



Software Quality Assurance

HNDIT-4022

Static Verification Techniques

Software Verification Vs Validation



Verification is

Verification typically involves reviews and meetings to evaluate documents, plans, code, requirements, and specifications. This can be done with checklists, issues lists, walkthroughs, and inspection meetings.

Two Types of Verification;

- ❑ Dynamic verification, also known as Test or Experimentation - This is good for finding bugs
- ❑ Static verification, also known as Analysis - This is useful for proving correctness of a program although it may result in false positives

Software Verification Vs Validation



Validation is

- Validation typically involves actual testing and takes place after verifications are completed.

Software Verification Vs Validation...



- Software verification asks the question, "Are we building the product right?"; that is, does the software conform to its specification.
- Software validation asks the question, "Are we building the right product?"; that is, is the software doing what the user really requires.

Software Verification Vs Validation...

Lifecycle phase	Dynamic testing	Static testing
Requirements analysis and specification		x
Top-level design		x
Detailed design		x
Implementation	x	x
Acceptance testing	x	

What is Static Testing?

- Static Testing is a software testing technique that involves reviewing and analyzing:- software documentation – design, or code without executing the software. It is a way of checking for errors and defects in the software by examining it in a “static” state rather than actively running it.
- Static Testing aims to identify issues early in software development when they are easier and less costly to fix.
- By catching defects early, Static Testing can help improve the software’s overall quality and reliability.
- Also, it enhances maintainability and ultimately saves time and money in the long run.

What is Static Testing?



There are two basic types of static testing.

1. People-based - People-based techniques are generally known as "reviews". There are different ways in which reviews can be performed.
2. Tool-based - The tool-based techniques examine source code and are known as "static analysis".

Why Static Testing?

- Static Testing is a valuable technique because it helps detect errors and defects in software before it is tested.
- For example, You review software requirements as part of Static Testing. You may identify potential conflicts that could be difficult to address later in the development cycle. Similarly, if you review code during Static Testing, you may spot issues like

coding errors,

inconsistent naming conventions

When to Perform Static Testing?



- Static testing is recommended to be done during the design, documentation, and development phases before dynamic testing commences.

Objectives of Static Testing



- Ensure all programming conventions, standards, and guidelines are followed.
- Verify that the source code is complete and can be compiled & built.
- Ensure that all design and implementation specifications are met.
- Identify areas of the software that may have logical, structural, formatting, or syntactic errors.

What is Subject to Static Testing?



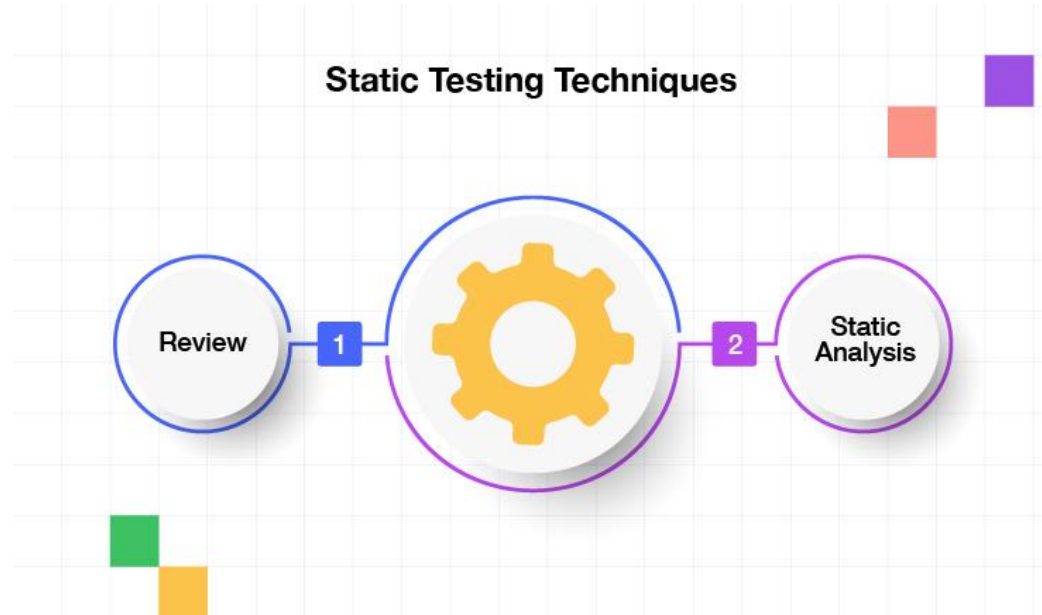
Here are some major features that are subject to static testing,

- Requirements & Specifications Review
- Structural Design Analysis
- Code Review
- Database Analysis
- Documentation Review
- User Manual Review

Static Testing Techniques

Static Testing is a necessary software testing technique comprising two approaches;

- ❑ Review
- ❑ Static Analysis



Static Testing Techniques...

Review

Reviews are a necessary feature of Static Testing. It enables testers to identify defects and issues in documentation, such as requirements and design. The importance of reviews lies in detecting the sources of failure at the earliest stage.

Static Analysis

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Benefits of Static Testing



Static Testing provides several benefits to software development projects.

- ☐ Early defect detection
- ☐ Improved code quality
- ☐ Reduced costs and time
- ☐ Prevention of common issues
- ☐ Improved collaboration

Type of Static Testing



Static Testing can be covered under two different types:

- ☐ Manual Static Testing
- ☐ Automated Static Testing

Manual Method of Static Testing



Manual static testing methods are techniques used to identify errors and defects in software code and documentation without actually executing the code

- ☐ Inspections
- ☐ Walkthroughs
- ☐ Informal reviews
- ☐ Technical reviews
- ☐ Audits

Automation Method of Static Testing



This method leverages specialized tools to analyze source code, documentation, and other artifacts without execution.

Static Analysis : Tools dissect the code's structure, logic, and flow, identifying potential errors like:

- Syntactic errors
- Logic errors
- Security vulnerabilities
- Code quality issues
- Coding standard violations
- Code Reviews & Lint Checks
- Formal Methods

Automation Method of Static Testing...



- Code Reviews & Lint Checks: Tools scan the code for adherence to defined coding standards and best practices, highlighting areas for improvement.
- Formal Methods: Utilize mathematical techniques to prove the correctness of code properties and ensure they adhere to specific specifications.

Tools Used for Static Testing



Here are some tools;

- ☐ Checkstyle
- ☐ SourceMeter
- ☐ Soot
- ☐ Lint
- ☐ SonarQube
- ☐ PDM
- ☐ Findings

What is Tested in Static Testing?



Key areas of Static Testing;

- ❑ Code Quality
 - Syntax errors
 - Coding standards
 - Potential bugs
 - Performance bottlenecks
 - Security vulnerabilities

- ❑ Documentation Quality
 - Requirements completeness and consistency
 - Design document correctness
 - Test plan completeness and feasibility

How Static Testing is Performed?



How static testing is performed;

- ❑ The first step in static testing is planning.
- ❑ prepare the necessary artifacts, such as source codes, design documents, requirements documents, and test cases.
- ❑ Static analysis is the core of this testing.
- ❑ Code reviews are an essential component of the static testing process.
- ❑ Small team of experts systematically reviews the code and finds potential errors using various methods.
- ❑ Any issues or bugs during the static testing process are reported and documented.
- ❑ The results collected during the static testing process should be analyzed to determine the quality of the software product. This is the final step in static testing.

Activity:



1. What is Static Testing?
2. What is tested in static testing?
3. Who inspects the documents in static testing?
4. State the different between Static testing and Dynamic testing.



Q&A's ?

Thank you !