

How complete are your tests?



Code Coverage in Eclipse

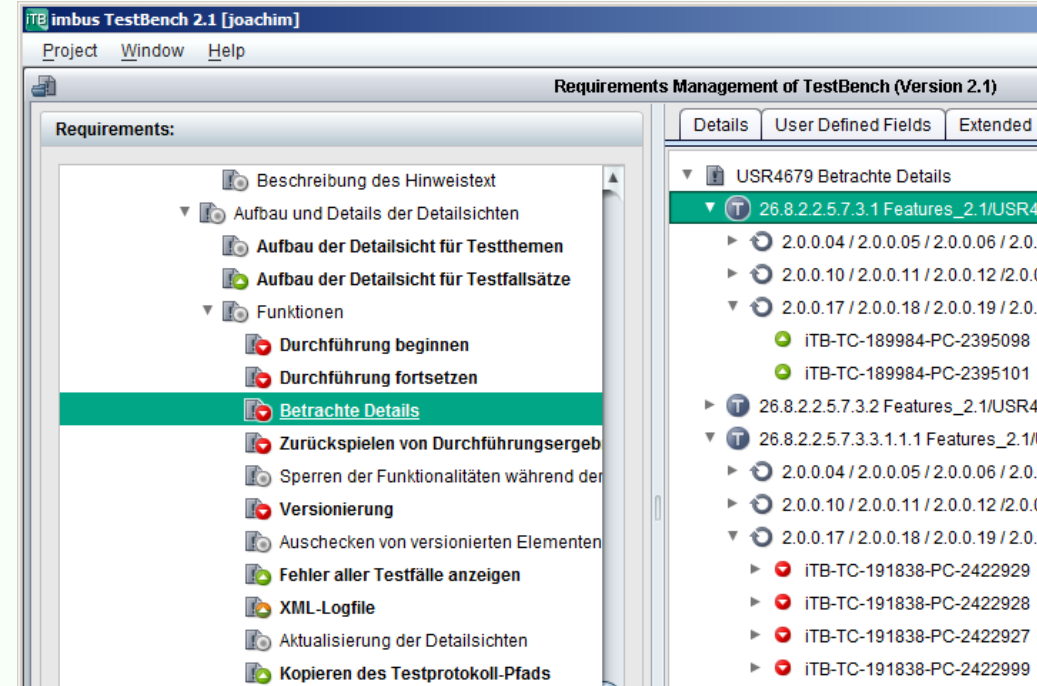
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Outline

- Motivation
- Types of Code Coverage
- Case Study:
 - Testing *TestBench*
 - Tool Requirements
- Code Coverage Tools

Why Code Coverage? (1)

- Tests need goals!
 - Black Box:
 - Requirement Coverage
 - System Tests
 - White Box:
 - Code Coverage
 - Integration/Unit Tests



```
private static String greetFirst(String... names) {  
    String name = null;  
    if (names.length > 0) {  
        name = names[0];  
    }  
    return name.endsWith("Anderson") ? "Welcome, Mr Anderson" : "Hello, Mr Anderson";  
}
```

Why Code Coverage? (2)

- Not for optimizing yet another code metric!
 - Easy to increase in *all the wrong ways...*
 - False sense of security
- What can go wrong with developer tests?
 - ... don't test what they are intended to
 - ... won't get executed
 - ... can be elaborate in the wrong places

→ *Analyze their coverage!*

Types of Code Coverage

- Coverage Types

- Statement Coverage

Not good enough!

- Branch Coverage

Often good enough...

- Condition Coverage

Difficult...

- Path Coverage

Usually impractical.

- Instrumentation Types

- Based on Source Code

Usually recommended, but...

- Based on Bytecode

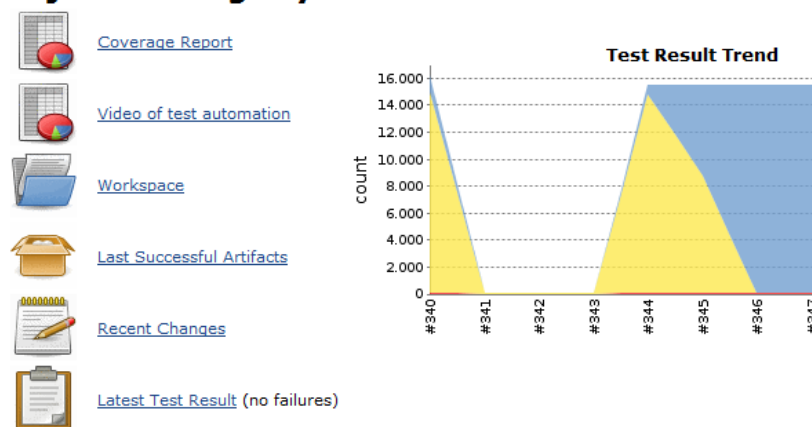
JVM multi-language support!

Case Study: Testing TestBench

- System Test (QF-Test, TestBench)

- ~16k tests run every night
- Takes 10 hours
- Video capturing
(due to popular request: done via vnc und vnc2flv)

Project iTB Nightly Test Automation



- Integration/Unit Test (TestNG)

- > 1000 tests run after each commit
- Takes 10 minutes
- Complemented by FindBugs

cc.mbus.taustems.element	9	75%	116/143	86%	117/143
cc.mbus.taustems.element.ui	17	47%	242/274	27%	259/274
cc.mbus.taustems.element.cl.EquivalClass	11	43%	198/230	14%	193/230
cc.mbus.taustems.element.cl.Instance	11	59%	217/113	22%	204/113
cc.mbus.taustems.element.cl.Line	23	45%	319/260	32%	357/245
cc.mbus.taustems.element.macro	9	81%	244/101	64%	216/101
cc.mbus.taustems.element.macro.param	8	57%	105/185	53%	121/160
cc.mbus.taustems.element.macro.param	5	81%	91/111	58%	97/100
cc.mbus.taustems.element.subdiv	4	41%	10/100	50%	17/111
cc.mbus.taustems.exceptions	6	9%	6/56	0%	0/18
cc.mbus.taustems.ordering	5	23%	12/24	11%	2/18
cc.mbus.taustems	6	43%	84/145	24%	117/159
cc.mbus.taustems.exceptions	20	3%	1/300	0%	0/300
cc.mbus.taustems.user	30	13%	274/2081	8%	277/2111
cc.mbus.taustems.util	54	21%	138/274	12%	140/295
cc.mbus.testbench.server	2	58%	21/37	58%	2/11
cc.mbus.testbench.server.eib2	2	81%	36/32	60%	30/35
cc.mbus.testbench.server.eib2.entity	9	20%	1/40	0%	0/18
cc.mbus.testbench.server.eib2.security	14	91%	196/210	90%	193/214
cc.mbus.testbench.server.eib2.group	4	3%	1/30	0%	0/18
cc.mbus.testbench.server.eib2.ui	12	62%	89/129	N/A	N/A
cc.mbus.testbench.server.eib2.session	2	75%	11/14	50%	7/14
cc.mbus.testbench.server.eib2.session.config	30	43%	22/49	37%	17/49
cc.mbus.testbench.server.eib2.session.protocol.portpost	13	50%	49/100	49%	49/100
cc.mbus.testbench.server.eib2.session.reporting	4	51%	40/100	36%	11/10
cc.mbus.testbench.server.eib2.session.test.casebase	3	48%	75/100	35%	50/100
cc.mbus.testbench.server.eib2.test.port.license	3	72%	13/18	N/A	N/A
cc.mbus.testbench.server.util	4	70%	33/41	100%	2/10
cc.mbus.testbench.shared	5	64%	4/6	33%	11/10
cc.mbus.testbench.util	22	65%	334/335	79%	110/144
cc.mbus.testbench.util.18c	3	42%	4/11	0%	0/2
cc.mbus.testbench.util.connector	15	20%	3/23	30%	3/10
cc.mbus.testbench.util.trace	11	58%	4/9	100%	10/15

Case Study: Tool Requirements

- Measures Branch Coverage
- Available via Command Line for Build
- Integration into CI Server (Hudson et al)
- Eclipse Plug-in Available
- Based on Bytecode
- Free if possible...

Code Coverage Tools

- *CodeCover* looks good not bytecode-based no CI integration
- *Emma / EclEmma* no branch coverage
- *Clover* looks good not free
- *Cobertura* no Eclipse plug-in
 - *eCobertura* Eclipse plug-in yay! still pretty basic

Links

- Eclipse Plug-ins
 - eCobertura - <http://ecobertura.johoop.de>
 - EclEmma - <http://eclemma.org/>
 - CodeCover - <http://codecover.org/>
 - Clover - <http://www.atlassian.com/software/clover/>
- Command Line / Ant
 - Cobertura - <http://cobertura.sourceforge.net/>
 - Emma - <http://emma.sourceforge.net/>
 - JaCoCo - <http://www.eclemma.org/jacoco/>

Thanks!



Any questions?