Appendix V

Data exchange for thermal analysis
a status update

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Abstract

This short presentation will give a factual overview of the current status for thermal analysis data exchange. A summary of current known issues and lessons learned will be presented at a practical level. Additionally the status with STEP-TAS and interfaces inside the thermal tools will be covered. Finally the STEP-TAS based TMM converter "TMMverter" will be introduced along with some usage examples.
Data Exchange for Thermal Analysis

James Etchells
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STEP-TAS in a nutshell

- Network Results Format (NRF)
- Meshed Geometrical Module (MGM)
- Space Kinematics Module (SKM)
- Space Mission Aspects (SMA)
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CURRENT STATUS
GEOMETRY

SYSTEMA <-> ESATAN-TMS

• Many conversion have been requested this year
• Native STEP-TAS interfaces working pretty well, several issues resolved
• Boolean cutting is (relatively) new in THERMICA and uses a slightly different approach to ESATAN-TMS
• Things to be aware of: cutting, recursive/heirarchical attributes, bulks/thicknesses, double sides inactivity
Thermal Desktop + NX Space Systems Thermal

- STEP-TAS 5.2 interfaces were reinstated in recent version
  - up/down converter to version 6.0 can be made available on request
- C&R express some interest in updating to a v6.0 interface and are in communication with ESA – **no funding source, no clear commitment**
- Best approach is currently TRASYS and TASverter to STEP-TAS 6.0 (used frequently in ESA)
- For **NX** an interface does exist, but challenges more fundamental but dialog is open with MAYA to see what we can improve

Viewer

- Long term request to replace BAGHERA view STEP-TAS viewer
CURRENT STATUS
NETWORK MODELS

TMMverter

What is TMMverter?
• Converter of TMMs using STEP-TAS as a neutral format

Features
• Bidirectional conversion between ESATAN and SINDA
• Supports most features of DATA blocks
  • a few rarely used SINDA macros are not implemented
• Most OPERATION block syntax is supported
  • plain MORTRAN/FORTRAN syntax is supported
  • a limited number of tool subroutines are supported (e.g. thermostats, interpolations, etc.) plus user defined mapping file
• Fluid analysis modules (FHTS and FLUINT) and not supported

Validation status
• Currently in a beta status
• Used on a number of real conversions in ESTEC
• Performance is OK
  • Large sets of radiative couplings will slow the tool down
TMMverter: Tips for use

**Preparation**
- Strip all unnecessary features from the TMM
- In particular remove superfluous user logic for results, reporting etc.

**Conversion**
- Generally works, but if problems...
- Adopt a step by step approach:
  - First remove all logic and attempt conversion with only DATA blocks
  - Add in part of model step

**Verification**
- It is essential to carry out a verification of the conversion
- Compare results from native and destination tools and assess the
  - Arithmic nodes,
    - Same (reduced) time step
    - Convergece

CURRENT STATUS
WRAP UP + LINKS
Data exchange expectations

- As a recipient I can work with an imported model as if it were a **native model**
  - full “feature tree” is available to be modified
  - Note – not even CAD tools allow this level of compatibility in AP203

Seamless Black Box

- As a user I provide a **black box plugin** to my customer
  - Underlying model is totally hidden
  - Thermal data (temperature, heat flow) exchanged at exposed interfaces
  - Co-simulation could be possible

Current objective:
Robust exchange of radiative geometry (classical GMM)
&
Associated thermal network model (classical TMM)

- Underlying model is totally hidden
- Thermal data (temperature, heat flow) exchanged at exposed interfaces
- Co-simulation could be possible
Final remarks

• As end users, please:
  • try to **use** the STEP-TAS interfaces
  • **report** any issues to developers, or ESA if you’re not sure
  • ESA are available to **support** where possible
  • **plan** conversions ahead, rules and guidelines to simplify model exchange may be needed

• Links:

  step-tas@thermal.esa.int

  http://exchange.esa.int

  ICES-2016-410, A Standard for the Exchange of Thermal Analysis Data (STEP-TAS)