Harmonization of Thermal and Space Environment Analysis Software

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• Overview
  – Background of ESTEC Harmonisation Activity
  – Present Situation and Need for Action
  – Inauguration of Steering Board
    • Objectives, list of members, working procedures
    • First Steering Board Meeting
    • Intended activity roadmap and actions
• **Background of Harmonization Activity**
  – T&SE Tools Harmonization Roadmap was presented on December 4 + 5, 2002 to National Delegations (A, CND, DK, F, D, N, S, CH, GB were present)
  – Consensus reached that
    • Standardized model data exchange is of primary importance
    • T&SE tools are essential for space product development.
    • Long term availability of such tools is of strategic importance for European Space Industry.

  

– **Conclusions / Actions**
  • (1) Continue with present program of activities for data exchange standards
  • (2) Establish a „Steering Board“ involving the user community
    – Clear mandate, but following existing ESA rules
    – Study existing solutions, cost benefit of new components, Open Source S/W
    – Define architecture and interfaces of a European library of S/W components to build thermal and space environment analysis tools
    – Recommend Go / No-Go decisions for development/implementation
  • (3) Maintain existing tools until equivalent (better?) tools are available and/or required by running / planned ESA projects
• Present Situation and Need for Action
  – Many thermal S/W tools are existing, which are sometimes similar or have overlapping functionalities
  – Obviously no easy way to counteract this development
    • Quotation from a 1994 ESA study:
      – „There are a great many S/W tools in use for space-related thermal engineering, but many of them are monolithic, not easily extendible and have overlaps in functionality, leading to a lot of functional redundancy and extra maintenance effort“

  The situation 10 years later has not changed or is even worse

– Selection of existing and future tools:
  • ESATAN, THERMICA, ALTAN, TOPIC, ARTIFIS, CORATHERM, GAETAN, Condor, ThermXL, Cat (CAP and Power) and many more…
  • And more to come: Concept Design Tool, ESATAP, THERMOSS …
  • Immediate consequence: Data exchange tools are needed and under development: STEP-TAS, STEP-NRF, STEP-SPE, SET-ATS, TASVERTER…
  • Interesting to observe: A mandatory exchange tool between SINDA and ESATAN is yet missing
- This situation is very surprising and not easy to understand
- T&SE tools are more or less non-commercial in nature due to the small user group (specialization in space engineering)
- In many cases they are developed and maintained by public funding. But then: Why so many tools??
- There are probably two main reasons for this situation:
  - System companies develop own tools (sometimes supported by national agencies) with the intention to reach a competitive edge in the space market
  - Developments in ESA and national agencies sometimes not sufficiently based on user requirements

- Development at System Companies
  - Development of own engineering tools is based on a wide-spread misconception that own tools improve an industry’s competitiveness. The contrary is the case:
    - Development of engineering tools cost invest budget and development resources
    - Maintenance difficult and costly, developers may leave the company
    - For tools developed for a certain project: What happens after termination of the project?
    - More important: System companies need to share data and recourses with subcontractors, which would not have the same software (also system companies are currently merging)
    - As consequence data conversion tools need to be developed, which again are costly and use valuable resources
• Automotive industry as a good example: Competing companies are sitting together in an effort to harmonize true commercial engineering tools, in order to facilitates data exchange with common suppliers
• European space industry moves in the opposite direction: With no realistic need different tools are produced, which need then to be harmonized by costly data exchange tools!
  – Tool Development at ESA and National Agencies (public funding):
    • Several tools have been developed, which could not be successfully introduced into the user community
    • Probable reasons:
      – User community was not really involved in the beginning and during definition of requirements
      – “Marketing” of ready products was not sufficient
      – There is a certain reluctance at companies to get involved in new S/W, because of personnel training, compatibility with existing tool infrastructure…
        Let’s continue with what we have!

• The need for a “Steering Board“ (SB)
  – One important objective of the SB is to involve the user community from the beginning of a tool development

  • SB sets priorities for short / long term development
  • Defines user requirement road map
  • ESA transforms SB results into competitive ITT’s
  • Tool development in industry (preferably system company with S/W developer as subcontractor)
  • SB declares successful development as standard tool
  • IPR with ESA
• The need for a “Steering Board“ (cont.)
  – We possibly need to change the way how we develop engineering tools

  **The primary rule should be:**
  To develop thermal engineering tools for the user community (and not solely for the customer)

  • Developing contractors should therefore be requested
    – to communicate with the user community via a mailing list
    – to inform the community on the progress and ask for comments, discuss requirements
    – to have users test the S/W before delivery
    – to preferably use a web based information system, etc.

• Major board assignments
  • Increase user community involvement in S/W tool development
  • Conceive a concept for a common thermal / environmental S/W architecture, which is modular for selective application and successive development
  • Ensure modular architecture to define individual tasks for short / long term development
  • Implement existing and to be developed S/W for use by the entire community
  • Regulate maintenance
  • Convince companies to use common tools, which fulfill user requirements, in lieu of proprietary engineering tools
  • Care to avoid duplication. There should be only one tool for a certain functionality in this non-commercial environment
• Major board assignments (cont.)
  • Represent the user community (although not all users are members of the board)
  • Have the mandate to declare a certain tool as an engineering standard for the ESA user community.
  • Users shall preferably commit themselves to apply such tools
  • Ensure that relevant ESA ITT’S are based on Board decisions

• Organization of the Board
  – The SB consists of representatives of the T&SE user community from ESA member states
  – The SB has now 14 voting members and 8 observers
  – Members are balanced between Prime-Contractors (4), SME (3), Research Institutes (3), Agencies (4)
  – Observers are Prime-Contractors (3), Agencies (4), S/W Developer (1)
  – S/W developers are non-voting members and have status of observers
  – Voting members shall not be guided by company interests, but by the overall objective to establish autonomous European capabilities to improve competitiveness and quality
  – Members have selected R. Schlitt as Chairperson and H. P. de Koning as ESA Secretary
  – Board decisions are taken by majority voting of present voting members
• Board Tasks
  – The SB analyses and decides on major strategic items, including
    • User requirements
    • Development options
    • Strategy and coordination
    • Priorities
    • Interfaces
    • Maintenance
    • Distribution and support
  – The SB extends and/or amends board rules by a 2/3 majority of the voting members

• Executive Team
  – The SB has nominated an Executive Team (ET) consisting of three SB members (Hans Peter de Koning [ESA], Eric Werling [CNES], Darius Nikanpour [CSA])
  – The ET performs the day-to-day management of running activities

• Board Mandate
  – Mandated to take all decisions concerning developments of future T&SE analysis software (based on ESA’s infrastructure budget)
  – ESA will make best effort to ensure implementation of decisions taken by the SB (the SB has formally no budget authority)
• First Study
  – The final Harmonization meeting agreed on an initial study phase to define a development road map, which addresses the following:
    • Identify and list existing solutions and products
    • Conduct a cost benefit analysis for components and/or blocks to be developed
    • Investigate the applicability of the OSS methodology
    • Estimate total cost to completion and yearly maintenance costs
    • Establish schedule and priorities
    • Establish methodology for distribution and maintenance
  – The task shall be performed as a Business Case Study
    • SOW to be established by the ET
    • Contract in DN to ASTRIUM (D, FN) and Eta_Max (D)
  – Next meeting of the SB takes place in November 03

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