

Introduction to FHIR Profiling

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HL7 FHIR DevDays

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Minneapolis, MN



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A collage of three promotional cards for Firely products. The left card is titled 'Firely Server' and describes it as a power for online portals, apps, or databases, listing features like 'Turnkey', 'Cloud-agnostic', and 'Integration'. The middle card features the 'simplifier.net' logo and the tagline 'The FHIR registry', showing a screenshot of the website. The right card is titled 'Firely .NET SDK' and describes it as an open source FHIR Software Development Kit, showing an illustration of a toolbox with SDK components. The Firely logo is at the bottom right of the collage.

Topics

1. The need for profiling
2. The FHIR Conformance layer
3. Implementation Guides and Packages
4. Profiles/Extensions
5. Registries



Introduction to FHIR Profiling

1. The need for profiling



Why do we need profiling?

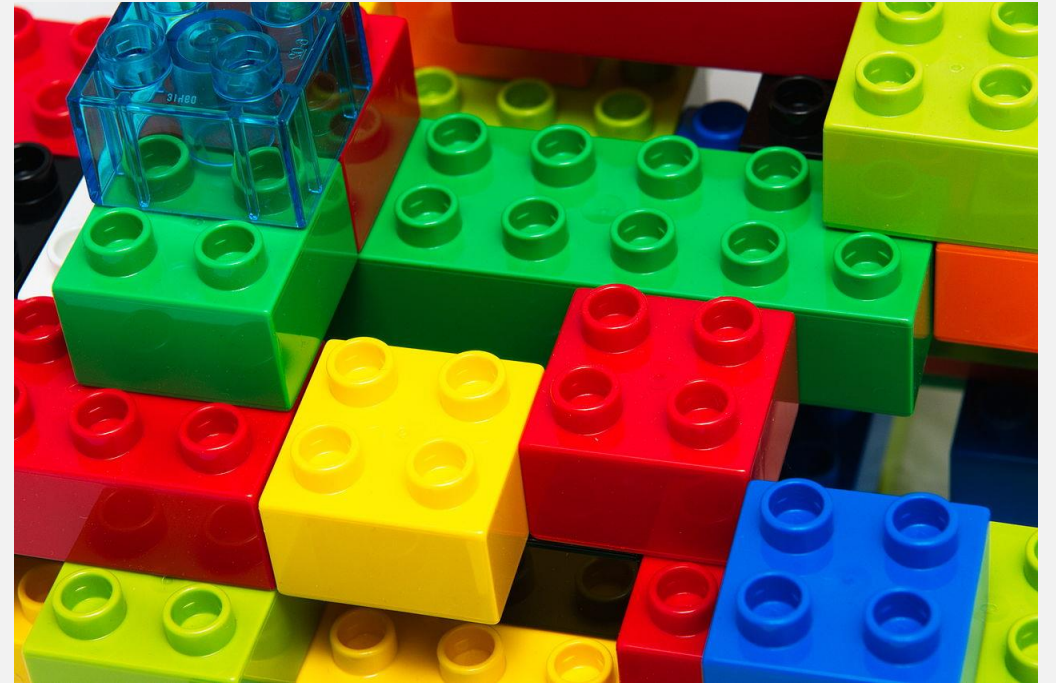
- FHIR provides a *platform specification*
“Standard building blocks for interoperability solutions”
- Single set of resources for many different contexts in healthcare
- Requires further adaptation to context of use



Profiling

Describe adaptations based on use & context:

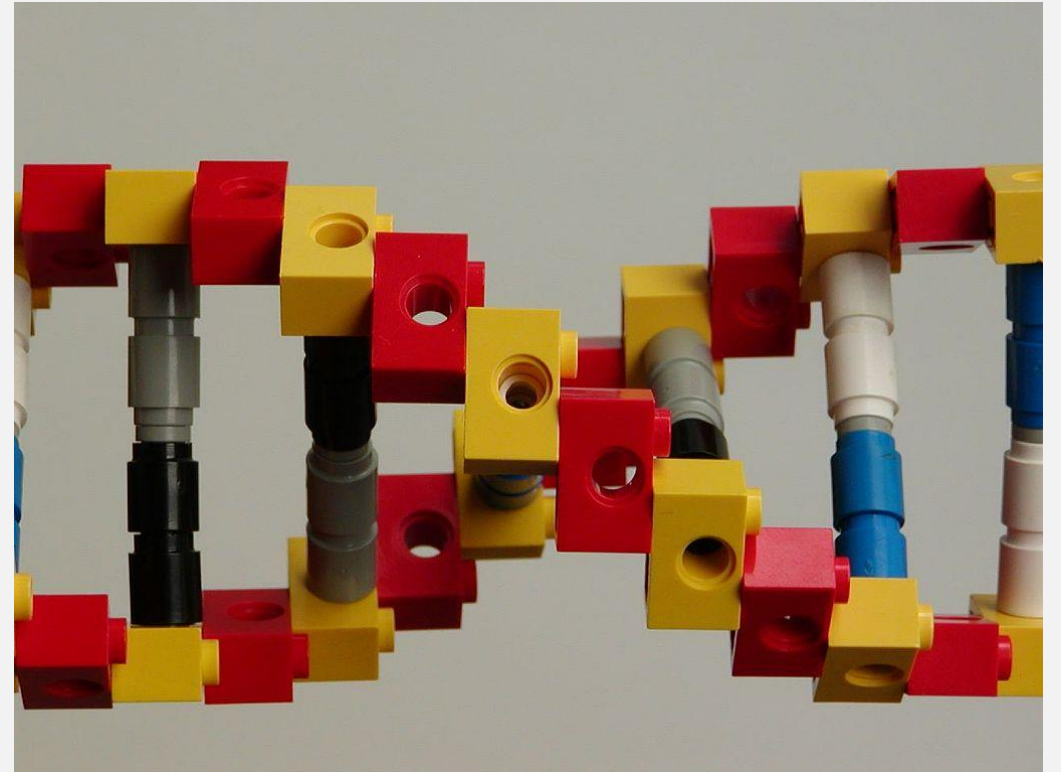
- Which resources & elements are used?
- Which API features are used?
- Which terminologies are used?
- How to map these to local requirements?



The FHIR Conformance layer

Allows 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.

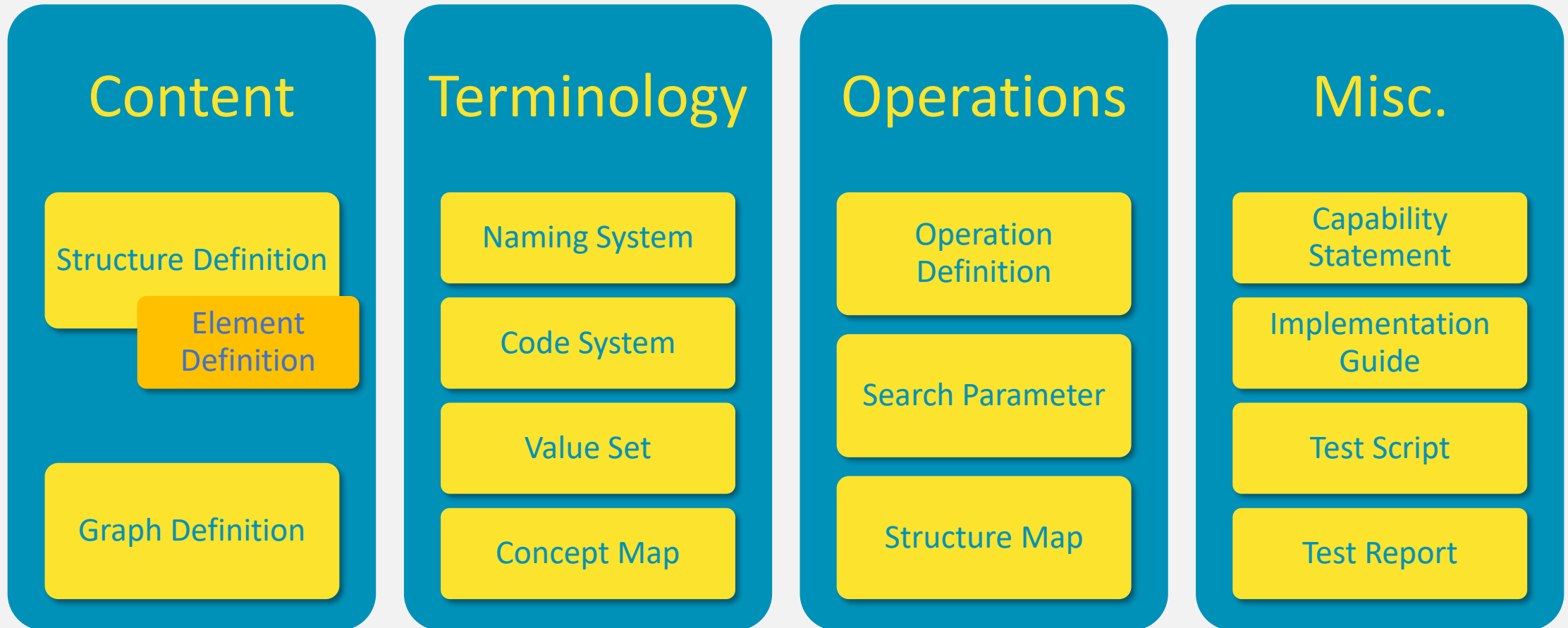


Introduction to FHIR Profiling

2. The FHIR Conformance layer



FHIR Conformance Resources



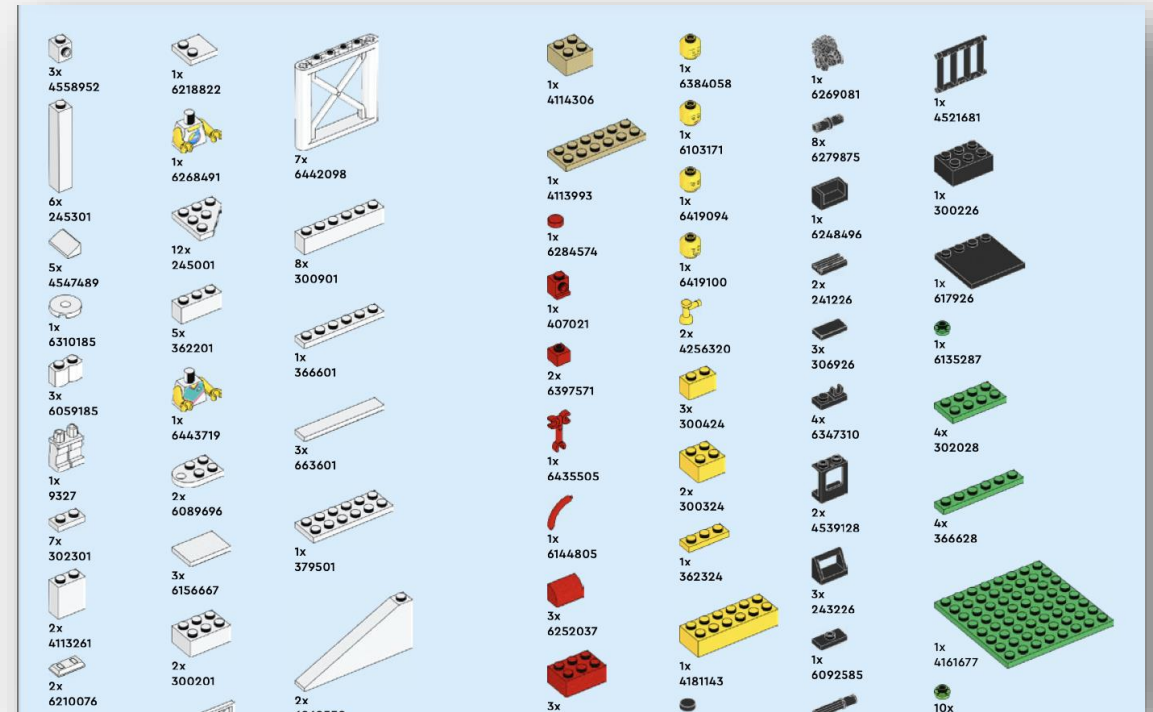
StructureDefinition

Defines data structures:

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

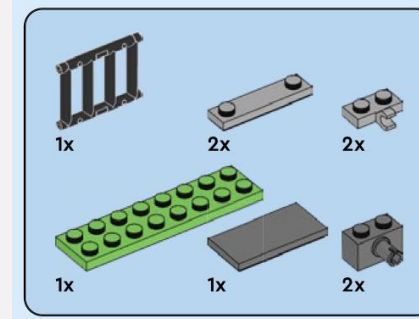
ValueSet

- A selection of a set of codes for use in a particular context
- Points to CodeSystem(s)
 - Defining a set of concepts with a coherent meaning
- Can be bound to elements in FHIR resource



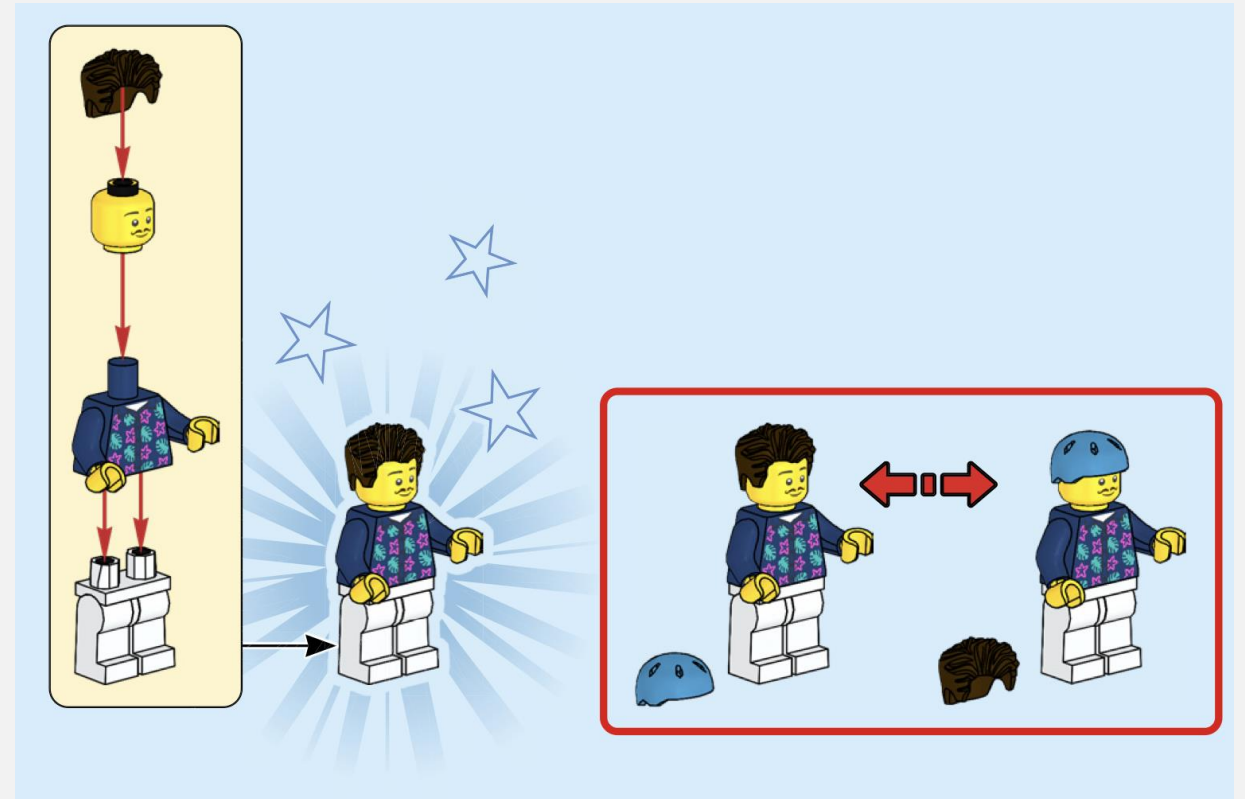
SearchParameter

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



OperationDefinition

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



CapabilityStatement

Defines supported:

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

Usage:

- Advertise supported capabilities
- Describe required capabilities

Name	Flags	Card.	Type	Description & Constraints
CapabilityStatement	N		DomainResource	A statement of system capabilities + Warning: Name should be usable as an identifier for the module by machine processed applications such as code generation


```

{
  "resourceType": "CapabilityStatement",
  "id": "46d0f08b-3168-46c8-adaa-04cb783d89d0",
  "meta": {},
  "language": "en-US",
  "url": "http://server.fire.ly/fhir/CapabilityStatement/FirelyServer",
  "version": "1.0",
  "title": "Firely Server 5.0.0 CapabilityStatement",
  "status": "active",
  "experimental": true,
  "date": "2023-06-05T14:30:54.0052428+00:00",
  "publisher": "Firely",
  "contact": [],
  "kind": "instance",
  "instantiates": [
    "http://hl7.org/fhir/uv/ips/CapabilityStatement/ips-server",
    "https://www.medizininformatik-initiative.de/fhir/core/modul-person/CapabilityStatement/metadata",
    "http://hl7.org/fhir/uv/bulkdata/CapabilityStatement/bulk-data",
    "http://hl7.org/fhir/us/core/CapabilityStatement/us-core-server",
    "http://hl7.org/fhir/CapabilityStatement/base2",
    "http://hl7.org/fhir/CapabilityStatement/base"
  ],
  "software": {},
  "implementation": {},
  "fhirVersion": "4.0.1",
  "format": [
    "xml",
    "json"
  ],
  "rest": [
    {
      "mode": "server",
      "resource": [
        {
          "type": "Account",
          "profile": "http://hl7.org/fhir/StructureDefinition/Account",
          "supportedProfile": [
            "http://hl7.org/fhir/StructureDefinition/Account"
          ]
        }
      ],
      "interaction": [
        {
          "code": "create"
        }
      ]
    }
  ]
}

```

The resource types in the conformance layer are used to define the FHIR core spec!

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



 *Eat Your Own Dogfood*

Canonical Url

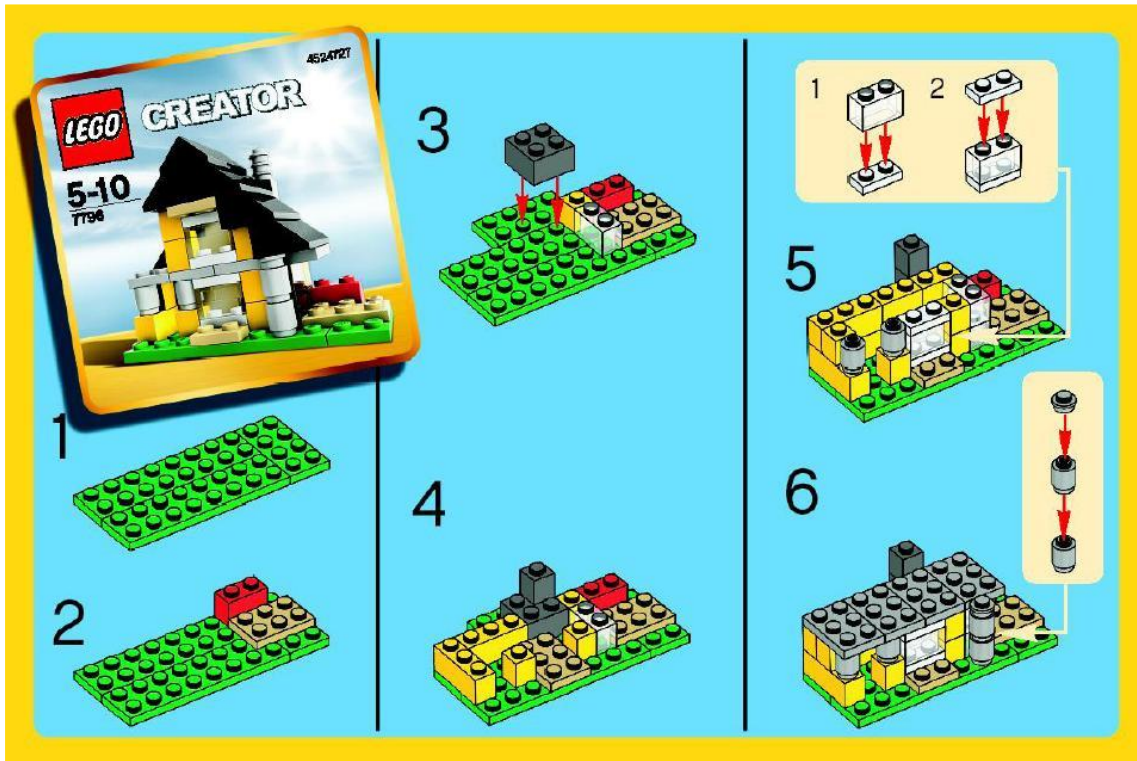
- Unique identifier (*uri*) for a conformance resource
 - Author-assigned
 - Shared by all instances
- Compare: Resource Id
 - Server-assigned
 - Unique per instance
- Example: <http://hl7.org/fhir/StructureDefinition/Patient>
<http://fhir.alp/StructureDefinition/AlpCorePatient>

Introduction to FHIR Profiling

3. Implementation Guides and Packages



FHIR and universal interoperability....

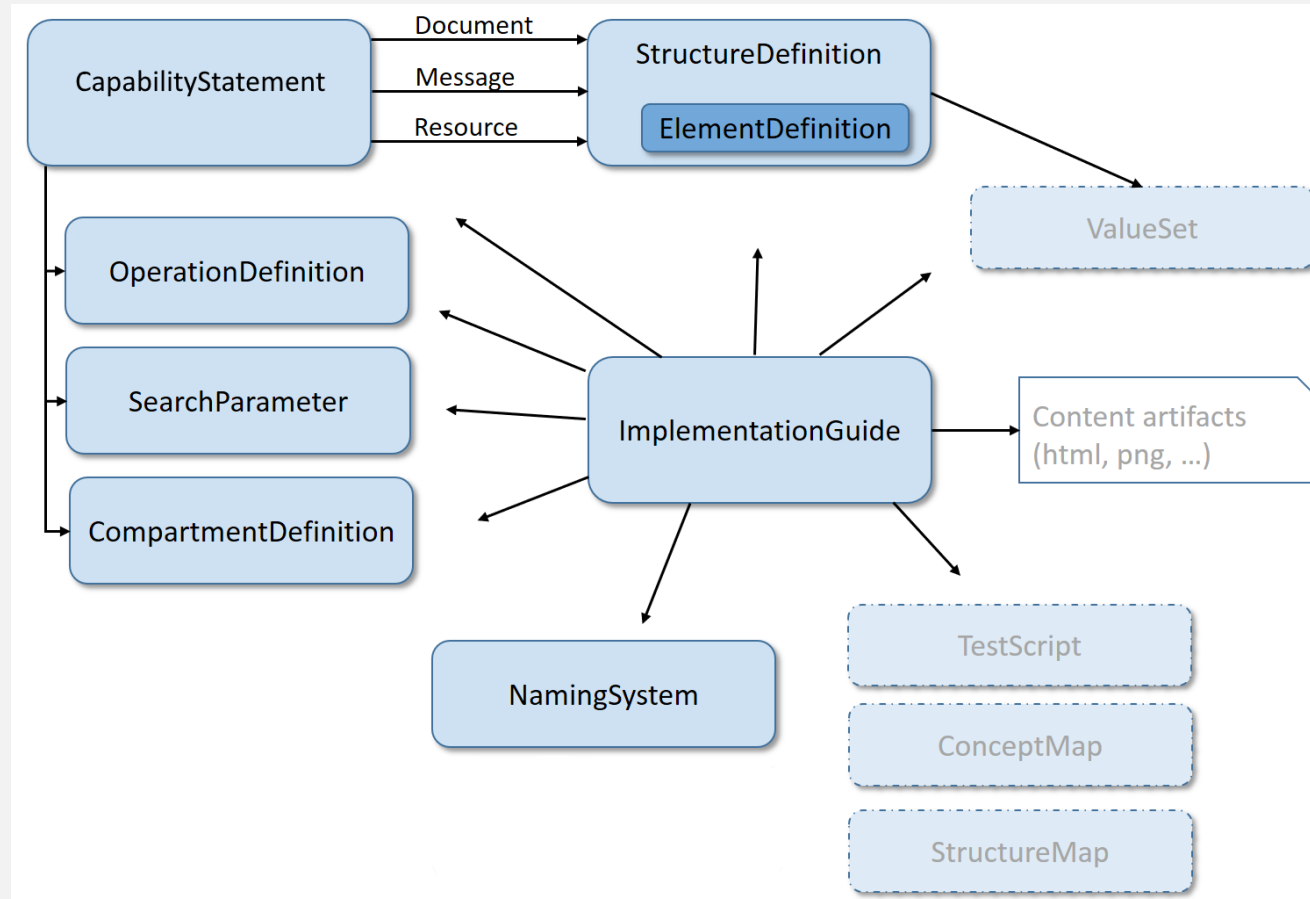


Implementation Guides

- Describe how FHIR is used in particular data exchange
- Set expectations
- Tell you what to do to ‘get it right’
- ImplementationGuide resource
 - Specifies links to:
 - Relevant FHIR artifacts (e.g. profiles)
 - Editorial content (documentation)
 - Usage:
 - Publish an implementation guide
 - Validate conformance



ImplementationGuide resource



FHIR Package

Versioned and published set of conceptually related FHIR conformance resources:

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



Introduction to FHIR Profiling

4. Profiles/Extensions



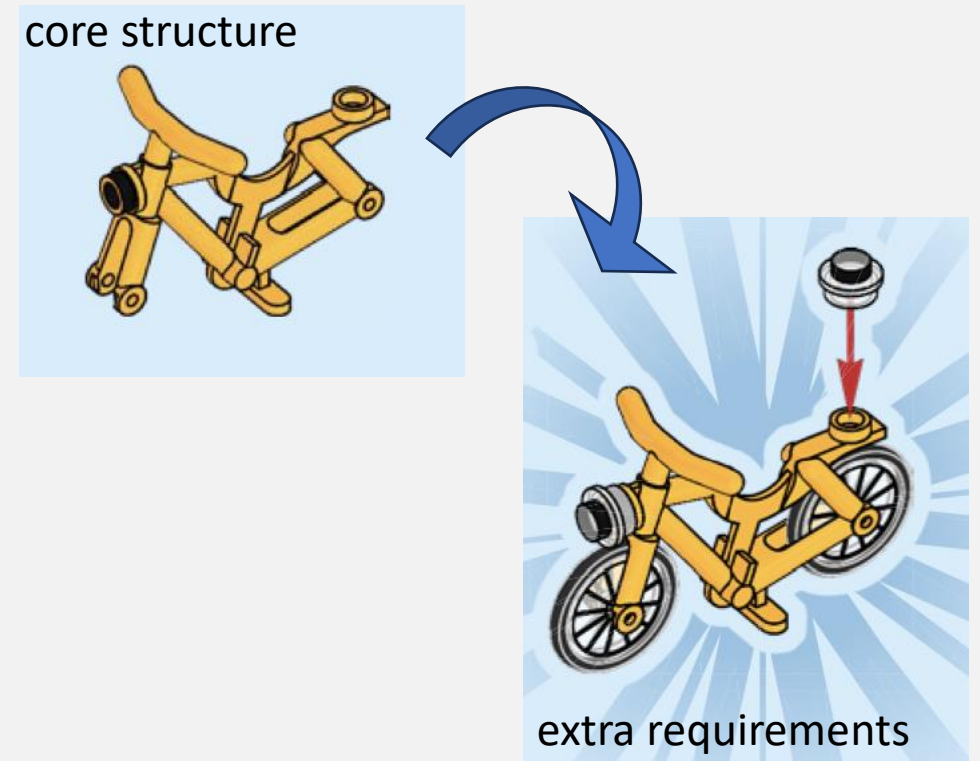
Profile

Defines constraints on:

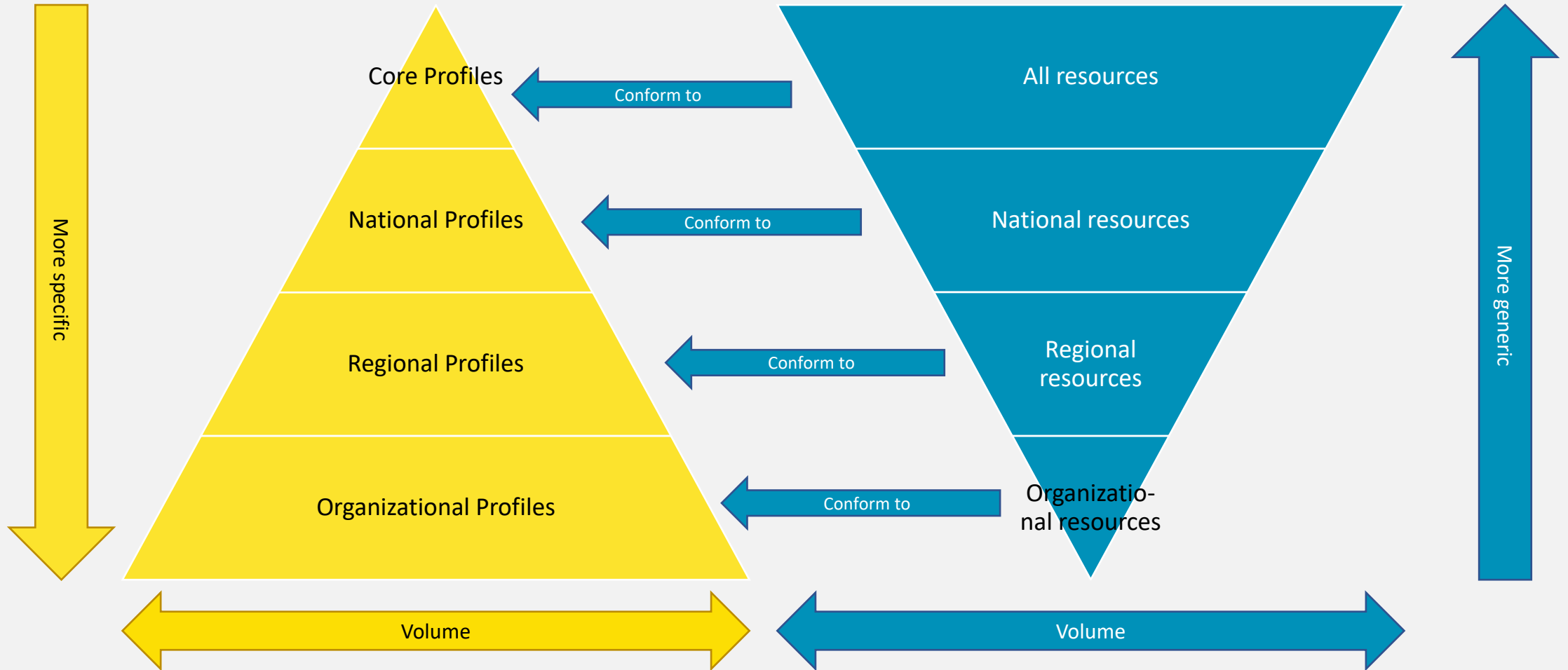
- A FHIR core datatype
- A FHIR core resource
- Another FHIR profile

Also used loosely to refer to:

- An implementation guide
- A conformance package



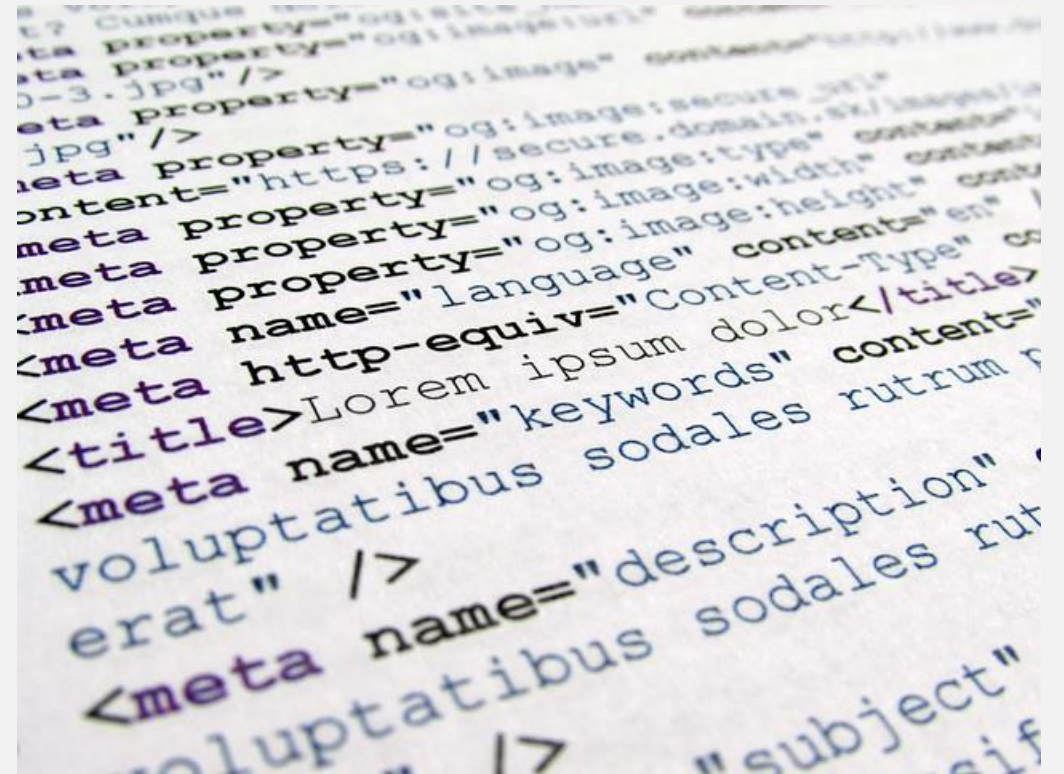
Layered Profiles



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

context	Σ	1..1	
supportingInformation	Σ	1..1	Reference(nl-core-patient)
authoredOn	Σ	1..1	Reference(Encounter EpisodeOfCare)
requester	Σ	0..*	Reference(Resource)
recorder	Σ	1..1	dateTime
reasonCode	Σ	0..1	BackboneElement
reasonReference	Σ	0..1	Reference(nl-core-practitioner)
		0..*	CodeableConcept Binding
		0..*	Reference(Observation ZIB Code)
		0..*	Annotation
		0..*	ZIB Instructions

Profiling a resource type

Element	Cardinality	Profile
extension: us-core-race	0..1	DomainResource
identifier	Σ 0..*	Identifier
active	?! Σ 0..1	boolean
name	Σ 0..* 1..1	HumanName
telecom	Σ 0..*	ContactPoint
gender	Σ 0..1	code
birthDate	Σ 0..1	date
deceased[x]	?! Σ 0..1	
deceasedBoolean		boolean
deceasedDateTime		dateTime
address	Σ 0..*	MyProfiledAddress
maritalStatus	0..1	CodeableConcept

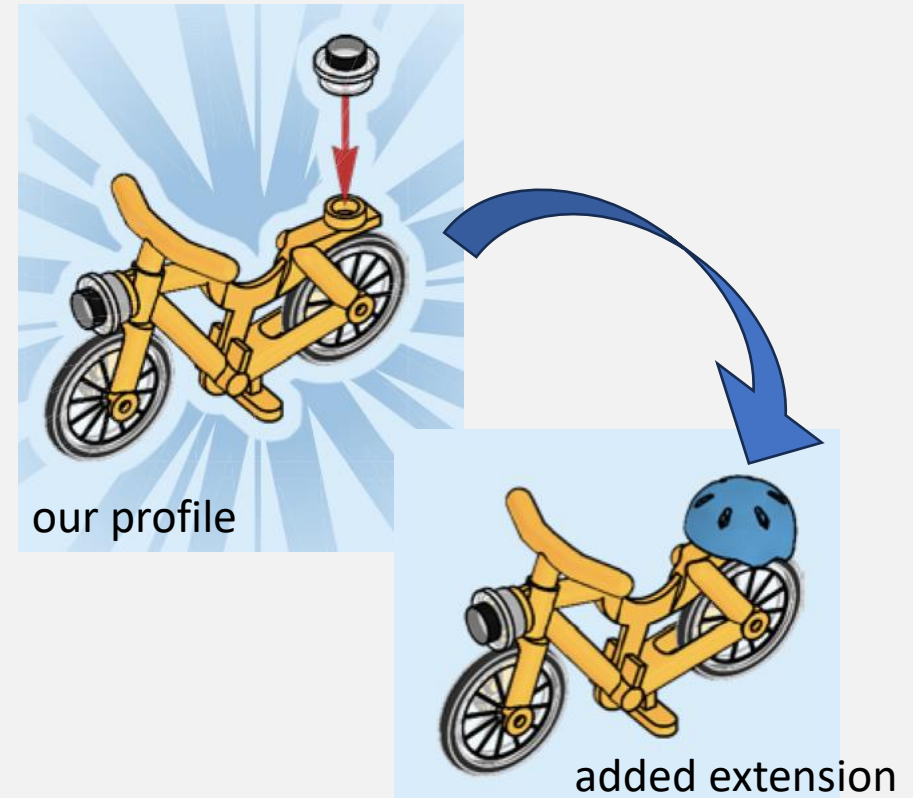
- Add an extension to support "RaceCode"
- Demand that the identifier uses your national patient identifier
- Limit names to just 1 (instead of 0..*)
- Limit choices for datatypes
- Use another profiled Resource type
- Forbid element (author with care!)

Extensions

Allows to define and introduce custom elements

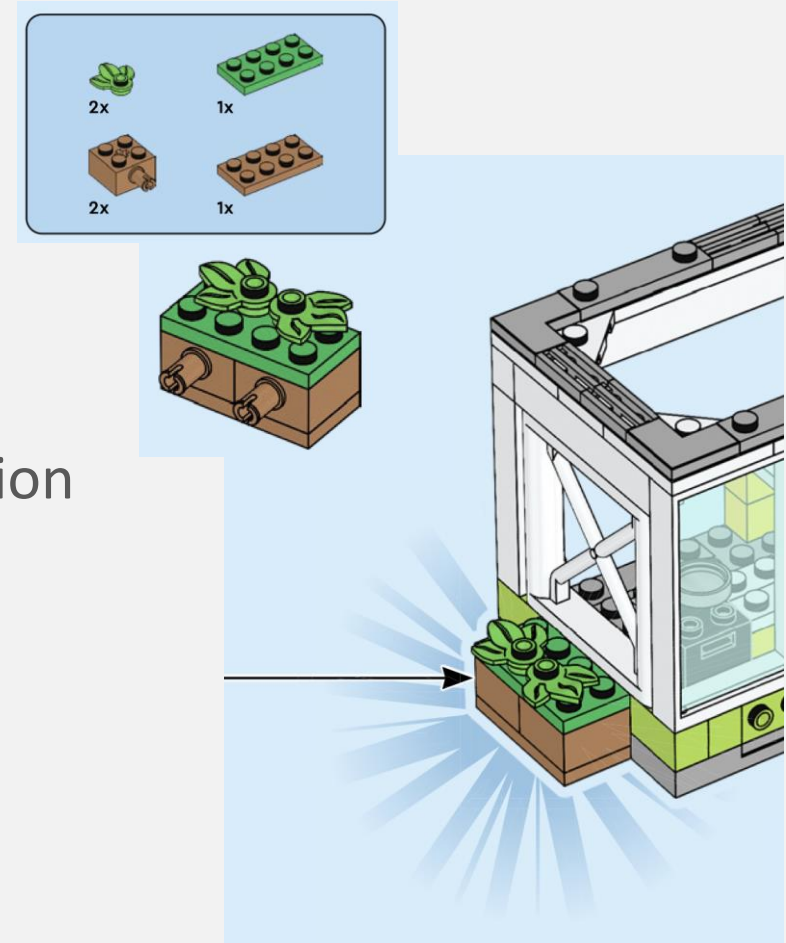
Example: Patient race, ethnicity

- 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



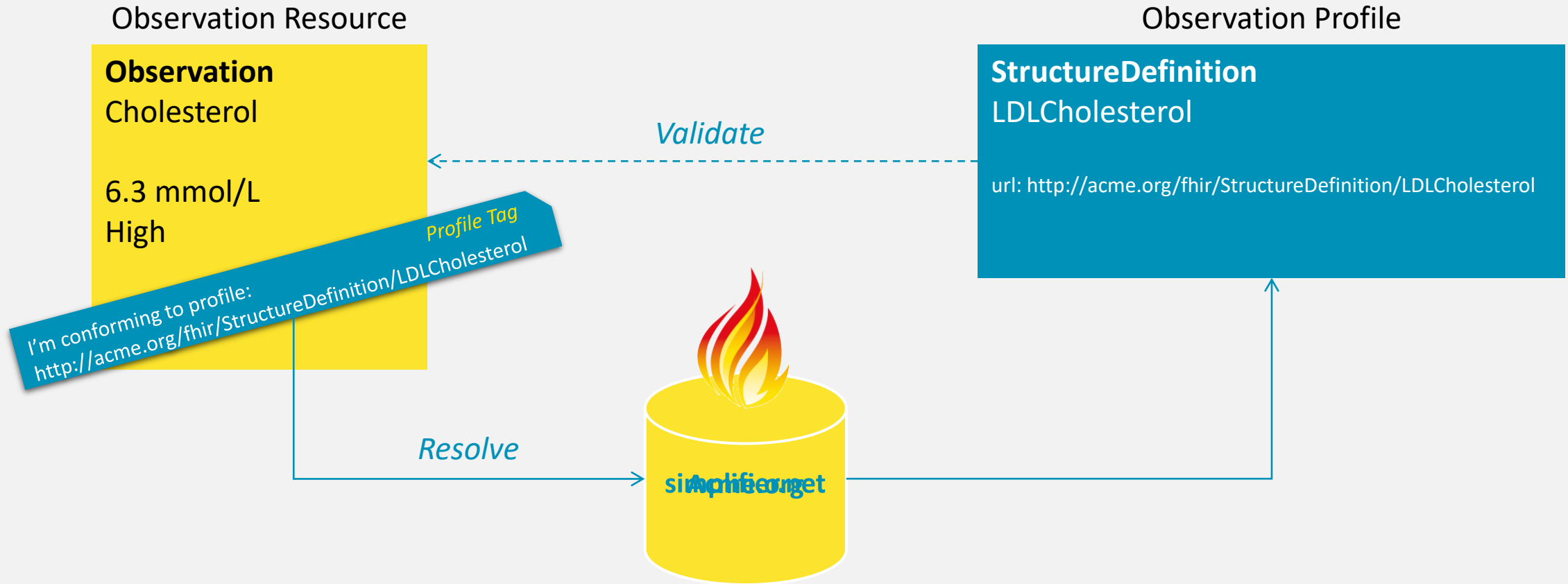
Complex constraints

- FHIRPath
 - To express extra rules that go beyond cardinality, etc.
 - Graph traversal language (<http://hl7.org/fhirpath>)
 - Fluent syntax; powerful, expressive and readable
- Example FHIRPath constraint on Bundle.type:
`type = 'document' implies (timestamp.hasValue())`

Example of a profile (us-core-patient)

 Patient	0..*	Patient	Information about an individual or animal receiving health care services
 race	0..1	(Complex)	(USCDI) US Core Race Extension URL: http://hl7.org/fhir/us/core/StructureDefinition/us-core-race
 ethnicity	0..1	(Complex)	(USCDI) US Core ethnicity Extension URL: http://hl7.org/fhir/us/core/StructureDefinition/us-core-ethnicity
 tribalAffiliation	0..*	(Complex)	(USCDI) Tribal Affiliation Extension URL: http://hl7.org/fhir/us/core/StructureDefinition/us-core-tribal-affiliation
 birthsex	0..1	code	(USCDI) Extension URL: http://hl7.org/fhir/us/core/StructureDefinition/us-core-birthsex Binding: Birth Sex (required): Code for sex assigned at birth
 genderIdentity	0..*	CodeableConcept	(USCDI) The individual's gender identity URL: http://hl7.org/fhir/us/core/StructureDefinition/us-core-genderIdentity Binding: Gender Identity (extensible)
 identifier	S	1..*	Identifier
 system	S	1..1	uri
 value	S	1..1	string
 name	S C	1..*	HumanName
 use		0..1	code
 family	S C	0..1	string
 given	S C	0..*	string
 suffix		0..*	string
 period		0..1	Period
 telecom		0..*	ContactPoint
 system	S	1..1	code
 value	S	1..1	string

Referring to a profile



Introduction to FHIR Profiling

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 packages
- Create Implementation Guides

Forge Profile editor and Package Manager



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

Folder: C:\Users\Michel\Documents\Temp\Forge-R4

Project Dependencies

VIEW Simplifier Installed SEARCH Search... Search Add Remove

Name	Version	Description	Url
SliceBugTest			https://packages.simplifier.net/SliceBugTest/
Furoretestproject			https://packages.simplifier.net/Furoretestproject/
Simplifier.Core.Stu3.DataTypes			https://packages.simplifier.net/Simplifier.Core.Stu3.DataTypes/
Simplifier.Core.STU3.ValueSets			https://packages.simplifier.net/Simplifier.Core.STU3.ValueSets/
Simplifier.Core.STU3.CodeSystems			https://packages.simplifier.net/Simplifier.Core.STU3.CodeSystems/
Simplifier.Core.STU3.Extensions			https://packages.simplifier.net/Simplifier.Core.STU3.Extensions/
Simplifier.Core.STU3			https://packages.simplifier.net/Simplifier.Core.STU3/
Demo.National.PatientCare			https://packages.simplifier.net/Demo.National.PatientCare/
Demo.Regional.PatientCare			https://packages.simplifier.net/Demo.Regional.PatientCare/
gefyra.sandbox			https://packages.simplifier.net/gefyra.sandbox/
ufp.core			https://packages.simplifier.net/ufp.core/
dummy.first			https://packages.simplifier.net/dummy.first/
ProvincialClientRegi.core			https://packages.simplifier.net/ProvincialClientRegi.core/
basisprofil.de			https://packages.simplifier.net/basisprofil.de/
PGO.02			https://packages.simplifier.net/PGO.02/
TestProjekt2.test			https://packages.simplifier.net/TestProjekt2.test/
Simplifier.Others.Stu3			https://packages.simplifier.net/Simplifier.Others.Stu3/
nictiz.fhir.nl.stu3.zib2017			https://packages.simplifier.net/nictiz.fhir.nl.stu3.zib2017/
Simplifier.Core.STU3.Resources			https://packages.simplifier.net/Simplifier.Core.STU3.Resources/
Simplifier.Core.STU3.ProfilesOthers			https://packages.simplifier.net/Simplifier.Core.STU3.ProfilesOthers/

Contact

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

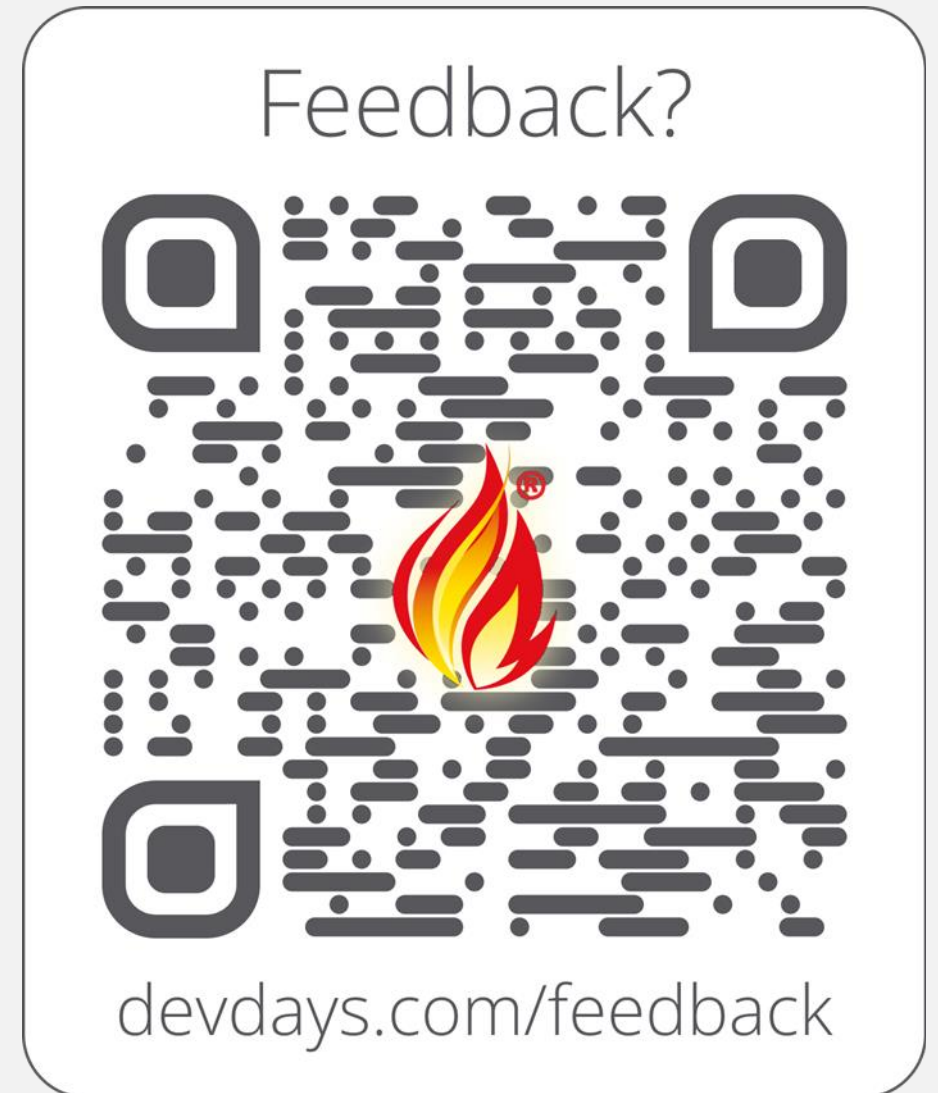
Q&A



Feedback

- Include link and/or QR code to collect feedback on your talk and DevDays

<https://www.devdays.com/feedback/>



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