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.

- Wikipedia (https://en.wikipedia.org/wiki/Terminology_server)

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

FHIR RestAPI

Terminology **API**

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

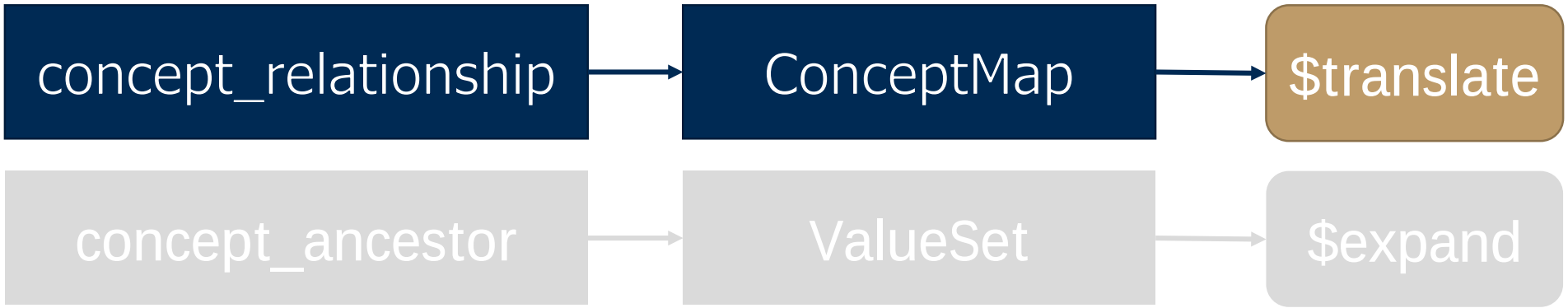
- Use relationship ID to define equivalence
- Return target coding system

FHIR equivalnce:

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

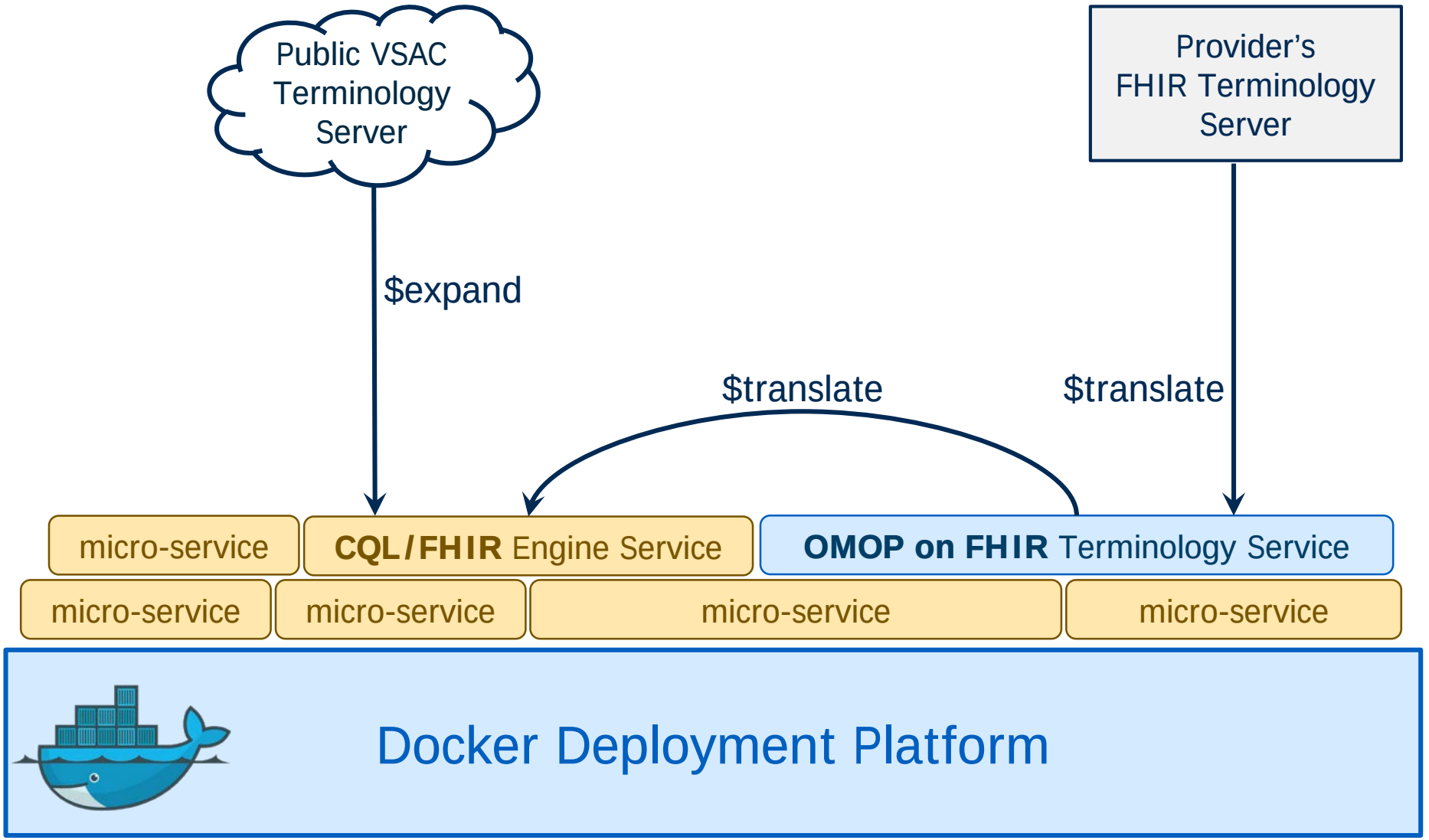


- $translate operation
- Local code system import for mapping to standard
- How it works:
  http://localhost:8080/fhir/ConceptMap/$translate?system=http://www.nlm.nih.gov/research/umls/rxnorm&code=311040&targetsystem=http://hl7.org/fhir/ndfrt
  - Source:
    RxNorm | 311040 | Insulin, Aspart, Human 100 UNT/ML Injectable Solution
  - Target:
    NDFRT | ??

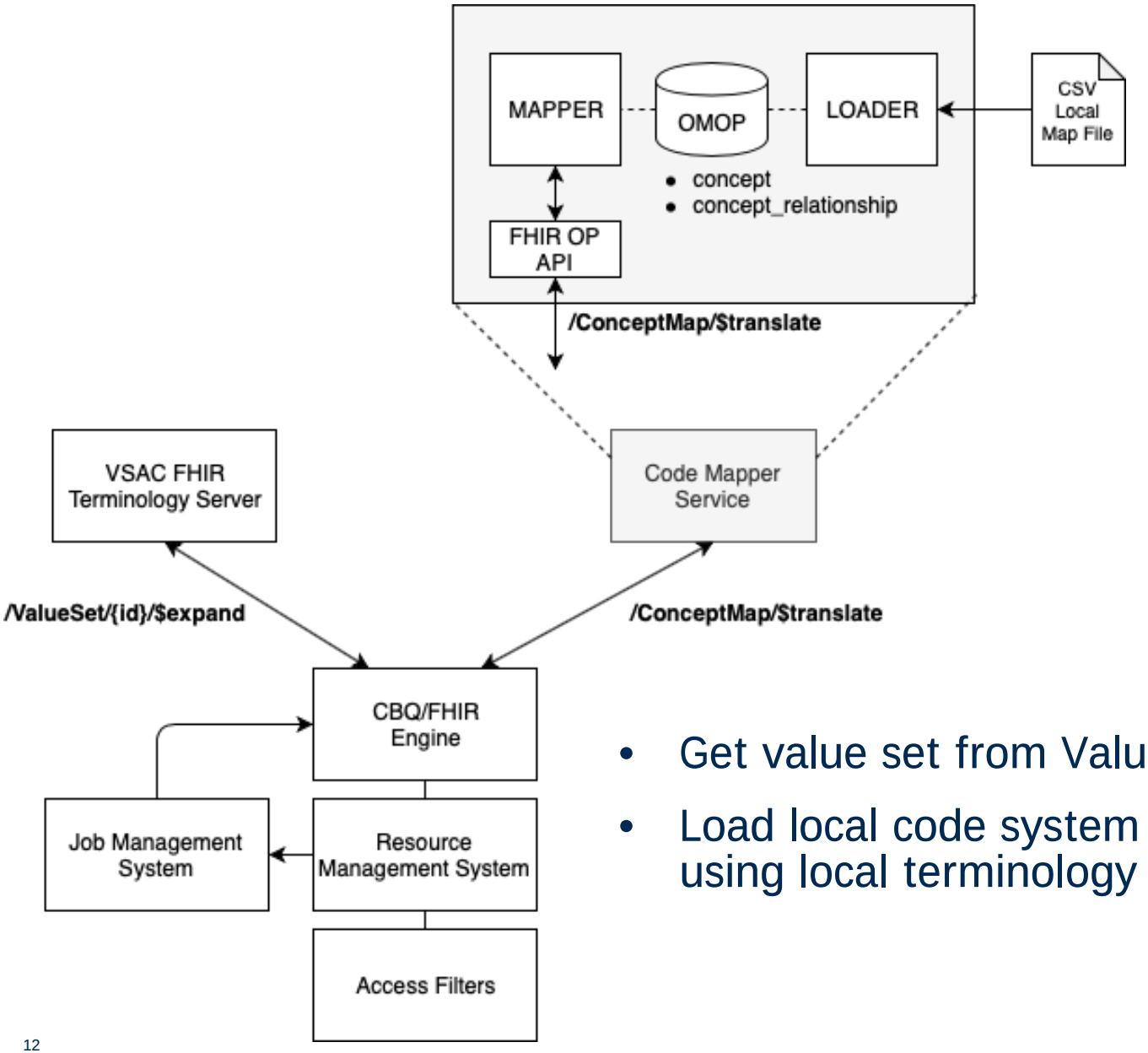
```
{
  "resourceType":"Parameters",
  "parameter":[
    {
      "name":"result",
      "valueBoolean":true
    },
    {
      "name":"match",
      "part":[
        {
          "name":"equivalence",
          "valueCode":"equivalent"
        },
        {
          "name":"concept",
          "valueCoding":{
            "system":"http://hl7.org/fhir/ndfrt",
            "code":"4014955",
            "display":"INSULIN,ASPART,HUMAN 100 UNT/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, 2ne 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, descripiton column is optional).
SOURCE_CODESYSTEM, SOURCE_CODE, SOURCE_DESC, TARGET_CODE
Other columns will be ignored.
MUSCLabOb^MUSC Lab Observation,**LOINC**
urn:hssc:srhs:la01:observation:code,**http://loinc.org**
SOURCE_CODESYSTEM,**SOURCE_CODE**,**SOURCE_DESC**,**TARGET_CODE**,LOINC Code Description,
urn:hssc:srhs:la01:observation:code,789,"% ALBUMIN, SERUM",13980-8,Albumin/Protein.total in Serum or Plasma by Electrophoresis,
urn:hssc:srhs:la01:observation:code,796,"% ALBUMIN, URINE",13992-3,Albumin/Protein.total in Urine by Electrophoresis,
urn:hssc:srhs:la01:observation:code,790,"% ALPHA 1, SERUM",13978-2,Alpha 1 globulin/Protein.total in Serum or Plasma by Electrophoresis,


Public VSAC Terminology Server
Provider's FHIR Terminology Server
$expand
$translate
$translate
micro-service
CQL/FHIR Engine Service
OMOP on FHIR Terminology Service
micro-service
micro-service
micro-service
micro-service
Docker Deployment Platform

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