

SACM 2.1 Argumentation Example

The usage of the argumentation package of SACM 2.1 will be illustrated using examples created using the Goal Structuring Notation (GSN), which is widely adopted visualization notation for assurance cases. GSN can be seen as an implementation of the Argumentation package of SACM. GSN diagrams can be fully translated to SACM using model-to-model transformation.

1.1 Claim

In GSN, a goal is represented as shown in Figure 1.

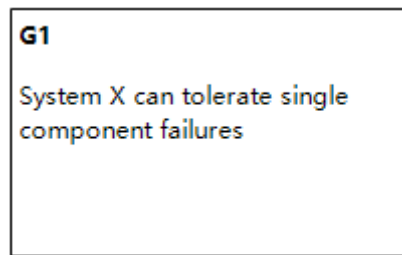


Figure 1

The SACM equivalent of Goal G1 is shown in Figure 2.

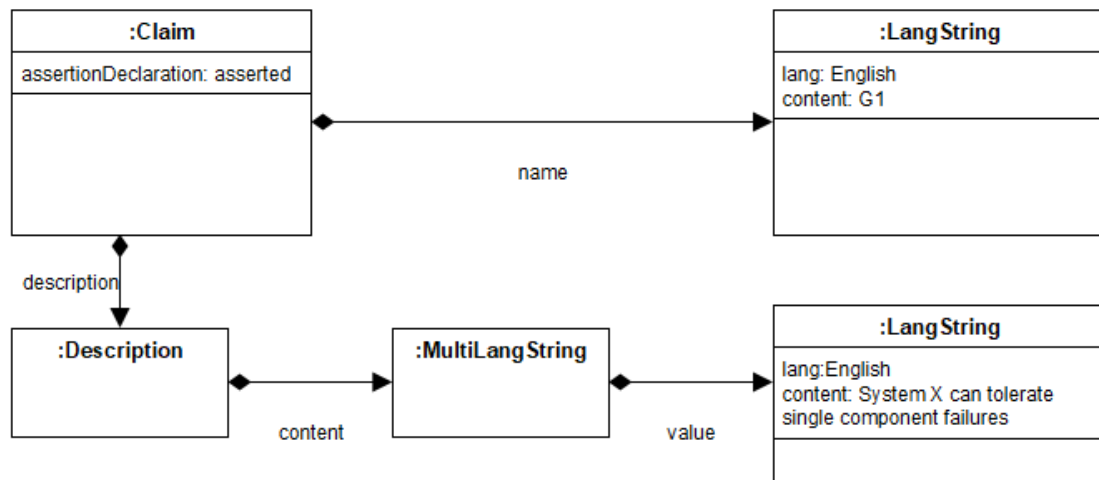


Figure 2

1.2 Solution

Where evidence is asserted to support the truth of a claim, this can be documented by providing a Solution in GSN, shown in Figure 3.

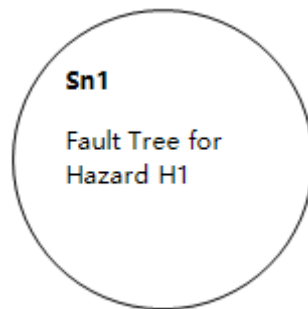


Figure 3

The SACM equivalent of Solution Sn1 is shown in Figure 4.

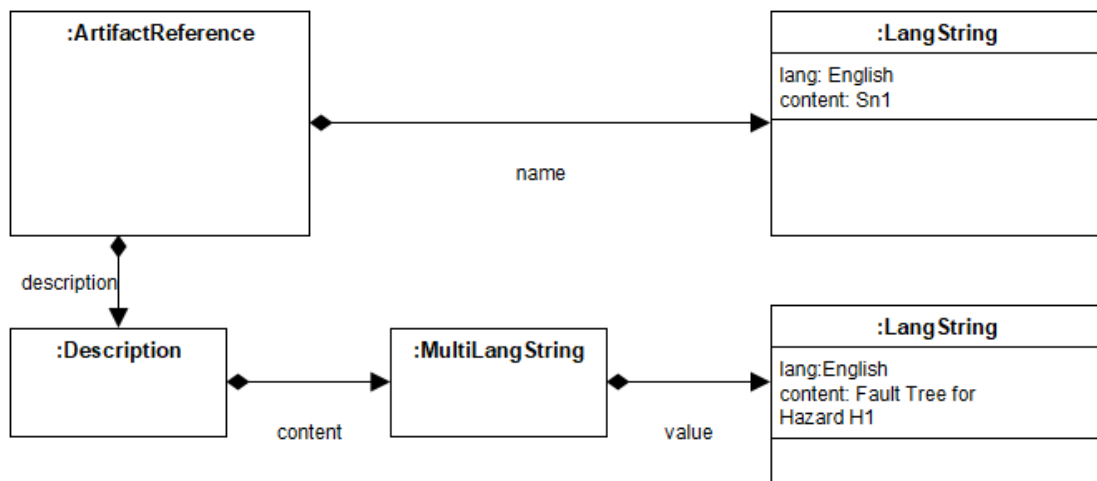


Figure 4

1.3 SupportedBy

When documenting how claims are said to be supported by its evidence, a SupportedBy relationship is used, as shown in Figure 5.

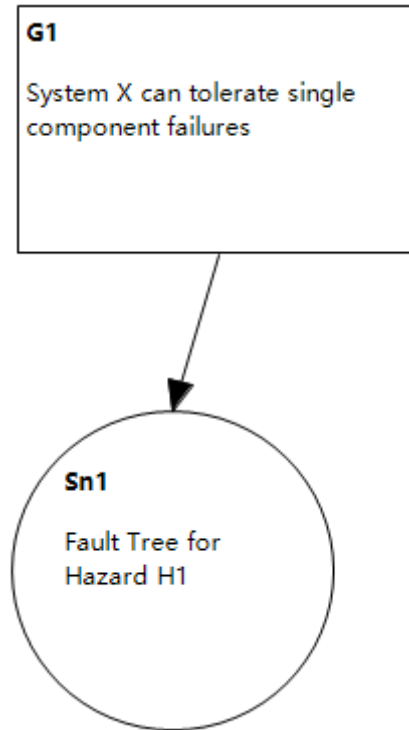


Figure 5

The SACM equivalent of SupportedBy is SACM's AssertedInference, as shown in Figure 6 (note: the *name* and the *description* of the Claim and the ArtifactReference are omitted for clarity).

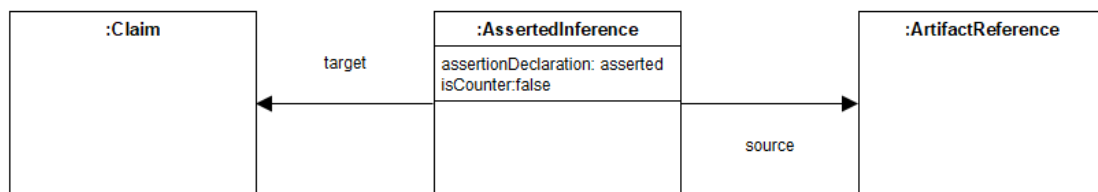


Figure 6

1.4 Strategy

When documenting how claims are said to be supported by sub-claims, it can be useful to document the reasoning step – i.e. the nature of the argument that connects the claim to its sub-claims. Figure 7 shows an example strategy in GSN:

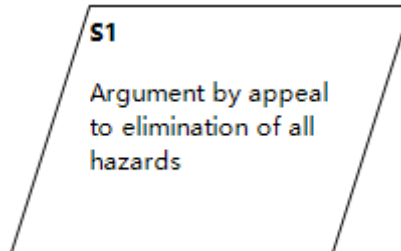


Figure 7

The SACM equivalent of S1 is shown in Figure 8.

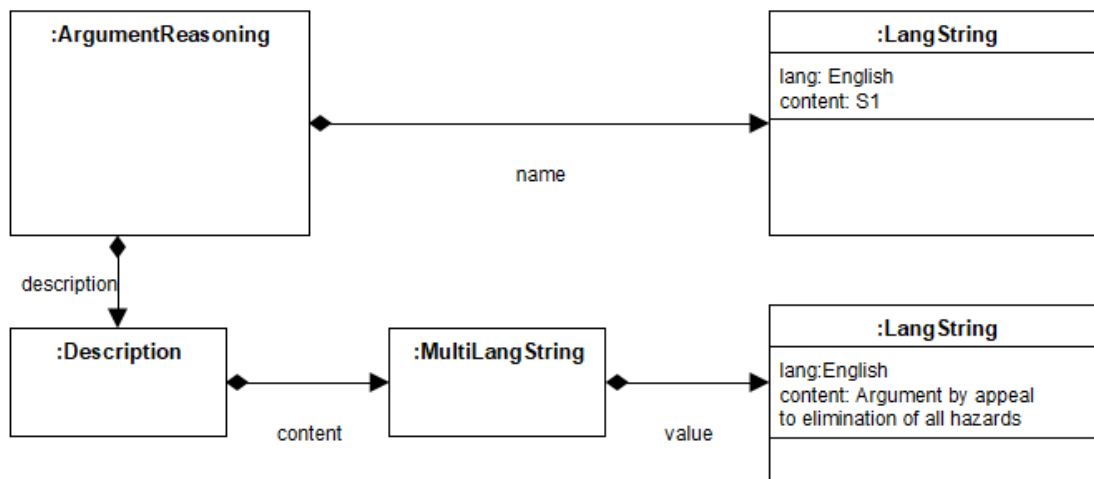


Figure 8

Strategy can be seen as an additional piece of information/description added to a SupportedBy. Therefore, for the argument shown in Figure 9, the SACM equivalent would look like it is shown in Figure 10 (omitting *name* and *description* for clarity).

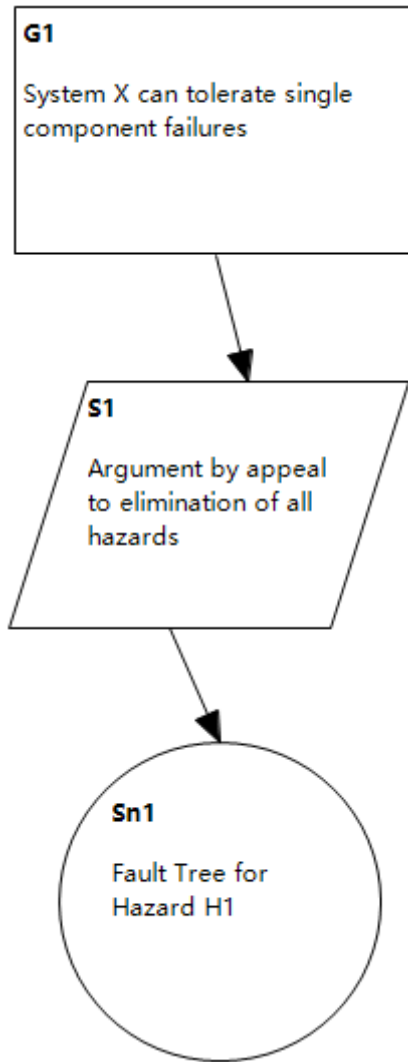


Figure 9

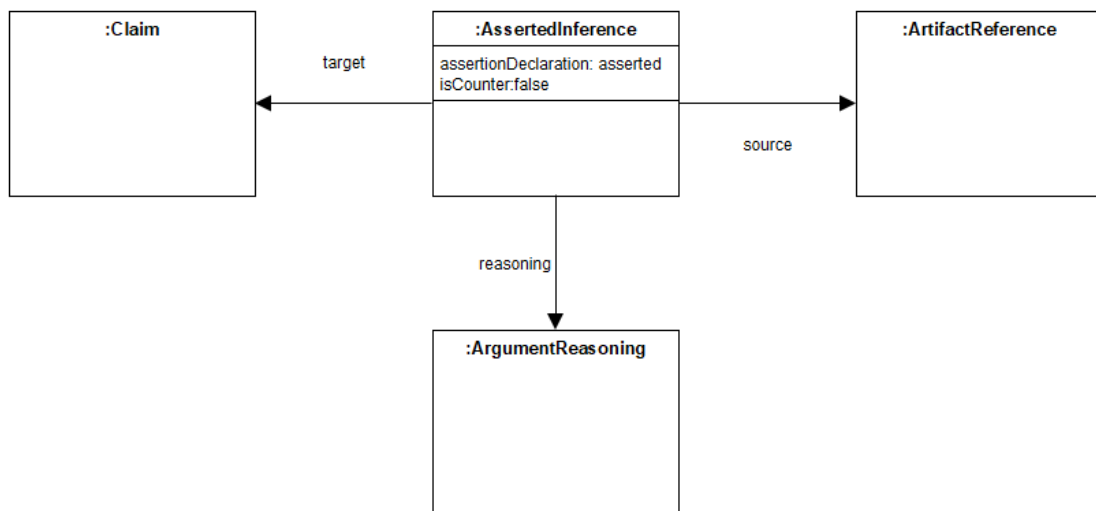


Figure 10

1.5 Context

When documenting a GSN goal of strategy it can also be important to capture the context in which the claim or reasoning step should be interpreted. This is done in GSN by documenting contexts.

Figure 11 shows an example context in GSN.

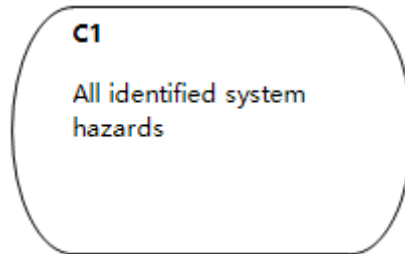


Figure 11

The equivalent of C1 is shown in Figure 12.

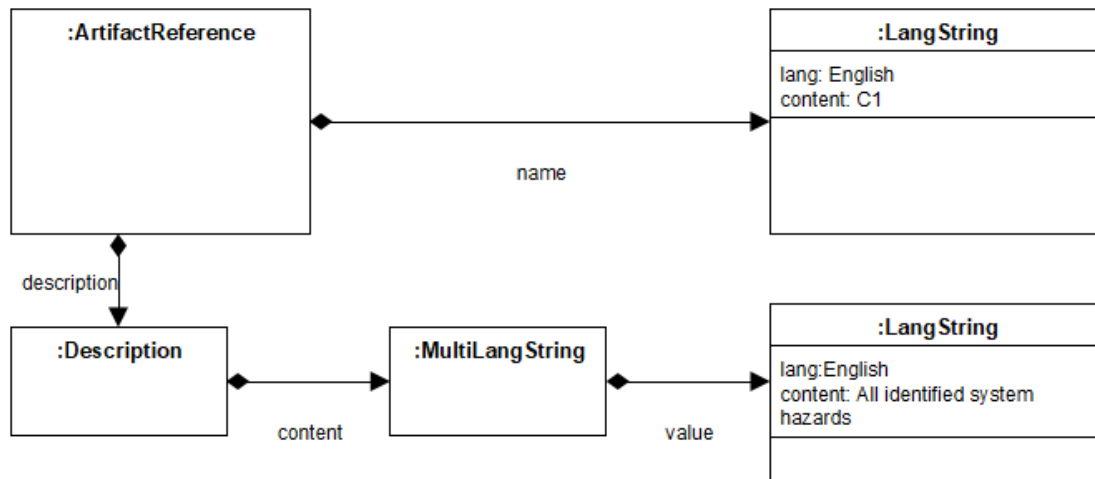


Figure 12

1.6 Assumptions

Some claims and argument strategies rely on assumptions to hold to be valid. These assumptions can be documented in GSN using the Assumption element, as shown in Figure 13.

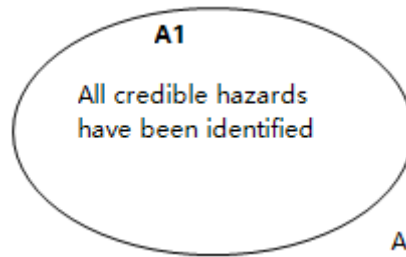


Figure 13

The SACM equivalent of A1 is shown in Figure 14.

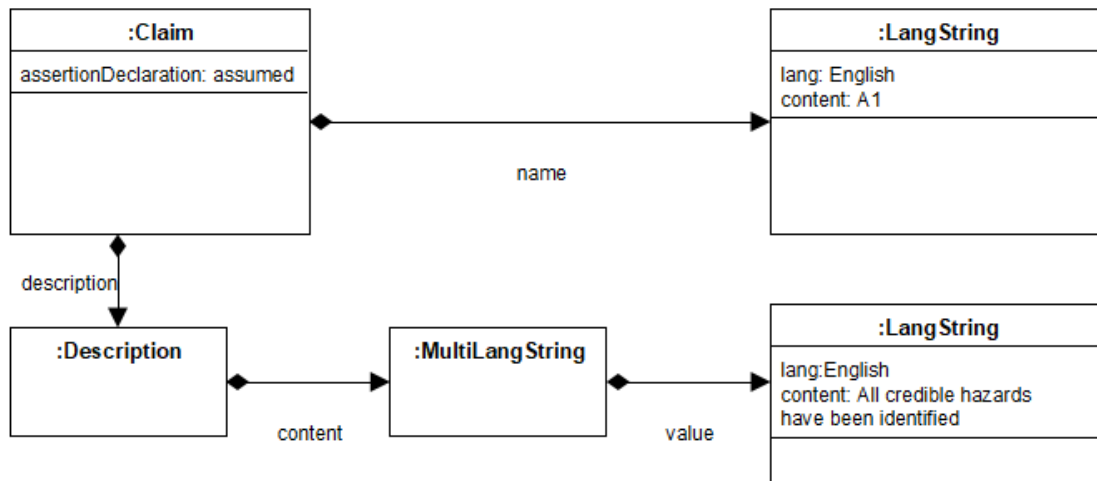


Figure 14

1.7 Justification

Argument authors may feel the need to justify a particular claim or argument strategy, to provide explanations as to why they consider it acceptable. This is done in GSN with the use of the Justification element, as shown in Figure 15.

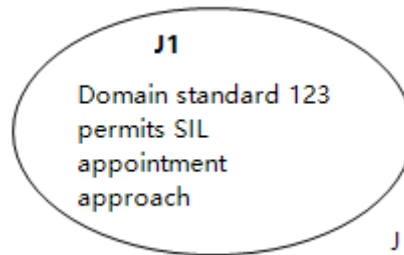


Figure 15

The SACM equivalent of J1 is shown in Figure 16.

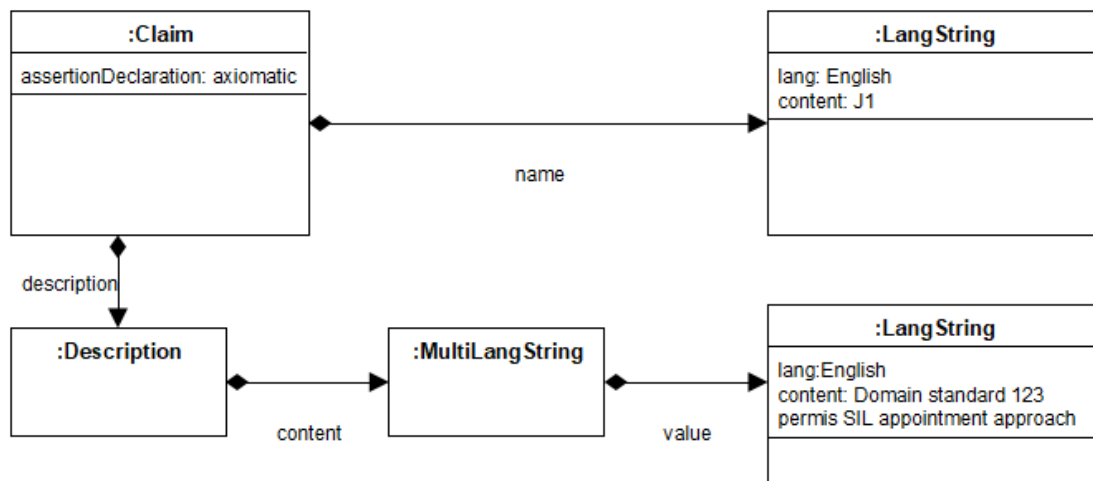


Figure 16

1.8 InContextOf

Context, Assumption and Justification can be attached to Goal or Strategy with the InContextOf relationship as shown in Figure 17.

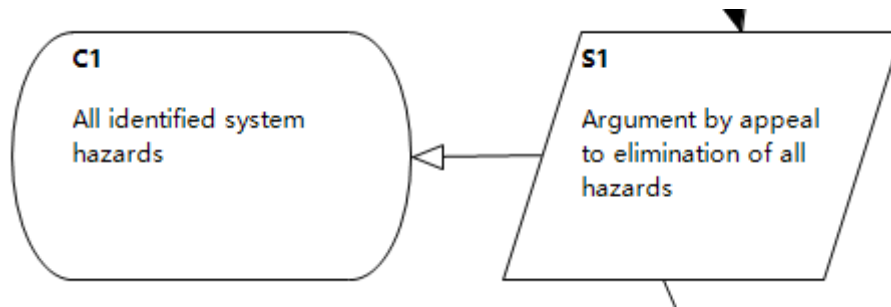


Figure 17

The SACM equivalent of the above segment is shown in Figure 18.

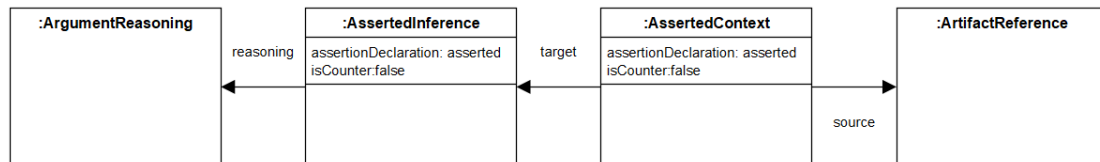


Figure 18

1.9 Module

In modular GSN, Modules are used to organise arguments. An example of GSN Module is shown in Figure 19.

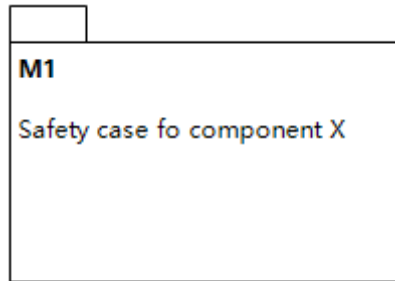


Figure 19

The SACM equivalent of M1 is shown in Figure 20.

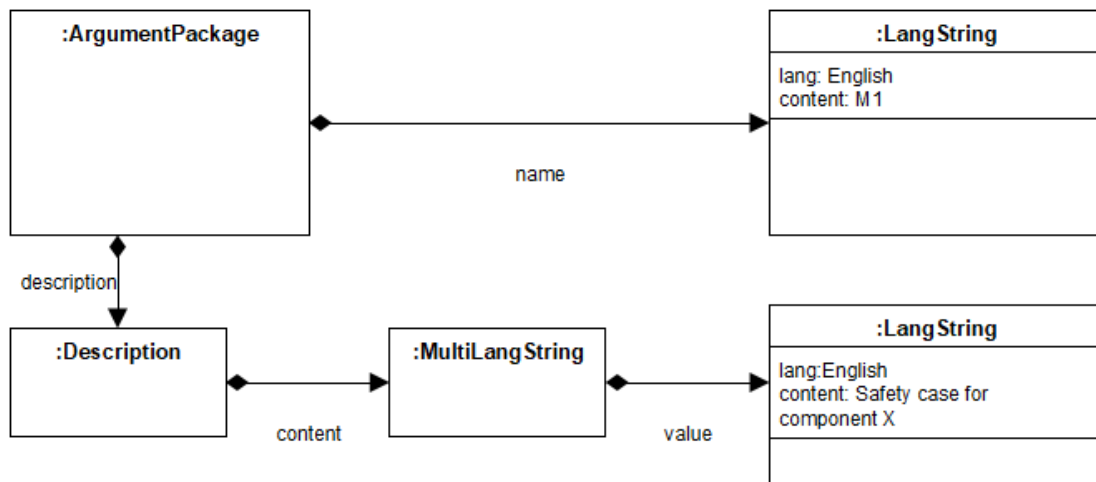


Figure 20

The example Module in Figure 21 puts together all previously mentioned concepts in one Module. The SACM equivalent of M1 (and its contained argument) is shown in Figure 22

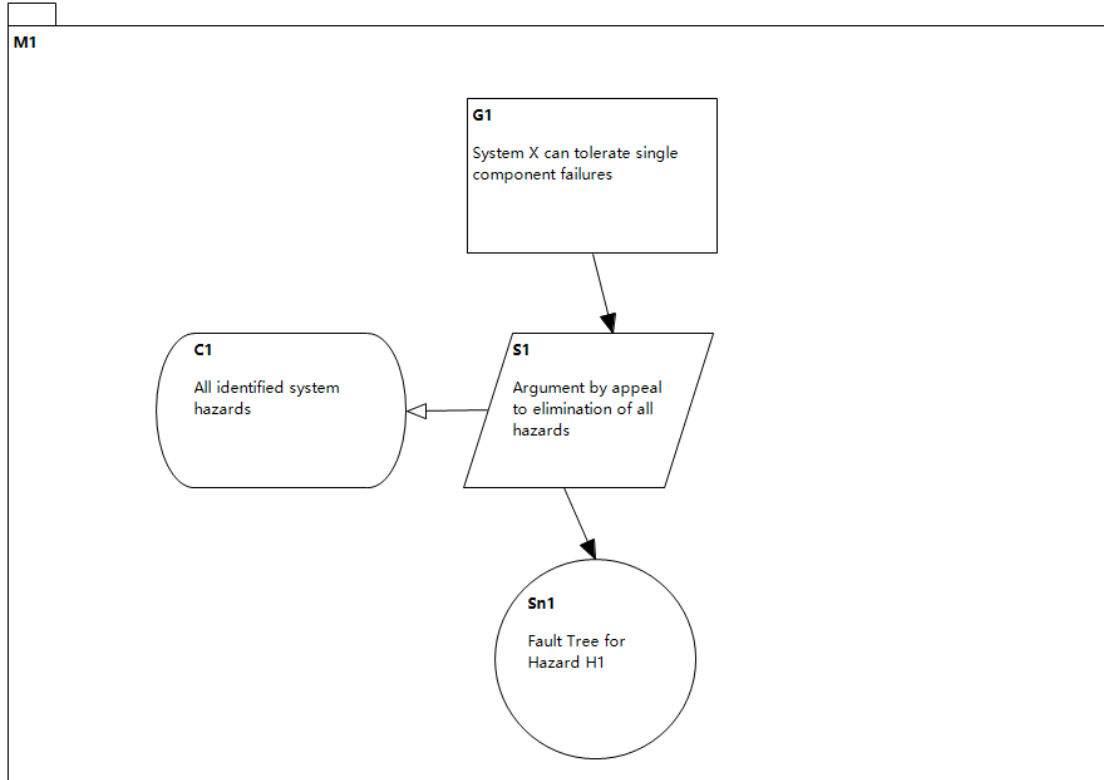


Figure 21

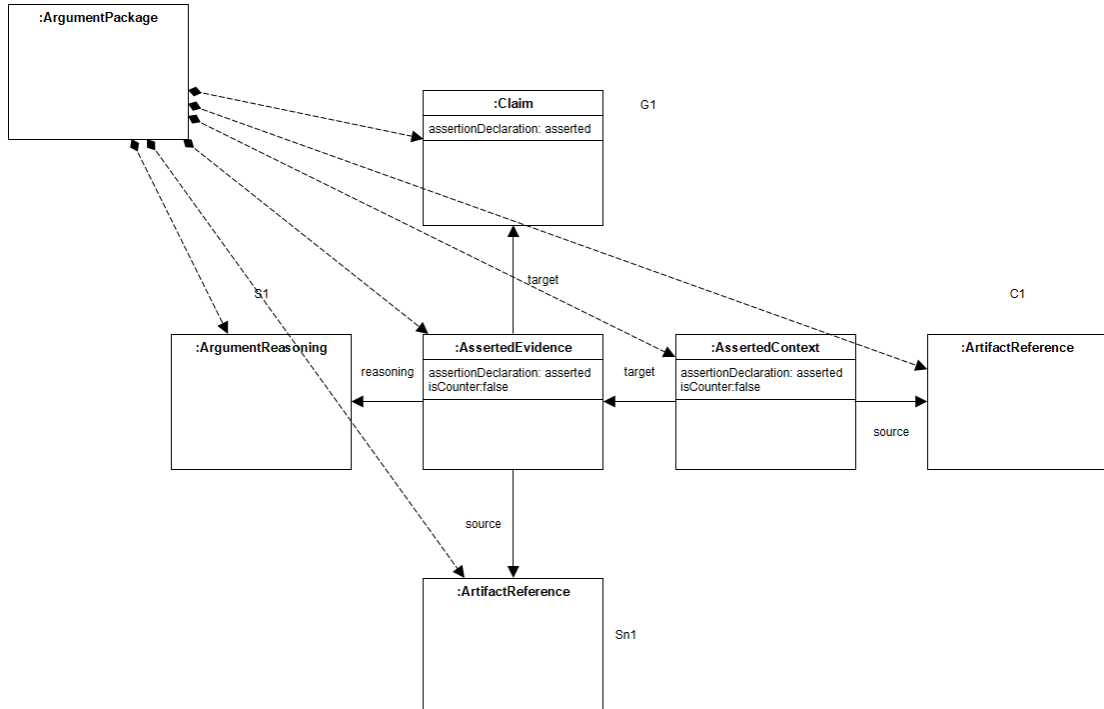


Figure 22