Virtual Satellite 4 FDIR

User Manual

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Chapter 1. What is Virtual Satellite 4 FDIR?

This user manual describes how to use the Software Virtual Satellite 4 FDIR (VirSat4 FDIR). The software is an extension to Virtual Satellite 4 CORE, for a guide on how to use Virtual Satellite in general, please refer to the Virtual Satellite 4 CORE Manual.

Chapter 2. Purpose

VirSat4 FDIR focuses on modeling Fault Detection, Isolation, and Recovery. This includes among others: Models on failure behavior, recovery behavior, detection behavior, analysis results, and more. The main purpose of VirSat4 FDIR is to enable the analysis of FDIR concepts by means of mathematically well founded evaluation.

The software primarily follows the ESA ECSS standards by means of the SAVOIR FDIR Handbook (http://savoir.estec.esa.int/SAVOIRDocuments.htm). For clarification on vocabulary, further details on FDIR analysis and process, please check the SAVOIR FDIR Handbook.

Chapter 3. Getting Started

3.1. Modeling Workflow

Learn in this section about the recommended workflow for approaching FDIR modeling & analysis. The workflow for creating fault models is up to the preference of the users. Nevertheless, basing the workflow on the following steps is recommended:

- Create a system model using the product structures concepts (PS Concept). For details check the Virtual Satellite 4 CORE User Manual.
- Create a SubSystem dedicated to Risk / FDIR.
- Create a list of Feared Events in this sub system and assign severity categories to them.
- Create a list of faults, with their basic events, for each equipment.
- Perform a Fault Tree Analysis to determine the fault propagations.
- Create the FDIRParameters category at the top of your system model and configure it.
- Create FDIR analysis categories for the desired faults
- Refine the system model and the Fault Tree Analysis and update the FDIR analysis

In the following sections, the various categories, means of analysis, etc. will be elaborated.

Chapter 4. Fault Modeling

Fault modeling forms the core of VirSat4 FDIR and is the primary activity required to perform any FDIR analysis. Learn in this section how to use the graphical editor to perform the main analysis of VirSat4 FDIR, Fault Tree Analysis (FTA), and how to use it to build up fault models.

4.1. Modeling Fault Trees

Faults, their propagations, and inhibiting fault propagation through means of FDIR is modeled using Fault Trees. Fault Trees are graphical models describing how faults combine with each other, propagate through the system, and eventually turn into a feared event. The recombination of faults is modeled via so-called Gates, such as "AND" and "OR". In this section you will learn the basics on Fault Tree Analysis, which gates are supported by the software, and how to use the graphical editor to create a Fault Tree. For further in-depth information on how to perform an FTA, we refer to the standards.

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Fault, BE, etc..

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SPARE, PAND, etc..

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