

Progress with STEP-TAS Data Exchange

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Sheet 1

Background - Definitions

- STEP = STandard for the Exchange of Product model data
(casual name for ISO 10303)
- STEP-TAS = Application Protocol for the Thermal Analysis for Space

Sheet 2

STEP-TAS-High Level Libraries

- High-level API (Application Programming Interface)
 - Application High Level Specifications (ARM concepts)
 - hides STEP complexity
 - Close to thermal tools
 - Full set of reading/writing functions in ANSI-C and F77
 - Associated documentation, examples and test suite
- With Baghera-View (CNES/Simulog) to perform independent visual inspection

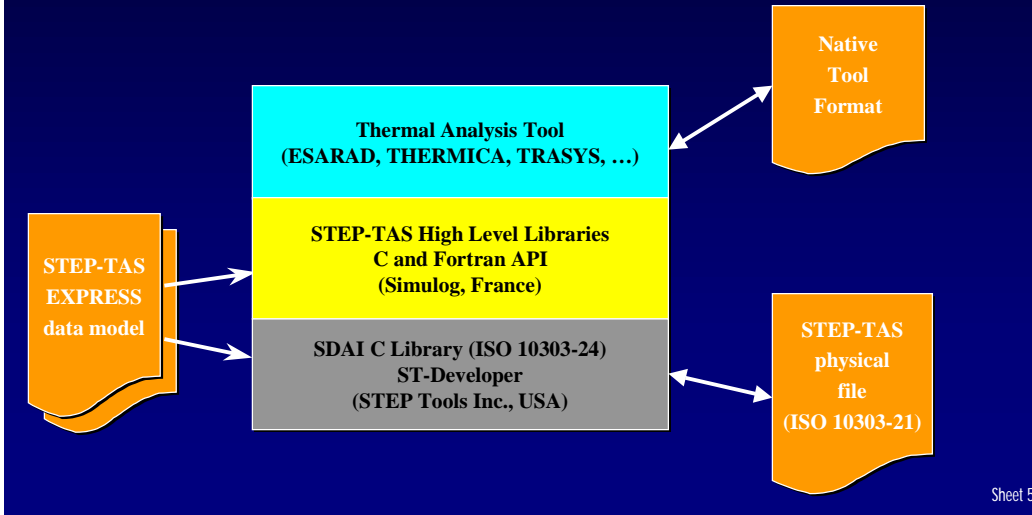
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Benefits of High Level Libraries Approach

- Available to tool developers at nominal cost (from Simulog)
 - Platforms: Windows, Sun/Solaris, HP-UX, Compaq/Tru64, SGI/Irix
- Faster interfaces development
- Enables to jumpstart converter implementation
- All converters share reading/writing approach
 - increased reliability
- Reduces converter validation / verification effort
- Extensibility at affordable cost - e.g. add HDF or XML encoding

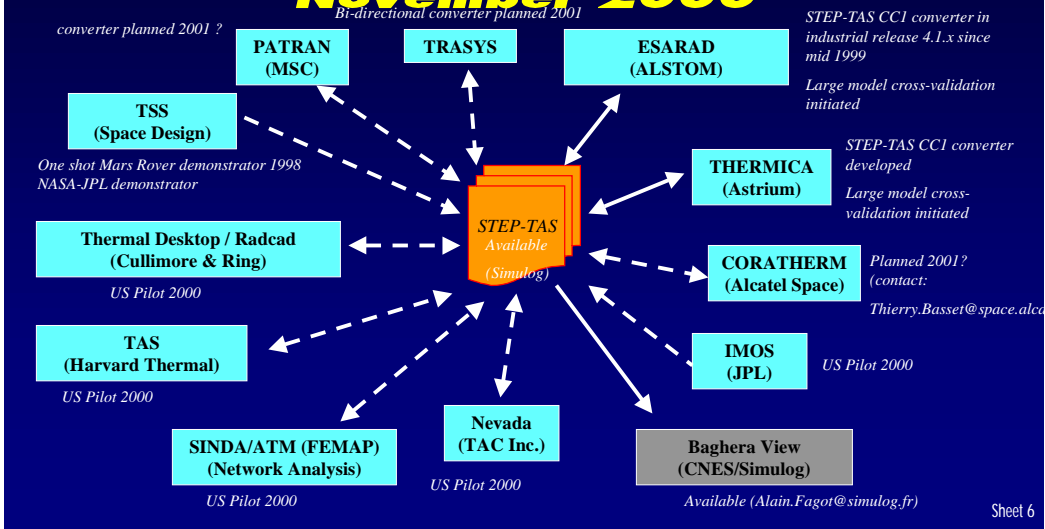
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STEP-TAS Converter Architecture



Sheet 5

The STEP-TAS roadmap - November 2000



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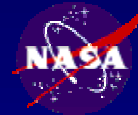
Status of STEP-TAS interfaces on European side

- ESARAD (ALSTOM, ESA)
 - bi-directional interface in industrial release since mid 1999
- THERMICA (ASTRIUM/Toulouse)
 - bi-directional interface completed
 - Industrial release expected 2000-Q4 (v3.2.18)
- Large model cross-validation ESARAD / THERMICA
 - Currently in progress
 - Thousands of thermal-radiative faces
 - Resolving performance / memory management issues

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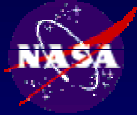
The US STEP-TAS Pilot

- Scope :
 - Implementation of a limited bi-directional STEP-TAS interface in US Thermal Tools
- Objectives
 - demonstrating feasibility,
 - raising awareness,
 - seed for full implementation.



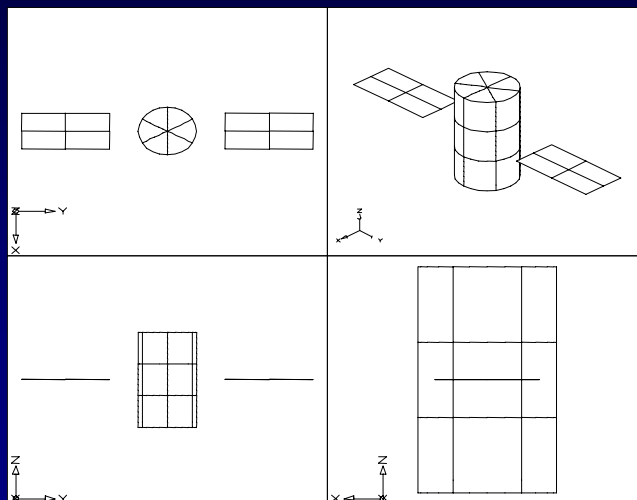
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The US STEP-TAS Pilot Participants



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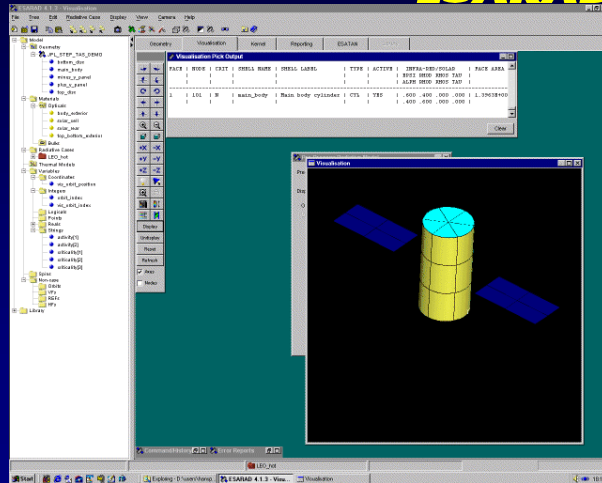
NASA-JPL STEP-TAS Demonstrator



- A feasibility and familiarisation study
- Objective: to develop a limited bi-directional STEP-TAS prototype converter

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NASA-JPL demonstrator in ESARAD



```
ISO-10303-21;
HEADER;
...
#109=TYPE_QUALIFIER('diffuse');
#110=TYPE_QUALIFIER('infra_red');
#111=ATR_PROPERTY_NAME('transmittance');
#112=ATR_PROPERTY_QUANTITATIVE(#111,
.SYMMETRICAL.);
#113=ATR_PROPERTY_USAGE(#71,#112,#114);
#114=ATR_PROPERTY_MEANING((#109,#110));
#115=SI_UNIT(*,$,.METRE.);
#116=SI_UNIT(*,$,.DEGREE_CELSIUS.);
#117=GLOBAL_UNIT_ASSIGNED_CONTEXT(' ',(#115,#116));
#118=GLOBAL_UNCERTAINTY_ASSIGNED_CONTEXT(' ',(#119,#120));
#119=UNCERTAINTY_MEASURE_WITH_UNIT(LENGTH_MEASURE(1.E-008),#115,
...

```

Details available at ftp://ftp.estec.esa.nl/pub/yc/step/JPL_STEP_TAS_DEMO/index.htm

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Status of STEP-TAS interfaces on US side (1/3)

- Bi-directional demonstrator development funded by NASA-JPL
- Limited scope by 5 vendors and JPL:
 - Thermal Desktop (Cullimore and Ring Inc.)
 - Nevada (TAC Inc.)
 - TSS (Space Design)
 - IMOS (JPL)
 - SINDA-G/ATM (Network Analysis Inc.)
 - TAS (Harvard Thermal)
 - TRASYS bi-directional converter development planned 2001
- Using STEP-TAS High Level Libraries from Simulog

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US STEP-TAS Pilot Status (2/3)

- Cullimore & Ring Technologies, Inc (Thermal Desktop)
 - completed pilot,
 - write and read capabilities developed,
 - release of beta 3.3, September 2000.
- TAC Technologies, Inc (Nevada)
 - write capability developed (Nevada to STEP-TAS)
 - only triangles, quadrilaterals and rectangles supported
- Space Design (TSS)
 - read capability developed (STEP-TAS to TSS)

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US STEP-TAS Pilot Status (3/3)

- JPL (IMOS)
 - write capability developed (IMOS to STEP-TAS)
- Network Analysis Inc. (SINDA-G/ATM)
 - uses THERMICA
 - uses Nevada
- Harvard Thermal (TAS)
 - on going

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STEP-TAS Accomplishments

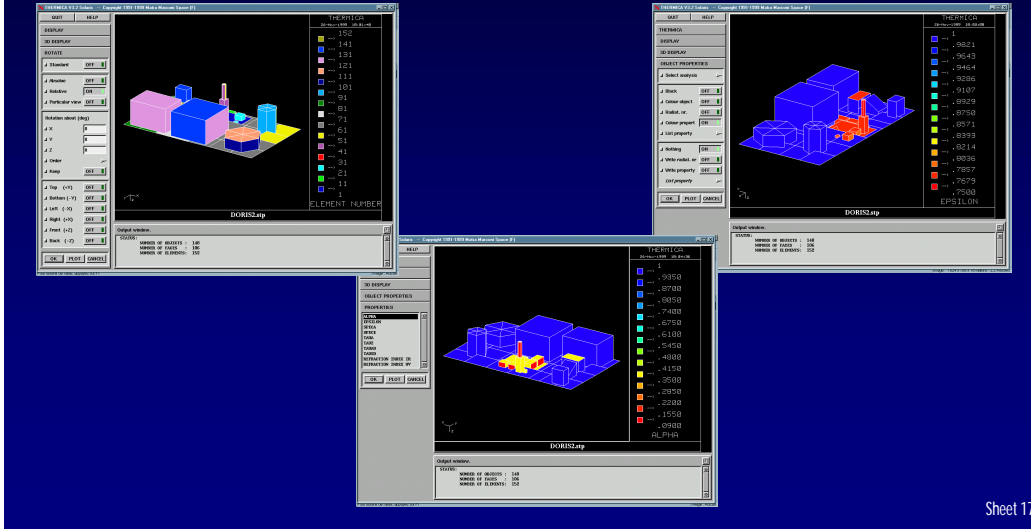
- Success of STEP-TAS pilot.
- Great promise for the future :
 - Universal thermal radiation model exchanges,
 - Significant resource saving can be realized,
 - Cross validation US tools / European tools planned.

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Examples of STEP-TAS exchanges

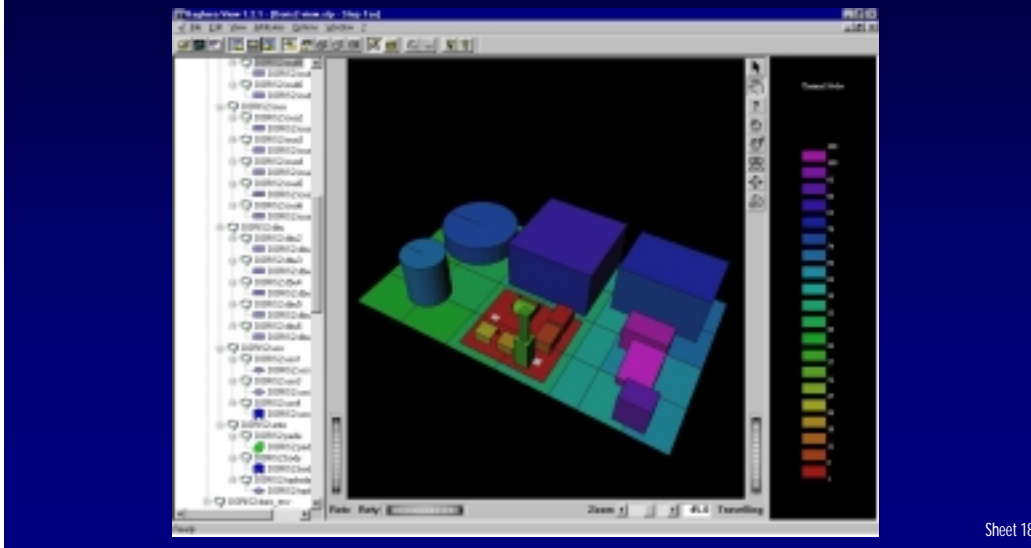
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Doris in THERMICA



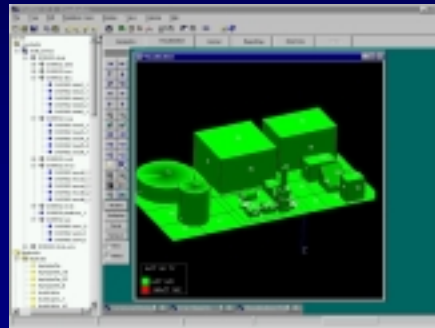
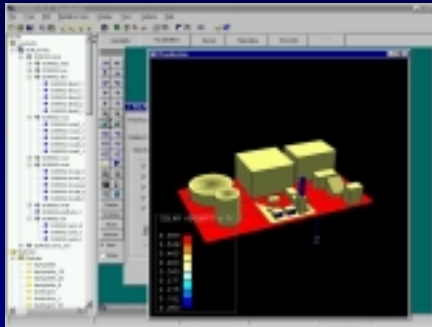
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Doris in Baghera-View



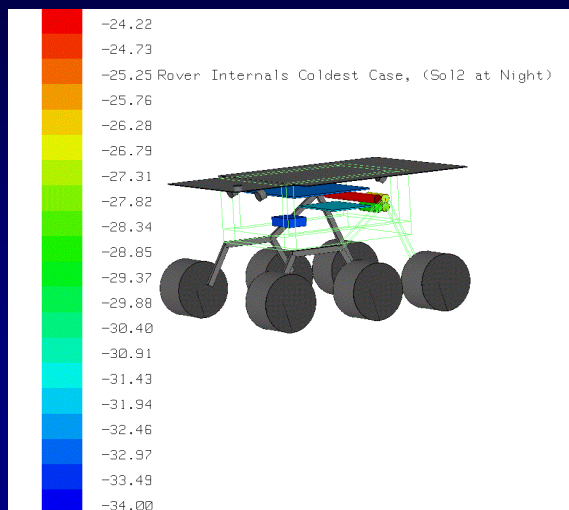
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DORIS in ESARAD



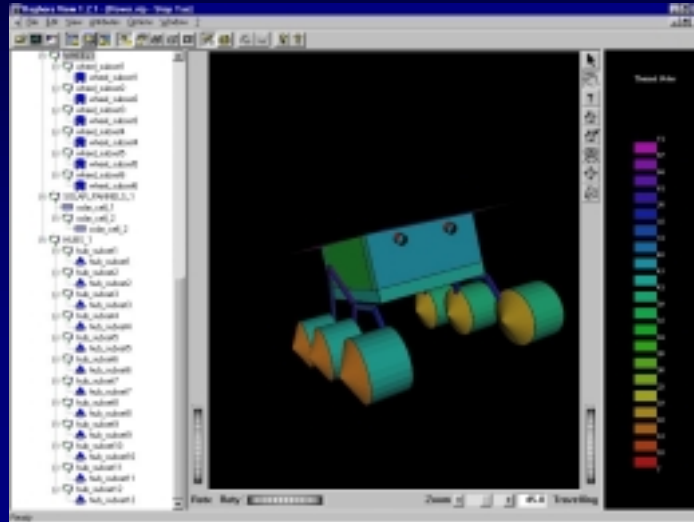
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Mars Rover in TSS



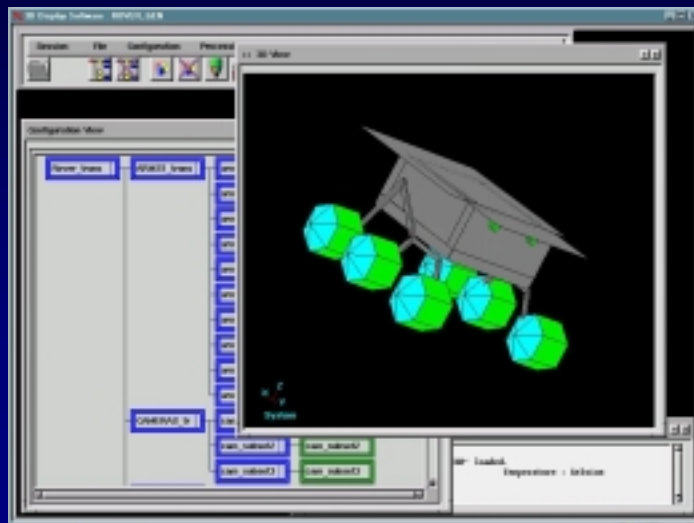
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Mars Rover in Baghera View



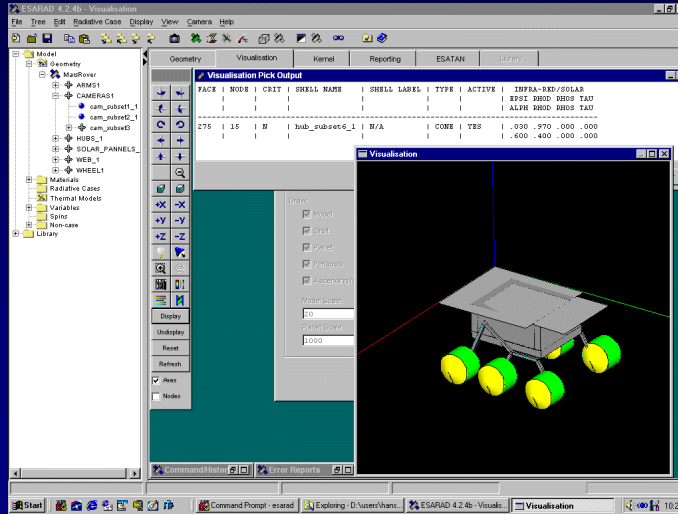
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Mars Rover in THERMICA



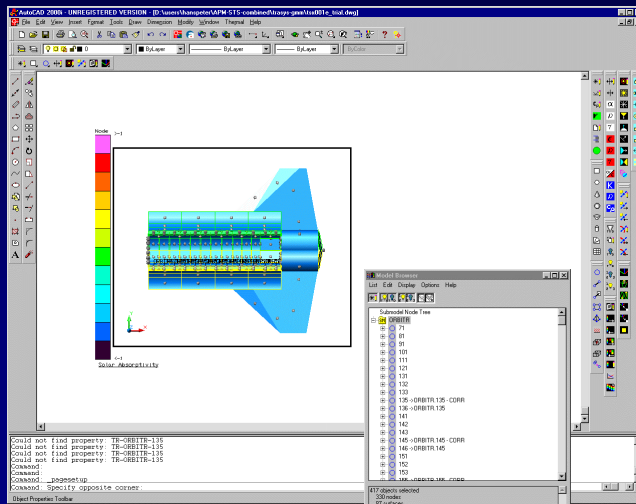
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Mars Rover in ESARAD



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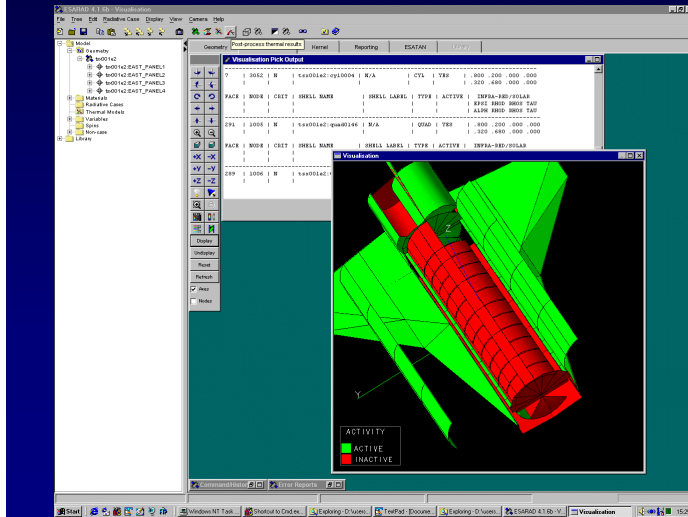
STEP-TAS transfer from Thermal Desktop 3.3Beta (1)



- ◆ NASA-JSC STS “390-node” Orbiter model in TRASYS
- ◆ Imported into Thermal Desktop
- ◆ Exported to STEP-TAS

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STEP-TAS transfer from Thermal Desktop 3.3Beta (2)



- ◆ STS “390-node” Orbiter model
- ◆ Imported into ESARAD from Thermal Desktop STEP-TAS file
- ◆ Obvious problems remain but

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On going Activities (end 2000-2001)

- For STEP-TAS, STEP-NRF protocols and associated libraries:
 - Issues on Application Protocols and libraries,
 - Test of exchanges of big models with STEP-TAS,
 - Improvement of the libraries performance.
- Development of TRASYS/STEP-TAS converter

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Conclusions / Future

- STEP-TAS High Level libraries v2.0 available since 99 on PC and Unix platforms.
- Big advances in achieving international acceptance and co-operation for exchange of thermal analysis models
- Now focus on industrial releases, large model validation and routine deployment in projects (customers e.g. ISS projects)
- Formal STEP-TAS standardisation underway
 - Short term under ECSS - Longer term considered under ISO
- STEP-TAS High Level Libraries v2.1 planned Q1 2001
 - version 2.1 available on PC and Sun Solaris (Nov 2000)

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Acknowledgements

- STEP-TAS and STEP-NRF were developed under ESA contract with CNES partnership by an industrial consortium consisting of
 - Simulog (F, prime)
 - Fokker Space (NL)
 - Association GOSET (F)
 - Epsilon Ingénierie (F)
 - Alstom Power (UK)
- Special thanks go to Georg Siebes of NASA-JPL who is and has been the driving force for the development and acceptance of STEP-TAS in the US.
- BagheraView was developed under CNES contract.

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