

Virtual Prototyping and Analysis with Model-Based Engineering

SERC to MITRE to US Government Sponsor

Omar Valverde

Lead Systems Engineer, Emerging Systems Engineering Technologies
MITRE Systems Engineering Technical Center

Peter Korfiatis

Department Chief Engineer, Agile System Design and Engineering
MITRE Systems Engineering Technical Center

8 November 2017

Systems Engineering Research Center (SERC) Sponsor Research Review (SSRR)



MITRE



MITRE

Timeline Moving of Research Bottom Line Up Front



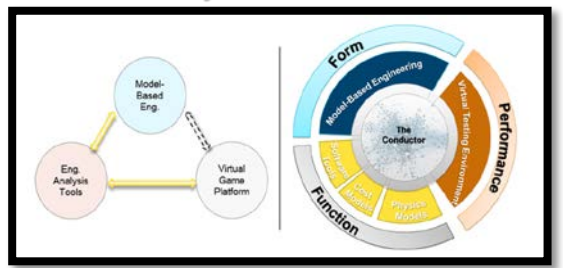
Graphical Concept of Operations



MITRE

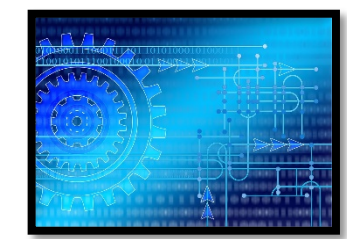
Systems Engineering Tech Center

Virtual Prototyping and Analysis with MBE



US Government Sponsor Transition

Simulation Environment Project



MITRE built on SERC research to develop technology and methodologies at sufficient maturity to transition to a major US Government sponsor program – ready to transition to more sponsor environments.

Graphical Concept of Operations Initial Research Conducted at SERC



Graphical Concept of Operations



Initial SERC Principal Investigator: Robert Clouthier
Current SERC Principal Investigator: Mark Blackburn
MITRE Champion: Peter Korfiatis (photo on the right)
Technical Reports: SERC-2009-TR-003, SERC-2010-TR-007, SERC-2011-TR-030, SERC-2011-TR-031



Abstract from SERC-2011-TR-031

Investigates the current approaches to Concept of Operations (CONOPS) development in use in various DoD and commercial organizations with the goal of understanding why CONOPS creation is such a lengthy process, and how the process can be made more agile. A number of CONOPS are cataloged and analyzed to understand which parts of the current standards are used by the creators of a CONOPS. Traditional CONOPS creation processes are discussed based on literature and face-to-face interviews with those involved with creating CONOPS in both traditional and nontraditional domains. Based on these findings, an agile CONOPS process that emphasizes stakeholder involvement and expedites shared mental models development is put forth. Additionally, current and emerging technologies that might be applicable to creating a graphical CONOPS are discussed. Finally, recommendations for future research to develop a toolbox for creating graphical CONOPS are presented.

Virtual Prototyping and Analysis with Model-Based Engineering

MITRE Innovation Program (MIP)

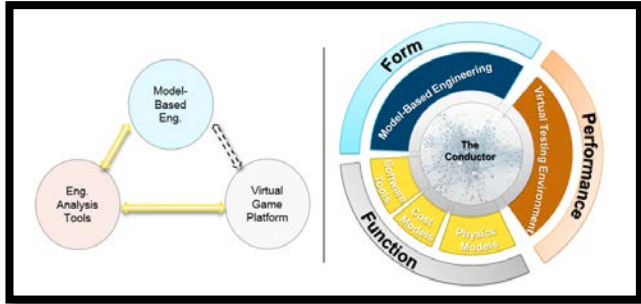


**Systems Engineering
Tech Center**

MITRE Principal Investigator: Omar Valverde (photo on the right)
Innovation Area: Agile Enterprises
Innovation Area Leads: Rob Pitsko, Chris Glazner
MITRE Products: Conference Paper, Demo Videos



Virtual Prototyping and Analysis with MBE



Excerpt from End of Year Report

The Virtual Prototyping and Analysis with Model Based Engineering research team developed, prototyped and evaluated a way to integrate model-based engineering with video-game technology so that complex systems could be better evaluated in context. This results in gathering knowledge of competing evaluation metrics from various stakeholders earlier in the life cycle, without hindering design freedom or escalating costs. Though leveraging the latest Model-Based Engineering techniques and video-game technology was critical, harmonizing the different modeling perspectives and techniques across various disciplines was necessary to meet the flexibility, adaptability, and scalability needs. A cross-disciplinary MITRE team successfully developed a framework with the necessary technology and methods to address these needs that can be instantiated into a use case specific simulation.



Simulation Environment Project Transition to US Government Sponsor



US Government Sponsor Transition

US Government Sponsor Transition

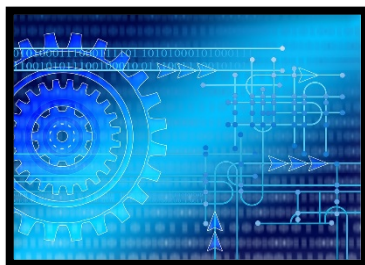
MITRE Project Lead: Jen Hebert (photo on the right)

MITRE Products: Live Demos



General description of project goals and objectives

Simulation Environment Project



The short-term goal is to bring these technologies to bear on a simulation environment for a specific Government sponsor. The long-term vision is the capability to instantiate any particular assets for varying operational environments. This will require using the modeling and simulation technologies and coupling them with FFRDC's independent research and development efforts.

Cross-Cutting Across MITRE

Joint Collaboration between Multiple Divisions

Systems Engineering Tech Center

Software Engineering Tech Center

Modeling and Simulation, Experimentation, and Analysis Tech Center

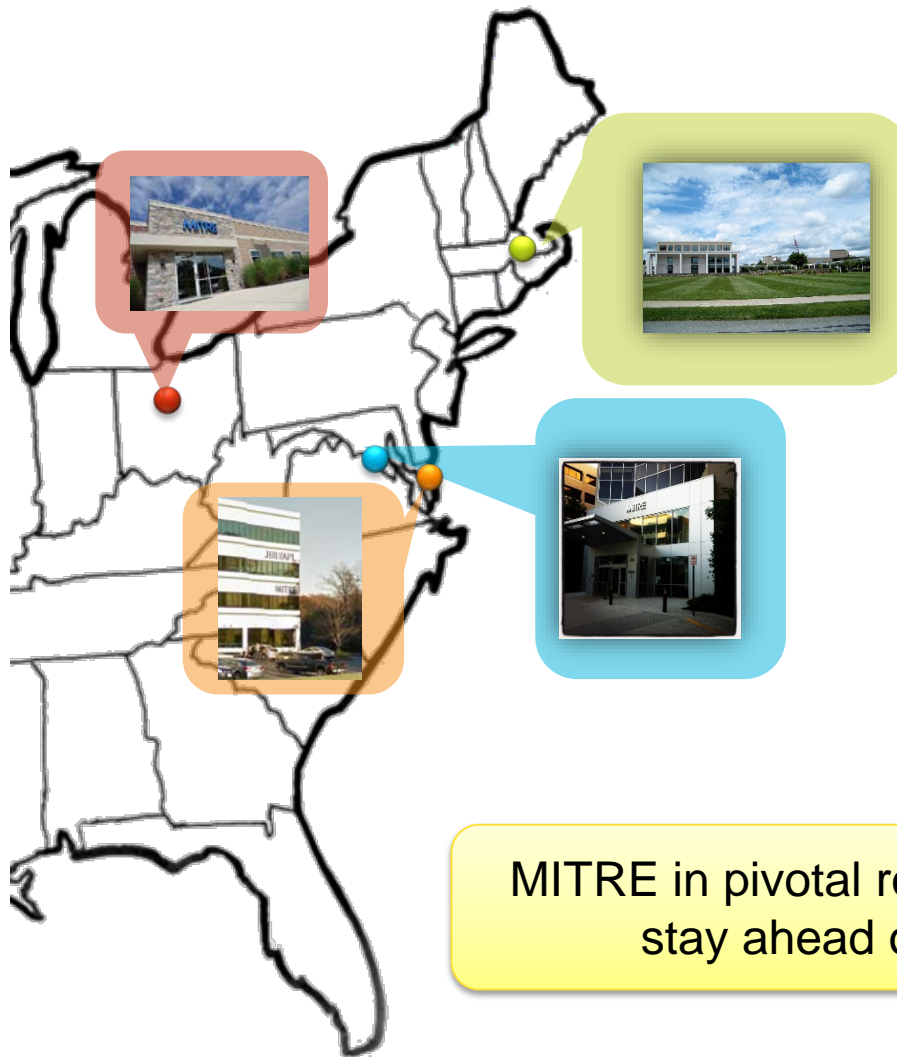
Electrical Systems and Technology Tech Center

Enterprise Integration

Space, Cyber, and Intelligence

OSD Program Division

Air Force Material Command Portfolio



Simulation Environment at MITRE

- Prototypes built at McLean and Bedford as risk reduction efforts, integration test-bed, and concept exploration
- Matured technologies, methods, and frameworks transferred to the US Government

MITRE in pivotal role for enabling our sponsors to stay ahead of the technological curve

Way-Forward Further Research Investment



Internal MITRE funding for high risk research that goes beyond current sponsor funding

MITRE Differentiator

MITRE, as an operator of several FFRDCs, is positioned to incorporate the latest MITRE developed technology, academia research, and commercially available technologies to continually evolve the research.

Identify SERC relevant endeavors and enable access to the simulation framework to build on and bring to bear the technologies they are developing

Other Institutions:

