

1 Introduction

SafeTree is part of the *SafeSuite* family of products, a powerful tool for the development of projects meeting common industry's safety standards.

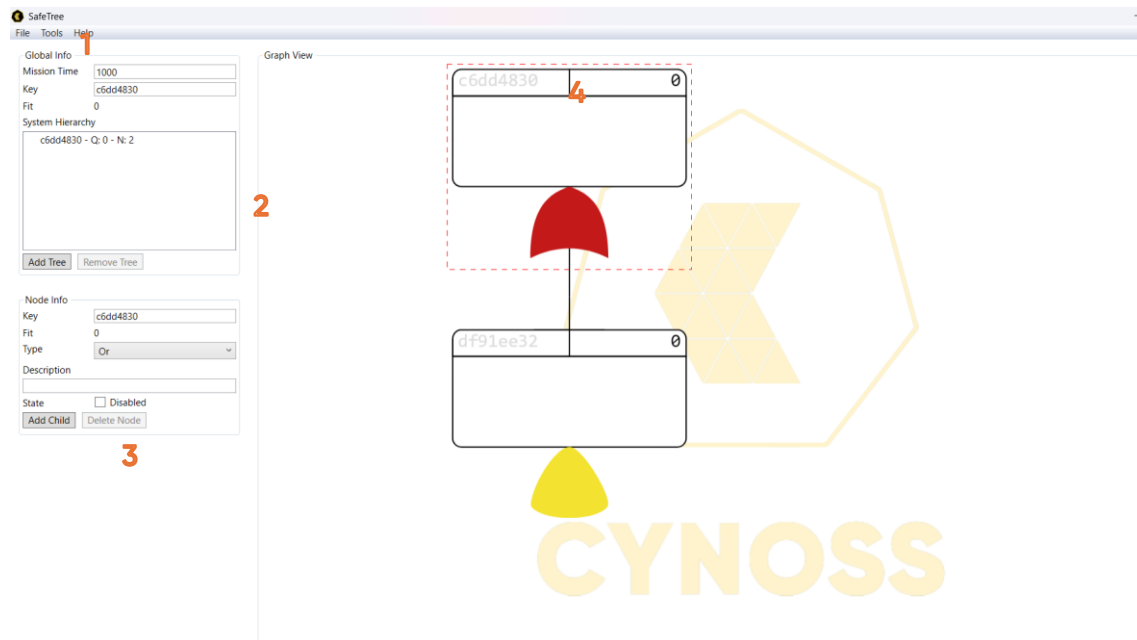
SafeTree provides a tool for Qualitative Fault Tree Analysis (FTA), which is a top-down deductive analysis method in which safety-concerned top-level events are decomposed in a series of lower-level events combined in a well-determined fashion; and for Quantitative Fault Tree Analysis, which delivers a global failure rate for top-level events depending on the drawn tree topology.

1.1 Features

- Support for different event types: failure, diagnosis and hardware endpoints.
- Automatic tree layout and drawing. Robust, single-view interface.
- Immediate failure rate recalculation.
- Simple, efficient navigation: zooming, panning, branch switching.
- Simple child branch management: duplicate, connect, disconnect trees.
- Enable/disable branches for quick impact assessment.
- Print to paper or PDF.
- Save/Load data in custom format enabling app-specific features.
- Support for software endpoints for informative and process integrity purposes.

2 Usage

2.1 Application parts

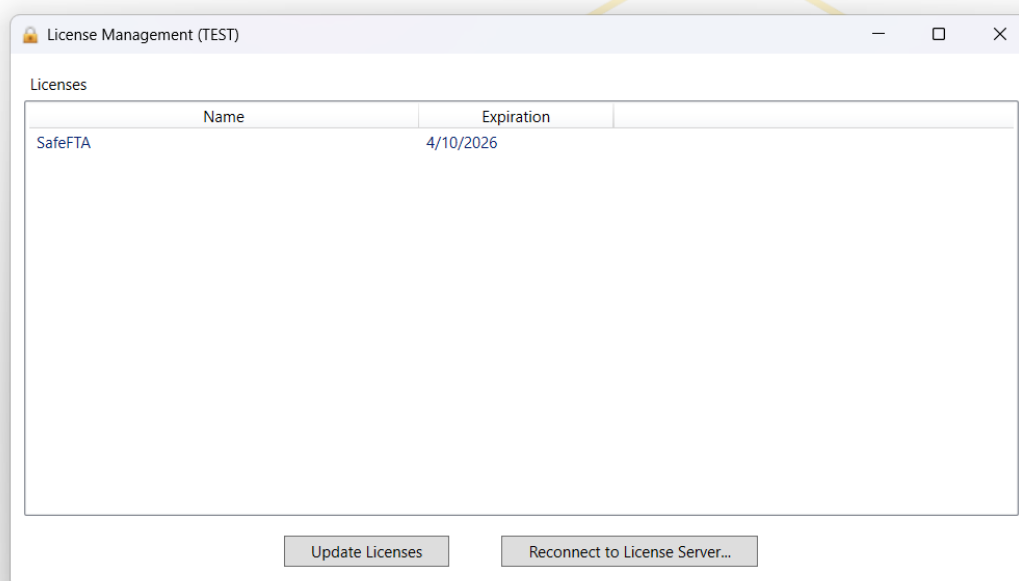


1. Menu
 - a. File > (New | Load | Save | Print | Exit)
 - b. Help > (About | License)
2. Global Info panel
3. Node Info panel
4. Graph View

2.2 Licensing

You cannot use the SAFETREE tool without a registered license. "No license" state blocks the Save, Import, Export features. Loading is still possible for demo purposes but severely limits the application's usability.

Your license status can be checked within the "Help > License Management" dialog. The dialog allows you to update your license, in case this is the first time you enter the application, or to reconnect to the license server in case the connection has been disabled.



In normal operation mode the application would reach the server by itself and thus your active license should appear on the dialog box.

NOTICE: Remember in any case that you will be requested to activate your license through email after your purchase.

2.3 License Activation Process (Node Lock)

1. Obtain your license key or invitation email by purchase or contacting safesuite@cynoss.net
2. Log in to the License Manager through your browser.
3. Authenticate and activate.
4. Install and launch SafeTree, so your node data can be stored by the system.
5. Wait for your license to be assigned by the supervisor.

Now you are ready to use your SafeTree.

NOTICE: SafeTree licensing system uses the port https 7072 for monitoring purposes. Please be sure this is available for the application. We beg you to carefully read the EULA documentation for further details.

2.4 Global Info panel

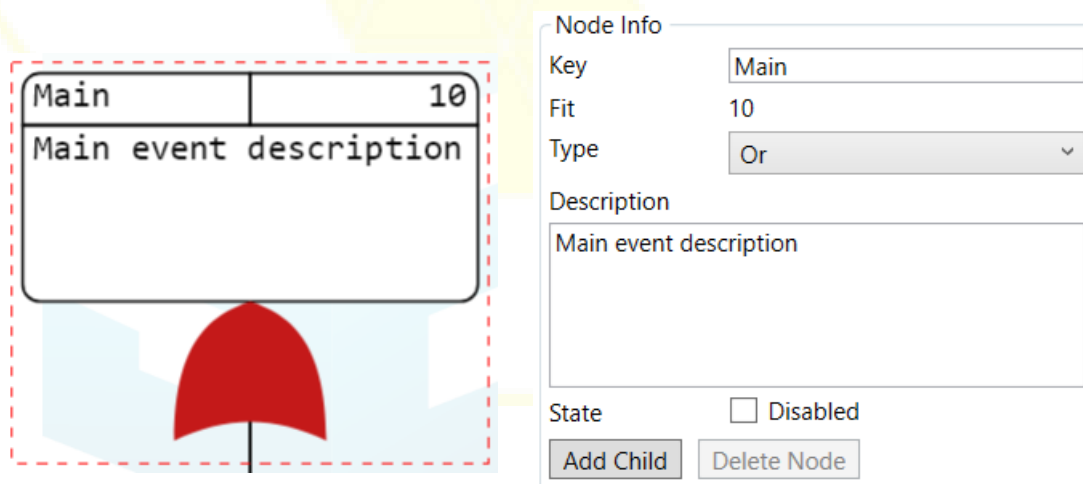
The aim of this panel is to display information of interest to the user at any point of the development process. It shows the **current top-level event failure rate**, as well as the name and the **tree structure** at a glance. New trees are added and deleted from here.

- **Mission Time:** required FTA parameter for diagnosed events. Units in hours.
- **Key:** top-level event name.
- **Fit:** read-only global failure rate top-level event. Units in FIT (failures in 10E9 hours).
- **System Hierarchy:** shows available trees. There can be top-level events and lower-level events, i.e. child branches. The items show their name, total branch failure rate (Q) (failures in 10E9 hours) and number of included events (N). Right-clicking on an item displays its context menu: "Copy Key", "Duplicate".
 - o System Hierarchy > **Copy Key:** copy currently selected tree key (name).
 - o System Hierarchy > **Duplicate:** copy selected tree, changing event names (uniqueness).
- **Add Tree:** adds a new top-level tree to the list.
- **Remove Tree:** deletes the currently selected tree and all subtrees.

2.5 Node Info panel

This panel shows information specific to the currently selected node, i.e. the one surrounded by a red dashed line. There are four main types of nodes: Or, And, End Point, Diagnosed.

2.5.1 Or Gate



The diagram shows a node labeled 'Main' with a FIT value of 10 and the description 'Main event description'. Below the node is a red semi-circular gate symbol. To the right is the 'Node Info' panel, which contains the following fields and controls:

- Key:** Main
- Fit:** 10
- Type:** Or (dropdown menu)
- Description:** Main event description
- State:** ☐ Disabled
- Buttons:** Add Child, Delete Node

This gate sums the FIT values of child nodes.

- **Key:** editable node name.
- **Fit:** read-only node FIT value.

- Type: event type.
- Description: event description.
- State: allows disabling a branch to ignore its value in higher-level calculations.
- Add Child: add new child event.
- Delete Node: delete this event and all descendants.

NOTICE: OR gates are typically used to describe the contribution from lower-level events to a common top-level event.

2.5.2 And Gate



Node Info

Key	Event 1.2
Fit	8
Type	And

Description

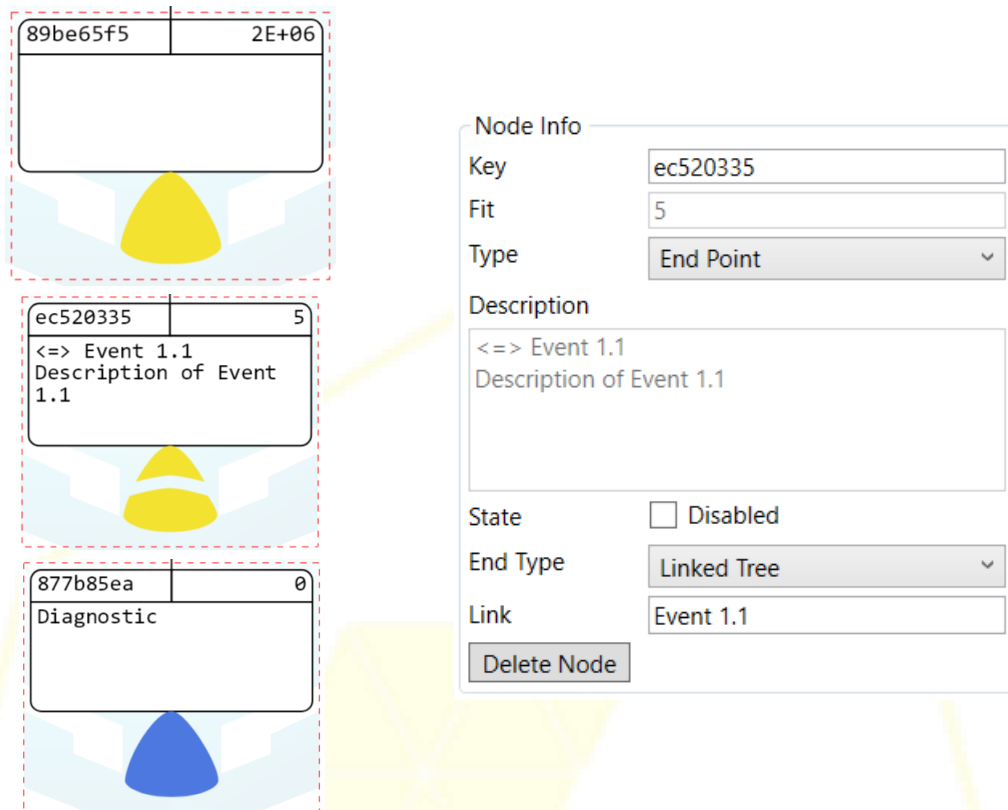
Description of Event 1.2

State ☐ Disabled

Add Child Delete Node

This gate multiplies FIT values of child nodes. This node's properties are the same as the "Or" gate.

2.5.3 End Point Gate



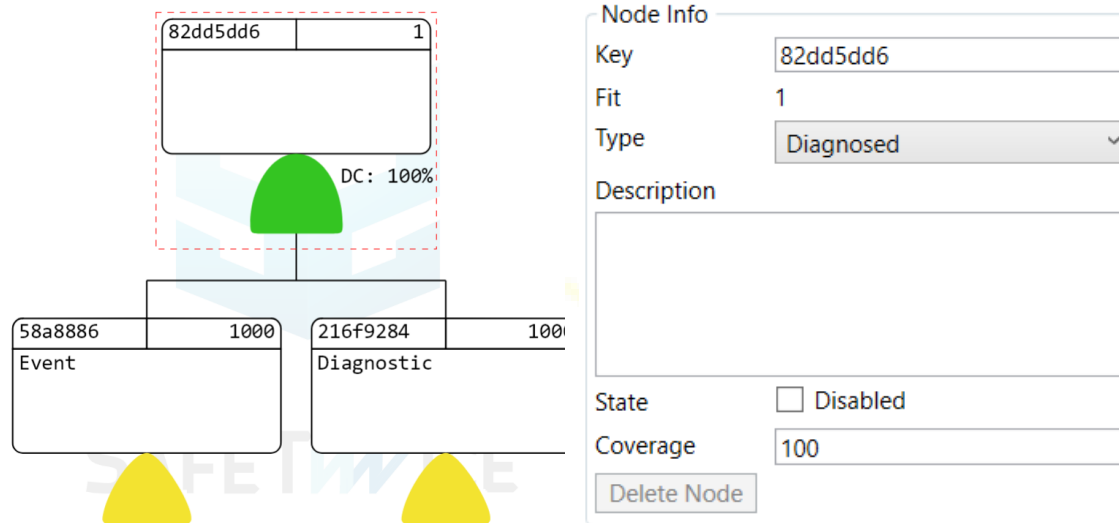
This gate provides an actual FIT value for higher-level gates, hence its "Fit" field is editable. There are three subtypes of end point nodes ("End Type"):

- Normal (yellow): editable FIT value.
- Linked Tree (yellow, split): used as linking point for child trees. Use top node's key of target tree as "Link" value. It can be copied from the System Hierarchy or written directly. The "Description" is read-only in this mode, displaying the link target.
- Software (blue): read-only zero FIT value. Used mainly as diagnostic node, clearly showing its type at a glance. By definition, correctly written SW diagnostics are error-free, i.e. have zero FITs.

The rest of the fields are similar to other node's fields.

NOTICE: End Point gates are typically used to describe bottom-level events for which a determined failure rate is available.

2.5.4 Diagnosed Gate



This gate combines an event branch (λ_E) with a diagnostic branch (λ_D) which can fail at a given rate (DC – Diagnostic “Coverage”). For automotive (ISO-26262) this is usually 60%, 90% or 99%. When at 100%, it simply works as an And gate. The global “Mission Time” (T) parameter is used by this gate internally:

$$\lambda = \lambda_E(1 - DC) + \lambda_E DC \lambda_D T$$

Note that children node types can be changed normally to suit any topology.

This gate is actually a combination of the other gates, but it is frequently used and therefore nice to have by default.

Note: the event branch is always on the left, and the diagnostic on the right. Bear it in mind in case the default descriptions are replaced.

NOTICE: Diagnosed gates (or AND gates) are typically used to describe dual point failures: a higher event is described as a lower-event failure rate weighted by a diagnostic mechanism (which is described by a diagnostic coverage ratio and a failure rate for the diagnostic mechanism itself).

2.6 View workflow

The application is designed for the workflow that is hereby explained.

Initially there is a single tree. Nodes can be added only to “And” and “Or” gates. A node can be deleted with the “Delete Node” button, removing also all descendants. A node type can be changed at any point, but this deletes descendants. Disable nodes with the “State” to bypass them.

When a tree grows to big or for modularity purposes, a new tree can be created with the "Add Tree" button. Trees can be deleted when selected, with the "Remove Tree" button. A tree can be duplicated using the context menu item "Duplicate" in the "System Hierarchy".

Trees can be linked together by means of an "End Point" node of type "Linked Tree". Only top-level trees can be linked (uniquely linked), i.e. those not already linked. This prevents circular references and does not limit design complexity. When linked, a tree appears as a child of its parent.

Note: be careful with delete operations since there is currently no undo operation.

Note: event keys must be unique, which is enforced by the application. This ensures traceability.

Quick tips

- The Graph View can be panned (hold left button) and zoomed (scroll wheel).
- Nodes in the Graph View are selected with the left mouse button.
- Reset the view with the context menu item in the Graph View.
- Items in the System Hierarchy have a context menu for "Copy Key", "Duplicate".
- Press "Enter" in any input box to commit changes without having to change focus.
- All text can be copy/pasted as usual.

2.7 Save/load

The project file has ".fta" extension. Save/load of project files is done through the "File" menu.

2.8 Print

Printing enables exporting all trees to paper or PDF, as chosen through the system's print dialog. A simple information box is added to the top of all pages displaying top-level node name, description, page index, and project name.

3 Tips, how to and more

There is a dedicated series of videos prepared to ease your job in our YouTube channel accessible through our Web Page www.cynoss.net

Nevertheless, do not hesitate to reach us at support@cynoss.net if you have any query. Remember that technical webinars are periodically scheduled by our technical team. We encourage you to log in to our users community to keep in touch with the development team.

Explore additional tutorials, walkthroughs, and updates on our channel.

4 FAQs

check www.cynoss.net

What does "node-locked" mean?

Your license is tied to a computer. So far SafeSuite licenses operate this way.

Can I transfer a license to another machine?

You can do it under request maximum 4 times

Is SafeTree only an on-premised software?

Yes, so far it is. Being such a specific tool, it is easier for us to manage. Let us know if you'd like to have a cloud version.

Is there a free trial available?

Sure! Just ask as by clicking on the "Free Trial" button on the web page

Is there a usage limitation in the EULA?

You should have downloaded the document in the same package.

Do you offer academic or startup discounts?

We offer students fee. Willing to hear from you... just contact us.

Is technical support included in the license fee?

We have a complete set of documentation, including videos and shorts in YouTube. Nevertheless, if you miss something just contact support@cynoss.net. Specific training and hot line support do have a price.

Can I change the colours of the gates?

Yep... no. It is fixed.