

HyperMSCs with Connectors for Advanced Visual System Modelling and Testing

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Abstract. Experiences with the use of the MSC language for complex system specifications have shown that certain extensions are necessary in order to arrive at sufficiently transparent and manageable descriptions. Extended HMSCs, where MSC reference symbols may either be presented by hypertext-like descriptions or, in an expanded form, as detailed MSCs, appear to be especially suitable for a compact and transparent MSC representation. For an effective usage of such advanced MSC constructs, a corresponding tool support seems to be mandatory where interactively the event structures of special paths can explicitly be expanded while others remain hidden as MSC references that contain solely textual descriptions. The name ‘*HyperMSCs*’ is proposed for such extended HMSCs. Beyond that, the communication between MSC references, operator expressions or HMSCs demands a generalisation of the gate concept. For that purpose, the introduction of MSC *connectors* denoting logical connections is suggested. MSC connectors may be expanded similar to MSC references. HyperMSCs enhanced by MSC connectors also provide a means for a selected visualisation of large MSCs in an interactive manner where, depending on the current selection, some parts are exhibited in full detail whereas other parts are presented in an abbreviated form. The same concepts may be applied for system modelling based on stepwise refinement starting with HyperMSCs, decomposed instances and MSC connector communication and for system testing.

1 Introduction

While Message Sequence Charts (MSCs) without any doubt are amongst the most popular and successful description techniques now, their real potential has not yet been exploited. Although the MSC language [8,15,22] contains very powerful composition mechanisms and other structural concepts, the language is still

used essentially to define a set of sample behaviours. However, with the increasing popularity of the MSC language, a more comprehensive application is demanded by some user communities. Recently, MSCs have been applied for a graphical presentation format for TTCN-3 test cases [16,17,19] and appears more intuitive than the tabular presentation format of TTCN-3. Experience with a comprehensive MSC based specification has shown that the MSC language needs certain extensions to facilitate reading and understanding of MSC diagrams, and to support and ease the handling of MSC documents. These extensions are strongly related to a corresponding advanced tool support. Hypertext-like mechanisms have been suggested for an appropriate handling of large MSC documents [6,16,17]. Because of this hypertext analogy, the term ‘HyperMSC’ has been introduced.

More generally, HyperMSCs can be viewed as a means for a selective detailed visualisation of certain parts of MSC, and consequently a hiding of other parts. With suitable tool support, such a selective visualisation may be quite flexible:

- MSC references may be folded and unfolded presenting their contents in a highly interactive manner; or
- decomposed instances can be used as a special kind of MSC reference to hide the message interaction description between selected instances if these messages actually are not in the focus of interest.

In addition to MSC references interpreted in a hypertext-like manner, the introduction of the *MSC connector concept* into the MSC language may be valuable for the same purpose. For complex MSC operator expressions MSC connectors have been proposed as a generalisation of the gate concept in [12,13]. They may be used quite generally for the hiding of the detailed description of the message flow between MSC references or decomposed instances. Furthermore, MSC connectors may be used to predefine communication patterns that could be re-used in different places thus providing for the compositionality of MSC specifications.

In the next section, a brief description is given of the MSC presentation format developed for TTCN-3 test cases at ETSI. This provides a motivation for the concepts of HyperMSCs and MSC connectors. Within Sect. 3, the concept of HyperMSCs is elaborated and demonstrated using an example of the CCBS service specification. Sect. 4 is dedicated to the introduction and elaboration of the MSC connector concept and in particular to the inclusion of MSC connectors into the HyperMSC concept. In Sect. 5, a summary and outlook is provided.

2 Motivation: A HyperMSC-Based Presentation Format for TTCN-3 Test Suites

An MSC-based presentation format for TTCN-3 [19] has been developed as part of the ETSI Specialist Task Force on “Specification of a Message Sequence Chart/UML format, including validation for TTCN-3” – [16,17, and ETSI STF 156]. Experiments with different variants of MSC representations