

**INCOSE TECHNICAL BOARD**  
**LIAISON ADVISORY STATEMENTS**  
**(INCOSE-TA-2003-003-01)**

Approved by the INCOSE Technical Board on May 29, 2003

**A. Name of Liaison Effort:** OMG/UML for Systems Engineering

**B. INCOSE Liaison Representative:** Sanford Friedenthal

**C. INCOSE point of contact and participants -**

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**D. Description of proposed standard or liaison activity**

The Systems Engineering Domain Special Interest Group (SE DSIG) is a joint INCOSE/OMG initiative to extend UML to systems engineering to satisfy the objectives outlined below. A memorandum of understanding between INCOSE and the OMG was signed in July 2001, and the SE DSIG kickoff meeting was held in September 2001. The SE DSIG has been working through the OMG technology adoption process to establish an extension to UML that satisfies the requirements for a general purpose systems modeling language. This effort has been worked in close coordination with the ISO AP-233 effort, which is focused on developing a systems engineering data interchange standard to support tool interoperability.

**E. INCOSE's level of participation**

The INCOSE liaison to the OMG also chairs the OMG SE DSIG. In addition, several INCOSE members have participated in the SE DSIG via a special arrangement to provide INCOSE members electronic access to the OMG documentation and email exploder, and enable attendance at the OMG technical meetings.

**F. Justification, including relevance to INCOSE and its members**

INCOSE has been able to leverage the OMG as a standards body to support the UML extension to SE. The OMG owns the UML Specification, and it is only through this body that the extension can be formally established. In addition, the liaison relationship has resulted in cross-fertilization between different domains, which has resulted in significant benefits to both the OMG and INCOSE. INCOSE has been able to introduce systems engineering to the OMG, and the OMG has been able to bring its extensive UML, software, and modeling expertise to INCOSE. In addition, this effort has provided increased exposure to INCOSE, resulting in some new INCOSE members.

### **G. Objectives satisfied or to be satisfied**

SE DSIG Objectives: Extend UML to systems engineering to support the following:

- Provide a standard SE modeling language to analyze, specify, design, and verify complex systems
- Facilitate integration of systems and software engineering disciplines
- Promote rigor in the transfer of information between disciplines and tools for developing systems

The SE DSIG is well on its way to achieving these objectives. The UML for SE RFP is being issued through the OMG at the end of March 2003. The RFP includes the requirements for the general purpose systems modeling language. The plan calls for final industry submissions in response to the RFP by March 2004 and adoption of the extension to UML for SE during the last half of 2004.

### **H. Dependencies, risks, and issues**

Dependencies:

The SE DSIG effort is dependent on the OMG technology adoption process. As such, the RFP and the submissions for the UML for SE extension is subject to approval by the OMG architecture board and other technical committees. There is some risk associated with this dependency, but it is felt to be minimal.

Risks and issues:

1) The primary technical risk is the ability of the UML extension to provide a robust solution for a general-purpose systems modeling language. This risk has been mitigated by a substantial requirements analysis effort through the SE DSIG to develop and validate the requirements, and evaluate the feasibility of solutions. The requirements analysis effort has included:

- Issuance of a request for information on the use of UML for SE and evaluation of the responses. The responses demonstrated many successful applications of UML to systems engineering, as well identification of the needs and outstanding technical issues to be addressed by the extension.
- Joint development of the SE Concept Model with AP-233/INCOSE
- Prototyping various applications of UML for SE
- Close coordination with UML V2.0 submission teams to influence UML V2.0 and ensure it provides the proper foundation for the extension
- Extensive review and feedback of the SE DSIG results through INCOSE, AP-233 and the OMG / SE DSIG.

2) A risk is associated with the systems community acceptance of the UML extension as a general-purpose systems modeling language. It is believed this risk will continue to be mitigated over time. There is already significant use of UML for systems engineering across industry and academia as evidenced by the responses to the UML for SE RFI and various articles in the open literature (including the INCOSE journal). In addition, UML

has become the de-facto standard among the software community, which significantly influences its use by systems engineers on programs. The extensive use by software engineers also provides an extensive infrastructure of tools, training, and skilled individuals that the SE community will leverage. Additionally, UML is being taught in the universities, which will make future acceptance even easier.

3) A risk is whether the tool vendors will implement the UML for SE extension. This risk is felt to be quite low based on the feedback and participation from many UML tool vendors such as Rational, I-Logix, Telelogic, and Artisan, and more traditional SE tool vendors such as Vitech Core and Popkin System Architect.

### **I. Anticipated schedule**

SE DSIG Kickoff – September 2001

UML for SE Request for Information – January – September 2002

Issue UML for SE RFP – March 28, 2003

Final Submissions for UML for SE – March ‘ 2004

Adopt UML for SE Specification – August 2004

### **J. Relationship to existing/planned collaborations and other standards activities**

As mentioned previously, the SE DSIG effort has been closely coordinated with the ISO AP-233 Working Group via the AP-233 Chair (Jim U’Ren) and the INCOSE Liaison (Dave Oliver).

### **K. Relationship to INCOSE Technical Operating Plan, if any**

This initiative is a fundamental enabler of the MDSD and MTTC initiative to improve the practice of systems engineering by supporting the transition to a model based approach to systems engineering.

### **L. Expected Duration of Effort**

The effort is expected to extend through the adoption of the specification for the UML for SE extension. This is planned for the end of 2004. There may be follow-on activity to further refine the language, which may result in additional activities beyond 2004.

### **M. INCOSE privileges and other benefits (e.g. price discounts, name/logo on cover, etc.)**

INCOSE members have had a special arrangement with the OMG enabling them to access the OMG electronic documentation and email exploder, and participate in the OMG technical meetings.

### **N. Draft Joint Working Agreement (or plan for developing), as required**

INCOSE/OMG Professional Working Agreement (Memorandum of Understanding)

- N.1 Signatures: INCOSE - Bill Mackey, John Clouet / OMG Henry A. Lowe  
N.2 Date signed: July 4, 2001 – July 4, 2003 (Needs to be extended)  
N.3 Location of Agreement: copy with Liaison and INCOSE admin.

### **O. Key Issues and INCOSE Advisories**

O.1 Issue #1 – The ability of the UML Extension for SE to satisfy the requirements for a general purpose systems modeling language.

O.1.1 Committee Position (if known) – The OMG fully endorses this effort through establishment of the SE DSIG, as well as endorsement from executive management within the OMG (R. Soley), and extensive participation from OMG members and other working groups.

O.1.2 INCOSE Advisory – INCOSE and the OMG have jointly chartered the SE DSIG to pursue this initiative. The results of the SE DSIG effort are on track with the objectives, and the risks are being mitigated (refer to risk #1 above).

O.2 Issue #2 – Acceptance of the UML extension by the SE community.

O.2.1 Committee Position (if known) – The UML extension for SE provides additional applications for the use of UML, which one of the primary technologies of the OMG.

O.2.2 INCOSE Advisory – INCOSE continues to have significant interest amongst its members in the use of UML for SE. The attendance at the UML for SE panels over the past two years and the attendance at the UML tutorials (OOSEM, ..) at the symposium and local chapters, indicate a high level of interest among the INCOSE membership. In addition, there is extensive other evidence of interest within the broader industry and academic community as indicated in risk #2 above.

O.3 Issue #3 – Implementation of the UML extension by the tool vendors.

O.3.1 Committee Position (if known) – The OMG process is directed squarely at this issue, by obtaining commitments from tool vendors to implement via a letter of intent. In addition, several of the major tool vendors have been actively participating in this effort as described in risk #3 above.

O.3.2 INCOSE Advisory. This effort is one of the major thrusts within the Modeling and Tools Technical Committee (MTTC), in support of the INCOSE modeling and tool initiatives.

Approved by the INCOSE Technical Board William F. Mackey, Chairman  
Date: May 29, 2003