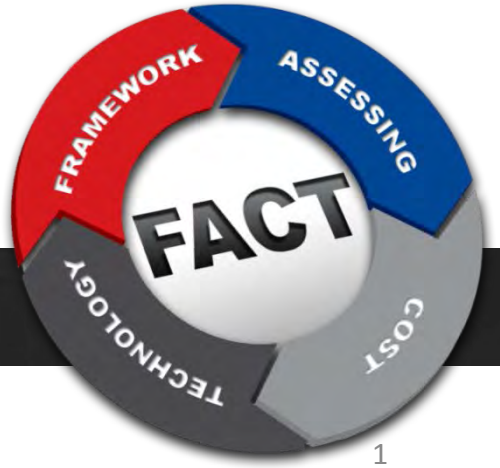
Framework for Assessing Cost and Technology

Integrating M&S into the Acquisition process

Michael O'Neal
Marine Corps Systems Command
michael.oneal1@usmc.mil
703-432-4373

Luis E. Velazquez
Marine Corps Systems Command
luis.velazquez@usmc.mil
703-432-3770



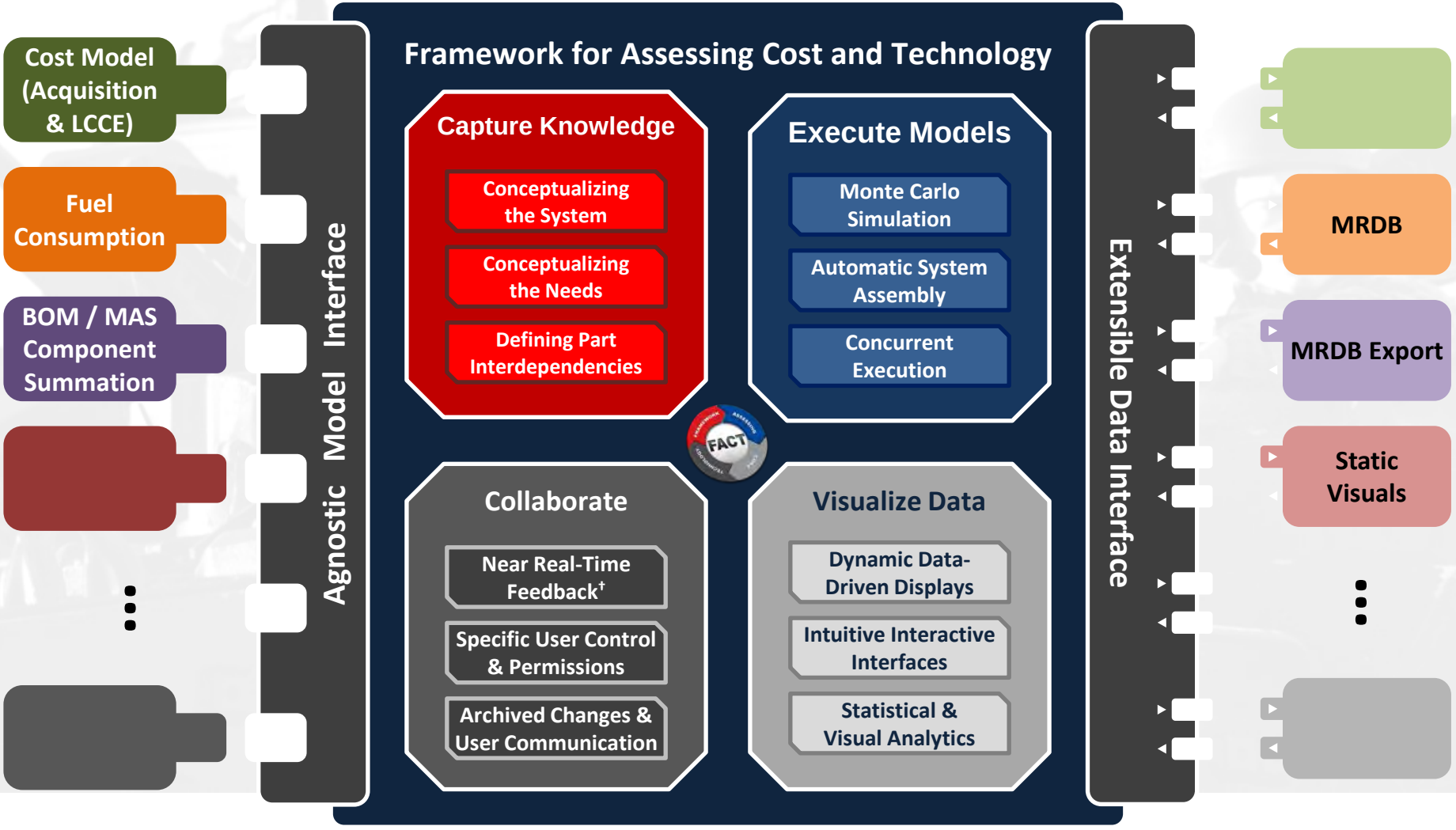
Framework for Assessing Cost and Technology (FACT)
Integration with HSI
Roadmap FY16-FY17

The Framework for Assessing Cost and Technology (FACT)

- **Winner of the 2014 Secretary of the Navy Innovation Excellence Acquisition Team of the Year Award**, introduced a new systems engineering tool into the MCSC.
- FACT enables ***rapid trade space and alternatives analysis*** in support of United States Marine Corps (USMC).
- It is capable of conducting trade space analysis from Pre-Milestone "A" analysis of alternatives to system disposal.

17 November 2015 – Pentagon Auditorium , Washington D.C., 2014-2015 DON Acquisition Excellence Award Ceremony. "Innovation Excellence Acquisition Team of the Year." Members of Marine Corps Systems Command are presented the Innovation Excellence Acquisition Team of the Year award presented by The Honorable Sean J. Stackley and Chief of Naval Operations (CNO) Admiral John Richardson.
Photo (Left to Right) *Mr. Smerchansky (SES), The Honorable Sean J. Stackley, BGen Shrader, Capt J Lujan, Jane Bachman, John Raisbeck, Luis E. Velazquez, Tyson Kackley, Alexander Solomon, Maj J. Reynolds, Mike O'Neal, Chief of Naval Operations (CNO) Adm. John Richardson (Photo Steven Vozzola, Pentagon)*

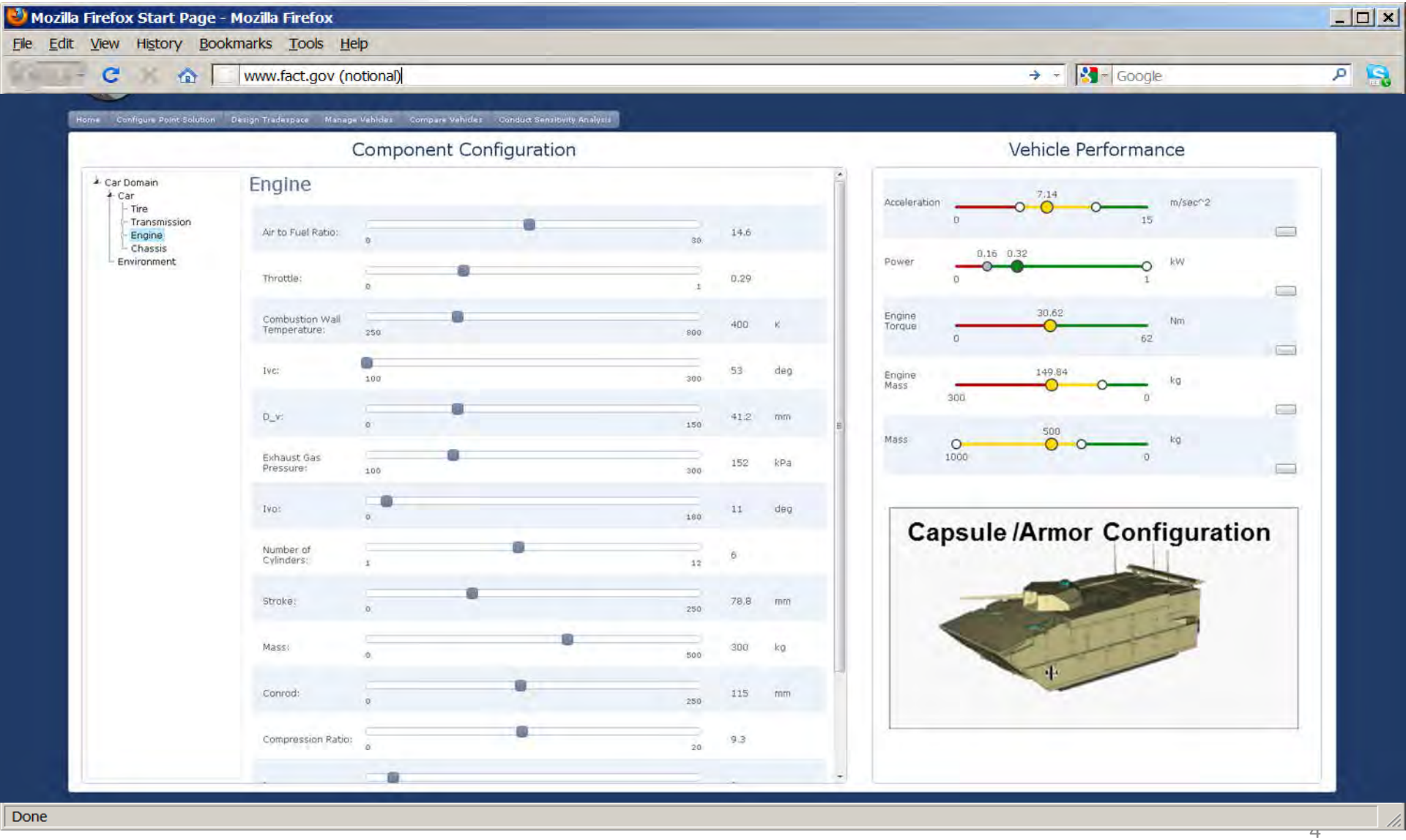
FACT Capability Overview



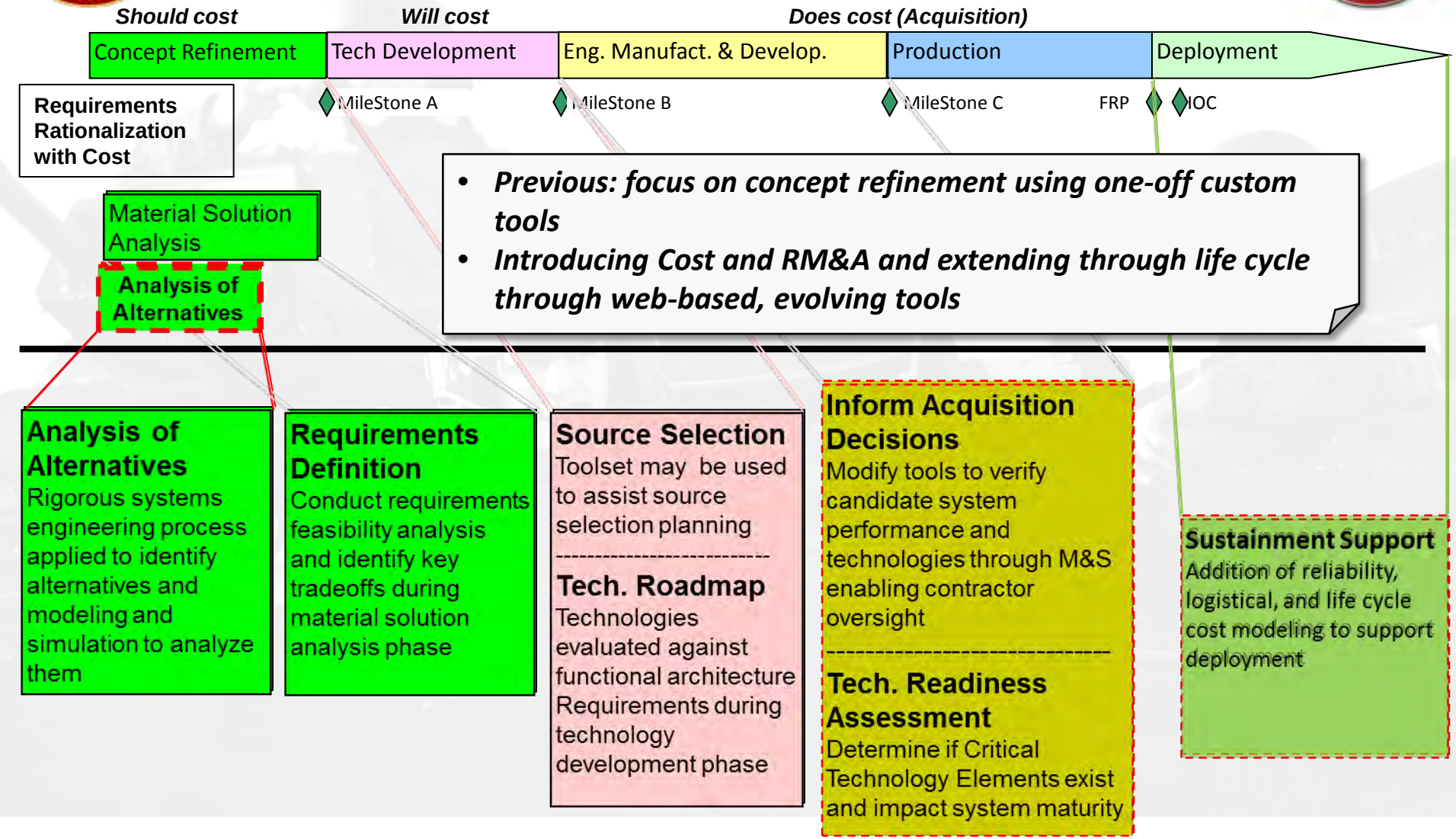
* There can be multiple models within these generic categories, e.g., cost models for both the life cycle and acquisition, each being its own "peg"

† Requires integrated models to be executable in near real-time

Web Browser Interface



M&S/SE Tools Applied Across the Vehicle Lifecycle



Human Systems Engineering Analysis Tool (HEAT)

- Developed under the SBIR Program by Harmonia Holdings Group, LLC, a company with a history building of HSI/Human Computer Interface (HCI) design tools that informed the design of HEAT.
- HEAT, is an ***optional software module*** installed into FACT for **HSI impact detection, analysis, prediction, comparison, and reporting**.
- HEAT also ***catalogs HSI artifacts*** (e.g. risks, user feedback, etc.) through a program's lifecycle in a repository to support evidence for final certification and reuse of lessons learned.
- HEAT's support of HSI is ***not limited to any platform*** and works for any hardware or software system which supports human habitation or provides a human interface (e.g., knobs/buttons, wearable computers, instrument panels in vehicles).

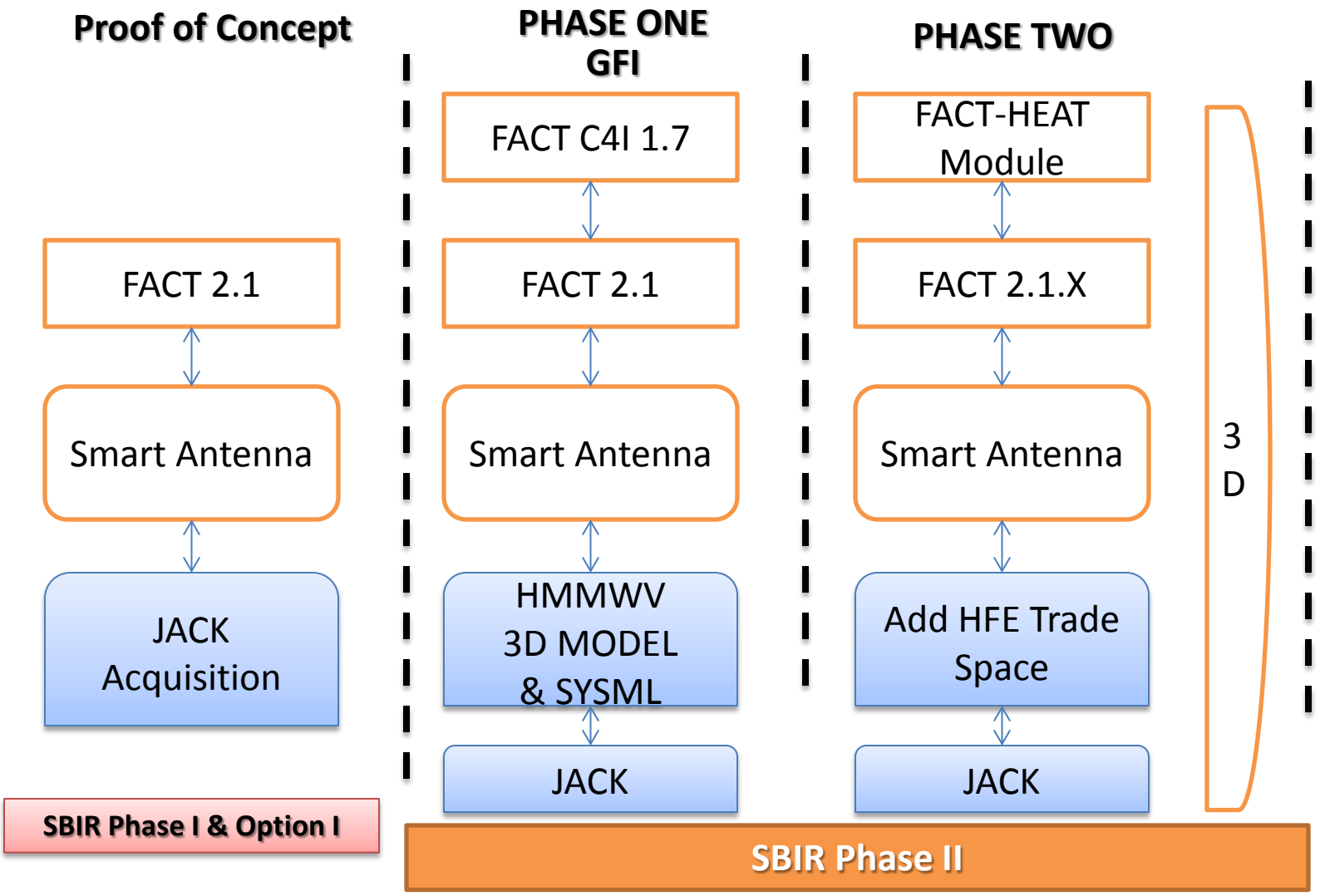
Use Case

A Naval Engineer is working on the design of a habitable space (e.g. cockpit, workstation, etc.) and wants HEAT to help him check if there are any impacts on an operator in that space.

- The user will load the system's CAD file into CAD JS and click the HEAT button.
- The user will be presented with a mock interface to step him through the rest of the process:

1. HEAT adds icons in the parts tree that are human-related;
2. User selects a part (e.g. console) of interest;
3. HEAT adds a human reservation to the 3D model in the form of a 3D rectangle roughly the size of a 95th percentile male to the part;
4. HEAT centers 3D model on the part with the human rectangle positioned appropriately;
5. User clicks 'Run collision detection';
6. User receives visual results.

Software Integration and Build Continuum



REV(2)
Nov 12,2015

FACT & HSI

120 DAYS
FACT 1.7 C4I into FACT 2.1.X

- **Day 1 to 5**
- **15 January**

Developer to Provide 3D CAD Model HMWVV (HMWVV CAD and Step File)

Day 1 to 30
Developer to review IDE, API, and Coding of existing FACT 2.1

- **Day 30**

19 February
Demonstration and Roadmap

March
Phase I ends

- **Day 6 to 100**

Vendor to migrate FACT 1.7 to
Develop and document USE Case
(FACT with an external model and surrogate modeling)

- FACT from Concept->WBS->SYSML<->CAD<->STEP FILE<->Python<->AngularJS<->Mongo
- Documentation details concept vehicle being introduced into the FACT framework
- Methodology of decomposing a concept to be integrated into a model such as FACT 2.1.X
- Developer how to connect to the CM CodeBeamer from IDE Eclipse
- Use the Vagrant scripts to build up the version of FACT to the designated version required (CentOS baseline to FACT 2.1.X)

- How make changes to python in FACT 2.1.X
- How to make changes to Angular JS in FACT 2.1.X
- How to make changes to MongoDB in FACT 2.1.X
- How to manipulate the FACT API to make a data call to the external webservices
- How to build a surrogate model into FACT 2.1.X
- How to migrate a CAD design into FACT
- How to map step file data from CAD to the different SYSML and WBS attributes
- How to aggregate multiple step file to a designated WBS
- How to conduct testing of the product in FACT 2.1.X

March
SIAT M&S Division IPR

PHASE **ONE** **TWO**

FACT

Considerations for a FACT Module Integration in general

New Module

Government – Provide

- FACT User & Developer Accounts
- FACT Development Documentation & CM
- Users for Usability Testing (Throughout)
- Requirements From Domain SMEs

Developer – Provide

- Detail Requirements
- Design
- Code
- Unit Testing
- Usability Testing
- Integration Testing

HSI HPT – Involvement

- Identify New Participant(s)
- Cross-Module Participation
- Maintaining FACT Module Consistency
- User-feedback Integration

FACT

HEAT
FY16-FY17

. . . TBD Module

TBD Module . . .

Baseline

FY16 QRTs 1-2

- Training Material
- Integrate HEAT into FACT (Alpha Release for Pilot)
- HEAT Usability Testing (Throughout)

Phase I Option

Functional

FY16 QRT 3-FY17 QRT 2

- HSI Requirements Analysis/ Management
- Alerts Management
- Human Modeling Support

Phase II

Extended

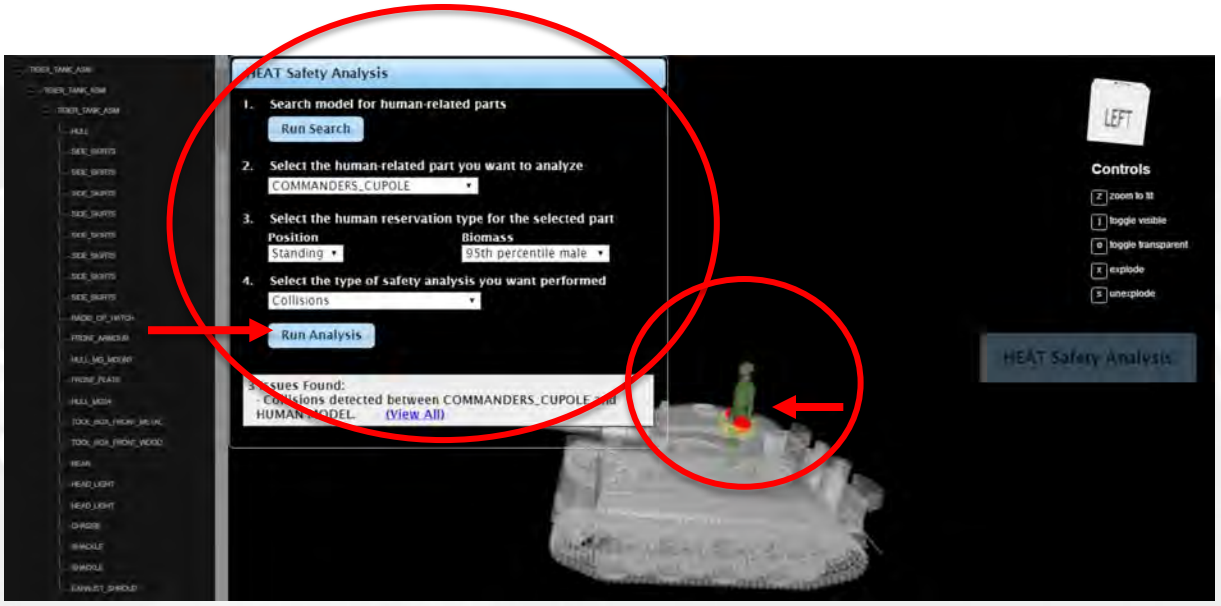
FY17 QRTs 2-4

- User-testing
- Reporting Support
- HSI Evaluation

Phase II Option

Prototype

- **Select** the type of safety analysis you want to run
- HEAT to **find** what issues it can on its own and utilize an HMT for more precise analysis and for dynamic properties such as movement or fatigue over time
- **Review** the issues found textually and in the model
- Issues would be **logged** in the HEAT repository for lessons-learned



Note: We show multiple choices to illustrate additional types of analysis we COULD investigate for support, but currently the Human Modeling Tool (Jack) provides only collision analysis, though additional manual analysis can be done using some of their dynamic and advanced modules