

HEALTH IT
STANDARDS TESTING INFRASTRUCTURE

NIST Medical Device Communication Testing

Semantic interoperability of Medical Devices

Test Tool Update

Joint IEEE / HL7 September WG Meeting @ Baltimore, MD

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NIST MDC Testing Staff

- John J. Garguilo, NIST, john.garguilo@nist.gov
 - Michael Faughn, NIST, michael.faughn@nist.gov
 - RTMMS – New Version Coming in October!
 - UTG, Terminology, HL7 V2+
 - 11073-10201 MDC Domain Information Model
 - DIM Modeling + “DIM Editor/Medical Device Profiler”
 - Nicolas Crouzier(Contractor-Dakota)
 - RTMMS – 11073-10101 MDC Nomenclature
 - HL7 V2 Tools (IGAMT + TCAMT support) – IHE Device Domain
- ❖ Note: As part of US Federal Government, all NIST work products are freely and publically available

Key Discussion Topics

- Work Area & Status Updates
- Health Information Technology –
Test Infrastructure - End-to-End Platform
- HL7 V2 IHE-PCD Tooling Status & Updates
- MDC Tooling and Harmonized Medical Device Nomenclature
- DIM Editor – Device Profile Builder

NIST Tools publicly available 24 (hours) x 7 (days) x 365 (days/year)

Conformance Tooling Suite

- *HL7 V2 (2.6) IHE-DEV (PCD Program) Validation Tools*
 - IHE-PCD Connectathon, [IHE DEV V2 Message Validation Tooling](#)
- Rosetta Terminology Mapping Management System (*RTMMS*)
<https://rtmms.nist.gov>
 - ***New System Coming Soon!***
- DIM Work - ‘DIM Editor/Profiler’ and ISO/IEEE 11073 UML Model
 - [Development Tool: dim.prometheuscomputing.com](http://dim.prometheuscomputing.com)
- NIST HL7 V2 Portal: <https://hl7v2tools.nist.gov/portal/#/tools>
 - IGAMT – Implementation Guide Authoring Management Tool
 - TCAMT – Test Case Authoring Management Tool

NIST Tools publicly available 24 (hours) x 7 (days) x 365 (days/year)

Work Areas & Status Updates

Conformance Tooling Portal: <http://hl7v2tools.nist.gov/portal/#/tools>

The screenshot displays the HL7 V2 Tools portal interface. At the top, there is a navigation bar with links for Home, Tools, Publications, Resources, Source Code, Links, and about. Below this is a search bar and a dropdown menu set to 'All Tools'. The main content area is a grid of tool cards, each with an information icon (i) in the bottom right corner. Two blue arrows point from the 'All Tools' dropdown to the 'HL7v2 Syndromic Surveillance Test Suite (2015 Edition)' and 'Immunization (2014 Edition)' cards. Red circles highlight the 'IHE PCD Connectathon and Pre-Connectathon' and 'RTMMS Rosetta Terminology Mapping Management System' cards.

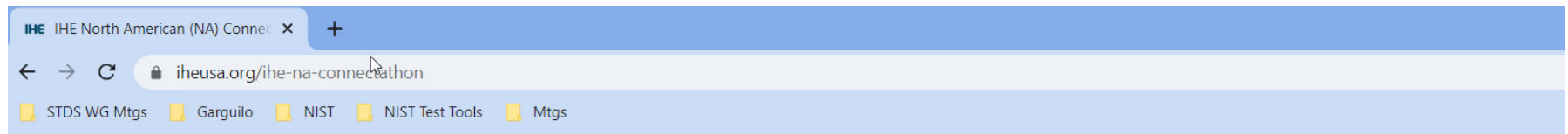
HL7v2 Immunization Test Suite (2015 Edition)	HL7v2 Syndromic Surveillance Test Suite (2015 Edition)	Electronic Lab Reporting (2014 and 2015 Edition)	Immunization (2014 Edition)	Syndromic Surveillance (2014 Edition)	Laboratory Results Interface (2014 Edition)
IHE PIX and PDQ Pre-Connectathon	IHE PCD Connectathon and Pre-Connectathon	IHE PIX and PDQ Connectathon	RTMMS Rosetta Terminology Mapping Management System	HL7 Web Services	Test Case Authoring and Management Tool (TCAMT)
Implementation Guide Authoring Tool (IGAMT-2) New Users	Implementation Guide Authoring Tool (IGAMT) Use only for your existing IGs	NIST HL7 v2 Lab Test Suite: eDOS, LOI, LRI R2 (2015), ELR	Forecasting for Immunization Test Suite (FITS)	HL7 V2 General Validation Tool	


Work Areas & Status Updates

HL7 V2 (2.6) IHE-PCD Validation Tools

- Enhancements to Pre-Connectathon (“Context-Based”, Connectathon Tools (“Context-Free”)
support IHE-PCD Cycle17; CPs + new PCIM Integration Profile
- *Key test events*
 - Supported IHE-North American + European Connectathon (September 2022)
 - Supporting IHE-Korea and Japanese Connectathons
- IHE-PCD Cycle 17 ended at last week’s (September 16, 2022) at IHE Connectathon Test Event
- Accepting new work and CPs for **Cycle 18** - 2022-23
(targeting IHE Connectathon Test Event in **February 2023** + HIMSS 2023)

https://www.iheusa.org/ihe-na-connectathon



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IHE North American (NA) Connectathon 2022

IHE Global Connectathon 2022

Are you working to fine-tune product interoperability? Complete months of development in minutes at the IHE Global Connectathon testing event and collaborate with your industry colleagues at one of the largest health IT testing events in the world. **IHE-Europe** and **IHE USA** will host their first face-to-face joint IHE Connectathon September 12-16, 2022. Ready to join us? Register [here!](#)

Connectathon Participants can find all the essential information [here](#).

IHE Experience and Standards Acceleration Programming [Schedule](#)

What is the Connectathon?



IHE 'Connectathons' September 12-16, 2022

North America: Atlanta
European: Montreux

Benefits of IHE Connectathon Testing

- Reduce Development Costs and Time to Market
- Debug systems and product capabilities within minutes leveraging a broad cross-section of industry partners on-site including:
- Electronic medical record (EMR) vendors, public health agencies, device vendors and key infrastructure components that support health information exchange including Patient Identity Managers, Document Registries and Repositories, Cross Community Gateways
- Leverage 20+ years of standards development experience and test tools developed in partnership with IHE International, IHE USA and [National Institute of Standards and Technology](#) (NIST)
- Learn, collaborate, and network with 450+ of the industry's top professionals at the largest interoperability testing event in the world

**IHE North American
September 12-16, 2022
'Connectathon'
By the numbers...**

IHE Connectathon: Atlanta + Montreux

• Patient Care Device

- 14 Organizations
- 22 Applications (18 US; 4 Montreux)
- 6 Integration Profiles
 1. DEC – Device Event Communication
 2. ACM – Alert Communication Management
 3. PIV – Pump Infusion Verification
 4. IPEC – Infusion Pump Event Communication
 5. MEMDMC – Med Equip Mgmt – Device Mgmt Comm
 6. PCIM – **New! – Patient Connected Identity Management**
- 150 Test Instances verified
- 4 DEV/PCD monitors

Organizations Tested:

Almaviva SpA
Baxter Healthcare
B. Braun Medical
Connexall
Enovacom
Epic
Fresenius Vial SAS
GE Precision Healthcare LLC
ICU Medical
IRM, Inc.
Innovision Medical Technologies
Mindray
Philips Medical Systems Nederland B.V.
Spok Inc.

Example of New V2 Validation Tool: Used at NA Connectathon

<https://ihe-pcd.nist.gov/pcdtool/#/home>

NIST PCD Test Suite 1.0.0-SuperBeta

Home Context-free Context-based Documentation About Hello Guest

Test Execution

Profile Group Type: Public Profile Groups: DEC profiles

Profiles Help

- DEC profiles
 - ORU^R01^ORU^R01
 - ACK^R01^ACK

Profile: ORU^R01^ORU^R01

Validation Report Profile Viewer ValueSets

Message Tree

- MSH[1]:Message Header R[1,1]
- PID[1]:Patient Identification R[1,1]
- PV1[1]:Patient Visit R[1,1]
- OBR[1]:Observation Request R[1,1]
- OBX[1]:Observation/Result R[1,1]
- OBX[2]:Observation/Result R[1,1]
- OBX[3]:Observation/Result R[1,1]
- OBX[4]:Observation/Result R[1,1]
- OBX[5]:Observation/Result R[1,1]
- OBX[6]:Observation/Result R[1,1]
- OBX[7]:Observation/Result R[1,1]

Message Content

```

1 MSH ^~^&|Bernoulli One|Bernoulli|Hill-Rom GW|Hill-Rom|20180115211358+0000|ORU^R40^ORU_R40|3441e31a-c703-4a04-b57b-3c32063
2 PID ||H02009001^^^BERNOULLI MRN^MR|Hon^Albert^^^L
3 PV1 I|HD Surgery^OR^1|||||||
4 OBR 1|3C1A5720180115211358^Bernoulli One|3C1A5720180115211358^Bernoulli One|196616^MDC_EVT_ALARM^MDC|||20180115211358+0000
5 OBX 1|69965^MDC_DEV_MON_PHYSIO_MULTI_PARAM_MDS^MDC|1.0.0.0||X|||||
6 OBX 2|69642^MDC_DEV_ANALY_SAT_02_VMD^MDC|1.22.0.0||X|||||
7 OBX 3|149530^MDC_PULS_OXIM_PULS_RATE^MDC|1.22.1.0||X|||||
8 OBX 4|ST 196648^MDC_EVT_HI|1.22.1.1.1|High Pulse Rate||R|20180115211358+0000|||||
9 OBX 5|NM 149530^MDC_PULS_OXIM_PULS_RATE^MDC|1.22.1.1.2 70||R|20180115211358+0000|||||
10 OBX 6|ST 68481^MDC_ATTR_EVENT_PHASE^MDC|1.22.1.1.3 start||R|||||
11 OBX 7|ST 68482^MDC_ATTR_ALARM_STATE^MDC|1.22.1.1.4 active||R|||||
    
```

Message Validation Result Help Remove Duplicates Report

3 Errors 161 Warnings 78 Alerts

3 All 3 Constraint Failure

Highlight All

Path	Description	Line #
MSH[1]-9[1].2	MSH_PCD_PCD-01_9 - The value of MSH-9 (Message Type) is 'ORU^R01^ORU_R01'.	1
MSH[1]-21[1].3	MSH_PCD_PCD-01_21 - [[The value of MSH-21[*].3 (Universal ID) is '1.3.6.1.4.1.19376.1.6.4.1'] OR [The value of MSH-21[*].3 (Universal ID) is '1.3.6.1.4.1.19376.1.6.1.1']]] AND [The value of MSH-21[*].4 (Universal ID Type) is 'ISO']	1
OBX[2]	OBX_3_MDC_Check - ERROR CODE #1: NIST custom plugin to check for MDC validity.	6

Rosetta Terminology Mapping Management System (*RTMMS*) ISO/IEEE 11073-10101

- RTMMS Deployment Update and service status
 - -10101a added + harmonized co-constraints (e.g., units, enums, body sites):
590 LOINC mappings to MDC terms!
 - -10101b Work underway, 10101c (future TBD)
 - NIST-IEEE Royalty Free Agreement makes available the “Works” (5 key nomenclature attributes) – *perpetual agreement*
 - Latest numbers...
 - Many thanks to lead Paul Schluter, retired Principal Engineer! 😊
- <https://rtmms.nist.gov>