World Class Standards

Use of TTCN3 in 3GPP for LTE Test

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Overview

- Background
- Define LTE Test
- Impacts of LTE test
- Conclusions

3GPP Conformance Test

- Third Generation Partner Project (3GPP) has developed specifications for third generation mobile telecommunications
  - A part of ITU IMT-2000 family
- 3GPP has also developed test specifications for User Equipment (UE – mobile phone) of the earlier technologies (FDD for UMTS, LCR TDD for TD-SCDMA)
  - The test specifications of protocols and signalling have implemented in TTCN2
  - Served the purpose for testing UE conformance and interoperability under the world-wide certification regime
- 3GPP has a large TTCN2 user group, but …
- Has, until now, a relatively young and small group of the TTCN3 users
  - For testing Call Control, Telephony, supplementary Services via IP Multimedia (IMS, MTSI)
- Will the situation be changed? And if it is, how fast will it be?

Long Term Evolution

- Current 3GPP work is focusing on the evolution (LTE) of the standard to provide true broadband mobile and a system beyond 3rd Generation
- LTE will achieve
  - 4 x user throughput
  - 4 x increased spectral efficiency
  - 10 x users / cell
- By the end of 2008, LTE specifications will be sufficiently stable for commercial implementation
- The 1st LTE commercial network will appear in Japan in 2009
- European, American and other Asian operators will quickly follow

Define LTE Test Specification

- All key LTE players have been involved
- The network operators have prioritized LTE features
  - Not prioritized features will have no test – no value for deployment
- The manufacturers have defined the test scenarios and test parameters
  - The test scenarios and parameters simulate the early LTE real networks behaviours
- 400 LTE test cases are now defined for the conformance test of the early LTE UE
- The certification will be started in 2010
- Production of a test specification for the 400 test cases has become the key to the future LTE

Is TTCN3 a right answer for LTE ?

- Is TTCN3 the right language for the LTE test specification?
  - Are there any potential blocking factors at the production of the test specifications by using TTCN3?
- To answer these, a pilot project started to identify the potential TTCN3 problems for LTE before the real LTE test specification is started
- The project resulted in a number of requirements and actions on
  - TTCN3 standardization
  - Core language itself
  - TTCN3 tools
  - TTCN3 host engine
  - LTE test architecture
- 3GPP held three workshops
  - evaluated the results from the pilot project and
- Determined that TTCN3 for LTE test, it is the right answer

TTCN3 Standardization

- TTCN3 core language shall be well maintained, enhanced and improved for the next 5 years
- Shorten the period for resolving problems
  - Current period = 1 year
  - identifying problems in the core language, change request, resolving changed text, MTS approval, ETSI publication
- Ensure sufficient fund to the ETSI STF responsible for TTCN3 maintenance, enhancement and improvement
- ETSI MTS, the TC hosting TTCN3 standardization, has reassured to support LTE test and will provide high priority for all CR from 3GPP
- A new release of ES 201 873 in v341 will be approved by MTS at end of June 2008 for 3GPP LTE test
  - V341 will be implemented in all TTCN3 tools by Oct 2008

TTCN3 Core Language

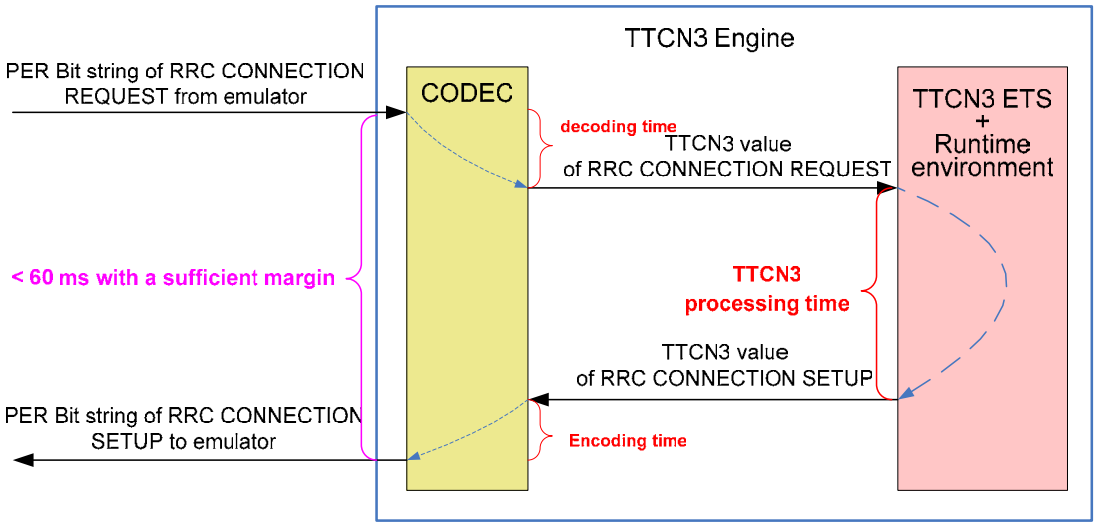
- 3GPP LTE will have a new release every year
  - LTE-Advanced is already emerging
- Each release adds a number of new features on the top
- 3GPP LTE specifications have extension mechanisms to allow the extensibility and backwards compatibility
- TTCN3 core language shall support the extension mechanisms in the LTE specifications
  - Any unnecessary modifications of the existing test specification caused by the rigidity or limitations of the TTCN3 core language shall be avoided when introducing new LTE options.
- Those ambiguities in TTCN3 languages shall be removed
  - If the language ambiguities lead to two different TTCN3 tool implementations which can cause an LTE UE unfairly fail at the test

TTCN3 Tools

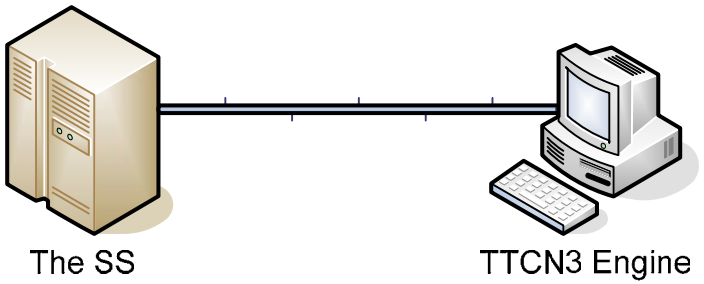
- 3GPP LTE requires multiple TTCN3 tools
- Synchronize all tools to support a unique version of the core language as the tools baseline and move forward in a scheduled way
- All TTCN3 tools shall be compatible with each other
  - Incompatible tools will lead to different LTE test implementations
- Tools shall support ASN.1 types and PER encoding
  - A major difference between the mobile specifications from the IP and wireless ones
- One month for the turn-around time of the tool customer cares from receiving an error report until submission of new software version or patch as correction
- Established a communication mechanism between the LTE test specification writers and the tool providers
  - Hold monthly conference calls
  - Can be changed to face-to-face meetings when necessary
- ETSI MTS is specifying test suites for testing tool compatibility
- More new types of TTVN3 tools are required for LTE test
  - Smart comparison tools - highlight the differences
  - Recursive selection tools - select a subset of test cases from a test suite

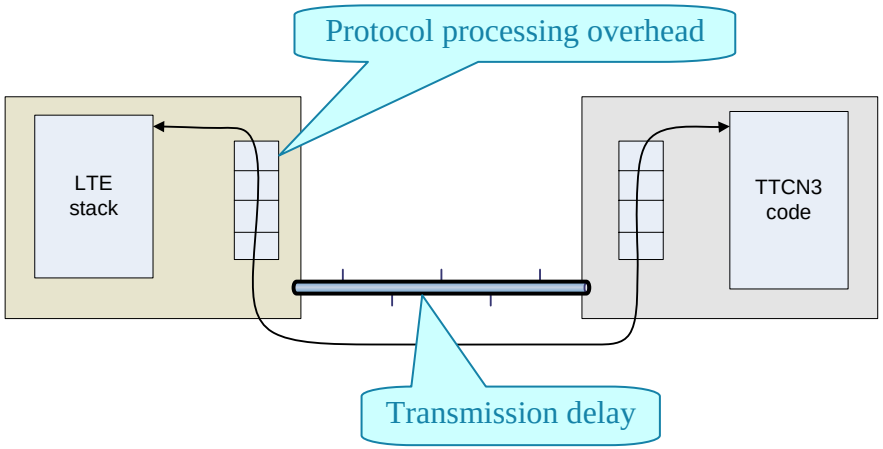
TTCN3 Engine Performance Requirements

- LTE requires that TTCN3 host engine including codec consumes the time budget < 60 ms with a sufficient margin
  - From receiving RRC CONNECTION REQUEST bit string to sending RRC CONNECTION SETUP bit string



LTE Test System Architecture





- Two separate machines connected by a communication link
- Transmission time delay
- Protocol processing time overhead
- If such overhead and delay are unacceptable:
  - Simplify protocol
  - Faster link
- The protocol and the link are out of standardization scope

Conclusions

- 3GPP concludes that
  - TTCN3 is a good choice to specify the detailed LTE specification
- 3GPP requires the TTCN3 maintenance and encourages the core language enhancement, improvement and evolution in a long term
  - To meet the requirements from LTE and LTE-Advanced test specifications
- Synchronized TTCN3 baseline moving
- LTE test relies on the firm support of the tool providers
  - Integrate tool providers in the chain of the development and maintenance of the LTE test specification
  - Require more tools with increased performance
- A large 3GPP TTCN3 user group is joining the TTCN3 user community, will make new contributions and stay happily with all of you for a long term