Chapter 1 – INTRODUCTION

1.1 BACKGROUND

The idea for an Exploratory Team on Verification, Validation, and Accreditation (VV&A) of Federations was first proposed during the 5th NATO Modelling and Simulation Group (NMSG) meeting in July 2000. Following initial preliminary discussions and a short meeting by interested parties in September 2000 at the United States Defense Modeling and Simulation Office (DMSO), it became clear that sufficient interest and substance existed for the formation of a Task Group (TG) on the subject.

Credibility is critical to the effective and appropriate use of modelling and simulations (M&S) when used independently or combined in a federation. The cornerstone to establishing M&S credibility is a robust VV&A process. There is a widely disparate understanding of the VV&A process within the NATO/Partners for Peace (PfP) community. Therefore the need exists to establish a consistent baseline of terminology, philosophy, and methodology.

Building a federation that incorporates representations appropriate to the needs of its users relies heavily on the information generated by the VV&A process. Just as the High Level Architecture (HLA) [1] provides the framework that addresses technical interoperability (e.g., issues related to connectivity and data exchange), a well-defined VV&A process supports the establishment of substantive interoperability (e.g., issues related to representations, consistency).

The NATO/PfP community currently has several major initiatives that require the development of M&S federations. The success of these initiatives is tied to the credibility of the federation results and therefore, the VV&A process. This makes definition of a consistent VV&A process even more imperative.

1.2 TASKING

The charter of this Task Group included seven distinct tasks:

1) Assess existing NATO and national VV&A products to determine applicability and leverage potential;
2) Determine VV&A issues of concern to the success of major NATO/PfP federation initiatives;
3) Formulate an outline describing the major elements of the VV&A baseline;
4) Evolve the baseline into a Technical Report;
5) Capture lessons learned from major NATO/PfP initiatives;
6) Revise the baseline to reflect lessons learned; and
7) Finalize the Technical Report.

In the course of executing the first task, the Task Group identified, assessed and compared the following products and approaches related to federation VV&A or with possible influence upon VV&A:

- International Test Operations Procedures VV&A Documentation Guidance [2];
- U.S. Department of Defense (DoD) VV&A Recommended Practices Guide [3];

- VV&A of Federations by V. Dobey and R. Lewis [4];
- Recommended Practice for VV&A of Distributed Interactive Simulations, Institute of Electrical and Electronics Engineers (IEEE) 1278.4 [5];
- German V-Model for Development of Computer-Based Systems [6, 7];
- Universität der Bundeswehr München (UBM) Model of VV&A of Models and Simulations by D. Brade [8];
- Guidelines for VV&A Techniques, THALES JP 11.20 [9, 10, 11];
- U.K./France Joint Study of VV&A of Models and Simulations [12];
- UK Process for VV&A for Synthetic Environments [13, 14];
- U.S. DoD Instruction for VV&A of Models and Simulations, DoDI 5000.61 [15];
- Verification and Validation of Software Systems, IEEE1012 [16];
- Director General (Scrutiny & Analysis) (DG(SRA)) Guidelines for the Verification and Validation of Operational Analysis Modelling Capabilities (Dec 2002) [17]; and
- Naval Sea Systems Command (NAVSEA) Dahlgren Accreditation Team (NDAT) VV&A Process [18, 19].

The Task Group then worked to combine these various concepts for and approaches to VV&A and systems development into an outline for a baseline for federation VV&A. This outline evolved into a draft technical report describing the baseline concepts. The structure of this report closely paralleled the High Level Architecture (HLA) Federation Development and Execution Process (FEDEP), IEEE 1516.3 [20].

Review of this report by a panel of VV&A experts as well as by the authors themselves revealed the disparities between the VV&A approaches of the member nations. The Task Group then decided that a consistent approach to the VV&A of federations could only be successfully developed if it was founded upon a unified model of the underlying VV&A processes.

Shortly after that decision, the First Combined Convention on International VV&A Standardization Endeavours (CConVV&A) [21] defined the relationship between ongoing VV&A initiatives and their associated products. These initiatives included Western European Armament Group Research and Technology program on VV&A (REVVA), International Test Operations Procedures (ITOP), the Simulation Interoperability Standards Organization (SISO) VV&A Overlay Product Development Group (PDG), and NATO Modelling & Simulation Group 019 (MSG-019). As these groups exchanged information about their ongoing efforts and the status of their products, the considerable overlap between the SISO VV&A PDG and NATO MSG-019 became clear. One of the recommendations coming from this convention was that these two efforts be combined. In January of 2005, the two groups met as the VV&A Overlay Drafting Group whose product would be a VV&A overlay to the FEDEP.

This report documents the results of the MSG-019 Task Group efforts to establish the draft VV&A Overlay of the FEDEP. The Overlay has entered the IEEE balloting process and is anticipated to become IEEE 1516.4. A final draft of the Overlay is included as an appendix to this report.

1.3 TASK GROUP MEMBERSHIP

Nations participating in the MSG-019 were Canada, France, Germany, Sweden, the United Kingdom, and the United States. The United States representative served as chair of the Task Group.

1.4 SCOPE OF EFFORT

The area of research this Task Group focused on is the VV&A of federations. The Task Group's scope was to address the issues most critical to the success of the aforementioned NATO/PfP initiatives. The scope of this effort included:

- Identifying and defining the terminology needed to clearly describe the VV&A Overlay processes;
- Characterizing the differences between federate VV&A and federation VV&A and using those differences to distinguish the responsibilities of those participating in federate and federation VV&A;
- Understanding the theoretical nature of the underlying VV&A processes while emphasizing the practical application of that theory;
- Developing a unified model of VV&A processes that addresses the disparate concerns and needs of the member nations;
- Building VV&A guidance based upon actual experience that captures that anecdotal but invaluable knowledge;
- Recognizing the unique role that VV&A plays in the FEDEP that contributes to ensuring that federations can sufficiently serve their intended uses;
- Capturing the assumptions upon which the guidance in the VV&A Overlay is based; and
- Understanding, as much as possible, the nature and extent of tailoring of the VV&A processes.

The scope of this research was also constrained by the assumption that the VV&A Overlay would apply primarily to the development and execution of HLA federations using the FEDEP [20].

While the VV&A Overlay is focused on the FEDEP, users, developers, and VV&A personnel working with simulations and simulation compositions not based upon the HLA can also benefit from the guidance in this document since the activities that this overlay describes can support any type of distributed simulation development.