




ERJU SYSTEM PILLAR

# Template - System Architecture Description



# Template - System Architecture Description

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Abstract	This document is a template for the System Architecture Description deliverable which is required per EN 50126-1:2017 - phase 5 for a system under consideration. It contains a general description of the system architecture to sufficient depth and to justify the architectural decisions. The goal is to convey a clear and overall understanding of the considered principles which led to the chosen architecture and to describe how the system architecture provides a solution to the system requirements.
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# Table of contents

1	Preamble	5
1.1	Purpose	5
1.2	Intended Audience	5
1.3	Document Context	5
1.4	Glossary	5
2	Overview	5
2.1	Overall description	5
2.2	Architectural principles	6
2.2.1		6
2.3	Functional distribution	6
2.4	Geographical distribution	6
3		7
3.1		7
3.1.1	Description	7
3.1.2	Interfaces	7
3.1.3	Functions	7
3.1.4	States	7
3.1.5	Non-functional requirements	7
3.1.6	Installation spaces	7
4	System interfaces	8
4.1	External interfaces	8
4.1.1		8
4.2	Internal interfaces	8
4.2.1		8
5	System behaviour	8
5.1		8
6	System data	9
6.1	Exchange items	9
6.2	Data classes	9
7	Appendix	9
7.1	Standards and references	9

# 1 Preamble

## 1.1 Purpose

This document describes the System Architecture as required per  SPPRAMSS-349 - [EN 50126-1:2017] phase 5 (architecture and apportionment of system requirements) for the <system under consideration>. It contains a general description of the system architecture to justify the architectural decisions. The goal is to convey a clear and overall understanding of the considered principles which led to the chosen architecture and to describe how the system architecture provides a solution to the system requirements.

## 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 by referencing the System definition, the System requirements Specification and the other input documents:*

- *the general description and principles of the system architecture;*
- *the structured decomposition of the system into system elements with defined external and internal system interfaces;*
- *the overall system behaviour distributed across the system elements (e.g. subsystems) considering the system functions;*
- *the overall system characteristics to meet the system performance, RAMS and security requirements.*

## 1.4 Glossary

*Note to author: Please **add here references to existing applicable definition work items** in the System Pillar glossary or **create a macro which lists** those work items. **Strong recommendation:** Please use the SPPROCESS/30 SP Metadata Management/Glossary Usage Guidelines : 722401 and avoid duplications of definition work items and the manual creation of new ones in this document.*

No references

# 2 Overview

## 2.1 Overall description

*Note to author: This section shall **give an overall architecture description to the system architecture** support by overview diagrams. Insert below one or more architecture diagrams showing how subsystem or components are generally interconnected following the view definitions available in SPPROCESS/10 SEMP V 01\_01/SEMP Annex M2 Capella diagram rules : 722401.*

**Recommendation:** *Please keep this chapter concise and do not duplicate the information captured in the subsequent chapters. Write all the other sections first and only then write a shortened summary here in this chapter as the last step.*

### <Diagram work items of the system architecture>

- <diagram following applicable view definitions and rules>



*Note to author: SAB diagrams are in general **not applicable for the system architecture** because Capella's system analysis layer cannot show subsystems on these. On logical architecture and physical architecture layer everything can be shown with LAB/PAB what's on a SAB but with the required more details.*

### <Text work items for the overall description of the system architecture>

- <show content>

## 2.2 Architectural principles

*Note to author: This section shall **describe the predominant architectural principles** and the solution decisions made which led to the choice of the system architecture. **Strong recommendation:** Reference here applicable work items which provide these architectural principles and list them based on the following possible input sources:*

- *non-functional system requirements or stakeholder requirements*
- *SPPROCESS/10 SEMP V 01\_01/System Pillar MBSE Methodology Handbook : 722401*
- *SPPROCESS/10 SEMP V 01\_01/SEMP Process XX - Trade-off Analysis : 722401*
-  *ARC-D2.5 Architecture Guidelines*
-  *System Concept\_CCS - Granularity Concepts and Principles - Main*

*The following non-exhaustive **example list of possible architectural principles** can be used a guide to collect those work items. Please remind that these principles are not invented in system architecture but are driven by the inputs mentioned above.*

- *migration aspects*
- *technological aspects and choices*
- *harmonisation and standardisation aspects (e.g. standardised interfaces, ...)*
- *life cycles (e.g. decoupling of different life cycles for different system elements)*
- *functional decomposition, allocation or grouping*
- *domain-specific separation of concerns (e.g. train, track, ...)*
- *performance, reliability, availability, maintainability, safety, security*
- *modularity, reuseability, interoperability, upgradeability, scalability, connectivity*
- *architectural layers (e.g. abstraction layers, OSI layers, ...)*
- *interface kinds and categories (e.g. FIS, FFFIS, SCI, SSI, SMI, ...)*

### 2.2.1 <Architectural principle P>

*Note to author: This subchapter **shall contain the information for one architectural principle.***

**Recommendation:** *If useful, then **create subchapters for individual principles or categories of principles** for content structuring. If applicable, please put the detailed elaboration of the principles and their rationales to the appendix to keep this section focussed on the main description.*

**<System requirement, Rule or Text work item for the main description of the architectural principle P>**

- *<show the content of the work item>*

**<Rationale work item for the rationale of the architectural principle P>**

## 2.3 Functional distribution

*Note to author: This chapter shall provide the **overall distribution of the system functions** around the various subsystems, based on the system requirements and decomposition or flow down of the system functions to more detailed functions. **Recommendation:** The corresponding architectural principles which led to this distribution are referenced here.*

**<Diagram work item of the functional allocation>**

- *<diagram following applicable view definitions and rules>*

## 2.4 Geographical distribution

*Note to author: This section shall **describe the overall geographical distribution of the system**, if applicable. This shall be done around the various subsystems, based on the system requirements.*

**Recommendation:** *The corresponding architectural principles which led to this distribution shall be referenced or explained here. Examples are power supply, communication restrictions (bandwidth, latency), distance to supporting infrastructure, installation cost (buildings, cabling), safety and security restrictions (redundancy, independence).*

#### <Diagram work item of the geographical distribution>

- <diagram following applicable view definitions and rules>

### 3 <Systems / Subsystems>

#### 3.1 <Subsystem S>

*Note to author: This chapter **provides the properties of a given subsystem or component**. This considers constraints, interfaces, functions and states. This section contains a detailed description of all subsystems identified in the previous sections.*

##### 3.1.1 Description

*Note to author: **Provide a concise overview of subsystem's or component's purpose** including a description and rationales which led to the development of this.*

#### <Diagram work item of the subsystem>

- <diagram showing the system element at the center and the surrounding ones>

#### <C2P System work item which represents the subsystem

- <show title and description>

##### 3.1.2 Interfaces

*Note to author: This section **gives the list of the subsystem or component interfaces**. Please refer to the work items and content of chapter 4 - System interfaces.*

##### 3.1.3 Functions

*Note to author: This section shall **list the functions which are performed by the subsystem** .*

#### <C2P Function work item>

- <show description>

*Note to author: This section **shall contain per function**:*

- *inputs and outputs represented by functional exchanges and their exchange items*
- *description the of transformation (i.e. behaviours) of inputs to outputs*

##### 3.1.4 States

*Note to author: This section shall **describe the main states of the subsystem or component** (e.g. operating states), if applicable.*

##### 3.1.5 Non-functional requirements

*Note to author: This section shall **reference or list the non-functional requirements** of the subsystem or component (e.g., safety, reliability, performance, security, availability).*

**Recommendation:** Please **insert a reference to a System PRAMS Apportionment Report and a System Security Apportionment Report**, if applicable. These provides the traceability details of how the non-functional system requirements for performance, RAM and safety are apportioned to this subsystem or component.

##### 3.1.6 Installation spaces

*Note to author: This section shall **describe and list the installation spaces** of the subsystem , if applicable.*

## 4 System interfaces

*Note to author: This chapter shall provide **a list of the external and internal interfaces of the system**. The decision has to be taken whether an interface needs to be managed as an interface via SPPROCESS/80 Templates/System Interface Definition : 722401 which complements and details the interface description the chapters below. The need to manage interfaces arises mainly due to the need to achieve an agreement between two or more parties (e.g. departments, teams, companies).*

### <Automatically generated overview of all external and internal interfaces>

- <optional list or table created by a macro>
- <show a collection of C2P Interface work items, if applicable>

### 4.1 External interfaces

*Note to author: The System Definition or System Requirements Specification may have captured already the external system interfaces to the system actors. But since new system elements emerge only after architectural decisions have been made, only at this point it becomes clear how the external interfaces are further routed/connected down to the newly defined subsystems. This **new information details the overall system understanding and must be captured** in this section.*

#### 4.1.1 <external interface X>

##### <Diagram work item of the external interface X>

- <diagram following applicable view definitions and rules>

##### <C2P Interface work item or C2P Physical Link work item which represents the external interface X>

- <show title and description>

### 4.2 Internal interfaces

*Note to author: This section is **only used in detail per internal interface which is not described in a separate System Interface Definition** document. It is recommended at least to list the internal interfaces in this section and to refer to an instance of the SPPROCESS/80 Templates/System Interface Definition : 722401 to make this document smaller and to ease the exchange of interface definitions.*

#### 4.2.1 <internal interface Y>

##### <Diagram work item of the internal interface Y>

- <diagram following applicable view definitions and rules>

##### <C2P-Interface work item or C2P Physical Link work item which represents the internal interface Y>

- <show title and description>

## 5 System behaviour

### 5.1 <capability realisation CR>

*Note to author: This chapter shall describe the **system behaviour for one capability realisation** along the various system elements (subsystem) from an end-to-end perspective. The goal is to demonstrate how the system elements are interacting through to their functions involved in the considered capability realisation. **Recommendation:** These capability realisations are used only as a structuring for the subchapters and are not populated here itself as work items. Please create one subchapter per capability realisation.*



<Diagram work item which represents the capability realisation>

- <diagram following applicable view definitions and rules>

<C2P work items which represent the functional chains of the capability realisation>

<C2P work items which represent the exchange scenarios of the capability realisation>

## 6 System data

*Note to author: This chapter shall **provide the system data used in the functional exchanges** between the subsystems and with system actors. This comprises the data exchange items with their names, corresponding literals, types, ranges of values as well as the data classes with a description of the class and the properties belonging to it.*

**Strong recommendation:** Please use references to interface definitions or further data-related documents, if applicable.

### 6.1 Exchange items

**Recommendation:** List in this subchapter the exchange items used in the functional exchanges..

<Exchange items of the capability realisation>

### 6.2 Data classes

**Recommendation:** List in this subchapter the data classes used in the exchange items.

## 7 Appendix

*Note to author: Put here references to applicable input documents, standards or regulations.*

### 7.1 Standards and references