

Unit – IV

Coding

The coding is the process of transforming the design of a system into a computer language format. This coding phase of software development is concerned with software translating design specification into the source code. It is necessary to write source code & internal documentation so that conformance of the code to its specification can be easily verified.

Coding is done by the coder or programmers who are independent people than the designer. The goal is not to reduce the effort and cost of the coding phase, but to cut to the cost of a later stage. The cost of testing and maintenance can be significantly reduced with efficient coding.

Goals of Coding

1. **To translate the design of system into a computer language format:** The coding is the process of transforming the design of a system into a computer language format, which can be executed by a computer and that perform tasks as specified by the design of operation during the design phase.
2. **To reduce the cost of later phases:** The cost of testing and maintenance can be significantly reduced with efficient coding.
3. **Making the program more readable:** Program should be easy to read and understand. It increases code understanding having readability and understand ability as a clear objective of the coding activity can itself help in producing more maintainable software.

For implementing our design into code, we require a high-level functional language. A programming language should have the following characteristics:

Characteristics of Programming Language

Following are the characteristics of Programming Language:

Readability: A good high-level language will allow programs to be written in some methods that resemble a quite-English description of the underlying functions. The coding may be done in an essentially self-documenting way.

Portability: High-level languages, being virtually machine-independent, should be easy to develop portable software.

Characteristics of Programming Language



Generality: Most high-level languages allow the writing of a vast collection of programs, thus relieving the programmer of the need to develop into an expert in many diverse languages.

Brevity: Language should have the ability to implement the algorithm with less amount of code. Programs mean in high-level languages are often significantly shorter than their low-level equivalents.

Error checking: A programmer is likely to make many errors in the development of a computer program. Many high-level languages invoke a lot of bugs checking both at compile-time and run-time.

Cost: The ultimate cost of a programming language is a task of many of its characteristics.

Quick translation: It should permit quick translation.

Efficiency: It should authorize the creation of an efficient object code.

Modularity: It is desirable that programs can be developed in the language as several separately compiled modules, with the appropriate structure for ensuring self-consistency among these modules.

Widely available: Language should be widely available, and it should be feasible to provide translators for all the major machines and all the primary operating systems.

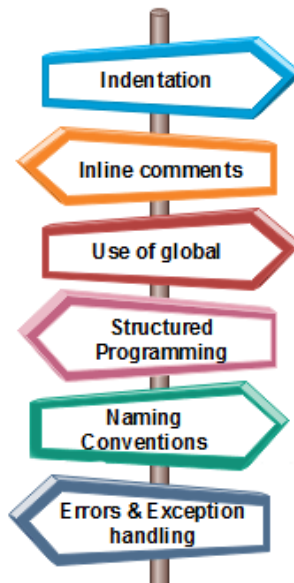
A coding standard lists several rules to be followed during coding, such as the way variables are to be named, the way the code is to be laid out, error return conventions, etc.

Coding Standards

General coding standards refers to how the developer writes code, so here we will discuss some essential standards regardless of the programming language being used.

The following are some representative coding standards:

Coding Standards



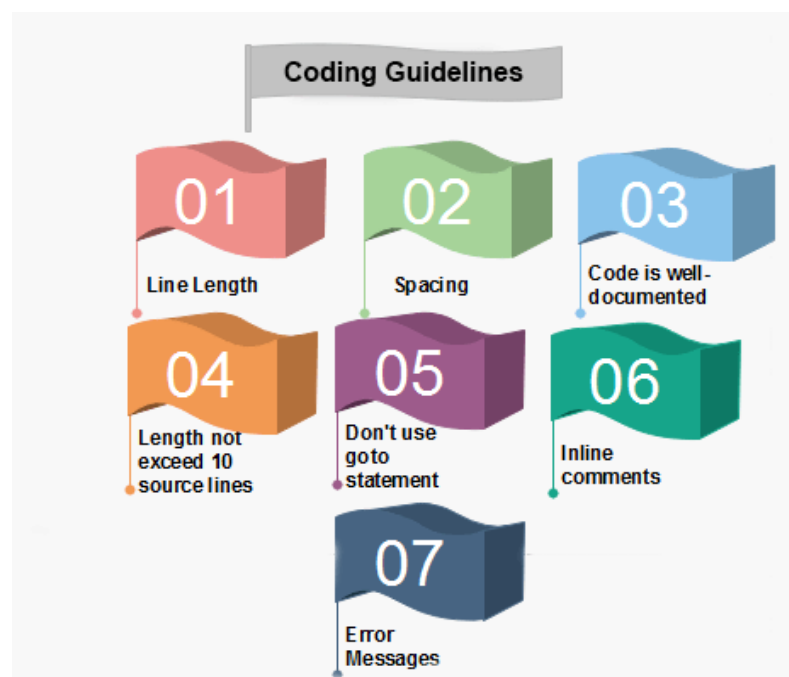
1. **Indentation:** Proper and consistent indentation is essential in producing easy to read and maintain programs.
Indentation should be used to:
 - Emphasize the body of a control structure such as a loop or a select statement.
 - Emphasize the body of a conditional statement
 - Emphasize a new scope block
2. **Inline comments:** Inline comments analyze the functioning of the subroutine, or key aspects of the algorithm shall be frequently used.
3. **Rules for limiting the use of global:** These rules file what types of data can be declared global and what cannot.
4. **Structured Programming:** Structured (or Modular) Programming methods shall be used. "GOTO" statements shall not be used as they lead to "spaghetti" code, which is hard to read and maintain, except as outlined line in the FORTRAN Standards and Guidelines.

5. **Naming conventions for global variables, local variables, and constant identifiers:** A possible naming convention can be that global variable names always begin with a capital letter, local variable names are made of small letters, and constant names are always capital letters.
6. **Error return conventions and exception handling system:** Different functions in a program report the way error conditions are handled should be standard within an organization. For example, different tasks while encountering an error condition should either return a 0 or 1 consistently.

Coding Guidelines

General coding guidelines provide the programmer with a set of the best methods which can be used to make programs more comfortable to read and maintain. Most of the examples use the C language syntax, but the guidelines can be tested to all languages.

The following are some representative coding guidelines recommended by many software development organizations.



1. Line Length: It is considered a good practice to keep the length of source code lines at or below 80 characters. Lines longer than this may not be visible properly on some terminals and tools. Some printers will truncate lines longer than 80 columns.

2. Spacing: The appropriate use of spaces within a line of code can improve readability.

Example:

Bad:

```
cost=price+(price*sales_tax)
fprintf(stdout, "The total cost is %5.2f\n", cost);
```

Better:

```
cost = price + ( price * sales_tax )
fprintf (stdout, "The total cost is %5.2f\n", cost);
```

3. The code should be well-documented: As a rule of thumb, there must be at least one comment line on the average for every three-source line.

4. The length of any function should not exceed 10 source lines: A very lengthy function is generally very difficult to understand as it possibly carries out many various functions. For the same reason, lengthy functions are possible to have a disproportionately larger number of bugs.

5. Do not use goto statements: Use of goto statements makes a program unstructured and very tough to understand.

6. Inline Comments: Inline comments promote readability.

7. Error Messages: Error handling is an essential aspect of computer programming. This does not only include adding the necessary logic to test for and handle errors but also involves making error messages meaningful.

Structured Programming

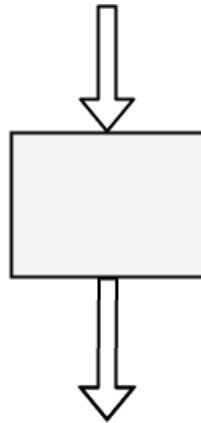
In structured programming, we sub-divide the whole program into small modules so that the program becomes easy to understand. The purpose of structured programming is to linearize control flow through a computer program so that the execution sequence follows the sequence in which the code is written. The dynamic structure of the program then resembles the static structure of the program. This enhances the readability, testability, and modifiability of the program. This linear flow of control can be managed by restricting the set of allowed applications construct to a single entry, single exit formats.

These are the following rules in structured programming:

Structured Rule One: Code Block

If the entry conditions are correct, but the exit conditions are wrong, the error must be in the block. This is not true if the execution is allowed to jump into a block. The error might be anywhere in the program. Debugging under these circumstances is much harder.

Rule 1 of Structured Programming: A code block is structured, as shown in the figure. In flow-charting condition, a box with a single entry point and single exit point are structured. Structured programming is a method of making it evident that the program is correct.

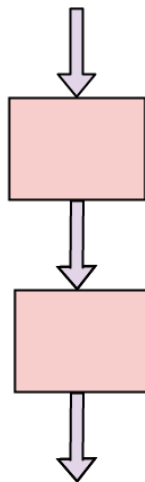


Rule1: Code block is structured

Structure Rule Two: Sequence

A sequence of blocks is correct if the exit conditions of each block match the entry conditions of the following block. Execution enters each block at the block's entry point and leaves through the block's exit point. The whole series can be regarded as a single block, with an entry point and an exit point.

Rule 2 of Structured Programming: Two or more code blocks in the sequence are structured, as shown in the figure.



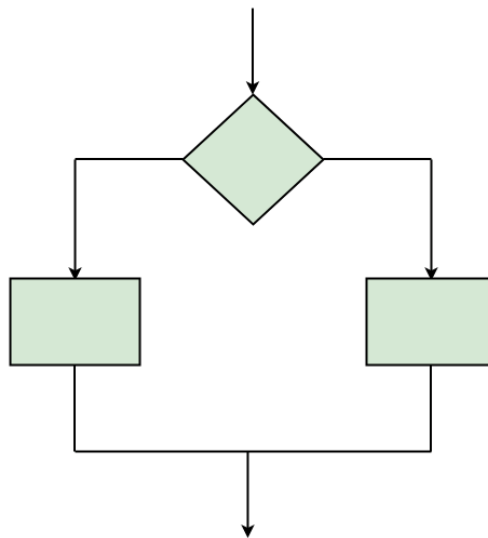
Rule2: A sequence of code blocks is structured

Structured Rule Three: Alternation

If-then-else is frequently called alternation (because there are alternative options). In structured programming, each choice is a code block. If alternation is organized as in the flowchart at right, then there is one entry point (at the top) and one exit point (at the bottom). The structure should be coded so that if the entry conditions are fulfilled, then the exit conditions are satisfied (just like a code block).

Rule 3 of Structured Programming: The alternation of two code blocks is structured, as shown in the figure.

An example of an entry condition for an alternation method is: register \$8 includes a signed integer. The exit condition may be: register \$8 includes the absolute value of the signed number. The branch structure is used to fulfill the exit condition.

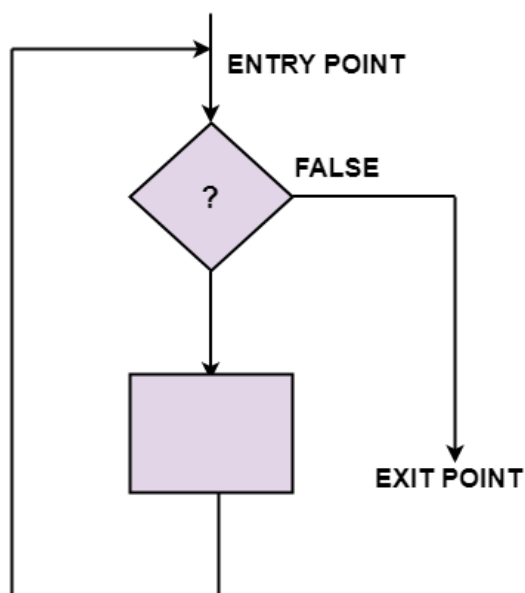


Rule 3: An alternation of code blocks is structured

Structured Rule 4: Iteration

Iteration (while-loop) is organized as at right. It also has one entry point and one exit point. The entry point has conditions that must be satisfied, and the exit point has requirements that will be fulfilled. There are no jumps into the form from external points of the code.

Rule 4 of Structured Programming: The iteration of a code block is structured, as shown in the figure.

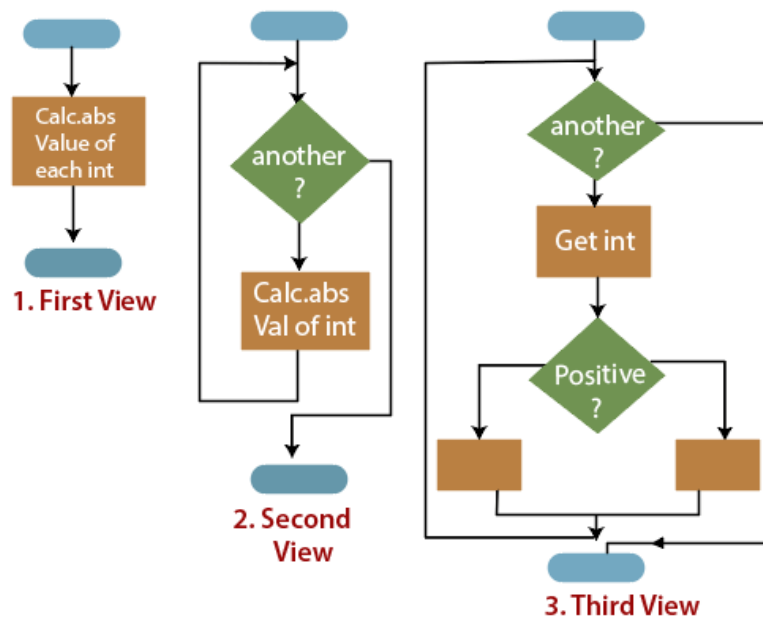


Rule 4: Iteration of code blocks is structured

Structured Rule 5: Nested Structures

In flowcharting conditions, any code block can be spread into any of the structures. If there is a portion of the flowchart that has a single entry point and a single exit point, it can be summarized as a single code block.

Rule 5 of Structured Programming: A structure (of any size) that has a single entry point and a single exit point is equivalent to a code block. For example, we are designing a program to go through a list of signed integers calculating the absolute value of each one. We may **(1)** first regard the program as one block, then **(2)** sketch in the iteration required, and finally **(3)** put in the details of the loop body, as shown in the figure.



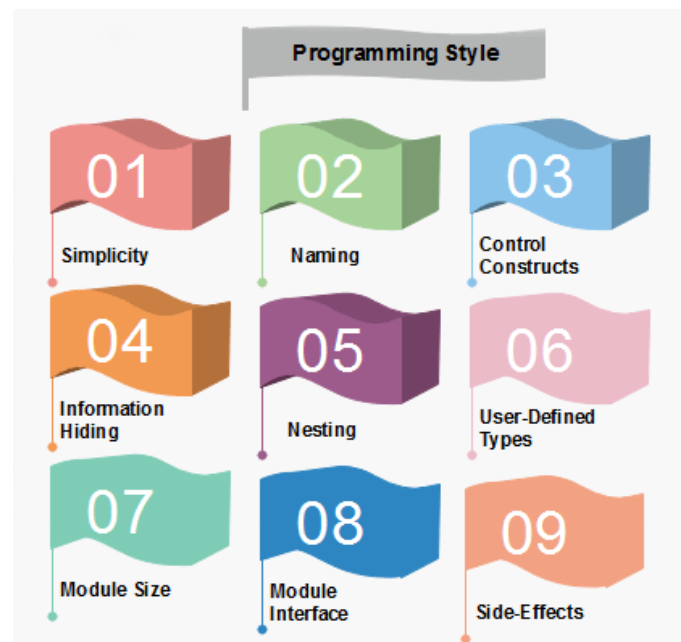
The other control structures are the case, do-until, do-while, and for are not needed. However, they are sometimes convenient and are usually regarded as part of structured programming. In assembly language, they add little convenience.

Programming Style

Programming style refers to the technique used in writing the source code for a computer program. Most programming styles are designed to help programmers quickly read and understand the program as well as avoid making errors. (Older programming styles also focused on conserving screen space.) A good coding style can overcome the many deficiencies of a first programming language, while poor style can defeat the intent of an excellent language.

The goal of good programming style is to provide understandable, straightforward, elegant code. The programming style used in a various program may be derived from the coding standards or code conventions of a company or other computing organization, as well as the preferences of the actual programmer.

Some general rules or guidelines in respect of programming style:



1. Clarity and simplicity of Expression: The programs should be designed in such a manner so that the objectives of the program is clear.

2. Naming: In a program, you are required to name the module, processes, and variable, and so on. Care should be taken that the naming style should not be cryptic and non-representative.

For Example: $a = 3.14 * r * r$
area of circle = 3.14 * radius * radius;

3. Control Constructs: It is desirable that as much as a possible single entry and single exit constructs used.

4. Information hiding: The information secure in the data structures should be hidden from the rest of the system where possible. Information hiding can decrease the coupling between modules and make the system more maintainable.

5. Nesting: Deep nesting of loops and conditions greatly harm the static and dynamic behavior of a program. It also becomes difficult to understand the program logic, so it is desirable to avoid deep nesting.

6. User-defined types: Make heavy use of user-defined data types like enum, class, structure, and union. These data types make your program code easy to write and easy to understand.

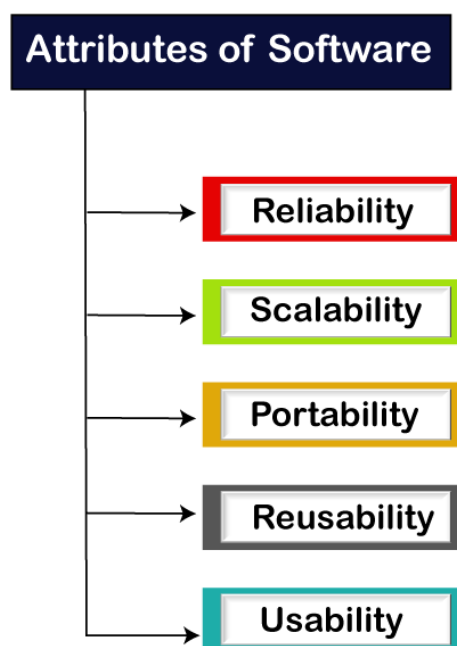
7. Module size: The module size should be uniform. The size of the module should not be too big or too small. If the module size is too large, it is not generally functionally cohesive. If the module size is too small, it leads to unnecessary overheads.

8. Module Interface: A module with a complex interface should be carefully examined.

9. Side-effects: When a module is invoked, it sometimes has a side effect of modifying the program state. Such side-effect should be avoided where as possible.

Software Testing

Software testing is a process of identifying the correctness of software by considering its all attributes (Reliability, Scalability, Portability, Re-usability, Usability) and evaluating the execution of software components to find the software bugs or errors or defects.



Software testing provides an independent view and objective of the software and gives surety of fitness of the software. It involves testing of all components under the required services to confirm that whether it is satisfying the specified requirements or not. The process is also providing the client with information about the quality of the software.

Testing is mandatory because it will be a dangerous situation if the software fails any of time due to lack of testing. So, without testing software cannot be deployed to the end user.

What is Testing

Testing is a group of techniques to determine the correctness of the application under the predefined script but, testing cannot find all the defect of application. The main intent of testing is to detect failures of the application so that failures can be

discovered and corrected. It does not demonstrate that a product functions properly under all conditions but only that it is not working in some specific conditions.

Testing furnishes comparison that compares the behavior and state of software against mechanisms because the problem can be recognized by the mechanism. The mechanism may include past versions of the same specified product, comparable products, and interfaces of expected purpose, relevant standards, or other criteria but not limited up to these.

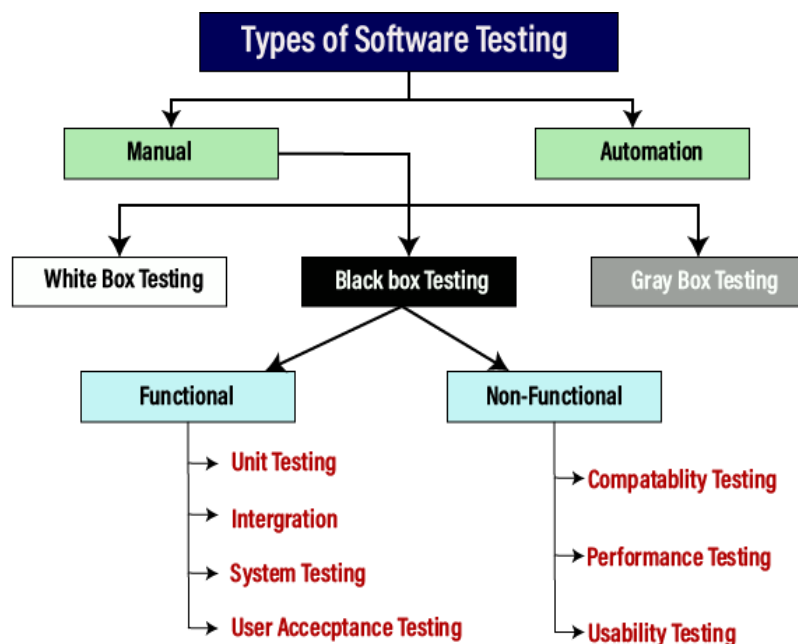
Testing includes an examination of code and also the execution of code in various environments, conditions as well as all the examining aspects of the code. In the current scenario of software development, a testing team may be separate from the development team so that Information derived from testing can be used to correct the process of software development.

The success of software depends upon acceptance of its targeted audience, easy graphical user interface, strong functionality load test, etc. For example, the audience of banking is totally different from the audience of a video game. Therefore, when an organization develops a software product, it can assess whether the software product will be beneficial to its purchasers and other audience.

Type of Software testing

We have various types of testing available in the market, which are used to test the application or the software.

With the help of below image, we can easily understand the type of software testing:



Manual testing

The process of checking the functionality of an application as per the customer needs without taking any help of automation tools is known as manual testing. While performing the manual testing on any application, we do not need any specific knowledge of any testing tool, rather than have a proper understanding of the product so we can easily prepare the test document.

Manual testing can be further divided into three types of testing, which are as follows:

- **White box testing**
- **Black box testing**
- **Gray box testing**

White Box Testing

The box testing approach of software testing consists of black box testing and white box testing. We are discussing here white box testing which also known as glass box is **testing, structural testing, clear box testing, open box testing and transparent box testing**. It tests internal coding and infrastructure of a software focus on checking of predefined inputs against expected and desired outputs. It is based on inner workings of an application and revolves around internal structure testing. In this type of testing programming skills are required to design test cases. The primary goal of white box testing is to focus on the flow of inputs and outputs through the software and strengthening the security of the software.

The term 'white box' is used because of the internal perspective of the system. The clear box or white box or transparent box name denote the ability to see through the software's outer shell into its inner workings.

Developers do white box testing. In this, the developer will test every line of the code of the program. The developers perform the White-box testing and then send the application or the software to the testing team, where they will perform the black box testing and verify the application along with the requirements and identify the bugs and sends it to the developer.

The developer fixes the bugs and does one round of white box testing and sends it to the testing team. Here, fixing the bugs implies that the bug is deleted, and the particular feature is working fine on the application.

Here, the test engineers will not include in fixing the defects for the following reasons:

- Fixing the bug might interrupt the other features. Therefore, the test engineer should always find the bugs, and developers should still be doing the bug fixes.

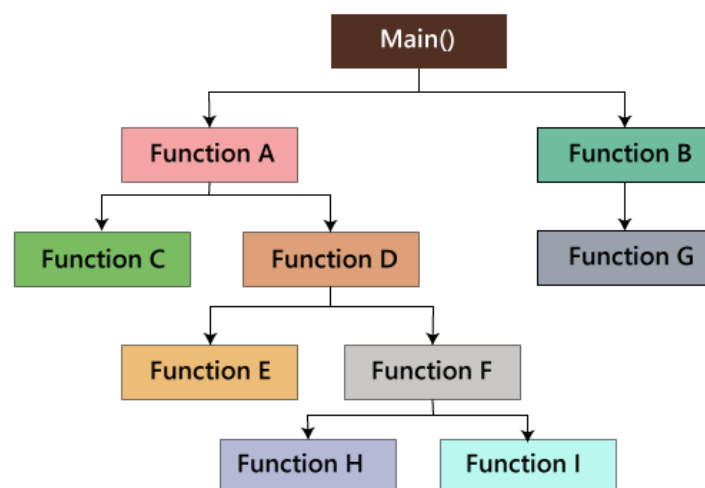
- If the test engineers spend most of the time fixing the defects, then they may be unable to find the other bugs in the application.

The white box testing contains various tests, which are as follows:

- Path testing
- Loop testing
- Condition testing
- Testing based on the memory perspective
- Test performance of the program

Path testing

In the path testing, we will write the flow graphs and test all independent paths. Here writing the flow graph implies that flow graphs are representing the flow of the program and also show how every program is added with one another as we can see in the below image:



And test all the independent paths implies that suppose a path from main() to function G, first set the parameters and test if the program is correct in that particular path, and in the same way test all other paths and fix the bugs.

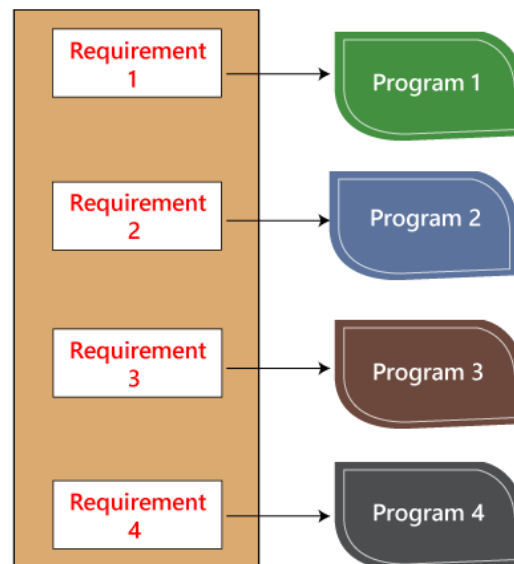
Loop testing

In the loop testing, we will test the loops such as while, for, and do-while, etc. and also check for ending condition if working correctly and if the size of the conditions is enough.

1. Test P
2. {

3.
4. }

As we can see in the below image that, we have various requirements such as 1, 2, 3, 4. And then, the developer writes the programs such as program 1,2,3,4 for the parallel conditions. Here the application contains the 100s line of codes.

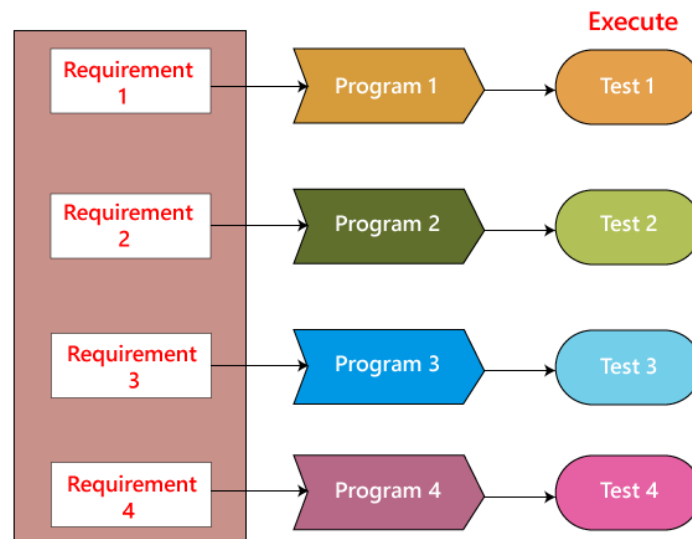


The developer will do the white box testing, and they will test all the five programs line by line of code to find the bug. If they found any bug in any of the programs, they will correct it. And they again have to test the system then this process contains lots of time and effort and slows down the product release time.

Now, suppose we have another case, where the clients want to modify the requirements, then the developer will do the required changes and test all four program again, which take lots of time and efforts.

These issues can be resolved in the following ways:

In this, we will write test for a similar program where the developer writes these test code in the related language as the source code. Then they execute these test code, which is also known as **unit test programs**. These test programs linked to the main program and implemented as programs.



Therefore, if there is any requirement of modification or bug in the code, then the developer makes the adjustment both in the main program and the test program and then executes the test program.

Condition testing

In this, we will test all logical conditions for both **true** and **false** values; that is, we will verify for both **if** and **else** condition.

The above program will work fine for both the conditions, which means that if the condition is accurate, and then else should be false and conversely.

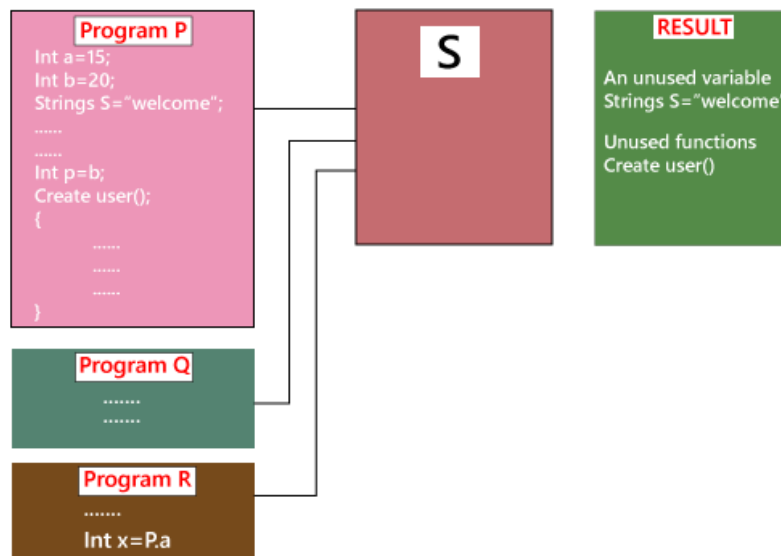
Testing based on the memory (size) perspective

The size of the code is increasing for the following reasons:

- **The reuse of code is not there:** let us take one example, where we have four programs of the same application, and the first ten lines of the program are similar. We can write these ten lines as a discrete function, and it should be accessible by the above four programs as well. And also, if any bug is there, we can modify the line of code in the function rather than the entire code.
- The **developers use the logic** that might be modified. If one programmer writes code and the file size is up to 250kb, then another programmer could write a similar code using the different logic, and the file size is up to 100kb.
- The **developer declares so many functions and variables** that might never be used in any portion of the code. Therefore, the size of the program will increase.

In the above code, we can see that the **integer a** has never been called anywhere in the program, and also the function **Create user** has never been called anywhere in the code. Therefore, it leads us to memory consumption.

We cannot remember this type of mistake manually by verifying the code because of the large code. So, we have a built-in tool, which helps us to test the needless variables and functions. And, here we have the tool called **Rational purify**.



Suppose we have three programs such as Program P, Q, and R, which provides the input to S. And S goes into the programs and verifies the unused variables and then gives the outcome. After that, the developers will click on several results and call or remove the unnecessary function and the variables.

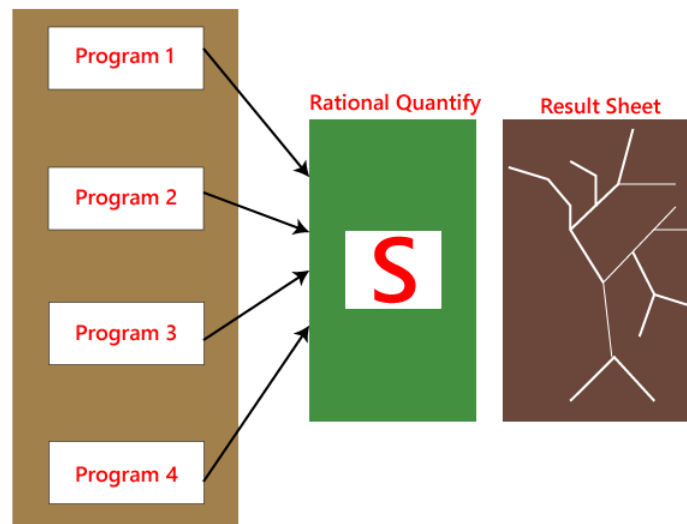
This tool is only used for the C programming language and C++ programming language; for another language, we have other related tools available in the market.

- The developer does not use the available in-built functions; instead they write the full features using their logic. Therefore, it leads us to waste of time and also postpone the product releases.

Test the performance (Speed, response time) of the program

The application could be slow for the following reasons:

- When logic is used.
- For the conditional cases, we will use **or & and** adequately.
- Switch case, which means we cannot use **nested if**, instead of using a switch case.

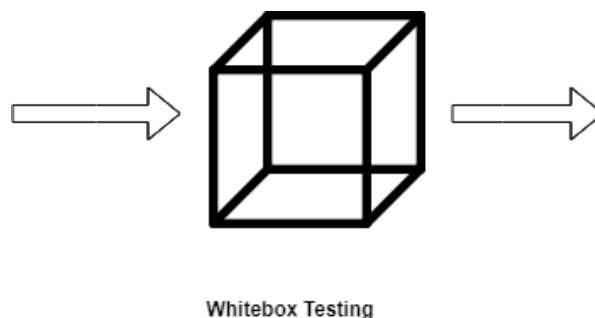


As we know that the developer is performing white box testing, they understand that the code is running slow, or the performance of the program is also getting deliberate. And the developer cannot go manually over the program and verify which line of the code is slowing the program.

To recover with this condition, we have a tool called **Rational Quantify**, which resolves these kinds of issues automatically. Once the entire code is ready, the rational quantify tool will go through the code and execute it. And we can see the outcome in the result sheet in the form of thick and thin lines.

Here, the thick line specifies which section of code is time-consuming. When we double-click on the thick line, the tool will take us to that line or piece of code automatically, which is also displayed in a different color. We can change that code and again and use this tool. When the order of lines is all thin, we know that the presentation of the program has enhanced. And the developers will perform the white box testing automatically because it saves time rather than performing manually.

Test cases for white box testing are derived from the design phase of the software development lifecycle. Data flow testing, control flow testing, path testing, branch testing, statement and decision coverage all these techniques used by white box testing as a guideline to create an error-free software.



White box testing follows some working steps to make testing manageable and easy to understand what the next task to do. There are some basic steps to perform white box testing.

Generic steps of white box testing

- Design all test scenarios, test cases and prioritize them according to high priority number.
- This step involves the study of code at runtime to examine the resource utilization, not accessed areas of the code, time taken by various methods and operations and so on.
- In this step testing of internal subroutines takes place. Internal subroutines such as non-public methods, interfaces are able to handle all types of data appropriately or not.
- This step focuses on testing of control statements like loops and conditional statements to check the efficiency and accuracy for different data inputs.
- In the last step white box testing includes security testing to check all possible security loopholes by looking at how the code handles security.

Reasons for white box testing

- It identifies internal security holes.
- To check the way of input inside the code.
- Check the functionality of conditional loops.
- To test function, object, and statement at an individual level.

Advantages of White box testing

- White box testing optimizes code so hidden errors can be identified.
- Test cases of white box testing can be easily automated.
- This testing is more thorough than other testing approaches as it covers all code paths.
- It can be started in the SDLC phase even without GUI.

Disadvantages of White box testing

- White box testing is too much time consuming when it comes to large-scale programming applications.

- White box testing is much expensive and complex.
- It can lead to production error because it is not detailed by the developers.
- White box testing needs professional programmers who have a detailed knowledge and understanding of programming language and implementation.

Black box testing

Black box testing is a technique of software testing which examines the functionality of software without peering into its internal structure or coding. The primary source of black box testing is a specification of requirements that is stated by the customer.

In this method, tester selects a function and gives input value to examine its functionality, and checks whether the function is giving expected output or not. If the function produces correct output, then it is passed in testing, otherwise failed. The test team reports the result to the development team and then tests the next function. After completing testing of all functions if there are severe problems, then it is given back to the development team for correction.



Generic steps of black box testing

- The black box test is based on the specification of requirements, so it is examined in the beginning.
- In the second step, the tester creates a positive test scenario and an adverse test scenario by selecting valid and invalid input values to check that the software is processing them correctly or incorrectly.
- In the third step, the tester develops various test cases such as decision table, all pairs test, equivalent division, error estimation, cause-effect graph, etc.
- The fourth phase includes the execution of all test cases.
- In the fifth step, the tester compares the expected output against the actual output.
- In the sixth and final step, if there is any flaw in the software, then it is cured and tested again.

Test process

The test process of black box testing is a kind of process in which the tester has specific knowledge about the software's work, and it develops test cases to check the accuracy of the software's functionality.

It does not require programming knowledge of the software. All test cases are designed by considering the input and output of a particular function. A tester knows about the definite output of a particular input, but not about how the result is arising. There are various techniques used in black box testing for testing like decision table technique, boundary value analysis technique, state transition, All-pair testing, cause-effect graph technique, equivalence partitioning technique, error guessing technique, use case technique and user story technique. All these techniques have been explained in detail within the tutorial.

Test cases

Test cases are created considering the specification of the requirements. These test cases are generally created from working descriptions of the software including requirements, design parameters, and other specifications. For the testing, the test designer selects both positive test scenario by taking valid input values and adverse test scenario by taking invalid input values to determine the correct output. Test cases are mainly designed for functional testing but can also be used for non-functional testing. Test cases are designed by the testing team, there is not any involvement of the development team of software.

Difference between white-box testing and black-box testing

Following are the significant differences between white box testing and black box testing:

White-box testing	Black box testing
The developers can perform white box testing.	The test engineers perform the black box testing.
To perform WBT, we should have an understanding of the programming languages.	To perform BBT, there is no need to have an understanding of the programming languages.
In this, we will look into the source code and test the logic of the code.	In this, we will verify the functionality of the application based on the requirement specification.
In this, the developer should know about the internal design of the code.	In this, there is no need to know about the internal design of the code.

Automation testing

Automation testing is a process of converting any manual test cases into the test scripts with the help of automation tools, or any programming language is known as automation testing. With the help of automation testing, we can enhance the speed of our test execution because here, we do not require any human efforts. We need to write a test script and execute those scripts.

Levels of Software Testing

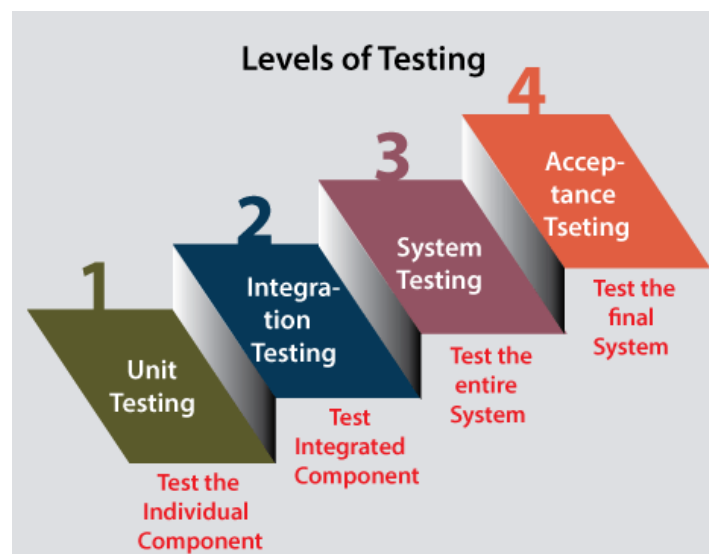
Testing levels are the procedure for finding the missing areas and avoiding overlapping and repetition between the development life cycle stages. We have already seen the various phases such as **Requirement collection, designing, coding testing, deployment, and maintenance** of SDLC (Software Development Life Cycle)

In order to test any application, we need to go through all the above phases of SDLC. Like SDLC, we have multiple levels of testing, which help us maintain the quality of the software.

Different Levels of Testing

The levels of software testing involve the different methodologies, which can be used while we are performing the software testing. In software testing, we have four different levels of testing, which are as discussed below:

1. **Unit Testing**
2. **Integration Testing**
3. **System Testing**
4. **Acceptance Testing**



As we can see in the above image that all of these testing levels have a specific objective which specifies the value to the software development lifecycle.

For our better understanding, let's see them one by one:

Level1: Unit Testing

Unit testing is the first level of software testing, which is used to test if software modules are satisfying the given requirement or not.

The first level of testing involves **analyzing each unit or an individual component** of the software application.

Unit testing is also the first level of **functional testing**. The primary purpose of executing unit testing is to validate unit components with their performance.

A unit component is an individual function or regulation of the application, or we can say that it is the smallest testable part of the software. The reason of performing the unit testing is to test the correctness of inaccessible code.

Unit testing will help the test engineer and developers in order to understand the base of code that makes them able to change defect causing code quickly. The developers implement the unit.

Level2: Integration Testing

The second level of software testing is the **integration testing**. The integration testing process comes after **unit testing**.

It is mainly used to test the **data flow from one module or component to other modules**.

In integration testing, the **test engineer** tests the units or separate components or modules of the software in a group.

The primary purpose of executing the integration testing is to identify the defects at the interaction between integrated components or units.

When each component or module works separately, we need to check the data flow between the dependent modules, and this process is known as **integration testing**.

We only go for the integration testing when the functional testing has been completed successfully on each application module.

In simple words, we can say that **integration testing** aims to evaluate the accuracy of communication among all the modules.

Level3: System Testing

The third level of software testing is **system testing**, which is used to test the software's functional and non-functional requirements.

It is **end-to-end testing** where the testing environment is parallel to the production environment. In the third level of software testing, **we will test the application as a whole system.**

To check the end-to-end flow of an application or the software as a user is known as **System testing.**

In system testing, we will go through all the necessary modules of an application and test if the end features or the end business works fine, and test the product as a complete system.

In simple words, we can say that System testing is a sequence of different types of tests to implement and examine the entire working of an integrated software computer system against requirements.

Level4: Acceptance Testing

The **last and fourth level** of software testing is **acceptance testing**, which is used to evaluate whether a specification or the requirements are met as per its delivery.

The software has passed through three testing levels (**Unit Testing, Integration Testing, System Testing**). Some minor errors can still be identified when the end-user uses the system in the actual scenario.

In simple words, we can say that Acceptance testing is the **squeezing of all the testing processes that are previously done.**

The acceptance testing is also known as **User acceptance testing (UAT)** and is done by the customer before accepting the final product.

Usually, UAT is done by the domain expert (customer) for their satisfaction and checks whether the application is working according to given business scenarios and real-time scenarios.

Defect tracking

It is generally done with the help of tools because we cannot track the status of each bug manually. And we also comment about how we communicate the bugs which are identified during the testing process and send it back to the development team and how the development team will reply. Here we also mention the priority of the bugs such as high, medium, and low.

Following are various aspects of the defect tracking:

- **Techniques to track the bug**

.....

.....

- **Bug tracking tools**

We can comment on the name of the tool, which we will use for tracking the bugs. Some of the most commonly used bug tracking tools are Jira, Bugzilla, Mantis, and Trac, etc.<

- **Severity**

The severity could be as following:

Blocker or showstopper

.....

..... (Explain it with an example in the test plan)

For example, there will be a defect in the module; we cannot go further to test other modules because if the bug is blocked, we can proceed to check other modules.

Critical

.....

..... (Explain it with an example in the test plan)

In this situation, the defects will affect the business.

Major

....

.... (Explain it with an example in the test plan)

Minor

..... (Explain it with an example in the test plan)

These defects are those, which affect the look and feel of the application.

- **Priority**

High-P1

.....

Medium-P2

.....

Low-P3

.....

.....

P4

Therefore, based on the priority of bugs like high, medium, and low, we will categorize it as P1, P2, P3, and P4.