

# **Object Management Group**

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## **Common Warehouse Metadata Interchange Request For Proposal**

OMG Document: ad/98-09-02

**Submissions due: September 17, 1999**

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## **Objective of this RFP**

This RFP requests for proposals that enable common warehouse metadata interchange (CWMI).

The specific objectives of this RFP are the following:

- Establish an industry standard specification for common warehouse metadata interchange.
- Provide a generic mechanism that can be used to transfer a wide variety of warehouse metadata.
- Leverage existing vendor-neutral interchange mechanisms as much as possible.

This RFP solicits proposals for the following:

- A complete specification of the syntax and semantics needed to export/import warehouse metadata and the common warehouse metamodel. This may consist of a specification for the common warehouse metamodel, APIs (in IDL), and/or interchange formats.

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 a membership of over 700 vendors, developers, and end users. Established in 1989, its mission is to promote the theory and practice of Object Technology (OT) for the development of distributed computing systems.

A key goal of OMG is create a standardized object-oriented architectural framework for distributed applications based on specifications that enable and support distributed objects. Objectives include the *reusability*, *portability*, and *interoperability* of object-oriented software components in heterogeneous environments. To this end, the OMG adopts interface and protocol specifications, based on commercially available object technology, that together define an Object Management Architecture (OMA).

### 1.2 Organization of this document

The remainder of this document is organized as follows:

Chapter 2 - *Architectural Context* - background information on OMG's Object Management 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, mandatory and optional requirements, issues to be discussed, evaluation criteria, and timetable that apply specifically to this RFP.

Additional RFP-specific chapters may also be included following Chapter 6.

### 1.3 References

The following documents are referenced in this document:

Richard Soley (ed.), *Object Management Architecture Guide*, Third Edition, Wiley, June 1995. OMG Document ab/97-05-05.

*The Common Object Request Broker: Architecture and Specification*, Revision 2.0, July 1996. OMG Document ptc/96-08-04.

*CORBA services: Common Object Services Specification*, Revised Edition,

March 1995. OMG Document formal/97-05-03.

*CORBA facilities Architecture*, Revision 4.0, November 1995.

*Business Committee RFP Attachment*, OMG Document omg/96-01-01.

*Policies and Procedures of the OMG Technical Process*, OMG Document pp/97-01-01 or successor.

These documents can be obtained by contacting OMG at [document@omg.org](mailto:document@omg.org). Many OMG documents, including this document, are available electronically from OMG's document server. Send a message containing the single line "help" to [server@omg.org](mailto:server@omg.org) for more information.

For more information about OMG visit OMG's Web page (URL <http://www.omg.org/>). If you have general questions about this RFP send email to [responses@omg.org](mailto:responses@omg.org).

## 2.0 Architectural Context

### 2.1 Object Management Architecture

The *Object Management Architecture Guide* (OMAG) describes OMG's technical objectives and terminology and provides the conceptual infrastructure upon which supporting specifications are based. The guide includes the *OMG Object Model*, which defines common semantics for specifying the externally visible characteristics of objects in a standard implementation-independent way, and the *OMA Reference Model*.

The Reference Model identifies and characterizes the components, interfaces, and protocols that compose the OMA. This includes the Object Request Broker (ORB) component that enables clients and objects to communicate in a distributed environment, and four categories of object interfaces:

- *Object Services* are interfaces for general services that are likely to be used in any program based on distributed objects.
- *Common Facilities* are interfaces for horizontal end-user-oriented facilities applicable to most application domains.
- *Domain Interfaces* are application domain-specific interfaces.
- *Application Interfaces* are non-standardized application-specific interfaces.

A second part of the Reference Model introduces the notion of domain-specific *Object Frameworks*. An Object Framework component is a collection of cooperating objects that provide an integrated solution within an application or technology domain and which is intended for customization by the developer or user.

Through a series of RFPs, OMG is populating the OMA with detailed specifications for each component and interface category in the Reference Model. Adopted specifications include the Common Object Request Broker Architecture (CORBA), CORBAServices, and CORBAFacilities.

The wide-scale industry adoption of OMG's OMA provides application developers and users with the means to build interoperable software systems distributed across all major hardware, operating system, and programming language environments.

### 2.2 CORBA

The *Common Object Request Broker Architecture* defines the programming interfaces to the OMA ORB component. An ORB is the basic mechanism by which objects transparently make requests to - and receive responses from - each other on the same machine or across a network. A client need not be aware of the mechanisms used to communicate with or activate an object, how the object is implemented, nor where the object is located. The ORB thus forms the foundation for building applications constructed from distributed objects and for

interoperability between applications in both homogeneous and heterogeneous environments.

The *OMG Interface Definition Language* (IDL) provides a standardized way to define the interfaces to CORBA objects. The IDL definition is the contract between the implementor of an object and the client. IDL is a strongly typed declarative language that is programming language-independent. Language mappings enable objects to be implemented and sent requests in the developer's programming language of choice in a style that is natural to that language.

CORBA 2.0 is an extension and restructuring of the earlier CORBA 1.2 specification. CORBA 2.0 is a family of specifications consisting of the following components:

- Core (including IDL syntax and semantics)
- Interoperability
- An expanding set of language mappings, including:
  - C, C++, SmallTalk, Ada95, COBOL, Java

Each component is a separate compliance point. The minimum required for a CORBA-compliant implementation is adherence to the core and one language mapping.

## **2.3 CORBA/Interoperability**

Interoperability between CORBA-compliant ORBs is provided by OMG's *Internet Inter-ORB Protocol* (IIOP). Adopted in December 1994 as the mandatory CORBA 2.0 protocol for “out of the box” interoperability, IIOP is the TCP/IP transport mapping of a *General Inter-ORB Protocol* (GIOP). IIOP enables requests to be sent to networked objects managed by other ORBs in other domains.

The OMG interoperability architecture also accommodates communication using optional *Environment-Specific IOPs* (ESIOPs), the first of which is the DCE-CIOP.

## **2.4 CORBAServices**

Object Services are general purpose services that are either fundamental for developing useful CORBA-based applications composed of distributed objects, or that provide a universal - application domain-independent - basis for application interoperability.

Object Services are the basic building blocks for distributed object applications. Compliant objects can be combined in many different ways and put to many different uses in applications. They can be used to construct higher level facilities and object frameworks that can interoperate across multiple platform environ-

ments.

Adopted OMG Object Services are collectively called CORBA services and include Naming, Events, LifeCycle, Persistent Object, Relationships, Externalization, Transactions, Concurrency Control, Licensing, Query, Properties, Security, Time, Collections, and Trading Services.

## **2.5 CORBA facilities**

Common Facilities are interfaces for horizontal end-user-oriented facilities applicable to most domains. Adopted OMG Common Facilities are collectively called CORBA facilities and include an OpenDoc-based Distributed Document Component Facility.

A specification of a Common Facility or Object Service typically includes the set of interface definitions - expressed in OMG IDL - that objects in various roles must support in order to *provide*, *use*, or *participate in* the facility or service. As with all specifications adopted by OMG, facilities and services are defined in terms of interfaces and their semantics, and not a particular implementation.

## **2.6 Object Frameworks and Domain Interfaces**

Unlike the interfaces to individual parts of the OMA “plumbing” infrastructure, Object Frameworks are complete higher level components that provide functionality of direct interest to end-users in particular application or technology domains. They are vertical slices down the OMG “interface stack”.

Object Frameworks are collections of cooperating objects categorized into *Application*, *Domain*, *Facility*, and *Service Objects*. Each object in a framework supports (through interface inheritance) or makes use of (via client requests) some combination of Application, Domain, CORBA facilities, and CORBA services interfaces.

A specification of an Object Framework defines such things as the structure, interfaces, types, operation sequencing, and qualities of service of the objects that make up the framework. This includes requirements on implementations in order to guarantee application portability and interoperability across different platforms.

Domain Task Force RFPs are likely to focus on Object Framework specifications that include new Domain Interfaces for application domains such as Finance, Healthcare, Manufacturing, Telecom, Electronic Commerce, and Transportation.

## **3.0 Adoption Process**

### **3.1 Introduction**

OMG adopts specifications for interfaces and protocols by explicit vote on a technology-by-technology basis. The specifications selected each fill in a portion of the OMA Reference Model. OMG bases its decisions on both business and technical considerations. Once a specification is adopted by OMG, it is made available for use by both OMG members and non-members.

For more detailed information on the adoption process see the *Policies and Procedures of the OMG Technical Process*.

### **3.2 Role of Board of Directors**

The OMG Board of Directors votes to formally adopt specifications on behalf of OMG. The OMG Technology Committees (Domain and Platform TCs) and Architecture Board (AB) provide technical guidance to the Board of Directors. In addition, the Business Committee of the Board provides guidance to ensure that implementations of adopted specifications are made commercially available.

### **3.3 Role of Technology Committees and Architecture Board**

Submissions to RFPs are evaluated by the TC Task Force (TF) that initiated the RFP. Selected specifications are recommended to the parent TC after being reviewed by the Architecture Board for consistency with the OMA. The full TC then votes to *recommend adoption* to the OMG Board.

### **3.4 Role of Task Forces**

The role of the initiating TF is to technically evaluate submissions and select one or more specifications that satisfy the requirements of the RFP. The process typically takes the following form:

- **Voter Registration**

Interested TF members may register to participate in specification selection votes for an 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. Companies who 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 next following meeting of the TF. Initial submissions are expected to be full and complete proposals and working implementations of the proposed specifications are expected to exist at the time of



submission.

- Evaluation Phase

A period of approximately 120 days follows during which the TF evaluates the submissions. During this time submitting companies have the opportunity to revise and/or merge their initial submissions, if they so choose.

- Revised Submissions

Final revised submissions are due by a specified deadline. Submitters again normally present their proposals at the next following meeting of the TF. Finalists may be requested to demonstrate implementations of their proposal.

- Selection Vote

When the registered voters of the TF believe that they sufficiently understand the relative merits of the revised submissions, a specification selection vote is taken.

### **3.5 Goals of the evaluation**

The primary goals of the TF evaluation process are to:

- Provide a fair and open process
- Force a critical review of the submissions and discussion by all members of the TF
- Give feedback to allow submitters to address concerns in their revised submissions
- Build consensus on acceptable solutions
- Enable voting members to make an informed selection decision

Submitters are expected actively to contribute to the evaluation process.

## **4.0 Instructions for Submitters**

### **4.1 Submission Effort**

Unlike a submission to an OMG Request For Information (RFI), an RFP submission may require significant effort in terms of document preparation, presentations to the initiating 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.

### **4.2 Letter of Intent**

A Letter of Intent (LOI) must be submitted to the OMG Business Committee signed by an officer of your organization signifying your intent to respond to the RFP and confirming your 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 4.3 below.

The LOI should designate a single contact point within your organization for receipt of all subsequent information regarding this RFP and your 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 Common Warehouse Metadata Interchange RFP. We will grant OMG and its members the right to copy our response for review purposes as specified in section 4.6 of the RFP. Should our response be adopted by OMG we will comply with the OMG Business Committee terms set out in section 4.3 of the RFP and in document omg/97-01-01.*

*<\_\_\_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\_\_\_>*

### **4.3 Business Committee RFP Attachment**

#### **4.3.1 Terms and Conditions**

*The OMG Business Committee has produced a document entitled “OMG Policy on Adoption of Specifications”. When reviewing submissions to each RFP, the specific items that the OMG Business Committee will be considering during the selection process are outlined below:*

- The optimization of interoperability and portability goals across multiple platforms.*
- Commitment by the proposed technology supplier to make the implementation available on commercially reasonable terms, applied in a non discriminatory fashion.*
- Submission of a Standard License Agreement and Support plans*
- A preferred, but not required, method for achieving multi-platform interoperability is source code licensing. Please include any provisions as such.*
- Assurance that the results in the duplication of the “look and feel” of any aspects of such proponents implementations from specifications will not result in infringement or obligation to pay royalties.*
- Plans for future revisions, enhancements, maintenance.*
- Agreement to grant to the Object Management Group, Inc., a non-exclusive, royalty-free, paid-up, worldwide license to copy and distribute the specification document and to modify the document and distribute copies of the modified version. Implementations or instantiations of the specifications are owned by the developer..*
- Upon OMG's acceptance of the sponsoring company's interfaces, the sponsoring company agrees to provide all documentation in an OMG prescribed format and in OMG endorsed terminology.*

#### 4.3.2 Definition of Commercial Availability

*For technology to be accepted and adopted by the OMG Board Of Directors (reference OMG document titled “OMG Policy on Adoption of Specifications - 2/12/90”) it must be commercially available within twelve (12) months or less from when the OMG Task Force (prior to the Technical Committee and Board vote) adopted the specification(s). This is required for proof of concept and expedient implementation of actual product and licensing procedures. Commercial availability is delineated as:*

- Technology that has been publicly announced as a product or embodied within another product.*
- Technology that is of production/manufacturing quality, has cleared a process of product shipment authorization, and can be demonstrated at OMG request (including installation, documentation, service, and support). Demonstrations may be required following RFP presentations to the OMG Technical Committee.*

- *Technology that can be referenced by at least two (2) consumers (customers) of the technology.*

*A statement of commercial availability must be accompanied by a letter of authorization by an officer of the company proposing the technology.*

## **4.4 Responding to RFP items**

### **4.4.1 Separate proposals**

Unless otherwise indicated in Chapter 6, independent proposals are solicited for each separate item in the RFP. Each item is considered a separate architectural entity for which a proposal may be made. A submitter may respond to any or all items. Each item will be evaluated independently by the initiating TF. Submissions that do not present clearly separable proposals for multiple items may therefore be at a disadvantage.

It should be noted that a given technology (e.g. software product) may support two or more RFP items. So long as the interfaces for each item are separable, this is not precluded.

### **4.4.2 Complete proposals**

Proposals for each separate RFP item must be complete. A submission must propose full specifications for each item and address all the relevant general and specific requirements detailed in this RFP.

### **4.4.3 Additional specifications**

Submissions may include additional specifications for items not covered by the RFP which 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 preempt the normal adoption process.

### **4.4.4 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 within the OMA if there are compelling technological reasons for a different approach.

## **4.5 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 confidentiality or proprietary information of any kind will be accepted in a submission to this RFP.

#### **4.6 Copyright Waiver**

If a submitted document is copyrighted, a waiver of copyright for unlimited duplication by the OMG is required to be stated in the document. In addition, a limited waiver of copyright is required that allows each OMG member to make up to fifty (50) copies of the document for review purposes only.

#### **4.7 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 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 the technical viability of their proposal. OMG will favor proposals based on technology for which sufficient relevant experience has been gained in CORBA-based or comparable environments.

#### **4.8 Format of RFP Submissions**

This section provides guidance on how to structure your RFP submission.

##### **4.8.1 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 models and terminology in the *Object Management Architecture Guide* and *CORBA* should be used in your submission. Where you believe this is not appropriate, describe and provide a rationale for the models and terminology

you believe OMG should use.

#### 4.8.2 Suggested Outline

A three part structure for submissions is suggested:

##### **PART I**

- Copyright Waiver (see 4.5)
- Submission contact point (see 4.2)
- Overview or guide to the material in the submission
- Overall design rationale (if appropriate)
- Statement of proof of concept (see 4.6)
- Resolution of RFP mandatory and optional requirements

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

*In addition, if your 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**

- Proposed specification

##### **PART III**

- Summary of optional versus mandatory interfaces

*Submissions must clearly distinguish interfaces that all implementations must support from those that may be optionally supported.*

- Proposed compliance points

*Submissions should propose appropriate compliance points for implementations.*

- 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.*

- Complete IDL definitions

*For reference purposes and to facilitate electronic usage, submissions should reproduce in one place a complete listing in compilable form of the IDL defi-*

*nitions proposed for standardization.*

#### **4.9 How to Submit**

Submitters should send an electronic version of their submission to the *RFP Submissions Desk* (rfp@omg.org) at OMG by 5:00 PM U.S. Eastern Standard Time (22:00 GMT) on the day of the submission deadline. Acceptable formats are Postscript, ASCII, PDF, FrameMaker, Word, and WordPerfect. However, it should be noted that a successful submission must be supplied to OMG's technical editors in Framemaker source format, using the most recent available OMG submission template (document ab/96-06-02 at the time of writing). The AB will not endorse adoption of any submission for which appropriately-formatted Framemaker sources are not available; 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 also send, within three (3) working days after the submission deadline, a single hardcopy version of their submission to the attention of the "RFP Submissions Desk" at the main OMG address shown on the first page of this RFP.

In addition, submitters are responsible for making available 100 paper copies to attendees of the TF meeting immediately following a submission deadline. There are normally two such presentation meetings, one for the initial and one for the revised submissions.

## 5.0 General Requirements on Proposals

### 5.1 Mandatory Requirements

- 5.1.1 Proposals shall express interfaces in OMG IDL. Proposals should follow accepted OMG IDL and CORBA programming style. The correctness of the IDL shall be verified using at least one IDL compiler (and preferably more than one). In addition to IDL quoted in the text of the submission, all the IDL associated with the proposal shall be supplied to OMG in compiler-readable form.
- 5.1.2 Proposals shall specify *operation behavior*, *sequencing*, and *side-effects* (if any).
- 5.1.3 Proposals shall be *precise* and *functionally complete*. There should be no implied or hidden interfaces, operations, or functions required to enable an implementation of the proposed specification.
- 5.1.4 Proposals shall clearly distinguish *mandatory* interfaces and other specification elements that all implementations must support from those that may be *optionally* supported.
- 5.1.5 Proposals shall *reuse* existing OMG specifications including CORBA, CORBA services, and CORBA facilities in preference to defining new interfaces to perform similar functions.
- 5.1.6 Proposals shall justify and fully specify any *changes or extensions* required to existing OMG specifications. This includes changes and extensions to CORBA inter-ORB protocols necessary to support interoperability. In general, OMG favors *upwards compatible* proposals that minimize changes and extensions to existing OMG specifications.
- 5.1.7 Proposals shall factor out functions that could be used in different contexts and specify their interfaces separately. Such *minimality* fosters re-use and avoids functional duplication.
- 5.1.8 Proposals shall use or depend on other interface specifications only where it is actually necessary. While re-use of existing interfaces to avoid duplication will be encouraged, proposals should avoid gratuitous use.
- 5.1.9 Proposals shall specify interfaces that are *compatible* and can be used with existing OMG specifications. Separate functions doing separate jobs should be capable of being used together where it makes sense for them to do so.
- 5.1.10 Proposals shall preserve maximum *implementation flexibility*. Implementation descriptions should not be included, however proposals may specify constraints



on object behavior that implementations need to take into account over and above those defined by the interface semantics.

- 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/IEC 10746, Reference Model of Open Distributed Processing (ODP). Where such compatibility is not achieved, 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 service or facility 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 objects that are introduced by the proposal?
  - Which accesses to security-sensitive objects must be subject to security policy control?
  - Does the proposed service or facility need to be security aware?
  - What CORBA security level and options are required to protect an implementation of the proposal? In answer to this question, a reasonably complete description of how the facilities provided by the level and options (e.g. authentication, audit, authorization, message protection etc.) are used to protect access to the sensitive objects introduced by the proposal shall be provided.
  - What default policies should be applied to the security sensitive objects introduced by the proposal?
  - Of what security considerations must the implementers of your proposal be aware?

## **5.2 Evaluation criteria**

Although the OMG adopts interface 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 ORB systems and software platforms will be considered.

### 5.2.3 Compliance: Inspectability and Testability

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

## 6.0 Specific Requirements on Proposals

### 6.1 Problem Statement

The amount of data in a given organization doubles every five years. Most organizations suffer from an overabundance of redundant and inconsistent data that is difficult to manage effectively, is increasingly difficult to access, and is difficult to use for decision making purposes. *Data warehousing* provides an excellent approach for transforming data into useful and reliable information to support the business decision making process. One of the most important aspects of data warehousing is *metadata*. Metadata is used for building, maintaining, managing, and using the data warehouse. Unfortunately, the proliferation of data management and analysis tools has resulted in almost as many different representations and treatments of metadata as there are tools.

The OMG has adopted specifications for a Meta Object Facility (MOF) and an Object Analysis and Design Facility (OA&DF). The *MOF* defines a meta-meta-model with sufficient semantics to describe metamodels in various domains. The MOF also provides a set of IDL interfaces that can be used to define and manipulate a set of interoperable metamodels. The *OA&DF* defines the Unified Modeling Language (UML) as the common OA&D metamodel and it also provides a set of IDL interfaces that support dynamic construction and traversal of user models. Both MOF and OA&DF use the *UML notation* for graphically defining the meta-meta-model and metamodel, respectively.

In addition to a graphical modeling language and dynamic interchange of model information using IDL, the OMG has issued a RFP for *Stream-based Model Interchange Format (SMIF)*, which can be used to exchange MOF-compliant metamodels (such as the UML metamodel) and models (such as UML models) compliant to these metamodels.

To solve the data warehouse metadata problem, since every data management and analysis tool requires different metadata and different metadata model (known as metamodel), it is simply not possible to have a single metadata repository that implements a single metamodel for all the metadata in an organization. Instead, what is needed is a standard for interchange of warehouse metadata, hereby called *Common Warehouse Metadata Interchange (CWMI)*, that is compliant with the MOF and the UML notation (if a graphical notation is required), and that can use the SMIF when it is standardized by the OMG.

### 6.2 Scope of Proposals Sought

The solution should be composed of the following elements:

- A *Common Warehouse Metadata Interchange (CWMI)* standard that consists of a specification for common warehouse metamodel, APIs (in IDL), and/or interchange formats that will enable the interchange of warehouse metadata

among data management and analysis tools and among warehouse metadata repositories.

- Use the MOF as the meta-metamodel for CWMI.
- Use the UML Notation as the graphical notation (if required) for CWMI.
- Use the SMIF as the stream-based interchange format for CWMI, when the SMIF is standardized by the OMG.

The main characteristics of the solution should be:

- Stable, industrial strength, based on proven technology.
- Generic, independent of any specific data warehouse implementation.
- Portable, able to be used on computers anywhere in the world.

### **6.3 Relationship to Existing OMG Specifications**

There is a close relationship between the common warehouse metamodel requested by this RFP and the OMG approved MOF meta-metamodel. The relationship is a subset relationship between all the meta-modeling concepts in the MOF meta-metamodel and those specific concepts used to define the common warehouse metamodel with sufficient precision to support unambiguous interchange of warehouse metadata.

There is an indirect, sibling relationship with the OA&DF. The OA&DF defines a common metamodel (UML) for object analysis and design, which uses the MOF as the meta-metamodel. This RFP requests a common metamodel for interchange of warehouse metadata, which also uses the MOF as the meta-metamodel. The proposed specification shall reference or use concepts in the OA&DF where applicable.

There is a close relationship with the SMIF. The common warehouse metamodel requested by this RFP and every warehouse model based on it shall be transferable using the stream-based model interchange format specified in SMIF, when it is adopted by the OMG. The common warehouse metadata interchange format requested by this RFP shall be either SMIF or interchangeable with SMIF.

These relationships are shown in Figure 1 and Figure 2:

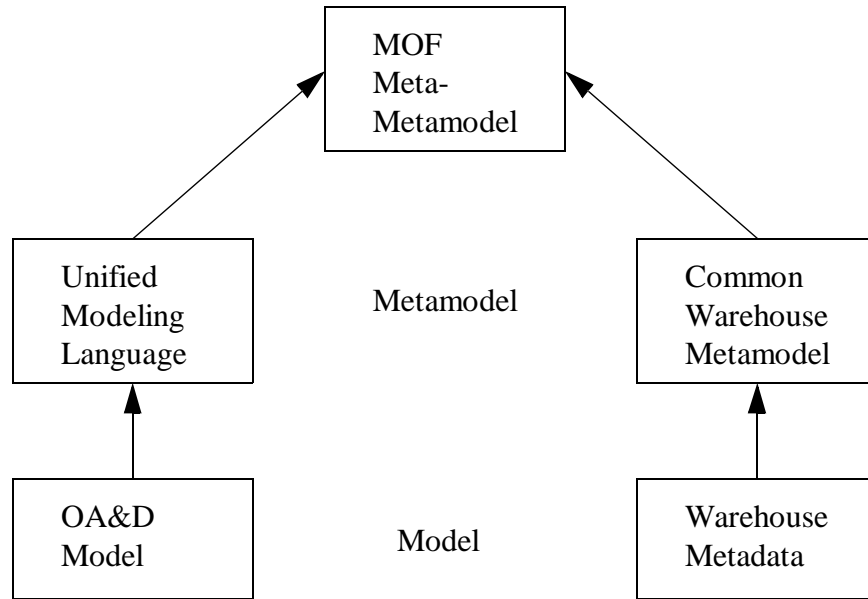


Figure 1 - MOF, UML & CWMI



Figure 2 - SMIF & CWMI

## **6.4 Related Documents and Standards**

### **6.4.1 MDIS**

Responders to this RFP should be aware of activities in the Meta Data Coalition. This group has defined a Meta Data Interchange Specification (MDIS Version 1.1) that pertains to both the syntax and semantics used to represent the metadata to be exchanged and a framework in which the specification will be used.

OMG members are encouraged to review this document and submit their coordinated comments to the Meta Data Coalition to ensure successful alignment with the eventual OMG adoption of a specification for Common Warehouse Metadata Interchange. This technical coordination can also take place in the context of the OMG Liaison Task Force.

For more information, browse the Meta Data Coalition Web page at:

<http://www.he.net/~metadata/>

### **6.4.2 MDAPI**

Responders to this RFP should be aware of activities in the OLAP Council. This group has defined a Multi-Dimensional API (MDAPI Version 2.0) which, among other things, provides metadata functions for OLAP multidimensional databases.

OMG members are encouraged to review this document and submit their coordinated comments to the OLAP Council to ensure successful alignment with the eventual OMG adoption of a specification for Common Warehouse Metadata Interchange. This technical coordination can also take place in the context of the OMG Liaison Task Force.

For more information, browse the OLAP Council Web page at:

<http://www.olapcouncil.org/>

### **6.4.3 OIM**

Responders to this RFP should be aware of the Microsoft Open Information Model (OIM). The OIM is intended to support tool interoperability via a shared information model. The following models in the OIM are of particular relevance to this RFP:

- Dbm - Database Model
- Tfm - Database Transformation Model
- Olp - OLAP Model

For more information, browse the OIM Web page at:

[http://www.microsoft.com/repository/prodinfo/OIM\\_over.htm](http://www.microsoft.com/repository/prodinfo/OIM_over.htm)

## **6.5 Mandatory Requirements**

Proposals shall use the MOF as the meta-metamodel.

Proposals shall provide a complete specification of the syntax and semantics needed to export/import warehouse metadata and the common warehouse metamodel. This may consist of a specification for common warehouse metamodel, APIs (in IDL), and/or interchange formats.

Proposals shall address the interchange of all warehouse metadata including both technical metadata and business metadata.

Proposals shall address the interchange of metadata that describes all warehouse data elements including data sources, transformations, and data targets.

Proposals shall address the interchange of metadata that describes all warehouse processing elements including scheduling, status reporting, and history recording.

Proposals shall address the interchange of metadata that describes informational data and the use of major types of informational data models (e.g., relational, multidimensional, and hierarchical classification) for representing informational data.

Proposals shall demonstrate support for import/export of warehouse metadata and the common warehouse metamodel. This demonstration shall include demonstration of a round-trip metadata exchange without information loss.

Proposals shall support use of international standard codesets.

## **6.6 Optional Requirements**

Proposals may address the interchange of operational data and the use of major types of operational data models (e.g., relational, object-oriented, and hierarchical) for representing operational data.

Proposals may address the administrative aspects of metadata interchange such as security (authorization and authentication).

In order to preserve the investments of OMG members, proposals may be upward-compatible with MDIS, MDAPI, and/or OIM. This does not imply downward-compatibility. The CWMI specification may contain constructs unsupported by MDIS, MDAPI, or OIM.

## **6.7 Issues to be discussed**

Proposals in response to this RFP may discuss the usage and relevance of related technologies such as MDIS.

Proposals should include information on how to perform conformance tests.

## **6.8 Evaluation Criteria**

The proposal should be robust and stable. The specification should be independent of any specific data warehouse implementation.

The specification shall use the MOF as the meta-metamodel, the UML Notation as the graphical notation (if required), and the SMIF as the stream-based interchange format, when the SMIF is standardized by the OMG.



## 6.9 RFP Timetable

The timetable for this RFP is given below. Note that the TF 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 in the Member Services section of OMG's Web page (URL <http://www.omg.org/>)

Approx Day	Event or Activity	Actual Date
	<i>Preparation of RFP by TF</i>	
	<i>Approval of RFP by Architecture Board</i>	September 17, 1998
	<i>Review by TC ("Three week rule")</i>	
0	TC votes to issue RFP	September 18, 1998
210	LOI to submit to RFP due	April 15, 1999
360	Initial submissions due	September 17, 1999
360	Voter registration closes	September 17, 1999
390	Initial submission presentations	October 1999
390	<i>Preliminary evaluation by TF</i>	October, 1999
480	Revised submissions due	January 7, 2000
480	Revised submission presentations	January 2000
540	<i>Final evaluation and selection by TF</i>	March 2000
	<i>Recommendation to AB and TC</i>	
600	<i>Approval by Architecture Board</i>	May 2000
	<i>Review by TC ("Three week rule")</i>	
600	TC votes to recommend specifications	May 2000
600	BOD votes to adopt specifications	May 2000

## 7.0 Glossary

The following glossary is largely extracted from the one prepared by Software AG and META Group (<http://www.data-warehouse.com/survival/k-glossary.html>).

**Business Metadata:** Business metadata is used to help end users understand and utilize the data in the warehouse, in business terms. It describes the business context and meaning of the warehouse data.

**Data:** Items representing facts, text, graphics, images, sound, and video. Data is the raw material of a system supplied by data producers and is used by information consumers to create information.

**Data Analysis Tools:** Software that provides a logical view of data in a data warehouse.

**Data Element:** The most elementary unit of data that can be identified and described in a system.

**Data Management:** Controlling, protecting, and facilitating access to data in order to provide information consumers with timely access to the data they need.

**Data Transformation:** Creating information from data. This includes decoding operational data and merging of data from multiple operational data sources.

**Data Warehouse:** An implementation of an informational database used to store sharable data sourced from an operational database.

**Information:** Data that has been processed in such a way that it can increase the knowledge of the person who receives it.

**Information Consumer:** A person or software service that uses data to create information.

**Metadata:** Metadata is data about data. Examples of metadata include data element descriptions, data type descriptions, attribute/property descriptions, range/domain descriptions, and process/method descriptions.

**OLAP:** On-Line Analytical Processing. OLAP uses a multidimensional view of aggregate data to provide quick access to strategic information for further analysis. OLAP and data warehouses are complementary. A data warehouse stores and manages data. OLAP transforms this data into strategic information.

**Operational Database:** The operational database contains detailed data used to run the day-to-day operations of a business. It is the source of data for the data warehouse.

**Technical Metadata:** Technical metadata, such as transformation mappings, is used to build and maintain the data warehouse processes. It describes the data used by various tools to store, manipulate, or move warehouse data.