

1-1-2000

Towards A Simulation Interoperability Methodology And Supporting Software

Robert W. Franceschini

Find similar works at: <https://stars.library.ucf.edu/istlibrary>
University of Central Florida Libraries <http://library.ucf.edu>

This Research Report is brought to you for free and open access by the Digital Collections at STARS. It has been accepted for inclusion in Institute for Simulation and Training by an authorized administrator of STARS. For more information, please contact STARS@ucf.edu.

Recommended Citation

Franceschini, Robert W., "Towards A Simulation Interoperability Methodology And Supporting Software" (2000). *Institute for Simulation and Training*. 200.
<https://stars.library.ucf.edu/istlibrary/200>

INSTITUTE FOR SIMULATION & TRAINING

**Towards a Simulation Interoperability
Methodology and Supporting Software**

October 2000

Dr. Piotr Windyga, Dr. Robert Franceschini, Mr. Brian Goldiez,
Ms Allison Griffin,

Institute for Simulation and Training
University of Central Florida



B332

IST-CF-00-01

TOWARDS A SIMULATION INTEROPERABILITY METHODOLOGY AND SUPPORTING SOFTWARE

Dr. Piotr Windyga
Dr. Robert Franceschini
Mr. Brian Goldiez
Ms. Allison Griffin

Institute for Simulation & Training, University of Central Florida
3280 Progress Drive, Orlando, Florida 32826-0544

ABSTRACT

Since a robust definition of simulation interoperability, together with unambiguous guidelines to achieve and assess interoperability in all possible scenarios is still a promise, building simulation components to be interoperable with complex simulation systems represents a challenging task. The multiplicity of situations that can arise and the unpredictable nature of the simulation exercises define a very wide range of cases that are extremely difficult to handle by means of manual methods.

In many simulators a wide range of parameters and conditions are required to assess interoperability. Parameters used for assessing interoperability in the US Army's Close Combat Tactical Trainer (CCTT) include those used to describe control methods, simulated performance of physical entities, behavioral characteristics of simulated entities, spatial and temporal consistency, communication mechanisms and the synthetic environment. Parameters in these simulator systems are the characteristics of interoperability that are normally used to provide an interoperability rating to a candidate system. This rating, based on the performance of the system, is obtained from testing the candidate system against pre-established parameters, which are statically weighted.

In this paper we discuss how the testing community can use simulator characteristics, such as those noted above, to devise an approach for measuring interoperability. Our approach can be used for cases where desired levels of simulator interoperability are known a priori, or when two simulators are brought together and the level of interoperability must be determined. The approach relies on identifying and comparing detailed performance characteristics for two simulators, characterizing interoperability over the course of a simulator exercise into three categories using statistical approaches, and participation or observation of users in relevant free play exercises. Data gathering is accomplished by

periodically capturing isolated parameters and through interactive exercises between the simulators using data loggers. A Lockheed Martin developed interoperability schema is used to categorize and address interoperability performance.

Once a body of knowledge and experience is gained from testing, the logical progression is to create a software architecture and tool that is based on quantitative and qualitative data. This tool could be used before, during and after a development involving simulation interoperability with a system, such as the CCTT. Using the tool before the development starts would allow for a better estimate of the level of effort required, while its use at the end of the development would allow the assessment of the level of interoperability achieved.

INTRODUCTION

Driven by the ultimate goal of increasing the benefits of modeling and simulation (M&S), interoperability has become a paramount issue. In the context of distributed simulations, interoperability is commonly understood as the ability of one simulation to function with another simulation to achieve a predefined objective. For example, conducting training exercises in a distributed virtual environment provides an opportunity for whole units or groups to train in a realistic but safe environment. Networking heterogeneous simulators together to create a virtual environment requires that the simulators conform to communication standards, such as Distributed Interactive Simulation (DIS) IEEE 1278 or High Level Architecture (HLA) IEEE P1516. Conforming to the standards does insure a minimum level of compatibility but it does not guarantee interoperability. There are many issues that must be addressed to insure a functional level of interoperability between heterogeneous simulations.

A close look at concrete interoperability initiatives reveals a challenging problem characterized by a large set of interrelated factors, not all equally important. Efforts to date appear to address general

matters of interoperability, but do not delve into the detailed treatment of what features need to align or how one is to conduct an interoperability assessment. Evaluating the interoperability of heterogeneous simulation systems is a complex problem. It can be a costly and time-consuming task. The Institute for Simulation and Training (IST) at the University of Central Florida has been researching the problem of evaluating simulation interoperability and has developed an approach for evaluating the interoperability of heterogeneous simulation systems. This approach considers the use of each simulation in the system, the components of each simulation and their importance in the interoperability of the simulation system. Furthermore, the approach provides for an objective, third party evaluation of interoperability.

The preliminary study takes the US Army's Close Combat Tactical Trainer (CCTT) system as the target simulation and analyzes the interoperability issue from the developing and integrating vendors' points of view. The technique for assessing interoperability is an integration and outgrowth of a body of recent papers and approaches addressing interoperability. A repertoire of simulation features is assembled, supported by associated statistics and thresholds that depend on the intended use of the interoperating simulations. The proposed method discriminates simulations' requirements among hierarchical categories (*must-have*, *interdependent*, and *nice-to-have*), according to their relative impact in achieving the objectives desired by the interoperation. Our approach is being codified in a CCTT interoperability test matrix that will be used to evaluate interoperability between CCTT and a target system, such as the Bradley Advanced Training System (BATS). The approach can be easily refined and extended to other types of simulators.

This paper describes the general issues involved in the interoperability of heterogeneous simulation systems. It also details the approach IST proposes to evaluate the interoperability between heterogeneous simulation systems. It includes a detailed description of the Interoperability Structure, which is part of the overall approach to interoperability evaluation. It includes an example of how the structure was used to evaluate the interoperability between CCTT and BATS including the Test Plan that was developed. Finally, this paper provides conclusions and future research plans.

DEFINITION OF THE PROBLEM

Interoperability is necessary for the effective interaction of heterogeneous simulations. Consistent information interchange and use of information in networked simulations is necessary for interoperability. The research detailed in this paper focuses on developing a definitive methodology for evaluating interoperability. For the purposes of this paper, a simulation system is defined as two or more heterogeneous simulations interoperating over a network as shown in Figure 1 below.

Evaluating the interoperability of heterogeneous simulation systems by testing every attribute can be time consuming and costly. A goal of this research was to develop a technique to evaluate the interoperability of heterogeneous simulation systems accurately without conducting an exhaustive test.

INTEROPERABILITY STRUCTURE

Prior to this work, IST performed a detailed review of current approaches to testing interoperability [Franceschini,2000]. IST concluded that interoperability evaluation should be restricted in scope to achieve useful results. To organize interoperability evaluations, IST proposes an interoperability structure. The structure consists of four important areas to consider when evaluating the interoperability of simulations, as follows:

Simulation Use – the function of the simulation. The intended use of the simulation dictates which functional areas must be considered in interoperability evaluations.

Simulation Components – the functional areas of the simulation that are necessary to evaluate for interoperability. Within this category it is important to consider behaviors of entities such as computer-generated forces.

Feasibility – the cost of testing and evaluation of simulation components.

Objectivity – for interoperability determinations to be meaningful, the evaluation must be conducted impartially. Often the individual simulation developers have a vested interest in convincing a sponsor about interoperability results. Making the evaluation as objective as possible ensures that interoperability determinations are not unduly influenced by issues of financial gain, etc.

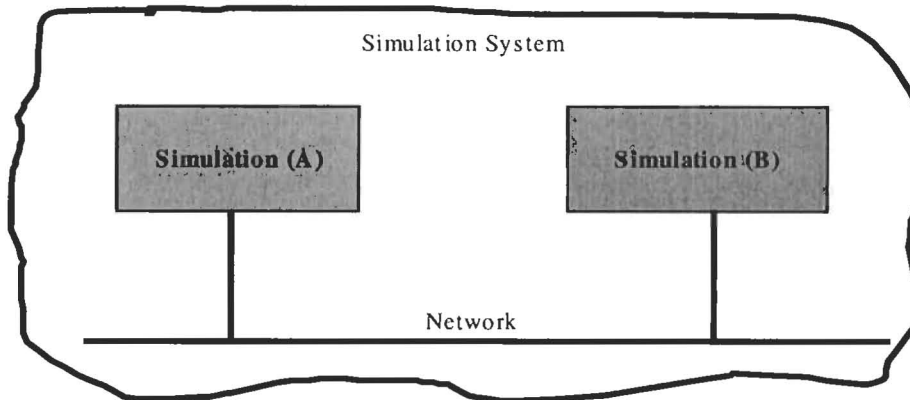


Figure 1 - Simulation System

These four areas can be combined into a process for determining an interoperability test plan. As shown in Figure 2 the first step to evaluating the interoperability of a simulation system is to determine the required *Use*. The *Use* of the simulation defines the *User (Scenario) Requirements*. The *User Requirements* can then be reviewed against the decomposition of the simulation to provide a list of *Technical Requirements*. Each item in the list of *Technical Requirements* should be evaluated for feasibility (cost). This analysis results in the final *Test Plan*, which identifies test attributes and their acceptable ranges of values.

The four areas in the interoperability structure are discussed in more detail in the following sections.

Simulation Use

When considering the evaluation of interoperability of simulation systems, a natural inclination is to attempt to conduct this assessment in a manner that is independent of the use of the system. The goal would be to develop an interoperability rating that can be understood without relating to a particular simulation scenario, something like "simulator A and simulator B are 0.8 interoperable," meaning that the simulators work well together 80% of the time. This is advantageous because it potentially provides a simple, absolute rating scale that can be easily understood.

However, such a rating scheme probably would not be meaningful in practice. Consider simulators A and B from the previous paragraph. Suppose that an exercise manager decides to use these simulators together and sees that they have an 80% interoperability rating, which she interprets as meaning a high degree of interoperability. A crucial component of her scenario is for a missile represented by simulator A to destroy a tank represented by simulator B. She will be disappointed to discover, after spending a large amount of time, effort, and money, that this particular interaction falls within the 20% of interactions between A and B that are not interoperable. This illustrates a general issue with simulation: that a relatively small detail can have tremendous importance for a particular scenario. Unfortunately, standard statistical analyses tend to assume that some small details can be ignored in favor of a coarse analysis (such as the 80% rating given above).

The solution to this problem is to carefully consider the intended use of the simulation. The use needs to be defined and analyzed to determine important interoperability details. These can be expressed as attributes describing a simulation scenario from the point of view of a user (rather than a simulation developer).

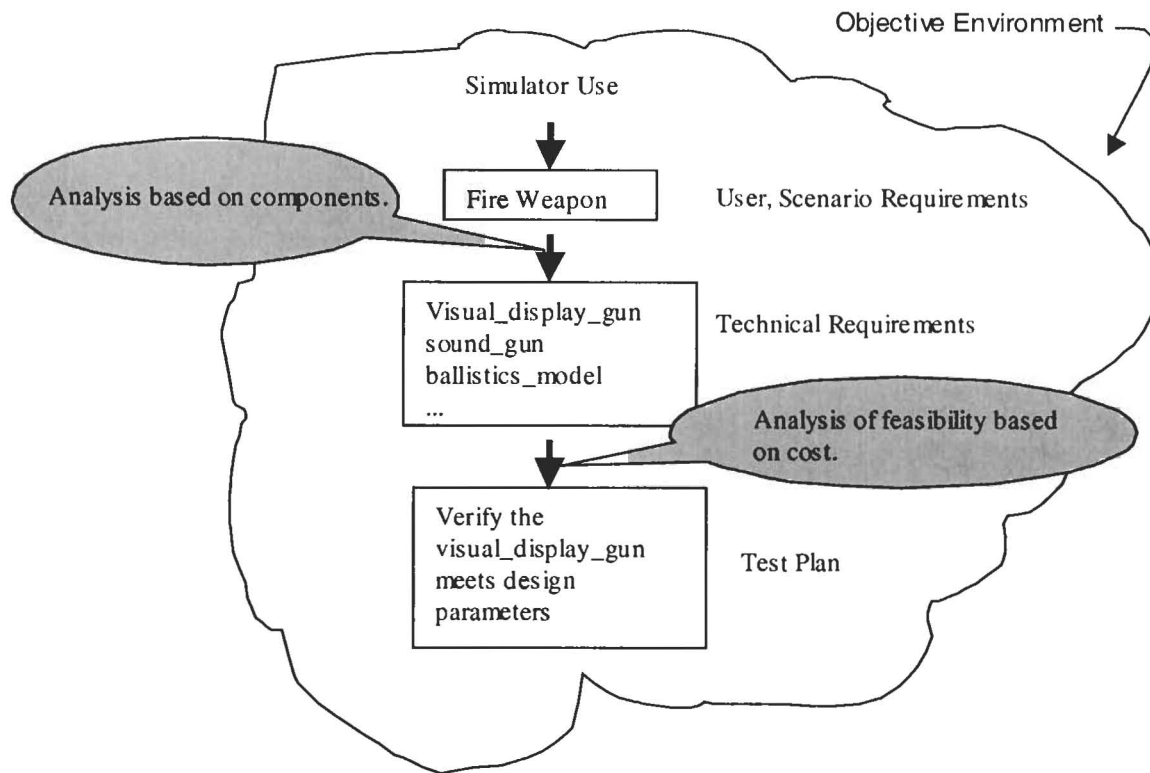


Figure 2 - Interoperability Evaluation

Simulation Components

To develop a technical understanding of the implications of user requirements, the various components of simulations must be understood. IST developed the taxonomy of system level and non-entity features shown in Table 1. Included in the taxonomy are such factors as network management, network loading and bandwidth availability, data management, and simulation management (system freeze, restart, and other features). This taxonomy represents the initial construct of a taxonomy that can be used in the evaluation of interoperability in a simulation system.

There are two approaches to using the information in the taxonomy:

1. Gather the characteristics of each simulation using this format allowing analysts (technical and subject matter experts) the ability to make an initial determination of areas where interoperability is feasible. Tests then would validate the analysis. Interoperability can then be assessed from a functional and technical point of view.

2. Determine which areas are important for interaction (based on training requirements for example) and create the scenarios with these objectives in mind. Once again, tests are used to validate the approach.

Both approaches were considered during development of the CCTT BATS interoperability tests (discussed later in this paper) with approach 2 being the selected approach in this case.

To insure a broad assessment of interoperability, simulation issues were investigated that directly and indirectly related to entity behavior and interaction. Among areas of interactions and classes of entities the following are included:

- *Direct Interactions of Like Entities:* These types of entities are similar in type to those already in the CCTT environment. Both human operated and SAF entities are included. An example would be a human operated M-1 tank.
- *Direct Interactions of Other Entities:* These types of entities are not present in the current CCTT, but would be such that direct interactions could be expected. Both human operated and SAF entities are included here. For example, non-combatant vehicles were assumed to not be present in the current CCTT,

but may be desired to better represent a desired training scenario.

- *Indirect Interaction of Entities:* These types of entities are such that only a subset of interactions is expected. For example, an entity used as a visual reference or to populate the battlespace, only, would fall into this category.
- *Other components of the battlespace linked to entities:* This category includes consistent representation of environmental effects, weapons performance, behavior models, communications models, and other physical and cognitive capabilities.

Our premise is that the degree of interoperability requirements will decrease as the review moves down the hierarchy of interactions described, above. The validity of this premise has been verified through discussions with military users, contractors, as well as through selective testing using simulation hardware.

Feasibility

Because the cost of evaluation must be considered, each level of interoperability must be further assessed as follows:

- 100% or strict observance for must-have attributes
- a percentage of compliance for interdependent attributes
- somehow include those nice-to-have attributes.

Users and analysts can sub-divide percentages into sub-levels or allocate percentages based on certain features of the simulation.

An example of this latter sub-division could be the requirement that vehicle dynamics (linear acceleration along all three axes, maximum velocity, range) match within 10%, while angular acceleration match within 20%. The items identified as important to interoperability would then be laid onto the levels of interoperability identified.

Each technical requirement can be evaluated in the following manner:

- must have* – requirements/parameters that are necessary for interoperability and functionality.
- interdependent* – requirements/parameters for which a statistical sample or minimum number of anomalies would be acceptable
- nice-to-have* - requirements/parameters that are not important or relevant to the desires of the connected simulations.

Objectivity

To be objective in evaluating interoperability, one requires a detailed, formal, mathematical interoperability definition. Such a definition would eliminate any subjectivity in the evaluation. For example, suppose one wanted to evaluate the interoperability of two simulations, one of which represents a missile flying to a target and the other represents the target. To evaluate interoperability, one would need a list of relevant attributes such as missile velocity, location, and lethality, target vulnerability, and the ranges of values that these attributes can assume. Armed with this information, objective determinations can be made as to whether the explosion of the missile will cause proper damage to the target, and whether that interaction is appropriately represented for the intended simulation use.

Unfortunately, in the near term it is unlikely that such a complete formal definition of interoperability will be developed. While there are partial definitions that specify interoperability on an attribute-by-attribute basis, there is not yet a proven unifying theoretical or practical framework for formally describing interoperability. Development of such a framework faces at least two challenges: properly enumerating and describing all relevant simulation attributes, and developing a method for combining the evaluations of these attributes into an overall meaningful interoperability rating.

Therefore, to minimize subjectivity, an independent third party should be involved to conduct the interoperability evaluation. As shown in Figure 2, the entire process is conducted by a third party. The developers of the simulations have a vested interest in the simulation and see the simulation from their point of view. A third party would be able to see both simulations from an objective viewpoint. The simulation developer is more focused on the functionality of their simulation. The independent review and evaluation of the interoperability of the simulation with another simulation brings additional insight into the areas that may need to be evaluated. A third party will also have access to the specifications of both simulations and will not focus on one over the other. The third party should also be one that is experienced in simulation interoperability.

PROTOTYPING THE APPROACH: CCTT & BATS INTEROPERABILITY

Using the approach detailed above, IST evaluated the interoperability of BATS with CCTT using CCTT as the baseline for interoperability. To provide some background on CCTT, it is part of the Combined

Arms Tactical Trainer, and is the first fully DIS compliant training system. CCTT creates a highly complex synthetic battlefield on which soldiers can conduct training in a combined arms environment. The primary training focus of CCTT is the training of full tank crews. BATS was built to simulate the U.S. Army's M2A2 and M2A3 Bradley Fighting Vehicles and to be used with CCTT in combined arms training exercises.

Table 1 – Taxonomy of Simulation Components

| Category | | Attribute | |
|--|--|--|--|
| Environmental Characteristics | | Ground terrain and features | |
| | | Air and features | |
| | | Ocean and littoral areas and features | |
| | | Space and features | |
| Set-up/Initialization | | Software load and configuration management | |
| | | Entity placement | |
| | | re-scripted scenarios | |
| | | Control strategy | |
| Simulated Entity Characteristics (can be vehicles or control nodes) | | Simulation runtime management | |
| | | Simulated Entity #1 Characteristics | Movement characteristics: <ul style="list-style-type: none"> • Dynamics models • Coordinate systems • Coordinate conversions |
| | | Vision systems | Visual characteristics Sensor characteristics |
| | | Weapons systems characteristics | Recognition of weapons Characteristics <ul style="list-style-type: none"> • P_k • P_h • Fly Out model |
| | | Communications systems characteristics | Voice <ul style="list-style-type: none"> • Digital • Analog Data |
| | | Monitor systems Sustainment | |
| Simulated Entity #2 Characteristics | | | |
| Simulated Entity #N Characteristics | | | |
| Behavioral Characteristics of Simulated Entities | | Protocols | Standard Non-standard |
| | | Cooperative | |
| | | Offensive | |
| | | Defensive | |
| Network topology | | Distributed Simulation Infrastructure Characteristics of the Operating System | |
| | | Software Languages | |

At this point, the use of BATS with CCTT has been determined and the functional requirements have been established and can now be mapped to the technical requirements. To do this IST used the listing of technical requirements provided in the CATT Interoperability Control Document (ICD), developed by Lockheed Martin [US Army STRICOM,2000]. The CATT ICD provides an overview of the CCTT system as well as a detailed listing of the technical requirements important to interoperability.

The technical requirements are divided among the following capability areas in the ICD:

1. Infrastructure
2. Simulation Management
3. Communications
4. Synthetic Environment
5. Image Generation

Each of these capability areas is further decomposed into capability tests indicating a testable attribute that can be used to validate the capability. Also, the ICD indicates the level of interoperability that is reached for each testable attribute that can be validated. The ICD defined five levels of interoperability shown in Table 2. IST mapped selected BATS functional requirements to the CATT ICD capability tests to determine which of the capability tests should be evaluated. IST also took into consideration that BATS reuses much of the CCTT software so the two simulations should be close to achieving a

interoperability level of Compliant as defined by the CATT ICD. The CCTT BATS Interoperability Test Plan [Griffin,2000] included the capability tests identified in the review.

CCTT BATS INTEROPERABILITY TEST PLAN

BATS is based on the M2A3, but manifests itself as an M2A2 for the interoperability testing described in the CCTT BATS Test Plan. In general, the CCTT and BATS Test Plan followed the requirements listed in the Lockheed Martin (LM) ICD. Additionally, tests for the interoperability of the enhanced features of the M2A3 and the CCTT system were included in the CCTT BATS Test Plan to insure critical parts of the simulation system are functional. For example, the M2A3 was built with enhanced command and control, which should be tested with CCTT to insure they operate within parameters. The M2A3 was also designed and built with enhanced mobility that should be tested to design parameters with CCTT. The resulting CCTT BATS Test Plan tests the basic simulation functions of BATS with CCTT but focuses on areas where BATS extends CCTT functionality; these areas will be tested thoroughly while functionality that is reused from CCTT will be spot-checked. The goal of the spot-checking is to confirm the correct use of common CCTT software (this is the Interdependent Tests noted elsewhere in this paper).

Table 2 CATT ICD Levels of Interoperability [U.S. Army STRICOM, 2000]

| Interoperability Level | Definition |
|---------------------------------|---|
| <u>Non-invasive:</u> | A simulation/simulator system is said to be non-invasive if it is able to operate on the local area network (LAN) in the same exercise with the CCTT system without degrading the performance of the CCTT system. |
| <u>Compliant:</u> | A simulation/simulator system is said to be compliant if it is non-invasive and it implements the Distributed Interactive Simulation (DIS) protocols in accordance with the IEEE Standard 1278.1-1995. A specific compliance determination must be made regarding each Protocol Data Unit (PDU) generated and interpreted by the simulation system. |
| <u>Compatible:</u> | A simulation/simulator system is said to be compatible with CCTT if (1) it is compliant; (2) its models and databases send and interpret PDUs in support of the realization of a common synthetic environment (coherent in space and time); and (3) it is managed in a way that is consistent with CCTT. |
| <u>Interoperable:</u> | A simulation / simulator system is said to be interoperable with CCTT if it is compatible and, for a given exercise, its performance characteristics support the fidelity required for the CCTT interoperability exercise. |
| <u>Fully Correlated:</u> | A simulation / simulator system is said to be fully correlated if it is interoperable and provides identical representations in all aspects of the synthetic environment, data sets, and algorithms as CCTT. |

Although functional areas are not addressed in the LM ICD they were included in the CCTT BATS Test Plan in the form of scenarios to test behaviors. Seven scenarios that best test the BATS functionality were selected from the standard set of CCTT scenarios. Free play tests will also be used to determine the interoperability of BATS with CCTT vehicles. Additionally, sequential tests will be used to gather data for a specific parameter of interest. It is also important for the parameter to be gathered under a variety of conditions. For example, in the case of visual system update rate, the minimum update rate should be verified in an isolated test specifically focused on capturing that single parameter. Also, update rate data should be gathered under a variety of polygon and texture loads, but such data gathering might not be practical. It is necessary, though, that the conditions under which a test parameter was gathered be documented.

Using the information discussed in the previous sections and paragraphs, IST developed a test plan to evaluate the interoperability of BATS with CCTT. The outline of the test plan is as follows:

1. Assessment of adherence by BATS to the DIS Standard and any extensions or modifications created by the CCTT
2. Assessment of incremental network traffic introduced by a new entity (e.g., M2A3)
3. Testing the physical performance of like entities in CCTT and BATS (both manned and SAF)
4. Testing the tactical performance of like entities in CCTT and BATS (SAF only)
5. Assessment of temporal compatibility of BATS and CCTT
6. Assessment of spatial compatibility of BATS and CCTT
7. Assessment of behavioral compatibility of BATS and CCTT
8. Additionally, testing physical and systems characteristics should be rigorous and include such items as:
 - a. Maximum acceleration and deceleration of the vehicle and any articulated items such as turrets
 - b. Turn radius
 - c. Range of vehicle
 - d. Checklist or range of simulated vehicle systems
 - e. Systems performance (e.g., weapons systems acquisition range)

SUMMARY AND FUTURE WORK

The objectives of this research are to develop, document, and evaluate a definitive methodology for achieving interoperability. The methodology is

codified in an interoperability structure, containing four main ideas: simulation use, simulation components, cost, and objectivity. These four ideas are combined to form a process for developing an interoperability test plan.

Based on the work done, IST plans to continue to develop taxonomy of interactivity between simulations. In the near term, IST will participate in observing selective CCTT BATS tests to assess individual simulation performance and interoperability. Our participation has the following objectives:

- Assess the suitability of IST's interoperability structure.
- Assess and document what types of positive interoperable exercises might be viable for CCTT and BATS as well as other simulations.
- Hypothesize the percentage or maximum number of anomalies for an acceptable level of interoperability.
- Identify and document what other types of tests should be conducted for future systems to assess interoperability. As an example, we might identify additional parameters that should be gathered during tests.

Our approach is to move forward to other classes of devices and interactions. This approach will be divided into a two by three matrix: one dimension for legacy systems and emerging systems and a second dimension for live, virtual, and constructive simulations. For legacy systems, IST hopes to prepare a design document describing several alternatives for entity related interfacing. Included will be methods for data conditioning (data ranges, break points, order of key multivariable interpolation), time conditioning, semantic alignment, or interface development, etc. A similar activity will be conducted for system issues. Suggested methods and techniques used for interoperability testing should be related to the taxonomy so that a general "checklist" approach can be used by a developer to gain confidence that all of the important categories are accounted for. A prioritized list of system level and non-entity features will be developed.

For emerging systems, critical variable and performance characteristics (entity and system related) will be defined in addition to the above investigations. Also, for emerging systems, IST plans to orient the work to considerations made *during* system design. As such, external or specific interfaces could be of secondary importance to

inherent design features. Performance parameters will be defined based on examination of test data, design documentation, and discussions with development engineers. The objective for emerging systems is to identify the critical variables and performance features affecting interoperability.

Finally, IST is developing approaches for achieving interoperability by modifying the interoperability structure whose overview is described in this paper. A database of interoperability characteristics would grow from continuing tests

ACKNOWLEDGEMENTS

The research program described in this paper is sponsored by STRICOM under contract N61339-99-K-0005. Opinions expressed in the paper are those of the authors and do not necessarily represent the views of the sponsor.

REFERENCES

Franceschini, R., et al. (2000). A Survey of the Theory and Practice of Simulation Interoperability. 2000 Spring Simulation Interoperability Workshop VOL 2, 625-636.

U.S. Army Simulation, Training and Instrumentation Command. (2000). Combined Arms Tactical Trainer Interoperability Control Document, (Lockheed Martin). Orlando, Florida.

Griffin, A., Windyga, P., Franceschini, R., and Goldiez, B. (2000). Interoperability of BATS and CCTT Test Plan, Institute for Simulation and Training Report (Draft), September 12, 2000.

AUTHOR BIOGRAPHIES

Piotr Windyga is a Senior Computer Research Scientist at the Institute for Simulation & Training at the University of Central Florida. He is the principal investigator of the Combat Trauma Patient Simulator project. Dr. Windyga has conducted several projects related to the automatic interpretation of medical images, and developed software for high-level image understanding and 3D reconstruction.

Robert Franceschini is an Assistant Professor of Computer Engineering in the School of Electrical Engineering and Computer Science and a member of the Department of Human Systems Integration Research at the Institute for Simulation and Training, University of Central Florida. He has performed research in distributed simulation, computer generated forces, multi-resolution simulation, data compression, and graph theory. He has over 30

published papers in those areas. Dr. Franceschini received a B.S. in Computer Science from the University of Central Florida in 1992 and a Ph.D. in Computer Science from UCF in 1999.

Brian Goldiez is the Deputy Director and Research Manager at the Institute for Simulation and Training, University of Central Florida. He has been active in interoperability research for 10 years and presently leads a research program whose goal is to move forward in addressing interoperability issues in simulators. He has published and lectured extensively in areas of testing, systems integration, interoperability, and computer graphics. Mr. Goldiez received a BS in Aerospace Engineering from the University of Kansas in 1973 and an MS in Computer Engineering from the University of Central Florida in 1979.

Allison Griffin is an Associate in Simulation at the Institute for Simulation and Training, University of Central Florida. She has been working in the field of simulation for 4 years and is currently the project lead on the Support to the Simulation Interoperability Standards Organization. In the past, Allison has also participated in the HLA BDS-D project. She also has over ten years experience in the field of nuclear power generation and the manufacture of nuclear fuel rods. Ms. Griffin has a B.S. in Mechanical Engineering from the University of Alabama at Birmingham in 1983 and a M.S. in Simulation Systems from the University of Central Florida in 1996.



0000201