netcetera

Continuous Delivery

Software-Deployments ohne graue Haare

24. Juni 2013 – Corsin Decurtins

2

deployments
per year

20

deployments
per day

Some numbers…

On the left

Traditional application from something like a bank, an insurance company, a government agency, a transport authority … you name it.

On the right

One of those new fancy social network, Web 2.0-ish application.

Think Facebook, Google Mail, Flickr, Twitter, …

Both are serious applications with serious business value and mission-critical IT systems.

Some numbers…

Both applications need a high up-time.

Deployments to the production environment are risky.

Complex deployments with a lot of dependencies.

Both companies try to reduce the risk of deployments.

Deployments are painful and stressful.

Two completely different approaches

"Banks" try to reduce the risk and effort for deployments by **reducing the number of deployments**.

The "Web 2.0" side tries to reduce the risk of deployments by making **much, much smaller deployments … but a lot of them**.

If it hurts,

do it often.

Our goals

Improve Quality

Fewer errors, less (unexpected) down-time.

Standardization

Different applications should deploy in a similar way.

Make it easier for the operations and the development teams.

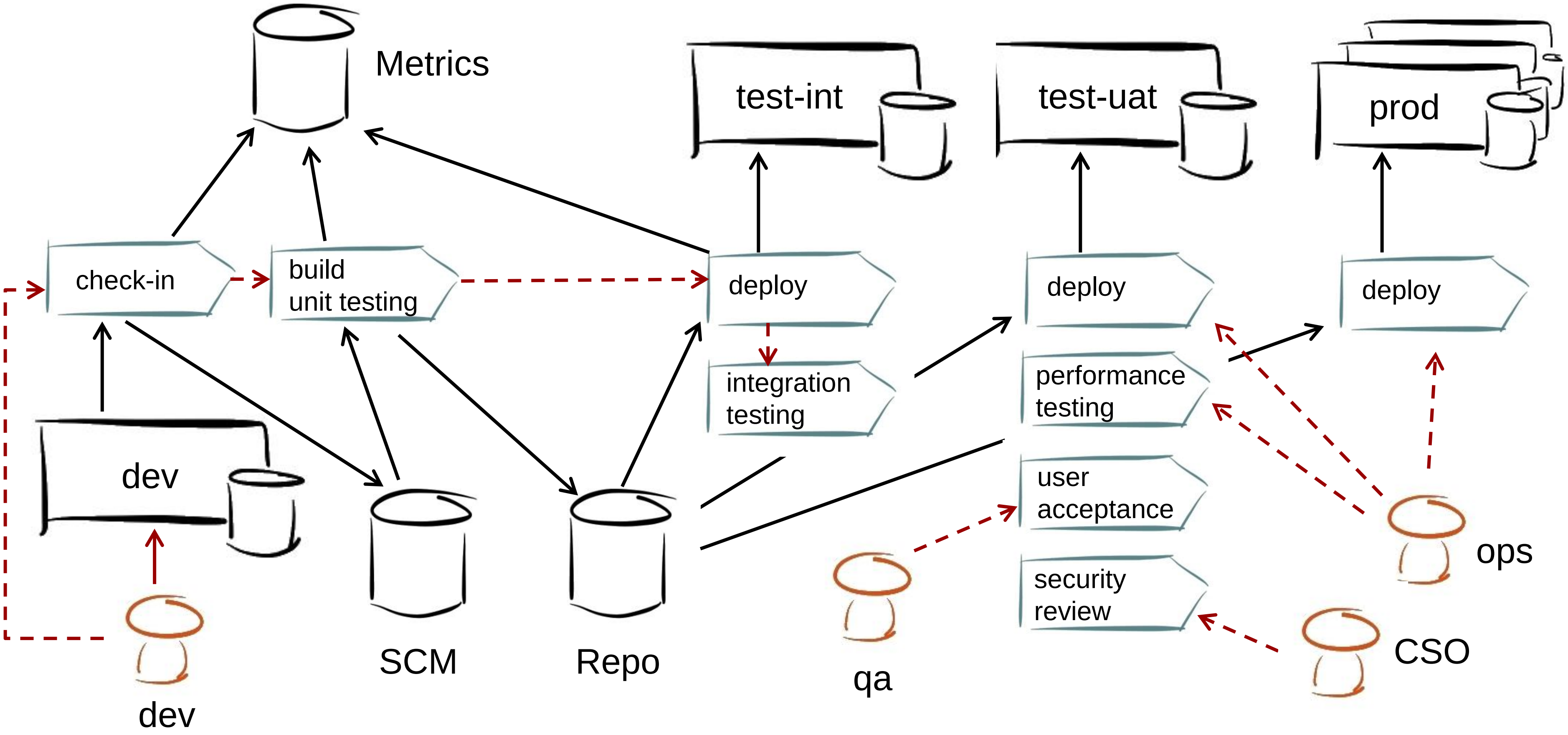
Faster Deployments

Less downtime, smaller need for off-hour deployments.

More Deployments

Faster time-to-market for features and bug fixes.

Less Stress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check-in
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unit testing
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deploy
dev
SCM
Repo
qa
ops
CSO
dev

Software Delivery Pipeline

The Software Delivery Pipeline is the combined set of **processes, procedures and tools** that you use to bring code from the **development environment** into **production**.

Of course you would make the pipeline even wider by including requirements engineering etc. but for the context of this talk, we will start with code.

Software Delivery Pipeline

Builds Propagate through the Pipeline

Successful completion of a step triggers the next steps.

Errors interrupt the Pipeline

In case of an error, the pipeline processing is interrupted.

Expensive steps are only done if the previous steps worked

For example (manual) User Testing is only done on builds that passed the automated tests.

Some Pipeline steps might require manual triggering

Deployment to uat or prod is probably still triggered manually

Software Delivery Pipeline

A few things that you should notice right here:

Everybody has a Software Delivery Pipeline.

- You might not have thought about it yet, it might be automated or manual, very simple or complex, but you have a pipeline.
- Whether you want it or not, whether you manage it or not.

Your pipeline might look differently.

- Depends on the project, the customer, the business domain, the degree of maturity, …

Continuous Delivery

Deliver software changes continuously and in a fully-automated way from the developer to the production environment.

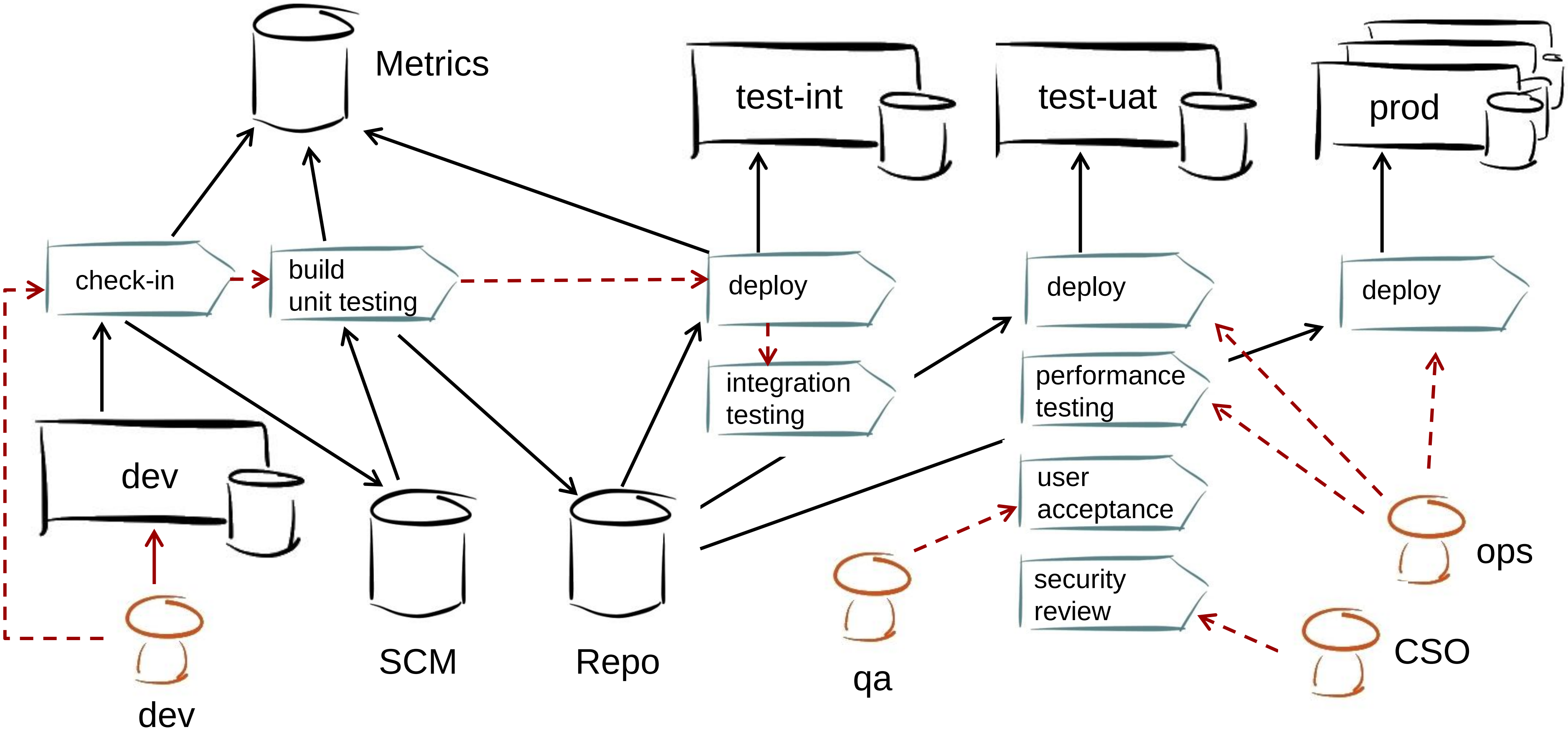
Very small increments

Automation

Fully automated QA

Continuously

Disruption-free deployments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Source Code Management (SCM)

Filesystem

CVS

git

SUBVERSION®

mercurial

PERFORCE

and many more

Source Code Management (SCM)

We are currently moving from Subversion to Git

Git has interesting properties related to Continuous Delivery

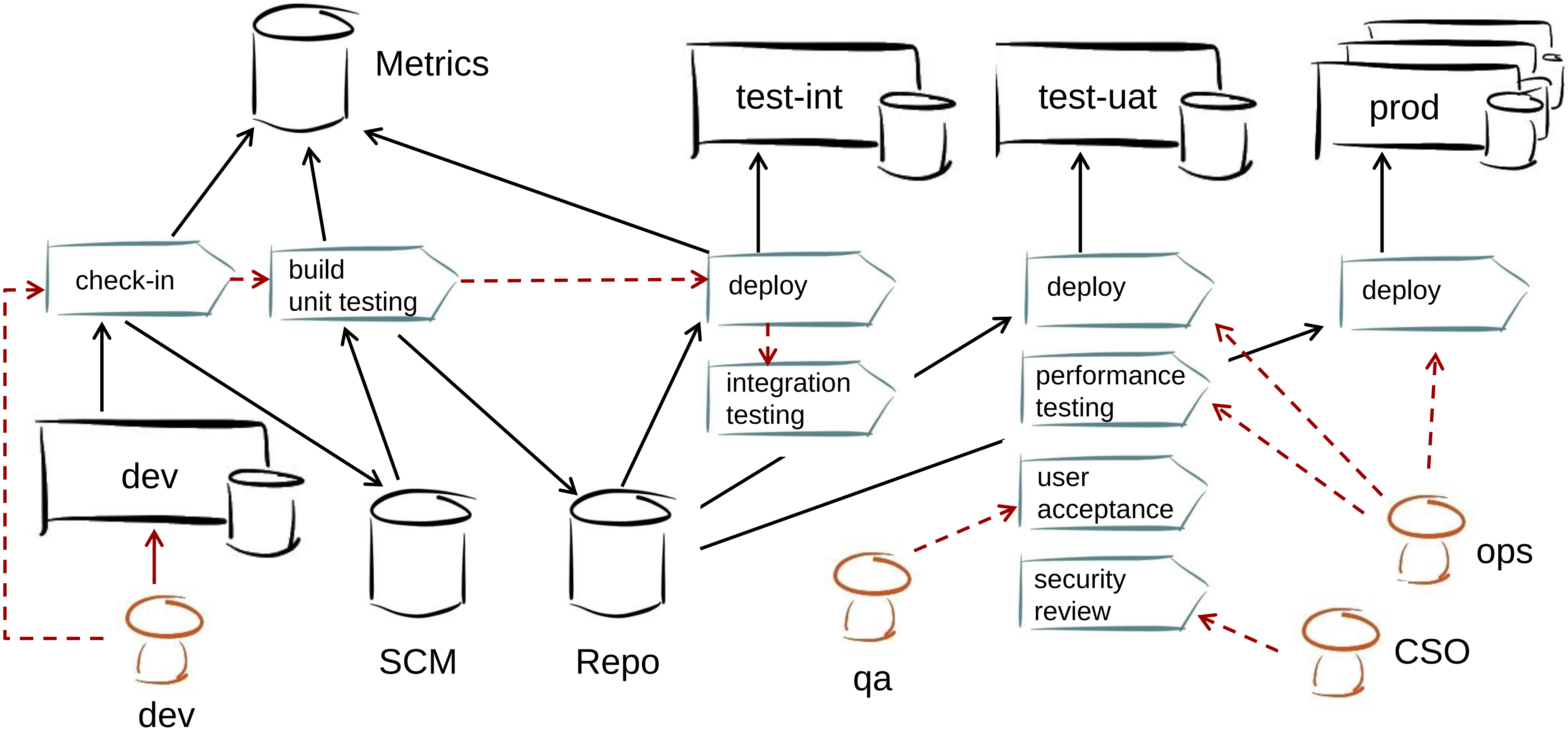
Potentially different software delivery pipelines per branch

Feature branches

- build, run unit tests, deploy to test, run integration tests, …
- but no deployment to QA and prod

Master branch

- full software delivery pipeline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Artifact Repository

Filesystem

maven

Nexus

npm

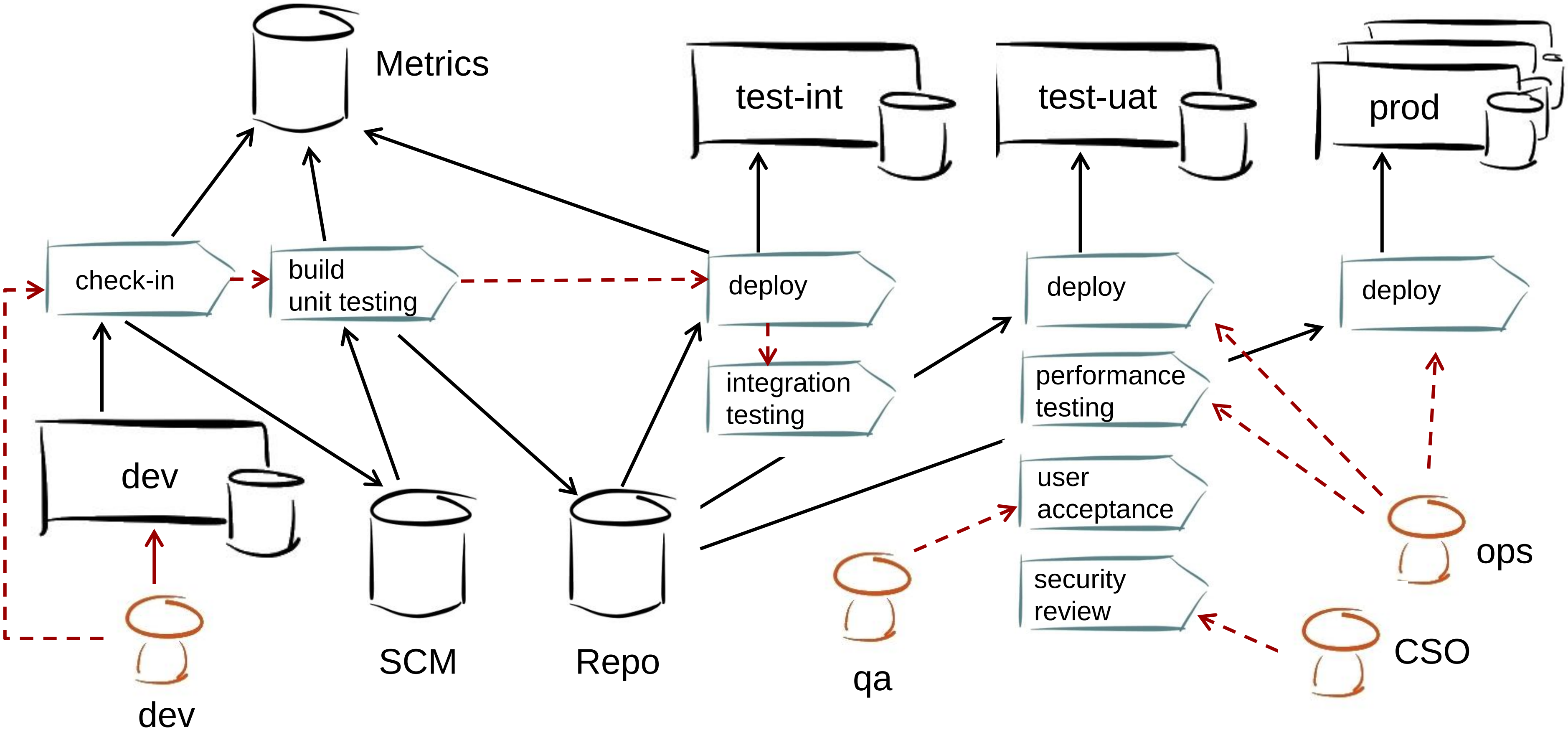
git

and many more

Artifact Repository

Important for the reproducability of builds and releases

We use Nexus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Build Server

and many more

Build Server

We use Jenkins (with some plugins)

Continuous Delivery requires a lot of build server power

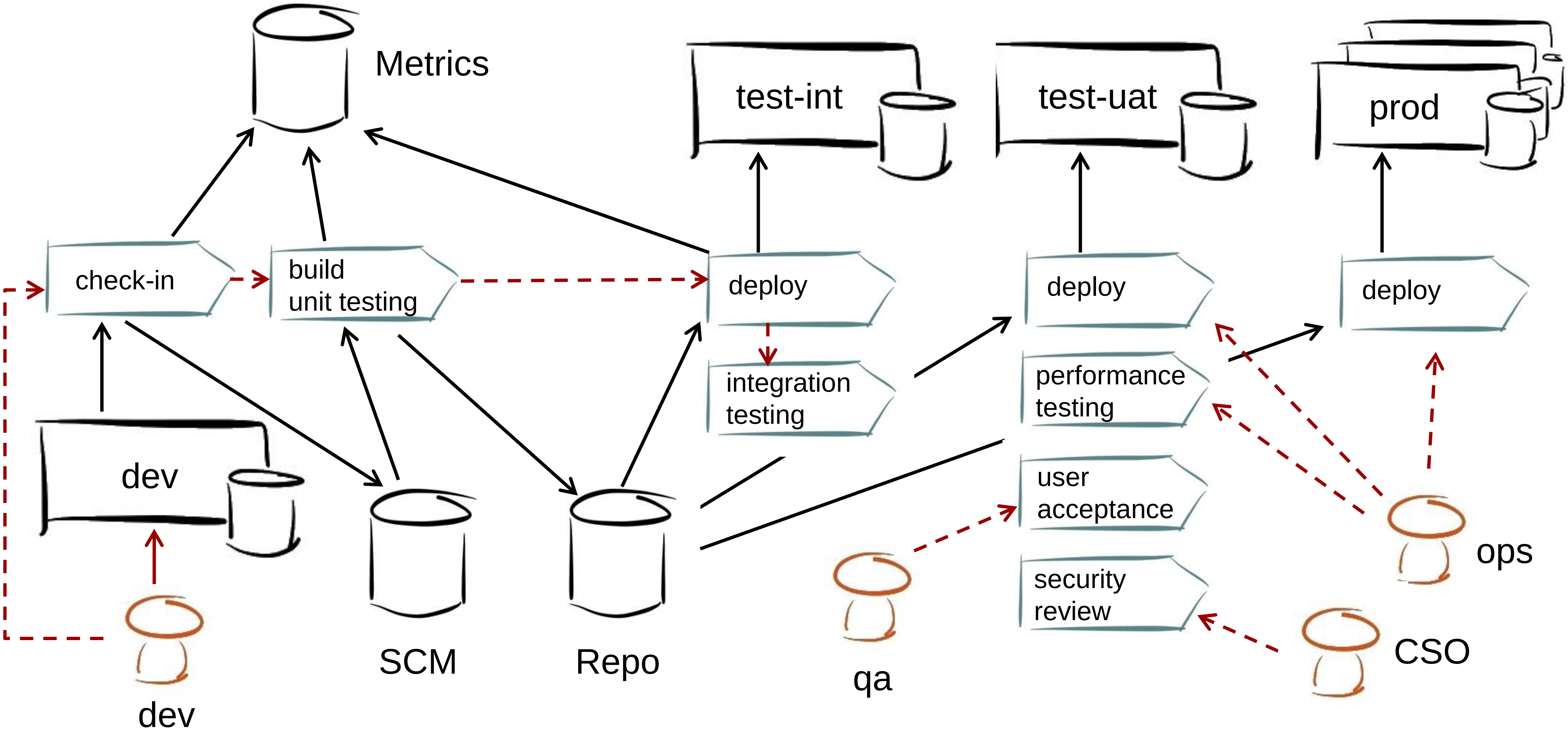
We currently have more than 400 build jobs on our main Jenkins server

1 main server and 6 slaves

Feature builds are yet to come

We (normally) build at most once per hour

Expensive build jobs (UI tests, performance tests) normally run only once per day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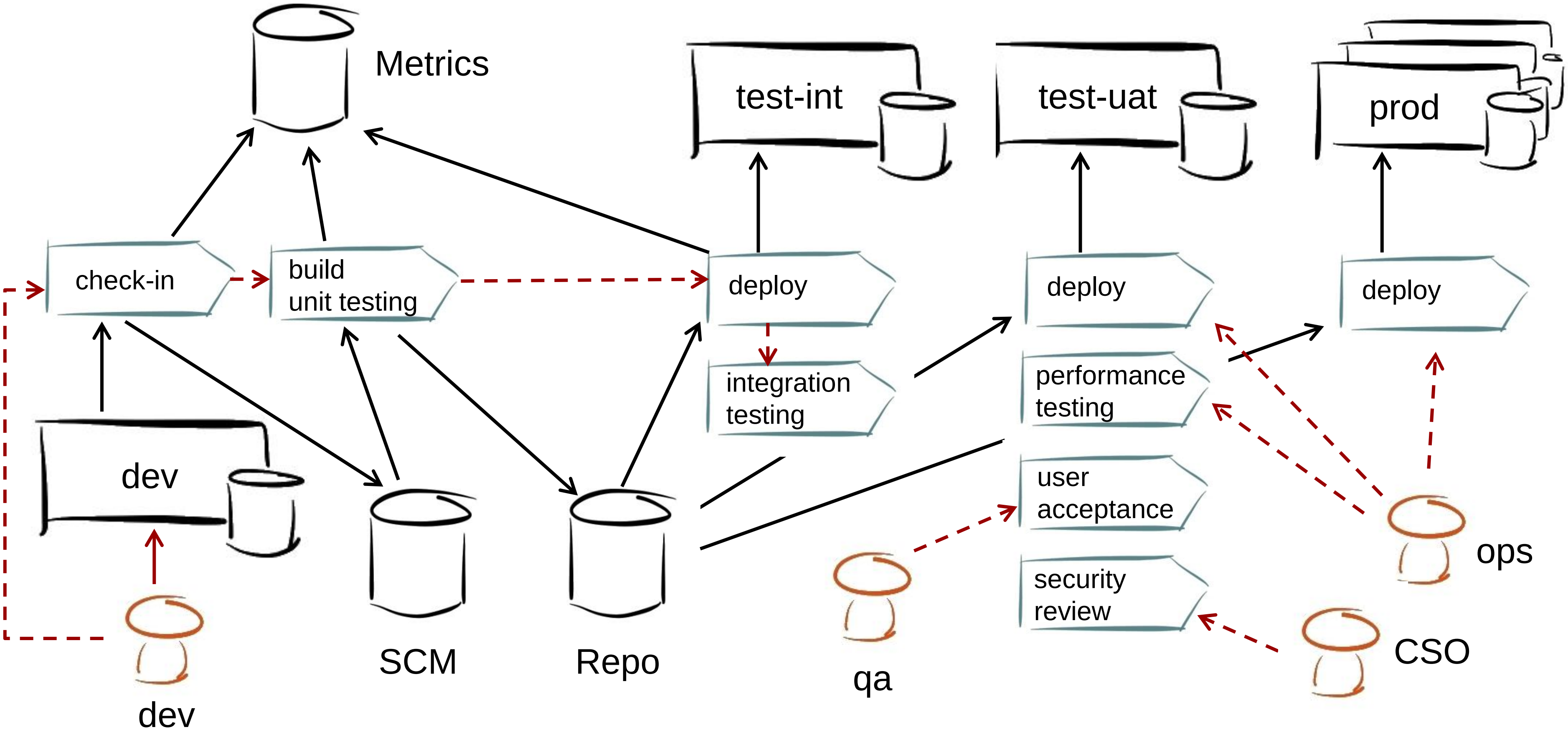
Issue Management

and many more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Metrics / Monitoring

MUNIN

sonarqube

Infostore

Nagios®

and many more

Metrics

Continuous collection of metrics about the code, deployments, performance numbers,…

We use SonarQube for code analysis

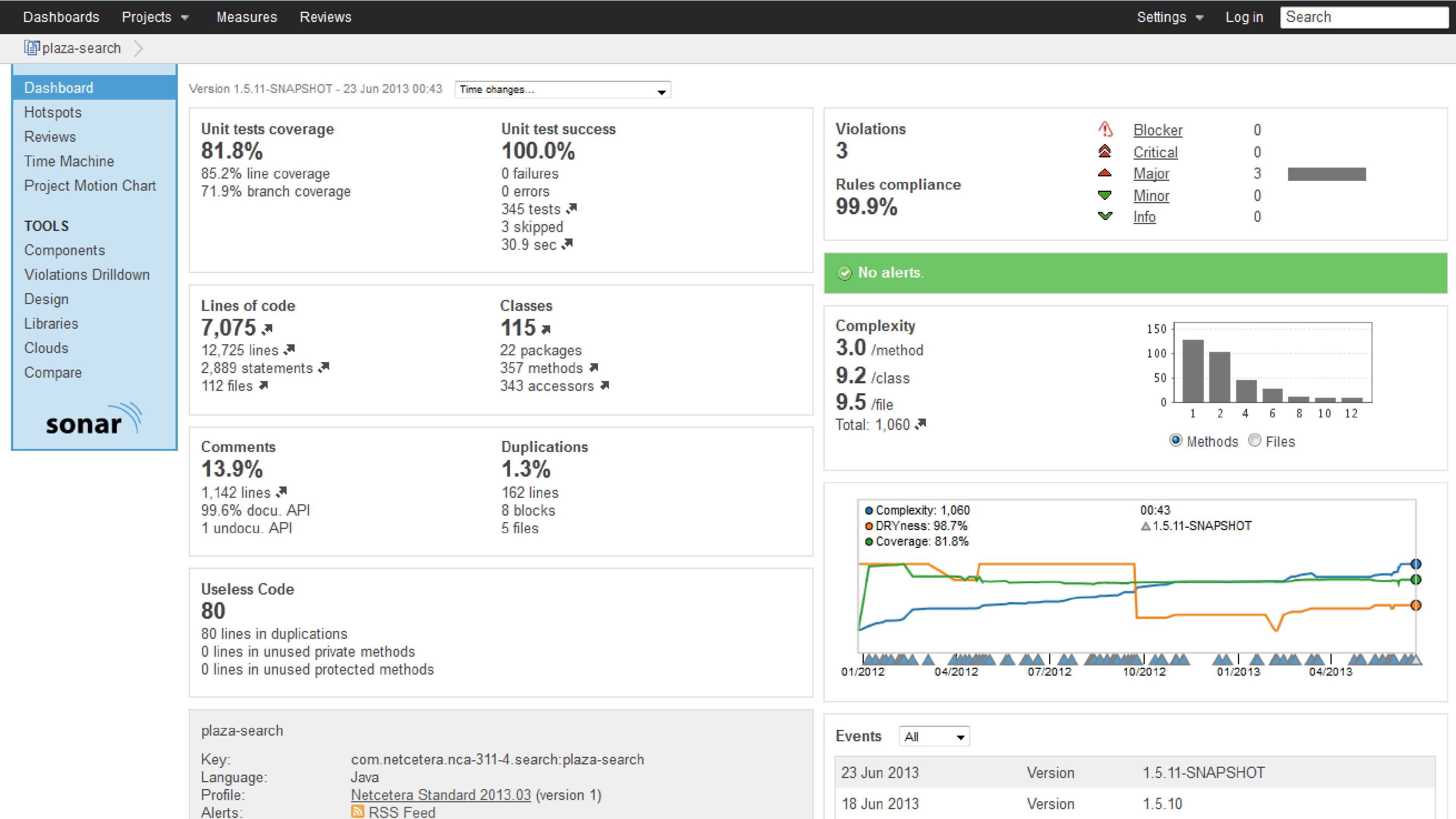
SonarQube rocks!

Summary data from Sonar as well as other metrics are imported into Infostore

Infostore is our company database

Includes information on dependencies

Hopefully soon as continuously measure performance metrics



Version 1.5.11-SNAPSHOT - 23 Jun 2013 00:43

Unit tests coverage
81.8%
85.2% line coverage
71.9% branch coverage

Unit test success
100.0%
0 failures
0 errors
345 tests
3 skipped
30.9 sec

Lines of code
7,075
12,725 lines
2,889 statements
112 files

Classes
115
22 packages
357 methods
343 accessors

Comments
13.9%
1,142 lines
99.6% docu. API
1 undocu. API

Duplications
1.3%
162 lines
8 blocks
5 files

Useless Code
80
80 lines in duplications
0 lines in unused private methods
0 lines in unused protected methods

plaza-search

Key: com.netcetera.nca-311-4.search:plaza-search
Language: Java
Profile: Netcetera Standard 2013.03 (version 1)
Alerts: RSS Feed

Violations
3

Rules compliance
99.9%

Blocker	0
Critical	0
Major	3
Minor	0
Info	0

✓ No alerts.

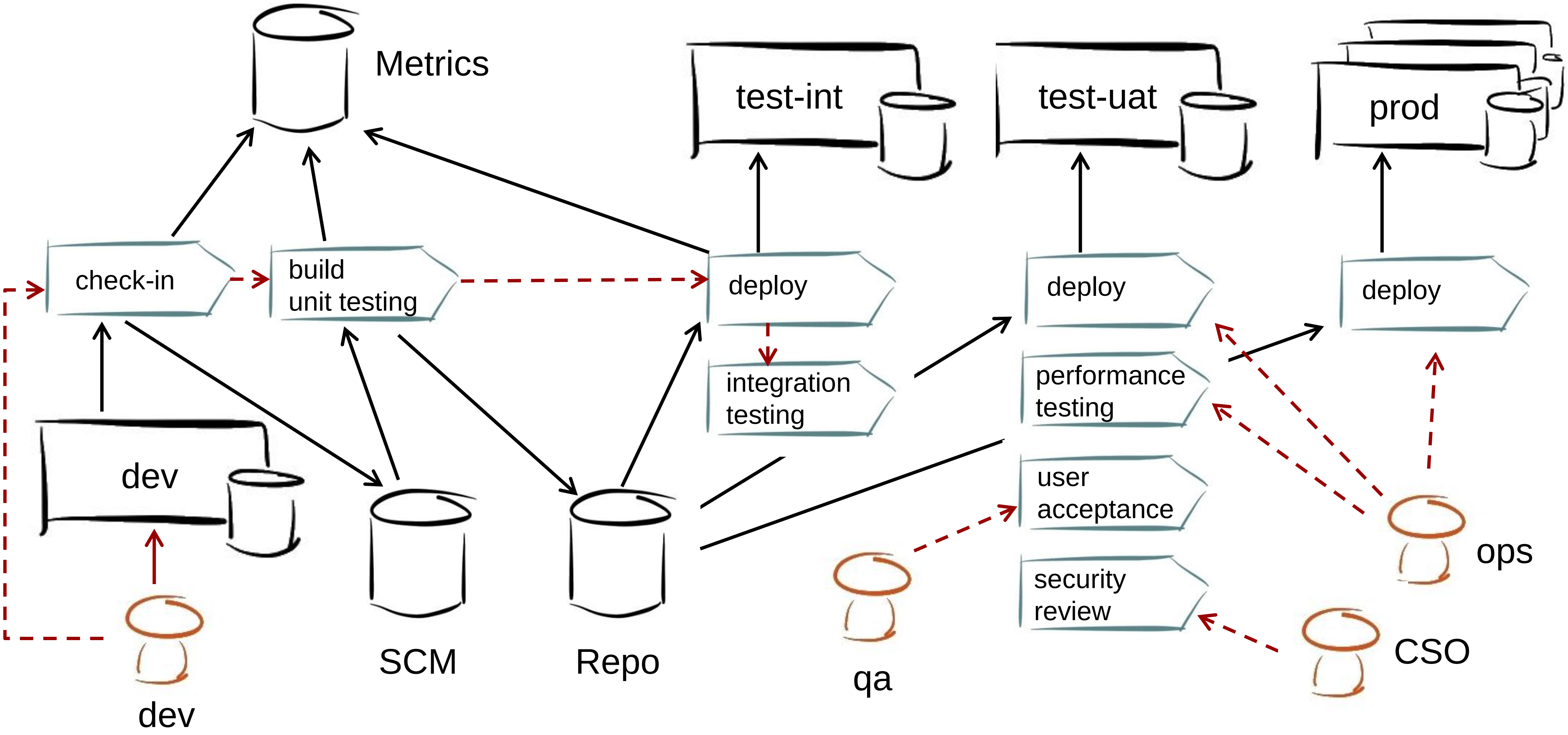
Complexity
3.0 /method
9.2 /class
9.5 /file
Total: 1,060

● Methods ○ Files

● Complexity: 1,060
● DRYness: 98.7%
● Coverage: 81.8%
00:43
△ 1.5.11-SNAPSHOT

Events All

23 Jun 2013	Version	1.5.11-SNAPSHOT
18 Jun 2013	Version	1.5.10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Testing

Se

Apache JMeter™

Jasmine

BDD for JavaScript

Karma

Spectacular Test Runner for JavaScript

JUnit

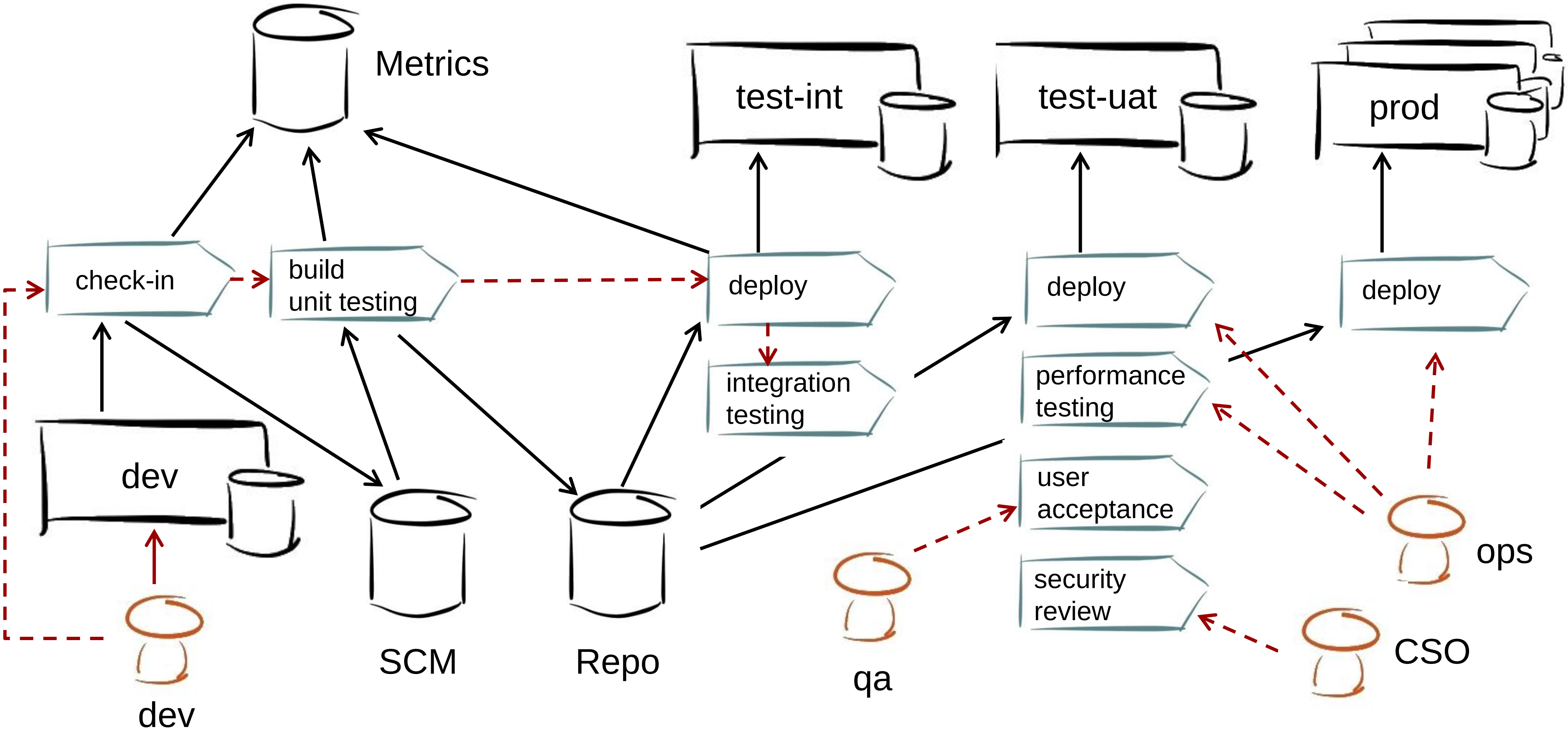
and many more

Testing

Fully automated and continuous testing is crucial

Testing on very different levels and in different places in the software delivery pipeline

Unit testing, integration testing, smoke tests, performance tests, load tests, UI tests, …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Deployment

Installation of a **software release** on a **target environment**

Replacement of existing software releases

Data migration

System reconfiguration

Automation of the Deployment Process

```
$ deploy <application> <version> <environment>
Deployment was successful
```

```
$ deploy <application> <version> <environment>
Deployment failed, rolled back to old version
```

Deployment

LiveRebel

Flyway

glu

Scripts

LIQUIBASE

RUN DECK

puppet labs

Chef

and many more

Deployment Tools (1/2)

We use Puppet for the deployment of infrastructure components

Application servers, web servers, …

Not suited for the application deployments that we do

- Security (push vs. pull)
- Lack of control over the deployment time

For application deployment, we currently use scripts and Rundeck as well as Flyway for database migrations

KISS

We have looked at other tools.

Deployment Tools (2/2)

The kind of deployment tool that you need, depends a bit on your needs.

Scripts/Rundeck: very low level, but simple and effective

LiveRebel: great for disruption-free deployments, but expensive if you do not need this feature

glu (and similar tools): great if you need to deploy an application on a farm of servers (and monitor them)

Puppet/Chef: great if you do not (have to) care about deployment times

Error Handling and Rollbacks

Ability to roll back at any time

- Back up the preexisting state of the system
- Try to make the deployment non-destructive

Detecting errors

- Deployment process has to be able to detect errors

Automated Rollbacks

- Very desirable
- But also very complex
- Has to be tested (continuously)

Manual Rollback

It's just a workaround, but often a viable option

Probability of failing deployments is relatively small

We are testing the deployment continuously after all

Automated deployment process provides operations people with the necessary tools and artifacts to roll back easily

Backups

Non-destructive deployments

Disruption-Free Deployments

Disruption-Free Deployments

If you make very frequent deployments, a downtime is not acceptable anymore.

Different tools, technologies and architectures for doing disruption-free deployments.

Blue/Green Deployments

Two production environments; blue and green.

Green is running as the current production system.

Deploy to blue, test and verify.

Switch from green to blue.

Very elegant solution.

State (database, session) is an issue.

http://martinfowler.com/bliki/BlueGreenDeployment.html

LiveRebel

LiveRebel

Product from ZeroTurnaround

Based on the JRebel technology

Replace running code without the need for restarting

Very cool technology

Commercial product, but worth every penny (if you ask me)

Far too expensive, if you do not really need disruption-free deployments

Tomcat Parallel Deployments

Tomcat Parallel Deployments

Tomcat 7 Parallel Deployments

Different version of a web application can be deployed in parallel

Tomcat routes requests to the different versions:

- If no session information is present in the request, use the latest version.
- If session information is present in the request, check the session manager of each version for a matching session and if one is found, use that version.
- If session information is present in the request but no matching session can be found, use the latest version.

http://tomcat.apache.org/tomcat-7.0-doc/config/context.html#Parallel_deployment

Data Migration

Data migration is a tricky thing

- Slow
- Complex
- Error-prone
- Stop-the-World

Automation and continuous testing helps

More frequent and therefore smaller deployments help

Data Migration Patterns

On-the-fly migration

- Application can deal with multiple versions of the database
- Data migration is done on-the-fly (batch job or touch-and-go)

Read-Only availability

- Database is read-only as long as the migration is on-going

Storage Layer abstraction

- Encapsulation of the storage layer

NoSQL storage layer

- Less stringent requirements on schema compliance

Deployment Testing

Deployment Testing

Deployments are tested continuously

Continuous Testing environment

- Continuously, triggered automatically

Pre-Production environment

- Regularly, triggered manually

"Same" configuration as the production environment

"Same" state as the production environment

Health-Check Pages

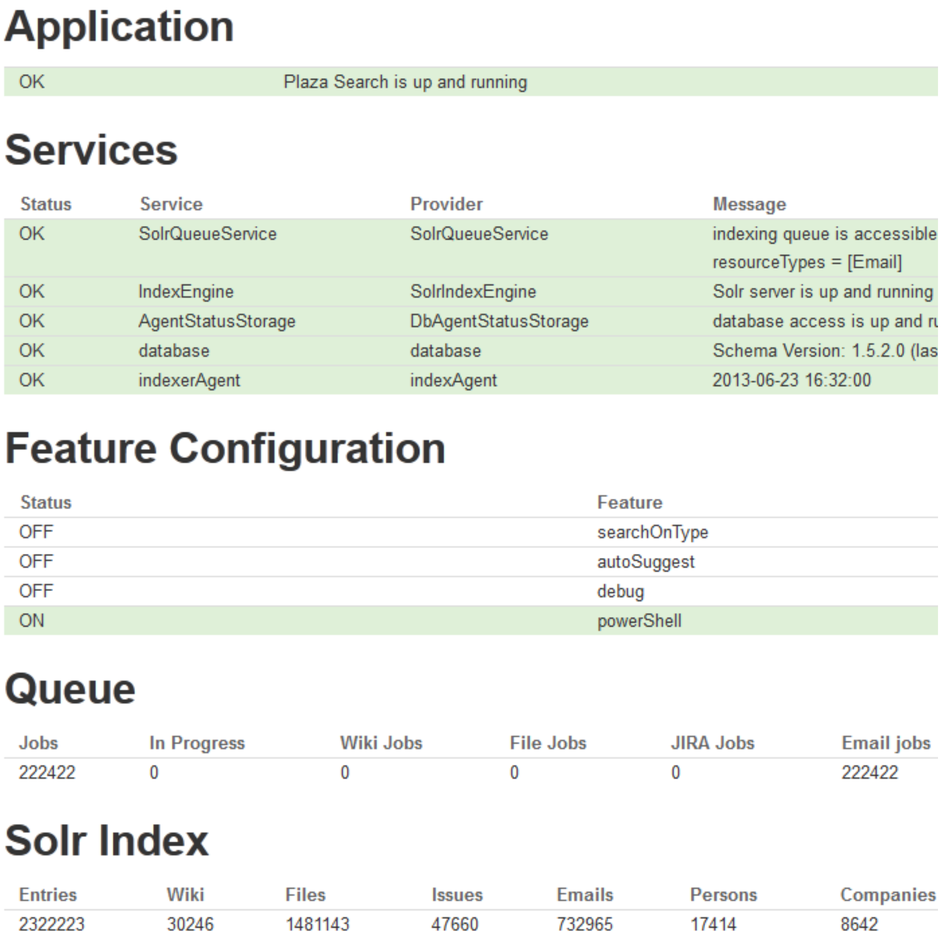
Simple page/resource in the application

Reports the current health status of an application

Basically:

- I'm fine, thanks. Got everything that I need.
- Not doing very well, missing some dependencies. Trying my best.
- I'm giving up. Some crucial dependencies missing. Please help.
- <no answer at all>

Can be used for monitoring purposes, but also for deployment smoke tests.



Application

OK	Plaza Search is up and running

Services

Status	Service	Provider	Message
OK	SolrQueueService	SolrQueueService	indexing queue is accessible resourceTypes = [Email]
OK	IndexEngine	SolrIndexEngine	Solr server is up and running
OK	AgentStatusStorage	DbAgentStatusStorage	database access is up and ru
OK	database	database	Schema Version: 1.5.2.0 (las
OK	indexerAgent	indexAgent	2013-06-23 16:32:00

Feature Configuration

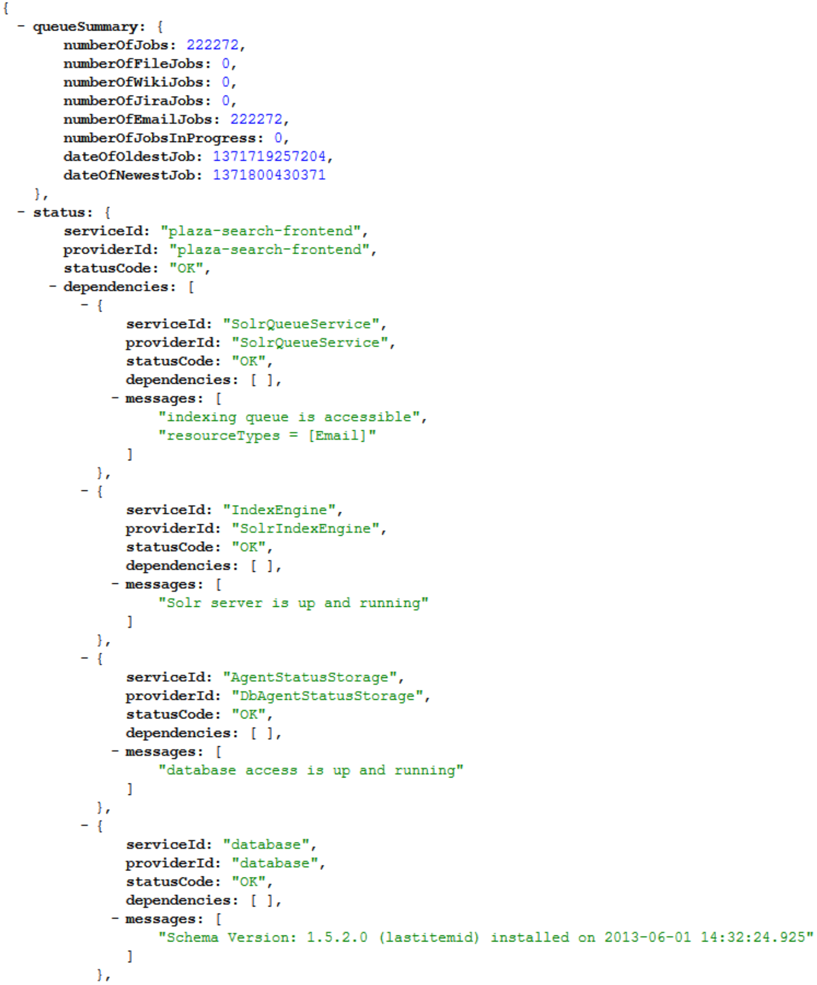
Status	Feature
OFF	searchOnType
OFF	autoSuggest
OFF	debug
ON	powerShell

Queue

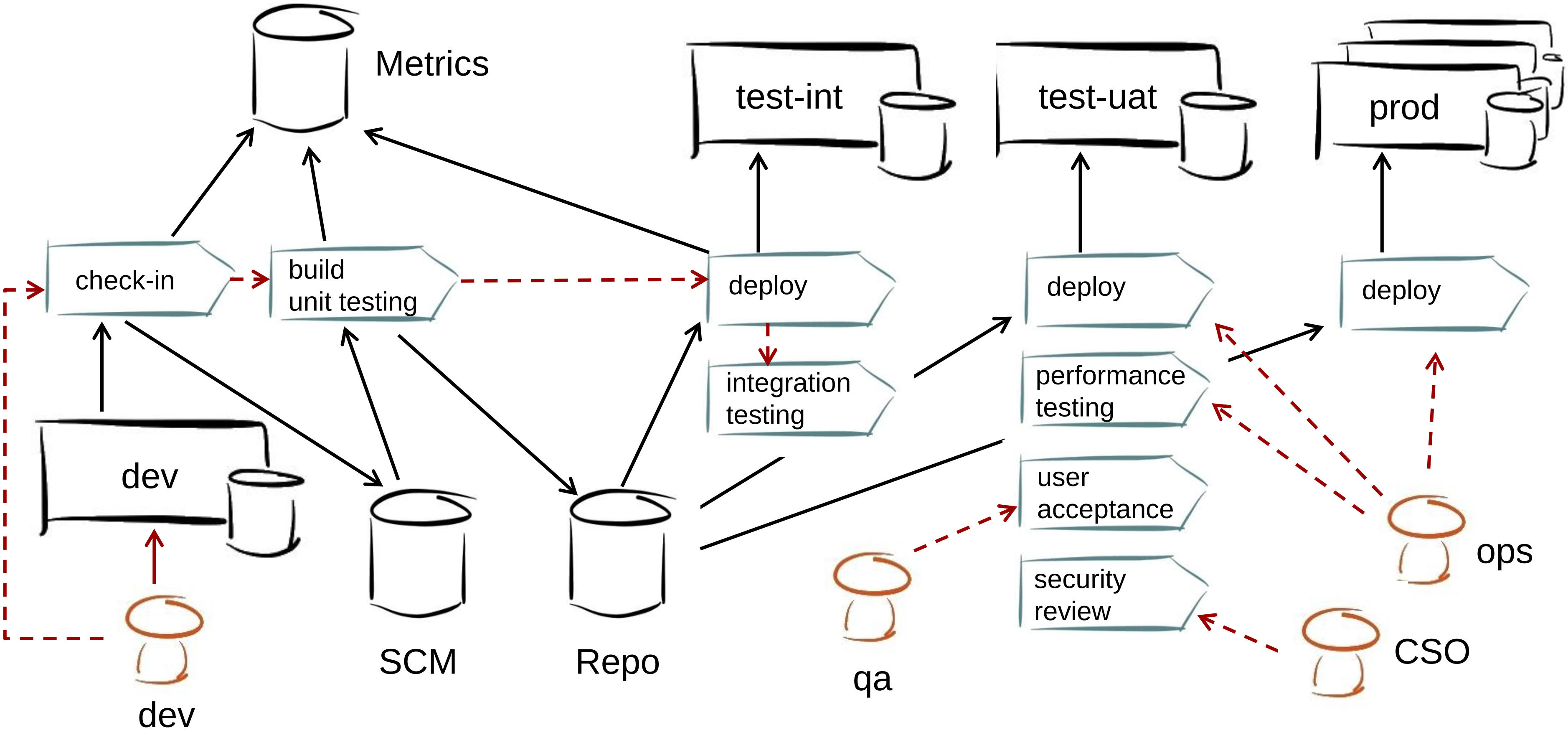
Jobs	In Progress	Wiki Jobs	File Jobs	JIRA Jobs	Email jobs
222422	0	0	0	0	222422

Solr Index

Entries	Wiki	Files	Issues	Emails	Persons	Companies
2322223	30246	1481143	47660	732965	17414	8642



```
{
 - queueSummary: {
       numberOfJobs: 222272,
       numberOfFileJobs: 0,
       numberOfWikiJobs: 0,
       numberOfJiraJobs: 0,
       numberOfEmailJobs: 222272,
       numberOfJobsInProgress: 0,
       dateOfOldestJob: 1371719257204,
       dateOfNewestJob: 1371800430371
   },
 - status: {
       serviceId: "plaza-search-frontend",
       providerId: "plaza-search-frontend",
       statusCode: "OK",
     - dependencies: [
         - {
               serviceId: "SolrQueueService",
               providerId: "SolrQueueService",
               statusCode: "OK",
               dependencies: [ ],
             - messages: [
                   "indexing queue is accessible",
                   "resourceTypes = [Email]"
               ]
           },
         - {
               serviceId: "IndexEngine",
               providerId: "SolrIndexEngine",
               statusCode: "OK",
               dependencies: [ ],
             - messages: [
                   "Solr server is up and running"
               ]
           },
         - {
               serviceId: "AgentStatusStorage",
               providerId: "DbAgentStatusStorage",
               statusCode: "OK",
               dependencies: [ ],
             - messages: [
                   "database access is up and running"
               ]
           },
         - {
               serviceId: "database",
               providerId: "database",
               statusCode: "OK",
               dependencies: [ ],
             - messages: [
                   "Schema Version: 1.5.2.0 (lastitemid) installed on 2013-06-01 14:32:24.925"
               ]
           },
```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How far do you want to go?
How far can you go?

Is the effort worth it?

Is the customer ready?

Is the operations team ready?

Mobile and client applications

Technical limitations

Build and test infrastructure

Production infrastructure

A way towards Continuous Delivery

It's a maturity process

It takes time to get there

Address what is hurting most

Automate further and further

Run continuously

Our Experiences

Increase of quality

Lowering of costs

Developers

Operations

Customers

Reduction of stress

You can do a lot without asking for permission

Continuous Delivery

Software Delivery Pipeline Automation

Continuation of Continuous Integration

Continuous…

… Builds, Integration, Testing

… Deployment, Migration

Deployment Testing

Smaller and faster deployments

Reduction of Deployment Risks

Quality Improvement

Faster Deployments

Down-Time minimalization

Shorter time-to-production

Less stressful deployments

Potential for more frequent deployments

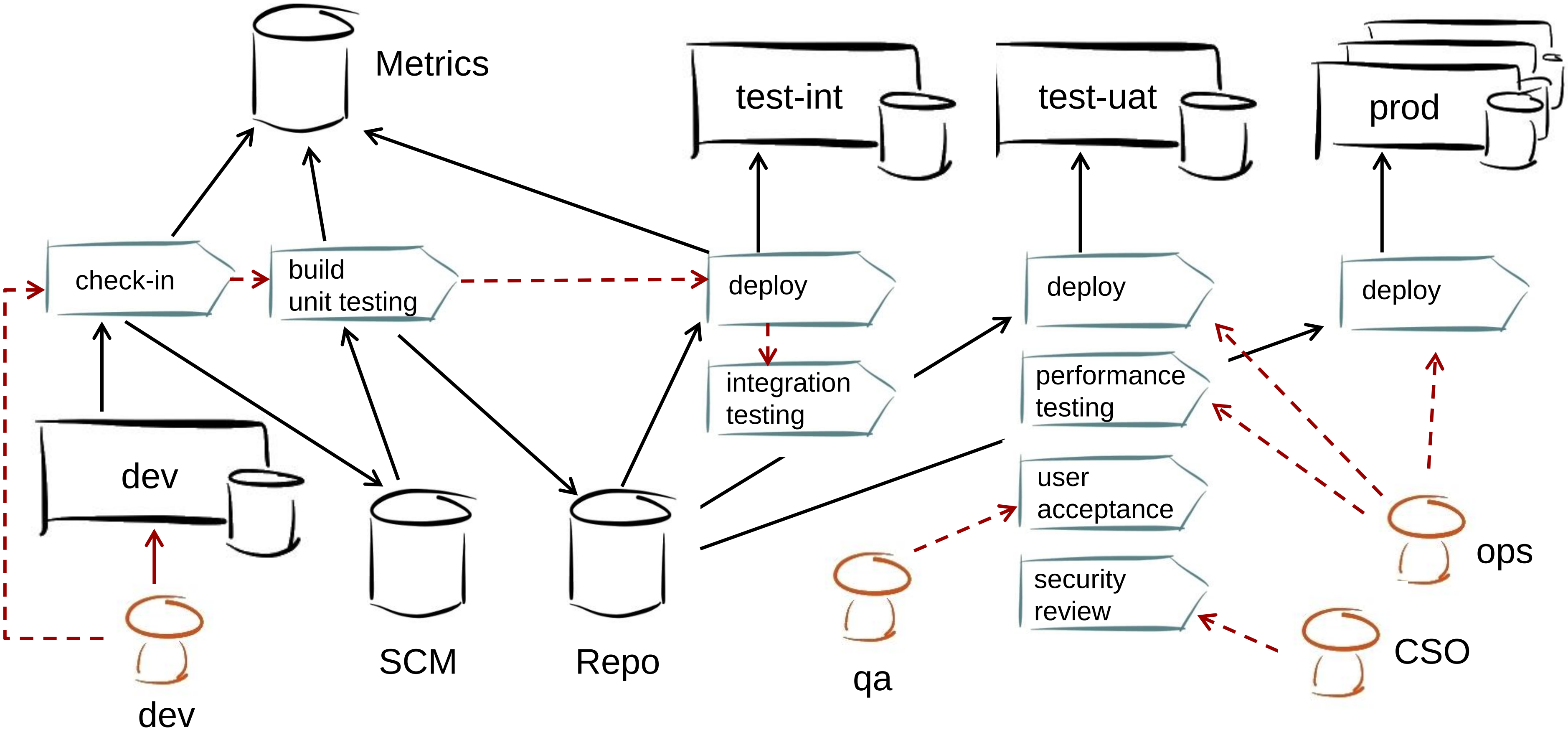
```
> deploy "Continuous Delivery" audience

deployment of Continuous Delivery
was started by user corsin

Continuous Delivery was successfully deployed
to environment audience

log file has been stored to:
http://www.slideshare.net/netceteragroup/


>
```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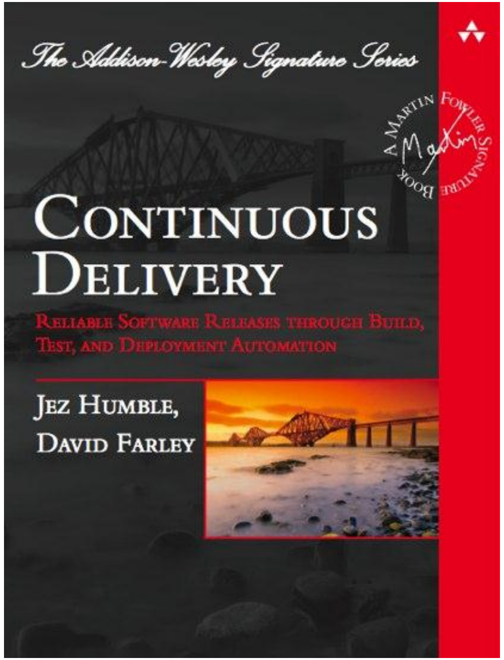
Further Reading


The Addison-Wesley Signature Series
A Martin Fowler Signature Book
Martin
Continuous Delivery
Reliable Software Releases through Build, Test, and Deployment Automation
Jez Humble,
David Farley

Continuous Delivery

Jez Humble, David Farley

Literally the book on "Continuous Delivery".

Further "Reading"

Continuous Delivery (Talk by Jez Humble, DevOps Day 2012)

http://www.infoq.com/presentations/Continuous-Delivery

Interview with Martin Fowler and Jez Humble on Continuous Delivery

http://www.infoq.com/interviews/jez-humble-martin-fowler-cd

Continuous Delivery (Blog by Jez Humble)
http://continuousdelivery.com/

Contact

Corsin Decurtins

corsin.decurtins@netcetera.com

+41 44 247 70 70

@corsin