Chapter VI

Requirements for the Testable Specifications and Test Case Derivation in Conformance Testing

Tanja Toroi, University of Kuopio, Finland

Anne Eerola, University of Kuopio, Finland

Abstract

Interoperability of software systems is a critical, everincreasing requirement in software industry. Conformance testing is needed to assure conformance of software and interfaces to standards and other specifications. In this chapter we shortly refer to what has been done in conformance testing around the world and in Finland. Also, testability requirements for the specifications utilized in conformance testing are proposed and test-case derivation from different kinds of specifications is examined. Furthermore, we present a conformance-testing environment for the healthcare domain, developed in an OpenTE project, consisting of different service-specific and shared testing services. In our testing environment testing is performed against open interfaces, and test cases can, for example, be in XML (extensible markup language) or CDA R2 (clinical document architecture, Release 2) form.
Introduction

In many organizations, the number of information systems is large and hence so are integration needs between these systems. At the moment, new systems are integrated into existing ones by tailoring them separately often by point-to-point integration. This is extremely expensive and inefficient in the long run. Application integration and process integration between organizations have increased the need to agree about common standards and open interfaces. By application integration we mean integration between software systems, whereas by process integration we mean the integration of human activities inside or between organizations. Normal software testing with different variations is important to assure functionality and quality of software systems, and their interoperability. If systems have open, standard-based interfaces their interoperability improves, introduction and integration become easier and less local adaptation work is needed. Today standardisation and conformance testing of open interfaces have been emphasized nationwide and internationally. Normally, the target architecture is defined first and interface definitions are then derived based on it. However, the development is still in its infancy. Interface definitions are not enough, conformance testing is also needed to examine if the systems really conform to standards or other specifications. Conformance testing can be utilised by component developers, component integrators and software clients. Component developers can show conformity to the standards of clients. Component integrator checks conformance to standards and integrates components without a great amount of local tailoring. Clients benefit from implementations that conform to standards by getting better interoperability and quality of software. In addition, clients may only change some components when renewing the system, and a big-bang situation, in which the whole application must be renewed at the same time, can be avoided.

Standardisation and conformance testing have been studied quite a lot in the telecommunication domain (ITU-T Recommendation X.290, 1996) but the practice is not well-established in other domains. Some business processes are quite deterministic (e.g., order-delivery and referral-report), while others are nondeterministic (e.g., marketing and home care) and the execution order of the processes can not be predicted as easily as the order of manufacturing processes. In general, a great number of interfaces exist to other systems. For example, in Kuopio University Hospital in Finland there are more than 180 information systems, most of them with nonconsistent or nonexisting interfaces. Those information systems have to communicate inside and between different organizations. Local tailoring is needed, which, in turn, causes interoperability problems. Systems are handling patient data. This also partly increases the difficulty to standardise data. In addition, systems are safety critical. Thus, interfaces and systems are harder to standardise and conformance testing is more difficult to perform than in many other domains. Standards are needed to promote interoperability. However, it should be remembered that standards can also be contradictory, such as ISO 15745 and ISO 16100 standards for interoperability (Kosanke, 2005).

In the OpenTE project, our research problem is how to develop a reliable conformance-testing environment for healthcare applications. The environment should be applicable in the software industry and healthcare organisations. We use constructive and experi-

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