Proposal for a Tutorial at DAIS 2001

Testing of Distributed Systems: TTCN-3 and its Graphical Format

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Introduction

In system engineering, testing is a generally accepted approach to validate systems and system components. Assured quality of system and system components is particularly important, as the time-to-market become ever shorter. A systematic approach to testing distributed systems is essential, so that the requirements of the market can be fulfilled. In the past, a methodology and framework for testing distributed systems, known as *conformance testing methodology and framework* (CTMF), have been developed and internationally standardized. CTMF covers all aspects of testing distributed systems such as test suite specification, test notation (TTCN - Tree and Tabular Combined Notation), test implementation and test execution. CTMF has been successfully applied to a number of systems which cover the range of e.g. e-mail systems and directory services to management and IN systems.

Currently, the third edition of TTCN (TTCN-3) has been developed to address testing needs of modern telecom and datacom technologies and to widen the scope of applicability. TTCN-3 is in the finalization phase at ETSI.

It is a text-based language for the specification of tests for reactive systems. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of CORBA based platforms, API testing etc. TTCN-3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing.

TTCN-3 is on syntactical (and methodological) level a drastic change compared to previous TTCN versions. However, the main concepts of TTCN have been retained and improved and new concepts have been included, so that TTCN-3 will be applicable for a broader class of systems. New concepts are, e.g. a test execution control program to describe relations between test cases such as sequences, repetitions and dependencies on test outcomes, dynamic concurrent test configurations, and test behaviour in asynchronous and synchronous communication environments. Further improved concepts are, e.g. the integration of ASN.1, the module and grouping concepts to improve the test suite structure, and the test component concepts to describe concurrent test setups.

In addition to the pure textual format, TTCN-3 defines two presentation formats: A tabular conformance testing presentation format that resembles the tabular form of TTCN-2 and a graphical presentation format that supports the presentation and also the development of TTCN-3 test cases as Test Sequence Charts which are derived from MSC.

Outline

The tutorial on "Testing of Distributed Systems: TTCN-3 and its Graphical Format" will cover the following topics:

- The Test Development Process
- Overview on TTCN-3
- Overview on the Graphical Format for TTCN-3
- Case Study with Example Test Cases for the CORBA ORBs

Related Papers

- Jens Grabowski, Anthony Wiles, Colin Willcock, Dieter Hogrefe. On the Design of the new Testing Language TTCN-3. 13th IFIP International Workshop on Testing Communicating Systems' (Testcom 2000), Ottawa, 29.8.2000-1.9.2000, Kluwer Academic Publishers, August 2000.
- Jens Grabowski. TTCN-3 - A new Test Specification Language for Black-Box Testing of Distributed Systems.17th International Conference and Exposition on Testing Computer Software (TCS'2000), Theme: Testing Technology vs.Testers' Requirements, Washington D.C., June 2000.
- Ekkart Rudolph, Ina Schieferdecker, Jens Grabowski. HyperMSC - a Graphical Representation of TTCN. Proceedings of the 2nd Workshop of the SDL Forum Society on SDL and MSC (SAM'2000), Grenoble (France), June, 26 - 28, 2000.
- Ekkart Rudolph, Ina Schieferdecker, Jens Grabowski. Development of an MSC/ UML Test Format. FBT'2000 - Formale Beschreibungstechniken für verteilte Systeme (Editors: J. Grabowski, S. Heymer), Shaker Verlag, Aachen, June 2000.

Further Material

- TTCN-3 Homepage (http://www.etsi.org/ptcc/ptcc_ttcn3.htm)
- TTCN-3 Launching Event, Oct. 2000 (http://www.etsi.org/ptcc/TTCN3pr.htm)

Target audience and technical level of presentation

The tutorial on "Testing of Distributed Systems: TTCN-3 and its Graphical Format" is targeted at an audience of academic and industrial personnel (e.g., system designer, system and software engineers, project manager).

It is structured to present basics and technical concepts of TTCN-3 and its use within the test development process. The audience will receive a solid overview and details related to the specification-based testing with TTCN-3.

It discusses the new concepts in TTCN-3 that make it in particular applicable to current telecom and datacom technologies (i.e. the support of dynamic configurations, test control and enhanced communication). It will discuss the extension mechanism of TTCN-3 to cover additional testing aspects such as real-time and performance. Finally, it presents the basics of the graphical format and discusses its use for the test development of distributed systems.

Biography of presenter

Ina Schieferdecker studied mathematical computer science at the Humboldt University in Berlin and received her Ph.D. on Performance-Enhanced System Specifications from the Technical University in Berlin in 1994. She attended the postgraduate course on open communication systems at the Technical University in Berlin. Since 1993, she is a researcher at GMD FOKUS and a lecturer at Technical University Berlin since 1995. In 1997, she had a research stay at the International Computer Science Institute, Berkeley, California working on test concepts for IP Telephony Systems. Her technical and research work covers testing methods for distributed systems and formal methods for the design, validation and prototyping of distributed systems. Ina Schieferdecker is the head of the Competence Center for Testing, Interoperability and Performance (TIP) since 1997. Ina Schieferdecker was/is actively involved in several R&D projects on testing being responsible for developing test concepts, designing and implementing test systems as well as performing test campaigns. She wrote research papers on various aspects of testing telecommunications systems and of developing test systems. She is involved in the definition of MSC at ITU-T SG10 and of TTCN-3 at ETSI, in particular in the graphical presentation format of TTCN-3.

Jens Grabowski studied Computer Science and Chemistry at the University of Hamburg, Germany, where he graduated with a diploma degree. During his studies he spent two years at the central research laboratory of the Siemens AG in Munich, Germany, where he focused on protocol specification and protocol validation based on Petri Nets, SDL and MSC. From 1990 to October 1995 he was research scientist at the University of Berne, Switzerland, where he received his Ph.D. degree in 1994. In Berne, he managed several research and development projects in the area of test case specification and test case generation for formally specified protocols. During this time he was also involved in the development of the MSC language at the International Telecommunications Union (ITU-T). Since October 1995, Jens Grabowski is researcher and lecturer at the Institute for Telematics at the Medical University in Lübeck, Germany. Since 1996, Jens Grabowski also works as expert in several standardization projects of the European Telecommunications Standards Institute (ETSI). In these projects, he participates in the development of conformance testing standards and the investigation of methods and tools to improve the ETSI conformance test procedure. Jens Grabowski is member of the ETSI experts team which develops the third edition of TTCN.

Further information

PROPOSED DURATION:
Half day, 3 hours length

MATERIAL:
Approximately 90 slides.

EQUIPMENT REQUIREMENTS:
Beamer for PC Notebook (preferred choice) or overhead projector.