Testing Communicating Systems: a Model, a Methodology, and a Tool *

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Abstract. This paper follows two main lines of research. The first line is related to the study of models for the description of systems. For this line, we introduce the model of *Communicating Systems* (CS), which defines a set of common resources, a set of entities, and a topology of communication. The second line focuses on testing methodologies adapted to protocol testing. For this line, we give a formal definition of a generic generation algorithm (GGA). We demonstrate that the CS model with a GGA supports various 1) test architectures, 2) test types: conformance, interoperability, embedded, component testing, and 3) test approaches: passive and active testing. The paper presents also the main characteristics of the TGSE tool (Test Generation, Simulation, and Emulation). TGSE is made-up of a test case generator, based on the CS model and implementing a GGA, a graphic simulator of the execution of a sequence generated by TGSE, and a real-time emulator of communicating specifications. In its current version, TGSE supports the passive and active testing of one or several components with data and temporal constraints.

1   Introduction

Protocol specifications are used to develop products and services. To ensure correctness of such products (implementations), testing, the process of checking that a system possesses a set of desired properties and/or behaviors, is one of the most used validation techniques.

Testing process is a hard work that is long, repetitive and which represents a potential source of errors. The use of formal specifications provides support for automating this process. Different models (FSM, EFSM, CEFSM, LTS, IOLTS, TIOA,...) and languages (SDL, Lotos, IF, UML,...) have been proposed to describe protocols and the desired behaviors about them in a formal way. Due to the nature of protocols/functions being tested, various test types are required. For example, in conformance testing, a single implementation is compared to relevant standards. In interoperability testing, two or more implementations are tested directly against each other, with the standard used primarily as a reference to adjudicate problems and incompatibilities, and secondarily as a guide

Testing Of Communicating Systems

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