SEMINARIO WEB

FHIR Serie Fundacional

CO-ORGANIZADO POR RECAINSA Y DIGITAL SQUARE

RECAINSA

digital square

Agenda y estructura

1. Introducción y estructura de la presentación
2. Áreas de normalización
3. Conceptos básicos de FHIR - Recapitulación + inmersión superficial
    1. Por qué FHIR, qué es FHIR, tipos de recursos, tipos de datos, métodos de intercambio, terminologías, búsqueda; preguntas y respuestas
    2. Integración - referencias, contenido, paquetes, documentos
    3. Cómo creamos y ampliamos FHIR; preguntas y respuestas
    4. Comunidad FHIR, herramientas, documentación
4. Preguntas y respuestas, debate, próximas actividades

Observaciones y descargo de responsabilidad

- FHIR® es la marca registrada de Health Level Seven® (HL7®) International.
- El uso de la marca FHIR® no constituye la aprobación de este curso/producto/servicio por parte de HL7 ®.
- Esta no es una formación oficial de HL7. Para este tipo de oportunidades de formación, le animamos a
  - http://www.hl7.org/training

Objetivos

- Esta presentación es una recopilación de materiales de libre acceso.
- Esta presentación se comparte bajo una licencia Creative Commons Attribution 4.0 (CC BY 4.0) - (se puede compartir y adaptar si se dan los créditos)
- Nuestro objetivo es ayudar / refrescar las habilidades de navegación y descubrimiento. El contenido utilizado no es exhaustivo, y pretende ser más amplio que profundo.
- Disponemos de poco tiempo, pero intentaremos atender preguntas - y valoraremos tus aportaciones para próximas sesiones.

Antes de empezar...

- **El resultado más importante de todo esto es que colaboramos, experimentamos y participamos**
  - https://chat.fhir.org

- RECAINSA está en el proceso de creación y oficialización de la comunidad FHIR CAM - promoción de eventos regionales y globales, interacción con la comunidad global...

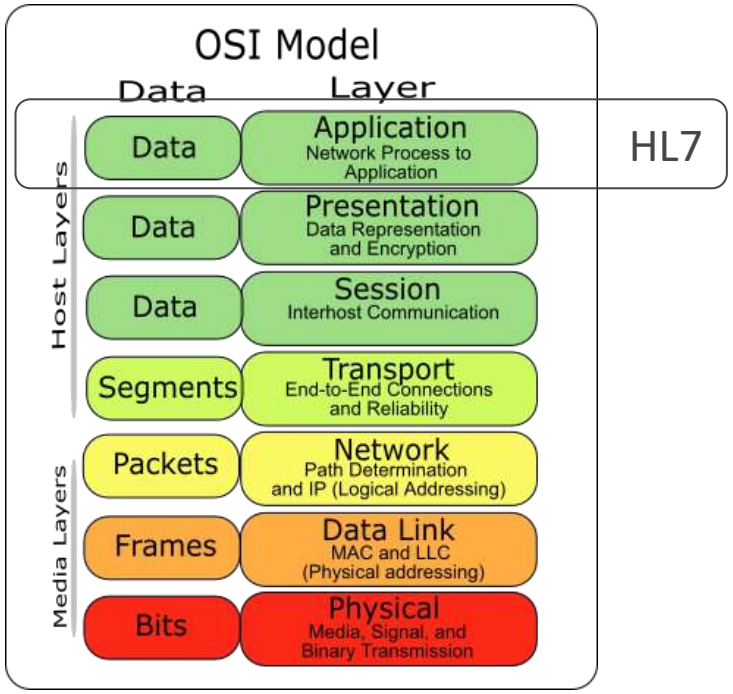
  - Contacto administrativo RECAINSA: Joseline Carias
  - Contacto comunidad RECAINSA: Alejandro Benavides

Áreas de normalización

Motivaciones para la normalización

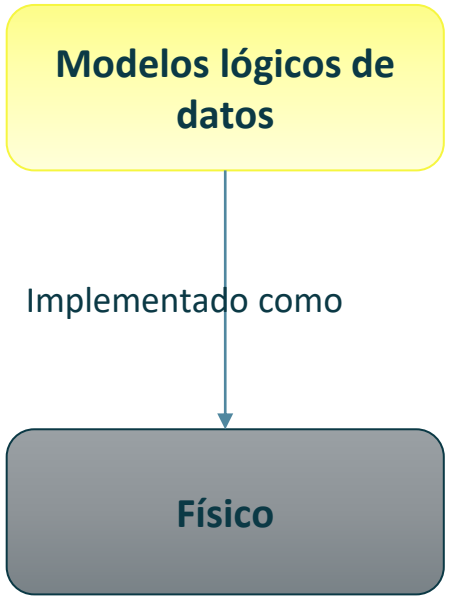
- Ser conforme a la norma X
- Preparar la internacionalización de productos
- Ser compatible con la solución Y
- Normalizar los datos
- Reducir la complejidad al tiempo que se admite la variedad

Situación: Niveles / tipos de normas



	Why	How	What	Who	Where	When
Contextual	Goal List	Process List	Material List	Organisational Unit & Role List	Geographical Locations List	Event List
Conceptual	Goal Relationship	Process Model	Entity Relationship Model	Organisational Unit & Role Relationship Model	Locations Model	Event Model
Logical	Rules Diagram	Process Diagram	Data Model Diagram	Role Relationship Diagram	Locations Diagram	Event Diagram
Physical	Rules Specification	Process Function Specification	Data Entity Specification	Role Specification	Location Specification	Event Specification
Detailed	Rules Details	Process Details	Data Details	Role Details	Location Details	Event Details

Niveles de información



Cómo se modelan
Descripciones de cómo se modelan los datos, con entidades, atributos y nociones de cardinalidad, relaciones, tipos de datos, etc.

Cómo se aplica
Un elemento de datos en un archivo, por ejemplo, Paciente.nombre[0].dado

Qué es FHIR?

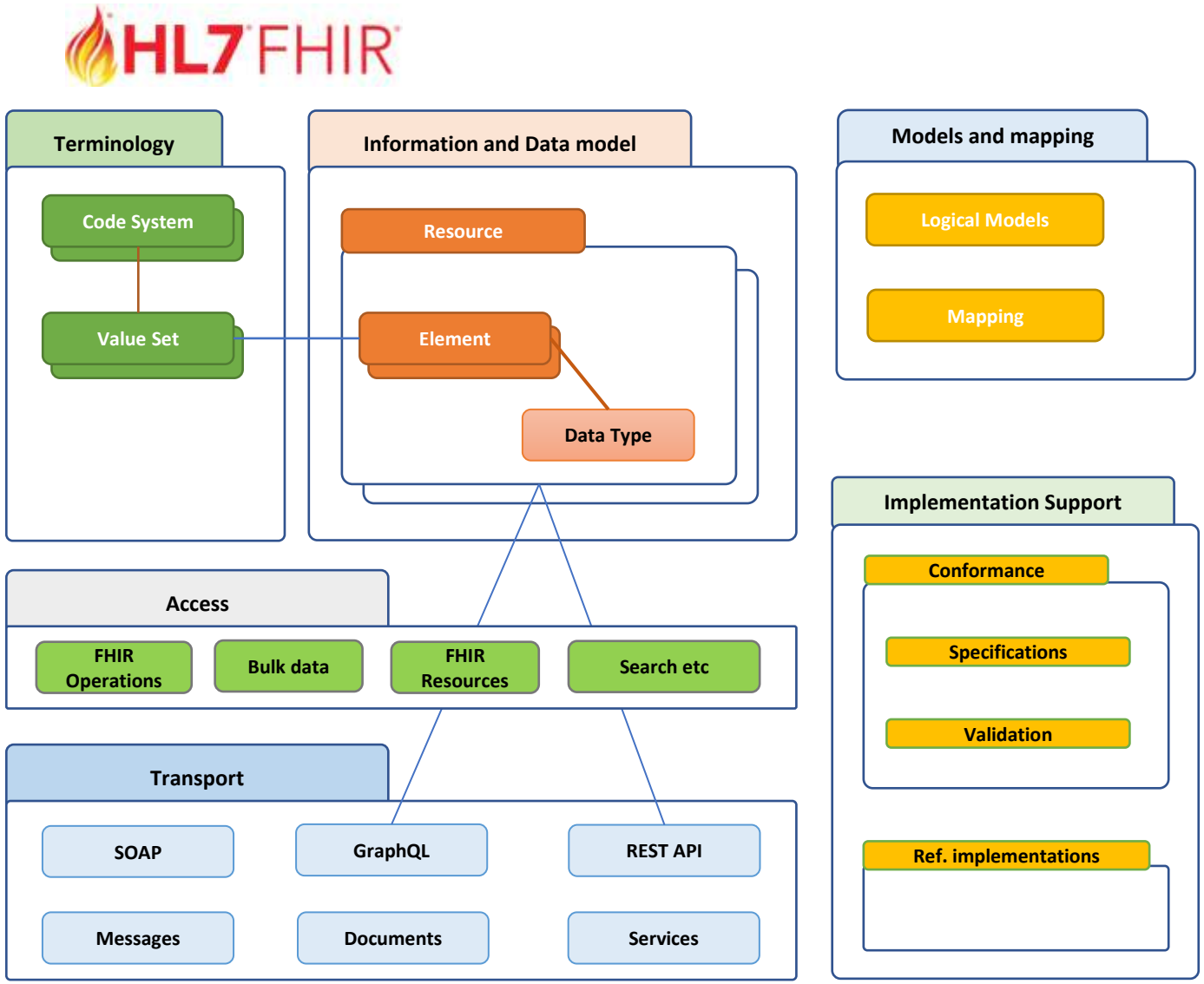
- Fast Healthcare Interoperability Resources
- Una especificación técnica para el intercambio de datos
- Especificación computable
- Basada en tecnologías y formatos estándar (JSON, XML, REST...)
- Define objetos de datos estándar (recursos) que pueden componerse para formar cualquier tipo de comunicación: desde la notificación de una medición de la tensión arterial hasta la consulta de artículos disponibles en inventario...
- Aborda algunos de los retos de la normalización
- Con el apoyo de una amplia comunidad global

Bigger picture: FHIR → Normas → Salud Digital

- **FHIR es no apenas una norma técnica, pero una comunidad, un ecosistema, y una (nueva) forma de hacer y gerenciar la Salud Digital**

- Otras sesiones
  - FHIR Profiling
  - FHIR y Terminologia
  - FHIR Search
  - FHIR ImplementationGuide
  - Gobernanza de FHIR y normas

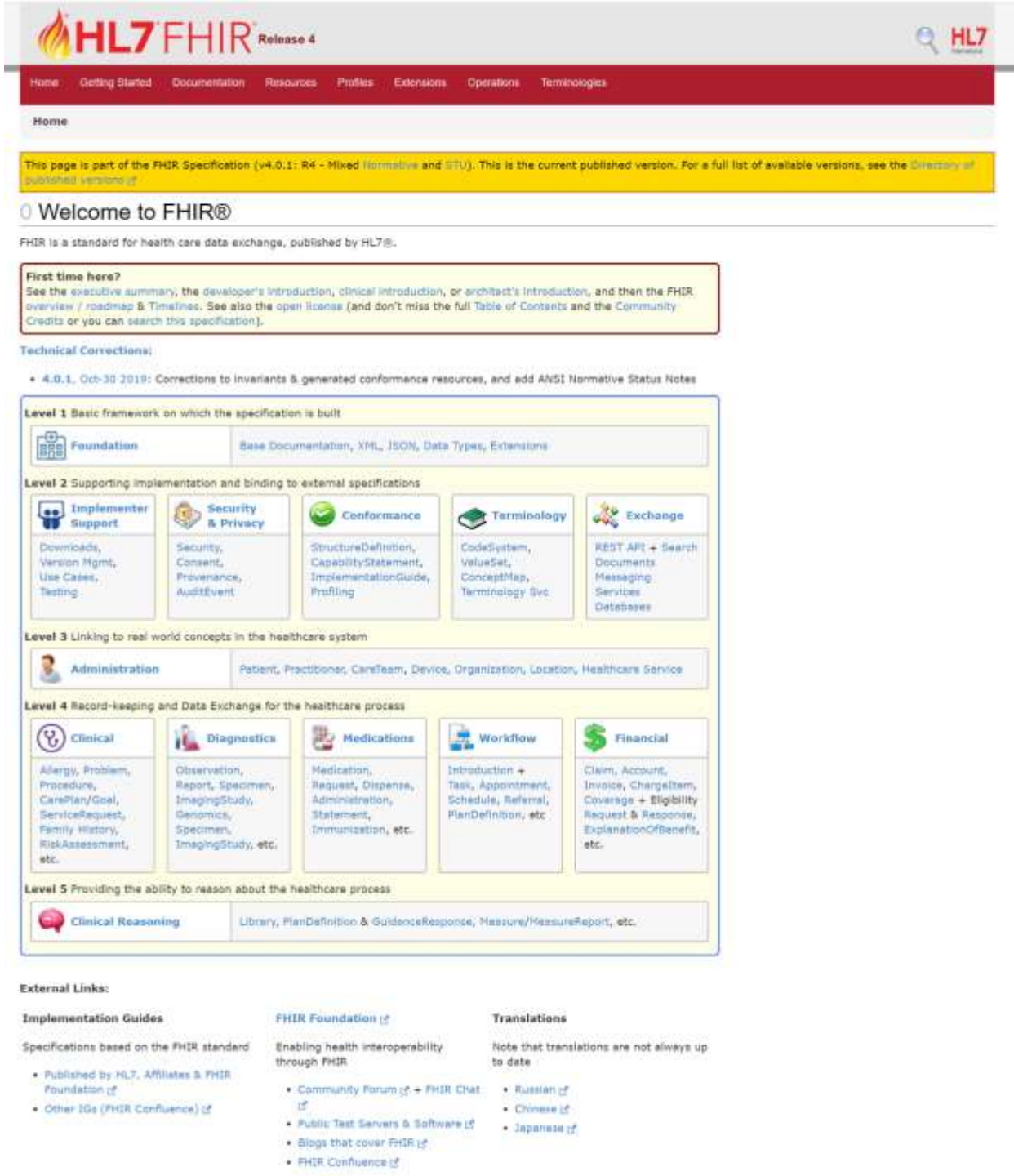
La norma HL7® FHIR



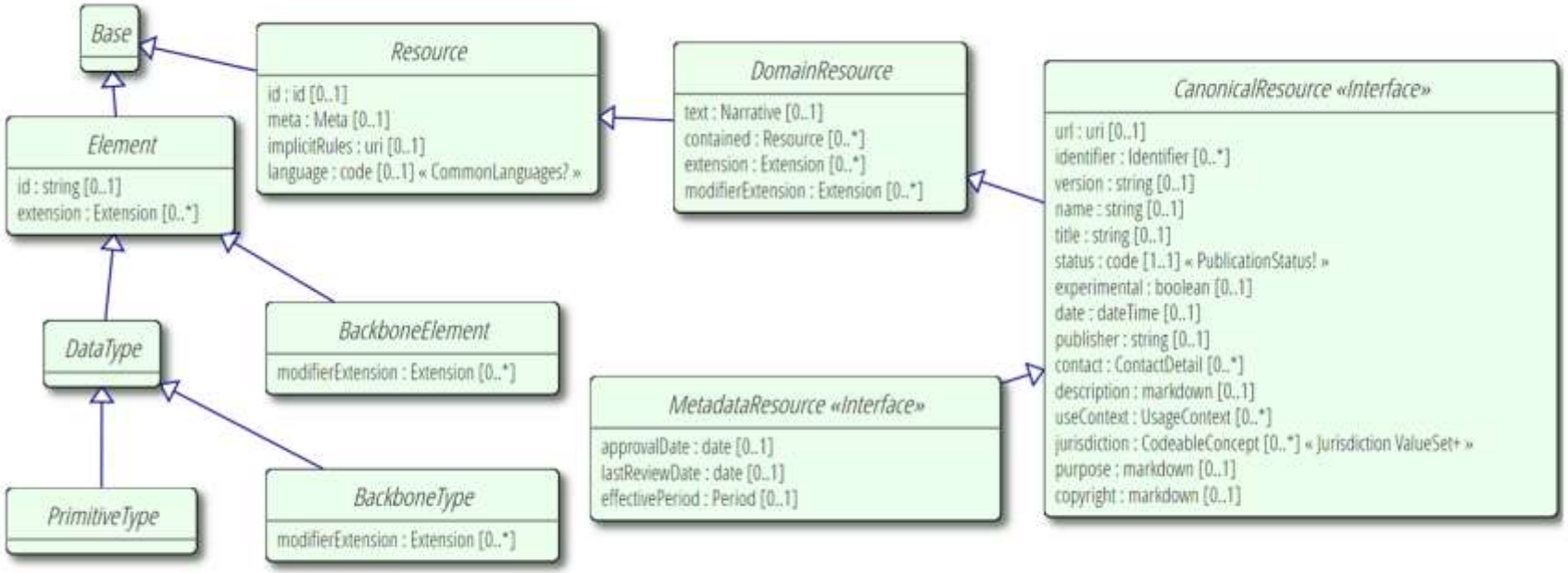
Publicación FHIR (siempre) en línea

http://hl7.org/fhir

http://build.fhir.org

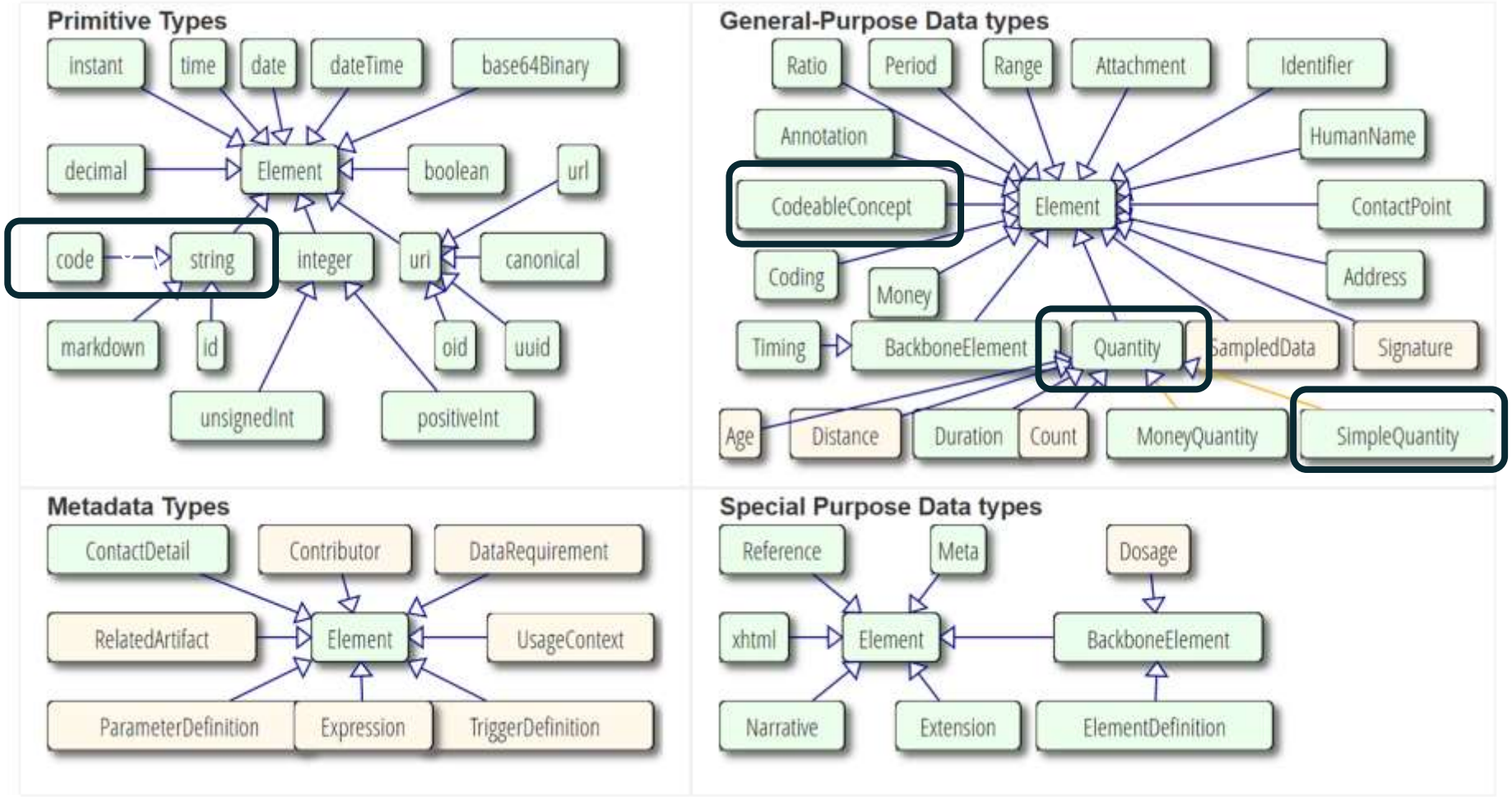


Tipos de estructuras en FHIR



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

Tipos de datos



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

Primitive Types

FHIR Name	Value Domain	XML Representation	JSON representation
boolean	true | false Regex: `true|false`	xs:boolean, except that **0 and 1 are not valid values**	JSON boolean (true or false)
integer	A signed integer in the range −2,147,483,648..2,147,483,647 (32-bit; for larger values, use decimal) Regex: `[0]|[-+]?[1-9][0-9]*`	xs:int, except that **leading 0 digits are not allowed**	JSON number (with no decimal point)
string	A sequence of Unicode characters Note that strings SHALL NOT exceed 1MB (1024*1024 characters) in size. Strings SHOULD not contain Unicode character points below 32, except for u0009 (horizontal tab), u0010 (carriage return) and u0013 (line feed). Leading and Trailing whitespace is allowed, but SHOULD be removed when using the XML format. Note: This means that a string that consists only of whitespace could be trimmed to nothing, which would be treated as an invalid element value. Therefore strings SHOULD always contain non-whitespace content This data type can be bound to a ValueSet Regex: `[ \r\n\t\S]+` (see notes below)	xs:string	JSON String
decimal	Rational numbers that have a decimal representation. See below about the precision of the number Regex: `-?(0|[1-9][0-9]*)(\.[0-9]+)?([eE][+-]?[0-9]+)?`	union of xs:decimal and xs:double (see below for limitations)	A JSON number (see below for limitations)
uri	A Uri Resource Identifier Reference (RFC 3986). Note: URIs are case sensitive. For UUID (urn:uuid:53fefa32-fcbb-4ff8-8a92-55ee120877b7) use all lowercase Regex: `\S*` (This regex is very permissive, but URIs must be valid. Implementers are welcome to use more specific regex statements for a URI in specific contexts) URIs can be absolute or relative, and may have an optional fragment identifier This data type can be bound to a ValueSet	xs:anyURI	A JSON string - a URI
url	A Uniform Resource Locator (RFC 1738). Note URLs are accessed directly using the specified protocol. Common URL protocols are `http(s):`, `ftp:`, `mailto:` and `mllp:`, though many others are defined	xs:anyURI	A JSON string - a URL
canonical	A URI that refers to a resource by its canonical URL (resources with a `url` property). The `canonical` type differs from a `uri` in that it has special meaning in this specification, and in that it may have a version appended, separated by a vertical bar (|). Note that the type `canonical` is not used for the actual canonical URLs that are the target of these references, but for the URIs that refer to them, and may have the version suffix in them. Like other URIs, elements of type `canonical` may also have #fragment references	xs:anyURI	A JSON string - a canonical URL
base64Binary	A stream of bytes, base64 encoded (RFC 4648) Regex: `(\s*([0-9a-zA-Z\+\=]){4}\s*)+` There is no specified upper limit to the size of a binary, but systems will have to impose some implementation based limit to the size they support. This should be clearly documented, though there is no computable for this at this time	xs:base64Binary	A JSON string - base64 content
instant	An instant in time in the format YYYY-MM-DDThh:mm:ss.sss+zz:zz (e.g. 2015-02-07T13:28:17.239+02:00 or 2017-01-01T00:00:00Z). The time SHALL specified at least to the second and SHALL include a time zone. Note: This is intended for when precisely observed times are required (typically system logs etc.), and not human-reported times - for those, use date or dateTime (which can be as precise as `instant`, but is not required to be). `instant` is a more constrained dateTime Note: This type is for system times, not human times (see date and dateTime below). Regex: `([0-9]([0-9]([0-9][1-9]|[1-9]0)|[1-9]00)|[1-9]000)-(0[1-9]|1[0-2])-(0[1-9]|[1-2][0-9]|3[0-1])T([01][0-9]|2[0-3]):[0-5][0-9]:([0-5][0-9]|60)(\.[0-9]+)?(Z|(\+|-)((0[0-9]|1[0-3]):[0-5][0-9]|14:00))`	xs:dateTime	A JSON string - an xs:dateTime
date	A date, or partial date (e.g. just year or year + month) as used in human communication. The format is YYYY, YYYY-MM, or YYYY-MM-DD, e.g. 2018, 1973-06, or 1905-08-23. **There SHALL be no time zone.** Dates SHALL be valid dates Regex: `([0-9]([0-9]([0-9][1-9]|[1-9]0)|[1-9]00)|[1-9]000)(-(0[1-9]|1[0-2])(-(0[1-9]|[1-2][0-9]|3[0-1]))?)?`	union of xs:date, xs:gYearMonth, xs:gYear	A JSON string - a union of xs:date, xs:gYearMonth, xs:gYear
dateTime	A date, date-time or partial date (e.g. just year or year + month) as used in human communication. The format is YYYY, YYYY-MM, YYYY-MM-DD or YYYY-MM-DDThh:mm:ss+zz:zz, e.g. 2018, 1973-06, 1905-08-23, 2015-02-07T13:28:17-05:00 or 2017-01-01T00:00:00.000Z. If hours and minutes are specified, a time zone SHALL be populated. Seconds must be provided due to schema type constraints but may be zero-filled and may be ignored at receiver discretion. Dates SHALL be valid dates. **The time "24:00" is not allowed**. Leap Seconds are allowed - see below Regex: `([0-9]([0-9]([0-9][1-9]|[1-9]0)|[1-9]00)|[1-9]000)(-(0[1-9]|1[0-2])(-(0[1-9]|[1-2][0-9]|3[0-1])(T([01][0-9]|2[0-3]):[0-5][0-9]:([0-5][0-9]|60)(\.[0-9]+)?(Z|(\+|-)((0[0-9]|1[0-3]):[0-5][0-9]|14:00)))?)?)?`	union of xs:dateTime, xs:date, xs:gYearMonth, xs:gYear	A JSON string - a union of xs:dateTime, xs:date, xs:gYearMonth, xs:gYear
time	A time during the day, in the format hh:mm:ss. There is no date specified. Seconds must be provided due to schema type constraints but may be zero-filled and may be ignored at receiver discretion. **The time "24:00" SHALL NOT be used. A time zone SHALL NOT be present.** Times can be converted to a Duration since midnight. Regex: `([01][0-9]|2[0-3]):[0-5][0-9]:([0-5][0-9]|60)(\.[0-9]+)?`	xs:time	A JSON string - an xs:time
code	Indicates that the value is taken from a set of controlled strings defined elsewhere (see Using codes for further discussion). Technically, a code is restricted to a string which has at least one character and no leading or trailing whitespace, and where there is no whitespace other than single spaces in the contents Regex: `[^\s]+(\s[^\s]+)*` This data type can be bound to a ValueSet	xs:token	JSON string
oid	An OID represented as a URI (RFC 3001); e.g. urn:oid:1.2.3.4.5 Regex: `urn:oid:[0-2](\.(0|[1-9][0-9]*))+`	xs:anyURI	JSON string - uri
id	Any combination of upper- or lower-case ASCII letters ('A'..'Z', and 'a'..'z', numerals ('0'..'9'), '-' and '.', with a length limit of 64 characters. (This might be an integer, an un-prefixed OID, UUID or any other identifier pattern that meets these constraints.) Regex: `[A-Za-z0-9\-\.]{1,64}`	xs:string	JSON string
markdown	A FHIR `string` (see above) that may contain markdown syntax for optional processing by a markdown presentation engine, in the GFM extension of CommonMark format (see below) Regex: `\s*(\S|\s)*` (can't put size limit in the regex - too large)	xs:string	JSON string
unsignedInt	Any non-negative integer in the range 0..2,147,483,647 Regex: `[0]|([1-9][0-9]*)`	xs:nonNegativeInteger	JSON number
positiveInt	Any positive integer in the range 1..2,147,483,647 Regex: `[1-9][0-9]*`	xs:positiveInteger	JSON number
uuid	A UUID (aka GUID) represented as a URI (RFC 4122); e.g. urn:uuid:c757873d-ec9a-4326-a141-556f43239520	xs:anyURI	JSON string - uri

- Puede limitarse aún más

Tipos de datos vs instancias

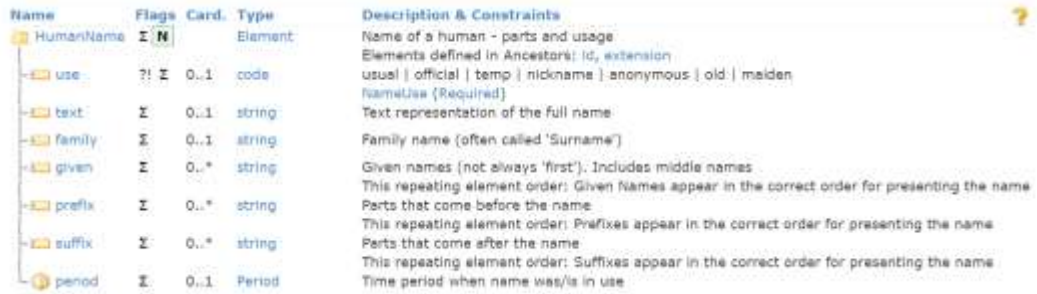
```
{
  "resourceType" : "Patient",
  "id" : "43961584-bf55-4ddf-9462-a37465fe4440",
  "identifier" : [
    {
      "type" : {
        "coding" : [
          {
            "system" : "http://terminology.hl7.org/CodeSystem/v2-0203/",
            "code" : "MR",
            "display" : "Medical record number"
          }
        ]
      },
      "system" : "http://myhospital.org/identifiers/patients",
      "value" : "P0000001"
    }
  ],
  "name" : [
    {
      "family" : "Doe",
      "given" : [
        "John"
      ]
    }
  ],
  "gender" : "male",
  "birthDate" : "1971-04-28T00:20:00Z"
}
```

Name	Flags	Card.	Type	Description & Constraints
Identifier	Σ N		Element	An identifier intended for computation Elements defined in Ancestors: id, extension
use	?! Σ	0..1	code	usual | official | temp | secondary | old (If known) IdentifierUse (Required)
type	Σ	0..1	CodeableConcept	Description of identifier IdentifierType (Extensible)
system	Σ	0..1	uri	The namespace for the identifier value
value	Σ	0..1	string	The value that is unique
period	Σ	0..1	Period	Time period when id is/was valid for use
assigner	Σ	0..1	Reference(Organization)	Organization that issued id (may be just text)

Documentation for this format

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

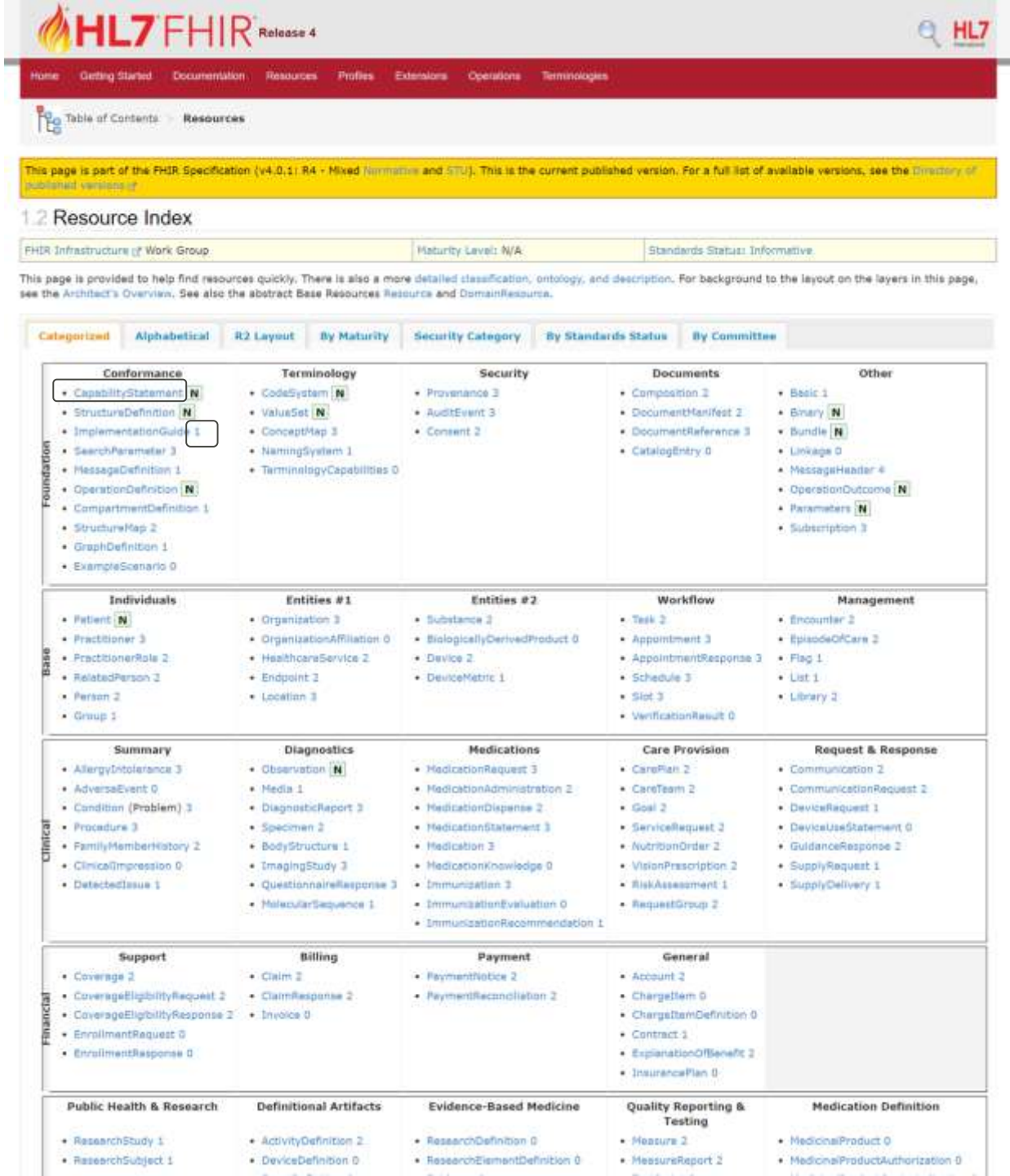


Name	Flags	Card.	Type	Description & Constraints
HumanName	Σ N		Element	Name of a human - parts and usage Elements defined in Ancestors: id, extension
use	?! Σ	0..1	code	usual | official | temp | nickname | anonymous | old | maiden NameUse (Required)
text	Σ	0..1	string	Text representation of the full name
family	Σ	0..1	string	Family name (often called 'Surname')
given	Σ	0..*	string	Given names (not always 'first'). Includes middle names This repeating element order: Given Names appear in the correct order for presenting the name
prefix	Σ	0..*	string	Parts that come before the name This repeating element order: Prefixes appear in the correct order for presenting the name
suffix	Σ	0..*	string	Parts that come after the name This repeating element order: Suffixes appear in the correct order for presenting the name
period	Σ	0..1	Period	Time period when name was/is in use

Tipos de recursos FHIR

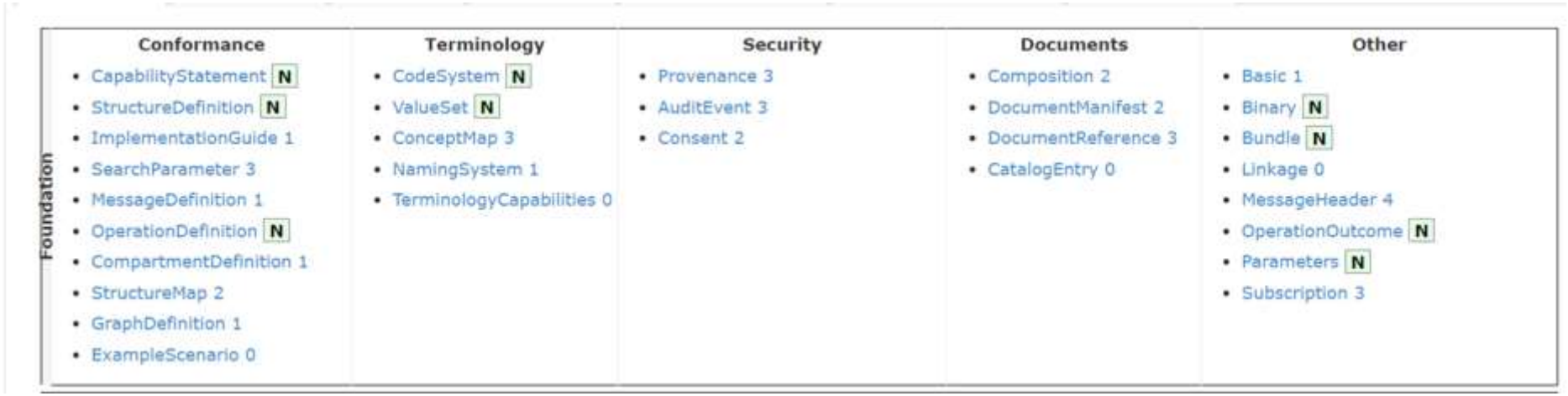
- Se definen computacionalmente
- Pueden extenderse (como la mayoría de los tipos)

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



Tipos de recursos "especiales" de FHIR

- Recursos fundacionales: se utilizan para definir aspectos fundamentales de FHIR (recursos, mapas, operaciones, capacidades)



Foundation

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

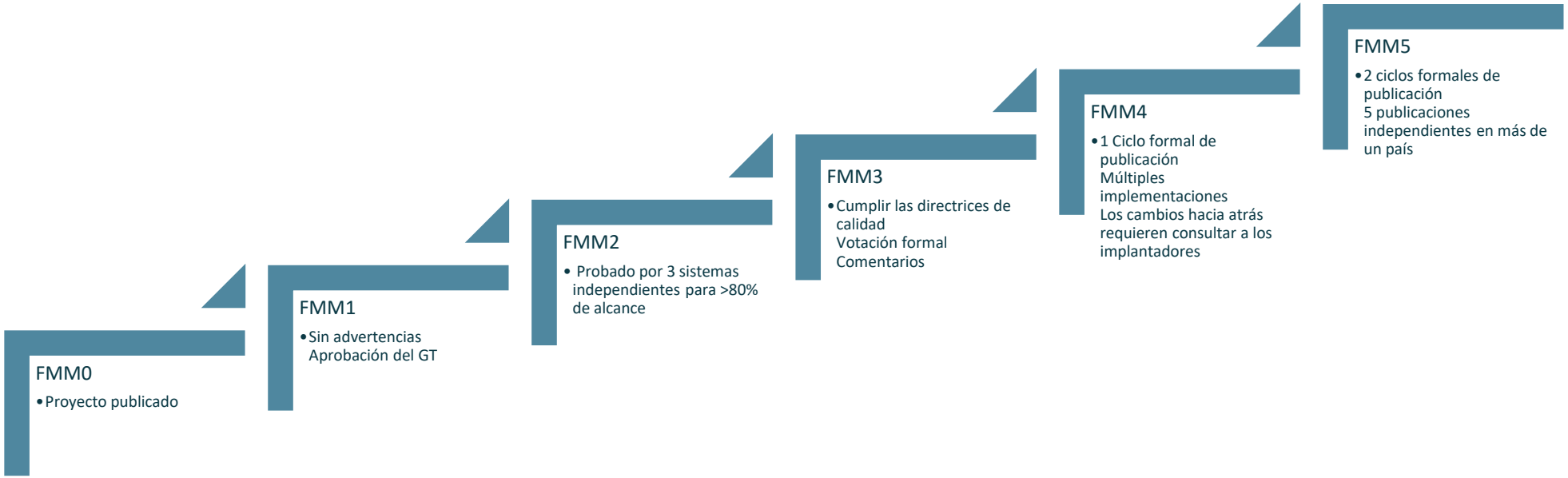
http://hl7.org/fhir/resourcelist.html

Proceso de desarrollo de FHIR

- Los grupos de trabajo de HL7 analizan continuamente las necesidades y mejoran el contenido estándar: recursos, orientación, etc.
- La comunidad HL7 y FHIR mejora continuamente el ecosistema y apoya la adopción.
- Los grupos de trabajo internacionales y nacionales pueden hacer lo mismo.

Niveles de madurez de FHIR

- **Los recursos FHIR (es decir, todos los artefactos de conformidad) tienen un nivel de modelo de madurez FHIR (FMM)**

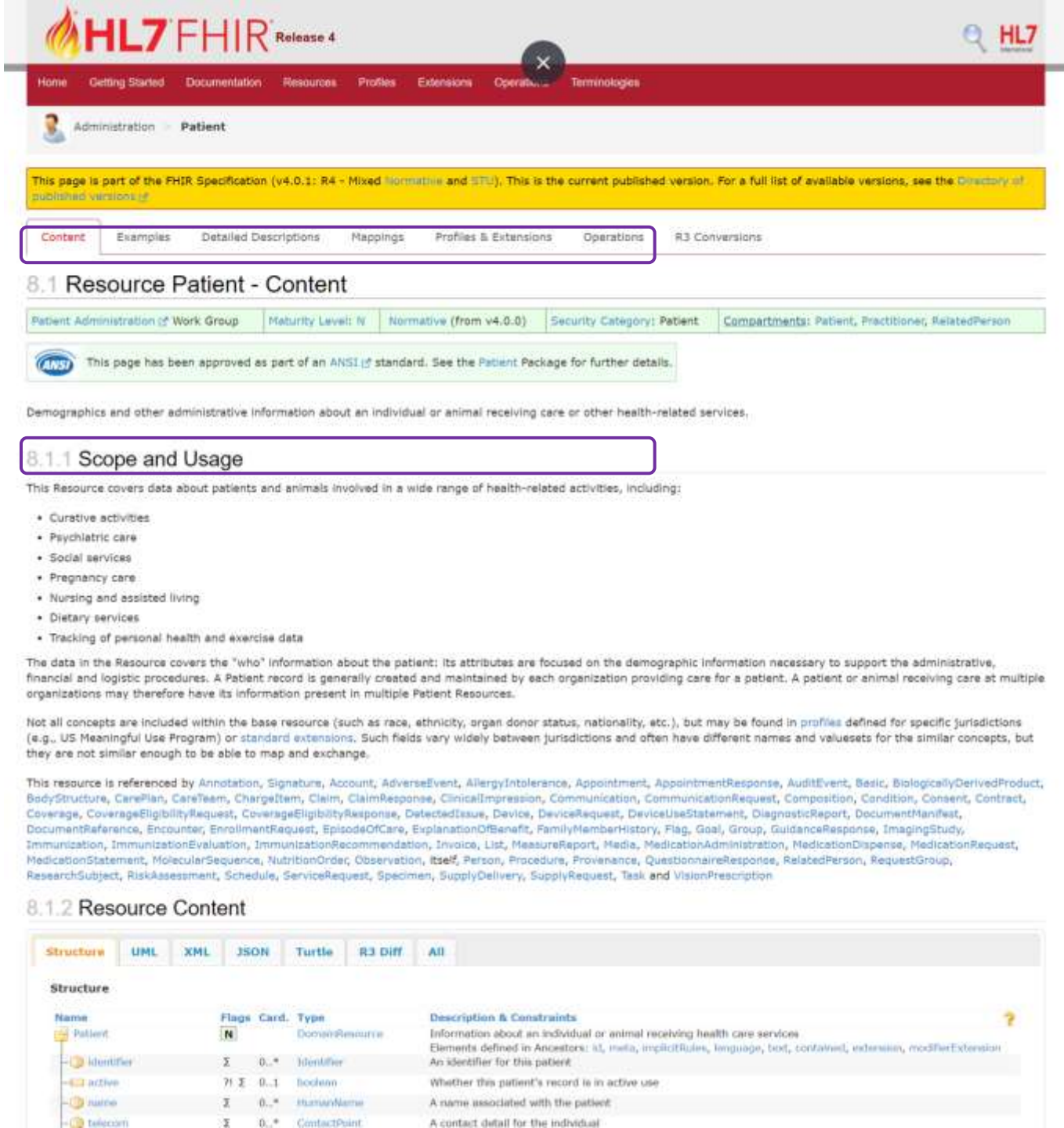


- **Los comentarios de los responsables de la aplicación son bienvenidos y forman parte del proceso**

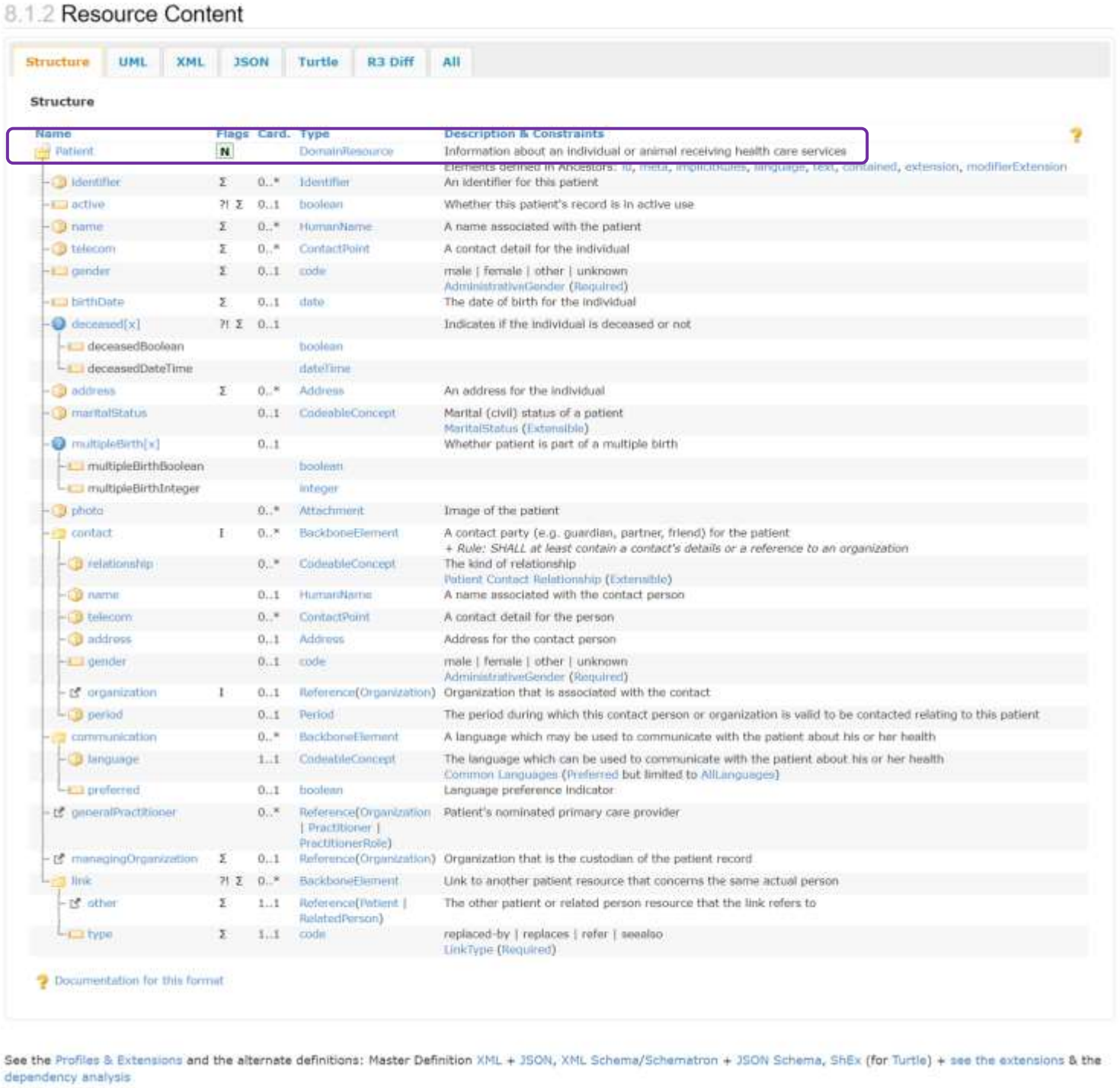
Recurso Patient

- Ámbito de aplicación y utilización

http://hl7.org/fhir/patient.html



Contenido de los recursos



8.1.2 Resource Content

Structure | UML | XML | JSON | Turtle | R3 Diff | All

Structure

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, contained, extension, modifierExtension
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	
address	Σ	0..*	Address	An address for the individual
maritalStatus		0..1	CodeableConcept	Marital (civil) status of a patient MaritalStatus (Extensible)
multipleBirth[x]		0..1		Whether patient is part of a multiple birth
multipleBirthBoolean			boolean	
multipleBirthInteger			integer	
photo		0..*	Attachment	Image of the patient
contact	I	0..*	BackboneElement	A contact party (e.g. guardian, partner, friend) for the patient *+ Rule: SHALL at least contain a contact's details or a reference to an organization*
relationship		0..*	CodeableConcept	The kind of relationship Patient Contact Relationship (Extensible)
name		0..1	HumanName	A name associated with the contact person
telecom		0..*	ContactPoint	A contact detail for the person
address		0..1	Address	Address for the contact person
gender		0..1	code	male | female | other | unknown AdministrativeGender (Required)
organization	I	0..1	Reference(Organization)	Organization that is associated with the contact
period		0..1	Period	The period during which this contact person or organization is valid to be contacted relating to this patient
communication		0..*	BackboneElement	A language which may be used to communicate with the patient about his or her health
language		1..1	CodeableConcept	The language which can be used to communicate with the patient about his or her health Common Languages (Preferred but limited to AllLanguages)
preferred		0..1	boolean	Language preference indicator
generalPractitioner		0..*	Reference(Organization | Practitioner | PractitionerRole)	Patient's nominated primary care provider
managingOrganization	Σ	0..1	Reference(Organization)	Organization that is the custodian of the patient record
link	?! Σ	0..*	BackboneElement	Link to another patient resource that concerns the same actual person
other	Σ	1..1	Reference(Patient | RelatedPerson)	The other patient or related person resource that the link refers to
type	Σ	1..1	code	replaced-by | replaces | refer | seealso LinkType (Required)

Documentation for this format

See the Profiles & Extensions and the alternate definitions: Master Definition XML + JSON, XML Schema/Schematron + JSON Schema, ShEx (for Turtle) + see the extensions & the dependency analysis

Enlaces o vínculos terminológicos

- Algunos tipos de datos pueden tener vínculos terminológicos (con obligatoriedad variable)

- Todos los elementos pueden tener vínculos (computables).
  - Los vínculos también se heredan

See the Profiles & Extensions and the alternate definitions: Master Definition XML + JSON, XML Schema/Schematron + JSON Schema, ShEx (for Turtle) + see the extensions & the dependency analysis

8.1.2.1 Terminology Bindings

Path	Definition	Type	Reference
Patient.gender Patient.contact.gender	The gender of a person used for administrative purposes.	Required	AdministrativeGender
Patient.maritalStatus	The domestic partnership status of a person.	Extensible	Marital Status Codes
Patient.contact.relationship	The nature of the relationship between a patient and a contact person for that patient.	Extensible	PatientContactRelationship
Patient.communication.language	A human language.	Preferred, but limited to AllLanguages	CommonLanguages
Patient.link.type	The type of link between this patient resource and another patient resource.	Required	LinkType

8.1.2.2 Constraints

id	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()`

Notes:

- multipleBirth can be either expressed as a Boolean (just indicating whether the patient is part of a multiple birth) or as an integer, indicating the actual birth order.
- Patient records may only be in one of two statuses: in use (active=true) and not in use (active=false). A normal record is active, i.e. it is in use. Active is set to 'false' when a record is created as a duplicate or in error. A record does not need to be linked to be inactivated.
- The *link* element is used to assert that two or more Patient resources are both about the same actual patient. See below for further discussion
- There should be only one preferred language (Language.preference = true) per mode of expression.
- The Contact for a Patient has an element organization, this is for use with guardians or business related contacts where just the organization is relevant.

8.1.3 Patient ids and Patient resource ids

A Patient record's Resource Id can never change. For this reason, the identifiers with which humans are concerned (often called MRN - Medical Record Number, or UR - Unit Record) should not be used for the resource's id, since MRN's may change, i.e. as a result of having duplicate records of the same patient. Instead they should be represented in the *Patient.identifier* list where they can be managed. This is also useful for the case of institutions that have acquired multiple numbers because of mergers of patient record systems over time.

Where there is a need to implement an automated MRN Identifier created for a patient record, this could be achieved by providing an identifier in the patient with an appropriate assigner, MRN Type and/or system but with no value assigned. Internal business rules can then detect this and replace/populate this identifier with 1 or more identifiers (as required).

8.1.4 Linking Patients

The *link* element is used to assert that patient resources refer to the same patient. This element is used to support the following scenarios where multiple patient records exist:

8.1.4.1 Duplicate Patient records

Managing Patient registration is a well-known difficult problem. Around 2% of registrations are in error, mostly duplicate records. Sometimes the duplicate record is caught fairly quickly and retired before much data is accumulated. In other cases, substantial amounts of data may accumulate. By using a link of type 'replaced-by', the record containing such a link is marked as a duplicate and the link points forward to a record that should be used instead. Note that the record pointed to may in its turn have been identified as created in error and forward to yet another Patient resource. Records that replace another record may use a link type of 'replaces' pointing to the old record.

8.1.4.2 Patient record in a Patient index

A Patient record may be present in a system that acts as a Patient Index: it maintains a (summary of) patient data and a list of one or more servers that are known to hold a more comprehensive and/or authoritative record of the same patient. The link type 'refer' is used to denote such a link. Note that linked records may contain contradictory information. The record referred to does not point back to the referring record.

8.1.4.3 Distributed Patient record

In a distributed architecture, multiple systems keep separate patient records concerning the same patient. These records are not considered duplicates, but contain a distributed, potentially overlapping view of the patient's data. Each such record may have its own focus or maintaining organization and there need not be a sense of one record being more complete or more authoritative than another. In such cases, links of type 'see also' can be used to point to other patient records. It is not a requirement that such links are bilateral.

8.1.5 Patient vs. Person vs. Patient.Link vs. Linkage

The Person resource on the surface appears to be very similar to the Patient resource, and the usage for it is very similar to using the Patient.Link capability.
The intention of the Person resource is to be able to link instances of resources together that are believed to be the same individual. This includes across resource types, such as RelatedPerson, Practitioner, Patient and even other Person resources.
The Patient Link however is only intended to be used for Patient resources.

Parámetros de búsqueda

8.1.12 Search Parameters

Search parameters for this resource. The common parameters also apply. See Searching for more information about searching in REST, messaging, and services.

Name	Type	Description	Expression	In Common
active TU	token	Whether the patient record is active	Patient.active	
address TU	string	A server defined search that may match any of the string fields in the Address, including line, city, district, state, country, postalCode, and/or text	Patient.address	3 Resources
address-city TU	string	A city specified in an address	Patient.address.city	3 Resources
address-country TU	string	A country specified in an address	Patient.address.country	3 Resources
address-postalcode TU	string	A postalCode specified in an address	Patient.address.postalCode	3 Resources
address-state TU	string	A state specified in an address	Patient.address.state	3 Resources
address-use TU	token	A use code specified in an address	Patient.address.use	3 Resources
birthdate TU	date	The patient's date of birth	Patient.birthDate	2 Resources
death-date TU	date	The date of death has been provided and satisfies this search value	(Patient.deceased as dateTime)	
deceased TU	token	This patient has been marked as deceased, or as a death date entered	Patient.deceased.exists() and Patient.deceased != false	
email TU	token	A value in an email contact	Patient.telecom.where(system='email')	4 Resources
family TU	string	A portion of the family name of the patient	Patient.name.family	1 Resources
gender TU	token	Gender of the patient	Patient.gender	3 Resources
general-practitioner TU	reference	Patient's nominated general practitioner, not the organization that manages the record	Patient.generalPractitioner (Practitioner, Organization, PractitionerRole)	
given TU	string	A portion of the given name of the patient	Patient.name.given	1 Resources
identifier TU	token	A patient identifier	Patient.identifier	
language TU	token	Language code (irrespective of use value)	Patient.communication.language	
link TU	reference	All patients linked to the given patient	Patient.link.other (Patient, RelatedPerson)	
name TU	string	A server defined search that may match any of the string fields in the HumanName, including family, give, prefix, suffix, suffix, and/or text	Patient.name	
organization TU	reference	The organization that is the custodian of the patient record	Patient.managingOrganization (Organization)	
phone TU	token	A value in a phone contact	Patient.telecom.where(system='phone')	4 Resources
phonetic TU	string	A portion of either family or given name using some kind of phonetic matching algorithm	Patient.name	3 Resources
telecom TU	token	The value in any kind of telecom details of the patient	Patient.telecom	4 Resources

Instancia de recursos


```
{
  "resourceType" : "Patient",
  "id" : "43961584",
  "meta" : {
    "versionId" : "1",
    "lastUpdated" : "2020-09-11T13:48:11.266Z"
  },
  "text" : {
    "status" : "generated",
    "div" : "<div xmlns=\"http://www.w3.org/1999/xhtml\"><p><b>Generated Narrative with Details</b></p><p><b>id</b>:
1</p><p><b>identifier</b>: Medical record number = P0000001</p><p><b>name</b>: John Doe </p><p><b>gender</b>: other</p><p><b>birthDate</b>:
28/04/1971 0:20:00 AM</p></div>"
  },
  "identifier" : [
    {
      "type" : {
        "coding" : [
          {
            "system" : "http://terminology.hl7.org/CodeSystem/v2-0203/",
            "code" : "MR",
            "display" : "Medical record number"
          }
        ]
      },
      "system" : "http://myhospital.org/identifiers/patients",
      "value" : "P0000001"
    }
  ],
  "name" : [
    {
      "family" : "Doe",
      "given" : [
        "John"
      ]
    }
  ],
  "gender" : "male",
  "birthDate" : "1971-04-28T00:20:00Z"
}
```

Búsqueda FHIR

- Los servidores FHIR pueden admitir búsquedas mediante GET o POST
- Las posibilidades de búsqueda pueden configurarse para sistemas individuales.
- La búsqueda puede incluir recursos adicionales o limitar los datos...

Búsqueda FHIR

- La búsqueda funciona como un filtro:
  - GET /Pacient - todos los pacientes
  - GET /Patient?_id=180252 - sólo el paciente con ese ID
  - GET /Paciente?identificador=http://hl7.org/fhir/sid/us-mbi|0000-000-0000
  - GET/Patient?birthdate=lt2010-10-01
- **Un recurso puede buscarse por sus parámetros de búsqueda**
- **Se puede buscar en un servidor a través de los recursos**

https://www.hl7.org/fhir/search.html

Parámetros de búsqueda

In the simplest case, a search is executed by performing a `GET` operation in the RESTful framework:

```
GET [base]/[type]?name=value&...{&_format=[mime-type]}
```

For this RESTful search (see definition in RESTful API), the parameters are a series of name=[value] pairs encoded in the URL or as an application/x-www-form-urlencoded submission for a POST:

```
POST [base]/[type]/_search{?[parameters]{&_format=[mime-type]}}
```

Search Parameter Types	Parameters for all resources	Search result parameters
Number Date/DateTime String Token Reference Composite Quantity URI Special	_id _lastUpdated _tag _profile _security _text _content _list _has _type	_sort _count _include _revinclude _summary _total _elements _contained _containedType

In addition, there is a special search parameters `_query` and `_filter` that allow for an alternative method of searching, and the parameters `_format` and `_pretty` defined for all interactions.

Structure

Name	Flags	Card.	Type	Description & Constraints
Practitioner	TU		DomainResource	A person with a formal responsibility in the provisioning of healthcare or related services Elements defined in Ancestors: id, meta, implicitRules, language, text, contained, extension, modifierExtension
identifier	Σ	0..*	Identifier	An identifier for the person as this agent
active	Σ	0..1	boolean	Whether this practitioner's record is in active use
name	Σ	0..*	HumanName	The name(s) associated with the practitioner
telecom	Σ	0..*	ContactPoint	A contact detail for the practitioner (that apply to all roles)
address	Σ	0..*	Address	Address(es) of the practitioner that are not role specific (typically home address)
gender	Σ	0..1	code	male | female | other | unknown AdministrativeGender (Required)
birthDate	Σ	0..1	date	The date on which the practitioner was born
photo		0..*	Attachment	Image of the person
qualification		0..*	BackboneElement	Certification, licenses, or training pertaining to the provision of care
identifier		0..*	Identifier	An identifier for this qualification for the practitioner
code		1..1	CodeableConcept	Coded representation of the qualification v2 table 0360, Version 2.7 (Example)
period		0..1	Period	Period during which the qualification is valid
issuer		0..1	Reference(Organization)	Organization that regulates and issues the qualification
communication		0..*	CodeableConcept	A language the practitioner can use in patient communication Common Languages (Preferred but limited to AllLanguages)

Documentation for this format

See the Profiles & Extensions and the alternate definitions: Master Definition XML + JSON, XML Schema/Schematron + JSON Schema, ShEx (for Turtle) + see the extensions & the dependency analysis

8.4.4.1 Terminology Bindings

Path	Definition	Type	Reference
Practitioner.gender	The gender of a person used for administrative purposes.	Required	AdministrativeGender
Practitioner.qualification.code	Specific qualification the practitioner has to provide a service.	Example	v2.0360.2.7
Practitioner.communication	A human language.	Preferred, but limited to AllLanguages	CommonLanguages

8.4.5 Notes:

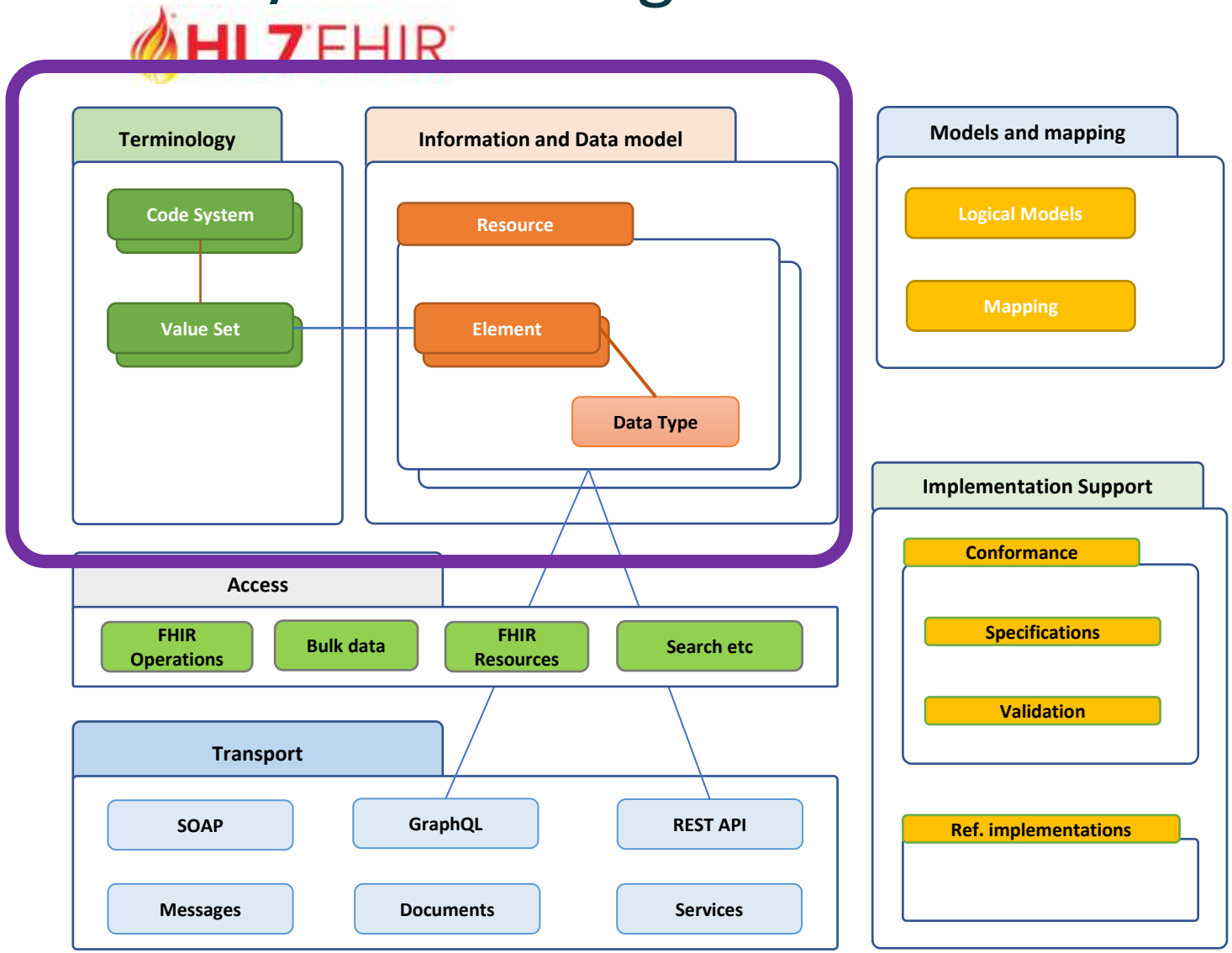
- The practitioner's Qualifications are acquired by the practitioner independent of any organization or role, and do not imply that they are allowed/authorized to perform roles relevant to the qualification at any specific Organization/Location.

8.4.6 Search Parameters

Search parameters for this resource. The common parameters also apply. See Searching for more information about searching in REST, messaging, and services

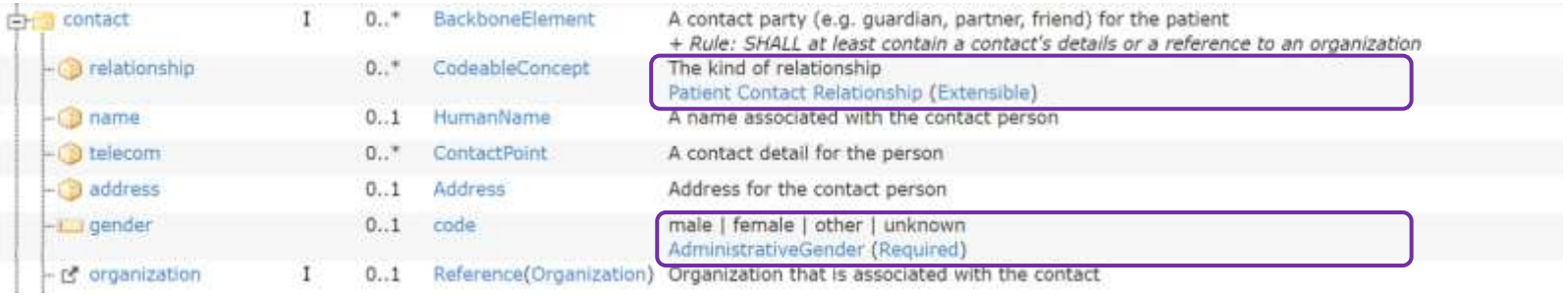
Name	Type	Description	Expression	In Common
active	token	Whether the practitioner record is active	Practitioner.active	
address	string	A server defined search that may match any of the string fields in the Address, including line, city, district, state, country, postalCode, and/or text	Practitioner.address	3 Resources
address-city	string	A city specified in an address	Practitioner.address.city	3 Resources
address-country	string	A country specified in an address	Practitioner.address.country	3 Resources
address-postalcode	string	A postalCode specified in an address	Practitioner.address.postalCode	3 Resources

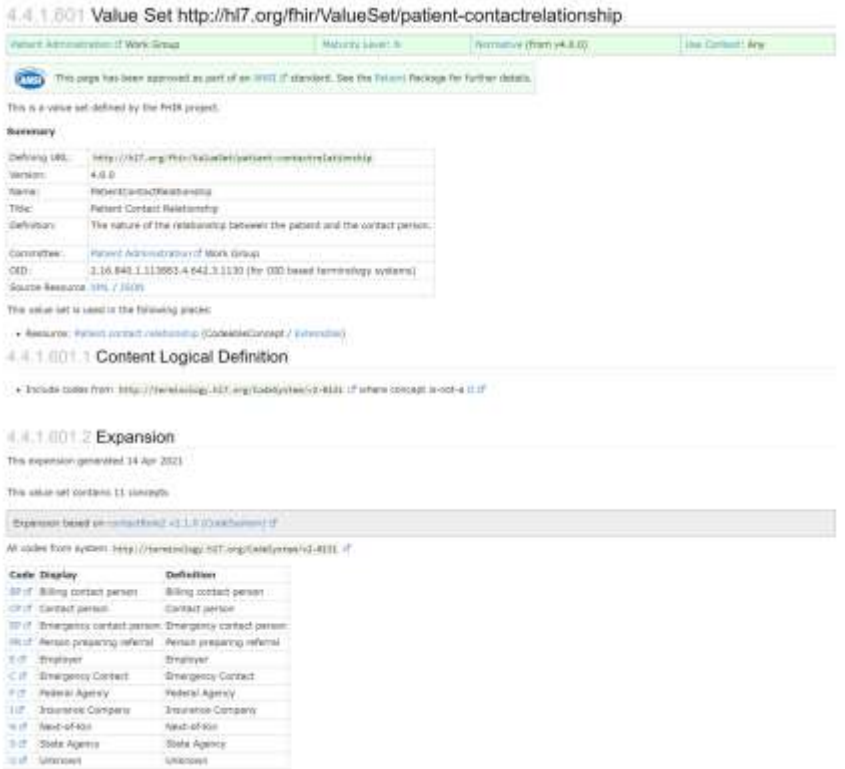
FHIR y terminologías

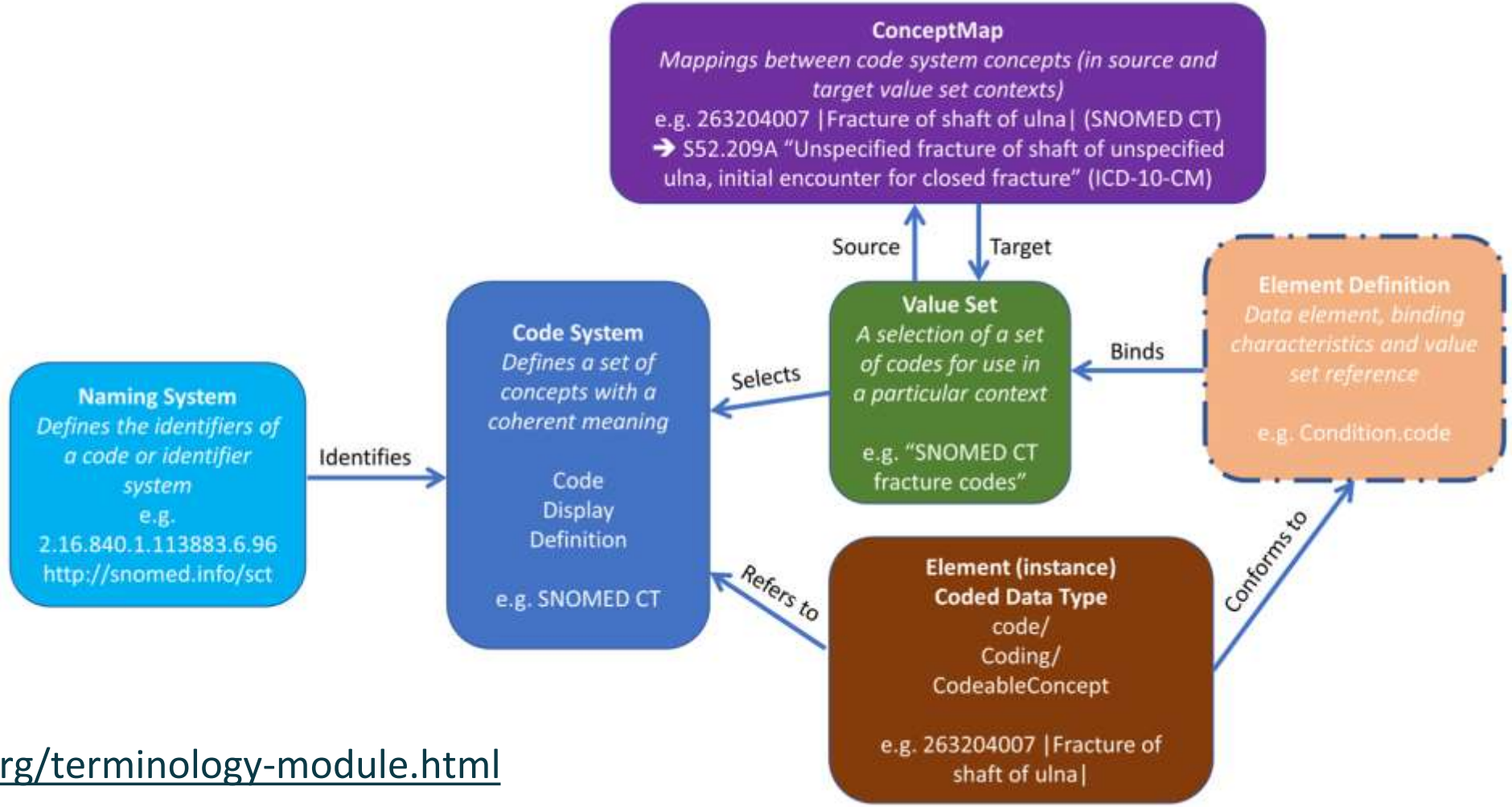


Uso de la terminología FHIR

- Algunos elementos de datos tienen un enlace terminológico (de una fuerza determinada)
  - A un ValueSet, que (normalmente) tiene valores de un CodeSystem



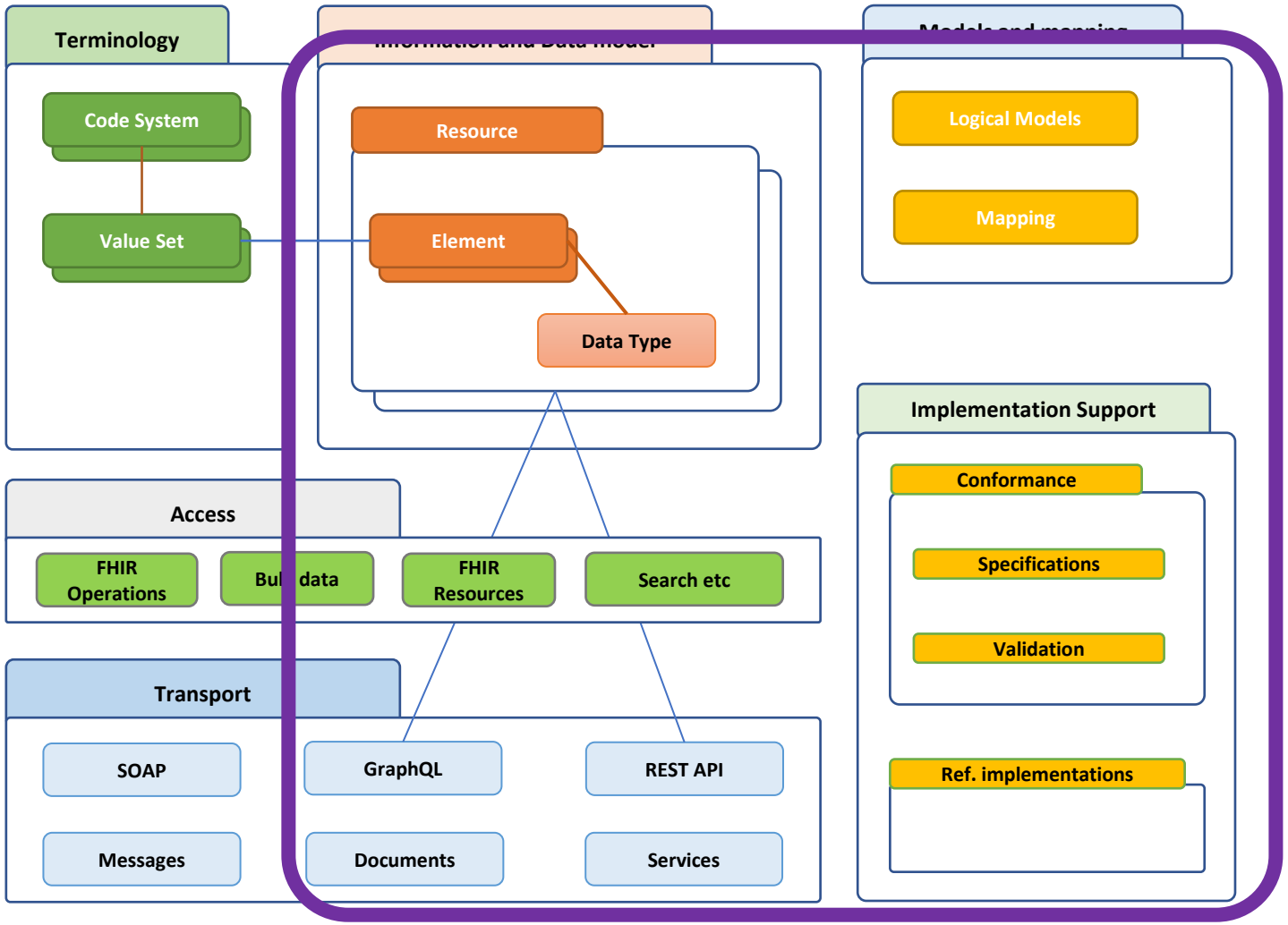




http://build.fhir.org/terminology-module.html

PREGUNTAS
Y
RESPUESTAS

Integración y relacionamiento de recursos FHIR



Referencias entre recursos

Un Recurso es normalmente la unidad atómica de intercambio. Los recursos se relacionan entre sí.

Name	Flags	Card.	Type	Description & Constraints
Reference	Σ N		Element	A reference from one resource to another + Rule: SHALL have a contained resource if a local reference is provided Elements defined in Ancestors: id, extension
reference	Σ I	0..1	string	Literal reference, Relative, internal or absolute URL
type	Σ	0..1	uri	Type the reference refers to (e.g. "Patient") ResourceType (Extensible)
identifier	Σ	0..1	Identifier	Logical reference, when literal reference is not known
display	Σ	0..1	string	Text alternative for the resource

2.3.0.2 Literal References

The `reference` is the key element - resources are identified and addressed by their URL. It contains a URL that is either

- an absolute URL
- a relative URL, which is relative to the Service Base URL, or, if processing a resource from a bundle, which is relative to the base URL implied by the `Bundle.entry.fullUrl` (see Resolving References in Bundles)
- an internal fragment reference (see "Contained Resources" below)

A relative reference to the Patient "034AB16" in an element named `subject` on a FHIR RESTful server:

```
<subject>
  <reference value="Patient/034AB16" />
</subject>
```

An absolute reference to a Structure Definition in an element named `profile`:

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

2.3.0.3 Logical References

In many contexts where FHIR is used, applications building a resource may know an identifier for the target of the reference, but there is no way for the application to convert this to a literal reference that directly references an actual resource. This situation may arise for several reasons:

- There is no server exposing any such resource. This is often the case with national identifiers (e.g. US SSN or NPI), and such identifiers are widely used
- The server that exposes the resource is not available to the source application, so it has no way to resolve an identifier to a reference
- The application is not in a RESTful environment - it is creating a message or a document

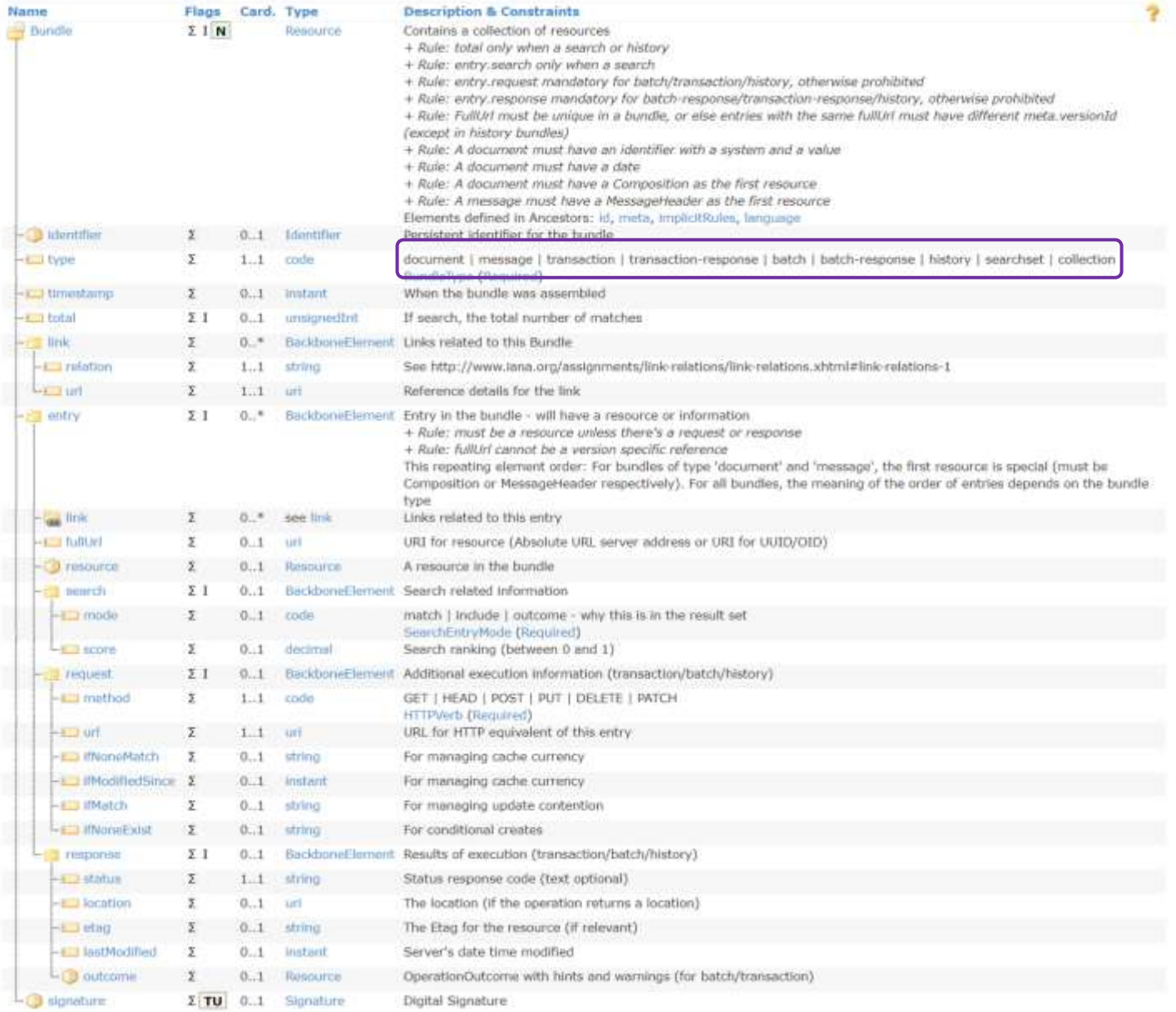
For further discussion of the use of identifiers on resources, see Consistent Resource Identification. In these cases, the source application may provide the identifier as a logical reference to the entity that the target resource would describe.

A logical reference to the Patient with an SSN of 000111111:

```
<patient>
  <identifier>
    <system value="http://hl7.org/fhir/sid/us-ssn" />
    <value value="000111111" />
  </identifier>
</patient>
```

Bundle

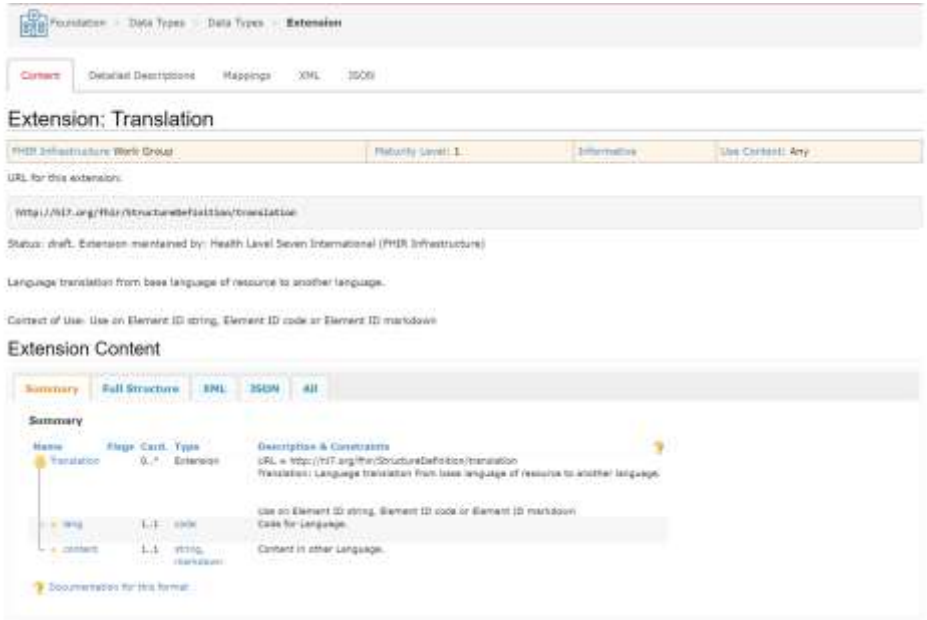
- Se utiliza para contener y agrupar recursos
- Diferentes tipos de paquetes
- Otros recursos sólo para agrupar:
  - Lista
  - Composición
  - (Grupo)

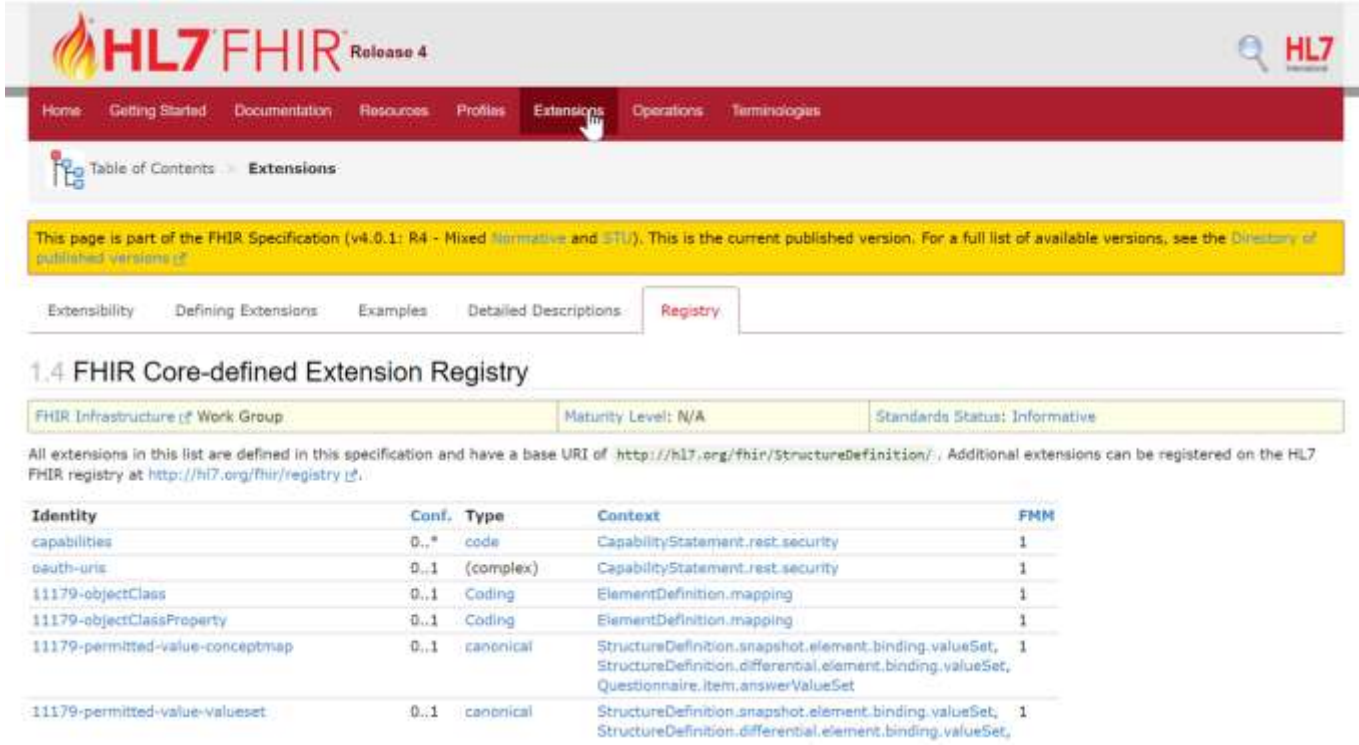


Name	Flags	Card.	Type	Description & Constraints
Bundle	Σ I N		Resource	Contains a collection of resources + Rule: total only when a search or history + Rule: entry.search only when a search + Rule: entry.request mandatory for batch/transaction/history, otherwise prohibited + Rule: entry.response mandatory for batch-response/transaction-response/history, otherwise prohibited + Rule: FullUrl must be unique in a bundle, or else entries with the same fullUrl must have different meta.versionId (except in history bundles) + Rule: A document must have an identifier with a system and a value + Rule: A document must have a date + Rule: A document must have a Composition as the first resource + Rule: A message must have a MessageHeader as the first resource Elements defined in Ancestors: id, meta, implicitRules, language
identifier	Σ	0..1	Identifier	Persistent identifier for the bundle
type	Σ	1..1	code	document | message | transaction | transaction-response | batch | batch-response | history | searchset | collection BundleType (Required)
timestamp	Σ	0..1	instant	When the bundle was assembled
total	Σ I	0..1	unsignedInt	If search, the total number of matches
link	Σ	0..*	BackboneElement	Links related to this Bundle
relation	Σ	1..1	string	See http://www.iana.org/assignments/link-relations/link-relations.xhtml#link-relations-1
url	Σ	1..1	uri	Reference details for the link
entry	Σ I	0..*	BackboneElement	Entry in the bundle - will have a resource or information + Rule: must be a resource unless there's a request or response + Rule: fullUrl cannot be a version specific reference This repeating element order: For bundles of type 'document' and 'message', the first resource is special (must be Composition or MessageHeader respectively). For all bundles, the meaning of the order of entries depends on the bundle type
link	Σ	0..*	see link	Links related to this entry
fullUrl	Σ	0..1	uri	URI for resource (Absolute URL server address or URI for UUID/OID)
resource	Σ	0..1	Resource	A resource in the bundle
search	Σ I	0..1	BackboneElement	Search related information
mode	Σ	0..1	code	match | include | outcome - why this is in the result set SearchEntryMode (Required)
score	Σ	0..1	decimal	Search ranking (between 0 and 1)
request	Σ I	0..1	BackboneElement	Additional execution information (transaction/batch/history)
method	Σ	1..1	code	GET | HEAD | POST | PUT | DELETE | PATCH HTTPVerb (Required)
url	Σ	1..1	uri	URL for HTTP equivalent of this entry
ifNoneMatch	Σ	0..1	string	For managing cache currency
ifModifiedSince	Σ	0..1	instant	For managing cache currency
ifMatch	Σ	0..1	string	For managing update contention
ifNoneExist	Σ	0..1	string	For conditional creates
response	Σ I	0..1	BackboneElement	Results of execution (transaction/batch/history)
status	Σ	1..1	string	Status response code (text optional)
location	Σ	0..1	uri	The location (if the operation returns a location)
etag	Σ	0..1	string	The Etag for the resource (if relevant)
lastModified	Σ	0..1	instant	Server's date time modified
outcome	Σ	0..1	Resource	OperationOutcome with hints and warnings (for batch/transaction)
signature	Σ TU	0..1	Signature	Digital Signature

Extensiones de FHIR

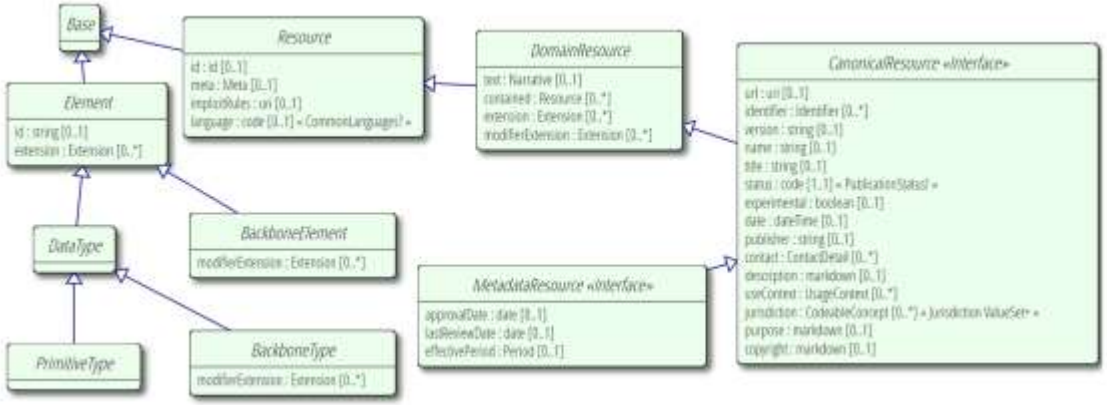
- La forma de añadir elementos a una estructura manteniendo la conformidad.
- Las extensiones también se definen mediante FHIR.
- FHIR proporciona algunas extensiones estándar: donde el elemento de datos no es muy común, pero donde hay utilidad en tener una forma común de expresarlo.





Recursos contenidos, extensiones

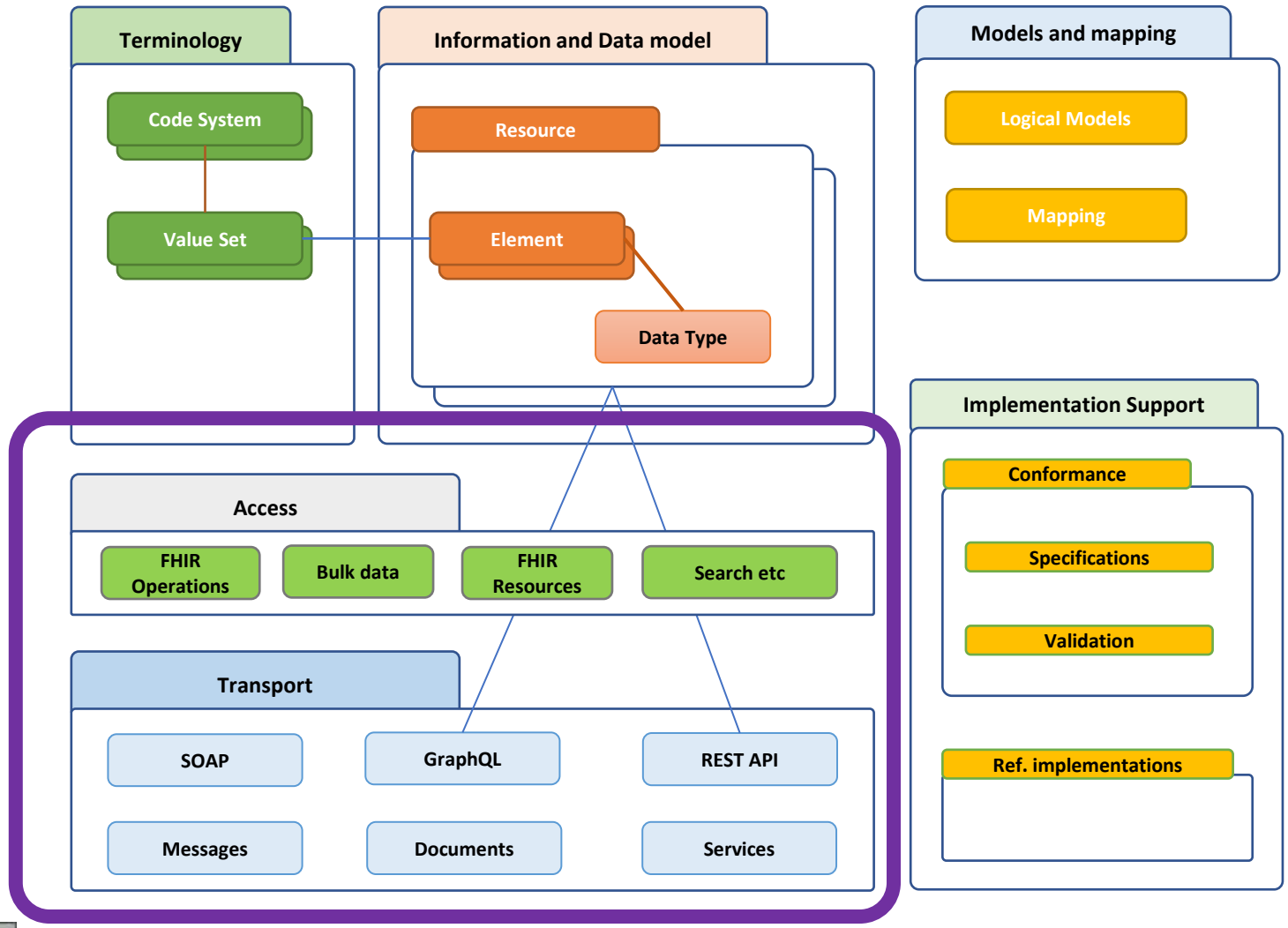
- Los recursos pueden contener otros recursos



Casi todo en FHIR se puede ampliar


```
{
  "resourceType" : "Patient",
  "id" : "43961584-bf55-4ddf-9462-a37465fe4440",
  "contained" : [
       {
         "resourceType": "Organization",
         "id": "123",
         "identifier": [
           {
             "system": "urn:ietf:rfc:3986",
             "value": "urn:oid:2.16.840.1.113883.19.5"
           }
         ],
         "name": "Good Health Clinic"
       }
  ],
  "extension" : [
    {
      "url" : "http://hl7.org/fhir/StructureDefinition/patient-birthPlace",
      "valueAddress" : {
        "city" : "Muenchen",
        "country" : "Germany"
      }
    }
  ],
  "identifier" : [
    {
      "type" : {
        "coding" : [
          {
            "system" : "http://terminology.hl7.org/CodeSystem/v2-0203/",
            "code" : "MR",
            "display" : "Medical record number"
          }
        ]
      },
      "system" : "http://myhospital.org/identifiers/patients",
      "value" : "P0000001"
    }
  ],
  "name" : [
    {
      "family" : "Doe",
      "given" : [ "John" ]
    }
  ],
  "gender" : "male",
  "birthDate" : "1971-04-28T00:20:00Z"
}
```

Intercambio de datos FHIR



Paradigmas de intercambio

http://www.healthintersections.com.au

FHIR admite 4 paradigmas

- RESTful API hl7.org/fhir/http.html
- Documentos (como CDA) hl7.org/fhir/documents.html
- Servicios (técnicas SOA) hl7.org/fhir/services.html
- Mensajes hl7.org/fhir/messaging.html

REST

- Enfoque más común
- GET (el verbo "leer")
  - GET un único recurso: GET Paciente/43961584
  - GET un conjunto de recursos GET Paciente (?...)
  - La respuesta es un recurso (un paciente, un paquete o un resultado de operación)
- POST (crear)
- PUT (actualizar)
- DELETE (eliminar)

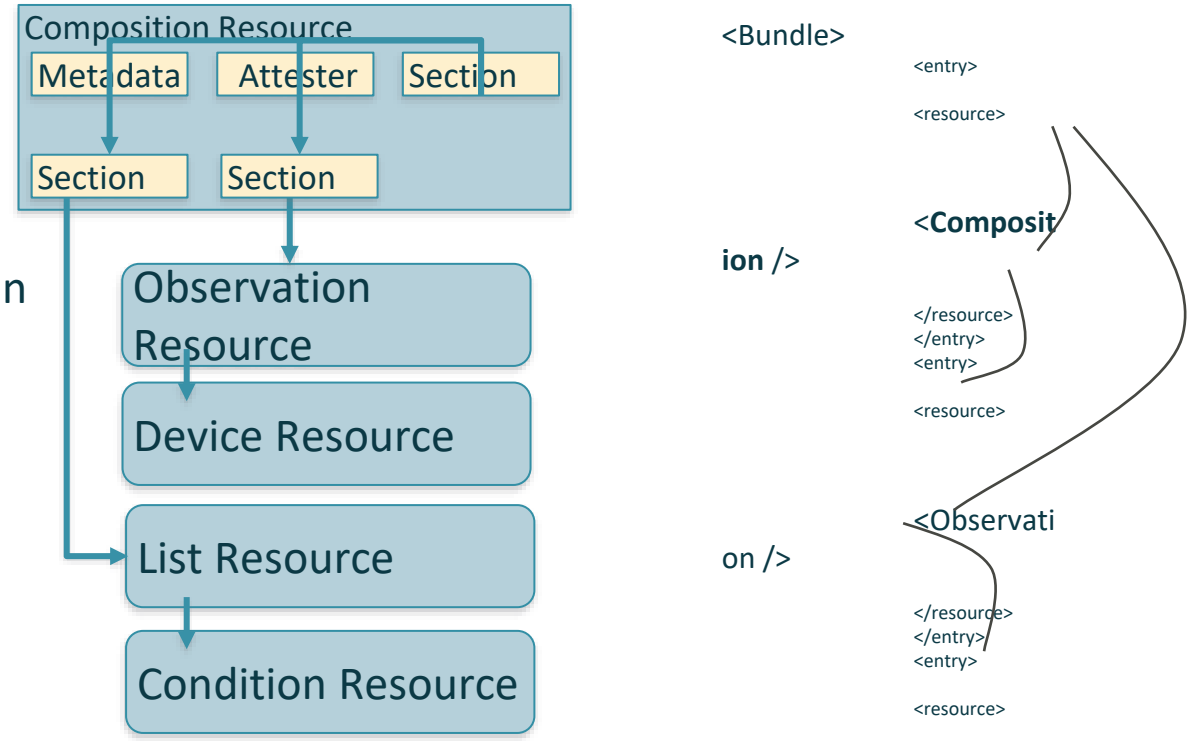
Ejemplo

```
(GET) http://test.fhir.org/r4/Patient/43961584/_history/4?_format=json
```

Documentos

- Un Bundle con
  - Tipo = documento
  - La primera entrada es una composición
  - N entradas referenciadas por Composición
  - Firma y procedencia

- Utilizado para
  - Persistencia
  - Administración
  - Autenticación
  - Contexto
  - Integridad
  - Legibilidad humana



http://build.fhir.org/documents

Suscripciones FHIR

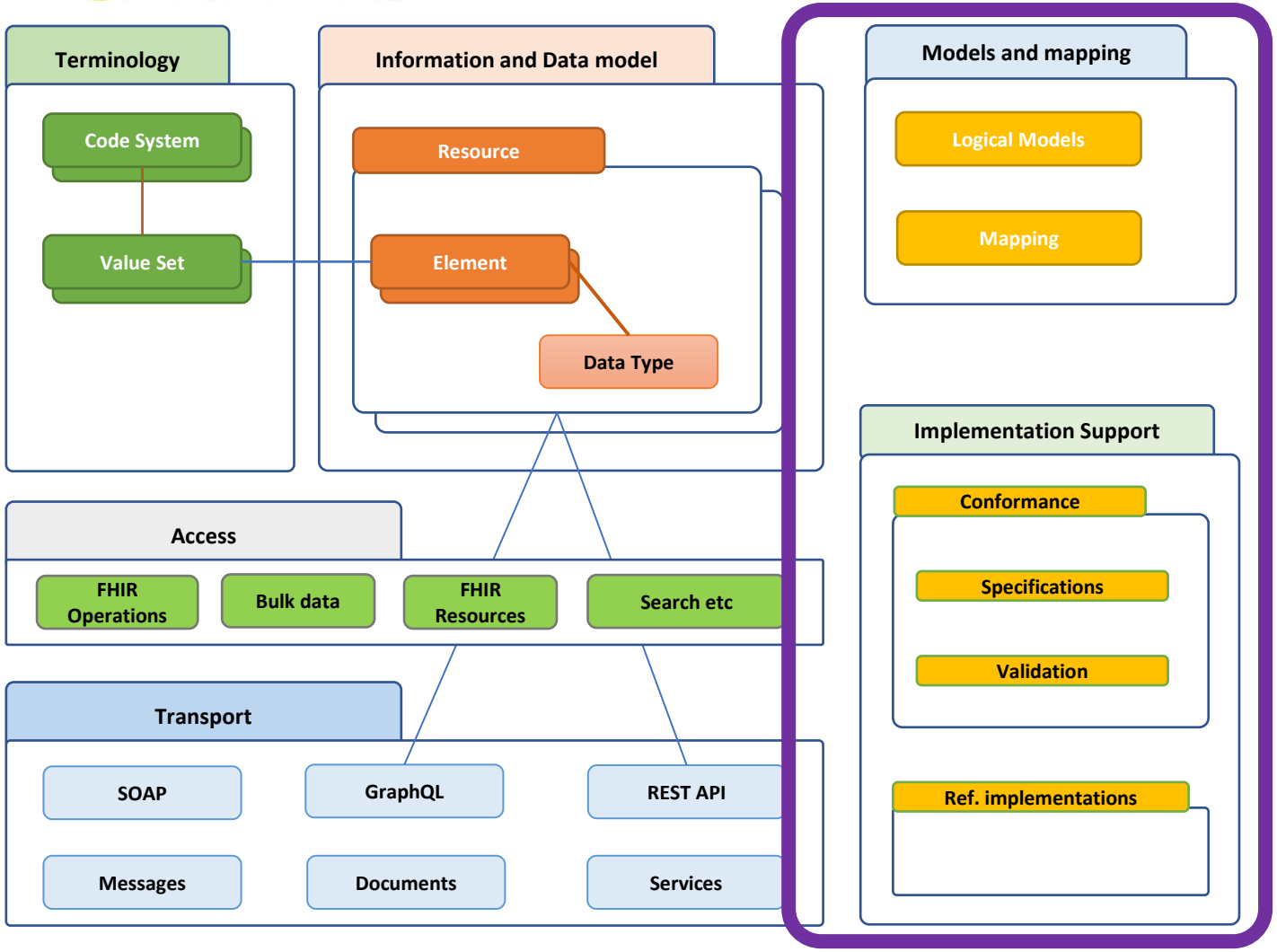
- Potencialmente interesante para "escuchar" los acontecimientos

  - SubscriptionTopic resources
    - Define the **data** and **change** used to trigger notifications
    - Define the filters allowed to clients
  - Subscription resources
    - Describe a client's request to be notified about events defined in a `SubscriptionTopic`
    - Set filters on events (as defined in the referenced `SubscriptionTopic`)
    - Describe the channel and endpoint used to send notifications
    - Describe the payload included in notifications (MIME type, content level, etc.)
  - subscription-notification Bundles
    - Describe a notification (using a SubscriptionStatus)
    - Contain zero or more notification payloads

http://build.fhir.org/subscriptions

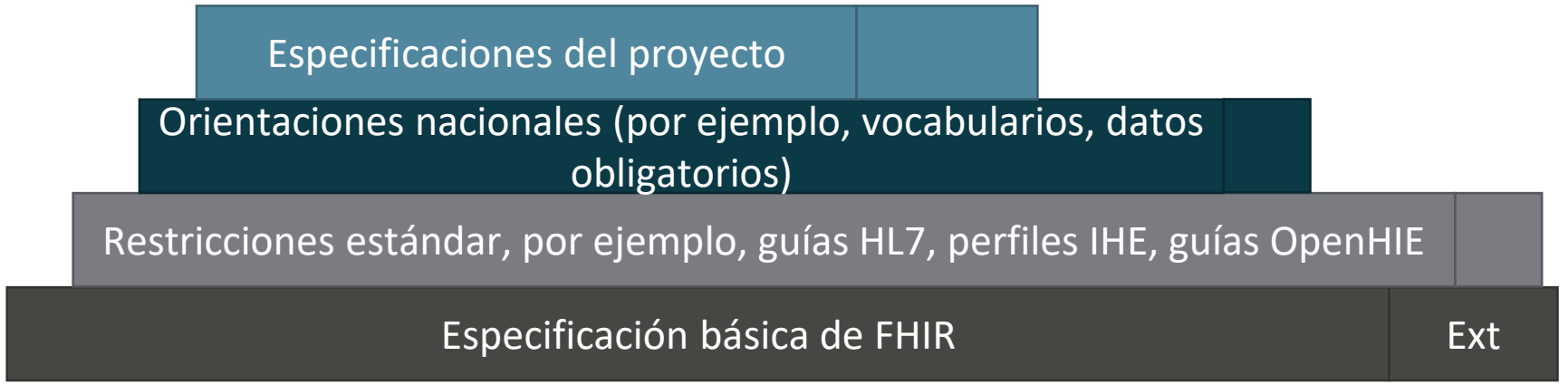
PREGUNTAS
Y
RESPUESTAS

Implementación de FHIR



Uso de FHIR en una implementación

- Será objeto de una sesión introductoria específica.
- Puede haber diferentes niveles: busque orientaciones ya existentes (o ayude a crearlas).
- Una especificación FHIR puede añadir restricciones y extensiones a la especificación de la que depende.



Aplicando restricciones en FHIR

- Las cardinalidades pueden reducirse - no aumentarse
- Se pueden reducir los enlaces de vocabulario - no aumentar o flexibilizar.
- Para elementos que son multiplos (0..*), podemos “reservar” secciones (“slicing”)
  - por ejemplo, reservar 1 ocurrencia de patient.identifier para “ID nacional”)

Herramientas de FHIR

- Servidores FHIR
  - De fácil acceso:
    - http://test.fhir.org/r4
    - http://hapi.fhir.org/

- Implementaciones de referencia (servidores y clientes en varias plataformas tecnológicas)

  https://confluence.hl7.org/display/FHIR/Open+Source+Implementations

Ponte en contacto, sé activo

- Consultar con otras personas (en chat.fhir.org o community.fhir.org)
  - https://foro.recainsa.org/
- Cree (o pida a alguien que cree) una solicitud de cambio a la norma
- Participar en un evento FHIR como DevDays (devdays.com), o un evento local
- Participar en un Connectathon de FHIR, testar un sistema, traer comentarios y conclusiones

Comentarios, preguntas y respuestas, debate
Próximas sesiones

Próximas sesiones

- **Perfiles y documentación FHIR**
  - En este seminario web exploraremos los aspectos básicos para crear y documentar una especificación FHIR® para un proyecto, un país o una aplicación individual. Veremos cómo la especificación FHIR® puede ampliarse y restringirse para dar soporte a necesidades específicas. Después de identificar lo que contiene una especificación FHIR®, veremos cómo se documentan dichas especificaciones, y cómo se hace de una buena manera para acelerar la entrega a través de la validación, las pruebas y la automatización. Recordaremos algunas de las características básicas de FHIR® en torno a la localización y el multilenguaje, que adquieren mayor importancia cuando se implementan perfiles FHIR®.

- **FHIR y Terminología**
  - En esta sesión se presentará la compatibilidad de FHIR® con las terminologías: Terminologías estándar (globales) como SNOMED CT, LOINC, o terminologías locales (por ejemplo códigos nacionales) frente a terminologías específicas del proyecto. Veremos los recursos FHIR® para terminologías, cómo se utilizan en otros recursos FHIR® y cómo definir nuevos recursos terminológicos, así como cómo localizar los conjuntos de valores. También echaremos un vistazo rápido a las operaciones básicas de terminología FHIR® y proporcionaremos algunos indicadores a recursos adicionales y servidores de terminología.

- **Guía de implementación de FHIR / Uso avanzado**
  - La culminación de esta serie fundacional será una sesión práctica tipo taller, con un ejemplo para cualquiera que desee crear su primera publicación de la especificación FHIR®. Utilizaremos las herramientas de código abierto (proporcionaremos instrucciones de instalación de antemano) y le guiaremos a través de la creación de una publicación de una Guía de Implementación en los aspectos más fundamentales: Configuración de un repositorio (compartido), adición de recursos de conformidad FHIR® (por ejemplo, perfiles, extensiones, conjuntos de valores), importación de dependencias de otras especificaciones, adición de texto narrativo y diagramas, y uso de un lenguaje abreviado para acelerar el trabajo. Al final, podrá encontrar el contenido publicado en su máquina, listo para compartir - o puede utilizar las herramientas de entrega continua de la comunidad para compartir el resultado en línea directamente desde su repositorio.

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