



An Approach of Combining Model-based Testing with Product Family Management



UCAAT, October 23rd, 2013 Hamza Samih (ALL4TEC), Dr. Ralf Bogusch (Cassidian)





- Overview of the MBAT project
- Current state of practice
- Combining test models with variability models
- Introduction to the use case
- Demonstrator
- Evaluation results
- Way ahead





MBAT: combined model-based analysis and testing of embedded systems

Objectives

- Reduce validation and verification (V&V) cost and time-to-market by advanced model-based V&V technology
- Provide a Reference Technology Platform (RTP) for effective V&V of embedded systems
- Ensure in several use cases that the MBAT RTP can be used in industry.

Key Data

- EU project (Artemis JU)
- 41 partners from automotive, aerospace and rail domain
- 8 countries
- Total budget: 34.5 Mio €
- 3 years (Nov 2011 Oct 2014)
- Project coordinator: Daimler AG
- Further information: http://www.mbat-artemis.eu







- Test process is mainly driven by (quality of) requirements and low degree of test automation
- Similar products are tested independently with no re-use of test artefacts



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- Test models describe what needs to be tested in the product family
- Variability models define variation points in the product family
- Product configuration enables automatic generation of test models
- Product test models allow generating product test suites





Introduction to the Sferion[™] Use Case



Degraded visual environment ...







Overview of the Demonstrator



MaTeLo Usage Model Editor MaTeLo Product Line Manager

Vedit OVM Editor

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MaTeLo Testor

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- Analyze potential product variants and features during the scoping with the help of the product feature matrix
- Prioritize features and define the product family scope

				Assessment							1	Products			
ID	Feature Name	Classification	Customer	tisfaction	Risk	Cost	Relevance			•	Chinook-Aus	CH53-Ger	NH90-Nor		
F1	System	Dom													
F2	Capabilities	Dom													
F3	Functions	Dom													
F4	Terrain slope, roughness indication for the landing point	Opt		2	1	1		2,00				х			
F5	Display real reference objects (sensor-based)	Opt		2	2	2		1,33				х			
F6	Display artificial reference objects	Ftr		3	1	1		2,33			х	х	X		
F7	Approach line	Ftr													
F8	Direct	Alt		2	1	1		2,00			х		х		
F9	Flightpath to landing position	Alt		3	1	2		2,00				x			
F10	Take-off grid	Ftr													
F11	Artificial	Alt		2	1	1		2,00			х		х		
F12	Sensor-based	Alt		3	1	2		2,00				х			
F13	Set landing point	Ftr		3	1	1		2,33			x	х	x		
F14	Handling pilot only	Alt		3	1	1		2,33				х	x		
F15	Both pilots	Alt		2	2	2		1,33			х				
F23	Data fusion (with way points)	Opt		3	2	2		1,67				х			
F16	HMI	Dom													
F17	Presentation symbology (static)	Ftr													
F18	Doghouse	Alt		3	1	2		2,00				х			
F19	NATO T	Alt		2	0	1		2,33					х		
F20	Helipad H	Alt		2	0	1		2,33					х		
F21	Low-cost doghouse	Alt		1	1	1		1,67			х				
F22	Distance-dependent symbology (dynamic)	Cst		3	1	1		2,33			С	С	С		
F24	Interfaces	Dom													
F25	HMSD	Ftr													
F26	Anvis HUD	Alt		3	1	2		2,00			х	х			
F27	MARK II Thales	Alt		3	1	2		2,00					х		
F28	MFD	Ftr		2	1	1		2,00			х	х	х		





 Document variation elements and constraints with the help of an Orthogonal Variability Model.





 Develop a test model which covers all functions of the product family and is associated with product family requirements





Product Management (1/3)

MBAT





- Map requirements to be verified with their associated features
- Configure product variants







• Generate test models for product variants

• Generate product-specific test cases



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• Test cases and procedures are generated from product-specific test model and can be imported into test automation system.

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- Clear potential that the combined approach of model-based testing and product family management leads to better quality test design at less time and less cost:
 - Model-based testing allows to automate parts of the test design.
 - Test models are reviewed and applied in many products in different contexts and various scenarios which leads to higher quality.
 - Test artefacts are re-used for each new product, rather than starting from scratch.
 - Less test artefacts need to be maintained for the product family since re-use is managed at the model level.
- The MaTeLo PLM tool is available as a prototype, but **not fully industrialized** yet:
 - Some usability and interoperability topics need to be improved in order to raise the acceptance by industrial end users.





Way Ahead: MBAT IOS and RTP









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Thank you



