

# The Terminology Server Challenge 2023

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# FHIR Terminology Servers (FTS)



- Terminology Binding: ValueSet for every element definition with coded data type
  - Codes/Concepts for every VS defined in ≥1 *CodeSystem*
  - Many CS, more VS to manage in large-scale FHIR projects
- FHIR defines terminology servers
  - Set of terminology-specific FHIR operations
  - RESTful **API**
  - (Create/Read/Update/Delete Functionality)
- Implemented by:
  - (some) General-Purpose FHIR Servers (GPFS)
    - Implement the entire HL7 FHIR Standard
    - Geared towards medical data
  - specialized FHIR Terminology Servers (FTS)
    - Implement only the Terminology Module
    - Geared towards handling terminology only





"Is there a **practical** difference between GPFS as terminology servers and purpose-built FTS?"

# The Terminology Server Challenge



Location / Date	68 <sup>th</sup> Annual Conference of the German Association for Medical Informatics, Biometry and Epidemiology (GMDS), Heilbronn, Germany, 2023-09-21
Organizers / Chairs	Members of the <b>Working Group <i>Medical Terminologies and</i> <i>Classifications</i> (MTK) of the GMDS and of the Service Unit Terminological Services of the Medical Informatics Initiative Germany</b>
Attendees	<ul> <li>Organizers</li> <li>Representatives of TS developers</li> <li>Members of the WG MTK</li> <li>Conference Attendees</li> </ul>
Objective	<ul> <li>Overview of the landscape of FHIR TS implementations</li> <li>Implementation state of the FHIR Terminology API</li> <li>Exploration of the boundary between GPFS and native FTS</li> <li>Not to determine a "winner"</li> </ul>
Procedure	<ul> <li>Short product presentations</li> <li>REST API calls with a defined use case/scenario</li> </ul>

#### Attendees



SU-TermServ

Product	Developer	License	Class
HAPI FHIR JPA Server <sup>1</sup>	Smile Digital Health, Toronto, Canada	open-source	GPFS
ID LOGIK ®	ID Berlin GmbH, Germany	commercial	FTS
Kodjin Terminology Service <sup>2</sup>	Edenlab, Kyiv, Ukraine & Tallinn, Estonia	commercial	FTS
Ontoserver ® <sup>2</sup>	Australian e-Health Research Centre, CSIRO, Brisbane, Australia	commercial	FTS

<sup>1</sup> Presented by Julian Saß from the organizational team as a point of comparison

<sup>2</sup> Presenters attended remotely

### **Use Case**



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- Derived from a Medical Informatics Initiative user story
  - Molecular Tumor Boards using cBioPortal
  - Terminology mapping via SNOMED CT post-coordinated expressions (PCEs) and subsumption testing → FHIR R4 ConceptMap
- Defined in API calls using the Postman API client
  - ConceptMap and other artefacts from previous study
  - Provided to & refined with participants well ahead of the session



T. Ohlsen, V. Kruse, R. Krupar, A. Banach, J. Ingenerf, and C. Drenkhahn, Mapping of ICD-O Tuples to OncoTree Codes Using SNOMED CT Post-Coordination, in: Stud. Health Technol. Inform., IOS Press, 2022 Collection Archive: <u>https://doi.org/10.5281/ZENODO.13860055</u>

#### **Interactions in the Postman Collection**



Capability Statement requests	What does the server report to be able to do?	
Resource creation	Can the server create resources via the standard <b>CRUD</b> RESTful interface?	
CodeSystem/\$lookup	<ul> <li>SNOMED CT pre- and post-coordinated</li> <li>ICD-O, OncoTree</li> </ul>	
CodeSystem/\$validate-code	<ul> <li>Including expected fails</li> </ul>	
ValueSet/\$expand	<ul> <li>Expansion of complex VS with filters</li> <li>Including SCT ECL</li> </ul>	
CodeSystem/\$subsumes	<ul> <li>Including pre- and post-coordinated SCT concepts</li> </ul>	
ConceptMap/\$closure	• <b>Complex operation</b> to calculate the transitive hull of a set of concepts	
ConceptMap/\$translate	<ul> <li>Including expected fails</li> </ul>	
CodeSystem/\$find-matches	<ul> <li>Complex operation to find concepts by their properties</li> <li>Using SNOMED CT</li> </ul>	

# Takeaways: GPFS vs native FTS



- GPFS often not sufficient for terminology operations
- Performance limitations
- Especially troublesome: advanced functionality, including SNOMED CT and LOINC usage
  - Special casing needed
- Inherent challenge in application design for GPFS

REST API Layer								
Operations	TS	FHIR Search	Instance validation	CQL				
Create/Read/Update/Delete (CRUD) Layer								
Index Layer								
Persistence Layer								

Blue-shaded areas are required both for GPFS and FTS implementations, white-shaded areas are only required for GPFS. Instance validation and CQL are only examples of what is required in a comprehensive GPFS.

# **Takeaways: FHIR API**



- Difference in implementation comprehensiveness:
  - Differing focus of the products
- Alignment towards FHIR Terminology API great opportunity
  - Interoperable User Interfaces
  - Purpose-built tooling for terminology operations
  - ...
- Gaps in the FHIR API
  - Integration of NLP, Large Language Models, AI, ...
- API doesn't solve problem of terminology maintenance and distribution

## Summary





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- FHIR API is great, but doesn't address all possible requirements
- Boundary between GPFS and FTS does exist
  - GPFS are not "worthless" as TS
- Overall strategy important factor in system selection
  - Terminology servers are a tool that must be chosen to fit the requirements



### Contact



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