

15. Best of Both Worlds: CORE-based WSAF with DOORS-based Requirements Management

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Abstract

The Whole-of-Systems Analytical Framework (WSAF) has been developed at DSTO with personnel from both Weapons Systems Division (WSD) and Aerospace Concepts Pty Ltd. It is based on Vitech CORE® and has evolved and matured through use on several projects and proved its worth as an MBSE capability environment. Despite the successes of the WSAF and the functionality within CORE® to support requirements management, Defence policy currently remains that IBM® Rational® DOORS® is mandatory for the requirements management on all ACAT I and ACAT II projects. Because of the Defence Materiel Organisation's (DMO) current investment in DOORS® (licences and number of people trained in its use, etc.) this situation is unlikely to change for some time.

This paper provides an overview of the means by which the capability modelling can be done using the WSAF to maintain model integrity whilst allowing projects to perform the ongoing management of requirements using DOORS®. The approach was developed and refined during the definition of the Land Combat Vehicle System (Defence Project LAND400), where the Operational Concept Document had been developed using the WSAF, and three Function and Performance Specifications (FPSs) covering nine vehicle variants needed to be produced using the WSAF but with the requirements transferred into DOORS® for use by the DMO project office.

In order to maintain consistency between the two databases a strict data management scheme was developed, including the definition of the data interface. One of the greatest challenges of this was to understand and overcome the different implementations of data attributes and relationships used in CORE® and DOORS®. Amongst the variety of information transferred through this interface was the unique identifier assigned in both software tools to ensure data veracity. Although many of the requirements were common across both the three main vehicle types and the nine vehicle variants, there were others which were unique to particular variants. This highlighted the strength of the model-based approach, where it was possible to update the detail of one requirement, which would be reported in all relevant specifications.

While the process developed and implemented still required manual "post-processing" of some of the data (mostly resulting from the differing character sets for hard returns, non-breaking spaces and special characters e.g. °, ±, etc), this work proved that the systems engineer really can have the "best of both worlds" - the strength of rich, model-based information architecture from CORE® and the benefit of rigorous requirements management from DOORS®.

This presentation will provide insight into the CORE® to DOORS® interface developed, the challenges faced and advice to personnel engaged on major capital equipment projects - in particular, they should not use the mandated policy of DOORS-based requirements management as an excuse to not use the WSAF to do capability modelling.

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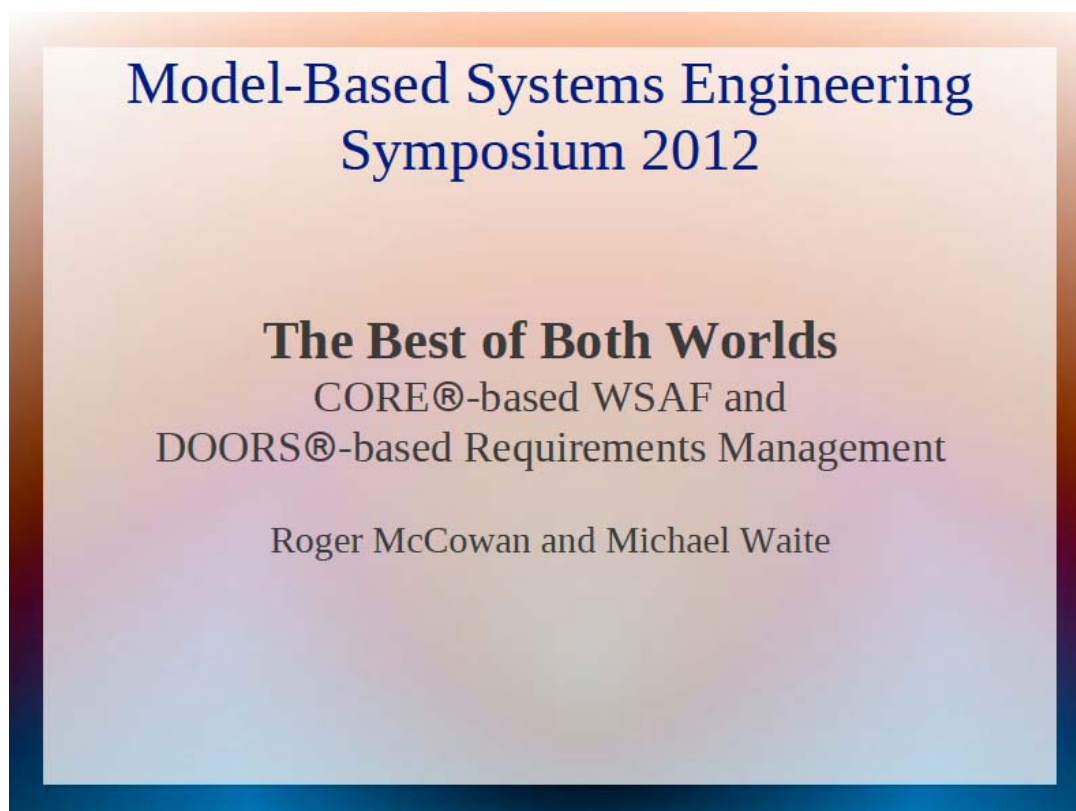
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Presenter Biographies

Mr Roger McCowan, BEng(Communications) is a senior Systems Engineer whose professional experience spans more than thirty years during which he has specialised in systems engineering across both the Defence and commercial sectors. He has extensive experience in requirements definition and analysis, system specification, architecture design, verification and validation, and project management, with a focus on networked information systems. He has published several papers in these fields.

Mr Michael Waite, BEng(Mechatronics) has been working as a professional engineer for over ten years since completing his Bachelor of Engineering (Mechatronics) degree in 2001. His career has seen him working for several multi-national automotive companies in Australia, Asia and Europe, including Mitsubishi Motors, Ford and Caterpillar. He currently works for Aerospace Concepts, a systems engineering consulting company, specialising in the development of complex-system capabilities.

Presentation



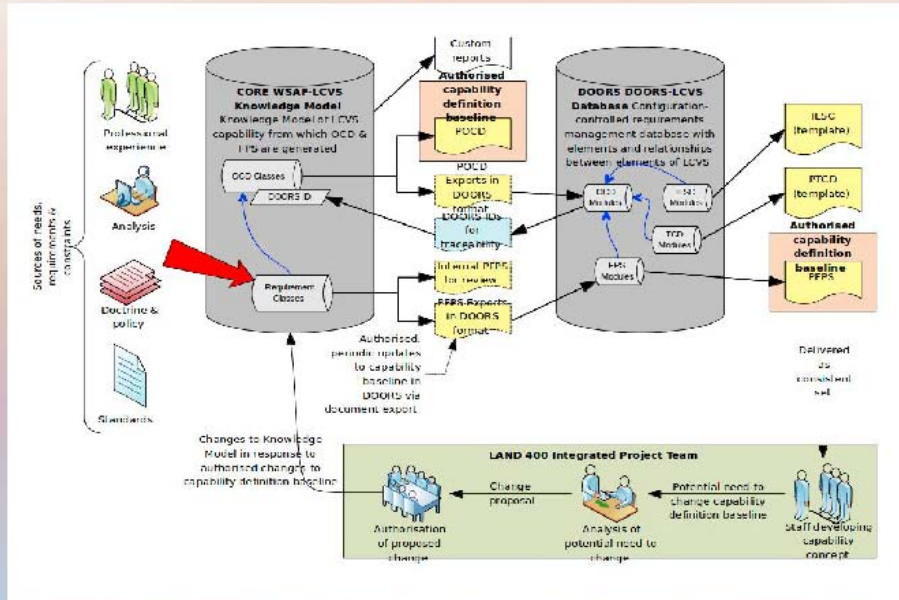
Overview of Presentation

- Project Context
- Approach
 - Strict data management scheme
- Interface
- Challenges
- Method/Process
- Conclusion
- Q & A

Project Context

- Land Combat Vehicle System (LAND400)
 - OCD developed during 2011 using WSAF
 - DMOSS Contract in 2012 to develop three FPSs covering nine vehicle variants
 - FPS requirements to be in DOORS® as per DMO policy
 - DMO Project Office/LEA provided SME and drafted many of the requirements using Excel

Approach



Interface (1)

- Single CSV file, exported from CORE®
- Fields
 - Vehicle Variant (Defined list, multi-valued)
 - DOORS Requirement ID
 - CORE Object ID
 - Requirement Text
 - Requirement Priority (Defined list)

(continued on next Slide)

Interface (2)

- Fields (continued)
 - Verification Method (Defined list, multi-valued)
 - FPS paragraph reference (in accordance with the FPS DID)
 - Rationale
 - OCD cross-references

Challenges

- Requirement Text copied from Excel cells contained embedded line feed codes (char(10)), as well as non-breaking spaces
- CSV exported from CORE loses diagrams and formatting information (superscript, bold, etc.)
- DOORS importation of CSV file could not handle special characters (e.g °, ±, smart-quotes, and non-breaking spaces)
- Attribute Definitions – mismatches will cause importation to fail

Method/Process (1)

- Export requirements with all relevant attributes from CORE, into a CSV file
- Use Excel on the resulting CSV file to substitute spaces for line-feed codes
- Use Excel to create a new column which combines the Heading Number and the Heading Title
- Use Word to find and replace all special characters
- Save as CSV, then insert hard return between every record, then save as TXT

Method/Process (2)

- Create the DOORS Requirements Module, with all attributes and attribute definitions
- Use DOORS to import the TXT file, which creates the structured requirements set
- Export just the DOORS Requirement ID attribute into a CSV file
- Merge the ReqID file with the updated CSV file
- Import the merged CSV file into DOORS to update all requirements with their attributes

Method/Process (3)

- In DOORS, perform find/replace on special characters
- Perform manual update of text with superscripts
- Insert diagrams and figures at appropriate places and levels
- Export CSV file from DOORS to update CORE with DOORS ReqIDs

Conclusions

- The process steps described took about one hour, on a requirement set of about 1800 requirements
- The WSAF CORE model remains the “Source of Truth” at all times, therefore changes are NOT made to the DOORS requirement objects
- Revisions are best done by replacing the DOORS requirement module, rather than updating attributes
- CORE®-based WSAF and DOORS®-based Requirements Management is simple and viable