




ERJU SYSTEM PILLAR

Template - System Definition



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Abstract	This document is a template for the System Definition deliverable which is required per EN 50126-1:2017 - phase 2 for a system under consideration.
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1 Preamble

1.1 Purpose

This document describes the System Definition as required per EN 50126-1 phase 2 (system definition and operational context) in  SPPRAMSS-349 - [EN 50126-1:2017] for the *<system under consideration>*.

1.2 Intended Audience

*Note to author: This section shall **describe the intended audience** for this document.*

1.3 Document Context

*Note to author: This section shall **describe the context** for this document.*

1.4 Glossary

Note to author: See  Glossary Usage Guidelines

1.4.1 Terms

No references

1.4.2 Abbreviations

2 System Definition

The purpose of the System Definition (phase 2) is to provide a basis of information about the system under consideration to enable RAMS analysis and security analysis (phase 3). This section also contains information to enable system requirements creation (phase 4).

2.1 System, mission profiles and assumptions

2.1.1 System description

Provide a high-level description of the system and its objectives (purpose/goals/benefits) in plain text here. Stakeholder level documents / concept documents may be referenced here.

Carry out appropriate analyses and definition of the system boundaries. It describes the defined system limits and, if possible, appends corresponding diagrams (e.g., MBSE) including descriptions.

Include system context diagram of the system under consideration.

Work item to be used:  SPPR-10062 - System

2.1.1.1 Human actors

List the human actors (as far as available and necessary) by name, description, rationale and allocation of actor functions that interface with the system under consideration. If the necessary information is not yet available to the project, only a list of the relevant stakeholders should be provided.

Work item to be used:  SPPR-10060 - Actor

2.1.1.2 External systems

List the external systems (as far as available and necessary) by name, description, rationale and allocation of actor functions that interface with the system under consideration.

Work item to be used: 🧑 SPPR-10060 - Actor or on lower levels internal 🏠 SPPR-10062 - System

2.1.2 System objectives

Define the objectives for the system under consideration.

Work Items to be used: 🏠 SPPR-10086 - Capability (optional), 🏠 SPPR-10098 - Scenario, 🧑 SPPR-10097 - Functional Chain (optional), diagram (control loops)

2.1.3 Mission profiles

Describe active operation mission profiles for the respective life cycle phases according to

🏠 SPPRAMSS-349 - [EN 50126-1:2017].

Information present here will impact the PRAM computation for the system (e.g. Availability, Reliability targets).

See 🏠 SPPRAMSS-8208 - Definition of mission profiles.

2.1.3.1 Operating assumptions

Describe any assumption valid for the system under consideration. Assumptions should be validated by the upper level of analysis. The goal of assumptions is to ease, limit or even allow PRAMS study. Using the system under consideration without meeting any of the identified assumption could invalidate the PRAMS studies.

2.1.3.2 Operating factors

This chapter aims at identifying the characteristics of the operating environment or usage of the system under consideration that could have an influence of PRAMS requirements. Typical factors are the foreseen operating lifetime, rate of switches for a point machine.

2.1.3.3 Reference mission profile(s)

Define reference operating conditions by defining, for each of them values of operating factors.

- Long term operating strategy and conditions (System under consideration being operated in its main mission)
- Logistic consideration (System under consideration being shipped or stored (after manufacturing, after repair, waiting to be used, ...))
- Commissioning strategy and conditions (System under consideration being prepared, installed, deployed and installed before revenue service).

2.1.3.4 Long term maintenance strategy and conditions

Describe how the system under consideration is maintained while fulfilling in its main mission.

- Predictive maintenance strategy and conditions
- Corrective maintenance strategy and conditions
- Planned maintenance strategy and conditions

2.1.4 System states

List the different states of operation of the system under consideration (i.e. normal, abnormal/degraded, maintenance mode), states, transitions and their interactions, if they could have an impact on the systems functionality and safety.

From  SPPRAMSS-349 - [EN 50126-1:2017] examples of modes of operation include:

- *normal, abnormal or degraded mode of operation, disconnect or connect states and transitions, etc., with their interactions,*
- *operational scenarios to be considered within the analysis, e.g. effects of maintenance operation (How, how often and by whom is the system maintained?),*
- *external requirements, e.g. external safety requirements resulting from the overall safety policy of the railway duty holder, from prevailing legal considerations, or from standards.*

Work item to be used:  SPPR-10110 - State

2.2 System interfaces

Carry out analyses regarding the interaction of the system with the physical environment, other technological systems, people, and other infrastructure operators. It documents the analyses carried out, the analyses results and the effects on the system model accordingly.


In addition to the functional interfaces, the location(s) of the system parts and their physical interfaces can influence but can also be influenced by neighbouring systems and environment. Note: If MBSE is used, the corresponding results can be reused in the respective chapters of the system definition.

Note: Consider to define details in a separate document (see System Interface Description template) and reference it only to improve the maintainability of the System Definition document.

2.2.1 Interfaces and interactions with physical environment

Describe the physical environment, e.g. climatic conditions, mechanical conditions, altitude.


List the external interfaces and interactions with physical environment.

Work item to be used:  SPPR-10071 - Interface

2.2.2 Interfaces and interactions with human actors

List the interfaces and interactions with humans. Respectively providing (as far as already known)

- *name, description and rationale and interacting actor/system/other party*
- *definition of exchange items, including direction*


Work item to be used:  SPPR-10071 - Interface

2.2.3 Interfaces and interactions with external systems

List the external interfaces and interactions with other technological systems. Respectively providing (as far as already known)

- *name, description and rationale and interacting*
- *definition of exchange items, including direction*
- *definition of the most important interface layers, needs to be decided per interface (e.g. if an interface is using an existing standard on lower interface layers, etc.)*

Note: In addition to the functional interfaces, the location(s) of the system parts and their interfaces can influence neighboring systems and environment.

Work item to be used:  SPPR-10071 - Interface

2.3 System functions

2.3.1 Functional overview

Include a system context diagram with allocated functions of the system under consideration including functional chains and control loops.

Work item to be used: Diagram

2.3.2 Functions in the scope of the system under consideration

List functions allocated to the system under consideration including their states of operation (based 2.1.4 - System states) and related state transitions to be performed by the system under consideration, with name, description, rationale. Describe:

- *the behaviour*
- *how to transform the inputs to the outputs*
- *logical and temporal inter-dependencies*

- *apportioned PRAMSS requirements*

Work item to be used:  SPPR-10082 - Function

2.3.3 Functions from the surrounding system(s)

List the individual functions that are exist outside the system under consideration which impact its design. Describe the behaviour, meaning dependencies from the inputs to the outputs, logical and temporal inter-dependencies with the system under consideration allocated functions.

Work item to be used:  SPPR-10082 - Function

2.4 Scope of operational aspects and constraints

List operational context information that will have an impact on the development of the system under consideration. They can be issued from legacy systems/projects (they should be identified) or from new official document (e.g. European directive, Railway undertaking/Infrastructure Manager internal documentation).

The chapters below should reflect the "real" actions foreseen in operation to reach the mission profile targets defined.

2.4.1 Review of past experience data for similar systems

List all legacy data from system(s) having the same (or partially same) scope of functionalities that could be useful to define the system under consideration. This section is not applicable for system under consideration deploying new functionalities where no similar system exist.

2.4.2 Constraints imposed by existing infrastructure

List all existing infrastructure constraints which shall be taken in account when designing the system under consideration. Example of infrastructure constraints types:

- *Existing track topology,*
- *Existing interfaces,*
- *Existing safety facilities,*
- *Removal of previously installed systems.*

2.4.3 System operating conditions and constraints

List all existing constraints (including P, RAM and Safety ones) which shall be taken in account when designing the system under consideration.

2.4.4 System maintenance conditions

Describe what restrictions and/or circumstances have to be taken into account in relation to maintenance activities to build the system under consideration. For example, the system under consideration design is facilitating maintenance activities with an easy access to equipment, proper protections for maintenance staff, remote diagnostic and update mechanisms.

2.4.5 Logistic support considerations

Not applicable in the scope of ERJU.

Note: Describe which measures of the system under consideration to take into account with regard to obsolescence and packaging, transport and storage. This is strongly linked to the manufacturing and managements of produced system under consideration. At this step of development, this is fully linked to each manufacturers own processes.

2.4.6 Operating procedures

Describe existing operating procedures and, for each of them,

- *responsible organisation(s) (RU, IM) and transition between the organisation (if more than one)*
- *if part of the system operating conditions and constraints*
 - *identify personnel permitted to carry out these actions*
 - *indicate the skills, qualifications and time-resources required.*


Note: If no human activities have been included in the analysis, the reasons for this should be clearly stated.

Note: Consider also the different modes of operation (i.e. normal, abnormal/degraded, maintenance mode), states and transitions and their interactions as introduced above 2.1.4 - System states, if they could have an impact on operating procedures.

2.5 Existing safety measures

List the existing safety requirements, measures, as well as the existing and new assumptions, which determine the limits for the risk assessment.

Define the existing safety measures or functions that affect the safety of the system under consideration design. This is to ensure that they are not re-analysed and not forgotten in the future safety analyses (i.e. Phase 3 to Phase 5).

The chapter is closely linked to the definition of functions that are outside the system under consideration (refer to chapter  SPPR-8048 - Functions from the surrounding system(s)). However, the focus of this chapter is exclusively on safety barriers.

This chapter is not intended to capture (new) details of the security measures or functions, but to reference the relevant information from the other chapters and describe their effect.

Finally, all information provided in this section aim at determining the limits for the risk assessment.

3 Appendix

3.1 Input documents

3.2 Standards and references

4 Open points and tasks for this template