Omnis on FHIR®

ODC 2024

HL7® FHIR®

omnis studio

Pre-Requisites for Code Along

- Docker Desktop
  https://www.docker.com/products/docker-desktop/
- Image
  docker pull hapiproject/hapi:latest
- Github
  https://github.com/advancedconcepts/Omnis-FHIR

About Me

- Stefan Csomor csomor@advanced.ch
- Using Omnis since 1986
- Medical Doctor & Ba CS
- Snomed & FHIR

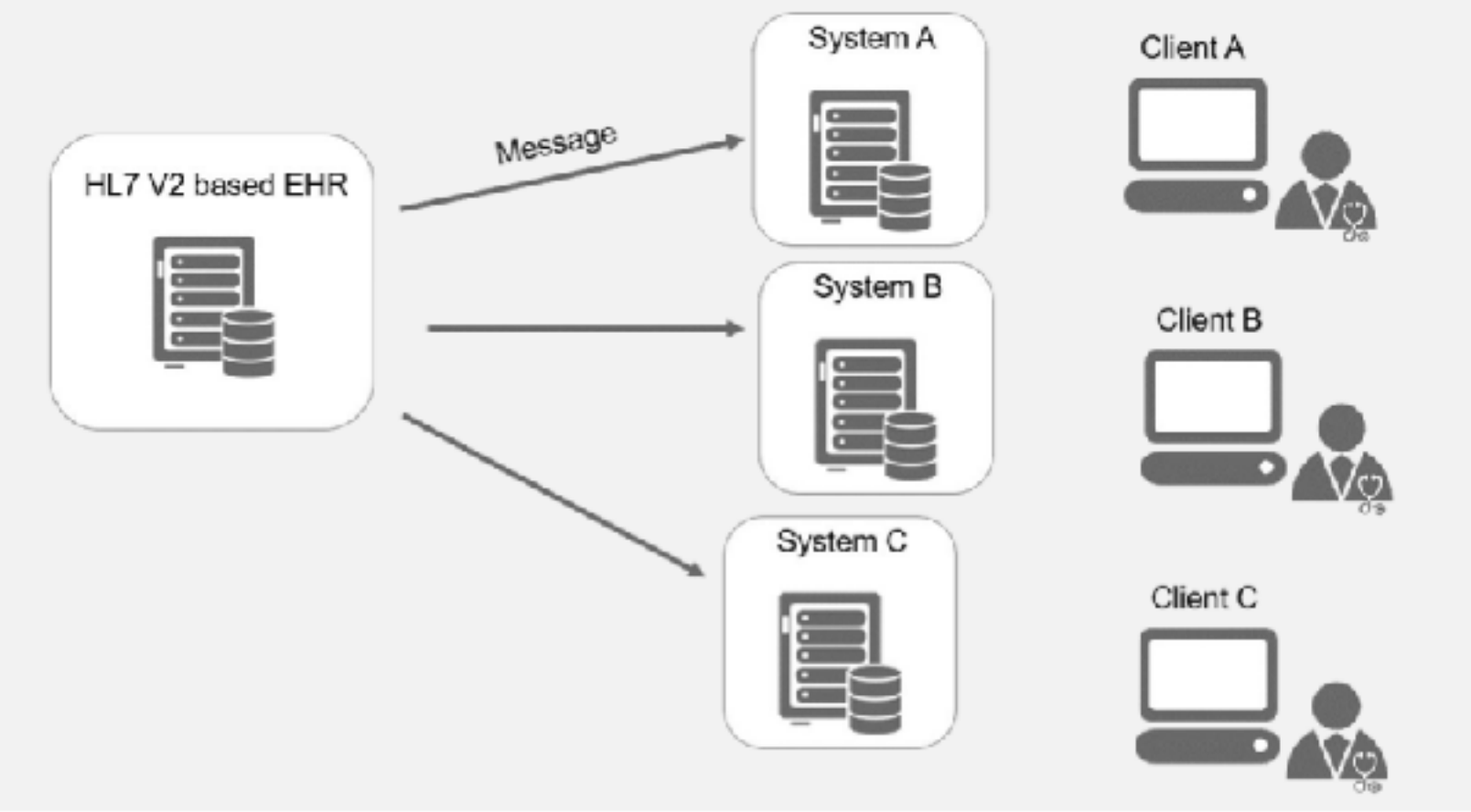
Agenda

- Short Introduction to FHIR
- Omnis Code with Examples
- Code / Demo
- Q&A

Short Introduction to

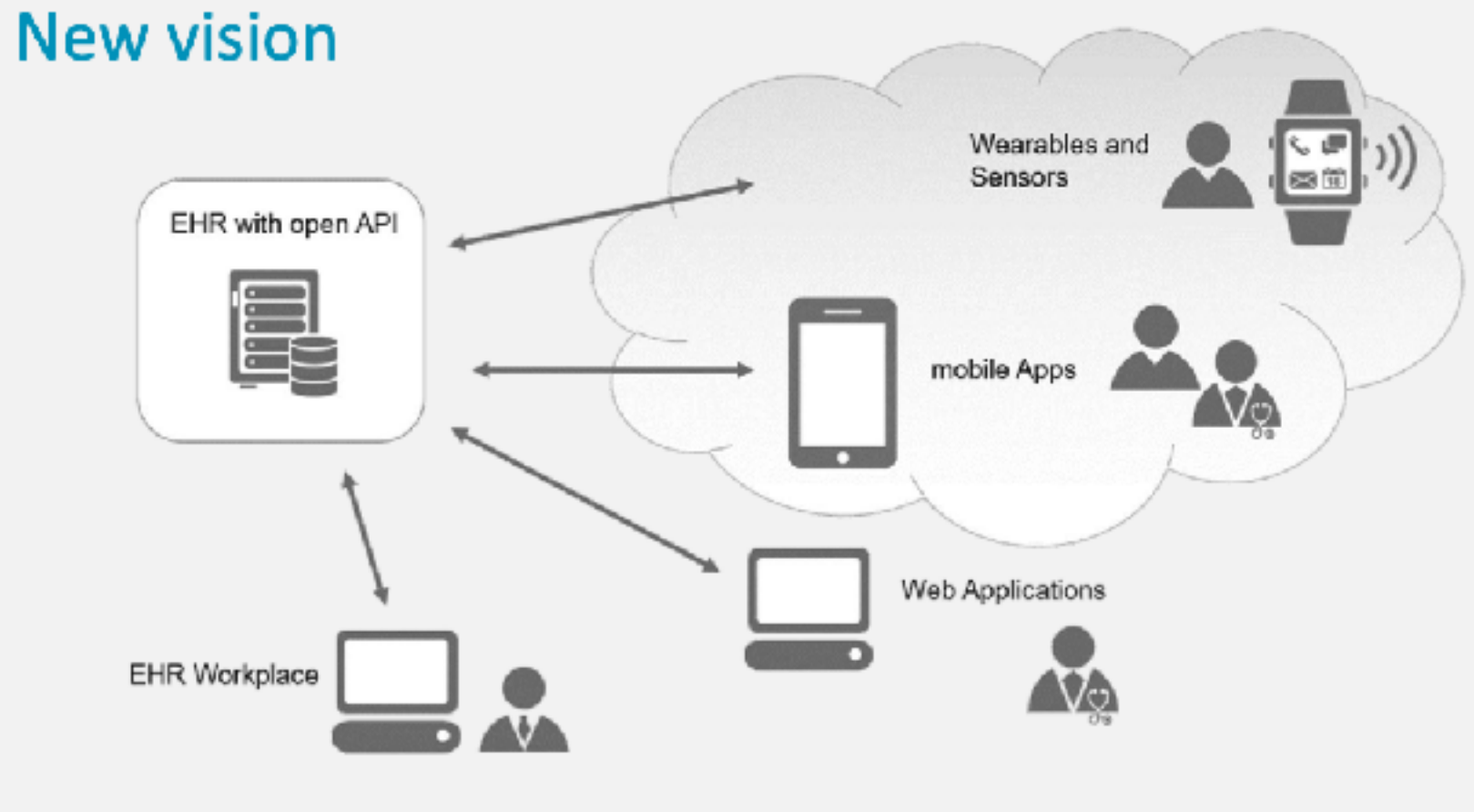
https://www.hl7.org/fhir

History – Data Push / HL7 Messages



State of the Art

- Cloud based
- Query driven
- Open API
- JSON (+XML)
- HTTP/REST



FHIR®

- **F**ast
  - Low Barrier of Entry / Implementors in mind
- **H**ealthcare
  - Domain
- **I**nteroperability
  - Not Modelling but Interchange
- **R**esources
  - Building blocks

FHIR Versions

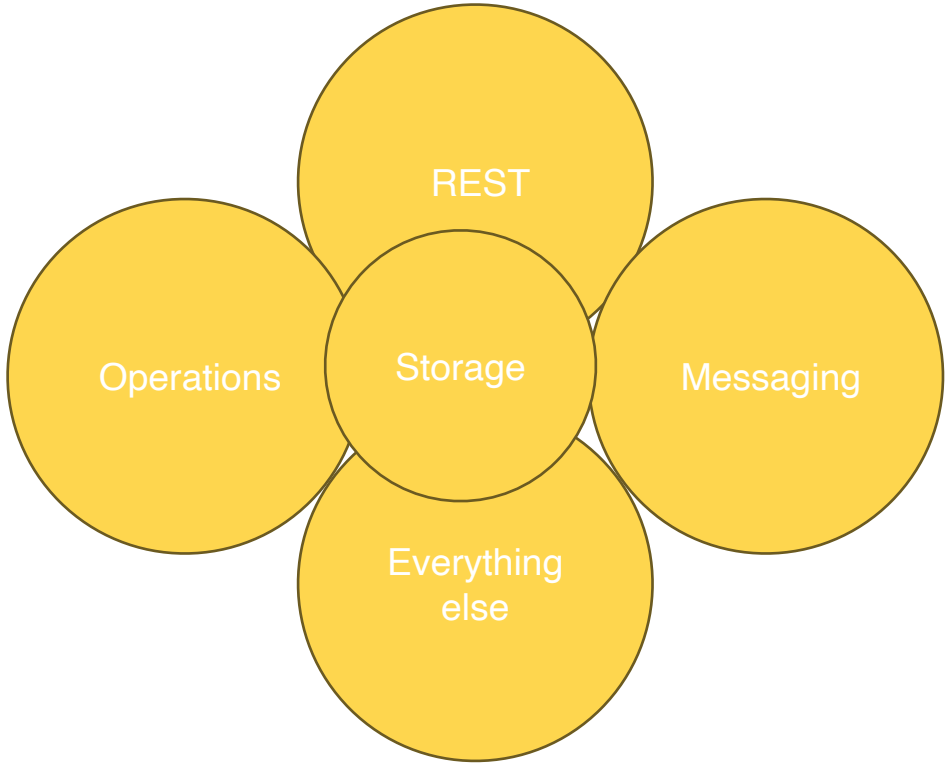
Mar 26, 2023	**Release 5** (Trial use - see below for discussion)
May 28, 2022	**Release 4B**: Staging release of modifications in specific areas
Dec 27, 2018	**Release 4** (1st Normative Content + Trial Use Developments)
Feb 21, 2017	Release 3 (**STU** - Standard for Trial Use)
Oct 24, 2015	**DSTU2** (Second Draft Standard for Trial Use)
Sept 30, 2014	**DSTU1** (First Draft Standard for Trial Use)

FHIR Manifesto

- For Implementors
- 80/20 % Rule
- Established Web-based Technologies
- Human Readable (JSON at least ;-)
- Strong Community

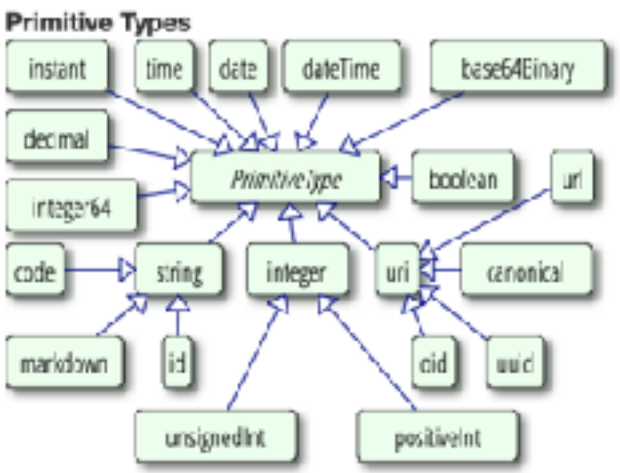
Exchange

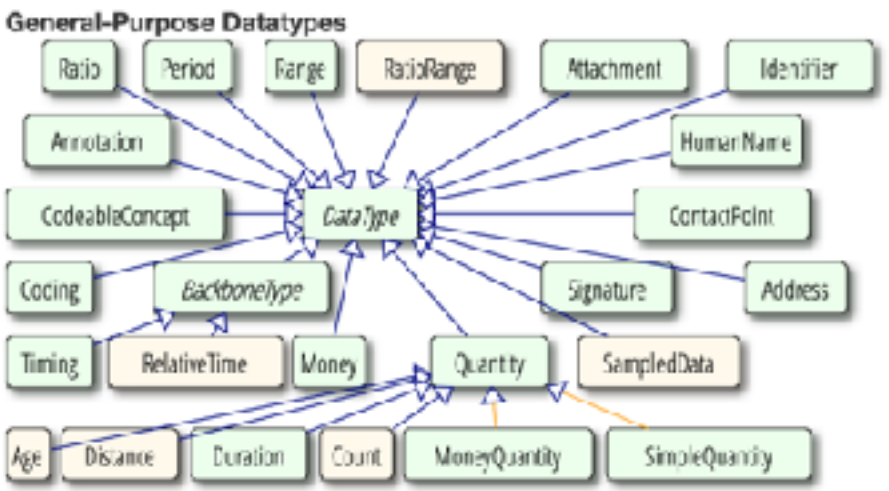
- REST most widely used
- But other possible
- FHIR data the same

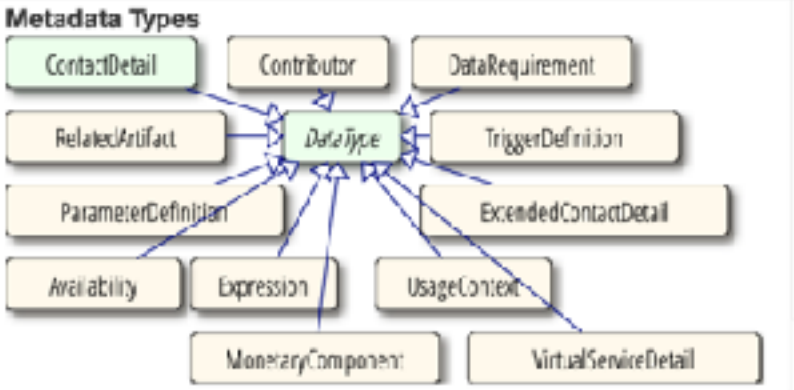


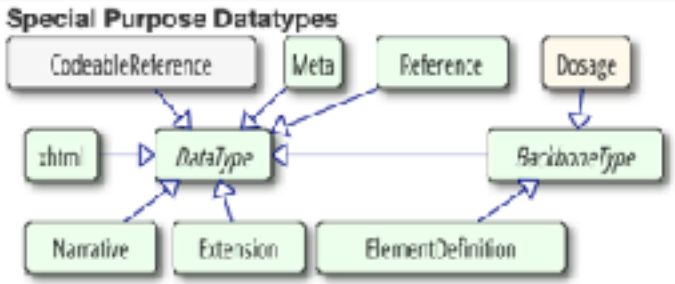
Lego Bricks for building Resources

- Simple/Primitive
  - Single Value
  - Lower Case
- Datatypes
  - Composed

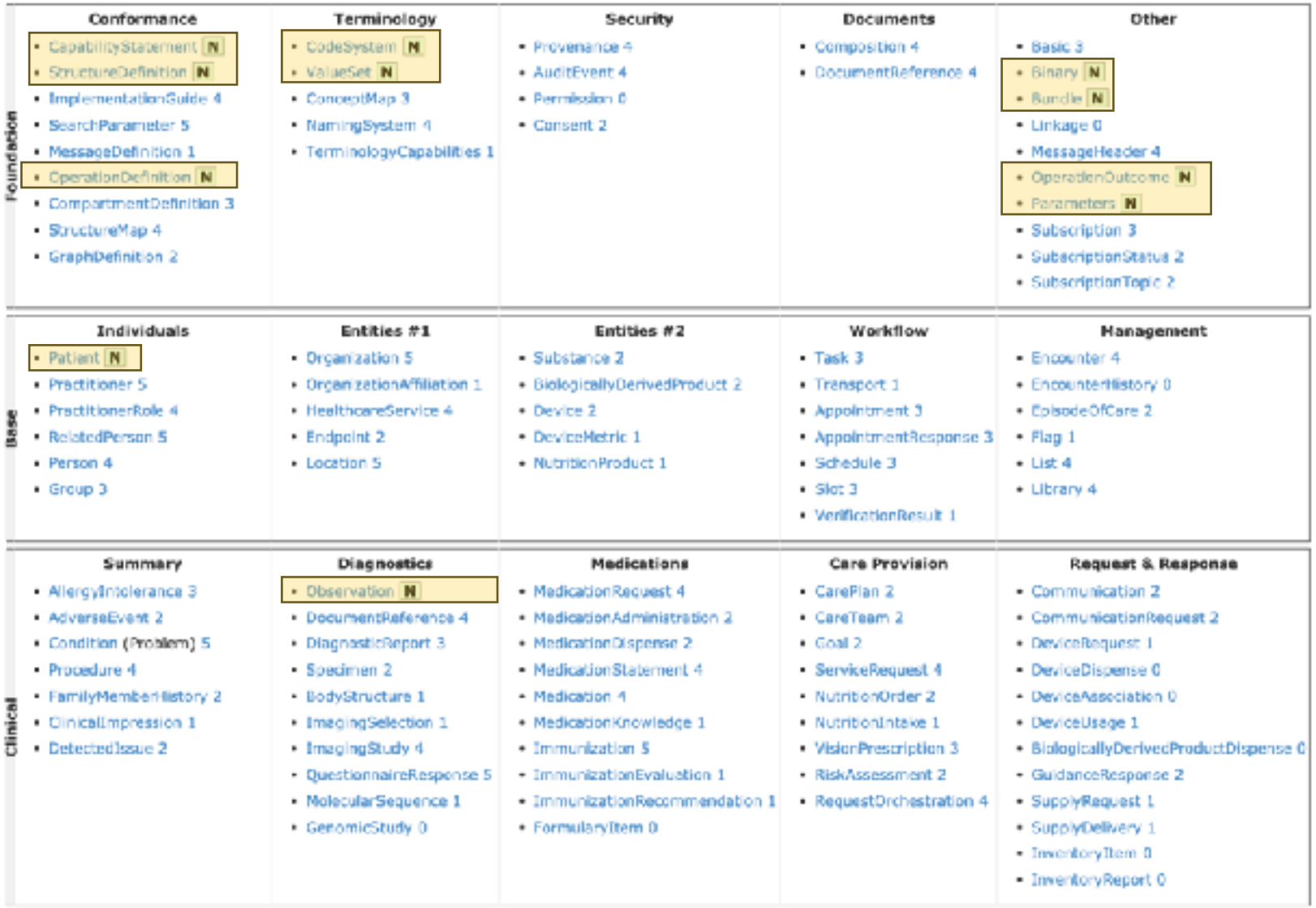








Resources http://hl7.org/fhir/resourcelist.html



Foundation

Conformance	Terminology	Security	Documents	Other
• CapabilityStatement N	• CodeSystem N	• Provenance 4	• Composition 4	• Basic 3
• StructureDefinition N	• ValueSet N	• AuditEvent 4	• DocumentReference 4	• Binary N
• ImplementationGuide 4	• ConceptMap 3	• Permission 0		• Bundle N
• SearchParameter 5	• NamingSystem 4	• Consent 2		• Linkage 0
• MessageDefinition 1	• TerminologyCapabilities 1			• MessageHeader 4
• OperationDefinition N				• OperationOutcome N
• CompartmentDefinition 3				• Parameters N
• StructureMap 4				• Subscription 3
• GraphDefinition 2				• SubscriptionStatus 2
				• SubscriptionTopic 2

Base

Individuals	Entities #1	Entities #2	Workflow	Management
• Patient N	• Organization 5	• Substance 2	• Task 3	• Encounter 4
• Practitioner 5	• OrganizationAffiliation 1	• BiologicallyDerivedProduct 2	• Transport 1	• EncounterHistory 0
• PractitionerRole 4	• HealthcareService 4	• Device 2	• Appointment 3	• EpisodeOfCare 2
• RelatedPerson 5	• Endpoint 2	• DeviceMetric 1	• AppointmentResponse 3	• Flag 1
• Person 4	• Location 5	• NutritionProduct 1	• Schedule 3	• List 4
• Group 3			• Slot 3	• Library 4
			• VerificationResult 1	

Clinical

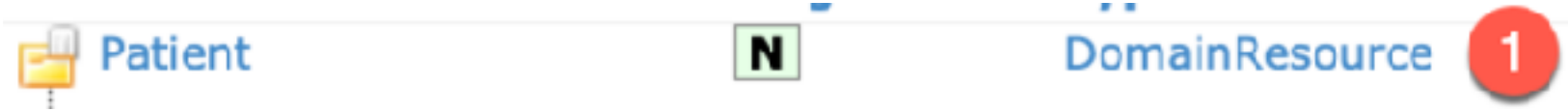
Summary	Diagnostics	Medications	Care Provision	Request & Response
• AllergyIntolerance 3	• Observation N	• MedicationRequest 4	• CarePlan 2	• Communication 2
• AdverseEvent 2	• DocumentReference 4	• MedicationAdministration 2	• CareTeam 2	• CommunicationRequest 2
• Condition (Problem) 5	• DiagnosticReport 3	• MedicationDispense 2	• Goal 2	• DeviceRequest 1
• Procedure 4	• Specimen 2	• MedicationStatement 4	• ServiceRequest 4	• DeviceDispense 0
• FamilyMemberHistory 2	• BodyStructure 1	• Medication 4	• NutritionOrder 2	• DeviceAssociation 0
• ClinicalImpression 1	• ImagingSelection 1	• MedicationKnowledge 1	• NutritionIntake 1	• DeviceUsage 1
• DetectedIssue 2	• ImagingStudy 4	• Immunization 5	• VisionPrescription 3	• BiologicallyDerivedProductDispense 0
	• QuestionnaireResponse 5	• ImmunizationEvaluation 1	• RiskAssessment 2	• GuidanceResponse 2
	• MolecularSequence 1	• ImmunizationRecommendation 1	• RequestOrchestration 4	• SupplyRequest 1
	• GenomicStudy 0	• FormularyItem 0		• SupplyDelivery 1
				• InventoryItem 0
				• InventoryReport 0

Resource Descriptions

eg https://hl7.org/fhir/patient.html

Name	Flags	Card.	Type	Description & Constraints
Patient	N		DomainResource (1)	Information about an individual or animal receiving health care services
		(2)		Elements defined in Ancestors: id, meta, implicitRules, language, text, contained, extension, modifierExtension
identifier	Σ	0..*	Identifier	An identifier for this patient
active (3)	?! Σ	0..1	boolean	Whether this patient's record is in active use
name (4)	Σ	0..*	HumanName	A name associated with the patient
telecom	Σ	0..*	ContactPoint	A contact detail for the individual
gender	Σ	0..1	code	male | female | other | unknown Binding: AdministrativeGender (Required)
birthDate	Σ	0..1	date	The date of birth for the individual
deceased[x] (5)	?! Σ	0..1		Indicates if the individual is deceased or not
deceasedBoolean			boolean	
deceasedDateTime			dateTime	
address	Σ	0..*	Address	An address for the individual
maritalStatus		0..1	CodeableConcept	Marital (civil) status of a patient Binding: Marital Status Codes (Extensible)

Inheritance



Name	Flags	Card.	Type
DomainResource	«A» N		Resource
text	C	0..1	Narrative
contained	C	0..*	Resource
extension		0..*	Extension
modifierExtension	?! Σ	0..*	Extension

Name	Flags	Card.	Type
Resource	«A» N		Base
id	Σ	0..1	id
meta	Σ	0..1	Meta
implicitRules	?! Σ	0..1	uri
language		0..1	code

```
{
  "resourceType": "Patient",
  "id": "example",
  "meta": {
    "profile": [
      "http://hl7.org/fhir/us/core/StructureDefinition/us-core-patient"
    ]
  },
  "text": {
    "status": "generated",
    "div": "<div xmlns=\"http://www.w3.org/1999/xhtml\"><p><b>Amy V. Baxter </b> female,DoB:
    1987-02-20 ( Medical Record Number: 1032702 (USUAL))</p></div>"
  },
  "extension": [{
    "url": "http://hl7.org/fhir/us/core/StructureDefinition/us-core-genderIdentity",
    "valueCodeableConcept": {
      "coding": [{
        "system": "http://terminology.hl7.org/CodeSystem/v3-NullFlavor",
        "code": "ASKU",
        "display": "asked but unknown"
      }],
      "text": "asked but unknown"
    }
  }],
  "identifier": [{
    "system": "http://hospital.smarthealthit.org",
    "value": "1032702"
  }],
  "active": true,
  "name": [{
    "family": "Baxter",
    "given": [
      "Amy",
```


Metadata

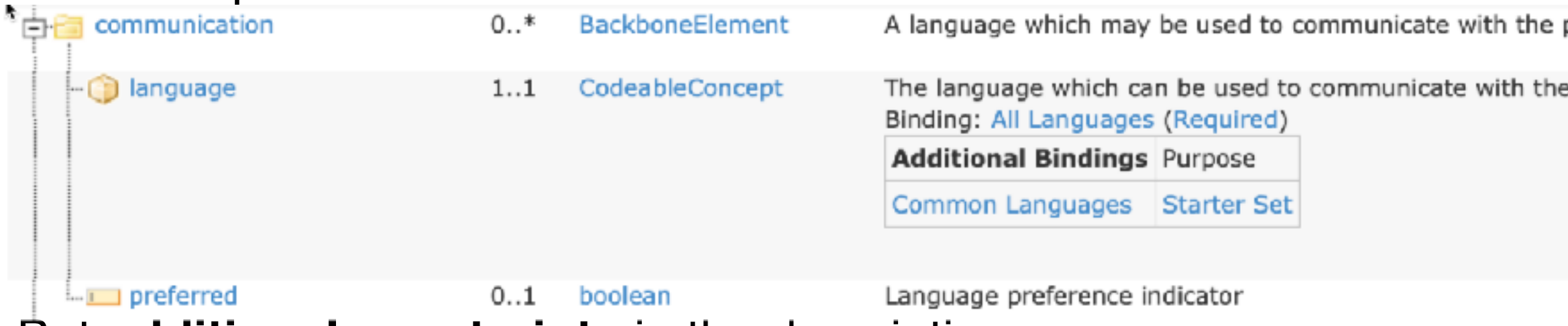
Narrative

Extensions

Data elements

Cardinality

- 0 .. * → Collections
- 1 .. 1 → mandatory
- 0 .. 1 → optional



communication	0..*	BackboneElement	A language which may be used to communicate with the p
language	1..1	CodeableConcept	The language which can be used to communicate with the Binding: All Languages (Required)
preferred	0..1	boolean	Language preference indicator

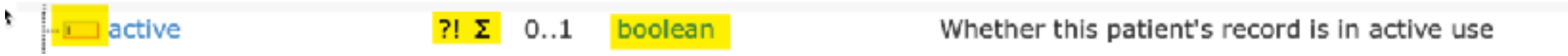
Additional Bindings	Purpose
Common Languages	Starter Set

- But **additional constraints** in the description

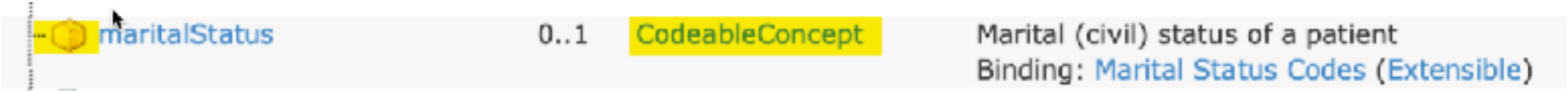
UniqueKey	Level	Location	Description	Expression
pat-1	Rule	Patient.contact	SHALL at least contain a contact's details or a reference to an organization	`name.exists() or telecom.exists() or address.exists() or organization.exists()`

Elements

- Simple Types (lowercase, field symbol)



  - ?! = modifier attributes (important for meaning, cannot be ignored)
  - Σ = part of summary
- Datatypes



Partial Dates

- **date** and **datetime** simple types can contain some partial date formats
  - Only year
    - **YYYY**
  - Only year and month
    - **YYYY-MM**
- Other variants (eg unknown year and unknown month but known day) only via extensions
- the types **instant** and **time** do not have such partial values allowed

Polymorphic Elements

- element can hold different types
  elementname[x] : [x] replaced by concrete type

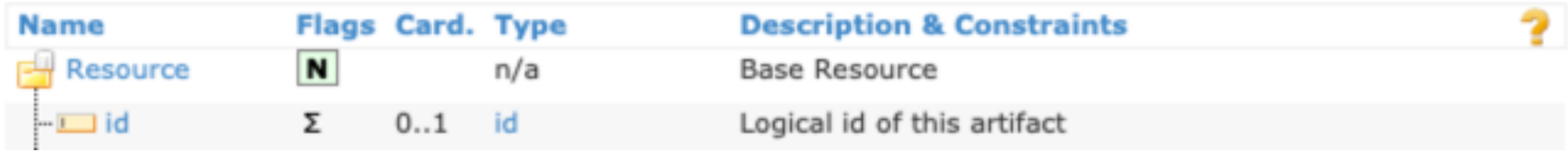
- both in XML, as in JSON

```
"deceasedDateTime" : "2015-02-14T13:42:00+10:00",
```

```
<deceasedDateTime value="2015-02-14T13:42:00+10:00"/>
```

Resource Identity

- Within the Resource Type: **id**



Name	Flags	Card.	Type	Description & Constraints
Resource	N		n/a	Base Resource
id	Σ	0..1	id	Logical id of this artifact

- Complete URI

https://exampleserver.omnis.net/Patient/a1b2c4-d5e6

1 endpoint

2 resource type

3 [logical] **id**

- Other Identifiers …

identifier	Σ	0..*	Identifier	An identifier for this patient

Linking Resources / References

Name	Flags	Card.	Type	Description & Constraints
Observation	N		DomainResource	Measurements and simple assertions *+ Rule: dataAbsentReason SHALL only be pres* *+ Rule: If Observation.component.code is the s* *SHALL NOT be present (the Observation.compo* *+ Rule: bodyStructure SHALL only be present i* Elements defined in Ancestors: id, meta, implic modifierExtension
identifier	Σ	0..*	Identifier	Business Identifier for observation
subject	Σ	0..1	Reference(Patient | Group | Device | Location | Organization | Procedure | Practitioner | Medication | Substance | BiologicallyDerivedProduct | NutritionProduct)	Who and/or what the observation is about

Literal References (via URLs)

Relative URL (Service Base URL)

```
"subject" : {
  "reference" : "Patient/f001",
  "display" : "P. van de Heuvel"
},
```

Absolute URL

```
{
  "profile" : {
    "reference" : "http://fhir.hl7.org/svc/StructureDefinition/c8973a22-2b5b-4e76-9c66-00639c99e61b"
  }
}
```

Internal Fragment Ref (contained Resource)

```
{
  "resourceType" : "Condition",
  "contained": [
    {
      "resourceType" : "Practitioner",
      "id" : "p1",
      "name" : [{
        "family" : "Person",
        "given" : ["Patricia"]
      }]
          }],
    "participant" : [{
      "function" : {
        "text" : "Asserter"
      },
      "actor" : {
        "reference" : "#p1"
      }
    }]
  }]
}
```

Extensions

- For the 20% not reflected in the Resource Description
- Small extra bits of data

  Useful or necessary in your country / your project / use case

```
{
  "resourceType" : "Patient",
  "id" : "FranzMuster",

  "extension" : [{
    "url" : "http://hl7.org/fhir/StructureDefinition/patient-birthPlace",
    "valueAddress" : { "city" : "Paris", "country" : "Frankreich" }
  },
  {
    "url" : "http://fhir.ch/ig/ch-core/StructureDefinition/ch-core-patient-ech-11-placeoforigin",
    "valueAddress" : { "city" : "Köniz", "state" : "BE" }
  },
```

Profiles and Implementation Guides

- FHIR Resource/Datatype + **Extensions** + **Constraints**
  = **Profile**

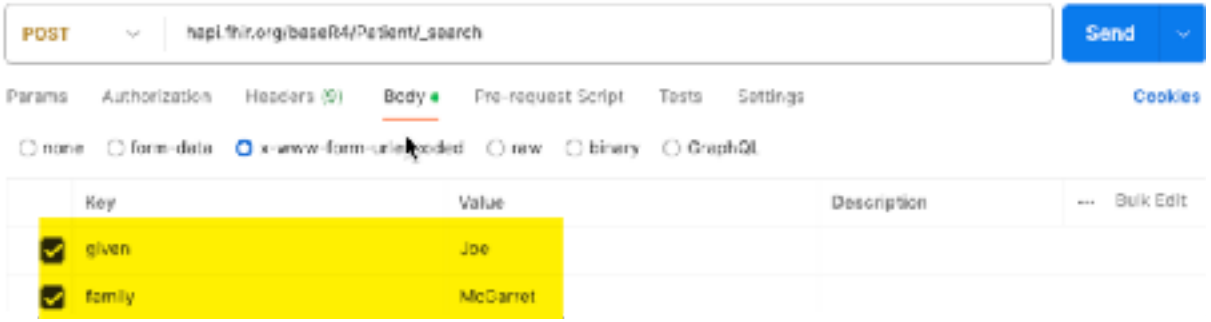

```
{
  "resourceType" : "Patient",
  "id" : "FranzMuster",
  "meta" : {
    "profile" : ["http://fhir.ch/ig/ch-core/StructureDefinition/ch-core-patient"]
  },
```


- Implementation Guide
  - Describe how to use in a particular data exchange / how to get it right

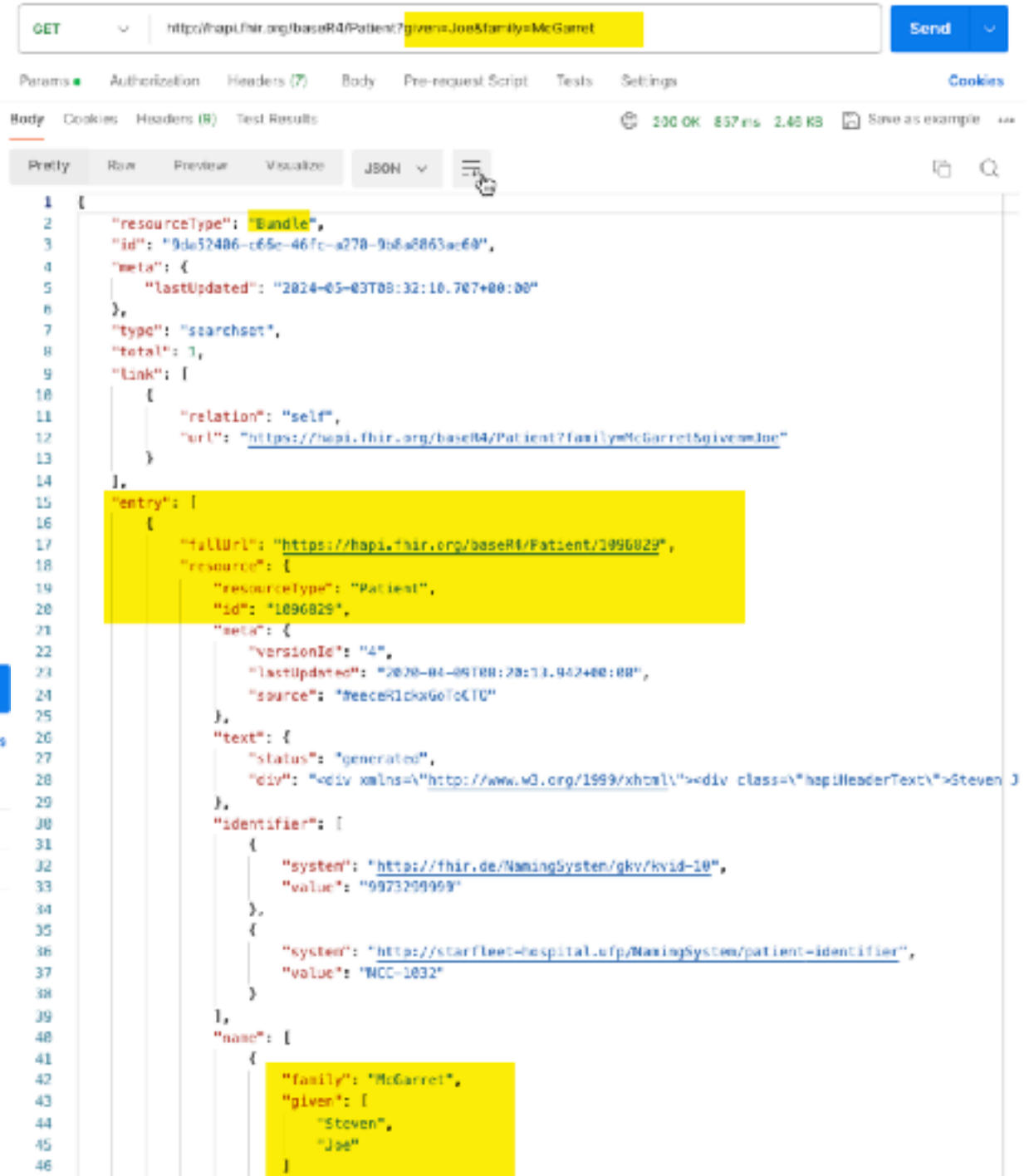
Searching

- REST Standard

  GET with Query
  or
  POST with Params



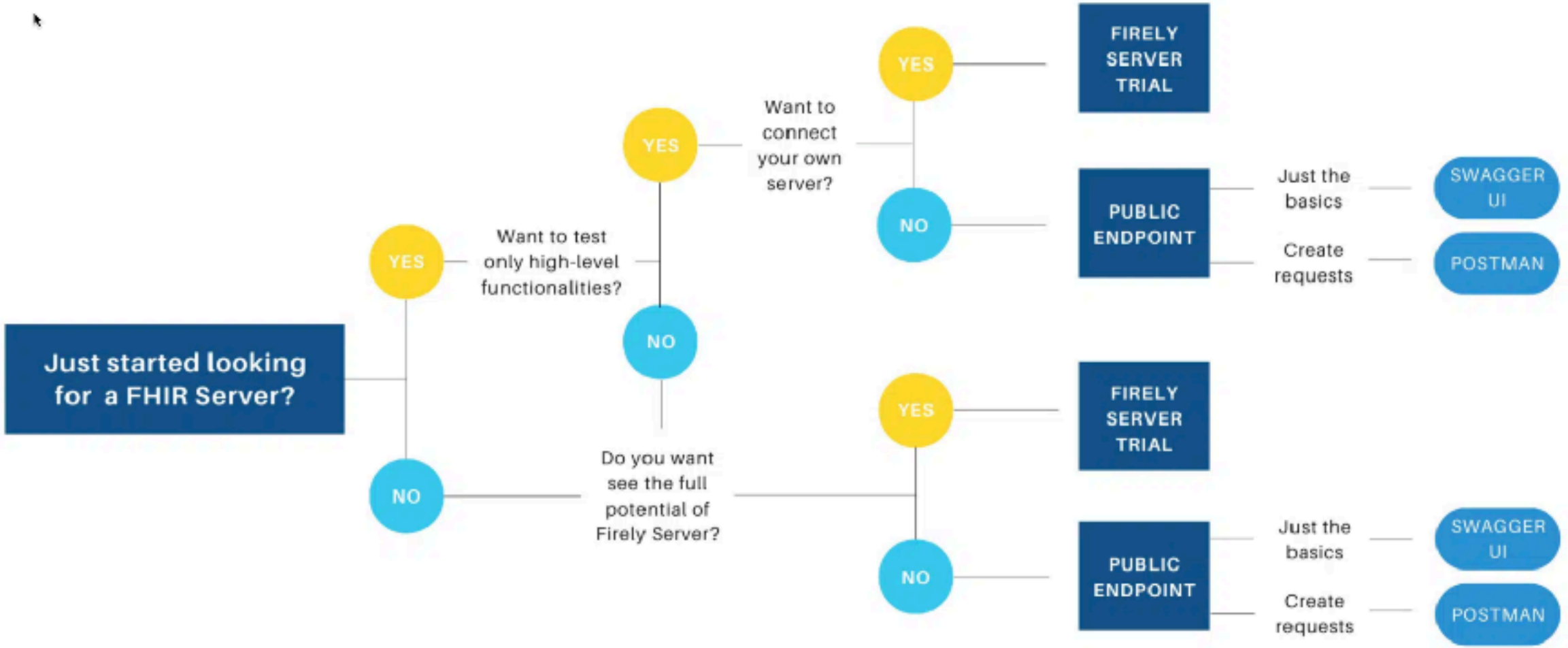
- Privacy Issues with GET in Logs



Security

- Authentication
  - for Web oAuth2
- Authorization/Access Control with Security Labels
- Audit Log
- Extensive Details at https://www.hl7.org/fhir/security.html

Test Servers: Public or Local



Public

- List at https://confluence.hl7.org/display/FHIR/Public+Test+Servers

Select by needed features, eg Authentication through Smart on FHIR

- https://server.fire.ly/r4 (/r5 etc ...)
- http://hapi.fhir.org (Web UI)

Local

- https://github.com/hapifhir/hapi-fhir-jpaserver-starter

Or

- https://hub.docker.com/r/hapiproject/hapi

```
docker pull hapiproject/hapi:latest
docker run -p 8080:8080 hapiproject/hapi:latest
```

http://localhost:8080 (right now at version 4.0.1)

Omnis on FHIR®

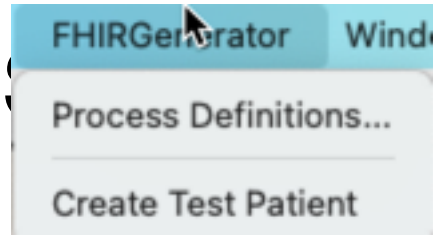
Real World Usage

- Until 2020 First only personal interest
  https://github.com/advancedconcepts/Omnis-FHIR
- 2021 Swiss Covid-19 Vaccination Portal offers FHIR API
  (although incorrectly handling addresses!)
- Since 2023 connecting own Practice Information System to Electronic Patient Record Domains using FHIR

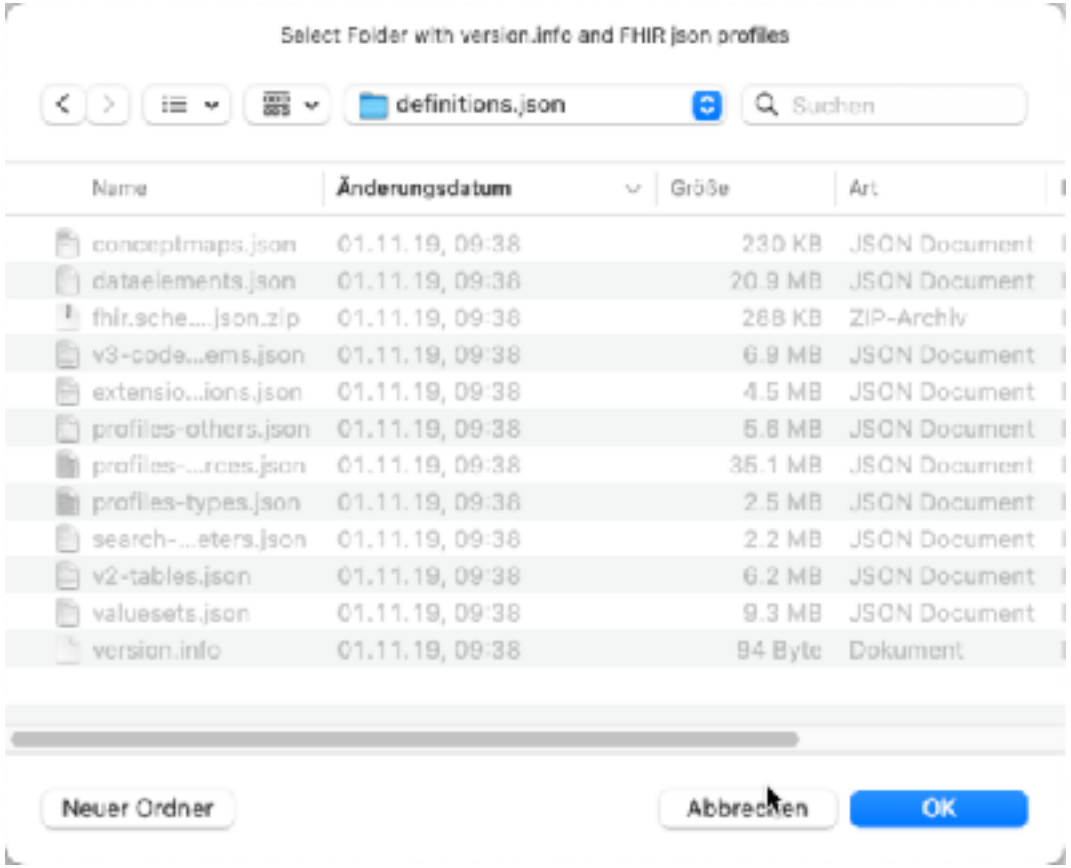
Supporting Classes in fhir.lbs

- **oFHIRContext**
  (Holding concrete FHIR Version, convenience methods)
- **oFHIRClientEndpoint**
  (REST Client)
- oFHIRBridge
  (Translation ‚native' ↔ FHIR representation)
- oFHIRServerEndpoint
  (REST Server) not within scope of this presentation

Generated Code for FHIR Types



- **fhir_tools.lbs** generates one fhir_xx.lbs from JSON FHIR Definition files of each release
- Pre-Generated for STU3, R4, R5
- So only for future versions or when handling is modified



Omnis FHIR Type System

- Many Simple/primitive Types
  - As elements mapped onto native Omnis Types

FHIR Type	Omnis Type
instant, time	kDate / kTime
date, datetime (*partial dates)*	kCharacter, $assign “polymorph“
base64binary	kBinary
integer, unsignedInt, positiveInt	kInteger/k32bitint
Integer64	kInteger/k64bitint
decimal	kNumber/kFloatdp
uri, oid, uuid, canonical, code, markdown, xhtml, id	kCharacter

Omnis FHIR Type System (cont)

- Modelled after FHIR Standard -> oFHIRBaseElement in FHIR.LBS
- For all (including simple types as objects):
  - FHIR Name kept (including casing), prefixed with ‚o‘
    - Patient -> oPatient, boolean -> oboolean
  - Object References used throughout
    - Indicate Type using a fixed version in Omnis IDE for autocomplete
- For CodeSystems code classes prefixed with ‚cs‘ are used
    - Do code method csGenderIdentity/$male …

oFHIRContext

- Challenge: Handling different FHIR Versions (fhir_xxx.lbs)
- Version depends on the target system(s)
  - Multiple version at work at runtime
- Indirection through instances oFHIRContext
  - Using Version String or version number as constructor argument
- Convenience Methods for Resource Creation

Code / Demo

Open fhir_sample_client.lbs

- Open oSampleClientEndpoint.$createPatientOnServer1

Set up FHIR Context

- In $createPatientOnServer1
  - Set up FHIR Context (base class methods)
    eg. to „r4“

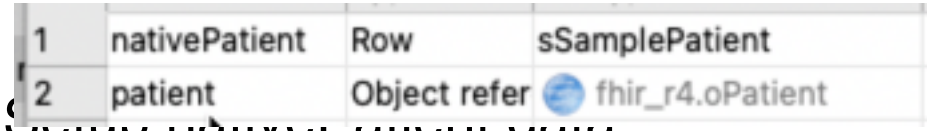
```
Calculate $cinst.$context as 'r4'
```

  - Verify context

```
If $cinst.$context().$isvalid()


End If
```

Create Resource

- Setup
  - Add local variable nativePatient (Row, sSamplePatient)
  - Add local variable patient (Object Reference, fhir_r4.oPatient)



1	nativePatient	Row	sSamplePatient
2	patient	Object refer	fhir_r4.oPatient

  - Setup native patient data

    Do method setupNativePatient (**nativePatient**)
- In the $isvalid() branch

  - Create Resource by FHIR Typename

    Calculate **patient** as $cinst.$context().$createResource('Patient')

Set Attributes

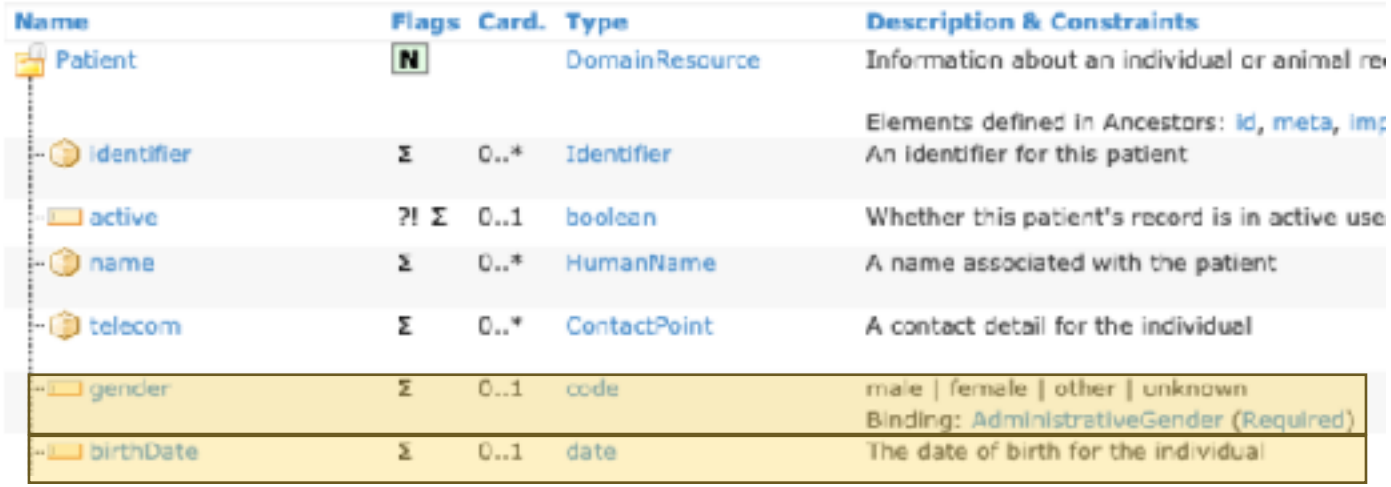
- In the $createPatientOnServer1

```
Do $cinst.$patientToResource($cinst.$context(),nativePatient.$ref,patient)
```

- In the $patientToResource method

  - We copy all attributes
    from the native representation **pNativePatient** (Item reference)
    into the FHIR Resource **pFHIRPatient** (Object Reference)
  - Since we will have to create new resources we also have
    pContext (Object Reference)

Simple Attributes



Name	Flags	Card.	Type	Description & Constraints
Patient	N		DomainResource	Information about an individual or animal re Elements defined in Ancestors: id, meta, imp
identifier	Σ	0..*	Identifier	An identifier for this patient
active	?! Σ	0..1	boolean	Whether this patient's record is in active use
name	Σ	0..*	HumanName	A name associated with the patient
telecom	Σ	0..*	ContactPoint	A contact detail for the individual
gender	Σ	0..1	code	male | female | other | unknown Binding: AdministrativeGender (Required)
birthDate	Σ	0..1	date	The date of birth for the individual

```
# Assignment: id
Calculate pFHIRPatient.id as pNativePatient.sampleID

# Assignment: birth
Calculate pFHIRPatient.$birthDate as pNativePatient.sampleBirth

# Switch matching codes: gender
Switch pNativePatient.sampleSex
  Case 'M'
    Do code method fhir_r4.csGenderIdentity/$male Returns pFHIRPatient.$gender
  Case 'F'
    Do code method fhir_r4.csGenderIdentity/$female Returns pFHIRPatient.$gender
  Default
    # if we do not know, we do not set
End Switch
```

Complex Attributes (Card ..1)

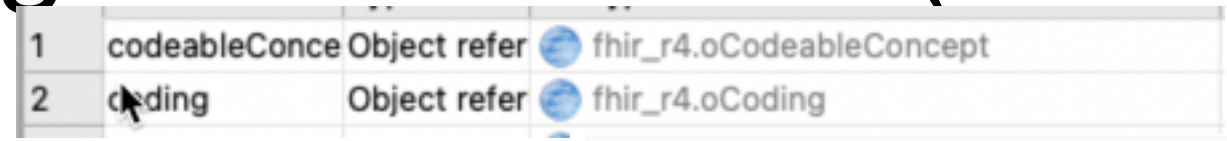
Name	Flags	Card.	Type	Description & Constraints
Patient	N		DomainResource	Information about an individual or an Elements defined in Ancestors: id, me
identifier	Σ	0..*	Identifier	An identifier for this patient
active	?! Σ	0..1	boolean	Whether this patient's record is in act
name	Σ	0..*	HumanName	A name associated with the patient
telecom	Σ	0..*	ContactPoint	A contact detail for the individual
gender	Σ	0..1	code	male | female | other | unknown AdministrativeGender (Required)
birthDate	Σ	0..1	date	The date of birth for the individual
deceased[x]	?! Σ	0..1		Indicates if the individual is deceased
deceasedBoolean			boolean	
deceasedDateTime			dateTime	
address	Σ	0..*	Address	An address for the individual
maritalStatus		0..1	CodeableConcept	Marital (civil) status of a patient MaritalStatus (Extensible)

Name	Flags	Card.	Type	Description & Constraints
CodeableConcept	Σ N		Element	Concept - reference to a terminology or just text Elements defined in Ancestors: id, extension
coding	Σ	0..*	Coding	Code defined by a terminology system
text	Σ	0..1	string	Plain text representation of the concept

- if not set, a new instance gets created automatically upon accessing

```
Calculate codeableConcept as pFHIRPatient.$maritalStatus

Switch pNativePatient.sampleMaritalStatus
  Case 'U'
    Calculate codeableConcept.text as "unmarried"
    ...
  Default
    # all other cases should be handled as well
End Switch
```

Adding to Collections (Card … >1)



Name	Flags	Card.	Type	Description & Constraints
CodeableConcept	Σ N		Element	Concept - reference to a terminology or just text Elements defined in Ancestors: id, extension
coding	Σ	0..*	Coding	Code defined by a terminology system
text	Σ	0..1	string	Plain text representation of the concept

Name	Flags	Card.	Type	Description & Constraints
Coding	Σ N		Element	A reference to a code defined by a terminology system Elements defined in Ancestors: id, extension
system	Σ	0..1	uri	Identity of the terminology system
version	Σ	0..1	string	Version of the system - if relevant
code	Σ	0..1	code	Symbol in syntax defined by the system
display	Σ	0..1	string	Representation defined by the system
userSelected	Σ	0..1	boolean	If this coding was chosen directly by the user

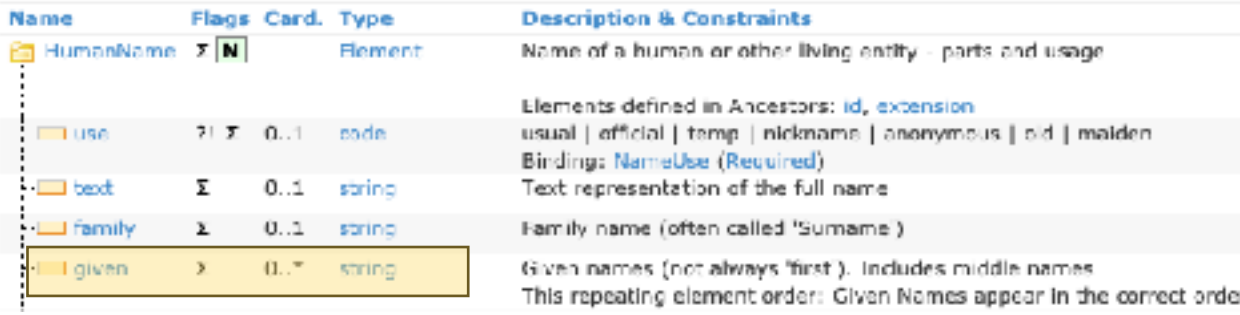
- Create Element, then use the add … method

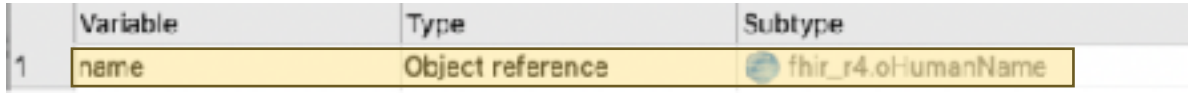
```
Calculate coding as pContext.$createResource("Coding")

Calculate coding.code as U'
Calculate coding.system as 'http://terminology.hl7.org/CodeSystem/v3-MaritalStatus'
Calculate coding.display as 'unmarried'

Do codeableConcept.$addcoding(coding)
```

- Convenience method

```
Calculate coding as pContext.$createcoding('http://terminology.hl7.org/CodeSystem/v3-MaritalStatus','U','unmarried')
```

Adding to Collections cont.





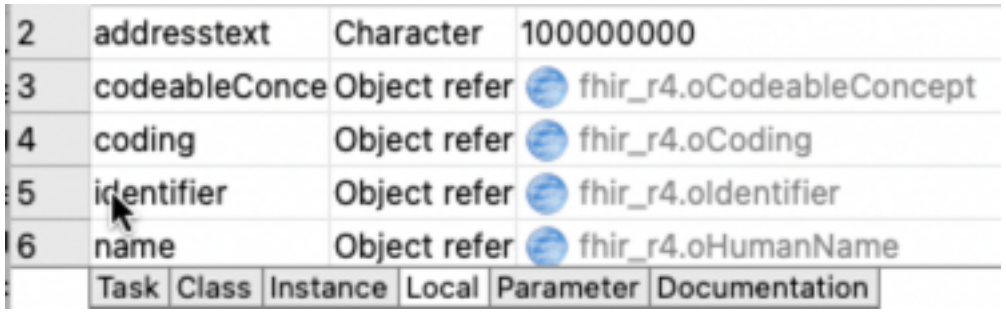
- Or use the add … method without param
  → creates new instance

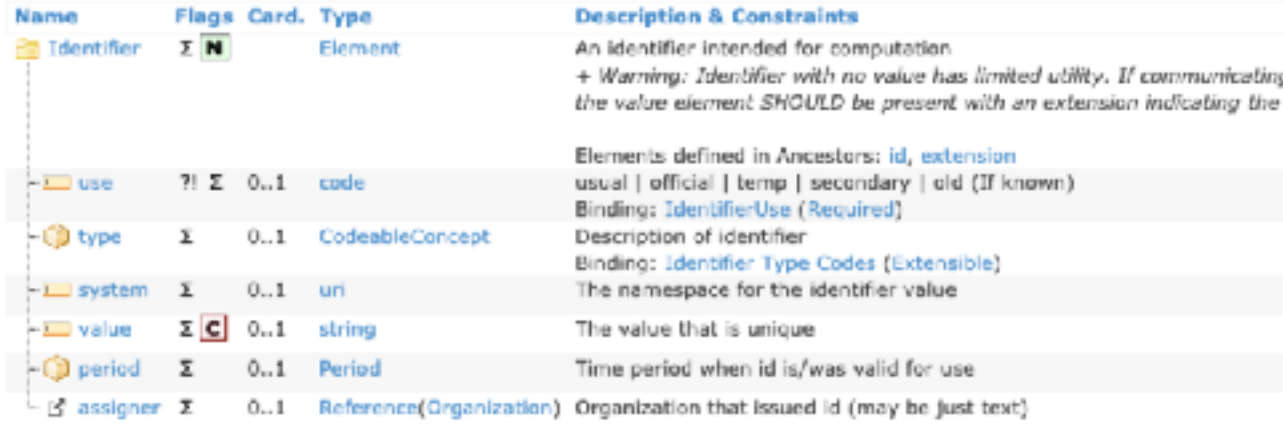
```
# calling add… to get a new instance (object ref)
Calculate name as pFHIRPatient.$addname()
Calculate name.$use as 'official'
Calculate name.$family as pNativePatient.sampleLastname
```

- For simple types direct add

```
# direct parameter (especially elegant for primitive types)
Do name.$addgiven(pNativePatient.sampleFirstname)
```

Identifiers (not the **id** element)



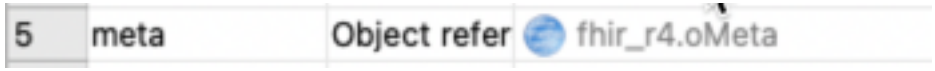


- Eg MR (Medical Record Number) is mandatory in many situations

```
Calculate identifier as pFHIRPatient.$addidentifier()
Calculate identifier.$use as 'usual'
Calculate identifier.$system as "http://www.myomnisfhirsample.org/"
Calculate identifier.$value as pNativePatient.sampleUUID

Calculate codeableConcept as identifier.$::type()
Calculate coding as codeableConcept.$addcoding()
Calculate coding.$system as "http://terminology.hl7.org/CodeSystem/v2-0203"
Calculate coding.$code as "MR"
```

Profiles

- Profiles indicate the «contract» a resource conforms to




```
Calculate meta as pFHIRPatient.$meta()
Do meta.$addprofile("http://fhir.ch/ig/ch-core/StructureDefinition/ch-core-patient")
Do meta.$addprofile("http://fhir.ch/ig/ch-core/StructureDefinition/ch-core-patient-epr")
```

Polymorphic Elements

Name	Flags	Card.	Type	Description & Constraints
Patient	N		DomainResource	Information about an individual or animal receiving health care services Elements defined in Ancestors: id, meta, implicitRules, language, text, containe
identifier	Σ	0..*	Identifier	An identifier for this patient
active	?! Σ	0..1	boolean	Whether this patient's record is in active use
name	Σ	0..*	HumanName	A name associated with the patient
telecom	Σ	0..*	ContactPoint	A contact detail for the individual
gender	Σ	0..1	code	male | female | other | unknown AdministrativeGender (Required)
birthDate	Σ	0..1	date	The date of birth for the individual
deceased[x]	?! Σ	0..1		Indicates if the individual is deceased or not
deceasedBoolean			boolean	
deceasedDateTime			dateTime	

If **pNativePatient**.sampleDeathdate<>”

- create either a boolean

```
Calculate polymorph as pContext.$createSimpleType('boolean’)
Calculate polymorph.$value as pNativePatient.sampleDeathdate<>”
```

- or a date

```
Calculate polymorph as pContext.$createSimpleType('date’)
Calculate polymorph.$value as pNativePatient.sampleDeathdate
```

- which is assigned to the element ‘deceased’

```
Calculate pFHIRPatient.$deceased as polymorph
End If
```

Extensions

1	address	Object reference	fhir_r4.oAddress
4	extension	Object reference	fhir_r4.oExtension

```
Calculate extension as pFHIRPatient.$addextension()

Calculate address as pContext.$createResource('Address')
Calculate address.city as pNativePatient.samplePlaceOfOriginCity
Calculate address.state as pNativePatient.samplePlaceOfOriginState

Calculate extension.url as 'http://fhir.ch/ig/ch-core/StructureDefinition/ch-core-patient-ech-11-placeoforigin'
Calculate extension.value as address
```

Dealing with References

- Create References

```
(… practitioner resource setup)
Calculate pFHIRPatient.$generalPractitioner as pContext.$createReference(practitioner)
```

- Create Internal References
  (contained Resource, outside scope of this presentation)

```
Do docRef.$addcontained(pSubSetAuthor)
Do docRef.$addauthor(pContext.$createInternalReference(pSubSetAuthor))
```

Getting the Data out of a Resource

- $**asxml**/**$asjson**() returns a text in the respective format
- $**astext**(format) as generic method

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Patient xmlns="http://hl7.org/fhir">
    <name>
        <use value="official"/>
        <family value="Doe"/>
        <given value="John"/>
    </name>
    <gender value="male"/>
    <birthDate value="1989-02-01"/>
```

Calculate res

```json
{
  "resourceType": "Patient",
  "name" : [
    {
      "use" : "official",
      "family" : "Doe",
      "given" : [
        "John"
      ] /given
    } /name[0]
  ], /name
  "gender" : "male",
  "birthDate" : "1989-02-01",
```

Communicating with a REST Server

- Setup Authentication
  - Most often oAuth2 (nothing special here)
- Setup FHIR Server Base URL

```
Calculate $cinst.$baseURL as 'http://localhost:8080/fhir'
```

Pushing Data on a REST Server

- Convenience Method

```
Calculate format as 'json'
Do $cinst.$POSTResource('Patient', patient, format) Returns response
```

- Or even more convenient

```
Do $cinst.$POSTPatient(patient,format) Returns response

If left(response.$statusCode(),1)='2'
  OK message Success {Resource Createds Call returned [response.$statusCode()]}
Else
  OK message Error {HTTP Call returned [response.$statusText()] ([response.$statusCode()])}
End If
```

- Test with browser

  http://localhost:8080/fhir/Patient?family=Muster

Querying a REST Server

- Convenience Method

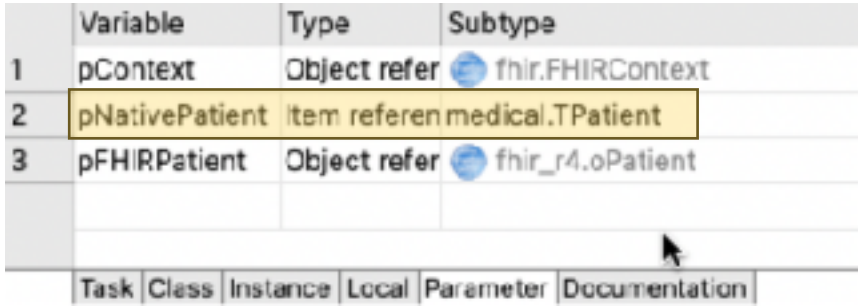
```
Do $cinst.$GETResource('Patient?family=Muster',format) Returns response

If left(response.$statusCode(),1)='2'
  Calculate content as utf8tochar(response.$content())
  Calculate bundle as $cinst.$context().$createFromText(content,format)
  OK message Success {Search Query returned [bundle.total] Elements}
Else
  OK message Error {HTTP Call returned [response.$statusText()] ([response.$statusCode()])}
End If
```

Maybe some Refactoring…

Translation

- Ingredient: Subclassed **oFHIRBridge**
- Move methods to your subclass

$patientToResource(pContextRef, pNativeResourceRef, pFHIRResourceRef)



This is called eg from oFHIRClientEndpoint‘s

$createPatientResourceFromNative

POST for creation

```
Do $cinst.$createPatientResourceFromNative(iCurrentPat.$ref) Returns patientResource

...

Do $cinst.$POSTResource('Patient',patientResource,format) Returns response
```

Setting up Resources

- Ingredient: Subclassed **oFHIRBridge**

  (Translating between „native“ and „FHIR“ Representation, see next slides)
- Subclass **oFHIRClientEndpoint**

  - Call Translation

```
Do iBridge.$patientToResource(iContext,pNativePatient.$ref,patient)
```

Q & A