Object Management Group

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Object Database Technology

Request For Information

OMG Document: *mars/2006-02-18*

Responses due: *June 1, 2006*

1.0 Introduction

1.1 The Object Management Group (OMG)

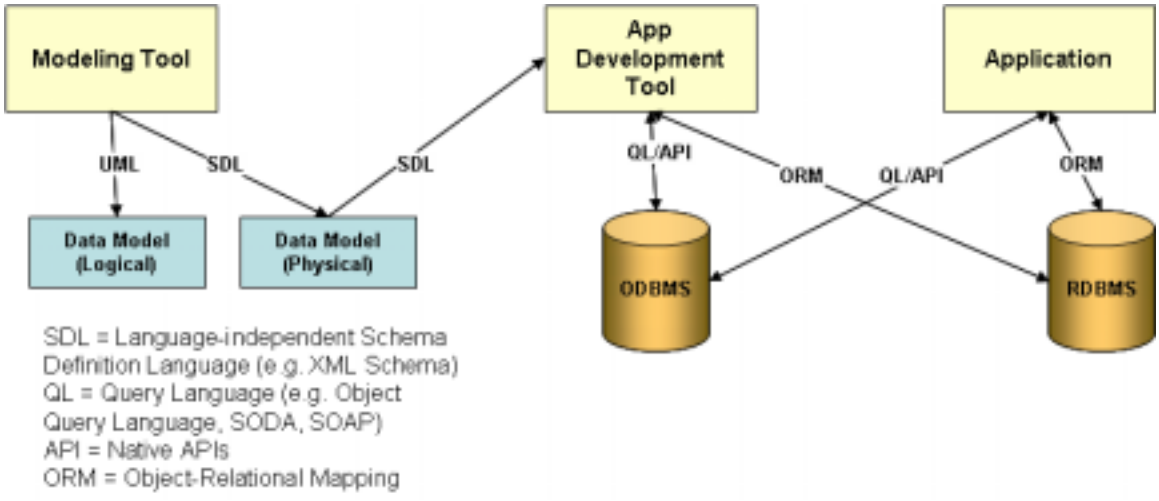
With well-established standards covering software from design and development, through deployment and maintenance, and extending to evolution to future platforms, the Object Management Group (OMG) supports a full-lifecycle approach to enterprise integration which maximizes ROI, the key to successful IT. OMG's Modeling standards, the basis for the MDA, include the Unified Modeling Language (UML) and Common Warehouse Metamodel (CWM). CORBA, the Common Object Request Broker Architecture, is OMG's standard open platform with hundreds of millions of deployments running today. Headquartered in Needham, MA, USA, the Object Management Group is an international, open membership, not-for-profit computer industry specifications consortium. More information about OMG can be found at www.omg.org.

1.2 Object Database Technology Working Group

The Object Database Technology Working Group (ODBT WG) is part of the OMG's Middleware and Related Services (MARS) Platform Task Force (PTF). The ODBT WG was formed to advance the standards for object databases and, through better standards, encourage broader adoption of object database technology. To this end, the OMG has acquired the rights to the works of the now-defunct Object Data Management Group (ODMG) and created the ODBT WG to advance standardization of object database technology beyond the last object database standard (ODMG 3.0).

The ODBT WG would like to create a set of standards that incorporates advances in object database technology (e.g., replication), data management (e.g., spatial indexing), and data formats (e.g., XML). It would also be desirable to include new features into these standards that support domains where object databases are being adopted (e.g., real-time systems). It is essential that any new object database technology standard has broad support of object database vendors. Some products already have some of the features the ODBT WG would like to include in this effort. Responses to this RFI will help the ODBT WG gain an accurate picture of the current state of the art in object database technology and an accurate assessment of the object database market. This information will prove invaluable in deciding what should and should not be included in future Requests For Proposals (RFPs) for object database technology standards.

The technologies being explored using this RFI are shown in the figure below:



1.3 RFI Objectives

1.3.1 What is an OMG RFI?

The intent of an OMG Request for Information (RFI) is to gather information for the purpose of guiding a subgroup in its efforts to provide solutions to industry problems. The RFI process is used by a subgroup to canvass a targeted industry segment for one or more of the following purposes:

- Acquiring general or specific information about industry requirements.
- Soliciting assistance in identifying potential technology sources.
- Soliciting input to validate a subgroup's roadmap.

Generally speaking, the RFI process determines which Requests For Proposal (RFPs) will be issued (and, based on negative feedback, which won't) or influences the way a particular RFP is constructed.

2.0 Information Being Requested

2.1 Summary of this RFI

Responses to this RFI will be used to direct future standardization efforts in the areas of data portability, data accessibility, application portability, and advanced features for object-oriented database management systems (ODBMSs). Sharing your experiences will be particularly helpful in this effort, especially to:

- Determine the areas that need standardization and their respective priorities
- Determine what capabilities currently exist in the marketplace

- Identify any *de facto* standards that have been adopted in the object database industry
- Identify potential RFPs

We are seeking information regarding:

- Needs for standardization of object database technology
- Use of XML in object database products, e.g., use of XML Schema Definitions (XSDs) to define object database schemas, use of XML for data import, export or exchange, etc.
- Use of SOAP/WSDL to allow the contents of an object database to be accessed by any Web Services applications
- Integration of object databases and CORBA in existing or planned products, e.g., does object database use the CORBA root object type as its root object type, can the objects in the database be easily accessed via CORBA, etc.
- Needs for adherence to ODMG 3.0 programming language bindings in existing products
- Which programming languages are supported by existing products and which programming languages will be supported in future products
- Which "advanced" features are already included in existing products and which "advanced" features are planned for inclusion in future products
- Which application domains are using object database technology

2.2 Detail

This RFI is seeking information in the categories described below. Respondents are asked to address areas in which they have expertise and/or interest. Therefore, it is not necessary that a single response to this RFI address all the topics. Conversely, respondents may consider areas not explicitly asked for if they feel the information provides useful guidance.

Topics of interest for this RFI include but are not limited to:

2.2.1 Identification of areas where object databases are used

1. Provide a description of how your customers are using your object database. For example, are they using it as an MIS solution, or are they licensing your object database under OEM terms? Is your logo visible on your customer's products? For what kinds of products do your customers use or include your object database?
2. Provide a description of trends you see in the object database marketplace

2.2.2 Identification of areas where standardization is needed

Provide a description of where you believe standards would benefit object database users and/or vendors. For example, would a standard XSD and XML format for object database contents address a marketplace need for data portability? Do your customers express concerns about interoperability between object databases from different vendors or between object and relational databases? Are there any de facto standards that are being used to address these concerns? Are there areas where standardization would offer a business benefit to your company? What do you think the priorities should be for establishing standards for object database technology, e.g., should data portability be addressed before application portability, etc.

Note that each of the following sections includes a question specifically about standardization for the subject area. If you respond to the questions in any of the following sections, please indicate in your response to this question what priority you would give to standardization efforts for the subject areas in the following sections.

2.2.3 Use of XML in object databases

1. Do your object database products allow an application developer to create a schema in XML Schema Definition (XSD) and auto-generate the required programming language class declarations from the XSD or vice-versa?
2. Do your object database products allow an application developer to create an XSD from an existing object database schema?
3. Do your object database products allow an application developer to import and export objects via XML?
4. Do your object database products allow an application developer to import data from an XML file and create a schema based on the contents of the XML file?
5. Do you see demand in the marketplace for object databases that include XML support? If so, what are customers asking for?
6. Do you believe a standard XSD for object databases would be supported by the object database industry? Do you think it would benefit your company and/or your customers?
7. Would your company be interested in participating in the OMG to create such a standard?

2.2.4 Use of Simple Object Access Protocol (SOAP)/Web Services Description Language (WSDL) in object databases

1. Do your object database products allow an application developer to automatically generate a set of SOAP messages and a WSDL file for those messages from an existing object database schema?
2. Do your object database products have features that support use of SOAP/WSDL to access their contents? If so, what are they?
3. Do you see demand in the marketplace for object databases that support SOAP/WSDL?
4. Do you believe a standard for the creation of SOAP/WSDL from an object database schema would be supported by the object database industry? Do you think it would benefit your company and/or your customers?
5. Would your company be interested in participating in the OMG to create such a standard?

2.2.5 Use of CORBA with object databases

1. Do your object database products share a common root type with CORBA so that its objects are by definition also CORBA objects?
2. Do your object database products allow an application developer to create an object database schema from a set of IDL files or vice versa?
3. Do your object database products have features that support use of CORBA to access their contents? If so, what are they?
4. Do you see demand in the marketplace for object databases that support integration with CORBA?
5. Do you believe a standard for the integration of CORBA with object databases would be supported by the object database industry? Do you think it would benefit your company and/or your customers?
6. Would your company be interested in participating in the OMG to create such a standard?

2.2.6 Use of Data Distribution Service (DDS) with object databases

1. Do your object database products share a common root type with DDS so that its objects are by definition also DDS objects?
2. Do your object database products allow an application developer to create an object database schema from a set of IDL files or vice versa?
3. Do your object database products have features that support use of DDS to access their contents? If so, what are they?

4. Do you see demand in the marketplace for object databases that support integration with DDS?
5. Do you believe a standard for the integration of DDS with object databases would be supported by the object database industry? Do you think it would benefit your company and/or your customers?
6. Would your company be interested in participating in the OMG to create such a standard?

2.2.7 Programming language support in object databases

1. Which programming languages do your object database products support? Which do you plan to support in the future?
2. Do your object database products conform to the programming language bindings in ODMG 3.0? If so, to which of the ODMG 3.0 programming language bindings do your products conform?
3. Do you believe the ODMG 3.0 programming language bindings should be revised?
4. Do you see demand in the marketplace for standard programming language bindings for object databases?
5. Do you believe standard programming language bindings for object databases would be supported by the object database industry? Do you think it would benefit your company and/or your customers?
6. Would your company be interested in participating in the OMG to create these standard bindings?

2.2.8 Security features

1. Do your object database products allow an application to specify access control lists (ACLs, which contain a list of users that have been granted access to a resource) at the server login level, the database level, the object level, the attribute level, or some combination of these? Please specify the granularity at which ACLs can be applied.
2. Do your object database products include security level attributes for all objects in all databases to allow an application to enforce a Mandatory Access Control (MAC) security policy? (A MAC security policy might be used in a database that supports a multi-level secure (MLS) application).
3. Do your object database products encrypt network communication? If so, please indicate which network traffic is encrypted and how keys are managed.
4. Do your object database products encrypt information held in persistent storage (e.g., files on a disk)?

5. Do your object database products encrypt information held in in-memory databases (if you products support in-memory databases)?
6. What features do your object database products include to assist in the management of security?
7. Do your object database products support authentication of users before accessing of the database. How is this done? Are certificates used and how are they managed?
8. Do your database products include any security logging functionality? If so, please describe this functionality.

2.2.9 Schema Evolution

1. Do your object database products support schema evolution? If so, describe what (if any) limitations there are on how a user's schemas can evolve and what features your product has to migrate existing data to a new schema.
2. Do your object database products provide a tool for mapping existing data from an old schema to a newer schema version? Are there certain kinds of schema changes (i.e. add a new attribute to a class) where the mapping is done automatically without the need for human interaction? In these cases, is data "ported" to the new schema automatically?
3. Do your object database products provide a tool for managing the version history of schemas? Can schema designers easily see the changes between two versions of a schema? Please describe how your schema version management tools are used for these tasks.

2.2.10 Support for new and advanced features

1. Do your object database products support replication? If so, do they allow multiple replicated copies of a database to be opened by multiple clients? Can "master" (write) responsibility for a database to be transferred to a replicant? Can an application update an object in a replicant? If so, how is consistency maintained (e.g., two phase commit, etc.)? Also, do your object database products offer varying levels of quality of service (QoS) for replication to optimize the performance of replication in a distributed system? Please describe any QoS levels provided, indicating how they would typically be used by an application developer.
2. Do your object database products support fault tolerance? If so, how?
3. Do your object database products support indexes, i.e. can an application have multiple indices on a collection of objects? If so, are the indices updated automatically if the key attributes that provide the ordering for an index are updated? If so, are the indices updated at transaction commit time? Are

updates to key attributes permitted? (NOTE: the reference to an index in this paragraph is not synonymous with the ODMG Dictionary collection).

4. Do your object database products support spatial indexing? If so, do they support insert of hypercubes (e.g., R-tree) or only points (e.g., quad-tree or kdb tree)?
5. Do your object database products ensure referential integrity (i.e. no dangling pointers)? For example, if an application deletes an object are references to that object automatically removed from any collections, relationships, indices, etc.?
6. Do your object database products enforce safe programming practices by nulling or otherwise invalidating programming language pointers to database objects when the enclosing transaction commits or aborts?
7. Do your object database products provide a circular array collection for efficient handling of time series data?
8. Do your object database products support in-memory databases? Do objects in an in-memory database have the same transaction and recovery semantics as objects in permanent storage (e.g., disk)?
9. Do your object database products support pre-allocation of storage for objects?
10. Does your company provide a Java (or other garbage-collected language) object database? If so, is “persistence by reachability” used to ensure referential integrity among persistent objects? If not, what mechanism is used to ensure consistent references for persistent objects?
11. Do your object database products require application developers to have their database objects inherit from a “persistence-capable” root class? If not, how does your product distinguish between “database objects” and regular programming language objects?
12. Do your object database products provide event notification so that changes in database objects’ attributes result in calls to callback functions in support of data or event driven programming? If so, do your products allow event notifications to be defined for replicants?
13. How do you respond to customer questions regarding stored procedures and triggers in your object-oriented database products?
14. Do your object database products support heterogeneous programming language access? For example, can a C++ program create an object in a database that can later be retrieved by an Ada program? If your database products support replication, can an application create a database and populate it with objects it created in programming language A and can another application open a replicant copy of that database in programming language B?
15. Do your object database products support the Object Description Language (ODL) defined in ODMG 3.0? If so, for which programming languages?

16. Do your object database products support the Object Query Language (OQL) defined in ODMG 3.0?
17. Do your object database products have multi-version concurrency control, or do they use traditional two-phase locking? Describe the concurrency control mechanisms used in your products.
18. Are there features described in the questions above that you do not currently support in your object database products but that you plan to support in future product releases? If so, are these feature additions the result of requests from your customers?
19. Do you see demand in the marketplace for standardization of new and advanced object database features like indexing, spatial indexing, replication, in-memory databases etc.?
20. Do you believe standards that define the required behavior and programming language bindings for advanced features for object databases would be supported by the object database industry? Do you think it would benefit your company and/or your customers? Would your company be interested in participating in OMG to create these standards?

2.2.11 Lessons Learned

1. Are there any lessons learned to offer regarding the adoption of object database technology?
2. Are there any lessons learned to offer regarding the standardization of object database technology?

3.0 Instructions for Responding to this RFI

3.1 Who May Respond

Responses from *anyone* in industry, government or academia with knowledge of object databases are welcome.

When and if OMG issues a subsequent Request for Proposals (RFP) in this area, OMG members at the appropriate membership level will be eligible to respond with detailed specifications. OMG is an open membership organization. Any company, university or organization is welcome to join and participate. For information, consult *http://www.omg.org/membership*.

3.2 How to Respond

One electronic copy in machine-readable format (typically ASCII, MS Word, or WordPerfect format) should be sent to ***omg-documents@omg.org***. One confirming paper copy of all documents should be sent to the OMG

postal address below.

Object Management Group, Inc.
140 Kendrick Street
Building A, Suite 300
Needham, MA 02494
USA
Attn: Object Database Technology RFI

Responses to this RFI must be received at OMG no later than 5:00 PM US Eastern Time (22:00 GMT) June 1, 2006.

Other communication regarding this RFI should be sent to the contacts listed in paragraph 3.8.

3.3 RFI Response Contact

Companies responding to this RFI shall designate a single contact within that company for receipt of all subsequent information regarding this RFI and the forthcoming series of RFPs. The name of this contact will be made available to all OMG members.

3.4 Format of RFI Responses

The following outline is offered to assist in the development of your response. You should include:

- A cover letter -- the cover letter should include a brief summary of your response, such as indicating to which areas you are responding and must also indicate if supporting documentation is included in your response.
- The response itself, covering any or all of the areas of information requested by this RFI.
- If required, a glossary that maps terminology used in your response to OMG standard terminology. (See OMG specifications [CORBA, UML, MOF, XMI] and a description of OMG's Model Driven Architecture [MDA] for OMG's standard terminology.)

Although the OMG does not limit the size of responses, you are asked to consider that the OMG will rely upon volunteer resources with limited time availability to review these responses. In order to assure that your response receives the attention it deserves, you are asked to consider limiting the size of your response (not counting any supporting documentation) to approximately 25 pages. If you consider supporting documentation to be necessary, please indicate which portions of the supporting documentation are relevant to this RFI.

3.5 Distribution of RFI Responses

Copies of all documentation submitted in response to this RFI will be available to all OMG members for review purposes.

3.6 Copyrighted Material

According to OMG Policies and Procedures, proprietary and confidential material shall not be included in any response to the OMG. Any material received is treated as a public document. If copyrighted material is sent in response to this RFI then a statement waiving that copyright for use by the OMG is required and a limited waiver of copyright that allows OMG members to make up to twenty-five (25) copies for review purposes is required. Consult Appendix B for a template for this copyright waiver.

3.7 Reimbursement

The OMG will not reimburse submitters for any costs in conjunction with their responses to this RFI.

3.8 Questions Regarding this RFI

Any technical questions regarding this RFI should be sent to:

OMG Object Database Technology Working Group Chair
Michael P. Card
Syracuse Research Corporation
6225 Running Ridge Road
North Syracuse, NY 13212
mcard@syrres.com
(315) 452-8290

Questions regarding the response process should be forwarded to:

Object Management Group, Inc.
140 Kendrick Street
Building A, Suite 300
Needham, MA 02494
USA
Attn: Mr. Juergen Boldt, Director of Member Services

Phone: +1-781-444 0404
Fax: +1-781-444 0320
Email: juergen@omg.org

4.0 Response Review Process and Schedule

4.1 Review Process

OMG RFIs are issued with the intent to survey industry to obtain information that provides guidance, which will be used in the preparation of RFPs. The OMG membership, specifically the Object Database Working Group, will review responses to this RFI. Based on those responses, the Object Database Working Group will augment its roadmap and prepare one or more RFPs.

4.2 Clarification

To fully comprehend the information contained within a response to this RFI, the reviewing group may seek further clarification on that response. This clarification may be requested in the form of brief verbal communication by telephone; written communication; electronic communication; or a presentation of the response to a meeting of the Object Database Technology Working Group.

4.3 RFI Response Presentations and Demonstrations

RFI Respondents may be invited to present their response to the Object Database Technology Working Group. The purpose of this presentation would be to seek clarification of information contained within the response (as noted above); to further explore issues raised; or to further meet the goals of the RFI.

In addition, a technology demonstration to the Object Database Technology Working Group may prove useful to support the RFI response. If desired, please coordinate with the Contact cited in paragraph 3.8.

4.4 Schedule

The schedule for responding to this RFI is as follows. Please note that early responses are encouraged.

RFI issued:	February 17, 2006
RFI responses due:	June 1, 2006
Review of RFI responses:	June 26, 2006

Appendix A References and Glossary Specific to this RFI

A.1 References Specific to this RFI

[CORBA] *http://www.omg.org/technology/documents/formal/corba_iiop.htm*.

[DDS] *http://www.omg.org/technology/documents/formal/data_distribution.htm*

[MDA] MDA Technical Perspective, *http://doc.omg.org/ab/2001-02-01*.

[MOF] Meta-Object Facility (MOF),
http://www.omg.org/technology/documents/formal/mof.htm.

[ODMG] *http://www.omg.org/cgi-bin/doc?omg/2004-07-02*

[UML] Unified Modeling Language (UML),
http://www.omg.org/technology/documents/formal/unified_modeling_language.htm.

[XMI] XML Metadata Interchange (XMI),
http://www.omg.org/technology/documents/formal/xml_metadata_interchange.htm.

A.2 Glossary Specific to this RFI

database object – an object instance or object type (class) maintained in persistent storage, which is managed by an object database management system (ODBMS)

Appendix B Template for Copyright Waiver for RFI Responses

[Date]

Object Management Group, Inc.
140 Kendrick Street
Building A, Suite 300
Needham, MA 02494
Attn: James Nemiah, General Counsel

Fax: 781-444-0320

Dear Mr. Nemiah:

This letter constitutes a limited license to use certain materials copyrighted by the undersigned. We understand that the Object Management Group, Inc. ("OMG") is a not-for-profit consortium that produces and maintains computer industry specifications for interoperable enterprise applications.

We understand that the Copyrighted Material identified below is being submitted to OMG as part of a response to the identified Request for Information (RFI), for use in connection with an OMG process that may result in the adoption of an OMG specification.

Source of Copyrighted Material:	
Copyrighted Material to be submitted to OMG:	
Submitter(s):	
RFI Doc.-Title & No.	

We hereby grant OMG the right to make an unlimited number of copies of the Copyrighted Material as part of the OMG adoption process.

We hereby grant each OMG member the limited right to make up to twenty-five (25) copies of the Copyrighted Material for review purposes only as part of the OMG adoption process.

Regards,