

Assignment Stage (AUTOSAR)

Project Training –Automotive Overview

30/07/2024

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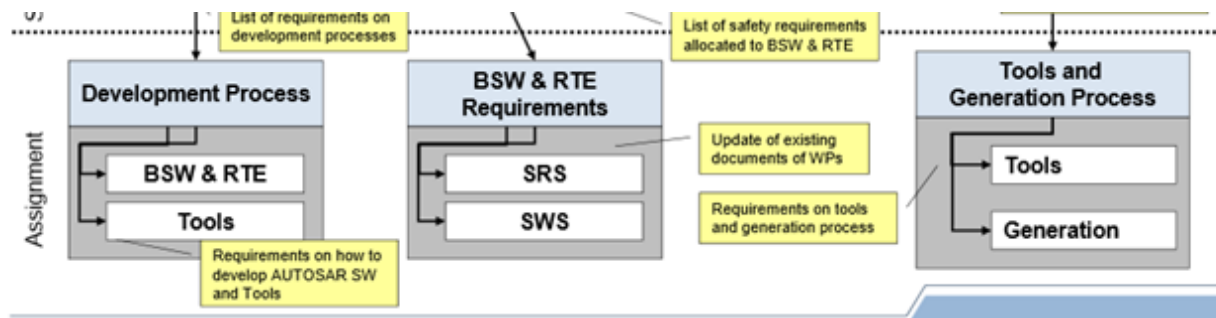
Version: 1.0

Created: 30/07/2024

Last Updated: 30/07/2024

Status: DRAFT (The status would change to finalized post the BA, PM and dev team review and sign off)

TASK: ELABORATE THE ASSIGNMENT STAGE OF AUTOSAR WITH DETAILED EXPLANATION OF THE COMPONENTS



The assignment stage deals with how consolidated safety requirements are distributed into actionable items within the AUTOSAR framework. Here's a detailed breakdown:

1. Development Process:

BSW & RTE: - BSW (Basic Software): This refers to the standard software components that form the foundation of the AUTOSAR software architecture. BSW handles tasks such as microcontroller abstraction, memory services, and communication services.

RTE (Runtime Environment): This acts as a middleware between the application software and the Basic Software. It ensures that the software components can interact with one another and with the underlying hardware in a standardized manner.

Tools: These are the various software tools used to design, implement, test, and validate AUTOSAR-based systems. Examples include code generators, configuration tools, and testing frameworks.

Requirements: There is a list of requirements related to the development process, guiding how AUTOSAR software (BSW and RTE) and tools should be developed and maintained. This ensures that safety considerations are integrated from the beginning of the development process.

2. BSW & RTE Requirements:

SRS (Software Requirement Specification): This document outlines the functional and non-functional requirements for the software components within the AUTOSAR framework. It ensures that all safety-related aspects are clearly defined and understood.

SWS (Software Specification): This document provides detailed specifications for the software components, including how they should be implemented to meet the SRS requirements. It ensures that all technical aspects are addressed, and the components are designed correctly.

Update of Existing Documents with Safety Requirements: As safety requirements evolve, it's crucial to update existing SRS and SWS documents to reflect new safety considerations. This ensures that all changes are documented and integrated into the development process.

Requirements on Tools and Generation Processes: This involves specifying how the tools used in the AUTOSAR framework should support the implementation of safety requirements. It also covers the processes for generating software components, ensuring they adhere to safety standards.

3. Tools and Generation Process:

Tools: These tools are specifically designed to aid in the development, testing, and maintenance of AUTOSAR software. They ensure that the software meets all specified safety requirements.

Generation: This refers to the process of automatically generating code and configurations based on predefined models and specifications. It ensures consistency and reduces the likelihood of human error.

Requirements on Tools and Generation: The tools and generation processes must adhere to safety requirements, ensuring that the generated code and configurations are safe and reliable. This involves rigorous testing and validation to confirm that safety standards are met.

Scenario: Developing an Electronic Stability Control (ESC) System Using AUTOSAR

1. Development Process: BSW & RTE

BSW (Basic Software): For the ESC system, the BSW layer handles essential tasks such as sensor data acquisition, CAN communication with other control units (like ABS and TCS), and actuator control for braking. For example, microcontroller abstraction layers allow the ESC software to interact with the vehicle's hardware sensors and actuators in a hardware-independent manner.

RTE (Runtime Environment): The RTE acts as the communication bridge between the application software components and the BSW. For example, when the ESC logic detects a need to stabilize the vehicle, the RTE facilitates the transmission of the necessary control signals to the braking system via the BSW.

Tools: Tools like configuration editors and code generators (e.g., DaVinci Developer) are used to define the ECU software architecture, generate the necessary AUTOSAR compliant code, and configure communication between components. For example, a tool may be used to configure the RTE, specifying which software components need to communicate.

2. BSW & RTE Requirements

SRS (Software Requirement Specification): For the ESC system, the SRS might specify that the system should detect vehicle instability within 100 milliseconds and activate the necessary corrective actions, such as brake application, to prevent loss of control. This requirement ensures that the ESC system responds quickly and effectively to prevent accidents.

SWS (Software Specification): The SWS would detail the exact implementation of the ESC algorithm, specifying the data input from various sensors (e.g., wheel speed sensors, yaw rate sensor), the processing logic to determine vehicle stability, and the control outputs to the brakes. It ensures that the software is developed in line with the SRS, with clear technical guidelines.

Update of Existing Documents with Safety Requirements: If new safety requirements emerge, such as improved braking control in certain environmental conditions, the SRS and SWS documents would be updated accordingly. This might include new safety checks or additional diagnostics to ensure system reliability.

Requirements on Tools and Generation Processes: The tools used in the ESC system's development must support safety standards such as ISO 26262, ensuring that the generated code is free from errors and meets all

safety requirements. For example, tools must validate that communication configurations do not introduce latencies that could compromise safety.

3. Tools and Generation Process

Tools: Specialized tools are used for model-based design and simulation of the ESC system, allowing engineers to test the system's behavior in various scenarios before implementation. For instance, a simulation tool might be used to model the vehicle's dynamics and test how the ESC system responds to different driving conditions.

Generation: The generation process involves creating AUTOSAR-compliant code for the ESC system from the defined models. This ensures that the software components are consistent with the specified design and meet all functional and safety requirements.

Requirements on Tools and Generation: The generation tools must produce code that is safe and reliable. For example, the code generation process might include checks to ensure that all safety-critical functions are implemented with redundancy and that there are no single points of failure.

Conclusion

In summary, the ESC system development within the AUTOSAR framework illustrates how safety requirements are meticulously integrated into every stage of the development process. From defining the functional requirements in the SRS to ensuring that the generated code adheres to safety standards, each component and process is designed to maintain vehicle stability and ensure passenger safety under all driving conditions.