

### 75<sup>th</sup> MORSS 712CD Cover Page

12-14 June 2007, at US Naval Academy, Annapolis, MD

If you would like your presentation included in the 75<sup>th</sup> MORSS Final Report CD it must:

- 1. Be unclassified, approved for public release, distribution unlimited, and is exempt from US export licensing and other export approvals including the International Traffic in Arms Regulations (22CFR120 et.seq.),
- 2. include MORS Form 712CD as the first page of the presentation and
- 3. a MORS form 712 A or B must be in the MORS Office no later than **14 June 2007**.

<u>Author Request</u> (To be completed by applicant) - The following author(s) request authority to disclose the following presentation in the MORSS Final Report, for inclusion on the MORSS CD and/or posting on the MORS web site.

Name of Principal Author and all other author	s):Tom Hurt, Lana McGlynn	
Principal Author's Organization and address:	RDECOM, SOSI, MATREX (Attn: AM	SRD-SS-M) 6000 6 <sup>th</sup> St, Suite 100, Fort Belvoir,
VA 22060	Phone:703-806-0995 E	Email:tom.hurt@us.aarmy.mil
Original title on 712 A/B:MATREX, - A	Unifying M&S Architecture for LVC Appli	cations
(Please use the same title listed on MORSS	S Form 712 A/B. If the title was changed p	lease list the revised title below.) Revised title:
MATREX: A Unifying Modeling and Sime	ulation Architecture for Live-Virtual-Cons	structive Applications
Presented in: WG(s) #29, 31, Backup	CGE_Special Session	,
Demonstration,	, Tutorial,	or Focus Session #

## The following presentation is believed to be: unclassified, approved for public release, distribution unlimited, and is exempt from US export licensing and other export approvals including the International Traffic in Arms Regulations (22CFR120 et.seq.)

<b>Report Documentation Page</b>				Form Approved OMB No. 0704-0188		
maintaining the data needed, and c including suggestions for reducing	lection of information is estimated t completing and reviewing the collect this burden, to Washington Headqu uld be aware that notwithstanding at DMB control number.	ion of information. Send comments arters Services, Directorate for Info	regarding this burden estimate rmation Operations and Reports	or any other aspect of the s, 1215 Jefferson Davis	nis collection of information, Highway, Suite 1204, Arlington	
1. REPORT DATE	2. REPORT TYPE			3. DATES COVERED		
01 JUN 2007		N/A		-		
4. TITLE AND SUBTITLE		5a. CONTRACT NUMBER				
MATREX: A Unifying Modeling and Simulation Architecture for Live-Virtual-Constructive Applications			ture for	5b. GRANT NUMBER		
				5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)				5d. PROJECT NUMBER		
				5e. TASK NUMBER		
				5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) RDECOM, SOSI, MATREX (Attn: AMSRD-SS-M) 6000 6th St, Suite 100, Fort Belvoir, VA			6th St, Suite	8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITO		10. SPONSOR/MONITOR'S ACRONYM(S)				
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAII Approved for publ	LABILITY STATEMENT ic release, distributi	on unlimited				
	otes 26. Military Operat 12-14, 2007, The or		• • •		Annapolis,	
14. ABSTRACT						
15. SUBJECT TERMS						
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF	18. NUMBER	19a. NAME OF	
a. REPORT <b>unclassified</b>	b. ABSTRACT unclassified	c. THIS PAGE unclassified	- ABSTRACT UU	OF PAGES 14	RESPONSIBLE PERSON	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18





U.S. Army Research, Development and Engineering Command



### TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

### MATREX: A Unifying Modeling and Simulation Architecture for Live-Virtual-Constructive Applications

### **MATREX Purpose**

MATREX v2.0 Environment

RDECON



### **Primary Partners and Customers:**

- RDECOM HQ, RDECs, and Labs
- PM FCS (BCT) MSO / FCS LSI
- TRADOC (BLCSE)
- 3CE (Cross Command Collaboration Effort) including
  Supports decision making over entire acquisition cycle TRADOC, ATEC, FCS LSI, RDECOM
- Other Army PMs and PEOs

#### Purpose:

To develop a composable M&S environment wherein a collection of multi-fidelity models, simulations and tools can be integrated into an established architecture for conducting analysis, experimentation and technology trade-offs for RDECOM and others.

#### **Benefits:**

- Enables reconfiguration and reuse of components for:
  - Engineering model development and evaluation
  - Technology tradeoffs
  - Capabilities assessments
  - Concept development
  - Experimentation
  - Testing
- Mutually and collectively leverages the world-class expertise of all RDECOM M&S laboratories for the benefit of the Army

Critical M&S capabilities necessary to support Network Centric Warfare representation and analysis

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



### Reduce expense of "Live" activities

#### TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

### Cross Command Collaboration Effort (3CE)

### **3CE Mission and Intent**

<u>Mission (Vision):</u> Develop a cross command Army M&S and data environment for design, development, integration, and testing of capabilities, systems, and prototypes.



IOC FOC System Development & Demonstration Operations & Support Technology Development Concept Production & Deployment Refinement FRP Decision **JCIDS** Concept LRIP/IOT&E Decision **Critical Design Review** Review Sustainment JROC **Pre-Systems Acquisition** Systems Acquisition System Concept System DT&E IOT&E Operations Design Dev Dev Live Virtua Constructive **3CE / Core Products** Process & Data TRADOC Toolbox Procedures Intent: PM FCS (BCT) ATEC **Purpose:** Identify, develop, and maintain a core set of M&S tools, data, and business processes that provide interoperable connectivity which links the participating organizations, to include providing a common RDECOM 3CE environment and expertise for the Army to leverage. End State: A 3CE environment that meets the common requirements of all three commands and PM FCS BCT to conduct distributed DOTMLPF **Relevant Today and Into the Future** development.

#### TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

RDECOM

### **MATREX Collaborations**

#### Distributed to . . . .

RDECOM

TRADOC	UofA Maneuver Battle Lab Air Maneuver Battle Lab Depth & Simultaneous Attack BL Battle Command Battle Lab TRAC Leavenworth TRAC-WSMR
	IRCC WSMAR HQ USAOTC USAOTC-IEW
ATEC	Electronic PG, Fort Lewis APG Test Center
	WDTC, Dugway PG RTTC
	RTTC-RSA
	PEO-STRI
Βd	NLOS-LS
	PM FCS (BCT) – FCS LSI
Other Services	LMC-Orlando (USN)
	Navy Research Lab
	Naval Air Warfare Center JTAGGS (USAF)



#### TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

### Systems Engineering for MATREX and RDECOM - Operational View



#### Integrated M&S System of Systems Engineering Capability for RDECOM via <u>MATREX:</u>

- Supporting PEOs and PMs with a coordinated RDECOM approach
- Common integrating SoS Architecture synchronized across RDECOM
- Standing up SE Nodes for M&S across RDECOM:
- Integrated M&S Culture
- Common Engineering Tools
- Common Requirements Database, terminology, and processes
- Distributed / Collaborative enabling services:
- Web Collaboration (STEM, IDE, AKO)
- DVL Services
- Maximize interoperability, flexibility and adaptation of RDECOM M&S capabilities to the Acquisition Communities needs.
- Common OM and Core Capabilities/Tools

MATREX reduces Technical and Cost Risks for the FCS and other programs through external coordination of RDECOM M&S

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

RDECOM





- Leverage 3CE requirements development (TRADOC Integrated Process 3 "Networked Fires" (IP-03), LSI mission threads, ATEC OTC, TRADOC BLCSE, ...) to drive capability, integrated process, and methodology development for 3CE, ATEC OTC, TRADOC BLCSE)
- Develop MATREX overarching M&S Framework consisting of:
  - OneSAF Objective System (OOS) integration into M&S architecture
  - Integrated capabilities and baseline that supports analysis of Future Force Network Centric Warfare (NCW)
  - MATREX Middleware Independence Capability (MMIC) which enables Live-Virtual-Constructive interoperability
  - Work toward a common means of simulation initialization and data collection and analysis tools and processes

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

# MATREX Middleware Independence Capability)



#### TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

### MATREX Event Management: Forward Look



#### TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

RDECOM

### MATREX Distributed Virtual Laboratory Connected to 3CE



RDECOM



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



- MATREX is helping to advance simulation technology, infrastructure, and processes to enable better informed decision making.
- MATREX (RDECOM) is working with TRADOC, ATEC, and the PM-FCS(BCT)/FCS LSI to build an Army solution for M&S experimentation applicable across the acquisition life cycle.
- MATREX is providing many of the tools and methodologies to help reduce technical, cost and schedule risk for PMs.



### Acronyms

- 3CE Cross-Command Collaborative Effort
- ACS Aerial Common Sensor
- AKO Army Knowledge On-Line
- ALCES Aggregate Level Communications Effects Service
- AMS Aviation Mobility Service
- AMSWG (OSD) Acquisition Modeling & Simulation Working Group
- ARMS Armaments Service
- ATC Automated Test Capability
- ATEC Army Test and Evaluation Command ٠
- ATIN ATEC Test Integration Network
- AUTL Army Universal Task List
- BCT Brigade Combat Team
- BLCSE Battle Lab Collaborative Simulation Environment
- C3HPM Command, Control, & Communications Human Performance Model
- C3GRID Command & Control, Computer GRID
- CES Communications Effects Server ٠
- CMS Countermine Server
- CMS2 Comprehensive Munitions & Sensor ٠ Server
- CSAT C4ISR Static Analysis Tool
- C4ISR Command & Control. Communications. Computers, Intelligence, Surveillance and Reconnaissance
- DCARS Data Collection, Analysis & Reporting Svstem
- DCA Data Collection & Analysis ٠
- DCAT Data Collection & Analysis Tool
- DES Damage Effects Server
- DOTMLPF Doctrine, Organization, Training, Materiel, Leadership, Personnel & Facilities
- DOS Dynamic Organization Service
- DTC Developmental Test Command
- DTE Distributed Test Event ٠
- . DT&E – Developmental Test and Evaluation
- DVL Distributed Virtual Laboratory
- EE Effects Engine
- FCS Future Combat Systems
- FOC Full Operational Capability
- FOM Federation Object Model

Tom Hurt / 703.806.0995 / tom.hurt@us.army.mil

- FRP Full Rate Production
- FSE – FCS Simulation Environment
- HLA RTI High Level Architecture Run Time Interface
- HC-NEBC Human Centric Network Enabled • **Battle Command**
- HPM Human Performance Model
- **IDE** Integrated Development Environment •
- IOC Initial Operational Capability
- IOT&E Initial Operational Test and Evaluation
- IER – Information Exchange Requirement
- IP03 Integrated Process 03, Networked Fires
- IPT – Integrated Process Team
- IWARS/DI Infantry Warrior Simulation/Dismounted ٠ Infantry
- JCAS – Joint Close Air Support
- JCIDS Joint Combat Integrated Defense System
- JROC Joint Requirements Oversight Council
- JSBE Joint Service Battlespace Environment ٠
- **KPP Key Performance Parameters** •
- LSI Lead Systems Integrator (FCS)
- LVC Live Virtual Constructive •
- LVCI Live Virtual Constructive Interoperability
- LVS - Lethality/Vulnerability Service
- MATREX – Modeling Architecture for Technology, Research, & EXperimentation
- MC2 Mobile Command & Control ٠
- MDA Model Driven Architecture
- MMIC MATREX Middleware Independence Capability
- MOE Measures of Effectiveness •
- MOP Measures of Performance
- M&S - Modeling and Simulation
- MSDE Military Scenario Development Environment
- MSDL Military Scenario Definition Language •
- MSLS Missile Service
- MSO PM FCS (BCT) Modeling & Simulation Office TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

14 of 14

- MTS Message Transceiver Service NCW -Network Centric Warfare
- NEC2 Networked Effects Command & Control
- NVIG Night Vision Image Generator
- OCS Organic Communications Service
- OneSAF One Semi-Automated Forces
- OOS OneSAF Objective System
- **OTB OneSAF Testbed Baseline**
- OTC Operational Test Command
- PEO Program Executive Office
- PM Product, or Program or Project Manager
- R2S Relative Roles Server
- RDECOM Research, Development, & Engineering Command
- RDEC Research, Development & Engineering Center
- S3E Systems Engineering, Experimentation, and Enterprise
- SANDS Situational Awareness Normalization & Dissemination Service
- SE Systems Engineering
- Sim Init Simulation Initialization
- SNE Synthetic Natural Environment
- SoS System of System
- SoSE System of System Engineering
- SOSCOE System of Systems Common Operating Environment
- STEM Science and Technology Enterprise Management
- S&T Science and Technology
- TENA Test & Training Enabling Architecture
- **TIE Technical Integration Event**
- TRADOC Training & Doctrine Command
- UAV Unmanned Aerial Vehicle
- UC Universal Controller

WI - Warfighter Interface

Mapping

- UJTL Universal Joint Task List
- USAF United States Air Force
- <u>USMC</u> United States Marine Corps V&V - Verification and Validation
- VDMS Vehicle Dynamics & Mobility Service

VV&A - Verification, Validation & Accreditation

23 May 2007

WECM - Warfighter Electronic Collection and