Agenda & Structure

• House rules, intro, agenda

• FHIR® Profiling: Why

• FHIR® Profiling: What
  • Functional
  • Technical

• FHIR® Profiling: How

• Interactive example + Q&A

• Profiling process
  • Analysis – workflow, exchange approach, content
  • Technical implementation
  • (Agile) Review

• Profiling artifacts:
  • Data and behaviour – StructureDefinition, OperationDefinition, SearchParameter
  • Vocabulary – ValueSet, CodeSystem, NamingSystem, ConceptMap
  • Examples – Instances and ExampleScenario
  • Support - CapabilityStatement
Remarks and disclaimers

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• This is not an official HL7 training. For such training opportunities, you are encouraged to
  • http://www.hl7.org/training

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  • All diagrams, except those that state otherwise, are original materials or taken from the FHIR website and support materials; all screenshots are from the FHIR website

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Goals

• Understand and apply the key concepts for HL7® FHIR® profiling

• In our limited time, we’ll expose some examples and entertain questions – please participate!
Before we start…

The most important outcome of this is that we collaborate, experiment and participate:

- [https://chat.fhir.org](https://chat.fhir.org)
- [http://community.fhir.org](http://community.fhir.org)

Upcoming event | DevDays 2021

- **Participants from Low and Lower Middle Income Countries**
  
  For those living in low and lower-middle-income countries, an opportunity to register at a discounted fee is available. The fee for those from Africa is $50 USD. The fee for other low and lower-middle-income countries is $100 USD (early bird before May 14, 2021) and $150 USD (regular after May 14, 2021).

- [https://www.devdays.com/june-2021/registration/](https://www.devdays.com/june-2021/registration/)
Why FHIR® Profiling
FHIR Implementation

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Using FHIR® in an implementation

• There are different levels of specification.
• A specification is based on the FHIR® base, or, very commonly, on existing specifications (OpenHID, IHE, national guidance).
• A FHIR® specification can add constraints and extensions to the specification it depends on.
Why to do FHIR® profiling (and why not)

• FHIR® profiling adapts the underlying specifications to a given context.

• Purpose is important:
  • Be clear about your purpose: Your system? Or your expectations for many systems?
  • When a constraint is applied, it cannot be removed in upper layers.
    • Be flexible with what you accept, strict with what you send.
    • Avoid systems to become non-compliant because of “ideal” constraints.

• Use profiling to transport your functional (and technical) constraints to the technical specifications.
What is FHIR®
Profiling
FHIR base resources

• FHIR® base resources (in a given version) represent the common agreed data sets for exchange
  • Usually referred as the 80%-20% rule: the 80% that are common across implementations

• FHIR® Resources are designed to be profiled
  • Constrained
  • Extended
FHIR® workflow

• The FHIR® workflow module defines the foundation for managing workflow with FHIR®.
  • For example, a prescription is a Request, a Dispense of that prescription is an Event.
  • When using these resources, there are foundational expectations about status, exchanged data, etc.
  • Examples: REST vs Subscriptions vs Messaging; Task to manage workflows, etc.

• Workflow can be implemented using different types of FHIR® constructs
FHIR® data exchange

• FHIR® provides mechanisms for exchanging data in several ways
  • REST
  • Messaging
  • Documents
  • Subscriptions
  • (others)

• A good reference: the DaVinci Health Record Exchange ImplementationGuide

• The data exchange can be defined using different FHIR® constructs
FHIR® terminologies

- Coded Elements are associated with a ValueSet
- ValueSets get codes from CodeSystems
- Identifiers are associated with NamingSystems

- All of the above are FHIR® concepts that can be reused or defined when profiling
FHIR® resource profiles

• FHIR® resources can be profiled:
  • Extensions added or constrained
  • Cardinalities constrained
  • Vocabulary bindings constrained
  • Slices can be created
  • …
FHIR® Implementation
How to do FHIR® Profiling and specification
Iterative process

• Use Cases
• Exchange method
• (Functional Data models)
• Technical implementation
  • Choose a base
  • Resource profiles
  • Vocabulary
  • Examples
Use Cases

1. Identify your data exchange process
   1. (trick: it helps to imagine a dialog)

2. List the actors, what they say to each other, what they expect
   1. Document
   2. Validate with your stakeholders

3. Capture meaningful examples
Exchange method

• Define / decide:
  • Push / Pull model? Who initiates?
  • Consistency of data?
  • ...

https://build.fhir.org/ig/HL7/davinci-ehrxx/exchanging.html
Functional Data Models

• Keeping your data in a “functional” module can be very helpful:
  • Facilitates discussion with non-technical people
  • Allows mapping to existing / other implementations
  • Enables structured capture of functional requirements (cardinalities, bindings..)
  • Facilitates migration to different FHIR versions or updates in base guidance

• If you have a reference, use it. If not, start with the FHIR® resource model.
Technical Implementation

FHIR® Foundation
Profiling data structures

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http://build.fhir.org/types.html
Profiling data structures

- [http://build.fhir.org/profiling.html](http://build.fhir.org/profiling.html)

- Profiling in FHIR® is a technical-based mechanism. Some narrative applies but most is computable.

- A “profile” is the name given to a constrained resource in FHIR®. Example: MedicationPrescription (profile of MedicationRequest).

- Most profiles are for existing resources. A new, custom resource is seldom needed – if you think you need one, please let us know.
  - Custom resources are based on the fhir Basic resource.
**StructureDefinition**

- Defines a data structure – a set of elements
  - Snapshot – full structure
  - Differential – difference to base

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http://build.fhir.org/structuredefinition
ElementDefinition

• Definition of a single data element and its metadata and constraints

http://build.fhir.org/elementdefinition
Element

• Definitions

• Cardinality

• Bindings - terminologies

• Constraints – expressions that can be used to validate content

• MustSupport, isModifier
Profiling data structures

• Resources:
  • Take one resource as base, add (Differential) constraints to its elements

• Extensions:
  • Take the Extension resource as base, add (Differential) constraints to its elements, and define context
Extensions

http://build.fhir.org/extensibility.html

• Most everything can be extended
• There are several extensions available in HL7: http://build.fhir.org/extensibility-registry.html
Terminologies

• Define ValueSets, CodeSystems, NamingSystems
• Apply them to bindings of data elements
OperationDefinition

• FHIR® provides mechanisms to define / register server operations
• For example `$document (return a document)`, `$expand (return an expanded valueset)
• We can define our own operations

(keep in mind that FHIR® is an interoperability standard, not a single system’s specification)

http://build.fhir.org/operationdefinition
SearchParameter

- FHIR® search works based on available search parameters.  
  ![Link](http://build.fhir.org/search)

- Sometimes we need other search parameters
  - For an extension, a specific slice, or an attribute that was not searchable

- Many FHIR® servers support custom search parameters

![Table](http://build.fhir.org/searchparameter)
Higher-level constrains

• Aggregated content definition
  • Documents
  • Messages

• Workflow constraints
Special case - questionnaire

• Questionnaire can be used in some circumstances to collect information in a structured, simplified way.

• Does not replace the FHIR® resources and is not intended to handle standard interoperability, but is a means for structured data capture

• http://hl7.org/fhir/uv/sdc/2019May/
Examples

• Try to have examples for each (key) change or feature
• Ideally those examples would align with any narrative you have
Workflow / Exchange approach

• Capture as narrative, provide examples
A CapabilityStatement defines how a system is expected to behave.

Use it to assert and consult a system’s expectations.
Reference implementations

- http://fhir.org/guides/registry/
- https://simplifier.net/
Tooling
Tools for profiling

• ...notepad...
• Forge https://fire.ly/products/forge/
• sushi (an implementation of FHIR® Shorthand) https://fshschool.org/
  • Include sushi online and gofsh
  • ...
Technical Implementation
Example

• Prescription for COVID vaccine (NOT certificate)
  • Profile: prescription
  • Terminology: Vaccine codes
  • Extensions: Patient gender
  • ...
Discussion
FHIR® Tools

FHIR® servers
• Readily available:
  • http://test.fhir.org/r4
  • http://hapi.fhir.org/

Reference implementations (servers and clients on several technology platforms)

https://confluence.hl7.org/display/FHIR/Open+Source+Implementations
Get in touch, be active

- Check with others (at chat.fhir.org or community.fhir.org)
- Create (or ask someone to create) a change request
- Join a FHIR® event like DevDays (devdays.com), discuss
- Join a FHIR® connectathon, test and provide feedback
Upcoming sessions

• 28 April | FHIR® 101 Refresher
• 26 May | FHIR® profiling & documentation
• 30 June | FHIR® and Terminology
• 28 July | FHIR® Implementation Guide / Advanced Usage
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