Continues Integration (SB5-MAI)

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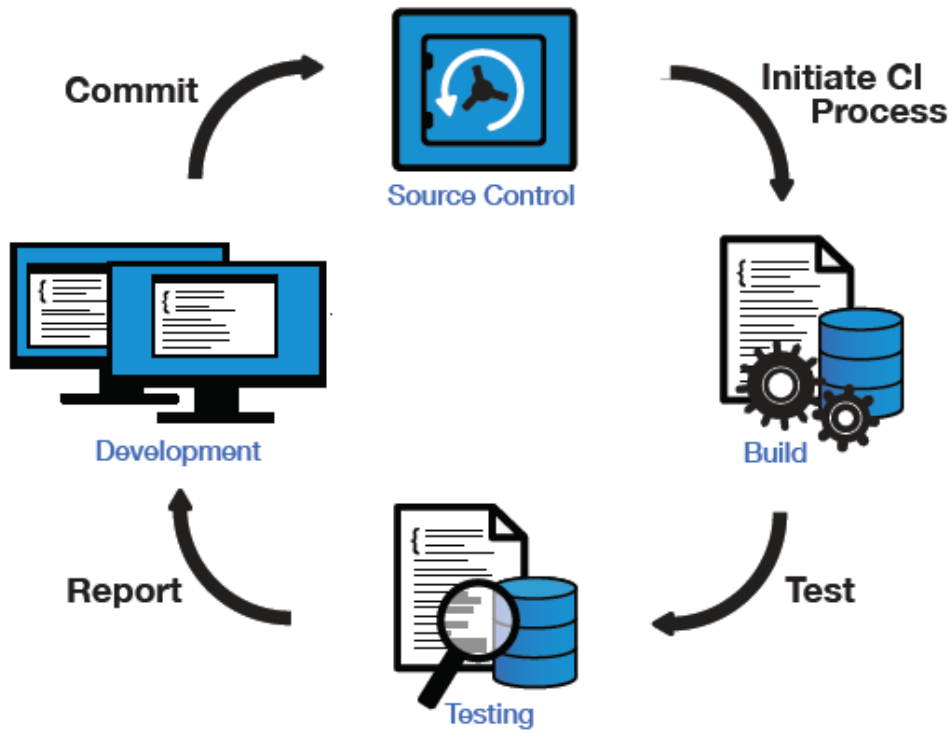
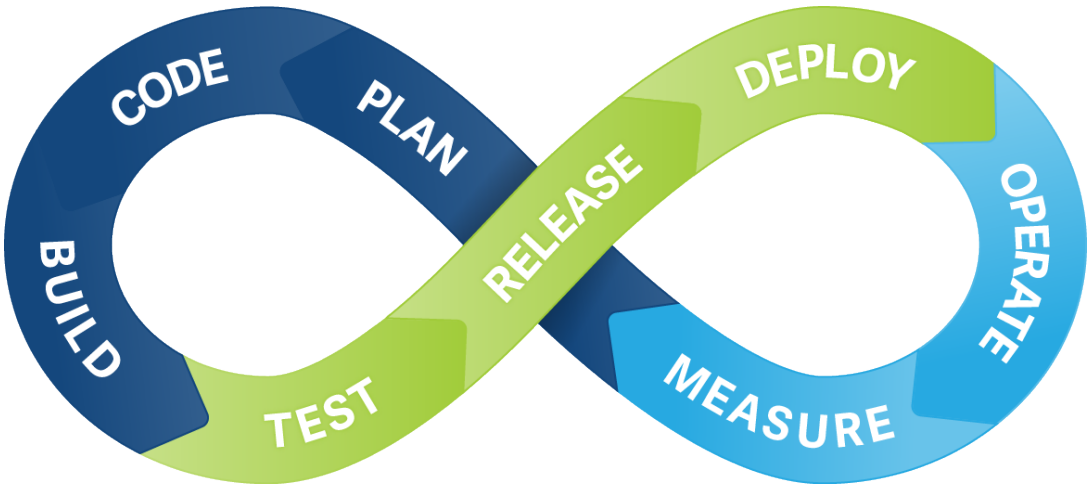
Continuous Integration

- Continuous Update for the whole software process
- Teams integrate their work multiple times per day
- Each integration is verified by an automated build
- Significantly reduces integration problems
- Develop cohesive software more rapidly



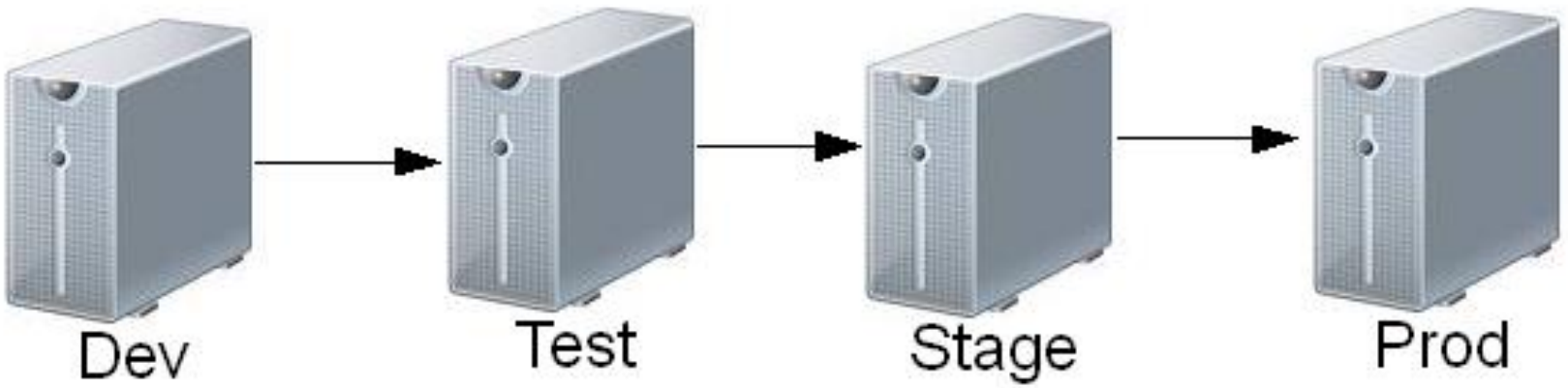
Five Principles of Continuous Integration



- Environments based on stability
- Maintain a code repository
- Commit frequently and build every commit
- Make the build self-testing

Continuous Integration

- Create server environments to model code stability
- Promote code to stricter environments as quality improves



Commit Frequently Build Every Commit

- Change your habits
  - Commit small, functional changes
  - Unit tests!
  - Team owns the code, not the individual

The code builds on my box…

- Source code repository is the source of record
- Build server settles disputes
  - Only gets code from Repo
- Build server the final authority on stability/quality

Build every commit

- Why compile frequently?
- Agile principles
  - If it hurts, do it more often
  - Difficult activities can be made more straightforward by doing them more frequently
  - Reduce time between defect introduction and removal
- Automate the build

Add testing to build

- Individual programmers $< 50\%$ efficient at finding their own bugs
- Multiple quality methods lead to more defects discovered
  - Use 3 or more methods for $> 90\%$ defect removal
- Most effective methods
  - Design inspections
  - Code inspections
  - Testing

Self Testing Builds

- System Tests
  - End-to-end test
  - Often take minutes to hours to run
- Unit tests
  - **Fast:** No database or file system
  - **Focused:** Pinpoint problems
  - Best method for verifying builds

Automated Quality with Continuous Integration

- Static code analysis
  - Looks for common java bugs (Findbugs, PMD)
  - Check for code compliance (Checkstyle)
- Unit test analysis
  - Measure coverage (Cobertura)
  - Look for hotspots, areas of low testing and high complexity (SONAR)

Build Server Hardware

- Maven and Java = lots of memory
- Compile and unit test = lots of CPU
- Static analysis = lots and lots of CPU
- **Please, KEEP IT FAST**

Free Continuous Integration Servers

- Hudson (Oracle)
  - Self updating and easy to administor
  - Many useful plugins
  - Great user interface
  - Scale out with additional nodes
  - Best by a wide margin
- Cruise Control (ThoughtWorks)
  - Yucky XML configuration
  - Commercial version (Cruise) is a rewrite
    Continuum (Apache)
  - Great Maven support
  - No plugins, ok user interface, and slow builds

Jenkins for Continuous Integration

- Jenkins – open source continuous integration server
- http://jenkins-ci.org
  - Easy to install
  - Easy to use
  - Multi-technology
  - Multi-platform
  - Widely used
  - Extensible
  - Free

Jenkins

Jenkins for a Developer

- Easy to install
  - Download one file – jenkins.war
  - Run one command – java -jar jenkins.war
- Easy to use
  - Create a new job – checkout and build a small project
  - Check-in a change – watch it build
  - Create a test – watch it build and run
  - Fix a test – check-in and watch it pass
- Multi-technology
  - Build C, Java, C#, Python, Perl, SQL, etc.
  - Test with Junit, Nunit, MSTest, etc.

More Power – Jenkins Plugins

- Over 300 plug-ins
  - Software configuration management
  - Builders
  - Test Frameworks
  - Virtual Machine Controllers
  - Notifiers
  - Static Analyzers

Jenkins: Version Control Systems

- Accurev, Bazaar, BitKeeper, ClearCase, Darcs, Dimensions, Git, Harvest, MKS Integrity, PVCS, StarTeam, Subversion, Team Foundation Server and Visual SourceSafe

Jenkins: Build Tools

- Ant
- Maven
- MSBuild
- Cmake
- Gradle
- Grails
- Scons
- Groovy

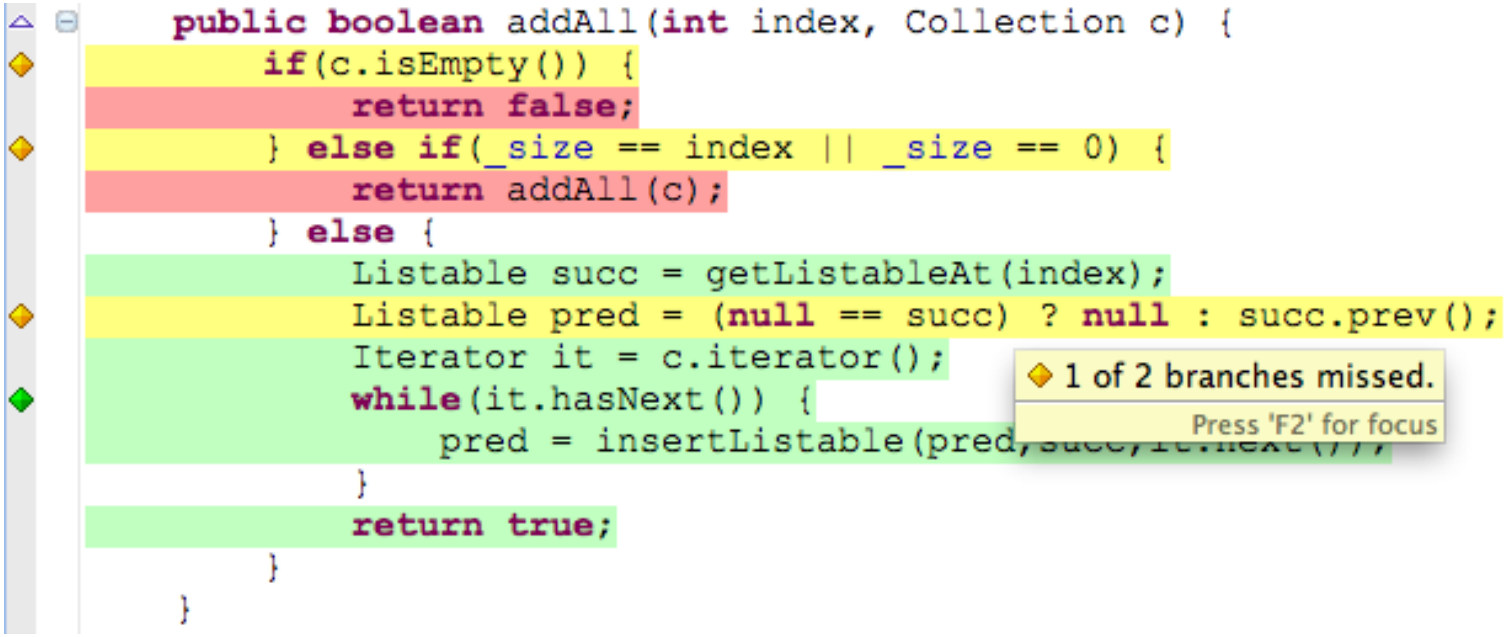
Jenkins: Test Frameworks

- Junit
- Nunit
- MSTest
- Selenium
- Fitnesse

Jenkins: Static Analysis

- Checkstyle
- CodeScanner
- DRY
- Crap4j
- Findbugs
- PMD
- Fortify
- Sonar
- FXCop

Jenkins: Code Coverage



- Emma
- Cobertura
- Clover
- GCC/GCOV

Jenkins: Other Tools

- Notification
  - Twitter
  - Campfire
  - Google Calendar
  - IM
  - IRC
  - Lava Lamp
  - Sounds
  - Speak
- Authorization
  - Active Directory
  - LDAP
- Virtual Machines
  - Amazon EC2
  - VMWare
  - VirtualBox
  - Xen
  - Libvirt