

# Comments on the ONC Interoperability Roadmap Version 1.0

Submitted by members of the Yosemite Project Steering Committee

<http://YosemiteProject.org>

*Yosemite Project Mission:*

*Semantic interoperability of all structured healthcare information*

These comments pertain to the ONC interoperability roadmap version 1.0 as a whole, though they mostly pertain to sections on information representations and policy / governance. Here is an outline; the points are explained below.

Technical recommendations:

1. Authoritative URIs
2. Resolvable URIs
3. Machine-processable definitions in RDF
4. RDF as a "best available candidate" for a universal information representation
5. Crowd-sourced data translation rules
6. Semantic convergence of standards

Policy recommendations:

7. Eliminate IP barriers to interoperability
8. Stronger interoperability incentives

## Technical Recommendations

### 1. Authoritative URIs

ONC should encourage the creation and maintenance of authoritative URIs as unique identifiers for all concepts, terms, data types and models used in healthcare information exchange.

- The ONC should encourage standards organizations to issue stable URIs for all healthcare-related concepts and entities.
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- Linked definitions should be free and open for all data recipients to read, without royalties or other licensing barriers

### 2. Resolvable URIs

ONC should encourage all authoritative URIs (as in point #1) to return both machine and human readable definitions when dereferenced either in a web browser or by a computer system.

- Resolvable URIs should follow guidelines described by the W3C in *URIs for the Semantic Web*: <http://www.w3.org/TR/cooluris/>

- Returned information should include language specific labels, definitions, synonyms, examples of use, and type information (including parent types and children subtypes).
- Definitions should not have intellectual property barriers that would limit or interfere with their use for interoperability purposes. Definitions should be free and open so that any party can access to easily determine the precise meaning of the term or concept in question.

### **3. Machine-processable definitions in RDF**

ONC should encourage standards organizations to publish machine processable definitions of healthcare information standards, in conjunction with human-oriented definitions.

- Machine processable definitions should be expressed in RDF and related vocabularies such as OWL.
- Machine processable definitions are an important step toward semantic linkage between healthcare information standards and their eventual convergence on common semantic definitions across standards.

### **4. RDF as a "best available candidate" for a universal information representation**

ONC should recognize RDF as the "best available candidate" to act as a universal information representation for healthcare data, in order to provide a common semantic foundation across all healthcare information standards and data formats.

- ONC should encourage standards organizations to define mappings from existing and new healthcare information representations to RDF. Adoption of RDF as a universal information representation does *not* require that healthcare data be exchanged in a standard RDF *format*. RDF is format independent: it provides a semantic layer that captures information content independent of data format.

### **5. Crowd-sourced data translation rules**

ONC should encourage the creation of sharable, crowd-sourced translation rules, based on RDF as a universal information representation, to facilitate the interoperable translation of healthcare data between data formats, data models and vocabularies.

### **6. Semantic convergence of standards**

ONC should facilitate the semantic convergence of healthcare standards toward uniform, consistent meanings across all healthcare-related domains, based on RDF as a universal information representation.

- The Unified Medical Language System (UMLS) currently lists over 100 standard medical vocabularies. There is a lot of semantic overlap between them, but not consistency. The use of RDF as a common semantic layer would facilitate semantic convergence of overlapping but inconsistent definitions across standards.
- ONC should encourage the creation of a publicly usable standards hub that captures RDF definitions of all healthcare standards. Such a hub would encourage semantic

linkage between standards, help detect semantic inconsistencies between standards (which inhibit semantic convergence), and encourage semantic convergence toward shared, universal, fine-grained definitions.

## **Policy Recommendations**

### **7. Remove intellectual property barriers to interoperability**

ONC should push for the elimination of intellectual property (IP) barriers that impede interoperability in healthcare.

- ONC should strongly encourage the adoption and use of free and open standards. Any individual or organization should be able to access and use whatever standards are needed for the interoperable exchange of healthcare data, without royalties or other licensing barriers.
- ONC should strongly encourage organizations that currently publish healthcare vocabularies or other standards to evolve their business models and licensing terms to permit their standards to be freely used, *for interoperability purposes*, without royalty or licensing barriers. The ONC should encourage such organizations to explore alternative business and licensing models that would meet this national need for eliminating interoperability barriers while still remaining financially viable. As one possible example, royalties might be charged for the internal use of a standard within a healthcare organization for their operational needs. However, for inter-organizational exchange of this same information no royalty would be charged.

### **6. Stronger interoperability incentives**

Interoperability incentives -- carrot and/or sticks -- are essential to achieving interoperability. There is no natural business incentive for a healthcare provider to make its data interoperable with its competitors. The ONC roadmap correctly noted that "fee for service" payment model is a key barrier to interoperability and includes some good recommendations, but much more is needed.

- ONC should enact the strongest possible interoperability incentives to encourage all stakeholders to achieve interoperability.
- ONC should identify, articulate and publicize possible public policy changes that would encourage healthcare interoperability, such as changes to federal or state laws or regulations that could be enacted, but that the ONC itself would not have the power to enact.

We are pleased that the ONC has undertaken this roadmap, and would be happy to work with the ONC to further clarify and help enact these proposed changes.

**Signed by the following members of the Yosemite Project Steering Committee**

**David Booth, PhD**, is a senior software architect at Hawaii Resource Group and at Rancho BioSciences, using Semantic Web technology to make clinical healthcare data interoperable between diverse systems. He is also leading a joint HL7-W3C effort to defined an RDF ontology for FHIR. He previously worked at KnowMED, using Semantic Web technology for healthcare quality-of-care and clinical outcomes measurement, and at PanGenX, applying Semantic Web technology to genomics in support of personalized medicine. Before that he worked on Cleveland Clinic's SemanticDB project, which uses RDF and other semantic technologies to perform cardiovascular research. Prior to that was a software architect at HP Software. He was also a W3C Fellow from 2002 to 2005, where he worked on Web Services standards before becoming involved in Semantic Web technology. He holds a Ph.D. in Computer Science from UCLA.

**Conor Dowling** is CTO of Caregraf, which uses Semantic Web technologies to help health-care providers gather and analyze the information they create during the course of a patient's care. He is a specialist in clinical-data analytics with a focus on how the definition of clinical know-how and institutions shapes the description of patient care.

**Michel Dumontier, PhD**, is an Associate Professor of Medicine at Stanford University in the Stanford Center for Biomedical Informatics Research. His research focuses on methods to integrate large, heterogeneous clinical and biomedical data for discovery. His research interests include (1) developing novel therapeutics for rare and complex diseases, (2) elucidating the mechanism of drug-induced side-effects, and (3) optimizing multi-drug therapies to minimize undesirable side effects.

**Claude Nanjo, MA MPH**, is a Software Architect at Cognitive Medical Systems. He is also an active contributor to a number of HL7 and S&I clinical modeling initiatives including Health eDecision (HeD), the Clinical Quality Framework (CQF), and Fast Health Interoperable Resources (FHIR). At both Cognitive Medical Systems and Zynx Health, Claude has been involved in a number of research projects exploring the intersection between Clinical Decision Support and the Semantic Web. Prior to joining Zynx Health, Claude was engaged in research developing machine learning solutions to mine information on the Web. Claude studied at the University of California where he obtained a B.S. in Biochemistry, a B.A. in History as well as a Masters degree in Public Health and African Area Studies.

**Rafael Richards MD MS, US Department of Veterans Affairs.** Dr. Richards works on VA-DoD interagency semantic interoperability. He is an invited expert in the W3C Semantic Web Healthcare and Lifesciences work group, and member of the HL7-W3C standards convergence group focused on RDF representation of FHIR.