




ERJU SYSTEM PILLAR

System Architecture Description- Railways_System_Architecture_Model_De - Main



System Architecture Description : Railways

System Architecture Model Description - Main

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1 Preamble

1.1 Purpose

The following document describes the all content of the operational analysis of Task 1 extracted from the Capella reference model.

1.2 Intended Audience

This document is addressed to the entire Pillar system for acknowledging the operational architecture described through TASK1.

1.3 Document context

1.4 Glossary




1.4.1 Terms

1.4.2 Abbreviations













2 Content of Operational Analysis

2.1 Operational Entities and Actors

2.1-1 - Railway System

ID	SPMS-4073
Children	<ul style="list-style-type: none"> •  SPMS-4049 - Infrastructure Manager (IM) •  SPMS-4063 - Railway Undertaking (RU)
Type	 C2P-Operational Entity










2.1-1.1 - Infrastructure Manager (IM)

ID	SPMS-4049
Parent	<ul style="list-style-type: none"> •  SPMS-4073 - Railway System
Children	<ul style="list-style-type: none"> •  SPMS-4052 - Infrastructure Monitoring Manager (IM) •  SPMS-4055 - Commercial Services (IM) •  SPMS-4058 - Connections Operator (IM) •  SPMS-4060 - Control-command and signalling (Operational Traffic Management) (IM) •  SPMS-4067 - Infrastructure Safety Management (IM) •  SPMS-4068 - Traffic Management (IM) •  SPMS-4081 - Infrastructure Assets Manager (IM) •  SPMS-4086 - Infrastructure Designer (IM) •  SPMS-4090 - Capacity Manager (IM) •  SPMS-4091 - Station manager and other facilities (IM)
Type	 C2P-Operational Entity

2.1-1.2 - Railway Undertaking (RU)

'Railway Undertaking' means any public or private undertaking licensed according to this Directive, the principal business of which is to provide services for the transport of goods and/or passengers by rail with a requirement that the undertaking ensure traction; this also includes undertakings which provide traction only;

DIRECTIVE 2012/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 November 2012 establishing a single European railway area (recast) – Article 3 definition 1






ID	SPMS-4063
Parent	<ul style="list-style-type: none"> •  SPMS-4073 - Railway System
Children	<ul style="list-style-type: none"> •  SPMS-4050 - Commercial Services (RU) •  SPMS-4078 - Safety Manager (RU) •  SPMS-4080 - Fleet Manager (RU) •  SPMS-4084 - Train Operator (including shunting) (RU)
Allocated	<ul style="list-style-type: none"> •  SPMS-3978 - ME_Generate electrical energy from regenerative braking •  SPMS-3983 - Measure electrical energy consumption •  SPMS-4037 - Consume+transform+store electrical energy •  SPMS-7896 - Consume non electric energy

Type	 C2P-Operational Entity
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2.1-2 - Customers



OPERATE TRAIN: Any external entity using a transport service, eg passengers, freight carrier, entities responsible for the ticket selling and after sales services

MANAGE ENERGY: a wholesale or final customer of electricity (e.g. RU, station manager). DIRECTIVE (EU) 2019/944 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU

ID	SPMS-4056
Children	<ul style="list-style-type: none">  SPMS-4064 - Other commercial systems  SPMS-4066 - Freight carrier  SPMS-4069 - Passengers
Allocated	<ul style="list-style-type: none">  SPMS-4017 - Consume electrical energy
Type	 C2P-Operational Entity




2.1-2.1 - Other commercial systems

If involved, interfaces between the train operations and the final customers : they can be in charge of selling tickets, information to customers in real time, transit in case of a delayed train...

ID	SPMS-4064
Parent	<ul style="list-style-type: none">  SPMS-4056 - Customers
Type	 C2P-Operational Entity


2.1-2.2 - Freight carrier



Includes "loader", "Unloader", "filler" and "unfiller" as per Directive (EU) 2016/798 article 3 definitions 25 to 28.

ID	SPMS-4066
Parent	<ul style="list-style-type: none">  SPMS-4056 - Customers
Allocated	<ul style="list-style-type: none">  SPMS-3979 - Load train
Type	 C2P-Operational Entity

2.1-2.3 - Passengers

Not supposed to know and understand the risks associated to the railway system. Railway system designers are supposed to anticipate the foreseeable reactions of passengers and adapt the system to them.

ID	SPMS-4069
Parent	<ul style="list-style-type: none">  SPMS-4056 - Customers










Allocated	<ul style="list-style-type: none"> •  SPMS-3968 - Receive travelling information
Type	 C2P-Operational Entity

2.1-3 - Suppliers

ROLLING STOCK: The concerned actors are the contracting entities as defined in Article 5 of ECM Regulation including their suppliers and service providers, or the certification bodies as defined in Article 6 of ECM Regulation. (Guide for the application of Article 14 of Directive (EU) 2016/798 and Commission Implementing Regulation (EU) No 2019/779 on a system of certification of entities in charge of maintenance for vehicles, § 1.1. Scope (Note 2))

INFRA:

- EN 14969:2006 (Railway applications - Track - Qualification system for railway trackwork contractors): This European Standard specifies the definitions, procedures, criteria and their assessment as well as the respective documentation related to a qualification system of trackwork contractors, which relates to the Directive 2004/17/EC). This qualification system identifies trackwork contractors that can be invited for tendering trackwork contracts. Evaluation of the contractors applying for parts of the contract, which are not trackwork, is not covered by this standard. This European Standard may also be used for a qualification system of trackwork contractors applying for contracts with a value below the minimum limit as defined in the Directive 2004/17/EC.
- ISO 22163:2023 (Quality management in the railway sector)

ID	SPMS-4074
Allocated	<ul style="list-style-type: none"> •  SPMS-3950 - Provide infrastructure maintenance capabilities (including tools) •  SPMS-3954 - Provide infrastructure maintenance services •  SPMS-3989 - Provide certified interoperable system / constituent •  SPMS-3994 - Provide infrastructure maintenance parts •  SPMS-3998 - Provide rolling stock maintenance services •  SPMS-3999 - Provide rolling stock maintenance capabilities (tools, software, infrastructures etc.) •  SPMS-4000 - Sell rolling stock assets •  SPMS-4009 - Provide rolling stock maintenance parts
Type	 C2P-Operational Entity

2.1-4 - Regulatory Authorities

Under European Union legislation, each Regulatory Body (RB) has the task to oversee the application of Community rules and act as an appeal body in case of disputes.








DIRECTIVE 2012/34/EU, Article 55: 'Each Member State shall establish a single national regulatory body for the railway sector. Without prejudice to paragraph 2, this body shall be a stand-alone authority which is, in organizational, functional, hierarchical and decision- making terms, legally distinct and independent from any other public or private entity. It shall also be independent in its organization, funding decisions, legal structure and decision- making from any infrastructure manager, charging body, allocation body or applicant. It shall furthermore be functionally independent from any competent authority involved in the award of a public service contract.' Thus it shall ensure that charges set by the Infrastructure Manager comply with Chapter II of 2001/14/EU and are nondiscriminatory. The RB oversees negotiations between applicants and the IM and intervenes when the requirements of 2001/14 are likely to be contravened.

Applicants have the right to appeal to the RB if they believe that they have been unfairly treated, discriminated against or are in any other way aggrieved. In particular, they may appeal against decisions adopted by the IM (or where appropriate the Railway Undertaking) concerning: a) the network statement; b) criteria contained within it; c) the allocation process and its outcome; d) the charging scheme; e) level or structure of infrastructure fees which it is, or may be, required to pay; f) arrangements for access.

DIRECTIVE 2012/34/EU, Article 55, all TSI regulations and regulation 2016/798, safety directive, art 3 (8) Beyond this definition, from the operational and technical point of view, regulatory bodies may also be

responsible for checking compliance to:




- the European rules, stated in TSIs;
- the 'national rules': means all binding rules adopted in a Member State, irrespective of the body issuing them, which contain railway safety or technical requirements, other than those laid down by Union or international rules, and which are applicable within that Member State to railway undertakings, infrastructure managers or third parties (regulation 2016/798, safety directive, art 3 (8))

ID	SPMS-4087
Children	<ul style="list-style-type: none"> •  SPMS-4047 - European regulation authorities •  SPMS-4053 - Member states •  SPMS-4057 - European and National Safety Authorities •  SPMS-4088 - Public transport authorities
Allocated	<ul style="list-style-type: none"> •  SPMS-3976 - Define infrastructure operations regulations •  SPMS-3977 - Define rolling stock operations regulations
Type	 C2P-Operational Entity

2.1-4.1 - Public transport authorities

ID	SPMS-4088
Parent	<ul style="list-style-type: none"> •  SPMS-4087 - Regulatory Authorities
Type	 C2P-Operational Entity

2.1-4.2 - European regulation authorities


ID	SPMS-4047
Parent	<ul style="list-style-type: none"> •  SPMS-4087 - Regulatory Authorities
Allocated	<ul style="list-style-type: none"> •  SPMS-3952 - Deliver pre-authorization to upgrade or renew infrastructure
Type	 C2P-Operational Entity




2.1-4.3 - Member states

Each of the 27 Member States is bound by the Treaties and the *acquis communautaire*. Each participates in governing the EU on equal terms.

There are 27 Member States: Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland and Sweden.







In the summaries of EU legislation, the term 'EU countries' is used often as alternative of 'Member States'.

ID	SPMS-4053
Parent	<ul style="list-style-type: none"> •  SPMS-4087 - Regulatory Authorities

Allocated	<ul style="list-style-type: none"> •  SPMS-4008 - Define general regulations (e.g.: health + safety, environmental etc.) •  SPMS-4014 - Regulate local mobility services
Type	 C2P-Operational Entity

2.1-4.4 - European and National Safety Authorities

'National safety authority' means the national body entrusted with the tasks regarding railway safety in accordance with this Directive [2016 / 798] or any body entrusted by several Member States with those tasks in order to ensure a unified safety regime.






ID	SPMS-4057
Parent	<ul style="list-style-type: none"> •  SPMS-4087 - Regulatory Authorities
Allocated	<ul style="list-style-type: none"> •  SPMS-3953 - Deliver authorization to upgrade or renew infrastructure or rolling stock •  SPMS-3997 - Define certification requirements •  SPMS-7048 - Store nominal data •  SPMS-7049 - Share nominal data
Type	 C2P-Operational Entity

2.1-5 - Certification bodies



ROLLING STOCK: As per Directive (EU) 2019/779 - article 2 - body responsible for the certification of entities in charge of maintenance or for certification of the entity or organisation that fulfil maintenance functions referred to in points (b), (c) or (d) of article 14 (3) of Directive (EU) 2016/798, or parts of those functions.

INFRA:



- EN 14969:2006 (Railway applications - Track - Qualification system for railway trackwork contractors): This European Standard specifies the definitions, procedures, criteria and their assessment as well as the respective documentation related to a qualification system of trackwork contractors, which relates to the Directive 2004/17/EC). This qualification system identifies trackwork contractors that can be invited for tendering trackwork contracts. Evaluation of the contractors applying for parts of the contract, which are not trackwork, is not covered by this standard. This European Standard may also be used for a qualification system of trackwork contractors applying for contracts with a value below the minimum limit as defined in the Directive 2004/17/EC.
- ISO 22163:2023 (Quality management in the railway sector)

ID	SPMS-4061
Children	<ul style="list-style-type: none"> •  SPMS-4070 - Notified Bodies (NoBo) •  SPMS-4071 - Designated Bodies (DeBo) •  SPMS-4075 - Assessment Bodies (AsBo)
Allocated	<ul style="list-style-type: none"> •  SPMS-4015 - Provide certificates
Type	 C2P-Operational Entity



2.1-5.1 - Notified Bodies (NoBo)

ID	SPMS-4070
Parent	<ul style="list-style-type: none"> •  SPMS-4061 - Certification bodies
Type	 C2P-Operational Entity

2.1-5.2 - Designated Bodies (DeBo)






ID	SPMS-4071
Parent	<ul style="list-style-type: none"> •  SPMS-4061 - Certification bodies
Type	 C2P-Operational Entity

2.1-5.3 - Assessment Bodies (AsBo)

ID	SPMS-4075
Parent	<ul style="list-style-type: none"> •  SPMS-4061 - Certification bodies
Type	 C2P-Operational Entity





2.1-6 - Vehicle Keeper






As per Directive (EU) 2016/798 - article 3 - definition 19: natural or legal person that, being the owner of a vehicle or having the right to use it, exploits the vehicle as a means of transport and is registered as such in a vehicle register referred to in article 47 of Directive (EU) 2016/797.

ID	SPMS-4076
Allocated	<ul style="list-style-type: none"> •  SPMS-4006 - Nominate ECM •  SPMS-4013 - Provide rolling stock assets •  SPMS-4024 - Request a rolling stock certification •  SPMS-4025 - Upgrade rollingstock
Type	 C2P-Operational Entity



2.1-7 - ECM

As per Directive (EU) 2016/798 - article 3 - definition 20: entity in charge of the maintenance of a vehicle, and registered as such in a vehicle register referred to in article 47 of Directive (EU) 2016/797.



ID	SPMS-4085
Children	<ul style="list-style-type: none"> •  SPMS-4048 - ECM D •  SPMS-4051 - ECM C •  SPMS-4082 - ECM A •  SPMS-4089 - ECM B

Allocated	<ul style="list-style-type: none"> •  SPMS-4001 - Supervise+coordinate rolling stock maintenance (including risk assessment) •  SPMS-4002 - Develop maintenance files •  SPMS-4003 - Manage fleet maintenance •  SPMS-4004 - Deliver maintenance (including preparation & usual checks)
Type	 C2P-Operational Entity



2.1-7.1 - ECM A

ID	SPMS-4082
Parent	<ul style="list-style-type: none"> •  SPMS-4085 - ECM
Type	 C2P-Operational Entity



2.1-7.2 - ECM B

ID	SPMS-4089
Parent	<ul style="list-style-type: none"> •  SPMS-4085 - ECM
Type	 C2P-Operational Entity

2.1-7.3 - ECM D

ID	SPMS-4048
Parent	<ul style="list-style-type: none"> •  SPMS-4085 - ECM
Type	 C2P-Operational Entity

2.1-7.4 - ECM C





ID	SPMS-4051
Parent	<ul style="list-style-type: none"> •  SPMS-4085 - ECM
Type	 C2P-Operational Entity

2.1-8 - Electricity undertakings

A natural or legal person who carries out at least one of the following functions: generation, transmission, distribution, aggregation, demand response, energy storage, supply or purchase of electricity, and who is responsible for the commercial, technical or maintenance tasks related to those functions, but does not include final customers

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ID	SPMS-4054
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Children	<ul style="list-style-type: none"> •  SPMS-4059 - Electricity market •  SPMS-4062 - Energy Transmitter •  SPMS-4065 - Energy Supplier
Type	 C2P-Operational Entity

2.1-8.1 - Electricity market

Markets for electricity, including over-the-counter markets and electricity exchanges, markets for the trading of energy, capacity, balancing and ancillary services in all timeframes, including forward, day-ahead and intraday markets.




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ID	SPMS-4059
Parent	<ul style="list-style-type: none"> •  SPMS-4054 - Electricity undertakings
Allocated	<ul style="list-style-type: none"> •  SPMS-3966 - Buy / Sell Electrical energy
Type	 C2P-Operational Entity

2.1-8.2 - Energy Transmitter

A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity.


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
ID	SPMS-4062
Parent	<ul style="list-style-type: none"> •  SPMS-4054 - Electricity undertakings
Allocated	<ul style="list-style-type: none"> •  SPMS-4044 - Transmit energy
Type	 C2P-Operational Entity

2.1-8.3 - Energy Supplier

Entity who sell, including the resale of electricity to a wholesale or final customer of electricity (e.g. RU, station manager)




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ID	SPMS-4065
Parent	<ul style="list-style-type: none"> •  SPMS-4054 - Electricity undertakings

Allocated	<ul style="list-style-type: none"> •  SPMS-3955 - Sell electrical energy to railway systems •  SPMS-3980 - Buy electrical energy for railway •  SPMS-3991 - Define electrical energy commercialization and supply strategy
Type	 C2P-Operational Entity

2.1-9 - Commercial Service (EM)

Supply of electrical energy.

ID	SPMS-4072
Allocated	<ul style="list-style-type: none"> •  SPMS-3981 - Manage energy distribution billing •  SPMS-3992 - Define electrical energy technical strategy
Type	 C2P-Operational Entity

2.1-10 - Alternative fuel supplier

Other energy sources and their supplies (e.g. fuels, heat, renewable energy or any other form of energy; not electrical energy).

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




ID	SPMS-4079
Type	 C2P-Operational Entity

2.1-11 - Energy Manager (EM)

The role of the entity « energy management» here in the TO-BE architecture is only to adapt the energy consumption in real time depending on the activity in the network, to save energy whenever it is possible. The failures and traffic restrictions are taken into account in real time by another entity of the IM and the traffic is updated at first by the traffic management, that can transfer the information to the energy manager.

So in that case, there is no direct interaction between operational traffic management and energy manager.





Sometimes energy manager is part of Infrastructure Manager, sometimes it's same entity. It depends on country organization. In this case we want to show that role of energy manager can be independent.

ID	SPMS-4077
Children	<ul style="list-style-type: none"> •  SPMS-4083 - Distribution System Operators
Allocated	<ul style="list-style-type: none"> •  SPMS-3995 - Manage electrical energy supply incidents •  SPMS-4032 - Manage electrical energy cutoff request •  SPMS-7963 - Manage electrical energy supply incidents (from another E.M from different country)
Type	 C2P-Operational Entity

2.1-11.1 - Distribution System Operators

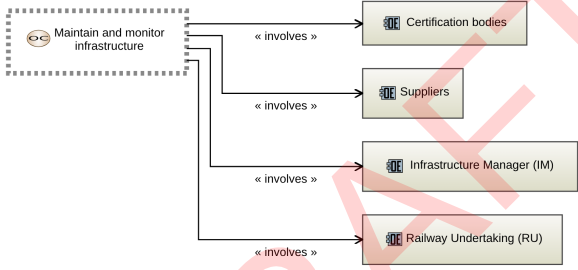




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2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU

ID	SPMS-4083
Parent	<ul style="list-style-type: none"> •  SPMS-4077 - Energy Manager (EM)
Allocated	<ul style="list-style-type: none"> •  SPMS-4022 - Collect+transform+distribute electrical energy + store energy •  SPMS-4038 - Control+adapt+supervise energy distribution
Type	 C2P-Operational Entity

2.2 Operational Capabilities

2.2-1 - Maintain and monitor infrastructure

ID	SPMS-3944
Context Diagram	 <p>Figure 1 Context Diagram of Maintain and monitor infrastructure</p>
Involved entities	<ul style="list-style-type: none"> •  SPMS-4049 - Infrastructure Manager (IM) •  SPMS-4061 - Certification bodies •  SPMS-4063 - Railway Undertaking (RU) •  SPMS-4074 - Suppliers

Involved Functions	<ul style="list-style-type: none"> •  SPMS-3949 - Update CS infrastructure data •  SPMS-3950 - Provide infrastructure maintenance capabilities (including tools) •  SPMS-3951 - Analyse infrastructure monitoring data •  SPMS-3954 - Provide infrastructure maintenance services •  SPMS-3956 - Manage infrastructure maintenance certification •  SPMS-3958 - Manage infrastucture data •  SPMS-3965 - Plan timetable •  SPMS-3984 - Request capacity for infrastructure maintenance •  SPMS-3985 - Generate+collect infrastructure monitoring data •  SPMS-3986 - Organize (planned & unplanned) infrastructure maintenance (including asset management & obsolescence management) •  SPMS-3987 - Develop infrastructure maintenance capabilities (including tools) •  SPMS-3988 - Execute infrastructure maintenance (including preparation+usual checks) •  SPMS-3993 - Manage parts supply (including obsolescence management) •  SPMS-3994 - Provide infrastructure maintenance parts •  SPMS-4015 - Provide certificates •  SPMS-4020 - Allocate capacity •  SPMS-4028 - Define infrastructure safety policy •  SPMS-4030 - Manage deviations (including Staff & fleet management) •  SPMS-4035 - Supervise+coordinate infrastructure maintenance •  SPMS-4038 - Control+adapt+supervise energy distribution •  SPMS-4040 - Control+supervise traffic (Operational Management of Authorizations for Movements (IM)) •  SPMS-4043 - Monitor traffic
Type	 C2P-Capability

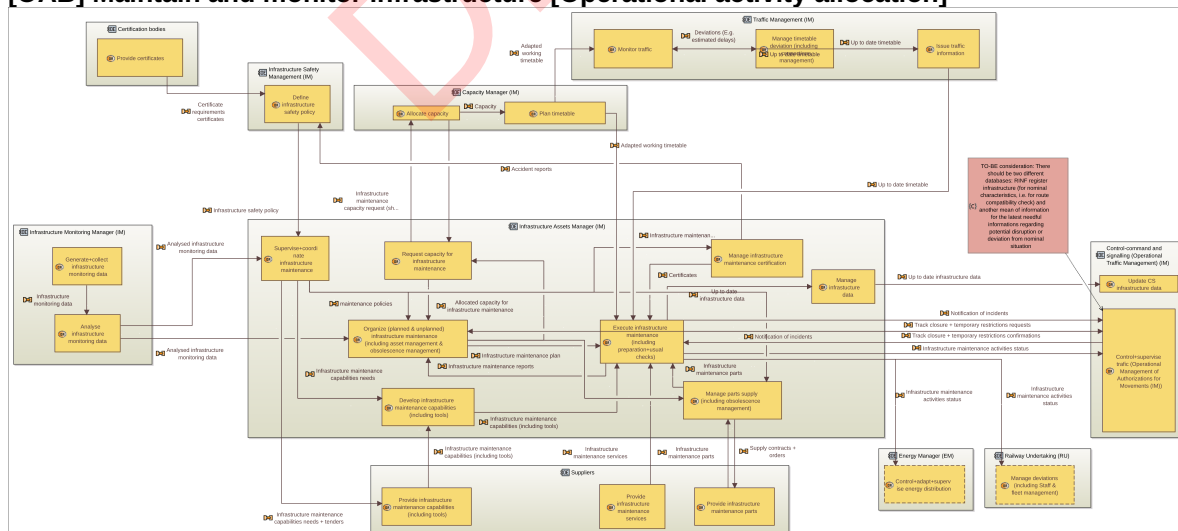
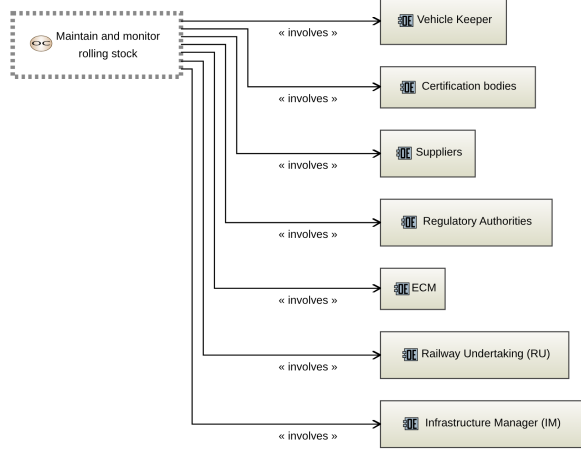


Figure 2 Diagram [OAB] Maintain and monitor infrastructure [Operational activity allocation]

2.2-2 - Maintain and monitor rolling stock

ID	SPMS-3945
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Context Diagram	 <p>The diagram shows a central use case 'Maintain and monitor rolling stock' (C2P-Capability) connected to seven external entities: Vehicle Keeper, Certification bodies, Suppliers, Regulatory Authorities, ECM, Railway Undertaking (RU), and Infrastructure Manager (IM). Each connection is labeled with the stereotype « involves ».</p>
Involved entities	<ul style="list-style-type: none"> SPMS-4049 - Infrastructure Manager (IM) SPMS-4061 - Certification bodies SPMS-4063 - Railway Undertaking (RU) SPMS-4074 - Suppliers SPMS-4076 - Vehicle Keeper SPMS-4085 - ECM SPMS-4087 - Regulatory Authorities
Involved Functions	<ul style="list-style-type: none"> SPMS-3962 - Define safety policy SPMS-3974 - Sell infrastructure services SPMS-3996 - Define rolling stock usage profile & performance targets SPMS-3997 - Define certification requirements SPMS-3998 - Provide rolling stock maintenance services SPMS-3999 - Provide rolling stock maintenance capabilities (tools, software, infrastructures etc.) SPMS-4000 - Sell rolling stock assets SPMS-4001 - Supervise+coordinate rolling stock maintenance (including risk assessment) SPMS-4002 - Develop maintenance files SPMS-4003 - Manage fleet maintenance SPMS-4004 - Deliver maintenance (including preparation & usual checks) SPMS-4006 - Nominate ECM SPMS-4007 - Compose train SPMS-4008 - Define general regulations (e.g.: health + safety, environmental etc.) SPMS-4009 - Provide rolling stock maintenance parts SPMS-4013 - Provide rolling stock assets SPMS-4015 - Provide certificates
Type	C2P-Capability

[OAB] Maintain and monitor rolling stock [Operational activity allocation]

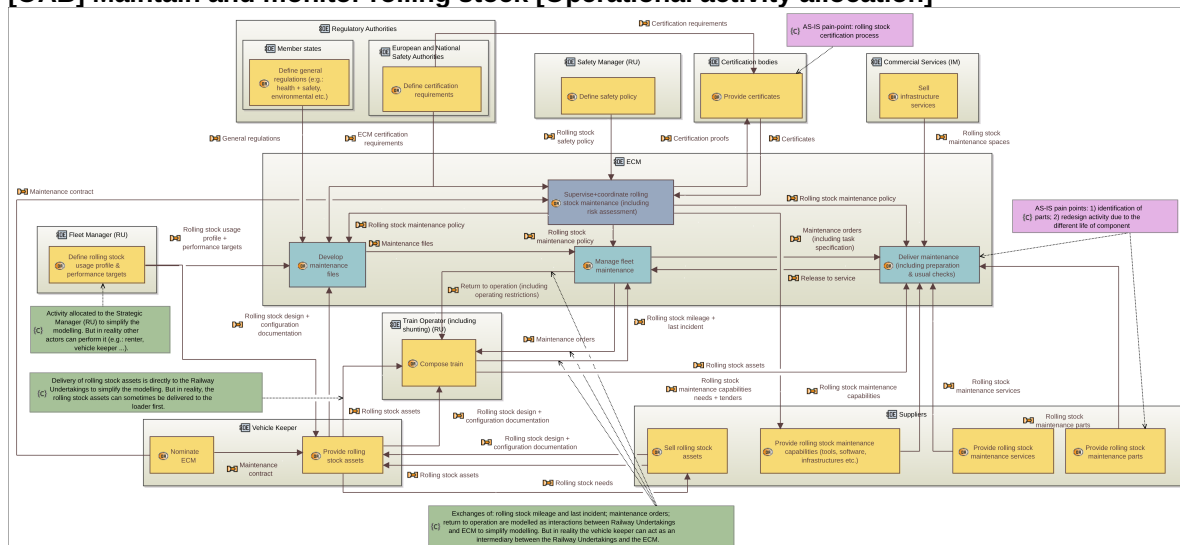
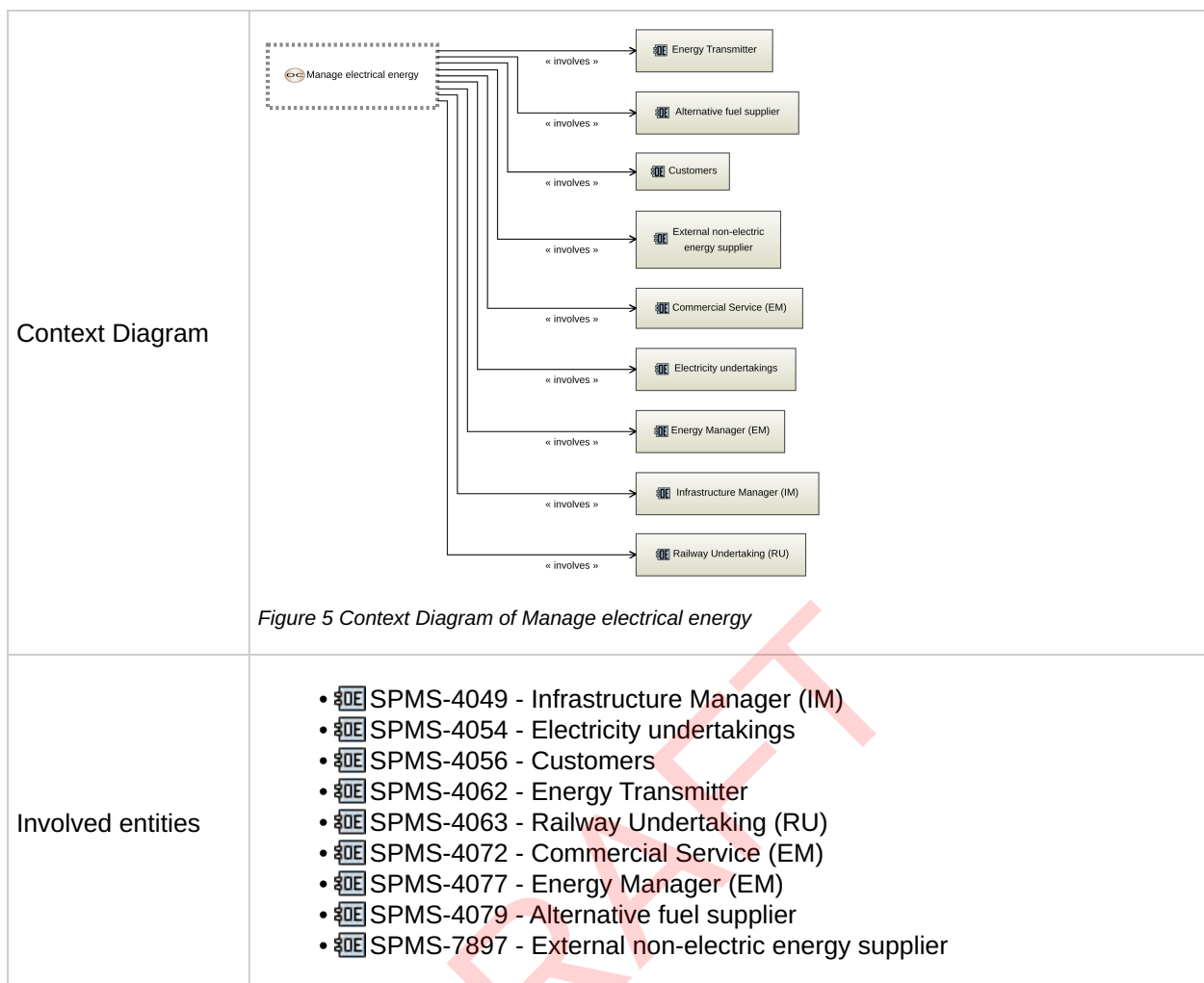





























Figure 4 Diagram [OAB] Maintain and monitor rolling stock [Operational activity allocation]

2.2-3 - Manage electrical energy

The manage Energy for the railway infrastructure capability is a continuous process that starts once conditions for energy distribution are met on a network and ends with energy being distributed to the infrastructure in a stable manner and specific requests have been addressed (cutoff, maintenance operations etc.). The process is continuous since any disruptions to the stable state of energy distribution will trigger new operations of the Manage Energy capability. Alternative energies (hydrogen, diesel) are not described here

ID	SPMS-3946
Pre Condition	<ul style="list-style-type: none"> - There are no cutoff requests received. - Information on traffic state and up to date timetable is known. - The status of maintenance is known. - Energy supply is available.
Post Condition	<ul style="list-style-type: none"> - Electrical power is being used by the railway infrastructure. - New requests for cutoffs have been addressed. - New requests for maintenance activities have been acknowledged.



Involved Functions	<ul style="list-style-type: none"> •  SPMS-3955 - Sell electrical energy to railway systems •  SPMS-3966 - Buy / Sell Electrical energy •  SPMS-3967 - Pay electrical energy consumption •  SPMS-3980 - Buy electrical energy for railway •  SPMS-3981 - Manage energy distribution billing •  SPMS-3982 - Pay electrical energy consumption •  SPMS-3983 - Measure electrical energy consumption •  SPMS-3985 - Generate+collect infrastructure monitoring data •  SPMS-3988 - Execute infrastructure maintenance (including preparation+usual checks) •  SPMS-3990 - Consume electrical energy •  SPMS-3991 - Define electrical energy commercialization and supply strategy •  SPMS-3992 - Define electrical energy technical strategy •  SPMS-3995 - Manage electrical energy supply incidents •  SPMS-4016 - Manage station electrical energy •  SPMS-4017 - Consume electrical energy •  SPMS-4019 - Control+Supervise field staff •  SPMS-4021 - Define transport services offer •  SPMS-4022 - Collect+transform+distribute electrical energy + store energy •  SPMS-4032 - Manage electrical energy cutoff request •  SPMS-4037 - Consume+transform+store electrical energy •  SPMS-4038 - Control+adapt+supervise energy distribution •  SPMS-4039 - Drive train (incl. shunting) •  SPMS-4043 - Monitor traffic •  SPMS-4044 - Transmit energy •  SPMS-4045 - Consume electrical energy •  SPMS-4046 - Collect+store electrical energy
Type	 C2P-Capability

[OAB] Manage electrical energy [Operational activity allocation]

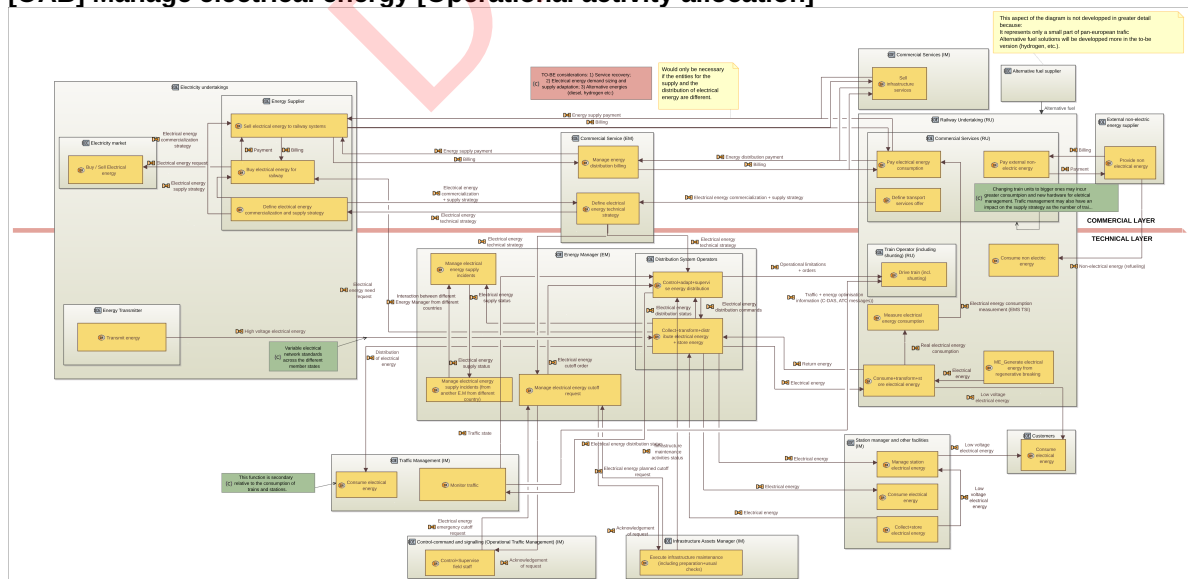


Figure 6 Diagram [OAB] Manage electrical energy [Operational activity allocation]

2.2-4 - Operate train

ID	SPMS-3943
Pre Condition	<ul style="list-style-type: none"> - The Rolling Stock assets must be available & their associated restrictions known (incl. Design and configuration documentation) <ul style="list-style-type: none"> - A theoretical timetable is available. - Track closures and restrictions are known (have been sent by infrastructure maintenance entities). - The RSRD and passenger information is known (has been sent by associated entities). <ul style="list-style-type: none"> - Electrical power is available in the infrastructure. - Limitations & orders related to energy consumption in the infrastructure is known. - The track occupation diagrams are known (sent by railway station managers). <ul style="list-style-type: none"> - The safety policies for the entities involved are known and applied. <ul style="list-style-type: none"> - The trainset is authorised (ERA TV) and has network access - Infrastructure operation regulations are taken into account by those who write the operational instructions to which the operational staff comply - Rolling stock operation regulations are taken into account by those who write the operational instructions to which the operational staff comply
Post Condition	<ul style="list-style-type: none"> - Train operation data is shared with entities related to Rolling Stocks maintenance. - Maintenance requests observed during operation are formulated and sent to entities related to Rolling Stocks maintenance. - Traffic information (destined to passengers and freight traffic managers) has been sent to RU. <ul style="list-style-type: none"> - Cutoff requests, if necessary, have been sent. - Up to date traffic information (destined to energy managers) has been sent to Energy managers. - Up to date Traffic information (destined to station managers) has been sent to station managers. - All safety related incidents have been recorded, informed and shared to related entities.

Context Diagram

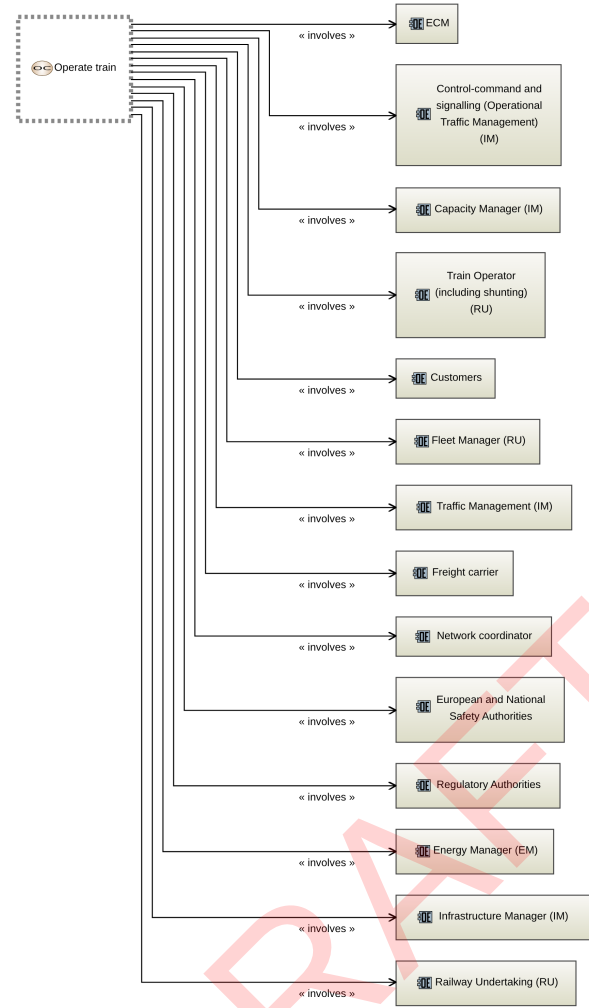











Figure 7 Context Diagram of Operate train

Involved entities

-  SPMS-4049 - Infrastructure Manager (IM)
-  SPMS-4056 - Customers
-  SPMS-4057 - European and National Safety Authorities
-  SPMS-4060 - Control-command and signalling (Operational Traffic Management) (IM)
-  SPMS-4063 - Railway Undertaking (RU)
-  SPMS-4066 - Freight carrier
-  SPMS-4068 - Traffic Management (IM)
-  SPMS-4077 - Energy Manager (EM)
-  SPMS-4080 - Fleet Manager (RU)
-  SPMS-4084 - Train Operator (including shunting) (RU)
-  SPMS-4085 - ECM
-  SPMS-4087 - Regulatory Authorities
-  SPMS-4090 - Capacity Manager (IM)
-  SPMS-7052 - Network coordinator

Involved Functions	<ul style="list-style-type: none"> •  SPMS-3947 - Monitor traffic (for another IM) •  SPMS-3948 - Plan train traffic (incl. allocating rolling stock to journey) •  SPMS-3957 - Prepare train operations •  SPMS-3960 - Raise operations incidents •  SPMS-3961 - Raise operations incidents •  SPMS-3964 - Manage rolling stock compatibility •  SPMS-3965 - Plan timetable •  SPMS-3968 - Receive travelling information •  SPMS-3974 - Sell infrastructure services •  SPMS-3976 - Define infrastructure operations regulations •  SPMS-3977 - Define rolling stock operations regulations •  SPMS-3979 - Load train •  SPMS-3988 - Execute infrastructure maintenance (including preparation+usual checks) •  SPMS-4003 - Manage fleet maintenance •  SPMS-4010 - Allocate crew to timetable •  SPMS-4011 - Collect+Analyze operations incidents data •  SPMS-4012 - Collect+Analyze operations incidents data •  SPMS-4018 - Compose train •  SPMS-4019 - Control+Supervise field staff •  SPMS-4023 - Control+Supervise trackside assets •  SPMS-4028 - Define infrastructure safety policy •  SPMS-4029 - Dispatch train (incl. shunting) •  SPMS-4030 - Manage deviations (including Staff & fleet management) •  SPMS-4031 - Manage timetable deviation (including connections management) •  SPMS-4033 - Issue traffic information •  SPMS-4034 - Manage track occupation and departure/arrival in stations •  SPMS-4038 - Control+adapt+supervise energy distribution •  SPMS-4039 - Drive train (incl. shunting) •  SPMS-4040 - Control+supervise traffic (Operational Management of Authorizations for Movements (IM)) •  SPMS-4043 - Monitor traffic
Type	 C2P-Capability

[OAB] Operate train [Operational activity allocation]

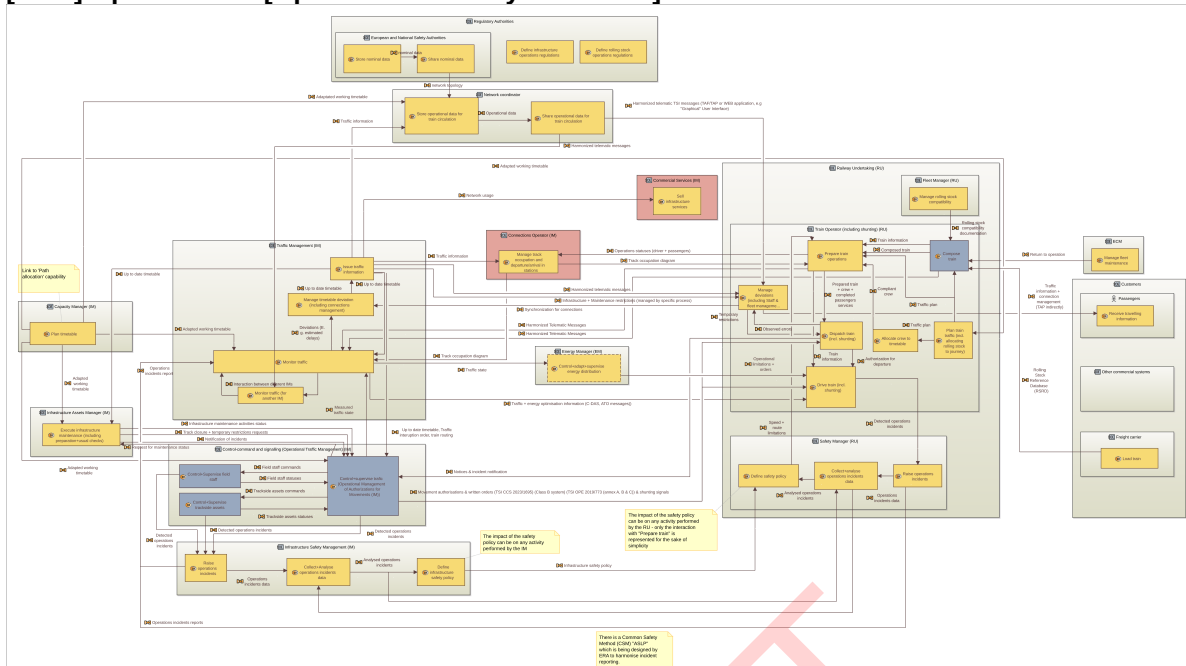


Figure 8 Diagram [OAB] Operate train [Operational activity allocation]

2.2-5 - Upgrade or renew infrastructure network capabilities

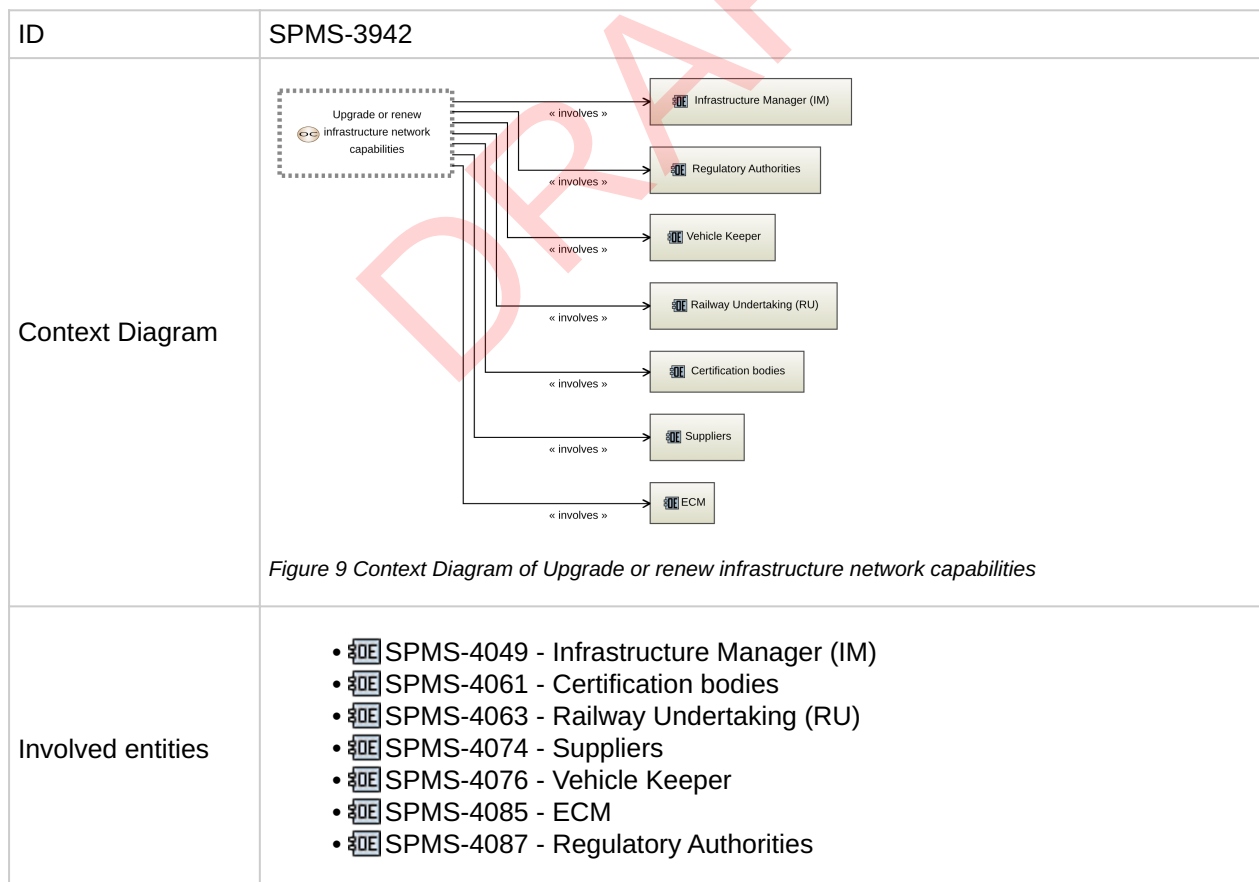


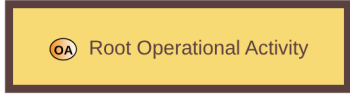

Figure 9 Context Diagram of Upgrade or renew infrastructure network capabilities

[OAB] Upgrade or renew infrastructure network capabilities [Operational activity allocation]


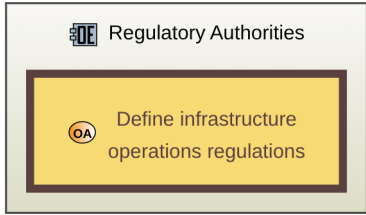



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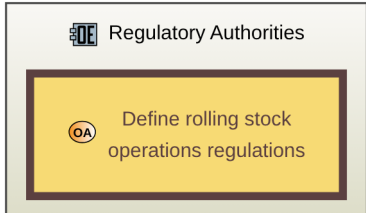

2.3-1 - Root Operational Activity

ID	SPMS-3975
Context Diagram	 <p><i>Figure 11 Context Diagram of Root Operational Activity</i></p>
Type	 C2P-Operational Activity


2.3-2 - Define infrastructure operations regulations

ID	SPMS-3976
Allocated to	<ul style="list-style-type: none">  SPMS-4087 - Regulatory Authorities
Context Diagram	 <p><i>Figure 12 Context Diagram of Define infrastructure operations regulations</i></p>
Type	 C2P-Operational Activity

2.3-3 - Define rolling stock operations regulations

ID	SPMS-3977
Allocated to	<ul style="list-style-type: none">  SPMS-4087 - Regulatory Authorities
Context Diagram	 <p><i>Figure 13 Context Diagram of Define rolling stock operations regulations</i></p>
Type	 C2P-Operational Activity

2.3-4 - ME_Generate electrical energy from regenerative braking

ID	SPMS-3978
Allocated to	<ul style="list-style-type: none">  SPMS-4063 - Railway Undertaking (RU)

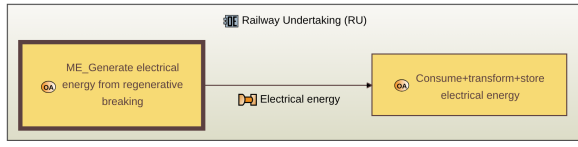

Context Diagram	 <p>The diagram shows a 'Railway Undertaking (RU)' boundary. Inside, there is a process 'ME_Generate electrical energy from regenerative breaking' (yellow box) and another process 'Consume+transform+store electrical energy' (yellow box). A data flow labeled 'Electrical energy' connects the first process to the second.</p>
Type	 C2P-Operational Activity

Figure 14 Context Diagram of ME_Generate electrical energy from regenerative breaking

2.3-5 - Load train


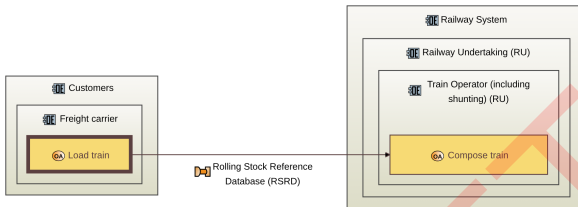

ID	SPMS-3979
Allocated to	<ul style="list-style-type: none">  SPMS-4066 - Freight carrier
Context Diagram	 <p>The diagram shows a 'Railway System' boundary containing a 'Railway Undertaking (RU)' boundary, which in turn contains a 'Train Operator (including shunting) (RU)' boundary. Outside the RU, there is a 'Customers' boundary containing a 'Freight carrier' boundary, which contains a 'Load train' process (yellow box). A data flow labeled 'Rolling Stock Reference Database (RSRD)' connects the 'Load train' process to a 'Compose train' process (yellow box) inside the 'Train Operator' boundary.</p>
Type	 C2P-Operational Activity

Figure 15 Context Diagram of Load train

2.3-6 - Buy electrical energy for railway

Purchase of electricity by railway entities from the supplier according to energy supply strategy.


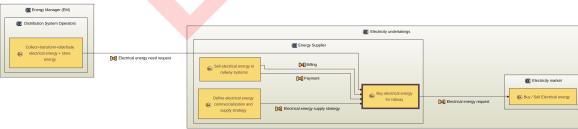


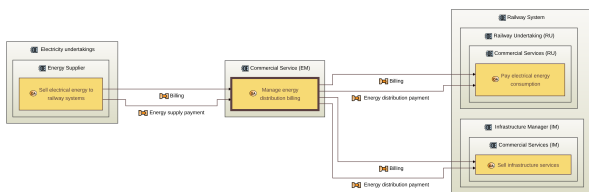

ID	SPMS-3980
Allocated to	<ul style="list-style-type: none">  SPMS-4065 - Energy Supplier
Context Diagram	 <p>The diagram shows a 'Energy supplier' boundary containing a 'Energy storage' process (yellow box) and a 'Energy distribution' process (yellow box). A data flow labeled 'Electrical energy need report' connects the 'Energy storage' process to the 'Energy distribution' process. The 'Energy distribution' process is connected to a 'Railway Undertaking (RU)' boundary, which contains a 'Train Operator (including shunting) (RU)' boundary. The 'Train Operator' boundary contains a 'Compose train' process (yellow box). A data flow labeled 'Rolling Stock Reference Database (RSRD)' connects the 'Compose train' process to the 'Energy distribution' process.</p>
Type	 C2P-Operational Activity

Figure 16 Context Diagram of Buy electrical energy for railway


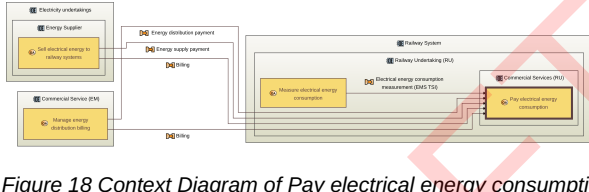

2.3-7 - Manage energy distribution billing

ID	SPMS-3981
Allocated to	<ul style="list-style-type: none">  SPMS-4072 - Commercial Service (EM)

Context Diagram	 <p>Figure 17 Context Diagram of Manage energy distribution billing</p>
Type	 C2P-Operational Activity


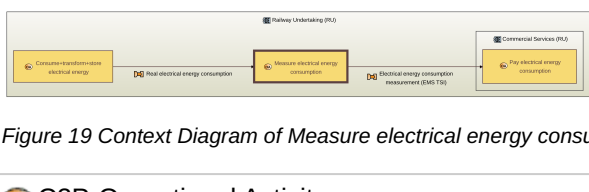

2.3-8 - Pay electrical energy consumption

Payment for electrical energy (e.g. RU/ station manager)


ID	SPMS-3982
Allocated to	<ul style="list-style-type: none">  SPMS-4050 - Commercial Services (RU)
Context Diagram	 <p>Figure 18 Context Diagram of Pay electrical energy consumption</p>
Type	 C2P-Operational Activity

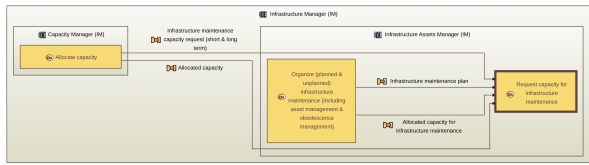

2.3-9 - Measure electrical energy consumption

Energy Measurement System (EMS) of traction energy compliant with EN50463, GM/RT2132, IEC62888 and TSI. There are undoubtedly other activities for measurement of energy in other areas of the railway network but they are not represented in the diagram because the focus is on the operational constraints (driven by pain points analysis).


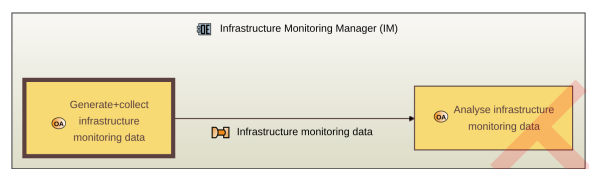

ID	SPMS-3983
Allocated to	<ul style="list-style-type: none">  SPMS-4063 - Railway Undertaking (RU)
Context Diagram	 <p>Figure 19 Context Diagram of Measure electrical energy consumption</p>
Type	 C2P-Operational Activity

2.3-10 - Request capacity for infrastructure maintenance


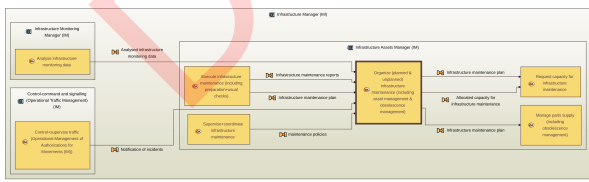

ID	SPMS-3984
Allocated to	<ul style="list-style-type: none">  SPMS-4081 - Infrastructure Assets Manager (IM)

Context Diagram	 <p>Figure 20 Context Diagram of Request capacity for infrastructure maintenance</p>
Type	 C2P-Operational Activity


2.3-11 - Generate+collect infrastructure monitoring data

ID	SPMS-3985
Allocated to	<ul style="list-style-type: none">  SPMS-4052 - Infrastructure Monitoring Manager (IM)
Context Diagram	 <p>Figure 21 Context Diagram of Generate+collect infrastructure monitoring data</p>
Type	 C2P-Operational Activity

2.3-12 - Organize (planned & unplanned) infrastructure maintenance (including asset management & obsolescence management)

ID	SPMS-3986
Allocated to	<ul style="list-style-type: none">  SPMS-4081 - Infrastructure Assets Manager (IM)
Context Diagram	 <p>Figure 22 Context Diagram of Organize (planned & unplanned) infrastructure maintenance (including asset management & obsolescence management)</p>
Type	 C2P-Operational Activity

2.3-13 - Develop infrastructure maintenance capabilities (including tools)

ID	SPMS-3987
Allocated to	<ul style="list-style-type: none">  SPMS-4081 - Infrastructure Assets Manager (IM)

Context Diagram	<p>Figure 23 Context Diagram of Develop infrastructure maintenance capabilities (including tools)</p>
Type	C2P-Operational Activity

2.3-14 - Execute infrastructure maintenance (including preparation+usual checks)

ID	SPMS-3988
Allocated to	<ul style="list-style-type: none"> SPMS-4081 - Infrastructure Assets Manager (IM)
Context Diagram	<p>Figure 24 Context Diagram of Execute infrastructure maintenance (including preparation+usual checks)</p>
Type	C2P-Operational Activity

2.3-15 - Provide certified interoperable system / constituent

ID	SPMS-3989
Allocated to	<ul style="list-style-type: none"> SPMS-4074 - Suppliers
Context Diagram	<p>Figure 25 Context Diagram of Provide certified interoperable system / constituent</p>
Type	C2P-Operational Activity

2.3-16 - Consume electrical energy

ID	SPMS-3990
Allocated to	<ul style="list-style-type: none"> SPMS-4068 - Traffic Management (IM)
Context Diagram	<p>Figure 26 Context Diagram of Consume electrical energy</p>

Type	C2P-Operational Activity
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2.3-17 - Define electrical energy commercialization and supply strategy

Supply strategy defines how the required quantity of energy to supply and will be procured in order to reduce the overall cost per energy unit (or other commercial criteria)

ID	SPMS-3991
Allocated to	<ul style="list-style-type: none"> SPMS-4065 - Energy Supplier
Context Diagram	<p>Figure 27 Context Diagram of Define electrical energy commercialization and supply strategy</p>
Type	C2P-Operational Activity

2.3-18 - Define electrical energy technical strategy

Technical strategy defines the quantity of energy required and how it shall be distributed across the railway energy infrastructure according to the transport offer.


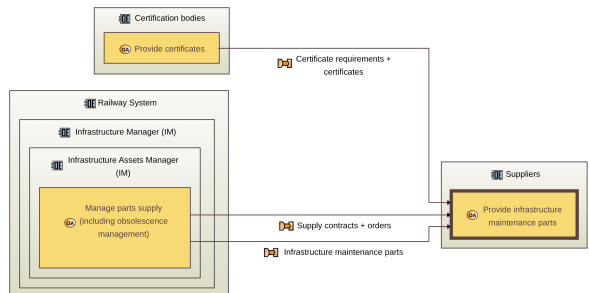

ID	SPMS-3992
Allocated to	<ul style="list-style-type: none"> SPMS-4072 - Commercial Service (EM)
Context Diagram	<p>Figure 28 Context Diagram of Define electrical energy technical strategy</p>
Type	C2P-Operational Activity

2.3-19 - Manage parts supply (including obsolescence management)

ID	SPMS-3993
Allocated to	<ul style="list-style-type: none"> SPMS-4081 - Infrastructure Assets Manager (IM)
Context Diagram	<p>Figure 29 Context Diagram of Manage parts supply (including obsolescence management)</p>


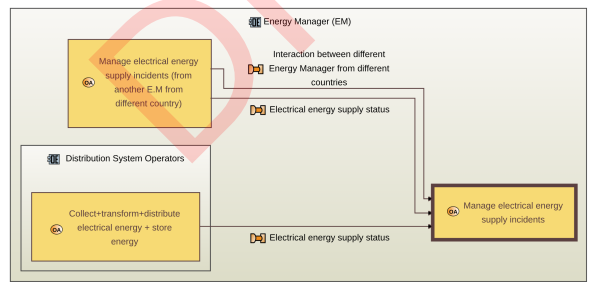

Type	 C2P-Operational Activity
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2.3-20 - Provide infrastructure maintenance parts

ID	SPMS-3994
Allocated to	<ul style="list-style-type: none">  SPMS-4074 - Suppliers
Context Diagram	 <p>The diagram shows the 'Provide infrastructure maintenance parts' activity within the 'Suppliers' context. It interacts with the 'Railway System' context, specifically the 'Infrastructure Assets Manager (IM)' and 'Infrastructure Manager (IM)'. The 'IM' provides 'Certificate requirements + certificates' to the 'Suppliers', who then provide 'Infrastructure maintenance parts' back to the 'IM'. The 'IM' also manages 'Supply contracts + orders' and 'Infrastructure maintenance parts'.</p> <p>Figure 30 Context Diagram of Provide infrastructure maintenance parts</p>
Type	 C2P-Operational Activity


2.3-21 - Manage electrical energy supply incidents

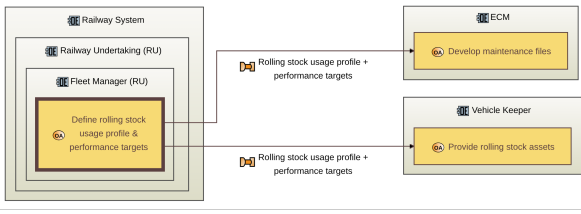
Management of the technical and operational aspects of incidents in energy system: Identifies incidents and applies the appropriate protocols in accordance to Operational or Safety policy if necessary.

ID	SPMS-3995
Allocated to	<ul style="list-style-type: none">  SPMS-4077 - Energy Manager (EM)
Context Diagram	 <p>The diagram shows the 'Manage electrical energy supply incidents' activity within the 'Energy Manager (EM)' context. It interacts with 'Distribution System Operators' and 'Energy Manager (EM)'. The 'Distribution System Operators' provide 'Electrical energy supply status' to the 'EM', which then manages 'Electrical energy supply incidents'. The 'EM' also interacts with 'Energy Manager from different countries' for 'Interaction between different Energy Manager from different countries'.</p> <p>Figure 31 Context Diagram of Manage electrical energy supply incidents</p>
Type	 C2P-Operational Activity

2.3-22 - Define rolling stock usage profile & performance targets

The definition of the rolling stock usage profile is under the responsibility of the keeper. Safety risks on performance targets have to be defined depending on the usage in operation conditions (e.g. high speed passenger unit has a user profile, than a freight train dangerous good tank wagon).

ID	SPMS-3996
Allocated to	<ul style="list-style-type: none">  SPMS-4080 - Fleet Manager (RU)

Context Diagram	 <p><i>Figure 32 Context Diagram of Define rolling stock usage profile & performance targets</i></p>
Type	C2P-Operational Activity

2.3-23 - Define certification requirements

ROLLING STOCK: The certification requirements are defined in Annex 2 of Directive (EU) 2016/798 and Commission Implementing Regulation (EU) No 2019/779 on a system of certification of entities in charge of maintenance for vehicles.

INFRA:

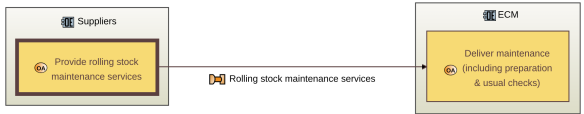

- EN 14969:2006 (Railway applications - Track - Qualification system for railway trackwork contractors): This European Standard specifies the definitions, procedures, criteria and their assessment as well as the respective documentation related to a qualification system of trackwork contractors, which relates to the Directive 2004/17/EC). This qualification system identifies trackwork contractors that can be invited for tendering trackwork contracts. Evaluation of the contractors applying for parts of the contract, which are not trackwork, is not covered by this standard. This European Standard may also be used for a qualification system of trackwork contractors applying for contracts with a value below the minimum limit as defined in the Directive 2004/17/EC.
- ISO 22163:2023 (Quality management in the railway sector)

ID	SPMS-3997
Allocated to	<ul style="list-style-type: none"> • SPMS-4057 - European and National Safety Authorities
Context Diagram	 <p><i>Figure 33 Context Diagram of Define certification requirements</i></p>
Type	C2P-Operational Activity

2.3-24 - Provide rolling stock maintenance services


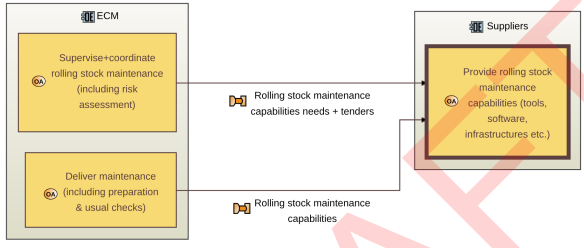

The rolling stock maintenance services are defined in Annex 2, paragraph IV of Directive (EU) 2016/798 and Commission Implementing Regulation (EU) No 2019/779 on a system of certification of entities in charge of maintenance for vehicles.

ID	SPMS-3998
Allocated to	<ul style="list-style-type: none"> • SPMS-4074 - Suppliers

Context Diagram	 <p>Figure 34 Context Diagram of Provide rolling stock maintenance services</p>
Type	 C2P-Operational Activity


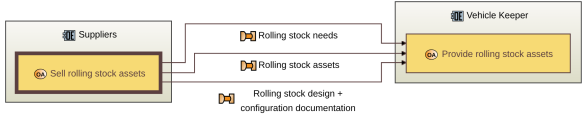

2.3-25 - Provide rolling stock maintenance capabilities (tools, software, infrastructures etc.)

The rolling stock maintenance capabilities are defined in Annex 2, paragraph II.3 of Directive (EU) 2016/798 and Commission Implementing Regulation (EU) No 2019/779 on a system of certification of entities in charge of maintenance for vehicles.

ID	SPMS-3999
Allocated to	<ul style="list-style-type: none">  SPMS-4074 - Suppliers
Context Diagram	 <p>Figure 35 Context Diagram of Provide rolling stock maintenance capabilities (tools, software, infrastructures etc.)</p>
Type	 C2P-Operational Activity

2.3-26 - Sell rolling stock assets


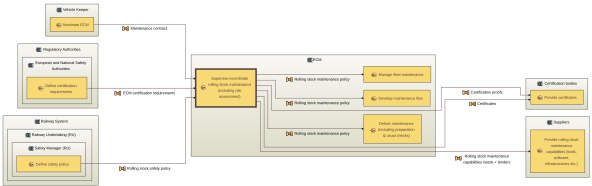

The rolling stock assets procurement are managed by contract between the owner and the supplier.

ID	SPMS-4000
Allocated to	<ul style="list-style-type: none">  SPMS-4074 - Suppliers
Context Diagram	 <p>Figure 36 Context Diagram of Sell rolling stock assets</p>
Type	 C2P-Operational Activity

2.3-27 - Supervise+coordinate rolling stock maintenance (including risk assessment)

As per Directive (EU) 2016/798 - article 14.3 (a)

ID	SPMS-4001
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Allocated to	•  SPMS-4085 - ECM
Context Diagram	 <p><i>Figure 37 Context Diagram of Supervise+coordinate rolling stock maintenance (including risk assessment)</i></p>
Type	 C2P-Operational Activity

2.3-28 - Develop maintenance files

As per Directive (EU) 2016/798 - article 14.3 (b)

Can be subcontracted

ID	SPMS-4002
Allocated to	<ul style="list-style-type: none"> SPMS-4085 - ECM
Context Diagram	<p>Figure 38 Context Diagram of Develop maintenance files</p>
Type	C2P-Operational Activity

2.3-29 - Manage fleet maintenance

As per Directive (EU) 2016/798 - article 14.3 (c)

Can be subcontracted

[illegible]

2.3-30 - Deliver maintenance (including preparation & usual checks)

As per Directive (EU) 2016/798 - article 14.3 (d)

Can be subcontracted

ID	SPMS-4004
Allocated to	<ul style="list-style-type: none"> SPMS-4085 - ECM
Context Diagram	<p>Figure 40 Context Diagram of Deliver maintenance (including preparation & usual checks)</p>
Type	C2P-Operational Activity

2.3-31 - Request an infrastructure certification

ID	SPMS-4005
Allocated to	<ul style="list-style-type: none"> SPMS-4081 - Infrastructure Assets Manager (IM)
Context Diagram	<p>Figure 41 Context Diagram of Request an infrastructure certification</p>
Type	C2P-Operational Activity

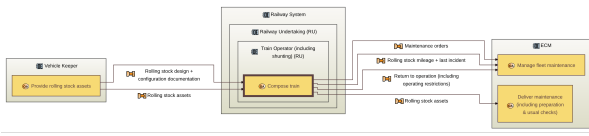
2.3-32 - Nominate ECM

After a vehicle is placed in service, an Entity in Charge of its Maintenance has to be designated and to be identified in the National Vehicle Register.

ID	SPMS-4006
Allocated to	<ul style="list-style-type: none"> SPMS-4076 - Vehicle Keeper
Context Diagram	<p>Figure 42 Context Diagram of Nominate ECM</p>
Type	C2P-Operational Activity

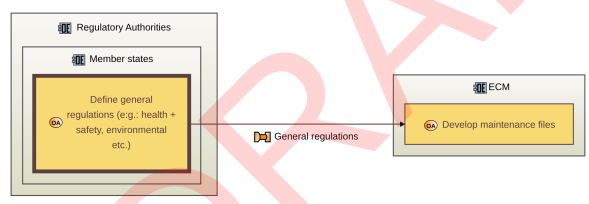
2.3-33 - Compose train

This activity is part of the capability "Operate train" by the interaction "Return to operation"

ID	SPMS-4007
Allocated to	<ul style="list-style-type: none"> SPMS-4084 - Train Operator (including shunting) (RU)
Context Diagram	 <p>The diagram shows the 'Compose train' activity within the 'Train Operator (including shunting) (RU)' context. It interacts with several external contexts: 'Vehicle keeper' (providing shunting stock assets), 'Railway system' (providing shunting stock design + configuration documentation and shunting stock assets), 'Maintenance orders' (providing shunting stock design + shunting stock assets), 'ECM' (storing shunting stock assets), and 'Person in operation (including shunting operations)' (providing shunting stock assets). The activity itself is labeled 'Compose train'.</p> <p>Figure 43 Context Diagram of Compose train</p>
Type	C2P-Operational Activity


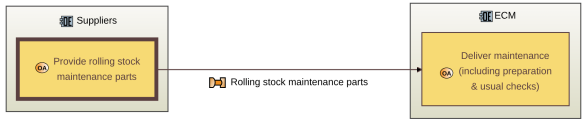

2.3-34 - Define general regulations (e.g.: health + safety, environmental etc.)

Besides Directive (EU) 2016/798 and Commission Implementing Regulation (EU) No 2019/779 on a system of certification of entities in charge of maintenance for vehicles, ECM must fulfil different European and National regulations about health + safety, environmental etc.

ID	SPMS-4008
Allocated to	<ul style="list-style-type: none"> SPMS-4053 - Member states
Context Diagram	 <p>The diagram shows the 'Define general regulations (e.g.: health + safety, environmental etc.)' activity within the 'Member states' context. It interacts with 'Regulatory Authorities' (providing general regulations) and 'ECM' (developing maintenance files). The activity itself is labeled 'Define general regulations (e.g.: health + safety, environmental etc.)'.</p> <p>Figure 44 Context Diagram of Define general regulations (e.g.: health + safety, environmental etc.)</p>
Type	C2P-Operational Activity

2.3-35 - Provide rolling stock maintenance parts

The management of the rolling stock maintenance parts is defined in Annex 2, paragraph IV.2 of Directive (EU) 2016/798 and Commission Implementing Regulation (EU) No 2019/779 on a system of certification of entities in charge of maintenance for vehicles.


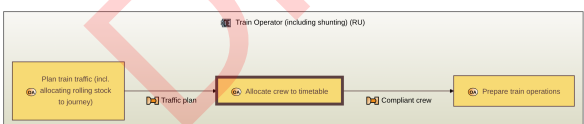

ID	SPMS-4009
Allocated to	<ul style="list-style-type: none"> •  SPMS-4074 - Suppliers
Context Diagram	 <p>The diagram shows a box labeled 'Suppliers' containing a yellow box 'Provide rolling stock maintenance parts'. An arrow labeled 'Rolling stock maintenance parts' points from this box to a box labeled 'ECM' containing a yellow box 'Deliver maintenance (including preparation & usual checks)'.</p> <p><i>Figure 45 Context Diagram of Provide rolling stock maintenance parts</i></p>
Type	 C2P-Operational Activity

2.3-36 - Allocate crew to timetable


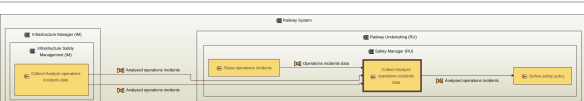

Involves checking crew compliance which includes checking the skills, route and rolling stock knowledge, medical.

E.g. for a driver:

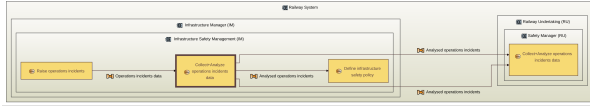
- rolling stock knowledge
- rule knowledge
- route knowledge
- physical and psychological fitness
- rest time fulfillment

ID	SPMS-4010
Allocated to	<ul style="list-style-type: none"> •  SPMS-4084 - Train Operator (including shunting) (RU)
Context Diagram	 <p>The diagram shows a box labeled 'Train Operator (including shunting) (RU)' containing a sequence of yellow boxes: 'Plan train traffic (incl. allocating rolling stock to journey)', 'Allocate crew to timetable', and 'Prepare train operations'. Arrows connect these boxes in sequence. The first arrow is labeled 'Traffic plan' and the second is labeled 'Compliant crew'.</p> <p><i>Figure 46 Context Diagram of Allocate crew to timetable</i></p>
Type	 C2P-Operational Activity

2.3-37 - Collect+Analyze operations incidents data

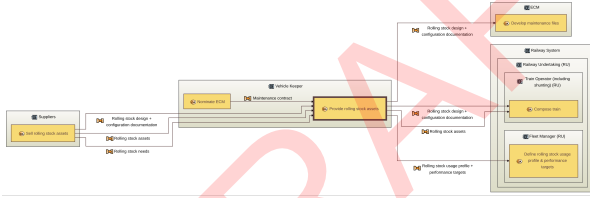
ID	SPMS-4011
Allocated to	<ul style="list-style-type: none"> •  SPMS-4078 - Safety Manager (RU)
Context Diagram	 <p>The diagram shows a box labeled 'Safety Manager (RU)' containing a complex flow of yellow boxes. It includes 'Collect+Analyze operations incidents data', 'Operations incidents data', 'Safety Manager (RU)', 'Collect+Analyze operations incidents data', 'Operations incidents data', and 'Safety Manager (RU)'. Arrows connect these boxes in a complex flow.</p> <p><i>Figure 47 Context Diagram of Collect+Analyze operations incidents data</i></p>
Type	 C2P-Operational Activity

2.3-38 - Collect+Analyze operations incidents data

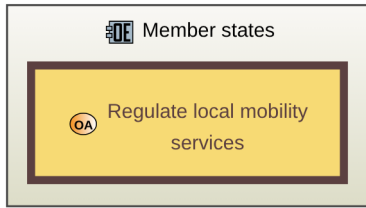
ID	SPMS-4012
Allocated to	<ul style="list-style-type: none"> SPMS-4067 - Infrastructure Safety Management (IM)
Context Diagram	 <p>Figure 48 Context Diagram of Collect+Analyze operations incidents data</p>
Type	C2P-Operational Activity

2.3-39 - Provide rolling stock assets

The fleet management is defined in Annex 2, paragraph III of Directive (EU) 2016/798 and Commission Implementing Regulation (EU) No 2019/779 on a system of certification of entities in charge of maintenance for vehicles.

ID	SPMS-4013
Allocated to	<ul style="list-style-type: none"> SPMS-4076 - Vehicle Keeper
Context Diagram	 <p>Figure 49 Context Diagram of Provide rolling stock assets</p>
Type	C2P-Operational Activity

2.3-40 - Regulate local mobility services

ID	SPMS-4014
Allocated to	<ul style="list-style-type: none"> SPMS-4053 - Member states
Context Diagram	 <p>Figure 50 Context Diagram of Regulate local mobility services</p>
Type	C2P-Operational Activity


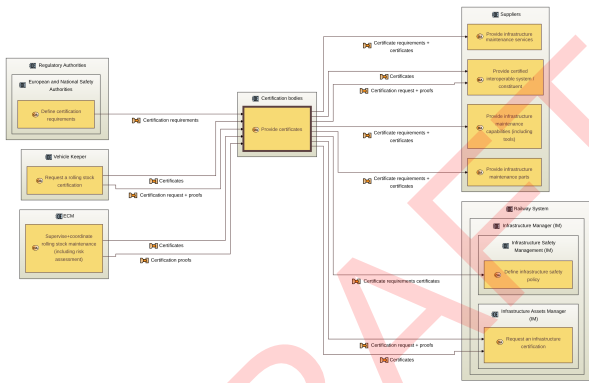

2.3-41 - Provide certificates

ROLLING STOCK: The certification system is defined in article 3 of Directive (EU) 2016/798 and

Commission Implementing Regulation (EU) No 2019/779 on a system of certification of entities in charge of maintenance for vehicles.


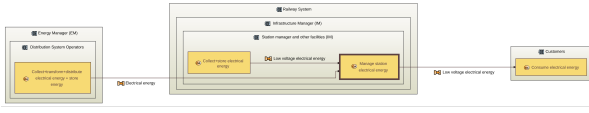

INFRA:

- EN 14969:2006 (Railway applications - Track - Qualification system for railway trackwork contractors): This European Standard specifies the definitions, procedures, criteria and their assessment as well as the respective documentation related to a qualification system of trackwork contractors, which relates to the Directive 2004/17/EC). This qualification system identifies trackwork contractors that can be invited for tendering trackwork contracts. Evaluation of the contractors applying for parts of the contract, which are not trackwork, is not covered by this standard. This European Standard may also be used for a qualification system of trackwork contractors applying for contracts with a value below the minimum limit as defined in the Directive 2004/17/EC.
- ISO 22163:2023 (Quality management in the railway sector)

ID	SPMS-4015
Allocated to	<ul style="list-style-type: none"> •  SPMS-4061 - Certification bodies
Context Diagram	 <p>Figure 51 Context Diagram of Provide certificates</p>
Type	 C2P-Operational Activity

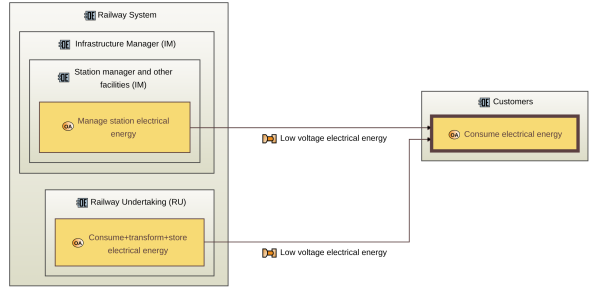
2.3-42 - Manage station electrical energy

This activity aims to propose and lead methodologies and processes to reduce energy consumption in a Station.

ID	SPMS-4016
Allocated to	<ul style="list-style-type: none"> •  SPMS-4091 - Station manager and other facilities (IM)
Context Diagram	 <p>Figure 52 Context Diagram of Manage station electrical energy</p>
Type	 C2P-Operational Activity


2.3-43 - Consume electrical energy

ID	SPMS-4017
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Allocated to	<ul style="list-style-type: none"> SPMS-4056 - Customers
Context Diagram	 <p>The diagram shows the 'Railway System' boundary containing 'Infrastructure Manager (IM)', 'Station manager and other facilities (SM)', and 'Railway Undertaking (RU)'. Inside IM is 'Manage station electrical energy'. Inside RU is 'Consume+transform+store electrical energy'. Outside the boundary is 'Customers' with 'Consume electrical energy'. Two 'Low voltage electrical energy' flows connect the station and RU components to the Customers component.</p> <p><i>Figure 53 Context Diagram of Consume electrical energy</i></p>
Type	C2P-Operational Activity

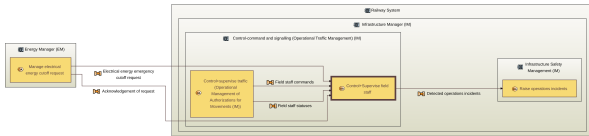
2.3-44 - Compose train

Make sure each vehicle composing the train is compliant for the intended service and that the consist is compliant. Define braking performance of the consist and possible running restrictions.

ID	SPMS-4018
Allocated to	<ul style="list-style-type: none"> SPMS-4084 - Train Operator (including shunting) (RU)
Context Diagram	 <p>The diagram shows the 'Railway System' boundary with 'Infrastructure Manager (IM)' and 'Railway Undertaking (RU)'. Inside IM are 'Train Management System (TMS)' and 'Train Control System (TCS)'. Inside RU are 'Train Operator (TO)' and 'Train Control System (TCS)'. Outside the boundary is 'Train Operator (TO)' with 'Train Control System (TCS)'. The diagram shows the flow of information between these components.</p> <p><i>Figure 54 Context Diagram of Compose train</i></p>
Type	C2P-Operational Activity




2.3-45 - Control+Supervise field staff

Closing the tracks under request from maintenance crew and reopening them after maintenance crew authorization.

ID	SPMS-4019
Allocated to	<ul style="list-style-type: none"> SPMS-4060 - Control-command and signalling (Operational Traffic Management) (IM)
Context Diagram	 <p>The diagram shows the 'Railway System' boundary with 'Infrastructure Manager (IM)' and 'Railway Undertaking (RU)'. Inside IM are 'Control-command and signalling (Operational Traffic Management) (IM)' and 'Infrastructure Safety Management (ISM)'. Inside RU are 'Control-command and signalling (Operational Traffic Management) (RU)' and 'Infrastructure Safety Management (ISM)'. Outside the boundary is 'Control-command and signalling (Operational Traffic Management) (IM)' with 'Infrastructure Safety Management (ISM)'. The diagram shows the flow of information between these components.</p> <p><i>Figure 55 Context Diagram of Control+Supervise field staff</i></p>
Type	C2P-Operational Activity


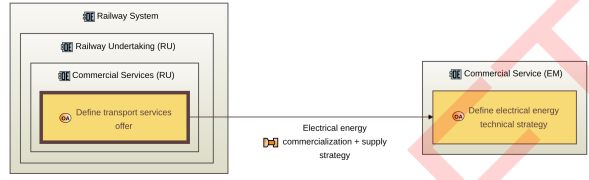

2.3-46 - Allocate capacity

ID	SPMS-4020
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Allocated to	<ul style="list-style-type: none"> •  SPMS-4090 - Capacity Manager (IM)
Context Diagram	 <p>Figure 56 Context Diagram of Allocate capacity</p>
Type	 C2P-Operational Activity


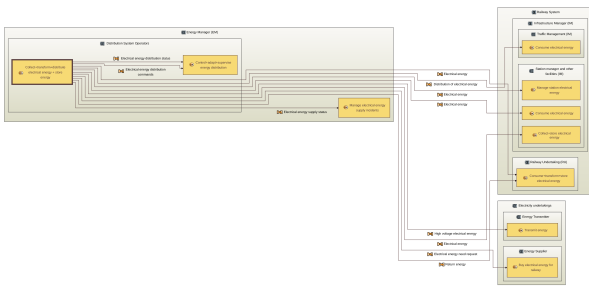

2.3-47 - Define transport services offer

Defines the the RU foreseen traffic and equipment. May notably influence the Energy Manager's technical strategy if the RU fleet has an impact on energy consumption.

ID	SPMS-4021
Allocated to	<ul style="list-style-type: none"> •  SPMS-4050 - Commercial Services (RU)
Context Diagram	 <p>Figure 57 Context Diagram of Define transport services offer</p>
Type	 C2P-Operational Activity

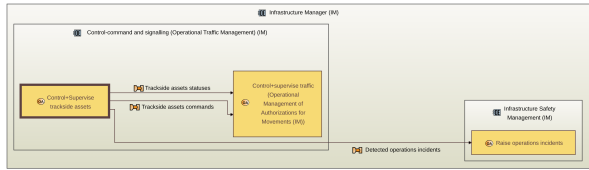
2.3-48 - Collect+transform+distribute electrical energy + store energy

Collect, transform and distribute electrical energy from distribution system to substations and contact line according to the distribution commands. This activity also receives return current due to regenerative braking and local energy collection from entities within the railway network. This activity is also responsible for providing a status of electrical distribution network.

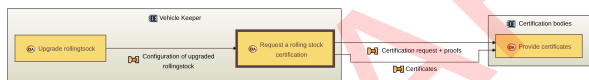
ID	SPMS-4022
Allocated to	<ul style="list-style-type: none"> •  SPMS-4083 - Distribution System Operators
Context Diagram	 <p>Figure 58 Context Diagram of Collect+transform+distribute electrical energy + store energy</p>
Type	 C2P-Operational Activity

2.3-49 - Control+Supervise trackside assets

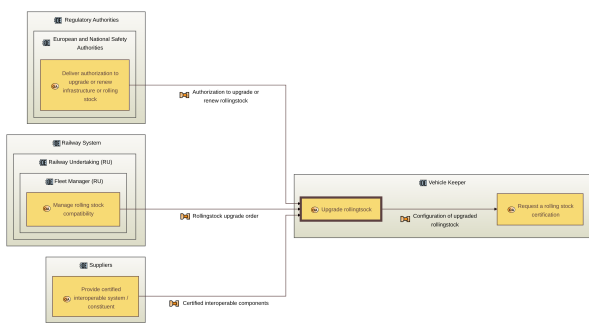
The trackside assets are mainly composed on switches and signals

ID	SPMS-4023
Allocated to	<ul style="list-style-type: none"> SPMS-4060 - Control-command and signalling (Operational Traffic Management) (IM)
Context Diagram	 <p>The diagram shows the 'Control-command and signalling (Operational Traffic Management) (IM)' system. It includes components like 'Control+supervise trackside assets', 'Trackside assets databases', 'Trackside assets commands', 'Control+supervise traffic (Operational Management of Authorizations for Movements) (MO)', and 'Infrastructure Safety Management (IS)'. Data flows include 'Trackside assets databases', 'Trackside assets commands', 'Detected operators incidents', and 'False operations incidents'.</p> <p>Figure 59 Context Diagram of Control+Supervise trackside assets</p>
Type	C2P-Operational Activity

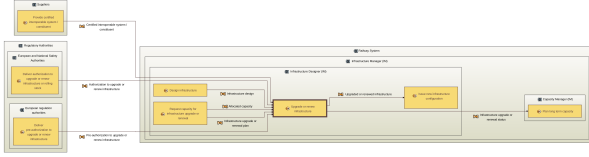
2.3-50 - Request a rolling stock certification

ID	SPMS-4024
Allocated to	<ul style="list-style-type: none"> SPMS-4076 - Vehicle Keeper
Context Diagram	 <p>The diagram shows the 'Vehicle Keeper' system. It includes components like 'Upgrade rollingstock', 'Configuration of upgraded rollingstock', 'Request a rolling stock certification', 'Certification request inputs', 'Certification bodies', and 'Provide certificates'. Data flows include 'Configuration of upgraded rollingstock', 'Certification request inputs', and 'Certificates'.</p> <p>Figure 60 Context Diagram of Request a rolling stock certification</p>
Type	C2P-Operational Activity

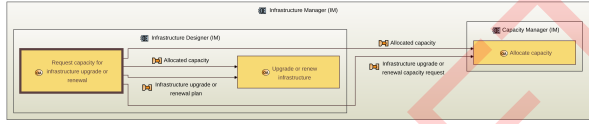
2.3-51 - Upgrade rollingstock

ID	SPMS-4025
Allocated to	<ul style="list-style-type: none"> SPMS-4076 - Vehicle Keeper
Context Diagram	 <p>The diagram shows the 'Vehicle Keeper' system and its interactions with external systems. It includes components like 'Regulatory Authorities', 'European and National Safety Authorities', 'Railway System', 'Train Manager (TM)', 'Suppliers', and 'Vehicle Keeper'. Data flows include 'Deliver authorizations to upgrade or renew infrastructure or rolling stock', 'Authorization to upgrade or renew rollingstock', 'Rollingstock upgrade order', 'Provide certified interoperable system / components', and 'Certified interoperable components'.</p> <p>Figure 61 Context Diagram of Upgrade rollingstock</p>
Type	C2P-Operational Activity

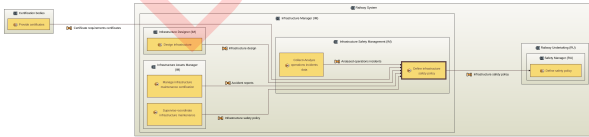
2.3-52 - Upgrade or renew infrastructure

ID	SPMS-4026
Allocated to	<ul style="list-style-type: none"> SPMS-4086 - Infrastructure Designer (IM)
Context Diagram	 <p>Figure 62 Context Diagram of Upgrade or renew infrastructure</p>
Type	C2P-Operational Activity

2.3-53 - Request capacity for infrastructure upgrade or renewal

ID	SPMS-4027
Allocated to	<ul style="list-style-type: none"> SPMS-4086 - Infrastructure Designer (IM)
Context Diagram	 <p>Figure 63 Context Diagram of Request capacity for infrastructure upgrade or renewal</p>
Type	C2P-Operational Activity

2.3-54 - Define infrastructure safety policy

ID	SPMS-4028
Allocated to	<ul style="list-style-type: none"> SPMS-4067 - Infrastructure Safety Management (IM)
Context Diagram	 <p>Figure 64 Context Diagram of Define infrastructure safety policy</p>
Type	C2P-Operational Activity

2.3-55 - Dispatch train (incl. shunting)

Train dispatch: The indication to the person driving the train that all station or depot activities are completed and that, as far as the staff responsible are concerned, movement authority has been granted for the train.

COMMISSION IMPLEMENTING REGULATION (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU – Appendix J

[illegible]

2.3-56 - Manage deviations (including Staff & fleet management)

Directive 2012/34/EU:

1. Traffic management during normal operating conditions involving the management of incidents resulting in limited deviations from the working timetable ;
2. Disruption management to address significant disturbances to network operations requiring concerted action;
3. Traffic management during crisis situations.

These three aspects are mainly done by the IM-TMS.


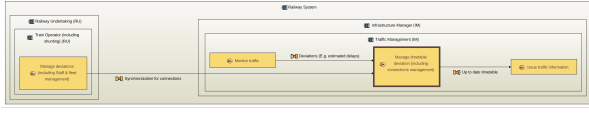

ID	SPMS-4030
Allocated to	<ul style="list-style-type: none"> SPMS-4084 - Train Operator (including shunting) (RU)
Context Diagram	<p>Figure 66 Context Diagram of Manage deviations (including Staff & fleet management)</p>
Type	C2P-Operational Activity

2.3-57 - Manage timetable deviation (including connections management)

Decides operational variations from planned timetable and train succession order and priorities. These variations can be changing the order of trains on a line or the order of trains entering a junction. They may be decided after concertation with RUs : rerouting, adding or removing a train stop, shortening the train route...


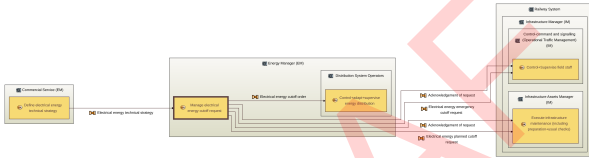

This activity is realized by the following function defined through the functional architecture of SPT3:

- Manage incident impact
- Store scenario
- Buy/modify Scenario
- Apply user choices
- Solve conflicts semi automatically
- Solve conflicts automatically
- Calculate connections
- Display configuration data

ID	SPMS-4031
Allocated to	<ul style="list-style-type: none"> •  SPMS-4068 - Traffic Management (IM)
Context Diagram	 <p>Figure 67 Context Diagram of Manage timetable deviation (including connections management)</p>
Type	 C2P-Operational Activity

2.3-58 - Manage electrical energy cutoff request

Management of the technical and operational aspects of energy cut-off: Converts the cutoff requests into cutoff orders - this may sometimes require an interpretation of the request by the Energy manager or is directly transmitted.


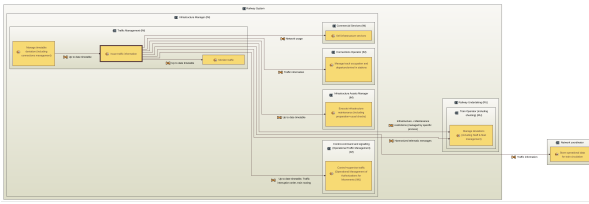

ID	SPMS-4032
Allocated to	<ul style="list-style-type: none"> •  SPMS-4077 - Energy Manager (EM)
Context Diagram	 <p>Figure 68 Context Diagram of Manage electrical energy cutoff request</p>
Type	 C2P-Operational Activity

2.3-59 - Issue traffic information

Record & Share the traffic management information & decisions.

This activity is realized by the following function defined through the functional architecture of SPT3:


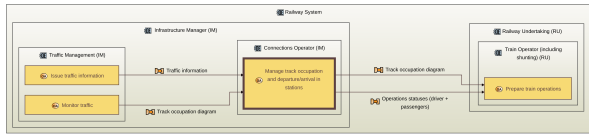

- Process events and decisions
- Publish real-time operational plan

ID	SPMS-4033
Allocated to	<ul style="list-style-type: none"> •  SPMS-4068 - Traffic Management (IM)
Context Diagram	 <p>Figure 69 Context Diagram of Issue traffic information</p>
Type	 C2P-Operational Activity


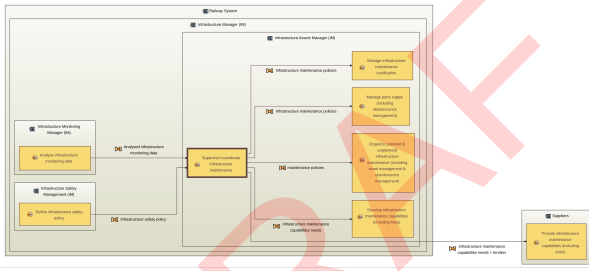

2.3-60 - Manage track occupation and departure/arrival in stations

Real time modifications of the track occupation diagram and of the timetable in the station in case of a


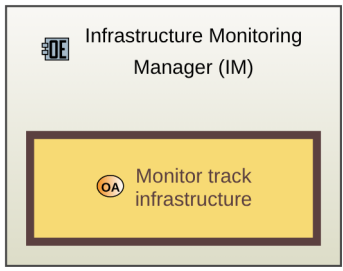

delay.

ID	SPMS-4034
Allocated to	<ul style="list-style-type: none"> •  SPMS-4058 - Connections Operator (IM)
Context Diagram	 <p>Figure 70 Context Diagram of Manage track occupation and departure/arrival in stations</p>
Type	 C2P-Operational Activity

2.3-61 - Supervise+coordinate infrastructure maintenance


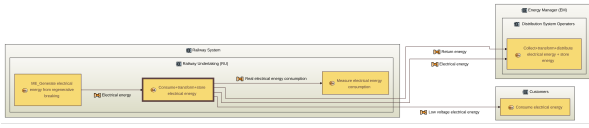

ID	SPMS-4035
Allocated to	<ul style="list-style-type: none"> •  SPMS-4081 - Infrastructure Assets Manager (IM)
Context Diagram	 <p>Figure 71 Context Diagram of Supervise+coordinate infrastructure maintenance</p>
Type	 C2P-Operational Activity

2.3-62 - Monitor track infrastructure




ID	SPMS-4036
Allocated to	<ul style="list-style-type: none"> •  SPMS-4052 - Infrastructure Monitoring Manager (IM)
Context Diagram	 <p>Figure 72 Context Diagram of Monitor track infrastructure</p>
Type	 C2P-Operational Activity

2.3-63 - Consume+transform+store electrical energy

Refers to all activities performed by the train relative to electrical energy management. ESS (Energy Storage Systems) could be batteries, ultracaps, ...

ID	SPMS-4037
Allocated to	<ul style="list-style-type: none"> •  SPMS-4063 - Railway Undertaking (RU)
Context Diagram	 <p>Figure 73 Context Diagram of Consume+transform+store electrical energy</p>
Type	 C2P-Operational Activity

2.3-64 - Control+adapt+supervise energy distribution

ID	SPMS-4038
Allocated to	<ul style="list-style-type: none"> •  SPMS-4083 - Distribution System Operators
Context Diagram	 <p>Figure 74 Context Diagram of Control+adapt+supervise energy distribution</p>
Type	 C2P-Operational Activity


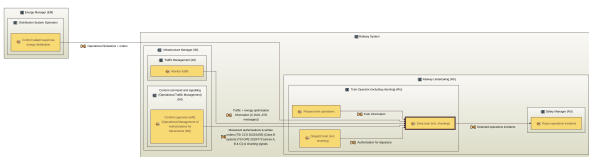
2.3-65 - Drive train (incl. shunting)

Refers to all actions the driver performs during the operation of a train.

"Train driver" means a person capable and authorized to drive trains, including locomotives, shunting locomotives, work trains, maintenance railway vehicles or trains for the carriage of passengers or goods by rail in an autonomous, responsible and safe manner.'

DIRECTIVE 2007/59/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2007 on the certification of train drivers operating locomotives and trains on the railway system in the Community – Article 3 (b)


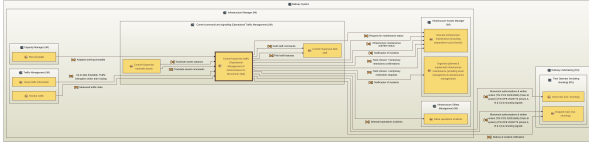

Could be implemented through DAS, ATO for GoA 0, 1 & 2 (TSI CCS)

ID	SPMS-4039
Allocated to	<ul style="list-style-type: none"> •  SPMS-4084 - Train Operator (including shunting) (RU)
Context Diagram	 <p>Figure 75 Context Diagram of Drive train (incl. shunting)</p>


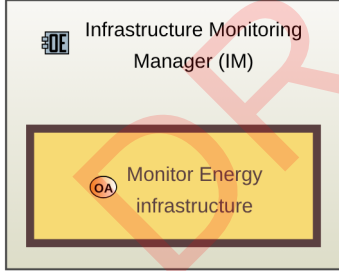

Type	 C2P-Operational Activity
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2.3-66 - Control+supervise traffic (Operational Management of Authorizations for Movements (IM))


Issues movement permission, controls switches and signals

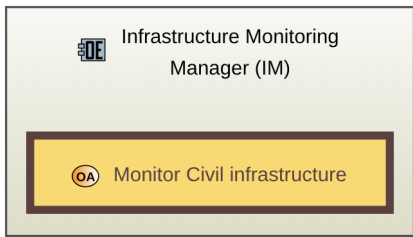

ID	SPMS-4040
Allocated to	<ul style="list-style-type: none">  SPMS-4060 - Control-command and signalling (Operational Traffic Management) (IM)
Context Diagram	 <p>Figure 76 Context Diagram of Control+supervise traffic (Operational Management of Authorizations for Movements (IM))</p>
Type	 C2P-Operational Activity

2.3-67 - Monitor Energy infrastructure

ID	SPMS-4041
Allocated to	<ul style="list-style-type: none">  SPMS-4052 - Infrastructure Monitoring Manager (IM)
Context Diagram	 <p>Figure 77 Context Diagram of Monitor Energy infrastructure</p>
Type	 C2P-Operational Activity

2.3-68 - Monitor Civil infrastructure

ID	SPMS-4042
Allocated to	<ul style="list-style-type: none">  SPMS-4052 - Infrastructure Monitoring Manager (IM)

Context Diagram	 <p>The diagram shows a large box labeled 'Infrastructure Monitoring Manager (IM)' containing a smaller box labeled 'Monitor Civil infrastructure'.</p> <p>Figure 78 Context Diagram of Monitor Civil infrastructure</p>
Type	 C2P-Operational Activity

2.3-69 - Monitor traffic


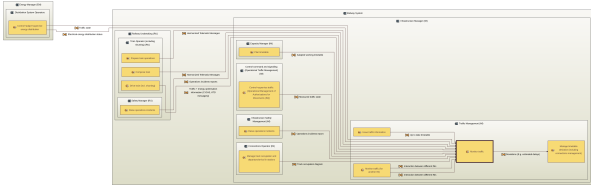

This activity involves following the trains and interpreting the information from the Control, command and signalling (Operational Traffic Management). It is responsible for identifying deviations from the theoretical timetable.

'The monitoring of railway traffic involves systematically keeping track of (or supervising) and collecting information concerning parameters such as: train location, train speed, train direction. It uses graphical systems. The main graphic screens of these systems show two kinds of diagrams: train tracks and train schedules. Train track diagrams indicate the schematic layout of railway tracks, signals, stations, and so on. They indicate the current position of trains, the condition of signals, the position of switches, and so on, using simplified drawings of actual railway tracks and signals. To notify operators of this information, the color of tracks and signals are displayed, and a train's number is displayed in text that dynamically changes according to supervisory data. Train schedule diagrams consist of lines which correspond to the movements of trains, train numbers for each train line, and horizontal and vertical lines can be inverted to show the positions of stations. They are presented as charts that illustrate train movements in actual time depicted along a horizontal axis.'

NetEurope – Glossary of Terms Related to Network Statements – Ninth edition, 2017

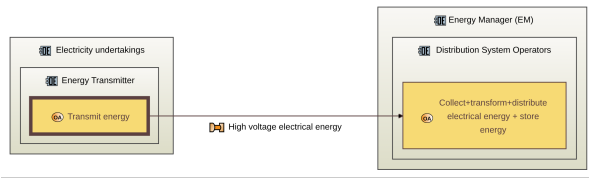
This activity is realized by the following function defined through the functional architecture of SPT3:

- Detect deviation
- Evaluate trains forecast
- Detects conflicts

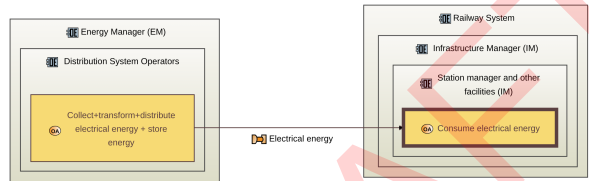
ID	SPMS-4043
Allocated to	<ul style="list-style-type: none"> •  SPMS-4068 - Traffic Management (IM)
Context Diagram	 <p>The diagram shows a complex system architecture with multiple components and their interactions.</p> <p>Figure 79 Context Diagram of Monitor traffic</p>
Type	 C2P-Operational Activity

2.3-70 - Transmit energy

The transport of electricity on the extra high-voltage and high-voltage interconnected system with a view to its delivery to final customers or to distributors, but does not include supply

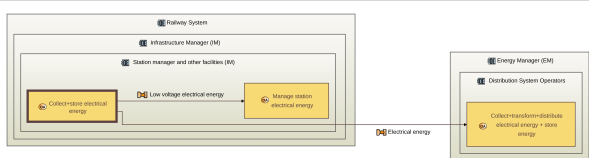
ID	SPMS-4044
Allocated to	<ul style="list-style-type: none"> SPMS-4062 - Energy Transmitter
Context Diagram	 <p>The diagram shows two main components. On the left, a box labeled 'Electricity undertakings' contains an 'Energy Transmitter' box, which in turn contains a 'Transmit energy' box. On the right, a box labeled 'Energy Manager (EM)' contains 'Distribution System Operators' and a 'Collect+transform+distribute electrical energy + store energy' box. A horizontal arrow labeled 'High voltage electrical energy' connects the 'Transmit energy' box to the 'Collect+transform+distribute electrical energy + store energy' box.</p> <p>Figure 80 Context Diagram of Transmit energy</p>
Type	C2P-Operational Activity

2.3-71 - Consume electrical energy

ID	SPMS-4045
Allocated to	<ul style="list-style-type: none"> SPMS-4091 - Station manager and other facilities (IM)
Context Diagram	 <p>The diagram shows two main components. On the left, a box labeled 'Energy Manager (EM)' contains 'Distribution System Operators' and a 'Collect+transform+distribute electrical energy + store energy' box. On the right, a box labeled 'Railway System' contains an 'Infrastructure Manager (IM)' box, which in turn contains a 'Station manager and other facilities (IM)' box, which finally contains a 'Consume electrical energy' box. A horizontal arrow labeled 'Electrical energy' connects the 'Collect+transform+distribute electrical energy + store energy' box to the 'Consume electrical energy' box.</p> <p>Figure 81 Context Diagram of Consume electrical energy</p>
Type	C2P-Operational Activity

2.3-72 - Collect+store electrical energy


Refers to collecting and storing energy obtained through photovoltaic means (or other energy collection methods) to reduce overall station consumption.

ID	SPMS-4046
Allocated to	<ul style="list-style-type: none"> SPMS-4091 - Station manager and other facilities (IM)
Context Diagram	 <p>The diagram shows two main components. On the left, a box labeled 'Railway System' contains an 'Infrastructure Manager (IM)' box, which in turn contains a 'Station manager and other facilities (IM)' box. Inside this box, there are two sub-boxes: 'Collect+store electrical energy' and 'Manage station electrical energy'. A horizontal arrow labeled 'Low voltage electrical energy' connects the 'Collect+store electrical energy' box to the 'Manage station electrical energy' box. On the right, a box labeled 'Energy Manager (EM)' contains 'Distribution System Operators' and a 'Collect+transform+distribute electrical energy + store energy' box. A horizontal arrow labeled 'Electrical energy' connects the 'Manage station electrical energy' box to the 'Collect+transform+distribute electrical energy + store energy' box.</p> <p>Figure 82 Context Diagram of Collect+store electrical energy</p>
Type	C2P-Operational Activity

2.3-73 - Monitor traffic (for another IM)

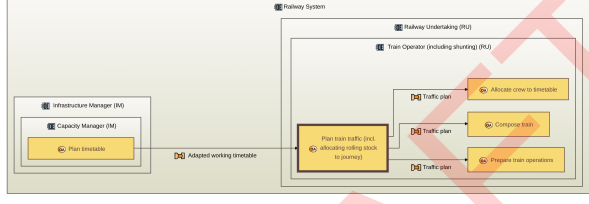
Cf. description of the Monitor Traffic activity.

ID	SPMS-3947
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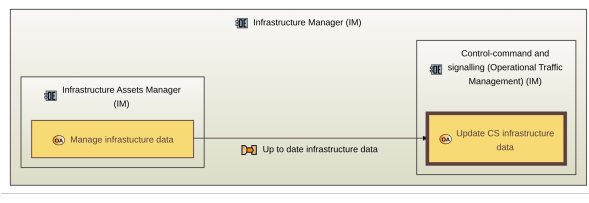
Allocated to	<ul style="list-style-type: none"> SPMS-4068 - Traffic Management (IM)
Context Diagram	 <p>Figure 83 Context Diagram of Monitor traffic (for another IM)</p>
Type	C2P-Operational Activity

2.3-74 - Plan train traffic (incl. allocating rolling stock to journey)

Includes resources management (RST, staff depending on the mission)

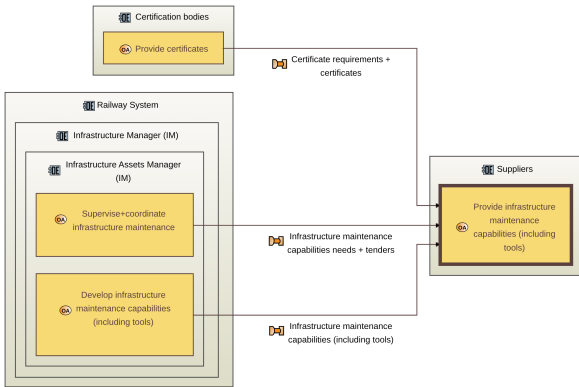
ID	SPMS-3948
Allocated to	<ul style="list-style-type: none"> SPMS-4084 - Train Operator (including shunting) (RU)
Context Diagram	 <p>Figure 84 Context Diagram of Plan train traffic (incl. allocating rolling stock to journey)</p>
Type	C2P-Operational Activity

2.3-75 - Update CS infrastructure data

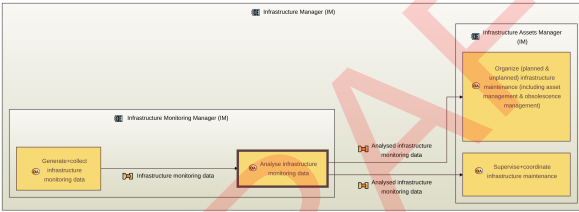
ID	SPMS-3949
Allocated to	<ul style="list-style-type: none"> SPMS-4060 - Control-command and signalling (Operational Traffic Management) (IM)
Context Diagram	 <p>Figure 85 Context Diagram of Update CS infrastructure data</p>
Type	C2P-Operational Activity

2.3-76 - Provide infrastructure maintenance capabilities (including tools)

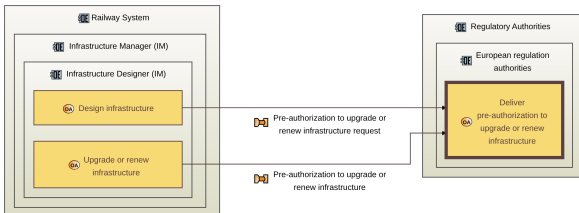
ID	SPMS-3950
Allocated to	<ul style="list-style-type: none"> SPMS-4074 - Suppliers

Context Diagram	 <p>The diagram shows the 'Provide infrastructure maintenance capabilities (including tools)' activity within the 'Suppliers' context. It receives inputs from 'Certification bodies' (via 'Certificate requirements + certificates') and 'Infrastructure Manager (IM)' (via 'Infrastructure maintenance capabilities needs + tenders' and 'Infrastructure maintenance capabilities (including tools)'). The IM context includes 'Infrastructure Assets Manager (IM)' and 'Supervise+coordinate infrastructure maintenance'. The Suppliers context also includes 'Provide infrastructure maintenance capabilities (including tools)'.</p> <p>Figure 86 Context Diagram of Provide infrastructure maintenance capabilities (including tools)</p>
Type	C2P-Operational Activity

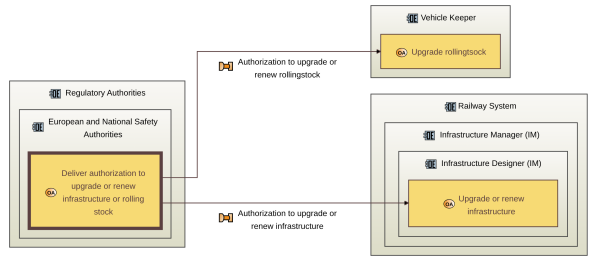
2.3-77 - Analyse infrastructure monitoring data

ID	SPMS-3951
Allocated to	<ul style="list-style-type: none"> SPMS-4052 - Infrastructure Monitoring Manager (IM)
Context Diagram	 <p>The diagram shows the 'Analyse infrastructure monitoring data' activity within the 'Infrastructure Monitoring Manager (IM)' context. It receives inputs from 'Infrastructure Assets Manager (IM)' (via 'Organise plan and implement infrastructure maintenance (including asset management & maintenance management)') and 'Infrastructure Monitoring Manager (IM)' (via 'Generate and collect infrastructure monitoring data' and 'Infrastructure monitoring data'). The IM context also includes 'Supervise+coordinate infrastructure maintenance'.</p> <p>Figure 87 Context Diagram of Analyse infrastructure monitoring data</p>
Type	C2P-Operational Activity

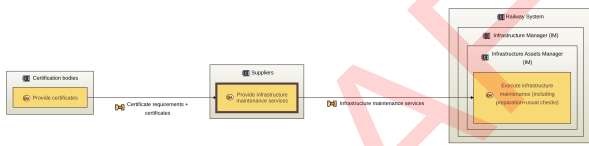
2.3-78 - Deliver pre-authorization to upgrade or renew infrastructure

ID	SPMS-3952
Allocated to	<ul style="list-style-type: none"> SPMS-4047 - European regulation authorities
Context Diagram	 <p>The diagram shows the 'Deliver pre-authorization to upgrade or renew infrastructure' activity within the 'Regulatory Authorities' context. It receives inputs from 'Infrastructure Designer (IM)' (via 'Design infrastructure') and 'Infrastructure Manager (IM)' (via 'Upgrade or renew infrastructure'). The IM context also includes 'Infrastructure Assets Manager (IM)'. The Regulatory Authorities context also includes 'European regulation authorities'.</p> <p>Figure 88 Context Diagram of Deliver pre-authorization to upgrade or renew infrastructure</p>
Type	C2P-Operational Activity

2.3-79 - Deliver authorization to upgrade or renew infrastructure or rolling stock

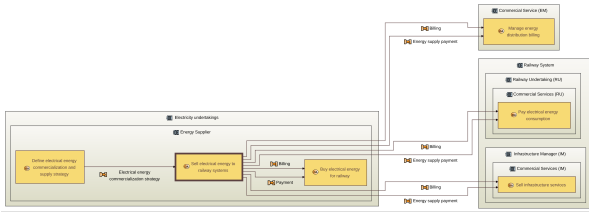
ID	SPMS-3953
Allocated to	<ul style="list-style-type: none"> SPMS-4057 - European and National Safety Authorities
Context Diagram	 <p>The diagram shows three main components: Regulatory Authorities (containing European and National Safety Authorities), Vehicle Keeper, and the Railway System (containing Infrastructure Manager and Infrastructure Designer). The Regulatory Authorities provide 'Authorization to upgrade or renew rolling stock' to the Vehicle Keeper. The Vehicle Keeper provides 'Authorization to upgrade or renew rolling stock' to the Infrastructure Manager. The Infrastructure Manager provides 'Authorization to upgrade or renew infrastructure' to the Infrastructure Designer. The Infrastructure Designer provides 'Authorization to upgrade or renew infrastructure' to the Infrastructure Manager.</p> <p>Figure 89 Context Diagram of Deliver authorization to upgrade or renew infrastructure or rolling stock</p>
Type	C2P-Operational Activity

2.3-80 - Provide infrastructure maintenance services




ID	SPMS-3954
Allocated to	<ul style="list-style-type: none"> SPMS-4074 - Suppliers
Context Diagram	 <p>The diagram shows three main components: Certification bodies, Suppliers, and the Railway System (containing Infrastructure Manager and Infrastructure Designer). Certification bodies provide 'Provide certificate' to Suppliers. Suppliers provide 'Provide infrastructure maintenance services' to the Infrastructure Manager. The Infrastructure Manager provides 'Infrastructure maintenance services' to the Infrastructure Designer. The Infrastructure Designer provides 'Infrastructure maintenance services' to the Infrastructure Manager.</p> <p>Figure 90 Context Diagram of Provide infrastructure maintenance services</p>
Type	C2P-Operational Activity

2.3-81 - Sell electrical energy to railway systems

Sell electrical energy by supplier to railway entities. Receives payments and issues payments billing information.

ID	SPMS-3955
Allocated to	<ul style="list-style-type: none"> SPMS-4065 - Energy Supplier
Context Diagram	 <p>The diagram shows three main components: Energy Supplier, Energy Supplier, and the Railway System (containing Infrastructure Manager and Infrastructure Designer). The Energy Supplier provides 'Electrical energy' to the Infrastructure Manager. The Infrastructure Manager provides 'Infrastructure maintenance services' to the Infrastructure Designer. The Infrastructure Designer provides 'Infrastructure maintenance services' to the Infrastructure Manager. The Infrastructure Manager provides 'Infrastructure maintenance services' to the Infrastructure Designer. The Infrastructure Designer provides 'Infrastructure maintenance services' to the Infrastructure Manager.</p> <p>Figure 91 Context Diagram of Sell electrical energy to railway systems</p>
Type	C2P-Operational Activity


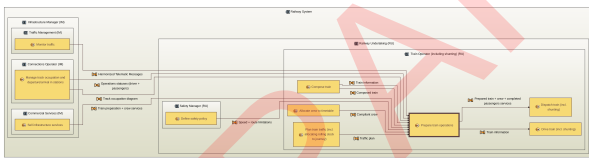

2.3-82 - Manage infrastructure maintenance certification

ID	SPMS-3956
Allocated to	<ul style="list-style-type: none"> •  SPMS-4081 - Infrastructure Assets Manager (IM)
Context Diagram	 <p>Figure 92 Context Diagram of Manage infrastructure maintenance certification</p>
Type	 C2P-Operational Activity


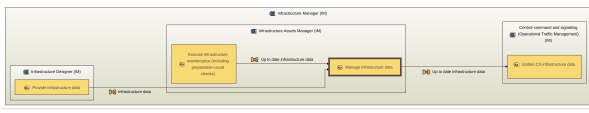

2.3-83 - Prepare train operations

Train preparation: Ensuring that a train is in a fit condition to enter service, that the train equipment is correctly deployed and the train composition matches the train's designated route(s). Train preparation also includes technical inspections carried out prior to the train entering service.


COMMISSION IMPLEMENTING REGULATION (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU – Appendix J



ID	SPMS-3957
Allocated to	<ul style="list-style-type: none"> •  SPMS-4084 - Train Operator (including shunting) (RU)
Context Diagram	 <p>Figure 93 Context Diagram of Prepare train operations</p>
Type	 C2P-Operational Activity

2.3-84 - Manage infrastructure data




ID	SPMS-3958
Allocated to	<ul style="list-style-type: none"> •  SPMS-4081 - Infrastructure Assets Manager (IM)
Context Diagram	 <p>Figure 94 Context Diagram of Manage infrastructure data</p>
Type	 C2P-Operational Activity

2.3-85 - Provide infrastructure data


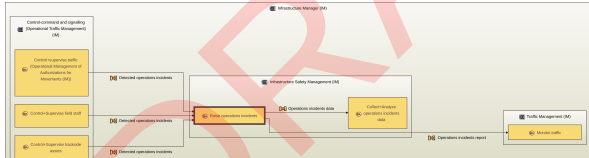

ID	SPMS-3959
Allocated to	<ul style="list-style-type: none"> •  SPMS-4086 - Infrastructure Designer (IM)

Context Diagram	 <p>Figure 95 Context Diagram of Provide infrastructure data</p>
Type	 C2P-Operational Activity

2.3-86 - Raise operations incidents




ID	SPMS-3960
Allocated to	<ul style="list-style-type: none">  SPMS-4078 - Safety Manager (RU)
Context Diagram	 <p>Figure 96 Context Diagram of Raise operations incidents</p>
Type	 C2P-Operational Activity

2.3-87 - Raise operations incidents

ID	SPMS-3961
Allocated to	<ul style="list-style-type: none">  SPMS-4067 - Infrastructure Safety Management (IM)
Context Diagram	 <p>Figure 97 Context Diagram of Raise operations incidents</p>
Type	 C2P-Operational Activity


2.3-88 - Define safety policy

Safety policy is a basic element of the safety management system and is approved by the organizations / executive and communicated to all staff. (DIRECTIVE (EU) 2016/798 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 May 2016 on railway safety, art 9.3 (a))

ID	SPMS-3962
Allocated to	<ul style="list-style-type: none">  SPMS-4078 - Safety Manager (RU)
Context Diagram	 <p>Figure 98 Context Diagram of Define safety policy</p>
Type	 C2P-Operational Activity

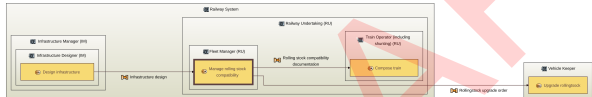
2.3-89 - Design infrastructure

Includes the design of infrastructure maintenance and infrastructure power supply strategy

ID	SPMS-3963
Allocated to	<ul style="list-style-type: none"> SPMS-4086 - Infrastructure Designer (IM)
Context Diagram	 <p>Figure 99 Context Diagram of Design infrastructure</p>
Type	C2P-Operational Activity

2.3-90 - Manage rolling stock compatibility

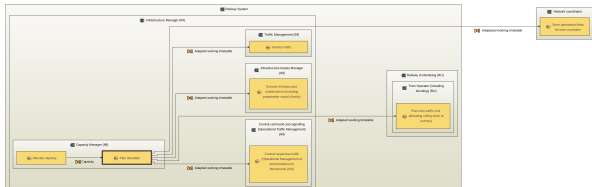
Identify restrictions on rolling stock running conditions (speed, loading...), depending on the route. The Route Compatibility Check (RCC) is performed, and the resulting documentation for operational staff is compiled, prior to operations under the RU responsibility.

ID	SPMS-3964
Allocated to	<ul style="list-style-type: none"> SPMS-4080 - Fleet Manager (RU)
Context Diagram	 <p>Figure 100 Context Diagram of Manage rolling stock compatibility</p>
Type	C2P-Operational Activity

2.3-91 - Plan timetable


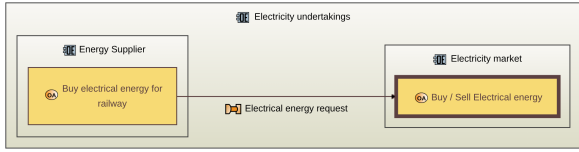

Directive 2012/34/EU: Infrastructure managers shall manage rail infrastructure capacity through a planning and allocation process comprising three phases: (a) strategic capacity planning; (b) scheduling and allocation of infrastructure capacity; (c) adaptation and rescheduling of allocated capacity. This activity is realized by the following function defined in the functional architecture of SPT3 :

- Export Capacity Plan
- Capture Capacity Plan
- Build Operational Plan

ID	SPMS-3965
Allocated to	<ul style="list-style-type: none"> SPMS-4090 - Capacity Manager (IM)
Context Diagram	 <p>Figure 101 Context Diagram of Plan timetable</p>


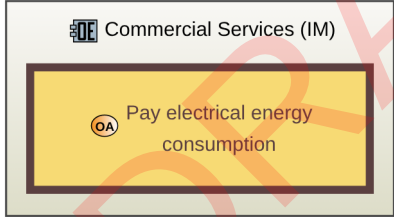

Type	 C2P-Operational Activity
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2.3-92 - Buy / Sell Electrical energy


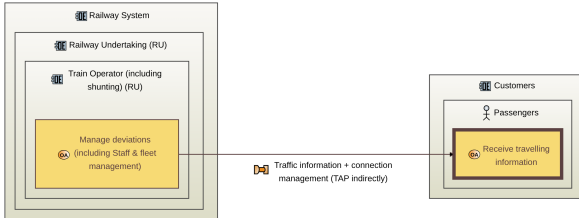
ID	SPMS-3966
Allocated to	<ul style="list-style-type: none">  SPMS-4059 - Electricity market
Context Diagram	 <p>The diagram shows the 'Buy / Sell Electrical energy' activity within the 'Electricity undertakings' boundary. It is connected to the 'Energy Supplier' boundary (via 'Buy electrical energy for railway') and the 'Electricity market' boundary (via 'Electrical energy request' and 'Buy / Sell Electrical energy').</p> <p><i>Figure 102 Context Diagram of Buy / Sell Electrical energy</i></p>
Type	 C2P-Operational Activity

2.3-93 - Pay electrical energy consumption

Payment for electrical energy (e.g. RU/ station manager)


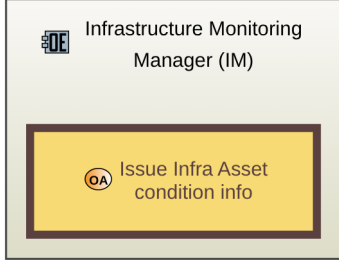

ID	SPMS-3967
Allocated to	<ul style="list-style-type: none">  SPMS-4055 - Commercial Services (IM)
Context Diagram	 <p>The diagram shows the 'Pay electrical energy consumption' activity within the 'Commercial Services (IM)' boundary.</p> <p><i>Figure 103 Context Diagram of Pay electrical energy consumption</i></p>
Type	 C2P-Operational Activity

2.3-94 - Receive travelling information




ID	SPMS-3968
Allocated to	<ul style="list-style-type: none">  SPMS-4069 - Passengers
Context Diagram	 <p>The diagram shows the 'Receive travelling information' activity within the 'Customers' boundary. It is connected to the 'Railway System' boundary (via 'Traffic information + connection management (TAP indirectly)'). The 'Railway System' boundary contains nested boundaries for 'Railway Undertaking (RU)', 'Train Operator (including shunting) (RU)', and 'Manage deviations (including staff & fleet management)'.</p> <p><i>Figure 104 Context Diagram of Receive travelling information</i></p>

Type	 C2P-Operational Activity
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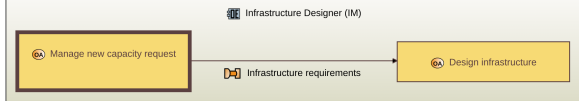

2.3-95 - Issue Infra Asset condition info

ID	SPMS-3969
Allocated to	<ul style="list-style-type: none">  SPMS-4052 - Infrastructure Monitoring Manager (IM)
Context Diagram	 <p>The diagram shows a central yellow box labeled 'Issue Infra Asset condition info' with a C2P icon. This box is nested within a larger grey box labeled 'Infrastructure Monitoring Manager (IM)' with an IM icon.</p> <p><i>Figure 105 Context Diagram of Issue Infra Asset condition info</i></p>
Type	 C2P-Operational Activity


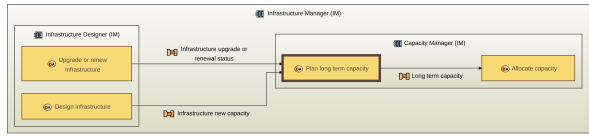

2.3-96 - Issue new infrastructure configuration

ID	SPMS-3970
Allocated to	<ul style="list-style-type: none">  SPMS-4086 - Infrastructure Designer (IM)
Context Diagram	 <p>The diagram shows a sequence of boxes: 'Issue new infrastructure configuration' (C2P), 'Infrastructure Designer (IM)' (IM), 'Issue new infrastructure configuration' (C2P), 'Infrastructure Designer (IM)' (IM), and 'Issue new infrastructure configuration' (C2P). Arrows indicate the flow between these components.</p> <p><i>Figure 106 Context Diagram of Issue new infrastructure configuration</i></p>
Type	 C2P-Operational Activity


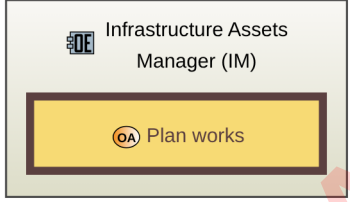

2.3-97 - Manage new capacity request

ID	SPMS-3971
Allocated to	<ul style="list-style-type: none">  SPMS-4086 - Infrastructure Designer (IM)
Context Diagram	 <p>The diagram shows a central yellow box labeled 'Manage new capacity request' with a C2P icon. This box is connected to a grey box labeled 'Infrastructure Designer (IM)' with an IM icon. Inside the IM box, there is a yellow box labeled 'Design infrastructure' with a C2P icon. An arrow labeled 'Infrastructure requirements' points from the 'Manage new capacity request' box to the 'Design infrastructure' box.</p> <p><i>Figure 107 Context Diagram of Manage new capacity request</i></p>
Type	 C2P-Operational Activity

2.3-98 - Plan long term capacity

ID	SPMS-3972
Allocated to	<ul style="list-style-type: none"> •  SPMS-4090 - Capacity Manager (IM)
Context Diagram	 <p>The diagram shows the 'Plan long term capacity' activity within the 'Capacity Manager (IM)' context. It is connected to 'Infrastructure Designer (IM)' via 'Infrastructure upgrade or renewal status' and 'Infrastructure new capacity' data flows. It also connects to 'Allocate capacity' via 'Long term capacity' data flow.</p> <p>Figure 108 Context Diagram of Plan long term capacity</p>
Type	 C2P-Operational Activity


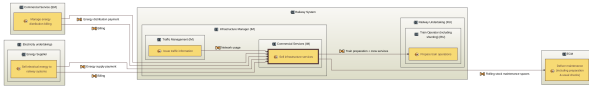

2.3-99 - Plan works

ID	SPMS-3973
Allocated to	<ul style="list-style-type: none"> •  SPMS-4081 - Infrastructure Assets Manager (IM)
Context Diagram	 <p>The diagram shows the 'Plan works' activity within the 'Infrastructure Assets Manager (IM)' context.</p> <p>Figure 109 Context Diagram of Plan works</p>
Type	 C2P-Operational Activity

2.3-100 - Sell infrastructure services

Interface between RU and IM, two missions are taken into account here : selling the services described in the network statement and charging the services based on real usage of infrastructure after the train has run, taking into account the operational deviations.

Selling the service involves considering the capacity and performance of the network, gathering the RUs needs, and defining with the RUs the timetable and services, and conditions of sales

ID	SPMS-3974
Allocated to	<ul style="list-style-type: none"> •  SPMS-4055 - Commercial Services (IM)
Context Diagram	 <p>The diagram shows the 'Sell infrastructure services' activity within the 'Commercial Services (IM)' context. It is connected to 'Infrastructure Assets Manager (IM)' via 'Infrastructure new capacity' and 'Infrastructure upgrade or renewal status' data flows. It also connects to 'Allocate capacity' via 'Long term capacity' data flow.</p> <p>Figure 110 Context Diagram of Sell infrastructure services</p>
Type	 C2P-Operational Activity

3 Appendix

3.1 Input documents

3.2 Standards and References

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