An Overview of UPDM

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Introduction

UML (Unified Modeling Language) is used as a modeling language for design and construction of major software systems. These are usually automated systems ready to carry out specific functionality. By contrast, when human organizations interact to achieve a common task, the functionality is more dynamic, yet the interacting entities must still be carefully coordinated to achieve a strategic outcome. This may include strategic interaction ranging from joint military task forces, interaction between major government departments, interaction of subsidiaries in multinational conglomerates, through to interaction between fire search and rescue task forces.

Modeling this type of strategic interaction is not new, however until now there has not been a unified modeling notation for doing so. The Unified Profile for DoDAF/MODAF (UPDM) addresses this concern – providing a formal language for modeling strategic interaction between organizations.

This whitepaper explains the core UPDM concepts, with examples created by Enterprise Architect's MDG technology for UPDM.

Why use UPDM

The core purpose of UPDM is to document a strategic coordination of a process (a task) and ensuring the underlying groups or entities involved are not only able to interact cooperatively, but are able to interact effectively, with clear definitions for interoperability ranging from the protocols used, through to hardware connectivity, ensuring all are following the guidelines laid out to achieve a combined forces goal.

Modeling inter-taskforce operations or inter-governmental operations involves modeling a larger 'System' based on cooperation of lesser systems. This involves:

- Effective communication of complex architectures
- Using a globally accepted design format

In order to:

- Reduce assumptions, misconceptions
- Increase visibility
- Mitigate risks
- Propagate a consistent model between task forces and departments to achieve consistent, coordinated outcomes

From UML to UPDM

Top-down development of a concept through to an application can involve modeling using the UML, as well as a process (or methodology) to develop the usable application. With UML there is consistency in the design modeled as it uses a common visual representation along with a common language able to be understood by any party involved in the process.

With UPDM what is being visually modeled is a concept of a joint task operation. This model defines the interaction of entities following a process to achieve a strategic...
outcome, while ensuring a coordinated cooperation and interaction between all parties involved.

UPDM is an extension of UML that allows for the design of strategic interaction, but being based on a common foundation language, it is able to be utilized internationally by all parties.

**UPDM Overview**

When dealing with a large system or operations involving separate entities undergoing a joint task interaction, you need to manage: the complexity, the operations to be performed, the communication between entities, as well as the costs and risks involved. Modeling allows those involved in design and administration to communicate and view the concepts behind an operation, re-assess the options and clarify the direction to ensure that the joint task forces can cooperate and achieve the outcome defined.

UPDM includes seven Viewpoints that support a progressive specification process – from a broad conceptual model through to well-defined, low-level designs.

The seven UPDM levels or 'Viewpoints' are:

- All Views
- Operational Views
- Service Orientated Views
- Strategic Views
- System Views
- Acquisition Views
- Technical Views

The process of specifying a UPDM model starts with a strategic overview and progresses down a series of more details views.

The benefits that UPDM provides in this process include:

- Modeling of the strategic interaction of services with well defined capabilities and an operational flow
- Getting more succinct communications between the different bodies involved
- Ability to reuse modeling across different tasks, different services and different domains
- Reducing the cycle time from concept to implementation

**Integrated Modeling**

Principally, UPDM models are defined using profiles from the UPDM specification. However other standard modeling notations, such as UML, SysML, SoaML and ODM can be used.

Figure 2 shows the cross-references that may exist between views. These cross-references may include relationships between elements or elements that are reused across multiple views. The figure also highlights other modeling notations that are commonly incorporated into specific views.
The model development can start with a top-down approach, but should involve an iterative process. For example, over time, a change in the Acquisitions and Technical view may result in corresponding updates to the Strategic or Operations views.

**Coordinating Complex Interactions**

When dealing with a complex task involving interaction between diverse groups; to maintain a consistent approach by all parties involved, there needs to be a method of managing the information interchanged by the various teams along with establishing common protocols in this interaction. This requires:

- A staged process with investment of different resources
- One common model accessible across the team
- Connectivity between entities being modeled
- A definition language common to all teams
A UPDM model must accommodate the different disciplines used in the operation, as well as the interaction between these groups. Consider the analogy of a building project. Draft drawings, or blue prints, for the building must be layered so as to outline the details appropriate to the different disciplines involved in the construction project, such as foundation concreting, glazing, plumbing, electrical layout etc. Each blueprint must be specified in a language common to all parties that rely on it to complete the project.

When dealing with a project that requires cooperative interaction between teams with multiple skill-sets and multiple facilities, it is critical to have one central model to help coordinate the teams. The shared model must support cross-linking between the entities being modeled and a common language to provide:

- One design source that defines the task cooperation
- A common visual notation
- Common information for managing team interactions in achieving the task direction

This is to:

- Improve collaboration with a common format
- Support interoperability and conversant collaboration between task forces
- Minimize the cycle times for deployment

All to achieve better team based interaction and collaboration.

**Options for Effective UPDM Modeling**

Apart from using diagrams for modeling there are numerous other options that contribute to effective modeling and interactivity. Being a model driven development environment, Enterprise Architect has many features that complement UPDM modeling. These include:

**Traceability**

Joint tasks operations can involve changes to strategic requirements, which have downstream impacts, and should be documented accordingly. These changes at the strategic level must be linked to corresponding changes at the technical level. Both are critical to ensure the operational changes are implemented in any future tasks performed.

When we connect models across various levels of abstraction, we can ‘drill-down’ from a high-level description of our system, and identify each of the design artifacts that realize some given functionality. Having this traceability means that we can automatically interrogate our model to answer key questions like “Are we delivering exactly what was agreed?”

UPDM has specific Views that define the necessary traceability like the SvcV-5 Operational Activity to Services Traceability Matrix. Figure 3 is an example of using Enterprise Architect’s Relationship Matrix and the Traceability view to trace Operational relationships.
For more details on these features see:

- [Traceability Tools](#)

**Milestones and Scheduling**

In UPDM, we describe ourselves organizationally, by defining our project portfolios together with milestones and scheduling.

When looking at the long term evolution of a joint task operation, at some point the system will need to move from one whole generation, based around one technology onto another generation based on the latest technology. Documenting this change is accommodated in a number of the UPDM Views (All Views, Acquisition View, Technical View etc.). This is critical for maintaining consistency in performing the tasks and operations.
Complementary to the UPDM Milestones and Scheduling are a number of Enterprise Architect tools for Project Management including Gantt Chart representation and time-lined resource usage.

For more details on these features see:

- Project Management
- Gap Analysis

**Collaboration Tools**

Critical to any joint task operation is the ability to collaborate in achieving the strategic outcome. When modeling, the same applies. Enterprise Architect provides a number of key tools for collaborative model development, including:

- Model Mail - supports messaging between team members to help resolve issues directly within the modeling environment. Direct links to relevant model elements can be included in messages.
- Team Review - a model-based forum for posting comments
- Project Management - used for Task Allocation

**Change Management**

UPDM supports models of changes that occur in the project. These can be enhanced by a variety of Enterprise Architect features for change management. Version Control, Audit tracking and the Baseline-Difference tools are some examples.

For more details on these features see:

- Manage Baselines
- Model Differences - Baseline Compare
- Visual Changes to Diagrams
- Version Control
Simulation

Using simulation you can check your models for correctness, before committing resources to implementing a given design – potentially avoiding costs associated with design flaws.

Figure 5 is an example of a State Machine simulation depicting the flight plan for a Search and Rescue operation.

Ontologies and Dictionaries

The UPDM AV-2 view is intended to provide an overall glossary or dictionary for the model. This maintains consistency and clarity of meaning of terms used to define external items referenced within your model. This dictionary can range from a simple document defining the key terms, the use of the Enterprise Architect Model Glossary, through to defining an Ontology of terms using the Enterprise Architect ODM OWL/RDF MDG Technology.

For more options see the Help topics on:

- Model Glossary.
- ODM MDG Technology

Data Modeling

The OV-7 view (DoDAF DIV-1/DIV-2) defines domain data types and their interrelationships as is commonly defined in a Logical Data Model. This can be used in
conjunction with existing Enterprise Architect data modeling features, allowing you to define Conceptual Data models, Logical Data model and DBMS-specific Physical Data models. MDA Transformations can also be used to generate Physical models from the Logical models.

For more detail see the

- Data Modeling
- MDA transforms and DDL transformations

This above covers a number of the key features that are directly related to UPDM modeling, there are many other Enterprise Architect features and languages that can be used in support of the UPDM modeling.

**UPDM Across Agencies**

OMG modeling standards can also serve to facilitate better decision-making in organizations other than joint task defense force operations. These same standards can be applied in defining policy-based information sharing across complex organizations like inter-departmental cooperation within a Government or strategically defining cooperation between various subsidiaries of corporate conglomerates.

For instance UPDM can be applied to inter-governmental interoperability, such as exchanges between state and federal government departments. One example of this would be coordinated operations involving state and federal law-enforcement agencies. With a well-defined information exchange and service architecture, we can determine whether the policies within each agency allow for satisfactory information exchange between them. Then model the process for cooperation and interchange between these agencies.

UPDM can be used to describe this process organizationally, by defining the project portfolios together with milestones and scheduling. We can then use that metadata to deliver a strategic vision by tracing the vision against goals, capabilities, and when/how these are intended to be delivered.

The modeling of these processes can be combined with our Systems models defining the departmental resources and their roles, together with the services they provide and the exchanges conducted between them.

We can also define a collection of technical resources including Standards, Policies, Rules and Regulations under which our Systems, Strategy and Programs are governed.
Conclusion

Operations that involve coordinated interaction of entities striving to achieve a strategic outcome, require well-defined processes using a specific structural language. UPDM provides a unified modeling framework for this type of strategic activity.

Equipped with the ability to define processes, complex systems, domain knowledge and project portfolios, you can use UPDM to combine these and provide a high level view of your entire architecture. This includes describing the operational activities, providing the context of how these activities fit together, along with the ability to appoint necessary resources to each activity.

UPDM also helps you to define the details of these activities – to describe the sequence of actions undertaken, the resources required and the cooperation between the task forces to achieve the desired outcome.