Wenn Sie diesen Text lesen können, müssen Sie die Folie im Post-Menü mit der Funktion «Folie eingefügen» erneut eingefügen. Sonst kann die Fläche nicht eingefärbt werden!
CONTENT

– Motivation
– Research questions
– Research objects
– Research methods
– Intermediate results
– Discussion
MOTIVATION

- Testing?
  - Find Bugs!
  - Quality!
  - Fast Deployment!
  - Short Release Cycles!
MOTIVATION

# Test Cases?
RESEARCH QUESTIONS

Relation between bugs and unit tests
– Does the discovery of bugs push the writing of tests?
– How many files need to be changed to fix a bug?
– Is it easy to write new tests?

Quality of unit tests
– Do existing tests prevent the occurrence of bugs?
– Are there bugs which occurred again after they were fixed?
RESEARCH OBJECTS

**Project ePostOffice**
- Digital platform for receiving and sending physical and electronic mail
- Mixed technologies
- Ongoing for 6 years

**Project PostApp**
- App of the Swiss Post *(Opening hours, location services, parcel tracking, ...)*
- Xamarin Mobile App
- New release few weeks ago
DEVELOPER TOOLS

- Confluence (Wiki, Requirements)
- Jira (Issue-Tracker, SCRUM)
- Git (Version control)
- Subversion (Version control)
Issues, Commits, File changes

Defective classes not covered by Tests
Possibly duplicate Bugs
Defective classes covered by Tests
RESEARCH METHODS 2/2

Defective classes not covered by Tests
- Why are they not covered by tests? => Assess testability of code
- How could we test them? => Suggest improvements

Possibly duplicate Bugs
- Which ones are really duplicate bugs? => Manual inspection
- Why did they occur again? => Study history

Defective classes covered by Tests
- How good are those tests? => Apply mutation testing to them
INTERMEDIATE RESULTS 1/4
TESTABILITY OF CODE AFFECTED BY BUGS

Method
– Manual inspection of 200 issues/bugfixes
– Classification of Testability

Results
– Testability is hard in most cases
– Reasons:
  – GUI components involved
  – Violation of Single Responsibility Principle
**INTERMEDIATE RESULTS 2/4**

**NUMBER OF FILES CHANGED DURING BUGFIX**

**Method**
- Same 200 issues as before
- Retrieve number of affected code files from Database

**Results**
- In 35% of the cases only one file changed
- In 54% more than one file changed
INTERMEDIATE RESULTS 3/4
DUPLICATE BUGS

Method
– Tool to compare diffs on method level
– List of commits which changed same method
– Manual inspection of suggestions to find real duplicate bugs

Results
– C# files: 20 possibly duplicate bugs, no similar bugs
– Java files: 135 possibly duplicate bugs, 7 similar bugs
INTERMEDIATE RESULTS 4/4
MUTATION TESTING

Method
– Apply mutation testing to bugs which are possibly covered by tests
– Use VisualMutator plugin from Warsaw university

Results
– Tool very unstable and slow
– No results yet
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REFERENCES 1/2

Literature

Tools
REFERENCES 2/2

Images

- https://commons.wikimedia.org/wiki/File:Logo_Universit%C3%A4t_Bern.svg (2018-06-09 19:15)
- App Icons from the ePof and PostApp project taken from their code repositories