

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

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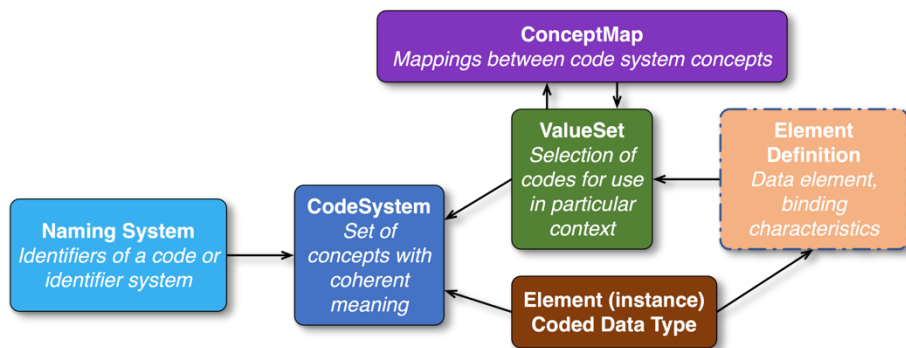


Federal Ministry
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and Space



HL7 FHIR Terminology Module & Terminology Servers (TS)

- 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**



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

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



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

- *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*

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

Zentraler Terminologieserver

für das deutsche Gesundheitswesen

[Home](#) [Kodiersysteme](#) [Wertelisten](#) [Mappings](#) [API Dokumentation](#) [Downloadbedingungen](#) [Release Notes](#)

Kodiersysteme

Ein Kodiersystem (CodeSystem) ist eine strukturierte Sammlung von Konzepten mit eindeutigen, sprachunabhängigen, standardisierten, meist numerischen oder alphanumerischen Codes. Jedem Konzept ist eine kodiersystemspezifische Bedeutung zugewiesen. Kodiersysteme sollen die Bedeutungsbeständigkeit aller Konzepte innerhalb des Kodiersystems sicherstellen. Oft gibt es hierarchische oder multihierarchische Beziehungen zwischen allgemeinen und spezifischen Konzepten. Zu den Kodiersystemen gehören Klassifikationen, Terminologien und Ontologien. Eine Bereitstellung von Informationen in kodierter Form dient einem systemunabhängigen, eindeutigen Austausch elektronischer Daten (Interoperabilität) und unterstützt die Datenanalyse.

Übersicht der Kodiersysteme auf dem zentralen Terminologieserver:

- ✓ ATC DDD GM ✓
- ✓ ICD-10-GM ✓
- ✓ ICD-10-WHO ✓
- ✓ ICD-O-3 ✓
- ✓ ICF ✓
- ✓ LOINC - Linguistic Variant ✓
- ✓ OPS ✓
- ✓ ORPHAcodes ✓
- ✓ UCUM - Deutsche Übersetzung ✓

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-termserve/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, ...

CRMI Implementation in SU-TermServ



SU-TermServ

CRMI Feed Package dependencies API Docs 

SU-TermServ Production Feed

This feed contains **60** packages.

Last updated 2025-09-02T07:58:01.683963237Z

Feed ID urn:uuid:cd6db5de-ce8f-404a-b8b3-dd303f38a8cf

Feed Link <https://ontoserver.mii-termserve.de/crmi/syndication.xml>

Author SU-TermServ <team@mail.mii-termserve.de>

Generator CRMI SyndicationTool for MII-TermServ (Version: 2.0.0-beta.1)

This is an Atom syndication feed as specified in the [HL7 Canonical Resources Management Infrastructure Implementation Guide \[CRMI\]](#).
It is generated using an open-source API, available from [GitLab](#) and licensed under CC-BY-4.0.
This API provided more services beyond the syndication feed generation. See the [GitLab repository](#) and the [generated API documentation](#) for more information.
This document is an XML file that can be read using FHIR-CRMI-compliant tooling, and this presentation is generated from the XML feed using front-end tooling in your browser. Download the raw XML here: [Download this XML file](#)

Packages in the CRMI feed

Name ▲	Title	Version	Updated	FHIR Version
> @mii-termserve/cas.registry	CAS Registry	2024.7.23	18/07/2025, 11:05:43	4.0.1
> @mii-termserve/de.bbmr.i.thir.terminology	BBMRI.de/CBA Impl...	1.2.0-suts.3	18/07/2025, 11:21:18	4.0.1
> @mii-termserve/de.bfarm.alpha-id-se	Alpha-ID-SE	2025.0.2	04/08/2025, 09:17:45	4.0.1
> @mii-termserve/de.bfarm.ask	ASK	2025.1.1	18/07/2025, 10:14:09	4.0.1
> @mii-termserve/de.bfarm.atc	ATC	2025.0.3	04/08/2025, 09:01:16	4.0.1
> @mii-termserve/de.bfarm.bill-of-	BOM package for all ...	2025.8.4	29/08/2025, 08:07:22	4.0.1

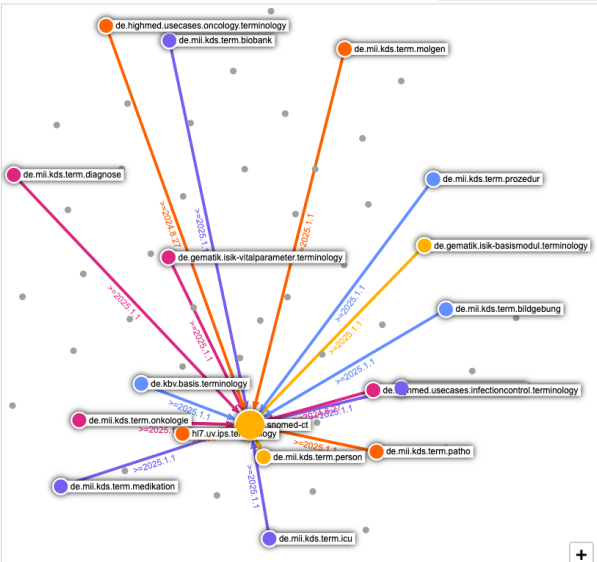


SU-TermServ

CRMI Feed Package dependencies API Docs 

Package Graph

☒ Simplify labels @mii-termserve/snomed-ct



Package info

Name @mii-termserve/snomed-ct

Version 2025.7.1

Node ID thir-npm://@mii-termserve/snomed-ct?version=2025.7.1

Description This package contains place holder resources for SNOMED CT versions indexed by the S U-TermServ server.

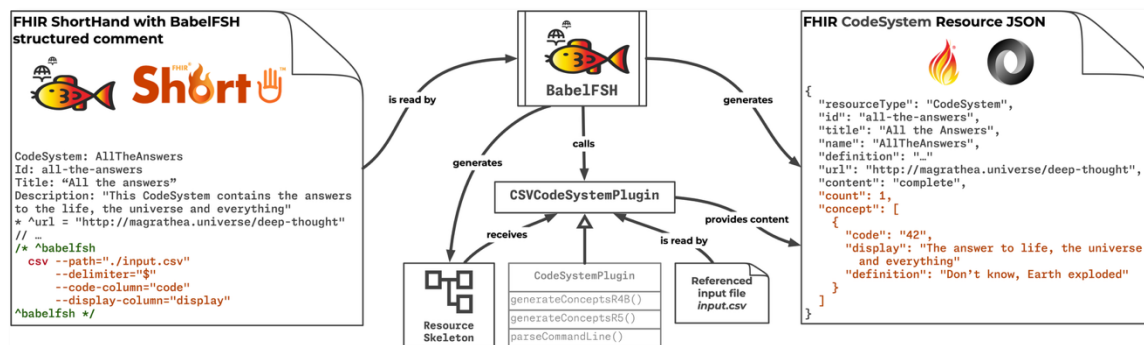
Resource counts • CodeSystem: 9

0 outbound dependencies

- @mii-termserve/de.kbv.basis.terminology
Constraint: >=2025.1.1
Resolved: 1.7.0-suts.4
- @mii-termserve/de.gematik.isik-basismodul.terminology
Constraint: >=2025.1.1
Resolved: 4.0.3-suts.4
- @mii-termserve/de.gematik.isik-vitalparameter.terminology
Constraint: >=2025.1.1
Resolved: 4.0.2-suts.1
- @mii-termserve/hl7.uv.i8.s.terminology
Constraint: >=2024.8.0
Resolved: 1.1.0-suts.4
- @mii-termserve/de.med.informatikinitiative.berndatensatz.terminology.bildgebung
Constraint: >=2025.1.1
Resolved: 2025.0.2-suts.1

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/babelfish-pp



Datendefinition



Kohortenselektion



Merkmalselektion



Gespeicherte Abfragen

Kriteriensuche

Definieren Sie Ihre Kohorte anhand von Kriterien, die Sie über das Suchfeld auswählen können. Für gezieltes Suchen können Sie auf bestimmte Terminologien (z. B. ICD-10, LOINC, OPS) oder KDS-Module einschränken. Sie können die Kohortenselektion direkt verwenden, um die Zahl von Patientinnen und Patienten deutschlandweit abzuschätzen.

Suchen

Kontext

WWW.ORPHA.NET (1...

KDS-Modul

Filter zurücksetzen

Name

Verfügbarkeit Terminologie

Termcode Kontext

☐	Osteogenesis imperfecta	?	WWW.ORPHA.NET 666	Diagnose
☐	CEDNIK syndrome	?	WWW.ORPHA.NET 66631	Diagnose
☐	Cerebrooculonasal syndrome	?	WWW.ORPHA.NET 66625	Diagnose
☐	Congenital pseudoarthrosis of the clavicle	?	WWW.ORPHA.NET 66630	Diagnose
☐	Cutaneous mastocytosis	?	WWW.ORPHA.NET 66646	Diagnose
☐	Diaphanospondylodysostosis	?	WWW.ORPHA.NET 66637	Diagnose
☐	Dilated cardiomyopathy with ataxia	?	WWW.ORPHA.NET 66634	Diagnose
☐	Extracutaneous mastocytoma	?	WWW.ORPHA.NET 66662	Diagnose
☐	Goldberg-Shprintzen megacolon syndrome	?	WWW.ORPHA.NET 66629	Diagnose

Schließen

Elternelement	Primary bone dysplasia with decr...	Bearbeiten
Kindelement	Osteogenesis imperfecta type 1	Bearbeiten
	Osteogenesis imperfecta type 2	Bearbeiten
	Osteogenesis imperfecta type 4	Bearbeiten
	Osteogenesis imperfecta type 3	Bearbeiten
	Osteogenesis imperfecta type 5	Bearbeiten

Zur Kohortenselektion hinzufügen

Kohortenselektion anzeigen

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

Contact

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