STEP-TAS Activities

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Open CASCADE

- **A member of Principia R & D**
  - **A group involved in Scientific Engineering, basically specialized in Numerical Simulation ..**
  - **.. Integrating Open CASCADE to address Software Engineering and CAD-CAE link**
  - **We support the Open Cascade and SALOME Technology Platforms**
  - **We provide Customer Solutions based on it**
- **Development Platforms for 3D software**
  - **For industrial, scientific, trade specific applications**
  - **Open Source approach : LGPL-compatible license**
  - **Runs on Linux, Windows, Unix**

Open CASCADE and STEP

- Adhesion to STEP, a standard for exchanges

  a key factor for collaborative work in heterogeneous environment
- Commitment and skills in STEP exchanges
- Open Source Platform for 3D Integration
  - Allows STEP exchanges of CAD data, healing, upgrading, etc..
  - Extensible in a modular and flexible way
- Dedicated tools for STEP
  - General Purpose (like STEP Viewer) ..
  - Or customized to specific user needs
- Integration in proprietary applications

  to reach the customer's need for collaborative work

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Benefits of Open CASCADE : the Open Source approach

- Open Source : a way to address a common concern
  - Open CASCADE; SALOME; ...
- Open Source : WHY
  - A basis for sharing efforts on mutual concerns
  - Easy Dissemination of the results
  - Open Control on Development Strategy and Evolution
- Open Source : HOW
  - Common project (consortium ..) or company initiative
  - Results as sources, libraries, ready-to-use executable ..
  - Involvement of partners all along the project
  - Open Source and Service Approach (no run-time fee)

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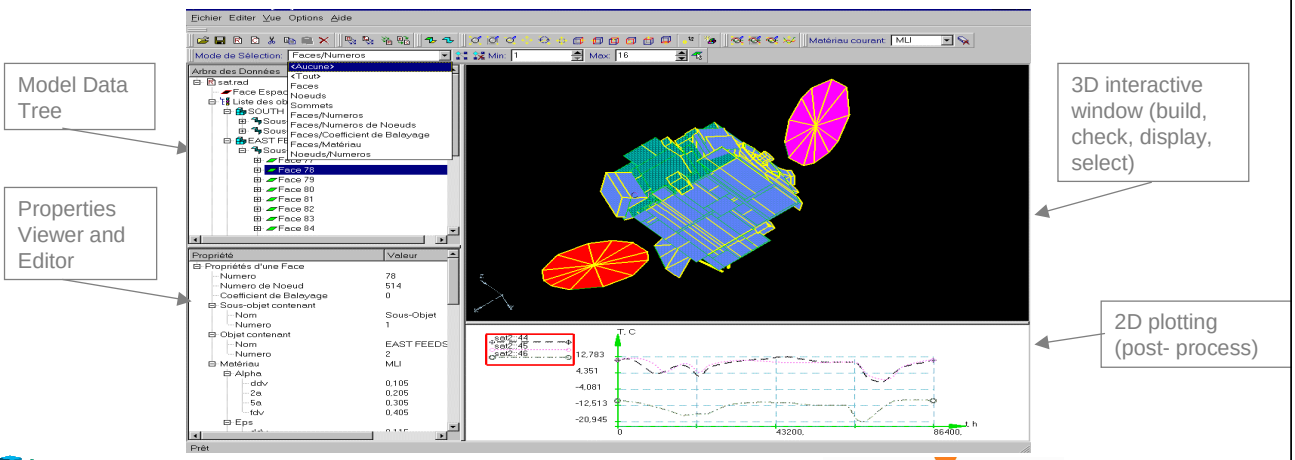
Alcatel Space's Tools and Strategy : the calculus chain

- Alcatel Space uses an in-house tool : CORATHERM (complete calculus chain)
- With its Modeller and Post-Processor : CIGAL2, developed by Open Cascade for Alcatel Space



Alcatel Space's Tools and Strategy : exchanges with other tools

- Alcatel Space needs to exchange data (especially for the scientific programs) between CORATHERM and other tools of the market place (ESARAD, THERMICA)
- Open Cascade develops interfaces for Alcatel Space CIGAL2-CORATHERM <==> STEP-TAS
  - In accordance with the harmonisation of T&SE analysis software and interfaces leaded by ESA

STEP-TAS exchanges with Alcatel's CIGAL2 / CORATHERM

- **Development in 3 steps**
  - **First step (achieved) : basic exchanges on geometrical radiative models**
  - **Second step (in progress) : exchanges of CIGAL2 primitives**
  - **Next step (to come in the frame of ARTES-8) : exchanges of surfacic geometrical conductive models**
- **Based on ESA's TASverter technology (Python)**
- **To read and write STEP Part21 files**
  - **as a neutral, transportable support for data exchanges**

Main Features of radiative models of CIGAL2 / CORATHERM

- **Material description**
  - **Library of materials, each is defined by a set of properties, each property is acknowledged for a set of life cycle stages**
  - **Computation modes : Total (for a specular and diffuse radiation)**
    Hypothesis : refraction ratio = 1

Input Quantities of **Coratherm**	**Thermica**	**Esarad**
Alpha-*	Alpha-Vis-Total	Alpha-Vis-Total
Eps-*	Eps-IR-Total	Eps-IR-Total
Tau-Vis-*	Tau-Vis-Diff	Tau-Vis-Total
Tau-IR-*	Tau-IR-Diff	Tau-IR-Total
Rho-Vis-Spec	Specularity ratio in IR	Rho-Vis-Diffus
Rho-IR-Spec	Specularity ratio in Vis.	Rho-IR-Diffus
Tau-Vis-Spec	Tau-Vis-Spec	Rho-Vis-Total
Tau-IR-Spec	Tau-IR-Spec	Rho-IR-Total

  - **or Diffuse (for a diffuse radiation) :** Alpha-Vis-Diffus, Eps-IR-Diffus, Tau-Vis-Diff, Tau-IR-Diff (same definition in Cigal2-CORATHERM, ESARAD, THERMICA)
  - **Space Environment : described as a Material**

Main Features of radiative models of CIGAL2 / CORATHERM

- **Geometry and structure**
  - **3-level structure : objects, sub-objects, Facets**
  - **Sub-objects can be :**
    - **Free Form Sets of Facets (triangles or quadrangles)**
    - **Simple Primitives (as DISK, Open CYLINDER ..)**
    - **Complex Primitives (as BOX, Full CYLINDER, ..)**
  - **All sub-objects, including the primitives, have Facets**
  - **Physical attributes, Node, Material are assigned to Facets**

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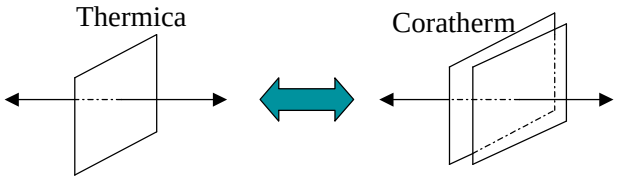
Main Features of radiative models of CIGAL2 / CORATHERM

- **Particular treatments**
  - **Double face**



  - **Inactive face which absorbs all the radiation**
    - **In Coratherm, declaration of geometrical face called “mask face” is made with an negative numerical coefficient**
  - **Possibility to change node indices with a connection file**
  - **Possibility to change labels of materials with a connection file**

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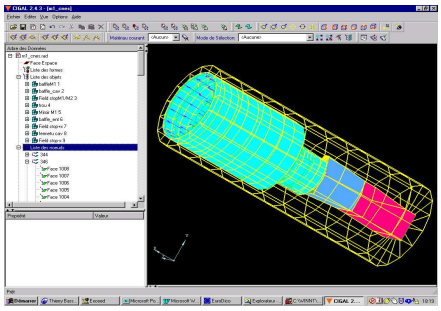
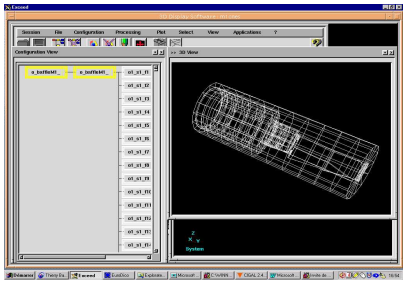
Application : exchanging radiative models by using STEP-TAS

- Interfaces used on the the Corot, GSTB, Koreasat ... programs in export and export modes
- Using of Tasverter tool available on the ESA website
- Example : M1 Mirror Corot



Interfaces

ESA
Tasverter
tool



THERMICA :
SYSBAS, .SYSMAT

```
TASverter completed succesfully.
Elapsed time is     81.2 seconds
```

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CIGAL2 / STEP-TAS : First step basic exchanges of radiative models

- Now achieved (from April 2004)
  integration of TASverter (using Python) in CIGAL2 application with support from ESA for this first use
- Exchange is based on Facets only
  Facets : Triangles, Quadrangles
  - on export : sets of facets (description of primitive ignored)
  - on import : facets are computed from STEP-TAS primitive
- Full support of CIGAL2 Material description
  - including stages of life cycle (transmitted in STEP-TAS)
  - computation modes : Total or Diffuse
  - additional data : provided by preference file
    (example : space temperature for export)

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CIGAL2 / STEP-TAS : Second step exchanges of CIGAL2 primitives

- In progress (to be delivered)
- Export
  - checks relevant primitives : same material for all facets
  - a simple primitive : directly exported to STEP-TAS as it is
  - a complex primitive : to a compound of STEP-TAS which lists its sub-parts (components), each one as a STEP-TAS primitive
- Import
  - recognizes a combination of primitives in a compound as describing a complex primitive of CIGAL2
  - by checking adequacy of : geometries, orientations, meshings
  - other primitives : directly mapped to simple primitives of CIGAL2

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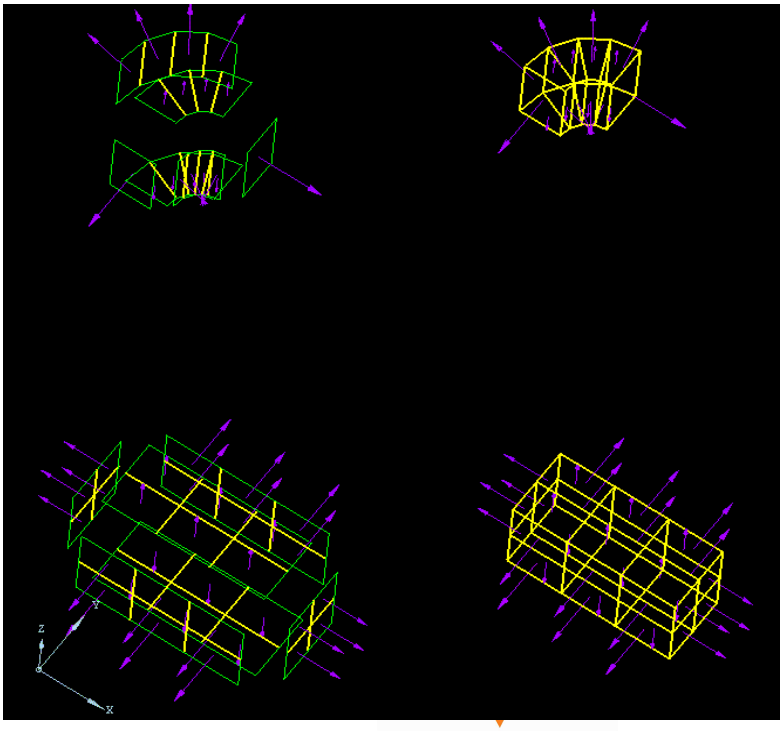
An example of complex primitive

Up-right : cylinder
(angle 90 deg, inner hole, full)
Up-left : its break-down

Down-left : box
Down-right : its break-down



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Next step (in the frame of ARTES-8) : surfacic conductive models

- Thermal analysis software pre-development philosophy
  - To insure compatibility and input data exchange solutions for already existing conductive modules (GENASSIST for EADS Astrium and “PLATEAU-EQUIVALE” for ALCATEL SPACE)
- Definition of standard data exchange
  - Panel, Units on structure, External and embedded heatpipes, Heat sink, Hole, Interface nodes, 2nd level elements of the model
- Development of standard data exchange format interfaces for conductive modules that will automate panel data exchange
- STEP-TAS format based on the TASverter tool

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In conclusion

- Open CASCADE and Alcatel Space are now jointly committed in working with STEP-TAS and TASverter
- STEP-TAS : a common way to exchange thermal data
- STEP-TAS Part21 file format
  - provides a neutral, transportable, easy to check, data support
  - allows embedded interfaces in each software
- Interest in having embedded interfaces in thermal softwares (as now done in CIGAL2)
- A concern : impact of coming evolutions of STEP-TAS and TASverter
  - to be integrated in the actually used interfaces
  - to assume compatibility (or notify needs for adaptation)

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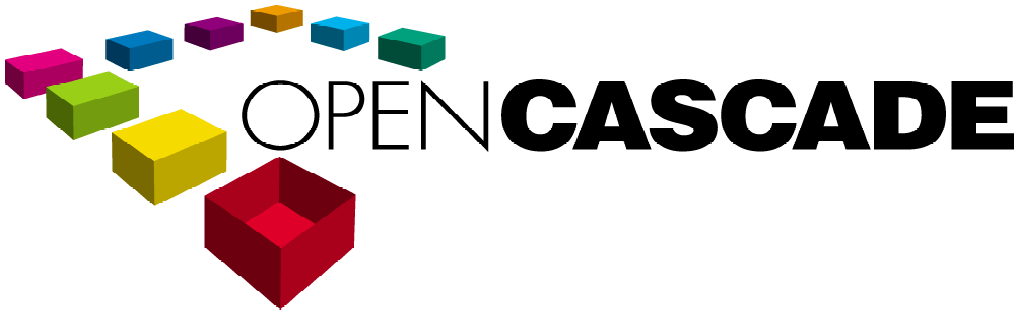
Thank you for your attention!



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