

# Testing with Partial Traced Requirements: A Necessary Step Towards Higher Quality System Level Verification

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System level verification has always been a difficult task. The difficulty does not stem from the fact that comprehensive test are difficult to write or execute, but because it is more and more difficult to decide when to stop testing with the claim that the quality required by the software has been demonstrated. A traditional criterion to stop the test process is to show that the software under test meets the behavior of its originating requirements. To achieve this, testing departments use different strategies, as dictated by their individual business needs. Some, for example, only create large sets of tests and run them against the application under test. When a test passes, the requirement that the test traces to, is marked. When all requirements are marked, the (behavioral) test process can stop. Others use a more involved strategy requiring complicated test assets to be developed in conjunction with separate traceability schemas that connect these test assets among themselves, and with the system requirements of the application under test. Both approaches, however, a plagued by a subtle but important flaw. The flaw originates from the difference on how the requirements are organized and how the tests are created and exercised. It is a common practice by test organizations to create tests that do not “vertically” test (the entire behavior) all the requirements, but decide to “horizontally” test (partial behavior) some. After running a test that partially test the behavior of a requirement, the arising question is whether to mark the

requirement as tested or not. If the requirement is marked tested, some unexercised behavior that the test did not cover may never be verified. If the requirement is not marked, when will the testing end?

The answer to this question is not trivial. If the tests are allowed to trace to the sub-requirement level, accurate coverage of what is really tested from the requirement set can be obtained. As a result, we will accurately know when the coverage is complete, and when the testing can stop. If however, tests cannot trace to the sub-requirement level and, due to financial or time to market considerations, the format of the requirements will not change, alternate solutions to achieve the same high quality in system verification must be researched.

This paper is proposing new approach called testing with partial traced requirements as an alternate solution to achieve quality system verification when sub-requirement tracing is unavailable. Partially traced requirements have already been used in a large two years project at Guidant Corporation. The project, called TMS, researched, built, and deployed a comprehensive test management system based on Guidant traceability graph. Partially traced requirements were successfully used: first to identify the issues related to sub-requirement tracing, and second to define a semi automated strategy to increase the quality system verification. In addition to presenting the methodology, this paper will also report on the experiences and lessons learned during development and deployment of TMS.