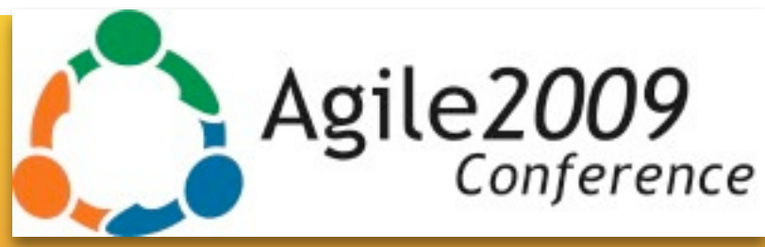

Making Agile Real

Java Power Tools
Getting it all together

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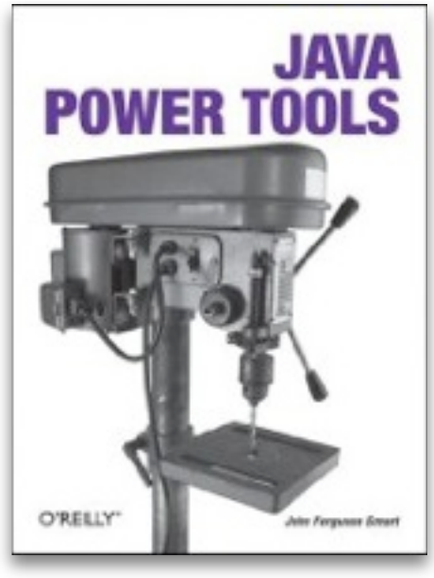
Twitter: wakaleo

Presentation Goals

Learn about the latest evolutions in Java development tools. In particular, learn how to improve and automate your development process using tools like Maven, Hudson, and many others.

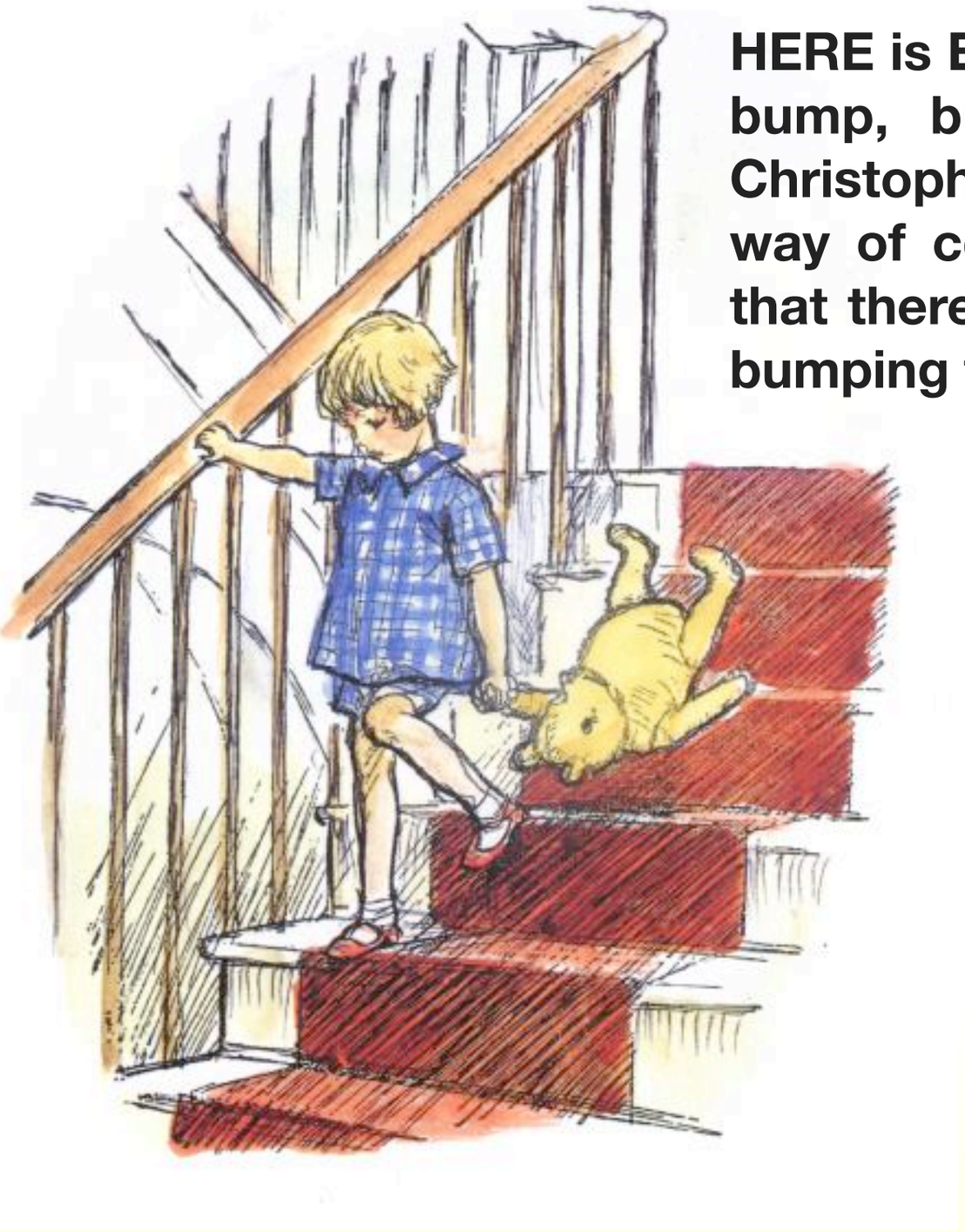
Speaker's qualifications

- John Ferguson Smart
  - Consultant, Trainer, Mentor, Author,...
  - Works with Enterprise Java, Web Development, and Open Source technologies
  - Author of 'Java Power Tools' (O'Reilly)
  - Writes articles for sites like JavaWorld, DevX and Java.net, and blogs on Java.net
  - Frequent speaker at conferences and Java User Groups
  - Likes to write about himself in the third person



Agenda

- What we will cover today:
  - Industrializing your build process
  - Organizing your internal artifacts
  - Improving your release management strategy
    - Automate the build process
    - Better testing practices
    - Monitoring code coverage and code quality metrics



HERE is Edward Bear, coming downstairs now, bump, bump, bump, on the back of his head, behind Christopher Robin. It is, as far as he knows, the only way of coming downstairs, but sometimes he feels that there really is another way, if only he could stop bumping for a moment and think of it.

-- A. A. Milne

Towards a better build process

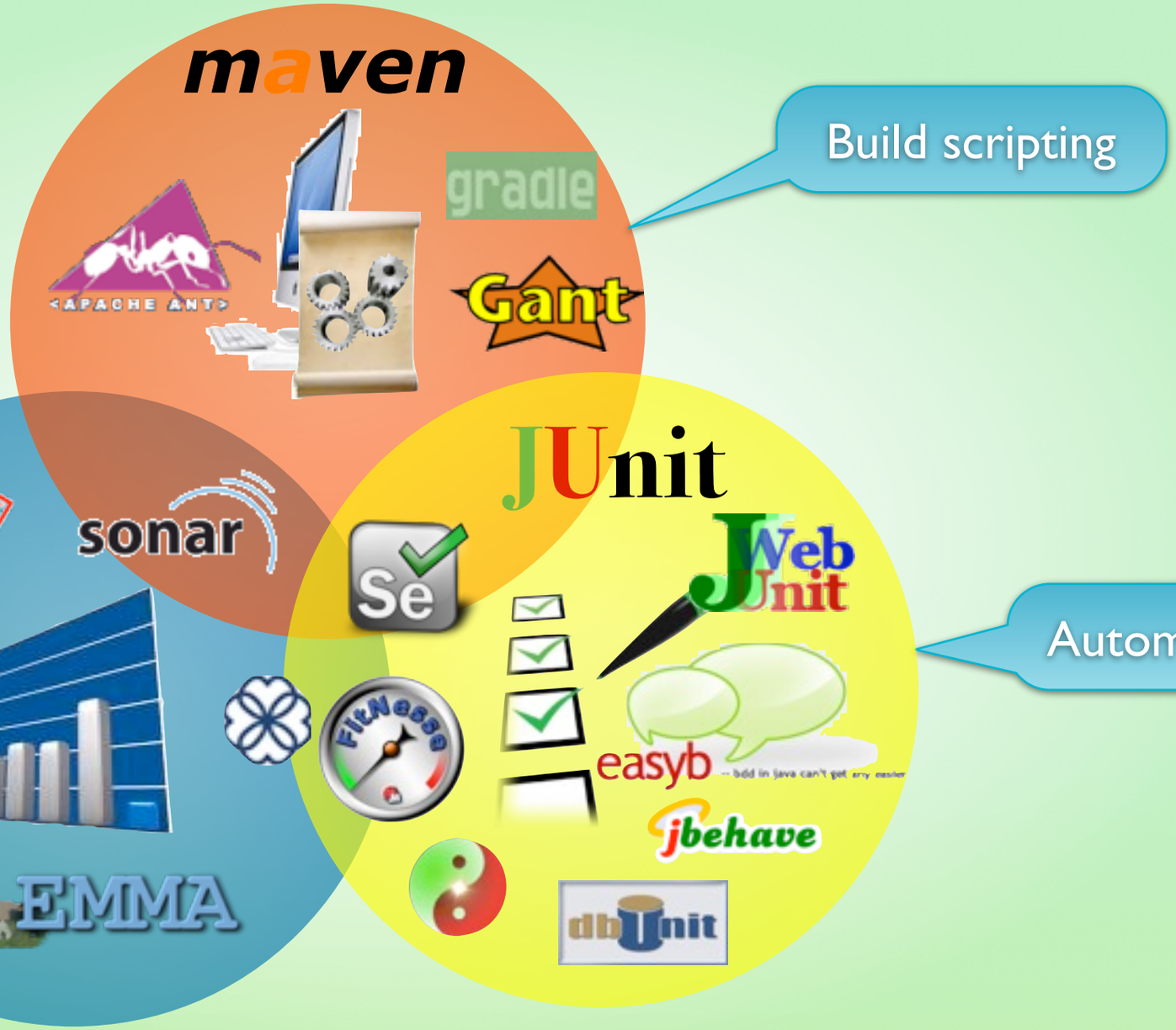
- Industrializing your build process
  - Why bother?
    - Each team and each project using different conventions?
    - Build scripts ad-hoc and difficult to understand and maintain?
    - Little reuse of components between teams and projects?
    - Code quality metrics and reporting are not done systematically, or not at all?
    - High learning curve and maintenance costs?
  - What can you do?
    - Set up a development infrastructure: e.g. *Maven 2, Nexus, Hudson...*

Towards a better build process

Build Automation - the big picture

CI build server

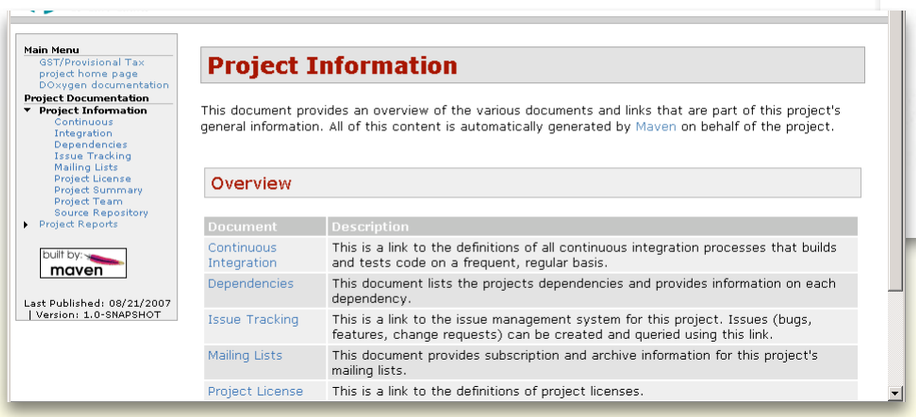
Continuous Integration

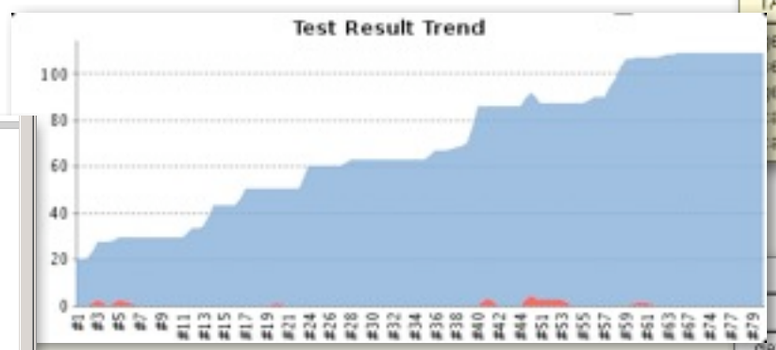


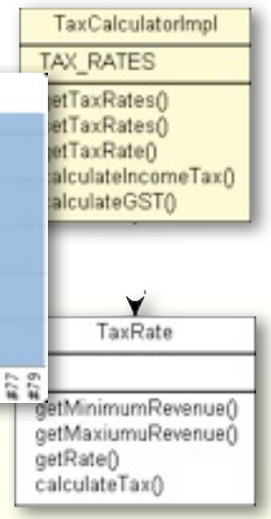
Towards a better build process

- Maven as a standardization tool

  - More than just your average build scripting tool!
    - ☑ A build tool
    - ☑ A dependency management tool
    - ☑ A documentation generation tool
    - ☑ A metrics/code quality reporting tool
    - ☑ A project management tool
    - ☑ And more…







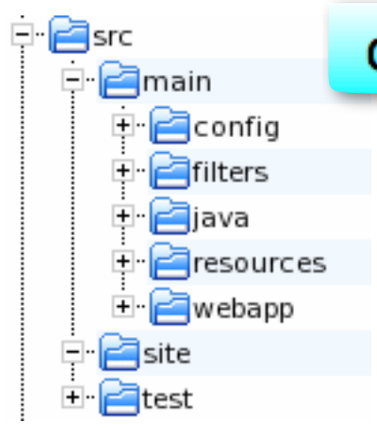
Towards a better build process

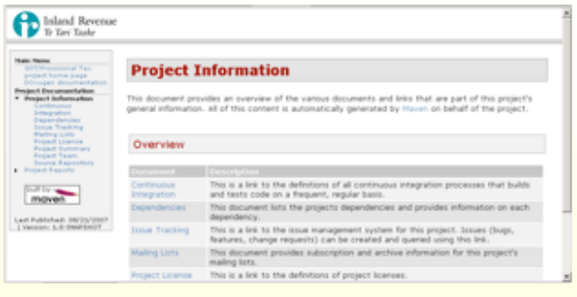
- So what can Maven do for me?
  - ☑ Standardize your build and deployment process
  - ☑ A standard, but extensible, build lifecycle
  - ☑ A standard directory structure
  - ☑ Clear and clean dependency management
  - ☑ Good technical documentation and reporting

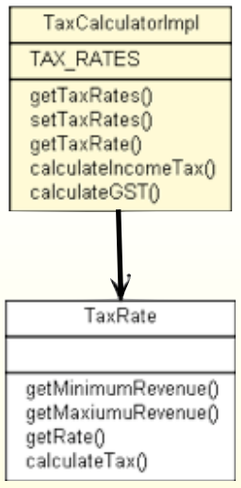
compile

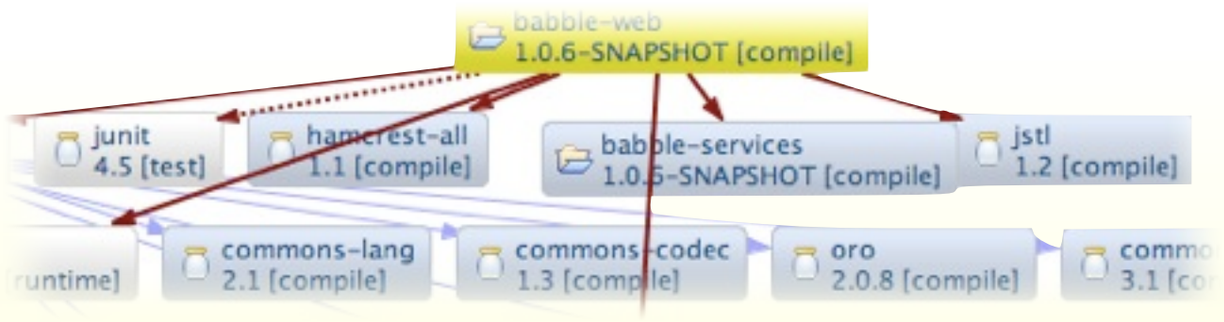
test

deploy



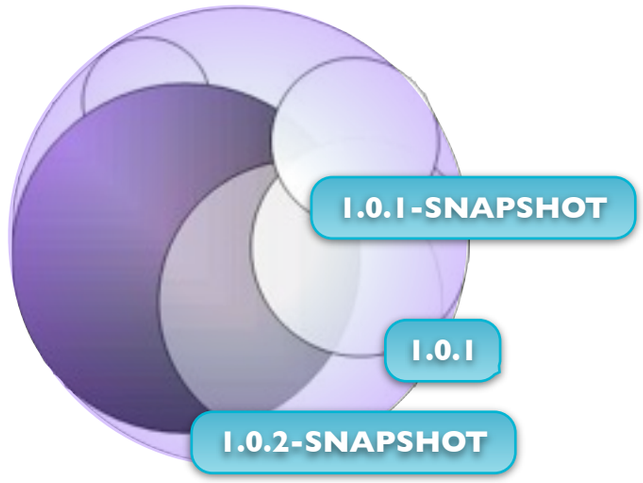


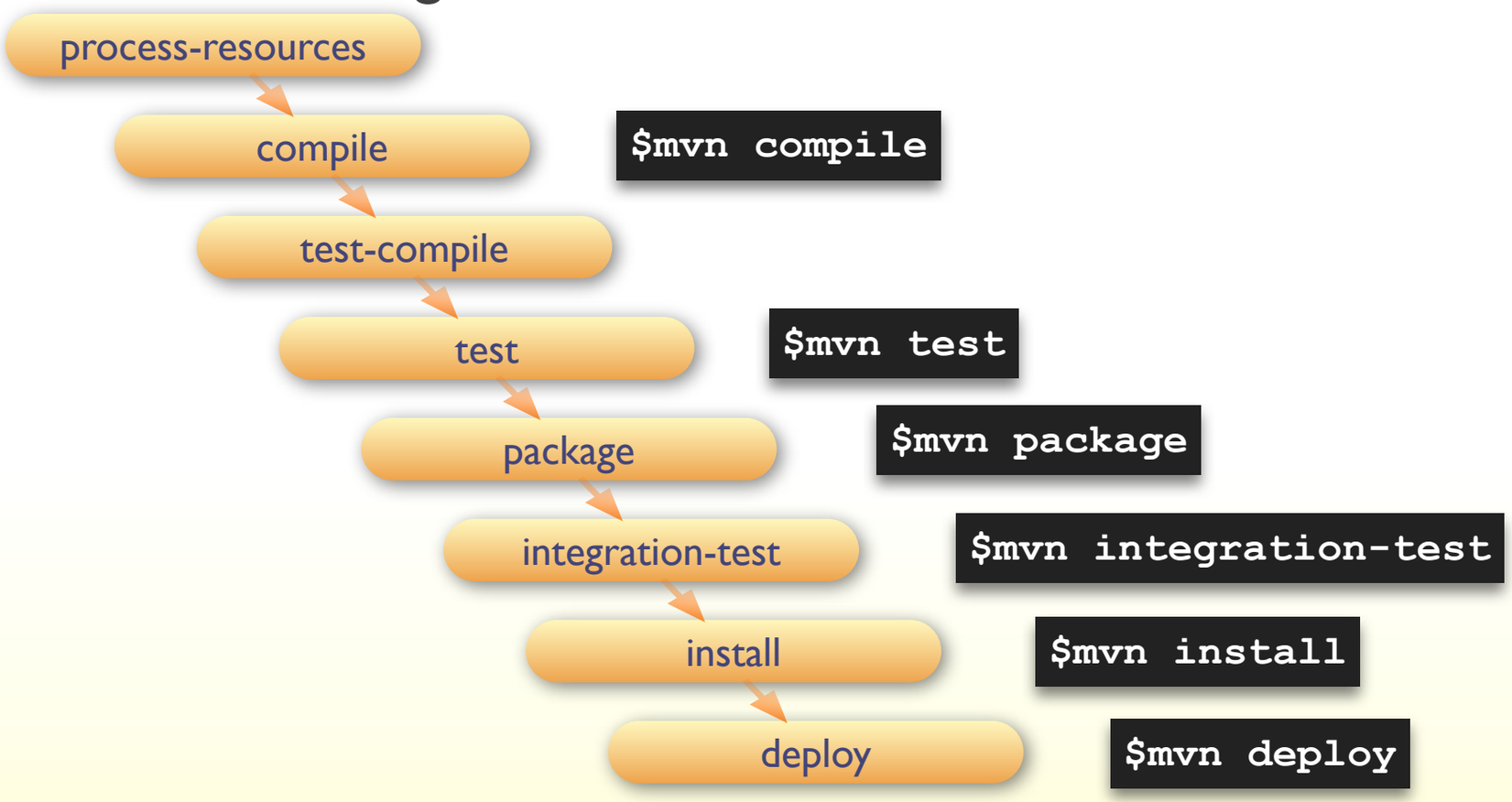




Towards a better build process

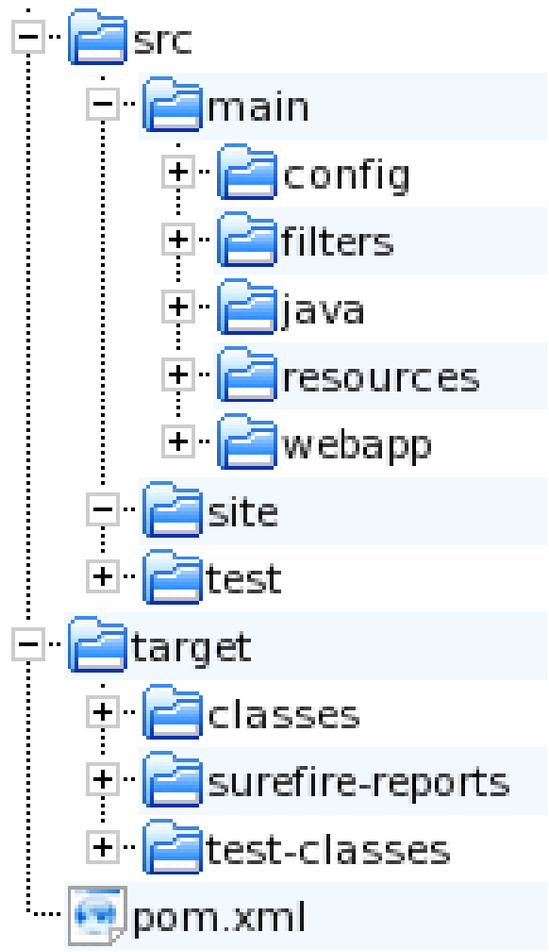
- Maven 2 Highlights
  - A Standard Life Cycle
    - A standardized approach to building your software
    - Familiar commands across all projects
    - No re-inventing the wheel





Towards a better build process

- Maven 2 Highlights
  - A Standard Directory Structure
    - Familiar structure across all projects
    - Lower learning curve
    - Convention Over Configuration
    - Less low-level scripting



Towards a better build process

- Maven 2 Highlights
  - A Standard Way of Identifying Artifacts
    - Each Maven artifact has a unique identifier, or “co-ordinates”

```
<project...>
    ...
    <groupId>com.mycompany.accounting</groupId>
    <artifactId>accounting-core</artifactId>
    <packaging>jar</packaging>
    <version>1.1</version>
    <name>Accounting Core package</name>
    ...
```

Project group name

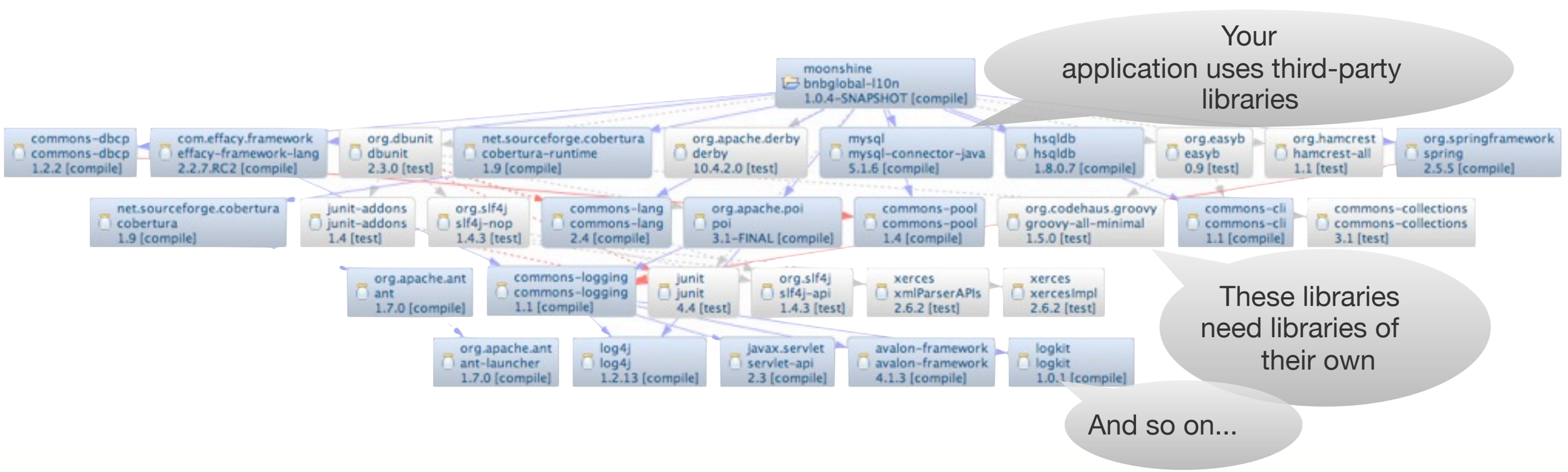
Artifact name

Version number

```
com/mycompany/accounting/accounting-core/1.1/accounting-core-1.1.jar
```

Towards a better build process

- Maven 2 Highlights
  - Dependency Management

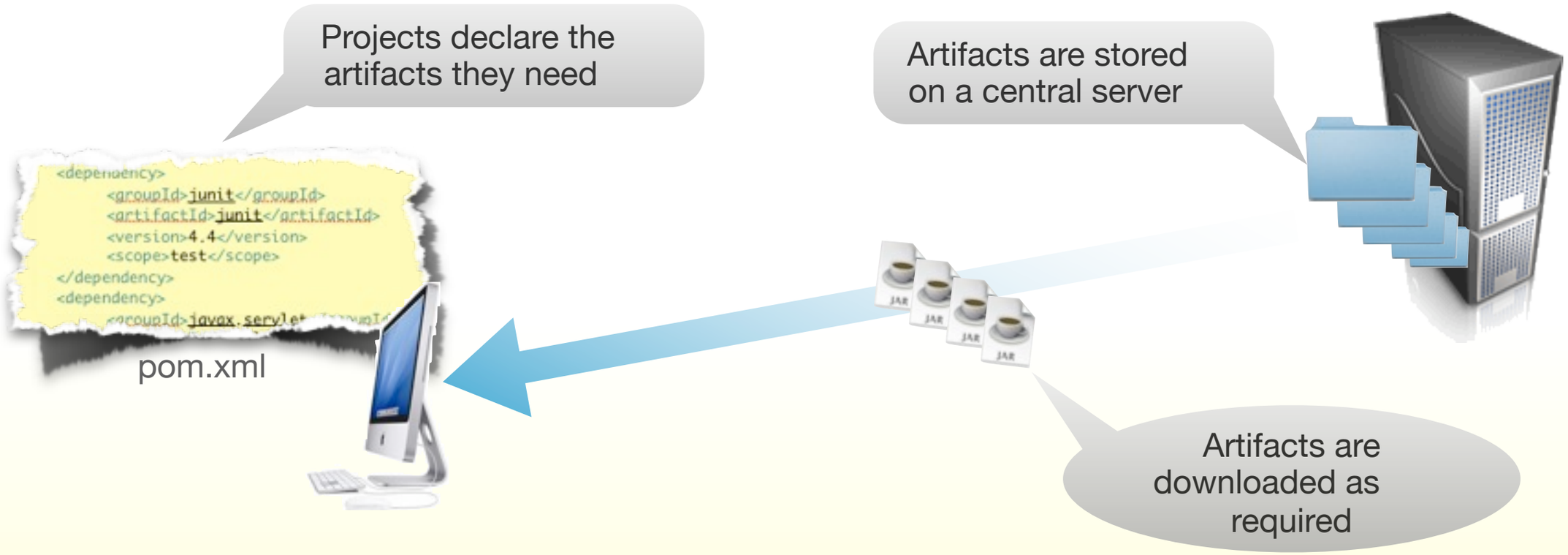


Towards a better build process

- Maven 2 Highlights
  - Traditional Dependency Management
    - Each project has its own set of JAR files
    - Unnecessary duplication
    - Hard to keep track of versions
    - Errors due to incompatible JAR files
    - Overloads the source code repository

Towards a better build process

- Maven 2 Highlights
  - Declarative Dependency Management
    - ☑ Artifact versions are stored on a central server
    - ☑ Each project “declares” what libraries and versions it needs
    - ☑ All the required dependencies are automatically downloaded



Towards a better build process

- Maven 2 Highlights
  - Declaring Dependencies in Maven
    - Declared in the build script itself
    - Dependencies with version numbers
    - Different types of dependencies
    - Compile, test, provided,...

```
<dependencies>
      <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>4.4</version>
            <scope>test</scope>
      </dependency>
      <dependency>
            <groupId>javax.servlet</groupId>
            <artifactId>servlet-api</artifactId>
            <version>2.4</version>
            <scope>provided</scope>
      </dependency>
      <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-core</artifactId>
            <version>2.5.6</version>
      </dependency>
        ...
</dependencies>
```

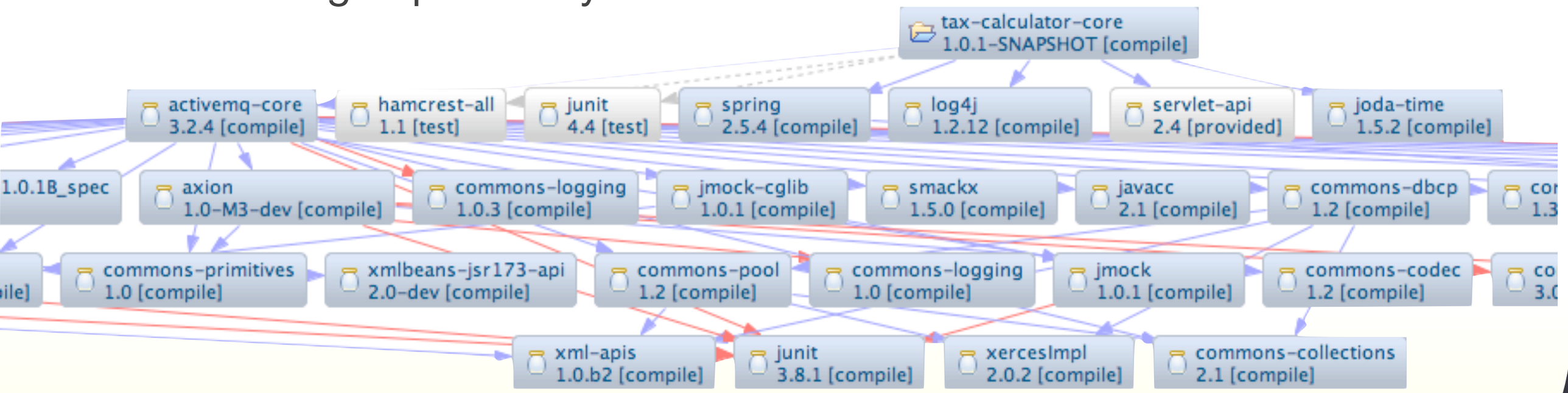
Version numbers

For tests only

Provided by the application server

Towards a better build process

- Managing Maven Dependencies
  - It's easier with Eclipse...m2eclipse
    - Adding new dependencies
    - Visualizing dependencies
    - Handling dependency conflict

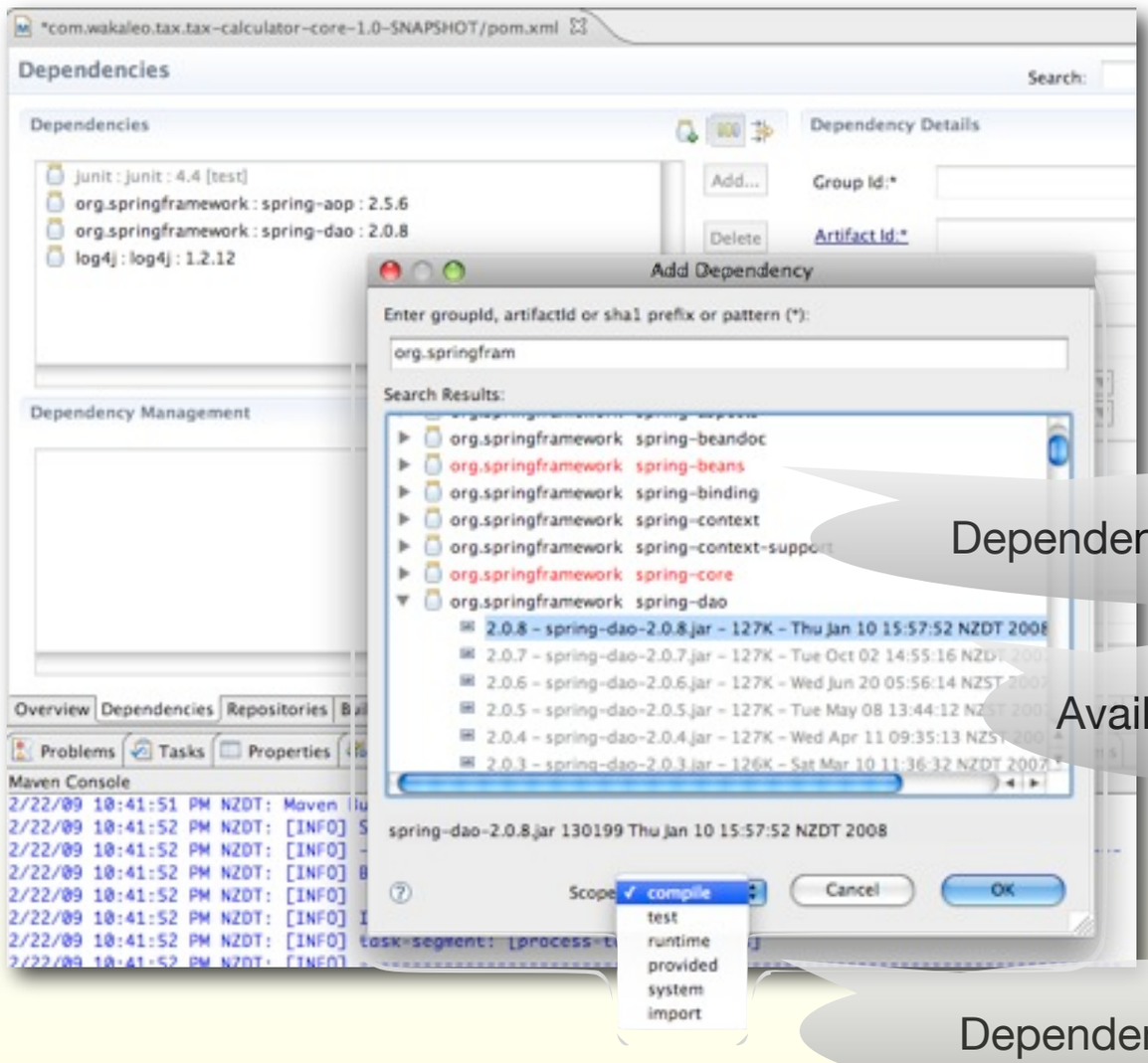


Towards a better build process

- Managing Maven Dependencies
  - Viewing Maven project dependencies

Towards a better build process

- Managing Maven Dependencies
  - Adding new dependencies...



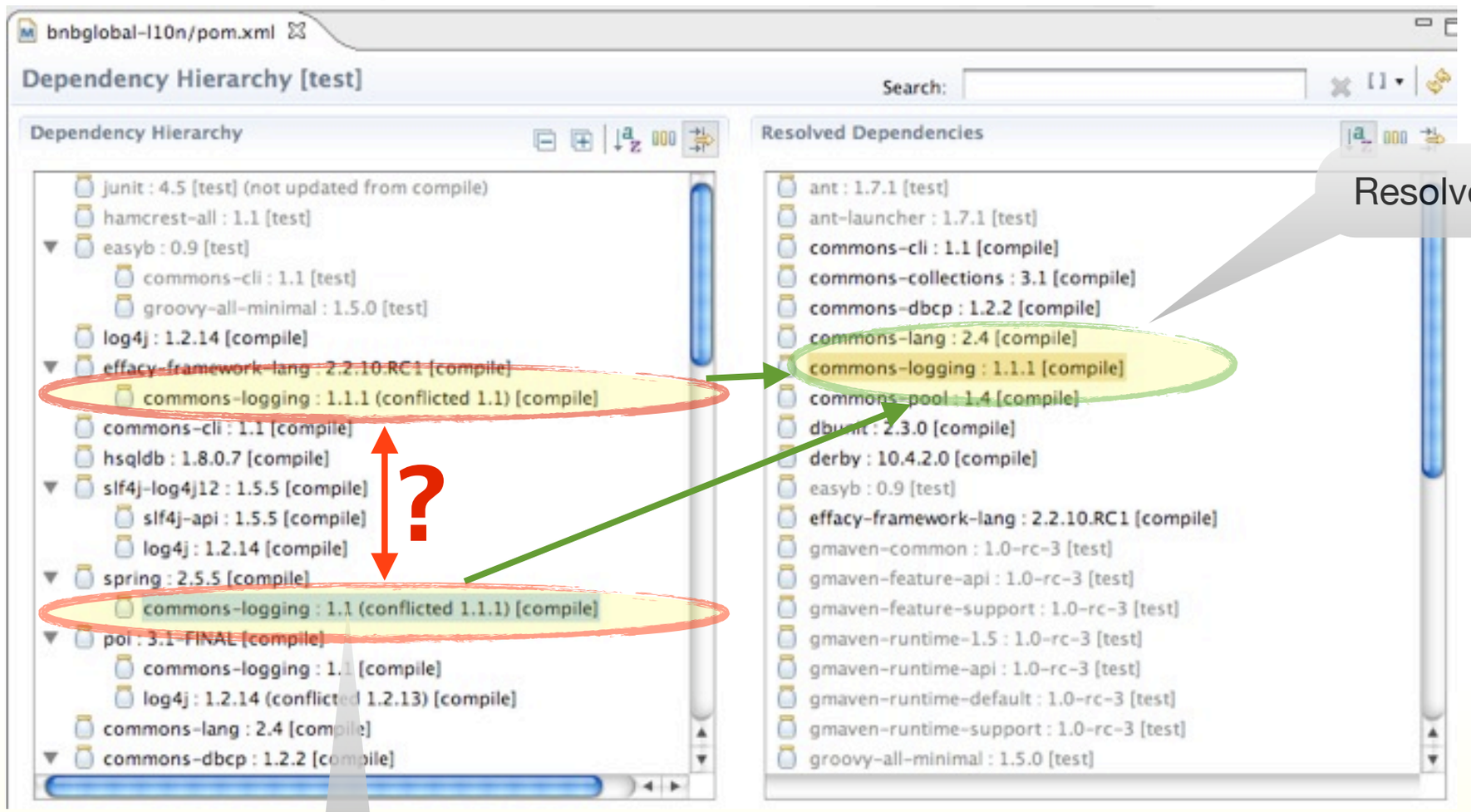
Dependencies already present in your project

Available versions

Dependency scopes

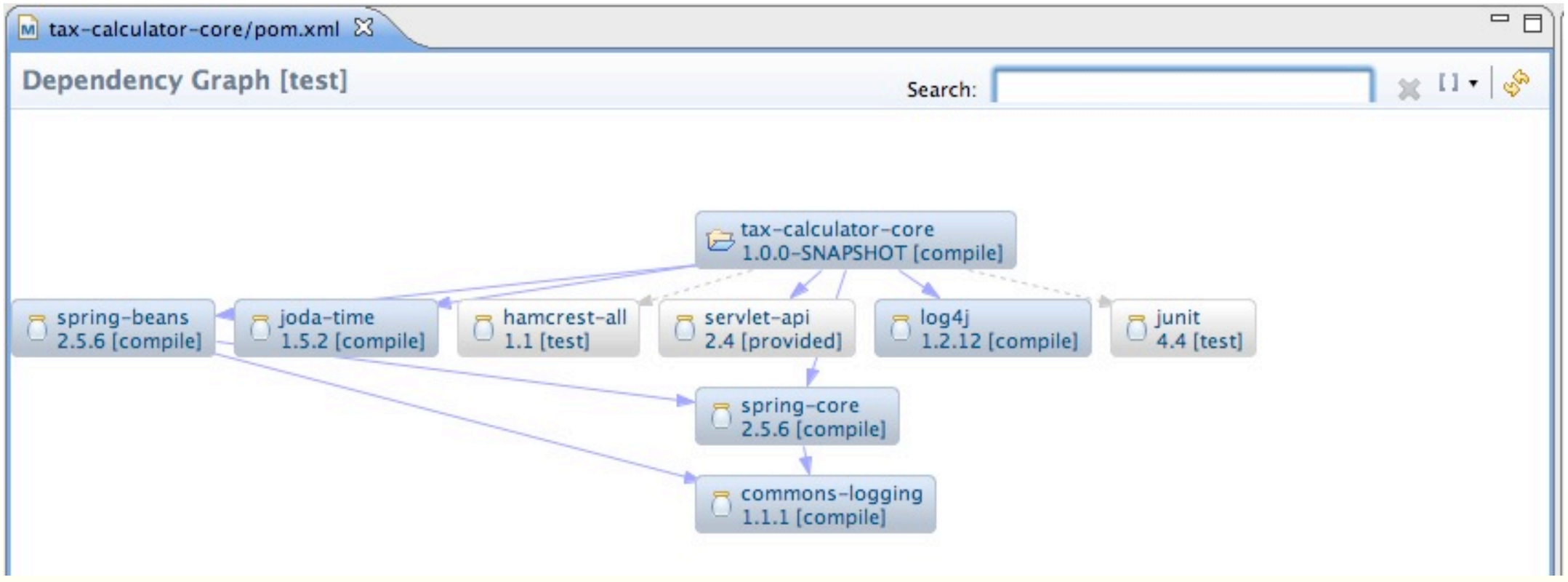
Towards a better build process

- Managing Maven Dependencies
  - Visualizing the Dependency Hierarchy



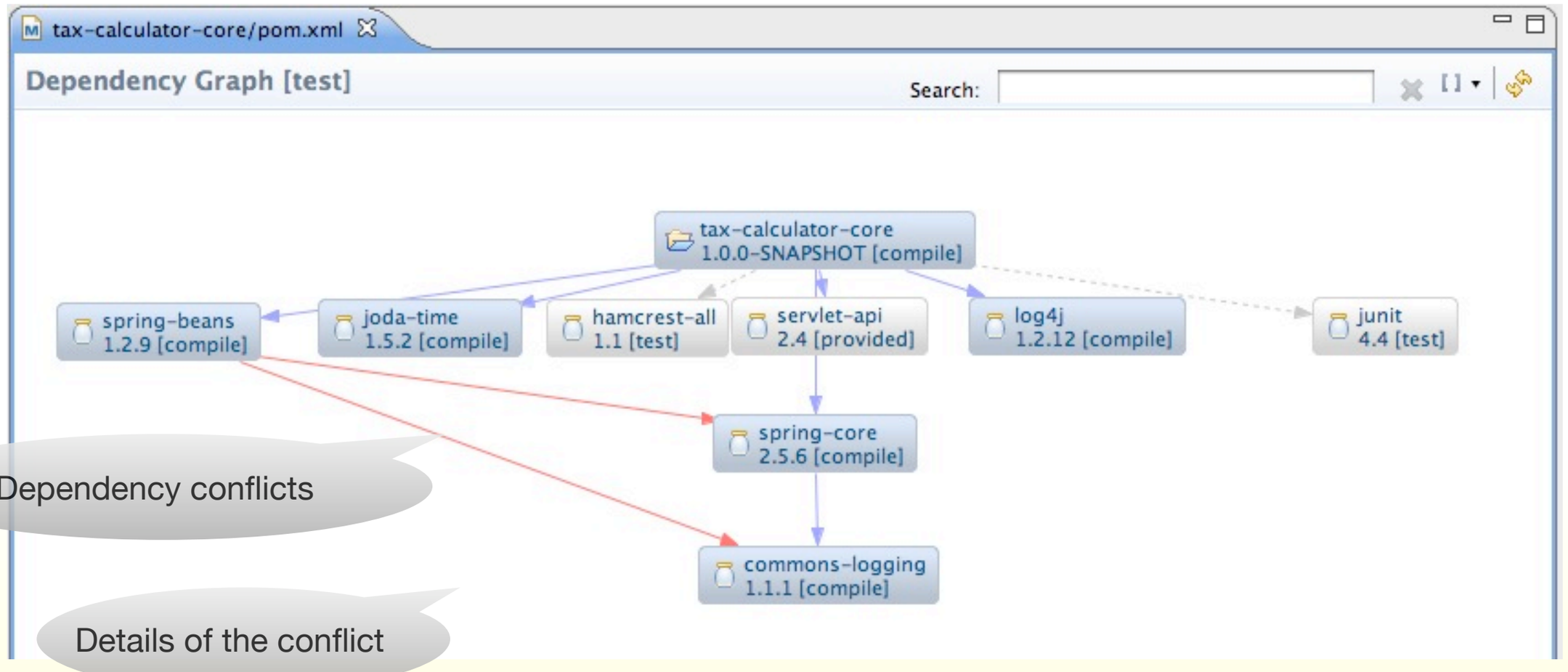
Towards a better build process

- Managing Maven Dependencies
  - Visualizing the Dependency Graph



Towards a better build process

- Managing Maven Dependencies
  - Visualizing conflicts in the Dependency Graph

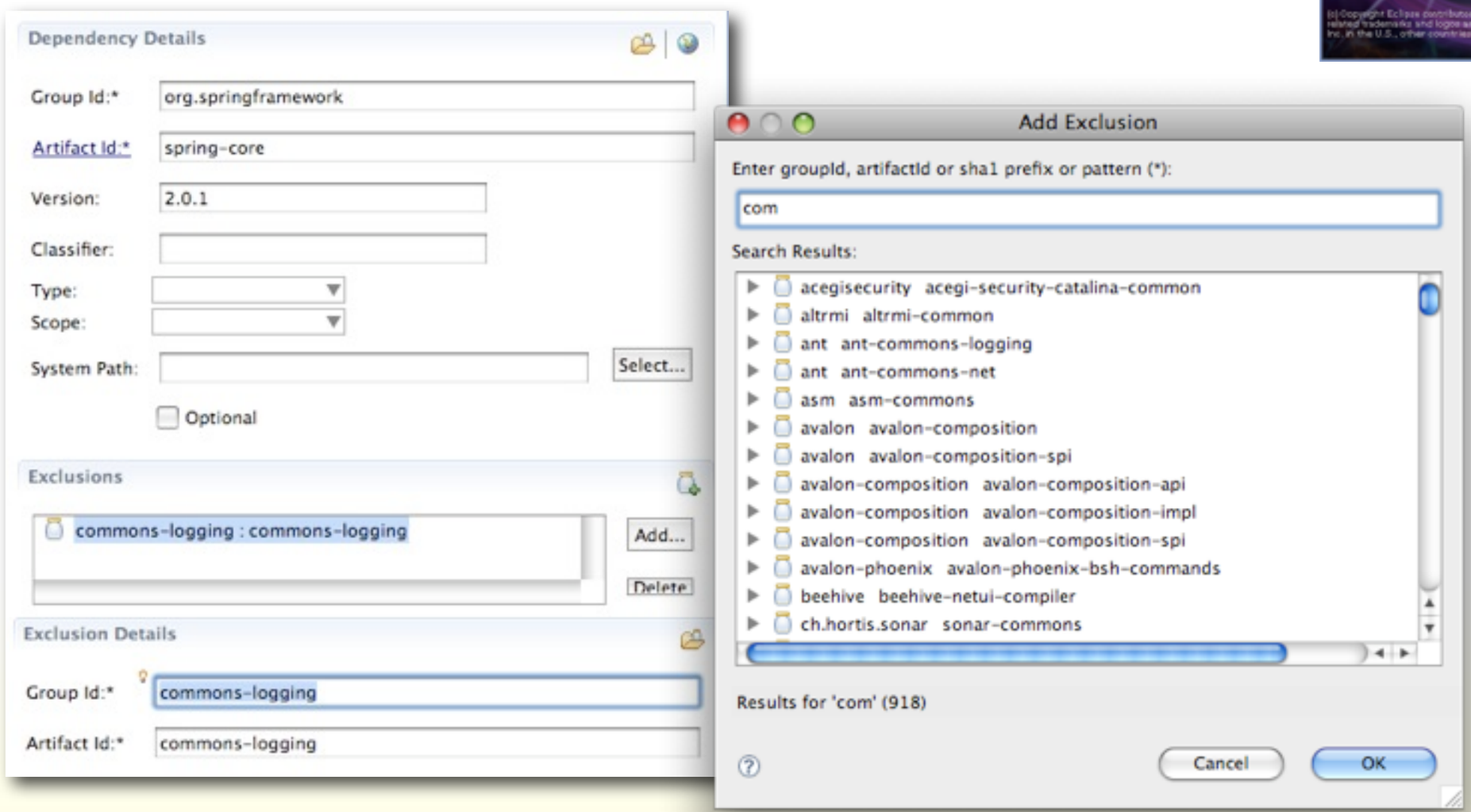


Dependency conflicts

Details of the conflict

Towards a better build process

- Managing Maven Dependencies
  - Excluding Dependencies



DEMO

A walk through a simple Maven 2 project

Organizing your artifacts

- Organizing your artifacts
  - Internal releases are hard to co-ordinate
    - How do I share my API with other teams?
    - Where is the latest version of that API?
    - What version am I using, anyway?
- What can you do?
  - Use an Enterprise Maven Repository

Organizing your artifacts

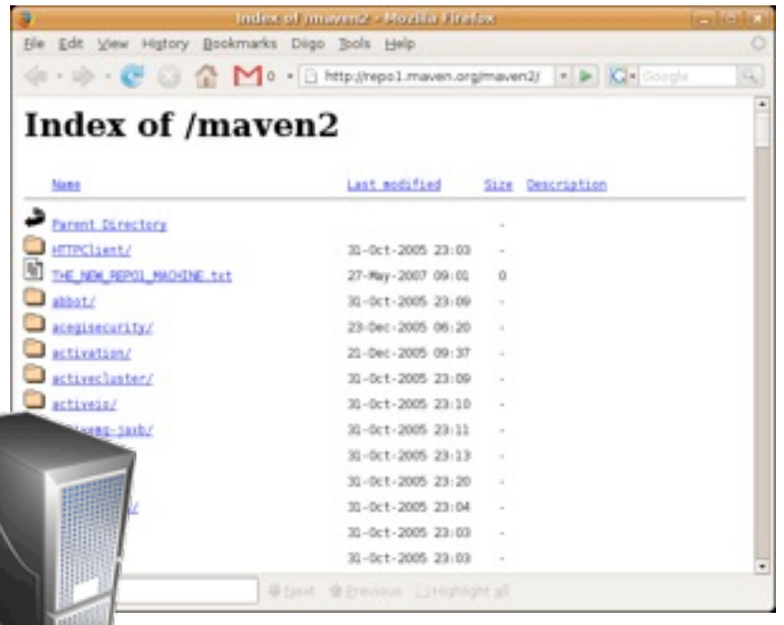
- Organizing your artifacts
  - Maven Repositories
    - JAR files are downloaded to a local cache

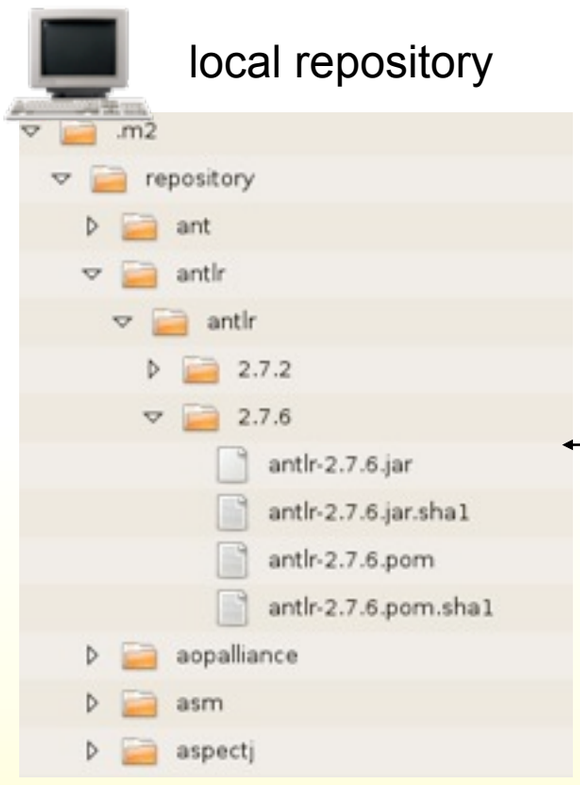
Organizing your artifacts

- Organizing your artifacts
  - Maven Repositories
    - Public web sites containing JARs for many open source projects
    - Maven automatically downloads the JARs you need onto your local machine
    - You can publish internal APIs on your own repository

Organizing your artifacts

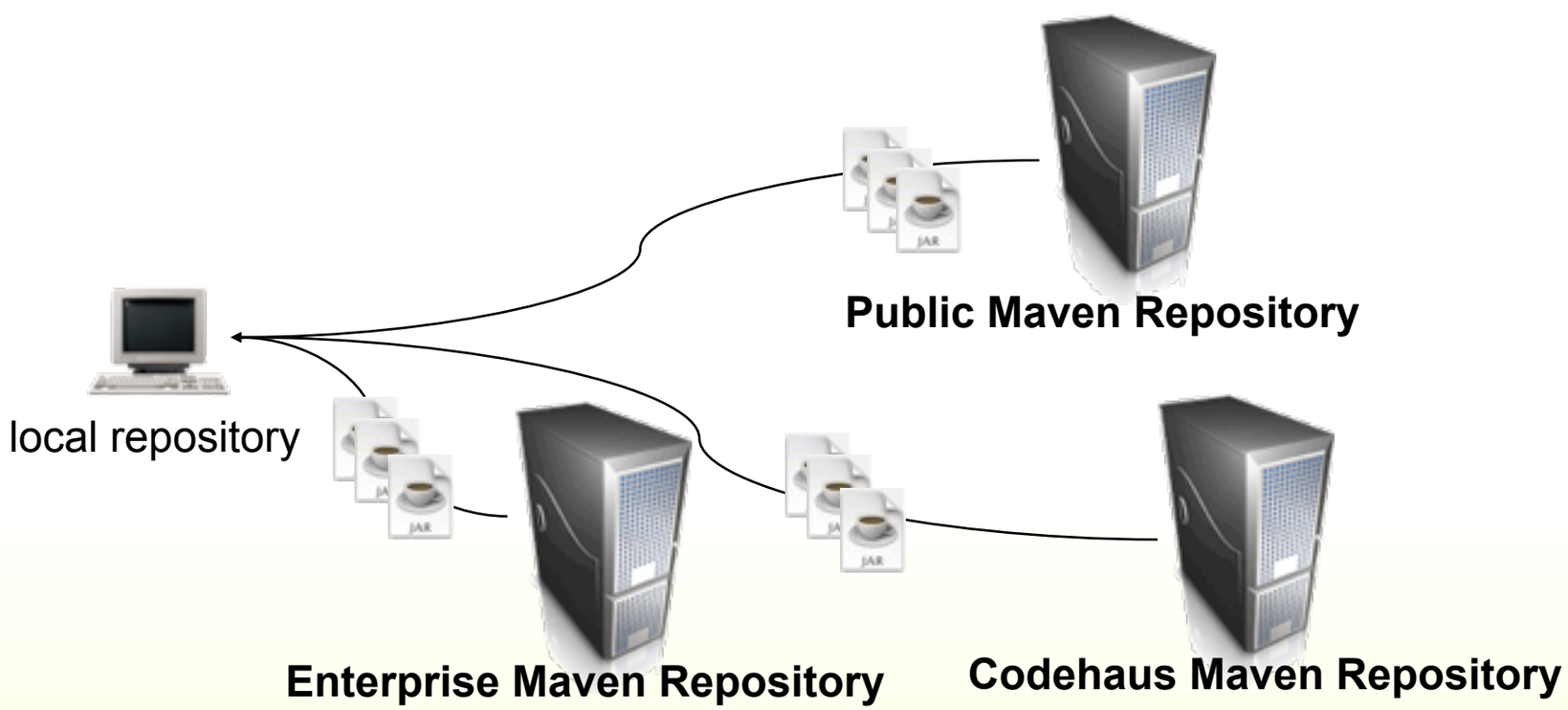
- Organizing your artifacts
  - Maven Repositories
    - JAR files are downloaded as required into a local cache





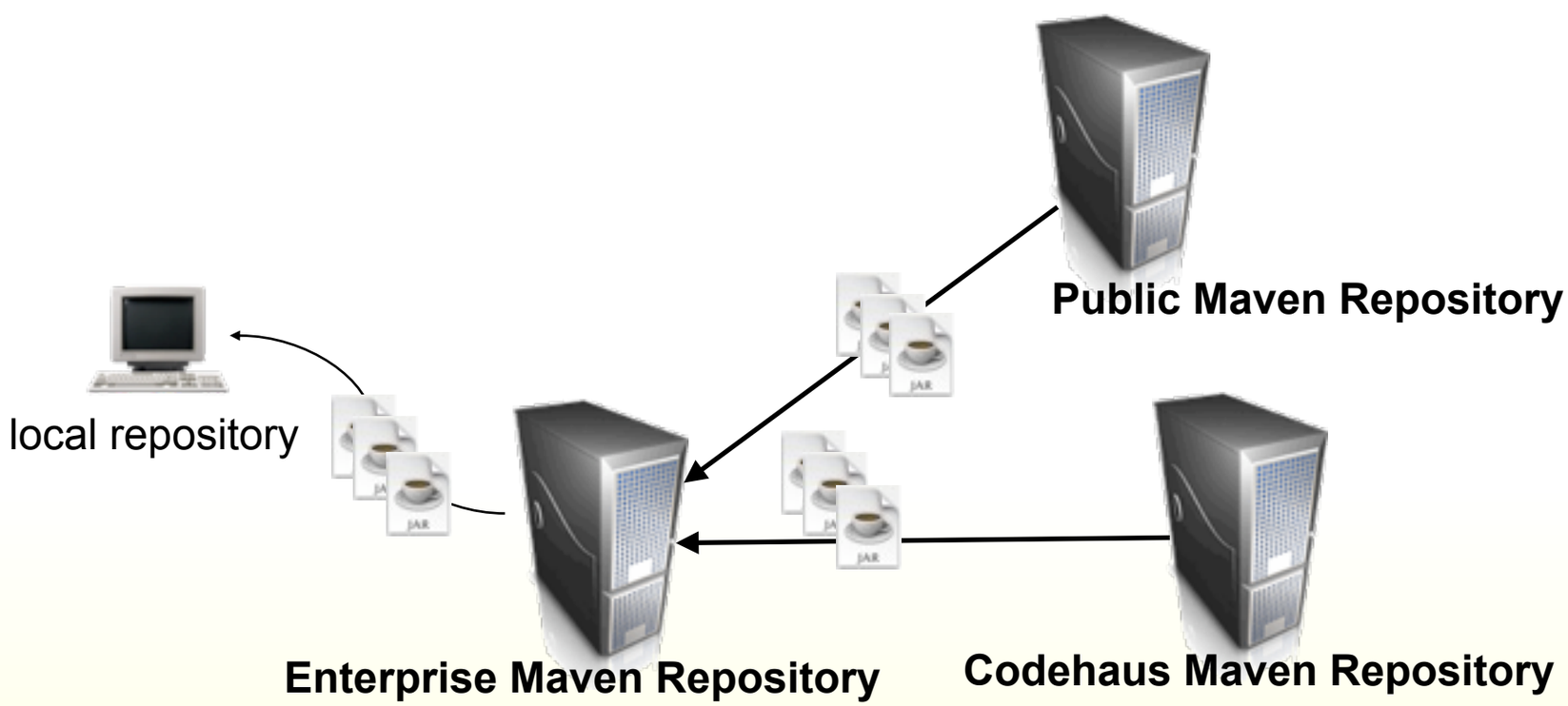
Organizing your artifacts

- Organizing your artifacts
  - Maven Repositories
    - There are several public Maven repositories
    - You can also share internal JARs in an Enterprise Maven Repository



Organizing your artifacts

- Organizing your artifacts
  - Maven Repositories
    - The Enterprise Maven Repository can also act as a proxy/cache to the public repositories

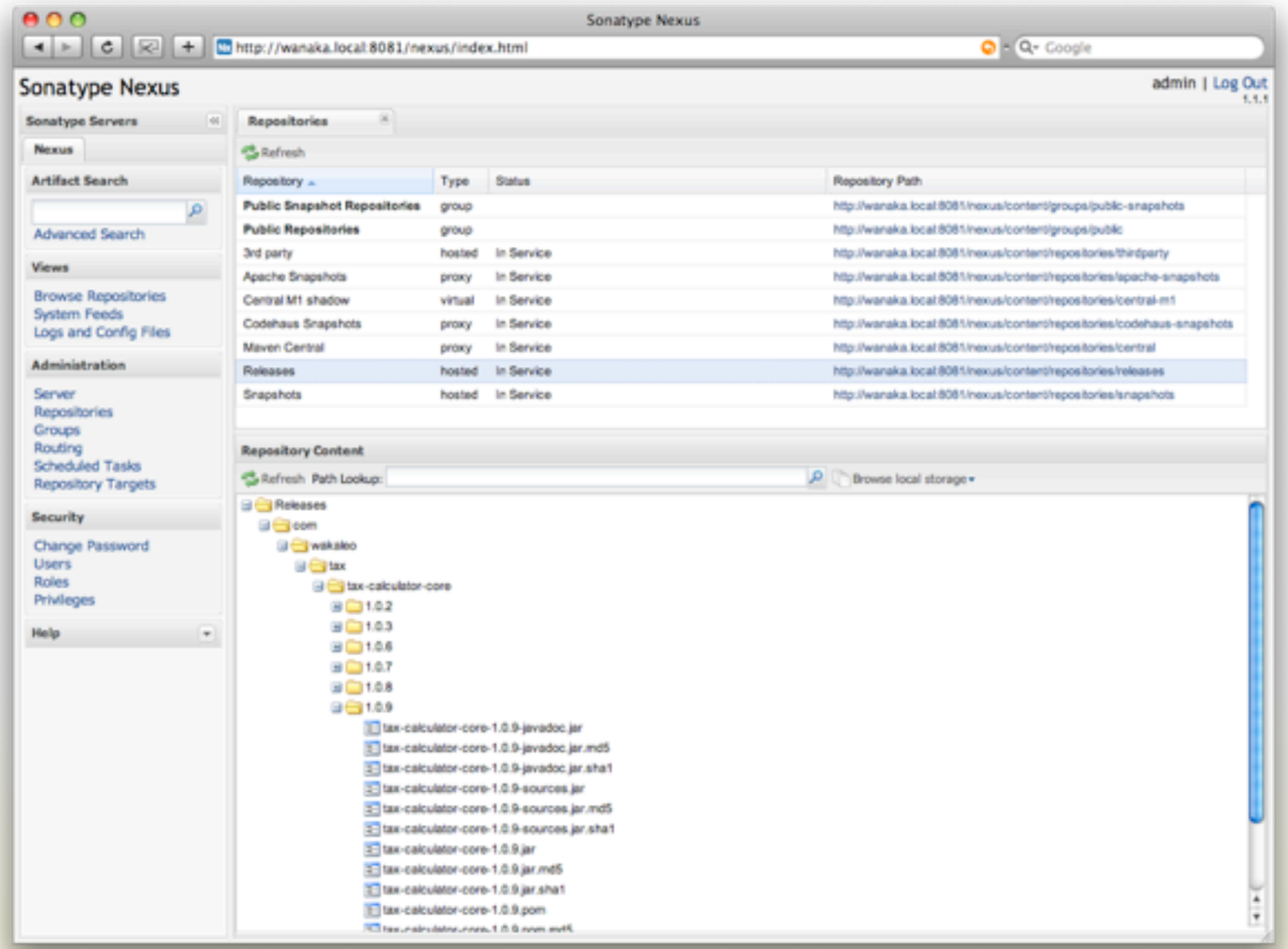


Organizing your artifacts

- Organizing your artifacts
  - Key Best Practices
    - Deploy your internal releases to a local Enterprise repository
    - Store proprietary JAR files you need here as well
    - Distinguish between snapshot and release versions

Organizing your artifacts

- Organizing your artifacts
  - Using the Nexus repository manager
    - Easy to set up
    - Easy to administer
    - Proxy/cache



DEMO

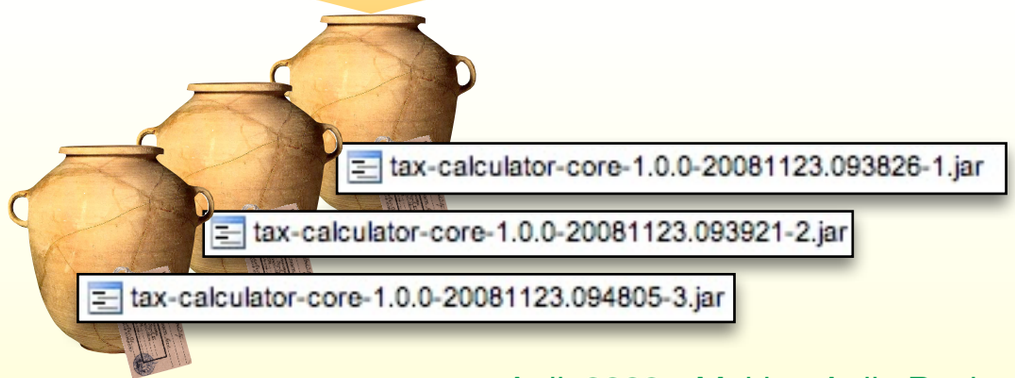
An Enterprise Repository

Better Release Management

- Working with snapshots and releases
  - Snapshots
    - Work in progress
    - A new time-stamped version deployed with each deployment

```
<artifactId>tax-calculator-core</artifactId>
<packaging>jar</packaging>
<version>1.0.0-SNAPSHOT</version>
```

$mvn deploy

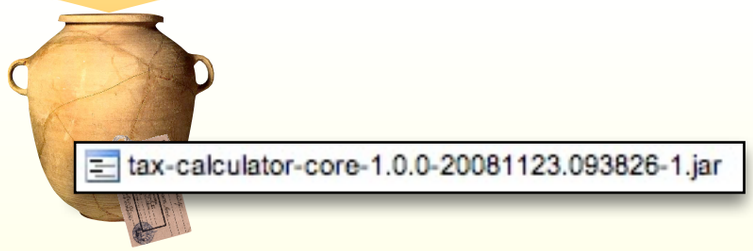


Better Release Management

- Working with snapshots and releases
  - Releases
    - Stable, tested release
    - The deployed artifact is unique

```
<artifactId>tax-calculator-core</artifactId>
<packaging>jar</packaging>
<version>1.0.0</version>
```

```
$mvn deploy
```



Better Release Management

- Working with snapshots and releases
  - Setting it all up in Maven
    - ☑ To deploy a snapshot version, you need:
      - A Snapshot repository
      - A SNAPSHOT version number
      - User authentication for the repository
      - A Snapshot configuration for the repository

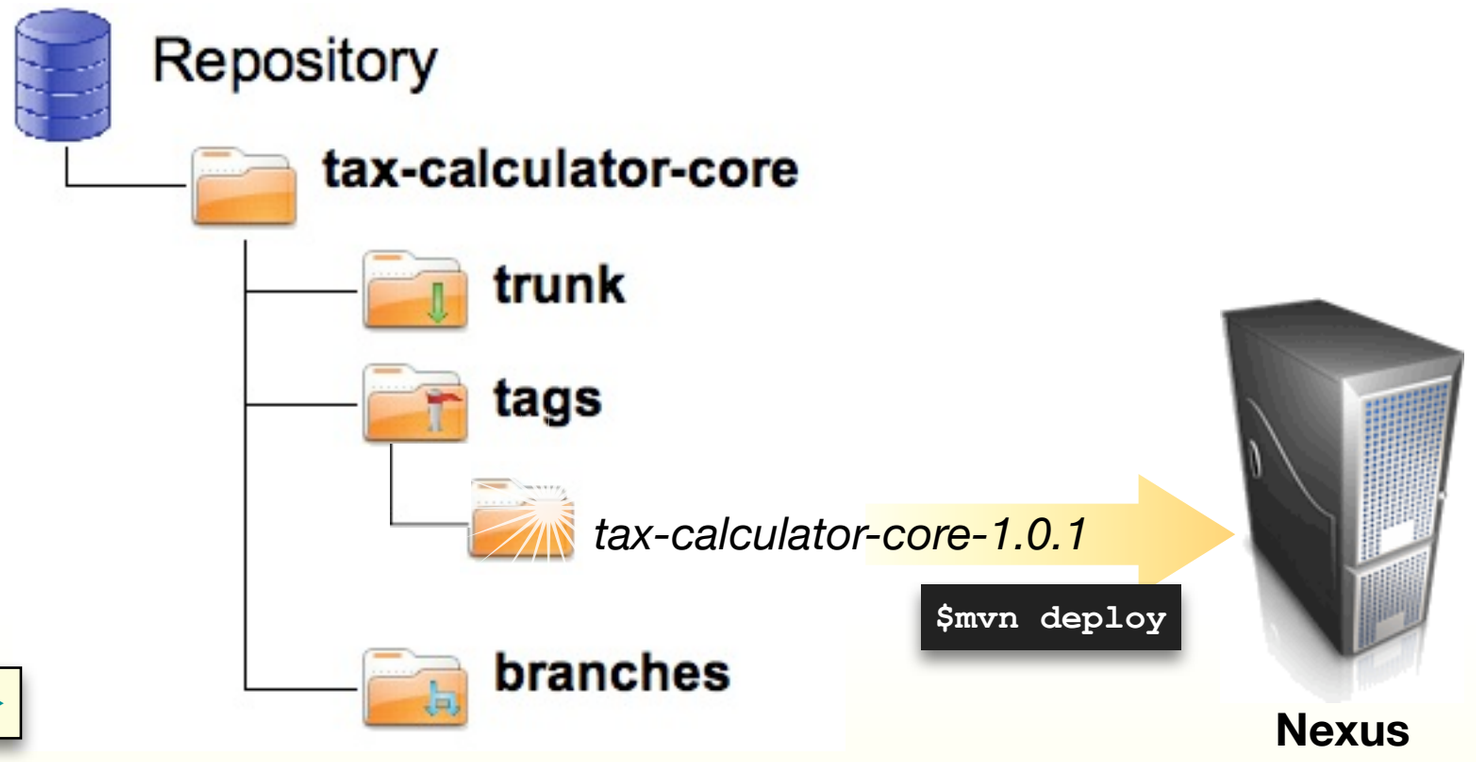
```
<version>1.0.1-SNAPSHOT</version>
```

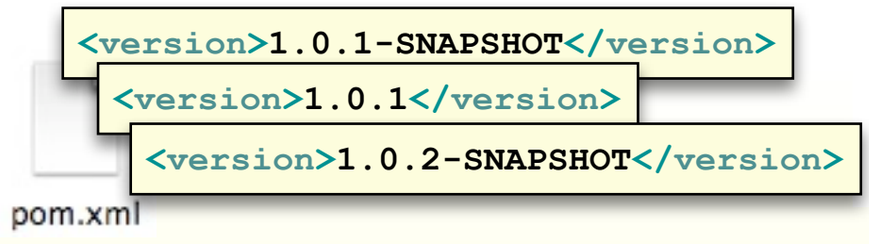
```
<settings>
   <servers>
      <server>
         <id>wakaleo-snapshots</id>
         <username>johns</username>
         <password>secret</password>
server>
ers>
s>
```

```
<distributionManagement>
      <snapshotRepository>
            <id>wakaleo-snapshots</id>
            <name>Internal Snapshots</name>
            <url>http://wanaka:8081/nexus/content/repositories/snapshots</url>
      </snapshotRepository>
      ...
</distributionManagement>
```

Better Release Management

- Working with snapshots and releases
  - Automating snapshot deployments
    - Use the maven-release-plugin to automate SCM book-keeping
      - mvn:prepare
      - mvn:perform
      - mvn:rollback





DEMO

Releases, Snapshots and Repositories

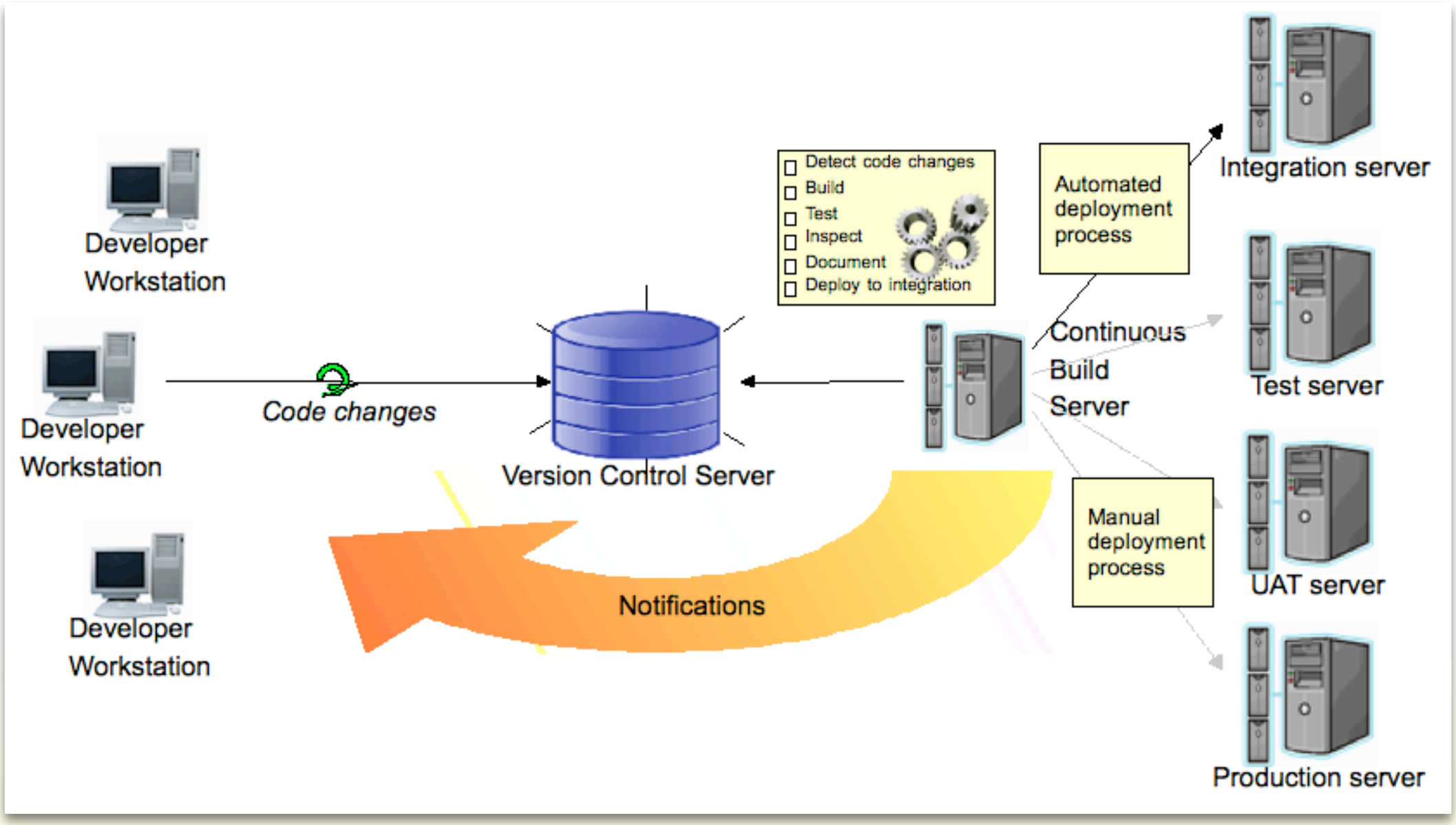
Automating the build process

- Continuous Integration - what's the issue?
  - Traditional development cycles are bad for your health:

    - Integration is long and difficult
    - Poor visibility on development progress
    - Functional tests are done too late
    - Raised issues are harder to fix
    - The client gets a sub-optimal product

Automating the build process

- Continuous Integration - what's involved?



Automating the build process

- Continuous Integration - why bother?
  - Smoother integration process
  - Automatic regression testing
  - Regular working releases
  - Earlier functional testing
  - Faster and easier bug fixes
  - Better visibility

Automating the build process

- Continuous Integration - what you need

Automated build process (e.g. Maven)

Automated tests (JUnit, Selenium, easyb...)

Source code repository

Continuous Build Server

Automating the build process

- Continuous Integration - what can it do?
  - More than just your average build scheduler!
    - ☑ Raise (and monitor) integration issues - fast!
    - ☑ Automatically publish Maven artifacts
    - ☑ Monitor your build process
    - ☑ Monitor and report on code quality and code coverage

Automating the build process

- Continuous Integration - raising issues fast!
  - Use an appropriate notification strategy, e.g.
    - ☑ The committer is notified for all build results
    - ☑ Team members are notified for any failed builds
    - ☑ Team leader gets special notification after 5 successive build failures

Automating the build process

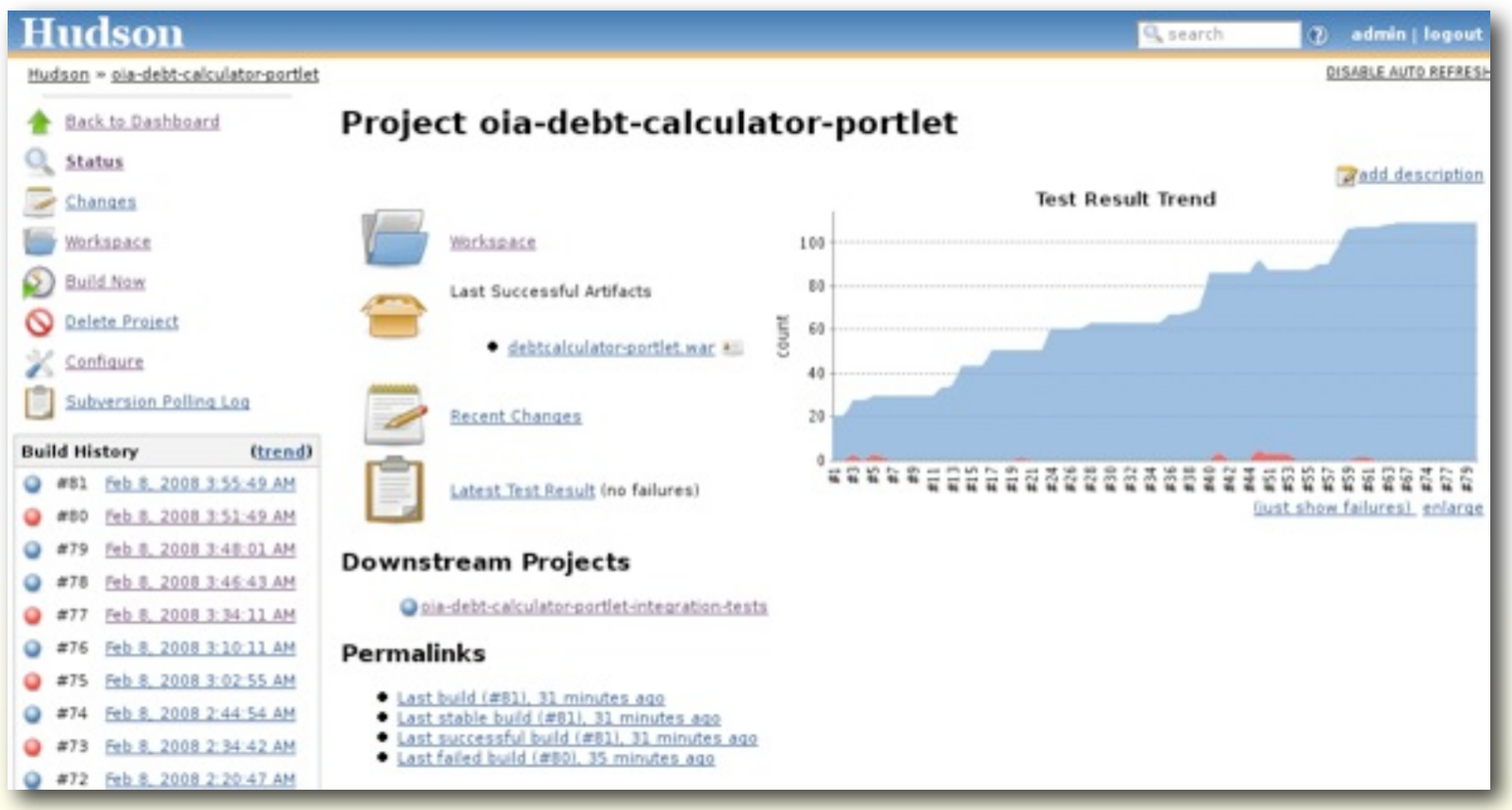
- Continuous Integration - raising issues fast!
  - Use an appropriate (fast) notification mechanism
    - Instant Messaging, SMS etc. for fast notification
    - Email as a secondary channel
    - RSS for consulting build history

Automating the build process

- Continuous Integration - raising issues fast!
  - Use a good build plan strategy
    - ☑ Fast builds first, e.g.
    - ☑ Unit tests before integration tests
    - ☑ Integration tests before metrics
  - Use manual builds where appropriate
    - ☑ Release builds
    - ☑ Deployments
    - ☑ ...

Automating the build process

- Looking for a good O/S Continuous Integration tool?
  - Try Hudson!
    - ☑ Easy to set up and configure
    - ☑ Good build and code quality metrics
    - ☑ Lots of plugins



DEMO

Automating the builds

Better Testing

- Improving your testing game
  - Innovative testing techniques
  - Automating unit tests
  - Separate unit tests and integration tests
  - Monitor test duration
  - Keep tabs on test coverage

Better Testing

- Use innovative testing techniques
  - Unit testing
    - A cornerstone of modern software development
    - Unit tests can help you:
      - Ensure that code behaves as expected
      - Make your code more flexible and easier to maintain
      - Detect regressions
      - Document your code

Better Testing

- Use innovative testing techniques
  - **Innovative** unit testing
    - More readable tests - Hamcrest asserts
    - More efficient tests - Parameterized tests
    - Cleaner tests - using Groovy
    - More accurate tests - Behavior Driven Development (BDD)
    - Functional and web tests
    - Use your imagination!

Better Testing

- Use innovative testing techniques
  - Hamcrest asserts
    - More expressive and readable test assertions
    - Easier to understand
    - Less chance of test errors

Better Testing

- Use innovative testing techniques
  - Hamcrest asserts
    - Traditional JUnit 3.x asserts are hard to read:
    - Parameter order is counter-intuitive for English-speakers
    - x=10 is written

```
assertEquals(10, x);
```

    - The statements don't read well for English-speakers
    - “Assert that are equal 10 and x”
    - Default error messages are sometimes limited:

```
String color = "yellow";
assertTrue(color.equals("red") || color.equals("blue") );
```

Failure Trace

java.lang.AssertionError:

at com.wakaleo.jpt.junit.lab5.taxcalculato

Better Testing

- Use innovative testing techniques
  - Hamcrest asserts
    - JUnit 4.4 introduces the assertThat statement
    - Rather than writing:

```
import static org.junit.Assert.*;
...
assertEquals(expectedTax, calculatedTax, 0);
```

    - You can write

```
import static org.hamcrest.Matchers.*;
...
assertThat(calculatedTax, is(expectedTax));
```

Better Testing

- Use innovative testing techniques
  - Parameterized tests
    - Run several sets of test data against the same test case
    - Help reduce the number of unit tests to write
    - Encourage developers to test more thoroughly

Better Testing

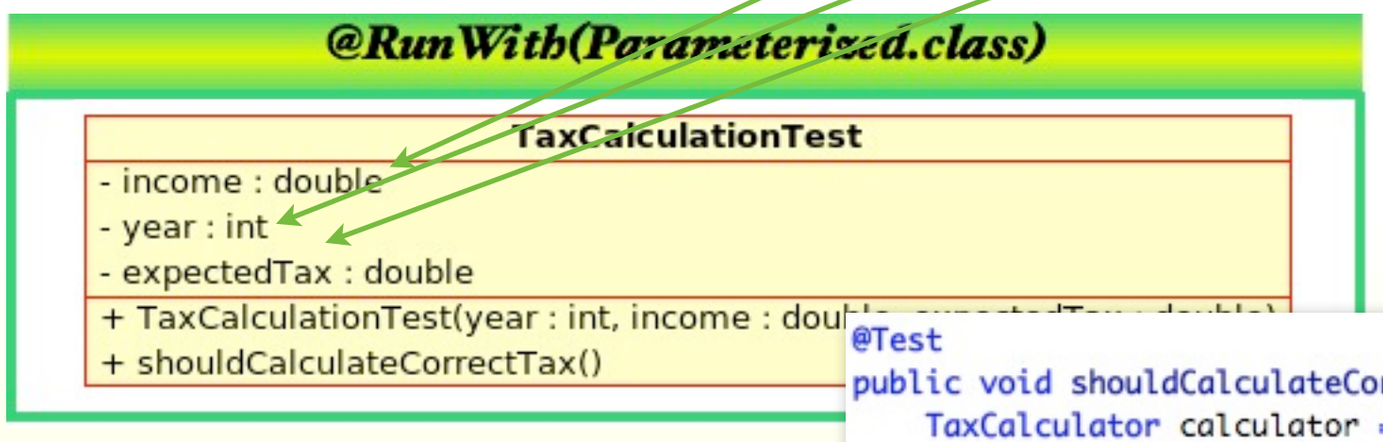
- Use innovative testing techniques
  - Parameterized tests
    - Example: Calculating income tax

Taxable income	PAYE rate for every $1 of taxable income (excluding ACC earners' levy)
up to $14,000	12.5 cents
$14,001 to $40,000 inclusive	21 cents
$40,001 to $70,000	33 cents
$70,000 and over	39 cents

Better Testing

- Use innovative testing techniques
  - Parameterized tests
    - What you need:
      - Some test data
      - A test class with matching fields
      - And some tests
      - And an annotation

Income	Year	Expected Tax
$0.00	2007	$0.00
$10,000.00	2007	$1,950.00
$20,000.00	2007	$3,900.00
$38,000.00	2007	$7,410.00
$38,001.00	2007	$7,410.33
$40,000.00	2007	$8,070.00
$60,000.00	2007	$14,670.00
$100,000.00	2007	$30,270.00




```
@Test
public void shouldCalculateCorrectTax() throws InvalidYearException {
    TaxCalculator calculator = new TaxCalculatorImpl();
    BigDecimal calculatedTax = calculator.calculateIncomeTax(income, year);
    assertThat(expectedTax, is(calculatedTax));
}
```

Better Testing

- Use mocks and stubs
  - Mockito - lightweight mocking


```
@Test
public void stubbing() {
    Stack<String> mockStack = mock(Stack.class);
    when(mockStack.pop()).thenReturn("hi there!");

    assertThat(mockStack.pop(), is("hi there!"));
}
```

Define Stubs

```
@Test
public void verifyCollaboration() {
    Stack<String> mockStack = mock(Stack.class);

    // do stuff
    mockStack.push("hi there!");
    mockStack.pop();

    // check what happened
    verify(mockStack).push("hi there!");
    verify(mockStack).pop();
}
```

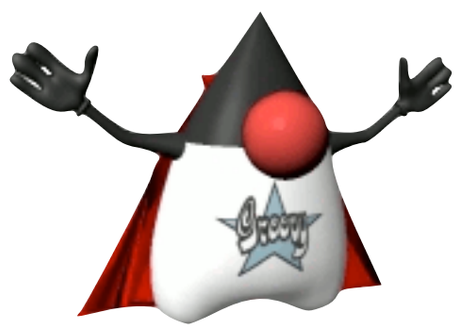
Verify interactions

DEMO

Better Testing - Parameterized Tests and Hamcrest Asserts

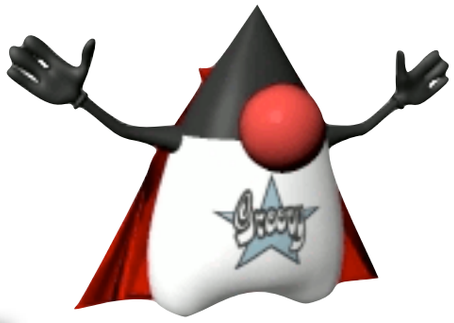
Better Testing

- Use innovative testing techniques
  - Groovy Testing
    - [x] Write more expressive unit tests in Groovy
    - [x] Expressive test code
    - [x] Quicker to write
    - [x] More incentive to write in-depth test cases
  - But
    - [x] Relatively limited IDE support...



Better Testing

- Use innovative testing techniques
  - Some examples...

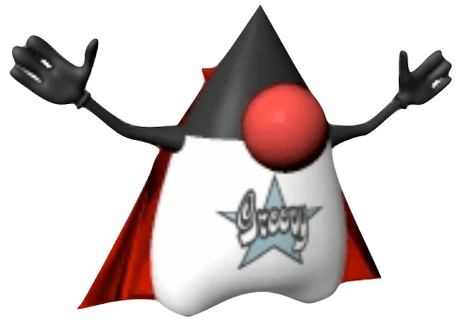



```
public class TaxCalculatorBusinessTest {

    private TaxCalculator calculator;

    @Before
    public void setup() {
        calculator = new TaxCalculatorImpl();
    }

    @Test
    public void shouldNotTaxLosses() throws InvalidYearException {
        BigDecimal tax = calculator.calculateIncomeTax(new BigDecimal("-100000"), 2009);
        assertThat(tax,is(new BigDecimal("0.00")));
    }
}
```

```
class GroovyTaxCalculatorBusinessTest {

    def calculator = new TaxCalculatorImpl()

    @Test
    void shouldNotTaxLosses() {
        def tax = calculator.calculateIncomeTax(-100000, 2009)
        assertThat tax,is(0.00)
    }
}
```

Better Testing

- Use innovative testing techniques
  - Some examples...

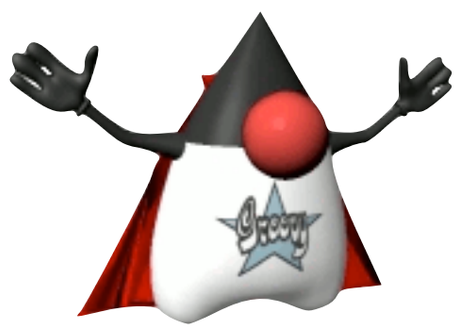



```
public class TaxCalculatorBusinessTest {

    private TaxCalculator calculator;

    @Before
    public void setup() {
        calculator = new TaxCalculatorImpl();
    }

    @Test(expected=InvalidYearException.class)
    public void shouldNotAcceptUnknownYears() throws InvalidYearException {
        calculator.calculateIncomeTax(new BigDecimal("100000"), 1901);
    }
}
```

```
class GroovyTaxCalculatorBusinessTest {

    final shouldFail = new GroovyTestCase().&shouldFail

    @Test
    void shouldNotAcceptUnknownYears() {
        shouldFail(InvalidYearException) {
            calculator.calculateIncomeTax(100000, 1901)
        }
    }
}
```

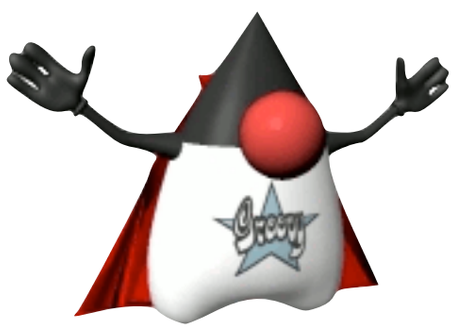
Better Testing

- Use innovative testing techniques
  - Behaviour-Driven Develpment
    - [x] It's not about writing tests
    - [x] TDD and BDD is about writing better code:
      - [x] Maintainable
      - [x] Flexible
      - [x] Reliable
      - [x] Simple



Better Testing

- Use innovative testing techniques
  - Behavior-Driven Develpment
    - BDD uses words like “should” to describe the desired behavior
      - “Should transfer money from account A to account B”
      - “Should deploy landing gear before touching ground”
      - ...



Better Testing

- Use innovative testing techniques
  - Enter Easyb
    - A BDD testing framework for Java
    - Make testing clearer and easier to write
    - Make tests self-documenting
    - Help developers focus on the requirements

Better Testing

- Use innovative testing techniques
  - Easyb stories:
    - ☑ Use a narrative approach
    - ☑ Describe a precise requirement
    - ☑ Can be understood by a stakeholder
    - ☑ Usually made up of a set of scenarios
    - ☑ Use an easy-to-understand structure:
      - *Given [a context]...*
      - *When [something happens]...*
      - *Then [something else happens]...*

Better Testing

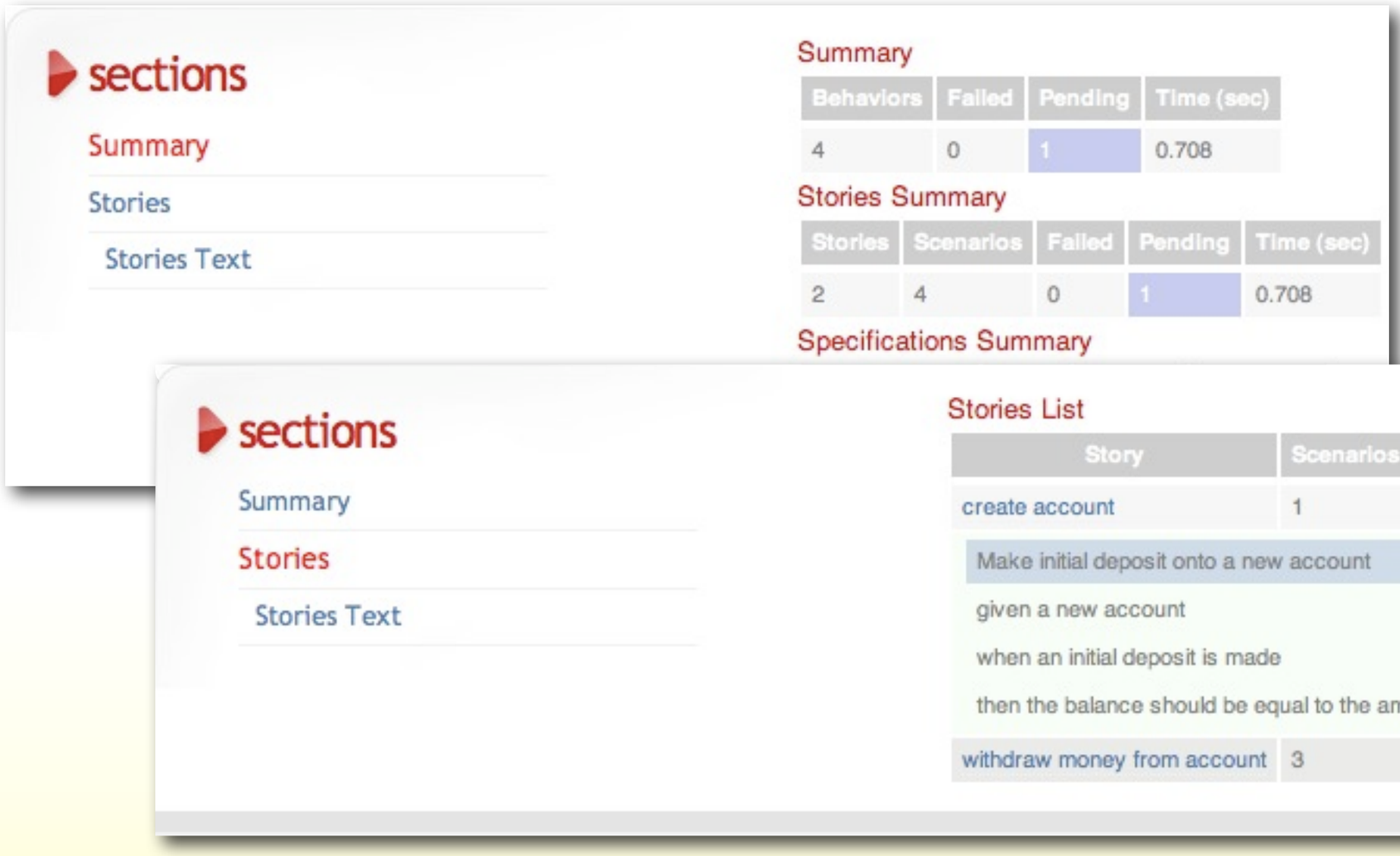
- Use innovative testing techniques
  - Enter Easyb
    - A Groovy-based DSL for Behaviour-Driven Development


```
import com.wakaleo.jpt.taxcalculator.InvalidYearException

scenario "Should not tax losses", {
     given "a correctly configured tax calculator",
      when "you calculate annual income tax for a negative income",
      then "the calculated tax should be zero",
}
```

```
import com.wakaleo.jpt.taxcalculator.InvalidYearException

scenario "Should not tax losses", {
     given "a correctly configured tax calculator", {
          calculator = new TaxCalculatorImpl()
     }
     when "you calculate annual income tax for a negative income", {
          tax = calculator.calculateIncomeTax(-10000, 2009)
     }
     then "the calculated tax should be zero", {
          assert tax == 0
     }
}
```

Better Testing

- Use innovative testing techniques
  - Easyb reporting
    - Simple but readable...



Better Testing

- Use innovative testing techniques
  - Continuous Testing
    - Run your tests whenever you save your code changes
    - Test failures are treated like compiler errors!
  - Two main tools:
    - Infinitest
    - JUnitMax

DEMO

Better Testing

- Use innovative testing techniques
  - Integration Test strategies
    - [x] Deploy to an embedded Jetty server for local integration tests
    - [x] Run local integration tests with a web testing tool
      - Selenium
      - HtmlUnit
      - JWebUnit
      - Canoo WebTest
    - [x] Deploy automatically to a publicly-visible integration server

Better Testing

- Web Testing Tools
  - Two strategies to developer web testing:
    - [x] Test before deployment
      - Use Jetty
      - Run web tests locally from within the normal build
    - [x] Test after deployment
      - Deploy to a test server
      - Run web tests against a remote server in a dedicated build job
  - You probably need both...

Better Testing

- Examples of Web Testing Tools
  - Selenium
    - Runs tests through a real browser
    - Accurate rendition of Javascript and AJAX behavior
    - High-level readable API
    - More complicated to set up
    - Slow

Better Testing

- Examples of Web Testing Tools
  - Selenium

```
@Test
public void testDepositAmount() throws Exception {
    Selenium selenium
        = new DefaultSelenium("localhost", 4444,
                              "*firefox",
                              "http://localhost:8080");
    selenium.start();
    selenium.open("/ebank-web");
    selenium.waitForPageToLoad("10000");
    selenium.type("depositAmount", "100");
    selenium.click("deposit");
    selenium.waitForPageToLoad("10000");
    selenium.isTextPresent("Current balance: $100");
}
```

Open up a web browser

These actions are executed in the browser

Better Testing

- Examples of Web Testing Tools
  - HTMLUnit
    - Simulates a browser
    - Lower level API
    - Easier to set up
    - Fast

Better Testing

- Examples of Web Testing Tools
  - HTMLUnit

```
@Test
public void depositCash() throws Exception {
    WebClient webClient = new WebClient();
    HtmlPage page = webClient.getPage("http://localhost:8080/ebank-web");
    assert page.asText().contains("Current Balance: $0");
    HtmlForm form = page.getForms().get(0);
    HtmlSubmitInput depositButton = form.getInputByName("deposit");
    HtmlTextInput textField = form.getInputByName("depositAmount");

    textField.setValueAttribute("100");

    HtmlPage result = depositButton.click();
    assert result.asText().contains("Current Balance: $100");
}
```

Simulates the browser

Requires knowledge of the page structure

Better Testing

- Examples of Web Testing Tools
  - JWebUnit
    - Simulates the browser (build on HTMLUnit)
    - Higher and more readable API
    - Easy to set up
    - Fast

Better Testing

- Examples of Web Testing Tools
  - JWebUnit

Simulates a browser

```
public class TestDepositStoryUI extends  WebTestCase {
   public void testDepositingCashShouldAddToBalance() {
      setBaseUrl("http://localhost:9090/ebank-web");
      beginAt("/");
      assertTextPresent("Current Balance: $0");
      setTextField("depositAmount","100");
      clickButtonWithText("deposit");
      assertTextPresent("Current Balance: $100");
   }
```

High-level API

DEMO

Better Testing - Web Testing

Automated Code Quality

- Why use code quality metrics
  - Better quality code
  - Code is easier to maintain
  - Detect potential bugs
  - Train new staff

Automated Code Quality

- Why automate code quality metrics
  - Global picture of code quality
  - Statistical code quality trends
  - More value-added manual reviews

Automated Code Quality

- How automate code quality metrics
  - Integrate code quality metrics into your build scripts
  - Run a special build reserved for code metrics
  - TIP: Code quality metrics are easier with Maven!

Automated Code Quality

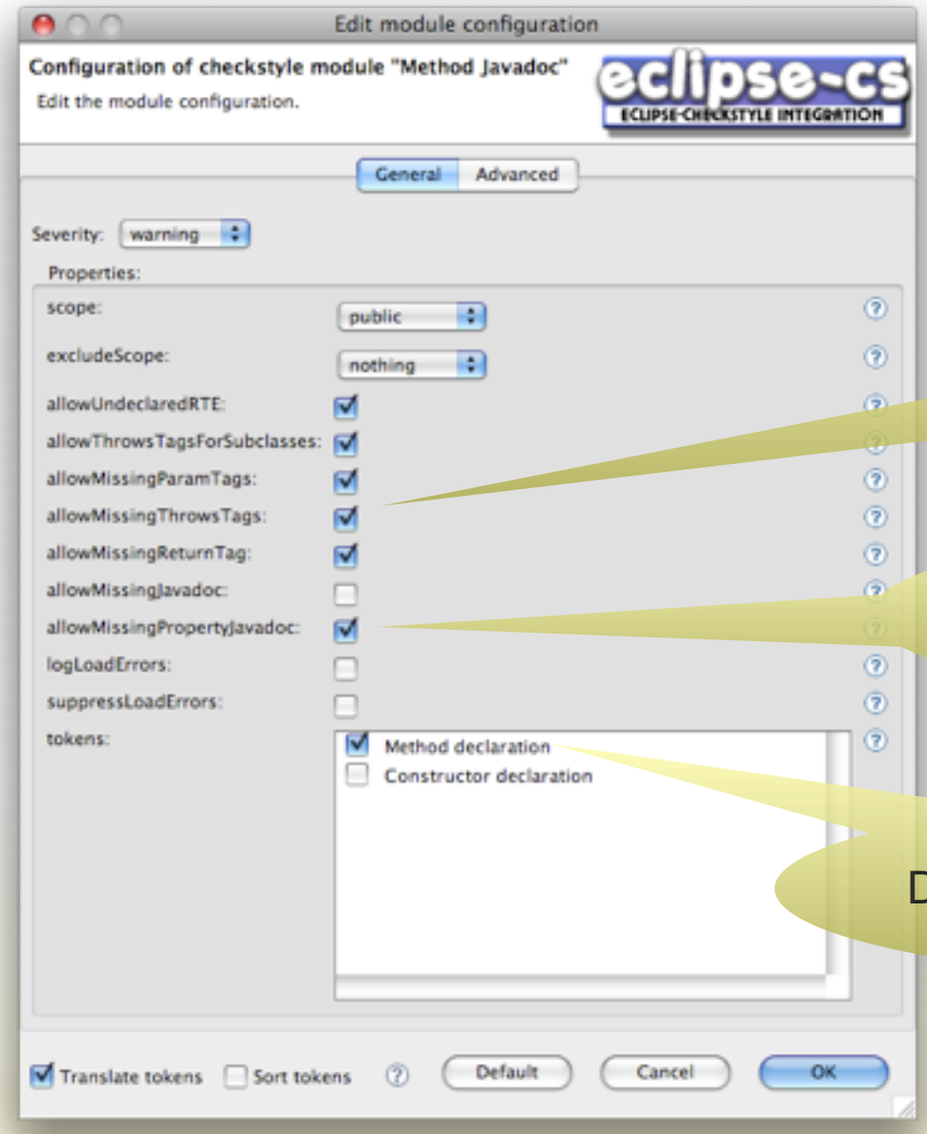
- Types of code quality metrics
  - Coding Standards
    - Naming conventions, Javadoc comments, layout,...
    - Tool: **Checkstyle**
  - Best Practices
    - Good programming habits, potential bugs,...
    - Tools: **Checkstyle**, **PMD**, **Findbugs, Crap4j**
  - Bug Detection
    - Broken code, dangerous code, bugs,...
    - Tool: **FindBugs**
  - Code Coverage
    - How much code is executed by your tests
    - Tool: **Cobertura**, **Emma**, **Clover**,**Crap4j**...

Automated Code Quality

- Coding standards - how far do you go?
  - Customize for your organization!
    - Configure rules to match your practices
    - Remove rules that don't apply
    - Add non-default rules where useful

Automated Code Quality

- Coding standards - how far do you go?
  - Example - Checkstyle javadoc conventions



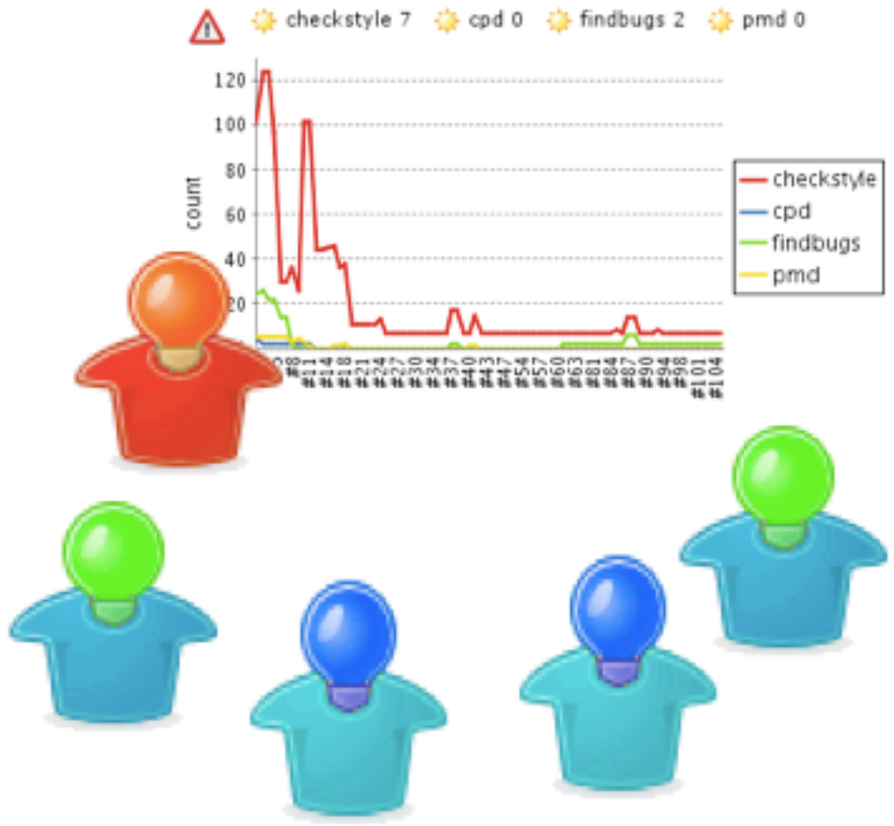
Don't worry about @param, @return etc.

Don't worry about getters and setters

Don't enforce for constructors

Automated Code Quality

- Team code reviews
  - Review code as a group
  - Long and slow if done manually
  - Benefits greatly from the use of tools

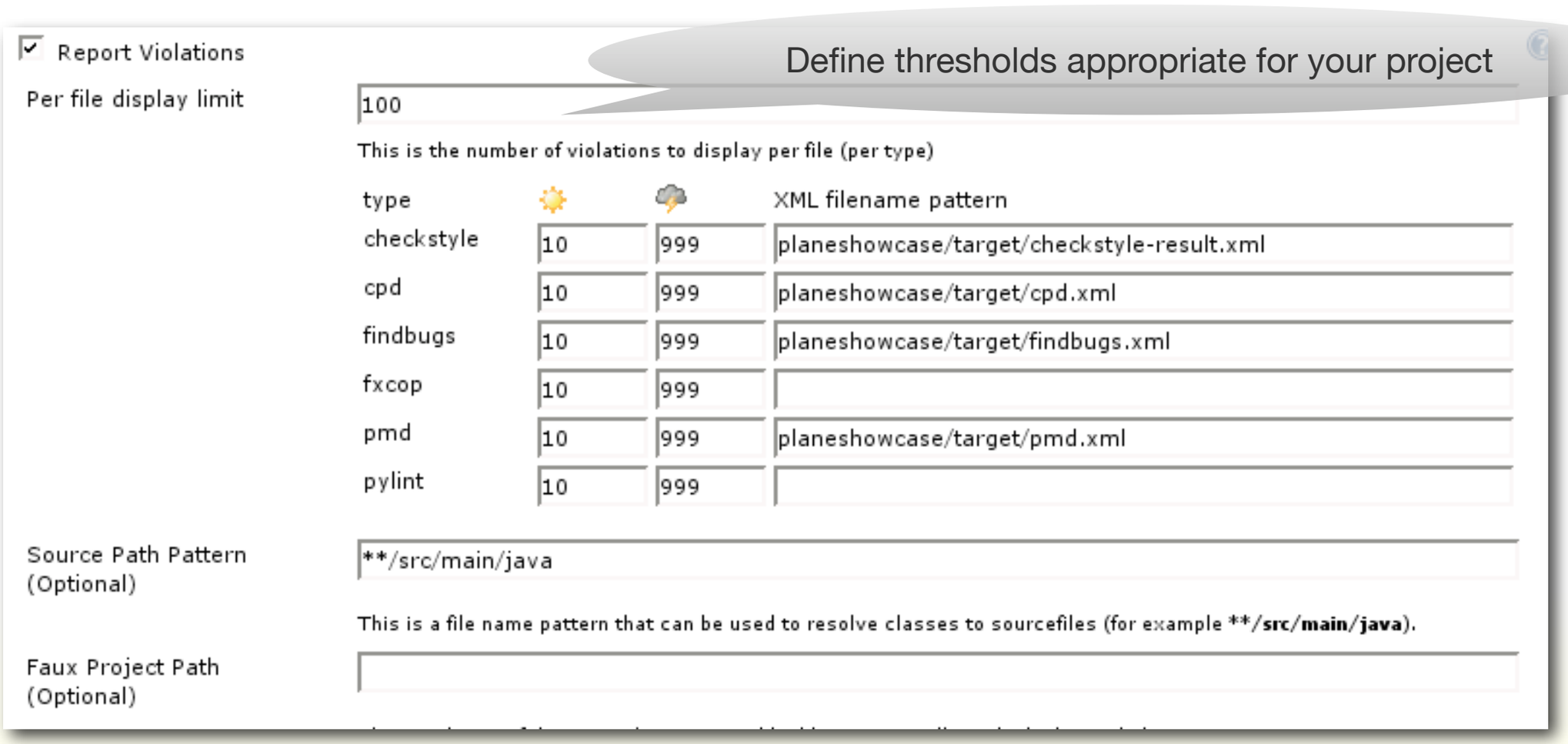


Automated Code Quality

- Automating code quality metrics with Hudson
  - Using the Violations plugin
    - Reports on Checkstyle, PMD, Findbugs, and others
    - Uses data generated with Maven or Ant

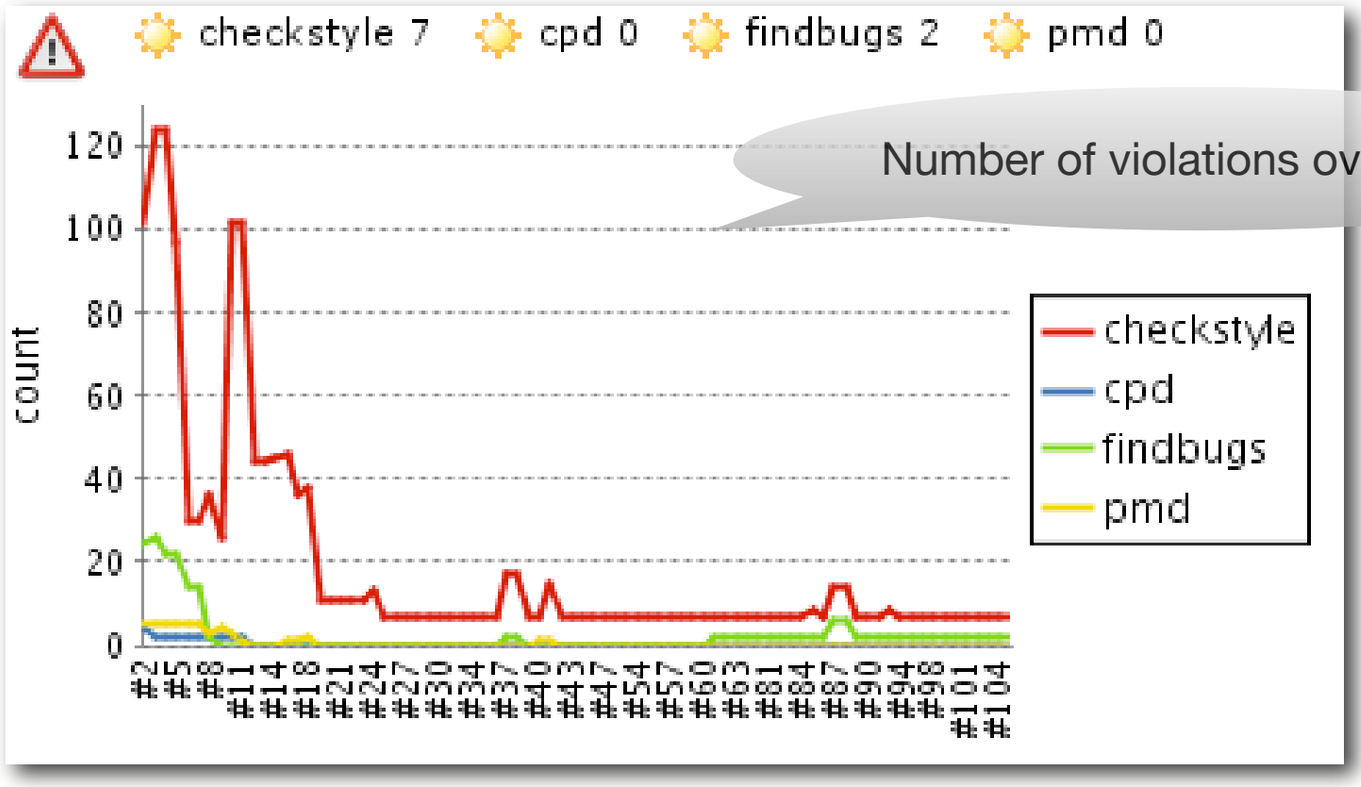
Automated Code Quality

- Automating code quality metrics with Hudson
  - Configuring the Violations plugin



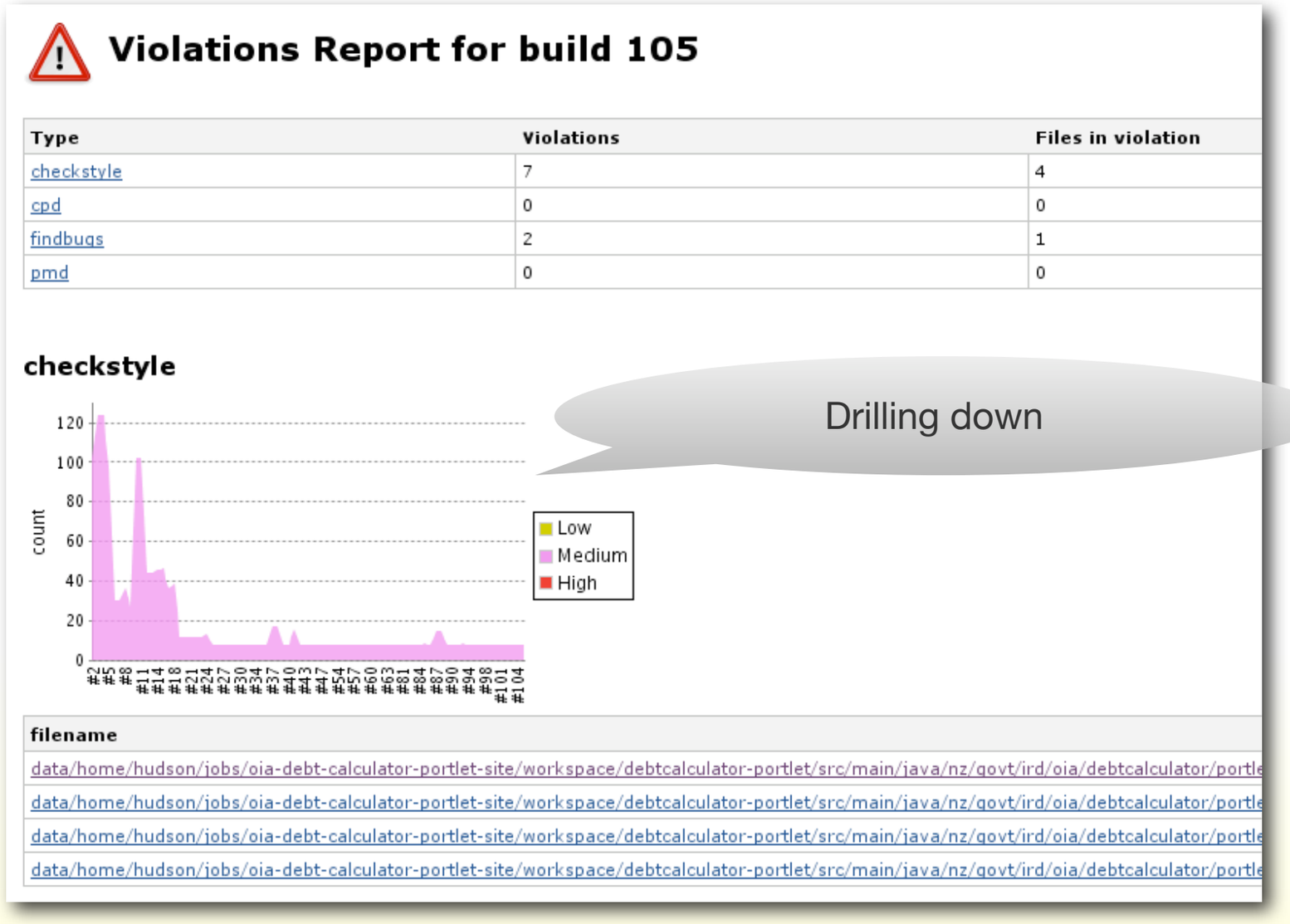
Automated Code Quality

- Automating code quality metrics with Hudson
  - Displaying the Violations reports



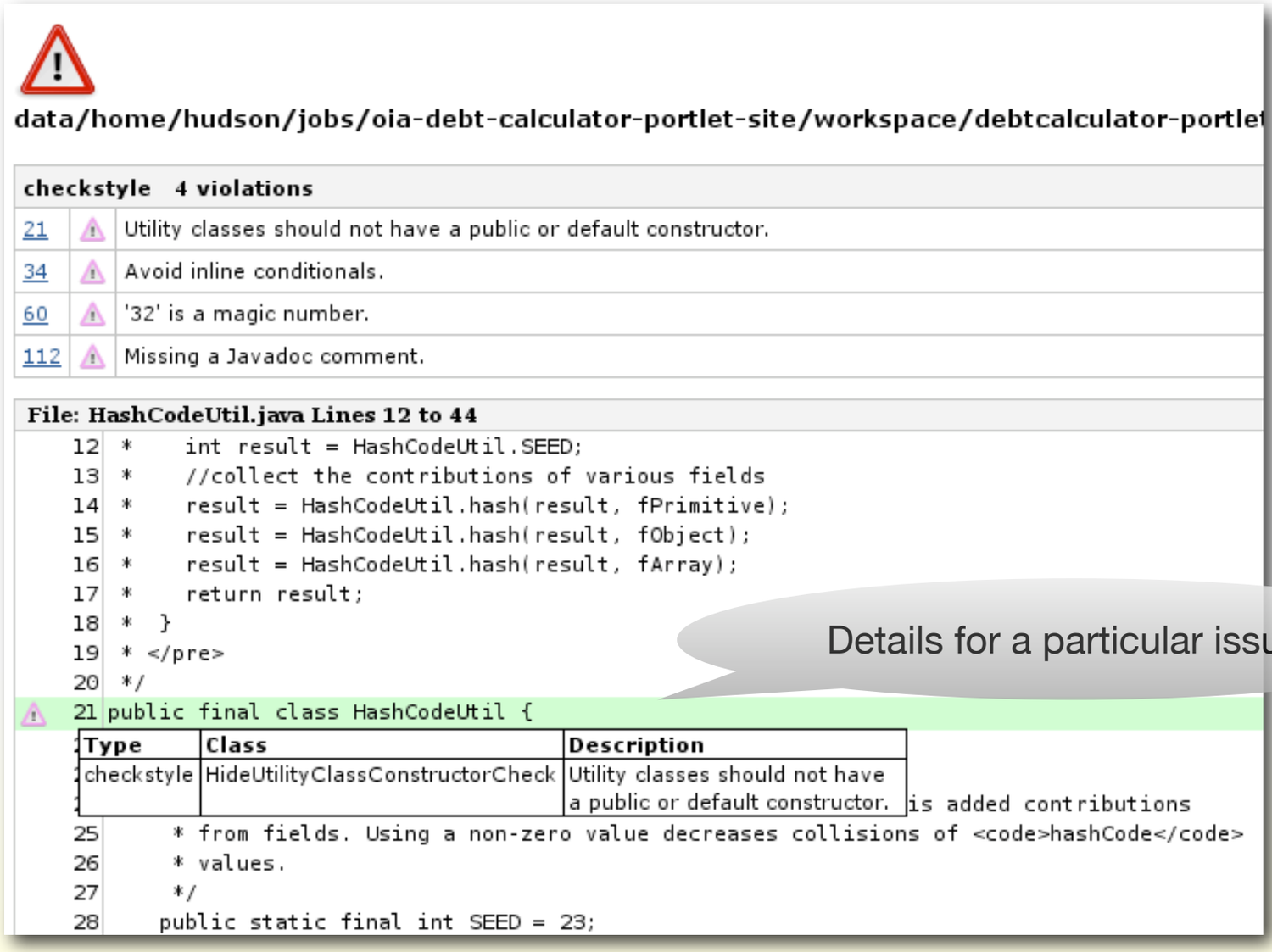
Automated Code Quality

- Automating code quality metrics with Hudson
  - Displaying the Violations reports

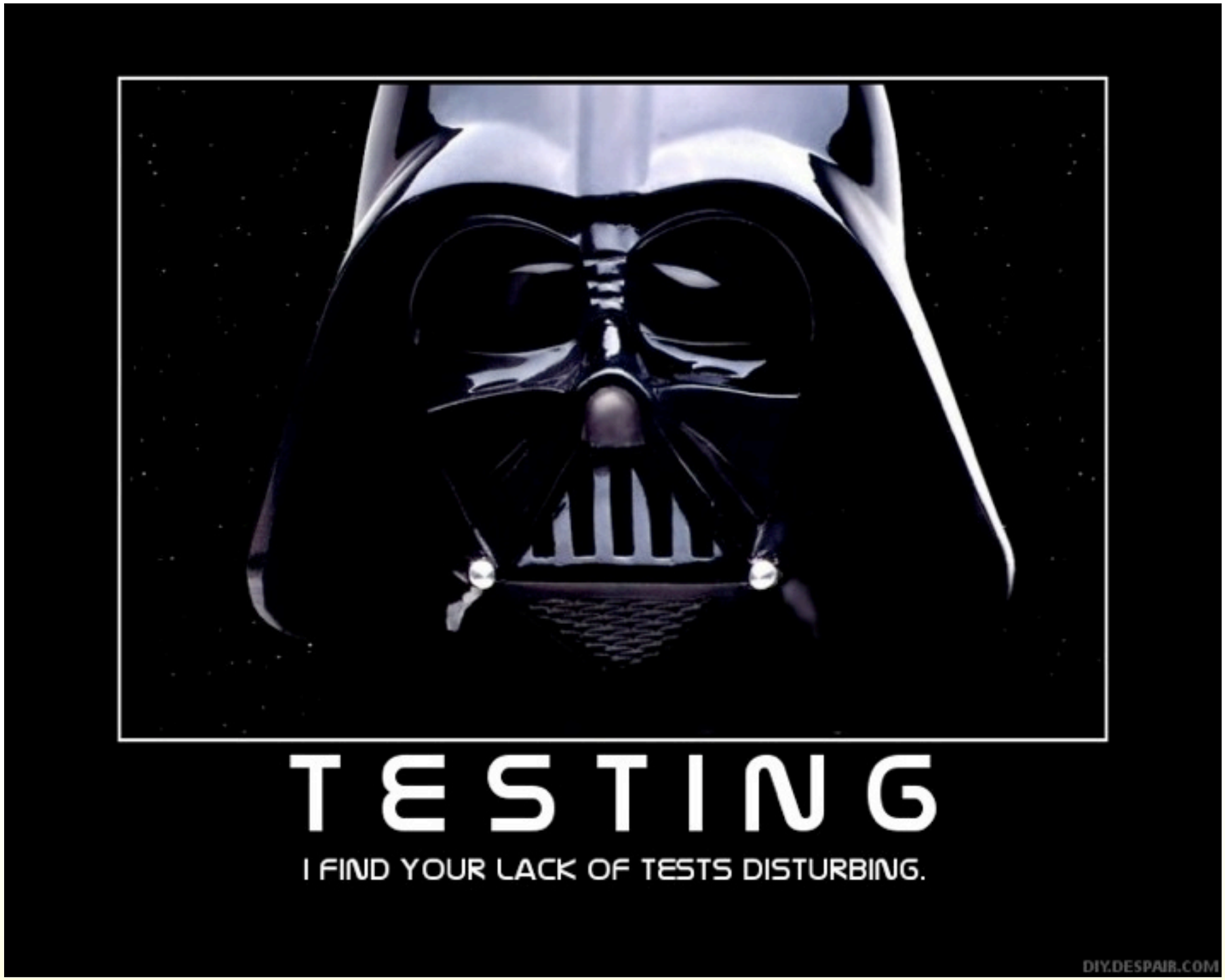


Automated Code Quality

- Automating code quality metrics with Hudson
  - Displaying the Violations details



Automated Code Quality

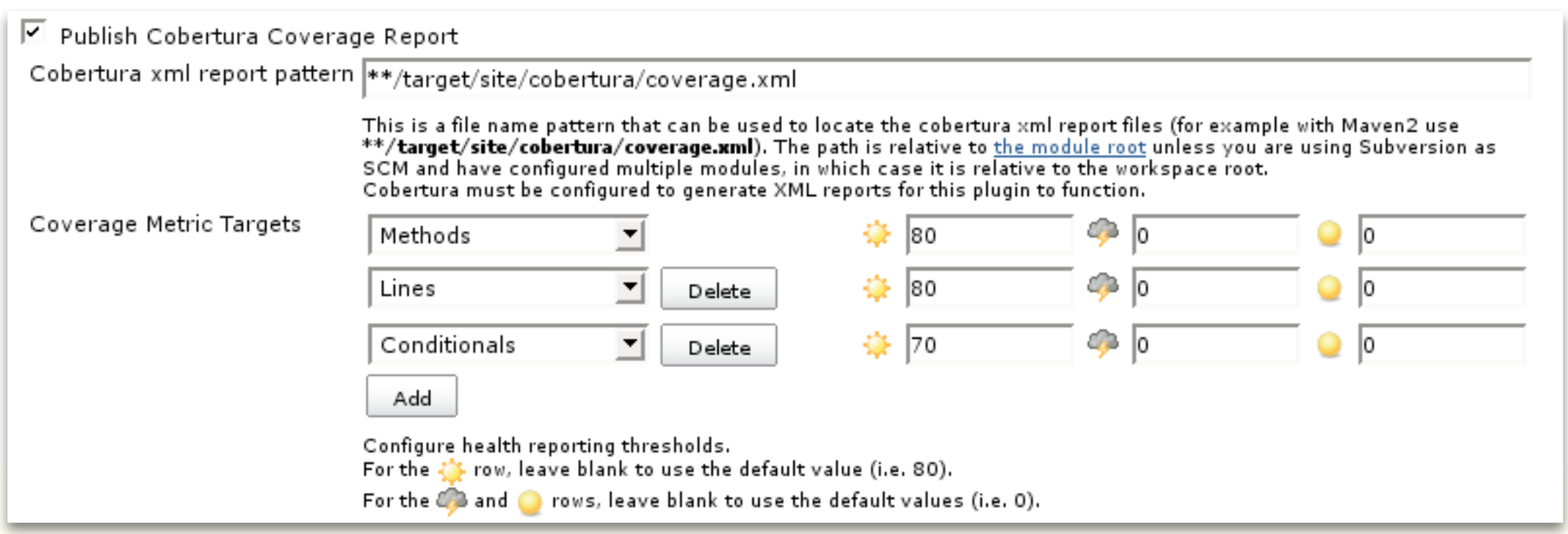


Automated Code Quality

- Code Coverage
  - What can code coverage metrics tell you:
    - Indicates what code is being executed by your unit tests.
    - Can help isolate untested code
    - Does not guarantee that the tests that are run are of high quality
    - Can be an indicator of whether tests are being written at all

Automated Code Quality

- Code Coverage
  - Using the Hudson code coverage plugins
    - ☑ Generate data using Ant or Maven
    - ☑ Report coverage metrics in Hudson



Automated Code Quality

- Code Coverage
  - Using the Hudson code coverage plugins
    - Cobertura coverage reports

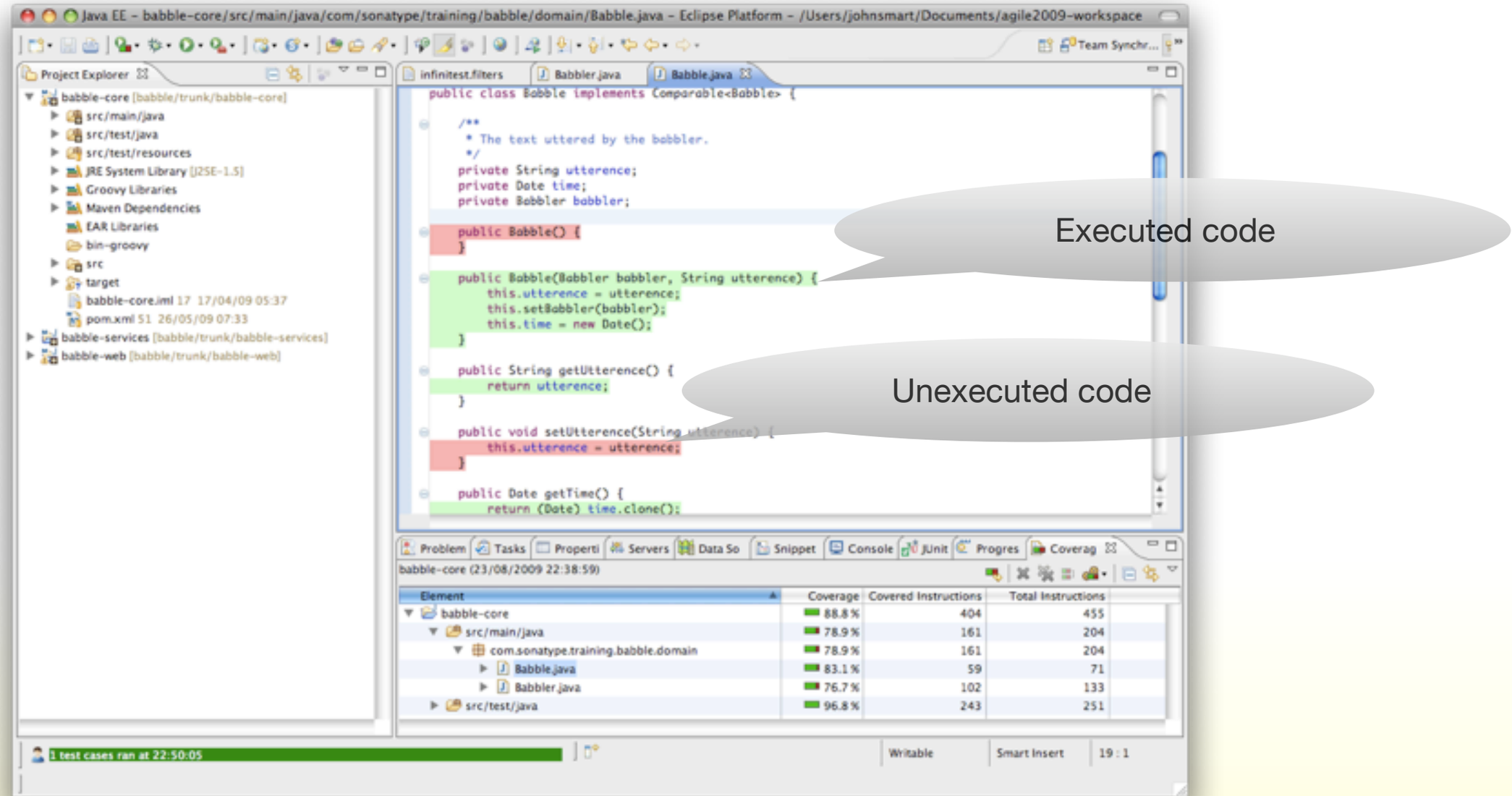
```
43        */
44       public Manifest getManifest() {
45   3       if (manifest == null) {
46   0           loadMetaInf();
47           }
48   3       return manifest;
49       }
50
51       public void setManifest(Manifest manifest) {
52   0       this.manifest = manifest;
53   0   }
54
55       public ServletContext getContext() {
56   0       return context;
57       }
58
59       public void setContext(ServletContext context) {
60   3       this.context = context;
61   3   }
62
63       /**
64        * Load the META-INF file.
65        */
66       public void loadMetaInf() {
67   3       String appServerHome = context.getRealPath("/");
68   3       File manifestFile = new File(appServerHome, "META-INF/MANIFEST.MF");
```

Executed code

Unexecuted code

Automated Code Quality

- Code Coverage
  - Using the ECLEclipse plugin

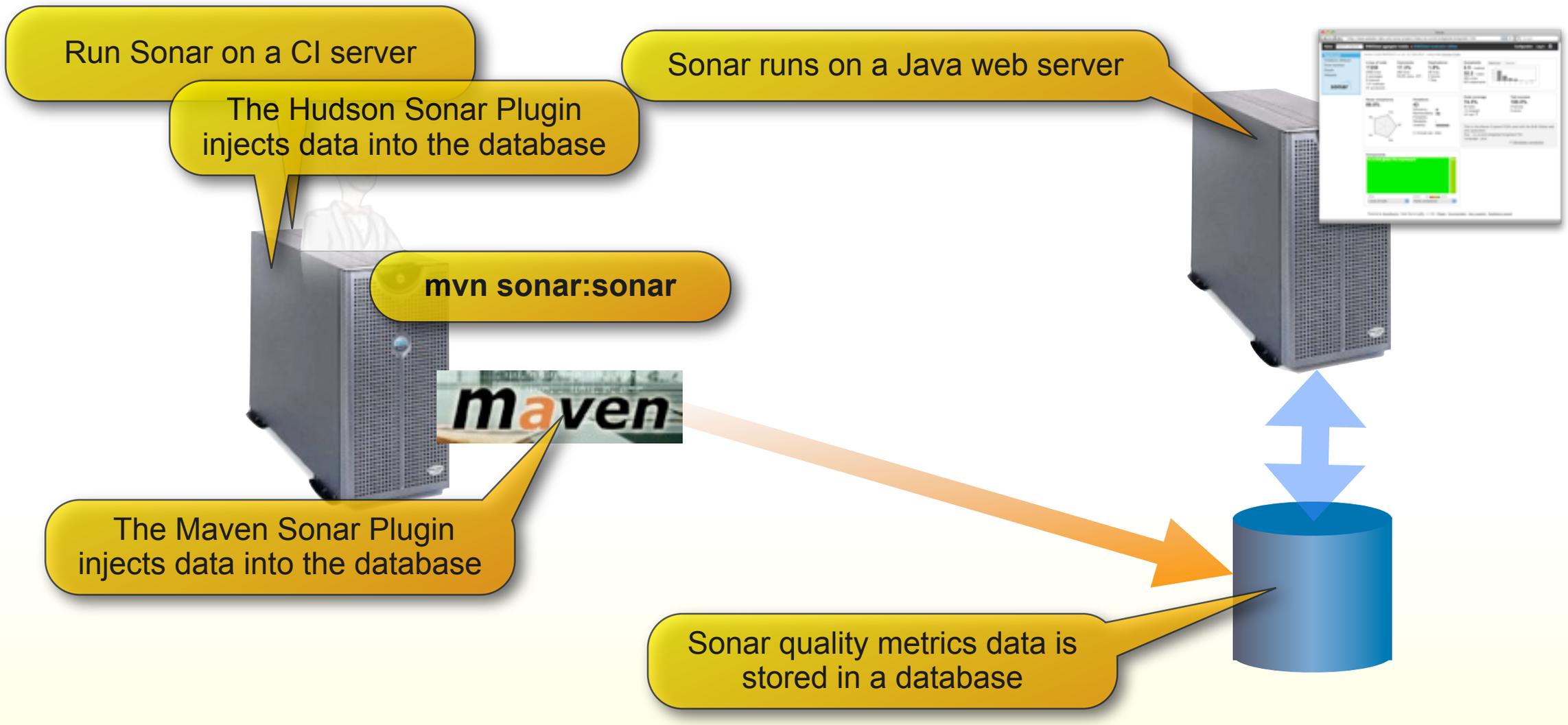


Automated Code Quality

- Code Quality Management
  - Check out Sonar!
    - Centralized code quality management
    - Generate code quality metrics in an automated build using Maven
    - Store code quality metrics in a database
    - Code quality metrics can be consulted on a web site

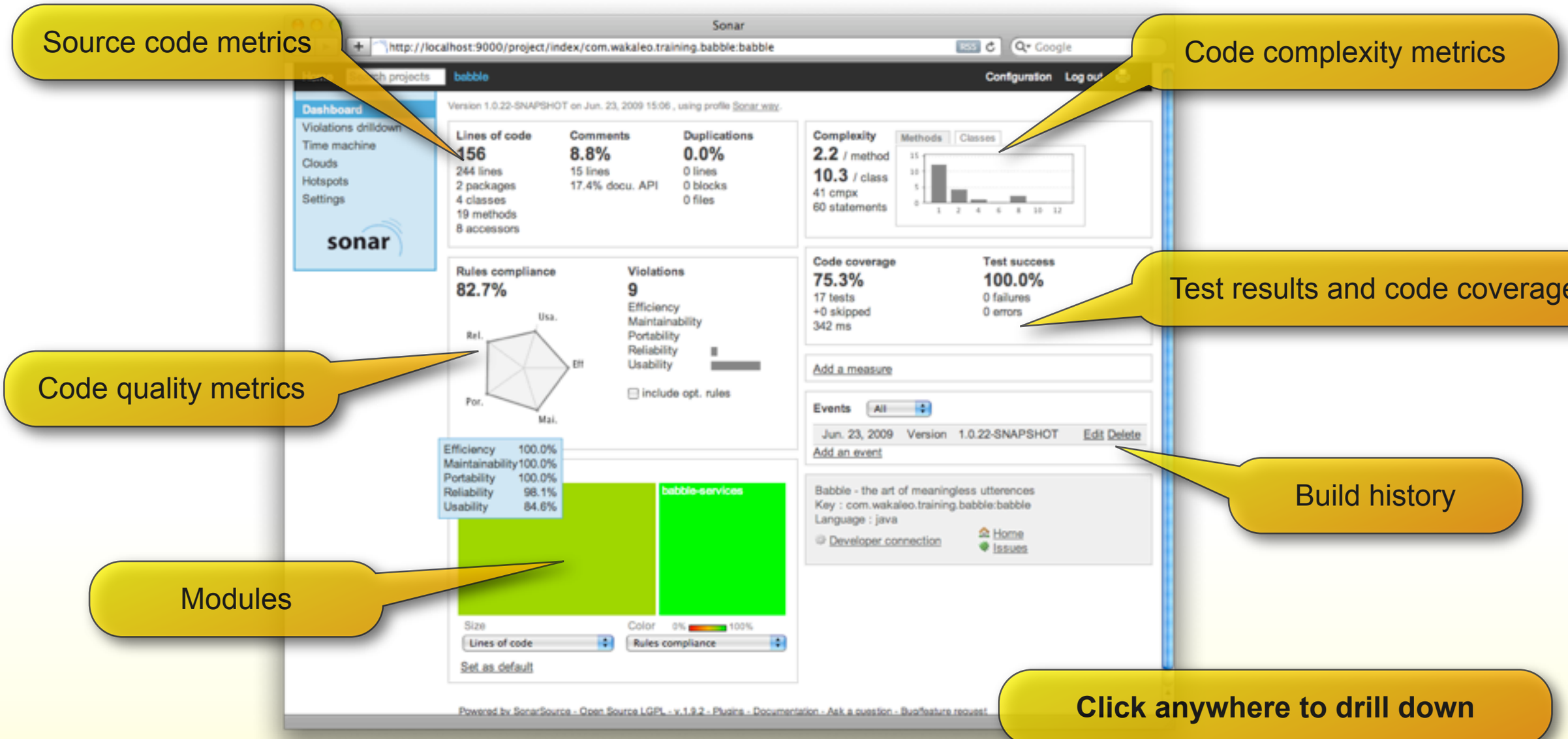
Automated Code Quality

- Code Quality Management
  - Sonar architecture



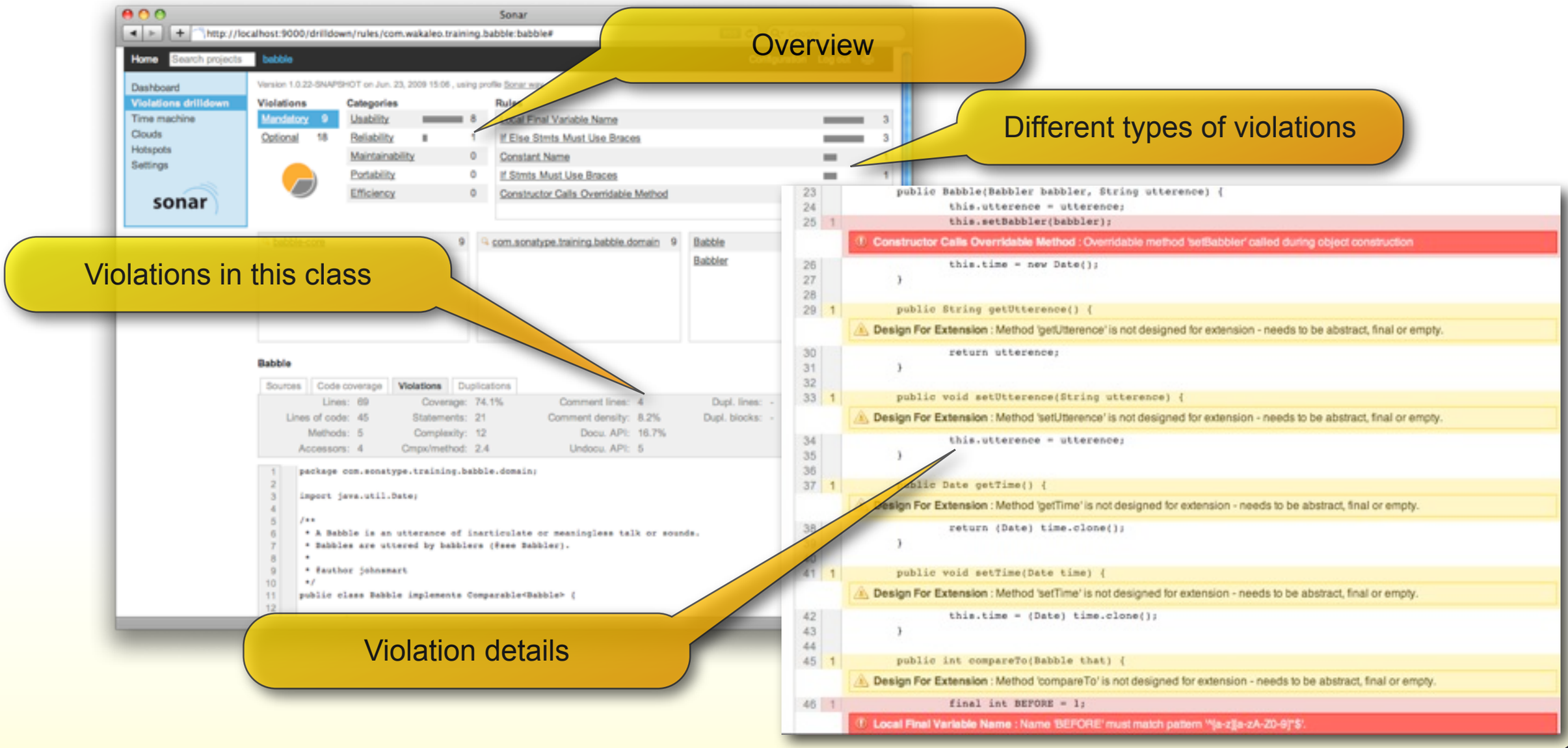
Automated Code Quality

- Code Quality Management
  - Sonar centralizes many code quality metrics



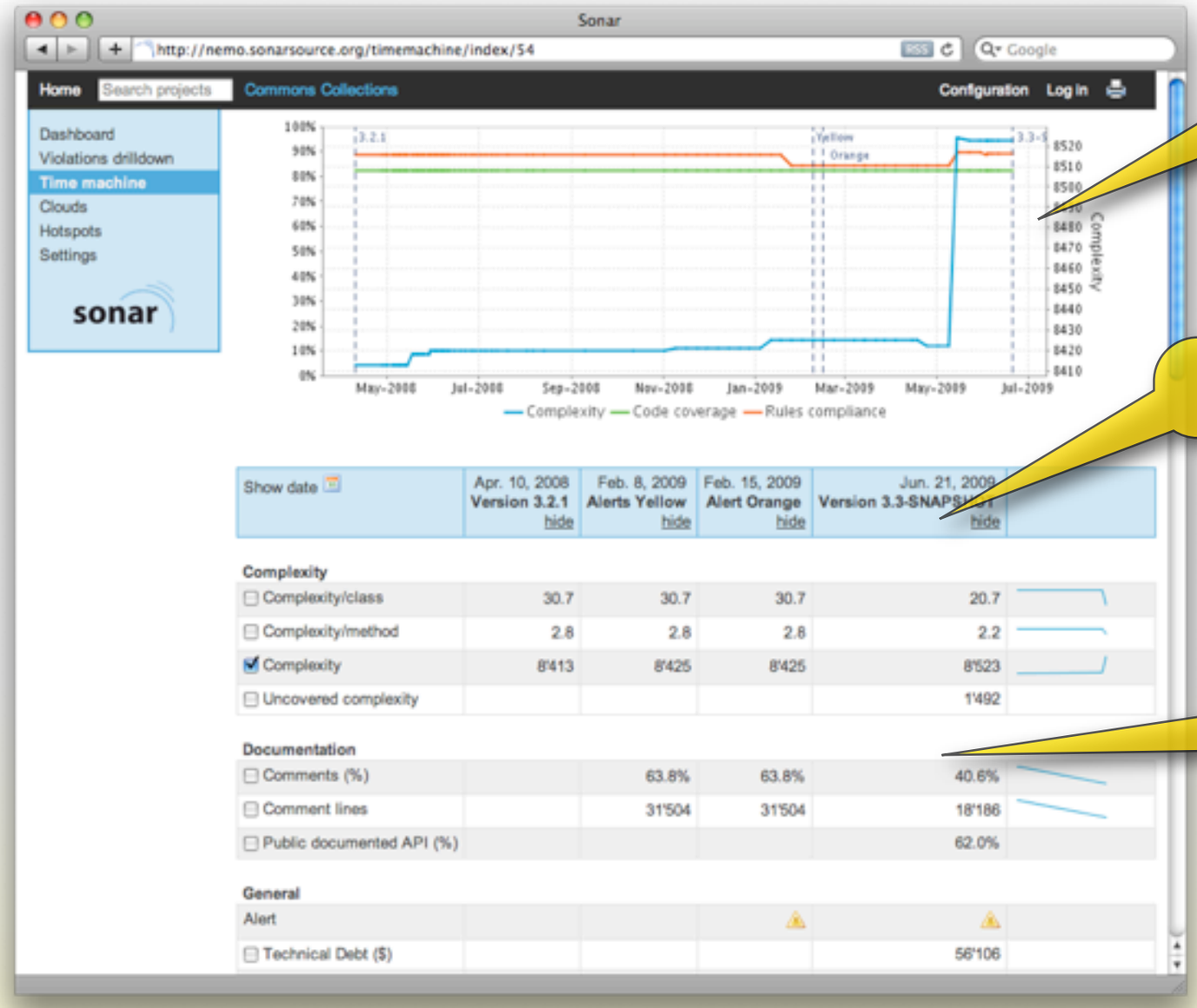
Automated Code Quality

- Code Quality Management
  - You can drill down to view the details for each type of issue



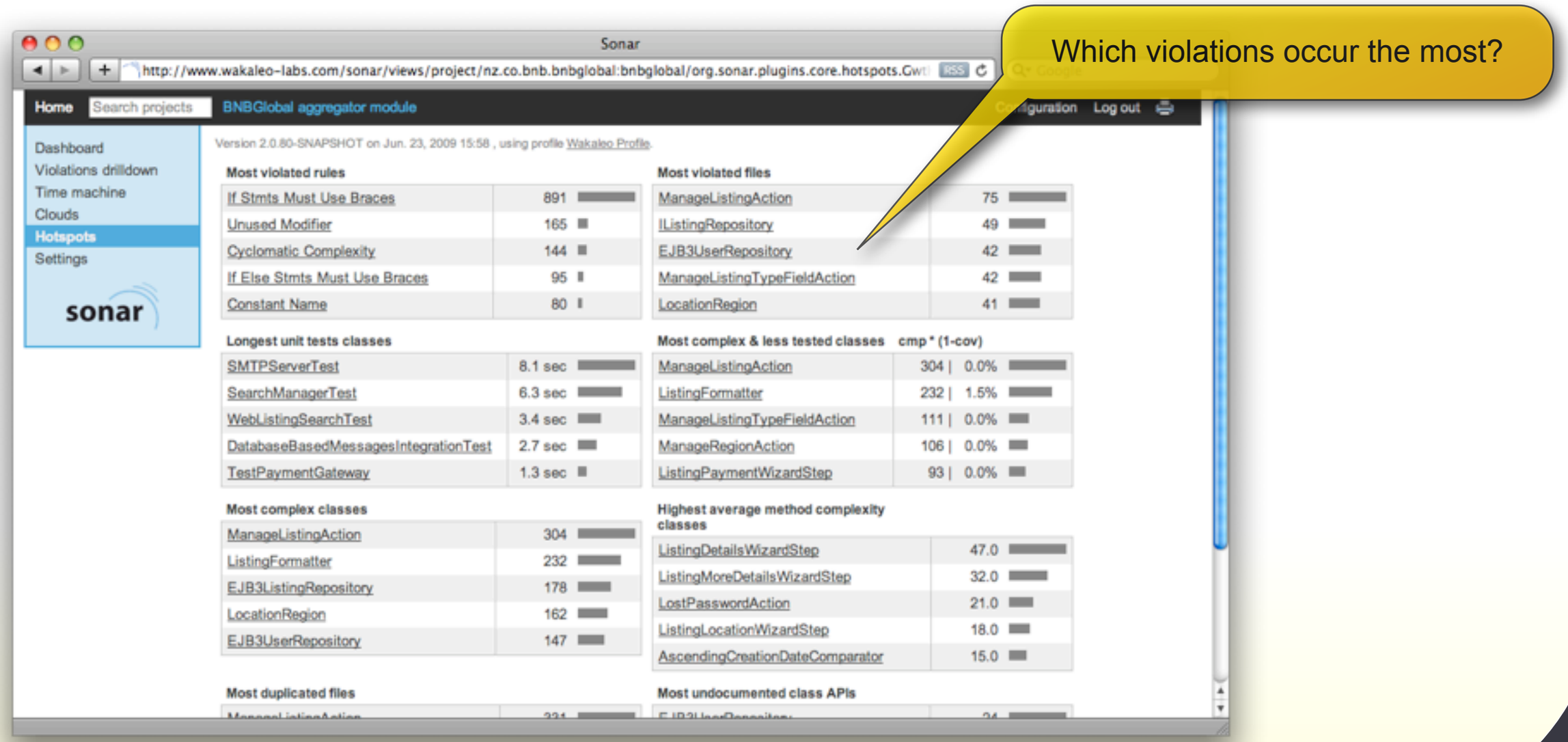
Automated Code Quality

- Code Quality Management
  - You can also view historical data



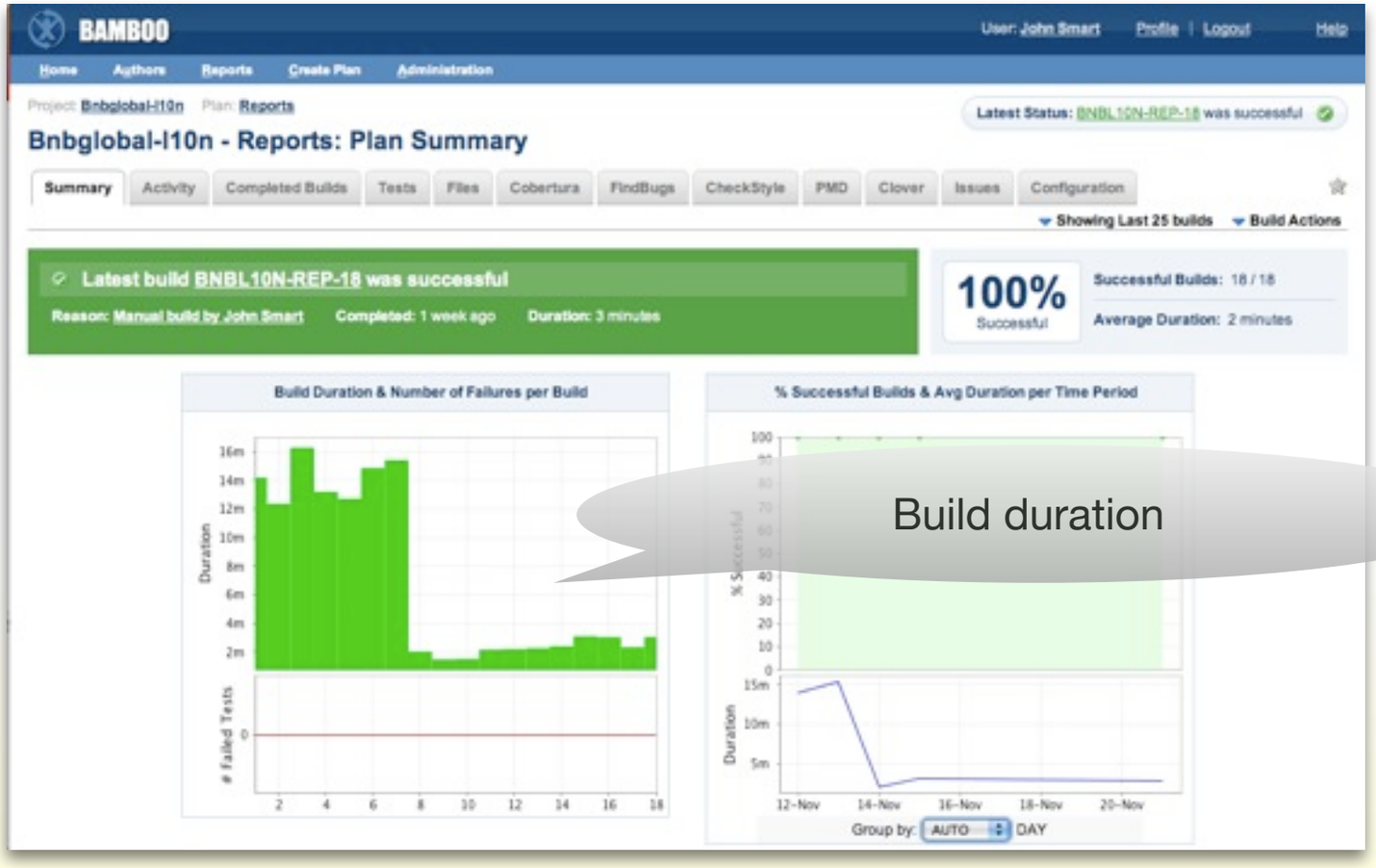
Automated Code Quality

- Code Quality Management
  - You can also view historical data



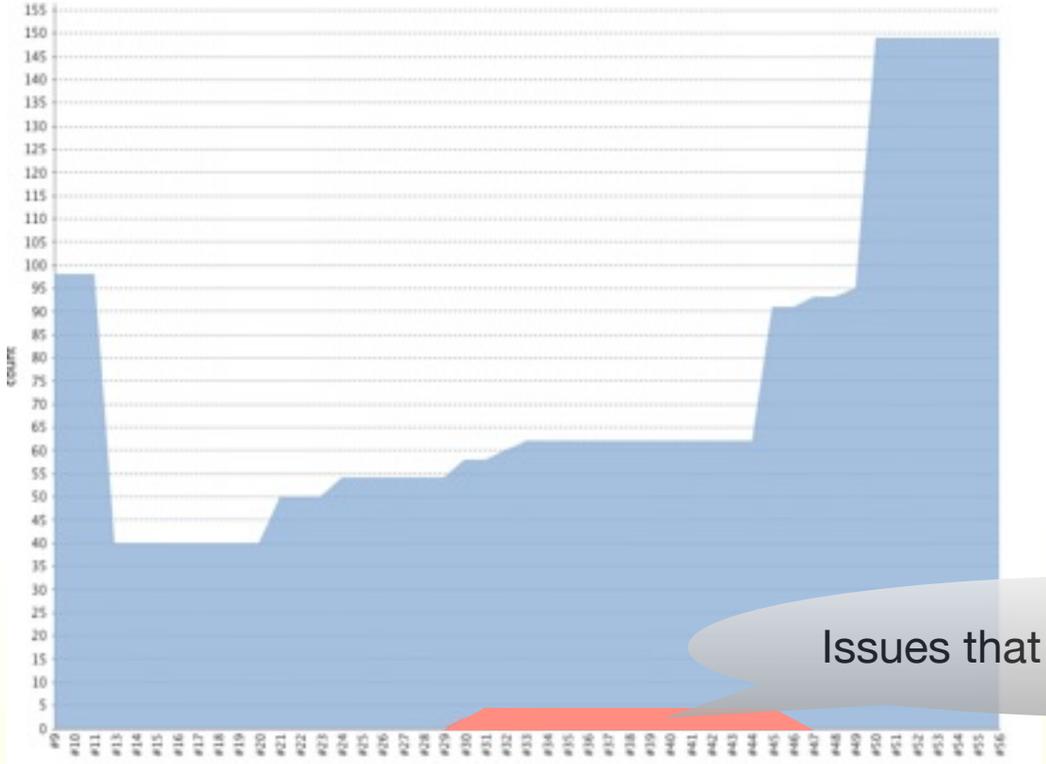
Automated Code Quality

- More advanced code quality metrics
  - How long do your tests run
    - Overly-long tests slow down your build process
    - They may also indicate a performance issue



Automated Code Quality

- More advanced code quality metrics
  - Are your tests failing repeatedly
    - ☑ May indicate a difficult technical issue
    - ☑ Could result in unreliable “quick-fix” solutions



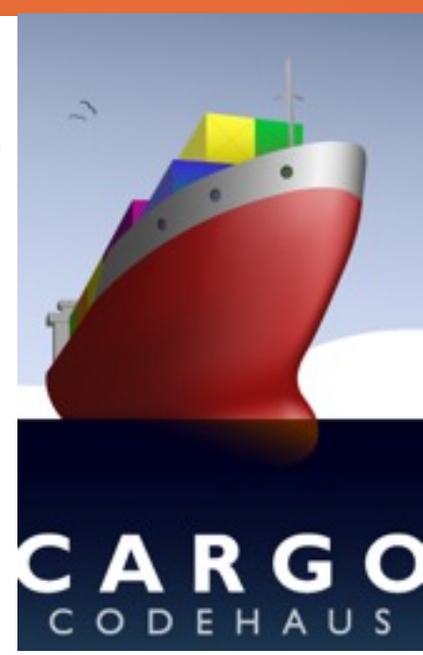
DEMO

Automated Code Quality

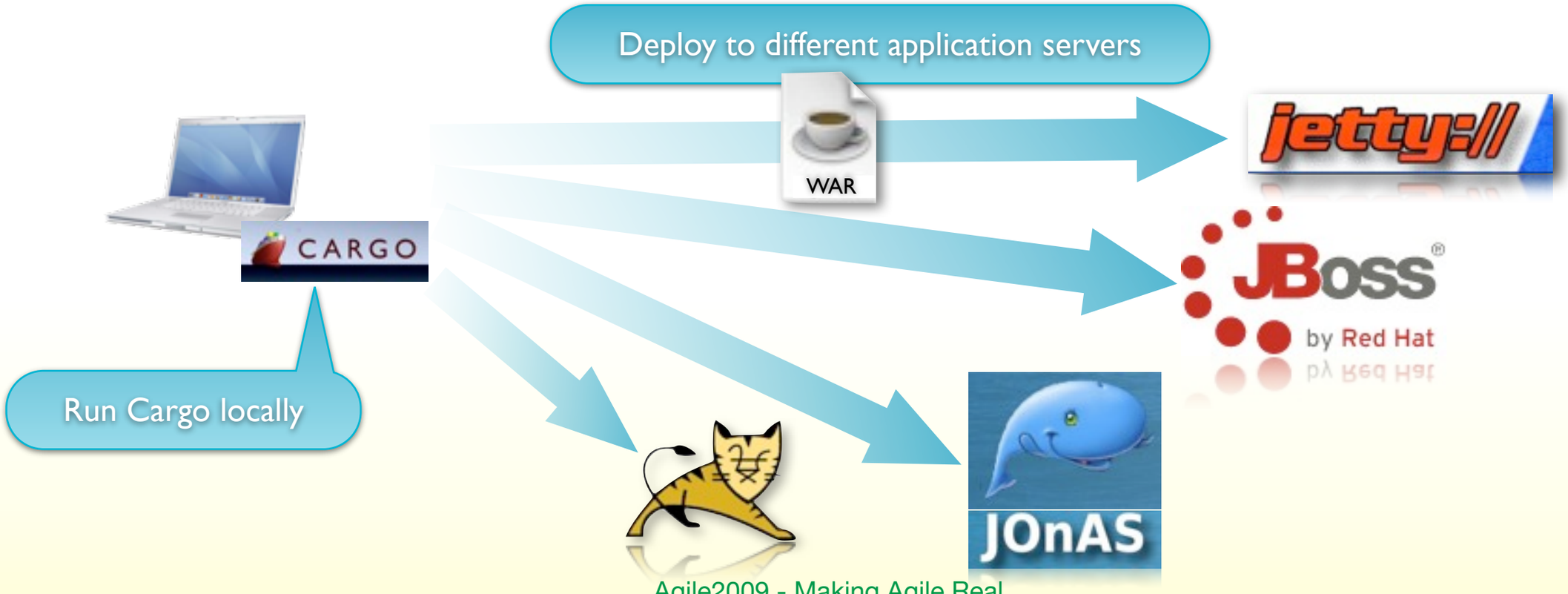
Automated Deployment

- Automate your deployment process
  - Reproducible process
  - Save time
  - Audit trace

Automated Deployment



- Automating the deployment process with Cargo
  - Start, stop and install application servers
  - Deploy to different application servers
  - Run a stand-alone instance
  - Or deploy to an existing server

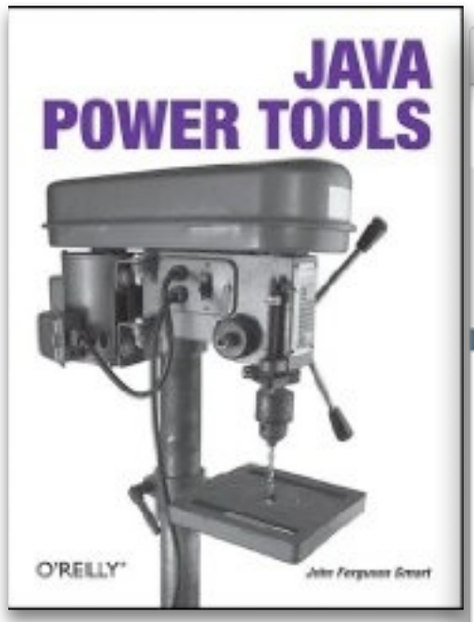


Summary

- There are many ways to improve a development process
  - Improve your build process and dependency management
  - Install a CI server and publish your APIs automatically
  - Use code quality metrics to isolate bottlenecks and fix problems
- Automate as much as possible!

John Ferguson Smart
Email: john.smart@wakaleo.com
Web: http://www.wakaleo.com
Twitter: wakaleo

Thanks for your attention!



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