BACnet Ontology Hackathon

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1. Objective and Goals

The objective of this Hackathon is to review an OWL ontology that was built from the ASN.1 productions in the BACnet™ standard. It is early in the ontology development lifecycle.

BACnet™ is a communications protocol for Building Automation and Control Systems (BACS) developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). BACnet is an American national standard, a European standard, a national standard in more than 30 countries, and an ISO global standard. The protocol is supported and maintained by ASHRAE Standing Standard Project Committee 135 (SSPC-135).

2. Challenges

There are two sets of challenges; intrinsic - those related to developing an ontology that properly models what is described in the standard, and extrinsic - where the standard uses terminology that is also used in other standards, but maybe inconsistent with those other standards.

2.1 Intrinsic Challenge

BACnet specifies not just the "on the wire" encoding and decoding of communications requests and responses, but also a rich model of "objects" and "properties". Properties have restrictions on their data types and values which may be atomic values (booleans, integers, strings, etc) or structured data (lists of composite objects). Many properties are optional, and in some cases optional properties are grouped together so if some specific property exists then another property must also exist in a BACnet conferment device.

Clause 21 of the standard specifies the request and response protocol data units in ASN.1 productions, and Annex C specifies the object types and properties as ASN.1, but both are woefully inadequate for formal model analysis. However, they do provide a lexicon and naming convention which could be used to build a ontology.

2.2 Extrinsic Challenge

The building automation industry is similar to the industrial process control industry and shares may of the same basic concepts and terminology. Formally matching these concepts will facilitate software developers developing systems that can provide a holistic view of operational performance and energy use throughout a campus that may include office, research, and manufacturing buildings.

Similarly, the OGC Observation and Measurement Model and the W3C Semantic Sensor Network Ontology share many of the same concepts and relationships with building automation sensor networks.

There are a variety of other standards which are being incorporated into new standards under development, for example, ISO 15926, IEC 61850 and the WXXM Weather Model are being incorporated into a new Facility Smart Grid Information Model (FSGIM) being built as part of the national smart grid initiative. An OWL model of the FSGIM is being developed, and BACnet would be considered one of its extrinsic stakeholders, so there is a great opportunity to bridge the two together.

3. Deliverables

The resulting OWL file and supporting documentation will be submitted to SSPC-135 for future inclusion into the standard.

4. Process Expectations

This Hackathon will begin with the RDF/RDFS transliteration produced by a script. It will be available in OWL Functional Syntax and RDF/XML that can be successfully imported into NeOn and Protégé with the expectation that the same format will be acceptable to other tools. The "hacking" will be a review of the development process and design considerations followed by a review of the output of analysis tools. There will be an ongoing discussion of the changes that should be made to the model to re-align it to best practices and/or satisfy the recommendations of the tools.