

# Necessary test cases for Decision Coverage and Modified Condition / Decision Coverage

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Coverage refers to the extent to which a given verification activity has satisfied its objectives. Coverage measures can be applied to any verification activity, although they are most frequently applied to testing activities. Appropriate coverage measures give the people doing, managing, and auditing verification activities a sense of the adequacy of the verification accomplished. [1]

The code coverage analysis contains three main steps [2], such as: finding areas of a program not exercised by a set of test cases, creating additional test cases to increase coverage and determining a quantitative measure of code coverage, which is an indirect measure of quality. Optionally it contains a fourth step: identifying redundant test cases that do not increase coverage.

Different types of code coverage analysis requires different set of test cases. In this paper we concern to Decision Coverage (DC), and Modified Condition / Decision Coverage (MCDC) testing methods. The DC only requires that every lines of a subprogram must be executed and every decisions must be evaluated to true and to false. The MCDC is more strict. It contains the requirements of DC and it demands to show that every condition in a decision independently affects the outcome. It is clear there are more test cases are needed to satisfy the requirements of MCDC than DC. But it is not so trivial how much can be spared when testing by DC instead of MCDC.

We analyzed several projects in subprogram level, and estimated how many test cases are needed to satisfy the 100% DC and MCDC coverage. These projects was written in Ada programming language, and some of them were open source and some of them were developed in the industry. We analyzed them in several aspects: McCabe metrics, nesting, maximal argument number in decision etc, and examined how these aspects affected the difference of necessary test cases. At last we answered to the question: how many test cases need more to satisfy MCDC then DC.

## References

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