

HOW TO HELP CREATE AND PROTECT MODELING AND SIMULATION VALUE - EFFECTIVE APPLICATION OF V&V SERVICES

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ABSTRACT

Experiences in the military M&S domain show that verification and validation (V&V) is still often more of an afterthought than an integral part of a M&S development or procurement. This is due to the fact that V&V is often considered as a difficult, costly and intangible practice, which highly depends on the M&S context. Due to decreasing budgets the Dutch MoD is increasing its reliance on M&S to help ensure their operational effectiveness. Given this increased reliance and the lack of common V&V practices, the Dutch MoD expressed the need to establish a V&V standard and a permanent V&V service provision organization. The Dutch National Aerospace Laboratory NLR and the Netherlands Organization for Applied Scientific Research TNO were tasked to realize this objective. This resulted in a V&V expertise center, named Q-tility. Q-tility is currently the preferred V&V service provider for the Dutch MoD, delivering V&V studies, training and consultancy.

V&V SERVICE PROVIDER SET-UP

The V&V expertise center Q-tility has been structured according to the new SISO/NATO Generic Methodology for Verification and Validation (GM-VV) enterprise layer guidelines. These guidelines provide processes, products and organizational elements to set-up and operate a permanent internal/external V&V organization for M&S. Q-tility is a strategic cooperation between NLR and TNO, providing independent V&V services to the Dutch MoD. It operates as a virtual organization and provides an internet portal to client organizations to access the V&V services.

To effectively and efficiently sustain V&V service provision Q-tility has implemented the GM-VV enterprise memory concept. This V&V enterprise memory consists of a pool of V&V engineers from each organization and V&V repository. The pool of V&V engineers is continuously trained and selected to address a specific M&S application or domain, such that the wide variety of V&V projects from the Dutch MoD can be properly staffed. The V&V repository consists of practical reusable information which is constantly updated with lessons-learned, experiences and knowledge gained from the V&V services:

1. V&V life-cycle model and product templates for conducting V&V projects
2. Recommended practice guides for V&V in specific applications and domains
3. Extensive R&D bibliography with V&V papers, standards, websites and other public available publication
4. VV&UQ methods, techniques and process support tools data-base
5. V&V argumentation network language and method
6. Data-base with domain specific and reusable V&V metrics, criteria, and argumentation patterns

The V&V life-cycle model, templates and recommended practices are tailored versions of the GM-VV project and technical process, products, organizational element and implementation guidelines. The Q-tility V&V argumentation language and method are a direct implementation of the GM-VV concept and guideline for having an argumentation structure in place to assure well-informed, traceable, transparent and repeatable V&V activities and decisions. The VV&UQ data-base core is based on existing VV&UQ method and technique taxonomies such as found in literature and from Q-tility's own V&V projects.

V&V SERVICE PROVISION APPLICATIONS AND BENEFITS

In the past three years the Dutch MoD has requested for V&V services from Q-tility multiple times in support of their acquisition and deployment processes of training simulations, as well as for test and evaluation (T&E) purposes:

1. V&V of a heavy weather ship handling simulator to support the Navy in their decision to either acquire a motion base or a non-motion base simulator
2. V&V of a public order management game (VBS2) to support the Military Police in more effectively deploying this serious game for training their staff
3. V&V of a distributed mission training environment for the Air Operations Control Station (AOCS) to support their T&E of simulator concepts for fighter familiarization training
4. V&V of the SPIKE medium anti-tank rocket simulator for the Army to support both their training as well the T&E of new operational doctrines
5. V&V of virtual maintenance trainer (VMT) for the NH90 helicopter to support the Air-force Maintenance School in attaining a certified simulation-based maintenance training program by the military aviation authorities (MLA)
6. V&V of an engineering simulation model for fighter robust power management design and development for the Air Warfare Center (AWC).

Feedback from the Dutch MoD stakeholders for the above projects proved that these V&V studies did help the them to make better-informed decisions, gave them a better insight in the M&S system quality to improve their M&S systems and deployment, and mitigated risk associated to the use of these M&S systems. This resulted in an increase of the overall M&S return on investments made by the Dutch MoD, even considering costs of V&V the net benefits were higher than the total costs. Furthermore, the efficiency (i.e. lead-time and cost reduction) of the V&V projects is enhanced by the permanent organization's standard scalable V&V life-cycle model and reuse of guidelines, methods, techniques and metrics that resulted from the lessons-learned from previous V&V studies.

Explicit examples from the above V&V studies, which are described in more detail in Roza et.al. (2012, 2013 and 2014), will be used to outline the V&V activities from the Q-tility V&V life-cycle model and associated methods, techniques and tools. Moreover, the major relationships between these V&V activities and the M&S process will be illustrated, along with how it protected and created added value for the models and simulations of the involved developer and user organizations.

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