Apelon DTS on FHIR®

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Apelon Leadership

• Internationally recognized terminology experts

• Strong, active commitment to open standards

• Terminology tools and professional services used around the world
Apelon’s Distributed Terminology System (DTS)

An open source terminology server
What Is a Terminology Server?

• A Terminology Server is:
  • a networked software component
  • that centralizes terminology knowledge
    • local catalogs
    • required billing and data exchange codes
    • international standard vocabularies
  • and provides *terminology services* to other network applications.
# Abundance of Terminologies

## Code Systems
- CPT
- CVX
- DSM IV
- HCPCS
- HL7
- ICD-9-CM*
- ICD-10
- ICD-10-AM
- ICD-10-CA
- ICD-10-CM*
- ICD-10-PCS
- ICPC
- LOINC
- MedDRA
- MeSH
- Multum
- MVX
- NDF-RT*
- NANDA
- NIC
- NOC
- Race and Ethnicity
- RxNorm
- SNOMED CT
- UMDNS*
- UNII
- International translations
- Additional code systems can be made available

## Mappings
- CPT to CVX
- CPT to SNOMED CT
- ICD-9-CM to SNOMED CT
- ICD-9-CM to ICD-10-CM/PCS (GEM)
- ICD-10-CM /PCS to ICD-9-CM (GEM)
- ICD-10-CM/PCS to ICD-9-CM (Reimbursement)
- RxNorm to proprietary (and inverse)
- SNOMED CT to CPT
- SNOMED CT to ICD-9-CM
- Comprehensive support for UMLS CUIs

## Subsets/Value Sets
- VA/KP Problem List
- Core Problem List
- LOINC Common Lab Orders Value Set
- Meaningful Use Subsets
- Quality Metric Subsets

*Code Systems developed and managed with Apelon tools and services*
Examples of Terminology Services

- **Term/name normalization:**
  What is SNOMED CT name for “heart attack”? *Myocardial Infarction*

- **Code translation**
  What is the ICD-9 code for *Myocardial Infarction*? 410.91

- **Grouping and aggregation**
  Is *Myocardial Infarction* a *Cardiac Disease*? True

- **Clinical knowledge**
  What drug treats *Myocardial Infarction*? Streptokinase

- **Quality Measure Value Set Validation**
  Is a ICD-9-CM code 648.04 in the Diabetes Diagnosis eCQM value set? True
Distributed Terminology System (DTS)

- Leading open-source terminology server
- Supports both standard and local terminologies
  - Searching
  - Browsing
  - Modeling
  - Extension
  - Mapping
  - Run-time services
DTS: The single source of truth

- Integration of all core terminologies into a common framework
- Automated and configurable terminology and value set updates
- Versioning
  - All terminology versions form point of integration into DTS are available in a single knowledge base
  - All user terminology artifacts (value sets, mappings, localizations) are versioned and can be audited
- Terminology authoring
  - Local code systems from flat lists to complex ontologies
  - Enumerated and logically defined value sets
  - Cross-terminology mappings
  - Local names, codes, other attributes
- Full-featured, customizable Java API and SOAP Web Services
- Open source (http://apelondts.org)
  - FHIR® integration
DTS Value Sets

DTS value sets can be constructed using enumerated lists and/or logical definitions.
DTS Components

• Knowledge Base (Content)
• Server
• Client API
• GUI applications
• Utilities and samples
• Subscription content service
• Professional support
Distributed Terminology System (DTS)
Use Case

Application Developer
• Wants to utilize a FHIR compliant Terminology Service
  • Access standard terminologies to validate codes, utilize value sets and translations
  • Utilize the FHIR standard
• While avoiding specifics of
  • Parsing FHIR messages and responses
DTS on FHIR

Make Terminology Services Simple to Integrate!
Step 1: Download the jar file

http://www.apelondts.org/Downloads/Software.aspx
Step 2: Add the jar file to your project
Step 3: FHIR Away!

DtsHttpRequestClient client = new DtsHttpRequestClient("http://fhir.ext.apelon.com/dtsserverws/fhir", "dtsadminuser", "dtsadmin");
List<ValueSetDvo> valueSet = DtsValueSetFactory.getValueSet("v2-0001", client);
Integration of FHIR Terminology Services

- Easy (almost trivial)
- Low Risk (encapsulated)
- Efficient (complexity of terminology is kept in a black box)
An Example DTS Terminology
Service Architecture

Application
EHR/EMR
Data Warehouse
Data Mart
Analytics Engine
etc.

Staging
DTS Validation
Approval

Patient

Accept
Edit
Reject
Patient Data Validation

- JSON and XML fully supported
- Object marshalling and manipulation
- FHIR messaging exposed and encapsulated
  - Do your own message processing
  - Just deal with POJOs
- 100% Touchstone tests passing
Patient Condition Validation

Got 100 conditions
Got 97 passes.
Got 3 fails.

http://snomed.info/sct: (368581000119106)
Neuropathy due to type 2 diabetes mellitus (disorder)

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Neuropathy due to type 2 diabetes mellitus (disorder)
FHIR Resources Supported by DTS Validation

- Patient
- AllergyIntolerance
- Condition
- Procedure
- FamilyMemberHistory
- ClinicalImpression
- DetectedIssue
- CarePlan
- CareTeam
- Goal
- ReferralRequest
- ProcedureRequest
- RiskAssessment
- VisionPrescription
- NutritionRequest
Patient Condition Validation
Example: Condition Record

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Condition xmlns="http://hl7.org/fhir" xmlns:ns2="http://www.w3.org/1999/xhtml">
  <id value="5849b677367120d02b6e3ee7"/>
  <clinicalStatus value="active"/>
  <verificationStatus value="confirmed"/>
  <code>
    <coding>
      <system value="http://snomed.info/sct"/>
      <code value="368581000119106"/>
      <display value="Neuropathy due to type 2 diabetes mellitus (disorder)"/>
    </coding>
  </code>
  <onsetDateTime value="2007-08-10T23:39:07-04:00"/>
</Condition>
```
Patient Condition Validation
Example: Validation Response

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Parameters xmlns="http://hl7.org/fhir">
  <id value="decefad1-7b28-4b7f-8492-5fd4890566d5"/>
  <parameter id="35383be4-4a55-490b-bef5-91f7f6b6b3d0">
    <name value="result"/>
    <valueBoolean id="0ffc938b-0fa7-4886-b377-bfa9ced76c4f" value="false"/>
  </parameter>
  <parameter id="08b9b17c-e98c-47b4-b3ed-6073f004059c">
    <name value="message"/>
    <valueString value="Unknown code '36858100119106' in system 'http://snomed.info/sct'."/>
  </parameter>
</Parameters>
```
Find the Missing Concept

Apelon DTSEditor 4.5.1-688 - Default DTS Layout

Search: Concepts
Status: All
Page Size: 10
Search For: Neuropathy due to type 2 diabetes mellitus (disorder)
Search In: Namespace
Namespace: All
Version: 27-Feb-2017
Search Results: 2 Matches (of 2)

Neuropathy due to type 2 diabetes mellitus (disorder)[SNOMED CT US Edition]
Neuropathy due to type 2 diabetes mellitus (disorder)[SNOMED CT AU Edition]
Exists in SNOMED CT AU Edition
But not in SNOMED CT
100% Touchstone Tests Passed!
Contact Us!

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Questions and Discussion