DoD M&S Executive Agents (Environment)
Air Force, Navy, & NGA

DoD's Ability to Exploit the Environment in M&S

2008 Defense Modeling and Simulation Conference

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
11 MAR 2008	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
DoDs Ability to Exploit the Environment in M&S	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) **Command and Control Modeling and Simulation U.S. Air Force**	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
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
2008 DoD M&S (Modeling and Simulation) Conference, presentations held in Orlando, Florida on March 10 - 14, 2008, The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**UU**	**14**	

Overview

- **Background**
  - **Replicating Natural Environments**
  - **M&S Environment Domain Leads for all DoD**
  - **Current Requirements**
- **Joint End-to-End Program**
- **Way Ahead**

WHY REPLICATE THE ENVIRONMENT

Goal: Effect System Performance/Human Behaviors within M&S

Natural

Processes

Climate
Illumination
Weather
Transmittance
Hydrologic Cycle
Sea State
Surface and Subsurface Flows
Ocean Parameters
Terrain surface and Features

System Performance

Sensor
Decision Makers
Flight Routes
Route Selection
Weapon Effects
Mobility
Course of Action
Line of Sight
Visibility
Acoustic Tracking

The Same

Synthetic

Climate
Physical Parameters
Weather Models
Sea State
Dynamic Terrain
Ocean Models
Hydrologic Modeling
Elevation
Features
Bathymetry

Behavior Models
Flight Routes
Route Selection
Weapon Effects
Mobility
Course of Action
Line of Sight
Visibility
Acoustic Tracking

WHO We Are

"DoD's Modeling and Simulation Executive Agents (MSEA)"

- **DoD MSEAs for Natural Environment**
  - Air & Space Natural Environment: Dept of Air Force
  - Ocean: Dept of Navy
  - Terrain: National Geospatial-Intelligence Agency (NGA)

MISSION: "Enable M&S developers and users to represent the natural environment and its effects rapidly, thoroughly, and consistently in a manner that promotes cost-effectiveness, ready access, interoperability, re-use, and confidence."

WHAT IS Needed

"Services/Components/Communities M&S Environment Requirements"

Data

- Industry/Government Standards
- Access On-The-Shelf Repositories
- Tailored Scenarios
- Integrated Domains
- Consistent Domains

Services

- Compatible with Service Oriented Architectures
- Just-In-Time Tailored Production

Tools

- Visualizations
- System Performance Effects
- Seamless Integration
  - M&S Architectures
  - C4I systems
  - National Data Repositories
- Automation

Other

- Reuse Existing Resources
- Leverage National Environment Centers of Expertise
- Correlate & Integrate Environment in Live and Virtual Systems with Constructive Simulations (JLVC, JMETC, DMO, etc)

JOINT END-TO-END PROGRAM

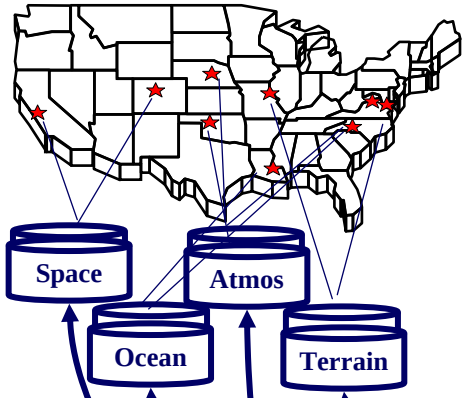
"*A Factory to Foxhole Process*"

#1 Build & Tailor Data

#2 Correlate Products, Effects

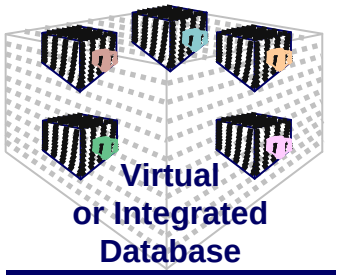
#3 Distribute Live, Virtual, Constructive

National Repositories



Environment Scenario Generation

Environmental Data Cube Support System



- Calculate Effects
- Dynamic Updates
- Produce Messages
- Generate Imagery
- Provide Visualizations

Run-Time Distributor

Simulation

White Cell or Analyst

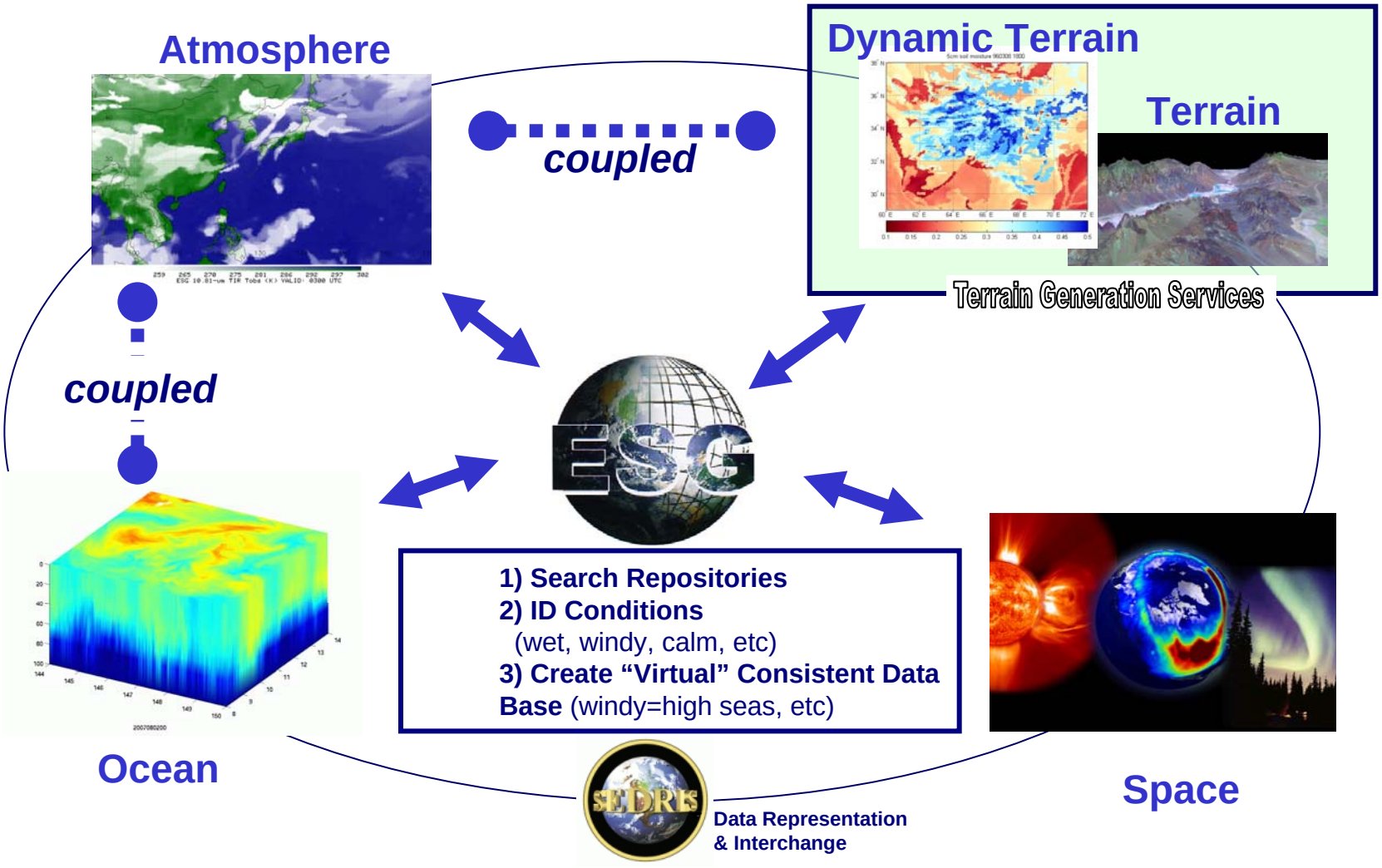
COP (C4ISR)

Users Set Objectives

Environmental Data Cube Support System

- AF, Navy, NGA "Led"
- Over-arching Environment Effort
- Leverage Gov't Environment Data Centers

#1: Build & Tailor Databases, On-Demand



Next Steps

1. Web Services for Ocean, Space

2. Fully automate JTDS/TGS (terrain) connectivity

3. Enhance standard interchanges

#2: Correlate Products & Effects

"Mobility Hypercube"

"Target Hypercube"

"IAMPS"

"SEIS"

Terrain Effects

Atmosphere Effects

Ocean Effects

Space Effects

Imagery

Graphics

Visualizations

Messages (C4I)

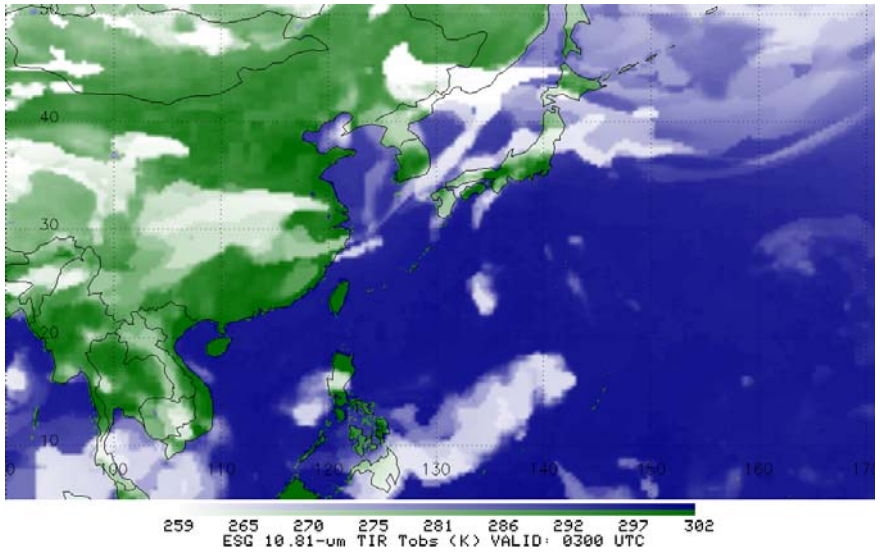
Terrain Data | Atmosphere Data | Ocean Data | Space Data

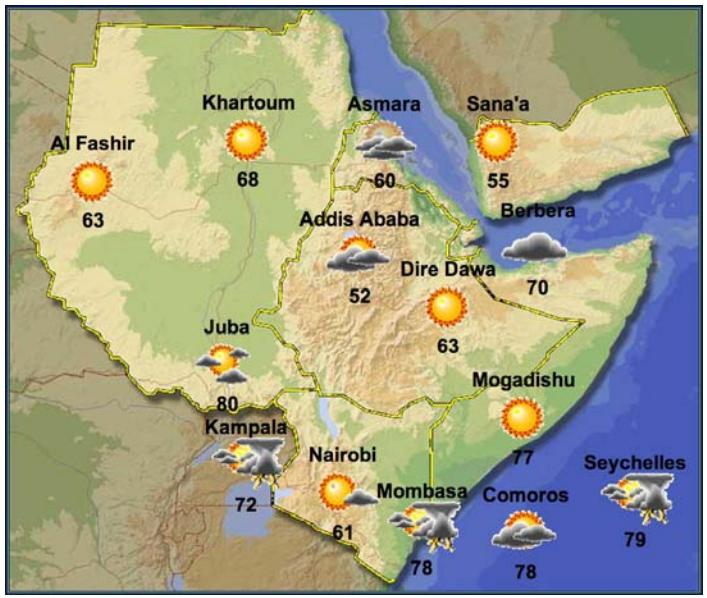
EDCSS Backbone

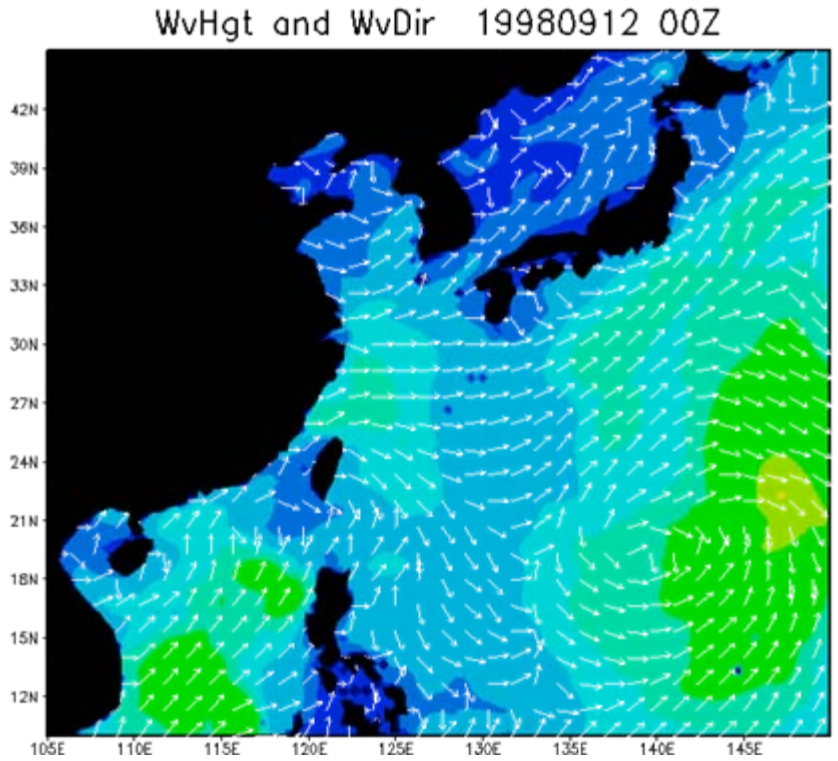
Next Steps

1. Automate IAMPS/SEIS reachback into Navy and NGDC
2. Improve Imagery resolution for IO and IC
3. Integrate and enhance National Labs work on mobility

Sample Synthetic Imagery, Messages (via EDCSS): PACOM, JTF Horn of Africa



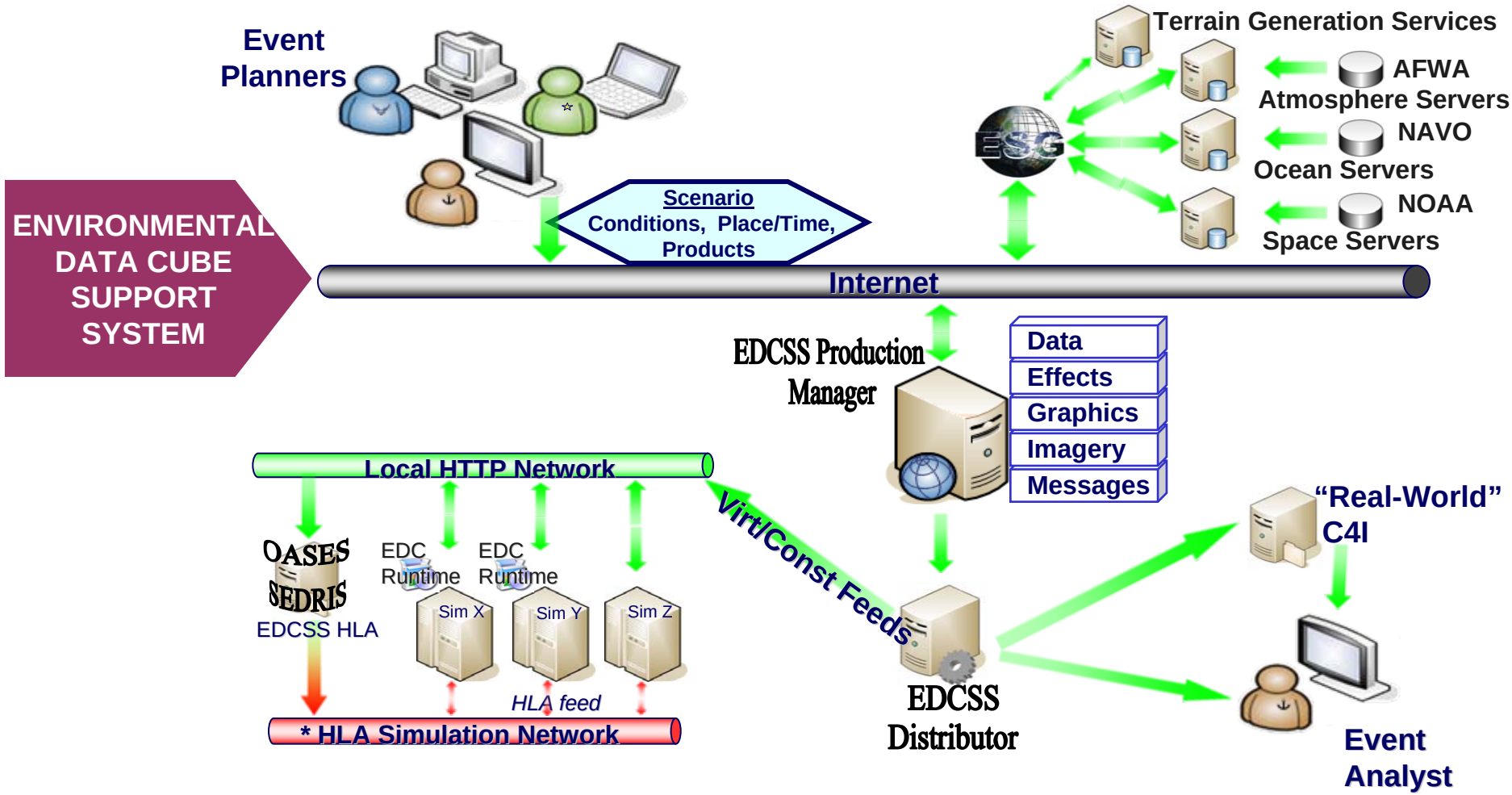




SAUS11 KAWN 061200 RRX

METAR ZBAA 290200Z 12007KT 10SM CLR 26/19 Q0988 RMK SLP149 LAT399N LON1163E ESGACMES=

#3: Distribute Environment Data & Products



Next Steps

1. Automate the dynamic weather/ocean overlays for JLVC

2. Build on on C4I conduits

3. Better integrate technology components (Service, joint)

4. Transition validated joint production & distribution technologies

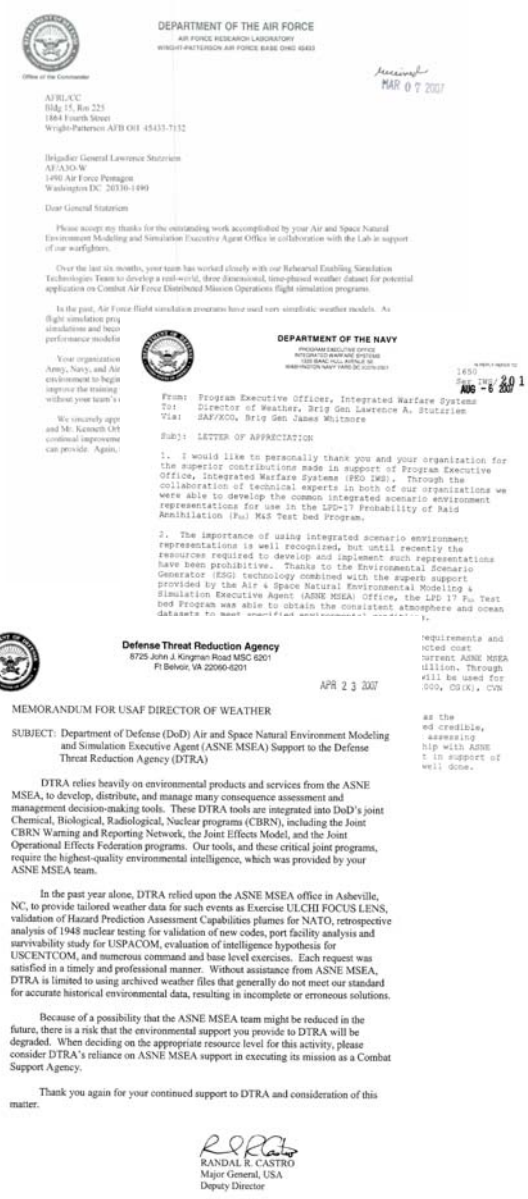
*** NOTE: HLA is Initial Prototype**

M&S Environment "Hall of Fame"

Flagship Programs Leveraging EDCSS

LEAD	FLAGSHIP COMMUNITY PROGRAMS	Integration Level		
		Started	*Partial*	*Fully*
Army	**Future Combat Systems (FCS)**	X		
Army	One Semi-Autmated Forces (ONESAF)	X		
Army	Army SOF Aviation Training and Rehearsal System (ASTARS)	X		
Navy	**Joint Semi-Automated Forces (JSAF)**		X	
Navy	**Integrated Warfare Systems (IWS) Testbed**		X	
Air Force	**Air Force Modeling and Simulation Training Toolkit (AFMSTT)**		X	
Air Force	**Talon SHU**	X		
Air Force	**Storm**		X	
Air Force	**Thunder**		X	
Air Force	**Distributed Mission Operations (DMO)**	X		
Joint	**Joint Expeditionary Force Experiment (JEFX)**			X
Joint	**Joint Strike Fighter**	X		
Joint	**Joint Rapid Scenario Generation (JRSG)**	X		
Joint	**Joint Training Data Services (JTDS)**	X		
Joint National Training Capability	**Joint Live-Virtual Constructive (JLVC) Federation**		X	
PACOM	**Terminal Fury**			X
EUCOM	**Austere Challenge**		X	
JFCOM	**Joint Conflict and Tactical Simulation (JCATS)**		X	
JFCOM	**Joint Analysis System**			X
Multi-National Experiment	**Urban Resolve 2015**		X	
JTF Mission Rehearsal	**Unified Endeavor/Horn of Africa MRX**		X	
Analysis	**Unified Engagement**		X	
FAA/NASA	**Next Generation [aircraft] Messaging System (NexGEN)**	X		
Defense Threat Reduction Agency	**Hazard Prediction and Assessment Capability (HPAC)**			X
National Reconnaissance Office	**National Warfare System (NWARS)**	X		

DoD Senior Leader Perspectives on EDCSS



DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY
WRIGHT-PATTERSON AIR FORCE BASE OHIO 45433

MAR 0 7 2007

AFRL/CC
Bldg 15, Rm 225
1864 Fourth Street
Wright-Patterson AFB OH 45433-7132

Brigadier General Lawrence Stutzriem
AF/ASO/W
1490 Air Force Pentagon
Washington DC 20330-1490

Dear General Stutzriem

Please accept my thanks for the outstanding work accomplished by your Air and Space Natural Environment Modeling and Simulation Executive Agent Office in collaboration with the Lab in support of our warfighters.

Over the last six months, your team has worked closely with our Rehearsal Enabling Simulation Technologies Team to develop a real-world, three dimensional, time-phased weather dataset for potential application on Combat Air Force Distributed Mission Operations flight simulation programs.

In the past, Air Force flight simulation programs have used very simplistic weather models. As flight simulation prog
simulations and beco
performance modelin

Your organization
Army, Navy, and Air
environment to begin
improve the training
without your team's

We sincerely appr
and Mr. Kenneth Ott
continual improveme
can provide. Again,

DEPARTMENT OF THE NAVY
PROGRAM EXECUTIVE OFFICE
INTEGRATED WARFARE SYSTEMS
1333 ISAAC HULL AVENUE SE
WASHINGTON NAVY YARD DC 20376-5601

1650
Ser IWS/ 20 1
AUG - 6 2007

From: Program Executive Officer, Integrated Warfare Systems
To: Director of Weather, Brig Gen Lawrence A. Stutzriem
Via: SAF/XCO, Brig Gen James Whitmore

Subj: LETTER OF APPRECIATION

1. I would like to personally thank you and your organization for the superior contributions made in support of Program Executive Office, Integrated Warfare Systems (PEO IWS). Through the collaboration of technical experts in both of our organizations we were able to develop the common integrated scenario environment representations for use in the LPD-17 Probability of Raid Annihilation (P_{RA}) MaS Test bed Program.

2. The importance of using integrated scenario environment representations is well recognized, but until recently the resources required to develop and implement such representations have been prohibitive. Thanks to the Environmental Scenario Generator (ESG) technology combined with the superb support provided by the Air & Space Natural Environmental Modeling & Simulation Executive Agent (ASNE MSEA) Office, the LPD 17 Fu Test bed Program was able to obtain the consistent atmosphere and ocean datasets to meet specified environmental requirements and

Defense Threat Reduction Agency
8725 John J. Kingman Road MSC 6201
Ft Belvoir, VA 22060-6201

APR 2 3 2007

MEMORANDUM FOR USAF DIRECTOR OF WEATHER

SUBJECT: Department of Defense (DoD) Air and Space Natural Environment Modeling and Simulation Executive Agent (ASNE MSEA) Support to the Defense Threat Reduction Agency (DTRA)

DTRA relies heavily on environmental products and services from the ASNE MSEA, to develop, distribute, and manage many consequence assessment and management decision-making tools. These DTRA tools are integrated into DoD's joint Chemical, Biological, Radiological, Nuclear programs (CBRN), including the Joint CBRN Warning and Reporting Network, the Joint Effects Model, and the Joint Operational Effects Federation programs. Our tools, and these critical joint programs, require the highest-quality environmental intelligence, which was provided by your ASNE MSEA team.

In the past year alone, DTRA relied upon the ASNE MSEA office in Asheville, NC, to provide tailored weather data for such events as Exercise ULCHI FOCUS LENS, validation of Hazard Prediction Assessment Capabilities plumes for NATO, retrospective analysis of 1948 nuclear testing for validation of new codes, port facility analysis and survivability study for USPACOM, evaluation of intelligence hypothesis for USCENTCOM, and numerous command and base level exercises. Each request was satisfied in a timely and professional manner. Without assistance from ASNE MSEA, DTRA is limited to using archived weather files that generally do not meet our standard for accurate historical environmental data, resulting in incomplete or erroneous solutions.

Because of a possibility that the ASNE MSEA team might be reduced in the future, there is a risk that the environmental support you provide to DTRA will be degraded. When deciding on the appropriate resource level for this activity, please consider DTRA's reliance on ASNE MSEA support in executing its mission as a Combat Support Agency.

Thank you again for your continued support to DTRA and consideration of this matter.

RANDAL R. CASTRO
Major General, USA
Deputy Director

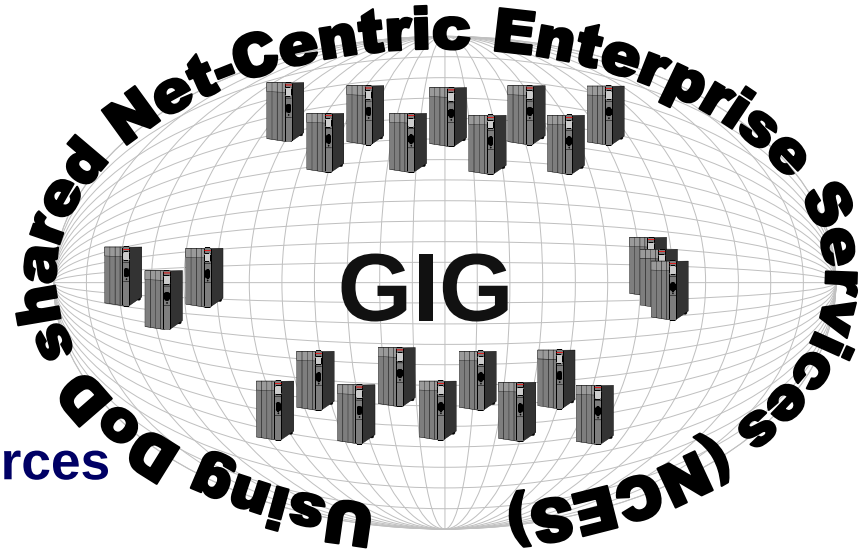
Maj Gen Ted F. Bowlds, Mar 2007
Air Force Research Lab Commander
"More Credible Performance"
"Improves Training Value to Our Warfighters"

RDML M. S. Frick, Aug 2007
Navy PEO for Integrated Warfare Systems
"Cost Avoidance of $50M"

MGen Randall R. Castro, Apr 2007
Defense Threat Reduction Agency Deputy Director
"Validation Plumes for NATO"
"Validation for Port Facility Analysis"

Joint Collaboration
The Way Forward

- Getting Environment into M&S is no longer…
  - Too hard
  - Too expensive
  - Too time-consuming



- Available to all DoD
  - Core Enterprise capabilities
  - Access, reuse of existing resources

- Need your programs to…
  - Utilize EDCSS capabilities
  - Pass new requirements to MSEAs

CONTACT INFO

- **DoD ASNE MSEA Senior Lead**
  Dr. Fred Lewis
  U.S. Air Force
  Director of Weather

- **DoD Ocean MSEA Senior Lead**
  RDML David Titley
  U.S. Navy
  Commander, Naval Meteorology and Oceanography Command

- **DoD Terrain MSEA Senior Lead**
  Ms. Mary Irvin
  National Geospatial-Intelligence Agency
  NGA Modeling and Simulation Executive Agent

- **MSEA Senior Lead Presenter**
  Mr. Keith Seaman
  Air Force Modeling and Simulation Senior Leader

- **DoD ASNE MSEA**
  Col Mark Zettlemoyer, A3O-W
  703-696-4936
  Mark.Zettlemoyer@pentagon.af.mil

- **DoD Ocean MSEA**
  Mr Steve Payne, GS15, CNMOC
  228-688-5507
  Steven.W.Payne@navy.mil

- **DoD Terrain MSEA**
  Mr Paul Foley, GS15, NGA
  703-808-2854
  Paul.G.Foley@nga.mil

- **MSEA Coordinator**
  Lt Col Allen Rabayda
  703-696-4786
  Allen.Rabayda@pentagon.af.mil