HL7® FHIR® DevDays

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FHIR Introduction to Profiling

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Who am I?

- Name: Lilian Minne
- Company: Firely, Amsterdam

- Background:
  - FHIR team since 2017
  - FHIR (profiling) consultant
  - Projects: Dutch birth care standard,
    Dutch national intensive care evaluation

firely

Document & Publish model

Retrieve model

Read/write

Forge

Firely Terminal

Simplifier.net

Firely Server

Firely .NET SDK

Automate

Build & Validate model

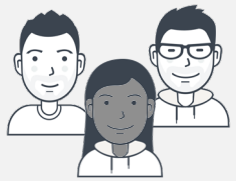
Collaborate

Explore model

Load data

Build plugins

Build apps



Build a FHIR model

Implement a FHIR API

Develop a FHIR App

Topics

1. The need for profiling
2. FHIR Conformance layer
3. Profiles/Extensions
4. Packages
5. Registry and Tooling

FHIR Profiling Overview

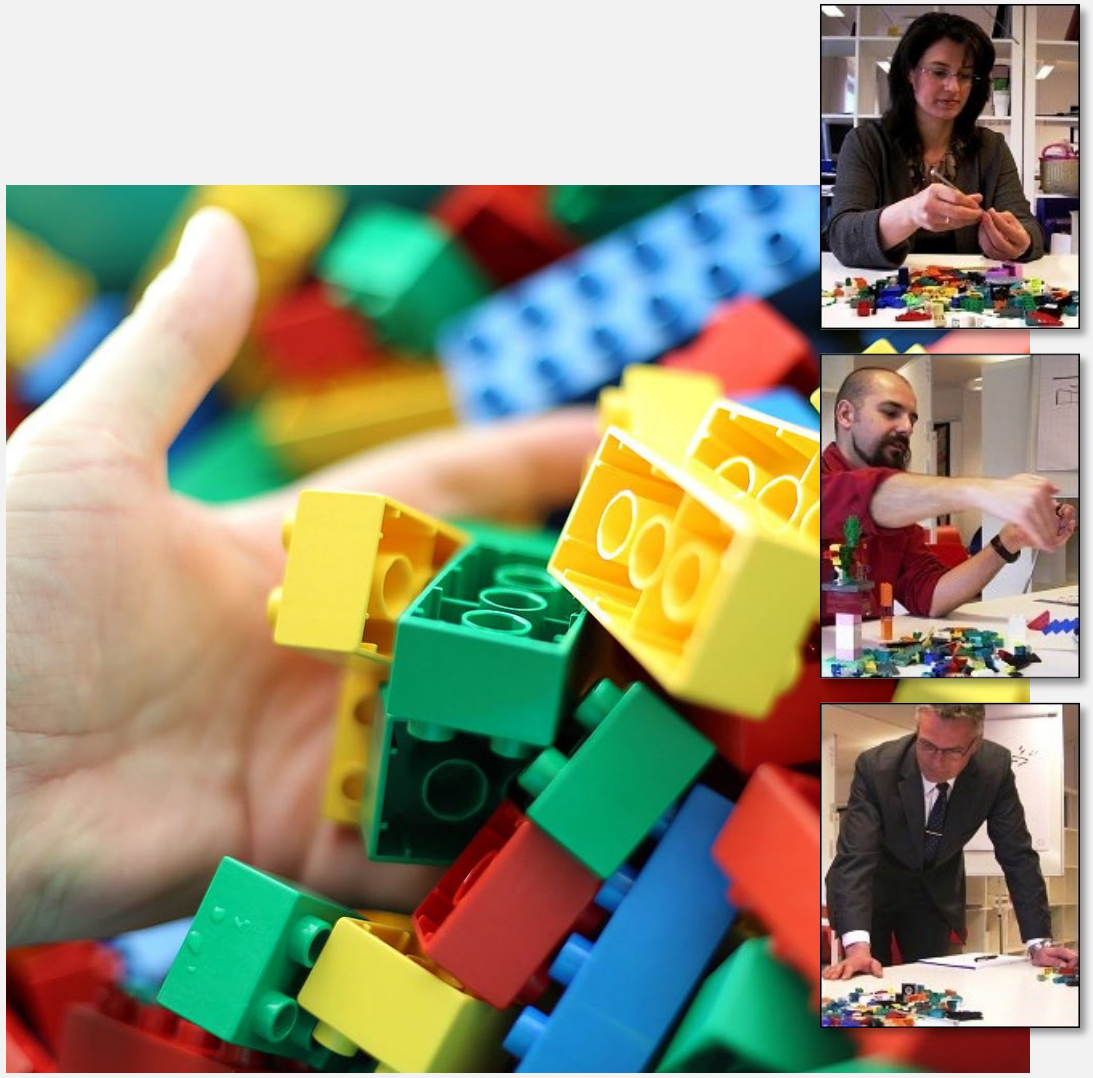
1. The need for profiling

Why do we need profiling?

- FHIR provides a *platform specification*

  “Standard building blocks for interoperability solutions”

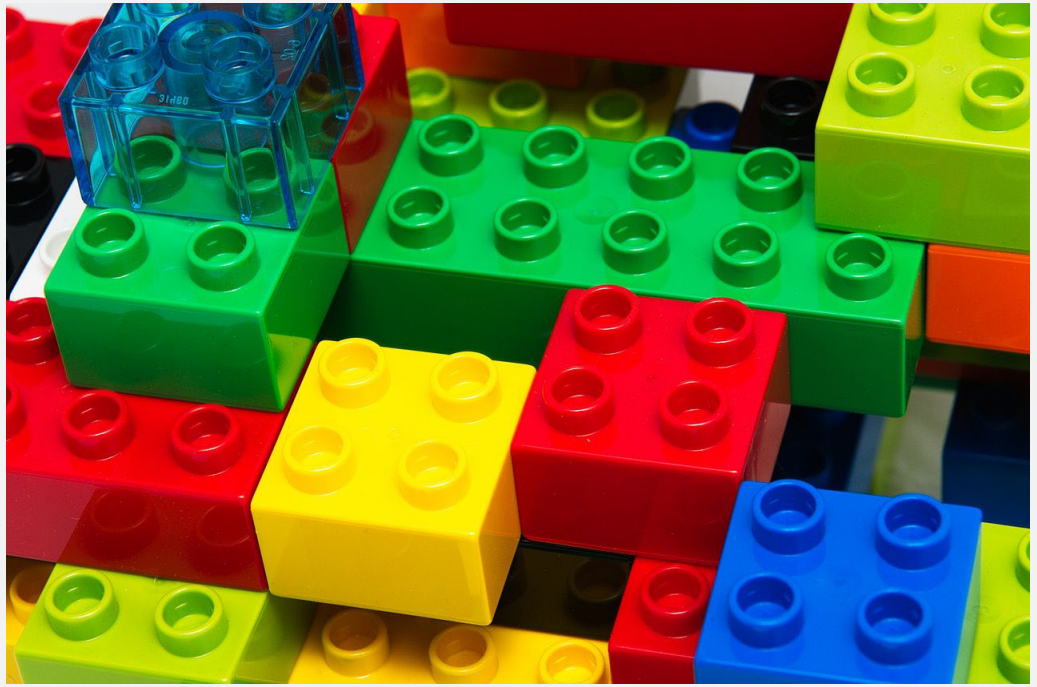
- Single set of resources for many different contexts in healthcare
- Requires further adaptation to context of use



Profiling

Describe adaptations based on use & context:

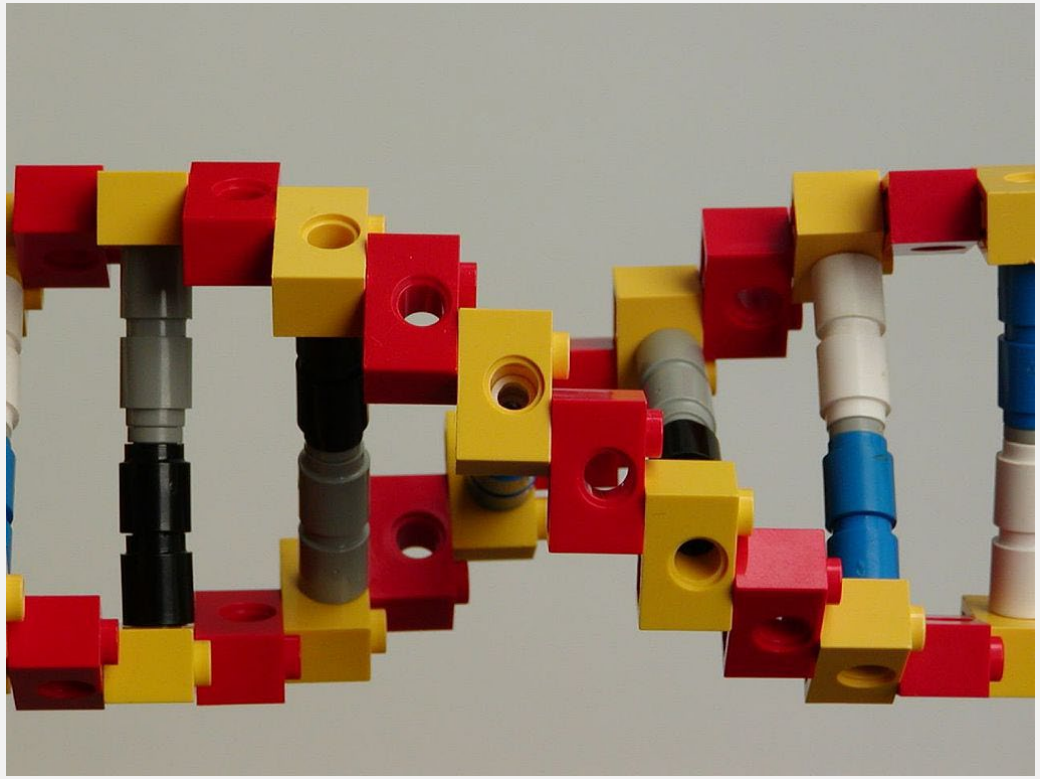
- Which resources & elements are used?
- Which API features are used?
- Which terminologies are used?
- How to map these to local requirements?



Profiling

Allow for these usage statements:

- To be authored in a **structured** manner
  - Independent of serialization format
- To be published in a repository
- To drive validation, code generation etc.



FHIR Profiling Overview

2. FHIR Conformance layer

FHIR Conformance Resources

Content

- Structure Definition
- Element Definition
- Graph Definition

Terminology

- Naming System
- Code System
- Value Set
- Concept Map

Operations

- Operation Definition
- Search Parameter
- Structure Map

Misc.

- Capability Statement
- Implementation Guide
- Test Script
- Test Report

StructureDefinition

Defines data structures:

- Resources
- Datatypes
- Constraints *(“profiles”)* on resources & datatypes
- Extensions
- Logical Models

OperationDefinition

- Defines REST interactions
  - Name of the operation
  - Input/output parameters
  - Behavior
  - Works on which resources?
- Extend/restrict the API

SearchParameter

- Defines named search parameters for REST API
  - Name
  - Interpretation?
  - Supports which resources?
  - Matches which resource elements?
- Extend/restrict the API

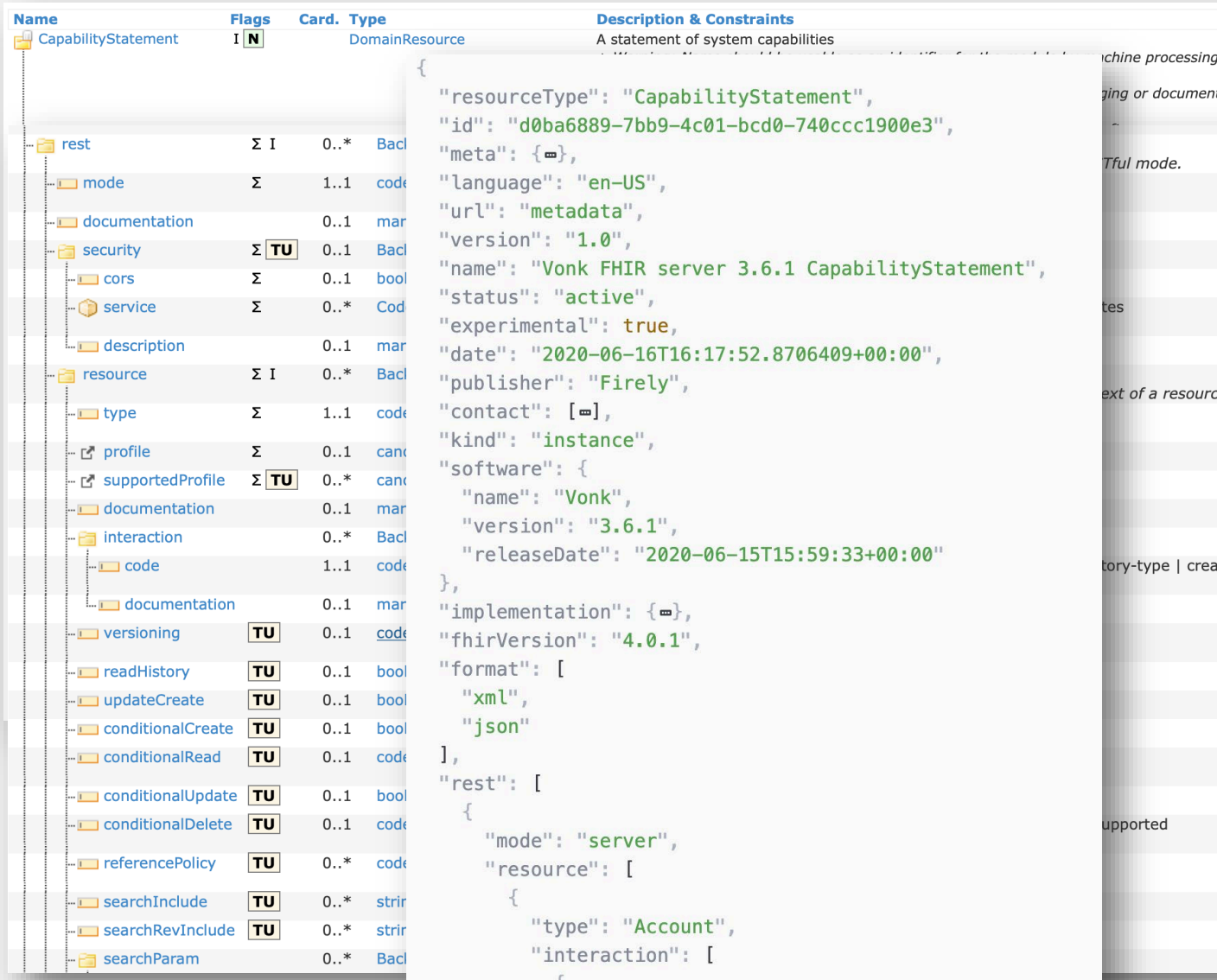
CapabilityStatement

Defines supported:

- Serialization formats
- Operations
- Resources, interactions, search parameters
- Profiles

Usage:

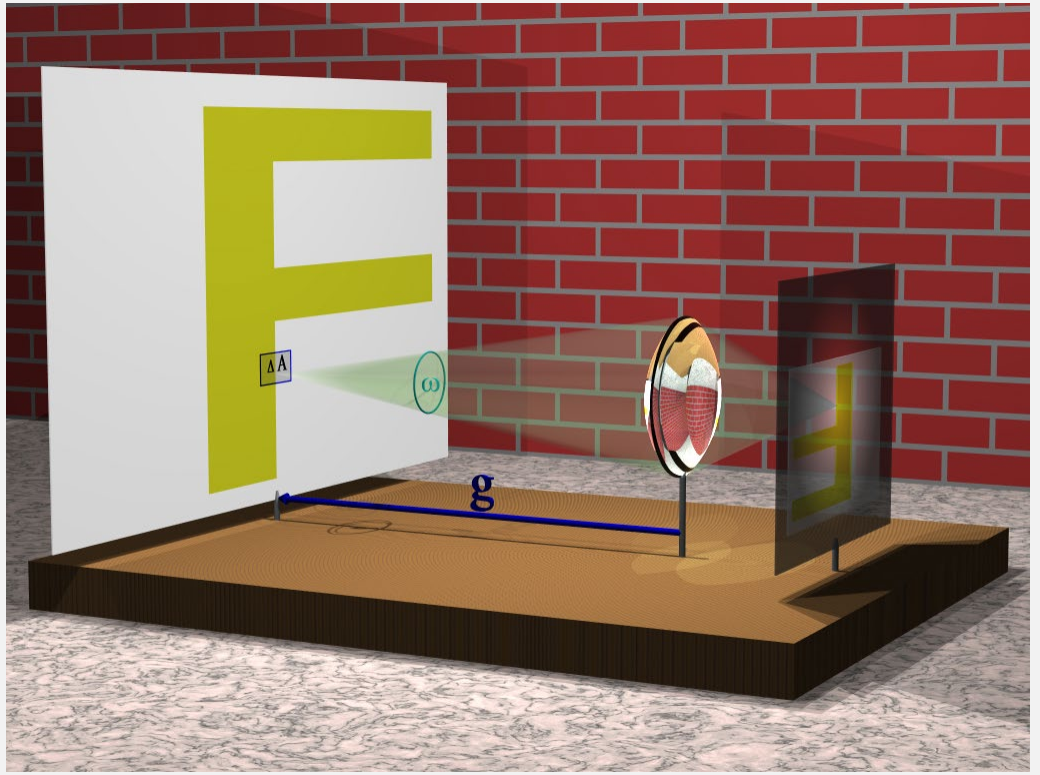
- Advertise supported capabilities
- Describe required capabilities



StructureMap

- Map of relationships between 2 structures

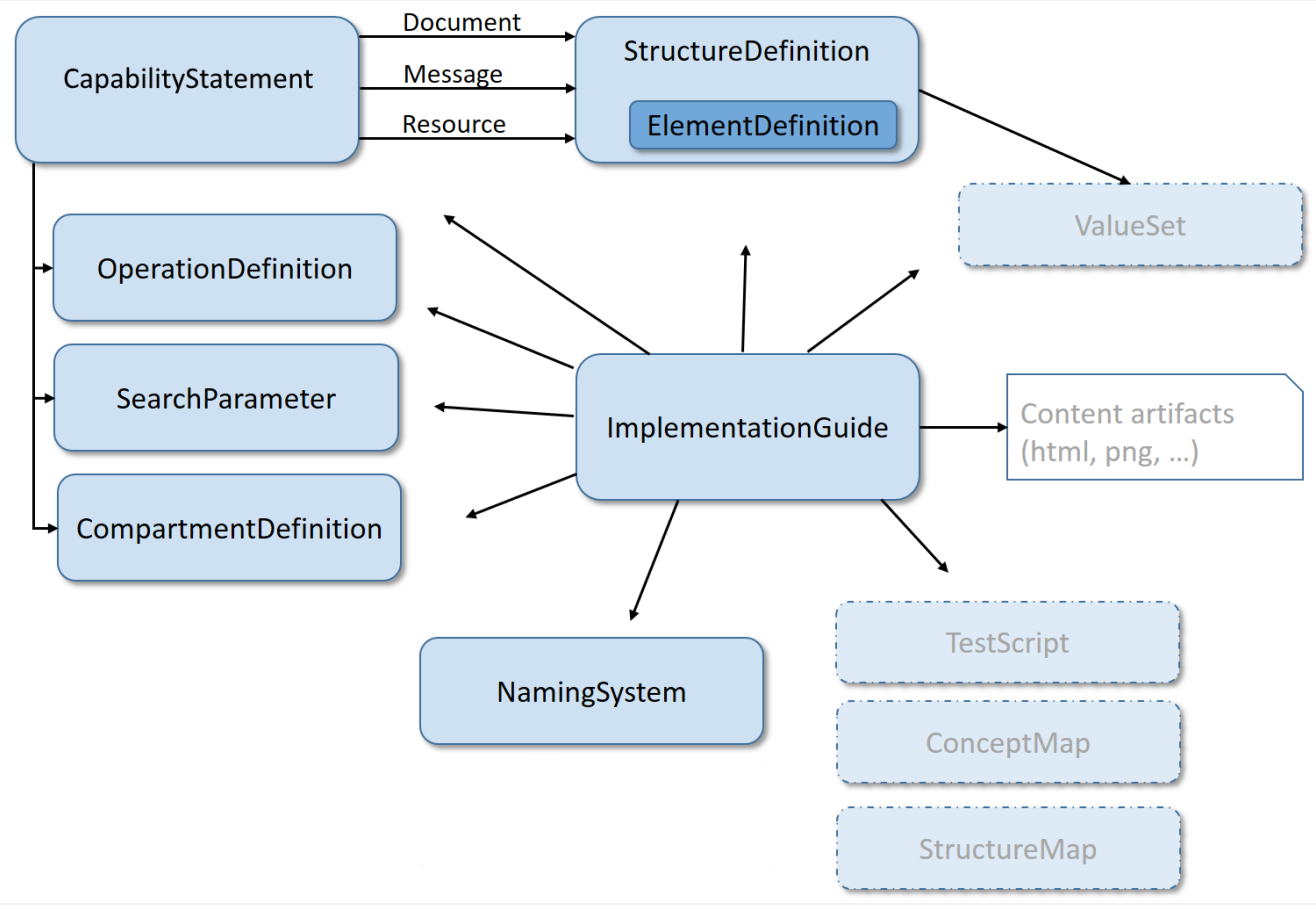
- Based on *FHIR Mapping Language*
- Can be used to transform data



ImplementationGuide

- Describes requirements for a FHIR implementation
- Specifies links to:
  - Relevant FHIR artifacts (e.g. profiles)
  - Editorial content (documentation)
- Usage:
  - Publish an implementation guide
  - Validate conformance

Conformance Module



Used to define the FHIR core spec

- Core datatypes
- Core resources
- Standard REST operations
- Standard search parameters
- Standard terminology

Eat Your Own Dogfood

Canonical Url

- Unique identifier *(uri)* for a conformance resource
  - Author-assigned
  - Shared by all instances
- Compare: Resource Id
  - Server-assigned
  - Unique per instance

- Example: http://hl7.org/fhir/StructureDefinition/Patient
  http://fhir.alp/StructureDefinition/AlpCorePatient

FHIR Profiling Overview

3. Profiles/Extensions

Profile

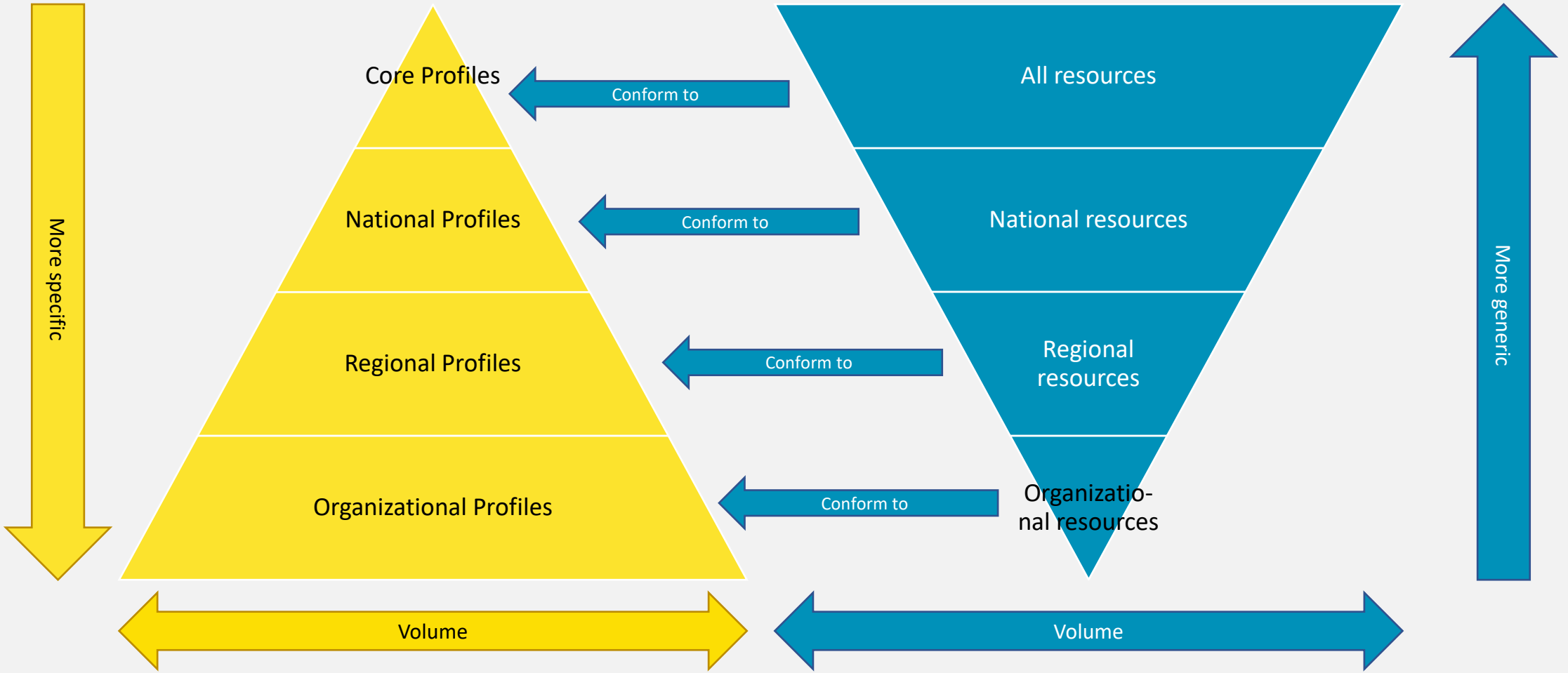
Defines constraints on:

- A FHIR core datatype
- A FHIR core resource
- Another FHIR profile

Also used loosely to refer to:

- An implementation guide
- A conformance package

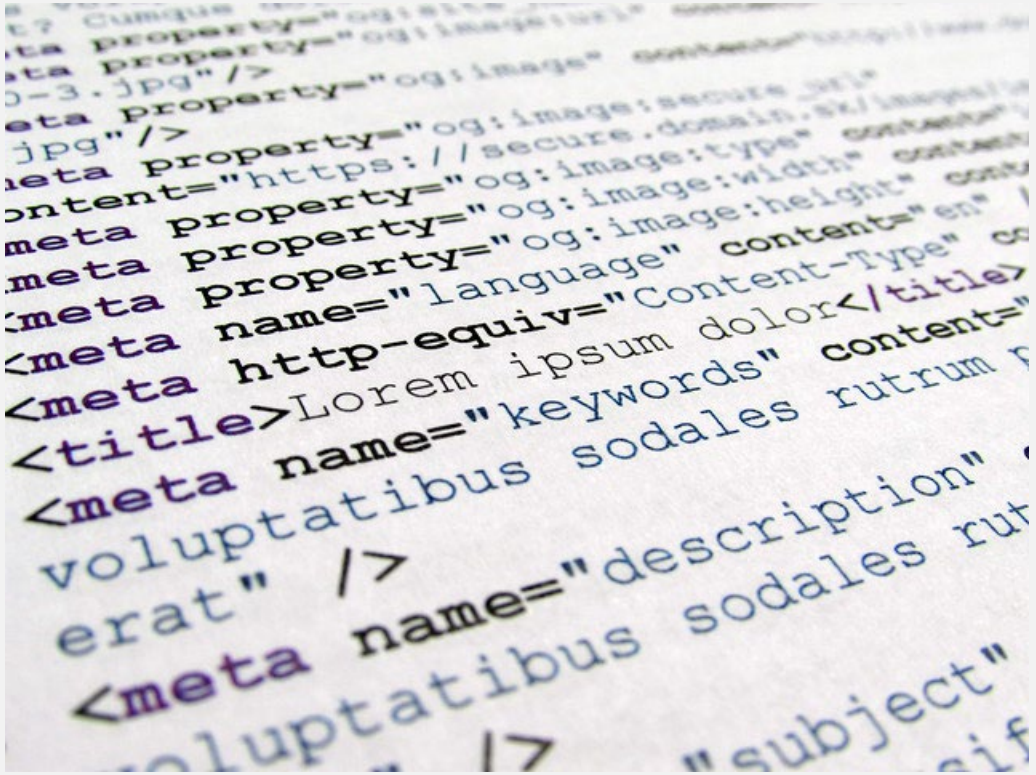
Layered Profiles



StructureDefinition

Metadata:

- **Canonical url**
- Name, Title
- Status (draft, active)
- Date, Version (author assigned)
- Author, publisher, contact, …
- Base profile

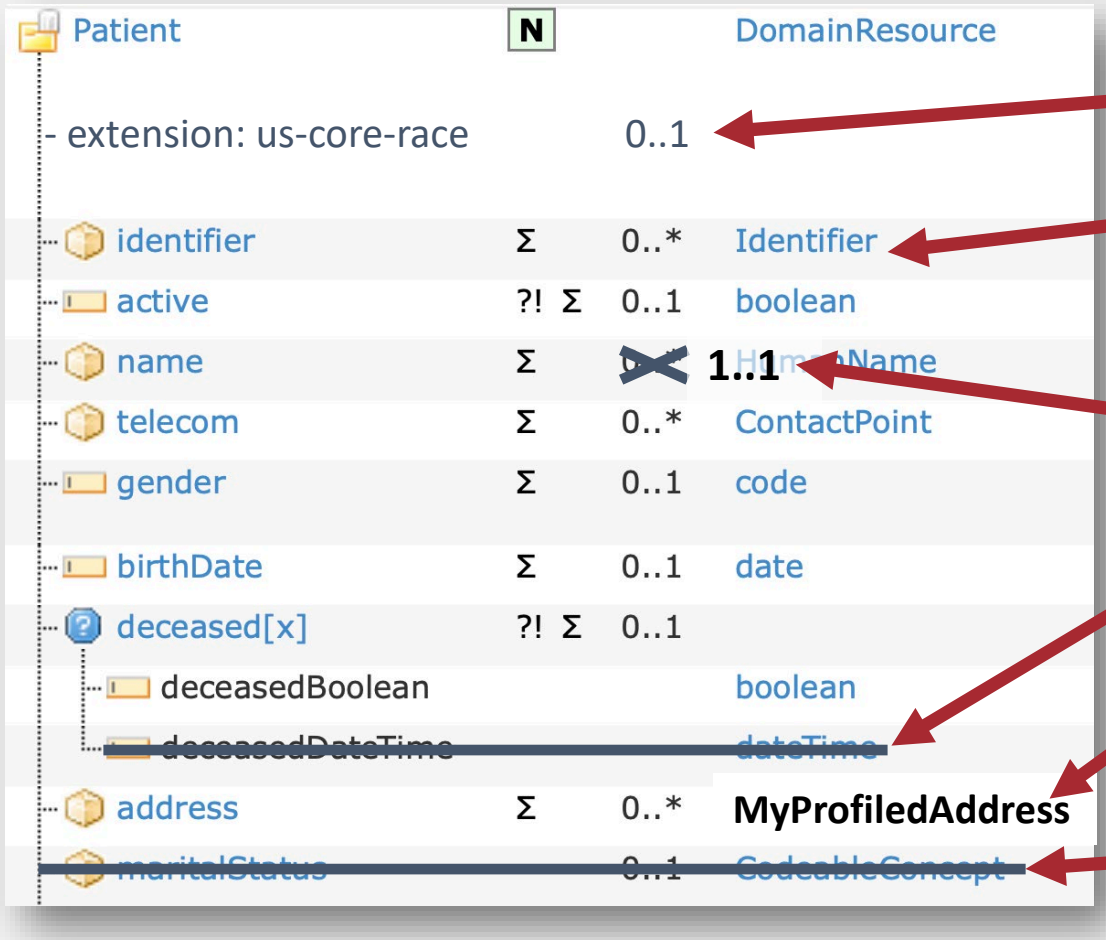


StructureDefinition

List of ElementDefinitions:

- Name, cardinality, data type
- Definitions, usage notes, requirements
- Fixed values
- Complex constraints, length limits
- Terminology bindings
- Mappings to other specifications

Profiling a resource type



Add an extension to support “RaceCode”

Demand that the identifier uses your national patient identifier

Limit names to just 1 (instead of 0..*)

Limit choices for datatypes

Use another profiled Resource type

Forbid element (author with care!)

Example of a profile (us-core-patient)

Patient			0..*	Patient	Information about an individual or animal receiving health care services
us-core-race	S		0..1	(Complex)	US Core Race Extension **URL:** http://hl7.org/fhir/us/core/StructureDefinition/us-core-race
us-core-ethnicity	S		0..1	(Complex)	US Core ethnicity Extension **URL:** http://hl7.org/fhir/us/core/StructureDefinition/us-core-ethnicity
us-core-birthsex	S		0..1	code	Extension **URL:** http://hl7.org/fhir/us/core/StructureDefinition/us-core-birthsex **Binding:** Birth Sex (required)
identifier	S		1..*	Identifier	An identifier for this patient
system	S		1..1	uri	The namespace for the identifier value
value	S		1..1	string	The value that is unique within the system.
name	S	I	1..*	HumanName	A name associated with the patient **us-core-8:** Either Patient.name.given and/or Patient.name.family SHALL be present or a Data Absent Reason Extension SHALL be present.
family	S	I	0..1	string	Family name (often called 'Surname')
given	S	I	0..*	string	Given names (not always 'first'). Includes middle names
telecom	S		0..*	ContactPoint	A contact detail for the individual
system	S		1..1	code	phone | fax | email | pager | url | sms | other **Binding:** ContactPointSystem (required)
value	S		1..1	string	The actual contact point details
use	S		0..1	code	home | work | temp | old | mobile - purpose of this contact point

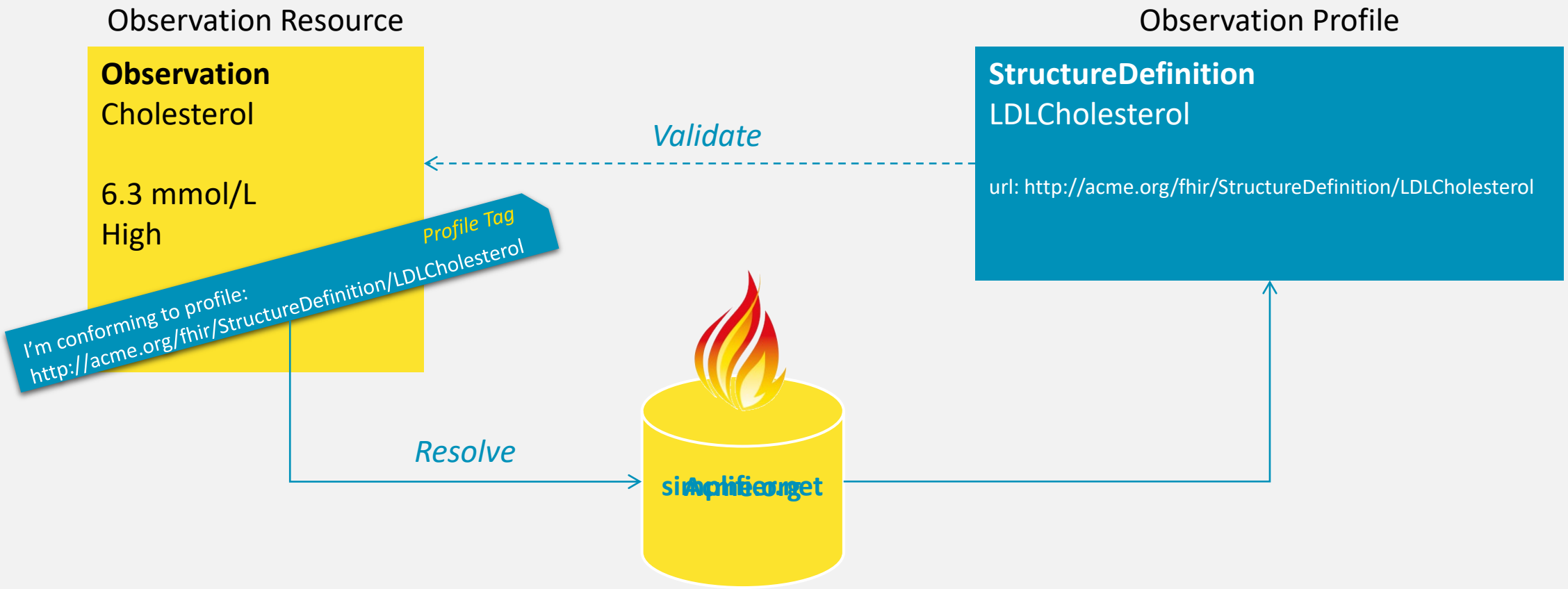
Complex constraints

- To express extra rules that go beyond cardinality, etc. use FHIRPath
  - Graph traversal language (hl7.org/fhirpath)
  - Independent of serialization format; supports XML, JSON, RDF, …
  - Independent of model; supports FHIR, V3, CIMI, QDM, …
  - Fluent syntax; powerful, expressive and readable
- Example:

```
Bundle.type='document' implies (Bundle.timestamp.hasValue())
```

- Interested to learn more?
  Come to the FhirPath session (Thu. Jun 9, 2:00 PM - 2:45 PM)

Referring to a profile



Extensions

Allows to define and introduce custom elements

Example: Patient race, ethnicity

- Registration is *mandatory* in US
- Registration is *illegal* in EU
- Cannot be defined by the core Patient resource definition!

Defining an extension

- Defined by StructureDefinition resource
- Unique identifier: canonical url
- Define extension context
  - Where can this extension be used?
  - Target structure: Resource | Datatype | Extension
  - List of type names and/or element paths
- Reusable in many profiles

FHIR Profiling Overview

4. Packages

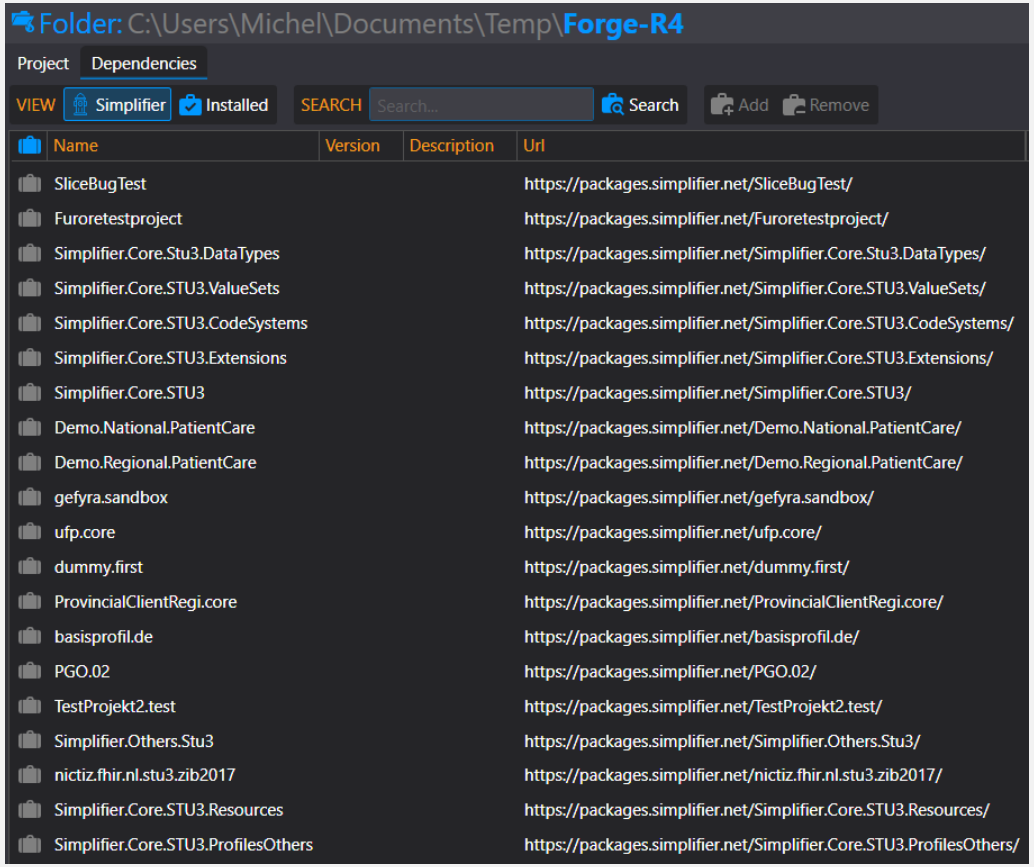
FHIR Package

Versioned and published set of conceptually related FHIR conformance resources:

- Structure Definitions (Profiles)
- Value Sets
- Operation Definitions
- Search Parameter Definitions
- Example Resources
- …

Forge Package Manager

- Browse and download FHIR packages from Simplifier registry
- Add/remove project dependencies
- Select profile extensions from package
- Derive profile from external dependency



FHIR Profiling Overview

5. Registry and Tooling

Official HL7 FHIR registries

- HL7 FHIR Profile registry
  - https://registry.fhir.org/
  - Find official profiles published by HL7 intl. & WGs

- HL7 FHIR Implementation Guide registry
  - http://www.fhir.org/guides/registry
  - Browse official HL7 implementation guides

SIMPLIFIER.NET

- Public FHIR registry
- Search, browse & find FHIR conformance resources:
  - Profiles, IGs, Valuesets, Examples, …
- Contains:
  - Official HL7 profiles
  - HL7 affiliate profiles
  - Private company profiles
  - Public user profiles

https://simplifier.net

SIMPLIFIER.NET

- Validate examples against profiles
  - Are my example resources valid?
- Incoming & outgoing references
  - Who is depending on my profiles/extensions?
- Official back-end for https://registry.fhir.org/
  - Publish from Simplifier to HL7 registry
- Create/Download FHIR NPM packages
- Create Implementation Guides

Profiling tools

- StructureDefinition
  (profiles/logical models/extensions)
  - Forge, Trifolia, ClinFHIR
- ImplementationGuide
  - Simplifier, HL7 IG publisher
- CapabilityStatement
  - FHIR Toolkit
- ValueSet, CodeSystem
  - Snapper, ClinFHIR
- SearchParameter
  - Forge
- Operation
  - Forge
- Example instances
  - Fred, NotePad++ plugin, ClinFHIR

disclaimer: this is just a selection, there may be other tools that are not listed here

What's next?

- Go to one of the modeling sessions:
  - Create an IG with FHIR Shorthand, lets build (2:55pm-3:40pm tomorrow)
  - Building a FHIR data model with Forge, lets build (4:10pm-4:55pm tomorrow)
  - Publishing a FHIR specification, tutorial (11:45am-12:30pm Wednesday)
  - Publishing a FHIR specification with Simplifier, let's build (2pm-2:45pm Wednesday)
  - Comparing profiles & implementation requirements, let's build (2pm-2:45pm Wednesday)
  - Publishing a FHIR specification with IG Publisher, let's build (2:55pm-3:40pm Wednesday)
  - Building dynamic IG's with FHIR Shorthand and FQL, let's build (4:10pm-4:55pm Wednesday)
  - IG publishing and quality control in the cloud , let's build (2pm-2:45pm Thursday)
  - FHIRPath by example, let's build (2pm-2:45pm Thursday)
  - Mapping with FHIR, let's build (2:55pm-3:40pm Thursday)

Contact

- During DevDays, you can find / reach me here:
  - Via Whova App – Speaker's Gallery
  - chat.fhir.org
  - lilian@fire.ly
- And you can email info@fire.ly for inquiries about FHIR software, solutions & services.

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