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IMIA

TermiCron: Bridging the Gap between FHIR Terminology Servers and Metadata Repositories

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Why is Metadata Needed?

- More and more medical data captured every year
- Secondary Use: Re-use of clinical data in research studies

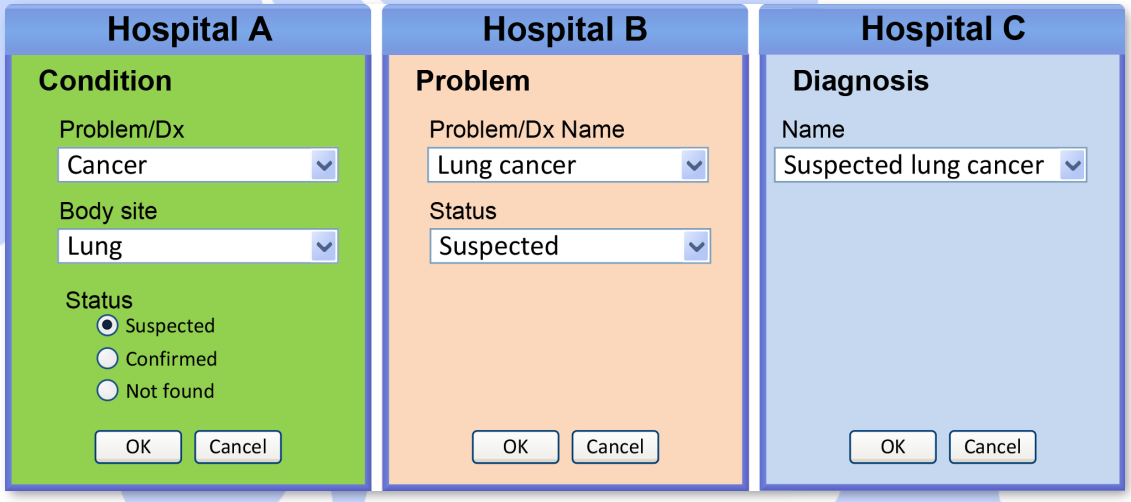
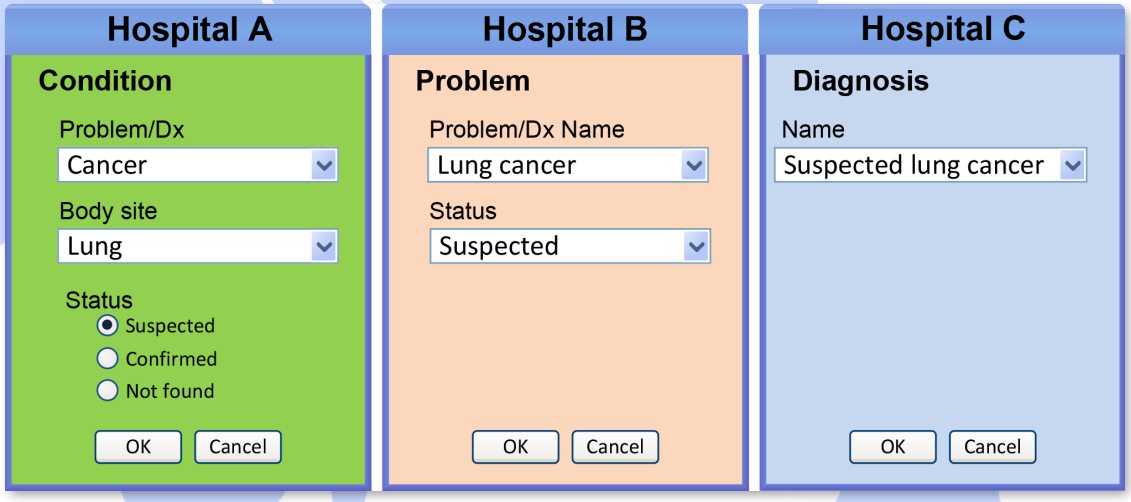


Image Source: Presentation "SNOMED CT As a Global Terminology" – Ian Green, SNOMED International (presented 2020-06-05) https://www.medizininformatik-initiative.de/sites/default/files/2020-06/2020-06-05_Folien_SNOMED-CT-Starter-Kurs_IanGreen_2.pdf [accessed 2021-08-30]

Why is Metadata Needed?

- More and more medical data captured every year
- Secondary Use: Re-use of clinical data in research studies
- Field of healthcare is broad and comprehensive
  - Different areas of study
  - Own naming systems and requirements
  - Dependency on context
- Large diversity of data models for capturing similar pieces of information



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Metadata and Metadata Repositories

- „Data About Data“
- Structured, atomic, units of information that describe data

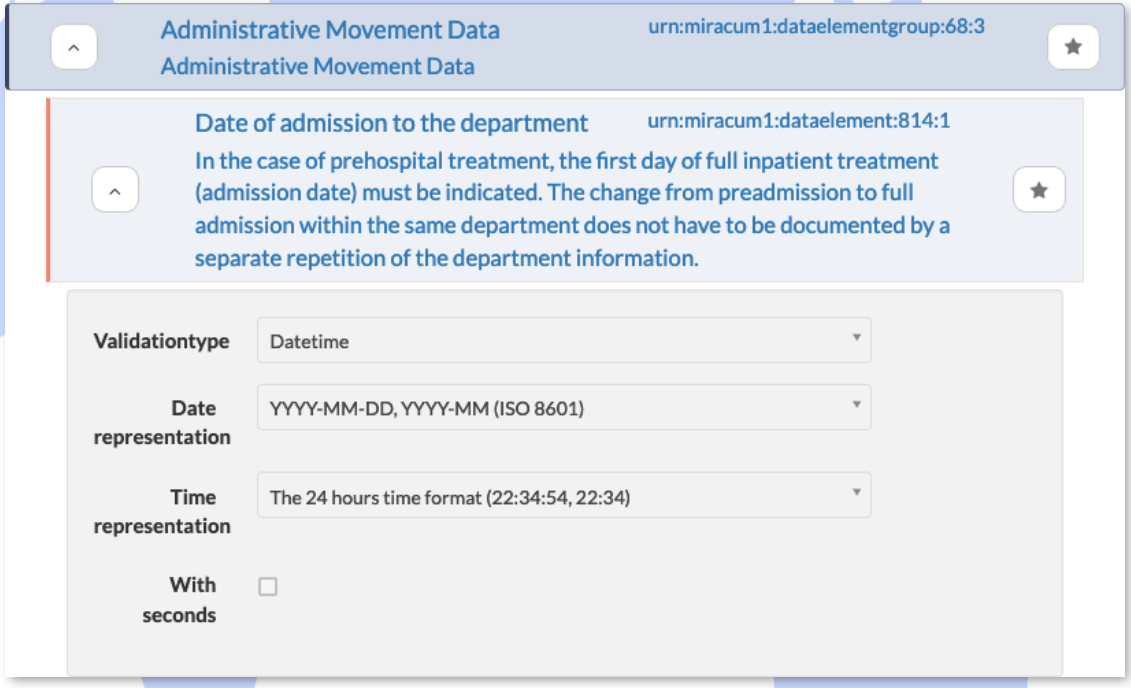

Image Source: Data Element “Administrative Movement Data” → “Date of Admission to Hospital Department” within an dataset in an MDR of the Medical Informatics Initiative in Germany, https://mdr.miracum.de/view.xhtml?namespace=miracum1 [accessed 2021-08-30, translated]

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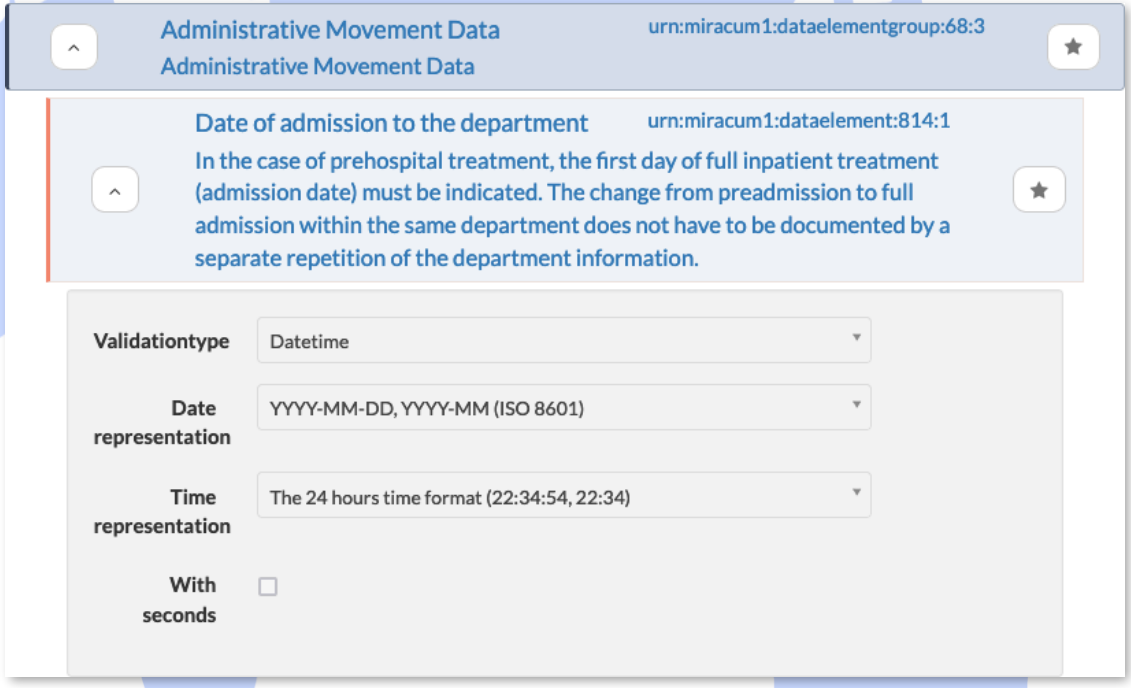

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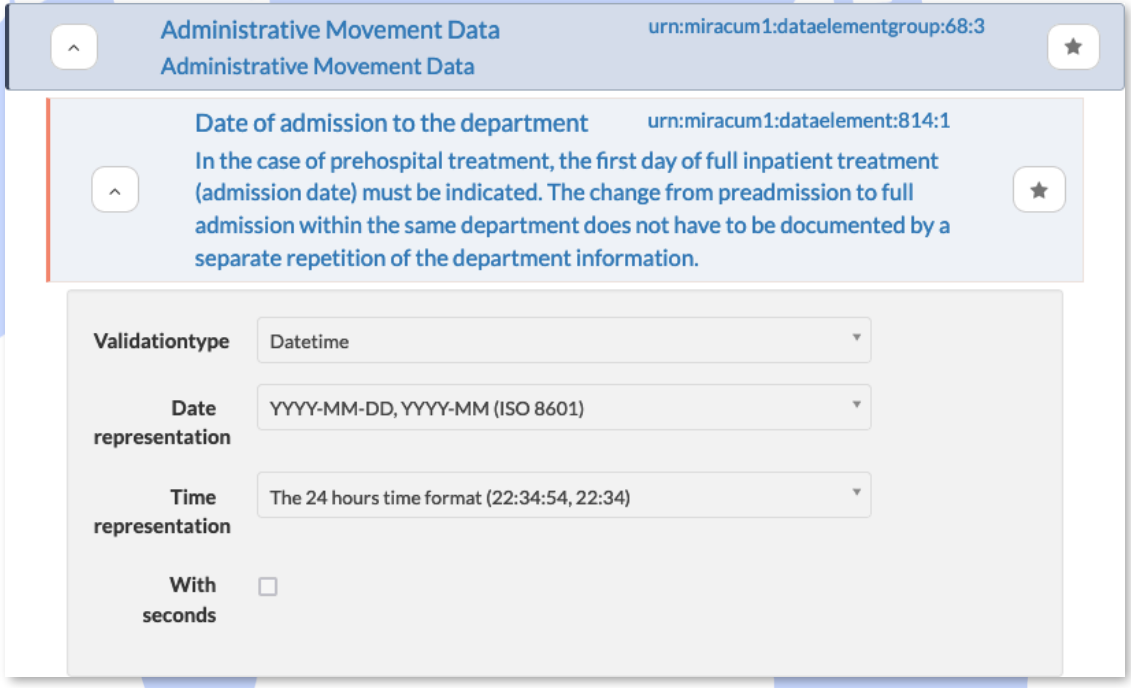
- Metadata Repositories store metadata at the schema level (e.g. attributes, data types, relations, annotations, …) for data elements
- ISO/IEC 21526, ISO/IEC 11179, et al., for Medical Metadata Repositories (MDRs)



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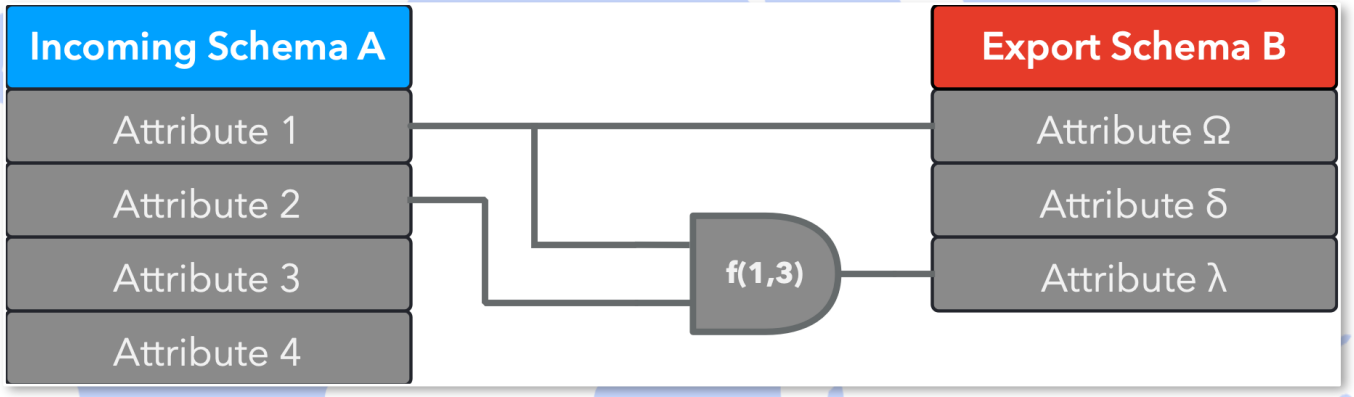
MDRs are a lot of work.



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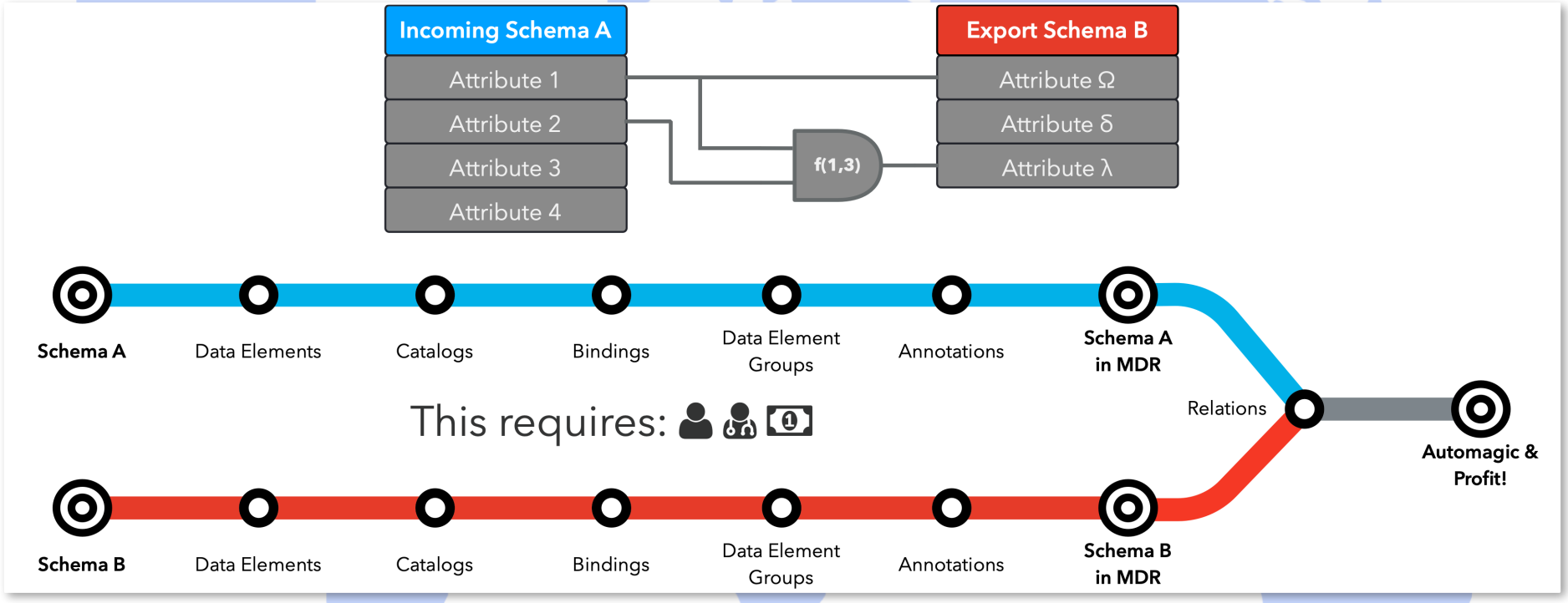

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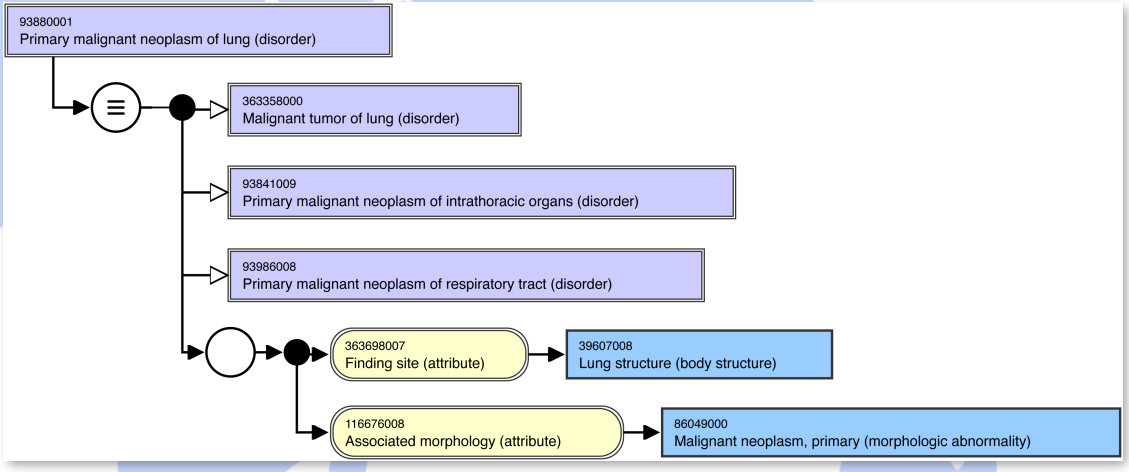
Common Terminology

- Common identification of relevant concepts required for cross-institutional exchange and integration of data (”semantic interoperability”)
- Use of adequate, expressive, terminologies throughout the entire data model ideal



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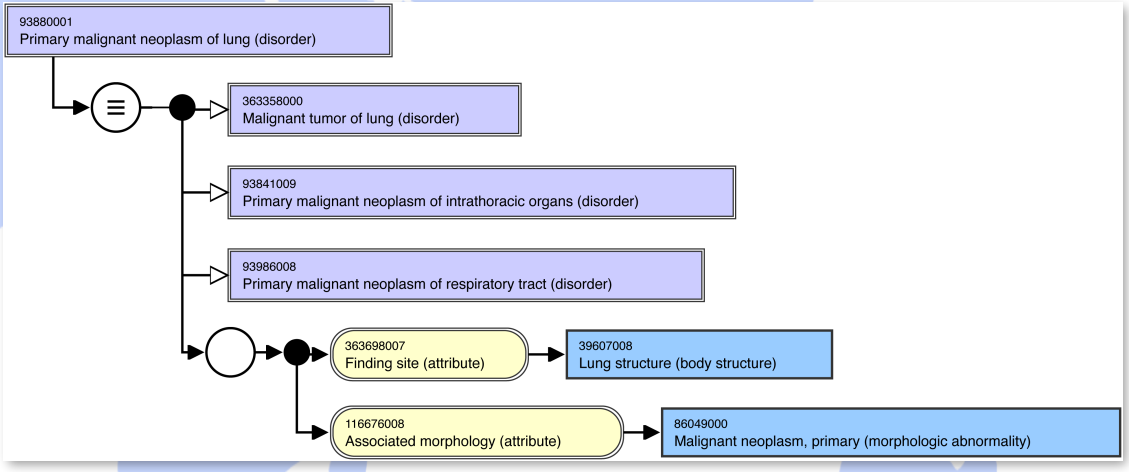

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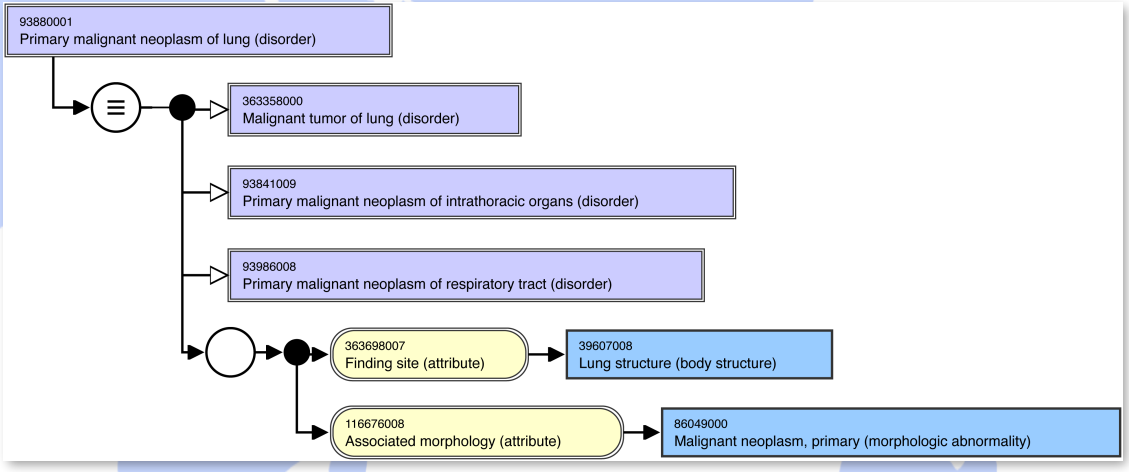
- Distribution of terminological artefacts?



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Terminology Servers (TS)

- Provision of Code Systems, Value Sets, and Mappings
  - Creation, Maintenance and Query

Image Source: Terminology Services Operations; Terminology Module, HL7 FHIR R4 Specification https://www.hl7.org/fhir/terminology-module.html [accessed 2021-08-30, modified]

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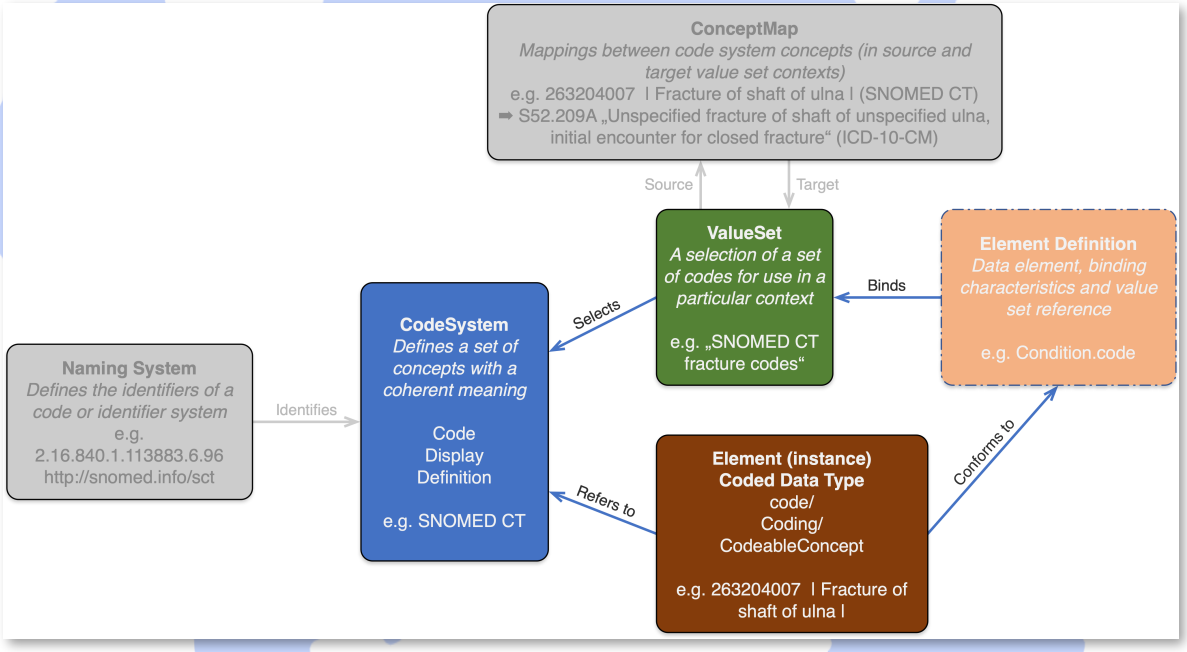
- Provision of Code Systems, Value Sets, and Mappings
  - Creation, Maintenance and Query
- Standards for TS design: HL7 FHIR 🔥
  - specifies *resources*: mature data model for terminological artefacts
  - specifies *operations*: REST-API surface of an compliant FHIR TS
- current initiatives for national (FHIR) TS



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- Binding of metadata elements to terminology a fundamental feature of MDR implementations
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- **Terminology does not belong in MDRs**
- *Responsibility split* between MDR and TS

MDR / TS Responsibility Split

- Referencing and query of TS resources within the MDR during creation and validation of data elements using FHIR APIs
- Not realised in practice!
  - Constant redefinition of value lists for the same atom of information

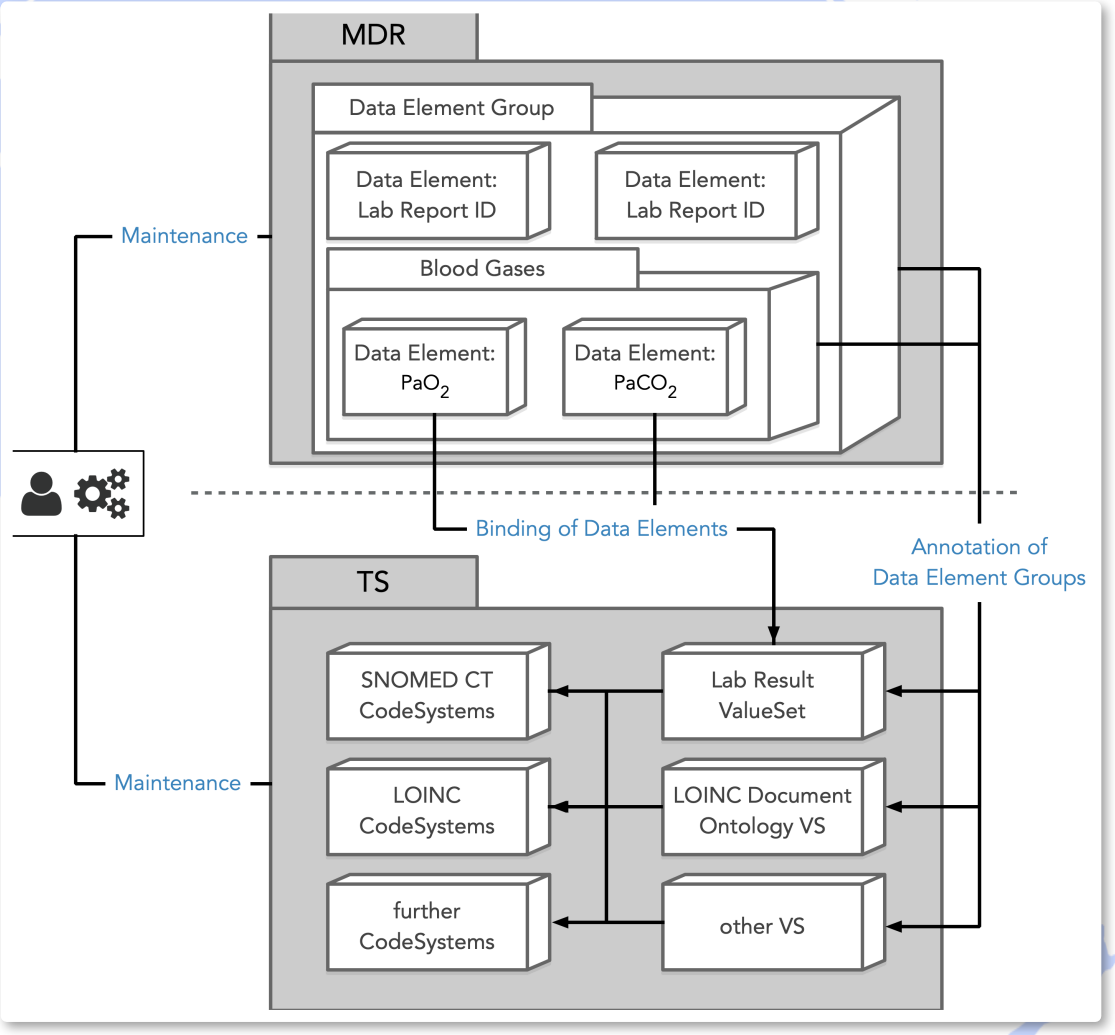

Image: Example of proposed responsibility split between MDR and TS

Concept

- "Stopgap Solution"
  - Bridge between TS and MDR until responsibility split is adopted
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  - Bridge between TS and MDR until responsibility split is adopted
- TS resources (ValueSet) drive MDR
- Consume FHIR terminology resources from authoritative sources
- Convert them to a suitable representation for MDRs
- Handle MDR specific requirements (authentication, format, updates etc.) transparently

TermiCron: Bridging the Gap between TS and MDRs

- Adaptable pipeline to provision terminological resources in MDR implementations

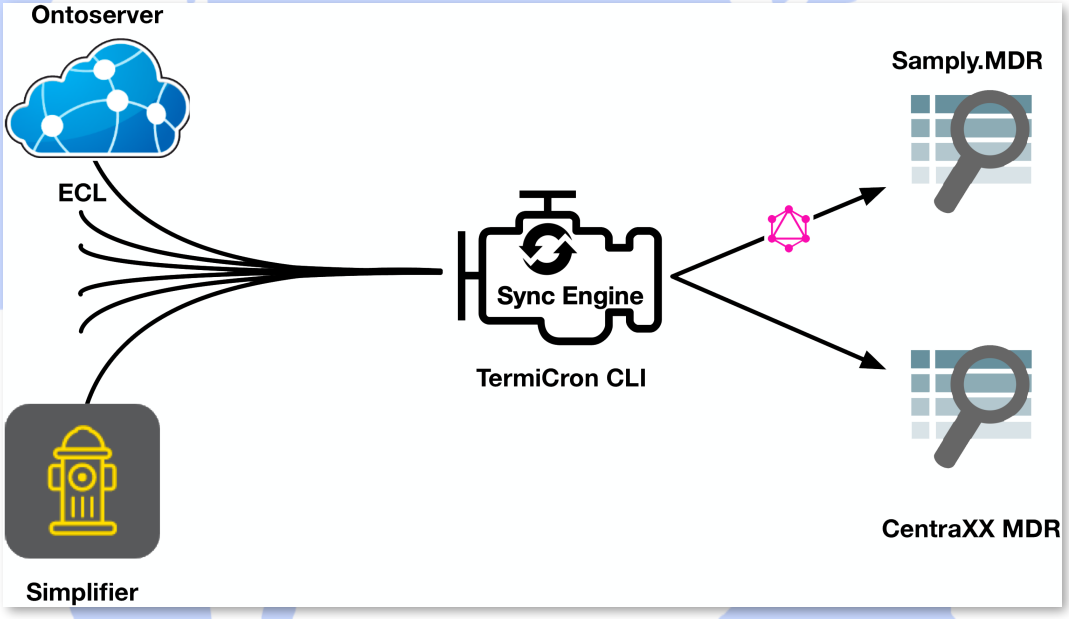

Image: High-Level concept of TermiCron

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  - FHIR NPM Registries (such as Simplifier)
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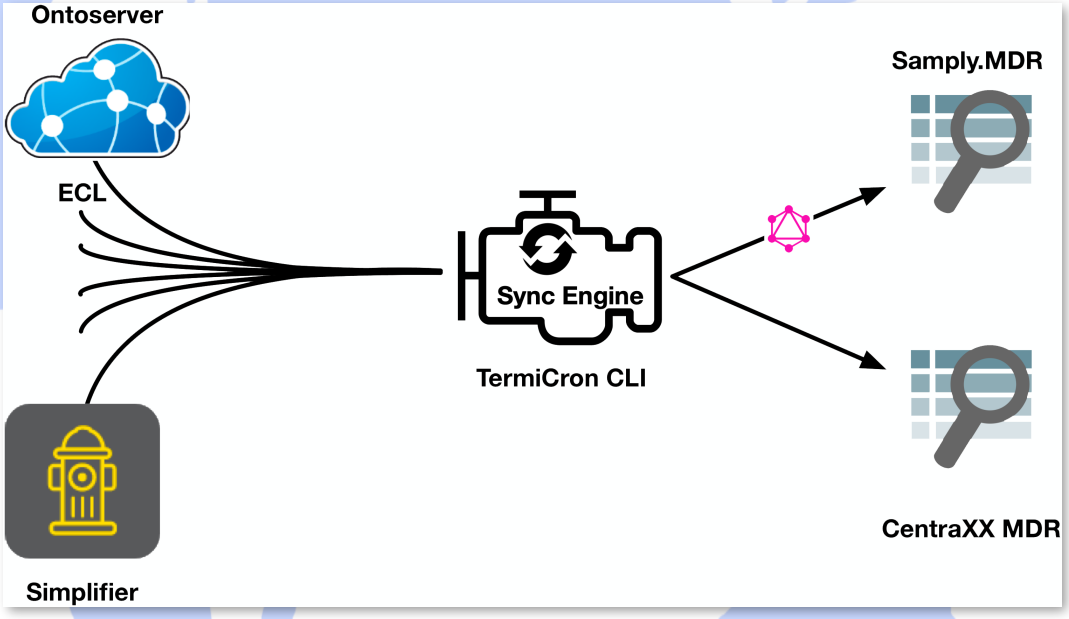

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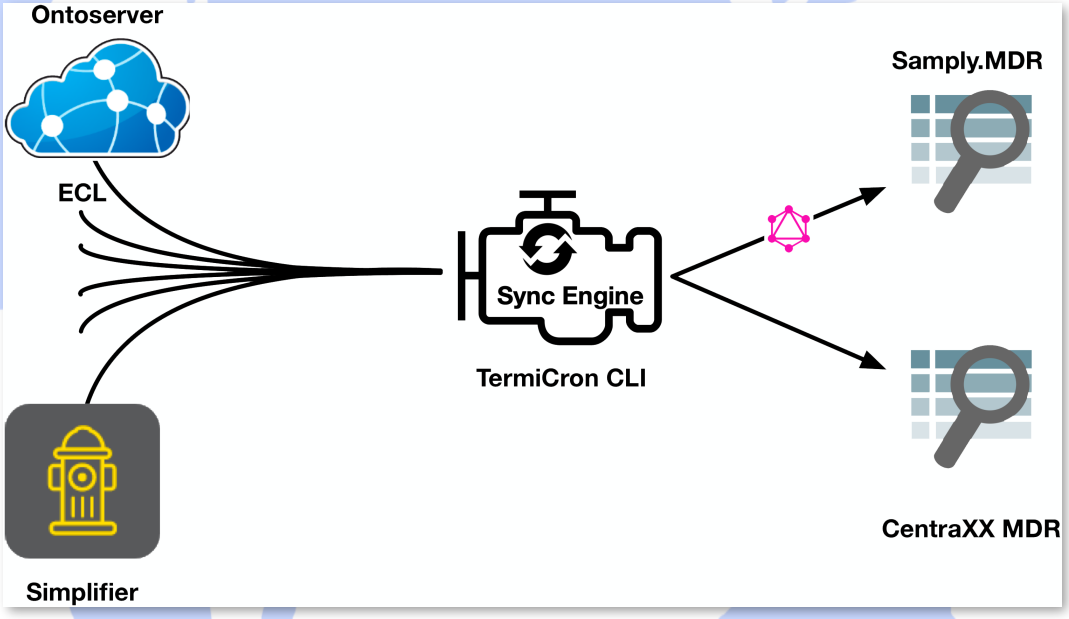
  - CentraXX MDR (proprietary)
  - Samply.MDR (open-source)



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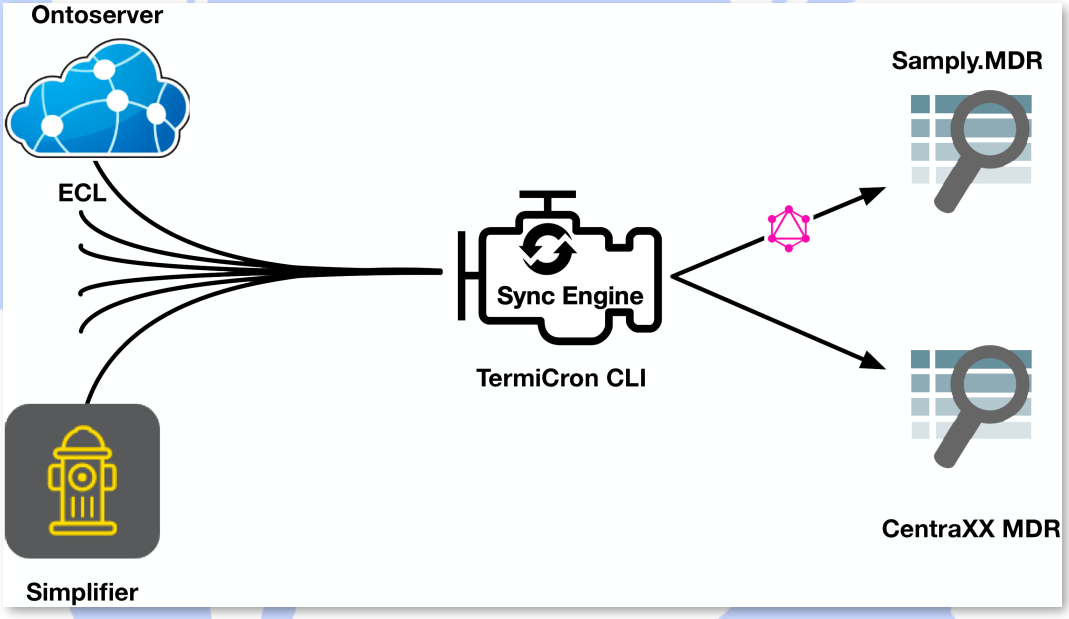
- Powerful Command Line Interface
- Free/Libre Open Source Software



https://github.com/itcr-uni-luebeck/TermiCron

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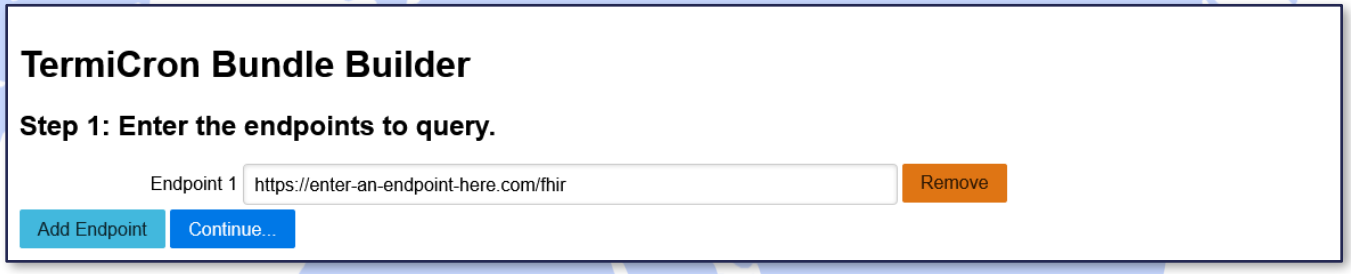
Results



Images: TermiCron Bundle Builder UI

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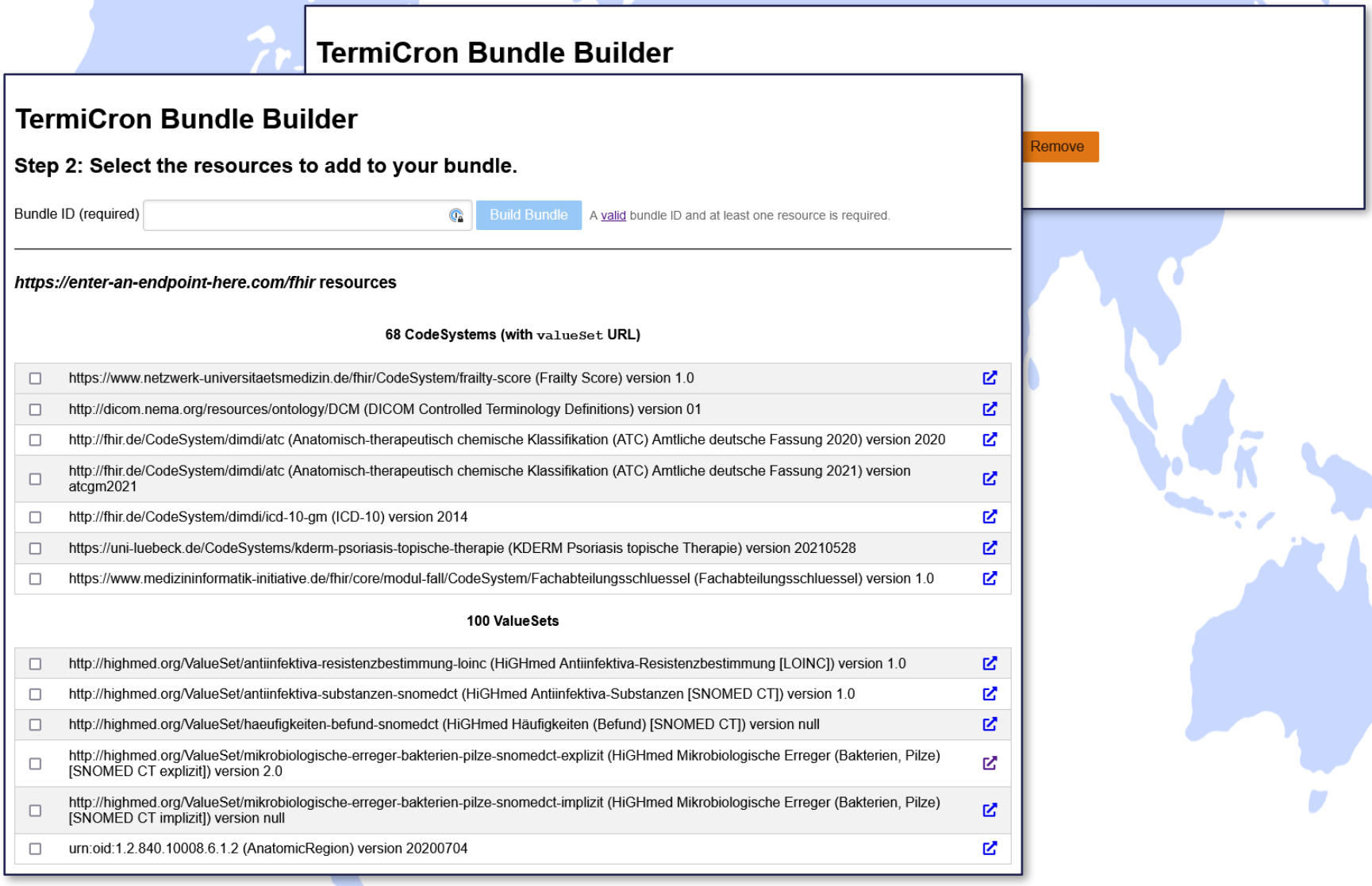

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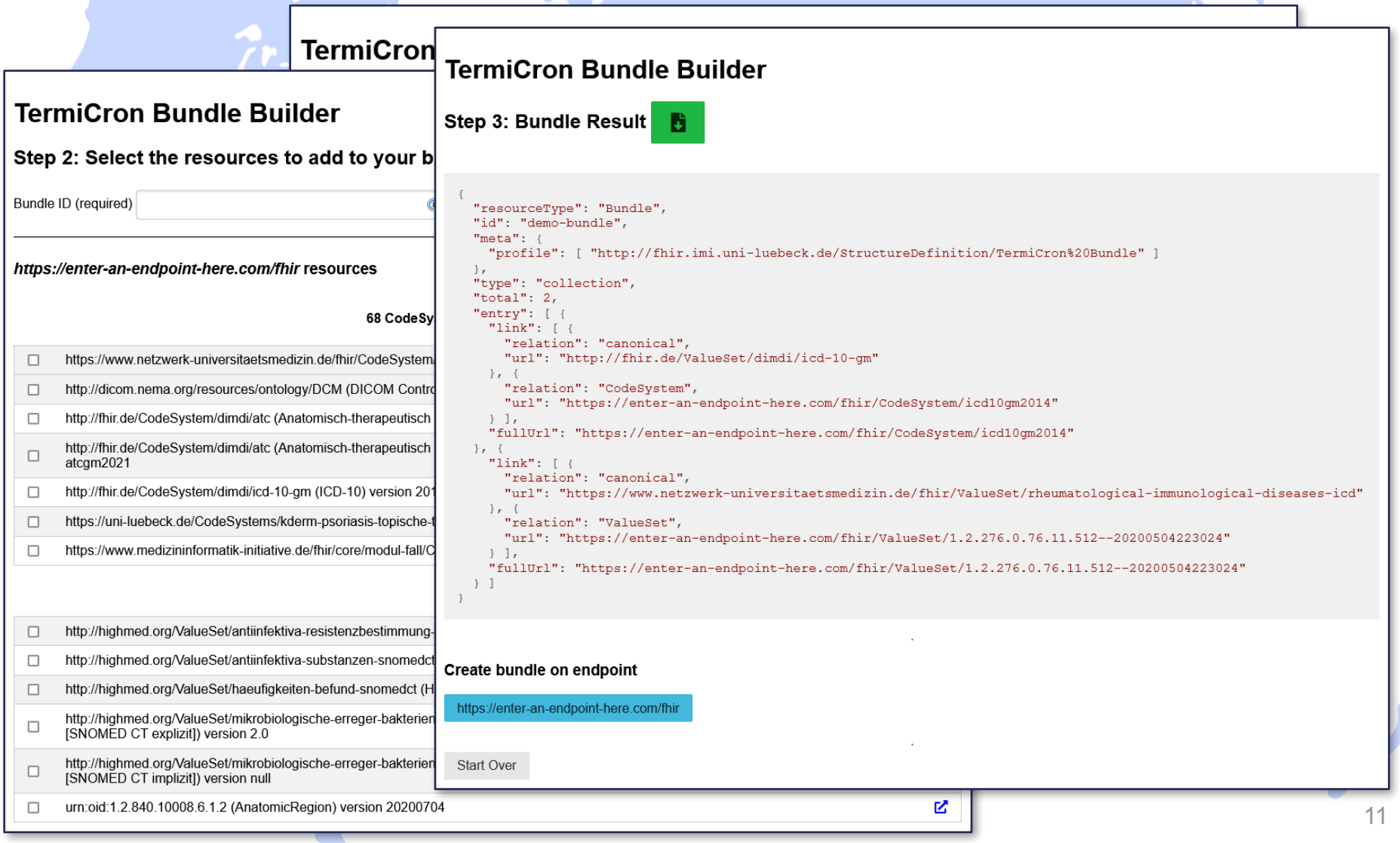

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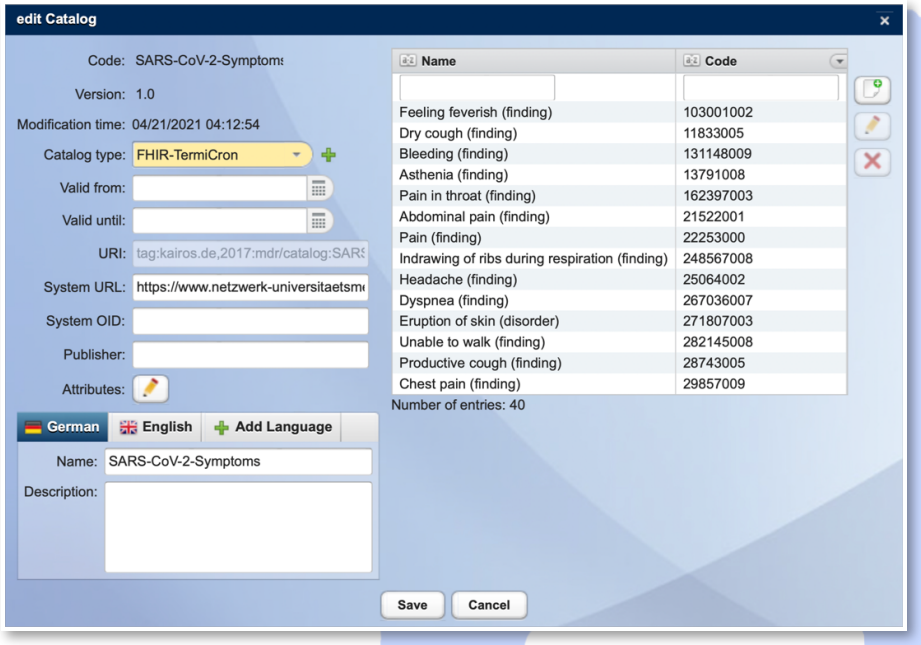


```
mutation {
    createConceptSystem (
        name: "SARSCoV2Symptoms"
        uri: "https://www.example.de/fhir/ValueSet/sars-cov-2-symptoms"
        version: "1.0"
        concepts: [
            {
                uri: "http://snomed.info/sct#21522001"
                prefLabel: "21522001"
                altLabel: ""
                definition: "Abdominal pain (finding)"
            }
            //…
]
    ) {
        name
    }
}
```

Images: [left] A FHIR CodeSystem within the CentraXX MDR;
[right] The same FHIR CodeSystem as a QL⁴MDR query

Discussion

- Free and open-source software can be adapted to other MDRs by the community
- Support for QL4MDR allows ISO 21526-compliant representation of FHIR VS for systems that don‘t internally comply to the standard
- Support for responsibility within MDRs split is sorely needed, and anticipated by ISO/IEC 21526
- “Stopgap” solution, but it works!

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