

Test Architecture for Distributed Network Management Software

József Hosszú

It is expected that in the near future the appearance of Internet Protocol (IP) based mobile networks and the growing number of users and emerging new applications of wired networks bring new tendencies in the number of routers, reaching even thousands [1]. It is essential to manage, i.e. monitor and control such networks. Network management systems (NMS) are being developed for networks of different technologies, being capable to handle the resulting large amount of management data. Testing functionality and performance of such system requires a test network in which the investigation can be carried out, but any firm – even the largest ones – cannot afford building a real test network due to the horrible hardware costs. Therefore, it is required to introduce a cost-saving and efficient method.

Basic functionality, that covers communication between routers and management system, can be verified in a small test network, however, building a large one (with 10,000 nodes) for testing purposes is rather expensive. Network emulation, i.e. imitating the behavior of a network by sending appropriate responses to the incoming packets, is a suitable concept for testing large-scale networks. It is obvious that one machine cannot compete against the capacity of a distributed system, thus the functionality, provided by the network emulator, have to be limited.

The presentation introduces an approach to software testing applicable for distributed network management systems using network emulation and TTCN-3 (Testing and Test Control Notation)[2]. It discusses the requirements for the testing environment, as well as the applicable types of testing (functional, performance and stress). The test architecture and a sample configuration is also described. The method applied is independent from both the networking technology and the applied NMS, as it only requires the proper specification of their interfaces. Developing test cases requires careful and exhaustive analysis of interfaces and system specifications considering non-deterministic and unhandled events during execution. A generalized test port of the applied Tester application provides a reasonable level of transparency of the lower interface [3] of the NMS, and the upper port is also flexible enough to be easily adopted to the user interface of any management system.

References

- [1] Kornél Bigus, “Emulation of Large-scale IP networks”, M.Sc. Thesis, Budapest University of Technology and Economics, 2000.
- [2] ETSI, “Methods for Testing and Specification (MTS); The Tree and Tabular Combined Notation version 3; Part 1: TTNC-3 Core Language”, ETSI ES 201 873-1, 2001.
- [3] ITU-T, Z.500, “Methods for Validation and Testing - Framework on formal methods in conformance testing”, 1997.