CIGAL2 : AN OPEN SOURCE PRE/POST-PROCESSING TOOL FOR CORATHERM & OTHER SOFTWARE ACTIVITIES

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- About CORATHERM Software
- A new pre-post processing : CIGAL2
- 3D Conduction Modeling

CORATHERM in ASPI Cannes

- History
  - → Since 30 years
  - → Today : 40 users
- Used for
  - → Analysis and sizing tool for the Thermal Control: Platforms, payloads, scientific and Telecom programs
- Interface with main European software (to be improved)
- 2000 : ASPI decision for updating its software (30th ICES - 2000)
- 2002 : European Community for Standardization for Space
  - → Rather standard data exchange format than a standard tool for all
  - → Possibility of Marketing Conductive Module

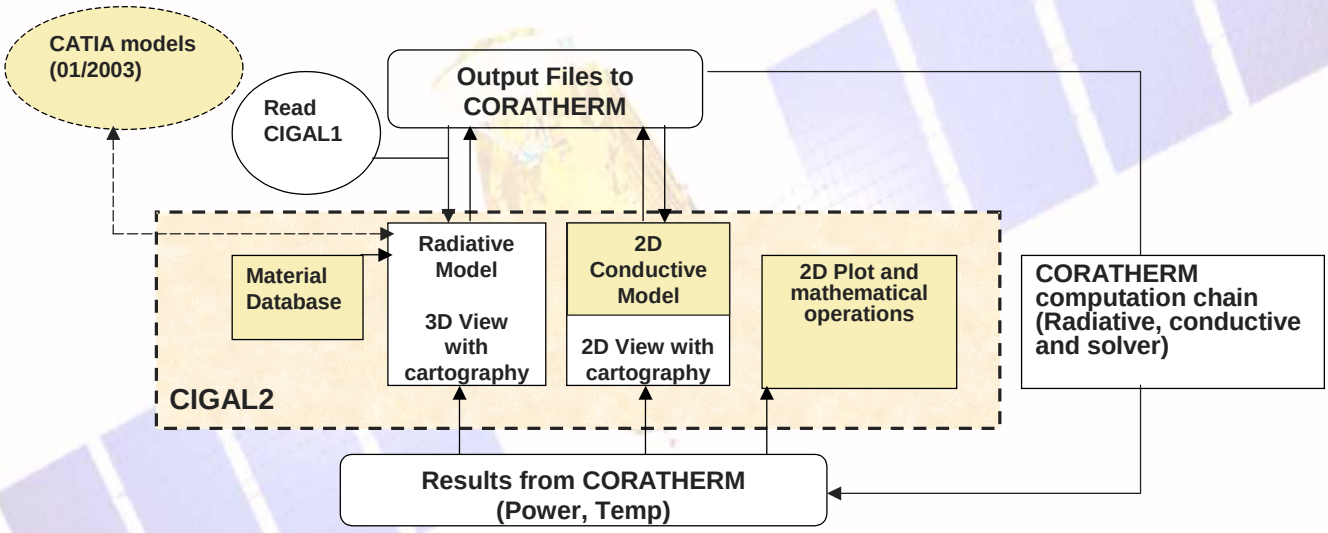
CORATHERM : Technical description

- Main parts :
  - →Radiative & 2D Conductive Modeling, Model condensing/Recalculation, Thermal solver
- Specific thermal modules :
  - → ...
  - → Calc. of thermal inputs for Thermo-Elastic analysis *(31st ICES-2001)*
  - → 3D Modeling of Thermal Conduction (in progress)
  - → LHP modeling at system level
- New Pre/Post Processing : **CIGAL 2**
  - → T0 development : 09/2001
  - → Currently used by Thermal analists (phase 1)

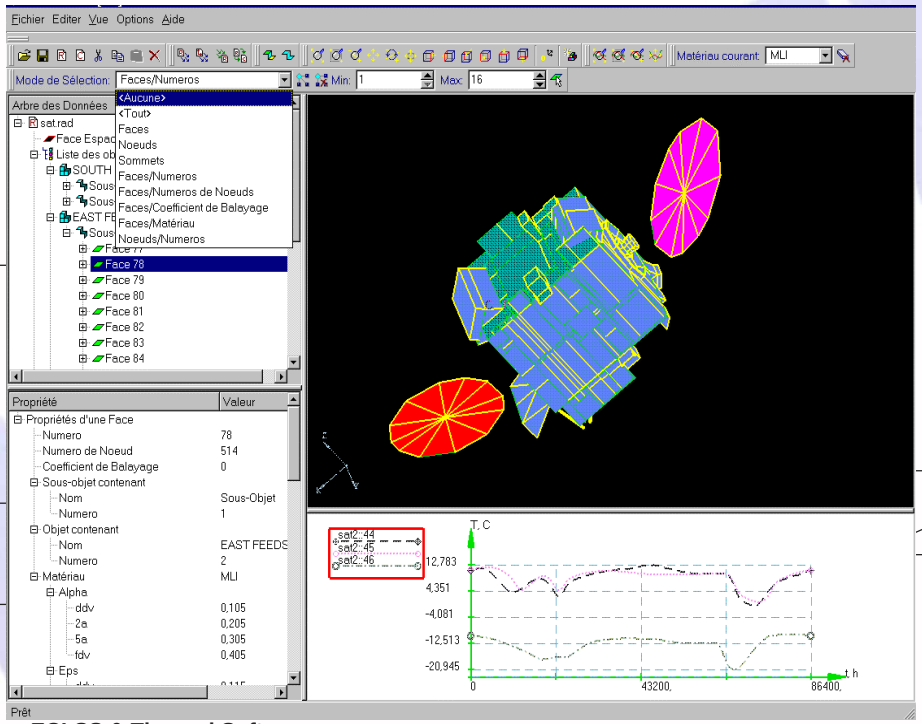
Why the Open Source Approach ?

- Built-in or dedicated solution ?
  - →Specific development fit better specific technical requirements
- Availability of source code
  - →Longevity and evolution of the software
  - →Facilitates porting issues
- The right to redistribute derived software
- Low cost for large utilization

Software Architecture



User Graphical Interface



Model Data Tree

3D interactive window (build, check and display)

Properties Editing

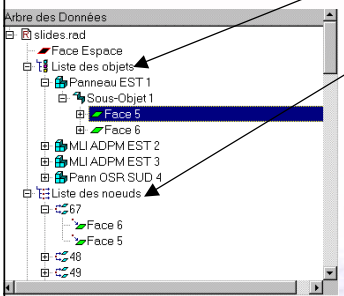
2D plotting (post-process)

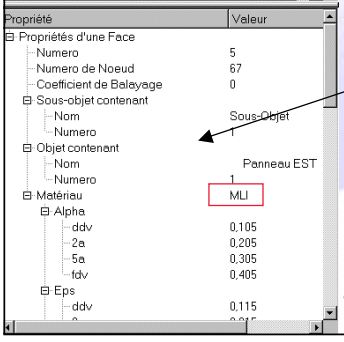
♦ Radiative Model Processing

→1 CIGAL2 Radiative model = 1 cavity of the total model

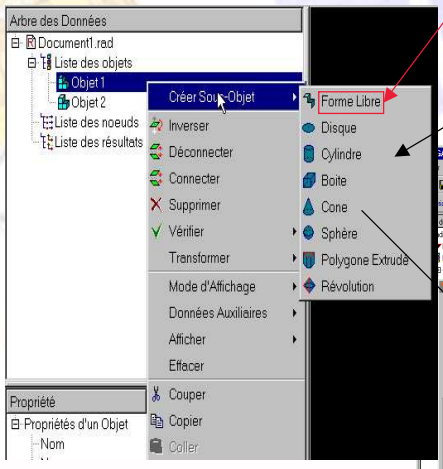
Organisation { Geometry
Nodal breakdown

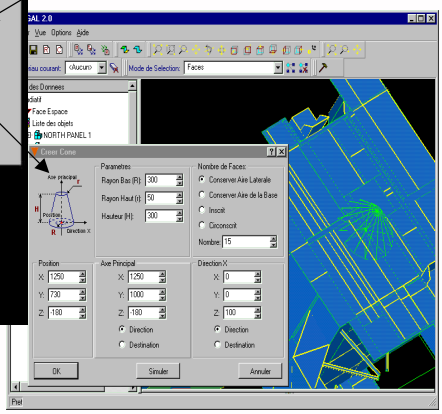
Numerous modeling possibilie (by facets or primitives)





Facets Attributes

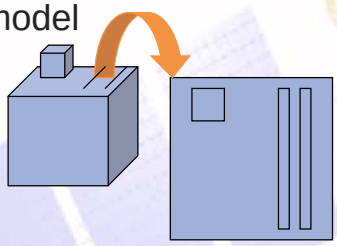




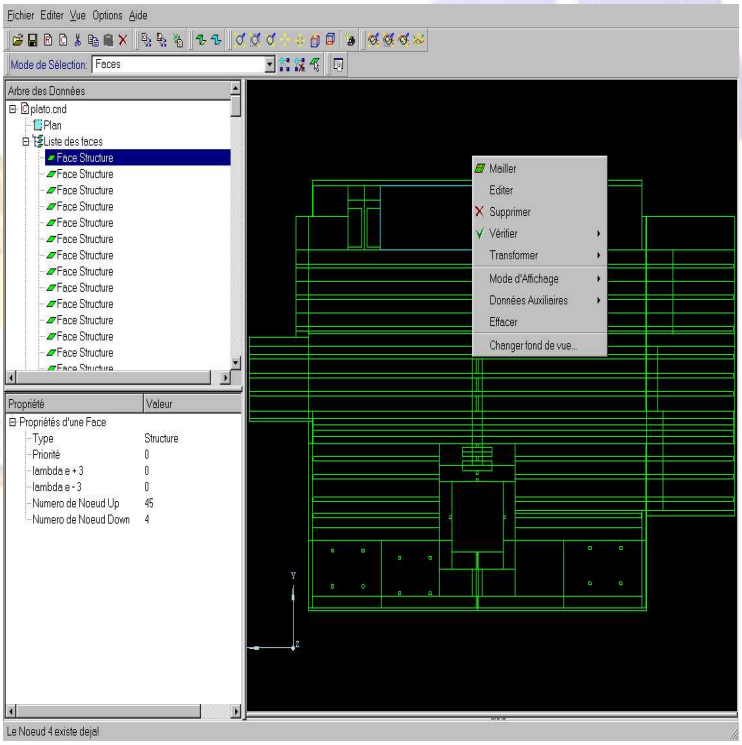
Thermal Software

2D Conductive Model

- 1 conductive model = 1 panel
- Specially adapted to the 2D conductive module (DF method)
- Possibility to create directly a conductive model from a part of radiative model



- Automatic generation of input data file for CORATHERM

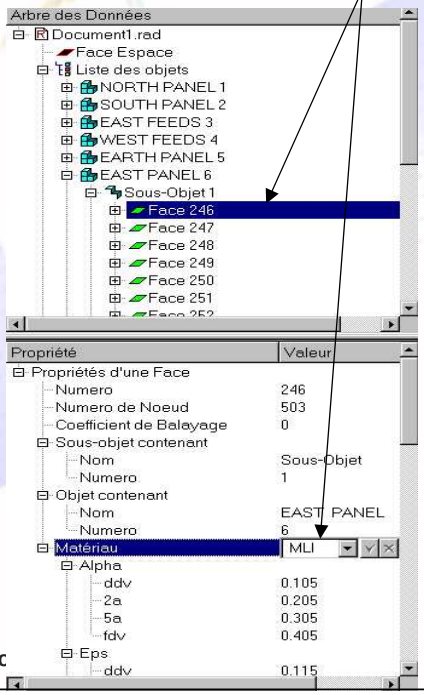


Material Database

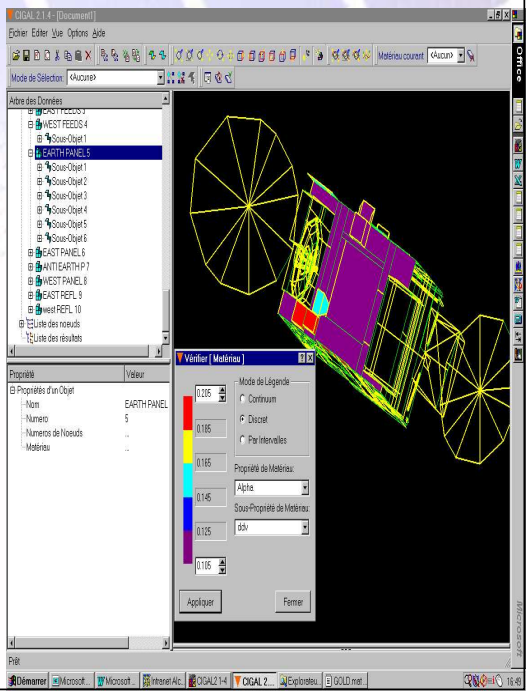
- Set of material datafile (text format)

```
NOM:NIDA
#Nid d'abeilles
# Dans cet exemple, Alpha n'est pas defini en ddv
Alpha  :  Absortivite
Alpha.2a  : 0.1
Alpha.5a  : 0.2
Alpha.ddv : 0.205
Eps  :  Emissivite
Eps.ddv : 0.2
Eps.2a  : 0.21
Eps.5a  : 0.22
Eps.fdv : 0.23
Rho  :  Reflexivite
Rho-Vis-Dif   :  Reflexivite Visible Diffuse
Rho-Vis-Dif.ddv : 0.3
Rho-Vis-Dif.2a  : 0.31
Rho-Vis-Dif.5a  : 0.32
Rho-Vis-Dif.fdv : 0.33
Rho-Vis-Spec  :  Reflexivite Visible Speculaire
Rho-Vis-Spec.ddv : 0.4
Rho-Vis-Spec.2a  : 0.41
Rho-Vis-Spec.5a  : 0.42
Rho-Vis-Spec.fdv : 0.43
Rho-IR-Dif    :  Reflexivite Infrarouge Diffuse
Rho-IR-Dif.ddv : 0.5
Rho-IR-Dif.2a  : 0.51
Rho-IR-Dif.5a  : 0.52
Rho-IR-Dif.fdv : 0.53
Rho-IR-Spec   :  Reflexivite Infrarouge Speculaire
Rho-IR-Spec.ddv : 0.6
Rho-IR-Spec.2a  : 0.61
Rho-IR-Spec.5a  : 0.62
Rho-IR-Spec.fdv : 0.63
Tau  :  Transmissivite
Tau-Vis-Dif   :  Transmissivite Visible Diffuse
Tau-Vis-Dif.ddv : 0.7
```

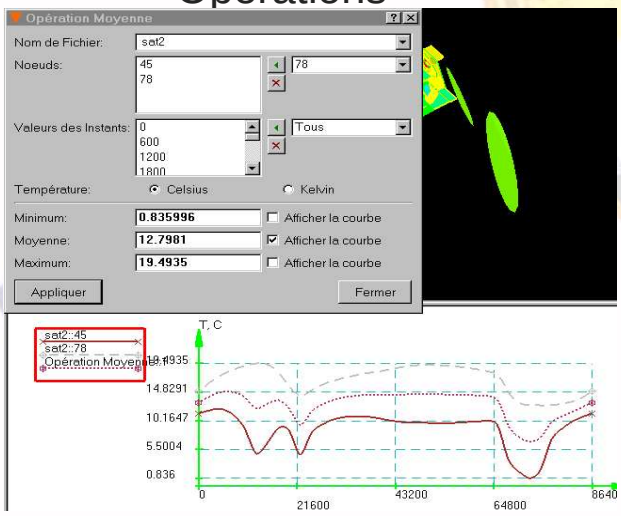
- Affectation of the materials to the model

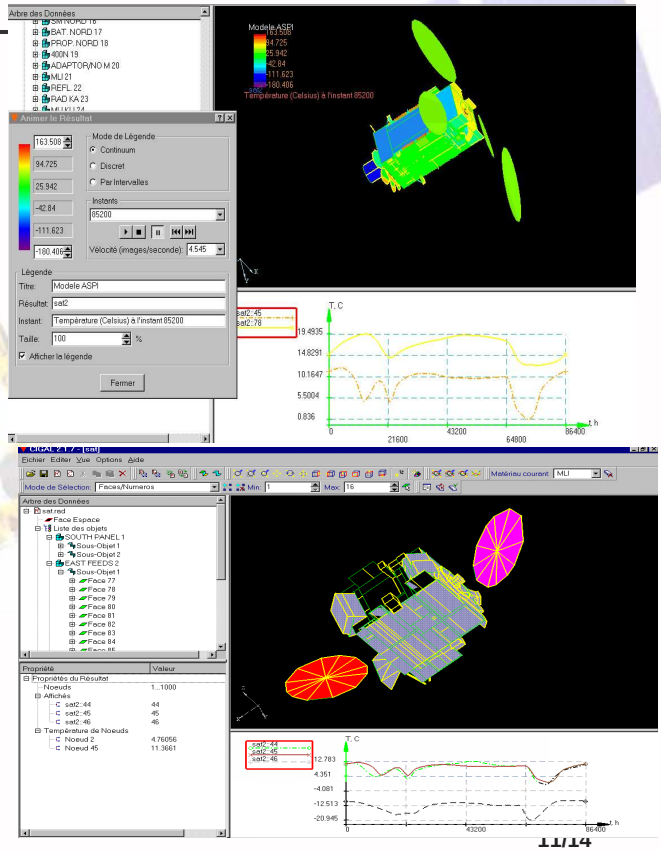


- Numerical & Graphical Checking of properties



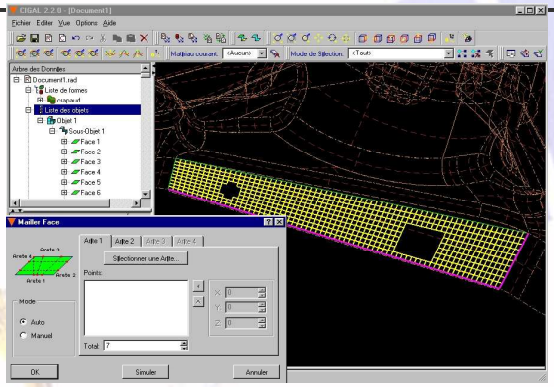
- Post Process
  - → 3D Animation
  - → 2D plot
  - → Math. Operations



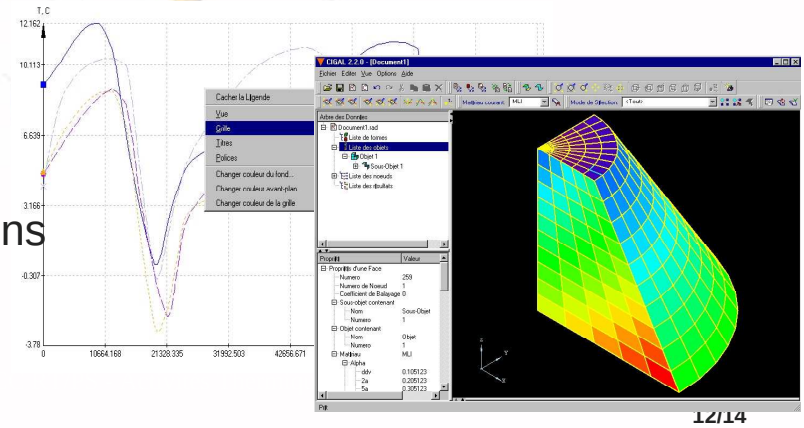


CIGAL2/Phase 2

- Import of CAD files (STEP AP203/214 and IGES
  - →Under development (deliverable in 01/2003)



- New possibilities
  - → Undo/Redo
  - → Partial revolution
  - → Excel like functions
  - → ….

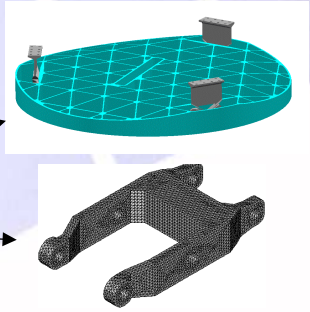


Prospects Round about CIGAL2

- Satisfaction of users
- A base for future developments (ECSS and ASP)
  - → 3D modeling of Thermal Conduction (in progress)
  - → STEP-TAS interface (2003)
  - → Orbital visualisation module

About 3D conduction modeling activities

- Current progress
  - → User needs assessment
    - Lot of time lost with hand-made conductive
    - 2 types of solutions required :
      - "2.5 D" : Adaptation of EQUIVALE
      - "Real 3D" : Pure conduction
  - → EF methods are promising



- ASP's in-house development
  - → On the base of a tool developed in Valence (Micro-electronics)
  - → 3D Thermal analysis software
    - Conduction, Radiation, Convection
    - FE, FD and lumped parameter methods
    - Integrated pre/post processing for Cartesian meshing + interfaces
    - Model condensing and re-calculation