Software Engineering I

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Contents

1 Bug Reporting **3**

1.1 Key Elements of Bug Reporting: 3

1.1.1 Reproduce 3

1.1.2 Isolate 3

1.1.3 Generalize 3

1.2 Terminology 4

2 Software Configuration Management (SCM) **4**

2.1 Version Control System (VCS) 4

2.2 Build(Maven) 5

2.3 Testing and JUnit 5

2.4 Software Production 6

2.5 Release 7

3 Extreme Programming(XP) **7**

3.1 Modified Waterfall 7

3.2 XP 8

1 Bug Reporting

1.1 Key Elements of Bug Reporting:

- Reproduce - Test it again
- Isolate - Test it differently
- Generalize - Test it elsewhere

1.1.1 Reproduce

- Three times would be good enough.
- Document the platform, environment and sequence of actions that would trigger the bug.

1.1.2 Isolate

- Change the variables
  - Make changes one at a time
  - Require thought and knowledge of system under test(SUT)
  - May not be immediate obvious
- Can be an extensive process
  - Match amount of effort to severity of problem
  - Unavoidable if it's your job

1.1.3 Generalize

- Look for related failures in SUT
- Avoid confusing unrelated problems

1.2 Terminology

- Programmer makes **mistake**.
- **Fault, defect, bug** happen in program.
- Program **fail** during execution
- **Error** Dirrentce between output with expectation.

2 Software Configuration Management (SCM)

- Change control
- Version Control
- Building
- Releasing

2.1 Version Control System (VCS)

Definition 2.1.1 *A Version Control System is a software system that keeps track of the changes made to a set of files so that you can recall a specific version.*

With VCS, you can:

- Collaborate
- Revert changes
- Go back to a specific version

Typical workflow: repo → check out → hack → check in

Problem: If multiple people are changing the same software?

- Locking? - Impossible, or people have to wait.
- Merging? - Risky, maybe introduce bugs.

2.2 Build(Maven)

Things to consider:

- Which compiler? Which flags?
- Which source file?
- Which libs?
- Which version?

Tools:

- make - Under Unix, original tool
- ant - Java based, uses XML
- Maven - Used by $\mathbb{K}$
- ...

2.3 Testing and JUnit

Why test?

- Improve quality
- Measure quality
- Learn the software

What is a test?

- Run program with known inputs, check results
- Test can document faults
- Test can document code

What kind of test?

- Programmer / Non=programmer
- Developer / Tester
- Unit test / Integration tests / Functional tests / System tests
- Automated/ manual

2.4 Software Production

Product = set of components/documents

- Codes
- Docs
- Tests
- Designs
- Requirements
- ...

You need to keep track of:

- Version
    - Sequence if versions during development
        - Alpha/Beta/Final release...
    - Different released versions
    - branch
        - Traditional VC: Avoid
        - Modern: Encourage use of short lived branches
        - Good reasons to branch
            - Fix bugs
            - Experiment version

      - Political fight
    - Bad reasons to branch
      - Support different platform (Make subclasses / use conditional compilation / make portability library instead)
      - Support different customer

- Resources
  - Test suites
  - Manual
  - User cases
  - Designs

Baseline Baseline is a software configuration item that has been reviewed and agreed upon, and that can be changed only through formal change control procedures

Control Authority management

2.5 Release

Release is a software configuration item that the developers give to other people. Release should be a baseline.

3 Extreme Programming(XP)

3.1 Modified Waterfall

1. Requirement, analysis
2. Design, Checking
3. Implementation, unit testing
4. Integration, System Testing
5. Maintenance

3.2 XP

Big ideas

- Don't write much docs
- Implement features one by one
- Release code frequently
- Work closely with the customer
- Communicate a lot with team members

Activities

- Requirement, analysis - Planning game
- Design, Checking - Test-driven development
- Implementation, unit testing - Refactoring for design
- Development - Pair Programming
- Integration - Continous integration