UNIVERSITÄT ZU LÜBECK

UNIKLINIK KÖLN

MHH Medizinische Hochschule Hannover

MEDICAL INFORMATICS INITIATIVE GERMANY

SU-TermServ

# BabelFSH

Interoperabilitätsforum, June 2024, Berlin @ DIN
Joshua Wiedekopf
IT Center for Clinical Research & Institute of Medical Informatics, University of Lübeck

SPONSORED BY THE

Federal Ministry of Education and Research

# About us

- “Module 2B Project” in the Medical Informatics Initiative: *advancing the harmonization of health data and IT solutions at the university hospital sites in cooperation with the NUM*
- Project funded 2023-2026 with three partner sites
  - University of Luebeck, Josef Ingenerf
  - University of Cologne, Oya Beyan & Andreas Beyer
  - Hanover Medical School, Michael Marschollek
- Goal: provide and support a central 🔥 terminology server to DICs and the MII/NUM in general, to support semantic interoperability
  - Support for CDS designers in the MII for the development of the CDS
  - Support for DICs to provide a reference server for terminology used in MII/NUM

# Our team

## Lübeck


Josef Ingenerf
PROF. DR. RER. NAT.


Joshua Wiedekopf
M. SC.


Tessa Ohlsen
M.SC.

## Köln


Andreas Beyer
PROF. DR.


Oya Deniz Beyan
PROF. DR.


Ana Grönke
DR.


Mostafa Kamal
M. SC.


Muhammad Adnan
M. SC.


René Tielsch-Nebel
DIPL. ING. (FH)


Samer Alkarkoukly
M.D. M.SC.


Simon Schumacher
DR.

## Hannover


Michael Marschollek
PROF. DR. MED. DR.-ING.


Birger Haarbrandt
M. SC.


Nele Philipzik
M. A.


Sarah Ballout
B. SC.

## Alumni


Cora Drenkhahn
M. SC.

# The Problem

- Using FHIR Terminology server operations requires access to FHIR CodeSystem resources
  - Except for SNOMED CT and LOINC, but that's a different story
- Many terminological resources aren't natively FHIR
  - *[BfArM resources, i.e. ICD-10-GM, ICD-10-WHO, ICD-O-3, ICF, [Orphanet], Alpha-ID-SE, OPS]: ClaML and CSV*
  - ATC: Excel sheets
  - EDQM Standard Terms: API
  - OncoTree: API or RDF
- Some CodeSystems also "define" ValueSets and/or ConceptMaps
- Conversion to FHIR requires the same thing being done over and over again
  - Define Metadata of the resource (-s), sometimes cleanly, sometimes hard-coded
  - Add content (concepts for CS, includes for VS, elements for CM) to the resource (-s), domain-specific fashion
  - Write out a FHIR JSON resource and/or upload to FHIR server

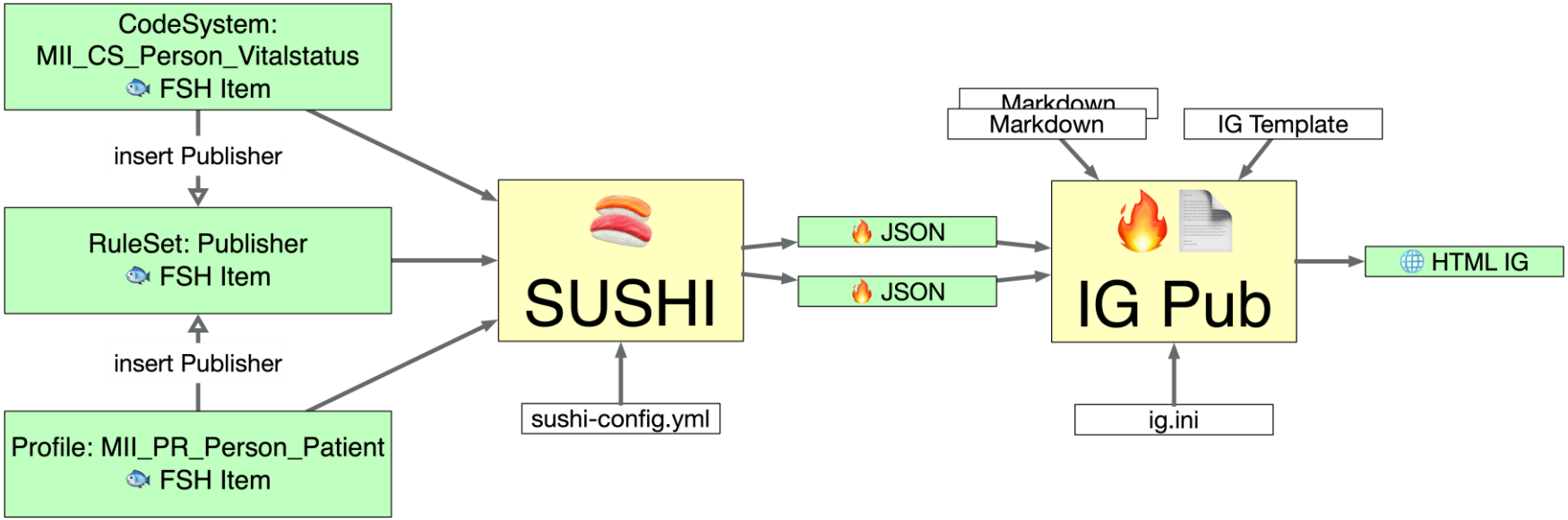
# FSH and SUSHI, briefly

- FSH = FHIR Shorthand; SUSHI Unshortens Short Hand Inputs
- FSH used for definition of profiles and IGs (mainly)
  - In-development specification for a domain-specific language
  - R2 of FSH released in Feb 2022; ongoing development for FSH 3.x
  - Specification defines syntax and semantics of the language
- SUSHI is the go-to method for converting FSH into FHIR
  - reference implementation and *de-facto* standard FSH “compiler”
  - Usable both “standalone” and together with the IG publisher
  - also defines an ANTLR4 grammar for parsing the formal language specification

# BabelFSH

- Use of FSH for definition of metadata in a language users are familiar with
  - Same language for definition of super-simple CS and especially profiles
- Use of “plugins” for domain-specific concept generation
  - If possible, general-purpose implementation
  - If not, that’s fine 😁
  - Very simple API for the definition of plugins: only produce a stream of concepts/includes/elements
- Parametrization of the plugins using “command line switches”
- Optionally take in input data from files or other mechanisms
- Write out FHIR JSON to an output folder
- Use of the SUSHI grammar and ANTLR4 parser with obvious restrictions and one extension
  - Generation of FSH items other than CS/VS/CM and RuleSet not intended
  - Comments give the parameters for the invoked plugins, delimited with recognition tokens

# SUSHI, FSH and the IG Publisher



Short with machine-readable comments

```
RuleSet: alphaid-se-metadata
* ^url = “http://fhir.de/
CodeSystem/bfarm/alpha-id”
* ^status = #active
// …

RuleSet: alphaid-se-babelfsh(version, oid, path)
* ^version = “{version}”
* ^identifier[+].system = “urn:ietf:rfc:3986”
* ^identifier[=].value = “urn:oid:{oid}”
* insert alphaid-se-metadata
/*^babelfsh
csv
  --path=‘{path}’
  --headers=[“gueltig”, “code”, “icd_10”]
  --delimiter=‘|’
  --code-column=code
  --display-column=‘display’
  --property-mapping=[{“column”: “icd_10”,
“property”: “icd_10_primaer”}]
^babelfsh*/

CodeSystem: AlphaIdSe
Id: alphaid-se-2024
Title: "Alpha-ID-SE"
Description: "The Alpha-ID is a sequential and stable
identification number, which is allocated to each
entry in the alphabetical index. It permits the
encoding of medical and natural language diagnostic
terms."
* insert alphaid-se-babelfsh-2018ff("2024",
"1.2.276.0.76.5.538", "./input-files/Alpha-ID/
alphaidse2024/
icd10gm2024_alphaidse_edvtxt_20230929.txt")
```

Alpha-ID-SE as input file

BabelFSH

CodeSystemPlugin “csv”

HL7 FHIR R4B or R5

```
{
  "resourceType": "CodeSystem",
  "id": "alphaid-se-2024",
  "url": "http://fhir.de/
CodeSystem/bfarm/alpha-id",
  "identifier": [
    {
      "system": "urn:ietf:rfc:3986",
      "value": "urn:oid:1.2.276.0.76.5.538"
    }
  ],
  "version": "2024",
  "name": "AlphaIdSe",
  "title": "Alpha-ID-SE",
  "status": "active",
  "experimental": false,
  "caseSensitive": false,
  "content": "complete",
  "property": [
    {
      "code": "icd_10_primaer",
      "description": "Der ICD-Code aus der Alpha-ID",
      "type": "string"
    }
  ],
  "concept": [
    {
      "code": "I1",
      "display": "Lymphatische Infiltration",
      "property": [
        {
          "code": "icd_10_primaer",
          "valueString": "D47.9"
        },
        {
          "code": "inactive",
          "valueBoolean": false
        }
      ]
    }
  ]
}
```

# Development perspective

- Implemented as of 2024-05-23: only CodeSystem plugins
  - CSV
  - Excel (started development for ATC)
  - ClaML: general using fhir-claml and BfArM-specific flavours
- Planned:
  - OncoTree (API)
  - EDQM Standard Terms (API); including several ValueSets ➔ API for VS/CM generation still NYI
  - … as required by the MII CDS and other partners
  - CM from OHDSI Athena
- Fancy ideas:
  - SQL using JDBC for “catalogs” in primary systems
  - Provision of FHIR API for nomenclatures (UCUM)
  - Web-based interface and/or language server integration in VS Code for simpler creation and validation of BabelFSH source files

# BabelFSH in use and in the future

- https://gitlab.com/mii-termserv/babelfsh
  - Also provided: example ***.babelfsh.fsh*** files
- Generation of FHIR resources used within the MII CDS and other projects
  - ultimately for upload to the SU-TermServ server; c.f. our (WIP) package registry
- Tool can help with difficult-to-license terminologies: share BabelFSH files instead of FHIR resources
- Representation of terminological artefacts subject to variation
  - Naming Conventions
  - Property definitions
  - Establishment of BabelFSH and sharing of definition files as a commonly-used tool can help alignment to conventions by making conversion process more transparent

MEDICAL INFORMATICS INITIATIVE GERMANY

SU-TermServ

# MII Service Unit *Terminological Services* (SU-TermServ)

https://mii-termserv.de
team@mail.mii-termserv.de

**A partnership between the University of Luebeck, the University of Cologne, and the Hannover Medical School**

UNIVERSITÄT ZU LÜBECK

UNIKLINIK KÖLN

MHH Medizinische Hochschule Hannover

SPONSORED BY THE

Federal Ministry of Education and Research