techno-platform independance interpolation in HL7 ontologies

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Keywords : International Interoperability, Web Ontology Language, Ontology, UDA.

BACKGROUND: The Medical fraternity and the health care service sector have long acknowledged the need for smart, IT-based healthcare systems operating globally, affording *Semantic Interoperability* which is the regulated, authorized, meaningful exchange, storage, management, and access to valued healthcare information. This cues in *Health Level Seven* (HL7), the predominant *interoperability-related* global healthcare standard in operation today. Introduced in 1987 by the HL7 International Inc., the standard has evolved to its current version 3. This current *manifestation* however has been found to be difficult to implement and maintain. True *global semantic interoperability* which is the germinal goal of the HL7 standard, is still an illusion.

OBJECTIVE: This study focuses on the belief that the achievement of true global interoperability is rooted at the labyrinths of specifications development. Infusing simplicity and unperplexed uniformity in the nascent specifications development process, and the resulting derived *analytic*, *design*, and *semantic interoperability*, will suffuse true global *International Interoperability* in application. In addition, m*ulti-faceted interoperability interpolation* in these core processes would promote and enhance numerous allied activities as well, from domain requirements cross-checking, audit, and consensus, to *kindred* system development verification and validation. This was the thrust of this study, and this paper propounds a significant first step which is the injection of *techno-platform independence* in HL7 ontology representations.

METHOD: The HL7 v3 *Ontology* is the foundational structure upon which the HL7 standard is built. The *Web Ontology Language* (acronymed *OWL*) has been hitherto used to model HL7 ontologies. The latest *OWL* release version 2.0 became a W3C working draft in December 2008. Our proposed solution remodels all *OWL* artifacts using the newly-devised, *techno-platform independant Unified Data Atom(UDA*$^+$*)* representation, either first-hand or as a single-step transliteration. This is a significant first step towards the achievement of *multi-faceted, overarching interoperability* in the nascent HL7 specification development processes, and is truly a *leapfrog* in all current HL7 implementation goals. The achievement of the seemingly elusive, true *International Interoperability* would categorically be advanced by the findings of this study.

Typical OWL Segment – derived from [1]

```
<rdf:RDF>
.....
<owl:Ontology rdf:about="">
        <rdfs:comment>  Hospital  Ontology
</rdfs:comment>
.....
        <rdfs:label>  Hospital  Ontology
</rdfs:label>
</owl:Ontology>
.....
</rdf:RDF>

<owl:Class rdf:ID = "Patient">
        <rdfs:subClassOf  rdf:resource  =
"#Person"/> .
</owl:Class>
```

OWL is markup language used specifically for *ontology* modelling, and possesses certain modelling-specific structures such as *Property*, *PropertyRestrictions*, *Properties Characteristics.*

RESULTS: If U^+ denotes the set of transliterated, target *DataAtoms* $\{u_1, u_2, u_3, u_4, \ldots, u_k\}$ as a result of the *Equivalence* relation T^+ acting on the source *OWL* informational schema O, then

$$T^+ : O \rightarrow U^+ \quad (1)$$ where

O - Problem domain *OWL* super schema and

U^+ - Problem-related target UDA^+ super schema

$$U^+ \in \mathbf{U}(u_i \leftrightarrow u_j) \quad (2)$$
$$\{i, j, = 1, 2, .., k\}$$

where U^+ : set of target DataAtoms with implicit, complete interconnectivity, and

$\mathbf{U}$: union of bidirectionally inter-connected, target DataAtom pairings.

This proposed solution successfully proved that T^+ is an ***Equivalence*** relation being , ***Reflexive***, ***Symmetric***, and ***Transitive***. This confirms that the mapping T^+ produces a target *set* U^+ equivalent to the source set O. It also satisfies the *necessary* condition for the $O \longrightarrow U^+$ mapping. In addition, it was also proved that the algorithm T^+ is *Complete and Exhaustive*, and is also *Syntactically* and *Semantically* valid.

DISCUSSION AND CONCLUSIONS: This paper presents a pragmatic and practical approach to achieving true HL7 globalization and *International Interoperability*. It focuses on excavating and capitalizing on the abounding interoperability potential afforded by core specification development processes, and synergistically aggregating to achieve this exigent goal. Our proposed solution remodels all HL7 ontology-related artifacts in the *techo-platform independent, uniformly-applicable, newly-devised Unified Data Atom(UDA^+)* representation, either first-hand or as a single-step transliteration, with a view to accruing *inclusive* benefit in terms of broadbased, global use of HL7 and *International Interoperability*. Principally significant is that *analysis and design interoperability* amongst all stakeholders also derived as a ,filip by applying this solution, affording uniform, solution-oriented consensus. Indeed, this paper propounds an unerring, reliable, and secure approach to actualize overarching, ubiquitous exchange.

REFERENCES:

[1] "*What-When-How, In Depth Tutorials and Information*",http://what-when-ow.com/information –science –and -technology/ owl-web-ontology-language-information-science/. [2] Cleary, J., *"XML and DTDs"*, School of Information Science, University of Texas, 2004. [3] Bozzato, L., Braghin, S., Trombetta, A., *"A Method and Guidelines for the Cooperation of Ontologies and Relational Databases in Semantic Web Applications"*, Proceedings of the 2nd International Workshop on Semantic Digital Archives, 2012. [4] *"HL7 International New"*, Health Level 7 International, May 2011. [5] Kalfoglou, Y., Schorlemmer, M., *"Information Flow Based Ontology Mapping"*, Proceedings of the 1st International Conference on Ontologies, Databases and Application of Semantics, 2002.

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