

Customizing and Testing State and Local Immunization HL7 v2 Implementation Guides *Using NIST IGAMT-lite and Immunization Test Suite*

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April 21st, 2015

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Workshop Goals

- Create a local immunization VXU implementation Guide
- Gain a better understanding of HL7 v2.x Conformance Profiles and how to add constraints
- Gain an understanding of NIST Conformance Testing
 - Understand context-free testing
 - Learn to use test suite to validate messages against the CDC national guide and customized (local) guide
- Gain an understanding of how to leverage the NIST tools to improve your On-boarding process

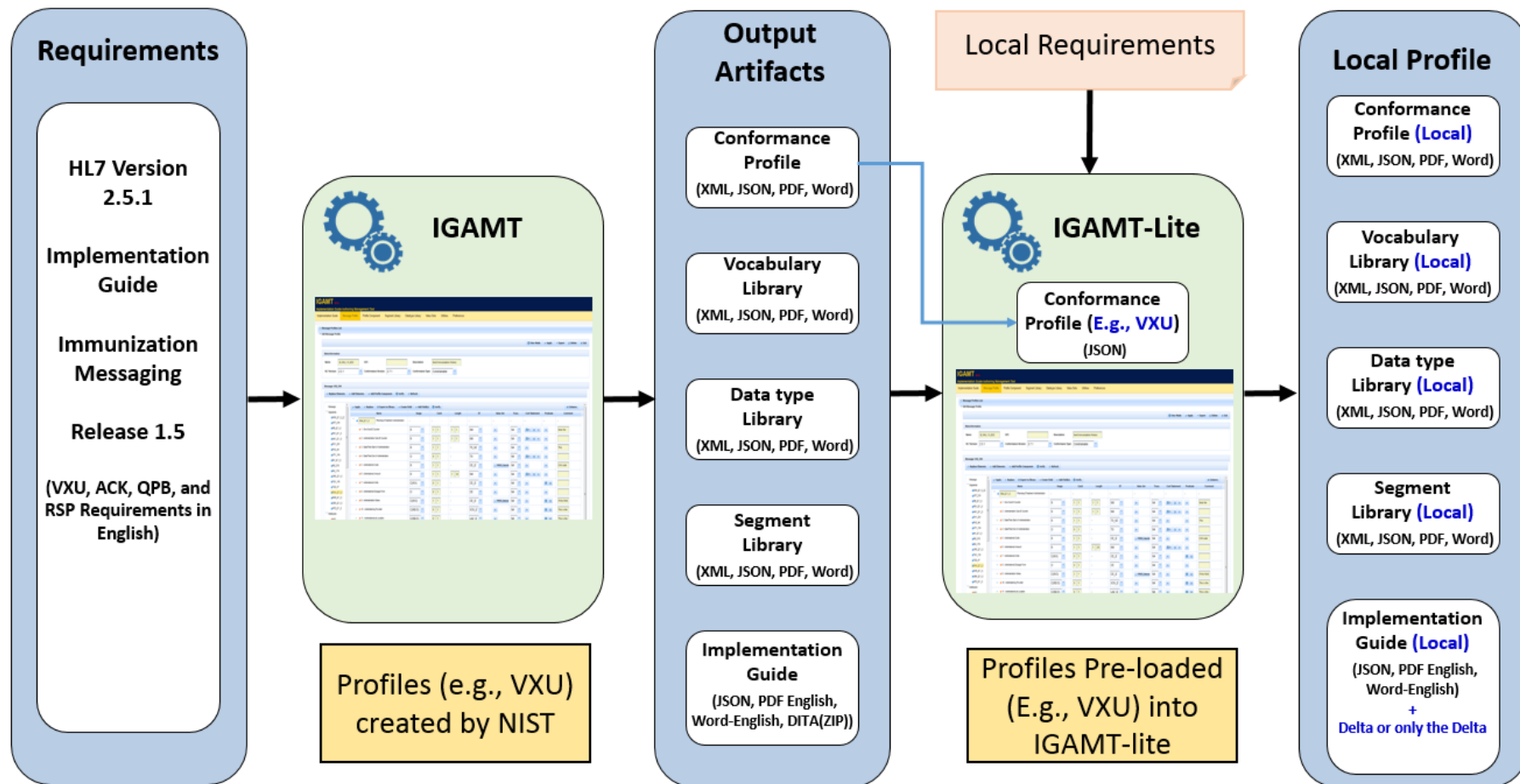
Agenda

- Presentation (20 minutes)
 - Overview
 - HL7 v2.x Conformance Profiles and Profile Hierarchy
 - Applying Constraints to the National Standard
 - Conformance Profiles and Relationship to Conformance Testing
- Tutorial (20 minutes)
 - Case Study: California Immunization Registry (CAIR) Implementation Guide
 - Review of the local implementation guide template
 - Using IGAMT-lite
 - User Registration
 - Creating an Implementation Guide
 - Adding Constraints and additional text to further document local constraints
 - Exporting the Implementation Guide (human and machine readable)
 - Context-free Validation
- Hands-on (20 minutes)
 - Using IGAMT-lite to modify national profile for local requirements

Benefits of Using IGAMT-lite

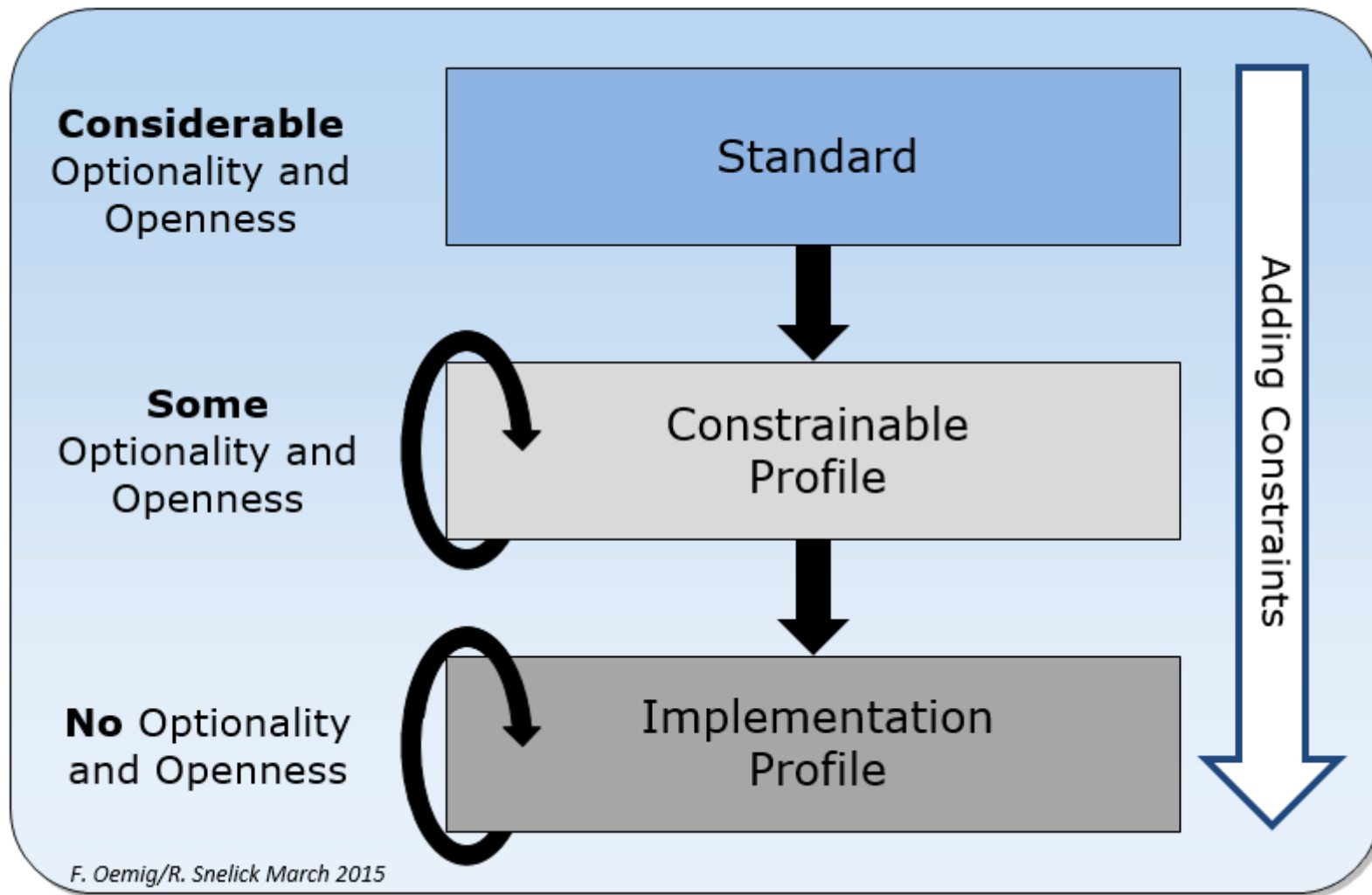
- Provides a way to manage and publish your local requirements
 - Enforces compliance with national guide
 - Beneficial for local implementations
 - Creates and manages HL7 V2 requirements
 - Message Definition
 - Segment Tables
 - Data Type Tables
 - Value Sets
 - Conformance Statements
 - **Better Specification of Requirements**
- Provides a machine processable (XML) profile
 - Can be used for many purposes:
 - Validating messages
 - NIST Framework or Local (NIST could host local validation—future consideration)
 - Web Application or Web Service
 - Part of testing EHR-S and IIS functional requirements
 - Documenting and Comparing interfaces and implementations
 - Generating messages
 - Generating code

Overview of Profile Customization using IGAMT-lite



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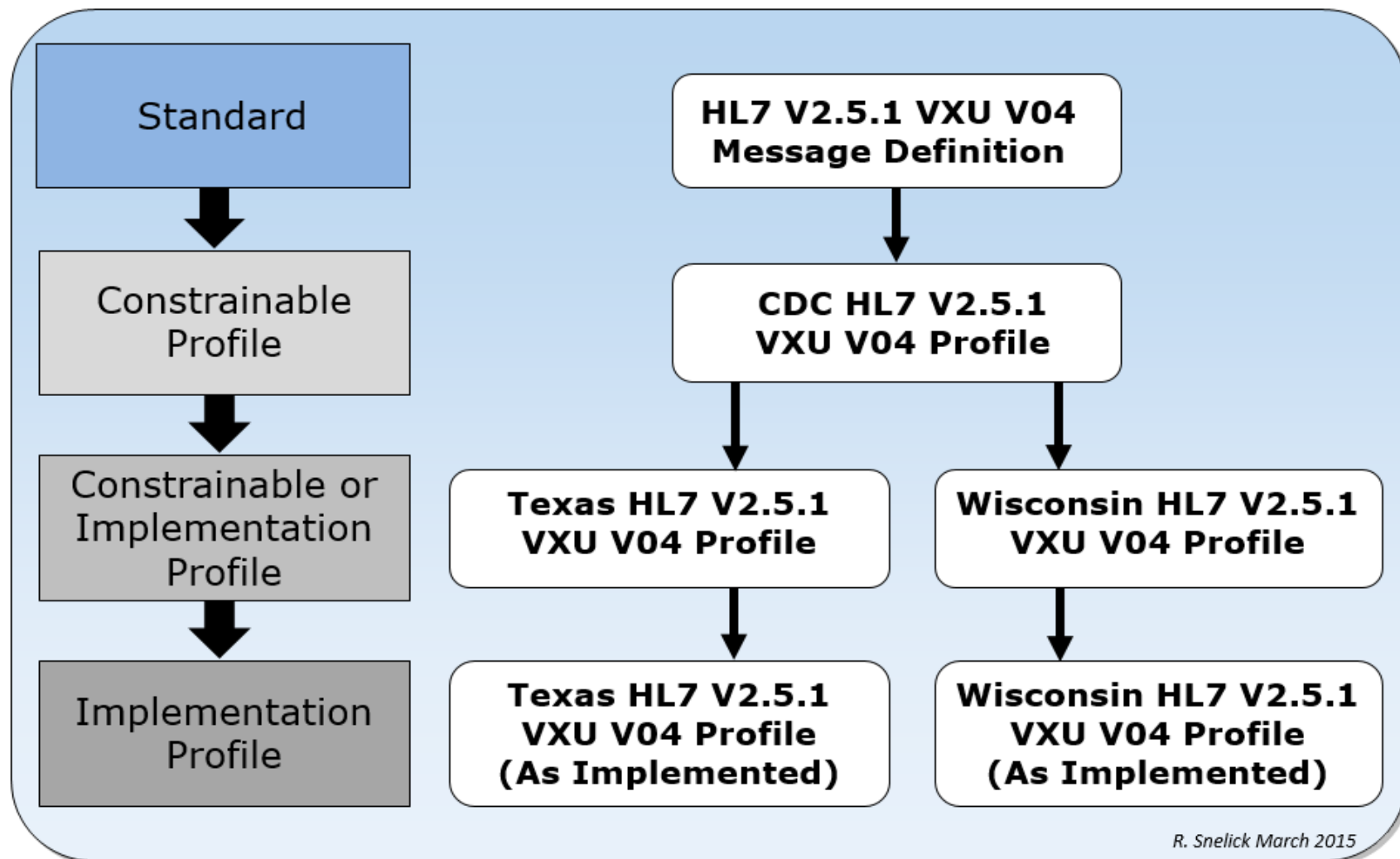
HL7 V2.x Profiling and Profile Hierarchy



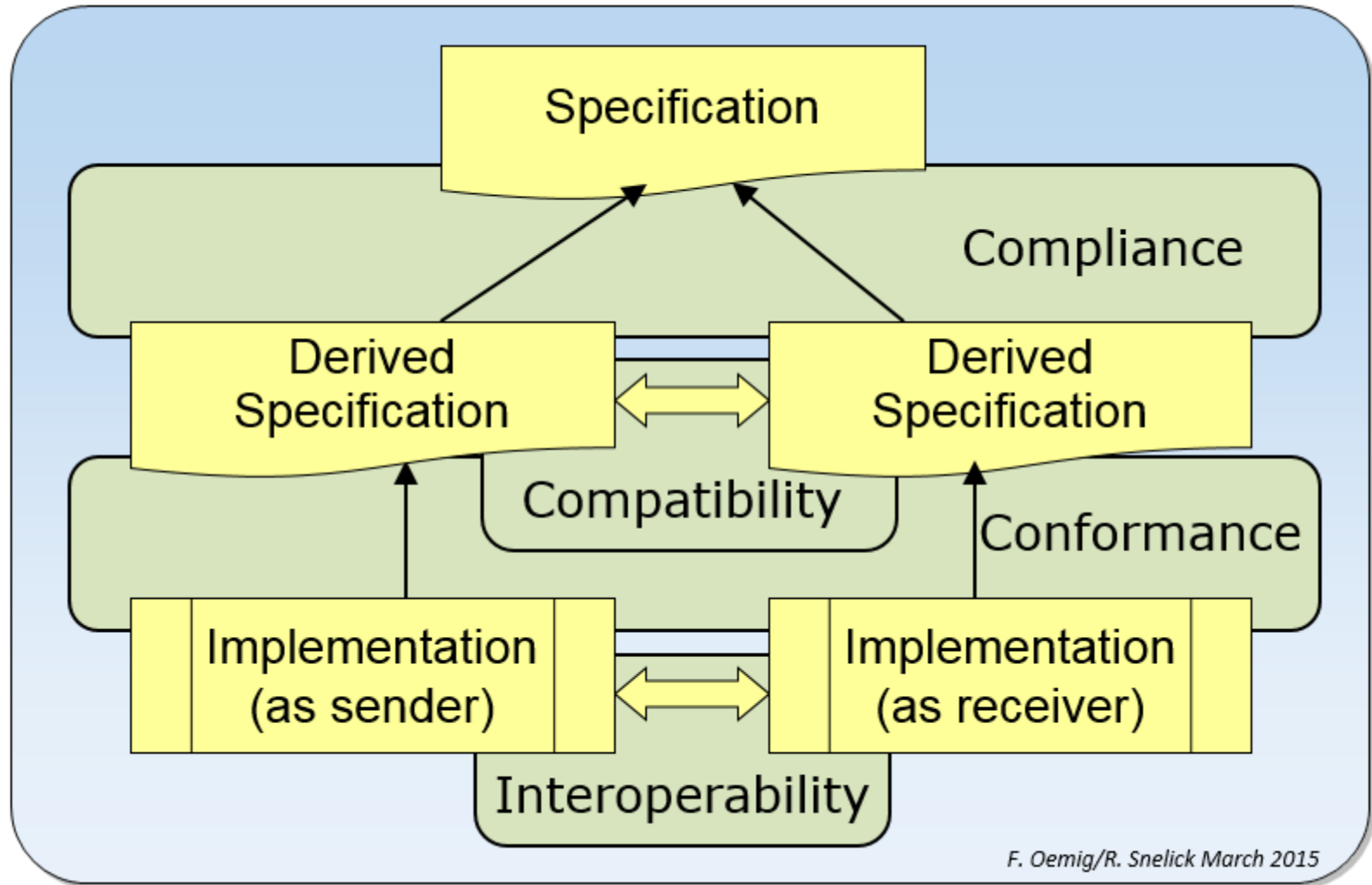
Applying Constraints

Constraint Type	Description	Examples																														
Usage	Indicates requirements for the presence (appearance) of an element. Also referred to as Appearance or Optionality indicator.	Constraint optional to required O → R																														
Cardinality	Indicates the number of occurrences for an element by specifying the minimum and maximum bounds.	Constrain the minimum cardinality from 0 (may be sent) to 1 (required to be sent) [0..1] → [1..1]																														
Data Type	Defines the data element structure and, at the primitive level, the type of data it may contain. Constraints include type substitution and specialization (when combined with other constraint types).	<table border="1"> <thead> <tr> <th>DT</th><th>Usage</th><th>Cardinality</th></tr> </thead> <tbody> <tr> <td>Element 1</td><td>R</td><td>1..1</td></tr> <tr> <td>Element 2</td><td>O</td><td>0..*</td></tr> <tr> <td>Element 3</td><td>O</td><td>0..1</td></tr> <tr> <td>Element 4</td><td>O</td><td>0..*</td></tr> </tbody> </table> → <table border="1"> <thead> <tr> <th>DT_I2</th><th>Usage</th><th>Cardinality</th></tr> </thead> <tbody> <tr> <td>Element 1</td><td>R</td><td>1..1</td></tr> <tr> <td>Element 2</td><td>RE</td><td>0..5</td></tr> <tr> <td>Element 3</td><td>X</td><td>0..0</td></tr> <tr> <td>Element 4</td><td>O</td><td>0..*</td></tr> </tbody> </table>	DT	Usage	Cardinality	Element 1	R	1..1	Element 2	O	0..*	Element 3	O	0..1	Element 4	O	0..*	DT_I2	Usage	Cardinality	Element 1	R	1..1	Element 2	RE	0..5	Element 3	X	0..0	Element 4	O	0..*
DT	Usage	Cardinality																														
Element 1	R	1..1																														
Element 2	O	0..*																														
Element 3	O	0..1																														
Element 4	O	0..*																														
DT_I2	Usage	Cardinality																														
Element 1	R	1..1																														
Element 2	RE	0..5																														
Element 3	X	0..0																														
Element 4	O	0..*																														
Value	Defines the allowable values for a coded element (i.e., a list of values).	[M, F, U, O, A] → [M, F, U]																														
Length	Defines a constraint on the number of characters that may be present in one occurrence of an element. Can specify a maximum or the minimum and maximum bounds.	80 Element may have at most 80 characters. [2..4] Element may have at minimum 2 and at most 4 characters.																														
Predicate (Conformance Statement)	Provides an explicit normative statement expressed in text or a testable expression that defines a constraint. Also referred to as a “conformance statement”.	PID.6.7 (Mother’s Maiden Name – Name Type Code) SHALL be valued “M”.																														

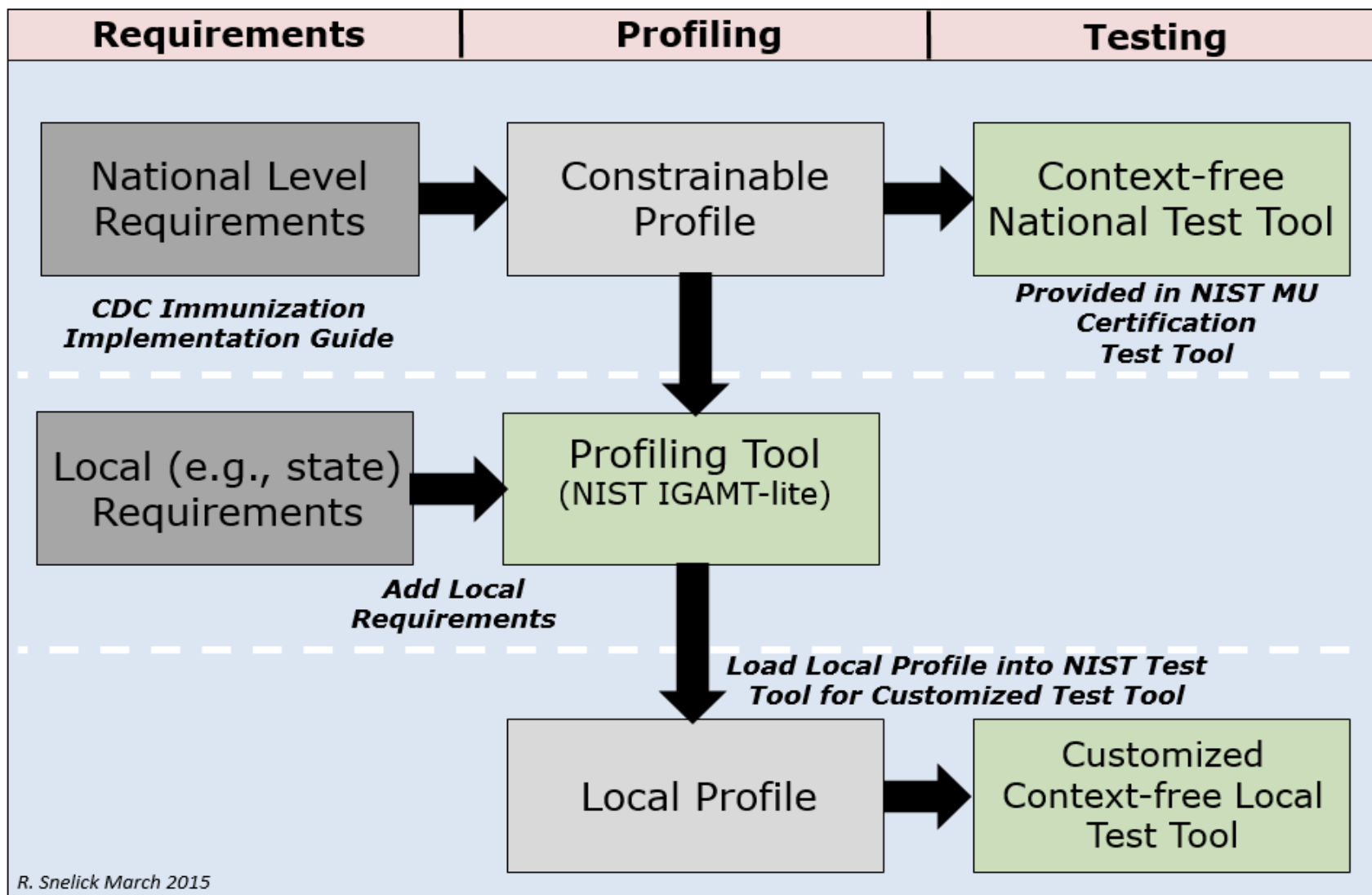
Creating Local Profiles



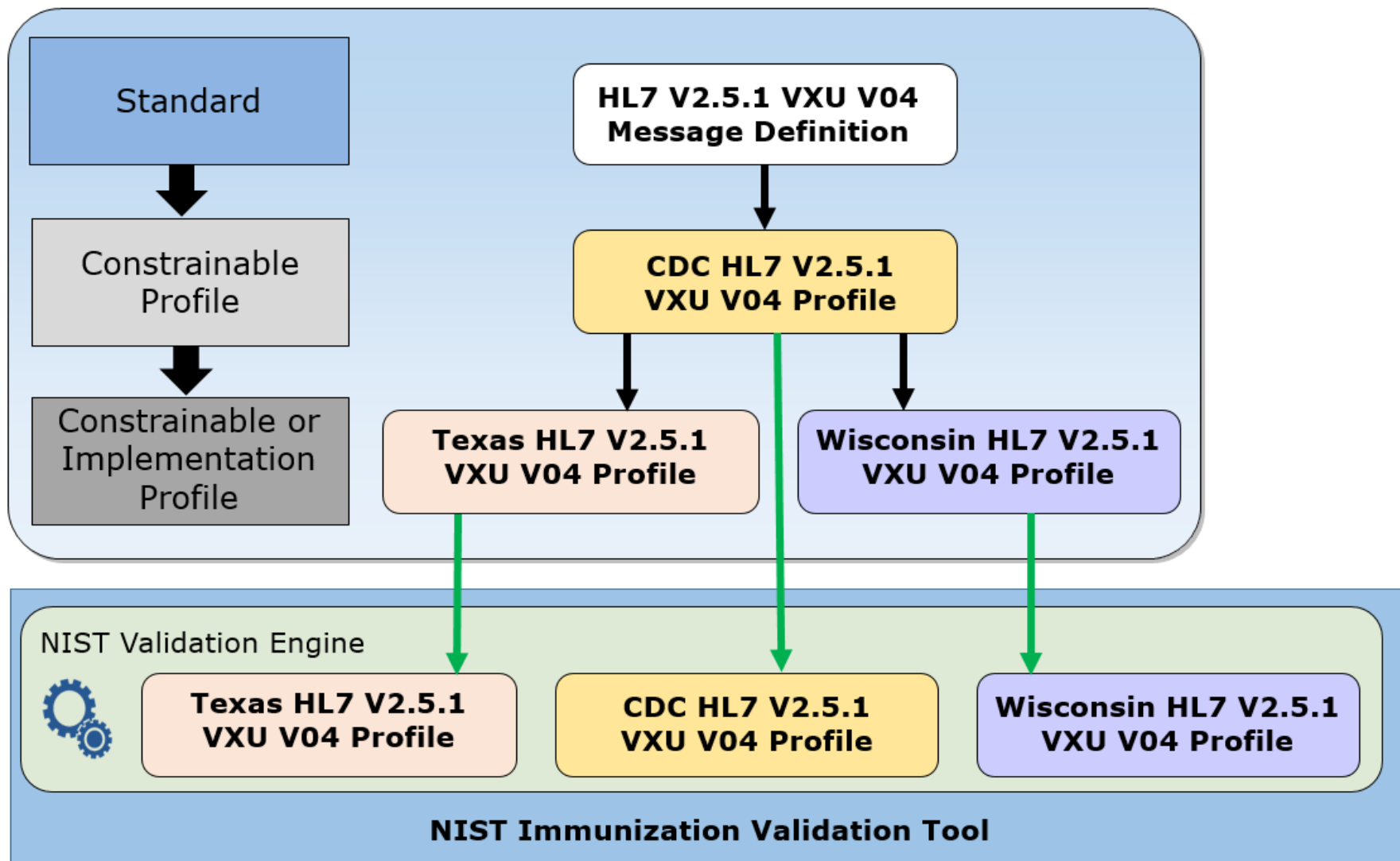
Understanding Profiling Terms



Profiling and Testing



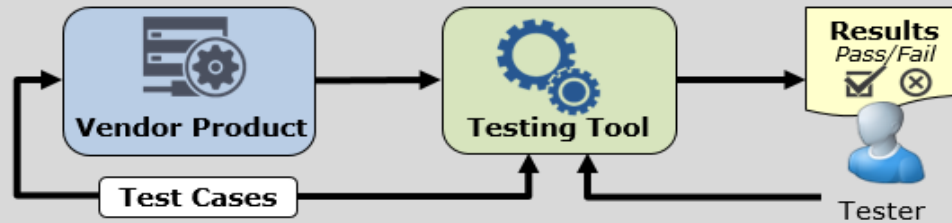
Conformance Testing of Local Profiles



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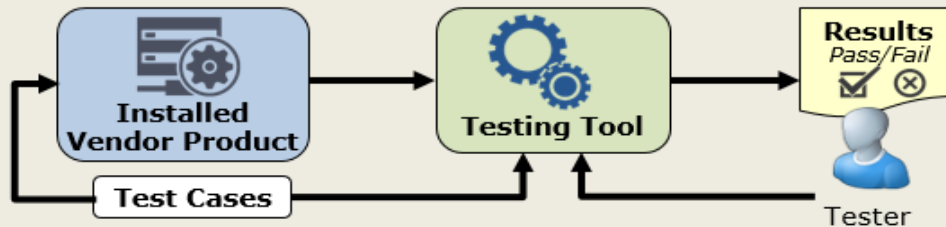
Testing Tiers

Phase 1: Capabilities Testing (Conformance Testing)



- National Requirements (Constrainable Profile)
- Vendor Product (Test Environment)

Phase 2: Site Capabilities Testing (Conformance Testing)



- Add Local Requirements (Implementation Profile)
- Vendor Product (Configured and Installed) (Test Environment)
- Revised Test Cases

Phase 3: Site Interface Testing (Interoperability Testing)

Site A
Purchases CEHRT 'ABC'



Working Interface
Harmonize local requirements

Site B
Purchases CEHRT 'XYZ'



- Requirements (Implementation Profiles)
- Vendor Product (Configured and Installed) (Test or Production Environment)

CEHRT = **C**ertified **E**HR **T**echnology

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HEALTH IT STANDARDS TESTING INFRASTRUCTURE

Tutorial

Part 1: Using NIST IGAMT-lite

Part 2: Context-free Validation

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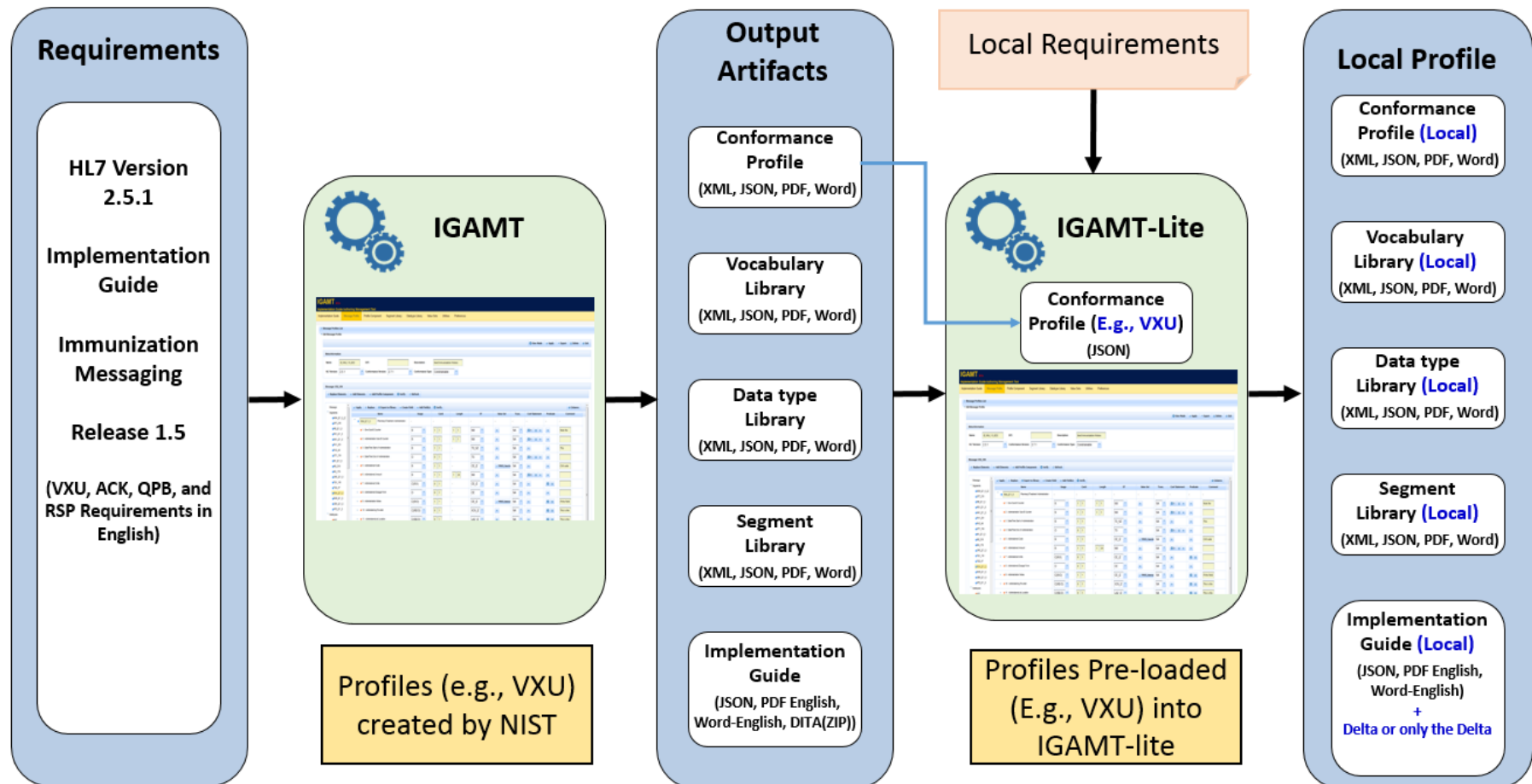
Robert Snelick

National Institute of Standards and Technology (NIST)

April 21st, 2015

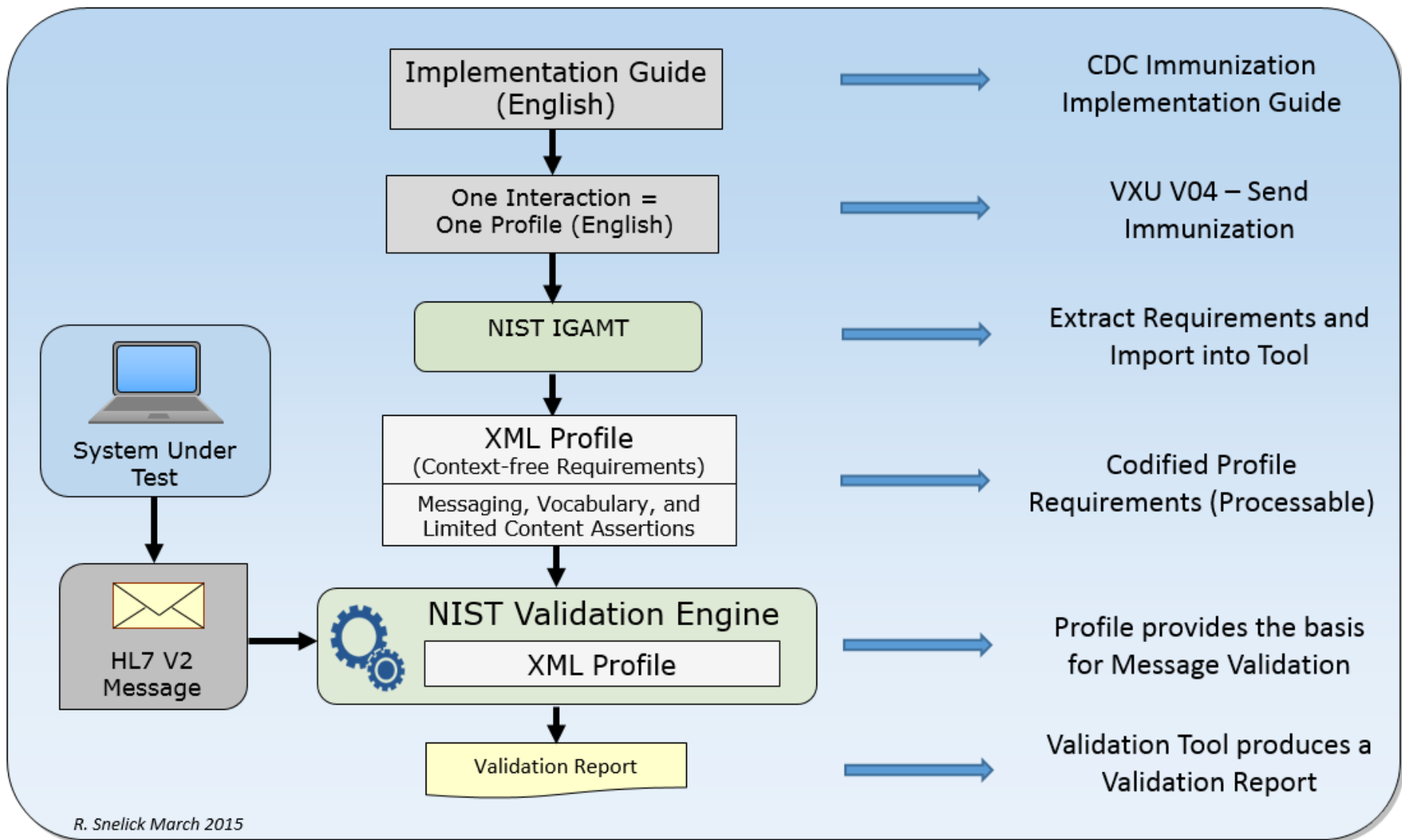
Contact: robert.snelick@nist.gov

Overview of Profile Customization using IGAMT-lite

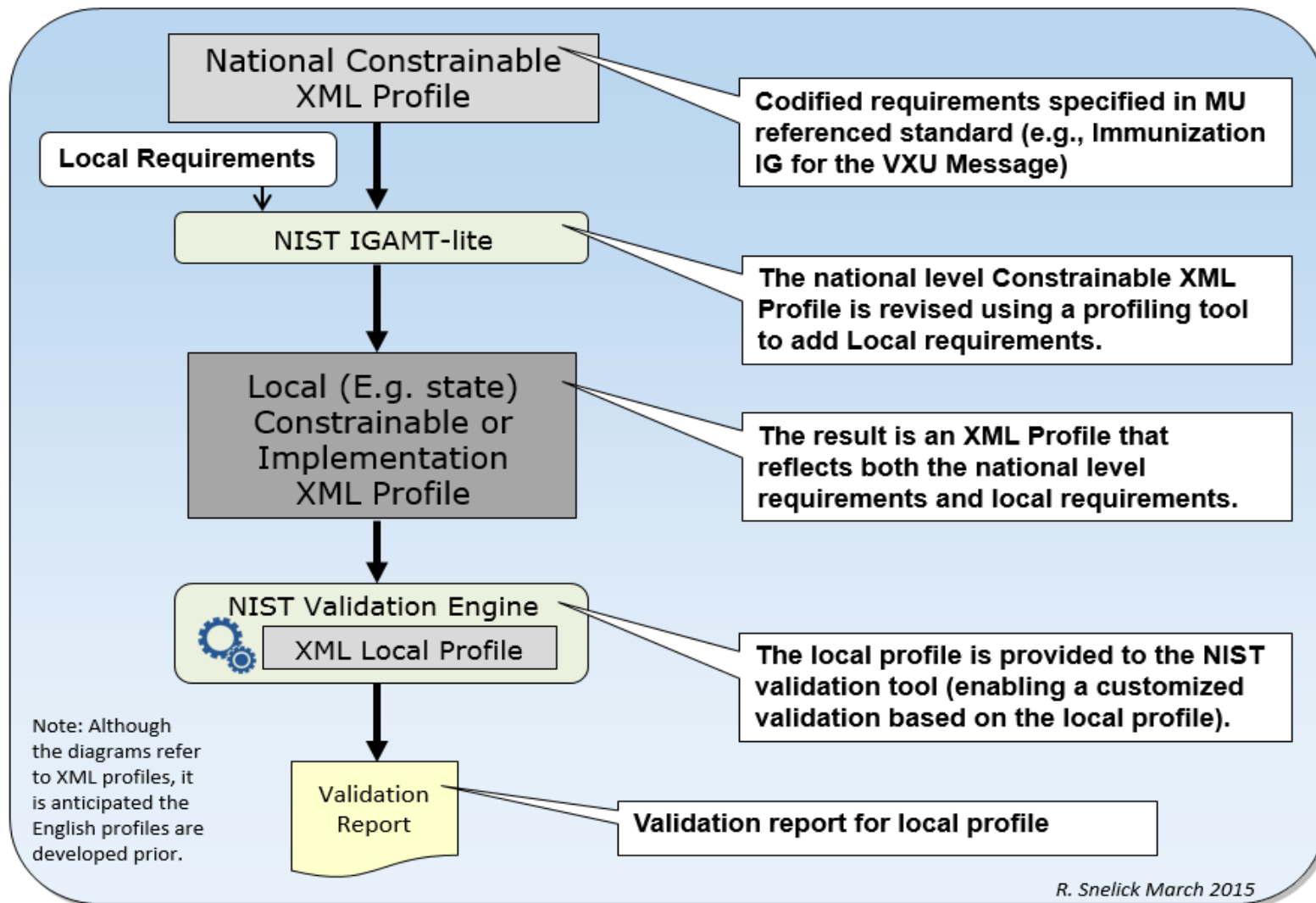


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NIST Profile and Validation Process



NIST Customized Profile and Validation Process



Profile Rendering

➤ Formats/Displays

- JSON
- XML
- Browse-able
- Excel
- PDF
- Word
- And More...

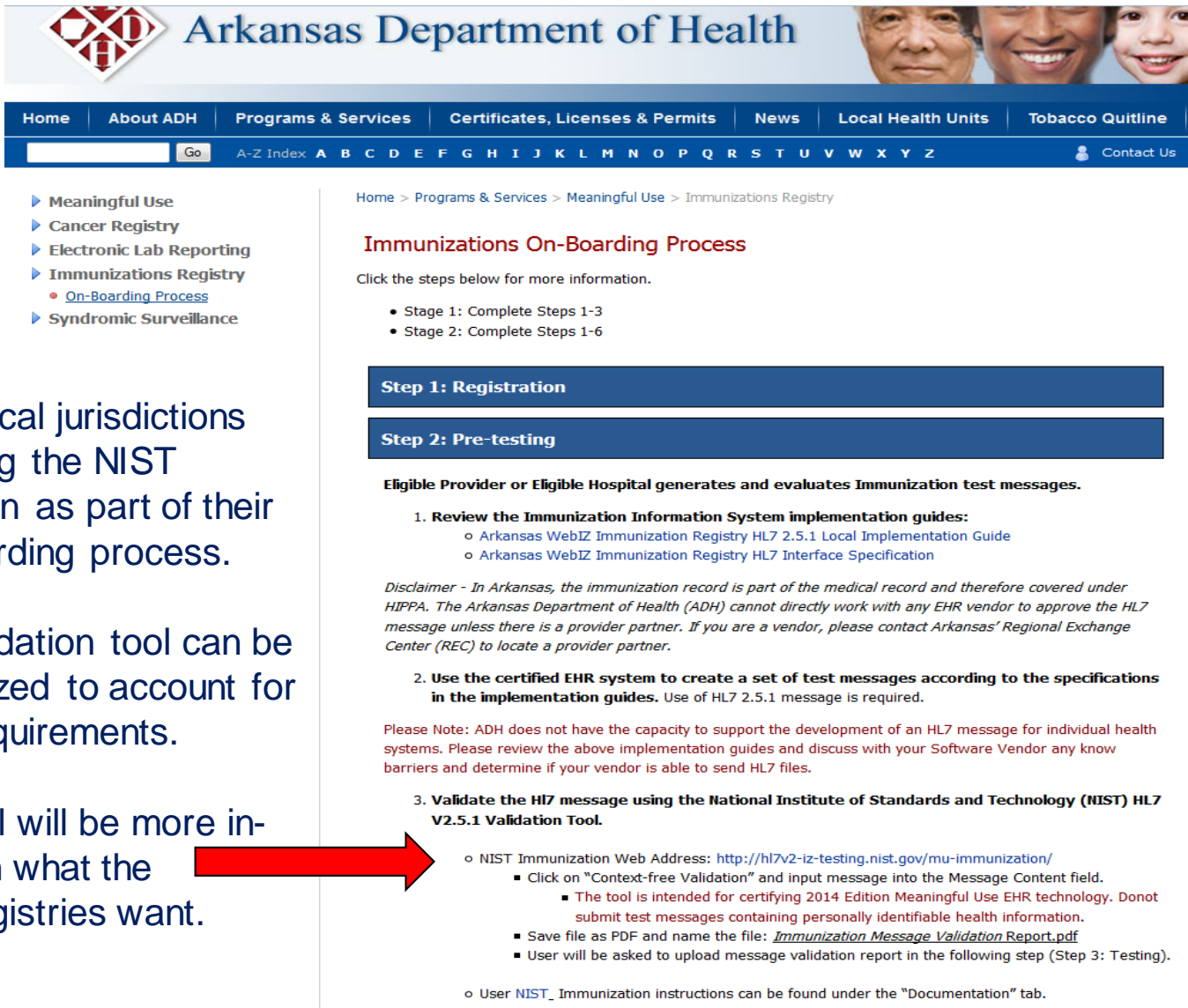
```

<!-- Some value in RXA-7 by EnglishDescription -->
- <Assertion>
  <Custom Id="2" className="gov.nist.healthcare.mu.iz.custom.RXA"/>
</Assertion>
</ConformanceStatement>
- <ConformanceStatement id="IZ-23" Profile="Base">
  <EnglishDescription>If RXA-20 is valued "CP" or "PA" and the first occurrence of RXA-9.1 (Administration Note code) is valued "00" then the message
  SHALL include an OBX segment associated with the RXA with OBX-3.1 shall equal "64994-7". This OBX will indicate the Patient Eligibility Category
  for Vaccine Funding Program.</EnglishDescription>
  - <Assertion>
    <Custom Id="1" className="gov.nist.healthcare.mu.iz.custom.RXA"/>
  </Assertion>
</ConformanceStatement>
- <Field Name="Give Sub-ID Counter" Usage="R" Min="1" Max="1" MinLength="1" MaxLength="4" Datatype="NM">
  - <ConformanceStatement id="IZ-28" Profile="Base">
    <EnglishDescription>RXA-1 ( Give Sub-id counter ) SHALL be valued "0" Note that "0" is zero.</EnglishDescription>
    - <Assertion>
      <PlainText value="0" location="."/>
    </Assertion>
  </ConformanceStatement>
</Field>
- <Field Name="Administration Sub-ID Counter" Usage="R" Min="1" Max="1" MinLength="1" MaxLength="4" Datatype="NM">
  - <ConformanceStatement id="IZ-29" Profile="Base">
    <EnglishDescription>RXA-2 (admin Sub-id) SHALL be valued "1"</EnglishDescription>
    - <Assertion>
      <PlainText value="1" location="."/>
    </Assertion>
  </ConformanceStatement>
</Field>
- <Field Name="Date/Time Start of Administration" Usage="R" Min="1" Max="1" MinLength="1" MaxLength="26" Datatype="TS_IZ">
  <Component Name="Time" Usage="R" MinLength="4" MaxLength="24" Datatype="DTM"/>
  <Component Name="Degree of Precision" Usage="X" MinLength="1" MaxLength="15" Datatype="ID"/>
</Field>
- <Field Name="Date/Time End of Administration" Usage="RE" Min="0" Max="1" MinLength="1" MaxLength="26" Datatype="TS_IZ">
  - <ConformanceStatement id="IZ-30" Profile="Base">
    <EnglishDescription>If RXA-4 (Date time of admin end ) is populated, then it SHALL be the same as Start time (RXA-3)</EnglishDescription>
  </ConformanceStatement>

```

FULL	MSH	PID	PD1	NK1	ORC	RXA	RXR	OBX	NTE			
Location						Usage	Cardinality	Data Type	Length	Table	Predicate	Conformance Statement
RXA.1 : Give Sub-ID Counter						R	[1,1]	NM	[1,4]			IZ-28:RXA-1 (Give Sub-id counter) SHALL be valued "0" Note that "0" is zero.
RXA.2 : Administration Sub-ID Counter						R	[1,1]	NM	[1,4]			IZ-29:RXA-2 (admin Sub-id) SHALL be valued "1"
RXA.3 : Date/Time Start of Administration						R	[1,1]	TS_IZ	[1,26]			
RXA.4 : Date/Time End of Administration						RE	[0,1]	TS_IZ	[1,26]			IZ-30:If RXA-4 (Date time of admin end) is populated, then it SHALL be the same as Start time (RXA-3)
RXA.5 : Administered Code						R	[1,1]	CE_IZ	[1,483]	CVX		
RXA.5.1 : Identifier						R	[1,1]	ST	[1,50]			
RXA.5.2 : Text						RE	[1,1]	ST	[1,999]			
RXA.5.3 : Name of Coding System						R	[1,1]	ID	[1,20]	0396		
RXA.5.4 : Alternate Identifier						RE	[1,1]	ST	[1,50]			
RXA.5.5 : Alternate Text						RE	[1,1]	ST	[1,999]			
RXA.5.6 : Name of Alternate Coding System						C(R/X)	[1,1]	ID	[1,20]	0396	If CE.4 (Alternate Identifier) is valued.	
RXA.6 : Administered Amount						R	[1,1]	NM	[1,20]			
RXA.7 : Administered Units						C(R/O)	[0,1]	CE_IZ	[1,483]	UCUM	If Administered Amount is not valued "999"	

Improve On-Boarding



The screenshot shows the Arkansas Department of Health website. The header includes the department's logo and name, along with a navigation bar with links to Home, About ADH, Programs & Services, Certificates, Licenses & Permits, News, Local Health Units, and Tobacco Quitline. A search bar and a contact link are also present. The main content area is titled 'Immunizations On-Boarding Process' and provides a step-by-step guide. A red arrow points from the third bullet point of the slide to the '3. Validate the HL7 message using the National Institute of Standards and Technology (NIST) HL7 V2.5.1 Validation Tool' section of the webpage.

Arkansas Department of Health

Home | About ADH | Programs & Services | Certificates, Licenses & Permits | News | Local Health Units | Tobacco Quitline

A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Contact Us

Meaningful Use
Cancer Registry
Electronic Lab Reporting
Immunizations Registry
 On-Boarding Process
Syndromic Surveillance

Home > Programs & Services > Meaningful Use > Immunizations Registry

Immunizations On-Boarding Process

Click the steps below for more information.

- Stage 1: Complete Steps 1-3
- Stage 2: Complete Steps 1-6

Step 1: Registration

Step 2: Pre-testing

Eligible Provider or Eligible Hospital generates and evaluates Immunization test messages.

- Review the Immunization Information System implementation guides:**
 - Arkansas WebIZ Immunization Registry HL7 2.5.1 Local Implementation Guide
 - Arkansas WebIZ Immunization Registry HL7 Interface Specification

Disclaimer - In Arkansas, the immunization record is part of the medical record and therefore covered under HIPPA. The Arkansas Department of Health (ADH) cannot directly work with any EHR vendor to approve the HL7 message unless there is a provider partner. If you are a vendor, please contact Arkansas' Regional Exchange Center (REC) to locate a provider partner.

- Use the certified EHR system to create a set of test messages according to the specifications in the implementation guides.** Use of HL7 2.5.1 message is required.

Please Note: ADH does not have the capacity to support the development of an HL7 message for individual health systems. Please review the above implementation guides and discuss with your Software Vendor any known barriers and determine if your vendor is able to send HL7 files.

- Validate the HL7 message using the National Institute of Standards and Technology (NIST) HL7 V2.5.1 Validation Tool.**
 - NIST Immunization Web Address: <http://hl7v2-iz-testing.nist.gov/mu-immunization/>
 - Click on "Context-free Validation" and input message into the Message Content field.
 - The tool is intended for certifying 2014 Edition Meaningful Use EHR technology. Do not submit test messages containing personally identifiable health information.
 - Save file as PDF and name the file: [Immunization Message Validation Report.pdf](#)
 - User will be asked to upload message validation report in the following step (Step 3: Testing).
 - User NIST_ Immunization instructions can be found under the "Documentation" tab.

Understanding Results From NIST MU HL7 V2 Test Tools

		National Level		State/Local Level		State/Local Level	
Usage Requirement of Element		RE	RE	R	R	R	R
Data Present in Element in Submitted		Yes	No	Yes	No	Yes	No
Test Tool Mode	Context-free	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Evaluated: No Error	Evaluated: Error
	Context-based (Test Data Provided)	Evaluated: No Error	Evaluated: Error	Evaluated: No Error	Evaluated: Error	Evaluated: No Error	Evaluated: Error
	Context-based (Test Data Not Provided)	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Evaluated: No Error	Evaluated: Error
NIST Test Tool Actual Results						User's Desired Results	

- NIST MU Certification Tools test to national level requirements (constrainable profiles)
- This testing specifically targets the capabilities of Vendor products
- When the tool is used at site-installations, users must recognize the implications of testing local requirements using a tool designed to test national level requirements
- The table above illustrates one example of results the tool will report when validating a message implemented to meet local requirements that differ from national level requirements; the tool will report results based on what it knows (per the national level conformance profile), not on what a local user wants it to know
- Site-based operators can provide a revised local level conformance profile to the validation engine to obtain validation results in accordance with local requirements. **OUR GOAL IN THIS WORKSHOP!**

Usage	Data Provided	Conformity Assessment
RE	Yes	Required
RE	No	Indifferent

Case Study

- California Immunization Registry (CAIR)
- 38 page guide documenting local requirements
- Local Profiling Process
 - Export base CDC VXU Profile template
 - Identify the differences
 - Use IGAMT-lite to document the differences
 - Address each the different type of constraints
 - Export Artifacts
 - Complete Profile, Segments, etc.
 - Various Formats (PDF, Word, XML)
- Load XML Profile into Validation Tool
 - Next part of presentation

Profiling: Message Definition Level

As Specified in CAIR

VXU Message Structure (Ignored segments not shown)

Segment	Cardinality	Description	Usage	Notes
MSH	[1..1]	Message Header	R	Every message begins with an MSH.
PID	[1..1]	Patient Identification	R	Every VXU requires one PID segment.
PD1	[1..1]	Patient Additional Demographics	R	Every PID segment must have one PD1 segment. Required for CAIR Disclosure information.
NK1	[0..*]	Next of Kin/Associated Parties	RE	PID segment in a VXU may have zero or more NK1 segments.
PV1	[0..1]	Patient Visit	RE	The PID segment in a VXU may have zero or one PV1 segments. CAIR requires if OBX segment is not sent.
ORC	[1..*]	Order Request	R	The order group in a VXU may have one or more ORC segments. ORC segments are required for each RXA segment.
RXA	[1..1]	Pharmacy/Treatment Administration	R	Each ORC segment in a VXU must have one RXA segment. Every RXA requires an ORC segment.
RXR	[0..1]	Pharmacy/Treatment Route	RE	Every RXA segment in a VXU may have zero or one RXR segment.
OBX	[0..*]	Observation/Result	RE	Every RXA segment in a VXU may have zero or more OBX segments.

IGAMT-lite: Use Usage and Cardinality constraint modifier to change “RE” to “R” and [0..1] to [1..1].

As Specified in IGAMT-lite

VXU Message Structure (optional segments not shown)

Segment	Cardinality	Usage	CAIR	Comment
MSH	[1..1]	R	R	Every message begins with an MSH.
PID	[1..1]	R	R	Every VXU has one PID segment.
[PD1]	[0..1] [1..1]	RE	R	Every PID segment in VXU may have one or less PD1 segment Every PID segment must have one PD1 segment. Required for CAIR disclosure information.
[[NK1]]	[0..*]	RE	RE	The PID segment in a VXU may have zero or more NK1 segments.
[[Begin Order group	[0..*]	RE	RE	Each VXU may have zero or more Order groups
ORC	[1..1]	R	R	The order group in a VXU must have one ORC segments.
RXA	[1..1]	R	R	Each ORC segment in a VXU must have one RXA segment. Every RXA requires an ORC segment.
[RXR]	[0..1]	RE	RE	Every RXA segment in a VXU may have zero or one RXR segments.
[[Begin Observation Group	[0..*]	RE	???	Every RXA segment in a VXU may have zero or more observation groups.
OBX	[1..1]	R	RE	Define as RE in CAIR and when combined with the group it is essentially an RE.
[NTE]	[0..1]	RE	???	Every OBX segment in a VXU may have zero or one NTE segment.
End Observation Group]]				
End Order Group]]				

Profiling: Segment Level

Master Field List – Comparison of National Standard to Local Specification


The Master Field List shows all of the fields that are expected to be populated in the VXU Message based on the HL7 v2.5.1 Implementation Guide: Immunization Messaging Release 1.5. Red text indicates Local Specification. Black italics are additional comments from Implementation Guide.

Red indicates differences in CAIR

Element	Element Name	Data Type	Usage	CAIR	Card	Len	Conditional Predicate	Value Set	Description/Comment	Differences in CAIR
	MSH-1	Field Separator	ST	R		[1..1]	1..1			
	MSH-2	Encoding Characters	ST	R		[1..1]	4..4			
Registry	MSH-3	Sending Application	HD	RE		[0..1]		HL70361	No suggested values defined. The values are locally defined by the IIS or by mutual agreement	Optional for Local
ID that is assigned by sending facility is supplied	MSH-4	Sending Facility	HD	RE	R	[0..1] [1..1]		HL70362 Constant for sender	No suggested values defined. The values are locally defined by the IIS or by mutual agreement	Populated with an ID from the Registry. Send by CAIR. Receiver could map to local value set.
Registry	MSH-5	Receiving Application	HD						No suggested values defined. The values are locally defined by the IIS or by mutual agreement	Ignored by Local

IGAMT-lite: Use Usage and Cardinality constraint modifier to change “RE” to “R” and [0..1] to [1..1].

Profiling: Creating Local Value Sets

Segment / Field	Data Element	Usage	HL7 Code Table	Comment
MSH-4	Sending Facility	R		Required in MSH segment. Sending facility ID supplied by CAIR.
MSH-6	Receiving Facility	R		This is used for the CAIR Region Code; See Appendix A for value.
MSH-7	Date/time of message	R		

APPENDIX A - CAIR Receiving Facility Codes for MSH-6

County	CAIR Regional Registry	HL7 Code (MSH-6)
ALAMEDA	BAY AREA	CAIRBA
BUTTE	NORCAL	CAIRNC
COLUSA	NORCAL	CAIRNC
CONTRA COSTA	BAY AREA	CAIRBA
DEL NORTE	NORCAL	CAIRNC
EL DORADO	GREATER SACRAMENTO	CAIRGS
FRESNO	CENTRAL VALLEY	CAIRCV

IGAMT-lite: Use the Value Set utility to create local value set and bind to MSH.6

Profiling: Constraining a Value Set

Acknowledgement type			
PID-3	Patient ID	R	This is the patient ID from the provider's system, commonly referred to as medical record number. CAIR only accepts type codes, 'MR', 'PI', or empty.
PID-5	Patient Name	R	Each name field has a 20 character length limit in CAIR

PID-3. Patient Identifier list

This is the patient ID from the provider's system, commonly referred to as the medical record number.

Warning: The sending system's patient id is a required field. The message will be rejected if this id is not sent or cannot be found in this field.

Position	Field Name	Status
1	id	required
2	check digit	ignored
3	code identifying the check digit scheme employed	ignored

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Version 2.4

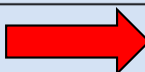
IGAMT-lite: Use the Value Set utility to clone, constrain, and bind to PID-3.5 (Patient Identifier-identifier type code).

4	assigning authority	required but may be empty
5	identifier type code	required, but may be empty
6	assigning facility	ignored

NOTE: CAIR only accepts identifier type codes **MR** (medical record number), **PI** (patient identifier), or empty string in PID-3.5

Note: PID-3.5 is a required element in the standard and in the CDC guide. IGAMT-lite will not allow for "weakening" of requirements. Therefore, a code to indicate "undetermined" should be added to the constrained value set.

Profiling: Length Elements (with Data Type Flavor)

Acknowledgement type				
PID-3	Patient ID	R		This is the patient ID from the provider's system, commonly referred to as medical record number. CAIR only accepts type codes, 'MR', 'PI', or empty.
PID-5	Patient Name	R		Each name field has a 20 character length limit in CAIR

PID-5	Patient Name	XPN XPN_CA	R	[1..*]				The first repetition shall contain the legal name. Multiple given names or initials are separated by spaces.	Each name field has limit of 20 characters in CAIR. Assuming this applies to first, middle, and last name.
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
XPN

Table 4-31 Extended

SEQ	COMPONENT NAME	Data Type	Usage	LEN	CAIR LEN
1	Family Name	FN	R		
2	Given Name	ST	R	30	20
3	Second and Further Given Names or Initials Thereof	ST	RE	30	20


FN

Table 4-12 Family Name

SEQ	COMPONENT NAME	Data Type	Usage	LEN	CAIR LEN	Value Set
1	Surname	ST	R	1..50	1..20	
2	Own Surname Prefix	ST	O			

IGAMT-lite: Create XPN and FN data type flavors and set the length limits accordingly. Bind FN flavor to XPN and then XPN flavor to PID-5 (Patient Name).

Profiling: Conformance Statements

PID-5	Patient's last name exceeds maximum length	Truncated at max length and inserted
PID-6, NK1-2	Mother's first name exceeds maximum length	Truncated at max length and inserted
PID-11	Invalid state code 	'CA' value inserted
RXA-5	Tdap given before age 7	Vaccine inserted

This is a somewhat fabricated, but is for demonstration purposes.

IGAMT-lite: Use the conformance statement utility to create a conformance statement.

CA-01: PID-11.4 (State or Province) SHALL be valued with the constant code "CA" drawn from US Postal Service State code system.

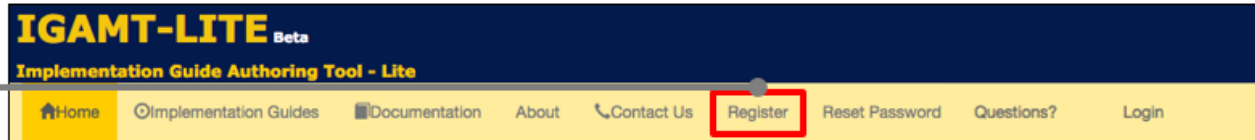
IGAMT-lite Walk-Through

- Slides for reference
- Some features have been updated since this slides were created

User Registration

1

From the IGAMT-lite 'Home' screen, click the 'Register' tab.



2

The Tester is prompted on the 'Create Account' unique account information.

Required account registration fields are indicated with an ''. Unless specifically noted, all fields without an '*' are optional.*

Create Account

Company Must be between 2 and 20 characters

First name

Last name

Username

Password

Confirm Password

Email

Create account

2a

IGAMT-lite provides the Tester with account registration field requirements in pop-out boxes.

2b

Once all fields are complete and meet field requirements, the Tester clicks 'Create Account'.

A prompt is sent to an IGAMT-lite administrator (NIST) and manual authorization occurs. The Tester receives an email notification when their account has been activated.

3

All Testers must 'Login' to IGAMT-lite with their credentials before initiating a testing session within the tool.

Tester loaded and created Implementation Guides are saved within tool user accounts.

Login

Please enter your username and password.

Username

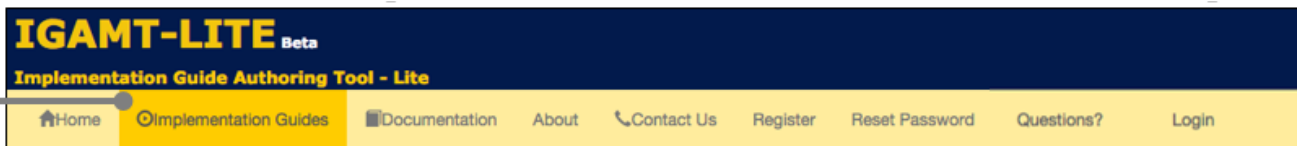
Password

Login Cancel

Creating an Implementation Guide

1

From the IGAMT-lite 'Home' screen, click the 'Implementation Guides' tab.



2

The Tester can import board level immunization Implementation Guides (e.g., National-level) and/or local jurisdiction requirement Implementation Guides (e.g., State-level) into the 'Predefined Implementation Guides' library table.

Identifier	Name	Organization Name	Topic	Status	
VXU_V04		NIST			Close

Identifier	Name	Organization Name	Topic	Status	
VXU_V04		NIST			Edit Close Diff Delete

2a

Click the 'Edit' button to access a custom Implementation Guide's metadata content and detailed data/component constraint modification options.

3

Select the 'Document' tab.



4

The Tester can input uniquely identifiable information for the custom Implementation Guide in the 'Implementation Guide MetaData' data fields.

Implementation Guide MetaData

IGAMT Project Identifier	Organization Name
IG_VXU_V04	NIST
IG Title	Version
Cloned VXU_V04	
IG Sub-Title	Date

4a

Clicking the 'Apply' button saves the changes and updates the 'Custom Implementation Guide' library table.

Creating an Implementation Guide

Implementation Guide MetaData

Conformance Profiles

Segments Definition

MSH - Message Header

SFT - Software Segment

PI0 - Patient Identification

PD1 - Patient Additional Demographic

NK1 - Next of Kin / Associated Parties

PV1 - Patient Visit

PV2 - Patient Visit - Additional Information

GT1 - Guarantor

IN1 - Insurance

IN2 - Insurance Additional Information

IN3 - Insurance Additional Information, Certification

ORC - Common Order

TQ1 - Timing/Quantity

TQ2 - Timing/Quantity Relationship

RXA - Pharmacy/Treatment Administration

ROR - Pharmacy/Treatment Route

OBR - Observation/Result

NTE - Notes and Comments

Datatypes Definition

ST - String Data

HD_IJ - Hierarchic Designator

TS_Z - Time Stamp

MSG_IJ_VXU - Message Type

PT_IJ - Processing Type

VID_IJ - Version Identifier

NM - Numeric

ID - String Data

CE - Coded Element

EI_IJ - Entity Identifier

XON_IJ - Extended Composite Name and Identifier

HD - Hierarchic Designator

ST_IJ - String Data

TX - Text Data

TS_IJ - Time Stamp

SI - Sequence ID

CK - Extended Composite ID with Check Digit

CK_IJ - Extended Composite ID with Check Digit

XPN_IJ - Extended Person Name

XPN_M - Extended Person Name

TS_NZ - Time Stamp

IS - String Data

XPN_IJ_DR - Extended Person Name

CE_IJ - Coded Element

XAD_IJ - Extended Address

Segment Definition

MSH - Message Header

Text1

SEQ	Field	Usage	Cardi	Length	Datatype	ValueSet	Conf Statement	Predicate	Comments
1	Field Separator	R	[1..1]	[1,1]	ST				
2	Encoding Characters	R	[1..1]	[4,4]	ST				
3	Sending Application	RE	[0..1]	[1,227]	HD_IJ	HL70361_IJ	If HD.2 (Universal ID) is not valued. If HD.1 (Namespace ID) is not valued. If HD.2 (Universal ID) is valued.	I2-5: The value of HD.2 (Universal ID) SHALL be formatted with ISO-compliant OID. I2-6: The value of HD.3 (Universal ID Type) SHALL be 'ISO'.	
4	Sending Facility	RE	[0..1]	[1,227]	HD_IJ	HL70362_IJ	If HD.2 (Universal ID) is not valued. If HD.1 (Namespace ID) is not valued. If HD.2 (Universal ID) is valued.	I2-5: The value of HD.2 (Universal ID) SHALL be formatted with ISO-compliant OID. I2-6: The value of HD.3 (Universal ID Type) SHALL be 'ISO'.	
5	Receiving Application	RE	[0..1]	[1,227]	HD_IJ	HL70361_IJ	If HD.2 (Universal ID) is not valued. If HD.1 (Namespace ID) is not valued. If HD.2 (Universal ID) is valued.	I2-5: The value of HD.2 (Universal ID) SHALL be formatted with ISO-compliant OID. I2-6: The value of HD.3 (Universal ID Type) SHALL be 'ISO'.	
6	Receiving Facility	RE	[0..1]	[1,227]	HD_IJ	HL70362_IJ	If HD.2 (Universal ID) is not valued. If HD.1 (Namespace ID) is not valued. If HD.2 (Universal ID) is valued.	I2-5: The value of HD.2 (Universal ID) SHALL be formatted with ISO-compliant OID. I2-6: The value of HD.3 (Universal ID Type) SHALL be 'ISO'.	
7	Date/Time Of Message	R	[1..1]	[1,26]	TS_Z				
8	Security	O	[0..1]	[1,40]	ST				
9	Message Type	R	[1..1]	[1,15]	MSG_IJ_VXU			I2-17: The value of MSG.1 (Message Code) SHALL be 'V04'. I2-17: The value of MSG.2 (Trigger Event) SHALL be 'V04'.	

5

From the 'Conformance Profiles' listed, selecting a 'Segment Definition' or 'Datatype Definition' displays the specific metadata for that element.

Data is not editable (e.g., read only) within the 'Documentation' tab of the custom Implementation Guide viewer window.

Creating a Conformance Profile

6

Select the 'Conformance Profiles' tab.

Document

Conformance Profiles

Segments


Datatypes

ValueSets

7

The 'Conformance Profile List' displays the library table of the available and crated Conformance Profiles. Clicking 'Edit' expands the MetaData and Content editable options.

Conformance Profile List

Identifier	Type	Event	Struct ID	Description	Comment
	VXU	V04	VXU_V04	Unsolicited vaccination record update	

Conformance Profile MetaData

Profile Identifier:

Profile Version:

Profile OID:

Profile Date:

IGAMT ID:

Comment:

Conformance Profile Content

Name	Usage	Cardinality	Predicate	Conformance Statement
V04*VXU_V04:Unsolicited vaccination record update	R	1..1		
1 MSH:Message Header	RE O C CE X B W	1..1		I2-12: The value of MSH.1 (Field Separator) SHALL be ' '. I2-13: The value of MSH.2 (Encoding Characters) SHALL be '^~&'. I2-15.2: The value of MSH.7.1 (Time) SHALL be formatted with YYYYMMDDHHMMSS+ZZZZ. I2-17: The value of MSH.9 (Message Type) SHALL be 'VXU/V04*VXU_V04'. I2-18: The value of MSH.12.1 (Version ID) SHALL be '2.5.1'. I2-42: The value of MSH.15 (Accept Acknowledgment Type) SHALL be 'ER'. I2-16: The value of MSH.16 (Application Acknowledgment Type) SHALL be 'AL'. I2-43: The value of MSH.21(1) (Message Profile Identifier) SHALL be 'ZZZ*CCPHNYS'.

8

For a selected 'Conformance Profile', the Tester can edit identifiable information for the custom Conformance Profile in the 'Conformance Profile MetaData' and 'Conformance Profile Content' fields. The available HL7 immunization conformant 'Usage' options are 'R', 'RE', 'C', 'CE', 'X', 'B', and 'W'. Invalid or incorrectly entered 'Cardinality' values are indicated in **RED**.

Profiling Fields

9

Select the 'Segments' tab.

Document Conformance Profiles **Segments** Datatypes ValueSets

10

Select the target HL7 message 'Segment' from the available options.

MSH SFT **PID** PD1 NK1 PV1 PV2 GT1 IN1 IN2 IN3 ORC TQ1 TQ2 RXA RXR OBX NTE

Segment Metadata

Name
PID

Description
Patient Identification

Label
PID_I2_1_5

Comment

Text1

Text2

Segment Content

Name	Usage	Cardinality	Length	Conf.Length	Datatype	ValueSet	Predicate	Conformance Statement	Comment
<div> <div>PID: Patient Identification</div> <div> <div>1: Set ID - PID</div> <div> <div>R</div> <div>0 1</div> <div>1 4</div> </div> </div> </div>	R	0 1	1 4		SI			The value of PID.1 (Set ID - PID) SHALL be '1'.	
2: Patient ID	X	0 0	1 20		CK				
3: Patient Identifier List	R	1 *	1 250		CK_I2				
4: Alternate Patient ID - PID	X	0 0	1 20		CK				
5: Patient Name	R	1 *	1 250		XP_N_I2			The value of PID.13(1,2) (Telecommunication Use Code) SHALL be 'PRN'.	
6: Mother's Maiden Name	RE	0 1	1 250		XP_N_M				
7: Date/Time of Birth	R	1 1	1 26		TS_NZ				

11

For a selected HL7 message 'Segment', the Tester can edit identifiable information in the 'Segment MetaData' and 'Segment Content' fields. The available HL7 immunization conformant 'Usage' options are 'R', 'RE', 'C', 'CE', 'X', 'B', and 'W'. Invalid or incorrectly entered 'Cardinality' values are indicated in RED. 'Datatype' elements are constrained by the Conformance Profile.

Profiling: Predicates and Conformance Statements

Segment Content

Name	Usage	Cardinality	Length	ConLength	Datatype	ValueSet	Predicate	Conformance Statement	Comment
1:PID: Patient Identification	R	1	1	4	ST	1	1		
2:Patient ID	R	1	1	20	CK	1	1		
3:Patient Identifier List	R	1	1	250	CK_UZ	1	1		
4:Alternate Patient ID - PID	R	1	1	20	CK	1	1		
5:Patient Name	R	1	1	250	PN_UZ	1	1		
6:Mother's Maiden Name	R	1	1	250	PN_M	1	1		
7:Date/Time of Birth	R	1	1	26	TS_MZ	1	1		

12

The Tester can modify the 'Predicate' and 'Conformance Statement' elements for a selected message 'Segment'.

Edit ConformanceStatement

ConformanceStatements of PID.1

ID	Description	Action
IQ-46	The value of PID.1 (Set ID - PID) SHALL be '1'.	
Test ID	PID.23 SHALL be presented	

Define New Conformance Statement of PID.1

ID: Test ID

PID.23 SHALL be presented

SHALL be presented

SHALL NOT be is not

presented a literal value one of list values a code of Value Set formatted value identical to the another no-f

Edit Predicate

Predicate of PID.1

Description	True Usage	False Usage	Action
-------------	------------	-------------	--------

Define New Predicate of PID.1

If PID.23 is 1, then TrueUsage of PID.1 is 1, else FalseUsage of PID.1 is 1

Update Predicate

Profiling: Data Types

13

Select the 'Datatypes' tab.

14

The 'Datatypes List' displays the library table of 'Datatypes' organized by 'Flavor', 'Base', and 'Description'.

These represent the datatypes available for the Conformance Profile and custom Implementation Guide.



Flavor	Base	Description	
ST	ST	String Data	Flavor Edit Delete
HD_IJZ	HD	Hierarchic Designator	Flavor Edit Delete
IS	IS	String Data	Flavor Edit Delete
ID	ID	String Data	Flavor Edit Delete
TS_Z	TS	Time Stamp	Flavor Edit Delete
DTM	DTM	Date/Time	Flavor Edit Delete
MSG_IJZ_VXU	MSG	Message Type	Flavor Edit Delete
PT_IJZ	PT	Processing Type	Flavor Edit Delete
VID_IJZ	VID	Version Identifier	Flavor Edit Delete
CE	CE	Coded Element	Flavor Edit Delete
NM	NM	Numeric	Flavor Edit Delete
FL_IJZ	FL	Entity Identifier	Flavor Edit Delete

15

To modify a target 'Datatype' from the library list, click the 'Edit' button.

Profiling: Data Types

Datatype Metadata

Name

HD

Label

HD_I2_7536563

Comment

Text

Datatype Content

Name	Usage	Length	ConfLength	Datatype	ValueSet	Predicate	Conformance Statement	Comment
▼ HD Hierarchic Designator	-	-	-	-	-	IZ-5 : The value of HD.2 (Universal ID) SHALL be formatted with ISO-compliant OID. IZ-6 : The value of HD.3 (Universal ID Type) SHALL be 'ISO'.	-	
● 1:Namespace ID	C	1 20		IS	HL70003_I2			
● 2:Universal ID	C	1 199		ST	+			
● 3:Universal ID Type	C	1 6		ID	HL70001_I2			

✓ R

RE

O

C

CE

X

B

W

✓ LX

CY

?

Change Table

Release Table

Details

16

For a selected 'Datatype', the Tester can edit identifiable information in the 'Datatype Metadata' and 'Datatype Content' fields. The available HL7 immunization conformant 'Usage' options are 'R', 'RE', 'C', 'CE', 'X', 'B', and 'W'. Invalid or incorrectly entered 'Cardinality' values are indicated in RED. 'Datatype' and 'ValueSet' elements are constrained by the Conformance Profile.

Profiling: Value Sets

17

Select the **'ValueSets'** tab.

Document Conformance Profiles Segments Datatypes ValueSets

Implementation Guide: IG_VXU_V04

Document Conformance Profiles Segments Datatypes ValueSets

Tables List

ID	Name	Version	CodeSys	OID	Type	Stability	Extensibility
<input type="radio"/> HL70361_I2		1.5			HL7	Static	
<input checked="" type="radio"/> HL70363_I2		1.5			HL7	Static	
<input type="radio"/> HL70301_I2		1.5			HL7	Static	
<input type="radio"/> HL70362_I2		1.5			HL7	Static	
<input type="radio"/> 0029					HL7	Static	
<input type="radio"/> HL70076_I2		1.5			HL7	Static	
<input type="radio"/> HL70003_I2		1.5			HL7	Static	
<input type="radio"/> HL70354_I2		1.5			HL7	Static	
<input type="radio"/> HL70103_I2		1.5			HL7	Static	
<input type="radio"/> 0207					HL7	Static	
<input type="radio"/> 0399					HL7	Static	
<input type="radio"/> 0396					HL7	Static	

18

The **'ValueSet'** tab displays all the available and created **'ValueSet Table Lists'** for use by the Tester for the constrainable Conformance Profile and custom Implementation Guide.

Metadata of HL70363_I2

Mapping Identifier	HL70363_I2	Name	
Version	1.5	CodeSys	
OID		Type	HL7
Stability	Static	Extensibility	

List of Codes of HL70363_I2

Code	Label	CodeSys	Source	Usage	Action
AKA	ALASKA		Local	S R	<input type="button" value="Delete"/>
ALA	ALABAMA		Local	S R	<input type="button" value="Delete"/>
ARA	ARKANSAS		Local	S R	<input type="button" value="Delete"/>
ADA	AMERICAN SAMOA		Local	S R	<input type="button" value="Delete"/>
AZA	ARIZONA		Local	S R	<input type="button" value="Delete"/>

18a

For a selected **'ValueSet Table List'** element, the Tester can edit identifiable information in the **'Value MetaData'** and **'List of Codes'** fields. The available HL7 immunization conformant **'Usage'** options are 'R', 'RE', 'C', 'CE', 'X', 'B', and 'W'.

1

Predefined Implementation Guides					
Identifier	Name	Organization Name	Topic	Status	
	VOLU_V04	NIST			+ Add - Remove + Clone

Custom Implementation Guides					
Identifier	Name	Organization Name	Topic	Status	
	VOLU_V04	NIST			+ Add - Remove + Clone + Edit + Delete

1a

2

Document Conformance Profiles Segments Datatypes ValueSets

3

Apply

Export

Close

Delete

Implementation Guide MetaData

IGAMT Project Identifier	Organization Name
IG_V06U_V04	NIST
IG Title	Version
Cloned V06U_V04	
IG Sub-Title	Date

HEALTH IT STANDARDS TESTING INFRASTRUCTURE

HEALTH IT STANDARDS TESTING INFRASTRUCTURE

Tutorial

Part 1: Using NIST IGAMT-lite

Part 2: Context-free Validation

Robert Savage

Centers for Disease Control (CDC)

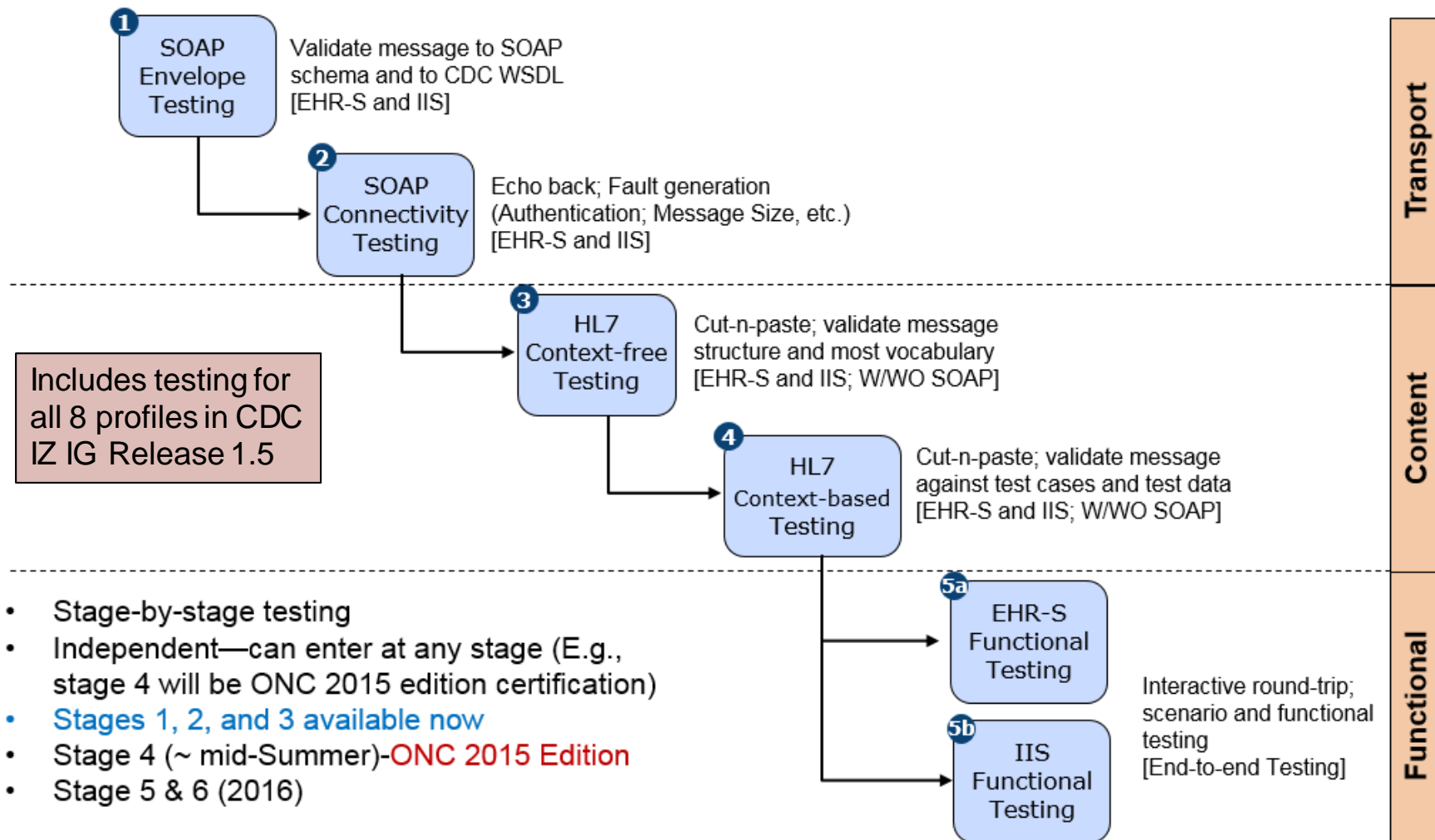
Robert Snelick

National Institute of Standards and Technology (NIST)

April 21st, 2015

Contact: robert.snelick@nist.gov

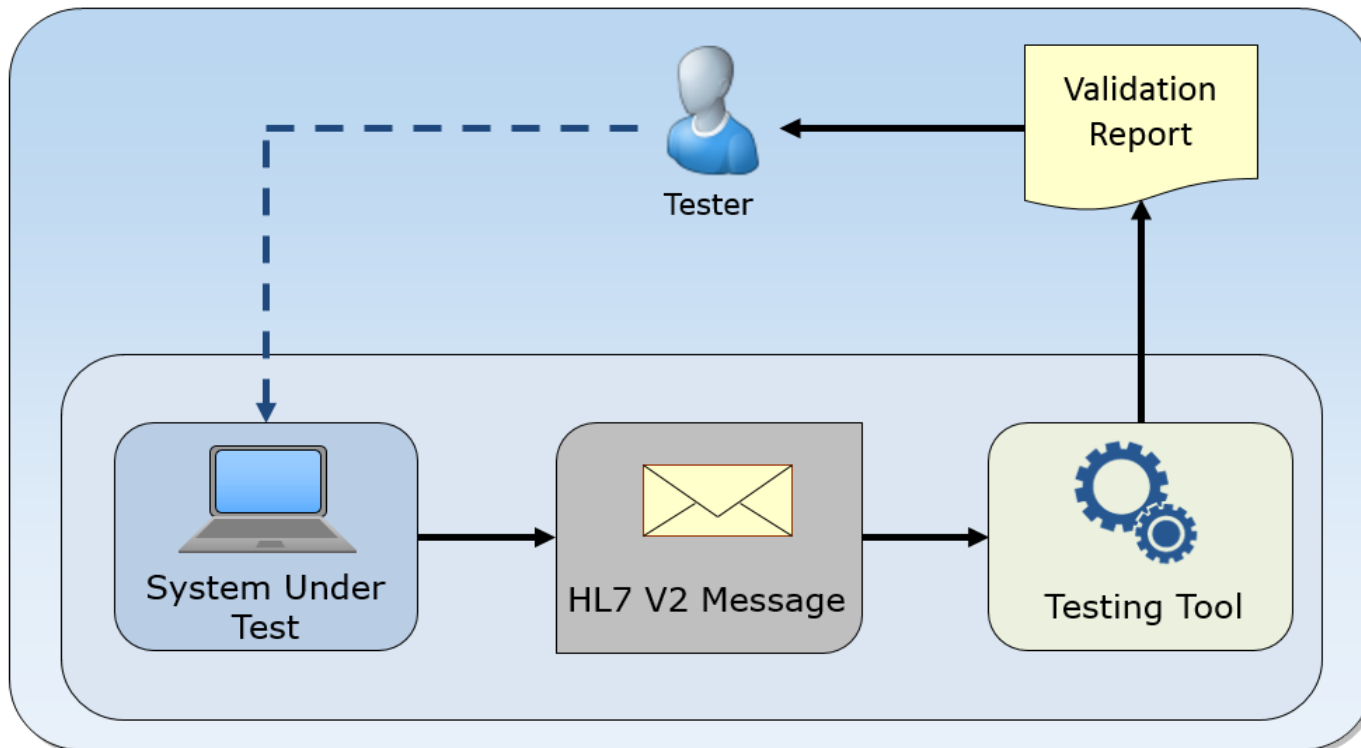
Immunization Test Suite



- Stage-by-stage testing
- Independent—can enter at any stage (E.g., stage 4 will be ONC 2015 edition certification)
- **Stages 1, 2, and 3 available now**
- Stage 4 (~ mid-Summer)-**ONC 2015 Edition**
- Stage 5 & 6 (2016)

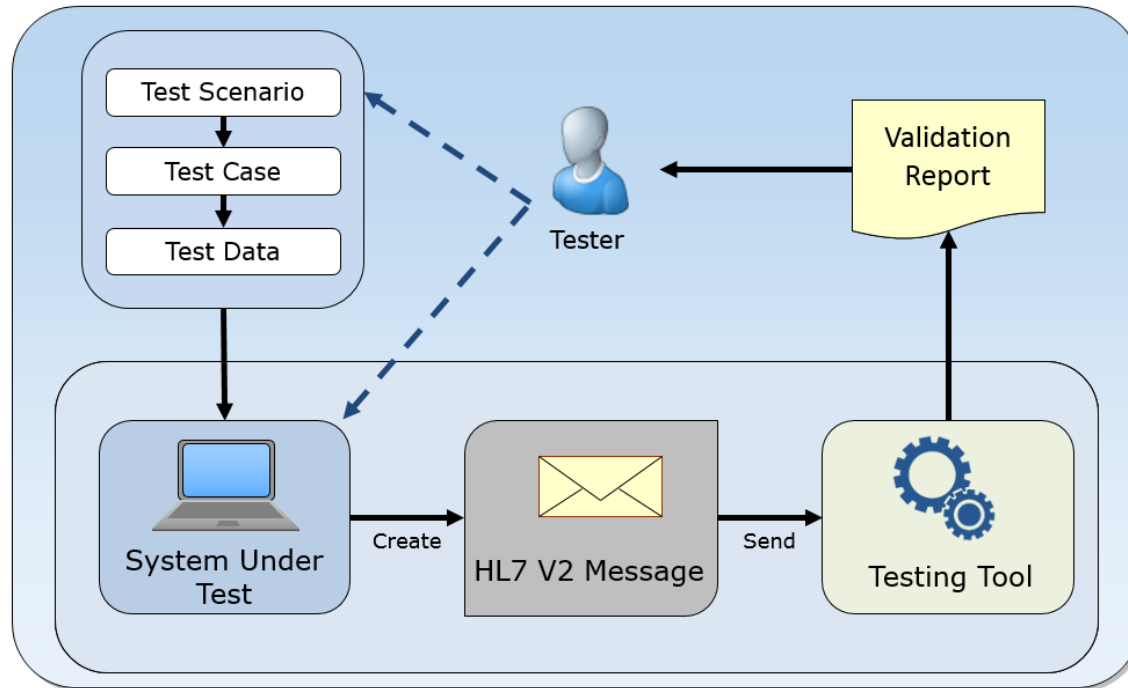
AIRA, CDC, and NIST Collaboration

Context-Free Testing



- No Test Cases provided
- Context (Test Scenario, etc.) is unknown to validation tool
- May be used to test any message created by an EHR
- Provides a simple and convenient method for testing message *structure* and most *vocabulary*

Context-based Testing



- Context (specific scenario, data, etc.) is known to validation tool
 - The EHR creates a message that corresponds to the test data provided
 - Testing will include the technical requirements and content-specific requirements specified in the test case
- Used for ONC EHR technology certification testing
- Expands the scope of testing (e.g., support for RE elements)

IZ-tool Context-free Testing Walk-Through

Purpose: The main objective of the tool is to establish a powerful and interactive environment in which a Tester can perform validation on created SOAP messages, HL7 Version 2.5.1 data, and Center for Disease Control's (CDC) Web Service Description Language (WSDL) specifications.

Key Capabilities of the Tool

HL7 Context-free Testing	A simple and convenient Test Case independent environment in which any HL7 message created by an EHR can be tested against adherence to structure and vocabulary within requirement based conformance profiles.
Conformance Profiles	A versatile testing capability leverages standards defined within the CDC HL7 Version 2.5.1 Implementation Guide for Immunization Messaging (Release 1.5 10/1/2014) to analyze HL7 message data being transmitted between an Immunization Information Systems (ISS) and a Electronic Health Record system (EHR-S).
Message Validation Engine	A Test Case independent environment in which an EHR-S or IIS created HL7 message can be loaded into a test environment, interactively viewed and modified in real-time, and validated against a selected Conformance Profile.
Validation Testing Report	Delivers a detailed report based on HL7 message segment validations against a selected Conformance Profile. Notifications are received for validation successes (i.e., Affirmatives), failures (i.e., Errors), and general notices (i.e., Warnings, Alerts, and Informational).

Current Build:

- **Version:** Beta v0.1
- **Environment:** The IZ ISS Test Suite is currently only accessible as a web application. The recommended method of access is using Chrome (latest stable build), Firefox (latest stable build), and Internet Explorer Version 9 web browsers.
- **URL:** <http://hl7v2-iz-r1.5-testing.nist.gov/>

Tool Access and Navigation

Objectives

- Establish access to the IZ ISS Test Suite tool (web application).
- Locate the Navigation Bar.
- Locate relevant documentation.
- Locate the Test Suite.

Informative Reference

- The IZ ISS Test Suite is accessible through the following URL:
<http://hl7v2-iz-r1.5-testing.nist.gov/>.
- This displays the IZ ISS Test Suite's Welcome Screen, which is indicated by the 'Home' tab.
- The 'Testing' tab contains the Test Suite tools and validation engine.
- The 'Documentation' tab contains relevant downloadable User, Documentation, Resources/Artifacts, and Notations.

1

The tool's Navigation Bar is located along the top. The options are 'Home', 'Testing', 'Documentation', 'About', and 'Contact Us'.

The Welcome Screen is located under the 'Home' tab.

NIST-CDC Immunization Test Suite Beta

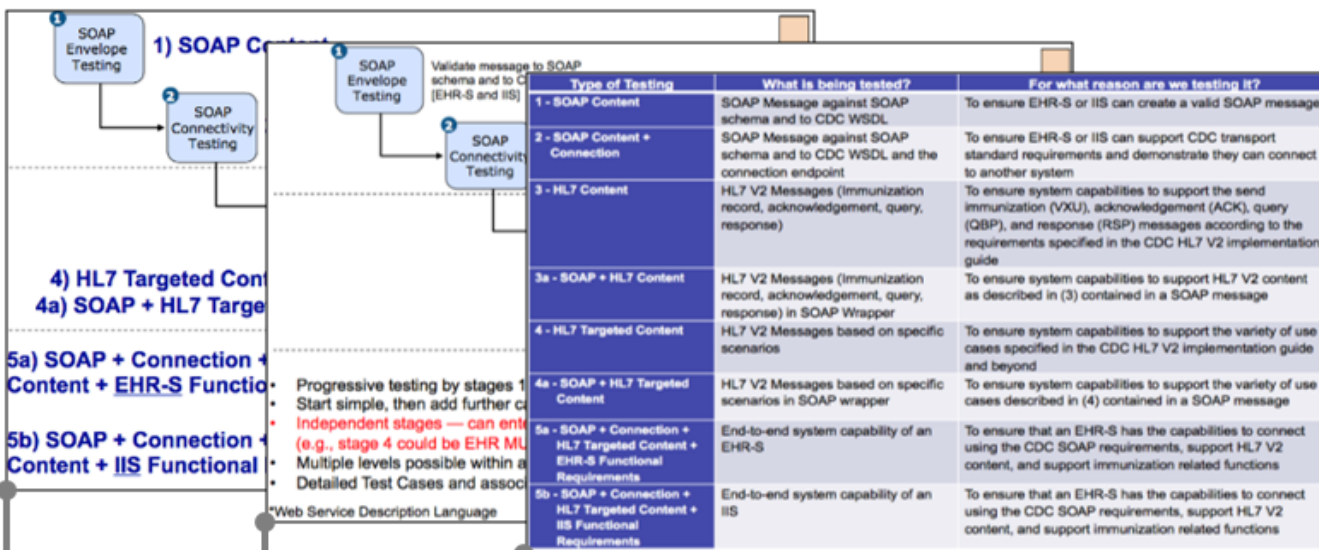
HL7 v2.5.1 Validation Tool

Home Testing Documentation About Contact Us

2

Scrolling down the Welcome Screen gives other useful information, such as the IZ ISS Test Suite:

- Components;
- Focus of Each Testing Stage;
- Testing Stage Benefits; and
- Testing Types.



Conformance Profile Selection

Objectives

- Locate the **'Testing'** tab on the Navigation Bar.
- Locate the **'HL7 Context-free'** tab.
- Locate the IZ ISS Test Suite's available **'Conformance Profiles'**.
- Access additional information on standard / implementation guide documentation and profile linkages.

Informative Reference

- The **'Testing'** tab contains the target HL7 Context-free testing elements and associated HL7 message validation engine.
- The **'Conformance Profiles'** are derived from the *CDC HL7 Version 2.5.1 Implementation Guide for Immunization Messaging (current release)* document.

NIST-CDC Immunization Test Suite Beta
HL7 v2.5.1 Validation Tool

3 Select **'Testing'** from the Navigation Bar.

4 Select the **'HL7 Context-free'** tab.

5 Select a **'Conformance Profile'** to test an HL7 message against.

6 The **'Validation'** tab is already preselected by the tool. The Tester should not need to reselect.

6a Selecting the **'i'** information button expands a detailed reference compendium for the Conformance Profiles.

Refer to *CDC HL7 Version 2.5.1 Implementation Guide for Immunization Messaging (current release)* for further detailed information

Navigation Bar: Home, Testing, Documentation, About, Contact Us

Context Tabs: 1 SOAP Envelope, 2 SOAP Connectivity, 3 HL7 Context-free, 4 HL7 Context-based, 5 EHR-S Functional, 6 IIS Functional

Conformance Profiles: VXU-Z22, ACK-Z23, QBP-Z34, QBP-Z44, RSP-Z31, RSP-Z32, RSP-Z33, RSP-Z42, i

Validation Bar: Validation, Report, Profile Viewer, Vocabulary

Profile Information Panel:

Standard
CDC HL7 Version 2.5.1 Implementation Guide for Immunization Messaging
Release 1.0 (10/01/2014)

Profiles

- Z220R01: SEND IMMUNIZATION
- Z22ACK: ACKNOWLEDGEMENT
- Z24G0P1: QUERY: COMPLETE IMMUNIZATION HISTORY QUERY
- Z24G0P2: QUERY: EVALUATED IMMUNIZATION HISTORY AND FORECAST
- Z24R0P1: RESPONSE: LIST OF CANDIDATES PROFILE
- Z24R0P2: RESPONSE: COMPLETE IMMUNIZATION HISTORY
- Z24R0P3: RESPONSE: ACKNOWLEDGEMENT WITH NO PERSON RECORDS
- Z24R0P4: RESPONSE: EVALUATED HISTORY AND FORECAST

Pairs:

- Z22 Z23: Send Immunization/ACK
- Z24 Z31: Query History/Response Candidates
- Z24 Z32: Query History/Response History
- Z24 Z33: Query History/Response Person Not Found
- Z24 Z42: Query History & Forecast/Response History & Forecast
- Z24 Z33: Query History & Forecast/Response Person Not Found

Load HL7 Message

Objectives

- Locate the '**Testing**' tab on the Navigation Bar.
- Locate the '**HL7 Context-free**' tab.
- Locate and select a profile from the IZ ISS Test Suite's available '**Conformance Profiles**'.
- Load an HL7 message into the IZ ISS Test Suite (either from local storage or by example).

Informative Reference

- An HL7 message can be loaded directly into the tool's '**Message Content**' field by copy/paste, direct from local file, or by default (preloaded and built-in) example.
- Clicking the '**Validate**' button performs instant message validation. The Tester can also elect to set an automatic message validation refresh frequency (Disable or 1 to 8 second delay).

7

With a Conformance Profile selected, an HL7 message can be loaded into the '**Message Content**' field by:

- Clicking the '**Browse**' button to load an existing HL7 message from the Tester's local machine; or
- Clicking the '**Load Example**' button to populate the a sample HL7 message based upon the Conformance Profile selection.

The validation frequency can be manipulated from '**1 to 8 seconds**'. Clicking the '**Validate**' button manually performs message validation against the selected Conformance Profile.

Selecting '**Download**' saves the viewable HL7 message in a .TXT formatted file on the Tester's local machine.

Selecting '**Clear**' clears all HL7 related message data from the Message Content field.

Message Content

4 second(s) -

Validate

Load Example

Browse

Download

Clear

```
MSH|^~&|Test EHR Application|X68|NIST Test Iz Reg|20120701082240-0500||VXU^V04^VXU V04|NIST-IZ-001.00|P|2.5.1|||ER|AL|||Z22^C
PID|1|D26376273^NIST MPI^MR||Snow^Madelynn^Ainsley^L|Lam^Morgan^M|20070706|F|2076-8^Native Hawaiian or Other Pacific I
PD1|1|02^Reminder/Recall - any method^HL70215|||A|20120701|20120701
NK1|1|Lam^Morgan^M|MT^Mother^HL70063|32 Prescott Street Ave^Warwick^MA^02452^USA^L|^PRN^PH^657^5558563
ORC|RE|IZ-783274^NDA|||I-23432^Burden^Donna^A^NIST-AA-1|57422^RADON^NICHOLAS^NIST-AA-1^L
RXA|0|120120814|140^Influenza, seasonal, injectable, preservative free^CVX|0.5|ml^Milliliter [SI Volume Units]^UCUM||00^New imm
RXR|C28161^Intramuscular^NCIT|LD^Left Arm^HL70163
OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V05^VFC eligible - Federally Qualified Health Center Patient (
OBX|2|CE|30956-7^vaccine type^LN|2|88^Influenza, unspecified formulation^CVX||F
OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20120702||F
OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20120814||F
```

8

When an HL7 message is loaded into the Message Content field, the '**Message Tree**' is automatically populated with the relevant HL7 message instance segments. Clicking the '+' and '-' arrows expand and contract the segments. Selecting an individual item shows its exact path with the Message Content field and viewable HL7 message (highlighted in yellow).

Message Tree

```
MSH(1)Message Header R(1,1)
  MSH(1)1(1)Field Separator R(1,1)
  \
  MSH(1)2(1)Encoding Characters R(1,1)
  \
  MSH(1)3(1)Sending Application R(1,1)
  MSH(1)4(1)Sending Facility R(1,1)
  MSH(1)6(1)Receiving Facility R(1,1)
  MSH(1)7(1)Date/Time Of Message R(1,1)
  MSH(1)9(1)Message Type R(1,1)
  MSH(1)10(1)Message Control ID R(1,1)
  MSH(1)11(1)Processing ID R(1,1)
  MSH(1)12(1)Version ID R(1,1)
  MSH(1)15(1)Accept Acknowledgment Type R(1,1)
  MSH(1)16(1)Application Acknowledgment Type R(1,1)
  MSH(1)21(1)Message Profile Identifier R(1,1)
  PID(1)Patient Identification R(1,1)
  PD1(1)Patient Additional Demographic R(1,1)
  NK1(1)Next of Kin / Associated Parties R(1,1)
  ORC(1)Common Order R(1,1)
  RXA(1)Pharmacy/Treatment Administration R(1,1)
  RXR(1)Pharmacy/Treatment Route R(1,1)
  OBX(1)Observation/Result R(1,1)
  OBX(1)Observation/Result R(1,1)
  OBX(1)Observation/Result R(1,1)
  OBX(1)Observation/Result R(1,1)
```

HL7 Message Validation

Objectives

- Locate the '**Testing**' tab on the Navigation Bar.
- Locate the '**HL7 Context-free**' tab.
- Locate and select a profile from the IZ ISS Test Suite's available '**Conformance Profiles**'.
- Load and validate an HL7 message within the IZ ISS Test Suite.

Informative Reference

- Performing HL7 message validation generates notifications for the Tester about the test and validation successes/failures. These are indicated as '**Errors**', '**Warnings**', '**Alerts**', '**Informational**', and '**Affirmatives**'.

9

The HL7 message validation results are displayed within the '**Message Validation Result**' field.

Various testing notifications are generated for the Tester. The types of notifications are:

- '**Errors**' – HL7 message elements that failed validation testing.
- '**Warnings**', '**Alerts**', and '**Information**' – HL7 message element information that may be useful for a Tester for profile conformance, but does not indicate a test fail nor non-profile conformant HL7 message element.
- '**Affirmatives**' – Lists HL7 message validation successes and condition predicate satisfactions.

The exact HL7 message '**Line**' and '**Column**' location where the notification was discovered is displayed, as well as '**Description**' for why the notification was flagged. Clicking the '**Path**' highlights in the Message Tree and Message Content fields the HL7 message notification data element. Clicking '**Details**' displays a popup with additional constraint/code metadata.

Clicking the '**Report**' button presents the Tester with a consumable Message Validation Report that captures the totality of HL7 Context-free validation for the given HL7 message under test.

Message Validation Result						Report
<div> <div>19 Errors</div> <div>0 Warnings</div> <div>0 Alerts</div> <div>15 Informational</div> <div>154 Affirmatives</div> </div>						
<div> <div>154 All</div> <div>69 Success</div> <div>85 Predicate</div> </div>						
Path	Description	Line	Column	Details		
MSH[1]	IZ-12 - The value of MSH.1 (Field Separator) SHALL be ' '.	1	1	Details		
MSH[1]	IZ-13 - The value of MSH.2 (Encoding Characters) SHALL be '^~\&'.	1	1	Details		
MSH[1]	IZ-TS_Z - The value of MSH.7.1 (Time) SHALL be formatted with YYYYMMDDHHMMSS+ZZZZ.	1	1	Details		
MSH[1]	IZ-17 - The value of MSH.9 (Message Type) SHALL be 'VXU^V04^VXU_V04'.	1	1	Details		
MSH[1]	IZ-15 - The value of MSH.12.1 (Version ID) SHALL be '2.5.1'.	1	1	Details		
MSH[1]	IZ-42 - The value of MSH.15 (Accept Acknowledgment Type) SHALL be 'ER'.	1	1	Details		
MSH[1]	IZ-16 - The value of MSH.16 (Application Acknowledgment Type) SHALL be 'AL'.	1	1	Details		
MSH[1]	IZ-43 - The value of MSH.21[1] (Message Profile Identifier) SHALL be 'Z22^CDCPHINVS'.	1	1	Details		
MSH[1].3[1]	IZ-5 - The value of HD.2 (Universal ID) SHALL be formatted with ISO-compliant OID.	1	10	Details		
MSH[1].3[1]	IZ-6 - The value of HD.3 (Universal ID Type) SHALL be 'ISO'.	1	10	Details		
MSH[1].4[1]	IZ-5 - The value of HD.2 (Universal ID) SHALL be formatted with ISO-compliant OID.	1	31	Details		

HL7 Message Validation Report

Objectives

- Locate the '**Testing**' tab on the Navigation Bar.
- Locate the '**HL7 Context-free**' tab.
- Locate and select a profile from the IZ ISS Test Suite's available '**Conformance Profiles**'.
- Load and validate an HL7 message within the IZ ISS Test Suite.
- Generate and review the '**Message Validation Report**'.

Informative Reference

- The '**Message Validation Report**' gives a Tester the complete narrative for a single validation test. Multiple tests cannot be combined together within the report.

10

Select the '**Report**' tab.

Validation **Report** Profile Viewer Vocabulary

11

The '**Message Validation Report**' presents the complete results of HL7 message validation testing in an easily consumable format.

Meta such as validation testing type, tool used, and profile used to validate against are included in the report.

A detailed summary of '**Errors**' (i.e., validation fails), '**Alerts**', '**Warnings**', '**Information**' elements, and '**Affirmatives**' (i.e., validation successes and condition predicate satisfactions) are also presented in the report.

*The '**Message Validation Report**' for a HL7 message validation test can also be viewed by clicking the '**Report**' button within the '**Message Validation Result**' field (see Step 9).

Message Validation Report			Date: 1427893529001
Validation Type		Context-free	
Testing Tool	Name Version	NIST-CDC Immunization Test Suite - HL7 V2.5.1 Validation Tool	
Profile	Name Organization Type Profile Version Profile Date Standard	Profile Name NIST See Profile MetaData Slide HL7 Version 2.5.1 Implementation Guide For Immunization Messaging Rel. 1.5 (10/01/2014) Immunization Clarification Addendum (Date)	
Message	Encoding	ER7	
Summary			
Errors			
Alerts		0	
Warnings		0	
Informational		15	
Affirmatives		154	
Validation Errors			
Coded Element			
1	Type:	CodeNotFound	
	Description:	Code Not Found: The value 'HL70064' at location OBX.5.3 (Name of Coding System) is not member of the value set 'HL70396_I2'.	
	Location:	Line: 8	
		Column: 145	
		Path: OBX[1].5[1].3[1]	
2	Type:	CodeNotFound	
	Description:	Code Not Found: The value 'HL70163' at location RXR.2.3 (Name of Coding System) is not member of the value set 'HL70396_I2'.	
	Location:	Line: 7	
		Column: 43	
		Path: RXR[1].2[1].3[1]	

Conformance Profile Data Elements

Objectives

- Locate the **'Testing'** tab on the Navigation Bar.
- Locate the **'HL7 Context-free'** tab.
- Locate and select a profile from the IZ ISS Test Suite's available **'Conformance Profiles'**.
- Load and validate an HL7 message within the IZ ISS Test Suite.
- Generate and review the **'Message Validation Report'**.
- Review HL7 message data type and element requirements.

Informative Reference

- The **'Profile Viewer'** gives a Tester the complete standard / implementation guide metadata components that is needed to perform supplemental message validation, error remediation, and troubleshooting.

12

Select the **'Profile Viewer'** tab.



13

This display presents an interactive interface in which to view data elements and table values for a selected Conformance Profile. The **'Message Structure'** tab displays all data segments for a selected Conformance Profile. Each segment can be filtered by selecting the corresponding tab. Data types are organized based on message **'Group'**, **'Segment'**, **'Field'**, **'Component'**, and **'Subcomponent'**.

Data elements may be filtered according to Usage by selecting either:

- **'R, RE, C (only)'** – Required, Required but may be empty, and Conditional; or
- **'R, RE, C, O, X (All)'** – Required, Required but may be empty, Conditional, Optional, and Not supported.

'Cardinality', **'Data Type'**, **'Length'** (minimum/maximum valid data element length), **'Value Set'**, **'Condition Predicate'**, and **'Conformance Statement'** fields are also represented for each data element.

R,RE,C (only) R,RE,C,O,X (All) Test Verbose Group Segment Field Component Subcomponent																			
Message Structure		MSH	SFT	PID	PD1	NK1	PV1	PV2	GT1	IN1	IN2	IN3	ORC	TQ1	TQ2	RXA	RXR	OBX	NTE
Name						Usage	Cardinality	Datatype	Length	Value Set		Predicate		Conformance Statement					
● NK1.1 Set ID - NK1						R	[1, 1]	SI	[1,4]										
▼ ● NK1.2 Name						R	[1, *]	XPN_I2	[1,250]					IZ-XX : The value of NK1.2[1] 7 (Name Type Code) SHALL be 'L'					
▼ ● NK1.2.1 Family Name						R		FN	[1,194]										
● NK1.2.1.1 Surname						R		ST	[1,50]										
● NK1.2.1.2 Own Surname Prefix						O		ST	[1,20]										
● NK1.2.1.3 Own Surname						O		ST	[1,50]										
● NK1.2.1.4 Surname Prefix From Partner/Spouse						O		ST	[1,20]										
● NK1.2.1.5 Surname From Partner/Spouse						O		ST	[1,50]										
● NK1.2.2 Given Name						C		ST	[1,30]										
● NK1.2.3 Second and Further Given Names or Initials Thereof						C		ST	[1,30]										
● NK1.2.4 Suffix (e.g., JR or III)						O		ST	[1,20]										
● NK1.2.5 Prefix (e.g., DR)						O		ST	[1,20]										
● NK1.2.6 Degree (e.g., MD)						X		IS	[1,6]	0360									
● NK1.2.7 Name Type Code						RE		ID	[1,1]	0200									
● NK1.2.8 Name Representation Code						O		ID	[1,1]	0465									
▶ ● NK1.2.9 Name Context						O		CE	[1,483]	0448									
▶ ● NK1.2.10 Name Validity Range						X		DR	[1,53]										

View Conformance Profile Vocabulary

Objectives

- Locate the **'Testing'** tab on the Navigation Bar.
- Locate the **'HL7 Context-free'** tab.
- Locate and select a profile from the IZ ISS Test Suite's available **'Conformance Profiles'**.
- Load and validate an HL7 message within the IZ ISS Test Suite.
- Generate and review the **'Message Validation Report'**.
- Review HL7 message data type and element requirements.
- Browse HL7 message vocabulary requirements.

Informative Reference

- The **'Vocabulary'** tab provides the Tester a reference repository for HL7 message and standard / implementation guide driven vocabulary requirements.

14

Select the **'Vocabulary'** tab.

Validation Report Profile Viewer **Vocabulary**

15

This display presents a functional way to browse Conformance Profile vocabulary requirements.

The search feature includes the capability to search based on vocabulary **'Table ID'**, **'Value Set Code'**, **'Value Set Name'**, and **'Description'**.

Clicking a **'Table ID'** in the **'Vocabulary Collections'** field populates the **'Value(Code)'**, **'CodeSys'**, and **'Description'** table fields.

The screenshot shows the 'Vocabulary Collections' interface with tabs for CDC-IZ, CDC-HL7-IZ, and HL7. The 'HL7' tab is selected, displaying a table of vocabulary collections. The 'Table Id' column is highlighted, and the 'NCIT' value set is selected. This selection populates the 'Value Set Information' panel on the right, which shows details for the 'NCIT' value set, including its name, code, and type. Below this, a table lists the values for the 'NCIT' value set, including their codes, system names, and descriptions.

Table Id	Value Set Name
CDCREC	Ethnic Group
CVX	Codes for Vaccines administered
MXV	Manufactures of vaccines
NCIT	Route of administration
NIPO01	Immunization information source
NIPO02	Substance refusal reason
NIPO03	Observation identifiers
PHYS_FundingEligibilityObsMethod_IIS	Funding Eligibility Observation

Value (Code)	CodeSys	Description
C28161	NCIT	Intramuscular
C36238	NCIT	Intradermal
C36276	NCIT	Intravenous
C36284	NCIT	Nasal
C36288	NCIT	Oral
C36299	NCIT	Subcutaneous
C38305	NCIT	Transdermal
C38676	NCIT	Percutaneous

Hands-on Activities and Tool URLs

1. Determine and document local requirements
2. Using IGAMT-lite modify CDC Profile, add constraints for:
 1. Usage
 2. Cardinality
 3. Length
 4. Data Type
 5. Value Sets
 6. Conformance Statements
3. Export Local Profile

- IGAMT-lite

hl7v2.igamt.nist.gov

- Immunization Test Suite

<http://hl7v2-iz-r1.5-testing.nist.gov/>

Status

- IGAMT-lite
 - IGAMT-lite Prototype Today
 - Seeking pilot testers
 - Webinar to be presented when finished
 - Send interest to:

Rob Snelick (robert.snelick@nist.gov)

- Immunization Test Suite
 - SOAP and HL7 Context-free testing is available
 - MU 2015 Edition (Summer)
 - VXU, ACK, QBP, RSP
 - Test Cases
 - Add data quality
 - EHR-S and IIS Functional Requirement Testing (2016)