Embedded Simulation Overview

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4/10/2008

1. REPORT DATE **10 APR 2008**	2. REPORT TYPE **N/A**	3. DATES COVERED **-**	
4. TITLE AND SUBTITLE **Embedded Simulation Overview**		5a. CONTRACT NUMBER	
		5b. GRANT NUMBER	
		5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) **Scott Lohrer**		5d. PROJECT NUMBER	
		5e. TASK NUMBER	
		5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **US Army RDECOM-TARDEC 6501 E 11 Mile Rd Warren, MI 48397-5000**		8. PERFORMING ORGANIZATION REPORT NUMBER **18802**	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S) **TACOM/TARDEC**	
		11. SPONSOR/MONITOR'S REPORT NUMBER(S) **18802**	
12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release, distribution unlimited**			
13. SUPPLEMENTARY NOTES **The original document contains color images.**			
14. ABSTRACT			
15. SUBJECT TERMS			

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT **SAR**	18. NUMBER OF PAGES **12**	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**			

Solving Tomorrow's Challenges Today

RDECOM
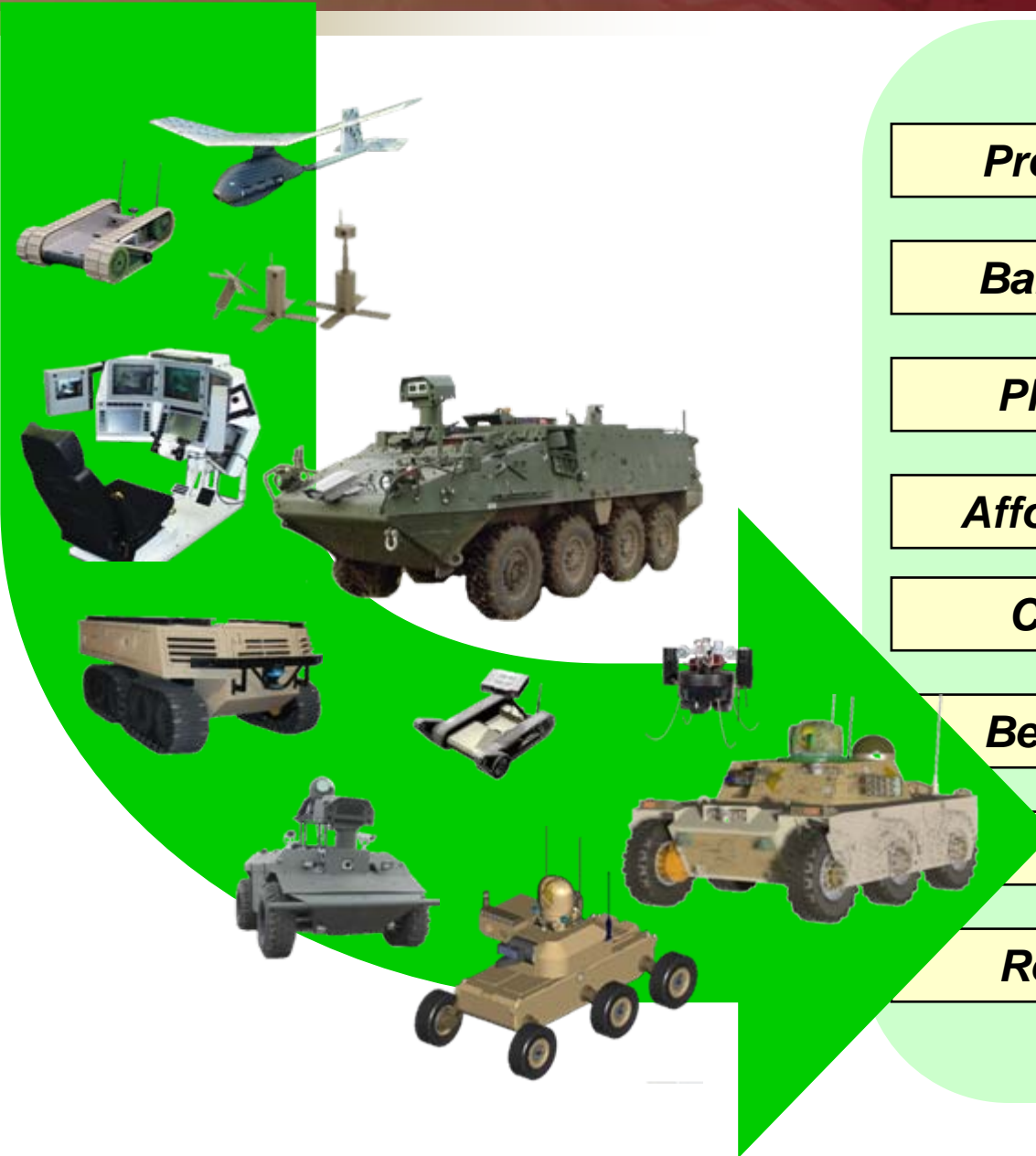
Teleoperation	
Protection	*Safe Operations*
Bandwidth	*Power & Energy*
Planning	*Classification*
Affordability	*Latency*
Convoy	*Weaponization*
Behaviors	*Sensing*
OCU	*Mobility*
Resolution	*Interoperability*
Payloads	

Embedded Simulation

Embedded Simulation System Capabilities

- **HLA and DIS compliant**
  - RPR and MATREX FOM
  - DREN connection
  - Classified DVL
- **Man-in-the-loop desktop or SIL**
- **Create a manned vehicle that can control n number of unmanned assets**
  - UGV, UAV, UGS
- **Sub system simulation**
  - Mobility, sensor, lethality, survivability
- **SOSCOE interface**
  - Integrate with real hardware
- **Live/Virtual mix**
  - Real vehicle with simulated sensor and weapon
  - Mission planning and rehearsal capability

Man-in-the-Loop

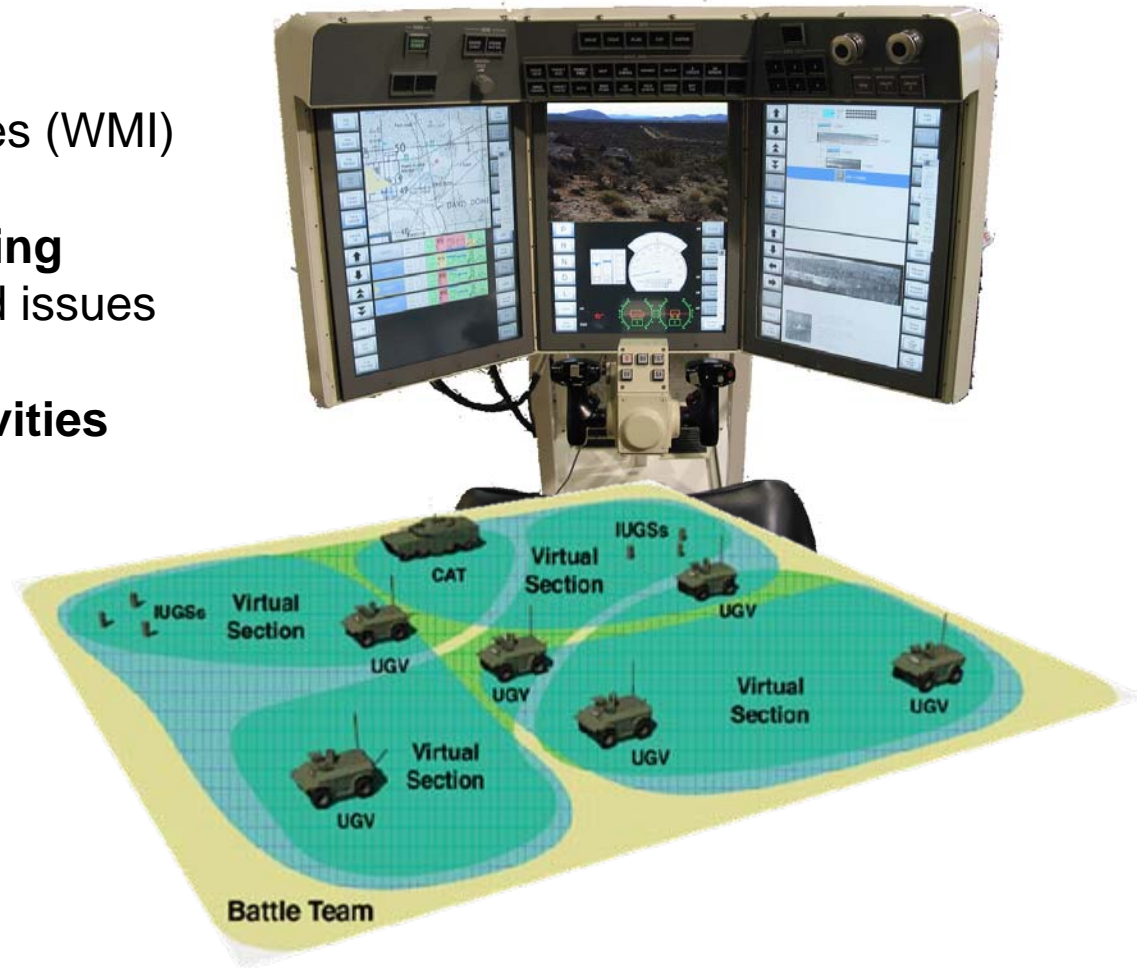**Embedded Simulation Technologies**
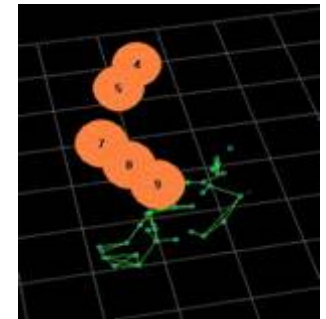 Warfighter machine interfaces (WMI)

Human Performance Modeling
  Modeling of human workload issues

Distributed Simulation Activities
  Virtual battlefield simulations

Human Performance

Workload Related Issues
Soldier Performance Investigations
Human Performance Modeling
Crew Workload
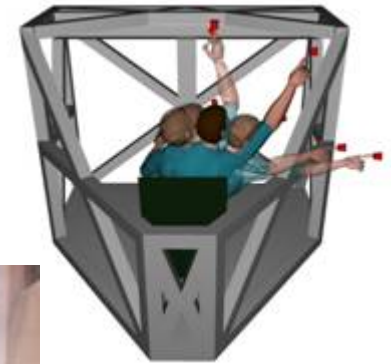
Vehicle Dynamics Modeling

Predict 3-D dynamic response of vehicle systems

- **vehicle steering, handling, stability, rollover, slope performance…**

Quantify benefits of tech-insertions or impacts due to configuration changes

- **Identify safe limits of operation**
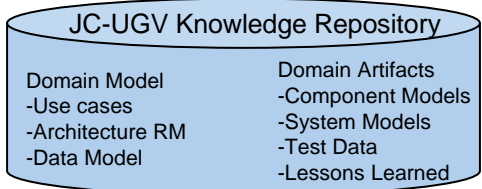- **Evaluate field mishaps/accidents**

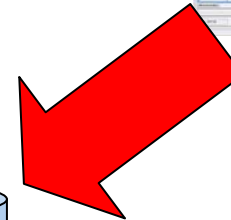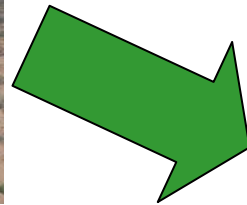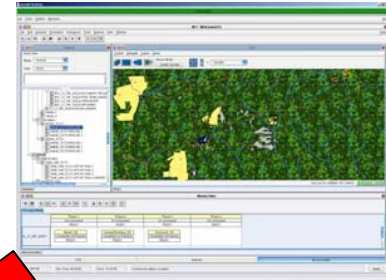# JC-UGV SIL

Live	Virtual	Constructive

JC-UGV Knowledge Repository

Domain Model
-Use cases
-Architecture RM
-Data Model

Domain Artifacts
-Component Models
-System Models
-Test Data
-Lessons Learned

JRC SIL


```
           OneSAF              IWARS

MATREX                                                      3CE
RTTC  ◄═══ Distributed Simulation Architecture ═══►         JTC/SIL
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| Behavioral Component Simulation | Parametric Component Simulation | | Sensor Simulation/ Stimulation |

Platform Vetronics Architecture

Prototype Automation

Prototype Sensor
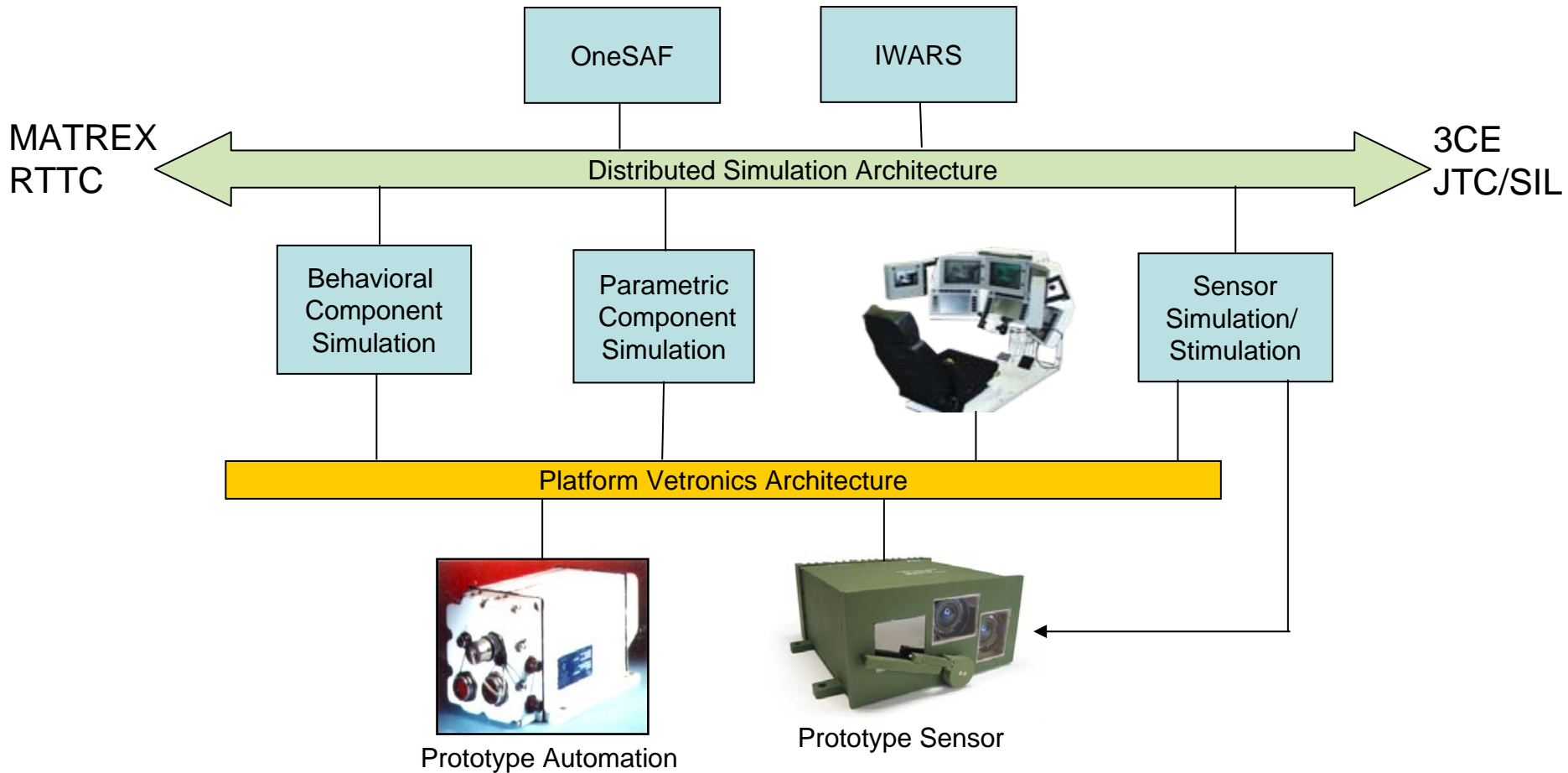
Integration of platform and modeling architectures supports interoperation of prototyped and simulated components

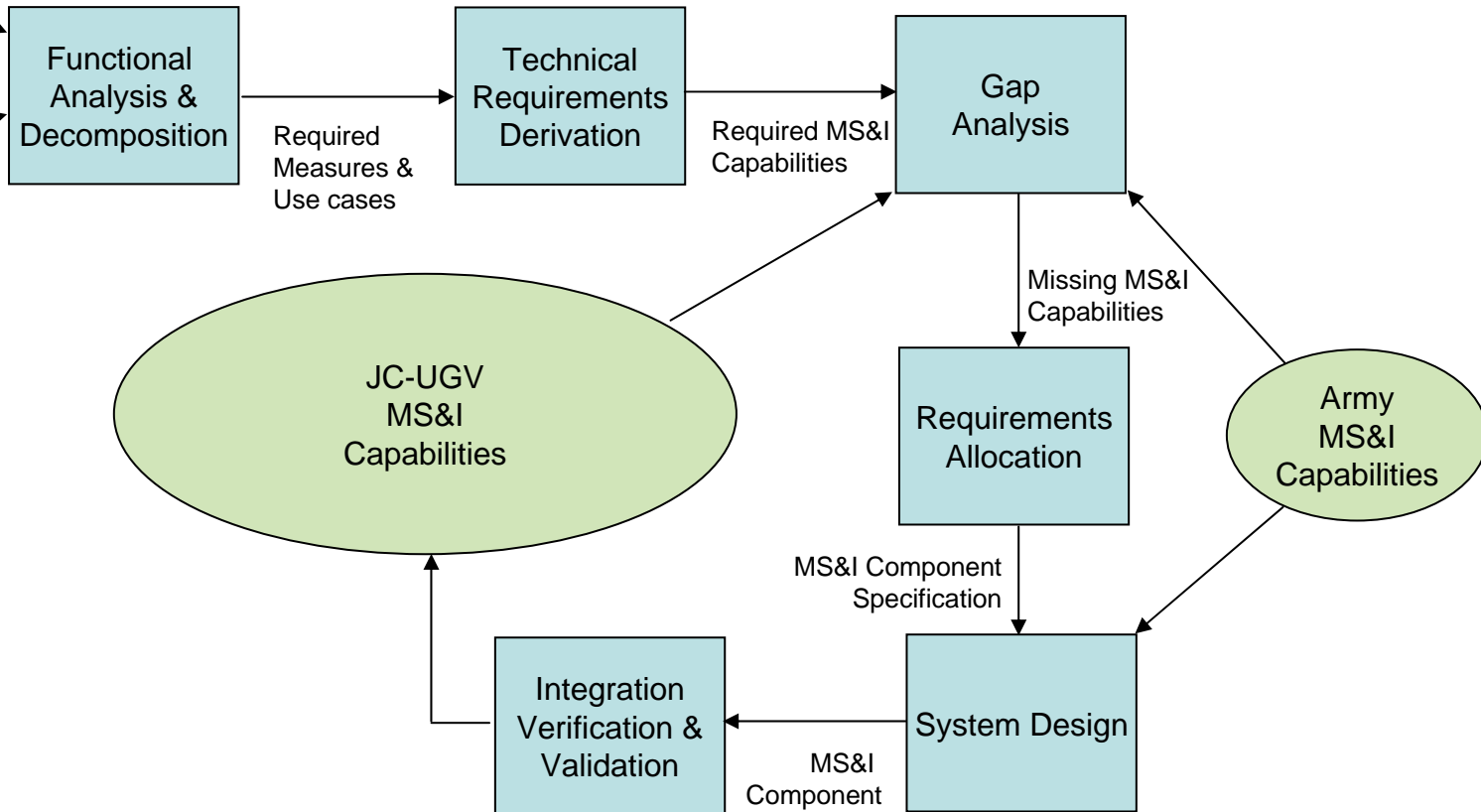# JC-UGV MS&I SIL Mid/Long Range Capability Development Process

Acquisition Issues

Operational Context

TRADOC

Functional Analysis & Decomposition

→ Required Measures & Use cases →

Technical Requirements Derivation

→ Required MS&I Capabilities →

Gap Analysis

Missing MS&I Capabilities

JC-UGV MS&I Capabilities

Requirements Allocation

Army MS&I Capabilities

MS&I Component Specification

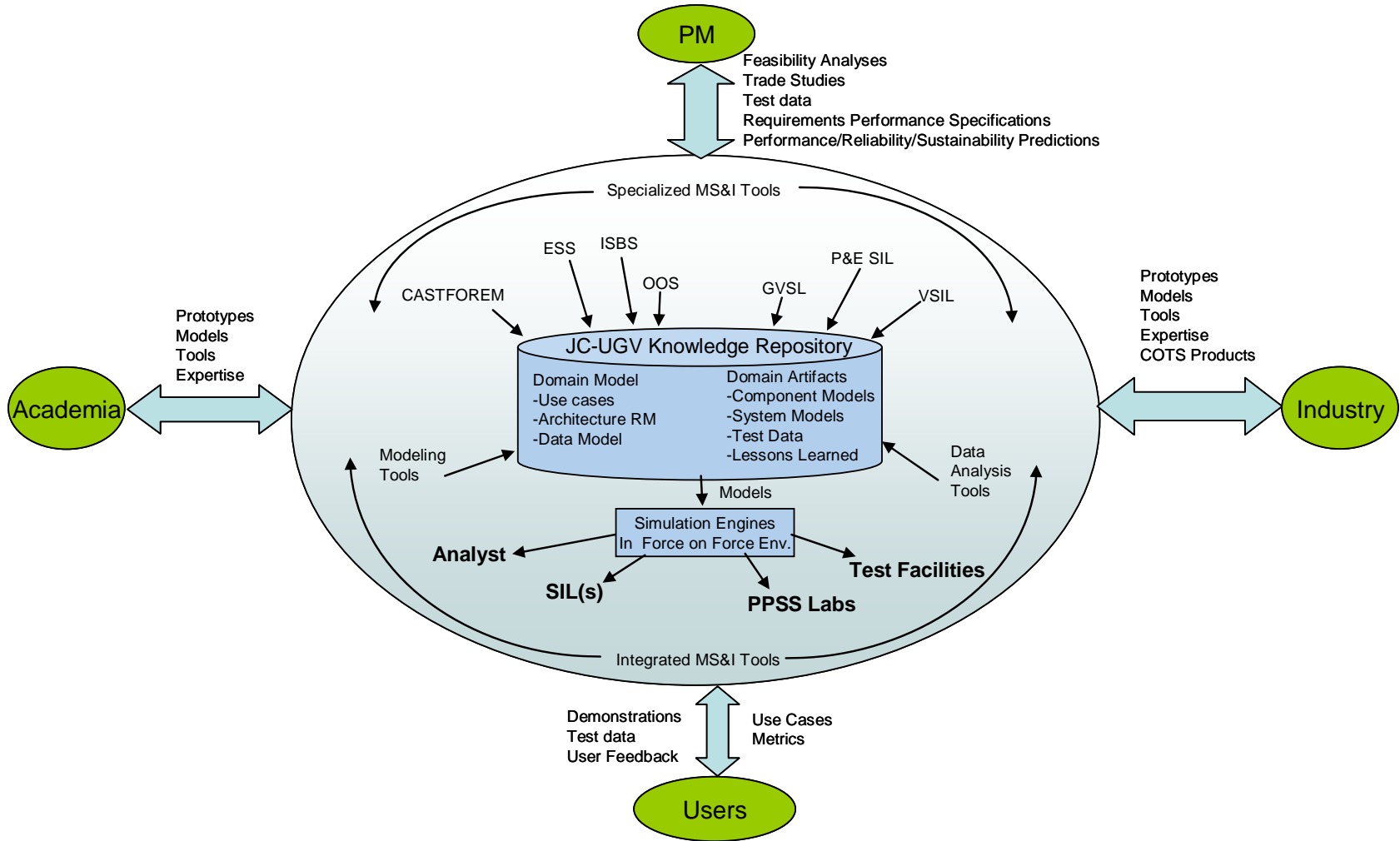**Integration Verification & Validation**

← MS&I Component ←

System Design

Back up slides

JC-UGV Modeling, Simulation, and Integration Environment

TARDEC UGV Safe Ops Effort

Maturing UGV Safe Operations Technology through Integration and Test

Detect, track, and avoid humans

Dismounted forces safety

Maintain lane among civilian traffic

100110
011011
011010

Integrating FCS representative technologies

Integration:
- **Gen 5 Autonomous Navigation System (ANS)**
- **Tactical Autonomous Combat – Chassis (TAC-C)**
- **ARL R-CTA developed algorithms**

Test & Experimentation:
- **Address FCS Risk UGV0213**
- **MULE & ARV relevant scenarios**

- **Directly address risks associated with employing UGVs in dynamic environments.**
- **Identify additional risk areas of operating UGVs around moving traffic, pedestrians, and dismounted forces.**