Content-ion over Data Quality

Understanding eHealth Exchange Content Testing

SHIEC Strategic Health Information Exchange Collaborative

Speakers

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Introduction

- The eHealth Exchange (eHX) is a network of exchange partners that securely share clinical information across the U.S. under a common framework
  - Managed by the sequoia project
- Participants:
  - 59 Regional and State HIEs
  - 75% of U.S. Hospitals
  - 4 Federal agencies: VA, DoD, CMS, SSA
- *Carequality also falls under The Sequoia Project umbrella*

Source: https://sequoiaproject.org/ehealth-exchange/about/

Introduction

- Prior to February 2018, testing was focused on transport (DIL Testing).

- As of last February 2018, the Content Testing program was launched.

Introduction

- Key Deadlines to be aware of:
  - All “new” exchange partners as of Feb. 2018 must follow the new content testing process
  - If you were already in production, or in the process of onboarding prior to Feb. 2018, you have until February 2019 to begin your testing process.
  - Once you start the testing process – you have 18 months to complete it.
- Planning / Budgeting
  - It’s important to assess NOW the # of documents you’ll need to test – as that will drive the amount of effort required

Let’s dive into the details

Background – Content Problems

- Documents shared via eHX are *mostly* C-CDAs
  - Type: *Mostly* Continuity of Care Documents (CCDs)

- Pain Points: **TACO** Problems 🌮
  - **T**erminology — Inconsistent terminology usage
  - **A**mbiguity — Specification is open to interpretation
  - **C**omplexity — C-CDA Spec is difficult, lacks examples
  - **O**ptionality — Inconsistent implementations across vendors

Source: https://sequoiaproject.org/ehealth-exchange/testing-overview/content-testing/

TACO Problems 🌮

- **Terminology:**
  - “You’re sending local codes for your labs. My system doesn’t know what to do with these, we need SNOMED or LOINC!”
- **Ambiguity:**
  - “Which <id> element means what again?” (ex. Payer Section!)
- **Complexity:**
  - “What is the scopingEntity of your participant’s paticipantRole?”
- **Optionality:**
  - “Spec says there SHOULD be <insert element> here. Your system doesn’t create it. My system expects it and errors if it’s not there!”

Content Testing to the rescue!

- eHX implemented “Content Testing” in February 2018 to address these issues
  - Prerequisite for all new participants
  - Existing participants must submit a test by February 2019
  - eHX is becoming the de-facto “standard” spec. & MU interpretation!

- eHX is providing an automated testing tool (ITP) for:
  - C-CDA R1.1 & R2.1
  - HITSP C-32

Source: https://sequoiaproject.org/ehealth-exchange/testing-overview/content-testing/

What does Content Testing Do?

- Checks Compliance With:
  - HL7 DSTU C-CDA Specification R1.1/R2.1, and
  - Meaningful Use 3 / Promoting Interoperability (2015 Edition)

- Lays the groundwork to encourage (or require) additional document types
  - H&P, Summary of Care (etc.)
  - Support more use cases

Source: eHealth Exchange Content Testing Program Guide v1.0

What do I need to test as a Participant?

What do I need to test?

- Participants must test:
  - **Document Source** - at least one sample for each
    - ex: HIE generated, Hospital A, Provider Office B
    - **Document Type** – at least one for each supported
      - ex: CCD, Transition of Care
      - **Document Version** – at least one for each supported
        - ex: C-32, C-CDA R1.1, C-CDA R2.1

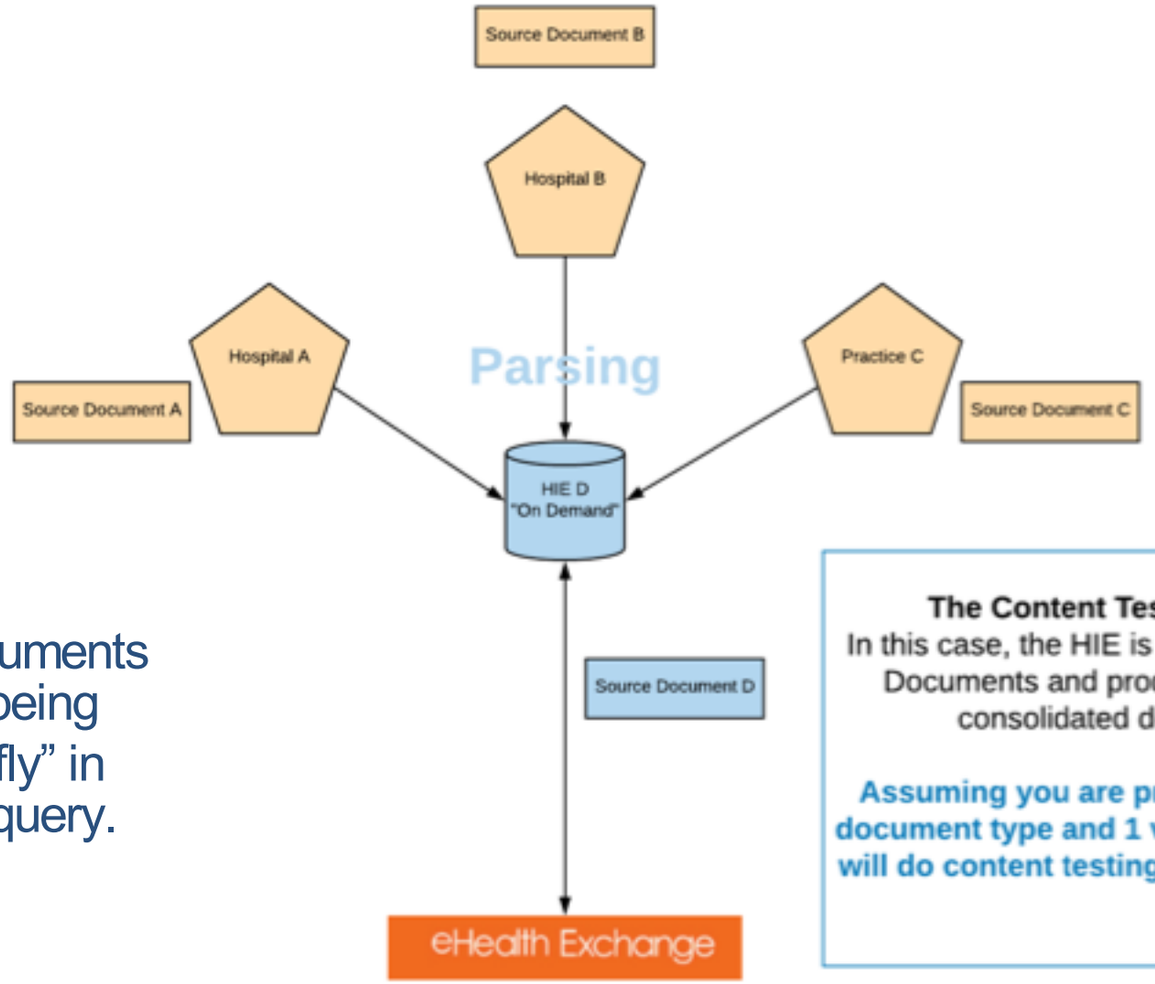
Source: https://sequoiaproject.org/ehealth-exchange/testing-overview/content-testing/

What if I only support On-Demand Documents?

- Many participants only support “on-demand” Documents:
  1) The HIE accepts data from many sources in many formats
     HL7v2, C32, CCDA, manual entry, etc
  2) Parses and stores it discreetly in your CDR
  3) Builds an On-Demand CCDA in response to eHX queries

- In these cases, the math is simple -
  - If only On-Demand documents are exchanged, then only On-Demand documents need to be tested (far fewer)

"On-demand" Documents mean they are being created "on the fly" in response to the query.

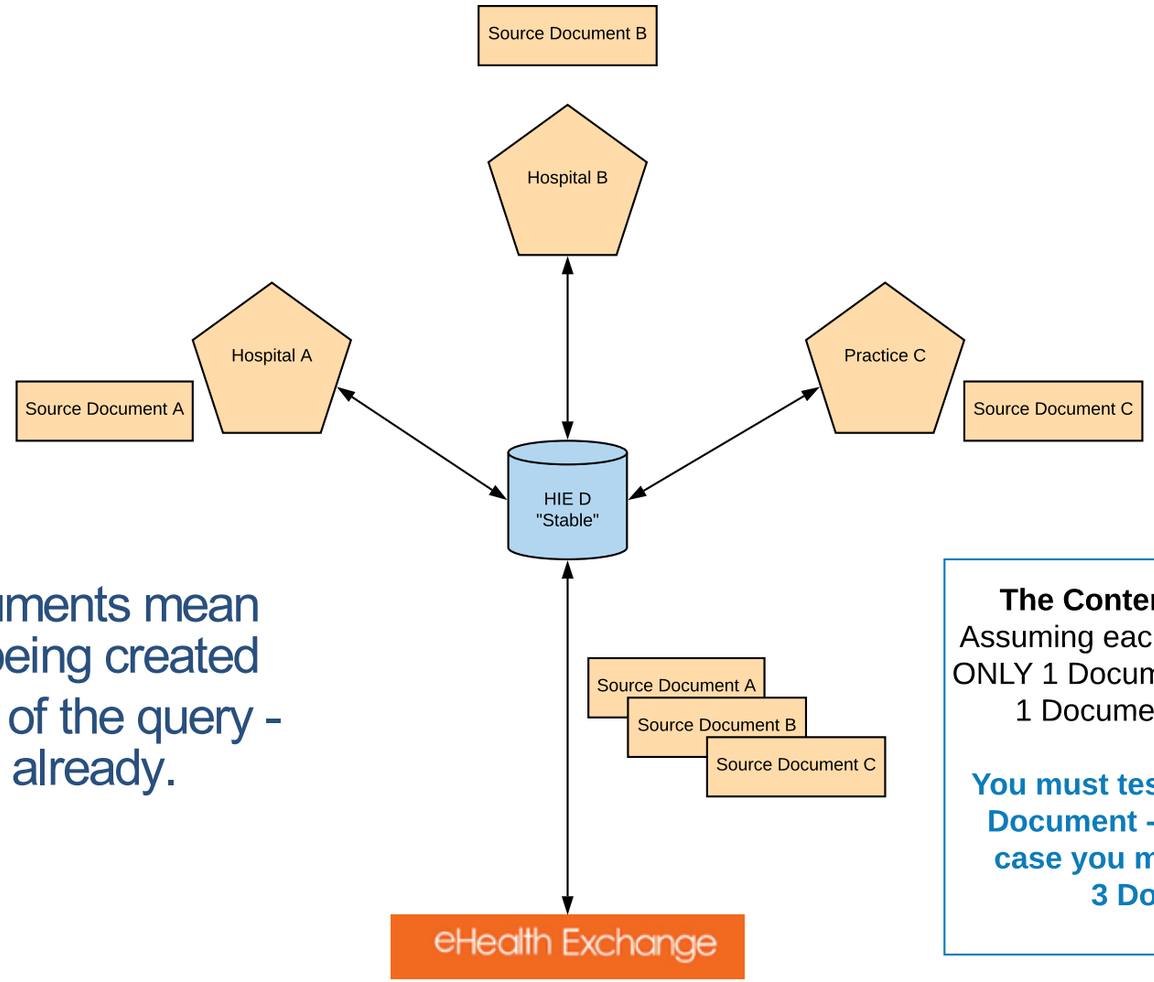


The Content Testing Math:
In this case, the HIE is parsing incoming Documents and producing a single consolidated document.

Assuming you are producing only 1 document type and 1 version, then you will do content testing for 1 document.

What if I support Stable Documents?

- Stable Documents are defined as:
  - Static Documents that have been pre-generated and are stored and retrieved upon query
- HIEs that retrieve, or retrieve and store; and then pass along documents authored by their data sources are using Stable Documents.
- The math can get “big” if you are dealing with multiple document types and/or versions.

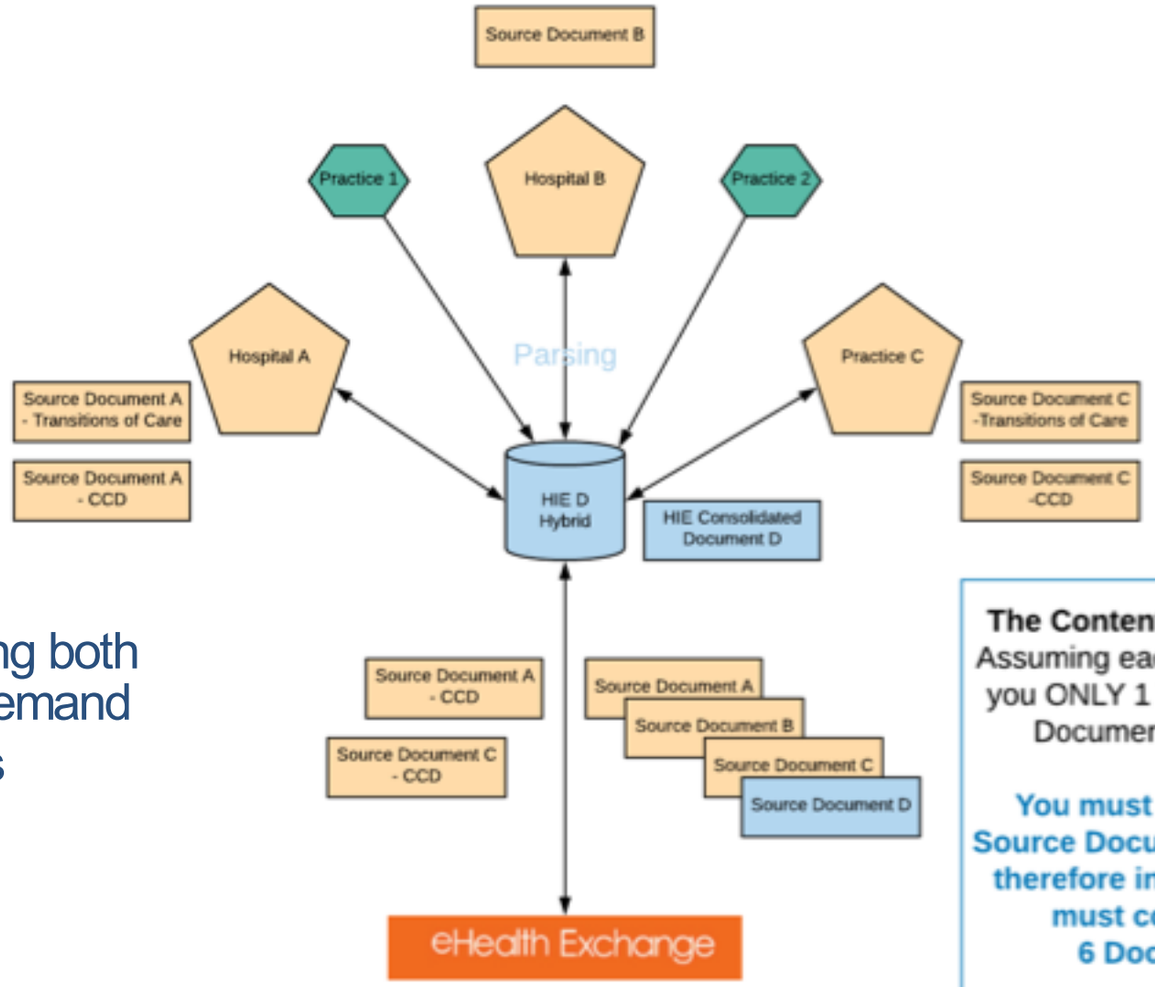


"Stable" Documents mean they are not being created at the moment of the query - they exist already.

The Content Testing Math:
Assuming each Source sends you ONLY 1 Document Type and ONLY 1 Document Version, then

You must test for each Source Document - therefore in this case you must content test 3 Documents.

You might be doing both Stable and On-Demand Documents



The Content Testing Math:
Assuming each Source sends you ONLY 1 Version of each Document Type, then

You must test for each Source Document and Type- therefore in this case you must content test 6 Documents.

What does a Certified Vendor need to test?

What does your Vendor need to test?

- Certified eHX Vendors must test ability to ***create*** and ***receive*** documents

- Vendors must submit at least one sample:
  - Of each supported **Document Type**
    - ex: CCD, Transition of Care
  - For each supported **Document Version**
    - ex: C-32, C-CDA R1.1, C-CDA R2.1

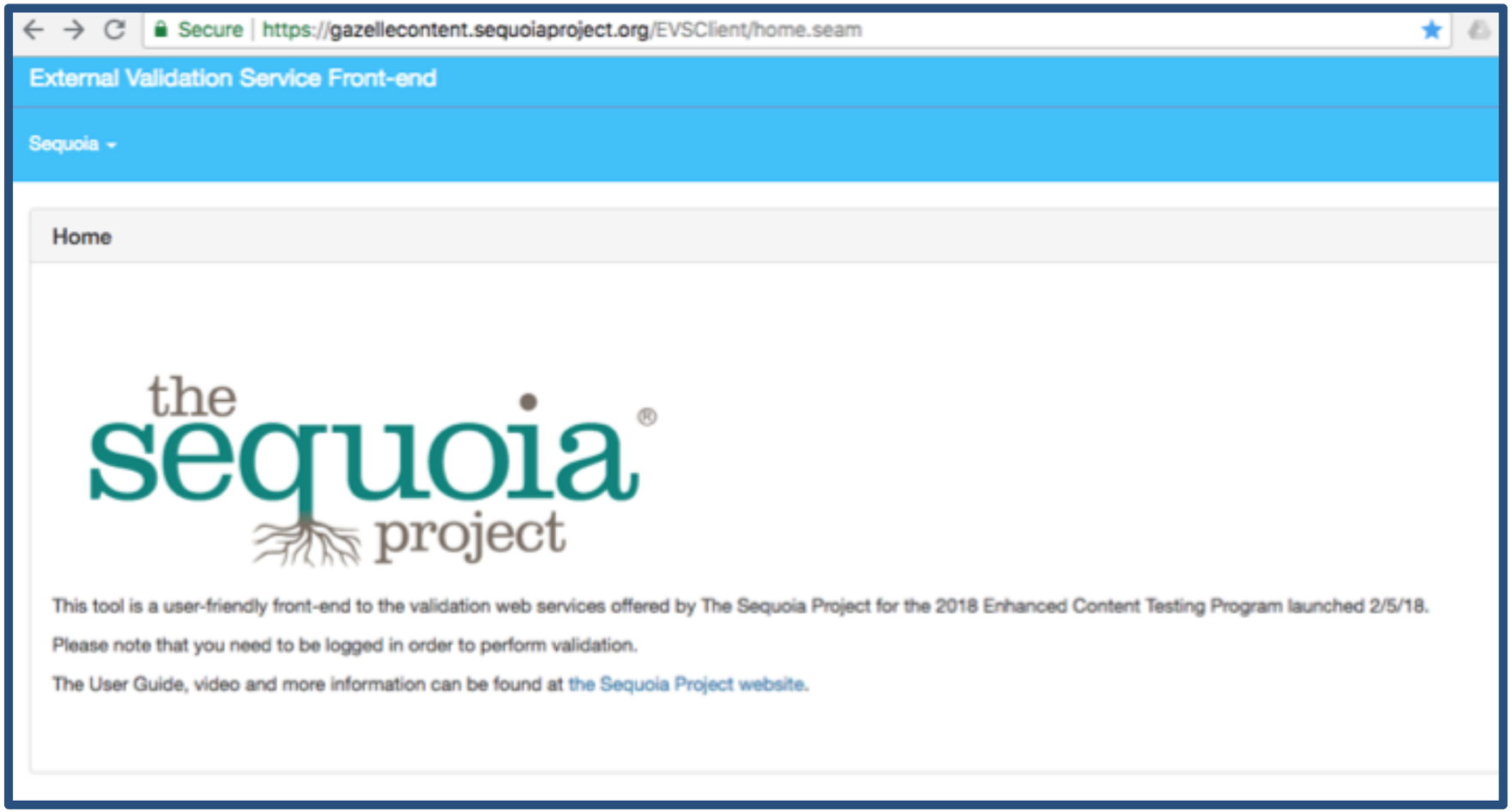
Source: https://sequoiaproject.org/ehealth-exchange/testing-overview/content-testing/

Content Testing Case Studies

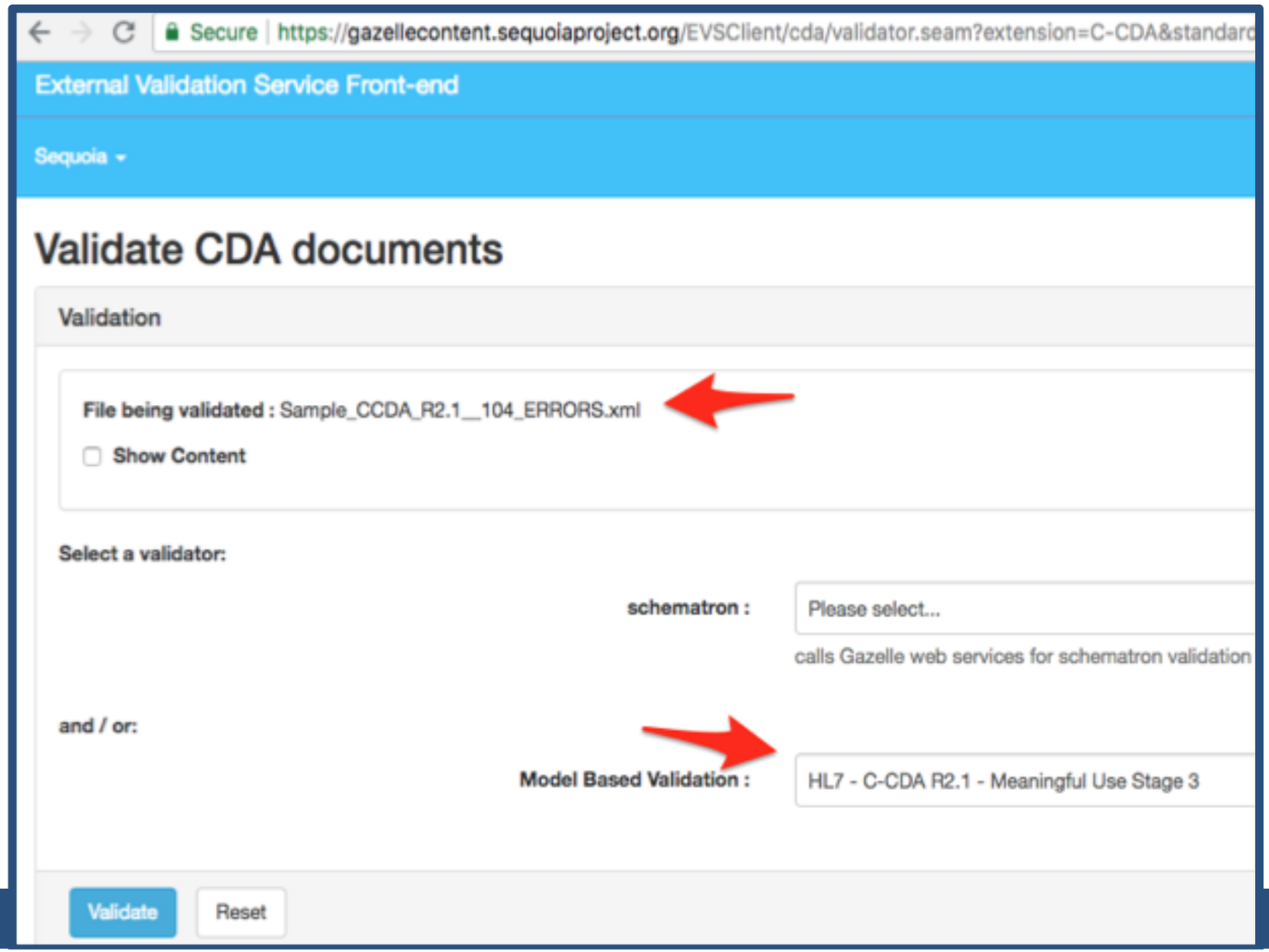
Case Study 1: Introduction to the Process

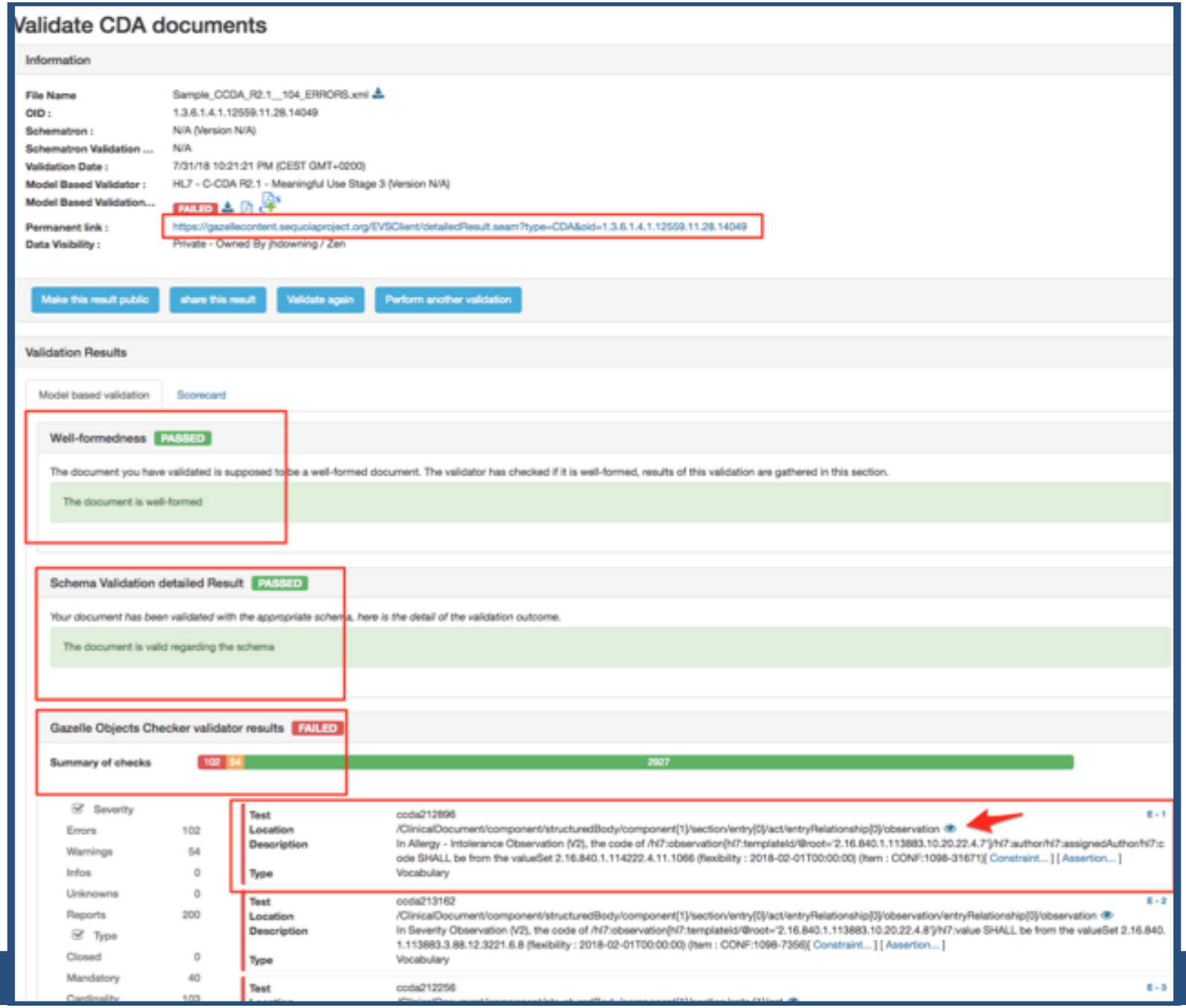
- Let's look at eHX's Content Testing Tool
  - The Content Testing Tool is web-based
- Upload C-CDAs and/or C32s one at a time
  - Once a document is uploaded, it can't be taken back (no PHI!)
- Swat errors until you pass

- Apply through eHX & log in with provided credentials



- Pick a file and “tell” the validator what type of document it is




Validate CDA documents
Information
File Name
Sample_CCDA_R2.1__104_ERRORS.xml
OID :
1.3.6.1.4.1.12559.11.28.14049
Schematron :
N/A (Version N/A)
Schematron Validation ...
N/A
Validation Date :
7/31/18 10:21:21 PM (CEST GMT+0200)
Model Based Validator :
HL7 - C-CDA R2.1 - Meaningful Use Stage 3 (Version N/A)
Model Based Validation...
FAILED
Permanent link :
https://gazellecontent.sequoiaproject.org/EVSClient/detailedResult.seam?type=CDA&oid=1.3.6.1.4.1.12559.11.28.14049
Data Visibility :
Private - Owned By jhdowning / Zen
Make this result public
share this result
Validate again
Perform another validation
Validation Results
Model based validation
Scorecard
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
Gazelle Objects Checker validator results
FAILED
Summary of checks
102
54
2927
Severity
Errors 102
Warnings 54
Infos 0
Unknowns 0
Reports 200
Type
Closed 0
Mandatory 40
E - 1
Test
coda212896
Location
/ClinicalDocument/component/structuredBody/component[1]/section/entry[0]/act/entryRelationship[0]/observation
Description
In Allergy - Intolerance Observation (V2), the code of /hl7:observation[hl7:templateId/@root='2.16.840.1.113883.10.20.22.4.7']/hl7:author/hl7:assignedAuthor/hl7:code SHALL be from the valueSet 2.16.840.1.114222.4.11.1066 (flexibility : 2018-02-01T00:00:00) (item : CONF:1098-31671)[Constraint...] [Assertion...]
Type
Vocabulary
E - 2
Test
coda213162
Location
/ClinicalDocument/component/structuredBody/component[1]/section/entry[0]/act/entryRelationship[0]/observation/entryRelationship[0]/observation
Description
In Severity Observation (V2), the code of /hl7:observation[hl7:templateId/@root='2.16.840.1.113883.10.20.22.4.8']/hl7:value SHALL be from the valueSet 2.16.840.1.113883.3.88.12.3221.6.8 (flexibility : 2018-02-01T00:00:00) (item : CONF:1098-7356)[Constraint...] [Assertion...]
Type
Vocabulary
E - 3
Test
coda212256

Validate CDA documents

Information

File Name	Sample_CCDA_R2.1__104_ERRORS.xml
OID :	1.3.6.1.4.1.12559.11.28.14049
Schematron :	N/A (Version N/A)
Schematron Validation ...	N/A
Validation Date :	7/31/18 10:21:21 PM (CEST GMT+0200)
Model Based Validator :	HL7 - C-CDA R2.1 - Meaningful Use Stage 3 (Version N/A)
Model Based Validation...	FAILED
Permanent link :	https://gazellecontent.sequoiaproject.org/EVSClient/detailedResult.seam?type=CDA&oid=1.3.6.1.4.1.12559.11.28.14049
Data Visibility :	Private - Owned By jhdowning / Zen

Make this result public | share this result | Validate again | Perform another validation

Validation Results

Model based validation | Scorecard

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.

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Make this result public | share this result | Validate again | Perform another validation

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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

Gazelle Objects Checker validator results FAILED

Summary of checks 102 54 2927

Severity	
Errors	102
Warnings	54
Infos	0
Unknowns	0
Reports	200

Test	ccda212896	E - 1
Location	/ClinicalDocument/component/structuredBody/component[1]/section/entry[0]/act/entryRelationship[0]/observation	
Description	In Allergy - Intolerance Observation (V2), the code of /hl7:observation[hl7:templateId/@root='2.16.840.1.113883.10.20.22.4.7']/hl7:author/hl7:assignedAuthor/hl7:code SHALL be from the valueSet 2.16.840.1.114222.4.11.1066 (flexibility : 2018-02-01T00:00:00) (item : CONF:1098-31671)[Constraint...] [Assertion...]	
Type	Vocabulary	

Test	ccda213162	E - 2
Location	/ClinicalDocument/component/structuredBody/component[1]/section/entry[0]/act/entryRelationship[0]/observation/entryRelationship[0]/observation	
Description	In Severity Observation (V2), the code of /hl7:observation[hl7:templateId/@root='2.16.840.1.113883.10.20.22.4.8']/hl7:value SHALL be from the valueSet 2.16.840	

```
639          <entryRelationship typeCode="SUBJ">
640            <observation classCode="OBS" moodCode="EVN">
```

(1/357)

Test	ccda212896	E - 1
Location	/ClinicalDocument/component/structuredBody/component[1]/section/entry[0]/act/entryRelationship[0]/observation	
Description	In Allergy - Intolerance Observation (V2), the code of /hl7:observation[hl7:templateId/@root='2.16.840.1.113883.10.20.22.4.7']/hl7:author/hl7:assignedAuthor/hl7:code SHALL be from the valueSet 2.16.840.1.114222.4.11.1066 (flexibility : 2018-02-01T00:00:00) (item : CONF:1098-31671)[Constraint...] [Assertion...]	

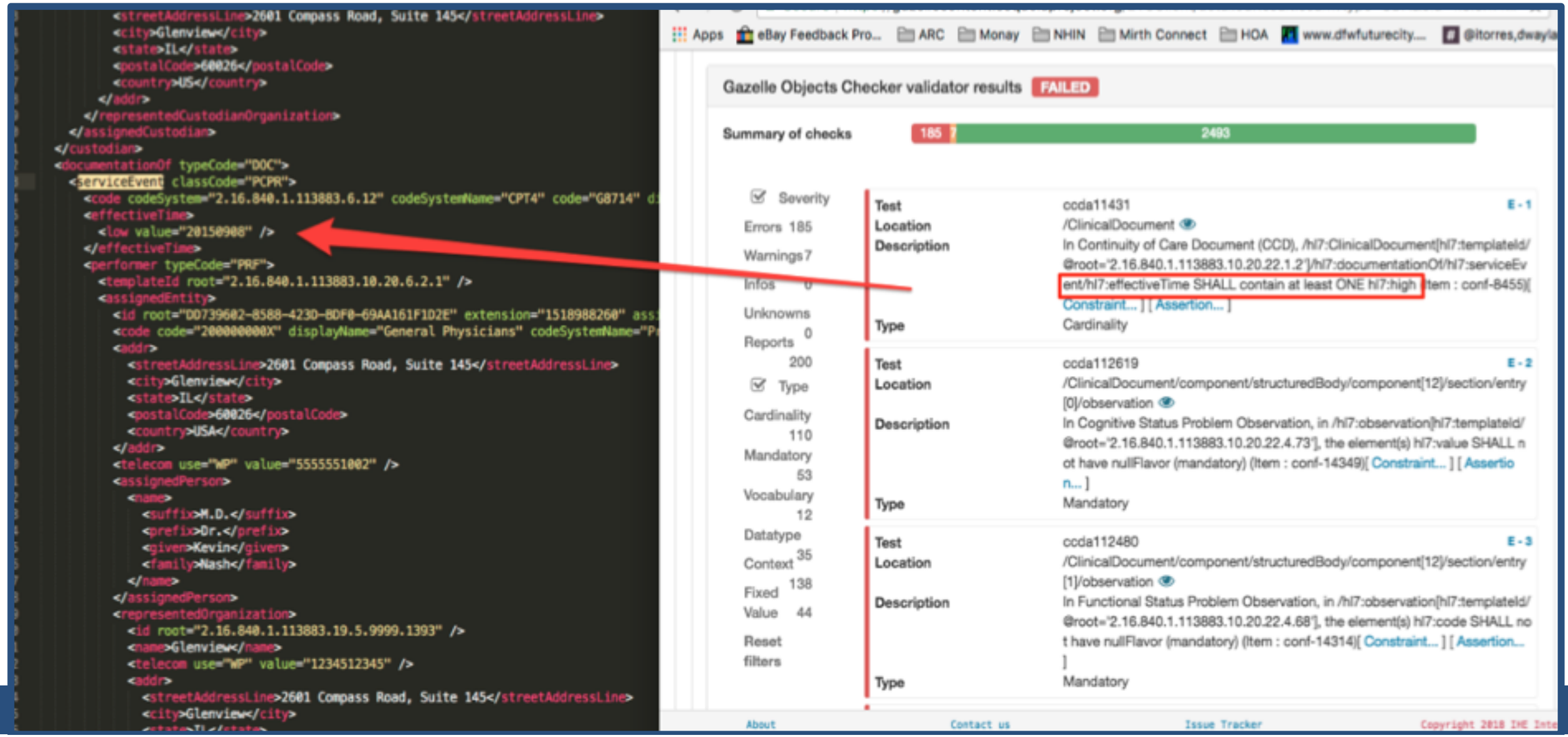
```
641              <!-- ** Allergy observation (V2) ** -->
642              <templateId extension="2014-06-09" root="2.16.840.1.113883.10.20.22.4.7"/>
643              <templateId root="2.16.840.1.113883.10.20.22.4.7"/>
644              <!-- <id root="4adc1020-7b14-11db-9fe1-0800200c9a66"/>-->
645              <id root="4ADC1020-7B14-11DB-9FE1-0800200C9A66"/>
646              <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
647              <!-- Observation statusCode represents the status of the act of observing -->
648              <statusCode code="completed"/>
649              <effectiveTime>
650                 <!-- The low value reflects the date of onset of the allergy -->
651                 <!-- Based on patient symptoms, presumed onset is May 1, 1998 -->
652                 <low value="19980501"/>
653                 <!-- The high value reflects when the allergy was known to be resolved (and will generally be absent) -->
654              </effectiveTime>
655              <value code="419199007" codeSystem="2.16.840.1.113883.6.96" codeSystemName="SNOMED CT" displayName="Allergy to substance" xsi:type="CD"/>
656              <author typeCode="AUT">
657                 <templateId root="2.16.840.1.113883.10.20.22.4.119"/>
658                 <time value="199805011145-0800"/>
659                 <!-- <assignedAuthor><id extension="222223333" root="2.16.840.1.113883.4.6"/><code code="207KA0200X" displayName="Allergy" codeSystem="2.16.840.1.113883.6.101
660                 <assignedAuthor>
661                    <id extension="555555555" root="2.16.840.1.113883.4.6"/>
662                    <code code="163W00000X" codeSystem="2.16.840.1.113883.5.53" codeSystemName="Health Care Provider Taxonomy" displayName="Registered nurse"/>
663                    <addr>
664                       <streetAddressLine>1004 Healthcare Drive </streetAddressLine>
665                       <city>Portland</city>
666                       <state>OR</state>
```

Case Study 1: Introduction to the Process

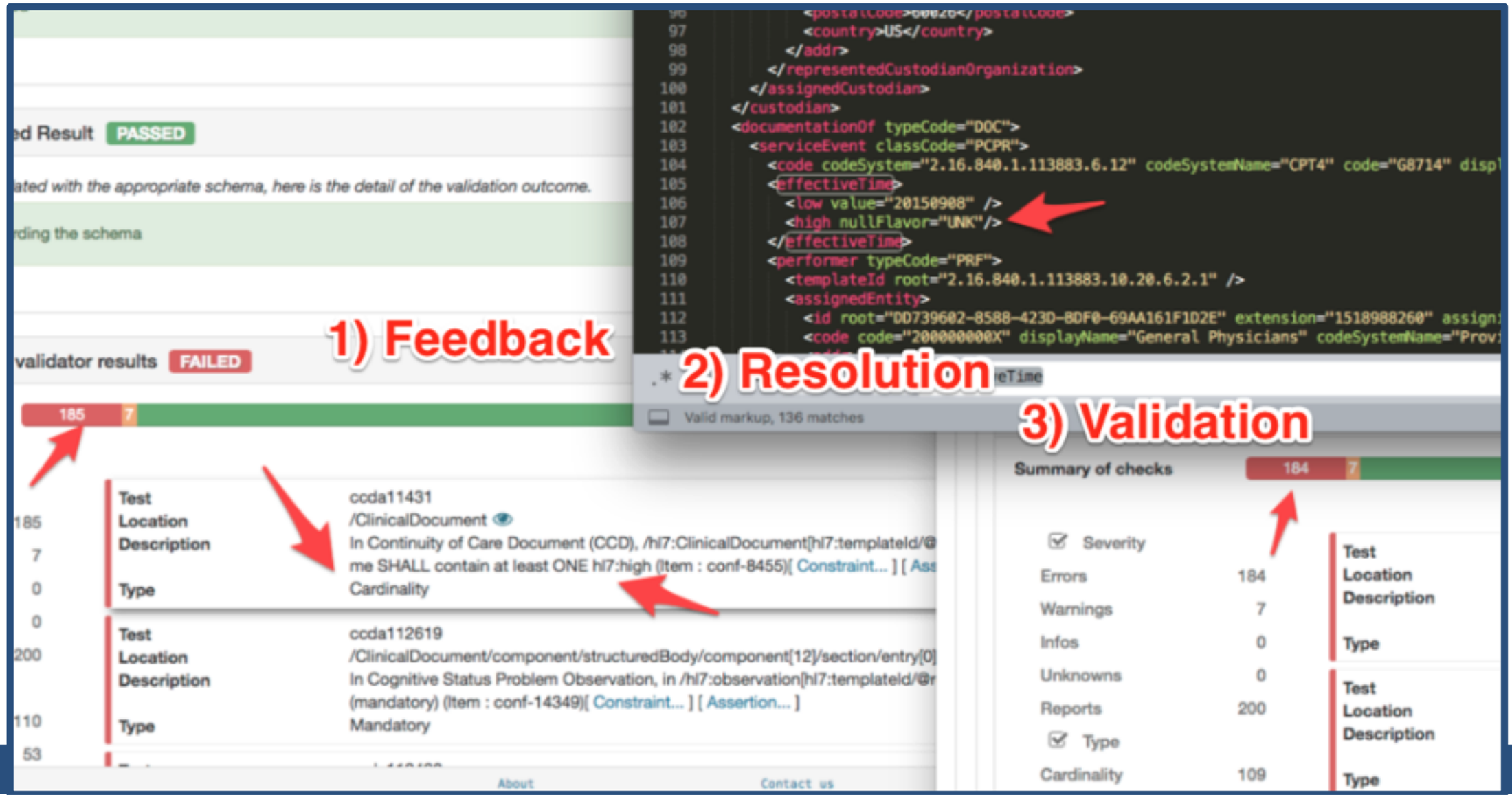
Takeaways:

- Most CCDAs will fail the first time
  - Bark worse than bite; Each instance of an error is separately reported
- Tool has easy click-to-navigate UI
- Some possible bugs with code sets
  - Zen has reported to eHealth Exchange team

Case Study 2: Solving a Content Problem



Case Study 2: Solving a Problem



Case Study 2: Solving a Content Problem

Takeaways:

- Solution - Modify C-CDA generator to include an effectiveTime <high>!
- Rinse-and-repeat to ferret out problems in your document generation
  - If you generated the document, these likely mean code changes
    - Which may mean involving vendors!
  - If you didn't generate the document, work with your document sources
  - There are on-the-fly solutions available as well (see FAQ)

FAQ

FAQ

- Is this the same as DIL testing?
  - No.
  - DIL testing is (was) transport-testing, which is still important.
    - It's being replaced by "Interoperability Testing Platform" (ITP)

- Is this the same as ITP Testing?
  - No.
  - Content testing is one component of ITP testing, in addition to transport and security testing.

FAQ

- We're already eHX participants. Do we need to do this?
  - Yes.
  - Existing participants have until February 2019 to formally test
    - These tests don't need to pass right away;
    - Participants have 18 months to fix and re-test
    - You can use the tool without starting the clock!

- We're considering joining eHX. Do we need to do this?
  - Yes.
  - New participants must also pass these tests within 18 months of onboarding

FAQ

- Do these rules apply to documents we didn’t originate?
  - Yes.
  - Documents made available on the exchange must pass these tests!

- My documents won’t pass these tests. What can I do?

  Consultants like Zen can help!

Strategies and Tools

- Zen has solutions that modify messages “inflight” to perform certain transport & content repairs.
  - Fixable examples include security related issues and content that can be resolved via mapping or data transformations
- Zen Pulsar – our IHE Test Gateway testing service
  - Develop, test and monitor your own Gateway by leveraging Zen’s Stargate Gateway.
- Zen Data Quality as a Service Offering
  - Content Analysis and Data Quality Scoring

Strategies and Tools

- 3rd Party Data Quality Tools
  - Data Scoring Tools like iQHD (Stella Technology) to more quickly identify content issues and provide easily understandable scorecards to data sources. Zen is using this tool in our Data Quality as a Service Offering
  - Data Quality Uplifting tools like Diameter Health to address semantic normalization issues (uplift local lab codes to LOINC)

Audience Questions

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What do I need to test?

- Example Scenario: HIE - Stable Documents Model
  - Two sources whose documents we intend to share over eHX:
    - **Hospital A (HA) sends us:**
      - CCDs; C-CDA R1.1 and R2.1
      - Transition of Care documents; C-CDA R2.1 only
    - **Clinic B (CB) sends us:**
      - CCDs; C-CDA R1.1 only
- We must test at least **4** documents:
  - **HA** CCD R1.1, CCD R2.1, ToC R2.1
  - **CB** CCD R1.1

Critical Assumption: "Stable" Documents

Simplify Interoperability