From MSC-2000 to UML 2.0 – The Future of Sequence Diagrams

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Abstract. This paper discusses how MSC-2000 could influence the Sequence Diagrams within UML 2.0, and why the UML 1.x semantics is partly inadequate for what is needed in the area of sequence charts. Extracts of a possible UML meta-model is shown and this can be understood as a conceptual model for MSC-2000 as well and an indication of an approach to the future MSC-2000 semantics. UML Collaboration Diagrams have no direct counterpart in SDL/MSC and the difference between sequence diagrams and collaboration diagrams is analyzed.

1 Introduction

MSC-2000 [1] was finalized in 1999. The most updated version is on the SDL Forum Society web-site http://www.sdl-forum.org.

UML is becoming the predominant industry standard for modeling. We all know that UML 1.x [2] is not the ultimate language. Therefore experts of the SDL/MSC community are taking part in the standardization process of UML 2.0, which will probably emerge as a complete set of notations in 2002. In this context it has been recognized that UML 1.x is too limited with respect to sequence diagrams, and since MSC-2000 has been mentioned a number of times in the UML community [3] they are expecting to find inspiration from it.

It is not the situation that MSC-2000 as a whole will be included in UML 2.0. Firstly there is a need to recognize that UML 2.0 will have the same "look-and-feel" as UML 1.x. There will probably (as usual) be strong requests to keep the changes as backwards compatible as possible. Secondly while MSC is a standalone language, UML sequence diagrams are one notation out of about ten diagram types, and the basic concepts must be aligned across these notations.

The requirements for UML 2.0 are set down in the Request For Proposal [4] and contain the following

> *6.5.4.3 Interactions*
> – Proposals shall define mechanisms to describe the decomposition of a role in an interaction into an interaction of its constituent parts.
> – Proposals shall provide mechanisms to refer from one interaction to other interactions to support composition of interactions. It shall be possible to define, at least, sequences of interactions, alternative interactions based on conditions, parallel execution of interactions, and repetition of an interaction.

R. Reed and J. Reed (Eds.): SDL 2001, LNCS 2078, pp. 38–51, 2001.

It is easily seen that these requirements correspond well with mechanisms already found in MSC in 1996 [5].

In this paper we focus exclusively on interaction diagrams (sequence and collaboration diagrams). UML activity diagrams also have similarities with sequence diagrams, but are not considered in this paper. Furthermore we have concentrated on answering the requirements of the RFP cited above and have not found room to discuss the possible impact of introducing even more of MSC-2000 such as more formal data, improved time constraints and improved control thread description. These aspects of MSC-2000 are not excluded by the RFP, but are not the main focus. We expect that sequence diagrams of UML will follow a maturing process rather the same as that of MSC. As UML 1.x sequence diagrams are similar to MSC-92, it is reasonable that the most focused changes are those that appeared in MSC already in 1996.

The organization of this paper is to present and discuss their similarities and difference of the UML diagrams: Collaboration diagrams and Sequence diagrams. Then we show how the well-known MSC mechanisms could be applied in the context of UML 2.0 Sequence Diagrams. We present a suggestion for a UML meta-model. We then discuss Collaboration diagrams for UML 2.0. Finally we summarize.

2 The Conceptual Model of Collaboration and Sequence Diagrams

UML is a set of graphical notations, but there is no graphical grammar as we can find in SDL and MSC standards. They have an abstract grammar in the form of a "meta-model". This meta-model is described in subset of UML itself (though in principle it should be described in another notation called MOF, which is similar to a subset of UML). The subset used for the meta-model is basically the class diagram. Even though it is supposedly an abstract grammar, it is sometimes confused with a conceptual model, which is not always exactly the same.

In the UML 1.x meta-model and the corresponding semantics, Interaction diagrams and Collaboration diagrams are two different views of the same model. They both describe interactions between something (somebody).

There are two distinct issues here:

1. What happens when we want to describe more elaborate structures than simple method-call constructs?
2. What are the things that interact, send messages etc.? These are questions about "roles".

If we look at the two forms, collaboration and sequence diagrams, they are quite similar. Collaboration diagrams are Sequence diagrams where the time dimension has collapsed and been replaced by a numbering scheme. An example is shown in Fig. 1.