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91st MORS Symposium

"Analytics as a Force Multiplier"

Army Future Force Structure Analysis

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Agenda

- Background, Sponsor and Problem Statement
- Methodology
- Scenario Planning and Development
- Mission Threads/Vignettes/Scenarios
- Wargame Units/System and Terrain Characteristics
- Future Force Structure Courses of Action (COA) Measures
- Translating Wargame into Simulation
- Data Elements and Structure
- Project Outcome and Future Work

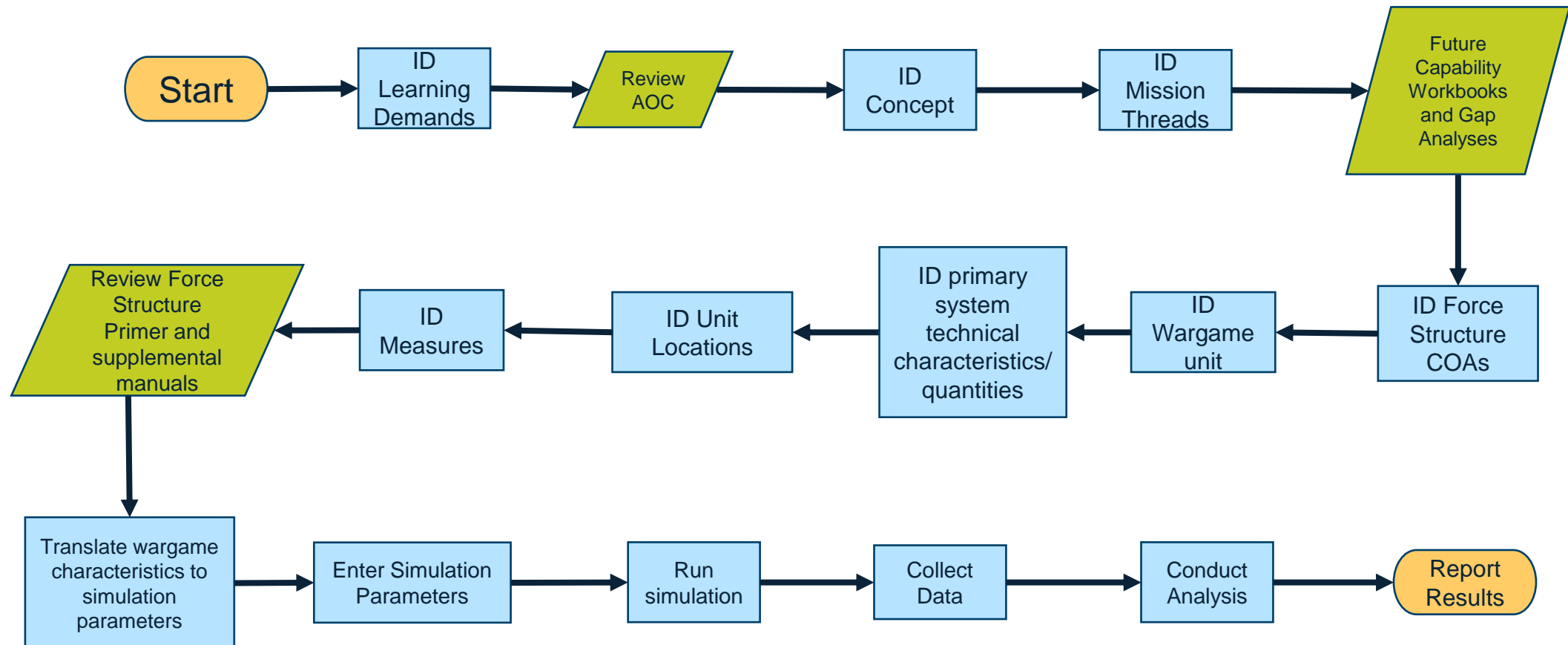
Background and Sponsor

- Army Futures Command (AFC), Futures and Concepts Center (FCC) Sponsor
- Support to wargaming the Future Study Program (FSP) and the writing of the next Army Operating Concept for 2040

This work is being done directly for a future Army concept and a direct sponsor

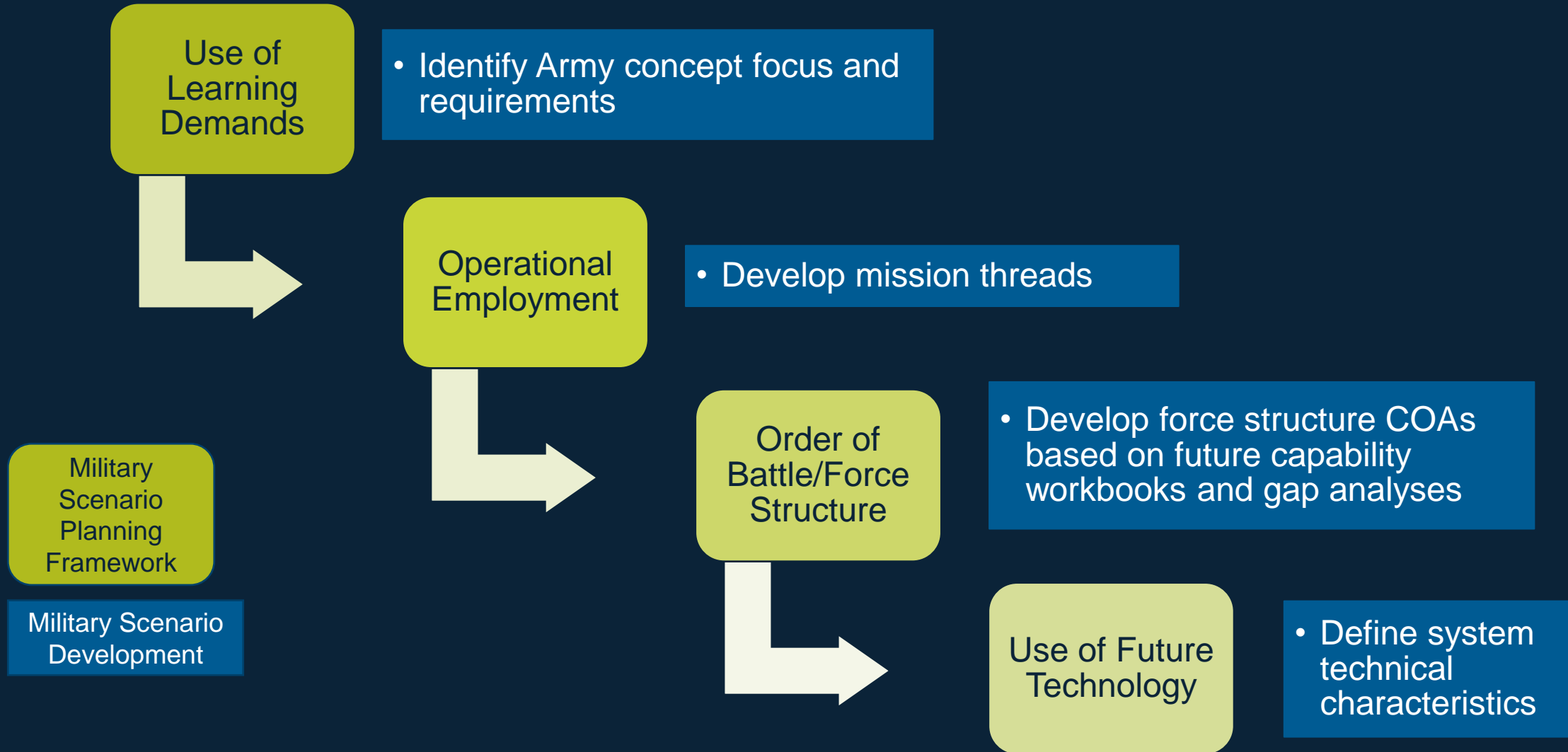
- Use of Operational Wargaming System (OWS) with VASSAL game engine
- Extending Wargaming into Simulation for experimentation with Future Army Force Structure

Methodology: Laying the groundwork for Force Structure Analysis



***Proof of concept starts at the Brigade level and progresses to higher echelons**

Military Scenario Planning Framework and Development Process

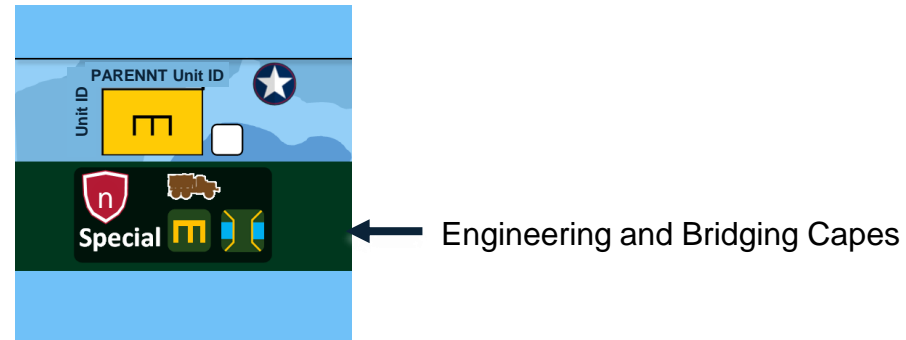
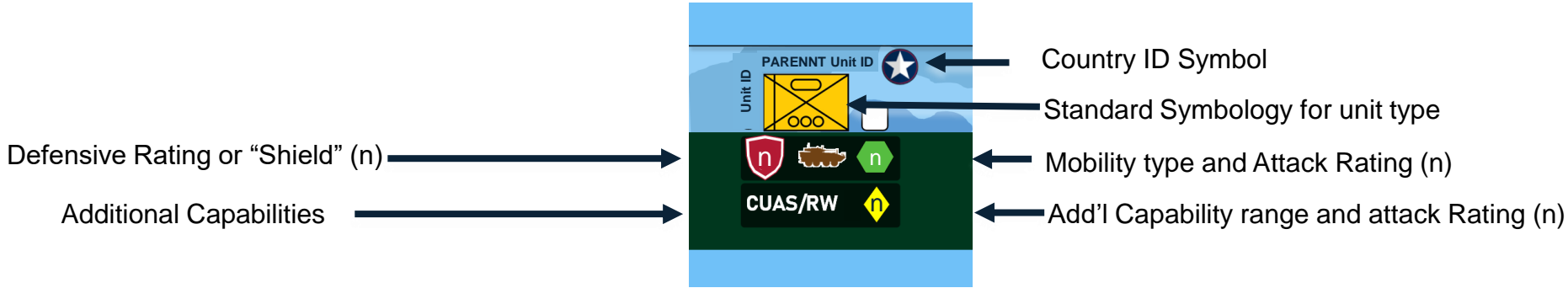


Mission Thread Examples

- Wet gap crossing
- Vertical envelopment
- Defend an APOD

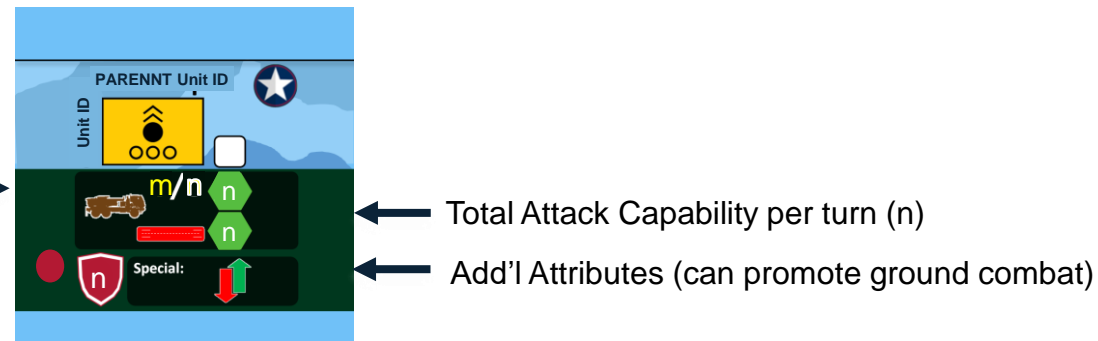
- Use Case = System level
- Mission Thread = System of Systems (SoS) Level
 - A [mission thread](#) is a sequence of end-to-end activities and events presented as a series of steps that accomplish the execution of one or more capabilities that the SoS supports.
- Vignette – includes environmental factors

ID Wargame Units: OWS Unit Representation



- 1 turn = 24 hours
- Operational Map = 200nm/hex
- Tactical Map = 10 nm/hex
- Global map. Theater maps
- Unit scale Bn to Theater Army
- All domains/WfF

Attack Capabilities and range (land attack only) (m/n)



System Technical Characteristics/Behaviors Examples

- Air
- Ground
- Surface
- Weapon (kinetic and non-kinetic)
- Communication
- Countermeasures
- Fire Control
- Munition
- Navigation
- Radar Warning Receiver
- Sensor
- Attack Vehicle
- Cyber
- Command Post (C2)

Terrain Characteristics - Unit Locations

Considerations:

- Area/Hex/Point
- Terrain coordinate system
- Elevation source data and resolution (DTED, HRTE)
- Map scale
- Terrain database formats
- Features (Buildings, roads, vegetation, soil type, etc.)

OWS/Vassal → NGTS:

- World file produced by GIS tool QGIS to edit the source map imagery
- Export as a .PNG file along with the .PGW world file
- Pixel coordinate into Lat/Long translator
- Export file from Vassal to NGTS

Wargame (OWS/Vassal)



Simulation (NGTS)



Sample COA Measures

COA 1 Baseline (Current) Force
 COA 2 (TBD)
 COA 3 (TBD)

Measures	Wet gap crossing	Vertical envelopment	Defend an APOD
	Time for Blue to cross gap	Distance Blue penetrates Red Defenses	Percent of damage to APOD
	Time for Blue to seize objective	Time to start/end envelopment	Time to secure APOD
		# / % of Red stimulated	
		# / % Red entities sensed	
		Time Blue senses Red	
		# / % Red engaged	
		# Blue rounds expended	
		Range at which Red engaged	
		Time Blue system engages	
	# / % Blue entities damaged		
	# / % Blue entities destroyed		
	# / % Red entities damaged		
	# / % Red entities destroyed		

Data Elements and Structure

Description	Command Level/ Unit Type	Defensive rating (Shield)	Primary System	Number of Counters	M1A2/M2	M1126	M109A7	M1283	M1150	IFPC
Unit	HQ (CP)				0	0	0	0	0	0
Unit	Combined Arms		M1A2/M2		0	0	0	0	0	0
Unit	Stryker		M1126		0	0	0	0	0	0
Unit	SP Artillery		M109A7		0	0	0	0	0	0
Unit	Engineer		M1150		0	0	0	0	0	0
Unit	AD		IFPC2		0	0	0	0	0	0

Source: "MCoE SUPPLEMENTAL MANUAL 3-90 FORCE STRUCTURE REFERENCE DATA"

Project Outcome and Future Work

Project Outcome:

- **Insights into Force Structure implications**
- **Instantiation of the interface protocol for OWS wargame and NGTS simulation**
 - Data structure that goes between the wargame and simulation
 - User developed OM (Object Model)

Future Work: Bridge Wargame to Simulation

- Instantiation of the interface protocol for any wargame and any simulation
- This effort will focus on researching methods for migrating the output of a wargame into an appropriate level (entity-based or aggregate) simulation for conducting Monte Carlo-style experiments.

Wargame Alternatives
OWS, COTS, Design your own
Others?

Simulation Alternatives
AFSIM, NGTS, OneSAF, VRForces, WARSIM
Others?

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