

Appendix U

STEP-TAS Activities

Abstract

This is a combined presentation. We will inform you about the progress that has been made in the past year on the following projects:

- IITAS (Industrial Implementation of STEP-TAS) in which Alstom Aerospace, Astrium Satellites (Toulouse) and Thales Alenia Space implement STEP-TAS import/export facilities in their respective tools ESARAD, THERMICA and CIGAL-2 under the lead of CSTB with assistance from DOREA. CSTB has also developed a light C++ software development kit for STEP-TAS and produced new releases of the graphical validation tool BagheraView.
- TASTMM in which DOREA is further developing foundations for the STEP-TAS software libraries and ESATAN / SINDA model exchange.
- TASverter in which ESA TEC-MCV is further validating and completing the STEP-TAS standard, now mainly for the exchange of space kinematic models and space mission aspects.

Also a brief outlook will be given on what to expect in the coming year.

U.1

Part 1
IITAS Industrial Implementation of STEP-TAS

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(CSTB, France)




IITAS

Industrial Implementation of STEP-TAS



22nd European Workshop on Thermal and ECLS
28-29 October 2008 at ESA/ESTEC, Noordwijk, The Netherlands
Eric Lebègue



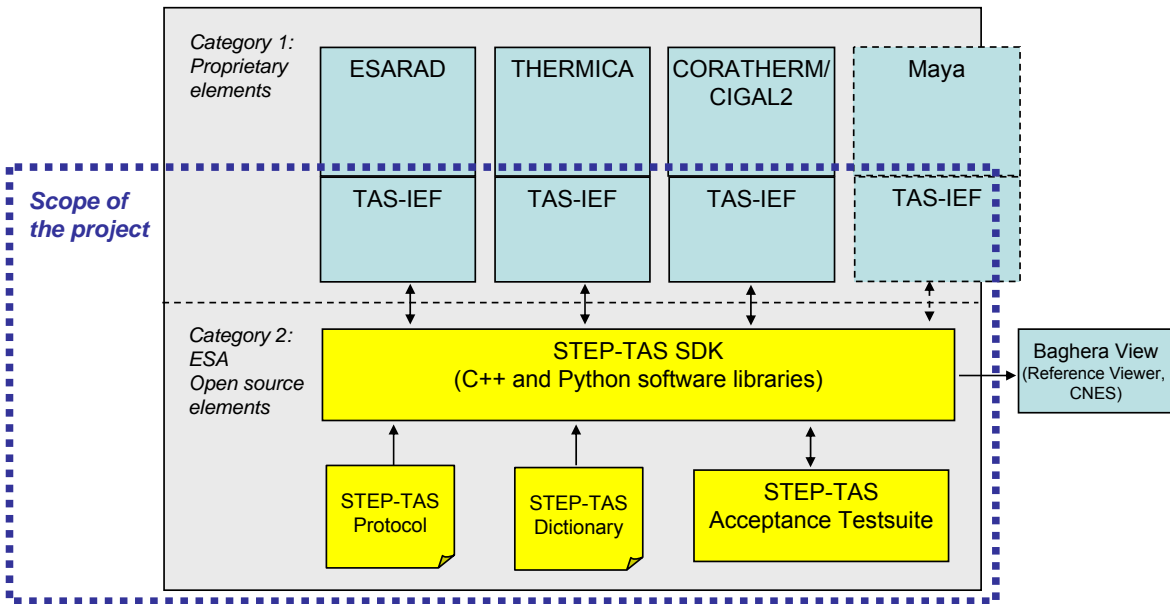




Page 1

Scope of the Project








Category 1: Proprietary elements

- ESARAD
- THERMICA
- CORATHERM/CIGAL2
- Maya

Category 2: ESA Open source elements



- STEP-TAS Protocol
- STEP-TAS Dictionary
- STEP-TAS Acceptance Testsuite
- STEP-TAS SDK (C++ and Python software libraries)
- Baghera View (Reference Viewer, CNES)

Scope of the project

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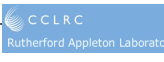

Page 2



C++ STEP-TAS SDK

- Development of C++ SDK:
 - based on :
 - expressik EXPRESS parser (University of Manchester)
 - + LightCpp C++ source code generator (CSTB) => one C++ class per STEP-TAS EXPRESS entity
 - + convenience classes, translation from PyExpress Python
 - + examples
 - Full validation process on Windows and Linux

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Page 3


Status of converters (TAS-IEFs)

- Alpha version available
 - ESARAD and THERMICA with C++ SDK
 - CIGAL2 with Python SDK
- To be started
 - Maya with C++ SDK ?


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Page 4








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Acceptance Testsuite

- > 300 ESA units tests cases
- + 3 industrial models :
 - ESARAD by CCLRC / RAL
 - THERMICA by EADS Astrium (D)
 - CIGAL2 by Thales Alenia Spaca


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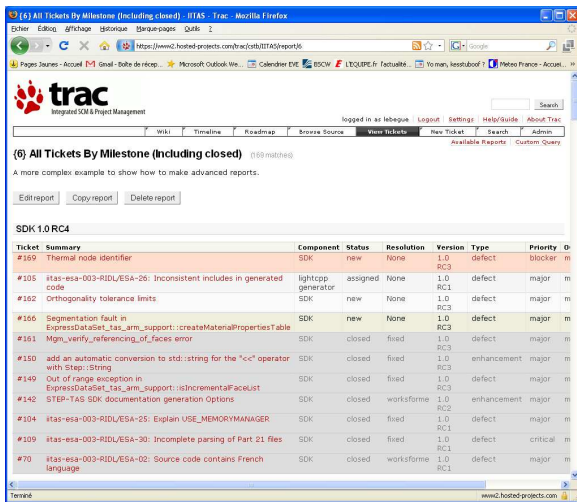
Page 5



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Hosted-projects Trac System



Ticket	Summary	Component	Status	Resolution	Version	Type	Priority
#150	Thermal node identifier	SDK	new	None	1.0	defect	major
#105	itas-esa-003-RIDU/ESA-26: Inconsistent includes in generated code	lighttpd generator	assigned	None	1.0	defect	major
#162	Orthogonality tolerance limits	SDK	new	None	1.0	defect	major
#166	Segmentation fault in ExpressDataSet::tbl_arm_support::createMaterialPropertiesTable	SDK	new	None	1.0	defect	major
#161	Mgmt_verify_referencing_of_faces error	SDK	closed	fixed	1.0	defect	major
#150	add an automatic conversion to std::string for the "<<" operator with Step::String	SDK	closed	fixed	1.0	enhancement	major
#149	Out of range exception in ExpressDataSet::tbl_arm_support::isIncrementalAccelList	SDK	closed	fixed	1.0	defect	major
#142	STEP-TAS SDK: documentation generation Options	SDK	closed	workforme	1.0	enhancement	major
#104	itas-esa-003-RIDU/ESA-25: Explain USE_MEMORYMANAGER	SDK	closed	fixed	1.0	defect	major
#109	itas-esa-003-RIDU/ESA-30: Incomplete parsing of Part 21 files	SDK	closed	fixed	1.0	defect	critical
#70	itas-esa-003-RIDU/ESA-02: Source code contains French language	SDK	closed	workforme	1.0	defect	major

- C++ SDK source code sharing
- Defects and feature requests management
 - For SDK and Baghera View
- Acceptance Testsuite
- Cross sharing of STEP-TAS generated files (from TAS converters)

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Page 6

CSTB
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esa **cnes**

Validation with Baghera View + TASVerter

Report

The file is not correct.
See the errors below:
FATAL : E#1
PyExpressWhereRuleError: Rule Mgm_disc.wr5 is violated for instance of ENTITY Mgm_disc
For Entity: TSHAPE_DISC_BASIC_01-errors#532
persistent instance of Mgm_disc
(Mgm_any_mixednd_geometric_item)
_p1 = TSHAPE_DISC_BASIC_01-errors#525
(Mgm_3d_cartesian_point)
_p2 = TSHAPE_DISC_BASIC_01-errors#526
(Mgm_3d_cartesian_point)
_p3 = TSHAPE_DISC_BASIC_01-errors#527
(Mgm_3d_cartesian_point)

Model hierarchy

General statistics of the model

Description	Value
Name	TSHAPE_DISC_B...
Time Stamp	2007-08-16T16:31...
DUNNBY AUTHOR	
Organization	ESA
Preprocessor	TASverter
version	(2007-03-19)
Originating system	THERMOCA SYBAS
Authorization	UMNKWN
Thermal faces number	6
Number of TAS_Cone	0
Number of TAS_Cylinder	0
Number of TAS_Disc	6
Number of TAS_Paraboloid	0
Number of ...	

Geometry display and filtering

Detailed attributes of the STEP-TAS objects

Element	Geometry	Material
Entity Infor...	Mgm_neshed_linear_bounded_surface	
IFC ID	#578	
Id	01492	
Name	DISC SHAPES <1>	
Description	UNSET	
Bounded Sur...		
Surface Type	Mgm_disc	
SIDE 1 Nsh...	UNSET	
SIDE 2 Nsh...	UNSET	
SIDE 1 Sur...	UNSET	
SIDE 2 Sur...	material 01 (#520)	
SIDE 1 Bulk...	UNSET	
SIDE 2 Col...	YELLOW	
Dr 1 Meshing 3		
Dr 2 Meshing 2		
Dr 1 SdM...	UNSET	
Dr 2 SdM...	UNSET	
Dr 1 Grid 5...	UNSET	
Dr 2 Grid 5...	UNSET	
Side 1 Faces		
Face nb 0	#579	
Face nb 1	#580	
Face nb 2	#581	
Face nb 3	#582	
Face nb 4	#583	
Face nb 5	#584	
Side 2 Faces		
Face nb 0	#586	
Face nb 1	#585	
Face nb 2	#587	
Face nb 3	#588	
Face nb 4	#589	
Face nb 5	#590	
Face nb 6	#591	
Face nb 7	#592	
Face nb 8	#593	
Face nb 9	#594	
Face nb 10	#595	

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ThalesAlenia Space ALSTOM EADS ASTRIUM CCLRC Rutherford Appleton Laboratory DOREA TECHNOLOGY

Page 7

U.2

Part 2

TASTMM – Foundations for the STEP-TAS software libraries

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Hans Peter DE KONING






ESA
Harrie ROOIJACKERS

TASTMM
Foundations for the STEP-TAS software libraries

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- TASTMM target
 - The global aim of TASTMM project is to **increase performance** and **reliability** of STEP-TAS python SDK
 - The STEP-TAS python SDK dealing both with **PART21** and **HDF5** formats.
- TASTMM tasks
 - Implementing Sdai Aggregates upon numpy and hdf5
 - Merging pyExpress and expressik SDK generators
 - Integrating p21/hdf5 SDK in ESATAP and TASverter
 - Implementing additional direct interfaces towards TAS/HDF5 mapping


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STEP-TAS python SDK




- A first version of STEP-TAS python SDK implementing Part21 and HDF5 format was implemented last year
- TASTMM improved performance of Sdai aggregate handling using:
 - Numpy implementation for Part21 datasets
 - Hdf5 implementation for HDF5 datasets
- SDK generation was implemented first with pyExpress generator
- Generated SDKs covers:
 - Inverse and derived attributes
 - Functions
 - Model and Entities rules

With the STEP-TAS python SDK
a STEP-TAS dataset can be fully handled and validated
both in Part 21 and HDF5







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Merging pyExpress and expressik generators



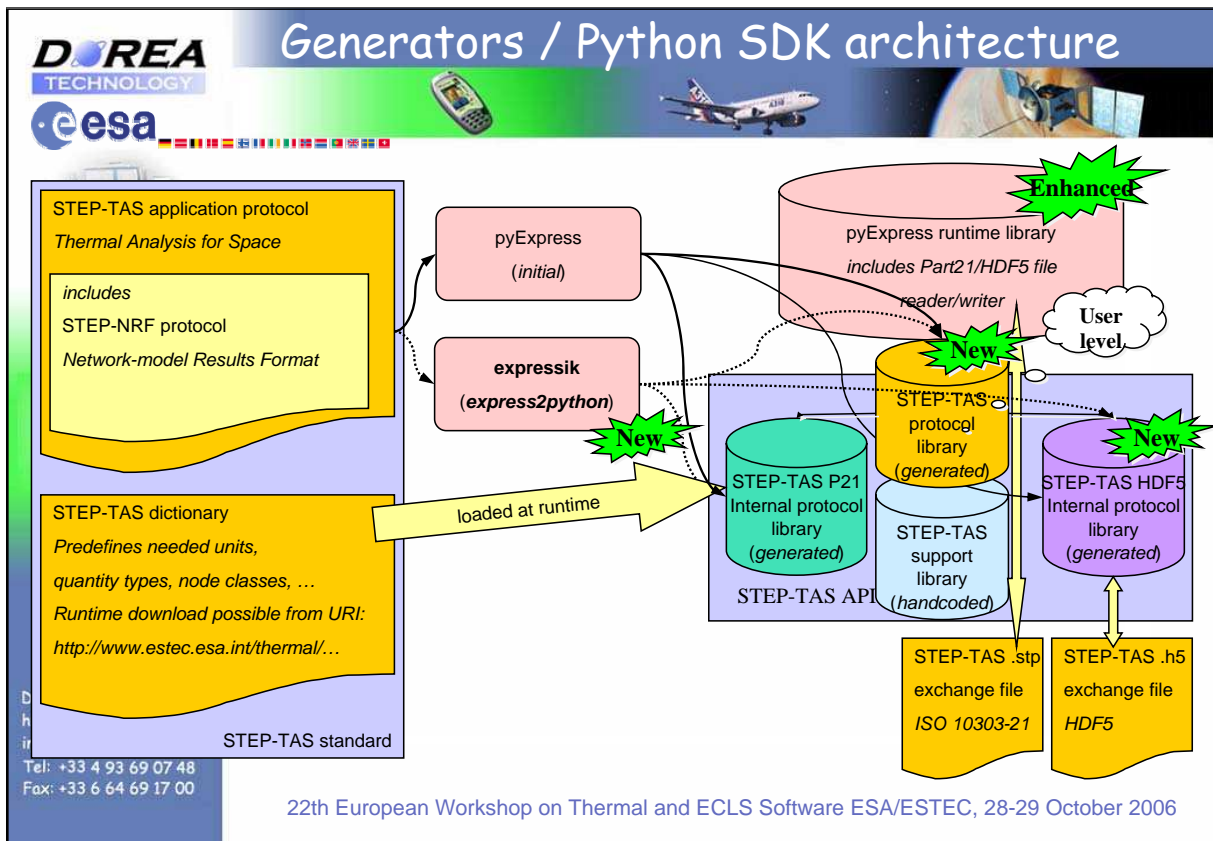
- Two SDK generators are used at ESTEC
 - pyExpress implemented by ESA, using pyExpressLib runtime library. (used for python SDK)
 - Expressik implemented by University of Manchester. (used for C++ SDK). With two variants:
 - University of Manchester: C++ generator
 - CSTB: light C++ generator (IITAS project)
- The aim of this task was to implement a Python SDK generator on top of expressik
 - Using expressik EXPRESS parser and metamodel
 - Delivering same SDK as pyExpress one (Part21 + HDF5)
 - Keeping pyExpressLib runtime library

The result is the express2python generator



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Integration of TAS SDK

- The STEP-TAS python SDK (P21 + HDF5) has been integrated and Validated in:**


 - TASverter: for validation and generation of HDF5 datasets (to be used in ESATAP)
 - ESATAP: STEP-TAS HDF5 is the native format of ESATAP.
- The STEP-TAS python SDK containing strong EXPRESS dataset validation, it appears sometimes too heavy for simple generation of HDF5 datasets from other formats.**
- As to have a high-performance processing chain usable in huge industrial cases, two direct interfaces towards HDF5 have been already implemented.**


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Direct interfaces



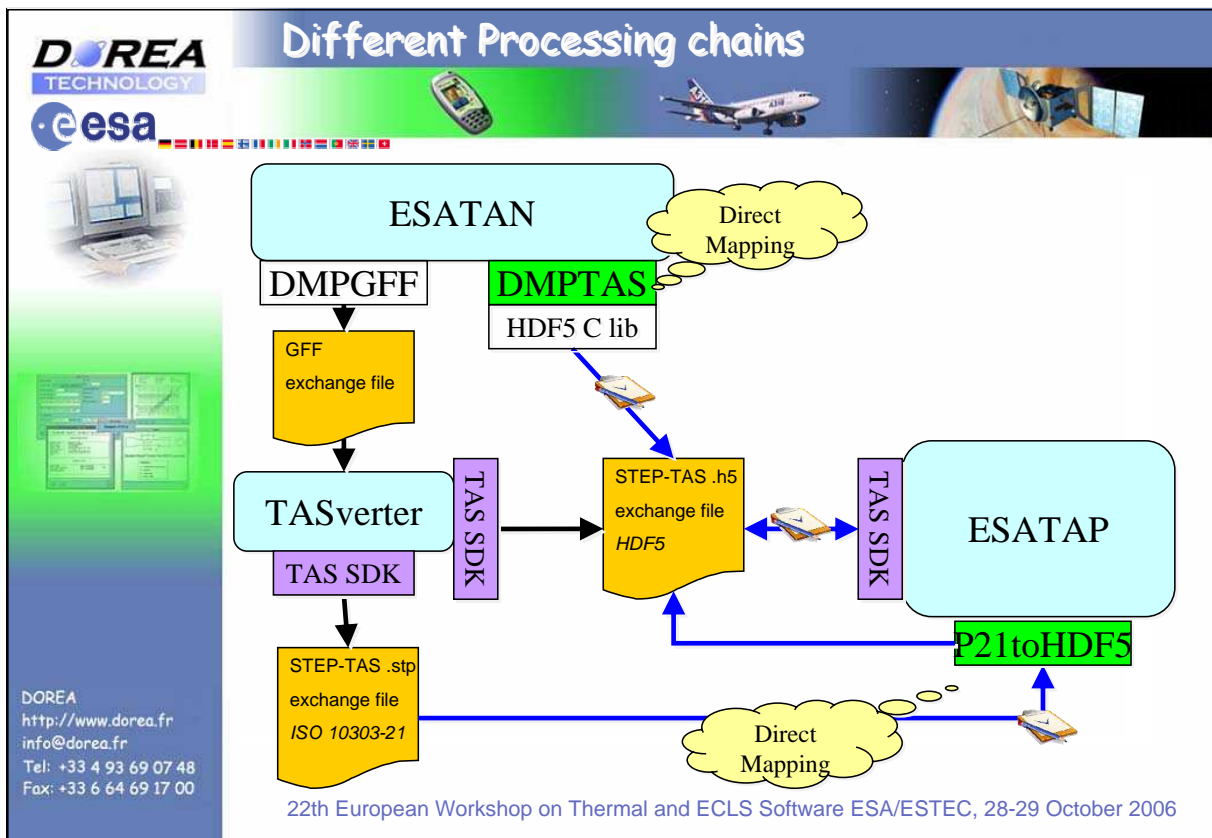







- **The Part21 to HDF5 conversion of STEP-TAS huge datasets was heavy because the Part21 dataset had to be fully loaded in memory before converting in HDF5 format.**
 - As to enhance performance in P21 to HDF5 conversion a specific part21 to HDF5 converter was implemented
 - **P21toHDF5** converts Part21 files on the flow (no loading)
 - It is integrated in ESATAP
- **Conversion of huge ESATAN models in STEP-TAS was not fast enough using TASverter**
 - As to enhance performances we implemented a specific ESATAN to HDF5 function
 - Named **DMPTAS** it is fully integrated in ESATAN




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Conclusion



We have now

- **A STEP-TAS python SDK implementing:**
 - Part21 and HDF5 repositories
 - Inverse, Derive attributes
 - Dataset Validation (Express rules)
 - Enhanced performance both on Part21 and HDF5
- **A generation of python SDK with expressik (express2python)**
 - Easier maintenance and evolution
- **A processing chain with added direct interfaces:**
 - Which allows to post-process huge models in ESTAP (Ex. Follows)
 - Huge number of nodes (5 000) and conductors(999 999)
 - Realistic number of time steps (100)
 - Huge result datacubes
 - 14 Node quantities
 - Datacube size = 7 000 000 values
 - 2 Conductor quantities
 - Datacube size = 199 999 800 values

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U.3

Part 3
Progress with STEP-TAS Activities

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Progress with STEP-TAS Activities

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Mechanical Engineering Department
Thermal and Structures Division

Activities in 2008

- IITAS – Industrial Implementation of STEP-TAS – in progress
 - ESA completes full test suite with automation tools
- IITAS-TMG – Prepared as GSTP activity with Maya (Canada) – KO expected Nov 2008
- TASverter by ESA TEC-MCV
 - Now more than 150 different users (2~5 downloads per week)
 - Routine use in many projects
 - Under maintenance – but very few bugs reported
- Evolution of Expressik to support code generators STEP EXPRESS to C++ and Python
- Evolution mapping STEP data into HDF5 format
- First validation of STEP-TAS Kinematics and Mission Aspects (CC2, CC4, CC5, CC6)
 - Implementation in TASverter for ESARAD
- Proof of concept implementation in DynaWorks® for import of STEP-TAS analysis predictions



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Sheet 2

Planned for 2009

- Completion of IITAS and IITAS-TMG
 - Emphasis on testing and obtaining robustness of imports/exports
- Full validation of STEP-TAS Kinematics and Mission Aspects
- First validation STEP-TAS for TMMs (ESATAN, SINDA, ...)
 - Model structure basically done under ESATAP
 - Includes approach to exchange user defined logic (MORTRAN, ...)
- Formalisation of STEP-NRF/TAS under ISO TC184/SC4
 - Was planned for 2008 but put on-hold due to lack of resources – shifted to 2009
- Support continuation of STEP-TAS for Thermal Desktop with C&R and NASA (hopefully)
- Consolidate support software and test suites as true open source software
 - Depending on ESA open source software policy that is currently being finalised



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Sheet 3

STEP-TAS / TASverter team at ESA

- Hans Peter de Koning
- Simon Appel
- James Etchells
- Duncan Gibson
- Harrie Rooijackers



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Sheet 4

References

- STEP-NRF and STEP-TAS
<http://www.esa.int/thermalcontrol>
Look for "Standards"
- TASverter
<https://exchange.esa.int>
Look for "TASverter"
Support requests to tasverter@thermal.esa.int
- ISO TC 184 / SC 4 standardization committee (a.o. STEP standards)
<http://www.tc184-sc4.org>
- European Cooperation for Space Standardization
<http://www.ecss.nl>



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Sheet 5

