



Developing an XML Architecture for VV&A

The Development of the Proposed
Verification Validation Markup Language
(VVML)

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Good afternoon, -NAME:, Support NAVMSMO with the development of a VV&A Automation Tool.

The Vision for VVML



V
XMSF
REUSE
COMPOSABILITY

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Agenda

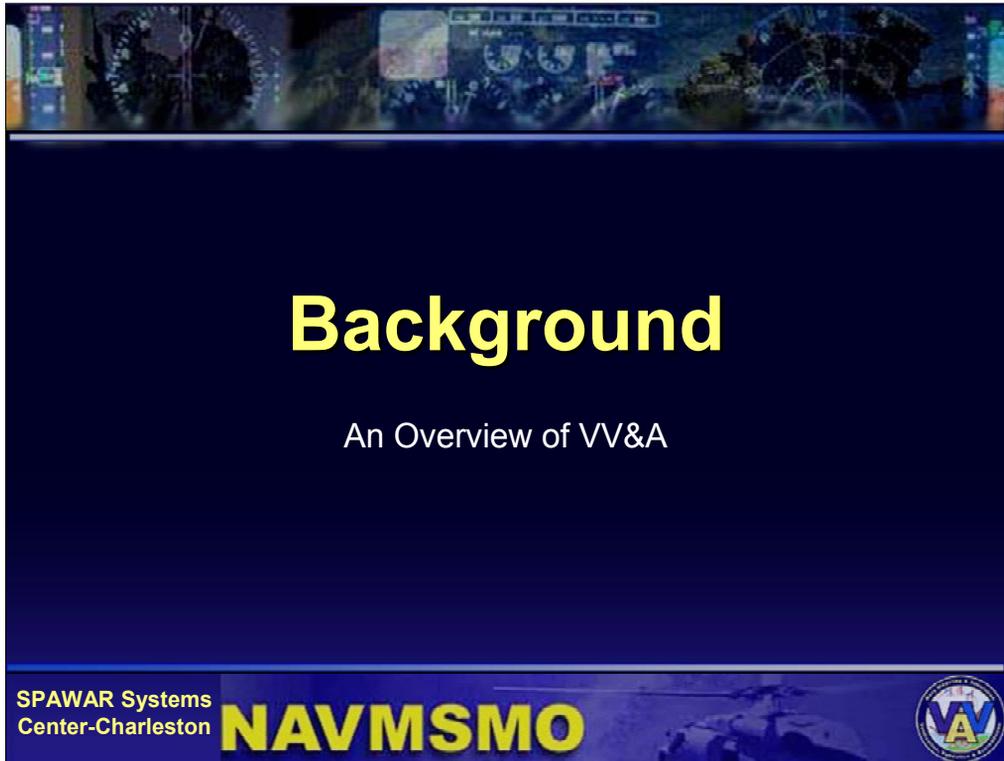
- Background: VV&A Documentation
- Evolution: VV&A Doc Tool (VDT) to a Framework
- Revolution: Executing Requirements in the VDT
- Requirements to Documentation
- Making the case for XML
- Example: Tracing Predictions to Outcomes
- Summary and Conclusions

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- 1. I will begin with a brief background of VV&A and the key role that documentation plays in this process.**
- 2. From this background, we will turn to the need for a documentation tool, and its evolution through a short history of the project in terms of requirements, capture, prototyping, and development. Specifically, we will discuss the need for the standalone tool to evolve into a flexible, web-enabled framework.**
- 3. Then we will move to the Revolution of the VDT from the user perspective: its features & capabilities, and how it mirrors the M&S and VV&A processes, with a demonstration of its current release.**
- 4. Following this, we turn to the developer's perspective and how VVML underpins the VDT to provide robust automation Results.**
- 5. We will then see the VDT in action through two use cases: Tracing predictions to outcomes and contributions to model repositories.**
- 6. Finally, we will sum up with FAQ's and conclusions.**



Why do we need a documentation tool? To answer this, let's begin with a short overview on VV&A and its documentation.

Workable Standards



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VV&A: Purpose

VV&A is the formal process of establishing an M&S's credibility

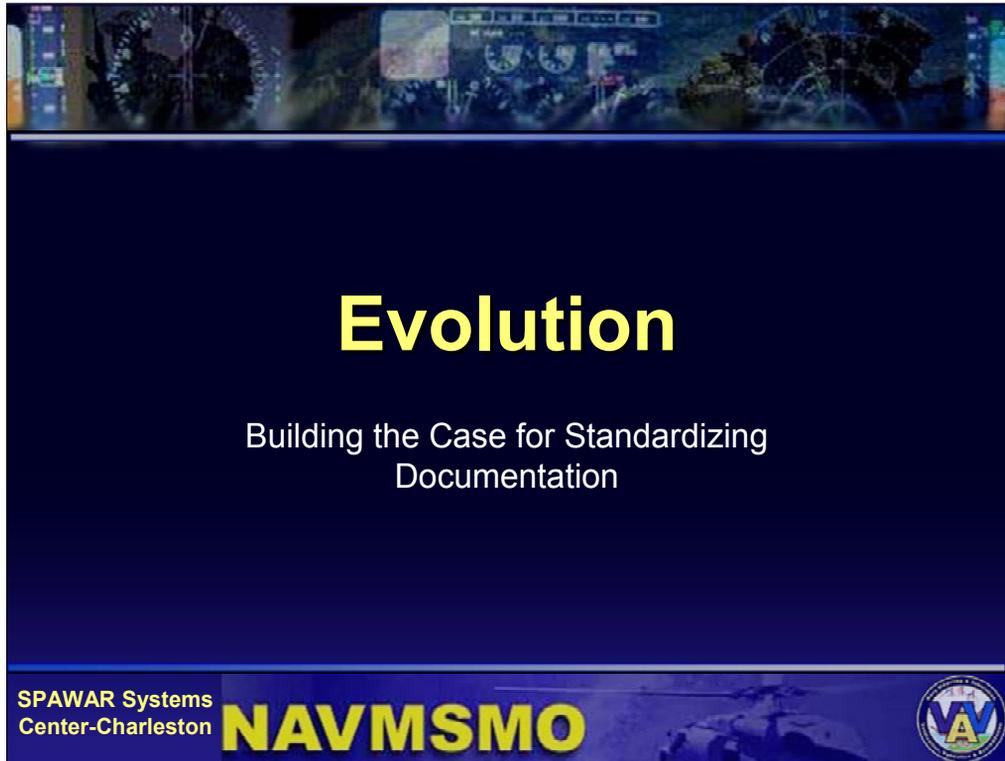
- Builds credibility and confidence in the M&S's use.
 - Reduces risks associated with use.
 - Supports re-use.
 - Satisfies policy requirements.

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VV&A's purpose is to build credibility in an M&S and confidence in using its results.



How did we identify XML as the solution to VV&A documentation needs? We now turn to an assessment of current documentation tools and yet-unresolved user needs.

Why a XML language for V&V?

- Requested features of the VV&A Doc Tool were driving force
 - Features (Repository search, embedded values, weighted variables) would be impossible without a framework
- Supports “Rapid Composability”
 - Allows immediate knowledge of the M&S “pedigree”

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Benefits of XML

- XML's structured Metadata creates relational links within and between documents.
- Universal Data Access
 - Ability to access, assess, and update existing data with only the changes needed.
- Adding properties to existing data, for example: A Goodyear Blimp pilot needs lat/lon for Busch Stadium rather than street address

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General benefits of XML include....

Interoperability

Things that must be together to work usually can't be shipped together. - unknown



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Interoperability requires knowledge of the component beyond that of simple metadata, the end-user of the M&S must have information relating to the “semantics” of the M&S

Having a “Pedigree” supports Interoperability

- VVML-formatted VV&A would link to Model Repositories and allow for quick and effective searches filtered by “Intended Use”.
- VVML expands Metadata usefulness by storing V&V information on the M&S
- M&S Users can quickly distinguish whether “the system is built right” and “is it the right system?”

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The M&S community is focusing more and more on reusability. However, effective model repositories require current information. Standalone tools do not have the capacity to automatically upload changes to documentation.

Simulated Runway displayed in Metric or Standard Scale?



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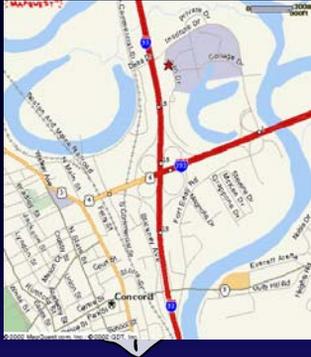
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As this picture illustrates, metadata alone isn't enough, how does the data contribute to the "intended use"

Search Only Applicable Data

■ Is it the correct data for the “Intended Use”?



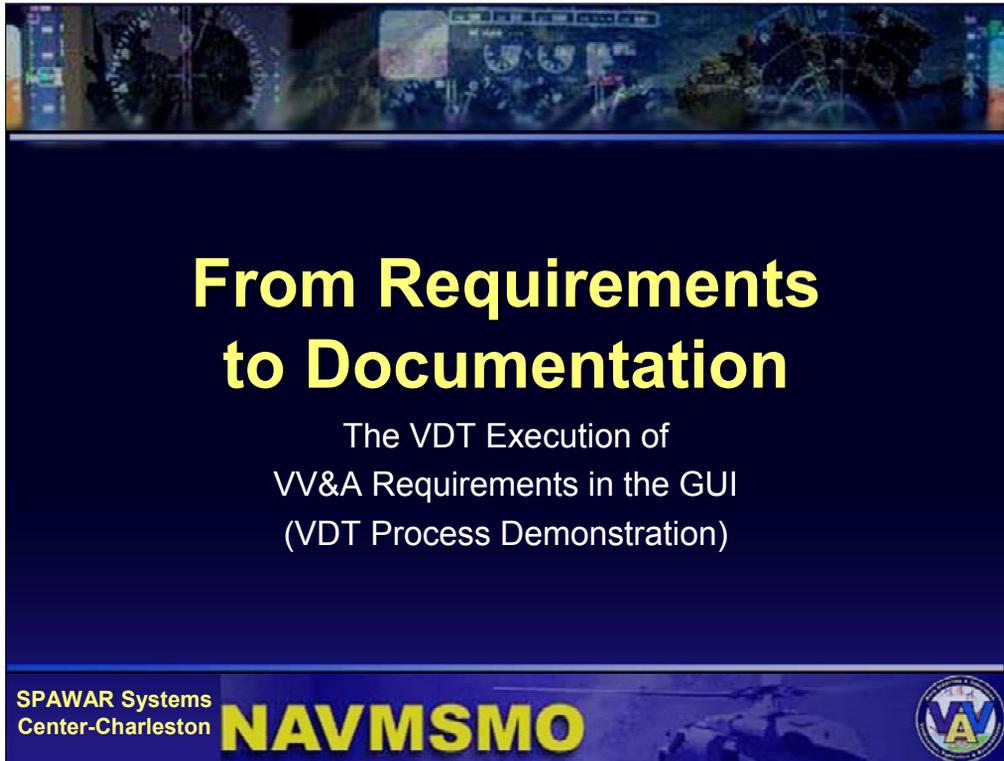
- Is this the best Map data I can find?
- Will this map overlay properly with other Map data?
- Can I use this Map as a data source for my intended use?

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The ability to filter searches



From Requirements to Documentation

The VDT Execution of
VV&A Requirements in the GUI
(VDT Process Demonstration)

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**The easiest way to show, step by step, how the VDT addresses each part of the VV&A process is to demonstrate the tool.
(SWITCH TO TOOL)**

Requirements Captured

- Module that will migrate legacy models to
- Risk vs. Cost Feature
- Must be Web Enabled (Compliant to TFW)
- Provide means to structure “levels of V&V” and measures of performance
- Ability to Track V&V Planning to Implementation

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These are some of the major requirements collected from the Beta test.

VV&A: Documentation

The screenshot displays the 'VV&A Documentation Tool' interface. On the left is a 'Project Explorer' with a tree view containing folders for 'Accreditation Plan', 'M&S Development', 'Accreditation Resource', and 'M&S Development'. The main editor window is titled 'Accreditation Plan - M&S Development' and contains the following text: 'Describe the overall M&S development/modification effort. Provide a diagram of the top-level M&S design.' Below this is a 'Sample diagram below' showing two interconnected processes:

- M&S Process:** A horizontal flow of boxes: 'M&S Need' (Intended Use) → 'Requirements Development & Management' (Functionality, Flowby, Credibility) → 'Technical Solution' (Design, Develop, Test) → 'Product Integration' (Integrate, Test, Deliver) → 'Support' (Operational Support, Maintenance, Disposal).
- VV&A Process:** A horizontal flow of boxes: 'Conceptual Model Validation' → 'Design Verification' → 'System Verification' → 'Results Validation'. A 'Data V&V' box is positioned below 'Design Verification' and 'System Verification' with arrows pointing to both.

Vertical arrows connect the VV&A process to the M&S process: 'Accreditation and V&V Planning' (between M&S Need and Requirements) and 'V&V and Accreditation Reporting & Accreditation Decision' (between Product Integration and Support).

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If VV&A is to be effective, it needs to clearly articulate the results of the M&S. The only way this is accomplished is through its documentation. Documentation tools are vital in streamlining and standardizing communication.



Revolution

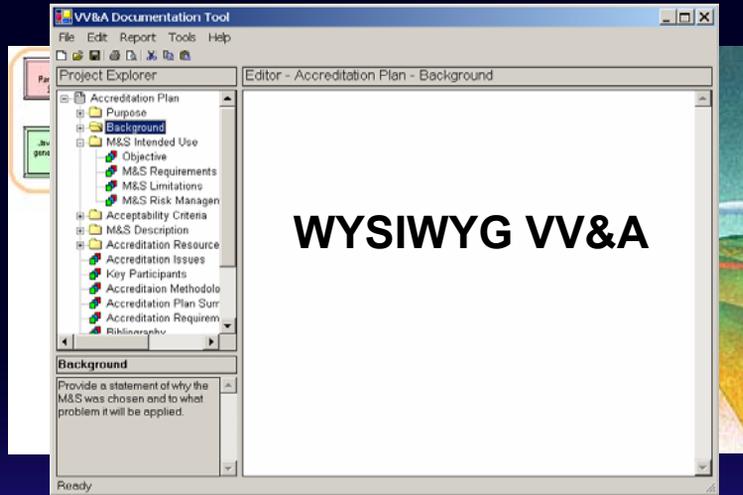
Executing Requirements through the VDT
(User Perspective)

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What to do? The Revolution of the VDT is in its flexibility and accessibility. Prove it, you say? Willingly! Let's begin with the user perspective.

Hide the Complexity



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Rapid Composability



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**Tracing Predictions
to Outcomes**

Example

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So.... Let's put the VDT through its paces and see how VVML executes the steps.

VV&A Handbook (Automated)

1. **Identify the test by name, date, and time.**
2. Test conductor's name, organization, phone, and e-mail address.
3. Describe the hardware/software architecture.
4. State the purpose relative to the acceptability criteria.
5. Provide a brief description.
6. Identify any prerequisite conditions that must be established prior to performing the test case.

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The automated input fields

Step 1: Test Result Capture

- **Test Description:**

- 1. Identify the test by name, date and time.

```
<A VVML: link="extended"  
      href="https://vdoc.spa.navy.mil/minewarfare_NA  
VSEA.vvml#ID(1211)"> Mod1, 09152004:1500  
minewarfare_NAVSEA_VVPlan /A>
```

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The underlying VVML

Step 2: URI (Uniform Resource Identifier)

- **Test Description:**

- 1. Identify the test by name, date and time.

```
<A VVML: link="extended"
```

```
href="https://wvdocs.navy.mil/minewarfare_NA
```

*A-FIST XXI simulates
vehicle movement and all
of the firing capabilities for
the M1A1*

```
od1, 09152004:1500
```

```
/A>
```

Unique ID stored for each iteration of tests

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User Input

Current Concerns

- **Do I need to learn a language?**
 - No. The VVML-enabled VDT is a (what you see is what you get) XML editor.
- **Will a VVML file increase file size and affect performance?**
 - Perhaps. the increased interoperability will most likely counter any effect on file size.
- **Is it necessary to re-write legacy/existing V&V?**
 - XML does not expose data as XML. Rather, it maps the VVML interface to the native data.

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Your initial reaction may be to think that this is something of an oxymoron. After all, isn't XML supposed to separate data and representation?

A Contribution to the Semantic Web

“The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation.”

The Semantic Web, *Scientific American*, May 2001.

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Bottom line:

Summary

- **VVML provides a “pedigree” of V&V information for M&S components**
- **Promotes reuse of models by making it easier to search for V&V’ed components**
- **Flexibility between standards: XML data manipulation (i.e.: from Navy to DoD and vice versa).**

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A Call for Participation

Try the VDT and let us know what you think:

1. Request a user name and password from: vva@navmsmo.hq.navy.mil
2. Log onto <http://navmsmo.hq.navy.mil>
3. Click on: VV&A (left navigation bar)/VV&A Documentation Tool.

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The VDT continues to evolve and the its success in meeting user needs hinges on user input. Try it out and let us know what you think.

Questions?

Thank you so much for your time.

Contact Information

- vvadoc@navy.mil
- <https://vvadoc.spawar.navy.mil/>

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