Ontology Summit 2012 Communique[1]

Ontology for Big Systems

1. Focus & Scope

The 2012 Ontology Summit, ***Ontology for Big Systems***, sought to explore, identify and articulate how ontology, its methods and paradigms, can bring value to the architecture and engineering of Big Systems throughout their full lifecycles.

The term Big Systems was intentionally vague and intended to cover a large scope that included many of the terms encountered in the media and engineering including:

- Big Data and the systems that handle it
- complex systems including those that support processing, physical or information, and socio-technical economic interactions/processes
- intelligent or smart systems…

As is traditional with the Ontology Summit series, the results were captured in the form of a communiqué, with expanded supporting material provided on the web[2].

2. Summary

The principal goal of the summit was to bring together and foster collaboration between the ontology community, systems engineering community, and stakeholders in Big Systems. The common thread that emerged for Big Systems and Big Data was models and modeling; the status of models as an authoritative source of information for these systems; the need to have models with greater fidelity and interoperability that adequately represent the complexity of the systems and their (operational) environments …

Among the current approaches to mitigate some of the complexity and cost factors associated with engineering are executable architectures and model based engineering. Each approach involves a model to either understand the thing being designed or to provide a predictive base of design. In each case current methodologies and tools often fall short of providing:

- sufficient rigor in their ability to adequately represent the system for the needs of the entire engineering lifecycle and its environment
- adequate ontological analysis of the domain or its constituent parts
- explicit semantics (usually only in the minds of the modelers and therefore prone to variation between modelers and inconsistency across disciplines)
- the use of logical inferencing to automate processes…

3. Introduction

In the past decade, more data has been collected, more video has been produced and more information has been published than in all of previous human history. At the same time, with the advent of the computer, digital representations, and the Internet, it has been possible to model more of the complexity of systems, connect more people, and connect more (information) systems.

… The tracks were as follows:

- Big Systems Engineering
- Big Data Challenge
- Large Scale Domain Applications
- Quality Cross Track
- Federation and Integration of Systems

3.1. Big Systems Engineering

Engineers and designers have always used a variety of models as part of their disciplines. Designing a car, a power plant, information application, or a transportation system relies heavily on creating a model of the system. Similarly, models are used extensively in trying to understand how complex systems such as the human body or climate works. In the computing age, it has become far easier to create and share these models, and given the scale and complexity of the systems being modeled, these models are becoming the authoritative source …

There are various standardization efforts underway to advance the semantic and ontological foundations, from the development of **ISO 15926** (a standard for data integration, sharing, exchange, and hand-over between computer systems), to providing formal semantics for the Unified Modeling Language. Similarly, groups are working to build repositories of ontologies, or libraries of ontology patterns - snippets that formalize important aspects of reality such as "part-of" or "is-a"…

4. Recommendations & Observations

This section represents a distillation of the discussion in this year's summit focused on recommendations and observations, beginning with a listing followed by more detailed explanations…

5. Conclusion

Big Systems can garner benefits in many ways from the use of ontology throughout their full lifecycles. To more completely integrate ontology and ontological analysis into the engineering community and its processes, the skills most needed include a combined understanding of a scientific or engineering discipline and knowledge of ontological analysis and ontology-based technologies. To realize this combination a transition based on existing paradigms and tools will need to be exploited in order to create the infrastructure, both technical and social (i.e. human systems integration), needed for quality ontology development and more general use…

The engineering ecosystem and Big Data users have much to gain from the use of ontology and ontological analysis. These capabilities can provide the key to engineer better systems, reduce costs and accelerate the process of scientific discovery and innovation.

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[1] This is the final version of the communique. Posted April 13, 2012. http://ontolog.cim3.net/OntologySummit/2012/communique.html (*in short*).
2 мая 2012 члены редколлегии журнала, являющиеся членами IAOA, одобрили и присоединились к официальному сообщению, подготовленному к саммиту по Онтологии для больших систем.

[2] http://ontolog.cim3.net/cgi-bin/wiki.pl?OntologySummit2012