Document Title	Requirements on Update and Configuration Management
Document Category	Requirement specification (RS)
Document UID	887
Document Status	published
Part of AUTOSAR Standard	Adaptive Platform
Part of Standard Release	R26-11

Document Change History			
Date	**Release**	**Changed by**	**Description**
2026-11-26	R26-11	AUTOSAR Release Management	• Validation of draft requirements
2025-11-27	R25-11	AUTOSAR Release Management	• Removal of RS_Main uptracing
2024-11-27	R24-11	AUTOSAR Release Management	• Introduced suspend and resume requirement • Introduced standardized trace points requirement
2023-11-23	R23-11	AUTOSAR Release Management	• Split document with RS Vehicle Update And Configuration Management
2022-11-24	R22-11	AUTOSAR Release Management	• Updated tracing to RS_SAF document
2021-11-25	R21-11	AUTOSAR Release Management	• Renamed to RS_UpdateAnd-ConfigurationManagement
2020-11-30	R20-11	AUTOSAR Release Management	• Added traceability to RS SAFETY document
2019-11-28	R19-11	AUTOSAR Release Management	• Added UCM Master concept requirements • Changed Document Status from Final to published
2019-03-29	19-03	AUTOSAR Release Management	• Spelling fixes • Minor explanation improvements

△

2018-10-31	18-10	AUTOSAR Release Management	• Requirements on Operating System updates • Requirement on Security • Requirement on History
2017-03-29	18-03	AUTOSAR Release Management	• Requirements on Software Updates • Requirements on Data Transfer • Requirements on Version Reporting • Requirements on Validation
2017-10-27	17-10	AUTOSAR Release Management	• Initial release

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1 Scope of Document

This document specifies requirements of the AUTOSAR Adaptive Platform on the Update and Configuration Management (UCM). The motivation of UCM is to provide a standardized way to install, update and uninstall software on the adaptive platform safely and securely.

2 Conventions to be used

The representation of requirements in AUTOSAR documents follows the table specified in [TPS_STDT_00078], see [1, Standardization Template].

The verbal forms for the expression of obligation specified in [TPS_STDT_00053] shall be used to indicate requirements, see [1, Standardization Template].

3 Acronyms and abbreviations

The glossary below includes acronyms and abbreviations relevant to the UCM module that are not included in the AUTOSAR TR Glossary.

Abbreviation / Acronym:	Description:
UCM	Update and Configuration Management
UCM Master	UCM Master is distributing packages and coordinating an update campaign in a vehicle
Backend	Backend is a server hosting Software Packages
Platform Health Manager	The Platform Health Manager functional cluster performs health monitoring on the AUTOSAR Adaptive Platform

Table 3.1: Acronyms and Abbreviations

Below acronyms and abbreviations relevant for this document are included in the AUTOSAR TR Glossary. This is to avoid duplicate definition of the technical term. And to refer to the correct document.

Term	Description:
Adaptive Application	see AUTOSAR TR Glossary
AUTOSAR Adaptive Platform	see AUTOSAR TR Glossary
Functional Cluster	see AUTOSAR TR Glossary
Service	see AUTOSAR TR Glossary
Electronic Control Unit	see AUTOSAR TR Glossary
Machine	see AUTOSAR TR Glossary
Manifest	see AUTOSAR TR Glossary
Software Package	see AUTOSAR TR Glossary
Software Cluster	see AUTOSAR TR Glossary
Vehicle Package	see AUTOSAR TR Glossary

Table 3.2: Reference to Technical Terms

4 Constraints and assumptions

This chapter lists known limitations of UCM in terms of unimplemented requirements. The intent is to provide an indication how the AUTOSAR Adaptive Platform will evolve in future releases.

The functionality described above is subject to modification and will be considered for inclusion in a future release of this document.

5 Requirements Specification

This chapter describes all requirements driving the work to define the AUTOSAR_RS_UpdateAndConfigurationManagement.

5.1 Functional Overview

One of the declared goals of AUTOSAR Adaptive Platform is the ability to flexibly update the software and its configuration through local (“tester-based”) or remote (“over-the-air”) updates. UCM provides services for updating the software and its configuration running on AUTOSAR Adaptive Platform. UCM is responsible for updates of Adaptive Applications and changes to the AUTOSAR Adaptive Platform itself, including all functional clusters and the underlying OS. Therefore this document includes requirements on the following functionalities:

- Installation of new software:
  - Install software
  - Install persistent data for the software
- Update of already installed software:
  - Update software
  - Update persistent data for the software
- Uninstallation of installed software:
  - Remove software
  - Remove data created by the software
- Providing information of installed software:
  - Names of installed software
  - Versions of installed software
- Security and safety of the update process
  - Authenticity and integrity validation
  - Software dependency check
  - Recovery of software after failure during update process

5.2 Functional Requirements

5.2.1 Functional Cluster initialization

[RS_UCM_00044] UCM Initialization ⌈

Description:	UCM shall be intialized before offering any services.
Rationale:	Calling APIs from uninitialized Functional Clusters that depend on prior initialization cannot be performed properly and may lead to undefined behavior. Therefore the API is only offered after internal initialization is completed.
Dependencies:	–
Use Case:	Startup of functional cluster.
Supporting Material:	–

⌋

5.2.2 Versions reporting

[RS_UCM_00002] UCM Version Information Reporting ⌈

Description:	UCM shall provide functionality to retrieve version information describing the software installed on AUTOSAR Adaptive Platform.
Rationale:	AUTOSAR Adaptive Platform shall support keeping software up-to-date through vehicle's lifecycle.
Dependencies:	–
Use Case:	Retrieve version information of the installed software to determine which software needs to be installed, updated or removed.
Supporting Material:	–

⌋

[RS_UCM_00010] UCM Download Status Reporting ⌈

Description:	UCM shall provide functionality to retrieve information describing the software downloaded, but not activated on AUTOSAR Adaptive Platform
Rationale:	AUTOSAR Adaptive Platform shall support downloading data and continuing it after re-establishing a lost connection.
Dependencies:	–
Use Case:	Retrieve list of downloaded packages to know which data still needs to be downloaded and which has been already downloaded and can now be installed.
Supporting Material:	–

⌋

[RS_UCM_00011] UCM Pending Changes Reporting ⌈

Description:	After processing one or several Software Packages, UCM shall support reporting pending changes that are intended to be introduced to software configuration.
Rationale:	AUTOSAR Adaptive Platform shall support retrieving information which changes shall be activated when update sequence goes through activation phase.
Dependencies:	–
Use Case:	Retrieve list of installed software in order to check that all intended software have been installed and are ready for activation.
Supporting Material:	–

⌋

5.2.3 Data management

[RS_UCM_00013] UCM Resource Availability Check ⌈

Description:	UCM shall assure that it has enough resources to receive, process and store the Software Package and associated data.
Rationale:	AUTOSAR Adaptive Platform shall protect itself from resource starvation. Resources may be for example memory, CPU time or network sockets. The resource check only covers the installation process. It is the responsibility of the integrator creating the Software Package to ensure enough resources for actual execution are available on the AUTOSAR Adaptive Platform (e.g. RAM, CPU time).
Dependencies:	–
Use Case:	Deny further transfers if no more resources for additional clients are available.
Supporting Material:	–

⌋

[RS_UCM_00014] UCM Download Completion Check ⌈

Description:	UCM shall verify if the size of the received data is the same as the allocated amount stated in the download request in order to ensure the download was successful.
Rationale:	UCM shall make sure complete Software Package was transferred.
Dependencies:	[RS_UCM_00013]
Use Case:	UCM shall assure that same amount of data has been transferred as was reserved in the downloaded request.
Supporting Material:	–

⌋

[RS_UCM_00015] UCM Processing Cleanup processing has finished ⌈

Description:	UCM shall remove all unneeded data such as logs, possible backups after Software Package processing has finished.
Rationale:	UCM shall make sure all unneeded resources are freed after Software Package processing has finished.
Dependencies:	–
Use Case:	At the end of update process UCM shall remove log files, stored backups for Software Package and other temporary items created during update process.
Supporting Material:	–

⌋

5.2.4 Data transfer

[RS_UCM_00025] UCM Download of Software Packages ⌈

Description:	UCM shall receive the Software Package from a Client.
Rationale:	AUTOSAR Adaptive Platform shall support receiving updates using the ara::com service interface only. Therefore no local, e.g. file-based transfer shall be used.
Dependencies:	–
Use Case:	Receive Software Package(s) from a DSA(Diagnostic Service Application).
Supporting Material:	–

⌋

[RS_UCM_00019] UCM Simultaneous Transfer of multiple Software Packages ⌈

Description:	UCM shall support simultaneous transfers of multiple Software Packages.
Rationale:	AUTOSAR Adaptive Platform shall support multiple update sources. Therefore several clients shall be able to transfer Software Packages to UCM simultaneously.
Dependencies:	[RS_UCM_00025]
Use Case:	Receive Software Package(s) from a DSA(Diagnostic Service Application).
Supporting Material:	–

⌋

5.2.5 Software updates

[RS_UCM_00001] UCM Software Install on AUTOSAR Adaptive Platform ⌈

Description:	UCM shall provide functionality to install new software on the AUTOSAR Adaptive Platform.
Rationale:	AUTOSAR Adaptive Platform shall support keeping software up-to-date and to introduce new features through out vehicles life cycle.
Dependencies:	–
Use Case:	Introduce new functionality with new Adaptive Application or replace old functionality by replacing old Adaptive Application with new Adaptive Application.
Supporting Material:	–

⌋

[RS_UCM_00028] UCM Functional Cluster Update ⌈

Description:	UCM shall provide functionality to update the AUTOSAR Adaptive Platform.
Rationale:	AUTOSAR Adaptive Platform shall support keeping the AUTOSAR Adaptive Platform up-to-date and to introduce fixes to the AUTOSAR Adaptive Platform software.
Dependencies:	–
Use Case:	Updating the AUTOSAR Adaptive Platform with latest features and fixes.
Supporting Material:	–

⌋

[RS_UCM_00029] UCM Operating System Update ⌈

Description:	UCM shall provide functionality to update the Operating System hosting the AUTOSAR Adaptive Platform.
Rationale:	AUTOSAR Adaptive Platform shall provide support for updating the entire vehicle software, including the Operating System under hosting the AUTOSAR Adaptive Platform, in order to enable updating Operating System with fixes and new features through out the life-cycle of the vehicle.
Dependencies:	–
Use Case:	Over-the-air updates including Operating System updates.
Supporting Material:	–

⌋

[RS_UCM_00003] UCM Software Update on AUTOSAR Adaptive Platform ⌈

Description:	UCM shall provide functionality to update already installed software.
Rationale:	AUTOSAR Adaptive Platform shall support keeping software up-to-date through vehicle's life cycle.
Dependencies:	–
Use Case:	Update an application to achieve updated or fixed functionality.
Supporting Material:	–

⌋

[RS_UCM_00020] UCM Cancellation of Update or Install Operation ⌈

Description:	UCM shall support cancellation of an update or install operation.
Rationale:	AUTOSAR Adaptive Platform shall support cancel of an update on user request.
Dependencies:	–
Use Case:	User can request cancellation of an operation if the installation or update is unwanted.
Supporting Material:	–

⌋

[RS_UCM_00026] UCM Sequential Processing ⌈

Description:	UCM shall process installation of new software, updates and removal of Software Packages sequentially, only one Software Package can be processed concurrently.
Rationale:	AUTOSAR Adaptive Platform shall support safe installation of Software Packages, therefore it shall not be possible to apply several modifications to installed software simultaneously.
Dependencies:	–
Use Case:	Software Packages are transferred by multiple clients. One client starts installing, the other has to wait until installation is finished to install packages transferred by it.
Supporting Material:	–

⌋

[RS_UCM_00004] UCM Software Removal on AUTOSAR Adaptive Platform ⌈

Description:	UCM shall provide functionality to uninstall already installed software.
Rationale:	AUTOSAR Adaptive Platform shall support removing unwanted, outdated or malfunctioning software.
Dependencies:	–

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Use Case:	Uninstall an application which will be replaced with other installed application or which is not needed anymore.
Supporting Material:	–

⌋

[RS_UCM_00005] UCM Removal of Persistent Data Owned by Uninstalled Software ⌈

Description:	UCM shall make sure that also persistent data is deleted with uninstalled software.
Rationale:	Make sure the uninstall process does not leave unused data.
Dependencies:	–
Use Case:	Make sure install and uninstall cycle do not leave unused data and does not cause memory issues.
Supporting Material:	–

⌋

[RS_UCM_00021] UCM Atomic Activation of Installed, Updated or Removed Software Clusters ⌈

Description:	UCM shall support atomic activation of installed or updated Software Clusters.
Rationale:	UCM shall apply the modifications to NVM in an inactive memory area and atomically switch when the modifications are finished.
Dependencies:	–
Use Case:	Install or update Software Clusters.
Supporting Material:	–

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[RS_UCM_00008] UCM Recovery Mechanism in case of Failed Activation

Upstream requirements: RS_SAF_10027

⌈

Description:	UCM shall assure that, in case of failed update process, the system will recover to the state it was before the update process started.
Rationale:	A failed update shall not result in a loss of desired functionality of the AUTOSAR Adaptive Platform.
Dependencies:	[RS_UCM_00021]
Use Case:	After a failed remote update the AUTOSAR Adaptive Platform recovers to the previous system state.

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Supporting Material:	–

⌋

[RS_UCM_00018] UCM Announcement of Software Changes ⌈

Description:	UCM shall make information available for other Functional Clusters that software configuration has changed.
Rationale:	Several Functional Clusters need to be constantly aware of current software features or configurations have been changed.
Use Case:	UCM shall provide information of installed or updated application for Functional Clusters which subscribed to this information. E.g. Execution Manager to manage start of the application or for Health Manager to monitor the functionality of the application.
Dependencies:	–
Supporting Material:	–

⌋

[RS_UCM_00027] UCM Safe Recovery from Unexpected Interruption

Upstream requirements: RS_SAF_10027

⌈

Description:	At startup, UCM shall be able to identify if some action was interrupted and exited in an uncontrolled way and needs to be reverted or finished to return the software into the previous state.
Rationale:	UCM shall make sure that software should not be started up into inconsistent and not updatable state.
Use Case:	After unexpected reset or crash UCM shall identify that there was an interruption while an action was on going and UCM shall handle this by reverting or by finishing the unfinished action.
Dependencies:	–
Supporting Material:	–

⌋

[RS_UCM_00031] UCM Downgrade Protection ⌈

Description:	UCM shall check that the version of the provided Software Package is not older, than the one that has been installed previously and prevent any attempt to install it.
Rationale:	UCM shall prevent installation of a version containing vulnerabilities which would allow security exploitation.
Use Case:	An attacker could explore security vulnerabilities in the older version to hack the AUTOSAR Adaptive Platform.

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Dependencies:	–
Supporting Material:	–

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[RS_UCM_00047] UCM Support for Suspending and Resuming of Updates ⌈

Description:	UCM shall provide functionality to suspend and resume ongoing processes during an update.
Rationale:	
Dependencies:	–
Use Case:	When processing of a big package or having long cleaning up, there is a high chance that there is a need to suspend due to shutdown of Machine or switch to a specific state or driving mode that forbids background processing due to safety considerations.
Supporting Material:	–

⌋

5.2.6 History, progress and status

[RS_UCM_00023] UCM Progress Reporting ⌈

Description:	UCM shall provide an interface to read progress of the update.
Rationale:	
Dependencies:	–
Use Case:	Provide progress information in order to indicate to the user of the off-board tester that ongoing update is alive and progressing.
Supporting Material:	During a UCM operation the user would like to have an idea of how long will it take to complete the operation and if an error occurs.

⌋

[RS_UCM_00024] UCM State Reporting ⌈

Description:	UCM shall provide an interface to read the status of UCM.
Rationale:	UCM shall provide its state to clients which can then react on changing states.
Dependencies:	–
Use Case:	One client is installing packages, another client has to wait until the state allows the next operation.
Supporting Material:	–

⌋

[RS_UCM_00032] UCM Action History ⌈

Description:	UCM shall provide an interface to return UCM's action history.
Rationale:	UCM shall provide its action history to help AUTOSAR Adaptive Platform troubleshooting.
Dependencies:	–
Use Case:	In order to investigate the lifecycle of the Adaptive Platform an interface for extracting UCM's action history has to be provided.
Supporting Material:	–

⌋

[RS_UCM_00045] UCM Production Errors ⌈

Description:	UCM shall report its production errors to diagnostic manager.
Rationale:	Production errors are reported to user and used for diagnostic purpose.
Dependencies:	–
Use Case:	Report production errors like failing rollback.
Supporting Material:	–

⌋

5.2.7 Validation

[RS_UCM_00006] UCM Software Package Cryptographic Protection ⌈

Description:	UCM shall only allow installation of authenticated Software Packages on the Adaptive Platform.
Rationale:	AUTOSAR Adaptive Platform shall ensure that Software Packages are unmodified and come from trusted origins.
Dependencies:	–
Use Case:	Protection of AUTOSAR Adaptive Platform from hacking attempts from untrusted origin.
Supporting Material:	–

⌋

[RS_UCM_00012] UCM Software Package Consistency Protection

Upstream requirements: RS_SAF_10039

⌈

Description:	UCM shall check the consistency of the received Software Package.
Rationale:	AUTOSAR Adaptive Platform shall make sure that the Software Package can be installed safely.
Dependencies:	–
Use Case:	To detect possible errors which might have occurred during creation of the Software Package, UCM shall check that provided Software Package meta-data and content match.
Supporting Material:	–

⌋

[RS_UCM_00007] UCM Dependency Check ⌈

Description:	UCM shall check dependencies configured for a Software Package.
Rationale:	AUTOSAR Adaptive Platform shall make sure that the dependencies of the considered package are fulfilled.
Dependencies:	–
Use Case:	Check that installed software is able to run with all needed dependencies available on AUTOSAR Adaptive Platform.
Supporting Material:	–

⌋

[RS_UCM_00030] UCM Software Verification

Upstream requirements: RS_SAF_10002

⌈

Description:	UCM shall require the updated software to be executed and verified before declaring that SW was successfully activated.
Rationale:	UCM shall declare activation to be successful only after it detects that Execution Manager can execute the software successfully.
Dependencies:	–
Use Case:	Ensuring that safety-critical application can be executed and thus monitored by the Platform Health Manager.
Supporting Material:	–

⌋

5.2.8 Standardization of Log and Trace Messages

[RS_UCM_00046] UCM Trace Points ⌈

Description:	UCM shall support standardized trace points during the update process.
Rationale:	Providing standardized trace points during update process provides information of the ongoing events during different phases of update like transfer, processing, and activation.
Dependencies:	ara::log
Use Case:	Tracing of different phases during update.
Supporting Material:	–

⌋

6 References

[1] Standardization Template
AUTOSAR_FO_TPS_StandardizationTemplate

A Change history of AUTOSAR traceable items

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

A.1 Traceable item history of this document according to AUTOSAR Release R23-11

A.1.1 Added Requirements in R23-11

Number	Heading
[RS_UCM_00045]	UCM shall report production errors

Table A.1: Added Requirements in R23-11

A.1.2 Changed Requirements in R23-11

none

A.1.3 Deleted Requirements in R23-11

Number	Heading
[RS_UCM_00033]	UCM Master shall support reporting version information of a complete vehicle
[RS_UCM_00034]	UCM Master shall record all UCM Master's action history
[RS_UCM_00035]	UCM Master shall coordinate software update in a vehicle across multiple Electronic Control Units
[RS_UCM_00036]	UCM Master shall use platform communication services for interacting with UCM subordinates
[RS_UCM_00037]	UCM Master shall ensure it is safe to perform any modification to the vehicle
[RS_UCM_00038]	UCM Master shall interact with driver
[RS_UCM_00039]	UCM Master shall prevent processing of compromised Vehicle Packages
[RS_UCM_00042]	UCM Master shall provide an interface to read the state of an update campaign
[RS_UCM_00043]	UCM Master shall orchestrate a software update campaign according to the Vehicle Package's Manifest

Table A.2: Deleted Requirements in R23-11

A.2 Traceable item history of this document according to AUTOSAR Release R24-11

A.2.1 Added Requirements in R24-11

Number	Heading
[RS_UCM_00046]	UCM shall support standardized trace points
[RS_UCM_00047]	UCM Support for Update Suspend and Resume.

Table A.3: Added Requirements in R24-11

A.2.2 Changed Requirements in R24-11

none

A.2.3 Deleted Requirements in R24-11

none

A.3 Traceable item history of this document according to AUTOSAR Release R25-11

A.3.1 Added Requirements in R25-11

none

A.3.2 Changed Requirements in R25-11

none

A.3.3 Deleted Requirements in R25-11

none

A.4 Traceable item history of this document according to AUTOSAR Release R26-11

A.4.1 Added Requirements in R26-11

none

A.4.2 Changed Requirements in R26-11

none

A.4.3 Deleted Requirements in R26-11

none