A FRAMEWORK TO MANAGE INFORMATION MODELS – THE PLANETARY DATA SYSTEM CASE STUDY. J. S. Hughes[1], D. J. Crichton[1] and C. A. Mattmann[1], [1]Jet Propulsion Laboratory (4800 Oak Grove Dr. Pasadena, CA 91109, {steve.hughes@jpl.nasa.gov, dan.crichton@jpl.nasa.gov, chris.mattmann@jpl.nasa.gov}).

Introduction: The Planetary Data System (PDS) Information Model has been formally captured in a tool framework based on an ontology modeling tool. Originally developed in the late 1980's, the information model had become inconsistent in many areas causing significant problems in data collection, preparation and validation. A PDS team determined the most reasonable interpretations of the model from existing documentation and developed an ontology. A specification document, which can be automatically generated from the framework, now provides a basis for streamlining, simplifying and improving the PDS standards for use both within PDS and internationally. This is critical as PDS begins a major upgrade towards the next generation of its standards.

Information Model: The information model is the foundation on which an information system is built. It defines the entities to be processed, their attributes, and the relationships that add meaning. It also provides the source for the descriptors, taxonomies, and classification schemes required by science information systems to meet their requirements. The development and subsequent management of the information model is the single most significant factor in the development of a successful information system.

Information Model Management: The tool framework supports the management of an information model with the rigor typically afforded to software development. This framework provides for evolutionary and collaborative development independent of system implementation choices. Once captured, the modeling information can be exported to various languages and notations for documentation and semiautonomous generation of code for traditional and semantic web applications. This framework is being successfully used for several science information systems including the Planetary Data System (PDS) [1,5], the International Planetary Data Alliance (IPDA) [2], the National Cancer Institute's Early Detection Research Network (EDRN) [3], and several Consultative Committee for Space Data Systems (CCSDS) projects.

The PDS Information Model: The PDS archives and distributes scientific data from NASA planetary missions, astronomical observations, and laboratory measurements. The PDS information model - also known as a metadata model – defines the data, missions, instruments, repositories, and people that are part of the planetary science domain. The defined concepts and terms allow people and computers to accurately communicate and subsequently support data storage, archive, search, locate, retrieval, processing, and reasoning.

Ontology Modeling Tool: The core component of the framework is an ontology modeling tool [4,6] into which the information model is captured. The content can be exported to semantic web languages such as the Web Ontology Language (OWL) and Resource Description Framework (RDF). The content can also be written to XML Metadata Interchange (XMI) files for import into UML tools allowing the generation of code and the expression of the model in a variety of notations including concept maps and class diagrams. Figure 1 illustrates a portion of the PDS conceptual model using a concept map.

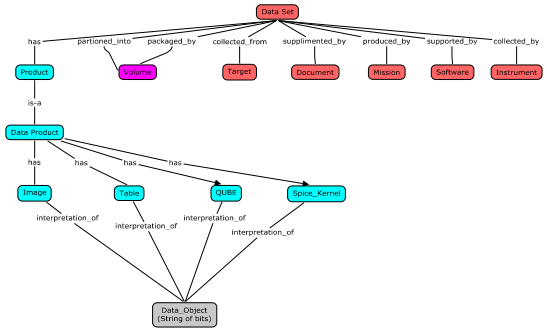

Figure 1 – Example Concept Map

Significance: The tool framework supports a model driven architecture. It formally captures the information model and allows the content to be used directly in the development process. This approach is expected to make the PDS more agile as it supports the continually changing Planetary Science domain.

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