

FY 99: Front End Analysis of Battle Staff Training Task

The deliverable was a document repository for background to support the Mission Essential Task List (METL) task alignment and Intelligent Agent (IA) Prototype Simulating Battalion Level Staff Functions tasks in FY99. This task identified the history, current status, efforts and current projects that gave our researchers a clear picture of the environment our IA software would have to behave and exist in.

FY 99: Information Flow Manager (Shared)

The deliverable was a prototype information message flow management tool software and report on analysis. UT conducted the data search and A&M developed the tool. We produced an information flow simulator that allowed a visual depiction of message traffic of the ABCS system. This was a joint task with UT.

FY99: Intelligent Agent Prototype

IA prototype software for limited set of battalion staff functions of which the ultimate goal is to use these agent-based simulations to support the training of brigade TOC staff members. During this task we developed a novel scheme for JESS-Java interaction, developed a Task Representation Language (TRL) for capturing TOC teamwork process knowledge, encoded Bn S2/FSO tasks for a movement to contact scenario, developed an algorithm for adaptive TOC teamwork process decomposition and execution with intelligent agents, conducted an object-oriented design of the prototype agent-based system, developed an TRL parser to automate the translation from TRL knowledge to Java, developed an agent interface to OTB for filtering PDU and for automating updates to the agent's ``world model'' and successfully implemented a distributed prototype system using Java and RMI.

FY99: SIMCI Support (Shared)

Investigate OTB DIF and provide report on same. We provided subject matter expertise, document review and substantial contribution to the Army's attempt to synchronize simulations with real world command and control systems.

FY00: OneSAF/Staff Training

Refine Intelligent Agent (IA) Prototype Model by incorporating the ability to respond to static, dynamic and reflex inputs, increase "apparent" intelligence of model, define limitations of model and minimum architecture requirements, develop model ability to work with different levels of autonomy, incorporate commercial technology where applicable, describe potential prototype uses beyond battle staff task functions and develop interface to OTB for Agent Based Simulations and C4I.

FY00: Training Operational Data Synchronizer (Shared)

Define the requirements and Design Development Plan for the Training and Operational Data Synchronizer. Develop the TODS system architecture and framework for TODS with identified tools. Document ABCS data structures for use in developing StartEx data. Conduct initial research on use of a data repository for developing StartEx data. We developed the TODS system architecture & framework, investigated CBS (Corps Battle Simulation) and the JCDB (Joint Common Data Base) compatibility, documented ABCS data structures and conducted initial research on the use of a data repository in developing StartEx data.

FY00: SIMCI Support (Shared)

Assess availability of internal Janus data to support Staff Training and provide direct support. We provided subject matter expertise, document review and substantial contribution to the Army's attempt to synchronize simulations with real world command and control systems.

FY00: DD2-N Support (Shared)

Identify areas of common interest between current and planned University XXI (UXXI) initiatives and the initiatives of the DD2-N Program. Our analysis of this task led us to conclude that the DD2-N initiatives include both the DD2-N Lettered tasks and the DD2-N Functional Capabilities Descriptions. The UXXI initiatives are the collective group of tasks that we have completed, are working on and have been selected for work. WE completed the study and provided the areas of common interest, along with appropriate points of contact to the DD2-N program managers.

FY00: All Source Analysis System (ASAS) Light 3D Terrain Visualization

To develop effective 3D terrain visualization capabilities that can be merged into existing Army analysis tools. The primary objectives were to create 3D traversable terrain, CARDG textures on the terrain and military symbology on the terrain. A hybrid terrain visualization approach was developed and combined with the optimal graphics language (OpenGL) that allowed hardware acceleration, high frame rates, platform portability and minimal cost of implementation. We developed a lightweight 3D engine that met all three task objectives of 3D traversable terrain, CARDG textures military symbology on the terrain

FY 01: CTSF Process Documentation

The primary research focus of the CTSF Process Documentation project was to review and document the critical processes involved in systems integration for Army digitization at the PEO-C3S Central Technical Support Facility Technical Division, Ft. Hood Texas. This analysis would then be utilized by the Technical Director to improve those processes where applicable. The primary deliverable for this project was the creation and distribution of a Multi-media CD ROM which documents key processes, products, and customers of the CTSF.

FY01: Staff Behaviors Module-OTB Interface (Shared)

The purpose of this task was to document the current task reference language and corresponding behavior sets, document the OTB interface and data interchange mechanisms and demonstrate via OTB the IA set in various scenarios.

FY01: Agent Based Integration w/Simulation - C4I AAR Systems

Provide recommendations and documentation regarding development and implementation of agent technology for use in data mining and AAR analysis. Development of an agent-type capability on a selected function with the simulation and C4I architecture. Over the course of the year this task migrated from the investigation of Intelligent Agent technology as data mining instruments for digital AAR tools to the development of an XML search engine for DCARS application based on the desires of the task sponsor. We developed a web browser search tool that has the capability to search across tactical LAN's of the Army's Battle Command System (ABCS), locate and retrieve operational data and command and control files. The search tool has a wide range of discriminatory parameters as it specializes in retrieval of xml operational graphics to be used for after-action review (AAR) purposes.

FY01: TODS Follow-On (Shared)

The follow-on task continued the development and delivery of an operationally capable StartEx data repository, continued research into the process of data replication between TODS and the JCDB and battlefield functional area specific databases which will result in an initial capability to populate the ABCS database with StartEx data. We researched and made recommendations on the appropriate data sources to populate the TODS data repository and methods for populating the TODS data repository, assisted in development of a common repository consisting of unit structures and relationships, unit organizational data, systems architectures and communications architectures and provided documentation and a prototype for demonstration.

FY01: DD2-N Distributed Training Proof of Principle #2 Support (Shared)

For the second year of the DD2-N program support University XXI was put in charge of the training effectiveness assessment for all exercises run as part of the Distributed Training Proof of Principle #2 (POP2) component of the Dd2-N program. We led the team that developed the evaluation matrices and assessment instruments, performed data collection before, during and after each exercise and led the analysis and report writing of the POP2 training effectiveness.

FY01: 3D Collection Management Planner & Reporting Tool Set

Continue to develop 3D visualization (static and dynamic) display capabilities to support intelligence analyst work on the ASAS-Light system. Expand to run on Unix Operating System (Solaris 7.0). Transfer functionality of the tool from the Windows NT to a UNIX based system. Transfer 3D TV capabilities from NT (ASAS Light) to UNIX (ASAS RWS) OS (software and documentation). We incorporated three-dimensional functionality into traditionally two-dimensional Army analysis tools, specifically the ASAS available on the RWS platform, which uses the Solaris implementation of the UNIX operating system. We established the ability to integrate vector-based objects into our environment from the NIMA VPF standard format. We have also implemented several optimizations of the standard rendering pipeline in order to increase rendering speed and thus improve application response time.

FY 02: ABCS Software Change Analysis Tool (Shared)

Combined three CTSF-TD tools (Audit Tool, Interrogator Tool and Hard Drive DB) by integrating their databases and functions with a single interface. This sub-task was performed by Texas A&M but the overall task was shared with UT Austin and was sponsored by the Director of the CTSF-TD. The original objective was determined to be not feasible in the intended environment. We created the System Interrogator Tool which combined several separate but process dependent software configuration management data bases and functions into a single tool and database.

FY 02: Hard Drive Reproduction Streamlining

The primary research focus of the Hard Drive Reproduction Streamlining project was to evaluate existing and planned hard drive reproduction systems and processes within the Central Technical Support Facility and develop a an improved process (including technology) that would more efficiently load and reload ABCS BAS system hard drives. The primary deliverable for this project was the fielding of a unique hardware and software system called the CTSF-Brick Burning System (C-BBS) which streamlined the reproduction process resulting in millions of dollars in manpower savings over the course of a single year. The system is currently in use in the CTSF.

FY02: Analysis and Control Element (ACE) 3d Terrain Visualization

Though not meant to be a follow-on task to the previous All Source Analysis System (ASAS) Light 3D Viewer and ASAS Remote Work Station (RWS) 3D Viewer it became a de facto follow-on task due to the use of the 3DTV Viewer engine as the core component of the 3D Collection Management Planner & Reporting Tool Set. The objectives of the task were to introduce the basic functionality for three dimensional map reconnaissance and Collection/Intelligence Surveillance & Reconnaissance (ISR) scheduling into the ACE; overlay, display and project collection plans and threat situation products/Courses of Action (COA's). The final product of this task is a 3D application integrated into the PM ASAS's ACE that provides 3D visualization capabilities along with baseline collection management functionality to the intelligence analyst supporting the warfighter.

FY 02: CTSF Process Documentation-Continuation

The primary research focus of the CTSF Process Documentation- Continuation project was to identify and document changes in the internal and external process within the CTSF which occurred over the previous year and document those changes in the CD Rom multi-media format. Additionally, conduct research into the feasibility of creating a Web version of the CD ROM material with the intent of reaching a broader audience across the army. The primary deliverable for this project was the delivery of both an updated CD Rom and the installation of a WEB version.

FY 03: Master Digital Training Tool

The primary research focus of Master Digital Training Tool (MDTT) project was to conduct analysis of existing and planned training resource scheduling systems being utilized at Ft. Hood Texas under the auspices of the Chief, Battle Command Training Branch, G-3, III Corps and Ft. Hood. Analysis would be used to create a web based, training scheduling system that provides training managers (Company through Division) with a single method of scheduling live-virtual-constructive training resources. The primary deliverable for this project was to build and field an intelligent software scheduler that can integrate disparate digital training resource requirements from both automated and manual methods of input.

FY 03: Configuration Management Quality Assurance Tool

The purpose of this task was to develop an on-line software tool that provides the environment for running quality assurance checks on battlefield functional area system software. It should be able to track the configuration management process in the CTSF from the introduction of new products into the system, testing and verifying the products, the introduction of these products into Army C4ISR baselines and the resulting loading of these sets of software into master hard drives for Army tactical automation system. We created a web based tool that combines tracking, testing and data storage for Army ABCS software products for the CTSF-TD at Fort Hood, TX. The CTSF-TD has adopted this as their primary configuration management tracking tool and it has become their key instrument to ensure Army battle commands systems get software in a correct and timely manner.

FY 04: OneSAF Objective System OPFOR C2 Messaging

The purpose of the task was to supplement the PM OneSAF's effort to complete the Objective OneSAF (OOS) simulation for Full Operational Capability (FOC) by developing and documenting a set of Opposing Force (OPFOR) Command and Control (C2) messages and topologies to provide an approximation of OPFOR C2 so that units training with the OOS have the ability to use their signals intelligence capabilities during OneSAF training exercises to identify, interdict and disrupt OPFOR communications, units and networks. We created the networks and messages used by the Opposing Force

(the enemy) in this new Army simulation. These added features enhance the Army's ability to better train and prepare for current and future operational missions.

FY 04: CTSF- Software Distribution System

The primary research focus of the CTSF-Software Distribution System (C-SDS) was to investigate configuration control, quality assurance and distribution management processes covering multiple baselines of the Army Battle Command System and then to identify improved methods for distribution. The primary deliverable for this project was the development of a prototype Software Distribution System (SDS) capable of distributing and managing the Army Battle Command System/Future C4ISR software as well as other software products from the CTSF to local and distant facilities.

FY 05: CTSF ABCS Remote Monitoring Device

The desired end state was to select a single tool set from numerous COTS selections that can be adapted to perform these functions on all C4ISR systems regardless of operating system or specific network connectivity. This selection was made prior to task start and the selected COTS product was not available. We then designed and developed a tool to serve this purpose. We built a customizable remote monitoring tool that operates on any ABCS operating system. The system consists of the remote monitor and target agents. It was delivered to the CTSF-TD and then to PM Common Software.

FY05: OneSAF Contemporary Operating Environment (COE) Civilian Information Infrastructure (CII) Command and Control (C2)

Develop and characterize a representation of the civilian information infrastructure, how COE OPFOR organization would use this infrastructure, what messages they would transmit and their communications hierarchy. We developed the COE CII and its supporting infrastructure. The CII is being integrated into OneSAF Build 2.1. We developed the set of COE messages that would be used by these organizations as well as the communications processes and supporting tables that would carry them across the CII.

FY 05: CTSF- Nexus

The primary research focus of the Central Texas Support Facility (CTSF) Nexus project was to develop a software tool or information repository capable of providing a single point of access to the many disparate software tracking tools and processes utilized in the day to day operations of the Central Technical Support Facility. Utilization of this tool would result in software and data products being more efficiently delivered to soldiers at the right place and right time. The primary deliverable for this project was a web based information sharing system with embedded content management capability encompassing processes and products utilized within the CTSF Technical Division.

FY06: OneSAF Future Operating Environment (FOE) Command and Control (C2) & Information Operations (IO)

Determine and characterize the COE OPFOR irregular Battle Command and Information Operations expected in the 2015-2025 timeframe. Define and describe Electronic Warfare, Computer Network Attack models and develop Psyop message transport process that would be used by these organizations. We developed a CII based computer network attack model, electronic warfare model and Psyop message transport model. The CNA model is being integrated into OneSAF in 2008. We also quantified the CII based regional communications tiers using the International Telecommunications Union world database for each country from 2006 to 2025.

FY06: Data Visualization

Conduct research and analysis on data visualization methods and process and compare them to the requirements of the U.S. Army Test & Evaluation Command (ATEC). Design and develop a system that meets ATEC's testing and evaluation data visualization needs. Developed a concept for a data visualization tool that provides a basic framework for selecting single or multiple data sources and creating a basic interactive visualization and developed, tested and fielded a prototype data visualization tool.

FY07: OneSAF Alternate Communications Means Infrastructure (ACM-I) Bridge

Develop and code the ACM-I Bridge and provide supporting documentation for integration into the PEO-STRI OneSAF simulation. The completed bridge will enable contemporary operational environment irregular organizations to use the communications components of the civilian information infrastructure model (cell phones, commercial radios, newspapers, etc.) in OneSAF. Develop the core psychological operations (Psyop) messaging procedures so that irregular force group leaders can communicate via ACM to the general population desired Psyop messages. We developed the ACM-I bridge and are have handed it off to TRISA modelers for integration into OneSAF. We developed two models to support Psyop message dissemination; the mood delta dissemination model and the civilian response overlay model for integration in to the set of models used in conjunction with the joint non-kinetic effects model (JNEM) in OneSAF.

FY07 – Data Visualization Continuation

Develop software capability packages building around the Data Visualization Framework completed in the 2006 UXXI task. Packages will result in significantly enhanced Data Visualization product generation capability which can be used across Operational Test Command Directorates. This task is in progress until December, 2008.

FY08: Collaborative Visual Analytics

Expand the existing data visualization framework into a collaborative visual analytic environment will allow teams of analysts in different locations to collaborate in the

identification and analysis of critical features within large datasets often produced during system of systems testing while operating in complex net-centric environments. This task is in progress until August, 2008.

FY08: Universal Audit Tool Metrics Study (formerly Virtual Machine Interrogation)

Study the problem of defining the metrics that will determine what software is present on a machine and the steps needed to determine out how to evaluate the metrics for use in the CTSF-TD CM proposed universal audit tool. The study fills in the hole of the metrics capture engine (MCE). It is a necessary prerequisite for making anything useful. The study focuses on tools and techniques to determine what processes are available to run on a machine of varying OS as multiple processes will be needed from multiple OS's. The study will also explore how the CTSF personnel can interpret metrics after the audit. This task is in progress until August, 2008.

FY08: Dynamic Entity Development

This task will prototype the ability of entities to add and remove physical and behavioral components and (e.g. picking up/mounting a weapon) or remove (putting down or dismounting) weapons during runtime. For this FY the task is to decompose each required capability into a series of discrete task and assign a level of implementability to each and propose an implementation scheme to achieve each capability and a list of performance trade-off options based on the results. Develop a prototype model of the selected implementation scheme. This task is in progress until August, 2008.

Pgm Yr	1	2	3	4	5	6	7	8	9	10
	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08
A&M Tasks:	Front End Analysis of Battle Staff Training Task	ASAS Light 3D Visualization	3D Collection Management Planner	ACE 3D Terrain Visualization				Data Visualization	Data Visualization - Continuation	Collaborative Visual Analytics
	Intelligent Agent Prototype	OneSAF/Staff Training	Staff Behaviors/OTB (s)	CBBS	Master Digital Training Tool	OOS OPFOR C2 Messaging	OOS COE OPFOR C2	FOE OPFOR C2 & IO	ACM-Infrastructure Bridge	Dynamic Entity Development
	SIMCI Support (s)	SIMCI Support (s)	SIM C4I AAR Int				ABCS Remote Monitoring Device			Audit Metrics Study
	Information Flow Manager (s)	DD2-n Support (s)	DD2-n Support Pop#2 (s)	ASCAT (s)	CMQA Tool	CTSF Software Distribution System	CTSF Nexus			
		TODS (s)	TODS Follow On (s)							
			CTSF Process Documentation	CTSF Process Documentation - web based						

Figure 1. TAMU UXXI Tasks by Program Year and Relationships (s=shared).