

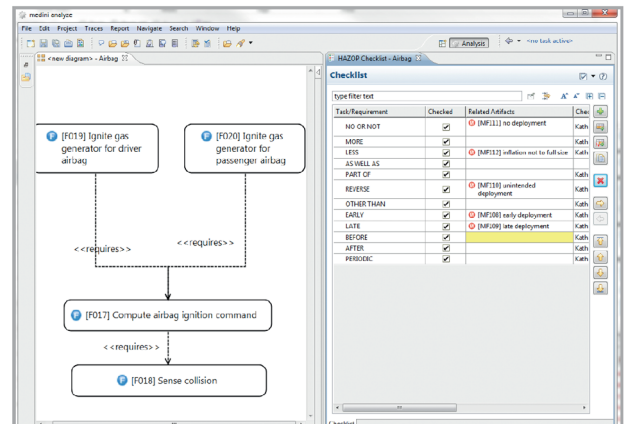
# Quality, Safety and Reliability Engineering

## / Main Features

- Quality analysis for product design and related processes according to SAE J1739, VDA quality handbook, etc.
- Safety analysis and design according to ISO 26262 for software-controlled safety-related functions.
- Integration of architectural/functional design with quality, reliability and functional safety analysis methods.
- Support of driving situation analysis, hazard and risk analysis, Fault Tree Analysis (FTA), Failure Mode and Effects Analysis (FMEA), probabilistic analysis and hardware failure metrics.
- Complete end-to-end traceability.
- Customizable work product/documentation generation.
- Teamwork with detailed compare and merge.
- Integration with IBM® Rational® DOORS, IBM® Rational® Rhapsody, Enterprise Architect, MATLAB®/Simulink®, Stateflow®, PTC Integrity, MS® Office, TortoiseSVN, IBM® Rational® ClearCase, IBM® Rational® Team Concert and others.

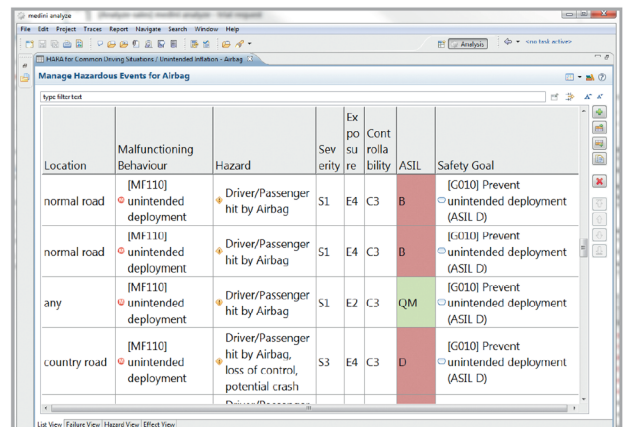
## / Item Definition

- Dedicated, customizable form for the item description.
- Graphical modeling of the functional architecture with functional dependencies and malfunctions.
- HAZOP analysis with predefined checklists.
- Initial item architecture with SysML.
- Inclusion of external documents and linking to external resources via URI.



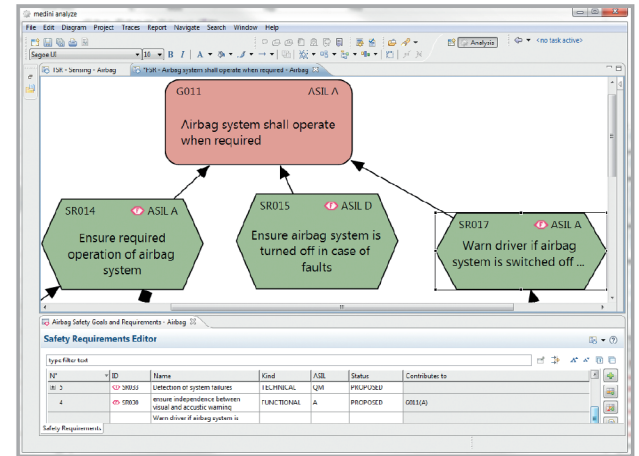
## / Hazard Analysis, Risk Assessment and ASIL Determination

- Table-based management of driving situations and hazardous events.
- Support for driving situation catalogues with drag & drop.
- Matrix for easy combination of malfunctions and driving situations.
- Customization with user attributes.
- ISO 26262 compliant ASIL determination.
- Comprehensive traceability.
- Derivation of safety goals.



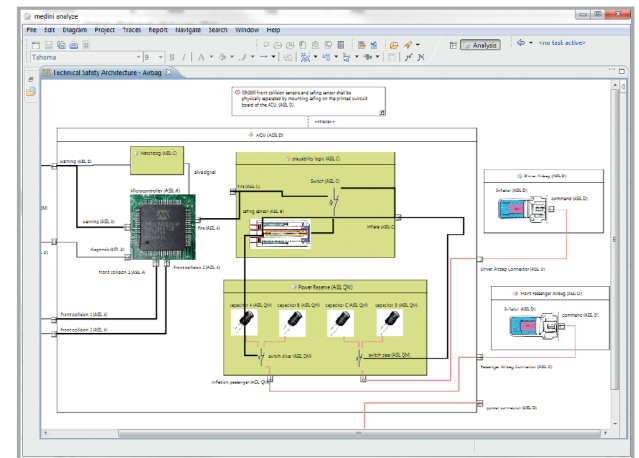
## / Requirement Analysis and Management

- Graphical and table editors for safety goals and requirements.
- Customization with user attributes.
- Capturing and management of functional and technical safety requirements.
- ASIL assignment and ASIL decomposition.
- Validation rules to check compliance with ISO 26262.
- Allocation of requirements to system architecture, HW and SW models and to function models.
- Visualization of requirement traceability on other diagrams.
- Import, export and round trip from/to requirements management systems (e.g. IBM® Rational® DOORS, PTC Integrity), including custom attribute mapping.



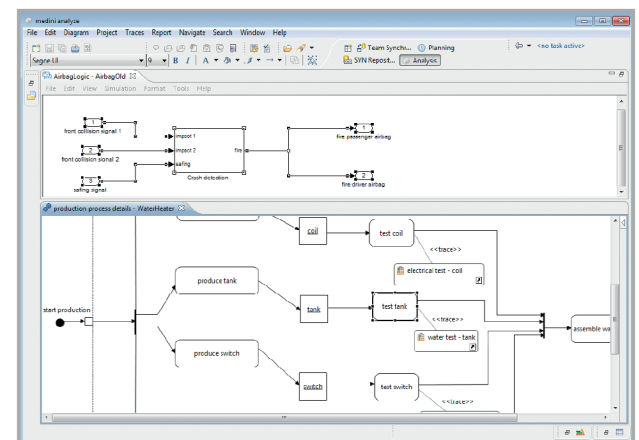
## / Architecture and Function Modeling (SysML)

- Graphical SysML and tabular editor for system models.
- Modeling of functions and processes with activity models.
- Element libraries for re-use.
- Automatic update in case of library change.
- Computation and visualization of the ASIL based on requirement allocation.
- Import and round-trip of models from Rhapsody and Enterprise Architect.
- Specification of failure modes and failure rates for elements of the system architecture.
- Failure rate determination using catalogs (SN 29500, MIL-HDBK-217F, IEC 62380, incl. mission profiles).
- BOM import, restructuring by drag & drop.



## / Function Behavior Modeling

- Activity modeling for behavior of functions as part of SysML modeling.
- Import, round-trip and visualization of MATLAB®/Simulink® and Stateflow® models.
- Allocation of Simulink® elements to elements of system model.
- Traceability to requirements and to safety analysis such as FTA and FMEA.
- Validation of the HW/SW mapping.
- Automatic creation of FTA models from MATLAB®/Simulink® models using structural path analysis.



## / Failure Mode and Effects Analysis (FMEA)

- Standard templates for design and process FMEA.
- End-to-end cause/effect chains across abstraction levels.
- Automatic computation of Risk Priority Numbers (RPN).
- Customization with user attributes including formulas.
- Automatic population and consistency of the table with structural elements and function elements from the architecture and process models.
- Automatic inclusion of all failure modes of the structural and functional elements.
- Excel and MSR-FMEA import (e.g., APIS IQ-FMEA, PLATO SCIO™).
- Connection to requirements management and task management.

| Component                                     | Potential Failures                                 | Potential Failure Effects   | Potential Failure Causes   | Related Functional Safety Requirements   |
|---|--|---|--|--|
| [[TF03]] Detection of light switch status     | [[MF010]] light switch status detection failure    | [[TF005]] Status evaluation and activation event<br>[[MF012]] evaluation and activation event failure |  | [[FSR01]] FLM shall detect any valid turn-on condition of low beam correctly. (ASIL B) |
| [[TF004]] Detection of Ignition status (CI15) | [[MF011]] Ignition (CI15) status detection failure | [[TF005]] Status evaluation and activation event<br>[[MF012]] evaluation and activation event failure |  | [[FSR01]] FLM shall detect any valid turn-on condition of low beam correctly. (ASIL B) |
|   |  | [[TF006]] light activation<br>[[MF011]] activation failure  | [[TF003]] Detection ... light switch status<br>[[MF010]] light switch status detection |  |

## / FMEDA and ISO 26262 Part 5 Hardware Metrics

- FMEDA with Safe Failure Fraction (SFF) computation.
- Calculation of Single Point Fault Metric (SPF) and Latent Fault Metric (LF).
- Safety element out of context support.
- Automatic synchronization of failure mode and failure rate data from architecture model.
- Failure rate distribution over children.
- Specification of cause/effect chains and automatic calculation of failure rates.
- Extensible catalog of safety mechanisms according to part 5 of ISO 26262.
- Default SPF/LF coverage for safety mechanisms.
- Rich validation and consistency checks.
- Traceability of safety mechanisms to requirements and SW/HW implementation.

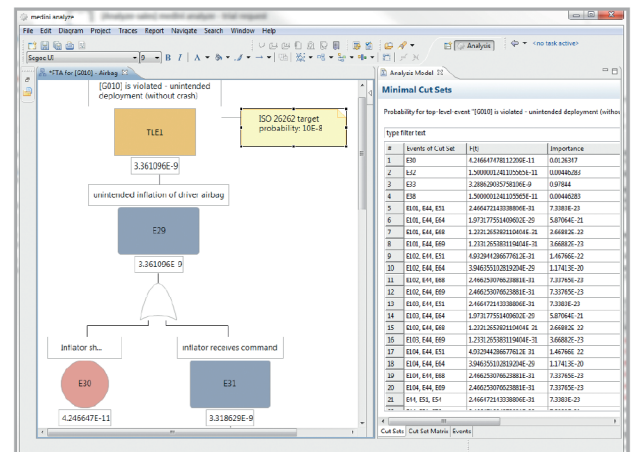
| Component Name   | Failure Rate (in FIT) | SPF (in FIT) | LF (in FIT) | Total Failure Rate | SPF Metric | LF Metric |
|------------------|-----------------------|--------------|-------------|--------------------|------------|-----------|
| Inflator (ASL D) | 0                     | 0            | 0           | 0                  | 0          | 0         |

| Metric                      | Value            | Target                  |
|-----------------------------|------------------|-------------------------|
| Total Failure Rate          | 0.000 (in FIT)   | 1.700 (in FIT)          |
| Total Safety Related        | 296.800 (in FIT) | 98.1% (expected 239.5%) |
| Total Latent Safety Related | 1.000 (in FIT)   | 14.700 (in FIT)         |
| Latent                      | 14.700 (in FIT)  | 93.1% (expected 58.8%)  |

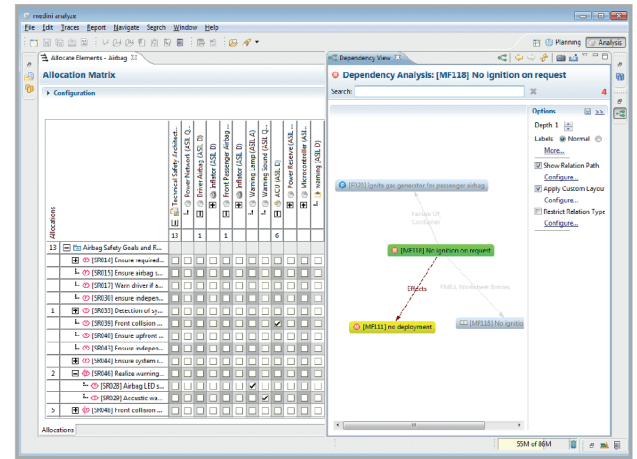
## / Fault Tree Analysis (FTA)

- Graphical editor for quantitative and qualitative FTA.
- Automatic layout and support to handle large fault trees by multiple diagrams.
- Creation of events and subtrees by drag & drop of architecture elements or failure modes from architecture model.
- Determination and evaluation of minimal cut-sets to find out their probability.
- Importance measures such as Birnbaum, Fussell-Vesely and Criticality.
- Seamless navigation from cut-sets to elements of the system design.
- Automatic re-calculation of probabilities after design changes.



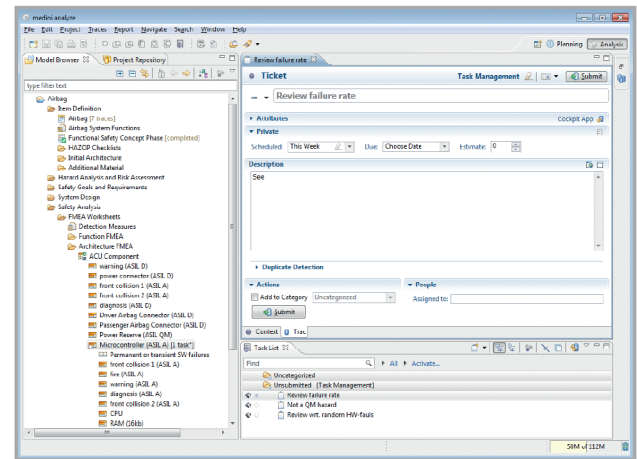
## / Sophisticated Traceability

- Definition of typed and untyped traces between information elements of any type within medini analyze.
- Definition of traces using trace-matrix or by quick-trace functionality.
- Navigation via traces to related elements in other models.
- Visualization of traced elements at any diagram.
- Filters and hierarchies to support the usage of large trace matrices.
- Impact analysis by graphical visualization of traces (customizable dependency viewer).



## / Team Work and Integrated Task Management

- Project compare with two-way and three-way difference analysis.
- Project merge functionality for team collaboration.
- Integration with configuration management systems (TortoiseSVN, IBM® Rational® ClearCase, PTC Integrity, etc.).
- Management of model versions, support of team synchronization.
- Integration with issue tracking systems (e.g., Bugzilla, Trac, RTC, Redmine, Jira, Microsoft® Outlook).
- Creation of tasks/comments for arbitrary model elements.
- Navigation from tasks to elements and vice versa.
- Context visualization for active tasks.
- Documentation of all decisions at the tasks.
- Scheduling, user assignment and e-mail notification.



## / Licensing

- Attractive product tailoring due to individually licensable components.
- Dongle and network floating licenses.
- Trial licenses on request.

## / System Requirements

- Supported platforms: Microsoft® Windows 7/8/10 (32- and 64-bit versions).
- Required disc space: 500 MB.
- Recommended memory size: 4 GB.

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