Session T6: V&V Tools, Templates, and other Resources

Session T6 leaders:

Co-Chair: **Jennifer Park** (Navy Modeling and Simulation Management Office)
Session Recorder: **Michelle Bevan** (MSIAC)

T6 Materials in Foundations '02 proceedings:

Papers

Overview of VV&A Tools, Templates, and Resources (10 pp) [T6_1Overview.pdf]
Automated Support Tools for Verification, Validation, and Accreditation (31 pp) [T6_2AutoTools.pdf]
VV&A Templates and Resources (10 pp) [T6_3Templates.pdf]
Jerry M. Feinberg (Modeling & Simulation Information Analysis Center)
Patrick W. Goalwin (Modeling & Simulation Information Analysis Center)

Slides (may contain back-up materials and notes)

Overview of VV&A Tools, Templates, and Resources (21 slides) [T6B-1 in both pdf and ppt formats]
Jerry M. Feinberg (Modeling & Simulation Information Analysis Center)
Patrick W. Goalwin (Modeling & Simulation Information Analysis Center)

Automated Support Tools for Verification, Validation, and Accreditation (22 slides) [T6-2 in both pdf and ppt formats]
Jerry M. Feinberg (Modeling & Simulation Information Analysis Center)
Patrick W. Goalwin (Modeling & Simulation Information Analysis Center)

VV&A Templates and Resources (25 slides) [T6-3 in both pdf and ppt formats]
Jerry M. Feinberg (Modeling & Simulation Information Analysis Center)
Patrick W. Goalwin (Modeling & Simulation Information Analysis Center)

Participants in this session are listed at the end of the Discussion Synopsis.

Discussion Synopsis (to provide perspective on papers & briefings identified above).

Background Information and Focus of Discussion:

- Presented the need for VV&A tools, templates, and resources
- Presented the types of VV&A tools, templates, and resources
- Presented examples of VV&A tools, templates, and resources
- Presented selected issues related to VV&A tools, templates, and resources:
  - stressing trends – high fidelity, distributed systems, adaptive systems
  - repositories (mechanics, how to populate, political issues)
  - templates (good and bad; have to make sure what you're doing)

We issued a plea for the community to supply us with examples of tools, templates, and resources and to identify community's need for VV&A tools. Please see attached presentations for further background information.

Discussion Generated:

1. Listing of tools currently used by participants:
    a. DON VV&A Documentation Template – This is two part template: Planning and Execution. Through questions and answers process, it brings attention to users key elements to consider when initiating VV&A process such as understanding of requirements, acceptability criteria, MOEs/MOPs, risk, configuration, cost, schedule and organization to support VV&A. Once the planning has been executed, the template assists a user in capturing the results of VV&A actions through generation of reports. The end product is Word document that can be edited. The DON VV&A Documentation Template is closely linked with DON Implementation Handbook.
    b. NASA Lessons Learned Repository.
    c. RPG Version 2.5 incorporating Lessons Learned (about Dec 02)
    d. AFOTEC Software User Evaluation (SUE) Tool – create questionnaires for users, starts with 200 questions – provides graphics and reports.
    e. Software Maintainability Tool – did not mention name – will forward information if finds valuable (Breitler). Purpose is to provide statistics on how well software meets its requirements. (Do an internet search on software maintainability – numerous returns)
    f. Operational Availability Implementation Guideline (Navy) – the appendix lists 250 government and commercial products/tools that give you calculations for maintainability, reliability, mean time between failures and other related elements.
    g. MacKay tool – input source data, reports is written for you. Tool is expensive ($30K), cheaper one is listed in d. ($2500).
    h. International Test and Evaluation Association (ITEA) class taught.
    i. Breitler developing his own tool for interpretation of statistical information to common language for customer because a tool isn't available.
    j. Excel – has excellent scatter graphs for visualization. Although beware of environment – even those tools have limitations (answers in radians instead of degrees as default).
    k. Quality Functional Deployment (QFD) provides thread analysis linking data sources to algorithms through simulation.
    l. Windchill – commercial product developed by ProEngineer.
    m. Oasis Configuration Management Program.
    n. Rational Rose
    o. DOOR
    p. Ft. Knox data evaluation tool (POC Paul Mundy)
    q. SIMMAN – developed for STRICOM used for setting up initial boundary conditions.
    r. MS Access.
    s. Precision Visualization System (PVS) – configuration management tool.
    t. Kbos – business management tool.

u. IMAN – equivalent to WindChill that contractors use.
v. NASA Software Quality Assurance called PVS.
w. Model Checker called SPIN.
x. NASA Model Methods Guidebook.
y. MindMap software – non-linear presentation that provides iterations and feedback.
z. CAD/CAM tools used for visualization.
aa. Aspect tool set.
bb. Cognitive Operational Requirement Environment (CORE) (used by Secretary of the Navy, Research and Development)
cc. MATLAB.
dd. SimLink.
ee. Software costing tool available on AG Greenhouse site – no name known.

2. General Observation:
    a. There was a lack of understanding of what VV&A is by customers that contributed to the reluctance of the experts to implement tools. Customer's perception is that tools make models "good" for all application rather than what the models was intended for.
    b. Majority of participants were looking for tools that will answer their VV&A implementation questions. Although realizing that not all tools will answer all VV&A question, it was stressed that M&S process must lay the foundation in order to select the tools necessary to conduct VV&A.
    c. Cost questions and concerns:
        - what should VV&A cost?
        - could/should the cost of VV&A exceed that of the program (i.e., can the cost of VV&A be more than 50% of the program cost if the risk justifies it?)
        - should the cost of VV&A exceed $0 (i.e., do we need VV&A at all?)
        - what is the cost of not doing VV&A?
        - no specific studies to address cost.
    d. Majority of tools discussed were software related tool. Although software runs the models and simulations, the tools to evaluate software is not necessary appropriate for M&S VV&A.
    e. M&S Management plan is an over-arching requirement to determine the VV&A process that in turn determines the appropriate tools necessary to implement VV&A.
        - VV&A tools are best used as part of an overall process
        - if you are going to perform VV&A, you should use tools to make the process easier (cheaper, faster, more reliable)
    f. Tools cannot replace Subject Matter Experts. The management has to make determination what is appropriate level of VV&A for their M&S needs.
    g. Software tools used for verification and requirements tracing
    h. Validation tools are few and far between
    i. Tools need to be built on techniques
    j. Techniques for validation tend to be statistically based, but are there other useful approaches for basing tools such as formal methods, control theory, etc.

k. Tools/techniques may be acceptable for interpolative situations, but not for extrapolative (predictive) situations
l. "lessons-learned" are rarely presented; usually only the exemplar developments are publicized. The abject failures are buried, even though we can learn much from them.

Summary: Although tools are an important aspect of VV&A, the fundamental problem is understanding what the M&S process is in relation to VV&A implementation. There is also confusion between tools that implement software V&V and M&S V&V.

Action Item: Collect information on all mentioned tools. Each participant has signed up to emailing those in at a later date.

T6 Session Participants (18)

First Name	Last Name	Organization
Juan	Arvelo	JHU/APL
Michelle	Bevan	MSIAC
Alan	Breitler	
Marcus	Coombs	Cranfield University (UK)
Andrew	Cronk	Simulation Technologies Inc.
Martin	Feather	NASA Jet Propulsion Laboratory/Cal Tech
Jerry	Feinberg	MSIAC
Patrick	Goalwin	IIT Research Institute (IITRI)
Peter	Hilgarth	
Jerry	Kniphfer	Virtual Targets Center
Raymond	Lowman	Computer Sciences Corporation
Megan	Meyer	Johns Hopkins University/APL
Orhun	Molyer	DND/CF SECO
Linda	Olson	Acton Burnell, Inc.
Jennifer	Park	OPNAV/SSC San Diego
Philip	Parry	BAE SYSTEMS
Joseph	Tasto	Immersion Medical
William	Yeakel	Orsa Corporation