MINI-DASS (Mission-Informed Needed Information - Discoverable Available Sensing Sources): A New Mission & Means Framework Ontological Approach for ISR Missions…*the magic rabbits*

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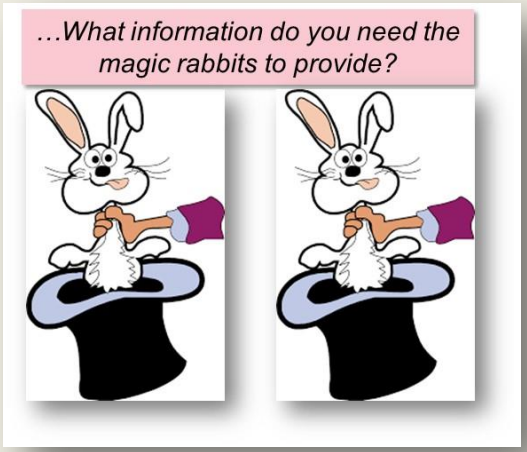
Outline

- Background and Context
- MINI-DASS Challenges: Dealing with Data & Information
- Implementation: Missions and Means Framework Model
- Developing an Ontology and Operators
- The Road Ahead
- Summary



Situational Understanding Representation

Decisions

Situational Understanding

Translate human intent to computer understanding

Intelligence Products

Plan - Pose questions, Hypothesize

Suitably render information for human understanding

Disseminate

Engage Sources

Process – Aggregate, Link, Correlate, Reason

Relevant, Data & Information

Forensics: Learned Data & Information

Discover, Query

Potentially Relevant Data

Automatic queries, taskings based on results

Collect Data – Discover, Filter, Contextualize, Extract

Soft

Text- Documents

HUMINT

Users-Experts

facebook

Cultural Awareness

Social Media

Webpages

Mission Variables

Databases- Spreadsheets

You Tube

Multimedia: Audio, Images, Video, Text

Geospatial

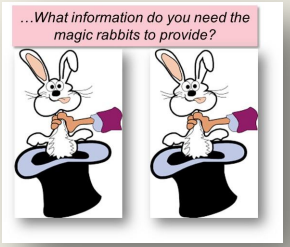
Sensors: FMV-Imagery-EO/IR…

…Radar, Acoustic, Ladar…

Hard

Key Points of Representation

- **Information query must be tied to mission/task**
  - Machine understanding of needed information
  - Information requests technology agnostic



- **Discovery, availability & *relevance* of information sources**
  - Any source or container that can deliver information to consumer
    - Fusion engines
    - Information processing techniques (including PED)
    - Social media
    - Sensors
  - Includes policy, especially in coalition environment
  - Determination of mission relevancy of information
- **Need ability to match capability of means to mission capabilities required**

MINI-DASS Objective

- ***Provide an informational-based MMF with an ontology developed that will enable the optimal matching of information available from discoverable information sources (means) to the mission-relevant information needed (mission) to provide enhanced situational understanding to the decision maker***

- **Domain: Limited to information sources and ISR operations that are at the edge including contested urban environments**
  - Focus on coalition operations complicates effort
    - Assets more disparate
    - Policy issues
  - Process closed questions
- **Goals**
  - Common description of requested information and capabilities that can be provided by available information sources (common language)
  - Automated capability to enhance understanding in the domains of (1) the environment and (2) the threat
  - Framework and mechanism to describe capabilities required
  - Automated model of current mission/task building processes

The Tough Challenges

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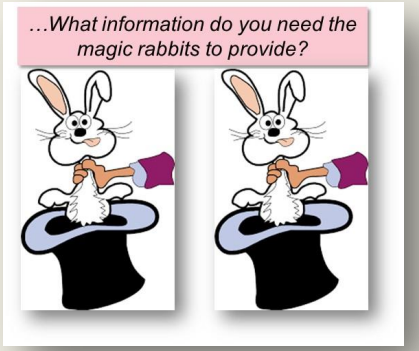
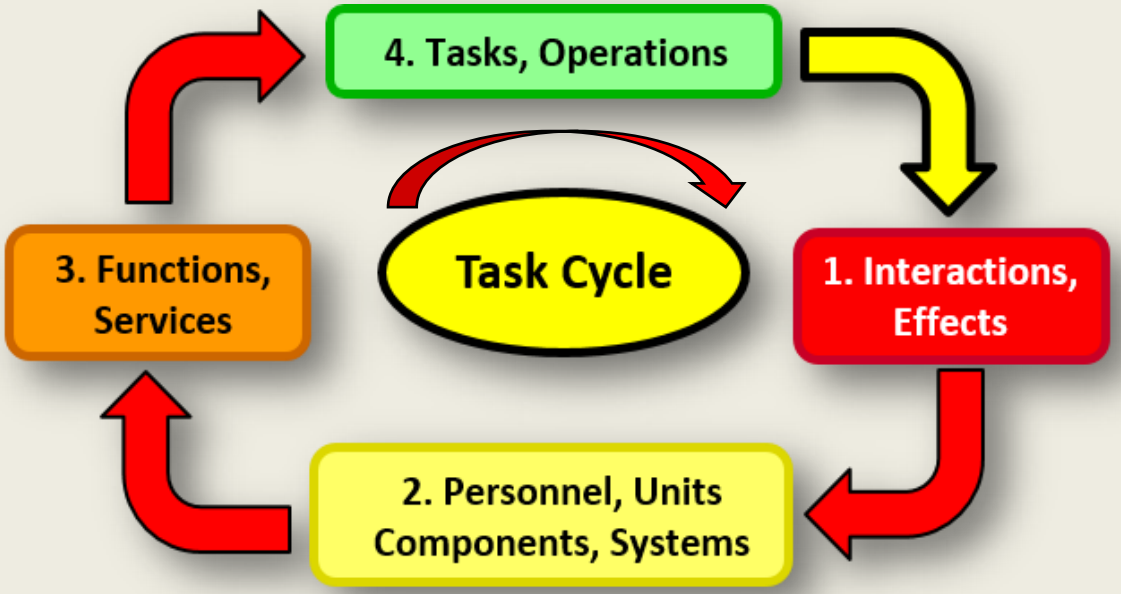
- **Mission/task builds**
  - Need to understand information needed
    - Stripped of assumed technology/information source
    - Convert to machine understanding
  - Need to determine information relevancy
    - Which sources have relevant information
    - What within-source information is relevant



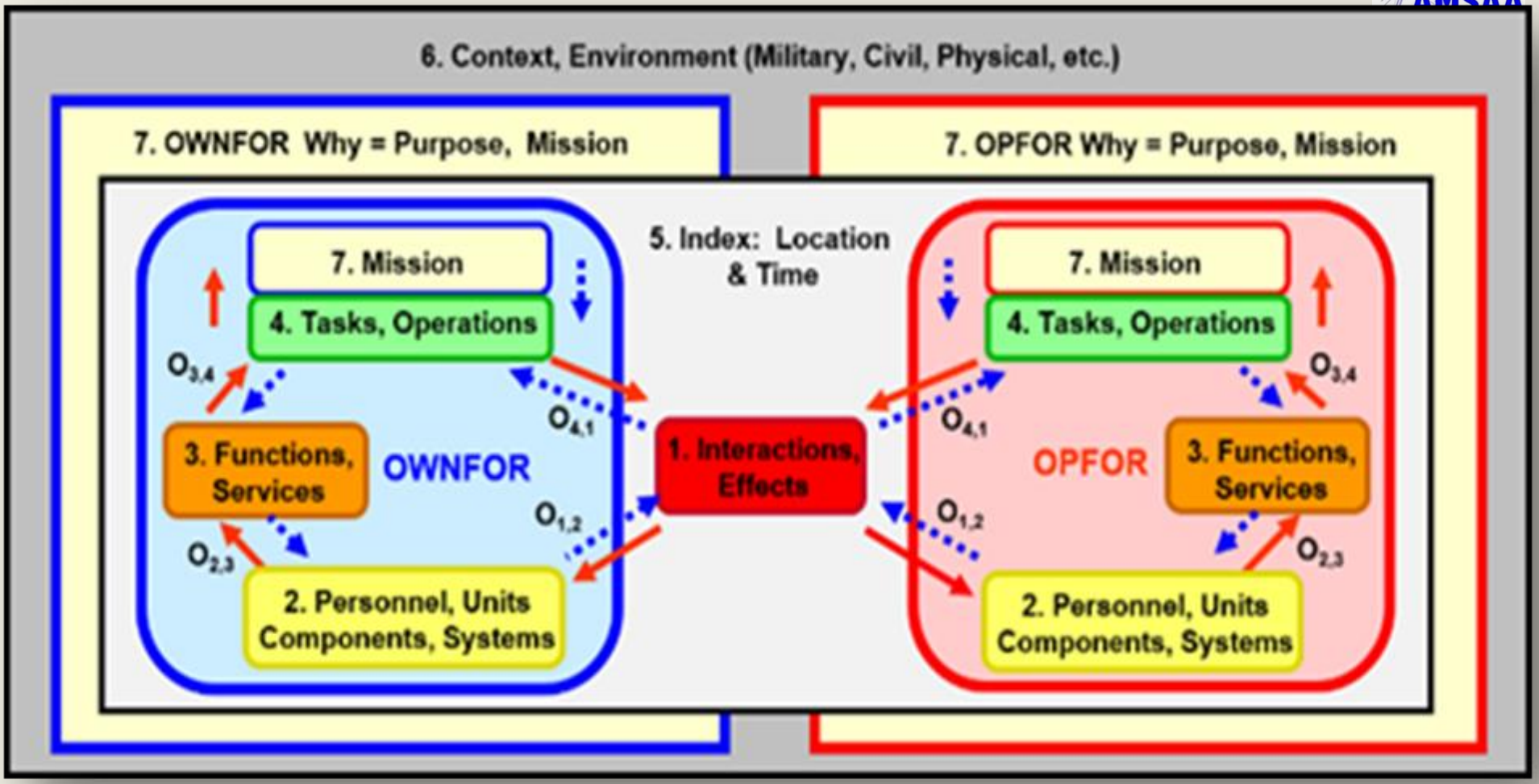
- **Domain ontology**
  - Model complex, disparate and soft source capabilities
    - Fusion engines
    - PED processes
    - Social media
    - Video
    - Traditional low-power sensors
  - Information source discovery & accessibility
- **Determine "goodness" of information to satisfy mission needs**
  - *Value* of data: veracity, relevance, orthogonality
  - Qualitative measure acceptable
  - Must be objective

Basic Mission-Execution MMF Model



- Model is generic and mission-independent
- Levels applied to MINI-DASS
  - Level-4 represents the “acquire-the-needed-information” mission (verbs)
  - Level-3 represents how well the capabilities of the available information source means satisfy the mission needs; basis for determining optimality and “goodness” of the “matches” (adverbs)
  - Level-2 represents capabilities of the information source means that are available (nouns)
  - Level-1 is the interactions and effects which includes mission programming and information source updating (adjectives)

Full Missions & Means Framework



It's About the Operators

- **Executing parties self-linked and crossed-linked through shared interactions and effects**
- **MMF model has levels connected by both explicit and implicit operators**
  - Certain levels "talk" only to other levels
  - Level instantiation must follow a specific causal order
- **Operators may change the state of levels**
  - $O_{1,2}$ operator changes state of Level 2 means
  - $O_{2,3}$ operator changes state of Level 3 capabilities
  - $O_{2,3}$ and $O_{3,4}$ operators are key to MINI-DASS

MINI-DASS is an multi-dimensional operations research optimization problem

Developing the Level 2 MINI-DASS Ontology

- **MMF model is generic**
  - Kinetic & ISR missions
- **Level 2 (means) domain-specific**
  - Ontologies have advantage of defining in advance exactly what each class of objects (MEANS) is and how it relates to all other objects within our domain of interest
  - Ontologies are classification systems, and in the process of building the ontology we must make *a priori* decisions as to what things belong together
- **ISR assets for Level 2 MINI-DASS ontology**
  - Social media
  - PED process
  - Fusion engine
  - Video

- Information source technical experts

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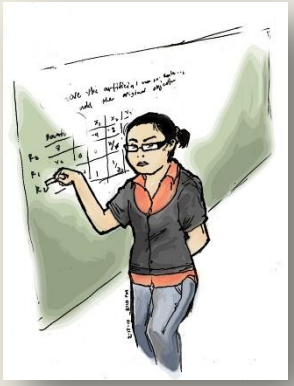
- Ontology experts

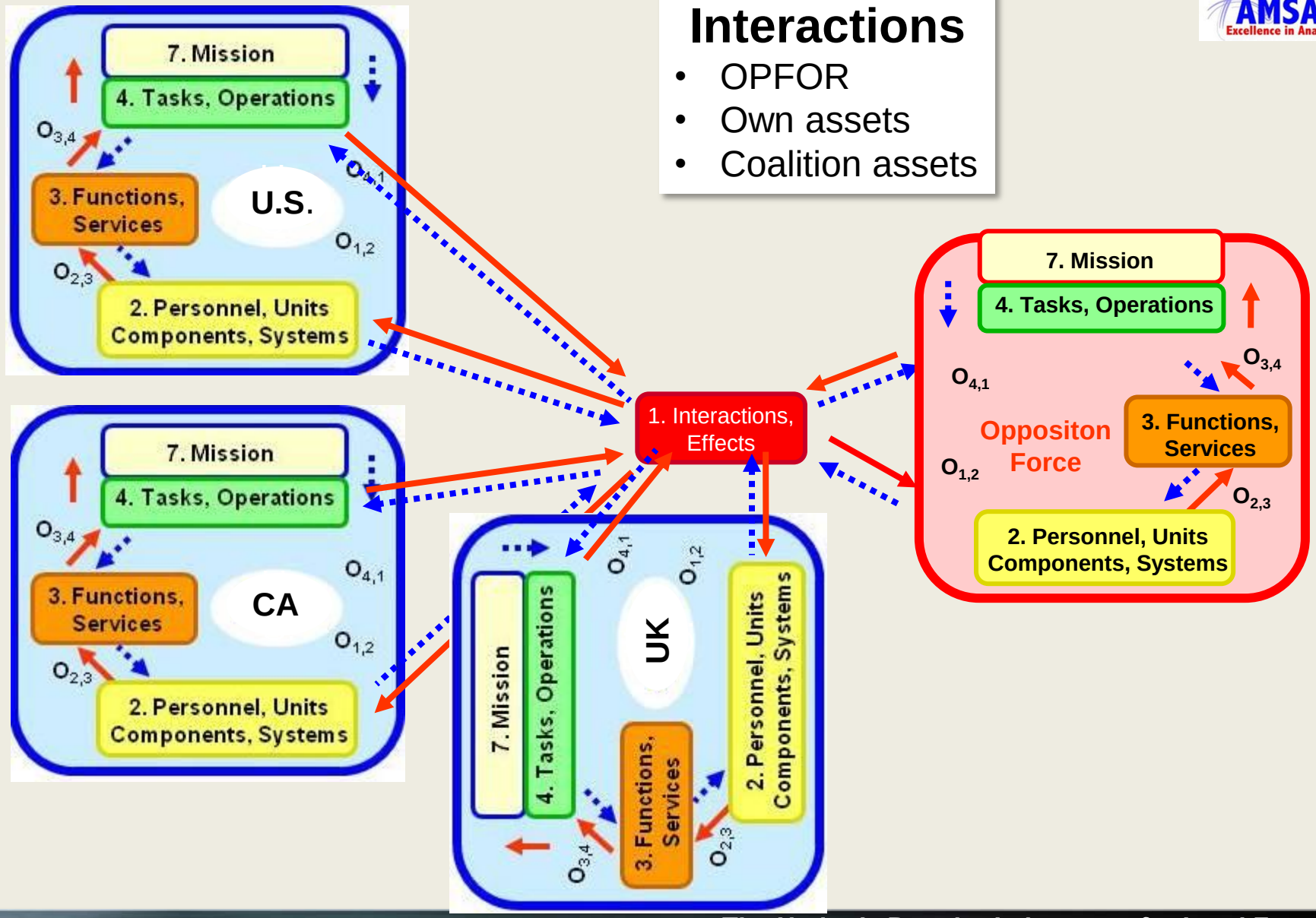
- Operational experts

- Operational Research experts



Interactions

- OPFOR
- Own assets
- Coalition assets



Summary

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- **Goal:** Provide an informational-based MMF that will enable optimal matching of information available from discoverable information sources (means) to the mission-relevant information needed (mission) to provide enhanced situational understanding to the decision maker
- **Multi-dimensional operations research effort**
- **It's a tough problem with numerous challenges**
  - Modeling sources with human-generated information
  - Finding the mission-relevant information
  - Determining "goodness" of information
- **No results yet**
  - MINI-DASS is a concept
  - Research just beginning
- **MMF model is generic; Level 2 ontology domain-specific**

We are attempting something new that, if successful, could have a significant impact on military operations!

Questions?