

Rapid Prototyping of AUTOSAR Software Components

Use Case

Do you know this challenge?

As of today, more and more vehicle functions are developed based on AUTOSAR Software Components (SWC). Several functional areas such as pollution and combustion functions, ADAS or hydride functions are covered by compositions of several AUTOSAR SWCs.

To validate their functional design, a validation is required which takes place after the coding phase but before the final integration phase by the OEMs. The aim is to verify the internal arithmetical functions of the AUTOSAR software components by integrating the AUTOSAR C code which was generated based on the function model.

Our Solution – ETAS INTECRIO AR2SIX

INTECRIO-AR2SIX extends the unitary validations of the coding teams with the possibility to prototype, simulate and debug AUTOSAR modules before their integration.

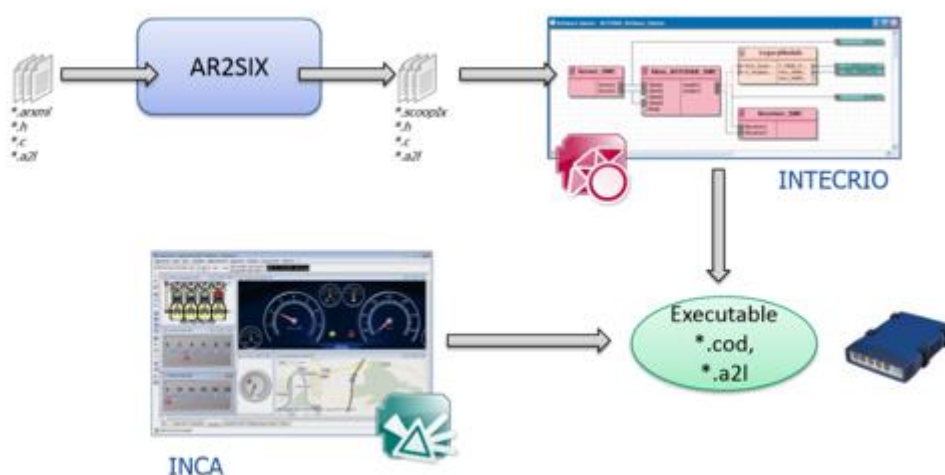
The solution proposed by ETAS has the double advantage of being compatible with both real-time targets such as ES910 and ES1000, and also with the offline simulation offered by INTECRIO-VP.

The SWCs are functionally tested on the vehicle that they were designed for, using the prototyping hardware which is installed in it.

Additional validations - often regression tests – can be made via offline simulation on the basis of real recording data using INTECRIO-RLINK.

Technical Details

To make the AUTOSAR SWC compatible with INTECRIO, the conversion tool AR2SIX has been developed. This tool takes original arxml, c, h and A2L input files and converts them into Scoop-IX – a format that can be understood by INTECRIO.



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The conversion is carried out in four major steps.

1. AUTOSAR C code stubbing

The AUTOSAR Runtime Environment (RTE) implements the communication infrastructure for the application software components (AUTOSAR Software Components) and Basic Software modules (BSW).

For each AUTOSAR SW Component, a specific AUTOSAR C code is generated (for example by the ETAS RTA-RTE tool) which is then integrated into the ECU's Runtime Environment (RTE).

The ECU's RTE and other AR Software Components which are called by the AR SWC to be validated are not available on the INTECRIO rapid prototyping platform. Consequently, the AR SWC are stubbed.

2. Visualization of internal variables

It is necessary to visualize internal variables of Software Components which are only present in the C code but which are not included in the component's A2L file.

Such an internal variable is an Inter-Runnable Variable (IRV) that is shared by various AUTOSAR Runnables of the same SWC instance.

AR2SIX parses the ARXML files to find these variables and adds them to the SCOOP-IX interface to make them visible during Rapid Prototyping.

3. Conversion to Scoop-IX

The INTECRIO rapid prototyping platform uses a "Scoop-IX" format for integrating C code. This format – described in XML – defines the sources, variables, data types, etc. of a C code to be integrated.

For integration of an AUTOSAR Software Component, this type of Scoop-IX file is automatically generated on the basis of its ARXML definition, its A2L file and its C code.

4. Compositions

To validate not only a single Software Component, but a composition of several Software Components the previous described steps can be carried out for each component of a composition. The automatic creation of an INTECRIO workspace with the interconnection of modules according to the AUTOSAR composition minimizes the effort needed to setup a workspace.

Tools used

- ETAS INTECRIO
- AR2SIX
- ETAS RTA-RTE
- ETAS INCA
- ETAS INTECRIO-RLINK

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