

INCOSE TECHNICAL BOARD
LIAISON ADVISORY STATEMENTS
(INCOSE-TA-2003-006-01)

Approved by the INCOSE Technical Board on June 29, 2003

A. Name of Liaison Effort - INCOSE liaison to AP233

B. INCOSE Liaison Representative –
David W. Oliver

C. INCOSE point of contact and participants -

C.1 Address

173 Iacuele Drive
Wakefield, RI 02879

C.2 Telephone

401-782-1601

C.3 Email address

Doliver106@cox.net

D. Description of proposed standard or liaison activity

AP233 is developing an international standard information model for systems engineering. AP233 provides the means to exchange data directly among systems engineering tools and engineering design tools. The standard is unlike any other associated with systems engineering. It is written in a rigorous and executable language for defining database schema. It deals directly with the primitive concepts used in systems engineering and the higher level concepts built upon them. Other standards, 1200P, 632, 15288, etc are written in natural language, with pictures and do not deal fully with some of the primitive concepts used in modeling. These are concepts like function and its relationship with I/O. Behavior as a concept is fully defined in AP233 in terms of function, I/O and function ordering.

The D-SIG in OMG, Sandy Freidenthal chair, was spun out of the AP233 effort and is establishing a UML Profile that will produce a specialized variant of the UML language for doing systems engineering work and using the modeling semantics defined in AP233. In the 03-04 fiscal year it will be necessary to attend only a few of the OMG meetings, those that examine the responses to the RFP for an extended UML language. Attendance is for the purpose of evaluating the responses to the RFP. Participation from AP233 will be essential to ensure the language that emerges meets the goals established at the origin of the D-SIG project.

E. INCOSE's level of participation

The INCOSE MDS and TIWG working groups have made major contributions to this effort for many years. The work has been done under the oversight of the STC and

MTTC. Strong interaction has occurred with the Requirements Management WG, The Risk WG and the Measurements WG. The INCOSE Tech board has supported Liaison from INCOSE to AP233 and to OMG. Memoranda of understanding have been accepted with both ISO and OMG.

F. Justification, including relevance to INCOSE and its members

A rigorous international standard for systems engineering requirements, system modeling, and systems engineering management is the essential factor for rigor in systems engineering, interchange of information among tools, and coherent education of future systems engineers. It is the underlying technology needed to take systems engineering beyond the use of text and into the computer age with efficient information exchange within an organization, among consortia of organizations or through a supplier chain where a variety of tools are in use.

G. Objectives satisfied or to be satisfied

AP233 is being developed in sequential releases of module sets. Each module set provides capability to perform an important part of systems engineering and to allow intercommunication among a set of tools in use by systems engineers. The first two module sets to be completed deal with requirements in documents and the exchange of information among requirements management tools and project data management tools. Interfaces have been built for eight different tools and data exchange has been verified. Not only are STEP requirements for standards met, but also a demonstrator and an efficient interface development tool have been provided. The first two module sets have been verified by information transfer with existing tools even before being balloted and accepted as an ISO standard. This procedure exceeds IOS requirements for standards and has demonstrated very low cost of developing an interface for a tool.

It is important to note that this is a rigorous standard that is verified through data exchange. None of the interfaces took more that a week or two to create. Low cost of implementation is one of the AP233 optimization criteria for the project to reduce the barriers for standard use.

Objectives:

Module Sets:

- Text Based Requirements
- Property Based Requirements
- Function Based Behavior
- State Based Behavior
- Structure and Analysis
- Validation and Verification
- Data Representation
- Risk Analysis
- Configuration Management
- Change Control Management
- Measurements
- Scheduling

Organizational Structure
Product Data Management
Security
Demonstrator and Interface Development tool for the above module sets
Semantic Dictionary and Concept Model for the above module sets

A semantic dictionary and concept model is being developed for systems engineering by both AP233 and the OMG D-SIG.

H. Dependencies, risks, and issues

The definition of AP233 semantics makes it possible to create an extension to the UML language so that it can be used for systems engineering and so that rigorous requirements can be written for software engineering in their own language. The AP233 team works closely with the OMG D-SIG, with INCOSE working groups, and with other ISO/SC4 AP's.

The major risk at present is a lack of funding to do the EXPRESS coding for the behavior module sets.

Major issues are stated in the final section.

I. Anticipated schedule

The schedule cannot be predicted without better knowledge of funding. Funding levels establish both timing and the sequence in which the objectives are met - module sets completed and through ISO ballot.

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

. The AP233 team works closely with the OMG D-SIG, with INCOSE working groups, and with other ISO/SC4 AP's.

K. Relationship to INCOSE Technical Operating Plan, if any

Not known

L. Expected Duration of Effort

Three years.

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

None known

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

Memoranda of Understanding have been written by INCOSE/ISO and INCOSE/OMG. The details are available from INCOSE archives.

O. Key Issues and INCOSE Advisories

Issues Concerning AP233 Liaison

O.1 Issue #1

Background:

Presently the ISO committees charge money for those who wish to receive their standards. The AP233 team collected data that showed that the resulting income was small and that the charges worked against widespread familiarity with the standards. INCOSE Liaison Advisory:

A letter was drafted to SC/4 proposing that those charges be dropped. That letter was approved and forwarded to the ISO secretariat. D.W. Oliver supported this position publicly.

O.2 Issue #2

Background:

MDSD-WG and the AP233 liaison conceived the idea of an OMG D-SIG to create a UML profile, a particular UML language for systems engineering. They worked with INCOSE and OMG management to generate a memorandum of understanding between the organizations and to get the D-SIG adopted within OMG by OMG voting procedures. The goals were to get a UML language that includes the systems engineering modeling semantics that are captured by AP233 and incorporated in the AP233 ISO standard. This provides two results:

- Ability to transform data among UML based tools and traditional systems engineering tools.
- Ability to create rigorous requirements models for software engineering in a language they use.
- Ability to perform systems engineering work using the special UML profile language for systems engineering.
- Ability to utilize heritage systems engineering information with UML based tools and the extended UML language.

INCOSE Liaison Advisory:

The D-SIG requirements document shall require that modeling capabilities that are currently absent in standard UML be introduced into the profile in a form that is backwards compatible with existing systems engineering modeling. These modeling capabilities include:

1. Engineering Analysis
2. Optimization through the use of optimization criteria (measures of effectiveness and measures of performance) with weights and regularization functions.
3. Executable Function Based Behavior (independent of state) that generates time lines, monte carlo simulations, and logical correctness of the model.

D.W. Oliver has taken the public position that the extended UML language shall be backward compatible with existing systems engineering modeling in those areas where UML has no present capability.

O.3 Issue #3

Background:

Some INCOSE symposium papers, tutorials, and journal articles state that systems engineering can be done currently with UML. If this were true there would be no need for the SE D-SIG in OMG led by Sandy Freidenthal. In fact, the semantics of existing UML is inadequate to express some of the concepts essential for systems engineering.

INCOSE Liaison Advisory:

D.W. Oliver has stated this in public, in papers, and in the role of AP233 liaison. The liaison person has no voice in setting the criteria for acceptance of INCOSE papers, tutorials, or journal articles. This issue is within the domain of policy, control and direction of the BOD and Tech board.

O.4 Issue #4

Background:

Some of the AP233 module sets require funding to generate the detailed EXPRESS code needed. Others are being built by other AP's and can be adopted. Funding for the AP233 work has come primarily from JPL and from Defense Logistics Operation, England. A contract from NRO that was expected to support this basic work will not do so. AP233 is concentrating now on module sets that require the least in funding to complete the work. There has been no funding from INCOSE member companies other than JPL.

INCOSE Liaison Advisory:

D.W. Oliver has stated this in public and to the CAB and Tech Board. The liaison person has inadequate voice or influence in obtaining funding. Is this issue of funding within the domain of policy and influence of the BOD and Tech board?

Approved by the INCOSE Technical Board William F. Mackey, Chairman

Date: June 29, 2003