



HL7 CDA to FHIR mapping hands-on

16.6.2022, workshop with HL7 Italy, Via Alessandria, 220, 00198 Roma RM, Italien

Agenda

- | | |
|---------------|--|
| 10.00 – 10.30 | High Level Introduction CDA and FHIR Mapping (Differences between Standards, FHIR Mapping Language as independent Mapping Exchange format) |
| 10.30 – 11.00 | FHIR Logical Model of CDA - Exercise |
| 11.15 – 12.15 | FHIR Mapping Language Introduction with conversion to StructureMap - Exercise |
| 14.00 – 15.00 | CDA to FHIR mapping hands-on with matchbox - Exercise (based on provided Italian example) |
| 15.00 – 15.30 | Summary, Questions and answers - Exercise |



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twitter: @oliveregger

2015 - founder ahdis

2003 - 2014 visionary AG, docbox
2002 - 2003 Ecofin Research & Consulting AG
1994 - 2001 SPEAG

2016 - Dozent BFH Bern, ZHAW Winterthur

Medizininformatik, Interoperabilität

HL7.ch

Technical Manager, member hl7 since 2009

IHE Suisse Member since 2015

IHE International ITI Technical Committee Co-Chair

Dipl. Inf. ETH, ETH Zürich, 1996

IHE XDS Advanced Training, 2015
Certified HL7 CDA Specialist, 2015
Certified Scrum Master, 2014
NDK eHealthcare, Nottwil, 2009



offering

- **Consulting and Teaching** in eHealth topics from HL7 (FHIR, V2, CDA), IHE and Swiss EPR
- **Design and Architecture** of eHealth Information systems: API's, Exchange formats, Architecture, Hosting, Security
- **Implementation** Coordination and Integration of eHealth Software-Projects, PoC

Workshop **Übungen Computer Setup**

- Editor: Visual Studio Code
 - REST Client Extension
 - fhir-tools Extension
 - FHIR Mapping Language Extension
- Github Desktop or git client locally
- Java Runtime for running HL7 Java Validator
- Docker

Visual Studio Code

 Visual Studio Code

Docs

Updates

Blog

API

Extensions

FAQ

 Search Docs

 Download

Version 1.45 is now available! Read about the new features and fixes from April.

Overview

SETUP

Overview

Linux

macOS

Windows

Network

Additional Components

GET STARTED

USER GUIDE

LANGUAGES

NODE.JS / JAVASCRIPT

TYPESCRIPT

PYTHON

JAVA

C++

CONTAINERS

Setting up Visual Studio Code



Getting up and running with Visual Studio Code is quick and easy. It is a small download so you can install in a matter of minutes and give VS Code a try.

Cross platform

VS Code is a free code editor, which runs on the macOS, Linux, and Windows operating systems.

Follow the platform-specific guides below:

- macOS
- Linux
- Windows

VS Code is lightweight and should run on most available hardware and platform versions. You can review the [System Requirements](#) to check if your computer configuration is supported.

Update cadence

VS Code releases a new version [each month](#) with new features and important bug fixes. Most platforms support auto updating and you will be prompted to install the new release when it becomes available. You can also manually check for updates by running **Help > Check for Updates** on Linux and Windows or running **Code > Check for Updates** on macOS.

IN THIS ARTICLE

Cross platform

Update cadence

Insiders nightly build

Portable mode

Additional components

Extensions

Next steps

Common questions

 [Tweet this link](#)

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<https://code.visualstudio.com/docs/setup/setup-overview>

REST Client

Visual Code Extension

1

2

3

The screenshot shows the Visual Studio Code interface with the REST Client extension installed. The left sidebar shows the 'EXTENSIONS: MARKETPLACE' view with a search for 'REST Client'. The right sidebar shows the 'Extension: REST Client' details page. The bottom panel shows the 'TERMINAL' view with the command 'cda-core-2.0 %'.

EXTENSIONS: MARKETPLACE

REST Client

- REST Client** 0.23.2 918K ★ 5
REST Client for Visual Studio Code
Huachao Mao [Install](#)
- Simple REST Client** 1.3.0 9K ★ 5
Easy to examine your API's responses directly within Visual Studio Code
Tino [Install](#)
- SP REST Client** 0.1.4 2K ★ 5
SharePoint REST Client for Visual Studio Code
Sergei Sergeev [Install](#)
- MicroProfile REST Client Generator** 0.1.1 2K
Generate a MicroProfile REST Client using the OpenAPI Generator
MicroProfile Community [Install](#)
- Bemba REST Client** 0.21.1 320
Fork of "REST Client" for internal use at Bemba
bemba [Install](#)
- Self Use REST Client** 1.0.0 213
REST Client for Visual Studio Code
cweijan [Install](#)
- HTTP Client** 0.34.0 16K ★ 5
Simple way to do HTTP requests.
Marcel J. Kloubert [Install](#)
- reStructuredText** 128.0.0 165K ★ 3.5
reStructuredText language support (RST/ReST linter, preview, l...
LeXtudio Inc. [Install](#)
- stREST Client** 0.1.3 445
stREST Client for Visual Studio Code
jgroom [Install](#)
- R LSP Client** 0.1.6 27K ★ 5
R LSP Client for VS Code
REditorSupport [Install](#)
- REST API** 3.0.1 12K
Extension that provides a REST API to control your editor.
Marcel J. Kloubert [Install](#)
- Azure REST for Ansible** 0.0.18 7K ★ 5
Create, update or delete any Azure resource using Ansible
Azure REST for Ansible [Install](#)

Extension: REST Client [humao.rest-client](#)

REST Client Huachao Mao | 918,744 | ★★★★★ | Repository | License

REST Client for Visual Studio Code

[Install](#)

[Details](#) [Feature Contributions](#) [Changelog](#)

REST Client

build [passing](#) chat [on github](#) VS Marketplace v0.23.2 downloads 4131680 installs 918949

rating average: 4.94/5 (204 ratings)

REST Client allows you to send HTTP request and view the response in Visual Studio Code directly.

Main Features

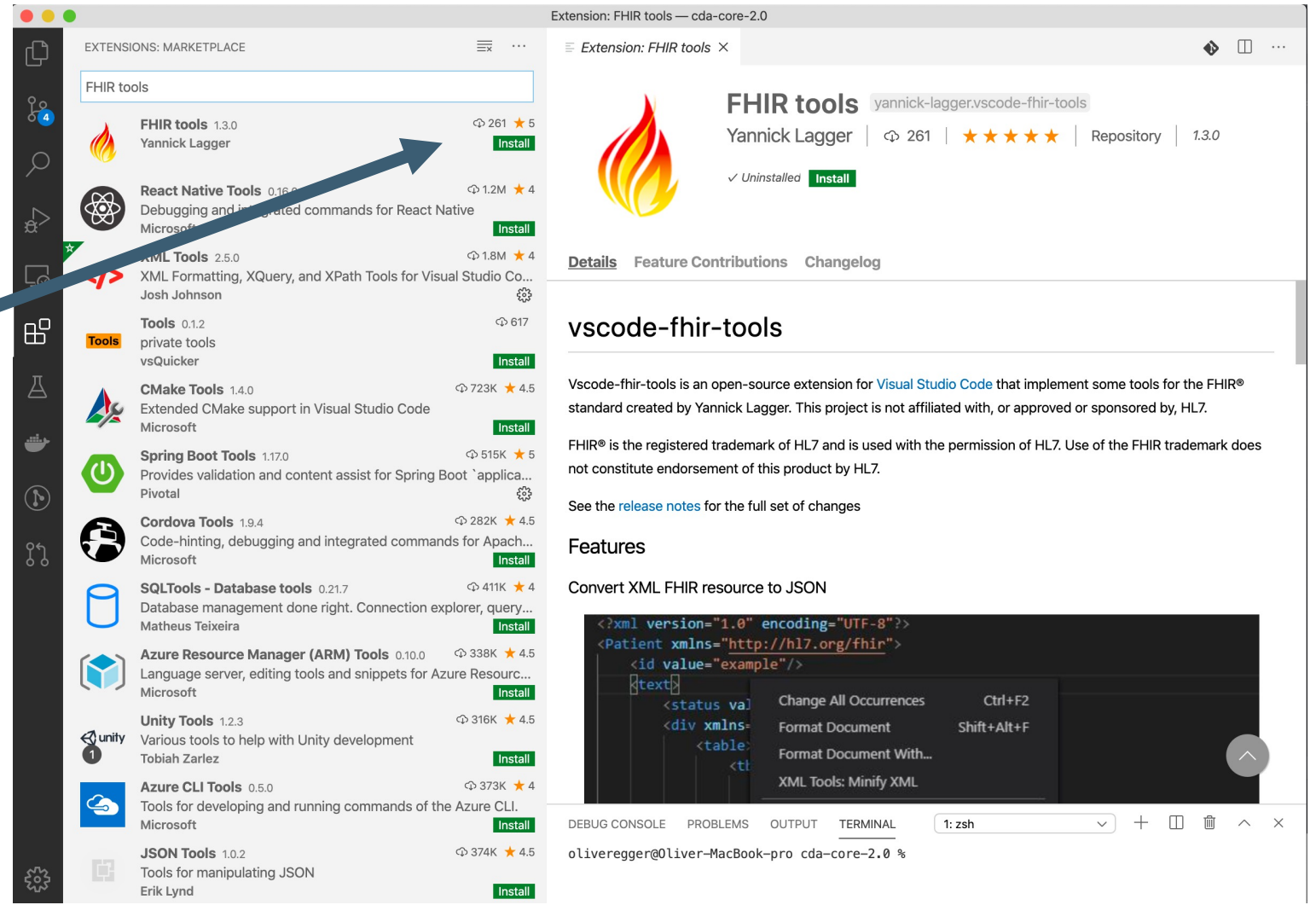
- Send/Cancel/Rerun **HTTP request** in editor and view response in a separate pane with syntax highlight
- Send **GraphQL query** and author **GraphQL variables** in editor
- Send **cURL command** in editor and copy HTTP request as **cURL command**
- Auto save and view/clear request history
- Organize **MULTIPLE** requests in the same file (separated by **###** delimiter)
- View image response directly in pane
- Save raw response and response body only to local disk
- Fold and unfold response body
- Customize font(size/family/weight) in response preview
- Preview response with expected parts(**headers only**, **body only**, **full response** and **both request and response**)

DEBUG CONSOLE TERMINAL ... 1: zsh

oliverregger@Oliver-MacBook-pro cda-core-2.0 %

FHIR tools

Visual Studio Code Extension



The image shows a screenshot of the Visual Studio Code interface. On the left, the 'EXTENSIONS: MARKETPLACE' view is open, displaying a list of extensions. The search bar at the top contains 'FHIR tools'. The first result is 'FHIR tools' by Yannick Lagger, version 1.3.0, with 261 downloads and 5 stars. A blue arrow points from the text 'Visual Studio Code Extension' to this extension. Other extensions listed include React Native Tools, XML Tools, Tools, CMake Tools, Spring Boot Tools, Cordova Tools, SQLTools - Database tools, Azure Resource Manager (ARM) Tools, Unity Tools, Azure CLI Tools, and JSON Tools.

On the right, the details page for the 'FHIR tools' extension is shown. The extension is by Yannick Lagger, version 1.3.0, with 261 downloads and 5 stars. It is currently 'Uninstalled'. The page includes tabs for 'Details', 'Feature Contributions', and 'Changelog'. The 'Details' tab is active, showing the extension's name 'vscode-fhir-tools' and a description: 'Vscode-fhir-tools is an open-source extension for Visual Studio Code that implement some tools for the FHIR® standard created by Yannick Lagger. This project is not affiliated with, or approved or sponsored by, HL7. FHIR® is the registered trademark of HL7 and is used with the permission of HL7. Use of the FHIR trademark does not constitute endorsement of this product by HL7. See the release notes for the full set of changes. Features: Convert XML FHIR resource to JSON'. Below the description, there is a code snippet showing XML FHIR resource conversion to JSON, with a context menu open over it showing options like 'Change All Occurrences', 'Format Document', 'Format Document With...', and 'XML Tools: Minify XML'.

FHIR Mapping Language

Visual Studio Code Extension

EXTENSIONS: MARKETPLACE

FHIR Mapping Lanugage

HEALEX

FHIR Mapping Language

Syntax highlighting for the FHIR mapping L...

Healex Systems

FHIR tools

Various tools that simplify the work with F...

Yannick Lager

244ms

FHIR Shorthand

FHIR Shorthand (FSH) Language Support ...

MITRE-Health

FHIR Converter

Enables the conversion of legacy formatte...

Microsoft

snapADDY Mapping Toolkit

Provides rich language support for snapA...

snapADDY GmbH

18

5

Install

FHIR JSON Tooling

Adds support for validation and some aut...

Clinical Quality Framework

142

Install

Stardog Mapping Syntax 2 (SMS...

Language intelligence (diagnostics, hover ...

Stardog Union

2K

Install

mappings

MCP mappings for Minecraft 1.8.9

Squagward

48

Install

Tiny Mappings for VSCode

Syntax highlighting for mapping files

ByMartrixX

448

Install

ArcGIS API for JavaScript Sni...

Code snippets for the ArcGIS API for Java...

6K

5

Extension: FHIR Mapping Language — cda-fhir-maps

cdataofhir_refertomedicinalaboratorio.http

cdataofhir_refertoradiologia.http

! application.yaml

README.md

HEALEX

FHIR Mapping Language

v1.0.0

Healex Systems

496

★★★★☆

Syntax highlighting for the FHIR mapping language

Disable

Uninstall

This extension is enabled globally.

Details

Feature Contributions

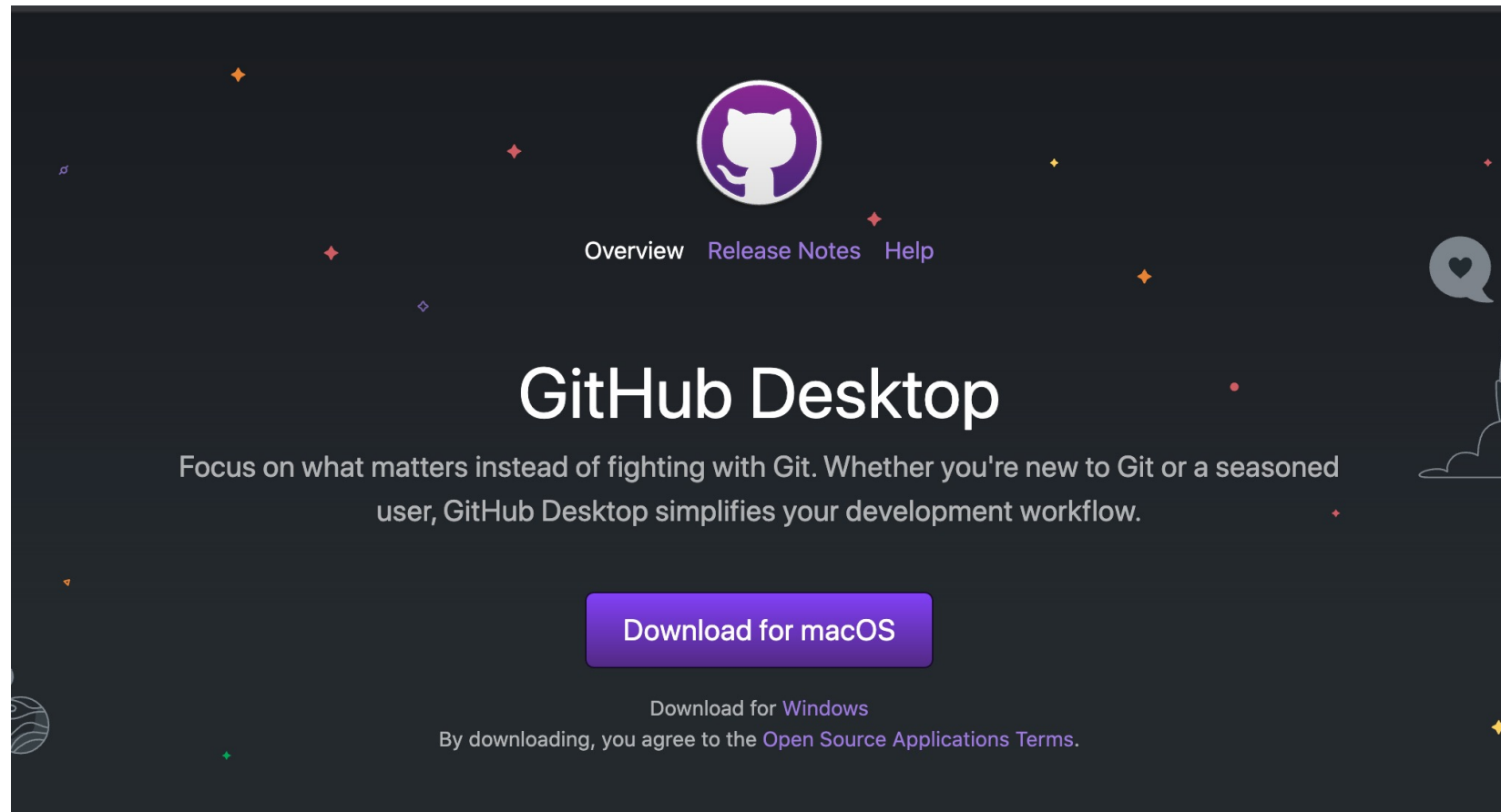
Runtime Status

HEALEX

FHIR Mapping Language Syntax Highlighter

This extension provides syntax highlighting for the FHIR Mapping Language and is published and maintained by [Healex](#). We are a German company building FHIR based solutions in healthcare.

Github Desktop



<https://desktop.github.com/>

Java



Suche 

Download Hilfe

HILFERESSOURCEN

- [Java installieren](#)
- [Java deaktivieren](#)
- [Java verwenden](#)
- [Allgemeine Fragen](#)
- [Mobile Java](#)
- [Sicherheit](#)
- [Support-Optionen](#)

Wie installiere ich Java?



Wählen Sie das Betriebssystem, um Anweisungen zur Installation von Java zu erhalten:

- [Windows](#)
- [Mac OS X](#)
- [Linux](#)
- [Solaris](#)

Download und Installation unter Windows

Download und Installation von Java sind einfach und kostenfrei. Es gibt verschiedene Möglichkeiten, Java für Windows zu erhalten

- Onlinedownload
- Offlinedownload

https://www.java.com/de/download/help/download_options.xml

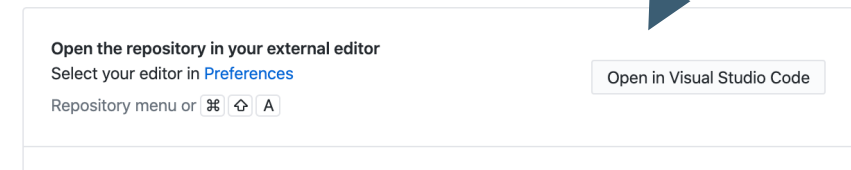
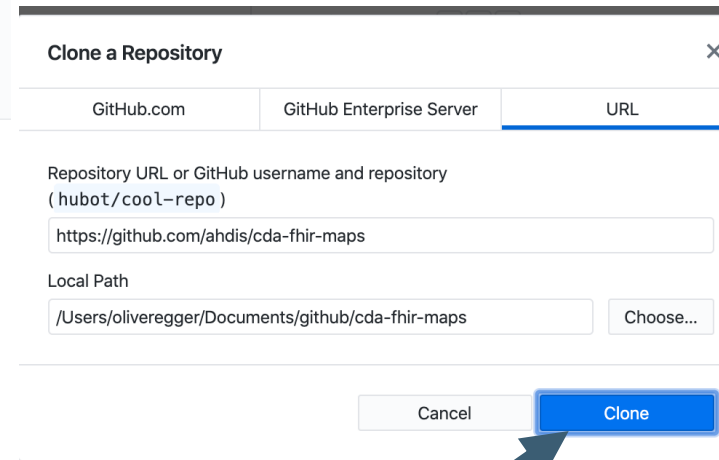
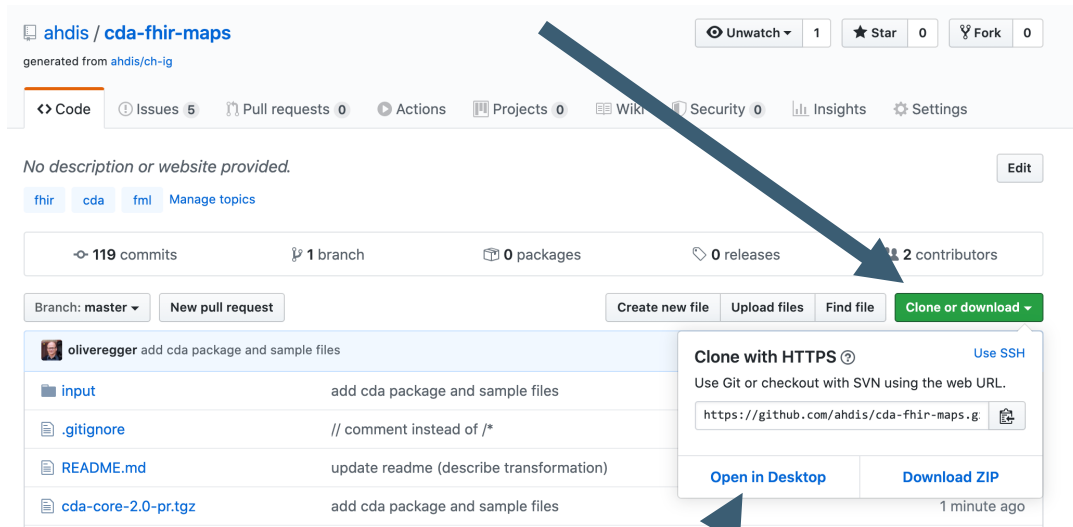


A screenshot of the Docker documentation website. The page has a dark blue header with the Docker logo and navigation links: Home, Guides (selected), Manuals, Reference, and Samples. A search bar is also present. The left sidebar shows a list of navigation items: Docker overview, Get Docker (selected), Get started, Language-specific guides, Develop with Docker, Set up CI/CD, Deploy your app to the cloud, Run your app in production, Educational resources, and Contribute to documentation. The main content area is titled "Get Docker" and features an orange banner with a warning icon and text: "Update to the Docker Desktop terms. Commercial use of Docker Desktop in larger enterprises (more than 250 employees OR more than \$10 million USD in annual revenue) now requires a paid subscription." Below this, a paragraph explains Docker as an open platform for developing, shipping, and running applications. Another paragraph states that Docker can be downloaded and installed on multiple platforms. At the bottom, there are three dark blue boxes with white icons and text: "Docker Desktop for Mac" (with an Apple logo), "Docker Desktop for Windows" (with a Windows logo), and "Docker Desktop for Linux" (with a Linux penguin logo). Each box includes a brief description of the application.

<https://docs.docker.com/get-docker/>

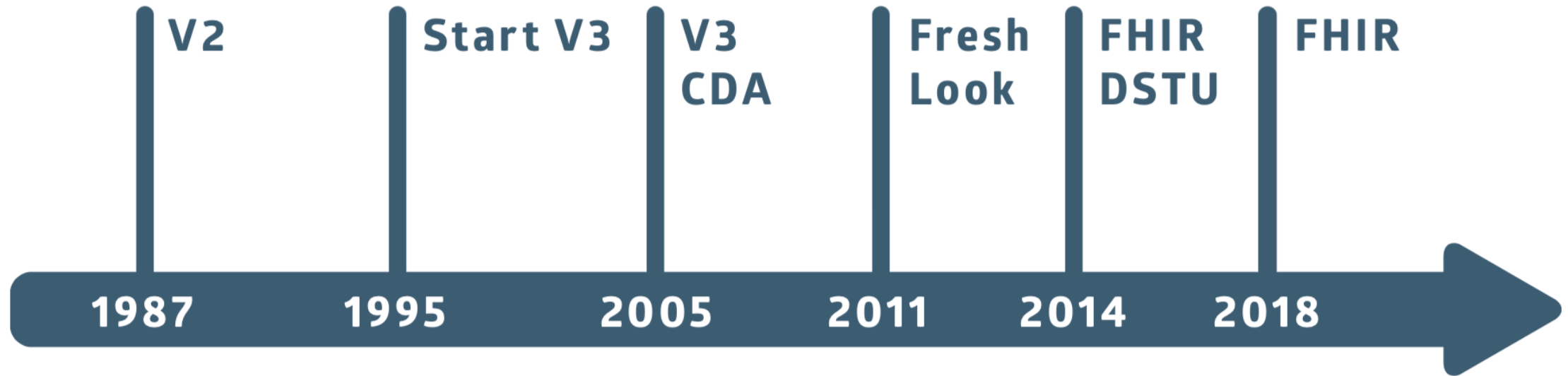
Preparation exercise

- <https://github.com/ahdis/cda-fhir-maps>
- Clone project with Desktop and open in Visual Studio Code



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HL7 CDA

Clinical Document Architecture

Dr. med. Allzeit Bereit
Facharzt für Allgemeine Medizin
Gruppenpraxis CH

Kopfzeile des Absenders des Dokumentes

Doktorgasse 2
8888 Musterhausen

bereit@gruppenpraxis.ch
<http://www.gruppenpraxis.ch>
Tel. 032 234 55 66
Fax 032 234 66 77

RoDiag
Radiologieinstitut
Röntgenstr. 1
8888 Musterhausen
Dokumentempfänger

Musterhausen, 03.10.2007/
*Dokumentdatum / -ersteller
(z.B. Kurzzeichen der MPA)*

ZUWEISUNG ZUR RADIOLOGISCHEN DIAGNOSTIK

Dokumentart

Betrifft: MUSTER Max, 12.12.1938, Leidensweg 10, 9999 Specimendorf
Tel. P: 032 685 12 34 G: 032 123 77 88

Patientenstammdaten, ev. Angaben zum Kostenträger

Gewünschte Untersuchung

Spezifizierung der gewünschten Untersuchung

Dringlichkeit / Wunschtermin

Angaben zum gewünschten Termin

Fragestellung

Grund für die Durchführung der Untersuchung und Angaben zum aktuellen Leiden resp. zum Grund der Untersuchung

Angaben zum Patienten

Erfolgte Voruntersuchungen

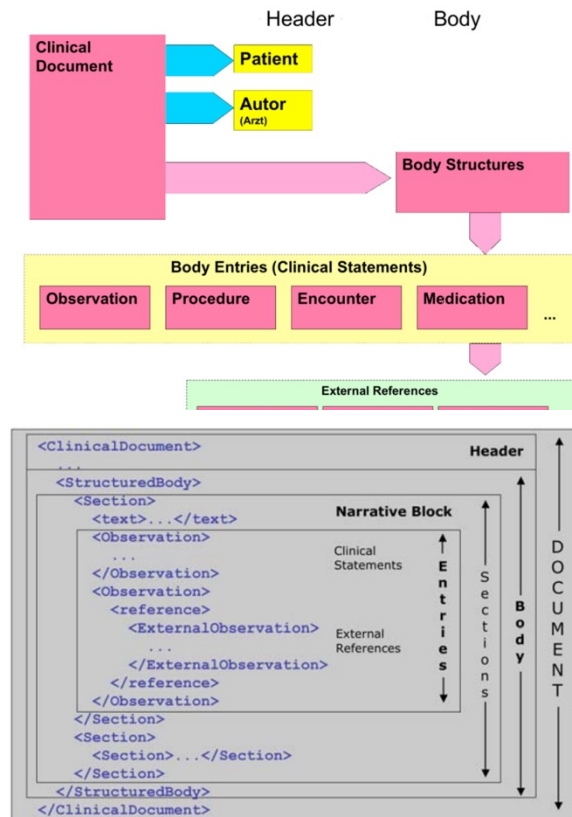
Befundkopie – Empfänger

Klinische Angaben

Beschreibung des aktuellen Leidens

Schwangerschaft ja / nein

Laborwerte (Quick / Tc, Kreatinin)





HL7 FHIR

F Fast

H Healthcare

I Interoperability

R Resources

<http://www.hl7.org/fhir/>



Resource

FHIR uses a collection of information models that define the data elements, constraints and relationships for the “business objects” most relevant to healthcare



API

FHIR builds on modernen Web Technology and RESTful Services

XML, JSON, HTTP und OAuth.

<http://www.hl7.org/fhir/>

FHIR Architecture



Nachrichten



Dokumente



REST



Services

Document Paradigms

Persistence

Stewardship

Authentication

Wholeness

Human readable

HL7 CDA

Clinical Document Architecture

Dr. med. Allzeit Bereit
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Dokumentempfänger

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Patientenstammdaten, ev. Angaben zum Kostenträger

Gewünschte Untersuchung

Spezifizierung der gewünschten Untersuchung

Dringlichkeit / Wunschtermin

Angaben zum gewünschten Termin

Fragestellung

Grund für die Durchführung der Untersuchung und Angaben zum aktuellen Leiden resp. zum Grund der Untersuchung

Angaben zum Patienten

Erfolgte Voruntersuchungen

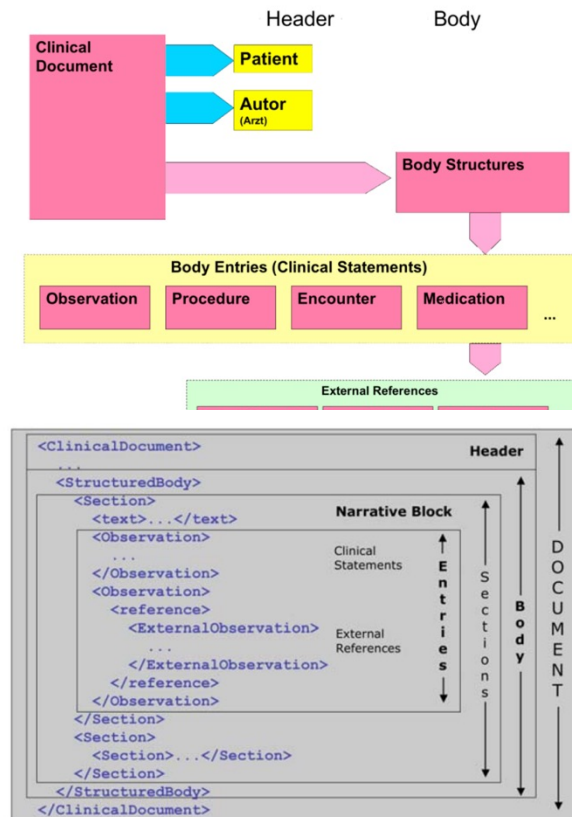
Befundkopie – Empfänger

Klinische Angaben

Beschreibung des aktuellen Leidens

Schwangerschaft ja / nein

Laborwerte (Quick / Tc, Kreatinin)

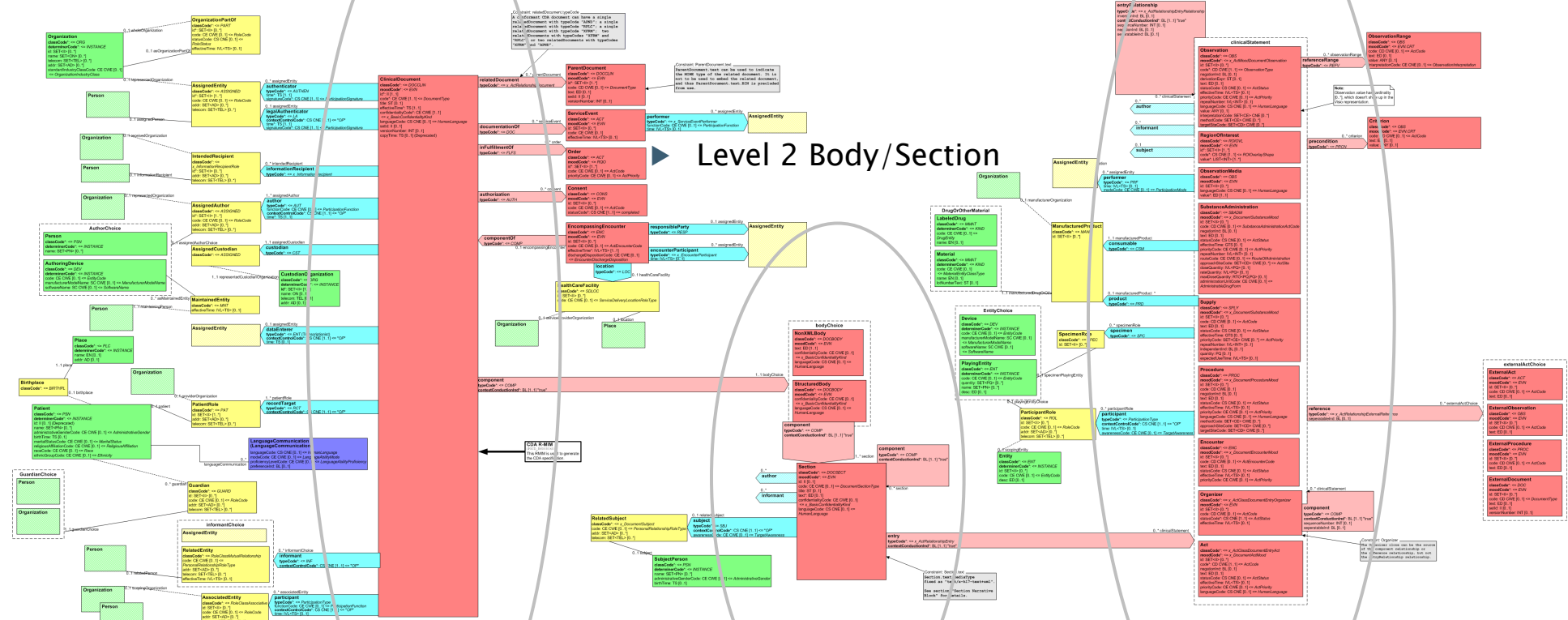


CDA RIM Modell

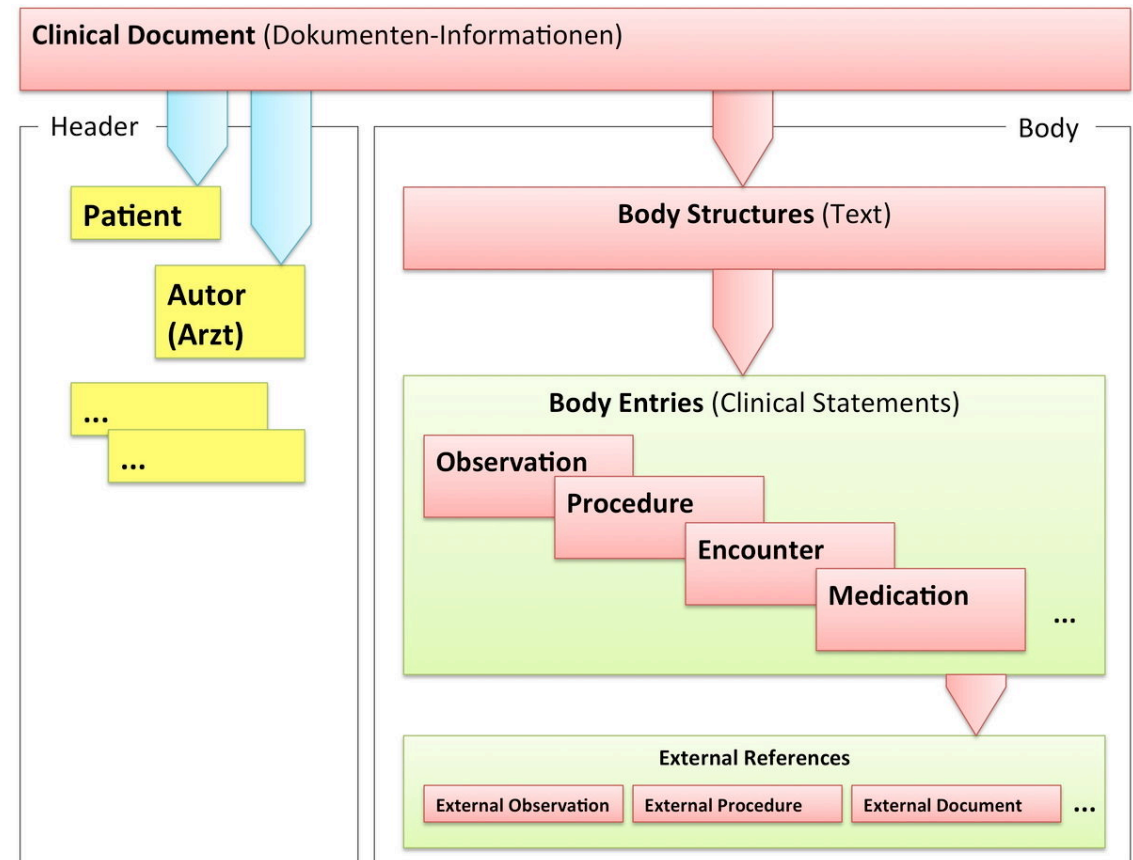
► Level 1 / Header

► Level 3 / Body / Entries

▶ Level 2 Body/Section

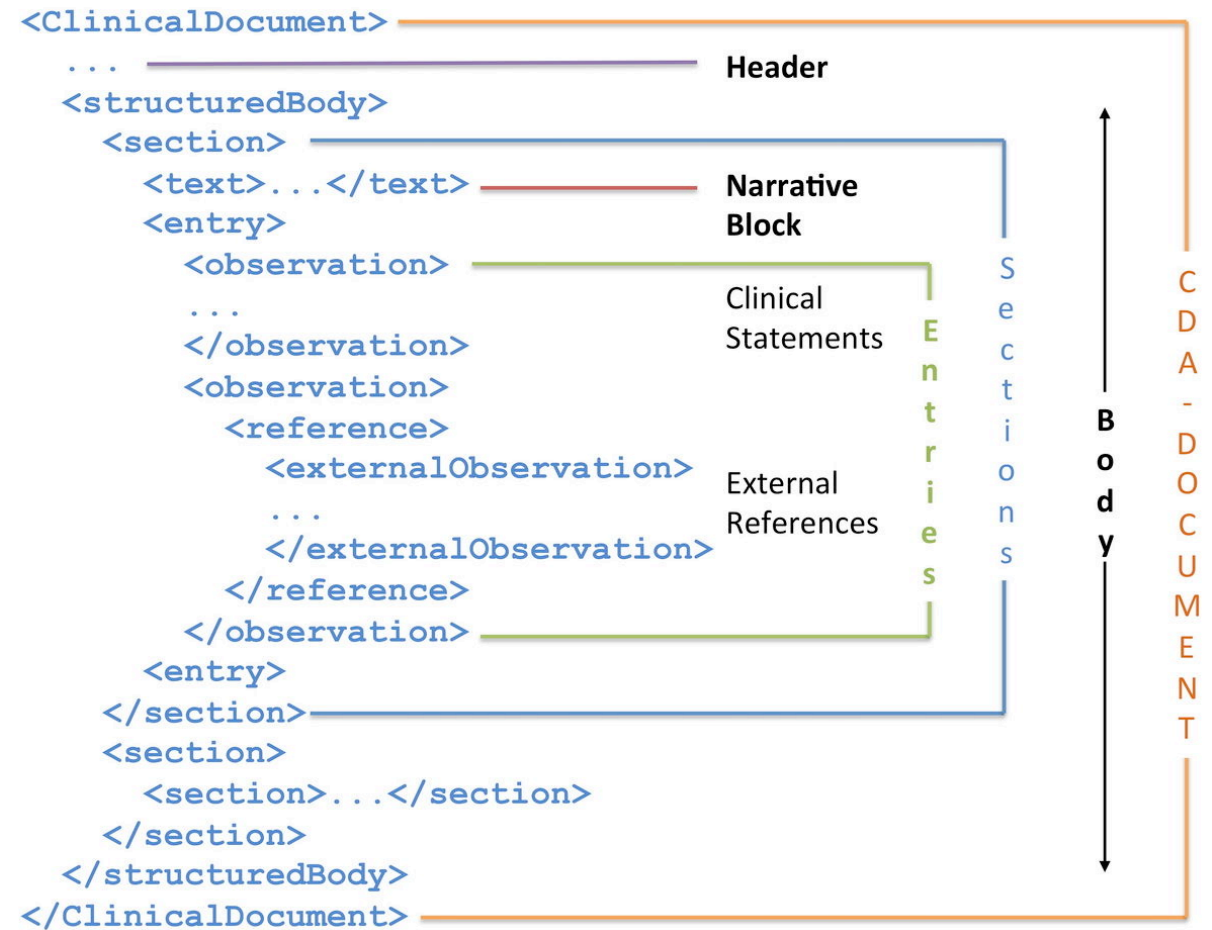


CDA Header and Body



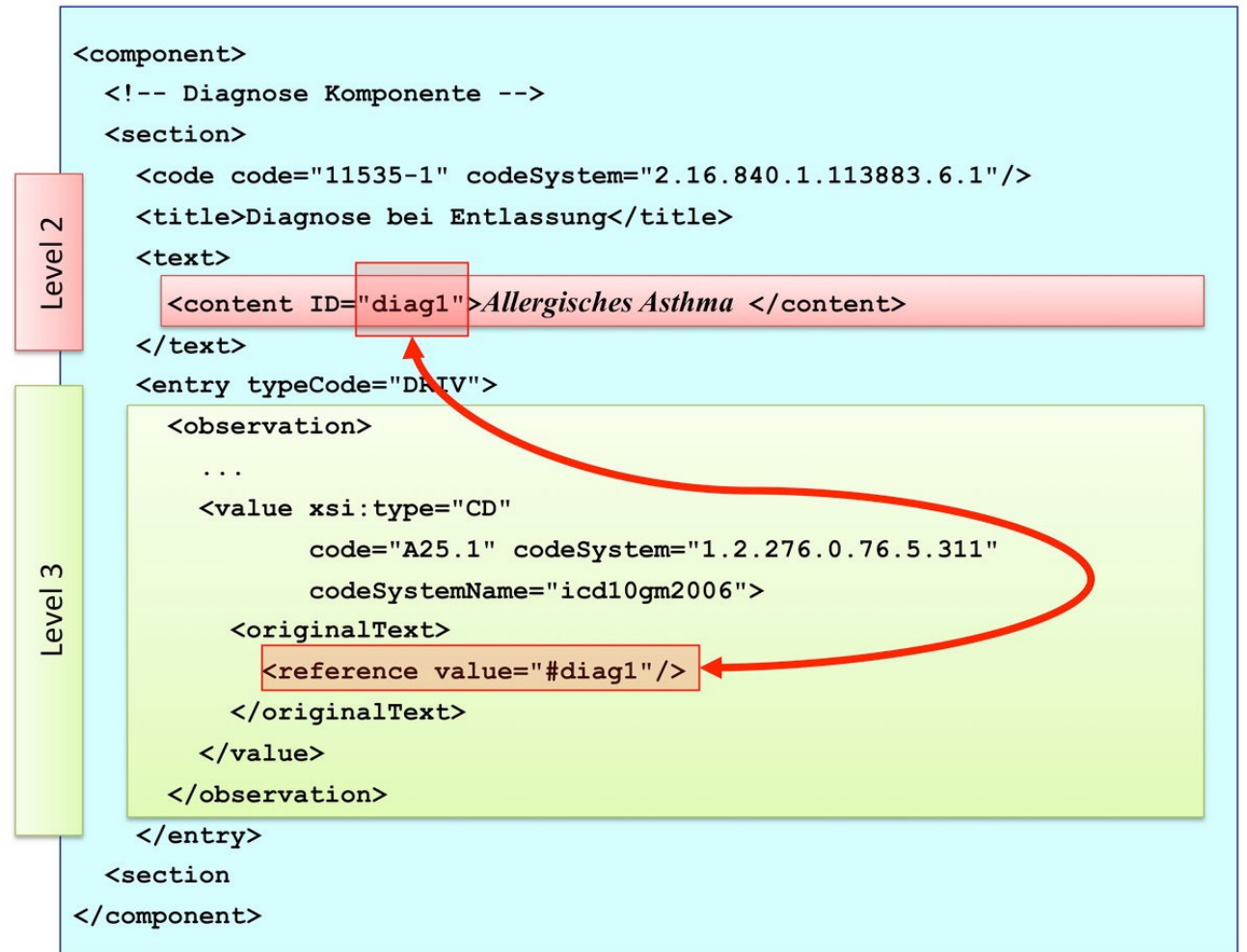
http://wiki.hl7.de/index.php?title=IG:Arztbrief_2014

CDA Documents XML View



http://wiki.hl7.de/index.php?title=IG:Arztbrief_2014

CDA section components, entry and reference to narrative



FHIR documents



HomeGetting StartedDocumentationResourcesProfilesExtensionsOperationsTerminologies

Home

This page is part of the FHIR Specification (v4.0.1: R4 - Mixed [Normative](#) and [STU](#)). This is the current published version. For a full list of available versions, see the [Directory of published versions](#).

0 Welcome to FHIR®

FHIR is a standard for health care data exchange, published by HL7®.

First time here?
See the [executive summary](#), the [developer's introduction](#), [clinical introduction](#), or [architect's introduction](#), and then the [FHIR overview / roadmap & Timelines](#). See also the [open license](#) (and don't miss the full [Table of Contents](#) and the [Community Credits](#) or you can [search this specification](#)).

Technical Corrections:

- 4.0.1, Oct-30 2019:** Corrections to invariants & generated conformance resources, and add ANSI Normative Status Notes

Level 1 Basic framework on which the specification is built

**Foundation**Base Documentation, XML, JSON, Data Types, Extensions

Level 2 Supporting implementation and binding to external specifications

**Implementer Support**
Downloads,
Version Mgmt,
Use Cases,
Testing

**Security & Privacy**
Security,
Consent,
Provenance,
AuditEvent

**Conformance**
StructureDefinition,
CapabilityStatement,
ImplementationGuide,
Profiling

**Terminology**
CodeSystem,
ValueSet,
ConceptMap,
Terminology Svc

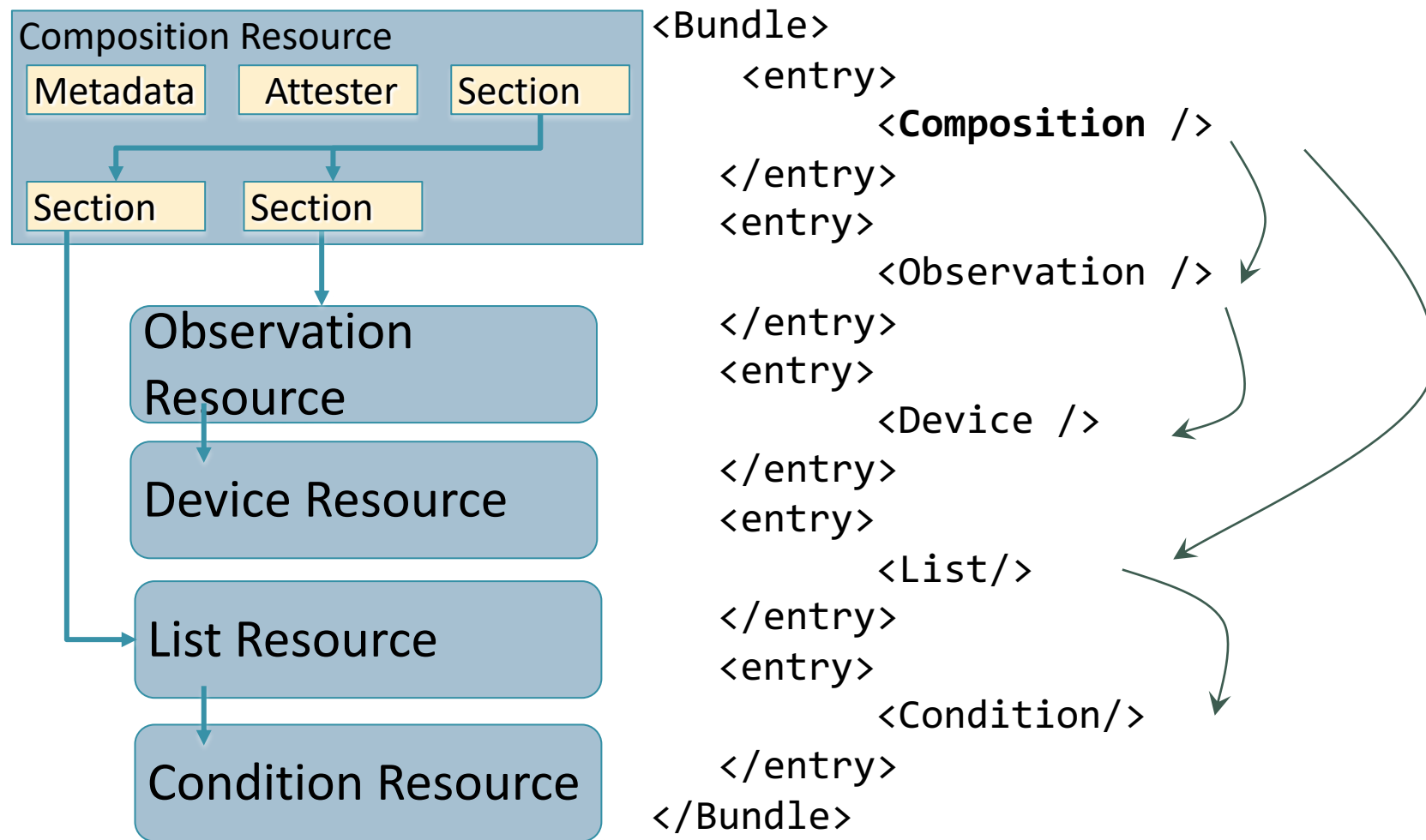
**Exchange**
REST API + Search
Documents
Messaging
Services
Databases

<http://www.hl7.org/fhir/>

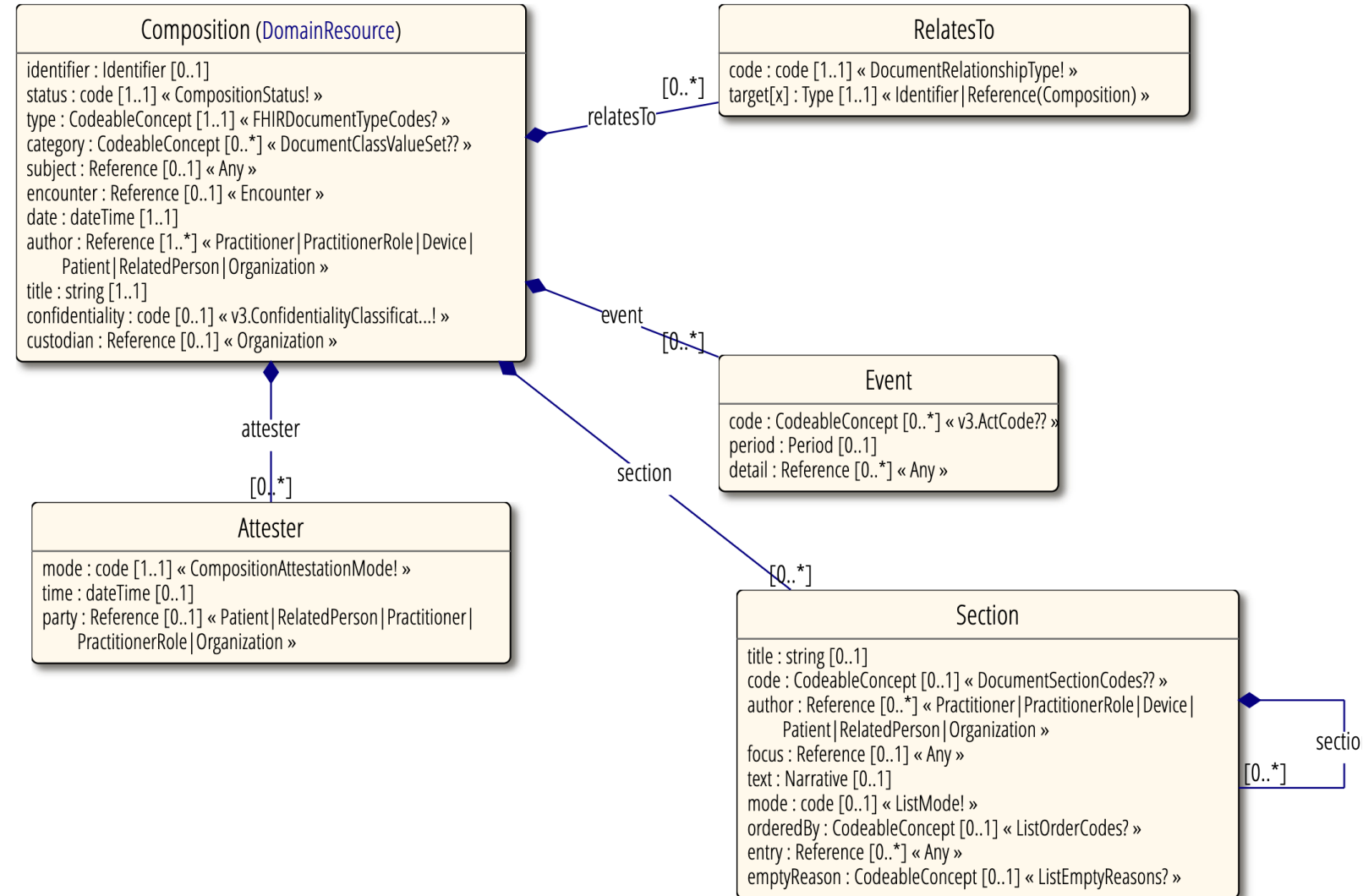
FHIR documents

- FHIR resources can be used to build documents that represent a composition: a coherent set of information that is a statement of healthcare information.
- First entry is a Composition Resource
 - Equivalent to CDA header and narrative
- Can be signed, authenticated, etc.
- A FHIR document has the same basic principles as a CDA document

Documents are Bundles



Composition Resource



Composition CDA Mapping



[Home](#) [Getting Started](#) [Documentation](#) [Resources](#) [Profiles](#) [Extensions](#) [Operations](#) [Terminologies](#)

 [Foundation](#) > [Composition](#) > **Mappings**

This page is part of the FHIR Specification (v4.0.1: R4 - Mixed [Normative](#) and [STU](#)). This is the current published version. For a full list of available versions, see the [Directory of published versions](#) 

[Content](#) [Examples](#) [Detailed Descriptions](#) **[Mappings](#)** [Profiles & Extensions](#) [Operations](#) [R3 Conversions](#)

2.41.10 Resource Composition - Mappings

Structured Documents  Work Group	Maturity Level: N/A	Standards Status: Informative	Security Category: Not Classified	Compartments: Device , Encounter , Patient , Practitioner , RelatedPerson
---	--	--	--	---

2.41.10.3 CDA (R2) (<http://hl7.org/v3/cda>

Composition	ClinicalDocument
<i>(meta.profile)</i>	ClinicalDocument.templateId
<i>(language)</i>	ClinicalDocument.languageCode
identifier	.setId
status	n/a
type	.code
category	n/a
subject	.recordTarget
encounter	componentOf encompassingEncounter

<http://hl7.org/fhir/composition-mappings.html>

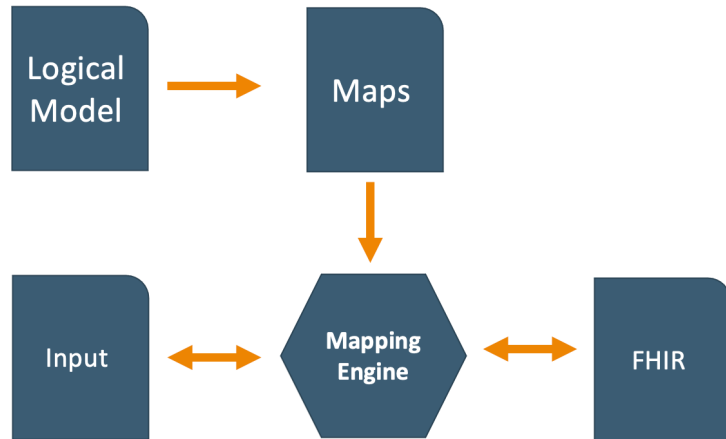
Mapping from CDA to FHIR

- CDA Level 1: (Just metadata and text), map to Bundle/Composition
 - CDA Level 2: Coded sections, map to Bundle/Composition
 - CDA Level 3: Structured entries, map to entries in Bundle
- Level 1, Level 2 can be done maybe 70% generic, there are some different or missing concepts or too general to map
- Level 3 general mapping hardly possible, can only be done on a profiled CDA (template), like C-CDA or a specific exchange format

Mappings should be done at the CDA template level rather than at the CDA specification

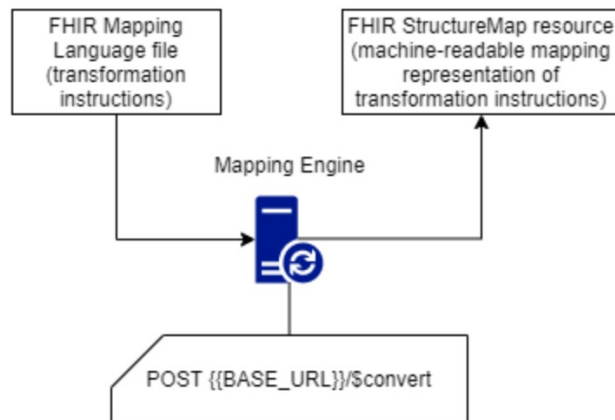
FHIR Mapping Language

<https://www.hl7.org/fhir/mapping-language.html>



The mapping language describes how one set of Directed Acyclic Graphs (an instance) is transformed to another set of directed acyclic graphs. It is not necessary for the instances to have formal declarations and/or be strongly typed - just that they have named children that themselves have properties.

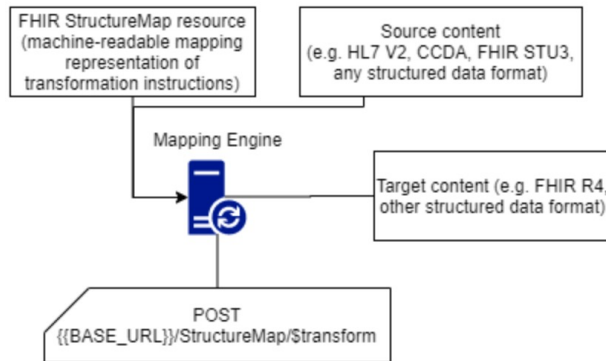
Mapping Authoring



- Define mapping instructions to transform the source content to the target content.
- Use the mapping engine to create a machine-readable representation of the mapping instructions in the form of a FHIR StructureMap resource.

```
// source: https://art-decor.org/art-decor/decor-templates--ch-pharm?section=templates&id=2.16.756.5.30.1.1.10.4.45
// target: http://build.fhir.org/ig/hl7ch/ch-emed/branches/master/StructureDefinition-ch-emed-ext-treatmentplan.html
group MTPReferenceEntryContentModule(source entryrelationship, target ext: Extension) {
  entryrelationship -> ext.url = 'http://fhir.ch/ig/ch-emed/StructureDefinition/ch-emed-ext-treatmentplan' . "url";
  entryrelationship.substanceAdministration as substanceAdministration then {
    substanceAdministration.id as id -> ext.extension as ext then InnerExtensionId(id, ext) . "innerExtensionId";
    substanceAdministration.reference as reference then {
      reference.externalDocument as externalDocument then {
        externalDocument.id as id -> ext.extension as ext then InnerExtensionExternalDocumentId(id, ext) . "innerExtensionExternalDocument";
      } . "externalDocument";
    } . "substanceAdministration";
  } . "id";
}
```

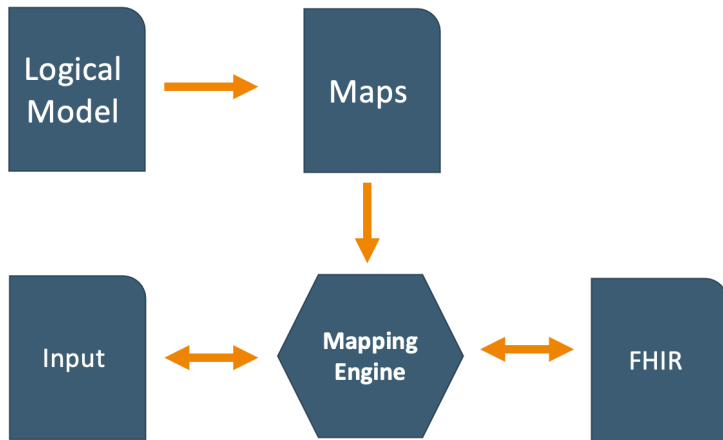
Mapping Execution



- Store the source FHIR StructureMap resource on the FHIR Server.
- Execute transformations - \$transform - The mapping engine requires:
 - The source content to transform.
 - The machine-readable representation of the mapping instructions previously created.
- Store the generated target content (optional)

<https://confluence.hl7.org/display/FHIR/Using+the+FHIR+Mapping+Language>

Logical model

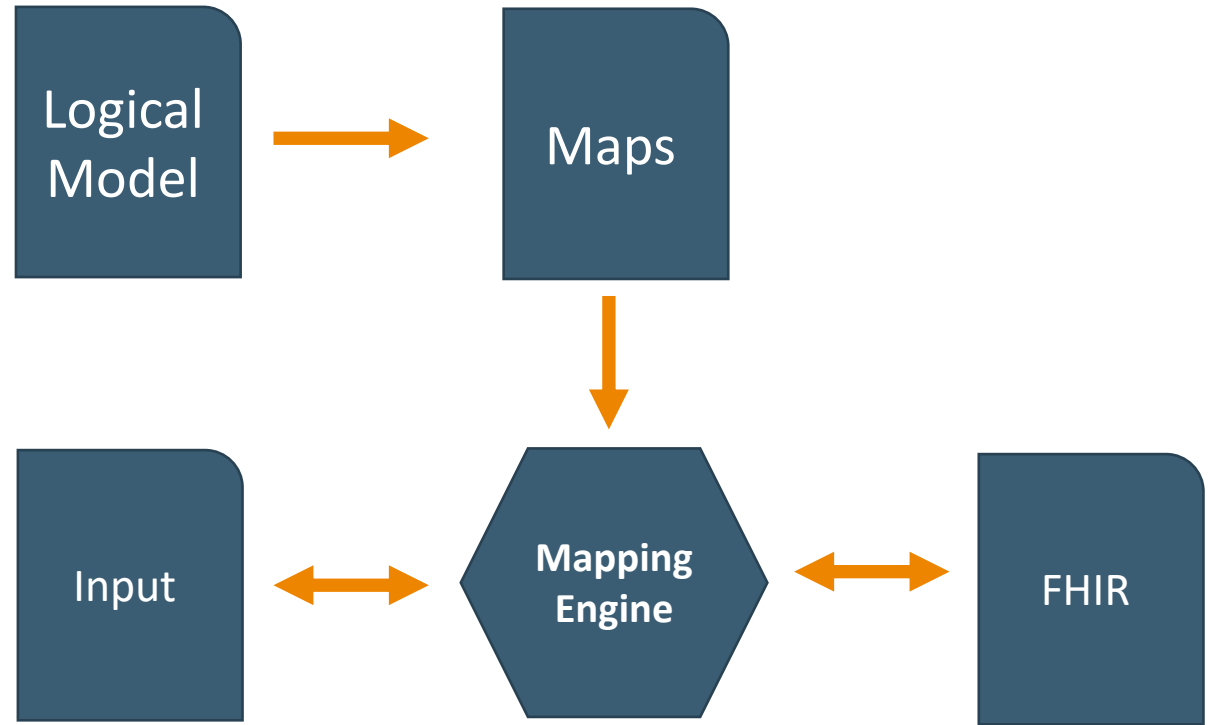


- ▶ Defining a content model to support the mapping language
- ▶ e.g. CDA Logical Model

<https://www.hl7.org/fhir/structureddefinition.html#logical>

FHIR Mapping Language

- Custom data to FHIR
- CDA to FHIR and back
- Structured Data Capture: Questionnaire Response to Resources
- ✓ Mappings have a textual representation
- ✓ Aligned to FHIR: ConceptMap, FHIRPath
- ✓ Maps can be integrated and distributed with IG's
- Need to describe Logical Model (rarely Parser)
- Steep Learning Curve for the Language
- API of the FHIR Mapping Language
- <https://www.hl7.org/fhir/mapping-language.html>



Feedback, Questions?

Agenda

- | | |
|---------------|--|
| 10.00 – 10.30 | High Level Introduction CDA and FHIR Mapping (Differences between Standards, FHIR Mapping Language as independent Mapping Exchange format) |
| 10.30 – 11.00 | FHIR Logical Model of CDA - Exercise |
| 11.15 – 12.15 | FHIR Mapping Language Introduction with conversion to StructureMap - Exercise |
| 14.00 – 15.00 | CDA to FHIR mapping hands-on with matchbox - Exercise (based on provided Italian example) |
| 15.00 – 15.30 | Summary, Questions and answers - Exercise |

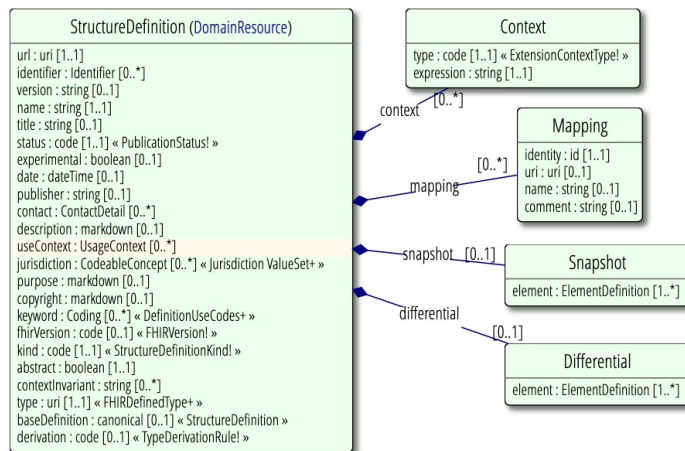
FHIR Logical model for CDA

FHIR Logical model

CDA

- Introduction FHIR Logical Model
- CDA logical Model – Implementation Guide
- FHIRPath
- Conversion CDA Narrative to xhtml

StructureDefinition



- The StructureDefinition resource describes a structure - a set of data element definitions, and their associated rules of usage. These structure definitions are used to describe both the content defined in the FHIR specification itself - Resources, data types, the underlying infrastructural types, and also are used to describe how these structures are used in implementations.
- Note that as part of the specification itself, a full set of structure definitions for all resources and data types is published.

StructureDefinition

Patient

Name	Flags	Card.	Type
 Patient	N		DomainResource
...  identifier	Σ	0..*	Identifier

See the [Profiles & Extensions](#) and the alternate definitions: Master Definition [XML](#) + [JSON](#),

```
<StructureDefinition xmlns="http://hl7.org/fhir">
```

```
  <id value="Patient"/>
```

```
  <url value="http://hl7.org/fhir/StructureDefinition/Patient"/>
```

```
  <version value="4.0.1"/>
```

```
  <name value="Patient"/>
```

```
  <status value="active"/>
```

```
  <date value="2019-11-01T09:29:23+11:00"/>
```

```
  <publisher value="Health Level Seven International (Patient Administration)"/>
```

```
  <kind value="resource"/>
```

```
  <abstract value="false"/>
```

```
  <type value="Patient"/>
```

```
  <baseDefinition value="http://hl7.org/fhir/StructureDefinition/DomainResource"/>
```

```
  <derivation value="specialization"/>
```

```
  <differential>
```

```
    <element id="Patient">
```

```
      <path value="Patient"/>
```

```
      <min value="0"/>
```

```
      <max value="*" />
```

```
    </element>
```

```
    <element id="Patient.identifier">
```

```
      <path value="Patient.identifier"/>
```

```
      <short value="An identifier for this patient"/>
```

```
      <definition value="An identifier for this patient."/>
```

```
      <requirements value="Patients are almost always assigned specific numerical identifiers."/>
```

```
      <min value="0"/>
```

```
      <max value="*" />
```

```
      <type>
```

```
        <code value="Identifier"/>
```

```
      </type>
```

<http://hl7.org/fhir/R4/patient.html>

StructureDefinition

Profile on Patient, CH-Core

Name	Flags	Card.	Type
Patient	I	0..*	Patient
Identifier		0..*	(Slice Definition)
Identifier:LocalPid		0..*	Identifier
type		1..1	CodeableConcept
coding		1..*	Coding
system		1..1	uri
code		1..1	code
system		1..1	uri
value		1..1	string

```
<StructureDefinition xmlns="http://hl7.org/fhir">  
  <id value="ch-core-patient"/>
```

```
  <url value="http://fhir.ch/ig/ch-core/StructureDefinition/ch-core-patient"/>  
  <version value="1.0.0"/>  
  <name value="CHCorePatient"/>  
  <title value="CH Core Patient Profile"/>  
  <status value="draft"/>  
  <date value="2018-10-14T16:00:00+02:00"/>  
  <publisher value="HL7 Switzerland"/>
```

```
  <kind value="resource"/>  
  <abstract value="false"/>  
  <type value="Patient"/>  
  <baseDefinition value="http://hl7.org/fhir/StructureDefinition/Patient"/>  
  <derivation value="constraint"/>
```

```
  <differential>  
    <element id="Patient">  
      <path value="Patient"/>  
      <short value="CH Core Patient"/>  
    </element>  
    <element id="Patient.identifier">  
      <path value="Patient.identifier"/>  
      <slicing>  
        <discriminator>  
          <type value="pattern"/>  
          <path value="$this"/>  
        </discriminator>  
        <rules value="open"/>  
      </slicing>
```

<http://fhir.ch/ig/ch-core/StructureDefinition-ch-core-patient.profile.xml.html>

Logical models based on StructureDefinitions

- StructureDefinitions can also be used to define any arbitrary structures that are a directed acyclic graph with typed nodes, where the primitive types are those defined by the FHIR specification.
- This technique has many uses
 - Describing any arbitrary content model
 - Describing existing HL7 content models (e.g. v2, CDA) using FHIR
 - Describing common design patterns used in FHIR
 - Defining a content model to support the mapping language

<http://hl7.org/fhir/structuredefinition.html#logical>

StructureDefinition

recordTarget

```
<recordTarget>
  <patientRole>
    <id extension="12345" root="2.16.840.1.113883.19.5"/>
    <patient>
      <name>
        <given>Henry</given>
        <family>Levin</family>
        <suffix>the 7th</suffix>
      </name>
      <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.1.1.1" />
      <birthTime value="19320924"/>
    </patient>
    <providerOrganization>
      <id root="2.16.840.1.113883.19.5"/>
    </providerOrganization>
  </patientRole>
</recordTarget>
```

<http://hl7.org/fhir/R4/patient.html>

```
<StructureDefinition xmlns="http://hl7.org/fhir">
  <id value="RecordTarget"/>
```

```
  <url value="http://hl7.org/fhir/cda/StructureDefinition/RecordTarget"/>
  <version value="2.1.0"/>
  <name value="CDAR2.RecordTarget"/>
  <title value="RecordTarget (CDA Class)"/>
  <status value="active"/>
```

```
  <fhirVersion value="4.0.1"/>
  <kind value="logical"/>
  <abstract value="false"/>
  <type value="RecordTarget"/>
  <baseDefinition value="http://hl7.org/fhir/StructureDefinition/Base"/>
  <derivation value="specialization"/>
```

```
  <differential>
    <element id="RecordTarget">
      <path value="RecordTarget"/>
      <min value="1"/>
      <max value="1"/>
    </element>
```

```
    <element id="RecordTarget.patientRole">
      <path value="RecordTarget.patientRole"/>
      <min value="1"/>
      <max value="1"/>
      <type>
        <code value="http://hl7.org/fhir/cda/StructureDefinition/PatientRole"/>
      </type>
    </element>
  </differential>
```

FHIR Logical model for CDA



ahenket

26 commits 5,970 ++ 3,484 --



seanmcilvenna

18 commits 4,448 ++ 31,243 --



grahamegrieve

16 commits 143,028 ++ 90,580 --

- supports the CCDA on FHIR guide, and other CDA/FHIR mapping projects
- Presented by Grahame at FHIR DevDays in 2016
- <https://github.com/HL7/cda-core-2.0>
- IG Publisher generates then the model:
- <http://build.fhir.org/ig/HL7/cda-core-2.0/branches/master/index.html>
- **Note:** no official release yet

FHIR Logical model CDA



Clinical Document Architecture V2.1, published by Health Level 7. This is not an authorized publication; it is the continuous build for version 2.1.0). This version is based on the current content of <https://github.com/HL7/cda-core-2.0/> and changes regularly. See the [Directory of published versions](#)

1 IG Home Page

1 CDA FHIR Definition

- [CDA FHIR Definition](#)

This FHIR Implementation Guide represents CDA using the FHIR Type Definition Framework

1.1 CDA Classes

- [ClinicalDocument](#)
- [Act](#)
- [Authenticator](#)
- [Author](#)
- [AuthoringDevice](#)
- [Authorization](#)
- [AssignedAuthor](#)
- [AssignedCustodian](#)
- [AssignedEntity](#)
- [AssociatedEntity](#)
- [Birthplace](#)
- [Component2](#)
- [ComponentOf](#)
- [Consent](#)
- [Criterion](#)
- [Custodian](#)
- [CustodianOrganization](#)
- [DataEnterer](#)
- [Device](#)
- [DocumentationOf](#)
- [EncompassingEncounter](#)
- [Encounter](#)
- [Entity](#)
- [ExternalAct](#)

1.2 V3 Data Types

- [AD: PostalAddress](#)
- [ADXP: CharacterString](#)
- [ANY: DataValue](#)
- [BL: Boolean](#)
- [CD: ConceptDescriptor](#)
- [CE: CodedWithEquivalents](#)
- [CO: CodedOrdinal](#)
- [CR: ConceptRole](#)
- [CS: CodedSimpleValue](#)
- [CV: CodedValue](#)
- [ED: EncapsulatedData](#)
- [EIVL_TS: EventRelatedPeriodicInterval](#)
- [EN: EntityName](#)
- [ENXP: EntityNamePart](#)
- [II: InstanceIdentifier](#)
- [INT: IntegerNumber](#)
- [INT-POS: PositiveIntegerNumber](#)
- [IVL_INT: Interval](#)
- [IVL_PQ: Interval](#)
- [IVL_TS: Interval](#)
- [MO: MonetaryAmount](#)
- [PIVL_TS: PeriodicIntervalOfTime](#)
- [PN: PersonName](#)
- [PQ: PhysicalQuantity](#)

V3 Datatypes

AD: PostalAddress

ANY: DataValue

BL: Boolean

CD: ConceptDescriptor

CE: CodedWithEquivalents

CO: CodedOrdinal

CR: ConceptRole

CS: CodedSimpleValue

CV: CodedValue

ED: EncapsulatedData

EIVL TS:
EventRelatedPeriodicInterval

EN: EntityName

EN: EntityName

II: InstanceIdentifier

INT: IntegerNumber

IVL INT: Interval

IVL PQ: Interval

IVL TS: Interval

MO: MonetaryAmount

PIVL TS: PeriodicIntervalOfTime

PQ: PhysicalQuantity

PQR: PhysicalQuantityRepresentation

QTY: Quantity

REAL: RealNumber

RTO PQ PQ: Ratio

SC: CharacterStringWithCode

ST: CharacterString

SXCM TS: GeneralTimingSpecification

SXPR TS: Component part of GTS

TEL: TelecommunicationAddress

TS: PointInTime

Datatypes: ANY – CD - CE

Text Summary

Differential Table

This structure is derived from Base

Name	Flags	Card.	Type
ANY		1..*	
nullFlavor		0..1	code

Text Summary

Differential Table

Snapshot Table

All

This structure is derived from CD

Name	Flags	Card.	Type	Description & Constraints ?
CE		1..*		
qualifier		0..0		

Text Summary

Differential Table

Snapshot Table

All

This structure is derived from ANY

Name	Flags	Card.	Type
CD		1..*	
code		0..1	string
codeSystem		0..1	string
codeSystemName		0..1	string
codeSystemVersion		0..1	string
displayName		0..1	string
valueSet		0..1	string
valueSetVersion		0..1	string
originalText		0..1	http://hl7.org/fhir/cda/StructureDefinition/ED
qualifier		0..*	http://hl7.org/fhir/cda/StructureDefinition/CR
translation		0..*	http://hl7.org/fhir/cda/StructureDefinition/CD

Text Summary

Differential Table

Snapshot Table

All

This structure is derived from CD

Name	Flags	Card.	Type
CE		1..*	
nullFlavor		0..1	code
code		0..1	string
codeSystem		0..1	string
codeSystemName		0..1	string
codeSystemVersion		0..1	string
displayName		0..1	string
valueSet		0..1	string
valueSetVersion		0..1	string
originalText		0..1	http://hl7.org/fhir/cda/StructureDefini
translation		0..*	http://hl7.org/fhir/cda/StructureDefini

CDA classes

ClinicalDocument

Act

Authenticator

Author

AuthoringDevice

Authorization

AssignedAuthor

AssignedCustodian

AssignedEntity

AssociatedEntity

Birthplace

Component2

ComponentOf

Consent

Criterion

Custodian

CustodianOrganization

DataEnterer

Device

DocumentationOf

EncompassingEncounter

Encounter

Entity

ExternalAct

ExternalDocument

ExternalObservation

ExternalProcedure

Guardian

HealthCareFacility

Informant

InformationRecipient

InfrastructureRoot

InFulfillmentOf

IntendedRecipient

LabeledDrug

...

CDA classes

Text Summary Differential Table Snapshot Table All				
This structure is derived from Base				
Name	Flags	Card.	Type	Description & Constraints
ClinicalDocument		1..1		
classCode		1..1	code	Binding: v3 Code System ActClass (extensible) Fixed Value: DOCCLIN
moodCode		1..1	code	Binding: v3 Code System ActMood (required) Fixed Value: EVN
realmCode		0..*	http://hl7.org/fhir/cda/StructureDefinition/CS	
typeId		0..1	http://hl7.org/fhir/cda/StructureDefinition/II	
templateId		0..*	http://hl7.org/fhir/cda/StructureDefinition/II	
code		1..1	http://hl7.org/fhir/cda/StructureDefinition/CE	Binding: http://terminology.hl7.org/ValueSet/v3-DocumentType (extensible)
title		0..1	http://hl7.org/fhir/cda/StructureDefinition/ST	
effectiveTime		1..1	http://hl7.org/fhir/cda/StructureDefinition/TS	
confidentialityCode		1..1	http://hl7.org/fhir/cda/StructureDefinition/CE	
languageCode		0..1	http://hl7.org/fhir/cda/StructureDefinition/CS	Binding: V3 Value SetHumanLanguage (required)
setId		0..1	http://hl7.org/fhir/cda/StructureDefinition/II	
versionNumber		0..1	http://hl7.org/fhir/cda/StructureDefinition/INT	
copyTime		0..1	http://hl7.org/fhir/cda/StructureDefinition/TS	
recordTarget		1..*	http://hl7.org/fhir/cda/StructureDefinition/RecordTarget	
author		1..*	http://hl7.org/fhir/cda/StructureDefinition/Author	
dataEnterer		0..1	http://hl7.org/fhir/cda/StructureDefinition/DataEnterer	

CDA & FHIR Logical Model

- attributes
- type attributes in xml
- text in xml elements
- CDA narrative vs xhtml
- V3 classes with id element and extension attribute
- foreign namespaces
- choice elements from CDA schema
- granularity of model (e.g. EntryRelationship as Element and not as only type)

cda xml attributes

```
<telecom use="HP"  
  value="tel:+41.32.685.12.34"/>
```

Text Summary

Differential Table

Snapshot Table

All

This structure is derived from ANY

Name	Flags	Card.	Type	Description & Constraints
TEL		1..*	ANY	
value		0..1	uri	
useablePeriod		0..*		
useablePeriod			IVL-TS	
useablePeriod			EIVL-TS	
useablePeriod			PIVL-TS	
useablePeriod			SXPR-TS	
use		0..*	code	Binding: v3 Code System AddressUse (required)

```
<element id="TEL.use">  
  <path value="TEL.use"/>  
  <representation value='xmlAttr'/>  
  <label value="Use Code"/>  
  <definition  
    value="One or more codes advising a system or user which tele  
elecommunication need."/>  
  <min value="0"/>  
  <max value="*/>  
  <type>  
    <code value="code"/>  
  </type>  
  <binding>  
    <strength value="required"/>  
    <valueSet value="http://terminology.hl7.org/ValueSet/v3-AddressUse"/>  
  </binding>  
</element>
```

```
<element id="TEL.value">  
  <path value="TEL.value"/>  
  <representation value="xmlAttr"/>  
  <min value="0"/>  
  <max value="1"/>  
  <type>  
    <code value="uri"/>  
  </type>  
</element>
```

type attribute xsi:type

```
<effectiveTime value="20180604"/>
```

```
<effectiveTime xsi:type="IVL_TS">
```

```
  <low value="20111129" />
```

```
</effectiveTime>
```

```
<effectiveTime operator='A' xsi:type='EIVL_TS'>
```

```
  <event code='ACM' />
```

```
</effectiveTime>
```

```
<element id="SubstanceAdministration.effectiveTime">
  <extension
    url="http://hl7.org/fhir/StructureDefinition/elementdefinition-defaulttype">
    <valueString value="http://hl7.org/fhir/cda/StructureDefinition/SXCM_TS"/>
  </extension>
  <path value="SubstanceAdministration.effectiveTime"/>
  <representation value="typeAttr"/>
  <min value="0"/>
  <max value="1"/>
  <type>
    <code value="http://hl7.org/fhir/cda/StructureDefinition/SXCM_TS"/>
  </type>
  <type>
    <code value="http://hl7.org/fhir/cda/StructureDefinition/IVL_TS"/>
  </type>
  <type>
    <code value="http://hl7.org/fhir/cda/StructureDefinition/EIVL_TS"/>
  </type>
  <type>
    <code value="http://hl7.org/fhir/cda/StructureDefinition/PIVL_TS"/>
  </type>
  <type>
    <code value="http://hl7.org/fhir/cda/StructureDefinition/SXPR_TS"/>
  </type>
</element>
```

Warning: Open discussion about type representation (IVL-TS vs IVL_TS), see https://chat.fhir.org/#narrow/stream/179273-CCDA-.2F.20FHIR.20mapping.20stream/topic/v3.20datatypes.20_.20instead.20of.20-

text in xml elements: ST datatype

<title>DCI Continuity of Care Document</title>

Text Summary

Differential Table

Snapshot Table

All

This structure is derived from ED

Name	Flags	Card.	Type	Description & Constraints ?
ED		1..*		
compression		0..0		
integrityCheck		0..0		
integrityCheckAlgorithm		0..0		
mediaType		0..1	code	Fixed Value: text/plain
representation		0..1	code	Fixed Value: TXT
data[x]		0..1	string	
reference		0..0		
thumbnail		0..0		

? Documentation for this format

```
<element id="ED.data[x]">
  <path value="ED.data[x]" />
  <representation value="xmlText" />
  <definition value="The string value" />
  <min value="0" />
  <max value="1" />
  <base>
    <path value="ED.data[x]" />
    <min value="0" />
    <max value="1" />
  </base>
  <type>
    <code value="string" />
  </type>
</element>
```

title.dataString

CDA narrative vs xhtml

```
<section>
  <templateId root="2.16.840.1.113883.10.20.22.2.17"/>
  <!-- ***** Social history section template ***** -->
  <code code="29762-2" codeSystem="2.16.840.1.113883.6.1" displayName="Social History"/>
  <title>Social History</title>
  <text>
    <table border="1" width="100%">
      <thead>
        <tr>
          <th>Social History Element</th>
          <th>Description</th>
          <th>Effective Date</th>
        </tr>
      </thead>
      <tbody>
        <tr>
          <td>
            <content>Smoking</content>
          </td>
          <td>Never as of 06/18/2015</td>
          <td>20150618000000</td>
        </tr>
      </tbody>
    </table>
  </text>
```

```
<element id="Section.text">
  <path value="Section.text"/>
  <representation value="cdaText"/>
  <min value="0"/>
  <max value="1"/>
  <base>
    <path value="Section.text"/>
    <min value="0"/>
    <max value="1"/>
  </base>
  <type>
    <code value="xhtml"/>
  </type>
  <mustSupport value="true"/>
</element>
```



validator: internal conversion

V3 classes with id element and extension attribute

```
<id root="31397B31-BE60-47E1-BEC6-F37816D42B0C"/>
```

```
<id extension="7601000201041" root="2.51.1.3"/>
```

```
<element id="ClinicalDocument.id">
  <path value="ClinicalDocument.id"/>
  <min value="1"/>
  <max value="1"/>
  <type>
    <code value="http://hl7.org/fhir/cda/StructureDefinition/II"/>
  </type>
</element>
```

```
<element id="II.extension">
  <path value="II.extension"/>
  <representation value="xmlAttr"/>
  <label value="Extension"/>
  <definition
    value="A character string as a unique identifier wi
  <min value="0"/>
  <max value="1"/>
  <type>
    <code value="string"/>
  </type>
</element>
```

Name	Flags	Card.	Type	Description & Constraints
Element	I		n/a	Base for all elements All FHIR elements must have a @value or children
id		0..1	string	Unique id for inter-element referencing
extension		0..*	Extension	Additional content defined by implementations

V3 classes are now derived from Base (not Element anymore), but Base is a R5 type <http://build.fhir.org/types.html#Base>

CDA & FHIR Logical Model Demonstration

- For this demonstration the FHIR Logical model for CDA has been forked. The generated IG can be found here: <https://github.com/ahdis/cda-core-2.0/releases> and is provided in <https://github.com/hl7ch/cda-fhir-maps/cda-core-2.0-pr.tgz>

CDA and FHIR Validator

The HL7 FHIR Validator can validate also models, you need to provide the packagename (cda-core-2.0-pr.tgz instead of hl7.fhir.cda#current)

```
java -jar /Users/oliveregger/.vscode/extensions/yannick-lagger.vscode-fhir-tools-1.5.0/validator_cli.jar ./input/cda-it/CDA2_Referto_di_Medicina_di_Laboratorio.xml -version 4.0.1 -ig cda-core-2.0-pr.tgz
```

```
Internal error in location for message: 'Error @1, 1: Found / expecting a token name', loc = '/v3:ClinicalDocument/v3:participant/v3:associatedEntity', err = 'Undefined attribute '@nullFlavor' on associatedEntity for type http://hl7.org/fhir/cda/StructureDefinition/AssociatedEntity (properties = [AssociatedEntity.classCode, AssociatedEntity.templateId, AssociatedEntity.id, AssociatedEntity.code, AssociatedEntity.addr, AssociatedEntity.telecom, AssociatedEntity.associatedPerson, AssociatedEntity.scopingOrganization])'
```

```
Internal error in location for message: 'Error @1, 1: Found / expecting a token name', loc = '/v3:ClinicalDocument/v3:documentationOf/v3:serviceEvent', err = 'Undefined element 'statusCode''
```

```
00:02.0293
```

```
Done. Times: Loading: 00:10.0139, validation: 00:02.0294. Memory = 294Mb
```

```
*FAILURE*: 9 errors, 0 warnings, 0 notes
```

<https://confluence.hl7.org/display/FHIR/Using+the+FHIR+Validator>

CDA and FHIR Validator

- CDA V3 Code validation is not supported with the validator
- Last Error seems a CDA Logical Model Problem

Error @ ClinicalDocument.author[0].assignedAuthor.classCode (line 55, col40): The value provided ('ASSIGNED') is not in the value set 'RoleClassAssignedEntity' (<http://terminology.hl7.org/ValueSet/v3-RoleClassAssignedEntity>), and a code is required from this value set) (error message = The code system '' is not known (encountered paired with code = 'ASSIGNED')); The code provided (#ASSIGNED) is not valid in the value set 'RoleClassAssignedEntity' (from <http://tx.fhir.org/r4>))

Error @ ClinicalDocument.inFulfillmentOf[0].typeCode (line 114, col35): The value provided ('FLFS') is not in the value set 'ParticipationType' (<http://terminology.hl7.org/ValueSet/v3-ParticipationType>), and a code is required from this value set) (error message = Unknown Code <http://terminology.hl7.org/CodeSystem/v3-ParticipationType#FLFS> in <http://terminology.hl7.org/CodeSystem/v3-ParticipationType>)

Error @ ClinicalDocument.documentationOf[0].typeCode (line 120, col34): The value provided ('DOC') is not in the value set 'ParticipationType' (<http://terminology.hl7.org/ValueSet/v3-ParticipationType>), and a code is required from this value set) (error message = Unknown Code <http://terminology.hl7.org/CodeSystem/v3-ParticipationType#DOC> in <http://terminology.hl7.org/CodeSystem/v3-ParticipationType>)

Error @ ClinicalDocument.recordTarget[0].patientRole.telecom[1].value (line 32, col50): URI values cannot have whitespace('tel:+39 3445812567')

Error @ ClinicalDocument.author[0].assignedAuthor.telecom[0].value (line 57, col50): URI values cannot have whitespace('tel:+39 3441834678')

Error @ ClinicalDocument.component.structuredBody.component[0].section.component[0].section.entry[0].act.entryRelationship[0].observation.referenceRange[0].observationRange.value.low.value (line 219, col47): The value ' 0.00' is not a valid decimal

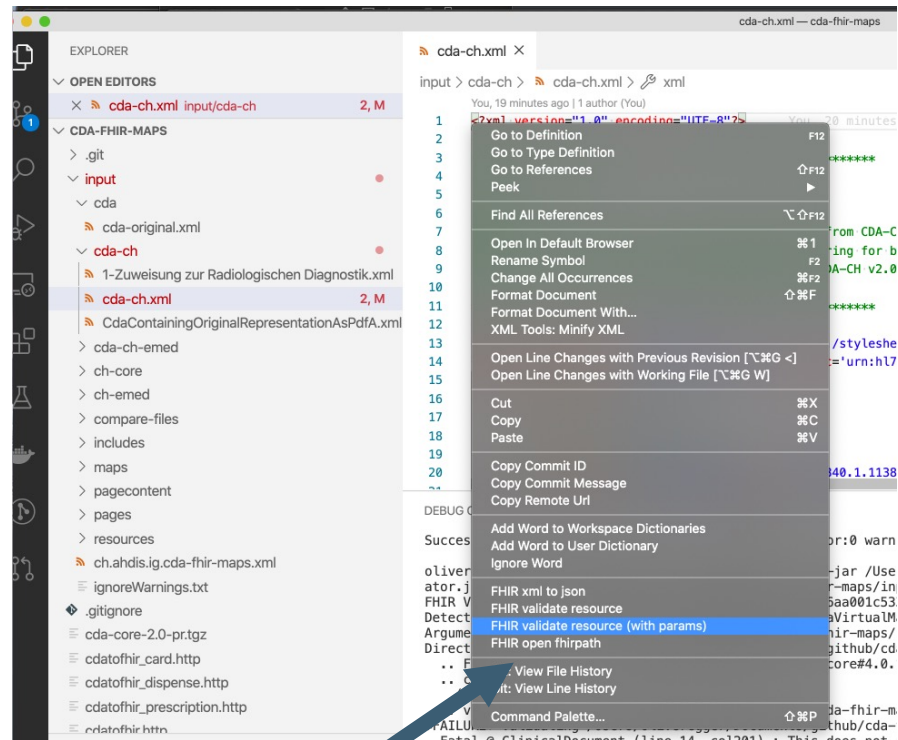
Error @ ClinicalDocument.component.structuredBody.component[0].section.component[0].section.entry[0].act.entryRelationship[0].observation.referenceRange[0].observationRange.value.high.value (line 220, col49): The value ' 20.00' is not a valid decimal

Error @ /v3:ClinicalDocument/v3:participant/v3:associatedEntity (line 112, col56): Undefined attribute '@nullFlavor' on associatedEntity for type <http://hl7.org/fhir/cda/StructureDefinition/AssociatedEntity> (properties = [AssociatedEntity.classCode, AssociatedEntity.templateId, AssociatedEntity.id, AssociatedEntity.code, AssociatedEntity.addr, AssociatedEntity.telecom, AssociatedEntity.associatedPerson, AssociatedEntity.scopingOrganization])

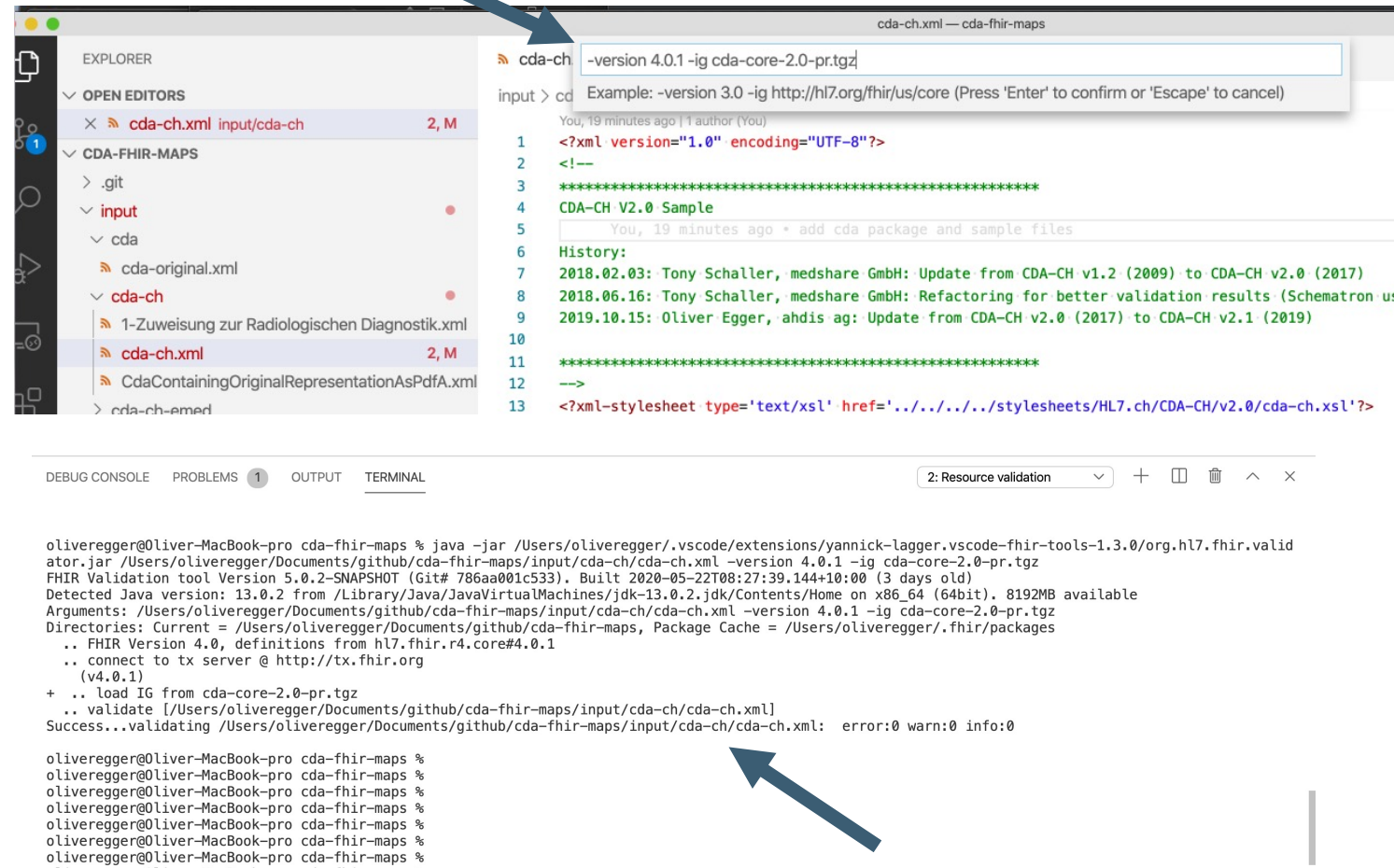
Error @ /v3:ClinicalDocument/v3:documentationOf/v3:serviceEvent (line 122, col38): Undefined element 'statusCode'

CDA and FHIR Validator

2) Add params -version 4.0.1 cda-core-2.0-pr.tgz



1) Right click on file to validate and select validate with params



3) Output

Applying FHIRPath expressions to CDA documents

- [FHIRPath](#) is a path based navigation and extraction language, somewhat like XPath.
- Operations are expressed in terms of the logical content of hierarchical data models, and support traversal, selection and filtering of data.
- Its design was influenced by the needs for path navigation, selection and formulation of invariants in both HL7 Fast Healthcare Interoperability Resources ([FHIR](#)) and HL7 Clinical Quality Language ([CQL](#)).

FHIRPath examples

- Patient.name.given
- Patient.telecom.where(use = 'official')
- Patient.name[0]

<http://hl7.org/fhirpath/>

<https://www.hl7.org/fhir/fhirpath.html>

Applying FHIRPath expressions to CDA documents

```
<recordTarget>
  <patientRole>
    <id extension="12345" root="2.16.840.1.113883.19.5"/>
    <patient>
      <name>
        <given>Henry</given>
        <family>Levin</family>
        <suffix>the 7th</suffix>
      </name>
      <administrativeGenderCode code="M" codeSystem="2.16.840.1.1
      <birthTime value="19320924"/>
```

```
java -jar org.hl7.fhir.validator.jar
      -version 4.0.1 -ig cda-core-2.0-pr.tgz
```

-fhirpath

```
recordTarget.patientRole.patient.name.given.dataString
input/cda/cda-original.xml
```

.. definitions from hl7.fhir.r4.core#4.0.1 (v4.0.1)

...evaluating

```
recordTarget.patientRole.patient.name.given.dataString
```

Henry

Summary CDA Logical Model

- Logical Model is a description of CDA
 - no API
 - datatypes are equivalent to FHIR
 - no FHIR resources
 - no query possibilities
- Logical Model can be used with the FHIR Mapping Language

Exercise

- Use the Java Validator to
 - validate the CDA File in ./input/cda-it/CDA2_Referto_Radiologia.xml
 - develop a FHIRPath expression to get the family name of the recordTarget

Feedback, Questions?

Agenda

- | | |
|---------------|--|
| 10.00 – 10.30 | High Level Introduction CDA and FHIR Mapping (Differences between Standards, FHIR Mapping Language as independent Mapping Exchange format) |
| 10.30 – 11.00 | FHIR Logical Model of CDA - Exercise |
| 11.15 – 12.15 | FHIR Mapping Language Introduction with conversion to StructureMap - Exercise |
| 14.00 – 15.00 | CDA to FHIR mapping hands-on with matchbox - Exercise (based on provided Italian example) |
| 15.00 – 15.30 | Summary, Questions and answers - Exercise |

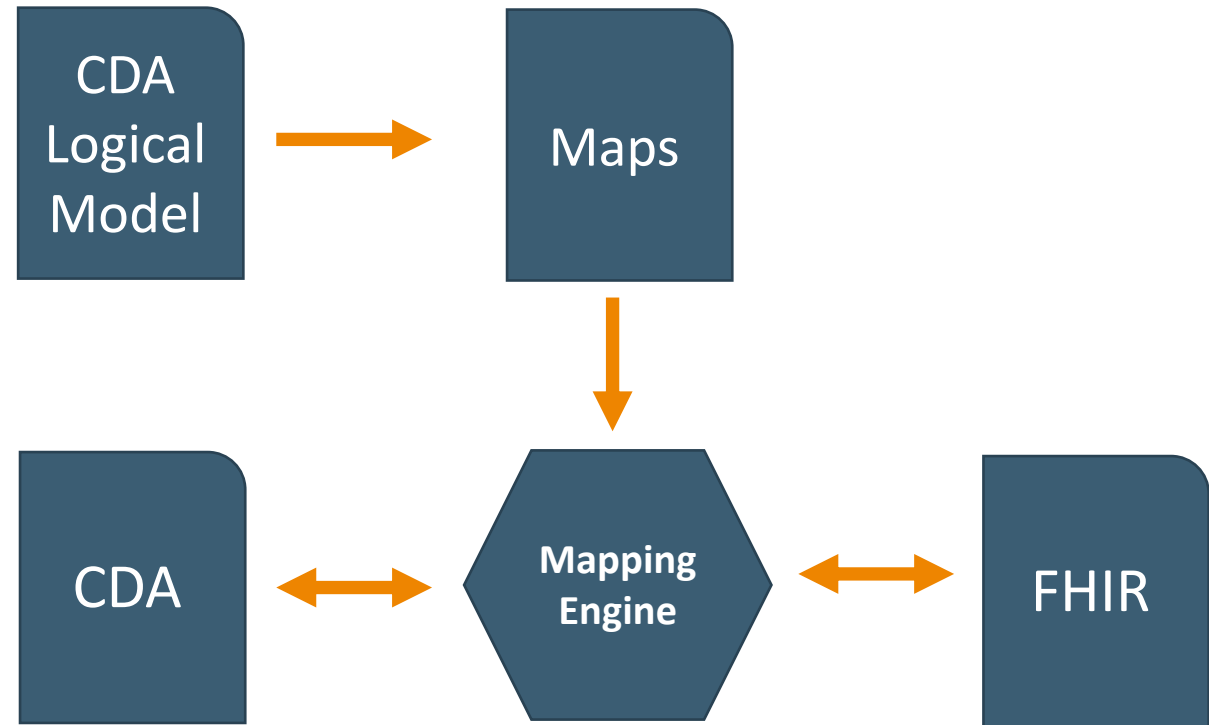
FHIR Mapping Language

FHIR Mapping Language

The mapping language describes how one set of Directed Acyclic Graphs (an instance) is transformed to another set of directed acyclic graphs. It is not necessary for the instances to have formal declarations and/or be strongly typed - just that they have named children that themselves have properties.

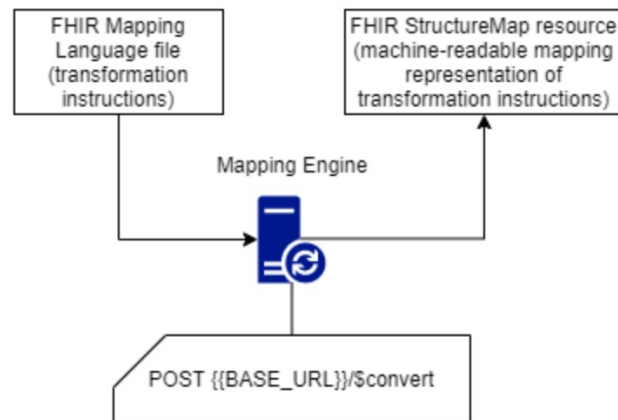
<https://www.hl7.org/fhir/mapping-language.html>

FHIR Mapping Language



<https://www.hl7.org/fhir/mapping-language.html>

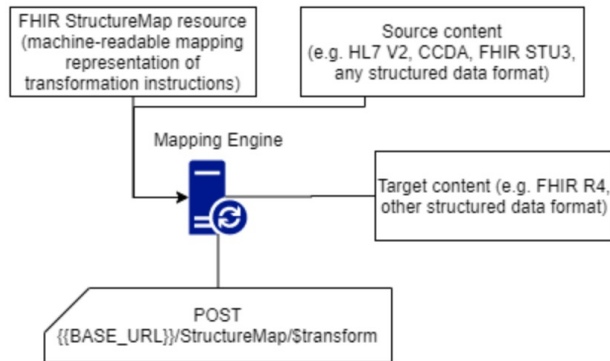
Mapping Authoring



- Define mapping instructions to transform the source content to the target content.
- Use the mapping engine to create a machine-readable representation of the mapping instructions in the form of a FHIR StructureMap resource.

<https://confluence.hl7.org/display/FHIR/Using+the+FHIR+Mapping+Language>

Mapping Execution



- Store the source FHIR StructureMap resource on the FHIR Server.
- Execute transformations - \$transform - The mapping engine requires:
 - The source content to transform.
 - The machine-readable representation of the mapping instructions previously created.
- Store the generated target content (optional)

<https://confluence.hl7.org/display/FHIR/Using+the+FHIR+Mapping+Language>

Mapping Engines

- Java FHIR Mapping
 - Java Validator
 - matchbox (hapi-fhir, java, test.ahdis.ch/matchbox)

FHIR Mapping Language



Release 4



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 Implementation Support > **Mapping Language**

This page is part of the FHIR Specification (v4.0.1: R4 - Mixed [Normative](#) and [STU](#)). This is the current published version. For a full list of available versions, see the [Directory of published versions](#) 

7.7.0 FHIR Mapping Language

FHIR Infrastructure  Work Group	Maturity Level : 0 (Draft)	Standards Status : Trial Use
--	--	--

The FHIR Specification includes a mapping language. The mapping language has a concrete syntax, defined and described in this page, and an abstract syntax, which is found in the [StructureMap](#) resource. See also the [Tutorial](#).

The mapping language describes how one set of Directed Acyclic Graphs (an instance) is transformed to another set of directed acyclic graphs. It is not necessary for the instances to have formal declarations and/or be strongly typed - just that they have named children that themselves have properties. On the other hand, when the instances are strongly typed - specifically, when they have formal definitions that are represented as [Structure Definitions](#), the mapping language can use additional type related features.

The mapping language addresses two very different kinds of transformations:

- Structural changes between the source and target structures
- Differences in content and formats in string (and related) primitives contained within the structures

A map has 6 parts:

- Metadata
- Embedded [ConceptMaps](#) to translate between different code systems
- References to the structures involved in the mapping
- Imports: additional Maps used by this map
- A series of groups, each with a list of input variables
- A series of transformation rules in each group

<https://www.hl7.org/fhir/mapping-language.html>

FHIR Mapping Language tutorial



[Home](#) [Getting Started](#) [Documentation](#) [Resources](#) [Profiles](#) [Extensions](#) [Operations](#) [Terminologies](#)

 Implementation Support > Mapping Language > **Mapping Language Tutorial**

This page is part of the FHIR Specification (v4.0.1: R4 - Mixed [Normative](#) and [STU](#)). This is the current published version. For a full list of available versions, see the [Directory of published versions](#) .

7.7.1 FHIR Mapping Language - Tutorial

FHIR Infrastructure  Work Group	Maturity Level: N/A	Standards Status: Informative
--	---------------------	---

This tutorial introduces the FHIR [mapping language](#).

7.7.1.1 Step #1: Simplest possible transform

To start with, we're going to consider a very simple case: mapping between two structures that have the same definition, a single element with the same name and the same primitive type:

Source Structure

TLeft
a : string [0..1]

Target Structure

TRight
a : string [0..1]

The left instance is transformed to the right instance by copying a to a

Note that for clarity in this tutorial, all the types are prefixed with T.

The first task to do is to set up the mapping context on a default group. All mappings are divided up into a set of groups. For now, we just set up a group named "tutorial" - the same as the name of the mapping. For this tutorial, we also declaring the source and target models, and specify that an application invokes this with a copy of the left (source) instance, and also an empty copy of the right (target) instance:

<https://www.hl7.org/fhir/mapping-tutorial.html>

Step #1: Simplest possible transform

Source Structure

```
TLeft  
a : string [0..1]
```

Target Structure

```
TRight  
a : string [0..1]
```

The left instance is transformed to the right instance by copying a to a

```
1  /// title = "tutorial-step1"  
2  /// status = draft  
3  
4  map "http://hl7.org/fhir/StructureMap/tutorial-step1" = "tutorial-step1"  
5  
6  uses "http://hl7.org/fhir/StructureDefinition/tutorial-left" alias TLeft as source  
7  uses "http://hl7.org/fhir/StructureDefinition/tutorial-right" alias TRight as target  
8  
9  group tutorial(source src : TLeft, target tgt : TRight) {  
10     ... src.a as a -> tgt.a = a "rule_a";  
11 }
```

<https://www.hl7.org/fhir/mapping-tutorial.html>

HL7 FHIR Java Validator

Copy validator to step1 directory or adjust path

```
% java -jar validator_cli.jar ./source/source1.xml -transform http://hl7.org/fhir/StructureMap/tutorial -  
version 4.0.1 -ig ./logical -ig ./map -output ./output.xml
```

```
FHIR Validation tool Version 5.6.43 (Git# 3fffad10e36f). Built 2022-04-28T02:39:57.434Z (39 days old)
```

```
Loading
```

```
  Load FHIR v4.0 from hl7.fhir.r4.core#4.0.1 - 4575 resources (00:06.0175)
```

```
  Load hl7.terminology#3.1.0 - 4117 resources (00:02.0370)
```

```
  Terminology server http://tx.fhir.org - Version 2.0.14 (00:01.0406)
```

```
  Load ./logical
```

```
  Load ./map
```

```
Start Transform http://hl7.org/fhir/StructureMap/tutorial
```

```
Group : tutorial; vars = source variables [src: (TLeft1)], target variables [tgt: (TRight1)], shared variables []
```

```
  rule : rule_a; vars = source variables [src: (TLeft1)], target variables [tgt: (TRight1)], shared variables []
```

```
...success
```

```
Done. Times: Loading: 00:10.0506. Max Memory = 4Gb
```

```
% cat output.xml
```

```
<?xml version="1.0" encoding="UTF-8"?>
```

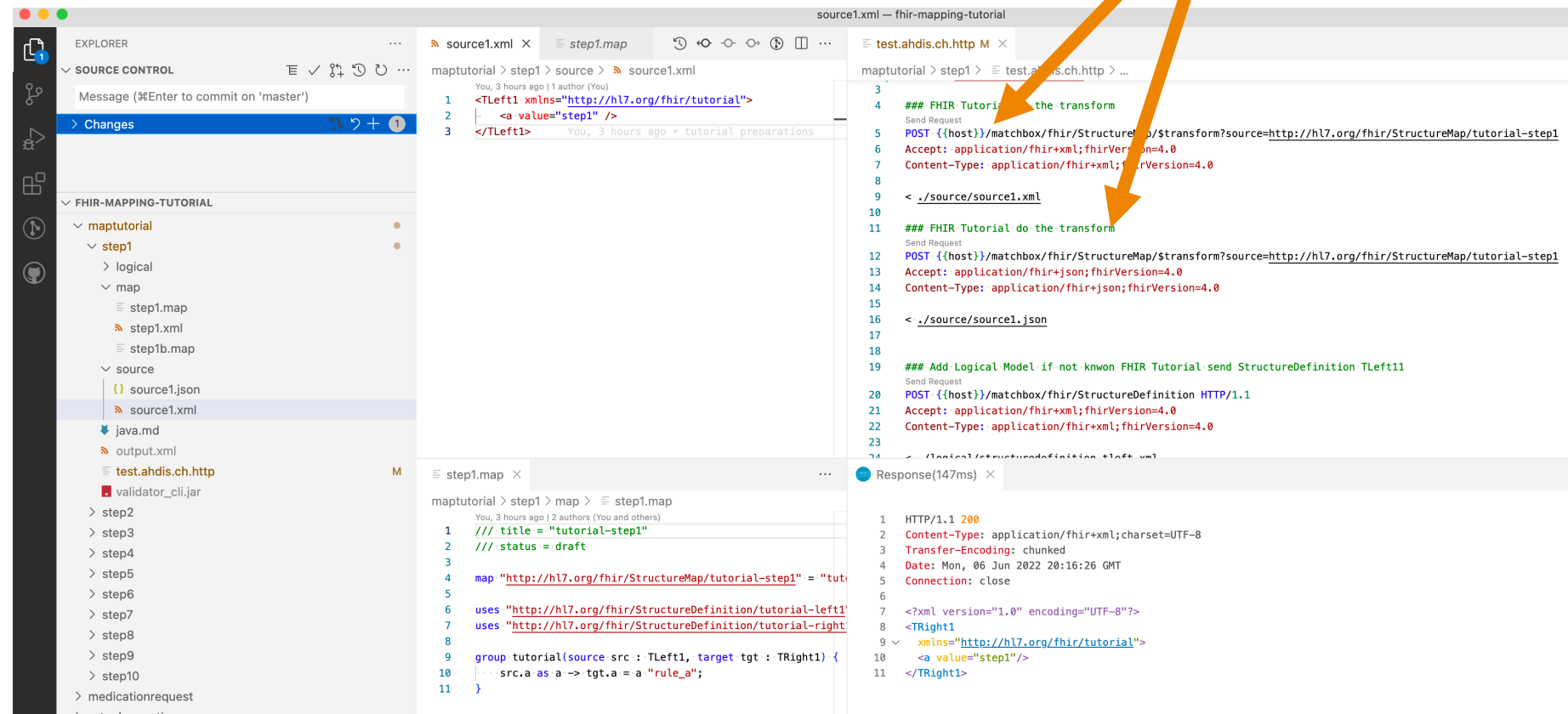
```
<TRight1 xmlns="http://hl7.org/fhir/tutorial">
```

```
  <a value="step1"/>
```

```
</TRight1>
```

<https://github.com/ahdis/fhir-mapping-tutorial/blob/master/step1/java.md>

Step #1: Demo mit VS Code REST Client



clone <https://github.com/ahdis/fhir-mapping-tutorial>

<https://github.com/ahdis/fhir-mapping-tutorial/blob/master/maptutorial/step2/test.ahdis.ch.http>

Step #2: Fields with different names

Source Structure

```
TLeft  
a1 : string [0..1]
```

Target Structure

```
TRight  
a2 : string [0..1]
```

The left instance is transformed to the right instance by copying a1 to a2

```
1  /// title = "tutorial-step2"  
2  /// status = draft  
3  
4  map "http://hl7.org/fhir/StructureMap/tutorial-step2" = "tutorial-step2"  
5  
6  uses "http://hl7.org/fhir/StructureDefinition/tutorial-left" alias TLeft as source  
7  uses "http://hl7.org/fhir/StructureDefinition/tutorial-right" alias TRight as target  
8  
9  group tutorial(source src : TLeft, target tgt : TRight) {  
10 | src.a1 as a -> tgt.a2 = a "rule_a";  
11 }  
12 |
```

<https://www.hl7.org/fhir/mapping-tutorial.html>

Step #5: Managing lists, part 1

Source Structure

```
TLeft  
a22 : string [0..*]
```

Target Structure

```
TRight  
a22 : string [0..*]
```

The left instance is transformed to the right instance by copying a22 to a22, once for each copy of a22

```
1  /// title = "tutorial-step5"  
2  /// status = draft  
3  
4  map "http://hl7.org/fhir/StructureMap/tutorial-step5" = "tutorial-step5"  
5  
6  uses "http://hl7.org/fhir/StructureDefinition/tutorial-left-5" as source  
7  uses "http://hl7.org/fhir/StructureDefinition/tutorial-right-5" as target  
8  
9  group tutorial(source src : TLeft, target tgt : TRight) {  
10 | src.a22 as a -> tgt.a22 = a "rule_a22";  
11 }  
12
```

<https://www.hl7.org/fhir/mapping-tutorial.html>

Step #6: Managing lists, part 2

Source Structure

```
TLeft  
  a23 : string [0..*]
```

Target Structure

```
TRight  
  a23 : integer [0..1]
```

The left instance is transformed to the right instance by copying a23 to a23, but there can only be one copy of a23

```
src.a23 as a -> tgt.a23 = a; // leave it to the transform engine  
src.a23 only_one as a -> tgt.a23 = a; // transform engine throws an error if there is more than one  
src.a23 first as a -> tgt.a23 = a; // Only use the first one  
src.a23 last as a -> tgt.a23 = a; // Only use the last one
```


Step #7: Simple Nesting

Source Structure

```
TLeft  
  aa : [0..*]  
  ab : string [1..1]
```

Target Structure

```
TRight  
  aa : [0..*]  
  ab : string [1..1]
```

```
src.aa as s_aa -> tgt.aa as t_aa then { // make aa exist  
  s_aa.ab as ab -> t_aa.ab = ab; // copy ab inside aa  
};
```

```
src.aa as s_aa -> tgt.aa as t_aa then ab_content(s_aa, t_aa); // make aa exist  
  
group ab_content(source src, target tgt) {  
  src.ab as ab -> tgt.ab = ab; // copy ab inside aa  
}
```

Transform Rules

```
src_context.field as new_variable where condition  
  -> tgt_context.field = create([type]) as new_variable  
    then [details] "name";
```

```
src.value : code as vs0  
  -> tgt.value = create("code") as vt0  
    then code(vs0, vt0) "valueCode";
```

FHIR Mapping Example 1

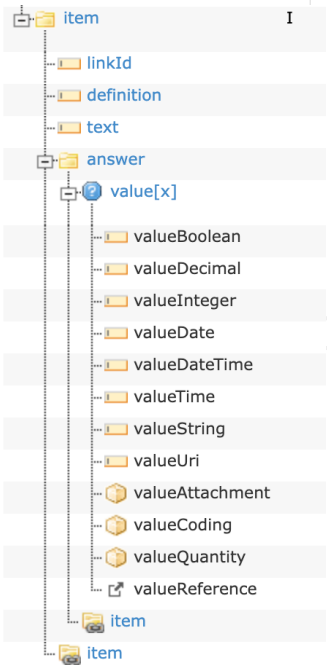
QuestResp.item.item.answer.valueString to Patient.gender

{ } qr.json M x

qrtopat > { } qr.json > [] item > { } 0 > [] item

You, 24 seconds ago | 1 author (You)

```
1 {
2   "resourceType": "QuestionnaireResponse",
3   "id": "qrpatientsexerresponse",
4   "questionnaire": "http://ahdis.ch/matchbox/fml/qrpatientsex",
5   "status": "in-progress",
6   "item": [
7     {
8       "linkId": "patient",
9       "text": "Patient",
10      "item": [
11        {
12          "linkId": "patient.sex",
13          "text": "Geschlecht",
14          "answer": [
15            {
16              "valueString": "male"
17            }
18          ]
19        }
20      ]
21    }
22  ],
23 }
```



{ } qr2patgender.map M x

qrtopat > map > { } qr2patgender.map

You, 57 seconds ago | 1 author (You)

```
1 map "http://ahdis.ch/matchbox/fml/qr2patgender" = "qr2patgender"
2
3 uses "http://hl7.org/fhir/StructureDefinition/QuestionnaireResponse" alias QuestionnaireResponse as source
4 uses "http://hl7.org/fhir/StructureDefinition/Patient" alias Patient as target
5
6 group QuestionnaireResponse(source src : QuestionnaireResponse, target tgt : Patient) {
7   src.item as item -> tgt as patient then item(item, patient);
8 }
9
10 group item(source src, target tgt : Patient) {
11   src.item as item where linkId.value in ('patient.sex') -> tgt.gender = (item.answer.valueString);
12 }
13
```

Name	Flags	Card.	Type
Patient	N		DomainResource
identifier	Σ	0..*	Identifier
active	?! Σ	0..1	boolean
name	Σ	0..*	HumanName
telecom	Σ	0..*	ContactPoint
gender	Σ	0..1	code

FHIR Mapping Example 2

QR.item.item.answer.valueString to ExplanationOfBenefit.type

≡ stringtocoding.map M ×

tests > ≡ stringtocoding.map

You, now | 1 author (You)

```

1 map "http://ahdis.ch/matchbox/fml/stringtocoding" = "stringtocoding"
2
3 uses "http://hl7.org/fhir/StructureDefinition/QuestionnaireResponse" alias QuestionnaireResponse as source
4 uses "http://hl7.org/fhir/StructureDefinition/ExplanationOfBenefit" alias ExplanationOfBenefit as target
5
6 group stringtocoding(source src : QuestionnaireResponse, target tgt : ExplanationOfBenefit) {
7   ... src.item as item -> tgt as eob then item(item, eob);
8 }
9
10 group item(source src, target tgt: ExplanationOfBenefit) {
11   ... src.item as item where linkId.value in ('patient.claim-type') ->
12   ... tgt.type as code, code.coding as coding, coding.system='http://terminology.hl7.org/CodeSystem/claim-type',
13   ... coding.code=(item.answer.valueString) "code2coding";
14 }
15

```

Name	Flags	Card.	Type
ExplanationOfBenefit	TU		DomainResource
identifier		0..*	Identifier
status	?! Σ	1..1	code
type	Σ	1..1	CodeableConcept

Name	Flags	Card.	Type
CodeableConcept	Σ N		Element
coding	Σ	0..*	Coding
text	Σ	0..1	string
Coding	Σ N		Element
system	Σ	0..1	uri
version	Σ	0..1	string
code	Σ	0..1	code
display	Σ	0..1	string

Exercise questionnaire response to FHIR resource

Use <https://github.com/ahdis/fhir-mapping-tutorial/tree/master/qrtopat>

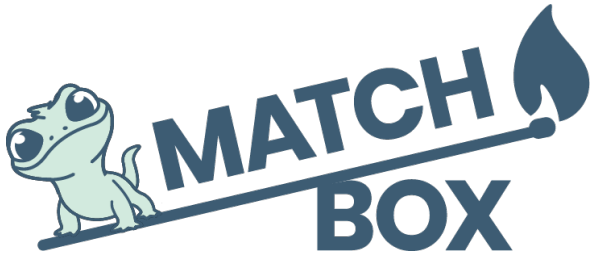
Apply the map [map/qr2patgender.map](#) to input [qr.json](#)

1. Apply the transformation with either FHIR Java validator or VSCode/RESTClient/[matchbox](#)
2. Change the mapping that the family name is mapped also from the questionnaire response (item.linkId = 'patient.family') to the Patient resource into the name.family element

Please change the url of the map if you use VSCode/RESTClient that you have your own map to work on.

Solutions

- see branch <https://github.com/ahdis/fhir-mapping-tutorial/tree/devdaysletsbuild>
- diff <https://github.com/ahdis/fhir-mapping-tutorial/compare/devdaysletsbuild?expand=1>



you can run also matchbox locally in a docker container instead of the test server, see <https://github.com/ahdis/matchbox> or <https://www.matchbox.health/>

Feedback, Questions?

Agenda

- | | |
|---------------|--|
| 10.00 – 10.30 | High Level Introduction CDA and FHIR Mapping (Differences between Standards, FHIR Mapping Language as independent Mapping Exchange format) |
| 10.30 – 11.00 | FHIR Logical Model of CDA - Exercise |
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| 14.00 – 15.00 | CDA to FHIR mapping hands-on with matchbox - Exercise (based on provided Italian example) |
| 15.00 – 15.30 | Summary, Questions and answers - Exercise |

CDA to FHIR

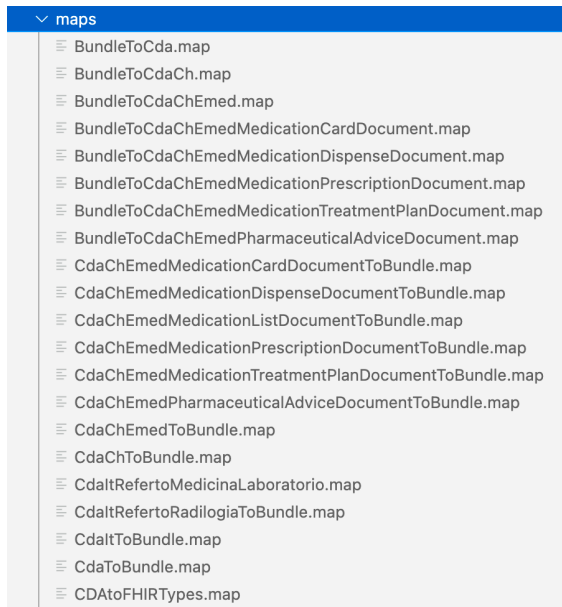
Map CDA to FHIR for HL7 Italy workshop

- Based on Swiss mapping project of HL7
- Includes example files provided by HL7 Italy
- Branch hl7italy (maybe fork at a later stage?)

```
▼ CDA-FHIR-MAPS
  > .git
  ▼ input
    > cda
    > cda-ch
    > cda-ch-emed
    ▼ cda-it
      📄 CDA2_Referto_di_Medicina_di_Laboratorio.xml
      📄 CDA2_Referto_Radiologia.xml
      {} FHIR_Referto_di_Medicina_di_Laboratorio.json
      {} FHIR_Referto_di_Radiologia.json
```

<https://github.com/hl7ch/cda-fhir-maps/tree/hl7italy>

Maps CDA to FHIR



- Datatypes: CDAtoFHIRTypes.map
- CDA: CDAtoBundle.map
- CDA-IT: CDAIttoBundle.map
- CdaltRefertoMedicinaLaboratorio.map
- CdaltRefertoRadilogiaToBundle.map

<https://github.com/ahdis/cda-fhir-maps>

Referto Radilogia - Document

```
1  map "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaItRefertoRadilogiaToBundle" => "CdaItRefertoRadilogiaToBundle"
~

33
34  group CdaItRefertoRadilogiaToBundle(source cda : ClinicalDocument, target bundle : Bundle) {
35    cda -> bundle.entry as e,
36    ..... e.resource = create('Composition') as composition,
37    ..... composition.id = uuid() as uuid,
38    ..... e.fullUrl = append('urn:uuid:', uuid),
39    ..... bundle.entry as e2,
40    ..... e2.resource = create('Patient') as patient, patient share patient,
41    ..... patient.id = uuid() as uuid2,
42    ..... e2.fullUrl = append('urn:uuid:', uuid2)
43    ..... then CdaItRefertoRadilogiaDocumentToBundle(cda, patient, composition, bundle) "ClinicalDocumentToBody";
44  }
45
```

<https://github.com/hl7ch/cda-fhir-maps/blob/hl7italy/input/maps/CdaltRefertoRadilogiaToBundle.map>

ATTENTION:
Sections need to be completed
Entries not done yet

Referto Radilogia – Section to Entry

```
46 group CdaItRefertoRadilogiaDocumentToBundle(source cda : ClinicalDocument, target patient : Patient, target composition : Composition, target bundle : Bundle)
47   extends ClinicalDocumentToBundle {
48     cda then ClinicalDocumentCompositionIt(cda, composition, patient, bundle) "composition";
49     cda.component as component then {
50       component.structuredBody as body then {
51         body.component as component then {
52           component.section as srcSection where (code.code='121181' and code.codeSystem='1.2.840.10008.2.16.4') -> composition.section as tgtSection
53           then SectionDICOMObjectCatalog(cda, srcSection, patient, tgtSection, bundle);
54           component.section as srcSection where (code.code='18785-6' and code.codeSystem='2.16.840.1.113883.6.1') -> composition.section as tgtSection
55           then SectionQuesitoDiagnostico(cda, srcSection, patient, tgtSection, bundle);
56           component.section as srcSection where (code.code='11329-0' and code.codeSystem='2.16.840.1.113883.6.1') -> composition.section as tgtSection
57           then SectionStoriaClinica(cda, srcSection, patient, tgtSection, bundle);
58         } "component";
59       } "body";
60     } "component";
61   }
```

<https://github.com/hl7ch/cda-fhir-maps/blob/hl7italy/input/maps/CdaItRefertoRadilogiaToBundle.map>

ATTENTION:
Copy of Swiss CDA Header,
Needs to be adapted for Italy

Clinical Document Composition It

```
151 // target: http://build.fhir.org/ig/nl/cn/cn-core/branches/master/structuredefinition-cn-core-composition-epr.html
152 group ClinicalDocumentCompositionIt(source src : ClinicalDocument, target tgt : Composition, target patientResource: Patient, target bundle : Bundle) {
153   src.confidentialityCode as confidentialityCode then {
154     confidentialityCode.code as v where ( 'http://fhir.ch/ig/ch-epr-term/ValueSet/DocumentEntry.confidentialityCode'.resolve().compose.include.concept.where($t
155     tgt.confidentiality = translate(v, 'http://fhir.ch/ig/ch-core/ConceptMap/documententry-confidentialitycode-to-fhir', 'code') as fhirconf,
156     fhirconf.extension as ext then ChExtEprConfidentialityCode(confidentialityCode, ext) "confCode";
157   } "confidentialityCode";
158   src.versionNumber as versionNumber where (versionNumber>1)-> tgt.extension as ext2 then ChExtEprVersionNumber(versionNumber, ext2) "versionNumber";
159   src.informationRecipient as informationRecipient -> bundle.entry as e then {
160     informationRecipient.intendedRecipient as intendedRecipient where $this.receivedOrganization.exists()=false
161     -> e.resource = create('Patient') as recipient,
162     recipient.id = uuid() as uuid,
163     e.fullUrl = append('urn:uuid:',uuid),
164     tgt.extension as ext then ChExtEprInformationRecipient(intendedRecipient, recipient, ext) "informationRecipient";
165     informationRecipient.intendedRecipient as intendedRecipient then {
166       intendedRecipient.receivedOrganization -> e.resource = create('Organization') as recipient,
167       recipient.id = uuid() as uuid2,
168       e.fullUrl = append('urn:uuid:',uuid2),
169       tgt.extension as ext
170       then ChExtEprInformationRecipientOrganization(intendedRecipient, recipient, ext) "informationRecipientOrganization";
171     } "intendedRecipientAsOrganization";
172   } "entry";
173   src.dataEnterer as dataEnterer -> bundle.entry as e,
174   e.resource = create('PractitionerRole') as practitionerRole,
175   practitionerRole.id = uuid() as uuid,
176   e.fullUrl = append('urn:uuid:',uuid),
177   tgt.extension as ext then ChExtEprDataEnterer(dataEnterer, bundle, practitionerRole, ext) "dataEnterer";
178 }
```

<https://github.com/hl7ch/cda-fhir-maps/blob/hl7italy/input/maps/CdaltToBundle.map>

ATTENTION:
Sections need to be completed
Entries not done yet

Referto Radilogia – Section to Entry

```
46 group CdaItRefertoRadilogiaDocumentToBundle(source cda : ClinicalDocument, target patient : Patient, target composition : Composition, target bundle : Bundle)
47 extends ClinicalDocumentToBundle {
48   cda then ClinicalDocumentCompositionIt(cda, composition, patient, bundle) "composition";
49   cda.component as component then {
50     component.structuredBody as body then {
51       body.component as component then {
52         component.section as srcSection where (code.code='121181' and code.codeSystem='1.2.840.10008.2.16.4') -> composition.section as tgtSection
53         then SectionDICOObjectCatalog(cda, srcSection, patient, tgtSection, bundle);
54         component.section as srcSection where (code.code='18785-6' and code.codeSystem='2.16.840.1.113883.6.1') -> composition.section as tgtSection
55         then SectionQuesitoDiagnostico(cda, srcSection, patient, tgtSection, bundle);
56         component.section as srcSection where (code.code='11329-0' and code.codeSystem='2.16.840.1.113883.6.1') -> composition.section as tgtSection
57         then SectionStoriaClinica(cda, srcSection, patient, tgtSection, bundle);
58       } "component";
59     } "body";
60   } "component";
61 }

65 group SectionDICOObjectCatalog(source cda : ClinicalDocument, source src : Section, source patient : Patient, target tgt, target bundle: Bundle)
66 extends ClinicalDocumentSection {
67   // src.entry as cdaEntry where (substanceAdministration.templateId.where(root='2.16.756.5.30.1.1.10.4.34')) -> bundle.entry as e, e.resource = create('Medicati
68   // ... medicationstatement.id = uuid() as uuid,
69   // ... e.fullUrl = append('urn:uuid:',uuid),
70   // ... tgt.entry = create('Reference') as reference, reference.reference = append('urn:uuid:',uuid) then {
71   // ... cdaEntry.substanceAdministration as substanceAdministration then MedicationTreatmentPlanItemEntryContentModule(src, substanceAdministration, patient, medica
72   // ... } "cdaEntry";
73 }
```

<https://github.com/hl7ch/cda-fhir-maps/blob/hl7italy/input/maps/CdaItRefertoRadilogiaToBundle.map>

CDAtoFHIR Types

```
155
156 group ADAddress(source src : AD, target tgt : Address) extends Any <<types>> {
157   · src.country as v -> tgt.country = (v.dataString);
158   · src.state as v -> tgt.state = (v.dataString);
159   · src.county as v -> tgt.district = (v.dataString);
160   · src.city as v -> tgt.city = (v.dataString);
161   · src.postalCode as v -> tgt.postalCode = (v.dataString);
162   · src.streetAddressLine as v -> tgt.line = (v.dataString) "streetAddress";
163   · src.streetName as v -> tgt.line = (v.dataString);
164   · src.houseNumber as v -> tgt.line = (v.dataString);
165   · src.use as c -> tgt.use = translate(c, '#addressUse', 'code') "addressUse";
166   · src.useablePeriod -> tgt.period;
167 }
```

CDAtoFHIR Types

```
155
156 group ADAddress(source src : AD, target tgt : Address) extends Any <<types>> {
157   · src.country as v -> tgt.country = (v.dataString);
158   · src.state as v -> tgt.state = (v.dataString);
159   · src.county as v -> tgt.district = (v.dataString);
160   · src.city as v -> tgt.city = (v.dataString);
161   · src.postalCode as v -> tgt.postalCode = (v.dataString);
162   · src.streetAddressLine as v -> tgt.line = (v.dataString) "streetAddress";
163   · src.streetName as v -> tgt.line = (v.dataString);
164   · src.houseNumber as v -> tgt.line = (v.dataString);
165   · src.use as c -> tgt.use = translate(c, '#addressUse', 'code') "addressUse";
166   · src.useablePeriod -> tgt.period;
167 }
```

```
Response(2851ms) ×
1 HTTP/1.1 200
2 Content-Type: application/fhir+xml;charset=UTF-8
3 Transfer-Encoding: chunked
4 Date: Sat, 18 Jun 2022 10:48:00 GMT
5 Connection: close
6
7 <?xml version="1.0" encoding="UTF-8"?>
8 <Bundle
9   xmlns="http://hl7.org/fhir">
10   <identifier>
11     <system value="urn:oid:2.16.840.1.113883.2.9.2.120.4.4"/>
12     <value value="030702.LCNLVC95L47H501Q.20220325112426.0QlvTq1J"/>
13   </identifier>
14   <type value="document"/>
15   <timestamp value="2022-03-30T11:24:26+01:00"/>
16   <entry>
17     <fullUrl value="urn:uuid:d3b71fb9-9ac0-46ee-b030-79f0dd5056c9"/>
18     <resource>
19       <Composition>
20         <language value="it-IT"/>
21         <extension url="http://fhir.ch/ig/ch-core/StructureDefinition/ch-ext-epr-informationrecipient">
22           <valueReference>
23             <reference value="urn:uuid:596a55c0-6d8a-4d13-861c-7b1a11dfd220"/>
24           </valueReference>
25         </extension>
26         <extension url="http://fhir.ch/ig/ch-core/StructureDefinition/ch-ext-epr-dataenterer">
27           <extension url="enterer">
28             <valueReference>
29               <reference value="urn:uuid:01ea8d9c-db82-4667-a2f9-c4f5090732d6"/>
30             </valueReference>
31           </extension>
32           <extension url="http://fhir.ch/ig/ch-core/StructureDefinition/ch-ext-epr-time">
```

```

1 map "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaItRefertoRadiologiaToBundle" = "CdaItRefertoRadiologiaToBundle"
2
3 //
4 // Referto di Radiologia
5
6 uses "http://hl7.org/fhir/cda/StructureDefinition/ClinicalDocument" alias ClinicalDocument as source
7 uses "http://hl7.org/fhir/cda/StructureDefinition/AssignedAuthor" alias AssignedAuthor as source
8 uses "http://hl7.org/fhir/cda/StructureDefinition/AssignedEntity" alias AssignedEntity as source
9 uses "http://hl7.org/fhir/cda/StructureDefinition/Author" alias Author as source
10 uses "http://hl7.org/fhir/cda/StructureDefinition/CustodianOrganization" alias CustodianOrganization as source
11 uses "http://hl7.org/fhir/cda/StructureDefinition/IVL_TS" alias IVL_TS as source
12 uses "http://hl7.org/fhir/cda/StructureDefinition/EIVL_TS" alias EIVL_TS as source
13 uses "http://hl7.org/fhir/cda/StructureDefinition/Observation" alias Observation as source
14 uses "http://hl7.org/fhir/cda/StructureDefinition/PatientRole" alias PatientRole as source
15 uses "http://hl7.org/fhir/cda/StructureDefinition/RecordTarget" alias RecordTarget as source
16 uses "http://hl7.org/fhir/cda/StructureDefinition/Section" alias Section as source
17 uses "http://hl7.org/fhir/cda/StructureDefinition/SubstanceAdministration" alias SubstanceAdministration as source
18 uses "http://hl7.org/fhir/cda/StructureDefinition/SXPR_TS" alias SXPR_TS as source
19
20 uses "http://hl7.org/fhir/StructureDefinition/Bundle" alias Bundle as target
21 uses "http://hl7.org/fhir/StructureDefinition/Composition" alias Composition as produced
22 uses "http://hl7.org/fhir/StructureDefinition/Patient" alias Patient as produced
23 uses "http://hl7.org/fhir/StructureDefinition/Practitioner" alias Practitioner as produced
24 uses "http://hl7.org/fhir/StructureDefinition/Organization" alias Organization as produced
25 uses "http://hl7.org/fhir/StructureDefinition/MedicationStatement" alias MedicationStatement as produced
26 uses "http://hl7.org/fhir/StructureDefinition/Dosage" alias Dosage as produced
27
28 imports "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaToFhirTypes"
29 imports "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaToBundle"
30 imports "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaItToBundle"
31

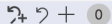
```

EXPLORER

SOURCE CONTROL

Message (⌘Enter to commit on '...)

Changes



CDA-FHIR-MAPS

.project

cda-core-2.0-pr.tgz

cdatafhir_card.http

cdatafhir_dispense.http

cdatafhir_list.http

cdatafhir_padv.http

cdatafhir_prescription.http

cdatafhir_refertomedicinalaborato...

cdatafhir_refertoradiologia.http

cdatafhir_treatmentplan.http

cdatafhir.http

fhirtocda_card.http

fhirtocda_dispense.http

fhirtocda_padv.http

fhirtocda_prescription.http

SEARCH

OPEN EDITORS

TIMELINE

OUTLINE

The active editor cannot provide
outline information.

cdatafhir_refertoradiologia.http

cdatafhir_refertomedicinalaboratorio.http

cdatafhir_refertomedicinalaboratorio.http > ...

You, 48 minutes ago | 1 author (You)

```

1  ### Create and Update CDA maps for converting to FHIR with RESTClient and running matchbox (locally)
2  ### Note: If you use matchbox on the test system check that you have your "own" maps, you need also to update o
3
4  ## @host = https://test.ahdis.ch/matchbox/fhir
5  5 references
6  @host = http://localhost:8080/matchbox/fhir
7
8  ## 1. POST CdaToFhirTypes.map
9  Send Request
10 POST {{host}}/StructureMap HTTP/1.1
11 Accept: application/fhir+xml;fhirVersion=4.0
12 Content-Type: text/fhir-mapping
13
14 < ./input/maps/CdaToFhirTypes.map
15
16 ## 2. POST CdaToBundle.map
17 Send Request
18 POST {{host}}/StructureMap HTTP/1.1
19 Accept: application/fhir+xml;fhirVersion=4.0
20 Content-Type: text/fhir-mapping
21
22 < ./input/maps/CdaToBundle.map
23
24 ## 3. POST CdaItToBundle.map
25 Send Request
26 POST {{host}}/StructureMap HTTP/1.1
27 Accept: application/fhir+xml;fhirVersion=4.0
28 Content-Type: text/fhir-mapping
29
30

```

Response(2913ms)

```

1  HTTP/1.1 200
2  Content-Type: application/fhir+xml;charset=UTF-8
3  Transfer-Encoding: chunked
4  Date: Sat, 18 Jun 2022 10:50:45 GMT
5  Connection: close
6
7  <?xml version="1.0" encoding="UTF-8"?>
8  <Bundle
9  < xmlns="http://hl7.org/fhir">
10 < identifier>
11 < system value="urn:oid:2.16.840.1.113883.2.9.2.30.4.4"/>
12 < value value="120905.FRRTZN80A01F205G.20220322T21221Z"/>
13 </identifier>
14 < type value="document"/>
15 < timestamp value="2022-03-22T12:12:21+01:00"/>
16 < entry>
17 < fullUrl value="urn:uuid:a6a77edf-c27d-4f26-b37c-2e2b94a6c008"/>
18 < resource>
19 < Composition>
20 < language value="it-IT"/>
21 < extension url="http://fhir.ch/ig/ch-core/StructureDefinition/ch-ext-epr-informationrecipient">
22 < valueReference>
23 < reference value="urn:uuid:048d0e18-5d63-4387-860d-7c2ef4a3d5c2"/>
24 </valueReference>
25 </extension>
26 < identifier>
27 < system value="urn:oid:2.16.840.1.113883.2.9.2.30.4.4"/>
28 < value value="120905.FRRTZN80A01F205G.20220322T21221Z"/>
29 < assigner>
30 < display value="Policlinico Gemelli"/>

```

CDA2_Referto_Radiologia.xml

CDA2_Referto_di_Medicina_di_Laboratorio.xml

input > cda-it > CDA2_Referto_di_Medicina_di_Laboratorio.xml

You, 49 minutes ago | 1 author (You)

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <ClinicalDocument xmlns="urn:hl7-org:v3" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLoc
3  <realmCode code="IT"/>
4  <typeId root="2.16.840.1.113883.1.3" extension="POCD_HD000040"/>
5  <templateId root="2.16.840.1.113883.2.9.2.30.10.8" extension="1.0"/>
6  <id root="2.16.840.1.113883.2.9.2.30.4.4" extension="120905.FRRTZN80A01F205G.20220322T21221Z"/>
7  <code code="11502-2" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" codeSystemVersion="2.19"
8  <title>REFERTO DI LABORATORIO</title>
9  <effectiveTime value="20220322T21221+0100"/>
10 <confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25" codeSystemName="HL7 Confidentiality" d
11 <languageCode code="it-IT"/>
12 <setId root="2.16.840.1.113883.2.9.2.30.4.4" extension="120905.FRRTZN80A01F205G.20220322T21221Z" assign
13 <versionNumber value="1"/>
14 <recordTarget typeCode="RCT" contextControlCode="OP">
15 < patientRole classCode="PAT">
16 < id root="2.16.840.1.113883.2.9.4.3.8" extension="RSSMRA81T20H501L" assigningAuthorityName="Mini
17 < addr use="HP">
18 < country>Italia</country>
19 < county>Roma</county>
20 < city>Roma</city>
21 < postalCode>00187</postalCode>
22 < streetAddressLine>Via Lombardia 12</streetAddressLine>
23 </addr>
24 < addr use="H">
25 < country>Italia</country>
26 < county>Roma</county>
27 < city>Roma</city>

```

CdataRefertoRadiologiaToBundle.map

CdataRefertoMedicinaLaboratorio.map

input > maps > CdataRefertoMedicinaLaboratorio.map

You, 48 minutes ago | 1 author (You)

```

1  map "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaItRefertoMedicinaLaboratorio" = "CdaItRefertoMedicinaLa
2
3  //
4  // Referto di Radiologia
5
6  uses "http://hl7.org/fhir/cda/StructureDefinition/ClinicalDocument" alias ClinicalDocument as source
7  uses "http://hl7.org/fhir/cda/StructureDefinition/AssignedAuthor" alias AssignedAuthor as source
8  uses "http://hl7.org/fhir/cda/StructureDefinition/AssignedEntity" alias AssignedEntity as source
9  uses "http://hl7.org/fhir/cda/StructureDefinition/Author" alias Author as source
10 uses "http://hl7.org/fhir/cda/StructureDefinition/CustodianOrganization" alias CustodianOrganization as sour
11 uses "http://hl7.org/fhir/cda/StructureDefinition/IVL_TS" alias IVL_TS as source
12 uses "http://hl7.org/fhir/cda/StructureDefinition/EIVL_TS" alias EIVL_TS as source
13 uses "http://hl7.org/fhir/cda/StructureDefinition/Observation" alias Observation as source
14 uses "http://hl7.org/fhir/cda/StructureDefinition/PatientRole" alias PatientRole as source
15 uses "http://hl7.org/fhir/cda/StructureDefinition/RecordTarget" alias RecordTarget as source
16 uses "http://hl7.org/fhir/cda/StructureDefinition/Section" alias Section as source
17 uses "http://hl7.org/fhir/cda/StructureDefinition/SubstanceAdministration" alias SubstanceAdministration as
18 uses "http://hl7.org/fhir/cda/StructureDefinition/SXPR_TS" alias SXPR_TS as source
19
20 uses "http://hl7.org/fhir/StructureDefinition/Bundle" alias Bundle as target
21 uses "http://hl7.org/fhir/StructureDefinition/Composition" alias Composition as produced
22 uses "http://hl7.org/fhir/StructureDefinition/Patient" alias Patient as produced
23 uses "http://hl7.org/fhir/StructureDefinition/Practitioner" alias Practitioner as produced
24 uses "http://hl7.org/fhir/StructureDefinition/Organization" alias Organization as produced
25 uses "http://hl7.org/fhir/StructureDefinition/MedicationStatement" alias MedicationStatement as produced
26 uses "http://hl7.org/fhir/StructureDefinition/Dosage" alias Dosage as produced
27
28 imports "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaToFhirTypes"
29 imports "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaToBundle"
30 imports "http://fhir.ch/ig/cda-fhir-maps/StructureMap/CdaItToBundle"
31

```

Exercise 1

- Perform the transformation in VSCode with RESTClient yourself for
CDA2_Referto_di_Medicina_di_Laboratorio.xml and
CDA2_Referto_Radiologia.xml
- If you want to do changes, please change the map urls or run matchbox locally in docker and change the host to localhost:8080/matchbox and post the Italy maps to it before the transform:

```
docker run --rm -i -t --name matchbox -p 8080:8080 -v  
/PATH/TO/DIR:/config eu.gcr.io/fhir-ch/matchbox:v220
```

<https://github.com/hl7ch/cda-fhir-maps/tree/hl7italy>

Exercise 2

setup matchbox running on own docker instance

- Configure PATH/TO/DIR where cda-fhir-maps is checked out (will use application.yaml)
- change the @host in the .http files to <http://localhost:8080/matchbox>
- post the Italy maps to it before invoking the operation

```
docker run --rm -i -t --name matchbox -p  
8080:8080 -v /PATH/TO/DIR:/config  
eu.gcr.io/fhir-ch/matchbox:v220
```

<https://github.com/hl7ch/cda-fhir-maps/tree/hl7italy>

Exercise 3

- map additional sections
- map level3 cda entries

<https://github.com/hl7ch/cda-fhir-maps/tree/hl7italy>

Agenda

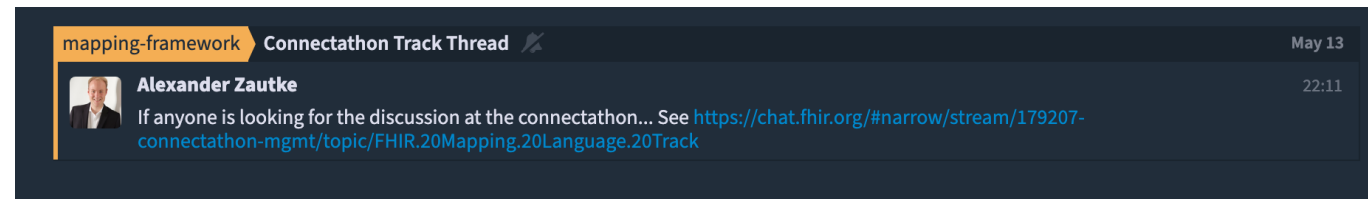
- | | |
|---------------|--|
| 10.00 – 10.30 | High Level Introduction CDA and FHIR Mapping (Differences between Standards, FHIR Mapping Language as independent Mapping Exchange format) |
| 10.30 – 11.00 | FHIR Logical Model of CDA - Exercise |
| 11.15 – 12.15 | FHIR Mapping Language Introduction with conversion to StructureMap - Exercise |
| 14.00 – 15.00 | CDA to FHIR mapping hands-on with matchbox - Exercise (based on provided Italian example) |
| 15.00 – 15.30 | Summary, Questions and answers - Exercise |

Wrapup / Summary

- CDA and FHIR documents
- FHIR Logical model for CDA
- Validate and convert CDA documents with the FHIR Validator
- Applying FHIRPath expressions to CDA documents
- FHIR Mapping Language: Mapping from CDA to FHIR

Zulip Streams

- [CDA](#)
- [CCDA / FHIR mapping stream](#)
- [cda to fhir](#)
- [cda/publish](#)
- [mapping-framework](#)



Feedback, Questions

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