The Apelon DTS Plug-in for Protégé

Tony Weida, Derrick Butler and Richard Corzo
Apelon, Inc.

Introduction

The Apelon Distributed Terminology System (DTS) Plug-in integrates Protégé with a robust and scalable enterprise terminology server, thus offering Protégé users a rich variety of enhanced functionality and convenient access to regularly maintained and updated terminology content.

SAGE

The SAGE[1] project seeks to create a standards-based technology infrastructure for computable (machine executable) clinical guidelines that can be shared and readily deployed within different clinical information system platforms. The SAGE consortium consists of Apelon, IDX (lead), Intermountain Healthcare, Mayo Clinic, University of Nebraska Medical Center, and Stanford Medical Informatics.[2] SAGE has adopted Protégé as its guideline authoring workbench.

Clinical Guidelines

Clinical guidelines capture best practices for providing medical care. For example, a hypertension guideline might assist doctors and nurses by offering consensus recommendations for managing the treatment of a patient with high blood pressure. We believe that grounding guidelines in standard terminology makes them easier to author, explain, understand, share, localize and execute.

Medical Terminology

Standard medical terminology is a fundamental aspect of comparable clinical data, thus it is essential for outcomes analysis and decision support based on best practices. Terminologies are composed of *concepts* representing distinct ideas such as diseases, drugs, procedures, and so on. The concepts are often organized in a taxonomy (generalization hierarchy). Different terms (synonymous words or phrases) may refer to the same concept.

Distributed Terminology System

Apelon's DTS is a comprehensive terminology system with a client-server architecture. DTS employs a unified content model for uniform access to terminologies based on Description Logic (DL) such as SNOMED-CT as well as others like CPT, ICD, and LOINC. Apelon delivers all major medical terminologies (plus cross-terminology mappings) to DTS servers on a regular subscription basis, ensuring that the latest version is always available. Each standard terminology resides in a separate namespace so it can be independently updated and versioned. Local extensions are housed in separate namespaces. Change management facilities help users

---

reconcile their local extensions with newly released versions of standard terminologies. DTS includes a full-function API, a fat-client editor, a web-based browser, and numerous utilities. Configurable search mechanisms include spelling correction and stemming, wildcards, word permutations, etc. For more details, please see http://www.apelon.com.

DTS Plug-in

By plugging a DTS client into Protégé and surfacing elements of the DTS GUI through a tab widget and a family of slot widgets, Apelon makes the power of DTS directly available to Protégé users. After connecting to a DTS server, users can navigate and search multiple standard terminologies along with local extensions, then select relevant concepts and transparently incorporate them in a Protégé model. Protégé slots are populated with classes representing HL7 Coded Value references – essentially triplets consisting of a code system, version, and code identifier – that map to terminology concepts in DTS (or elsewhere). Those reference classes are organized in a hierarchy and managed by a garbage collection facility with incremental and batch processing options. Users can review and explicitly expunge deprecated references as appropriate. Building on Protégé's "allowed parents" mechanism, the plug-in supports context sensitive selection and validation of terminology references, plus manual override. It is important to emphasize that while authoring guidelines, a Protégé user is unconcerned with the underlying mapping mechanism. S/he simply creates, views, updates and deletes slot values and allowed parents as if they *are* DTS concepts, using familiar Protégé buttons and gestures.

The DTS plug-in also provides Protégé users with two unique representational facilities: concept expressions and runtime classification. C*oncept expressions* adapt familiar Boolean operators (and, or, not) to concisely define arbitrary subsets of existing concept taxonomies. For example, "hypertensive disease but not hypertensive renal disease and not hypertensive encephalopathy and not hypertensive heart disease and not malignant hypertension" identifies a SNOMED CT concept but excludes several of its children along with their descendants. In DL, classification is the process of automatically organizing a set of concepts into a taxonomy strictly according to their logical definitions, such that each concept is more specific than all its ancestors and more general than all its descendants. *Run-time classification* allows users to extend a standard DL-based terminology such as SNOMED CT with additional concepts expressed in the same language. Through run-time classification, users can see how those additional concepts *would* fit within the original taxonomy without compromising the original.

While integrating terminology services with Protégé, we have emphasized a fundamental software engineering principle: separation of concerns. Protégé, as the SAGE guideline workbench, is directly responsible for the guidelines themselves. That is consistent with Protégé's original intent. Terminology representation and access – along with thorny matters such as terminology extension, versioning, and change management – are delegated to a focused companion system which was specifically engineered and optimized from the ground up with terminology in mind. Nonetheless, through the elegant mechanism of plug-ins, Protégé users enjoy transparent terminology support as if it were all one environment. Indeed, in a very real sense it *is* one environment.