Making Agile Real

Executable requirements: BDD with easyb and JDave

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Presentation Goals

Principles and Practices of Behavior-Driven Development
See two Java BDD frameworks in action: EasyB and JDave
See Lasse and John fight it out to see prove which is best

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

Speaker's qualifications

- **Lasse Koskela**
  - (Also) Consultant, Trainer, Mentor, Author,...
  - (Also) Works with Enterprise Java, Web, and Open Source technologies
  - Author of 'Test Driven' (Manning)
  - Long-time contributor and moderator at JavaRanch
  - Frequent speaker at conferences like this

Agenda

- What will we cover today
  - What is Behavior-Driven Development (BDD)?
  - Introducing two BDD frameworks for Java: **easyb** and **JDave**
  - See how they cope with different BDD use cases:
    - ☑ Testing simple requirements
    - ☑ Handling fixtures and refactoring tests
    - ☑ SDLC integration and reporting
    - ☑ IDE integration

Test Driven Development

- Principles of Test-Driven Development (TDD)
  - Remember: It's not (just) about writing tests
    - Design and write better code
    - Refactor with confidence
  - Although TDD vocabulary uses the word "test" a lot...

Behavior Driven Development

- Behavior Driven Development (BDD)
  - A better vocabulary for teaching TDD
  - Uses words like “should” to describe the desired behavior, e.g.
    - “shouldDoThis”
    - “shouldBeThat”

Behavior Driven Development

- Behavior Driven Development (BDD)
  - Two main styles:
    - “TDD done right”
    - “Executable requirements”

BDD using plain old JUnit

- Can you do BDD with ordinary JUnit tests?
  - Yes!
  - Is it ideal? Not really...

```
package org.ebank.domain;

import org.junit.Test;
import static org.junit.Assert.assertTrue;
import java.math.BigDecimal;

public class AccountTest {

    @Test
    public void balanceShouldBeEqualToInitialDepositAfterInitialBalance() {
        Account account = new Account();
        BigDecimal initialAmount = new BigDecimal("100");
        account.makeDeposit(initialAmount);
        assertTrue(account.getBalance().equals(initialAmount));
    }
}
```

Lots of “boiler-plate” code

Long method names

Cumbersome asserts

Can do better?

BDD Frameworks for Java

- Use a BDD testing framework
  - Make testing clearer and easier to write
  - Make tests self-documenting
  - Help developers focus on the requirements

Introducing our BDD frameworks

- Choices, choices...
  - **Easyb**
    - Groovy-based BDD testing framework
    - Uses a Groovy DSL to express BDD specifications
    - Also works with Groovy and Grails
    - “Executable Requirements”
  - **JDave**
    - Java-based BDD testing framework
    - Extends JUnit, yielding excellent IDE support
    - Tight integration into mock objects
    - “TDD Done Right”™

Introducing Easyb

- Easyb use a narrative approach:
  - Stories describe a precise requirement
  - They can (usually) be understood by a stakeholder
  - A story contains a set of scenarios
- Scenarios use an easy-to-understand structure:
  - Given [a context]...
  - When [something happens]...
  - Then [something else happens]...

BDD in Action

- A sample application - online banking
  - Start by defining the behavior!

User Story 1 - Opening a bank account

As a customer, I want to open a bank account so that I can put my money in a safe place.

User Story 2 - withdraw money

As a customer, I want to open a bank account so that I can put my money in a safe place.

Task
Open new account

Task
Make initial deposit

Task
Withdraw money

BDD in Action

- A sample application - online banking
  - Tasks are at the heart of our BDD stories

Task – Make initial deposit onto a new account

given "a newly created account"

when "an initial deposit is made into this account"

then "the account balance should be equal to the amount deposited".

Easyb in Action

- Writing an easyb story
  - Start with the task...making an initial deposit

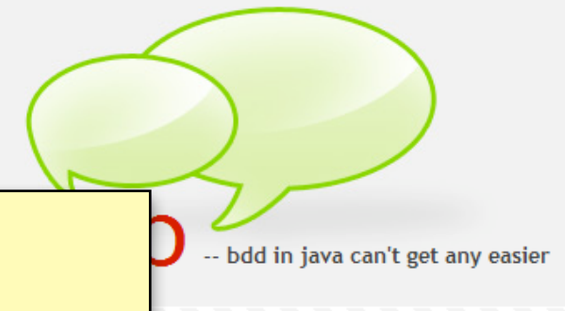
Task – Make initial deposit onto a new account
given "a newly created account" when "an initial deposit is made into this account" then "the account balance should be equal to the amount deposited".

```
scenario "Make initial deposit onto a new account", {
    given "a newly created account"
    when "an initial deposit is made into this account"
    then "the account balance should be equal to the amount deposited"
}
```

A valid easyb scenario!

Easyb in Action

- Anatomy of an easyb story




```
scenario "Make initial deposit onto a new account", {
    given "a newly created account"
    when "an initial deposit is made into this account"
    then "the account balance should be equal to the amount deposited"
}
```

- "**Scenario**": corresponds to precise requirement
- "**Given**": the context in which this requirement applies
- **"When"**: An event or action
- **"Then"**: The expected results of this action

Easyb in Action

- Implementing the scenario
  - Tests are written in Groovy
  - Can use all Java classes and APIs


```
package org.ebank.domain

scenario "Make initial deposit onto a new account", {
    given "a new account",{
       account = new Account()
    }
    when "an initial deposit is made", {
       initialAmount = 100
       account.makeDeposit(initialAmount)
    }
    then "the balance should be equal to the amount deposited", {
        account.balance.shouldBe initialAmount
    }
}
```

Automatic handling of BigDecimals

Readable assertions

Introducing JDave

- Pure JUnit 4 extension
- JDave uses a structural approach:
  - Inner classes represent scenarios we call “contexts”
  - One test class often contains a set of contexts
- Programmers can use inheritance to describe similar contexts concisely
- The structure forms a narrative of specified behavior:
  - (class) Specifying Http Caching...
  - (context) When Incoming Request Is For Static Content...
  - (specification) ...Caching Headers Are Set

JDave in Action

- Implementing the bank deposit scenario
  - Tests are written in pure Java
  - Can use all Java APIs and language features


```
package org.ebank.domain

@RunWith(JDaveRunner.class)
public class AccountSpec extends Specification<Account> {
    public class WhenInitialDepositIsMade {
        public Account create() {
            Account account = new Account();
            account.makeDeposit(100);
            return account;
        }

        public void balanceShouldBeEqualToAmountDeposited() {
            specify(context.balance(), should.equal(100));
        }
    }
}
```

The "fixture" or "context" is a first class concept in JDave

Readable assertions

Handling exception cases

- Let's look at a more complicated example...
  - Withdrawals:

Task – Withdraw money from an account

given "an account with a certain balance"

when "a sum is withdrawn from the accou

then "the withdrawn sum is deducted fro
balance".

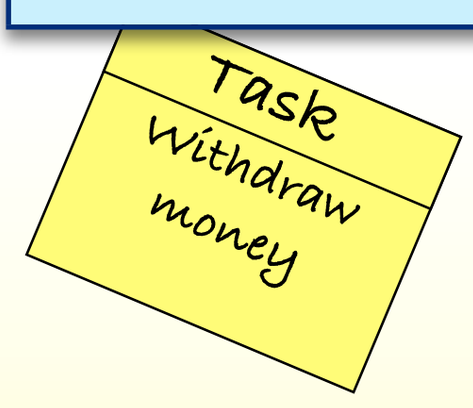
Task – Withdraw too much money

given "an account with a certain balance"

when "a sum is withdrawn from the account"

then "an error is raised"

and "the balance remains unchanged "



Easyb in Action again

- Let's look at a more complicated example...
  - Withdrawals:

Task – Withdraw money from an account
given "an account with a certain balance" when "a sum is withdrawn from the account" then "the withdrawn sum is deducted from the account balance".

```
scenario "Withdraw money from an account", {
    given "an account with a certain balance", {
       initialBalance = 100
       account = new Account()
       account.balance = initialBalance
    }
    when "a sum is withdrawn from the account", {
       amountWithdrawn = 20
       account.withdraw(amountWithdrawn)
    }
    then "the withdrawn sum is deducted from the account balance", {
        account.balance.shouldBe initialBalance - amountWithdrawn
    }
}
```

Easyb in Action again

- Let's look at a more complicated example...
  - Withdrawals:

Task – Withdraw too much money

given "an a

when "a sur

then "an err

and "the bal

```
scenario "Withdraw more money than there is in the account", {
    given "an account with a certain balance", {
        initialBalance = 100
        account = new Account()
        account.balance = initialBalance
    }
    and "an amount is withdrawn that is greater than the balance", {
        withdrawTooMuchMoney = {
            account.withdraw(150)
        }
    }
    then "an InsufficientFundsException is raised", {
        ensureThrows(InsufficientFundsException.class){
            withdrawTooMuchMoney()
        }
    }
    and "the account balance remains unchanged", {
        account.balance.shouldBe initialBalance
    }
}
```

Use a closure to encapsulate the action

Check that an exception is thrown

And ensure that the balance is unchanged

JDave in Action again

- JDave has built-in support for specifying that an exception should be thrown


```
public class AccountSpec extends Specification<Account> {
    public class WhenWithdrawingMoreThanThereIsInTheAccount {
        int initialBalance = 100;
        Block that;

        public Account create() {
            final Account account = new Account(initialBalance = 100);
            that = new Block() {
                public void run() throws Throwable {
                    account.withdraw(initialBalance + 1);
                }
            };
            return account;
        }

        public void anInsufficientFundsExceptionIsThrown() {
            specify(that, should.raise(InsufficientFundsException.class));
        }

        public void theAccountBalanceRemainsUnchanged() {
            specify(after(that).balance(), should.equal(initialBalance));
        }
    }
}
```

Use a "block" (closure) to encapsulate the action

Check that an exception is thrown

And ensure that the balance is unchanged

Easyb assertions

- Tools for expressing behavior in easyb
  - The **shouldBe** syntax:
    - Intuitive, readable and flexible

```
account.balance.shouldBe initialAmount
```

```
account.balance.shouldBeEqualTo initialAmount
```

```
account.balance.shouldNotBe 0
```

```
account.balance.shouldBeGreaterThan 0
```

```
account.shouldHave(balance:initialAmount)
```

JDave assertions

- Fluent API for specifying desired behavior
  - The **specify(x , should.*)** syntax:
    - Intuitive, readable and flexible

```
specify(context.balance(), should.equal(100));
```

```
specify(new Block() {}, should.raise(TypeOfException.class));
```

```
specify(returnedObject, should.be == certainInstance);
```

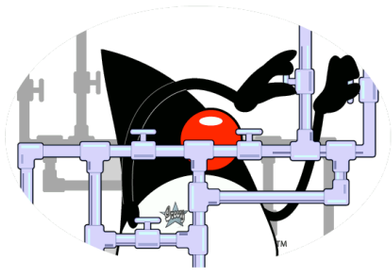
```
specify(aCollection, should.contain(someObject, anotherObject));
```

```
specify(aCollection, must.not().contain(thatOtherObject));
```

Some folks might prefer "must" over "should"

Organizing your tests

- More complex test may need to be refactored:
  - Get infrastructure code out of the test cases
  - Test cases are more readable and understandable
  - Test cases are easier to maintain

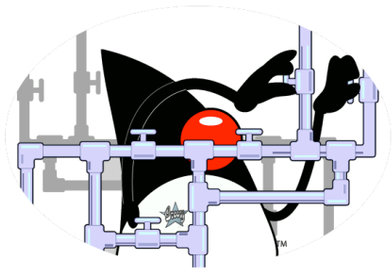


- JUnit has fixtures:
  - @Before/@After and @BeforeClass/@AfterClass in JUnit 4.x
  - setup() and teardown() in JUnit 3.x

- What about Easyb and JDave?

Easyb fixtures

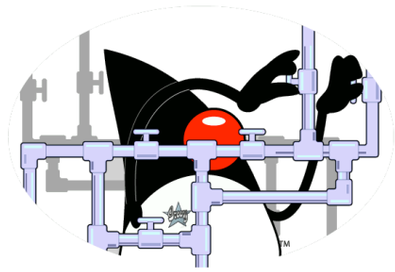
- Structuring your tests...fixtures in easyb
  - Setting up the test environment...
    - **before** is run at the start of the whole story
    - **before_each** is run before each scenario
    - Useful for setting up databases, test servers, etc.



```
before_each "initialize an instance of selenium", {
  given "selenium is up and running", {
    selenium = new DefaultSelenium("localhost", 4444,
      "*firefox", "http://testserver.wakaleo.com/onlinebank")
    selenium.start()
  }
  and "given a person is at the home page", {
    selenium.open("http://testserver.wakaleo.com/onlinebank/index.html")
  }
}
```

Easyb fixtures

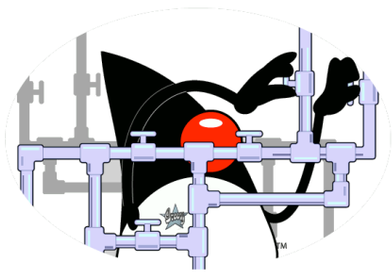
- Structuring your tests...fixtures in easyb
  - Cleaning up afterwards
    - **after** is run at the end of the whole story
    - **after_each** is run after each scenario
    - Useful for shutting down test servers, cleaning up databases etc.



```
after_each "shut down selenium", {
  then "selenium should be shutdown", {
    selenium.stop()
  }
}
```

JDave fixtures

- Structuring your tests...fixtures in JDave
  - Setting up and tearing down the test environment...
    - **create( )** is run before each scenario (*context* in JDave-speak)
    - **destroy( )** is run after each *context*
    - Useful for setting active locale, clearing caches, etc.



```
public class AccountS
  Locale previousLoca

  @Override
  public void create(
    previousLocale =
    Locale.setDefault
  }

  @Override
  public void destroy
    Locale.setDefault
  }

  public class WhenRe
}
```

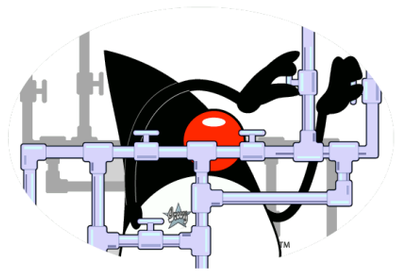
```
public class StackSpec extends Specification<Stack> {
  public class EmptyStack {
    public Stack create() {
      return new Stack();
    }

    public void destroy() {
      // we could tear down stuff here if we wanted to
    }

    public void isEmpty() {
      specify(context.isEmpty());
    }
  }
}
```

JDave fixtures

- Structuring your tests...fixtures in JDave
  - One-time setup and tear-down
    - not implemented at the moment
    - need to use create( ) and a shutdown hook for, e.g. starting up and shutting down a fake SMTP server, etc.



```
public abstract class IntegrationSpec<T> extends Specification<T> {
  Wiser smtpServer;

  @Override
  public void create() {
    if (smtpServer == null) {
      smtpServer = new Wiser();
      smtpServer.start();
      Runtime.getRuntime().addShutdownHook(new Runnable() {
        public void run() {
          smtpServer.stop();
        }
      });
    }
  }
}
```

Note to self (Lasse):
Make sure I'm up-to-date with how latest JDave deals with create()

Web testing with Easyb

- Many options - let's look at two
  - Selenium
    - Runs in a browser
    - High-level API
    - Runs slower and more work to set up
  - HtmlUnit
    - Simulates a browser
    - Runs faster, easy to set up
    - API slightly lower level

Web testing with Easyb

- Writing functional tests with HtmlUnit

Task – Deposit cas

given "the account detail

and "the user clicks on t

Set up HtmlUnit web client

Display the home page

Check the initial balance

Enter a value in a text field

Click a button

Check result page

```
import com.gargoylesoftware.htmlunit.WebClient
import com.gargoylesoftware.htmlunit.html.*

before_each "initialize a web client", {
  given "a web client has been created", {
      webClient = new WebClient()



scenario "Deposit cash via the web interface", {
    given "the application home page is displayed", {
      page = webClient.getPage("http://localhost:8080/ebank-web")
    }
    and "the current balance is 0", {
      page.asText().contains "Current Balance: \$0"
    }
    when "the user enters a value in the 'deposit cash' field", {
        form = page.forms[0];
        depositButton = form.getInputByName("deposit");
        textField = form.getInputByName("depositAmount");
        textField.valueAttribute = "100";

        resultPage = depositButton.click();
    }
    then "the balance should be equal to the amount deposited", {
      resultPage.asText().contains "Current Balance: \$100"
    }
}
```

Web testing with Easyb

- Writing functional tests with Selenium

```
import com.thoughtworks.selenium.DefaultSelenium;
import com.thoughtworks.selenium.Selenium;

before_each "initialize a web client", {
  given "selenium is up and running", {
    selenium = new DefaultSelenium("localhost", 4444,
                                   "*firefox", "http://localhost:8080");
    selenium.start();
  }
}

after "stop selenium" , {
 then "selenium should be shutdown", {
  selenium.stop()
 }
}
...
```

Set up a Selenium client

Shut down afterwards

Web testing with Easyb

- Writing functional tests with Selenium

```
import com.thoughtworks.selenium.DefaultSelenium;
import com.thoughtworks.selenium.Selenium;

before_each "initialize a web client", {
  given "selenium is up and running", {
    selenium = new DefaultSelenium("localhost", 4444,
```

```
scenario "Deposit cash via the web interface", {
    given "the application home page is displayed", {
      selenium.open("/ebank-web");
      selenium.waitForPageToLoad("2000");
    }
    and "the current balance is 0", {
      selenium.isTextPresent("Current balance: \$100");
    }
    when "the user enters a value in the 'deposit cash' field", {
      selenium.type("depositAmount", "100")
      selenium.click("deposit")
      selenium.waitForPageToLoad("2000")
    }
    then "the balance should be equal to the amount deposited",
      selenium.isTextPresent("Current balance: \$100");     }
    }
}
```

Open home page

Check initial balance

Type a value

Click a button

Check result

Web testing with JDave

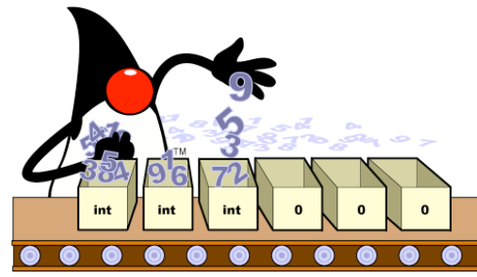
- JDave was never designed for functional testing of web applications, but...
- Remember the create/shutdown hook trick?
- It's not that difficult to create your own testing API for web testing

```
public class FunctionalTest extends WebTestingSpecification {
    public class WhenDepositingCashViaTheWebInterface {
        given.user().isAt("/ebank-web");
        given.page().contains("Current balance: $100");
        when.user().enters("100").to("depositAmount");
        and.user().clicks("deposit");
        then.page().contains("Current balance: \$100");
    }
}
```

...but you have to do it yourself

BDD and the SDLC

- A test framework should blend into your build lifecycle
  - Test automation
  - Integrate with Ant and Maven
  - Play nicely with Continuous Integration tools



Easyb in the SDLC

- Integrating easyb with Ant
  - Use the easyb Ant task

The Ant easyb task

```
<taskdef name="easyb" classname="org.easyb.ant.BehaviorRunnerTask">
  <classpath>
    <pathelement location="${lib.dir}/easyb-0.9.5.2.jar"/>
    <pathelement location="${lib.dir}/groovy-all-1.6.3.jar"/>
  </classpath>
</taskdef>
...
<target name="easyb">
  <easyb>
    <classpath>
      <pathelement location="${lib.dir}/easyb-0.9.5.2.jar"/>
      <pathelement location="${lib.dir}groovy-all-1
      <pathelement location="${lib.dir}/commons-cl
      <pathelement path="target/classes" />
    </classpath>
    <report location="target/stories.html" format="html" />
    <behaviors dir="src/test/easyb">
      <include name="**/*.story" />
    </behaviors>
  </easyb>
</target>
```

Generate pretty HTML reports

Run easyb against these stories

Easyb in the SDLC

- Integrating easyb with Ant
  - Use the easyb Ant task

Invoke the Ant task

```
$ ant easyb
Buildfile: build.xml

easyb:
    [easyb] easyb is preparing to process 2 file(s)
    [easyb] Running create account story (createAccount.story)
    [easyb] Scenarios run: 1, Failures: 0, Pending: 0, Time elapsed: 0.696 sec
    [easyb] Running withdraw money from account story
(withdrawMoneyFromAccount.story)
    [easyb] Scenarios run: 3, Failures: 0, Pending: 1, Time elapsed: 0.102 sec
    [easyb]
    [easyb] 4 total behaviors ran (including 1 pending behavior) with no failures
    [easyb] easyb execution passed

BUILD SUCCESSFUL
Total time: 4 seconds
```

Number of behaviors run

Also shows unimplemented stories

Easyb in the SDLC

- Integrating easyb with Maven
  - Use the **maven-easyb-plugin** plugin


```
<project...>
    ...
    <build>
      <plugins>
        <plugin>
          <groupId>org.easyb</groupId>
          <artifactId>maven-easyb-plugin</artifactId>
          <version>0.9.5.2</version>
          <configuration>
              <storyType>html</storyType>
              <storyReport>target/easyb/easyb.html</storyReport>
              <xmlReport>target/easyb/report.xml</xmlReport>
          </configuration>
        </plugin>
      </plugins>
    </build>
</project>
```

The Maven easyb plugin

Generate pretty HTML reports

Easyb in the SDLC

- Integrating easyb with Maven
  - Use the **maven-easyb-plugin** plugin
  - Just run **mvn test**


```
$ mvn test
...
[INFO] [easyb:test {execution: default}]
[INFO] Using easyb dependency org.easyb:easyb:jar:0.9.5.2:compile
[INFO] Using easyb dependency commons-cli:commons-cli:jar:1.1:compile
[INFO] Using easyb dependency org.codehaus.groovy:groovy-all:jar:1.6.0:compile
[INFO] Using easyb dependency junit:junit:jar:3.8.2:compile
[INFO] Using easyb dependency org.apache.ant:ant:jar:1.7.1:compile
[INFO] Using easyb dependency org.apache.ant:ant-launcher:jar:1.7.1:compile
[INFO] Using easyb dependency jline:jline:jar:0.9.94:compile
     [java] Running create account story (createAccount.story)
     [java] Scenarios run: 1, Failures: 0, Pending: 0, Time elapsed: 0.647 sec
     [java] Running withdraw money from account story (withdrawMoneyFromAccount.story)
     [java] Scenarios run: 3, Failures: 0, Pending: 1, Time elapsed: 0.104 sec
     [java] 4 total behaviors ran (including 1 pending behavior) with no failures
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESSFUL
[INFO] ------------------------------------------------------------------------
```

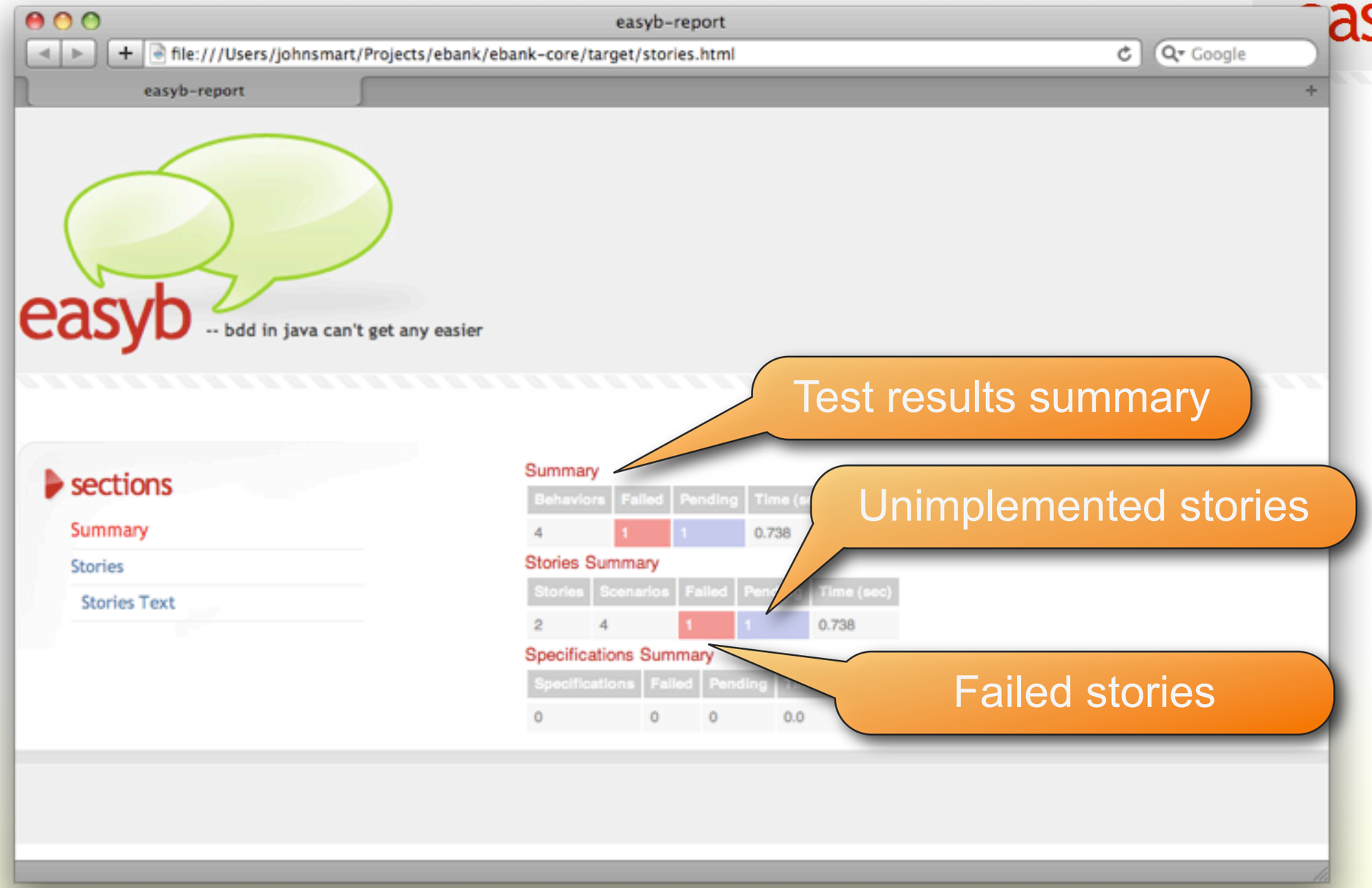
Run the easyb tests

Easyb test results

Unimplemented stories

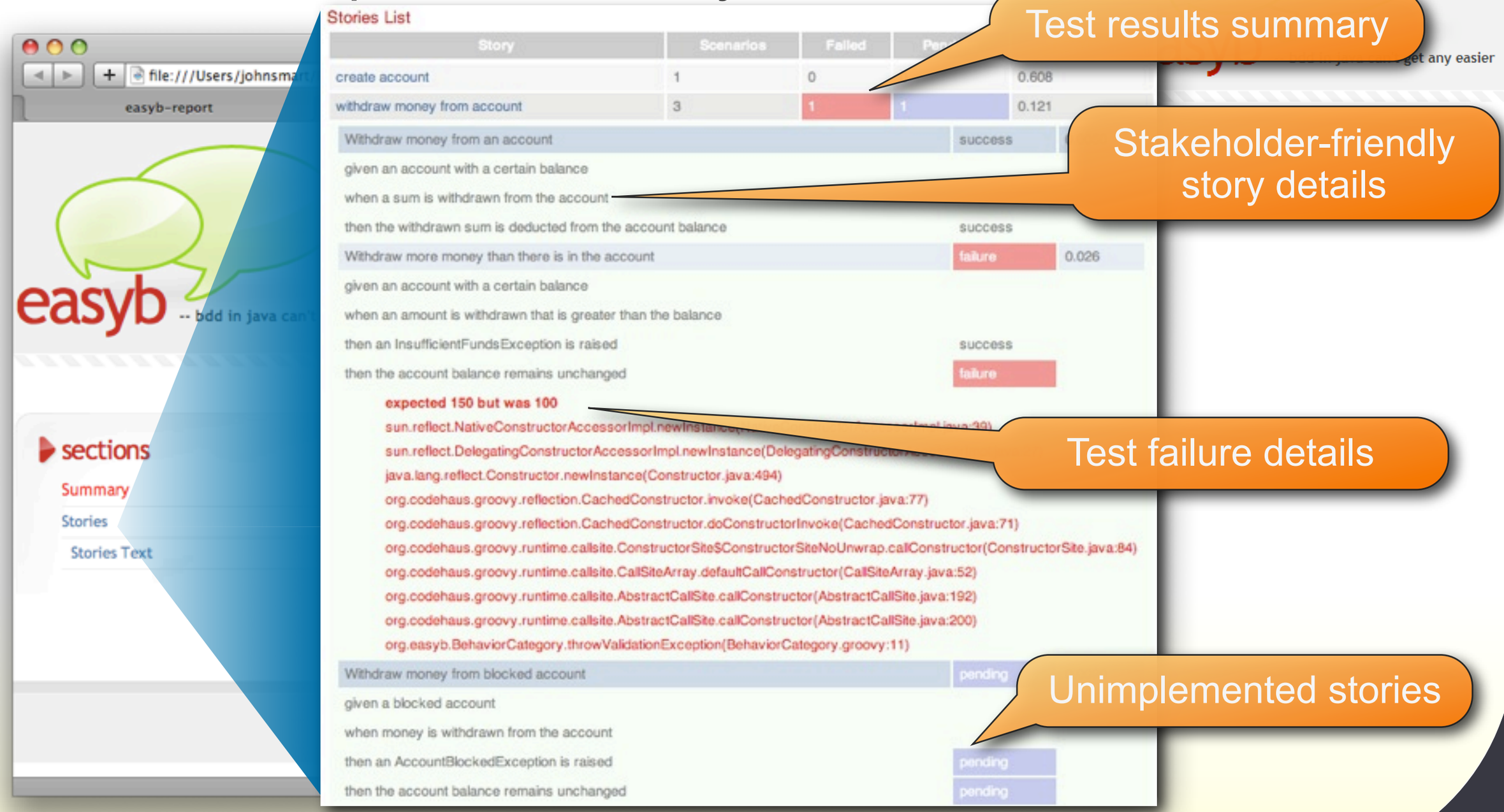
Easyb in the SDLC

- HTML test reports with Easyb



Easyb in the SDLC

- HTML test reports with Easyb



Easyb in the SDLC

- Easyb currently lacks good CI integration
  - You can deploy the current HTML test results
  - But XML test results are not JUnit-compatible
  - So CI tools like Hudson and Bamboo cannot collect test results metrics

JDave in the SDLC

- JUnit extension
  - Ant, Maven, Buildr, ...
- JUnit XML output

JDave in the SDLC

- Running JDave specifications with Ant
  - Use the standard junit task

```
<target name="test">
    <junit>
        <classpath refid="classpath.test"/>
        <formatter type="xml"/>
        <batchtest todir="${target.reports}">
            <fileset dir="${target.test}">
                <include name="**/*Spec.class"/>
            </fileset>
        </batchtest>
    </junit>
</target>
```

The only difference to running standard JUnit tests is our naming convention.

JDave in the SDLC

- Running JDave specifications with Ant
  - Use the standard junit task

Invoke the Ant task

```
$ ant test
Buildfile: build.xml

compile:
    [mkdir] Created dir: /Work/jdave-examples/target/classes/prod
    [javac] Compiling 2 source files to /Work/jdave-examples/target/classes/prod
    [javac] Compiling 1 source file to /Work/jdave-examples/target/classes/prod

test:
    [mkdir] Created dir: /Work/jdave-examples/target/reports
    [junit] Running jdave.examples.StackSpec
    [junit] Tests run: 8, Failures: 0, Errors: 0, Time elapsed: 0.116 sec

BUILD SUCCESSFUL
Total time: 1 second
```

Behaviors being run are called "tests"...

...but at least they're fast

JDave in the SDLC

- Integrating JDave with Maven
  - Using the standard Surefire plugin


```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-surefire-plugin</artifactId>
    <configuration>
        <includes>
            <include>**/*Spec.java</include>
        </includes>
        <systemProperties>
            <property>
                <name>jdave.tools.specdox.format</name>
                <value>txt</value>
            </property>
        </systemProperties>
    </configuration>
</plugin>
```

Tell Surefire what your specs look like

Generate a plain text report (or XML for further processing and transformation)

JDave in the SDLC

- Integrating JDave with Maven
  - Using the standard Surefire plugin
  - JDave needs to be added as a dependency
  - And the reporting plugin (if you want them)


```
<dependencies>
    <dependency>
        <groupId>org.jdave</groupId>
        <artifactId>jdave-junit4</artifactId>
        <version>1.2-SNAPSHOT</version>
        <scope>test</scope>
    </dependency>
</dependencies>
```

```
<reporting>
    <plugins>
        <plugin>
            <groupId>org.jdave</groupId>
            <artifactId>jdave-report-plugin</artifactId>
        </plugin>
    </plugins>
</reporting>
```

JDave in the SDLC

- Integrating JDave with Maven
  - Using the standard Surefire plugin
  - JDave needs to be added as a dependency
  - And the reporting plugin (if you want them)
  - These are available from the LaughingPanda repository


```
<pluginRepositories>
   <pluginRepository>
      <id> laughing-panda </id>
      <url> http://www.laughingpanda.org/maven2/ </url>
   </pluginRepository>
</pluginRepositories>
<repositories>
   <repository>
      <id> laughing-panda </id>
      <url> http://www.laughingpanda.org/maven2/ </url>
   </repository>
</repositories>
```

JDave in the SDLC

- Integrating JDave with Maven
  - Just run **mvn test**

Run the JDave specifications

```
$ mvn test
...
[INFO] [surefire:test]
[INFO] Surefire report directory: /Work/jdave-examples

-------------------------------------------------------
 T E S T S
-------------------------------------------------------
Running jdave.examples.StackSpec
Tests run: 8, Failures: 0, Errors: 0, Skipped: 0, Time

Results :

Tests run: 8,

[INFO] ------
[INFO] BUILD SUCCESSFUL
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 4 seconds
```

JDave specifications are again reported just like JUnit tests...

```
StackSpec:

Empty stack
  - is empty
  - is no longer empty after push

Full stack
  - is full
  - complains on push
  - contains all items
  - does not contain removed item
  - contains all but removed item

Stack which is neither empty nor full
  - adds to the top when sent push
```

...and in a more human-readable format

JDave in the SDLC

- Running JDave specifications with Buildr
  - List dependencies and include "*Spec"


```
define 'jdave-examples' do
  project.group = 'org.agile2009'
  project.version = '1.0-SNAPSHOT'

  test.with 'junit:junit:jar:4.6',
            'org.jmock:jmock:jar:2.4.0',
            'org.jmock:jmock-legacy:jar:2.4.0',
            'org.jmock:jmock-junit4:jar:2.4.0',
            'asm:asm:jar:1.5.3',
            'cglib:cglib-nodep:jar:2.1_3',
            'org.objenesis:objenesis:jar:1.1',
            'org.hamcrest:hamcrest-core:jar:1.1',
            'org.hamcrest:hamcrest-library:jar:1.1',
            'org.jdave:jdave-core:jar:1.2-SNAPSHOT',
            'org.jdave:jdave-junit4:jar:1.2-SNAPSHOT'

  test.include '*Spec'
end
```

Our spec classes end with "Spec"

JDave in the SDLC

- Running JDave specifications with Buildr
  - List dependencies and include "*Spec"

Invoke Buildr

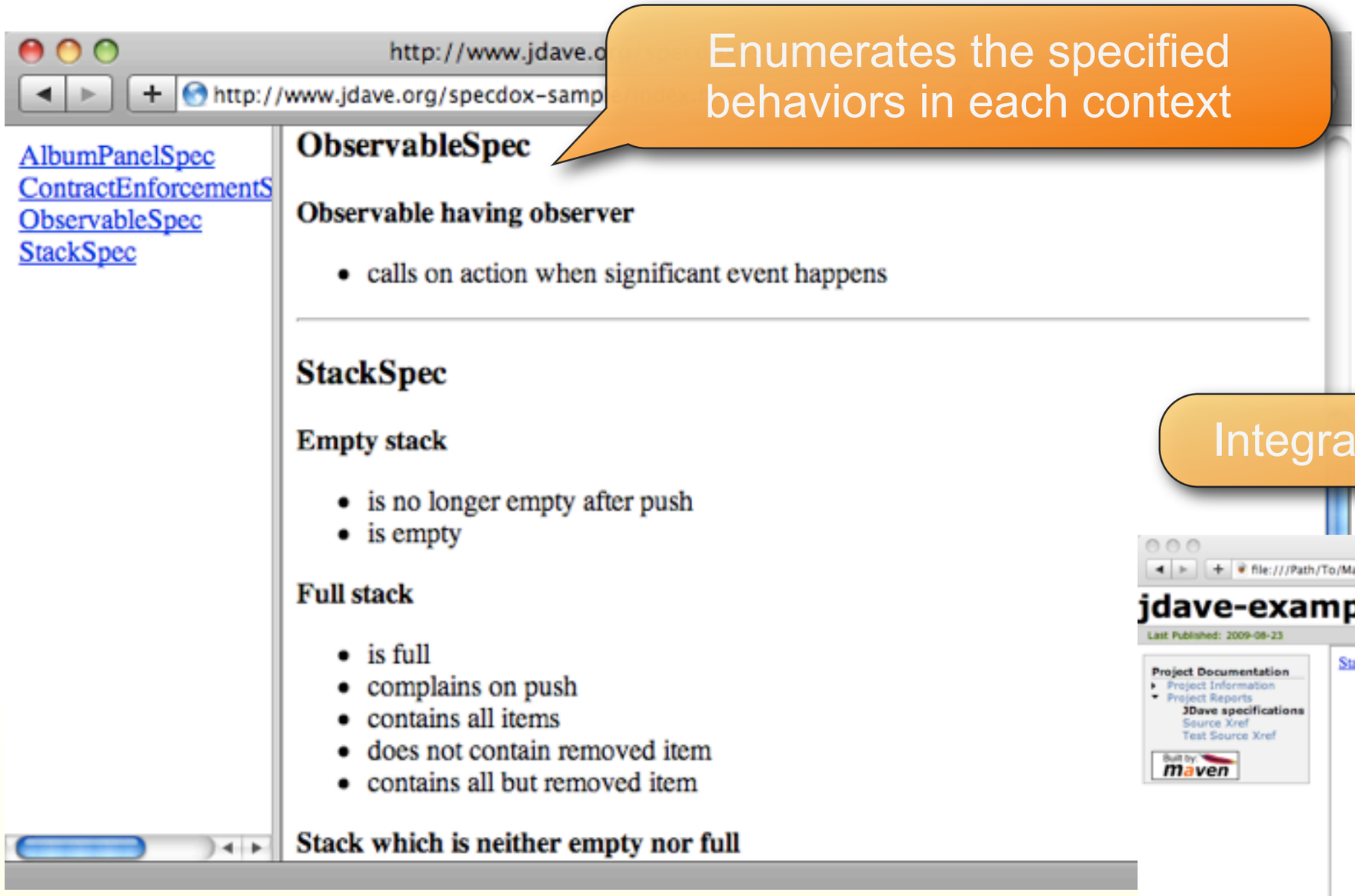
```
$ buildr test
(in /Work/jdave-examples, development)
Testing jdave-examples
Running tests in jdave-examples
Trying to override old definition of datatype junit
    [junit] Testsuite: jdave.examples.StackSpec
    [junit] Tests run: 8, Failures: 0, Errors: 0, Time elapsed: 0.114 sec
    [junit]
    [junit] Testcase: isEmpty took 0.018 sec
    [junit] Testcase: isNoLongerEmptyAfterPush took 0.003 sec
    [junit] Testcase: isFull took 0.001 sec
    [junit] Testcase: complainsOnPush took 0.001 sec
    [junit] Testcase: containsAllItems took 0.002 sec
    [junit] Testcase: doesNotContainRemovedItem took 0.001 sec
    [junit] Testcase: containsAllButRemovedItem took 0.002 sec
    [junit] Testcase: addsToTheTopWhenSentPush took 0.002 sec
Completed in 0.987s
```

Each spec class is treated as a JUnit test suite...

...and the individual specifications as test cases.

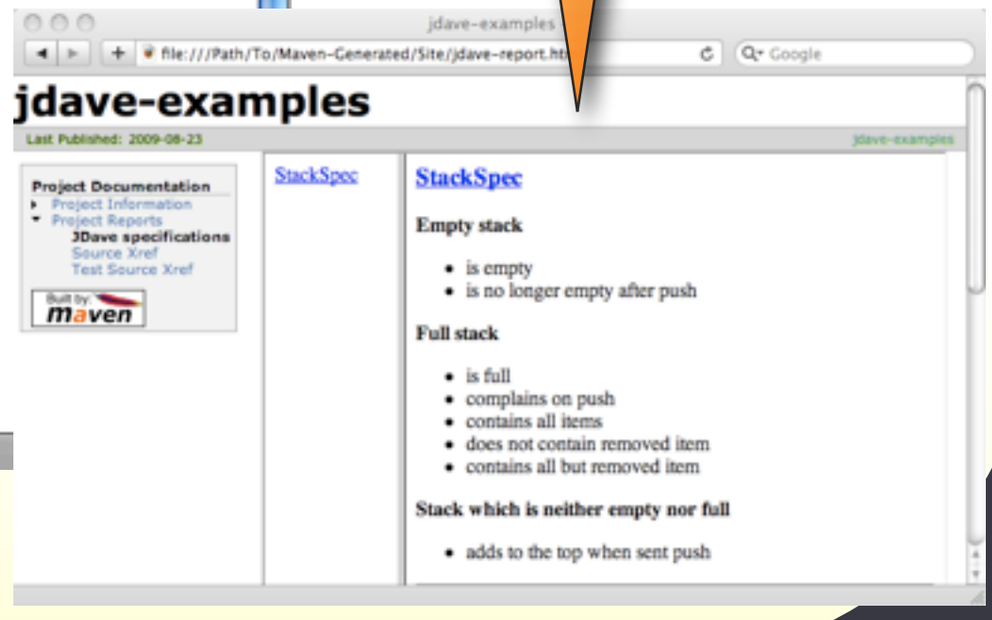
JDave in the SDLC

- HTML test reports with JDave



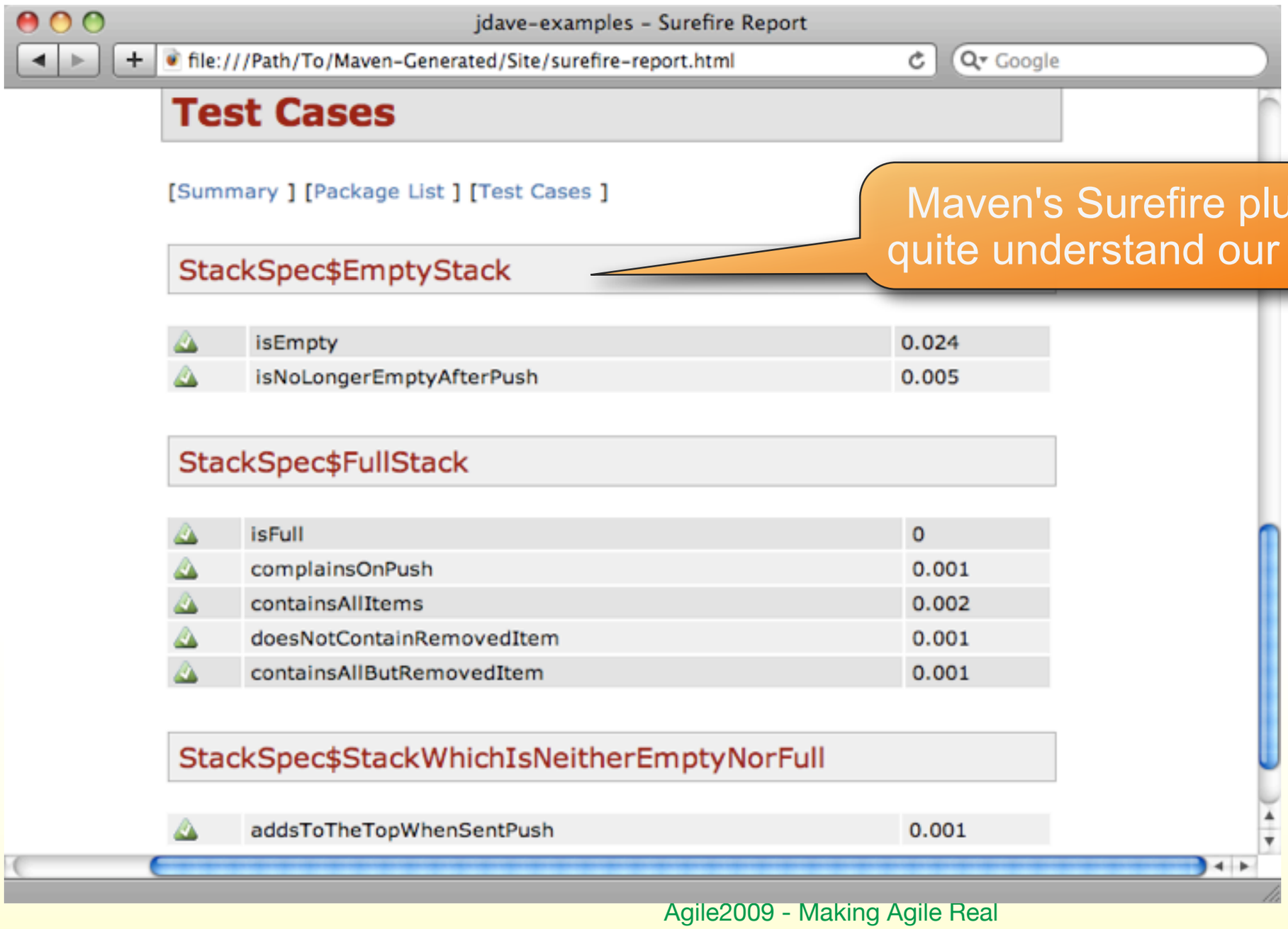
Enumerates the specified behaviors in each context

Integrated with Maven site



JDave in the SDLC

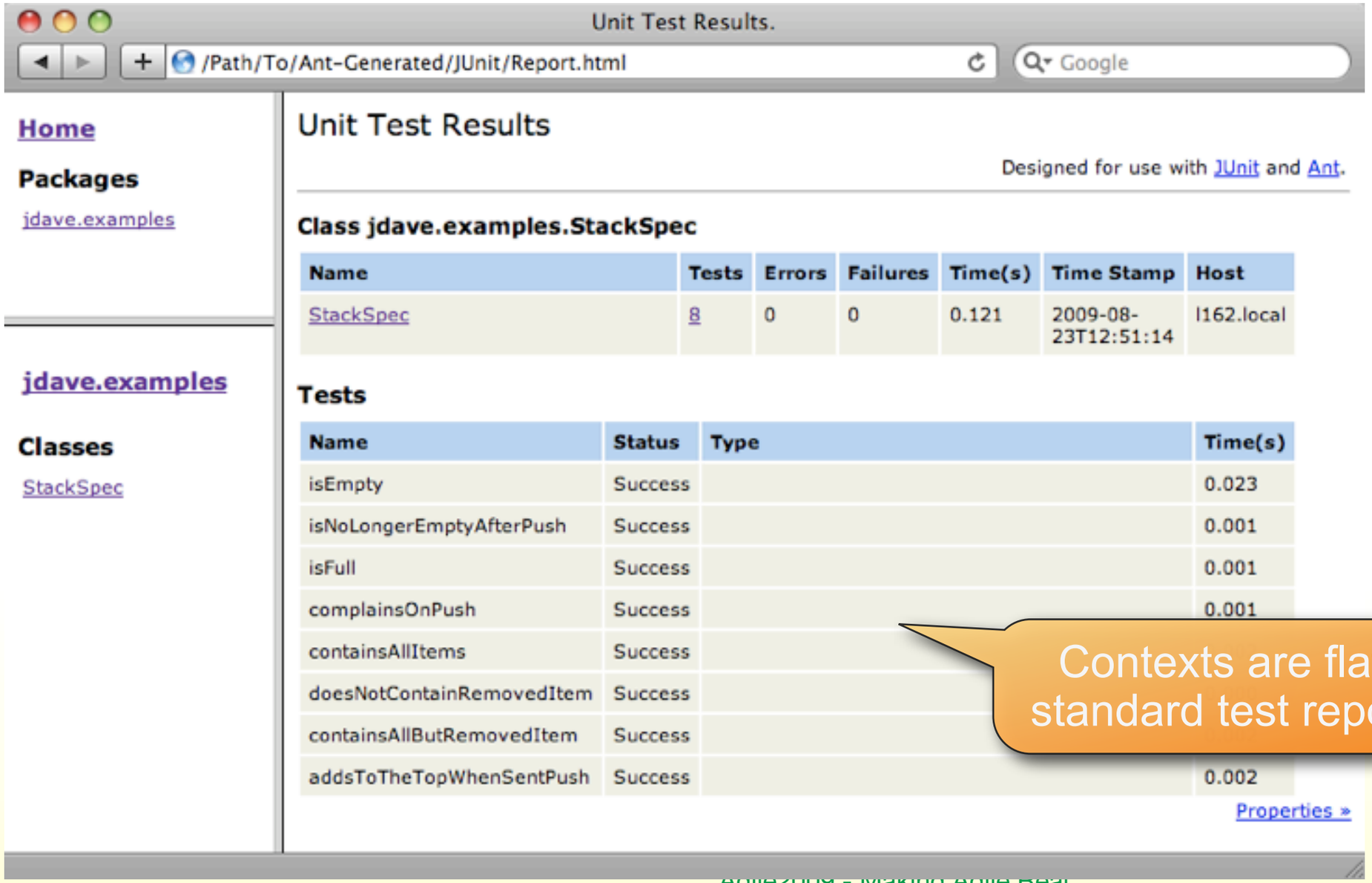
- HTML test reports with JDave



Maven's Surefire plugin doesn't quite understand our conventions

JDave in the SDLC

- Ant's <junitreport/> task is somewhat insufficient for our purposes



Contexts are flattened, making the standard test report almost unusable.

What about IDE support?

- You work with an IDE.
  So should your test framework.
- How well are the BDD frameworks supported in the major IDEs?

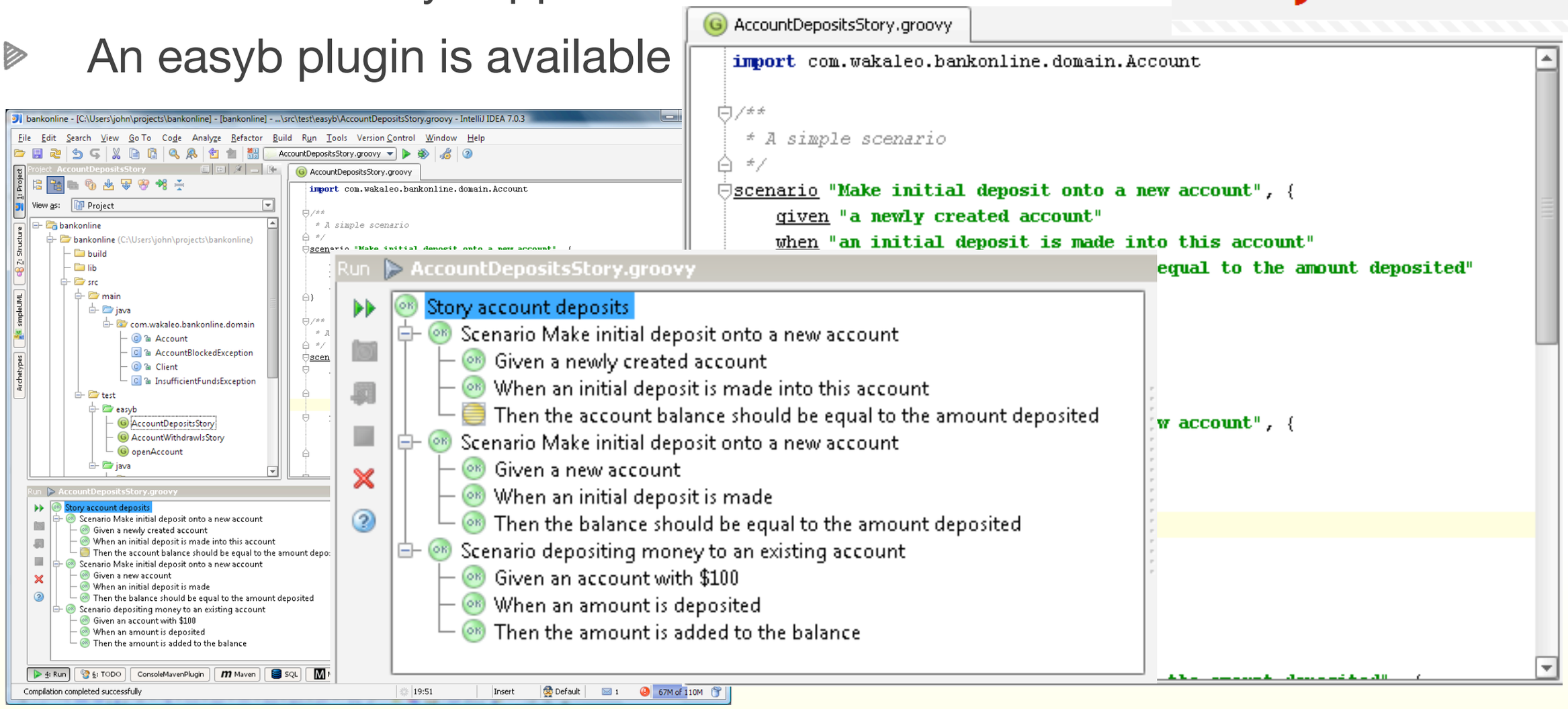
- Syntax highlighting
- Code completion
- Running stories from within the IDE
- ...

What about IDE support?

- IDE Support for easyb:
  - Several options
    - IntelliJ
    - Eclipse
    - NetBeans
- Not all options are equal...

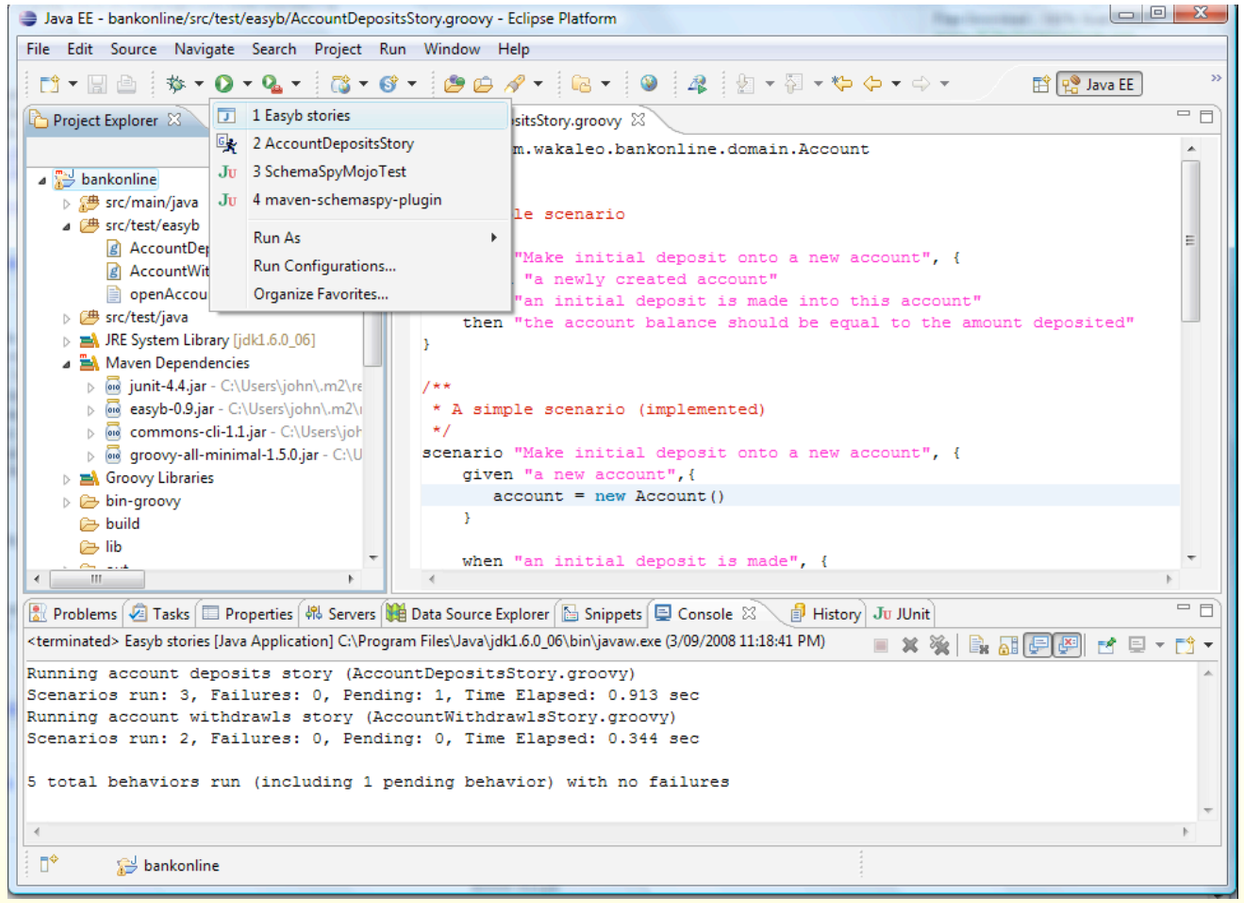
Easyb in your IDE

- Running easyb in IntelliJ
  - Excellent Groovy support
  - An easyb plugin is available



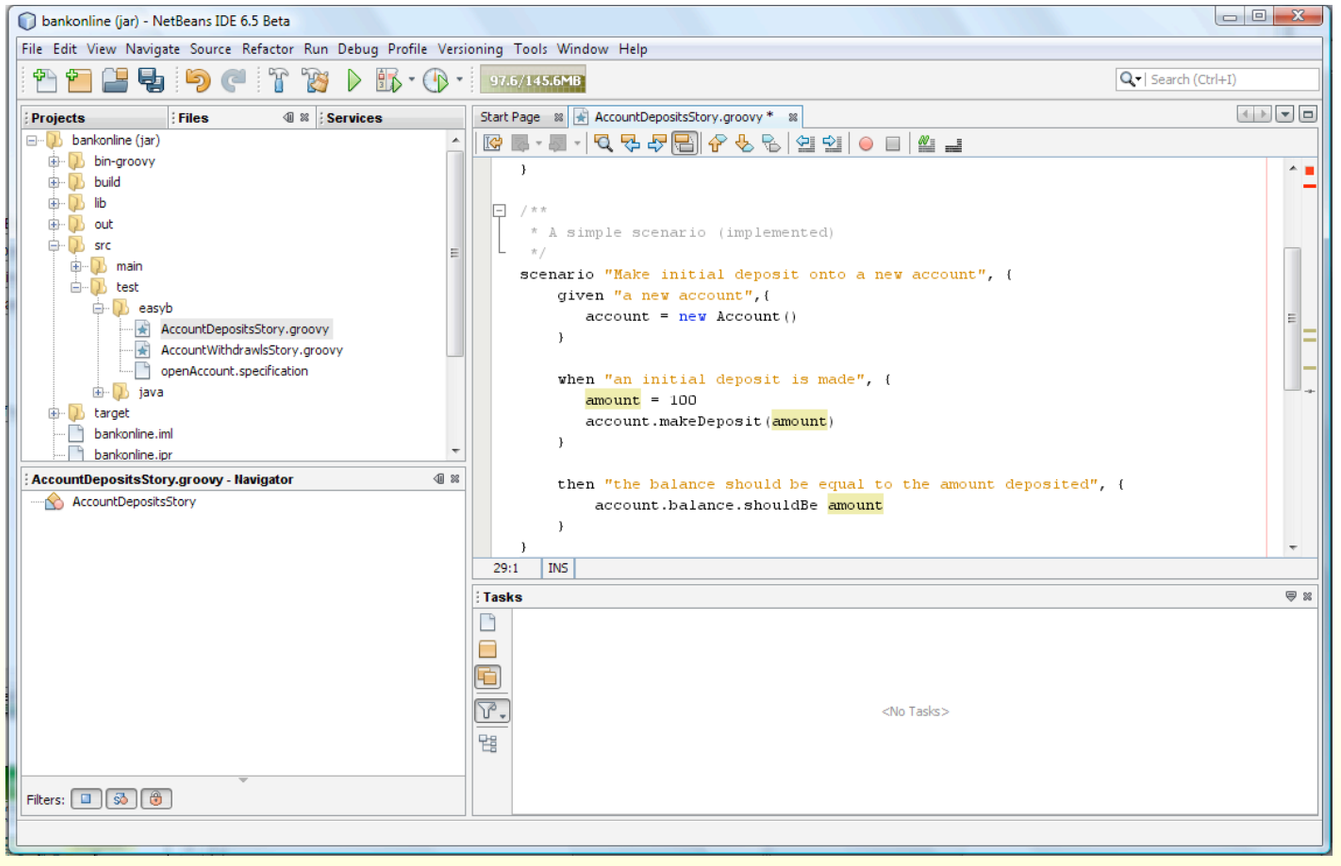
Easyb in your IDE

- Running easyb in Eclipse
  - Some Groovy support available
  - No dedicated easyb plugin yet
  - Easyb stories run via Ant or Maven



Easyb in your IDE

- Running easyb in NetBeans
  - Good Groovy support available in NetBeans 6.5 and 6.7
  - No dedicated easyb plugin yet
  - Easyb stories run via Ant or Maven

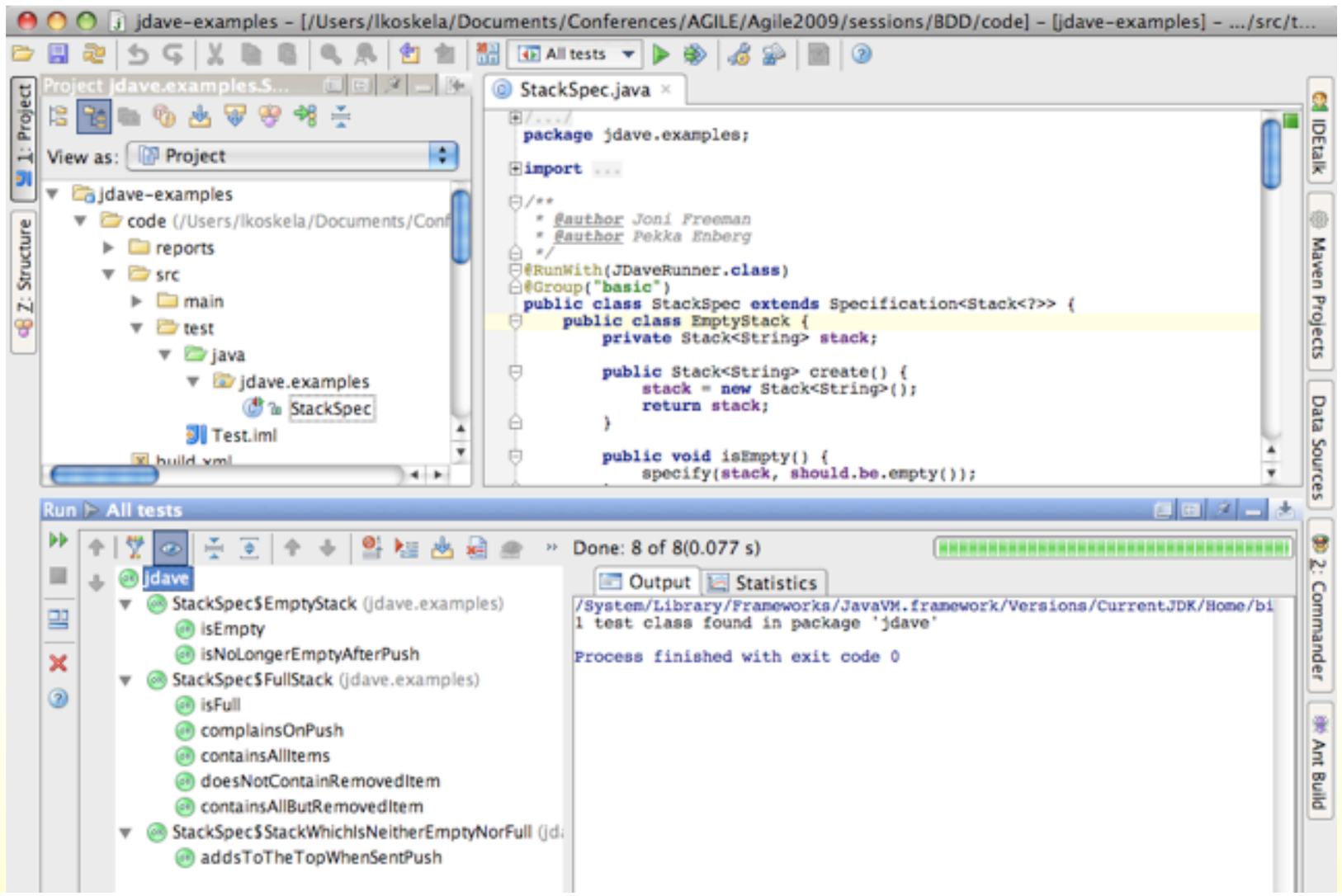


JDave in your IDE

- Standard JUnit, remember?
- All mainstream IDEs support JDave:
  - IntelliJ
  - Eclipse
  - NetBeans
  - (are there any others?)

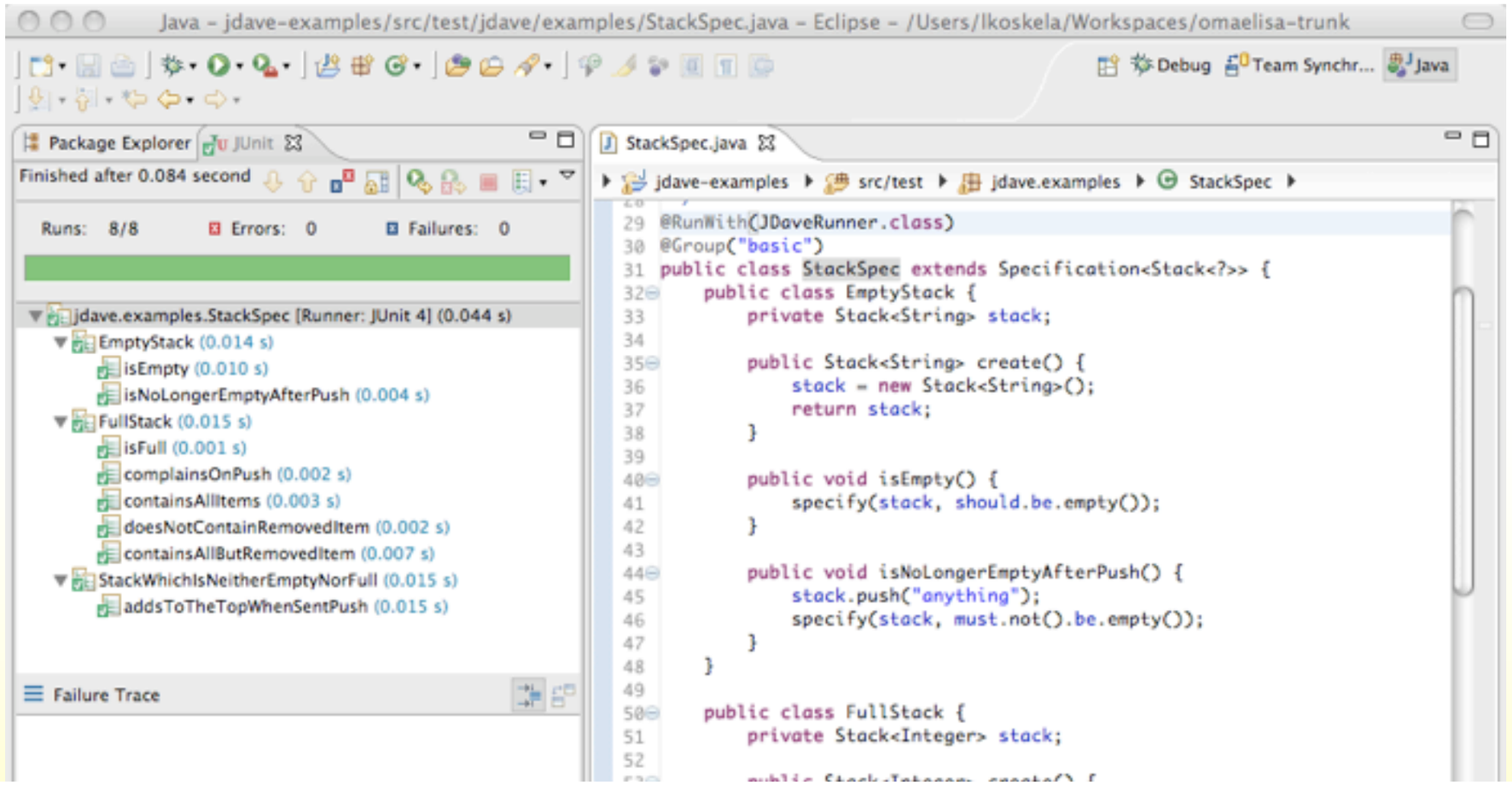
JDave in your IDE

- Running JDave in IntelliJ
  - Through the built-in JUnit runner
  - Click a spec and IDEA navigates to the code



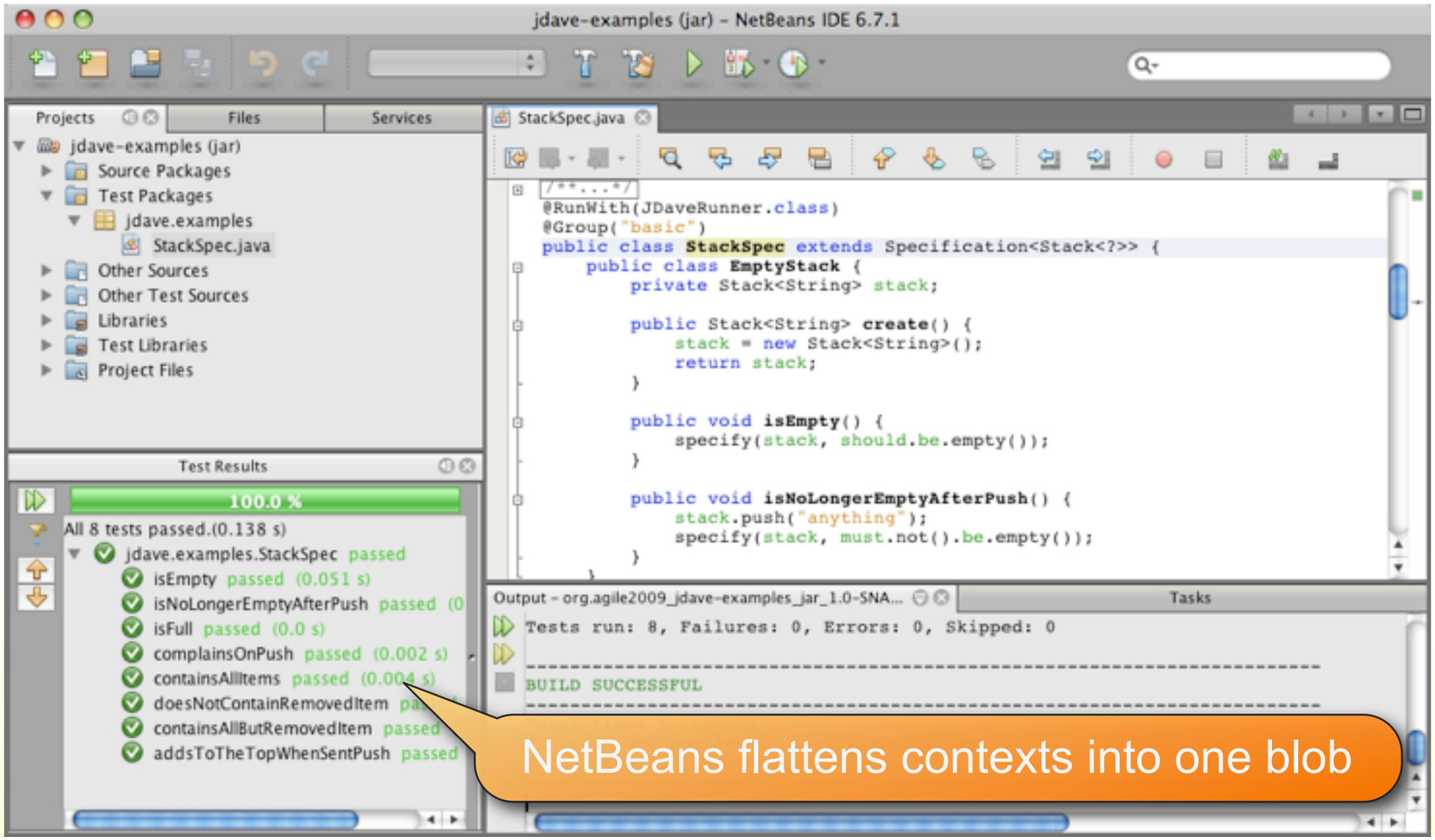
JDave in your IDE

- Running JDave in Eclipse
  - Through the built-in JUnit runner
  - Click a spec and Eclipse navigates to the code
    - (only works for classes and specifications, not for contexts)



JDave in your IDE

- Running JDave in NetBeans
  - Through the built-in JUnit runner
  - Runs contexts but doesn't report them



Limitations of Easyb

- What are the weak points of easyb?
  - Script errors can be hard to find


```
scenario "Deposit cash via the web interface", {
    given "the application home page is displayed", {
      selenium.open("/ebank-web")
      selenium.waitForPageToLoad("2000")
    }
    and "the current balance is 0"{
      selenium.isTextPresent("Current balance: \$100")
```

Missing comma

Obscure error message

```
[java] There was an error running your easyb story or specification
    [java] groovy.lang.MissingMethodException: No signature of method: Script1.the current balance is 0() is applicable for argument
types: (Script1$_run_closure3_closure7) values: [Script1$_run_closure3_closure7@70c116]
    [java]     at org.codehaus.groovy.runtime.ScriptBytecodeAdapter.unwrap(ScriptBytecodeAdapter.java:54)
    [java]     at org.codehaus.groovy.runtime.callsite.PogoMetaClassSite.callCurrent(PogoMetaClassSite.java:78)
...
```

  - Documentation a little light
  - Limited IDE support (Groovy)
  - XML output not JUnit-compatible

Limitations of JDave

- What are the weak points of JDave?
  - Java's syntax isn't quite as flexible as one might hope
  - IDE support is limited as far as editing goes
    - Inner classes
    - Anonymous subclasses
    - Carpal tunnel syndrome
  - The built-in specify(...) matchers could render more descriptive error messages upon failure

Thank You