



# The Role of Modeling and Simulation in the Evaluation of FCS: OneSAF, NETS, and DETES

Jerry Wightman, U.S. Army/PMFCS BCT ENV & CNST

Donna Smoot, U.S. Army/AEC

Michael Thurston, U.S. Army/WSMR/SVAD

Jonathan Morrow-Jones, L-3 Communications-Jaycor

Robert Gray, Bob Gray Consulting

Lindsay Samora, Strategic Analysis, Inc.

**9 April 2008**



# Report Documentation Page

Form Approved  
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE <b>APR 2008</b>		2. REPORT TYPE <b>N/A</b>		3. DATES COVERED <b>-</b>	
4. TITLE AND SUBTITLE <b>The Role of Modeling and Simulation in the Evaluation of FCS: OneSAF, NETS, and DETES</b>				5a. CONTRACT NUMBER	
				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) <b>U.S. Army/PMFCS BCT ENV &amp;CNST</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release, distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>See also ADM202664. Advanced Development of Unified Electromagnetic (EM) Design Software Capability, The original document contains color images.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>UU</b>	18. NUMBER OF PAGES <b>9</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

# Acknowledgments

- ATEC
  - Paul Kelley and Donna Smoot
- FCS
  - Jerry Wightman and Ed Dunlap
- WSMR/SVAD
  - John O’kuma, Mike Thurston, and Marty Fritz
- DTRA/NTES
  - Dexter Simmons (THTk) and MAJ Gary Brett (UEM)
- L-3 Communications – Jaycor (NETS/THTk)
  - Jonathan Morrow-Jones, Sam McKinney, and Dennis Krueger
- BGC (DETES/UEM)
  - Bob Gray
- Strategic Analysis
  - Lindsay Samora and Scott Klakken



UNCLASSIFIED



Use or disclosure of data contained on this page is subject to the restrictions on the title page of this document

# Motivation for M&S

- FCS is a system-of-systems (SoS)
- Evaluation required at SoS level
- Evaluation relies on modeling & simulation
- Response to environment stresses need to be represented in simulations
  - Initial Nuclear Radiation (INR) effects
    - Prompt, secondary, and delayed gammas
    - Prompt and delayed neutrons
  - EM effects
    - High Altitude Electromagnetic Pulse (HEMP)
    - High Powered Microwaves (HPM)
    - Near lightning strikes (LEMP)

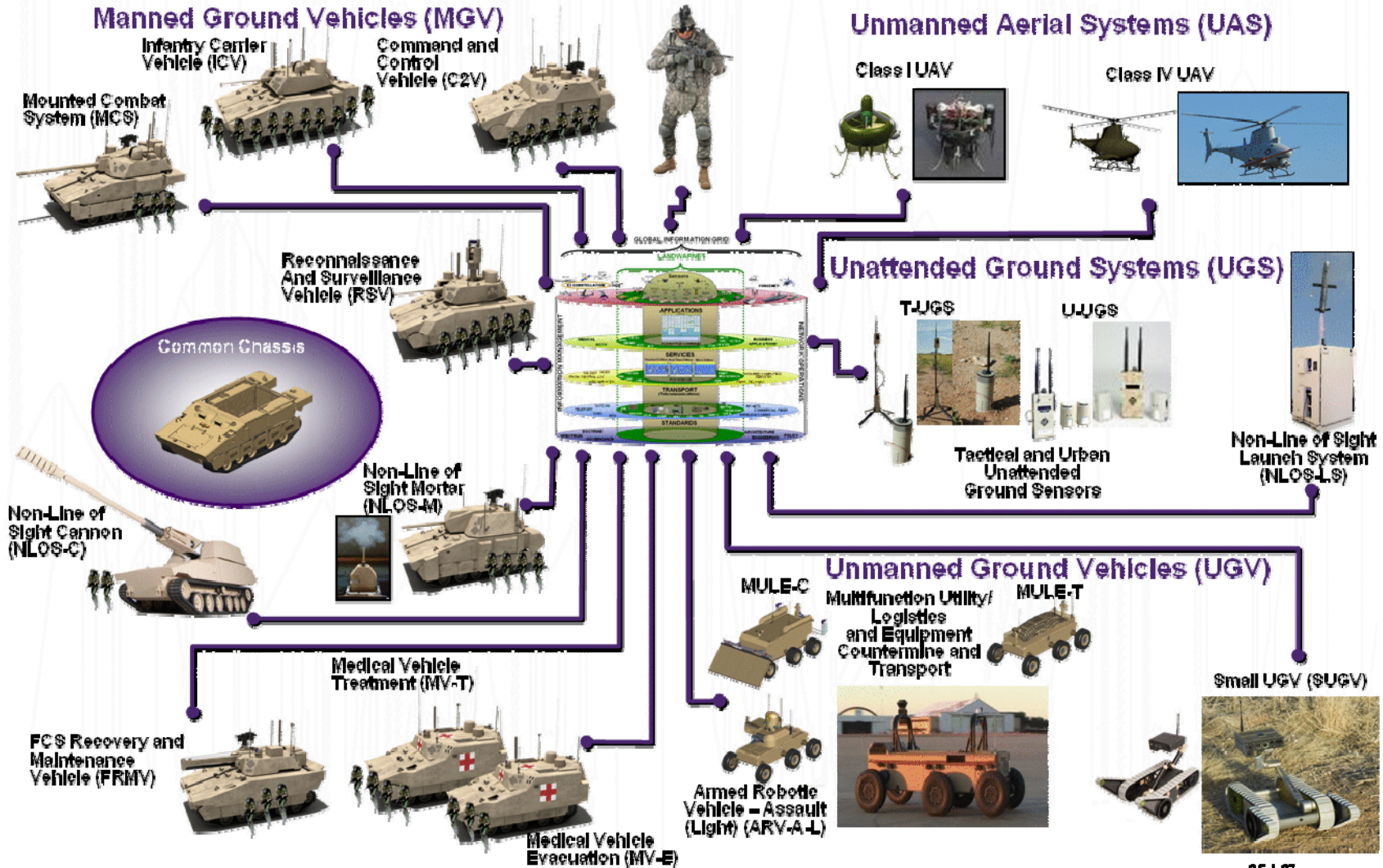


UNCLASSIFIED



Use or disclosure of data contained on this page is subject to the restrictions on the title page of this document

# FCS Brigade Combat Team...

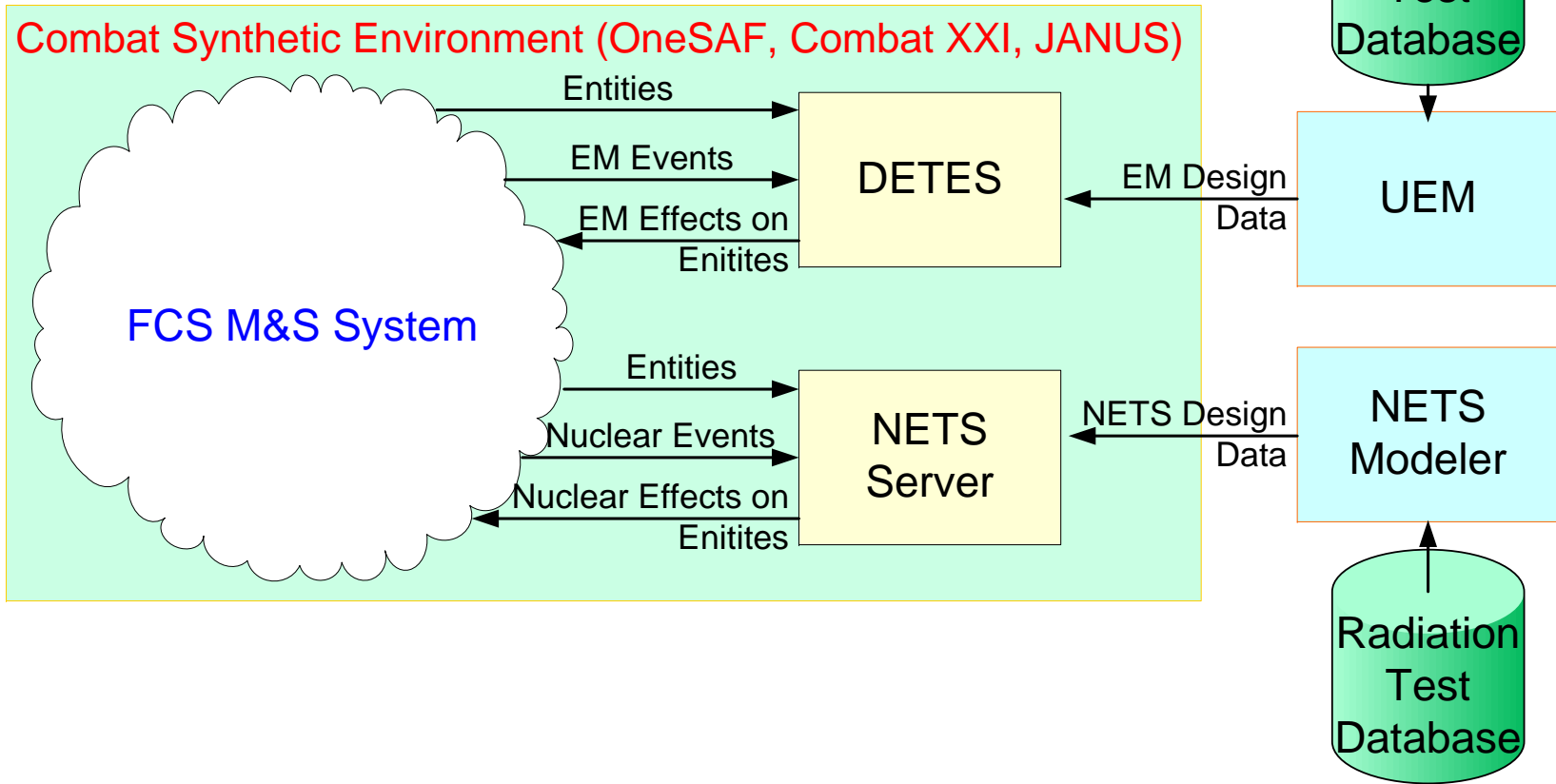


UNCLASSIFIED



Use or disclosure of data contained on this page is subject to the restrictions on the title page of this document

# NETS / DETES Operational Diagram



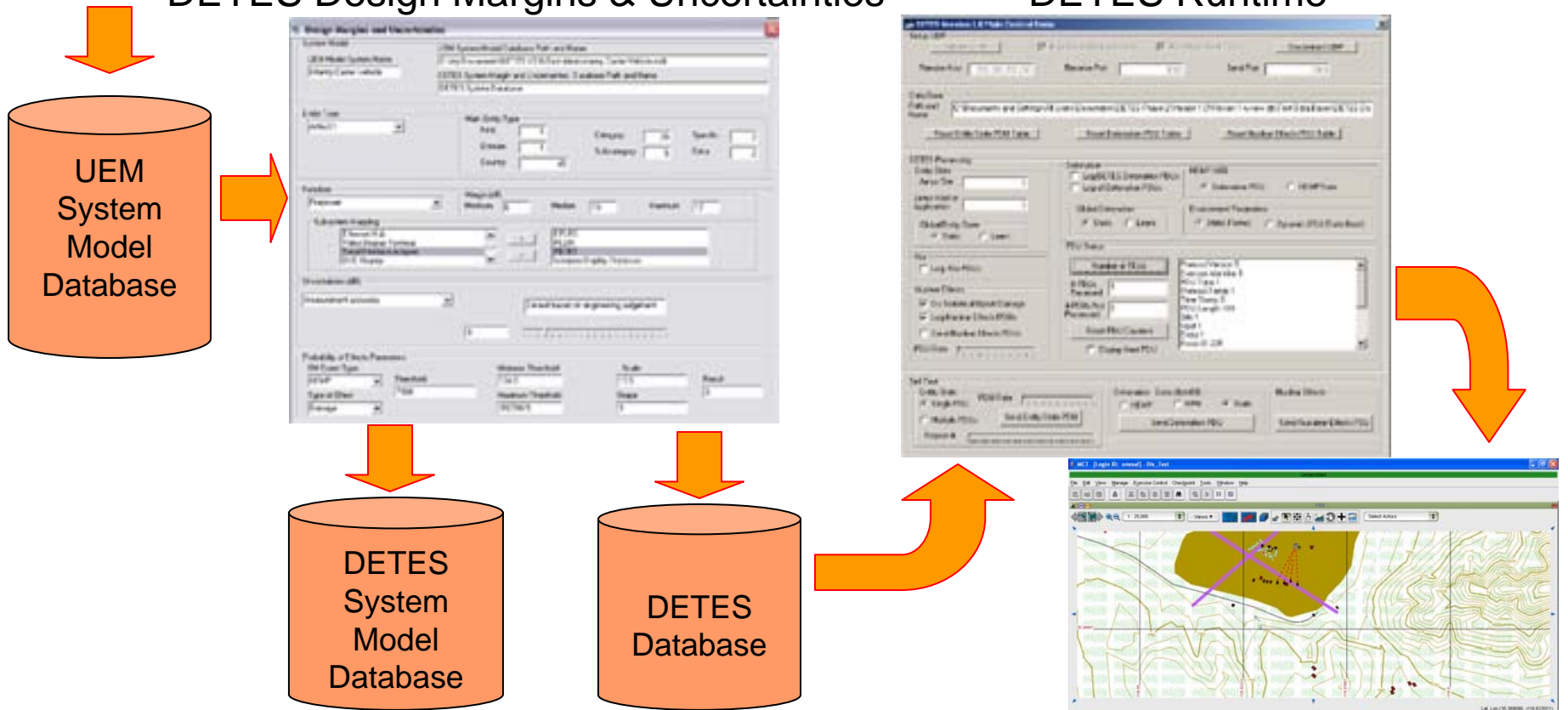




# DETES Functional Flow (2)

DETES Design Margins & Uncertainties

DETES Runtime



- Subsystem/Functional Relationships
- Actual Design Margins
- Uncertainties

Probability of Effect Parameters

OneSAF



UNCLASSIFIED



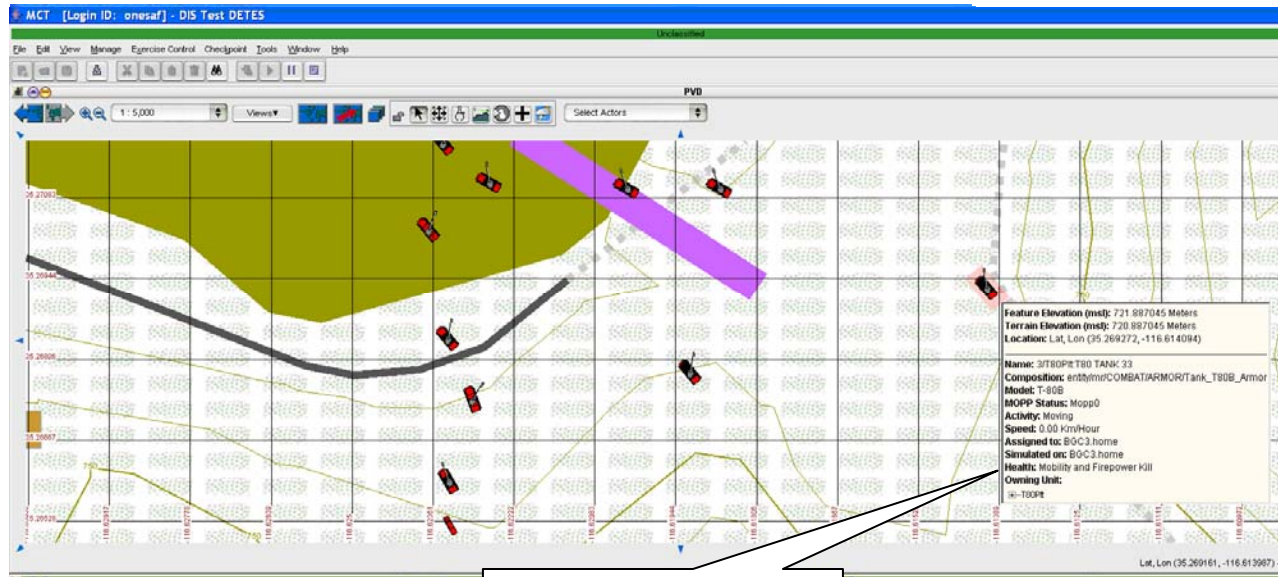
FUTURE COMBAT SYSTEMS  
**FCS**  
One Team - The Army, DARPA, Industry



Use or disclosure of data contained on this page is subject to the restrictions on the title page of this document

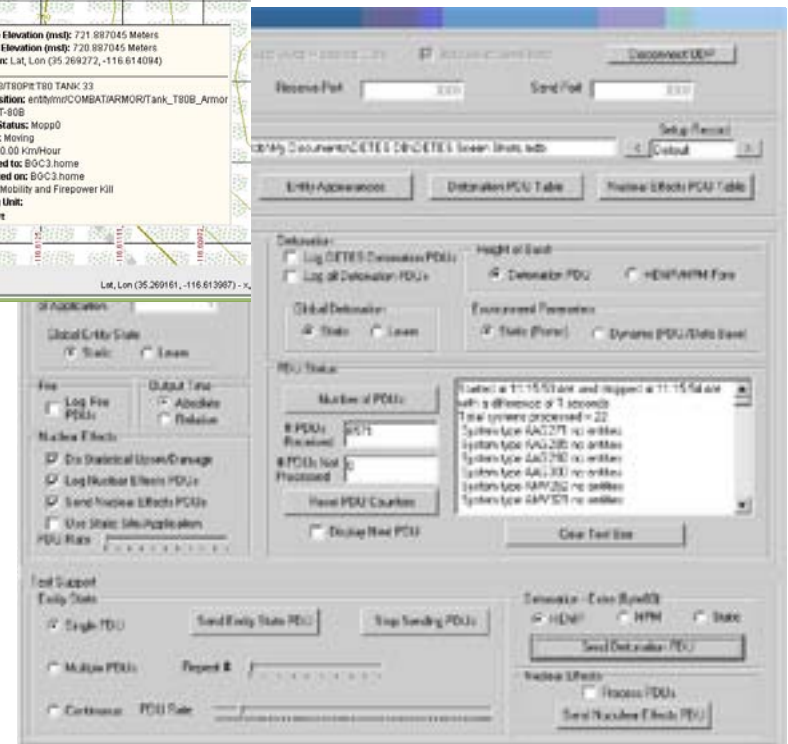


# Example DETES Interop with OneSAF

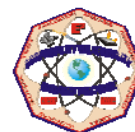


Mobility & Firepower Kill

DETES Runtime



UNCLASSIFIED



FUTURE COMBAT SYSTEMS  
**FCS**  
One Team - The Army, DARPA, Industry



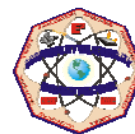
Use or disclosure of data contained on this page is subject to the restrictions on the title page of this document

# Summary

- FCS is a system-of-systems (SoS)
- Success determined SoS level
- Evaluation relies on modeling & simulation
  - Models must be VV&A'd
  - Use of test data from parts to system level
- Response to environment stresses need to be represented in simulations
  - NETS provides models for INR effects on system electronics in battlefield simulations
  - DETES provides models for EM effects on system electronics in battlefield simulations



UNCLASSIFIED



FUTURE COMBAT SYSTEMS  
**FCS**  
*One Team - The Army, DARPA, Industry*



Use or disclosure of data contained on this page is subject to the restrictions on the title page of this document