SEDRIS Vision

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1. Introduction

1.1 Purpose

Joint training exercises, using a common synthetic environment, have become the current objective in the Modeling and Simulation community. An extremely large investment (in man-hours and dollars) is made in the creation of a synthetic environment database. Effective reuse of such assets is paramount with today's budget constraints. Effective transfer of data between training systems is critical to achievement of interoperability between disparate training systems.

The purpose of this paper is to present a "management level vision" of the SEDRIS Program. SEDRIS' open transmittal medium can and will save significant dollars and will improve the success rate of training systems' interoperability. Additionally, the points presented here will be utilized in Chapter 1 of the Synthetic Environment Domain Description.

1.2 References *{Larry's option – depending on document desired size}*

1. Synthetic Environment Domain Description
2. The Synthetic Environment White Paper
3. Synthetic Environment Databases White Paper
4. DoD 5000.59-P, DMSO Modeling and Simulation (M&S) Master Plan, 17 October 1995
5. SEDRIS As An Interchange Medium White Paper
6. FAQuest Transcript, STRICOM, 23-24 July 1997
7. Synthetic Environment data representation and Interchange Specification (SEDRIS) Rationale Document, Version Draft 0.2, 20 June 1996

2. The Vision

2.1 The Importance of a Synthetic Environment to the M&S Community

Synthetic environment, as used in today's networked, interoperable heterogeneous training systems, means more than just the visual scene of the simulated battlespace. In addition to the visual aspects of the natural environment (terrain, ocean or atmosphere) and objects on the battlefield, the synthetic environment must now encapsulate non-visual information to allow entities under computer control to properly interpret and navigate the environment.

A synthetic environment is created through a costly/time-consuming process resulting in an integrated, fused data set referred to as a synthetic environment database. This database contains sets of objects which define and describe a natural environment. The data objects describe a geographical region and the elements and events expected to occur there. A synthetic environment database also encapsulates the geometric and topological relationships between the data objects. These relationships are critical in ensuring that the run-time databases, derived from the synthetic environment database, will be correlated so that all “views” of the environment are the same. An important “view” is that of computer generated forces who do not “see” the battlefield but must use the data representations to correctly interpret the environmental conditions.

The current architecture of the simulated training domain is a network of heterogeneous systems. This architecture provides the capability for interoperability between training systems. To achieve interoperability, individual training systems must interchange synthetic environment data as a pre-condition to operating in the “same” environment. Achieving a high degree of correlated “sameness” of the synthetic environment is a must to ensure that conditions for a “fair fight” will exist between trainees in each networked trainer. The correlation problem is now expanded from internal “views” of the battlefield to multiple training systems’ “views” of the battlefield.

Data interchange, therefore, is not just for reuse in building synthetic environment databases but is a central element for achieving interoperability between distributed, heterogeneous training system networks. To successfully interchange environmental data, the interchange mechanism must account for all data types and their relationships used to describe the synthetic environment. The goal is a ***loss-less***, ***unambiguous*** transfer of data from one database directly into another. This interchange capability will save dollars through synthetic environment data reuse and will improve training effectiveness through interoperability of training systems. An unambiguous, loss-less data interchange will minimize the potential inter-training system correlation concern.

2.2 The Importance of an Open Synthetic Environment Description Mechanism

The DMSO Modeling and Simulation Master Plan states “Models of military operations depend on interaction with representations of the natural environment. Environmental representations must be seamless in terrain, ocean, atmosphere, and space boundary regions to present fully integrated data for M&S use.”

Because the synthetic environment is a critical element of training systems, they are carefully constructed and, hence, are expensive. New or augmented environmental databases should be leveraged off existing databases which represent similar geographic regions. Such leveraged reuse would dramatically lower production time and cost.

Unfortunately, synthetic environment data interchange is currently accomplished by point-to-point unique conversions between two specific systems. Conversion of one system’s data to another’s format is based upon rigidly defined formats for the source and target databases. Because of differing proprietary database formats, each conversion requires the development of custom data conversion software. These point-to-point solutions are expensive, time consuming and often unreliable. To meet the specific implementation of the target system, the converted datasets usually have to undergo additional conversions before a useable run-time database is obtained. Conversions add the risk of data loss or fidelity diminution. As additional data sources are added, the number of unique conversions increases geometrically.

It is easier to communicate with a model (*i.e.*, a meta-model) of the data than with the actual data. The meta-model describes the data through its attributes rather than through its storage format. The data model removes ambiguity by ensuring that all types of environmental data are captured and the relationships between alternate representations (*e.g.*, feature vs. geometry) are defined. A data model supports development of Application Programmer Interfaces (APIs) to be used for accessing the data. A data model therefore enables reuse and ***open interchange*** of synthetic environmental data since data producers and consumers can readily develop software tools, utilizing the APIs, to convert their native data to and from the data model.

3. SEDRIS Solution

SEDRIS has adopted the concept of a meta-model based transmittal medium. Through its standardized Data Model and supporting APIs, SEDRIS provides an ***open*** and ***integrated*** medium for all synthetic environment data producers and consumers. This singular commonality is the basis for projections of considerable cost savings.

From the beginning, SEDRIS set out to explicitly accommodate the superset of the system-specific data elements required by an interchange mechanism rather than merely the minimal set of shared data elements. In its current form, SEDRIS supports the full range of synthetic environmental data with the integration of terrain, ocean, atmosphere, and space. Additionally, pre-computed topology relationships are provided to support the environment interpretations required by SAF and CGF forces. The SEDRIS data model discipline provides unambiguous and loss-less transfer of all data.

The SEDRIS Data Model is the foundation for correlating separate/distributed synthetic environment databases. One data flow path will drive synthetic environment database commonality within heterogeneous, networked training systems.

SEDRIS is intended to meet the need for interactive and distributed systems sharing common descriptions of the natural environment as a precondition for interoperability. Correlated initial environments is ***the*** critical precondition to achieving environment interoperability.