The Emerging ISO10303 Modular Architecture:
In Search of an Agile Platform for Adoption by SMEs

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ABSTRACT

ISO10303 STEP (STandard for the Exchange of Product model data) released a suite of application protocols covering the most important product life-cycle activities. The maturity in the development and usage of these standard models was conducted to the redesign of the classical architecture of STEP application protocols to a more agile architecture in order to better fit the emergent technologies and facilitate the understanding, development, reuse, and implementation of normalized reference product data models. This paper introduces the new modular architecture of ISO10303, comparing it with the classic architecture of STEP. Then, it describes the structure of the new modular AP236, concluding with a proposal for a graphical framework for the design and development of normalized modules and new modular application protocols.

Keywords: AP326; graphical modeling; ISO10303 STEP; modular application protocols; product data model; XML

INTRODUCTION

The increasing number of specialized and complementary software applications working for the industry and, specifically, those covering inter-cross-industrial areas, has driven information technology (IT) providers and industry, in general, to look for standards to represent process and product data (Chen, 2004).

Currently, standards are a basis for the implementation of electronic services and data exchange, which support the interoperability among related applications when executed in integrated platforms (Jardim-Gonçalves, 2001a).

Most of the application protocols (APs) have been developed with the contribution of the major international industrial companies and experts, under the umbrella of international organizations, such as the ISO10303 STEP model data (ISO10303, 2003).

An AP represents the standard reference model for a specific scope of an application. APs are independent of software applications, and its reference models are described, using the EXPRESS language (ISO10303-11, 1998). The data are exchanged, using Standard Data Access Interfaces (SDAI, ISO10303-22, 1996), Neutral Format (ISO10303-21, 2001), or XML (ISO10303-28, 2003).
Motivations for Adoption of Modular APs

To cover the complete scope of one application domain, the standard protocol may lead to very complex models. To reduce this problem, the research community has been working to support the reuse, integration, and extensions of already existent APs by stimulating the recycling of most of the existent standardized work and by providing easier mechanisms to manage and understand the reference models (ISO TC184/SC4, IS - ISO 10303, Part1, 1994).

Modularization is the newest activity that was recently introduced to STEP. With it, selected modules can be combined dynamically as the basis for the development of completely new APs. The intention is to make the APs more interoperable, cheaper, easier to understand and manage, and quicker to develop.

In this new modular architecture, each module is seen as a small AP, with its respective reference and interpreted model. The inclusion of the application reference model in a module is a major clue in the modularization approach, because it extends the application interpreted construct (AIC) concept of the classical STEP architecture in a closer industrial representation.

Compared to the typically complex integrated models in the classical architecture of STEP, the standard modular architecture better supports the development of future new systems. Its granularity makes the representation of systems more flexible, interoperable, and independent. Figure 1 depicts the typical architecture of a modular AP.

The development of a new module is driven from different sources and by many requirements in order to provide an appropriate contribution to the set of standard modules and a better integration in the AP in development.

A modular AP is developed by integrating a set of modules. These modules can be new or reused from the repository of available standard modules. Major identified advantages in adopting a modular architecture are:

- Reduction of the high cost of developing a completely integrated AP, since it is composed mostly of a set of available modules;
- Different APs can have the same requirements, and the use of the same module in different APs can avoid different solutions for the same scope and requirements;
- Modules can be reused, ensuring the compatibility in the use of the existing data and in the reuse of the interfacing software to access the data;
- Modular APs easily can be extended, reduced, or reused.

Graphical Representation and Edition of Modules

The development of APs is a complex task, requiring expertise in the application scope and standard methodology. The introduction of visual components can assist the develop-

![Figure 1. Architecture of a modular AP](image-url)
Pre-Standardization of Cognitive Radio Systems
Vladislav V. Fomin, Arturas Medeisis and Daiva Vitkute-Adžgauskiene (2012).
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