Internal Patient Summary Testing (Introduction)

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In General

- This is an overview and not training
- If I am speaking too quickly, please interrupt and ask me to slow down
- The agenda does not show it, but I have allocated 20 minutes at the end for questions
  - If you think it important to ask for clarification before waiting for the Question and Answer session, please interrupt
  - If the question can wait, type it in the chat window now. I will ask the moderator to take notes
- I will share a link to the slides. You might find it easier to view some slides on you computer.
  - There are a few figures that have too much small detail

Agenda

Topic	Allocation
IPS Motivation	5
IPS Collaborators	5
IPS Specification	10
Experience with IHE Testing	5
IPS Testing Outline	5
IPS Testing Tools	10

HL7® FHIR® DevDays

JUNE | 2021

International Patient Summary (IPS) - Moving from Specification to (Global) Implementation

Robert Hausam MD, Hausam Consulting LLC



HL7 FHIR DevDays 2021, Virtual Edition, June 7–10, 2021 | @HL7 | @FirelyTeam | #fhirdevdays | www.devdays.com

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IPS: a focused Patient Summary



Provide a **healthcare summary** for a citizen at the point of care



It is **minimal** and **non-exhaustive**



It is **specialty-agnostic** and **condition-independent**……but still **clinically relevant**

IPS: a focused Patient Summary



Designed to be **simple** and **implementable**

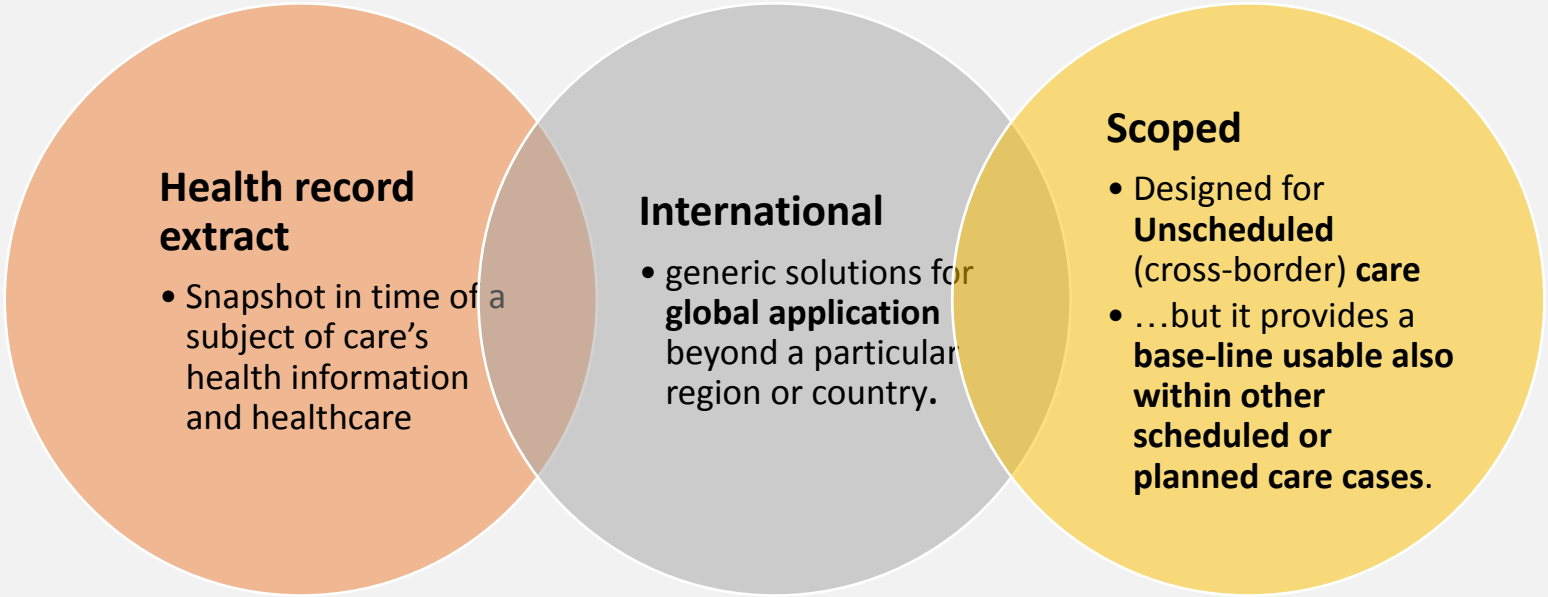


Usable **any time**, in **any place**; by **any one**



Multi-beneficiaries: Individuals, Healthcare Providers, Society

International Patient Summary



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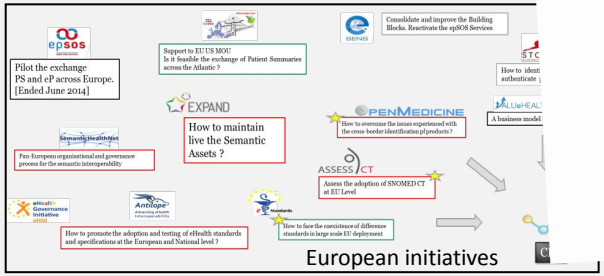
The Patient Summary journey…



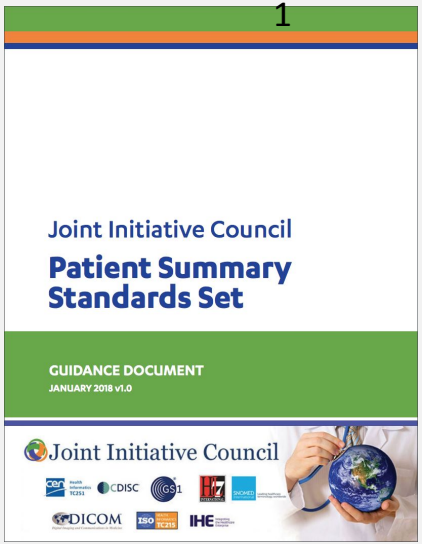


2009-2016

2017-2018

IPS

2017-2021



Development Timeline

2009 - 2016	Various European Initiatives	Individual European Specifications
2017 - 2018	Joint Initiative Council	Patient Summary Standards Set
2017 - 2021	HL7	IPS Implementation Guides
2017 - 2021	SNOMED	IPS Terminology
2017 - 2021	IHE	IPS Integration Profile

IPS Standards Artefacts

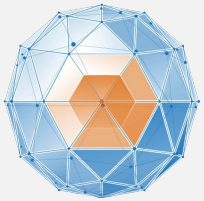
- **ISO/DIS 27269** approved
- **CEN/EN 17269** and **CEN/TS 17288** published
- **HL7 FHIR** and **CDA** Implementation Guides (**IG**) published as *"Standard for Trial Use"*
- **IHE IPS Profile** for both CDA and FHIR published for *"Trial Implementation"*
- **SNOMED CT** has published the free for use "**Global Patient Set (GPS)**" (including the IPS "free set")

IPS Implementation Initiatives

- **Global Digital Health Partnership (GDHP)**

  Interoperability Work Stream - IPS Work Group

  - Leadership from US/ONC
  - 31 countries & WHO
  - Goals
    - 10 countries implementing IPS in pilot project by end of 2021
    - 20 countries implementing IPS, with 10 in production use, by end of 2022



- **Global Consortium for eHealth Interoperability (GCeHI)**
  - HL7, IHE, HIMSS

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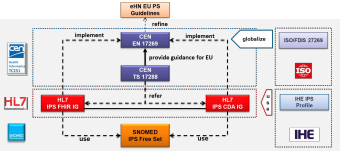
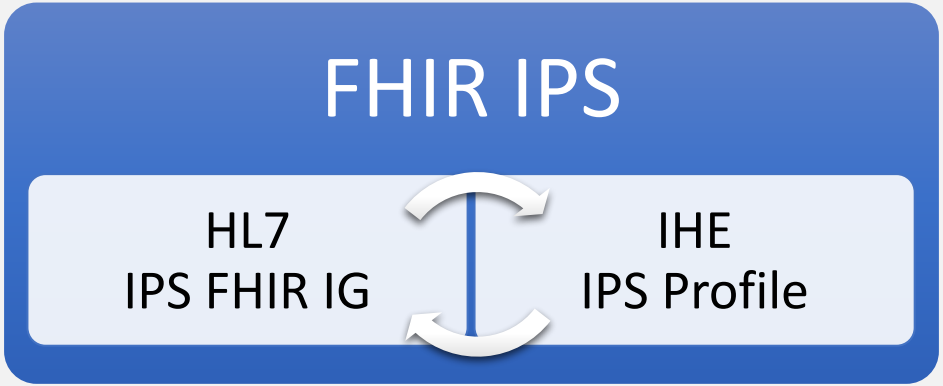


The FHIR IPS

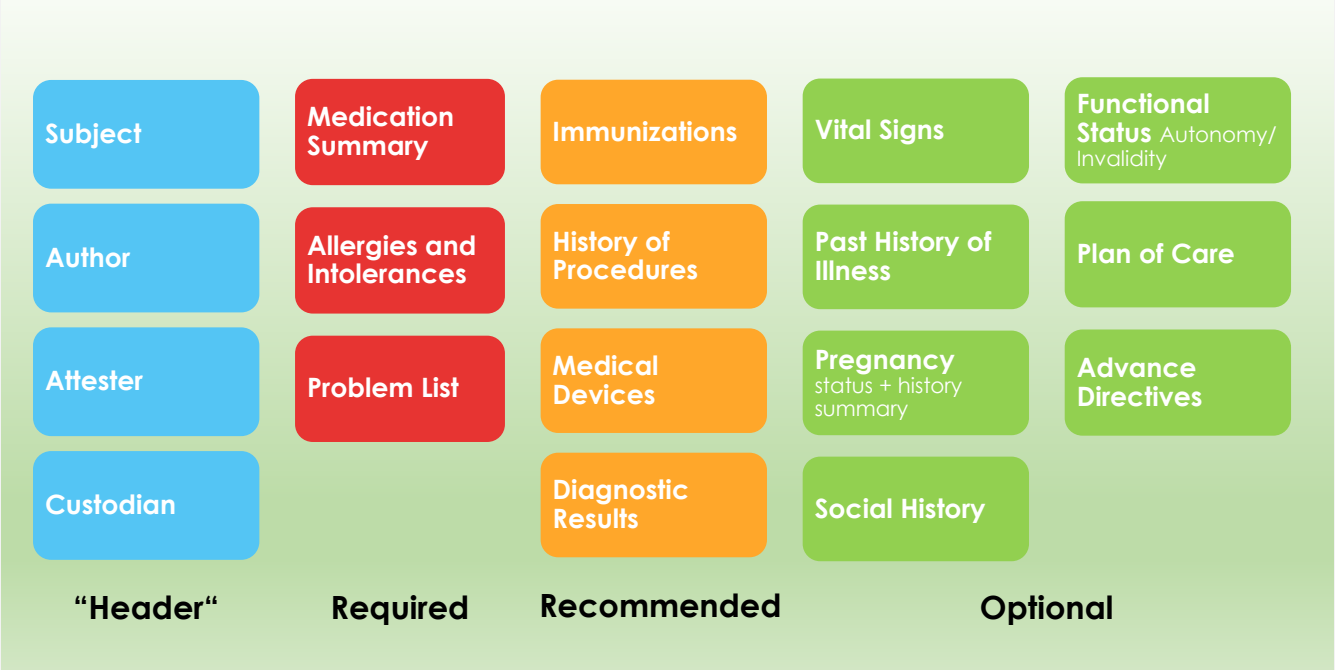
There is only one FHIR IPS !



High Level Artifacts

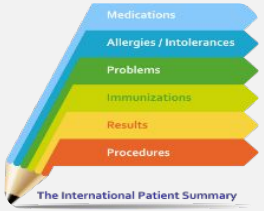
Contribution	Contributor
FHIR IPS Implementation Guide	HL7
CDA IPS Implementation Guide	HL7
Terminology	SNOMED
Document Exchange Model	IHE

IPS Content Sections



Envisioned “specialized” IPS use

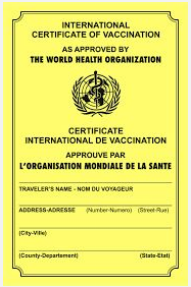
The IPS





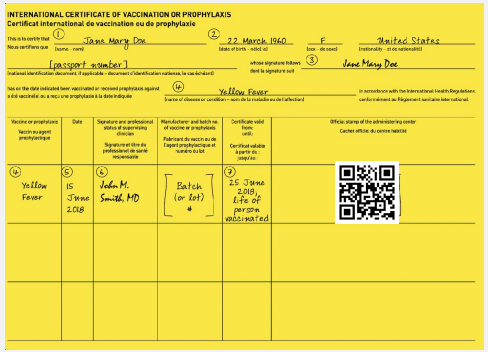
The “Immunization” IPS





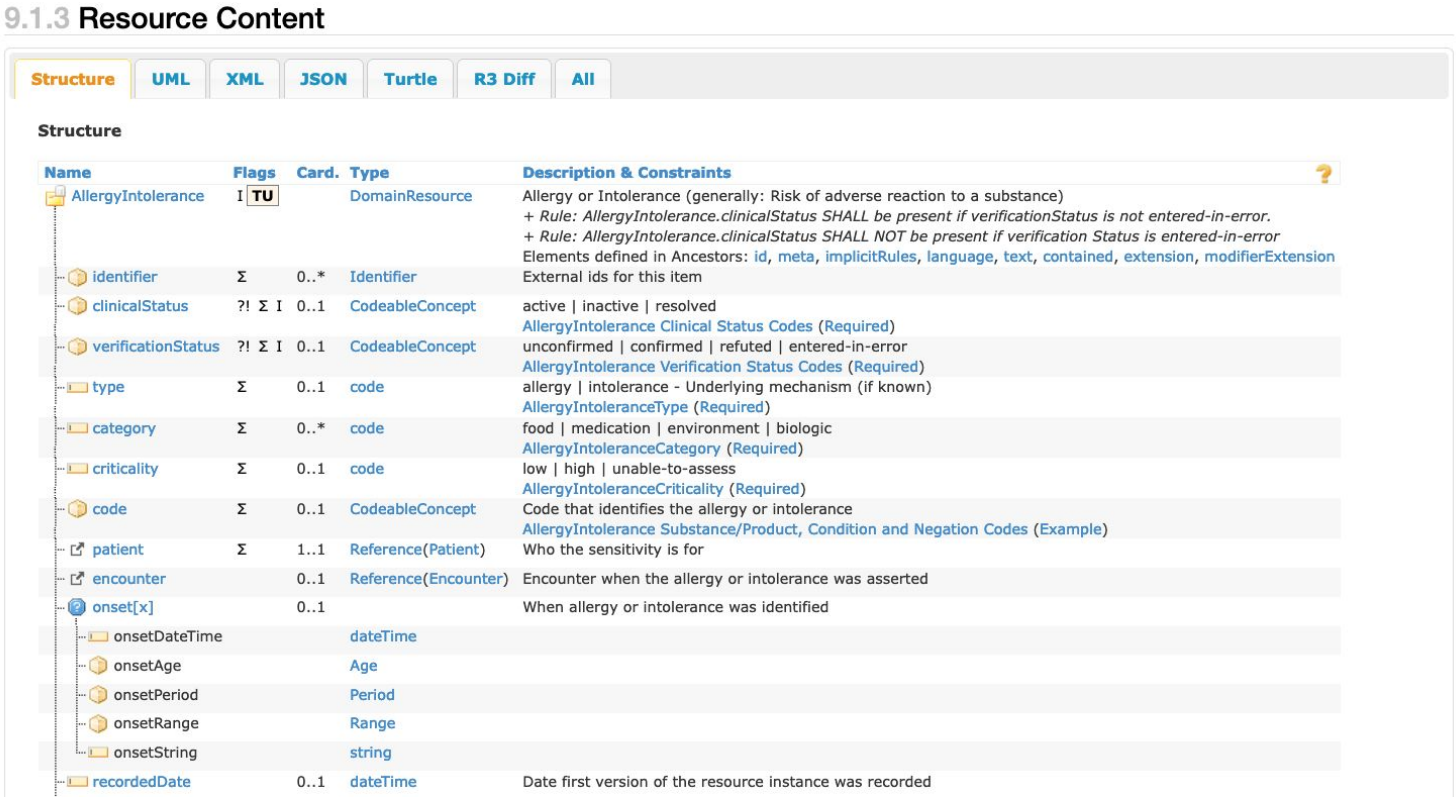
Transform

Digital Certificate



FHIR Vaccination Certificate

Allergies and Intolerances Resource (R4)



9.1.3 Resource Content

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

Structure

Name	Flags	Card.	Type	Description & Constraints
AllergyIntolerance	I TU		DomainResource	Allergy or Intolerance (generally: Risk of adverse reaction to a substance) *+ Rule: AllergyIntolerance.clinicalStatus SHALL be present if verificationStatus is not entered-in-error.* *+ Rule: AllergyIntolerance.clinicalStatus SHALL NOT be present if verification Status is entered-in-error* Elements defined in Ancestors: id, meta, implicitRules, language, text, contained, extension, modifierExtension
identifier	Σ	0..*	Identifier	External ids for this item
clinicalStatus	?! Σ I	0..1	CodeableConcept	active | inactive | resolved AllergyIntolerance Clinical Status Codes (Required)
verificationStatus	?! Σ I	0..1	CodeableConcept	unconfirmed | confirmed | refuted | entered-in-error AllergyIntolerance Verification Status Codes (Required)
type	Σ	0..1	code	allergy | intolerance - Underlying mechanism (if known) AllergyIntoleranceType (Required)
category	Σ	0..*	code	food | medication | environment | biologic AllergyIntoleranceCategory (Required)
criticality	Σ	0..1	code	low | high | unable-to-assess AllergyIntoleranceCriticality (Required)
code	Σ	0..1	CodeableConcept	Code that identifies the allergy or intolerance AllergyIntolerance Substance/Product, Condition and Negation Codes (Example)
patient	Σ	1..1	Reference(Patient)	Who the sensitivity is for
encounter		0..1	Reference(Encounter)	Encounter when the allergy or intolerance was asserted
onset[x]		0..1		When allergy or intolerance was identified
onsetDateTime			dateTime	
onsetAge			Age	
onsetPeriod			Period	
onsetRange			Range	
onsetString			string	
recordedDate		0..1	dateTime	Date first version of the resource instance was recorded

Allergies and Intolerances Resource (IPS)

14.16.1.1 Formal Views of Profile Content

Description of Profiles, Differentials, Snapshots and how the different presentations work.

Text Summary | Differential Table | Snapshot Table | Snapshot Table (Must Support) | All

This structure is derived from AllergyIntolerance

Summary

Mandatory: 1 element
Must-Support: 17 elements

Structures

This structure refers to these other structures:

- Codeable Concept (IPS) (http://hl7.org/fhir/uv/ips/StructureDefinition/CodeableConcept-uv-ips)
- Patient (IPS) (http://hl7.org/fhir/uv/ips/StructureDefinition/Patient-uv-ips)

Extensions

This structure refers to these extensions:

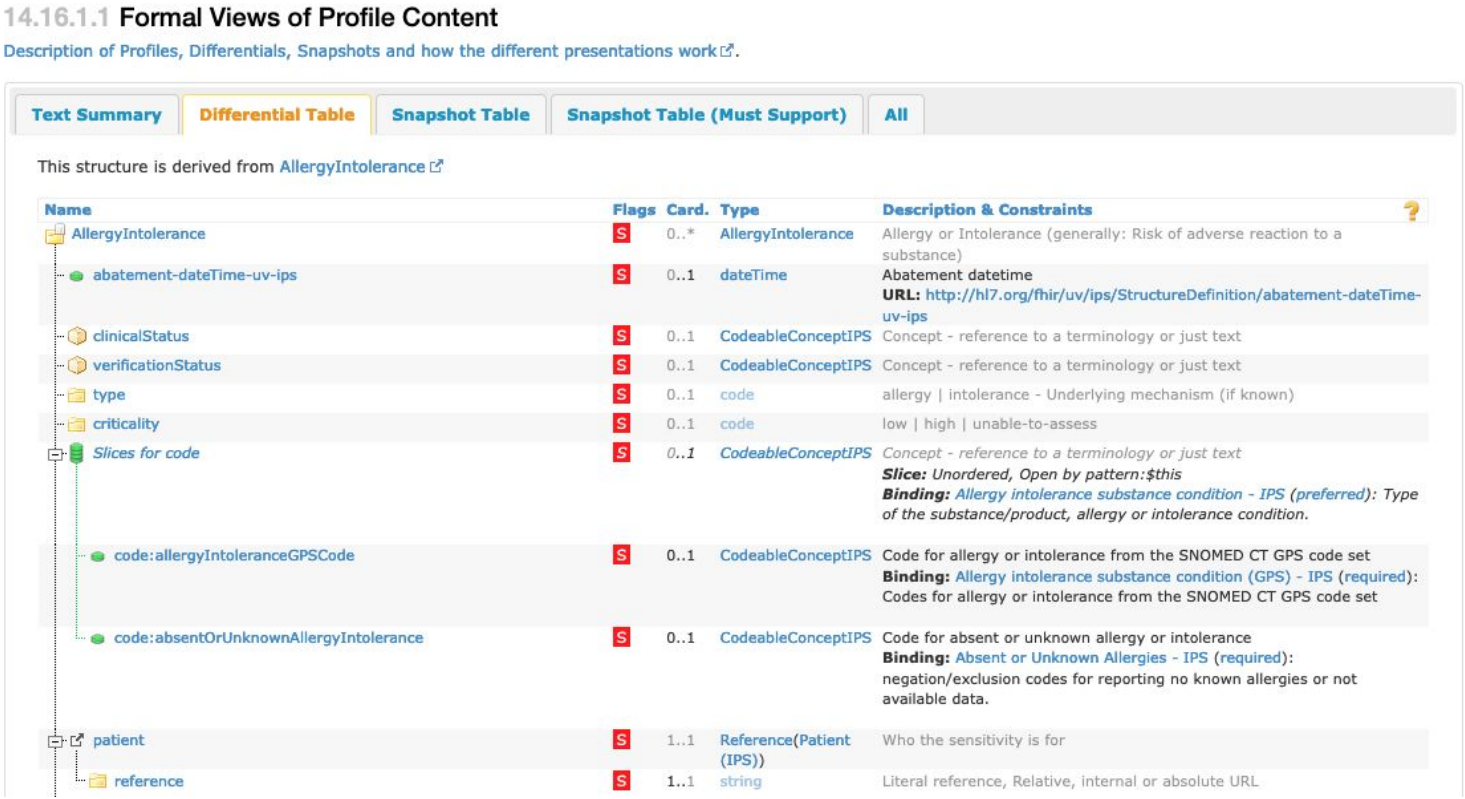
- http://hl7.org/fhir/uv/ips/StructureDefinition/abatement-dateTime-uv-ips

Slices

This structure defines the following Slices:

- The element AllergyIntolerance.code is sliced based on the value of pattern:$this
- The element AllergyIntolerance.reaction.manifestation is sliced based on the value of pattern:$this

Allergies and Intolerances Resource (IPS)



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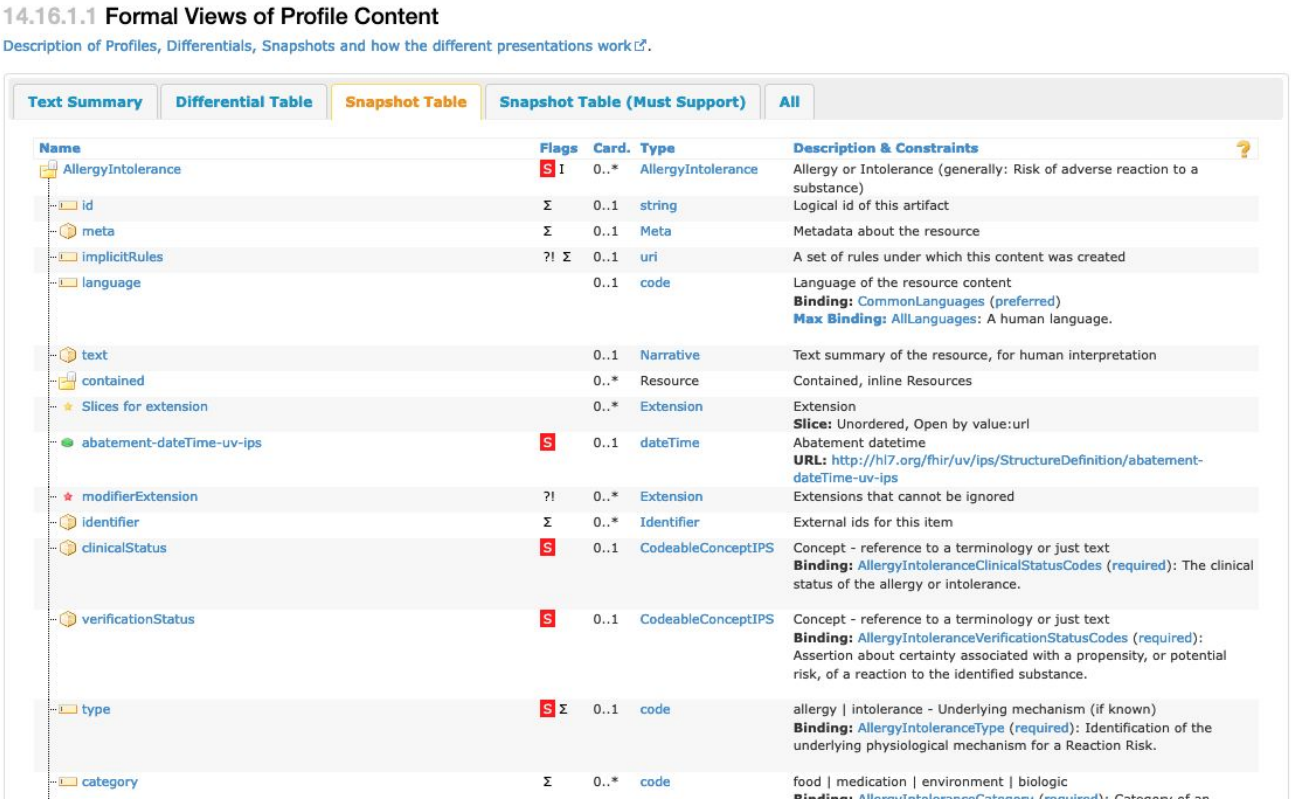
Description of Profiles, Differentials, Snapshots and how the different presentations work.

Text Summary | Differential Table | Snapshot Table | Snapshot Table (Must Support) | All

This structure is derived from AllergyIntolerance

Name	Flags	Card.	Type	Description & Constraints
AllergyIntolerance	S	0..*	AllergyIntolerance	Allergy or Intolerance (generally: Risk of adverse reaction to a substance)
abatement-dateTime-uv-ips	S	0..1	dateTime	Abatement datetime **URL:** http://hl7.org/fhir/uv/ips/StructureDefinition/abatement-dateTime-uv-ips
clinicalStatus	S	0..1	CodeableConceptIPS	Concept - reference to a terminology or just text
verificationStatus	S	0..1	CodeableConceptIPS	Concept - reference to a terminology or just text
type	S	0..1	code	allergy | intolerance - Underlying mechanism (if known)
criticality	S	0..1	code	low | high | unable-to-assess
Slices for code	S	*0..1*	*CodeableConceptIPS*	*Concept - reference to a terminology or just text* ***Slice:*** *Unordered, Open by pattern:$this* ***Binding:*** *Allergy intolerance substance condition - IPS (preferred): Type of the substance/product, allergy or intolerance condition.*
code:allergyIntoleranceGPSCode	S	0..1	CodeableConceptIPS	Code for allergy or intolerance from the SNOMED CT GPS code set **Binding:** Allergy intolerance substance condition (GPS) - IPS (required): Codes for allergy or intolerance from the SNOMED CT GPS code set
code:absentOrUnknownAllergyIntolerance	S	0..1	CodeableConceptIPS	Code for absent or unknown allergy or intolerance **Binding:** Absent or Unknown Allergies - IPS (required): negation/exclusion codes for reporting no known allergies or not available data.
patient	S	1..1	Reference(Patient (IPS))	Who the sensitivity is for
reference	S	1..1	string	Literal reference, Relative, internal or absolute URL

Allergies and Intolerances Resource (IPS)



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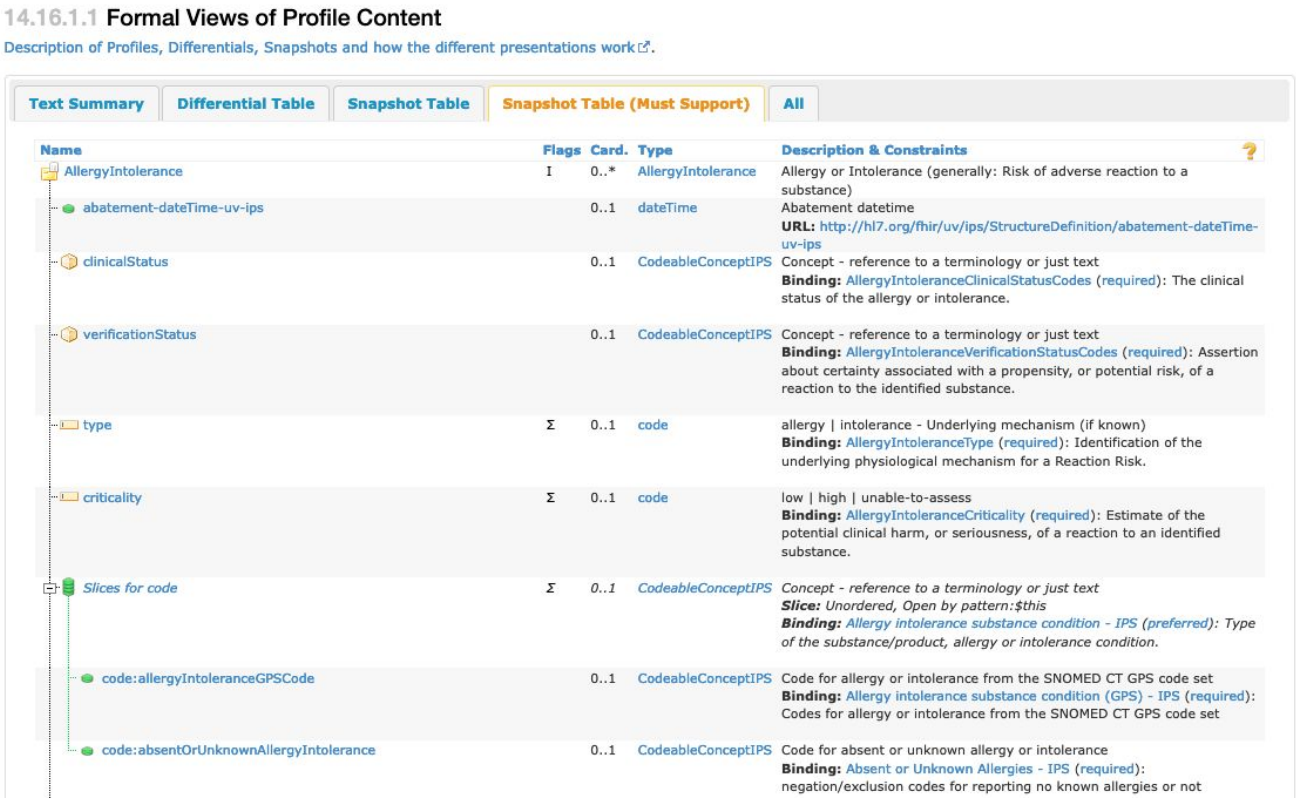
Description of Profiles, Differentials, Snapshots and how the different presentations work.

Text Summary | Differential Table | Snapshot Table | Snapshot Table (Must Support) | All

Name	Flags	Card.	Type	Description & Constraints
AllergyIntolerance	S I	0..*	AllergyIntolerance	Allergy or Intolerance (generally: Risk of adverse reaction to a substance)
id	Σ	0..1	string	Logical id of this artifact
meta	Σ	0..1	Meta	Metadata about the resource
implicitRules	?! Σ	0..1	uri	A set of rules under which this content was created
language		0..1	code	Language of the resource content **Binding:** CommonLanguages (preferred) **Max Binding:** AllLanguages: A human language.
text		0..1	Narrative	Text summary of the resource, for human interpretation
contained		0..*	Resource	Contained, inline Resources
Slices for extension		0..*	Extension	Extension **Slice:** Unordered, Open by value:url
abatement-dateTime-uv-ips	S	0..1	dateTime	Abatement datetime **URL:** http://hl7.org/fhir/uv/ips/StructureDefinition/abatement-dateTime-uv-ips
modifierExtension	?!	0..*	Extension	Extensions that cannot be ignored
identifier	Σ	0..*	Identifier	External ids for this item
clinicalStatus	S	0..1	CodeableConceptIPS	Concept - reference to a terminology or just text **Binding:** AllergyIntoleranceClinicalStatusCodes (required): The clinical status of the allergy or intolerance.
verificationStatus	S	0..1	CodeableConceptIPS	Concept - reference to a terminology or just text **Binding:** AllergyIntoleranceVerificationStatusCodes (required): Assertion about certainty associated with a propensity, or potential risk, of a reaction to the identified substance.
type	S Σ	0..1	code	allergy | intolerance - Underlying mechanism (if known) **Binding:** AllergyIntoleranceType (required): Identification of the underlying physiological mechanism for a Reaction Risk.
category	Σ	0..*	code	food | medication | environment | biologic

Allergies and Intolerances Resource (IPS)



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Name	Flags	Card.	Type	Description & Constraints
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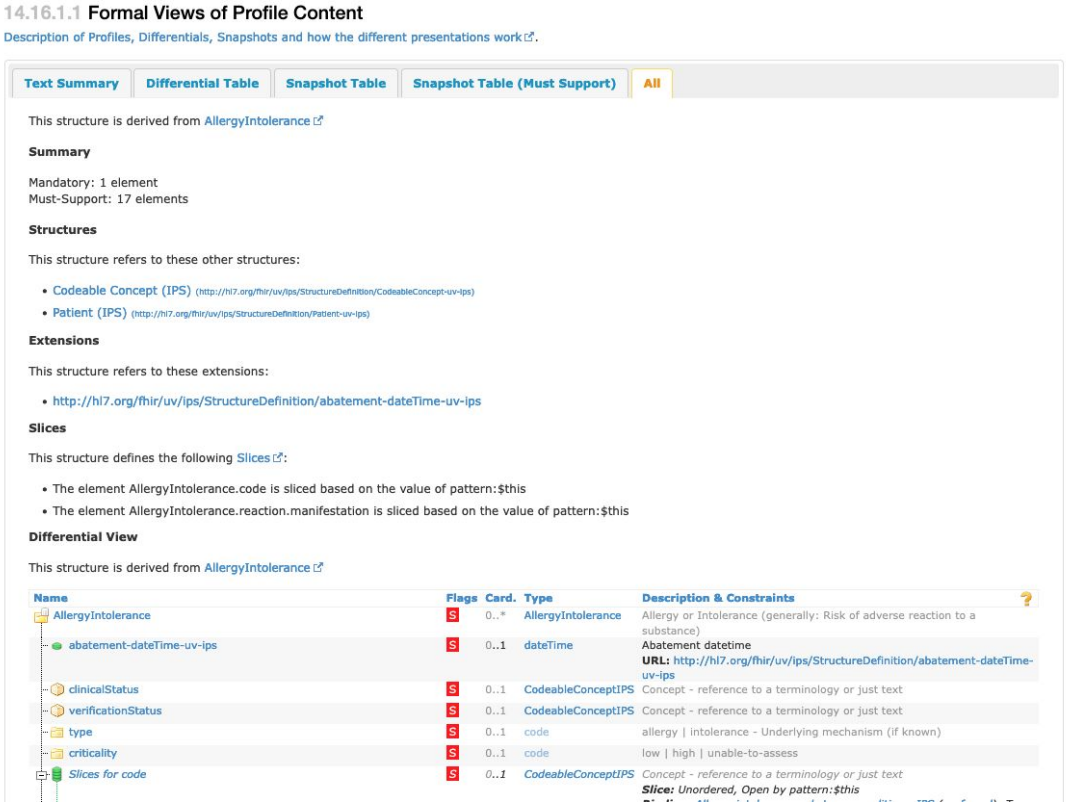
abatement-dateTime-uv-ips		0..1	dateTime	Abatement datetime **URL:** http://hl7.org/fhir/uv/ips/StructureDefinition/abatement-dateTime-uv-ips
clinicalStatus		0..1	CodeableConceptIPS	Concept - reference to a terminology or just text **Binding:** AllergyIntoleranceClinicalStatusCodes (required): The clinical status of the allergy or intolerance.
verificationStatus		0..1	CodeableConceptIPS	Concept - reference to a terminology or just text **Binding:** AllergyIntoleranceVerificationStatusCodes (required): Assertion about certainty associated with a propensity, or potential risk, of a reaction to the identified substance.
type	Σ	0..1	code	allergy | intolerance - Underlying mechanism (if known) **Binding:** AllergyIntoleranceType (required): Identification of the underlying physiological mechanism for a Reaction Risk.
criticality	Σ	0..1	code	low | high | unable-to-assess **Binding:** AllergyIntoleranceCriticality (required): Estimate of the potential clinical harm, or seriousness, of a reaction to an identified substance.
Slices for code	Σ	*0..1*	*CodeableConceptIPS*	*Concept - reference to a terminology or just text* ***Slice:** Unordered, Open by pattern:$this* ***Binding:** Allergy intolerance substance condition - IPS (preferred): Type of the substance/product, allergy or intolerance condition.*
code:allergyIntoleranceGPSCode		0..1	CodeableConceptIPS	Code for allergy or intolerance from the SNOMED CT GPS code set **Binding:** Allergy intolerance substance condition (GPS) - IPS (required): Codes for allergy or intolerance from the SNOMED CT GPS code set
code:absentOrUnknownAllergyIntolerance		0..1	CodeableConceptIPS	Code for absent or unknown allergy or intolerance **Binding:** Absent or Unknown Allergies - IPS (required): negation/exclusion codes for reporting no known allergies or not

Allergies and Intolerances Resource (IPS)



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- The element AllergyIntolerance.reaction.manifestation is sliced based on the value of pattern:$this

Differential View

This structure is derived from AllergyIntolerance

Name	Flags	Card.	Type	Description & Constraints
AllergyIntolerance	S	0..*	AllergyIntolerance	Allergy or Intolerance (generally: Risk of adverse reaction to a substance)
abatement-dateTime-uv-ips	S	0..1	dateTime	Abatement datetime **URL:** http://hl7.org/fhir/uv/ips/StructureDefinition/abatement-dateTime-uv-ips
clinicalStatus	S	0..1	CodeableConceptIPS	Concept - reference to a terminology or just text
verificationStatus	S	0..1	CodeableConceptIPS	Concept - reference to a terminology or just text
type	S	0..1	code	allergy | intolerance - Underlying mechanism (if known)
criticality	S	0..1	code	low | high | unable-to-assess
Slices for code	S	*0..1*	*CodeableConceptIPS*	*Concept - reference to a terminology or just text* ***Slice:*** *Unordered, Open by pattern:$this*

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Why Does Anyone Test Anything?

What	Why
Two Systems (mechanical or electronic)	Do they work together now? How can we make them work together?
Single System	Does it conform to specification? ● Will it work in the future? ● Why did it stop working?
Human: Screening Visit	Am I at risk for ….? Do I have ….?
Human	Did the student understand the material? Does job candidate have needed skills?

IHE Testing: My Experience

- Connectathon Testing
  - System to system interoperability
  - Conformance testing software as a tool to prepare for interoperability testing
- Conformity Assessment
  - Assisted with project and test review
  - Not part of implementation
- I try to ask myself:
  - Why am I doing this?
  - What can we do that will best help immediate customers and bigger picture?

Required vs Must Support

- Required:
  - Your document is not legal if you omit this data
- Must Support:
  - Your system has to be able to accept it
  - When the data are entered, you must include it in the document



Name	Flags	Card.	Type
Patient	N		DomainResource
identifier	Σ	0..*	Identifier
active	?! Σ	0..1	boolean
name	Σ	0..*	HumanName
telecom	Σ	0..*	ContactPoint
gender	Σ	0..1	code
birthDate	Σ	0..1	date



Name	Flags	Card.	Type
Patient	S	0..*	Patient
identifier	S	0..*	Identifier
name	S I	1..*	HumanName
text	S	0..1	string
family	S	0..1	string
given	S	0..*	string
telecom	S	0..*	ContactPoint
gender	S	1..1	code
birthDate	S	1..1	date

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IPS Big Picture

- Creator: Can I create and share an IPS document that can be
  - Imported by a different system?
  - Viewed by a patient or care provider?
  - Be used to provide care?
- Consumer: Can I accept or retrieve an IPS document:
  - To provide care?
  - Care includes providing information to a different provider and/or different system.

IPS Big Picture

- Creator: Can I create and share an IPS document that can be
  - Imported by a different system?
  - Viewed by a patient or care provider?
  - Be used to provide care?
- Consumer: Can I accept or retrieve an IPS document:
  - To provide care?
  - Care includes providing information to a different provider and/or different system.

Creator: Conformance

Conformance Question: Can I …	Mechanism
Create a conformant IPS document? ● Includes proper coded values	Validation Tool
Submit my IPS document to a standard FHIR server?	Simulator Tool
Submit my IPS document using an IHE Document Sharing Transaction?	Simulator Tool
Respond to search queries and retrieve requests so someone can retrieve an IPS?	Simulator Tool
Create an IPS document with clinical content?	Validation Tool

Consumer: Conformance

Conformance Question: Can I …	Mechanism
Process conformant IPS documents? ● Use as input for providing care ● Import into my system like other records ● Export an updated version ● Translate to different language or coded values	Sample files
Process non-conformant documents? (Bonus points)	Sample files
Retrieve an IPS document from a standard FHIR server?	Simulator Tool
Obtain an IPS document using an IHE Document Sharing Transaction? (accept, retrieve)	Simulator Tool

Creator - Consumer: Interoperability

Interoperability Question
Can we exchange documents?
Can consumer parse and import content?
Can we support a clinical a clinical scenario? ● Unscheduled office visit for patient travelling ● Import summary, add content, export ● Translate document to different language ● Map coded values to different vocabulary
Can we collaborate at the individual resource level?

Documentation to Expect

- Expected outcomes of testing
- Overview of the test process
- Test instructions
- Evaluation criteria
- Sample files and clinical data
- Links to online tools when they are configured/ready
- Training material

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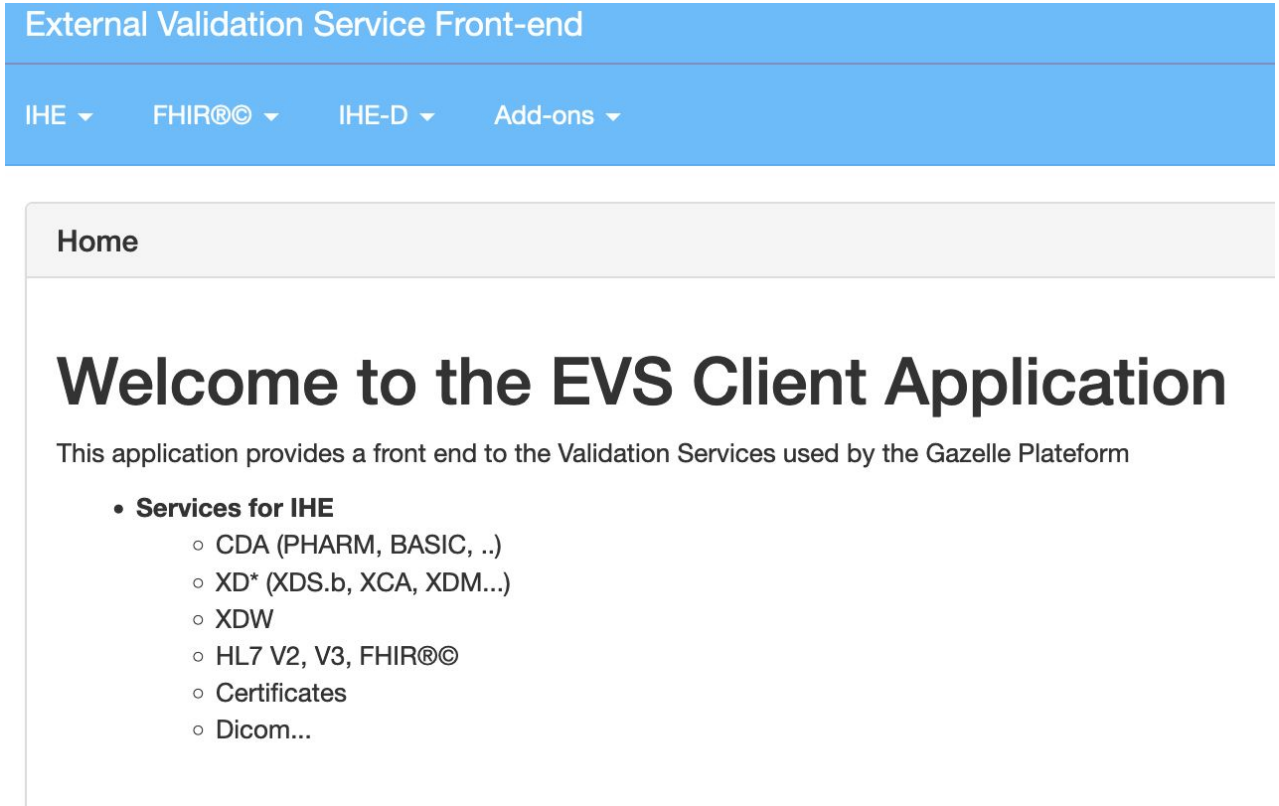
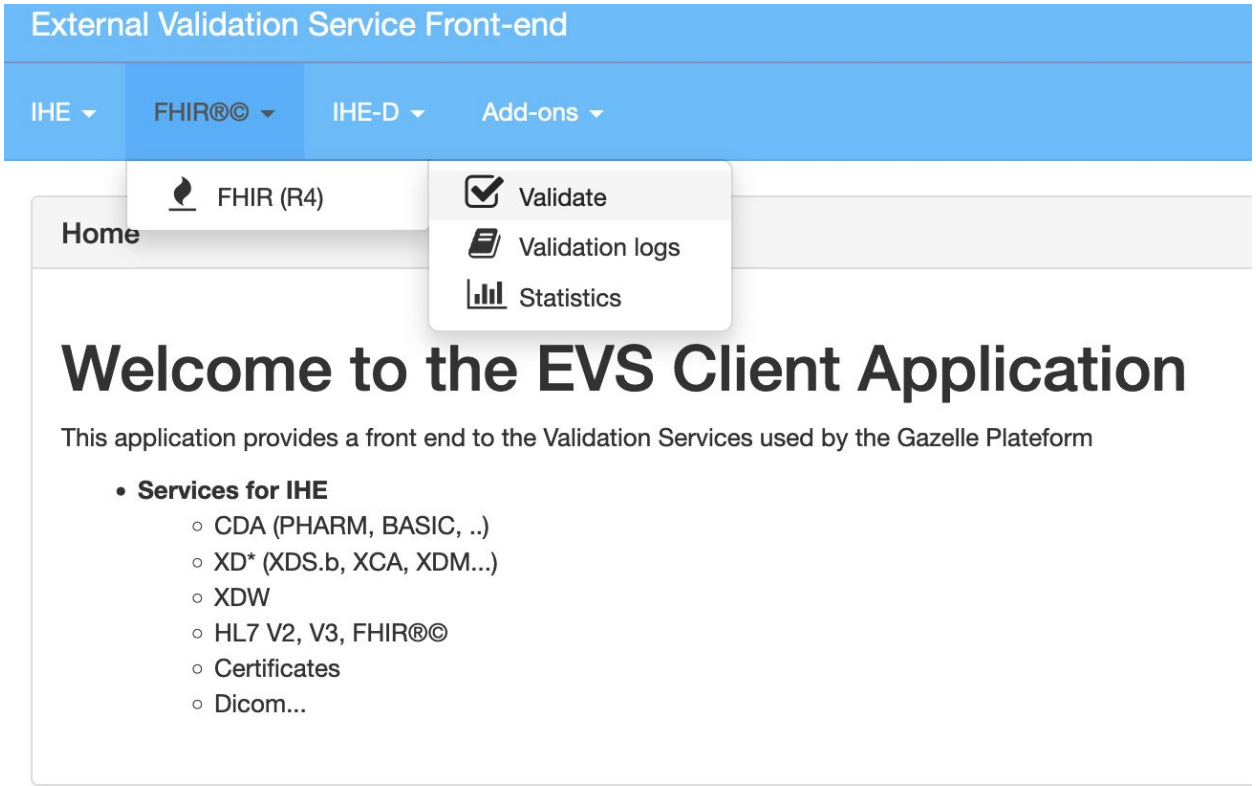
Known Tools

Gazelle EVS Client	Provides Web UI for message / resource validation	Kereval / IHE Catalyst
Matchbox	IG based validation as an extension to HAPI FHIR	Oliver Egger
Sample Files		Various
IPS Viewer	Web software to render an IPS	John D'Amore
Inferno	Retrieves / validates (IPS) data from FHIR servers. SMART on FHIR testing	MITRE
XDS Toolkit	IHE Document Sharing test tool (XDS.b, XCA)	NIST: Sunil Bhaskarla
Asbestos	Tests IHE Mobile Access to Health Documents (MHD) profile	NIST: Sunil Bhaskarla

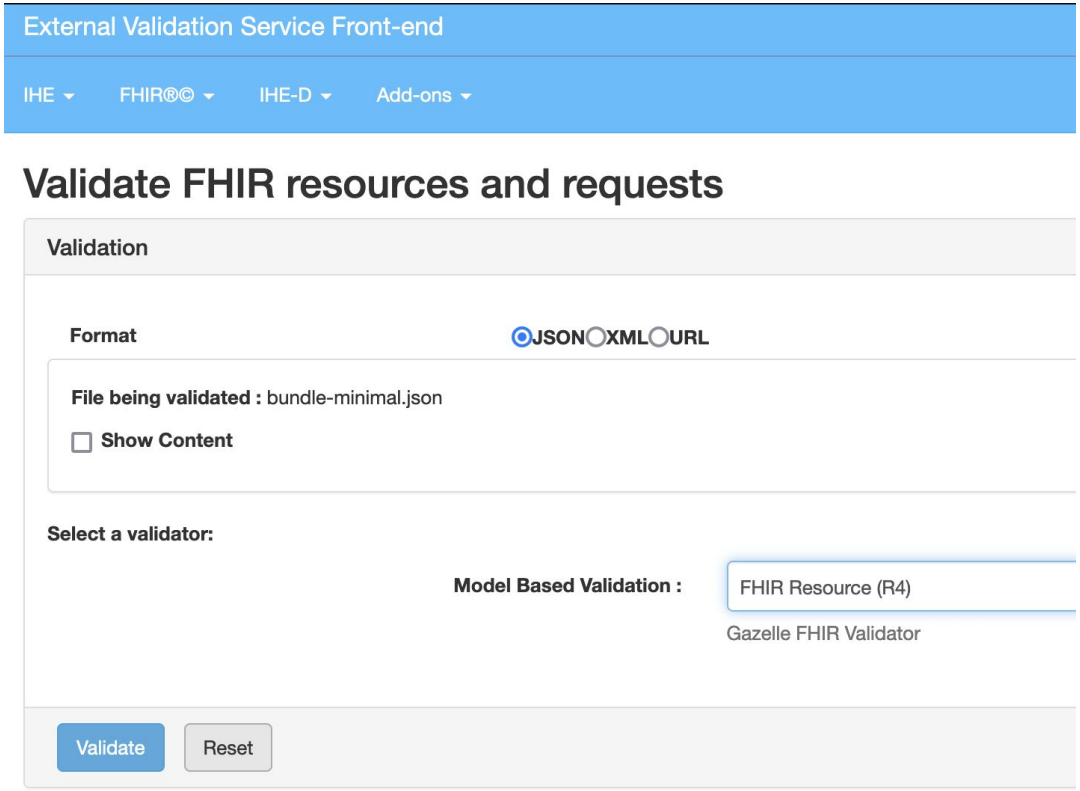
EVS Client


External Validation Service Front-end
IHE
FHIR®©
IHE-D
Add-ons
Home
Welcome to the EVS Client Application
This application provides a front end to the Validation Services used by the Gazelle Plateform
Services for IHE
CDA (PHARM, BASIC, ..)
XD* (XDS.b, XCA, XDM...)
XDW
HL7 V2, V3, FHIR®©
Certificates
Dicom...

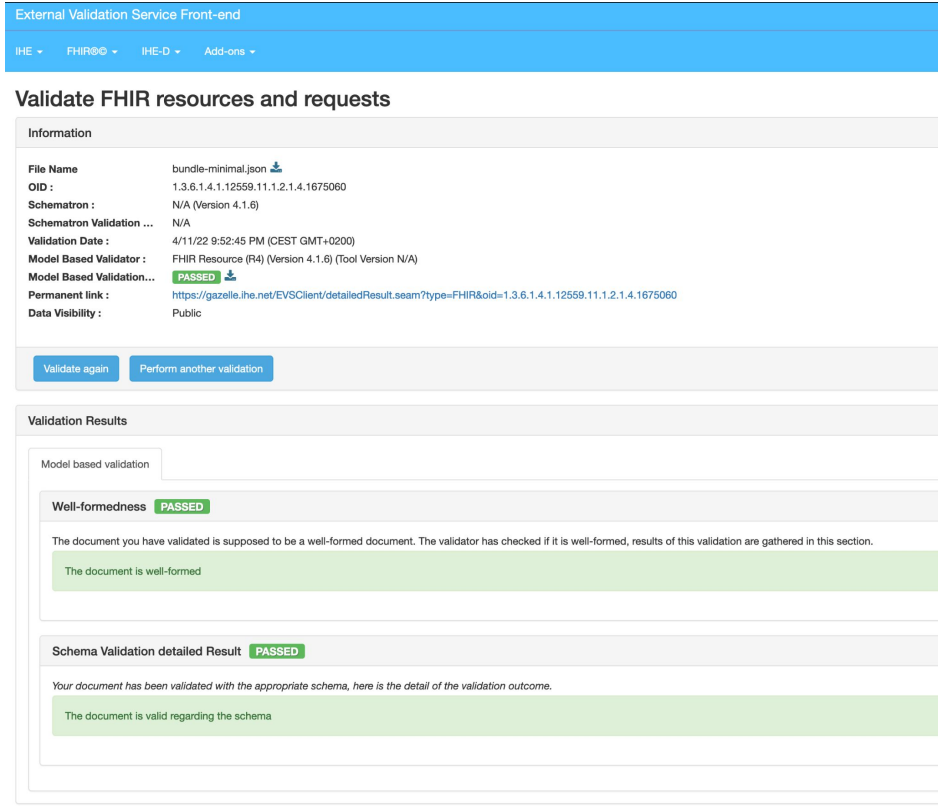
EVS Client


External Validation Service Front-end
IHE
FHIR®©
IHE-D
Add-ons
FHIR (R4)
Validate
Validation logs
Statistics
Home
Welcome to the EVS Client Application
This application provides a front end to the Validation Services used by the Gazelle Plateform
Services for IHE
CDA (PHARM, BASIC, ..)
XD* (XDS.b, XCA, XDM...)
XDW
HL7 V2, V3, FHIR®©
Certificates
Dicom...

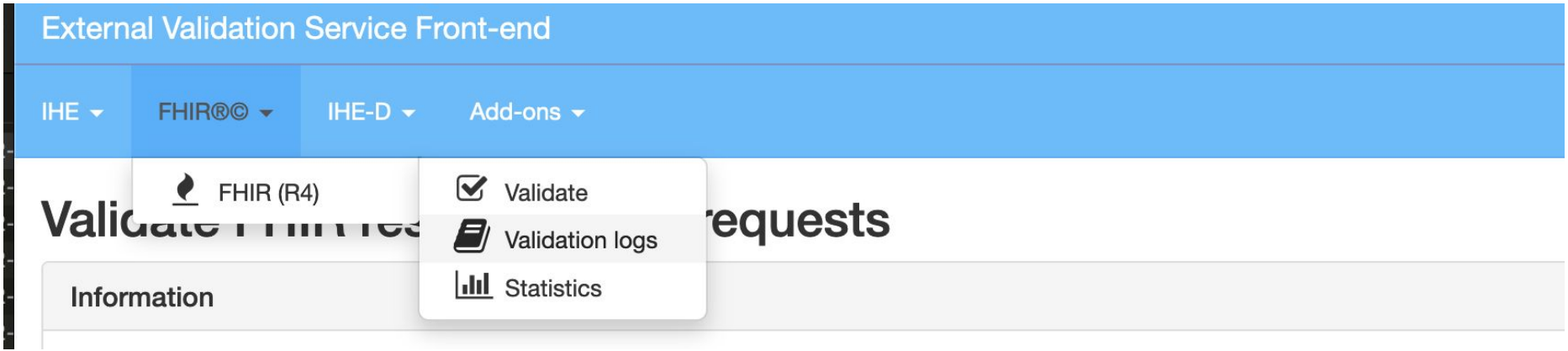
EVS Client


External Validation Service Front-end
IHE
FHIR®©
IHE-D
Add-ons
Validate FHIR resources and requests
Validation
Format
JSON XML URL
File being validated : bundle-minimal.json
Show Content
Select a validator:
Model Based Validation :
FHIR Resource (R4)
Gazelle FHIR Validator
Validate
Reset

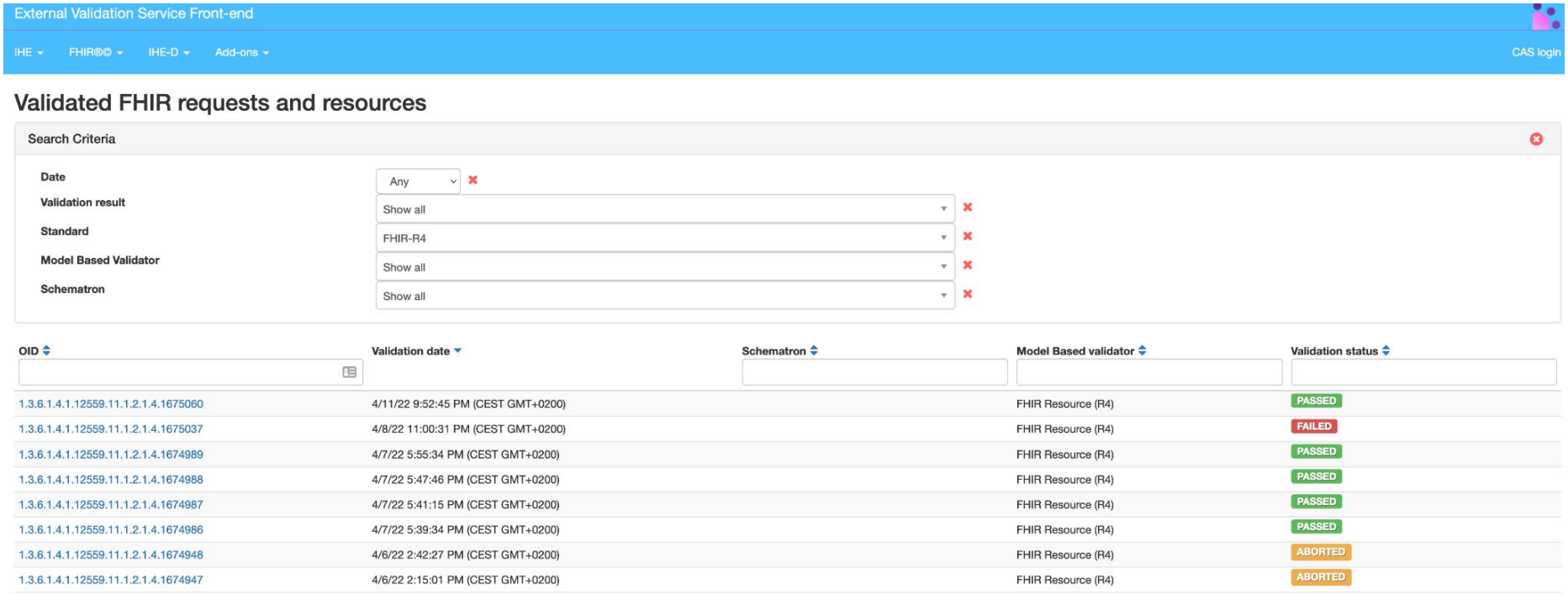
EVS Client


External Validation Service Front-end
IHE
FHIR®©
IHE-D
Add-ons
Validate FHIR resources and requests
Information
File Name
bundle-minimal.json
OID :
1.3.6.1.4.1.12559.11.1.2.1.4.1675060
Schematron :
N/A (Version 4.1.6)
Schematron Validation ...
N/A
Validation Date :
4/11/22 9:52:45 PM (CEST GMT+0200)
Model Based Validator :
FHIR Resource (R4) (Version 4.1.6) (Tool Version N/A)
Model Based Validation...
PASSED
Permanent link :
https://gazelle.ihe.net/EVSClient/detailedResult.seam?type=FHIR&oid=1.3.6.1.4.1.12559.11.1.2.1.4.1675060
Data Visibility :
Public
Validate again
Perform another validation
Validation Results
Model based validation
Well-formedness
PASSED
The document you have validated is supposed to be a well-formed document. The validator has checked if it is well-formed, results of this validation are gathered in this section.
The document is well-formed
Schema Validation detailed Result
PASSED
Your document has been validated with the appropriate schema, here is the detail of the validation outcome.
The document is valid regarding the schema

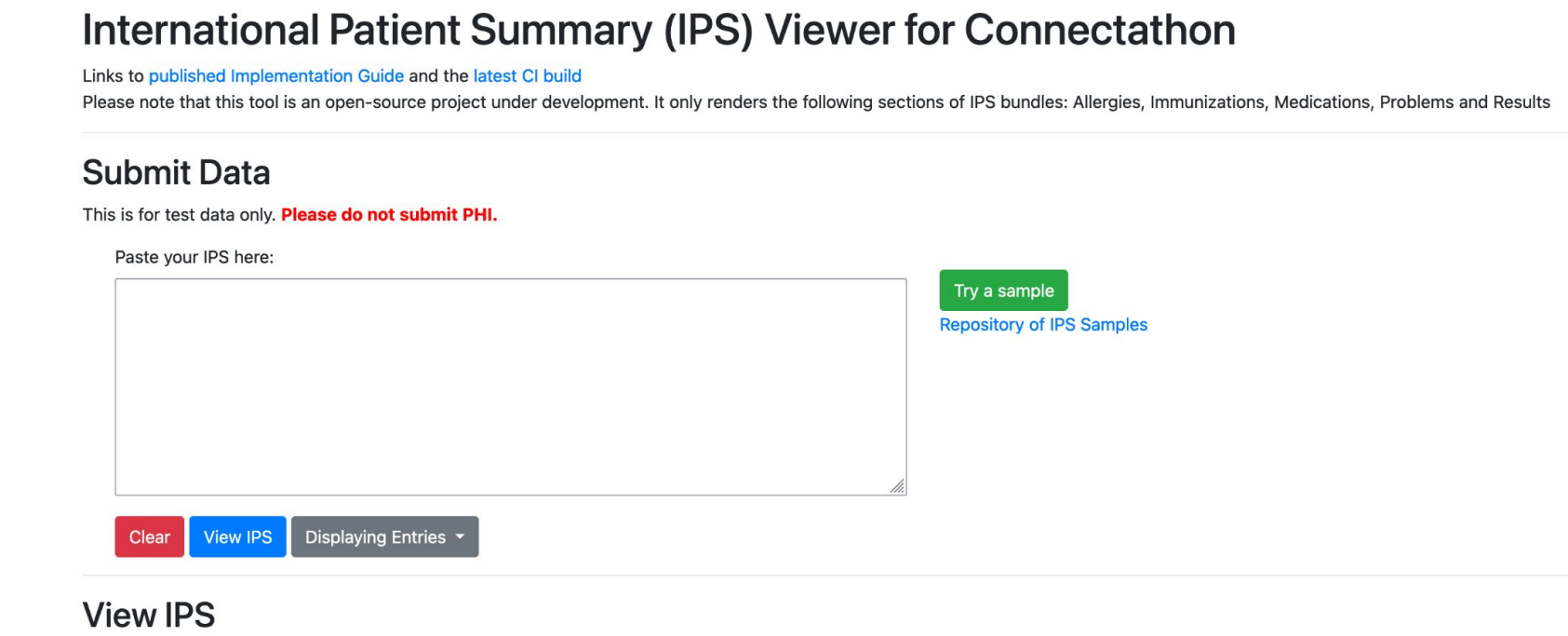
EVS Client


External Validation Service Front-end
IHE
FHIR®©
IHE-D
Add-ons
FHIR (R4)
Validate
Validation logs
Statistics
Information

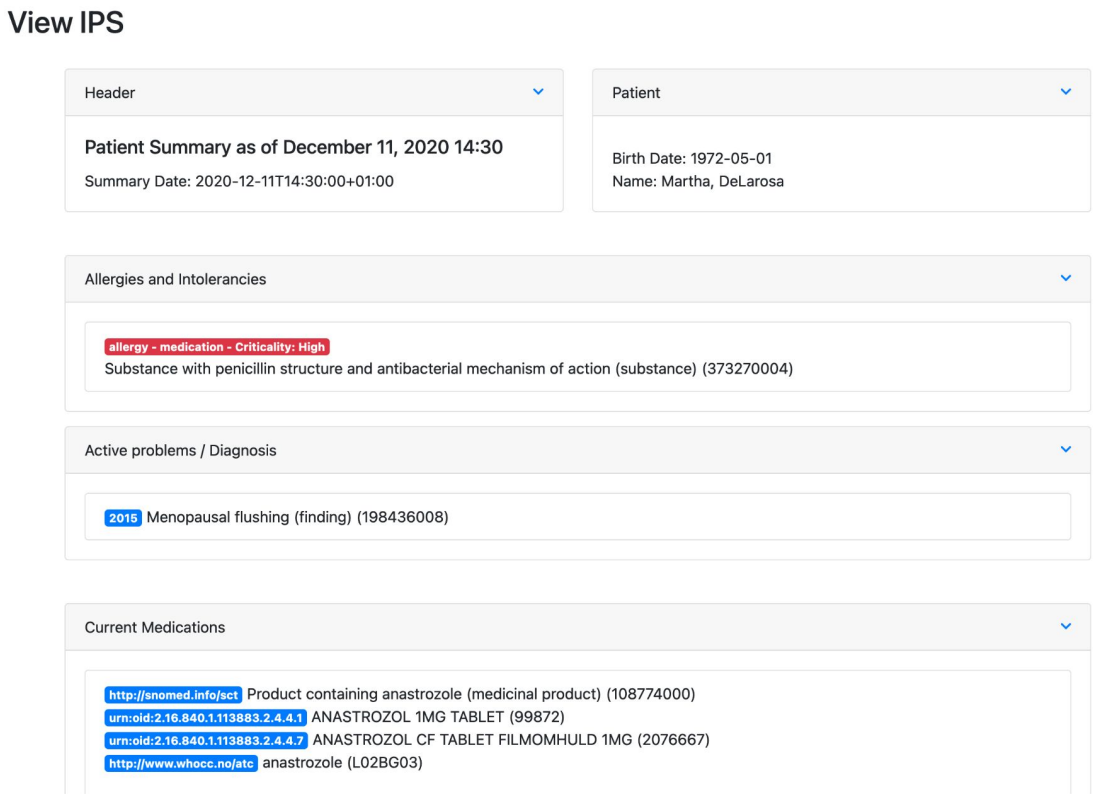
EVS Client


External Validation Service Front-end
IHE
FHIR®©
IHE-D
Add-ons
CAS login
Validated FHIR requests and resources
Search Criteria
Date
Any
Validation result
Show all
Standard
FHIR-R4
Model Based Validator
Show all
Schematron
Show all
OID
Validation date
Schematron
Model Based validator
Validation status
1.3.6.1.4.1.12559.11.1.2.1.4.1675060
4/11/22 9:52:45 PM (CEST GMT+0200)
FHIR Resource (R4)
PASSED
1.3.6.1.4.1.12559.11.1.2.1.4.1675037
4/8/22 11:00:31 PM (CEST GMT+0200)
FHIR Resource (R4)
FAILED
1.3.6.1.4.1.12559.11.1.2.1.4.1674989
4/7/22 5:55:34 PM (CEST GMT+0200)
FHIR Resource (R4)
PASSED
1.3.6.1.4.1.12559.11.1.2.1.4.1674988
4/7/22 5:47:46 PM (CEST GMT+0200)
FHIR Resource (R4)
PASSED
1.3.6.1.4.1.12559.11.1.2.1.4.1674987
4/7/22 5:41:15 PM (CEST GMT+0200)
FHIR Resource (R4)
PASSED
1.3.6.1.4.1.12559.11.1.2.1.4.1674986
4/7/22 5:39:34 PM (CEST GMT+0200)
FHIR Resource (R4)
PASSED
1.3.6.1.4.1.12559.11.1.2.1.4.1674948
4/6/22 2:42:27 PM (CEST GMT+0200)
FHIR Resource (R4)
ABORTED
1.3.6.1.4.1.12559.11.1.2.1.4.1674947
4/6/22 2:15:01 PM (CEST GMT+0200)
FHIR Resource (R4)
ABORTED

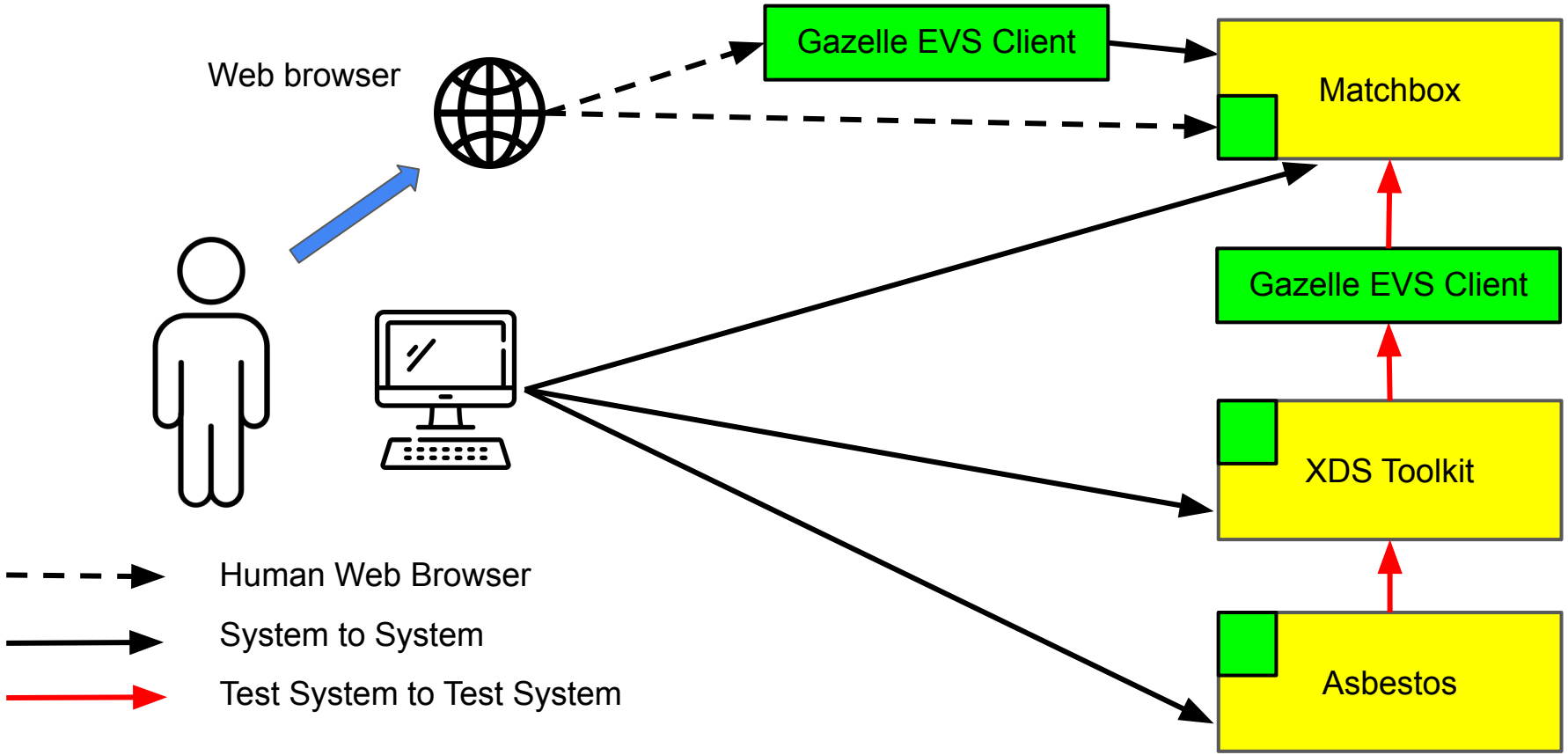
IPS Viewer


International Patient Summary (IPS) Viewer for Connectathon
Links to published Implementation Guide and the latest CI build
Please note that this tool is an open-source project under development. It only renders the following sections of IPS bundles: Allergies, Immunizations, Medications, Problems and Results
Submit Data
This is for test data only. Please do not submit PHI.
Paste your IPS here:
Try a sample
Repository of IPS Samples
Clear
View IPS
Displaying Entries
View IPS

IPS Viewer


View IPS
Header
Patient Summary as of December 11, 2020 14:30
Summary Date: 2020-12-11T14:30:00+01:00
Patient
Birth Date: 1972-05-01
Name: Martha, DeLarosa
Allergies and Intolerancies
allergy - medication - Criticality: High
Substance with penicillin structure and antibacterial mechanism of action (substance) (373270004)
Active problems / Diagnosis
2015 Menopausal flushing (finding) (198436008)
Current Medications
http://snomed.info/sct Product containing anastrozole (medicinal product) (108774000)
urn:oid:2.16.840.1.113883.2.4.4.1 ANASTROZOL 1MG TABLET (99872)
urn:oid:2.16.840.1.113883.2.4.4.7 ANASTROZOL CF TABLET FILMOMHULD 1MG (2076667)
http://www.whocc.no/atc anastrozole (L02BG03)

Testing (FHIR) Document Structure



Reference Material

IPS - Moving from Specification to (Global) Implementation

International Patient Summary Overview Web Page

HL7 FHIR Home Page

Resource Formats (help with interpreting resource documentation)

HL7 FHIR IPS Implementation Guide

HL7 CDA IPS Implementation Guide

FHIR R4: AllergyIntolerance Resource

IPS: AllergyIntolerance Resource

Reference Material

External Validation Service (EVS) Client / Front End

IPS Viewer

- Public web site
- GitHub repository

IPS Samples

- With IPS Viewer
- FHIR Implementation Guide Samples

Question and Answer

1. Composition Resource (need documentation/training)
2. Will the IHE IPS profile leverage MHDS
3. Are the validators specific to the particular codes in the document
    a. What are the coded values that are appropriate for a region / this region
4. Suggestion to support codes using IHE SVCM
    a. Steve: See if HAPI FHIR supports this or Matchbox