Litton
TASC

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TASC ASTT TECHNICAL AND MANAGEMENT MONTHLY PROGRESS REPORT

Progress Report for the Period:

1 March – 31 March 1998

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1. INTRODUCTION

This report provides a summary of the progress made during the report period under TASC's three ASTT (Advanced Simulation Technology Thrust) projects:

- MRA (Multiresolution Analysis), CLIN 0001/0002, Whitney
- JETS (JSIMS Environmental Tailoring), CLIN 0003/0004, Ouzts
- FROST (Framework of Reusable Objects), CLIN 0005/0006, Stanzione.

This report contains both Technical (Section 2) and Management / Financial (Section 3) status information, reported individually for each of the three projects.

2. TECHNICAL SUMMARY

2.1 MRA - MULTIRESOLUTION ANALYSIS (CLIN 0001/0002)

2.1.1 Technical Accomplishments

During March, we continued development of the terrain experiment implementation by incorporating a simple model of the effect of atmospheric haze on intervisibility. This, combined with an abstracted models of target detection and kill effectiveness, will enable us to make our first assessment of the impact of reduced terrain resolution on consistency at the component and behavior model stages of the ASTT/SNE Reference Model.

For the ocean acoustic experiment we worked to clarify and take advantage of links between work being done under the MIV program to improve our experiment. This resulted in a slight change of viewpoint, focusing now on two key issues:

1) impact of the resolution with which the ocean volume is represented on the output of an abstract model of a detection algorithm and
2) differences between detection results driven by two different models of acoustic transmission loss (each using the same ocean volume representation).

Responding to a request by the Government, we prepared an extensive overview of the entire MRA project for presentation to a panel of experts, including the ASTT/SNE program sponsors, on 26 March. The presentation led to several informative and helpful discussions and, importantly, access to a much better source of terrain data. We expect to receive those data next month and will be using one or more of the individual data sets for our next terrain-based experiment.

2.1.2 Results Obtained Related to Previously Identified Problem Areas

Not applicable.

2.1.3 Technical or Schedule Problem Areas

None.

2.1.4 Activities Planned for the Next Reporting Period

During April, we will complete our initial Matlab-based terrain experiment. Results will include comparisons of the MOCs computed at each stage of the Reference Model based on the simple abstracted models we will implement for component and behavior actions. While very preliminary, these results will be consistent with one of the principal goals of the MRA project, to develop *procedures and measures* for dealing with multi-resolution and multi-level modeling issues. We will be emphasizing development of a much more extensive and realistic terrain-based experiment using a ModSAF platform augmented by behavior models incorporated in the CFOR planning algorithms. Work on the ocean acoustic experiment (major emphasis) and atmosphere experiment (minor emphasis) will also continue during the month. In addition, a detailed MRA experimental design plan is being prepared.

2.2 JETS - JSIMS ENVIRONMENTAL TAILORING SERVICES (CLIN 0003/0004)

2.2.1 Technical Accomplishments

Early in March, Pete Dailey and Dana Sherer attended the Weather Scenario Generator (WSG) Users Group meeting in Boulder, CO. At the meeting, Pete Dailey presented a brief aimed at developing synergy between WSG, TAOS and the JETS project. The presentation was well received. TAOS/JETS volunteered as a Beta user upon the first release of the WSG system.

One of the contacts made at the WSG meeting was Michael Adams (USAF M&S) who noted that the National Weather Service (NWS) is working on some editing algorithms for operational weather products related to the AWIPS project. He put Pete Dailey in contact with Dr. David Ruth at the NWS. Pete has contacted Dr. Ruth and expects to obtain information that will supplement similar alteration schemes being worked on at the U. K. Meteorological Office.

We are continuing to work with Numerical Weather Prediction (NWP) models to improve our understanding of the naturally evolving effects of edits to a SNE. The Klemp and Wilhelmson (KW) cloud model, implemented last year, is proving to be a valuable tool in our research. We can use the model to study the implications of SNE edits to a wide variety of variables such as temperature and winds, as well as more complex features such as fronts. Because the KW model does not incorporate terrain effects, however, we have implemented and tested a second more complex NWP model (NCAR/PSU Mesoscale Model Version 5 also known as MM5). Running MM5 is functionally and computationally more rigorous than the KW model. We expect MM5 to compliment but not replace our use of the KW model for our tailoring investigation. Specifically, KW model will be used whenever possible due to its high level of efficiency and utility. MM5 will be used when more complex effects such as topography impact our results.

We have laid out a plan for proceeding with the development and implementation of SNE tailoring algorithms (discussed in Section 2.2.4 below).

2.2.2 Results Obtained Related To Previously Identified Problem Areas

Not applicable.

2.2.3 Technical or Schedule Problem Areas

None.

2.2.4 Activities Planned for the Next Reporting Period

In anticipation of the upcoming “Preliminary Tailoring Algorithm Report”, due in early July, we have laid out a plan for proceeding with our investigation of SNE tailoring algorithms.

We expect the "Preliminary Tailoring Algorithm Report" to contain the following results (and will proceed with our research accordingly):

- Algorithm theory – a scheme for the implementation of tailoring algorithms which assure a desirable level of consistency across all variables in space and time. This analysis requires careful consideration of the types of edits likely to be performed by the training community as well as the degree of cross-variable consistency required by simulations. The analysis will deal with two types of algorithms: (1) merging and (2) blending. *Merging* involves the addition of an SNE segment at some time within a scenario. Implicit to this process is that the SNE being merged is internally self-consistent, thus merging algorithms do not manipulate the SNE segment itself, but rather attempts to introduce the segment in as seamless a manner as possible. *Blending*, on the other hand, is the introduction of one or more variables into a SNE at one or more times. The edits to be blended are not necessarily self-consistent (e.g., there may be edits which are collocated but conflict with one another) and are not necessarily correlated with unedited variables at the same location and time (e.g., a wind edit may be inconsistent with the existing pressure gradient field).

- Preliminary results – an analysis of factors that impact local modification of a Synthetic Natural Environment (SNE). Based on the results of the "Environmental Tailoring Requirements Analysis", we will determine the environmental variables most likely to be manipulated and conduct an analysis of how local changes to that variable must be blended and correlated with (a) other parts of the domain, (b) other times, and (c) other variables. Using algorithms developed to this point, we will discuss the approach and visually demonstrate the effects of various edits on the SNE in both space and time.

- Consistency analysis – an analysis of consistency as it pertains to local perturbations to an SNE. We will consider two types of consistency: (1) across variables in time and space, and (2) across multiple resolutions. The variable consistency analysis is concerned with the ramifications of edits placed on one or more variables to the other variables in the SNE. The resolution consistency analysis is concerned with the effect of edits placed at one resolution on representations dealing with data at other resolutions. The analysis will involve the use of the Total Ocean Atmosphere Services system (TAOS) as well as behavioral models such as ModSAF.

2.3 FROST - FRAMEWORK OF REUSABLE OBJECTS (CLIN 0005/0006)

2.3.1 Technical Accomplishments

Tom Stanzione, Alan Evans, and Forrest Chamberlain continued investigating key issues in the FROST architecture, especially how FROST could be used in Parallel Discrete Event Simulation (PDES) systems, such as JSIMS using SPEEDES, and how FROST could use the HLA/RTI in conjunction with a COTS database management system. We have identified functionality within the FROST architecture for Lock Management, Time Synchronization, and Update Management, some of which can be provided by the RTI. Three separate architectures were identified for FROST, and the architecture shown in Figure 1 provides the most flexibility and the best potential performance of the three. In this architecture, a COTS OODBMS is used for the majority of the SNE, particularly the quiescent data, which is all of the data that has been committed at the global virtual time in PDES. The Update Management component of the GTEMS would distribute SNE changes via the RTI in a real-time simulation and SPEEDES in JSIMS. This Update Management would be independent of time management, so would work with either conservative or optimistic time management schemes. We have started to implement this architecture as the FROST prototype.

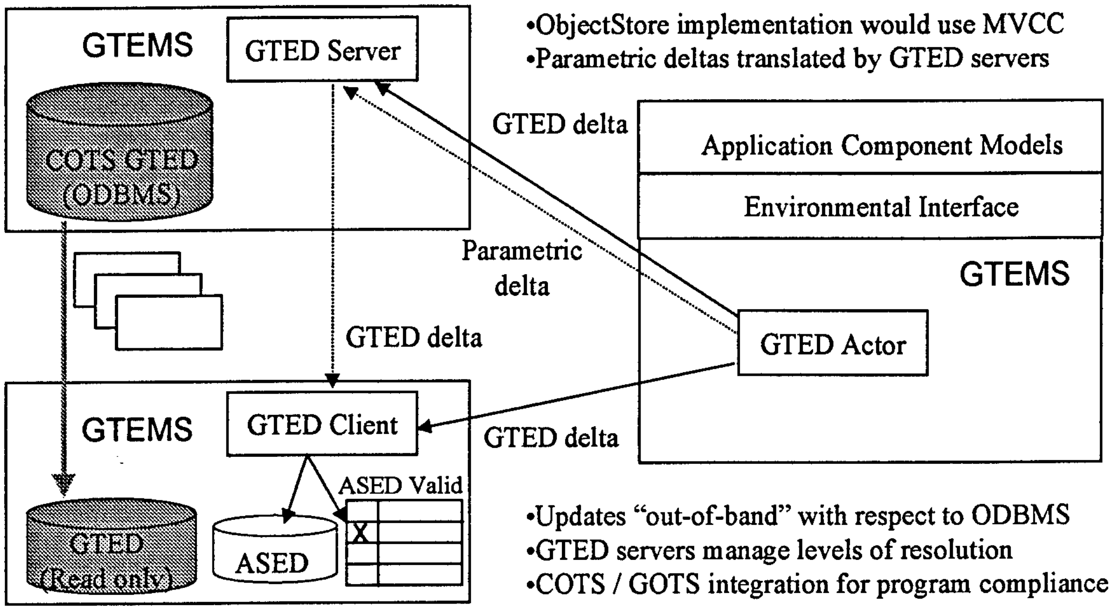

Figure 1 - FROST Architecture

Eric Yee and Howard Lu continued with the evaluation of ObjectStore and Objectivity. They continued performing experiments populating modifying, and retrieving terrain data from these systems, using the RTV program's Intermediate Database (IDB) as an example GTED. They put metrics in place to measure performance, particularly with distributed databases across multiple hosts. They collected data on how long it took to populate databases of varying sizes and the time it took to extract data in different access patterns. They found about an order of magnitude difference in access time between ObjectStore over Objectivity, when accessing data either locally or across the network. The database size with Objectivity was also about twice the size of the same data in an ObjectStore database, and took much longer to generate. ObjectStore was also determined to be easier to use, since it was easier to debug ObjectStore's pointers than Objectivity's handles. ObjectStore has a notification capability where as Objectivity does not, and the locking granularity is smaller with ObjectStore. Objectivity does have a better replication capability, however, but ObjectStore does have some replication capability. Based on this analysis, we decided to use ObjectStore for the object oriented database management system for the FROST prototype, although we are also taking another look at Oracle to make sure the analysis we did was thorough enough.

2.3.2 Results Obtained Related to Previously Identified Problem Areas

Not applicable.

2.3.3 Technical or Schedule Problem Areas

None.

2.3.4 Activities Planned for the Next Reporting Period

We will continue to refine the FROST architecture and start the implementation of the prototype. We will use Rational Rose to capture the object-oriented design of the FROST prototype. We will make arrangements to purchase ObjectStore, and also take another look at Oracle, since we have some reservations about the analysis that was done. We will continue to define the Environmental Interface and determine the requirements for the SEDRIS transmittal necessary for the prototype GTED. We will also start to prepare for the FROST peer review scheduled for early June.

3. MANAGEMENT AND FINANCIAL SUMMARY

3.1 MRA (CLIN 0001/0002)

3.1.1 Cost Element Problem Areas

None.

3.1.2 Program Financial Status*

Work Breakdown	Cumulative to Date ($)**			At Completion ($)***		
Structure or Task Element	Planned Expend	Actual Expend	% Compl	BAC	LRE	Remarks
TOTAL FY97-99 CLIN 0005/0006	335,850	405,297	26.0%	1,560,746	1,560,746	

*** Includes both funding in-hand (FY 97-98) and planned (FY 99).**
**** Excludes cost of money.**
***** Excludes fee and cost of money.**

Based on currently authorized work:

(1)	Is current funding sufficient for the current FY	Yes
(2)	What is the next Fiscal Year's funding requirement at anticipated levels	$720K
(3)	Have you included in the report narrative any explanation of the above data and are they cross-referenced?	No

3.1.3 Travel and Meetings

Date	Location	Subject
3/9-13/98	Orlando FL	Spring SIW
3/26/98	Washington DC	Expert Peer Review Discussions

3.1.4 Any Significant Changes to the Contractor Organization or Method of Operation

None.

3.1.5 Summary of Engineering Change Proposal (ECP) Status

None.

3.2 JETS (CLIN 0003/0004)

3.2.1 Cost Element Problem Areas

None.

3.2.2 Program Financial Status*

Work Breakdown	Cumulative to Date ($)**			At Completion ($)***		
Structure or Task Element	Planned Expend	Actual Expend	% Compl	BAC	LRE	Remarks
TOTAL FY97-99 CLIN 0003/0004	178,500	234,229	26.9%	871,413	871,413	

*** Includes both funding in-hand (FY 97-98) and planned (FY 99).**
**** Excludes cost of money.**
***** Excludes fee and cost of money.**

Based on currently authorized work:

(1) Is current funding sufficient for the current FY — Yes

(2) What is the next Fiscal Year's funding requirement at anticipated levels — $500K*

(3) Have you included in the report narrative any explanation of the above data and are they cross referenced ? — No

***Reflects guidance received at February IPR to expect $500 K in FY 99.**

3.2.3 Travel and Meetings

Date	Location	Subject
3/9-13/98	Orlando, FL	Spring SIW
3/24-25/98	Boulder, CO	WSG Program Review

3.2.4 Any Significant Changes to the Contractor Organization or Method of Operation

None.

3.2.5 Summary of Engineering Change Proposal (ECP) Status

None.

3.3 FROST (CLIN 0005/0006)

3.3.1 Cost Element Problem Areas

We are spending more that we planned based on the requests to investigate the JSIMS and RTI architecture implications of FROST. These costs were not anticipated and may result in decreased functionality in the prototype. We will also run out of funds this fiscal year before we can receive next fiscal year funds if we continue to spend at this rate.

3.3.2 Program Financial Status*

Work Breakdown	Cumulative to Date ($)**			At Completion ($)***		
Structure or Task Element	Planned Expend	Actual Expend	% Compl	BAC	LRE	Remarks
TOTAL FY97-99 CLIN 0005/0006	286,865	$366,616	32.4%	1,128,752	1,128,752	

*** Includes both funding in-hand (FY 97-98) and planned (FY 99).**

**** Excludes cost of money.**
***** Excludes fee and cost of money.**

Based on currently authorized work:

(1)	Is current funding sufficient for the current FY ?	Yes
(2)	What is the next Fiscal Year's funding requirement at anticipated levels	$545K
(3)	Have you included in the report narrative any explanation of the above data and are they cross referenced ?	Yes, see 3.3.1

3.3.3 Travel and Meetings

Date	Location	Subject
9-12 Mar	Orlando, FL	Spring Simulation Interoperability Workshop
11 Mar	Orlando, FL	ASTT Technical Exchange meeting with DERA
20 Mar	SAIC, Burlington, MA	Discussions with ODI on ObjectStore

3.3.4 Any Significant Changes to the Contractor Organization or Method of Operation

Robert Coury has left TASC. Andrew Gronosky has taken his place on the TASC team for this project.

3.3.5 Summary of Engineering Change Proposal (ECP) Status

None.