

Object Management Group

First Needham Place
250 First Avenue, Suite 100
Needham, MA 02494

Telephone: +1-781-444-0404
Facsimile: +1-781-444-0320

Request For Proposal

Robot Technology Components (RTCs)

OMG Document: ptc/2005-09-01

Letters of Intent due: December 15, 2005

Submissions due: January 23, 2006

Objective of this RFP

This RFP solicits proposals for a Platform Independent Model (PIM) and at least a CORBA Platform Specific Model (PSM) of composable RTCs that specify

- common interfaces for RTCs to transfer data and commands,
- a set of minimum common states of RTCs and transitions among them,
- profiles of the resource data model of Super Distributed Objects (SDOs) to describe capabilities and properties of RTCs,

as an extension to the specification of SDOs.

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/IOP[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])

ptc/2005-09-01

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

Large numbers of robots are used for repetitive tasks in factories. These conventional industrial robots are designed for simple common tasks.

Conventional industrial robots were designed once, and their copies were sold. Therefore, even if money and time were spent in the development of the robot, profit was able to be taken.

On the other hand, the service robot in the future is expected to support our daily life in various ways. Such robots include the cleaning robot and the mowing robot and also a robotic space in which functional modules are distributed – for example, where life support and nursing for individuals are achieved by cooperation of these functional modules.

In order to provide robotic systems that support our daily lives, it is necessary to create custom-made robot systems into which various robotic functions are integrated to satisfy the needs of each customer. To open such a new robot industry, such custom-made robot systems should be developed easily. Once such capabilities are developed and adopted, they can be applied to all types of robotic systems.

Generally, robot systems are integrations of a lot of robot technology functions, such as actuators, sensors, controllers, and so on, some of which include hardware and some are pure software.

In order to make those robot systems, especially non-industrial custom-made robot systems, easier and more effective, it is necessary to compose robot systems as integrations of robot technology function modules.

Figure 1 is a typical figure of the robot system which is formed from modules.

For example, the servo of a robot arm consists of functional elements such as

- A sensor module which outputs the angle of a joint,
- A controller module which takes the angle information output from the sensor module and decides what the input should be to an actuator module,
- An actuator module which operates the actuator hardware based on its input.

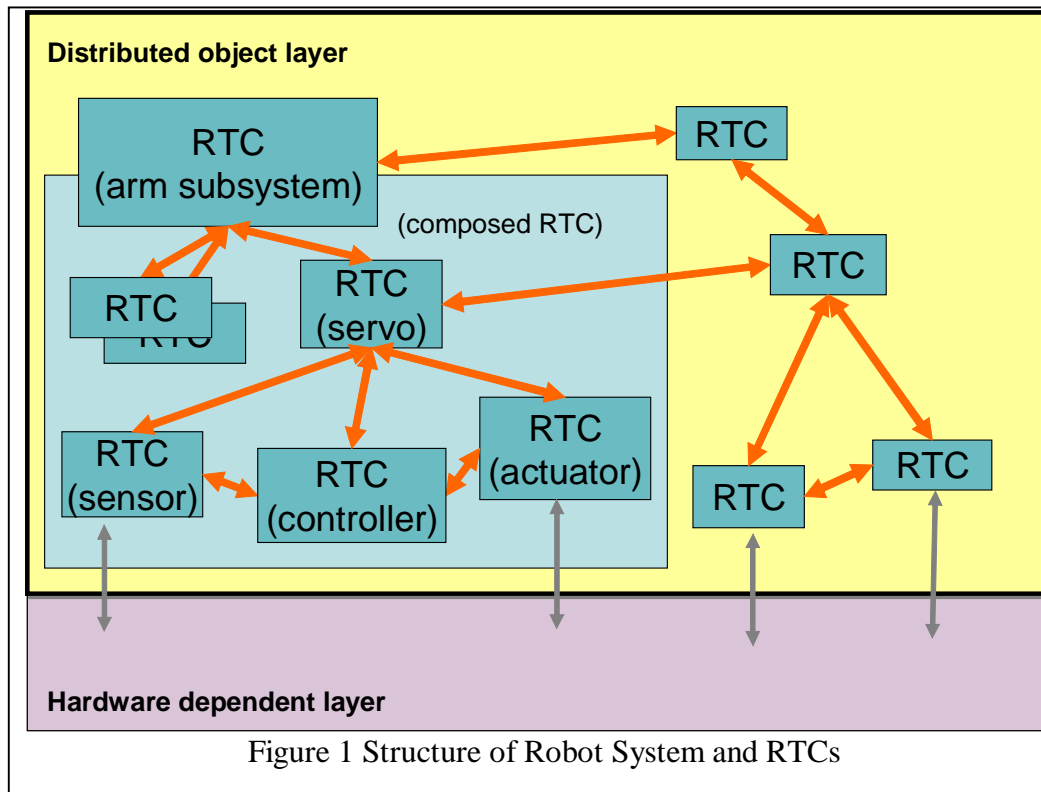
The servo module integrates and manages the behaviors of those elements.

In addition, the robot arm system which consists of these function modules can, itself, be considered a module that provides arm functions.

As for the hardware dependent layer, developers of robot systems use various kinds of platforms, computer hardware, operating systems, computer languages, communication methods and so on. Those are dependent on implementations and it is difficult to standardize those implementations.

To achieve the reusability and interoperability of robot modules, it is important to standardize in the distributed object layer. We call the robot modules in this level “Robot Technology Components (RTCs)”.

RTCs are software modules which support the functionality of such robot technology elements as sensors, controllers and motors. They have following



characteristics (Figure 2):

- Each RTC has its own functional task. For example, the sensor RTC periodically accesses the hardware measurement device, gets data, does data processing, and sends the data to the controller if necessary.

The controller RTC sends the actuator RTC the operation input that it has decided upon, based on the received data.

The functionality might have been achieved through a combination of hardware and software mechanisms, or it might have been achieved purely through the software. RTCs could be passive or active components.

- They exchange data with each other. For instance, the controller RTC receives data from the sensor RTC, and decides the value it will provide to the motor RTC operation.
- They exchange commands with each other. For instance, the controller RTC changes the operation parameter and changes the operation mode according to requests from other modules.
- It is necessary to be able to compose a new RTC from a combination of RTCs. This supports hierarchical construction of robot systems. Moreover, this gives the degree of freedom of the grain size selection to the RTC developer. And, this facilitates wrapping an existing technology as an RTC. For instance, a certain developer might construct the arm component as a synthesis of a sensor, a controller, and a motor as shown in Figure 1. Or, a conventional arm vender might wrap an existing arm system as an arm component without changing the existing arm system. It is important for them to be treated as the same arm RTC from the outside (Figure 1).

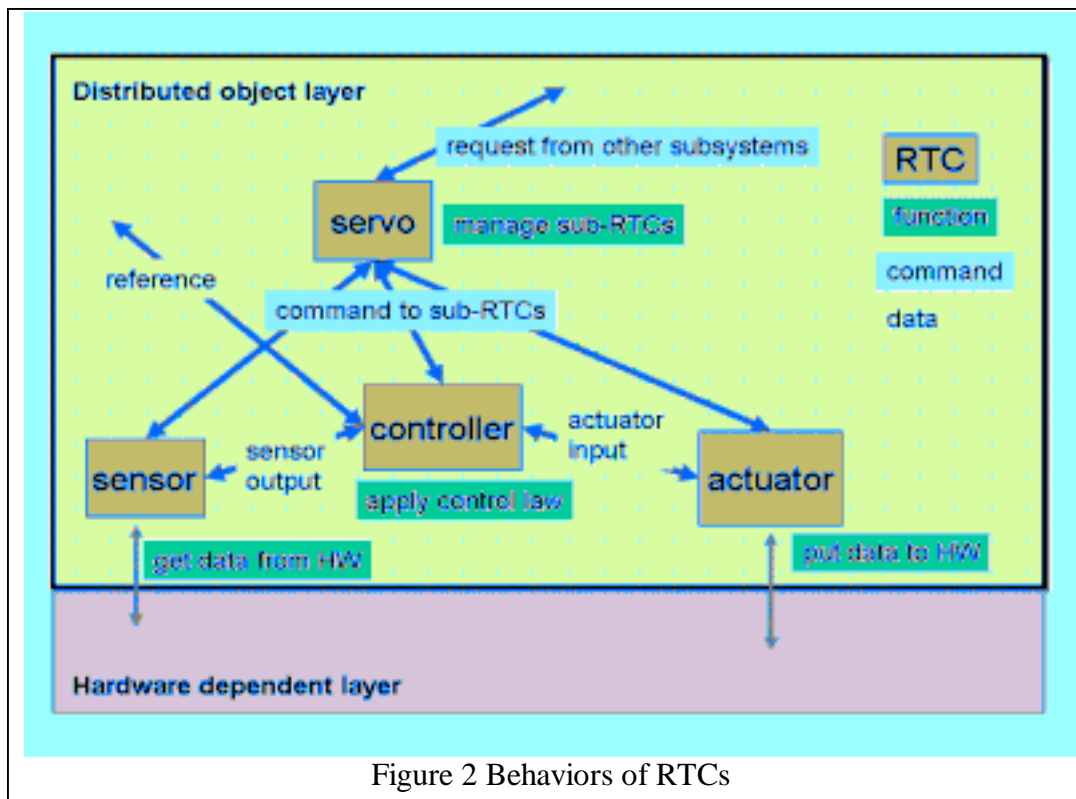


Figure 2 Behaviors of RTCs

RTCs are modules of robot technology functions which may include hardware devices.

We already have the specification of SDO in OMG for modules that may contain hardware devices.

SDO is defined by a key interface called SDO interface, other interfaces related to functions which SDO provides and the resource data model which expresses various attributes of the SDO including these interfaces. The user can access all functions that SDO offers by acquiring the resource data through the SDO interface.

An RTC can be considered as a kind of SDO. This RFP requires the specification of RTCs to be a refinement of SDOs to the robotics domain.

Advantages to using SDOs as a basis of the RTC specification:

- SDO is the specification of autonomous modules containing hardware devices,
- The attribute and the offered function could be accessed through the resource data obtained from the SDO interface.
- Above all, the SDO specification is an existing OMG standard.

Disadvantages to using SDOs as the basis of the RTC specification:

- The SDO specification does not yet guarantee reusability and interoperability. The robotics domain must first mutually agree on common usage patterns of the SDO specification.
- The resource data of a SDO contains a lot of information about the SDO. But there is no specification of which data are essential for reusability and interoperability and which are not. For example, “vender” of the SDO might not be important for reusability and interoperability.

To use SDO in robotics domain, extension and modification of the specification are needed.

6.2 Scope of Proposals Sought

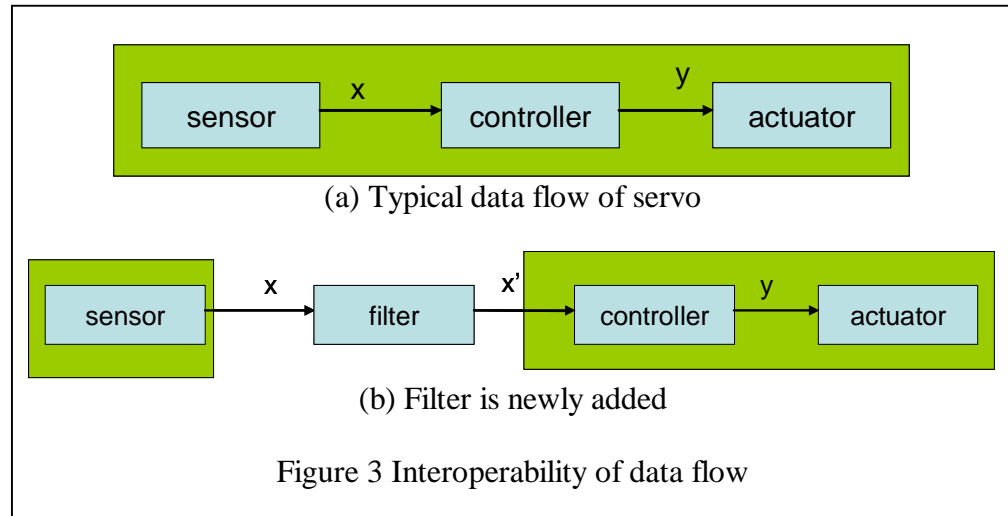
This RFP seeks proposals that specify RTCs as a framework, based on the SDO specification, for the modularization of robot technology functions in the distributed object layer.

It is necessary to consider the following in the specification of RTCs:

- (1) The proposed RTC specification should provide a framework for the modularization of robot technology functionality in an interoperable and flexible manner.
- (2) The RTC specification must be general enough to allow a variety of robot systems to be easily constructed.
- (3) The RTC specification must provide for reusability and interoperability. Modules implemented by one vendor should be able to be replaced with modules from other vendors.
- (4) The functions provided by RTCs and environment in which RTCs are used may vary according to each robot system. Therefore, the grain size of RTCs should be able to be freely chosen by developers. Additionally, a large RTC may be composed of smaller RTCs.
- (5) Efficiency, timeliness and small footprint are important aspects of robot technology. However, the degree of each strongly depends on implementation and the target environment. Since such concerns are not platform independent, this RFP does not mention them, but rather seeks proposals in which interoperability and reusability are the most important features.
- (6) As described earlier, RTCs can be considered applications or specializations of SDOs within the robotics domain. In specializing SDOs, RTC specification should consider the following:
 - The possible specification of a common service interface for all RTCs. Such an interface might handle on/off functions, for example.
 - RTCs shall communicate with other RTCs directly, and cooperate to realize their tasks. RTCs should provide both the command and data communication interfaces.

Figure 3 (a) shows an example of typical data flow between RTCs. A filter is often added to the output data of the sensor for the characteristic improvement as shown in Figure 3 (b). It is important that, to achieve interoperability and reusability, the RTCs should be developed such that

other RTCs do not have to be changed. Both the command and data interfaces need to be defined for achieving this interoperability.



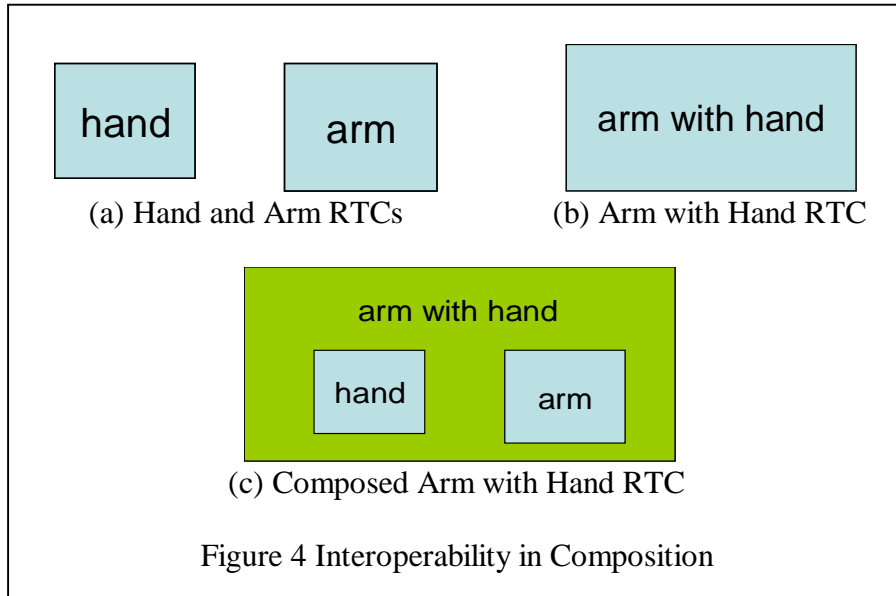
- An arm and a hand may be made as separate RTCs (Figure 4). It is also possible to combine an arm and a hand in a single RTC. Additionally, an ‘arm and hand’ RTC may be made by combining an arm RTC and a hand RTC. No matter how created, a member of each category of RTC must be treated the same as every other member of the category. In other words, the implementation of an RTC should be separate and distinct from the interface to the RTC.

Interfaces for each component RTC must be provided as well as an interface for the combined RTC. In the above example, interfaces should be provided for arm functions, for hand functions and for ‘arm with hand’ functions.

The base states and the state transitions of the life cycle of all RTCs need to be defined. Moreover, RTCs should be composable, i.e., the externally visible states of “arm with hand” are the same as “composed arm with hand.”

- The resource data of a SDO is designed to contain a lot of information about the SDO. But most of items are optional and usages of them are not defined. We would like to specify some items of the data model appropriate to express attributes of RTCs well.

- A discovery method of RTCs is important in real usage, though it is not included in the specification of SDO given the fact that it is often an implementation or application-dependent issue. However, it may be beneficial to include some generic discovery method.



(7) Real-time support

Real-time features are sometimes very important in robot programming. They strongly depend on implementation and platform choices, so that the developer of each RTC can choose the appropriate platform and write a real-time program. While it is very difficult to support “hard” real-time operation between RTCs, ideas for platform-independent “soft” real-time or pseudo-real-time support are encouraged. Ideas for alternate ways to support real-time features, for example the adding of timestamps to data, are also welcome.

6.3 Relationship to Existing OMG Specifications

Submitters should examine the following OMG specifications for possible benefit:

- Platform Independent Model (PIM) and Platform Specific Model (PSM) for Super Distributed Objects (SDO) Specification version 1.0 [formal/2004-11-01]
- Meta-Object Facility(MOF) 2.0 Core Available Specification [ptc/2004-10-15]

- Unified Modeling Language: Infrastructure version 2.0 [ptc/2004-10-14]
- Unified Modeling Language: Superstructure version 2.0 [formal/2005-07-04]
- OCL 2.0 Specification version 2.0 [ptc/2005-06-06]
- UML Profile for Schedulability, Performance, and Time Specification version 1.1 [formal/2005-01-02]
- Lightweight CORBA Component Model [ptc/2004-06-10]
- Deployment and Configuration of Component-based Distributed Applications Specification working draft [ptc/2005-01-07]
- PIM and PSM for SWRADIO Components Final Adopted Specification [drc/2004-05-04]
- Data Distribution Service for Real-time Systems Specification version 1.0 [formal/2004-12-02]
- Data Acquisition form Industrial Systems Specification version 1.1 [formal/2005-06-04]
- Historical Data Acquisition form Industrial Systems Specification version 1.0 [formal/2005-06-02]
- Smart Transducers Interface Specification version 1.0 [formal/2003-01-01]
- Distributed Simulation System Specification version 2.0 [formal/2002-11-11]

6.4 Related Activities, Documents and Standards

Proposals may include existing systems, documents, URLs, and standards that are relevant to the problems discussed in this RFP. They can be used as background information for the proposal.

Examples:

- AUTOSAR (Automotive Open System Architecture)
<http://www.autosar.org/>

- CARMEN: Carnegie Mellon Robot Navigation Toolkit
<http://www-2.cs.cmu.edu/~carmen/>
- CLARAty: Coupled Layer Architecture for Robotic Autonomy
<http://robotics.jpl.nasa.gov/tasks/claraty/homepage.html>
- CLAWAR : CLimbing And Walking Robots Project
<http://www.clawar.com/home.htm>
- IEEE1451 (Smart Sensor and Actuator Interface Standard)
<http://ieee1451.nist.gov/>
- IEEE Robotics and Automation Society, Technical Committee on Network Robot
- IEEE Robotics and Automation Society, Technical Committee on Programming Environments in Robotics and Automation
- SAE AS-4 Unmanned Systems Committee or JAUS: Joint Architecture for Unmanned Systems
<http://www.jauswg.org/>
- LAAS Open Software for Autonomous Systems:
<http://softs.laas.fr/openrobots/index.php>
- MARIE : Mobile and Autonomous Robotics Integration Environment
<http://marie.sourceforge.net/en/HomePage.html>
- MIRO: Middleware for mobile robot applications
<http://smart.informatik.uni-ulm.de/MIRO/>
- Network Robots Forum
<http://www.scat.or.jp/nrf/>
- OPC Foundation
<http://www.opcfoundation.org/>
- OROCOS: Open Robot Control Software, Open Realtime Control Service
<http://www.orocos.org/>
- Orca:
<http://orca-robotics.sourceforge.net/>

- ORiN :Open Robot/Resource Interface for the Network
<http://www.orin.jp/>
- Player/Stage
<http://playerstage.sourceforge.net/>
- Ptolemy Project
<http://ptolemy.eecs.berkeley.edu/>
- RCS (Realtime Control Systems Architecture)
<http://www.isd.mel.nist.gov/projects/rcs/>
- RSi: Robot Service Initiative
<http://www.robotservice.org/>
- RT middleware Project
<http://www.is.aist.go.jp/rt>
- SAE AADL (Society for Automotive Engineers, Architecture Analysis and Design Language)
<http://www.aadl.info/>
- RETF (Robotics Engineering Task Force)
<http://www.robo-etf.org/>
- URC (Ubiquitous Robotic Companion) Project
- Yaorozu Project
<http://www.8mg.jp/>

6.5 Mandatory Requirements

Proposals shall provide a platform independent model (PIM) and at least one CORBA-specific model of RTCs as an extension to the specification of Super Distributed Objects (SDOs). The models shall meet the following requirements:

- (1) Proposals shall specify common interfaces for RTCs to transfer data and commands.
- (2) RTCs typically pass through administrative states (e.g. Starting, Fault, Running...). Proposals shall specify a set of minimum common states of RTCs and transitions among them.
- (3) RTCs should be composable, e.g. the externally visible administrative states of “arm with hand” are the same as “composed arm with hand.”

- (4) Proposals shall specify profiles of the resource data model of SDO (PIM and PSM for Super Distributed Objects, ver.1.0 [formal/04-11-01]) to describe capabilities and properties of RTCs.

6.6 Optional Requirements

None.

6.7 Issues to be discussed

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.)

- **Applicability of the specification**

Proposals shall show at least one example of RTCs for a specific application robot system (manipulator control, mobile robot system, robotic space, and so on) using the specified model and interface.

The examples will show concrete usage and applicability of the specification.

- **Simplicity of the specification and footprint of implementation**

Proposal shall discuss simplicity of the design and its footprint in implementation.

Simplicity and footprint are related to the efficiency of the RTC and its applicability to embedded systems and thus are important to the wide use of the specification.

Moreover, if the design is simple, it is easy to use in each application of the robotics domain and is extensible in the future.

- **Discovery of RTCs**

Proposals shall discuss discovery of RTCs. It is important in actual usage, especially for bootstrapping a composed RTC. It is not included in the specification of SDO given the fact that it is often an implementation or application-dependent issue.

- **Real-time support**

Proposals shall discuss their use of real-time features.

- Other issues

Proposals shall discuss how other features such as security, safety, reliability could be supported.

6.8 Evaluation Criteria

Proposals will be evaluated in terms of consistency in their specifications, feasibility and versatility across a wide range of different robot applications.

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/public_schedule/ under the item identified by the name of this RFP.

Approx Day	Event or Activity	Actual Date
	<i>Preparation of RFP by SIG</i>	<i>May 30, 2005</i>
	<i>RFP placed on OMG document server</i>	<i>May 31, 2005</i>
	<i>Review by TF</i>	<i>June 21, 2005</i>
	<i>Preparation of RFP by TF</i>	<i>August 1, 2005</i>
	<i>RFP placed on OMG document server</i>	<i>August 22, 2005</i>
	<i>Approval of RFP by Architecture Board Review by TC</i>	<i>September 15, 2005</i>
<i>0</i>	<i>TC votes to issue RFP</i>	<i>September 16, 2005</i>
<i>90</i>	<i>LOI to submit to RFP due</i>	<i>December 15, 2005</i>
<i>129</i>	<i>Initial Submissions due and placed on OMG document server ("Three week rule")</i>	<i>January 23, 2006 (at least 12 weeks form issue)</i>
<i>143</i>	<i>Voter registration closes</i>	<i>February 6, 2006 (one week before TM)</i>
<i>150</i>	<i>Initial submission presentations</i>	<i>February 13, 2006</i>
	<i>Preliminary evaluation by TF</i>	

262	<i>Revised Submissions due and placed on OMG document server (“Three week rule”)</i>	<i>June 5, 2006</i>
283	<i>Revised submission presentations</i>	<i>June 26, 2006</i>
	<i>Final evaluation and selection by TF Recommendation to AB and TC</i>	
	<i>Approval by Architecture Board Review by TC</i>	
287	<i>TC votes to recommend specifications</i>	<i>June 30, 2006</i>
360	<i>BOD votes to adopt specifications</i>	<i>September, 2006</i>

Appendix A References and Glossary Specific to this RFP

A.1 References Specific to this RFP

None.

A.2 Glossary Specific to this RFP

Super Distributed Object (SDO) - A Super Distributed Object (SDO) is a logical representation of a hardware device or a software component that provides well-known functionality and services. OMG has the formal specification of SDO: “Platform Independent Model (PIM) and Platform Specific Model (PSM) for Super Distributed Objects (SDO) Specification” [formal/2004-11-01].

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.