NOR-STA version 8 implements GSN Community Standard Version 3 in the following scope, as described in this document:

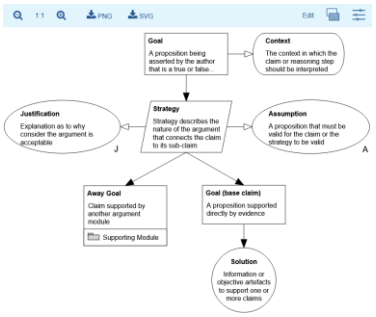
- Core GSN: full implementation of argument element types and relations, and the diagram
- Modular Extension: all three types of argument interfaces are supported
- Argument Pattern Extension: partial implementation of pattern functionality, no graphical representation

1 Representing GSN arguments in NOR-STA

You can work with GSN arguments in the following views in NOR-STA:

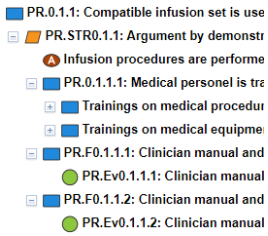
- **GSN diagram view**

  The diagram view is intended to present the argument in a graphical way. You can adjust the layout of the argument, as well as paging of the argument sections.



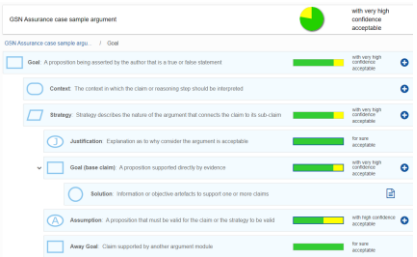
- **Argument tree view (Full view)**

  You can edit the structure of GSN assurance cases in the full view of the argument. You can add, modify, edit, search and delete goals, strategies, justifications, solutions and context elements as well as perform an assessment.
  NOR-STA will ensure the right structure of your argument.



- **Basic view of the argument tree**

  The Basic view is oriented on presenting one section of the argument at a time and provides easy navigation between sections. In Basic view you can browse the argument, make an assessment and perform basic editing functions: add, edit and delete argument elements. GSN symbols of element types make it easier to analyze the argument.



- **Modular diagram view (Architecture view)**

  The diagram presents the architecture view of connected assurance cases.

2 Core GSN

NOR-STA implements all types of GSN argument elements and all relations between them. Core GSN is fully implemented in NOR-STA:

- Goal (Claim)
- Strategy
- Justification
- Assumption
- Solution
- Context

The hierarchical view used in NOR-STA is a tree with linked elements. The links are used in NOR-STA to implement elements used more then once in the argument.

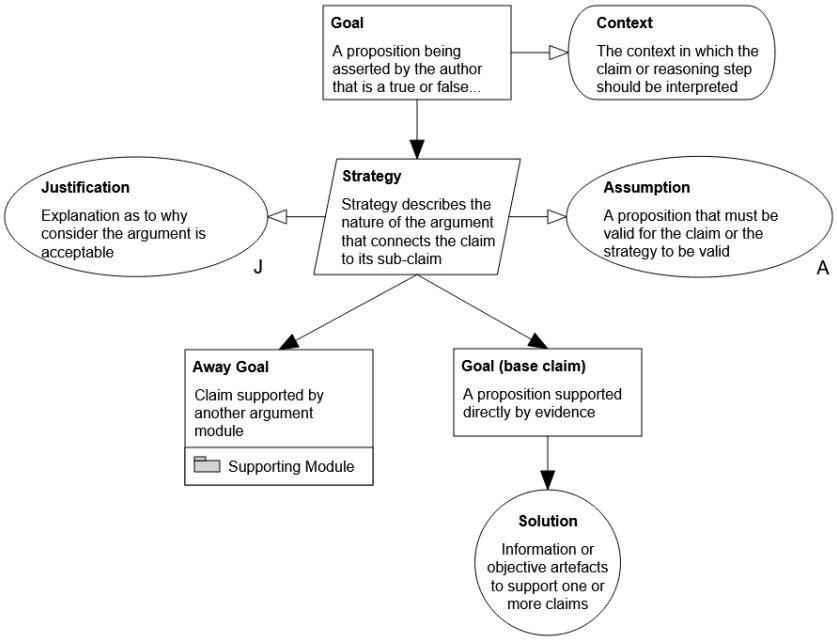


Figure 1. GSN diagram produced in NOR-STA presenting types of argument elements

2.1 Pages of assurance case diagrams

NOR-STA supports development of large assurance cases. As such assurance cases can be difficult to visualize as one GSN diagram, it is possible to divide the diagram into several pages. A user can decide if the argument is to be presented on one big page or on a number of pages. NOR-STA still maintains the consistency of an assurance case no matter how its GSN representation had been split into pages..

NOR-STA implements 'Off-Page' decorators. By clicking on a decorator you can navigate to the other page of the diagram.

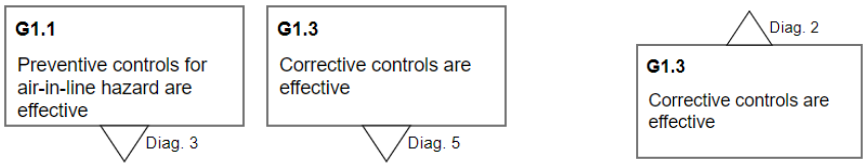


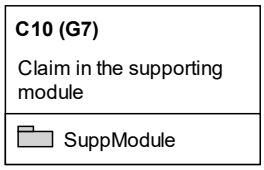
Figure 2. 'Off-Page decorators for assurance case diagrams divided into pages

Elements on the boundaries of a diagram pages are claims. It is required that one reasoning step is presented on one page and cannot be divided between different pages. A single reasoning step is a claim, its context, supporting strategy and premises.

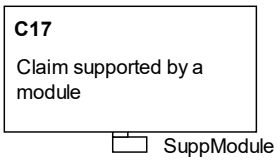
3 Modular Extension

NOR-STA implements modular arguments and binding of different argument modules through their interfaces. NOR-STA implements three types of interfaces specified in GSN Modular Extension:

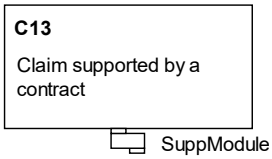
- **Away element** – citation of an element in another module. This is simply a link to a claim in another module. When you use away elements then names and descriptions of the claims from the supporting module will appear in your argument. It works like a link, but to another module.



- **Supported by another module** – element is supported by another element in a supporting module. This type of connection was already implemented in NOR-STA.



- **Supported by a contract** – element is supported by another element in a supporting module through an intermediary contract. The contract needs an assessment to be made by the user if the supporting claim sufficiently supports a given claim in all its context.



Another element of GSN Modular extension is the **architecture view**:

- **Argument modules** are represented as rectangles with a smaller rectangles adjoining at the top left,
- **ModuleSupportedBy** relationship is represented as a line with a solid arrowhead.

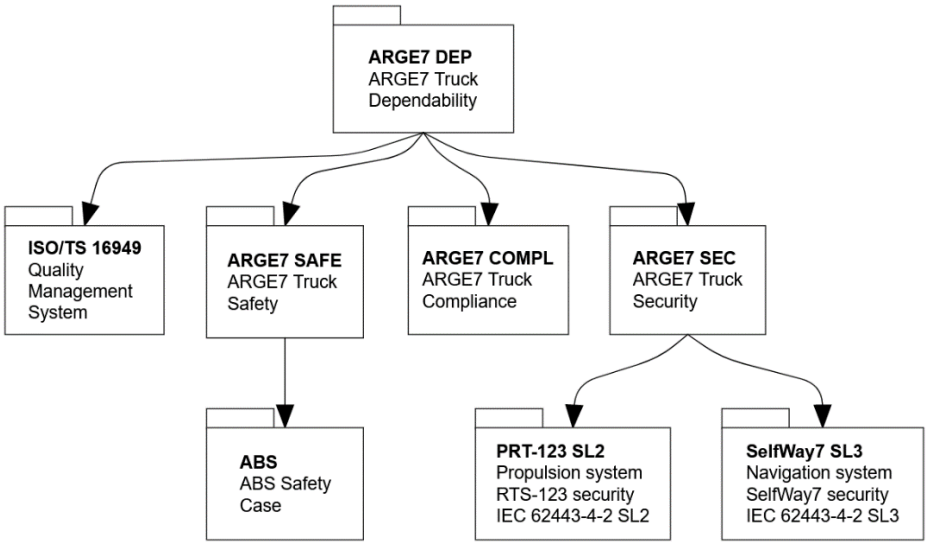


Figure 3. Architecture view in NOR-STA

The scope of argument binding in NOR-STA is limited to claims. No other types of away elements are implemented in the current version of NOR-STA.

4 Argument Pattern Extension

NOR-STA features include argument templates and a synchronization mechanism which implements some elements of GSN Argument Pattern Extension:

- **Optional instantiation** 
  NOR-STA implements optional instantiation with the use of tags. Users may use tags to denote branches of the argument in the template and then for each implementation argument they can specify branches to be applicable for a given instantiation. The same parameters can be used to control a number of optional branches of the template.
- **Choice instantiation** 
  NOR-STA implements optional instantiation with the use of tags. Users may use tags to denote sets of branches of the argument in the template. For each implementation argument the user may specify parameters to control sets of applicable branches.
- **Multiple instantiations** 
  Multiple instantiations are managed manually at the instantiation time. By default NOR-STA creates one instantiation and the user can perform multiplication with copy/paste operation.

NOR-STA implements the pattern mechanisms described above, however, the graphical symbols of patterns defined in GSN Standard are not implemented in the current version of NOR-STA.

5 NOR-STA Extensions – Argument assessment

NOR-STA implements argument assessment and enables presenting GSN diagrams colored depending on the assessment results. A sample diagram is presented in Fig. 5.

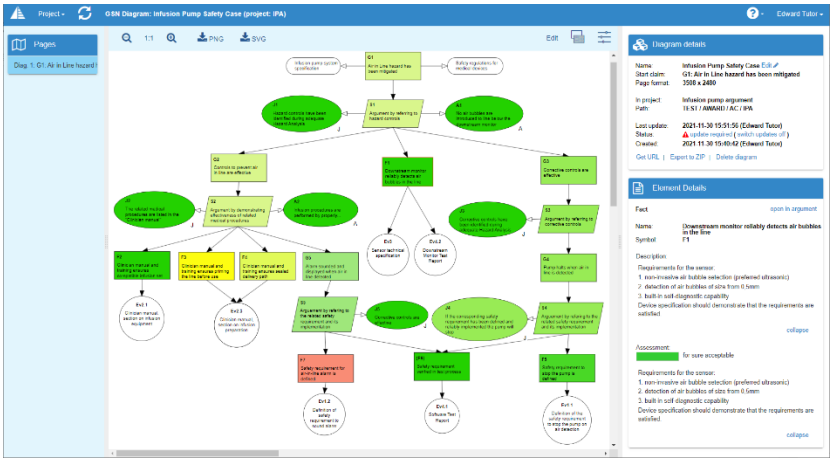


Figure 4. NOR-STA extension: presenting assurance case assessment

When you need more information about NOR-STA please visit our website www.argevide.com or contact us at office@argevide.com