GMU C^{4}I and Cyber Center

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http://c4i.gmu.edu

C^{4}I & Cyber Center Mission

- Perform advanced research in defense, intelligence and security-related Information Technology
  - Be recognized as premier source of knowledge and innovation
  - Provide advice and assistance to military and civil authorities
- Serve as a bridge between military requirements, civil-security needs, and faculty who possess relevant expertise

C⁴I & Cyber Center Focus Areas

- 25-year track record; broad spectrum of research and education across:
  - Modeling and Simulation
  - Cybersecurity and Cyberspace Operations
  - Distributed Education and Training Sensing and Fusion
  - Rapid Prototyping, Field Experimentation, and Military Utility Analysis
  - Decision Support
  - Communications and Signal Processing
  - Information System Architectures
- Diverse DoD/IC/Corporate/International sponsors

Current Major Projects

- **Inference Enterprise Multi-Modeling**
  - Integrating multiple models to evaluate and forecast performance of enterprises at detecting insider threats

- **Battle Management Language (BML)**
  - Command & Control – Simulation Interoperation
  - Joint, Coalition (NATO), Geospatial, Multi Agency

- **Close Air Support Experimentation**
  - Supporting US Air Force effort to shape new technologies while "bending the cost curve"

- **International C2 Research Simulation Testbed**
  - Industry-supported laboratory with international impact

Partorships

Many projects performed cooperatively with other organizations, e.g.:

- Industry/academic teams, either as the lead or as a member
- Industry, as a subcontractor
- Other universities, in academic studies
- Other units of GMU, particularly other Centers
- Government organizations and FFRDCs, in policy or technology studies

Currently sixteen Industry Partners

- Range from very large to small businesses

About 50 teaching & research faculty

- Most hold security clearances, including some SCI

George Mason University

- Enrollment is 33,000, with students studying in 198 degree programs at the undergraduate, master's, doctoral and professional levels.

- Mason is distributed across three campuses – Fairfax, Arlington and Prince William counties.

- In 2012, U.S. News & World Report named Mason the number one university to watch on its Up and Coming School list.

- The Times of London named Mason among the Top 100 Under 50, which identified the top 100 universities in the world that are under 50 years old.

- In 2016 Mason was identified as Carnegie R1 (Highest Research)

Volgenau School of Engineering (VSE)

- **Founded in 1985** (School of Information Technology and Engineering)
  - 160 faculty; 6000+ undergraduate and 1100+ graduate students
  - 8 academic departments (Engineering, Computer Science, Statistics)
- First PhD in Information Technology in the USA
  - And four other PhD degrees
- Only civil institution with a C4I & Cyber Center

Relationships Within Volgenau School and GMU

- The C4I & Cyber Centers activities cut across all elements of VSE in synergistic relationships
  - benefits from expertise of Departments
  - provides value to them by bringing in external project support resources
- Center is affiliated with other VSE activities
  - System Architectures Laboratory
  - Evolutionary Computation Laboratory
  - Center for Secure Information Systems
  - Center for Distributed and Intelligent Computation
  - Learning Agents Center
  - Sensor Fusion Laboratory
- And with GMU Department of Geography and GeoInformation Science (GGS)
- Building ties with other schools: Conflict Analysis & Resolution, Public Policy, Business
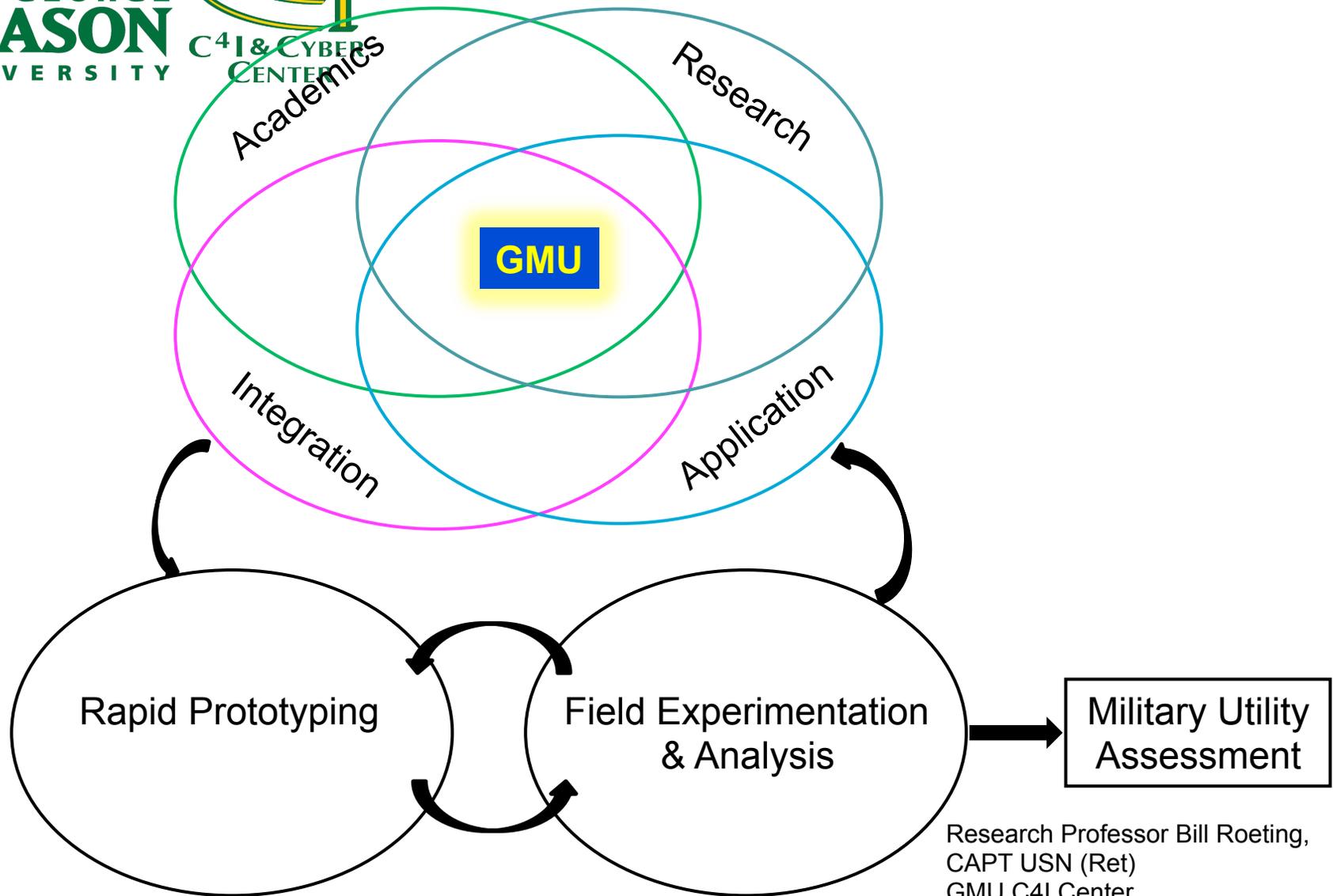
External Activities

- Web page
  - http://c4i.gmu.edu

- Seminars by C4I & Cyber Center faculty and visitors
  - All C4I Center faculty and visitors
  - Online and recorded for playback
  - Many co-sponsored by departments

- Annual symposium
  - "Critical Issues in C4I" Symposium with AFCEA
  - Next occurrence: 18-19 May 2016 GMU Johnson Center

- Advisory group
  - Nationally-recognized senior leaders
  - Organized by Director Emeritus Van Trees

- C4I & Cyber Center Fellows from government and industry

- Industry partners

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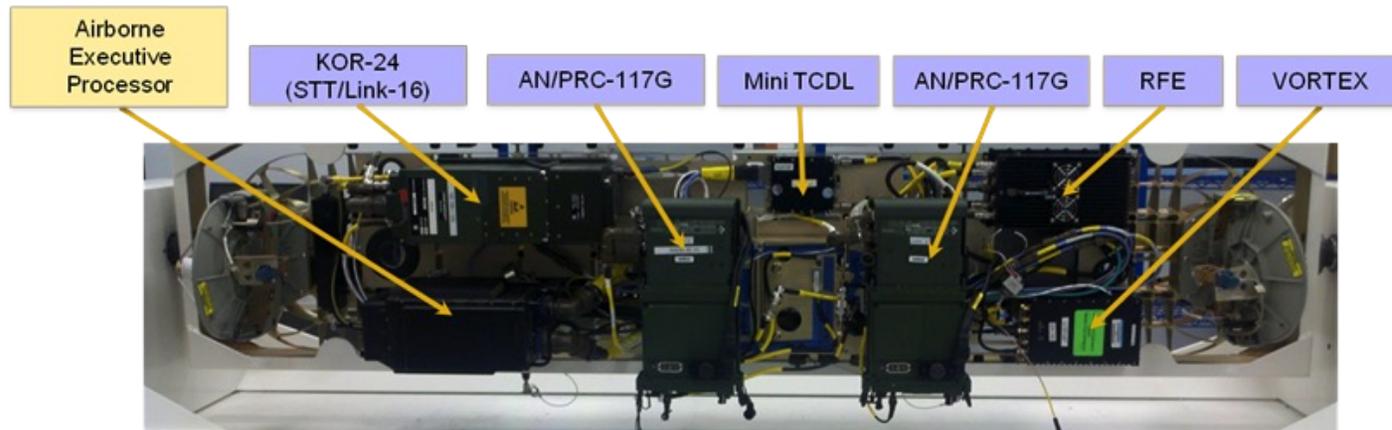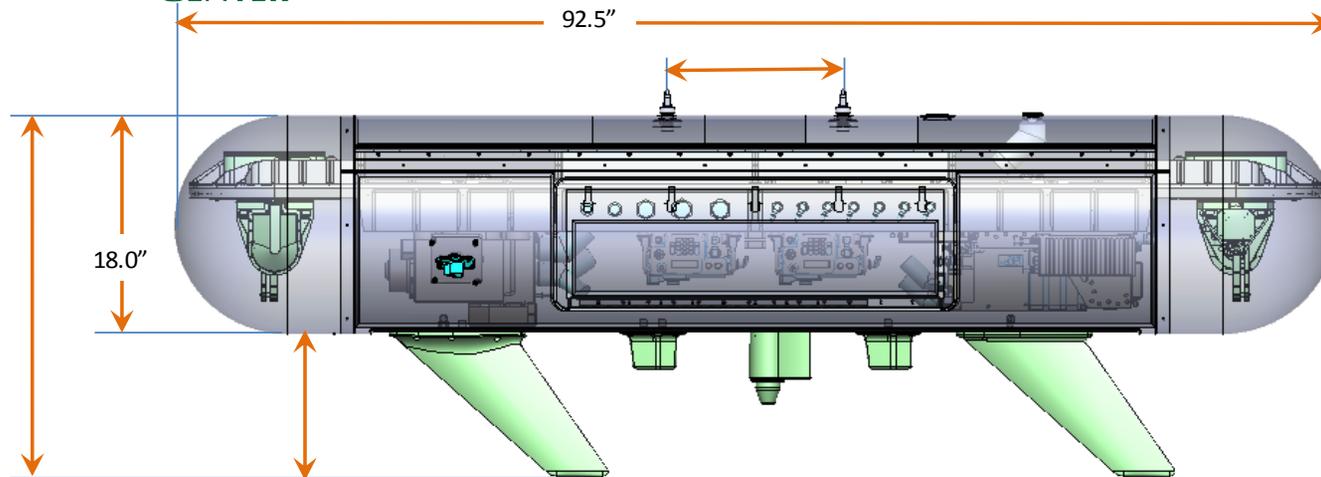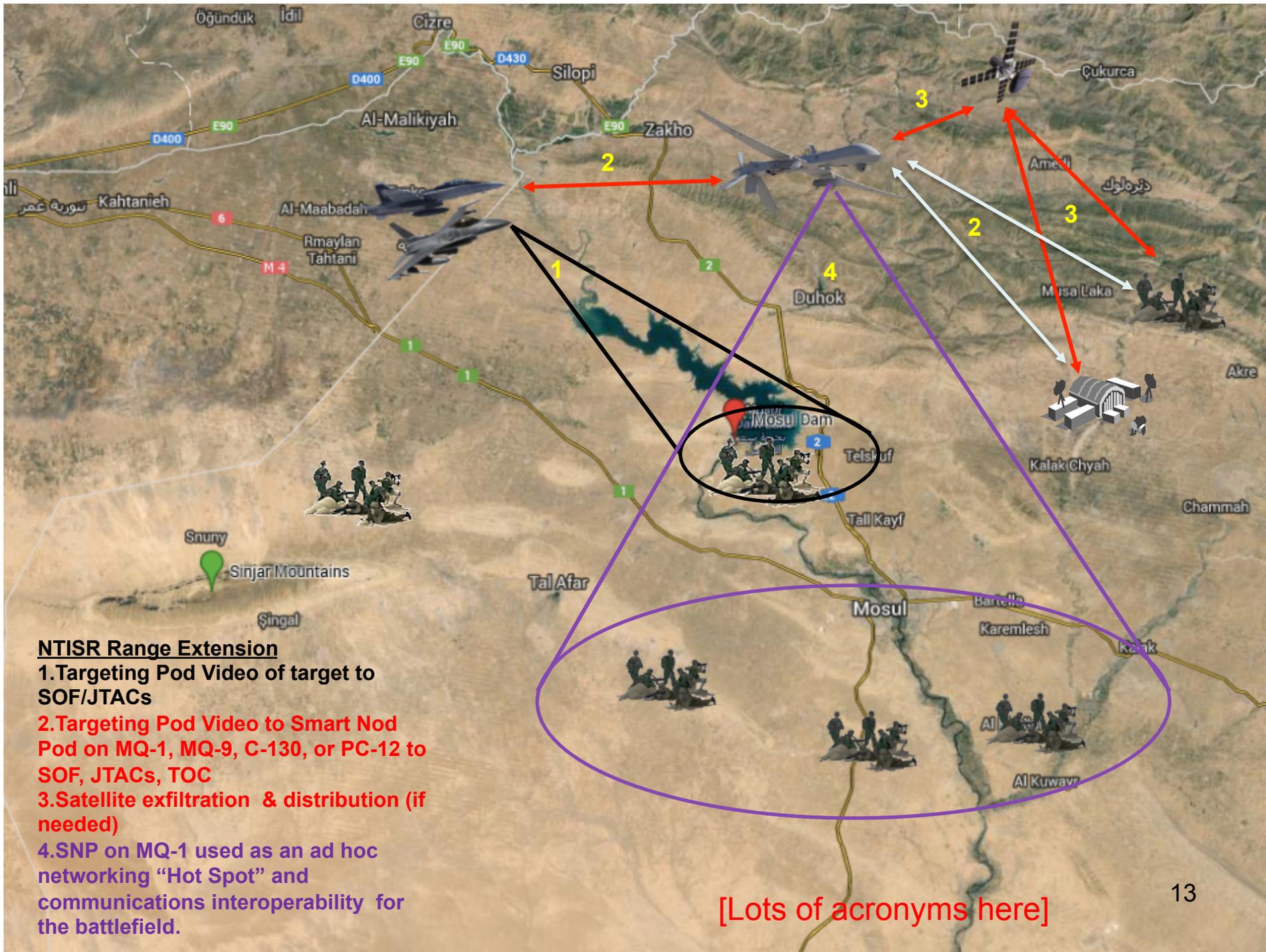
Backup Slides:
Selected Projects

Systems Interoperability Prototyping

GEORGE MASON UNIVERSITY

C4I & CYBER CENTER

GMU

Academics

Research

Integration

Application

Rapid Prototyping

Field Experimentation & Analysis

Military Utility Assessment

Research Professor Bill Roeting,
CAPT USN (Ret)
GMU C4I Center
Area Lead – Rapid Prototyping,
Fielding, & Experimentation

Smart Node Pod Design and Equipment

NTISR Range Extension
1. Targeting Pod Video of target to SOF/JTACs
2. Targeting Pod Video to Smart Nod Pod on MQ-1, MQ-9, C-130, or PC-12 to SOF, JTACs, TOC
3. Satellite exfiltration & distribution (if needed)
4. SNP on MQ-1 used as an ad hoc networking "Hot Spot" and communications interoperability for the battlefield.

[Lots of acronyms here]

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SciCast

- Improve Intelligence Forecasting
  - 500 real forecasting problems per year
  - Have demonstrated accurate forecasts
- Realtime massively concurrent Bayesian combinatorial knowledge representation and inference
- Sponsored by IARPA

- Period of Performance:
  - May 2011 – May 2015
- PI: Charles Twardy
  - Co-PI: Kathryn Laskey
- Team:
  - GMU C4I & Econ
  - Inkling Markets, Inc.
  - Gold Brand Software LLC
  - KaDSCi LLC
  - Tuuyi, Inc.
  - 1000s of participant "analysts"

Academic Plugfesting

- Grew out of work with AFCEA and Esri to demonstrate rapid integration solutions

- Currently sponsored by Defense Intelligence Information Enterprise
  - Building shared infrastructure for Defense Common Ground System as managed by US Army, Navy, MC, AF, and Intel

- Projects in past year:
  - Seed a GMU student plugfest group
    - Student participation AFCEA San Diego Feb 2015
  - Build an open source integration of Common Map API outside of Ozone Widget Framework
    - Successful agile development demonstrated May 2015

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Battle Management Language

- Dr. Michael Hieb is the internationally recognized leader in this area
- Automating C2-Simulation interoperation (C2SIM)
- geoBML project: complementary geospatial information
- Active NATO partnership (MSG-145)
- SISO C-BML standards activity
- Multiple sponsors
  - Army Geospatial Center, Army SIMCI, DMSO/MSCO, NATO RTO, AMSO, Saab
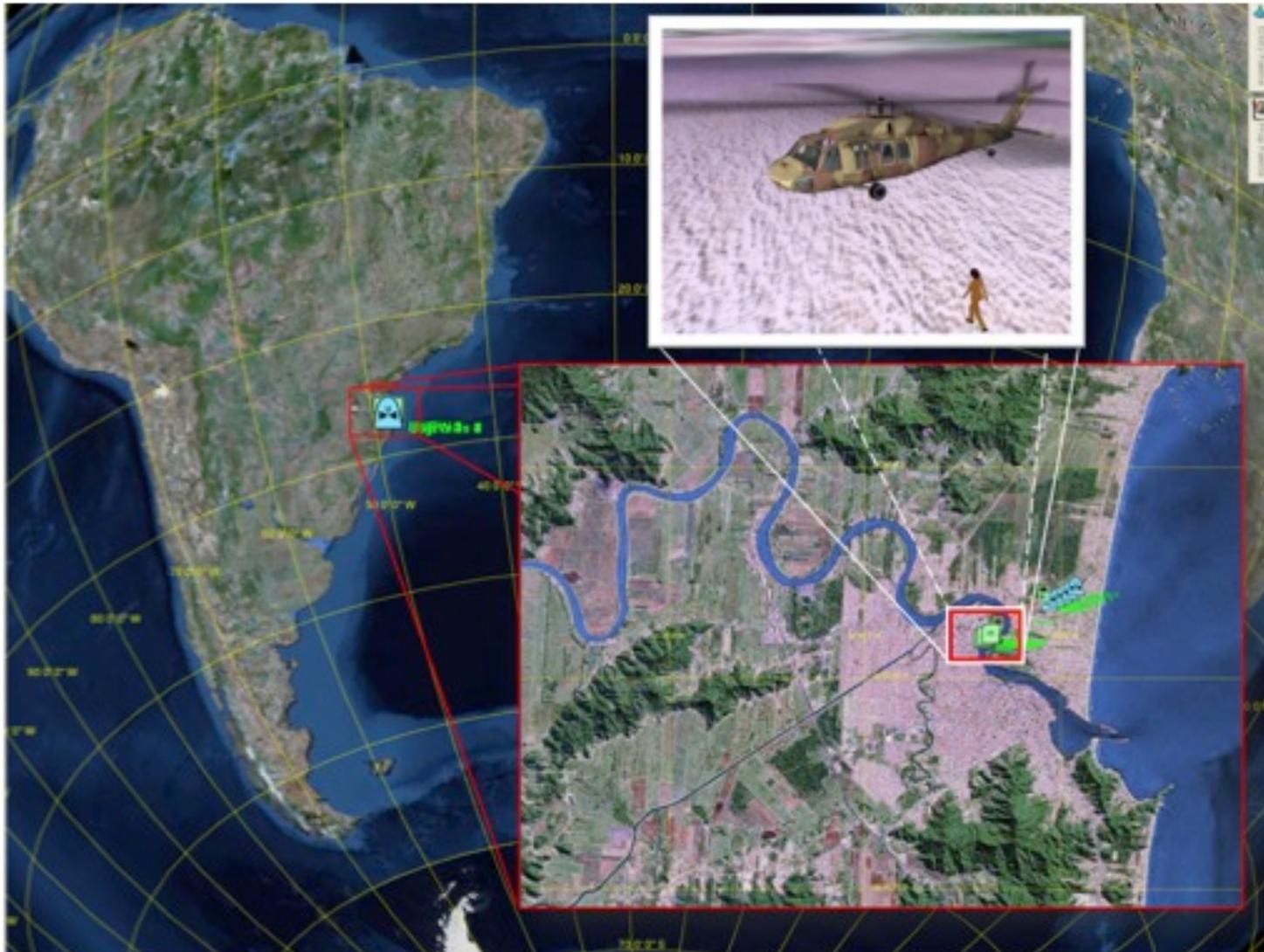
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WISE/SBML Project

- GMU is helping Saab expand C2SIM capabilities in WISE

- GMU builds code; free to publish papers

  - Saab review to ensure no disclosure of proprietary info

- Saab responsible for integration and quality control

- Successfully completed:

  - Incorporate SBMLServer in WISE

  - Demo WISE supporting C2-simulation operation

  - Prototype 10x performance translating server

  - NATO MSG-085 Final Demonstration Ft Leavenworth Dec 2013

  - Supported 6 nation C2 systems and 5 national simulations

International C2/Simulation Testbed

- Joint Use Cases running on Simulations in both Brazil (ITA) and the US (George Mason C4I Center)

    - facilitates collaborative C2 research by University Faculty, PhD/Masters Students and Industry

    - Conference and Journal Publications,

    - Research Demonstrations, and Research Prototypes

- WISE-SBML with Saab (separately, for now)

- Saudi participation proposed

Collaboration with ITA (Brazil) in C2 Research Testbed

Simulation of Plans can be an effective way to convey Command Intent.

In this example, being developed in GMU C4I & Cyber Center, a rescue operation in Santa Catarina, Brazil is planned.

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Manager-Leaders

- Dr. Kathryn Blackmond Laskey, Professor of Systems Engineering & Operations Research
  - Long-term cornerstone of C4I Center; applies information technology to support better inference and decision making
- Dr. Tod Levitt, Research Professor
  - Pattern Recognition & Artificial Intelligence; Designated firefighter
- Dr. Michael Hieb, Research Associate Professor
  - C2 & Simulation expert, in demand by DoD; International Projects
- Dr. Paulo Costa, Associate Professor
  - Semantic Technologies expert; retired Brazilian AF Lt Col ;
  - Cyber Lead for VSE
- William Roeting, Research Professor
  - Systems Interoperability Prototyping; retired USN Captain
- Dr. Linton Wells II, Executive Advisor
- Dr. J. Mark Pullen, Professor of Computer Science
  - Director; Networked multimedia; interoperability; distributed education