

## **COLLABORATIVE ENGINEERING ENTERPRISE**

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The concept of Simulation Based Acquisition (SBA) emerged over the last eight years thanks to the potential benefits of applying Modeling and Simulation (M&S) to the acquisition of Department of Defense (DoD) systems. However, the adaptation of SBA has been limited. It has been clear from the start that the acquisition community consists not only of the DoD acquisition workforce, but also the industry. As such, there must be a means of communication between a large group of individuals in various organizations in order to carry out SBA effectively. We envision Collaborative Engineering Enterprise (CEE) as a good solution to support SBA activities and operations. The CEE is an application in an integrated framework for cross-disciplinary information sharing and decision support. Traditionally, members of the engineering, testing, and management teams work in isolation on their specific parts of a problem. Integration of the results from these different efforts is difficult, expensive, time consuming and error prone. The CEE will provide a common electronic framework within which the organization and its partners can collaborate to accomplish their tasks by discussing, analyzing, and iterating all aspects of system design using shared information, models, and applications. XMSF ideas presented by Brutzman, Zyda, Pullen and Morse (2002) in their XMSF workshop white paper can certainly help in our efforts to develop a better and more useful CEE system.

A scalable, client-server architecture is considered to be a good fit for the CEE system where clients (mobile users of the system) connect to a centralized server. Our vision for implementation is a client software that runs on common computing platforms ranging from desktop computers to personal digital assistants that ties the user to a wealth of information about the project he or she is working on without having to contact people on the phone or traveling. The information, once generated, should be available to the project team asynchronously.

Some CEE concepts are implemented in a generic system sponsored by Office of Naval Research (ONR) to support distributed team collaboration for developing future weapon system concepts (Schmorrow, et al, 2002). The current ONR CEE system includes capabilities to:

- Support project management functions by tracking and monitoring tasks;
- Provide tools to help define tasks in collaboration so team members can agree on how to perform a project, more specifically on who is going to perform what task.
- Create a virtual enterprise to support distributed team operations with persistent

virtual space within which applications, documents and people are directly accessible in virtual rooms, floors and buildings.

- Provide a virtual personal office interface where each CEE user can store data and manage his/her activities.
- Provide a framework for integrating simulations and diverse collaborative capabilities to enhance productivities and generating products in a timely manner.

The future areas that we will focus on include:

### **Integrated Model Environment**

The ease of conducting analysis with faster turnaround time will be required in order to meet SBA needs. In addition, linking with additional higher fidelity engineering models for system trade-off and optimization will be needed. Therefore, an Integrated Model Environment (IME) is necessary. The IME is a tool for automating and integrating engineering analyses. It will greatly decrease the turnaround time needed for conducting trade studies. The IME enables users to incorporate analysis software into reusable components that can be published on the CEE. Once published, users can access these components from any computer on the CEE network, regardless of their platform type, through a standard protocol. Simulation codes are wrapped and maintained to run on their native platforms: UNIX or Windows. Trade studies are performed on the integrated model. Part of the attractiveness of the IME concept is to allow anyone, anywhere to access sophisticated analytical models from any computer that can run the CEE client software..

### **Process Flow enhancements**

We use process flow diagrams to represent tasks, responsibilities and products. We are working on developing capabilities to have multiple individuals to work on the same process flow at the same time in a distributed, shared environment. This will let key individuals to work together to determine *what needs to be done* and, when appropriate, *who needs to do it* in a collaborative environment. If used properly, this tool has the potential to alleviate misunderstanding of tasks and associated responsibilities that are all too common in large organizations.

### **CEE Collaborative Tool Enhancements**

- Integrate low bandwidth voice-over-IP capability (e.g. IVOX)
- COTS Collaboration tool integration (e.g. remote conferencing)
- Configuration (version) control implantation for the repository.

### **External Application embedding**

Use a software agent to embed application into the CEE system in order to run applications that are not available to the user locally. A test of this concept could involve embedding JSAF into CEE so that a user on a low-powered computer can run JSAF through the CEE system

### **Wireless PDA connection**

Another area that is of importance is to improve the connectivity of the people on the go to the enterprise. The use of PDAs is ubiquitous; more so than notebook computers because PDAs are light and user friendly. It is important to develop usable interfaces on the PDAs, given the challenge of small screen sizes and lack of keyboards in most cases. We will develop such interfaces that will link users wirelessly to the enterprise so that the user does not have to be in a hotel room or an office building to reach her team when there is an immediate need. Thus, the limitation on where the individual will be mostly lifted.

Many of these tasks will involve creating our own application communication protocols. It would certainly be better if we could use a standard such as XMSF that the general community develops and maintains.

We also notice firewalls as a significant nuisance in deploying a distributed system. XMSF effort should address that issue also.

### **References**

- Brutzman, D., Zyda, M., Pullen, M. and Morse, K.L. (2002). *Extensible Modeling and Simulation Framework (XMSF) Opportunities for Web-Based Modeling and Simulation*. Technical Opportunities Workshop Whitepaper, The MOVES Institute, Naval Postgraduate School, 14 June 2002.
- Schmorrow, D., Riley, B., Ng, H., Guleyupoglu, S., and Segaria, F. (2002). Collaborative Engineering Enterprise for WARCON. SISO Simulation Interoperability Workshop, Paper #02S-SIW-080, Orlando, FL.