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Developing a Model-Based Systems Engineering (MBSE) Land Domain Construct for Marine Corps Systems Command

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#1 Goal – Adapt to Change Quickly

- Transition from a document-based systems engineering environment to a model-based systems engineering (MBSE) environment

- Design systems with an end-to-end mission complete lifecycle focus.

- Develop an Ontology and Conceptual Data Model (CDM), which is foundational to an Authoritative Source of Data.

  ✓ **Data Exchange**

  ✓ **Continuity**

  ✓ **Traceability**

Capabilities, Operations, Functions · Measures · Systems & Services · Program Management · Location · Manpower, Personnel, Management · Policy, Directives, Guidance · Maintenance · Logistics

MBSE requires a mindset change that focuses on the system and the system perspectives, not the documents that describe the system.

#2 Strategy – Mission Based

War is both timeless and ever changing. While the basic nature of war is constant, the means and methods we use evolve continuously." -MCDP-1

Flexibility to conduct a wide variety of missions.

- Uses Force Design 2030 as a guide
- Littoral maneuver and sustainment
- Maritime reconnaissance/counter reconnaissance
- Long-range precision fires

#3 Method – Ontology & CDM Development

Represents the system of interest from multiple perspectives which allows for the exploration of the system holistically.

Focus Areas:

1-Identify a generic ontology that comprehensively represents the system across the lifecycle.

2-Analyze the relationship between entities defined within the ontology.

3-Demonstrate the utility of having authoritative data within a defined structure and validate the generic ontology and CDM using an example mission thread.

4-Design a framework for a roadmap that will help MCSC transition to a MBSE environment.

#4 Results

Defined an ontology and CDM to support and guide system engineering modeling projects.

- Test cases to demonstrate that the ontology and CDM captures system design from the highest levels of the mission and follows it through its detailed design for its entire lifecycle.
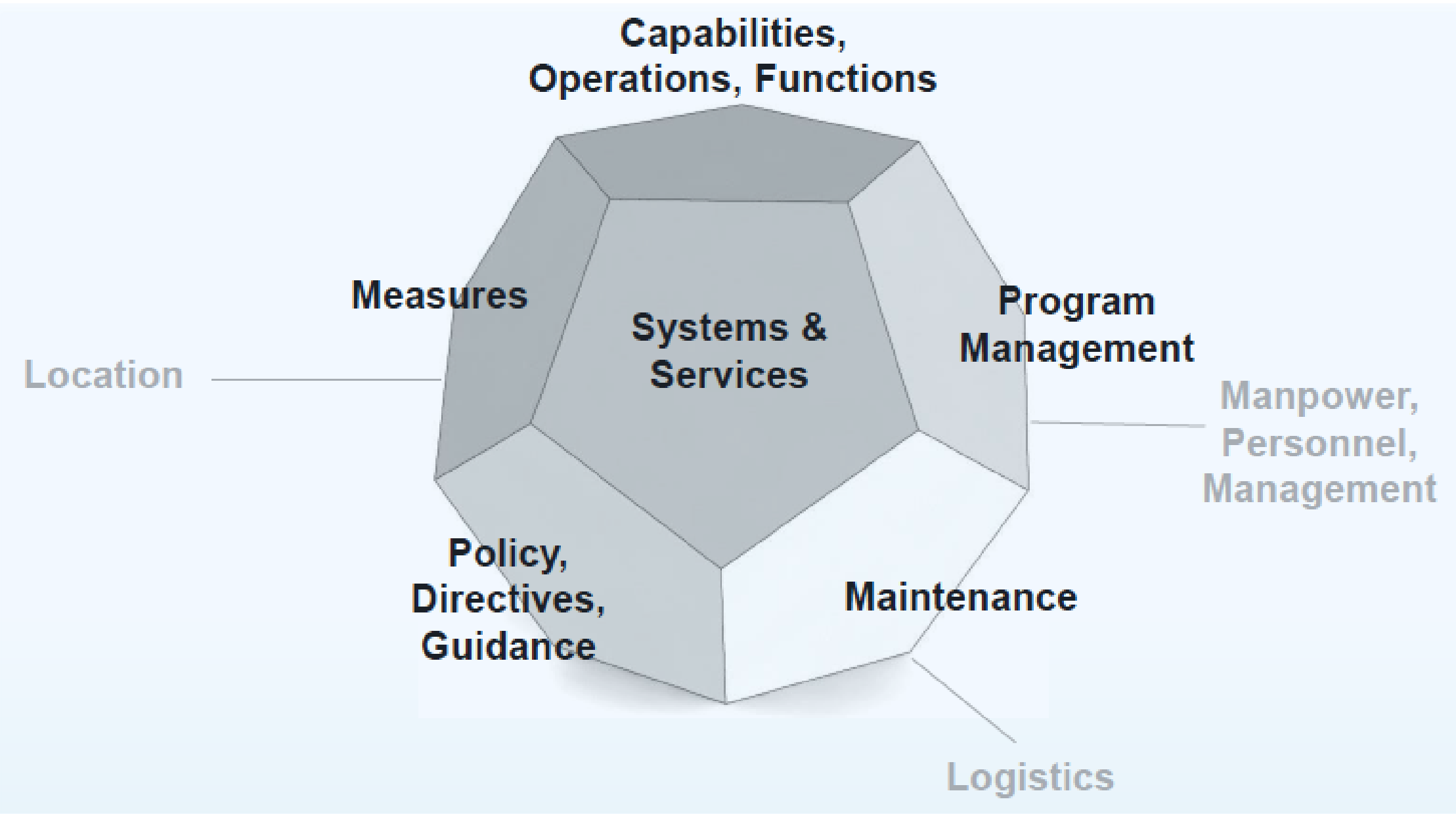
Ontology - Demonstrates that systems can be defined with a minimal set of overarching entities, and then mapped to the data of a real-world system.

- Defines a parsimonious set of entities to reduce model data to the "atomic level."

CDM - Demonstrated that the full-breadth the system can be modeled, and enables a "Rosetta Stone" to provide a translation of data from various modeling languages and MBSE tools.

- Defines the system model representing the most common date types and relationships that represent a system.

For more information refer to the following: NRP FY22 Tech Report, Vaneman, Carlson, White, Stone
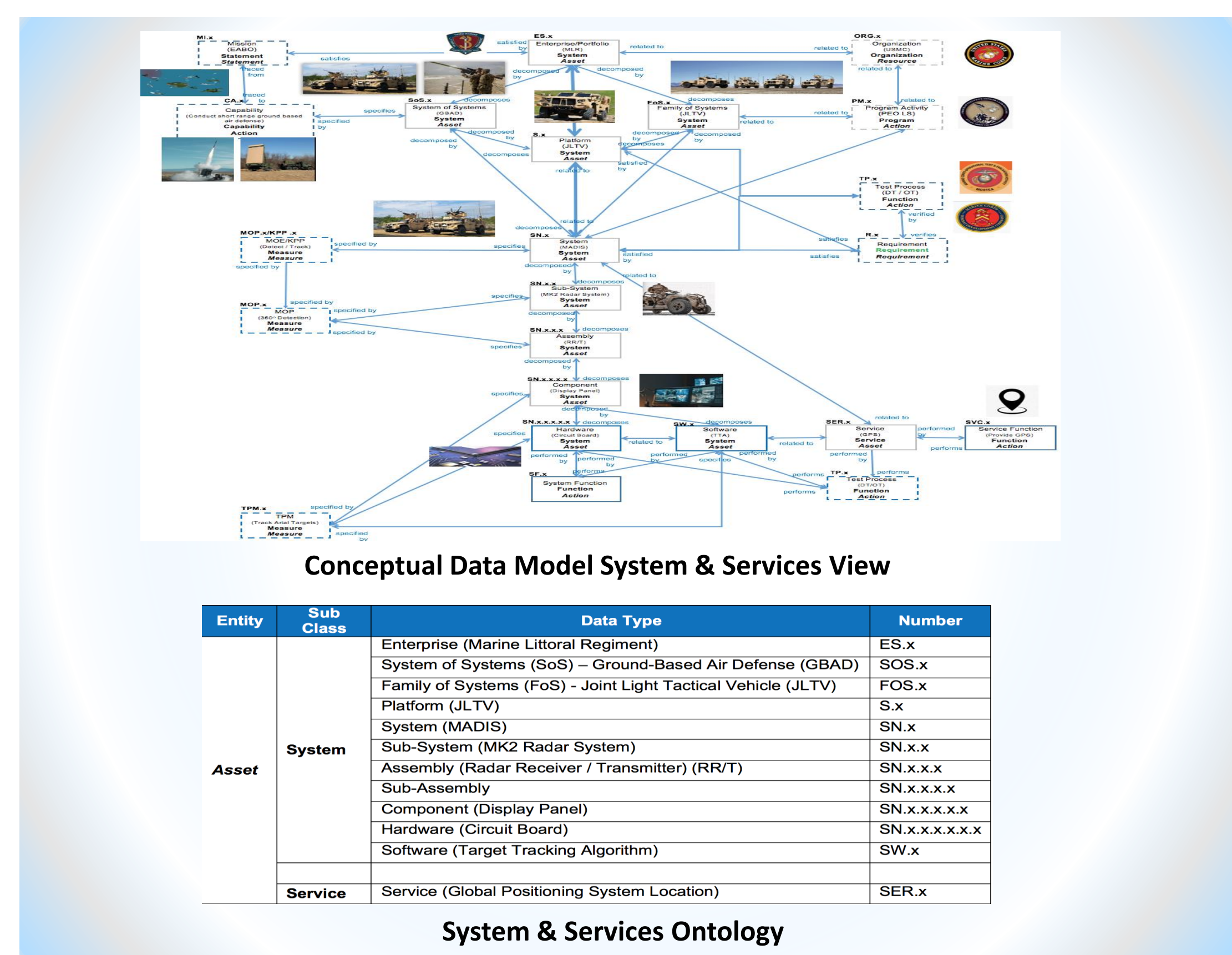

Conceptual Data Model System & Services View

Entity	Sub Class	Data Type	Number
Asset	System	Enterprise (Marine Littoral Regiment)	ES.x
		System of Systems (SoS) – Ground-Based Air Defense (GBAD)	SOS.x
		Family of Systems (FoS) - Joint Light Tactical Vehicle (JLTV)	FOS.x
		Platform (JLTV)	S.x
		System (MADIS)	SN.x
		Sub-System (MK2 Radar System)	SN.x.x
		Assembly (Radar Receiver / Transmitter) (RR/T)	SN.x.x.x
		Sub-Assembly	SN.x.x.x.x
		Component (Display Panel)	SN.x.x.x.x.x
		Hardware (Circuit Board)	SN.x.x.x.x.x.x
		Software (Target Tracking Algorithm)	SW.x
	Service	Service (Global Positioning System Location)	SER.x

System & Services Ontology

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