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SIMULATION INTEROPERABILITY USING MICRO SAINT SIMULATION SOFTWARE

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ABSTRACT

For the past fifteen years, Micro Saint simulation software has been helping people answer questions on how to make their businesses more profitable and productive. Recently, customers have requested that Micro Saint have the capability to communicate and exchange information with other programs. In response to this request, COM Services was added to the most recent release of Micro Saint.

This paper will focus on the new features of Micro Saint 3.1 and specifically COM Services.

1 INTRODUCTION

Micro Saint 3.1, a discrete-event simulation tool, is an efficient and cost-effective tool for simulating the complexities of systems within manufacturing, health care, retail, the military, human factors, process redesign and the service industry. The problems being analyzed range from process control and resource utilization to military maintenance procedures and human performance. Micro Saint's power, flexibility, and tools for optimization make it the simulation tool of choice for many organizations. If you can draw your system as a flow chart, then you can build a model of your process in Micro Saint. Micro Saint's intuitive graphical user interface, animation features, and the power to model systems of any type or size make it a flexible tool for all types of companies.

However, in today's high tech world, communication has become key to the successful operation of business, military and health care systems. In particular, companies see the value of having interoperability between various software programs. However, in many cases, the information cannot be transferred from one software program to another.

Recognizing this emerging need for inter-model communication, COM Services was developed as a new feature for Micro Saint. One of the critical needs that has been identified in the simulation community is the ability for different models developed by different organizations even using different modeling tools to be able to communicate. In general, there are two types of communication that might be sought:

1. *Dynamic data exchange during simulation runs* whereby, one simulation relies upon another simulation federate to provide data during the simulation. This concept is illustrated in Figure 1 where different military simulation objects reflecting different systems (e.g., tanks, and airplanes) interact to be able to form a larger simulation of the battlefield.
2. *Sharing data between simulation runs* through a central data repository. For example, Figure 2 illustrates how, during system requirements definition and development, some models' outputs may serve as other models' inputs.

There have been and continue to be a number of attempts at developing inter-model communication standards such as the Department of Defense's High Level Architecture (HLA). Even though this standard is being

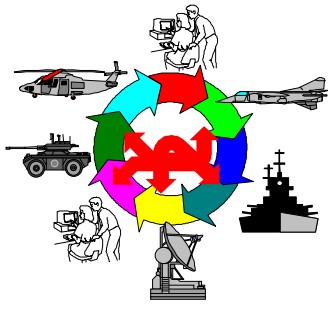

Figure 1: An Example of Dynamic Interaction of Simulation Components

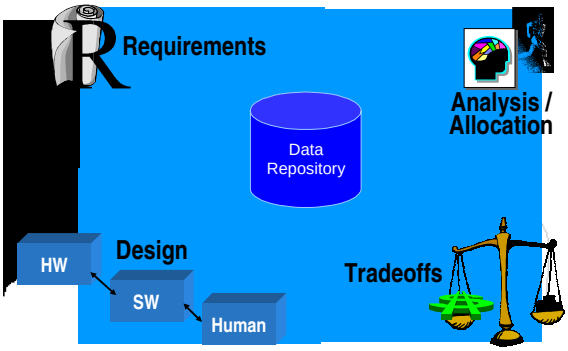

Figure 2: An Example of Simulation Model Data Exchange Needs

developed for the military, it is a general standard that is applicable to private industry as well as is evidenced by the interest in HLA being demonstrated by the National Institute of Standards and Technology. However, even with the need for simulation interoperability and the emerging standards, many of the discrete event simulation tools have not supported these goals. Development of models that communicate openly has required either the development of models without tools or the development of complex interface software to overlay on top of the discrete event simulation tools.

Micro Saint's new release overcomes this shortcoming. Now, companies using Micro Saint will have the capability of using COM Services to further their analysis of processes and systems. COM Services will allow users to have two or more simulation models send data back and forth. In addition, COM Services can be used to have Micro Saint send data to and receive data from another software program. The uses for COM Services are only limited by a customer's creativity.

Additionally, through the development of relatively straightforward interface software, Micro Saint models can adhere to standard model communication protocols such as HLA.

2 WHAT ARE COM SERVICES?

Micro Saint has recognized the communication need in the simulation market and has taken the steps to insure interoperability using something called COM services. The word COM stands for Component Object Model. COM is programming language independent and allows more than one application to send information to another application. These capabilities are part of the reason it was chosen for use with Micro Saint. In addition, COM is the most widely used object model for developing distributed and concurrent systems.

Using Visual Basic, Visual C++, Borland C++ or some other programming language as the middleware between Micro Saint and another application is the key to setting up interoperability. This sharing of information causes solutions to not only become more accurate but also save much needed time in any project. More accurate results mean better models being built and better data collection, this could indirectly yield higher profits, or more efficient system designs. For example. Figure 3 presents the middleware concept for the integration of Micro Saint into HLA-compliant environments.

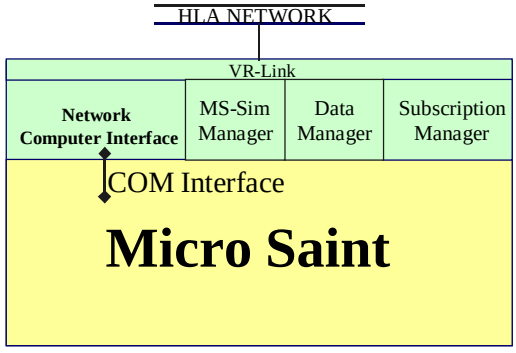

Figure 3: The Middleware Concept for HLA-Compliant Simulations using Micro Saint COM Services

Along with the interaction between software applications, COM also allows Micro Saint and the user to interact in real time. Changes can be made to the simulation model as the model is running. For example, users can change variable values while the model is running.

3 COM SERVICE CAPABILITIES

COM Services is the enhancement that makes communications between Micro Saint and other software applications possible. Included with COM Services are command line capabilities that will allow users to start, stop, and continue the model. In addition, model control allows the user to pause, halt and abort the model through parsed expressions.

Data exchange allows users to pass variable values into Micro Saint and pass variable values out of Micro Saint. Control of the event queue allows users to insert scenario events into the event queue at specified times in the future. In addition, users can receive event queue information from Micro Saint while the model is running. Lastly, COM Services allows Micro Saint to send messages to the user when a model has ended or if errors have occurred.

4 SUMMARY

The future growth of the simulation market will hinge largely on our ability to build models that can communicate. We must be able to build models that we know others can take advantage of, not ones that have a shelf life of "solving one problem." As different models can share data, the power of simulation during engineering and design will be greatly increased. In Micro Saint, we have developed a basic architecture that will support that strategy and, over the next few years, we will continue to develop and refine this technology.

AUTHOR BIOGRAPHIES

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DR. K. RONALD LAUGHERY JR. has twenty-four years experience in the areas of simulation; human factors engineering; training systems analysis, design, and evaluation; and systems analysis. Since establishing Micro Analysis and Design in 1981, he has managed the development of computer modeling and simulation languages, the design and evaluation of training simulators, and the analysis of training simulator requirements. Additionally, he has participated in the application of the tools to both government and private industry.