

What is Software White Box Testing?

The white box testing is a procedure that includes verification of the internal structure, and logic of the software. A tester who is in charge of this has complete access to the source code. He uses his knowledge of the internal working of the software, and his technical skills to create the tests that can validate the code. The software white box testing is also called the transparent testing, open box testing, structural testing or code-based testing.

The verification of the softwares interior algorithm, flow, and structure is the main objective of the white box testing. The white box test cases cover the different paths of the code, and logic to ensure that the user specifications are met.

What does Software White Box Testing Mainly Work Upon?

The software white box testing mainly work upon the items listed below –

- The software white box testing mainly works on verifications of all paths that the source code uses. It also covers all the decision paths to confirm if they are required, accurate, and effective.
- The white box testing utilizes the static code analysis technique to determine all the probable security problems in the software.
- The white box testing covers the loop testing to test if all the loops in the code are working properly, and effectively. It also ensures that the loop handles the variables correctly within the scope.
- The white box testing covers data flow testing which includes the verification of all the paths taken by the variables to confirm that they have been declared, utilized, and initialized properly.

Types of Software White Box Testing

The different types of the software white box testing are listed below –

- [Unit Testing](#) – This type of testing is conducted by the developers themselves.
- [Integration Testing](#) – This type of testing is conducted just after the unit testing.
- [Regression Testing](#) – This type of testing is conducted to validate whether any code changes have introduced new issues in the software.

Techniques Used in the Software White Box Testing

The techniques used in the software white box testing are listed below –

Statement Coverage

In this approach, the primary objective is to cover all the statements, and nodes in the source code at least once. It helps to determine the faulty section of the code.

Branch Coverage

In this approach, the primary objective is to cover all the branches from every decision point in the source code at least once.

Condition Coverage

In this approach, the primary objective is to cover all the conditions in the source code.

Multiple Conditions Coverage

In this approach, the primary objective is to cover every combination of the potential results of the conditions that are verified at least once in the source code.

Basis Path Testing

In this approach, initially the control flow graphs are created followed by the calculation of the [cyclomatic complexity](#) of the code. It helps to determine the minimum count of the test cases that can be generated from each individual independent path in the source code.

Loop Testing

In this approach, the primary objective is to cover every loop to detect issues at their start and in the end.

Differences between Software Black Box and White Box Testing

The difference between software black box and white box testing are listed below –

Sr.No	Black Box Testing	White Box Testing
1	The internal working of the software is not known to the testers.	The internal working of the software is known to the testers.
2	It only deals with the inputs fed to the software and the outputs generated from them.	It deals with the independent code snippets, algorithms, methods, functions etc.
3	It only verifies the software functionalities and if they are working as per the user requirements.	It verifies the internal working of the software.
4	It does not require technical skills and programming knowledge of the testers.	It requires technical skills and programming knowledge of the testers.
5	It uses methods like equivalence partitioning, boundary value analysis, error guessing etc.	It uses methods like statement coverage, boundary value analysis, data flow, control flow etc.
6	It mainly focuses on the functional periphery of the software.	It mainly focuses on the unit, integration, and system level testing of the software.

Process of Software White Box Testing

The process of the the software white box testing are listed below –

- **Inputs** – It includes the specifications, requirements, architecture and design documents, and the source code.
- **Processing** – It includes identification of all the probable risks in the software.
- **Test Planning** – It includes the creation, and execution of test cases as per the test plan.
- **Reporting** – It includes the evaluation of test execution results, and reporting the errors. Once completed, the report is shared with the stakeholders.

Types of White Box Testing Tools

The different white box testing tools are listed below –

- PyUnit
- NUnit
- Bugzilla
- CSUnit
- VeraUnit
- CppUnit
- Fiddler
- OpenGrok
- Wireshark
- HP Fortify

Features of Software White Box Testing

The different features of the software white box testing are listed below –

- The software white box testing helps to evaluate the code coverage so that the sections of the code which remained untested can be identified.
- The software white box testing requires the full access of the source code to the developers.
- The software white box testing requires the testers experience, technical skills, and knowledge of the programming languages.
- The software white box testing detects the logical issues namely infinite loop, improper conditions etc.
- The white box testing helps to conduct the integration testing by identifying various components of the software.

- The software white box testing helps to conduct the unit testing of the code.
- The software white box testing assists in optimizing the code by determining the performance bottlenecks, extra code etc.
- The software white box testing helps perform the security testing, and to identify various security vulnerabilities in the code.
- The software white box testing validates the architecture, and design documents.
- The software white box testing ensures that the developed code is as per the standards, guidelines and compliances.
- The software white box testing identifies the syntax, and logical errors in the code.
- The software white box testing confirms every possible path, and iterations of the code.
- The software white box testing detects, and gets rid of the redundant, and unused sections of the code.

Advantages of Software White Box Testing

The advantages of the software white box testing are listed below –

- The software white box testing is extensive as it verifies the complete code, and its structures.
- The software white box testing achieves code optimization by eradicating the dead code.
- The software white box testing helps to detect defects at the early stages of the software development life cycle(SDLC).
- The software white box testing can easily be adopted in the SDLC.
- The white box testing helps to determine complicated bugs in the software.
- The software white box testing helps in creation of more detailed, and productive test cases to touch all the paths of the code.

Disadvantages of Software White Box Testing

The disadvantages of the software white box testing are listed below –

- The software white box testing requires technical skills, programming knowledge, and full access to the source code.
- The white box testing is mainly focussed on the interior working of the software, and may miss its external errors.
- The white box testing may be conducted by the testers who may be biased since they are already familiar with internal working of the software.
- The white box testing fails to determine the functionality of software which is missed from the implementation as it only covers the available source code.
- The software white box testing does not guarantee that there will not be any defect leakage in the production.