# 11073 Tooling HL7 F2F January 2018 New Orleans g00.gl/WA6uA0

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### TL;DR

- The DIM is expressed as UML. The UML governs everything.
- Device Profile Editor web app, printed standard, and XSD are programmatically generated.
- Web app is nominally usable now (prove me wrong).

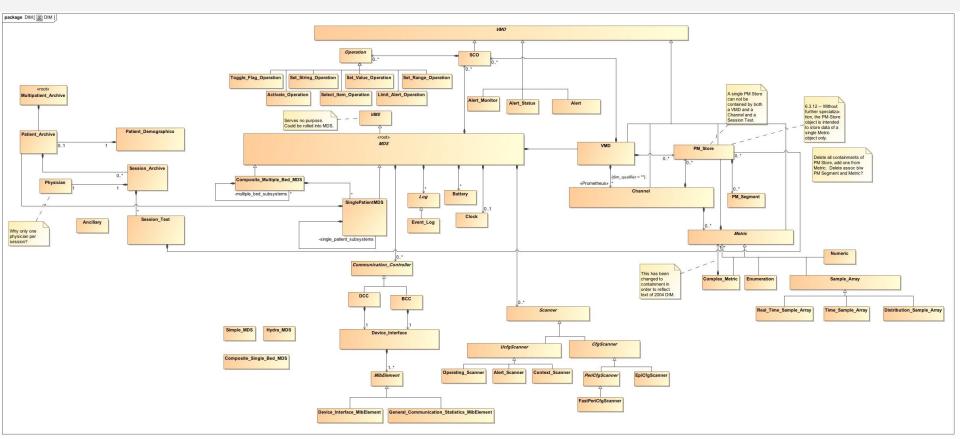
### **UML Development**

- Initial UML model of the DIM programmatically derived from 11073-10201:2004 in early 2012
- Work on applications begun FY 2013
- Manual revisions performed
- Ongoing development of additional UML

### **Tool Genesis from UML Models**

- IEEE11073:10101 Nomenclature (RTMMS)
- IEEE11073:10201 Point of Care Device DIM
- IEEE11073:20601 Personal Health Device DIM
- IEEE11073:10207 BICEPS
- IEEE11073:20101 (ASN.1 Simple Types)
- Device Profiles
- UML Metamodel (represents 10201 UML in web applications)
- Printed Standard

### **PoCD DIM Classes**



### The Model is the Standard

Why? Because it is computable.

Programmatically deriving artifacts from a common source of truth help to ensure harmonization.

- Printed Standard
- Software tools (Device Profiling, Validation, ...)
- XML Schema
- Inter-Standard Interoperability

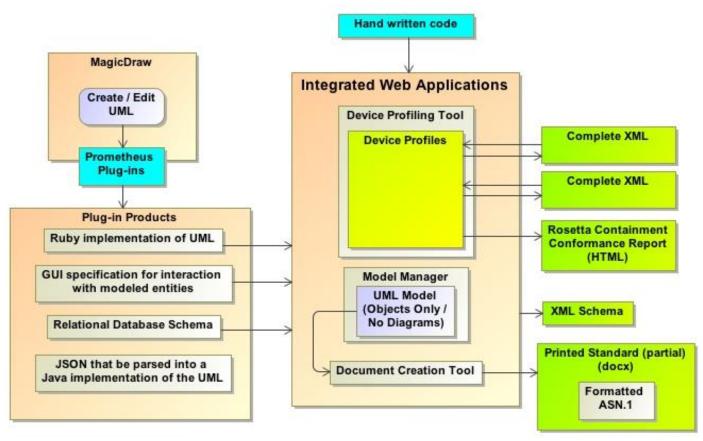
### **UML Challenges**

- UML (or UML tools) has trouble expressing some constructs in a convenient way
  - Class instance variables are unsupported
  - o BNF (i.e. ASN.1)
  - BIT STRING (syntactic representation of multiple boolean attributes)
- Keep the standard 'pure' vs. supporting the functionality that artifacts require.

### **UML Challenges**

- Each UML element type used has to be implemented for code module that produces an end product (web application, printed standard, etc.). Lots of work the first time you do it and every time you build a new module to produce a new type of artifact.
- UML and XML have some differences that are difficult to reconcile.
- Available UML tools aren't perfect.

### From UML to Everything Else



### **Generated from UML**

- Web Application Specification
  - Database Schema
  - Class definitions
  - Default User Interface Specification
- ~1000 classifiers
- ~ 3,000 lines of in-memory code per classifier\*
- UML!

<sup>\*</sup> once fully processed by the application generation toolchain

# **Generated from Application Code**

#### Web Application

- Device XML
  - Concise "Rosetta
     Containment Hierarchy"
  - Comprehensive, complete representation
- HTML "dotted" notation tables for devices

#### **Command Line**

- XML Schema
- ASN.1
- DIM pseudocode
- .docx for inclusion in IEEE document
- ad-hoc, custom reports

### **Web Application Features**

- Create and Manage Device Infomation Model Profiles
  - Containment + Nomenclature
- RTMMS mirror
- Manage UML model(s) (\*with caution)
- Build standards document content (.docx)

# Since San Diego WG Meeting (Fall 2017)

San Diego Slide Deck: goo.gl/1bujhK

### PHD to UML

### ASN.1

 String manipulation > Hash / Struct > UmlMetamodel Instances > MagicDraw Instances > Web App

### DIM classes

MagicDraw Instances by hand

# DIM Comparisons (PHD vs PoCD)

Google Sheets comparing class attribution b/w PHD and PoCD

Now that the PHD model is complete, in-depth, programmatic comparisons are easy to do.

### **BICEPS Profile Editor**

### biceps.prometheuscomputing.com

- Ask for me an invitation code
- Proof of Concept / Prototype
- Not fully functional
- BICEPS presents challenges (in the Web App)
   beyond those presented by 10201 & 20601.
- In collaboration with Simon Baumhof

# Round-Trip UML Web App to UML Tool (MagicDraw)

- Not quite there yet but getting there will be easy
- Facilitated by:
  - New MagicDraw plugins
  - New (to the DIM project) Ruby UML Metamodel Library
  - Custom exchange format / DSL

# Generating an IEEE Standard

### From the Model to the Document

- 99+% of Section 7: DIM Object Definitions
  - ∘ ~²⁄₃ of the content of the entire document
- Structure and content of generated material is managed via web application

### iMeetCentral (goo.gl/CKk8FG)

11073 Working Group\* -> Drafts -> Drafts in Progress

- 2010 Draft
- Current, Generated Draft
- Diff b/w 2010 Draft and Current Draft

\*Not 11073 PoCD Working Group Workspace

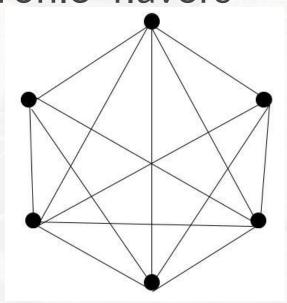
### **Comments & Revisions**

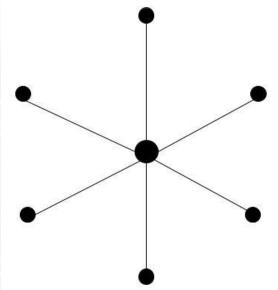
Google Sheet: goo.gl/NE8FjJ

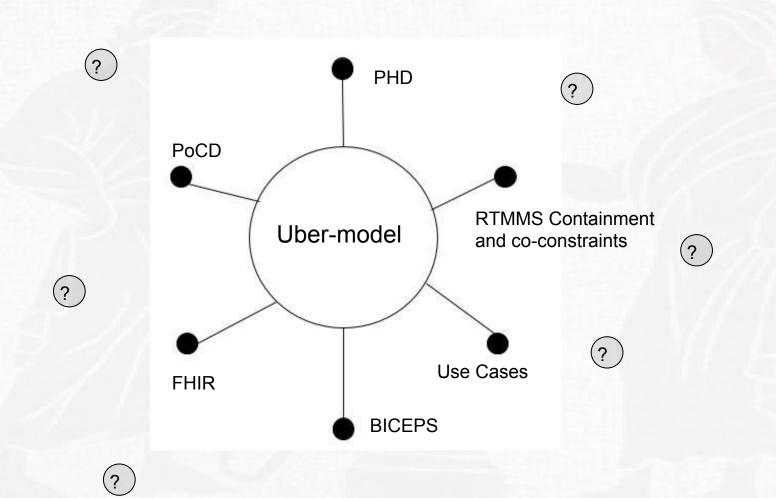
- Try to understand and resolve all items
- Assume that the new draft represents a best effort to address items found in the spreadsheet
- Clean the slate and start Comments & Revisions document going forward

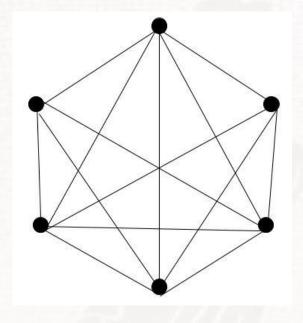
### **What Could Be?**

 Mappings / Translations between device profile "flavors"



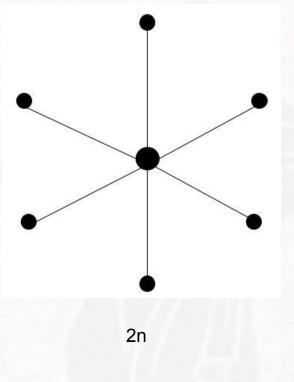






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|----|---|-----|---|-----|---|
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| Models | Fully<br>Connected | "Uber-model"<br>hub |  |
|--------|--------------------|---------------------|--|
| 2      | 2                  | 4                   |  |
| 3      | 6                  | 6                   |  |
| 4      | 12                 | 8                   |  |
| 5      | 20                 | 10                  |  |
| 6      | 30                 | 12                  |  |
| 7      | 42                 | 14                  |  |
| 8      | 56                 | 16                  |  |
| 9      | 72                 | 18                  |  |
| 10     | 90                 | 20                  |  |
| 11     | 110                | 22                  |  |
| 12     | 132                | 24                  |  |



Each edge represents mappings in both directions, thus 2(n(n-1)/2) and 2(n).

