Goal Structured Notation (GSN)

Introduction

The aim of this annex is to give the reader an understanding of GSN as used within annexes B and C of this document.

GSN is a graphical notation for the description of arguments and enables clear communication of complex, comprehensive and defensible argument. The purpose of the goal structure is to show how *goals* are broken down into sub-goals, and eventually supported by evidence (*solutions*) whilst making clear the *strategies* adopted, the rationale behind the approach (*assumptions, justifications*) and the *context* in which the goals are stated.

This annex provides an explanation of the GSN symbology used to represent the Tornado Safety Cases and the numbering system employed.

Notation

The symbols used to represent these components of the argument can be seen at Figure 1

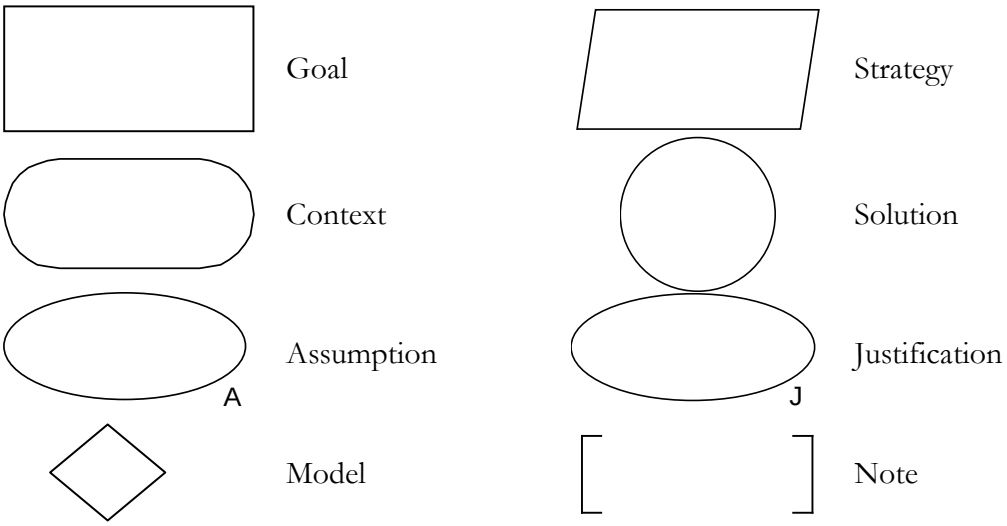

Figure 1 – GSN symbols

To illustrate how these symbols, often referred to as "nodes", are used to represent an argument, Figure 2 has been produced. This simple example shows how the goal of showing 'subsystem architecture is safe & suitable' will be achieved. The strategy box is used to explain or clarify the approach being used to achieve the higher goal. In this case the example indicates that the top goal can be achieved through successful demonstration of *both* of the two sub-goals. It can be seen that the first sub goal is to show that the design is appropriate, however, the meaning of appropriate in this context must be qualified. Also this goal relies upon the assumption that the specification is correct. The solution box below this sub-goal indicates how this goal has been achieved.

The symbol ◇ as shown beneath the context node " Appropriate = ?" indicates that this definition requires further *development*. Similarly, the symbol △ that appears beneath the goal numbered **2** shows that the goal requires *instantiation* i.e. it lacks credible supporting argument or evidence.

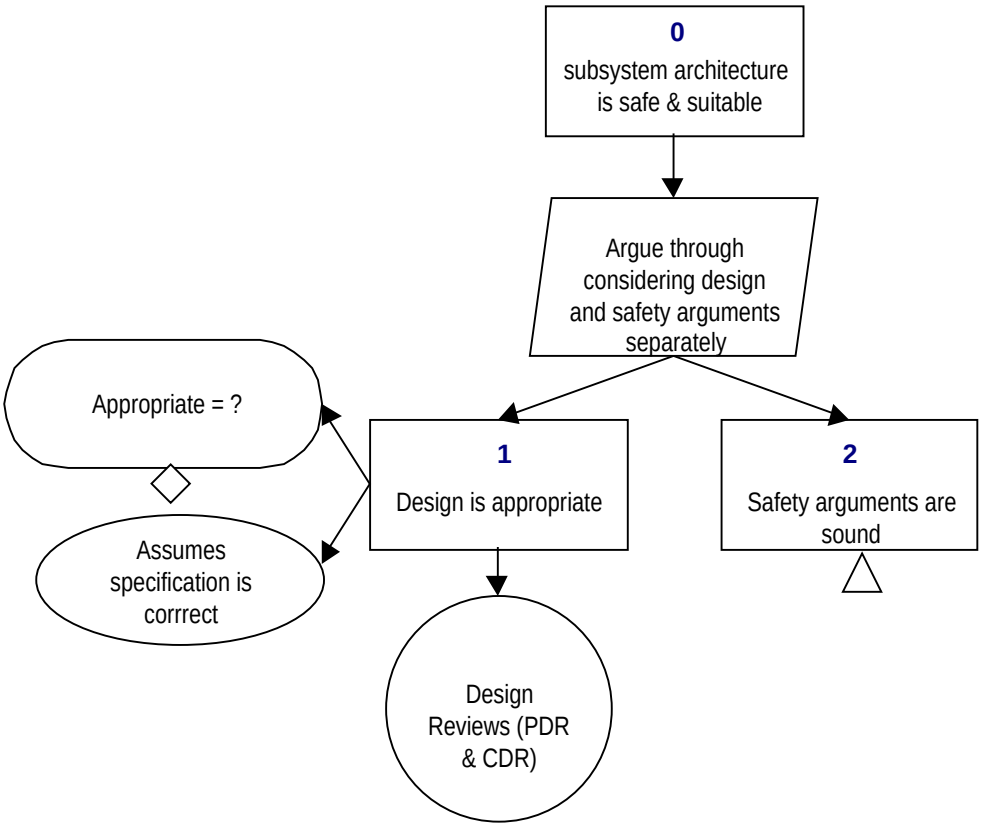

Figure 2 – Example argument using GSN

Numbering System

The GSN numbering system employed within the Tornado Safety Case have been chosen to to allow traceability up and down the goal hierarchy. The top-level goals in Annexes B and C are designated as goals **0** with subordinate goals numbered along the lines of a Work Breakdown Structure. Thus Goal **11** will be the first sub-goal of Goal **1** and Goal **112** will be the second sub-goal of Goal **11**.

Given the large number of nodes in the two Tornado GSNs, this numbering convention is only employed for the goals. All other nodes e.g. contexts, assumptions, strategies, solutions, are identifed by reference to their related goal.