

Continuous Integration mit Hudson

(Noch) fauler werden in 10 Schritten

















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27.01.2010, Mannheim



Continuous Integration Builds for NetBeans Projects [\(machine\)](#)

All Community ML Builds Push To main-silver builds

S	W	Job ↓	Letzter Erfolg
		analytics-server	1 Monat 6 Tage (#1049)
		apitest	2 Stunden 4 Minuten (#410)
		javascript-tests	3 Monate 18 Tage (#242)
		karelnb	21 Stunden (#154)
		NB-Core-Build	3 Stunden 3 Minuten (#2832)
		nb-javac	3 Stunden 42 Minuten (#118)
		l10nkit	8 Monate 3 Tage (#471)
		latex	9 Stunden 56 Minuten (#10)



Build #805 (06.05.2009 12:52:45)



Revision: 1759

Changes

1. BUGFIX: Now all Attachments are at least listed. #4030 ([detail](#))

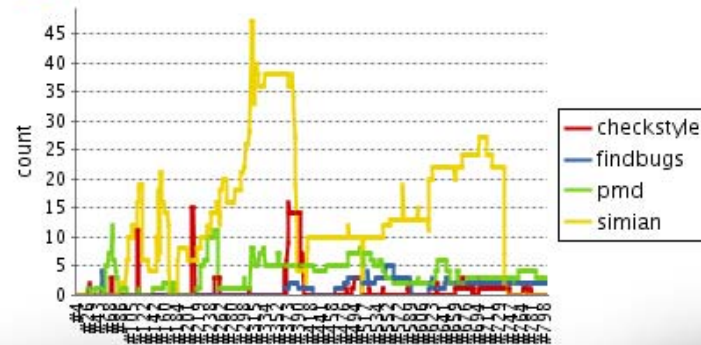


[Testergebnis](#) (1 fehlgeschlagener Test / +1)

[facade.impl.DownloadServiceTest.testGetProductFileList](#)



☀ checkstyle 0 ☀ findbugs 2 ☀ pmd 3 ☀ simian 0



Testergebnis : org.netbeans.modules.javascript.editing

Fehlschläge (-1)

Tests (±0)

Alle fehlgeschlagenen Tests

Testname	Dauer	Alter
org.netbeans.modules.javascript.editing.JsCodeCompletionTest.testAutoQuery2	0.0020	1
org.netbeans.modules.javascript.editing.HtmlCompletionTest.test1	3.131	28
org.netbeans.modules.javascript.editing.HtmlCompletionTest.test6	0.118	28
org.netbeans.modules.javascript.editing.JsTypeAnalyzerTest.testGetType	2.797	43
org.netbeans.modules.javascript.editing.JsTypeAnalyzerTest.testGetType2	0.106	43
org.netbeans.modules.javascript.editing.JsKeystrokeHandlerTest.testDeleteContComment	0.018	44
org.netbeans.modules.javascript.editing.JsKeystrokeHandlerTest.testNoDeleteContComment	0.024	44
org.netbeans.modules.javascript.editing.JsKeystrokeHandlerTest.testNoMatchInComments	0.11	44
org.netbeans.modules.javascript.editing.JsKeystrokeHandlerTest.testdeleteWord2	0.019	44
org.netbeans.modules.javascript.editing.JsIndexerTest.testIndexPrototypeNew	0.565	104
org.netbeans.modules.javascript.editing.JsIndexerTest.testWindow	0.707	104


Alle Tests

Klasse	Dauer	Fehlgeschlagen	(Veränderung)	Summe	(Veränderung)
AstOffsetTest	4.1 Sekunden	0		25	
AstUtilitiesTest	5.7 Sekunden	0		1	
ElementUtilitiesTest	2.5 Sekunden	0		1	
EmbeddedFormatterTest	4.7 Sekunden	0		4	
HtmlCompletionTest	4.2 Sekunden	2		10	
JsAnalyzerTest	4.7 Sekunden	0		17	
JsCodeCompletionTest	2 ms	1		1	
JsCommentFormatterTest	2.4 Sekunden	0		3	



checkout/src/main/java/controller/impl/AbstractProductFeaturesController.java

findbugs 1 violation

296  instanceof will always return true

simian 1 violation

309  Duplication of 9 lines from [line 692 in ShoppingCartActionsController.java](#).

File: AbstractProductFeaturesController.java Lines 287 to 319

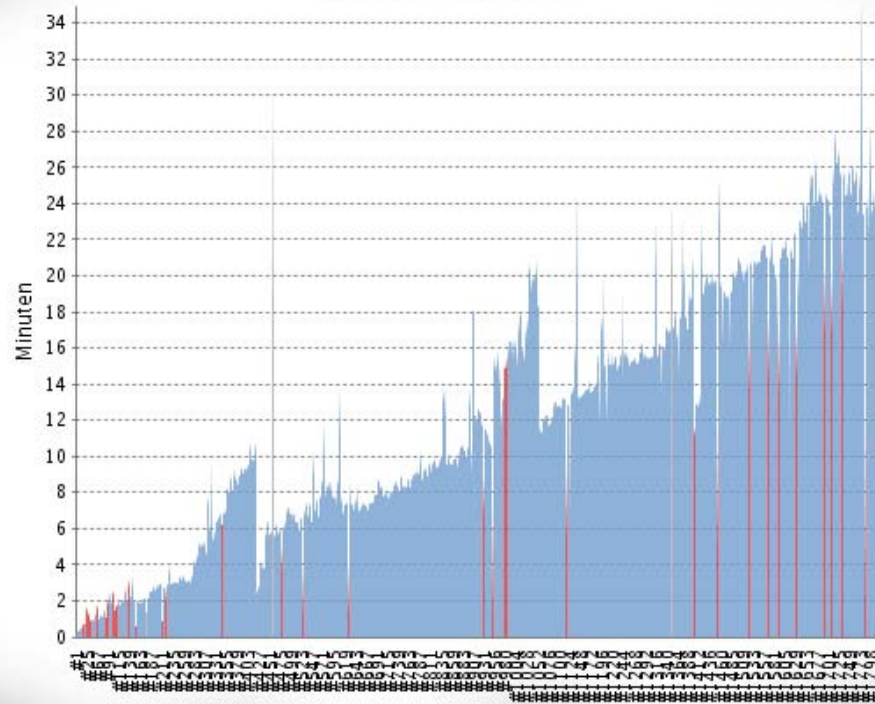
```
287     List<FeatureGroupDto> result = new ArrayList<FeatureGroupDto>();
288     IPimLocale locale = pbLocaleService.getByIsoCodeWithFallback(deeplinkView.getLocale());
289
290     //Build List of excluded IPimFeature.
291     List<IPimFeature> excludedFeatures = getCFGExcludedPimFeatures();
292
293     //Iterate over the FGs in the list.
294     for (IPimObject fgFsSObject : fgFsSnList) {
295         //Ignoring Objects which are not: IPimFeatureGroupFeatureSetStructureNode.
296         if (!(fgFsSObject instanceof IPimFeatureGroupFeatureSetStructureNode)) {
297             continue;
298         }
299         IPimFeatureGroupFeatureSetStructureNode fgFsSN = (IPimFeatureGroupFeatureSetStructureNode) fgFsSObject;
300         IPimFeatureGroup featureGroup = fgFsSN.getSource();
301         FeatureGroupDto featureGroupDto = null;
302         String fgName = this.localizedTextService.getLocalizedName(featureGroup);
303         if (lifecycleService.isLifecycleFeatureGroup(featureGroup)) {
304             //Generate lifecycle feature group dto.
305             featureGroupDto = getFeatureGroupDtoLifecycle(pimObject);
306         } else {
307             //Generate normal feature group dto.
308             featureGroupDto = getFeatureGroupDtoNormal(featureGroup);
309         }
310         result.add(featureGroupDto);
311     }
312     return result;
```


**Build-Verlauf****([Trend](#))**

-  #10 [28.10.2008 15:01:33](#)
-  #9 [28.10.2008 14:37:55](#)
-  #8 [28.10.2008 14:31:34](#)
-  #7 [28.10.2008 14:01:33](#)
-  #6 [28.10.2008 12:02:51](#)
-  #5 [28.10.2008 12:01:34](#)
-  #4 [27.10.2008 16:10:35](#)
-  #3 [27.10.2008 16:08:15](#)
-  #2 [27.10.2008 15:55:44](#)
-  #1 [27.10.2008 15:52:09](#)

[Alle Builds](#)[Nur Fehlschläge](#)

Build-Zeit (Trend)



Übersicht [Hudson] - Mozilla Firefox

Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe

http://deadlock.netbeans.org/hudson/ hudson jbos

Übersicht [Hudson] hudson: an extensible co...

Hudson

Benutzer Build-Verlauf Projektbeziehungen Fingerabdruck überprüfen

Geplante Builds

- rubytests
- PHP-build
- nb6.1 web-110n
- validate-project-xmls

Build-Prozessor Status

No.	Status
1	Baue NB-Core-Build #1345
2	Baue trunk #3750
3	Baue profiler-main #153

Continuous Integration Builds for NetBeans Projects

Services on this machine are described at: [DeadlockMachine](#)

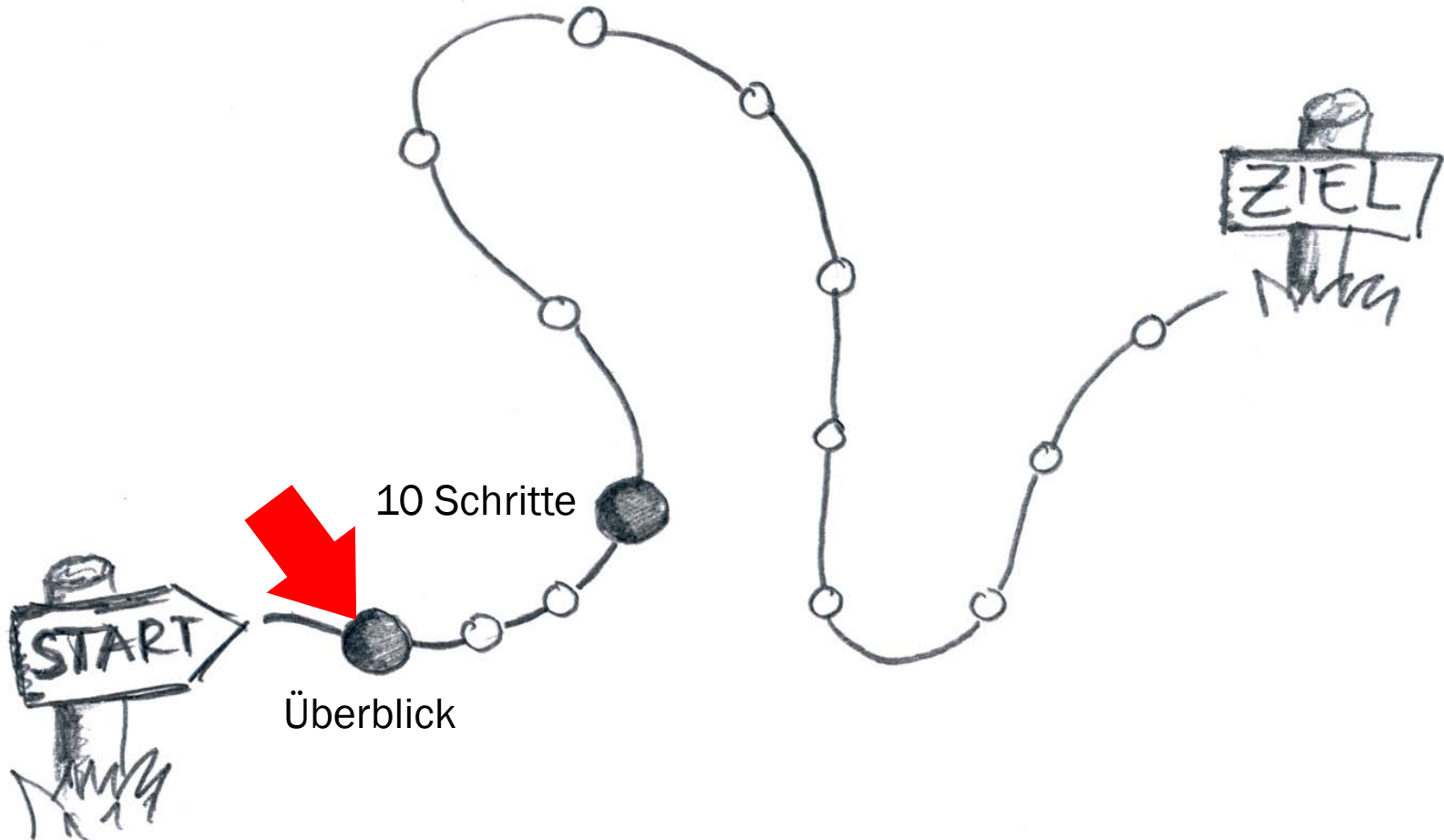
S	W	Job ↓	Letzter Erfolg	Letzter Fehlschlag	Letzte Dauer
☐	☀	analytics-server	4 Tage 9 Stunden (#789)	Unbekannt	48 Minuten
☐	☀	apitest	1 Stunde 24 Minuten (#118)	3 Monate 12 Tage (#1)	5 Minuten 1 Sekunde
☐	☀	fagsuck	6 Stunden 33 Minuten (#432)	Unbekannt	3 Minuten 21 Sekunden
☐	☀	FindBugs	10 Monate (#35)	Unbekannt	2 Stunden 41 Minuten
☐	☁	javadoc-nbms	2 Monate 4 Tage (#3)	2 Monate 4 Tage (#2)	6 Sekunden
☐	☀	JavaFX_NB_daily	10 Stunden (#159)	Unbekannt	5 Minuten 8 Sekunden
☐	☀	javascript-tests	7 Stunden 3 Minuten (#54)	Unbekannt	30 Minuten
☐	☀	l10nkit	16 Stunden (#422)	6 Tage 15 Stunden (#416)	1 Stunde 21 Minuten
☐	☁	latex	8 Stunden 32 Minuten (#280)	2 Tage 8 Stunden (#277)	3 Minuten 27 Sekunden
☐	☀	laziness	1 Stunde 33 Minuten (#131)	Unbekannt	42 Minuten
☐	☐	macpkg	Unbekannt	Unbekannt	Unbekannt

Fertig



Gestatten, Hudson.

Agenda



Über den Referenten: Dr. Simon Wiest

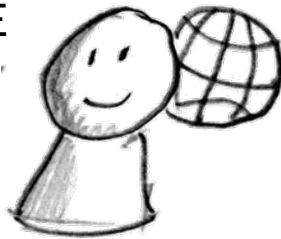
Privat: Hudson-Committer



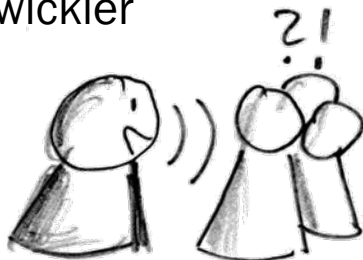
Lokalisierung DE



Plug-In Entwickler



Internationalisierung

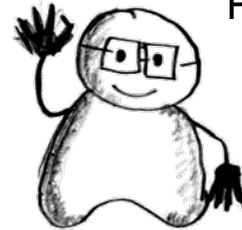


Support & Evangelisierung

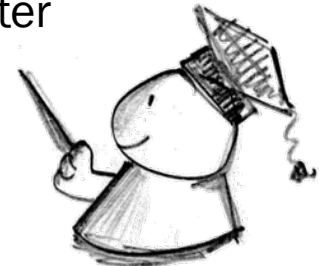
Beruflich: Hudson-Anwender



Projektleiter



Java Architekt

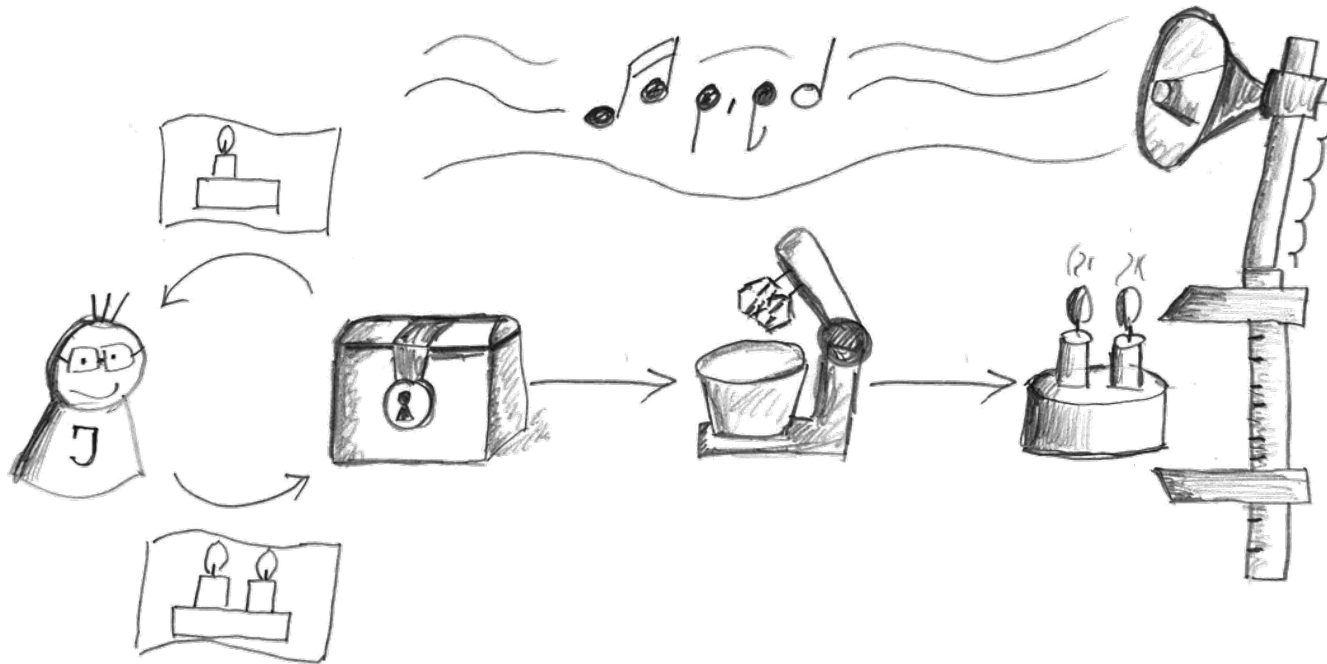


Coach



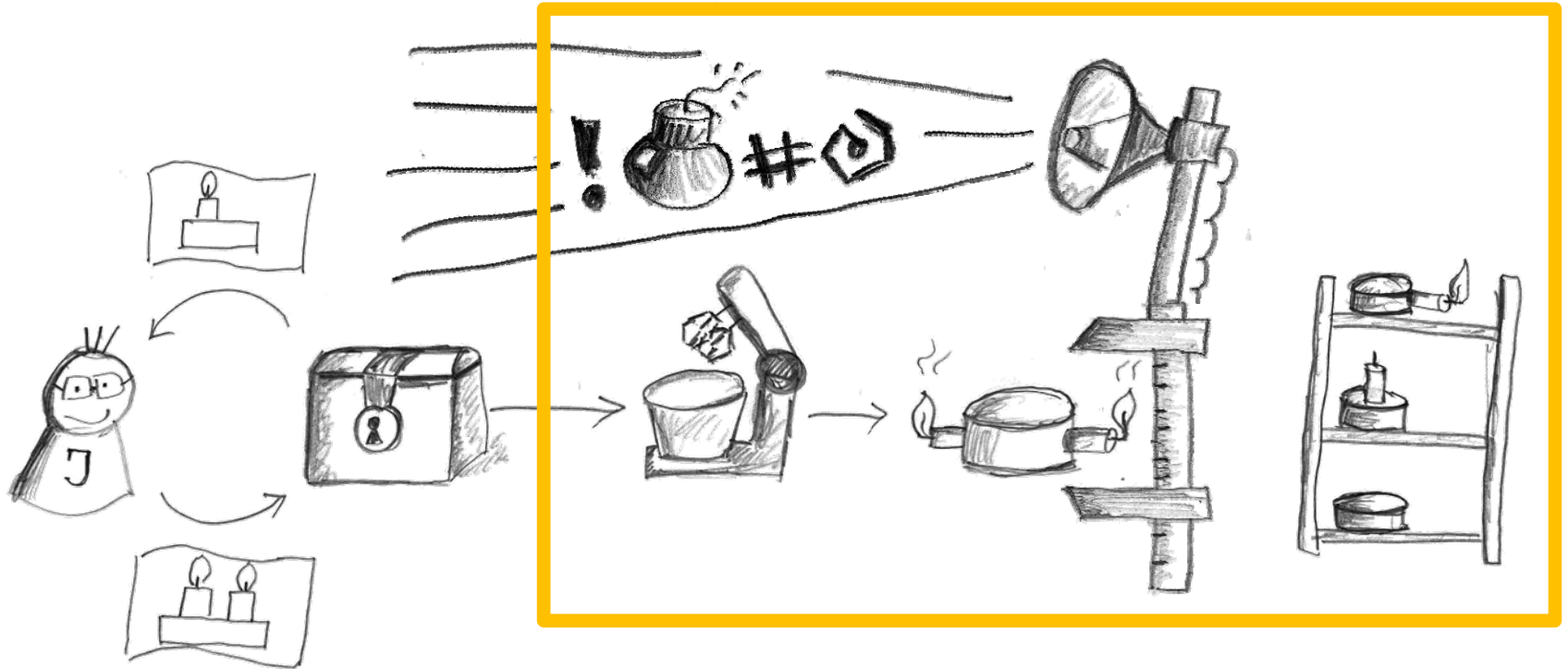
IT-Freiberufler

Was ist kontinuierliche Integration (CI)?

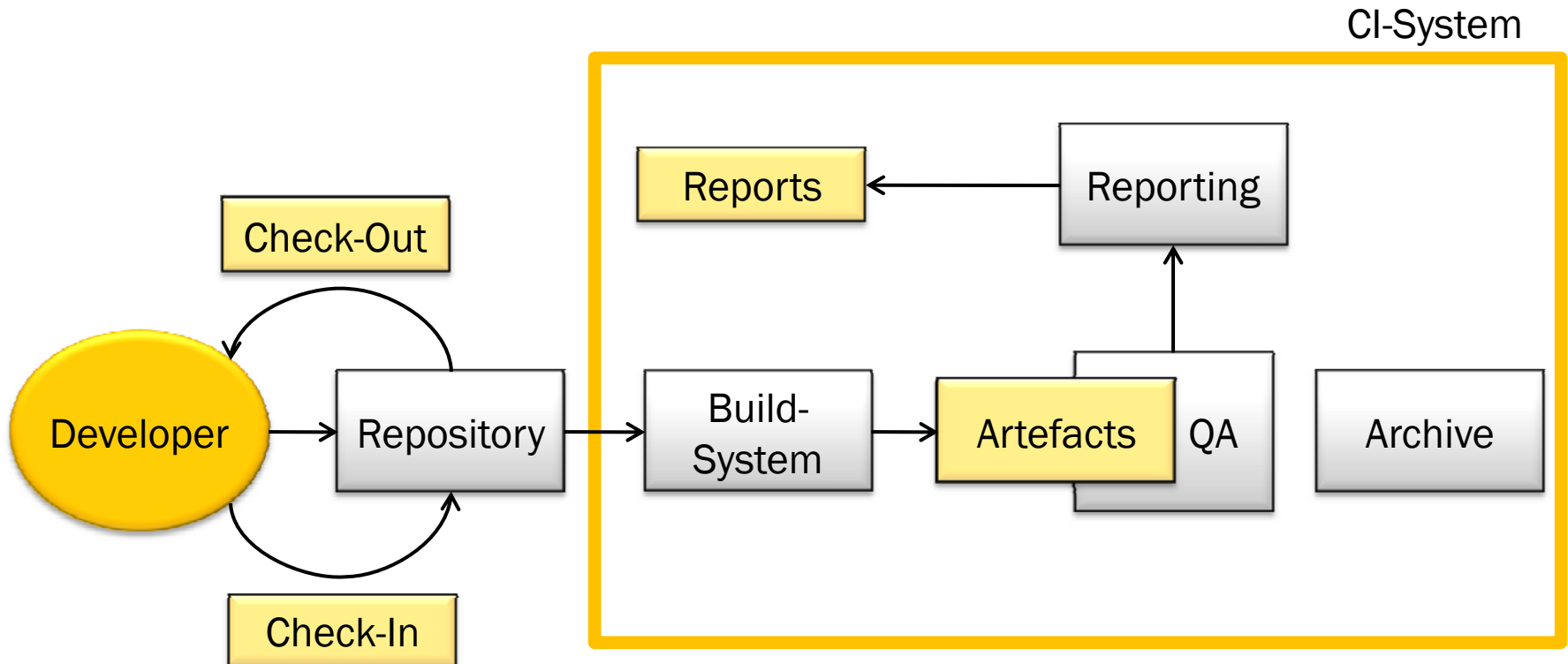


Was ist kontinuierliche Integration (CI)?

orchestriert durch CI-System



Was ist kontinuierliche Integration (CI)?



- Subversion
- CVS
- Perforce
- Git
- ...

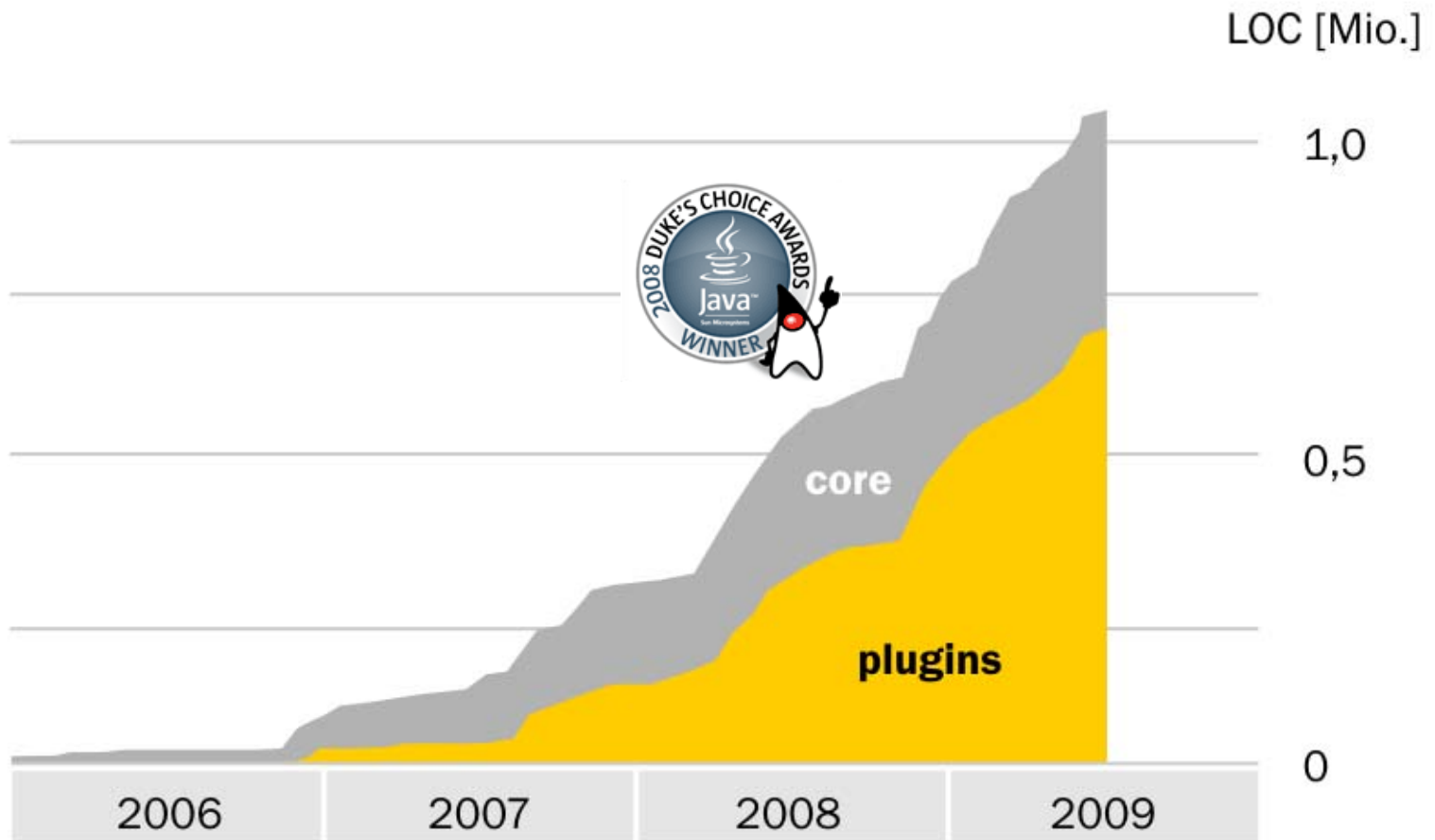
- Ant
- Maven
- Shell-Skript
- Batch-Datei
- ...

- JUnit
- TestNG
- CheckStyle
- PMD
- ...

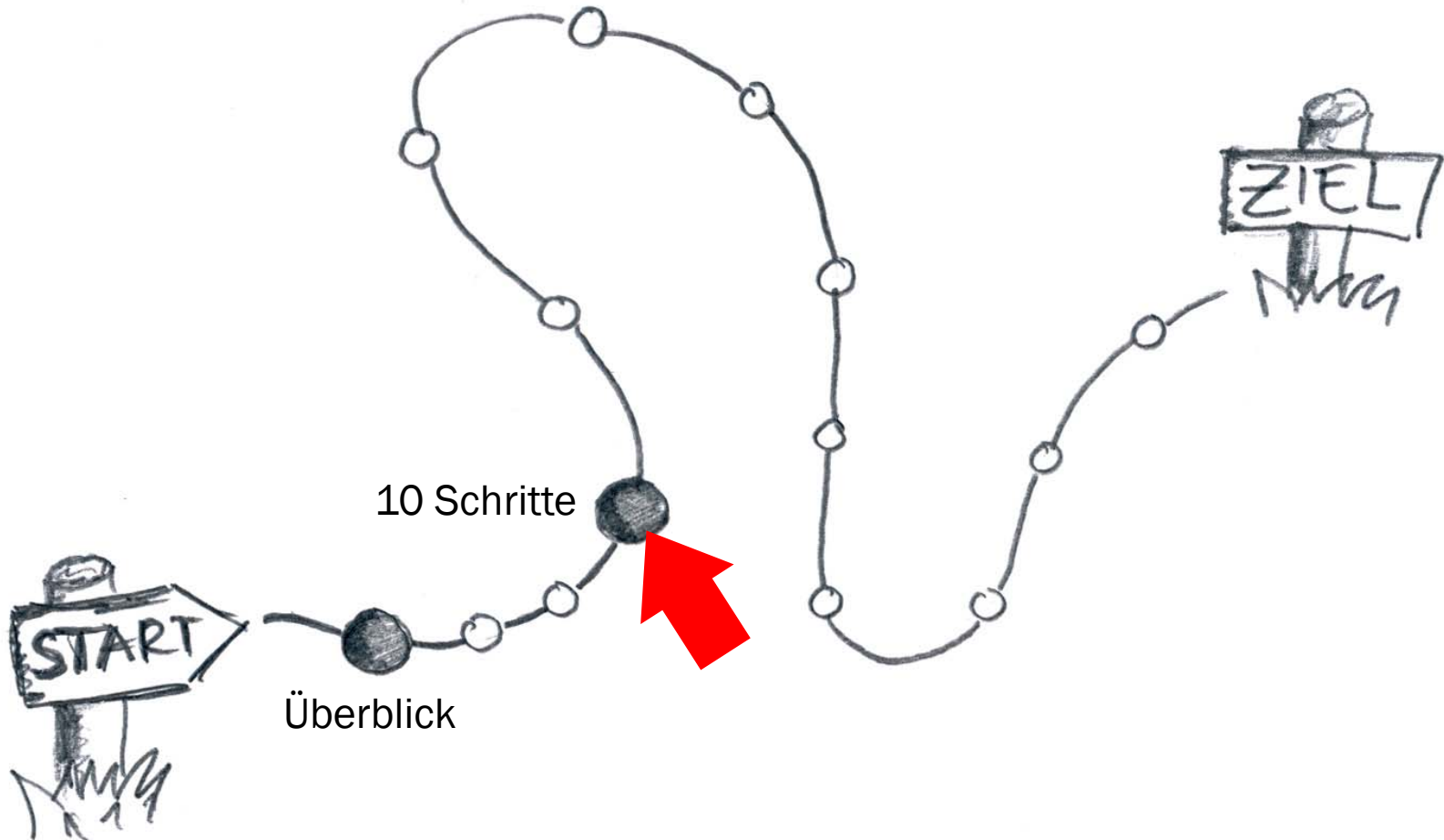
Wer verwendet Hudson (und darf es zugeben)?



Hudson: Ein Projekt in voller Fahrt.



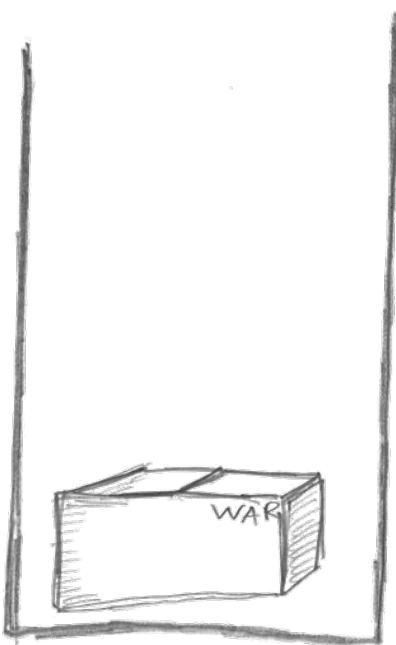
Agenda



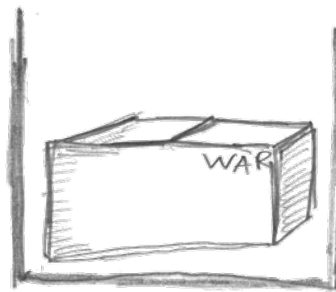
1. Installation: Denkbar einfach.



Download als
WAR-Datei
Ca. 26 MB



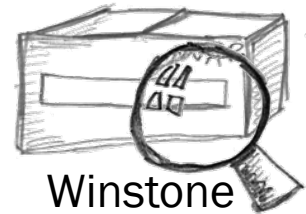
WebSphere



Tomcat



Jetty



Winstone
(Eingebettet)

2. Konfiguration: Komfortabel und übersichtlich.

The screenshot shows the Hudson web interface configuration page. It features a sidebar with navigation links like 'Neuen Job anlegen', 'Hudson verwalten', 'Benutzer', and 'Build-Verlauf'. The main content area is divided into sections: 'Geplante Builds' (showing no builds planned), 'Build-Prozessor Status' (a table with 2 ready builds), 'Globale Eigenschaften' (with checkboxes for environment variables and security), 'Maven' (with a table for installed versions, including 'Maven 2.1.0'), and 'JDK' (with a table for installed versions, including 'JDK 1.6.0_11'). Each input field has a help icon, and there are buttons for adding and removing installations.

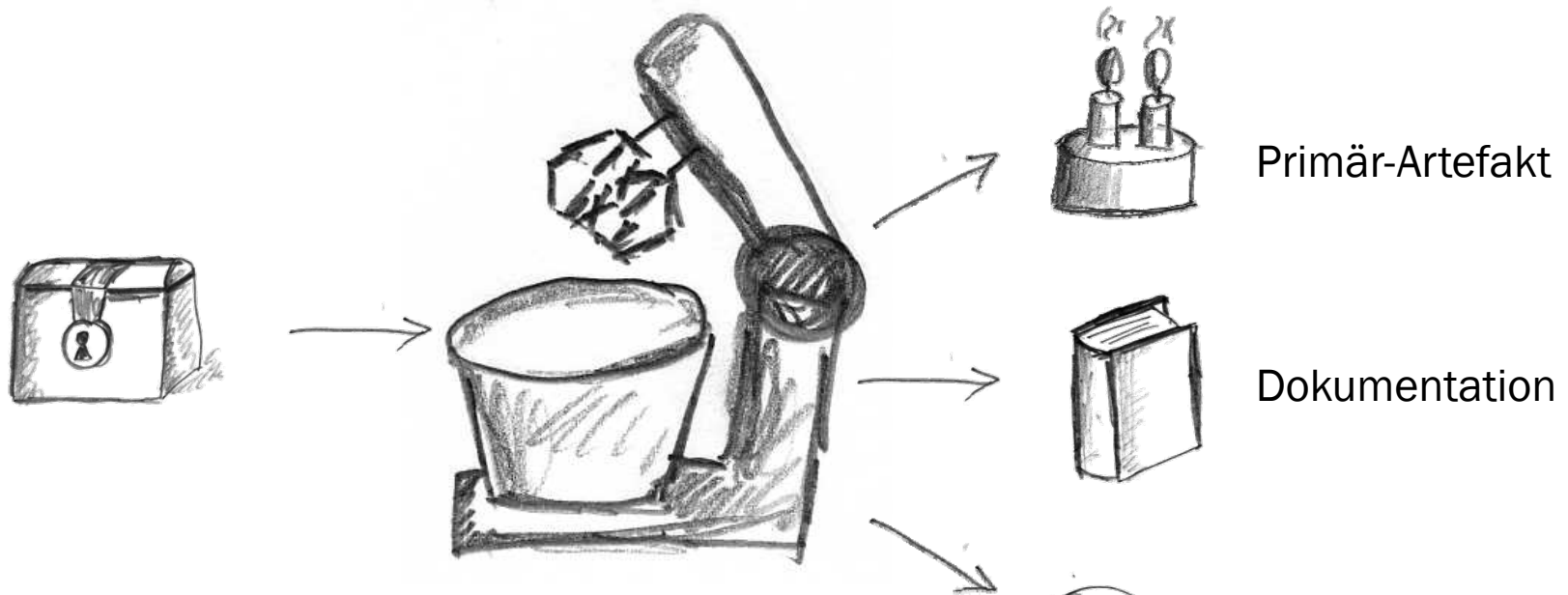
Web-Interface

```
1 <?xml version='1.0' encoding='UTF-8'?>
2 <hudson>
3   <version>1.313</version>
4   <numExecutors>2</numExecutors>
5   <mode>NORMAL</mode>
6   <authorizationStrategy class="hudson.security.AuthorizationStrategy$Unsecured">
7     <securityRealm class="hudson.security.SecurityRealm$None"/>
8   </authorizationStrategy>
9   <systemMessage>&lt;h1&gt; Willkommen auf dem JFS-Demo-Hudson-Server!&lt;/h1&gt;
10  &lt;a href="mailto://papierkorb@foobar.de"&gt;freundlichen Administrat
11  </systemMessage>
12  <jdks>
13    <jdk>
14      <name>JDK 1.6.0_11</name>
15      <home>C:\Programme\Java\jdk1.6.0_11</home>
16      <properties/>
17    </jdk>
18  </jdks>
19  <clauses/>
20  <slaves/>
21  <quietPeriod>5</quietPeriod>
22  <scmCheckoutRetryCount>0</scmCheckoutRetryCount>
23  <views>
24    <hudson.model.AllView>
25      <owner class="hudson" reference="../../.." />
26      <name>Alle</name>
27    </hudson.model.AllView>
28  </views>
29  <primaryView>Alle</primaryView>
30  <slaveAgentPort>0</slaveAgentPort>
31  <label></label>
32  <nodeProperties/>
33  <globalNodeProperties/>
34  <disabledAdministrativeMonitors/>
35 </hudson>
```

XML-Konfigurationsdateien

Wann immer möglich, werden Konventionen oder sinnvolle Vorgabewerte verwendet.

3. Build-Systeme: Java – und darüber hinaus!



Eingebaut

- Ant
- Maven
- Shell Skript
- Windows Batch

Über Plug-Ins

- Gant, Groovy
- MSBuild, Nant
- Rake, Ruby
- und viele mehr!

Primär-Artefakt

Dokumentation

Testergebnisse

4. Berichten: Grenzenlos durch Plugins.

Hudson 100.4-gspim-server

Projekt 100.4-gspim-server
Server-Back End der PIM-Komponente aus der GIANTsuite.

Verfügbare Online-Dokumentationen:

- javadoc API
- Package-Schemata
- Javadoc
- classycle.xml

Verfügbare Online-Dokumentationen:

- Dokumentation
- Arbeitsbereich
- Letzte Änderungen
- Letztes Testergebnis (Kein Test fehlergeschlagen.)

Build-Verlauf (Trend)

Build-ID	Datum	Zeitpunkt
#948	10.09.2008	17:31:40
#947	10.09.2008	17:01:40
#946	10.09.2008	16:31:40
#945	10.09.2008	14:28:33
#944	10.09.2008	13:31:40
#943	10.09.2008	13:01:40
#942	10.09.2008	12:01:40
#941	09.09.2008	17:55:25
#940	09.09.2008	16:26:07
#939	09.09.2008	16:01:58
#938	09.09.2008	15:05:18
#937	09.09.2008	14:51:32
#936	09.09.2008	14:31:59
#935	09.09.2008	14:01:58
#934	09.09.2008	11:01:59
#933	09.09.2008	10:38:53
#932	09.09.2008	09:28:52
#931	09.09.2008	18:01:58
#930	09.09.2008	17:01:58
#929	09.09.2008	17:31:58
#928	09.09.2008	17:01:58
#927	09.09.2008	16:01:58
#926	09.09.2008	13:57:19
#925	09.09.2008	12:01:58
#924	09.09.2008	09:31:59
#923	04.09.2008	17:03:49
#922	04.09.2008	16:02:25
#921	04.09.2008	14:31:50
#920	04.09.2008	13:31:50
#919	04.09.2008	12:05:49

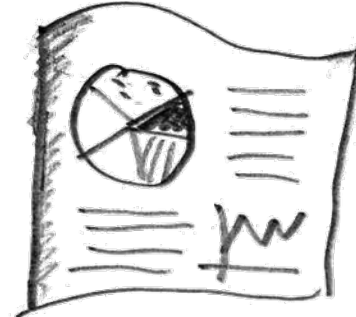
Trend der Testergebnisse

checkstyle 3 findbugs 1 pmd 3 (+1) simian 44 (+2)

Offene Punkte Trend

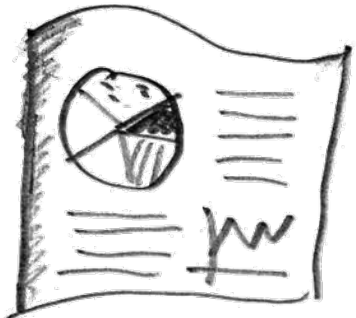
FindBugs Trend

Hudson ver. 1.252



Eingebaut

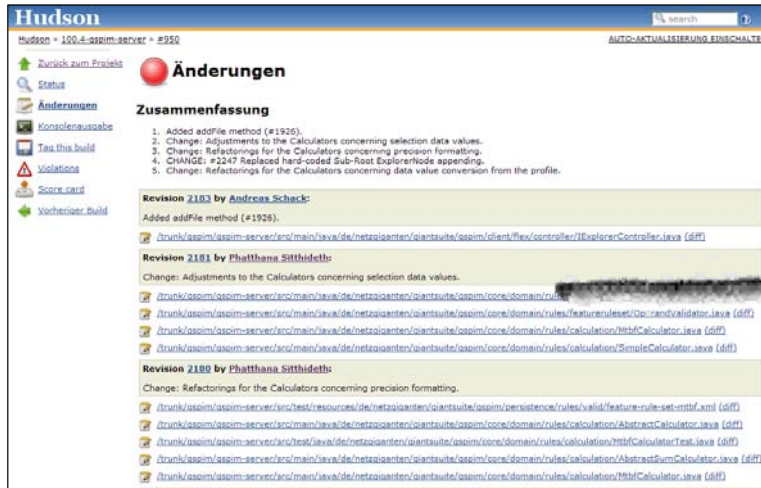
- JUnit
- TestNG



Über Plug-Ins

- CheckStyle
- PMD
- FindBugs
- Simian
- u.v.m.

5. Source Code Repositories: Mehr als nur „Auschecken“.



Hudson 100.4-asmim-server #950

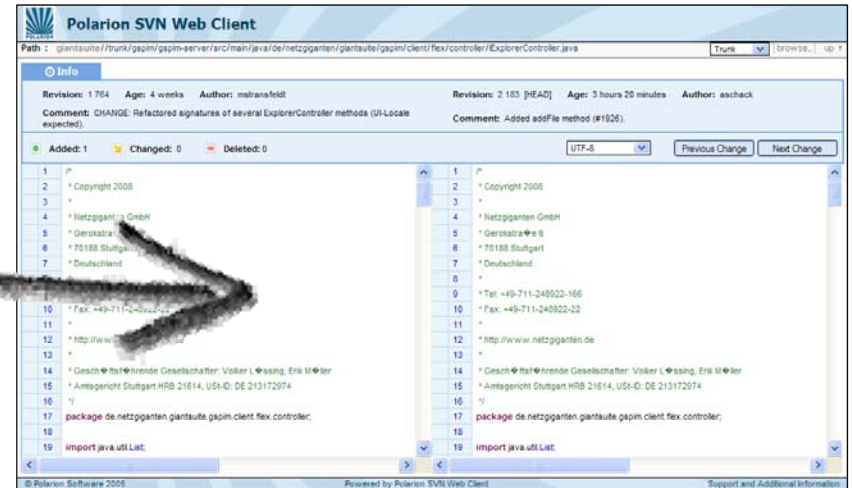
Änderungen

Zusammenfassung

1. Added addFile method (#1926).
2. Change: Adjustments to the Calculators concerning selection data values.
3. Change: Refactorings for the Calculators concerning precision formatting.
4. CHANGE: #2247 Replaced hard-coded Sub-Root ExplorerNode appending.
5. Change: Refactorings for the Calculators concerning data value conversion from the profile.

Revision 2183 by Andreas Schack:
Added addFile method (#1926).
[\(trunk/asmim/asmim-server/src/main/java/de/netzgganten/gantsuite/asmim/client/flex/controller/ExplorerController.java \(diff\)\)](#)

Revision 2181 by Phatthana Sithideth:
Change: Adjustments to the Calculators concerning selection data values.
[\(trunk/asmim/asmim-server/src/main/java/de/netzgganten/gantsuite/asmim/core/domain/rules/...](#)
[\(trunk/asmim/asmim-server/src/test/resources/de/netzgganten/gantsuite/asmim/persistence/rules/valid/feature-rule-set-ctrl.xml \(diff\)\)](#)
[\(trunk/asmim/asmim-server/src/main/java/de/netzgganten/gantsuite/asmim/core/domain/rules/calculation/AbstractCalculator.java \(diff\)\)](#)
[\(trunk/asmim/asmim-server/src/test/java/de/netzgganten/gantsuite/asmim/core/domain/rules/calculation/AbstractCalculatorTest.java \(diff\)\)](#)
[\(trunk/asmim/asmim-server/src/main/java/de/netzgganten/gantsuite/asmim/core/domain/rules/calculation/AbstractSumCalculator.java \(diff\)\)](#)
[\(trunk/asmim/asmim-server/src/main/java/de/netzgganten/gantsuite/asmim/core/domain/rules/calculation/MinCalculator.java \(diff\)\)](#)



Polarion SVN Web Client

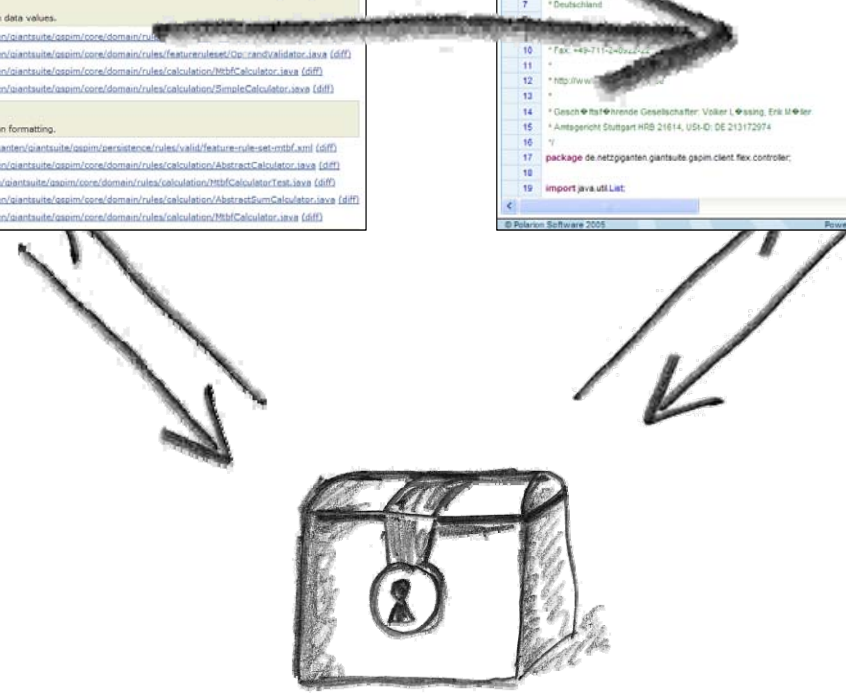
Path: gantsuite/trunk/gpmi/gpmi-server/src/main/java/de/netzgganten/gantsuite/gpmi/client/flex/controller/ExplorerController.java

Revision: 1764 Age: 4 weeks Author: mstransfeldt
Revision: 2183 [HEAD] Age: 3 hours 20 minutes Author: aschack

Comment: CHANGE: Refactored signatures of several ExplorerController methods (UI-Locale expected).
Comment: Added addFile method (#1926).

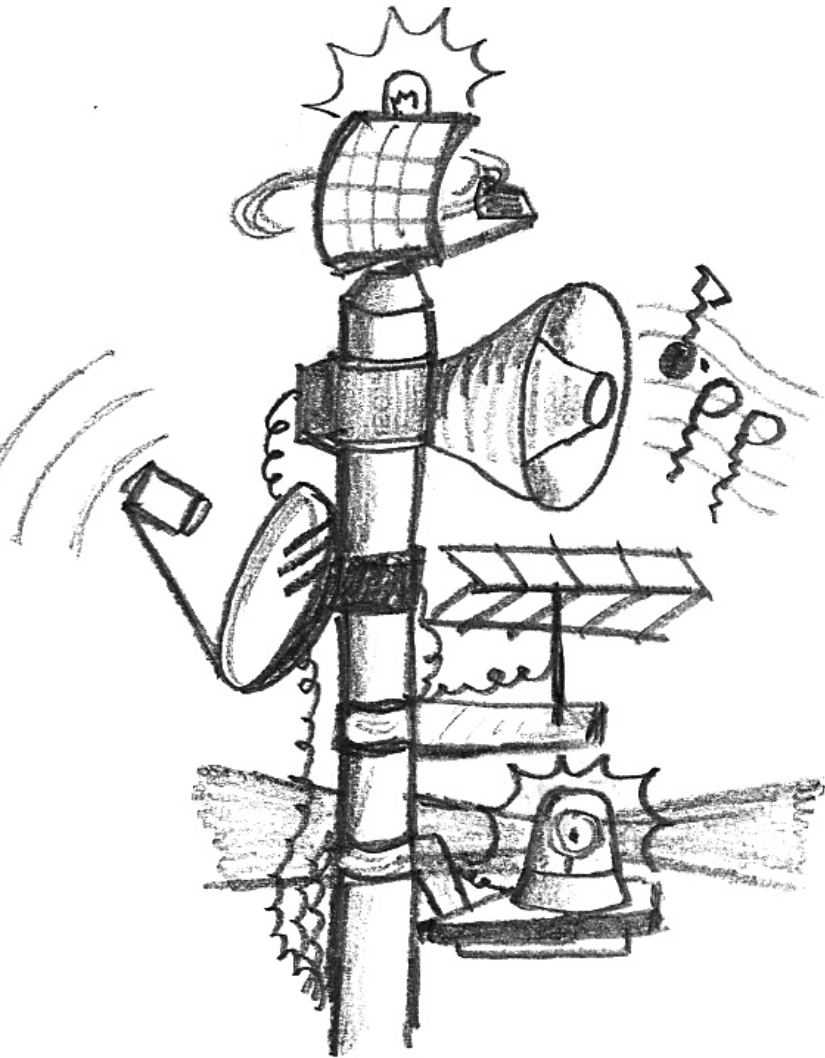
Added: 1 Changed: 0 Deleted: 0

```
1  * Copyright 2008
2  *
3  *
4  * Netzgganten GmbH
5  * Gerokstraße 8
6  * 70188 Stuttgart
7  * Deutschland
8  *
9  * Tel: +49-711-24922-166
10 * Fax: +49-711-24922-22
11 *
12 * http://www.netzgganten.de
13 *
14 * Gesch@ft@krende Gesellschaften: Volker L@ssing, Erik U@ler
15 * Amtsgericht Stuttgart HRB 21614, USt-ID: DE 213172974
16 *
17 package de.netzgganten.gantsuite.gpmi.client.flex.controller;
18
19 import java.util.List;
```



Repository

6. Benachrichtigungen: Viele Kanäle stehen offen.

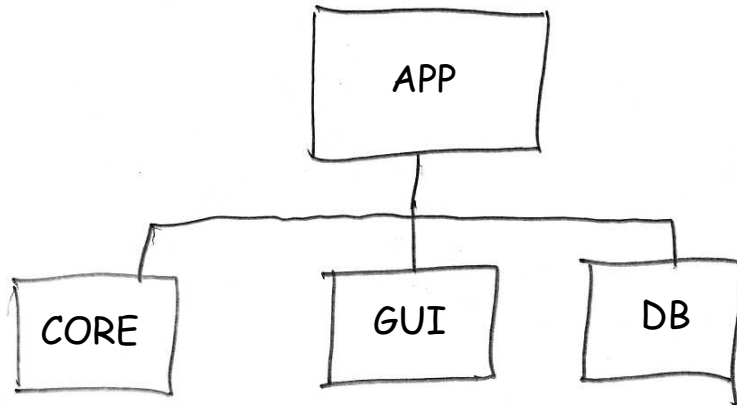


- E-Mail
- RSS-Feeds
- Instant Messenger
- Twitter
- Plugins für IDEs & Browser
- Desktop-Gadgets

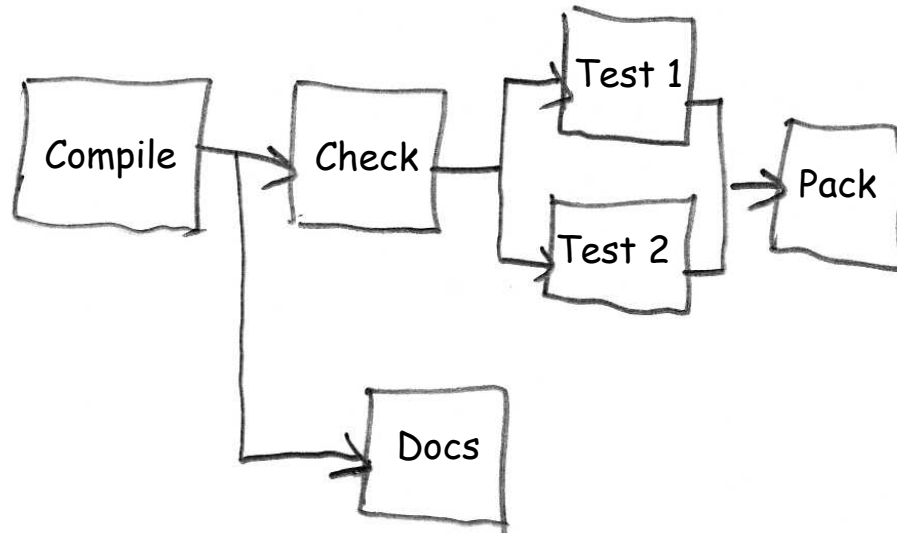
7. Remote API: Hudson lässt sich einfach automatisieren.



8. Abhängigkeiten zwischen Jobs: Intelligentes Bauen.

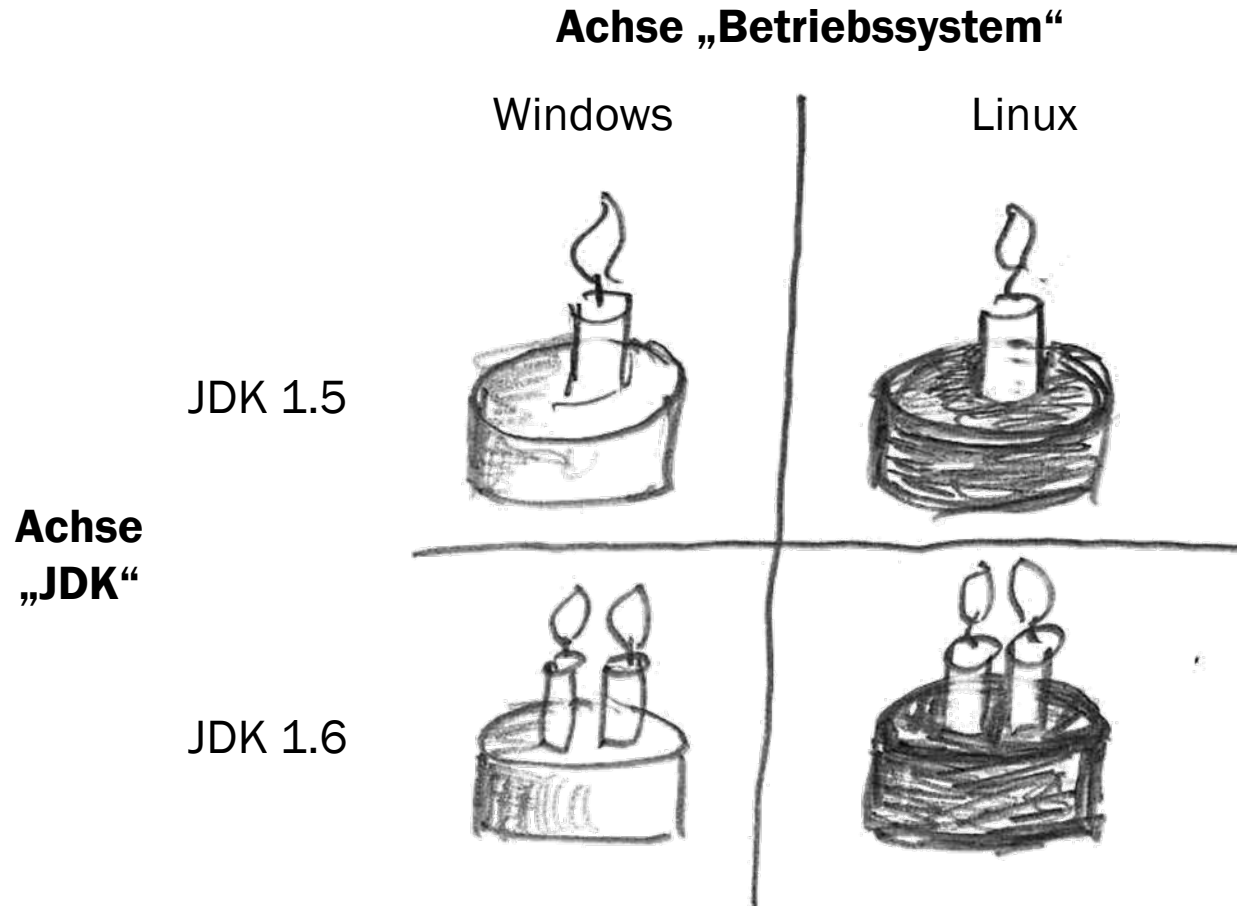


Abhängigkeiten
zwischen
Komponenten

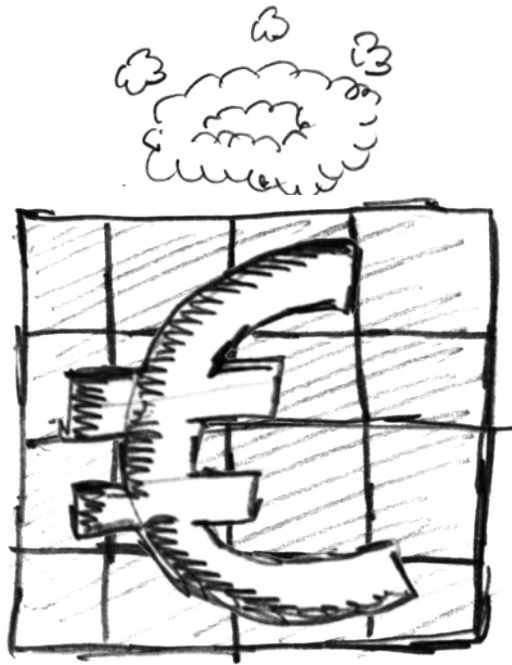


Abhängigkeiten
zwischen
Build-Schritten

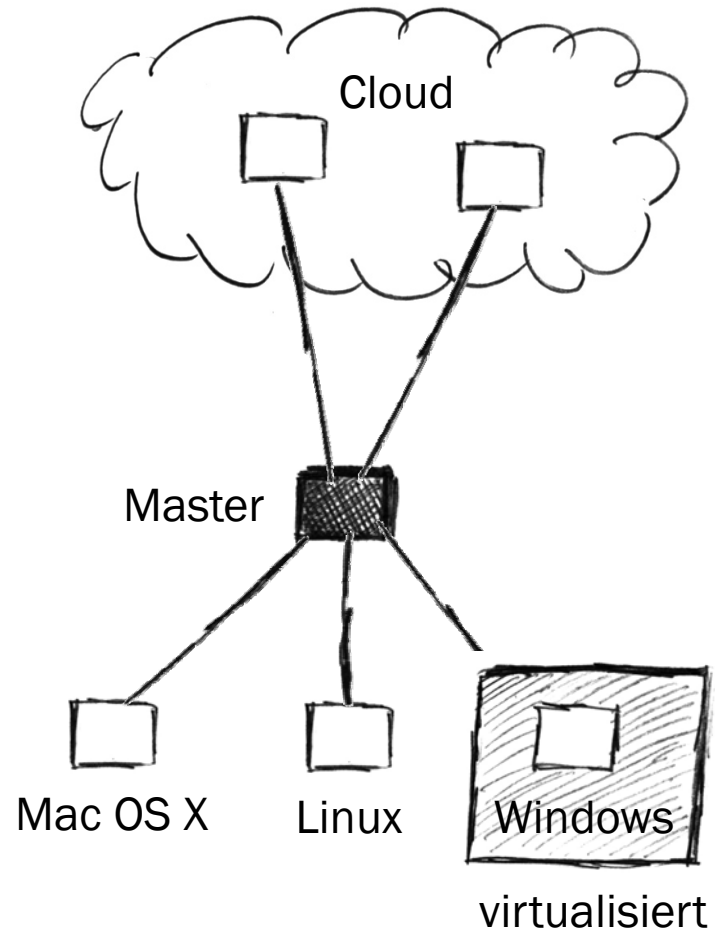
9. Matrix-Builds: Hudson übernimmt die Fleißarbeit.



10. Verteilte Builds: Skalierbare Leistung mit OS-Vielfalt.



lokale Builds

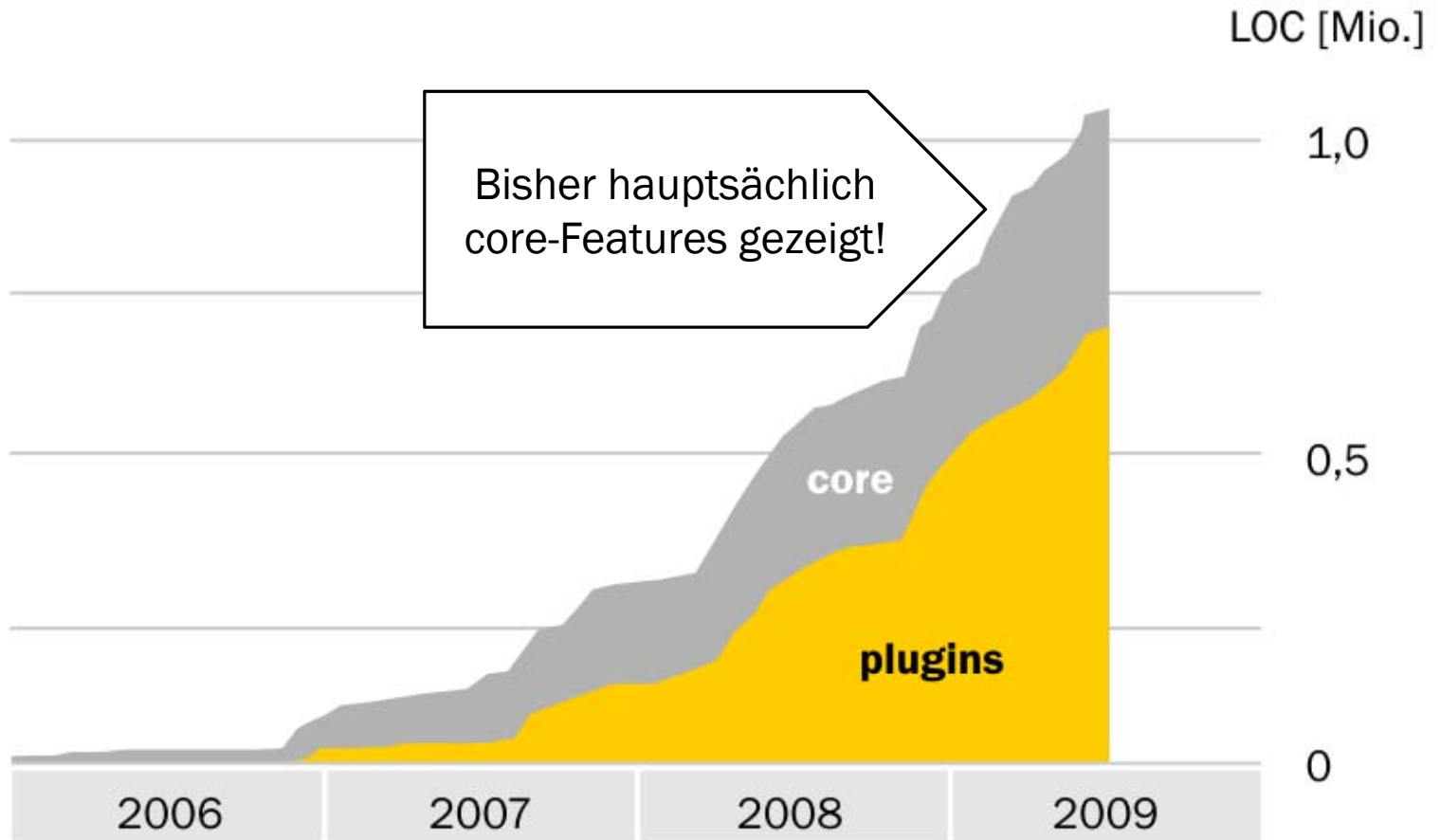


verteilte Builds

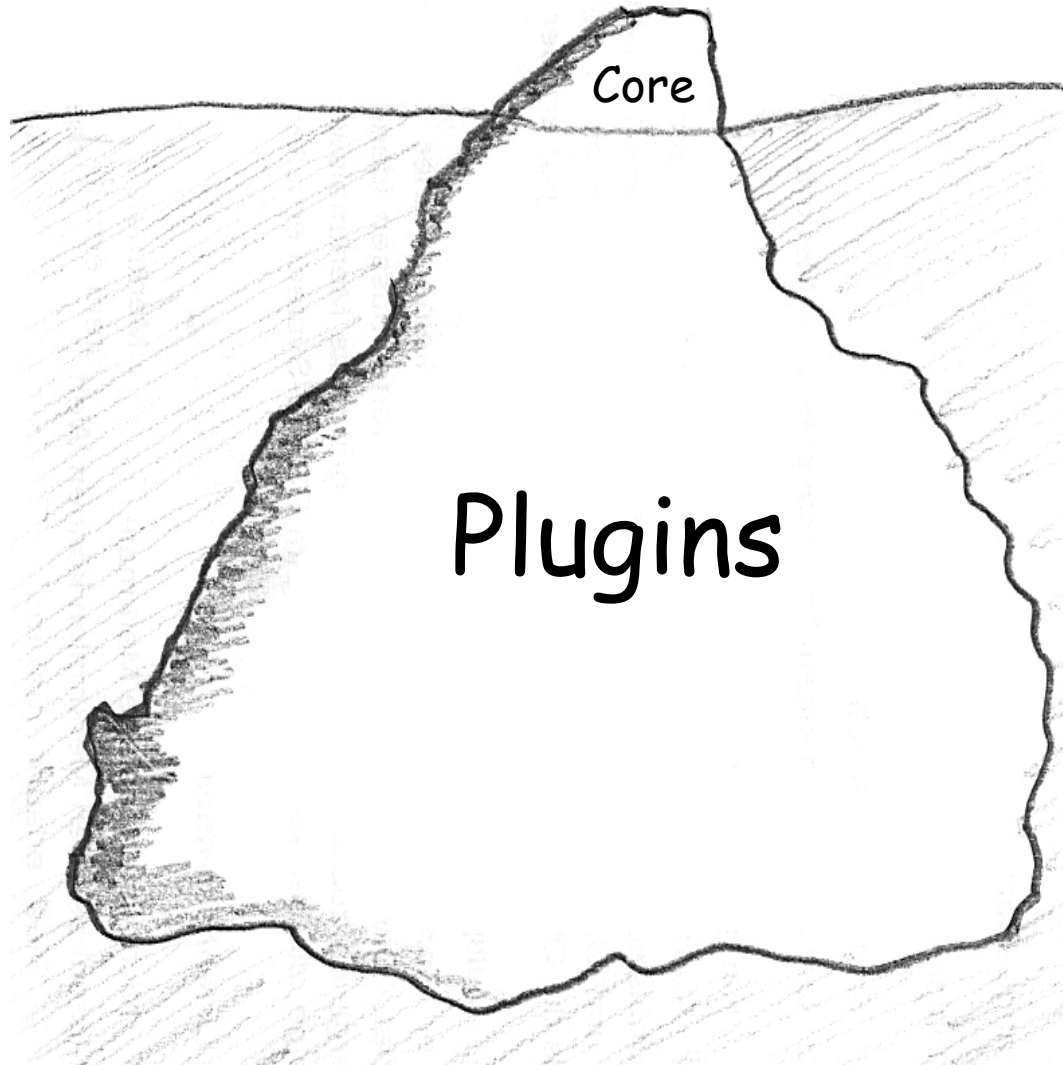
Zusammenfassung: Alle 10 Schritte auf einen Blick

- Installation
- Konfiguration
- Build-Support
- Berichte
- SCM-Integration
- Kommunikation
- Remote-API/CLI
- Abhängige Jobs
- Matrix-Builds
- Verteilte Builds

Haben wir da nicht etwas vergessen?

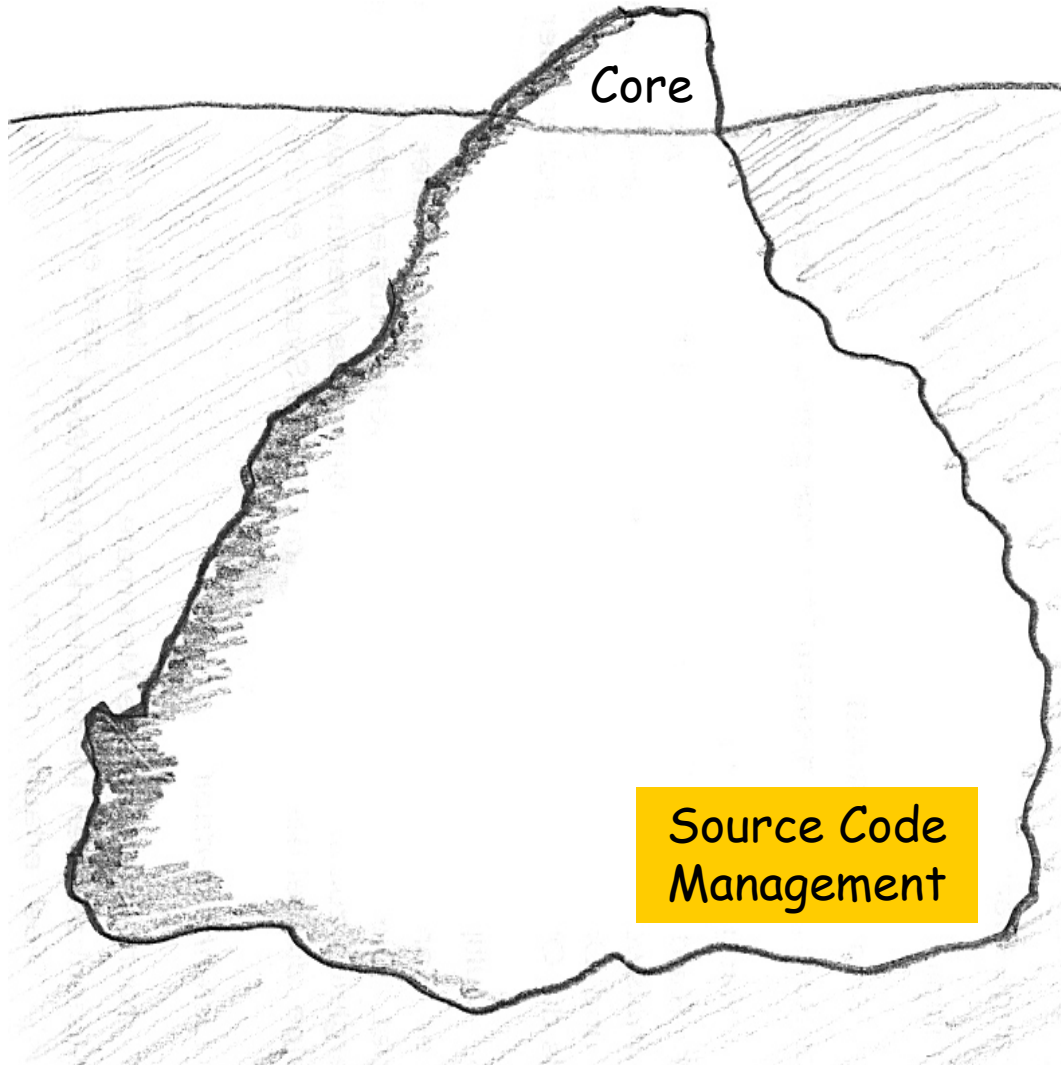


Über 200 Plugins erweitern den Core!



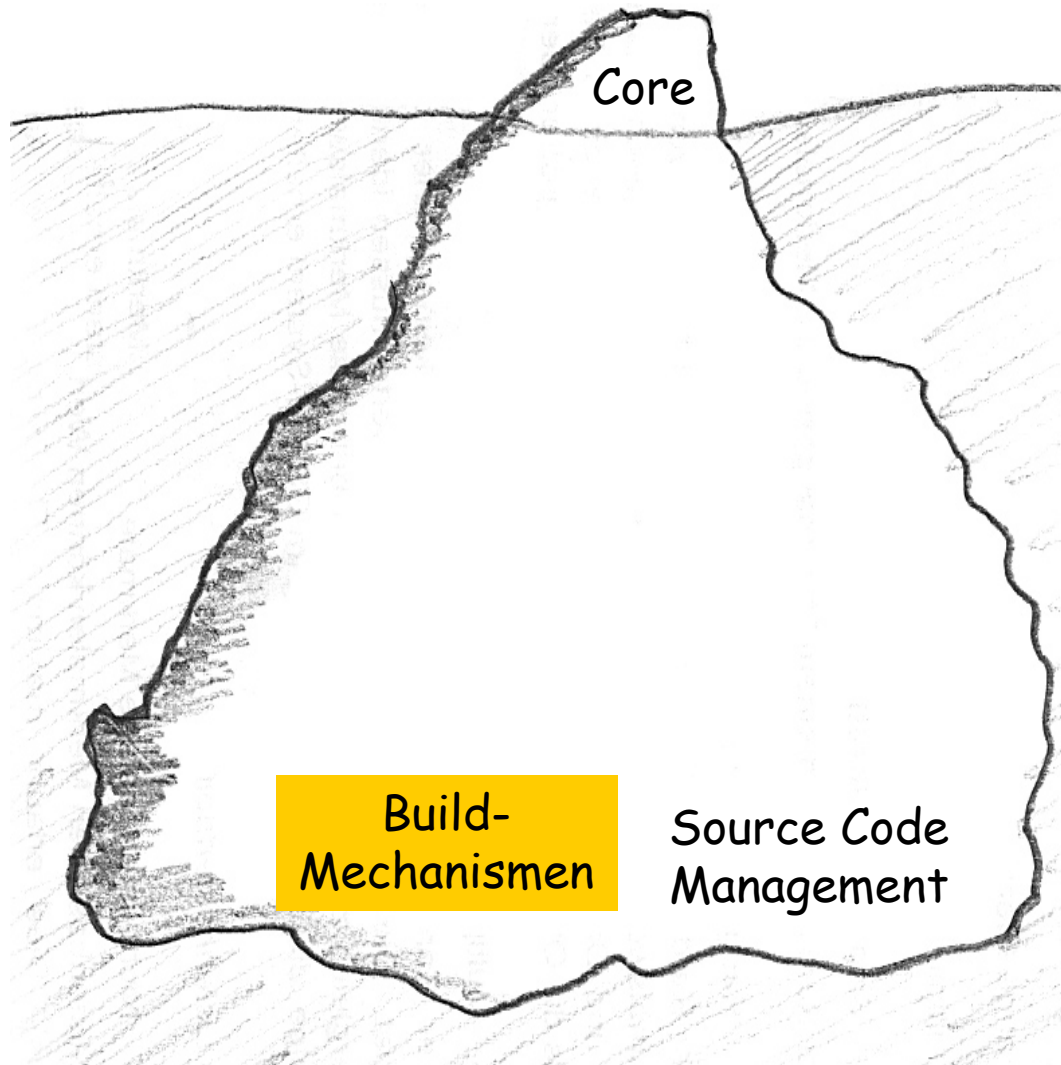
- Update-Center für einfache Installation und Aktualisierung
- 1-2 neue Plugins pro Woche(!)
- Maven-Tools für Plugin-Entwicklung
- Gute Unterstützung durch Developer-Mailingliste

Über 200 Plugins erweitern den Core!



Accurev
Bazaar
BitKeeper
ClearCase
CMVC
CVS
File System SCM
Git
Harvest
Mercurial
Perforce
PVCS
Subversion
Synergy
Team Foundation Server
Template Project
URL
Visual SourceSafe

Über 200 Plugins erweitern den Core!



Ant

Batch File

Buckminster

Gant

Gradle

Grails

Groovy

Kundo

Maven

MSBuild

Nant

PowerShell

Rake

Ruby

SCons

SCTMExecutor

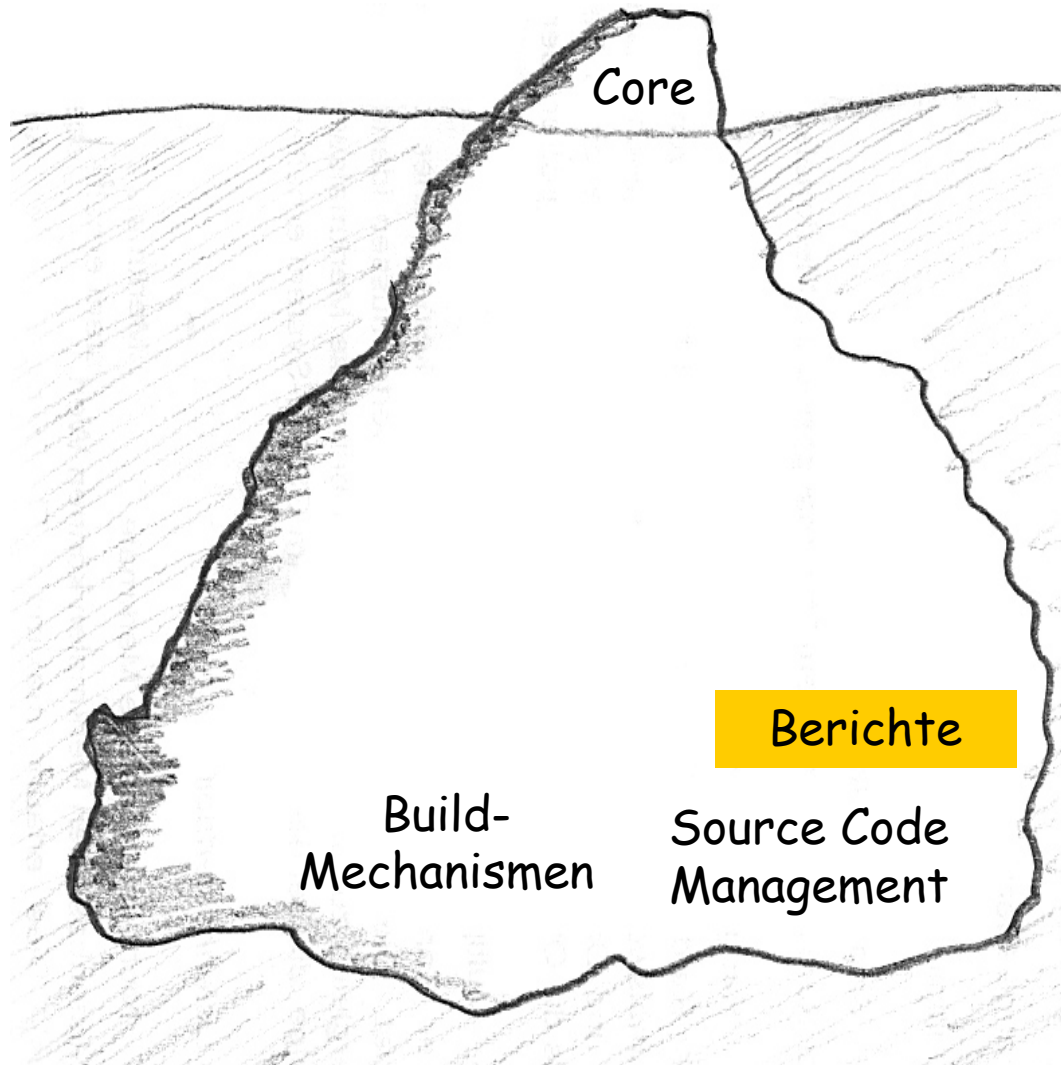
Shell script

Selenium AES

Seleniumhq

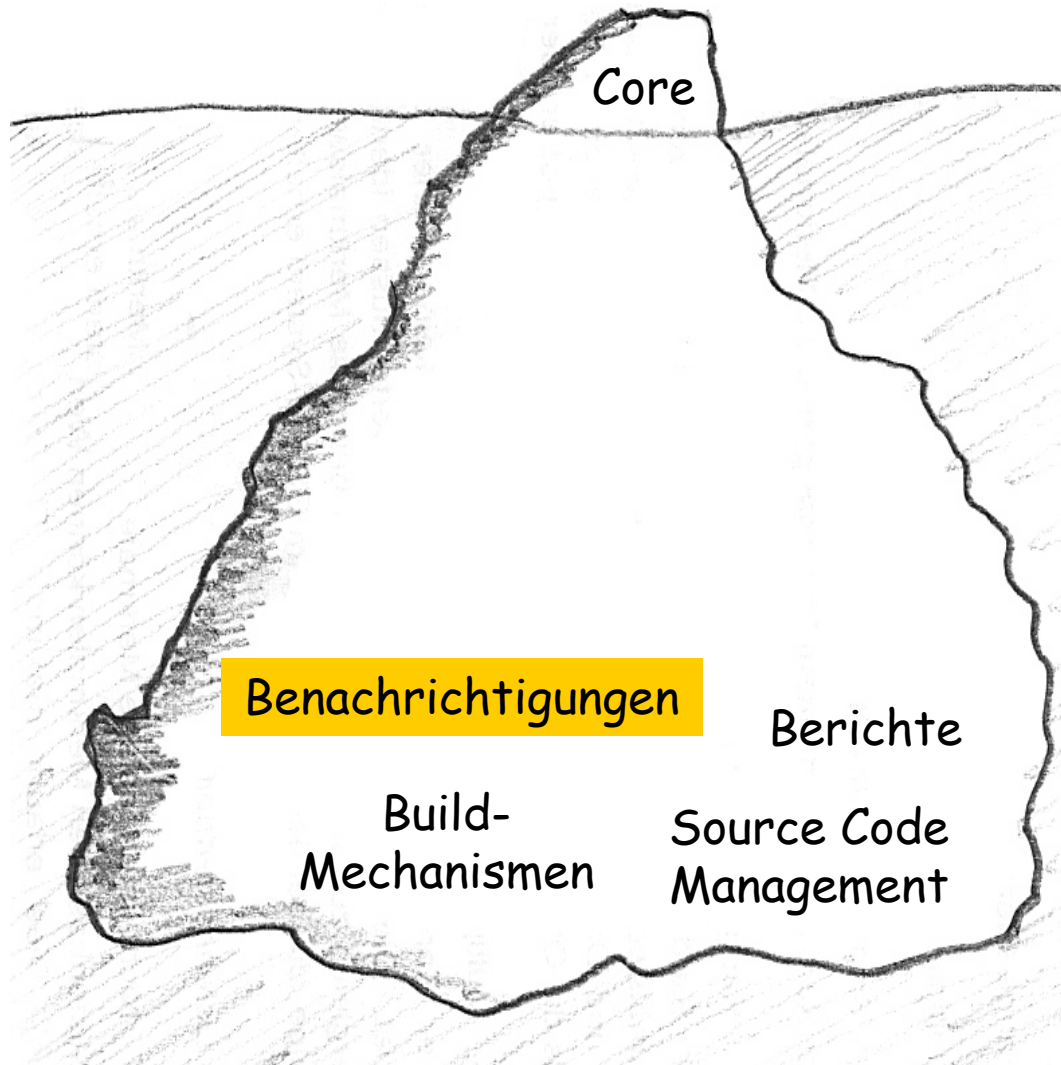
(und weitere)

Über 200 Plugins erweitern den Core!



CCCC	NCover
Checkstyle	NUnit
Clover	Plot
Cobertura	PMD Plugin
CppUnit	PureCoverage
Crap4J	Ruby metrics
Doxygen	Selenium AES
DRY	Seleniumhq
Emma	Serenitec
FindBugs	SLOCCount
Gallio	Task Scanner
Gnat	Testability
Grinder	Explorer
Japex	Violations
Javadoc	Warnings
JavaNCSS+	WebTest
JavaTest Rprt.	Presenter
JUnit	
MSTest	

Über 200 Plugins erweitern den Core!



Campfire

Email

Google Calendar

hudsonTracker

IRC

Jabber

Nabaztag

SameTime

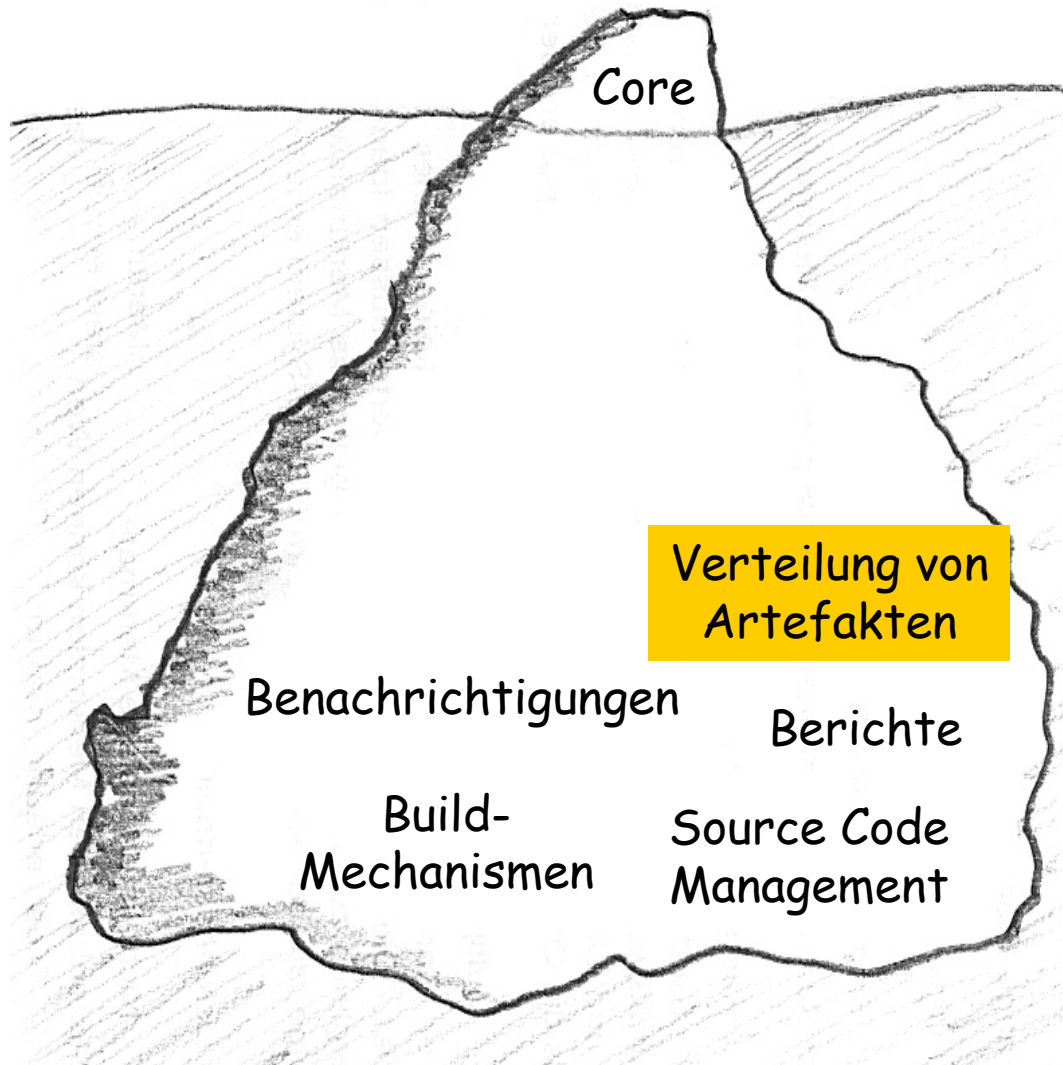
Status Monitor

RSS

TuxDroid

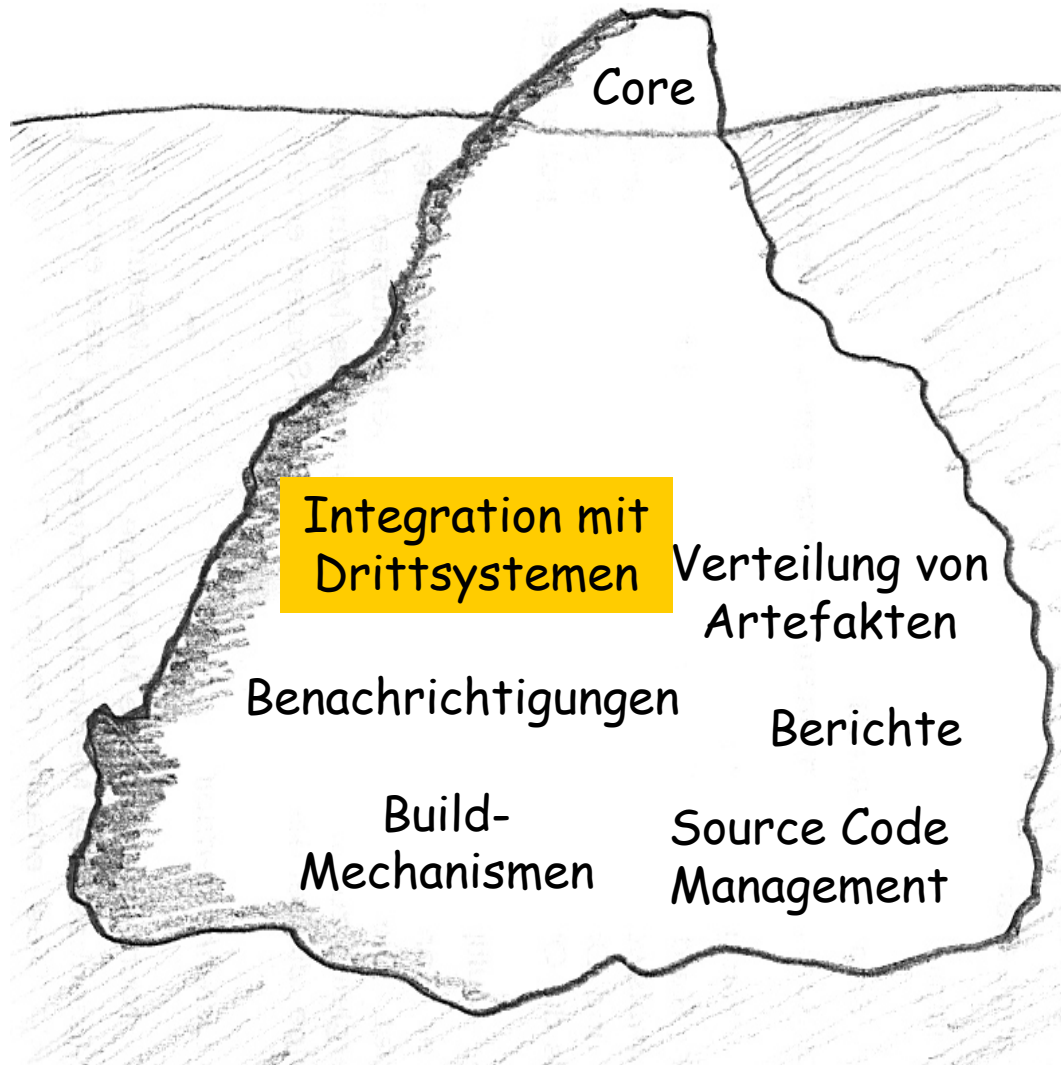
Twitter

Über 200 Plugins erweitern den Core!



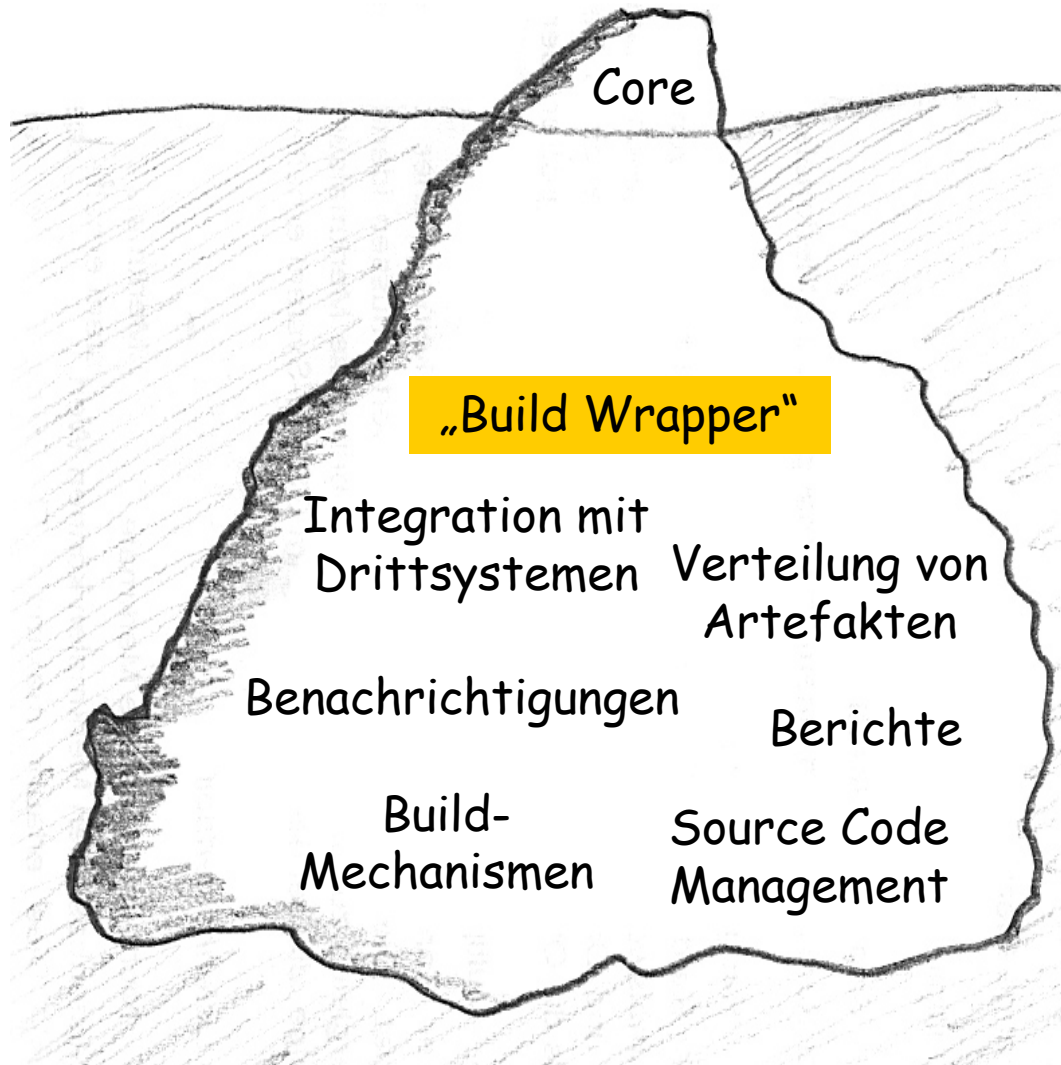
FTP Publisher
java.net Uploader
SCP
SFEE
SVN

Über 200 Plugins erweitern den Core!



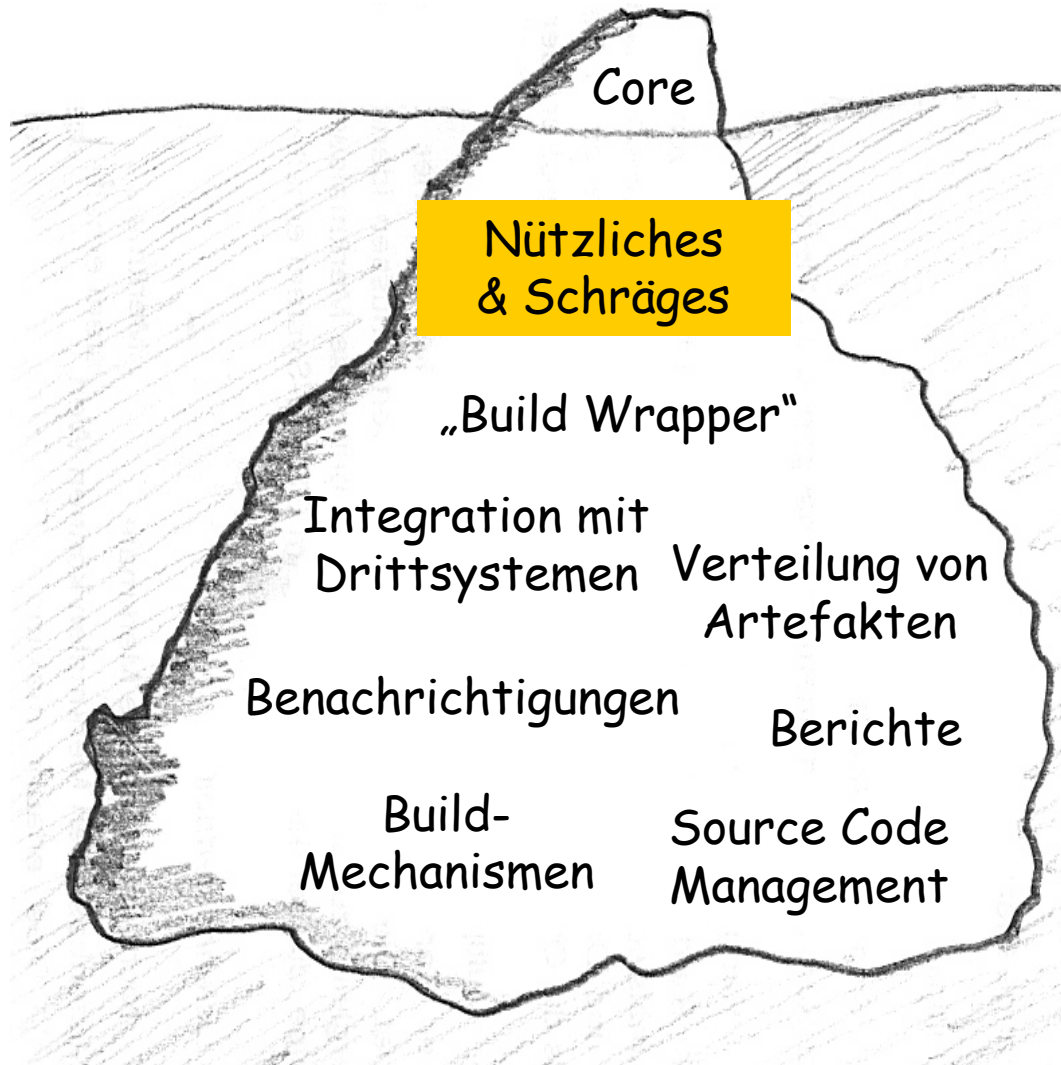
Active Directory Mantis
Android App PXE
Audit Trail Polarion
Backlog Redmine
Bugzilla RegEx Email
Cluster mgmt. SFEE
Crowd Selenium
Firefox Add-on Sonar
Github Swarm
Google Calend. Trac
Google Code Windows Tray
Google Desktop
HGCA
Hadoop
iPhone App
JIRA
Java.net
Kagemai
LDAP Email

Über 200 Plugins erweitern den Core!



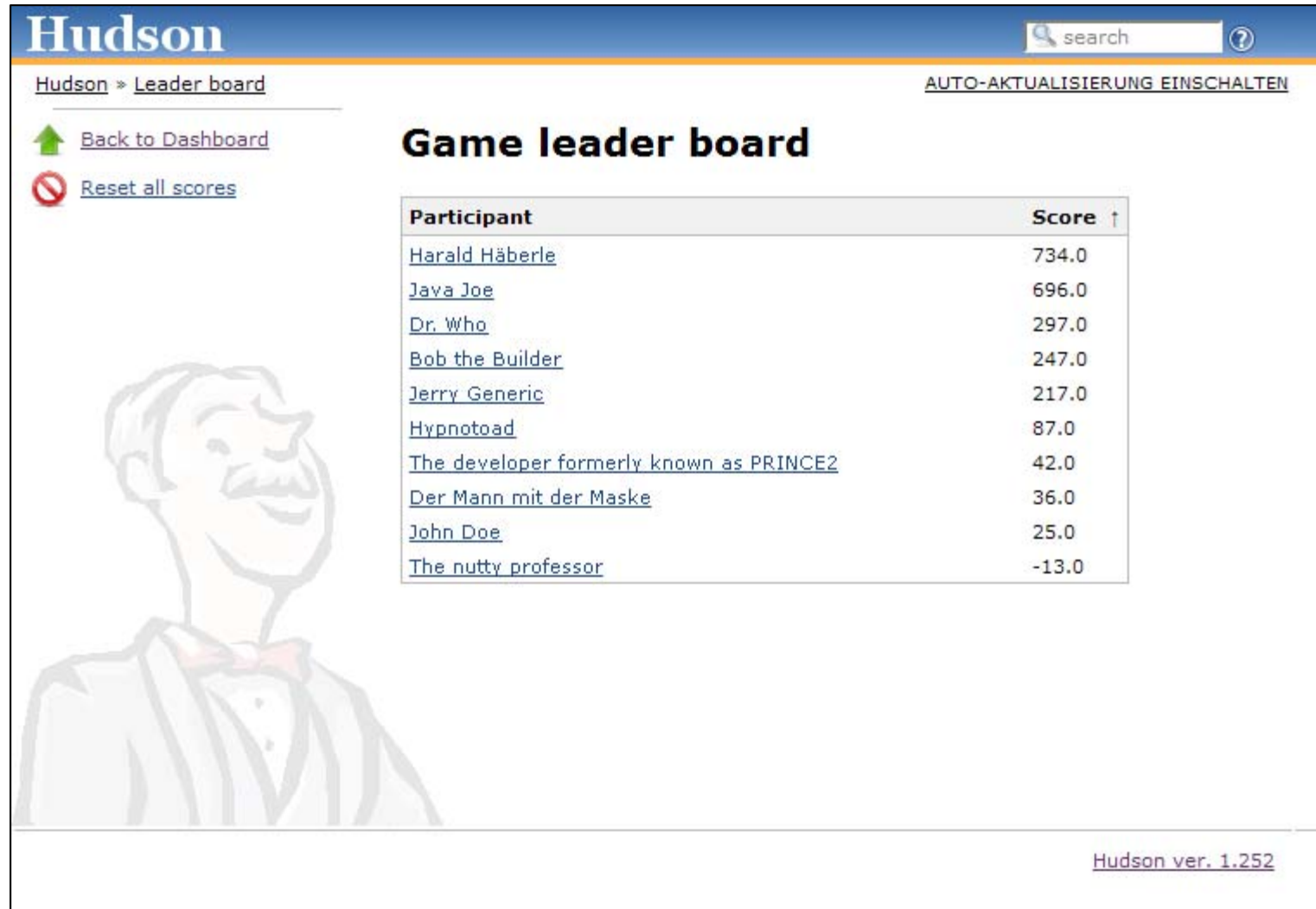
Hudson Central. Job(Re)Action
Hudson Distr. Workspace Clean
Locks and Latches
M2 Extra Steps
M2 Release
Release
Template Project
VMware
Xvnc
ZenTimestamp

Über 200 Plugins erweitern den Core!



- Build-timeout
- Change Log History
- Claim
- Configuration Slicing
- Cygnus
- Emotional Hudson
- Google Analytics
- Green Balls
- JBPM
- Locale
- Port Allocator
- Promoted Builds
- Radiator View
- Retry Failed Builds
- Sectioned View
- Sidebar-Link
- Slave-status
- Continuous Integration Game

Plugin „Continuous Integration Game“



The screenshot shows the Hudson CI Game Leaderboard interface. At the top left is the 'Hudson' logo. To its right is a search bar with a magnifying glass icon and a question mark icon. Below the logo is a breadcrumb trail: 'Hudson > Leader board'. On the right side of the top bar, there is a link 'AUTO-AKTUALISIERUNG EINSCHALTEN'. On the left side, there are two links: 'Back to Dashboard' with a green arrow icon and 'Reset all scores' with a red 'no' icon. The main content area is titled 'Game leader board' and contains a table with two columns: 'Participant' and 'Score'. The table lists ten participants with their respective scores. On the left side of the main content area, there is a faint, stylized illustration of a man with a mustache, wearing a suit and a bow tie. At the bottom right of the page, the version number 'Hudson ver. 1.252' is displayed.

Hudson

search ?

Hudson > Leader board

AUTO-AKTUALISIERUNG EINSCHALTEN

[Back to Dashboard](#)

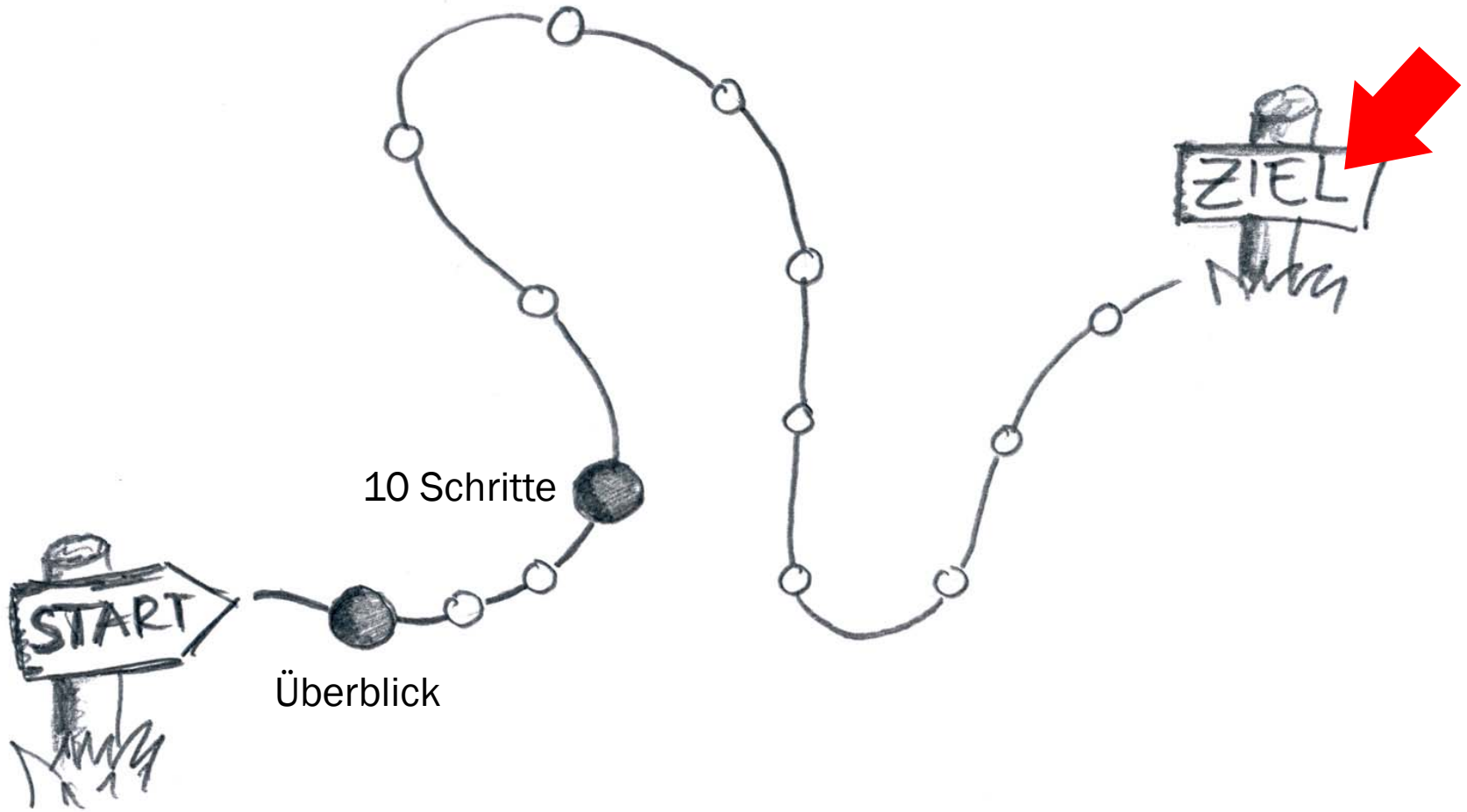
[Reset all scores](#)

Game leader board

Participant	Score ↑
Harald Häberle	734.0
Java Joe	696.0
Dr. Who	297.0
Bob the Builder	247.0
Jerry Generic	217.0
Hypnotoad	87.0
The developer formerly known as PRINCE2	42.0
Der Mann mit der Maske	36.0
John Doe	25.0
The nutty professor	-13.0

Hudson ver. 1.252

Agenda



HERUNTERLADEN

EINSETZEN

WEITERSAGEN

MITMACHEN

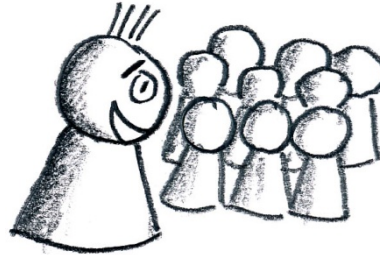
hudson-ci.org



Beratung



Buch



Vortrag



Dr. Wiest – Ingenieurbüro für Softwaretechnik

Wiesfleckenstrasse 13

72810 Gomaringen

www.simonwiest.de

BACKUP

Empfohlene Nachlese

■ Hudson

- Projektseite. hudson.dev.java.net
- JBoss Hudson CI Server. hudson.jboss.org/hudson
- Interview mit Hudson-Initiator Kohsuke Kawaguchi
blogs.sun.com/glassfishpodcast (Episode #007)

■ Continuous Integration

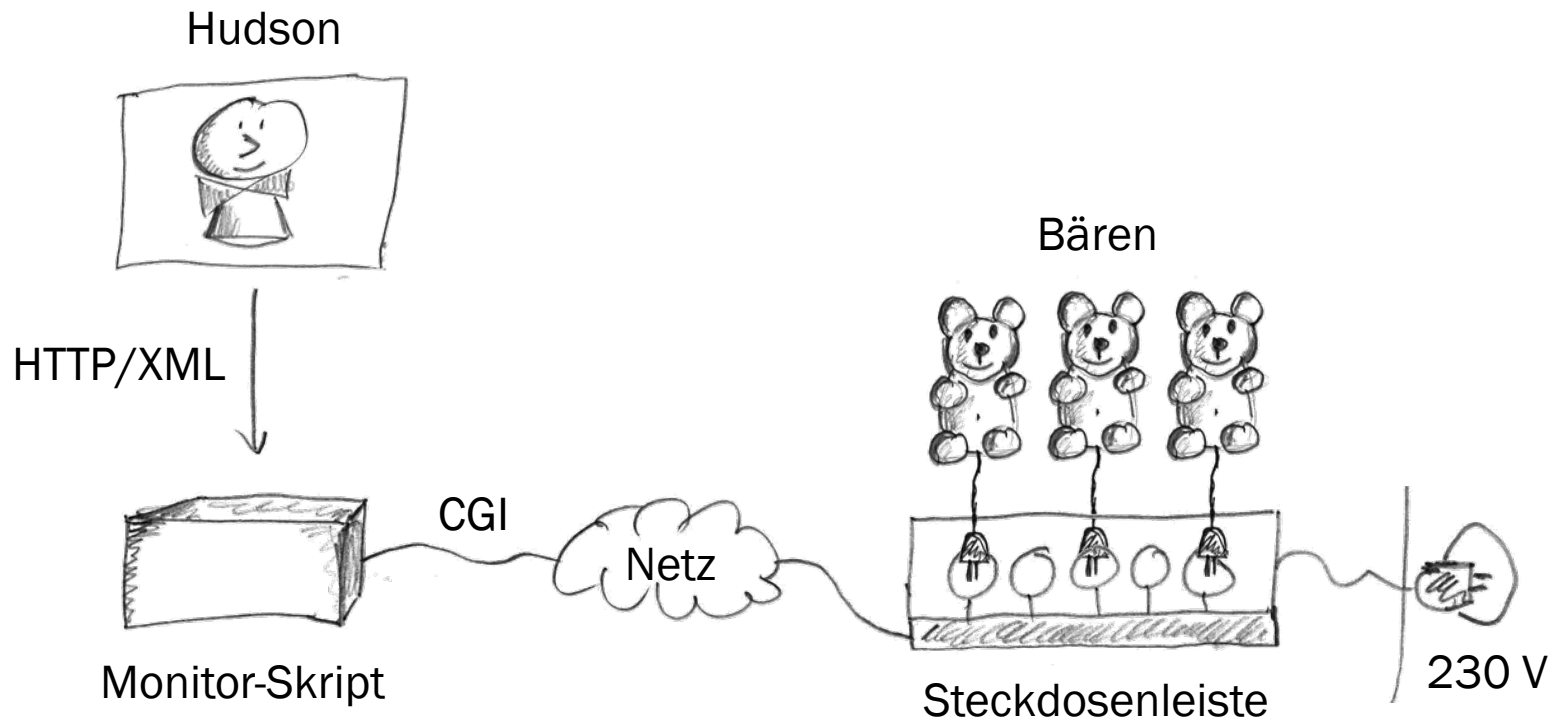
- White Paper von Martin Fowler. www.martinfowler.com
- CI Feature Matrix. confluence.public.thoughtworks.org
- P.M. Duvall: Continuous Integration. 2007.

■ Projektautomatisierung (allgemein)

- J. F. Smart: Java Power Tools. 2008.
- M. Hüttermann: Agile Java-Entwicklung in der Praxis. 2007.

Wie funktionieren die Bären?

Mehr dazu im Hudson Wiki
wiki.hudson-ci.org//x/AQA1AQ

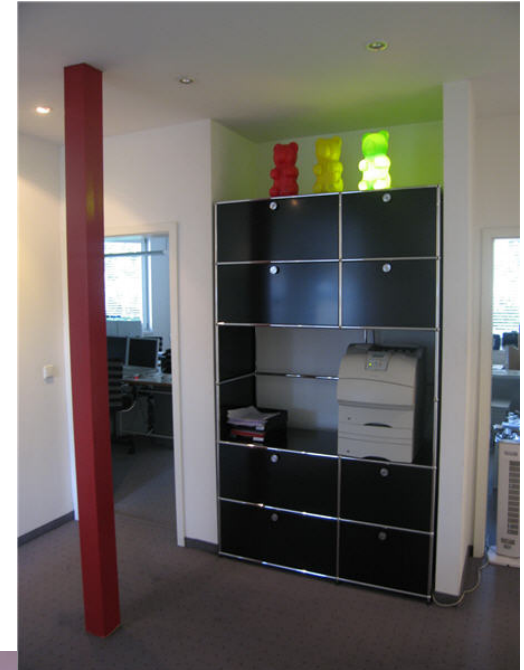


Wie funktionieren die Bären?



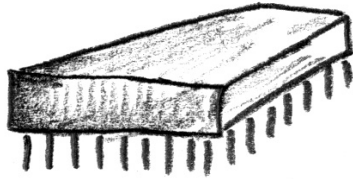
Ingenieurbüro Dr. Wiest,
Gomaringen

last.fm,
London/UK

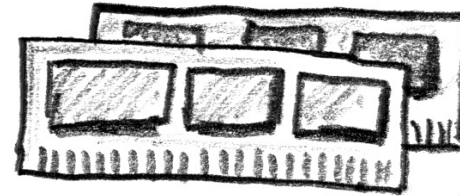


Netzgiganten GmbH,
Stuttgart

Bonus-Folie: Hardware aufrüsten lohnt.



CPU



Hauptspeicher



Festplatte



Netzwerk

The Joel (Spolsky) Test

1. Do you use **source control**?
2. Can you make a **build in one step**?
3. Do you make **daily builds**?
4. Do you have a **bug database**?
5. Do you **fix bugs before writing new code**?
6. Do you have an **up-to-date schedule**?
7. Do you have a **spec**?
8. Do programmers have **quiet working conditions**?
9. Do you use the **best tools money can buy**?
10. Do you have **testers**?
11. Do new **candidates write code** during their interview?
12. Do you do **hallway usability testing**?



www.rockstardemos.de