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An OpenSEA Framework using ISO24707 Common Logic

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***Abstract*—We propose an OpenSEA (Open Semantic Enterprise Architecture) as a conceptual framework for enterprise interoperability that combines ontology of enterprise architecture with an abstract syntax for logic systems. This framework could provide the foundations for different domains using different ontologies and different systems to interoperate at a semantic level and provide meaningful descriptions to all levels of the enterprise. As such business processes, web services, data and skills could all be traded across open networks. This framework refers to the open standards of TOGAF9 and ISO 24707:2007 Common Logic to create a Semantic Enterprise Architecture, hence OpenSEA. Specifically, we provide an overview of how terms used by TOGAF can be represented using Common Logic and specialized with different logic systems and terminology yet retaining enough commonality to allow meaningful communication across open networks.**

Keywords-component; Ontology, Logic, Semantic, Enterprise Architecture, TOGAF, Zachman, Service Oriented Architecture (SOA)

I. INTRODUCTION

In order for Service Oriented Architecture to evolve the foundations should be in place for an 'Internet of Services', as described by the International Research Forum in 2008 [1] . The forum identified that services should be machine readable, extend beyond web services to include the XaaS marketplace, they should have better ontologies and, ideally, be semantically enriched.

Any efforts to create this type of 'one size fits all' solution will typically encounter silos of data and information as services become specialized. Furthermore, efforts to incorporate semantic reasoning or descriptions will encounter the problems associated with different logic systems, different ontologies and different syntax. A degree of commonality needs to be retained which combines strict governance and control with the free market.

II. OPENSEA

Bridges [2] observed that TOGAF's abstract language for enterprises provided the basis for an upper ontology for enterprises as it is designed to be extendable rather than specific to a given market or industry sector. It was observed that the problems associated with enabling semantic interoperability could be addressed by the standards provided by ISO24707:2007 Common Logic. This lead to a proposed framework coined by the term OpenSEA, to reflect the open standards that are combined to allow for the description of semantic enterprise architectures.

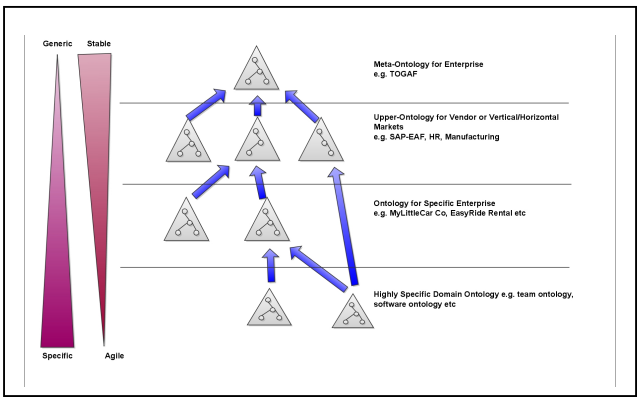

Figure 1. A Graphical Representation of OpenSEA [2]

Figure 1 shows how OpenSEA uses TOGAF as an upper ontology that is generic, highly stable and strictly governed. Subdomains extend the terms provided by TOGAF to become more specific and could include a domain for a vendor, vertical or horizontal market (again, generic and governed) down to highly specific domains that represent a specialist group or even a team of workers. These specialized domains are agile and loosely governed to reflect the dynamic nature of language [3] yet a commonality is always retained with the more stable, shared and generalized ontologies.

III. THE NEED FOR A COMMON LOGIC

Semantic systems should provide the capability to recognize, represent and react to the meaning of data in the context of the goals of the user [4]. However, two legacy systems can be brought to interoperate better than two semantic systems using different ontologies [4]. It is also observed that the Semantic Web's RDF has limitations in terms of its descriptive power [5].

To assist, ISO 24707:2007 Common Logic (CL) proposes a standardized approach to develop interoperation between systems using different formalisms and representations. 'The intent is that the content of any system

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that using first-order logic can be represented in this International Standard. The purpose is to facilitate the interchange of first-order logic-based information between systems' [6].

IV. Previous Examples of Formalising Enterrprise Architrecture

Sowa and Zachman [7] used Conceptual Graphs (CG) to formalize Zachman's original Information System Architecture (ISA). Conceptual Graph Interchange Format (CLIF) is now recognized as a CL compliant dialect and given the rise of Zachman's Enterprise Architecture Framework the early interpretations in [7] re-emerge in its relevance to OpenSEA. They showed how CG could formalize all levels of the ISA and provide a single tool for modeling and interrelating data flow diagrams, organization charts, functions, motivation etc. This introduces the opportunity to interconnect the perception of different agents within a unified model as shown in Figure 2.

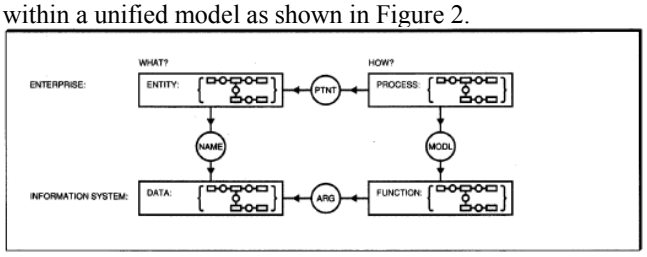

Figure 2. Four Cells of Zachman's ISA and their Inter-relationships [7]

Extending the notion beyond a single tool and beyond the boundaries of a single enterprise, one can see how powerful OpenSEA could be in providing this degree of interoperability between systems and domains.

V. Objects within OpenSEA

TOGAF proposes that all metamodel objects have a number of Attributes including ID, Name, Description, Category, Source and Owner [8].

Metamodel Object	Metamodel Attribute	Description
All Metamodel Objects	ID	Unique identifier for the architecture object.
	Name	Brief name of the architecture object.
	Description	Textual description of the architecture object.
	Category	User-definable categorization taxonomy for each metamodel object.
	Source	Location from where the information was collected.
	Owner	Owner of the architecture object.

Within OpenSEA all instances, concepts, and relations are represented as objects identified by a URL which can be traced back to a root concept by means of the categorization rather than the domain name..

In this framework the objects can be defined in XCL, an XML of CL defined for communication across open networks. The ID, Category, Source and Owner are all represented using URLs, and the name and description by a human-readable text string. The attributes are extended with 'Definition', which provides for an XCL based definition of how the object is defined by other objects. It is this definition of the object by its inter-relationship with other objects that justifies the term 'Semantic'

'Category' is used as the means of embedding the well recognized 'IS-A' relationship and thereby allows for different systems to trace the commonality between two objects in a similar way to how DNS allows the communication between disparate domains. A crucial difference being that an OpenSEA allows for multiple categorizations and the commonality is independent of domain name, thereby allowing for the extension of definitions across and within domains and enterprises.

VI. Further Research

Recognizing that this work is still at an early stage, we are interested in re-examining the work of Sowa and Zachman using the OpenSEA framework and the opportunities provided by using CL tools to enrich the knowledge of participating domains through business rules and inference.

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