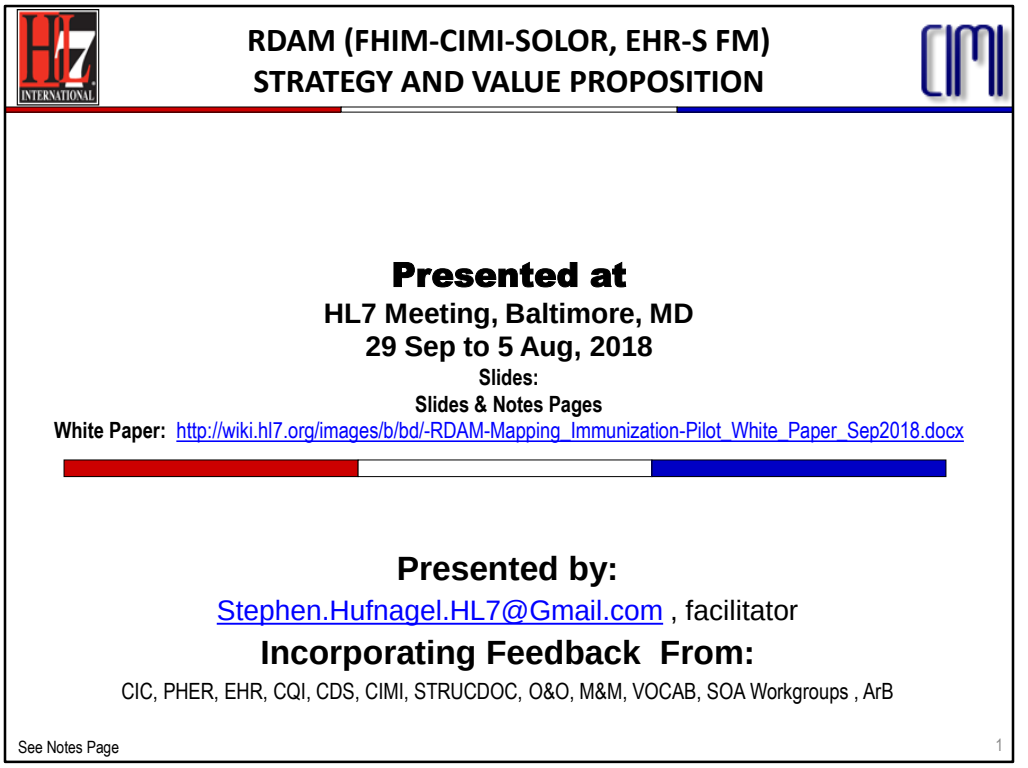


CHRONOLOGY:

2008 Federal Health Information Models start

2011 Clinical Information Model Initiative (CIMI) start

2016-01-16 CIMI Sponsored HL7 Investigative Study start

- The Jan-Sep 2016 CIMI-Sponsored HL7 CIMI-FHIM Integration Investigative-Study includes: The Open Group Healthcare Forum, HL7 CIMI WG, HL7 EHR WG and HL7 CIC WG

2016-03-01 CIMI-FHIM Integration Task Force

2016-08-15 "CIMI-FHIM-SOLOR-CQF Integration" Preliminary Report

2016-08-17/18 Health Interoperability and Exchange Alliance (HIEA) Technical Forum

- Health Interoperability and Exchange Alliance (HIEA) Technical Forum
- Topic: Information Modeling: Foundation to Semantic Interoperability
- C0-Sponsors: ONC OST, FHA, IPO DOD VA
- This Health Interoperability and Exchange Alliance (HIEA) Technical Forum on "Information Modeling: Foundation to Semantic Interoperability" event was a key component of a mix of collaborative activities. This event had key stakeholders coming together under the facilitation of the DoD/VA IPO ONC Liaison, Nona Hall, BSN, MA who on behalf of the co-sponsors and through the support of the IPO's HIEA Technical Forum showcased this initiative and results to date.
- As we go forward, there is logic to stay connected no matter what current and immediate task we are attending to.

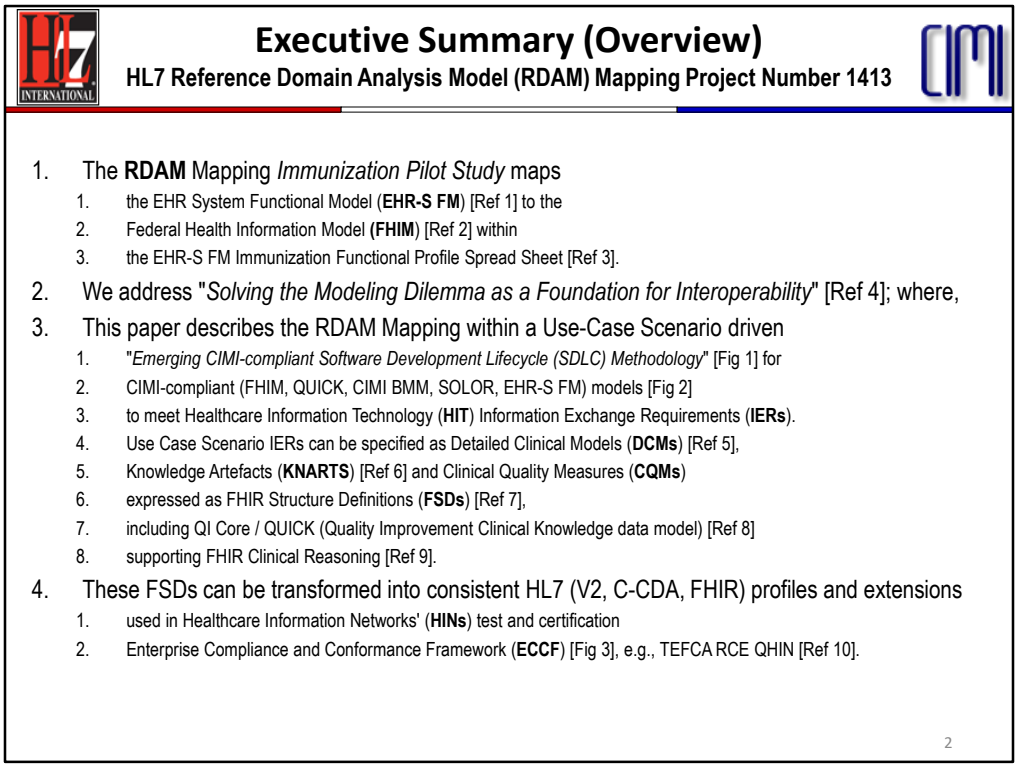
2016-09-07 FHA "CIMI-FHIM-SOLOR-CQF Integration" Report PPT-Brief to FHA Federal Partners

2016-09-15 "CIMI-FHIM-SOLOR-CQF Integration" Final Report

2016-09-17 HL7 Meeting in Baltimore, MD

- "CIMI-FHIM-SOLOR-CQF Integration" Report PPT-Brief at HL7

- HL7 FY2017 “CIMI-FHIM-SOLOR-CQF Integration” Project Scope Statement (PSS) vetted at HL7



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4. Solving the Modeling Dilemma as a Foundation for Interoperability by Berndt Blobel and Frank Oemig, Intl. HL7 Interop Conference (IHIC) 2018 in Portsmouth, UK. https://www.ejbi.org/abstract/solving-the-modeling-dilemma-as-a-foundation-for-interoperability-4614.html
5. CIMI Detailed Clinical Models https://CIMI.HL7.org
6. HL7 Knowledge Artefact (KNART) Specification http://wiki.hl7.org/index.php?title=Knowledge_Artifact_Specification
7. FHIR Immunization Resources https://www.hl7.org/fhir/immunization.html
8. QI-Core IG http://hl7.org/FHIR/us/qicore/2016Sep/index.html
9. FHIR Clinical Reasoning Module http://www.hl7.org/fhir/clinicalreasoning-module.html http://wiki.hl7.org/index.php?title=Clinical_Reasoning_Module
10. HL7 May 2018 Newsletter Article http://www.hl7.org/documentcenter/public/newsletters/HL7_NEWS_20180523.pdf

Executive Summary (Models)

The CIMI-compliant (FHIM, QUICK, CIMI BMM, SOLOR, EHR-S FM) logical models are built on a standards foundation.

- CIMI BMM is based on ISO 13606 and
- SOLOR is a SNOMED extension including LOINC and RxNorm using EL++ descriptive logic.
- QI Core / QUICK data model and unified FHIR Clinical Reasoning module (CQL (Clinical Quality Language), CQF (Clinical Quality Framework), CDS Hooks) are FHIR Standards for Trial Use (STU3 and STU4) Implementation Guides.
- The FHIR Clinical Reasoning module provides resources and operations to enable the representation, distribution, and evaluation of clinical knowledge artifacts (KNARTs) such as clinical decision support rules, quality measures, order sets, and protocols. In addition, the reasoning module describes how expression languages can be used throughout the specification to provide dynamic capabilities.
- FHIM has over 10 years of clinical input and standards alignment; but, has not been balloted by HL7.
- EHR-S FM R2 is a normative HL7 and ISO standard.

Executive Summary (Next Steps))

Assuming HL7 TSC and HHS ONC concurrence, the RDAM Mapping next-step plan includes extending the immunization pilot study to a full software development lifecycle immunization demonstration using CIMI-compliant model driven development tools:

- 1) FHIM mapped EHR-S FM defined requirements use-case scenario events-context defined within the CIMI-FSD tool stack,
- 2) Quality Improvement and Clinical Knowledge (**QUICK**) data model,
- 3) immunization DAM and RDAM review, update and harmonization by PHER clinical workgroup,
- 4) DCMs, KNARTs and CQMs expressed as FSDs plus
- 5) CIMI-compliant V2, C-CDA and FHIR profile and extension generation.

These next-step tasks support care team (immunization screening, reporting, care delivery and follow-up) and transfers-of-care use-case scenarios.

Executive Summary (Business Case)

- **Business Case,** in a nutshell,
- **Problem**: HL7 (V2, C-CDA, FHIR) implementation-and-mapping variability results in 1) semantic inconsistency-and-ambiguity, 2) reduced interoperability and 3) reduced HIT value (patient safety, care quality, low cost) across Federated HINs.
- **Strategic Goals:** Semantic Integrity across
- HL7 Product lines and product families (V2, C-CDA, FHIR)
- TEFCA RCE QHINs
  - https://www.healthit.gov/sites/default/files/draft-guide.pdf
- FHIR US-Core and FHIR QI-Core future normative ballots
  - http://www.hl7.org/fhir/us/core/
  - http://hl7.org/fhir/us/qicore/index.html
- **Approach**: Separation of Clinical Statement (syntax, context, terminology, workflow) data-quality concerns; where, CIMI-compliant (FHIM, QUICK, CIMI BMM, SOLOR, EHR-S FM) logical-specification of DCMs and CQMs are expressed as FSDs for interoperable V2, C-CDA and FHIR implementations.
- **Value Proposition**: CIMI-compliance positively improves semantic integrity resulting in improved patient value within HL7 cross family scalability (interoperability) with reduced complexity (cost) across federated HINs, e.g., TEFCA RCE QHINs

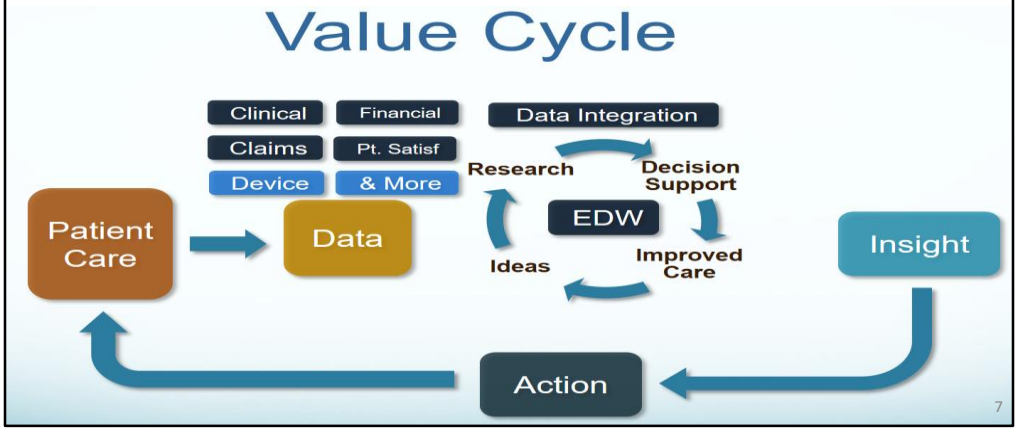
5

Goal

- **Our goal** is “to help people live the healthiest lives possible” by enabling a “Learning Healthcare System” supporting areas such as, but not limited to, Precision Medicine.”
- **This requires** data that is computable, usable and interpretable across disparate systems.
- **Our current-state** is unable to deliver on this goal; however, there is a solution.
- We have made significant inroad with the exchange of data and standards and their adoption; but, we must return our focus on the data to make additional advancements.

IT Objective

Our IT objective is to make the appropriate data available when it is needed, where it needed and how it is needed. We plan to integrate existing models, with semantically-consistent computable-data, including provenance data (who, what, when, where, why, how) across different platforms, e.g., population health, Clinical Decision support, EHR patient documentation systems, etc. using tooling to generate various implementation styles, including HL7 Fast Healthcare Interoperable Resources (FHIR).



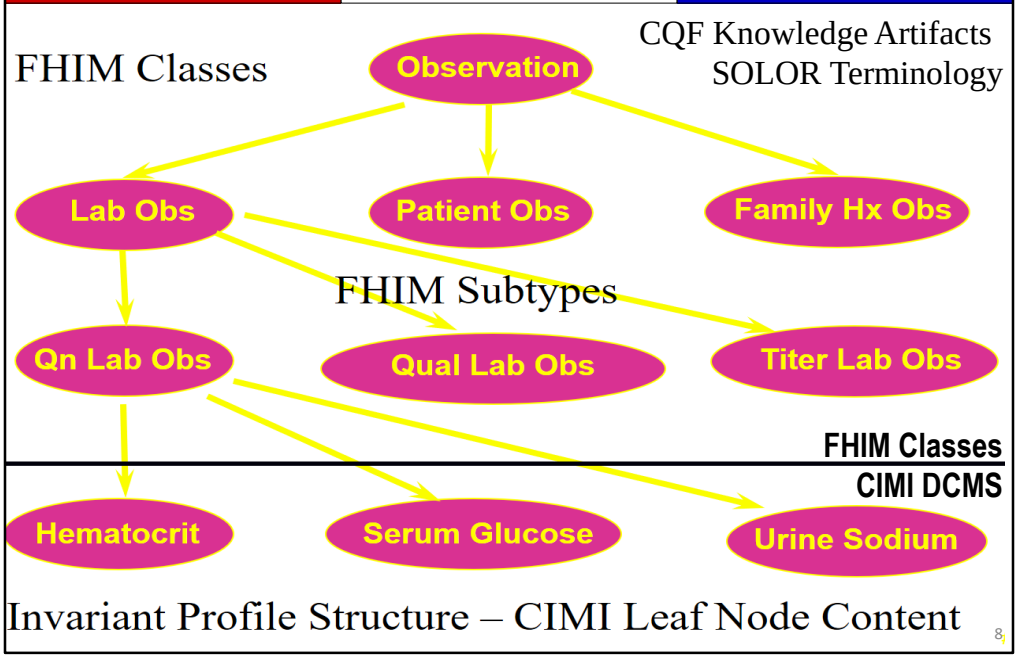
Our clinical goal is "to help people live the healthiest lives possible." **Our technical goal** is to enable "Learning Healthcare Systems" supporting areas such as, but not limited to, Precision Medicine."

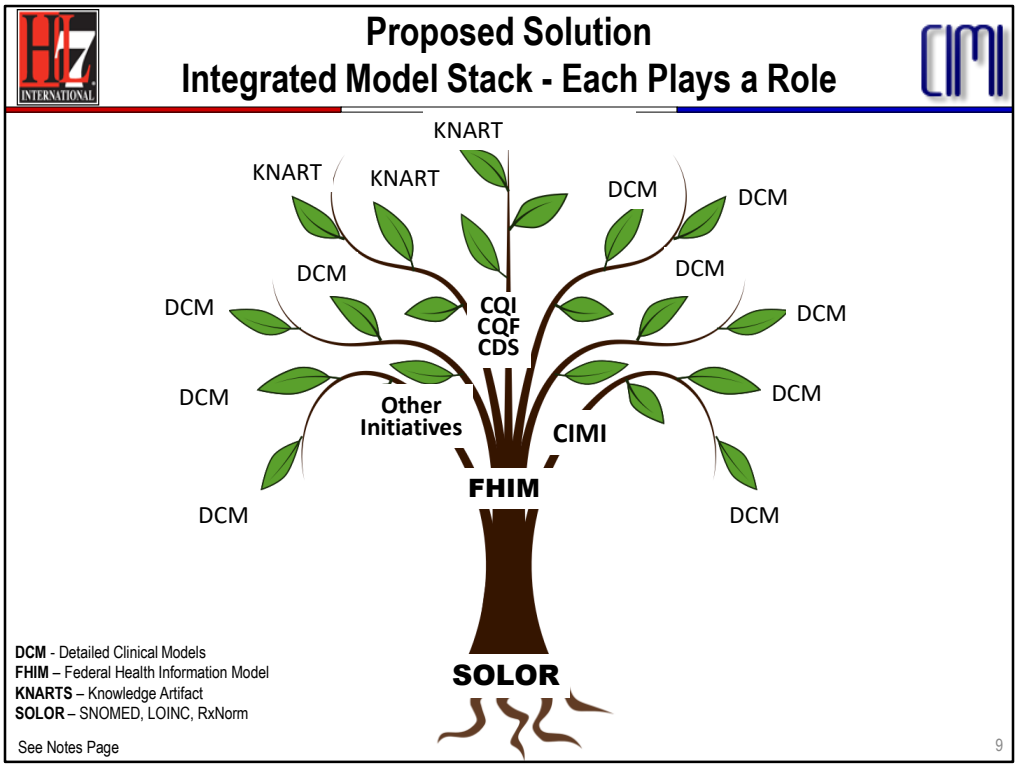
> **These goals require** data that is computable, usable and interpretable across disparate systems.
>
> **Our current-state** is unable to deliver these goals; however, there is a solution.

Our IT objective is to make the appropriate data available when it is needed, where it needed and how it is needed. We plan to integrate existing models, with semantically-consistent computable-data, including provenance data (who, what, when, where, why, how) across different platforms, e.g., population health, Clinical Decision support, EHR patient documentation systems, etc. using tooling to generate various implementation styles, including HL7 Fast Healthcare Interoperable Resources (FHIR).

Our goal is "To help people live the healthiest lives possible;" where, the foundation of a Learning Healthcare System is accurate, computable, data starting with the integration of CIMI, FHIM, SOLOR, CQF, DAF and other Information Models into a widely used HL7/ISO standard [Stan Huff] engaging specifically to bolster FHIR Profiles

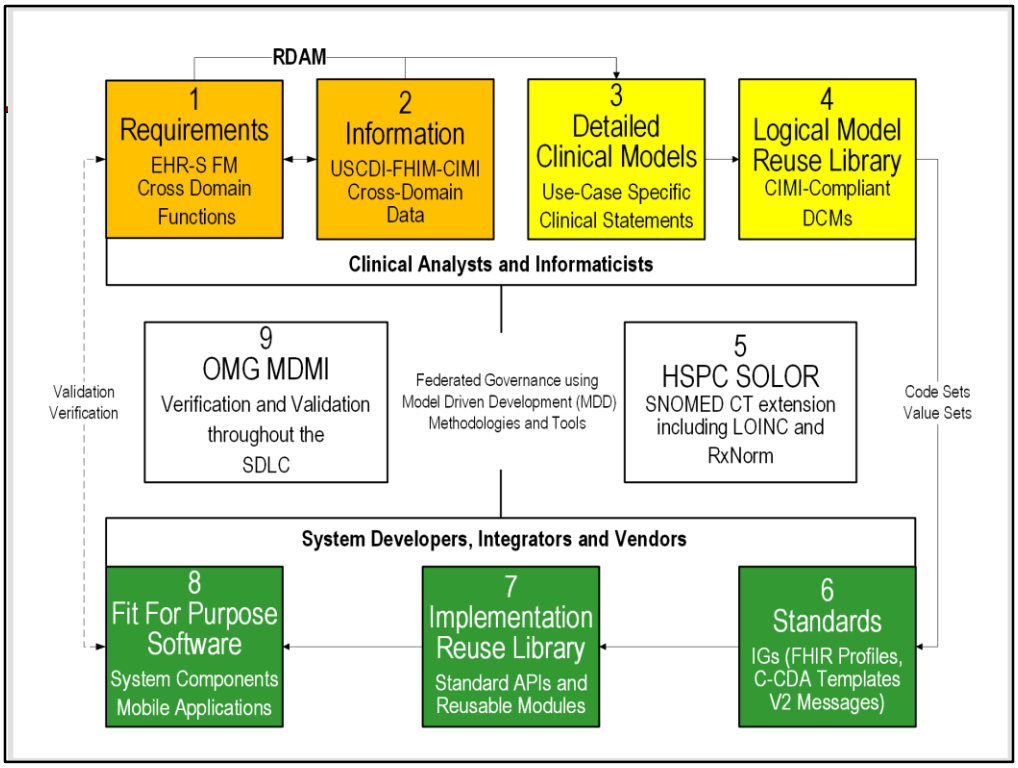
Clinical Example
CIMI-FHIM Integration





As shown in *this slide, each model contributes to an Integrated Model Stack*, the proposed operational architecture involves the definition of clinical knowledge in the form of formally modeled information artifacts that could be used in compose-able health records, care plans and other shared clinical data. As represented in this slide, the combination of SOLOR, FHIM, CIMI DCMs and CQF KNARTs while complementary fulfill a different information modeling contribution.

- SOLOR is SNOMED with extensions for LOINC and RXNorm.
- FHIM is Federal Health Information Model
- CIMI DCMs is Clinical Information Model Initiative Detailed Clinical Model
- CQF KNARTs is Clinical Quality Framework Knowledge Artefacts



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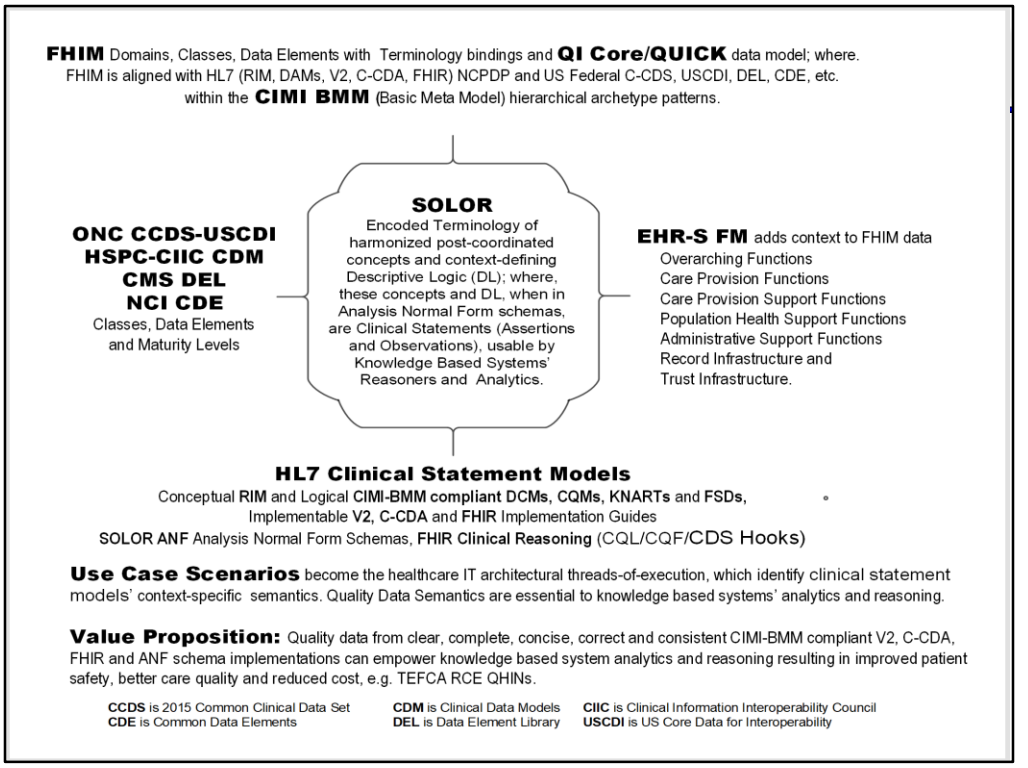

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Subject Specification	Enterprise Business Viewpoint	Information Viewpoint	Computation Viewpoint	Engineering Viewpoint
CIM Conceptual *Computation Independent Model*	EHR-S FM Use Case Scenarios	FHIM, CIMI BMM QUICK, SOLOR	Domain Context Descriptive Logic	Knowledge Based Systems
PIM Logical *Platform Independent Model*	RDAM Mapping EHR-S FM to FHIM	Observational Knowledge	Implementation Guides	Assertional Knowledge
PSM Implementable *Platform Specific Model*	Transactions IHE Profiles	Data Warehouses Knowledge Bases	Proc. Knowledge SWR Components	Platforms, Apps and Configuration Mgmt

VIEWPOINT	DEFINES
Enterprise	system context and data sharing requirements and standards
Information	data required by the system using static, invariant, and dynamic schemas.
Computation	Components and services functional system architectural model & APIs
Engineering	required systems infrastructure.
Technology	not shown: HAPI FHIR, VSAC, TermSpace, OntoServer, MDHT, MDMI, SHR, Penrad & Cognative tools

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   http://www.hl7.org/documentcenter/public/newsletters/HL7_NEWS_20180523.pdf
8. QI-Core IG http://hl7.org/FHIR/us/qicore/2016Sep/index.html