

# *OMG UML v. 1.4: Revisions and Recommendations*

## **OMG UML 1.4 Revision Task Force**

**A report prepared for the members of the Object Management Group summarizing the proposed minor revision to the *OMG UML Specification v. 1.3*.**

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This report summarizes the work of the second UML Revision Task Force (UML RTF), which was chartered by the Platform Technology Committee in August 1999 to produce a minor revision to the *OMG UML Specification* version 1.3 (OMG documents ad/99-06-08 and formal/00-03-01). It describes the scope and process of the RTF and outlines the areas where it made corrections and other improvements in its recommended revision (*OMG UML Specification v. 1.4*; OMG document ad/01-02-13). Detailed responses to specific issues submitted to the RTF are described in an appendix (OMG document ad/01-02-12). The report concludes with recommendations for the next revisions of the language.

### *Scope*

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When making revisions the UML RTF followed the guidelines stated in the *OMG Policy and Procedures* (OMG document pp/99-11-02) regarding the scope of its work:

An F/RTF is chartered by the appropriate TC to gather comments on a particular specification from OMG Members and others, and to decide whether changes are necessary in response to those comments. An F/RTF may recommend changes that provide clarification of the wording without changing its intent, or minor revisions that correct the detail of the specification without adding or removing significant functionality. Enhancements to the specification are outside the scope of the F/RTF, and must be deferred to a later RFP process (see section 4.2).

Following this charter the RTF made the following kinds of changes:

- Fixed typographic and grammatical errors.
- Resolved logical inconsistencies.

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## Process

- Corrected technical errors and omissions.
- Clarified vague and ambiguous statements.
- Improved document organization and readability.

In cases where there was a question whether a change was a minor revision or an enhancement, the RTF took a conservative position and recommended that the proposed change be made by a UML 2.0 RFP process.

## *Process*

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The revision work was an open process, where the UML RTF met regularly at OMG Technical Committee meetings to review and resolve outstanding issues. The issues considered included those formally submitted to the OMG via the [uml-rtf@omg.org](mailto:uml-rtf@omg.org) and [issues@omg.org](mailto:issues@omg.org) mailing lists, as well as issues identified by RTF members.

The RTF classified the issues and stored them in an issues database, which allowed the task force to systematically review and resolve them. Issues that couldn't be resolved quickly were delegated to one of the following working groups for further action:

- Structural Working Group (SWG) — responsible for the notation and semantics associated with the Foundation Package.
- Behavioral Working Group (BWG) — responsible for the notation and semantics associated with the Behavioral Elements package, except for the State Machine and Activity Graph subpackages.
- State Machines Working Group (SMWG) — responsible for the notation and semantics associated with the State Machines and Activity Graph packages.
- Model Management Working Group (MMWG) — responsible for the notation and semantics associated with the Model Management package.
- Profile Working Group (PWG) — responsible for revising profiles and extension mechanisms so that the language can be customized correctly and efficiently.
- Model Interchange Working Group (MIWG) — responsible for the specification of the XMI DTD and the CORBA IDL for model interchange.
- OCL Working Group (OWG) — responsible for the specification of the Object Constraint Language.
- Architectural Working Group (AWG) — responsible for the architectural integrity of the UML specification and its alignment with other facilities, such as the Meta-Object Facility (MOF) and the XMI Facility.

Between Technical Committee meetings the working groups functioned as virtual teams that recommended corrections and clarifications to the issues assigned to them. Working groups reported their progress during bi-weekly RTF teleconferences where they sought task force consensus for their proposed changes. A draft of the UML 1.4 specification (*OMG UML Specification v. 1.4 beta R1*; OMG document ad/00-11-01) was made available on the OMG web on November 13, 2000, four weeks before the OMG Technical Meeting in Orlando during the week of December 11, 2000. The RTF used the review feedback from the beta draft to further refine the specification. In addition, the

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## Revision Changes

RTF published updates to its internal issues database on the UML RTF web (<http://www.celigent.com/omg/umlrtf>)<sup>1</sup> so that others could track its progress.

The RTF voted via electronic ballots and teleconference between January 29 - February 2, 2001 to recommend this report and the final draft of the UML 1.4 specification, which was later assigned OMG document number ad/01-02-13 and posted to the OMG web. Thirteen out of a possible fifteen named representatives listed on the OMG web ([www.omg.org/techprocess/meetings/schedule/UML\\_1.4\\_RTF.html](http://www.omg.org/techprocess/meetings/schedule/UML_1.4_RTF.html)) voted in favor of recommending both this report and the final draft. Only the named representatives from Concept 5 Technologies and Klasse Objecten did not participate.

The RTF also made a version of its final draft with change bars (OMG document ad/01-02-14) available. However, it should be noted that because the final draft includes numerous non-technical editing changes to improve the document's organization and readability, the usefulness of the change bars is limited.

## *Revision Changes*

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The most significant revisions were made to the following modeling areas during the UML 1.4 revision process:

- profiles and extension mechanisms
- components and artifacts
- collaborations and patterns

Profile and extension mechanism constructs were revised to address the needs of users and vendors who need to customize UML correctly and efficiently. Changes include improvements to make these constructs more scalable and more straightforward to implement. Component modeling constructs were updated to address the requirements of current practices for component-based development, especially where EJB, COM+ and CCM are used for implementation. Revisions include a sharper distinction between executable components and the physical artifacts that implement them. Collaboration modeling constructs were revised to improve the organization of the semantics and the support for subordinate collaborations. The latter changes will be useful for modeling patterns in terms of other patterns (e.g., as used in frameworks).

The following sections provide a more detailed summary of the changes, organized in a manner consistent with the structure of the specification:

### CHANGE SUMMARY

**Modeling Language: Foundation package (Structural Elements).** The following changes were made to the UML Foundation package, which specifies the semantics for the static structure of models:

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1. A link to the UML RTF web site is available on <http://www.omg.org/homepages/>.

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## Revision Changes

- **Core**
  - Refined Component so that it can more effectively model component-based development using EJB, COM+ and CCM components. Also defined Artifact to specify physical artifacts (e.g., EJB JAR files, DLLs) separately from the components (e.g., EJB Entity Beans, COM Objects) that they implement.
  - Added TemplateArgument to correct the binding of Template arguments.
  - Refined Composition so that it denotes the responsibility of the whole for the parts, but the parts can be detached. (Removed any references to "coincidental lifetimes" remaining from 1.3.)
  - Added "package" visibility for modelers concerned with Java implementations.
  - Added "ordering" property for everything that has multiplicity, notably Attributes.
- **Data Types**
  - Refined DataType with the following subclasses: Primitive, Enumeration, and ProgrammingLanguageDataType.
- **Extension Mechanisms**
  - Refined Stereotypes to improve its correctness, and allow the definition of multiple stereotypes per model element.
  - Added TagDefinition so that users can specify what kind of tagged values will be allowed by a particular profile. Tags can now be strongly typed.

**Modeling Language: Behavior Elements package.** The following changes were made to the UML Behavioral Elements package, which specifies the semantics for the dynamic behavior of models:

- **Common Behavior**
  - Added SubsystemInstance to provide a run-time representation of Subsystem.
  - Refined the associations relating instances with other instances and links to address ownership issues.
- **Collaborations**
  - Added CollaborationInstanceSet and InteractionInstanceSet to organize the various instances that participate in a collaboration.
  - Clarified common semantics shared by sequence diagrams and collaboration diagrams.
  - Refined the semantics and notation for subordinate collaborations, useful for modeling patterns that use other patterns (e.g., as used in frameworks).
- **State Machines**
  - Refined well-formedness rules and added OCL operations for LCA and Ancestor
  - Added a standard stereotype «stateInvariant» of Constraint to indicate that a constraint holds for instances of a classifier when an instance is in that state.
- **Activity Graphs**
  - Added notation for call states.
  - Added standard tags for usage of object flow states.

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## Revision Changes

**Modeling Language: Model Management package.** The following changes were made to the UML Model Management package, which specifies how model elements are organized into models, packages and subsystems.

- Added Profile stereotype of Package to organize user-defined extensions using stereotypes, tagged values and constraints.
- Refined Package so that it can contain any kind of model element.
- Refined Subsystem to include the details of communication via stimuli.

**UML Example Profiles.** The UML Example Profiles (formerly “UML Standard Profiles”) were updated to be consistent with revisions to the Semantics and Notation related to profiles.

**UML Model Interchange.** The *CORBAfacility Specification* and *UML XMI DTD Description* chapters were combined into a *UML Model Interchange* chapter.

- The interchange metamodel (formerly known as the “physical metamodel”) has been updated to reflect changes to the abstract syntax of the semantics metamodel (a.k.a. the “logical metamodel”). All association references (cf. role names) in the revised interchange metamodel are explicit.
- The IDL interfaces and XML DTD are provided as separate artifacts rather than as text within the UML specification. In addition, the interchange metamodel is provided as an XML document based on the MOF Model DTD.

**Object Constraint Language.** The Object Constraint Language was updated to correct various problems identified by users and to make it consistent with revisions to the semantics and notation.

- Refined the Let construct so that it allows parameters and variables/operations can be reused in multiple constraints.
- Required predefined operations to specify parameter lists (e.g., collection->size()) to make them consistent with user-defined operations.

## DETAILED CHANGES

The RTF considered 155 issues, most of which were submitted to it before the comment deadline of March 1, 2000. These issues were tracked in an issues database that was made available on the UML RTF web. A summary of issue actions by the RTF is shown in Table 1.

**TABLE 1. Summary of Issue Actions**

RESOLUTION	DESCRIPTION	NUMBER
Resolved	Corrected or clarified	86
Declined	Considered and declined	31
Deferred	Deferred to UML 2.0, MOF RTF or Action Semantics	23
Previously resolved	Corrected or clarified in UML 1.3	13
Redundant	Redundant with another issue	2
	<b>TOTAL</b>	<b>155</b>

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## Recommendations

A detailed report of the issues database, which includes specific resolutions for all submitted issues, can be found in *Appendix A: Issues Database Report* (OMG document ad/01-02-12) of this RTF report. The appendix will be provided to [issues@omg.org](mailto:issues@omg.org) so that they can update the *Issues for UML 1.4 Revision Task Force* page ([cgi.omg.org/issues/uml-rtf.html](http://cgi.omg.org/issues/uml-rtf.html)) appropriately.

## *Recommendations*

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In performing its work the UML RTF identified various improvements to the language that it was unable to make because they were either outside of its scope (e.g., they constituted an enhancement, not a minor revision) or required more time than was available. Improvements in the former category should be considered by submissions to UML 2.0 RFPs (ad/00-09-01, ad/00-09-02 and ad/00-09-03), while improvements in the latter category could be considered by submissions to UML 2.0 RFPs or another UML RTF. In both cases, many UML RTF members actively participated in the UML 2.0 Working Group to ensure that the most significant issues were captured in the problem statement sections of the UML 2.0 RFPs.

Since work is currently underway on the UML 2.0 submissions, we consider it counter-productive and potentially confusing to generate another minor revision in the UML 1.x series. Consequently, we recommend that if another UML RTF is chartered it should focus on making clarifications to UML 1.4, rather than revising it. All outstanding major and minor revision issues should be addressed by the UML 2.0 final submissions.

However, we note that an exception might need to be made for the Action Semantics for UML RFP final submission, which is scheduled to be completed after the completion of UML 1.4 and before the initial submissions for the UML 2.0 Infrastructure RFP. Adoption of this submission will likely require localized changes to the UML 1.4 metamodel. Consequently, the OMG should consider chartering a Finalization Task Force to generate a UML 1.4.1 minor revision which restricts its changes to those required by the Action Semantics for UML final submission.