EVALUATION OF INTEROPERABLE OPEN ARCHITECTURE'S BY MEANS OF **CAPABILITY DEVELOPMENT** IN THE MISSION PLANNING DOMAIN

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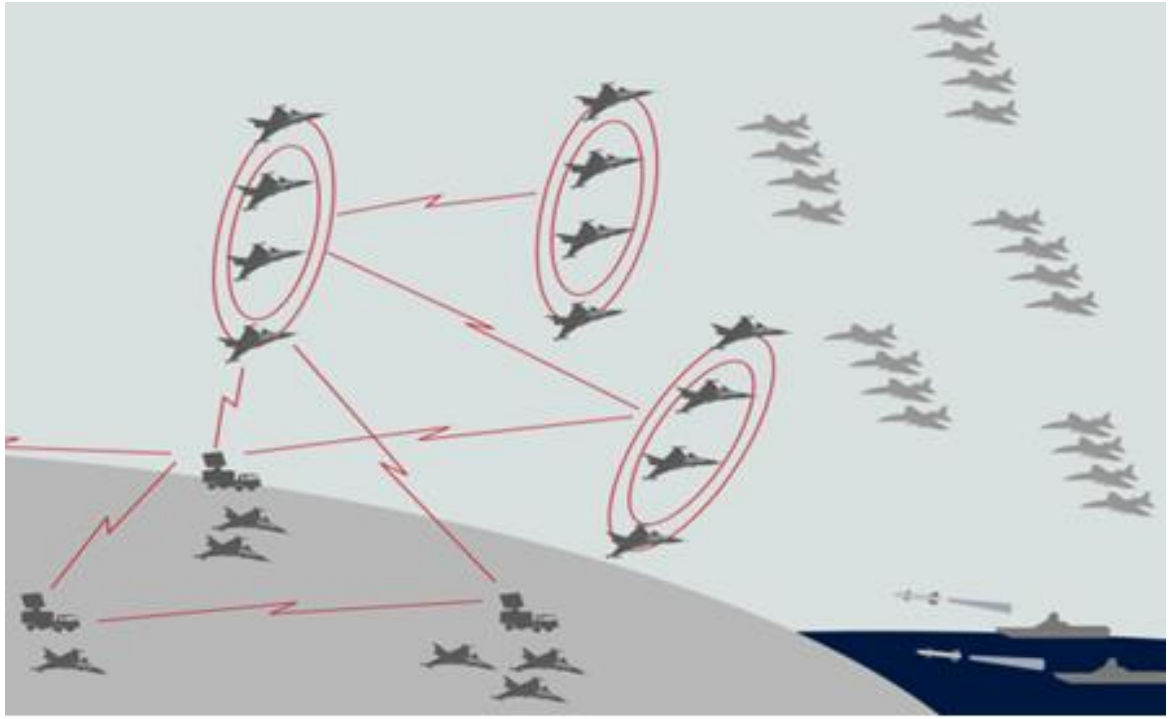
AGENDA

- Future Challenges
- Motivation - Why IOA and Autonomous Capabilties
- Domain Ontologies
- High Level System Capabilities
- Capability Development Environment
- Syntactic Interoperability
- Semantic Interoperability
- A Semantic Mission Model (example)
- Mission Planning Domain Capabilities
  - Autonomous Planning
  - Dynamic Re-planning

FUTURE CHALLENGES

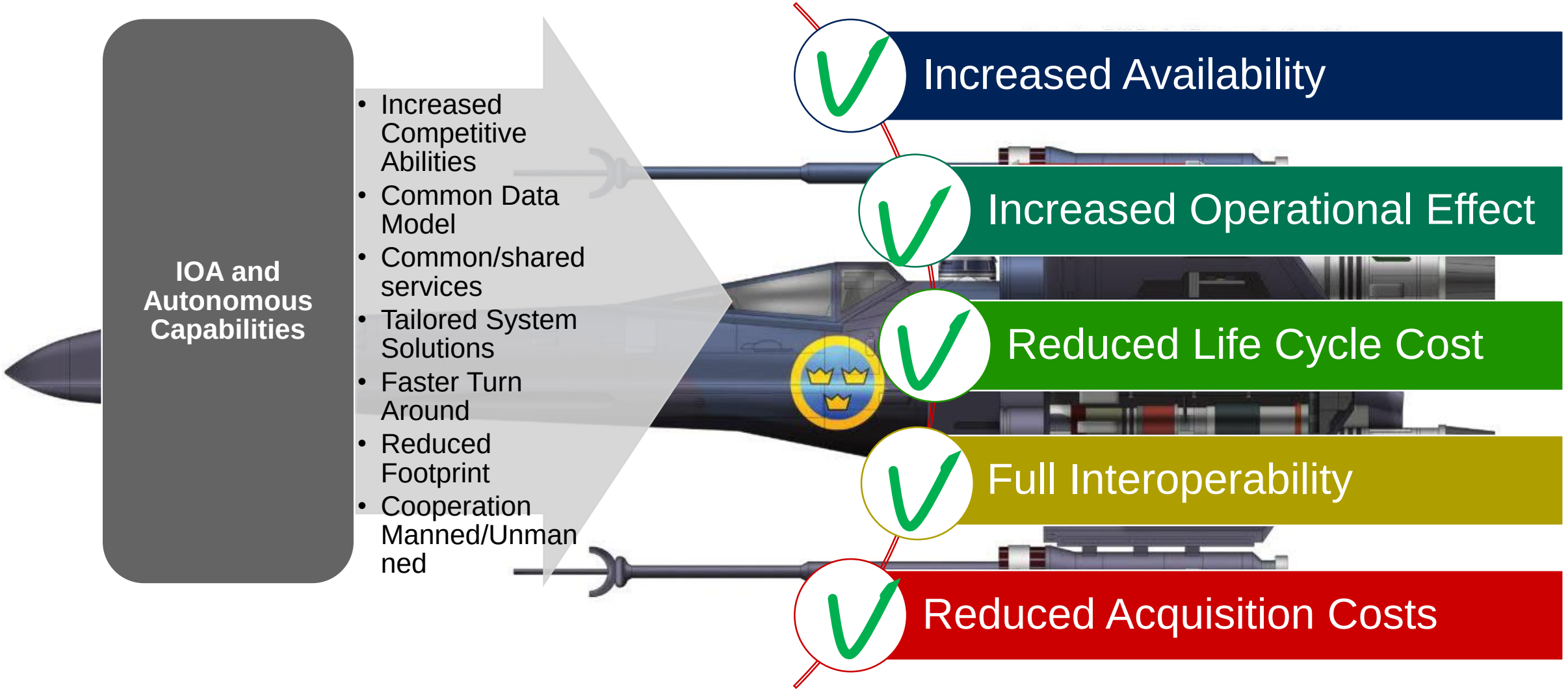
- **We are heading towards increasingly complex air operations and scenarios**
  - **Heterogeneous forces that cooperates to solve tasks**
  - **Complex vehicles and sensors**
  - **Tasks may geographically and time-wise distributed**
- **This will result in increased System of Systems (SoS) dependencies**
  - **Air vehicles and systems**
  - **Land and water-based**
    - **Vehicles**
    - **Systems**
    - **Forces**
  - **Support systems**
  - **Environment**



MOTIVATION - WHY IOA AND AUTONOMOUS CAPABILITIES?

IOA and Autonomous Capabilities

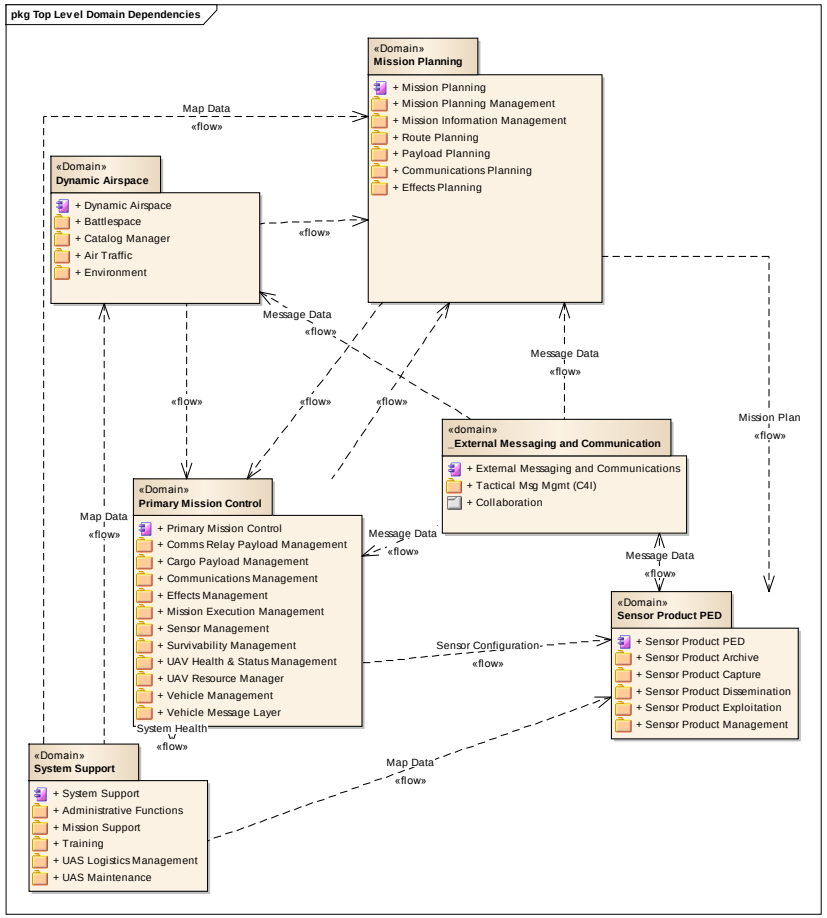
- Increased Competitive Abilities
- Common Data Model
- Common/shared services
- Tailored System Solutions
- Faster Turn Around
- Reduced Footprint
- Cooperation Manned/Unmanned



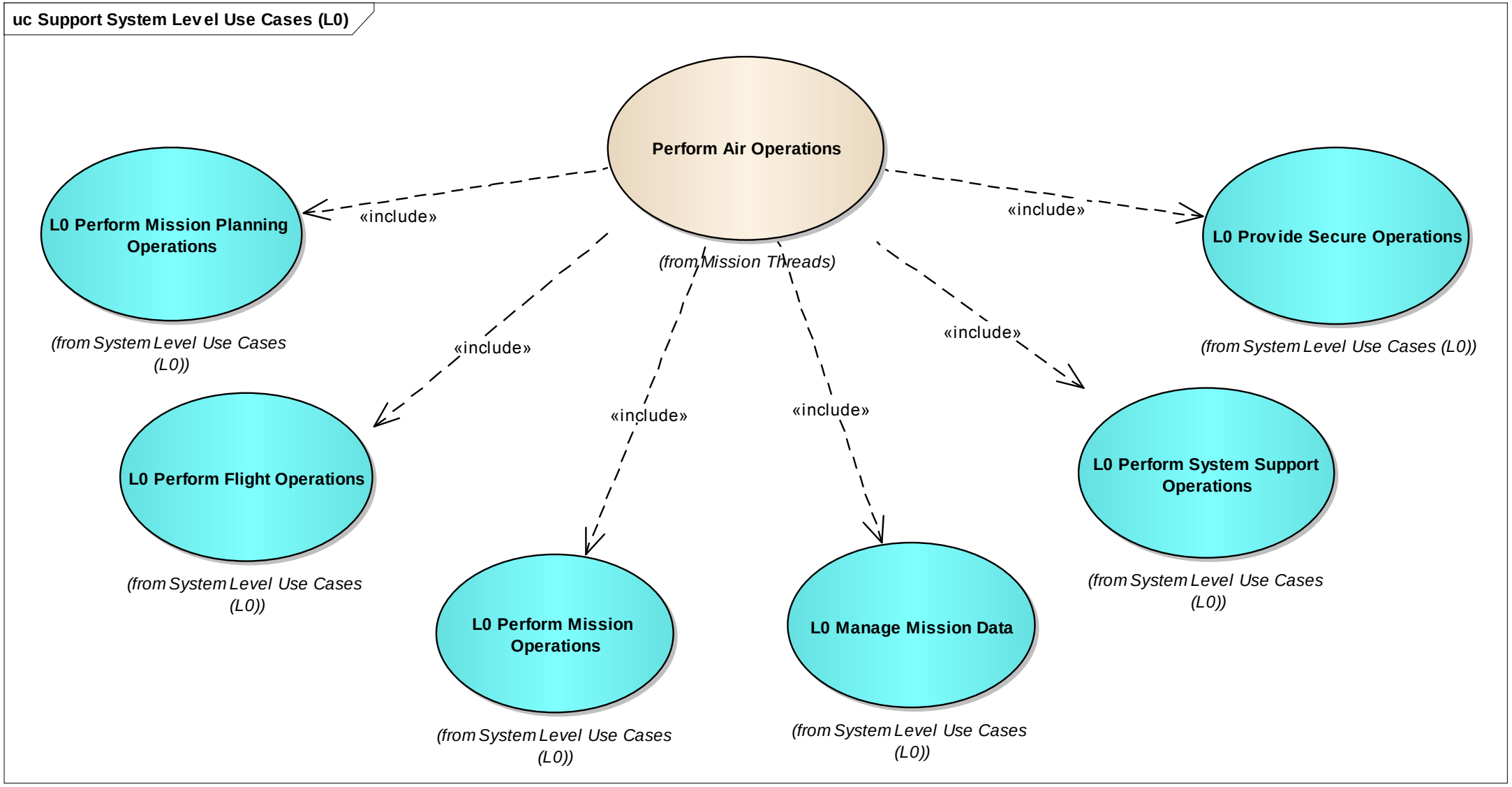
- Increased Availability
- Increased Operational Effect
- Reduced Life Cycle Cost
- Full Interoperability
- Reduced Acquisition Costs

DOMAIN ONTOLOGIES

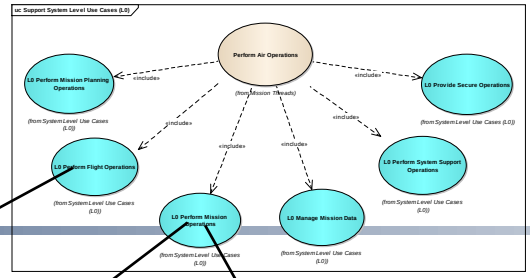
- A common domain ontology “a common/shared view of the world”
  - A basis for interoperability
  - Scalable
  - Descriptive
- A basis for information sharing
  - From macro to micro level
  - Specialized domain services with well defined interfaces
  - A loosely coupled system architecture
  - Problem free connection/disconnection of services



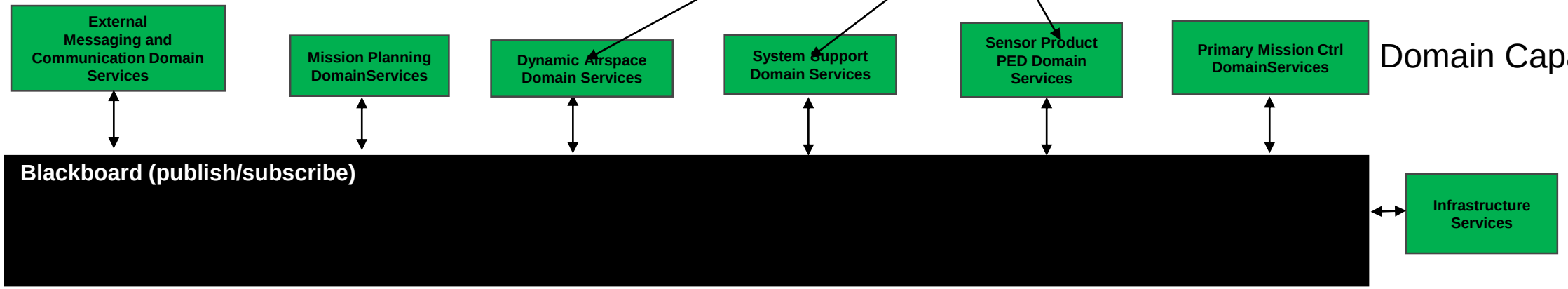
HIGH LEVEL SYSTEM CAPABILITIES



CAPABILITY DEVELOPMENT ENVIRONMENT



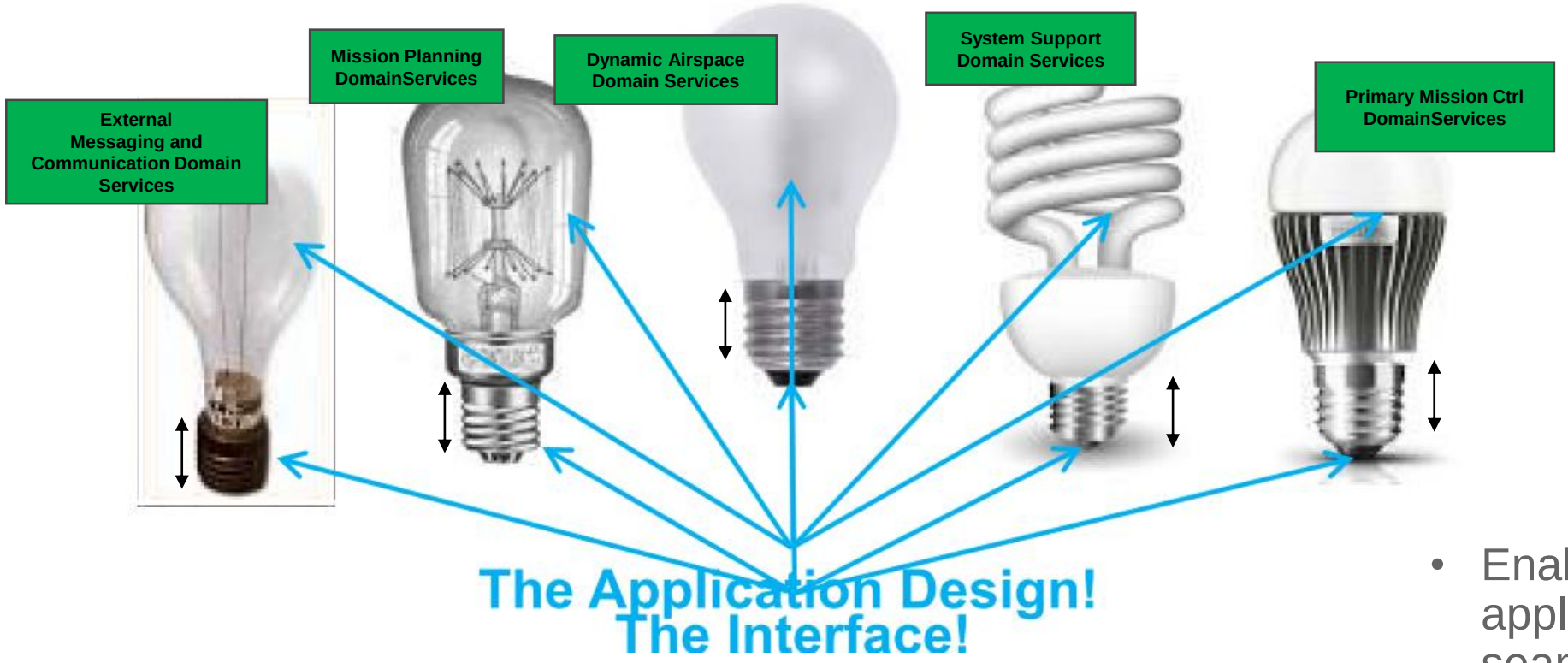
High level system capabilities



Domain Capabilities

- A capability development environment based on:
  - Well defined domains, sub-domains and domain services
  - A publish/subscribe communication interface
  - Domain interoperability
    - Syntactical via well-defined interfaces
    - Semantically via a semantic/konceptual model

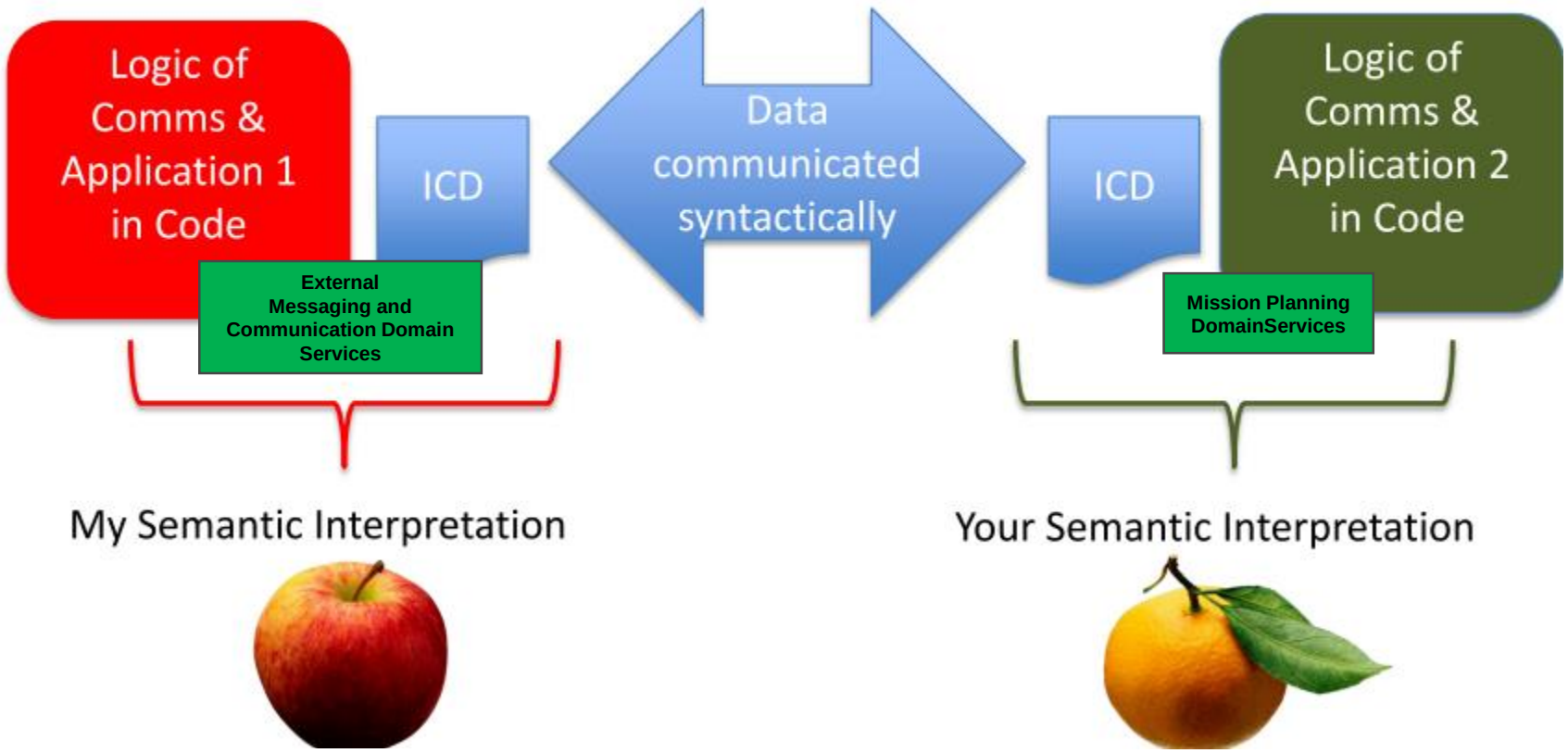
SYNTACTIC INTEROPERABILITY



Ref. Lockheed Martin

- Enables specialized applications to be seamlessly plugged/unplugged into a common environment

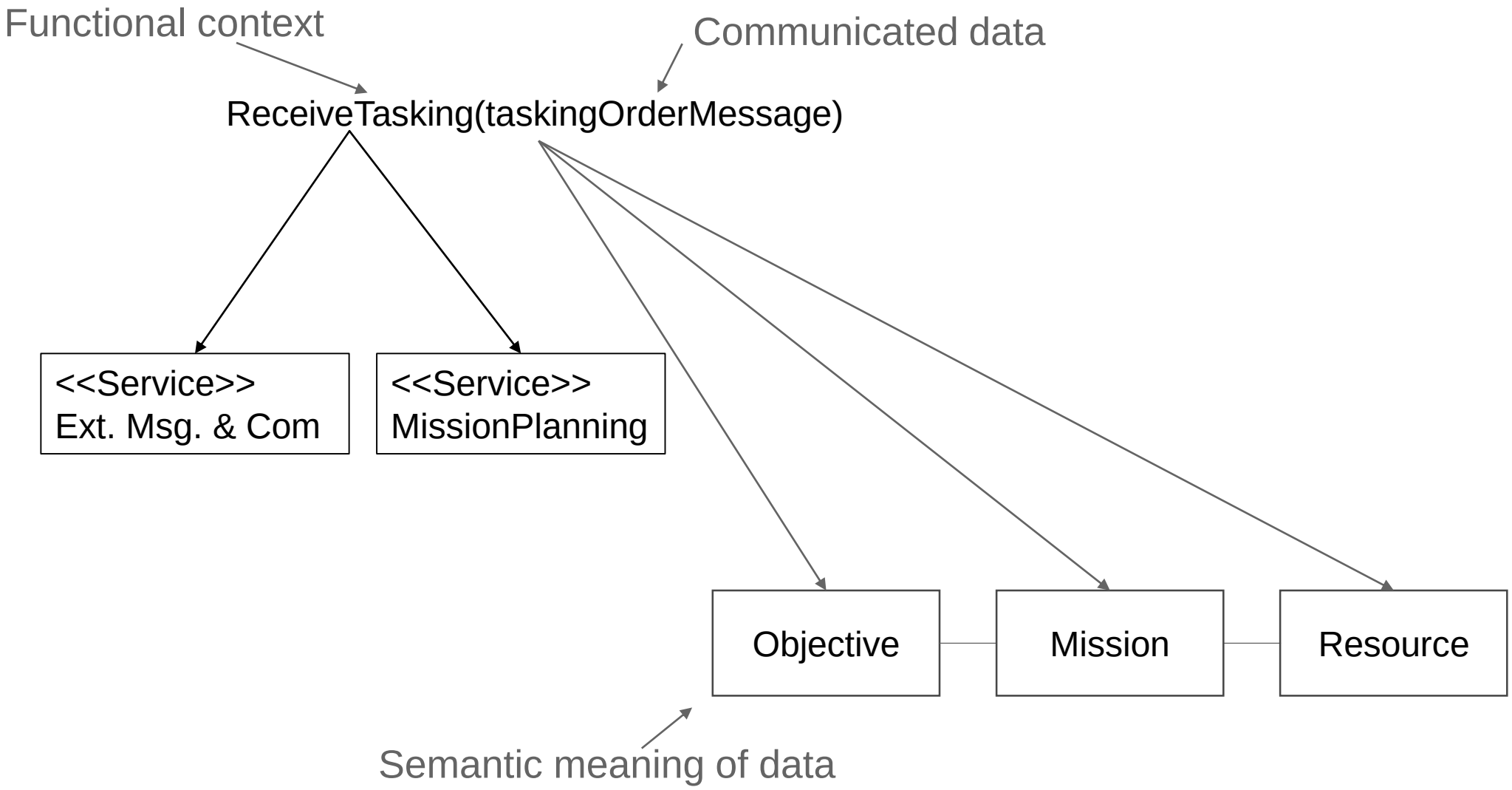
SEMANTIC INTEROPERABILITY SLIDE #1



- Just decode data syntactically is not enough
- One must be able to interpret the meaning of the decoded data

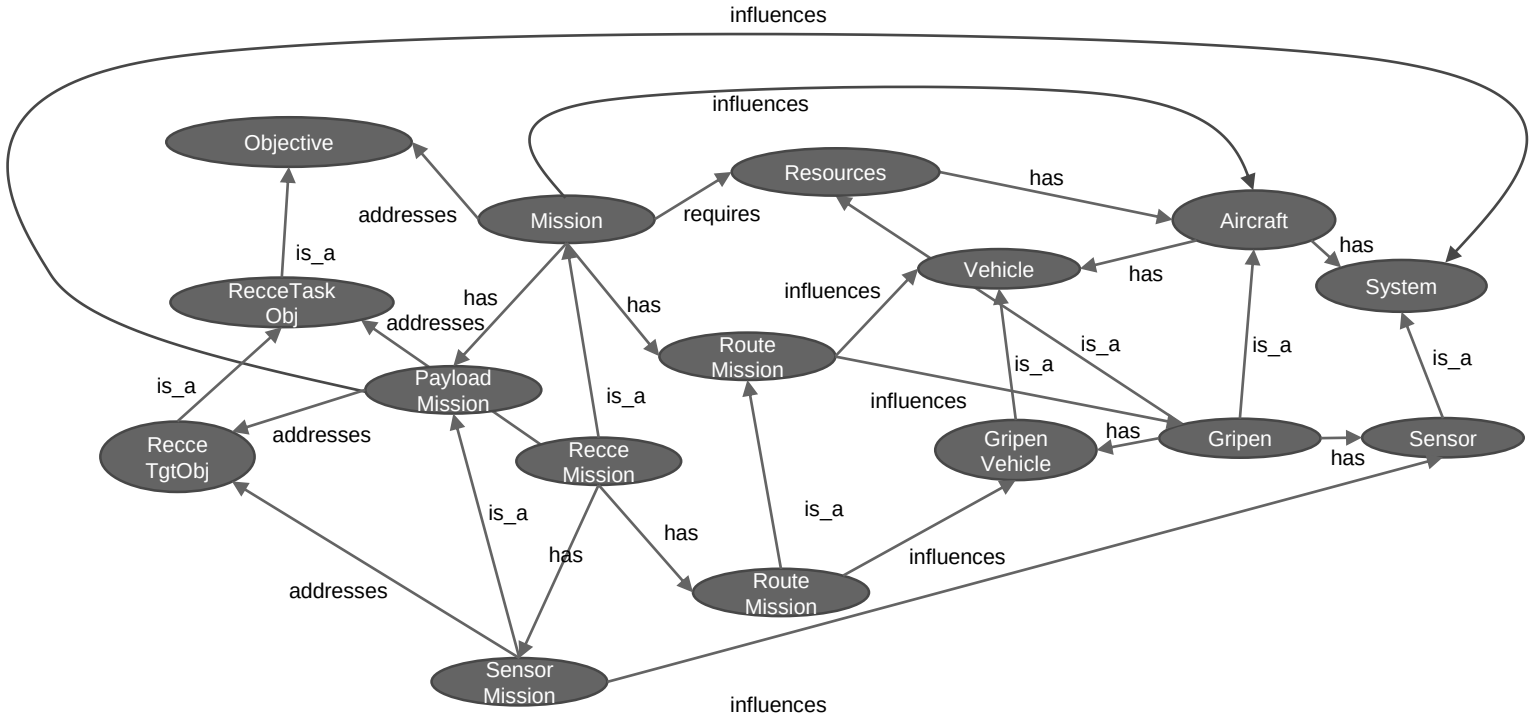
Ref: Market Altitude

SEMANTIC INTEROPERABILITY SLIDE #2

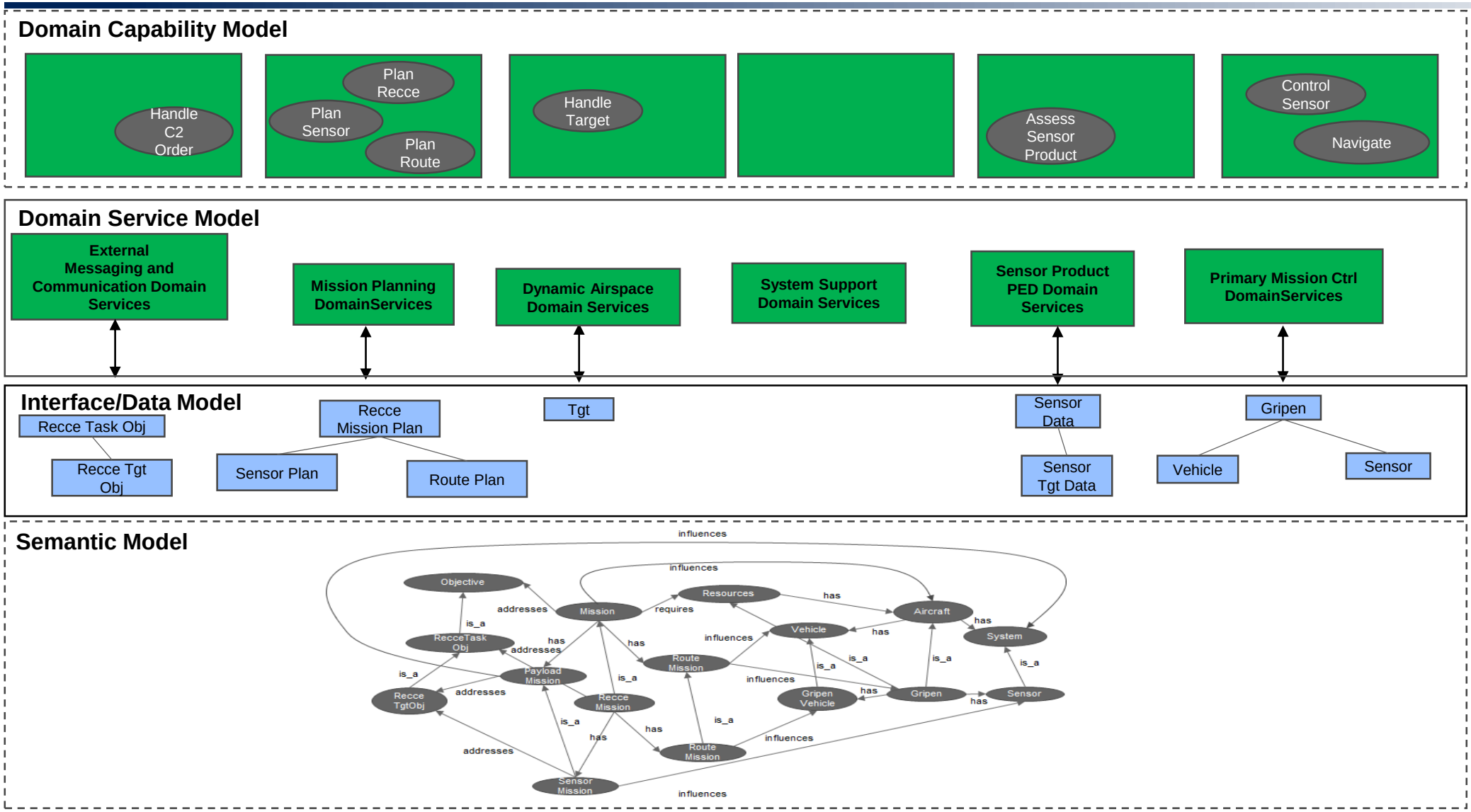


A SEMANTIC MISSION MODEL (EXAMPLE)

- An ”open world” that describes entities, relations and attributes
- Can be seen as an ontology
- Where an ontology is a combination of:
  - A Taxonomy (classification of entities)
  - An extended vocabulary:
    - Individuals (instances of classes)
    - Attributes
    - Relations
  - A set of inferences such as
    - Classification/validation of unknown/known entities
    - Rules
    - Semantic validation



EXAMPLE OF MULTI-DOMAIN CAPABILITY DEVELOPMENT: MISSION PLANNING

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