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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 Standardization Template TPS-StandardizationTemplate, chapter Support for Traceability.

The verbal forms for the expression of obligation specified in [TPS_STDT_-00053] shall be used to indicate requirements, see Standardization Template TPS-StandardizationTemplate, chapter Support for Traceability.

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 initialized before starting to provide 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:	–

](RS_Main_00514)

5.2.2 Versions reporting

[RS_UCM_00002] UCM shall support reporting version information for an AUTOSAR Adaptive Platform [

Description:	The 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_Main_00150, RS_Main_00503)

[RS_UCM_00010] UCM shall support reporting of Software Packages downloaded for AUTOSAR Adaptive Platform [

Description:	The 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:	–
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|(RS_Main_00150, RS_Main_00503)

[RS_UCM_00011] UCM shall support reporting software versions which have been installed and will be activated when new versions are activated [

Description:	After processing one or several Software Packages , UCM shall support reporting 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:	–

|(RS_Main_00150, RS_Main_00503)

5.2.3 Data management

[RS_UCM_00013] UCM shall check that it has enough resources to receive, process and store the [Software Package](#) and associated data [

Description:	UCM shall assure that it has enough resources to receive, process and store the Software Package and associated data. 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).
Rationale:	AUTOSAR Adaptive Platform shall protect itself from resource starvation.
Dependencies:	–
Use Case:	Deny further transfers if no more resources for additional clients are available.
Supporting Material:	–

|(RS_Main_00150, RS_Main_00503)

[RS_UCM_00014]{DRAFT} UCM shall check that correct amount of data has been transferred for the [Software Package](#) [

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
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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_Main_00150](#), [RS_Main_00503](#))

[RS_UCM_00015]{DRAFT} UCM shall remove all unneeded data after [Software Package](#) 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:	–

]([RS_Main_00150](#), [RS_Main_00503](#))

5.2.4 Data transfer

[RS_UCM_00025] UCM shall support receiving of [Software Package](#) data [

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_Main_00503](#))

[RS_UCM_00019] UCM shall support simultaneous transfers 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:	–

]([RS_Main_00503](#))

5.2.5 Software updates

[RS_UCM_00001]{DRAFT} UCM shall support installing new software on [AUTOSAR Adaptive Platform](#) [

Description:	The 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_Main_00150](#), [RS_Main_00503](#))

[RS_UCM_00028]{DRAFT} UCM shall support updating [Functional Clusters](#) [

Description:	The 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_Main_00150](#), [RS_Main_00503](#))

[RS_UCM_00029]{DRAFT} UCM shall support updating the underlying Operating System [

Description:	The 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_Main_00150, RS_Main_00503)

[RS_UCM_00003]{DRAFT} UCM shall support updating installed software on 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_Main_00150, RS_Main_00503)

[RS_UCM_00020]{DRAFT} UCM shall support cancellation of an 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_Main_00150, RS_Main_00503)

[RS_UCM_00026] UCM shall process installation of new Software Packages, updates and removal of existing Software Packages sequentially [

Description:	UCM shall process installation of new software, updates and removal of Software Packages sequentially, only one Software Package can be processed in time.
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_Main_00150, RS_Main_00503)

[RS_UCM_00004]{DRAFT} UCM shall support uninstalling software on AUTOSAR Adaptive Platform [

Description:	The UCM shall provide functionality to uninstall already installed software.
Rationale:	AUTOSAR Adaptive Platform shall support removing unwanted, outdated or malfunctioning software.
Dependencies:	–
Use Case:	Uninstall an application which will be replaced with other installed application or which is not needed anymore.
Supporting Material:	–

](RS_Main_00150, RS_Main_00503)

[RS_UCM_00005]{DRAFT} UCM shall make sure that persistent data owned by uninstalled software is deleted [

Description:	The 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_Main_00150, RS_Main_00503)

[RS_UCM_00021]{DRAFT} UCM shall support atomic activation of installed or updated 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:	–

]([RS_Main_00150](#), [RS_Main_00503](#))

[RS_UCM_00008]{DRAFT} UCM shall support a recovery mechanism in case of failed activation [

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.
Supporting Material:	–

]([RS_Main_00150](#), [RS_Main_00503](#), [RS_Main_00011](#), [RS_SAF_10027](#))

[RS_UCM_00018] UCM shall announce when an application has been installed, updated or uninstalled [

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_Main_00150](#), [RS_Main_00503](#))

[RS_UCM_00027]{DRAFT} UCM shall be able to safely recover from unexpected interruption. [

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_Main_00150](#), [RS_Main_00503](#), [RS_SAF_10027](#))

[RS_UCM_00031]{DRAFT} UCM shall prevent installation of arbitrary previous version of an Adaptive Application or the Adaptive Platform [

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 .
Dependencies:	–
Supporting Material:	–

]([RS_Main_00150](#))

5.2.6 History, progress and status

[RS_UCM_00023]{DRAFT} UCM shall provide an interface to read progress of the update [

Description:	UCM shall provide an interface to read progress of the update
Rationale:	Make the information available to user
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_Main_00150](#))

[RS_UCM_00024]{DRAFT} UCM shall provide an interface to read the state of UCM
[

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_Main_00503)

[RS_UCM_00032]{DRAFT} UCM shall provide an interface to return UCM's 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_Main_00150)

[RS_UCM_00045]{DRAFT} UCM shall report production errors [

Description:	The UCM production errors shall be reported 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:	–

](RS_Main_00011)

5.2.7 Validation

[RS_UCM_00006]{DRAFT} UCM shall verify Software Package authenticity and integrity using strong cryptographic techniques [

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_Main_00150, RS_Main_00503)

[RS_UCM_00012]{DRAFT} UCM shall check the consistency of transferred Software Package [

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_Main_00150, RS_Main_00503, RS_SAF_10039)

[RS_UCM_00007]{DRAFT} UCM shall check that software dependencies are fulfilled [

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_Main_00150, RS_Main_00503)

[RS_UCM_00030]{DRAFT} UCM shall be able to verify the updated software during activation [

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:	–

] ([RS_Main_00150](#), [RS_Main_00503](#), [RS_SAF_10002](#))

6 Requirements Tracing

The following table references the features specified in [1] and links to the fulfillments of these.

Requirement	Description	Satisfied by
[RS_Main_00011]	Mechanisms for Reliable Systems	[RS_UCM_00008] [RS_UCM_00045]
[RS_Main_00150]	AUTOSAR shall support the deployment and reallocation of AUTOSAR Application Software	[RS_UCM_00001] [RS_UCM_00002] [RS_UCM_00003] [RS_UCM_00004] [RS_UCM_00005] [RS_UCM_00006] [RS_UCM_00007] [RS_UCM_00008] [RS_UCM_00010] [RS_UCM_00011] [RS_UCM_00012] [RS_UCM_00013] [RS_UCM_00014] [RS_UCM_00015] [RS_UCM_00018] [RS_UCM_00020] [RS_UCM_00021] [RS_UCM_00023] [RS_UCM_00026] [RS_UCM_00027] [RS_UCM_00028] [RS_UCM_00029] [RS_UCM_00030] [RS_UCM_00031] [RS_UCM_00032]
[RS_Main_00503]	AUTOSAR shall support change of communication and application software at runtime.	[RS_UCM_00001] [RS_UCM_00002] [RS_UCM_00003] [RS_UCM_00004] [RS_UCM_00005] [RS_UCM_00006] [RS_UCM_00007] [RS_UCM_00008] [RS_UCM_00010] [RS_UCM_00011] [RS_UCM_00012] [RS_UCM_00013] [RS_UCM_00014] [RS_UCM_00015] [RS_UCM_00018] [RS_UCM_00019] [RS_UCM_00020] [RS_UCM_00021] [RS_UCM_00024] [RS_UCM_00025] [RS_UCM_00026] [RS_UCM_00027] [RS_UCM_00028] [RS_UCM_00029] [RS_UCM_00030]
[RS_Main_00514]	System Security Support	[RS_UCM_00044]
[RS_SAF_10002]	AUTOSAR shall provide mechanisms to support safe verification mechanisms of platform basic software modules, functional-clusters, software components, applications, services and their respective configuration data.	[RS_UCM_00030]
[RS_SAF_10027]	AUTOSAR shall provide mechanisms to prevent the loss of a valid configuration.	[RS_UCM_00008] [RS_UCM_00027]
[RS_SAF_10039]	AUTOSAR shall support mechanisms to detect unintended alteration of data.	[RS_UCM_00012]

Table 6.1: RequirementsTracing

7 References

- [1] Main Requirements
AUTOSAR_FO_RS_Main

A Appendix

B 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.

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

B.1.1 Added Requirements in R23-11

Number	Heading
[RS_UCM_00045]	UCM shall report production errors

Table B.1: Added Requirements in R23-11

B.1.2 Changed Requirements in R23-11

none

B.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 B.2: Deleted Requirements in R23-11