Creating Terminology Server for FHIR using OMOP CDM

OMOP on FHIR Project
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What is Terminology Server?

a piece of software providing a range of terminology-related software services through an applications programming interface to its client applications.

Why do we need a Terminology Server?

• We have needs for terminology.
  - Interoperability using same vocabulary
  - Easy of getting meanings from concept sets
  - And more…

• Terminology Server enables the programmatic access of terminology content

• With standard terminology services, the access technology can be reused

• Updates on terminology can be available to all client applications
ValueSet, ConceptMap, CodeSystem

**Terminology API**

- ValueSet
- ConceptMap
- CodeSystem

**FHIM RestAPI**

**OMOP CDM**

**Concept/Vocabulary Database**

concept, concept_relationship, concept_ancestor, relationship, vocabulary
Terminology in FHIR

- **CodeSystem**: a set of codes with meanings.
- **ValueSet**: a set of codes from those defined by one or more code systems to specify which codes can be used in a particular context.
- **ConceptMap**: a mapping from a set of concepts defined in a code system to one or more concepts defined in other code systems.
- **ExpansionProfile**: used to configure the behavior of the terminology server for expansions and validations.
- **NamingSystem**: a curated namespace that issues unique symbols within that namespace for the identification of concepts, people, devices, etc.
Concept/ Vocabulary in OMOP

- **concept**: a record that represents clinical information in all domains.

- **concept_relationship**: defines direct relationships between concepts

- **concept_ancestor**: hierarchical relationships between concepts

- **relationship**: defines type of a relationship.

- **concept_class**: list of classifications used to differentiate concepts.

- **vocabulary**: list of vocabularies used in concept.
**ValueSet in FHIR**

Concept and concept_ancestor in OMOP CDM can be used to create ValueSet resources.

Example: Cholesterol | Bld-Ser-Plas (LOINC Codes for Cholesterol in Serum/Plasma)
- Find concepts with parent = LP43571-6 from concept_ancestor.
- Add the concepts to expansion of valueset resource
- Example: https://www.hl7.org/fhir/valueset-example-expansion.json.html

**ConceptMap in FHIR**

concept_relationship in OMOP CDM can be used to create ConceptMap resources

Example: translate one concept in a domain to another concept in a different domain
- Use relationship ID to define equivalence
- Return target coding system

FHIR equivalence:
- relatedto | equivalent | equal | wider | subsumes | narrower | specializes | inexact | unmatched | disjoint

Need to find matching relationship from relationship table in OMOP.
Current implementation of Terminology Server

- $translate operation
- Local code system import for mapping to standard
- How it works:
  - Source:
    RxNorm | 311040 | Insulin, Aspart, Human 100 UNT/ML Injectable Solution
  - Target:
    NDFRT | ??
{"resourceType":"Parameters",
"parameter":[
{
   "name":"result",
   "valueBoolean":true
},
{
   "name":"match",
   "part":[
   {
      "name":"equivalence",
      "valueCode":"equivalent"
   },
   {
      "name":"concept",
      "valueCoding":{
         "system":"http://hl7.org/fhir/ndft",
         "code":"4014955",
         "display":"INSULIN,ASPART,HUMAN 100 UNIT/ML INJ"
      }
   }
   ]
},
]}
}
Local code system to standard code system mapping CSV file

# Coding map document.
# 1st line: defines mapping. Must be OMOP vocabularies (eg. RxNorm). Comma separated. 1st value is source, 2nd is target.
# 2nd line: defines same mapping but with FHIR coding system name.
# If vocabulary does not exist, it will be created in the database.
# 3rd line: Definition of column. There are three required columns (if standard coding, description column is optional).
#       SOURCE_CODESYSTEM, SOURCE_CODE, SOURCE_DESC, TARGET_CODE
#       Other columns will be ignored.
MUSCLabOb ^MUSC Lab Observation, LOINC
SOURCE_CODESYSTEM, SOURCE_CODE, SOURCE_DESC, TARGET_CODE, LOINC Code Description, urn:hssc:shs:la01:observation:code, 789, "% ALBUMIN, SERUM", 13980-8, Albumin/Protein.total in Serum or Plasma by Electrophoresis,
urn:hssc:shs:la01:observation:code, 796, "% ALBUMIN, URINE", 13992-3, Albumin/Protein.total in Urine by Electrophoresis,
urn:hssc:shs:la01:observation:code, 790, "% ALPHA 1, SERUM", 13978-2, Alpha 1 globulin/Protein.total in Serum or Plasma by Electrophoresis,
Bit more detail between the services

- Get value set from Value Set Authority Center
- Load local code system mapping and get it using local terminology server
Questions ??

http://omoponfhir.org/ for more about OMOP on FHIR