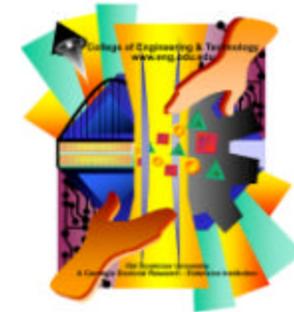


Synthetic Environments at VMASC



Andreas Tolk, Ph.D.

Virginia Modeling Analysis and Simulation Center
Old Dominion University

Presentation Outline

- **Who is VMASC?**
 - **The Academic View of VMASC**
 - **The Government View of VMASC**
 - **The Industry View of VMASC**
- **Overview of the VMASC Battle Lab**
 - **Components**
 - **Applications**
- **Actual Research done at VMASC**
 - **XMSF**
 - **Composability**
 - **Homeland Security**
- **And Where is SEDRIS?**



Who is VMASC?



Virginia Modeling, Analysis & Simulation Center

<http://www.vmasc.odu.edu>

VMASC Overview

- Enterprise Center, College of Engineering & Technology, Old Dominion University
- Established July 1997 by the Commonwealth of Virginia
- Focus on Modeling & Simulation and Visualization
- Locations in
 - Suffolk, TCC-Portsmouth (VMASC West)
 - ODU-Norfolk Campus (VMASC East)
- Faculty/Staff - 60 full & part-time
- Multidisciplinary - activities have included faculty from all six academic colleges and from other universities (such as the Naval Postgraduate School, George Mason University, etc.)

Academia

Military/Gov.

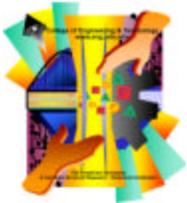
Industry

VMASC – The Academic View



Old Dominion University

- Virginia public university; organized 1930 as branch of the College of William & Mary; independent 1962
- Approximately 19,000 students and 1,000 faculty



College of Engineering and Technology

- Full range of engineering programs
- M.S. and Ph.D. degrees in M&S (inter-departmental)



Virginia Modeling, Analysis & Simulation Center

- University research laboratory, specializing in:
Modeling & Simulation, Visualization, and Analysis
- Provider of engineering and technical services
- Home of M&S graduate programs

The VMASC M&S Graduate Programs

Master's Degree in M&S

- Multidisciplinary program
- Five departments:
 - Electrical and Computer Engineering
 - Engineering Management
 - Computer Science
 - Psychology
 - Occupational and Technical Education
- Two options:
 - Master of Science
 - Master of Engineering
- Core Courses plus electives

50

Doctoral Program in M&S

- Established Fall 2000
- First doctoral program at a public university
- First Ph.D. in M&S in Fall 2003
- Core Courses
 - Advanced Discrete Systems Simulation
 - Foundations for Continuous and Real-Time Simulation
 - Simulation Theory and Formalisms
 - Ph.D. Seminar

35

VMASC – The Government View

- Cooperative Research & Development Agreement (CRADA) of ODU with U.S. JFCOM
 - Joint War Fighting Center (JWFC) and Joint Battle Center (JBC) within the Joint Training Analysis and Simulation Center (JTASC) in Suffolk
 - U.S. Army's Training and Doctrine Command (TRADOC) and Military Traffic Management Command/Transportation Engineering Agency (MTMCTEA) in Newport News
 - U.S. Navy in Norfolk and Virginia Beach
 - U.S. Air Force in Langley
- National Center for Collaboration in Medical Modeling and Simulation Established by Congress in FY2002, joint program with Eastern Virginia Medical School (EVMS)

Stimulate technology-related economic development in the Commonwealth of Virginia

VMASC – The Industry View

Employ “Value-Added Proposition” approach to aid industry partners to expand opportunities

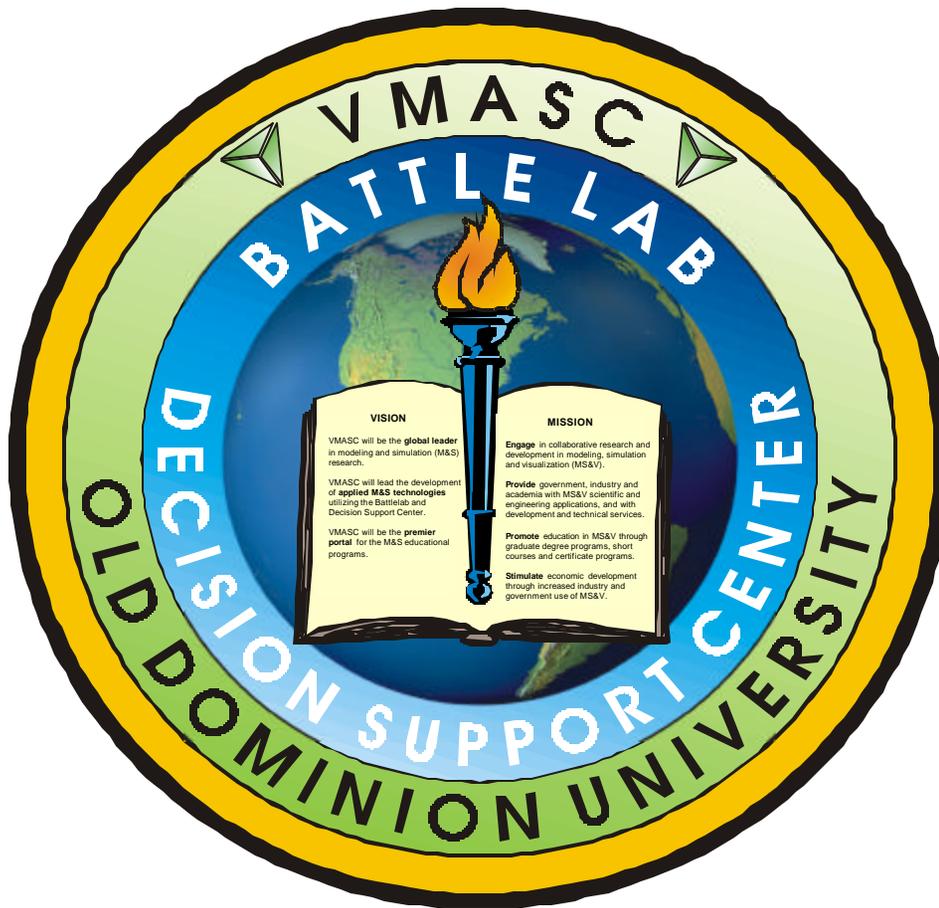
150 MEMBERS

9	Academic
15	Affiliate
24	Government
102	Industry



The VMASC Battle Lab

Overview of the VMASC Battle Lab



Points of Contact:

Technical Director:
Dr. Roland R. Mielke

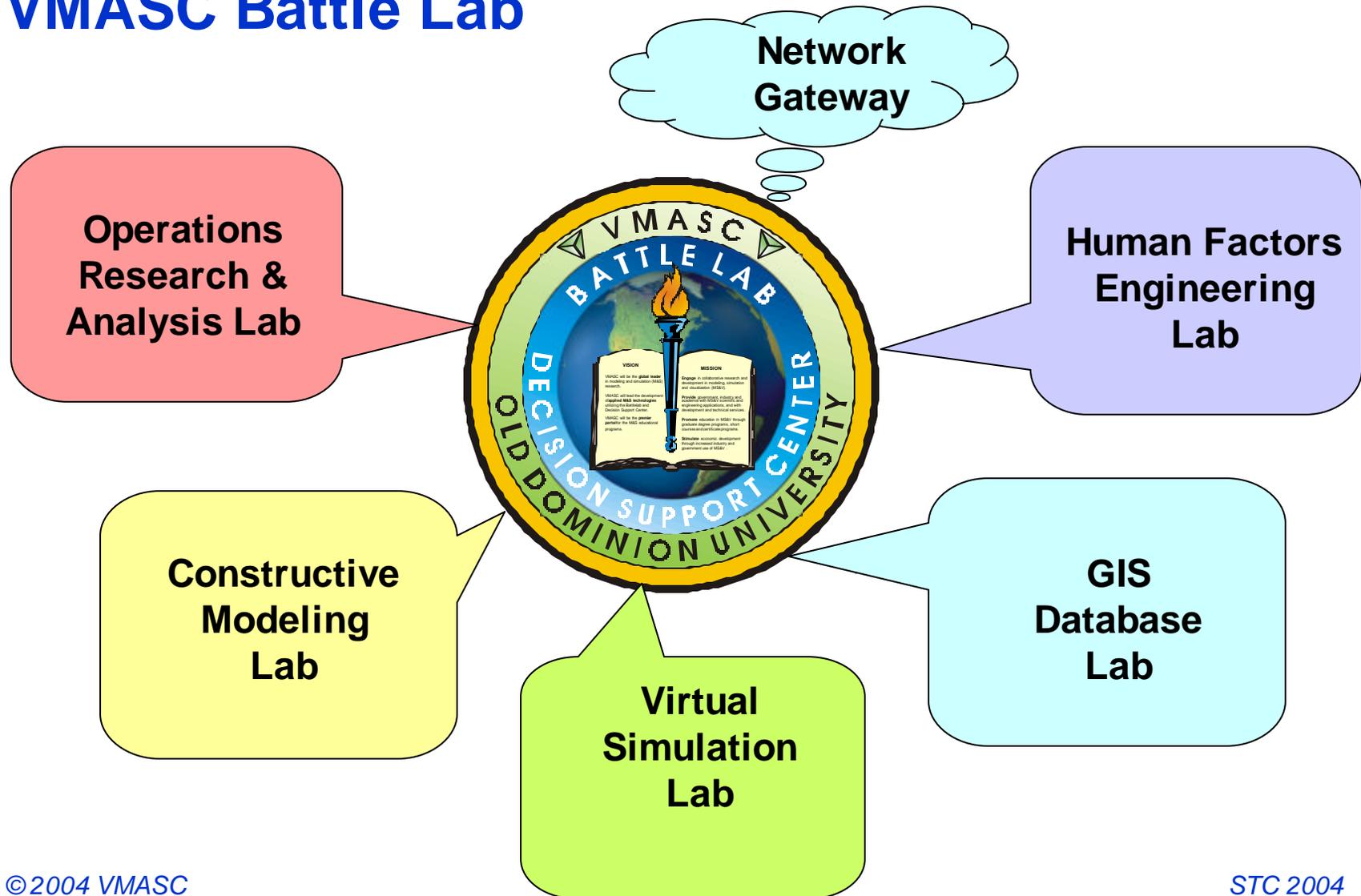
Battle Lab Director:
Mr. Mark A. Phillips

Why an Academic Battle Lab?

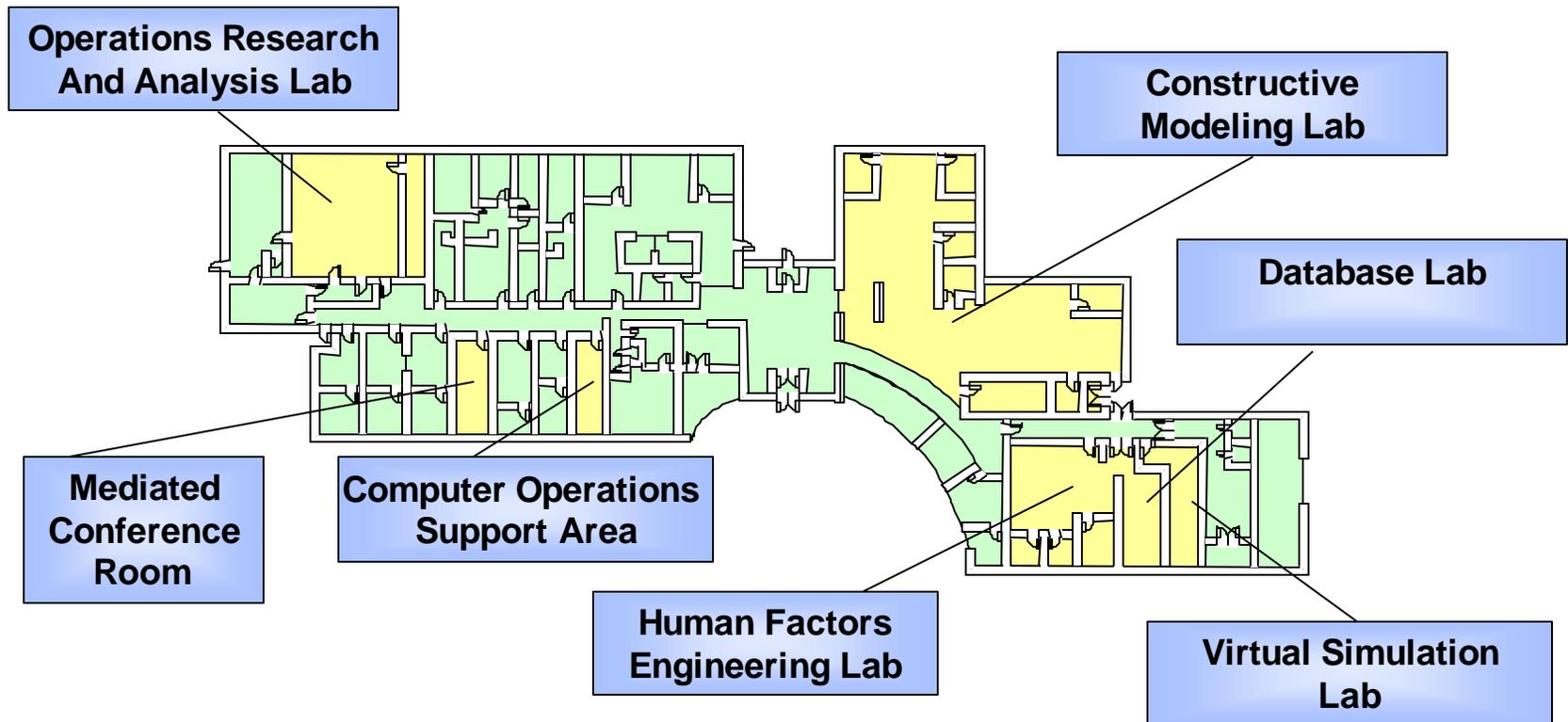


- Establishing the infrastructure required at VMASC for **conduction of research and graduate education** in computer modeling, simulation, and visualization.
- Positioning VMASC to better **support military commands** that utilize simulation for training and experimentation.
- Enhancing VMASC ability to **transfer this technology** for the use by government and industry.

VMASC Battle Lab

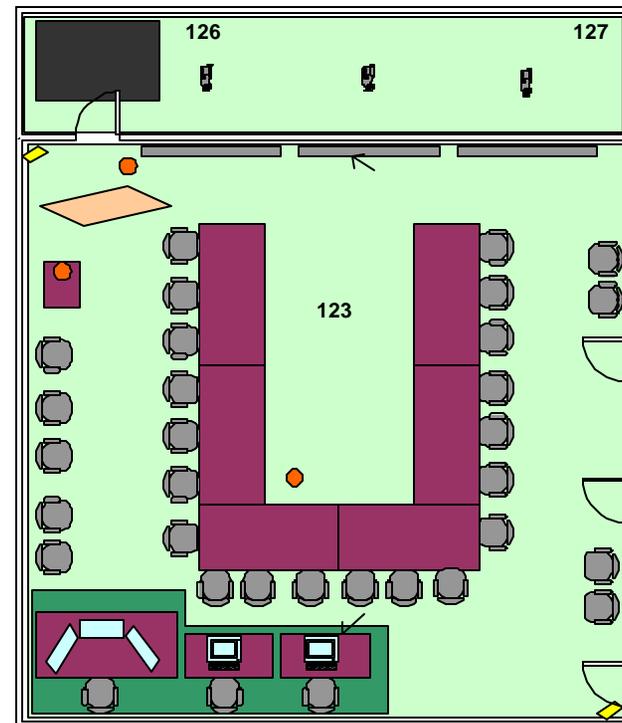


VMASC Battle Lab Components



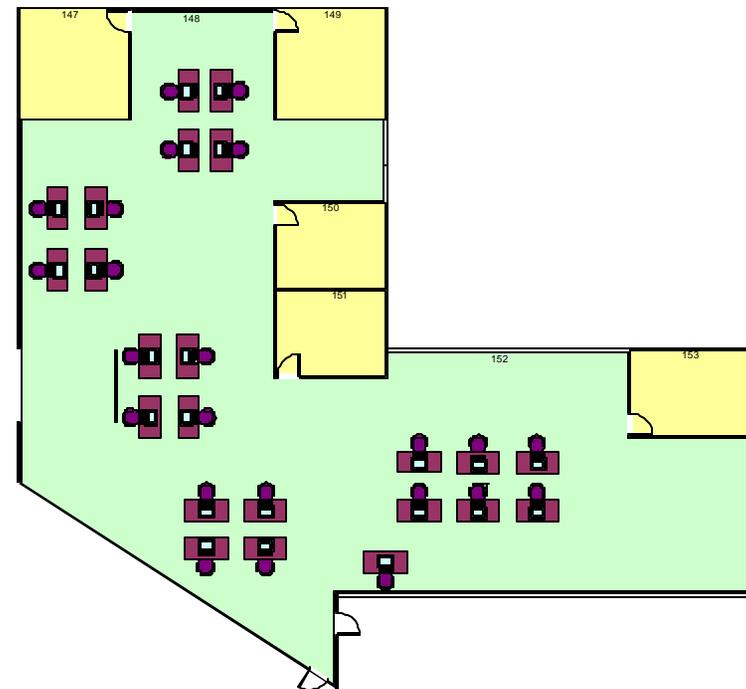
OPERATIONS RESEARCH & ANALYSIS LABORATORY

- **Configuration**
 - Large open area configured as a small auditorium/classroom
- **Equipment**
 - Three rear-projection wall displays
 - Teleconference and collaboration systems
- **Utilization**
 - Group presentations and teleconferences
 - Classroom for short-courses and training sessions
 - Analysis sessions and collaborative design meetings



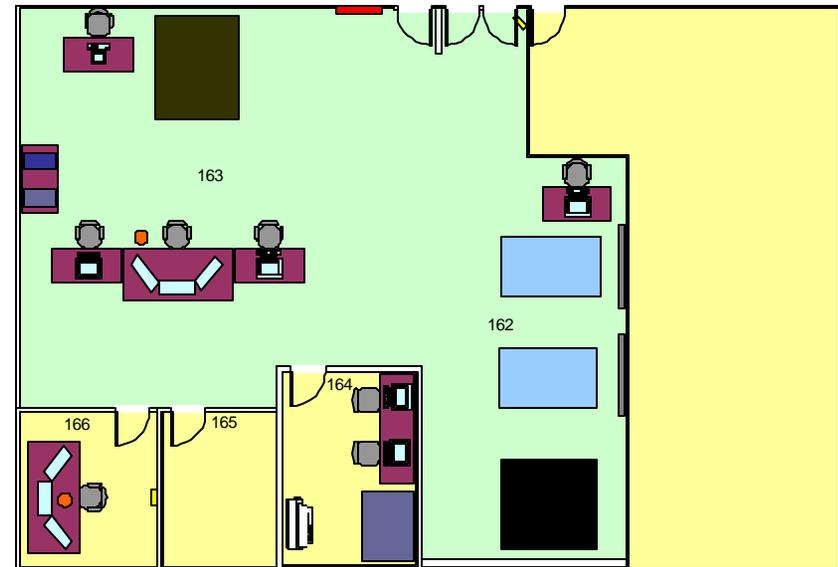
CONSTRUCTIVE MODELING LABORATORY

- **Configuration**
 - Large, re-configurable computer workstation laboratory
- **Equipment**
 - Thirty computer workstations
 - Digital communication system with data-logging feature
- **Utilization**
 - Model and simulation code development
 - Team areas for wargame exercises
 - General computer laboratory



HUMAN FACTORS ENGINEERING LABORATORY

- **Configuration**
 - A controlled environment suitable for testing human subjects
- **Equipment**
 - Visualization workstations
 - ImmersaDesk 2
 - Flight Simulators
 - Subject Monitoring
 - GIS/Database Work Area
- **Utilization**
 - Human-computer interface studies and experiments
 - Visualization experiments



"Making Better Decisions Faster!" - Decreasing the Decision Cycle

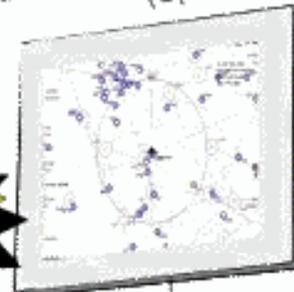
Group Decision Support for Experimentation & Design



Exploration into Portable computing and Distributed Data Systems



Large Scale Data Visualization (Operational Analysis and After Action Review)



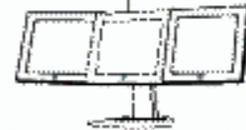
Flexibility & Connectivity are Key to the Battle Lab Concept

Networked Simulations - Using Distributed Architectures



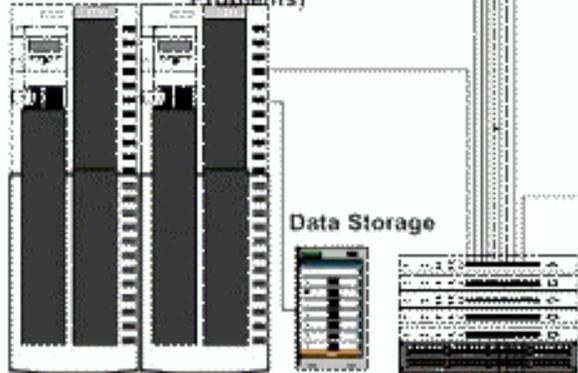
High Performance Computing Scalable Low Cost

Small Scale Visualization for Interface Design & Experimentation



Video/Audio & Data Switching/Router for Reconfigurability

(Large Scale Operations Research Problems)



Data Storage

High Speed Data Inter-Connectivity



Man-In-The-Loop Human Factors Experimentation
This could include traffic or driving analysis, air traffic control and pilot workload projects.

The VMASC Battle Lab in the M&S Program

- MSIM 630:
Development and Application of Combat Models
(Combat Modeling II)
- Master Thesis Students
 - Computer Science
 - Electrical and Computer Engineering
 - Engineering Management
- Student Support (GRA) in all Projects
- Computer Science Tutorial on Applied Artificial Intelligence (AI): Military Application Domain

Actual Research at VMASC

Extensible M&S Framework (XMSF)

VMASC is one of the Core Architects of XMSF:

- MOVES Institute,
Naval Postgraduate School
- C3I Center,
George Mason University
- Virginia Modeling Analysis & Simulation Center, Old
Dominion University
- SAIC, San Diego



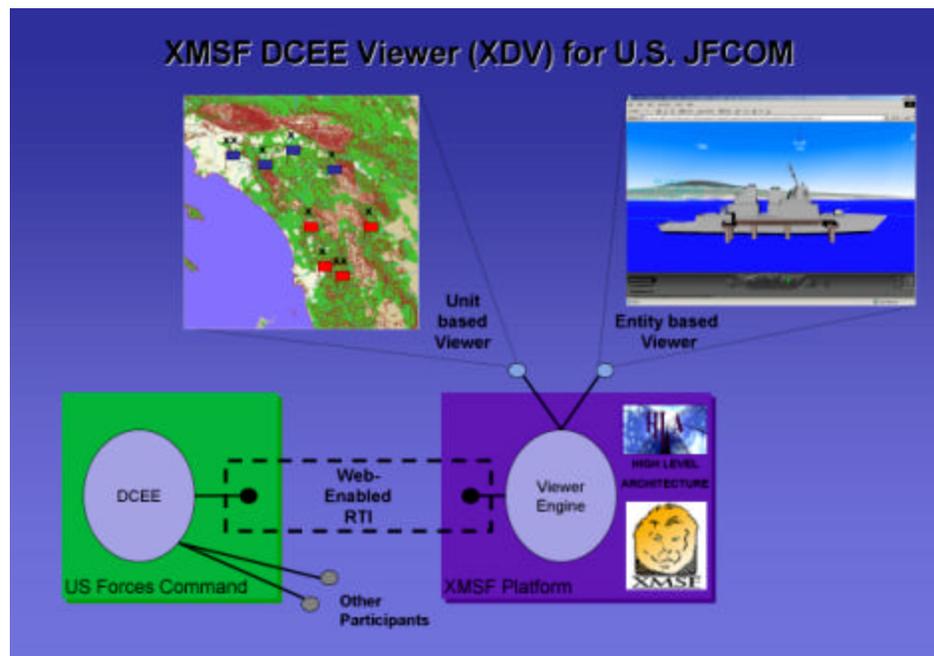
The Extensible Modeling and Simulation Framework (XMSF) is defined as a set of web-based technologies and services, applied within an extensible framework, that enables a new generation of modeling & simulation (M&S) applications to emerge, develop and interoperate.

Current work in Web Services are an appropriate basis for organizing and composing the many necessary capabilities of Web/XML and Internet/networking needed for M&S applications.

XMSF DCEE Viewer (XDV)

XMSF 1:

Develop an open standard based Viewer for the Distributed Continuous Experimentation Environment (DCEE) of the U.S. Joint Forces Command Experimentation Directorate



Project Lead: GD/AIS

Partners: SAIC; NPS

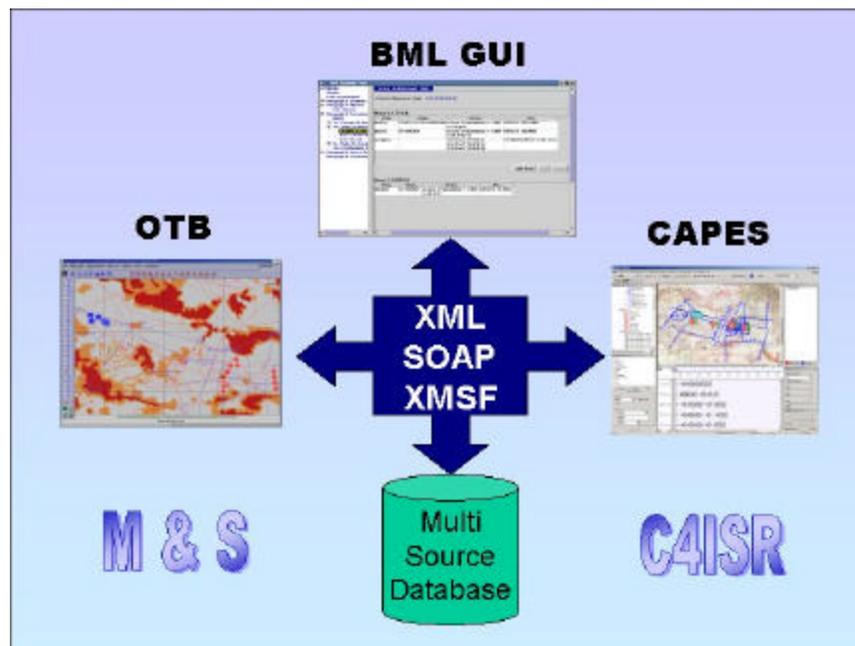
The XMSF DCEE Viewer (XDV)

- Runs on Commercial-off-the-Shelf (COTS) PCs,
- Uses web-based protocols to display the actual situation within the DCEE federation
- Can be used by eligible DCEE users wherever an Internet-connection is available
- Comprises the Web-Enabled RTI, an Entity Based Viewer, and a Unit Based Viewer

XMSF Battle Management Language (XBML)

XMSF 2:

Transfer the Army Project Battle Management Language to a Joint and Combined Solution based on Open Standards



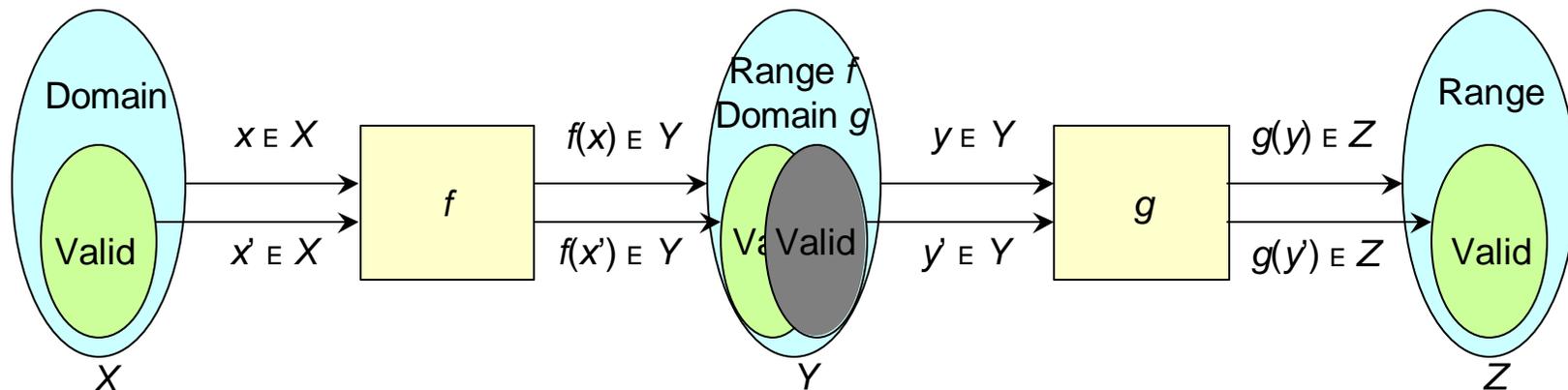
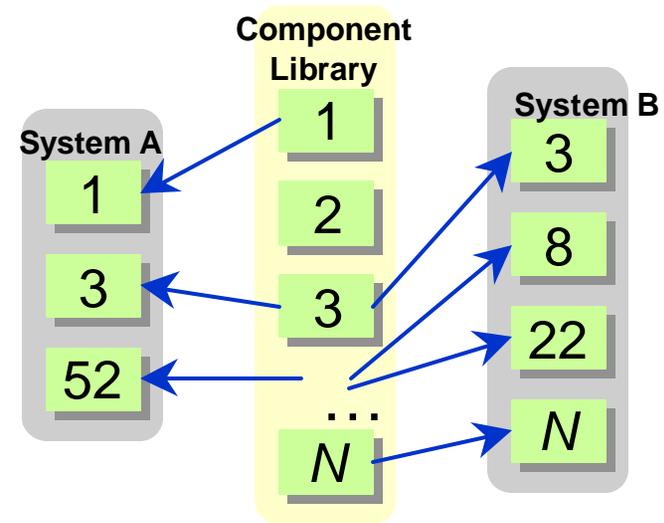
Project Lead: GMU
Partners: ACS; Alion

BML is the unambiguous representation of doctrine applicable for C4ISR, M&S, and robotics

Composability

Composability 1:

Develop theory of semantic composability of models based on computability theory and mathematical logic

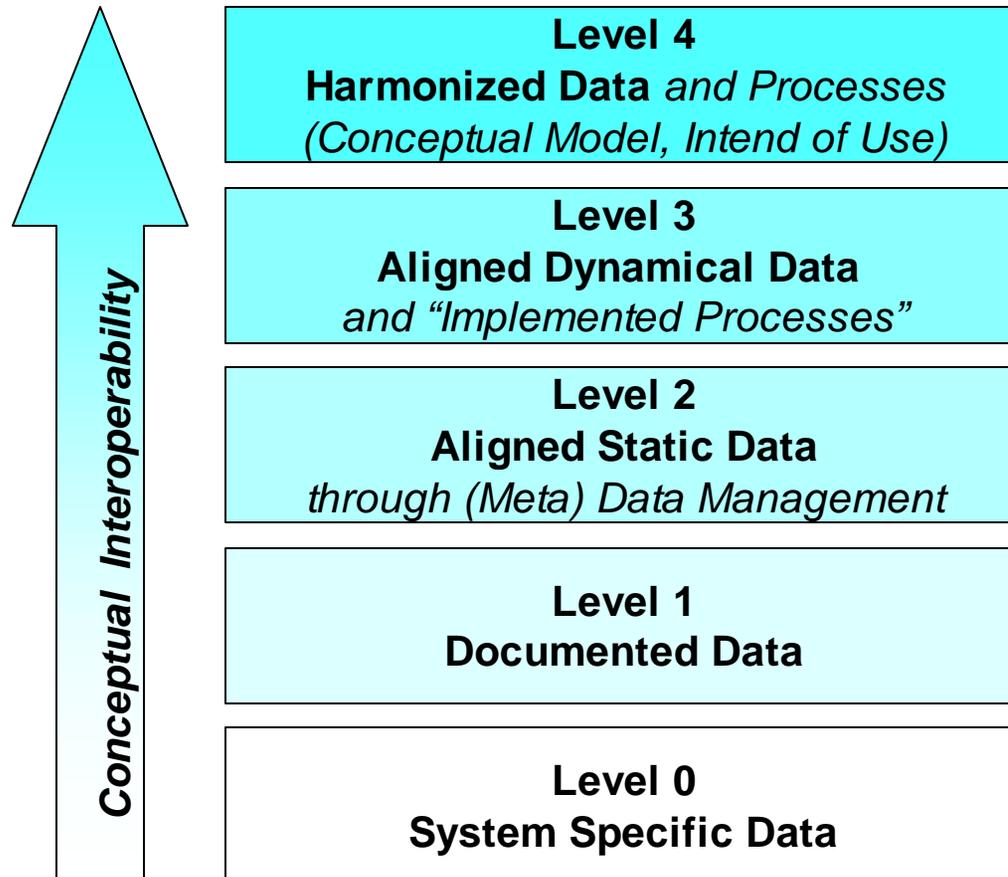


$$z = g(f(x))$$

Composability

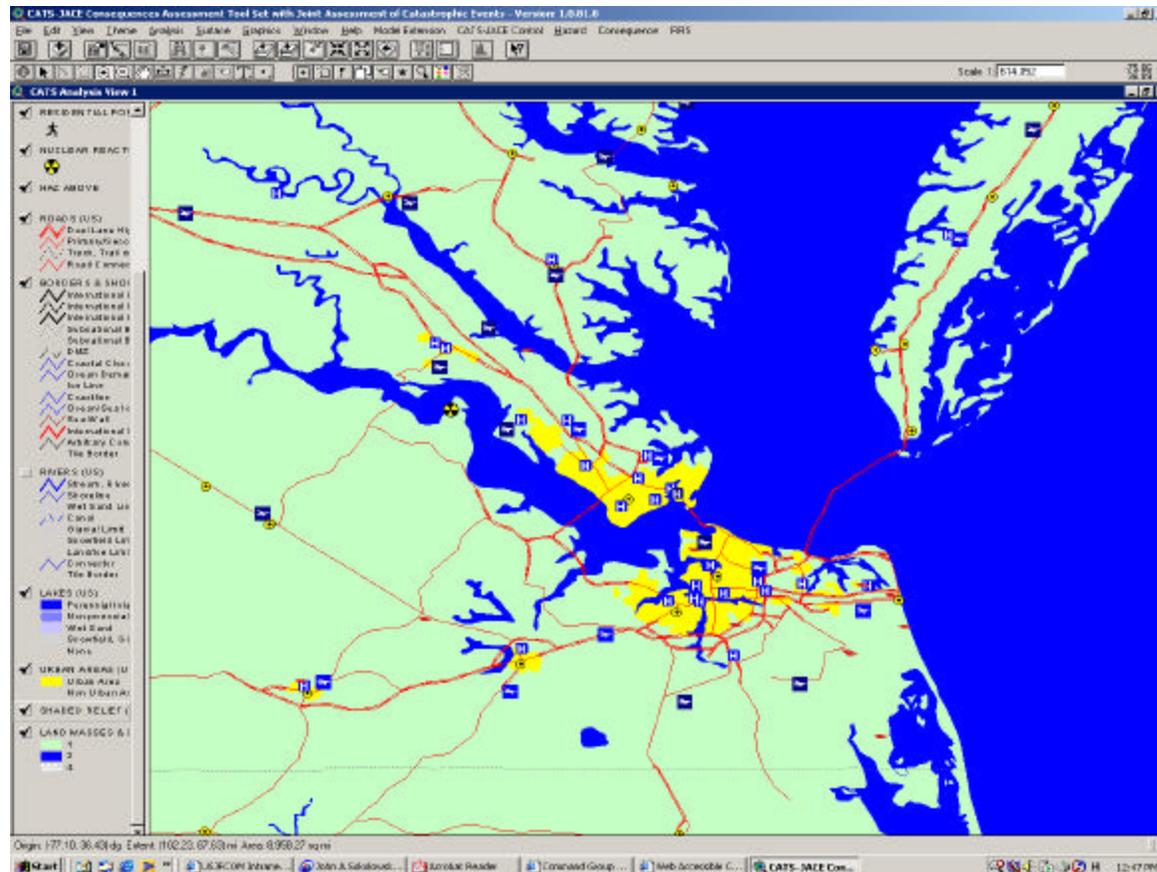
Composability 2:

Applicability of software engineering methods to increase interoperability Of M&S: The Levels of Conceptual Interoperability Model (LCIM)



Homeland Security

Develop persistent simulation capability and facility for civil authorities to conduct Homeland Security training, analysis, and decision support



Where is SEDRIS?

SEDRIS at VMASC

- M&S Program
 - MSIM 620: Combat Modeling I
Introduction to SEDRIS (3 hours)
 - MSIM 630: Combat Modeling II
SEDRIS Tutorial and Applications (3 – 6 hours)
- VMASC Research
 - XMSF: Web Services for SEDRIS
 - Composability: Influence of SEDRIS
 - Homeland Security: Applicability of SEDRIS

Please, give us **SEDRIS XML**
for XMSF and C4ISR/GIG

VMASC is proposing SEDRIS whenever adequate to consider the solutions within the Research Projects

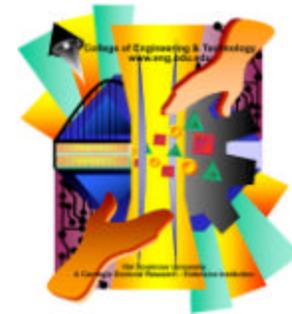
Point of Contacts at VMASC

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- Mikel D. Petty, Ph.D.
 - Chief Scientist
 - *Composability*
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 - *XMSF*
 - Phone: 757 686-6203
 - atolk@odu.edu



Questions



<http://www.vmasc.odu.edu>