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Chapter XIV

An OO Methodology Based on the Unified Process for GIS Application Development

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ABSTRACT

This chapter introduces an object-oriented methodology for Geographical Information Systems (GIS) development. It argues that a COTS-based development methodology combined with the UML, can be extended to support the spatiotemporal peculiarities that characterize GIS applications. The author hopes that by typifying both enterprises and developments, and, with a thorough knowledge of the software component granularity in the GIS domain, it will be possible to extend and adapt the proposed COTS-based methodologies to cover the full lifecycle. Moreover, some recommendations are outlined to translate the methodology to the commercial iCASE Rational Suite Enterprise and its relationships with tool kits proposed by some GIS COTS vendors.

INTRODUCTION

As in other domains, the development of GIS follows the new trends in technology (i.e., Microsoft .NET, WEB services, etc.) and in methodology (Component Based Development (CBD)). The object-oriented paradigm has also been adopted in the GIS developments. For example, object-oriented modeling languages, such as UML, have been extended to support spatiotemporal characteristics. New proposals to extend, adapt or complement previous solutions in areas, such as requirements engineering, modeling languages, methodologies, patterns, and so on, are continually appearing in the scientific community. However, from the enterprise point of view, the use of these proposals is not a straightforward matter.

On the other hand, the market offers new alternative software products or new versions, with the interoperable capability based on the current standards (Opengis, FGDC, ISO, etc.). However the capability to integrate these new software products at the same rate as they emerge is often lacking, when the methodology used does not contemplate this kind of change. So GIS application developments, particularly those carried out in small and medium enterprises, face the same risks or problems as the software developed in other domains:

- inaccurate understanding of end-user needs;
- inability to deal with changing requirements;
- modules that do not fit together;
- software that is hard to maintain or extend;
- late discovery of serious project flaws;
- poor software quality;
- unacceptable software performance;
- team members are in each other's way, making it impossible to reconstruct who changed what, when, where and why;
- an untrustworthy build-and-release process;
- businesses' demand for increased productivity, improved quality with faster development and deployment and the building of software in a repeatable and predictable fashion.

In this chapter, we outline a methodology that covers the full lifecycle of the software engineering process in the GIS domain. Software engineering addresses a wide diversity of domains (e.g., banking, transportation, manufacturing), tasks (e.g., administrative support, decision support, process control) and environments (e.g., human organisations, physical phenomena). The scientific community agrees that a specific domain/task/environment may require some specific focus and dedicated techniques. This is the case with GIS due to its spatiotemporal peculiarities. In particular, activities like domain analysis as well as requirement elicitation and specification are the main topics of research carried out in the GIS domain. This