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Outline

Introduction

 Continuous Integration: Principles and practices identify key concepts of continuous integration reduce risks using continuous integration

Outline

2. Setting up a Continuous Integration system

Build software at every change

Test continuously

Inspect the code continuously

Deploy continuously

Get a continuous feedback

Conclusion

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INTRODUCTION

« It's hard enough for software developers to write code that works on their machine. But even when that's done, there's a long journey from there to software that's producing value - since software only produces value when it's in production. » Martin Fowler

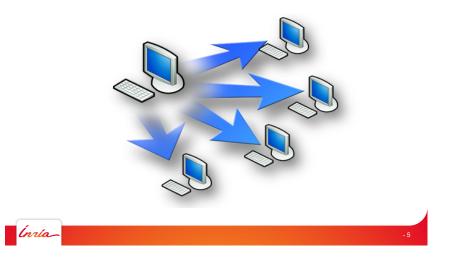
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Deployable software



Reduce time



Increase the code quality





Increasing user requirements



Software development nowadays



Where we want to go





CI is a process

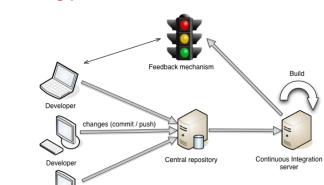


Continuous Integration

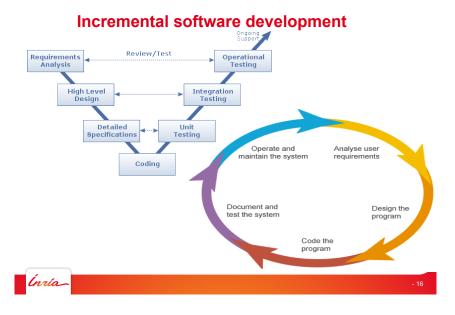
Software development strategy CI is the process of integrating work and appling quality control frequently.







Build



CI big picture

Developer

What is integration?



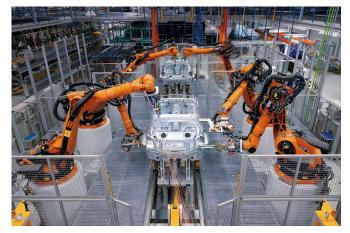
Why is it difficult?



What is a build?



Automation is the key



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Automation is the key



Small increments



Software decomposition

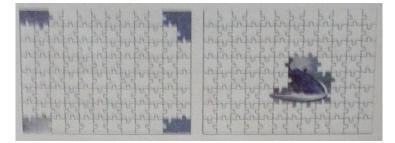
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Software decomposition



Valuable elements first #1



Incremental development: classic and value driven



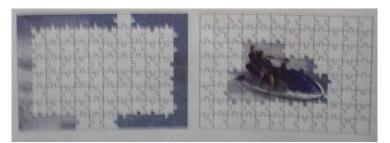
Valuable elements first #2



Incremental development: classic and value driven

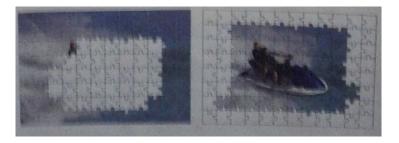


Valuable elements first #3



Incremental development: classic and value driven

Valuable elements first #4



Incremental development: classic and value driven







Commit

CI practices

- 1. Commit often to the central source code repository
- 2. Commit one change at a time (small increments)
- 3. Avoid getting broken code
- 4. Run private builds
- 5. Don't commit broken code
- 6. Fix broken builds immediately
- 7. Write automated developer tests
- 8. All tests and inspections must pass

More time to focus on added value tasks



Exercise

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Are you using a Version Control System (VCS, i.e. svn, git, etc.)? Is your VCS shared by all developers? Is your project's build process fully automated? Is it repeatable? Are you writing tests? Are you running automated tests? Is tests execution part of your build process? How do you check coding / design rules? Do you have an automated feedback? Are you using a dedicated integration machine to build software?



Unusable software in the development stage



Exercise: Reducing risks





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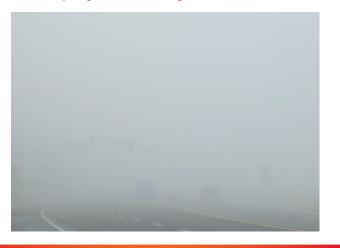
Lack of deployable software



Late discovery of defects



Lack of project visibility



Low quality software



Design / code smells



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2 Implementing Continuous Integration

Implementing Continuous Integration Build software at every change

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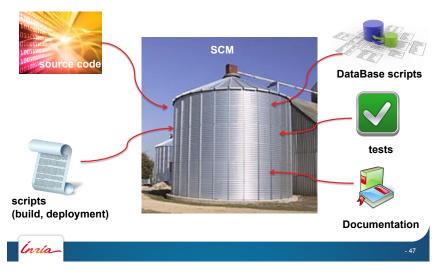
Automate builds



Single command builds

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INFO]	jakubiak-xuggle-xuggler-red5-videotranscoder
INF0]	
INF0]	
INFO]	BUILD SUCCESSFUL
INFO]	Total time: 18 seconds
INFO	Finished at: Wed Feb 11 19:10:26 CET 2009
	Final Memory: 54M/400M
INFO]	
ntekû	<pre>iakubiak-01 /cvodrive/c/xuoole/jakubiak-red5/jakubiak-xuoole-pom</pre>

Centralize software assets



Project layout



Fail build fast



Build for any environment



Manage your environment

Store configuration with source code test data, database scripts, build script, deployment script

Third-party libraries

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use a dependency manager (ex: maven) or store them into the version control system

Dedicated integration build machine





Use a CI server



Using a CI server

- Long-running process which can execute a simple workflow at regular intervals
- View of the results of the processes, notifications, access to outputs
- Manage build distribution across a grid
- Integration with a lot of tools

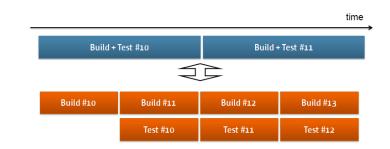
Unique opportunity to get all steps (installation, configuration) needed to have a running application.



Keep your build fast!

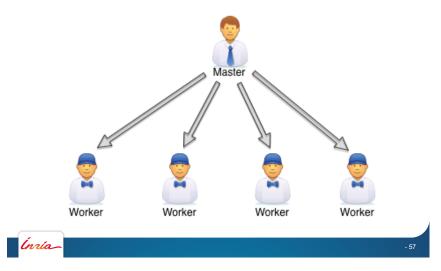


Staged builds



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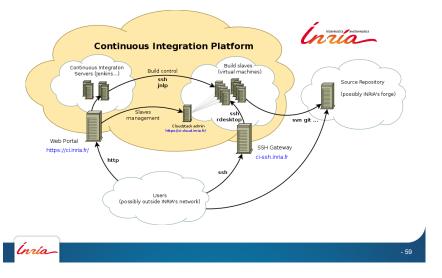
Distributed builds



Jenkins dashboard

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Inria CI platform https://ci.inria.fr



B Implementing Continuous Integration Test continuously

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Test continuously

"Our acceptance tests validate that we built the right thing, while our unit and functional tests verify that we built the thing right."

Confidence



Unit testing

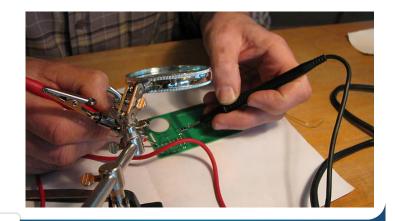
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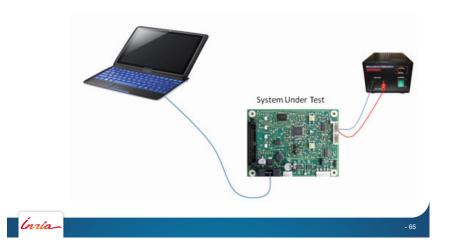
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<pre>public class TestAdder {</pre>
<pre>public void testSum() {</pre>
Adder adder = new AdderImpl();
<pre>// can it add positive numbers?</pre>
<pre>assert(adder.add(1, 1) == 2);</pre>
<pre>assert(adder.add(1, 2) == 3);</pre>
<pre>assert(adder.add(2, 2) == 4);</pre>
<pre>// is zero neutral?</pre>
<pre>assert(adder.add(0, 0) == 0);</pre>
<pre>// can it add negative numbers?</pre>
assert(adder.add(-1, -2) == -3);
<pre>// can it add a positive and a negative?</pre>
<pre>assert(adder.add(-1, 1) == 0);</pre>
<pre>// how about larger numbers?</pre>
<pre>assert(adder.add(1234, 988) == 2222);</pre>
1

Component testing



System testing



Functional testing



Test doubles

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Dummy objects Fake objects Stubs Mocks

Test doubles > Fake objects

class MemberDAO {
 private Connection connection;
 public Member find(String id) {
 return connection.createQuery("..").findOne();
 }
}

class FakeMemberDAO {
 private Map<Long, Member> members;

```
public Member find(String id) {
  return this.members.get(id);
}
```

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Test doubles > Stubs

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public interface MailService {
 public void send (Message msg);
}



Test doubles > Stubs

public void testMemberMailSentWhenSubscribed() {
 // Création d'un membre
 Member member = new Member("login", "password");

// On insère le stub à la place du mailer par défaut MyApp.setMailer(new MailServiceStub());

// On enregistre le membre MyApp.register(member);

// Un mail doit être envoyé
assertEquals(1, mailer.numberSent());





Test doubles > Mocks

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public void testFillingDoesNotRemoveIfNotEnoughInStock() {
 Order order = new Order(TALISKER, 51);
 Mock warehouse = mock(Warehouse.class);

warehouse.expects(once()).method("hasInventory")
.withAnyArguments()
.will(returnValue(false));

order.fill((Warehouse) warehouse.proxy());

assertFalse(order.isFilled());



CI and tests

Automate tests

Categorize tests to be able to run slower tests at different intervals than faster tests. Write tests for defects : regression tests to ensure that the defect will not surface again. Use a bug tracker.

Run faster tests first

Make component tests repeatable : ensure that the data is in a "known state" (ex;: use a database test framework)

Limit the number of asserts in a test case to spend less time tracking down the cause of a test failure.

Implementing Continuous Integration Inspect the code continuously

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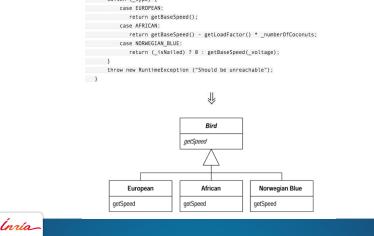
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Reduce code complexity

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Reduce code complexity > cyclomatic complexity double getSpeed() { switch (_type) { case EUROPEAN:



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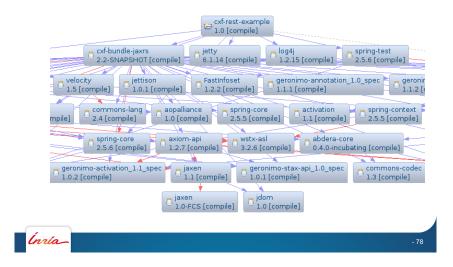
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Complexité

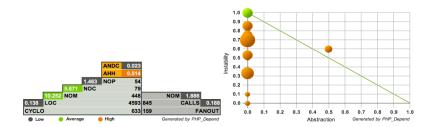
Perform design reviews

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Perform design reviews

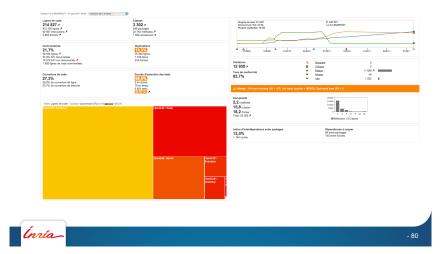


Maintain organizational standards with code audit

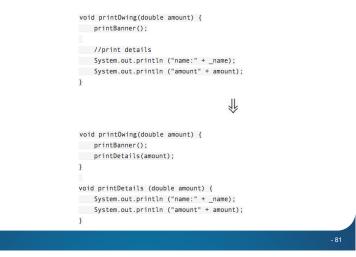


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Maintain organizational standards with code audit



Reduce duplicate code > Extract method pattern



Assess Code coverage

Overview Changes (1) Tests Build Log Build Param	aters Depend	encies Artifacts	Code Coverage
NCoverExplorer Coverage Report - Darjeeling :: vs-pl Report generated on: Tho 18-Feb-2010 at 19:08:54 NoveeExplorer version: 1.3.6.36 Filtering / Sorting: None / CoveragePercentageDescending	ugin v4 (NCov	er) Project St	atistics: Files: 607 NCLOC:16797 Classes: 869 Functions: 3901 Unvisited: 2470 Seq Pts:15490 Unvisited:10201
Project	Acceptable	Unvisited Function:	s Function Coverage
Darjeeling :: vs-plugin v4 (NCover)	80.0 %	2470	36.7 %
Hodules	Acceptable		s Function Coverage
JetBrains.TeamCity.EventTrackers.dll	80.0 %	10	84.6 %
JetBrains.TeamCity.WebLinkListener.dll	80.0 %	11	76.6 %
JetBrains.TeamCity.Network.Login.dll	80.0 %	35	61.1 %
JetBrains.TeamCity.Common.dll	80.0 %	2	60.0 %
JetBrains.TeamCity.Connect.dll	80.0 %	214	51.6 %
JetBrains.TeamCity.SVN.dll	80.0 %	215	59.6 %
JetBrains.TeamCity.Perforce.dll	80.0 %	151	64.0 %
JetBrains.TeamCity.Network.Utils.dll	80.0 %	12	52.0 %
JetBrains.TeamCity.Utils.dll	80.0 %	533	33.2 %
JetBrains.TeamCity.TestsView.dll	80.0 %	142	16.5 %
JetBrains.TeamCity.Login.dll	80.0 %	35	16.7 %
JetBrains.TeamCity.RemoteRun.dll	80.0 %	797	15.3 %
JetBrains.TeamCity.Package.dll	80.0 %	313	3.4 %
Module	Acceptable		s Function Coverage
JetBrains.TeamCity.EventTrackers.dll Namespace / Classes	80.0 %	10	84.6 %
JetBrains.TeamCity.EventTrackers.Impl		9	85.5 %
PersonalChangesTrackerBase		0	100.0 %
ListenerInfo		0	100.0 %
To an Association Thread		0	100.0 %
		<u>^</u>	100.0 //



Communication !

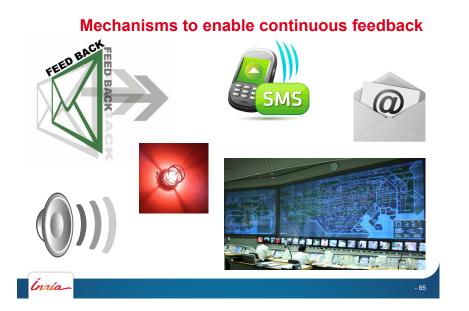
"As a general rule, the most successful man in life is the man who has the best information."

Benjamin Disraeli (1804-1881)

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Continuous deployment

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Continuous deployment





Continuous deployment

- 1. Tag releases put inti production
- 2. Produce a clean environment,
 - free of assumptions

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- 3. Generate and label builds
- 4. Successfully run tests at all levels in a clone of the production environment
- 5. Create build feedback reports
- 6. Be able to rollback quickly if needed

Always run tests locally before committing





Don't check in on a broken build



Time-box fixing before reverting



Never go home on a broken build



Don't comment out failing tests

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Test Driven Development



ALL CODE IS GUILTY UNTIL PROVEN INNOCENT

CODESMACK



Some suggested practices

eXtreme Programming development practices (refactoring)



Failing a build

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- for slow tests,
- for warnings,
- for code style breaches





Some suggested practices



Get the latest version here !

What you should keep in mind



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Automation is the key



You need tests !



Team adherence, discipline



Agreement of the team

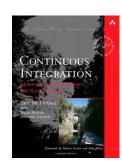
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> Highest priority : Fix changes that breaks the application



References

Continuous Integration article by Martin Fowler http://martinfowler.com/articles/ continuousIntegration.html



Continuous Integration softwares (non exhaustive list) :

- Jenkins http://jenkins-ci.org/
- Bamboo http://www.atlassian.com/software/bamboo/overview
- Travis http://about.travis-ci.org/
- Hydra http://nixos.org/hydra/

Wikipedia

http://sourcemaking.com



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Thank you!

