HL7 Data Quality Tool: Transformation to a General Purpose Open Source Tool

2017 AIRA National Meeting

Chicago, IL

April 12, 2017

Topics

- History of HL7 Data Quality Tool (DQT)
- Features of HL7 DQT
- Generalizing the HL7 DQT

Background

- HL7 Data Quality Tool work began under "work for hire" agreements with New York City

- NYC agreed to release the HL7 Data Quality Tool software into Open Source community under **GNU Lesser General Public License (LGPL) version 3**

In the beginning…
the HL7 Web Service

- Validates HL7 messages
- Saves/updates patients and immunizations
- Saves HL7 message metadata, aka audit data (including errors)
- Sends response messages (including errors)
- Went Live: June 2009

HLN Consulting LLC

However...

- IIS staff need tools for QA during onboarding process

- HL7 senders (e.g. EHR system vendors) not using the errors in the ACK response
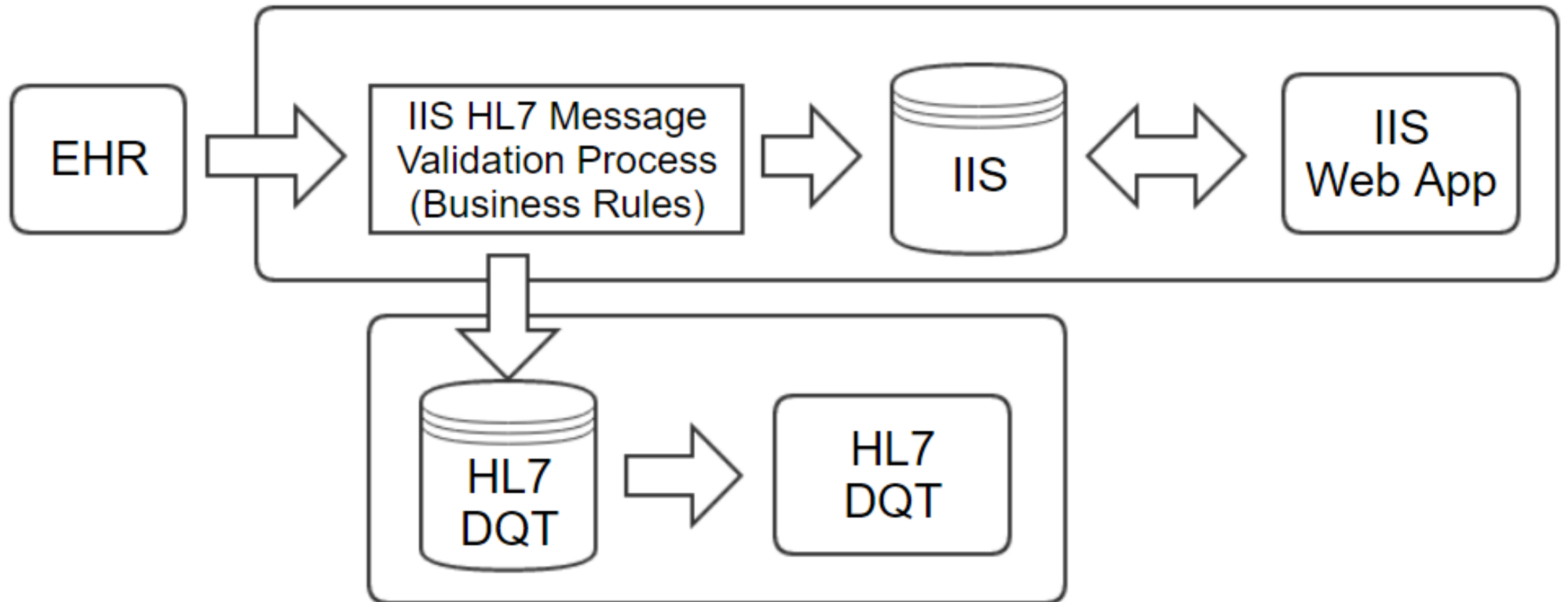
HLN Consulting LLC

Then came... the HL7 Data Quality Tool

- Search and list HL7 messages - by facility and date
- Parse and display individual HL7 messages
- Usefully display error data previously stored by HL7 Web Service
- Went Live: May 2011
- Now Supports 2.3.1 & 2.5.1, VXU & VXZ/QBP

HLN Consulting LLC

Data Flow Diagram

VXU Search Results List – 6 Failed Messages

Reporting Facility - *NYC-DOH Bureau of Child Health (8000N70)

Facility Name	Facility Code	Account Name	Contact Name	Contact Number	Contact Email	Error Stats
*NYC-DOH Bureau of Child Health	8000N70	HLNHL7CIR				

All Messages	Success (No Errors)	Success (Non-Fatal Errors)	Partial Success	Failed
9	0	3	0	6

Failed

Id	Msg Ctrl ID	Type	Received	Admin Facility	Message Status	Fatal Errors	Non-Fatal Errors
9014338	15560	VXU	01/07/2013 4:58 PM	1629C06	FAILURE	REQUIREDFIELD (1)	TABLEVALUENOTFOUND (2), UNKNOWNKEYIDENTIFIER (1), VALUEMISSI...
9015826	DEVITO AND ALVARADO PEDIATRICS, PLLC-35015	VXU	01/07/2013 5:13 PM	0669X01	FAILURE	REQUIREDFIELD (1), UNKNOWNKEYIDENTIFIER (1)	VALUEMISSING (3)
9016058	DEVITO AND ALVARADO PEDIATRICS, PLLC-35009	VXU	01/07/2013 5:16 PM	2200X01	FAILURE	MISMATCH (1), REQUIREDFIELD (1)	VALUEMISSING (3)
9016083	DEVITO AND ALVARADO PEDIATRICS, PLLC-35009	VXU	01/07/2013 5:16 PM	2200X01	FAILURE	MISMATCH (1), REQUIREDFIELD (1)	VALUEMISSING (3)

Individual Message – Parsed by Segment & Field

Message Information

<< Previous | >> Next

Message log ID: 9014338
Reporting facility name: *NYC-DOH Bureau of Child Health
Reporting facility code: 8000N70
Administering locations: 1629C06
Number of errors: 9

Filter Rows:
- ✓ CIR supported fields
- Fields with values
- Fields with errors

Fields with fatal errors ▢
Fields with non-fatal errors ▢
CIR supported fields ▢
CIR unsupported fields ▢

Search all fields: [   ]

Fatal Error	Non Fatal Error	Seq	Segment	Name	Value
		1	MSH-1	Field Separator	|
		1	MSH-2	Encoding Characters	^~\&
		1	MSH-3.1	Sending Application:Namespace ID	EPIC
		1	MSH-4.1	Sending Facility:Namespace ID	8000N70
		1	MSH-7.1	Date/Time Of Message:Time Of An Event	20130102123954
		1	MSH-9.1	Message Type:Message Type	VXU
		1	MSH-9.2	Message Type:Trigger Event	V04
		1	MSH-10	Message Control ID	15560
		1	MSH-11.1	Processing ID:Processing ID	T
		1	MSH-12.1	Version ID:Version ID	2.3.1
		1	MSH-16	Application Acknowledgment Type	
		1	PID-3.1	Patient Identifier List:ID	302727253
	ValueMissing	1	PID-3.5	Patient Identifier List:Identifier Type Code	

Displays Errors
with Field Names, Values and Color Coding

Message Information

<< Previous   >> Next

Message log ID: 9014338
Reporting facility name: *NYC-DOH Bureau of Child Health
Reporting facility code: 8000N70
Administering locations: 1629C06
Number of errors: 9

Filter Rows:
☑ CIR supported fields
☐ Fields with values
☐ Fields with errors

Fields with fatal errors ☐
Fields with non-fatal errors ☐
CIR supported fields ☐
CIR unsupported fields ☐

		1	PV1-20.1	Financial Class:Financial Class	V02
		1	RXA-3.1	Date/Time Start of Administration:Time Of An Event	20130102
RequiredField		1	RXA-5.1	Administered Code:Identifier	
		1	RXA-5.2	Administered Code:Text	INFLUENZA SEASONAL, PRES FREE
	ValueMissing	1	RXA-5.3	Administered Code:Name Of Coding System	
		1	RXA-9.1	Administration Notes:Identifier	00
		1	RXA-9.2	Administration Notes:Text	
		1	RXA-9.3	Administration Notes:Name Of Coding System	
	ValueMissing	1	RXA-10.1	Administering Provider:ID Number	1568536100
	ValueMissing	1	RXA-10.2.1	Administering Provider:Family Last Name:Family Name	THOMAS
	ValueMissing	1	RXA-10.3	Administering Provider:Given Name	SUZY

Toggle for IIS Supported Fields, Fields with Values, and Fields with Errors

Generalizing the HL7 DQT

- Generalize for use by other IIS
  - Decoupled from IIS and created web service interface
- Generalize for use with other HL7 Message Types
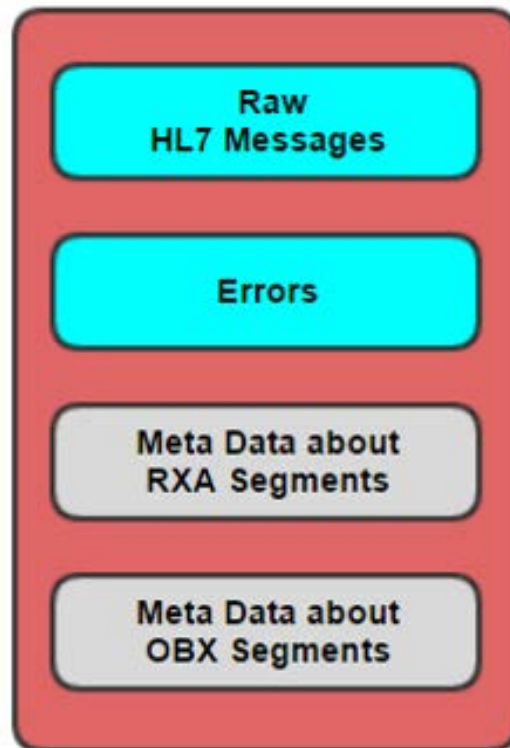 - Modified data model

REST Interface

- Very simple standards base interface
- Can be called by Java, .NET, or other technologies
- API has just 1 method
- Accepts data in JSON format
  - Text based heirarchical key/value method for representing data, similar to XML but simpler
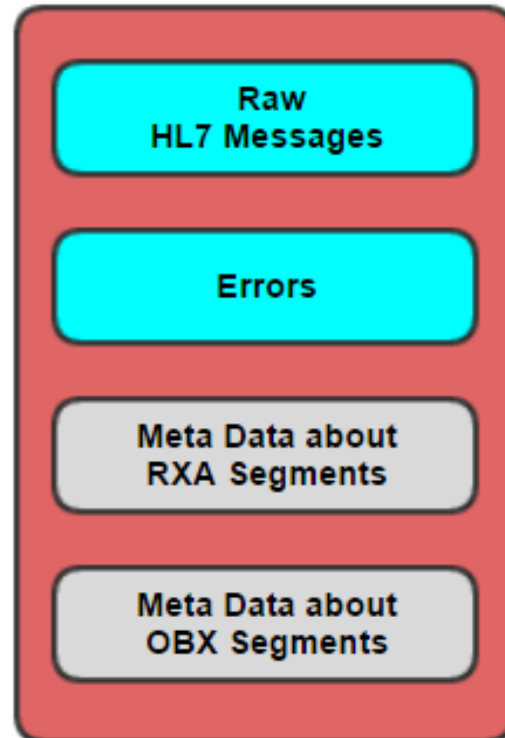- Could be enhanced to accept XML as well, if desired

HL7 DQT Data Model

Original
Data Model

HL7 DQT Data Model

The Errors Table

Table Name: WS_HL7_MESSAGE_LOG_ERROR

Notes: One row per error detected by the IIS for a particular HL7 message.

COLUMN_NAME	TYPE_NAME	COLUMN_SIZE
MESSAGE_LOG_ID	NUMBER	10
SEVERITY	CHAR	1
SEGMENT_NAME	CHAR	3
SEGMENT_SEQUENCE	NUMBER	4
SEGMENT_ERROR_CODE	NUMBER	3
FIELD_NAME	VARCHAR	50
ERROR_REASON	VARCHAR	50
SEGMENT_FIELD_POS	VARCHAR	10
SEGMENT_FIELD_INDEX	NUMBER	3

RXA Meta Data Table - replaced by....

Table Name: WS_HL7_MESSAGE_LOG_RXA_STATS

Note: Contains one row for each immunization report and for each disease/immunity report in a VXU message. (For disease/immunity reports this is the parent table and the WS_HL&_MESSAGE_LOG_OBSV_STATS table is the child table. For immunization reports, there is no child table).

COLUMN_NAME	TYPE_NAME	COLUMN_SIZE
MESSAGE_LOG_ID	NUMBER	10
IMM_ID	NUMBER	10
RXA_SEQUENCE	NUMBER	4
ADMINISTERED_DATE	DATE	7
ADMINISTERED_CODE	VARCHAR2	5
ADMINISTERED_LOCATION	VARCHAR2	12
CONVERTED_ACTION_CODE	CHAR	1
RXA_ACTION_CODE	CHAR	1
ADD_REQUEST	CHAR	1
ADDED	CHAR	1
ADD_ERROR	CHAR	1
ADD_DUP_ERROR	CHAR	1
DELETE_REQUEST	CHAR	1
DELETED	CHAR	1
DELETE_ERROR	CHAR	1
DELETE_NOT_FOUND	CHAR	1
DELETE_EMAIL_REQUEST	CHAR	1
REJECTED	CHAR	1

…Generic Audit Tables

Table Name: WS_HL7_AUDIT_GROUP

Notes: Zero or one row per IIS defined HL7 message audit group associated with an incoming HL7 message. HL7 audit groups are used to record groups of related metadata items associated with a particular inbound HL7 message processed by the IIS.

COLUMN_NAME	TYPE_NAME	COLUMN_SIZE
GROUP_ID	VARCHAR	32
MESSAGE_LOG_ID	NUMBER	
GROUP_NAME	VARCHAR	32
SEGMENT_TYPE	VARCHAR	32
SEGMENT_SEQUENCE	NUMBER	

Table Name: WS_HL7_AUDIT_GROUP_PROPERTY

Notes: One row per IIS defined audit group property per HL7 message audit group associated with an incoming HL7 message. Each row represents a specific metadata item value belonging an HL7 audit group

COLUMN_NAME	TYPE_NAME	COLUMN_SIZE
PROPERTY_ID	VARCHAR	32
GROUP_ID	VARCHAR	32
PROPERTY_NAME	VARCHAR	32
PROPERTY_VALUE	TEXT	Variable, max

Remaining Work (v 1.0)

- Testing
- Documentation

Broader Use of the Open Source HL7 DQT

- Fully Open Source – source code and runtime code will be available with no cost
- Wiki page to be created with more information including Product Roadmap
- Seeking to establish a collaborative Open Source Community around this tool
- Tool will only be developed further with community interest, participation, and funding
- HLN will support this tool for those who wish

Future Enhancements (v 2.0)

- Support use by external users (e.g. providers)
- Track/categorize submissions by EHR system type
- Add a FHIR Interface
- Support message type configuration via the GUI

HLN
Consulting LLC

Contact Information

Michael Suralik

856-751-1094

suralik@hln.com

Noam Arzt

858-538-2220

arzt@hln.com

URL: www.hln.com/ice

Email: ice@hln.com

Possible Models to Fund New Features

- First one who needs a feature pays

- Negotiate collaborative funding

- If funded support is sufficient, use that pool of dollars for enhancements

- Seek outside funding/grants