Test Driven Development

Introduction to TDD

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Topic List

- Types of Testing
- What is Test Driven Development?
- What is Unit Testing?
- The JUnit Framework.

Types of Software Testing

Software testing is categorized into different levels based on scope and purpose:

1. **Unit Testing**
   - Tests individual components (methods/classes) in isolation.
   - Typically automated using frameworks like JUnit.
   - Ensures correctness of small, self-contained code units.
2. **Integration Testing**
   - Tests interactions between integrated components (e.g., multiple classes or modules).
   - Ensures data flows correctly between units.
   - May involve database connections, APIs, or third-party services.

Types of Software Testing contd.

3. System Testing

- Tests the entire application as a whole.
- Verifies that the complete system meets requirements.
- Often includes performance, security, and usability testing.

4. Acceptance Testing

- Validates the software against business requirements.
- Ensures it meets user expectations.
- Can be manual (user acceptance testing) or automated.

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Test Driven Development

- Tests are written before you write the program code.

- A test framework is used so that automated testing can be done after every small change to the code.
    - This may be as often as every 5 or 10 minutes.

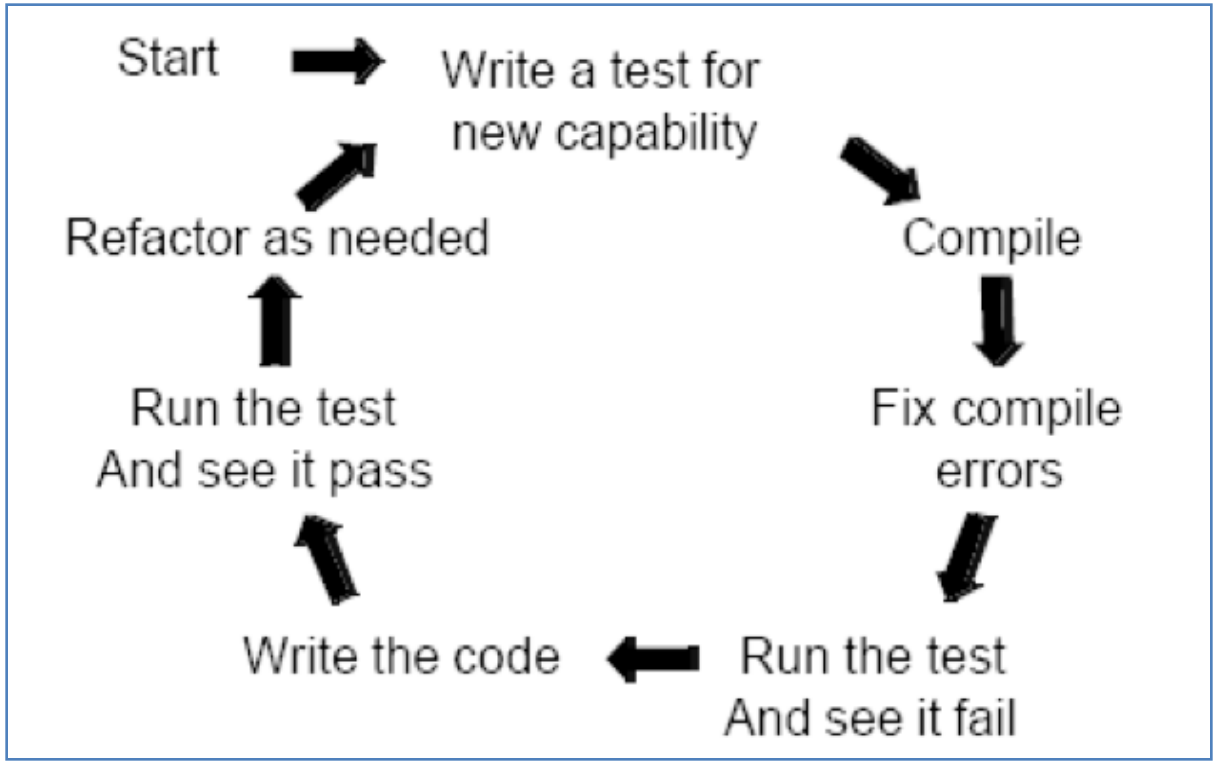
- This approach must be learned and practiced.

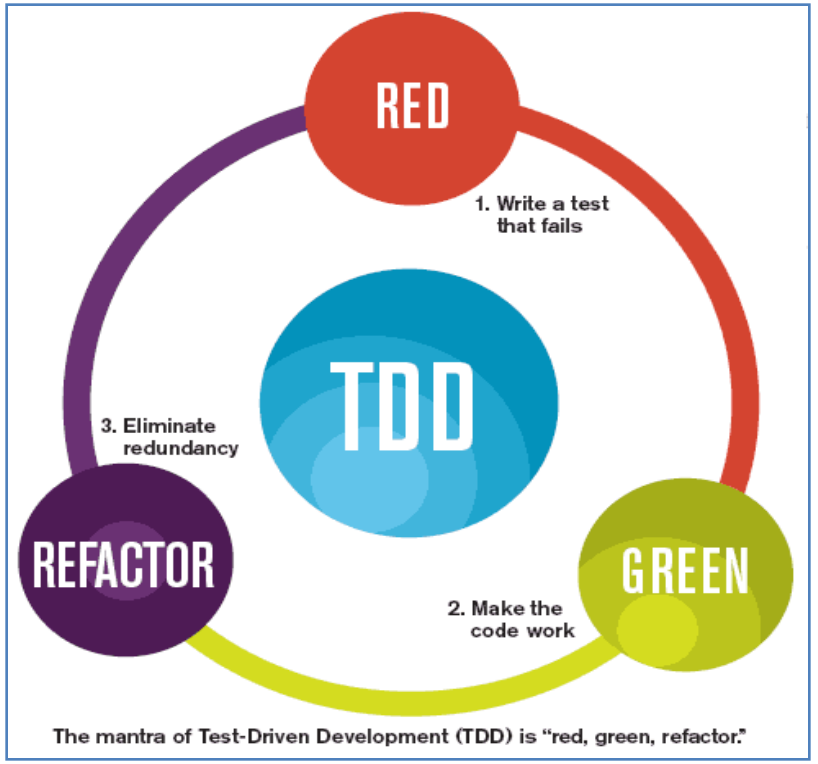
Why bother with Test Driven Development?

- It makes your designs better.
- Fewer bugs; drastically reduces the amount of time spent debugging code.
- More maintainable code.
- During development, the program always works—it may not do everything required, but what it does, it does right.

- Your new philosophy (axiom):
  - *'Code that isn't tested doesn't work'*

Test-driven development.





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- Unit tests are performed to prove that a piece of code does what the developer thinks it should do.
- The question remains open as to whether that's the right thing to do according to the customer or end-user:
  - that is acceptance testing

What does Unit Testing Accomplish ?

- *Does the **code** do what was expected?*
  - i.e. is the code fulfilling the intent of the developer?
- *Does the **code** do what was expected all the time*?
  - exceptions get thrown, disks get full, network lines drop, buffers overflow - is the code still performing as expected?
- *Can the **code** be depended upon?*
  - Need to know for certain both its strengths and its limitations.

How is Unit Testing carried out?

- **Step 1**: Decide how to test the method in question before writing the code itself.
- **Step 2**: Write the test code itself, either before or concurrently with the implementation code.
- **Step 3**: Run the test itself, and probably all the other tests in that part of the system.

Key Feature of executing tests: need to be able to determine at a glance whether all tests are succeeding/failing.

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JUnit

- JUnit is a unit testing framework for the Java programming language.

- JUnit has been important in the development of test-driven development, and is one of a family of unit testing frameworks collectively known as xUnit.

http://www.tutorialspoint.com/junit/junit_overview.htm

JUnit Features

- Open source framework used for writing & running tests.
- Provides *Annotations* to identify the test methods.
- Provides *Assertions* for testing expected results.
- Provides Test runners for running tests.
- JUnit tests can be run automatically and they check their own results and provide immediate feedback. There's no need to manually comb through a report of test results.
- Junit shows test progress in a bar that is green if test is going fine and it turns red when a test fails.

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“Good programmers write code, great programmers write tests”

“Never, in the field of programming, have so many owed so much to so few”

- Martin Fowler on the developers behind JUnit

Any Questions?