

Object Management Group

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Request For Proposal

Information Management Metamodel (IMM)

OMG Document: ab/2005-12-02

Letters of Intent due: May, 2006
Submissions due: September, 2006

Objective of this RFP

This RFP solicits proposals for a standard metamodel to address the needs of Information Management. This includes the scope of the existing Common Warehouse Metamodel (CWM) standard but is extended to cover the following areas:

- MOF2 Metamodel for Information Management (IMM)
- UML2 Profile for Relational Data Modeling, with a mapping to the IMM metamodel and SQL DDL
- UML2 Profile for Logical (Entity Relationship) Data Modeling, with a mapping to the IMM metamodel
- UML2 Profile for XML Data Modeling, with a mapping to the IMM metamodel and XML Schema
- UML2 Profile for Record Modeling, with a mapping to the IMM metamodel and COBOL Copybooks

- A standardized 'Information Engineering' data modeling notation with a mapping to the IMM metamodel

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 (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 ab 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), [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 respondent 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 extend this deadline 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 *Adopted Specification*.

- *Business Committee Questionnaire*

The submitting members whose proposal is recommended for adoption need to submit their response 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 *adopted* submission for publishing as a formal, publicly available specification. Its responsibility includes production of one or more prototype implementations and fixing any problems that are discovered in the process. This ensures that the final available standard is actually implementable and has no show-stopping bugs. Upon completion of its activity the FTF recommends adoption of the resulting draft standard called the *Available Specification*. The FTF must also provide evidence of the existence of one or more prototype implementations. The parent TC acts on the recommendation and recommends adoption to the BoD. OMG Technical Editors produce the *Formal Published Specification* document based on this *Available 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 *Available Specification* by implementers and users. The output of the RTF is a revised specification reflecting minor technical changes.

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 the 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 the submission 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 the submission. 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/02-04-02.

<____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/2002-04-02.

Commercial considerations in OMG technology adoption

A1 Introduction

OMG wishes to encourage rapid commercial adoption of the technologies (specifications and support measures) 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 the submission.

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.*
- *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.

In the case of the proposed adoption of support measures, the BC needs to have proof of the intent to use or recommend such support measures within 12 months of the date when the support measures were recommended for adoption by the appropriate Task Force.

A2.3 Access to Intellectual Property Rights

OMG will not adopt a specification or support measure 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 or support measure, 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 or support measure. Accordingly, the submitter must certify that it is not aware of any claim that the specification or support measure 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 or support measure 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 the

submission 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 or support measure.

A2.4 Publication of the specification

Should the submission or support measures be adopted, the submitter must grant OMG (and its sublicensees) a worldwide, 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 or support measure after OMG adoption, for instance by showing the BC development plans for future revisions, enhancement or maintenance.

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 to the satisfaction of the TF managing the evaluation process, the technical viability of their proposal. 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 the 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

- The name of the RFP that the submission is responding to.
- List of OMG members making the submission (see 4.1) listing exactly which members are making the submission, 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 the submission, an individual contact point who is authorized by the member to officially state the member’s position relative to the submission, including matters related to copyright ownership, etc. (see 4.3)
- Overview or guide to the material in the submission
- 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 adopted 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 Postscript, ASCII, PDF, Adobe FrameMaker, Microsoft Word, and WordPerfect. However, it should be noted that a successful (adopted) submission must be supplied to OMG’s technical editors in FrameMaker source format, using the most recent available OMG submission template (see [FORMS]). The AB will not endorse adoption of any submission for which appropriately formatted FrameMaker sources are not submitted to OMG; it may therefore be convenient to prepare all stages of a submission using this template.

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, the response 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 response 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

6.1 Problem Statement

6.1.1 CWM

OMG's Common Warehouse Metamodel (CWM) has been successful and is mature and stable, with widespread and increasing adoption by vendors and customers for metadata interchange: most widely in the area of relational database information.

The uptake has been somewhat hampered by CWM's name – many of the potential uses of CWM have no connection with building or managing data warehouses. It is in effect a core standard for representing the management of any form of information resource: it has been recognized as such by being made one of MDA's 'cornerstone' standards (the others being MOF and UML). Hence this RFP proposes the name **Information Management Metamodel (IMM)** instead of CWM.

With the advent of MDA there is now far more emphasis on modeling compared to when CWM was originated - as primarily a means of interchange only.

However CWM has not been updated since CWM 1.1 in 2001 and a small but significant number of issues have been 'stacking up'. Most notable is the less than adequate support for modeling XML data structures. Although there is an independent metamodel for XML structure in the XMI 2.1 specification, this is not integrated into the CWM Core and so cannot benefit from common CWM modeling capabilities such as Type Mapping, Transformations, Warehouse Process definitions etc.

Now that UML2 and MOF2 are stable there is the opportunity to take advantage of their new features to address some long-standing issues in CWM; and achieve interoperability with the latest generation of tools. One Issue has been that CWM 1.0 had to create a disjoint subset of UML 1.x for scalability reasons – which reduced scope for inter-working with UML.

Since CWM 1.1 a number of new standards and initiatives (see section 6.3) have emerged within OMG which partially overlap with CWM – mainly in non-'Core' areas. Rather than arbitrary overlap, it is preferable to have integration and re-use, and this can also benefit from the new capabilities of MOF2. The goal is to allow either 'standalone' use of the new metamodel or integrated use with one or more of these other metamodels.

6.1.2 UML for Data Modeling

Many UML vendors and users have wanted to use UML tools for data modelling and ended up defining their own UML profiles. However each has made their own interpretation and trade-offs. As a result there is no generally accepted standard nor interoperability. From an MDA perspective there is no opportunity to define Transformations that either generate or consume such data models.

One of the leading such profiles was produced by Scott Ambler who writes (at <http://www.agiledata.org/essays/dataModeling101.html#Notations>)

“This is not an official data modeling notation (yet). Although several suggestions for a data modeling profile for the UML exist, including Naiburg and Maksimchuk’s (2001) and my own (Ambler 2001a), none are complete and more importantly are not “official” UML yet. Having said that, considering the popularity of the UML, the other data-oriented efforts of the Object Management Group (OMG), and the lack of a notational standard within the data community it is only a matter of time until a UML data modeling notation is accepted within the IT industry. “

It is time for OMG to step up to the plate. But rather than a standalone RFP it makes a lot more sense to develop such a Profile in the context of an overall Information Management capability, for the following reasons:

- A profile coupled with a normative metamodel provides the best of both worlds (use of UML tools and more natural interchange, transformation and model management working at the metamodel element rather than UML level)
- OMG experience has shown that a Profile is easier to understand and use with a fully-developed metamodel behind it
- Forward compatibility with CWM – leveraging the significant bridges already in the market
- Integration of data modelling into a broader information management metamodel provides more capability and less of a silo (though it should be possible to use the data modelling metamodel standalone)

6.1.3 UML for XML Modeling

As for data modeling (though to a lesser extent) there are a few UML profiles for modelling XML Schemas in an MDA context. Likewise it makes sense to standardize one.

6.1.4 Data Modeling Notation

The only de jure standard is IDEF1X: many users prefer the IE style of diagram for which there is no formal definition – and tools tend to support a combination of techniques from one of about 4 books/papers written by the leading protagonists such as Finkelstein.

There is therefore an opportunity, which would be welcomed by many in the data modeling community, for OMG to solidify a standard in this area. And with a formal metamodel mapping.

The data modeling community still has quite a high level of resistance to the UML notation: the vision of this RFP is to allow tools to switch between UML and the other notations as easy as tools today allow switching between IDEF1X and (some variant of) IE. This will have significant benefits for improved communication between different communities (even database designers and developers in the same organization).

The situation is even more precarious for Entity Relationship models and notations, where there is even less of a consensus. For an indication of the approach see [McFadyen] and [Chen]. This is compounded by lack of a clear definition as to what a ‘logical’ model really should consist of and how normalized it should be.

6.1.5 CWM Issues

Some issues were deferred by the CWM RTFs as being too ‘large’ for a RTF. The full set of issues is at <http://www.omg.org/issues/cwm-rtf.open.html> which should be used as the definitive source for considering all issues not just those mentioned here. Many are addressed by other aspects of this RFP – for example to use the latest version and capabilities of MOF (Issues 4509, 4510, 4511, 5695, 5697), reuse latest capabilities of UML (Issues 4398, 4399, 4402, 4406, 4407, 4470, 4512, 5921), to provide stronger support in areas that are (now) touched on by business-related specifications (e.g. Contact information) (4460, 4470, 4472, 4473, 4513, 4515) and COBOL (4717). The remaining specific issues are as follows:

6.1.5.1 *Issue 4430, 5106, 5299 – Relational metamodel*

Support for Sequence, Parameters, applicability of Triggers

6.1.5.2 *Issues 4247, 4400, 4461, 4467 – XML Schema metamodel*

These are covered by the requirements for XML Schema

6.1.5.3 Issue 4401 – reconcile transformations and type mapping

QVT may now also address this issue.

6.1.5.4 Issue 4463 – factor out Data Mining classification package

6.1.5.5 Issue 4516 – factor out Measurement model from Warehouse Process

6.1.5.6 Issue 4519 – Ensure Warehouse Processes clearly reference required physical information

6.1.5.7 Issue 4583 – modeling and packaging guidelines for extension: this is referenced in section 6.7 of this RFP.

6.1.6 Usage Scenario

The following outlines how IMM may be used across (potentially) many different tools. This is a vision and not a statement of requirements. Communication between the tools may be by exchanging XMI files, access to a common repository, or use of APIs (either MOF Reflection or generated from IMM using MOF language bindings)

- A data analyst creates an Entity Relationship diagram. It is possible to trace the Entities to the formal definitions of the corresponding terms in an existing Business Vocabulary conforming to SBVR (either in the ER tool or a separate trace mapping tool).
- A transformation is applied to the ER model using a QVT tool to apply a general pattern to create a Relational data model (e.g. to generate an Association table for each many-many Relationship).
- A relational database expert loads the Relational data model and uses a relational database tool to optimize it based on the documented needs of the intended use. The latter are outside the scope of IMM but could come from a Requirements model, UML system design. But it should be possible to trace from design decisions in the relational design to the requirements influencing the decision. This will result in a new version of the relational model (compared to that automatically generated).
- The relational model is loaded into a UML tool used by the application designer, who uses the UML Profile representation of the model to incorporate database access based on the correct table definition. And then generate the Java code for the system. (The system modeling and

generation is outside scope of IMM but IMM provides the access to the correct data model in that environment)

- A model-to-text generation tool generates SQL text from the relational model. This is scheduled for deployment on the actual relational database software in conjunction with the deployment of the (new version) of the application.
- The relational model is read by a data warehousing tool which is used to design an Extract to be run every night for a datamart. The datamart cube and underlying relational design is recorded as an IMM model.
- The cube structure is loaded into a business reporting tool and used by a business analyst to generate end user reports and queries. The traceability information can also be accessed and incorporated (from relational model back to ER model back to business vocabulary) in order to present the reports to the users using the business terms they are familiar with. Links are automatically created allowing the user to click a link to access the full definition of the term through dynamic access to the original SBVR model/repository.

6.1.7 Metamodel Independence

Although the previous section presents a complete integrated picture, it is certainly not a requirement, nor expected, that single tools will be required to have all these capabilities, nor to support the whole metamodel. This means that:

- Tools covering just one specific area can still be conformant: for example a tool that just helped users design and create relational databases.
- Such tools will not be burdened with having to implement the whole of the IMM metamodel, but just those aspects that are their concern

6.2 Scope of Proposals Sought

In summary this RFP seeks proposals that cover the following areas:

- MOF2 Metamodel for Information Management (IMM)
- UML2 Profile for Relational Data Modeling, with a mapping to the IMM metamodel and SQL DDL

- UML2 Profile for Logical (Entity Relationship) Data Modeling, with a mapping to the IMM metamodel
- UML2 Profile for XML Data Modeling, with a mapping to the IMM metamodel and XML Schema
- UML2 Profile for Record Modeling, with a mapping to the IMM metamodel and COBOL Copybooks
- A standardized data modeling notation with a mapping to the IMM metamodel

The following is a checklist of the packages in CWM 1.1, and how it is expected they will be covered in IMM: that is not to say that the approach will be identical to CWM (for example submitters may not wish to inherit from a common Core). This table is a guide and does not supersede the requirements in sections 6.5 and 6.6; it does not distinguish mandatory and optional requirements.

Note ‘integration’ in this table is intended to be loose and leave freedom to submitters to reuse, extend, package merge or link to another metamodel.

Object Model Core	Consider integration with UML2 Infrastructure if a common set of supertypes is still felt appropriate.
Business Information	Consider integration with Organization Structure Metamodel
Data Types	Consider integration with UML
Expression	Consider integration with UML
Keys and Indexes	Carry forward
Type Mapping	Consider integration with QVT, and consolidation with Transformations part of CWM
Software Deployment	Consider integration with UML and/or IT Portfolio Management Facility
Object-Oriented Resource	Consider integration with UML, with extension for OODB; add UML Profile

Relational	Carry forward; consider integration with Eclipse SQL metamodel; add UML Profile
Record	Carry forward but extend to include COBOL data structures (as in the CWM Extension); add UML Profile
Multidimensional	Carry forward
XML	Consider integration with Eclipse XSD metamodel; add UML Profile
Transformation	Consider integration with QVT; however higher level classifier/feature maps should also be considered for retention
OLAP	Carry forward
Data Mining	Carry forward
Information Visualization	Carry forward
Business Nomenclature	Consider integration with Ontology Definition Metamodel and/or Semantics of Business Vocabulary and Rules
Warehouse Process	Consider integration with Business Process Definition Metamodel
Warehouse Operation	Carry forward

6.3 Relationship to Existing OMG Specifications

6.3.1 MOF 2 ptc/04-10-15

The original CWM 1.x metamodel stretched MOF 1.3 and CWM's requirements spawned several of the changes in the UML2 Infrastructure – for example Association generalization. Therefore it is expected that the IMM metamodel would need the facilities of CMOF rather than EMOF (in the same way CMOF is

used by UML2 itself) - though this is not a requirement. This is also indicated through the requirement to reuse portions of the UML2 metamodel which is in CMOF.

6.3.2 UML 2 formal/05-07-05

The IMM should, where appropriate (e.g. for OO Database Modeling), integrate with or reuse the UML2 metamodel – either ‘in the large’ or in factored form (the Infrastructure). Profiles contained in submissions should be UML2 Profiles.

6.3.3 Ontology Definition Metamodel (ODM) (not yet adopted at time of issuing this RFP) – RFP is [ad/03-03-40](#)

This provides coverage of conceptual information modeling in a variety of technologies (RDFS, OWL, Topic Maps, Common Logic) as both metamodels and UML 2 Profiles. It has an overlap with Business Nomenclature in CWM. It should be possible to transform and/or trace data models in IMM to such conceptual models or ontologies.

6.3.4 Semantics of Business Vocabulary and Rules (SBVR) [bei/05-08-01](#)

This covers business concepts and rules expressed in semi-formal natural language with a logic- and MOF-based formal underpinning. This has an even higher (than ODM) overlap with Business Nomenclature in CWM. As for ODM, it should be possible to transform and/or trace data models in IMM to such conceptual models.

6.3.5 MOF Queries Views Transformations ad/05-07-01

This covers the areas of Transformations and Type Mapping covered by CWM 1.x. However higher-levels of transformation description, such as provided by ClassifierMap and FeatureMap models in CWM, may also be appropriate in IMM. QVT may also be used for tracing levels of abstraction such as Business-Conceptual-Logical-Physical data models (whether automatically generated or not).

It can also be used to express the actual transformations required in submissions by this RFP.

6.3.6 MOF Model to Text (not yet adopted at time of issuing this RFP) – RFP is [ad/04-04-07](#)

This can be used to express the actual textual transformations required in submissions by this RFP.

6.3.7 IT Portfolio Management Facility dtc/04-11-03

This covers areas addressed by CWM 1.x including Deployment (also covered by UML) and Business Information (also covered by OSM).

6.3.8 Organization Structure Metamodel (OSM) (not yet adopted at time of issuing this RFP) – RFP is [bei/04-06-05](#)

This metamodel covers organization structures and relationships and contact information. It therefore covers areas addressed by CWM 1.x Business Information.

6.3.9 Knowledge Discovery Metamodel (KDM) (not yet adopted at time of issuing this RFP) – RFP is It/03-11-04

This metamodel covers data structures from both a persistent (database) and program language perspective.

6.3.10 XMI formal/05-09-01

The XMI 2.1 standard, as well as being relevant for metamodel and model interchange, contains a metamodel for XML Schema that is very close to [Eclipse XSD]. It is expected that the IMM will replace this metamodel which will be removed from the XMI specification (it is not directly relevant to the purpose of XMI)

6.3.11 Business Process Definition Metamodel (BPDM) (not yet adopted at time of issuing this RFP) RFP is [bei/03-01-06](#)

This covers the definition of business processes and so may cover (part of) the Warehouse Process area of CWM 1.x.

6.4 Related Activities, Documents and Standards

6.4.1 IDEF 1X

Submitters are referred to this as a commonly used notation that it should be possible to map to the proposed relational metamodel and profile. See [IDEF1X] and [IDEF1X Hay]

6.4.2 Information Engineering

Submitters are referred to this as a commonly used notation that it should be possible to map to the proposed relational metamodel and profile. See [IE Hay].

6.4.3 Existing UML Profiles for Data Modeling

Submitters are referred to the following as potentially useful background: they are existing attempts to address a part of the problem space. Note that these are all UML 1.x profiles and do not take advantage of new UML2 metamodel constructs, diagramming capabilities, or profile construction. See [Ambler], [Gorp], [NoMagic Relational], [Rational Relational]

6.4.4 Existing UML Profiles for XML Modeling

Submitters are referred to the following as potentially useful background: they are existing attempts to address a part of the problem space. Note that these are all UML 1.x profiles and do not take advantage of new UML2 metamodel constructs, diagramming capabilities, or profile construction. See [Carlson], [Carlson Eclipse],

6.4.5 Eclipse Metamodels

The Eclipse foundation has open source metamodels (in ECore form, but saveable as EMOF) for both Relational [Eclipse Relational] and XML [Eclipse XSD] structures. The latter is the basis of the XML metamodel in the XMI spec (see 6.3.7). These metamodels continue to evolve so submitters are advised to check for updated versions.

6.4.6 Financial Domain Task Force UML Mapping RFPs

The following RFPs are asking for submissions related to mapping from UML models to XML Schemas for exchange of payment information. Submitters may wish to learn from or influence this ongoing work:

[dte/05-09-13](#) (Conversion Models for Payment Message Standards RFP)

[dte/05-09-14](#) (XMI Profile for ISO 20022 RFP)

6.4.7 Object Role Model (ORM)

Submitters are referred to this as an entity relationship modeling notation commonly used in healthcare, environmental models, the building and manufacturing industries. It should be possible to map the principal elements of this notation to the proposed relational model and profile. See www.orm.net

6.4.8 EXPRESS ISO 10303-11.2 (2004)

Submitters are referred to this as an entity relationship modeling notation commonly used in manufacturing and the building industries, particularly in EU and ISO standards in those areas. It should be possible to map the principal elements of this notation to the proposed relational model and profile.

6.4.9 ISO 11179-3 Metadata Repository Model ISO 11179-3.2 (2004)

Submitters are referred to this as a UML model for repositories of “data elements” - named data units, such as medical diagnostic and treatment codes, product UPNs, and other “dynamic classification codes”, commonly used in e-Government. It should be possible to reference such repositories as definitions of such data types and their possible values. And as a consequence, this model may be important to the specification of Data Types in the IMM.

6.5 Mandatory Requirements

6.5.1 Metamodel

Proposals shall contain an Information Management Metamodel (IMM), compliant with CMOF, and depicted using UML2 notation with normative form in MOF2 XMI.

The scope of the metamodel shall be at least as great as CWM 1.1 (see section 6.2 for a guide to expected coverage of CWM).

This metamodel shall reuse, and where necessary extend, relevant parts of the UML2 metamodel.

Where other OMG standard metamodels (those listed in section 6.3) cover the same scope then IMM shall integrate with, rather than duplicating, those metamodels.

However it shall be possible to use IMM ‘standalone’ without requiring implementations compliant with those other standards.

The metamodel shall be modular: the packages should be usable in part, and reusable with other metamodels.

Submissions shall contain a number of compliance points allowing compliant tools to support identified packages, or subsets of the complete IMM: see section 6.1.7 for more detail.

6.5.2 Relational Metamodel and Profile

The IMM shall include Package(s) for Relational Database modeling.

This shall be a PSM for the Relational platform and be capable of representing all non-syntactic aspects of SQL92 Data Definition Language (at the 'intermediate' conformance level). See [SQL92] and [FirstSQL] for a tutorial.

The metamodel shall also be capable of representing all aspects of the IE and IDEF1X notations (see 6.4).

The Relational Model shall be transformable to SQL92 DDL.

Proposals shall contain a UML2 Profile for Relational data modeling, documented using the notation recommended in the UML2 Specification and with its normative form in UML2 XMI.

The Relational Profile shall be mapped to the Relational Metamodel.

6.5.3 Entity Relationship Metamodel and Profile

The IMM shall include Package(s) for Entity Relationship modeling

The metamodel shall be capable of representing at minimum all aspects of the Chen notation [Chen].

Proposals shall contain a UML2 Profile for Entity Relationship modeling, documented using the notation recommended in the UML2 Specification and with its normative form in UML2 XMI.

The Entity Relationship Profile shall be mapped to the Entity Relationship Metamodel.

6.5.4 XML Metamodel and Profile

The IMM shall include Package(s) for XML Data modeling capable of representing all non-syntactic aspects of the XML Schema 1.0 XML language.

The metamodel shall closely match the XML Schema metamodel in the XMI specification and replace it

Instances of the XML Metamodel shall be transformable to XML Schemas.

Proposals shall contain a UML2 Profile for XML data modeling, documented using the notation recommended in the UML2 Specification and with its normative form in UML2 XMI.

The XML Profile shall be mapped to the XML Metamodel.

6.5.5 Resolution of Deferred CWM Issues

Proposals shall review and resolve outstanding CWM issues which include those listed in the subsections of 6.1.5.

6.6 Optional Requirements

6.6.1 Extended Record Metamodel and Profile

[Note: The IMM must include Package(s) for basic Record modeling as part of meeting the mandatory requirement to provide forward migration for CWM 1.1.]

The IMM may include an extended metamodel for record modeling that should be capable of representing all non-syntactic aspects of COBOL Data Divisions.

The Extended Record Metamodel should be transformable to COBOL syntax.

Proposals may contain a UML2 Profile for Record modeling, documented using the notation recommended in the UML2 Specification and with its normative form in UML2 XMI.

The Record Profile should be mapped to the Record Metamodel (or the Extended Record Metamodel at the discretion of submitters).

6.6.2 Object Oriented Database (OODB) Metamodel and Profile

The IMM may include a metamodel for modeling of object oriented databases (OODBs).

The OODB Metamodel should be transformable to ODMG DDL syntax.

Proposals may contain a UML2 Profile for OODB modeling, documented using the notation recommended in the UML2 Specification and with its normative form in UML2 XMI.

The OODB Profile should be mapped to the OODB Metamodel.

6.6.3 Provision of Transformations

Where this RFP requests that models be 'transformable', submissions may supply the actual transformations - expressed in QVT and/or ModelToText as appropriate.

6.6.4 Support for Methods

Submissions may include with the Relational Profile constraints to represent the rules of platform and particular methods e.g. IDEF1X

Submissions may include with the Relational Profile shapes/icons matching the common notations of particular methods

6.6.5 Relational Data Modeling Notation

Proposals may provide a normative definition of the relational modeling notation for the IE style of modeling.

6.6.6 Representation of metamodel

Proposals may provide a non-normative representation of the IMM metamodel using one of the relational modeling notations. This would be to facilitate communication with the data modeling community.

6.6.7 Support for File Transfer as a type of data movement

Proposals may provide a means of representing the transfer of files between directories and/or machines as part of a Warehouse Process.

6.7 Issues to be discussed

Proposals shall specify a migration path from CWM 1.1.

Proposals shall provide non-normative instance diagrams and accompanying explanatory text for each package and profile to show how their proposals can be used to represent simple but representative models

Proposals shall discuss their rationale for their selection of the parts of UML2 metamodel that were reused.

Proposals shall discuss and justify their approach for integrating the proposed IMM with the other OMG metamodels in 6.3 and how IMM can be used standalone.

Proposals shall discuss how to use QVT and Model to Text for the transformations (unless they have been provided in response to optional requirement 6.6.2).

Proposals shall also discuss how to model and maintain manually created traceability links – for example from the logical Entity Relationship to physical Relational and XML models.

Proposals shall discuss how the proposed IMM metamodel could be extended (this shall also address CWM Issue 4583).

These issues will be considered during submission evaluation. They should not be part of the proposed normative specification. (Place them in Part I of the submission.)

6.8 Evaluation Criteria

Proposals will be evaluated on:

- Support of CWM 1.1 and ease of migration
- How natural the metamodel maps to the notations
- How natural the Profiles are for UML users, and the extent to which sensible default mappings can be achieved without the need for explicit stereotypes

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
<i>Preparation of RFP by TF</i>	<i>7 December 2005</i>
<i>RFP placed on OMG document server</i>	<i>14 November 2005</i>

<i>Approval of RFP by Architecture Board Review by TC</i>	<i>8 December 2005</i>
<i>TC votes to issue RFP</i>	<i>9 December 2005</i>
<i>LOI to submit to RFP due</i>	<i>5 May 2006</i>
<i>Initial Submissions due and placed on OMG document server (“Three week rule”)</i>	<i>4 September 2006</i>
<i>Voter registration closes</i>	<i>21 September 06</i>
<i>Initial Submission presentations</i>	<i>27 September 06</i>
<i>Preliminary evaluation by TF</i>	<i>September 06</i>
<i>Revised Submissions due and placed on OMG document server (“Three week rule”)</i>	<i>April 07</i>
<i>Revised Submission presentations</i>	<i>April 07</i>
<i>Final evaluation and selection by TF Recommendation to AB and TC</i>	<i>June 07</i>
<i>Approval by Architecture Board Review by TC</i>	<i>June 07</i>
<i>TC votes to recommend specification</i>	<i>June 07</i>
<i>BoD votes to adopt specification</i>	<i>September 07</i>

Appendix A References and Glossary Specific to this RFP

A.1 References Specific to this RFP

The following documents are referenced in this document:

[Ambler]

<http://www.agiledata.org/essays/umlDataModelingProfile.html>

[Carlson]

<http://www.xml.com/pub/a/2001/10/10/uml.html>

[Carlson Eclipse]

<http://update.xmlmodeling.com/updates/index.html>

(doc.zip/reference/profile inside the Eclipse download has documentation for the UML Profile for XML Schema)

[Chen]

Chen, Peter "The Entity-Relationship Model: Toward a Unified View of Data" ACM Transactions on Database Systems I (I). March 1976, pp 8-46

[COBOL]

ISO 1989:2002 - [Programming Language COBOL](#)

[Eclipse Relational]

<http://www.eclipse.org/webtools/wst/components/rdb/WebPublishedDBDefinitionModel/DBDefinition.htm>

[Eclipse XSD]

<http://eclipse.org/emf/xsd.php>

[FirstSQL]

<http://www.firstsql.com/tutor.htm>

[Gorp]

<http://www.fots.ua.ac.be/~pvgorp/research/datamodelingprofile/>

[IDEF1X FIPS184]

<http://www.itl.nist.gov/fipspubs/idef1x.doc>

[IDEF1X Hay],

<http://www.essentialstrategies.com/publications/modeling/idef1x.htm>

[IE Hay]

<http://www.essentialstrategies.com/publications/modeling/infoeng.htm>

[McFadyen]

<http://io.uwinnipeg.ca/~rmcfadye/2914/ERD/introEntityRelationshipModeling.htm>

[No Magic Relational]

<http://www.magicdraw.com/files/articles/Sep04%20Applying%20UML%20for%20Relational%20Data%20Modeling.htm?NMSESSID=6fa86909edc2eebf845d068413d73d6e>

[ODMG]

Object Data Standard, Jan 2000, published by Morgan Kaufman **ISBN 1-ISBN 1-55860-647-5**

Edited by R. G. G. Cattell, Douglas K. Barry, Mark Berler, Jeff Eastman, David Jordan, Craig Russell, Olaf Schadow, Torsten Stanienda, and Fernando Velez

[Rational Relational]

<http://www.jeckle.de/files/RationalUML-RDB-Profile.pdf>

[SQL92]

<http://www.itl.nist.gov/fipspubs/fip127-2.htm>

[XML Infoset]

XML Information Set <http://www.w3.org/TR/2004/REC-xml-infoset-20040204/>

A.2 Glossary Specific to this RFP

ECore – native metamodel format for the Eclipse Modeling Framework (EMF) <http://www.eclipse.org/emf>. It is generally interchangeable with the Essential MOF (EMOF) compliance level of MOF2

IDEF 1X - Commonly used notation for logical models of relational databases, standardized by NIST See [IDEF1X FIPS184] and [IDEF1X Hayes].

Information Engineering (IE) – Widely used traditional software development method, focused on data analysis. Includes a commonly used data modeling notation, most famous for using ‘crows feet’ to represent multiplicity.

Data Definition Language (DDL) – The part of SQL (typically) used for declaring information structures (Tables, Columns, Schemas) as opposed to manipulating them.

Appendix B General Reference and Glossary

B.1 General References

The following documents are referenced in this document:

[ATC] Air Traffic Control Specification,

http://www.omg.org/technology/documents/formal/air_traffic_control.htm

[BCQ] OMG Board of Directors Business Committee Questionnaire,

<http://www.omg.org/cgi-bin/doc?bc/02-02-01>

[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_EDO_C_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>

[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>

B.2 General Glossary

Architecture Board (AB) - The OMG plenary that is responsible for ensuring the technical merit and MDA-compliance of RFPs and their submissions.

Board of Directors (BoD) - The OMG body that is responsible for adopting technology.

Common Object Request Broker Architecture (CORBA) - An OMG distributed computing platform specification that is independent of implementation languages.

Common Warehouse Metamodel (CWM) - An OMG specification for data repository integration.

CORBA Component Model (CCM) - An OMG specification for an implementation language independent distributed component model.

Interface Definition Language (IDL) - An OMG and ISO standard language for specifying interfaces and associated data structures.

Letter of Intent (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.

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.

Metadata - Data that represents models. For example, a UML model; a CORBA object model expressed in IDL; and a relational database schema expressed using CWM.

Metamodel - A model of models.

Meta Object Facility (MOF) - An OMG standard, closely related to UML, that enables metadata management and language definition.

Model - A formal specification of the function, structure and/or behavior of an application or system.

Model Driven Architecture (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.

Normative – 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).

Normative Reference – References that contain provisions that one must conform to in order to claim compliance with the standard that contains said normative reference.

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.

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.

Platform Specific Model (PSM) - 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.

Request for Information (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.

Request for Proposal (RFP) - A document requesting OMG members to submit proposals to the OMG's Technology Committee. Such proposals must be received by a certain deadline and are evaluated by the issuing task force.

Task Force (TF) - The OMG Technology Committee subgroup responsible for issuing a RFP and evaluating submission(s).

Technology Committee (TC) - The body responsible for recommending technologies for adoption to the BoD. There are two TCs in OMG – *Platform TC* (PTC), that focuses on IT and modeling infrastructure related standards; and *Domain TC* (DTC), that focus on domain specific standards.

Unified Modeling Language (UML) - An OMG standard language for specifying the structure and behavior of systems. The standard defines an abstract syntax and a graphical concrete syntax.

UML Profile - A standardized set of extensions and constraints that tailors UML to particular use.

XML Metadata Interchange (XMI) - An OMG standard that facilitates interchange of models via XML documents.