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Advanced FSH: What to Do When You're Hooked

Chris Moesel, The MITRE Corporation



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ORGANIZED BY



Howdy!

- Chris Moesel
- Principal Health Technology Engineer @ MITRE
 - Co-creator of FHIR Shorthand with Mark Kramer
 - Development lead for FSH Tools (SUSHI, GoFSH, etc.)
 - Technical lead for AHRQ's CDS Connect project



FSHy Face



A US non-profit operating federally-funded research and development centers, working in the public interest. We bring a conflict-free perspective and a whole of government vantage point to bring innovative ideas into existence.

Learning Objectives

At the end of this advanced tutorial, you'll know:

- How to manage large lists of items in FSH
- How to re-use common code by leveraging RuleSets
- What slicing is, why to use it, and how to use it
- How to convert an existing IG to FSH using GoFSH
- What's new in the next FSH specification and tools

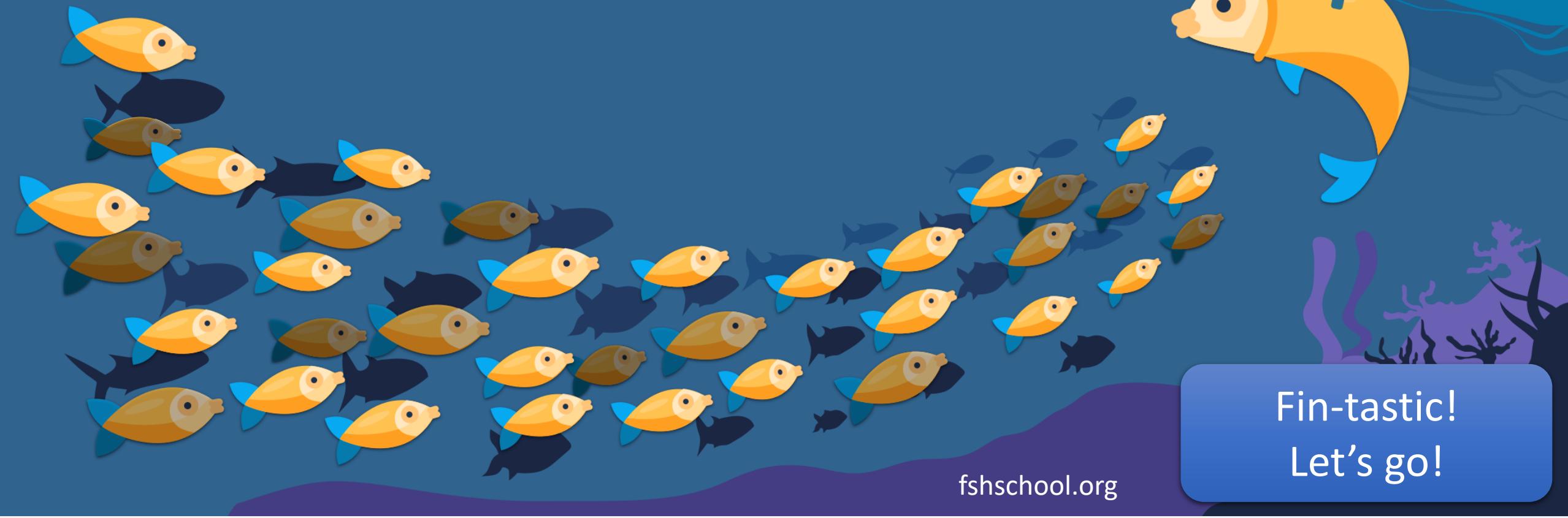
Why is FSH so awesome?



It's Scalable!

"[Fish scales](#)" by [Rajesh dangi at English Wikipedia](#) is licensed under [CC BY 2.5](#).

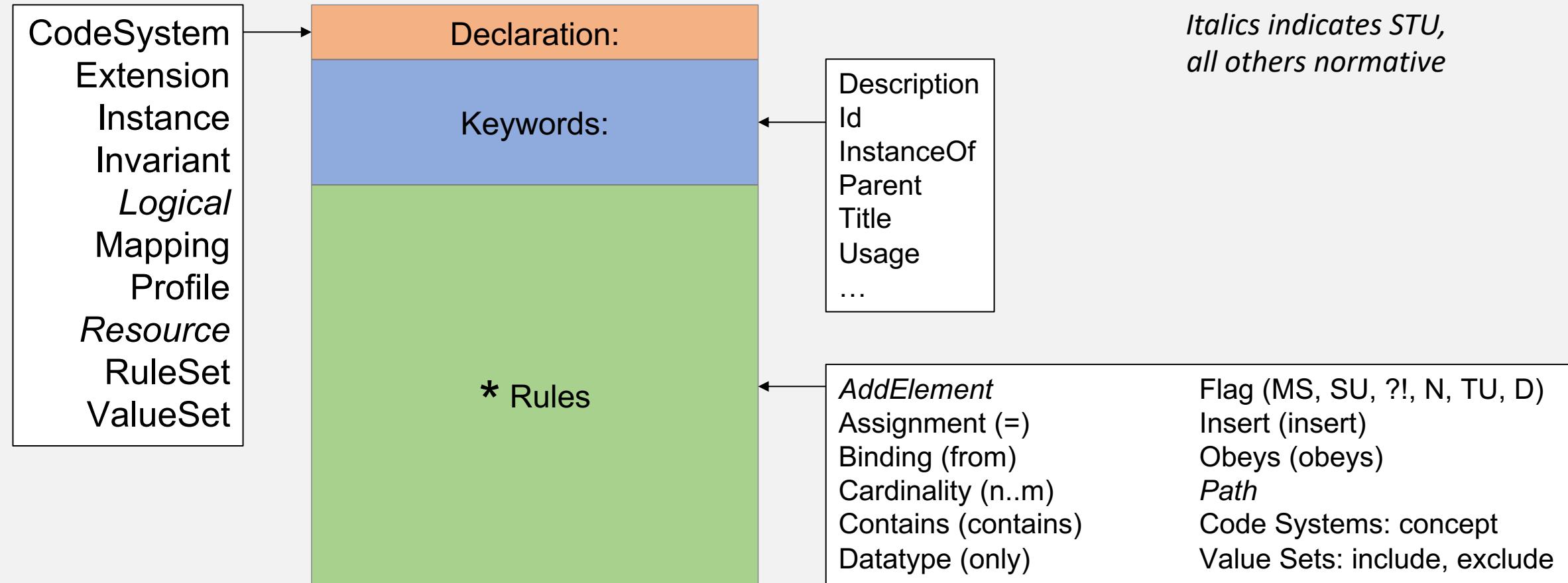
Back to the Basics



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Fin-tastic!
Let's go!

Anatomy of a FSH Item



Defining Profiles in FHIR Shorthand

FSH Keyword	Usage	Element in StructureDefinition	Data Type	Required
Profile	Name of the profile	name	name	Yes
Parent	Base definition of the profile	baseDefinition	name/id/url	Yes
Id	Identifier of the profile	id	id	No
Title	Title of the profile	title	string	No
Description	Human-readable description	description	string	No

Example Profile on FHIR R4 Observation

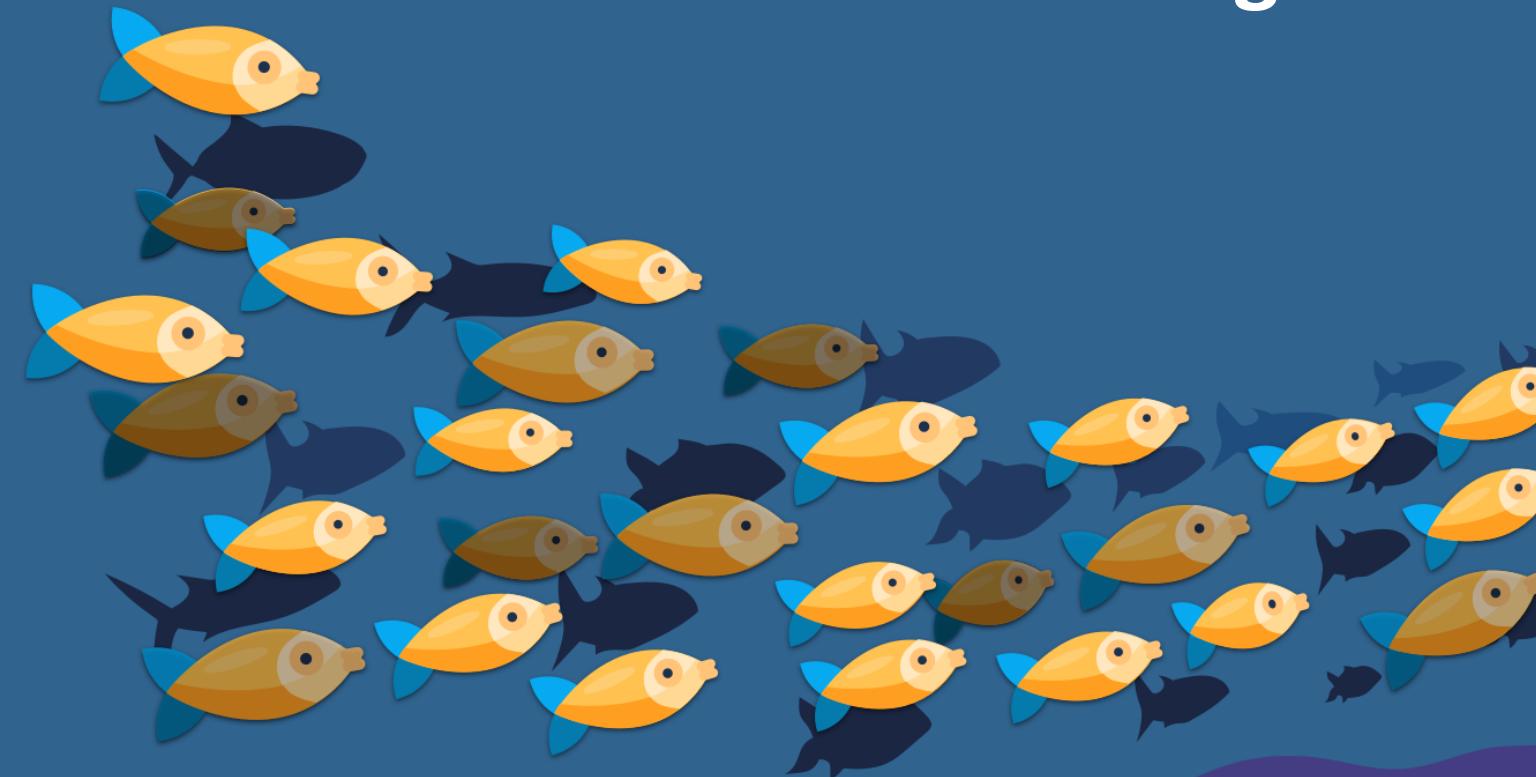
```

Profile: BodyWeightProfile
Parent: Observation
Id: example-weight-profile
Title: "Body Weight"
Description: "An example profile for collecting bodyweight"
* code = http://loinc.org#29463-7 // Body weight
* value[x] only Quantity
* value[x] from BodyWeightUnits
  
```



Name	Flags	Card.	Type	Description & Constraints
Observation		0..*	Observation	Measurements and simple assertions
code		1..1	CodeableConcept	Type of observation (code / type)
coding		1..*	Coding	Required Pattern: At least the following
system		1..1	uri	Code defined by a terminology system
code		1..1	code	Fixed Value: (complex)
value[x]		0..1	Quantity	Identity of the terminology system
				Fixed Value: http://loinc.org
				Symbol in syntax defined by the system
				Fixed Value: 29463-7
				Actual result
				Binding: BodyWeightUnits (required)

Tackling Tediosity with Soft Indexing



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Cool and
So-fish-ticated!

Managing Lists w/ Explicit Indexing (FSH 1.0)

```
* 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
```

Managing Lists w/ 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:

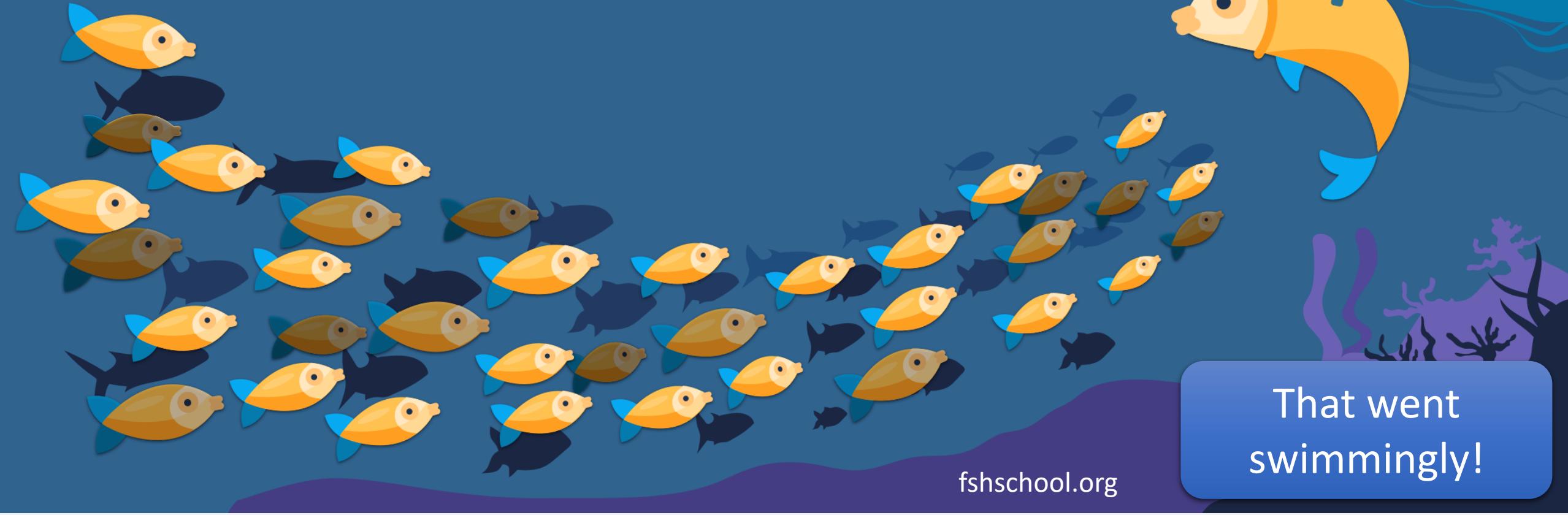
- [+] → next item in array
- [=] → last referenced item in the array
- Start an empty array with [+], [0], or implicit index 0

```
* 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

Tackling Tediosity with RuleSets



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RuleSets

```
RuleSet: ContactAndCopyright
* ^contact[+].name = "Homer Simpson"
* ^contact[=].telecom.system = #phone
* ^contact[=].telecom.value = "939-555-0113"
* ^copyright = "© 2022 Springfield Nuclear Power Plant"
```

```
Profile: RadiationTherapyPatient
Parent: Patient
* insert ContactAndCopyright
* name 1..* MS
```



SUSHI Preprocessor

```
Profile: RadiationTherapyPatient
Parent: Patient
* ^contact[+].name = "Homer Simpson"
* ^contact[=].telecom.system = #phone
* ^contact[=].telecom.value = "939-555-0113"
* ^copyright = "© 2022 Springfield Nuclear Power Plant"
* name 1..* MS
```

RuleSets allow you to:

- Define common rules *once*
- And apply them multiple times

Use the **insert** keyword to apply rulesets in definitions where they *fit*.

But wait! There's more!

Parameterized RuleSets

```
RuleSet: Context(type, expression)
* ^context[+].type = {type}
* ^context[=].expression = {expression}
```

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

 SUSHI Preprocessor

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

Parameterized RuleSets have:

- Input parameters (*in parentheses*)
- Placeholders (*in curly braces*)

When you **insert** rulesets:

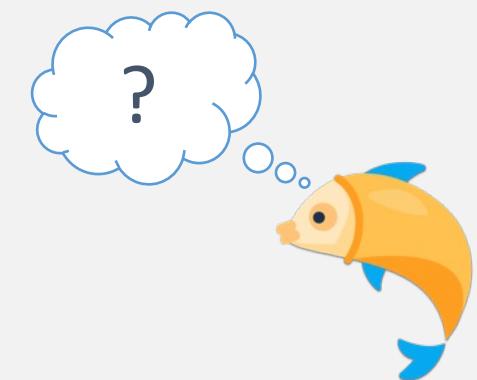
- Specify values in parentheses
- Separate values by a comma

Works like simple **find & replace**

- Escape commas & ending parentheses
- e.g., *insert RS(#foo, "a\|,b\|,c\|,... (etc.\|)")*

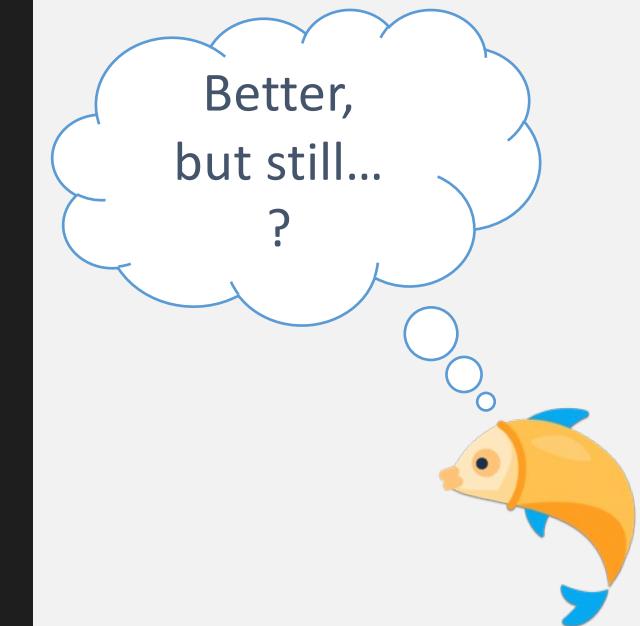
Example: Capability Statement

```
// 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
```



Example: CapabilityStatement w/ Alias & Soft Indexing

```
// 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
```



Example: RuleSets for Repeated FSH

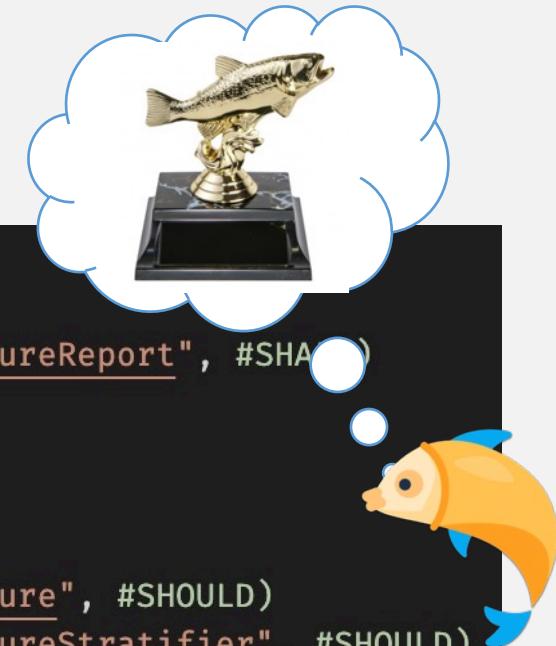
```
RuleSet: SupportResource (resource, expectation)
* rest.resource[+].type = {resource}
* rest.resource[=].extension[0].url = $ExpExt
* rest.resource[=].extension[0].valueCode = {expectation}

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)
```

Example: CapabilityStatement w/ RuleSets



```
// 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)
```

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

Trophy available for purchase at
<https://www.trophies2go.com/catch-of-the-day-trout-trophy.html>

Preprocessed FSH (sushi -p)

```
> 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"
```

Resolved alias

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"
```

Inserted RuleSet

Expanded paths

Explicit indices

Slicing (Without Losing a Finger)



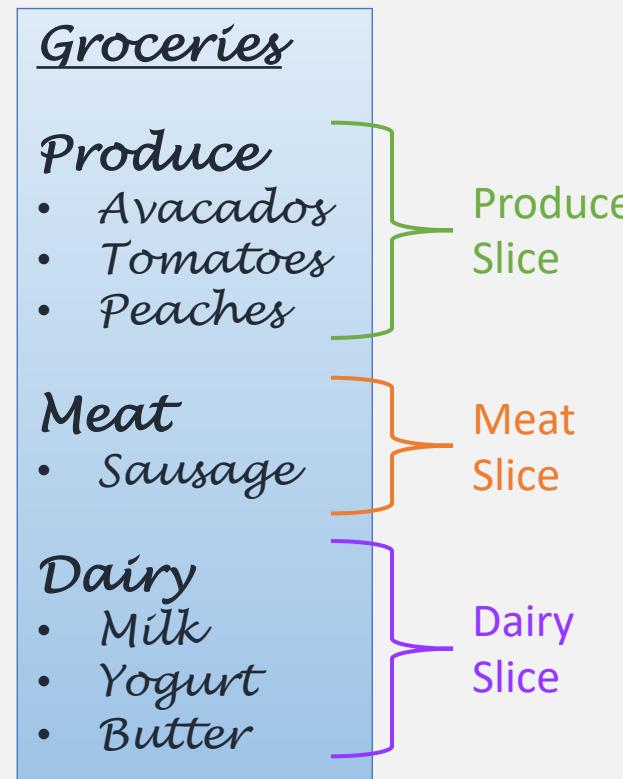
fhschool.org



We're
piranha roll!

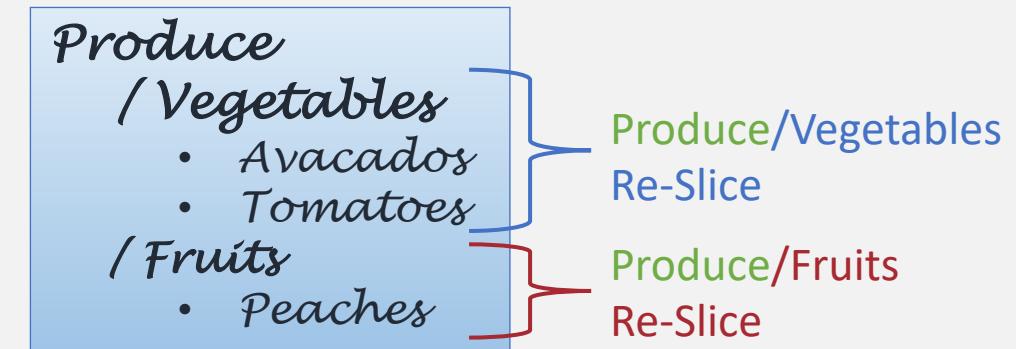
Slicing: Defining and Constraining Sub-Lists

Slicing allows you to split a list into one or more sub-lists (*slices*)



- Slices must be mutually exclusive
- Sort items into slices using discriminators
- Apply different constraints to each slice
- Optionally require slices to be in order
- Optionally allow items that don't fit in any slice

- Re-slice to support sub-sub-lists (*expert level*)



Slicing Element in ElementDefinition

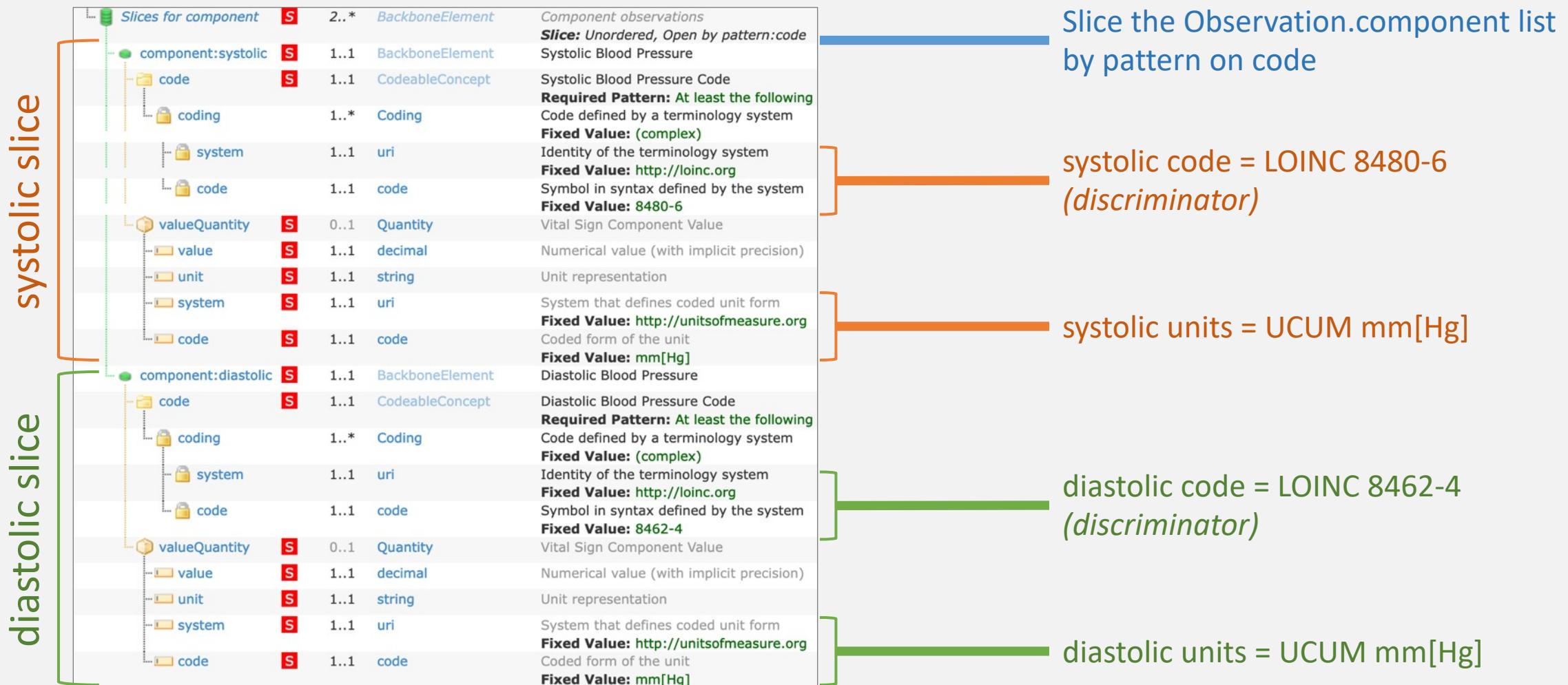
 slicing	Σ I	0..1	Element	This element is sliced - slices follow + Rule: If there are no discriminators, there must be a definition
 discriminator	Σ	0..*	Element	Element values that are used to distinguish the slices
 type	Σ	1..1	code	value exists pattern type profile DiscriminatorType (Required)
 path	Σ	1..1	string	Path to element value
 description	Σ I	0..1	string	Text description of how slicing works (or not)
 ordered	Σ	0..1	boolean	If elements must be in same order as slices
 rules	Σ	1..1	code	closed open openAtEnd SlicingRules (Required)

Understanding `slicing.discriminator.type`:

- **value**: match if the value is exactly the same as the value* in the slice
- **pattern**: match if the value fits the pattern* in the slice (*deprecated in R5; use value*)
- **exists**: match based on the presence or absence of the element
- **type**: match if the element has the same type as the element in the slice
- **profile**: match if the element has the same profile as the element in the slice
- **position**: match by index (*added in R5*)

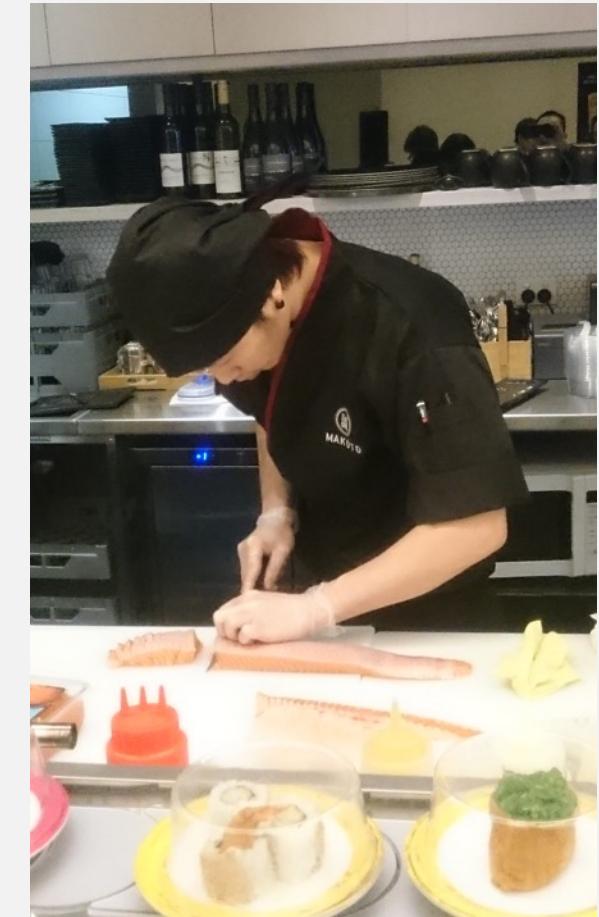
* or is a member of the value set

Real World Slicing: US Core Blood Pressure



Slicing with FSH in Three Steps

1. Define the slicing logic
2. Identify the slices
3. Define each slice



[Sushi chef slicing salmon sashimi, apprentice - Makoto, Emporium Melbourne, CC BY-NC 2.0 via Flickr](#)

Slicing Step 1: Define the Slicing Logic

Slicing logic elements defined in ElementDefinition:

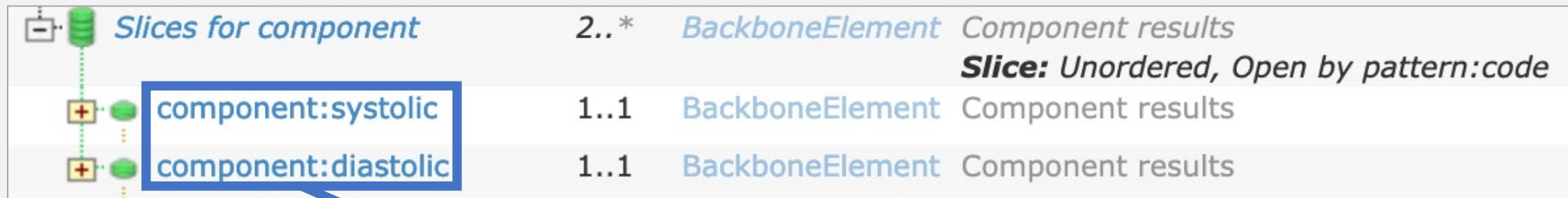
 slicing	Σ I	0..1	Element	This element is sliced - slices follow + Rule: If there are no discriminators, there must be a definition
 discriminator	Σ	0..*	Element	Element values that are used to distinguish the slices
 type	Σ	1..1	code	value exists pattern type profile DiscriminatorType (Required)
 path	Σ	1..1	string	Path to element value
 description	Σ I	0..1	string	Text description of how slicing works (or not)
 ordered	Σ	0..1	boolean	If elements must be in same order as slices
 rules	Σ	1..1	code	closed open openAtEnd SlicingRules (Required)

FSH example of Blood Pressure slicing logic:

```
// Step 1: Define the slicing logic
* component ^slicing.discriminator.type = #pattern // or #value, #profile
* component ^slicing.discriminator.path = "code"    // any FHIRPath expression
* component ^slicing.rules = #open     // additional elements are ok
* component ^slicing.ordered = false   // by default, array elements in any order
* component ^slicing.description = "Slice pattern for component.code" // optional
```

Slicing Step 2: Identify the Slices

Component slices in Blood Pressure profile:



element:sliceName

FSH example of identifying component slices in Blood Pressure profile:

```
// Step 2: Identify the slices
* component contains
    systolic 1..1 and // each slice is identified by name, card, & optional flags
    diastolic 1..1      // using "and" to separate each slice identification
```

Slicing Step 3: Define Each Slice

Component slices in Blood Pressure profile:

Slices for component		2..*	BackboneElement	Component results Slice: Unordered, Open by pattern:code
component:systolic		1..1	BackboneElement	Component results
code		1..1	CodeableConcept	Type of component observation (code / type) Required Pattern: At least the following
coding		1..*	Coding	Code defined by a terminology system Fixed Value: (complex)
system		1..1	uri	Identity of the terminology system Fixed Value: http://loinc.org
code		1..1	code	Symbol in syntax defined by the system Fixed Value: 8480-6
value[x]		0..1	Quantity	Actual component result Required Pattern: At least the following
system		1..1	uri	System that defines coded unit form Fixed Value: http://unitsofmeasure.org
code		1..1	code	Coded form of the unit Fixed Value: mm[Hg]

Discriminator element

FSH example of identifying component slices in Blood Pressure profile:

```
// Step 3: Define each slice: systolic
* component[systolic].code = $LNC#8480-6 // LNC#8480-6 distinguishes the slice
* component[systolic].value[x] only Quantity
* component[systolic].value[x] = $UCUM#mm[Hg]
```

Slicing Steps 1 - 3



```

Profile: BloodPressureProfile
Id: example-bp
Parent: Observation
Title: "Blood Pressure"
Description: "An example blood pressure profile"
* code = $LNC#85354-9

// Step 1: Define the slicing logic
* component ^slicing.discriminator.type = #pattern // or #value, #profile
* component ^slicing.discriminator.path = "code" // any FHIRPath expression
* component ^slicing.rules = #open // additional elements are ok
* component ^slicing.ordered = false // by default, array elements in any order
* component ^slicing.description = "Slice pattern for component.code" // optional

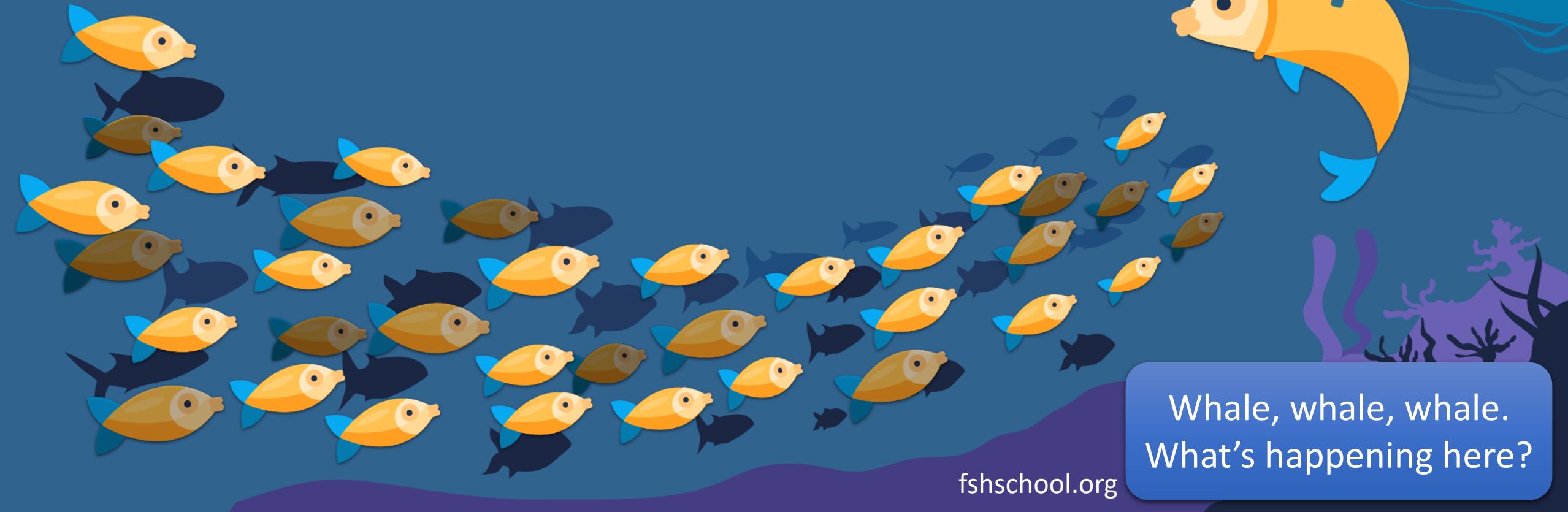
// Step 2: Identify the slices
* component contains
    systolic 1..1 and // each slice is identified by name, card, & optional flags
    diastolic 1..1 // using "and" to separate each slice identification

// Step 3: Define each slice: systolic
* component[systolic].code = $LNC#8480-6 // LNC#8480-6 distinguishes the slice
* component[systolic].value[x] only Quantity
* component[systolic].value[x] = $UCUM#mm[Hg]

// Step 3: Define each slice: diastolic
* component[diastolic].code = $LNC#8462-4 // LNC#8462-4 distinguishes the slice
* component[diastolic].value[x] only Quantity
* component[diastolic].value[x] = $UCUM#mm[Hg]

```

Mastering GoFSH



fhschool.org

Whale, whale, whale.
What's happening here?

GoFSH

Convert FHIR XML/JSON to FSH

- Command line interface
- Supports FSH 2.0
- Multiple output styles
- Common uses:
 - Kickstart an IG conversion to FSH
 - Learn about FSH through examples

```
Install: npm install -g gofsh
```



GoFSh Usage

```
> gofsh --help
Usage: goFSh [path-to-fhir-resources] [options]

Options:
  -o, --out <out>                      the path to the output folder
  -l, --log-level <level>                 specify the level of log messages: error, warn, info (default), debug
  -d, --dependency <dependency...>       specify dependencies to be loaded using format dependencyId@version (FHIR R4
                                            included by default)
  -s, --style <style>                    specify how the output is organized into files: file-per-definition (default),
                                            group-by-fsh-type, group-by-profile, single-file
  -f, --fshing-trip                     run SUSHI on the output of GoFSh and generate a comparison of the round trip
                                            results
  -i, --installed-sushi                  use the locally installed version of SUSHI when generating comparisons with the
                                            "-f" option
  -t, --file-type <type>                specify which file types GoFSh should accept as input: json-only (default),
                                            xml-only, json-and-xml
  --indent                                output FSH with indented rules using context paths
  --meta-profile <mode>                 specify how meta.profile on Instances should be applied to the InstanceOf
                                            keyword: only-one (default), first, none
  -a, --alias-file <alias-filePath>      specify an existing FSH file containing aliases to be loaded.
  --no-alias                               output FSH without generating Aliases
  -u, --useFHIRVersion <fhirVersion>     specify which FHIR version to use when it cannot be inferred
  -v, --version                            print goFSh version
  -h, --help                               display help for command
```

GoFSH Options

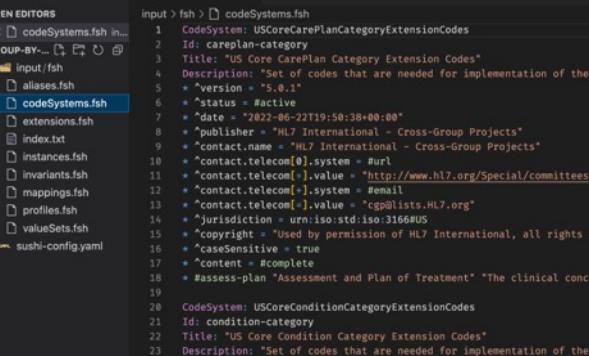
--style file-per-definition

```
USCoreBirthSexExtension.fsh - file-per-definition

input.fsh > extensions > USCoreBirthSexExtension.fsh

1 Extension: USCoreBirthSexExtension
2 Id: us-core-birthsex
3 Title: "US Core Birth Sex Extension"
4 Description: "A code classifying the person's sex assigned at birth"
5 * version = "#0.1"
6 * date = "2019-05-21"
7 * publisher = "HL7 International - Cross-Group Projects"
8 * contact.name = "HL7 International - Cross-Group Projects"
9 * contact.telecom[0].system = "#url"
10 * contact.telecom[0].value = "http://www.hl7.org/Special/committees/birthsex"
11 * contact.telecom[1].system = "#email"
12 * contact.telecom[1].value = "cpg@lists.HL7.org"
13 * jurisdiction = urn:iso:std:iso:3166#US
14 * copyright = "Used by permission of HL7 International, all rights reserved"
15 * context.type = #element
16 * context.expression = "Patient"
17 . 0..1
18 . * definition = "A code classifying the person's sex assigned at birth"
19 . * comment = "The codes required are intended to present birth sex"
20 . * isModifier = false
21 * value[x] 1..1
22 * value[x] only code
23 * value[x] from BirthSex (required)
24 * value[x] binding.description = "Code for sex assigned at birth"
```

--style group-by-fsh-type



The screenshot shows a code editor window titled "codeSystems.fsh — group-by-fsh-type". The left sidebar displays the file structure under "EXPLORER", including "OPEN EDITORS" (codeSystems.fsh), "GROUP-BY...", "input/fsh" (which contains "aliases.fsh" and "codeSystems.fsh"), and other files like "extensions.fsh", "index.txt", etc. The main pane shows the "codeSystems.fsh" file content:

```
input > fsh > codeSystems.fsh
  1 CodeSystem: USCoreCarePlanCategoryExtensionCodes
  2 Id: careplan-category
  3 Title: "US Core CarePlan Category Extension Codes"
  4 Description: "Set of codes that are needed for implementation of the US-Core CarePlan Category Extension Codes"
  5 * ^version = "5.0.1"
  6 * ^status = #active
  7 * ^date = "2022-06-22T19:50:38+00:00"
  8 * ^publisher = "HL7 International - Cross-Group Projects"
  9 * ^contact[0].name = "HL7 International - Cross-Group Projects"
  10 * ^contact.telecom[0].system = #url
  11 * ^contact.telecom[0].value = "http://www.hl7.org/Special/committees/cgp"
  12 * ^contact.telecom[1].system = #email
  13 * ^contact.telecom[1].value = "cgp@lists.HL7.org"
  14 * ^jurisdiction = urn:iso:std:iso:3166#US
  15 * ^copyright = "Used by permission of HL7 International, all rights reserved Creative Commons Attribution-NonCommercial-ShareAlike license"
  16 * ^caseSensitive = true
  17 * ^content = #complete
  18 * ^assesses-plan = "Assessment and Plan of Treatment" "The clinical conclusions and assessments made by the care plan"
  19
  20 CodeSystem: USCoreConditionCategoryExtensionCodes
  21 Id: condition-category
  22 Title: "US Core Condition Category Extension Codes"
  23 Description: "Set of codes that are needed for implementation of the US-Core Condition Category Extension Codes"
  24 * ^version = "5.0.1"
  25 * ^status = #active
  26 * ^date = "2022-06-22T19:50:38+00:00"
```

--style group-by-profile

```
USCoreMedicationProfile.fsh - group-by-profile
```

EXPLORER

OPEN EDITORS

GROUP-BY-PROFILE

- USCoreImmunizationProfile.fsh
- USCoreImplantableDeviceProfile.fsh
- USCoreLaboratoryResultObservationProfile.fsh
- USCoreLocation.fsh
- USCoreMedicationProfile.fsh
- USCoreMedicationRequestProfile.fsh
- USCoreObservationClinicalTestResultProfile.fsh
- USCoreObservationImagingProfile.fsh
- USCoreObservationSDOHAssessment.fsh
- USCoreObservationSexualOrientationProfile.fsh
- USCoreObservationSocialHistoryProfile.fsh
- USCoreObservationSurveyProfile.fsh
- USCoreOrganizationProfile.fsh
- USCorePatientProfile.fsh
- USCorePediatricBMIForAgeObservationProfile.fsh
- USCorePediatricHeadOccipitalFrontalCircumferenceObservationProfile.fsh
- USCorePediatricWeightForHeightObservationProfile.fsh

OUTLINE

TIMELINE

USCoreMedicationProfile.fsh

```
input > fsh > USCoreMedicationProfile.fsh
  Profile: USCoreMedicationProfile
  Parent: Medication
  ID: us-core-medication
  Title: "US Core Medication Profile"
  Description: "When referencing a medication, the MedicationRequest or MedicationStatement SHALL reference this profile via the 'profile' element in the 'base' element of the resource's JSON representation"
  * "version" = "5.0.1"
  * "status" = #active
  * "experimental" = false
  * "date" = "2019-05-21"
  * "publisher" = "HL7 International - Cross-Group Projects"
  * "contact.name" = "HL7 International - Cross-Group Projects"
  * "contact.telecom[0].system" = #url
  * "contact.telecom[0].value" = "http://www.hl7.org/Special/committees/pharmaceutical/medicationprofile.htm"
  * "contact.telecom[1].system" = #email
  * "contact.telecom[1].value" = "cpg@lists.HL7.org"
  * "jurisdiction" = urn:iso:std:iso:3166#US
  * "copyright" = "Used by permission of HL7 International, all rights reserved"
  * . "definition" = "|`"
  * . "comment" = "\\\""
  * . "mustSupport" = false
  code 1.. MS
  * code from $2.16.840.1.113762.1.4.1010.4 (extensible)
  instance: uscore-med1
  instance: USCoreMedicationProfile
  title: "Uscore Med1 Example"
```

--style single-file

```
resources.fsh — single-file

EXPLORER
OPEN EDITORS
resources.fsh input...
SINGLE-FILE
input.fsh
index.txt
resources.fsh
sushi-config.yaml

resources.fsh
input > fsh > resources.fsh
40 Alias: organization-type = "http://terminology.hl7.org/CodeSystem/organization-type"
41 Alias: $ICD10 = "http://www.cms.gov/Medicare/Coding/ICD10"
42 Alias: $vs-RoleCode = "http://terminology.hl7.org/CodeSystem/v3-RoleCode"
43 Alias: $us-core-provenance-participant-type = "http://hl7.org/fhir/us/core/CodeSystem-us-core-provenance-participant-type"
44 Alias: $vitalsigns = "http://hl7.org/fhir/StructureDefinition/vitalsigns"
45 Alias: $patient-genderIdentity = "http://hl7.org/fhir/StructureDefinition/patient-genderIdentity"
46 Alias: $condition-assertedDate = "http://hl7.org/fhir/StructureDefinition/condition-assertedDate"
47 Alias: $url = "http://www.hl7.org/fhir/ValueSet/2.16.840.1.113762.1.4.1186.8"
48 Alias: $url = "http://cts.nlm.nih.gov/fhir/ValueSet/2.16.840.1.113762.1.4.1999.30"
49 Alias: $url = "http://cts.nlm.nih.gov/fhir/ValueSet/2.16.840.1.113762.1.4.113762.1.4.1.113762.1.4.1999.30"
50 Alias: $url = "http://cts.nlm.nih.gov/fhir/ValueSet/2.16.840.1.113762.1.4.1.113762.1.4.1.113762.1.4.1.113762.1.4.1.1918.4"
51 Alias: $medicationrequest-status = "http://hl7.org/fhir/ValueSet/medicationrequest-status"
52 Alias: $medicationrequest-intent = "http://hl7.org/fhir/ValueSet/medicationrequest-intent"
53 Alias: $medicationrequest-category = "http://hl7.org/fhir/ValueSet/medicationrequest-category"
54 Alias: $url = "http://cts.nlm.nih.gov/fhir/ValueSet/2.16.840.1.114222.4.11.1066"
55 Alias: $url = "http://cts.nlm.nih.gov/fhir/ValueSet/2.16.840.1.113885.11.20.9.30"
56 Alias: $url = "http://cts.nlm.nih.gov/fhir/ValueSet/2.16.840.1.113762.1.4.1.1921.32"
57
58 Profile: USCorePediatricHeadOccipitalFrontalCircumferencePercentileProfile
59 Parent: USCoreVitalsignsProfile
60 Id: head-occipital-frontal-circumference-percentile
61 Title: "US Core Pediatric Head Occipital-frontal Circumference Percentile Profile"
62 Description: "To promote interoperability and adoption through common implementation"
63 * ^experimental = false
64 * ^date = "2020-11-18"
65 * ^publisher = "HL7 International - Cross-Ground Projects"
```

GoFSh Option: --fshing trip

FSHing Trip provides a *round-trip* analysis of generated FSH



FSHing Trip Comparison

Files changed (61) hide

→ {package/example → fshing-trip/fsh-generated/resources}/Bundle-66c8856b-ba11-4876-8aa8-467aad8c11a2.json	+8	-20
→ {package/example → fshing-trip/fsh-generated/resources}/Bundle-c887e62f-6166-419f-8268-b5ecd6c7b901.json	+6	-14
→ {package/example → fshing-trip/fsh-generated/resources}/Bundle-uscore-mo3.json	+1	-9
→ {package/example → fshing-trip/fsh-generated/resources}/CarePlan-colonoscopy.json	+8	-8
→ {package → fshing-trip/fsh-generated/resources}/CodeSystem-careplan-category.json	+16	-16

GoFSH: FSHing Trip Comparison

		re-ordered properties; insignificant difference	
96 97 98	<pre> "patternCodeableConcept": { "coding": [{ "system": "http://loinc.org", "code": "39156-5" }] }, { "id": "Observation.valueQuantity", "path": "Observation.valueQuantity", "min": 0, "max": "1", "mustSupport": true }, { "id": "Observation.valueQuantity.value", "path": "Observation.valueQuantity.value", "min": 1, "max": "1", "type": [{ "code": "decimal" }], "mustSupport": true } } </pre>	<p>Inherited from parent; no need to repeat</p>	
99 100 101 102 103 104			<pre> "patternCodeableConcept": { "coding": [{ "code": "39156-5", "system": "http://loinc.org" }] } } </pre>
105 106			<pre> }, { "id": "Observation.valueQuantity", "path": "Observation.valueQuantity", "min": 0, "max": "1", "type": [{ "code": "Quantity", "extension": [{ "url": "http://hl7.org/fhir/StructureDefinition/elementdefinition-valueBoolean" }] }], "mustSupport": true } </pre>
107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122		<p>same as base resource; not needed in differential</p>	<p>Best practice is to explicitly specify type in type slices</p>

GoFISH: FSHing Trip Comparison



Missing a whole slice?
That could be a problem...

Betta
Investigate!

```
107      {
108      "id": "Observation.category:us-core/social-history",
109      "path": "Observation.category",
110      "sliceName": "us-core/social-history",
111      "requirements": "Used for filtering that this is a social history observa
112      "min": 1,
113      "max": "1",
114      "patternCodeableConcept": {
115          "coding": [
116              {
117                  "system": "http://terminology.hl7.org/CodeSystem/observation-catego
118                  "code": "social-history"
119              }
120          ],
121      },
122      "mustSupport": true
123  },
124  {
125      "id": "Observation.category:sdoh",
126      "path": "Observation.category",
```

```
114      {
115          "id": "Observation.category:sdoh",
116          "path": "Observation.category",
```

GoFISH *did* emit an error that hinted there might be an issue here:

error Element sliceName "us-core/social-history" is not correctly used to populate id "Observation.category:us-core/social-history" according to the algorithm specified here: <https://www.hl7.org/fhir/elementdefinition.html#id>. The value implied by the id will be used.

And so did SUSHI:

error No element found at path category[us-core] for ContainsRule in USCoreObservationSocialHistoryProfile, skipping rule
File: /Users/cmoesel/dev/HL7/uscore-501/fshing-trip/input/fsh/profiles/USCoreObservationSocialHistoryProfile.fsh
Line: 24

GoFSHing Tips

- GoFSH works best when provided clean input
 - Ideally, no (or few) errors in the IG's QA report
 - Preferably, from a downloaded package or IG /output folder
 - If possible, use packages that contain profiles' snapshots
 - If possible, avoid duplicate files and non-FHIR XML/JSON files
- GoFSH or SUSHI may find problems in the original source
- GoFSH is not perfect
 - Always review the generated FSH and final outputs
 - Consider optimizing FSH (e.g., reduce redundancy w/ RuleSets)

GoFISH in a Hurry

FSH ONLINE
Powered by SUSHI v2.10.1 and GoFISH v1.6.5

FSH Examples Convert to JSON ► Convert to FSH  Save All Configuration

Profiles + New JSON Editor bodyweight

FSH

```

1 Alias: $vitalsigns = http://hl7.org/fhir/StructureDefinition/vitalsigns
2
3 Profile: observation-bodyweight
4 Parent: $vitalsigns
5 Id: bodyweight
6 Title: "Observation Body Weight Profile"
7 Description: "FHIR Body Weight Profile"
8 * extension[0].url = "http://hl7.org/fhir/StructureDefinition/structuredefinition-summary"
9 * extension[0].valueMarkdown = "### Complete Summary of the Mandatory Requirements\r\ncode"
10 * extension[0].valueInteger = 5
11 * extension[0].url = "http://hl7.org/fhir/StructureDefinition/structuredefinition-fmm"
12 * extension[0].valueCode = "#oo"
13 * extension[0].url = "http://hl7.org/fhir/StructureDefinition/structuredefinition-wg"
14 * extension[0].valueCode = "#trial-use"
15 * extension[0].valueCode = "#draft"
16 * status = "draft"
17 * experimental = false
18 * date = "2018-08-11"
19 * publisher = "Health Level Seven International (Orders and Observations Workgroup)"
20 * contact.telecom.system = "#url"
21 * contact.telecom.value = "http://www.hl7.org/Special/committees/orders/index.cfm Orders and Observations"
22 * . 0..*
23 * . short = "FHIR Body Weight Profile"
24 * . definition = "This profile defines how to represent body weight observations in FHIR using a code"
25 * code ^short = "Body Weight"
26 * code ^definition = "Body Weight."
27 * code ^comment = "additional codes that translate or map to this code are allowed. For example a code.alias[0] = "Test"
28 * code.alias[0] = "Name"
29 * code.coding ~slicing.discriminator[0].type = #value
30 * code.coding ~slicing.discriminator[0].path = "code"
31 * code.coding ~slicing.discriminator[0].type = #value
32 * code.coding ~slicing.discriminator[0].path = "system"
33 * code.coding ~slicing.ordered = false
34 * code.coding ~slicing.rules = #open
35 * code.coding contains BodyWeightCode 1..1
36 * code.coding[BodyWeightCode].system 1..1
37 * code.coding[BodyWeightCode].system only uri
38 * code.coding[BodyWeightCode].system = "http://loinc.org" (exactly)
39 * code.coding[BodyWeightCode].code 1..1
40 * code.coding[BodyWeightCode].code only code
41 * code.coding[BodyWeightCode].code = "#29463-7" (exactly)
42 * valueQuantity.value 1..1 MS
43 * valueQuantity.value only decimal
44 * valueQuantity.unit 1..1 MS
45 * valueQuantity.unit only string
46 * valueQuantity.system 1..1 MS
47 * valueQuantity.system only uri
48 * valueQuantity.system = "http://unitsofmeasure.org" (exactly)
49 * valueQuantity.code 1..1 MS
50 * valueQuantity.code only code
51 * valueQuantity.code from http://hl7.org/fhir/ValueSet/uicom-bodyweight|4.0.1 (required)
52 * valueQuantity.code short = "Coded responses from the common UCUM units for vital signs value set"
53 * valueQuantity.code definition = "Coded responses from the common UCUM units for vital signs value set"
54 * valueQuantity.code binding.extension.url = "http://hl7.org/fhir/StructureDefinition/elementdefinition-binding-x-codesystem-uri"
55 * valueQuantity.code binding.extension.valueString = "BodyWeightUnits"
56 * valueQuantity.code binding.description = "Common UCUM units for Body Weight."
57 * valueQuantity.code binding.description = "Common UCUM units for Body Weight."

```

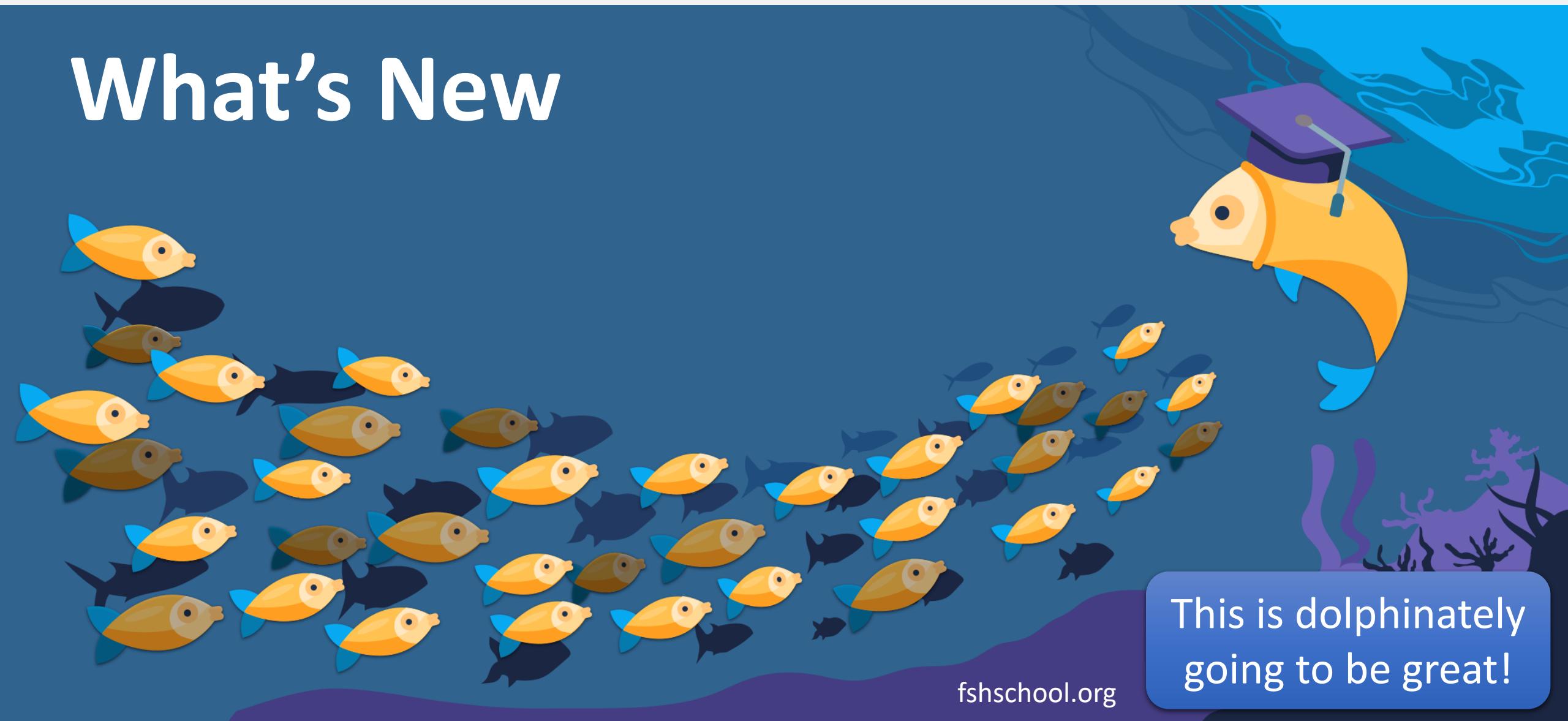
FHIR JSON: bodyweight

```

1 +
2   "resourceType" : "StructureDefinition",
3   "id" : "bodyweight",
4   "text" : {
5     "status" : "generated",
6     "div" : "<div xmlns='http://www.w3.org/1999/xhtml'>to do</div>"
7   },
8   "extension" : [
9     {
10       "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-summary",
11       "valueMarkdown" : "### Complete Summary of the Mandatory Requirements\r\ncode"
12     },
13     {
14       "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-fmm",
15       "valueInteger" : 5
16     },
17     {
18       "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-wg",
19       "valueCode" : "#oo"
20     },
21     {
22       "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-standards-status",
23       "valueCode" : "trial-use"
24     },
25     {
26       "url" : "http://hl7.org/fhir/StructureDefinition/bodyweight",
27       "version" : "4.0.1",
28       "name" : "observation-bodyweight",
29       "title" : "Observation Body Weight Profile",
30       "status" : "draft",
31       "experimental" : false,
32       "date" : "2018-08-11",
33       "publisher" : "Health Level Seven International (Orders and Observations Workgroup)",
34       "contact" : [
35         {
36           "telecom" : [
37             {
38               "system" : "url",
39               "value" : "http://www.hl7.org/Special/committees/orders/index.cfm Orders and Observations"
40             }
41           ],
42           "description" : "FHIR Body Weight Profile",
43           "fhirVersion" : "4.0.1",
44           "mapping" : [
45             {
46               "identity" : "workflow",
47               "url" : "http://hl7.org/fhir/workflow",
48               "name" : "Workflow Pattern"
49             },
50             {
51               "identity" : "sct-concept",
52               "url" : "http://snomed.info/conceptdomain",
53               "name" : "SNOMED CT Concept Domain Binding"
54             },
55             {
56               "identity" : "v2",
57               "url" : "http://hl7.org/v2",
58               "name" : "HL7 v2 Mapping"
59             },
60             {
61               "identity" : "rim",
62               "url" : "http://hl7.org/v3",
63               "name" : "HL7 Mapping"
64             }
65           ]
66         }
67       ],
68       "code" : [
69         {
70           "alias" : "Test"
71         }
72       ],
73       "alias" : [
74         "Name"
75       ],
76       "coding" : [
77         {
78           "system" : "http://loinc.org"
79         }
80       ],
81       "slicing" : {
82         "discriminator" : [
83           {
84             "path" : "code"
85           }
86         ],
87         "ordered" : false
88       }
89     }
90   ]
91 
```

Console Problems ①

What's New



fhschool.org

This is dolphinately
going to be great!

FSH 3.0: Instances of Logical Models

```

Logical:      Human
Id:          Human
Characteristics: #can-be-target
Title:        "Human Being"
Description:   "A member of the Homo sapiens species."
* name 0...* SU HumanName "Name(s) of the human"
* birthDate 0..1 SU dateTime "The date of birth, if known"
* deceased[x] 0..1 SU boolean or dateTime or Age "Is the human deceased?"
* family 0..1 BackboneElement "The human's family"
  * mother 0..2 FamilyMember "The human's mother (biological/adoptive)"
  * father 0..2 FamilyMember "The human's father (biological/adoptive)"
  * sibling 0...* FamilyMember "The human's siblings"

Logical:      FamilyMember
Id:          FamilyMember
Title:        "Family Member"
Description:   "A reference to a family member."
* human 1..1 SU Reference(Human) "The family member"
* biological 0..1 boolean "Biologically related?"

Instance: Bob
InstanceOf: Human
Title:        "Human Bob"
Description:   "Bob is a Human"
* name
  * given = "Bob"
  * family = "Robertson"
* birthDate = "2000-10-10"
* family
  * mother
    * human = Reference(Sue)
    * biological = true
  * father
    * human = Reference(Jim)
    * biological = true

```

2.3.1 Example Binary: Human Bob

This content is an example of the [Human Being](#) Logical Model and is not a FHIR Resource

```
{
  "resourceType": "http://example.org/StructureDefinition/Human",
  "name": [
    {
      "given": [
        "Bob"
      ],
      "family": "Robertson"
    }
  ],
  "family": [
    "mother": [
      {
        "human": {
          "reference": "Sue"
        },
        "biological": true
      }
    ],
    "father": [
      {
        "human": {
          "reference": "Jim"
        },
        "biological": true
      }
    ]
  ],
  "birthDate": "2000-10-10"
}
```

FSH 3.0: Extension Context

2.1.5.1.2 Context

Extensions are always defined against some particular context - which elements they can extend. There are three different ways to specify which elements an extension can be found on:

Code	Context type	Context format	Examples
fhirpath	A FHIRPath expression that selects the set of elements on which the extension can appear	The FHIRPath statement always starts from the root of the resource that might contain the element	Condition (Condition Observation).code
element	Formal Element Id for the element	Element Ids are unique within the base specification, and within a structure definition. The full path for the element is [url]#[elementid]. If there is no #, the Element id is one defined in the base specification	Address.part.value http://hl7.org/fhir/StructureDefinition/restrate#Observation.category:vscat.coding
extension	Another extension	The canonical URL of the extension, optionally followed by #code for extension that appear within a complex extension	http://hl7.org/fhir/StructureDefinition/device-din

Extensions SHALL only be used on a target that appears in their context list.

FSH 2.0: Use caret rules

```
Extension: ObsBodyPosition
Id: observation-bodyPosition
Title: "Observation Body Position"
* ^context[0].type = #element
* ^context[=].expression = "Observation"
* ^context[+].type = #element
* ^context[=].expression = "Specimen.collection"
* value[x] 1..
* value[x] only CodeableConcept
```

FSH 3.0: Use Context keyword

```
Extension: ObsBodyPosition
Id: observation-bodyPosition
Context: Observation, Specimen.collection
Title: "Observation Body Position"
* value[x] 1..
* value[x] only CodeableConcept
```

- Enclose fhirpath in quotes
- Use unquoted names, ids, or URLs for resources
- Use FSH paths to target specific elements

FSH 3.0: Invariant Rules

FSH 2.0: All Keywords

```
Invariant: us-core-5
Description: "SHOULD have a translation to the NDC value set"
Severity: #warning
Expression: "vaccineCode.coding.where(system='http://hl7.org/fhir/sid/ndc').empty()"
XPath: "not(exists(f:vaccineCode/f:coding/f:system[@value='http://hl7.org/fhir/sid/ndc']))"
```

FSH 3.0: Keywords or Rules (including extensions)

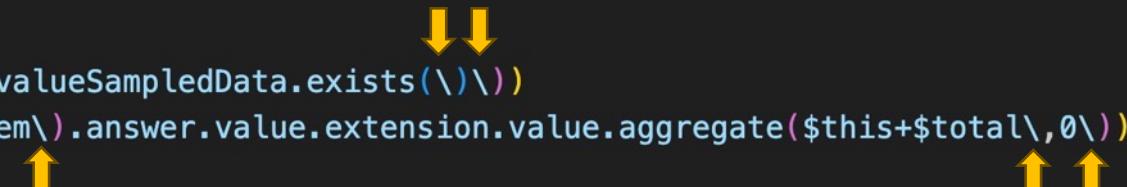
```
Alias: $bestpractice = http://hl7.org/fhir/StructureDefinition/elementdefinition-bestpractice

Invariant: us-core-5
Description: "SHOULD have a translation to the NDC value set"
* severity = #warning
* expression = "vaccineCode.coding.where(system='http://hl7.org/fhir/sid/ndc').empty()"
* xpath = "not(exists(f:vaccineCode/f:coding/f:system[@value='http://hl7.org/fhir/sid/ndc']))"
* extension[$bestpractice].valueBoolean = true
```

FSH 3.0: Escape from Escaping

FSH 2.0: You must *always* escape) and , in RuleSet parameters

```
Instance: MyTest
InstanceOf: TestScript
Title: "My Test Script"
Description: "A small test with a few FHIRPath expressions"
// some rules
* insert AddVariableToTestScript(firstObservation, component.all(valueSampledData.exists(\)\)))
* insert AddVariableToTestScript(testResponse, resource.repeat(item\).answer.value.extension.value.aggregate($this+$total\,0\))
// more rules
```



FSH 3.0: Enclose parameters in [[]] to avoid escaping (friendlier for FHIRPath)

```
Instance: MyTest
InstanceOf: TestScript
Title: "My Test Script"
Description: "A small test with a few FHIRPath expressions"
// some rules
* insert AddVariableToTestScript(firstObservation, [[component.all(valueSampledData.exists())]])
* insert AddVariableToTestScript(testResponse, [[resource.repeat(item).answer.value.extension.value.aggregate($this+$total,0)]])
// more rules
```



SUSHI 2.0 and 3.0: Default Slice Ordering

```

Profile: IdentifiablePractitioner
Parent: Practitioner
Title: "Identifiable Practitioner"
Description: "A practitioner with an NPI and SSN"
* identifier ^slicing.discriminator.type = #value
* identifier ^slicing.discriminator.path = "system"
* identifier ^slicing.rules = #open
* identifier ^slicing.description = "Slice by system"
* identifier contains npi 1..1 and ssn 1..1
* identifier[npi].system 1..1
* identifier[npi].system = "http://hl7.org/fhir/sid/us-npi"
* identifier[ssn].system 1..1
* identifier[ssn].system = "http://hl7.org/fhir/sid/us-ssn"

Instance: PractitionerSally
InstanceOf: IdentifiablePractitioner
* identifier[ssn].value = "123-45-6789"
* identifier[npi].value = "0246813579"

Instance: PractitionerSallyIndexed
InstanceOf: IdentifiablePractitioner
* identifier[0].system = "http://hl7.org/fhir/sid/us-ssn"
* identifier[0].value = "123-45-6789"
* identifier[1].system = "http://hl7.org/fhir/sid/us-npi"
* identifier[1].value = "0246813579"

Instance: PractitionerSallyExtra
InstanceOf: IdentifiablePractitioner
* identifier[npi].value = "0246813579"
* identifier[ssn].value = "123-45-6789"
* identifier[+].system = "http://example.org/customid"
* identifier[=].value = "9999999"

```

PractitionerSally

```

"identifier": [
  {
    "system": "http://hl7.org/fhir/sid/us-npi",
    "value": "0246813579"
  },
  {
    "system": "http://hl7.org/fhir/sid/us-ssn",
    "value": "123-45-6789"
  }
]

```



Slices in profile order, not instance order.

PractitionerSallyIndexed

```

"identifier": [
  {
    "system": "http://hl7.org/fhir/sid/us-npi",
    "value": "123-45-6789"
  },
  {
    "system": "http://hl7.org/fhir/sid/us-ssn",
    "value": "0246813579"
  }
]

```



WARN Sliced element Practitioner.identifier is being accessed via numeric index. Use slice names in rule paths when possible.

Slices in instance order, but values swapped.

PractitionerSallyExtra

```

"identifier": [
  {
    "system": "http://hl7.org/fhir/sid/us-npi",
    "value": "0246813579"
  },
  {
    "system": "http://hl7.org/fhir/sid/us-ssn",
    "value": "123-45-6789"
  }
]

```



WARN Sliced element Practitioner.identifier is being accessed via numeric index. Use slice names in rule paths when possible.

Extra custom identifier is missing.

SUSHI 3.0: w/ instanceOptions > manualSliceOrdering: true

```

Profile: IdentifiablePractitioner
Parent: Practitioner
Title: "Identifiable Practitioner"
Description: "A practitioner with an NPI and SSN"
* identifier ^slicing.discriminator.type = #value
* identifier ^slicing.discriminator.path = "system"
* identifier ^slicing.rules = #open
* identifier ^slicing.description = "Slice by system"
* identifier contains npi 1..1 and ssn 1..1
* identifier[npi].system 1..1
* identifier[npi].system = "http://hl7.org/fhir/sid/us-npi"
* identifier[ssn].system 1..1
* identifier[ssn].system = "http://hl7.org/fhir/sid/us-ssn"

Instance: PractitionerSally
InstanceOf: IdentifiablePractitioner
* identifier[ssn].value = "123-45-6789"
* identifier[npi].value = "0246813579"

Instance: PractitionerSallyIndexed
InstanceOf: IdentifiablePractitioner
* identifier[0].system = "http://hl7.org/fhir/sid/us-ssn"
* identifier[0].value = "123-45-6789"
* identifier[1].system = "http://hl7.org/fhir/sid/us-npi"
* identifier[1].value = "0246813579"

Instance: PractitionerSallyExtra
InstanceOf: IdentifiablePractitioner
* identifier[npi].value = "0246813579"
* identifier[ssn].value = "123-45-6789"
* identifier[+].system = "http://example.org/customid"
* identifier[=].value = "9999999"

```

PractitionerSally

```

"identifier": [
  {
    "system": "http://hl7.org/fhir/sid/us-ssn",
    "value": "123-45-6789"
  },
  {
    "system": "http://hl7.org/fhir/sid/us-npi",
    "value": "0246813579"
  }
]

```



PractitionerSallyIndexed

```

"identifier": [
  {
    "system": "http://hl7.org/fhir/sid/us-ssn",
    "value": "123-45-6789"
  },
  {
    "system": "http://hl7.org/fhir/sid/us-npi",
    "value": "0246813579"
  },
  {
    "system": "http://hl7.org/fhir/sid/us-npi"
  },
  {
    "system": "http://hl7.org/fhir/sid/us-ssn"
  }
]

```



PractitionerSallyExtra

```

"identifier": [
  {
    "system": "http://hl7.org/fhir/sid/us-npi",
    "value": "0246813579"
  },
  {
    "system": "http://hl7.org/fhir/sid/us-ssn",
    "value": "123-45-6789"
  },
  {
    "system": "http://example.org/customid",
    "value": "9999999"
  }
]

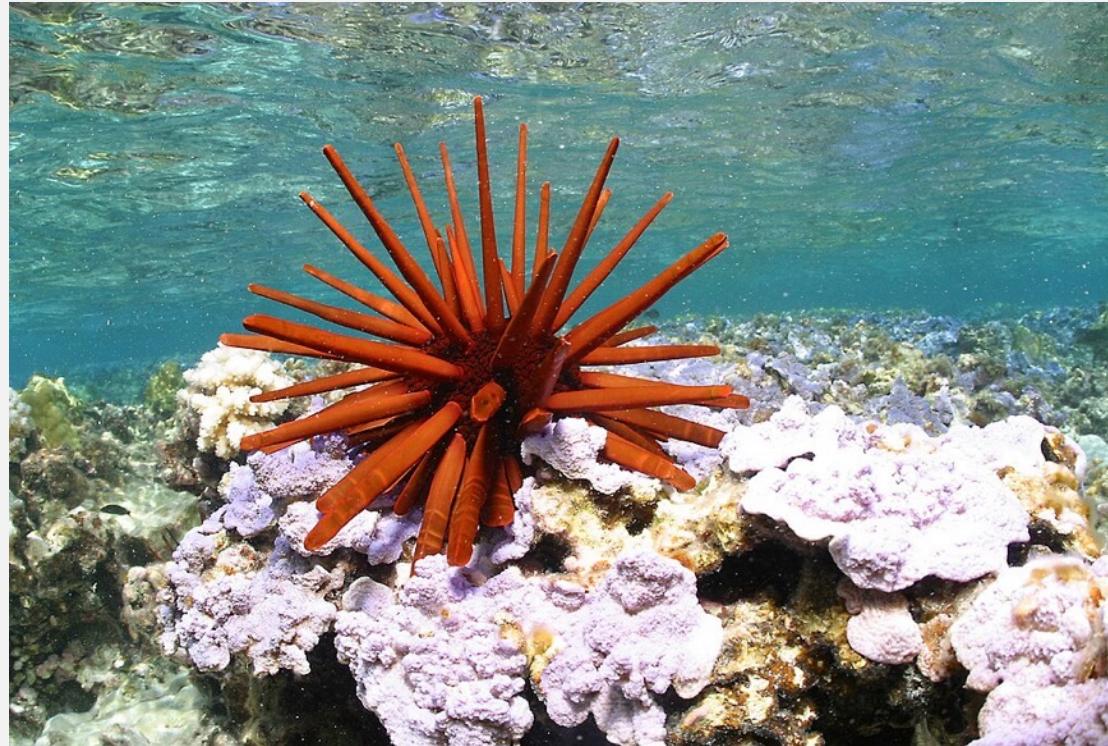
```



Indexed identifiers in requested order, but...

Extra slices without values added at end.

SUSHI 3.0: More Puns!



"File:Red pencil urchin - Papahānaumokuākea.jpg" by U.S. Fish & Wildlife Service - Pacific Region's is licensed under [CC BY 2.0](#).

Over 30 new puns, including:

- You really made a splash!
- Swish! Nothing but fishnet.
- Having a sinking feeling?
- You're up to urchin in mistakes.

Download SUSHI 3.0 for more!

Q&A



Contact Chris Moesel

- Whova App – Speaker's Gallery
- Email: cmoesel@mitre.org
- <https://chat.fhir.org>



So long and thanks
for all the FSH!

[Bottlenose Dolphin](#), CC0 1.0 via Wikimedia Commons

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