A Conceptual Framework for Testing Communications Protocols

This paper mainly talks about the issues in conformance testing of communication protocols. It first introduces the background of communication protocol testing. In order to achieve a reliable environment and ensure the interoperability of various manufactures equipments, we must ensure that the protocols conform to their respective standards. This concept is emphasized by International Organization for Standardization (ISO) and the International Telegraph and Telephone Consultative Committee (CCITT). The languages communication protocols use is not precise enough so that different interpretations will lead to different implementations which can not interoperate with each other. Due to complexity, ambiguity and variety of protocols and specifications, the testing has become a challenging task. The importance of this task has been recognized by researchers and a considerable number of papers are presented. They focus on both theoretical and practical aspects of the testing but seldom of them give a complete perspective. In the early 1980’s, research and development was initiated on methods to test the Open System Interconnection communication protocols in Europe. Other organizations and countries subsequently joined the effort which resulted in a focus and growth of interest in conformance evaluation methods. And this consequence will finally result in a standardized language and standardized test methods for use in ISO and CCITT.

The paper introduces the fundamental model of the protocol and the services it provides, as well as the methods to represent the protocol specifications. It also analysis an example of testing a four-function calculator to illustrate the basic concepts in testing and provides an analogy between this test and conformance testing of communication protocol: being tested as a black box is the fundamental assumption in conformance testing. The paper also includes a section listing a set of papers to discuss the concepts and terminology in this tutorial. The difficulty involved in conformance testing is defined, with the OSI-RM structure discussed. Formal tools like finite state machine which is used to describe the protocol specifications are also introduced with the methods to representing it and formal techniques used in it.

In conclusion, this paper introduces to us a fundamental framework underlying standardized communication protocol which is called OSI Reference Model. Each layer of it is independent so that it doesn't need implementation details of other layers. Definitions and relationships between protocol specifications are discussed, as well as two data transmission modes, connection and connectionless oriented. Formal tools FSMs and EFSMs are introduced to represent protocol specifications. It also provides each FDT with an example and leave a further topic as an advance study for interested readers.