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Archetype Modeling Language (AML)

(A UML Profile for Modeling Archetypes)

Request For Proposal

OMG Document: health/2012-06-06

Letters of Intent due: August 21, 2012
Submissions due: February 18th, 2013

Questions on this RFP : RFP@AMLprofile.org

Objective of this RFP

The objective of this RFP is to provide a standard for modeling Archetype Models (AMs) using UML, to support the representation of Clinical Information Modeling Initiative (CIMI) artifacts in UML. Archetypes are Platform Independent Models (PIMs), which are developed as a set of constraints on a specific Reference Model (RM).

This RFP solicits proposals for an UML Profile, to be known as the "Archetype Modeling Language" (AML). The AML Profile will be developed as an aggregation of three sub-profiles, which together meet the requirements of archetype modeling. The three sub-profiles of the AML Profile will include:

- *Reference Model Profile (RMP)*: This profile will enable the specification of reference models, upon which archetypes can be based.

- *Constraint Model Profile (CMP)*: This profile will support the specification of constraints on a given reference model, to enable the development of archetypes, including Clinical Information Models (CIMs).

- *A Terminology Binding Profile (TBP)*: This profile will support the binding of information models to terminology, with optional support for binding to CTS2. Terminology bindings will include:
    1. *Value Bindings*: Linkage of the data model to value domains, which restrict the valid value of an attribute to a set of values that corresponds to a set of meanings recorded in an external terminology;
    2. *Semantic Bindings:* Defining the meaning of model elements, using concepts in an external terminology; and
    3. *Constraint Bindings:* Specifying constraints on the information model, using concepts and relationships defined in an external terminology.

This set of three UML sub-profiles (which together constitute the AML) will enable the specification of CIMI clinical model content (using the CIMI Reference Model), and the generation of CIMI clinical model artefacts, such as the Archetype Definition Language (ADL). While the transformation of AML models to an instance of the Archetype Object Model v1.5 (AOM-1.5) is optional, this transformation must be possible. The Archetype Definition Language (ADL) is a serialization of the Archetype Object Model.

Background:

The Clinical Information Modeling Initiative (CIMI, http://informatics.mayo.edu/CIMI) is an international collaboration that is dedicated to providing a common representation of health information content so that semantically interoperable information may be created and shared in health records, messages, and documents.

The CIMI Reference Model is the underlying Reference Model on which CIMI's clinical information models are defined. The reference model defines a rigorous and stable set of modeling patterns, including a set of structural patterns, complex data types and demographic classes. All CIMI clinical models will be defined by constraining the CIMI reference model. Each instance of a CIMI

Clinical Model will be a constrained instance of the CIMI reference model which conforms to the constraints defined by the associated clinical model.

<u>This RFP is focused on developing a UML profile that enables the specification of the CIMI reference model, and CIMI clinical models that are defined as a set of constraints on this reference model. It is anticipated that this modeling approach will be developed in such a way that it is generalisable for use with other reference models and in other domain areas.</u>

CIMI's work is guided by the following principles:

- CIMI specifications and models will be freely available to all, at no cost. The initial use cases will focus on the requirements of organizations involved in providing, funding, monitoring or governing healthcare, the requirements of providers of healthcare IT and healthcare IT standards, and the requirements of national and international eHealth programs, professional organizations, health providers and clinical system developers.
- CIMI is committed to making clinical models available in a single formalism, based on the Archetype Object Model v1.5 (AOM 1.5) from the openEHR Foundation (http://www.openehr.org/home.html). Initially this formalism will be a direct serialization of AOM – namely, the Archetype Definition Language (ADL).
- CIMI is also committed to the development of a profile of the Unified Modeling Language (UML) from the Object Management Group (OMG) that incorporates the semantics of the AOM 1.5, and adopting this profile as an alternative modeling approach for developing CIMI models.
- CIMI intends its models to be converted into local formats for implementation.
- CIMI is committed to transparency in its work products and process.

The motivation for including a reference model in the CIMI clinical modeling architecture is to provide a consistent computational framework upon which model authoring and translation tools can be based. The reference model is the 'common language' used to describe all clinical models. It provides a single information model, which can be used to represent instances of all clinical models, and upon which further constraints can be applied to represent the specific information requirements of all clinical model. This information model represents the core artifact that is implemented in software, as it provides the physical structure of the clinical models and its example instances. Existing

implementation experience has shown that this increases the computational capabilities of the resulting modeling and translation tools.[1]

Acknowledgements

The following individuals contributed to the authoring of the RFP and/or have assisted the CIMI UML team in the development of this RFP:

Name	Organization
Thomas Beale	Ocean Informatics
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Executive Sponsors

ONC	The Office of the National Coordinator for Health Information Technology (ONC) is a staff division of the Office of the Secretary, within the US Department of Health and Human Services. It is primarily focused on coordination of nationwide efforts to implement and use health information technology and the electronic exchange of health information. With the passage of the HITECH Act, the ONC is charged with building an interoperable, private and secure nationwide health information system and supporting the widespread, meaningful use of health IT.
VHA	The Veterans Health Administration (VHA) is the component of the United States Department of Veterans Affairs (VA) that implements the medical assistance program of the VA through the administration and operation of numerous VA outpatient clinics, hospitals, medical centers, and long-term healthcare facilities. VHA developed a low cost open source electronic medical records system, VistA, which can be accessed remotely by health care providers. With this system, patients and nurses are given bar-coded wristbands, and all medications are bar-coded as well. Nurses are given wands, which they use to scan themselves, the patient, and the medication bottle before dispensing drugs. This helps prevent four of the most common dispensing errors: wrong med, wrong dose, wrong time, and wrong patient. The system, which has been adopted by all veterans hospitals and clinics and continuously improved by users, has cut the number of dispensing errors in half at some facilities and saved thousands of lives.
Military Health System (DOD)	The Military Health System is the enterprise within the United States Department of Defense responsible for providing health care to active duty and retired U.S. Military personnel and their dependents. The mission of the Military Health System (MHS) is to provide health support for the full range of military operations and sustain the health of all who are entrusted to MHS care. The primary mission of the medical services system is to maintain the health of military personnel, so they can carry out their military missions, and to be prepared to deliver health care required during wartime.
Canada	Canada Health Infoway is an independent, federally funded, not-for-profit

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[1] http://informatics.mayo.edu/CIMI/index.php/Main_Page

Health Infoway	organization tasked with accelerating the development of electronic health records (EHR) across Canada. As a strategic investor, they work with Canadian provinces and territories with the goal of creating an electronic health record for 50% of Canadians. Infoway's members are Canada's 14 federal, provincial and territorial Deputy Ministers of Health. Infoway's investments are prioritized toward local, provincial and national projects which align with the Pan-Canadian EHR Blueprint, itself developed by Infoway. Beyond these strategic investments, Infoway has no mandate to enforce compliance, as Canadian healthcare is generally governed at the Provincial level. Development of a network of effective interoperable electronic health record solutions across Canada – linking clinics, hospitals, pharmacies and other points of care – is intended to improve access to health care services for Canadians, enhance their quality of care and make the health care system more efficient.
NHS	NHS Connecting for Health is part of the UK Department of Health and was formed on 1 April 2005, replacing the former NHS Information Authority. It has the responsibility of delivering the NHS National Programme for IT (NPfIT), an initiative by the Department of Health in England to move the National Health Service (NHS) in England towards a single, centrally-mandated electronic care record for patients and to connect 30,000 General practitioners to 300 hospitals, providing secure and audited access to these records by authorized health professionals. In due course it is planned that patients will also have access to their records online through a service called HealthSpace. NPfIT is said by NHS CFH to be "the world's biggest civil information technology programme".
NEHTA	The National E-Health Transition Authority Limited (known as NEHTA) was established by the Australian, State and Territory governments to develop better ways of electronically collecting and securely exchanging health information. The Commonwealth Government approved the development of the personally controlled electronic health record (PCEHR) system in 2010, and allocated funding to deliver this by July 2012. NEHTA has been contracted as a managing agent on behalf of the Department of Health and Ageing (DOHA) in relation to contracts and agreements for: National Infrastructure Partner/s; National Change and Adoption Partner; Benefits Evaluation Partner; and eHealth Sites.
Intermountain Healthcare	Intermountain Healthcare is a non-profit healthcare system and is the largest healthcare provider in the intermountain West. Intermountain Healthcare provides hospital and other medical services in Utah and Idaho. Intermountain Healthcare operates 22 hospitals in Utah and 1 hospital in Idaho. Intermountain also operates clinics, and urgent care facilities that are run by physicians as part of the Intermountain Medical Group. In total, Intermountain Healthcare operates over 160 healthcare facilities, employs about 700 of Utah's 4,600 physicians and provides insurance to about 19 percent of Utahns.

For further details see Chapter 6 of this document

1.0 Introduction

1.1   Goals of OMG

The Object Management Group (OMG) is the world's largest software consortium with an international membership of vendors, developers, and end users. Established in 1989, its mission is to help computer users solve enterprise integration problems by supplying open, vendor-neutral portability, interoperability and reusability specifications based on Model Driven Architecture (MDA). MDA defines an approach to IT system specification that separates the specification of system functionality from the specification of the implementation of that functionality on a specific technology platform, and provides a set of guidelines for structuring specifications expressed as models. OMG has established numerous widely used standards such as OMG IDL[IDL], CORBA[CORBA], Realtime CORBA [CORBA], GIOP/IIOP[CORBA], UML[UML], MOF[MOF], XMI[XMI] and CWM[CWM] to name a few significant ones.

1.2   Organization of this document

The remainder of this document is organized as follows:

Chapter 2 - *Architectural Context* - background information on OMG's Model Driven Architecture.

Chapter 3 - *Adoption Process* - background information on the OMG specification adoption process.

Chapter 4 - *Instructions for Submitters* - explanation of how to make a submission to this RFP.

Chapter 5 - *General Requirements on Proposals* - requirements and evaluation criteria that apply to all proposals submitted to OMG.

Chapter 6 - *Specific Requirements on Proposals* - problem statement, scope of proposals sought, requirements and optional features, issues to be discussed, evaluation criteria, and timetable that apply specifically to this RFP.

Appendix A – *References and Glossary Specific to this RFP*

Appendix B – General References and Glossary

1.3   Conventions

The key words "**must**", "**must not**", "**required**", "**shall**", "**shall not**", "**should**", "**should not**", "**recommended**", "**may**", and "**optional**" in this document are to be interpreted as described in RFC 2119 [RFC2119].

1.4   Contact Information

Questions related to the OMG's technology adoption process may be directed to *omg-process@omg.org*. General questions about this RFP may be sent to *responses@omg.org*.

OMG documents (and information about the OMG in general) can be obtained from the OMG's web site *(http://www.omg.org/)*. OMG documents may also be obtained by contacting OMG at *documents@omg.org*. Templates for RFPs (like this document) and other standard OMG documents can be found at the OMG Template Downloads Page at *http://www.omg.org/technology/template_download.htm*

2.0 Architectural Context

MDA provides a set of guidelines for structuring specifications expressed as models and the mappings between those models. The MDA initiative and the standards that support it allow the same model specifying business system or application functionality and behavior to be realized on multiple platforms. MDA enables different applications to be integrated by explicitly relating their models; this facilitates integration and interoperability and supports system evolution (deployment choices) as platform technologies change. The three primary goals of MDA are portability, interoperability and reusability.

Portability of any subsystem is relative to the subsystems on which it depends. The collection of subsystems that a given subsystem depends upon is often loosely called the *platform,* which supports that subsystem. Portability – and reusability - of such a subsystem is enabled if all the subsystems that it depends upon use standardized interfaces (APIs) and usage patterns.

MDA provides a pattern comprising a portable subsystem that is able to use any one of multiple specific implementations of a platform. This pattern is repeatedly usable in the specification of systems. The five important concepts related to this pattern are:

1. *Model* – A model is a representation of a part of the function, structure and/or behavior of an application or system. A representation is said to be formal when it is based on a language that has a well-defined form ("syntax"), meaning ("semantics"), and possibly rules of analysis, inference, or proof for its constructs. The syntax may be graphical or textual. The semantics might be defined, more or less formally, in terms of things observed in the world being described (e.g. message sends and replies, object states and state changes, etc.), or by translating higher-level language constructs into other constructs that have a well-defined meaning. The optional rules of inference define what unstated properties you can deduce from the explicit statements in the model. In MDA, a representation that is not formal in this sense is not a model. Thus, a diagram with boxes and lines and arrows that is not supported by a definition of the meaning of a box, and the meaning of a line and of an arrow is not a model—it is just an informal diagram.

2. *Platform* – A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.

3. *Platform Independent Model (PIM)* – A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.

4. *Platform Specific Model (PSM)* – A model of a subsystem that includes information about the specific technology that is used in the realization of that subsystem on a specific platform, and hence possibly contains elements that are specific to the platform.

5. *Mapping* – Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel. A mapping may be expressed as associations, constraints, rules, templates with parameters that must be assigned during the mapping, or other forms yet to be determined.

For example, in case of CORBA the platform is specified by a set of interfaces and usage patterns that constitute the CORBA Core Specification [CORBA]. The CORBA platform is independent of

operating systems and programming languages. The OMG Trading Object Service specification [TOS] (consisting of interface specifications in OMG Interface Definition Language (OMG IDL)) can be considered to be a PIM from the viewpoint of CORBA, because it is independent of operating systems and programming languages. When the IDL to C++ Language Mapping specification is applied to the Trading Service PIM, the C++-specific result can be considered to be a PSM for the Trading Service, where the platform is the C++ language and the C++ ORB implementation. Thus the IDL to C++ Language Mapping specification [IDLC++] determines the mapping from the Trading Service PIM to the Trading Service PSM.

Note that the Trading Service model expressed in IDL is a PSM relative to the CORBA platform too. This highlights the fact that platform-independence and platform-specificity are relative concepts.

The UML Profile for EDOC specification [EDOC] is another example of the application of various aspects of MDA. It defines a set of modeling constructs that are independent of middleware platforms such as EJB [EJB], CCM [CCM], MQSeries [MQS], etc. A PIM based on the EDOC profile uses the middleware-independent constructs defined by the profile and thus is middleware-independent. In addition, the specification defines formal metamodels for some specific middleware platforms such as EJB, supplementing the already-existing OMG metamodel of CCM (CORBA Component Model). The specification also defines mappings from the EDOC profile to the middleware metamodels. For example, it defines a mapping from the EDOC profile to EJB. The mapping specifications facilitate the transformation of any EDOC-based PIM into a corresponding PSM for any of the specific platforms for which a mapping is specified.

Continuing with this example, one of the PSMs corresponding to the EDOC PIM could be for the CORBA platform. This PSM then potentially constitutes a PIM, corresponding to which there would be implementation language specific PSMs derived via the CORBA language mappings, thus illustrating recursive use of the Platform-PIM-PSM-Mapping pattern.

Note that the EDOC profile can also be considered to be a platform in its own right. Thus, a model expressed via the profile is a PSM relative to the EDOC platform.

An analogous set of concepts apply to Interoperability Protocols wherein there is a PIM of the payload data and a PIM of the interactions that cause the data to find its way from one place to another. These then are realized in specific ways for specific platforms in the corresponding PSMs.

Analogously, in case of databases there could be a PIM of the data (say using the Relational Data Model), and corresponding PSMs specifying how the data is actually represented on a storage medium based on some particular data storage paradigm etc., and a mapping from the PIM to each PSM.

OMG adopts standard specifications of models that exploit the MDA pattern to facilitate portability, interoperability and reusability, either through an initio development of standards or by reference to existing standards. Some examples of OMG adopted specifications are:

1. *Languages* – e.g. IDL for interface specification, UML for model specification, OCL for constraint specification, etc.

2. Mappings – e.g. Mapping of OMG IDL to specific implementation languages (CORBA PIM to Implementation Language PSMs), UML Profile for EDOC (PIM) to CCM (CORBA PSM) and EJB (Java PSM), CORBA (PSM) to COM (PSM) etc.

3. *Services* – e.g. Naming Service [NS], Transaction Service [OTS], Security Service [SEC], Trading Object Service [TOS] etc.

4. *Platforms* – e.g. CORBA [CORBA].

5. *Protocols* – e.g. GIOP/IIOP [CORBA] (both structure and exchange protocol), XML Metadata Interchange [XMI] (structure specification usable as payload on multiple exchange protocols).

6. *Domain Specific Standards* – e.g. Data Acquisition from Industrial Systems (Manufacturing) [DAIS], General Ledger Specification (Finance) [GLS], Air Traffic Control (Transportation) [ATC], Gene Expression (Life Science Research) [GE], Personal Identification Service (Healthcare) [PIDS], etc.

For an introduction to MDA, see [MDAa]. For a discourse on the details of MDA please refer to [MDAc]. To see an example of the application of MDA see [MDAb]. For general information on MDA, see [MDAd].

Object Management Architecture (OMA) is a distributed object computing platform architecture within MDA that is related to ISO's Reference Model of Open Distributed Processing RM-ODP[RM-ODP]. CORBA and any extensions to it are based on OMA. For information on OMA see [OMA].

3.0 Adoption Process

3.1 Introduction

OMG adopts specifications by explicit vote on a technology-by-technology basis. The specifications selected each satisfy the architectural vision of MDA. OMG bases its decisions on both business and technical considerations. Once a specification adoption is finalized by OMG, it is made available for use by both OMG members and non-members alike.

Request for Proposals (RFP) are issued by a *Technology Committee* (TC), typically upon the recommendation of a *Task Force* (TF) and duly endorsed by the *Architecture Board* (AB).

Submissions to RFPs are evaluated by the TF that initiated the RFP. Selected specifications are *recommended* to the parent TC after being *reviewed* for technical merit and consistency with MDA and other adopted specifications and *endorsed* by the AB. The parent TC of the initiating TF then votes to *recommend adoption* to the OMG Board of Directors (BoD). The BoD acts on the recommendation to complete the adoption process.

For more detailed information on the adoption process see the *Policies and Procedures of the OMG Technical Process* [P&P] and the *OMG Hitchhiker's Guide* [Guide]. In case of any inconsistency between this document and the [P&P] in all cases the [P&P] shall prevail.

3.2 Steps in the Adoption Process

A TF, its parent TC, the AB and the Board of Directors participate in a collaborative process, which typically takes the following form:

• *Development and Issuance of RFP*

RFPs are drafted by one or more OMG members who are interested in the adoption of a standard in some specific area. The draft RFP is presented to an appropriate TF, based on its subject area, for

approval and recommendation to issue. The TF and the AB provide guidance to the drafters of the RFP. When the TF and the AB are satisfied that the RFP is appropriate and ready for issuance, the TF recommends issuance to its parent TC, and the AB endorses the recommendation. The TC then acts on the recommendation and issues the RFP.

- *Letter of Intent (LOI)*

  A Letter of Intent (LOI) must be submitted to the OMG signed by an officer of the member organization which intends to respond to the RFP, confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements. (See section 4.3 for more information.). In order to respond to an RFP the organization must be a member of the TC that issued the RFP.

- *Voter Registration*

  Interested OMG members, other than Trial, Press and Analyst members,   may participate in specification selection votes in the TF for an RFP. They may need to register to do so, if so stated in the RFP. Registration ends on a specified date, 6 or more weeks after the announcement of the registration period. The registration closure date is typically around the time of initial submissions. Member organizations that have submitted an LOI are automatically registered to vote.

- *Initial Submissions*

  Initial Submissions are due by a specified deadline. Submitters normally present their proposals at the first meeting of the TF after the deadline. Initial Submissions are expected to be complete enough to provide insight on the technical directions and content of the proposals.

- *Revision Phase*

  During this time submitters have the opportunity to revise their Submissions, if they so choose.

- *Revised Submissions*

  Revised Submissions are due by a specified deadline. Submitters again normally present their proposals at the next meeting of the TF after the deadline. (Note that there may be more than one Revised

Submission deadline. The decision to set new Revised Submission deadlines is made by the registered voters for that RFP.)

• *Selection Votes*

When the registered voters for the RFP believe that they sufficiently understand the relative merits of the Revised Submissions, a selection vote is taken. The result of this selection vote is a recommendation for adoption to the TC. The AB reviews the proposal for MDA compliance and technical merit. An endorsement from the AB moves the voting process into the issuing Technology Committee. An eight-week voting period ensues in which the TC votes to recommend adoption to the OMG Board of Directors (BoD). The final vote, the vote to adopt, is taken by the BoD and is based on technical merit as well as business qualifications. The resulting draft standard is called the *Alpha Specification*.

• Business Committee Questionnaire

The submitting members whose proposal is recommended for adoption need to submit their responses to the BoD Business Committee Questionnaire [BCQ] detailing how they plan to make use of and/or make the resulting standard available in products. If no organization commits to make use of the standard, then the BoD will typically not act on the recommendation to adopt the standard - so it is very important to fulfill this requirement.

• Finalization

A Finalization Task Force (FTF) is chartered by the TC that issued the RFP, to prepare an Alpha submission for publishing as a Formal (i.e. publicly available) specification, by fixing any problems that are reported by early users of the specification. Upon completion of its activity the FTF recommends adoption of the resulting Beta (draft) specification. The parent TC acts on the recommendation and recommends adoption to the BoD. OMG Technical Editors produce the Formal Specification document based on this Beta Specification.

• Revision

A Revision Task Force (RTF) is normally chartered by a TC, after the FTF completes its work, to manage issues filed against the Formal Specification by implementers and users. The output of the RTF is a Beta specification reflecting minor technical changes, which the TC

and Board will usually approve for adoption as the next version of the Formal Specification.

3.3 Goals of the evaluation

The primary goals of the TF evaluation are to:

- Provide a fair and open process
- Facilitate critical review of Submissions by members of OMG
- Provide feedback to submitters enabling them to address concerns in their revised submissions
- Build consensus on acceptable solutions
- Enable voting members to make an informed selection decision

Submitters are expected to actively contribute to the evaluation process.

4.0 Instructions for Submitters

4.1 OMG Membership

To submit to an RFP issued by the Platform Technology Committee the submitter or submitters must be either Platform or Contributing members on the date of Submissions deadline, while for Domain Technology RFPs the submitter or submitters must be either Contributing or Domain members. Submitters sometimes choose to name other organizations that support a submission in some way; however, this has no formal status within the OMG process, and for OMG's purposes confers neither duties nor privileges on the organizations thus named.

4.2 Submission Effort

An RFP submission may require significant effort in terms of document preparation, presentations to the issuing TF, and participation in the TF evaluation process. Several staff months of effort might be necessary. OMG is unable to reimburse submitters for any costs in conjunction with their submissions to this RFP.

4.3 Letter of Intent

A Letter of Intent (LOI) must be submitted to the OMG Business Committee signed by an officer of the submitting organization signifying its intent to respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial

availability requirements. These terms, conditions, and requirements are defined in the *Business Committee RFP Attachment* and are reproduced verbatim in section 4.4 below.

The LOI should designate a single contact point within the submitting organization for receipt of all subsequent information regarding this RFP and Submissions. The name of this contact will be made available to all OMG members. The LOI is typically due 60 days before the deadline for initial submissions. LOIs must be sent by fax or paper mail to the "RFP Submissions Desk" at the main OMG address shown on the first page of this RFP.

Here is a suggested template for the Letter of Intent:

This letter confirms the intent of <organization required> (the organization) to submit a response to the OMG <RFP name required> RFP. We will grant OMG and its members the right to copy our response for review purposes as specified in section 4.7 of the RFP. Should our response be adopted by OMG we will comply with the OMG Business Committee terms set out in section 4.4 of the RFP and in document omg/06-03-02.

<contact name and details required> will be responsible for liaison with OMG regarding this RFP response.

The signatory below is an officer of the organization and has the approval and authority to make this commitment on behalf of the organization.

<signature required>

4.4 Business Committee RFP Attachment

This section contains the text of the Business Committee RFP attachment concerning commercial availability requirements placed on submissions. This attachment is available separately as an OMG document omg/06-03-02.

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Commercial considerations in OMG technology adoption

A1 Introduction

OMG wishes to encourage rapid commercial adoption of the specifications it publishes. To this end, there must be neither technical, legal nor commercial obstacles to their implementation. Freedom from the first is largely judged through technical review by the relevant OMG Technology Committees; the second two are the responsibility of the OMG Business Committee. The BC also looks for evidence of a commitment by a submitter to the commercial success of products based on Submissions.

A2 Business Committee evaluation criteria

A2.1 Viable to implement across platforms

While it is understood that final candidate OMG submissions often combine technologies before they have all been implemented in one system, the Business Committee nevertheless wishes to see evidence that each major feature has been implemented, preferably more than once, and by separate organizations. Pre-product implementations are acceptable. Since use of OMG specifications should not be dependent on any one platform, cross-platform availability and interoperability of implementations should be also be demonstrated.

A2.2 Commercial availability

In addition to demonstrating the existence of implementations of the specification, the submitter must also show that products based on the specification are commercially available, or will be within 12 months of the date when the specification was recommended for adoption by the appropriate Task Force. Proof of intent to ship product within 12 months might include:

- *A public product announcement with a shipping date within the time limit.*

- *Demonstration of a prototype implementation and accompanying draft user documentation.*

Alternatively, and at the Business Committee's discretion, submissions may be adopted where the submitter is not a commercial software provider, and therefore will not make implementations commercially

available. However, in this case the BC will require concrete evidence of two or more independent implementations of the specification being used by end- user organizations as part of their businesses. Regardless of which requirement is in use, the submitter must inform the OMG of completion of the implementations when commercially available.

A2.3 Access to Intellectual Property Rights

OMG will not adopt a specification if OMG is aware of any submitter, member or third party which holds a patent, copyright or other intellectual property right (collectively referred to in this policy statement as "IPR") which might be infringed by implementation or recommendation of such specification, unless OMG believes that such IPR owner will grant a license to organizations (whether OMG members or not) on non-discriminatory and commercially reasonable terms which wish to make use of the specification. Accordingly, the submitter must certify that it is not aware of any claim that the specification infringes any IPR of a third party or that it is aware and believes that an appropriate non-discriminatory license is available from that third party. Except for this certification, the submitter will not be required to make any other warranty, and specifications will be offered by OMG for use "as is". If the submitter owns IPR to which an use of a specification based upon its submission would necessarily be subject, it must certify to the Business Committee that it will make a suitable license available to any user on non- discriminatory and commercially reasonable terms, to permit development and commercialization of an implementation that includes such IPR.

It is the goal of the OMG to make all of its technology available with as few impediments and disincentives to adoption as possible, and therefore OMG strongly encourages Submissions of technology as to which royalty-free licenses will be available. However, in all events, the submitter shall also certify that any necessary license will be made available on commercially reasonable, non-discriminatory terms. The submitter is responsible for disclosing in detail all known restrictions, placed either by the submitter or, if known, others, on technology necessary for any use of the specification.

A2.4 Publication of the specification

Should Submissions be adopted, the submitter must grant OMG (and its sublicensees) a world- wide, royalty-free license to edit, store, duplicate

and distribute both the specification and works derived from it (such as revisions and teaching materials). This requirement applies only to the written specification, not to any implementation of it.

A2.5   Continuing support

The submitter must show a commitment to continue supporting the technology underlying the specification after OMG adoption, for instance by showing the BC development plans for future revisions, enhancement or maintenance.

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4.5   Responding to RFP items

4.5.1   Complete proposals

A submission must propose full specifications for all of the relevant requirements detailed in Chapter 6 of this RFP. Submissions that do not present complete proposals may be at a disadvantage.

Submitters are highly encouraged to propose solutions to any optional requirements enumerated in Chapter 6.

4.5.2   Additional specifications

Submissions may include additional specifications for items not covered by the RFP that they believe to be necessary and integral to their proposal. Information on these additional items should be clearly distinguished.

Submitters must give a detailed rationale as to why these specifications should also be considered for adoption. However submitters should note that a TF is unlikely to consider additional items that are already on the roadmap of an OMG TF, since this would pre-empt the normal adoption process.

4.5.3   Alternative approaches

Submitters may provide alternative RFP item definitions, categorizations, and groupings so long as the rationale for doing so is clearly stated. Equally, submitters may provide alternative models for how items are provided if there are compelling technological reasons for a different approach.

4.6 Confidential and Proprietary Information

The OMG specification adoption process is an open process. Responses to this RFP become public documents of the OMG and are available to members and non-members alike for perusal. No confidential or proprietary information of any kind will be accepted in a submission to this RFP.

4.7 Copyright Waiver

Every submission document must contain: (i) a waiver of copyright for unlimited duplication by the OMG, and (ii) a limited waiver of copyright that allows each OMG member to make up to fifty (50) copies of the document for review purposes only. See Section 4.9.2 for recommended language.

4.8 Proof of Concept

Submissions must include a "proof of concept" statement, explaining how the submitted specifications have been demonstrated to be technically viable. The technical viability has to do with the state of development and maturity of the technology on which a submission is based. This is not the same as commercial availability. Proof of concept statements can contain any information deemed relevant by the submitter; for example:

"This specification has completed the design phase and is in the process of being prototyped."

"An implementation of this specification has been in beta-test for 4 months."

"A named product (with a specified customer base) is a realization of this specification."

It is incumbent upon submitters to demonstrate the technical viability of their proposal to the satisfaction of the TF managing the evaluation process. OMG will favor proposals based on technology for which sufficient relevant experience has been gained.

4.9 Format of RFP Submissions

This section presents the structure of a submission in response to an RFP. *All submissions* must contain the elements itemized in section 4.9.2 below before they can be accepted as a valid response for evaluation or a vote can be taken to recommend for adoption.

4.9.1 General

- Submissions that are concise and easy to read will inevitably receive more consideration.

- Submitted documentation should be confined to that directly relevant to the items requested in the RFP. If this is not practical, submitters must make clear what portion of the documentation pertains directly to the RFP and what portion does not.

- The key words "**must**", "**must not**", "**required**", "**shall**", "**shall not**", "**should**", "**should not**", "**recommended**", "**may**", and "**optional**" shall be used in Submissions with the meanings as described in RFC 2119 [RFC2119].

4.9.2 Required Outline

A three-part structure for submissions is required. Part I is non-normative, providing information relevant to the evaluation of the proposed specification. Part II is normative, representing the proposed specification. Specific sections like Appendices may be explicitly identified as non-normative in Part II. Part III is normative specifying changes that must be made to previously adopted specifications in order to be able to implement the specification proposed in Part II.

PART I

- A cover page carrying the following information (a template for this is available [Inventory]):

    - The full name of Submissions

    - The primary contact for Submissions

    - The acronym proposed for the specification (e.g. UML, CORBA)

    - The name and document number of the RFP to which this is a response

    - The document number of the main submission document

    - An inventory of all accompanying documents, with OMG document number, short description, a URL where appropriate, and whether they are normative.

- List of OMG members making Submissions (see 4.1) listing exactly which members are making Submissions, so that submitters can be

matched with LOI responders and their current eligibility can be verified.

- Copyright waiver (see 4.7), in a form acceptable to the OMG.

  One acceptable form is:

  "Each of the entities listed above: (i) grants to the Object Management Group, Inc. (OMG) a nonexclusive, royalty-free, paid up, worldwide license to copy and distribute this document and to modify this document and distribute copies of the modified version, and (ii) grants to each member of the OMG a nonexclusive, royalty-free, paid up, worldwide license to make up to fifty (50) copies of this document for internal review purposes only and not for distribution, and (iii) has agreed that no person shall be deemed to have infringed the copyright in the included material of any such copyright holder by reason of having used any OMG specification that may be based hereon or having conformed any computer software to such specification."

  If you wish to use some other form you must get it approved by the OMG legal counsel before using it in a submission.

- For each member making Submissions, an individual contact point who is authorized by the member to officially state the member's position relative to Submissions, including matters related to copyright ownership, etc. (see 4.3)

- Overview or guide to the material in Submissions

- Overall design rationale (if appropriate)

- Statement of proof of concept (see 4.8)

- Resolution of RFP requirements and requests

  Explain how the proposal satisfies the specific requirements and (if applicable) requests stated in Chapter 6. References to supporting material in Part II should be given.

  In addition, if the proposal does not satisfy any of the general requirements stated in Chapter 5, provide a detailed rationale.

- Responses to RFP issues to be discussed

  Discuss each of the "Issues To Be Discussed" identified in Chapter 6.

PART II

The contents of this part should be structured based on the template found in [FORMS] and should contain the following elements as per the instructions in the template document cited above:

- Scope of the proposed specification

- Proposed conformance criteria

  Submissions should propose appropriate conformance criteria for implementations.

- Proposed normative references

  Submissions should provide a list of the normative references that are used by the proposed specification

- Proposed list of terms and definitions

  Submissions should provide a list of terms that are used in the proposed specification with their definitions.

- Proposed list of symbols

  Submissions should provide a list of special symbols that are used in the proposed specification together with their significance

- Proposed specification

PART III

- Changes or extensions required to existing OMG specifications

  Submissions must include a full specification of any changes or extensions required to existing OMG specifications. This should be in a form that enables "mechanical" section-by-section revision of the existing specification.

4.10 How to Submit

Submitters should send an electronic version of their submission to the *RFP Submissions Desk* (*omg-documents@omg.org*) at OMG Headquarters by 5:00 PM U.S. Eastern Standard Time (22:00 GMT) on the day of the Initial and Revised Submission deadlines. Acceptable formats are Adobe FrameMaker source, ODF (ISO/IEC 26300), OASIS Darwin Information Typing Architecture (DITA) or OASIS DocBook 4.x (or later).

Submitters should make sure they receive electronic or voice confirmation of the successful receipt of their submission. Submitters

should be prepared to send a single hardcopy version of their submission, if requested by OMG staff, to the attention of the "RFP Submissions Desk" at the main OMG address shown on the first page of this RFP.

5.0 General Requirements on Proposals

5.1   Requirements

5.1.1   Submitters are encouraged to express models using OMG modeling languages such as UML, MOF, CWM and SPEM (subject to any further constraints on the types of the models and modeling technologies specified in Chapter 6 of this RFP). Submissions containing models expressed via OMG modeling languages shall be accompanied by an OMG XMI [XMI] representation of the models (including a machine-readable copy). A best effort should be made to provide an OMG XMI representation even in those cases where models are expressed via non-OMG modeling languages.

5.1.2   Chapter 6 of this RFP specifies whether PIM(s), PSM(s), or both are being solicited. If proposals specify a PIM and corresponding PSM(s), then the rules specifying the mapping(s) between the PIM and PSM(s) shall either be identified by reference to a standard mapping or specified in the proposal. In order to allow possible inconsistencies in a proposal to be resolved later, proposals shall identify whether the mapping technique or the resulting PSM(s) are to be considered normative.

5.1.3   Proposals shall be *precise* and *functionally complete*. All relevant assumptions and context required for implementing the specification shall be provided.

5.1.4   Proposals shall specify *conformance criteria* that clearly state what features all implementations must support and which features (if any) may *optionally* be supported.

5.1.5   Proposals shall *reuse* existing OMG and other standard specifications in preference to defining new models to specify similar functionality.

5.1.6   Proposals shall justify and fully specify any *changes or extensions* required to existing OMG specifications. In general, OMG favors proposals

that are *upwards compatible* with existing standards and that minimize changes and extensions to existing specifications.

5.1.7   Proposals shall factor out functionality that could be used in different contexts and specify their models, interfaces, etc. separately. Such *minimalism* fosters re-use and avoids functional duplication.

5.1.8   Proposals shall use or depend on other specifications only where it is actually necessary. While re-use of existing specifications to avoid duplication will be encouraged, proposals should avoid gratuitous use.

5.1.9   Proposals shall be *compatible* with and *usable* with existing specifications from OMG and other standards bodies, as appropriate. Separate specifications offering distinct functionality should be usable together where it makes sense to do so.

5.1.10 Proposals shall preserve maximum *implementation flexibility*. Implementation descriptions should not be included and proposals shall not constrain implementations any more than is necessary to promote interoperability.

5.1.11 Proposals shall allow *independent implementations* that are *substitutable* and *interoperable*. An implementation should be replaceable by an alternative implementation without requiring changes to any client.

5.1.12 Proposals shall be compatible with the architecture for system distribution defined in ISO's Reference Model of Open Distributed Processing [RM-ODP]. Where such compatibility is not achieved, or is not appropriate, responses to the RFP must include reasons why compatibility is not appropriate and an outline of any plans to achieve such compatibility in the future.

5.1.13 In order to demonstrate that the specification proposed in responses to this RFP can be made secure in environments requiring security, answers to the following questions shall be provided:

- What, if any, are the security sensitive elements that are introduced by the proposal?

- Which accesses to security-sensitive elements must be subject to security policy control?

- Does the proposed service or facility need to be security aware?

- What default policies (e.g., for authentication, audit, authorization, message protection etc.) should be applied to the security sensitive elements introduced by the proposal? Of what security considerations must the implementers of your proposal be aware?

The OMG has adopted several specifications, which cover different aspects of security and provide useful resources in formulating responses. [CSIV2] [SEC] [RAD].

5.1.14 Proposals shall specify the degree of internationalization support that they provide. The degrees of support are as follows:

a) Uncategorized: Internationalization has not been considered.

b) Specific to <region name>: The proposal supports the customs of the specified region only, and is not guaranteed to support the customs of any other region. Any fault or error caused by requesting the services outside of a context in which the customs of the specified region are being consistently followed is the responsibility of the requester.

c) Specific to <multiple region names>: The proposal supports the customs of the specified regions only, and is not guaranteed to support the customs of any other regions. Any fault or error caused by requesting the services outside of a context in which the customs of at least one of the specified regions are being consistently followed is the responsibility of the requester.

d) Explicitly not specific to <region(s) name>: The proposal does not support the customs of the specified region(s). Any fault or error caused by requesting the services in a context in which the customs of the specified region(s) are being followed is the responsibility of the requester.

5.2   Evaluation criteria

Although the OMG adopts model-based specifications and not implementations of those specifications, the technical viability of implementations will be taken into account during the evaluation process. The following criteria will be used:

5.2.1   Performance

Potential implementation trade-offs for performance will be considered.

5.2.2 Portability

The ease of implementation on a variety of systems and software platforms will be considered.

5.2.3 Securability

The answer to questions in section 5.1.13 shall be taken into consideration to ascertain that an implementation of the proposal is securable in an environment requiring security.

5.2.4 Conformance: Inspectability and Testability

The adequacy of proposed specifications for the purposes of conformance inspection and testing will be considered. Specifications should provide sufficient constraints on interfaces and implementation characteristics to ensure that conformance can be unambiguously assessed through both manual inspection and automated testing.

5.2.5 Standardized Metadata

Where proposals incorporate metadata specifications, usage of OMG standard XMI metadata [XMI] representations must be provided as this allows specifications to be easily interchanged between XMI compliant tools and applications. Since use of XML (including XMI and XML/Value [XML/Value]) is evolving rapidly, the use of industry specific XML vocabularies (which may not be XMI compliant) is acceptable where justified.

6.0 Specific Requirements on Proposals

This section contains the requirements and supporting information specific to this RFP.

6.1 Problem Statement

This sub-section describes the problem to be addressed by the AML UML Profile. The content of this sub-section is not intended to define requirements for submitters, but rather to provide an understanding of the problem and the issues to be addressed. The mandatory requirements are contained in section 6.5 and optional requirements are contained in section 6.6.

6.1.1 Background

There is a need for information interoperability between health entities. Information needs to be shared between organizations and across international boundaries. The inability to share this information in a repeatable manner greatly affects the quality of care provided. The Clinical Information Modeling Initiative (CIMI) has the potential to be a disruptive innovation in eHealth. By providing the AML specifications for the representation of health information content, semantically interoperable information may be created and shared in health records, messages, and documents. The CIMI initiative affords the opportunity to enable the storage of lifelong health information; simplify data exchange, aggregation, querying and analysis; and support knowledge-based activities such as decision support. This will be achieved through the development of non-proprietary, common and fully defined information models of clinical content and known transformations.

The clinical reference model (an instance of a reference model), clinical archetype models and associated terminology will serve as the domain vocabulary for clinical information. The syntax and semantics defined by these clinical archetype models shall be maintained by users, in a common language that can be consistently understood and shared. The AML Profile will enable the creation, definition and use of this common language in UML.

The purpose of the AML Profile is to enable an UML ecosystem that supports and underpins CIMI activities through the use of adopted standards. The AML Profile will provide a clear, consistent means of designing clinical models using UML, where tool vendors may add additional value/usability; clinical modeling concepts are separated from specific solutions (ex. XML, JSON, DB schema, etc.); and the creation of open source solutions is enabled.

This RFP seeks a solution that will:
- Create a collection of complementary UML profiles that work together to support the creation of CIMI content models;

- Support the specification of CIMI content models in UML, such that they can be translated into AOM 1.5;

- Be capable of being used in other domain areas, with other reference models;

- Be capable of being used in developing specific implementations of CIMI content models using platform specific solutions (e.g. Clinical Document Architecture (CDA), openEHR etc.)

The AML Profile will provide consistency, by ensuring that a UML representation of a CIMI model produced by one developer can be accurately interpreted by developers, modelers and transformations. It will offer completeness by ensuring that a developer can produce a UML representation of any CIMI reference and constraint model. Finally, the AML Profile will offer practicality by ensuring that a developer/modeler can develop a CIMI compliant clinical model by employing the profile in current UML modeling tools.

Within the healthcare community the pattern of creating a common model that is reused by others to create specialized models through constraining the original model is often referred to as reference / constraint modeling. The reference model consists of syntax-neutral and technology-independent building blocks that can be used for data modeling. Major benefits of this approach include improved reuse of existing data artifacts and improved enterprise interoperability.

6.2 Scope of Proposals Sought

Submissions should provide a family of UML sub-profiles that enables the representation of semantic-based information models and addresses the problem of the lack of semantic interoperability within and between applications and databases in healthcare computing environments, including across enterprises and national borders. <u>The AML Profile is the aggregation of three sub-profiles – the Reference Model Profile (RMP), the Constraint Model Profile (CMP) and the Terminology Binding Profile (TBP)</u>.

Traditionally, a single model containing all the required information concepts is designed for a specific application, transport and database without regard to interoperability. Standards for the exchange of that health data between applications and databases have been focused on static message definitions that have not enabled a sufficient degree of interoperability or flexibility. They have not enabled 'single-source' modeling, whereby a single definition (e.g. a microbiology lab result) can be re-used for multiple purposes, such as a message definition, a document definition, a screen display form, a screen data capture form, or a report.

A more flexible and interoperable way of standardizing business semantics has long been required.

Submissions should provide a means for developing a common set of semantic building blocks that represent the general types of healthcare data in use today. The solution should provide an approach for the creation of new healthcare information models and the semantic binding of these information models to published terminologies to achieve semantic interoperability of data.

The desired solution can be employed wherever health data is being defined, stored, used, shared or exchanged. It will be especially well suited for defining clinical data models and for creating data exchange standards for information flows amongst and between health agencies worldwide, governmental agencies, and/or other organizations in an open, global environment.

The user community is drawn from both business and government, and includes data modelers, business document modelers, business process modelers, and application developers of different health organizations that require a common understanding and interoperability of information.

Underpinning the responses to this RFP should be the use of MDA with the separation of concerns between what is required to solve a specific problem, the platform independent model (PIM), and the specific technology solutions to be employed in a solution, the platform specific model (PSM). Using MDA techniques and technologies the platform specific model is "provisioned" from the platform independent model by using mapping and transformation technologies.

The platform independent model (PIM) is a logical specification of information and knowledge that does not include specific technology choices or parameters, but as an example in the case of CIMI does contain the logical clinical models. In the context of CIMI the PIM represents the language for clinical modeling – in this case, AML. When provisioning from the PIM to the PSM, the specific technology choices of the PSM (egg. CDA, CDL, etc.) need to be specified, as do specific platform specific parameters such as technology namespaces, metadata, etc.

To maintain this separation of concerns, AML requires a collection of UML profiles: a Reference Model Profile, a Constraint Model Profile and a Terminology Binding Profile (with an optional binding to CTS2) to be used to define domain specific PIM(s) (i.e. Clinical information models), and an optional set of transformations that may bi-directionally transform AML models to and from AOM 1.5 models.

The following diagram (figure 1) is intended to provide a conceptual architecture of the desired profile. It depicts the relationships between the AML components and other model abstractions and resources (e.g. CTS2). Reponses to this RFP should provide a minimum of three separate profiles: a Reference Model Profile, a Constraint Model Profile and a Terminology Binding Profile.

The Terminology Binding Profile may provide binding semantics necessary to access and retrieve terminology sets from a CTS2 compliant resource. This binding will support the ability to query CTS2 compliant servers in the process of building clinical models. Furthermore, a transformation from AML models to semantically equivalent Archetype Object Models (AOM) is strongly desired, but is optional. If not provided, it must be demonstrated that this transformation is possible. The figure below shows the CIMI Reference model (defined using the Reference Model Profile) and a Clinical Information Model for Blood Pressure (defined using the Constraint Model and Terminology Binding Profiles) as an example. The Clinical Information Model is a constrained model based upon the CIMI Reference model. The AML profile could also be used to create other

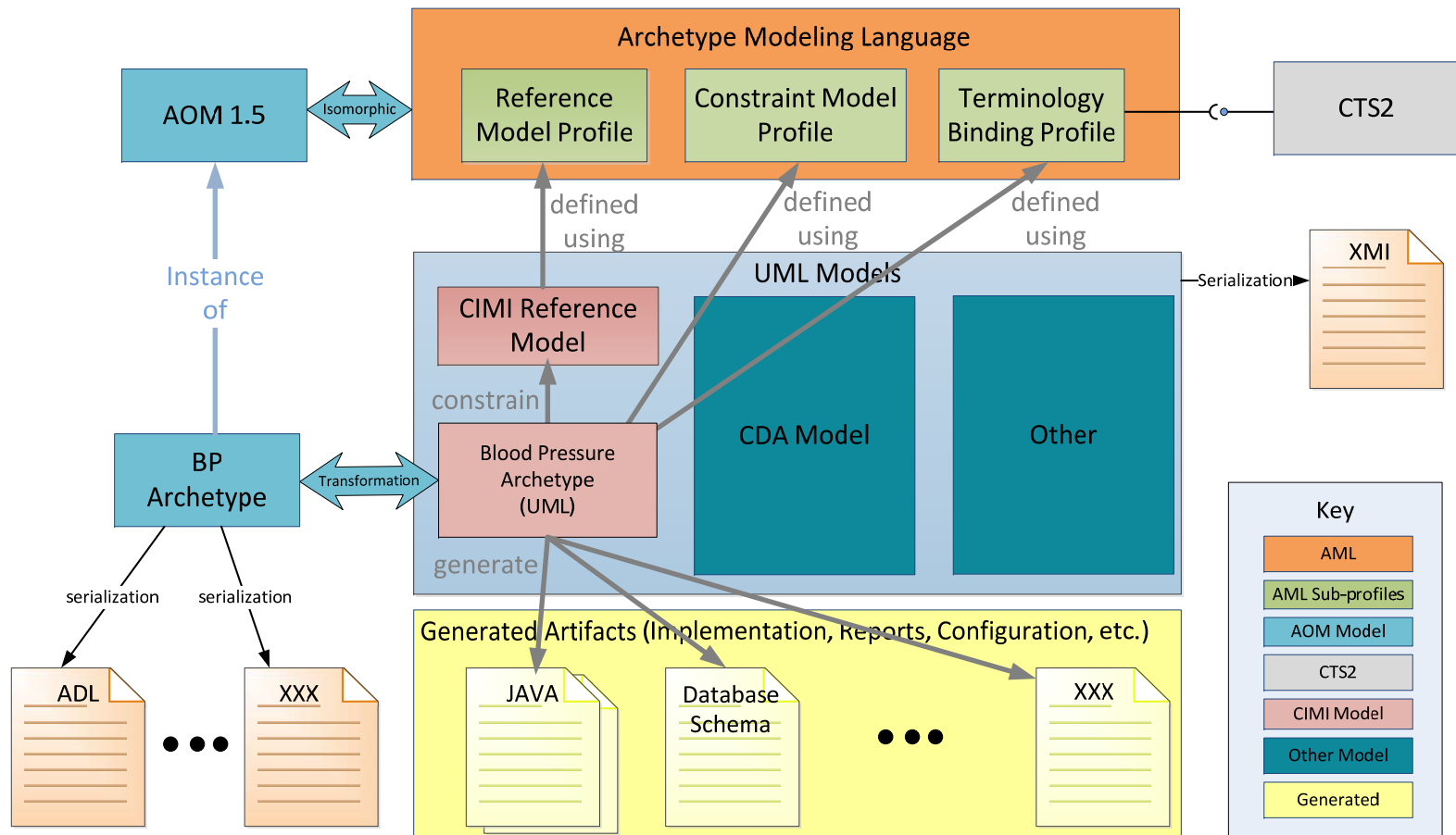domain specific reference models, such as that used by the Clinical Document Architecture (CDA http://hl7book.net/index.php?title=CDA) or CDL.

Figure 1. Conceptual Profile Architecture

6.2.1.1 Support for Reference Modeling (RM)

The CIMI modeling methodology utilizes a two level modeling approach. The first level, the reference model, defines the "language" of clinical modeling. The reference model is an UML model, defined using the Reference Model Profile (RMP). All subsequent (progeniture) information models are constrained subsets of the reference model. The RMP is expected to be extremely small, since its only requirement is to enable instances of information model classes to carry information about the RM elements from which they were derived. In the case of openEHR, for example, this is achieved since all reference model elements inherit from a common class LOCATABLE, which includes attributes such as archetype_node_id and archetype_details, used to record archetype information in data instances. A RMP might enable this via a class stereotype that ensures that these attributes are included in all Reference Model elements.

6.2.1.2 Support for Constraint Modeling

The purpose of the Constraint Modeling Profile (CMP) is to provide the semantics of constraints, to enable the construction of archetypes (e.g. Clinical Information Models) that are constrained sub-sets of the reference model.

Constraint modeling allows the reuse of either the RM classes, or preexisting archetypes to define new, but further constrained archetypes. An archetype is a subset of the progenitor model and may not introduce new model elements (i.e. classes or properties) or inflate constraints. It may only reuse existing elements from the RM or progenitor models that maybe further narrowed.

6.2.1.3 Support for Terminology Binding

The UML profile for terminology binding enables a PIM-level information model to define the semantic meaning of classes and associations, and to constrain class attributes to value sets that are defined in external terminology systems (e.g. SNOMED-CT or LOINC).

It is NOT the goal of the Terminology Binding Profile (TBP) to support the representation of a terminology system, such as the relationship of concepts within SNOMED-CT. However, it is expected that the TBP will include sufficient metadata about terminology systems to facilitate binding references to them and to validate that instances of the reference model satisfy modeled terminology

constraints. It is also expected that lists of terminology system codes (value sets) may be represented in UML, using profile stereotypes as necessary, or as references to externally defined value sets within a terminology system.

The responses will address the linkage of the data model to Value Sets, where the values must be restricted to a discrete set that correspond to a set of meanings and/or terms recorded in an external terminology (ontology). The set of possible meanings can potentially be (a) large - possible values may include thousands of possibilities, (b) dynamic - the contents of the meaning lists may undergo frequent updates independent of model updates and (c) context specific - the set of permissible meanings for a given enumeration may be connected to different sets of meanings in different contexts.

It should be noted that ISO 11179 contains one additional model element - Enumerated Value Domain - which identifies a set of possible values in a data record that are then mapped to corresponding elements in the Enumerated Conceptual Domain.

Responses will address the ability to associate a named concept domain and/or value set identifier with a model element and the ability to use a terminology service to resolve Conceptual Domains and Value Sets for both viewing and model publication. The semantic binding needs to be able to bind to anything – classes, attributes and associations. Each binding in a specialized archetype should be subsumed by the associated binding in the parent archetype.

6.2.2 The Future Benefits

- **Availability –** CIMI models are expressed in the same UML tooling environment in which the software is being constructed, making content models directly available to software developers.
- **Based on Best Practices**- Services will be based on established open standards
- **Reduces Time to Success –** There is an established user base of modelers using UML who are comfortable with the technology.
- **Plug and Play –** Will be implemented consistently by multiple tool vendors who are prolific in the market.
- **Reduced Risk –** By aligning the profile with the needs of the CIMI requirements, we are spreading the development risk over a much larger community rather than one group assuming the burden.

- **Rapid Uptake –** Organizations are inherently more comfortable with a standards-based approach. The solution is not proprietary, but is the aggregation of many different people, skills, talents, and experiences.

6.2.3 Use of Model-Driven Architecture and UML

Model-Driven Architecture (MDA) is the OMG approach to defining the functionality of systems in structured models. One of the value propositions of MDA is that software developers can generate executable software. The structured models represent the "logical" view of the required functionality in a *platform-independent model (PIM)* that intentionally avoids any dependency on a particular program language, operating system, application platform, or other physical mechanism. The translation of the PIM into a physical form that a computer can execute happens via one or more transformations supported by tooling designed to bridge the logical and physical layers.

The development of tools to support MDA has relied upon the adoption of open standard modeling formats, such as UML. The very nature of tools that bridge separate domains—such as abstract modeling and physical execution—necessitates an approach that is inclusive of multiple vendors, execution models, and programming languages. It is likely that without the foundation of open standard modeling notations and metamodels[2], MDA could never have achieved its current level of adoption and success.

Many architects and developers are familiar with UML in its graphical, diagrammatic form—and it is indeed useful for communication via visual models. However, in a MDA context, a significant feature of UML is that it includes a standards-based representation of the structure of the model underneath the graphical representation. At the lowest level, this representation consists of the XML Metadata Interchange (XMI) format, which specifies an XML-based structure for representing generic models. The Meta Object Facility (MOF) leverages XMI to establish metamodels for modeling frameworks like UML, and enables a diverse, robust ecosystem of tools to grow around these frameworks. The ultimate result of the standards-based approach is that models exist in a predictable, consistent, vendor-neutral format that allows tools to read, manipulate, and leverage the structure in each model, independent of the graphical representation that is most familiar to human users.

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[2]

While in theory it may be possible to generate a platform-specific, executable output artifact from an arbitrary UML model, in practice most MDA tools require the use of UML stereotypes, as defined in UML profiles, to guide the generation. UML has long supported the notion of a profile to constrain the UML metamodel in order to meet the requirements of a certain modeling domain or methodology. MDA tools leverage profiles to prevent modelers from defining model constructs that are impossible to represent in the physical layer, and to provide generation mechanisms with the specific information they need to produce correct physical models.

While MDA has most extensively been used to support the development of executable software, the philosophy and concepts of MDA can easily be extended to support exchange specification artifacts, such as MPDs (Model Package Descriptions), that have a physical representation in XML Schema.

6.2.4 Recognition of related efforts

NIEM represents a successful effort to support cross-enterprise information sharing in the U.S. Government. Other efforts to support information sharing and architectural metadata include "UCORE" and "DoDAF", both sponsored by the U.S. Department of defense. DoDAF is a comprehensive architectural framework for defense which is also supported as a UML profile, UPDM. UCORE enables federal, state, local and tribal government agencies, and non-government organizations to share and aggregate situational awareness information.

DoDAF, UCORE and potentially other programs may both complement and overlap with the AML Profile. While this RFP does not require unification with these other efforts, submitters are asked to consider reuse and integration where appropriate and discuss how NIEM-UML relates to their submission.

6.3 Relationship to other OMG Specifications and activities

6.3.1 Relationship to OMG specifications

The following OMG specifications may be related to AML:

- Unified Modeling Language (UML 2.4.1) - formal/2012-05-06 and formal/2012-05-07. UML provides an extensible and accepted modeling framework.
- Object Constraint Language (OCL) - http://www.omg.org/spec/OCL/2.3.1. OCL provides a language for specifying constraints in models.
- Unified Profile for DoDAF/MODAF (UPDM) 2.0 (http://www.omg.org/spec/UPDM/). UPDM is the UML representation of the defense architectural standards DoDAF and MoDAF.
- Meta Object Facility (MOF 2.4.1) - http://www.omg.org/spec/MOF/2.4.1. MOF provides a framework for meta-modeling in which the abstract syntax of UML and other modeling languages is described.
- XML Metadata Interchange (XMI®) - http://www.omg.org/spec/XMI/2.4.1. XMI provides a XML interchange format for MOF models.
- Query/View/Transformation - QVT (http://www.omg.org/spec/QVT/1.1): QVT is the OMG standard for expressing model transformation rules.
- MOF Models to Text Transformation Language - http://www.omg.org/spec/MOFM2T/1.0/. Model to text provides a way to specify transformation of models to textual representations.
- CWM – Common Warehouse Metamodel (http://www.omg.org/spec/CWM/1.1) defines a meta model for common data modeling schema
- SBVR - Semantics of Business Vocabulary and Business Rules (http://www.omg.org/spec/SBVR/1.0) specifies a model for defining business vocabulary and rules
- SOPES: dtc/2010-05-08 Shared Operational Picture Exchange Services (SOPES)
- Reusable Asset Specification (RAS) - http://www.omg.org/spec/RAS/2.2. RAS provides guidelines and recommendations about the structure, content and descriptions of reusable software assets.
- Information Exchange Data Model (IEDM): This has a relationship to the JC3IEDM named in the document already.
- Model Driven Message Interoperability (MDMI) - http://www.omg.org/spec/MDMI/1.0/. MDMI provides a standard for data interchange (mapping) between different messages and file formats.
- Ontology Definition Meta Model (ODM) – http://www.omg.org/spec/ODM/1.0/. ODM provides MOF and UML representations of multiple ontology languages including OWL, RDF/S and Common Logic.

Most of the above specifications have an active standards process and submitters should consult the OMG web site for possible revised versions of these specifications. Use of newer versions of specifications is encouraged but not required.

6.3.1.1 UML and OCL

AML will be based on UML and will contain UML profiles that support OCL (Object Constraint Language) constraints where practical.

6.3.1.1 QVT

Transformations specified in AML profile may be specified in QVT (Query/View/Transformation) where practical.

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6.3.1.2 ODM

ODM (Ontology Definition Metamodel) may be used for optional requirement 6.6+ to provide a platform specific model based on RDF-Schema. ODM may also be considered for the representation of the vocabularies contained in CIMI reference namespaces.

6.3.1.3 Model Driven Message Interoperability (MDMI)

MDMI is complementary to AML Profile and anticipates AML can be used to enhance the use and value of MDMI in healthcare. Areas that may be explored are the generation of some or all of MDMI Maps, some or all of the MDMI Referent Index, and providing traceability between Reference Models in AML Profile and legacy industry standard messages and legacy data in existing healthcare systems.

6.3.2   Relationship to other OMG Documents and work in progress

6.3.2.1 Information Meta Model (IMM) – (http://www.omg.org/techprocess/meetings/schedule/IMM_RFP.html). IMM will include a meta model for XML schema that can be used with a QVT mapping for CIMI.

6.3.2.2 Information Exchange Framework (IEF) Policy Vocabulary (IEPV) RFP - http://www.omg.org/techprocess/meetings/schedule/IEF_IEPV.html. The objective of Information Exchange Framework (IEF) Policy Vocabulary is

to enhance the ability of organizations to describe the rules governing the sharing and protection of information.

6.3.2.3 UML Profile for XBRL Global Ledger Framework - http://www.omg.org/techprocess/meetings/schedule/UML_Profile_for_XBRL_Global_Ledger_Framework_RFP.html. XBRL provides standard exchange schema that may be related to CIMI.

6.3.2.4 NIEM-UML Profile – National Information Exchange Model UML Profile (Gov/2012-06-02)

6.4   Related non-OMG Activities, Documents and Standards

6.4.1 CIMI Specifications

AML is a collaborative effort between the OMG and CIMI communities. The normative specifications produced under CIMI represent requirements for AML. These documents include:

- The CIMI Reference Model (UML class diagram and Word documentation)

- The openEHR Archetype Object Model 1.5 (modified to support CIMI requirements)

The process of utilizing UML for modeling CIM (Clinical Information Model) has already started within the CIMI community. This existing effort is expected to represent a starting point for the OMG standard but conformance with it is not required (http://informatics.mayo.edu/CIMI/index.php/Main_Page).

6.4.2 OHT

Open Health Tools (OHT) is a non-profit trade association that promotes the availability of open technologies in healthcare worldwide. With over 60 members, OHT is transforming the global market for healthcare IT in ways that make access to high quality healthcare easier and more affordable. Open Health Tools develops and uses open source software code and implements transparent and egalitarian governance processes that serve the needs of development communities around the world.

6.4.3 OpenEHR

The openEHR Foundation is a not-for-profit foundation supporting the open research, development, and implementation of openEHR EHRs. The openEHR specifications are based on a combination of 15 years of European and Australian research and development into EHRs and new paradigms, including what has become known as the archetype methodology for specification of content. The openEHR specifications include information and service models for the EHR, demographics, clinical workflow and archetypes. They are designed to be the basis of a medico-legally sound, distributed, versioned EHR infrastructure.

6.4.4 HL7

The Health Level Seven (HL7) Reference Information Model (RIM) is a static model of health and health care information as viewed within the scope of HL7 standards development activities. The RIM is the ultimate source from which all HL7 version 3.0 protocol specification standards draw their information-related content.

The HL7 V3 standard development process is a model-driven methodology in which a network of inter-related models are developed to depict the static and behavioral aspects of the requirements and design of HL7 standards, as well as the underlying semantics and business rules that govern them.

The RIM provides a static view of the information needs of HL7 V3 standards. It includes class and state-machine diagrams and is accompanied by use case models, interaction models, data type models, terminology models, and other types of models to provide a complete view of the requirements and design of HL7 standards.

The classes, attributes, state-machines, and relationships in the RIM are used to derive domain-specific information models that are then transformed through a series of constraining refinement processes to eventually yield a static model of the information content of an HL7 standard.

6.4.5 ISO13972 DCM

The ISO TC 215 health informatics project for DTS 13972 Detailed Clinical Models (Draft Technical Specification) provides a solid set of requirements for clinical model specifications and processes for involvement and governance.

An implementation of those requirements is realized in a UML Style Guide <http://results4care.wikispaces.com/DCM_UML_StyleGuide>. That UML Style Guide is used to create a number of UML DCM's in various project in the Netherlands and for HL7.

Health informatics - Detailed Clinical Models - Part 1: Quality processes regarding detailed clinical model development, governance, publishing and maintenance

Health informatics - Detailed Clinical Models - Part 2: Quality attributes of detailed clinical models

6.4.6 UCore

UCore is a joint U.S. DOD (Department of Defense), Intelligence Community (IC), DOJ (Department of Justice) and DHS (Department of Homeland Security) program that started in 2007 to enable federal, state, local and tribal government agencies, and non-government organizations to share and aggregate situational awareness information. A widespread example of this is plotting objects on a map from disparate organizations unified by a common purpose, such as, responding to a cyber-first strike. From a technical perspective, UCore 2.0 is an extensible markup language (XML) specification for *where, when, who, what* aspects of information sharing.

In 2008, the Chief Architect, Office of Management and Budget (OMB), the DOD Chief Information Officer (CIO), and the IC CIO endorsed the UCore. In 2010, the North American Treaty Organization (NATO), the Multi-lateral Interoperability Programme (MIP), and the ABCA nations decided to use the UCore as the foundation for interoperability, as they decompose the Joint Command Control and Consultation Information Exchange Data Model (JC3IEDM) into loosely coupled models managed by COIs.

UCore was designed with the assumption that only a small number of data elements should be standardized across a diverse set of organizations that support a multitude of missions, mission partners and business functions. Consequently, the scope of the UCore data dictionary was limited to four (4) interrogatives: when, where, who and what. NIEM was designed with the assumption that any data could be standardized across community boundaries.

UCore implements the DOD Metadata Specification (DDMS) and IC standard for security marking. Both specifications can be applied to the entire message or individual data elements. The Universal Lexicon (ULEX) framework, developed by DOJ, is so tightly coupled with the UCore interrogatives that it is part of the UCore standard.

AML and UCore are two distinct tools within the information exchange toolkit. UCore includes a messaging format, while AML represents a content standard which is message format agnostic. AML's focus is the data layer of an information exchange. As such, AML intentionally does not address all of the necessary technologies for information exchange. The AML metadata specification would therefore need to be extended to support DDMS.

More information about UCore may be found at https://ucore.gov/ucore/.

6.5   Mandatory Requirements

6.5.1   AML Logical Profile

Submissions shall specify an AML Logical Profile as defined below. The AML Profile shall be a set of UML stereotypes and properties which support the modeling of CIMI archetypes. The use of the AML Profile shall result in UML models that are free from dependency on any physical representation (such as XML Schema). In MDA terms, the AML Profile is a specification of the platform independent model (PIM).

6.5.1.1 AML Sub-Profiles

Submissions shall be comprised of a minimum of three sub-profiles: the Reference Model Profile, Constraint Model Profile, and the Terminology Binding Profile.   Effectively, the AML Logical Profile is an aggregation of these subprofiles.

Elements defined in one sub profile should be reused in the other sub profiles; they should not be redefined

6.5.1.2 AML Model Lifecycle Meta Data

<u>Submissions shall provide support for AML Lifecycle metadata on the model to address version management, profile naming, references, namespace, etcetera. At a minimum, submissions shall support the items below. Submitters shall designate which metadata items are mandatory.</u>

- Identifier -- unique id of this model
- namespace -- reverse domain name of organization that published this model
- modelVersion – version of the archetype (i.e. model)
- profileVersion – version of the AML profile
- profileTool – tool and version of tool used to produce the model
- referenceModel -- name of reference model on which this model is based
- referenceModelVersion -- version of the reference model on which this model is based
- referenceModelPublisher -- name of organization publishing the reference model on which this model is based
- referenceModelPackageClosure -- name of the reference model package whose association closure defines the group for this model. It defines the package or packages that are considered the namespace used that may be reused and constrained, i.e. the name of an RM package whose class provides the set of classes that may be subsetted.
- referenceModelClass -- name of the class from the reference model which is the root class (Primogenitor) of this model
- lifecycleState -- with values like Initial, Draft, In Review, Approved, Published, Superseded, Obsolete
- isGenerated -- indicates whether this model was generated rather than being authored. This is used to determine whether or not the model can be overwritten by regeneration.

6.5.1.3 AML Model Descriptive Meta Data

<u>Submissions shall include the concept of an ALM Model as part of the Profile. The profile shall allow for metadata tagging of ALM Models based upon the metadata items enumerated below, taken from ISO 13606.2. Deviations from this metadata set shall be substantiated in the submission</u>

- Description: Text
- originalAuthor: Hash <String, String> - example:
    - "name": "John Doe"
    - "organisation": "Beverly Hillbillies"
    - "email": "john.doe@gmail.com"
    - "date": "12/04/2011"
- contributors: List <String>
- purpose: Text
- use: Text
- misuse: Text
- keywords: List <Text>
- resources: List<Uri>otherDetails: Hash <String, String>
- copyright: Text

6.5.1.4 Original Language Metadata Support.

Submissions shall provide the ability for AML model to be tagged to indicate the original natural language of expression and language translations. Example items such as the following subset are included for consideration. Submissions shall substantiate the metadata chosen.

- originalLanguage
- translations: including, for each language:
    - language
    - author
    - otherDetails (e.g. name, value pair)
    - accreditation

6.5.1.5 Archetype Object Model (AOM) 1.5

Submissions shall provide functional coverage for the full set of capabilities or equivalent, as defined in AOM 1.5 [AOM].

6.5.1.6 Language Translations

Submissions shall allow each model element to have one or more translations recorded for each of its values (e.g. between international and realm-specific reference terms or between semantically equivalent terms in different coding systems).

6.5.2 Reference Profile Requirements

6.5.2.1 Model element references to reference model

Submissions shall support the ability to model the relationships between archetype model elements (AME) and the reference model elements (RME) from which they are defined.

An AME is any model element that is defined by constraining a RME. An archetype is an aggregation of AMEs. An AME is considered to be a subset of the associated RME, in that all possible sets of instances of the AME must be contained in the set of possible instances of the RME. The RME is said to subsume the AME, and the AME is subsumed by the RME.

A reference model defines a stereotype (or pattern graph) projecting a universe of potentially compliant instances. A Reference Model Element is a well-formed compliant instance of the Reference Model, and a Subset Model Instance is a partial graph of an RME.

6.5.2.2 Model element references to progenitor model elements

Submissions shall support the ability of each archetype model element (AME) to be associated with progenitor model elements.

Each AME should have the ability to be defined by reference to another AME. This enables an AME to be defined as a subset of an AME from a parent archetype model. It also allows archetype model instances to be associated on an element by element basis with its progenitor / primogenitor archetype model.

6.5.2.3 Reference Model Primogenitor

Submissions shall support the ability of each archetype model element to be directly or indirectly (through subsetting) extended from a single meta element, which contains all the tags/properties required by all archetype model elements. Submissions shall substantiate properties chosen.

6.5.2.4 Primitive Types

Submissions shall provide a set of primitive data types. Example items such as the following are included for consideration. Submissions shall substantiate the set of primitive types chosen.

Integer, Real, Boolean, Character, String, Date, Time, DateTime and Duration.

The set of primitive types selected shall be sufficient to support the definition of the CIMI Reference Model(http://informatics.mayo.edu/CIMI/index.php/Main_Page).

6.5.3 Constraint Model Profile Requirements

6.5.3.1 Identification

Submissions shall provide the ability to immutably and uniquely name model elements.

6.5.3.2 Reference Model (RM) conformance

Submissions shall provide the ability to define archetype models (AMs) as progeniture constrained subset models of a reference model. All elements in an AM are directly associated with the RM and their instances are a subset of the instances of the RM.

An archetype model conforms to and is subsumed by the reference model if and only if it does not violate any inheritance, containment, association relationship, multiplicity of any property, type, constraint, etc in the reference model. An archetype model SHALL NOT EXTEND the reference model (ie. Add new properties, classes, up cast types, or relax existing constraints). The archetype model may only narrow the reference model or another archetype model.

6.5.3.3 Model Specialization (Narrowing)

Submissions shall provide the ability to reference and define specializations of previously defined archetype models (AMs).
It should be possible to create archetype models (progeniture) that are specializations of other archetype models, where the specialized (progeniture) model is more tightly constrained than its parent (progenitor) model.

6.5.3.4 Differential representation of specialized models

Submissions shall provide the ability for differential representation of archetype models (AMs).

A specialized AM is represented differentially with respect to its parent AM, by only representing the differences between the specialized AM and its parent. This differential representation uses the same approach as a

subtype class in UML which contains only the differences with respect to the ancestor class. This ensures maintainability.

6.5.3.5 Model Flattening

Submissions shall provide a flattening specification.

The profile supports the flattening of lineages of specialized AMs represented in differential form into the effective 'flat form' at any point in the specialization hierarchy. The flattened form should include all constraints that have been applied in the given AM and in any ancestor (progenitor) AM. The application of the flattening specification must always produce the same results.

6.5.3.6 Model Flattening Pedigree

Submissions shall provide the ability to capture and maintain tractable lineage from flattened to progenitor AMs.

The profile shall support the ability to capture and maintain the lineage of specialization from each element of a specialized AM to the corresponding element of each ancestor (progenitor) AM.

6.5.3.7 Model Direct Associations

Submissions shall provide the ability for an AM to be re-used by another AM by direct reference.

6.5.3.8 Model Constrained Associations ('Slots')

Submissions shall provide the ability for an AM to be composed from a set of other pre-existing AMs.

An AM can specify a 'slot' or entry point at which other AMs can be included. The valid set of AMs that can be included in a given slot can be specified in terms of constraints on the includable AMs based on their content/concept.

6.5.3.9 Model Constraints – Reference Model class subtype

Submissions shall allow model elements within an AM to be constrained to a given Reference Model class subtype.

6.5.3.10 Attribute Value Constraints

Submissions shall provide the ability in an AM to constrain RM attributes to a given type and to specify a valid value set.

Attributes of a primitive type (typically Integer, Real, Boolean, Character, String, Date, Time, DateTime and Duration) within the reference model can be constrained to specific value subsets in an AM, e.g. using ranges, specific values or by other means such as patterns.
For example, an attribute defined as a string value shall be able to be constrained to limit acceptable values, such as a two-character strings where the first is Alphabetic and the second is numeric from 1-5.

6.5.3.11 Default and Assumed values

Submissions shall provide the ability to provide default and assumed values for AM elements of both primitive and complex types.

6.5.3.12 Occurrences

Submissions shall provide the ability to specify the allowable occurrence of instance data.

An AM can specify for any object node the allowed number of occurrences of data instances that conform to that node within a container node. Sibling objects defined within the same container nodes can each have occurrences defined for them.

6.5.3.13 Cardinality

Submissions shall provide the ability to define cardinality that is subsumed by progenitor elements.

Attributes (i.e. properties) from the RM can have their cardinality constrained within an AM.

6.5.4 Terminology Profile Requirements

6.5.4.1 Semantic Binding of Classes

Submissions shall provide the ability to bind an AM class to either a concept code from SNOMED CT (or other terminology), or to a Concept Domain, that represents the semantic meaning of the AM class.

6.5.4.2 Semantic Binding of Associations and Relationships

Submissions shall provide the ability to bind an association between AM classes to a concept code from SNOMED CT (or other terminology), or to a Concept Domain, that represents the semantic meaning of the AM association.

6.5.4.3 Semantic Binding of Properties

Submissions shall provide the ability to bind AM properties to a concept code from SNOMED CT (or other terminology), or to a Concept Domain, that represents the semantic meaning of the AM properties.

6.5.4.4 Value Binding of Classes and Properties

Submissions shall provide the ability to bind AM classes and attributes to code systems, value sets and/or concept domains. This binding constrains the allowed values of the instances.

Value bindings shall bind an AM class or attribute to a value set defined in an external terminology, to a code system, or to a concept domain.

6.5.4.5 Usage Context Definition

Submissions shall provide the ability to define usage context in the UML model, including at least an identifier and name.

As an example, China or US.

6.5.4.6 Concept Domain Definition

Submissions shall provide the ability to define concept domains in the UML model, including at least an identifier and name.

6.5.4.7 Code System Version Definition

Submissions shall provide the ability to define metadata about a code system version in the UML model, including at least identifier, name, version, and source URL.

6.5.4.8 Value Set Version Definition

Submissions shall provide the ability to define metadata about a value set version in the UML model, including at least identifier, name, version, and source URL.

6.5.4.9 Resolved Value Set Members

<u>Submissions shall provide the ability to define members within a value set version.</u>

Each member is defined by at least a code, concept name, and code system reference.

6.5.4.10   Concept Domain Binding

<u>Submissions shall provide the ability to bind a concept domain with a resolved value set in a specified usage context.</u>

<u>For example, the use of "state codes" supported for a string value intended to represent geographic regions within a country.</u>

6.5.4.11 Concept Model Terminology Definition

<u>Submissions shall allow each concept model structure within an AM to be defined as a single terminology expression created by combining the values of each component data element within the structure.</u>

In some cases, a single concept (e.g. diagnosis) can be represented either using a model structure (e.g. diagnosis name: 'arthritis', body site: 'knee', laterality: 'left'), or as a pre or post-coordinated terminology expression (e.g. 'arthritis of the left knee'). By associating a concept model structure with a terminology expression that defines how instances of the structural components could be combined together inside the terminology, instance data can be represented either way (i.e. either in structure or in terminology) in an isomorphic manner.

6.5.4.12 Terminology Constraint Bindings

<u>Submissions shall provide the ability to define constraints on an AM, using concepts and relationships defined in an external terminology.</u>

6.6   Optional Requirements

6.6.1.1 Common Terminology Service (CTS2)

<u>Submissions may propose a method to query a CTS2 service to discover concept domains, code systems, and resolved value sets.</u>

6.6.1.2 Validate Code Contained in Value Set (CTS2)

Submissions may propose a method to query a CTS2 service and validate that a given code is contained in a specified value set.

This is used to validate that instances of the AM satisfy value binding constraints.

6.6.1.3 Resolved Value Set Synchronization (CTS2)

Submissions may propose a method to synchronize a cached copy of value set members in UML with the current resolved value set definition via CTS2 queries.

6.6.1.4 Concept Domain and Value Set Resolution (CTS2)

Submissions may propose a method to for using a terminology service to resolve Concept Domains and Value Sets for both viewing and model publication

6.6.1.5 MOF Definition of AOM 1.5

Submissions may provide a MOF definition that is semantically equivalent to AOM 1.5

6.6.1.6 Mapping Definition of AML Profile to AOM 1.5

Submissions may specify the transformation / mapping from the AML profile to AOM 1.5 MOF (6.5.1.5).

The use of OMG-QVT is encouraged where practical.

6.6.1.7 Mapping Definition of AOM 1.5 to AML Profile

Submissions may specify the transformation / mapping from AOM 1.5 MOF(6.5.1.5) to the AML profile.

The use of OMG-QVT is encouraged where practical.

6.6.1.8 Modeling Conventions / Usage

Submissions may provide example models, usage tutorials, usage methodologies, etc. for the proposed solution.

The use of OMG-QVT is encouraged where practical

6.6.1.9 Model-Driven Implementations

Submissions may provide for the terminology binding metadata to be used to generate complete PSM implementations.

For example, OCL invariant rules that validate whether instances satisfy the information model's terminology constraints.

6.6.1.10   AML Model Descriptive Metadata

Submissions may include additional metadata items they deem pertinent to address version management, profile naming, references, namespace, etc, extending the required metadata items enumerated in 6.5.1.2. Justification for included metadata items is required.

6.6.1.11   AML User-Defined Meta Data

Submissions may provide support for AML Profile variable metadata to allow user defined model element specific tuples (tag name, value) for all profile elements (including the model itself).

Example: Property with tag "Reason" with value "Support Requirement 1.3".

6.6.1.12   Terminology Binding to AML User-Defined Meta Data

Submissions may provide support for terminology binding to user defined tag names in support of 6.6.1.1.

6.7   Issues to be discussed

6.7.1   Submissions shall discuss the relationship between AML and other related Health standards, the existing CIMI specifications and the CIMI process.

6.7.2   Submissions shall discuss the relationship between AML and other ongoing exchange standards efforts, including but not limited to HL7 RIM and V3 methodology.

6.7.3   Submissions shall discuss their relationship with other relevant standards including but not limited to the Unified Profile for NIEM UML and DoDAF/MODAF (UPDM) 2.0.

6.7.4   Submissions shall discuss their relationship with other relevant standards including but not limited to the Clinical Document Language (CDL).

6.7.5   Submissions shall discuss their relationship with other relevant standards including but not limited to ISO-13606.

6.7.6   Submissions shall discuss their relationship with other relevant draft international specifications including but not limited to ISO-13972.

6.7.7   Submissions shall discuss their relationship with other relevant standards including but not limited to United Nations Centre for Trade Facilitation and Electronic Business UN/CEFACT CCTS V3.0

6.8   Evaluation Criteria

6.8.1   Submissions will be evaluated based on compliance with RFP requirements.

6.8.2   Submissions will be evaluated based on alignment with CIMI specifications and requirements.

6.8.3   Submissions will be evaluated based on the usability and intuitive representation of CIMI models (http://informatics.mayo.edu/CIMI/index.php/Main_Page).

6.8.4   Submissions will be evaluated based on ease of use.

6.8.5   Submissions will be evaluated based on their ability to support the testing of the consistency of CIMI models against CIMI specifications and requirements.

6.8.6   Submissions will be evaluated based on their ability to support the generation of a single formalism for the sharing of CIMI clinical models.

6.9   Other information unique to this RFP

None

6.10 RFP Timetable

The timetable for this RFP is given below. Note that the TF or its parent TC may, in certain circumstances, extend deadlines while the RFP is running, or may elect to have more than one Revised Submission step. The latest timetable can always be found at the OMG *Work In Progress* page at http://www.omg.org/schedules under the item identified by the name of this RFP. Note that "<month>" and "<approximate month>" is the name of the month spelled out; e.g., January.

Event or Activity	Actual Date
Preparation of RFP by TF	
RFP placed on OMG document server	*May 21rd, 2012*
Approval of RFP by Architecture Board	*June 21th 2012*

Review by TC	
TC votes to issue RFP	*June 22st 2012*
LOI to submit to RFP due	*August 21st. 2012*
Initial Submissions due and placed on OMG document server ("Four week rule")	*November 12th, 2012*
Voter registration closes	*December 1st, 2012*
Initial Submission presentations	*December 12th, 2012*
Preliminary evaluation by TF	*January 13th, 2013*
Revised Submissions due and placed on OMG document server ("Four week rule")	*February 18th, 2013*
Revised Submission presentations	*March 20th, 2013*
Final evaluation and selection by TF *Recommendation to AB and TC*	*March 21th, 2013 {If vote to vote can be obtained}*
Approval by Architecture Board *Review by TC*	*March 21nd, 2013*
TC votes to recommend specification	*April, 2013*
BoD votes to adopt specification	*May, 2013*

Appendix A   References

A. 1   RFP Specific References

The following documents are directly relevant to this RFP:

[ADL] openEHR Archetype Definition Language,
http://www.openehr.org/svn/specification/TRUNK/publishing/architecture/am/adl1.5.pdf .12/May/2012

[AOM] openEHR Archetype Object Model,
http://www.openehr.org/svn/specification/TRUNK/publishing/architecture/am/aom1.5.pdf . 12/May/202

[AOMT] openEHR Archetype Templates
http://www.openehr.org/svn/specification/TRUNK/publishing/architecture/am/tom.pdf[CIMI] CIMI Reference Model Requirements
http://informatics.mayo.edu/CIMI/index.php/CIMI_Reference_Model_Requirements

[ARCH] Archetypes: Constraint-based Domain Models for Future-proof Information Systems,
http://www.openehr.org/publications/archetypes/archetypes_beale_oopsla_2002.pdf

[HL7v3] Core Principles and Properties of HL7 Version 3 Models defines: Concept Domain, Code System, Value Set,

o http://www.hl7.org/v3ballot/html/infrastructure/coreprinciples/v3modelcoreprinciples.html
o http://www.hl7.org/v3ballot/html/welcome/environment/index.html

[CTS2] Common Terminology Service 2 (CTS-2),
http://informatics.mayo.edu/cts2/index.php/Main_Page

[MDS] ISO 11179, http://metadata-standards.org/11179/

A. 2   General References

The following documents are included in this RFP as general references:

[BCQ] OMG Board of Directors Business Committee Questionnaire,
http://doc.omg.org/bc/07-08-06

[CCM] CORBA Core Components Specification,
http://www.omg.org/technology/documents/formal/components.htm

[CORBA] Common Object Request Broker Architecture (CORBA/IIOP), *http://www.omg.org/technology/documents/formal/corba_iiop.htm*

[CSIV2] CORBA: Chapter 26

[CWM] Common Warehouse Metamodel Specification, *http://www.omg.org/technology/documents/formal/cwm.htm*

[DAIS] Data Acquisition from Industrial Systems, *http://www.omg.org/technology/documents/formal/dais.htm*

[EDOC] UML Profile for EDOC Specification, *http://www.omg.org/techprocess/meetings/schedule/UML_Profile_for_EDOC_FTF.html*

[EJB] "Enterprise JavaBeans™", *http://java.sun.com/products/ejb/docs.html*

[FORMS] "ISO PAS Compatible Submission Template". *http://www.omg.org/cgi-bin/doc?pas/2003-08-02*

[GE] Gene Expression, *http://www.omg.org/technology/documents/formal/gene_expression.htm*

[GLS] General Ledger Specification , *http://www.omg.org/technology/documents/formal/gen_ledger.htm*

[Guide] The OMG Hitchhiker's Guide,, *http://www.omg.org/cgi-bin/doc?hh*

[IDL] ISO/IEC 14750 also see [CORBA] Chapter 3.

[IDLC++] IDL to C++ Language Mapping, *http://www.omg.org/technology/documents/formal/c++.htm*

[Inventory] Inventory of Files for a Submission/Revision/Finalization, *http://doc.omg.org/smsc/2007-09-05*

[MDAa] OMG Architecture Board, "Model Driven Architecture - A Technical Perspective", *http://www.omg.org/mda/papers.htm*

[MDAb] "Developing in OMG's Model Driven Architecture (MDA)," *http://www.omg.org/docs/omg/01-12-01.pdf*

[MDAc] "MDA Guide" (*http://www.omg.org/docs/omg/03-06-01.pdf*)

[MDAd] "MDA "The Architecture of Choice for a Changing World™"", *http://www.omg.org/mda*

[MOF] Meta Object Facility Specification, *http://www.omg.org/technology/documents/formal/mof.htm*

[MQS] "MQSeries Primer",
   http://www.redbooks.ibm.com/redpapers/pdfs/redp0021.pdf

[NS] Naming Service,
   http://www.omg.org/technology/documents/formal/naming_service.htm

[OMA] "Object Management Architecture™", *http://www.omg.org/oma/*

[OTS] Transaction Service,
   http://www.omg.org/technology/documents/formal/transaction_service.htm

[P&P] Policies and Procedures of the OMG Technical Process,
   http://www.omg.org/cgi-bin/doc?pp

[PIDS] Personal Identification Service,
   http://www.omg.org/technology/documents/formal/person_identification_service.htm

[RAD] Resource Access Decision Facility,
   http://www.omg.org/technology/documents/formal/resource_access_decision.htm

[RFC2119] IETF Best Practices: Key words for use in RFCs to Indicate Requirement Levels, (*http://www.ietf.org/rfc/rfc2119.txt*).

[RM-ODP] ISO/IEC 10746

[SEC] CORBA Security Service,
   http://www.omg.org/technology/documents/formal/security_service.htm

[TOS] Trading Object Service,
   http://www.omg.org/technology/documents/formal/trading_object_service.htm

[UML] Unified Modeling Language Specification,
   http://www.omg.org/technology/documents/formal/uml.htm

[UMLC] UML Profile for CORBA,
   http://www.omg.org/technology/documents/formal/profile_corba.htm

[XMI] XML Metadata Interchange Specification,
   http://www.omg.org/technology/documents/formal/xmi.htm

[XML/Value] XML Value Type Specification,
   http://www.omg.org/technology/documents/formal/xmlvalue.htm

Appendix B   Glossary[3]

Archetype		An archetype is a re-usable, formal model of a concept. An archetype is expressed as a computable set of constraint statements, on an underlying reference model (URM). Concepts that can be modelled using archetypes include weight measurement, blood pressure, microbiology results, discharge referral, prescription, diagnosis. CIMI archetypes will be represented as an instance of the 'Archetype Object Model'.
Archetype Definition Language	ADL	ADL is a formal language for expressing archetypes. It provides a formal, textual syntax for describing constraints on any domain entity whose data is described by an information model (also known as the 'underlying reference model'). The ADL syntax is semantically equivalent to the AOM, and represents one possible serialisation of the AOM. The current version of ADL is known as 'ADL 1.5'.
Archetype Instance		A single instantiation of data conforming to a specific archetype. In the context of CIMI this data will typically be clinical.
Archetype Object Model	AOM	The AOM is the definitive expression of archetype semantics, and is independent of any particular syntax. The AOM is defined as an object model, using a UML class diagram. It is a generic model, meaning that it can be used to express archetypes for any reference model in a standard way. Version 1.4 of the AOM was standardised in ISO-13606:2. The current version is known as 'AOM 1.5'.
Archetype Query Language	AQL	Archetype Query Language (AQL) is a declarative query language developed specifically for expressing queries used for searching and retrieving the clinical data found in archetype-based EHRs. AQL expresses the queries at the archetype level, i.e. semantic level, other than at the data instance level. This is the key in achieving sharing queries across system boundaries or enterprise boundaries.
Architecture Board	AB	The OMG plenary that is responsible for ensuring the technical merit and MDA-compliance of RFPs and their

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[3] http://informatics.mayo.edu/CIMI/index.php/GlossaryTopics

		submissions.
Association		Establishes a relationship between objects, along with the properties of that relationship; provides a structure that does not establish existence of an object but instead specifies relationships between objects
Augmentation		A block of additional data added to an object type to carry additional data beyond that of the original object definition
Board of Directors		The OMG body that is responsible for adopting technology.
CIMI Reference Model	CRM	The CIMI Reference Model is the Underlying Reference Model on which CIMI's clinical models (i.e. archetypes) are defined. This reference model defines a rigorous and stable set of modelling patterns, including a set of complex datatypes, information patterns (e.g. data, qualifier, state), and structural patterns (e.g. composition, entry, tree). All CIMI clinical models (i.e. archetypes) will be defined by constraining the CIMI reference model. The reference model is intended to be instantiated with patient data, which conforms to the constraints defined by the associated clinical model.
Cardinality Constraint		A cardinality constraint limits the number of instances of an element that can exist in a given relationship in a clinical model - for example '0..1', '1..Many'.
Catalog		List of artifacts in the IEPD that is machine-readable; in an open, portable format; and browser-displayable
Class		A class describes a set of objects that share the same specifications of features, constraints, and semantics.
Class Diagram		A UML class diagram is a structure diagram that depicts packages, classes and objects, their relationships, constraints attributes and operations.
Classification		An exhaustive set of mutually exclusive categories to aggregate data at a pre-prescribed level of specialization for a

		specific purpose.
Clinical Data Repository	CDR	A data store that holds and manages clinical data collected from service encounters at the point-of-service locations, for example: hospitals, clinics, etc.
Clinical Document Architecture	CDA	The HL7 Clinical Document Architecture (CDA) is an XML-based markup standard intended to specify the encoding, structure and semantics of clinical documents for exchange.
Clinical Information Model	CIM	A representation of the structured clinical information (including relationships, constraints and terminology), that describes a specific clinical concept - e.g. a blood pressure observation, a Discharge Summary, or a Medication Order.
Clinical Information Modelling Initiative	CIMI	An initiative established to 'improve the interoperability of healthcare information systems through shared implementable clinical information models.'
Clinical Information Modelling Initiative Specification	CIMI Specifications	CIMI specifications are those specifications adopted or published by the CIMI, including the CIMI reference model, the CIMI constraint formalism, and the CIMI data types.
Clinical Model Governance		A set of policies and processes through which the high clinical quality of all clinical artefacts (including clinical models/archetypes) is maintained, during creation, storage, verification, maintenance, and distribution, by, for and on behalf of CIMI.
Clinical Model Repository	CMR	A data store that holds clinical information models, and associated artifacts, in an agreed sharable format.
Clinical Model Verification		The act of reviewing, inspecting or testing, in order to establish that a specification meets appropriate clinical safety and quality standards.
Clinical ModellingModeling Language	CML	A language used to define clinical information models. Examples include: • Archetype Definition Language (ADL) • Unified Modelling Language (UML) Ontology Web Language (OWL)
Clinical Requirement		• Requirements that articulate clinical needs - including clinical practices, standards, guidelines,

		principles or other clinical concepts.
Code System		A managed collection of uniquely identifiable concepts with associated representations. An ontological system for representing a set of concepts, e.g. SNOMED-CT, LOINC, ICD-10, etc
Common Object Request Broker Architecture	CORBA	An OMG distributed computing platform specification that is independent of implementation languages.
Common Terminology Services 2.0	CTS2	CTS2 is a specification that provides a standard interface to disparate terminology sources. The Information Model specifies the structural definition, attributes and associations of Resources common to structured terminologies such as Code Systems, Binding Domains and Value Sets. The Computational Model specifies the service descriptions and interfaces needed to access and maintain structured terminologies.
Common Warehouse Metamodel	CWM	An OMG specification for data repository integration.
Concept		An idea. In information modelling, a concept is represented as a word or phrase in order to support human understanding, but may also be represented with a concept identifier in order to bind it to a controlled terminology or ontology.
Concept DomainConceptual Information Model	CIM	A named category of like concepts that will be bound to one or more coded elements in an information model. Concept Domains exist to constrain the intent of the coded element and are independent of any specific vocabulary, code system, or Realm. A Concept Domain provides a high level grouping for all things possible in a given domain from which value sets will be constructedA representation of real-world objects and their relationships and constraints as understood by domain experts. A conceptual model should include no implementation-specific details.
Concept Domain BindingConcept Domain		The association of a value set with a concept domain in a given context.A

		named category of like concepts that will be bound to one or more coded elements in an information model. Concept Domains exist to constrain the intent of the coded element and are independent of any specific vocabulary, code system, or Realm. A Concept Domain provides a high level grouping for all things possible in a given domain from which value sets will be constructed
ConformanceConcept Domain Binding		The requirement that those who participate in CIMI by contributing data components or creating and sharing ADL artifacts are following the agreed-upon procedures for doing so and that all documentation meets minimum criteria and the CIMI Naming and Design Rules where applicable.The association of a value set with a concept domain in a given context.
Constraint FormalismConformance		The requirement that those who participate in CIMI by contributing data components or creating and sharing ADL artifacts are following the agreed-upon procedures for doing so and that all documentation meets minimum criteria and the CIMI Naming and Design Rules where applicable.
Constraint ModelConstraint Formalism		A formal specification used for describing constraints on an Underlying Reference Model. The Constraint Model is used to express clinical information models (i.e. archetypes). Not to be confused with the clinical information models that are instances of the constraint model.
Constraint Modelling FormalismConstraint Model		A formal specification used for describing constraints on an Underlying Reference Model. The Constraint Model is used to express clinical information models (i.e. archetypes). Not to be confused with the clinical information models that are instances of the constraint model.
Constraint SchemaConstraint Modelling Formalism		A schema with the purpose of restricting or constraining content that appears in

		instances of the subset schema
Controlled VocabularyConstraint Schema		Controlled vocabulary means the structure and semantics that compose CIMI have agreed upon meaning across the CIMI community. The vocabulary can be drawn upon to standardize exchange content; in doing so there are specific constraints on how and when to extend the vocabulary. The CIMI controlled vocabulary is currently expressed as word documents, XML Schemas and XLS mapping documentsA schema with the purpose of restricting or constraining content that appears in instances of the subset schema
CORBA Component ModelControlled Vocabulary		An OMG specification for an implementation language independent distributed component model.Controlled vocabulary means the structure and semantics that compose CIMI have agreed upon meaning across the CIMI community. The vocabulary can be drawn upon to standardize exchange content; in doing so there are specific constraints on how and when to extend the vocabulary. The CIMI controlled vocabulary is currently expressed as word documents, XML Schemas and XLS mapping documents
Corporate GovernanceCORBA Component Model		An OMG specification for an implementation language independent distributed component model.
DL-Based Reference TerminologyCorporate Governance		A reference terminology designed to support a set of tractable logical computations defined within description logic, including classification and imputation.
Data ElementDL-Based Reference Terminology		A data element is a named node in a clinical model which is associated with a specific data type. Data elements may be assigned value bindings to define the set of permissible values. The (indirect) association of a data element concept with an enumerated conceptual domainA reference terminology designed to support a set of tractable logical computations defined within description logic, including classification and imputation.
Data Element ConceptData Element		Conceptual model behind a data element (ISO-11179)A data element is a named node in a clinical model which is associated with a specific data type. Data elements may be assigned value bindings

		to define the set of permissible values. The (indirect) association of a data element concept with an enumerated conceptual domain
Data TypeData Element Concept		A data storage model or template that defines the attributes for a specific type or range of values. It acts to formalize the requirements for data of specific types so that all of the attributes needed to process the data are known by a receiver. This includes simple types such as integer, boolean, and string as well as complex types such as quantity and coded value.Conceptual model behind a data element (ISO-11179)
DescriptionData Type		In the context of terminology, a description is a human-readable term assigned to a specific concept. Each description is assigned a unique description ID.A data storage model or template that defines the attributes for a specific type or range of values. It acts to formalize the requirements for data of specific types so that all of the attributes needed to process the data are known by a receiver. This includes simple types such as integer, boolean, and string as well as complex types such as quantity and coded value.
Description LogicDescription	DL	Description Logic is a family of formal knowledge representation languages. A DL models concepts, roles and individuals, and their relationships. The design of OWL and SNOMED CT are both based on Description Logic.In the context of terminology, a description is a human-readable term assigned to a specific concept. Each description is assigned a unique description ID.
Design PatternDescription Logic	DPDL	In software engineering, a design pattern is a general reusable solution to a commonly occurring problem within a given context. In the context of information modeling, a conceptual or logical topology that is useful for satisfying a family of related requirements.Description Logic is a family of formal knowledge representation languages. A DL models concepts, roles and individuals, and their relationships. The design of OWL and SNOMED CT are both based on Description Logic.
Detailed Clinical ModelDesign Pattern	DCMDP	A Detailed Clinical Model (DCM) is an information model of a discrete set of precise clinical knowledge which can be

		used in a variety of contexts. DCMs provide the data element specification and attributes, including the possible values and types of the attributes, and where possible a model and technical implementation specifications needed to convey the clinical reality in a fashion that is understandable to both clinical domain experts and modelers. Organizations that have begun specifying or using DCMs include HL7 International, Nictiz (NL), Parelsnoer (NL), Results 4 Care (NL), and ISO (13972).In software engineering, a design pattern is a general reusable solution to a commonly occurring problem within a given context. In the context of information modeling, a conceptual or logical topology that is useful for satisfying a family of related requirements.
Enumerated Conceptual DomainDetailed Clinical Model	DCM	A set of value meaningsA Detailed Clinical Model (DCM) is an information model of a discrete set of precise clinical knowledge which can be used in a variety of contexts. DCMs provide the data element specification and attributes, including the possible values and types of the attributes, and where possible a model and technical implementation specifications needed to convey the clinical reality in a fashion that is understandable to both clinical domain experts and modelers. Organizations that have begun specifying or using DCMs include HL7 International, Nictiz (NL), Parelsnoer (NL), Results 4 Care (NL), and ISO (13972).
Exchange SchemaEnumerated Conceptual Domain		An XML schema with the purpose of defining the actual content model of the information exchange.A set of value meanings
EXtensible Markup LanguageExchange Schema	XML	XML is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. It is defined in the XML 1.0 specification produced by the W3C.An XML schema with the purpose of defining the actual content model of the information exchange.
European Committee for StandardizationEXtensible Markup Language	CENXML	CEN is a major provider of European Standards and technical specifications.CEN's 31 National Members work together to develop voluntary European Standards (ENs).XML is a markup language that defines a set of rules for encoding documents in a format

		that is both human-readable and machine-readable. It is defined in the XML 1.0 specification produced by the W3C.
Fast Healthcare Interoperability ResourcesEuropean Committee for Standardization	FHIRCEN	Fast Healthcare Interoperability Resources (FHIR, pronounced "Fire") is an HL7 specification that defines a set of 'Resources' that represent granular clinical concepts.CEN is a major provider of European Standards and technical specifications.CEN's 31 National Members work together to develop voluntary European Standards (ENs).
First Order Predicate LogicFast Healthcare Interoperability Resources	FOPLFHIR	First-order predicate logic is a formal system used in mathematics, philosophy, linguistics, and computer science, which includes the features of propositional logic as well as predicates and quantification.Fast Healthcare Interoperability Resources (FHIR, pronounced "Fire") is an HL7 specification that defines a set of 'Resources' that represent granular clinical concepts.
Formal LanguageFirst Order Predicate Logic	FOPL	A formal language is a set of words defined by means of a formal grammar. Formal languages are often used as the basis for defining programming languages and other systems. In the context of CIMI, examples of formal languages include the Archetype Definition Language (ADL), Unified Modelling Language (UML), Object Constraint Language (OCL) and eXtensible Markup Language (XML).First-order predicate logic is a formal system used in mathematics, philosophy, linguistics, and computer science, which includes the features of propositional logic as well as predicates and quantification.
Fully Defined ConceptFormal Language		A concept that is uniquely defined by a set of defining relationships.A formal language is a set of words defined by means of a formal grammar. Formal languages are often used as the basis for defining programming languages and other systems. In the context of CIMI, examples of formal languages include the Archetype Definition Language (ADL), Unified Modelling Language (UML), Object Constraint Language (OCL) and eXtensible Markup Language (XML).
GovernanceFully Defined Concept		Governance relates to consistent management, cohesive policies, guidance, processes and decision-rights for a given area of responsibility. Types of governance relevant to CIMI include:

		• Clinical governance • Technical governance Organisational (or corporate) governanceA concept that is uniquely defined by a set of defining relationships.
[Health Level 7HL7 version 3](#)	HL7HL7 v3	Founded in 1987, Health Level Seven International (HL7) is a not-for-profit, ANSI-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services.Health Level Seven Version 3 (V3) is a suite of specifications based on HL7's Reference Information Model (RIM) used to produce messages and electronic documents expressed in XML syntax.
[HL7 Standard or SpecificationGovernance](#)		HL7 and its members provide a framework (and related standards) for the exchange, integration, sharing, and retrieval of electronic health information. These standards define how information is packaged and communicated from one party to another, setting the language, structure and data types required for integration between systems. HL7 standards include: • HL7 version 2 • HL7 version 3 • Clinical Document Architecture (V3) Reference Information Model (V3)Governance relates to consistent management, cohesive policies, guidance, processes and decision-rights for a given area of responsibility. Types of governance relevant to CIMI include: • Clinical governance • Technical governance Organisational (or corporate) governance
[HL7 version 2HL7 Standard or Specification](#)	HL7 v2	HL7's Version 2.x (V2) messaging standard is widely used for electronic data exchange in the clinical domain. This

		messaging standard allows the exchange of clinical data between systems.HL7 and its members provide a framework (and related standards) for the exchange, integration, sharing, and retrieval of electronic health information. These standards define how information is packaged and communicated from one party to another, setting the language, structure and data types required for integration between systems. HL7 standards include: • HL7 version 2 • HL7 version 3 • Clinical Document Architecture (V3) • Reference Information Model (V3)
HL7 version 3HL7 version 2	HL7 v3HL7 v2	• Health Level Seven Version 3 (V3) is a suite of specifications based on HL7's Reference Information Model (RIM) used to produce messages and electronic documents expressed in XML syntax.HL7's Version 2.x (V2) messaging standard is widely used for electronic data exchange in the clinical domain. This messaging standard allows the exchange of clinical data between systems.
Health Level 7HL7 version 3	HL7HL7 v3	Founded in 1987, Health Level Seven International (HL7) is a not-for-profit, ANSI-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services.Health Level Seven Version 3 (V3) is a suite of specifications based on HL7's Reference Information Model (RIM) used to produce messages and electronic documents expressed in XML syntax.
IHTSDO Standard or SpecificationHealth Level 7	HL7	Standards and specifications that have been published by the IHTSDO. IHTSDO standards and specifications include:

		• SNOMED CT SNOMED CT Compositional GrammarFounded in 1987, Health Level Seven International (HL7) is a not-for-profit, ANSI-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services.
ISO Standard or SpecificationIHTSDO Standard or Specification		Standards, specifications and technical reports that have been published by ISO, or are planned for publication by ISO.Standards and specifications that have been published by the IHTSDO. IHTSDO standards and specifications include: • SNOMED CT SNOMED CT Compositional Grammar
ISO-13606ISO Standard or Specification	ISO-13606	• ISO-13606 Health informatics - Electronic Health Record Communication is a suite of specifications for electronic health record communication that includes the following parts: *ISO-13606:1 'Part 1: Reference model'. Published in 2008. *ISO-13606:2 'Part 2: Archetype interchange specification'. Published in 2008. *ISO-13606:3 'Part 3: Reference archetypes and term lists'. Published in 2009. *ISO-13606:4 'Part 4: Security'. Published in 2009. *ISO-13606:5 'Part 5: Interface specification'. Published in 2010.Standards, specifications and technical reports that have been published by ISO, or are planned for publication by ISO.
ISO-13972ISO-13606	ISO-13972ISO-13606	'Health informatics - Detailed Clinical Models' is an ISO specification (committee draft) for defining detailed clinical models, including the following parts: * 'Part 1: Quality processes regarding detailed clinical model development, governance,

		publishing and maintenance'. Committee draft in 2011. * 'Part 2: Quality attributes of detailed clinical models'. Committee draft in 2011.ISO-13606 Health informatics - [Electronic Health Record](#) Communication is a suite of specifications for electronic health record communication that includes the following parts: *ISO-13606:1 'Part 1: Reference model'. Published in 2008. *ISO-13606:2 'Part 2: Archetype interchange specification'. Published in 2008. *ISO-13606:3 'Part 3: Reference archetypes and term lists'. Published in 2009. *ISO-13606:4 'Part 4: Security'. Published in 2009. *ISO-13606:5 'Part 5: Interface specification'. Published in 2010.
[ISO-18308ISO-13972](#)	ISO-18308ISO-13972	ISO-18308 is an ISO standard entitled 'Health informatics - Requirements for an electronic health record architecture' and published in 2011.'Health informatics - Detailed Clinical Models' is an ISO specification (committee draft) for defining detailed clinical models, including the following parts: * 'Part 1: Quality processes regarding detailed clinical model development, governance, publishing and maintenance'. Committee draft in 2011. * 'Part 2: Quality attributes of detailed clinical models'. Committee draft in 2011.
[ISO-8601ISO-18308](#)	ISO-8601ISO-18308	'Data elements and interchange formats - Information interchange - Representation of dates and times'. Published in 2004.ISO-18308 is an ISO standard entitled 'Health informatics - Requirements for an electronic health record architecture' and published in 2011.
[Information ModelISO-8601](#)	IMISO-8601	A structured representation of the information requirements of a domain. An information model expresses the [classes](#) of information required, and their attributes, relationships and constraints.'Data elements and interchange formats - Information interchange - Representation of dates and times'. Published in 2004.
[Interface Clinical ModelInformation Model](#)	IM	A clinical model that represents the information structures, constraints and terminology intended for display in a clinical user interface.A structured representation of the information requirements of a domain. An information model expresses the [classes](#) of information required, and their attributes,

		relationships and constraints.
Interface Definition LanguageInterface Clinical Model		An OMG and ISO standard language for specifying interfaces and associated data structures.A clinical model that represents the information structures, constraints and terminology intended for display in a clinical user interface.
Interface TerminologyInterface Definition Language		A maintained set of unique identified terms designed to be compatible with the natural language of the user.An OMG and ISO standard language for specifying interfaces and associated data structures.
International Classification of Diseases and Related Health ProblemsInterface Terminology	ICD	The ICD is a medical classification, published by the World Health Organisation, which provides codes to classify diseases and a wide variety of signs, symptoms, abnormal findings, complaints, social circumstances, and external causes of injury or disease.A maintained set of unique identified terms designed to be compatible with the natural language of the user.
International Classification of Diseases and Related Health Problems - 10th RevisionInternational Classification of Diseases and Related Health Problems	ICD-10ICD	The 10-th revision of the ICD. This code set allows more than 155,000 different codes and permits tracking of many new diagnoses and procedures - a significant expansion on the 17,000 codes available in ICD-9.The ICD is a medical classification, published by the World Health Organisation, which provides codes to classify diseases and a wide variety of signs, symptoms, abnormal findings, complaints, social circumstances, and external causes of injury or disease.
International Health Terminology Standards Development OrganisationInternational Classification of Diseases and Related Health Problems - 10th Revision	IHTSDOICD-10	The International Healthcare Terminology Standards Development Organization (IHTSDO) is a not-for-profit association that develops and promotes use of SNOMED CT to support safe and effective health information exchange.The 10-th revision of the ICD. This code set allows more than 155,000 different codes and permits tracking of many new diagnoses and procedures - a significant expansion on the 17,000 codes available in ICD-9.
International Organization of StandardizationInternational Health Terminology Standards Development Organisation	ISOIHTSDO	ISO is the world's largest developer and publisher of International Standards. ISO is a network of the national standards institutes of 162 countries, on member per country, with a Central Secretariat in

		Geneva, Switzerland, that coordinates the system.The International Healthcare Terminology Standards Development Organization (IHTSDO) is a not-for-profit association that develops and promotes use of SNOMED CT to support safe and effective health information exchange.
Isosemantic ModelInternational Organization of Standardization	ISO	A model that, while different in structure, represents the same semantic content as a second model.ISO is the world's largest developer and publisher of International Standards. ISO is a network of the national standards institutes of 162 countries, on member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system.
Key ConceptIsosemantic Model		The main concept of interest in a clinical model, about which the other attributes and relationships provide additional information. In the context of a SNOMED CT compositional grammar expression, this is also known as the 'focus concept'.A model that, while different in structure, represents the same semantic content as a second model.
Letter of Intent Key Concept	LOI	A letter submitted to the OMG BoD's Business Committee signed by an officer of an organization signifying its intent to respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements.The main concept of interest in a clinical model, about which the other attributes and relationships provide additional information. In the context of a SNOMED CT compositional grammar expression, this is also known as the 'focus concept'.
Logical Information ModelLetter of Intent	LIMLOI	An information model that is independent of system-specific implementation details, but incorporates some implementation-specific decisions (e.g. relational table design, openEHR archetype).A letter submitted to the OMG BoD's Business Committee signed by an officer of an organization signifying its intent to respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements.
Logical Observation Identifiers Names and CodesLogical Information Model	LOINCLIM	LOINC is a dataset of universal identifiers for laboratory and other clinical

			observations to facilitate exchange and storage of clinical results or vital signs for patient care and research.An information model that is independent of system-specific implementation details, but incorporates some implementation-specific decisions (e.g. relational table design, openEHR archetype).
MappingLogical Observation Identifiers Names and Codes	LOINC		Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel. LOINC is a dataset of universal identifiers for laboratory and other clinical observations to facilitate exchange and storage of clinical results or vital signs for patient care and research.
MetadataMapping			Metadata ('data about data') is defined as data providing information about other data, such as * Purpose of the data * Time and date of creation * Creator or author of dataSpecification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel.
MetamodelMetadata			A metamodel ('model of a model') is an abstract representation of the characteristics and properties of a model or set of models. These models are instances of the metamodel.Metadata ('data about data') is defined as data providing information about other data, such as * Purpose of the data * Time and date of creation * Creator or author of data
Meta Object Facility Metamodel	MOF		An OMG standard, closely related to UML, that enables metadata management and language definition.A metamodel ('model of a model') is an abstract representation of the characteristics and properties of a model or set of models. These models are instances of the metamodel.
ModelMeta Object Facility	MOF		A formal specification of the function, structure and/or behavior of an application or system.An OMG standard, closely related to UML, that enables metadata

		management and language definition.
Model Driven Architecture Model	MDA	An approach to IT system specification that separates the specification of functionality from the specification of the implementation of that functionality on a specific technology platform.A formal specification of the function, structure and/or behavior of an application or system.
ModifierModel Driven Architecture	MDA	A modifier is an attribute that changes the meaning of a clinical concept in a way that does not specialize the meaning. This is in contrast to a 'qualifier' for which the resulting meaning is a subtype of the original meaning. 'Family history of', 'Planned' and 'Not done' are examples of modifiers.An approach to IT system specification that separates the specification of functionality from the specification of the implementation of that functionality on a specific technology platform.
Name BindingModifier		The relationship between a node in the information model and a terminology description that serves as the name of the node.A modifier is an attribute that changes the meaning of a clinical concept in a way that does not specialize the meaning. This is in contrast to a 'qualifier' for which the resulting meaning is a subtype of the original meaning. 'Family history of', 'Planned' and 'Not done' are examples of modifiers.
NodeName Binding		A named part of an information model.The relationship between a node in the information model and a terminology description that serves as the name of the node.
NormativeNode		Provisions that one must conform to in order to claim compliance with the standard. (as opposed to non-normative or informative which is explanatory material that is included in order to assist in understanding the standard and does

		not contain any provisions that must be conformed to in order to claim compliance). A named part of an information model.
Normative ReferenceNormative		References that contain provisions that one must conform to in order to claim compliance with the standard that contains said normative reference.Provisions that one must conform to in order to claim compliance with the standard. (as opposed to non-normative or informative which is explanatory material that is included in order to assist in understanding the standard and does not contain any provisions that must be conformed to in order to claim compliance).
Object Constraint LanguageNormative Reference	OCL	A formal language used to describe expressions on UML models. These expressions typically specify invariant conditions that must hold for the system being modeled or queries over objects described in a model.References that contain provisions that one must conform to in order to claim compliance with the standard that contains said normative reference.
Object Management Group SpecificationObject Constraint Language	OMG SpecificationOCL	OMG specifications are those specifications published by the OMG, including the Meta Object Facility (MOF), and the Unified Modelling Language (UML).A formal language used to describe expressions on UML models. These expressions typically specify invariant conditions that must hold for the system being modeled or queries over objects described in a model.
OntologyObject Management Group Specification	OMG Specification	A formal representation of knowledge as a set of concepts within a domain, and the relationships between those concepts.OMG specifications are those specifications published by the OMG, including the Meta Object Facility (MOF), and the Unified Modelling Language

		(UML).
OpenEHR SpecificationOntology		openEHR specifications are those specifications published by the openEHR Foundation, including Archetype Definition Language (ADL), Archetype Object Model (AOM), the openEHR reference model (RM) and the Archetype Query Language (AQL).A formal representation of knowledge as a set of concepts within a domain, and the relationships between those concepts.
OrganisationOpenEHR Specification		A social group which distributes tasks for a collective goal.openEHR specifications are those specifications published by the openEHR Foundation, including Archetype Definition Language (ADL), Archetype Object Model (AOM), the openEHR reference model (RM) and the Archetype Query Language (AQL).
Organisational GovernanceOrganisation		The processes, customs, policies, laws and institutions which have an impact on the way an organisation is controlled. Organisational governance also includes the relationships among the many stakeholders involved and the goals for which the corporation is governed. It guarantees that an organisation is directed and controlled in a responsible, professional and transparent manner with the purpose of safeguarding its long-term success.A social group which distributes tasks for a collective goal.
Organisational RequirementOrganisational Governance		Requirements that support organisational needs. Organisational requirements may relate to the organisational structures, activities of individuals and groups, power structures, obligations, responsibilities, control, autonomy, values and ethics of the organisation.The processes, customs, policies, laws and institutions which have an impact on the way an organisation is controlled. Organisational governance also includes the relationships among the many stakeholders involved and the goals for which the corporation is governed. It guarantees that an organisation is directed and controlled in a responsible, professional and transparent manner with the purpose of safeguarding its long-term success.
Physical Information ModelOrganisational Requirement		A model designed for a specific technology implementation.Requirements that support organisational needs. Organisational requirements may relate to

		the organisational structures, activities of individuals and groups, power structures, obligations, responsibilities, control, autonomy, values and ethics of the organisation.
Platform[Physical Information Model](#)		A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.A model designed for a specific technology implementation.
Platform Independent Model Platform	PIM	A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it. A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.
Platform Specific ModelPlatform Independent Model	PSMPIM	A model of a subsystem that includes information about the specific technology that is used in the realization of it on a specific platform, and hence possibly contains elements that are specific to the platform.A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.
PrimogenitorPlatform Specific Model	PSM	Base model element that rationalizes children model elementsA model of a subsystem that includes information about the specific technology that is used in the realization of it on a specific platform, and hence possibly contains elements that are specific to the platform. It is the root element (ie. has no Progenitors). It is the base element.
ProgenitorPrimogenitor		A model element or collection model elements that rationalizes the existence of an element.Base model element that rationalizes children model elementsan element from which another element is descended or originates; an ancestor or parent.

ProgenitureProgenitor		Model element resulting from existing model element(s).A model element or collection model elements that rationalizes the existence of an element A descendent of a model elements
Postcoordinated ConceptProgeniture		A concept that coordinates two or more constituent concepts but is not pre-defined in the terminology, e.g., "arm" plus "has laterality" plus "left."Model element resulting from existing model element(s)
Precoordinated ConceptPostcoordinated Concept		A concept that is defined in terms of other concepts and has been assigned a unique identifier.A concept that coordinates two or more constituent concepts but is not pre-defined in the terminology, e.g., "arm" plus "has laterality" plus "left."
Primitive ConceptPrecoordinated Concept		A concept which has not been fully defined in terms of other concepts.A concept that is defined in terms of other concepts and has been assigned a unique identifier.
QualifierPrimitive Concept		A concept which has not been fully defined in terms of other concepts.
RDFQualifier		
Reference Information Model (HL7)RDF	HL7 RIM	The Reference Information Model (RIM) is an object model created as part of the HL7 Version 3 methodology, representing clinical and administrative data and the life cycle of that data. It is shared among all domains and underpins the specifications created in all domains.
Reference ModelReference Information Model (HL7)	RMHL7 RIM	A Reference Model is an information model which defines a set of modelling patterns upon which the clinical models are defined. All CIMI clinical models will be defined by constraining the CIMI reference model. The CIMI reference model is intended to be instantiated with patient data, which conforms to the constraints defined by the associated clinical model.The Reference Information Model (RIM) is an object model created as part of the HL7 Version 3 methodology, representing clinical and administrative data and the life cycle of that data. It is

			shared among all domains and underpins the specifications created in all domains.
Reference SetReference Model	RM		The Reference Set mechanism, in SNOMED CT, provides a standard way to refer to a set of SNOMED CT components (i.e. concepts, relationships, descriptions or reference sets). CIMI will use reference sets to specify terminology value bindings in CIMI clinical models.A Reference Model is an information model which defines a set of modelling patterns upon which the clinical models are defined. All CIMI clinical models will be defined by constraining the CIMI reference model. The CIMI reference model is intended to be instantiated with patient data, which conforms to the constraints defined by the associated clinical model.
Reference TerminologyReference Set			A terminology designed to provide common semantics for diverse implementations.The Reference Set mechanism, in SNOMED CT, provides a standard way to refer to a set of SNOMED CT components (i.e. concepts, relationships, descriptions or reference sets). CIMI will use reference sets to specify terminology value bindings in CIMI clinical models.
RelationshipReference Terminology			A relationship is an association or link between two clinical concepts. Relationships can exist either within the clinical model (i.e. structural relationships) or within a terminology (e.g. SNOMED CT).A terminology designed to provide common semantics for diverse implementations.
RepositoryRelationship			A repository is a location for storage. CIMI plans to populate two types of repository: * Clinical Model Repository - for storing clinical information models * Terminology Server - for storing clinical terminologyA relationship is an association or link between two clinical concepts. Relationships can exist either within the clinical model (i.e. structural relationships) or within a terminology (e.g. SNOMED CT).
Request for InformationRepository	RFI		A general request to industry, academia, and any other interested parties to submit information about a particular technology area to one of the OMG's Technology Committee subgroups.A repository is a location for storage. CIMI plans to populate two types of repository: * Clinical

		Model Repository - for storing clinical information models * Terminology Server - for storing clinical terminology
Request for ProposalRequest for Information	RFPRFI	A document requesting OMG members to submit proposals to an OMG Technology Committee. Such proposals must be received by a certain deadline and are evaluated by the issuing Task Force.A general request to industry, academia, and any other interested parties to submit information about a particular technology area to one of the OMG's Technology Committee subgroups.
RequirementRequest for Proposal	RFP	A requirement is a statement that identifies a necessary attribute, capability, characteristic, or quality of a system for it to have value and utility to a user.A document requesting OMG members to submit proposals to an OMG Technology Committee. Such proposals must be received by a certain deadline and are evaluated by the issuing Task Force.
Resource Description FrameworkRequirement	RDF	RDF is a standard model for data interchange on the Web. RDF extends the linking structure of the Web to use URIs to name the relationship between things as well as the two ends of the link (this is usually referred to as a 'triple'). This linking structure forms a directed, labeled graph, where the edges represent the named link between two resources, represented by the graph nodes.A requirement is a statement that identifies a necessary attribute, capability, characteristic, or quality of a system for it to have value and utility to a user.
Resources For HealthResource Description Framework	RFHRDF	RDF is a standard model for data interchange on the Web. RDF extends the linking structure of the Web to use URIs to name the relationship between things as well as the two ends of the link (this is usually referred to as a 'triple'). This linking structure forms a directed, labeled graph, where the edges represent the named link between two resources, represented by the graph nodes.

SNOMED CTResources For Health	SCTRFH	SNOMED CT (Systemized Nomenclature of Medicine - Clinical Terms') is a comprehensive clinical terminology, which is owned, maintained, and distributed by IHTSDO (The International Health Terminology Standards Development Organization).
SNOMED CT Compositional GrammarSNOMED CT	SCT	A formal grammar used to compose SNOMED CT expressions.SNOMED CT (Systemized Nomenclature of Medicine - Clinical Terms') is a comprehensive clinical terminology, which is owned, maintained, and distributed by IHTSDO (The International Health Terminology Standards Development Organization).
SPARQL Protocol and RDF Query LanguageSNOMED CT Compositional Grammar	SPARQL	The SPARQL Protocol and RDF Query Language (SPARQL) is a query language and protocol for RDF.A formal grammar used to compose SNOMED CT expressions.
Semantic BindingSPARQL Protocol and RDF Query Language	SPARQL	The association of a node in an information model with a concept from a controlled terminology that represents its meaning.The SPARQL Protocol and RDF Query Language (SPARQL) is a query language and protocol for RDF.
Semantic InteroperabilitySemantic Binding		The ability of two or more systems to automatically interpret information exchanged meaningfully and accurately in order to produce useful results as defined by the end users of both systems.The association of a node in an information model with a concept from a controlled terminology that represents its meaning.
Standard or SpecificationSemantic Interoperability		A technical standard is an established norm or requirement about technical systems. It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes and practices. A specification sets out an explicit set of requirements to be satisfied by a material, product or service.The ability of two or more systems to automatically interpret information exchanged meaningfully and accurately in order to produce useful results as defined by the end users of both systems.
Task ForceStandard or Specification	TF	The OMG Technology Committee subgroup responsible for issuing a RFP and evaluating submission(s).A technical standard is an established norm or requirement about technical systems. It is usually a formal document that establishes

		uniform engineering or technical criteria, methods, processes and practices. A specification sets out an explicit set of requirements to be satisfied by a material, product or service.
Technical GovernanceTask Force	TF	A governance framework through which the high technical quality of all artefacts (for example, clinical models/archetypes, reference model, constraint formalism and terminology) is maintained, during creation, storage, verification, maintenance, and distribution.The OMG Technology Committee subgroup responsible for issuing a RFP and evaluating submission(s).
Technical RequirementTechnical Governance		Technical requirements pertain to the technical aspects that a system must fulfill, such as performance-related issues, reliability issues and availability issues. In the context of CIMI, technical requirements also relate to the technical specifications to which artefacts must conform.A governance framework through which the high technical quality of all artefacts (for example, clinical models/archetypes, reference model, constraint formalism and terminology) is maintained, during creation, storage, verification, maintenance, and distribution.
Technology CommitteeTechnical Requirement	TC	The body responsible for recommending technologies for adoption to the BoD. There are two TCs in OMG – the *Platform TC* (PTC) focuses on IT and modeling infrastructure related standards; while the *Domain TC* (DTC) focuses on domain specific standards.Technical requirements pertain to the technical aspects that a system must fulfill, such as performance-related issues, reliability issues and availability issues. In the context of CIMI, technical requirements also relate to the technical specifications to which artefacts must conform.
TemplateTechnology Committee	TC	A template is a constraint specification applied to one or more archetypes. Templates are used to create definitions of content for specific applications such as a particular document or message, specific use cases, screen forms, message types or reports. Templates are defined using the same constraint formalism as archetypes - i.e. the AOM. Typical examples include 'acute care discharge summary', 'GP referral' and radiology

		report'.The body responsible for recommending technologies for adoption to the BoD. There are two TCs in OMG – the *Platform TC* (PTC) focuses on IT and modeling infrastructure related standards; while the *Domain TC* (DTC) focuses on domain specific standards.
TermTemplate		A human-readable name assigned to a concept. A concept may have multiple terms associated with it, in which case the terms are synonyms.A template is a constraint specification applied to one or more archetypes. Templates are used to create definitions of content for specific applications such as a particular document or message, specific use cases, screen forms, message types or reports. Templates are defined using the same constraint formalism as archetypes - i.e. the AOM. Typical examples include 'acute care discharge summary', 'GP referral' and radiology report'.
TerminologyTerm		A vocabulary of technical terms used in a particular field, subject, science, or art.A human-readable name assigned to a concept. A concept may have multiple terms associated with it, in which case the terms are synonyms.
Terminology BindingTerminology		The assertion of a relationship between the information model and the terminology.A vocabulary of technical terms used in a particular field, subject, science, or art.
Terminology Expression LanguageTerminology Binding		A formal grammar used to create expressions from one or more terminology concepts -- for example, SNOMED CT compositional grammar.The assertion of a relationship between the information model and the terminology.
Terminology ServerTerminology Expression Language	TS	A terminology server is a piece of software providing a range of terminology-related software services through an Applications Programming Interface to its client applications.A formal grammar used to create expressions from one or more terminology concepts -- for example, SNOMED CT compositional grammar.
Unified Modeling LanguageTerminology Server	UMLTS	UML is a standardised modeling language developed by the Object Management Group to specify, visualise, modify, construct and document the artifacts of an object-oriented software-intensive system. In the context of CIMI, the phrase 'UML

		model' will most commonly refer to a UML class diagram.A terminology server is a piece of software providing a range of terminology-related software services through an Applications Programming Interface to its client applications.
Unified Modeling Language ProfileUnified Modeling Language	UML ProfileUML	A profile in the Unified Modelling Language (UML) provides a generic extension mechanism for customizing UML models for particular domains and platforms. Profiles are defined using stereotypes, tag definitions, and constraints that are applied to specific model elements, such as Classes, Attributes, Operations and Activities. A Profile is a collection of such extensions that collectively customize UML for a particular domain or platform.UML is a standardised modeling language developed by the Object Management Group to specify, visualise, modify, construct and document the artifacts of an object-oriented software-intensive system. In the context of CIMI, the phrase 'UML model' will most commonly refer to a UML class diagram.
Usage Context		The condition under which a binding is valid. Usually a country or geographic region.
Value BindingUnified Modeling Language Profile	UML Profile	The identification of the valid concepts that may populate a given node in a clinical model. Value bindings may be defined using an intensional definition (i.e. rules which define the set of valid concepts), an extensional definition (i.e. a list of valid concepts), or reference to a terminology reference set or value set.A profile in the Unified Modelling Language (UML) provides a generic extension mechanism for customizing UML models for particular domains and platforms. Profiles are defined using stereotypes, tag definitions, and constraints that are applied to specific model elements, such as Classes, Attributes, Operations and Activities. A Profile is a collection of such extensions that collectively customize UML for a particular domain or platform.
Value SetValue Binding		A value set is the set of values that is valid for use in a specific context, e.g. to define the domain of a data element. Value sets may be defined extensionally by listing the valid values explicitly, or intensionally by providing a definition by which valid values

		can be identified. The Represents a uniquely identifiable set of valid concept representations, where any concept representation can be tested to determine whether or not it is a member of the value set. Value sets exist to constrain the content for a coded element in an information model; they represent a vocabulary constraint statement. Value set complexity may range from a simple flat list of concept codes drawn from a single code system, to an unbounded hierarchical set of possibly post-coordinated expressions drawn from multiple code systems.The identification of the valid concepts that may populate a given node in a clinical model. Value bindings may be defined using an intensional definition (i.e. rules which define the set of valid concepts), an extensional definition (i.e. a list of valid concepts), or reference to a terminology reference set or value set.
Web Ontology LanguageValue SetValue Binding	OWL	The Web Ontology Language OWL is a semantic markup language for publishing and sharing ontologies on the World Wide Web. OWL is developed as a vocabulary extension of RDF (the Resource Description Framework) and is derived from the DAML+OIL Web Ontology Language.A value set is the set of values that is valid for use in a specific context, e.g. to define the domain of a data element. Value sets may be defined extensionally by listing the valid values explicitly, or intensionally by providing a definition by which valid values can be identified. The Represents a uniquely identifiable set of valid concept representations, where any concept representation can be tested to determine whether or not it is a member of the value set. Value sets exist to constrain the content for a coded element in an information model; they represent a vocabulary constraint statement. Value set complexity may range from a simple flat list of concept codes drawn from a single code system, to an unbounded hierarchical set of possibly post-coordinated expressions drawn from multiple code systems.The identification of the valid concepts that may populate a given node in a clinical model. Value bindings may be defined using an

		intensional definition (i.e. rules which define the set of valid concepts), an extensional definition (i.e. a list of valid concepts), or reference to a terminology reference set or value set.
World Wide Web ConsortiumWeb Ontology LanguageValue Set	W3COWL	The World Wide Web Consortium (W3C) is an international community where member organizations, a full-time staff, and the public work together to develop Web standards.The Web Ontology Language OWL is a semantic markup language for publishing and sharing ontologies on the World Wide Web. OWL is developed as a vocabulary extension of RDF (the Resource Description Framework) and is derived from the DAML+OIL Web Ontology Language.A value set is the set of values that is valid for use in a specific context, e.g. to define the domain of a data element. Value sets may be defined extensionally by listing the valid values explicitly, or intensionally by providing a definition by which valid values can be identified. The Represents a uniquely identifiable set of valid concept representations, where any concept representation can be tested to determine whether or not it is a member of the value set. Value sets exist to constrain the content for a coded element in an information model; they represent a vocabulary constraint statement. Value set complexity may range from a simple flat list of concept codes drawn from a single code system, to an unbounded hierarchical set of possibly post-coordinated expressions drawn from multiple code systems.
World Wide Web Consortium Standard or SpecificationWorld Wide Web ConsortiumWeb Ontology Language	W3COWL	W3C standards and specifications are those specifications published by the W3C, including Web Ontology Language (OWL), SPARQL, eXtensible Markup Language (XML) and Resource Description Framework (RDF).The World Wide Web Consortium (W3C) is an international community where member organizations, a full-time staff, and the public work together to develop Web standards.The Web Ontology Language OWL is a semantic markup language for publishing and sharing ontologies on the World Wide Web. OWL is developed as a vocabulary extension of RDF (the Resource Description Framework) and is

		derived from the DAML+OIL Web Ontology Language.
XML Metadata InterchangeWorld Wide Web Consortium Standard or SpecificationWorld Wide Web Consortium	XMIW3C	An OMG standard that facilitates interchange of models via XML documents.W3C standards and specifications are those specifications published by the W3C, including Web Ontology Language (OWL), SPARQL, eXtensible Markup Language (XML) and Resource Description Framework (RDF).The World Wide Web Consortium (W3C) is an international community where member organizations, a full-time staff, and the public work together to develop Web standards.
XML Metadata InterchangeWorld Wide Web Consortium Standard or Specification	XMI	An OMG standard that facilitates interchange of models via XML documents.W3C standards and specifications are those specifications published by the W3C, including Web Ontology Language (OWL), SPARQL, eXtensible Markup Language (XML) and Resource Description Framework (RDF).
XML Metadata Interchange	XMI	An OMG standard that facilitates interchange of models via XML documents.