Chapter XIV

Extension to UML Using Stereotypes

Daniel Riesco
Universidad Nacional de San Luis and Universidad Nacional de Rio Cuarto, Argentina

Paola Martellotto
Universidad Nacional de Rio Cuarto, Argentina

German Montejano
Universidad Nacional de San Luis, Argentina

ABSTRACT

The objective of this chapter is to first present the basic extension mechanisms proposed by UML. We then propose an extension to facilitate the modeling of specific applications. UML provides three extension mechanisms to allow the modelers to make some common extensions without having to modify the language of modeling underlying “Tag Values,” “Restrictions,” and “Stereotypes.” There are several adaptations of UML, which occasionally exceed the extension mechanisms of UML. In this chapter, we present our proposal of “Evolutionary Stereotypes.” We also present a tool that incorporates evolutionary stereotypes within two modules: the model checker and the dynamic semantics. A case study about time restrictions in a real-time system is shown. The reason for this proposal is that UML provides mechanisms for doing extensions; but, UML does not assure incorporation of new elements to the meta-model with dynamic semantics.

INTRODUCTION

Unified Modeling Language (UML) provides a wide set of modeling and notational concepts to cover the needs of modeling software projects. However, users often require
new notations and additional characteristics, which are not included in the standard
UML. These needs are satisfied by way of different extension mechanisms, which allow
new classes of modeling elements to be included. These mechanisms can be used to
define the semantics, characteristics, and notations of new elements in relation to the
UML meta-model.

The extension mechanisms provided by UML (Booch, Rumbaugh & Jacobson,
2000) are the tag values, the restrictions, and the stereotypes. Additionally, there are
several proposals to extend UML that exceed the extension mechanisms proposed by
UML. Among them, is the possibility to mention the different types of stereotypes as
decorative, descriptive, and restrictive stereotypes defined by Schleicher and Westfechtel
(2001). These add more semantics to the meta-model and build a base for model analysis.
However, to assure consistency and code generation, external modules should be
introduced.

The stereotypes have been broadly used in different domains, for example, to
instance the model of Web applications, to assist in the design of real-time, object-
oriented systems, to assist in the design framework, to capture the structure and behavior
of communication protocols, etc. In these proposals, the stereotypes (like extensions to
UML) are used. The best stereotypes are restrictive; but, they do not allow a new
semantics to be associated to the elements that have been incorporated in order to assure
consistency with the UML meta-model.

The evolutionary stereotypes (Riesco et al., 2002) are found in other existing
proposals to extend the UML meta-model. These are incorporated into modeling tools
so that developers can modify the meta-model, incorporating new elements with the
Corresponding semantics. This incorporation is carried throughout the definition of
classes that introduce new semantics, but that also maintain consistency with the meta-
model. The modules to check consistency and for code generation are incorporated in
modeling tools to facilitate the developer’s task when extending the UML meta-model.

The objective of this chapter is to present the basic mechanisms of the extension
proposed by UML, as well as extension proposals that have arisen to facilitate the
modeling of specific applications.

UML EXTENSION MECHANISMS

UML provides three extension mechanisms to allow modelers to make some
common extensions without having to modify the underlying modeling language.

The UML extension mechanisms (Booch, Rumbaugh & Jacobson, 2000) include:

- **Tag values**: Tag values provide a form for defining new properties of elements that
  already exist.
- **Restrictions**: These provide a form for imposing rules about the elements and their
  properties.
- **Stereotypes**: Stereotypes provide a form for defining new extensions of elements
  and refining the semantics of elements that already exist.

On the whole, these three extensibility mechanisms allow for configuration and
extensions of UML according to the specific project requirements. These mechanisms
Rules Verification and Validation

[www.igi-global.com/chapter/rules-verification-validation/35863?camid=4v1a](www.igi-global.com/chapter/rules-verification-validation/35863?camid=4v1a)