

Delivery Context Ontology Evolution

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FIT-350405-2007-1
FIT-350401-2006-2

Background

- The Delivery Context Ontology provides a formal model of the characteristics of the environment in which devices interact with the Web or other services.
- The DC includes the characteristics of the device, the software used to access the service and the network providing the connection among others.
- The DC Ontology is intended to serve as a common understanding of the Context enabling
 - The creation of interoperable Context Vocabularies, such as the DDR Core Vocabulary
 - The definition of domain-specific entities based on standard properties and classes
 - The interoperability between Context APIs, such as the DDR Simple API or DCCI

General Issues

- Unmanageable big file containing around 100 classes and properties
 - It is impossible to check consistency
 - Edition cannot be shared
- Inconvenient Units representation
- Completeness
 - Are there additional fundamental classes and properties that should be included?
- Simplification (more generic properties, less maintenance overhead)
- Understandability → Be more graphic!

Modularization

- Issues
 - owl:imports is not versatile as there can be problems with circled importations
 - Protege is not very good at working with modular ontologies based on distributed namespace URIs
- Proposed Actions
 - Refactor classes and properties in different namespaces
 - Using the Protege 3.3 Refactoring Wizard
 - Develop a custom Protege plugin to:
 - Isolate (in different files) classes and properties belonging to the same namespace
 - Isolate (in different files) example instances from the classes themselves
 - Combine in one file “whole ontology” for editing purposes
 - Define general purpose classes ready-to-be-used by sub-ontologies
 - Define the rules to be followed by those creating compliant sub-ontology modules

Proposed Sub-Ontology Modules

- Each module will have its own namespace URI with a common base
 - Ex: <http://www.w3.org/2007/uwa/context/software.owl#>
 - <http://www.w3.org/2007/uwa/context/hardware.owl#>
- Common Entities Module : common.owl
 - General purpose classes and properties
 - Referenced by every other module
- Hardware Entities Module : hardware.owl
- Software Entities Module : software.owl
- Web Entities Module : web.owl
- Java Entities Module : java.owl
- Location Entities Module : location.owl
- Network Entities Module : network.owl
- Delivery Context Module : deliverycontext.owl

Units Issue

- Premise 1: we want to represent measurable quantities in the Delivery Context ontology (device weight, screen width, etc.)
- Premise 2: there is no explicit support in RDF nor OWL to represent measurable quantities
- The approach currently used in the DC ontology is questionable:
 - Escalar values (numbers) are represented as RDF instances. RDF has an special kind of node (literal node) for this purpose.
 - Centimeters should not be a class. A class is a collection of instances (objects). What does it mean an instance of Centimeters?
 - 15 centimeters should not be an instance of Centimeters. It “is a” length, not a Centimeter.
 - What does it mean $\text{Centimeters} \subseteq \text{PhysicalLength}$? Subclassification defines subsets of objects. Centimeters are a unit of measurement, not a length.
 - It is not clear whether equal lengths should share the same instance of Centimeters

Units : Proposed solution

- Divide and conquer:
 - 1) How to model units of measurement? → we need an ontology of measurement units
 - CTIC designed and published a domain-independent units of measurement ontology (MUO), aligned with metrology standards.
 - 2) How to represent measurable quantities in OWL/RDF? → we need an usage manual
 - A user's manual is available: “How to apply MUO to your ontology”
 - 3) Which is the URI for each measurement unit? → we need a shared vocabulary
 - The MUO ontology is populated with hundreds of instances automatically extracted from UCUM.
 - 4) How to capture conversions between units?
 - MUO does not attempt to capture conversions. DL reasoners cannot compute them, anyway. Conversions may be externalized to web services.

Next Steps

- Write a new **Last Call Working Draft** ready for October F2F meeting
 - Ontology modularization
 - Define the rules that allow third parties to create subontologies compliant with the Delivery Context Ontology
 - Define Conformance Rules for Vocabularies / APIs compliant the Ontology
 - Property Simplification
 - Base Classes enabling modularization
- Ask for feedback to the OMA regarding completeness and modularization
- Ask for feedback to the SW Groups about the proposed units solution
 - A WG Note / Rec for representing units on the Semantic Web
- Write an Ontology Primer (by the end of the year)

Ontology Primer

- Table of Contents
 - Overview of the Ontology
 - General Purpose Classes and Properties
 - Description of the different Modules
 - **Diagrams**
 - Relationship with APIs
 - **Ex. the DDR Simple API & DDR Core Vocabulary**
 - Relationship with Vocabularies
 - How to create a Vocabulary compliant with the Ontology
 - **Ex. the DDR Core Vocabulary**
 - Extending the Ontology
 - **Extending a module with a custom properties and classes**
 - **Creating a new sub-ontology module**
 - **Using the Protege Plugins**
 - Ontology Applications

References

- Delivery Context Ontology WD April 2008
<http://www.w3.org/TR/dcontology>
- DDR Core Vocabulary
<http://www.w3.org/TR/ddr-core-vocabulary/>
- DDR Simple API
<http://www.w3.org/TR/DDR-Simple-API>
- DCCI
<http://www.w3.org/TR/dpf>
- Analysis of alternatives for unit representation:
https://forge.morfeo-project.org/wiki_en/index.php/Measurement_units_in_ontologies
- Measurement units ontology (MUO), with instances and documentation: <http://purl.oclc.org/NET/muo/>
- Usage manual: “How to apply MUO to your ontology”:
https://forge.morfeo-project.org/wiki_en/index.php/How_to_use_MUO
- Design notes about MUO and its alignment with metrology standards:
https://forge.morfeo-project.org/wiki_en/index.php/Units_of_measurement_ontology
https://forge.morfeo-project.org/wiki_en/index.php/Formal_qualities_and_units
- About conversion between units of measurement:
https://forge.morfeo-project.org/wiki_en/index.php/Conversions_between_units_of_measurement

