

SEDRES-2 – Systems Engineering Data Representation and Exchange Standardisation – 2

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Anfang 2000 startet im Rahmen des EU IST (Information Societies Technology) Programms das Projekt SEDRES-2. Damit werden die Forschungs- und Entwicklungsaktivitäten im Bereich Systementwicklung, Produktdefinition und Anforderungsmodellierung auf europäischer und internationaler Ebene fortgeführt. Der folgende Artikel gibt eine kurze Einführung in die Thematik und Ziele des SEDRES-2 Projektes.

The European IST (Information Societies Technology) project SEDRES-2 will start in the beginning of the Year 2000. This continues the IMW's research and development activities in system and requirements engineering on European and international level. The following article gives a short introduction and defines the goals of the SEDRES-2 project.

1 Organisation of SEDRES-2

After completing the contract preparation phase in October 1999 the kick-off for the SEDRES-2 project is planned in January 2000. SEDRES-2 is an 18 months project with a consortium mainly consisting of the major European enterprises of Aerospace and Defence industry:

Project co-ordinator:

- DaimlerChrysler Aerospace - DASA, Military Aircraft, Munich, Germany.

Industrial partners:

- AEROSPATIALE MATRA Lanceurs – AML, France
- Finmeccanica Alenia Aerospace-Aeronautics Division – ALENIA, Italy
- British Aerospace MA&A – Bae, United Kingdom
- SAAB Military Aircraft – SAAB, Sweden
- Società Italiana Avionica – SIA, Italy

STEP consultancy company:

- EUROSTEP Ltd – EUROSTEP, United Kingdom

Academic partners:

- University of Linköping – LIU, Sweden
- Loughborough University – LUTCHI, United Kingdom
- Technical University of Clausthal – TUC, Germany.

2 Project objectives

The SEDRES-2 mission statement is:

To extend, validate and standardise the Systems Engineering (SE) data model and nurture its practical implementation and multi-sector exploitation as a key enabler for the competitiveness of European industry.

The top-level objectives of the project are:

1. To drive the on-going AP-233 activity in the areas of data modelling, test material, document preparation, to ensure that European interests are represented in the emerging systems engineering data exchange standard;
2. To validate the standard by performing practical case study definition, prototyping, use and evaluation of the emerging standard within real SE activities;
3. To achieve the adoption ("take-up") of AP-233 by all stakeholders, by maximising the two-way dialogue between the first two tracks of work, and between SEDRES-2 and such stakeholders, and to ensure that the vision of generic systems engineering is appropriately supported by the emerging standard.

2.1 Driving the on-going AP-233 activity

The first objective is largely dictated by the nominal time frame of the AP-233 development, and the need for different types of, and levels of quality of ISO STEP products to become available against that timeframe. Products will include:

- Refined process (AAM) and data (ARM, AIM) models;

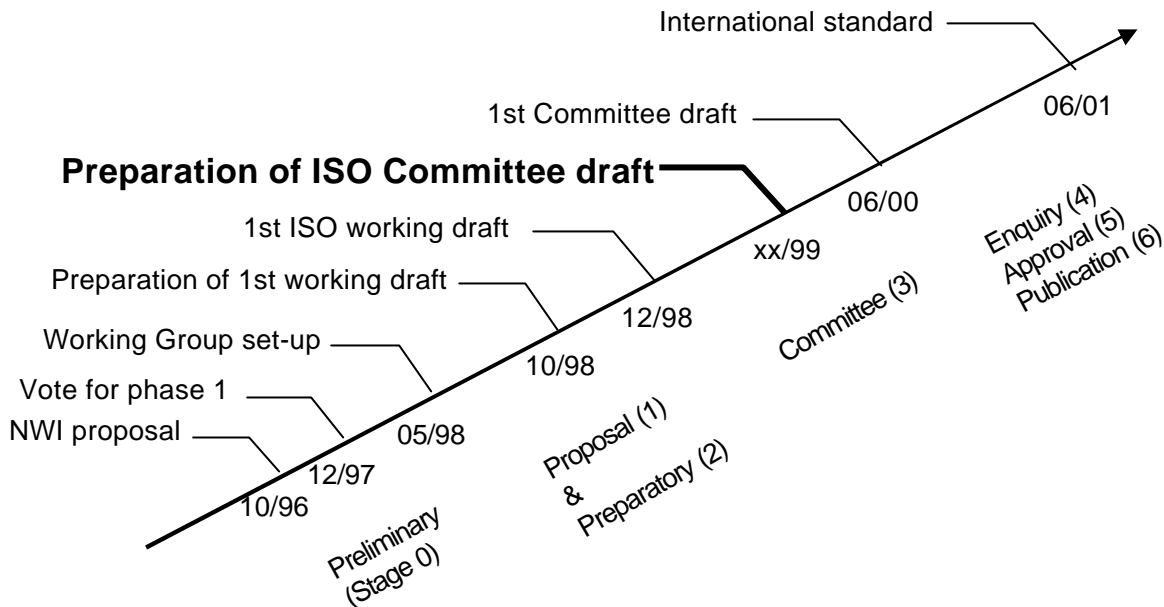


Figure 1: AP233 ISO development schedule

- Identification of, and subsequently rationalisation with, other STEP components, such as other AP's, Integrated Resources, and Modules (such as the PDM Schema);
- Abstract test suite material;
- Technical working documents addressing issues that arise, which would contribute to the Annexes required to support the AP-233 document set.

The AP-233-related documents have to be produced to fit the AP-233 development time scale, which includes development of 1st Committee Draft (CD) by June 2000; production of International Standard (IS) by June 2001. It is possible, due to the breadth of systems engineering data that a second version of AP-233 will subsequently need to be produced. Also note that the SEDRES-2 partners are not in control of the AP233 time frame; it is possible that the time frame will slip as indicated above. For these reasons, concluding work in a Stage 2 of SEDRES-2 is a potential future extension to SEDRES-2 outside of the current project contract.

2.2 Validation of the standard within real SE activities

The second objective is very much industry driven, and is to achieve a validation of the use and benefits of AP-233-based data sharing in an international, tool-heterogeneous, systems engineering environment. Two practical systems engineering case studies and associated contexts will be de-

veloped to focus the refinement of this objective down to further sub-objectives. The project will produce:

- Refined definitions of Validation Scenarios (VS's), case study material, implied requirements on the standard, representative SE roles played by partners, use of SE tools and subsets of the SE process to be exercised. The first validation scenario VS1 is based on real aircraft design material. Validation scenario VS2 deals with simplified data of the automated transfer vehicle (ATV) for the international space station ISS.
- definitions of the extended data domain to be covered (see figure 2);
- identification of the available technology that can be used to create SE tools interfaces, data repositories and sharing mechanisms;
- tool interfaces, and evaluation utilities forming a validation environment, and test results (the specific design tools currently planned to be used are listed in figure 2);
- evaluation objectives and approach, including effectiveness measures;
- results of exercising the Validation Scenarios and of the evaluation of the resulting SE environment, including projected cost savings and effectiveness metrics.

The technical areas for innovative prototyping & extension of the data model over the current generation SEDRES (1)/AP-233 data model include:

- extended requirements type handling, going beyond simple textual fragments to the rich

	Validation Scenario #1	Validation Scenario #2
Application Context	Aircraft	Space Vehicle
Phases of the system engineering process taken into account	Detailed design	Preliminary design
Technical data (domain) handled	- Detailed functionality - Properties - Behaviour - Configuration Management data	- System and Component Requirement - Physical - Preliminary design data - Traceability
System engineering environment	Statemate, MatrixX, Teamwork, Exchanges by STEP flat file	Labsys, StP, Teamwork, DOORS, Demanda, Exchanges by STEP flat file

Figure 2: Validation Scenario Context definition

- forms now found in customer requirements documents;
- property analysis, extending the data model to support analysis for certain non-functional system properties, including availability and safety properties.
- support for topological architectures;
- support for the object-oriented modelling paradigm;
- support for validation and verification activities;
- support for design traceability;
- development and validation of a trade studies framework;
- support for Product Data Management across systems engineering data, converged with PDM Schema work already happening internationally.

2.3 The SEDRES.network

The third objective reflects the aims of the SEDRES.network and dissemination activities as key elements in the adoption and takes up of the SEDRES-2 proposal. The following paragraphs explain the vision of the SEDRES.network concept, once this is fully realised as a focal point for a Systems Engineering cluster within a group of EC part-funded projects. Within the current SEDRES-2 project, there are activities planned and resourced to:

- create the initial support infrastructure for the SEDRES.network concept (in the form of a suitable web page);

- create initial operations of SEDRES.network, in so far as resources allow;
- create a Business Case for the full SEDRES.network realisation; this business case is likely to form a major part of a proposal for additional funding, based on the need for co-ordination of a group of EC projects around a systems engineering focus, and which would be a practical realisation of a project thematic cluster, with well-defined business objectives.

SEDRES.network has the objective to manage the evolution of the AP-233 standard across various stakeholders: users in aerospace and other sectors, ISO/STEP community, design tool vendors, the Com-mission, INCOSE. It will ensure the cross-sector cohesion of the emerging AP-233 data exchange standard, such that the standard fully supports the generic nature of systems engineering as practised across industry sectors, while managing the inevitable diversity that different sectors require, into an extensible architecture for the standard.

The SEDRES.network element of SEDRES-2 will interact with a number of distinct groups in the following ways. It will interact with the group of validation projects expected from each of a number of different industry sectors, to achieve a commitment to make use of emerging AP-233 interfaces for data exchange and a commitment to act as an SE environment validation project for SEDRES-2/AP-233. It will also ensure awareness and consistency of SEDRES/AP-233 and the availability of an interface development 'package', so reducing risk to such projects and SE tool vendors. Validation projects are planned or are expected to arise from: SEDRES-2 itself, with the prototyping and evaluation

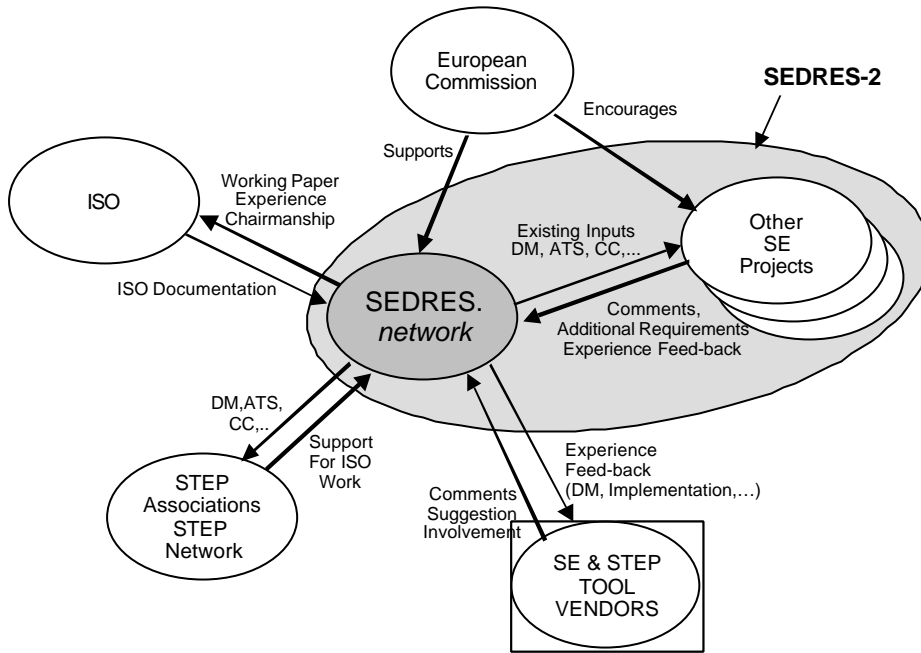


Figure 3: The SEDRES-2. network

activity using aircraft and ATV case studies; the WOODS project in the automotive industry, with a project led by Peugeot.

SEDRES.network has the objective to ensure that the AP-233 work group is informed about the ongoing technical developments and work status within SEDRES-2, so AP-233 will gain industrial and technical feedback from prototyping and evaluation experiences, and guidance on the core-standard versus industry-sector extensions.

SEDRES.network will interact with STEP Associations to obtain the current philosophy on STEP style and architecture, and achieve for them an awareness of SEDRES/AP-233 and of SEDRES-2 experiences. STEP Associations will make it easier for AP-233 to achieve appropriate quality, consistency and integration with existing STEP resources.

SEDRES.network will interact with SE & STEP Tool Vendors to obtain co-operation in the development of AP-233 interfaces, and identify trends on SE tool support for Product Data Management (PDM). Similarly, it will ensure that there is awareness within this group of SEDRES/AP-233 status and of SEDRES-2 experiences.

Finally, a web site will be developed as part of the SEDRES.network including the introduction of an active working space.

In summary, in the current contract for SEDRES-2, there are minimum activities to support the definition of the SEDRES.network concept and its initial realisation, with the expectation that the business

case for a cluster focus would be targeted at a subsequent EC research call.

3 Overview of the work-package structure

The SEDRES-2 project is organised into seven work-packages (WP).

WP 1 defines the scope of the extensions to the existing SEDRES/AP233 data model. Furthermore, WP1 specifies the scope, the methodology and the evaluation objectives applied for the validation scenarios.

The focus of work-package 2 is the development of the data exchange standard, which will rely on internal experience and will take into account the external view captured through the SEDRES.network from the standard, application and technology axes.

The validation scenarios and the necessary software components and interfaces are developed and tested within work-package 3.

Work-package 4 deals with the evaluation of the standard by performing the validation scenarios.

The SEDRES.network as described before is established in work-package 5. The initial operation will be the development of a website.

Further exploitation and dissemination of the SEDRES-2 results will be done in work-package 6. Work-package 7 is dedicated to project management.

The participation of the Institut für Maschinenwesen is based on the knowledge gained within the EU projects KARE (Knowledge Acquisition and sharing for Requirements engineering) and SIMNET (Workflow Management for Simultaneous engineering networks).

The work will focus on the data modelling of the extensions to AP233 (WP2), development of the industrial validation scenario 2 (WP3) and its evaluation (WP4). The web support of the initial SEDRES.network for exploitation and dissemination will be part of the responsibilities in WP5 and WP6.