

Continuous Integration

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Overview

- Why integration?
- What is Continuous Integration (CI)?
- Continuous Integration process
- CI infrastructure
- CI tools

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Integration

- Integration occurs when changes are merged with the source code repository

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Broken Integration

- You have a broken integration when:
 - Source code server does not build successfully
 - Shared component works in one system, but breaks others
 - Unit tests fail
 - Code quality fails (coding conventions, quality metrics)
 - Deployment fails

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Manual Integration

- Integration becomes expensive
 - if made manual (build, test, deployment, ...)
 - with too few checkin's (hours or days...)
 - if integration problems and bugs are detected too late
- Reduces desire to refactor
 - long time between integration increases risk of merge

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What is Continuous Integration?

- *“Continuous Integration is a software development practice where members of a team integrate their work frequently, usually each person integrates at least daily - leading to multiple integrations per day. Each integration is verified by an automated build (including test) to detect integration errors as quickly as possible.”*

<http://martinfowler.com/articles/continuousIntegration.html>

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Why continuous integration ?

- Maintain a code repository
- Automate the build
- Make the build self-testing
- Everyone commits to the baseline every day
- Every commit (to baseline) should be built
- Keep the build fast

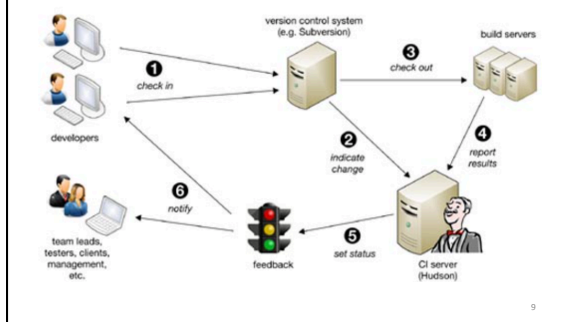
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Why continuous integration ? (cont'd)

- Test in a clone of the production environment
- Make it easy to get the latest deliverables
- Everyone can see the results of the latest build
- Automate deployment

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CI Workflow



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Realizing Continuous Integration

- Monitor a VCS repository for changes
 - If changes are found, then start the build
- Build your application
 - through your existing Ant or Maven scripts
- Run your xUnit Test suite
- Run code audit tools
 - Checkstyle, code coverage, ...

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Realizing Continuous Integration (cont'd)

- Report on the build results
 - Send formatted email notifications
 - Publish results to a website
- (Optionally) Publish the application
- Configuration is through a central XML file

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The Agile Process

- Continuous Integration is only one aspect of an overall process. For it to work best, you need to
 - Plan iteratively
 - Schedule regular releases with evolving levels of functionality
 - Implement incrementally
 - Identify and implement small work tasks
 - refactor if necessary

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The Agile Process (cont'd)

- Report proactively
 - Identify exactly the contents (CIs) of any build, in both file and content
 - Automate reports!

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CI Benefits

- Reduced Risks
 - Always aware of current status of the project
 - Less time spent investigating integration bugs
 - Integrating testing performed early
 - Integration bugs caught early
 - Less time wasted because of broken code in VCS
 - Broken builds caught early

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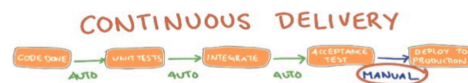
CI Benefits (cont'd)

- Prove your system can build!
- Increase code quality with additional tasks

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Continuous Delivery

- Continuous Delivery is the ability to get changes of all types—including new features, configuration changes, bug fixes and experiments—into production, or into the hands of users, *safely* and *quickly* in a *sustainable* way.



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Continuous Deployment

- The next step of continuous delivery: Every change that passes the automated tests is deployed to production automatically. Continuous deployment should be the goal of most companies that are not constrained by regulatory or other requirements.



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CI Obstacles [2]

- 1. Individuals may see CI counterproductive
 - Product managers want to launch new features
 - Project managers want the team to meet the deadline
 - Programmers want to fix the bug they are working on
 - It seems that keeping the build is an extra burden on people
 - Solution: team leaders help employees understand the costs and benefits of CI

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- 2. Tough to integrate CI into an existing development flow

- Solution

- Give enough time for people to develop their new workflow
- Ensure them that the company has their backs even if things might not go very smoothly at the beginning

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- 3. Requiring developers of writing more test cases

- Solution

- Emphasize that writing test cases from early on could save a lot of time for your team and ensure high test coverage of your product
- Embed the idea in the company culture that test cases are as valuable assets as the codebase itself.

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- 4. Developers ignoring error messages

- Developers ignore or mute the overwhelming amount of CI notifications, and may miss the updates that are relevant to them

- Solution

- Only send critical updates
- Only send the notification to developers who are in charge of fixing it

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- 5. Creating Fear-Driven Development

- Being afraid of breaking the build or not passing tests could build up pressure and fear in individuals.

- Solution

- Make team members consider failed test as positive results, the earlier their tests fail the earlier they can resolve problems.

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Reference

[1] Martin Kropp, Continuous Integration, <https://web.fhnw.ch/plattformen/swc/Literature/10-continuousintegration.pdf>.

Last visited: 1/18

[2] 5 Challenges That Can Break Your Continuous Integration Efforts, <https://medium.com/flow-ci/5-challenges-that-can-break-your-continuous-integration-efforts-94aded600b3d>. Last visited: 1/18

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