EXPERIENCE OF FULL SCALE IMPLEMENTATION OF AUTOSAR R4.0.X

BACKGROUND

Updating the Electrical Platform by:

1. New Architecture
2. New Base Technology concepts
3. New Methodology & Tool chain

Prerequisite: Leverage common industry solutions & standards & tools aiming at an open platform

Strategic decisions:

- Use Autosar 4
- Use pure standard below RTE => enables competition
- Enhancements and adjustments to be incorporated in the standard.

AUTOSAR TRACK RECORD

Cooperation among all the biggest vehicle OEM's in the world !

Standardised BSW architecture

Standardised methodology and templates
- Based on SPEM 2.0
- XML based template definition
- UML based information model

Early support for new vehicle technologies such as:
- FlexRay
- Safety
- Diagnostics over IP
- ………

4 major releases of Autosar specifications

RELEASE 1.0

R1.0 in June 2005, containing 53 standard- and 2 auxiliary deliverables

- 1 Meta model
- 3 Templates
- 11 Soft ware Requirement Specifications (SRS)
- 35 Soft ware Specifications (SWS)
- 3 Support documents / guidelines
- 2 Auxiliary documents

Used by BMW for 2007 model year 7-series.

RELEASE 2.0 AND 2.1

R2.0 in May 2006, containing 86 standard- and 17 auxiliary deliverables
- 1 Meta model
- 3 Templates
- 29 Soft ware Requirement Specifications (SRS)
- 46 Soft ware Specifications (SWS)
- 7 Support documents / guidelines
- 17 Auxiliary documents

R2.1 in January 2007, containing 71 standard- and 56 auxiliary deliverables
- 3 Templates
- 1 Soft ware Requirement Specifications (SRS)
- 51 Soft ware Specifications (SWS)
- 3 Application Interface specifications
- 13 Support documents / guidelines
- 56 Auxiliary documents

Used by BMW and there supplier chain.
Used by VCC for initial work on Autosar based systems.

RELEASE 3.0 AND 3.1

R3.0 in February 2008, containing 67 standard- and 70 auxiliary deliverables
- 4 Templates
- 1 Soft ware Requirement Specifications (SRS)
- 53 Soft ware Specifications (SWS)
- 9 Support documents / guidelines
- 70 Auxiliary documents

R3.1 in August 2008, containing 67 standard- and 69 auxiliary deliverables
- 4 Templates
- 1 Soft ware Requirement Specifications (SRS)
- 53 Soft ware Specifications (SWS)
- 9 Support documents / guidelines
- 69 Auxiliary documents

Used by BMW, Daimler, VW and their supplier chain.
Used by VCC for work on Autosar based systems.

AUTOSAR R4.0 BENEFITS

- Latest FR spec support
- Latest LIN spec support
- Improved Diagnostic support
- Improved mode mgmt support
- Ethernet support
- Timing model
- Variant handling
- Safety (E2E/Memory partitioning)

ENSURE COMPETETION BETWEEN AUTOSAR IMPLEMENTORS

Compliance (to what and to which extent) ?
- AUTOSAR version R4.0.2/R4.0.3/R4.1.1 ?
- "Fully and exactly" or "limited and close enough" ?

Bugs ?
- Relevant for VCC, in implementation and specification ?
- Formal AUTOSAR bugzilla or "project driven" Quick fix ?

USE COMPETETION BETWEEN TOOL IMPLEMENTORS

for development speed and quality

- Complete tool chain (design to implementation)
- Only one standardised data exchange format
- Only one standard interpretation of data

STANDARDISED DATA EXCHANGE FORMAT

Vital part for VCC development process

- Reduce risks (for interpretation or process errors)
- Cost reduction (no manual "fixing" or extra tooling)
- Faster integration of ad-hoc developed tools.
- Attract new tool developers
- Reduce maintenance cost for VCC back bone tool chain
- XML is nice….. and .arxml is the accepted standard ☺
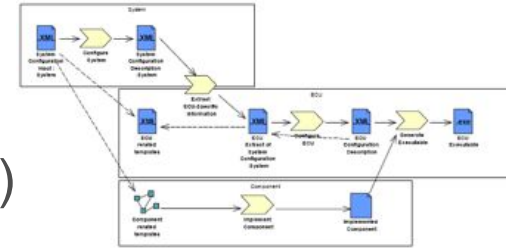
Figure 2.1:   Methodology Overview out of

COMPLETE TOOL CHAIN

Future implementation speed and quality requires:

Design tools for

- System development
- ECU development

Analysis tools for

- System evaluation and quality assurance
- ECU evaluation and quality assurance

USE COMPETETION BETWEEN BSW IMPLEMENTORS

for development speed and quality

Limited AUTOSAR "Compliance" test strategy
- Focus on HW/Application independent part of BSW
- Test space set using AUTOSAR standard configuration

Model driven test approach
- Test model developed based on R4.0.2
- Bugs (and deviations from AUTOSAR) easy to detect
- ….. success ?

USE COMPETETION BETWEEN BSW IMPLEMENTORS

AUTOSAR spec updates vs Autosar versions
- Yes, it's an issue…..

Ambiguities in AUTOSAR specs
- Yes, there are some….
- … but reduced in later versions

BSW IMPLEMENTATION

Makes maximum use of flexibility in specs.
        ….differently

"Improvements" without Bugzilla tracking
        => Not AUTOSAR

Flavours of AUTOSAR
        = #of BSW suppliers

COMPETITION BETWEEN AUTOSAR IMPLEMENTORS

At project start
- #BSW suppliers claiming to have R4.0.2 (or later) => 6
- BSW and config tool maturity => low to medium.
- System design tool maturity => low

Today
- #BSW suppliers of R4.0.2 (or later) => using 7 of 8 known
- BSW and config tool maturity => medium to high
- System design tool maturity => medium

ADDING FUNCTIONALITY BASED ON AUTOSAR
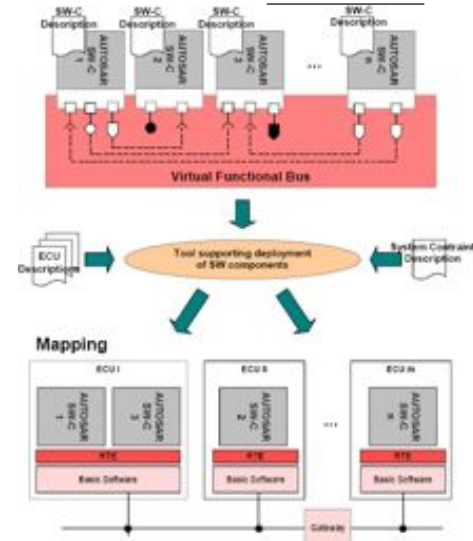
Autosar SW-Component description
- Standardised format to describe applications

Autosar VFB
- Environment to test applications

Autosar RTE
- Generated Run Time Environment for applications

ADDING INNOVATIONS

From non-automotive domains
- GW easy to connect to existing infrastructure
  - Autosar supported network
  - Maintenance support (Diagnostics/SWDL)
  - Following safety policy