThrowEvents_b14cc466-8ffe-b680-44b5-7b4230970e1b

SIGNAL INTERMEDIATE THROW EVENT

Incoming	Outgoing
SUBPROCESS Correzione per spunta non regolare e conferma doc ingresso MVII	TASK 0690_Aggancio LM Molo VII

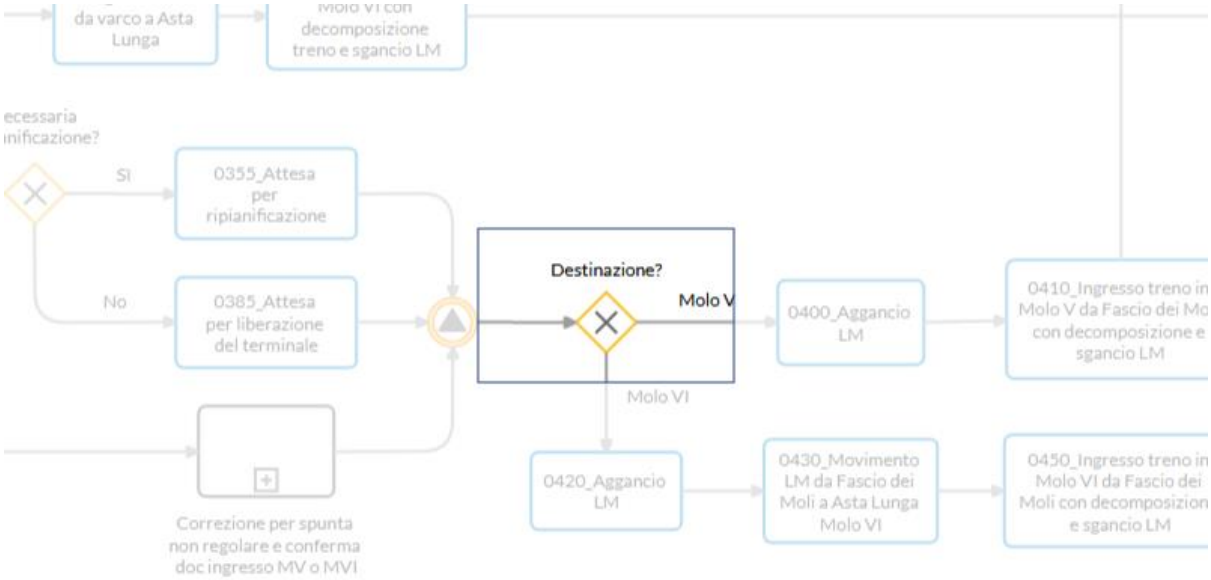
Attributes

SIGNAL REFERENCE

RichiamoLM_ManovraSec_FdM

Destinazione?

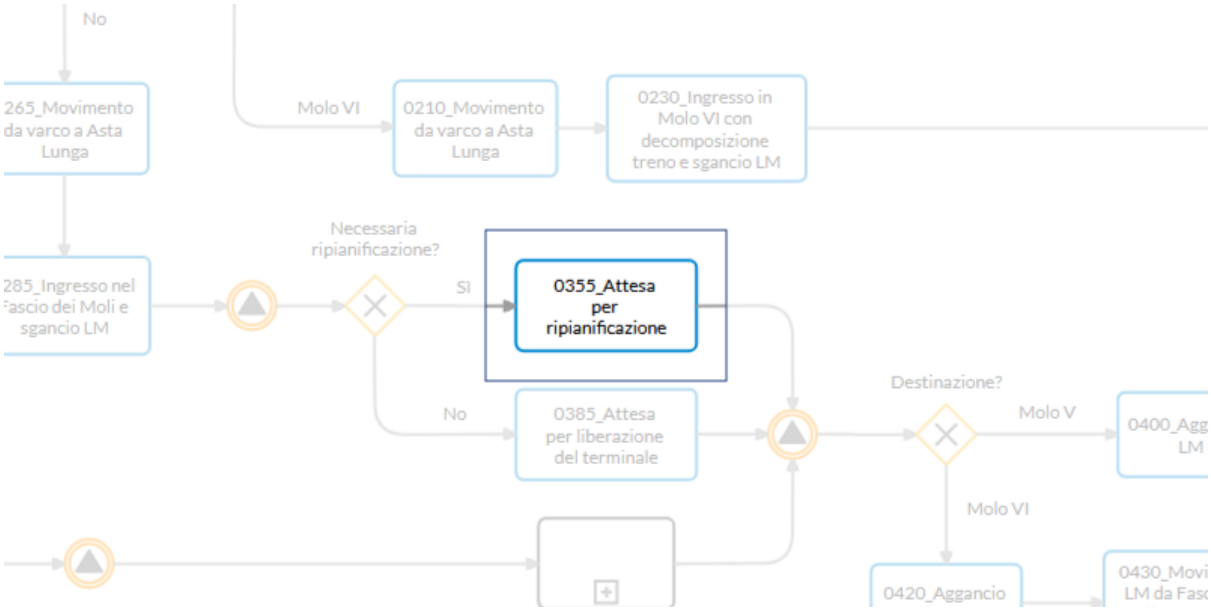
EXCLUSIVE GATEWAY



Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_f905a240-733a-403f-1316-8584403b6e49	TASK 0400_Aggancio LM through Molo V
	TASK 0420_Aggancio LM through Molo VI

0355_Attesa per ripianificazione

TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Necessaria ripianificazione? through Sì	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_f905a240-733a-403f-1316-8584403b6e49

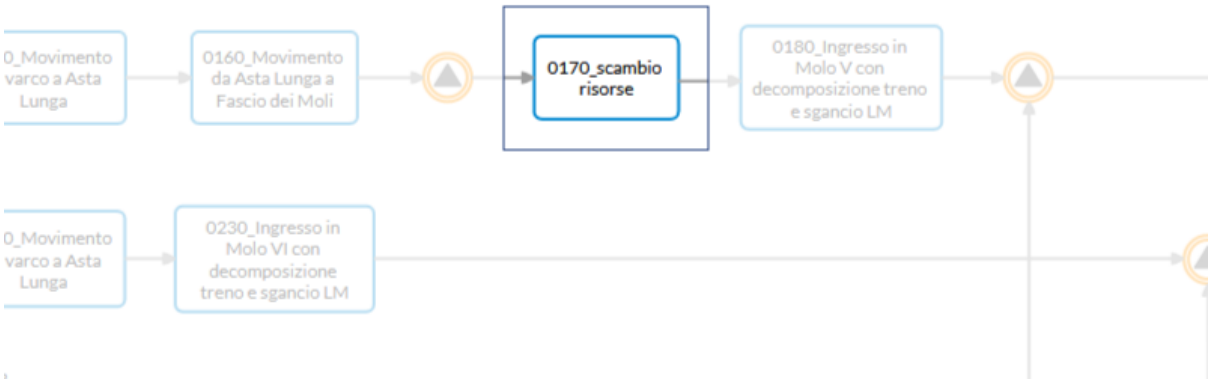
0385_Attesa per liberazione del terminale

TASK

Incoming	Outgoing
EXCLUSIVE GATEWAY Necessaria ripianificazione? through No	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_f905a240-733a-403f-1316-8584403b6e49

0170_scambio risorse

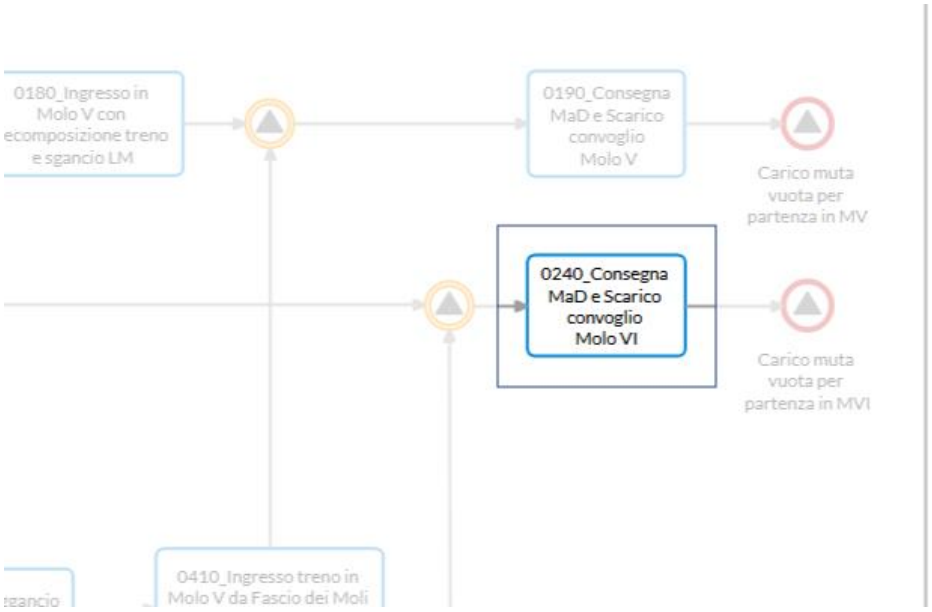
TASK



Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_cb55183d-f3f6-5962-f289-04e45e583163	TASK 0180_Ingresso in Molo V con decomposizione treno e sgancio LM

0240_Consegna MaD e Scarico convoglio Molo VI

TASK

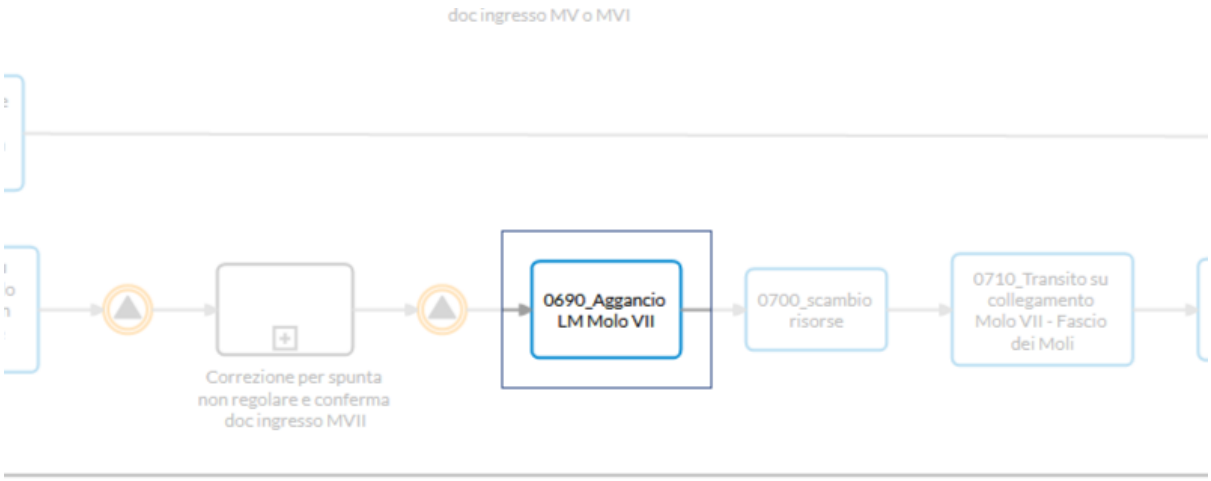


Il Gestore Unico consegna la Messa a Disposizione (MaD 6° GU-Terminal). Il terminalista scarica quindi il convoglio nel terminal TEMPO. M6.

Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_fb82e814-cf2f-a9ae-c5ff-e67f996df4b7	SIGNAL END EVENT Carico muta vuota per partenza in MVI

0690_Aggancio LM Molo VII

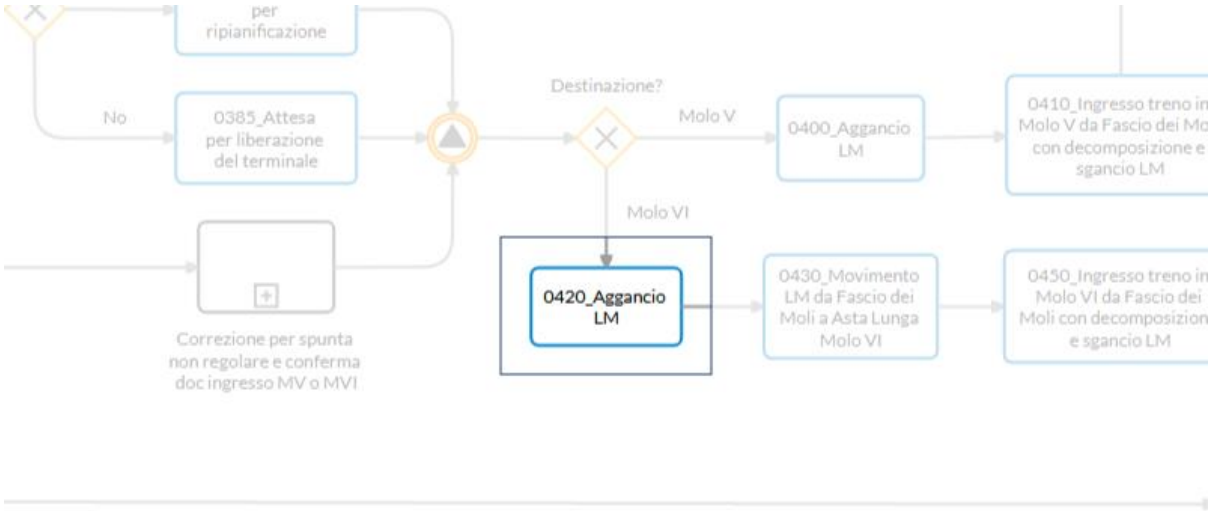
TASK



Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_b14cc466-8ffe-b680-44b5-7b4230970e1b	TASK 0700_scambio risorse

0420_Aggancio LM

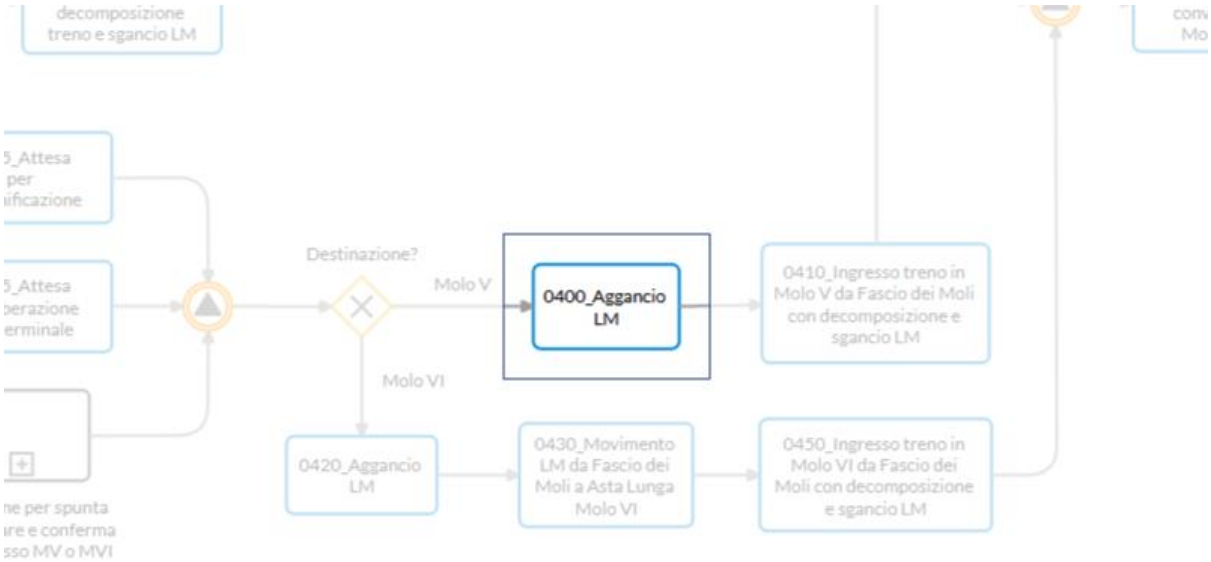
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Destinazione? through Molo VI	TASK 0430_Movimento LM da Fascio dei Moli a Asta Lunga Molo VI

0400_Aggancio LM

TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Destinazione? through Molo V	TASK 0410_Ingresso treno in Molo V da Fascio dei Moli con decomposizione e sgancio LM

0180_Ingresso in Molo V con decomposizione treno e sgancio LM

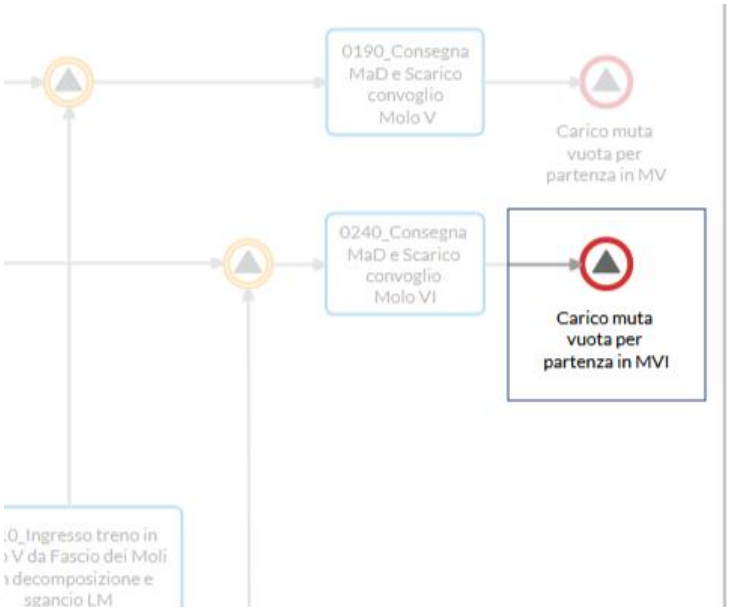
TASK

Il Gestore Unico esegue la manovra secondaria unica se c'è la disponibilità di ricezione nel terminale.TEMPO. M5. L

Incoming	Outgoing
TASK 0170_scambio risorse	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_3900b813-c8b4-df27-6ac1-d8199682efea

Carico muta vuota per partenza in MVI

SIGNAL END EVENT



Incoming

TASK
0240_Consegna MaD e Scarico convoglio Molo VI

Attributes

SIGNAL REFERENCE
Avvio partenza da MVI

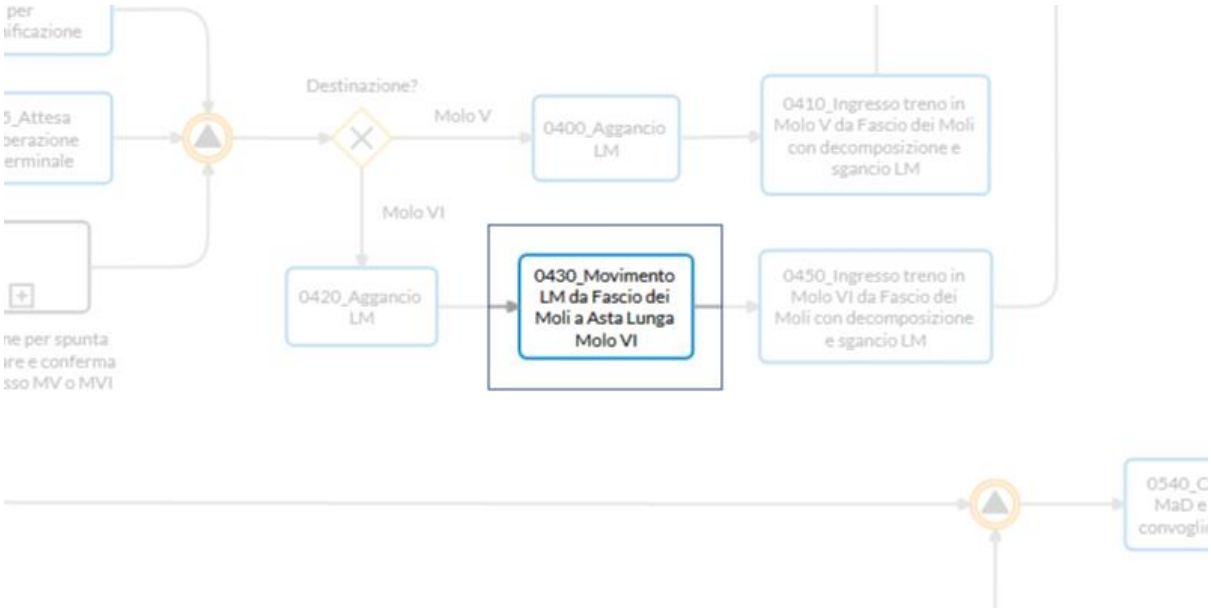
0700_scambio risorse

TASK

Incoming	Outgoing
TASK 0690_Aggancio LM Molo VII	TASK 0710_Transito su collegamento Molo VII - Fascio dei Moli

0430_Movimento LM da Fascio dei Moli a Asta Lunga Molo VI

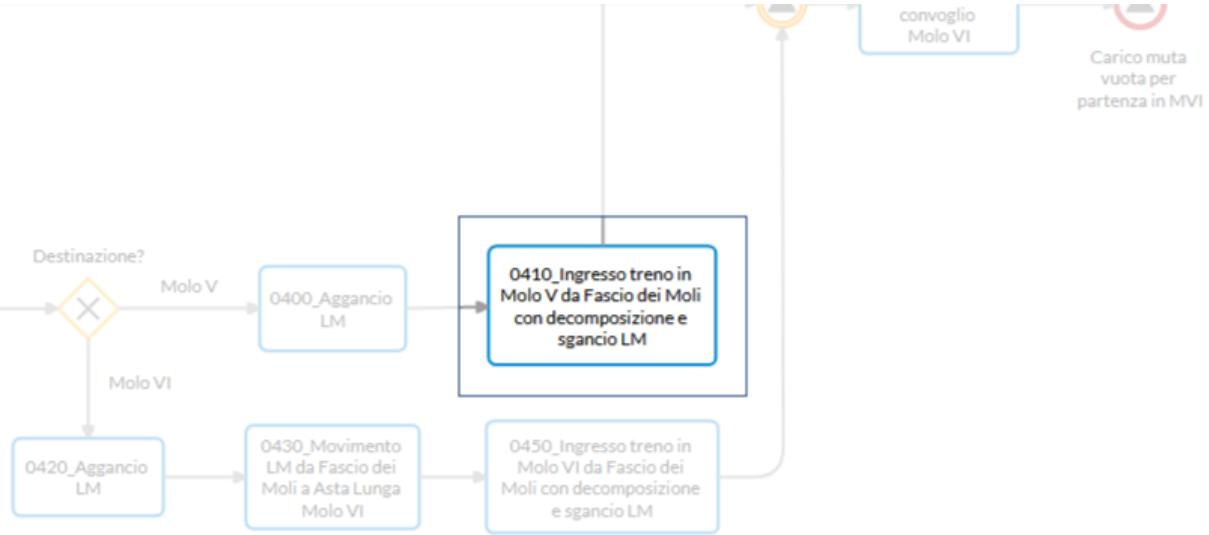
TASK



Incoming	Outgoing
TASK 0420_Aggancio LM	TASK 0450_Ingresso treno in Molo VI da Fascio dei Moli con decomposizione e sgancio LM

0410_Ingresso treno in Molo V da Fascio dei Moli con decomposizione e sgancio LM

TASK



Incoming	Outgoing
TASK 0400_Aggancio LM	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_3900b813-c8b4-df27-6ac1-d8199682efea

signalIntermediateThrowEvents_3900b813-c8b4-df27-6ac1-d8199682efea

SIGNAL INTERMEDIATE THROW EVENT

Incoming

TASK
0410_Ingresso treno in Molo V da Fascio dei Moli con decomposizione e sgancio LM

TASK
0180_Ingresso in Molo V con decomposizione treno e sgancio LM

Outgoing

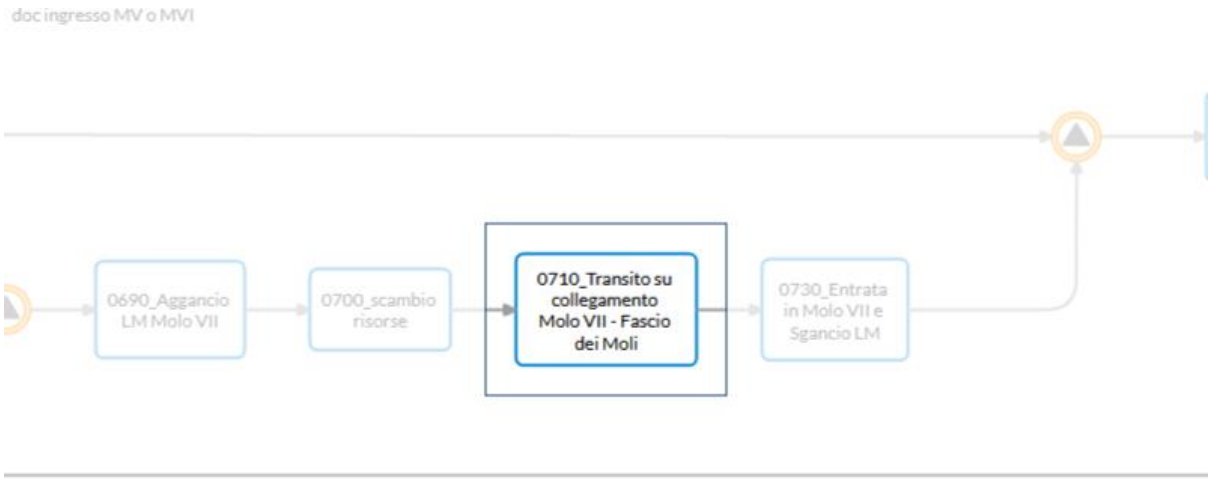
TASK
0190_Consegna MaD e Scarico convoglio Molo V

Attributes

SIGNAL REFERENCE
Locomotiva_molo5

0710_Transito su collegamento Molo VII - Fascio dei Moli

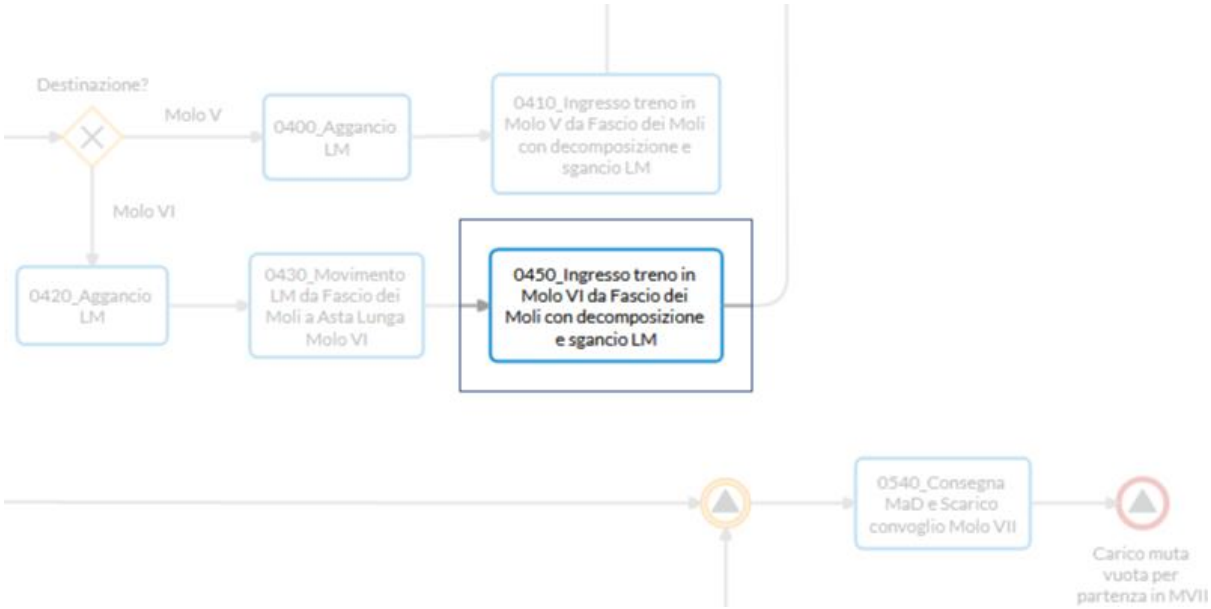
TASK



Incoming	Outgoing
TASK 0700_scambio risorse	TASK 0730_Entrata in Molo VII e Sgancio LM

0450_Ingresso treno in Molo VI da Fascio dei Moli con decomposizione e sgancio LM

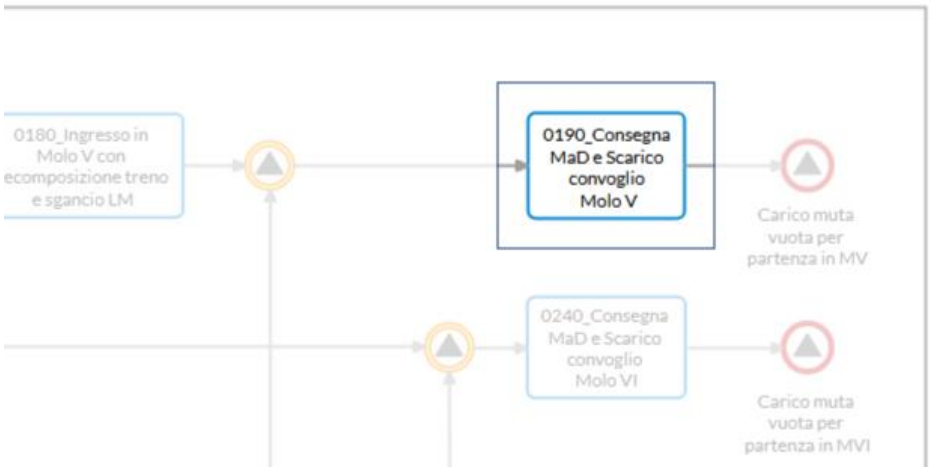
TASK



Incoming	Outgoing
TASK 0430_Movimento LM da Fascio dei Moli a Asta Lunga Molo VI	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_fb82e814-cf2f-a9ae-c5ff-e67f996df4b7

0190_Consegna MaD e Scarico convoglio Molo V

TASK



Il Gestore Unico consegna la Messa a Disposizione (MaD 6° GU-Terminal). Il terminalista scarica quindi il convoglio nel terminal TEMPO. M5

Incoming	Outgoing
SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_3900b813-c8b4-df27-6ac1-d8199682efea	SIGNAL END EVENT Carico muta vuota per partenza in MV

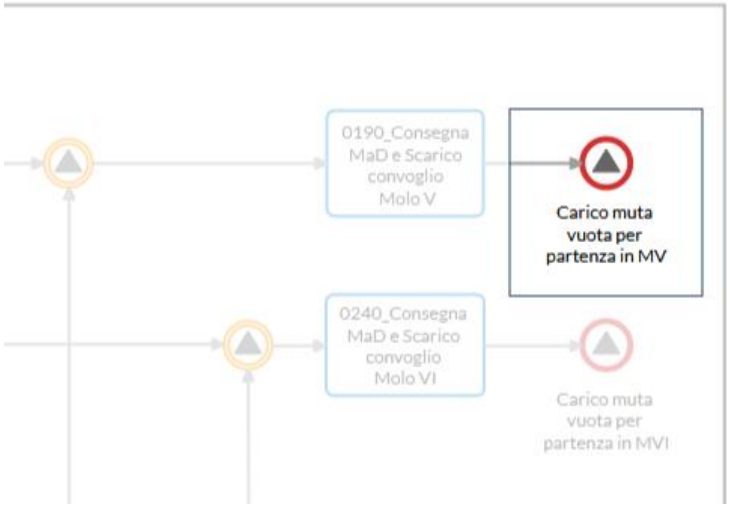
0730_Entrata in Molo VII e Sgancio LM

TASK

Incoming	Outgoing
TASK 0710_Transito su collegamento Molo VII - Fascio dei Moli	SIGNAL INTERMEDIATE THROW EVENT signalIntermediateThrowEvents_45b96777-4146-b81c-a5cc-22d7c348dc16

Carico muta vuota per partenza in MV

SIGNAL END EVENT



Incoming

TASK
0190_Consegna MaD e Scarico convoglio Molo V

Attributes

SIGNAL REFERENCE
Avvio partenza da MV

2.1.1.1. Subprocess: Correzione per spunta non regolare e conferma doc ingresso MVII

startEvents_752516a3-cf35-c2d1-ccd5-97be4ad59af6

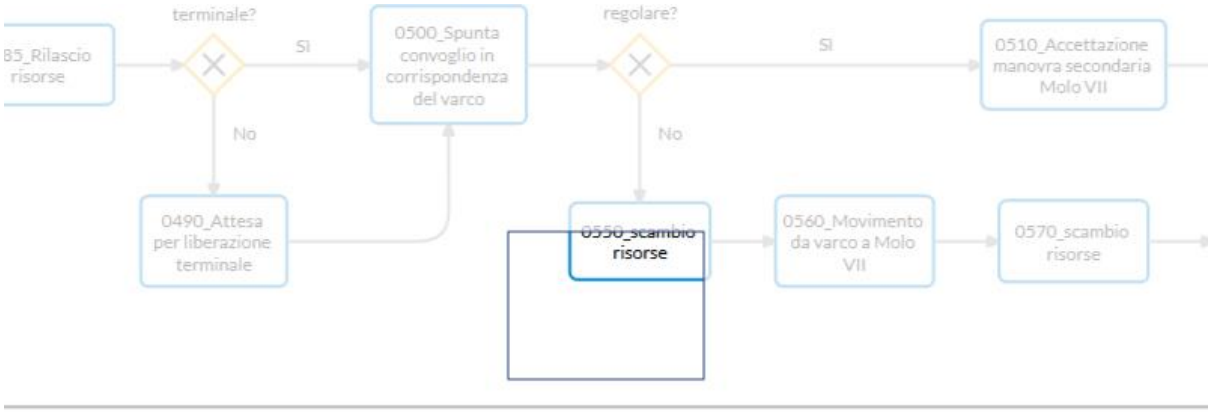
START EVENT

Outgoing

TASK
0590_Modifica CH30 per incongruenza

0590_Modifica CH30 per incongruenza

TASK



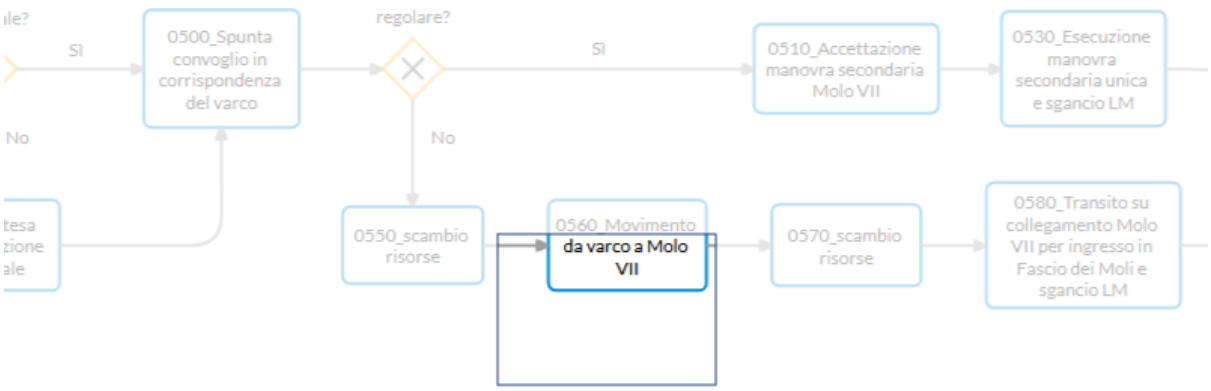
Se la spunta non è regolare, la Guardia di Finanza modifica lo stato del CH30 da Confermato a Incongruente (stato X). Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
START EVENT startEvents_752516a3-cf35-c2d1-ccd5-97be4ad59af6	TASK 0600_Verifica incongruenza

0600_Verifica incongruenza

TASK



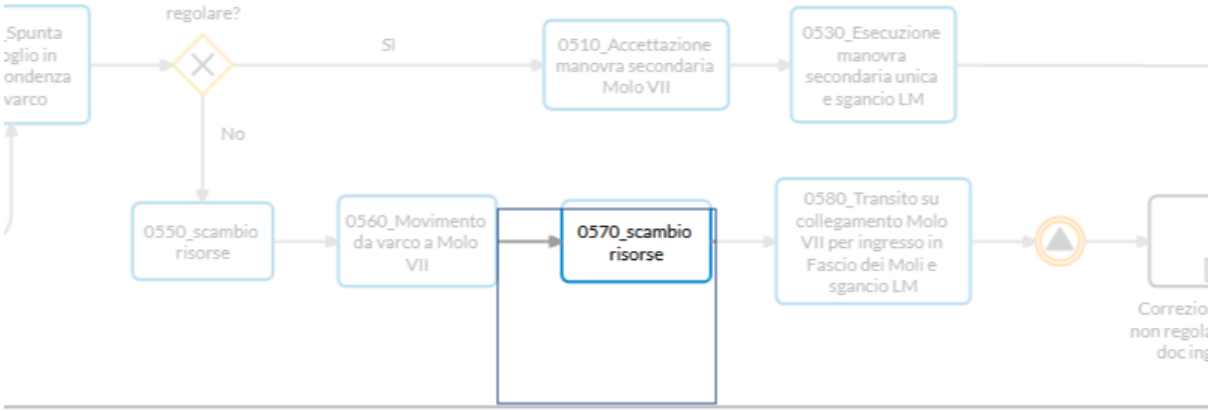
L' incongruenza viene verificata dal terminalista. Tempo. PFN-S. L.

> 5 min

Incoming	Outgoing
TASK 0590_Modifica CH30 per incongruenza	TASK 0610_Richiesta autorizzazione per modifica dati a dogana

0610_Richiesta autorizzazione per modifica dati a dogana

TASK



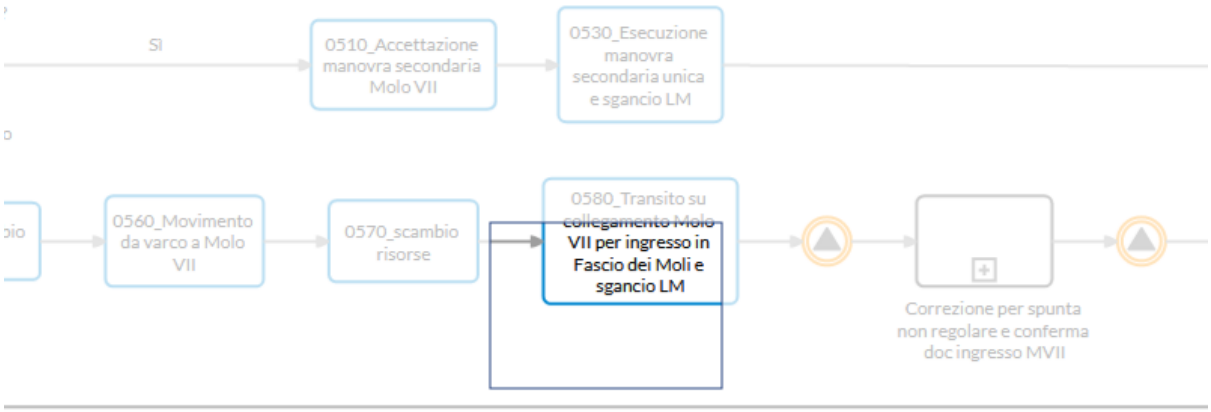
Una volta verificata la natura dell'incongruenza, il terminalista richiede l'autorizzazione alla modifica dei dati alla dogana. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0600_Verifica incongruenza	TASK 0620_Modifica CH30 pre-autorizzazione

0620_Modifica CH30 pre-autorizzazione

TASK



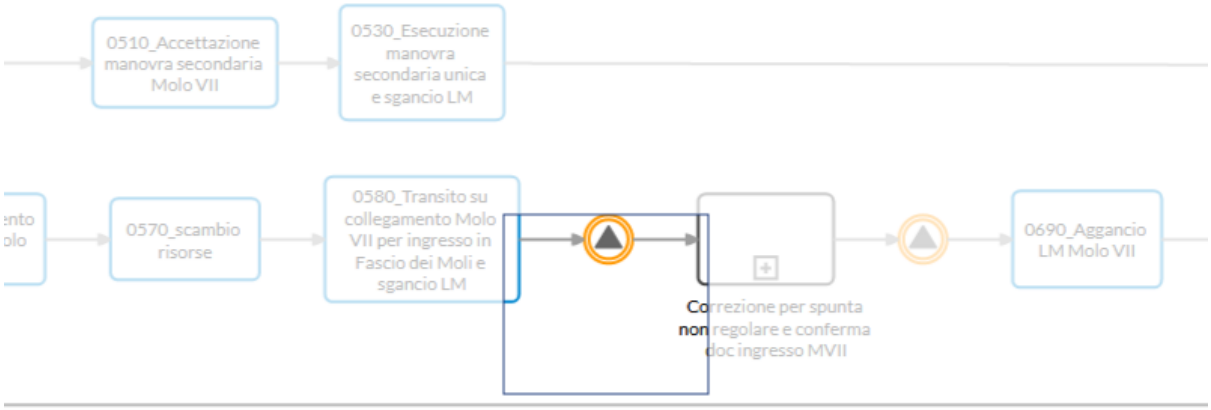
La Dogana modifica lo stato del CH30 da Incongruente a Modificabile. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0610_Richiesta autorizzazione per modifica dati a dogana	TASK 0630_Autorizzazione ad effettuare modifica al terminalista

0630_Autorizzazione ad effettuare modifica al terminalista

TASK



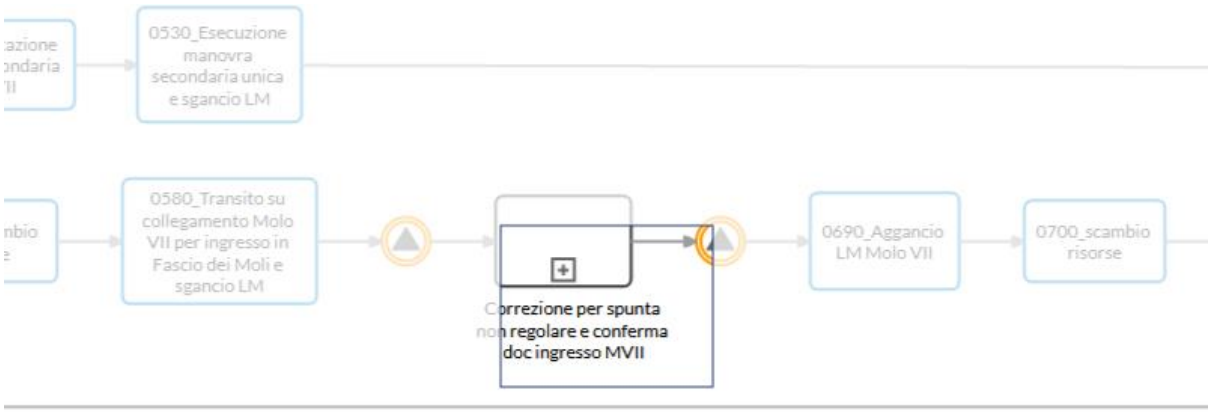
L'autorità doganale autorizza il terminalista ad effettuare delle modifiche al CH30. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0620_Modifica CH30 pre-autorizzazione	TASK 0640_Modifica CH30 per correzione incongruenza

0640_Modifica CH30 per correzione incongruenza

TASK



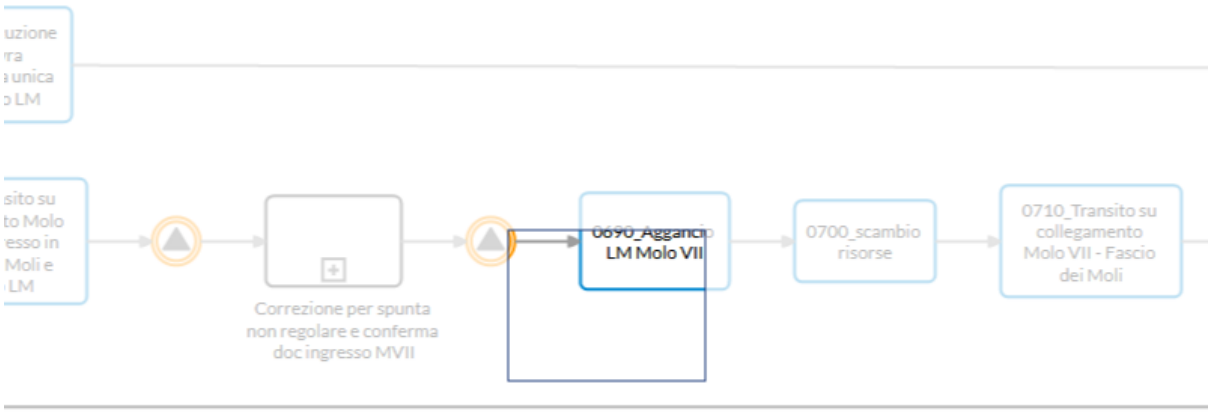
Il terminalista modifica il CH30 e lo riconsegna alla Dogana nello stato Definitivo. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0630_Autorizzazione ad effettuare modifica al terminalista	TASK 0650_Conferma CH30

0650_Conferma CH30

TASK



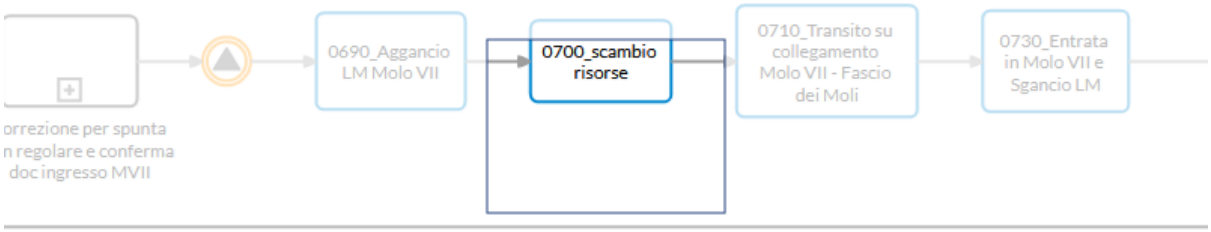
La Dogana conferma il CH30 variandone lo stato da Definitivo a Confermato. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0640_Modifica CH30 per correzione incongruenza	TASK 0660_Controllo corrispondenza convoglio-dati CH30

0660_Controllo corrispondenza convoglio-dati CH30

TASK



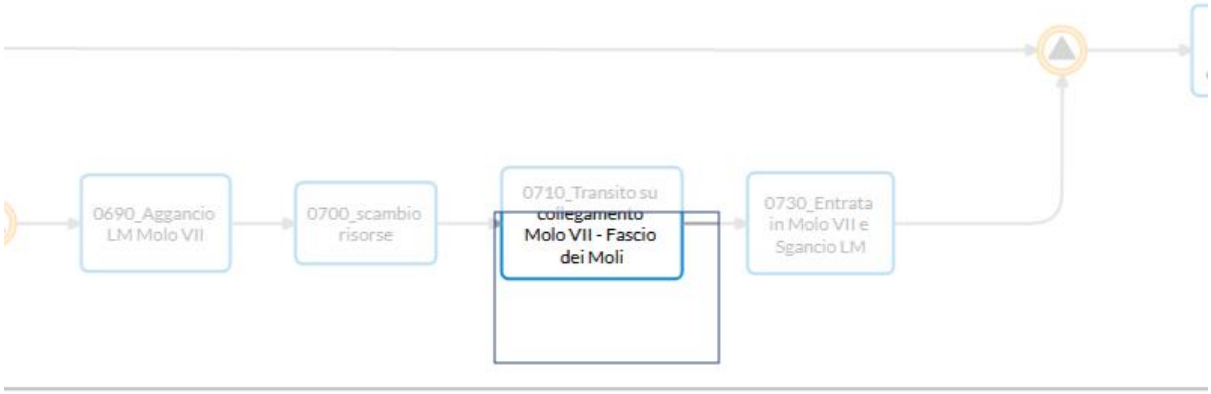
Il CH30 torna quindi alla Guardia di Finanza che opera presso il varco, la quale controlla la corrispondenza tra il convoglio e i dati del CH30. Tempo. PFN-S. L.

> 5 min

Incoming	Outgoing
TASK 0650_Conferma CH30	TASK 0670_Modifica CH30 con ingresso treno

0670_Modifica CH30 con ingresso treno

TASK



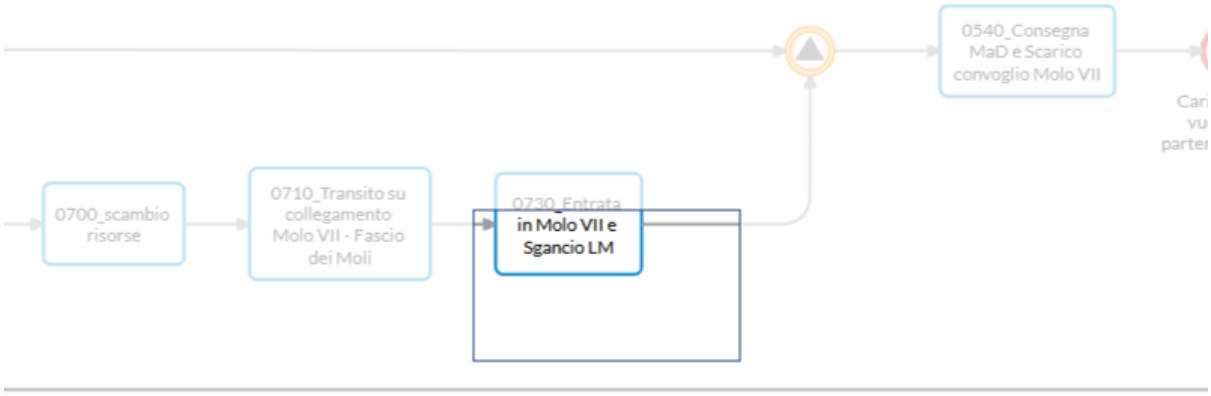
la Guardia di Finanza modifica lo stato del CH30 da Confermato ad Entrato (stato Q). Tempo. PFN. L.

> 1 min

Incoming	Outgoing
TASK 0660_Controllo corrispondenza convoglio-dati CH30	TASK 0680_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

0680_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

TASK



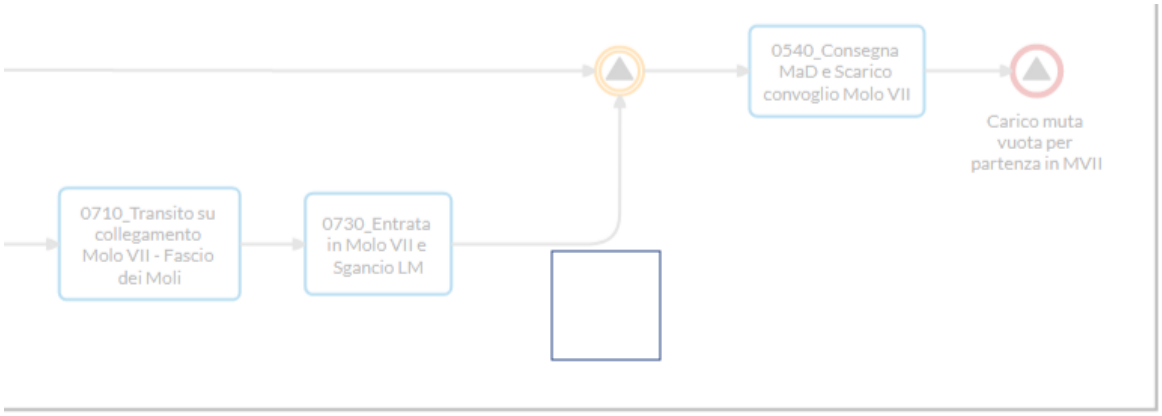
L'autorità doganale varia lo stato del CH30 da Entrato (stato Q) a Riscontrato. Tempo. PFN. L.

> 5 min

Incoming	Outgoing
TASK 0670_Modifica CH30 con ingresso treno	END EVENT endEvents_faa94613-31e0-6de6-9bb1-9b0cb0e7bcc1

endEvents_faa94613-31e0-6de6-9bb1-9b0cb0e7bcc1

END EVENT



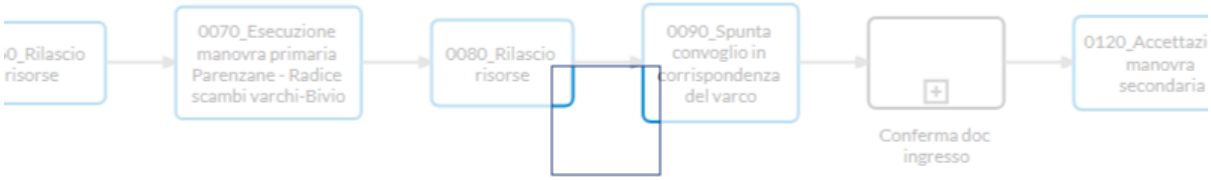
Incoming

TASK
0680_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

2.1.1.2. Subprocess: Conferma doc ingresso

startEvents_f13ea928-1cad-8530-4ab1-528433b6edf0

START EVENT

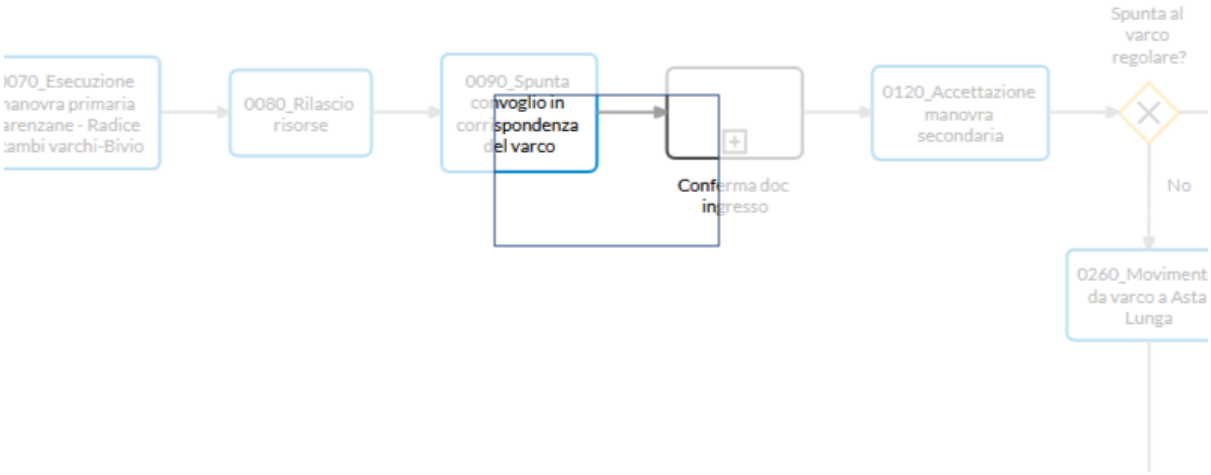


Outgoing

TASK
0100_Modifica CH30 con ingresso treno

0100_Modifica CH30 con ingresso treno

TASK



la Guardia di Finanza modifica lo stato del CH30 da Confermato ad Entrato (stato Q). Tempo. PFN. L.

> 1 min

Incoming

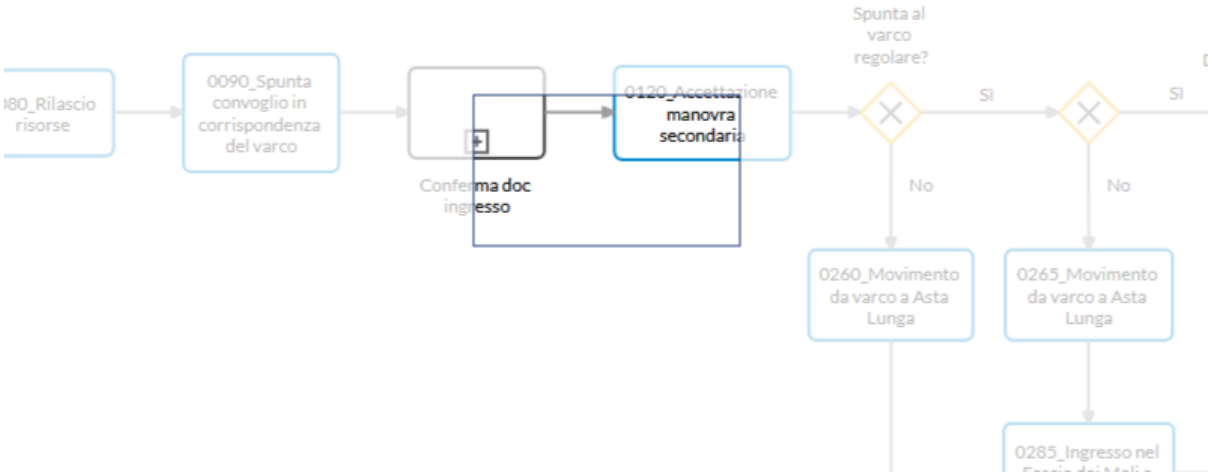
START EVENT
startEvents_f13ea928-1cad-8530-4ab1-528433b6edf0

Outgoing

TASK
0110_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

0110_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

TASK



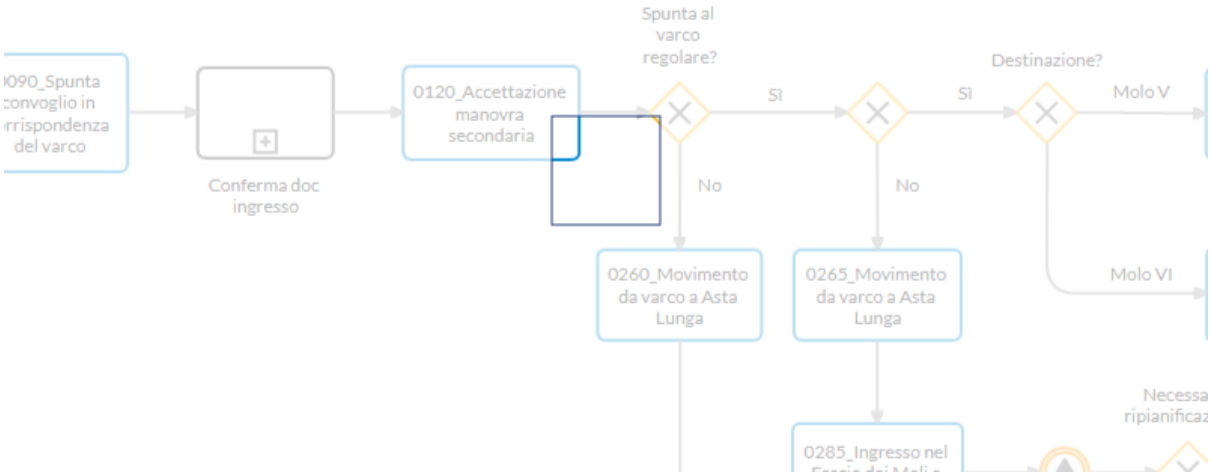
L'autorità doganale varia lo stato del CH30 da Entrato (stato Q) a Riscontrato. Tempo. PFN. L.

> 3 min

Incoming	Outgoing
TASK 0100_Modifica CH30 con ingresso treno	END EVENT endEvents_b397e649-27e2-e072-e233-66f1a6c425ee

endEvents_b397e649-27e2-e072-e233-66f1a6c425ee

END EVENT



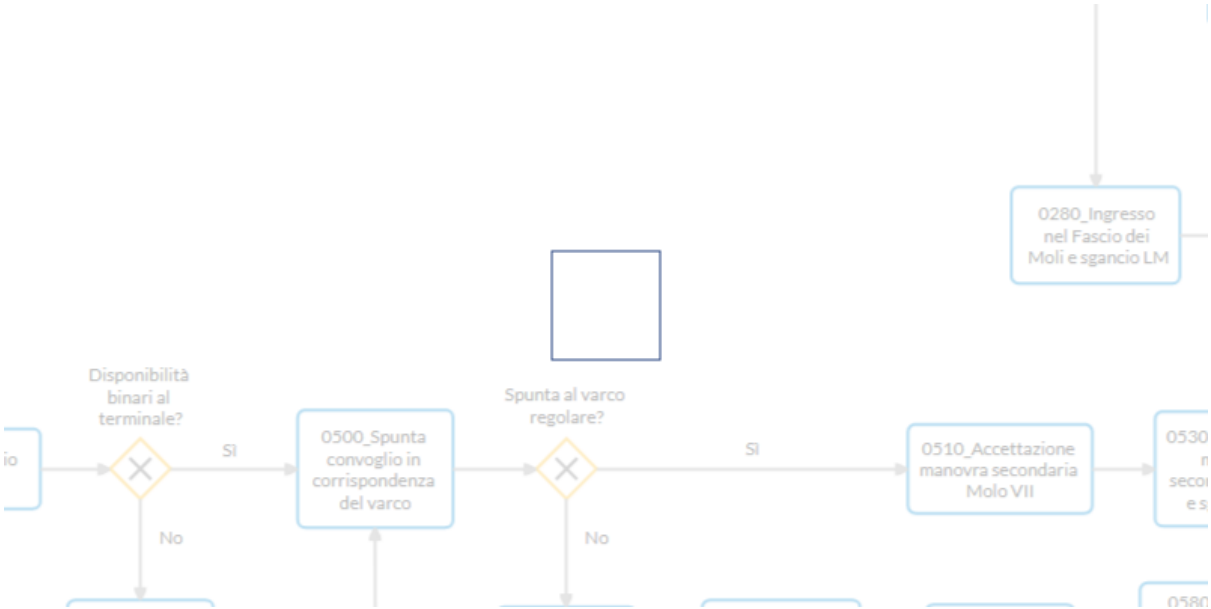
Incoming

TASK
0110_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

2.1.1.3. Subprocess: Correzione per spunta non regolare e conferma doc ingresso MV o MVI

startEvents_e6901f66-d49a-8772-9905-12cf86436092

START EVENT

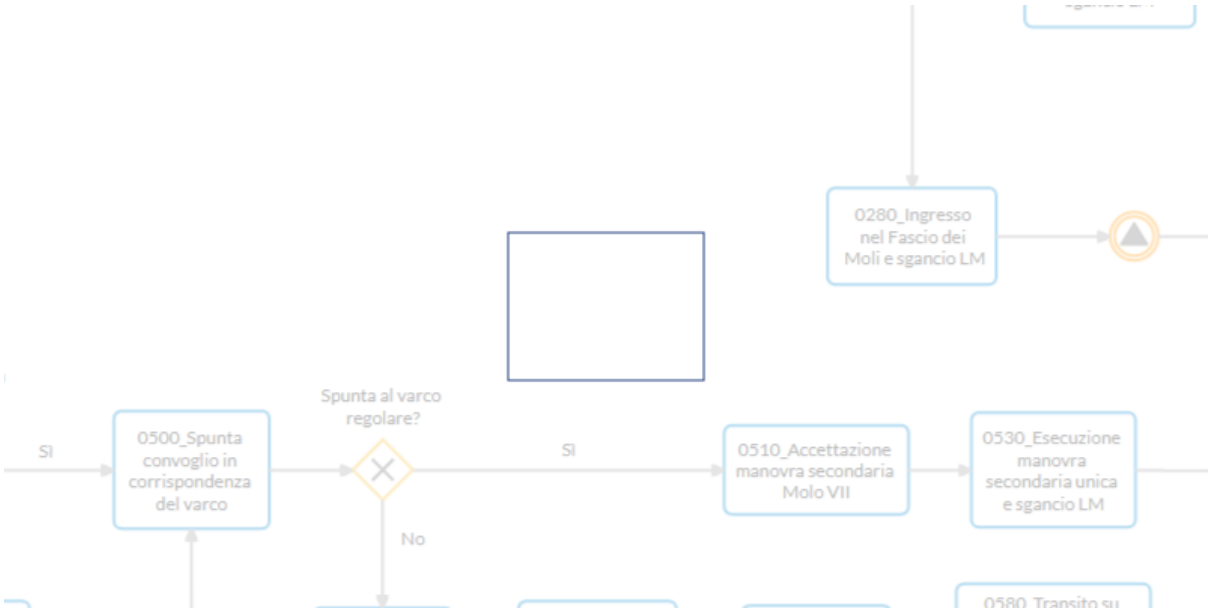


Outgoing

TASK
0290_Modifica CH30 per incongruenza

0290_Modifica CH30 per incongruenza

TASK



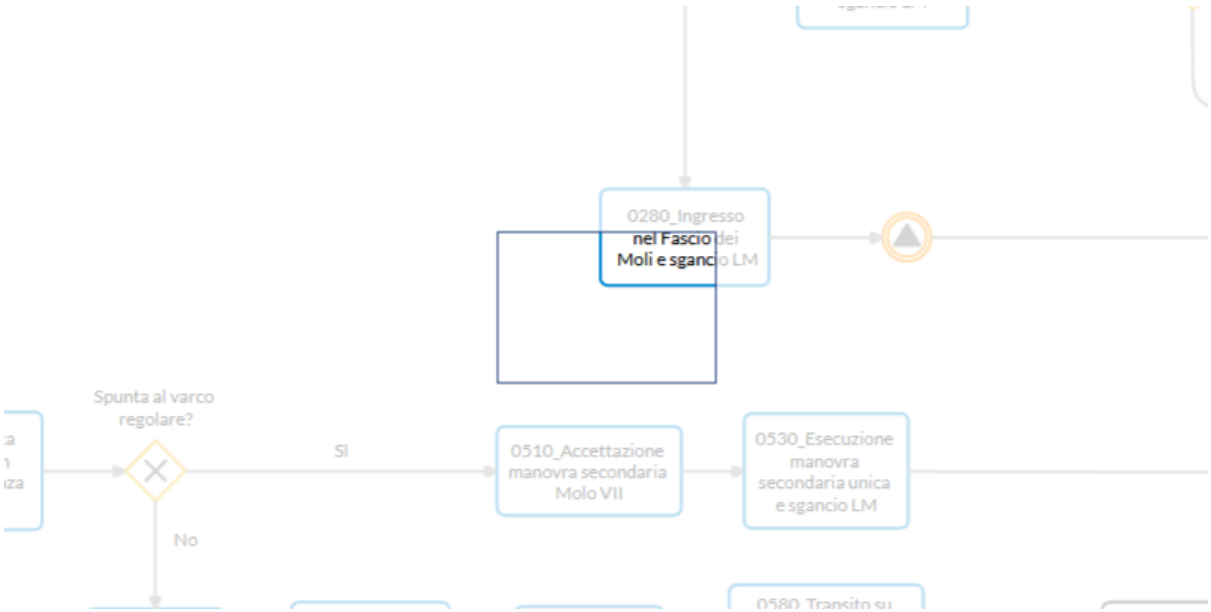
Se la spunta non è regolare, la Guardia di Finanza modifica lo stato del CH30 da Confermato a Incongruente (stato X). Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
START EVENT startEvents_e6901f66-d49a-8772-9905-12cf86436092	TASK 0300_Verifica incongruenza

0300_Verifica incongruenza

TASK



L' incongruenza viene verificata dal terminalista. Tempo. PFN-S. L.

> 5 min

Incoming	Outgoing
TASK 0290_Modifica CH30 per incongruenza	TASK 0310_Richiesta autorizzazione per modifica dati a dogana

0310_Richiesta autorizzazione per modifica dati a dogana

TASK

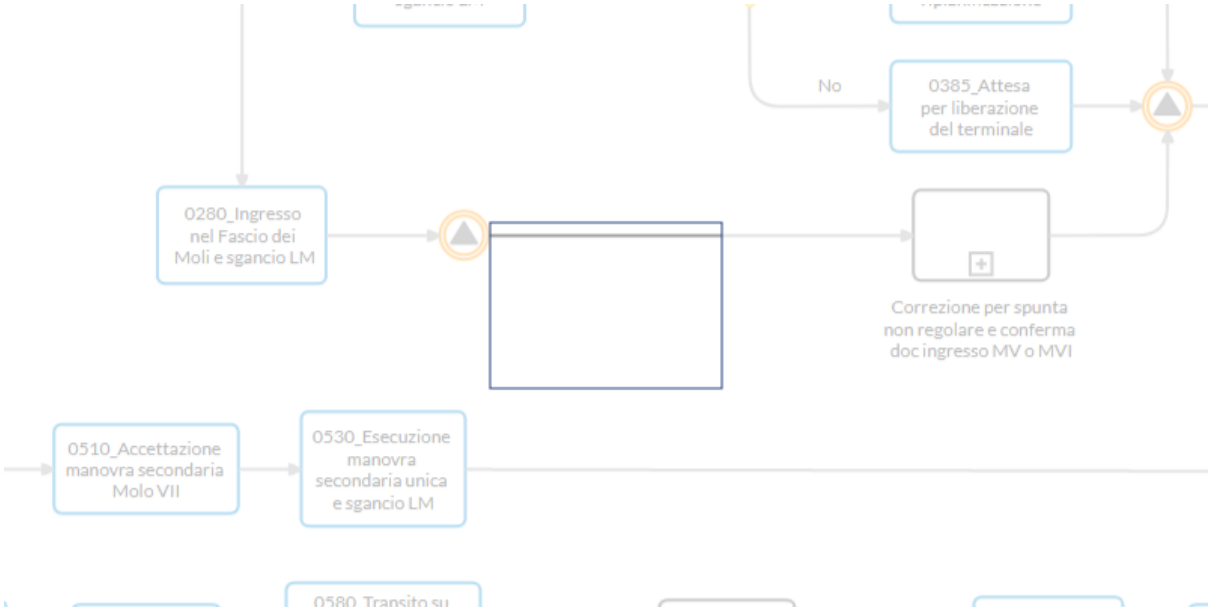
Una volta verificata la natura dell'incongruenza, il terminalista richiede l'autorizzazione alla modifica dei dati alla dogana. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0300_Verifica incongruenza	TASK 0320_Modifica CH30 pre-autorizzazione

0320_Modifica CH30 pre-autorizzazione

TASK



La Dogana modifica lo stato del CH30 da Incongruente a Modificabile. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0310_Richiesta autorizzazione per modifica dati a dogana	TASK 0330_Autorizzazione ad effettuare modifica al terminalista

0330_Autorizzazione ad effettuare modifica al terminalista

TASK

L'autorità doganale autorizza il terminalista ad effettuare delle modifiche al CH30. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0320_Modifica CH30 pre-autorizzazione	TASK 0340_Modifica CH30 per correzione incongruenza

0340_Modifica CH30 per correzione incongruenza

TASK

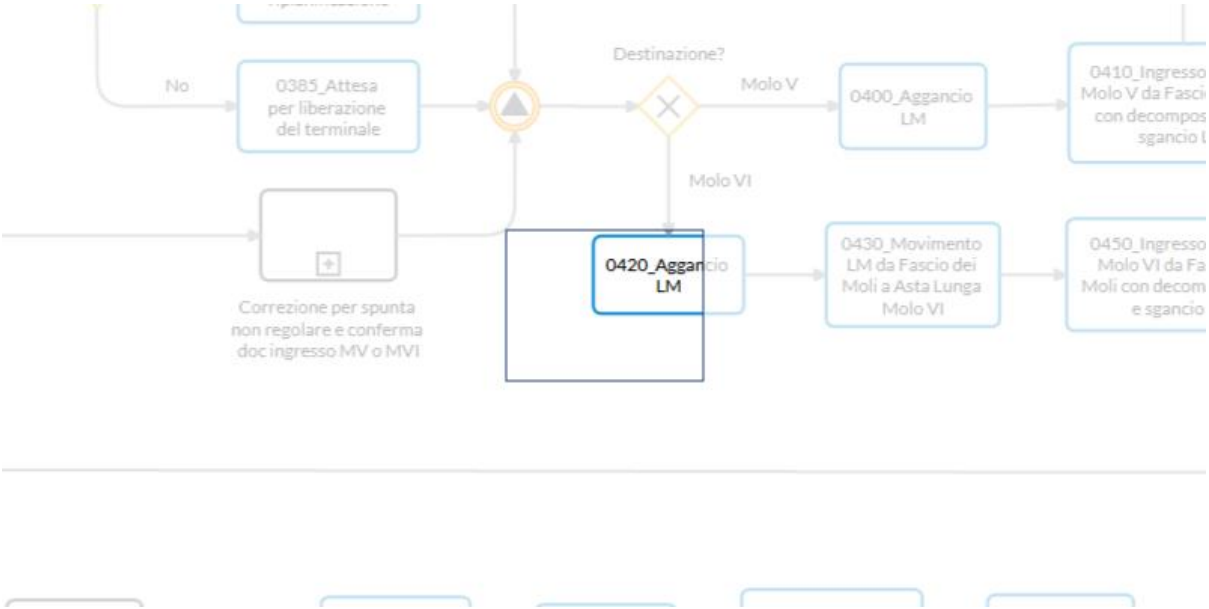
Il terminalista modifica il CH30 e lo riconsegna alla Dogana nello stato Definitivo. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0330_Autorizzazione ad effettuare modifica al terminalista	TASK 0350_Conferma CH30

0350_Conferma CH30

TASK



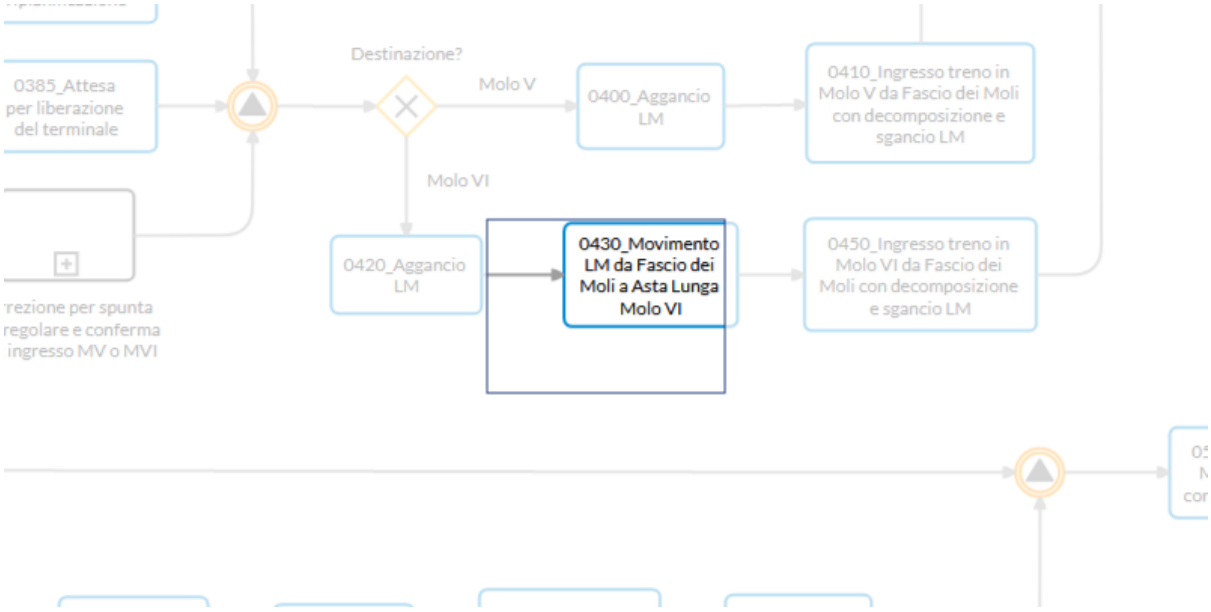
La Dogana conferma il CH30 variandone lo stato da Definitivo a Confermato. Tempo. PFN-S. L.

> 1 min

Incoming	Outgoing
TASK 0340_Modifica CH30 per correzione incongruenza	TASK 0360_Controllo corrispondenza convoglio-dati CH30

0360_Controllo corrispondenza convoglio-dati CH30

TASK



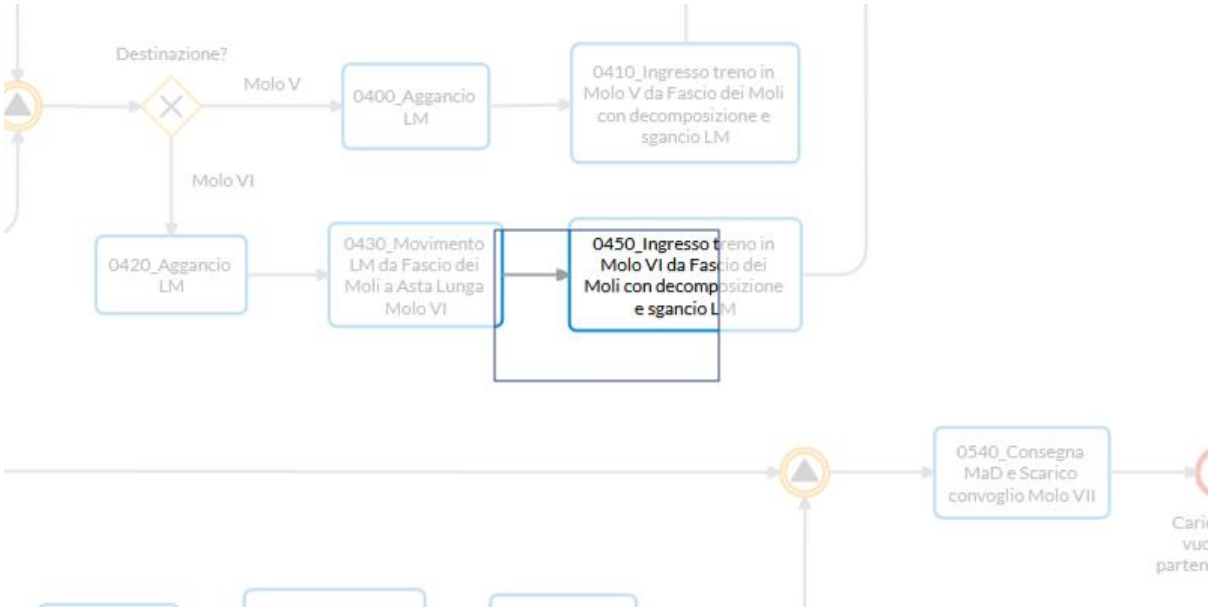
Il CH30 torna quindi alla Guardia di Finanza che opera presso il varco, la quale controlla la corrispondenza tra il convoglio e i dati del CH30. Tempo. PFN-S. L.

> 5 min

Incoming	Outgoing
TASK 0350_Conferma CH30	TASK 0370_Modifica CH30 con ingresso treno

0370_Modifica CH30 con ingresso treno

TASK



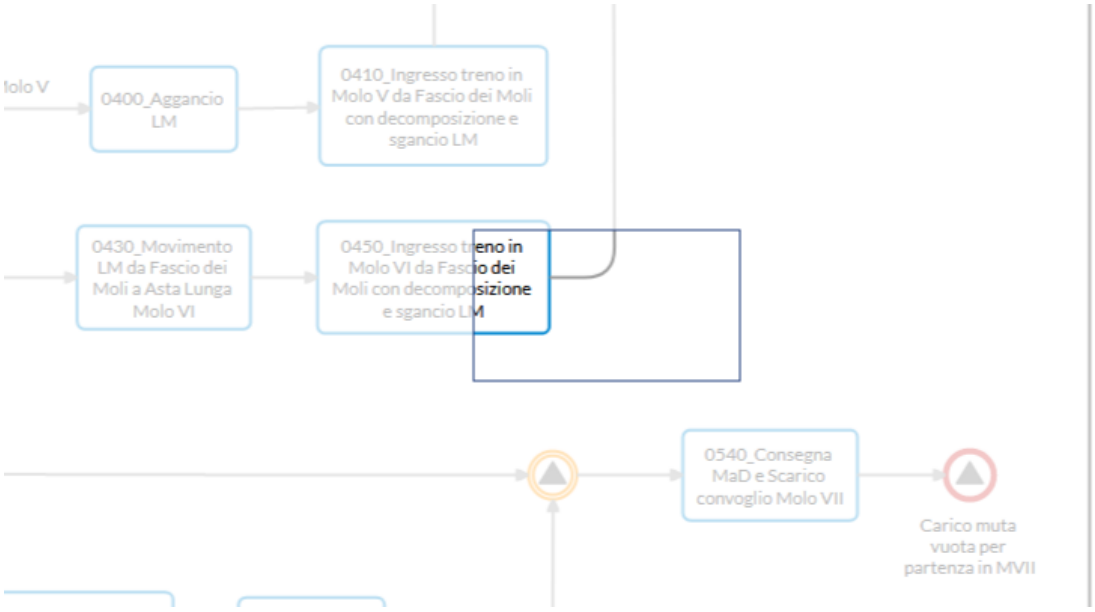
la Guardia di Finanza modifica lo stato del CH30 da Confermato ad Entrato (stato Q). Tempo. PFN. L.

> 1 min

Incoming	Outgoing
TASK 0360_Controllo corrispondenza convoglio-dati CH30	TASK 0380_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

0380_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

TASK



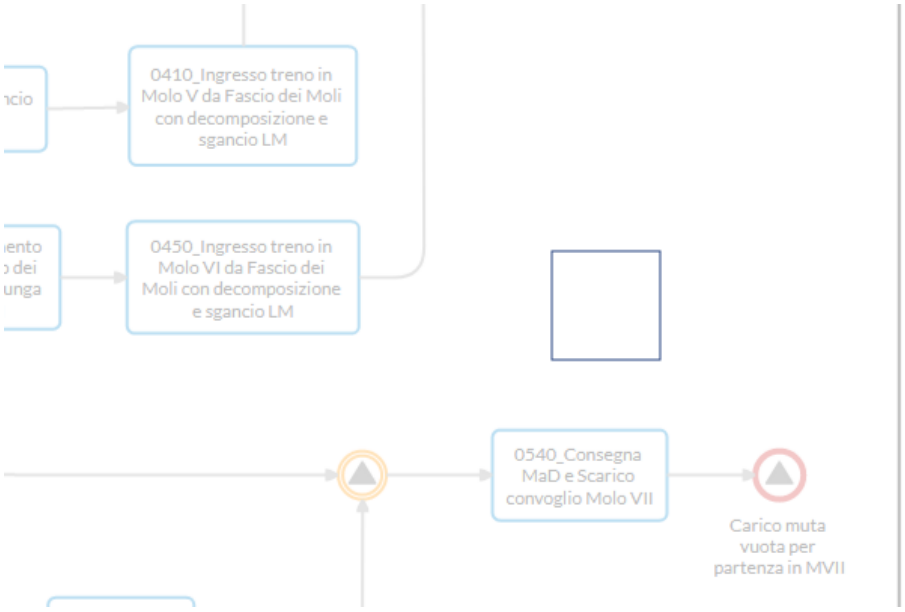
L'autorità doganale varia lo stato del CH30 da Entrato (stato Q) a Riscontrato. Tempo. PFN. L.

> 5 min

Incoming	Outgoing
TASK 0370_Modifica CH30 con ingresso treno	END EVENT endEvents_d770065f-b4d7-57c3-c61a-1f4741474552

endEvents_d770065f-b4d7-57c3-c61a-1f4741474552

END EVENT

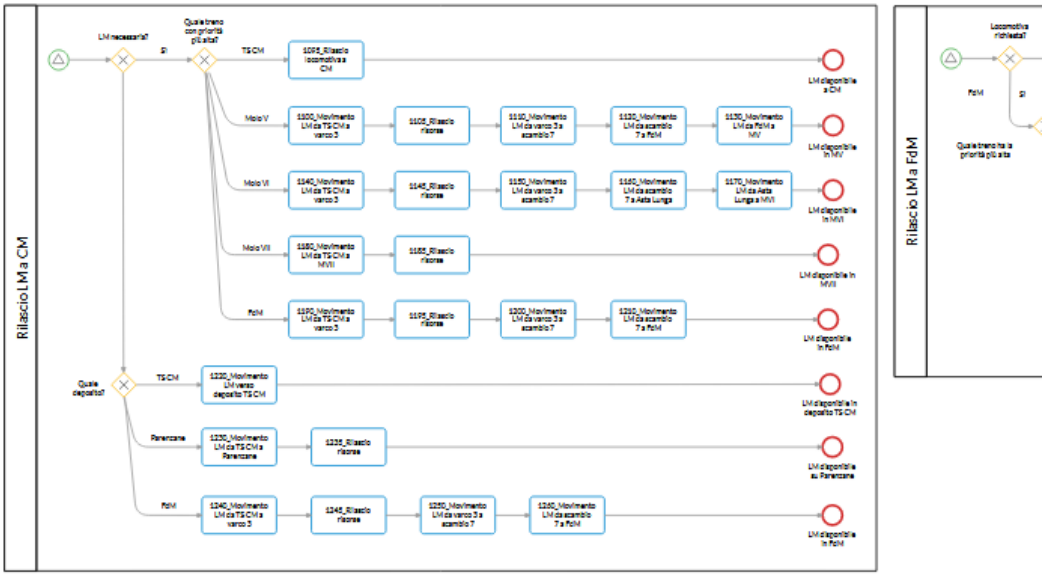


Incoming

TASK
0380_Invio email Sinfomar + Registrazione A/18 e Modifica CH30

3. Diagram: Rilascio LM

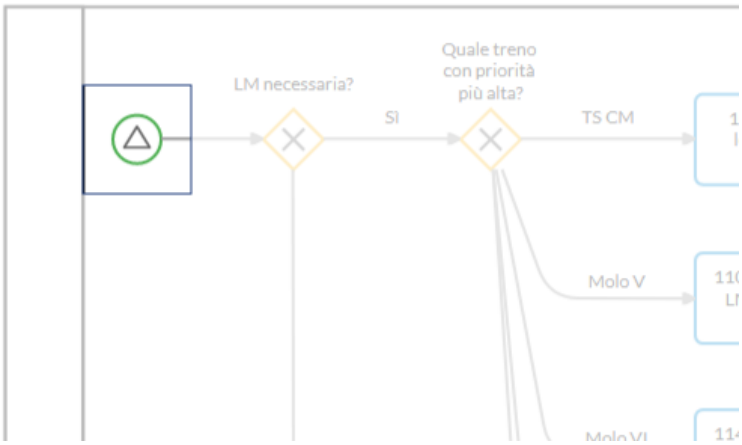
3.1. Process: Rilascio LM a CM



3.1.1. Process Elements

signalStartEvents_833c4020-50b3-8dab-da8e-ce8e2605ceff

SIGNAL START EVENT



Outgoing

Outgoing

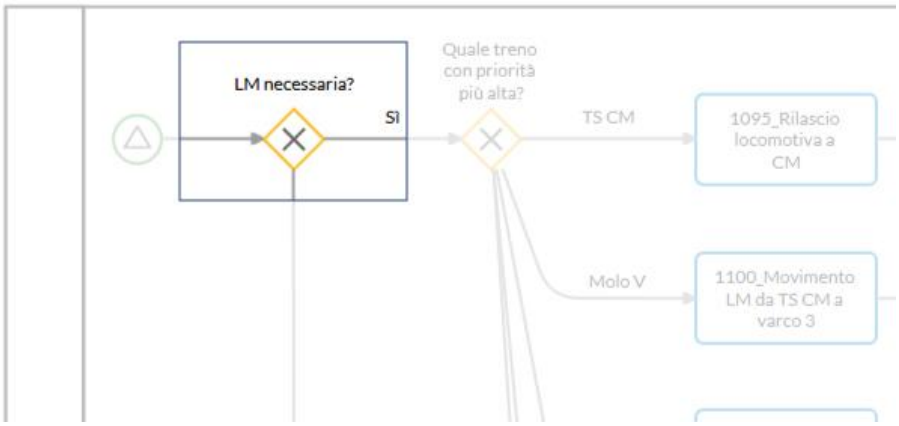
EXCLUSIVE GATEWAY
LM necessaria?

Attributes

SIGNAL REFERENCE
Sgancio_LM_CM

LM necessaria?

EXCLUSIVE GATEWAY



Incoming

SIGNAL START EVENT
signalStartEvents_833c4020-50b3-8dab-da8e-ce8e2605ceff

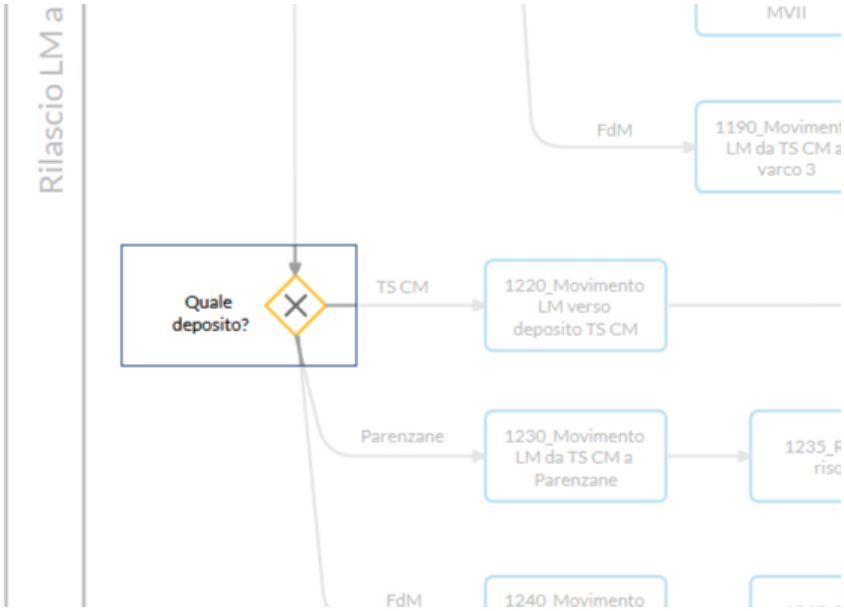
Outgoing

EXCLUSIVE GATEWAY
Quale treno con priorità più alta?
through Sì

EXCLUSIVE GATEWAY
Quale deposito?

Quale deposito?

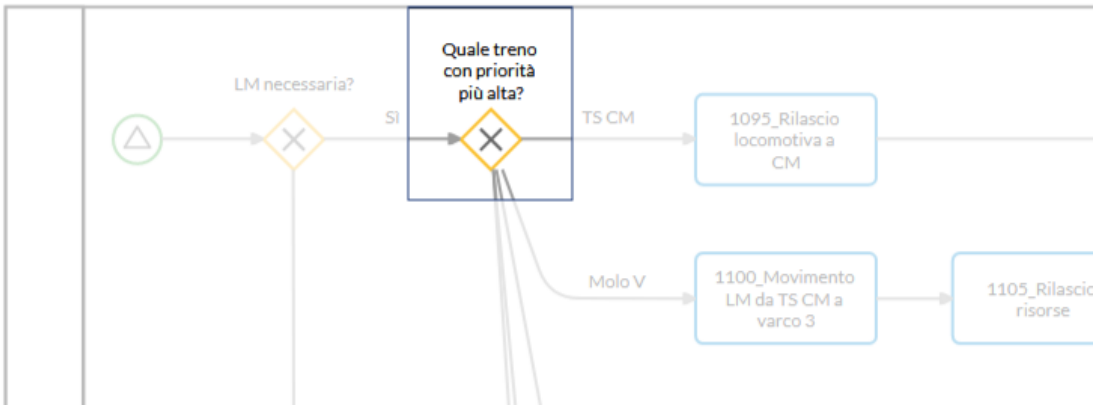
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM necessaria?	TASK 1220_Movimento LM verso deposito TS CM through TS CM
	TASK 1230_Movimento LM da TS CM a Parenzane through Parenzane
	TASK 1240_Movimento LM da TS CM a varco 3 through FdM

Quale treno con priorità più alta?

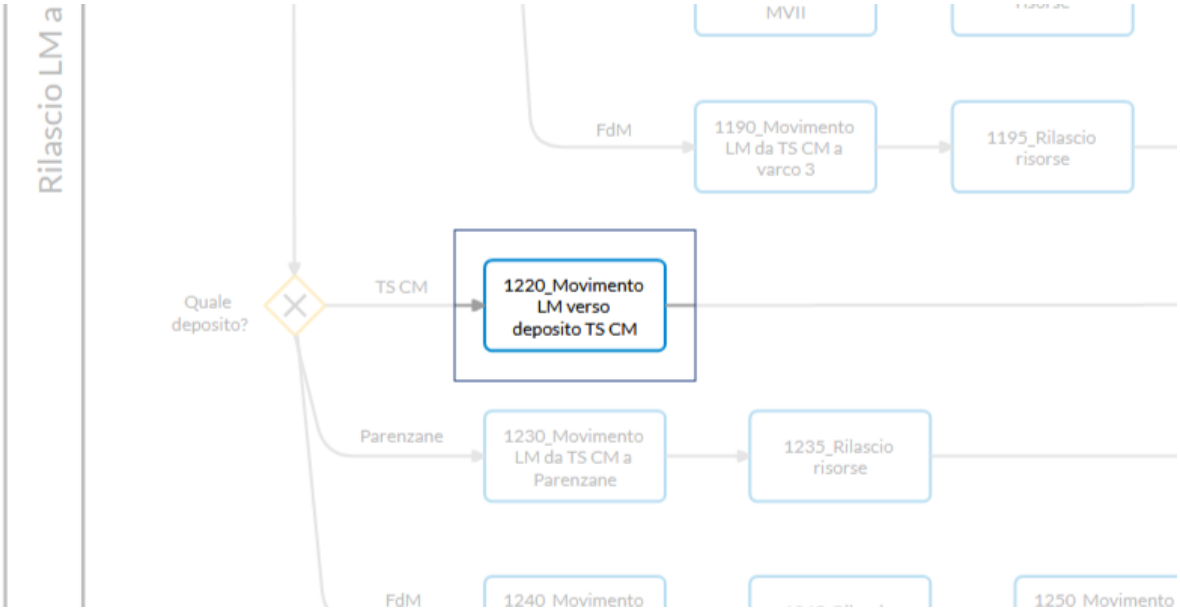
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM necessaria? through Sì	TASK 1100_Movimento LM da TS CM a varco 3 through Molo V
	TASK 1140_Movimento LM da TS CM a varco 3 through Molo VI
	TASK 1180_Movimento LM da TS CM a MVII through Molo VII
	TASK 1190_Movimento LM da TS CM a varco 3 through FdM
	TASK 1095_Rilascio locomotiva a CM through TS CM

1220_Movimento LM verso deposito TS CM

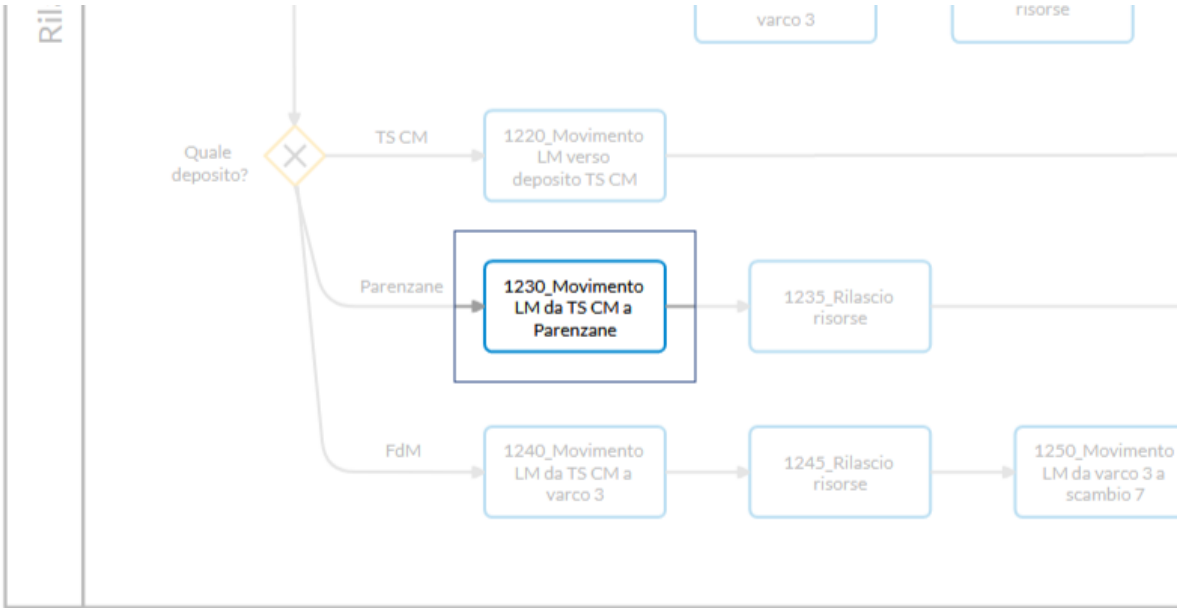
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale deposito? through TS CM	END EVENT LM disponibile in deposito TS CM

1230_Movimento LM da TS CM a Parenzane

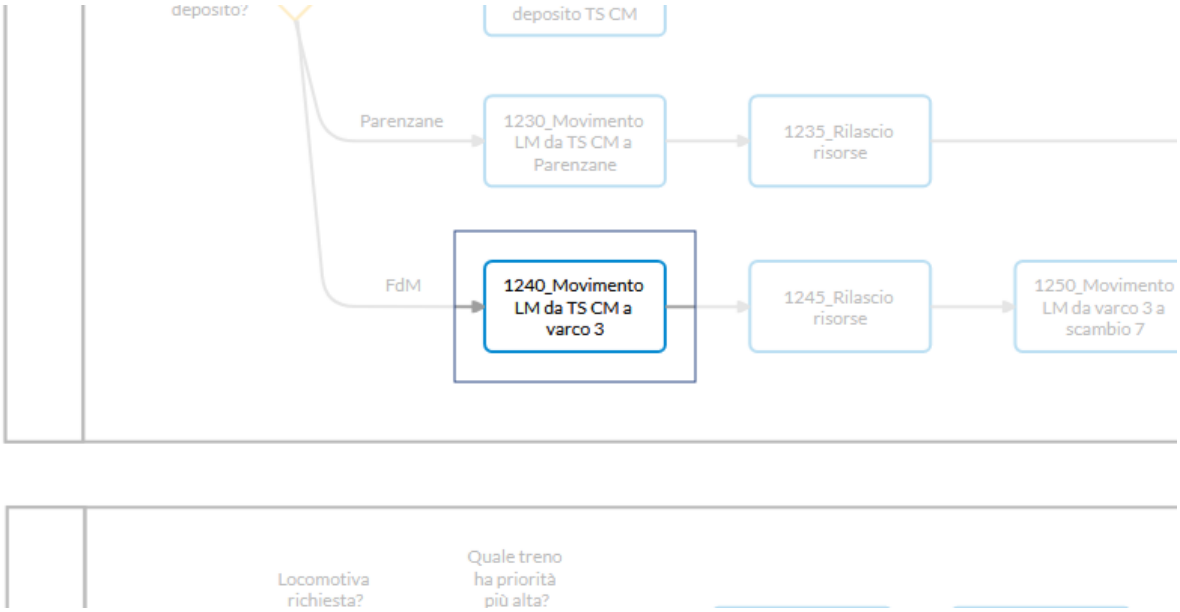
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale deposito? through Parenzane	TASK 1235_Rilascio risorse

1240_Movimento LM da TS CM a varco 3

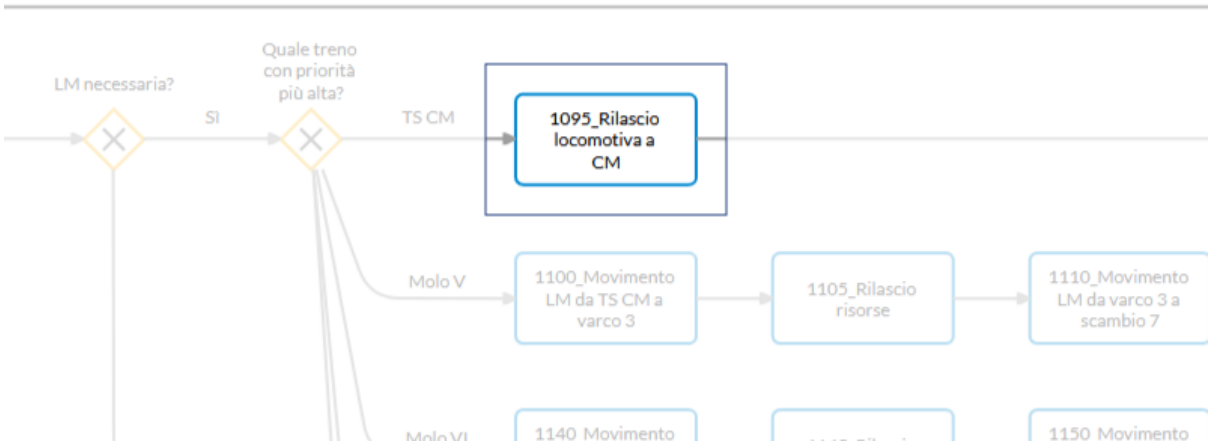
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale deposito? through FdM	TASK 1245_Rilascio risorse

1095_Rilascio locomotiva a CM

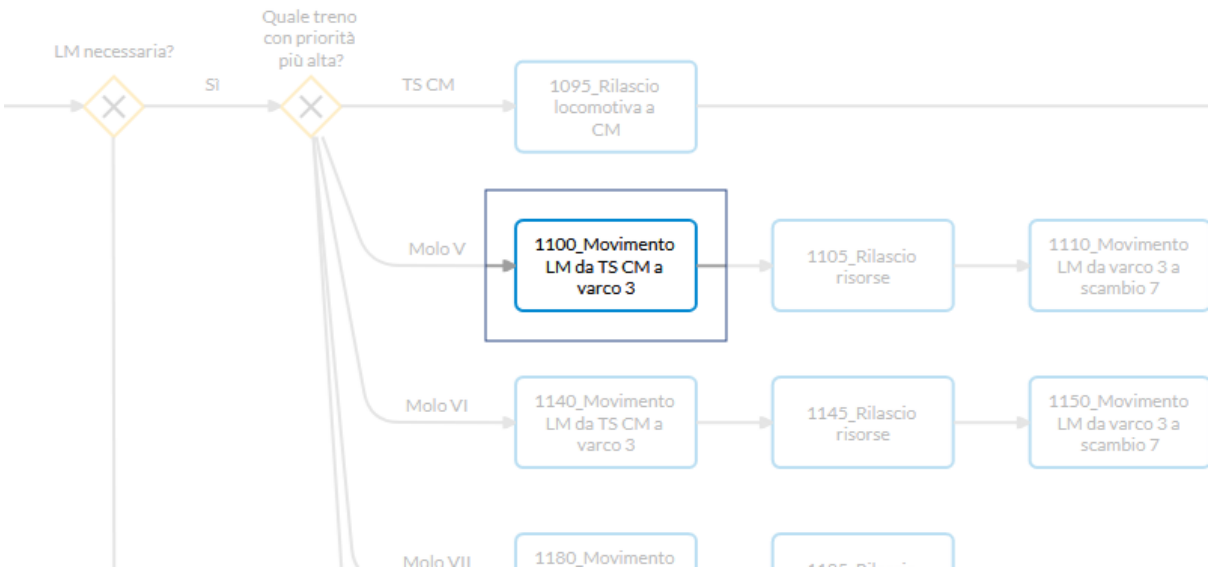
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno con priorità più alta? through TS CM	END EVENT LM disponibile a CM

1100_Movimento LM da TS CM a varco 3

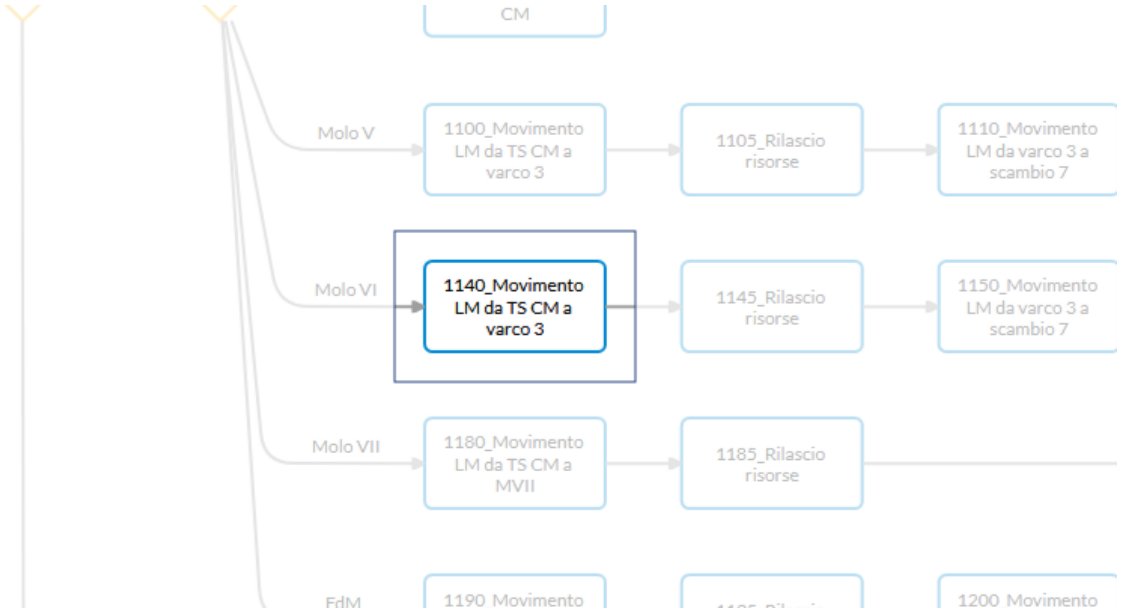
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno con priorità più alta? through Molo V	TASK 1105_Rilascio risorse

1140_Movimento LM da TS CM a varco 3

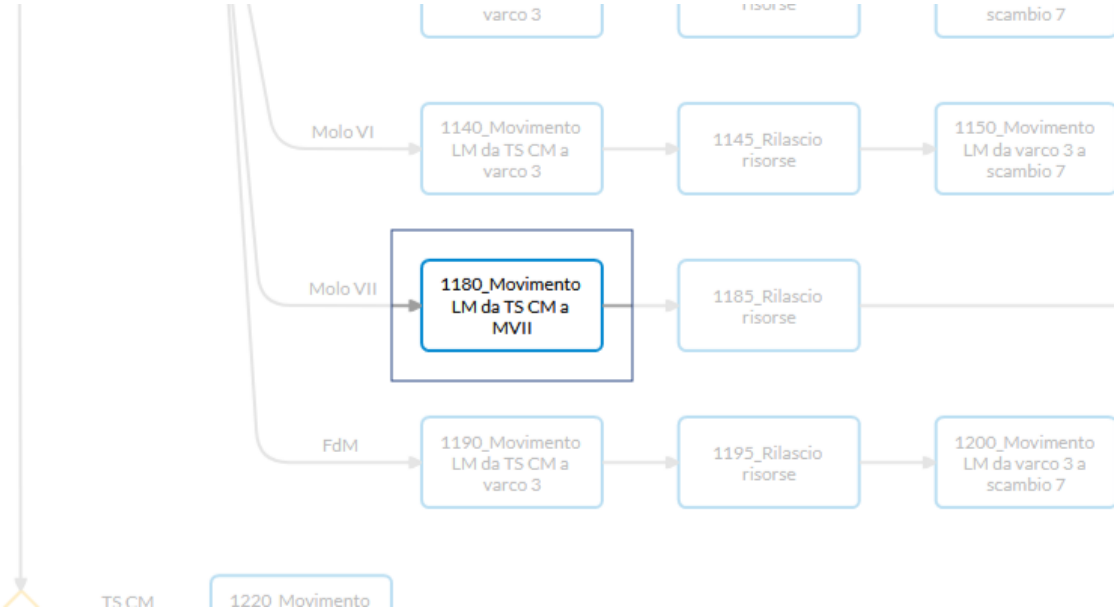
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno con priorità più alta? through Molo VI	TASK 1145_Rilascio risorse

1180_Movimento LM da TS CM a MVII

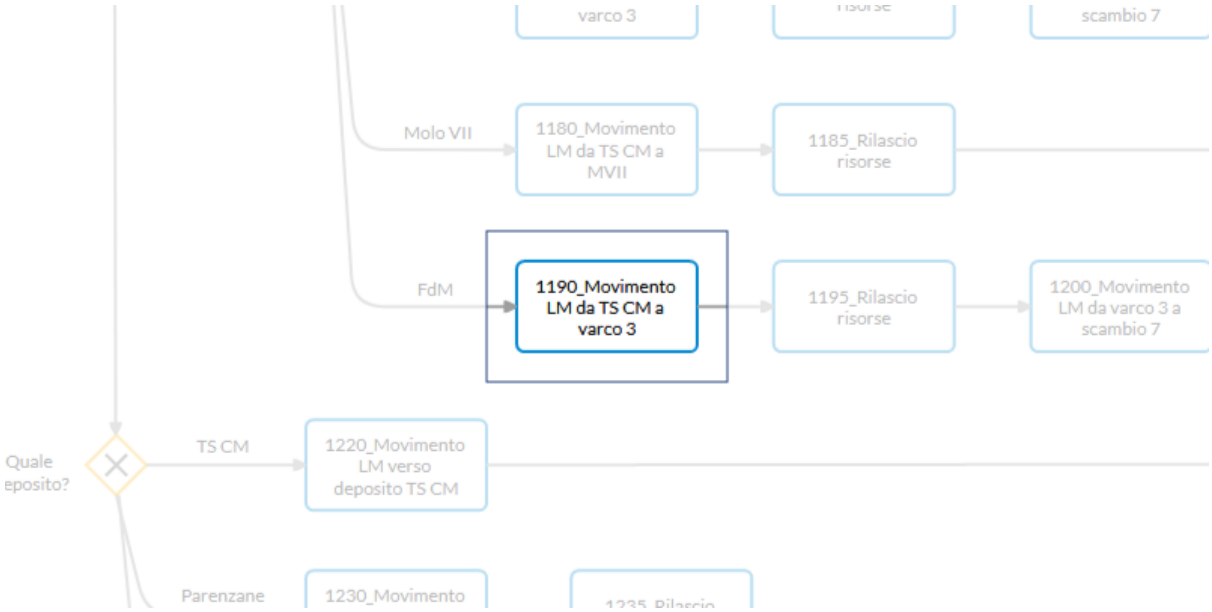
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno con priorità più alta? through Molo VII	TASK 1185_Rilascio risorse

1190_Movimento LM da TS CM a varco 3

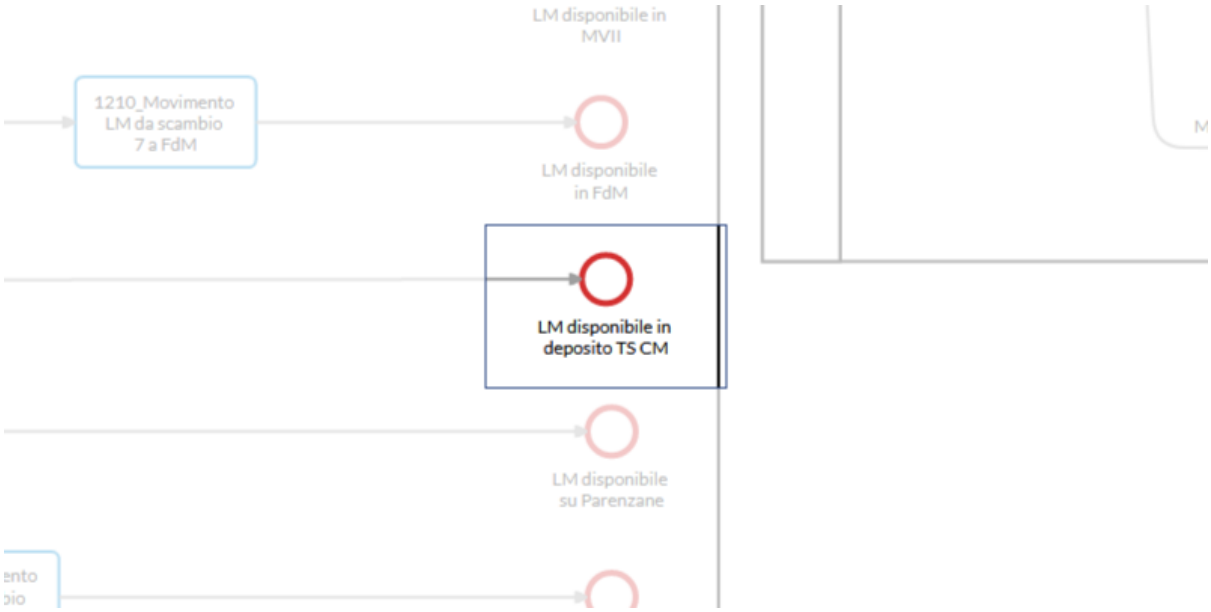
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno con priorità più alta? through FdM	TASK 1195_Rilascio risorse

LM disponibile in deposito TS CM

END EVENT



Incoming
TASK 1220_Movimento LM verso deposito TS CM

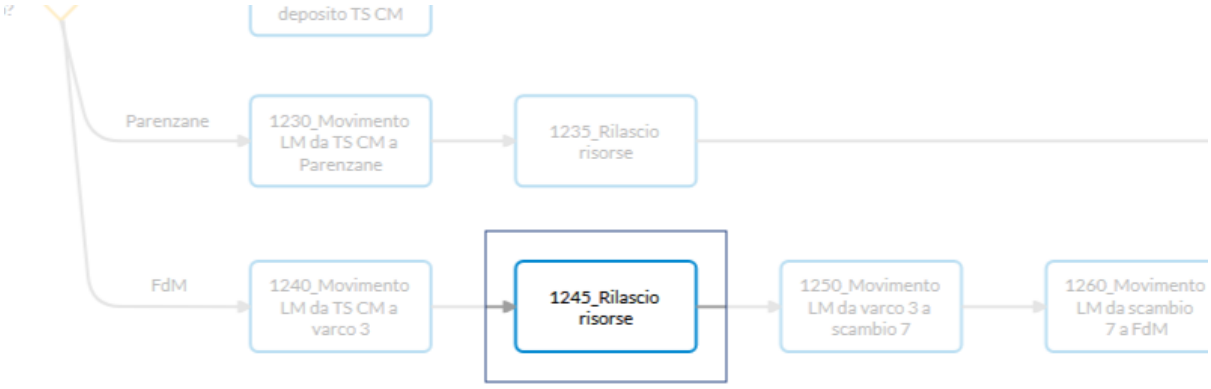
1235_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1230_Movimento LM da TS CM a Parenzane	END EVENT LM disponibile su Parenzane

1245_Rilascio risorse

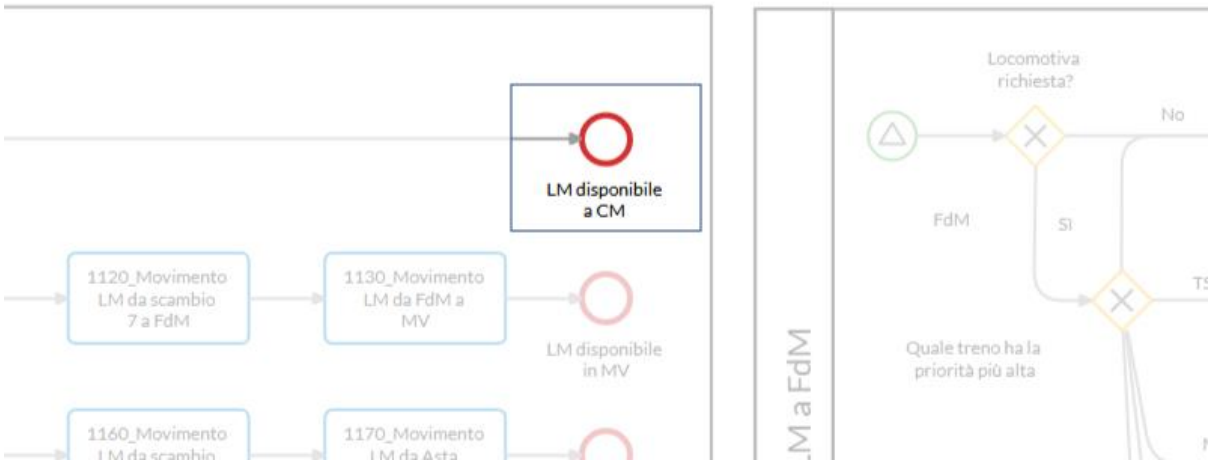
TASK



Incoming	Outgoing
TASK 1240_Movimento LM da TS CM a varco 3	TASK 1250_Movimento LM da varco 3 a scambio 7

LM disponibile a CM

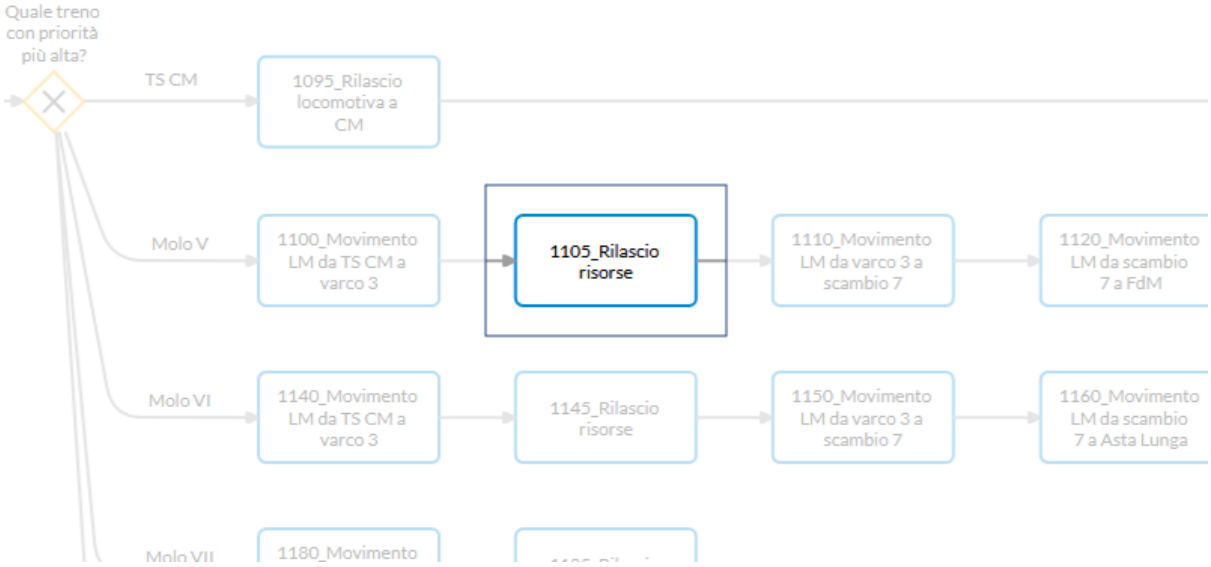
END EVENT



Incoming
TASK 1095_Rilascio locomotiva a CM

1105_Rilascio risorse

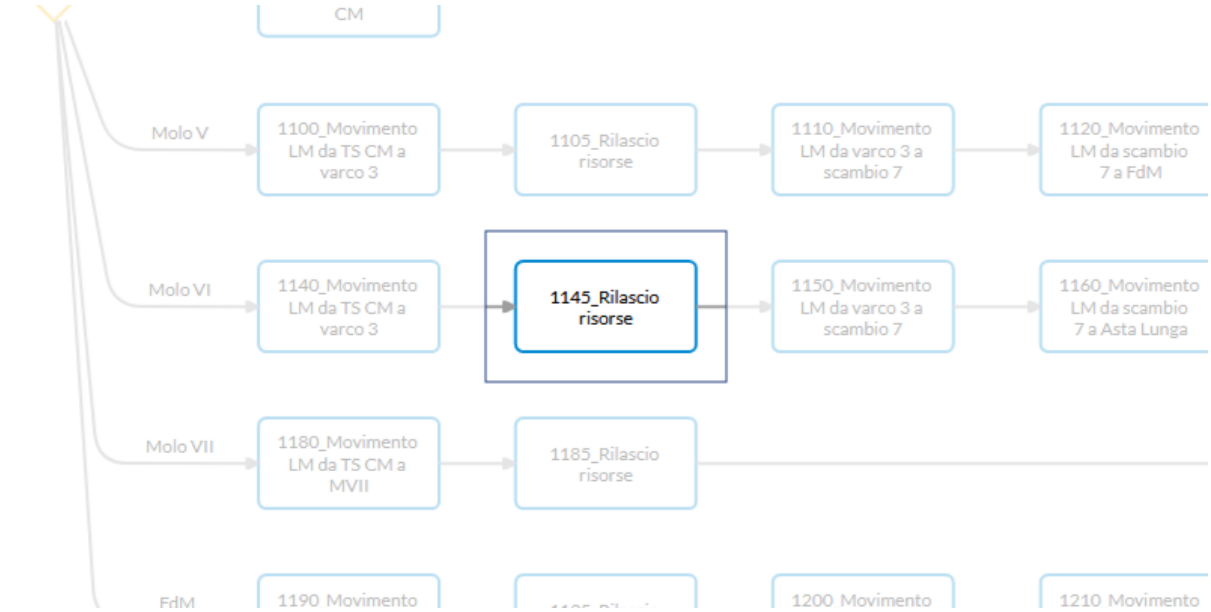
TASK



Incoming	Outgoing
TASK 1100_Movimento LM da TS CM a varco 3	TASK 1110_Movimento LM da varco 3 a scambio 7

1145_Rilascio risorse

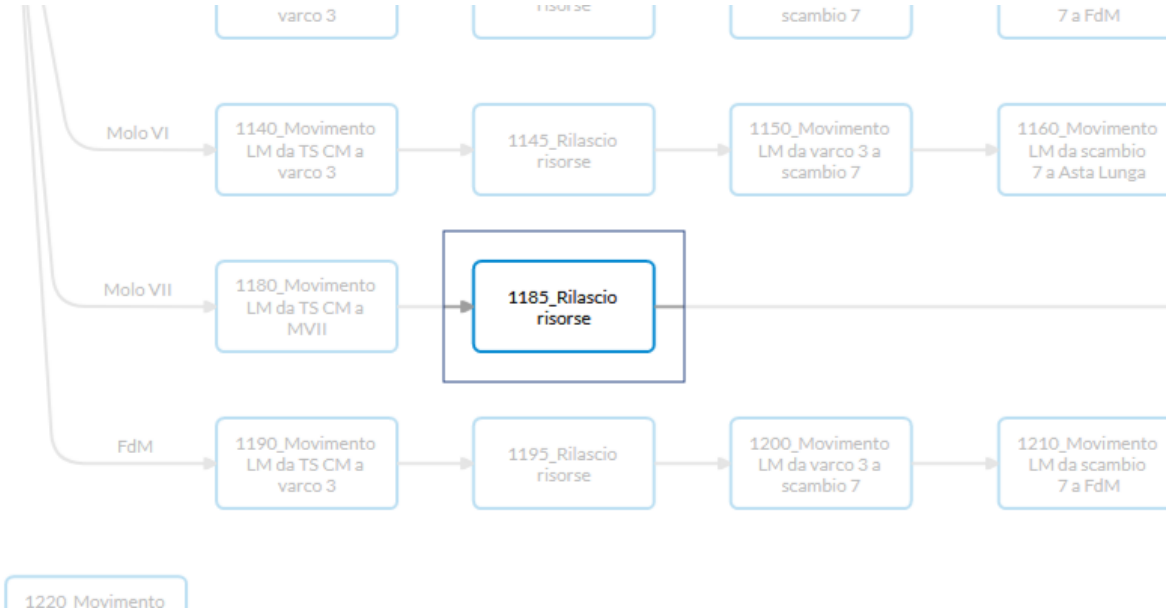
TASK



Incoming	Outgoing
TASK 1140_Movimento LM da TS CM a varco 3	TASK 1150_Movimento LM da varco 3 a scambio 7

1185_Rilascio risorse

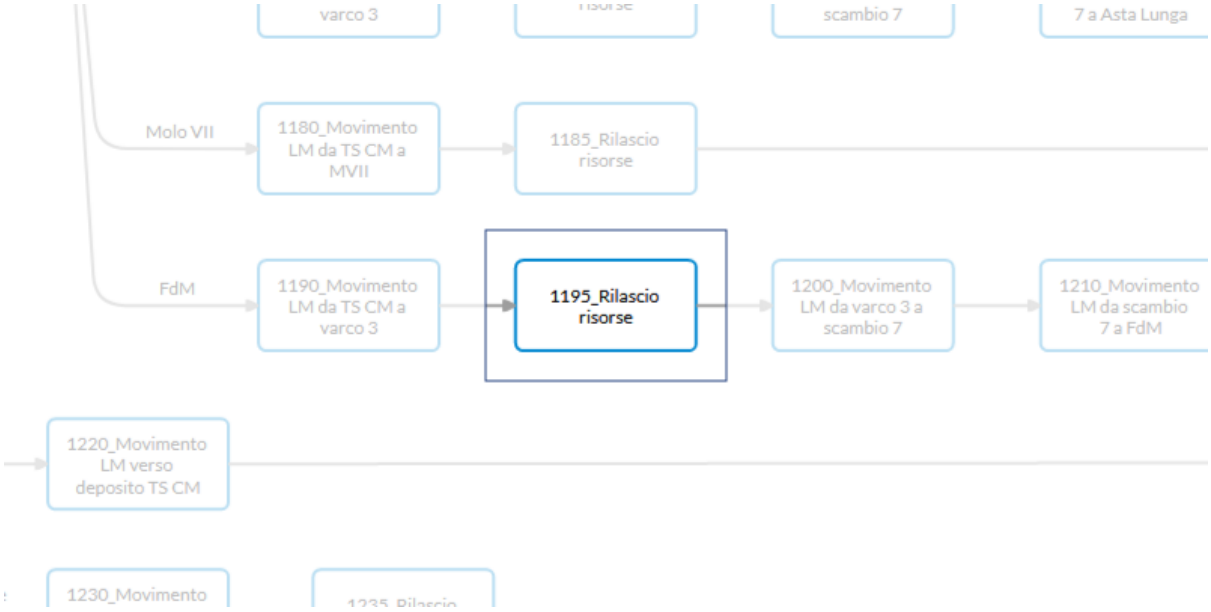
TASK



Incoming	Outgoing
TASK 1180_Movimento LM da TS CM a MVII	END EVENT LM disponibile in MVII

1195_Rilascio risorse

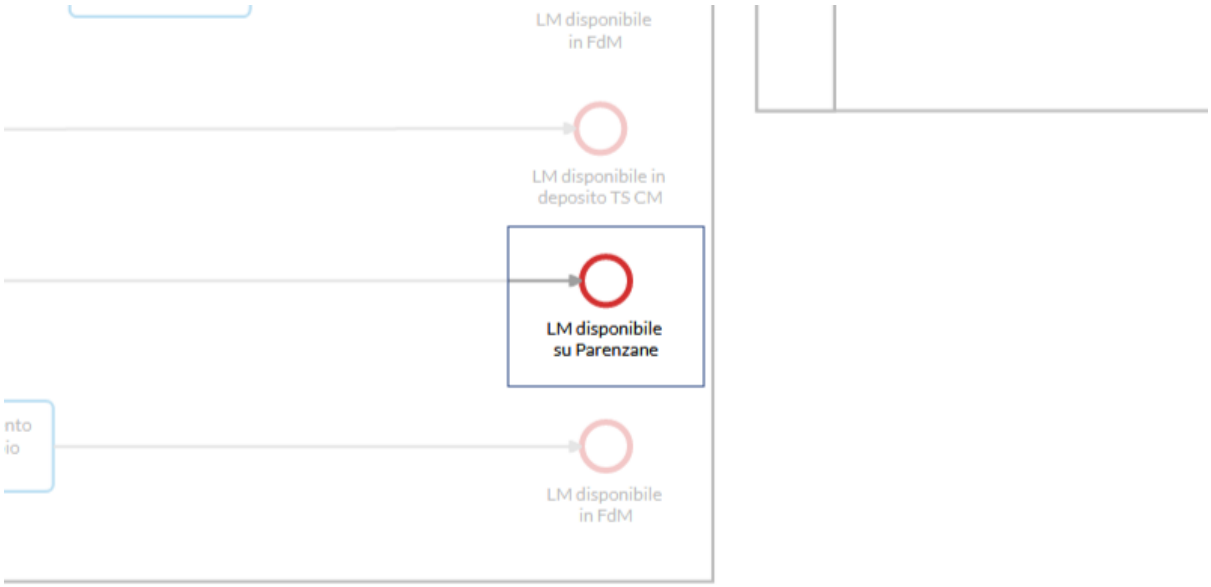
TASK



Incoming	Outgoing
TASK 1190_Movimento LM da TS CM a varco 3	TASK 1200_Movimento LM da varco 3 a scambio 7

LM disponibile su Parenzane

END EVENT

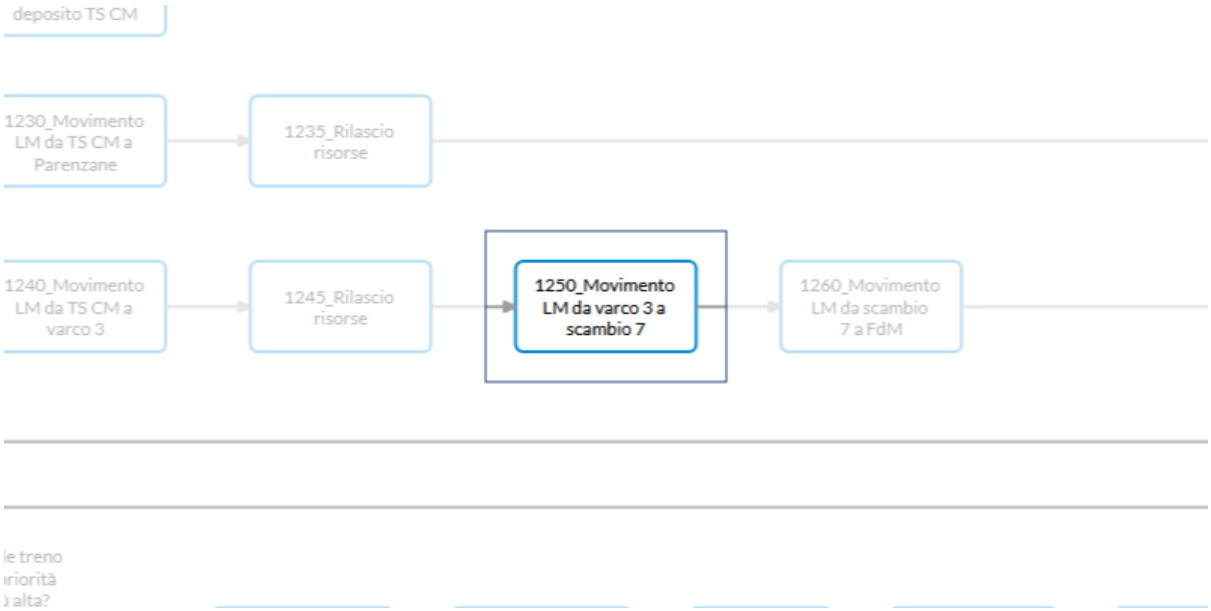


Incoming

TASK
1235_Rilascio risorse

1250_Movimento LM da varco 3 a scambio 7

TASK



Incoming

TASK
1245_Rilascio risorse

Outgoing

TASK
1260_Movimento LM da scambio 7 a FdM

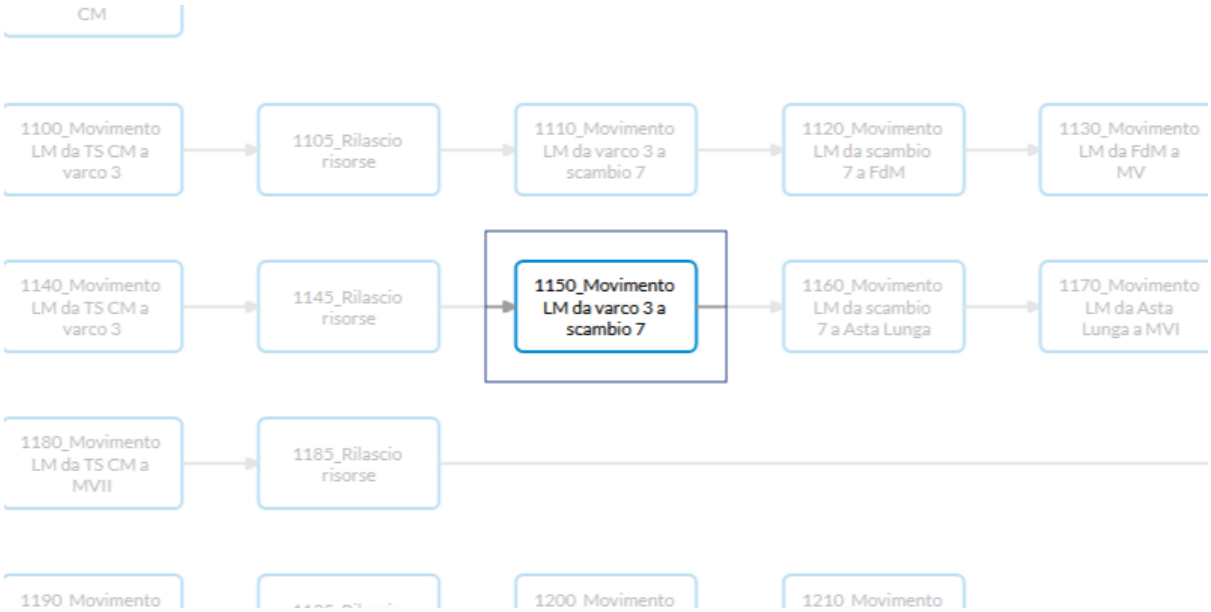
1110_Movimento LM da varco 3 a scambio 7

TASK

Incoming	Outgoing
TASK 1105_Rilascio risorse	TASK 1120_Movimento LM da scambio 7 a FdM

1150_Movimento LM da varco 3 a scambio 7

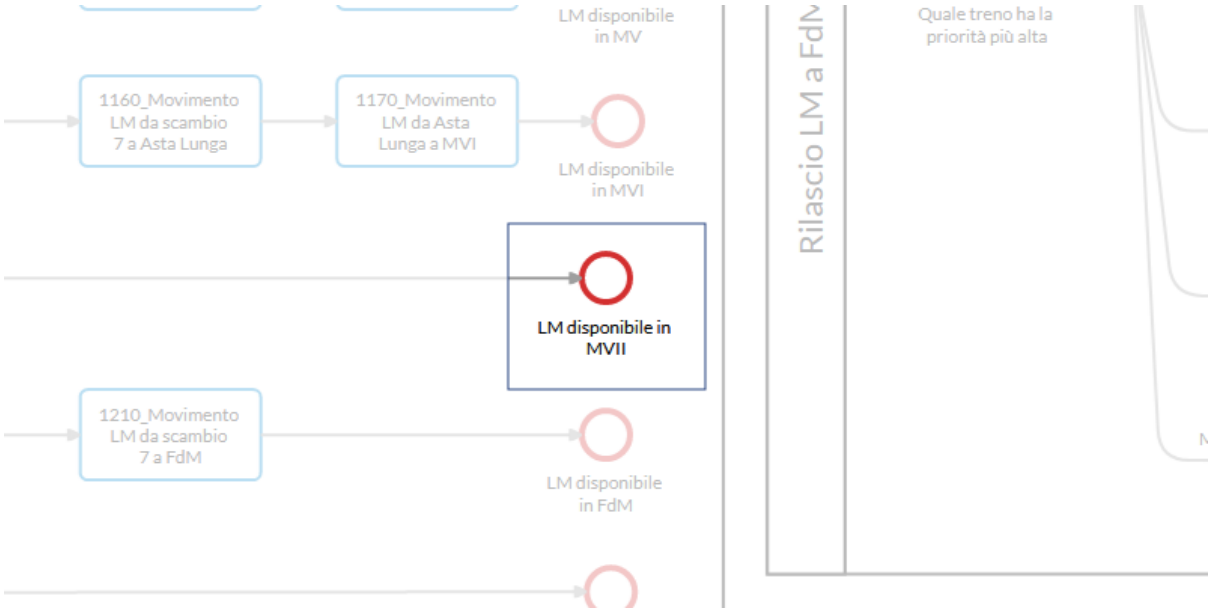
TASK



Incoming	Outgoing
TASK 1145_Rilascio risorse	TASK 1160_Movimento LM da scambio 7 a Asta Lunga

LM disponibile in MVII

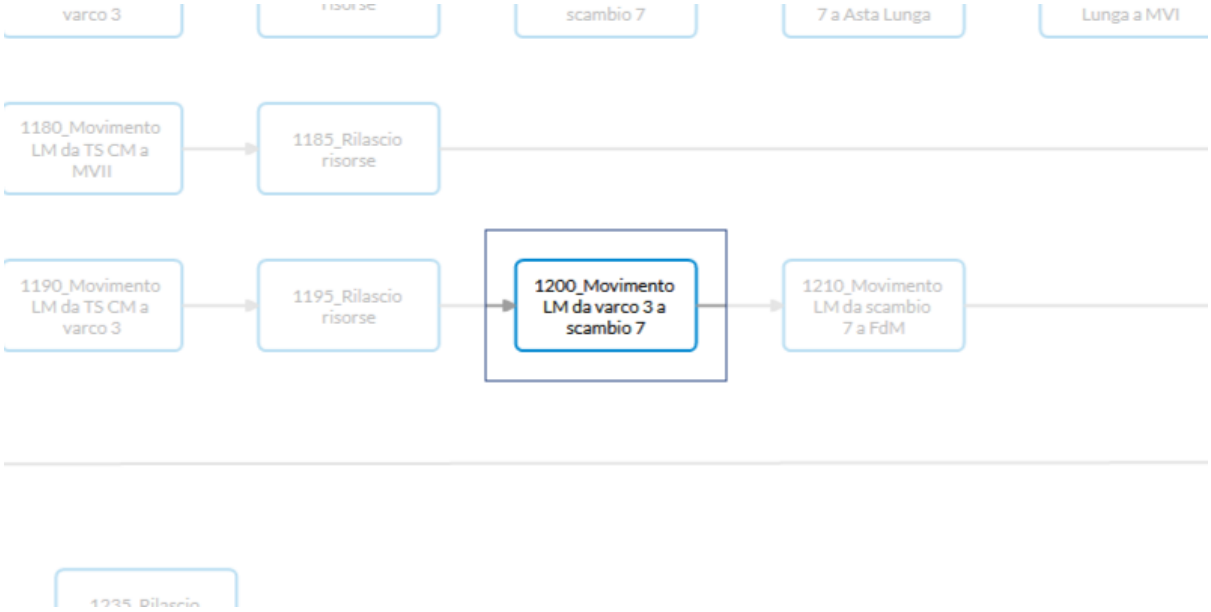
END EVENT



Incoming
TASK 1185_Rilascio risorse

1200_Movimento LM da varco 3 a scambio 7

TASK



Incoming	Outgoing
TASK 1195_Rilascio risorse	TASK 1210_Movimento LM da scambio 7 a FdM

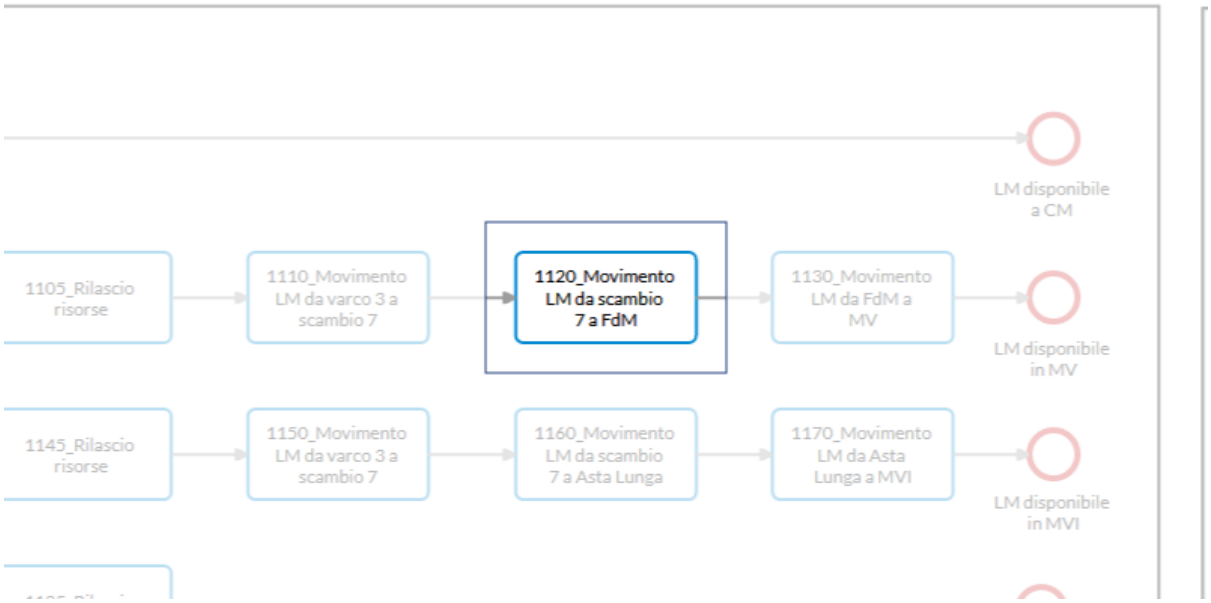
1260_Movimento LM da scambio 7 a FdM

TASK

Incoming	Outgoing
TASK 1250_Movimento LM da varco 3 a scambio 7	END EVENT LM disponibile in FdM

1120_Movimento LM da scambio 7 a FdM

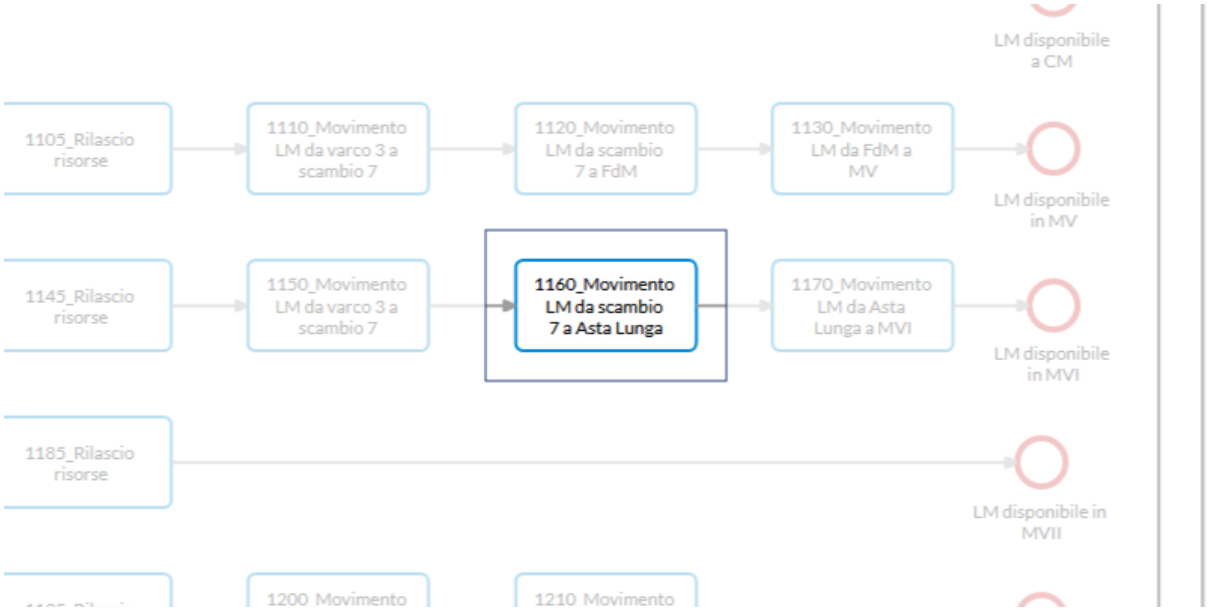
TASK



Incoming	Outgoing
TASK 1110_Movimento LM da varco 3 a scambio 7	TASK 1130_Movimento LM da FdM a MV

1160_Movimento LM da scambio 7 a Asta Lunga

TASK



Incoming	Outgoing
TASK 1150_Movimento LM da varco 3 a scambio 7	TASK 1170_Movimento LM da Asta Lunga a MVI

1210_Movimento LM da scambio 7 a FdM

TASK

Incoming	Outgoing
TASK 1200_Movimento LM da varco 3 a scambio 7	END EVENT LM disponibile in FdM

LM disponibile in FdM

END EVENT

Incoming
TASK 1260_Movimento LM da scambio 7 a FdM

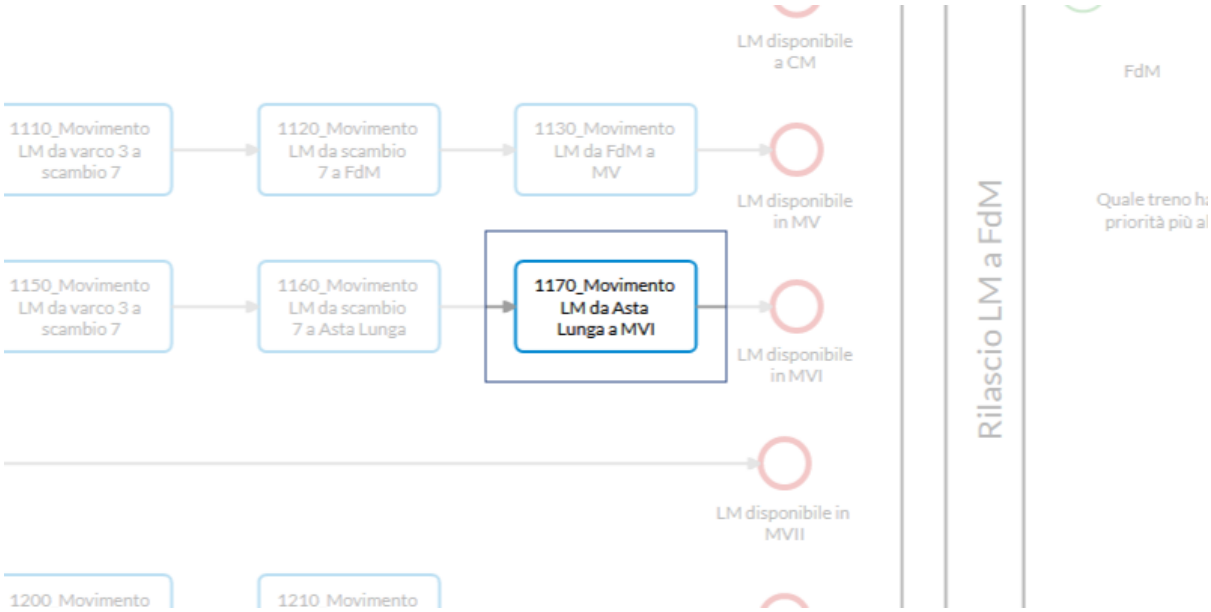
1130_Movimento LM da FdM a MV

TASK

Incoming	Outgoing
TASK 1120_Movimento LM da scambio 7 a FdM	END EVENT LM disponibile in MV

1170_Movimento LM da Asta Lunga a MVI

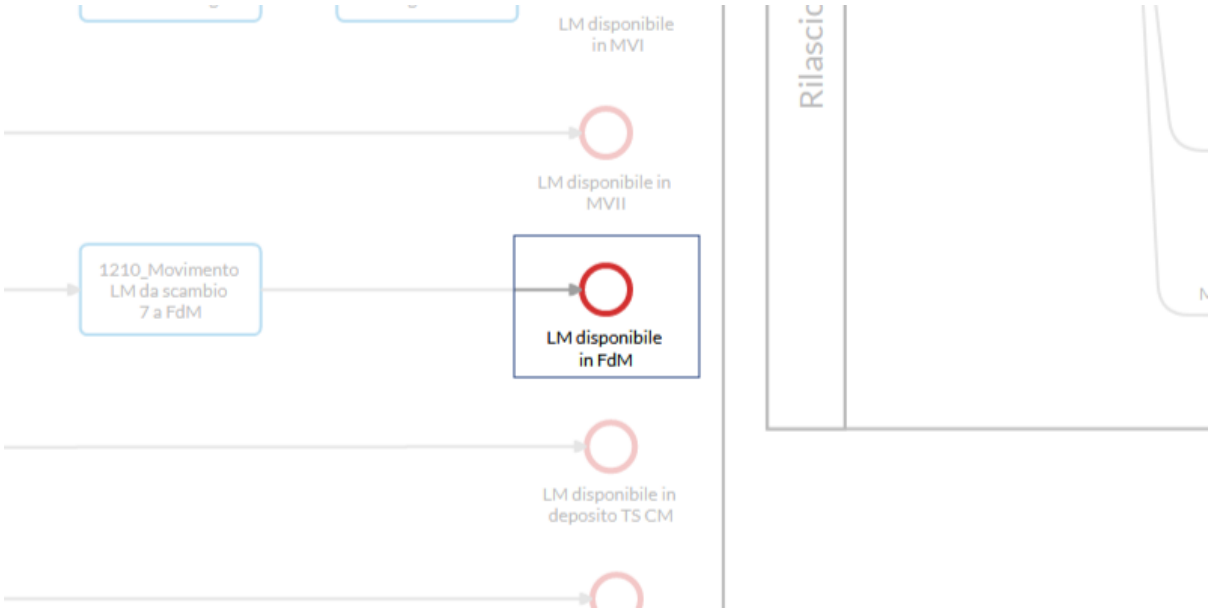
TASK



Incoming	Outgoing
TASK 1160_Movimento LM da scambio 7 a Asta Lunga	END EVENT LM disponibile in MVI

LM disponibile in FdM

END EVENT

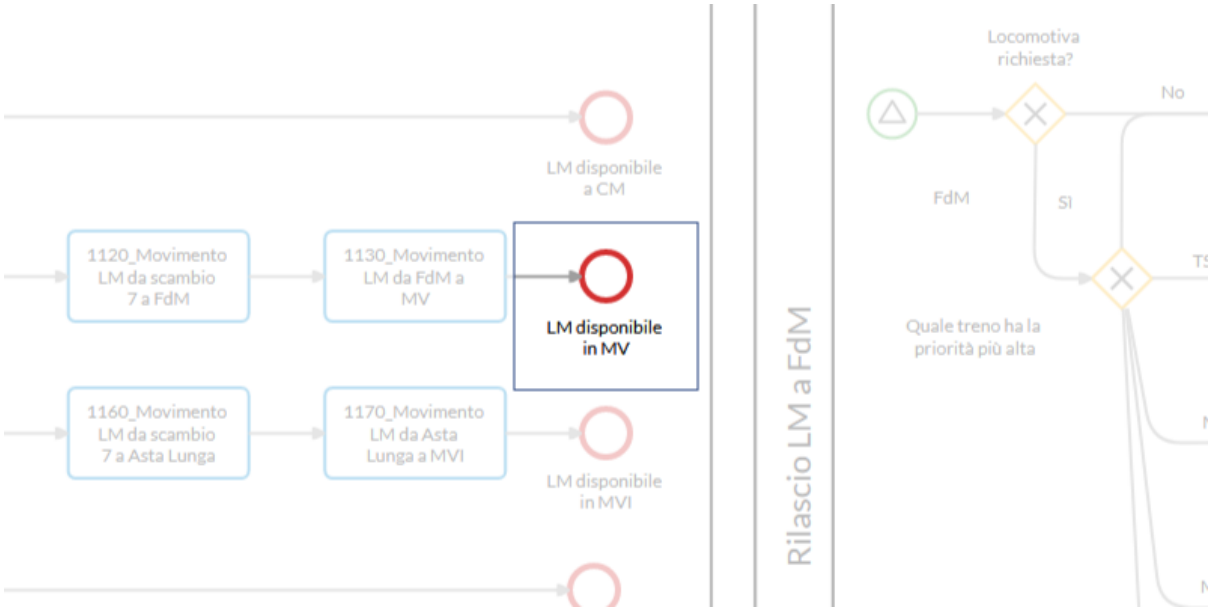


Incoming

TASK
1210_Movimento LM da scambio 7 a FdM

LM disponibile in MV

END EVENT

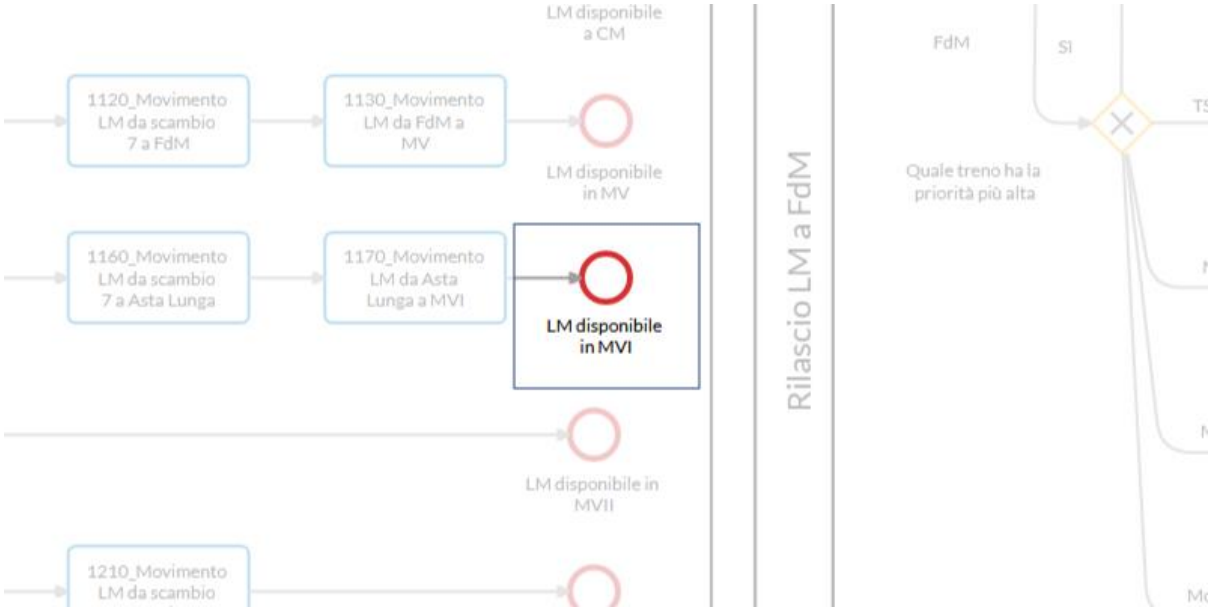


Incoming

TASK
1130_Movimento LM da FdM a MV

LM disponibile in MVI

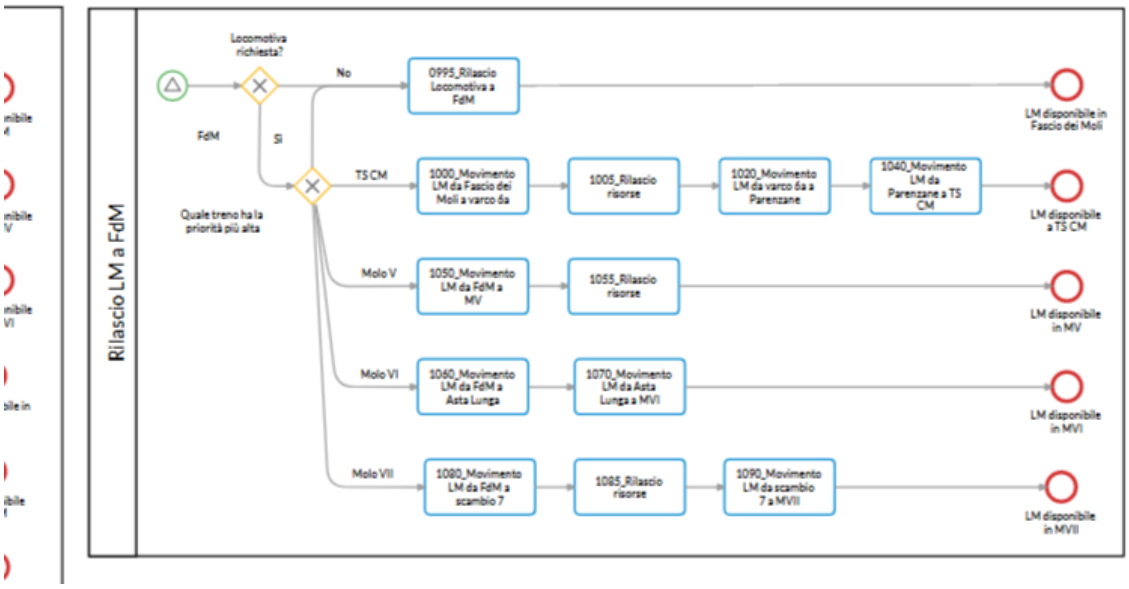
END EVENT



Incoming

TASK
1170_Movimento LM da Asta Lunga a MVI

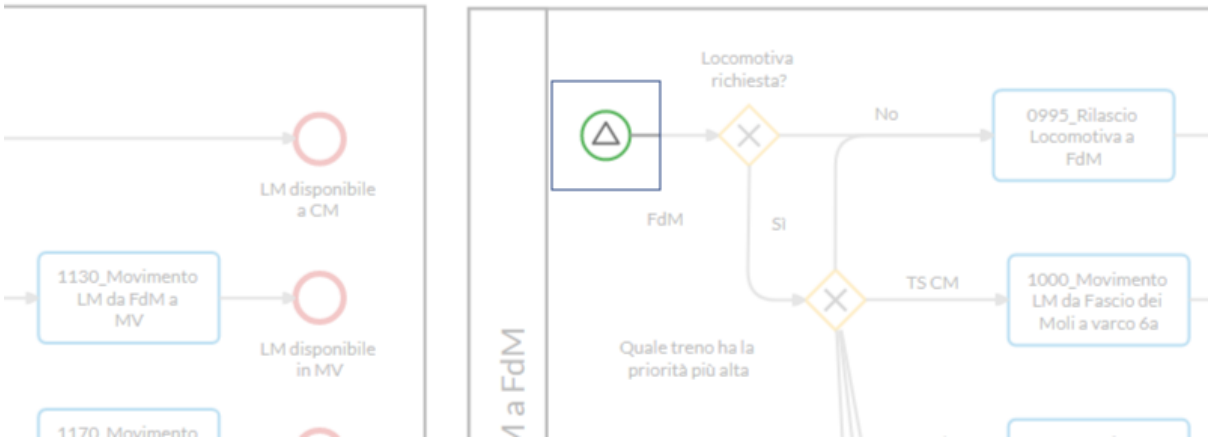
3.2. Process: Rilascio LM a FdM



3.2.1. Process Elements

signalStartEvents_3c1f83a5-9554-bce5-9e15-3764e7e55c2c

SIGNAL START EVENT



Outgoing

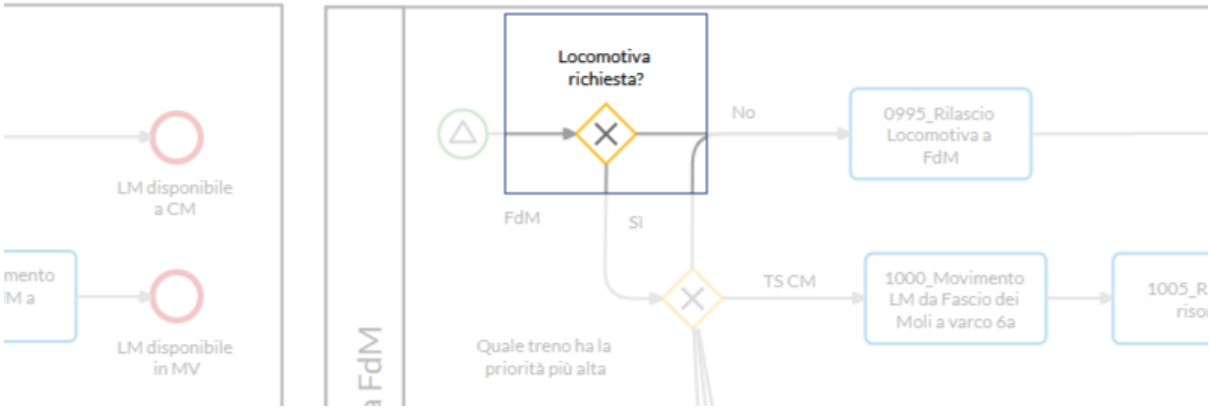
EXCLUSIVE GATEWAY
Locomotiva richiesta?

Attributes

SIGNAL REFERENCE
SgancioLM_ManovraSec_FdM

Locomotiva richiesta?

EXCLUSIVE GATEWAY



Incoming

SIGNAL START EVENT
signalStartEvents_3c1f83a5-9554-bce5-9e15-3764e7e55c2c

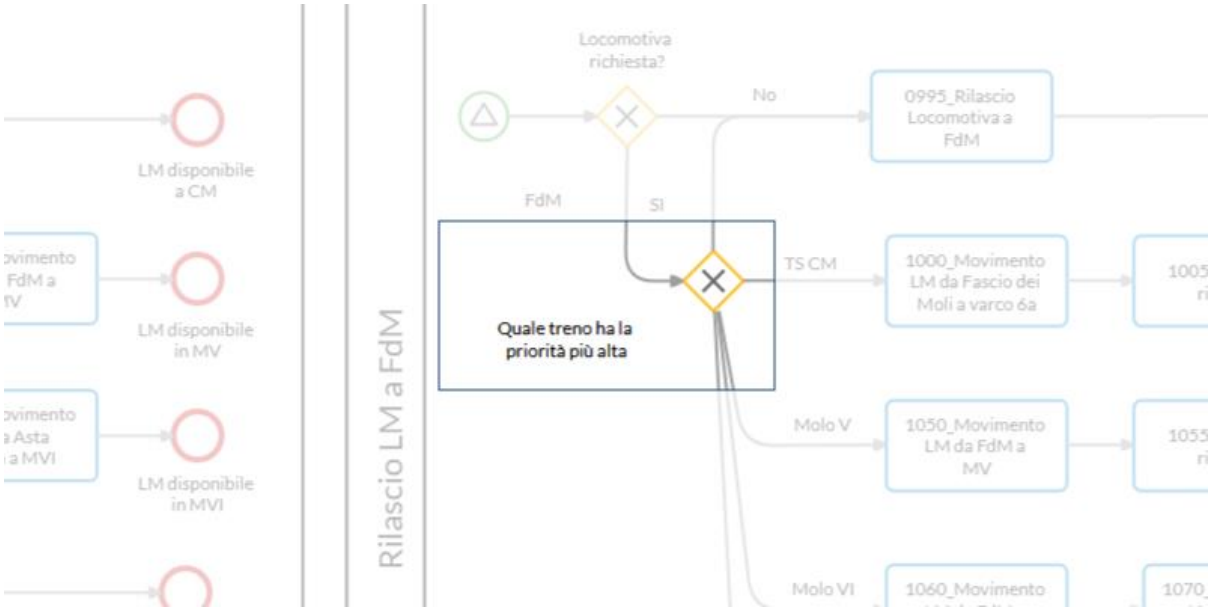
Outgoing

EXCLUSIVE GATEWAY
Quale treno ha la priorità più alta
through Sì

TASK
0995_Rilascio Locomotiva a FdM
through No

Quale treno ha la priorità più alta

EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY Locomotiva richiesta? through Sì	TASK 1000_Movimento LM da Fascio dei Moli a varco 6a through TS CM
	TASK 1050_Movimento LM da FdM a MV through Molo V
	TASK 1060_Movimento LM da FdM a Asta Lunga through Molo VI
	TASK 1080_Movimento LM da FdM a scambio 7 through Molo VII
	TASK 0995_Rilascio Locomotiva a FdM through FdM

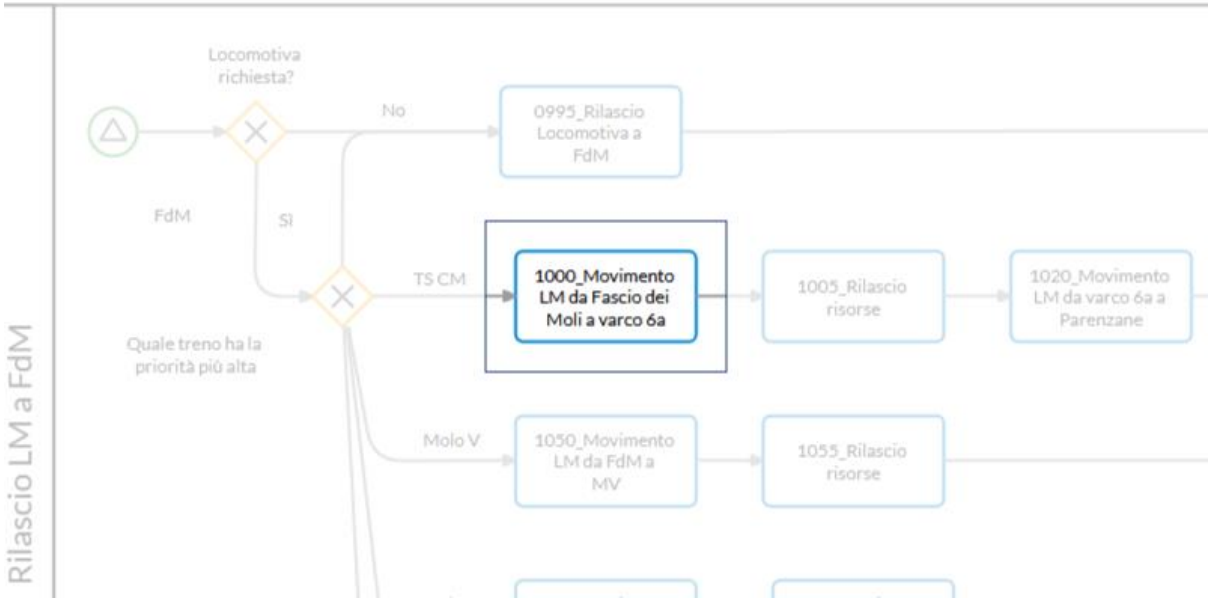
0995_Rilascio Locomotiva a FdM

TASK

Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha la priorità più alta through FdM	END EVENT LM disponibile in Fascio dei Moli
EXCLUSIVE GATEWAY Locomotiva richiesta? through No	

1000_Movimento LM da Fascio dei Moli a varco 6a

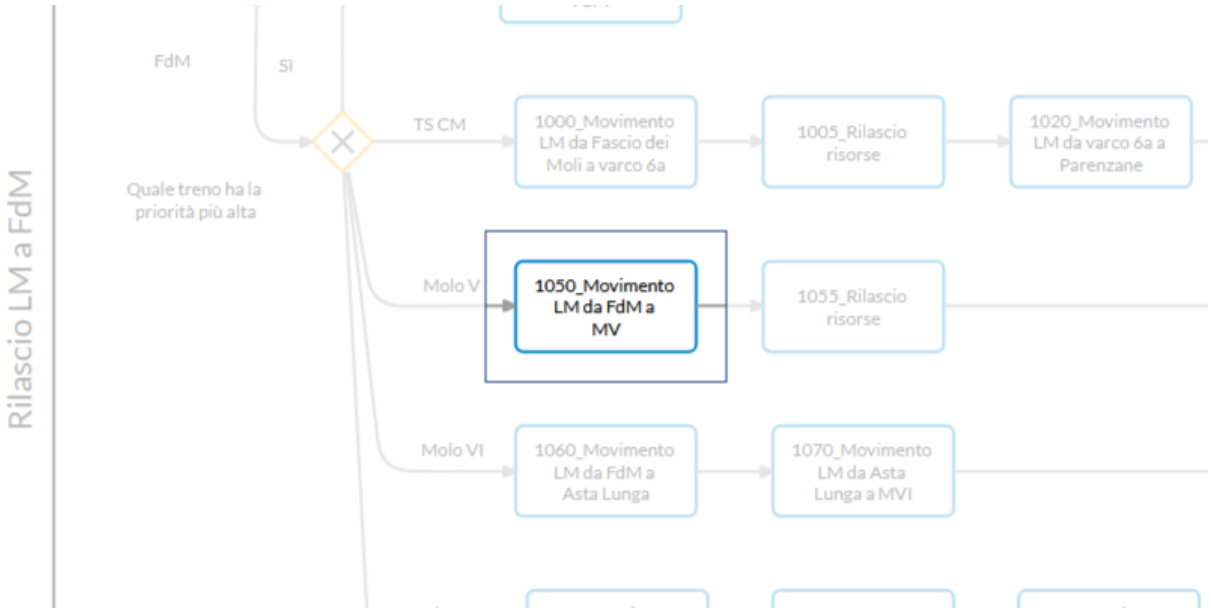
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha la priorità più alta through TS CM	TASK 1005_Rilascio risorse

1050_Movimento LM da FdM a MV

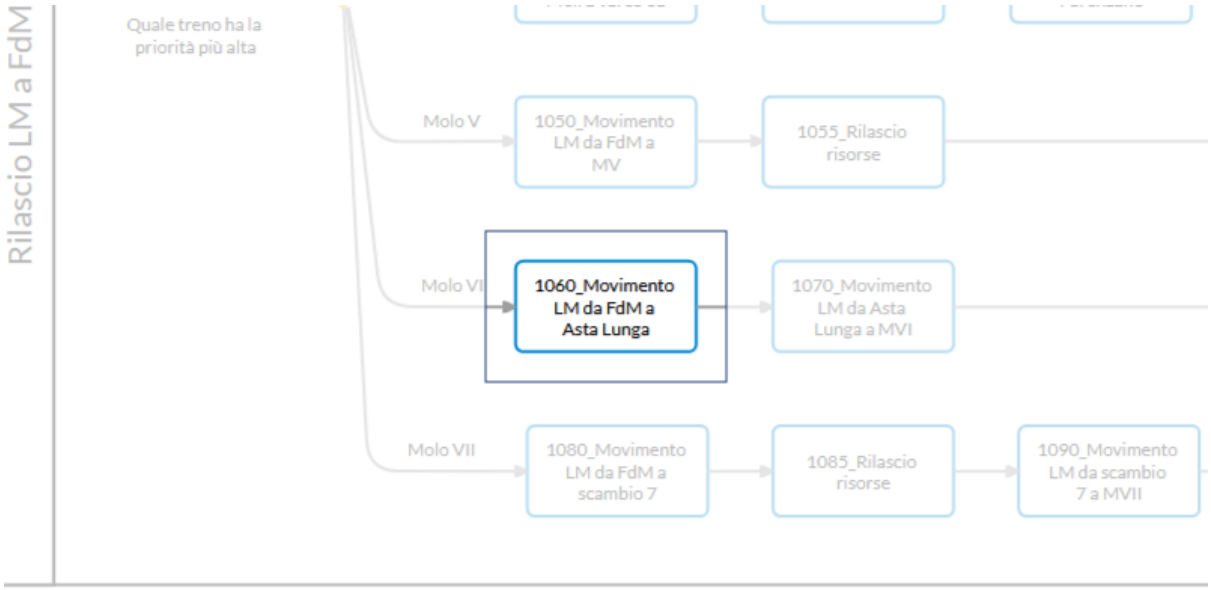
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha la priorità più alta through Molo V	TASK 1055_Rilascio risorse

1060_Movimento LM da FdM a Asta Lunga

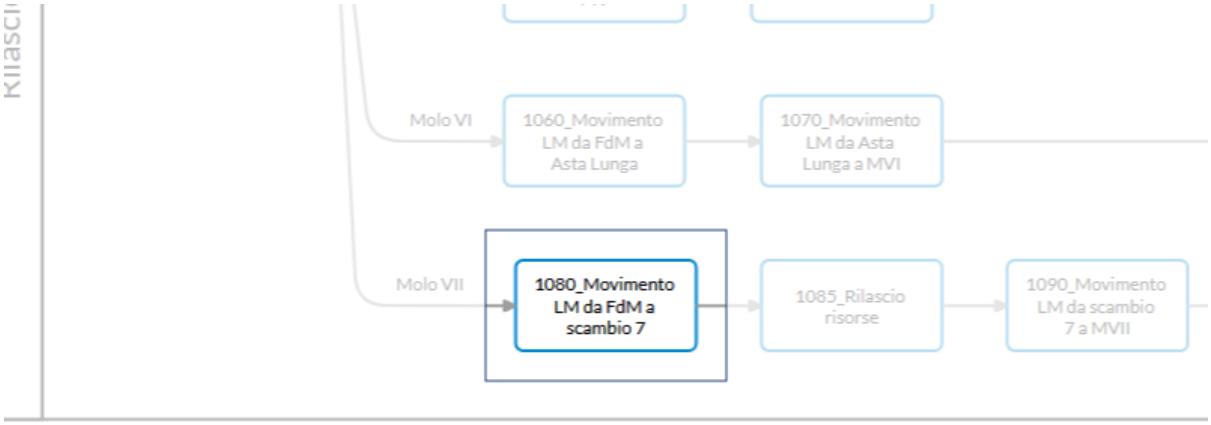
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha la priorità più alta through Molo VI	TASK 1070_Movimento LM da Asta Lunga a MVI

1080_Movimento LM da FdM a scambio 7

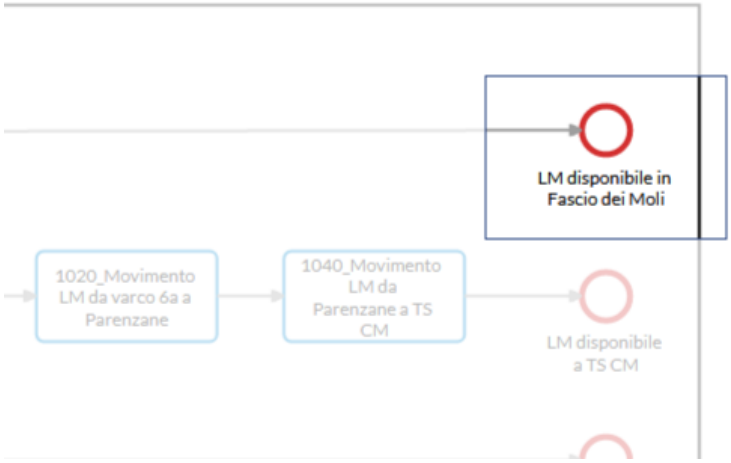
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha la priorità più alta through Molo VII	TASK 1085_Rilascio risorse

LM disponibile in Fascio dei Moli

END EVENT



Incoming

TASK
0995_Rilascio Locomotiva a FdM

1005_Rilascio risorse

TASK

Incoming

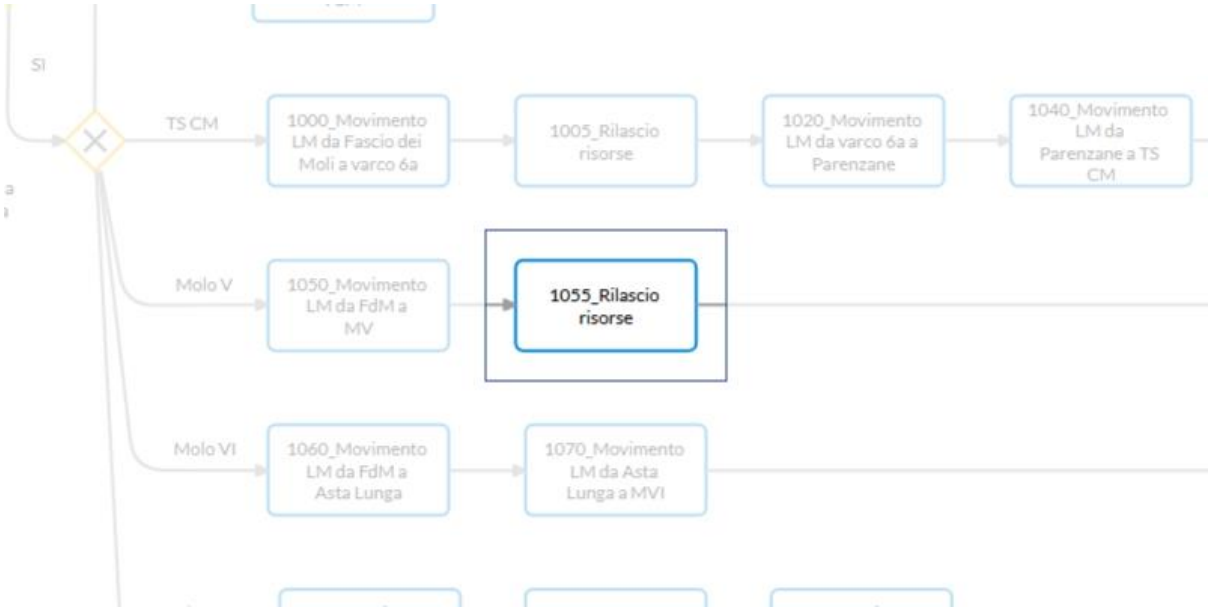
TASK
1000_Movimento LM da Fascio dei Moli a varco 6a

Outgoing

TASK
1020_Movimento LM da varco 6a a Parenzane

1055_Rilascio risorse

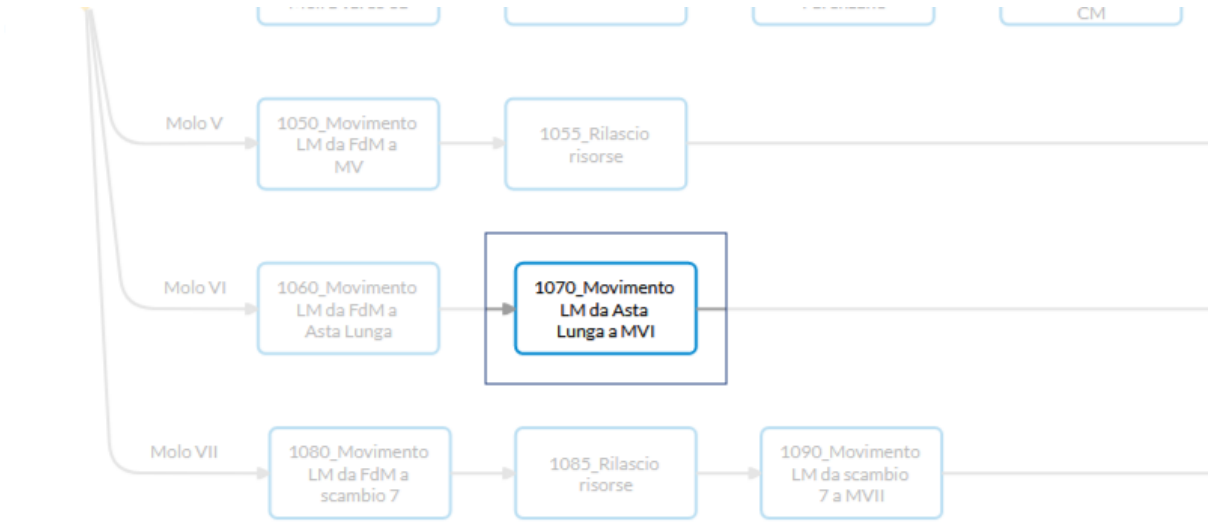
TASK



Incoming	Outgoing
TASK 1050_Movimento LM da FdM a MV	END EVENT LM disponibile in MV

1070_Movimento LM da Asta Lunga a MVI

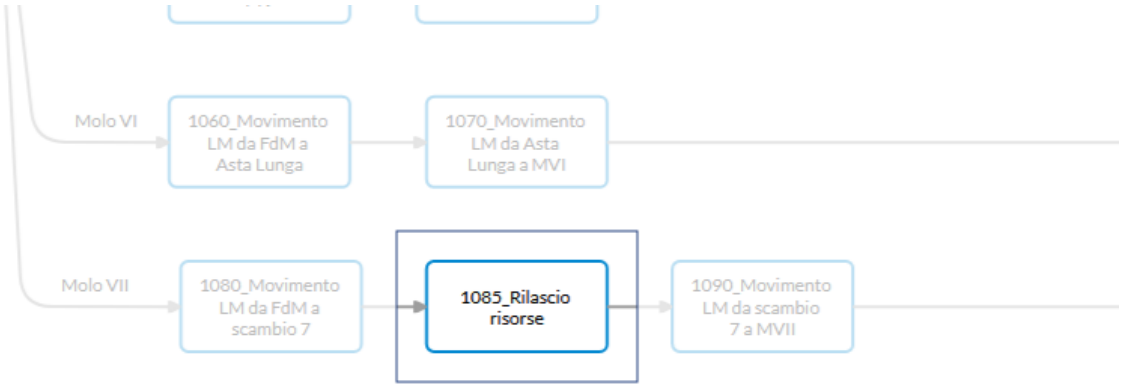
TASK



Incoming	Outgoing
TASK 1060_Movimento LM da FdM a Asta Lunga	END EVENT LM disponibile in MVI

1085_Rilascio risorse

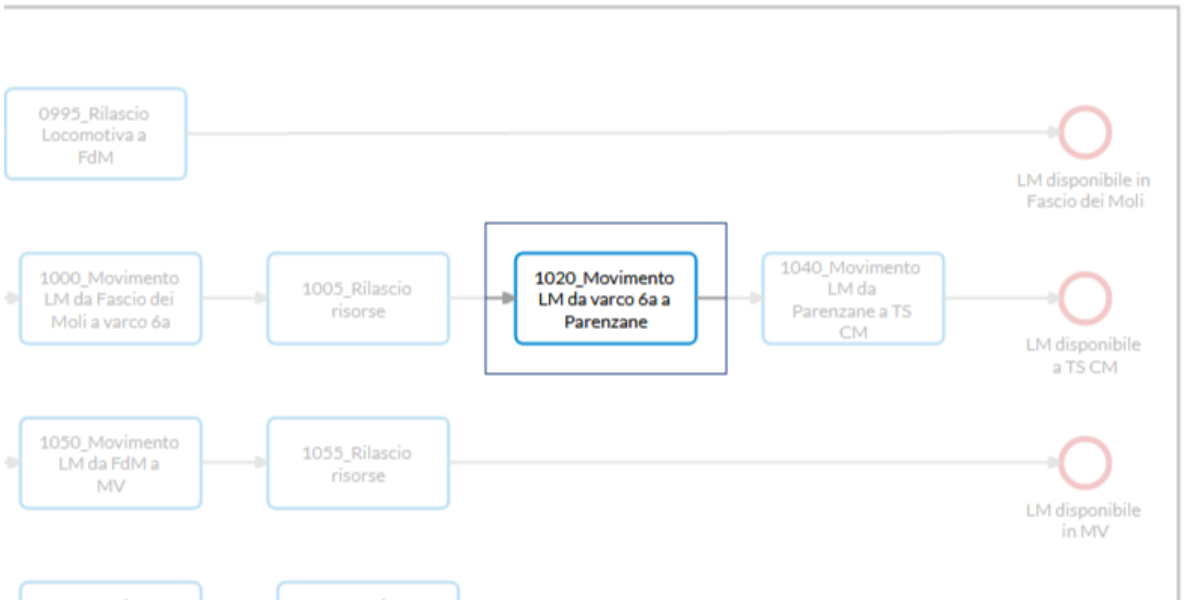
TASK



Incoming	Outgoing
TASK 1080_Movimento LM da FdM a scambio 7	TASK 1090_Movimento LM da scambio 7 a MVII

1020_Movimento LM da varco 6a a Parenzane

TASK



Incoming	Outgoing
TASK 1005_Rilascio risorse	TASK 1040_Movimento LM da Parenzane a TS CM

LM disponibile in MV

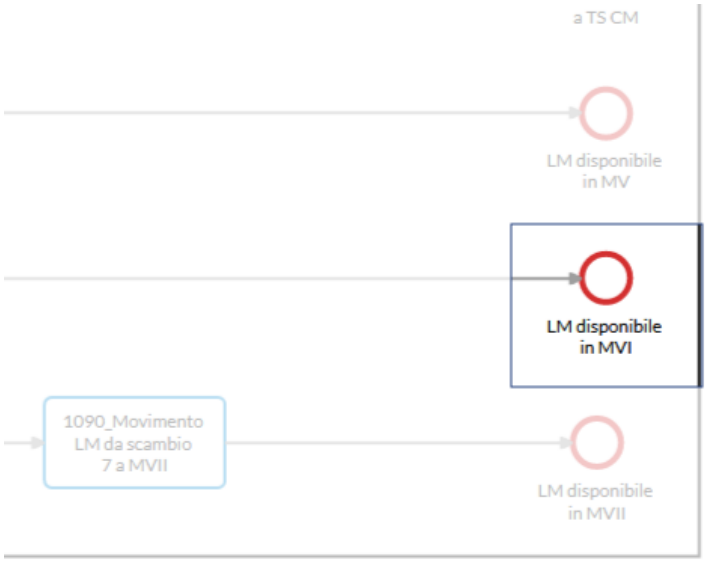
END EVENT

Incoming

TASK
1055_Rilascio risorse

LM disponibile in MVI

END EVENT

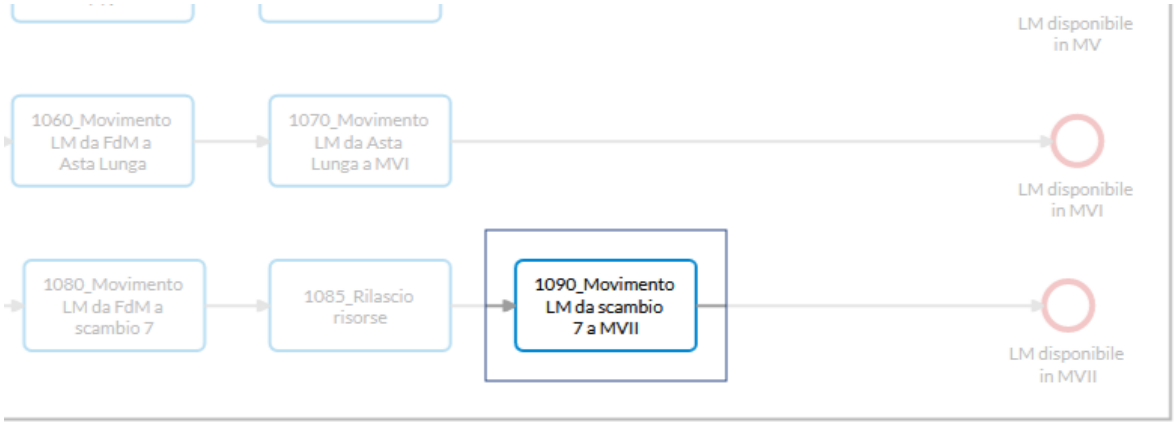


Incoming

TASK
1070_Movimento LM da Asta Lunga a MVI

1090_Movimento LM da scambio 7 a MVII

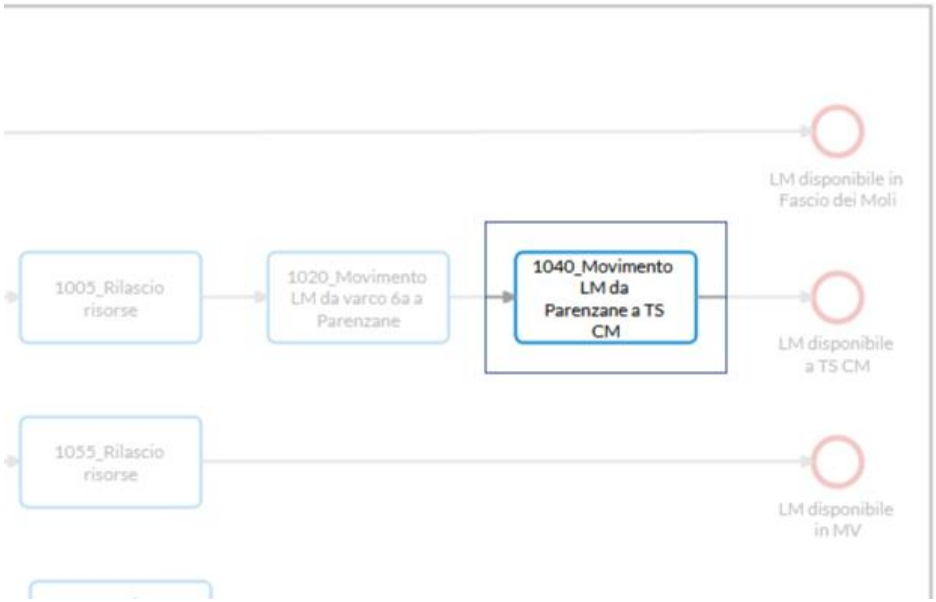
TASK



Incoming	Outgoing
TASK 1085_Rilascio risorse	END EVENT LM disponibile in MVII

1040_Movimento LM da Parenzane a TS CM

TASK



Incoming	Outgoing
TASK 1020_Movimento LM da varco 6a a Parenzane	END EVENT LM disponibile a TS CM

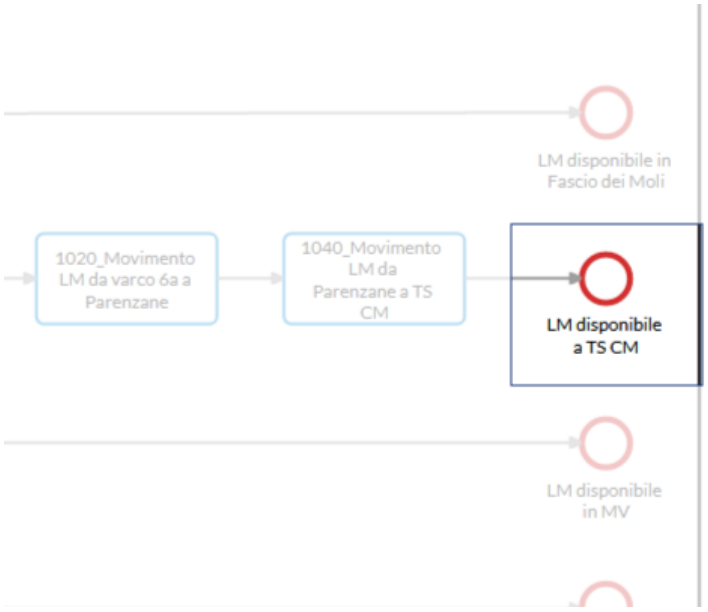
LM disponibile in MVII

END EVENT

Incoming
TASK 1090_Movimento LM da scambio 7 a MVII

LM disponibile a TS CM

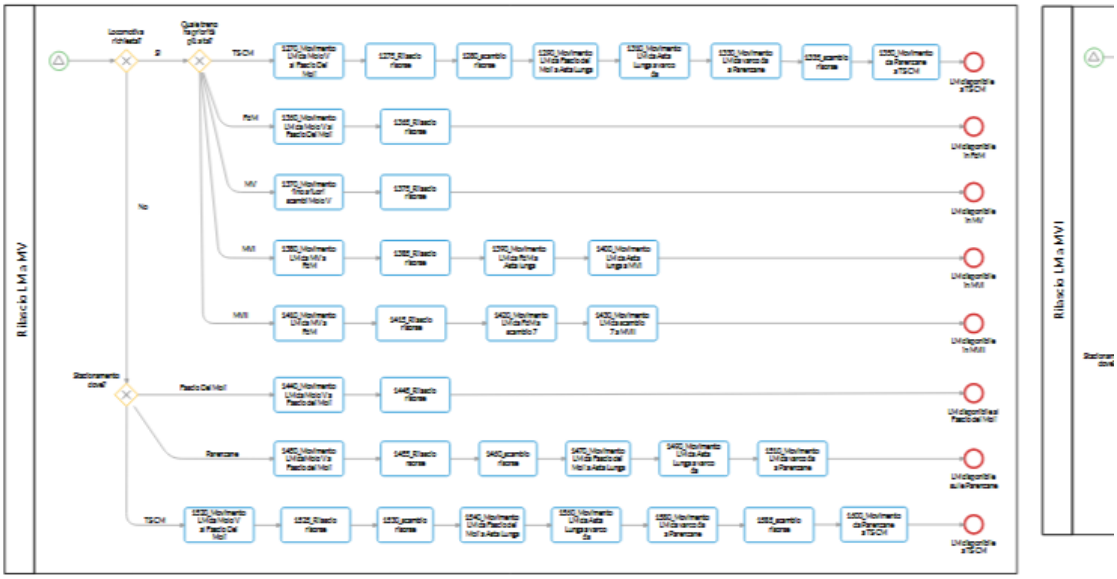
END EVENT



Incoming

TASK
1040_Movimento LM da Parenzane a TS CM

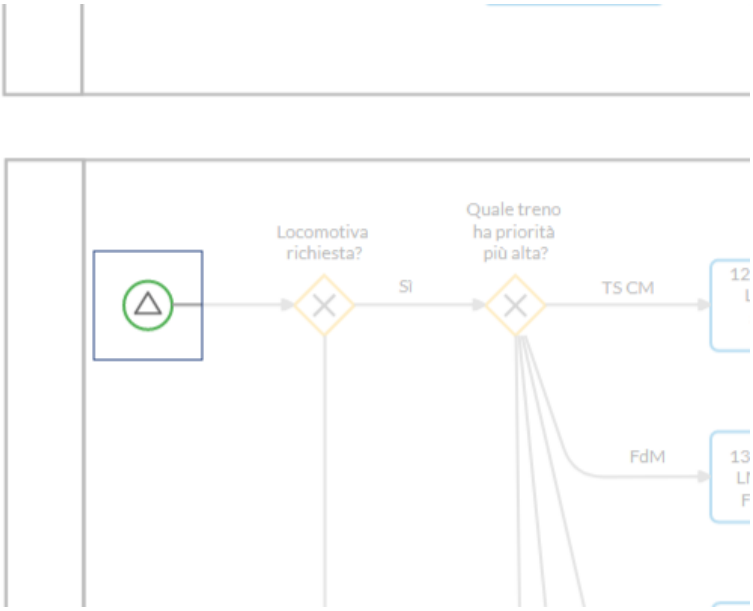
3.3. Process: Rilascio LM a MV



3.3.1. Process Elements

signalStartEvents_83cc2a20-4486-4e9f-39c1-06df6e902d4f

SIGNAL START EVENT



Outgoing

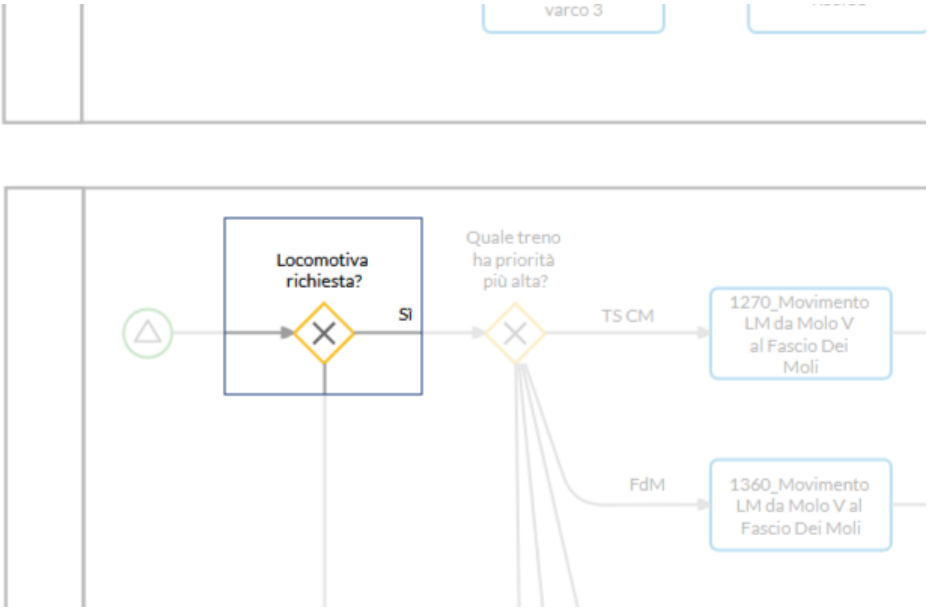
EXCLUSIVE GATEWAY
Locomotiva richiesta?

Attributes

SIGNAL REFERENCE
Locomotiva_molo5

Locomotiva richiesta?

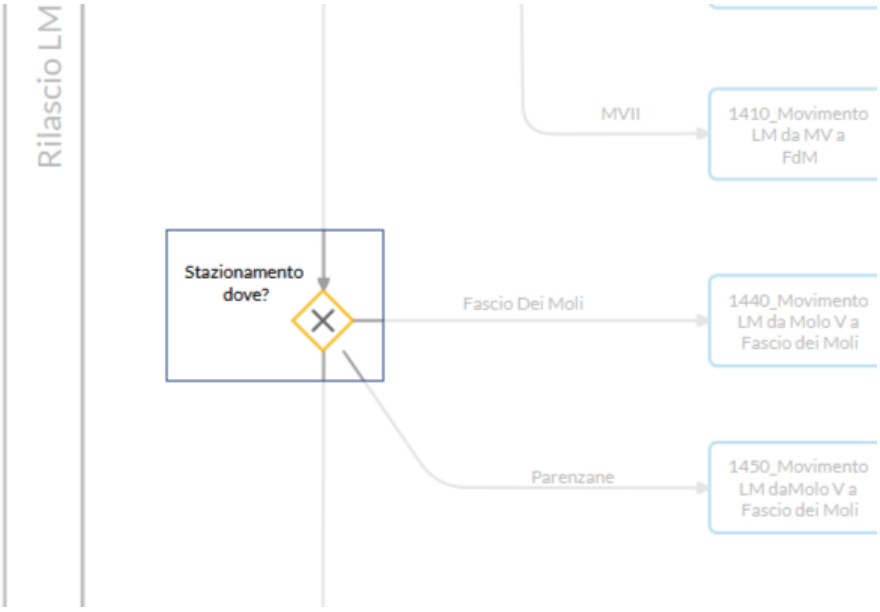
EXCLUSIVE GATEWAY



Incoming	Outgoing
SIGNAL START EVENT signalStartEvents_83cc2a20-4486-4e9f-39c1-06df6e902d4f	EXCLUSIVE GATEWAY Stazionamento dove? through No
	EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through Sì

Stazionamento dove?

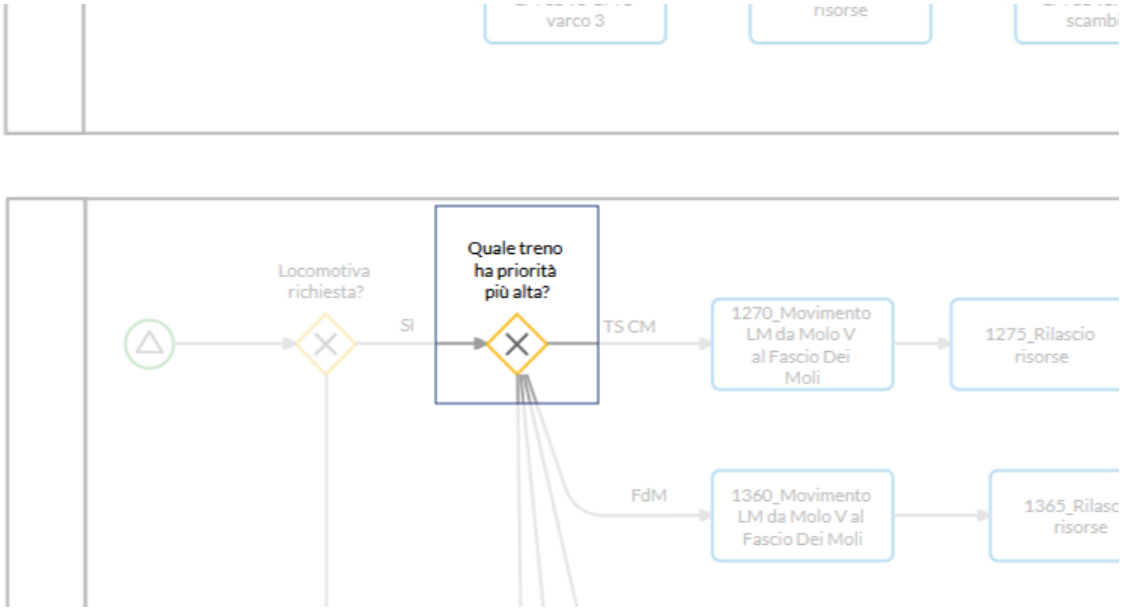
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY Locomotiva richiesta? through No	TASK 1450_Movimento LM daMolo V a Fascio dei Moli through Parenzane
	TASK 1440_Movimento LM da Molo V a Fascio dei Moli through Fascio Dei Moli
	TASK 1520_Movimento LM da Molo V al Fascio Dei Moli through TS CM

Quale treno ha priorità più alta?

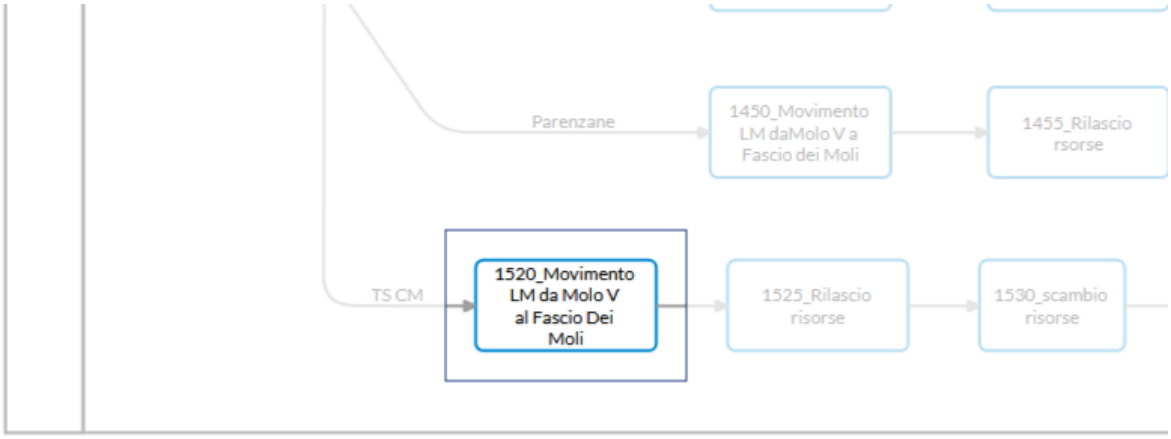
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY Locomotiva richiesta? through Sì	TASK 1270_Movimento LM da Molo V al Fascio Dei Moli through TS CM
	TASK 1360_Movimento LM da Molo V al Fascio Dei Moli through FdM
	TASK 1370_Movimento fino a fuori scambi Molo V through MV
	TASK 1380_Movimento LM da MV a FdM through MVI
	TASK 1410_Movimento LM da MV a FdM through MVII

1520_Movimento LM da Molo V al Fascio Dei Moli

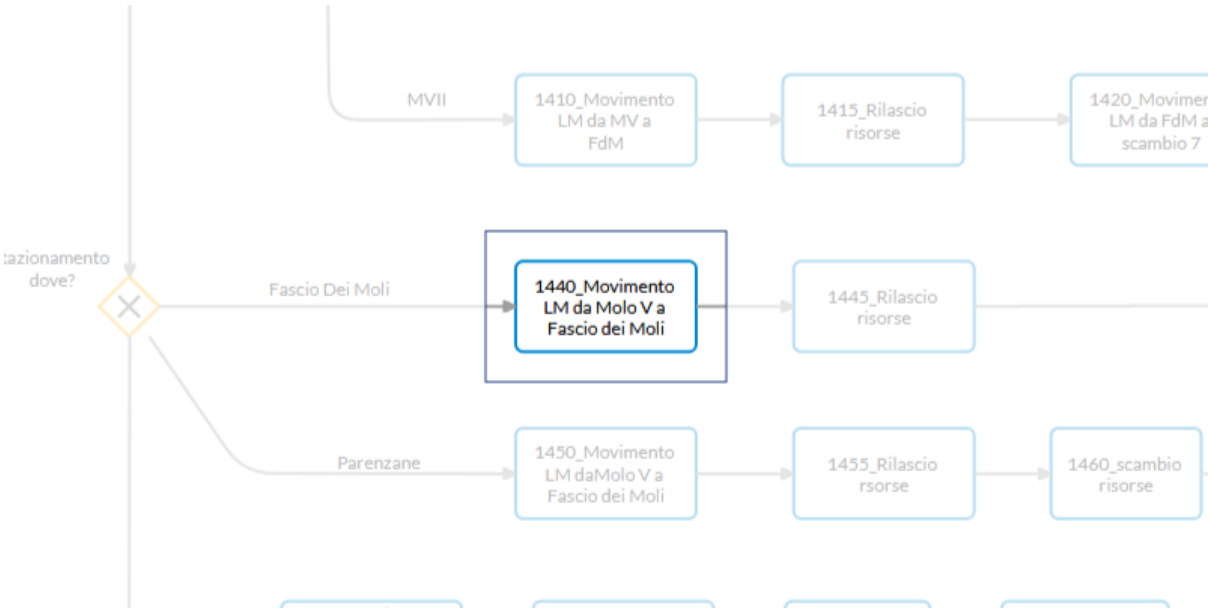
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through TS CM	TASK 1525_Rilascio risorse

1440_Movimento LM da Molo V a Fascio dei Moli

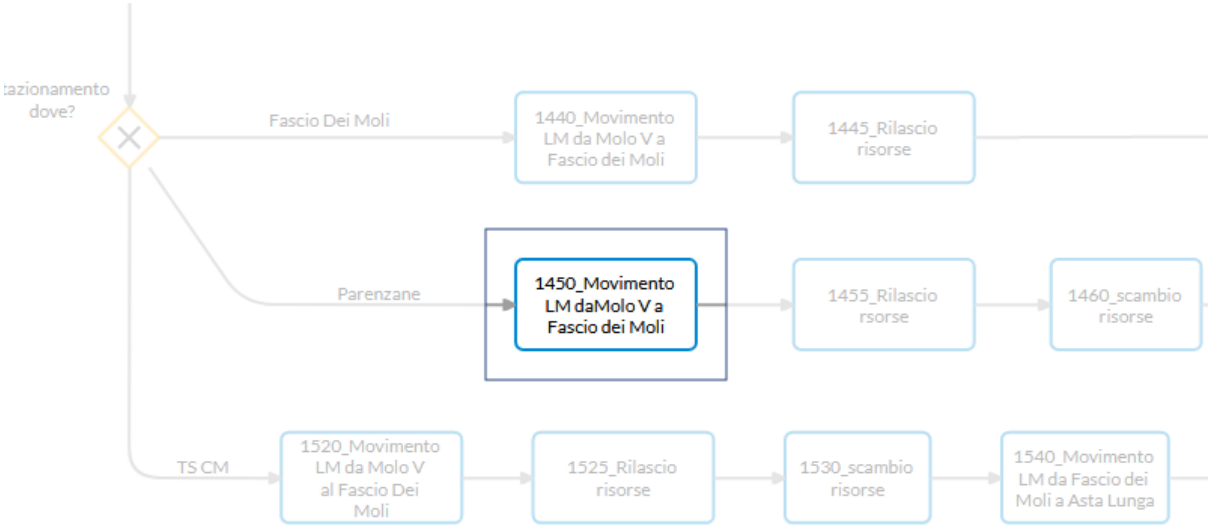
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through Fascio Dei Moli	TASK 1445_Rilascio risorse

1450_Movimento LM daMolo V a Fascio dei Moli

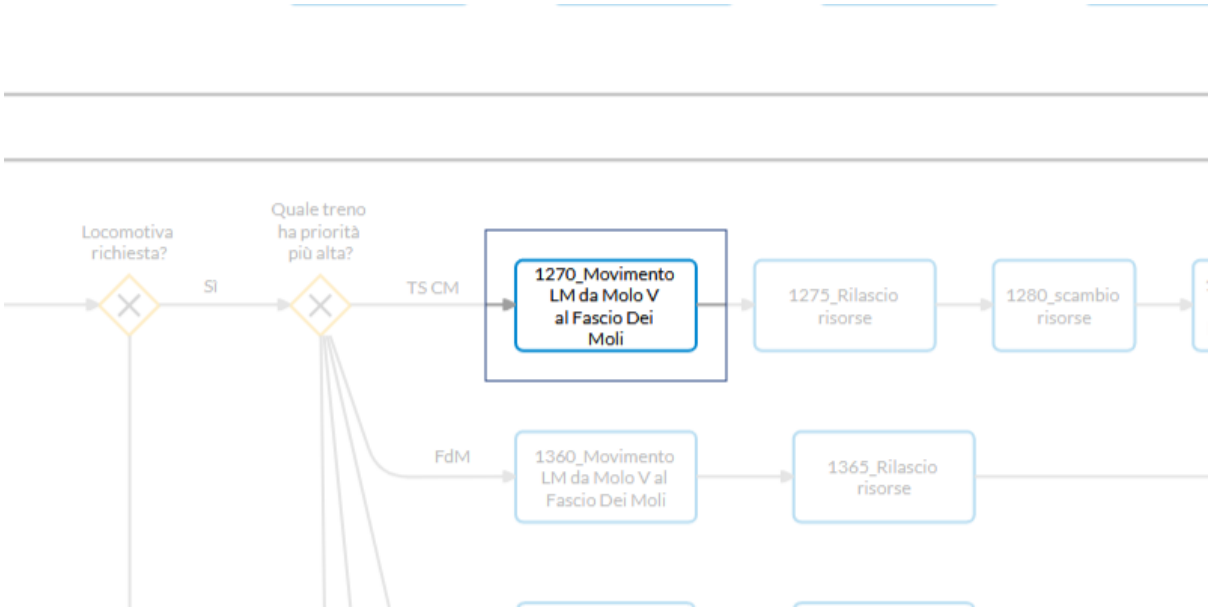
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through Parenzane	TASK 1455_Rilascio rsorse

1270_Movimento LM da Molo V al Fascio Dei Moli

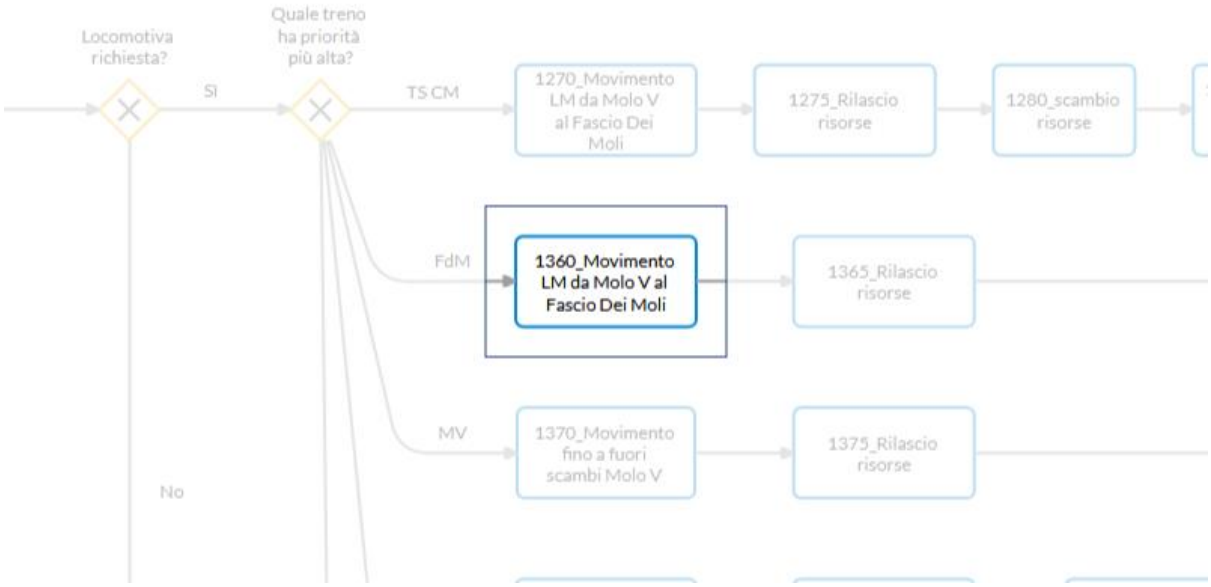
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through TS CM	TASK 1275_Rilascio risorse

1360_Movimento LM da Molo V al Fascio Dei Moli

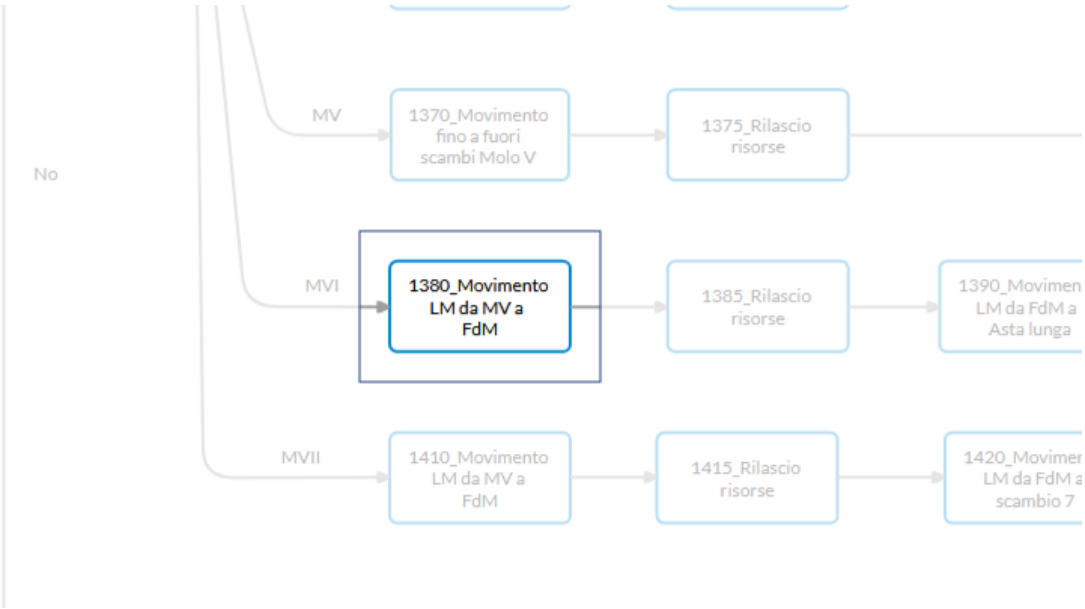
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through FdM	TASK 1365_Rilascio risorse

1380_Movimento LM da MV a FdM

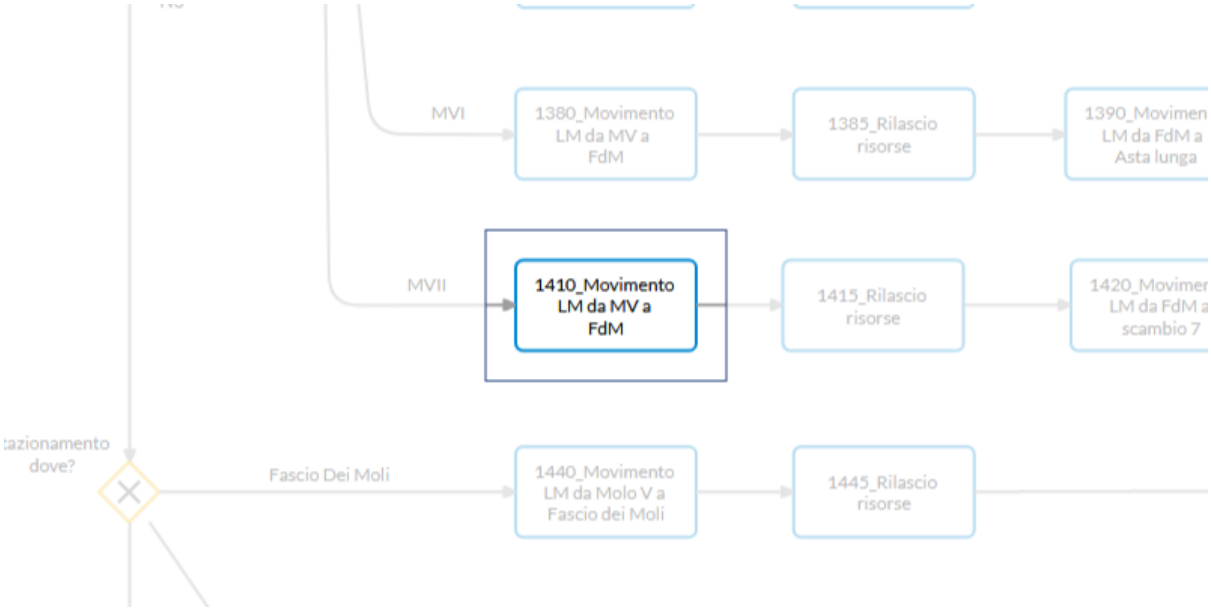
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MVI	TASK 1385_Rilascio risorse

1410_Movimento LM da MV a FdM

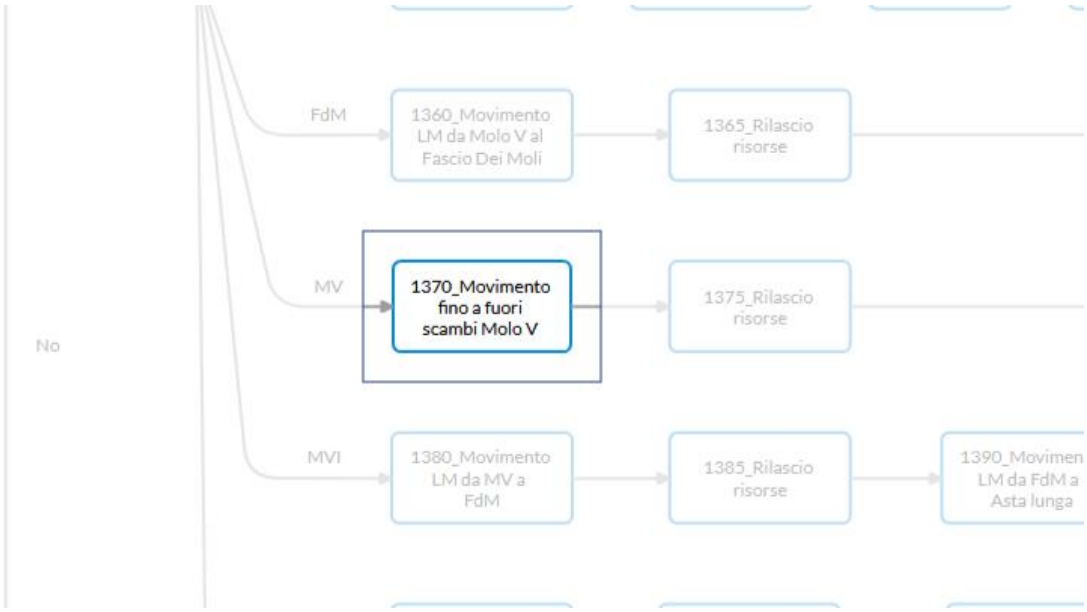
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MVII	TASK 1415_Rilascio risorse

1370_Movimento fino a fuori scambi Molo V

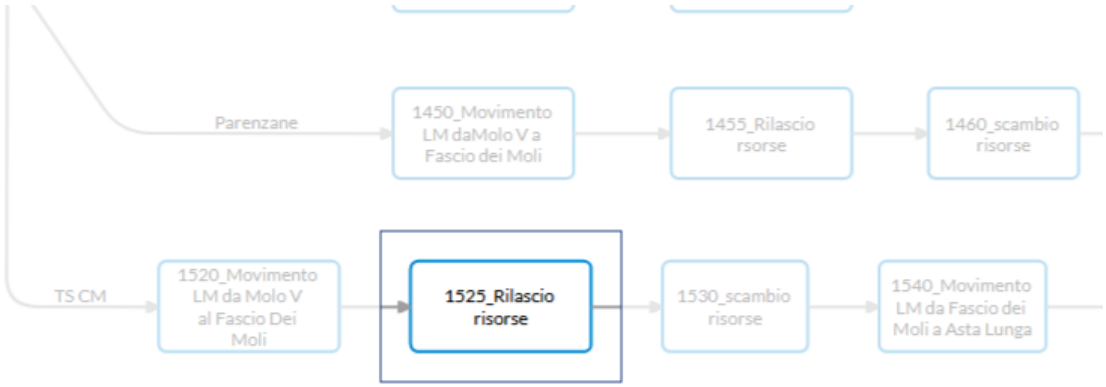
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MV	TASK 1375_Rilascio risorse

1525_Rilascio risorse

TASK



Incoming	Outgoing
TASK 1520_Movimento LM da Molo V al Fascio Dei Moli	TASK 1530_scambio risorse

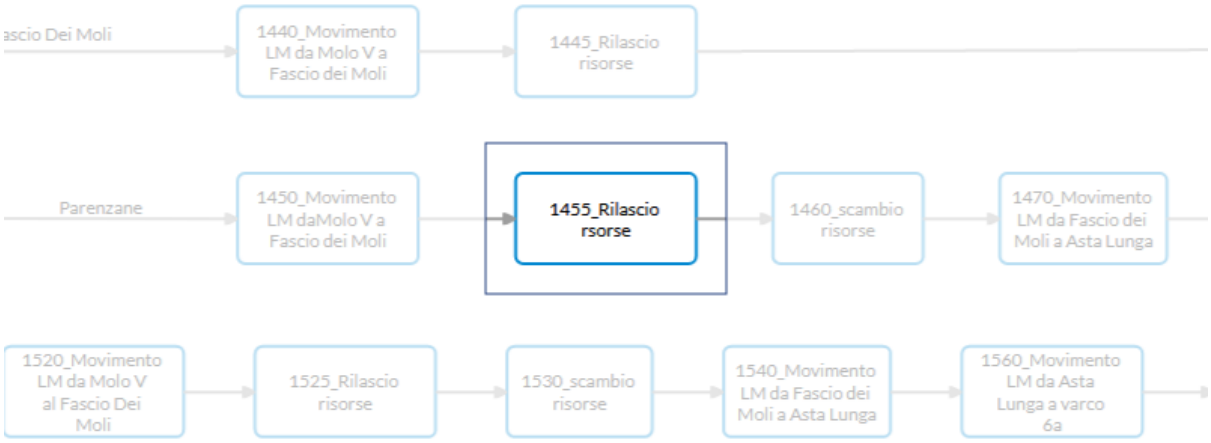
1445_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1440_Movimento LM da Molo V a Fascio dei Moli	END EVENT LM disponibile al Fascio dei Moli

1455_Rilascio rsorse

TASK



Incoming	Outgoing
TASK 1450_Movimento LM daMolo V a Fascio dei Moli	TASK 1460_scambio risorse

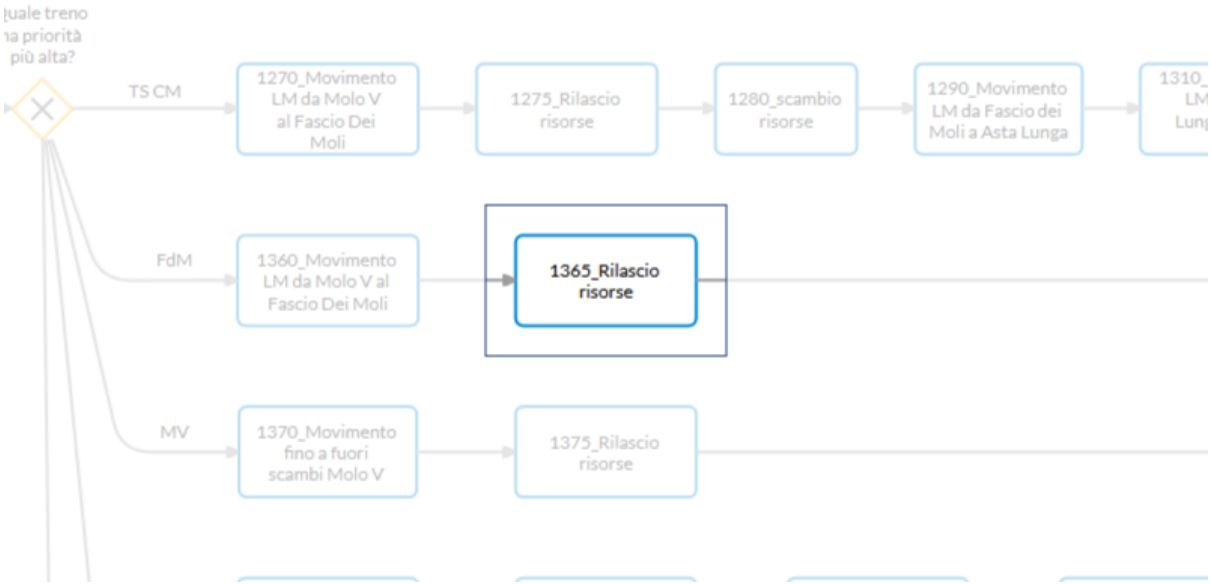
1275_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1270_Movimento LM da Molo V al Fascio Dei Moli	TASK 1280_scambio risorse

1365_Rilascio risorse

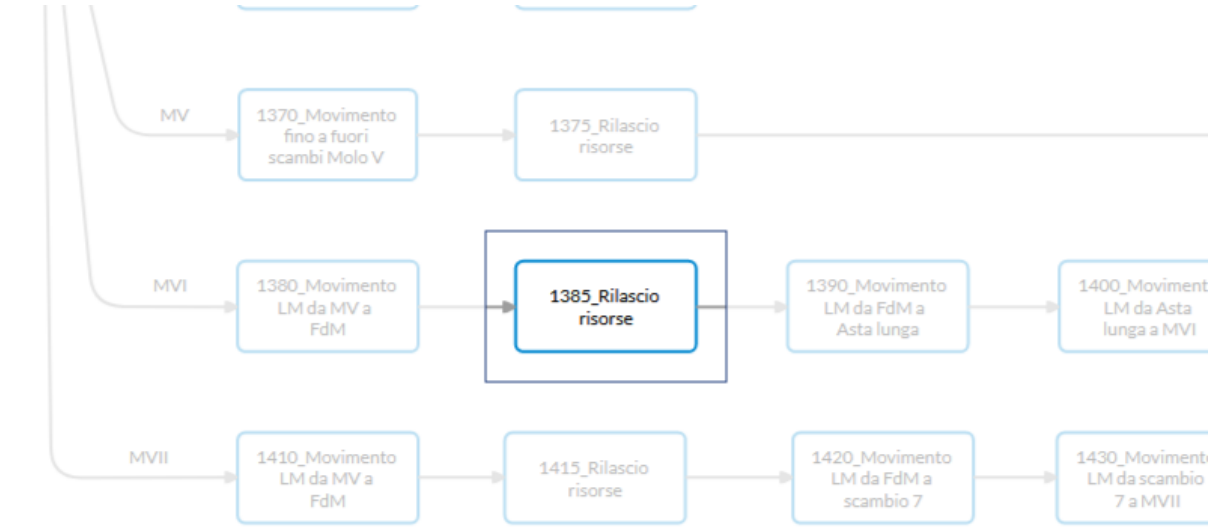
TASK



Incoming	Outgoing
TASK 1360_Movimento LM da Molo V al Fascio Dei Moli	END EVENT LM disponibile in FdM

1385_Rilascio risorse

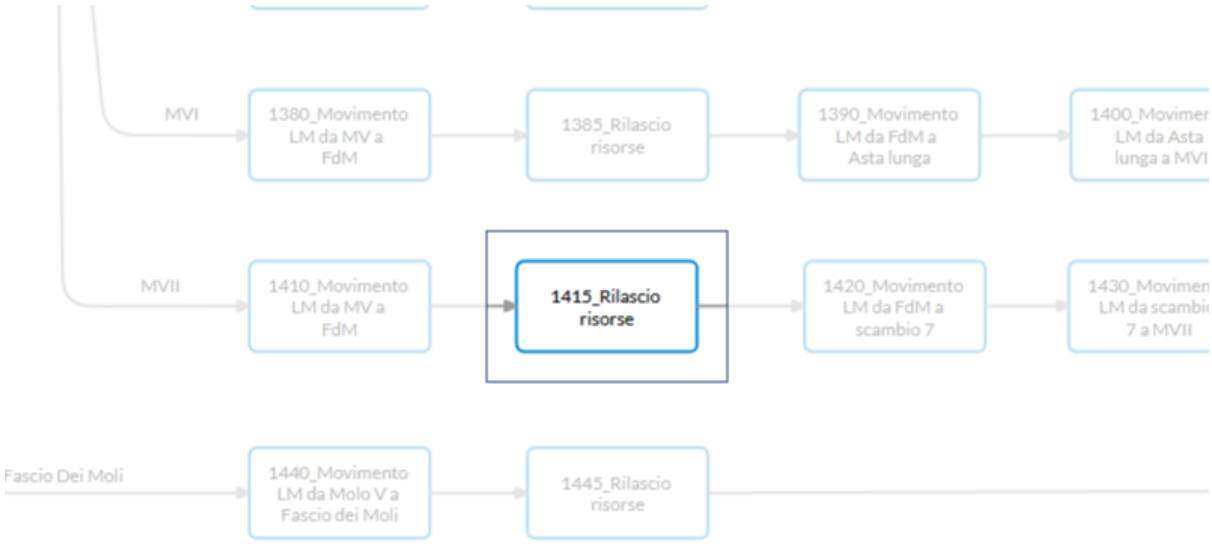
TASK



Incoming	Outgoing
TASK 1380_Movimento LM da MV a FdM	TASK 1390_Movimento LM da FdM a Asta lunga

1415_Rilascio risorse

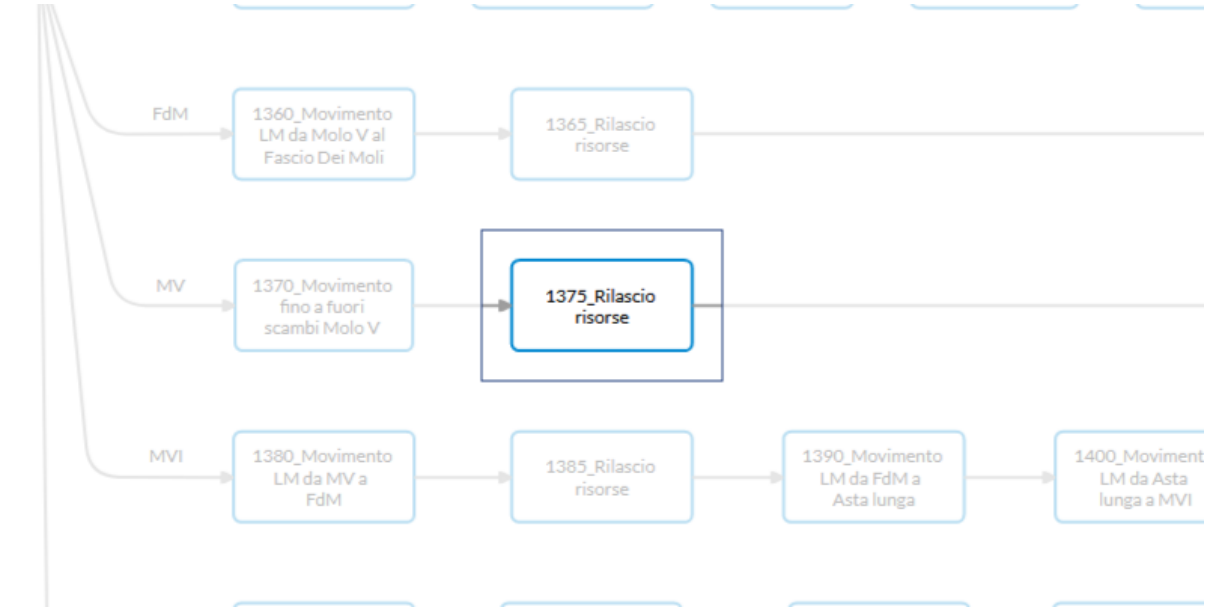
TASK



Incoming	Outgoing
TASK 1410_Movimento LM da MV a FdM	TASK 1420_Movimento LM da FdM a scambio 7

1375_Rilascio risorse

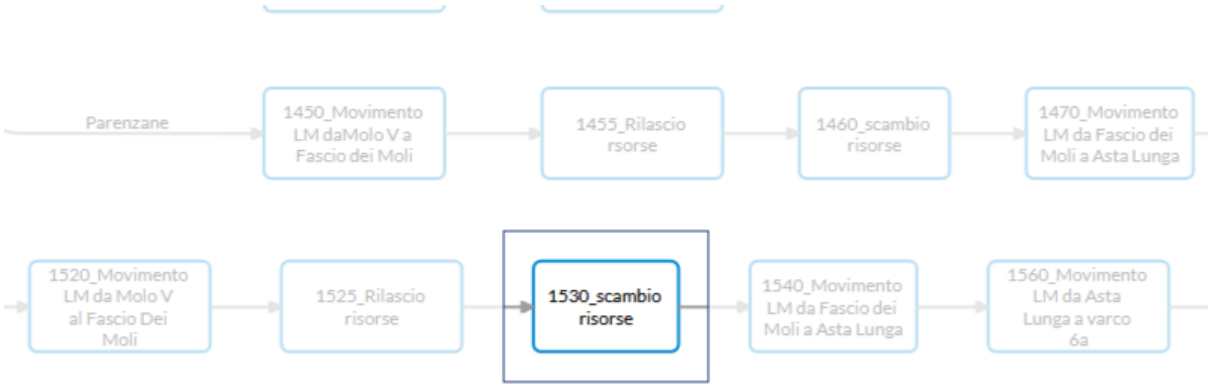
TASK



Incoming	Outgoing
TASK 1370_Movimento fino a fuori scambi Molo V	END EVENT LM disponibile in MV

1530_scambio risorse

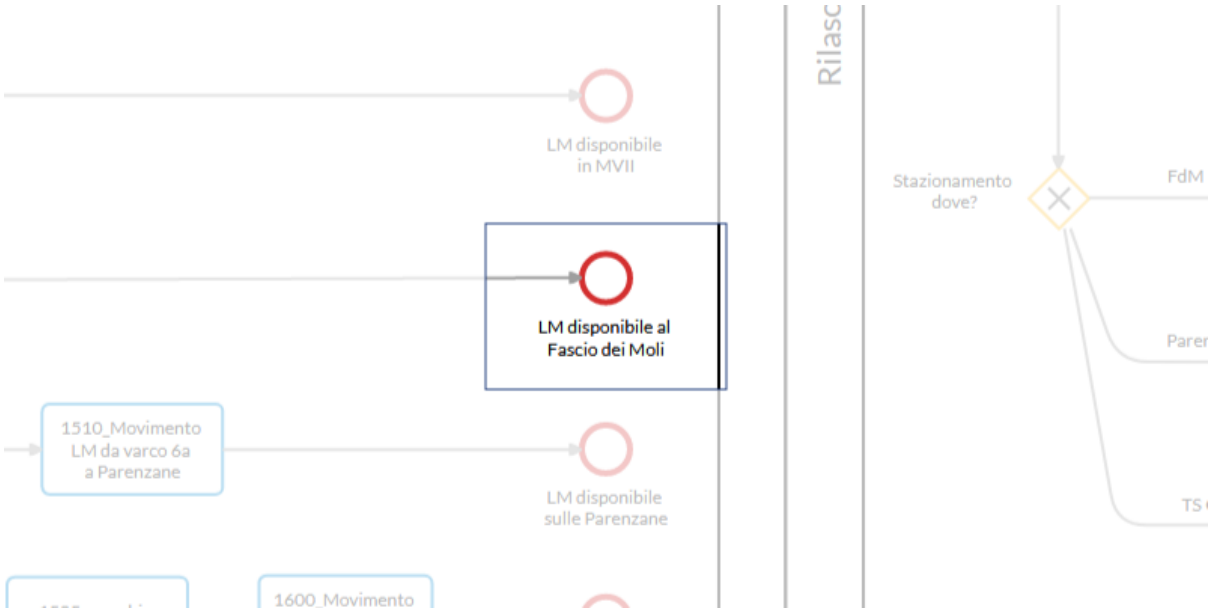
TASK



Incoming	Outgoing
TASK 1525_Rilascio risorse	TASK 1540_Movimento LM da Fascio dei Moli a Asta Lunga

LM disponibile al Fascio dei Moli

END EVENT

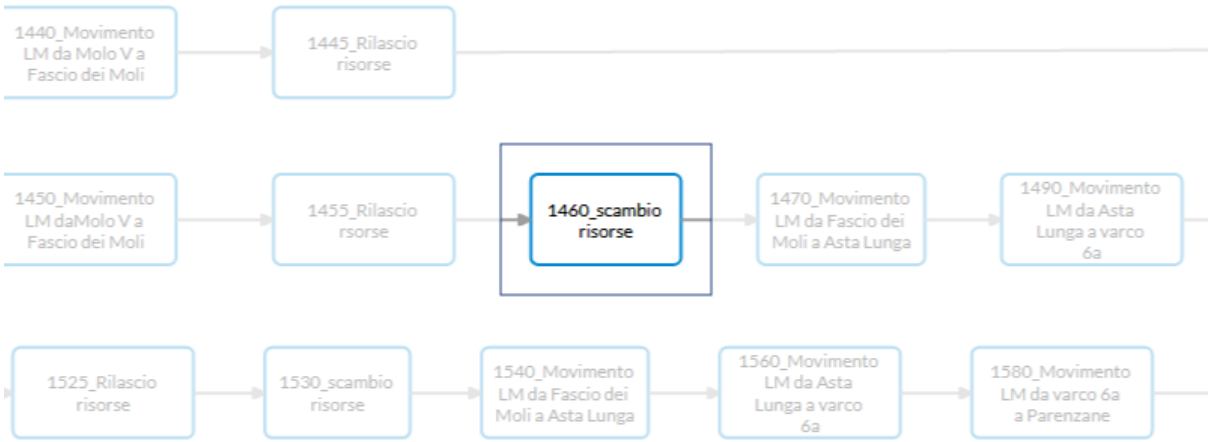


Incoming

TASK
1445_Rilascio risorse

1460_scambio risorse

TASK



Incoming	Outgoing
TASK 1455_Rilascio rsorse	TASK 1470_Movimento LM da Fascio dei Moli a Asta Lunga

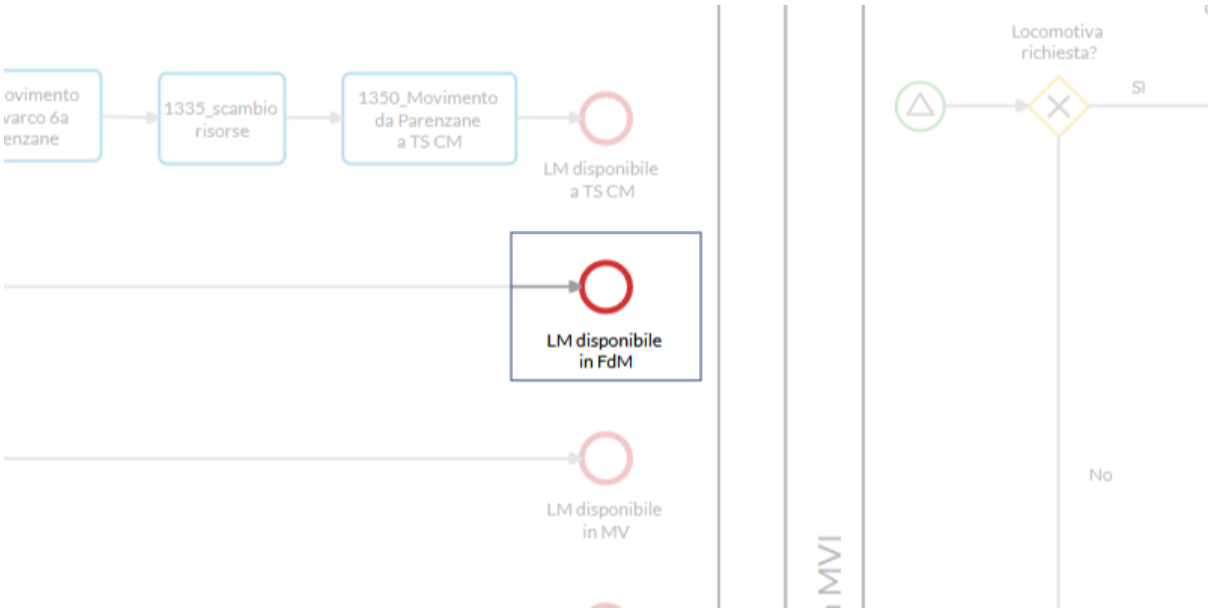
1280_scambio risorse

TASK

Incoming	Outgoing
TASK 1275_Rilascio risorse	TASK 1290_Movimento LM da Fascio dei Moli a Asta Lunga

LM disponibile in FdM

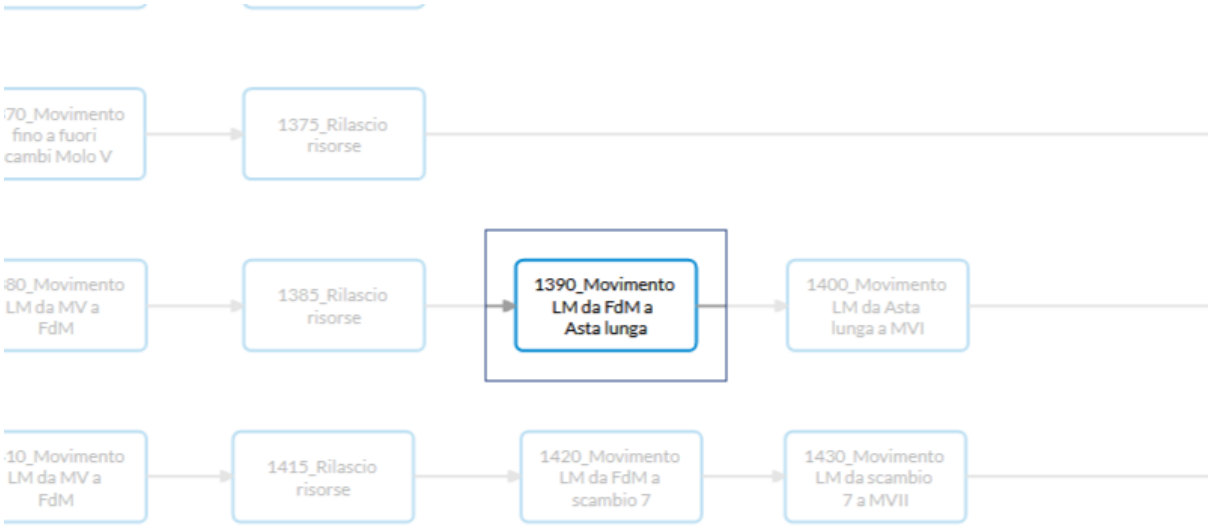
END EVENT



Incoming
TASK 1365_Rilascio risorse

1390_Movimento LM da FdM a Asta lunga

TASK



Incoming	Outgoing
TASK 1385_Rilascio risorse	TASK 1400_Movimento LM da Asta lunga a MVI

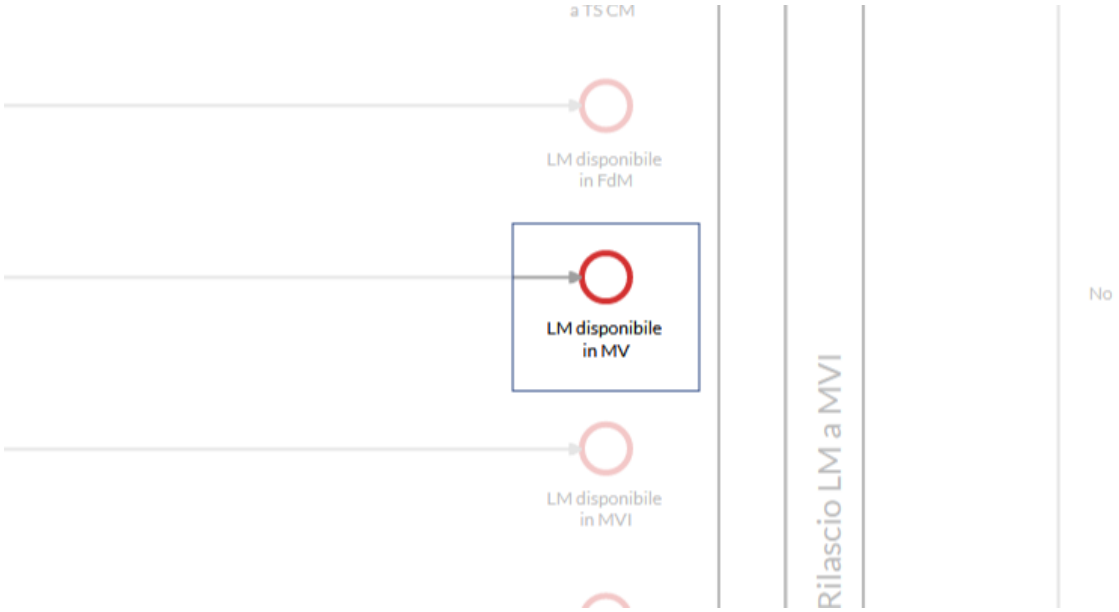
1420_Movimento LM da FdM a scambio 7

TASK

Incoming	Outgoing
TASK 1415_Rilascio risorse	TASK 1430_Movimento LM da scambio 7 a MVII

LM disponibile in MV

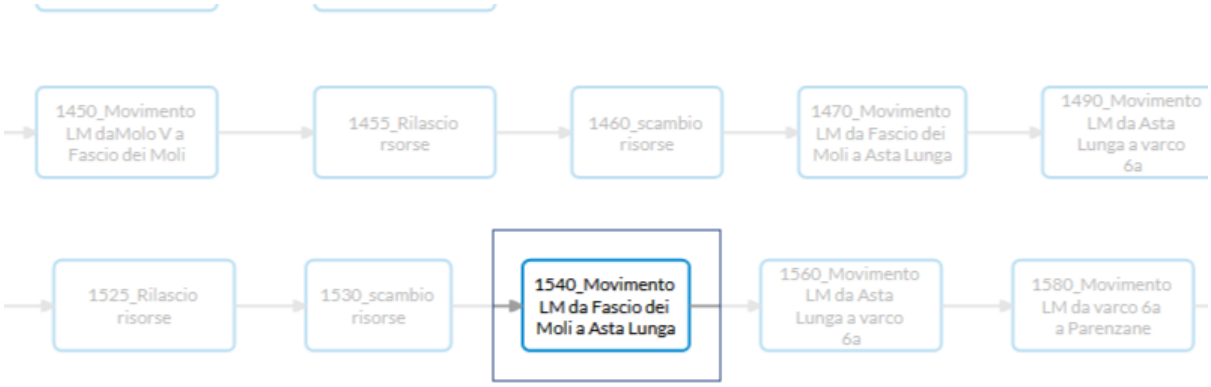
END EVENT



Incoming
TASK 1375_Rilascio risorse

1540_Movimento LM da Fascio dei Moli a Asta Lunga

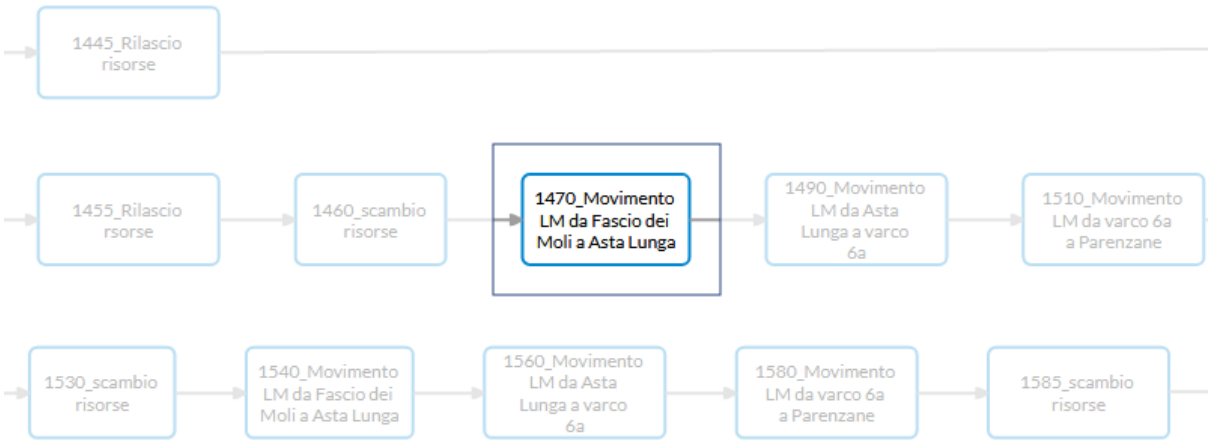
TASK



Incoming	Outgoing
TASK 1530_scambio risorse	TASK 1560_Movimento LM da Asta Lunga a varco 6a

1470_Movimento LM da Fascio dei Moli a Asta Lunga

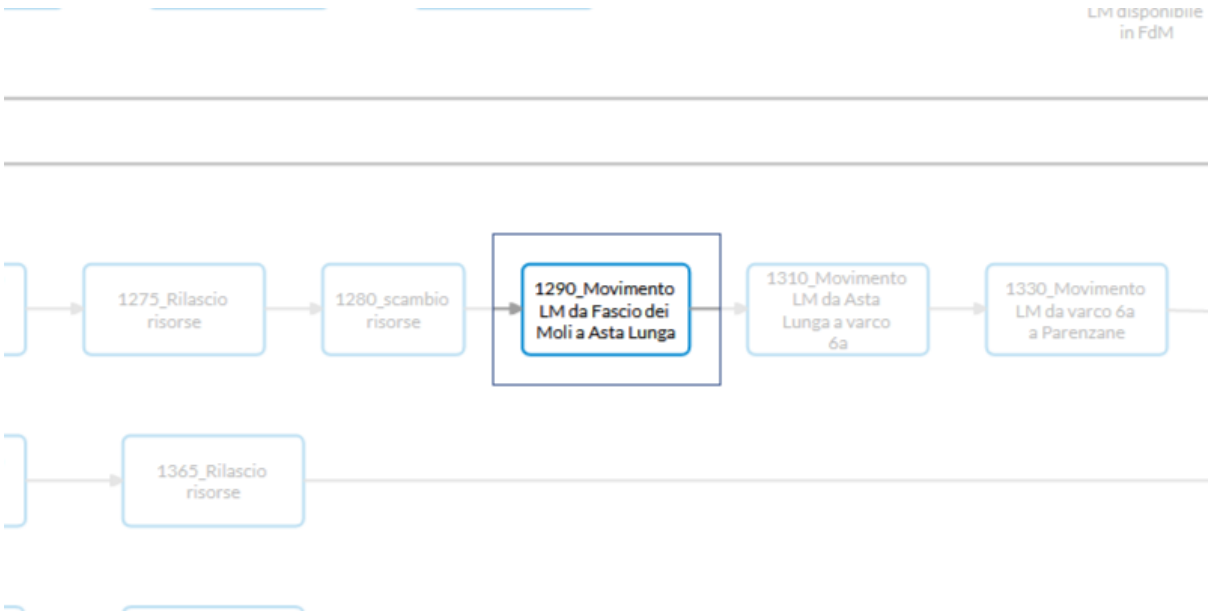
TASK



Incoming	Outgoing
TASK 1460_scambio risorse	TASK 1490_Movimento LM da Asta Lunga a varco 6a

1290_Movimento LM da Fascio dei Moli a Asta Lunga

TASK



Incoming	Outgoing
TASK 1280_scambio risorse	TASK 1310_Movimento LM da Asta Lunga a varco 6a

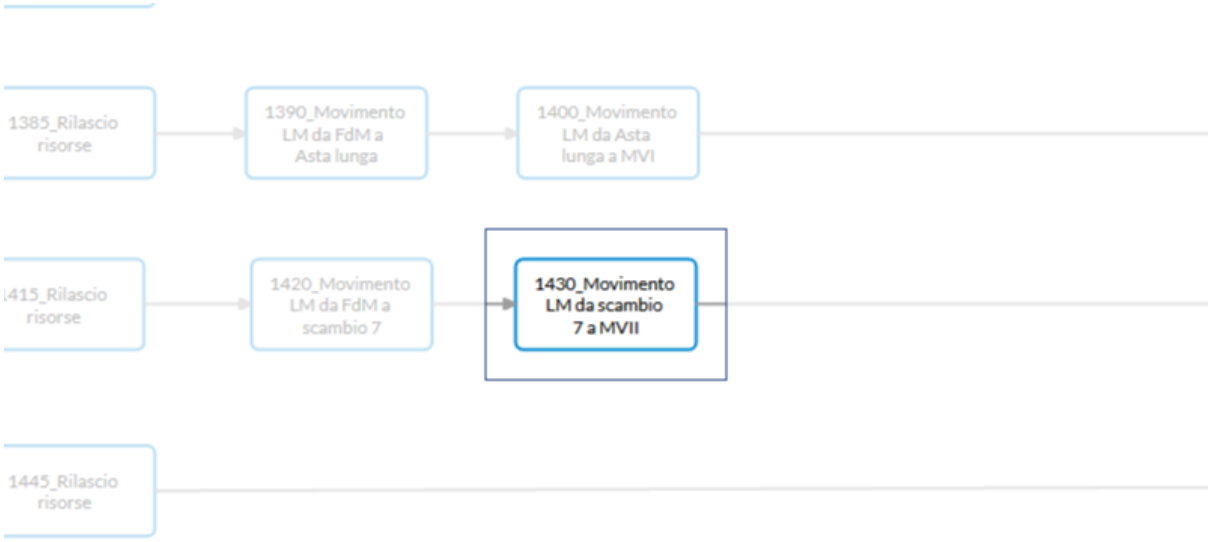
1400_Movimento LM da Asta lunga a MVI

TASK

Incoming	Outgoing
TASK 1390_Movimento LM da FdM a Asta lunga	END EVENT LM disponibile in MVI

1430_Movimento LM da scambio 7 a MVII

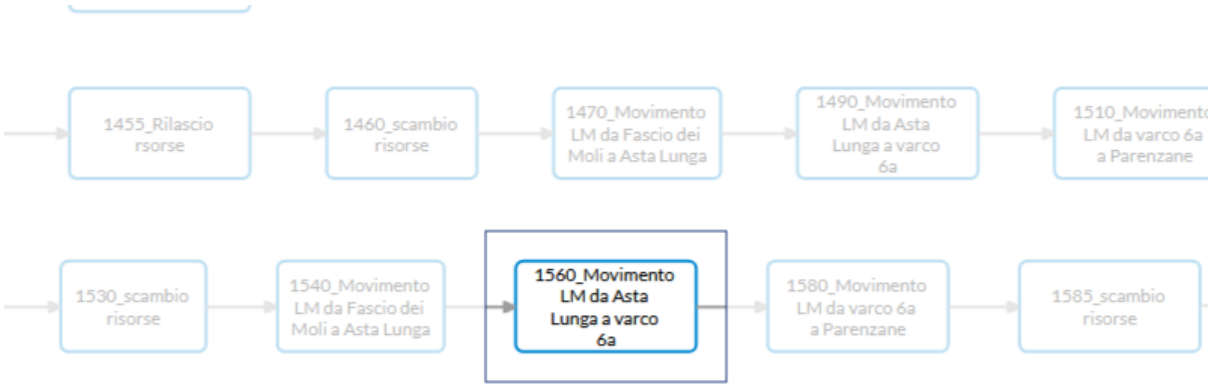
TASK



Incoming	Outgoing
TASK 1420_Movimento LM da FdM a scambio 7	END EVENT LM disponibile in MVII

1560_Movimento LM da Asta Lunga a varco 6a

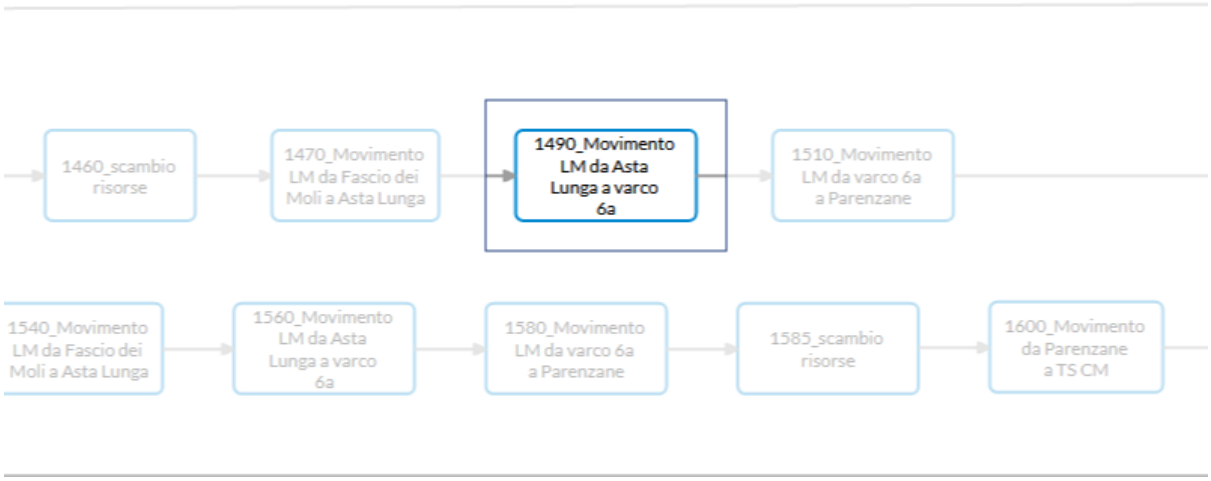
TASK



Incoming	Outgoing
TASK 1540_Movimento LM da Fascio dei Moli a Asta Lunga	TASK 1580_Movimento LM da varco 6a a Parenzane

1490_Movimento LM da Asta Lunga a varco 6a

TASK



Incoming	Outgoing
TASK 1470_Movimento LM da Fascio dei Moli a Asta Lunga	TASK 1510_Movimento LM da varco 6a a Parenzane

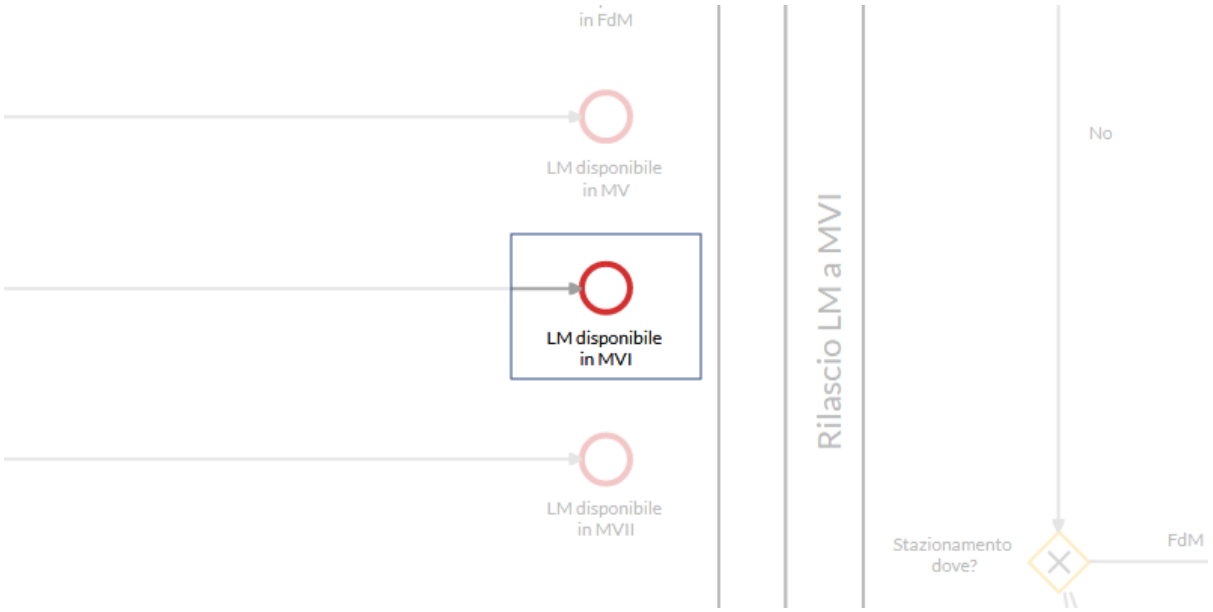
1310_Movimento LM da Asta Lunga a varco 6a

TASK

Incoming	Outgoing
TASK 1290_Movimento LM da Fascio dei Moli a Asta Lunga	TASK 1330_Movimento LM da varco 6a a Parenzane

LM disponibile in MVI

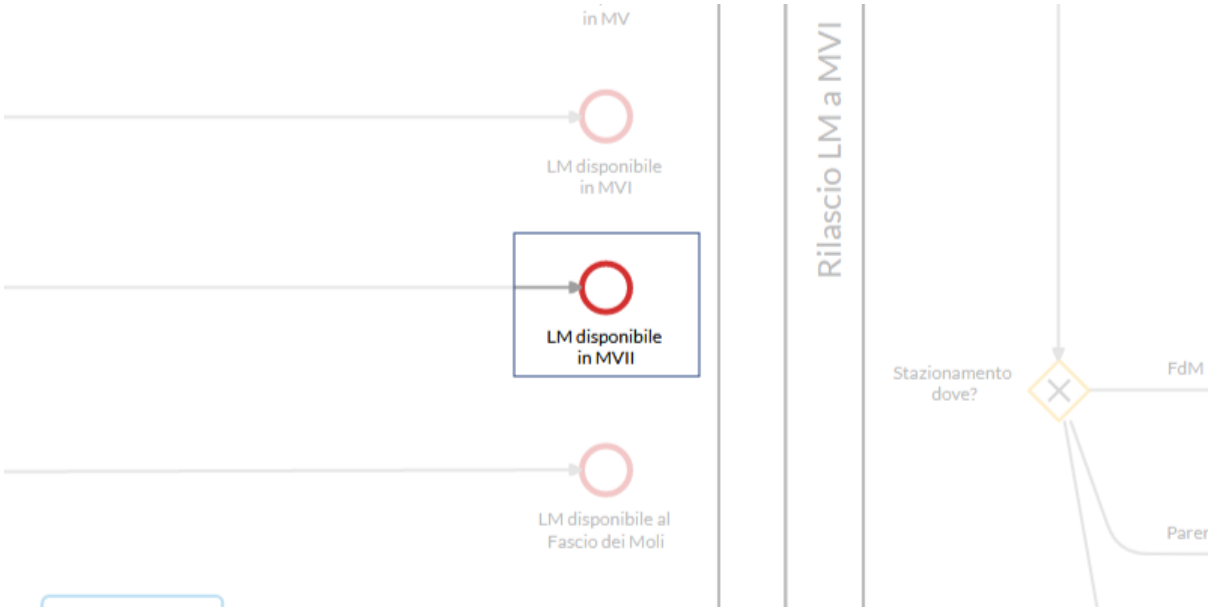
END EVENT



Incoming
TASK 1400_Movimento LM da Asta lunga a MVI

LM disponibile in MVII

END EVENT

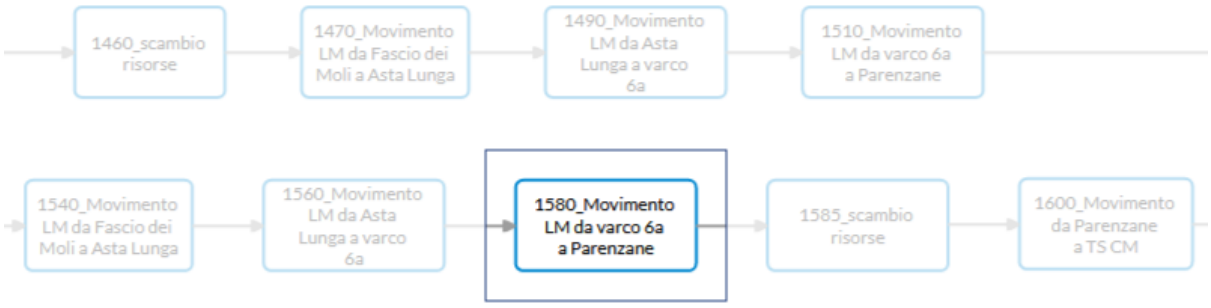


Incoming

TASK
1430_Movimento LM da scambio 7 a MVII

1580_Movimento LM da varco 6a a Parenzane

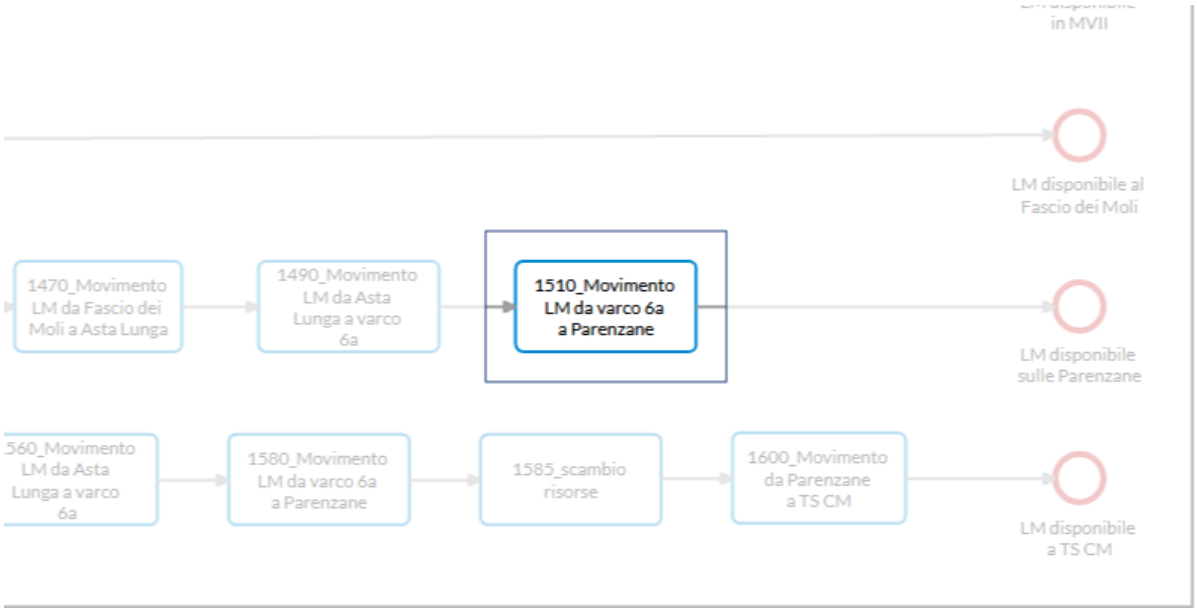
TASK



Incoming	Outgoing
TASK 1560_Movimento LM da Asta Lunga a varco 6a	TASK 1585_scambio risorse

1510_Movimento LM da varco 6a a Parenzane

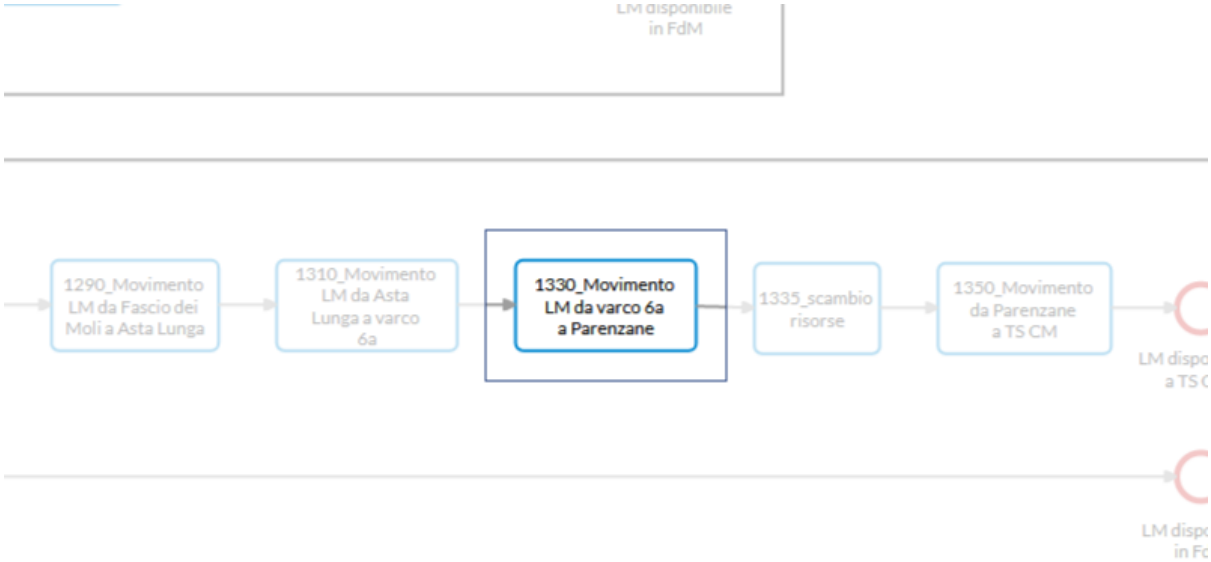
TASK



Incoming	Outgoing
TASK 1490_Movimento LM da Asta Lunga a varco 6a	END EVENT LM disponibile sulle Parenzane

1330_Movimento LM da varco 6a a Parenzane

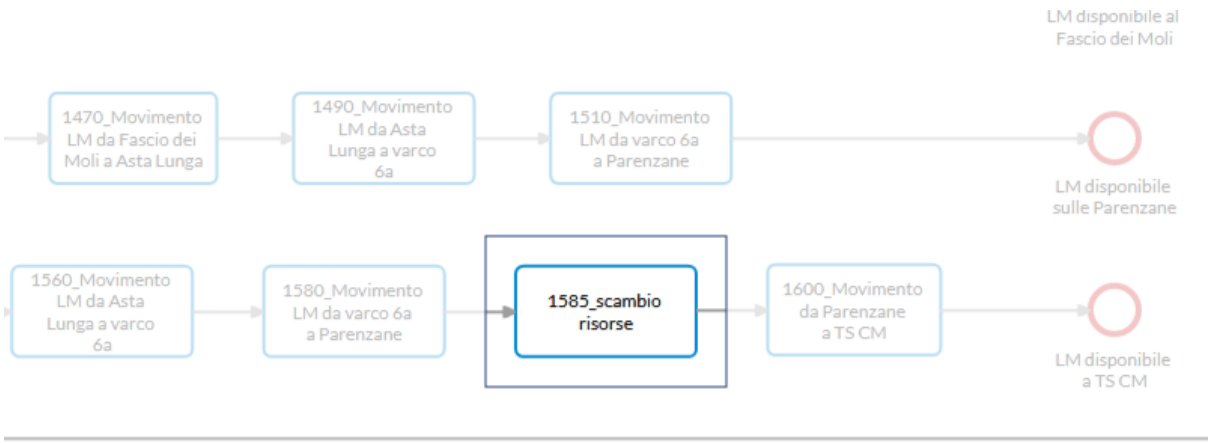
TASK



Incoming	Outgoing
TASK 1310_Movimento LM da Asta Lunga a varco 6a	TASK 1335_scambio risorse

1585_scambio risorse

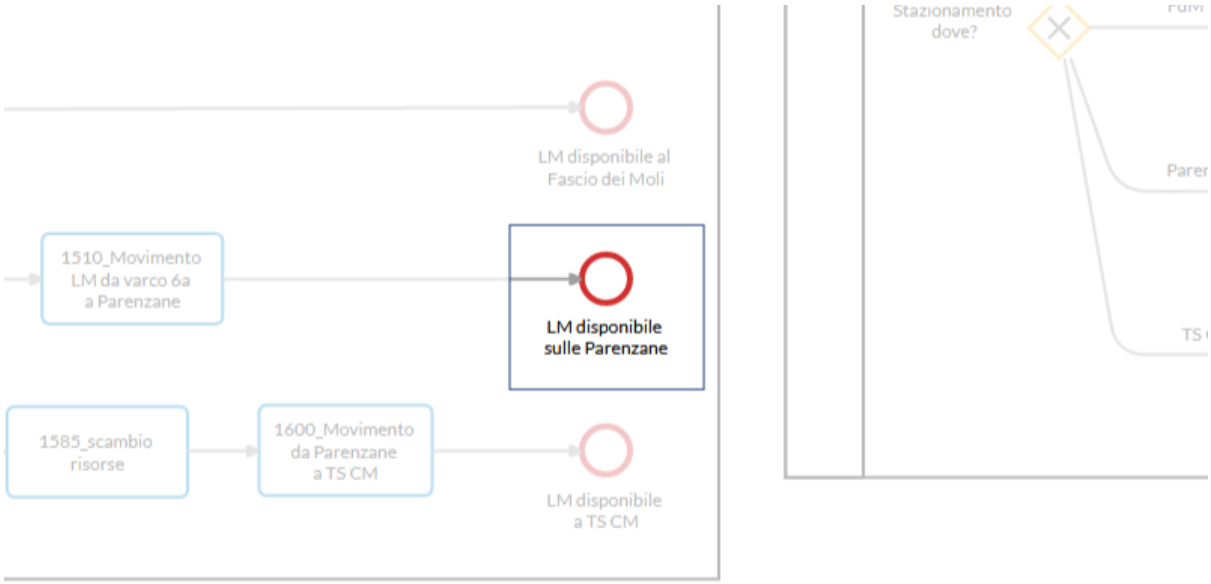
TASK



Incoming	Outgoing
TASK 1580_Movimento LM da varco 6a a Parenzane	TASK 1600_Movimento da Parenzane a TS CM

LM disponibile sulle Parenzane

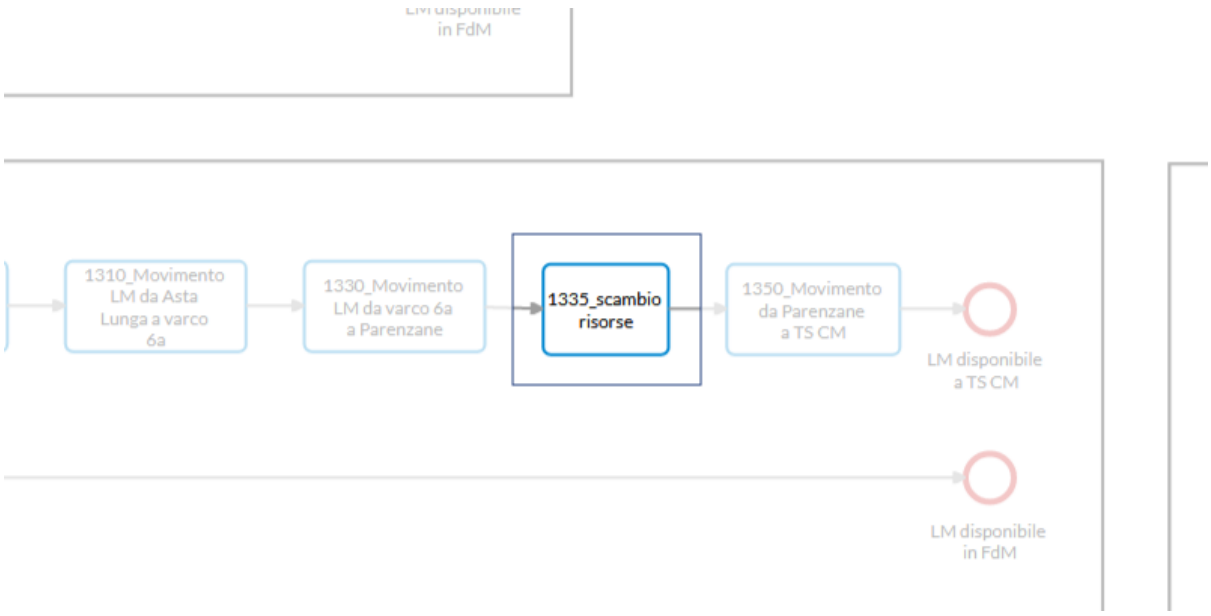
END EVENT



Incoming
TASK 1510_Movimento LM da varco 6a a Parenzane

1335_scambio risorse

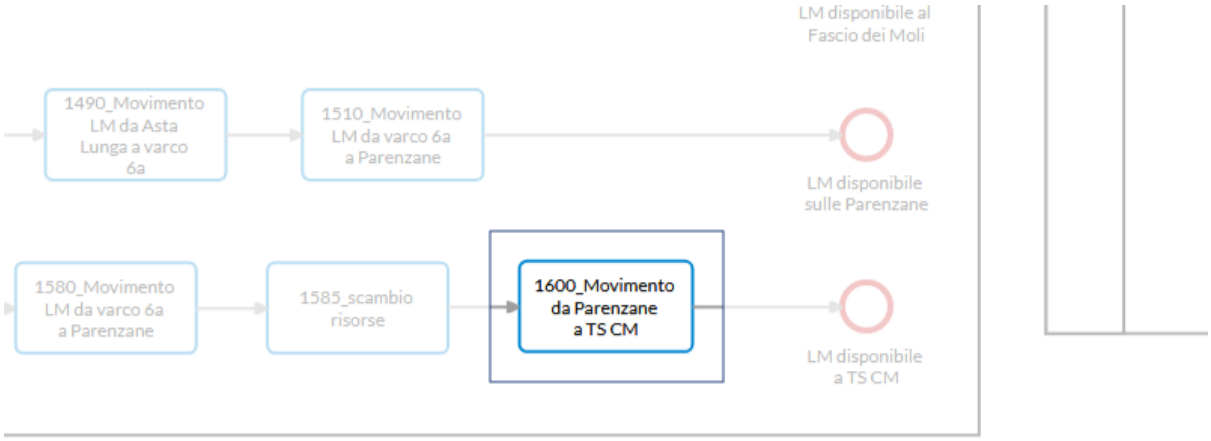
TASK



Incoming	Outgoing
TASK 1330_Movimento LM da varco 6a a Parenzane	TASK 1350_Movimento da Parenzane a TS CM

1600_Movimento da Parenzane a TS CM

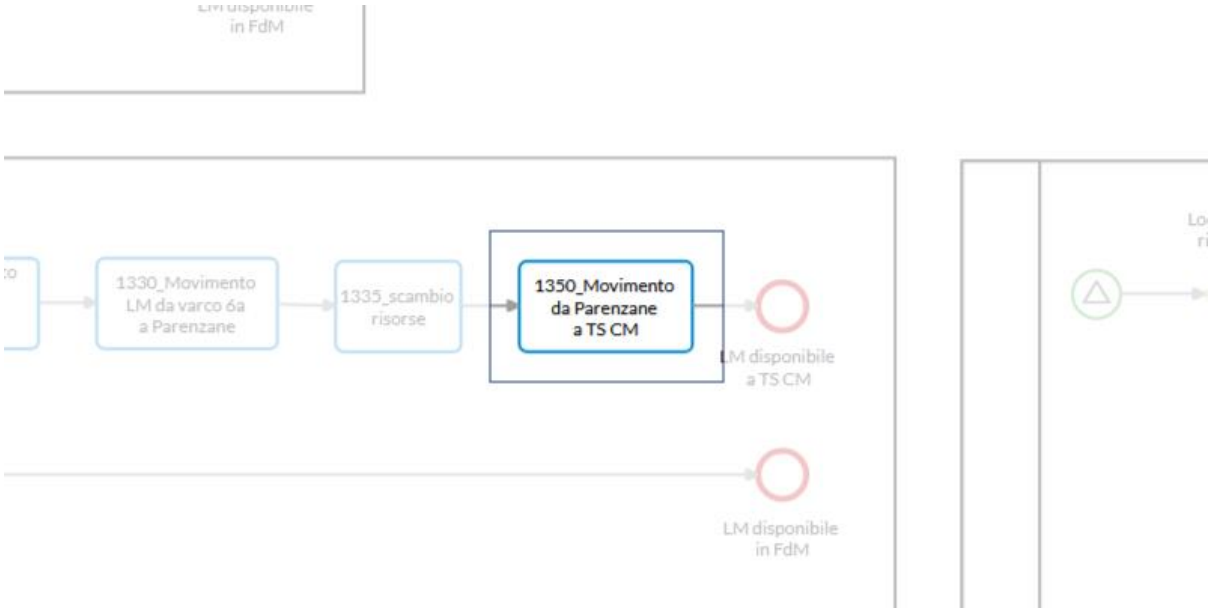
TASK



Incoming	Outgoing
TASK 1585_scambio risorse	END EVENT LM disponibile a TS CM

1350_Movimento da Parenzane a TS CM

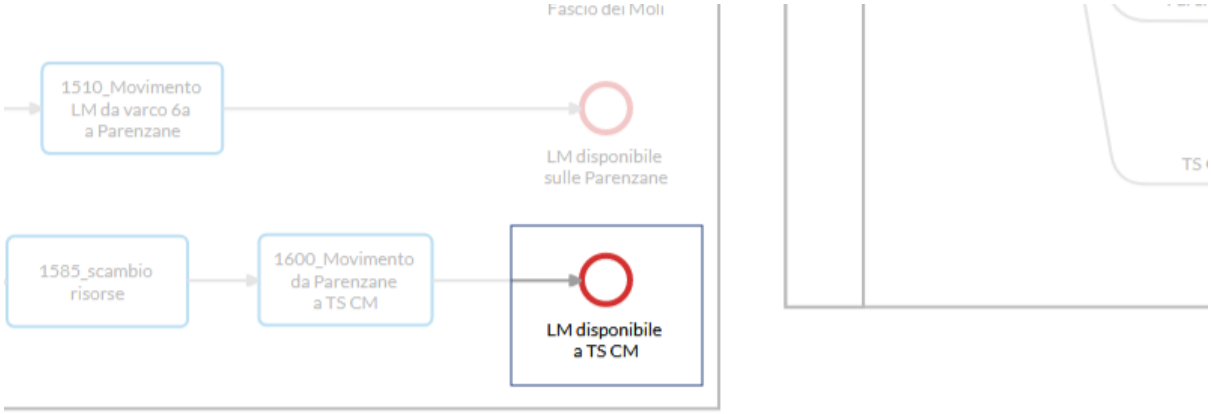
TASK



Incoming	Outgoing
TASK 1335_scambio risorse	END EVENT LM disponibile a TS CM

LM disponibile a TS CM

END EVENT

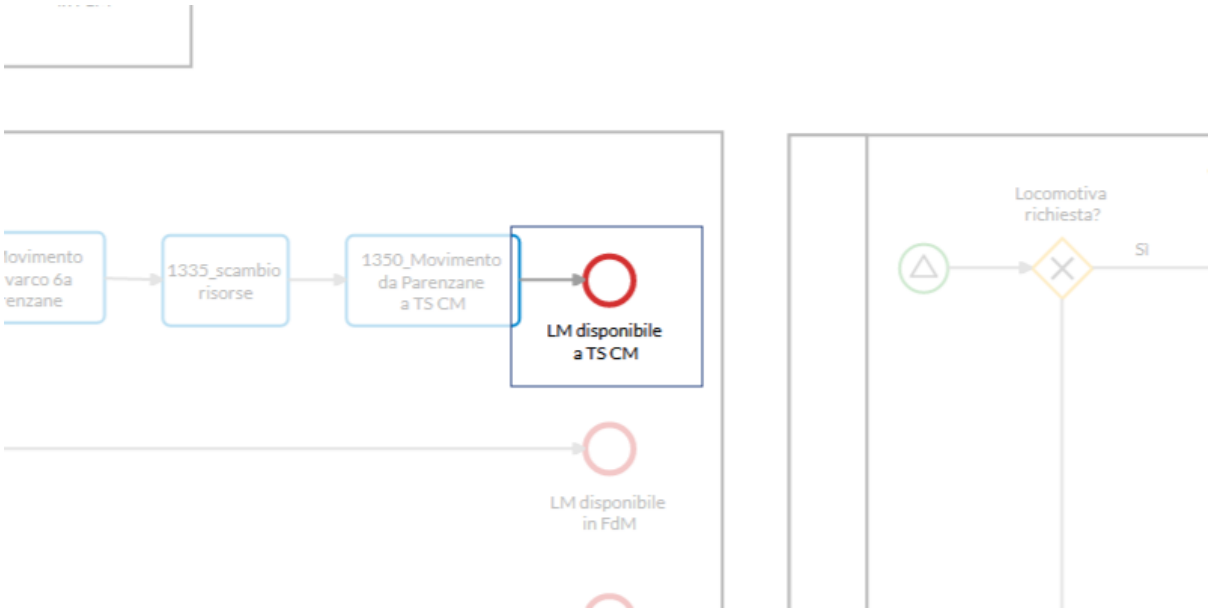


Incoming

TASK
1600_Movimento da Parenzane a TS CM

LM disponibile a TS CM

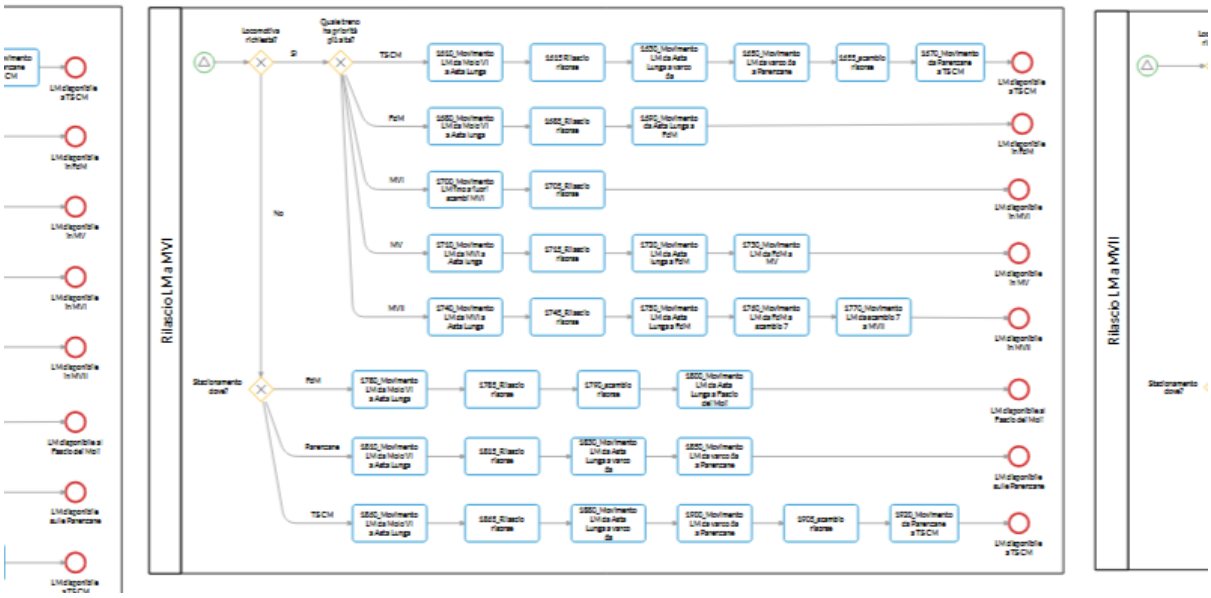
END EVENT



Incoming

TASK
1350_Movimento da Parenzane a TS CM

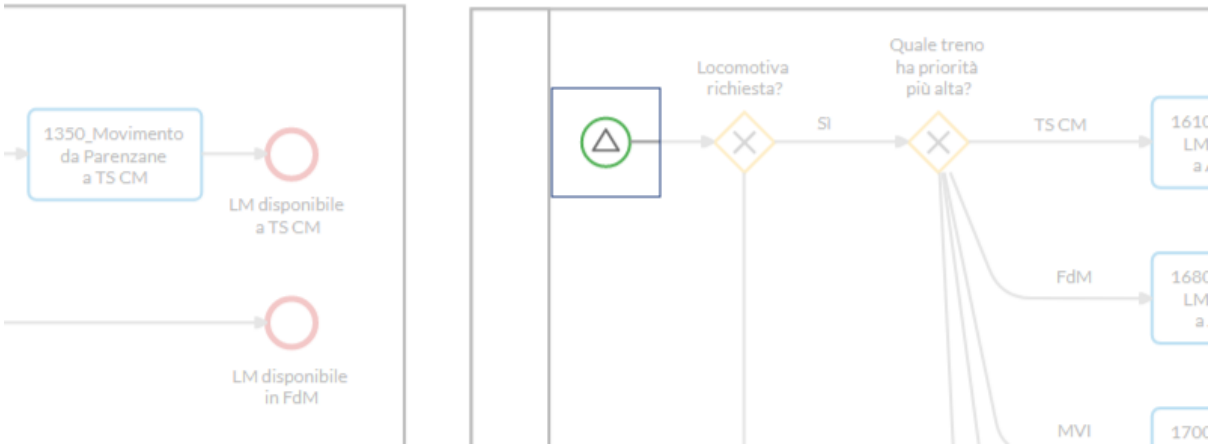
3.4. Process: Rilascio LM a MVI



3.4.1. Process Elements

signalStartEvents_724c235c-e095-1dc6-3d90-6275d2075b17

SIGNAL START EVENT



Outgoing

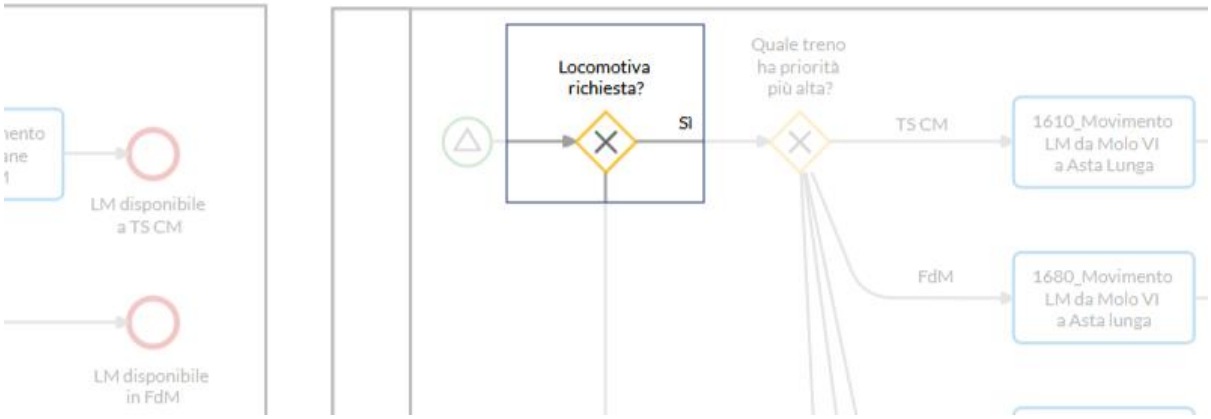
EXCLUSIVE GATEWAY
Locomotiva richiesta?

Attributes

SIGNAL REFERENCE
Locomotiva_molo6

Locomotiva richiesta?

EXCLUSIVE GATEWAY



Incoming

SIGNAL START EVENT
signalStartEvents_724c235c-e095-1dc6-3d90-6275d2075b17

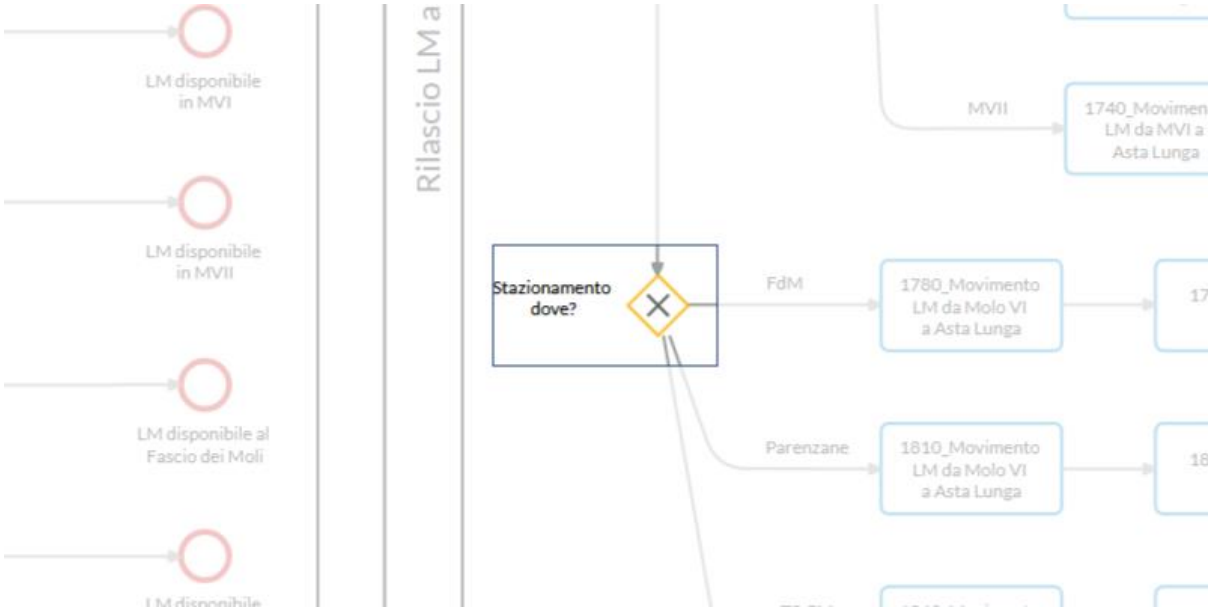
Outgoing

EXCLUSIVE GATEWAY
Stazionamento dove?
through No

EXCLUSIVE GATEWAY
Quale treno ha priorità più alta?
through Sì

Stazionamento dove?

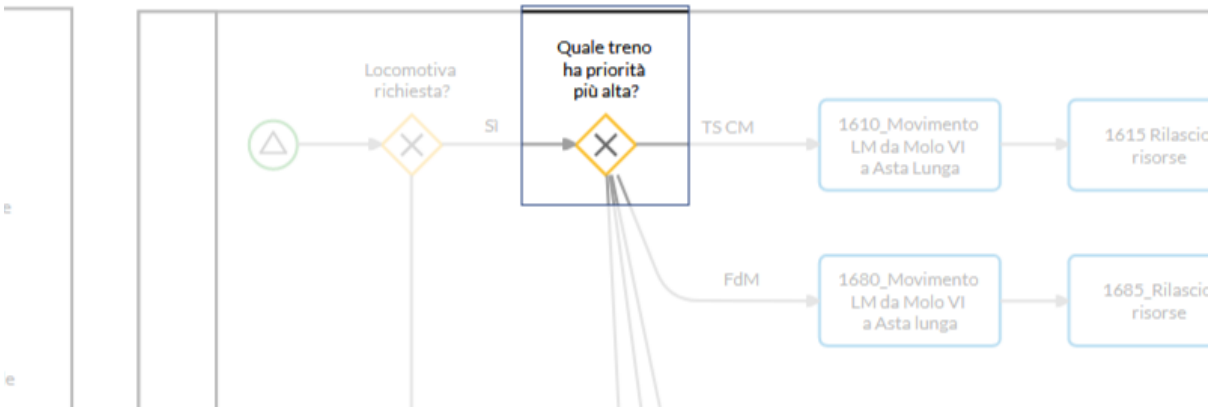
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY Locomotiva richiesta? through No	TASK 1780_Movimento LM da Molo VI a Asta Lunga through FdM
	TASK 1810_Movimento LM da Molo VI a Asta Lunga through Parenzane
	TASK 1860_Movimento LM da Molo VI a Asta Lunga through TS CM

Quale treno ha priorità più alta?

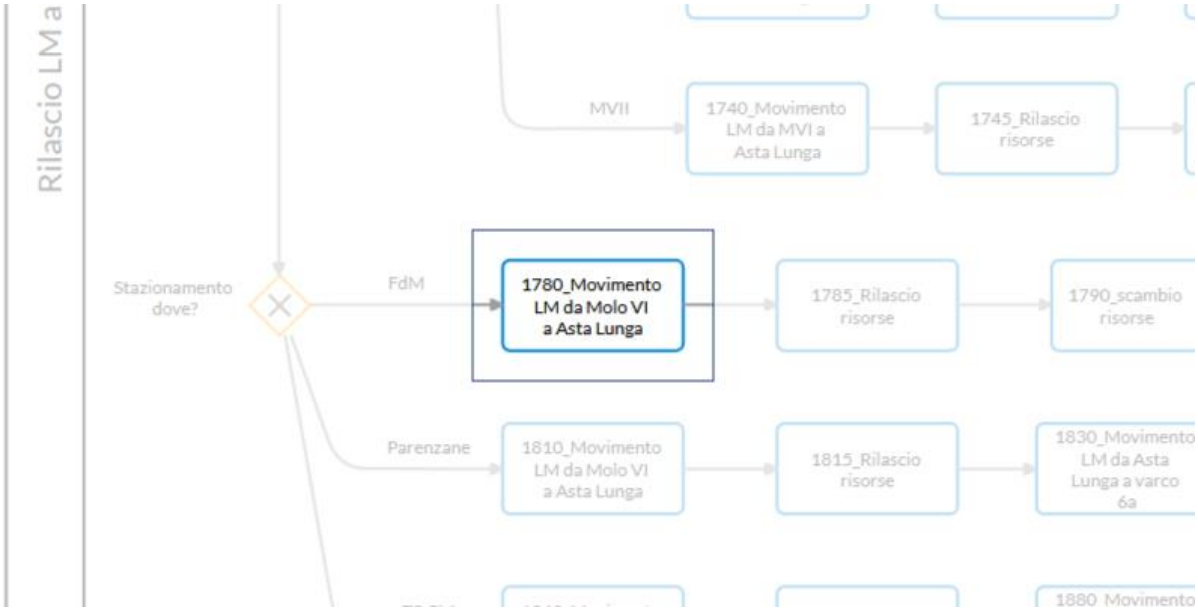
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY Locomotiva richiesta? through Sì	TASK 1610_Movimento LM da Molo VI a Asta Lunga through TS CM
	TASK 1700_Movimento LM fino a fuori scambi MVI through MVI
	TASK 1710_Movimento LM da MVI a Asta lunga through MV
	TASK 1740_Movimento LM da MVI a Asta Lunga through MVII
	TASK 1680_Movimento LM da Molo VI a Asta lunga through FdM

1780_Movimento LM da Molo VI a Asta Lunga

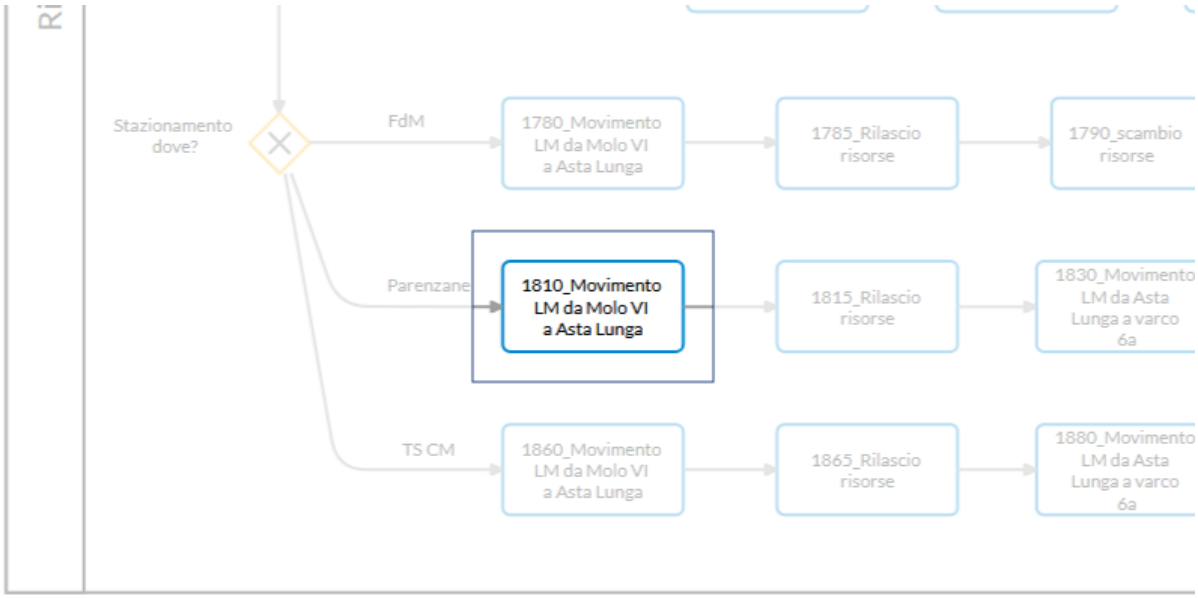
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through FdM	TASK 1785_Rilascio risorse

1810_Movimento LM da Molo VI a Asta Lunga

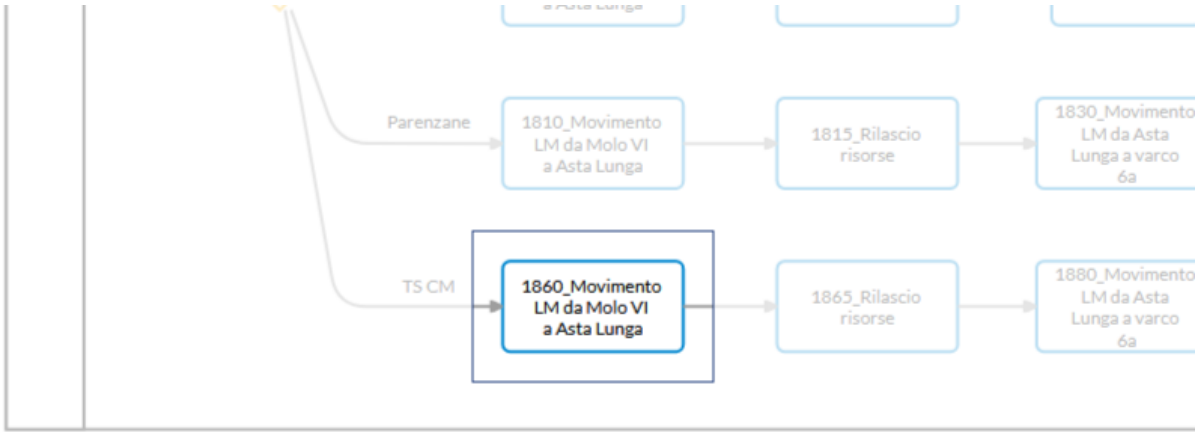
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through Parenzane	TASK 1815_Rilascio risorse

1860_Movimento LM da Molo VI a Asta Lunga

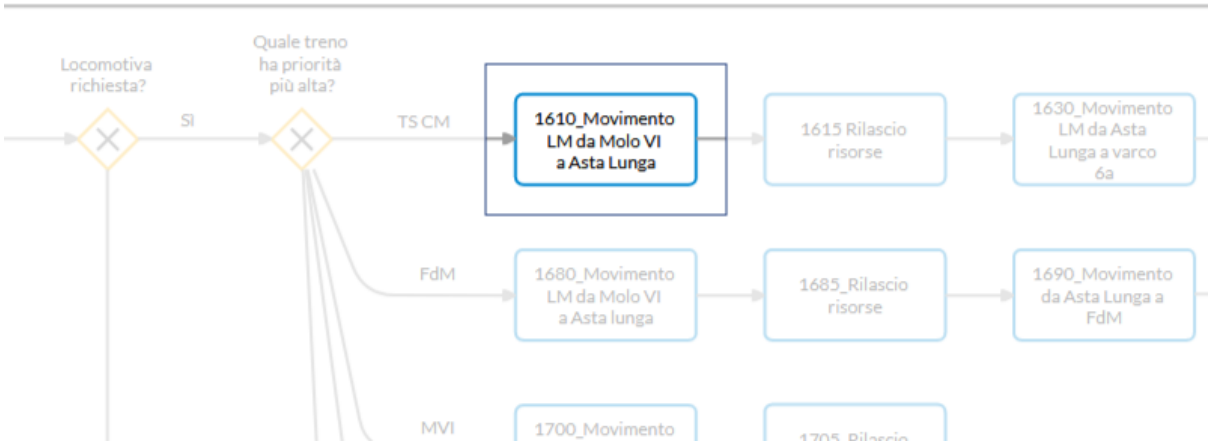
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through TS CM	TASK 1865_Rilascio risorse

1610_Movimento LM da Molo VI a Asta Lunga

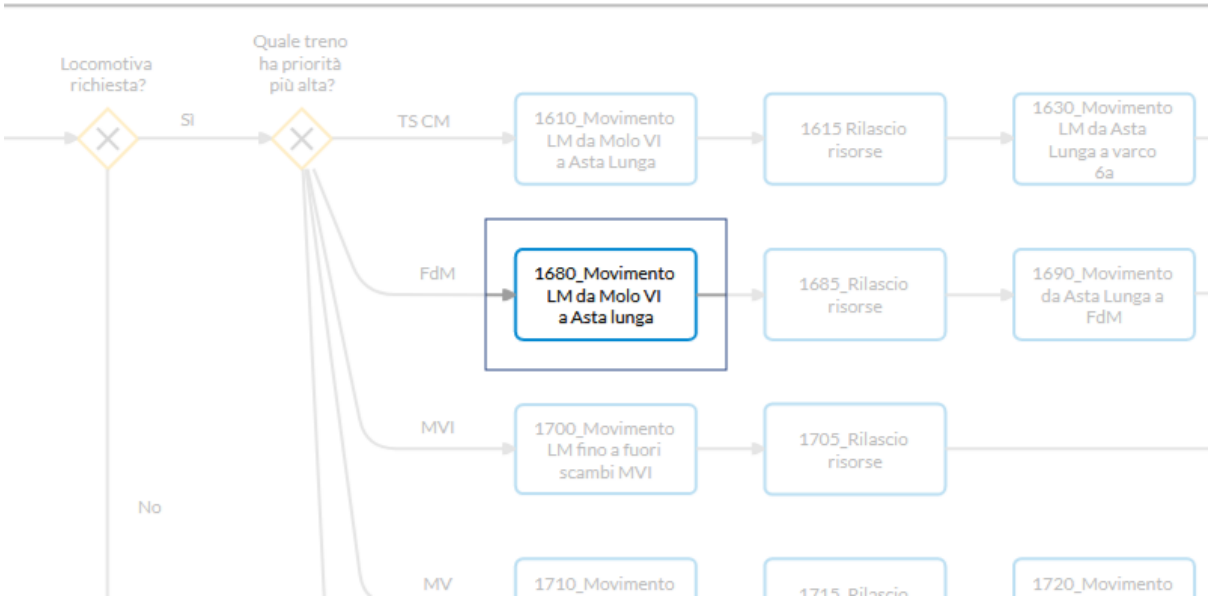
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through TS CM	TASK 1615 Rilascio risorse

1680_Movimento LM da Molo VI a Asta lunga

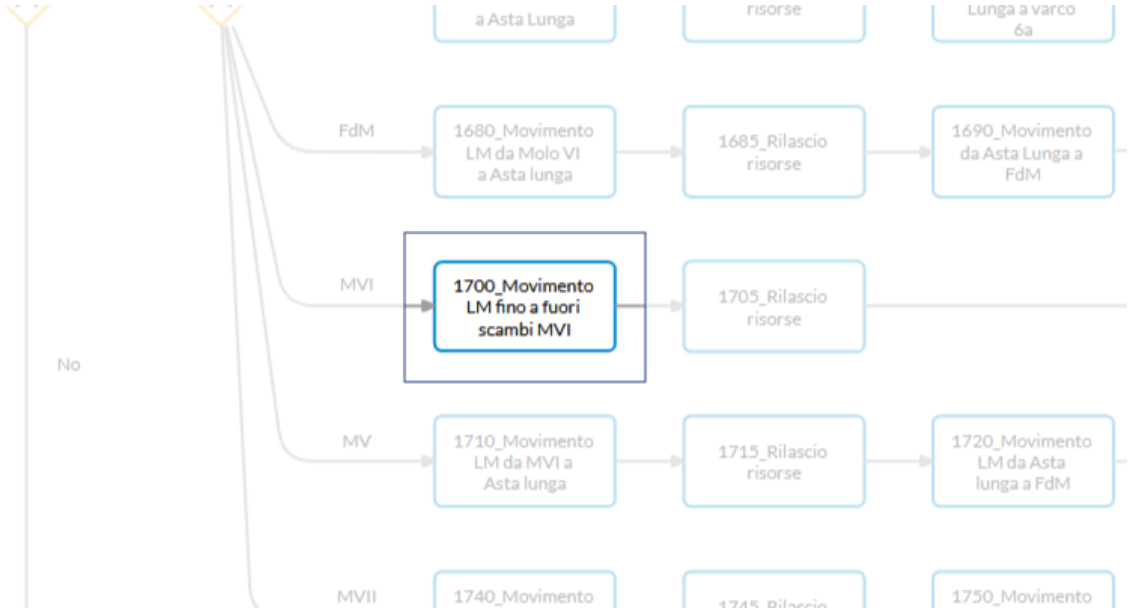
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through FdM	TASK 1685_Rilascio risorse

1700_Movimento LM fino a fuori scambi MVI

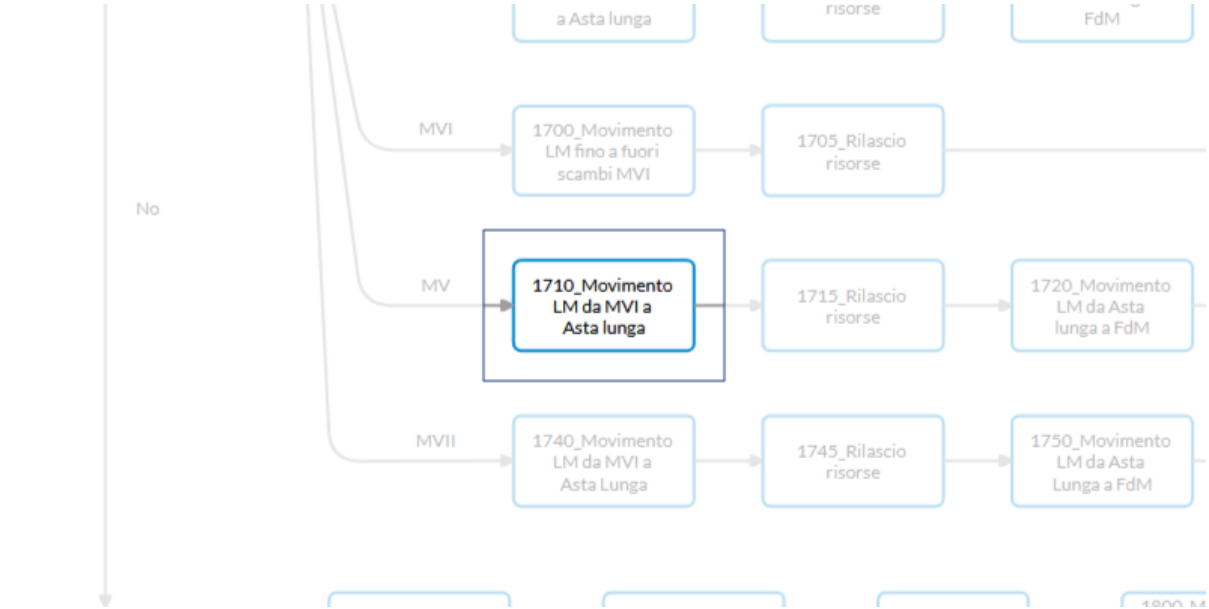
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MVI	TASK 1705_Rilascio risorse

1710_Movimento LM da MVI a Asta lunga

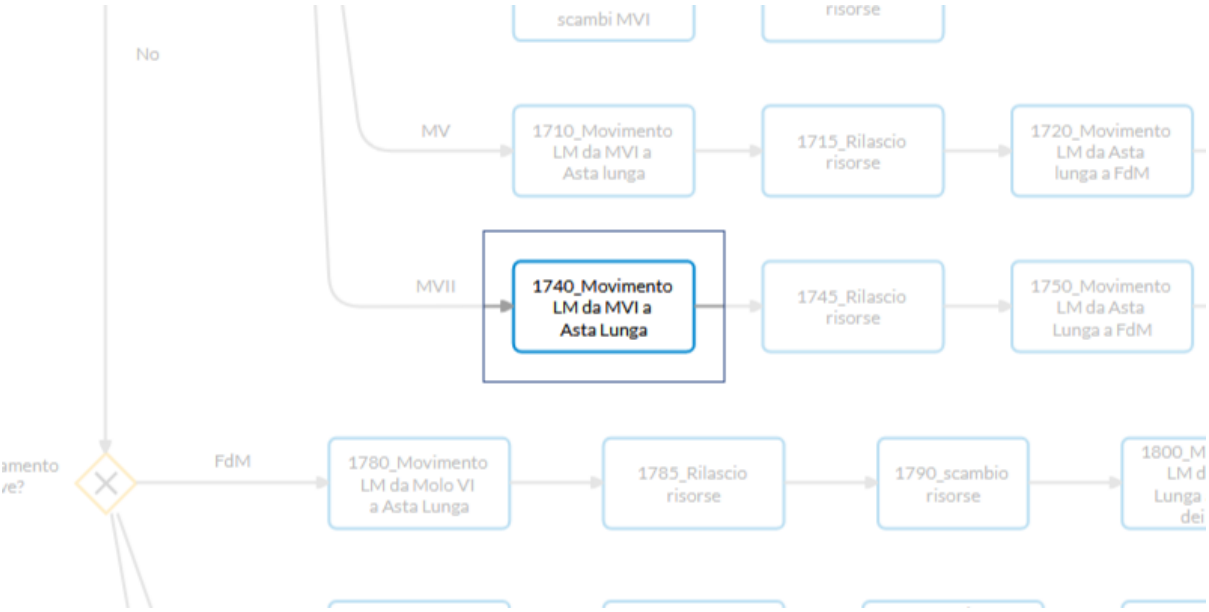
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MV	TASK 1715_Rilascio risorse

1740_Movimento LM da MVI a Asta Lunga

TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MVII	TASK 1745_Rilascio risorse

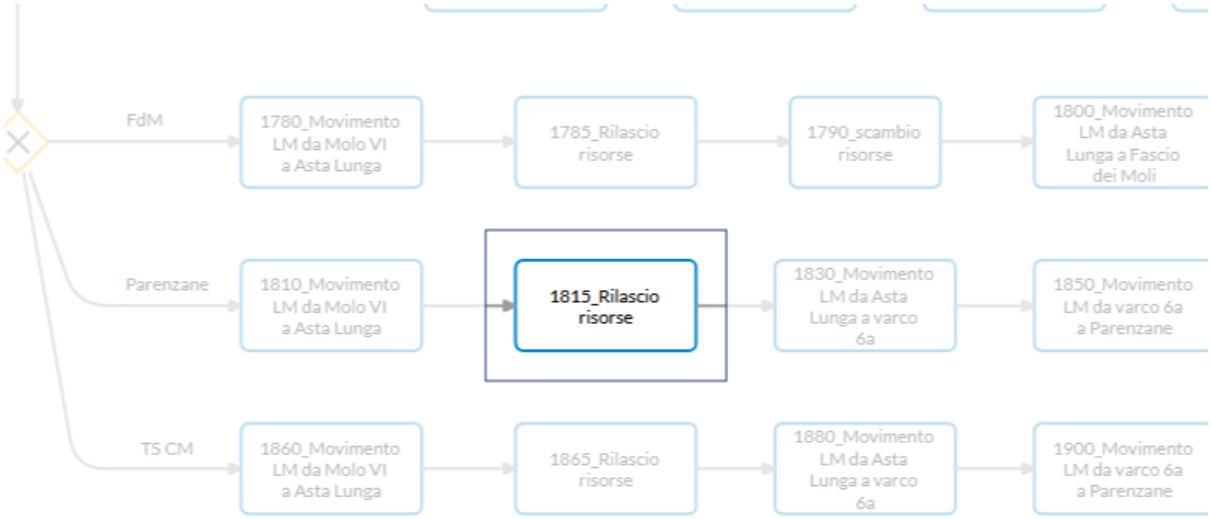
1785_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1780_Movimento LM da Molo VI a Asta Lunga	TASK 1790_scambio risorse

1815_Rilascio risorse

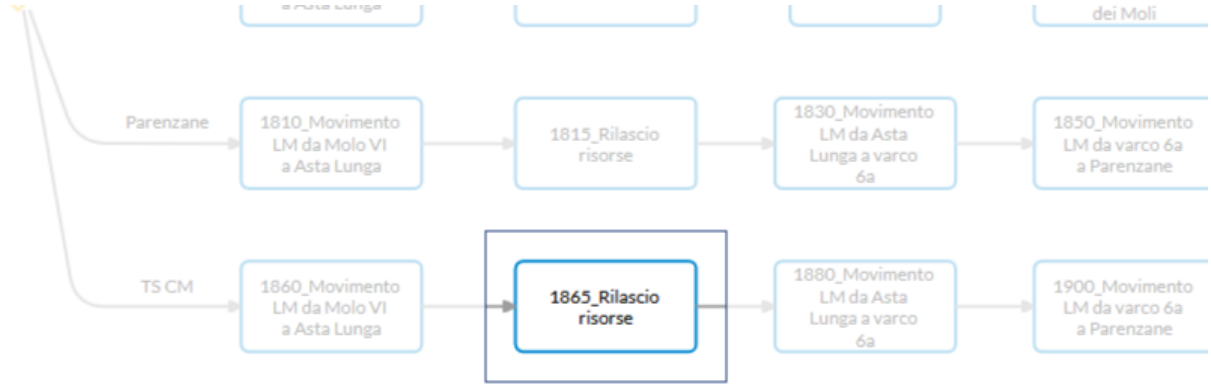
TASK



Incoming	Outgoing
TASK 1810_Movimento LM da Molo VI a Asta Lunga	TASK 1830_Movimento LM da Asta Lunga a varco 6a

1865_Rilascio risorse

TASK



Incoming	Outgoing
TASK 1860_Movimento LM da Molo VI a Asta Lunga	TASK 1880_Movimento LM da Asta Lunga a varco 6a

1615 Rilascio risorse

TASK

Incoming	Outgoing
TASK 1610_Movimento LM da Molo VI a Asta Lunga	TASK 1630_Movimento LM da Asta Lunga a varco 6a

1685_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1680_Movimento LM da Molo VI a Asta lunga	TASK 1690_Movimento da Asta Lunga a FdM

1705_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1700_Movimento LM fino a fuori scambi MVI	END EVENT LM disponibile in MVI

1715_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1710_Movimento LM da MVI a Asta lunga	TASK 1720_Movimento LM da Asta lunga a FdM

1745_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1740_Movimento LM da MVI a Asta Lunga	TASK 1750_Movimento LM da Asta Lunga a FdM

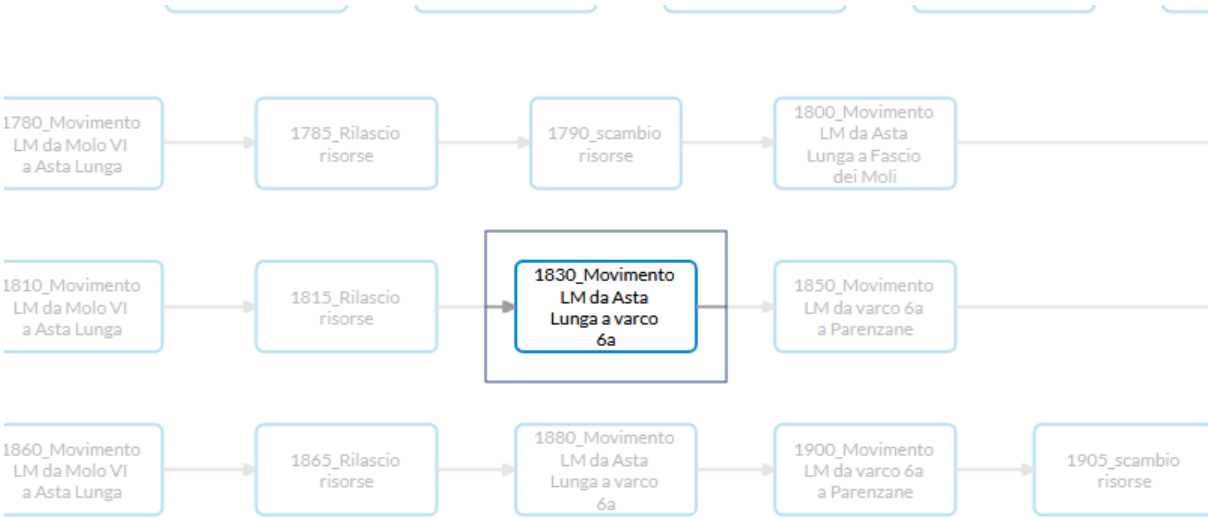
1790_scambio risorse

TASK

Incoming	Outgoing
TASK 1785_Rilascio risorse	TASK 1800_Movimento LM da Asta Lunga a Fascio dei Moli

1830_Movimento LM da Asta Lunga a varco 6a

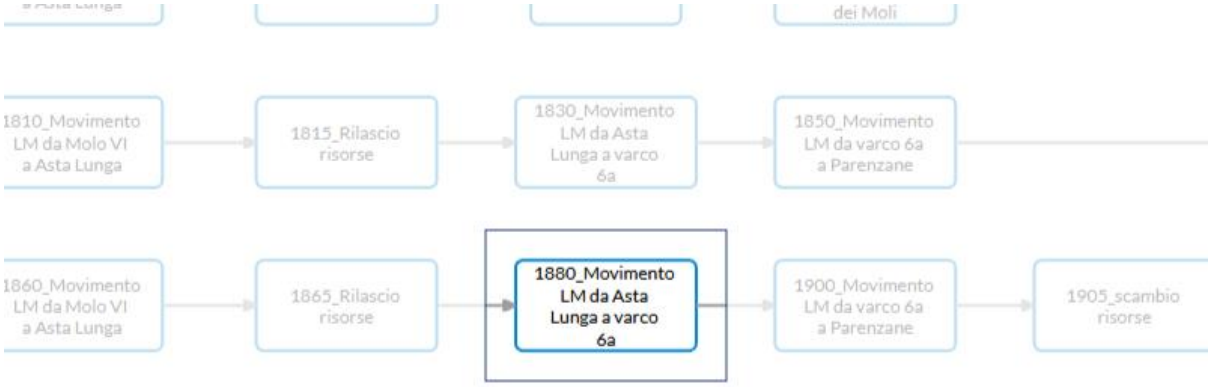
TASK



Incoming	Outgoing
TASK 1815_Rilascio risorse	TASK 1850_Movimento LM da varco 6a a Parenzane

1880_Movimento LM da Asta Lunga a varco 6a

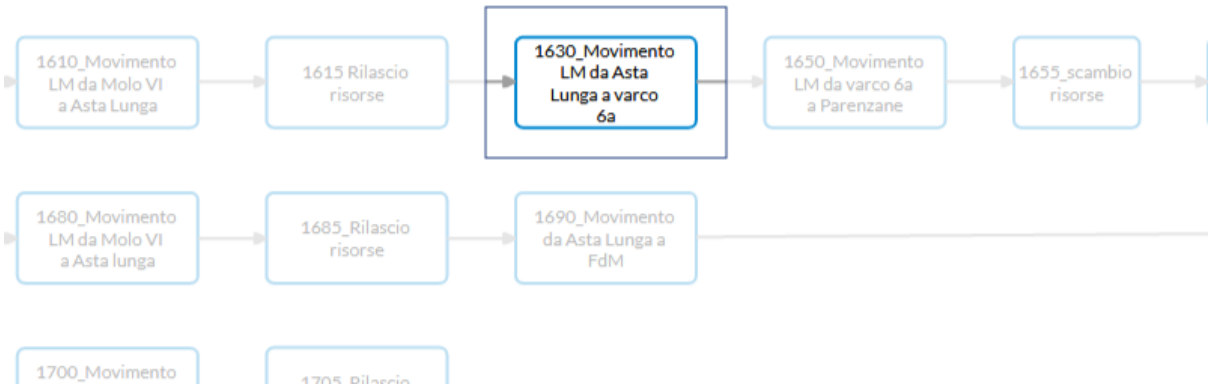
TASK



Incoming	Outgoing
TASK 1865_Rilascio risorse	TASK 1900_Movimento LM da varco 6a a Parenzane

1630_Movimento LM da Asta Lunga a varco 6a

TASK



Incoming	Outgoing
TASK 1615 Rilascio risorse	TASK 1650_Movimento LM da varco 6a a Parenzane

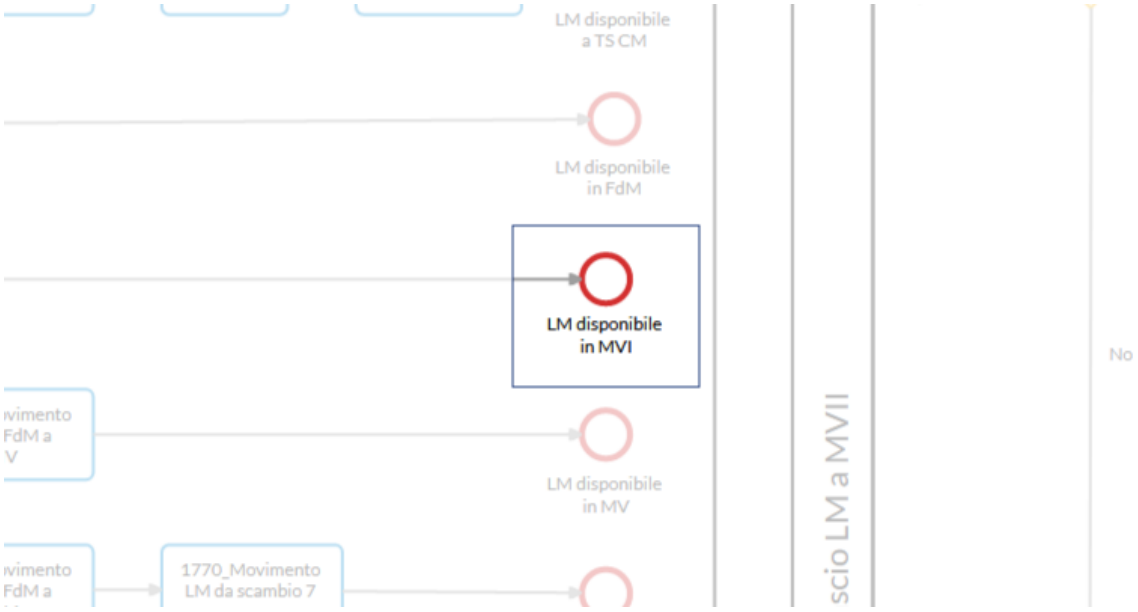
1690_Movimento da Asta Lunga a FdM

TASK

Incoming	Outgoing
TASK 1685_Rilascio risorse	END EVENT LM disponibile in FdM

LM disponibile in MVI

END EVENT



Incoming

TASK
1705_Rilascio risorse

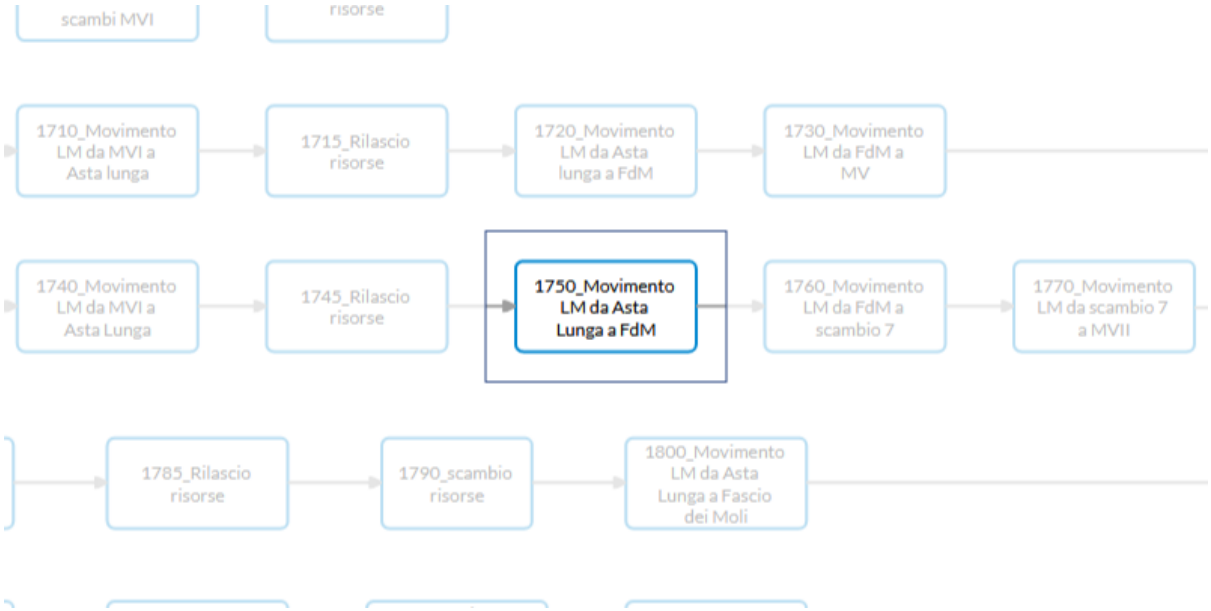
1720_Movimento LM da Asta lunga a FdM

TASK

Incoming	Outgoing
TASK 1715_Rilascio risorse	TASK 1730_Movimento LM da FdM a MV

1750_Movimento LM da Asta Lunga a FdM

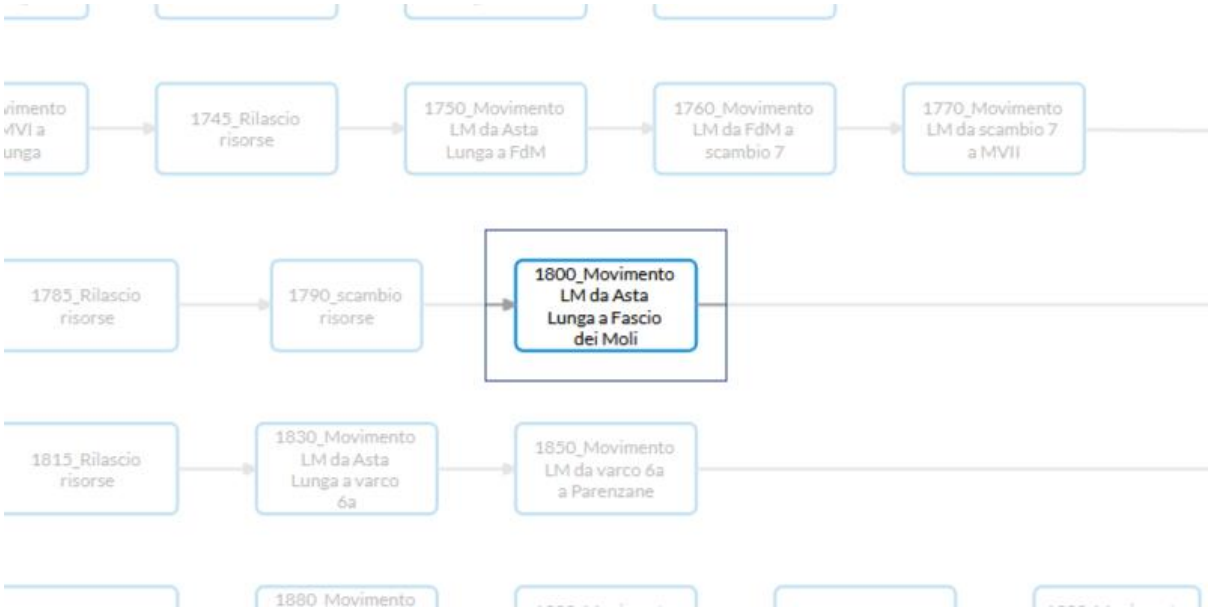
TASK



Incoming	Outgoing
TASK 1745_Rilascio risorse	TASK 1760_Movimento LM da FdM a scambio 7

1800_Movimento LM da Asta Lunga a Fascio dei Moli

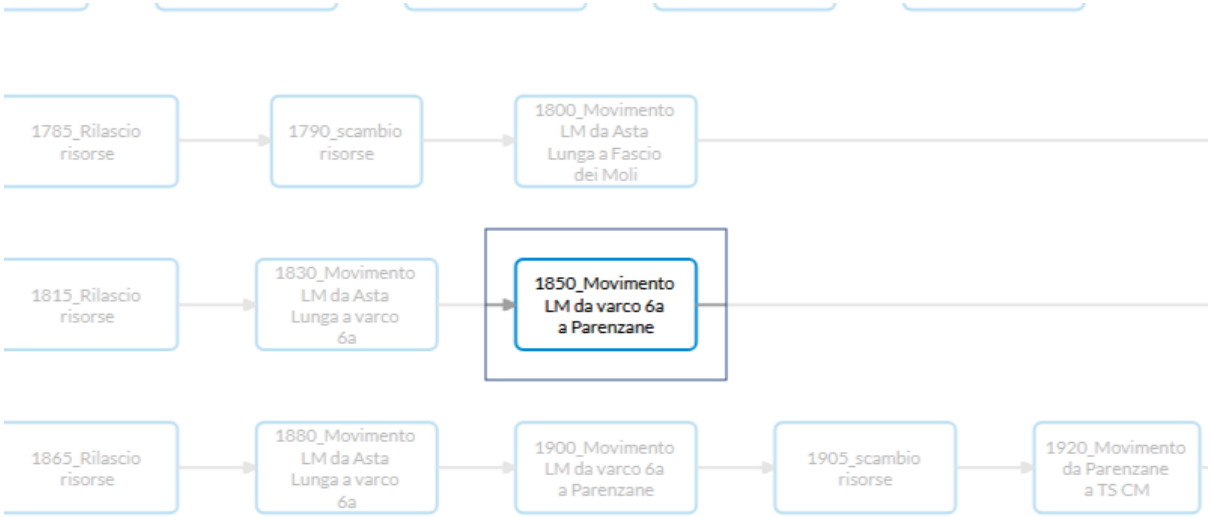
TASK



Incoming	Outgoing
TASK 1790_scambio risorse	END EVENT LM disponibile al Fascio dei Moli

1850_Movimento LM da varco 6a a Parenzane

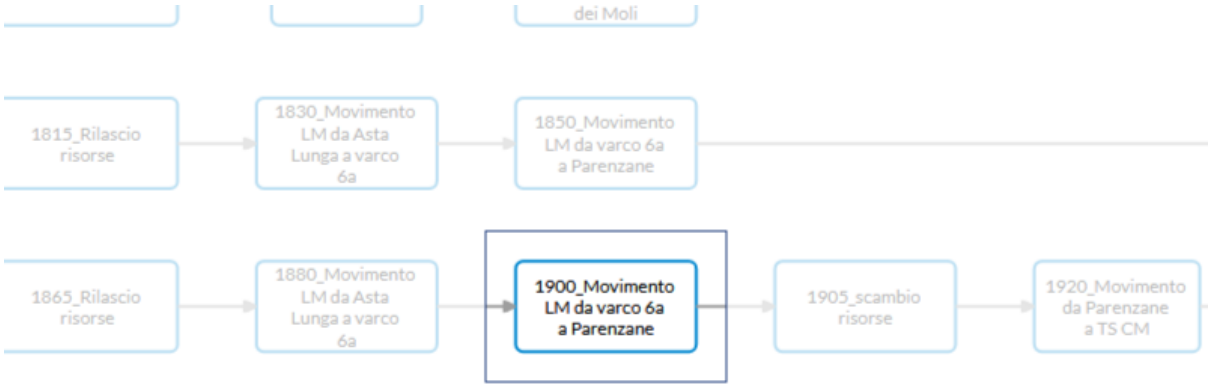
TASK



Incoming	Outgoing
TASK 1830_Movimento LM da Asta Lunga a varco 6a	END EVENT LM disponibile sulle Parenzane

1900_Movimento LM da varco 6a a Parenzane

TASK



Incoming	Outgoing
TASK 1880_Movimento LM da Asta Lunga a varco 6a	TASK 1905_scambio risorse

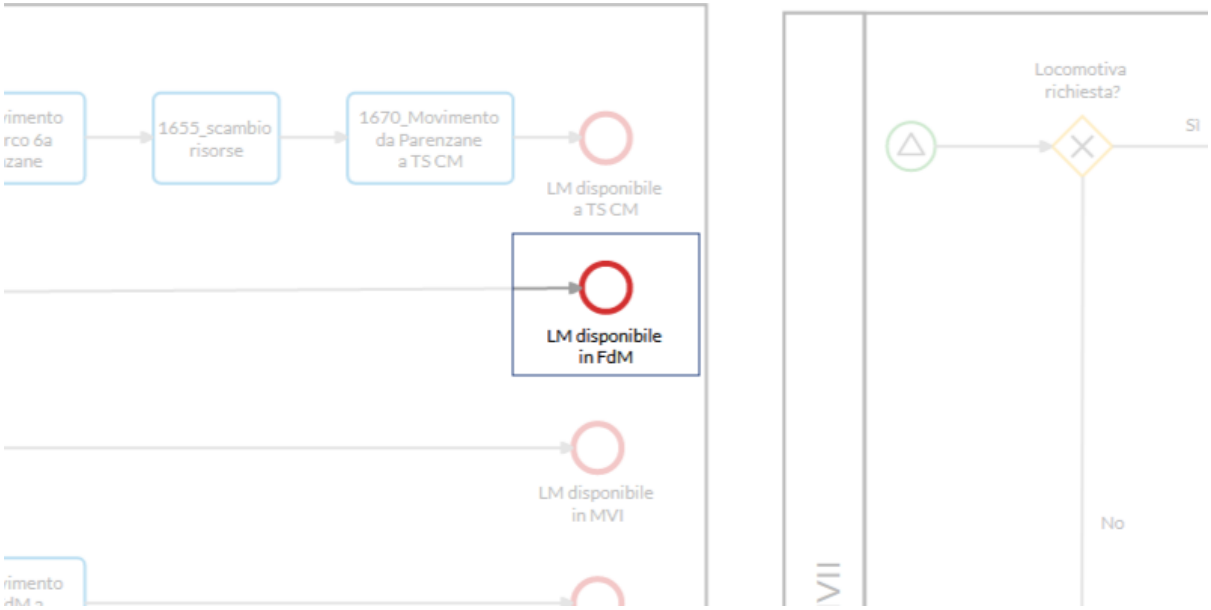
1650_Movimento LM da varco 6a a Parenzane

TASK

Incoming	Outgoing
TASK 1630_Movimento LM da Asta Lunga a varco 6a	TASK 1655_scambio risorse

LM disponibile in FdM

END EVENT

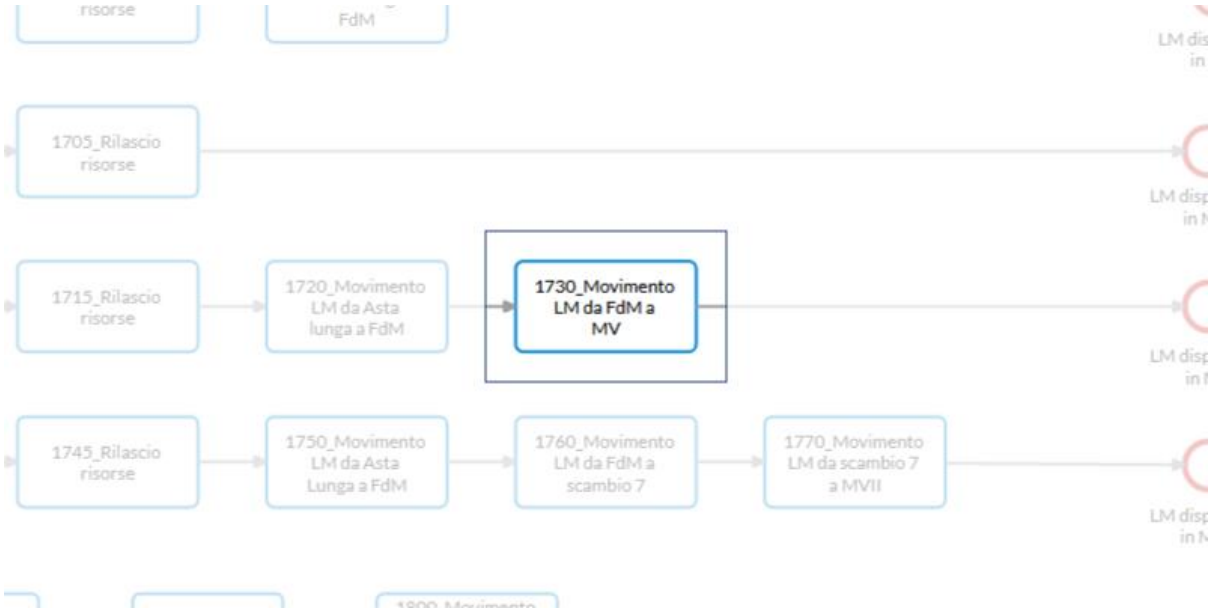


Incoming

TASK
1690_Movimento da Asta Lunga a FdM

1730_Movimento LM da FdM a MV

TASK



Incoming

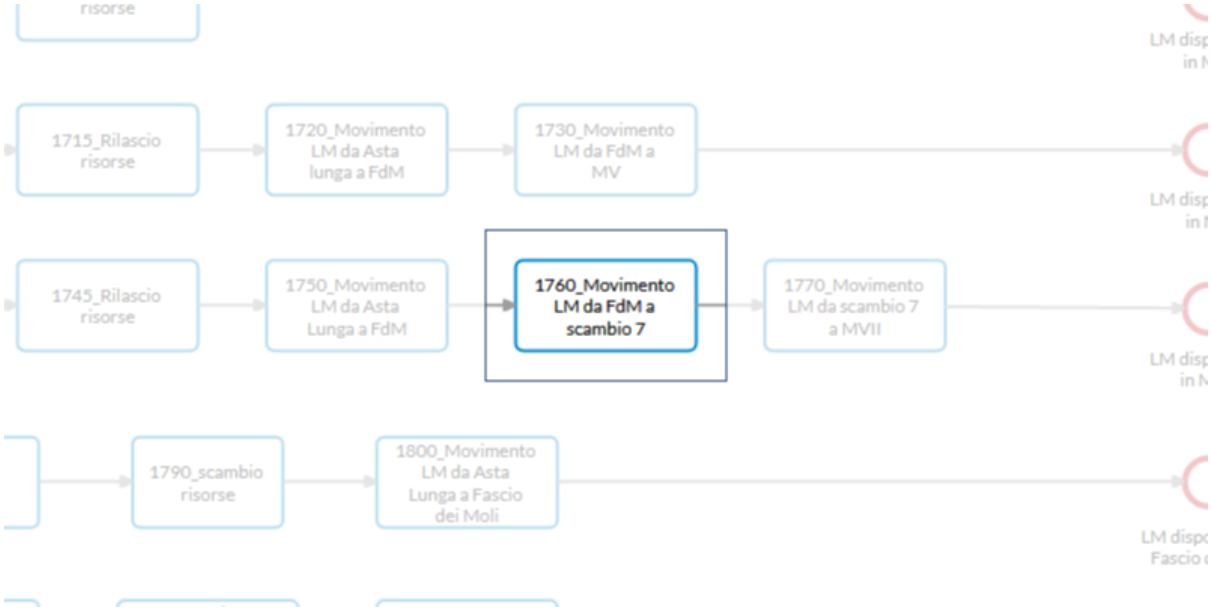
TASK
1720_Movimento LM da Asta lunga a FdM

Outgoing

END EVENT
LM disponibile in MV

1760_Movimento LM da FdM a scambio 7

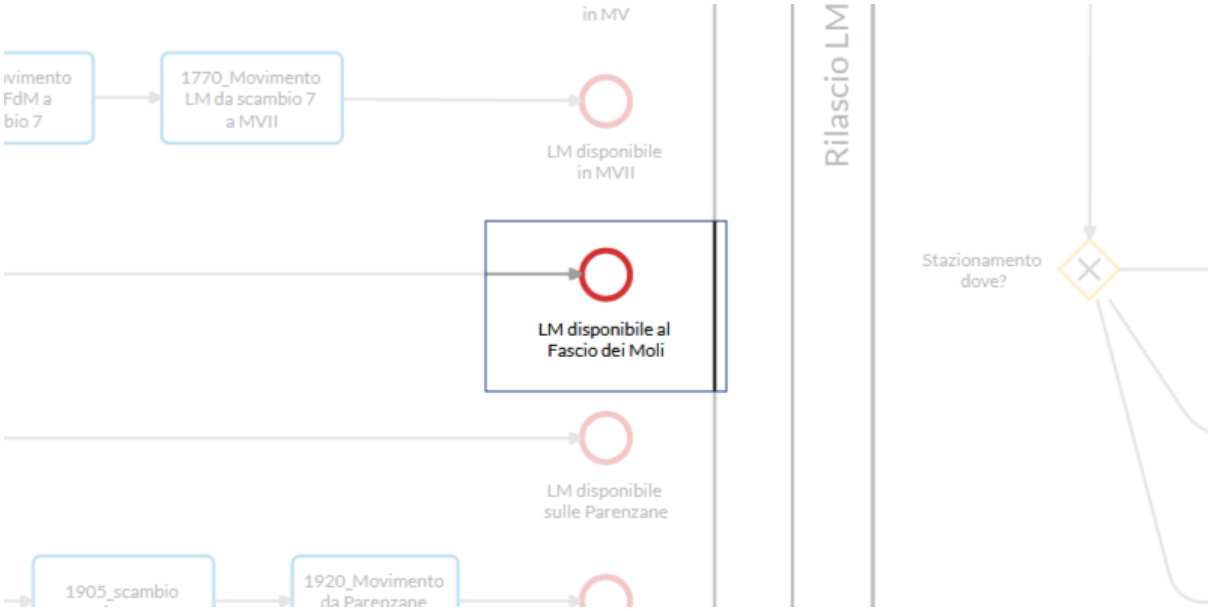
TASK



Incoming	Outgoing
TASK 1750_Movimento LM da Asta Lunga a FdM	TASK 1770_Movimento LM da scambio 7 a MVII

LM disponibile al Fascio dei Moli

END EVENT

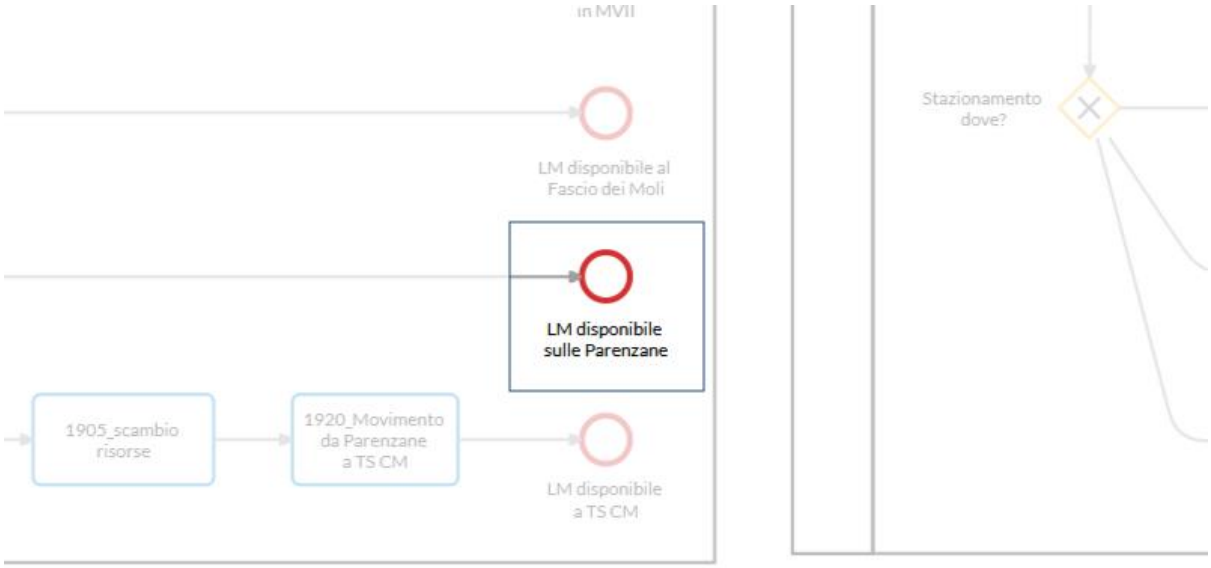


Incoming

TASK
1800_Movimento LM da Asta Lunga a Fascio dei Moli

LM disponibile sulle Parenzane

END EVENT

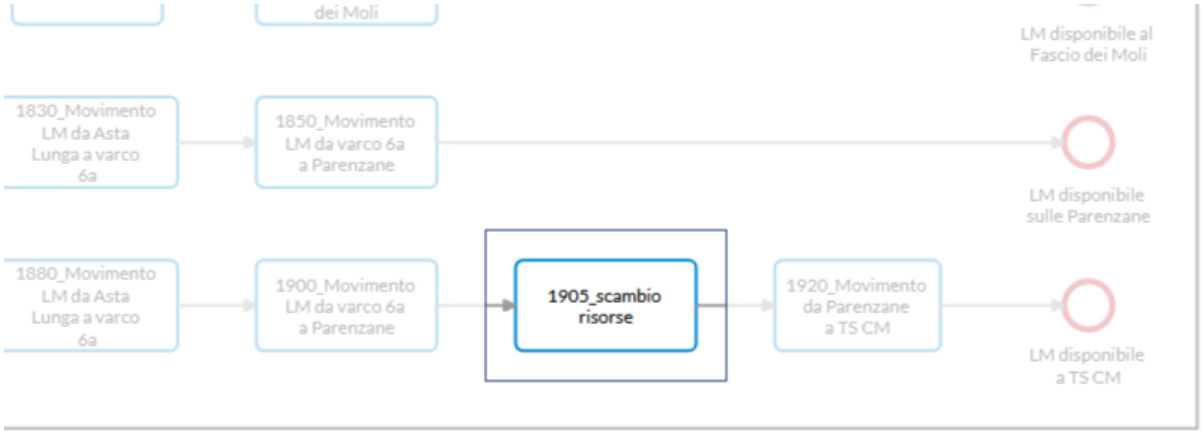


Incoming

TASK
1850_Movimento LM da varco 6a a Parenzane

1905_scambio risorse

TASK



Incoming	Outgoing
TASK 1900_Movimento LM da varco 6a a Parenzane	TASK 1920_Movimento da Parenzane a TS CM

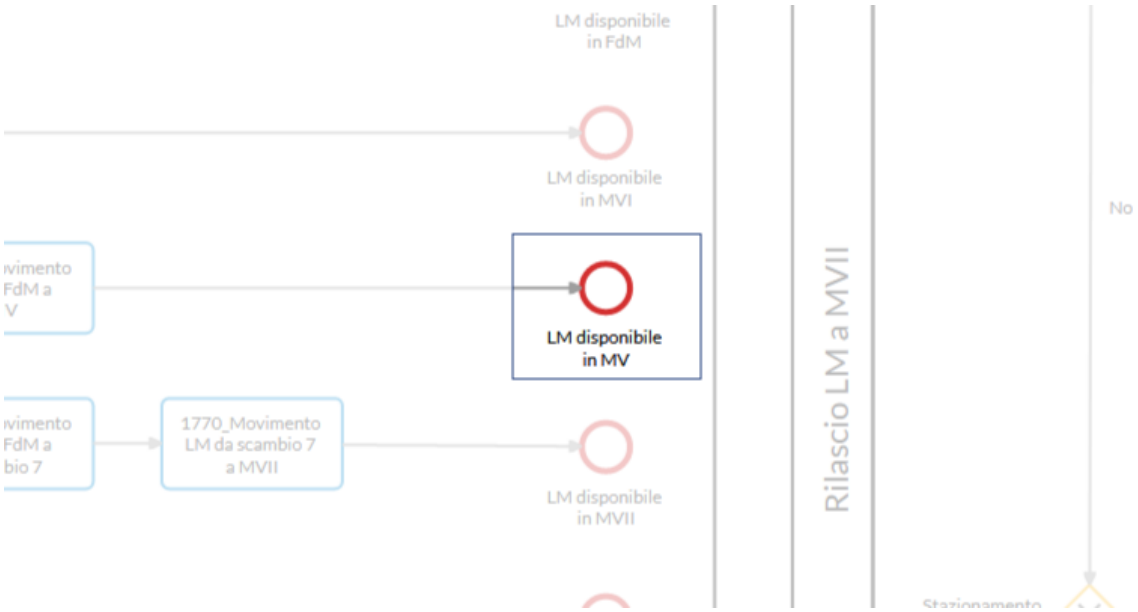
1655_scambio risorse

TASK

Incoming	Outgoing
TASK 1650_Movimento LM da varco 6a a Parenzane	TASK 1670_Movimento da Parenzane a TS CM

LM disponibile in MV

END EVENT



Incoming
TASK 1730_Movimento LM da FdM a MV

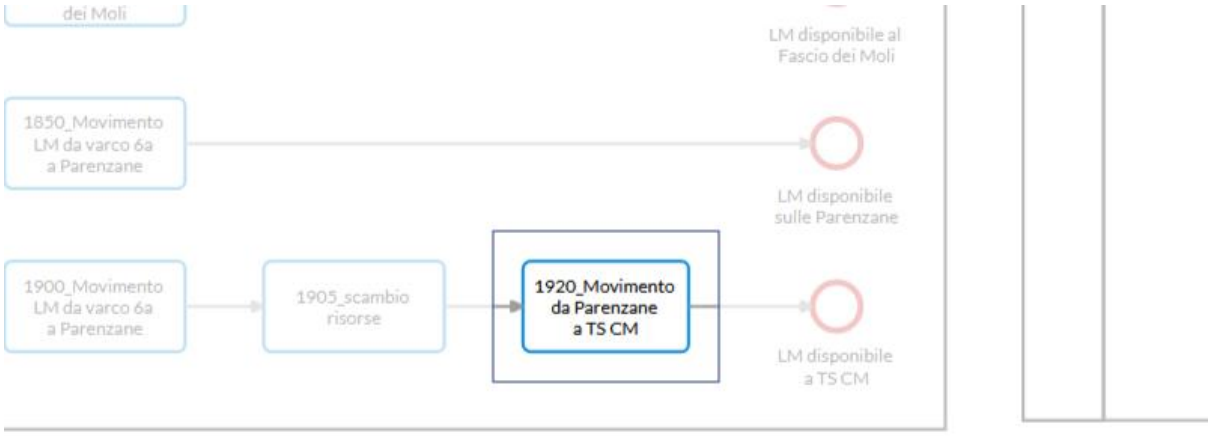
1770_Movimento LM da scambio 7 a MVII

TASK

Incoming	Outgoing
TASK 1760_Movimento LM da FdM a scambio 7	END EVENT LM disponibile in MVII

1920_Movimento da Parenzane a TS CM

TASK



Incoming	Outgoing
TASK 1905_scambio risorse	END EVENT LM disponibile a TS CM

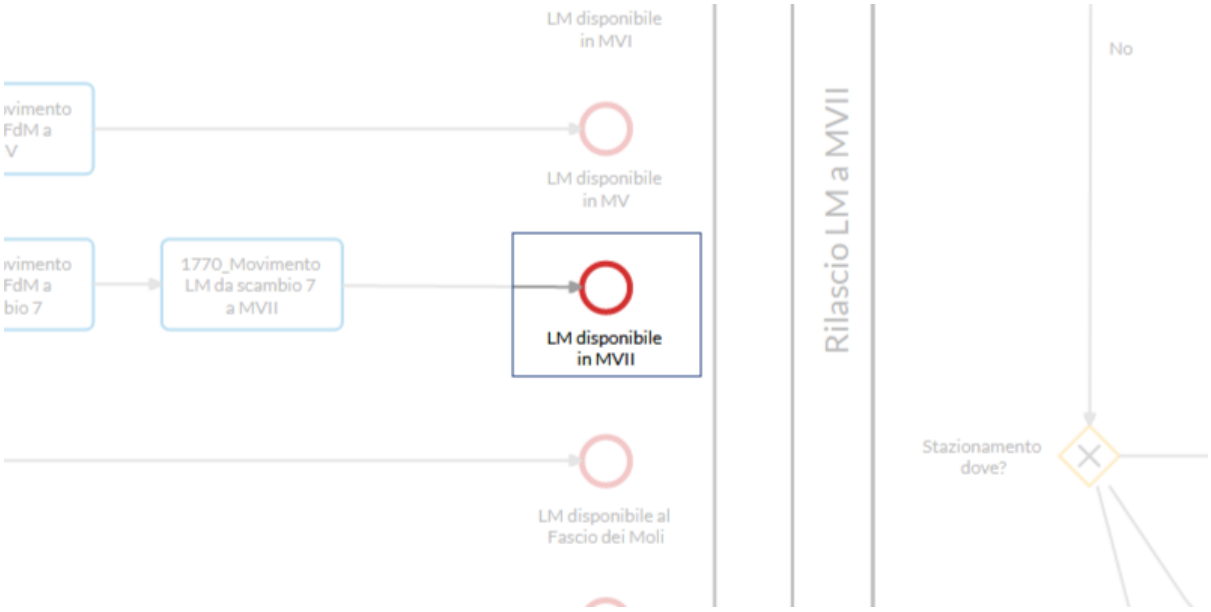
1670_Movimento da Parenzane a TS CM

TASK

Incoming	Outgoing
TASK 1655_scambio risorse	END EVENT LM disponibile a TS CM

LM disponibile in MVII

END EVENT

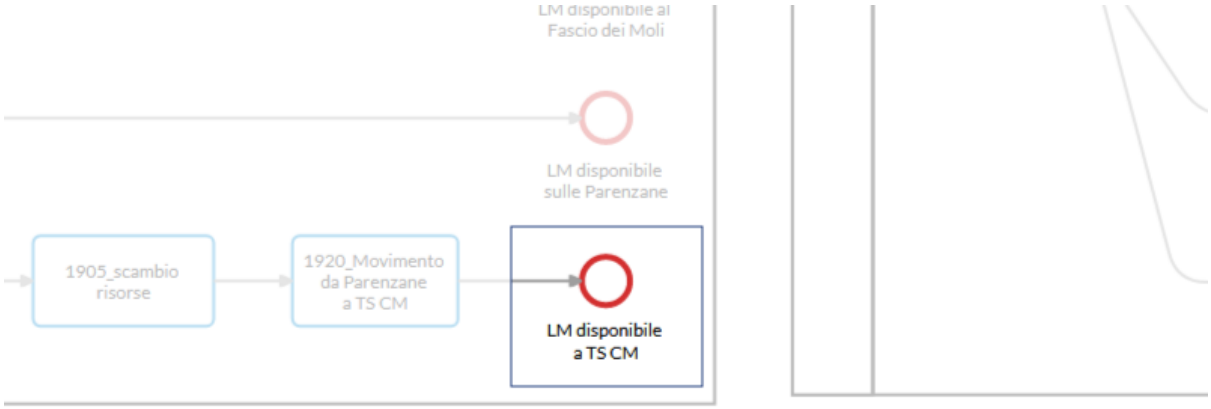


Incoming

TASK
1770_Movimento LM da scambio 7 a MVII

LM disponibile a TS CM

END EVENT

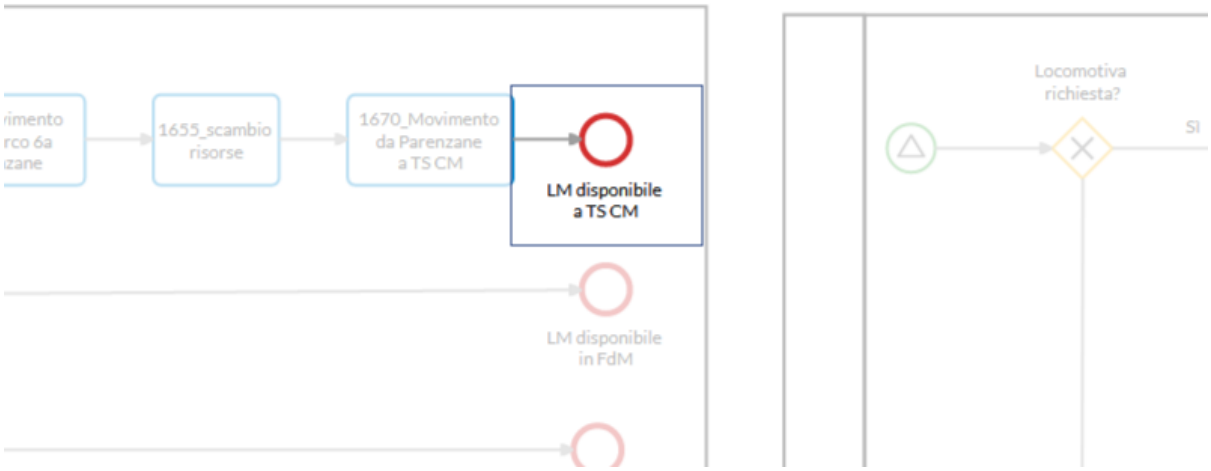


Incoming

TASK
1920_Movimento da Parenzane a TS CM

LM disponibile a TS CM

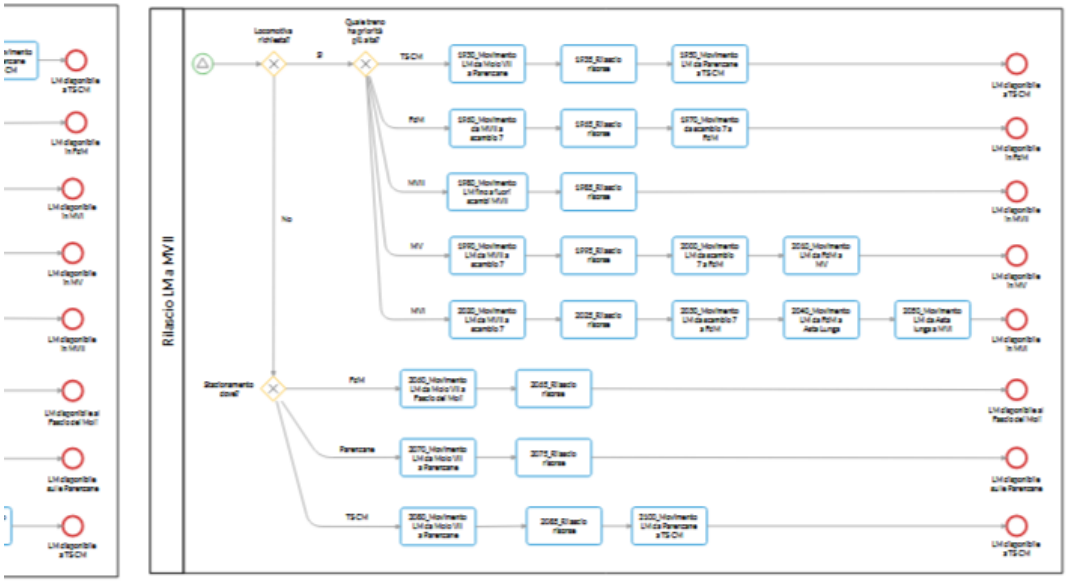
END EVENT



Incoming

TASK
1670_Movimento da Parenzane a TS CM

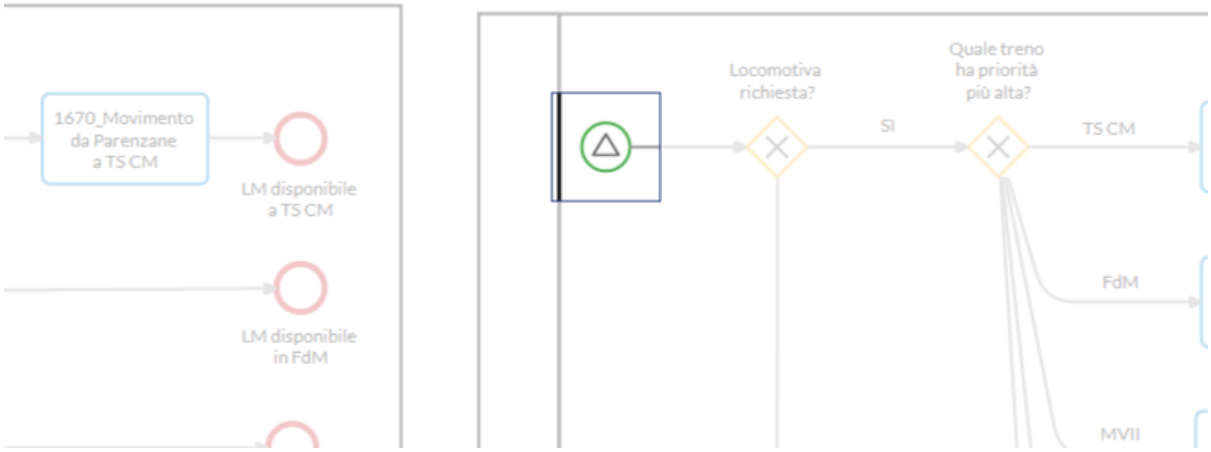
3.5. Process: Rilascio LM a MVII



3.5.1. Process Elements

signalStartEvents_af1fd7f6-9e9e-ed23-064a-bcb20b67918a

SIGNAL START EVENT



Outgoing

EXCLUSIVE GATEWAY
Locomotiva richiesta?

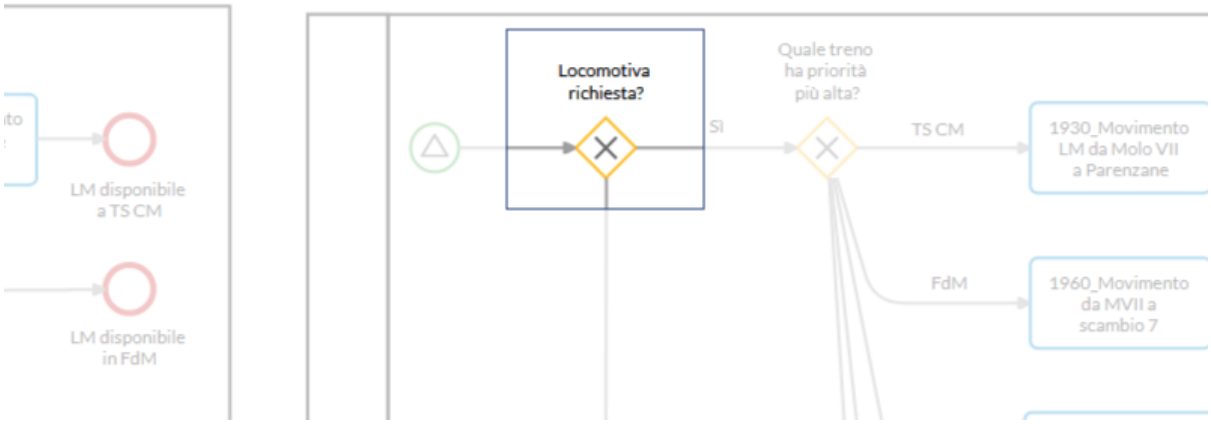
Attributes

Attributes

SIGNAL REFERENCE
Locomotiva_molo7

Locomotiva richiesta?

EXCLUSIVE GATEWAY



Incoming	Outgoing
SIGNAL START EVENT signalStartEvents_af1fd7f6-9e9e-ed23-064a-bcb20b67918a	EXCLUSIVE GATEWAY Stazionamento dove? through No
	EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through Sì

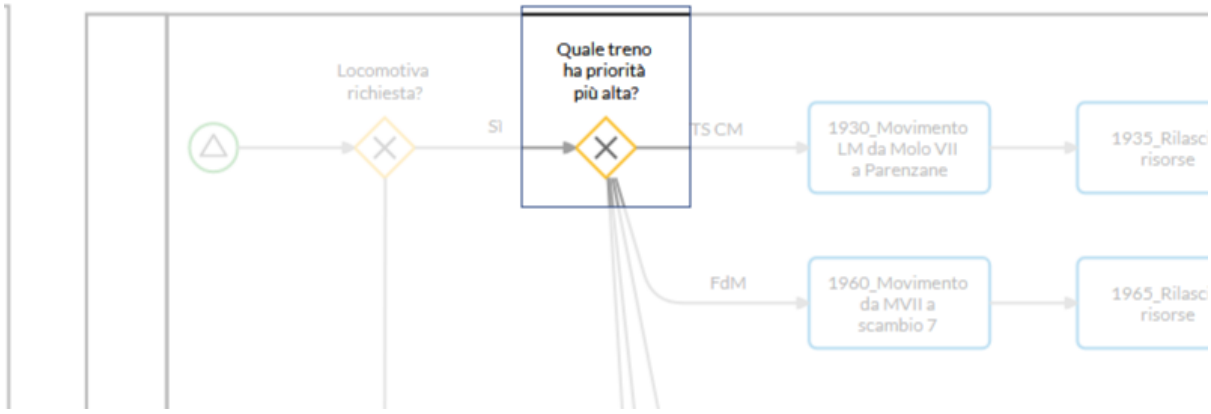
Stazionamento dove?

EXCLUSIVE GATEWAY

Incoming	Outgoing
EXCLUSIVE GATEWAY Locomotiva richiesta? through No	TASK 2080_Movimento LM da Molo VII a Parenzane through TS CM
	TASK 2060_Movimento LM da Molo VII a Fascio dei Moli through FdM
	TASK 2070_Movimento LM da Molo VII a Parenzane through Parenzane

Quale treno ha priorità più alta?

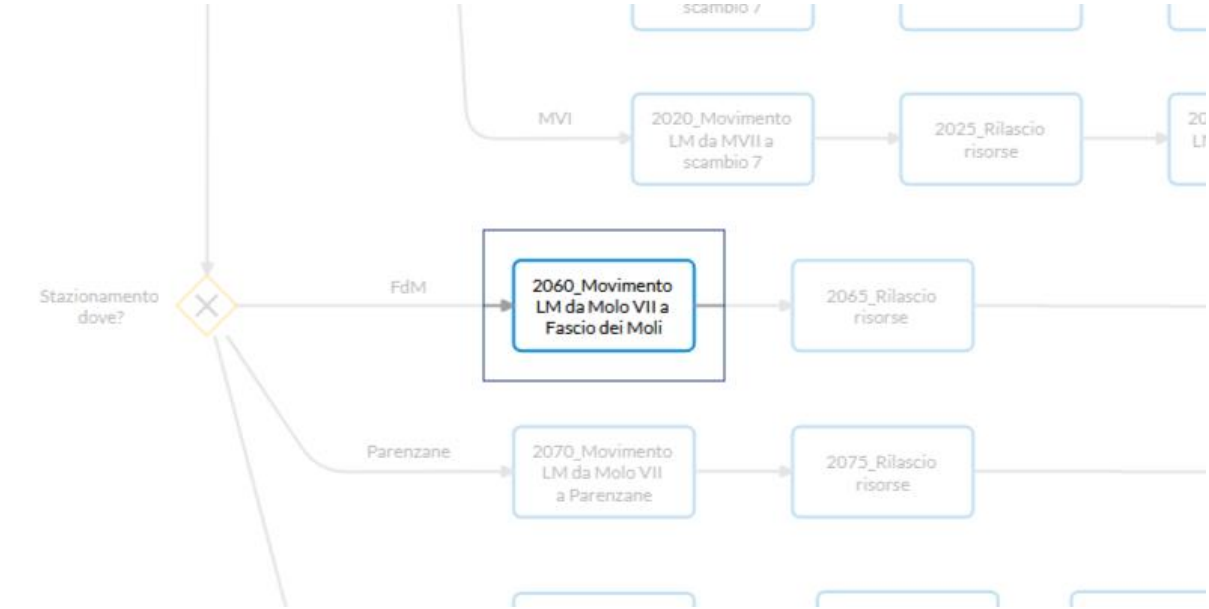
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY Locomotiva richiesta? through Sì	TASK 1960_Movimento da MVII a scambio 7 through FdM
	TASK 1930_Movimento LM da Molo VII a Parenzane through TS CM
	TASK 1980_Movimento LM fino a fuori scambi MVII through MVII
	TASK 1990_Movimento LM da MVII a scambio 7 through MV
	TASK 2020_Movimento LM da MVII a scambio 7 through MVI

2060_Movimento LM da Molo VII a Fascio dei Moli

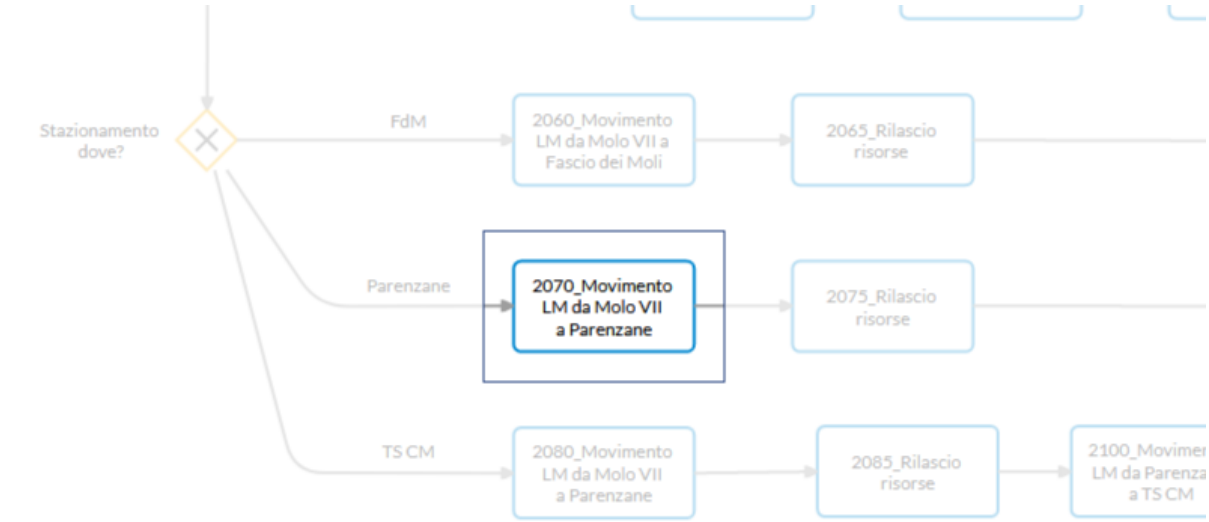
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through FdM	TASK 2065_Rilascio risorse

2070_Movimento LM da Molo VII a Parenzane

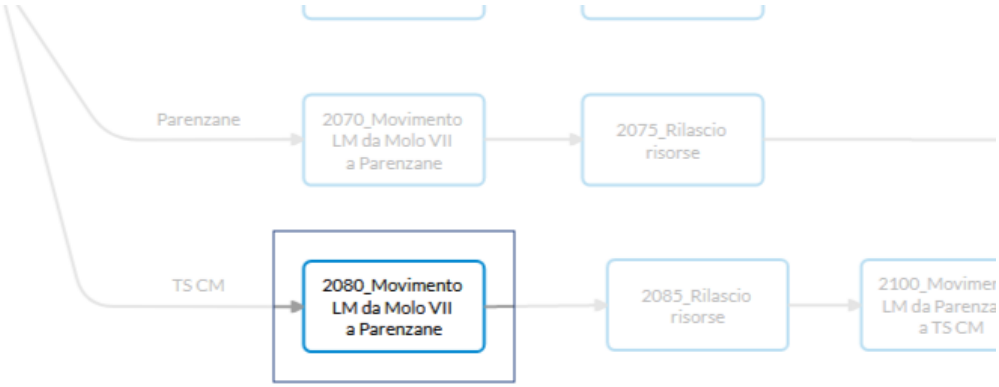
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through Parenzane	TASK 2075_Rilascio risorse

2080_Movimento LM da Molo VII a Parenzane

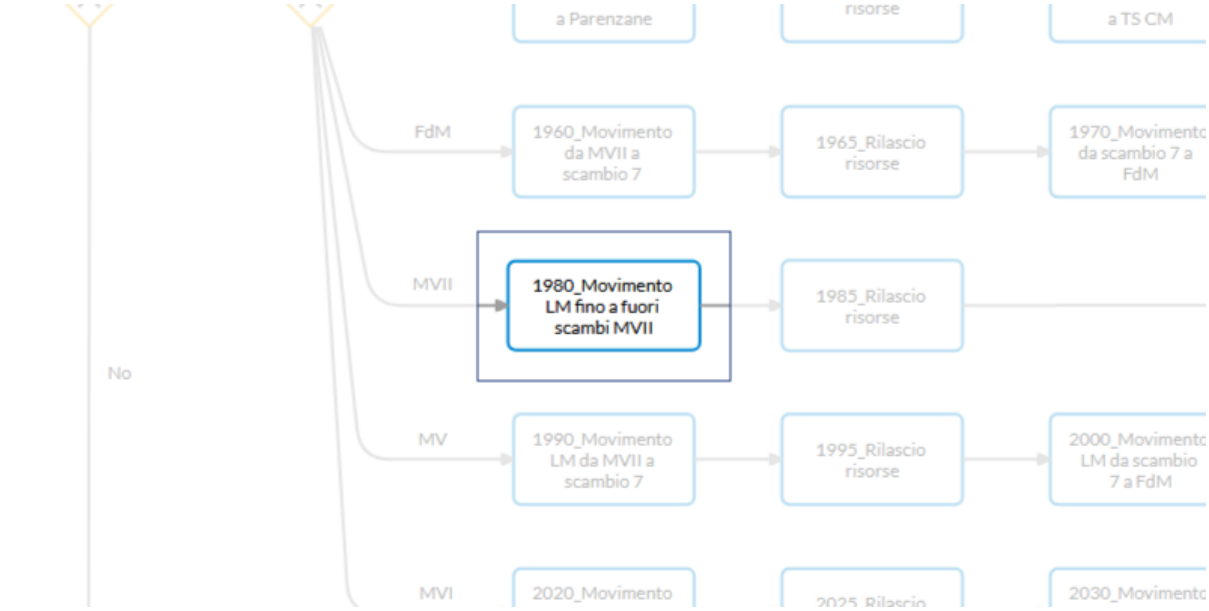
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Stazionamento dove? through TS CM	TASK 2085_Rilascio risorse

1980_Movimento LM fino a fuori scambi MVII

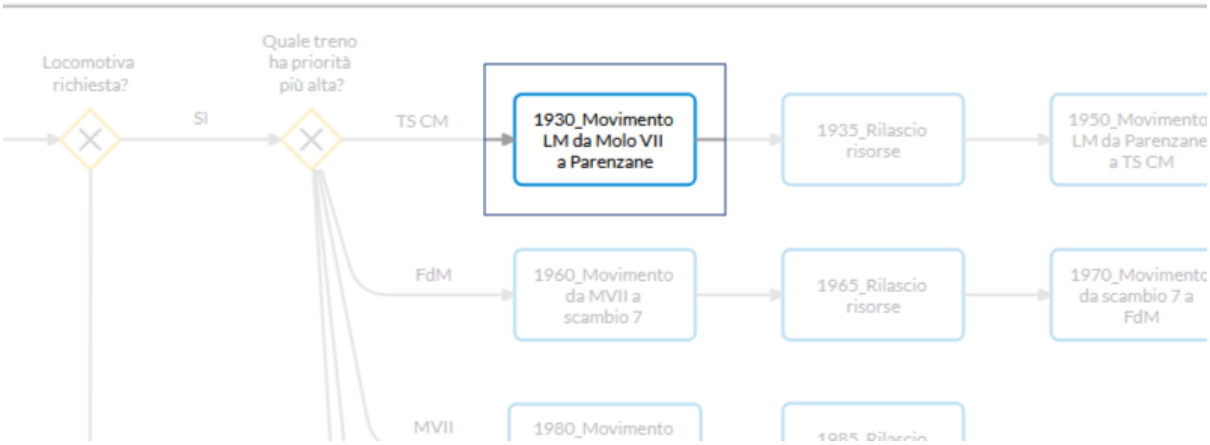
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MVII	TASK 1985_Rilascio risorse

1930_Movimento LM da Molo VII a Parenzane

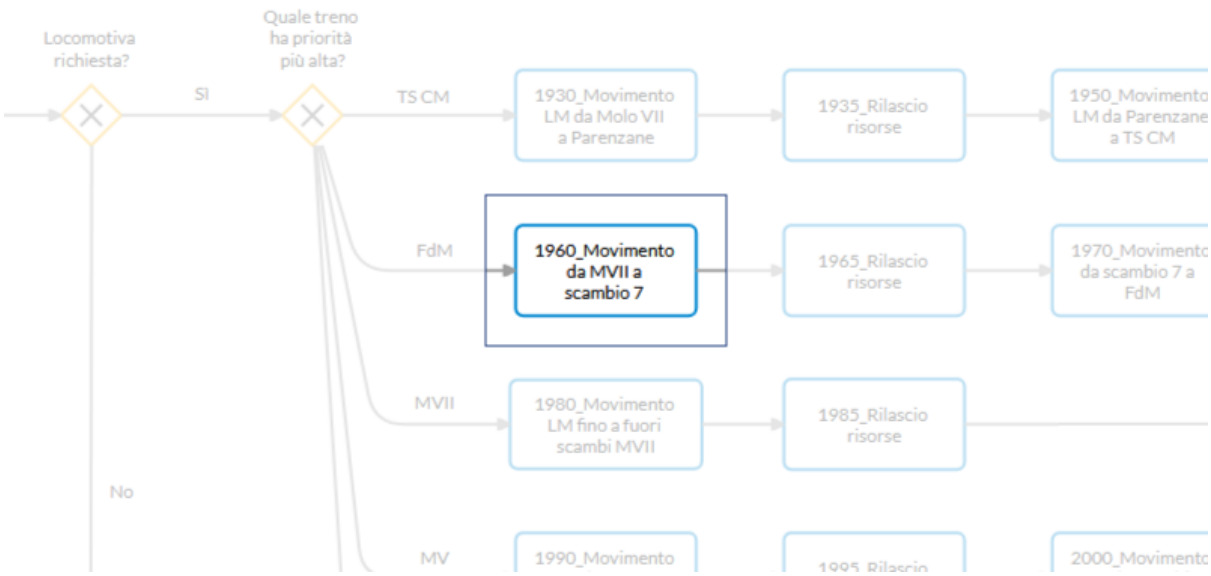
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through TS CM	TASK 1935_Rilascio risorse

1960_Movimento da MVII a scambio 7

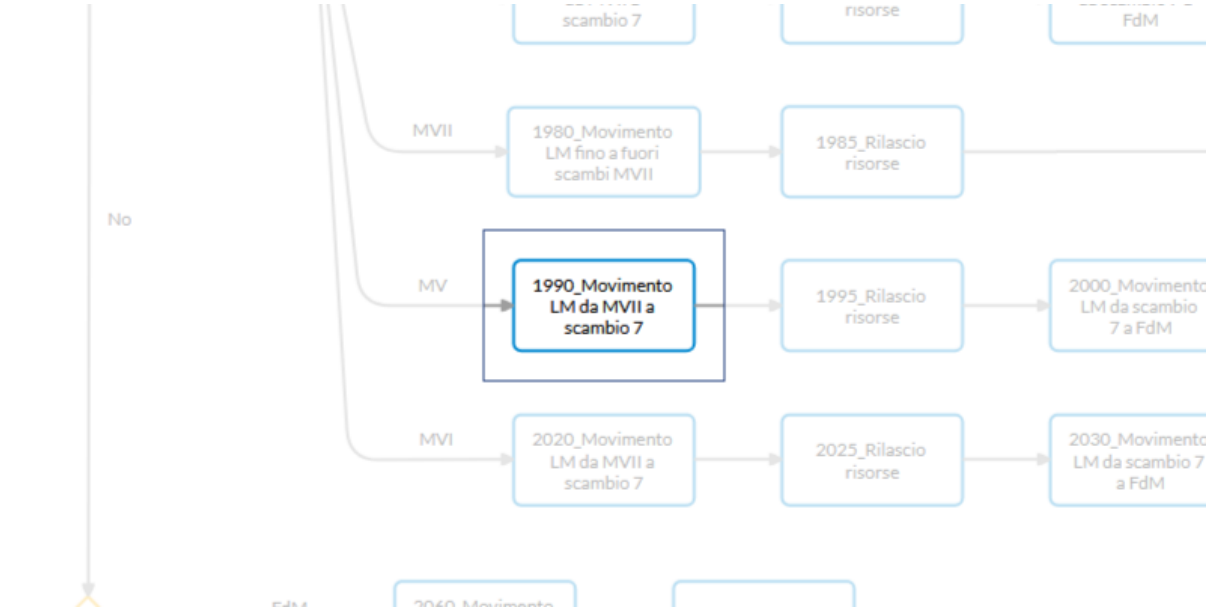
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through FdM	TASK 1965_Rilascio risorse

1990_Movimento LM da MVII a scambio 7

TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MV	TASK 1995_Rilascio risorse

2020_Movimento LM da MVII a scambio 7

TASK

Incoming	Outgoing
EXCLUSIVE GATEWAY Quale treno ha priorità più alta? through MVI	TASK 2025_Rilascio risorse

2065_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2060_Movimento LM da Molo VII a Fascio dei Moli	END EVENT LM disponibile al Fascio dei Moli

2075_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2070_Movimento LM da Molo VII a Parenzane	END EVENT LM disponibile sulle Parenzane

2085_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2080_Movimento LM da Molo VII a Parenzane	TASK 2100_Movimento LM da Parenzane a TS CM

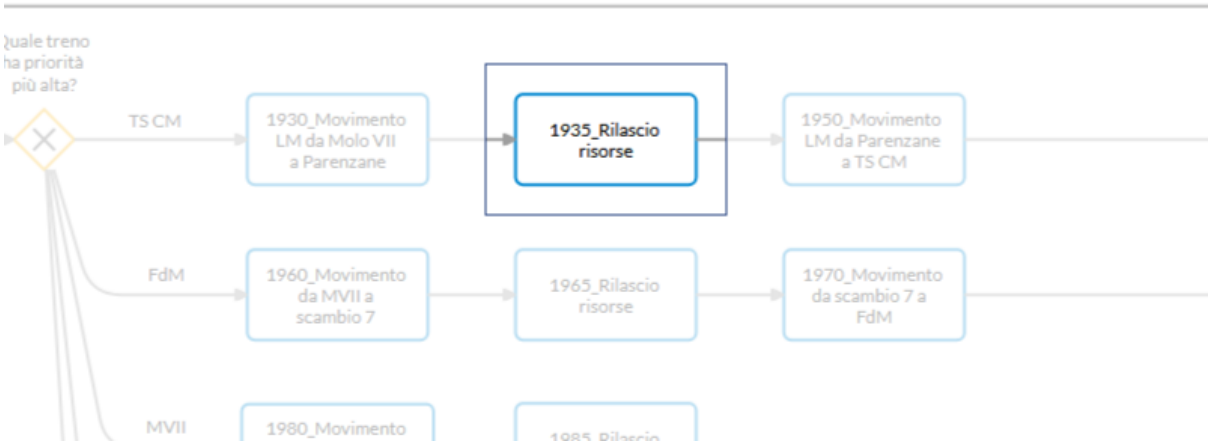
1985_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1980_Movimento LM fino a fuori scambi MVII	END EVENT LM disponibile in MVII

1935_Rilascio risorse

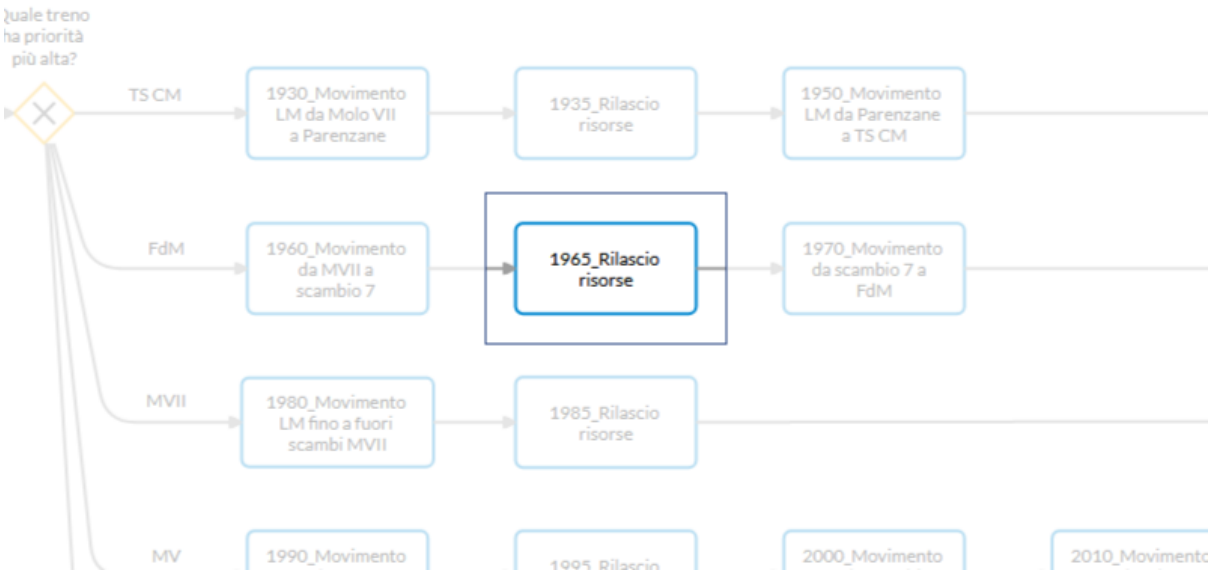
TASK



Incoming	Outgoing
TASK 1930_Movimento LM da Molo VII a Parenzane	TASK 1950_Movimento LM da Parenzane a TS CM

1965_Rilascio risorse

TASK



Incoming	Outgoing
TASK 1960_Movimento da MVII a scambio 7	TASK 1970_Movimento da scambio 7 a FdM

1995_Rilascio risorse

TASK

Incoming	Outgoing
TASK 1990_Movimento LM da MVII a scambio 7	TASK 2000_Movimento LM da scambio 7 a FdM

2025_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2020_Movimento LM da MVII a scambio 7	TASK 2030_Movimento LM da scambio 7 a FdM

LM disponibile al Fascio dei Moli

END EVENT

Incoming

TASK
2065_Rilascio risorse

LM disponibile sulle Parenzane

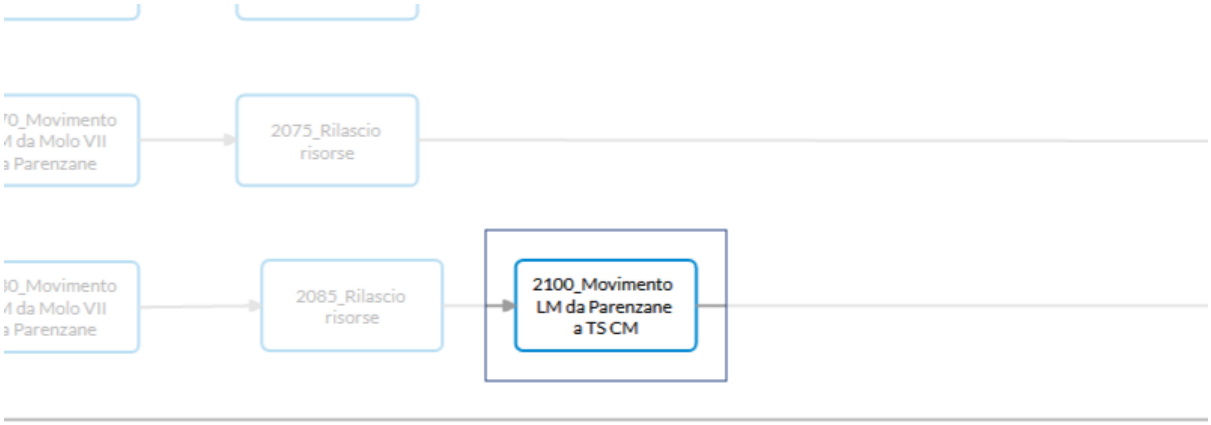
END EVENT

Incoming

TASK
2075_Rilascio risorse

2100_Movimento LM da Parenzane a TS CM

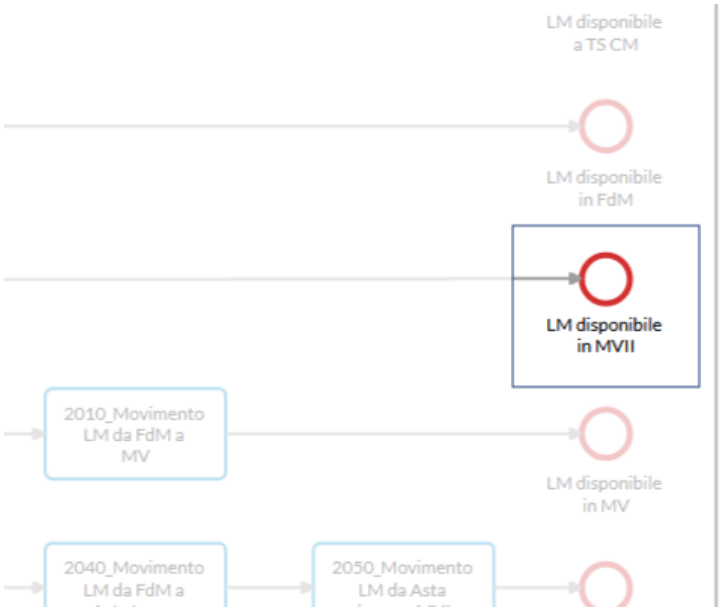
TASK



Incoming	Outgoing
TASK 2085_Rilascio risorse	END EVENT LM disponibile a TS CM

LM disponibile in MVII

END EVENT

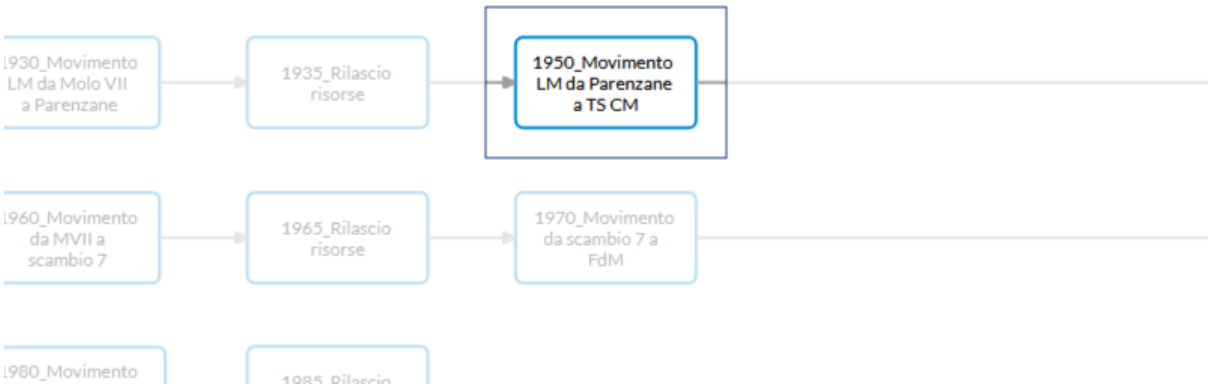


Incoming

TASK
1985_Rilascio risorse

1950_Movimento LM da Parenzane a TS CM

TASK



Incoming

TASK
1935_Rilascio risorse

Outgoing

END EVENT
LM disponibile a TS CM

1970_Movimento da scambio 7 a FdM

TASK

Incoming	Outgoing
TASK 1965_Rilascio risorse	END EVENT LM disponibile in FdM

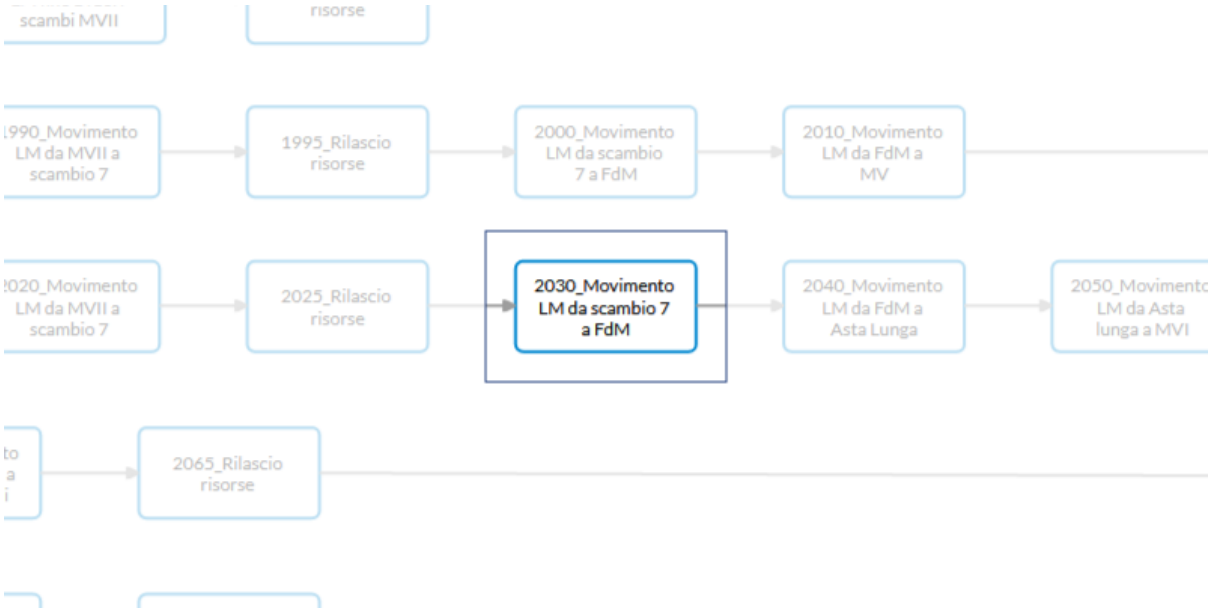
2000_Movimento LM da scambio 7 a FdM

TASK

Incoming	Outgoing
TASK 1995_Rilascio risorse	TASK 2010_Movimento LM da FdM a MV

2030_Movimento LM da scambio 7 a FdM

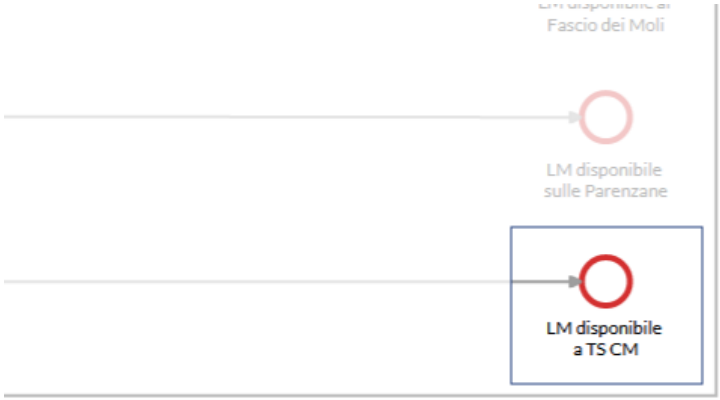
TASK



Incoming	Outgoing
TASK 2025_Rilascio risorse	TASK 2040_Movimento LM da FdM a Asta Lunga

LM disponibile a TS CM

END EVENT



Incoming

TASK
2100_Movimento LM da Parenzane a TS CM

LM disponibile a TS CM

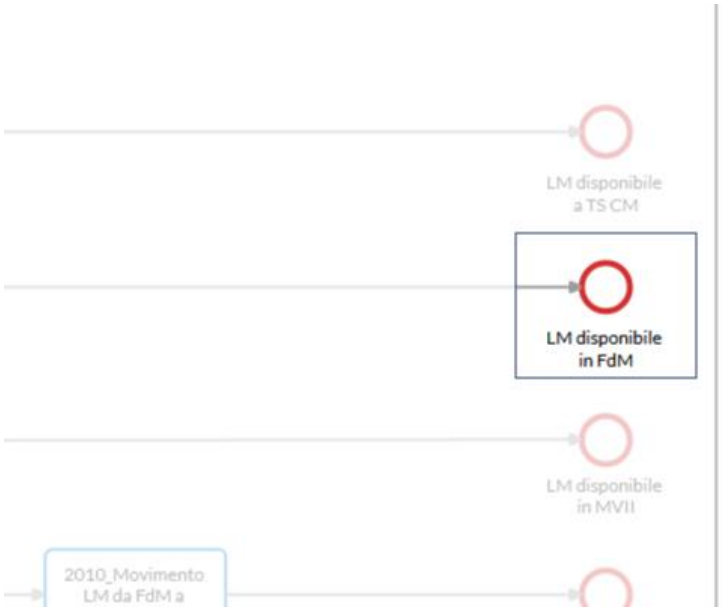
END EVENT

Incoming

TASK
1950_Movimento LM da Parenzane a TS CM

LM disponibile in FdM

END EVENT



Incoming

TASK
1970_Movimento da scambio 7 a FdM

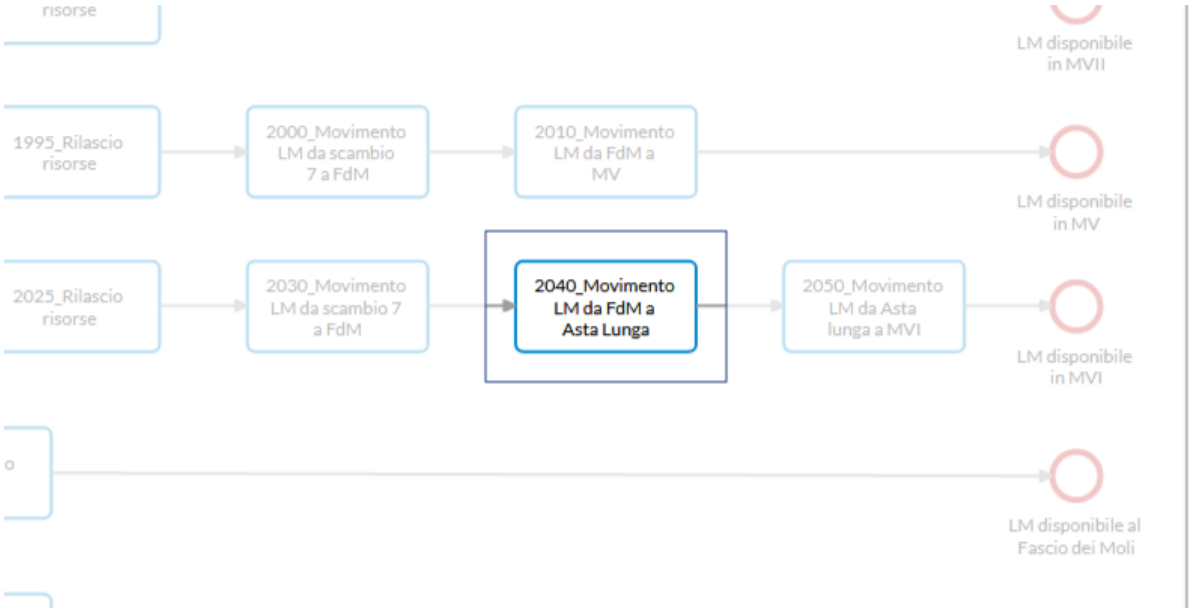
2010_Movimento LM da FdM a MV

TASK

Incoming	Outgoing
TASK 2000_Movimento LM da scambio 7 a FdM	END EVENT LM disponibile in MV

2040_Movimento LM da FdM a Asta Lunga

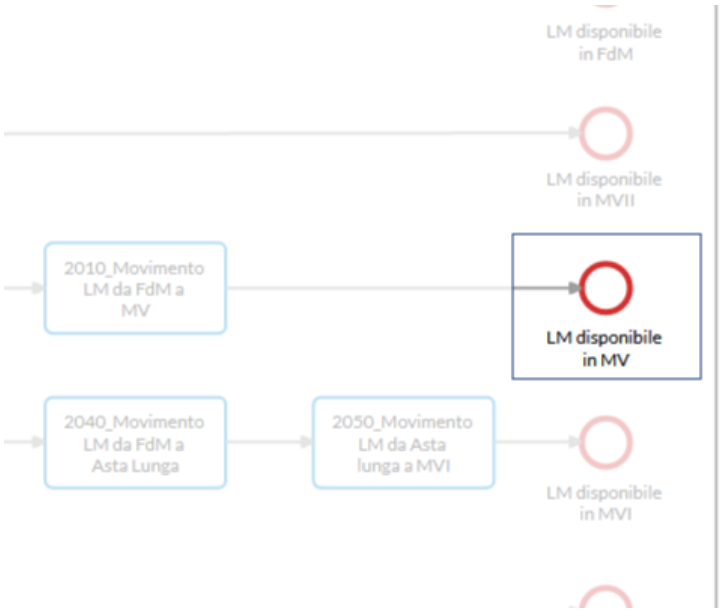
TASK



Incoming	Outgoing
TASK 2030_Movimento LM da scambio 7 a FdM	TASK 2050_Movimento LM da Asta lunga a MVI

LM disponibile in MV

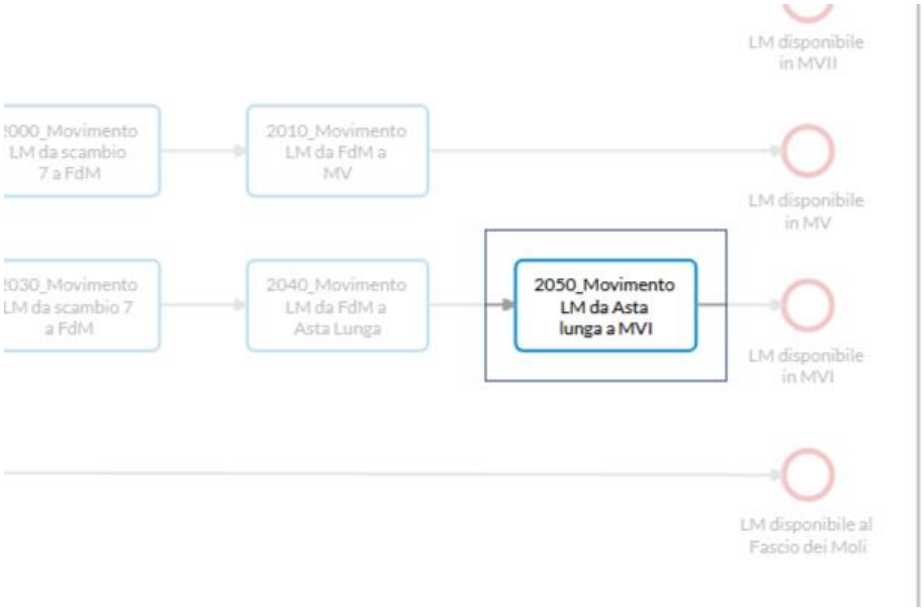
END EVENT



Incoming
TASK 2010_Movimento LM da FdM a MV

2050_Movimento LM da Asta lunga a MVI

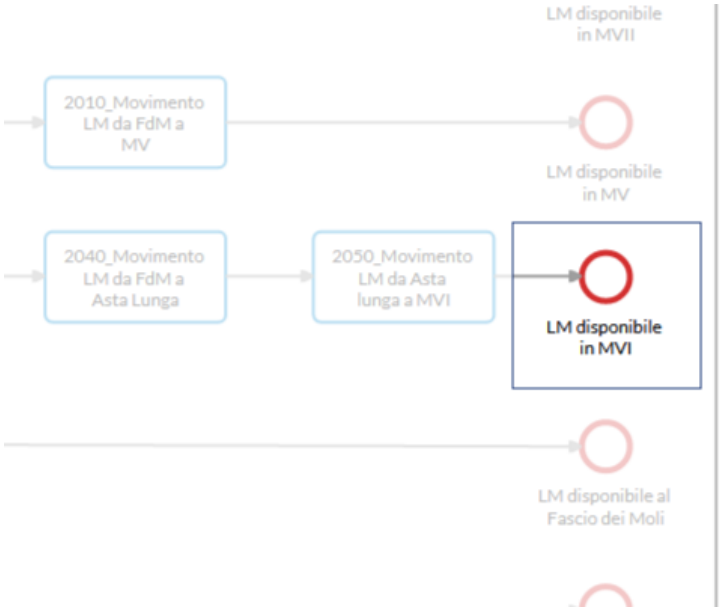
TASK



Incoming	Outgoing
TASK 2040_Movimento LM da FdM a Asta Lunga	END EVENT LM disponibile in MVI

LM disponibile in MVI

END EVENT

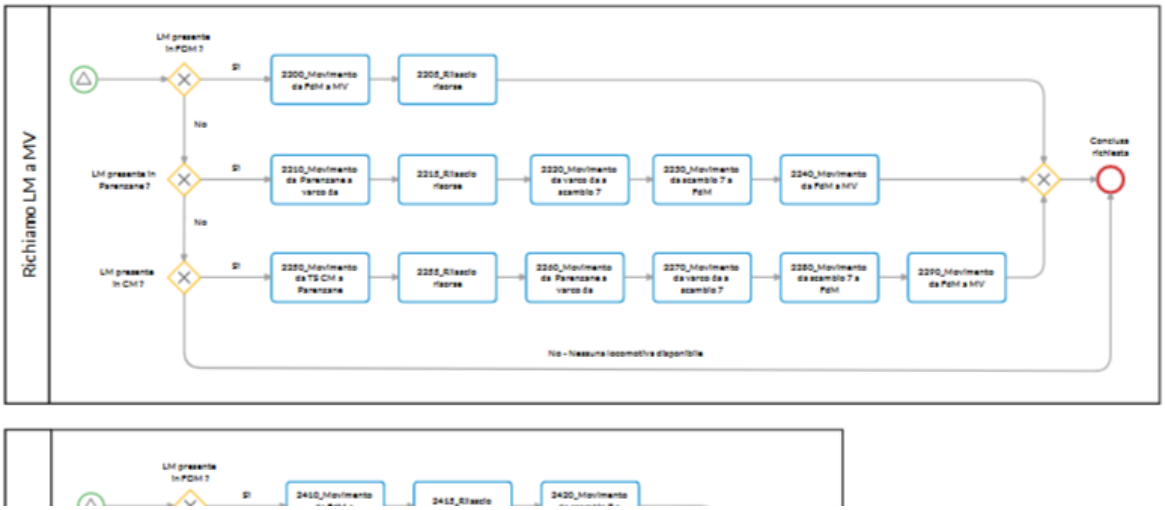


Incoming

TASK
2050_Movimento LM da Asta lunga a MVI

4. Diagram: Richiamo LM

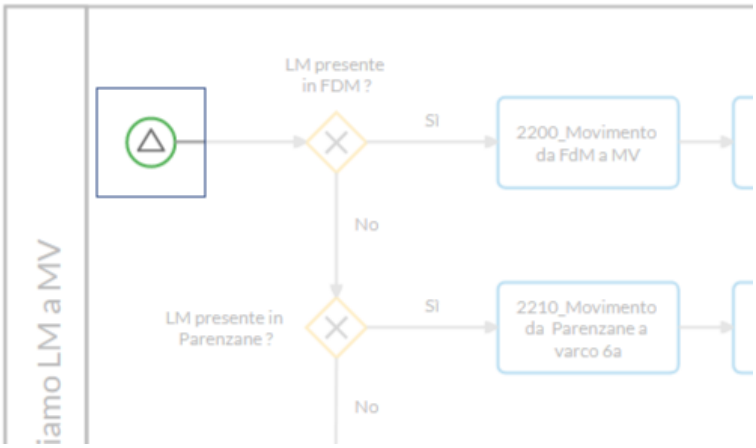
4.1. Process: Richiamo LM a MV



4.1.1. Process Elements

signalStartEvents_75f67a40-2d4b-42f5-4038-71dc9a7e5bd2

SIGNAL START EVENT



Outgoing

Outgoing

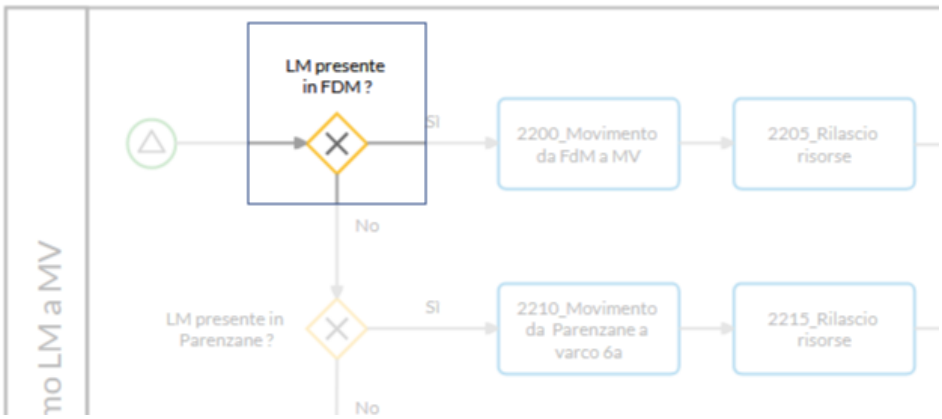
EXCLUSIVE GATEWAY
LM presente in FDM ?

Attributes

SIGNAL REFERENCE
Richiamo_LM_estrazione_MV

LM presente in FDM ?

EXCLUSIVE GATEWAY



Incoming

SIGNAL START EVENT
signalStartEvents_75f67a40-2d4b-42f5-4038-71dc9a7e5bd2

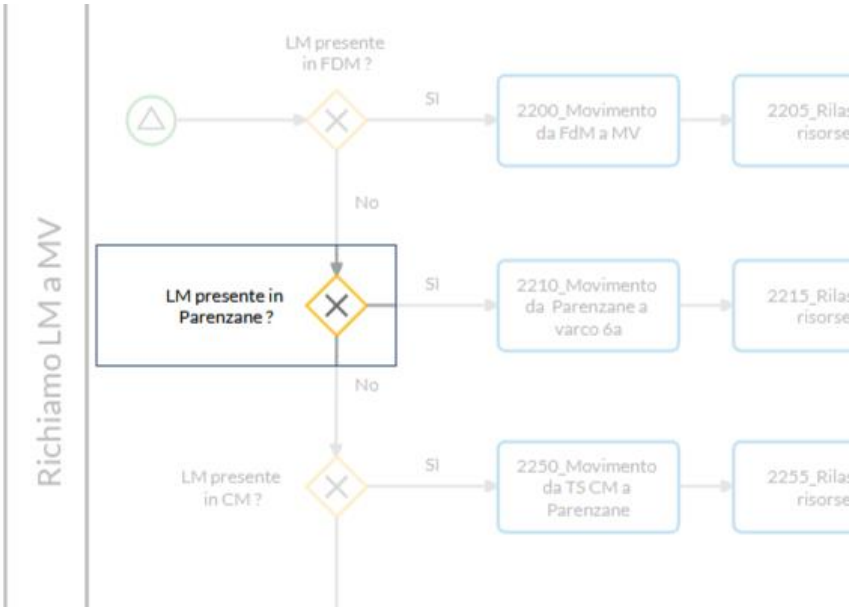
Outgoing

TASK
2200_Movimento da FdM a MV
through Sì

EXCLUSIVE GATEWAY
LM presente in Parenzane ?
through No

LM presente in Parenzane ?

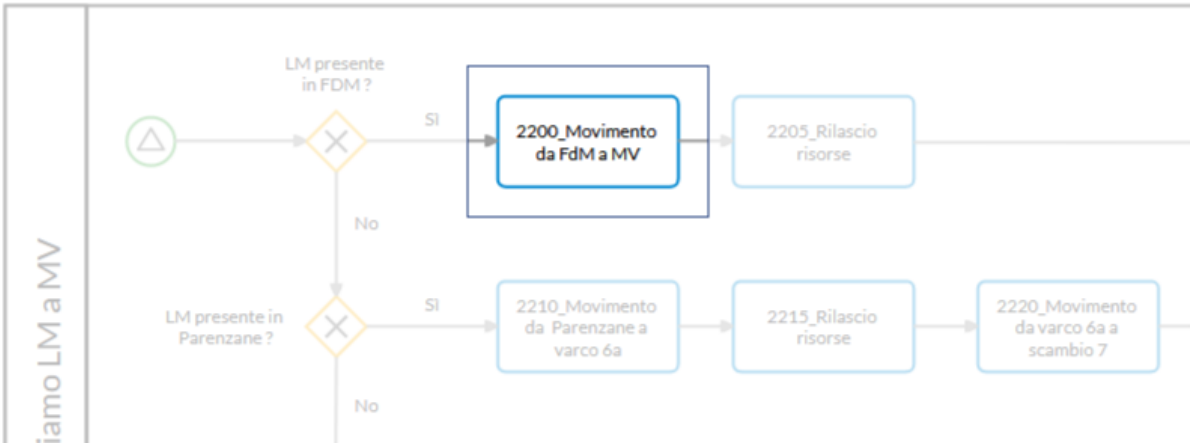
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in FDM ? through No	TASK 2210_Movimento da Parenzane a varco 6a through Sì
	EXCLUSIVE GATEWAY LM presente in CM ? through No

2200_Movimento da FdM a MV

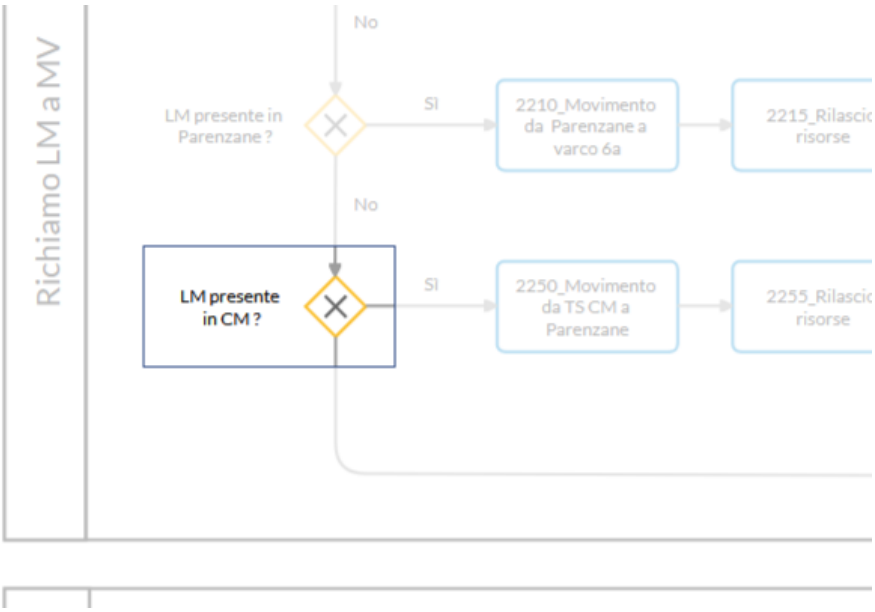
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in FDM ? through Sì	TASK 2205_Rilascio risorse

LM presente in CM ?

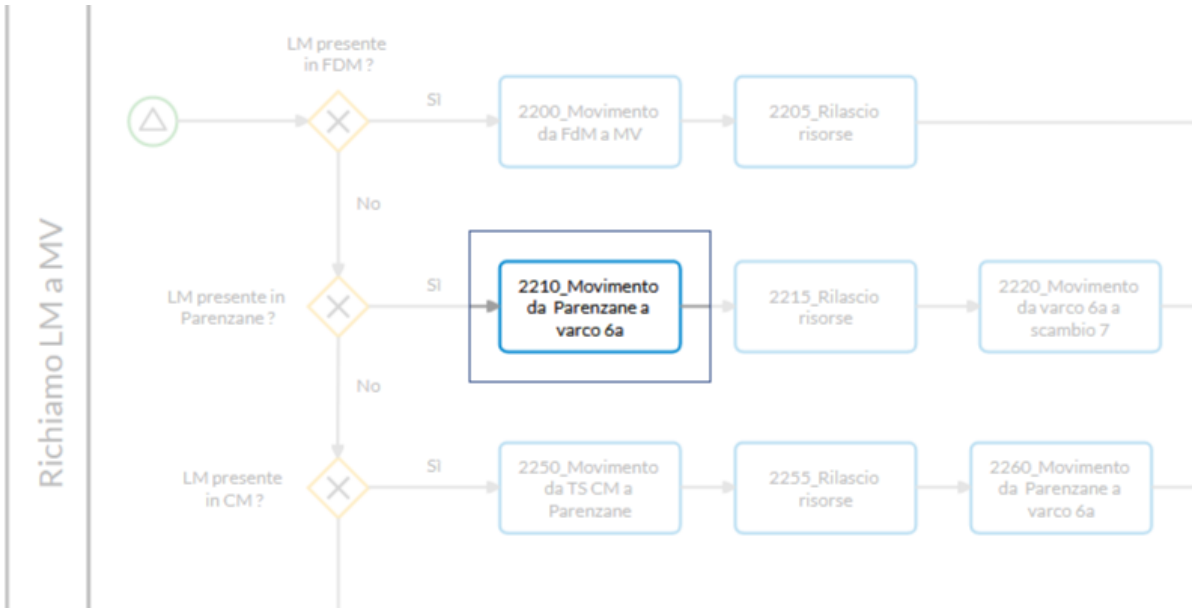
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in Parenzane ? through No	END EVENT Conclusa richiesta through No - Nessuna locomotiva disponibile
	TASK 2250_Movimento da TS CM a Parenzane through Sì

2210_Movimento da Parenzane a varco 6a

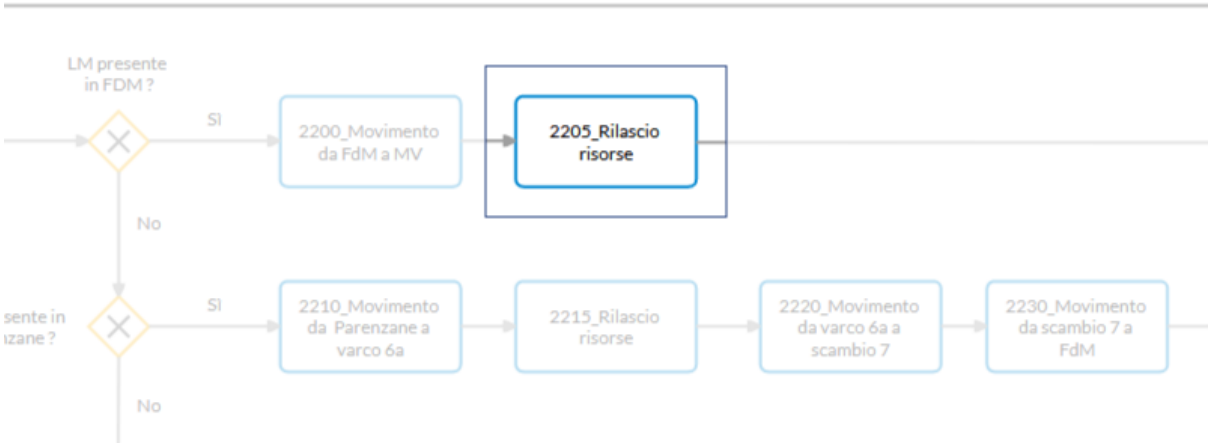
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in Parenzane ? through Sì	TASK 2215_Rilascio risorse

2205_Rilascio risorse

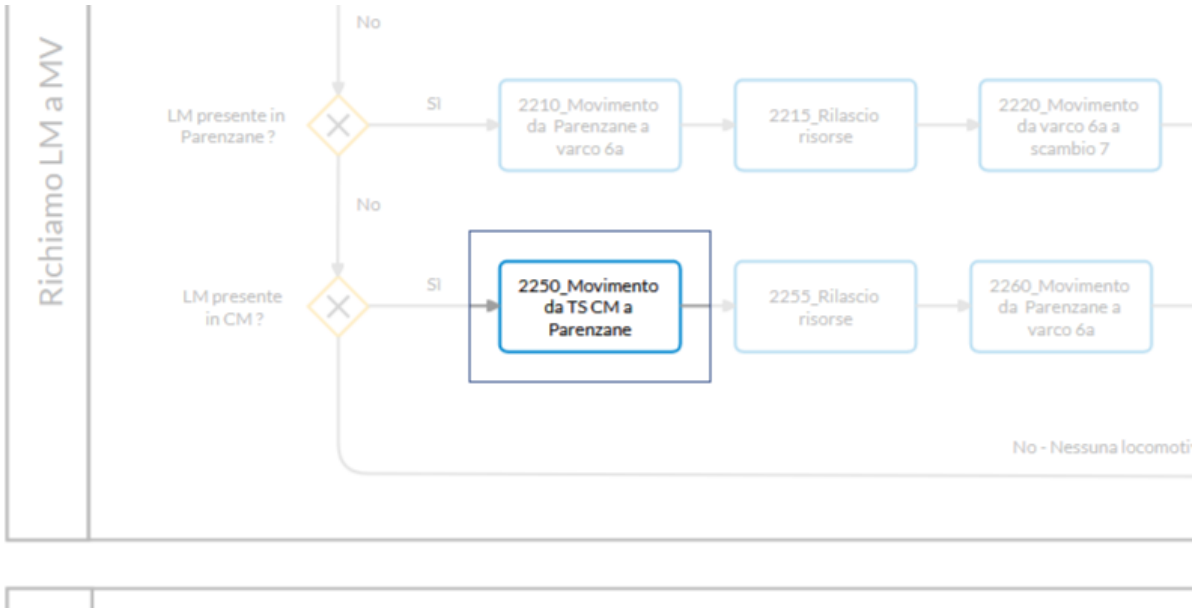
TASK



Incoming	Outgoing
TASK 2200_Movimento da FdM a MV	EXCLUSIVE GATEWAY Exclusive Gateway_7870

2250_Movimento da TS CM a Parenzane

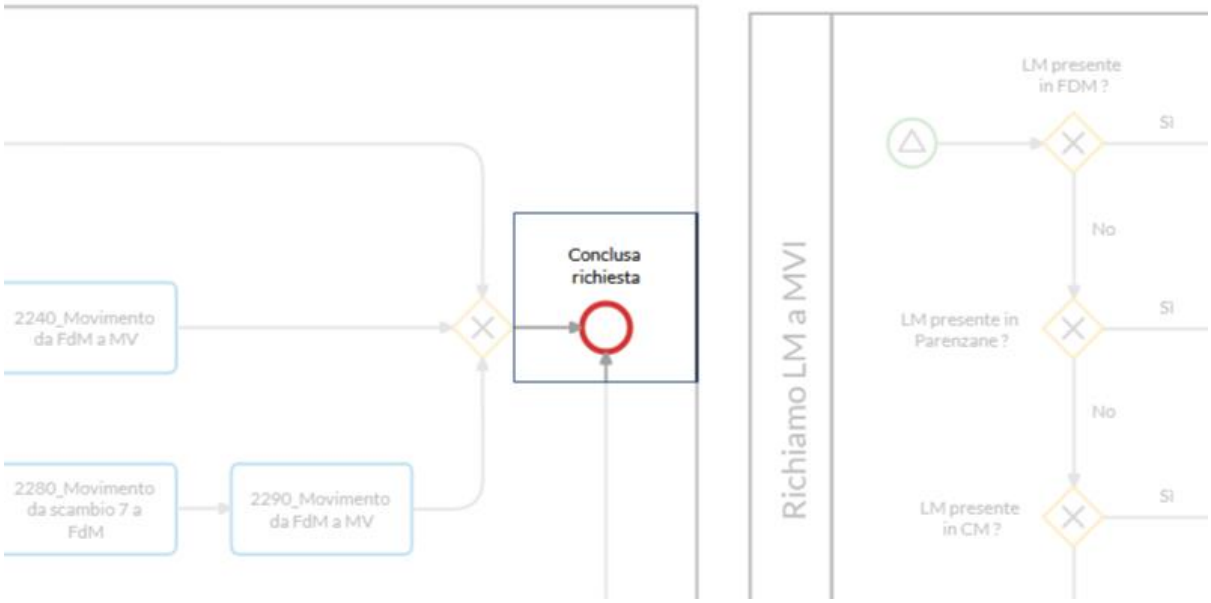
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in CM ? through Sì	TASK 2255_Rilascio risorse

Conclusa richiesta

END EVENT



Incoming

EXCLUSIVE GATEWAY
Exclusive Gateway_7870

EXCLUSIVE GATEWAY
LM presente in CM ?
through No - Nessuna locomotiva disponibile

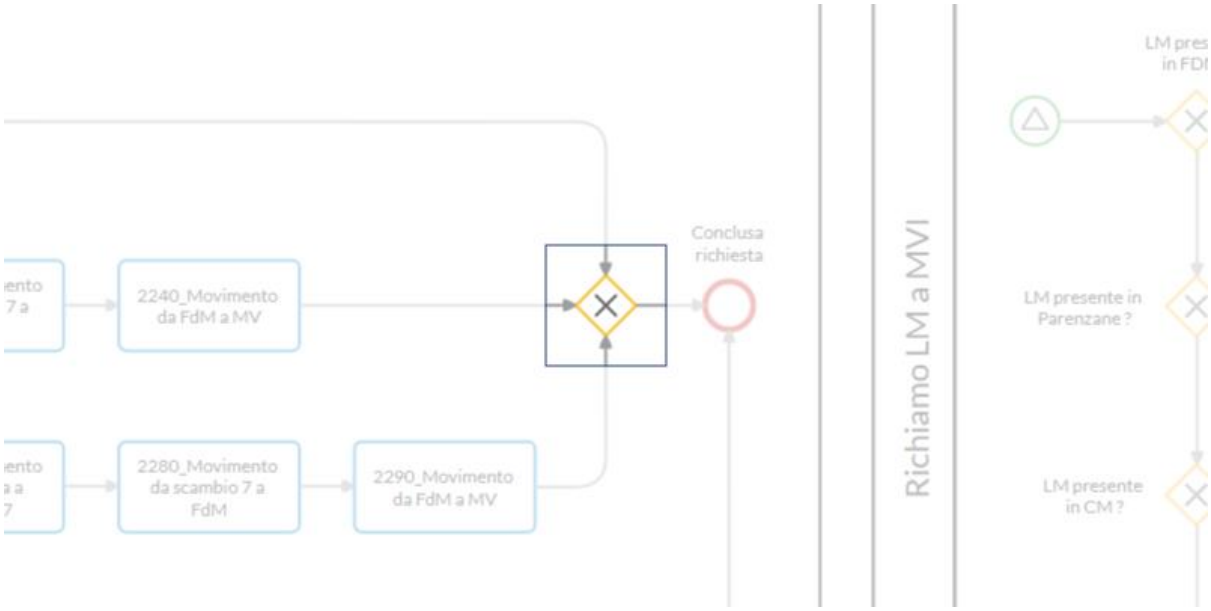
2215_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2210_Movimento da Parenzane a varco 6a	TASK 2220_Movimento da varco 6a a scambio 7

Exclusive Gateway_7870

EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 2290_Movimento da FdM a MV	END EVENT Conclusa richiesta
TASK 2240_Movimento da FdM a MV	
TASK 2205_Rilascio risorse	

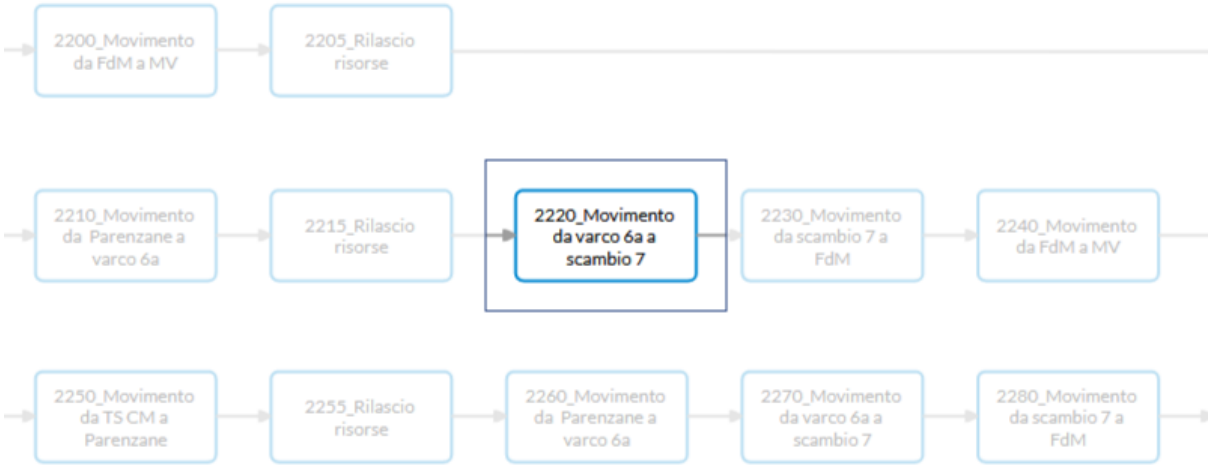
2255_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2250_Movimento da TS CM a Parenzane	TASK 2260_Movimento da Parenzane a varco 6a

2220_Movimento da varco 6a a scambio 7

TASK



Incoming	Outgoing
TASK 2215_Rilascio risorse	TASK 2230_Movimento da scambio 7 a FdM

2260_Movimento da Parenzane a varco 6a

TASK

Incoming	Outgoing
TASK 2255_Rilascio risorse	TASK 2270_Movimento da varco 6a a scambio 7

2230_Movimento da scambio 7 a FdM

TASK

Incoming	Outgoing
TASK 2220_Movimento da varco 6a a scambio 7	TASK 2240_Movimento da FdM a MV

2270_Movimento da varco 6a a scambio 7

TASK

Incoming	Outgoing
TASK 2260_Movimento da Parenzane a varco 6a	TASK 2280_Movimento da scambio 7 a FdM

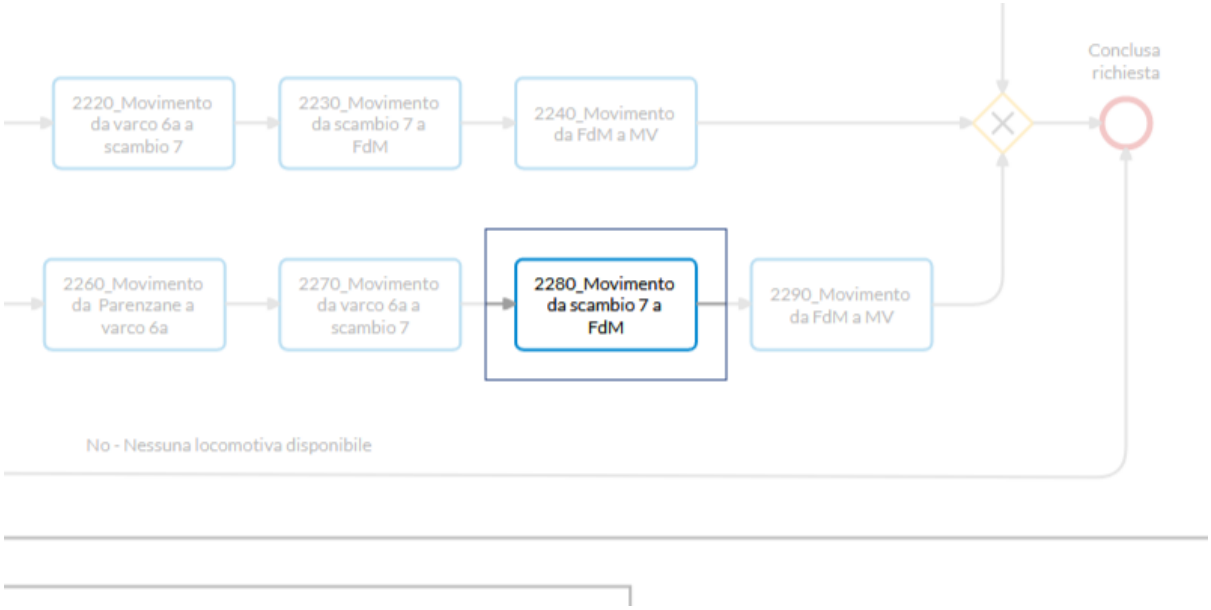
2240_Movimento da FdM a MV

TASK

Incoming	Outgoing
TASK 2230_Movimento da scambio 7 a FdM	EXCLUSIVE GATEWAY Exclusive Gateway_7870

2280_Movimento da scambio 7 a FdM

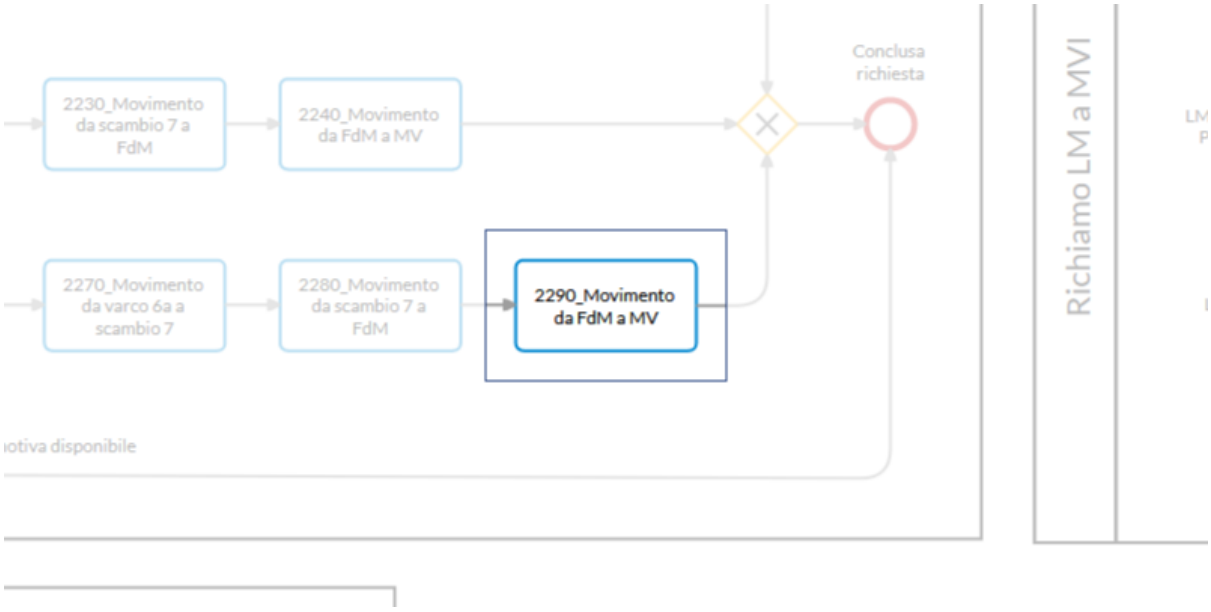
TASK



Incoming	Outgoing
TASK 2270_Movimento da varco 6a a scambio 7	TASK 2290_Movimento da FdM a MV

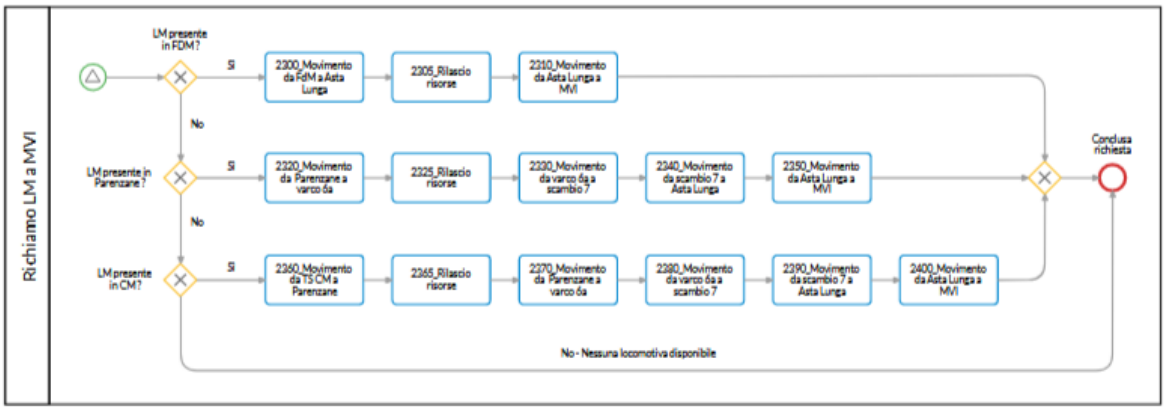
2290_Movimento da FdM a MV

TASK



Incoming	Outgoing
TASK 2280_Movimento da scambio 7 a FdM	EXCLUSIVE GATEWAY Exclusive Gateway_7870

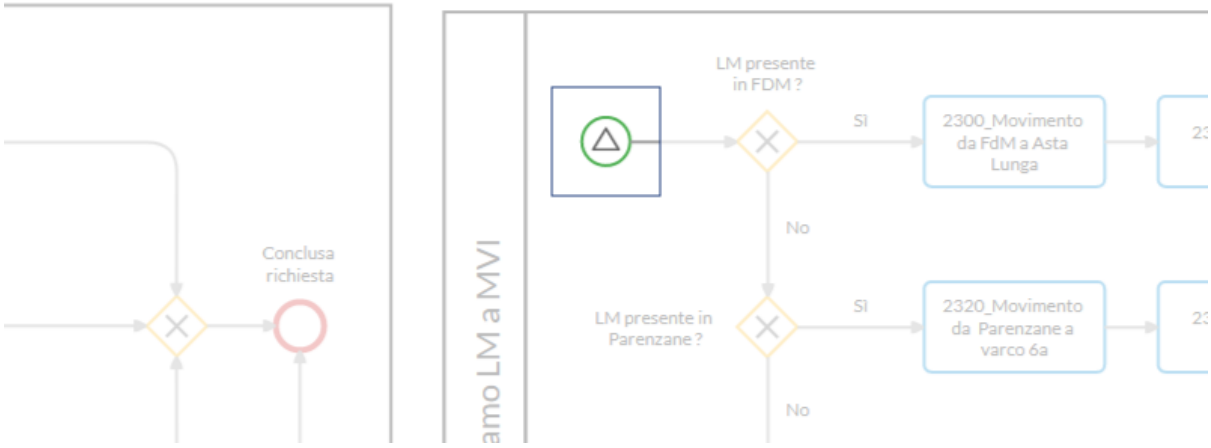
4.2. Process: Richiamo LM a MVI



4.2.1. Process Elements

signalStartEvents_e393f159-7e27-fecc-6875-c5befd049161

SIGNAL START EVENT



Outgoing

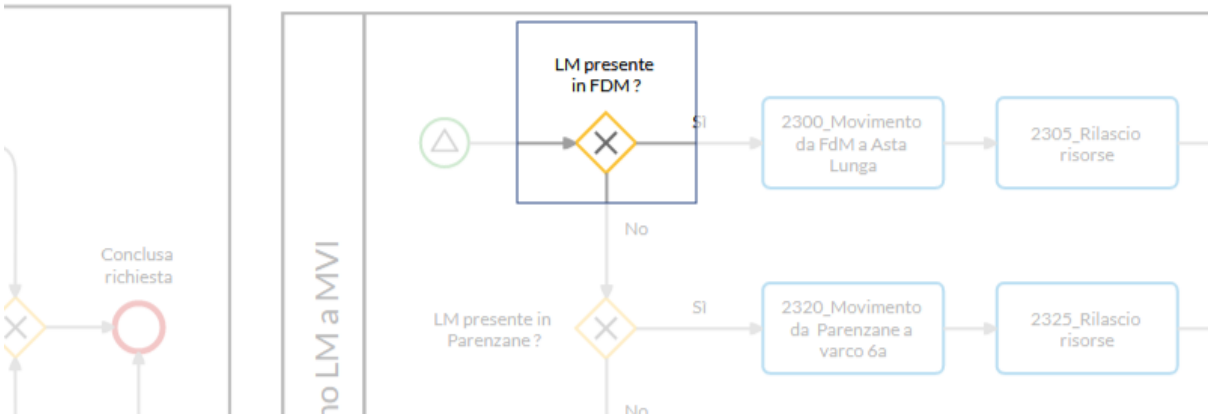
EXCLUSIVE GATEWAY
LM presente in FDM ?

Attributes

SIGNAL REFERENCE
Richiamo_LM_estrazione_MVI

LM presente in FDM ?

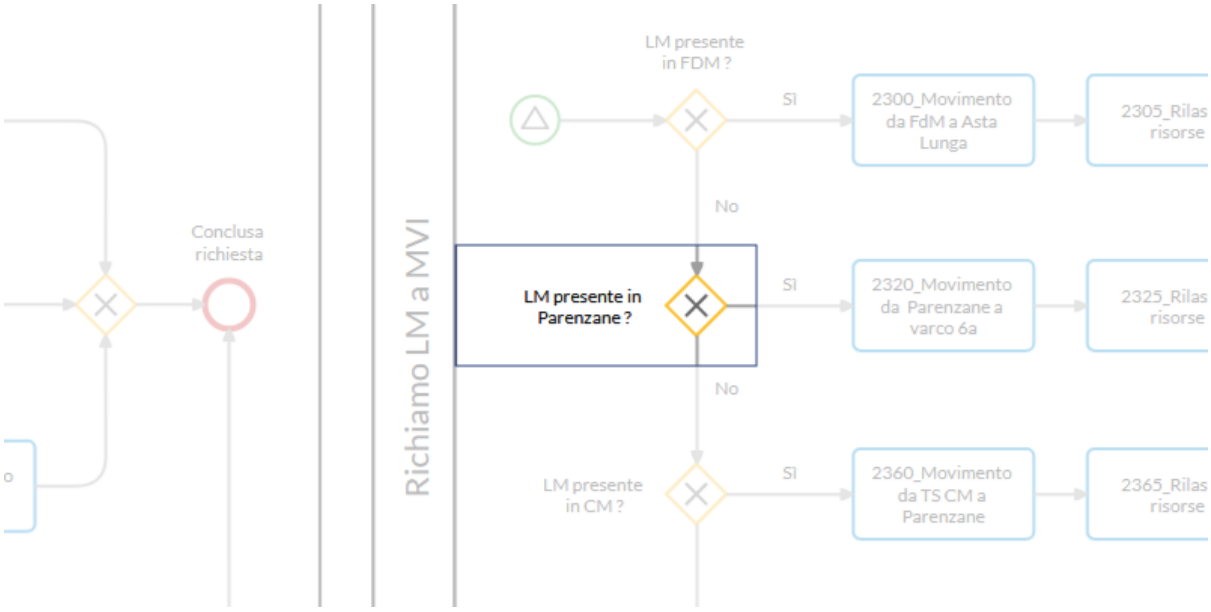
EXCLUSIVE GATEWAY



Incoming	Outgoing
SIGNAL START EVENT signalStartEvents_e393f159-7e27-fecc-6875-c5befd049161	EXCLUSIVE GATEWAY LM presente in Parenzane ? through No
	TASK 2300_Movimento da FdM a Asta Lunga through Sì

LM presente in Parenzane ?

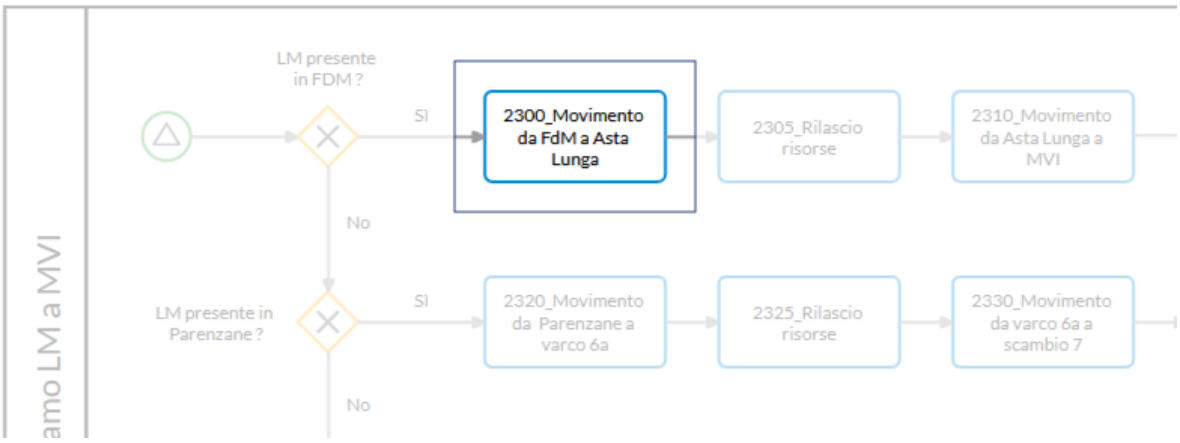
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in FDM ? through No	EXCLUSIVE GATEWAY LM presente in CM ? through No
	TASK 2320_Movimento da Parenzane a varco 6a through Sì

2300_Movimento da FdM a Asta Lunga

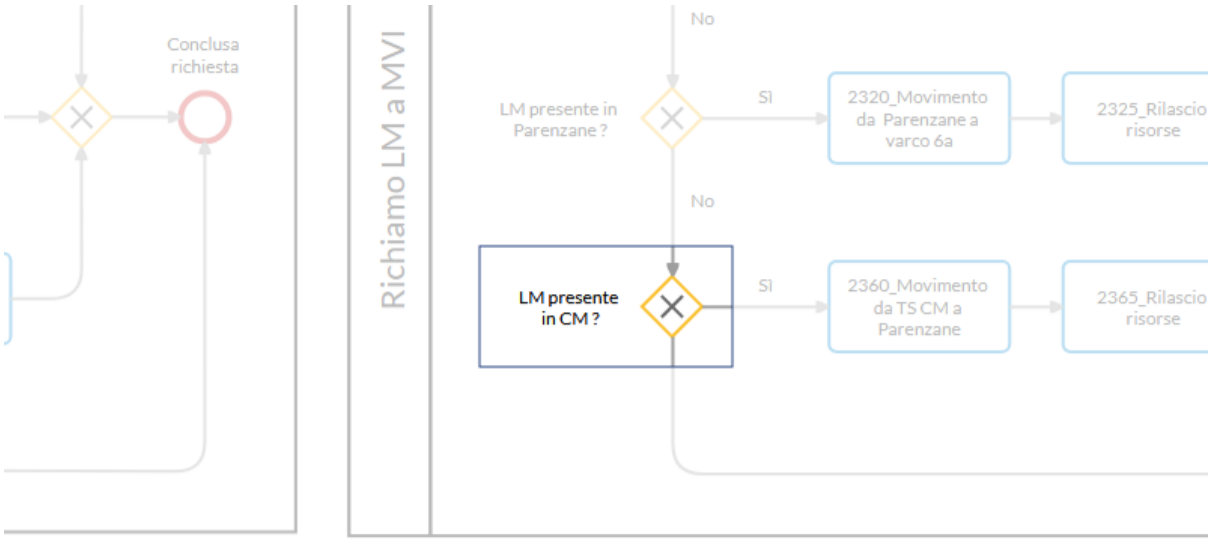
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in FDM ? through Sì	TASK 2305_Rilascio risorse

LM presente in CM ?

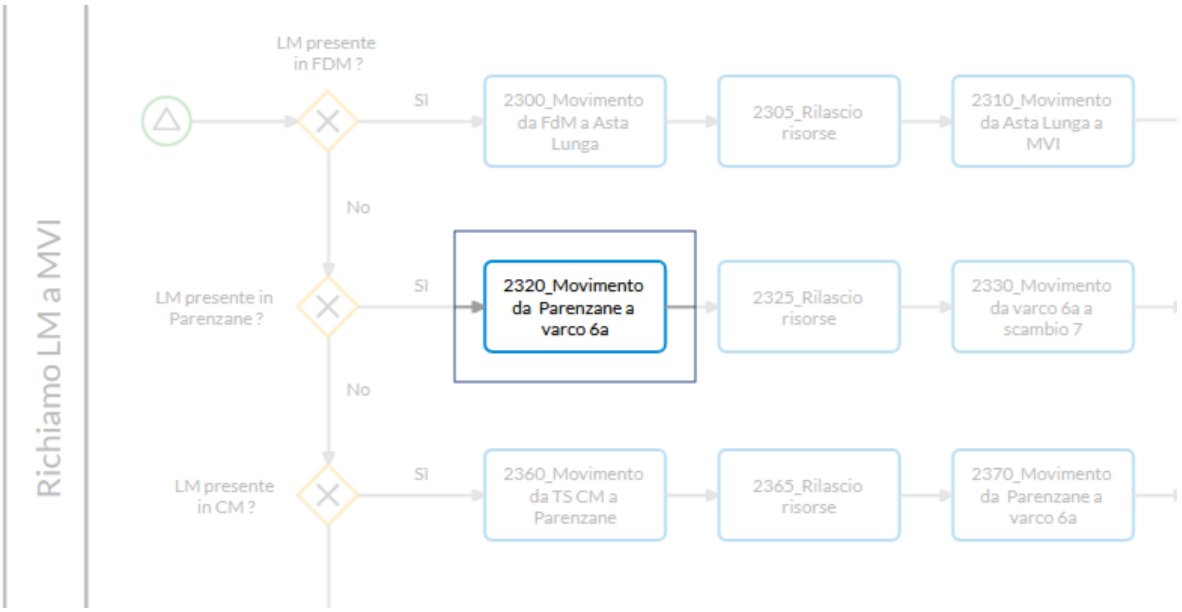
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in Parenzane ? through No	TASK 2360_Movimento da TS CM a Parenzane through Sì
	END EVENT Conclusa richiesta through No - Nessuna locomotiva disponibile

2320_Movimento da Parenzane a varco 6a

TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in Parenzane ? through Sì	TASK 2325_Rilascio risorse

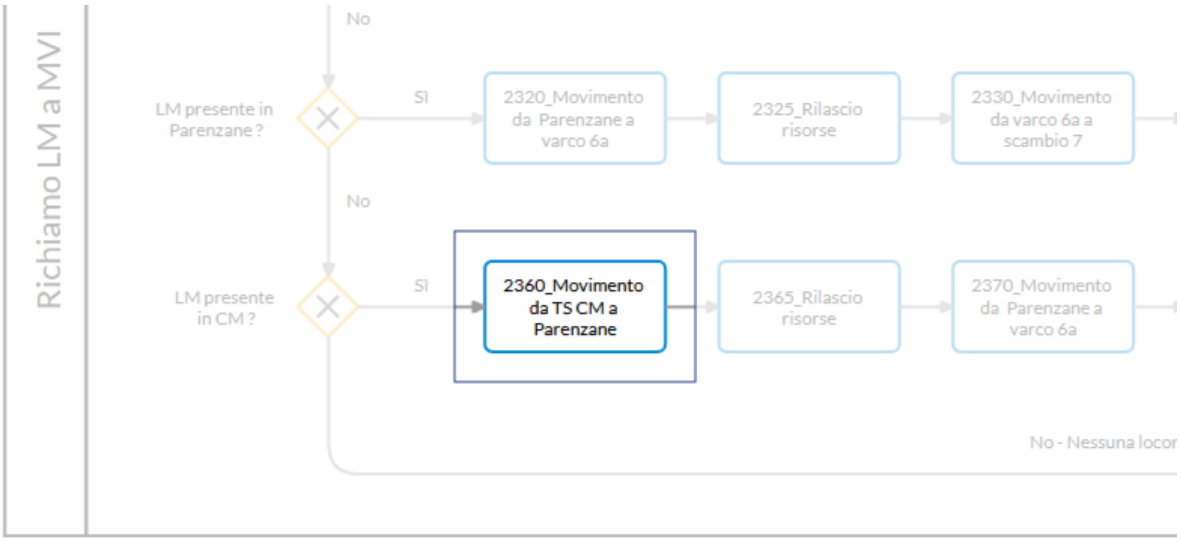
2305_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2300_Movimento da FdM a Asta Lunga	TASK 2310_Movimento da Asta Lunga a MVI

2360_Movimento da TS CM a Parenzane

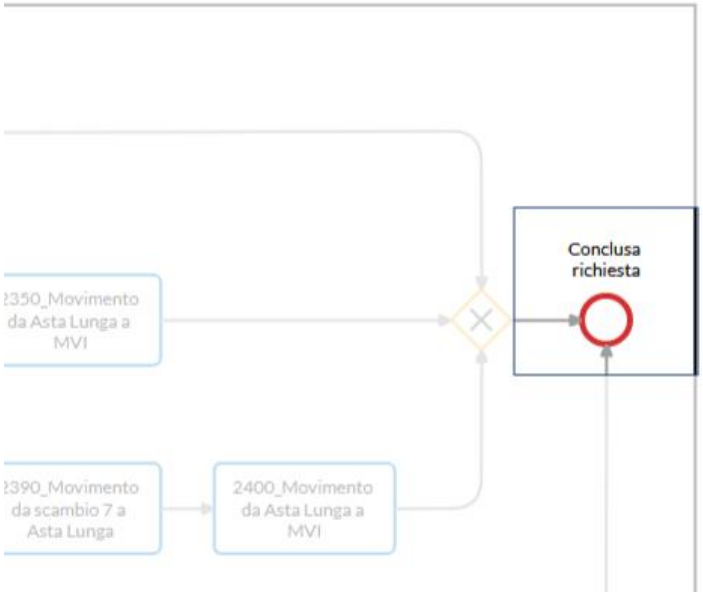
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in CM ? through Sì	TASK 2365_Rilascio risorse

Conclusa richiesta

END EVENT



Incoming

EXCLUSIVE GATEWAY
Exclusive Gateway_7870

EXCLUSIVE GATEWAY
LM presente in CM ?
through No - Nessuna locomotiva disponibile

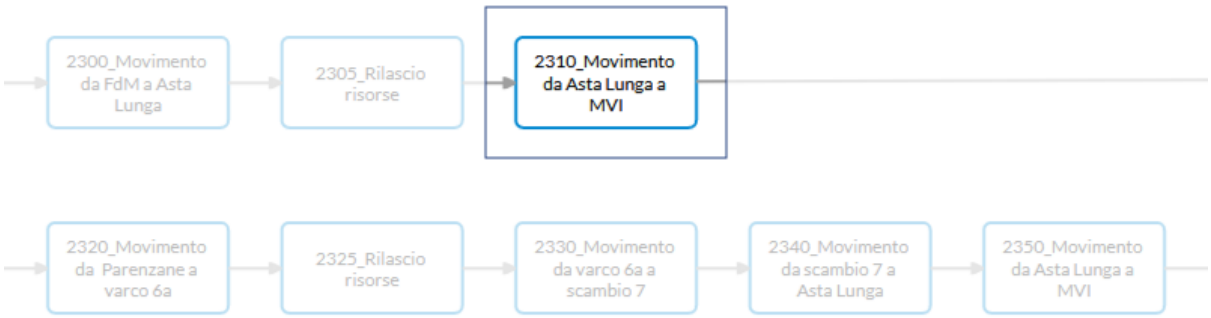
2325_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2320_Movimento da Parenzane a varco 6a	TASK 2330_Movimento da varco 6a a scambio 7

2310_Movimento da Asta Lunga a MVI

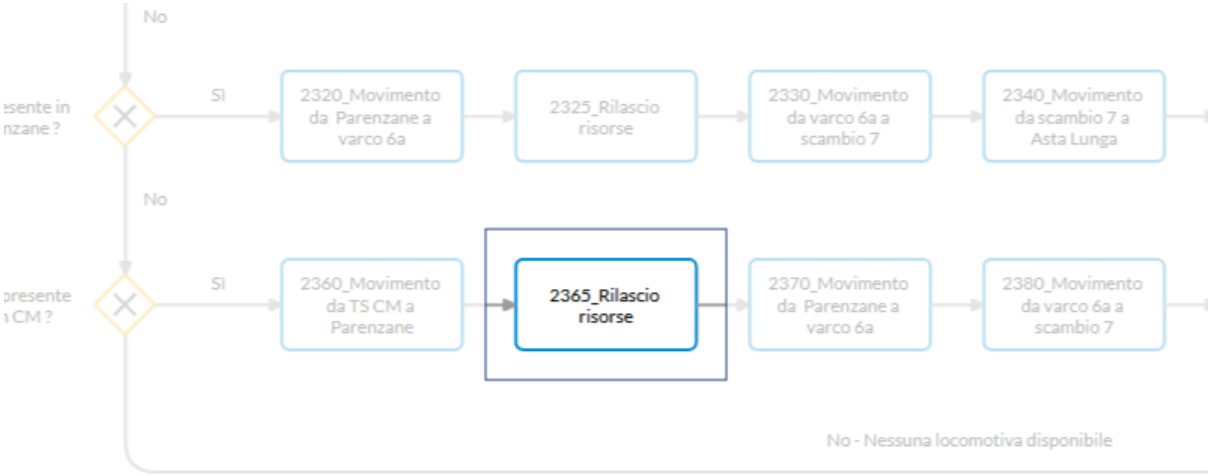
TASK



Incoming	Outgoing
TASK 2305_Rilascio risorse	EXCLUSIVE GATEWAY Exclusive Gateway_7870

2365_Rilascio risorse

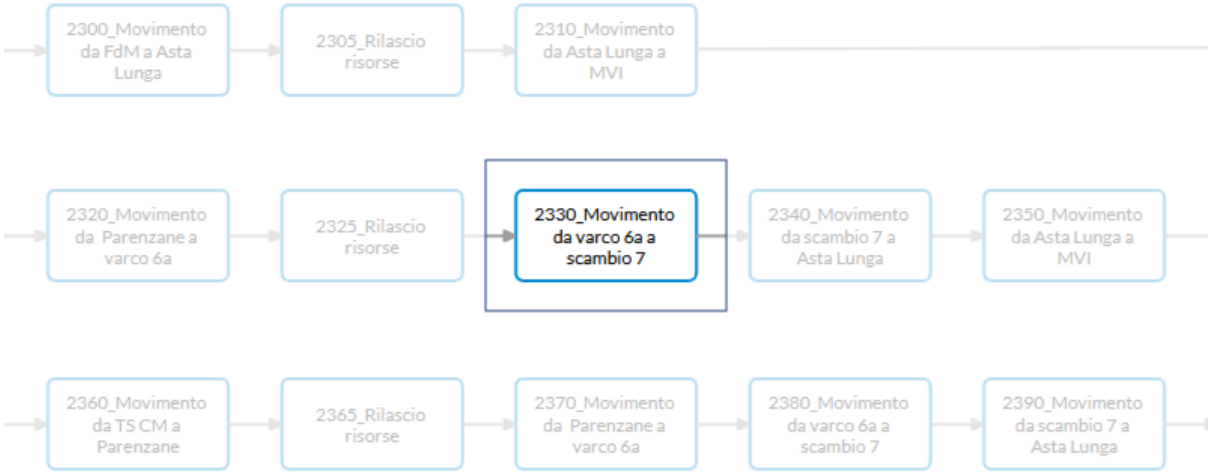
TASK



Incoming	Outgoing
TASK 2360_Movimento da TS CM a Parenzane	TASK 2370_Movimento da Parenzane a varco 6a

2330_Movimento da varco 6a a scambio 7

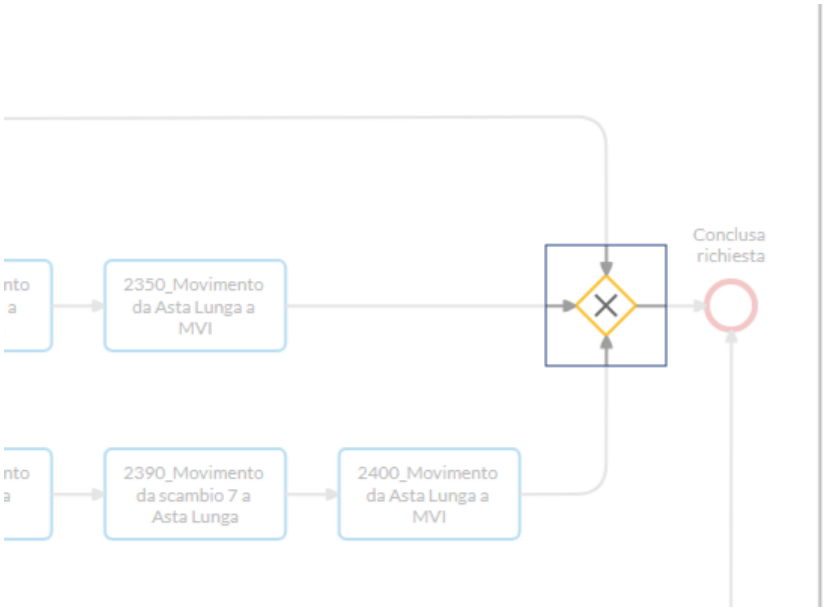
TASK



Incoming	Outgoing
TASK 2325_Rilascio risorse	TASK 2340_Movimento da scambio 7 a Asta Lunga

Exclusive Gateway_7870

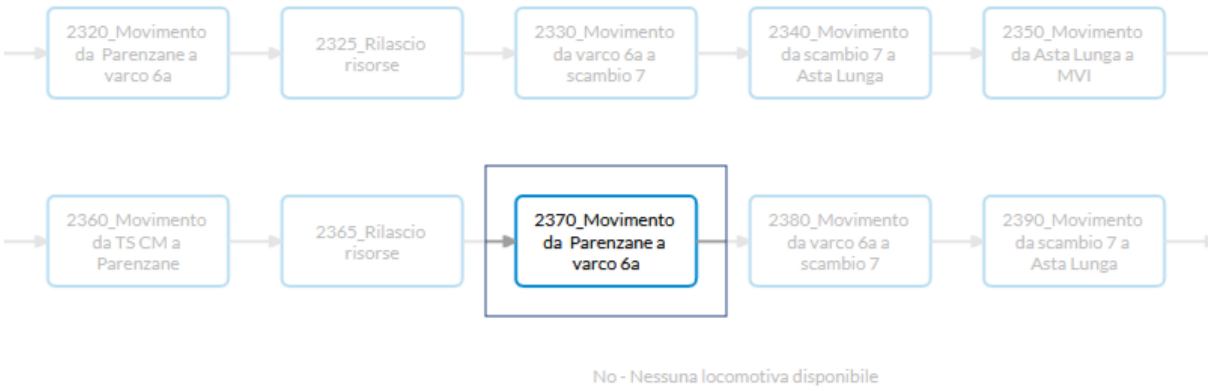
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 2400_Movimento da Asta Lunga a MVI	END EVENT Conclusa richiesta
TASK 2350_Movimento da Asta Lunga a MVI	
TASK 2310_Movimento da Asta Lunga a MVI	

2370_Movimento da Parenzane a varco 6a

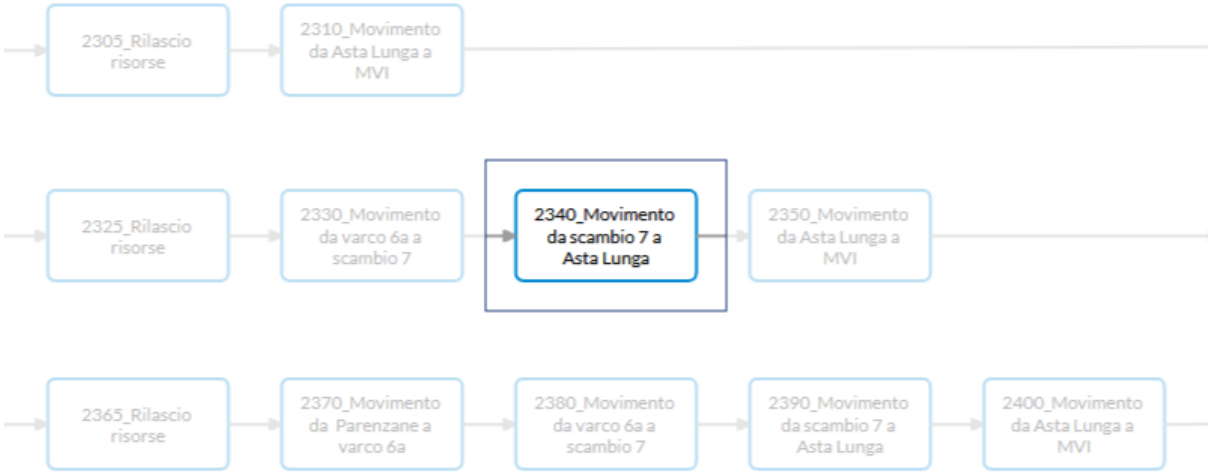
TASK



Incoming	Outgoing
TASK 2365_Rilascio risorse	TASK 2380_Movimento da varco 6a a scambio 7

2340_Movimento da scambio 7 a Asta Lunga

TASK



Incoming	Outgoing
TASK 2330_Movimento da varco 6a a scambio 7	TASK 2350_Movimento da Asta Lunga a MVI

2380_Movimento da varco 6a a scambio 7

TASK

Incoming	Outgoing
TASK 2370_Movimento da Parenzane a varco 6a	TASK 2390_Movimento da scambio 7 a Asta Lunga

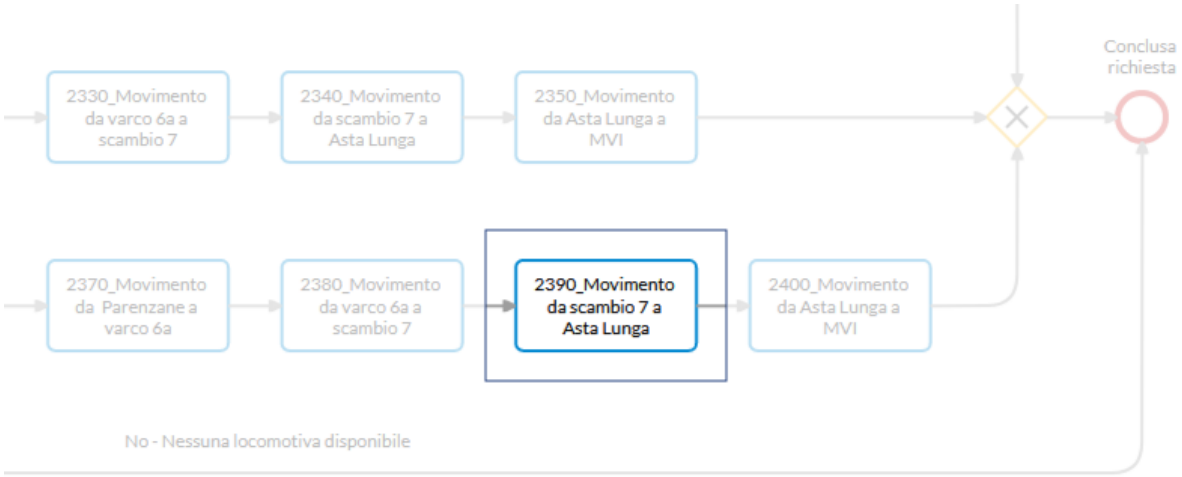
2350_Movimento da Asta Lunga a MVI

TASK

Incoming	Outgoing
TASK 2340_Movimento da scambio 7 a Asta Lunga	EXCLUSIVE GATEWAY Exclusive Gateway_7870

2390_Movimento da scambio 7 a Asta Lunga

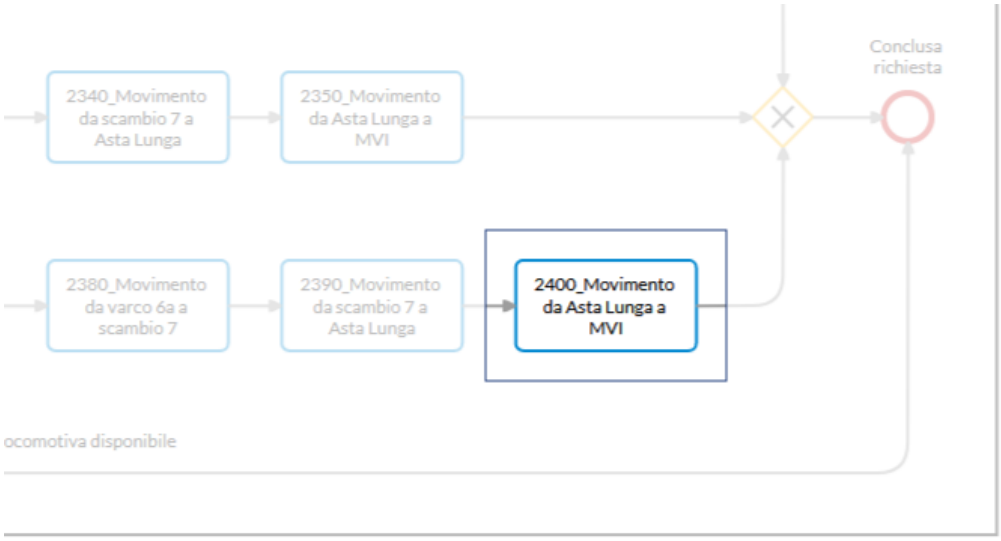
TASK



Incoming	Outgoing
TASK 2380_Movimento da varco 6a a scambio 7	TASK 2400_Movimento da Asta Lunga a MVI

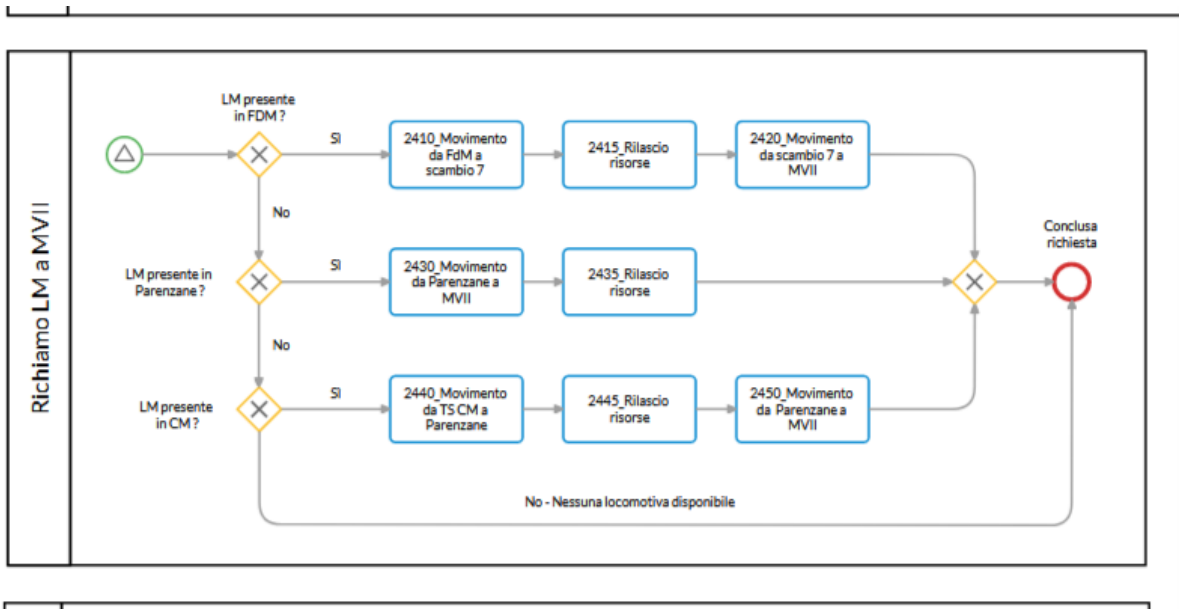
2400_Movimento da Asta Lunga a MVI

TASK



Incoming	Outgoing
TASK 2390_Movimento da scambio 7 a Asta Lunga	EXCLUSIVE GATEWAY Exclusive Gateway_7870

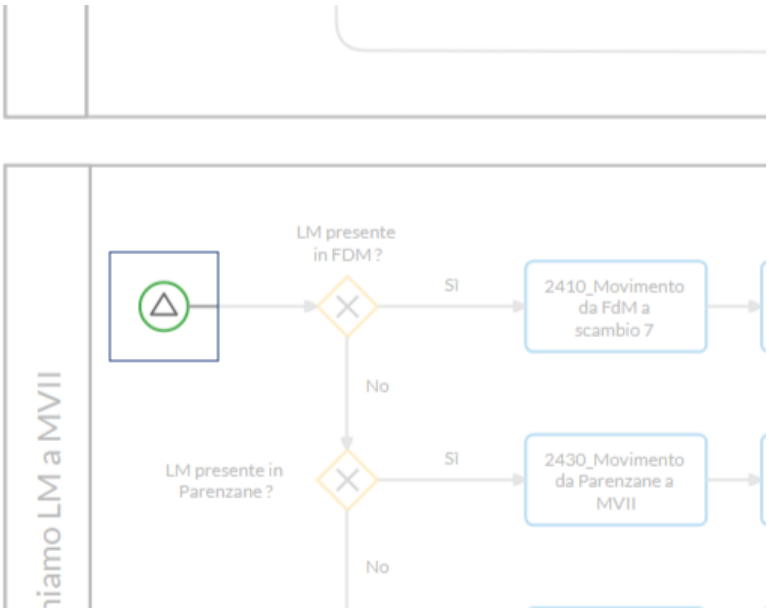
4.3. Process: Richiamo LM a MVII



4.3.1. Process Elements

signalStartEvents_14753c6f-d30e-9709-7e75-9e2f1c3b5242

SIGNAL START EVENT



Outgoing

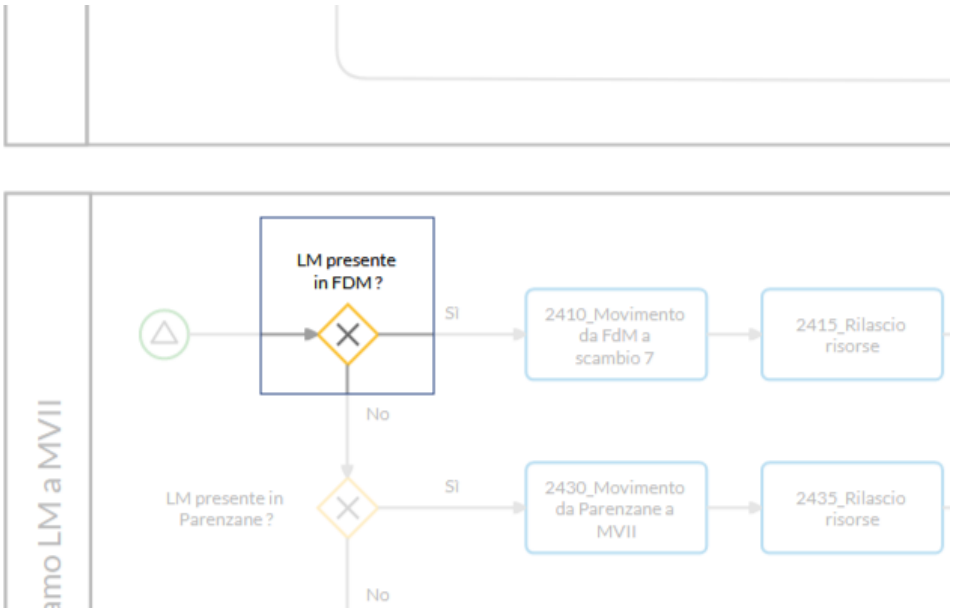
EXCLUSIVE GATEWAY
LM presente in FDM ?

Attributes

SIGNAL REFERENCE
Richiamo_LM_estrazione_MVII

LM presente in FDM ?

EXCLUSIVE GATEWAY



Incoming

SIGNAL START EVENT
signalStartEvents_14753c6f-d30e-9709-7e75-9e2f1c3b5242

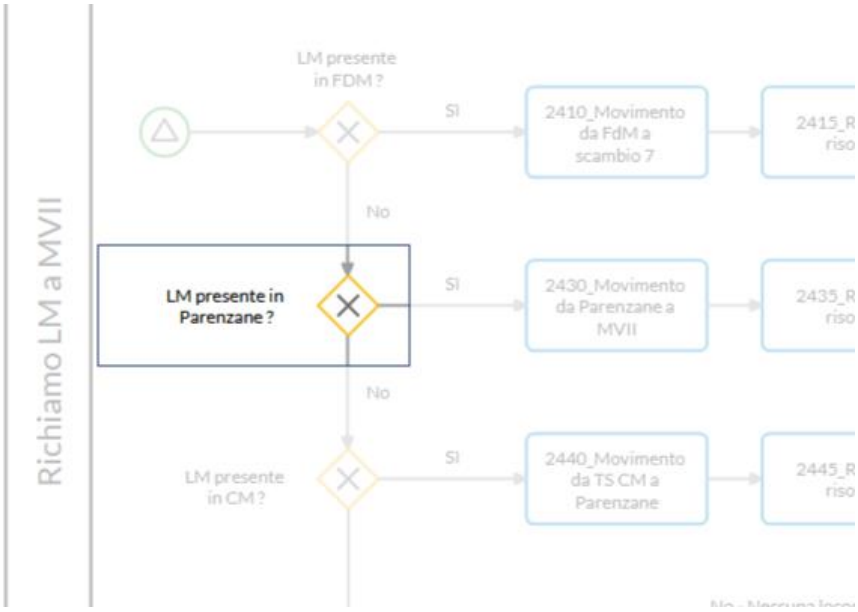
Outgoing

EXCLUSIVE GATEWAY
LM presente in Parenzane ?
through No

TASK
2410_Movimento da FdM a scambio 7
through Sì

LM presente in Parenzane ?

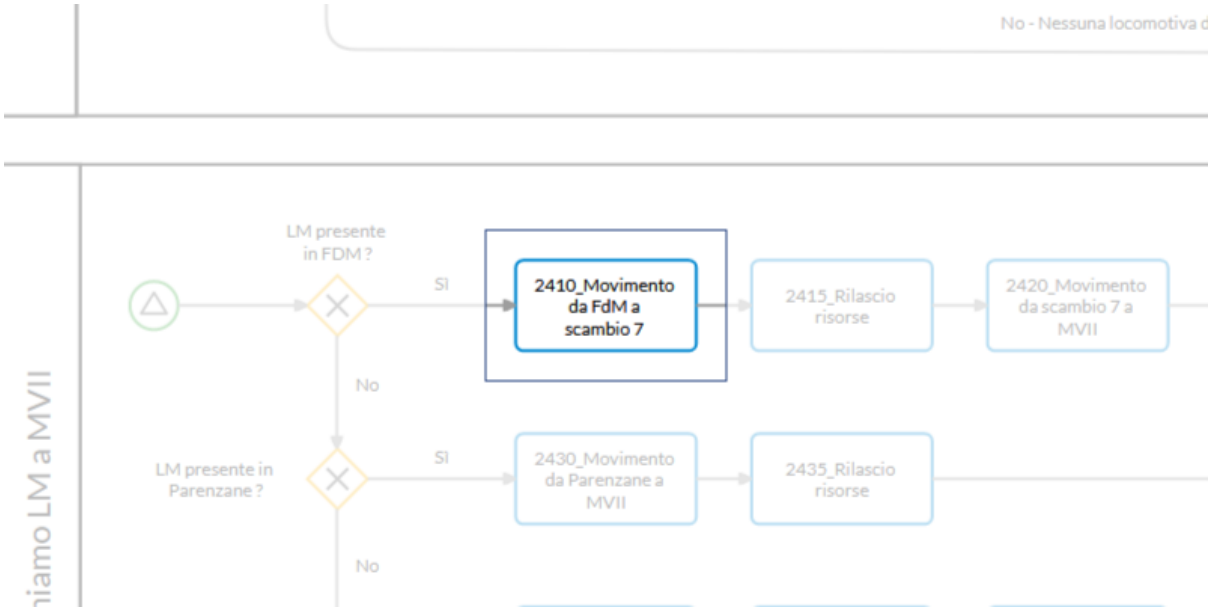
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in FDM ? through No	EXCLUSIVE GATEWAY LM presente in CM ? through No
	TASK 2430_Movimento da Parenzane a MVII through Sì

2410_Movimento da FdM a scambio 7

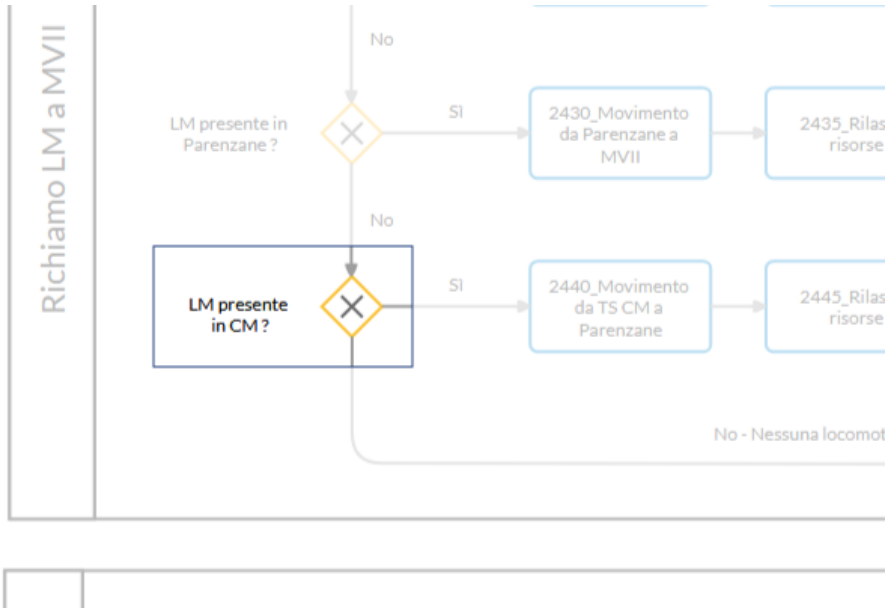
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in FDM ? through Sì	TASK 2415_Rilascio risorse

LM presente in CM ?

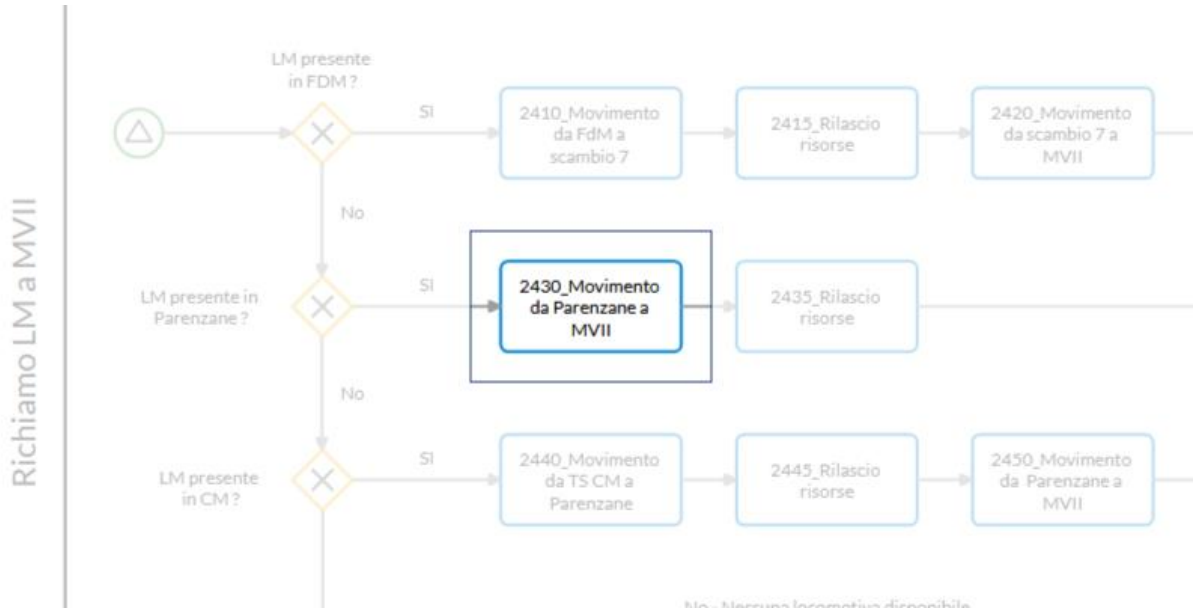
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in Parenzane ? through No	TASK 2440_Movimento da TS CM a Parenzane through Sì
	END EVENT Conclusa richiesta through No - Nessuna locomotiva disponibile

2430_Movimento da Parenzane a MVII

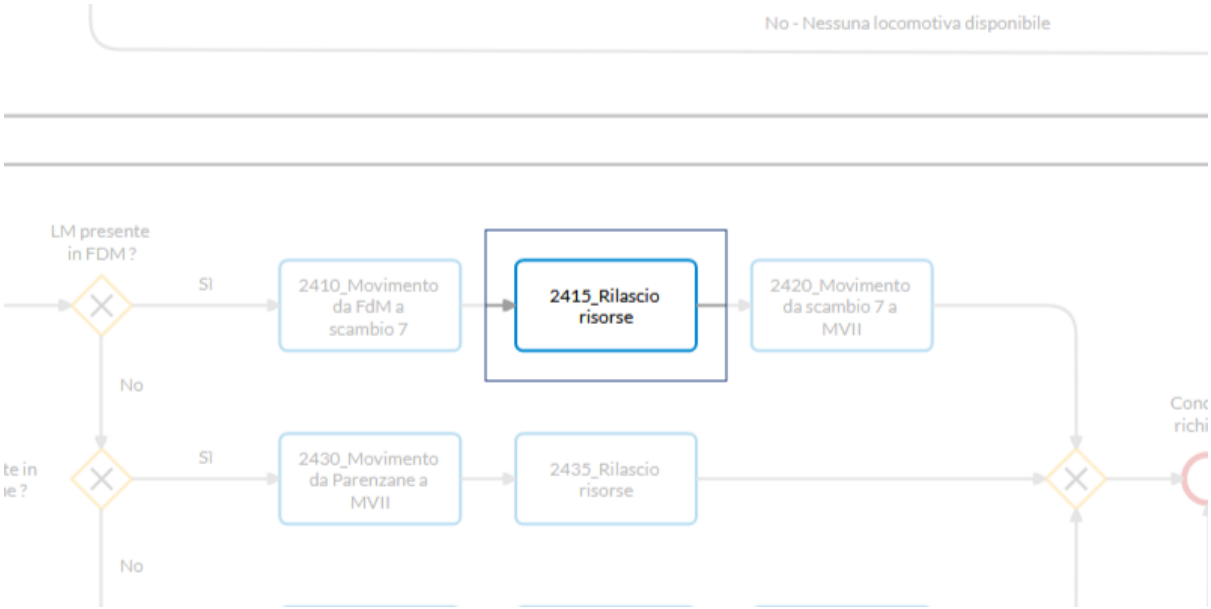
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in Parenzane ? through Sì	TASK 2435_Rilascio risorse

2415_Rilascio risorse

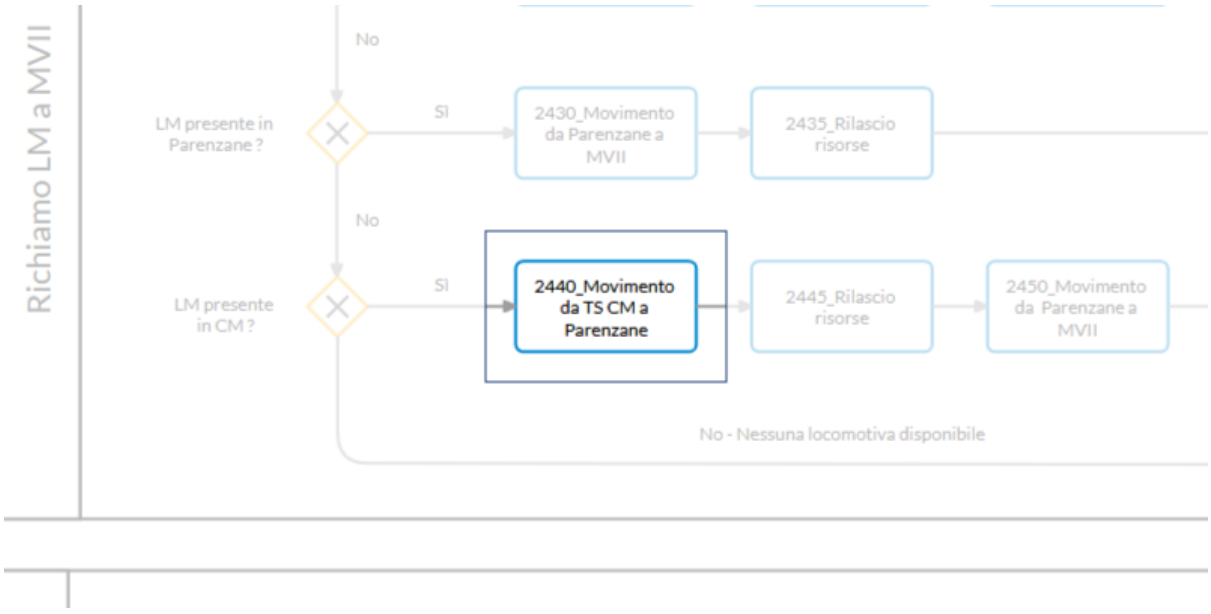
TASK



Incoming	Outgoing
TASK 2410_Movimento da FdM a scambio 7	TASK 2420_Movimento da scambio 7 a MVII

2440_Movimento da TS CM a Parenzane

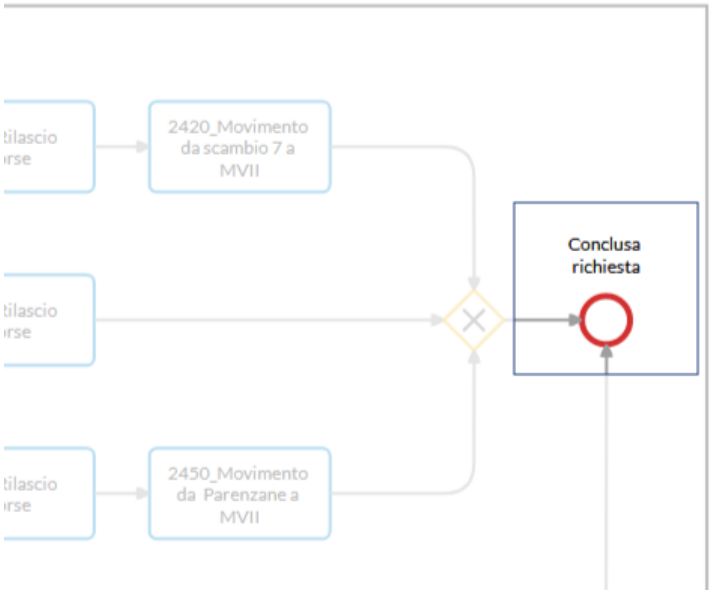
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente in CM ? through Sì	TASK 2445_Rilascio risorse

Conclusa richiesta

END EVENT



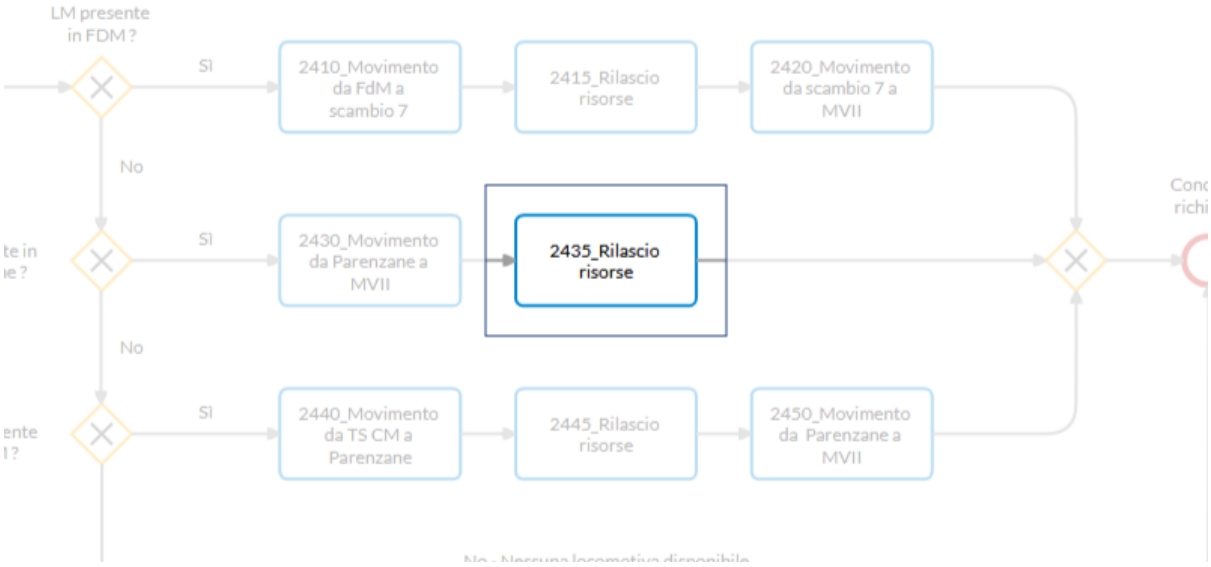
Incoming

EXCLUSIVE GATEWAY
LM presente in CM ?
through No - Nessuna locomotiva disponibile

EXCLUSIVE GATEWAY
Exclusive Gateway_7870

2435_Rilascio risorse

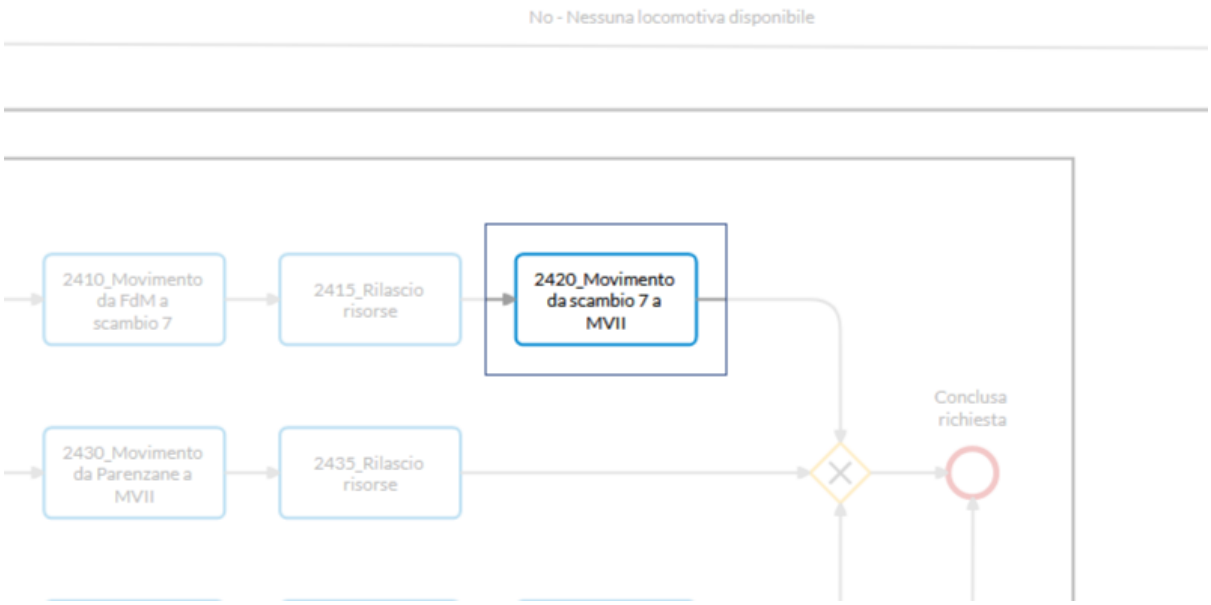
TASK



Incoming	Outgoing
TASK 2430_Movimento da Parenzane a MVII	EXCLUSIVE GATEWAY Exclusive Gateway_7870

2420_Movimento da scambio 7 a MVII

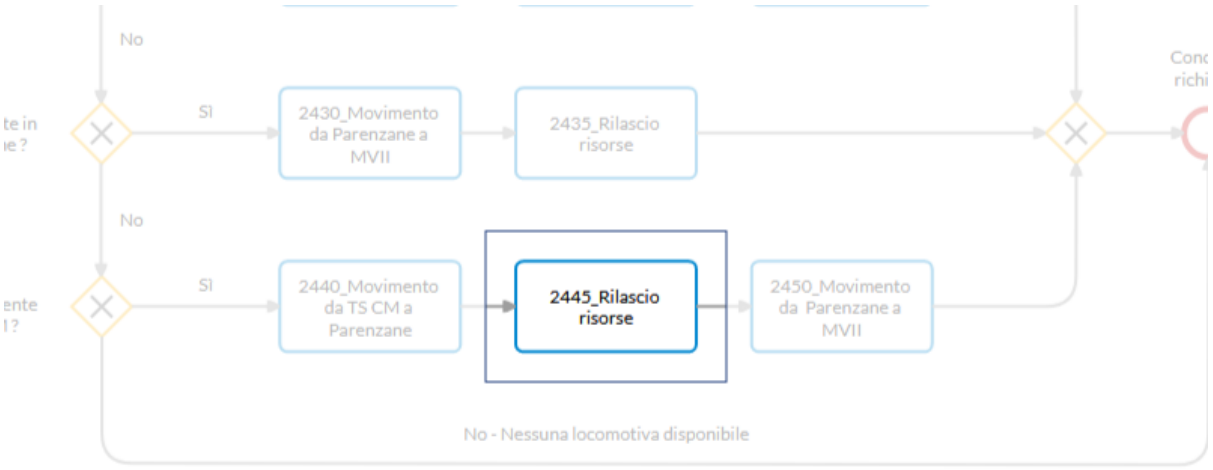
TASK



Incoming	Outgoing
TASK 2415_Rilascio risorse	EXCLUSIVE GATEWAY Exclusive Gateway_7870

2445_Rilascio risorse

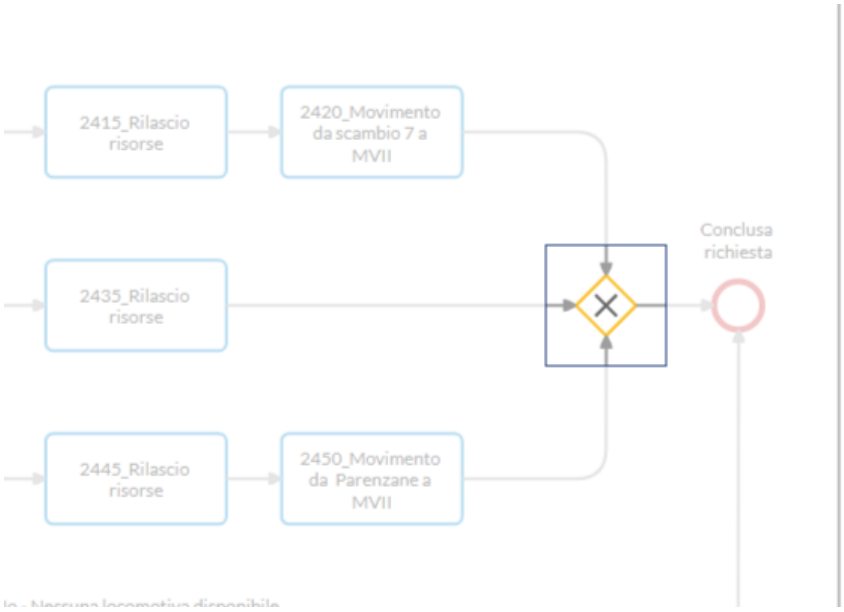
TASK



Incoming	Outgoing
TASK 2440_Movimento da TS CM a Parenzane	TASK 2450_Movimento da Parenzane a MVII

Exclusive Gateway_7870

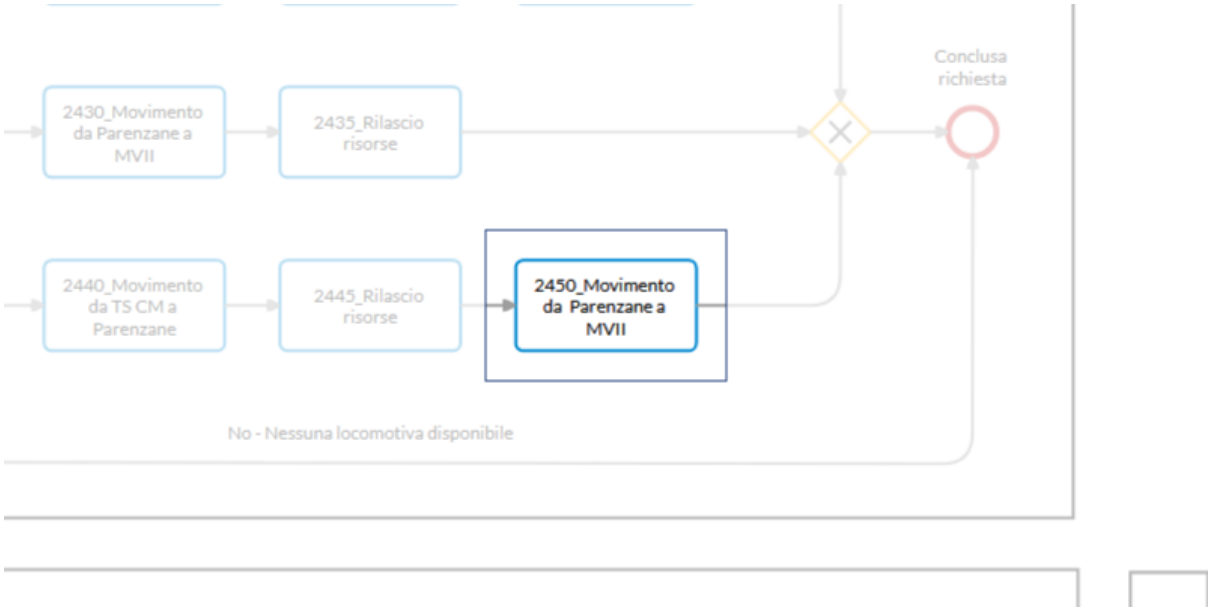
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 2420_Movimento da scambio 7 a MVII	END EVENT Conclusa richiesta
TASK 2450_Movimento da Parenzane a MVII	
TASK 2435_Rilascio risorse	

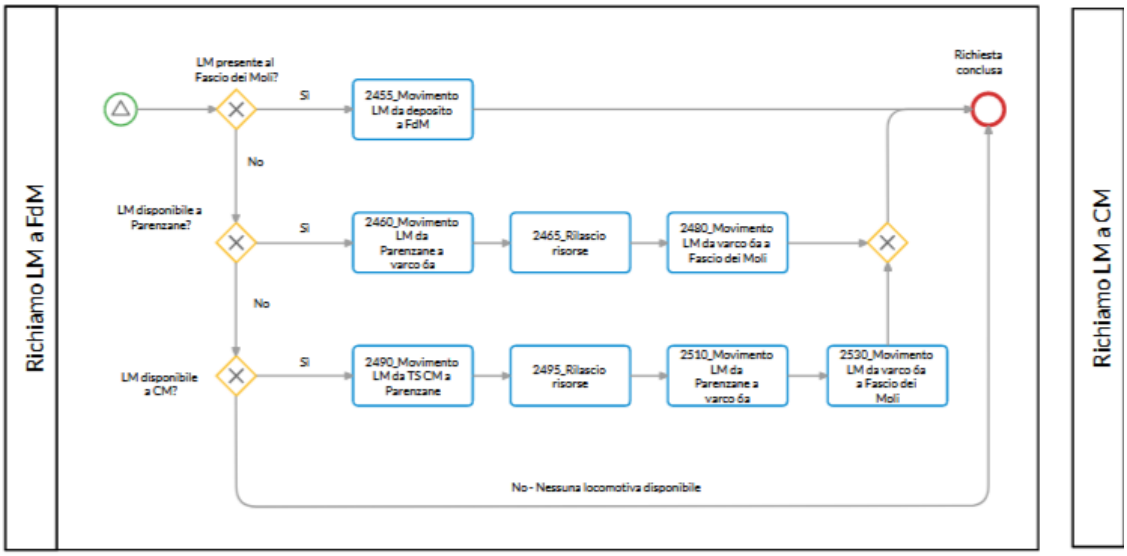
2450_Movimento da Parenzane a MVII

TASK



Incoming	Outgoing
TASK 2445_Rilascio risorse	EXCLUSIVE GATEWAY Exclusive Gateway_7870

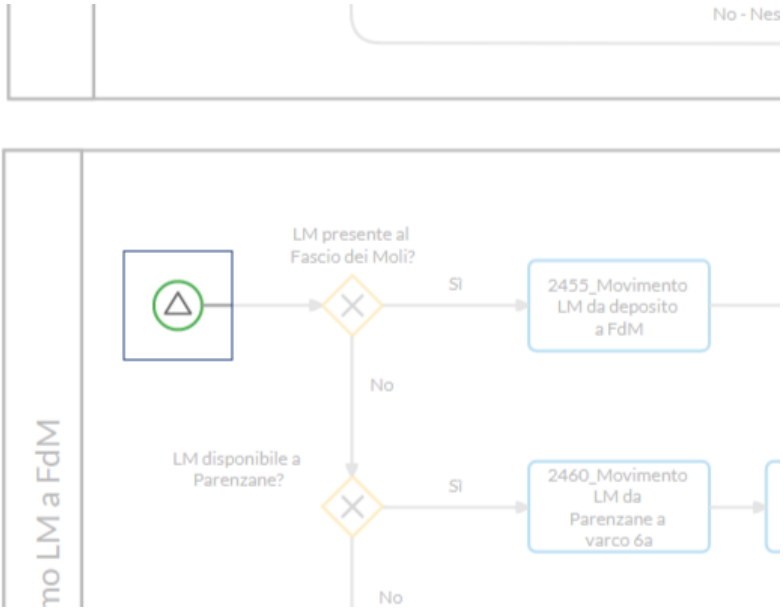
4.4. Process: Richiamo LM a FdM



4.4.1. Process Elements

signalStartEvents_0a73bdfc-5555-4362-e519-62cde1756533

SIGNAL START EVENT



Outgoing

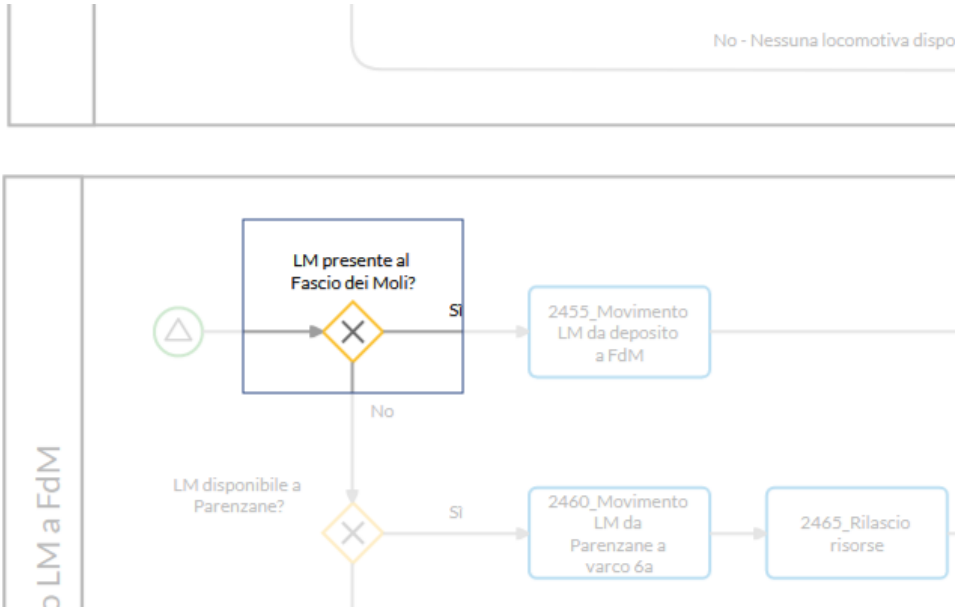
EXCLUSIVE GATEWAY
LM presente al Fascio dei Moli?

Attributes

SIGNAL REFERENCE
RichiamoLM_ManovraSec_FdM

LM presente al Fascio dei Moli?

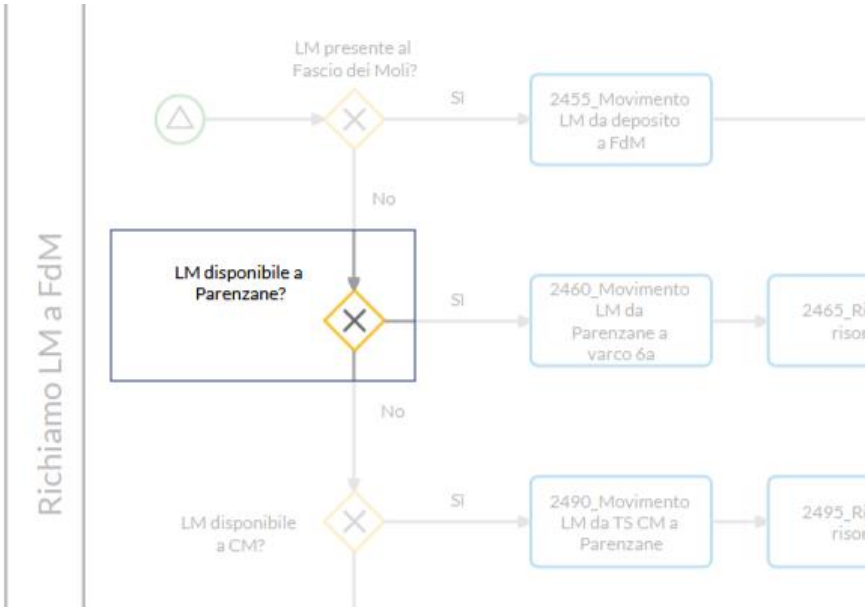
EXCLUSIVE GATEWAY



Incoming	Outgoing
SIGNAL START EVENT signalStartEvents_0a73bdfc-5555-4362-e519-62cde1756533	EXCLUSIVE GATEWAY LM disponibile a Parenzane? through No
	TASK 2455_Movimento LM da deposito a FdM through Sì

LM disponibile a Parenzane?

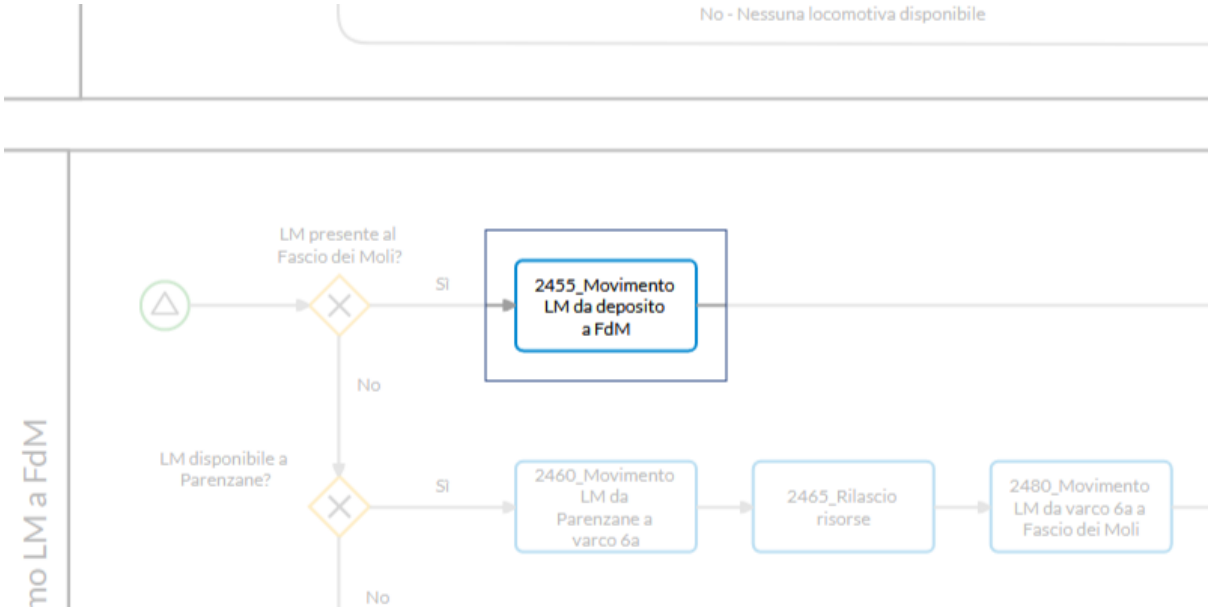
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente al Fascio dei Moli? through No	EXCLUSIVE GATEWAY LM disponibile a CM? through No
	TASK 2460_Movimento LM da Parenzane a varco 6a through Sì

2455_Movimento LM da deposito a FdM

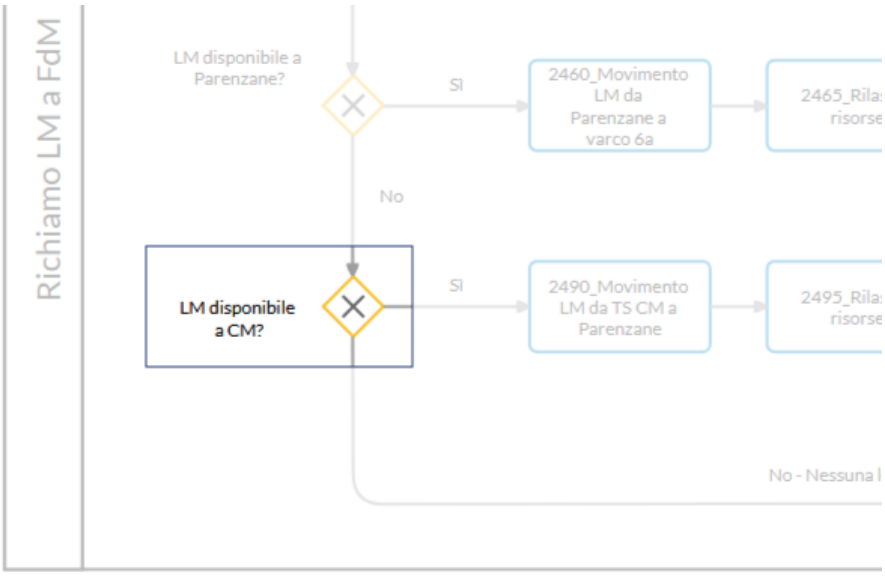
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM presente al Fascio dei Moli? through Sì	END EVENT Richiesta conclusa

LM disponibile a CM?

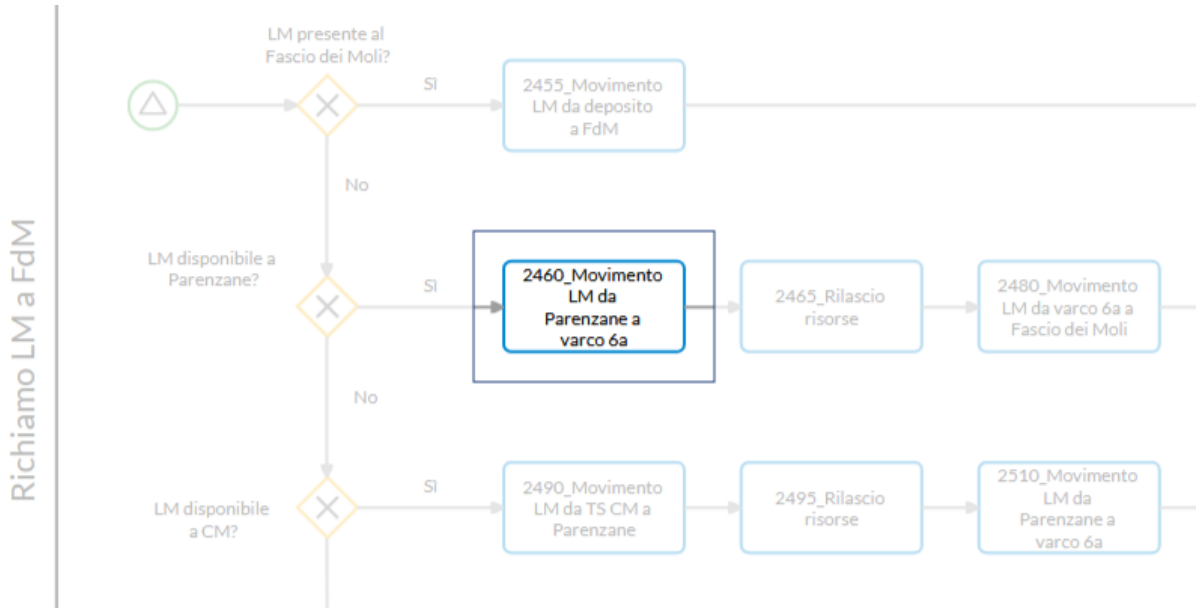
EXCLUSIVE GATEWAY



Incoming	Outgoing
EXCLUSIVE GATEWAY LM disponibile a Parenzane? through No	TASK 2490_Movimento LM da TS CM a Parenzane through Sì
	END EVENT Richiesta conclusa through No - Nessuna locomotiva disponibile

2460_Movimento LM da Parenzane a varco 6a

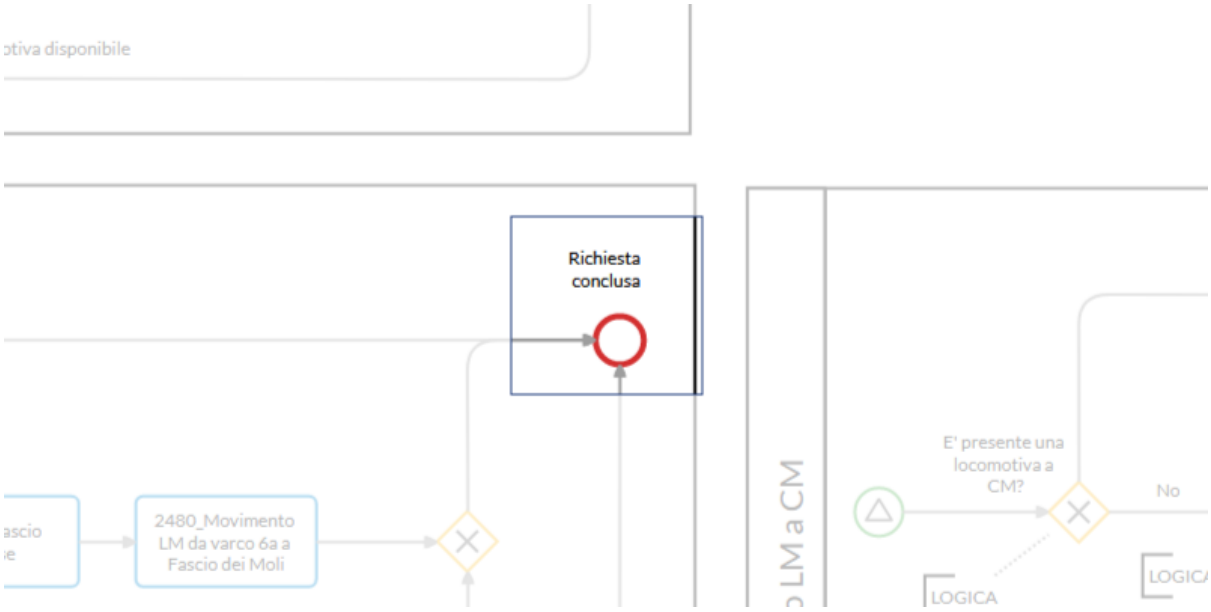
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM disponibile a Parenzane? through Sì	TASK 2465_Rilascio risorse

Richiesta conclusa

END EVENT



Incoming

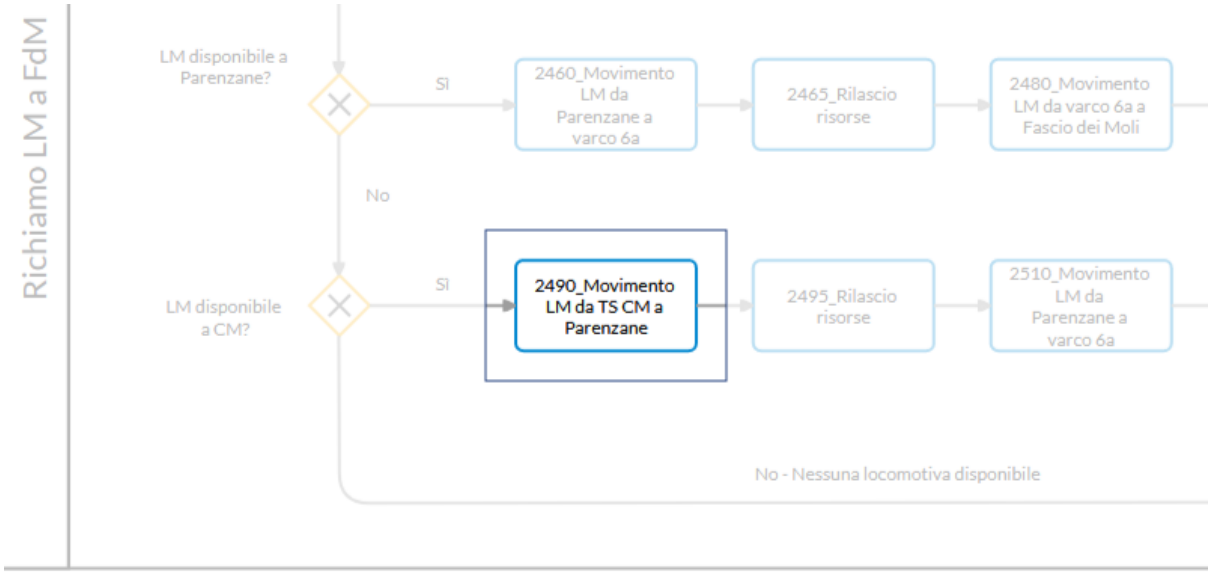
TASK
2455_Movimento LM da deposito a FdM

EXCLUSIVE GATEWAY
LM disponibile a CM?
through No - Nessuna locomotiva disponibile

EXCLUSIVE GATEWAY
Exclusive Gateway_2918

2490_Movimento LM da TS CM a Parenzane

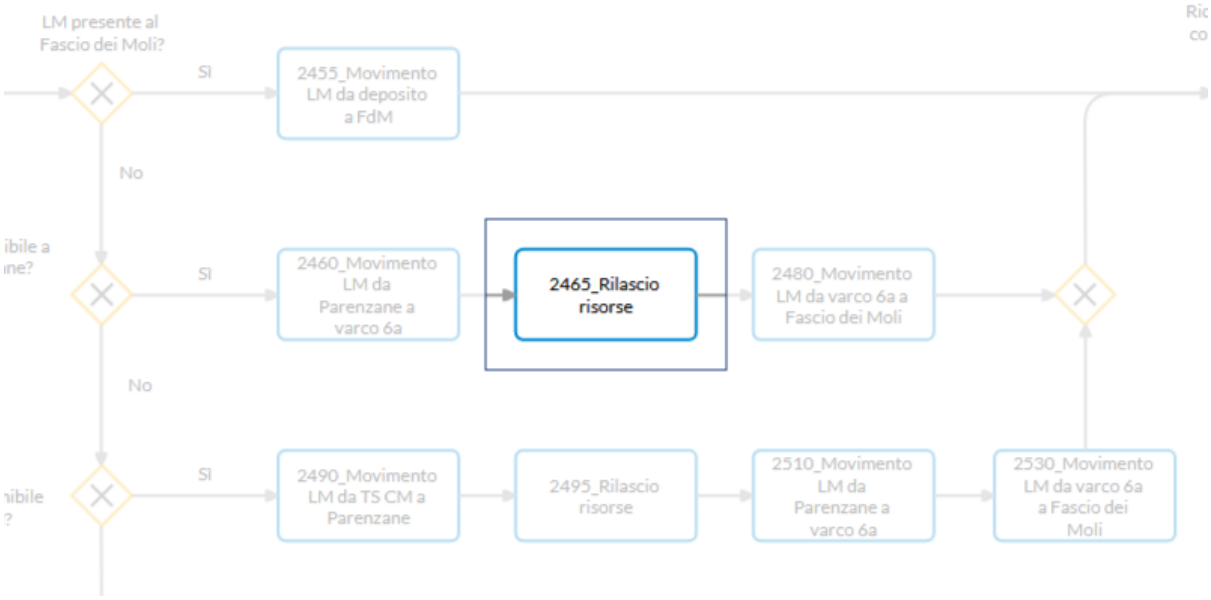
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY LM disponibile a CM? through Sì	TASK 2495_Rilascio risorse

2465_Rilascio risorse

TASK



Incoming	Outgoing
TASK 2460_Movimento LM da Parenzane a varco 6a	TASK 2480_Movimento LM da varco 6a a Fascio dei Moli

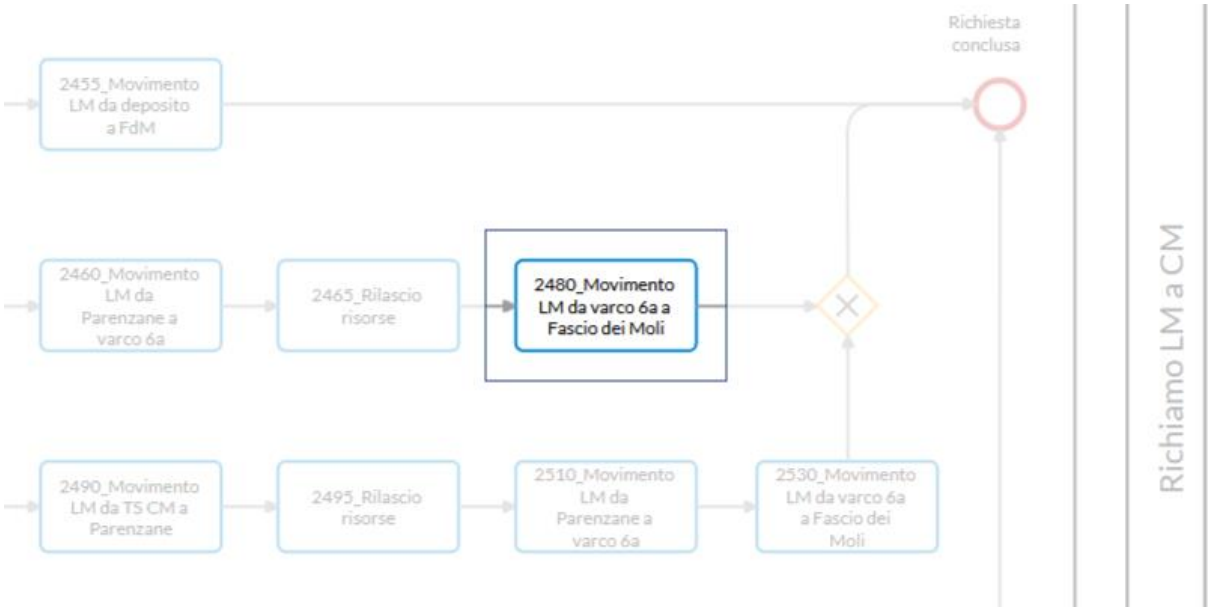
2495_Rilascio risorse

TASK

Incoming	Outgoing
TASK 2490_Movimento LM da TS CM a Parenzane	TASK 2510_Movimento LM da Parenzane a varco 6a

2480_Movimento LM da varco 6a a Fascio dei Moli

TASK



Incoming	Outgoing
TASK 2465_Rilascio risorse	EXCLUSIVE GATEWAY Exclusive Gateway_2918

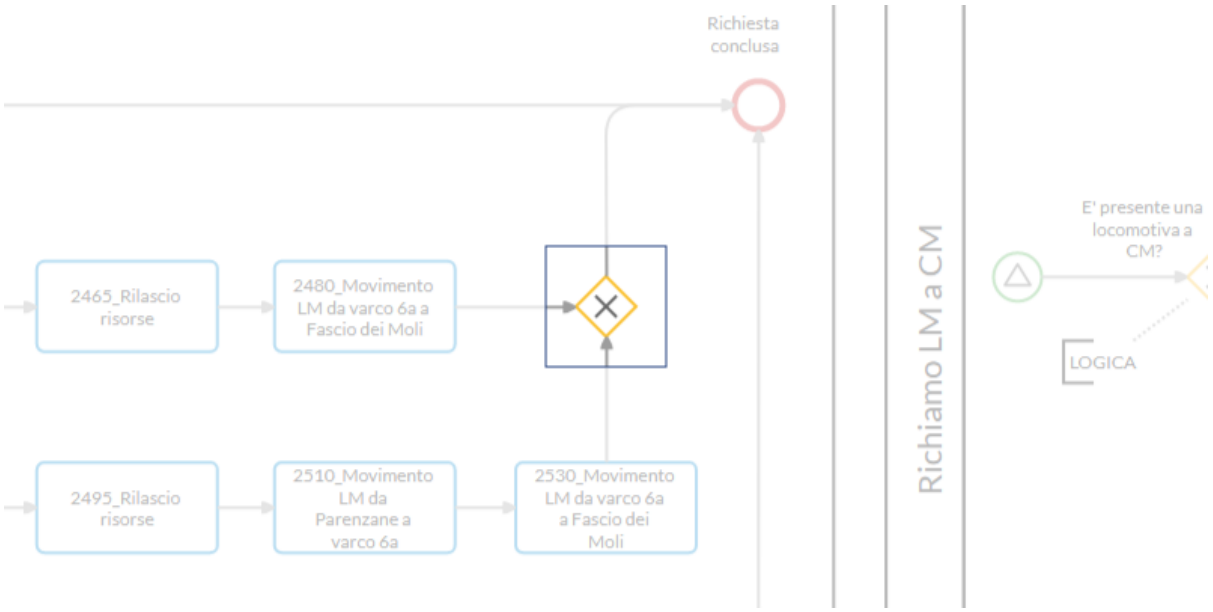
2510_Movimento LM da Parenzane a varco 6a

TASK

Incoming	Outgoing
TASK 2495_Rilascio risorse	TASK 2530_Movimento LM da varco 6a a Fascio dei Moli

Exclusive Gateway_2918

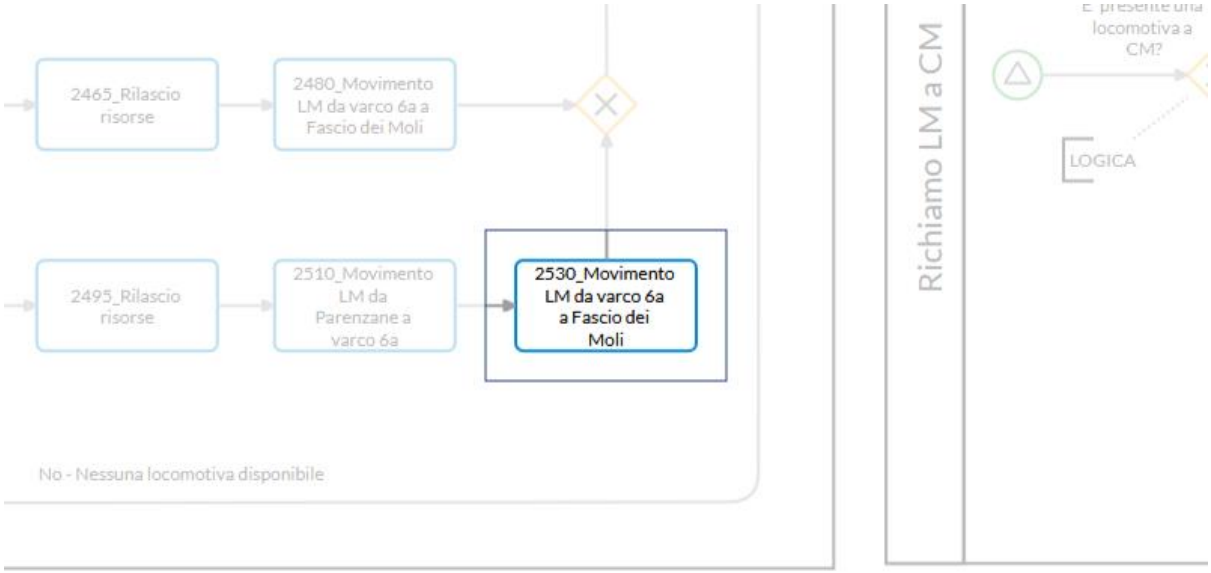
EXCLUSIVE GATEWAY



Incoming	Outgoing
TASK 2530_Movimento LM da varco 6a a Fascio dei Moli	END EVENT Richiesta conclusa
TASK 2480_Movimento LM da varco 6a a Fascio dei Moli	

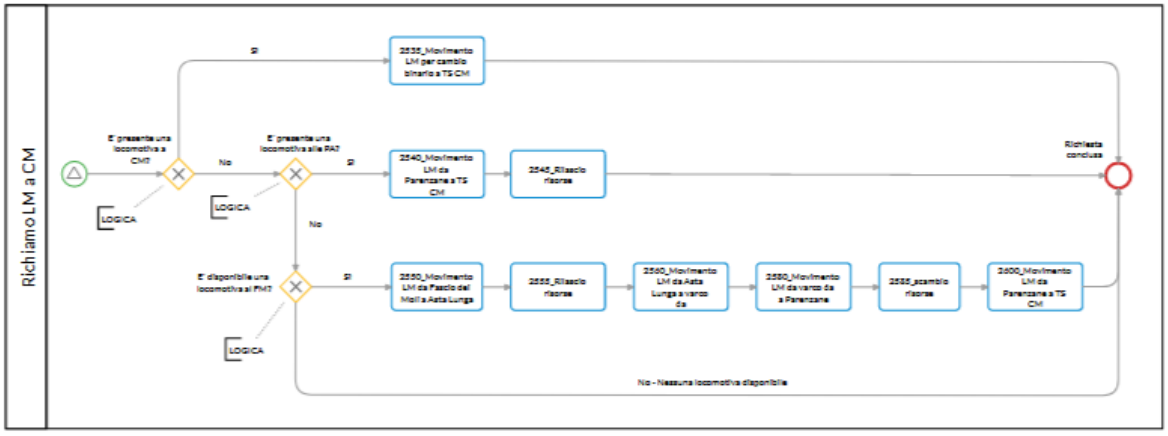
2530_Movimento LM da varco 6a a Fascio dei Moli

TASK



Incoming	Outgoing
TASK 2510_Movimento LM da Parenzane a varco 6a	EXCLUSIVE GATEWAY Exclusive Gateway_2918

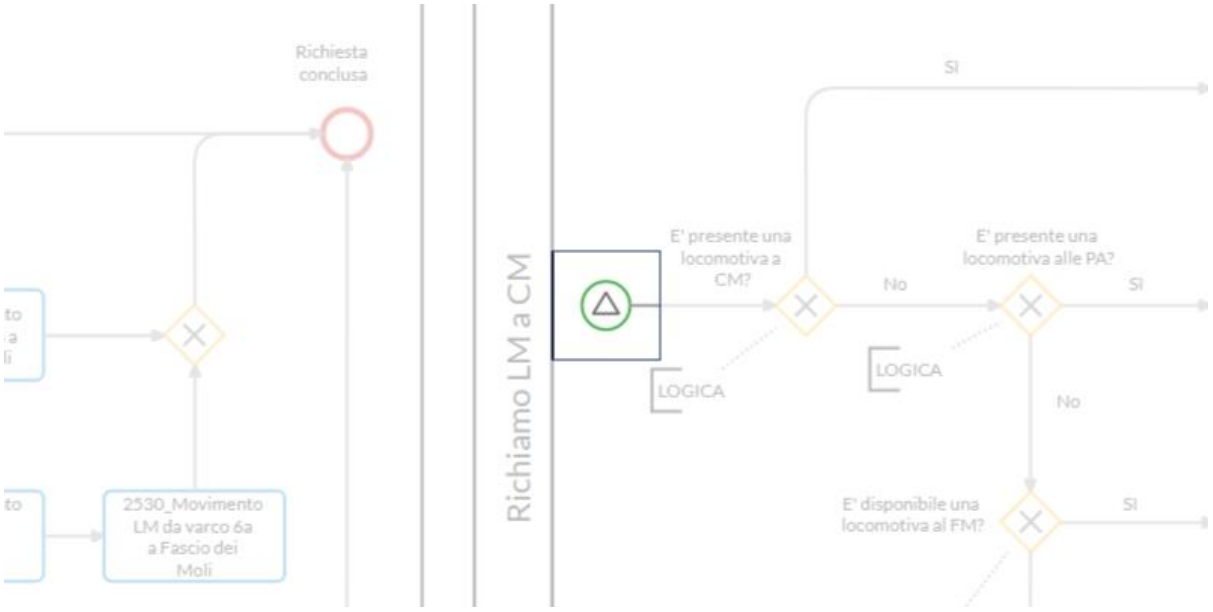
4.5. Process: Richiamo LM a CM



4.5.1. Process Elements

signalStartEvents_a38ad7a7-19d2-170d-a46f-35785cb2f954

SIGNAL START EVENT



Outgoing

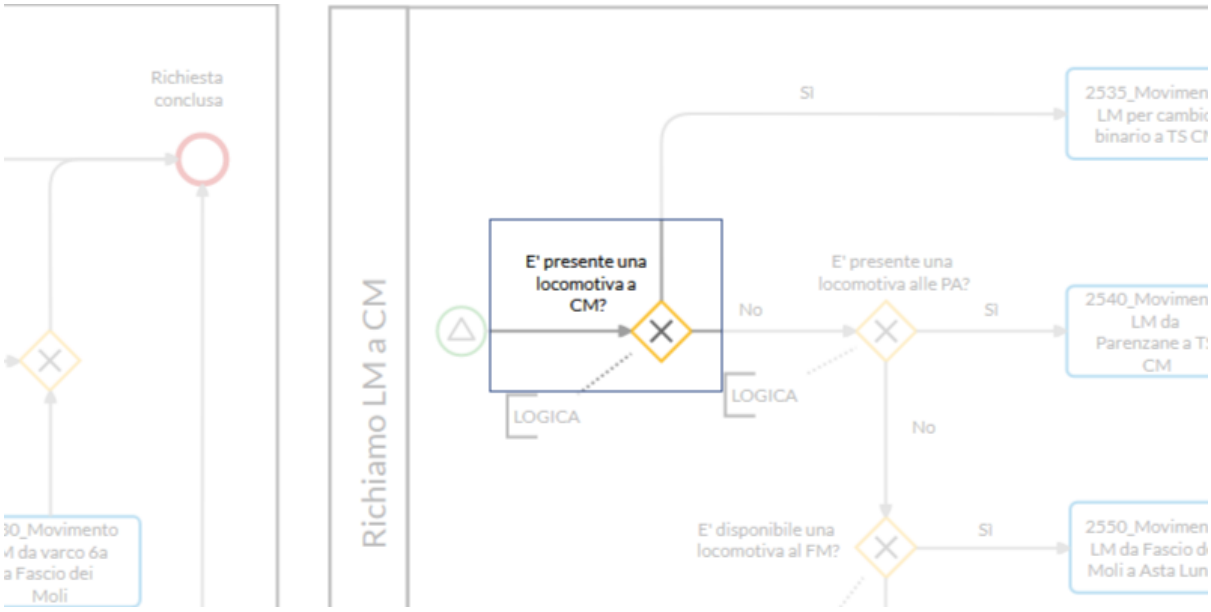
EXCLUSIVE GATEWAY
E' presente una locomotiva a CM?

Attributes

SIGNAL REFERENCE
richiamoLocomotiva

E' presente una locomotiva a CM?

EXCLUSIVE GATEWAY

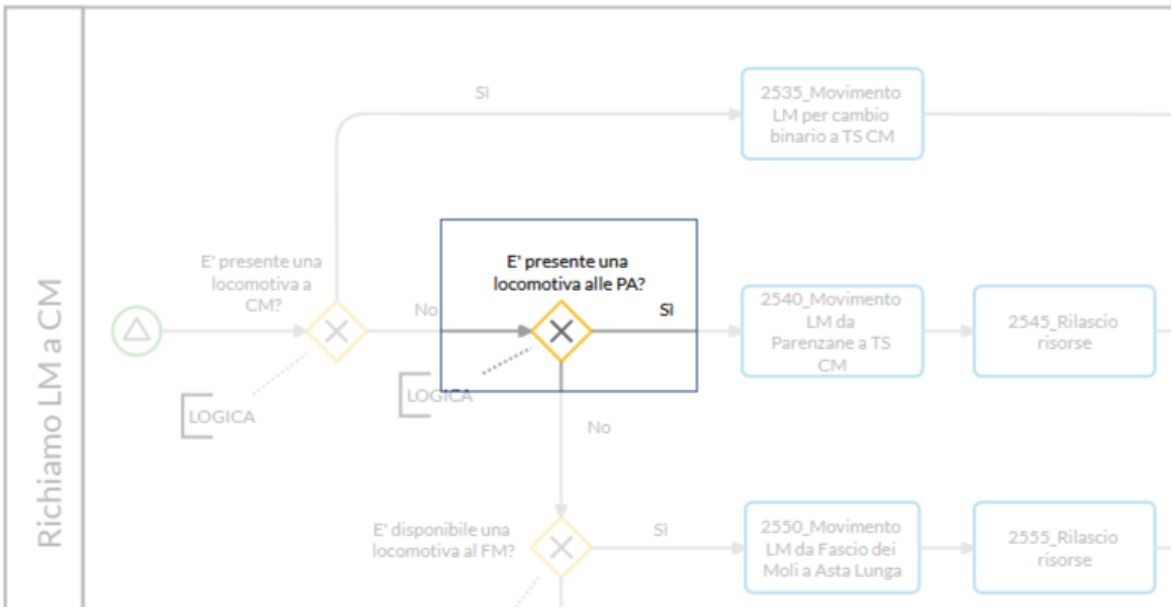


> LOGICA

Incoming	Outgoing
SIGNAL START EVENT signalStartEvents_a38ad7a7-19d2-170d-a46f-35785cb2f954	EXCLUSIVE GATEWAY E' presente una locomotiva alle PA? through No
	TASK 2535_Movimento LM per cambio binario a TS CM through Sì

E' presente una locomotiva alle PA?

EXCLUSIVE GATEWAY

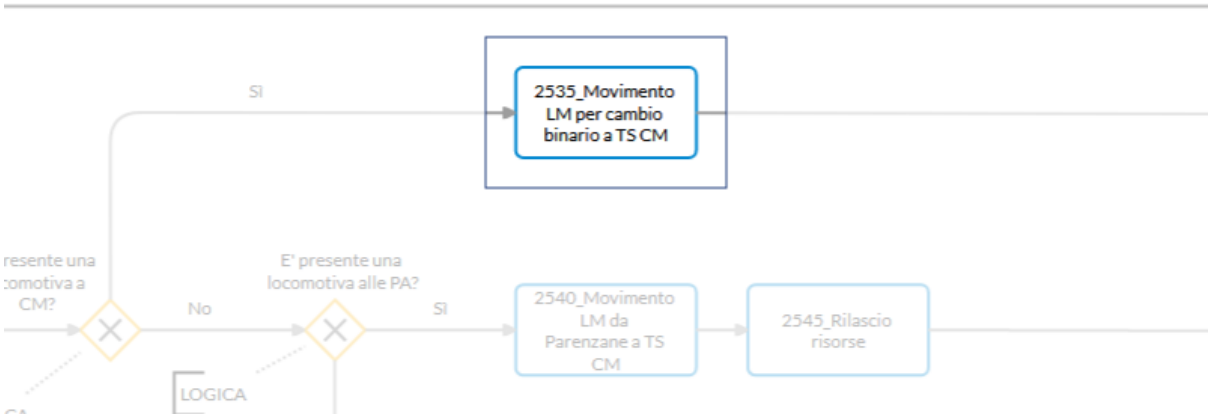


> LOGICA

Incoming	Outgoing
EXCLUSIVE GATEWAY E' presente una locomotiva a CM? through No	EXCLUSIVE GATEWAY E' disponibile una locomotiva al FM? through No
	TASK 2540_Movimento LM da Parenzane a TS CM through Sì

2535_Movimento LM per cambio binario a TS CM

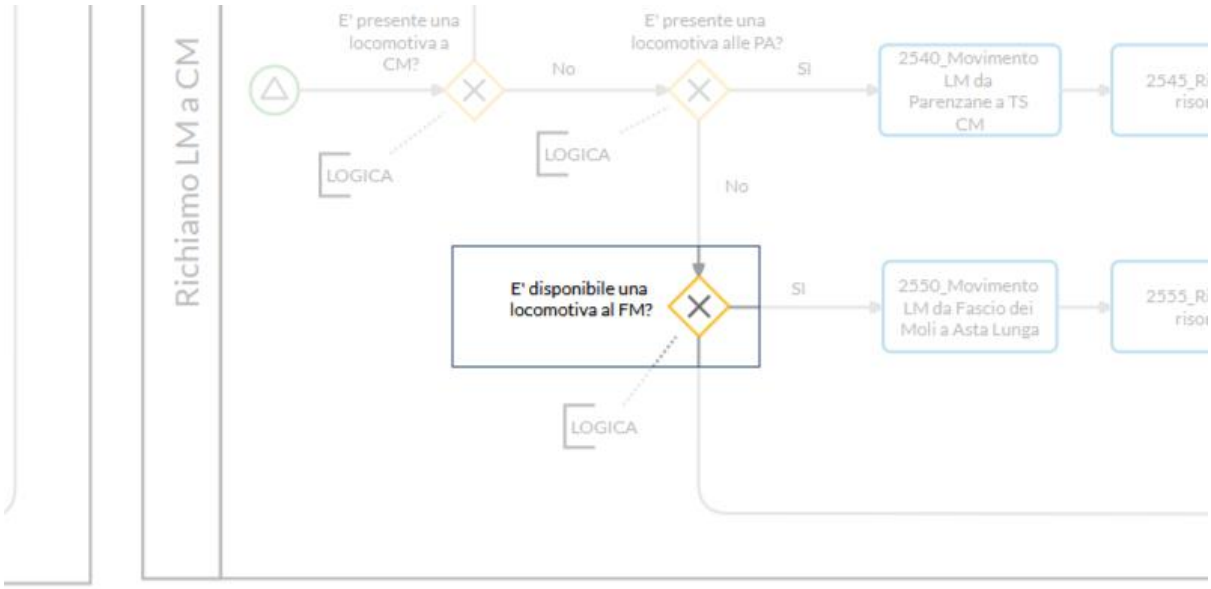
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY E' presente una locomotiva a CM? through Sì	END EVENT Richiesta conclusa

E' disponibile una locomotiva al FM?

EXCLUSIVE GATEWAY

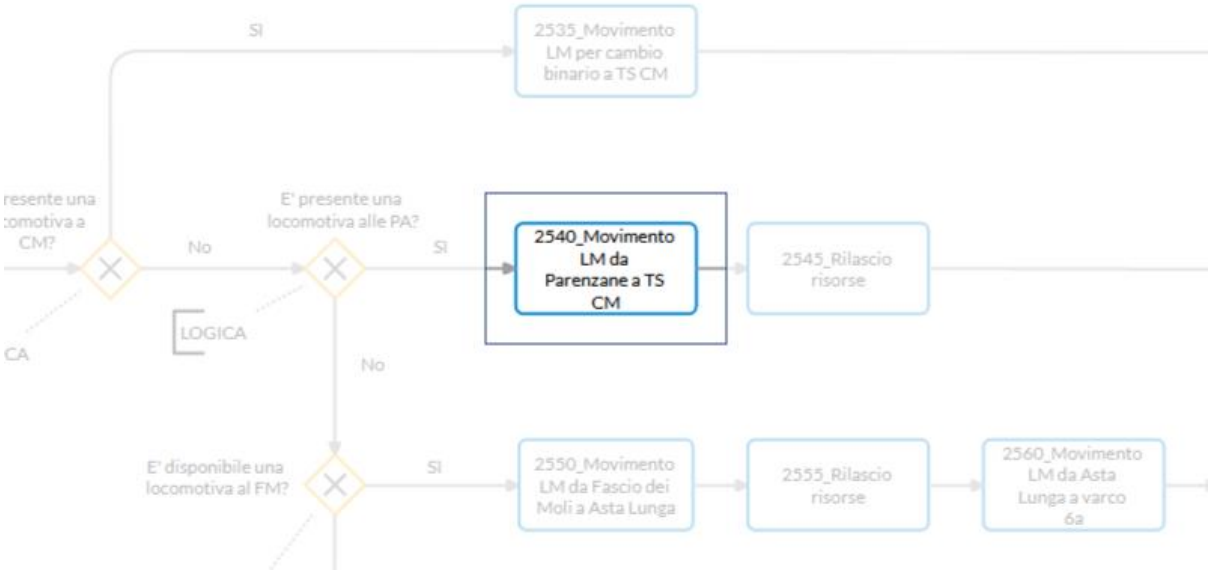


> LOGICA

Incoming	Outgoing
EXCLUSIVE GATEWAY E' presente una locomotiva alle PA? through No	TASK 2550_Movimento LM da Fascio dei Moli a Asta Lunga through Sì
	END EVENT Richiesta conclusa through No - Nessuna locomotiva disponibile

2540_Movimento LM da Parenzane a TS CM

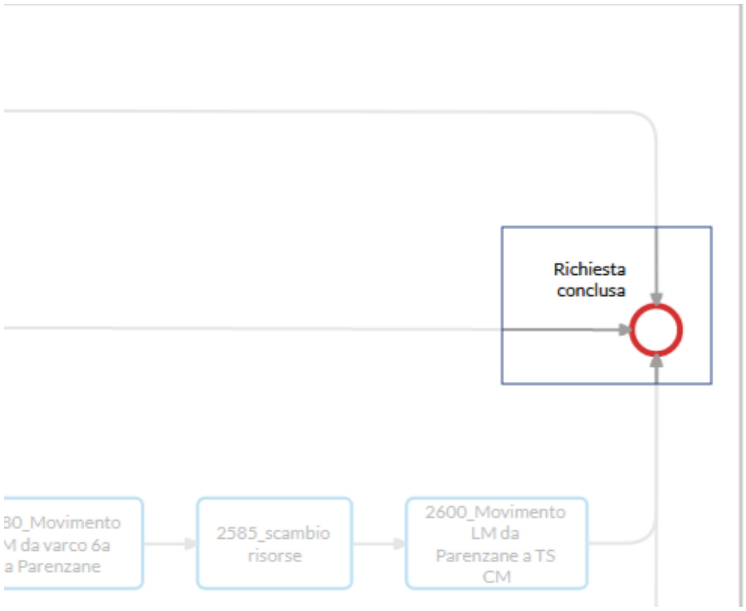
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY E' presente una locomotiva alle PA? through Sì	TASK 2545_Rilascio risorse

Richiesta conclusa

END EVENT



Incoming

TASK
2545_Rilascio risorse

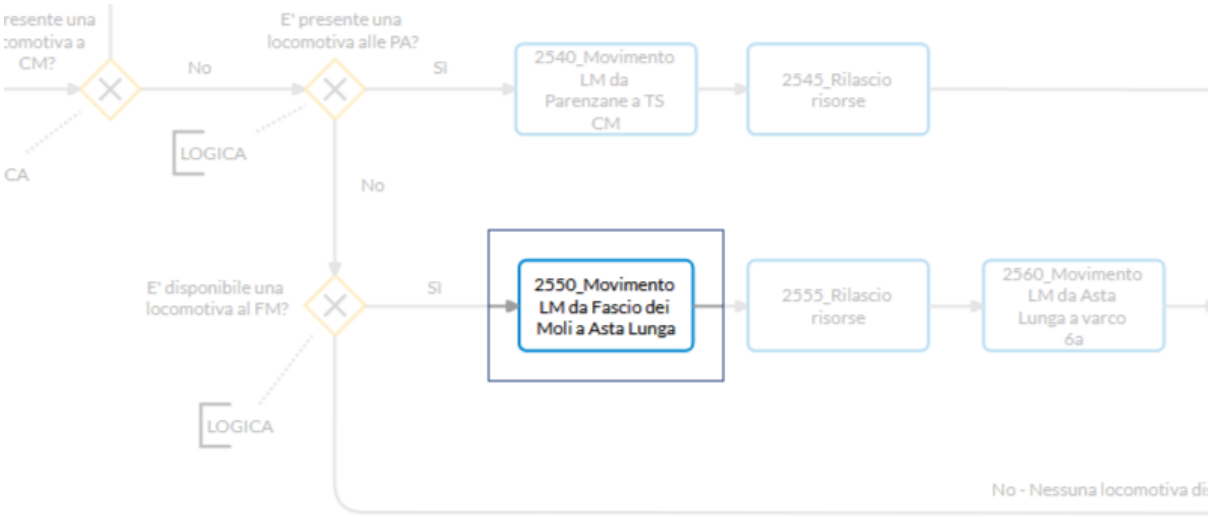
TASK
2535_Movimento LM per cambio binario a TS CM

EXCLUSIVE GATEWAY
E' disponibile una locomotiva al FM?
through No - Nessuna locomotiva disponibile

TASK
2600_Movimento LM da Parenzane a TS CM

2550_Movimento LM da Fascio dei Moli a Asta Lunga

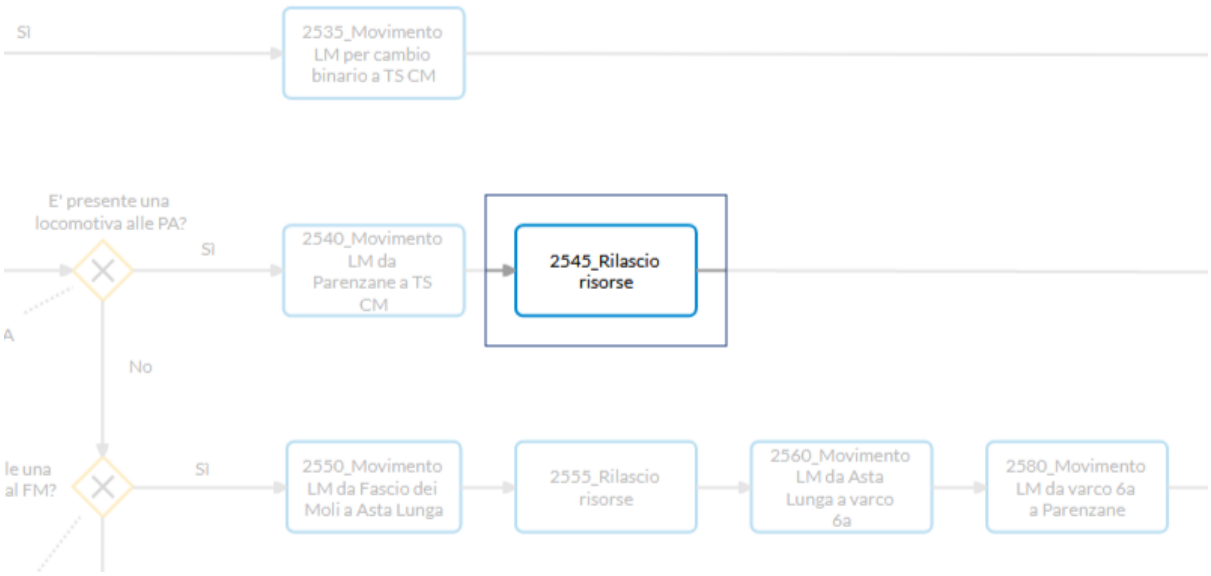
TASK



Incoming	Outgoing
EXCLUSIVE GATEWAY E' disponibile una locomotiva al FM? through Sì	TASK 2555_Rilascio risorse

2545_Rilascio risorse

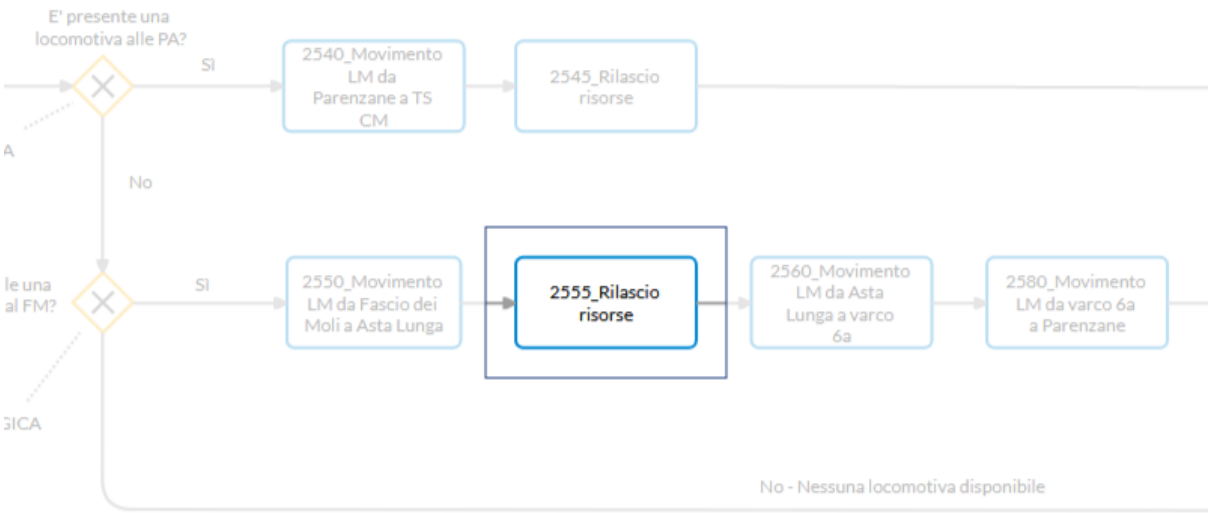
TASK



Incoming	Outgoing
TASK 2540_Movimento LM da Parenzane a TS CM	END EVENT Richiesta conclusa

2555_Rilascio risorse

TASK



Incoming	Outgoing
TASK 2550_Movimento LM da Fascio dei Moli a Asta Lunga	TASK 2560_Movimento LM da Asta Lunga a varco 6a

2560_Movimento LM da Asta Lunga a varco 6a

TASK

Incoming	Outgoing
TASK 2555_Rilascio risorse	TASK 2580_Movimento LM da varco 6a a Parenzane

2580_Movimento LM da varco 6a a Parenzane

TASK

Incoming	Outgoing
TASK 2560_Movimento LM da Asta Lunga a varco 6a	TASK 2585_scambio risorse

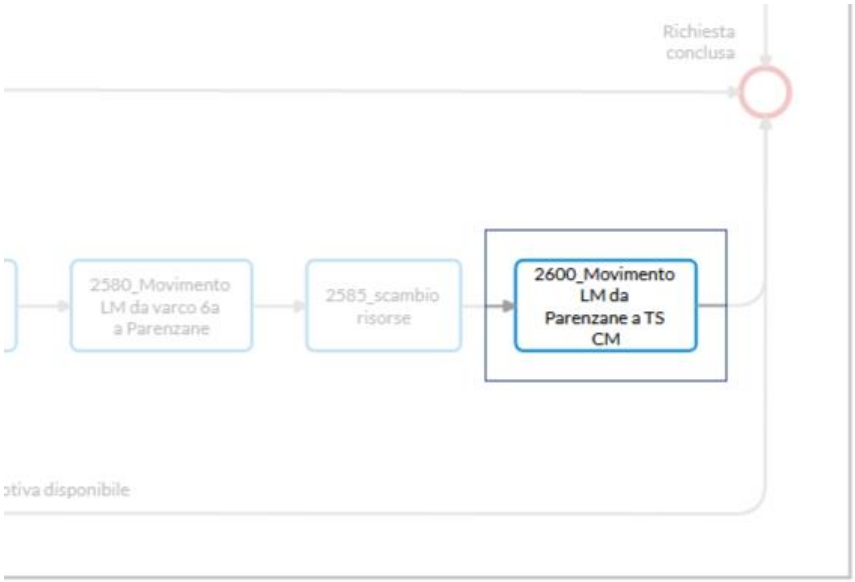
2585_scambio risorse

TASK

Incoming	Outgoing
TASK 2580_Movimento LM da varco 6a a Parenzane	TASK 2600_Movimento LM da Parenzane a TS CM

2600_Movimento LM da Parenzane a TS CM

TASK



Incoming	Outgoing
TASK 2585_scambio risorse	END EVENT Richiesta conclusa

5. Complementary Definitions and Elements: definitions

5.1. Signals

Locomotiva_molo7
SIGNAL

Locomotiva_molo6
SIGNAL

Locomotiva_molo5
SIGNAL

richiamoLocomotiva
SIGNAL

RichiamoLM_ManovraSec_FdM
SIGNAL

SgancioLM_ManovraSec_FdM
SIGNAL

Avvio partenza da MV
SIGNAL

Sgancio_LM_CM
SIGNAL

Avvio partenza da MVI
SIGNAL

Avvio partenza da MVII
SIGNAL

Richiamo_LM_estrazione_MV
SIGNAL

Richiamo_LM_estrazione_MVI
SIGNAL

Richiamo_LM_estrazione_MVII
SIGNAL

5.2. Errors

Capacità residua per porto industriale
ERROR

MULTI-ACTOR MULTI-CRITERIA EVALUATION

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ANNEX 21

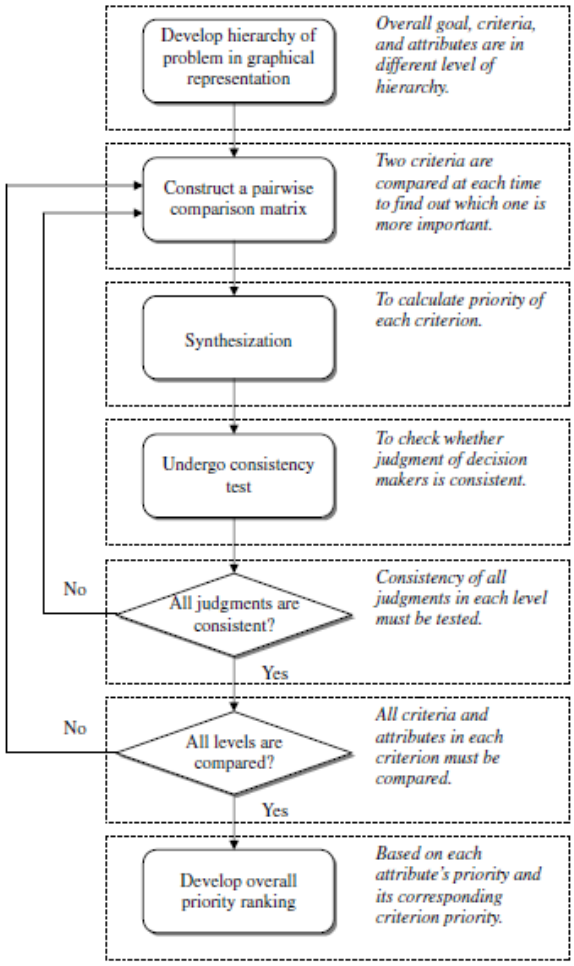
1. INTRODUCTION TO MULTI-ACTOR MULTI-CRITERIA EVALUATION

Along with the estimation of the optimal port railway capacity, an evaluation procedure has been carried out in order to prioritize the main port railway operational features, considering a variety of criteria and involving different stakeholders. To this end, a specific multi-criteria decision analysis method (MCDA), namely the Analytic Hierarchy Process (AHP) method, has been adopted and a few port actors have been actively engaged in the appraisal procedure, so as to obtained shared outcomes through a participatory decision process.

1.1. THE AHP METHOD: MAIN PRINCIPLES

The AHP method is a quite easy analytical and synthetic MCDA approach, whose application consists of the following three main stages: hierarchy construction, priority analysis and consistency verification. As illustrated in Picture 1, in the first phase decision makers need to break down complex decision problems into simpler parts, which are then organized according to a multi-level hierarchical structure. The definition of such arrangement for the overall goal, criteria and their relative attributes allows decision makers to analyse more rationally and efficiently the decision problem at hand. After the creation of the decision-making framework, in the second stage pairwise comparisons are performed among components belonging to the same level of the hierarchy, based on decision makers' experience and knowledge or on data provided by surveys. Notably, two elements of the same level are compared to one in the upper level, which represents the parent node. Judgments on comparative attractiveness of criteria and their attributes are expressed according to Saaty's 1-9 fundamental scale, which is reported in Picture 2. Under this preference scale, an element characterized by a higher mark is intended to have more significance than another one associated to a lower value. A variety of application examples demonstrate that such rating approach makes the AHP method a valid technique to generate accurate weights, even when the insights of the person answering pairwise comparison questions are not clearly defined. Since comparisons reflect subjective judgements, a certain degree of inconsistency in stated preferences can be observed, especially for decision systems presenting five or more factors for each level. In this regard, the third phase of the AHP involves checking inconsistency through the confrontation of data resulting from decision makers' judgements and a set of random outcomes obtained by random evaluations. The measure developed by Saaty to estimate inconsistency is called the "Inconsistency Ratio" (IR) and its value can range between zero, when there is a perfect consistency of input data, and a large positive number. Analogously, also a "Consistency Ratio" (CR) can be calculated. In the context of the AHP theory, Saaty suggested that an IR which equals 0.1 or less is acceptable, while higher values implicate the need of reviewing input data or comparisons, or even reconsidering the effectiveness of the whole structure of the multi-criteria decision problem. Two common mistakes causing a high IR can possibly occur, i.e. when decision makers state an intransitive relationship in pairwise comparisons, or in the event that comparative judgments are inadvertently inverted.

Picture 1 - The AHP flowchart



Picture 2 - Saaty's fundamental pairwise comparison scale

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective.
2	Weak or slight	
3	Moderate importance	Experience and judgment slightly favor one activity over another.
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favor one activity over another.
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance is demonstrated in practice.
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation.
1.1–1.9	When activities are very close a decimal is added to 1 to show their difference as appropriate.	A better alternative way to assigning the small decimals is to compare two close activities with other widely contrasting ones, favoring the larger one a little over the smaller one when using the 1–9 values.
Reciprocals of above	If activity i has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i.	This is logical assumption.
Measurements from ratio scales		When it is desired to use such numbers in physical applications; alternatively, often one estimates the ratios of such magnitudes by using judgment.

Notwithstanding the importance of complying to consistency principles, an excessive review and improvement of judgements could be counterproductive for the definition of weights, because the preferences of decision makers could be altered.

Finally, on the basis of the relative priorities of attributes and criteria, the AHP concludes with a synthesis of judgements, aimed at developing the overall priority ranking.

In addition to accounting multiple evaluation criteria, even the consideration of multiple stakeholders proves to be necessary to accurately perform assessment procedures and, thus, to provide decision makers with reliable recommendations. This need is motivated by the fact that, on one hand, stakeholder participation enables to compensate the possible lack of information at the disposal of a single analysist and, on the other hand, it enhances the acceptability of the final decision, especially when dealing with highly controversial issues.

1.2. APPLICATION TO PORT RAILWAY OPERATIONAL FEATURES

The AHP method, in its form of a multi-criteria multi-actor evaluation procedure, has been adopted for the case study of the Port of Trieste, in reference to the main objective of increasing port railway capacity. The appraisal has concerned the determination of priorities for some key port railway operational features and it has provided useful insights that have been also to thoroughly analyse punctual optimization results.

1.2.1. OVERVIEW OF THE EVALUATION PROCESS DEVELOPMENT

Following the principles of the AHP technique, the initial step of the evaluation procedure has consisted in the creation of the assessment framework for the decision problem at hand. Therefore, the number and the structure of the hierarchical levels have been defined, using nodes and clusters to arrange the elements to be evaluated. Just as the final result of the overall assessment procedure, even building the appraisal framework implies making choices that can influence outcome. Nevertheless, they pertain to a different decisional level if compared to the one in which the actual resolution of the problem is reached. Tracing and motivating such choices are fundamental tasks that analysts should perform, in order to engage decision makers in an open and transparent evaluation process. Other than in the determination of the main goal, of the actors to be involved and of the alternatives to be assessed, the impact of the decisions taken to create the evaluation framework proves to be quite evident in the identification of the criteria against which the performances of the initiatives are appraised. The reference to the main goal of the decision problem constitutes the essential requirement for the individuation of appropriate criteria. In this respect, criteria have been established by a group of experts according to the involved stakeholders' objectives and they have been partially derived from the analysis of the BPMN representation of railway processes. Such analysis has highlighted various process features related to managerial, technical and financial aspects, whose conversion into performance parameters has suggested some of the elements considered in the appraisal procedure. Thus, consistently with the context-sensitive approach adopted to develop the BPMN models of the examined railway processes, the resorting to an analogous method for the definition of criteria has enabled the creation of a case-specific evaluation framework.

Subsequently, the priority of the elements composing the elaborated appraisal framework has been estimated through pair-wise comparisons between elements during some structured interviews, which have been administered in person to the engaged stakeholders. In that occasion, interviewees have been provided with a survey questionnaire and, prior to the attribution of judgements, they have been assisted in the comprehension of the AHP method, especially for the use of the Saaty's 1-9 rating scale.

Judgements expressed by each individual stakeholder during interviews have been then aggregated, in order to obtain comprehensive assessment results. On the contrary, the preferences with respect to the elements concerning the evaluation of scenarios of intervention have been suggested by a group of experts during a technical meeting.

Finally, judgements have been implemented into the decision-making software called Super Decisions, developed by the team collaborating with Saaty, which is based on the AHP. By embedding this synthesis methodology, it permits to set priorities through the combination of judgements and data, with the aim of effectively ranking options and of carrying out sensitivity analysis. The use of such supporting software is widely spread in different practical and research fields, like manufacturing, agriculture, environmental management and transport.

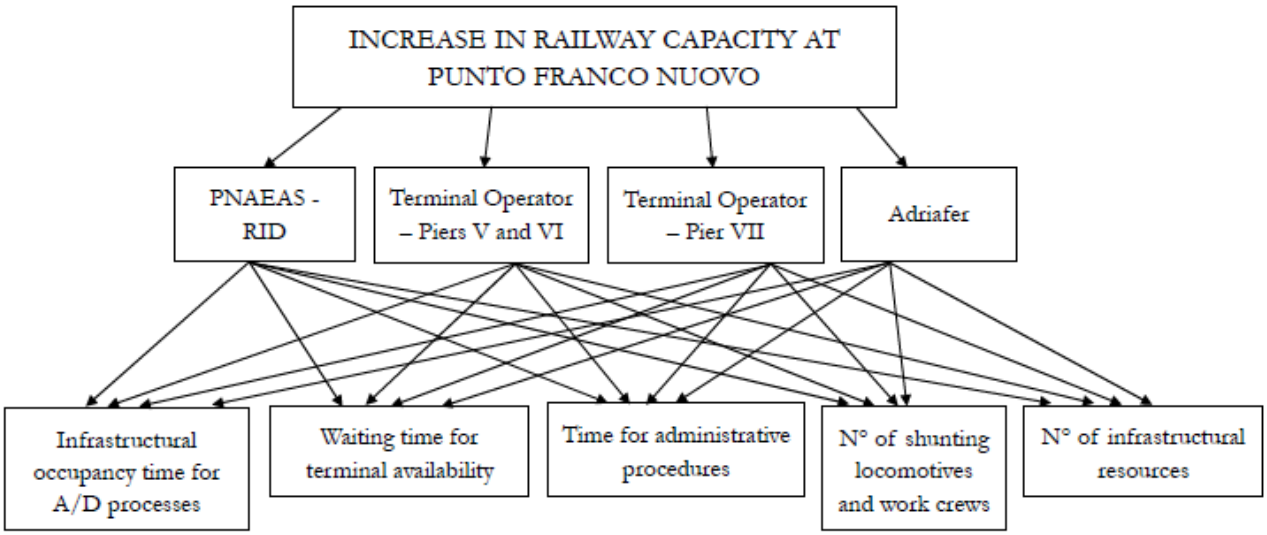
1.2.2. DEVELOPMENT OF THE DECISION FRAMEWORK

The evaluation framework developed for the evaluation of key port railway operational features is reported in Picture 3. As it can be noticed, at the top of the hierarchy there is the main goal of the decision problem, which consists in the increase in railway capacity at the Punto Franco Nuovo, i.e. the commercial part of the Port of Trieste where the majority of railway traffic is currently generated and attracted. The second level of the hierarchical framework contains the actors engaged in the evaluation procedure, namely the PNAEAS – RID, the terminal operator of the Piers V and VI, the terminal operator of Pier VII, and the shunting operations manager Adriafer. RID has been engaged in the assessment since it represents the department of the PNAEAS that is specifically in charge of managing railway traffic in the Port of Trieste. The terminal operators of the piers located at the Punto Franco Nuovo have been considered because they are the subjects who actually handle freight and provide intermodal services. Finally, Adriafer has been included in the appraisal process because it is currently the only company responsible for the performing of shunting operations in the port, whose execution directly impacts on railway capacity. In order to evaluate the priority of the major features affecting railway capacity, in the third level of the hierarchy the following criteria have been inserted:

- the infrastructural occupancy time to carry out train arrival/departure processes;
- the waiting time for terminal availability;
- the time needed to perform administrative procedures;
- the number of shunting locomotives and working crews; and
- the number of infrastructural resources.

The first two time-related criteria have been selected for their primary importance in the determination of the possible annual number of trains with respect to the physical movement of vehicles. On the contrary, although concerning non-material aspects of railway processes, the duration of administrative activities has been considered for its eventual repercussion on the infrastructure occupancy, especially during the train passage through the gateway separating the Free Port zone from the remaining port areas. Lastly, the two final criteria correspond to the different types of resources that are essential to perform train transfers.

Picture 3 - Evaluation framework related to key port railway operational features



The survey questionnaire used to interview the involved actors is reported in the Annex, while the numerical judgements expressed by each actor against pair-wise comparisons are illustrated below, together with a qualitative explanation.

1.2.2.1. PNAEAS – RID

According to the preferences indicated in Table 1, RID considers to cover a greater role with respect to both the terminal operators because, referring to the aim of enhancing the railway capacity at the Punto Franco Nuovo, it attributes a quite remarkable importance to its responsibility in managing and arranging railway port infrastructure. However, it recognizes that also the quality of operations performed at terminals to load and unload goods significantly affects the amount of train flows that can be generated in the port. Indeed, in line with this reasoning, judgements expressed by the RID suggest that the influence of terminal operators for the attainment of the main goal is not negligible at all, even if with the different extent between the two involved operators. Notably, RID deems itself to be much more relevant than the terminal operator of Piers V and VI, while just slightly more important than the terminal operator of Pier VII. This difference is motivated by the fact that, comparing the two operators, the latter one proves to be more independent by the RID in managing its own railway traffic and because, in the future, its activities could potentially concern a wider area of the port. On the contrary, the RID assigned equal importance to its role in the confrontation with Adriafer, since it considers that organizational aspects regulating the use of infrastructural resources are as meaningful as the performing of efficient shunting operations for the achievement of capacity increases. In comparing the engaged terminal operators, a slightly higher relevance has been attributed by the RID to the one operating at Piers V and VI, since potential advancements in the management of train flows related to its relative terminals would entail greater beneficial effects to the traffic of the whole Punto Franco Nuovo. Proof to this, it must be noted that train arrival and departure processes concerning the Pier VII currently results to be more seamless, thanks to its more pronounced independence in the occupation of the infrastructural elements composing the port railway network. Lastly, the RID prioritizes the influential role of both the considered terminal operators with respect to the one of Adriafer, giving thus more significance to terminal activities rather than to shunting operations in the accomplishing a growth in port railway capacity.

Table 1 - Comparisons between actors according to PNAEAS – RID

COMPARISON BETWEEN ACTORS		
Actor i	**Comparison**	**Actor j**
PNAEAS - RID	5>	Terminal Operator – Piers V and VI
PNAEAS - RID	3>	Terminal Operator – Pier VII
PNAEAS - RID	1	Adriafer
Terminal Operator – Piers V and VI	3>	Terminal Operator – Pier VII
Terminal Operator – Piers V and VI	5>	Adriafer
Terminal Operator – Pier VII	3>	Adriafer

Regarding the preferences expressed by the RID when confronting criteria, as indicated in Table 1, the infrastructural occupancy time for train arrival and departure processes has been assigned to a greater relevance in all the identified pair-wise comparisons, except for the one with the time for administrative procedures. Indeed, evidences observed on field prove that those documentary activities can severely impact on the performing of railway operations, especially at the gateway delimiting the Free Port zone, substantially hindering the railway capacity. According to the RID, a quite significant role is covered also by the waiting time for the terminal availability because, as mentioned in the discussion of the judgement concerning stakeholders' level of influence, loading and unloading activities definitely affect the possible entity of the train traffic volume. Conversely, the infrastructural occupancy time has been deemed to prevail by far not only the number of shunting locomotives and of work crews, but also the number of infrastructural resources. As a matter of fact, a great amount of both kinds of resources does not ensure a shorter duration in the railway network occupancy, stressing that even organizational aspects in carrying out operations are a key feature to enable a potential increase in capacity. The waiting time for the terminal availability has been considered by the DIF slightly less important just in the confrontation with the time needed for administrative procedures, while it has been preferred over the criteria related to human, vehicle and infrastructural resources, due to the influence of terminal operations in processing trains. In light of the relevance of the time for administrative procedures stressed previously, the DIF has attributed an outstanding significance to this criterion, with respect to the ones regarding all the different types of considered resources. Finally, in relation to these latter, the number of infrastructural resources has been considered by the RID to have a very limited higher priority as against the ones strictly necessary to perform shunting operations, because network availability represents an essential requirement to transfer trains to/from the terminals.

Table 2 - Comparisons between criteria according to PNAEAS – RID

COMPARISON BETWEEN CRITERIA		
Criterion i	**Comparison**	**Criterion j**
Infrastructural occupancy time for A/D processes	3>	Waiting time for terminal availability
Infrastructural occupancy time for A/D processes	1	Time for administrative procedures
Infrastructural occupancy time for A/D processes	8>	N° of shunting locomotives and work crews
Infrastructural occupancy time for A/D processes	7>	N° of infrastructural resources
Waiting time for terminal availability	<3	Time for administrative procedures
Waiting time for terminal availability	5>	N° of shunting locomotives and work crews
Waiting time for terminal availability	4>	N° of infrastructural resources
Time for administrative procedures	7>	N° of shunting locomotives and work crews
Time for administrative procedures	6>	N° of infrastructural resources
N° of shunting locomotives and work crews	<2	N° of infrastructural resources

1.2.2.2. Terminal Operator – Piers V and VI

As reported in Table 3, the terminal operator of Piers V and VI considers all the terminal operators to be of the same importance of the RID because, although according to a different perspective, both parts are fundamental to attain the goal of increasing railway capacity at the Punto Franco Nuovo. Indeed, the former contribute in the achievement of such objective playing a commercial role, while the latter acts as the managerial responsible for port railway improvements. Also Adriafer is considered to be of equal importance with respect to the RID, since it is currently the only company performing shunting operations at the Punto Franco Nuovo. Between the two terminal operators, the one carrying out freight movements at Piers V and VI recognises a quite moderate greater relevance of the terminal operator of Pier VII, in terms of a higher number of processed trains. Taking into account the present operational conditions at the Punto Franco Nuovo, a mutual influence between the activities of the two terminal operators is evident due to the common use of resources, intended as railway infrastructure and shunting locomotives. This reciprocal interaction has been recently limited by differentiating the use of Pier V and Pier VI based on the available handling equipment: the former is employed for loading and unloading operations, whereas the latter is meant to be a buffer for waiting trains, in order to decongest the Trieste Campo Marzio station. Regarding the comparison between terminal operators and Adriafer, the terminal operator of Piers V and VI suggests to attribute them the same importance, because the scheduling of train arrival/departure to/from all the terminals is agreed with Adriafer, without creating disproportional arrangements between the involved terminals. Finally, the inclusion also of the Italian infrastructure manager RFI among the engaged actors has been proposed by the terminal operator of Piers V and VI, given its role in scheduling freight train traffic on the national railway network.

Table 3 - Comparisons between actors according to the terminal operator of Piers V and VI

COMPARISON BETWEEN ACTORS		
Actor i	**Comparison**	**Actor j**
PNAEAS - RID	1	Terminal Operator – Piers V and VI
PNAEAS - RID	1	Terminal Operator – Pier VII
PNAEAS - RID	1	Adriafer
Terminal Operator – Piers V and VI	<5	Terminal Operator – Pier VII
Terminal Operator – Piers V and VI	1	Adriafer
Terminal Operator – Pier VII	1	Adriafer

Referring to the first comparison between criteria indicated in Table 4, during the interview the terminal operator of Piers V and VI provided discordant judgments based on the different availability of infrastructural resources in the two terminals under his management. Indeed, more tracks are present on Pier V, allowing to simultaneously perform loading and unloading activities on two trains. On the contrary, Pier VI disposes of a lower number of tracks, which permits to execute terminal operations exclusively on one train at time. Given this situation, taking into account Pier V, the infrastructural occupancy time for arrival and departure processes represents by far a much more significant criterion as compared to the waiting time for terminal availability, because of the ability of such pier to process more trains in parallel. Indeed, as principle of general value, eventual delays on the remaining port railway network leading to the main train station severely hinder the productivity of terminals. Conversely, this barrier is deemed to be less pronounced for Pier VI, due to the inherent limit of possessing just few tracks. Proof to this is shown in the preference expressed by the terminal operator concerning such pier, for which the waiting time for terminal availability covers a definitely much more meaningful role as against to the infrastructural occupancy time. Despite these controversial circumstances, in the evaluation procedure only the judgement concerning Pier V has been considered, because of its greater contribution in attaining a possible increase in port railway capacity at the Punto Franco Nuovo. Besides, the infrastructural occupancy time for train arrival and departure processes has been considered, respectively, by far and absolutely much more important than the time for administrative procedures and the number of shunting locomotives and work crews. In the first case, the duration of administrative procedures is not intended as a barrier, because the activities for the preparation of the documents accompanying trains are usually carried out in advance by the shipping agency. In the second case, the terminal operator of Piers V and VII suggests to give more attention on the management of work crews performing shunting operations, rather than on the entity of their composition. On the contrary, the infrastructural occupancy time has been considered only almost much more significant than the number of infrastructural resources, due to the great importance of the potential availability of these latter, for example for buffer purposes. Furthermore, based on the interviewee's opinion, the waiting time for terminal availability definitely represents a more important parameter with respect to both the time for administrative procedures and the number of shunting locomotives and work crews, but it covers a less meaningful role if compared to the number of infrastructural resources. With regard to the vehicle and human resources, a slightly greater significance has been attributed to the time for administrative procedures, since such activities are performed when trains are still on the terminals and, thus, their smooth execution is key for operators willing to enhance railway capacity. Given the need of disposing of more tracks to increase train flows, the number of infrastructural resources proves to be much more important than the time for

administrative procedures, while it has the same relevance as against the number of shunting locomotives and work crews. Indeed, both these last two criteria are equally essential to manage and grow port train traffic.

Table 4 - Comparisons between criteria according to the terminal operator of Piers V and VI

COMPARISON BETWEEN CRITERIA		
Criterion i	**Comparison**	**Criterion j**
Infrastructural occupancy time for A/D processes	7>	Waiting time for terminal availability
Infrastructural occupancy time for A/D processes	8>	Time for administrative procedures
Infrastructural occupancy time for A/D processes	9>	N° of shunting locomotives and work crews
Infrastructural occupancy time for A/D processes	4>	N° of infrastructural resources
Waiting time for terminal availability	9>	Time for administrative procedures
Waiting time for terminal availability	9>	N° of shunting locomotives and work crews
Waiting time for terminal availability	4>	N° of infrastructural resources
Time for administrative procedures	2>	N° of shunting locomotives and work crews
Time for administrative procedures	<5	N° of infrastructural resources
N° of shunting locomotives and work crews	1	N° of infrastructural resources

1.2.2.3. Terminal Operator – Pier VII

According to judgements included in Table 5, the terminal operator of Pier VII considers that terminal operators are of equal importance with respect to the RID, since this latter is in charge of supporting the commercial interests of operators in terms of both managerial and infrastructural aspects. Conversely, the RID is deemed to cover a much more significant role as compared to Adriafer. Regarding the assessment of the influence of the considered terminal operators, the same relevance is attributed to both of them, suggesting that there is no competition between the two since they refer to different logistics marketplaces. On the contrary, in the confrontation with Adriafer, terminals operators turn out to be by far much more important, even though efficient shunting operations are considered a meaningful contribution for the functioning of the terminals.

Table 5 - Comparisons between actors according to the terminal operator of Pier VII

COMPARISON BETWEEN ACTORS		
Actor i	**Comparison**	**Actor j**
PNAEAS - RID	1	Terminal Operator – Piers V and VI
PNAEAS - RID	1	Terminal Operator – Pier VII
PNAEAS - RID	5>	Adriafer
Terminal Operator – Piers V and VI	1	Terminal Operator – Pier VII
Terminal Operator – Piers V and VI	7>	Adriafer
Terminal Operator – Pier VII	7>	Adriafer

Regarding operational features, based on the perspective of the terminal operator of Pier VII illustrated in Table 6, the waiting time for terminal availability proves to be by far much more important than the occupancy time of the remaining port railway infrastructure, because it directly impacts on the number of transfers that the operator can potentially perform. As opposed to the previous comparison, the infrastructure occupancy time assumes a more relevant role in the confrontation with the time needed for administrative procedures, since these latter are usually finalised in advance and, thus, they limitedly hinder train arrival/departure processes. The strict correlation between the infrastructural time occupancy and the number of shunting locomotives and work crews is reflected in the entity of the judgement expressed by the terminal operator of Pier VII, for which the same importance is attributed to the two criteria under examination. With respect to infrastructural resources, they are considered to be much more relevant than infrastructural occupancy time, since the availability of tracks enables to compensate possible criticalities, like train delays. Indeed, the presence of buffer tracks external to the terminals proves to be very useful, allowing to dedicate internal terminal tracks only for train loading and unloading activities and, consequently, to increase the potential number of served trains. This opportunity would be particularly advantageous for the terminal operator of Pier VII because, at present, train loading and unloading operations at his terminal are carried out based on the train time scheduling of the national railway network, rather than on the traditional management approach considering time slots. Generally speaking, the possibility provided by buffer tracks of permitting a rapid turnover of trains at terminals represents a concern of utmost importance shared by all operators, similarly to the management of traffic flows related to the other transport modes converging at ports.

In line with previous reasonings, the waiting time for terminal availability is deemed to be by far much more important than the time for administrative procedures, while it assumes equal relevance with respect to the number of human, vehicle and infrastructural resources, due to their connection. Both these latter elements cover a quite greater role if compared to the time for administrative procedures, whereas they have been attributed to the same level of significance in the confrontation between them.

Table 6 - Comparisons between criteria according to the terminal operator of Pier VII

COMPARISON BETWEEN CRITERIA		
Criterion i	**Comparison**	**Criterion j**
Infrastructural occupancy time for A/D processes	<7	Waiting time for terminal availability
Infrastructural occupancy time for A/D processes	7>	Time for administrative procedures
Infrastructural occupancy time for A/D processes	1	N° of shunting locomotives and work crews
Infrastructural occupancy time for A/D processes	<5	N° of infrastructural resources
Waiting time for terminal availability	7>	Time for administrative procedures
Waiting time for terminal availability	1	N° of shunting locomotives and work crews
Waiting time for terminal availability	1	N° of infrastructural resources
Time for administrative procedures	<7	N° of shunting locomotives and work crews
Time for administrative procedures	<7	N° of infrastructural resources
N° of shunting locomotives and work crews	1	N° of infrastructural resources

1.2.2.4. Adriafer

Judgements included in Table 7 report the standpoint of Adriafer with regard to the level of influence of the engaged stakeholders, for which both the terminal operators are considered slightly more important than the RID. The relevance of this latter is acknowledged especially in terms of its role in managing the infrastructural investments that have been planned for the near future in the Port of Trieste. On the contrary, in the confrontation between itself and the RID, Adriafer has been deemed to have an equal importance for the attainment of the main goal. According to Adriafer, the involved terminal operators are meant to exert the same influence in achieving an increase in railway capacity. This assumption is expected to be confirmed also in the next years, when the implementation of the planned infrastructural interventions will permit the independence between the train flows generated/attracted by the two terminals. Indeed, due to the current port railway network configuration, a certain mutual interaction between such traffic volumes is present. Nevertheless, in this regard Adriafer claims to ensure neutrality in performing shunting operations, so as to accomplish the optimal functioning of the port system, without favouring any individual terminal. Such explanation motivates the preferences expressed by Adriafer in relation to the comparison as against terminal operators, for which Adriafer suggests covering a much more important role for attaining a growth in railway capacity. Indeed, Adriafer argues to sustain the commercial interests of terminal operators by serving their demand for shunting operations, in the view of enhancing the capacity of the whole port.

Table 7 - Comparisons between actors according to Adriafer

COMPARISON BETWEEN ACTORS		
Actor i	**Comparison**	**Actor j**
PNAEAS - RID	<2	Terminal Operator – Piers V and VI
PNAEAS - RID	<2	Terminal Operator – Pier VII
PNAEAS - RID	1	Adriafer
Terminal Operator – Piers V and VI	1	Terminal Operator – Pier VII
Terminal Operator – Piers V and VI	<6	Adriafer
Terminal Operator – Pier VII	<6	Adriafer

Referring to Table 8, based on the preferences stated by Adriafer, the infrastructural occupancy time for arrival/departure processes proves to be almost slightly more important than the waiting time for terminal availability due to their strict interrelation. In contrast, even though to a limited extent, it covers a less significant role when compared to the time needed for administrative procedures. Indeed, as for example, the duration of the train check at the gateway separating the Free Port zone from the surrounding port areas definitely influences the performing of shunting operations, regardless the distance to be travelled and the speed adopted along the infrastructure while carrying out arrival/departure processes. Besides, infrastructural time occupancy reveals to be much more relevant in the confrontation with the number of shunting locomotives and work crews, since performing shunting operations more quickly is considered to have greater relevance rather than introducing additional vehicles or staff. Instead, with regard to infrastructural resources, the disposal of a good amount of tracks is preferred over the network time occupancy, as it permits the seamless conducting of railway operations. Concerning the waiting time for terminal availability, while it is slightly less meaningful than the time for administrative procedures, it assumes the same importance of the number of shunting locomotive and work crews due to their functional link. In line with previous judgements, the number of infrastructural resources has been deemed to be nearly much more important also than the waiting time for terminal availability. The almost equal relevance attributed to the time for administrative procedures when compared to the number of both shunting-related and infrastructural resources reflects the scarce correlation captured by Adriafer between the two analysed criteria. Finally, the availability of an adequate number of infrastructural resources is considered much more significant than the one of shunting locomotives and work crews, since it represents an essential requirement to efficiently carry out shunting operations, avoiding peak work periods. To this end, the necessity of disposing of buffer tracks has been marked as a crucial factor.

Table 8 - Comparisons between criteria according to Adriafer

COMPARISON BETWEEN CRITERIA		
Criterion i	**Comparison**	**Criterion j**
Infrastructural occupancy time for A/D processes	2>	Waiting time for terminal availability
Infrastructural occupancy time for A/D processes	<2	Time for administrative procedures
Infrastructural occupancy time for A/D processes	5>	N° of shunting locomotives and work crews
Infrastructural occupancy time for A/D processes	<5	N° of infrastructural resources
Waiting time for terminal availability	<3	Time for administrative procedures
Waiting time for terminal availability	1	N° of shunting locomotives and work crews
Waiting time for terminal availability	<4	N° of infrastructural resources
Time for administrative procedures	1	N° of shunting locomotives and work crews
Time for administrative procedures	<2	N° of infrastructural resources
N° of shunting locomotives and work crews	<5	N° of infrastructural resources

Judgements expressed by the engaged actors on the relative importance of criteria have turned out to be quite consistent, apart from the ones stated by the terminal operator of Piers V and VI, whose inconsistency ratio slightly exceeds the threshold value of 0,1 established by Saaty. However, the preferences of such stakeholder have not been reviewed due to the very modest entity of the inconsistency and also because, as mentioned, forcing the improvement of judgements may alter the actual perspective of actors.

1.2.3. EVALUATION RESULTS

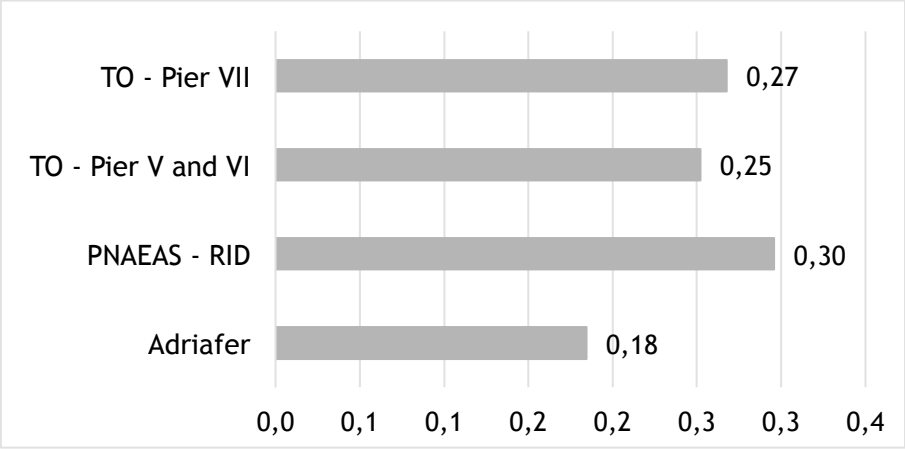
Like saying, final evaluation results have been obtained by implementing the judgements passed on the various elements of the evaluation frameworks into a decision support software, providing suggestions of their overall importance. Furthermore, some sensitivity analyses have been performed, in order to assess possible modifications in the outcomes to varying of the relevance of certain elements.

The outcomes of this assessment application concern the determination of both the actors' level of influence and the global priority values for the considered parameters. Aggregated results for the estimation of the stakeholders' influential contribution in reaching the main goal have been obtained synthesising judgements through the geometric mean.

Regarding actors' level of influence, Picture 4 shows that the PNEAS – RID has revealed to be the most influential stakeholder for the attainment of an increase in railway capacity at the Punto Franco Nuovo. Even terminal operators have turned out to cover a remarkable role in achieving the main goal, while

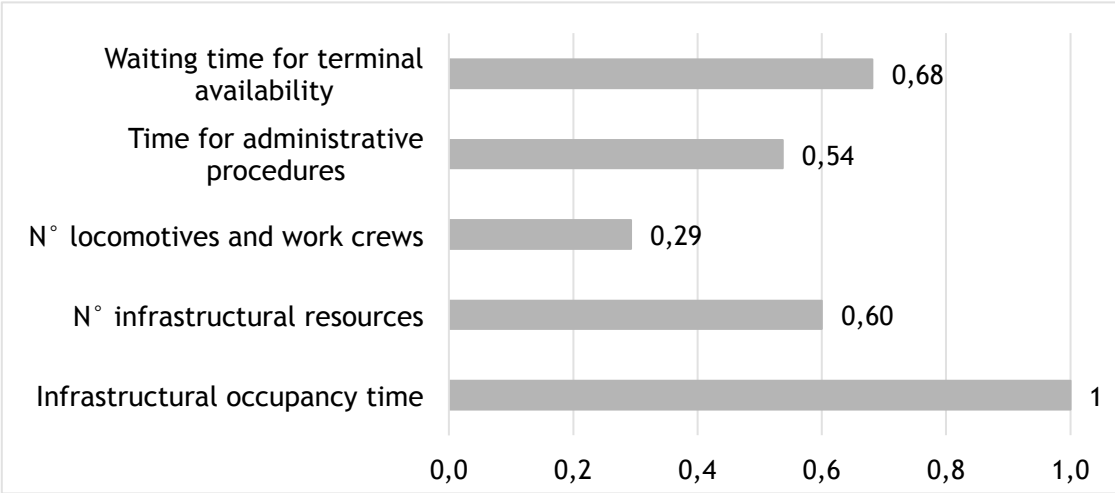
Adriafer has proved to be attributed to a less impacting role. This aggregated outcome demonstrates homogeneity among the interviewed actors in attributing preferences to stakeholders' influence, agreeing on the greater importance of the tasks performed by the RID to manage both port railway infrastructure and operations.

Picture 4 - Actors' level of influence



With respect to the relative significance of criteria, Picture 5 illustrates that, aggregating judgements coming from the different engaged actors, the infrastructural occupancy time represents the most important criterion, followed by the waiting time for terminal availability and, immediately after, by the number of infrastructural resources. Besides, a remarkable importance has been attributed to the time needed to accomplish administrative procedures, while the least meaningful priority has been associated to the number of shunting locomotives and work crews. The quite distinct gap between the weight value of the criterion related to the infrastructural occupancy time and those of the remaining factors stresses that enabling seamless train transfers along the port railway network is deemed to be the crucial feature to attain an increase in railway capacity.

Picture 5 - Prioritization of criteria



Insights coming from the evaluation of port railway operational features prove to strongly sustain the results obtained by the optimization procedure, highlighting the usefulness of combining the two approaches. As a matter of fact, referring to Picture 5, the aggregated value estimated for criteria priorities confirm the importance of the infrastructural availability, in terms of both the entity of resources and their occupancy time. Such consideration can be observed especially in relation to port railway network, but also to terminals. Even the minor relevance of operational resource is line with optimization outcomes, since the increase in the optimal port railway capacity has turned out not to be influenced beyond a certain value of the number of shunting locomotives.

1.2.4. SENSITIVITY ANALYSIS

Sensitivity analyses have been performed in order to capture changes in the preferences attributed to certain elements of the evaluation frameworks, to varying of the importance of related factors. Such analyses prove to offer decision makers a useful support to better understand how changes in the significance of different aspects can possibly influence the final recommendation.

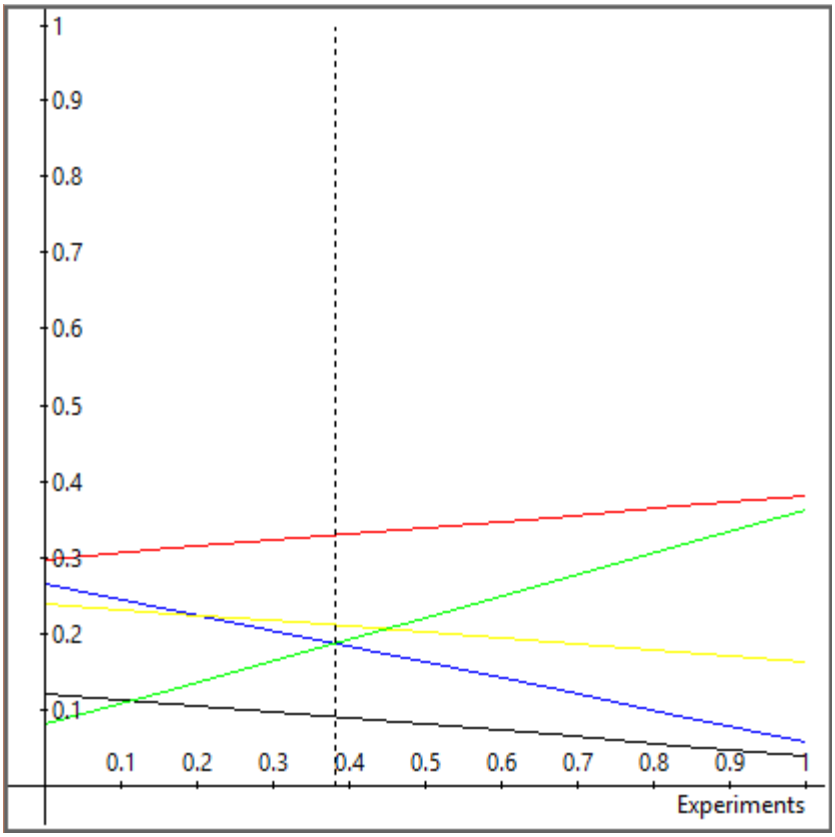
The analyses have been carried out to study changes in the relative importance of the considered criteria, with respect to variations in the actors' level of influence. Table 0 reports the diverse colours attributed by the Super Decisions software to identify the various criteria in the graphical representation of their significance trends.

Table 9 - Legend for criteria

LEGEND FOR CRITERIA	
Infrastructural occupancy time	
N° infrastructural resources	
N° locomotives and work crews	
Time for administrative procedures	
Waiting time for terminal availability	

Concerning the PNAEAS – RID, Picture 6 highlights that a quite remarkable inversion in the priorities of criteria occurs when the level of influence of the port technical department is close to 0.4. Indeed, it implicates a meaningful increase in the relevance of the time for port administrative procedures, accompanied by a more modest growth in the significance of the infrastructural occupancy time. Along with the rise in the weight value of such criteria, a decrease in the importance of the remaining parameters can be observed, especially for the one related to the number of infrastructural resources. Although no reversals in the overall priority classification of criteria has been recorded, the slope of the line marking the relevance of the time for administrative procedures suggests a pronounced increase in its importance in face of small changes in the RID's level of influence. Therefore, in the view of a railway capacity increase, these tendencies in criteria priorities confirm the significance attributed also to organizational aspects, and not only to resource availability.

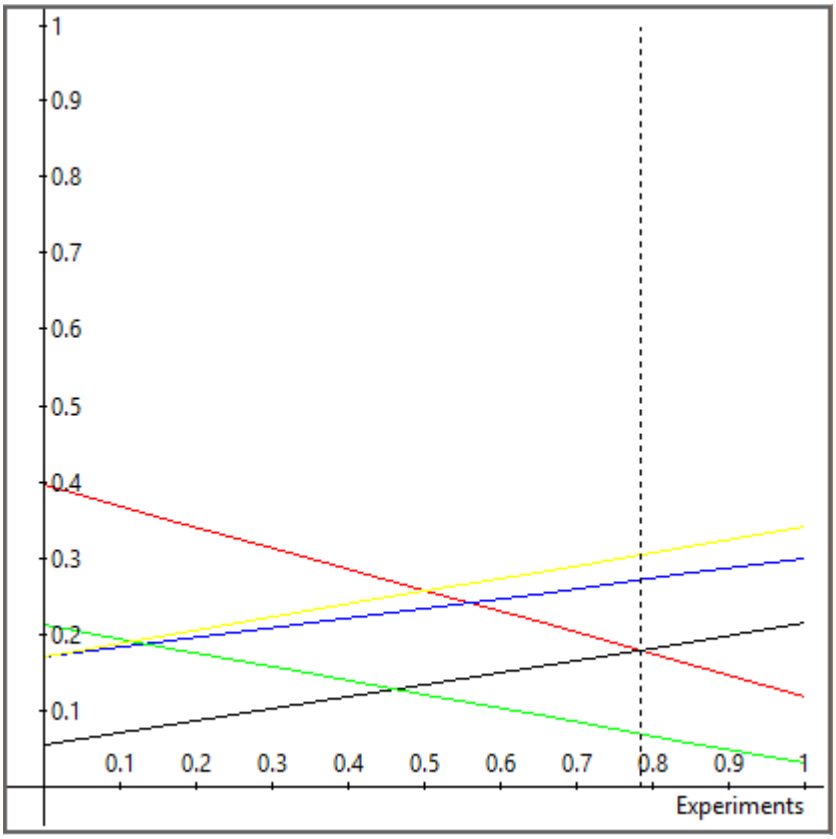
Picture 6 - Sensitivity analysis for the level of influence of PNAEAS - RID



No significant inversions in the criteria classification have resulted from variations in the level of influence of the Terminal Operator managing Piers V and VI, so any graphical visualization of the tendencies in criteria priorities has not been reported.

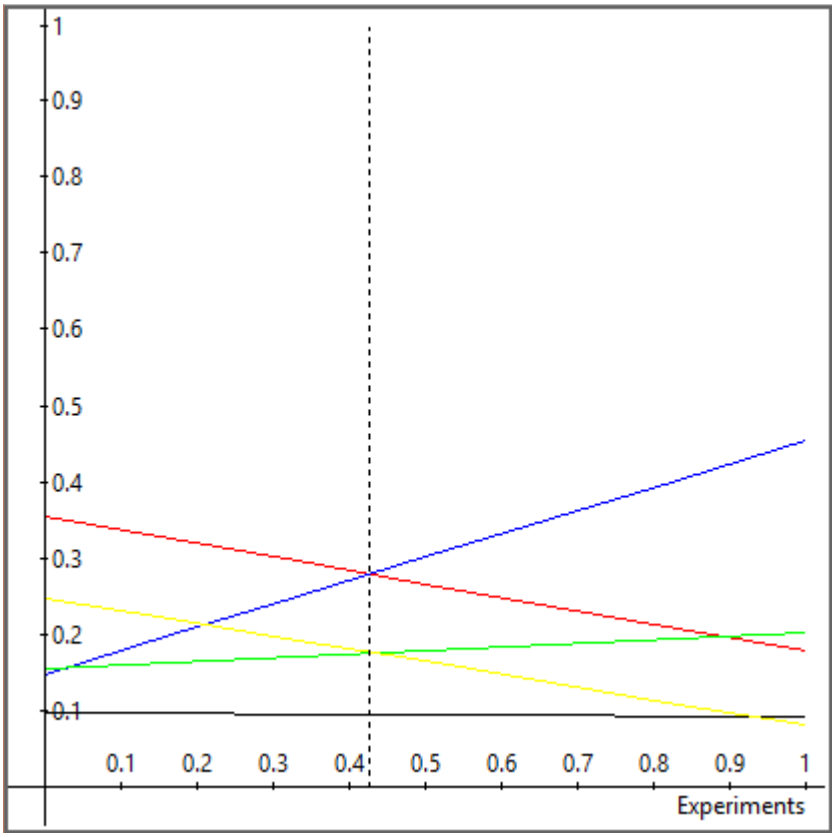
As illustrated in Picture 7, the increase in the level of influence of the Terminal Operator handling Pier VII implicates a noticeable rise in the weight value of criteria related to the waiting time for terminal availability and the number of both the considered types of resources. Such growth occurs concurrently to a remarkable reduction in the priority concerning the infrastructural occupancy time and the duration of administrative procedures. Indeed, clear inversions in the prioritization of criteria can be observed in correspondence to an influence value equalling approximately to 0.55 and 0.8 for the examined actor. This trend underlines that, with the aim of growing railway capacity, a rise in the level of influence of the Terminal Operator of Pier VII throws light on the importance of the smoothness in performing terminal and shunting operations, given a larger availability of resources.

Picture 7 - Sensitivity analysis for the level of influence of the Terminal Operator of Pier VII



Regarding the shunting operations company, Picture 8 shows a distinct reversal in the priority of criteria in the range between 0.4 and 0.5 of Adriafer level of influence. As a matter of fact, for an almost equal importance attributed to the number of locomotives and work crews, greater relevance is definitely assumed by the criterion related to number of infrastructural resources and, to a more modest extent, also by the one concerning the time for administrative procedures. As such, the resulting variation in the criteria classification points out that, based on a more influential role of Adriafer, the attainment of an increase in port railway capacity mainly depends on the availability of infrastructural resources, paired with an efficient preparation of the documents necessary for train transfers.

Picture 8 - Sensitivity analysis for the level of influence of Adriafer



ANNEX

Rating scale:

- 1 if the two compared elements are of equal importance;
- 3 if an element is slightly more important than the other;
- 5 if an element is much more important than the other;
- 7 if an element is by far much more important than the other;
- 9 if an element is definitely much more important than the other;
- 2, 4, 6, 8 for intermediate values between two adjacent judgements.

COMPARISON BETWEEN ACTORS																		
Actor i	**Comparison**																	**Actor j**
PNAEAS - RID	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Terminal Operator - Piers V and VI
PNAEAS - RID	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Terminal Operator - Pier VII
PNAEAS - RID	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Adriafer
Terminal Operator - Piers V and VI	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Terminal Operator - Pier VII
Terminal Operator - Pier V and VI	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Adriafer
Terminal Operator - Pier VII	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Adriafer

COMPARISON BETWEEN CRITERIA																		
Criterion i	**Comparison**																	**Criterion j**
Infrastructural occupancy time for A/D processes	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Waiting time for terminal availability
Infrastructural occupancy time for A/D processes	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Time for administrative procedures
Infrastructural occupancy time for A/D processes	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	N° of shunting locomotives and work crews
Infrastructural occupancy time for A/D processes	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	N° of infrastructural resources
Waiting time for terminal availability	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Time for administrative procedures
Waiting time for terminal availability	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	N° of shunting locomotives and work crews
Waiting time for terminal availability	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	N° of infrastructural resources
Time for administrative procedures	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	N° of shunting locomotives and work crews
Time for administrative procedures	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	N° of infrastructural resources
N° of shunting locomotives and work crews	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	N° of infrastructural resources