

Appendix F

ESATAP 2.1.0 evolutions and implementation of new User's requirements

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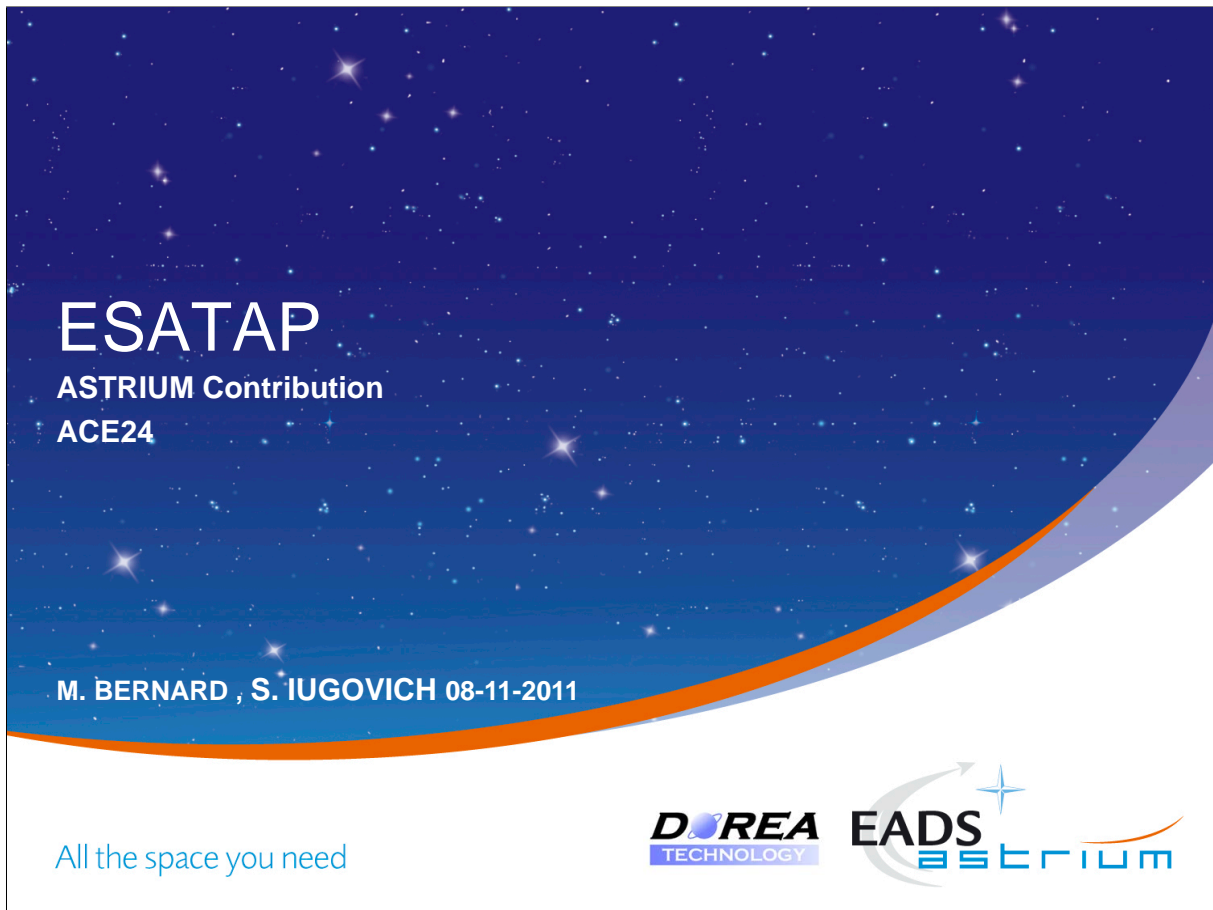
Alain Fagot
(Dorea, France)

Harrie Rooijackers
(ESA/ESTEC, The Netherlands)

Abstract

Since version 2.0.0 thermal analysts emitted interest for new functionalities to be integrated in ESATAP. Version 2.1.0 of ESATAP aims to provide an answer to these new needs. We can mention:

- providing easy handling of multiple cases post-processing,
- Integration of the notion of equipment,
- New report and plot components dealing with multiple cases and multiple specifications
- Archiving of tasks for quality aspects.

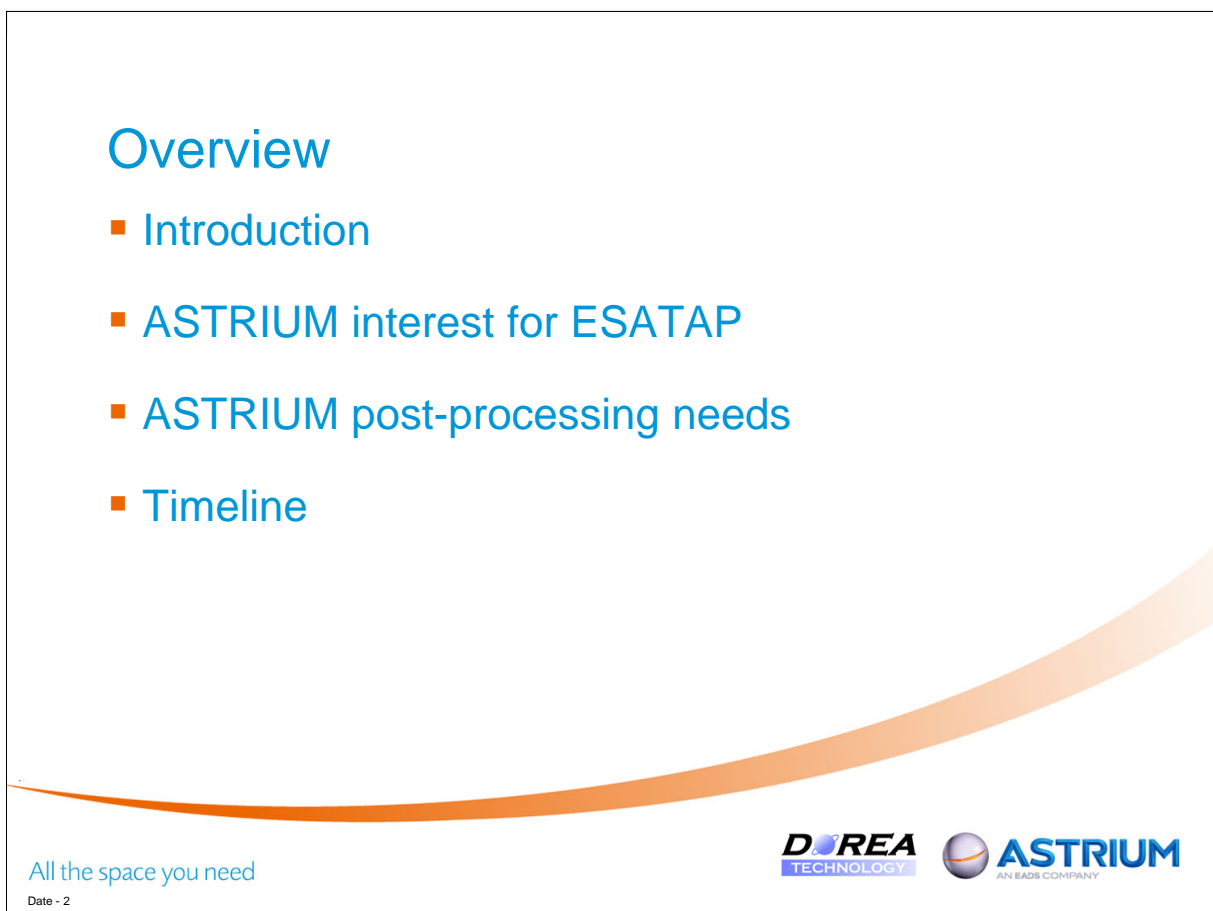


ESATAP
ASTRIUM Contribution
ACE24

M. BERNARD , S. IUGOVICH 08-11-2011

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Overview

- Introduction
- ASTRIUM interest for ESATAP
- ASTRIUM post-processing needs
- Timeline

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Introduction

- Thermal models get more and more complex:
 - => post-process more complex too
 - => synthesis need

- ASTRIMUM has seen in ESATAP ways of improving analysis:
 - Efficiency
 - Reliability
 - "Quality"

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ASTRIUM interest for ESATAP

- Improving efficiency:
 - High computation performances
 - "Infinite" computation possibilities
 - "All-in-one" post-processing tool

- Improving reliability:
 - Automatic post-process avoiding "manual" intervention.
 - Input / output consistency.

- Improving "Quality":
 - Post-process procedure configurable
 - Post-process re-doable at will

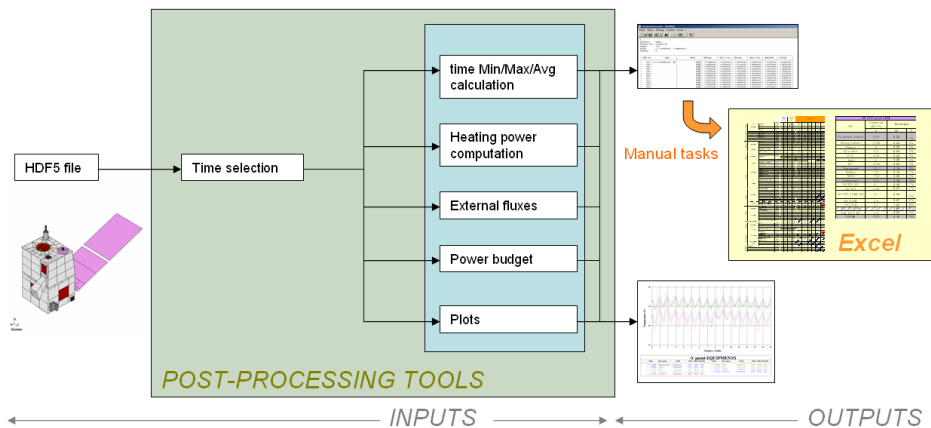
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ASTRIUM post-processing needs

- Existing in-house standardized post-process procedure involving many tools and also manual sub-tasks:



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ASTRIUM post-processing needs

- Temperature results presented at component level:
 - Which node(s) to consider for component temperature?
 - Which uncertainty should be applied?
 - Which temperature specification should be considered (operating or non-operating)?
- Component notion to be implement in ESATAP => DOREA development.

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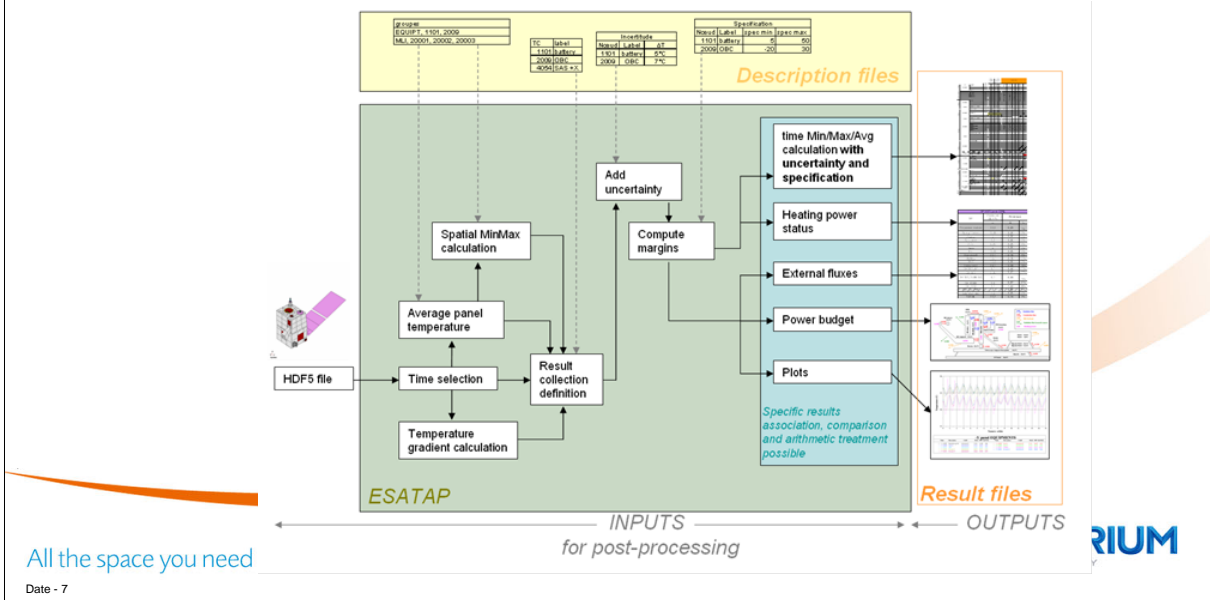
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ASTRIUM post-processing needs

- Process using ESATAP (without any manual modification of results):



Timeline

- ASTRIUM specification for ESATAP development:**
 - Specification & associated developments to be shared with the thermal analysts community
 - Specification delivered to ESA & DOREA: November 2009
 - DOREA first answer to specification including Matrix of Compliance: February 2010
 - ASTRIUM/DOREA spec discussion/evolution/clarification: Spring 2010
- Post-process use case for development & validation:**
 - Delivered by ASTRIUM to DOREA: February 2011
- ESATAP developments wrt ASTRIUM specification:**
 - Beginning: February 2010
 - End of major components developments (equip...): Summer 2011
 - Internal evaluation: still to be done

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THERMISOL to STEP-NRF Converter

- THERMISOL does not directly generate STEP-NRF output files.
- A file converter has been developed and validated to generate STEP-NRF file (compatible with ESATAP) from the THERMISOL H5 file.
- Validated in June 2011






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ESA/ESTEC, 08-09 November 2011

**ESATAP 2.1.0 Evolutions
Implementation of
new User's requirements**

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Topics

■ Introduction


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Introduction



- Since version 2.0.0
 - ESATAP Demonstrations and Trainings were made to Thermal Users
 - Thermal Users made first evaluations of ESATAP
 - Requests for new capabilities to perform specific post processing were asked.
- New User needs:
 - Deal with multiple input datasets for comparison ("HOT", "COLD" cases for example)
 - Definition of Tasks to implement "in house" post processing
 - Using ESATAP to perform global check analysis of Datasets
- The version 2.1.0 intends to answer these new user's requests.


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Topics



- Introduction
- Groups and Equipments


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Groups and Equipments



- Automatic creation of groups from model/sub model (for example used in heat flows)
- Equipments now handled by ESATAP
 - Equipment is a group of nodes
 - Equipment has an "On" or "OFF" status (dissipation ">0" or "=0")
 - Dissipation driven by a single pilot node named "QI_node"
 - Equipment status can be forced to ON or OFF
 - Equipments are fully stored in STEP-TAS format
- ESATAP Components added:
 - Calculation of Equipment status
 - Returns result with computed and forced status
 - Create groups and equipments from CSV (Excel) description file


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Create groups and equipments from CSV description file



- The AddGroupFromFile component
 - Two inputs: The input dataset and The group/equipment description file (CSV/Excel)
 - Accepts ESATAP node facilities description (1-3, asName, ..)
 - Specific control for Overriding (or not) existing group
- Example of group description file:

Group_type	Group_ID	Group_name	Type	ID	Equipment_status
Group	LINEAR_BAR/2010	Group1	Node	LINEAR_BAR/1-3	
			Node	LINEAR_BAR/5	
Group	LINEAR_BAR/2011	Group2	Node	asName(LINEAR_BAR/node 10)	
			Node	LINEAR_BAR/5	
Group	LINEAR_BAR/2010		Node	LINEAR_BAR/10	
Equipment	LINEAR_BAR/3010	Equip1	Node	LINEAR_BAR/1-3	UNSET
			Node	LINEAR_BAR/5	
Equipment	LINEAR_BAR/3011	Equip2	Node	LINEAR_BAR/2-3	ON
			Node	LINEAR_BAR/5	
Equipment	LINEAR_BAR/3012	Equip3	Node	LINEAR_BAR/1-3	OFF
			Node	LINEAR_BAR/5	
Equipment	LINEAR_BAR/3013	Equip4	Node	LINEAR_BAR/1-3	
			Node	LINEAR_BAR/5	


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Topics



- Introduction
- Groups and Equipments
- New plot task


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Plot multiple cases with specifications






- Inputs:
 - 1 or more CASES, outputs of Thermisol or ESATAN (ex. "Hot" and "Cold" cases).
 - 1 or more specifications defined in CSV files (Ex.Design, Acceptance, Qualification, Non operational)
 - > Specification example

Time [s]	Type	ID	T_lower_bound [K]	T_upper_bound [K]
ALL	asList	ThermisolMainModel/2003	218.15	348.15
ALL	asList	ThermisolMainModel/3001	278.15	308.15
ALL	asList	ThermisolMainModel/3002	278.15	308.15
ALL	asList	ThermisolMainModel/3003	248.15	328.15
ALL	asList	ThermisolMainModel/3004	258.15	303.15

- Output:
 - A bar chart plot of min/max Temperatures for each required node.
 - For all cases
 - With Display of required specifications.




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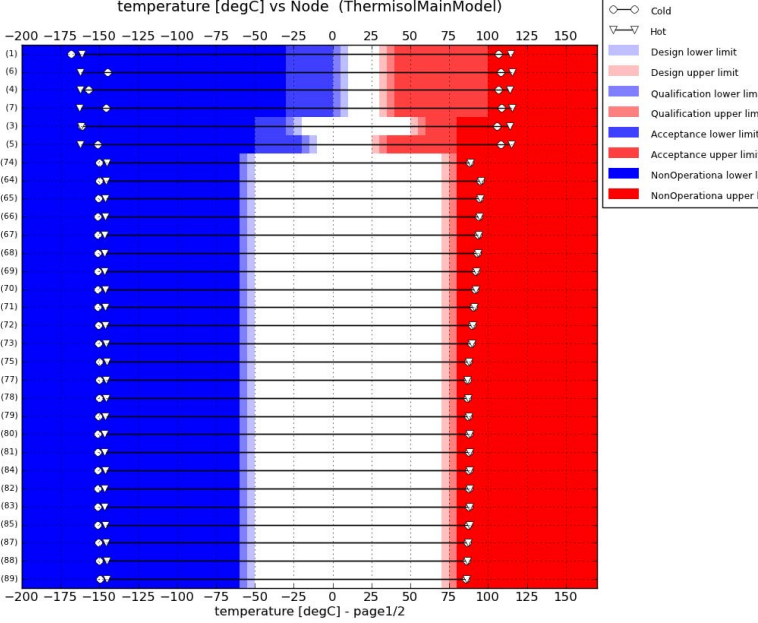
Plot multiple cases with specifications

Plot output

temperature [degC] vs Node (ThermisoMainModel)

- PSR +Y CM (1)
- PSR +Y PM (6)
- PSR -Y CM (4)
- PSR -Y PM (7)
- ADES (3)
- SCU A, B (5)
- X battery MODULES + (74)
- X battery MLI exter (64)
- X battery MLI modul (65)
- X battery MLI exter (66)
- X battery +Y RADIA (67)
- X battery +Y RAD M (68)
- X battery +Y RADIAT (69)
- X battery Pipe Vapor (70)
- X battery Pipe Vapor (71)
- X battery Baseplate (72)
- X battery Baseplate (73)
- X battery MODULES - (75)
- X battery -Y RADIAT (77)
- X battery -Y RAD M (78)
- X battery -Y RADIAT (79)
- X battery MLI inter (80)
- X battery MLI inter (81)
- +X battery MODULES + (84)
- +X battery Baseplate (82)
- +X battery Baseplate (83)
- +X battery MODULES - (85)
- +X battery -Y RADIA (87)
- +X battery -Y RAD M (88)
- +X battery -Y RADIAT (89)






Legend:

- Cold
- ▽ Hot
- Light Blue: Design lower limit
- Light Red: Design upper limit
- Dark Blue: Qualification lower limit
- Dark Red: Qualification upper limit
- Light Blue: Acceptance lower limit
- Light Red: Acceptance upper limit
- White: NonOperational lower limit
- White: NonOperational upper limit

temperature [degC] - page1/2




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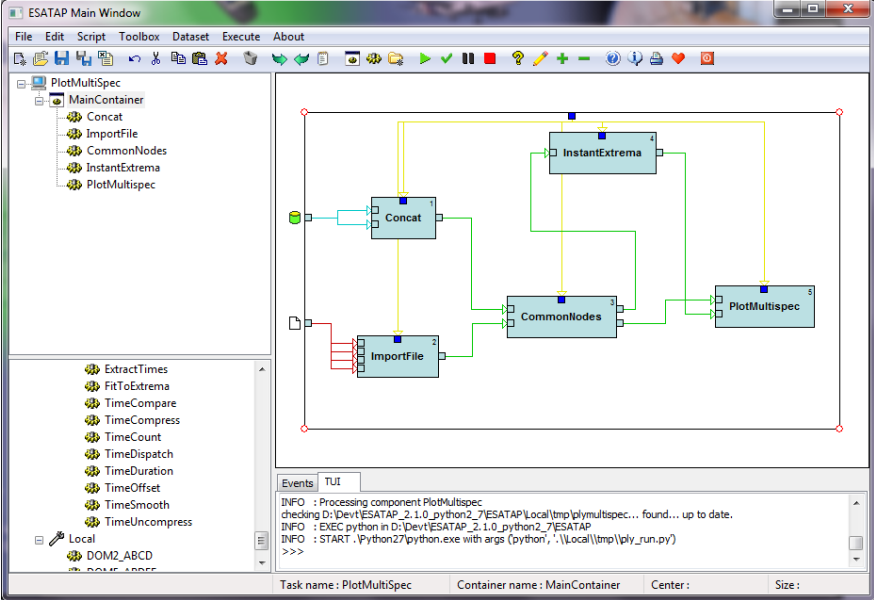
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Plot multiple cases with specifications

The Task:



```

INFO : Processing component PlotMultiSpec
checking D:\Dev\ESATAP_2.1.0_python2_7\ESATAP_local\temp\plymultispec... found... up to date.
INFO : EXEC python in D:\Dev\ESATAP_2.1.0_python2_7\ESATAP
INFO : START :Python27\python.exe with args (python', ':\local\temp\ply_run.py)
>>>
                    
```

Task name : PlotMultiSpec Container name : MainContainer Center : Size :

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Topics





- Introduction
- Groups and Equipments
- New plot task
- New reports




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New reports

- The new report generation is driven by an "Output Description File (CSV/Excel)" defining:
 - Sections (Thermal Zones)
 - Observable items (no need to define Obs. Item in ESATAP controls)
 - Displayed Quantities (no need to define quantities in ESATAP controls)
- The only mandatory inputs are:
 - Datasets and results in dataset
 - The Output Description File
 - The name of the output report




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New reports

- The output description file (CSV/Excel):

Thermal zone label	Type	Id	Quantity
S/L Temperatures			
	Node	ThermisolMainModel/1	T
	Node	ThermisolMainModel/3	T
...
	Node	ThermisolMainModel/116	
	Node	ThermisolMainModel/125	
	asGroup	ThermisolMainModel/2001	
	asGroup	ThermisolMainModel/2002	
External Fluxes			
	asGroup	ThermisolMainModel/2001	Q_S_a
	asGroup	ThermisolMainModel/2002	Q_A_a
Equipments			
	asGroup	ThermisolMainModel/3001	P_I
	asGroup	ThermisolMainModel/3002	P_I
	asGroup	ThermisolMainModel/3003	P_I
	asGroup	ThermisolMainModel/3004	P_I
	asGroup	ThermisolMainModel/3005	P_I
	asGroup	ThermisolMainModel/3006	P_I




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New reports

- Example of report: Summary Report (CSV/Excel)

Type	Id	Name	Quantity	Unit	Min	Max	Avg
S/L Temperatures							
Node	ThermisolMainModel/112	[-X-Y MMH2 TANK MLI]	T	[degC]	-143,965	101,236	-2,637
Node	ThermisolMainModel/110	[-X-Y TANK MLI NTO3]	T	[degC]	-150,331	100,484	-2,722
Node	ThermisolMainModel/116	[-X+Y TANK MLI NTO1]	T	[degC]	-144,189	99,462	-2,528
Node	ThermisolMainModel/82	[+X battery Baseplate	T	[degC]	-146,691	88,16	-0,456
Node	ThermisolMainModel/114	[-X+Y TANK MLI MMH4]	T	[degC]	-144,357	100,526	-2,587
Node	ThermisolMainModel/106	[He TANK]	T	[degC]	-152,092	98,707	-2,9
Node	ThermisolMainModel/3	ADE5	T	[degC]	-161,911	114,108	2,748
Node	ThermisolMainModel/1	PSR +Y CM	T	[degC]	-161,283	114,662	2,491
Node	ThermisolMainModel/72	[-X battery Baseplate	T	[degC]	-146,113	90,282	0,678
Node	ThermisolMainModel/4	PSR -Y CM	T	[degC]	-162,197	113,842	2,801
Node	ThermisolMainModel/5	SCU A,B	T	[degC]	-162,452	114,893	2,823
Group	ThermisolMainModel/2002	Wall -Y	T	[degC]	-158,581	108,076	-0,698
Group	ThermisolMainModel/2001	Wall +Y	T	[degC]	-151,728	117,501	-1,018
Node	ThermisolMainModel/125	[LAE TITANIUM NOZZLE]	T	[degC]	-143,803	112,757	-1,472
External Fluxes							
Group	ThermisolMainModel/2002	Wall -Y	Q_A_a	[W]	0	8631,12	176,641
Group	ThermisolMainModel/2001	Wall +Y	Q_S_a	[W]	0	8633,543	178,357
Equipments							
Equipment	ThermisolMainModel/3001	PSR +Y	P_I	[W]	0	8592,393	208,267
Equipment	ThermisolMainModel/3002	PSR -Y	P_I	[W]	0	8509,625	208,6
Equipment	ThermisolMainModel/3003	ADE5	P_I	[W]	0	8293,532	210,393
Equipment	ThermisolMainModel/3004	SCU A1B	P_I	[W]	0	8641,144	213,443
Equipment	ThermisolMainModel/3005	Battery -Y	P_I	[W]	0	8560,061	177,109
Equipment	ThermisolMainModel/3006	Battery +Y	P_I	[W]	0	8430,191	181,543

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Topics







- Introduction
- The superdatacube
- Groups and Equipments
- New plot task
- New reports
- Tasks archiving




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Archiving/Replay of tasks





- The main goal is to increase Thermal Analysis quality process.
 - Capability to store a Task with:
 - All user settings
 - All necessary inputs: STEP-TAS datasets, external files (.csv, .xml, .html, ...).
 - The task is dated and archived
 - The task can be retrieved and executed with its exact creation environment.

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Topics

- Introduction
- The superdatacube
- Groups and Equipments
- New plot task
- New reports
- Tasks archiving
- General Evolutions




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General Evolutions

- Migration to Python 2.7.2 and last generation of OSS
 - Enhances performances, functionalities and maintainability
 - Last OSS 64 bits compatible
- Easier installation
 - Simple script performs download and installation
- ESATAP and DMPTAS are available on:
 - Windows 32 and 64 bits (real 64 bits version)
 - RedHat 5.4 64 bits
 - OpenSuze 11 64 bits

ESATAP 2.1.0 will be available for download
January 2012

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