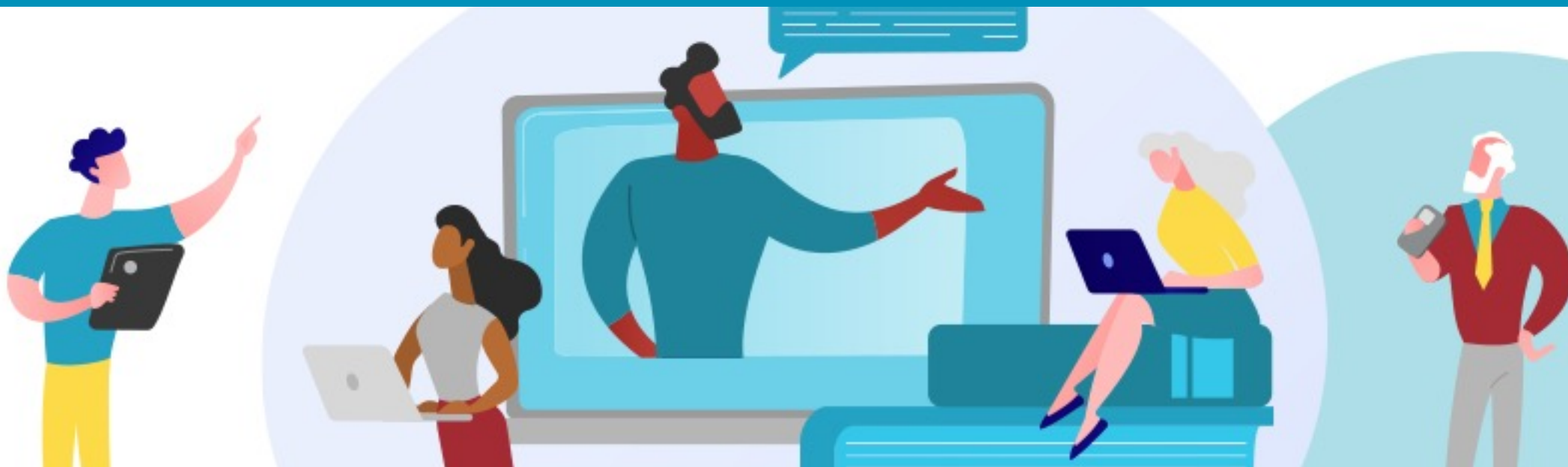


# Tutorial: Advanced FHIR Shorthand and Tools

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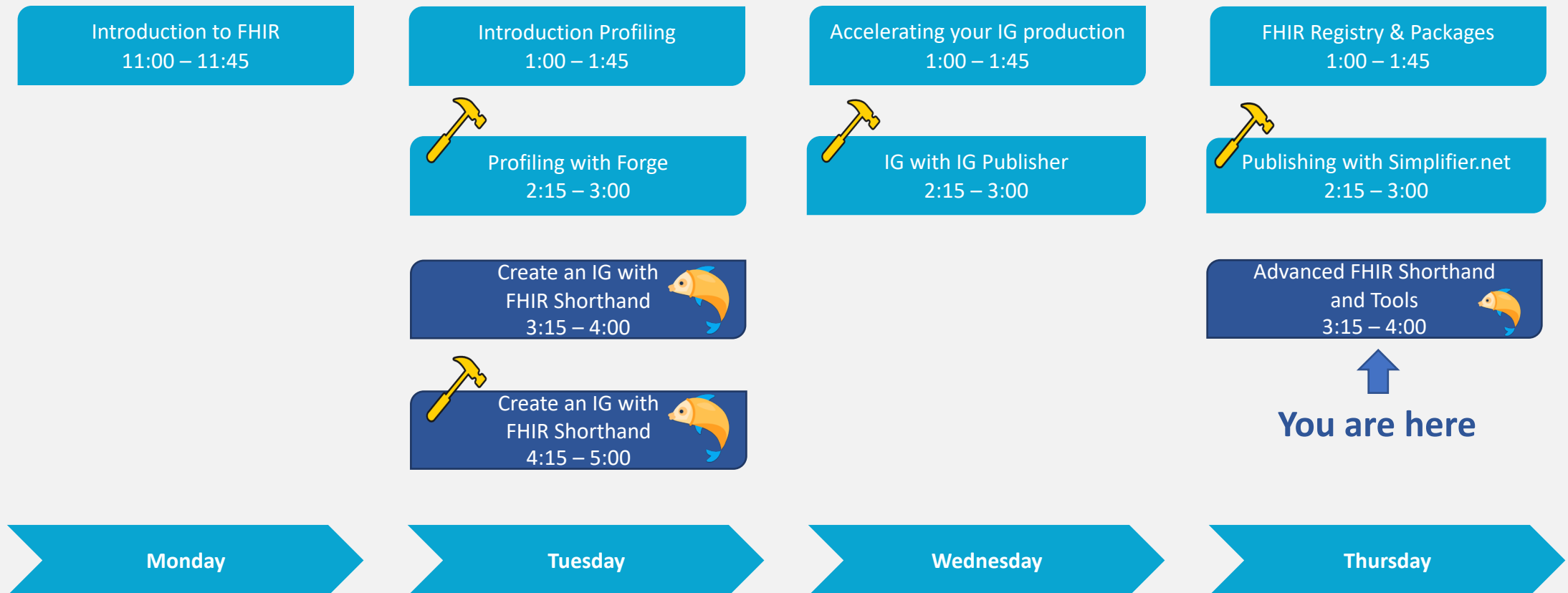
mCODE™



Clinical  
**Quality**  
Language



# Track overview: Let's Build a FHIR specification





Background



# Profiling Approaches



## Hand-Editing

## Spreadsheets

## User Interfaces

**Profile on Patient<sup>(5)</sup>: PatienNL**

Properties Narrative Element Tree Element Grid Xml

Edit the meta properties of the selected resource or component.

**URL**

**Resource ID**

**Name**

**Description**

## Command-Driven

MAKE ME A SANDWICH.

OKAY.

Profile: MyPatient  
 Parent: Patient  
 \* name 1..\* MS

## Example: COVID-19 Diagnosis Profile

```
Profile: CovidDiagnosis
Parent: Condition
Description: "How to report COVID"
* code = $icd#U07.1
* severity from CovidSeverityVS (required)
* subject only Reference(Patient)
* subject 1..1

Alias: $icd = http://hl7.org/fhir/sid/icd-10-cm
```



# What's New in FSH STU Two

*Get it? Fish stew?  
(Don't worry, he'll be fine. FSH will survive this one.)*

# Explicit Indexing

```

* item[0].linkId = "sp-101"
* item[0].text = "What is your date of birth?"
* item[0].type = #date


* item[1].linkId = "sp-102"
* item[1].text = "What is your country of birth?"
* item[1].type = #code

* item[2].linkId = "sp-103"
* item[2].text = "What country do you currently reside in?"
* item[2].type = #code

* item[3].linkId = "sp-104"
* item[3].text = "What country did you travel to?"
* item[3].type = #code

* item[4].linkId = "sp-105"
* item[4].text = "When did the travel start?"
* item[4].type = #date

* item[5].linkId = "sp-106"
* item[5].text = "When did the travel end?"
* item[5].type = #date
  
```



## Problems with explicit indexing:

- Error prone (oops, I missed one!)
- Adding/removing items in the middle requires renumbering
- Similar blocks of code are not reusable

```

* item[ ].linkId = "sp-108"
* item[ ].text = "When state do you currently reside in?"
* item[ ].type = #code
  
```



# Soft Indexing

```

* item[+].linkId = "sp-101"
* item[=].text = "What is your date of birth?"
* item[=].type = #date


* item[+].linkId = "sp-102"
* item[=].text = "What is your country of birth?"
* item[=].type = #code

* item[+].linkId = "sp-103"
* item[=].text = "What country do you currently reside in?"
* item[=].type = #code

* item[+].linkId = "sp-104"
* item[=].text = "What country did you travel to?"
* item[=].type = #code

* item[+].linkId = "sp-105"
* item[=].text = "When did the travel start?"
* item[=].type = #date

* item[+].linkId = "sp-106"
* item[=].text = "When did the travel end?"
* item[=].type = #date
  
```



## Soft indexing approach:

- [+] → next item in array
- [=] → last referenced item in the array
- Start an empty array with [+] or [0] or implicit index 0

```

* item[+].linkId = "sp-108"
* item[=].text = "When state do you currently reside in?"
* item[=].type = #code
  
```

## Advantages of soft indexing:

- No need to count (counting is hard!)
- Easily add/remove/move items
- Copy/paste and RuleSet friendly

## Parameterized RuleSets (a.k.a. Macros)

```
RuleSet: name(parameter1, parameter2, parameter3...)
* rule1
* rule2
// More rules
```

```
RuleSet: Context(path)
* ^context[+].type = #element
* ^context[=].expression = "{path}"

Extension: OrganizationPreferredContact
* insert Context(Organization.contact)
* value[x] only boolean
```



```
Extension: OrganizationPreferredContact
* ^context[+].type = #element
* ^context[=].expression = "Organization.contact"
* value[x] only boolean
```

### • Defining parameterized RuleSets

- Use the same **RuleSet** keyword as normal RuleSets
- Follow the name w/ list of parameter names in parentheses
- Wrap parameter name in curly braces to use its value in rules

### • Inserting parameterized RuleSets

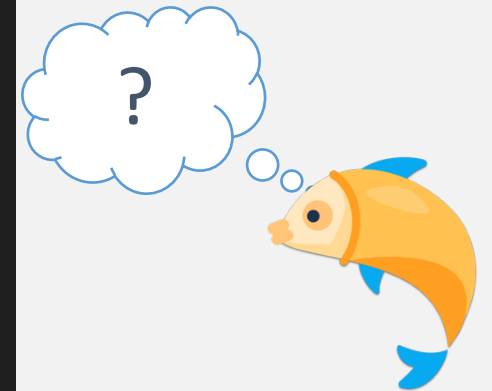
- Use the same **insert** keyword as normal insert rules
- Follow the name w/ list of parameter values in parentheses
- Parameter values are inserted as text strings (nothing fancy!)

# CapabilityStatement Example

```

// MeasureReport requirements
* rest.resource[0].type = #MeasureReport
* rest.resource[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[0].extension[0].valueCode = #SHALL
* rest.resource[0].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureReport"
* rest.resource[0].supportedProfile[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[0].supportedProfile[0].extension[0].valueCode = #SHALL
* rest.resource[0].interaction[0].code = #create
* rest.resource[0].interaction[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[0].interaction[0].extension[0].valueCode = #SHALL
* rest.resource[0].interaction[1].code = #update
* rest.resource[0].interaction[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[0].interaction[1].extension[0].valueCode = #SHALL
// Measure requirements
* rest.resource[1].type = #Measure
* rest.resource[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].extension[0].valueCode = #SHALL
* rest.resource[1].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasure"
* rest.resource[1].supportedProfile[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].supportedProfile[0].extension[0].valueCode = #SHOULD
* rest.resource[1].supportedProfile[1] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureStratifier"
* rest.resource[1].supportedProfile[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].supportedProfile[1].extension[0].valueCode = #SHOULD
* rest.resource[1].interaction[0].code = #create
* rest.resource[1].interaction[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].interaction[0].extension[0].valueCode = #SHOULD
* rest.resource[1].interaction[1].code = #update
* rest.resource[1].interaction[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].interaction[1].extension[0].valueCode = #SHOULD

```



Loosely based on <https://build.fhir.org/ig/HL7/fhir-saner/>

# CapabilityStatement Example: Soft Indexing & Aliases

```

// MeasureReport requirements
* rest.resource[0].type = #MeasureReport
* rest.resource[=].extension[0].url = $ExpExt
* rest.resource[=].extension[=].valueCode = #SHALL
* rest.resource[=].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureReport"
* rest.resource[=].supportedProfile[=].extension[0].url = $ExpExt
* rest.resource[=].supportedProfile[=].extension[=].valueCode = #SHALL
* rest.resource[=].interaction[0].code = #create
* rest.resource[=].interaction[=].extension[0].url = $ExpExt
* rest.resource[=].interaction[=].extension[=].valueCode = #SHALL
* rest.resource[=].interaction[+].code = #update
* rest.resource[=].interaction[=].extension[0].url = $ExpExt
* rest.resource[=].interaction[=].extension[=].valueCode = #SHALL
// Measure requirements
* rest.resource[+].type = #Measure
* rest.resource[=].extension[0].url = $ExpExt
* rest.resource[=].extension[=].valueCode = #SHALL
* rest.resource[=].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasure"
* rest.resource[=].supportedProfile[=].extension[0].url = $ExpExt
* rest.resource[=].supportedProfile[=].extension[=].valueCode = #SHOULD
* rest.resource[=].supportedProfile[+] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureStratifier"
* rest.resource[=].supportedProfile[=].extension[0].url = $ExpExt
* rest.resource[=].supportedProfile[=].extension[=].valueCode = #SHOULD
* rest.resource[=].interaction[0].code = #create
* rest.resource[=].interaction[=].extension[0].url = $ExpExt
* rest.resource[=].interaction[=].extension[=].valueCode = #SHOULD
* rest.resource[=].interaction[+].code = #update
* rest.resource[=].interaction[=].extension[0].url = $ExpExt
* rest.resource[=].interaction[=].extension[=].valueCode = #SHOULD

```



Loosely based on <https://build.fhir.org/ig/HL7/fhir-saner/>

# CapabilityStatement Example: Parameterized RuleSets

```
RuleSet: SupportResource (resource, expectation)
* rest.resource[+].type = {resource}
* rest.resource[=].extension[0].url = $ExpExt
* rest.resource[=].extension[0].valueCode = {expectation}

RuleSet: SupportProfile (profile, expectation)
* rest.resource[=].supportedProfile[+] = {profile}
* rest.resource[=].supportedProfile[=].extension[0].url = $ExpExt
* rest.resource[=].supportedProfile[=].extension[0].valueCode = {expectation}

RuleSet: SupportInteraction (interaction, expectation)
* rest.resource[=].interaction[+].code = {interaction}
* rest.resource[=].interaction[=].extension[0].url = $ExpExt
* rest.resource[=].interaction[=].extension[0].valueCode = {expectation}
```

```
// MeasureReport requirements
* insert SupportResource(#MeasureReport, #SHALL)
* insert SupportProfile("http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureReport", #SHALL)
* insert SupportInteraction(#create, #SHALL)
* insert SupportInteraction(#update, #SHALL)
```

Loosely based on <https://build.fhir.org/ig/HL7/fhir-saner/>

# CapabilityStatement Example: Comparing Approaches

## FSH STU1 Representation

```
Instance: TestCapabilityStatement1
InstanceOf: CapabilityStatement
Usage: #example
* status = #active
* date = "2020-12-18"
* kind = #requirements
*.fhirVersion = #4.0.1
* format[0] = #json
* rest.mode = #server

// MeasureReport requirements
* rest.resource[0].type = #MeasureReport
* rest.resource[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[0].extension[0].valueCode = #SHALL
* rest.resource[0].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureReport"
* rest.resource[0].supportedProfile[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[0].supportedProfile[0].extension[0].valueCode = #SHOULD
* rest.resource[0].interaction[0].code = #create
* rest.resource[0].interaction[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[0].interaction[0].extension[0].valueCode = #SHALL
* rest.resource[0].interaction[1].code = #update
* rest.resource[0].interaction[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[0].interaction[1].extension[0].valueCode = #SHALL

// Measure requirements
* rest.resource[1].type = #Measure
* rest.resource[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].extension[0].valueCode = #SHALL
* rest.resource[1].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasure"
* rest.resource[1].supportedProfile[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].supportedProfile[0].extension[0].valueCode = #SHOULD
* rest.resource[1].supportedProfile[1] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureStratifier"
* rest.resource[1].supportedProfile[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].supportedProfile[1].extension[0].valueCode = #SHOULD
* rest.resource[1].interaction[0].code = #create
* rest.resource[1].interaction[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].interaction[0].extension[0].valueCode = #SHOULD
* rest.resource[1].interaction[1].code = #update
* rest.resource[1].interaction[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[1].interaction[1].extension[0].valueCode = #SHOULD

// Location requirements
* rest.resource[2].type = #Location
* rest.resource[2].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[2].extension[0].valueCode = #SHALL
* rest.resource[2].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/saner-resource-location"
* rest.resource[2].supportedProfile[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[2].supportedProfile[0].extension[0].valueCode = #SHOULD
* rest.resource[2].interaction[0].code = #create
* rest.resource[2].interaction[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[2].interaction[0].extension[0].valueCode = #SHOULD
* rest.resource[2].interaction[1].code = #update
* rest.resource[2].interaction[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[2].interaction[1].extension[0].valueCode = #SHOULD

// QuestionnaireResponse requirements
* rest.resource[3].type = #QuestionnaireResponse
* rest.resource[3].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[3].extension[0].valueCode = #SHALL
* rest.resource[3].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/SanerQuestionnaireResponse"
* rest.resource[3].supportedProfile[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[3].supportedProfile[0].extension[0].valueCode = #SHALL
* rest.resource[3].interaction[0].code = #create
* rest.resource[3].interaction[0].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[3].interaction[0].extension[0].valueCode = #SHALL
* rest.resource[3].interaction[1].code = #update
* rest.resource[3].interaction[1].extension[0].url = "http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation"
* rest.resource[3].interaction[1].extension[0].valueCode = #SHALL
```

Loosely based on <https://build.fhir.org/ig/HL7/fhir-saner/>

## Soft Indices and Aliases

```
Alias: $ExpExt = http://hl7.org/fhir/StructureDefinition/capabilitystatement-expectation

Instance: TestCapabilityStatement2
InstanceOf: CapabilityStatement
Usage: #example
* status = #active
* date = "2020-12-18"
* kind = #requirements
*.fhirVersion = #4.0.1
* format[0] = #json
* rest.mode = #server

// MeasureReport requirements
* rest.resource[0].type = #MeasureReport
* rest.resource[0].extension[0].url = $ExpExt
* rest.resource[0].extension[0].valueCode = #SHALL
* rest.resource[0].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureReport"
* rest.resource[0].supportedProfile[0].extension[0].url = $ExpExt
* rest.resource[0].supportedProfile[0].extension[0].valueCode = #SHALL
* rest.resource[0].interaction[0].code = #create
* rest.resource[0].interaction[0].extension[0].url = $ExpExt
* rest.resource[0].interaction[0].extension[0].valueCode = #SHALL
* rest.resource[0].interaction[1].code = #update
* rest.resource[0].interaction[1].extension[0].url = $ExpExt
* rest.resource[0].interaction[1].extension[0].valueCode = #SHALL

// Measure requirements
* rest.resource[1].type = #Measure
* rest.resource[1].extension[0].url = $ExpExt
* rest.resource[1].extension[0].valueCode = #SHALL
* rest.resource[1].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasure"
* rest.resource[1].supportedProfile[0].extension[0].url = $ExpExt
* rest.resource[1].supportedProfile[0].extension[0].valueCode = #SHOULD
* rest.resource[1].supportedProfile[1] = "http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureStratifier"
* rest.resource[1].supportedProfile[1].extension[0].url = $ExpExt
* rest.resource[1].supportedProfile[1].extension[0].valueCode = #SHOULD
* rest.resource[1].interaction[0].code = #create
* rest.resource[1].interaction[0].extension[0].url = $ExpExt
* rest.resource[1].interaction[0].extension[0].valueCode = #SHOULD
* rest.resource[1].interaction[1].code = #update
* rest.resource[1].interaction[1].extension[0].url = $ExpExt
* rest.resource[1].interaction[1].extension[0].valueCode = #SHOULD

// Location requirements
* rest.resource[2].type = #Location
* rest.resource[2].extension[0].url = $ExpExt
* rest.resource[2].extension[0].valueCode = #SHALL
* rest.resource[2].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/saner-resource-location"
* rest.resource[2].supportedProfile[0].extension[0].url = $ExpExt
* rest.resource[2].supportedProfile[0].extension[0].valueCode = #SHOULD
* rest.resource[2].interaction[0].code = #create
* rest.resource[2].interaction[0].extension[0].url = $ExpExt
* rest.resource[2].interaction[0].extension[0].valueCode = #SHOULD
* rest.resource[2].interaction[1].code = #update
* rest.resource[2].interaction[1].extension[0].url = $ExpExt
* rest.resource[2].interaction[1].extension[0].valueCode = #SHOULD

// QuestionnaireResponse requirements
* rest.resource[3].type = #QuestionnaireResponse
* rest.resource[3].extension[0].url = $ExpExt
* rest.resource[3].extension[0].valueCode = #SHALL
* rest.resource[3].supportedProfile[0] = "http://hl7.org/fhir/us/saner/StructureDefinition/SanerQuestionnaireResponse"
* rest.resource[3].supportedProfile[0].extension[0].url = $ExpExt
* rest.resource[3].supportedProfile[0].extension[0].valueCode = #SHALL
* rest.resource[3].interaction[0].code = #create
* rest.resource[3].interaction[0].extension[0].url = $ExpExt
* rest.resource[3].interaction[0].extension[0].valueCode = #SHALL
* rest.resource[3].interaction[1].code = #update
* rest.resource[3].interaction[1].extension[0].url = $ExpExt
* rest.resource[3].interaction[1].extension[0].valueCode = #SHALL
```

## Parameterized RuleSets

```
Instance: TestCapabilityStatement3
InstanceOf: CapabilityStatement
* status = #active
* date = "2020-12-18"
* kind = #requirements
*.fhirVersion = #4.0.1
* format[0] = #json
* rest.mode = #server

// MeasureReport requirements
* insert SupportResource(#MeasureReport, #SHALL)
* insert SupportProfile("http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureReport", #SHALL)
* insert SupportInteraction(#create, #SHALL)
* insert SupportInteraction(#update, #SHALL)

// Measure requirements
* insert SupportResource(#Measure, #SHALL)
* insert SupportProfile("http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasure", #SHOULD)
* insert SupportProfile("http://hl7.org/fhir/us/saner/StructureDefinition/PublicHealthMeasureStratifier", #SHOULD)
* insert SupportInteraction(#create, #SHOULD)
* insert SupportInteraction(#update, #SHOULD)

// Location requirements
* insert SupportResource(#Location, #SHALL)
* insert SupportProfile("http://hl7.org/fhir/us/saner/StructureDefinition/saner-resource-location", #SHOULD)
* insert SupportInteraction(#create, #SHOULD)
* insert SupportInteraction(#update, #SHOULD)

// QuestionnaireResponse requirements
* insert SupportResource(#QuestionnaireResponse, #SHALL)
* insert SupportProfile("http://hl7.org/fhir/us/saner/StructureDefinition/SanerQuestionnaireResponse", #SHALL)
* insert SupportInteraction(#create, #SHALL)
* insert SupportInteraction(#update, #SHALL)
```



- Compact
- Consistent
- Easier to read
- Easier to write
- Fewer mistakes

# Logical Models and Resources: Custom Content Structures

	Logical Models	Resources
<b>Primary Use Case</b>	Domain Analysis Models	Electronic Data Exchange
<b>Recommended for</b>	IG Authors	HL7 Work Groups
<b>FHIR-conformant?</b>	Yes	HL7 Resources Only
<b>Supported by IG Publisher?</b>	Yes	No
<b>Allowed Parents</b>	Logical Models, Complex Types	DomainResource, Resource
<b>Default Parent (FSH)</b>	Base (R5, backported to R4)	DomainResource

## FSH Rules for Logical Models and Resources

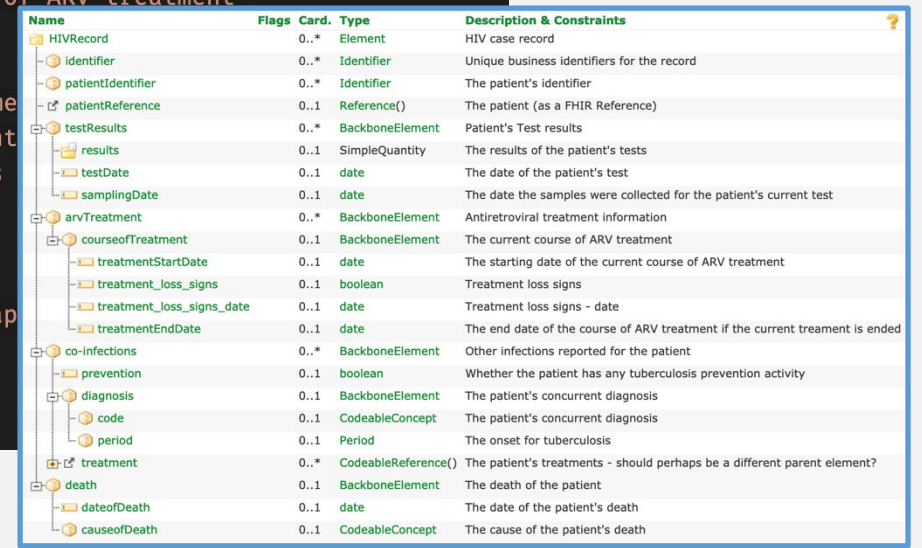
- New Rule: AddElement Rule
- Familiar Rules: Binding, Cardinality, Flag, Insert, Obeys, and Type
  - Disallowed: Assignment and Contains (see [Interpretation of ElementDefinition in different contexts](#))
- Logical models and resources cannot constrain elements inherited from their parent

# Logical Models: HIVRecord Example

```

Logical: HIVRecord
Id: HIVRecord
Parent: Element
Title: "HIV Longitudinal Record Logical Model"
Description: "This is the logical model for the shared record for an HIV patient."
* identifier 0..* Identifier "Unique business identifiers for the record"
* patientIdentifier 0..* Identifier "The patient's identifier"
* patientReference 0..1 Reference "The patient (as a FHIR Reference)"
* testResults 0..* BackboneElement "Patient's Test results"
  * results 0..1 SimpleQuantity "The results of the patient's tests"
  * testDate 0..1 date "The date of the patient's test"
  * samplingDate 0..1 date "The date the samples were collected for the patient's current test"
* arvTreatment 0..* BackboneElement "Antiretroviral treatment information"
  * courseOfTreatment 0..1 BackboneElement "The current course of ARV treatment"
    * treatmentStartDate 0..1 date "The starting date of the current course of ARV treatment"
    * treatment_loss_signs 0..1 boolean "Treatment loss signs"
    * treatment_loss_signs_date 0..1 date "Treatment loss signs - date"
    * treatmentEndDate 0..1 date "The end date of the course of ARV treatment if the current treatment is ended"
  * co-infections 0..* BackboneElement "Other infections reported for the patient"
  * prevention 0..1 boolean "Whether the patient has any tuberculosis prevention activity"
  * diagnosis 0..1 BackboneElement "The patient's concurrent diagnosis"
    * code 0..1 CodeableConcept "The patient's concurrent diagnosis"
    * period 0..1 Period "The onset for tuberculosis"
  * treatment 0..* CodeableReference "The patient's treatments - should perhaps be a different parent element?"
* death 0..1 BackboneElement "The death of the patient"
  * dateofDeath 0..1 date "The date of the patient's death"
  * causeofDeath 0..1 CodeableConcept "The cause of the patient's death"
  
```

Yes, this does compile!



Adapted from: <http://build.fhir.org/ig/openhie/hiv-ig/branches/master/StructureDefinition-model-hiv-record.html>



# Logical Models and Resources: AddElement Rule




```
* <element> {min}..{max} {flags} {datatype} "{short}" "{definition}"
```

```
* email 0..* string "The person's email addresses"
```

```
* preferredName[x] 0..1 SU string or HumanName "The person's preferred name" ""
  Sometimes patients prefer to be called by a name other than their _formal_ name. This may be:
  * their nick name
  * their maiden name
  * etc.
  ""
```

```
* serviceAnimal 0..* BackboneElement "Service animals" "Animals trained to assist the person by performing certain tasks."
* serviceAnimal.name 0..1 string "Name of service animal" "The name by which the service animal responds."
* serviceAnimal.breed 1..* CodeableConcept "Breed of service animal" "The dominant breed or breeds of the service animal."
* serviceAnimal.startDate 0..1 date "Date the service animal began work" "When the service animal began working for the person."
```

Looks familiar, right? Well... almost. *Can you spot the difference?*

Name	Flags	Card.	Type	Description & Constraints
 Patient	<b>N</b>		DomainResource	Information about an individual or animal receiving health care services Elements defined in Ancestors: <code>id</code> , <code>meta</code> , <code>implicitRules</code> , <code>language</code> , <code>text</code> , <code>contained</code> , <code>extension</code> , <code>modifierExtension</code>
 identifier	Σ	0..*	Identifier	An identifier for this patient
 active	?! Σ	0..1	boolean	Whether this patient's record is in active use

# FSH STU1 Path Syntax: The ~~Problem~~ Annoyance

Nested elements require redundant paths and result in high text density

```

Logical: HIVRecord
Id: HIVRecord
Parent: Element
Title: "HIV Longitudinal Record Logical Model"
Description: "This is the logical model for the shared record for an HIV patient."
* identifier 0..* Identifier "Unique business identifiers for the record"
* patientIdentifier 0..* Identifier "The patient's identifier"
* patientReference 0..1 Reference "The patient (as a FHIR Reference)"
* testResults 0..* BackboneElement "Patient's Test results"
* testResults.results 0..1 SimpleQuantity "The results of the patient's tests"
* testResults.testDate 0..1 date "The date of the patient's test"
* testResults.samplingDate 0..1 date "The date the samples were collected for the patient's current test"
* arvTreatment 0..* BackboneElement "Antiretroviral treatment information"
* arvTreatment.courseOfTreatment 0..1 BackboneElement "The current course of ARV treatment"
* arvTreatment.courseOfTreatment.treatmentStartDate 0..1 date "The starting date of the current course of ARV treatment"
* arvTreatment.courseOfTreatment.treatment_loss_signs 0..1 boolean "Treatment loss signs"
* arvTreatment.courseOfTreatment.treatment_loss_signs_date 0..1 date "Treatment loss signs - date"
* arvTreatment.courseOfTreatment.treatmentEndDate 0..1 date "The end date of the course of ARV treatment if the current treatment ended"
* co-infections 0..* BackboneElement "Other infections reported for the patient"
* co-infections.prevention 0..1 boolean "Whether the patient has any tuberculosis prevention activity"
* co-infections.diagnosis 0..1 BackboneElement "The patient's concurrent diagnosis"
* co-infections.diagnosis.code 0..1 CodeableConcept "The patient's concurrent diagnosis"
* co-infections.diagnosis.period 0..1 Period "The onset for tuberculosis"
* co-infections.treatment 0..* CodeableReference "The patient's treatments - should perhaps be a different parent element?"
* death 0..1 BackboneElement "The death of the patient"
* death.dateofDeath 0..1 date "The date of the patient's death"
* death.causeofDeath 0..1 CodeableConcept "The cause of the patient's death"
  
```



Adapted from: <http://build.fhir.org/ig/openhie/hiv-ig/branches/master/StructureDefinition-model-hiv-record.html>

# Indent Rules: A Sensible Way to Represent Path Structure

Indent two spaces to prepend the previous less-indented rule's path

```

Logical: HIVRecord
Id: HIVRecord
Parent: Element
Title: "HIV Longitudinal Record Logical Model"
Description: "This is the logical model for the shared record for an HIV patient."
* identifier 0..* Identifier "Unique business identifiers for the record"
* patientIdentifier 0..* Identifier "The patient's identifier"
* patientReference 0..1 Reference "The patient (as a FHIR Reference)"
* testResults 0..* BackboneElement "Patient's Test results"
  * results 0..1 SimpleQuantity "The results of the patient's tests"
  * testDate 0..1 date "The date of the patient's test"
  * samplingDate 0..1 date "The date the samples were collected for the patient's current test"
* arvTreatment 0..* BackboneElement "Antiretroviral treatment information"
  * courseOfTreatment 0..1 BackboneElement "The current course of ARV treatment"
    * treatmentStartDate 0..1 date "The starting date of the current course of ARV treatment"
    * treatment_loss_signs 0..1 boolean "Treatment loss signs"
    * treatment_loss_signs_date 0..1 date "Treatment loss signs - date"
    * treatmentEndDate 0..1 date "The end date of the course of ARV treatment if the current treatment ended"
* co-infections 0..* BackboneElement "Other infections reported for the patient"
  * prevention 0..1 boolean "Whether the patient has any tuberculosis prevention activity"
  * diagnosis 0..1 BackboneElement "The patient's concurrent diagnosis"
    * code 0..1 CodeableConcept "The patient's concurrent diagnosis"
    * period 0..1 Period "The onset for tuberculosis"
  * treatment 0..* CodeableReference "The patient's treatments - should perhaps be a different parent element?"
* death 0..1 BackboneElement "The death of the patient"
  * dateofDeath 0..1 date "The date of the patient's death"
  * causeofDeath 0..1 CodeableConcept "The cause of the patient's death"
  
```

## Indent rules work in:

- Profiles
- Extensions
- Logical Models
- Resources
- Mappings
- Instances
- Code Systems (*stay tuned*)

## With:

- Path-based rules
- New “path rule”
- Concept rules (*stay tuned*)

Adapted from: <http://build.fhir.org/ig/openhie/hiv-ig/branches/master/StructureDefinition-model-hiv-record.html>

# Example Custom Resource and Instance: EmergencyVehicle

```

Resource:      EmergencyVehicle
Title:         "Emergency Vehicle"
Description:   "An emergency vehicle, such as an ambulance or fire truck."
* identifier 0..* SU Identifier
  "Identifier(s) of the vehicle"
  "Vehicle identifiers may include VINs and serial numbers."
* make 0..1 SU Coding
  "The vehicle make"
  "The vehicle make, e.g., Chevrolet."
* make from EmergencyVehicleMake (extensible)
* model 0..1 SU Coding
  "The vehicle model"
  "The vehicle model, e.g., G4500."
* model from EmergencyVehicleModel (extensible)
* year 0..1 SU positiveInt
  "Year of manufacture"
  "The year the vehicle was manufactured"
* servicePeriod 0..1 Period
  "When the vehicle was in service"
  "Start date and end date (if applicable) when the vehicle operated."
* operator 0..* Reference(Organization or Practitioner or PractitionerRole)
  "The operator"
  "The organization or persons responsible for operating the vehicle"
* device 0..* Reference(Device)
  "Devices on board"
  "Devices on board the vehicle."
  
```

```

{
  "resourceType": "EmergencyVehicle",
  "id": "Vehicle258",
  "identifier": [{
    "value": "258",
    "system": "http://acme.org/vehicle/identifiers"
  }],
  "make": {
    "code": "Chevrolet",
    "system": "http://devdays.com/fsh/CodeSystem/EVMake"
  },
  "model": {
    "code": "G4500",
    "system": "http://devdays.com/fsh/CodeSystem/EVModel"
  },
  "year": 2018,
  "servicePeriod": {
    "start": "2018-08-12"
  },
  "operator": [{
    "reference": "Organization/82793"
  }],
  "device": [
    { "reference": "Device/89042537" },
    { "reference": "Device/23490853" },
    { "reference": "Device/58972589" }
  ]
}
  
```

# Defining Code Systems in STU1

Defining URL:	urn:oid:2.16.840.1.113883.6.238
Version:	3.1.1
Name:	RaceAndEthnicityCDC
Title:	Race & Ethnicity - CDC
Status:	Active
Content:	All the concepts defined by the code system are included in the code system resource
Definition:	The U.S. Centers for Disease Control and Prevention (CDC) has prepared a code set for use in coding race and ethnicity data. This code set is based on current federal standards for classifying data on race and ethnicity, specifically the minimum race and ethnicity categories defined by the U.S. Office of Management and Budget (OMB) and a more detailed set of race and ethnicity categories maintained by the U.S. Bureau of the Census (BC). The main purpose of the code set is to facilitate use of federal standards for classifying data on race and ethnicity when these data are exchanged, stored, retrieved, or analyzed in electronic form. At the same time, the code set can be applied to paper-based record systems to the extent that these systems are used to collect, maintain, and report data on race and ethnicity in accordance with current federal standards. Source: <a href="#">Race and Ethnicity Code Set Version 1.0</a> .
Publisher:	HL7 US Realm Steering Committee
Content Mode:	Complete
Source Resource:	<a href="#">XML / JSON / Turtle</a>

## Properties

Code	URL	Description	Type
abstract		True if an element is considered 'abstract' - in other words, the code is not for use as a real concept	boolean

This code system urn:oid:2.16.840.1.113883.6.238 defines the following codes:

Lvl	Code	Display	Definition
1	1000-9	Race	Race, Note that this is an abstract 'grouping' concept and not for use as a real concept
2	1002-5	American Indian or Alaska Native	American Indian or Alaska Native
3	1004-1	American Indian	American Indian
3	1735-0	Alaska Native	Alaska Native
3	1006-6	Abenaki	Abenaki
3	1008-2	Algonquian	Algonquian
3	1010-8	Apache	Apache
3	1021-5	Arapaho	Arapaho
3	1026-4	Arikara	Arikara
3	1028-0	Assiniboine	Assiniboine

<http://www.hl7.org/fhir/us/core/CodeSystem-cdcrec.html>

Code systems with hierarchical codes and/or code-specific metadata (property, designation) must be defined as FSH Instances

Top-level metadata  
SUPPORTED

Property definition  
SUPPORTED

Property use  
NOT SUPPORTED

Hierarchical codes  
NOT SUPPORTED

```
Instance: cdcrec
InstanceOf: CodeSystem
Usage: #definition
* url = "urn:oid:2.16.840.1.113883.6.238"
* version = "3.1.1"
* name = "RaceAndEthnicityCDC"
* title = "Race & Ethnicity - CDC"
* status = #active
* publisher = "HL7 US Realm Steering Committee"
* description = "The U.S. Centers for Disease Control and Prevention (CDC) has prepared a code set for use in coding race and ethnicity data. This code set is based on current federal standards for classifying data on race and ethnicity, specifically the minimum race and ethnicity categories defined by the U.S. Office of Management and Budget (OMB) and a more detailed set of race and ethnicity categories maintained by the U.S. Bureau of the Census (BC). The main purpose of the code set is to facilitate use of federal standards for classifying data on race and ethnicity when these data are exchanged, stored, retrieved, or analyzed in electronic form. At the same time, the code set can be applied to paper-based record systems to the extent that these systems are used to collect, maintain, and report data on race and ethnicity in accordance with current federal standards. Source: Race and Ethnicity Code Set Version 1.0."
* hierarchyMeaning = #is-a
* content = #complete
* property.code = #abstract
* property.description = "True if an element is considered 'abstract' - in other words, the code is not for use as a real concept"
* property.type = #boolean
* concept[0].code = #1000-9
* concept[=].display = "Race"
* concept[=].definition = "Race, Note that this is an abstract 'grouping' concept and not for use as a real concept"
* concept[=].property.code = #abstract
* concept[=].property.valueBoolean = true
* concept[=].concept[0].code = #1002-5
* concept[=].concept[=].display = "American Indian or Alaska Native"
* concept[=].concept[=].definition = "American Indian or Alaska Native"
* concept[=].concept[=].concept[0].code = #1004-1
* concept[=].concept[=].concept[=].display = "American Indian"
* concept[=].concept[=].concept[=].definition = "American Indian"
* concept[=].concept[=].concept[+].code = #1735-0
* concept[=].concept[=].concept[=].display = "Alaska Native"
* concept[=].concept[=].concept[=].definition = "Alaska Native"
* concept[=].concept[=].concept[+].code = #1006-6
* concept[=].concept[=].concept[=].display = "Abenaki"
* concept[=].concept[=].concept[=].definition = "Abenaki"
* concept[=].concept[=].concept[+].code = #1008-2
* concept[=].concept[=].concept[=].display = "Algonquian"
* concept[=].concept[=].concept[=].definition = "Algonquian"
* concept[=].concept[=].concept[+].code = #1010-8
* concept[=].concept[=].concept[=].display = "Apache"
* concept[=].concept[=].concept[=].definition = "Apache"
* concept[=].concept[=].concept[+].code = #1021-5
* concept[=].concept[=].concept[=].display = "Arapaho"
* concept[=].concept[=].concept[=].definition = "Arapaho"
* concept[=].concept[=].concept[+].code = #1026-4
* concept[=].concept[=].concept[=].display = "Arikara"
* concept[=].concept[=].concept[=].definition = "Arikara"
* concept[=].concept[=].concept[+].code = #1028-0
* concept[=].concept[=].concept[=].display = "Assiniboine"
* concept[=].concept[=].concept[=].definition = "Assiniboine"
```

# Defining Code Systems in FSH STU2

## Top-level metadata

SUPPORTED

## Property Definition

SUPPORTED

## Property Use

SUPPORTED

## Hierarchical codes

SUPPORTED

## Concept caret rule

## Concept hierarchy

```

CodeSystem: RaceAndEthnicityCDC
Id: cdcrec
Title: "Race & Ethnicity - CDC"
* ^hierarchyMeaning = #is-a
* ^property[0].code = #abstract
* ^property[=].type = #boolean
* ^property[=].description = "True if an element is considered 'abstract' - in other words, the code is not for use..."
* #1000-9 "Race" "Race, Note that this is an abstract 'grouping' concept and not for use as a real..."
* #1000-9 ^property.code = #abstract
* #1000-9 ^property.valueBoolean = true
* #1000-9 #1002-5 "American Indian or Alaska Native" "American Indian or Alaska Native"
* #1000-9 #1002-5 #1004-1 "American Indian" "American Indian"
* #1000-9 #1002-5 #1735-0 "Alaska Native" "Alaska Native"
// ...
* #1000-9 #2028-9 "Asian" "Asian"
* #1000-9 #2028-9 #2029-7 "Asian Indian" "Asian Indian"
* #1000-9 #2028-9 #2030-5 "Bangladeshi" "Bangladeshi"
// ...
* #1000-9 #2131-1 "Other Race" "Note that this term remains in the table for completeness, even though..."
* #2133-7 "Ethnicity" "Ethnicity Note that this is an abstract 'grouping' concept and not for use as a real..."
* #2133-7 ^property.code = #abstract
* #2133-7 ^property.valueBoolean = true
* #2133-7 #2135-2 "Hispanic or Latino" "Hispanic or Latino"
* #2133-7 #2135-2 #2137-8 "Spaniard" "Spaniard"
* #2133-7 #2135-2 #2148-5 "Mexican" "Mexican"
// ...
* #2133-7 #2186-5 "Not Hispanic or Latino" "Note that this term remains in the table for completeness, even though..."
  
```

Adapted from <http://www.hl7.org/fhir/us/core/CodeSystem-cdcrec.html>

# Defining Code Systems in FSH STU2: Indent Paths

## Top-level metadata

SUPPORTED

## Property Definition

SUPPORTED

## Property Use

SUPPORTED

## Hierarchical codes

SUPPORTED

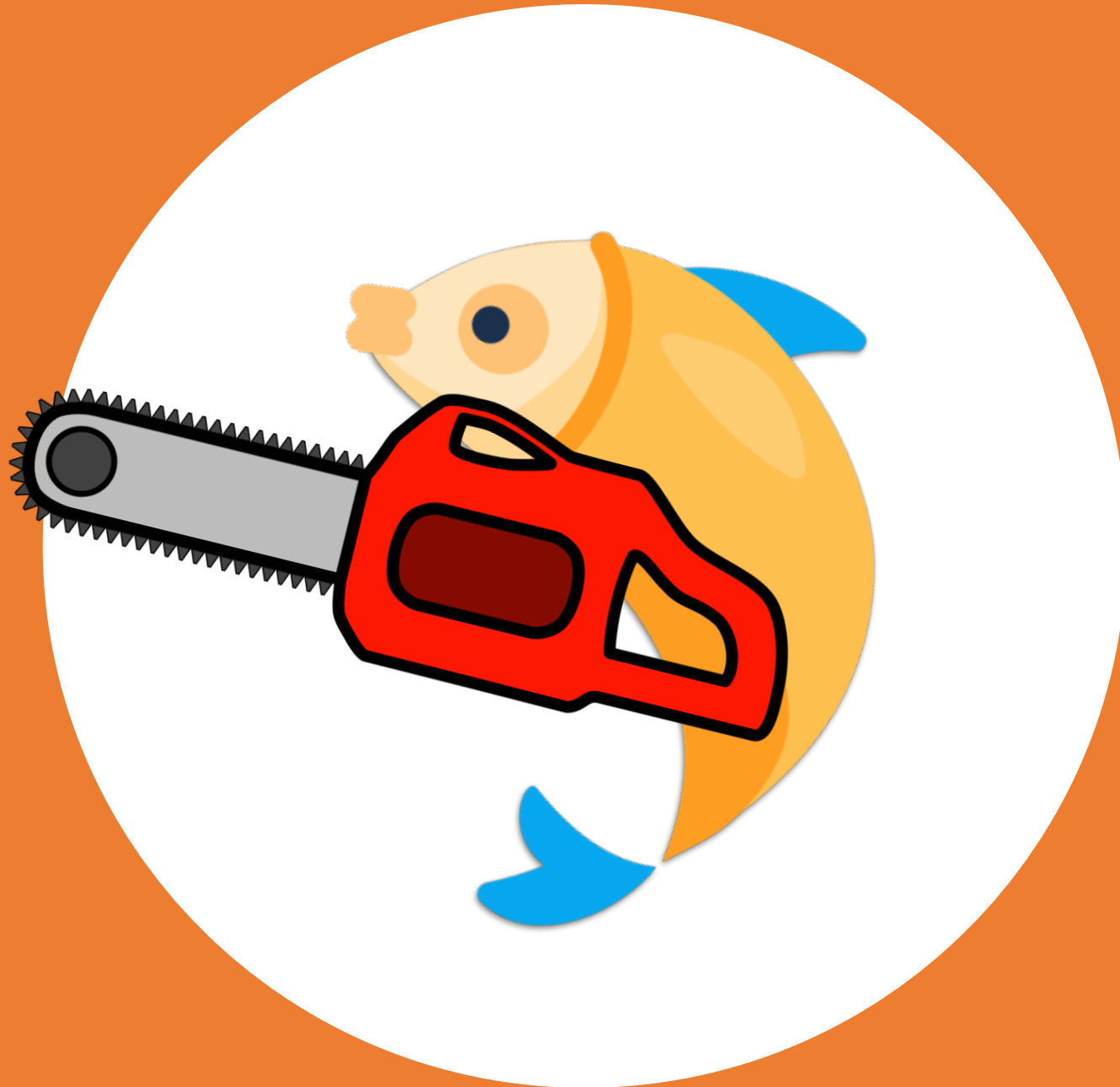
## Concept caret rule

## 3<sup>rd</sup> level code

```

CodeSystem: RaceAndEthnicityCDC
Id: cdcrec
Title: "Race & Ethnicity - CDC"
* ^hierarchyMeaning = #is-a
* ^property[0].code = #abstract
* ^property[=].type = #boolean
* ^property[=].description = "True if an element is considered 'abstract' - in other words, the code is not for use..."
* #1000-9 "Race" "Race, Note that this is an abstract 'grouping' concept and not for use as a real..."
  * ^property.code = #abstract
  * ^property.valueBoolean = true
  * #1002-5 "American Indian or Alaska Native" "American Indian or Alaska Native"
    * #1004-1 "American Indian" "American Indian"
    * #1735-0 "Alaska Native" "Alaska Native"
    // ...
  * #2028-9 "Asian" "Asian"
    * #2029-7 "Asian Indian" "Asian Indian"
    * #2030-5 "Bangladeshi" "Bangladeshi"
    // ...
  * #2131-1 "Other Race" "Note that this term remains in the table for completeness, even though..."
  * #2133-7 "Ethnicity" "Ethnicity Note that this is an abstract 'grouping' concept and not for use as a real..."
    * ^property.code = #abstract
    * ^property.valueBoolean = true
    * #2135-2 "Hispanic or Latino" "Hispanic or Latino"
      * #2137-8 "Spaniard" "Spaniard"
      * #2148-5 "Mexican" "Mexican"
      // ...
    * #2186-5 "Not Hispanic or Latino" "Note that this term remains in the table for completeness, even though..."
  
```

Adapted from <http://www.hl7.org/fhir/us/core/CodeSystem-cdcrec.html>



# FSH Tools



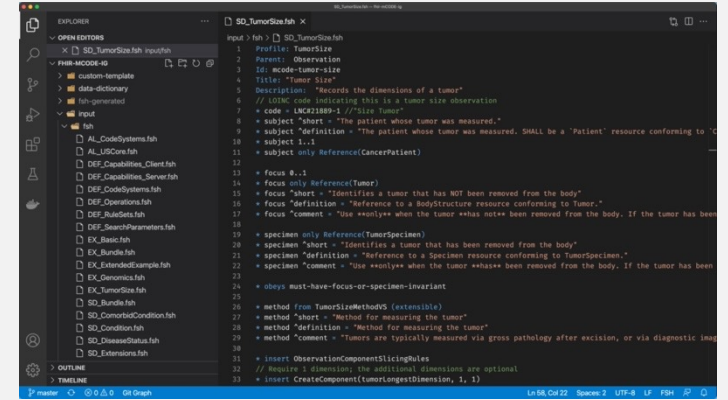




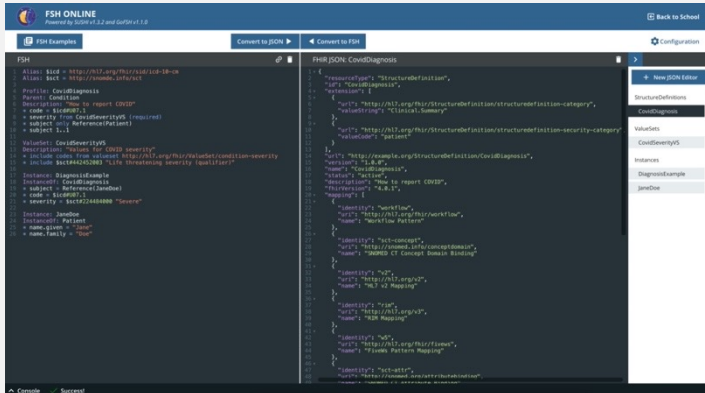
SUSHI



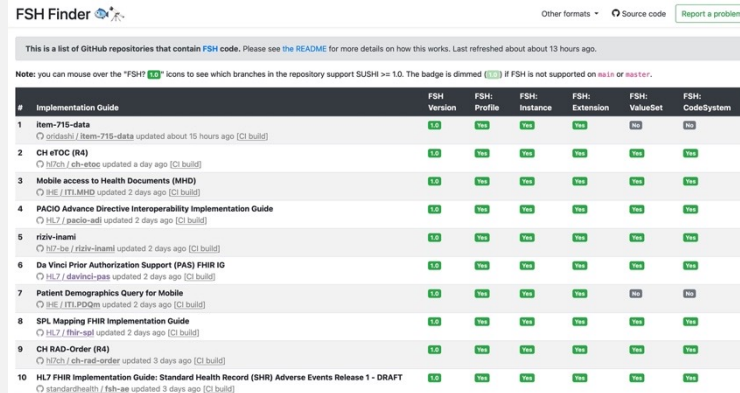
GoFSH



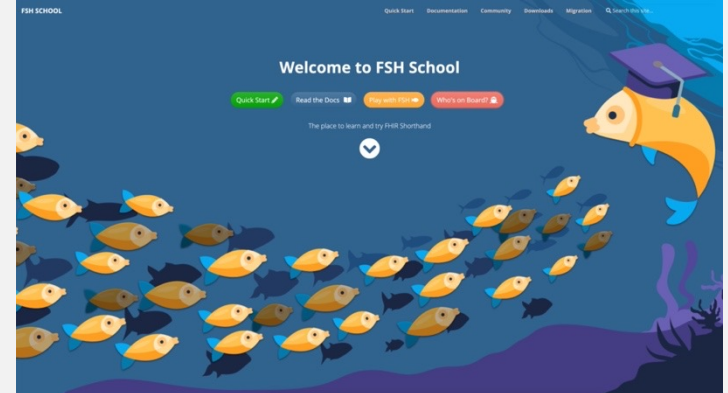
VS Code Extension



FSH Online



FSH Finder

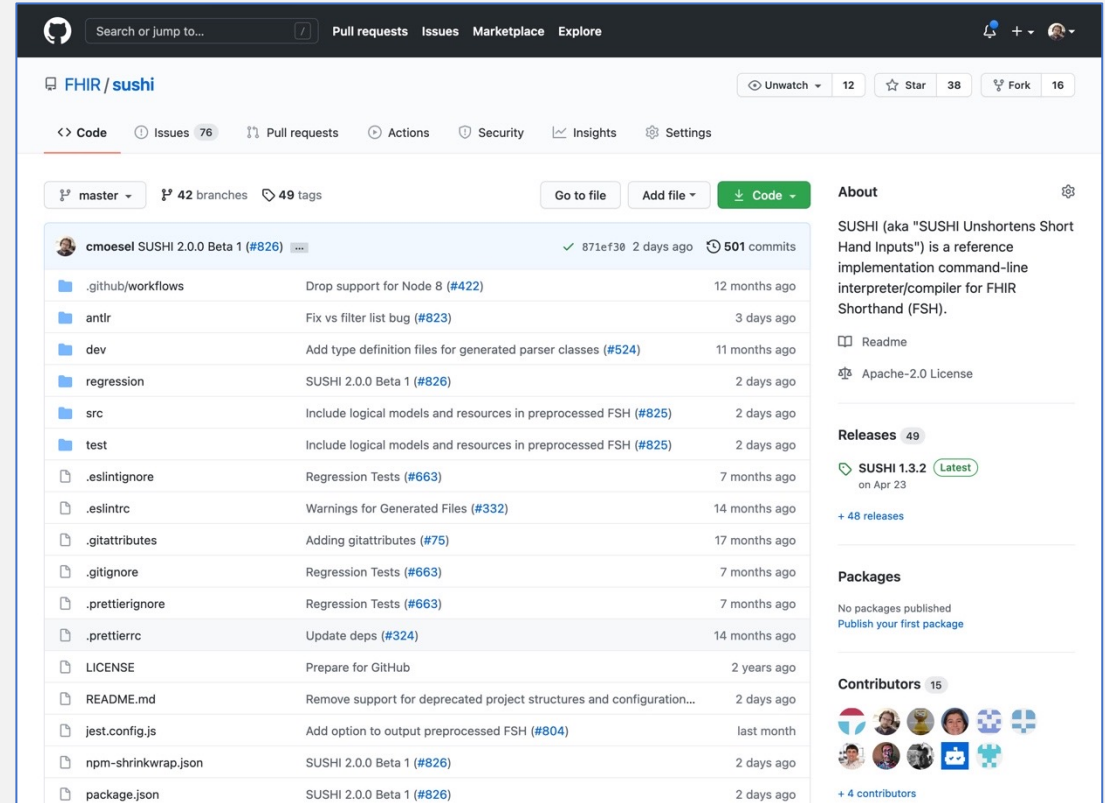


FSH School

# SUSHI: SUSHI Unshortens Shorthand Inputs

## New! SUSHI 2.0.0-beta.1

- Logical Models & Resources
- Indent Paths
- Concept Hierarchy & Caret Rules
- Preprocessed FSH Output
- *Breaking Changes*
  - Space before \* is now meaningful
  - Deprecated syntax not supported
  - Legacy project format not supported



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cmoesel SUSHI 2.0.0 Beta 1 (#826) 871ef30 2 days ago 501 commits

.github/workflows	Drop support for Node 8 (#422)	12 months ago
antr	Fix vs filter list bug (#823)	3 days ago
dev	Add type definition files for generated parser classes (#524)	11 months ago
regression	SUSHI 2.0.0 Beta 1 (#826)	2 days ago
src	Include logical models and resources in preprocessed FSH (#825)	2 days ago
test	Include logical models and resources in preprocessed FSH (#825)	2 days ago
.eslintignore	Regression Tests (#663)	7 months ago
.eslintrc	Warnings for Generated Files (#332)	14 months ago
.gitattributes	Adding gitattributes (#75)	17 months ago
.gitignore	Regression Tests (#663)	7 months ago
.prettierrc	Regression Tests (#663)	7 months ago
.prettierrc	Update deps (#324)	14 months ago
LICENSE	Prepare for GitHub	2 years ago
README.md	Remove support for deprecated project structures and configuration...	2 days ago
jest.config.js	Add option to output preprocessed FSH (#804)	last month
npm-shrinkwrap.json	SUSHI 2.0.0 Beta 1 (#826)	2 days ago
package.json	SUSHI 2.0.0 Beta 1 (#826)	2 days ago

About SUSHI (aka "SUSHI Unshortens Short Hand Inputs") is a reference implementation command-line interpreter/compiler for FHIR Shorthand (FSH).

Readme Apache-2.0 License

Releases 49 SUSHI 1.3.2 Latest on Apr 23 + 48 releases

Packages No packages published Publish your first package

Contributors 15 + 4 contributors

<https://github.com/FHIR/sushi>

Install SUSHI Beta: `npm install -g fsh-sushi@2.0.0-beta.1`

# SUSHI 2.0.0: Preprocessed FSH Output

```
sushi -p myproject
```

## FSH in /input/fsh

```
Alias: CAT = http://hl7.org/fhir/ValueSet/observation-category

Profile: ObservationProfile
Parent: Observation
* insert Metadata
* category from CAT (required)

RuleSet: Metadata
* ^version = "1.2.3"
* ^publisher = "Example publisher"

Instance: PatientInstance
InstanceOf: Patient
* name
  * given[+] = "John"
  * given[+] = "Q"
  * family = "Patient"
```

## Preprocessed FSH in /\_preprocessed

```
Alias: CAT = http://hl7.org/fhir/ValueSet/observation-category

// Originally defined on lines 3 - 6
Profile: ObservationProfile
Parent: Observation
Id: ObservationProfile
* ^version = "1.2.3"
* ^publisher = "Example publisher"
* category from http://hl7.org/fhir/ValueSet/observation-category (required)

// Originally defined on lines 12 - 17
Instance: PatientInstance
InstanceOf: Patient
Usage: #example
* name.given[0] = "John"
* name.given[1] = "Q"
* name.family = "Patient"
```

Resolved alias

Inserted RuleSet

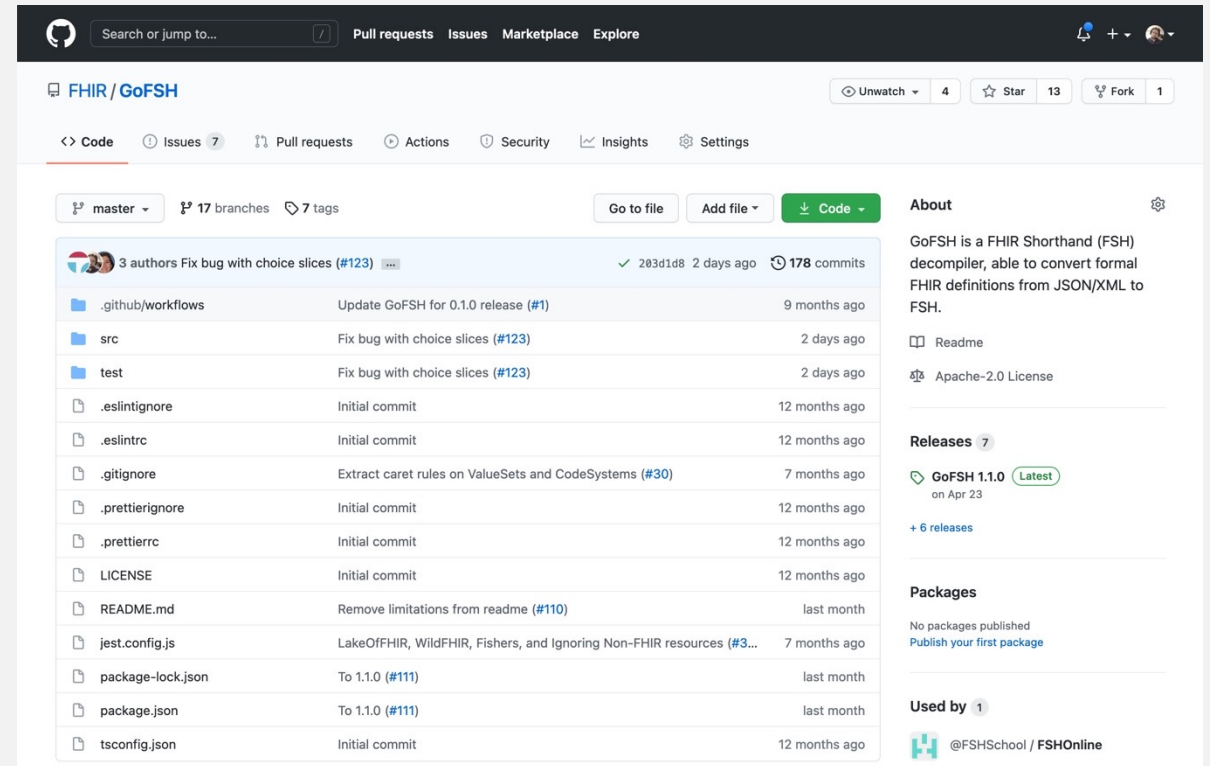
Expanded paths

Explicit indices

# GoFSH: Converts FHIR JSON/XML to FSH

## GoFSH 1.x (Current Release)

- Command line interface
- Converts FHIR JSON/XML to FSH
- Multiple output formats
- Supports FSH STU1, plus
  - Soft Indexing
- Development *in progress* for:
  - Logical Models & Resources
  - Hierarchical CodeSystems
  - Concept Caret Rules
  - Indent Paths



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master 17 branches 7 tags Go to file Add file Code

3 authors Fix bug with choice slices (#123) 203d1d8 2 days ago 178 commits

.github/workflows	Update GoFSH for 0.1.0 release (#1)	9 months ago
src	Fix bug with choice slices (#123)	2 days ago
test	Fix bug with choice slices (#123)	2 days ago
.eslintignore	Initial commit	12 months ago
.eslintrc	Initial commit	12 months ago
.gitignore	Extract caret rules on ValueSets and CodeSystems (#30)	7 months ago
.prettierignore	Initial commit	12 months ago
.prettierrc	Initial commit	12 months ago
LICENSE	Initial commit	12 months ago
README.md	Remove limitations from readme (#110)	last month
jest.config.js	LakeOfFHIR, WildFHIR, Fishers, and Ignoring Non-FHIR resources (#3...	7 months ago
package-lock.json	To 1.1.0 (#111)	last month
package.json	To 1.1.0 (#111)	last month
tsconfig.json	Initial commit	12 months ago

**About**

GoFSH is a FHIR Shorthand (FSH) decompiler, able to convert formal FHIR definitions from JSON/XML to FSH.

Readme Apache-2.0 License

**Releases** 7

GoFSH 1.1.0 Latest on Apr 23 + 6 releases

**Packages**

No packages published Publish your first package

**Used by** 1

@FSHSchool / FSHOnline

<https://github.com/FHIR/GoFSH>

Install: `npm install -g gofsh`

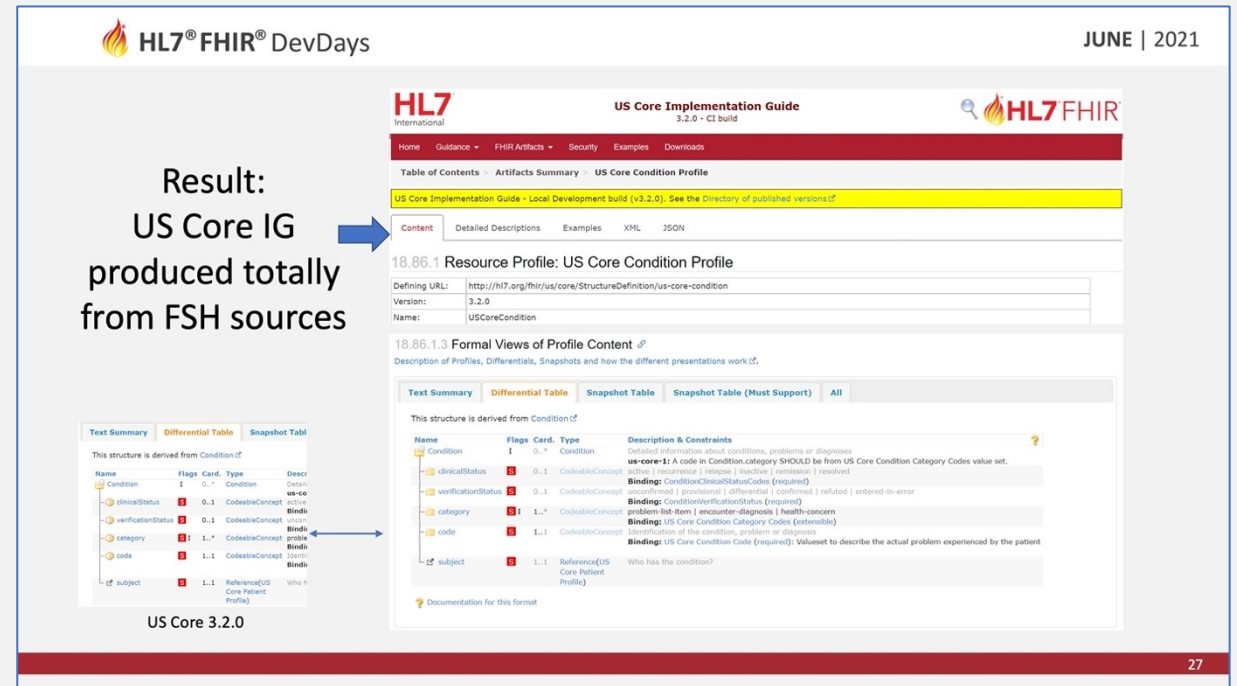
# GoFSH: Converting US Core IG to FSH

Sound exciting? Check out:

Let's Build: Create an Implementation Guide with FHIR Shorthand  
 June 8 @ 4:15pm (time travel required)

**Spoiler Alert!** 

Result:  
 US Core IG  
 produced totally  
 from FSH sources



The screenshot shows the HL7 US Core Implementation Guide website for version 3.2.0. The page title is "US Core Implementation Guide 3.2.0 - CI build". The navigation menu includes Home, Guidance, FHIR Artifacts, Security, Examples, and Downloads. The main content area displays the "US Core Condition Profile" structure, which is derived from a Condition. The structure is shown in a table format with columns for Name, Flags, Cardinality, Type, and Description & Constraints.

Name	Flags	Card.	Type	Description & Constraints
Condition	I	0..*	Condition	Detailed information about conditions, problems or diagnoses
clinicalStatus	S	0..1	CodeableConcept	<b>us-core-1:</b> A code in Condition.category SHOULD be from US Core Condition Category Codes value set.
verificationStatus	S	0..1	CodeableConcept	<b>Binding:</b> ConditionClinicalStatusCodes (required)
category	S	1..*	CodeableConcept	<b>Binding:</b> ConditionVerificationStatus (required)
code	S	1..1	CodeableConcept	<b>Binding:</b> US Core Condition Category Codes (extensible)
subject	S	1..1	Reference(US Core Patient Profile)	<b>Binding:</b> US Core Condition Code (required); <b>ValueSet:</b> to describe the actual problem experienced by the patient

US Core 3.2.0

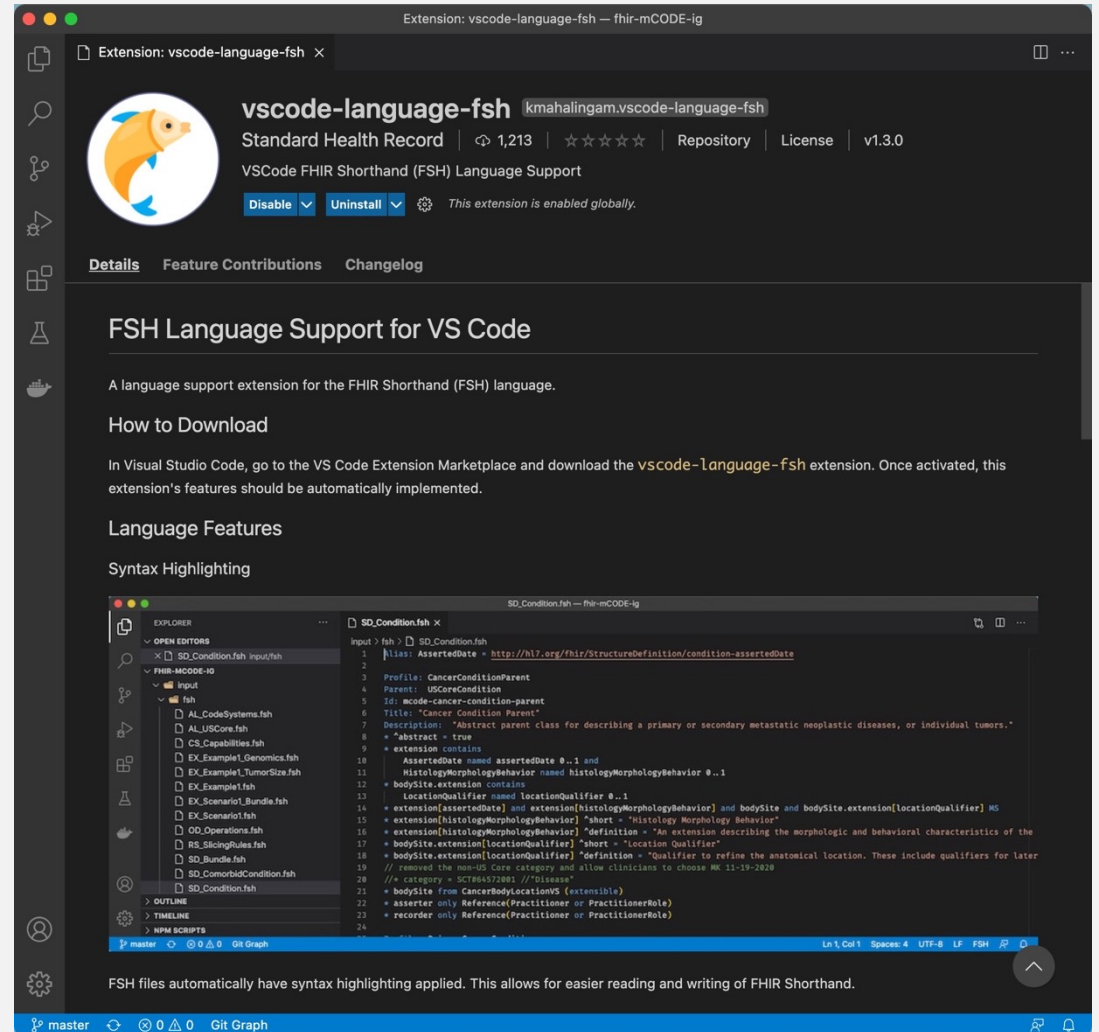
# VS Code Extension: vscode-language-fsh

## VS Code FSH Extension

- Visual Studio Code Editor
- Syntax highlighting
- Snippets
- Go to definition
- Open FHIR documentation

## Install:

- Open a .fsh file in VS Code, or
- Search “FSH” in marketplace
- Go to: <https://bit.ly/3fUslk7>



Extension: vscode-language-fsh — Thir-mCODE-ig

**vscode-language-fsh** kmahalingam.vscode-language-fsh  
 Standard Health Record | 1,213 | ☆☆☆☆ | Repository | License | v1.3.0  
 VSCode FHIR Shorthand (FSH) Language Support  
 Disable | Uninstall | This extension is enabled globally.

**Details** | Feature Contributions | Changelog

### FSH Language Support for VS Code

A language support extension for the FHIR Shorthand (FSH) language.

#### How to Download

In Visual Studio Code, go to the VS Code Extension Marketplace and download the `vscode-language-fsh` extension. Once activated, this extension's features should be automatically implemented.

#### Language Features

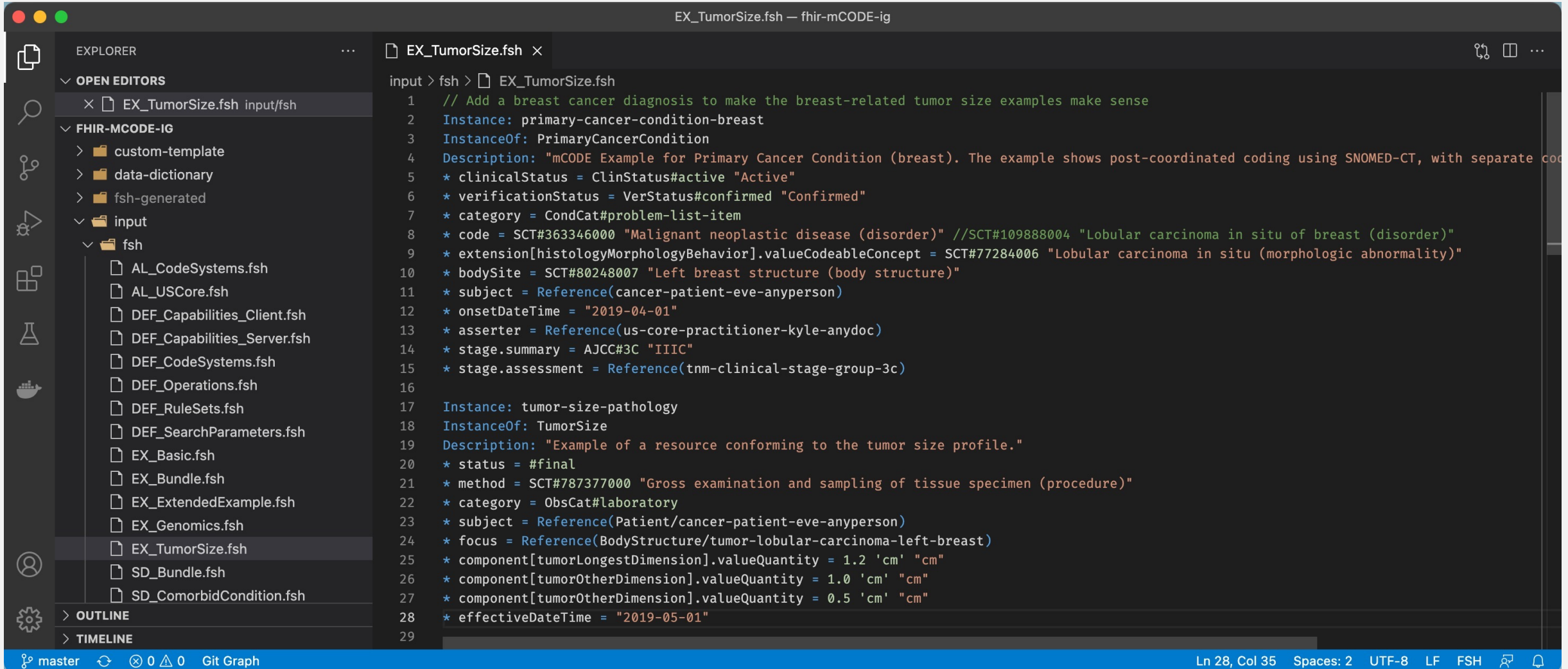
##### Syntax Highlighting

```

input > fsh > SD_Condition.fsh
1 | class: AssertedDate = http://hl7.org/fhir/StructureDefinition/condition-assertedDate
2
3 | Profile: CancerConditionParent
4 | Parent: USCoreCondition
5 | Id: code-cancer-condition-parent
6 | Title: "Cancer Condition Parent"
7 | Description: "Abstract parent class for describing a primary or secondary metastatic neoplastic diseases, or individual tumors."
8 | *abstract = true
9 | *extension contains
10 |   AssertedDate named assertedDate 0..1 and
11 |   HistologyMorphologyBehavior named histologyMorphologyBehavior 0..1
12 | *bodySite.extension contains
13 |   LocationQualifier named locationQualifier 0..1
14 | *extension[assertedDate] and extension[histologyMorphologyBehavior] and bodySite and bodySite.extension[locationQualifier] MS
15 | *extension[histologyMorphologyBehavior] "short = "Histology Morphology Behavior"
16 | *extension[histologyMorphologyBehavior] "definition = "An extension describing the morphologic and behavioral characteristics of the
17 | *bodySite.extension[locationQualifier] "short = "Location Qualifier"
18 | *bodySite.extension[locationQualifier] "definition = "Qualifier to refine the anatomical location. These include qualifiers for later
19 | // removed the non-US Core category and allow clinicians to choose ICD 10-2020
20 | // category = SCD44S/2021 //Disuse"
21 | *bodySite from CancerBodyLocationVS (extensible)
22 | *asserter only Reference(Practitioner or PractitionerRole)
23 | *recorder only Reference(Practitioner or PractitionerRole)
24
  
```

FSH files automatically have syntax highlighting applied. This allows for easier reading and writing of FHIR Shorthand.

# VS Code Extension: Syntax Highlighting



The screenshot shows the VS Code editor with the FSH file `EX_TumorSize.fsh` open. The left sidebar shows the Explorer view with the file structure. The main editor area displays the FSH code with syntax highlighting. The code is as follows:

```

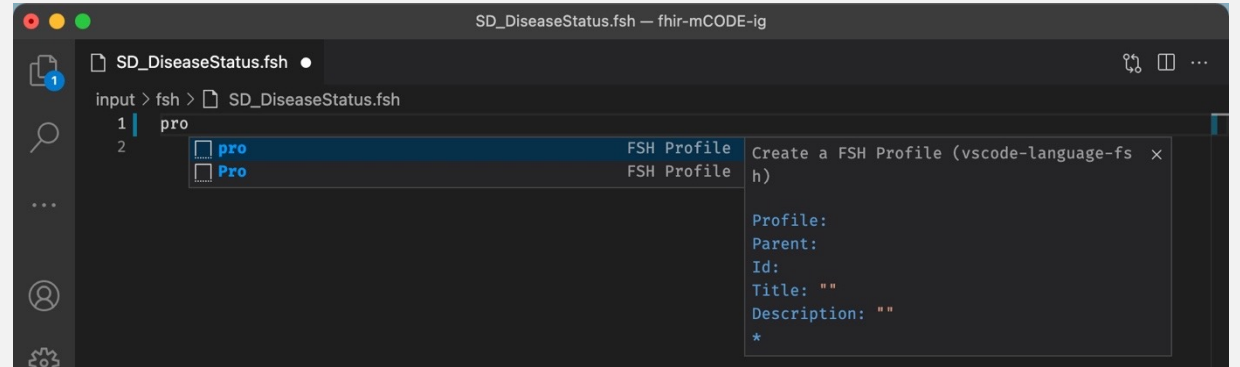
input > fsh > EX_TumorSize.fsh
1 // Add a breast cancer diagnosis to make the breast-related tumor size examples make sense
2 Instance: primary-cancer-condition-breast
3 InstanceOf: PrimaryCancerCondition
4 Description: "mCODE Example for Primary Cancer Condition (breast). The example shows post-coordinated coding using SNOMED-CT, with separate cod
5 * clinicalStatus = ClinStatus#active "Active"
6 * verificationStatus = VerStatus#confirmed "Confirmed"
7 * category = CondCat#problem-list-item
8 * code = SCT#363346000 "Malignant neoplastic disease (disorder)" //SCT#109888004 "Lobular carcinoma in situ of breast (disorder)"
9 * extension[histologyMorphologyBehavior].valueCodeableConcept = SCT#77284006 "Lobular carcinoma in situ (morphologic abnormality)"
10 * bodySite = SCT#80248007 "Left breast structure (body structure)"
11 * subject = Reference(cancer-patient-eve-anyperson)
12 * onsetDateTime = "2019-04-01"
13 * asserter = Reference(us-core-practitioner-kyle-anydoc)
14 * stage.summary = AJCC#3C "IIIC"
15 * stage.assessment = Reference(tnm-clinical-stage-group-3c)
16
17 Instance: tumor-size-pathology
18 InstanceOf: TumorSize
19 Description: "Example of a resource conforming to the tumor size profile."
20 * status = #final
21 * method = SCT#787377000 "Gross examination and sampling of tissue specimen (procedure)"
22 * category = ObsCat#laboratory
23 * subject = Reference(Patient/cancer-patient-eve-anyperson)
24 * focus = Reference(BodyStructure/tumor-lobular-carcinoma-left-breast)
25 * component[tumorLongestDimension].valueQuantity = 1.2 'cm' "cm"
26 * component[tumorOtherDimension].valueQuantity = 1.0 'cm' "cm"
27 * component[tumorOtherDimension].valueQuantity = 0.5 'cm' "cm"
28 * effectiveDateTime = "2019-05-01"
29
    
```

The status bar at the bottom indicates the current position: Ln 28, Col 35, Spaces: 2, UTF-8, LF, FSH.

# VS Code Extension: Snippets

## 1. Type a FSH trigger phrase\*

Trigger	FSH Item	Keywords
pro	Profile	Profile, Parent, Id (auto), Title (auto), Description
ext	Extension	Extension, Id (auto), Title (auto), Description
vs	ValueSet	ValueSet, Id (auto), Title (auto), Description
cs	CodeSystem	CodeSystem, Id (auto), Title (auto), Description
inst	Instance	Instance, InstanceOf, Usage (choice), Title (auto), Description



The screenshot shows the VS Code editor with a file named 'SD\_DiseaseStatus.fsh'. The cursor is at the start of a new line, and the text 'pro' has been typed. A snippet suggestion dropdown is visible, showing two options: 'pro' (FSH Profile) and 'Pro' (FSH Profile). The 'pro' option is selected, and a preview of the snippet is shown to the right, displaying the following text:

```

Profile:
Parent:
Id:
Title: ""
Description: ""
*

```

## 2. Hit <Enter> or <TAB> to start

- Use <TAB> to visit placeholders
- Bonus: Automatic id and title



The screenshot shows the VS Code editor with the snippet expanded. The text is as follows:

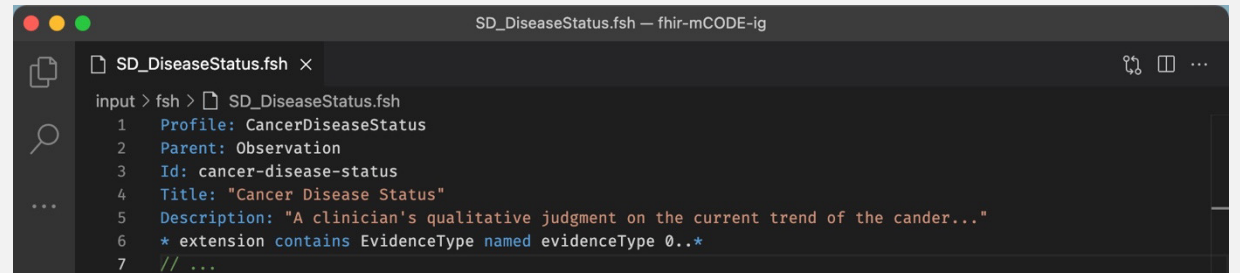
```

1 Profile:
2 Parent:
3 Id:
4 Title: ""
5 Description: ""
6 *

```

## 3. Start writing your rules

\* Logical / Resource to be added soon.



The screenshot shows the VS Code editor with the final FSH rule written in the file 'SD\_DiseaseStatus.fsh'.

```

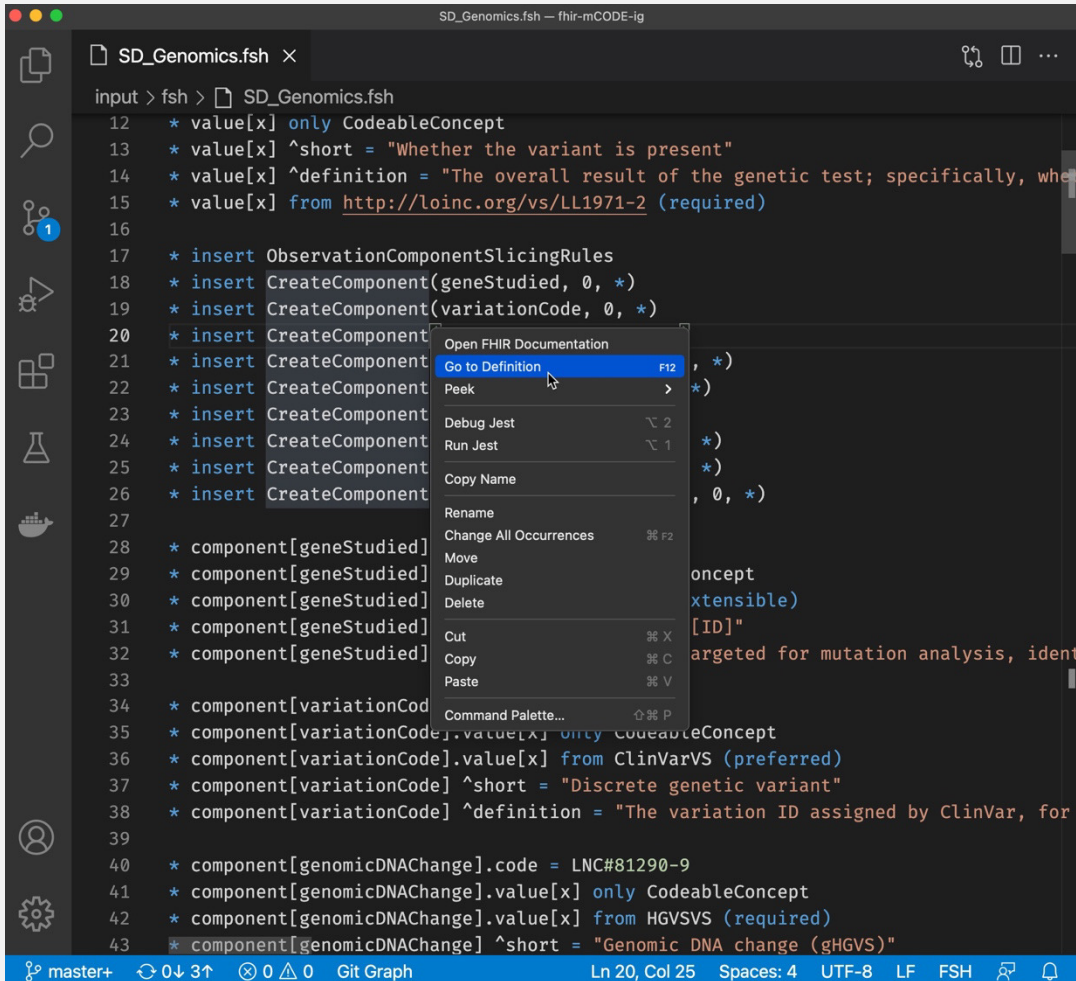
input > fsh > SD_DiseaseStatus.fsh
1 Profile: CancerDiseaseStatus
2 Parent: Observation
3 Id: cancer-disease-status
4 Title: "Cancer Disease Status"
5 Description: "A clinician's qualitative judgment on the current trend of the cander..."
6 * extension contains EvidenceType named evidenceType 0..*
7 // ...

```



# VS Code Extension: Go to Definition

Right-click a FSH name and “Go to Definition” to see its definition



SD\_Genomics.fsh — fhir-mCODE-ig

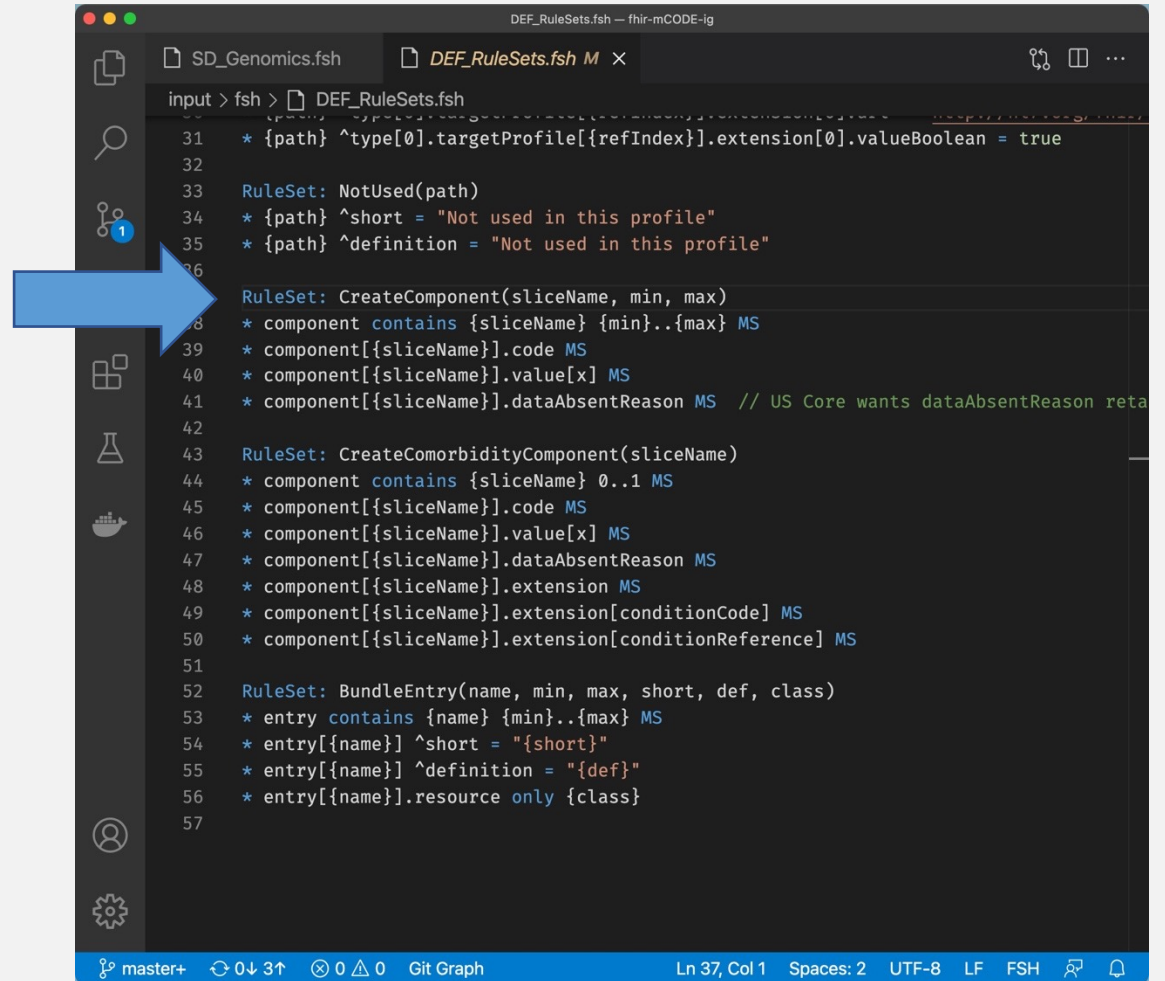
```

input > fsh > SD_Genomics.fsh
12 * value[x] only CodeableConcept
13 * value[x] ^short = "Whether the variant is present"
14 * value[x] ^definition = "The overall result of the genetic test; specifically, whether the variant is present"
15 * value[x] from http://loinc.org/vs/LL1971-2 (required)
16
17 * insert ObservationComponentSlicingRules
18 * insert CreateComponent(geneStudied, 0, *)
19 * insert CreateComponent(variationCode, 0, *)
20 * insert CreateComponent
21 * insert CreateComponent
22 * insert CreateComponent
23 * insert CreateComponent
24 * insert CreateComponent
25 * insert CreateComponent
26 * insert CreateComponent
27
28 * component[geneStudied]
29 * component[geneStudied]
30 * component[geneStudied]
31 * component[geneStudied]
32 * component[geneStudied]
33
34 * component[variationCode]
35 * component[variationCode].value[x] only CodeableConcept
36 * component[variationCode].value[x] from ClinVarVS (preferred)
37 * component[variationCode] ^short = "Discrete genetic variant"
38 * component[variationCode] ^definition = "The variation ID assigned by ClinVar, for the variant"
39
40 * component[genomicDNAChange].code = LNC#81290-9
41 * component[genomicDNAChange].value[x] only CodeableConcept
42 * component[genomicDNAChange].value[x] from HGVSVS (required)
43 * component[genomicDNAChange] ^short = "Genomic DNA change (gHGVS)"
  
```

Context menu options:

- Open FHIR Documentation
- Go to Definition** F12
- Peek
- Debug Jest
- Run Jest
- Copy Name
- Rename
- Change All Occurrences
- Move
- Duplicate
- Delete
- Cut
- Copy
- Paste
- Command Palette...

Ln 20, Col 25 Spaces: 4 UTF-8 LF FSH



DEF\_RuleSets.fsh — fhir-mCODE-ig

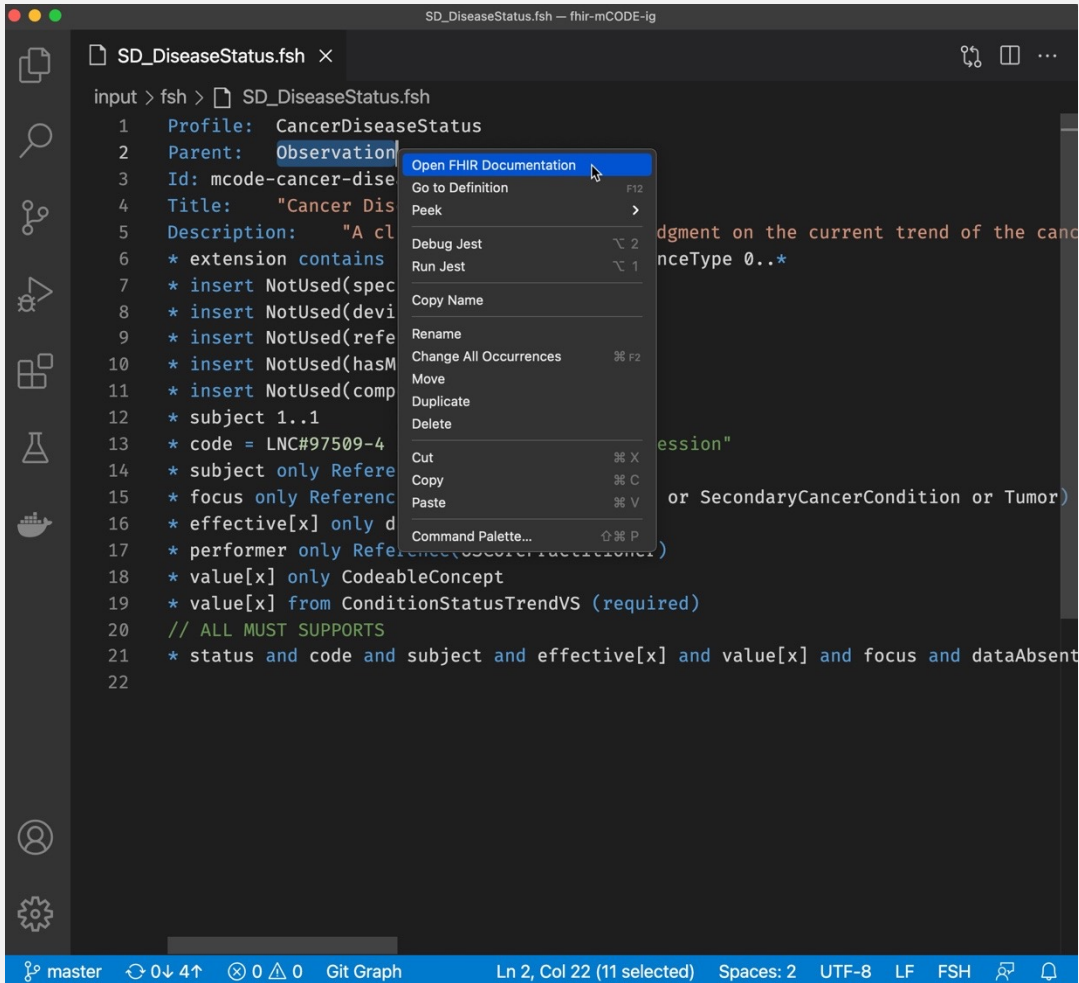
```

input > fsh > DEF_RuleSets.fsh
31 * {path} ^type[0].targetProfile[refIndex].extension[0].valueBoolean = true
32
33 RuleSet: NotUsed(path)
34 * {path} ^short = "Not used in this profile"
35 * {path} ^definition = "Not used in this profile"
36
37 RuleSet: CreateComponent(sliceName, min, max)
38 * component contains {sliceName} {min}..{max} MS
39 * component[{sliceName}].code MS
40 * component[{sliceName}].value[x] MS
41 * component[{sliceName}].dataAbsentReason MS // US Core wants dataAbsentReason retained
42
43 RuleSet: CreateComorbidityComponent(sliceName)
44 * component contains {sliceName} 0..1 MS
45 * component[{sliceName}].code MS
46 * component[{sliceName}].value[x] MS
47 * component[{sliceName}].dataAbsentReason MS
48 * component[{sliceName}].extension MS
49 * component[{sliceName}].extension[conditionCode] MS
50 * component[{sliceName}].extension[conditionReference] MS
51
52 RuleSet: BundleEntry(name, min, max, short, def, class)
53 * entry contains {name} {min}..{max} MS
54 * entry[{name}] ^short = "{short}"
55 * entry[{name}] ^definition = "{def}"
56 * entry[{name}].resource only {class}
57
  
```

Ln 37, Col 1 Spaces: 2 UTF-8 LF FSH

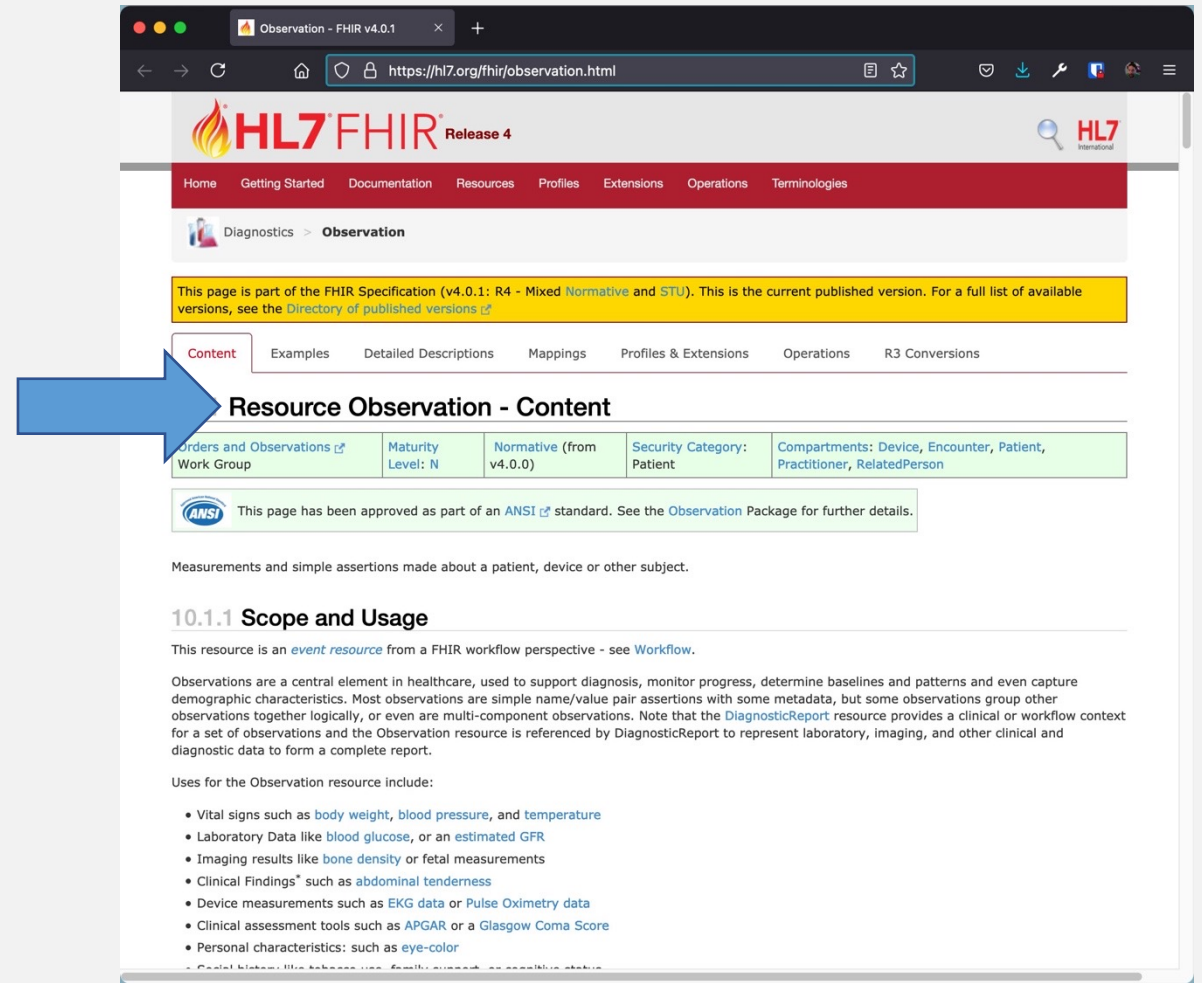
# VS Code Extension: Go to FHIR Documentation

Right-click a FHIR name and “Go to FHIR Documentation” to see its definition



```

SD_DiseaseStatus.fsh — fhir-mCODE-ig
SD_DiseaseStatus.fsh x
input > fsh > SD_DiseaseStatus.fsh
1 Profile: CancerDiseaseStatus
2 Parent: Observation
3 Id: mcode-cancer-dise
4 Title: "Cancer Dis
5 Description: "A cl
6 * extension contains
7 * insert NotUsed(spec
8 * insert NotUsed(devi
9 * insert NotUsed(refe
10 * insert NotUsed(hasM
11 * insert NotUsed(comp
12 * subject 1..1
13 * code = LNC#97509-4
14 * subject only Referenc
15 * focus only Referenc
16 * effective[x] only d
17 * performer only Referenc
18 * value[x] only CodeableConcept
19 * value[x] from ConditionStatusTrendVS (required)
20 // ALL MUST SUPPORTS
21 * status and code and subject and effective[x] and value[x] and focus and dataAbsent
22
  
```



Observation - FHIR v4.0.1

https://hl7.org/fhir/observation.html

HL7 FHIR Release 4

Home Getting Started Documentation Resources Profiles Extensions Operations Terminologies


Diagnostics > Observation

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

**Resource Observation - Content**

Orders and Observations Work Group	Maturity Level: N	Normative (from v4.0.0)	Security Category: Patient	Compartments: Device, Encounter, Patient, Practitioner, RelatedPerson
------------------------------------	-------------------	-------------------------	----------------------------	---

 This page has been approved as part of an [ANSI](#) standard. See the [Observation Package](#) for further details.

Measurements and simple assertions made about a patient, device or other subject.

### 10.1.1 Scope and Usage

This resource is an *event resource* from a FHIR workflow perspective - see [Workflow](#).

Observations are a central element in healthcare, used to support diagnosis, monitor progress, determine baselines and patterns and even capture demographic characteristics. Most observations are simple name/value pair assertions with some metadata, but some observations group other observations together logically, or even are multi-component observations. Note that the [DiagnosticReport](#) resource provides a clinical or workflow context for a set of observations and the Observation resource is referenced by DiagnosticReport to represent laboratory, imaging, and other clinical and diagnostic data to form a complete report.

Uses for the Observation resource include:

- Vital signs such as [body weight](#), [blood pressure](#), and [temperature](#)
- Laboratory Data like [blood glucose](#), or an [estimated GFR](#)
- Imaging results like [bone density](#) or fetal measurements
- Clinical Findings\* such as [abdominal tenderness](#)
- Device measurements such as [EKG data](#) or [Pulse Oximetry data](#)
- Clinical assessment tools such as [APGAR](#) or a [Glasgow Coma Score](#)
- Personal characteristics: such as [eye-color](#)

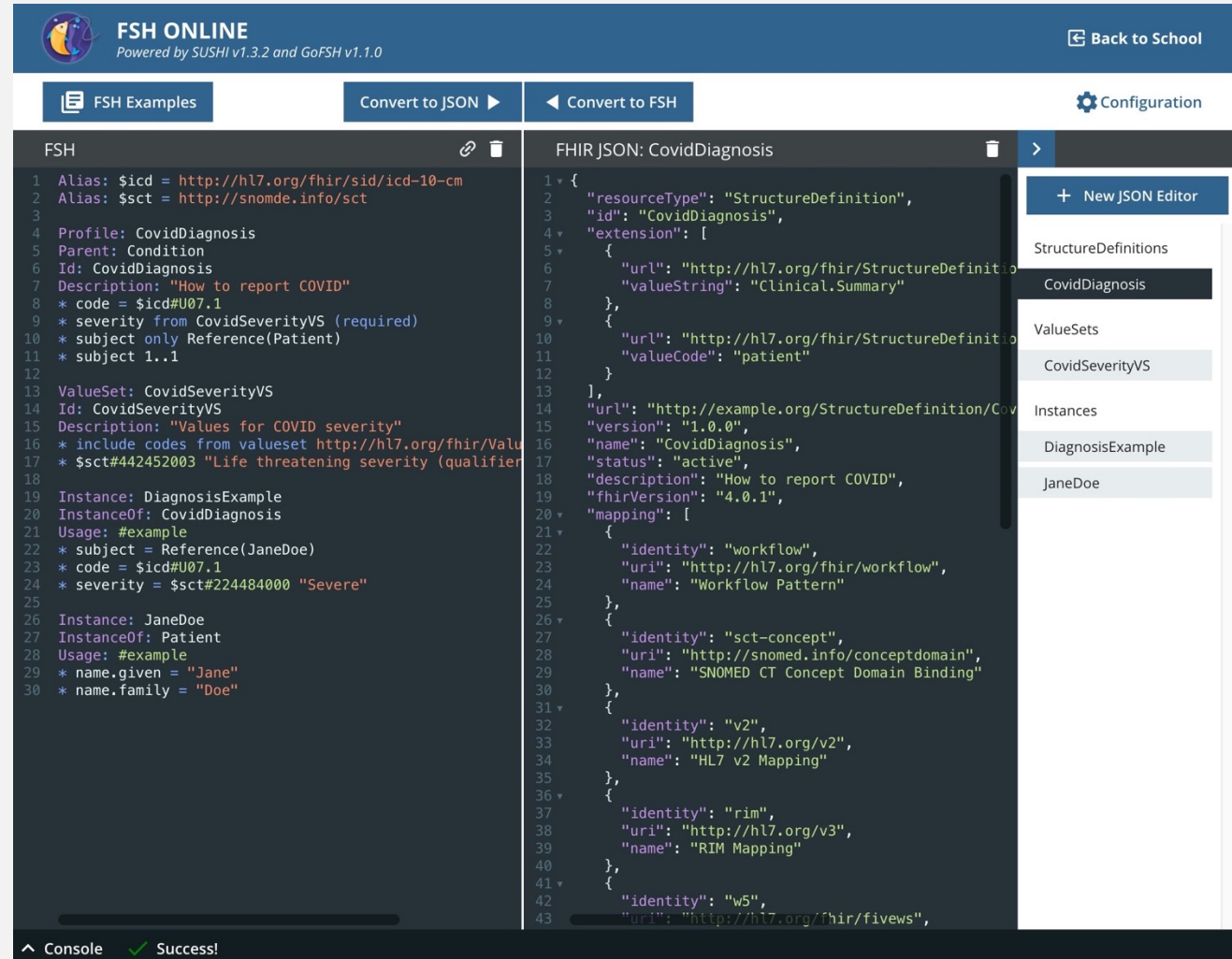
# FSH Online

## FSH Online Features

- Convert FSH to FHIR on the web
- Convert FHIR to FSH on the web
- Browse and Copy FSH examples
- Share FSH definitions w/ others

## Recommended for:

- Quickly trying some FSH out
- Quickly converting FHIR to FSH
- Debugging FSH definitions
- Reporting errors (share your link)



The screenshot shows the FSH Online web application. At the top, it says "FSH ONLINE Powered by SUSHI v1.3.2 and GoFSH v1.1.0". There are navigation buttons for "FSH Examples", "Convert to JSON", and "Convert to FSH". A "Back to School" button is in the top right. Below the navigation, there are two main panels. The left panel, titled "FSH", contains FSH code for a CovidDiagnosis profile and an instance. The right panel, titled "FHIR JSON: CovidDiagnosis", shows the corresponding JSON representation. A sidebar on the right side of the JSON panel lists various FHIR resources like StructureDefinitions, ValueSets, and Instances, with "CovidDiagnosis" selected. At the bottom, there is a "Console" area showing a "Success!" message.

<https://fshschool.org/FSHOnline>

# FSH Online: Features

1. Browse Examples

2. FSH to FHIR (SUSHI)

3. Share FSH

4. Clear FSH

5. View Log

The screenshot shows the FSH Online interface with the following features highlighted by numbered red circles:

- 1**: FSH Examples button in the top navigation bar.
- 2**: Convert to JSON button in the top navigation bar.
- 3**: Copy icon for the FSH code.
- 4**: Clear icon for the FSH code.
- 5**: Console button at the bottom left.
- 6**: Convert to FSH button in the top navigation bar.
- 7**: Configuration button in the top navigation bar.
- 8**: Clear icon for the FHIR JSON code.
- 9**: New JSON Editor button in the right sidebar.
- 10**: CovidDiagnosis item selected in the right sidebar.

The main content area is split into two panels:

- FSH Panel (Left):** Contains FSH code for a CovidDiagnosis profile and its instances. The code includes aliases, profile information, severity values, and example instances for a patient named JaneDoe.
- FHIR JSON: CovidDiagnosis Panel (Right):** Shows the resulting JSON structure for the CovidDiagnosis profile, including details like resource type, ID, extension, and mapping.

At the bottom, a console message indicates: **5** ^ Console ✓ Success!

6. FHIR to FSH (GoFSH)

7. Configure Settings

8. Clear JSON

9. New JSON

10. View JSON

# FSH Online: Browse and Copy Examples (New!)

The screenshot shows the FSH Online web application interface. At the top, it says "FSH ONLINE Powered by SUSHI v1.3.2 and GoFSH v1.1.0" and has a "Back to School" link. A navigation menu on the left lists various FSH categories: Aliases, Code Systems, Extensions, Instances, Invariants, Mappings, Paths, Profiles, Rule Sets, Rules, and Value Sets. The "Extensions" category is expanded, and "Simple Extensions" is selected. A modal window titled "Simple Extensions" is open, displaying a list of example extensions in FSH syntax. At the bottom of the modal, there are "Copy to clipboard" and "Close" buttons. The background shows a code editor with some text visible.

**FSH ONLINE**  
Powered by SUSHI v1.3.2 and GoFSH v1.1.0

**FSH Examples**

- Aliases
  - External Aliases
  - FHIR Aliases
  - US Core Aliases
- Code Systems
  - Local Code Systems
- Extensions
  - Complex Extensions
  - Simple Extensions
- Instances
- Invariants
- Mappings
- Paths
- Profiles
- Rule Sets
- Rules
- Value Sets

**Simple Extensions**

```

1 // @Name: Simple Extensions
2 // @Description: Examples of extensions with values (no sub-extensions)
3
4 Extension: Laterality
5 Description: "Body side of a body location."
6 * value[x] only CodeableConcept
7 * value[x] from http://hl7.org/fhir/ValueSet/bodysite-laterality (required)
8
9 Extension: TherapySessionsCompleted
10 Id: therapy-sessions-completed
11 Title: "Therapy Sessions Completed"
12 Description: "The number of sessions of some therapy."
13 // Limit the context to Procedures -- Also see Rule Sets for a context-setting rule set
14 * ^context[+].type = #element
15 * ^context[=].expression = "Procedure"
16 * value[x] only unsignedInt // 0 or more
17
18 Extension: RelatedCondition
19 Id: related-condition
20 Title: "Condition related to the current resource"
21 Description: "The resource has an unspecified relationship with a Condition."
22 * value[x] only Reference(Condition)
    
```

Copy to clipboard Close

Console Success!

# FSH Finder

## 100+ Implementation Guides

- US
- New Zealand
- Switzerland
- Belgium
- Denmark
- Sweden
- WHO
- DaVinci
- Covid SANER, Logica
- CARIN Blue Button
- SMART Vaccine Credential

<https://fhschool.org/fsh-finder>

### FSH Finder

[Other formats](#) | [Source code](#) | [Report a problem](#)

This is a list of GitHub repositories that contain **FSH** code. Please see [the README](#) for more details on how this works. Last refreshed about about 20 hours ago.

**Note:** you can mouse over the "FSH? 1.0" icons to see which branches in the repository support SUSHI >= 1.0. The badge is dimmed (1.0) if FSH is not supported on `main` or `master`.

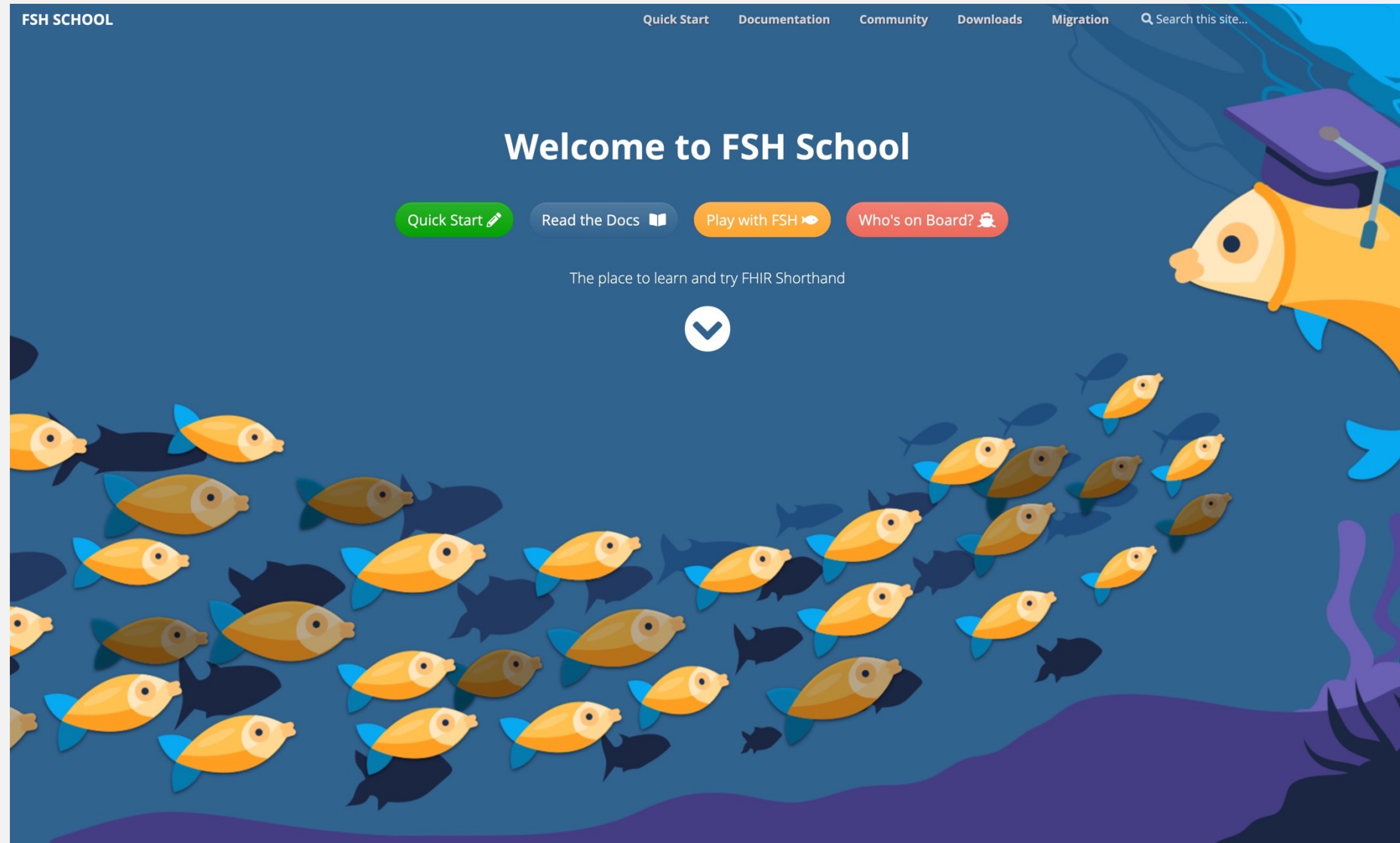
#	Implementation Guide	FSH Version	FSH: Profile	FSH: Instance	FSH: Extension	FSH: ValueSet	FSH: CodeSystem
1	<b>item-715-data</b> <a href="#">oridashi / item-715-data</a> updated about 21 hours ago [CI build]	1.0	Yes	Yes	Yes	No	No
2	<b>CH eTOC (R4)</b> <a href="#">hl7ch / ch-etoc</a> updated a day ago [CI build]	1.0	Yes	Yes	Yes	Yes	Yes
3	<b>Mobile access to Health Documents (MHD)</b> <a href="#">IHE / ITI.MHD</a> updated 2 days ago [CI build]	1.0	Yes	Yes	Yes	Yes	Yes
4	<b>PACIO Advance Directive Interoperability Implementation Guide</b> <a href="#">HL7 / pacio-adi</a> updated 2 days ago [CI build]	1.0	Yes	Yes	Yes	Yes	Yes
5	<b>riziv-inami</b> <a href="#">hl7-be / riziv-inami</a> updated 2 days ago [CI build]	1.0	Yes	Yes	Yes	Yes	Yes
6	<b>Da Vinci Prior Authorization Support (PAS) FHIR IG</b> <a href="#">HL7 / davinci-pas</a> updated 2 days ago [CI build]	1.0	Yes	Yes	Yes	Yes	Yes
7	<b>Patient Demographics Query for Mobile</b> <a href="#">IHE / ITI.PDQm</a> updated 2 days ago [CI build]	1.0	Yes	Yes	Yes	No	No
8	<b>SPL Mapping FHIR Implementation Guide</b> <a href="#">HL7 / fhir-spl</a> updated 2 days ago [CI build]	1.0	Yes	Yes	Yes	Yes	Yes
9	<b>CH RAD-Order (R4)</b> <a href="#">hl7ch / ch-rad-order</a> updated 3 days ago [CI build]	1.0	Yes	Yes	Yes	Yes	Yes
10	<b>HL7 FHIR Implementation Guide: Standard Health Record (SHR) Adverse Events Release 1 - DRAFT</b> <a href="#">standardhealth / fsh-ae</a> updated 3 days ago [CI build]	1.0	Yes	Yes	Yes	Yes	Yes

# FSH School

Your portal to

- FSH Online
- FSH Finder
- SUSHI docs
- GoFSH docs
- Tutorials
- Presentations
- Other resources

<https://fshschool.org>

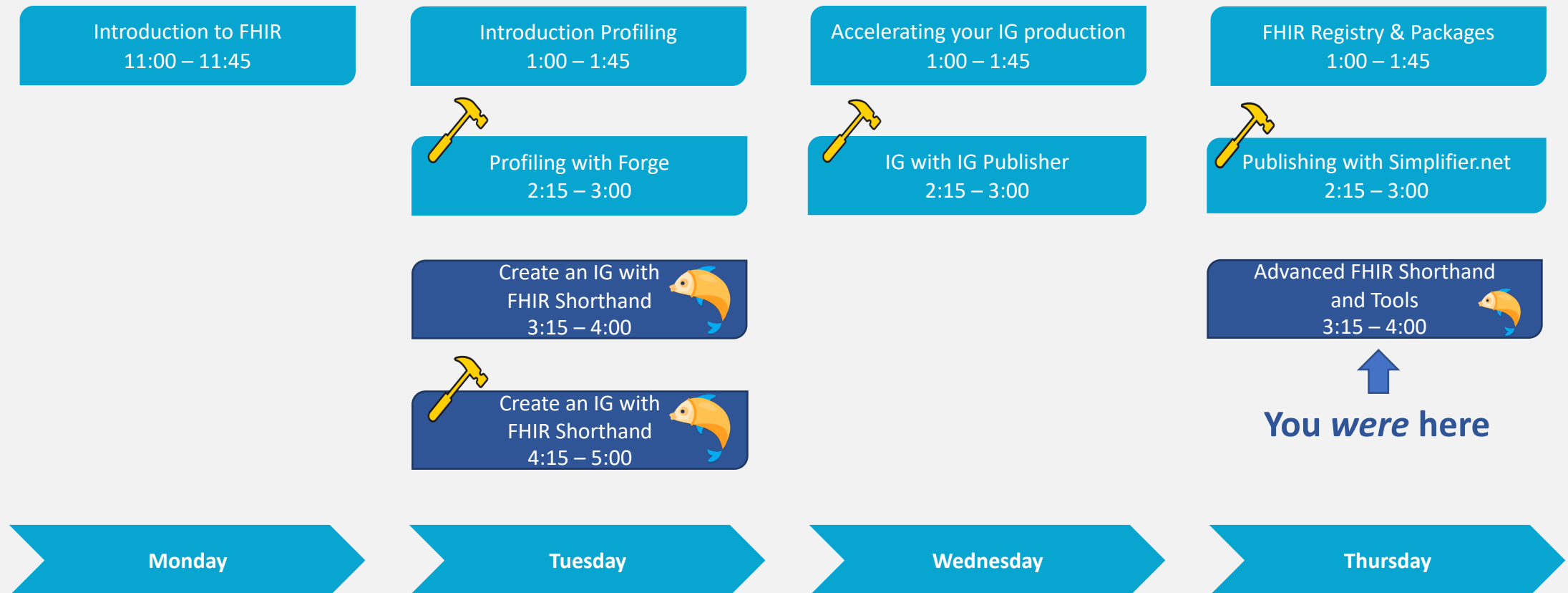


## FSH Resources and Tools

- [FSH Language Specification](#) -- HL7 FHIR Standard
- [SUSHI](#) -- compile FSH into FHIR Artifacts
- [FSH School](#) -- web site with documentation, tools, examples
- [FSH Online](#) -- interactive FHIR Shorthand with examples
- [GoFSH](#) -- convert existing implementation guides into FSH (beta)
- [FSH Finder](#) -- web crawler to find FSH projects
- [VS Code extension](#) -- code highlighter for VS Code editor
- [# shorthand](#) -- Zulip chat channel



# Track overview: Let's Build a FHIR specification



Questions?



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