Presentation of the PC version of the ESABASE/Debris Impact Analysis Tool

H.Sdunnus (1), A.Langwost (1), G. Drolshagen (2), J. Soerensen (2)

(1) eta_max space GmbH
(2) ESA/ESTEC

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Presentation Outline

• Background and Motivation

• Presentation of PC ESABASE
  ▪ Concept
  ▪ Handling
  ▪ Components

• Hands-On Demo

• Conclusion & Outlook
Background

- Ageing Space Environment Analysis Tools
  - Platform dependence
  - Cumbersome user interfaces
  - Restricted data models
  - Undefined or non-existent interfaces to external tools
  - Unsatisfactory pre- and post-processing capabilities
  - Serious constraints of their acceptance and availability (ESABASE;..)
Background and Motivation

• Ageing Space Environment Analysis Tools
  ▪ Platform dependence
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• ESA Study
  ▪ „Porting of the existing ESABASE/Debris Application to PC platform“
  ▪ Usage of Off The Shelf (OTS) tools and Open Source software
  ▪ Provision of Open Interfaces (STEP)

• Result
  ▪ PC-ESABASE = Open Frontier framework + ESABASE/Debris solver

Presentation of PC ESABASE

Concept Handling Components
PC ESABASE Concept

User Input Acquisition

- Satellite Model
  - Geometry
  - Kinematics
  - Pointing

- Mission
  - Orbit
  - Duration
  - Maneuvers

- Solver parameters
  - Debris
  - Other
Pre-Processor

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Solver

Application of Models
- “General Services”
  - Orbit Propagation
  - Meshing
  - Ray Tracing
- Physical model(s)
  - Debris & Meteoroids
  - Radiation
  - …
  - ..

Post Processor

Analysis of Results
- Results Visualisation
  - 2D Charts
  - 3D Chart
  - Mapping to geometry
  - File viewing
- Post-Processing
- Report Generation
  - Export to office tools
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PC ESABASE Concept

Pre-Processor  Solver  Post Processor

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Handling
- An analysis case („Project“) is specified by three + one dedicated project files
- Each file is physically existing, enabling standard file handling activities
  - Configuration control
  - File access via networks
  - Compression, encryption, backup
  - File exchange in distributed teams
- A project may contain several files of the same type, allowing for parametric case studies by combining files representing different options
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Geometry file
Mission file
Physics file
Results file

Geometry 1.0
Mission 1.0
Physics 1.0
Results n

Geometry 1.1
Mission 1.1
Physics 1.1

Geometry 1.2
Mission 2.0
Physics 2.0

Geometry 2.0
Mission 2.1
Physics 2.1

Geometry 2.1
Mission 3.0
Physics 2.2

Results n
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**Handling**

**Project Explorer**
- List of currently open projects
- List of available project files, organised in project directories

**Outline**
- Structured, generic visualisation of selected data file
Handling

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Outline
- Structured, generic visualisation of selected data file

Property Editor
- Generic editing of data model content

Editor Area
- Dedicated editors for specific purposes
- Geometry editing
- Input Acquisition
- Results Visualization
PC ESABASE Components

- **GUI** → Eclipse (CPL)
  - full availability to the features of the Java Standard Widget Toolkit (SWT)
    - Window management
    - File handling
  - Offers a „Plugin Model“

- **Model Builder/Viewer** → Open Cascade (GPL like license)
  - Open Source CAD library
  - available on PC and other platforms (Windows, Linux, Solaris)
  - Interfaces: STEP (AP 203 and 214), IGES and others
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- **Visualisation** → VisAD (LGPL)
  - Java component library for interactive and collaborative visualization and analysis of numerical data

- **Reporting** → JFreeReport (LGPL)
  - JFreeReport is used to display formatted data tables and analysis reports
Hands-On Demo

Conclusions and Outlook
Summary and Outlook

- Based on Open Source OTS tools the Open Frontier Platform has been created
- Open Frontier provides
  - A solution for PC platforms
  - An ergonomic framework for user input acquisition and visualisation
  - A flexible work flow concept
  - A STEP interface (STEP SPE in preparation)

- Options for extensions/applications
  - Inclusion of solvers from various disciplines → e.g. radiation
  - Offers particular advantages due to the fact that different solvers may work on exactly the same geometry
  - The availability of already available Eclipse plugins provide extensive possibilities for pre- and post processing.