

# *Software Architecture and Techniques*

## Errors, Vulnerabilities, and Smells In Source Code

# Clean Code

- Simplest step to improve your source code is to use tools
- Tools are cheap, fast, and do not require coordination with experts
- Tools can only find **non-quality**
- Practice daily to improve – same as to go to the gym -

# Clean Code

- Compiler errors
- Compiler warnings
- Static checks
  - Bugs → high probability it will crash
  - Errors → it can crash
  - Vulnerabilities → it can be hacked
  - Smells → it will cost to maintain

# Tools

- Analyze with your IDE functions
- Jacoco
- SpotBugs
- SonarLint and SonarQube
- Checkstyle
- PMD

# Sonar Rules

- Around 500 rules only for Java code
- Subset of **OWASP** vulnerabilities
- Subset of **MISRA** rules for C and C++ code
- De facto standard
- If you find a better tool, just use it

*Goal: Improve Quality of your **product** and source code*

# OWASP

- Injection
- Broken Authentication
- Sensitive Data Exposure
- XML External Entities XEE
- Broken Access Control
- Security Misconfiguration
- Cross Site Scripting XSS
- Insecure Deserialization
- Using Components with known vulnerabilities
- Insufficient Logging and Monitoring

# Why use Tools?

- It is cheaper to use tool than to use humans to review code
- You can do it every few minutes
- Nobody is watching over your shoulder
- But tools can only find simple problems

*The approach we recommend to code quality?*

*Manage it as a water leak, fix the leak before you mop the floor!*

# Goals

- No compiler errors
- No compiler warnings
- No Sonar, Spotbugs errors, vulnerabilities or smells
- Code coverage shall be higher than 60%
- **Every found bug has a test reproducing it before you correct the error**



# Why Pair Programming?

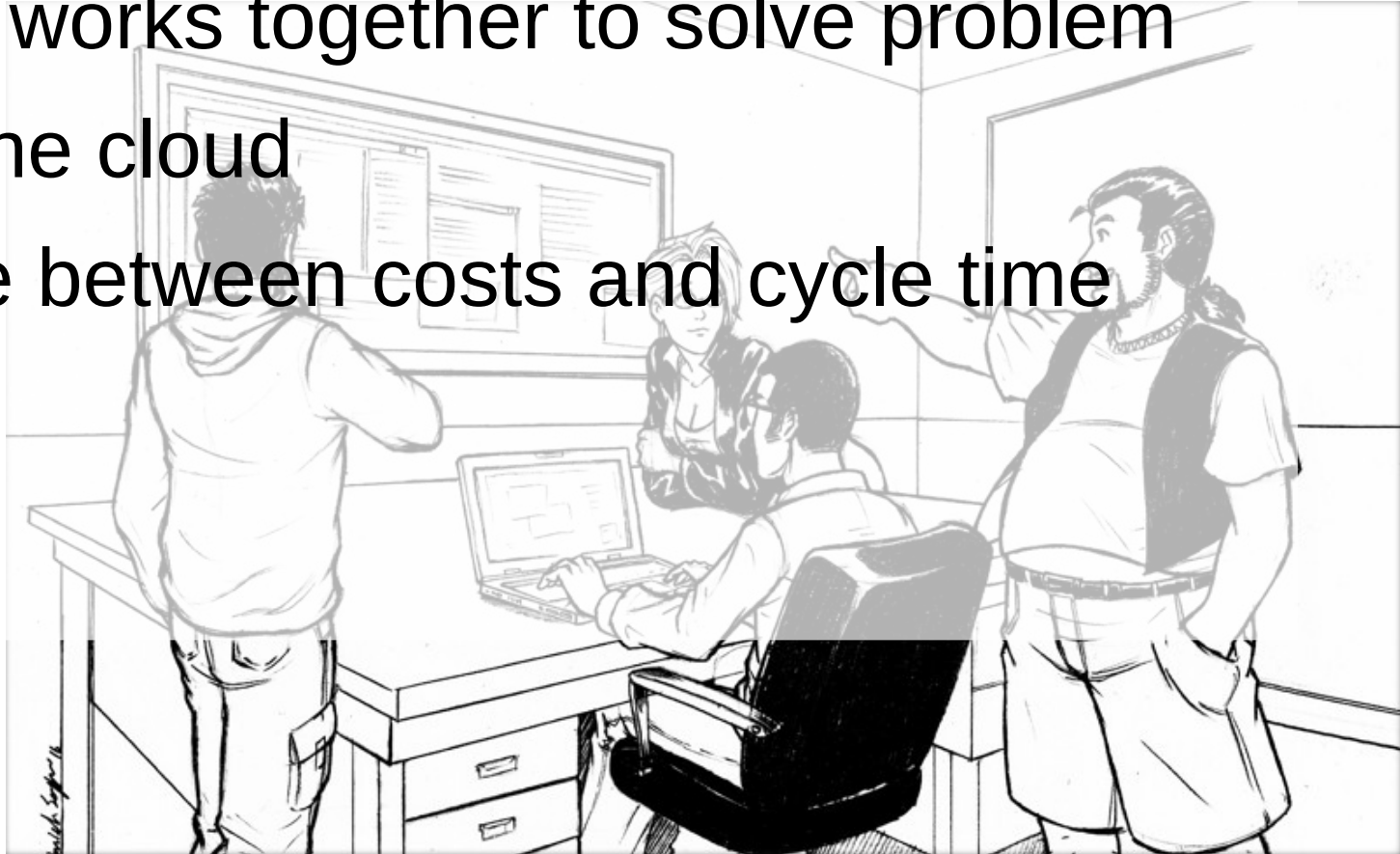
- Tools only detect simple semantic problems
- People help you to improve your design
- People help you to get started with architecture
- Multiple team members know the code

## ***Wisdom of the crowd***

pair programming, mob programming

# Next Stage: Mob Programming

- Whole team works together to solve problem
- Wisdom of the cloud
- Compromise between costs and cycle time



# Technical Meetings / Dojos

A group of people in a meeting room. In the foreground, a man in a black jacket sits at a curved wooden table, working on a laptop. Behind him, several other people are gathered around a larger table, some looking at laptops and others at a large screen in the background. The screen displays code. The room has blue walls and large windows.

You still should hold coding dojos

You still should do architecture workshop each sprint

*Remember: Tools find non-quality, they currently cannot measure quality*

# SonarLint and SonarQube

- Work in pair
- Run SonarLint “Analyze with SonarLint”
- Read the generated report
- Study the rule description
- Repeat

# Forensics Approach

CODESCENE

<> Projects ⚙ Configuration 📖 Documentation 🚪 Logout

ANALYSIS RESULTS  
VISUAL STUDIO CODE

Dashboard  
Scope  
Technical Debt  
Hotspots  
Refactoring Targets  
Temporal Coupling  
Rising Hotspots  
Complexity Warnings  
Architecture  
Social Analyses  
Project Management

Prioritize improvements to the highlighted files. Red is most serious. +

Hotspots Refactoring Targets Code Age Code Churn Programming Language

System / vscode / src / vs

- base
- code
- editor
- platform
- workbench
- css.build.js
- css.js
- loader.js
- monaco.d.ts
- nls.js
- vscode.d.ts
- vscode.proposed.d.ts

```
git log --pretty=format: --name-only | sort | uniq -c | sort -rg | head -10
```

```
git log --numstat --pretty=format:'[%h] %an %ad %s' --date=short
```

# Advanced Tools

- Module concept of Java 9
  - Compiler validation of dependencies and visibilities
- ArchUnit
  - Codify dependency rules as unit tests

# Modules

- Huge impact on architecture
- Still *bleeding edge* in Java
  - *Java communities are laggards* -
- Formalize bounded domains
- Compiler validation

# ArchUnit

- Good approach before modules
- Custom rules for specific needs
- *Leading edge* with Java – sometimes laggards with new features -



# DevOps Approach

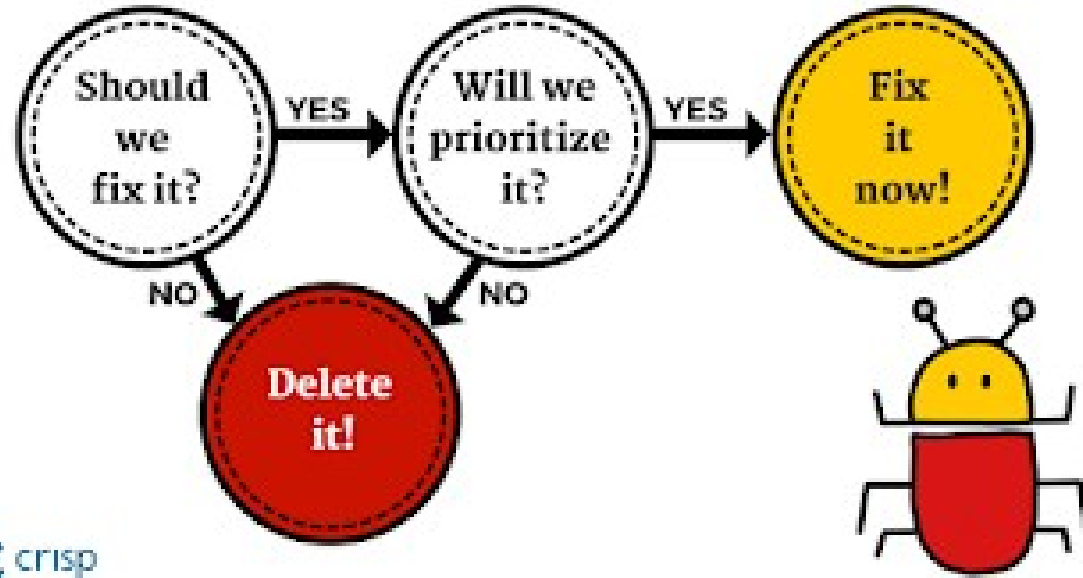
- Tools make only sense if they are automatically triggered in your CI/CD
  - They are part of your Gradle or maven build
- Automatic quality gates are the corollary

# Zero Bug Policy

- No Open Bug
- Fix it or forget it
- Deliver quality
- Have happy users
- No more bug board

## FIX IT NOW OR DELETE IT

THE DEFINITIVE BUG MANAGEMENT SYSTEM



# Zero Bug Culture

- No bug evaluation committee
- No big JIRA bug database
- No planning or discussion of bug fixing

Just do it!

# Bad APIs

- Force clients to write bad code
- Lack of consistency in nomenclature
- Centralize access to the features in a single class
- Do not use immutable objects
- Do not document your API
- Use old Java style

# Bad Scrum / Agile

- Missing Definition of Done *DoD*
- Missing git training
- Missing coding guidelines
- Missing deployed application multiple times per week
- Missing DevOps discipline

# Exercises (1/3)

- Read the cheat sheet “Clean Code”
- Code coverage with with IntelliJ and Jacoco
  - How to improve code coverage?
  - Why should you improve code coverage?
  - How much should you improve code coverage?
- Static checks with IntelliJ and SonarLint
  - Explore tools such as [Snyk](#)

# Exercises (2/3)

- Coding dojos with student code examples
  - Remove smells
  - Refactor
  - Unit tests
  - Test driven tests
  - Always regularly commit to git with meaningful comments

# Exercises (3/3)

- Optional exercise
  - Connect your gitlab project to SonarQube
  - Extend your pipeline to generate SonarQube metrics
  - Study your git history over time
    - Read Martin Fowler post  
*[Patterns for Managing Source Code Branches](#)*