SOPES IEDM Overview

Standardized Data Patterns for the MIP JC3IEDM / NATO STANAG 5525

The Shared Operational Picture Exchange Services (SOPES) represents an OMG C4I DTF initiative to develop a set of open standards for generic architectures, interfaces and technologies that promote interoperability during coalition, partner, or multi-agency operations. The standards will define a set of services that can be rapidly adapted to changing mission requirements; without the need for software modification. Much of this effort will be reflected in the MARS Information Exchange Framework (IEF), which subsumed much for the original SOPES scope and objectives. The following Requests for standardization will be issued in 2010:

1. Information Exchange Policy Language (IEPL);
2. Information Policy Enforcement Service (IPES); and
3. Information Policy and Rules Management Service (IPRMS).

The C4I DTF (Domain Task Force) is focusing on the development of specifications for systems and services which enhance interoperability during crisis response, disaster relief, emergency management or military operations. The task force is currently focusing on relates to Information Interoperability in the areas of situational awareness, collaboration and planning across multiple domains, communities and agencies.

Many of the underlying capabilities have been identified by a large number of organizations, agencies and communities. The IEF/SOPES initiatives are seeking to adopt a series of multi-use specifications that support a wide range of operational domains. This Information Exchange Data Model (IEDM) provides a community specification for a rich set of situational awareness, collaboration and planning semantics that evolved through more than fifteen years of development, testing and demonstrations; has NATO ratification (STANAG 5525); and the acceptance of more than twenty-five nations. The maturity of the JC3IEDM provides an opportunity to increase interoperability between NGOs, OGDs, PVOs and the military during international and domestic operations.

Problem Space

Events like 9-11, Katrina, SARS, Operational Exercises and government reports have high-lighted a longstanding need to improve capacity and quality of information sharing amongst responders to major events, crisis and emergency events.

IEF/SOPES initiatives

The IEF/SOPES initiatives seek to facilitate interoperability through standardization in several architectural areas:

- Shared data structures for Situational Awareness, Collaboration and Planning information (JC3IEDM);
- Shared Semantics for exchange of Situational Awareness, Collaboration and Planning information (MIP PDU & SOPES XML);
- Shared processes for specifying the policies, doctrine and rules governing the sharing of information (SOPES Data Patterns and OCL);
- Mechanisms to enforce the policy governing the sharing information (IPES);
- Framework for the management, accreditation and dissemination of information sharing policies, doctrine and rules (IPRMS);
- Framework for increased flexibility and agility in the exchange of situational and planning information;
- Framework for enhancing information security; and
- Interfaces for related specifications and standards.

Successful implementation of SOPES/IEF will provide more than the successful exchange of data between heterogeneous organizations and systems. The exchanges will be conducted in a manner that delivers higher quality information based on standardized delivery rules. Each participant will be provided with information needed for a shared appreciation of the operational situation and plans with the data requisite to performance of his/her specific role/function. The policy/rule based approach will improve Information quality as characterized by:

- Accurate: semantics to accurately convey the perceived situation.
- Relevant: information tailored to specific requirements of the mission, role, task or situation at hand.
- Timeliness: information flow required to support key processes, including decision making.

- Usable: information presented in a common, easily understood format.
- Complete: information that provides all necessary (or available) information.
- Brief: information tailored to the level-of-detail required.
- Secure: selectively share information in accordance with the credentials of the recipient.
- Trust: users trust the quality and content of the information provided.

SOPES Modeling Paradigm

The modeling paradigm provides a systematic approach to the specification and design of information sharing requirements. It provides:

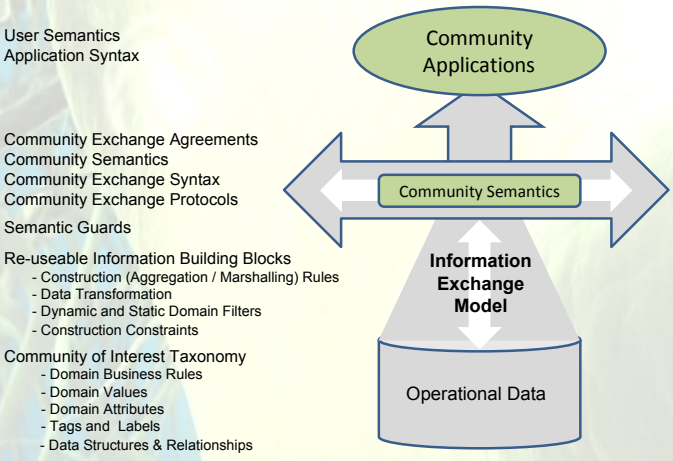
1. A modeling profile based on UML and integrated into the Unified Profile for DODAF and MODAF (UPDM).
2. Explicit architecture practices that capture the business rules for the export, transform and load processes, which are typically embedded in middleware applications. These include:
   b. Community semantics, which include structure and syntax, transformations, data filters, business rules and data store transactions,
   c. Capture of concepts in Model Driven Architecture (MDA) transformations to executable policies, which are alterable during operations;
   d. Capture of useful and meaningful models for stakeholders, users and developers.
   e. Alignment with evolving architecture frameworks;
   f. Full traceability to requirements; and
   g. Design for change.

In an object environment (e.g., OO DB or object layer), support objects can be used efficiently (with a single instantiation) by multiple information-composites (semantics and transactions) providing a highly efficient processing environment. Traditional approaches use a different information instance for each composite, and require increased memory and complex processing for data synchronization. Using the multi-use approach enables "event-driven global update." A single data change (new instance of data/information) can initiate the build and release of all transactionals and semantics in which the element is contained.

SOPES IEDM uses data patterns to define a set of ontological commitments. These commitments are defined as semantic and transactional (UML) models that describe informational concepts and the relationships between concepts for the domain of interest. The SOPES IEDM specification describes a set of information exchange concepts (data patterns) for situational awareness, collaborative and planning aligned to the JC3IEDM (STANAG 5525). The SOPES IEDM data patterns describe:

- Individual information elements;
- Classes: sets, collections, or types of objects;
- Attributes: properties, features, characteristics, or parameters;
- Relations: ways that objects can be related to one another, for data storage and in the construction of semantics (meaningful data object: this specification); and
- Events (watch points): changes to the data environment (e.g., attributes or relations) that trigger an exchange of information.

Using an MDA process, the specification can be translated into a policies (Provided PSM is in JAVA) for



constructing and interpreting information exchanges using reusable architectural components aligned directly to commonly used architecture frameworks (e.g., DODAF, MODAF and Zachman).

SOPES IEDM Components

The SOPES IEDM Specification provides: XML Schemas; and JAVA classes, platform specific models, for 190 reusable data patterns in 16 subject areas, including:

1. Actions (45)
2. Capabilities (6)
3. Context (13)
4. Control Features (6)
5. Facilities (22)
6. Geographical Features (5)
7. Holdings (2)
8. Locations (22)
9. Materiel (9)
10. Meteorological Features (2)
11. Object Item (11)
12. Object Type (3)
13. Organization (19)
14. Personnel (7)
15. Plans & Orders (12)
16. Reporting (2)

The defined data patterns for the JC3IEDM include:

Action

1. Action_Context_Status
2. Action_Effect
3. Action_Effect_Item
4. Action_Effect_Type
5. ActionEvent_CBRN
6. ActionEvent_ChemicalBiological
7. ActionEvent_Composite
8. ActionEvent_Detail
9. ActionEvent_Nuclear
10. ActionEvent_NuclearWeapon
11. ActionEvent_Radioactive
12. ActionEvent_Radiological
13. ActionEvent_Status
14. Action_Functional_Assoc
15. Action_Location
16. Action_Objective
17. Action_Objective_Item
18. Action_Objective_Item_Marking
19. Action_Objective_Item_Target_Personnel_Protection
20. Action_Objective_Task
21. Action_Objective_Type
22. Action_Reference_Assoc
23. Action_Required_Capability
24. Action_Resource
25. Action_Resource_Employment
26. Action_Resource_Employment_Aircraft
27. Action_Resource_Employment_Electronic_Warfare
28. Action_Resource_Employment_Maritime
29. Action_Resource_Employment_Reconnaissance
30. Action_Resource_Item
31. Action_Resource_Type
32. ActionTask_Composite
33. ActionTask_Status
34. ActionTask_ROE
35. Action_Temporal_Assoc
36. Associated_Target_Detail
37. Candidate_Target_Detail
38. Candidate_Target_Detail_Assoc
39. Candidate_Target_Detail_Authorisation
40. Candidate_Target_Detail_Item
41. Candidate_Target_Detail_Type
42. Candidate_Target_List
43. Candidate_Target_List_Assoc
44. Candidate_Target_List_Authorisation
45. Request_Answer

Capability

1. Capability_Composite
2. Capability_Reference_Assoc
3. EngineeringCapability_Type
4. FireCapability_Type
5. StorageCapability_Type
6. TransmissionCapability_Type

Context

1. Context_Assessment
2. Context_Context_Assoc_Status
3. Context_Element
4. Context_Element_Reporting_Data_Item
5. Context_Element_Status
6. Context_Item
7. Context_Object_Item_Assoc_Status
8. Context_Reporting_Data_Assoc
9. Context_Specification
10. Operational_Information_Group_Organisation_Assoc
11. Operational_Information_Group_Organisation_Assoc_Status
12. Operational_Information_Group_Plan_Order_Content
13. Reference_Assoc

ControlFeature

1. ApproachDirection_Item
2. ControlFeature_Item
3. ControlFeature_Item_Type
4. ControlFeature_Position
5. ControlFeature_Status
6. ControlFeature_Type

Facility

1. Facility_Item
2. Facility_Item_Type
3. Facility_Position
4. Facility_Status
5. Facility_Type
6. MFSI_Casualty_Group
7. MFSI_Casualty_Type
8. MFSI_Evacuation
9. MFS_Casualty_Bed_Occupancy
10. MFS_Pending_Casualty_Evacuation
11. MFS_Pending_Surgery
12. Medical_Facility_Status_Composite
13. Military_Obstacle
14. Minefield_Maritime_Casualty_Estimate
15. Minefield_Maritime_Sustained_Threat_Measure_Of_Effectiveness
16. Network_Facility_Capacity
17. Network_Facility_Frequency
18. Network_Facility_Item
19. Network_Facility_Service
20. The Network_Facility_Service_Status
21. Runway_Approach_Direction_Assoc
22. Runway_Item

GeographicFeature

1. GeographicFeature_Item
2. GeographicFeature_Item_Type
3. GeographicFeature_Position

4. GeographicFeature_Status
5. GeographicFeature_Type

Holding

1. Holdings
2. Holding_Transfer

Location

1. Absolute_Point
2. Cartesian_Point
3. Cone_Volume
4. CorridorArea_Surface
5. Ellipse_Surface
6. FanArea_Surface
7. Geographic_Point
8. Geometric_Volume_Item
9. LinePoint_Item
10. Line_Item
11. Location_Composite
12. OrbitArea_Surface
13. Point_Item
14. Point_Reference
15. PolyarcArea_Surface
16. PolygonArea_Surface
17. Relative_Coordinate_System
18. Relative_Point
19. Sphere_Volume
20. Surface_Item
21. Surface_Volume
22. TrackArea_Surface

Materiel

1. Consumable_Materiel_Type
2. Equipment_Type
3. Materiel_Item
4. Materiel_Item_Type
5. Materiel_Position
6. Materiel_Status
7. Materiel_Type
8. Principal_Equipment_Type
9. Vessel_Type

MeteorologicalFeature

1. MeteorologicalFeature_Item
2. MeteorologicalFeature_Position

ObjectItem

1. Object_Item_Address
2. Object_Item_Affiliation
3. Object_Item_Assoc
4. Object_Item_Assoc_Status
5. Object_Item_Capability
6. Object_Item_Group_Account
7. Object_Item_Group_Account_Detail
8. Object_Item_Hostility_Status
9. Object_Item_Reference_Assoc
10. Object_Item_Type
11. Object_Reference

ObjectType

1. Object_Item_Object_Type_Establishment
2. Object_Type
3. Object_Type_Affiliation
4. Object_Type_Capability_Norm
5. Object_Type_Establishment
6. Object_Type_Establishment_Detail
7. Object_Type_Reference_Assoc

Organisation

1. Executive_Military_Organisation_Type
2. Government_Organisation_Type
3. Military_Organisation_Type
4. Military_Post_Type
5. Organisation_ActionTask_ROE
6. Organisation_Action_Assoc
7. Organisation_Item
8. Organisation_Item_Type
9. Organisation_Materiel_Type_Assoc
10. Organisation_Plan_Order_Assoc
11. Organisation_Plan_Order_Assoc_Status
12. Organisation_Position
13. Organisation_Reference_Assoc
14. Organisation_Status
15. Organisation_Structure
16. Organisation_Structure_Detail
17. Organisation_Type
18. Task_Formation_Type
19. Unit_Type

Person

1. Person_Identification_Document
2. Person_Item
3. Person_Item_Type
4. Person_Language_Skill
5. Person_Position
6. Person_Status
7. Person_Type

Plans & Orders

1. Order_Status
2. Plan_Order_Assoc
3. Plan_Order_Component
4. Plan_Order_Component_Content
5. Plan_Order_Component_Content_Reference
6. Plan_Order_Component_Header_Content
7. Plan_Order_Component_Structure
8. Plan_Order_Distribution
9. Plan_Order_Distribution_Acknowledgement
10. Plan_Order_Header_Content
11. Plan_Order_Item
12. Plan_Status

Report

1. Absolute_Reporting_Data
2. Relative_Reporting_Data

REFERENCES AND LINKS

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