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△

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## 1 Scope of Document

This document specifies the requirements of Adaptive Applications to the functional cluster Persistency of the AUTOSAR Adaptive Platform. The motivation is to provide a standardized and portable way to store and write data persistently.

## 2 Conventions to be Used

The representation of requirements in AUTOSAR documents follows the table specified in [TPS\_STDT\_00078], see Standardization Template, chapter Support for Traceability ([1]).

The verbal forms for the expression of obligation specified in [TPS\_STDT\_00053] shall be used to indicate requirements, see Standardization Template, chapter Support for Traceability ([1]).

### 2.1 Requirements Guidelines

There are no special guidelines for requirements for the functional cluster Persistency.

### 3 Acronyms and Abbreviations

There are no acronyms and abbreviations relevant within this document that are not included in the [2, AUTOSAR Glossary].



## 4 Requirements Specification

This chapter describes all requirements driving the work to define the functional cluster Persistency.

The functional cluster Persistency will be referenced as “Persistency” in the remainder of this document.

### 4.1 Functional Overview

The AUTOSAR Adaptive Platform Persistency provides services for Adaptive Applications and other functional clusters of the AUTOSAR Adaptive Platform. The AUTOSAR Adaptive Platform Persistency is responsible for all aspects which regard the storage/retrieval of data, and therefore it has to deal with:

- Persistently storing data over boot and ignition cycles.
- Accessing data which has been stored persistently.
- Using a unique identifier to access data.
- Reading and writing data from/to files.
- Encryption of persistent data.
- Error detection and correction of stored data.
- Monitoring storage space.

### 4.2 Functional Requirements

Persistency shall fulfill the following functional requirements.

## 4.2.1 Configuration of Persistent Data

### [RS\_PER\_00010] Configurable Layout of Persistent Data

Upstream requirements: [RS\\_Main\\_00440](#)

[

<b>Description:</b>	<p>Persistency shall support the configuration of the available key-value storages and file storages.</p> <p><b>Additional Information:</b></p> <p>This configuration includes mandatory parts like the identifiers and location of the storages, and may also include optional parts like pre-configured storage elements (key-value pairs and their data types, and files) as well as redundancy, encryption, and additional information about necessary updates.</p>
---------------------	---

]

## 4.2.2 Storage of Persistent Data

### [RS\_PER\_00018] Initialization and Shutdown

Upstream requirements: [RS\\_Main\\_00011](#)

[

<b>Description:</b>	<p>Persistency shall support central initialization and shutdown.</p> <p><b>Additional Information:</b></p> <p>Application developers control the life cycle of all functional clusters using a central mechanism. This mechanism helps Persistency to prepare and clean up its environment in order to ensure a reliable behavior. E.g. the available storages need to be read from the manifest before any storage can be accessed. And before shutdown, all data of Persistency needs to be persisted.</p>
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]

### [RS\_PER\_00001] Storage of Persistent Data

Upstream requirements: [RS\\_Main\\_00440](#)

[

<b>Description:</b>	<p>Persistency shall support persistent storage of data of an Adaptive Application or of another Functional Cluster.</p> <p><b>Additional Information:</b></p> <p>There are different possibilities for an implementation of Persistency to store data. Persistency could use a file system, in which case it does not have full control over the actual storage on the physical device. Alternatively, it could use a physical device directly, in which case it might have to take care of wear leveling, because these devices have a limited number of write cycles, and some devices don't feature wear leveling in hardware.</p>
<b>Rationale:</b>	<p>Applications need to preserve data from one run-time to the next. This data could be settings, diagnostic data, calibration data, or error logs.</p>

]

### [RS\_PER\_00002] Retrieval of Persistent Data

Upstream requirements: [RS\\_Main\\_00440](#)

[

<b>Description:</b>	<p>Persistency shall support retrieval of persisted data of an Adaptive Application or of another Functional Cluster.</p> <p><b>Additional Information:</b></p> <p>An Adaptive Application or another functional cluster which stores persistent data needs to restore it after a restart of an Adaptive Application, another functional cluster, or of the whole platform.</p>
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]

### [RS\_PER\_00003] Key-Value Storage

Upstream requirements: [RS\\_Main\\_00440](#)

[

<b>Description:</b>	<p>Persistency shall support identification of a value by using a unique key.</p> <p><b>Additional Information:</b></p> <p>Data needs to be stored in way that it can be easily be accessed by using a unique identifier. The values are characterized by their data type.</p>
---------------------	--

]

### [RS\_PER\_00004] File Storage

Upstream requirements: [RS\\_Main\\_00440](#)

[

<b>Description:</b>	<p>Persistency shall support access to file-like structures.</p> <p><b>Additional Information:</b></p> <p>Data needs to be read and written from files inside folders, and associated meta data (e.g. access time) needs to be available. Files can contain UTF-8 text or binary data.</p>
<b>Rationale:</b>	PSE51 does not contain file system support.

]

### 4.2.3 Secure Storage of Persistent Data

#### [RS\_PER\_00005] Encryption and Decryption

Upstream requirements: [RS\\_Main\\_00514](#)

[

<b>Description:</b>	<p>Persistency shall support encryption and decryption of persistent data.</p> <p><b>Additional Information:</b></p> <p>The encryption and decryption are not visible to the adaptive application or the functional cluster using Persistency.</p> <p>The algorithm and key are subject to configuration.</p>
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]

#### [RS\_PER\_00019] Authentication

Upstream requirements: [RS\\_Main\\_00514](#)

[

<b>Description:</b>	<p>Persistency shall support authentication of persistent data.</p> <p><b>Additional Information:</b></p> <p>Persistency shall provide a standardized way to authenticate persistent data and check authenticity of persistent data using a MAC.</p>
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]

#### 4.2.4 Safe Storage of Persistent Data

##### [RS\_PER\_00008] Detection of Data Corruption

*Upstream requirements:* [RS\\_Main\\_00011](#), [RS\\_SAF\\_10039](#)

[

<b>Description:</b>	<p>Persistency shall be able to detect data corruption in persistent memory.</p> <p><b>Additional Information:</b></p> <p>The corruption may be caused by systematic or random failures. To be able to detect corrupted data, some redundancy is needed, which can be anything from a checksum to a full copy. Additionally, an adaptive application can register for receiving information about data corruption.</p> <p>The actual mechanisms used for ensuring data consistency are subject to configuration.</p>
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]

##### [RS\_PER\_00009] Recovery of Corrupted Data

*Upstream requirements:* [RS\\_Main\\_00011](#), [RS\\_SAF\\_10040](#)

[

<b>Description:</b>	<p>Persistency shall be able to recover data that was corrupted.</p> <p><b>Additional Information:</b></p> <p>To be able to recover corrupted data, a redundant copy of the data is needed. Additionally, an adaptive application can register for receiving information about data recovery.</p> <p>The actual mechanisms and the granularity of redundancy are subject to configuration.</p>
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]

## 4.2.5 Installation, Update, Roll-back, and Clean-Up of Persistent Data

### [RS\_PER\_00012] Installation

*Upstream requirements:* [RS\\_Main\\_00150](#), [RS\\_Main\\_00503](#)

[

<b>Description:</b>	<p>Persistency shall support installation of persistent data.</p> <p><b>Additional Information:</b></p> <p>Persistent storages can be installed with pre-configured values for keys in a key-value storage and pre-configured files in a file storage. The pre-configured data is provided by the manifest.</p>
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]

### [RS\_PER\_00013] Update

*Upstream requirements:* [RS\\_Main\\_00150](#), [RS\\_Main\\_00503](#)

[

<b>Description:</b>	<p>Persistency shall support updates of persistent data.</p> <p><b>Additional Information:</b></p> <p>Persistent storages can be updated, including values in a key-value storage and files in a file storage. The update strategy and updated data is provided by the manifest.</p>
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]

### [RS\_PER\_00014] Rollback

*Upstream requirements:* [RS\\_Main\\_00150](#), [RS\\_Main\\_00503](#)

[

<b>Description:</b>	<p>Persistency shall support rollback of persistent data.</p> <p><b>Additional Information:</b></p> <p>Persistent storages can be reset to the previous content in case an update failed. Downgrade to a previous version is not supported.</p>
---------------------	---

]

### [RS\_PER\_00016] Cleanup

Upstream requirements: [RS\\_Main\\_00150](#), [RS\\_Main\\_00503](#)

[

<b>Description:</b>	<p>Persistency shall support cleanup after an update of persistent data.</p> <p><b>Additional Information:</b></p> <p>After an update was finalized, it is possible to clean up the backup data created during an update for a potential rollback.</p>
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]

## 4.2.6 Resource handling for Persistent Data

### [RS\_PER\_00011] Storage Quota

Upstream requirements: [RS\\_Main\\_00011](#)

[

<b>Description:</b>	<p>Persistency shall be able to limit the amount of storage used by persistent data.</p> <p><b>Additional Information:</b></p> <p>The storage space allocated by persistent data is monitored continuously, similar to a file system quota.</p>
<b>Rationale:</b>	Reliable access to data storages.

]

### [RS\_PER\_00017] Storage Size

Upstream requirements: [RS\\_Main\\_00440](#)

[

<b>Description:</b>	Persistency shall be able to report the amount of currently used storage.
---------------------	---

]

## 4.3 Non-Functional Requirements

Persistency currently does not have any non-functional requirements.

## 5 Requirements Tracing

The following table references the requirements specified in the [3, AUTOSAR Main Requirements] and the [4, AUTOSAR Safety Requirements], and links to the fulfillments of these.

Requirement	Description	Satisfied by
[RS_Main_00011]	Mechanisms for Reliable Systems	[RS_PER_00008] [RS_PER_00009] [RS_PER_00011] [RS_PER_00018]
[RS_Main_00150]	AUTOSAR shall support the deployment and reallocation of AUTOSAR Application Software	[RS_PER_00012] [RS_PER_00013] [RS_PER_00014] [RS_PER_00016]
[RS_Main_00440]	AUTOSAR shall standardize access to non-volatile memory	[RS_PER_00001] [RS_PER_00002] [RS_PER_00003] [RS_PER_00004] [RS_PER_00010] [RS_PER_00017]
[RS_Main_00503]	AUTOSAR shall support change of communication and application software at runtime.	[RS_PER_00012] [RS_PER_00013] [RS_PER_00014] [RS_PER_00016]
[RS_Main_00514]	System Security Support	[RS_PER_00005] [RS_PER_00019]
[RS_SAF_10039]	AUTOSAR shall support mechanisms to detect unintended alteration of data.	[RS_PER_00008]
[RS_SAF_10040]	AUTOSAR shall support data recovery mechanisms.	[RS_PER_00009]

**Table 5.1: Requirements Tracing**



## 6 References

- [1] Standardization Template  
AUTOSAR\_FO\_TPS\_StandardizationTemplate
- [2] Glossary  
AUTOSAR\_FO\_TR\_Glossary
- [3] Main Requirements  
AUTOSAR\_FO\_RS\_Main
- [4] Safety Requirements for AUTOSAR Adaptive Platform and AUTOSAR Classic Platform  
AUTOSAR\_FO\_RS\_Safety

## A History of Requirements

Please note that the lists in this chapter also include requirements that have been removed from the specification in a later version. These requirements do not appear as hyperlinks in the document.

### A.1 Requirement History of this Document According to AUTOSAR Release 17-03

#### A.1.1 Added Requirements in 17-03

[\[RS\\_PER\\_00001\]](#) [\[RS\\_PER\\_00002\]](#) [\[RS\\_PER\\_00003\]](#) [\[RS\\_PER\\_00004\]](#)

#### A.1.2 Changed Requirements in 17-03

none

#### A.1.3 Deleted Requirements in 17-03

none

### A.2 Requirement History of this Document According to AUTOSAR Release 17-10

#### A.2.1 Added Requirements in 17-10

[\[RS\\_PER\\_00005\]](#) [\[RS\\_PER\\_00007\]](#) [\[RS\\_PER\\_00008\]](#) [\[RS\\_PER\\_00009\]](#)

#### A.2.2 Changed Requirements in 17-10

[\[RS\\_PER\\_00001\]](#) [\[RS\\_PER\\_00002\]](#) [\[RS\\_PER\\_00003\]](#) [\[RS\\_PER\\_00004\]](#)

#### A.2.3 Deleted Requirements in 17-10

none

### **A.3 Requirement History of this Document According to AUTOSAR Release 18-03**

#### **A.3.1 Added Requirements in 18-03**

[\[RS\\_PER\\_00010\]](#)

#### **A.3.2 Changed Requirements in 18-03**

[\[RS\\_PER\\_00002\]](#) [\[RS\\_PER\\_00003\]](#) [\[RS\\_PER\\_00004\]](#) [\[RS\\_PER\\_00008\]](#)

#### **A.3.3 Deleted Requirements in 18-03**

[\[RS\\_PER\\_00007\]](#)

### **A.4 Requirement History of this Document According to AUTOSAR Release 18-10**

#### **A.4.1 Added Requirements in 18-10**

[\[RS\\_PER\\_00011\]](#) [\[RS\\_PER\\_00012\]](#) [\[RS\\_PER\\_00013\]](#) [\[RS\\_PER\\_00014\]](#) [\[RS\\_PER\\_00015\]](#) [\[RS\\_PER\\_00016\]](#)

#### **A.4.2 Changed Requirements in 18-10**

none

#### **A.4.3 Deleted Requirements in 18-10**

none

### **A.5 Requirement History of this Document According to AUTOSAR Release 19-03**

#### **A.5.1 Added Requirements in 19-03**

none

## **A.5.2 Changed Requirements in 19-03**

[\[RS\\_PER\\_00001\]](#)

## **A.5.3 Deleted Requirements in 19-03**

[\[RS\\_PER\\_00016\]](#)

## **A.6 Requirement History of this Document According to AUTOSAR Release R19-11**

### **A.6.1 Added Requirements in R19-11**

[\[RS\\_PER\\_00017\]](#) [\[RS\\_PER\\_00018\]](#)

### **A.6.2 Changed Requirements in R19-11**

none

### **A.6.3 Deleted Requirements in R19-11**

none

## **A.7 Requirement History of this Document According to AUTOSAR Release R20-11**

### **A.7.1 Added Requirements in R20-11**

none

### **A.7.2 Changed Requirements in R20-11**

[\[RS\\_PER\\_00004\]](#)

### **A.7.3 Deleted Requirements in R20-11**

none

## **A.8 Requirement History of this Document According to AUTOSAR Release R21-11**

### **A.8.1 Added Requirements in R21-11**

[\[RS\\_PER\\_00016\]](#)

### **A.8.2 Changed Requirements in R21-11**

[\[RS\\_PER\\_00001\]](#) [\[RS\\_PER\\_00004\]](#) [\[RS\\_PER\\_00008\]](#) [\[RS\\_PER\\_00009\]](#) [\[RS\\_PER\\_00012\]](#) [\[RS\\_PER\\_00013\]](#)

### **A.8.3 Deleted Requirements in R21-11**

[\[RS\\_PER\\_00015\]](#)

## **A.9 Requirement History of this Document According to AUTOSAR Release R22-11**

### **A.9.1 Added Requirements in R22-11**

[\[RS\\_PER\\_NA\]](#)

### **A.9.2 Changed Requirements in R22-11**

none

### **A.9.3 Deleted Requirements in R22-11**

none

## **A.10 Requirement History of this Document According to AUTOSAR Release R23-11**

### **A.10.1 Added Requirements in R23-11**

[\[RS\\_PER\\_00019\]](#)

### **A.10.2 Changed Requirements in R23-11**

[RS\_PER\_00001] [RS\_PER\_00002] [RS\_PER\_00003] [RS\_PER\_00004] [RS\_PER\_00005] [RS\_PER\_00008] [RS\_PER\_00009] [RS\_PER\_00010] [RS\_PER\_00011] [RS\_PER\_00012] [RS\_PER\_00013] [RS\_PER\_00014] [RS\_PER\_00016] [RS\_PER\_00017] [RS\_PER\_00018]

### **A.10.3 Deleted Requirements in R23-11**

none

## **A.11 Requirement History of this Document According to AUTOSAR Release R24-11**

### **A.11.1 Added Requirements in R24-11**

none

### **A.11.2 Changed Requirements in R24-11**

none

### **A.11.3 Deleted Requirements in R24-11**

none

## B Not Applicable Requirements

### [RS\_PER\_NA]

*Upstream requirements:* RS\_Main\_00049, RS\_Main\_00050, RS\_Main\_00106, RS\_Main\_00650,  
RS\_Main\_01002, RS\_Main\_01004, RS\_Main\_01005, RS\_Main\_01007,  
RS\_SAF\_00007, RS\_SAF\_10027, RS\_SAF\_10041, RS\_SAF\_10042

[These requirements are not applicable to this specification.]