

# Automated Defect Prevention with Open Source

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Alex Obradovic

[aobradovic@gmail.com](mailto:aobradovic@gmail.com)

# Overview

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- Use open source to provide tool/process integration and traceability
- Present a common problem scenario in an organization
- Explain reasons for the problem
- Propose an Open Source ADP solution
- Refine and customize the infrastructure
- Explain integration
- Explain traceability

# Problem defined: Lack of integration and automation (process and tools)

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- Data collected, kept in islands of unrelated data
- Organizations exclusively rely on manual processes
- Unreliable process results in data loss, errors
- Integration efforts target specific tools, but not tools and processes
- Audits effortful and expensive

# Reasons?

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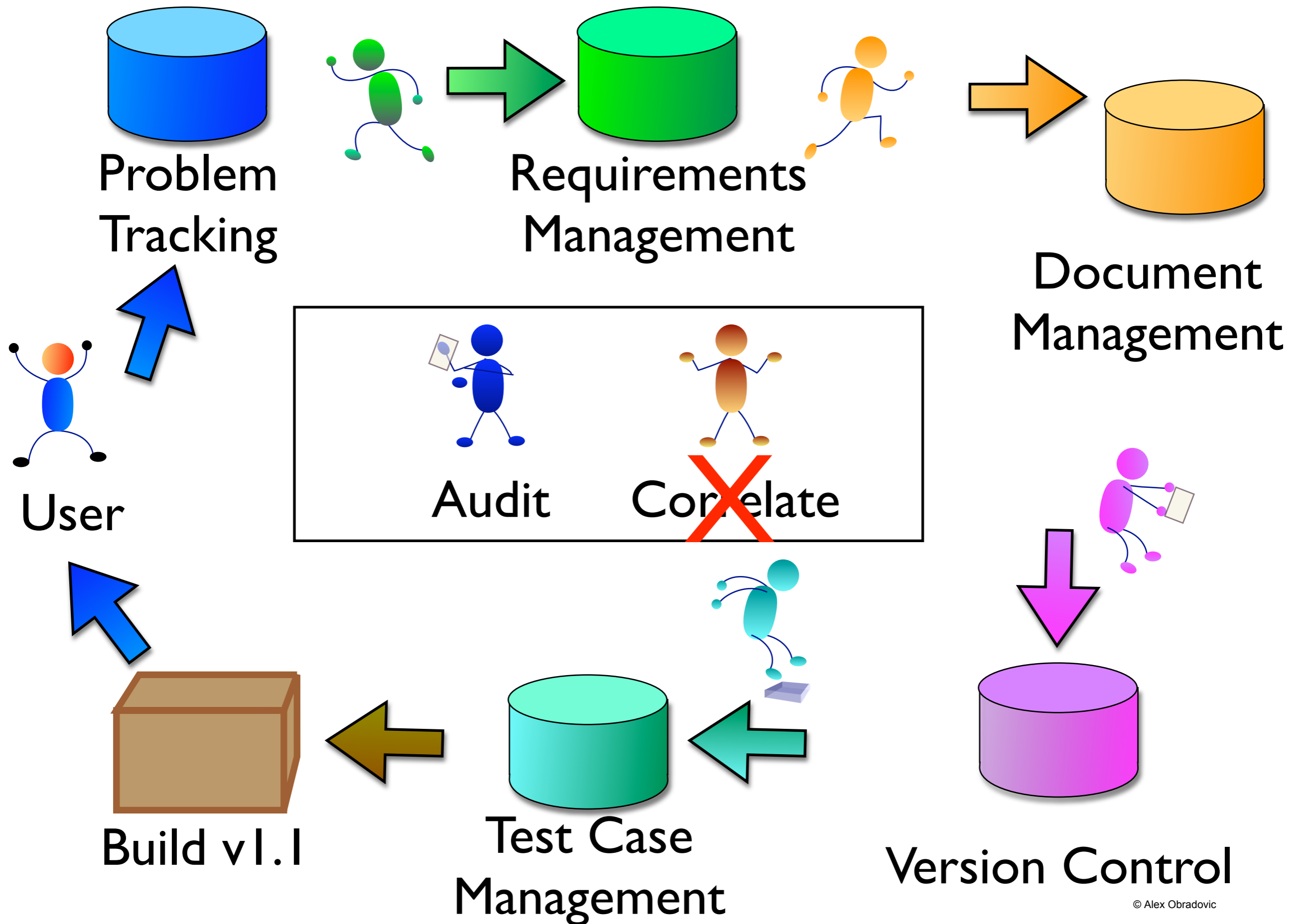
- Lack of well-established methodologies for tool/process automation
- CS/SE Curriculums do not focus on tools
- Tool/process integration may be difficult and lengthy process
- Well integrated tools may be vertical solutions which require vendor lock in
- Purchasing decisions made by multiple departments based solely on features of individual tools, not on their integration potential
- Purchasing influenced by marketing and/or the past experiences of decision makers

# Achieving Tool/Process integration with Open Source and ADP

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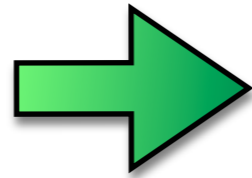
- Infrastructure tools: Version control (Subversion), Problem/Requirements/Change Management/Test Case management (Bugzilla), Automated Build Tool (Hudson), ScmBug, LDAP, more...
- Industry's best practices: Unit testing, Coding Standards, Style and Code checkers...
- Customizations: Integration of tools and processes, Code control, Policies...
- Measurement and reporting: Individual tool reports, Custom reports...
- Automation: Regression unit tests, automated builds, static analysis
- Incremental implementation

# Maintenance Change Request

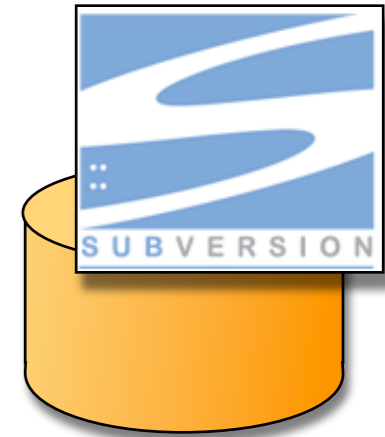
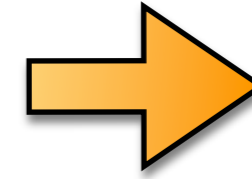




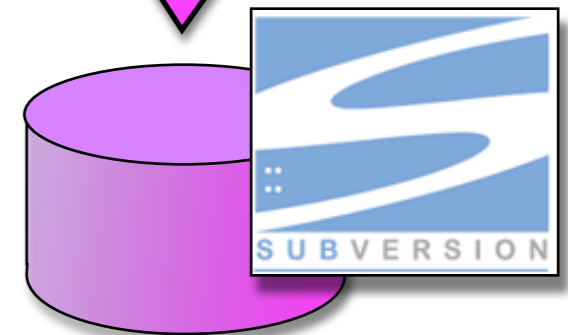
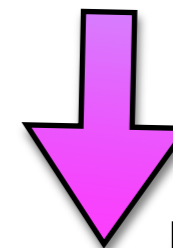
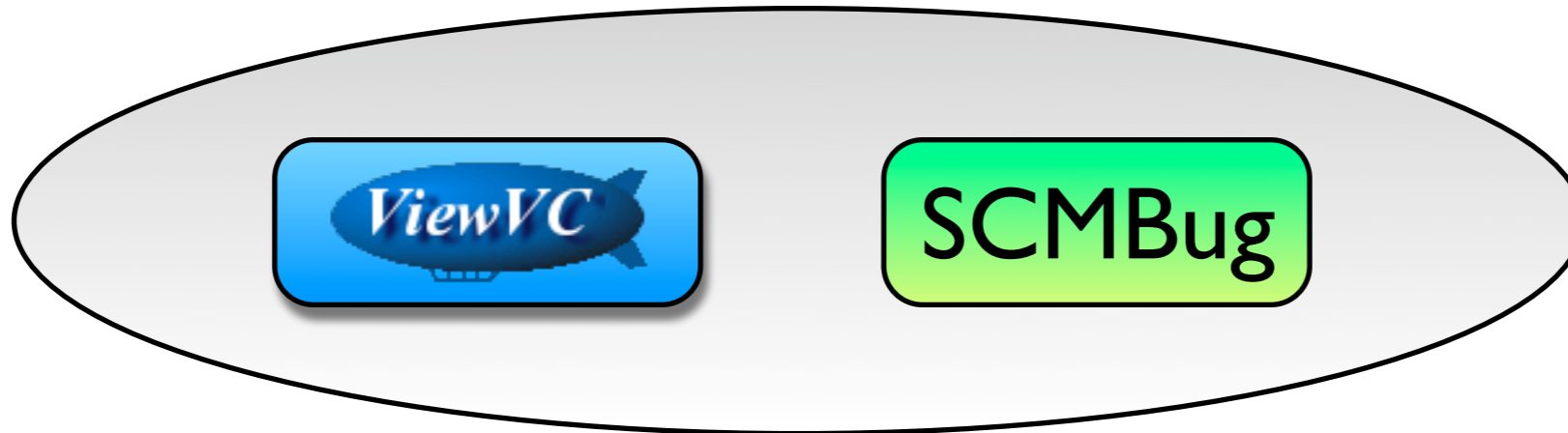
Problem Tracking



Requirements Management



Document Management



Version Control



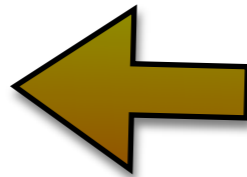
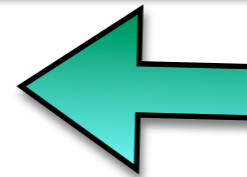
Hudson



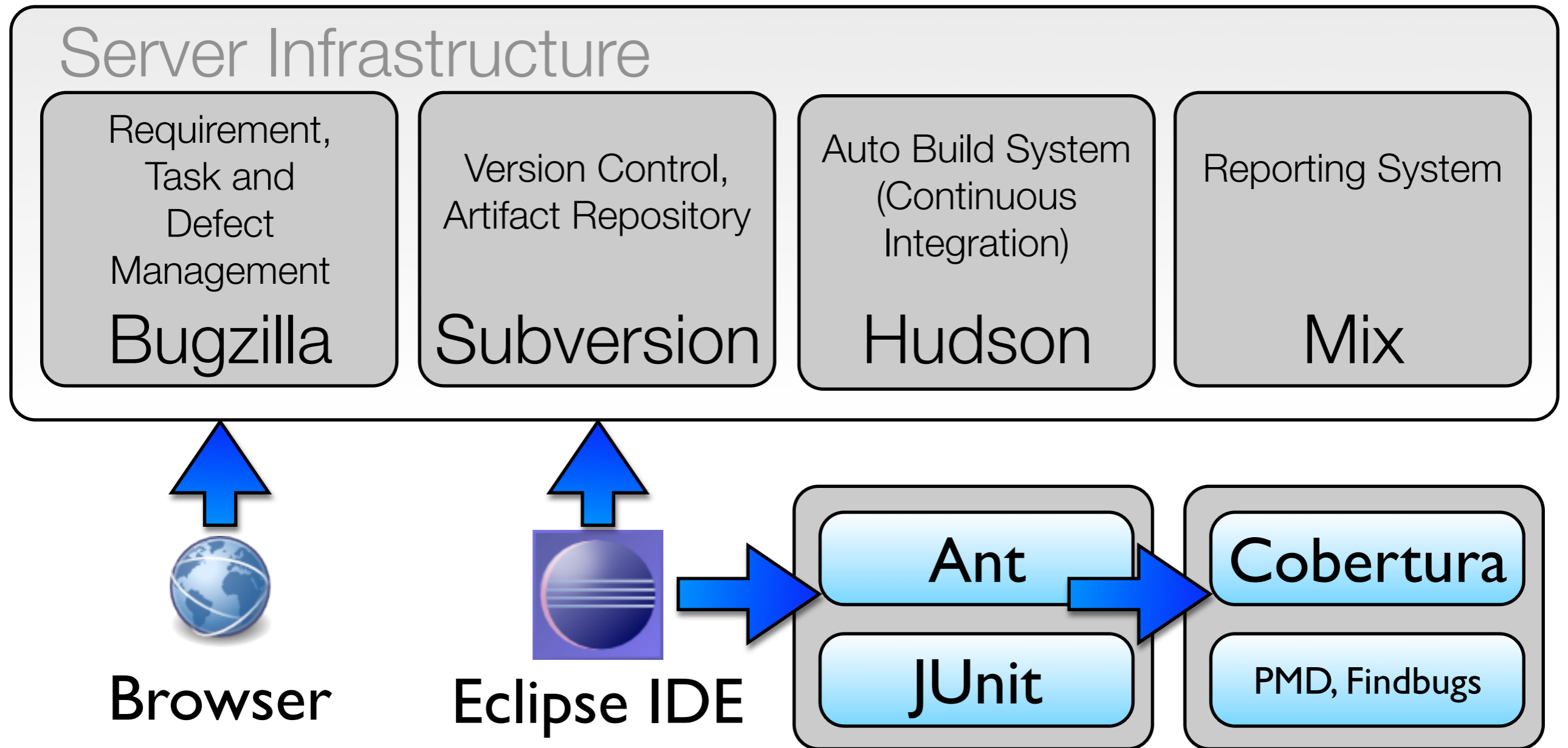
Build v1.1



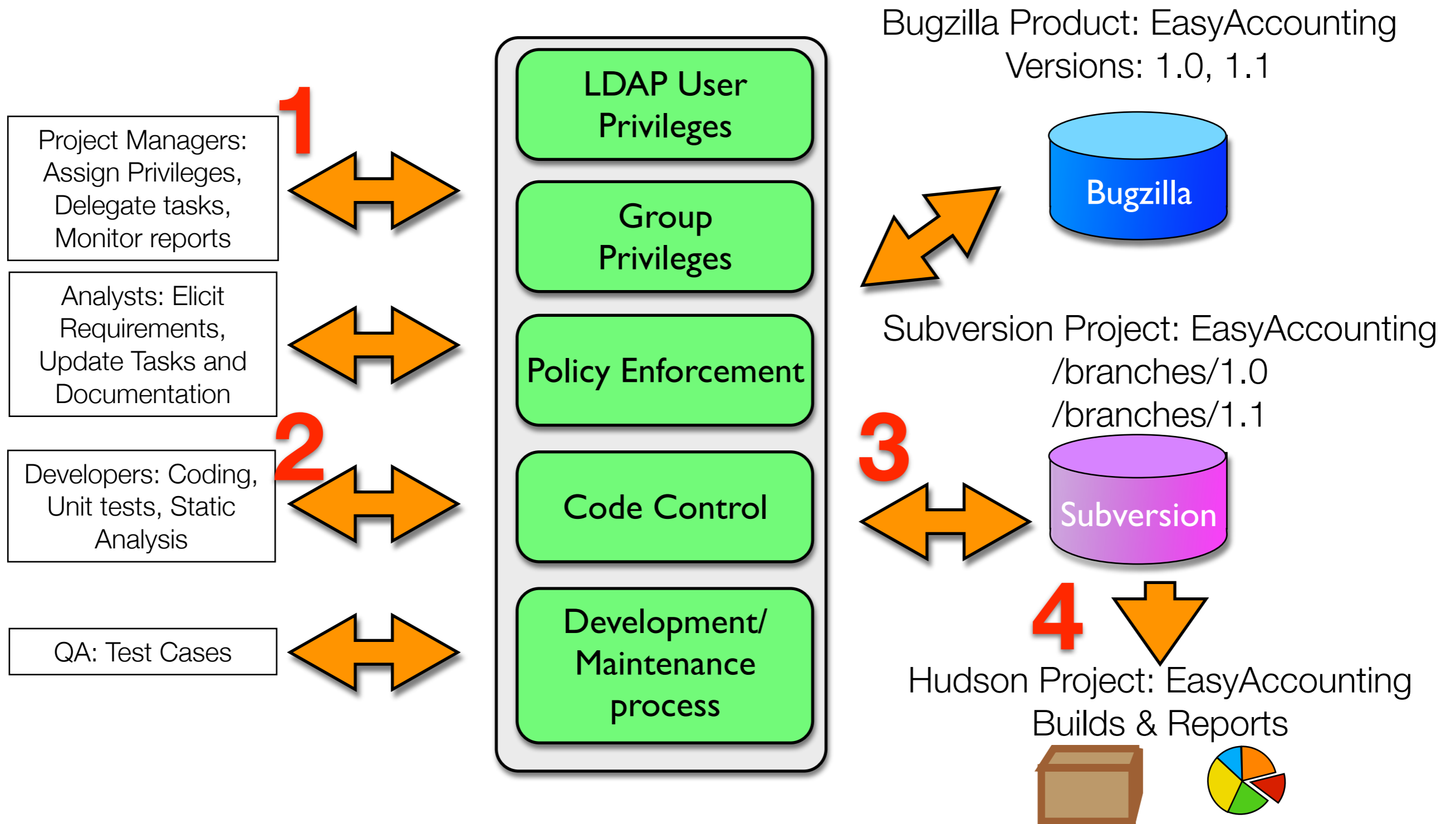
Test Case Management



# Introducing ADP Infrastructure



# ADP Infrastructure Example



# Bugzilla View: Http access

Bugzilla

[Bugzilla](#) Version 2.22.2

**Bugzilla Bug 18** Subtraction method missing from the math package.

Last modified: 2008-04-21 21:37:30

**Bug List:** (This bug is not in your last search results) [Show last search results](#)

[Search page](#)

[Enter new bug](#)

**Bug#:** [18](#)

**Product:** Easy Accounting

**Component:** Math package

**Status:** ASSIGNED

**Resolution:**

**Assigned To:** Alex Obradovic  
<alex@alexe.org>

**Hardware:** All

**OS:** All

**Version:** EasyAccounting\_RELEASE\_1-1-0

**Priority:** P1

**Severity:** normal

**Reporter:** Helpdesk <helpdesk@alexe.org>

**Add CC:**

**CC:**

**URL:**

**Summary:** Subtraction method missing from the math package.

**Flags:**

manager: Defect

Requirement

Task

addl. Defect

**Requestee:**

Orig. Est.	Current Est.	Hours Worked	Hours Left	% Complete	Gain	Deadline
8.0	0.0	0.0 + <input type="text"/>	<input type="text"/>	0	8.0	<input type="text"/> (YYYY-MM-DD)

[Summarize time \(including time for bugs blocking this bug\)](#)

# Eclipse View: Maintenance/Development

The screenshot displays the Eclipse IDE interface for a Java project named "EasyAccountingTrunk". The Package Explorer on the left shows the project structure, including the "src" directory with the package "org.alexe.easyaccounting.math" containing "ICalculator.java" and "CalculatorImpl.java". The "test" directory is also visible. The central editor shows the "build.xml" file with the following XML content:

```
<project name="easyaccounting-math-build" b
  <property name="jar.file.name" value="d

  <!-- all outputs of the build script go
  <property name="target_folder" value="t

  <!-- compiled java classes go here -->
  <property name="compiled_classes" value

  <!--cobertura instrumented classes for
  <property name="cobertura_instrumented
```

The Outline view on the right shows a list of tasks under "taskuer tasks.properties":

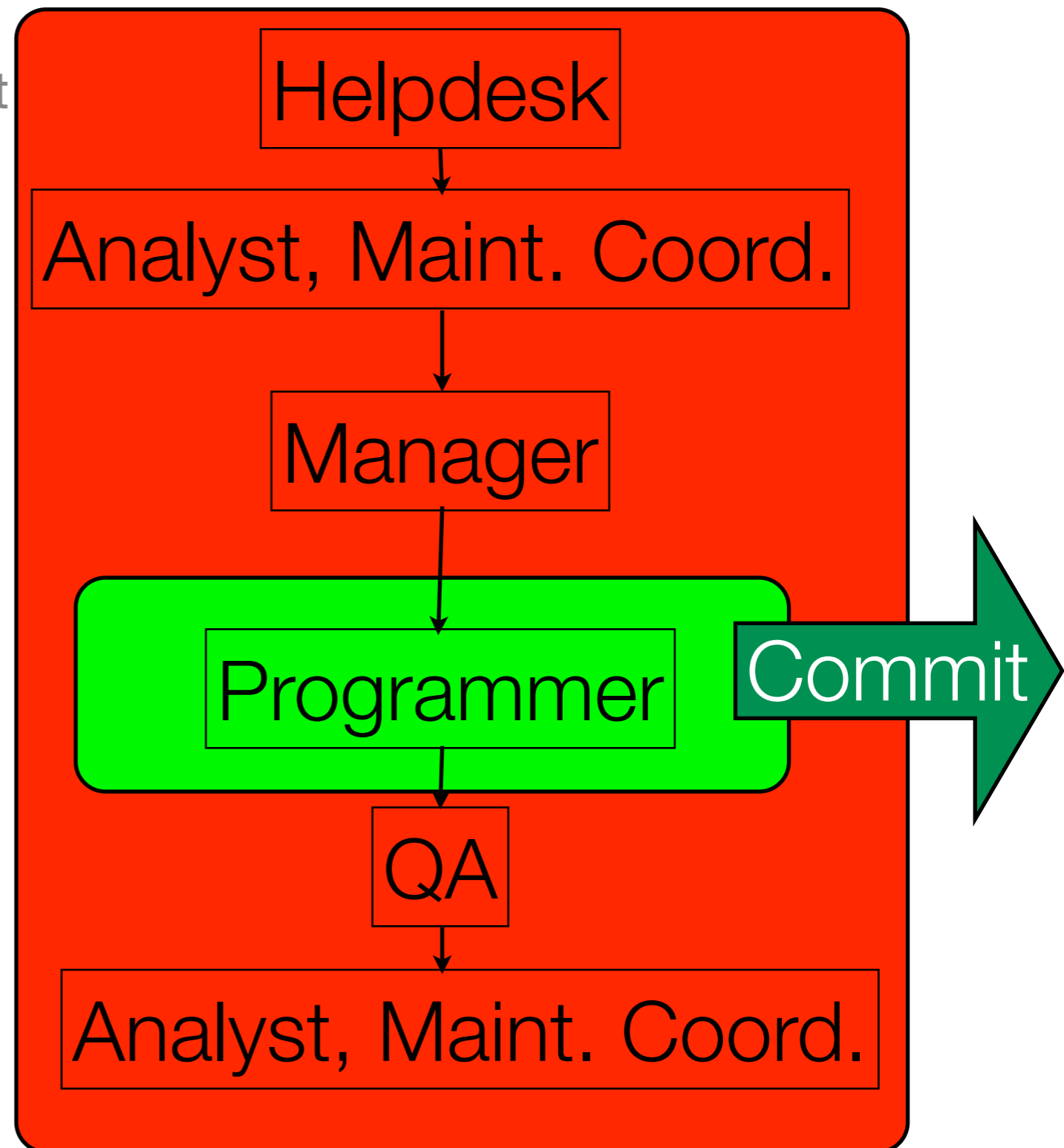
- B1000\_compile\_java\_source\_cod
- C1000\_pmd\_static\_analysis
- C1100\_compile\_junit\_tests
- C1200\_Cobertura\_code\_coverag
- C1300\_Execute\_Junit\_Tests
- C1400\_Generate\_Cobertura\_Rep
- C1500\_Create\_Jar

The bottom panel shows the "Task List" tab, which displays a list of tasks from a Bugzilla repository:

- 8: Sample problem with the version 1.1
- 9: Perform a change request, add a new feature
- 10: Change tax rate to accommodate new government regulations

# Life-cycle of a problem report, a need for code control

- Helpdesk gets a report of a defect
- Analyst assigned by default, adds documentation
- Approval sought from a project manager
- Request assigned to a programmer
- Request assigned to SQA
- Request Resolved, then closed



# Code Control Rules: Code can be checked in if

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- A developer has a LDAP access
- Developer supplies a Change Request number
- Change Request has a status that allows code check in
- Change request is assigned to a developer who is attempting to check in the code
- Check-in comment is of appropriate length

# Hudson View: Project Dashboard

- [Back to Dashboard](#)
- [Status](#)
- [Changes](#)
- [Workspace](#)
- [Build Now](#)
- [Delete Project](#)
- [Configure](#)
- [Violations](#)
- [Coverage Report](#)
- [Subversion Polling Log](#)

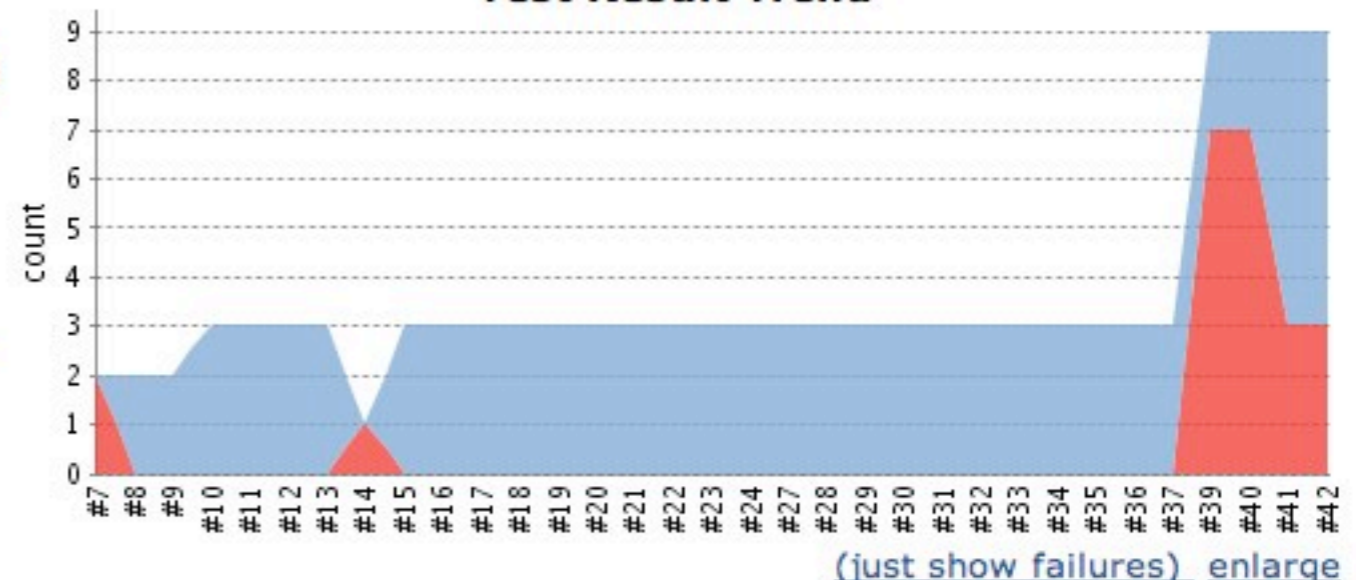
## Project mylyn-bugzilla

Builds mylyn-bugzilla API required by ADPDashboard in order to create a set of templated tasks for the new project

[edit description](#)

- [Coverage Report](#)
- [Workspace](#)
- [Recent Changes](#)
- [Latest Test Result \(3 failures / ±0\)](#)

### Test Result Trend



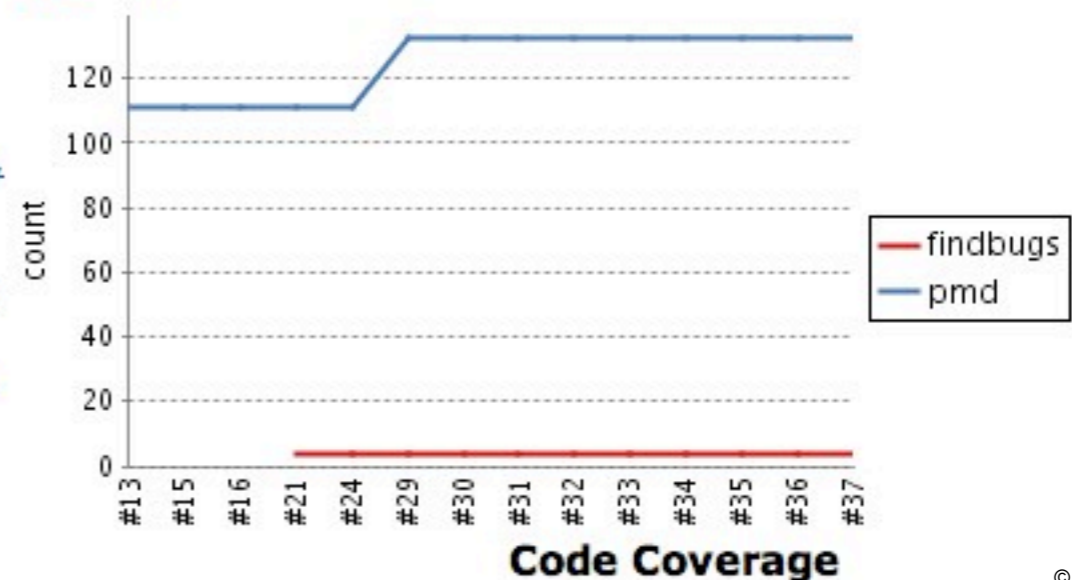
### Build History [\(trend\)](#)

	#42	<a href="#">Apr 21, 2008 3:38:33 AM</a>
	#41	<a href="#">Apr 21, 2008 3:35:25 AM</a>
	#40	<a href="#">Apr 21, 2008 3:33:45 AM</a>
	#39	<a href="#">Apr 21, 2008 3:21:38 AM</a>
	#38	<a href="#">Apr 3, 2008 2:51:45 PM</a>
	#37	<a href="#">Mar 21, 2008 1:09:45 PM</a>
	#36	<a href="#">Mar 20, 2008 2:39:45 AM</a>
	#35	<a href="#">Mar 2, 2008 8:05:14 PM</a>
	#34	<a href="#">Mar 2, 2008 8:04:14 PM</a>
	#33	<a href="#">Mar 2, 2008 7:56:42 PM</a>
	#32	<a href="#">Mar 2, 2008 7:55:14 PM</a>

### Permalinks


- [Last build \(#42\), 3 days 5 hours ago](#)
- [Last stable build \(#37\), 1 month 3 days ago](#)
- [Last successful build \(#37\), 1 month 3 days ago](#)
- [Last failed build \(#42\), 3 days 5 hours ago](#)

findbugs 4 pmd 133



# Traceability Example: Start with a Hudson build

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 **Build #3 (Apr 21, 2008  
9:39:03 PM)**

Delete this build

Started 2 days 4 hours ago  
Took [18 seconds](#)

 [add description](#)



Revision: 30

Changes

1. bug 18: added subtraction method. ([detail/ViewSVN](#))

**Traceability  
to code  
Change Set**


# Traceability Example: Follow to ViewVC Change Set

[\[easyaccounting\]](#)

Repository:



## Revision 30

Jump to revision:   

Author: alex

Date: Tue Apr 22 01:37:22 2008 UTC (2 days, 4 hours ago)

Log Message: bug [18](#): added subtraction method.

**Traceability link to Bugzilla Change Request**

### Changed paths:

Path	Details
<a href="#">branches/EasyAccounting_RELEASE_1-1-0/src/org/alexe/easyaccounting/math/CalculatorImpl.java</a>	<a href="#">modified</a> , <a href="#">text changed</a>
<a href="#">branches/EasyAccounting_RELEASE_1-1-0/src/org/alexe/easyaccounting/math/ICalculator.java</a>	<a href="#">modified</a> , <a href="#">text changed</a>
<a href="#">branches/EasyAccounting_RELEASE_1-1-0/test/org/alexe/easyaccounting/math/CalculatorTest.java</a>	<a href="#">modified</a> , <a href="#">text changed</a>

[Server Admin](#)

Powered by [ViewVC 1.0.4](#)

[ViewVC Help](#)

# Traceability Example: Follow to Bugzilla Change Request

----- Comment #4 From [Alex Obradovic](#) 2008-04-21 21:37:30 [[reply](#)] -----

added subtraction method.

Branch: [branches/EasyAccounting\\_RELEASE\\_1-1-0](#)

Affected files:

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11 --> 30 [Easy](#)

Accounting:branches/EasyAccounting\_RELEASE\_1-1-0/src/org/alexe/easyaccounting/math/CalculatorI  
\*\*\*\*\*

TRACEBILITY LINKS:

Download version 11:

[http://adp.alexe.org/viewvc/easyaccounting/branches/EasyAccounting\\_RELEASE\\_1-1-0/src/org/alexe](http://adp.alexe.org/viewvc/easyaccounting/branches/EasyAccounting_RELEASE_1-1-0/src/org/alexe)

Download version 30:

[http://adp.alexe.org/viewvc/easyaccounting/branches/EasyAccounting\\_RELEASE\\_1-1-0/src/org/alexe](http://adp.alexe.org/viewvc/easyaccounting/branches/EasyAccounting_RELEASE_1-1-0/src/org/alexe)

Repository view:

[http://adp.alexe.org/viewvc/easyaccounting/branches/EasyAccounting\\_RELEASE\\_1-1-0/src/org/alexe](http://adp.alexe.org/viewvc/easyaccounting/branches/EasyAccounting_RELEASE_1-1-0/src/org/alexe)

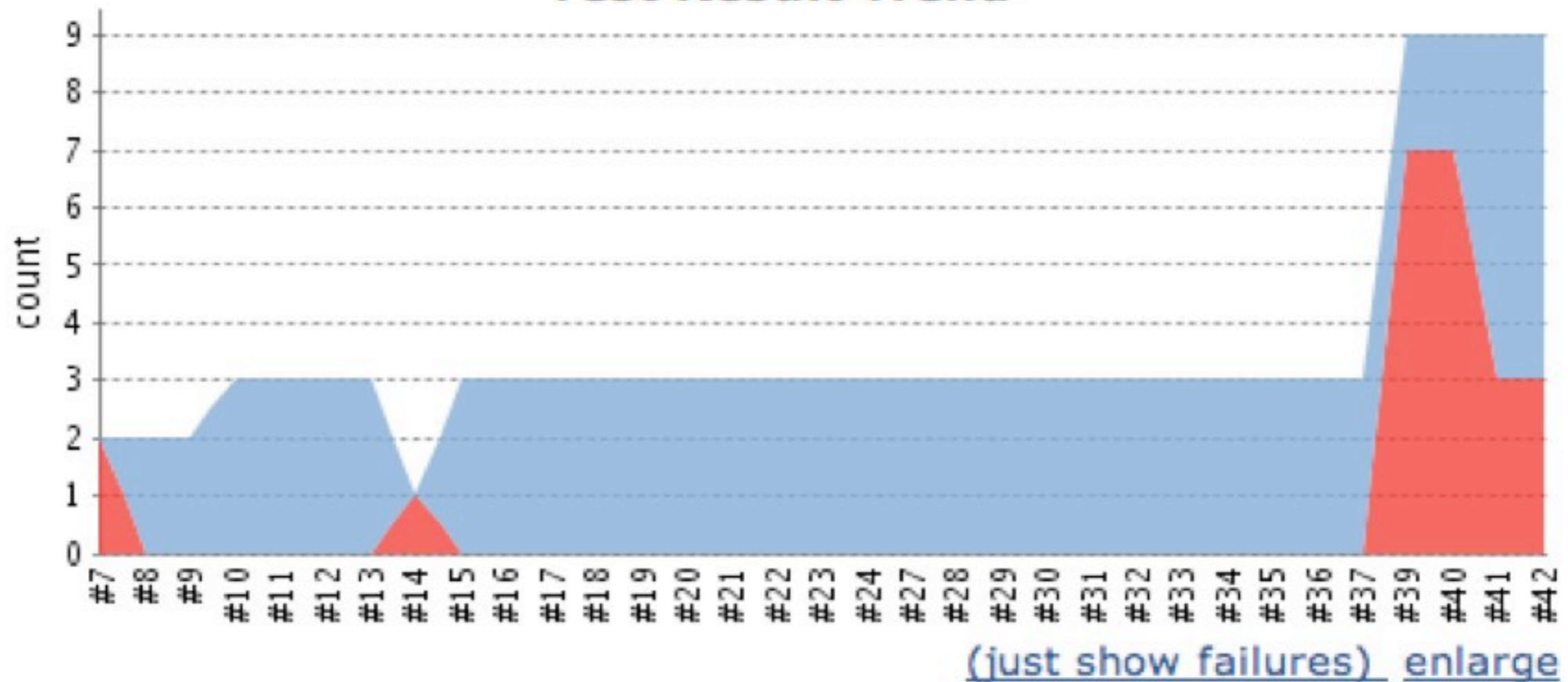
Traceability Link  
Back to ViewVc  
Change Set



# Reporting Examples: Test Result Trend

 [edit description](#)

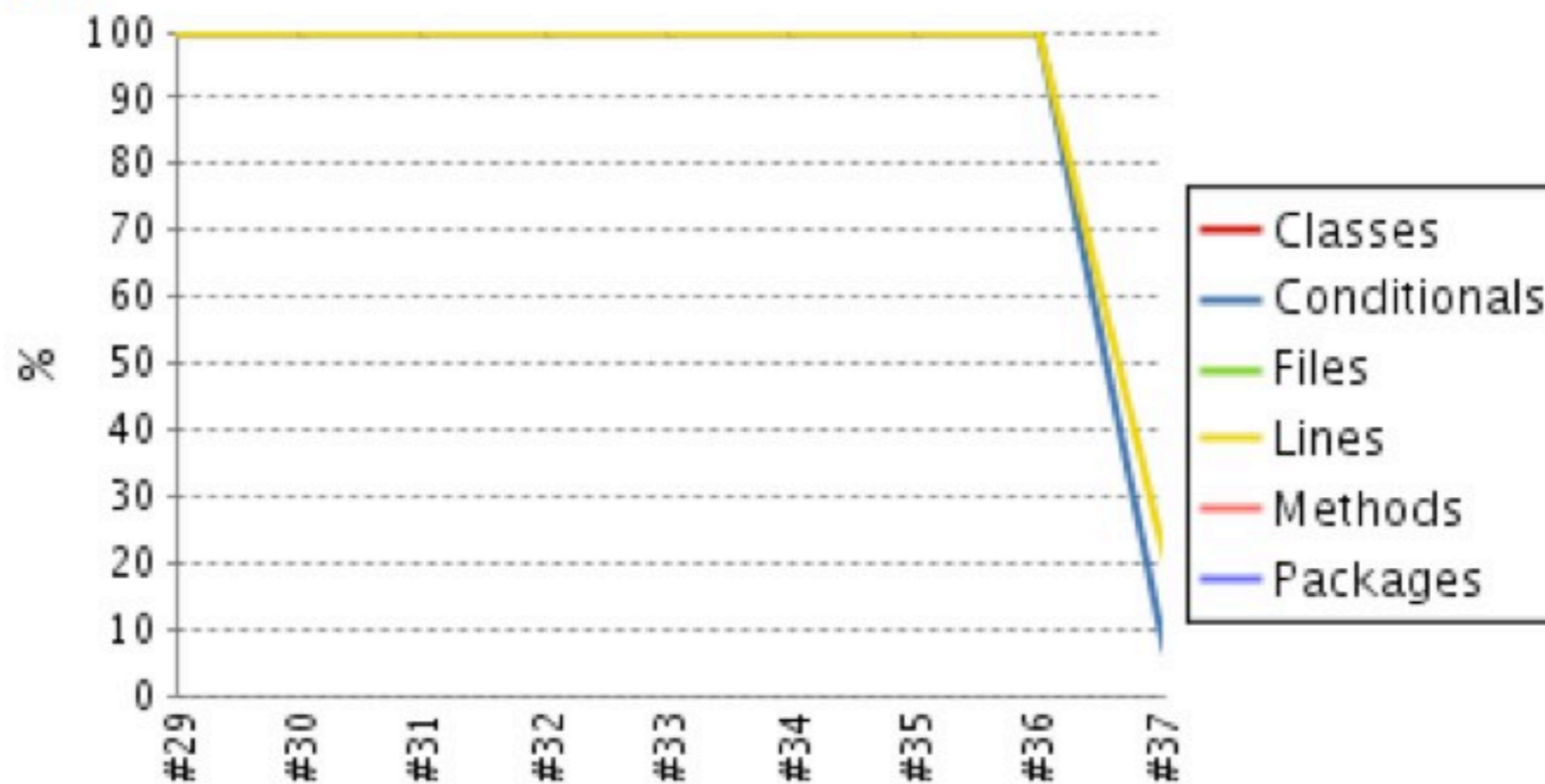
## Test Result Trend



# Reporting Examples: Code Coverage Trend

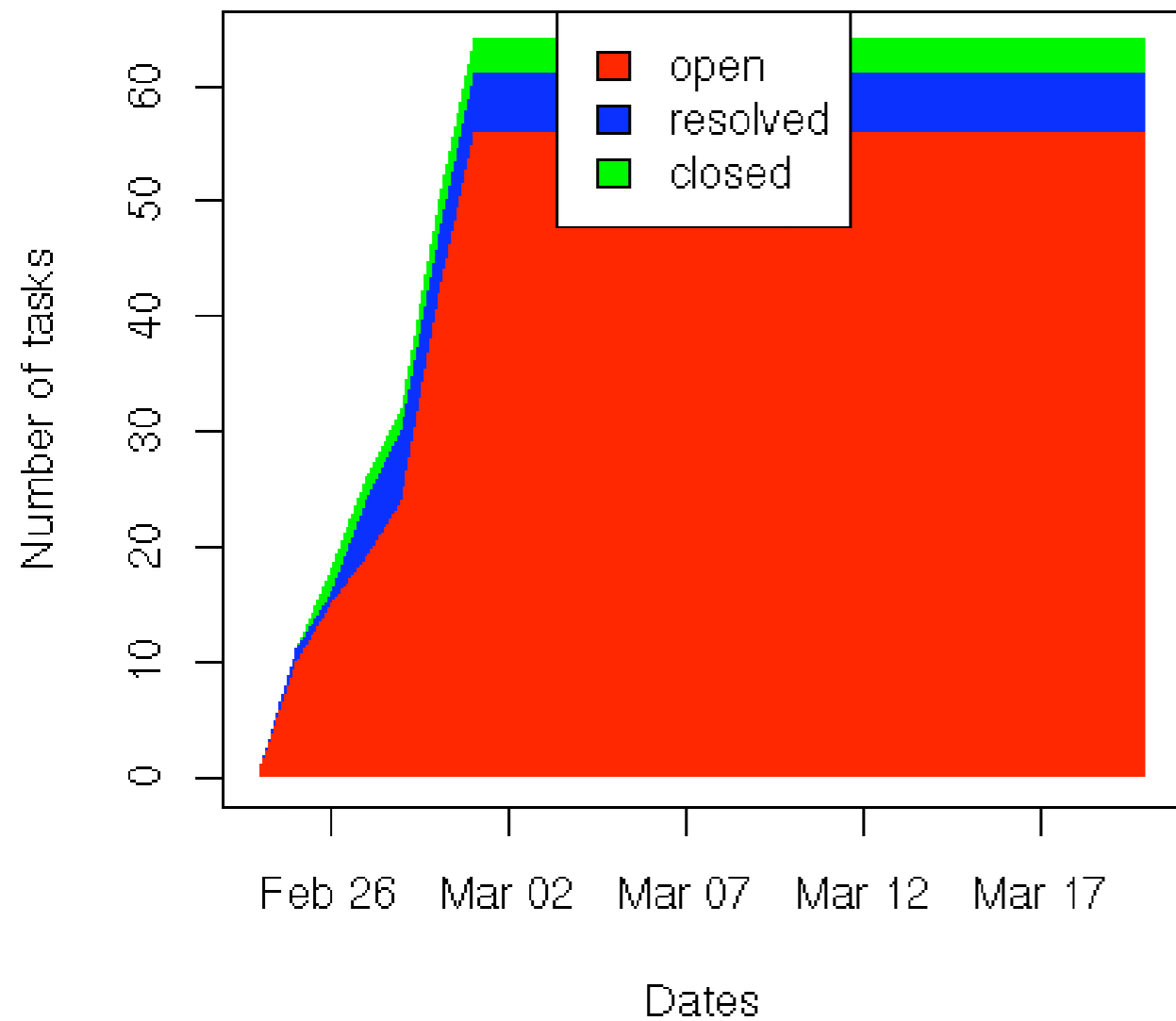
## Code Coverage

**Packages 100% Files 83% Classes 83%**  
**Methods 49% Lines 21% Conditionals**  
7%

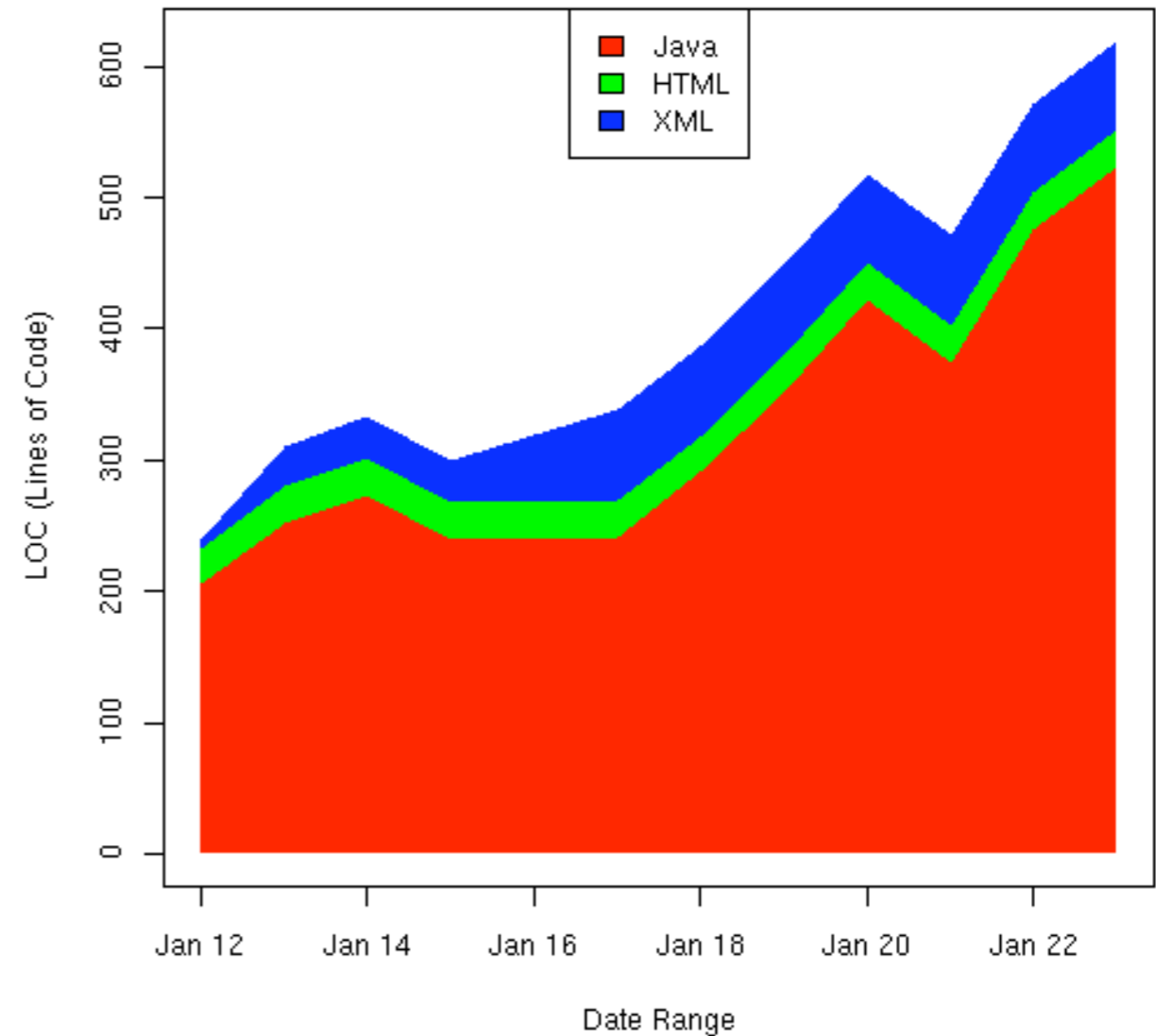


# Reporting Examples: Custom Reports

## Remaining Work



## Code Growth



Created with R Project for statistical computing

# Final thoughts: Open Source and Software Engineering curriculum

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- Software Engineering concepts can be enhanced with hands on training
- Everyone can obtain and use Open Source tools freely
- Everyone can get involved and influence Open Source projects
- Students can build/assemble reference implementations, which can be improved by each new generation of students
- Students can apply appropriate technology evaluation criteria during each course to select suitable tools
- Tools can be used freely even after graduation

# References

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- Automated Defect Prevention: Best Practices in Software Management, by Dorota Huizinga and Adam Kolawa, John Wiley & Sons, Inc., August 2007
- ADP with Open Source Website, Alex Obradovic's graduate project, <http://adp.alexe.org>
- Bugzilla, <http://www.bugzilla.org/>
- Subversion, <http://subversion.tigris.org/>
- ViewVC, <http://www.viewvc.org/>
- ScmBug, <http://www.mkgnu.net/?q=scmbug>
- Eclipse, <http://www.eclipse.org/>
- Hudson, <https://hudson.dev.java.net/>
- Eclipse IDE, <http://www.eclipse.org/>
- PMD, <http://pmd.sourceforge.net/>
- Cobertura, <http://cobertura.sourceforge.net/>
- Findbugs, <http://findbugs.sourceforge.net/>
- JUnit, <http://www.junit.org/>
- Ant, <http://ant.apache.org/>
- The R Project for Statistical Computing, <http://www.r-project.org/>

# Questions, Contact

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Alex Obradovic  
[obradovic@gmail.com](mailto:obradovic@gmail.com)