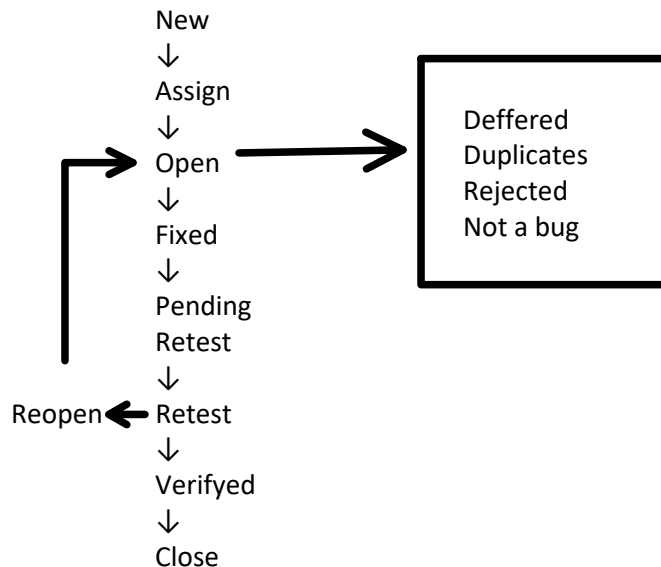


Bug Life cycle



Errors : mistake by the developer/coder

Fault : It a Flaw or defect which make an error

Failure : When the fault cause then software behaves incorrectly during run time

Objective

- **Detect Defects Early**: Identify bugs before release.
- **Ensure Quality**: Validate that the software meets user and business requirements.
- **Verify Functionality**: Confirm that the application works as intended.
- **Improve Reliability**: Ensure the software runs correctly under various conditions.
- **Maintain Customer Satisfaction**: Deliver a defect-free product to the user.
- **Support Decision Making**: Help in release decisions by reporting risks and issues.

Type of Software testing

1. Manual Testing
2. Automation testing

Techniques of ST

1. WBT
2. BBT

White Box Testing:

- Also called **structural or glass box testing**.
- Tester knows the **internal code, logic, and structure**.
- Focus is on **how** the system works.

- Performed by **developers**.

Example

Unit Testing

Path testing

Loop testing

Benefits of Structural Testing (White Box):

1. **Code Coverage:** Measures how much code is tested (statements, branches, paths).
2. **Complexity Testing:** Measures logical complexity (e.g., using Cyclomatic Complexity).

Black Box Testing

- Also called **functional or behavioral testing**.
- Tester does **not know the internal code**.
- Focus is on **what** the system does.
- Performed by **testers or users**.

Examples

Functional testing

Non-functional testing

Regression testing

Cyclomatic Complexity

CC is use in WBT To measure the complexity of program control flow

Formula: $CC = E - N + 2P$

E = No. of Edges

N = No. of Nodes

P = No. of Connected Component

Static analysis tools

1. SonarQube
2. checkStyle
3. PMD
4. ESLint
5. PYLint

Cause-Effect Diagram (Fishbone)

Man

Machine

Method

Material

Measurement

Environment

6 sigma

Six Sigma is a **data-driven methodology** aimed at improving process quality by identifying and eliminating defects. In software development, Six Sigma helps reduce bugs, improve performance, and enhance customer satisfaction.

Methodology

1. **Define**

2. Measure
3. Analyze
4. Improve
5. Control