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MEDICAL INFORMATICS INITIATIVE GERMANY

SU-TermServ

Implementation of HL7 FHIR-based Terminology Services for a National Federated Health Research Infrastructure

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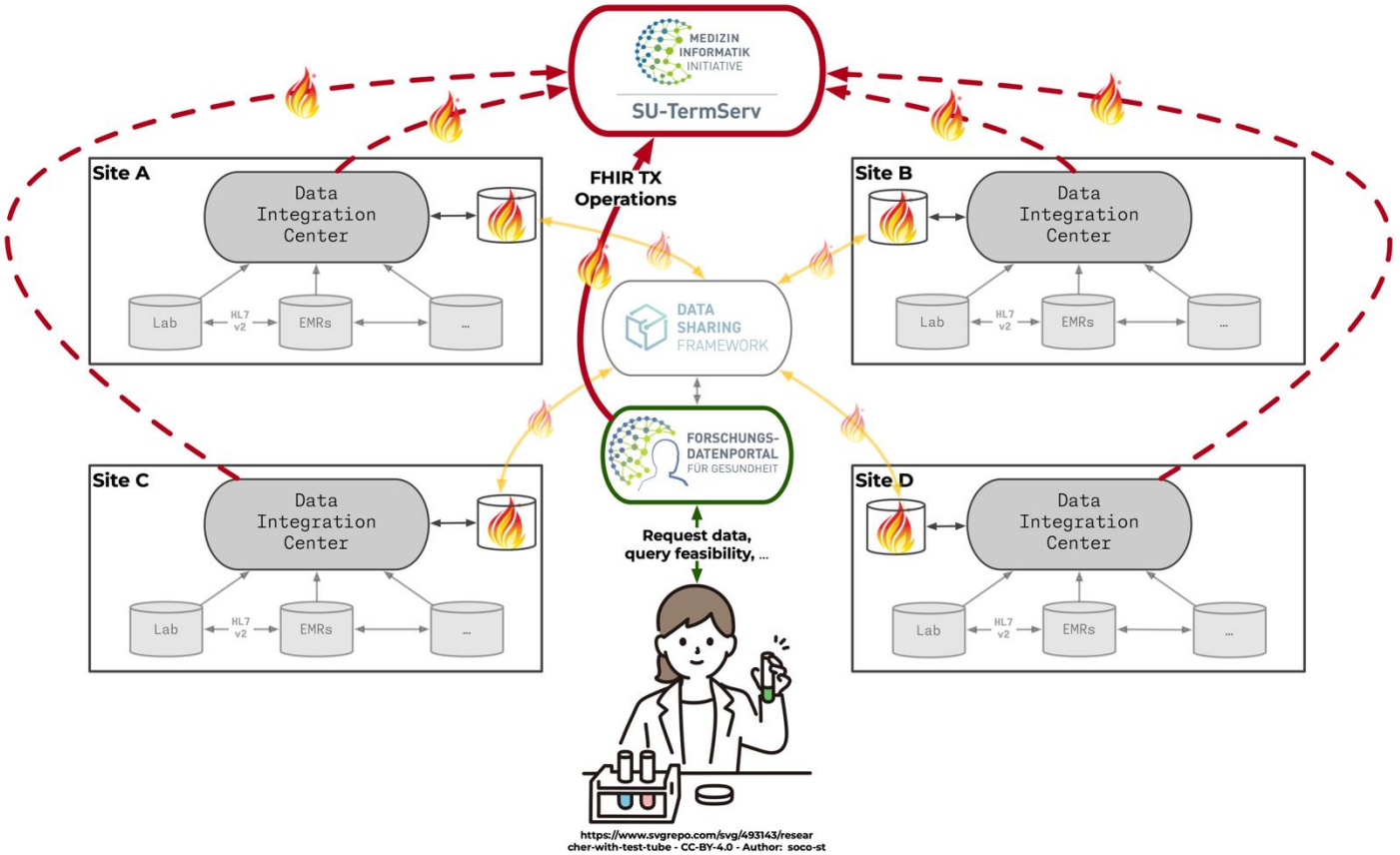
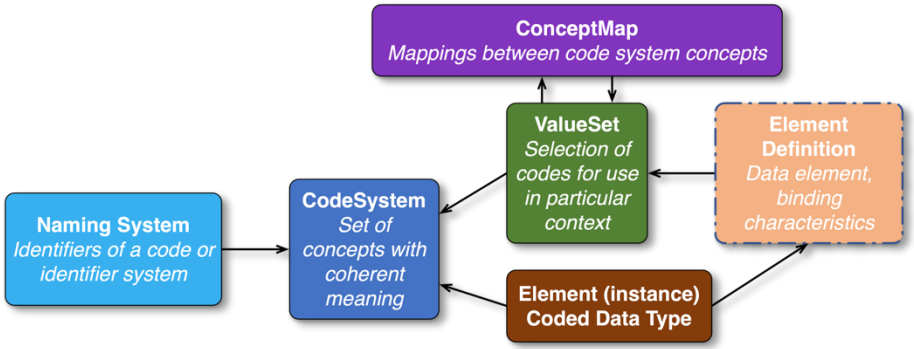


High-Level Overview of the MII's infrastructure

HL7 FHIR Terminology Module & Terminology Servers (TS)



Simplified from https://hl7.org/fhir/terminology-module.html; CC-0

- Simple, but powerful conceptual model
- Definition of 4 relevant resource types
- Codes assigned within the ***CodeSystem***
- Concept of ***binding*** data elements towards ***ValueSets*** as subsets
- ***ConceptMap*** *scoped to use cases*
- Identity through ***canonical URIs***

CodeSystem	ValueSet	ConceptMap
$lookup $validate-code $subsumes $find-matches	$validate-code $expand	$translate $closure
via HTTP GET or HTTP POST		
Definition: OperationDefinition **Input/Output resources:** Parameters		

Ongoing challenges of the SU-TermServ

- *Requirement analysis*
- *Software selection*
- Differentiation from other services
- Identification of relevant resources
- Provision of relevant resources
- Generation from non-FHIR sources
- Content maintenance
- *Terminology Research*
- *Community Support*

s.mii-termserv.de/gmds2025
(Paper & Slides)

Differentiation from other services

- BfArM “Zentraler Terminologieserver” (ZTS)—§ 355 Sec. (12)-(14) SGB V
  - *Die [gematik] errichtet und betreibt eine Plattform, auf der […] Terminologien […] bereitgestellt und von Nutzern in geeigneter Form abgerufen werden können (Terminologieserver). Der Terminologieserver dient insbesondere der* ***zentralen Bereitstellung sowie der Versionierung.*** **[1]**
  - **Note**: no FHIR operations required by the ZTS (but on the roadmap)
  - Currently 9 code systems—**limited utility in the MII**
- NFDI / TS4NFDI
  - Central TS for the *National Research Data Network*, not just biomedical sciences
  - *[T]o* ***integrate and converge individual solutions*** *into a standardized, interoperable, and sustainable* ***service suite*** *with [a] Service Wrapper, API Gateway, mapping service and reusable GUI widgets.* **[2]**
  - **Note**: no HL7 FHIR Terminology Module in scope

[1] § 355 Section (12) of the Fifth Book of the German Social Code (SGB V)
[2] https://base4nfdi.de/projects/ts4nfdi, accessed 2 Sep 2025

Snapshot of https://terminologien.bfarm.de/kodiersysteme.html, accessed 2 Sep 2025

Identification of relevant resources

- Requirements mainly driven by MII's Core Dataset modules (and others)
- Dependencies between modules
- Dependencies to upstream sources
  - **Standards**: HL7 FHIR standard itself, DICOM, terminology.hl7.org, ISO-IEEE 11073-10101
  - **International ImplementationGuides**: HL7 Universal Realm (International Patient Summary IG, Genomics Reporting IG)
  - **National Standards**: HL7 Germany Base Profiles
  - **Other national actors**: Kassenärztliche Bundesvereinigung (KBV), Gematik (ISIK)
  - **External terminology**: SNOMED CT, LOINC, ICD-10-GM, OPS, ORPHAcodes, …
- **1790 CodeSystem, 5146 ValueSet, 145 ConceptMap (= 7081 Resources)** as of 2 Sep 2025
  - **1657 unique CodeSystem URIs, 3946 unique VS, 133 CM (= 5736 unique resources)**

Provision process

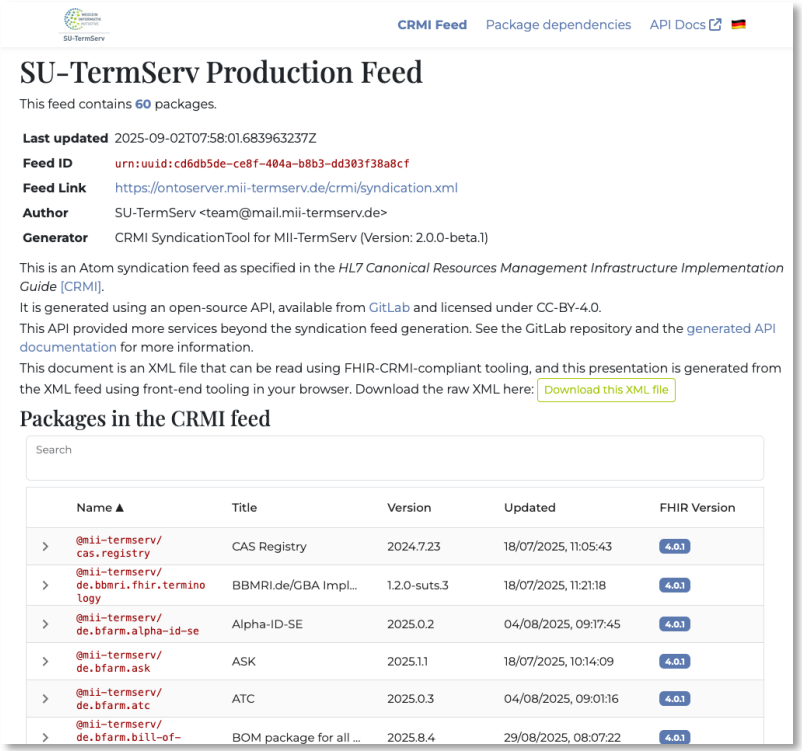
- Based on FHIR / NPM packages
- Management of complex dependencies
- https://gitlab.com/mii-termserv/fhir-resources
- **Drawbacks**
  - **Complexity:** Ad-hoc maintenance of resources simpler at face value
- **Benefits**
  - **Transparency**: Git repos, interactive insights into dependencies, additional metadata
  - **Automation**: Upload & validation; package creation and maintenance
  - **Flexibility:** Reactivity to external factors (e.g. new terminology on BfArM ZTS)
  - **…**

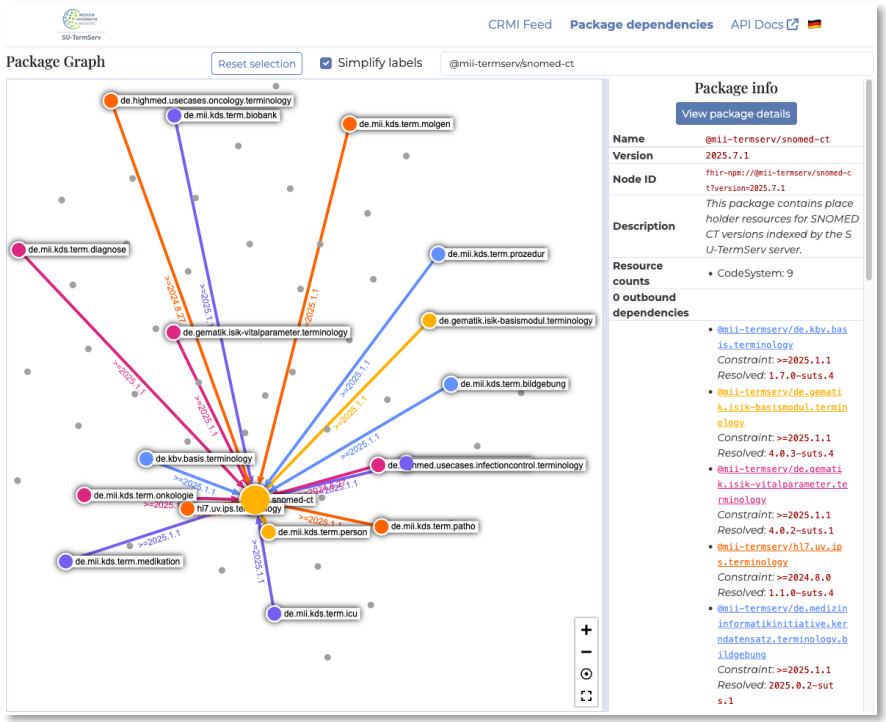
Canonical Resource Management Infrastructure (CRMI) Implementation Guide

- Definitions by HL7 *Clinical Decision Support* Working Group
- To “facilitate the content management lifecycle” for:
  - Authoring,
  - **Publishing**,
  - **Distribution**,
  - Implementation,
- FHIR Knowledge, Terminology and Conformance Artefacts
  - Library, Measure, …
  - **CodeSystem / ValueSet / ConceptMap / NamingSystem**
  - StructureDefinition, ImplementationGuide, …

https://hl7.org/fhir/uv/crmi/index.html

CRMI Implementation in SU-TermServ

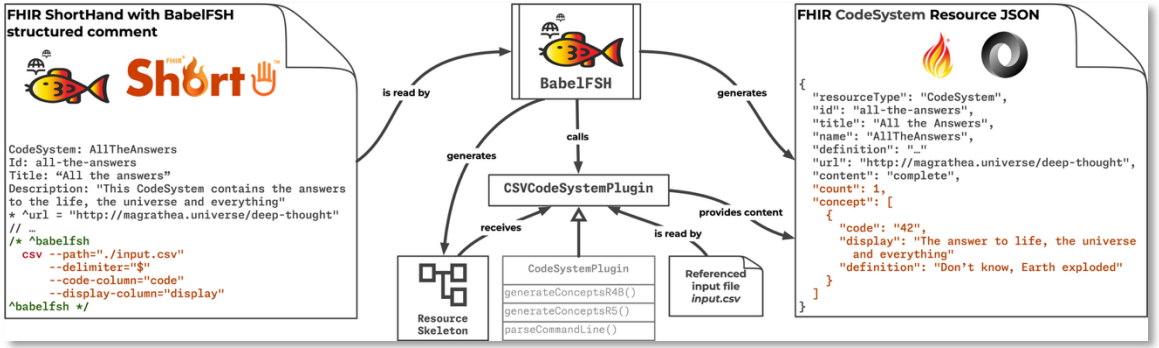




Screenshots from the production terminology service, https://ontoserver.mii-termserv.de/crmi, accessed 2 Sep 2025

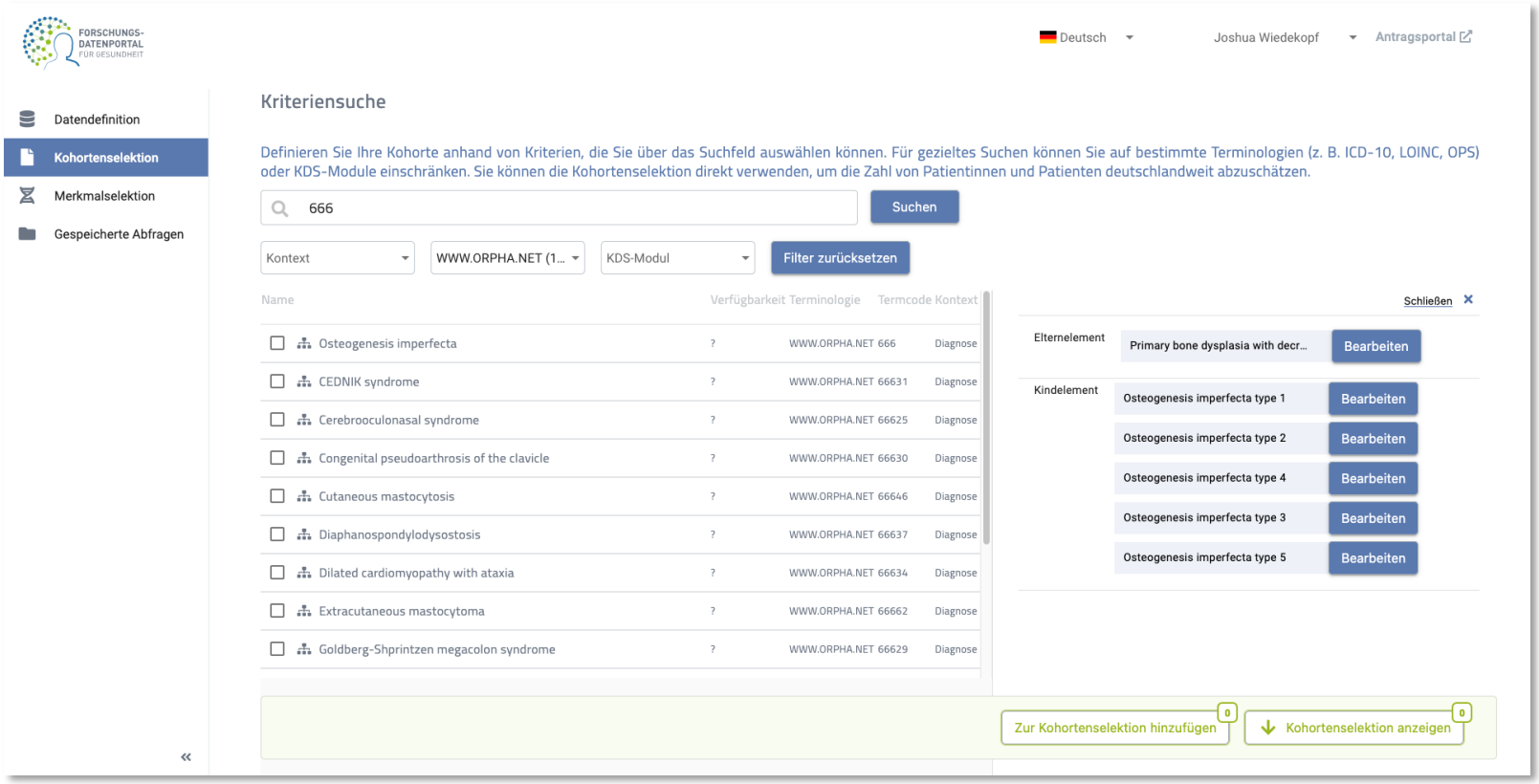
Generation of FHIR resources from other datatypes

- Most (large-scale) terminology resources not maintained in FHIR
- Conversion needed for FHIR TS usability
- *BabelFSH*
  - Uses FSH + plugin architecture
  - Provides a flexible, performant and consistent experience for developers
- In broad use within the SU-TermServ



Wiedekopf, Joshua, Tessa Ohlsen, Ann-Kristin Kock-Schoppenhauer, and Josef Ingenerf. *BabelFSH—A Toolkit for an Effective HL7 FHIR-Based Terminology Provision*. Preprint, Springer Science and Business Media LLC, 23 July 2025. https://doi.org/10.21203/rs.3.rs-6992162/v1.

s.mii-termserv.de/babelfsh-pp



Screenshot of the feasibility query functionality of the German Portal for Medical Research Data (FDPG), accessed 2 Sep 2025, https://feasibility.forschen-fuer-gesundheit.de/feasibility-query/search

Conclusions

- Terminology server provision and maintenance not trivial
- The MII is a complex and powerful project
  - …requiring a complex and powerful infrastructure
- Alignment to external factors allows flexible operations and allows good fit with those projects
- Package-based distribution as the foundation for professionalized maintenance and innovations
- Open-Source tools and ethos as a state-of-the-art model for other implementations in other jurisdictions

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