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Enhancements to FACT for Representing the Marine Air-Ground Task Force for Energy Management Trade Space Exploration

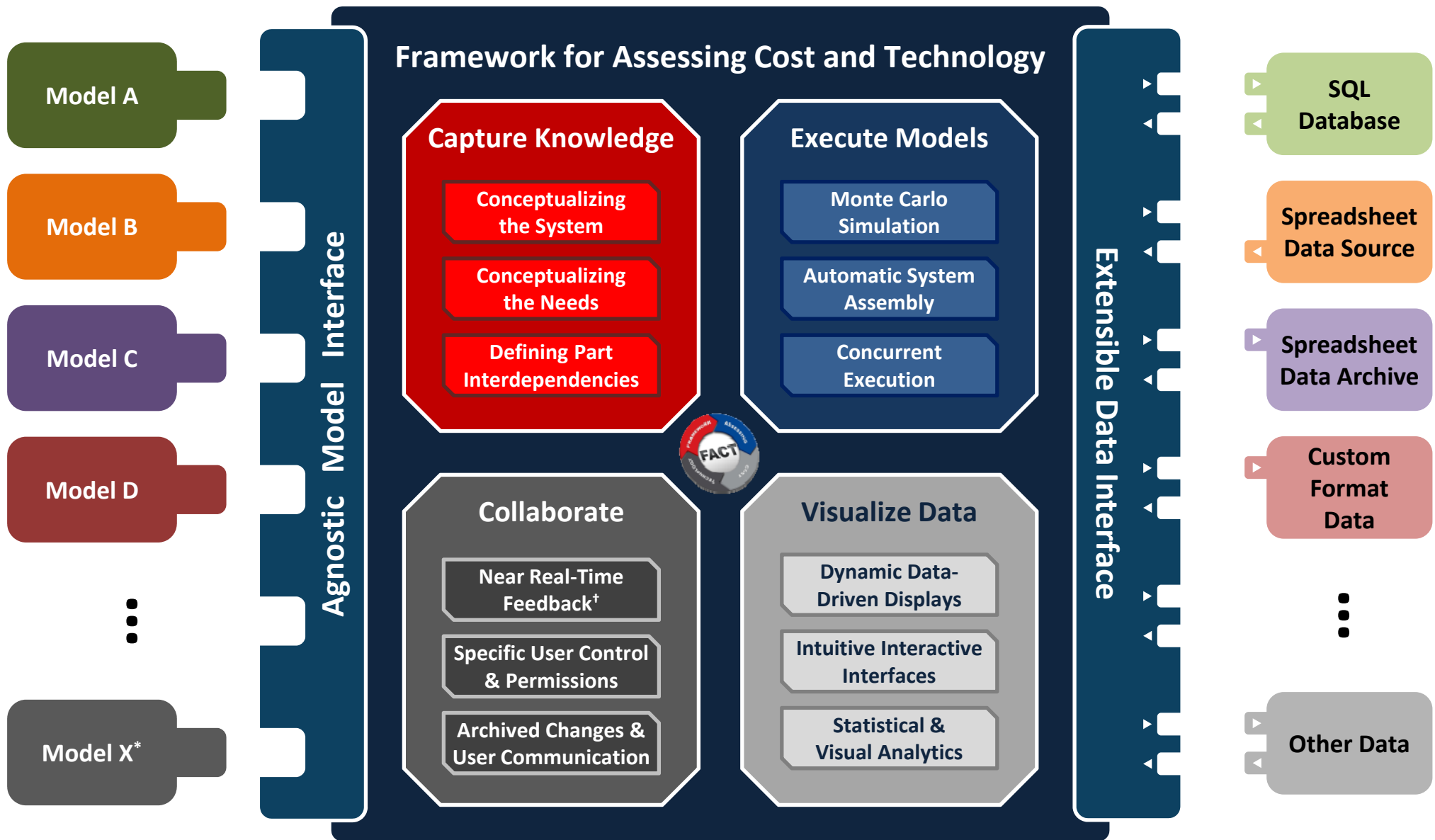
30 October 2013

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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

- Development of an Energy Modeling and Simulation (M&S) Trade Space and Alternatives Analysis Capability within the Framework for Assessing Cost and Technology (FACT)
- Design Tool to Assist in Optimizing Expeditionary Capabilities Across All Warfighting Functions
- Preserving Warfighting Capability – Lightening the Load to the MAGTF

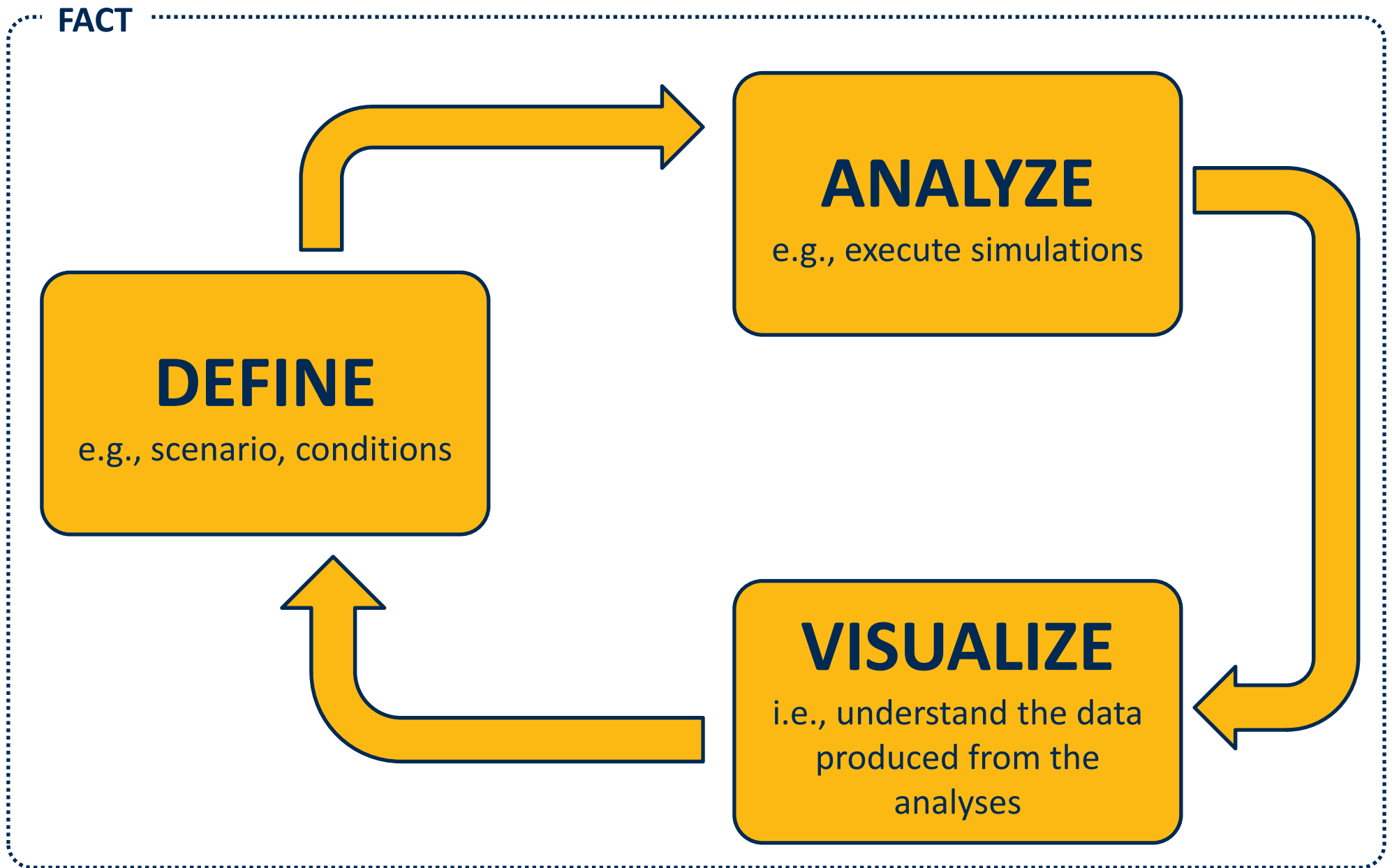
The Current Approach



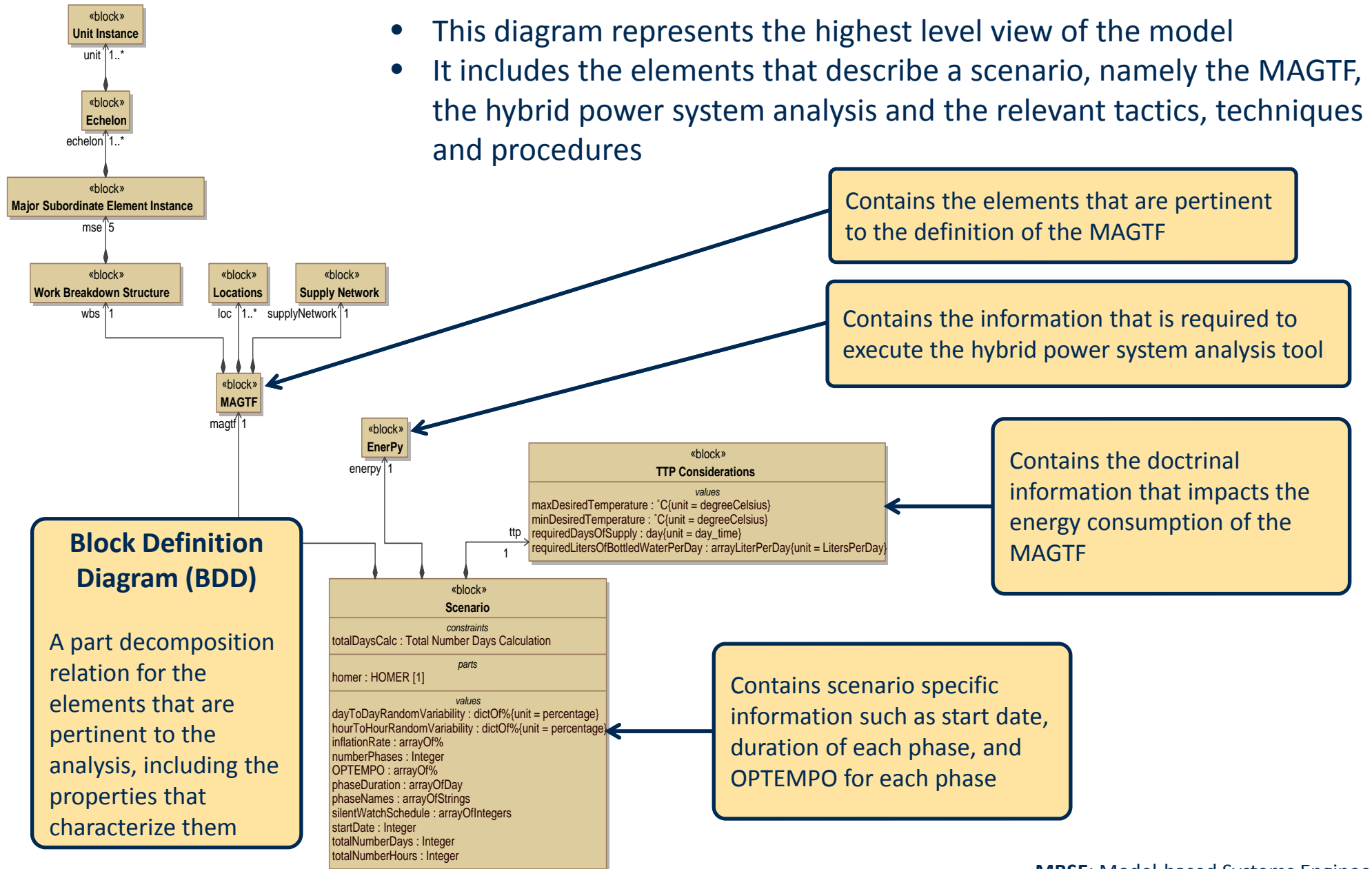
- Focused studies to answer specific questions
 - e.g., what is the impact of improved environmental control units (ECUs) on the fuel consumption of a representative MAGTF?
- Leverage a variety of analyses tools
 - HOMER* Energy Modeling Software
 - Custom analyses, developed on a *per project* basis
- MAGTF capabilities evaluated within complex scenarios that require extensive effort to define

* <http://homerenergy.com/>

The Quantitative Decision Making Process



Use MBSE to analyze the MAGTF's fuel, energy and water consumption



Using FACT to Augment Existing Energy Analysis Capabilities for a MAGTF



- Facilitate the rapid quantitative analysis of new DOTMLPF solutions to increase the MAGTF's logistic independence

	Hybrid Power System Model	Energy Consumption Model
What is it?	<ul style="list-style-type: none"> Renewable energy micro-electric grid modeling and simulation tool 	<ul style="list-style-type: none"> A MAGTF-level energy and water consumption analysis tool
What can FACT add?	<ul style="list-style-type: none"> Model multiple loosely interdependent micro-grids, <ul style="list-style-type: none"> e.g. FOBS and Patrol Bases 	<ul style="list-style-type: none"> Facilitate the definition of scenarios <ul style="list-style-type: none"> Current analysis tools define the MAGTF force structure at its lowest level
	<ul style="list-style-type: none"> Collaboratively define and evaluate multiple scenarios 	<ul style="list-style-type: none"> Add geographic awareness to the analysis <ul style="list-style-type: none"> i.e., seamlessly capture the effects of terrain, weather, etc.
	<ul style="list-style-type: none"> Calculate required number of convoys to supply the network of MAGTF bases 	

Extending FACT to Accommodate the Needs of MAGTF-level analyses



- Create new scenario definition user interface for FACT
 - Allow user to rapidly define the geographic and force structure characteristics of the scenario of interest
- Extend FACT to accommodate “flexible” work breakdown structures
 - The System-of-Systems nature of the MAGTF forces FACT to model work breakdown structures that are not rigidly fixed a priori, but can change depending on the scenario

Rapid Scenario Definition User Interface

The screenshot displays the 'Operational Scenario' interface. On the left, there is a 'Locations' list and a 'MAGTF' tree. The main area is a map of Atlanta with several units placed on it. A 'Define Force Structure' window is open, showing a tree of units. Callouts provide details about the MAGTF instantiation, force structure definition, geographical scenario, and open source mapping.

Instantiation of the MAGTF
Contains a tree with the TO&E of the currently instantiated MAGTF

Force Structure Definition
Equip the MAGTF based on USMC TO&E

Geographical Scenario
Define Geographical Location of Bases and the Logistics Network

Open Source Mapping
OpenStreetMaps and LeafletJS provide an extensible mapping capability, no reciprocal sharing license

FACT-Energy Use Cases



- Evaluate materiel and non-materiel solutions to reduce MAGTF fuel, water and battery re-supply convoys
 - Increased fuel consumer efficiency, e.g. generators and vehicles
 - Introduction of hybrid power systems
 - Consideration of tactical water purifiers
 - Improved battery efficiency
 - Better trained vehicle drivers
 - Proper electrical grid layout ensuring optimal generator loading
 - Table of Equipment tradeoffs
 - Alternate re-supply routes

- All evaluations enabled by rapid scenario definition using environmental and terrain data as inputs to the analyses

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