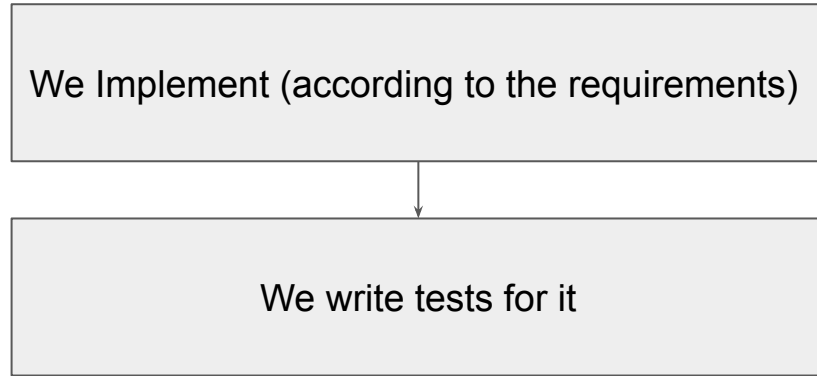


CMPUT 301 Lab 8

Test Driven Development and Continuous Integration

With Github Action

Traditionally...



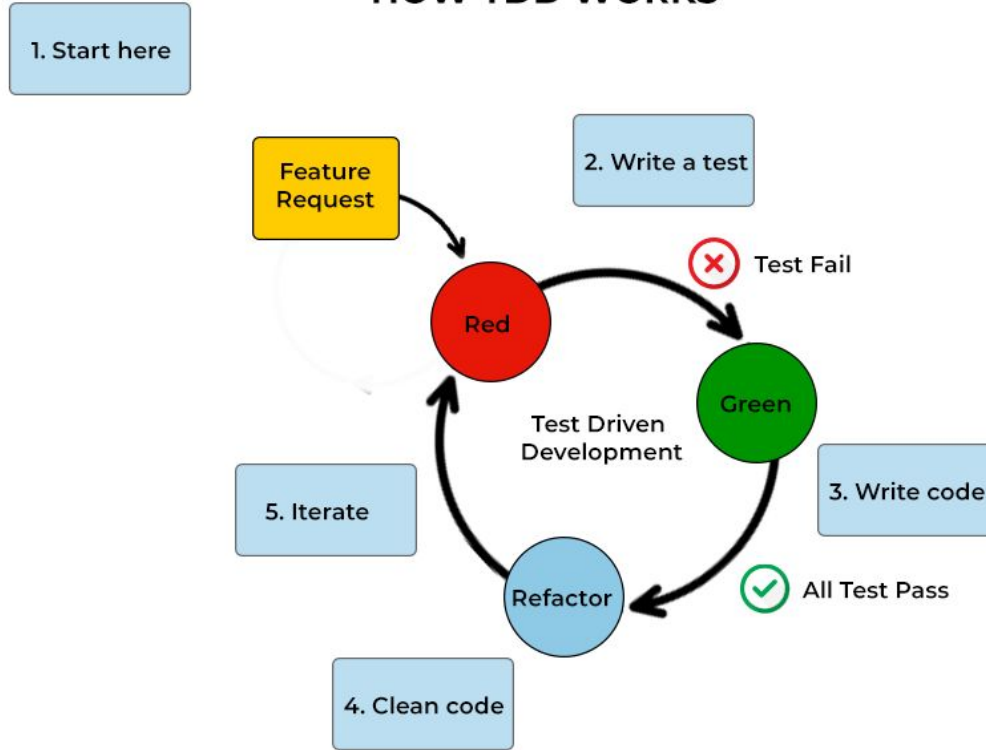
Problems:

- **Miss early problems that could've been caught**
- **No time left to write test (So no idea if the code is even working)**
- **More expensive to refactor code if a problem was caught**

Test Driven Development (TDD)

- Doing things in reverse
- Think about a test. Usually based on the requirements
- Write the test
- Implement the code
- **In the simplest way possible so that the test passes**
- **Refactor the code:**
 - Very often, we are focused on making the test pass instead of applying best practices
 - Do so after the test is green
 - Low level refactor: rename variables, extract common function into methods
 - High level refactor: change class design, change design pattern

HOW TDD WORKS



TDD Pros and Cons

Pros:

- Minimize useless code, as each code has requirements attached to it (In the form of unit test)
- Clear focus: making the test pass. Giving us clear indication on how to approach the problem.
- Ensure close adherence to requirements.
- No need to worry about testing afterwards, and no untested code.
- Codes are testable and can be validated.
- Faster feedback in development cycle. Code is tested immediately after it is pushed.

TDD Pros and Cons

Cons:

- Easy to mismanage time spent. Too much time spent on writing test instead of implementing the code (The important bit)
- Slow. Not very flexible with changing requirements.
- Not always possible on:
 - Large complex code base
 - Legacy system
 - Certain library or frameworks



Common TDD pitfalls

As a developer:

- Writing too many tests at once
- Writing tests that are too large
- Writing tests that are too trivial
- Writing tests for trivial code

As a team:

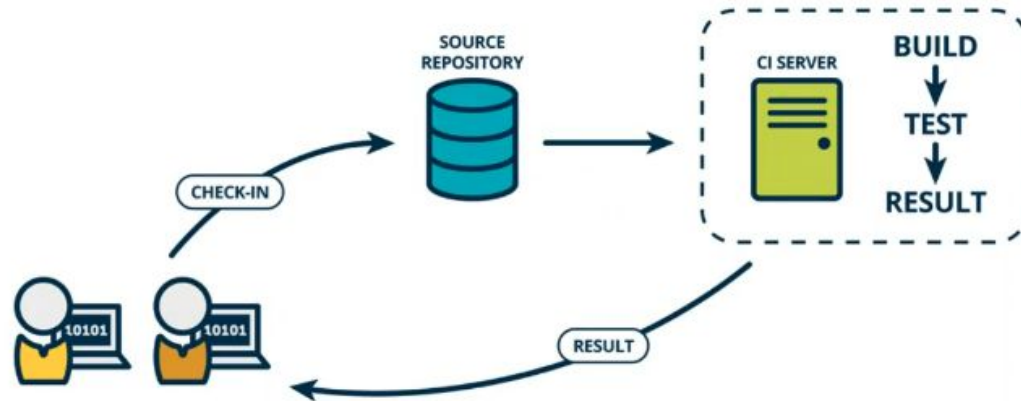
- Inconsistent use of TDD
- Under maintenance of test suites

TDD Summary

- Write a failing test first, make it pass in the simplest way, refactor
- Having tests with good coverage is more important than TDD
- Not a “silver bullet”. Apply it wisely.
- **Listen to your test**
 - Too many test: Possibly low cohesion?
 - Too many mocks: Possible high coupling?
 - Complex setup: Too complicated to use?
- **Not a replacement for code review**

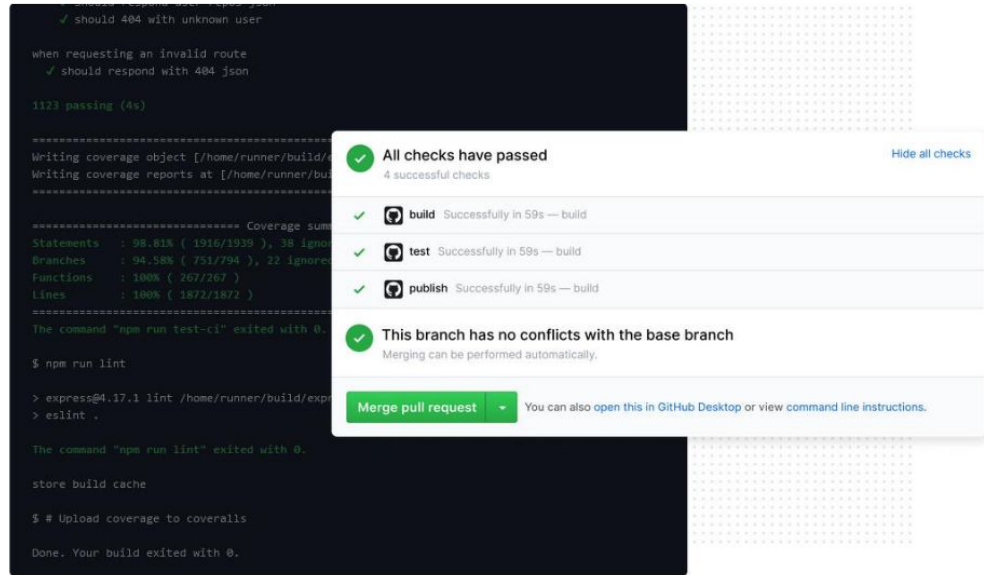
Continuous Integration

- A process where the software is automatically build, test and analyzed in response to every software changes in the source repository
- Making sure the main branch is always production ready
- Making it a lot easier to find and remove bugs, as we can know immediately if the build is broken



Github Action

- One of the many tools for Continuous Integration
- Other options includes:
 - Travis CI
 - ansible
 - Puppet
- Why Github Action:
 - Already integrated into Github
 - Widely used in industry
 - Free



Github Action Workflow

- A way of configuration management.
- Scripts to specify system configuration (packages, OS, versions)
- **This concept is not unique to GH Action**
- **Should be put under version control** (Git in our case)
- It is in YAML format for GH Action

[Documentation](#)

YAML

```
name: learn-github-actions
run-name: ${{ github.actor }} is learning GitHub Actions
on: [push]
jobs:
  check-bats-version:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v3
      - uses: actions/setup-node@v3
        with:
          node-version: '14'
      - run: npm install -g bats
      - run: bats -v
```

TDD + CI

- Ensures TDD is enforced, and ensures tests in CI have good coverage
- Automate testing process and feedback

✓ **GREEN fix: resolve test errors**

Tartan Unit Test #50: Commit dea4dcf pushed by Jack-Gray

✗ **REFACTOR: resolve merge conflicts**

Tartan Unit Test #49: Commit a55bcc6 pushed by Jack-Gray

✓ **REFACTOR: add javadocs and delete commented code**

Tartan Unit Test #48: Commit c26ba7c pushed by Jack-Gray

✓ **GREEN Implemented password valid checking**

Tartan Unit Test #47: Commit d716d30 pushed by flyrobot27

✗ **RED Add passcode_valid variable to return is password is valid**

Tartan Unit Test #46: Commit 0bc22ba pushed by flyrobot27

Want more details?

Take CMPUT 402
Now for lab demo