



The 3C Approach for Agile Quality Assurance

**Continuous Integration, Continuous Measurement,
Continuous Improvement**

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About me

- Jens Jäger
- Freelance IT Consultant
- Java, Ruby, Javascript, Web,...
- Agile methods

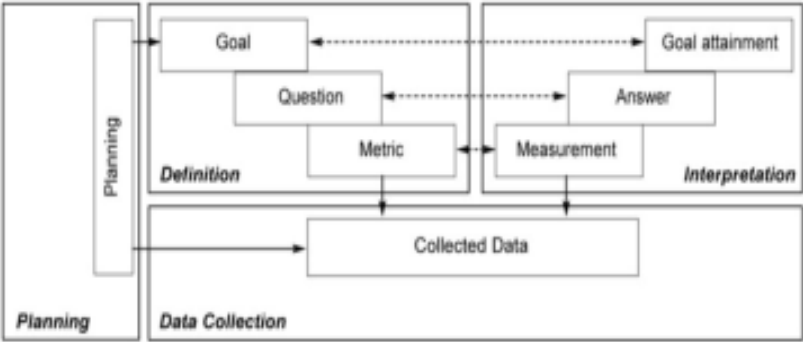
Agenda

- Motivation & Goal
- Project Context
- Traditional and Agile Measurement & Metrics
- Continous Integration
- Continous Measurement
- Continous Improvement
- Conclusion & Outlook

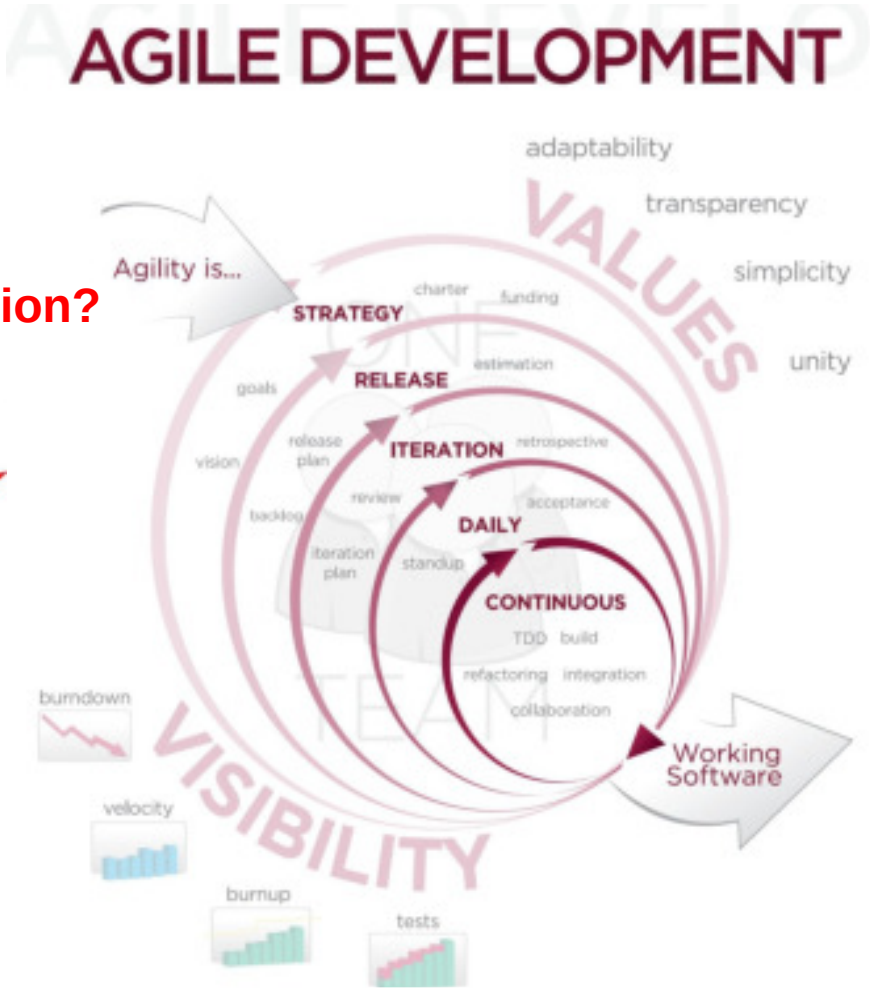
Motivation

Independent from Process Model!

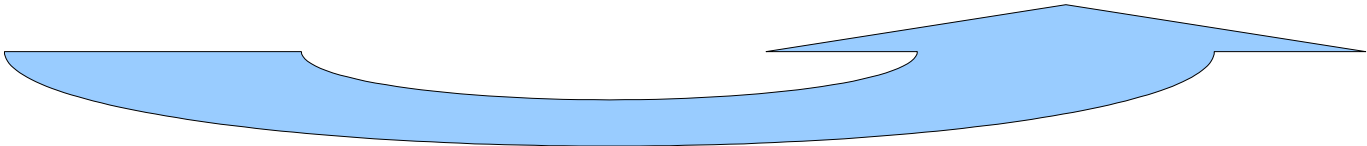
Traditional Measurement



Contradiction?



Integration of Metrics in Agile Processes?



Goal

- looking for: Agile Quality Assurance
 - Metrics-based
 - Embedded in Agile Process
- Solution: 3C-Approach
 - Agile Practice: **Continuous Integration**
 - Enhanced with **Continuous Measurement**
 - Enhanced with **Continuous Improvement**



Project Context

- Project „IBIS“ (within project cluster I2)



- T-Systems, Systems Integration



- Agile Process Model I2 (based on XP)



- Industrial Context: Automotive

- Technology Context:

- Web-Technology
- Distributed Systems (EAI)

- Project-/Product-State

- Evolution (new features)
- Maintenance (bugfixing)
- so-called „Brownfield-Project“

Project Context

- Internal Software Quality?
- partly in need for improvement!
- Causes
 - Missing Quality Rules
 - Time & Budget Pressure
 - Missing QA-KnowHow
 - Missing QA-Tools
 - „out-dated“ Source Code (based on Java 1.3)

T · · Systems ·



Qualität



ISO 25000

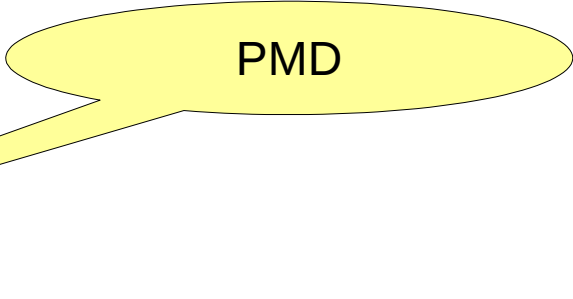
Traditional and Agile Measurement & Metrics

- Traditional Metrics

- LOC
- CK-Metrics
- Comments Density
- Duplicated Code
- Code-Style-Violations
- Design-Rule-Violations



Checkstyle



PMD

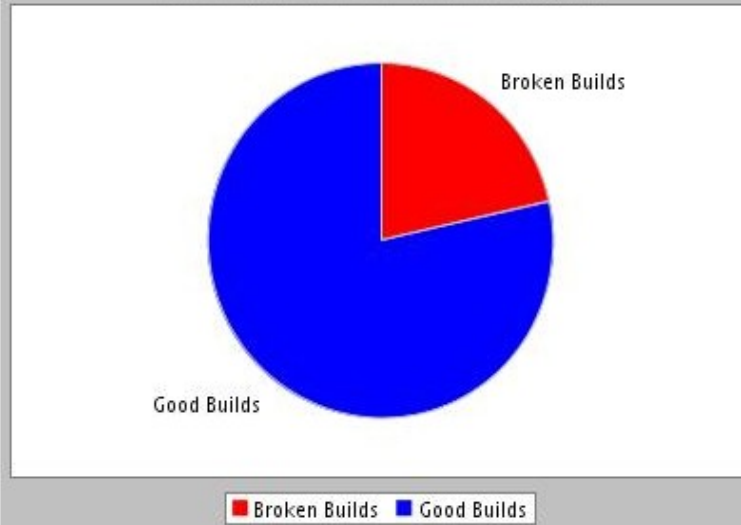
- Agile Metrics

- Number of Broken Builds/Number-Of-Failed-Integrations
 - Process-Metric/Quality-Constraint
 - Broken Build = found bug
 - Dysfunctional effects: use as KPI
 - Problem: Infrastructur

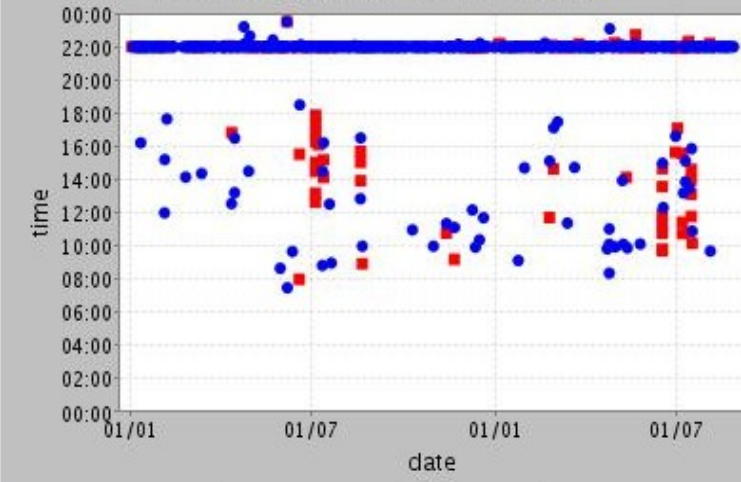
Number-of-Broken-Builds

Number of Build Attempts 521
Number of Broken Builds 112
Number of Successful Builds 409

Breakdown of build types



Breakdown of build types



Agile Metrics

- Number of Tests
- Test Growth Ratio
 - Better than number of Tests for Brownfield-Projects
 - $\text{testGrowthRatio} = \Delta\text{sourceCode} / \Delta\#\text{Tests}$
with (usually)
 $\Delta\text{sourceCode} \geq 0$
 $\Delta\#\text{tests} \geq 0$
- Test-Coverage
 - C0-Line-Coverage
 - C1-Branch-Coverage
 - $\text{testCoverage} = \text{codeCoveredByTests} / \text{completeCode}$
with $0 \leq \text{testCoverage} \leq 1$



Cobertura

Test-Coverage

Packages

[All](#)
[de.tsystems.ec.ibis.BB2RV](#)
[de.tsystems.ec.ibis.GSSNImport](#)
[de.tsystems.ec.ibis.LossForeca](#)
[de.tsystems.ec.ibis.fagros](#)
[de.tsystems.ec.ibis.fagros.gen](#)
[de.tsystems.ec.ibis.firstfmv](#)
[de.tsystems.ec.ibis.matriximport](#)
[de.tsystems.ec.ibis.mg](#)

All Packages

Classes

[APIManager \(0%\)](#)
[APWarrantyAPI \(N/A\)](#)
[APWarrantyAPIImpl \(0%\)](#)
[AbstractDetailScreenHandler \(0](#)
[AbstractFileSearchHandler \(0%](#)
[AbstractMultiPrintHelper \(0%](#)
[AbstractPreExecDetailScreen \(](#)
[AbstractPreExecVehSearch \(0%](#)
[AbstractPrintOfferHandler \(0%](#)
[AbstractPrintOffersHandler \(0%](#)
[AbstractRequestor \(0%\)](#)
[AbstractSearchHandler \(15%\)](#)
[AbstractSearchResultHandler \(](#)
[AbstractSinglePrintHelper \(0%](#)
[AbstractStateEventFactory \(88](#)
[AbstractVehSearchHandler \(0%](#)
[AbstractVehSearchListHandler](#)
[AbstractWebServiceFactory \(0](#)
[AccountingAPI \(N/A\)](#)
[AccountingAPICofico \(0%\)](#)
[AccountingAPIImpl \(0%\)](#)
[AccountingCommonBase \(63%](#)
[AccountingController \(N/A\)](#)

Coverage Report - All Packages

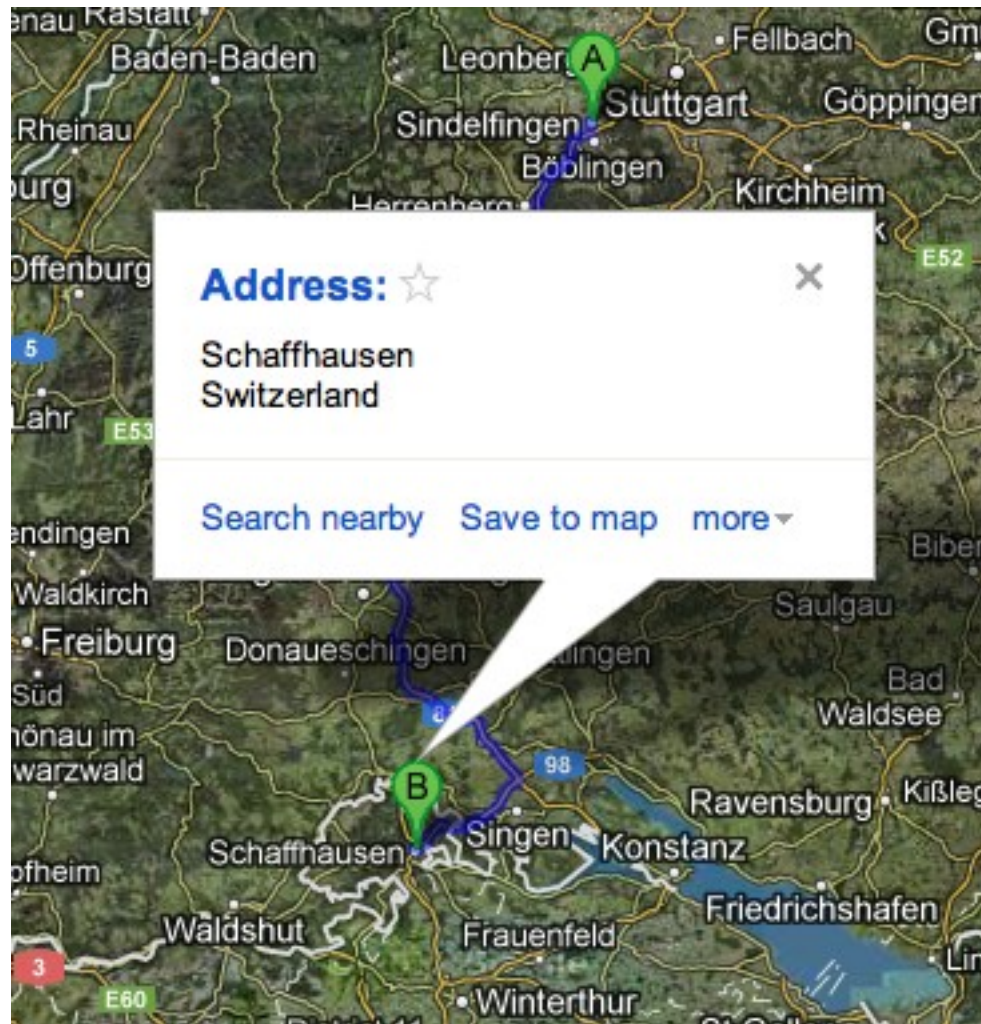
Package	# Classes	Line Coverage	Branch Coverage	Complexity
All Packages	1545	16% 22177/142821	10% 5221/50911	1,617
de.tsystems.ec.ibis.BB2RV	7	70% 240/344	42% 65/154	1,719
de.tsystems.ec.ibis.GSSNImport	3	0% 0/155	0% 0/74	0
de.tsystems.ec.ibis.LossForecastCSVImport	3	0% 0/143	0% 0/54	1
de.tsystems.ec.ibis.fagros	4	76% 133/176	44% 35/80	1,5
de.tsystems.ec.ibis.fagros.generated	11	26% 54/204	50% 2/4	1,556
de.tsystems.ec.ibis.firstfmv	11	65% 167/258	59% 43/73	1,05
de.tsystems.ec.ibis.matriximport	8	80% 188/235	81% 78/96	0
de.tsystems.ec.ibis.mg	11	0% 0/175	0% 0/22	1,471
de.tsystems.ec.ibis.mg.executor	1	0% 0/45	0% 0/8	0
de.tsystems.ec.ibis.mg.ibisqfas	7	0% 0/171	0% 0/28	1,588
de.tsystems.ec.ibis.mg.ibisqfas.monitor	7	0% 0/100	0% 0/32	1
de.tsystems.ec.ibis.portfolio	3	2% 3/127	0% 0/70	1
de.tsystems.ec.ibis.rvrequestimport	9	0% 0/264	0% 0/142	1,7
de.tsystems.ec.ibis.tabaco.cofico	4	0% 0/31	N/A N/A	1
de.tsystems.ec.ibis.tabaco.cofico.controller	3	0% 0/33	N/A N/A	3
de.tsystems.ec.iucca	54	19% 568/3042	16% 201/1286	1,686
de.tsystems.ec.iucca.BB2RV	1	35% 29/82	11% 6/54	0
de.tsystems.ec.iucca.ac	1	2% 5/246	5% 2/40	0
de.tsystems.ec.iucca.actions	248	0% 26/24771	0% 4/11815	5,545
de.tsystems.ec.iucca.actions.preexec	272	0% 5/16056	0% 0/8168	1,667
de.tsystems.ec.iucca.actions.validation	32	3% 4/143	0% 0/134	1,711
de.tsystems.ec.iucca.api	24	1% 3/223	0% 0/38	1,029
de.tsystems.ec.iucca.api.buyback	4	0% 0/30	0% 0/4	1,5
de.tsystems.ec.iucca.api.buyback.buybackinformationservice	5	0% 0/64	N/A N/A	0
de.tsystems.ec.iucca.api.buyback.buybackinformationservice.impl	2	0% 0/106	0% 0/72	1,5
de.tsystems.ec.iucca.api.buyback.enrichment	6	80% 110/137	N/A N/A	1
de.tsystems.ec.iucca.api.buyback.enrichment.impl	2	2% 4/180	0% 0/196	6,7
de.tsystems.ec.iucca.api.buyback.info	4	0% 0/76	N/A N/A	0
de.tsystems.ec.iucca.api.buyback.info.impl	1	0% 0/30	0% 0/20	5,5
de.tsystems.ec.iucca.api.buyback.management	9	75% 448/596	N/A N/A	0
de.tsystems.ec.iucca.api.buyback.management.impl	8	54% 986/1816	51% 580/1128	1,375
de.tsystems.ec.iucca.api.buyback.priceupdate	1	N/A N/A	N/A N/A	1
de.tsystems.ec.iucca.api.buyback.priceupdate.impl	1	60% 3/5	N/A N/A	1

Cultural Break

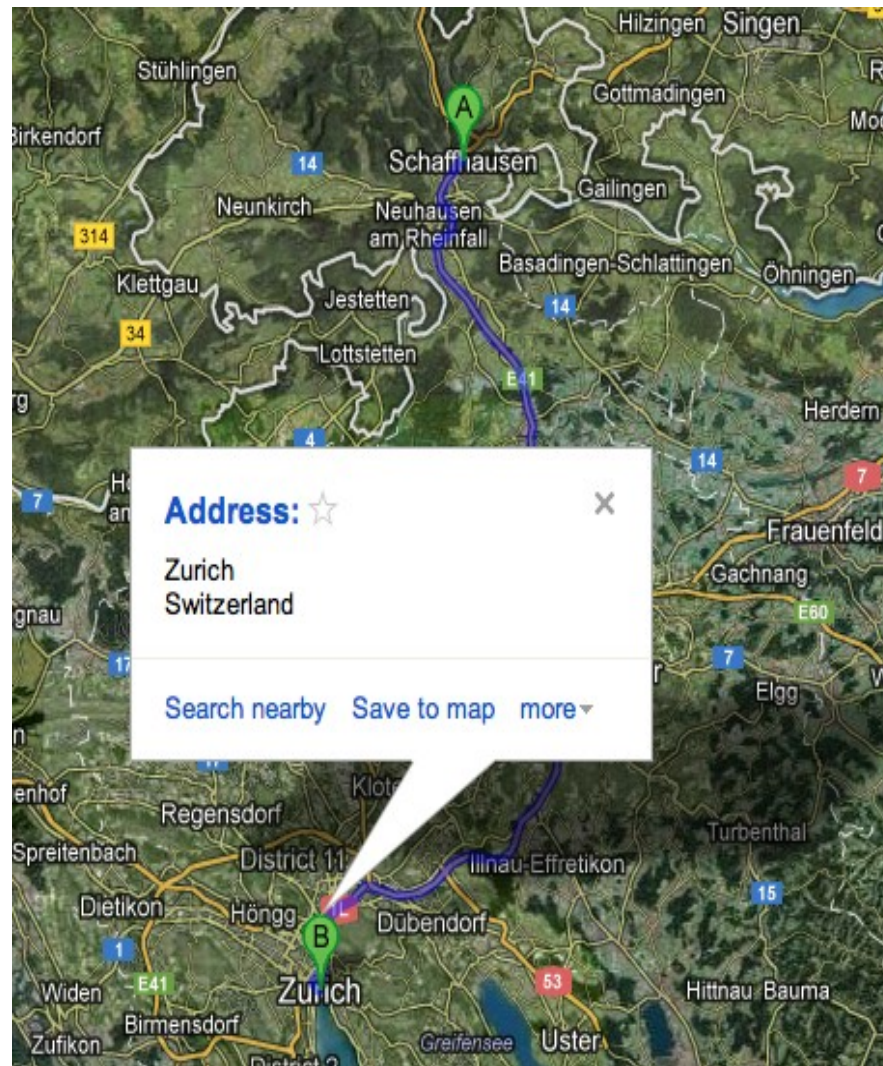
- Germany's autobahn network has a total length of about 12,800 km (7,953 Miles)
- Which ranks as the fifth-longest in the world
- There is no speed limit on german autobahn



Stuttgart – Border: 150Km - 1hour



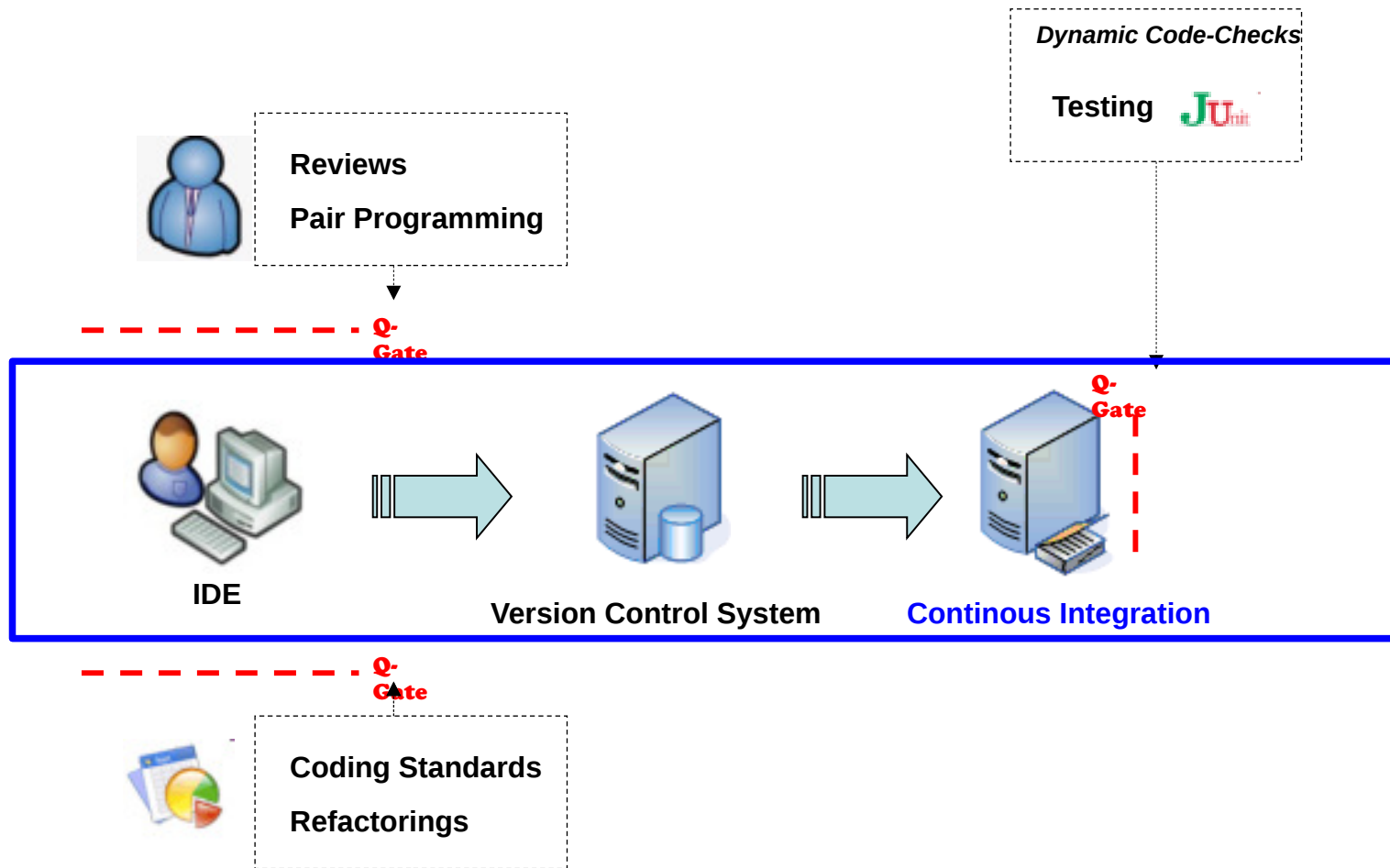
Border – Zürich: 50Km - 1hour



Continuous Integration

- Continuous Integration of Source Code in Code-Base
 - Continuous Integration → Automatization → CI Engines
 - Code-Base → VCS (Version Control System)
 - Successful Integration =
 - No Compile Errors
 - No Test Failures (Regression Tests)
 - Procedure in case of Broken Build: Fixing is highest priority for the team
- Quality Aspects
 - Tests → external Quality
 - (Metrics → internal Quality)

Continuous Integration

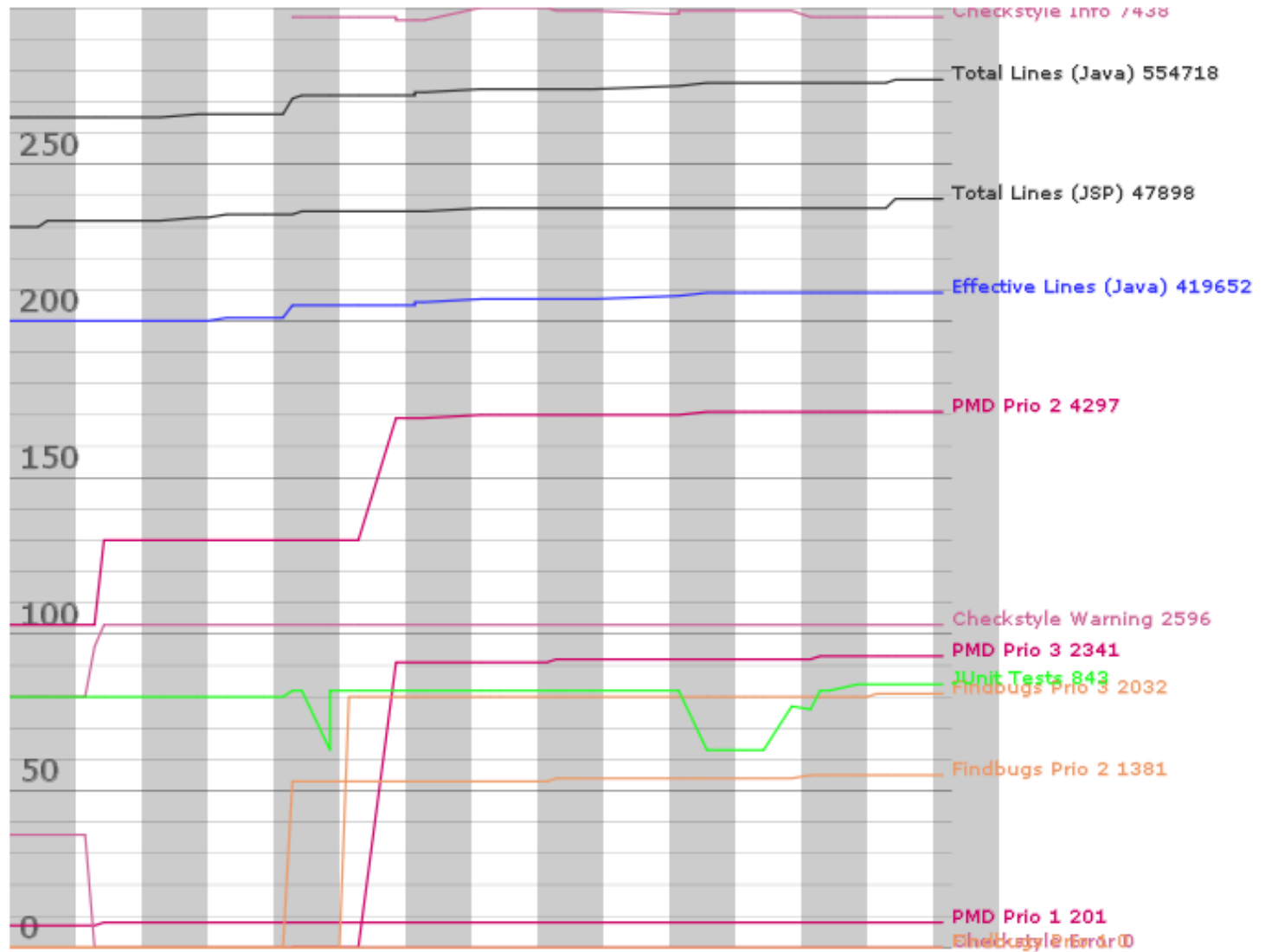


Continuous Measurement

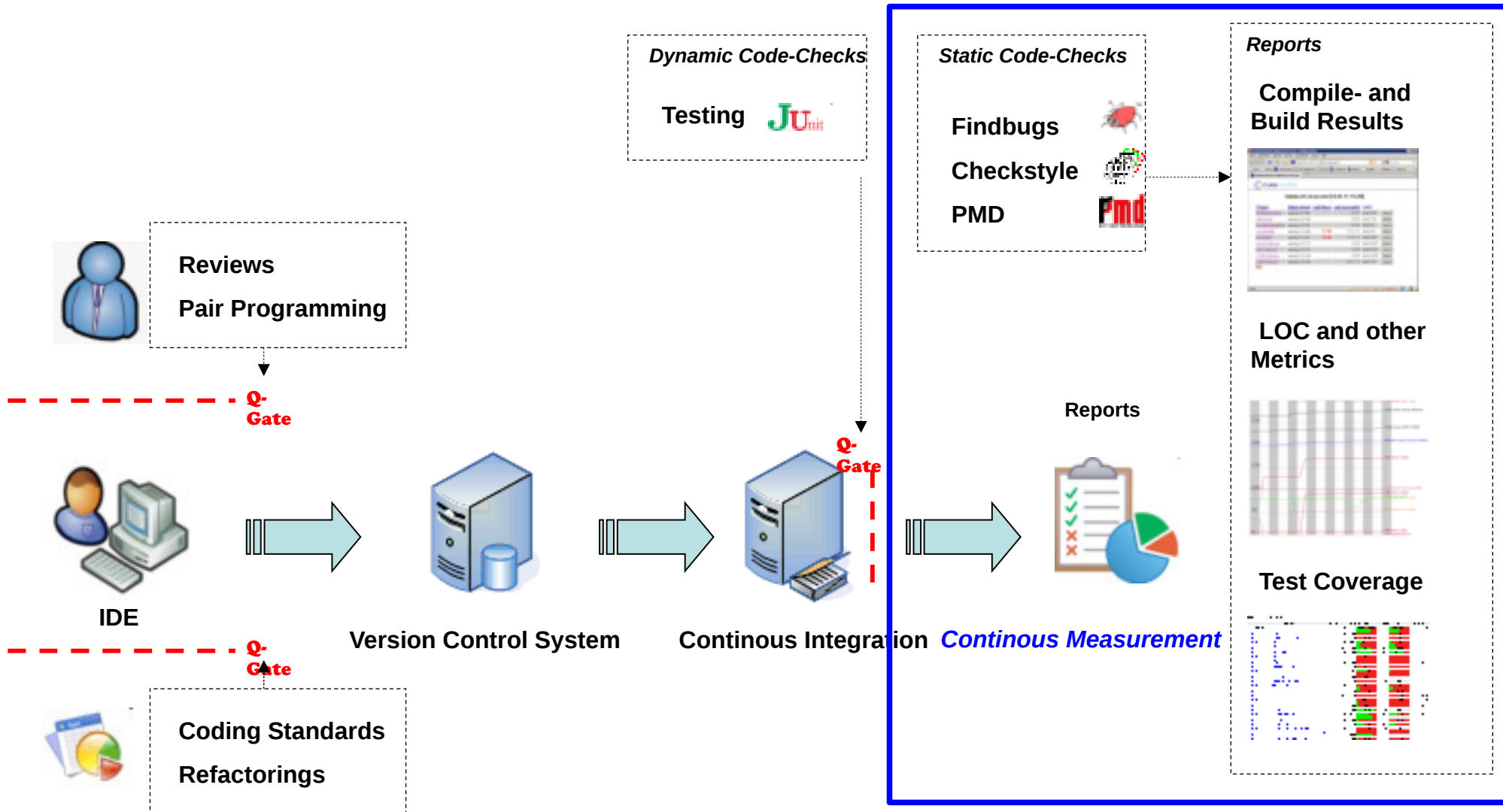
- Generation of Reports through CI-Engine
 - Total Lines (Java)
 - Effective Lines (Java)
 - Total Lines (JSP)
 - JUnit Tests
 - Checkstyle error/warning/info
 - Findbugs Prio 1/2/3
 - PMD Prio 1/2/3



Continuous Measurement



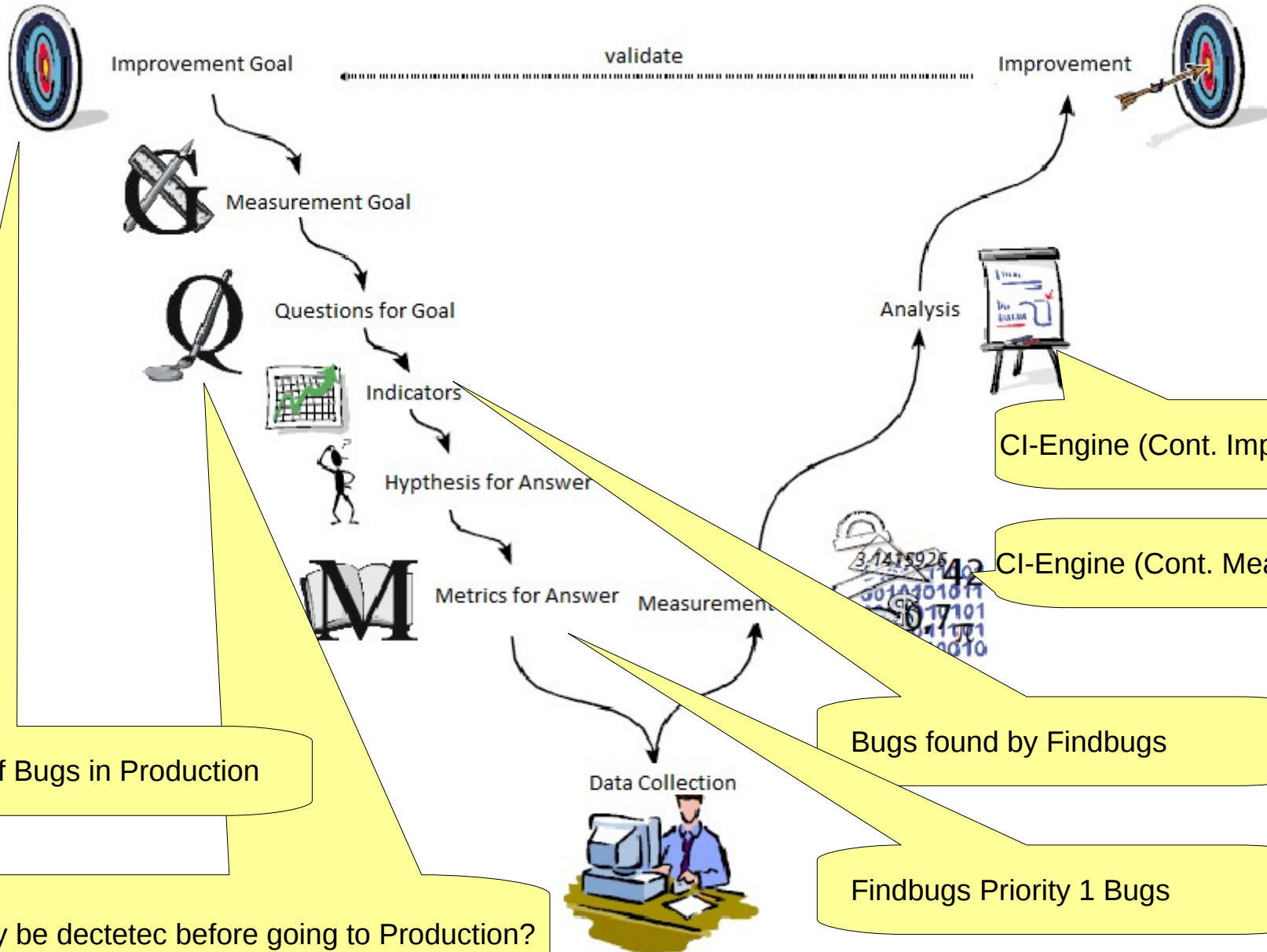
Continuous Measurement



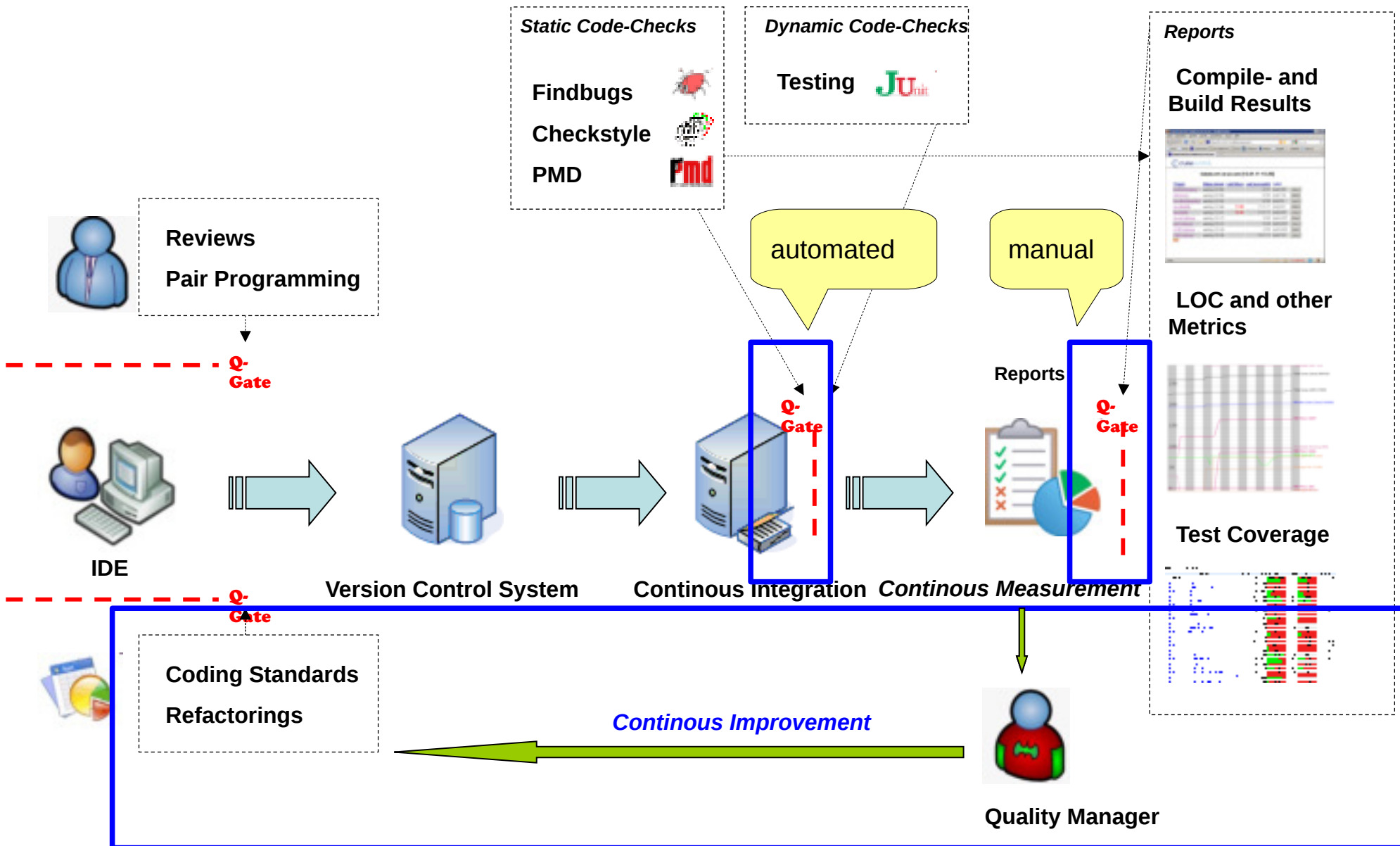
Continuous Improvement

- Manual Interpretation of the Reports
 - Deduction of Improvement Steps
 - Changes to Coding Standards / Coding Style Guide
 - Plan Refactorings
 - Set new thresholds (Tools)→ Break-off criteria for CI
 - Completion through Quality-Manager
 - Plan under consideration of functional evolution and budget
 - Use of the GQM (Goal-Question-Metric)-Approach

Continuous Improvement



Continuous Improvement



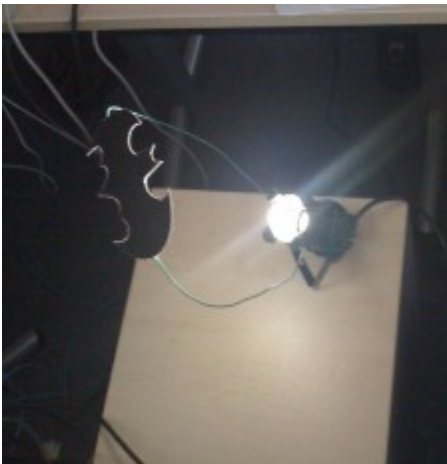
Conclusion

- Advantages of the Measurement Process
 - Changes to the Metrics / Code Quality over time
- Advantages of the Improvement Process
 - Not only selective improvements...
 - ...but preservation through automated Q-Gates
- Combination of agile and (traditional) Metrics
 - Agile Practice Continuous Integration as Base
 - Infrastructur for Continuous Measurement
 - Starting Point for Continuous Improvement

- Challenges
 - Analyzation of Metrics
 - Deduction of Improvement Steps
 - Setting of thresholds
- Further consideration of context
 - Evolution and Maintenance
 - in Agile Processes
 - in Measurement Process
 - New Agile Practices?
 - New Agile Metrics?
 - Adjustment of existing Agile Practices?

Extreme Feedback Device

Shows off if Continuous Integration is broken



Quality-Manager: Batman-Shirt!



Questions/Feedback?

- Contact me
 - Email: mail@jensjaeger.com
 - Blog: jensjaeger.com



- Build our own Batman lamp:
<http://www.jensjaeger.com/2010/04/extreme-feedback-device-the-batman-lamp/>