Michael Tamm | MOTOR-TALK GmbH

Cleverly Testing Webapplications With WebDriver

Who am I?

Michael Tamm

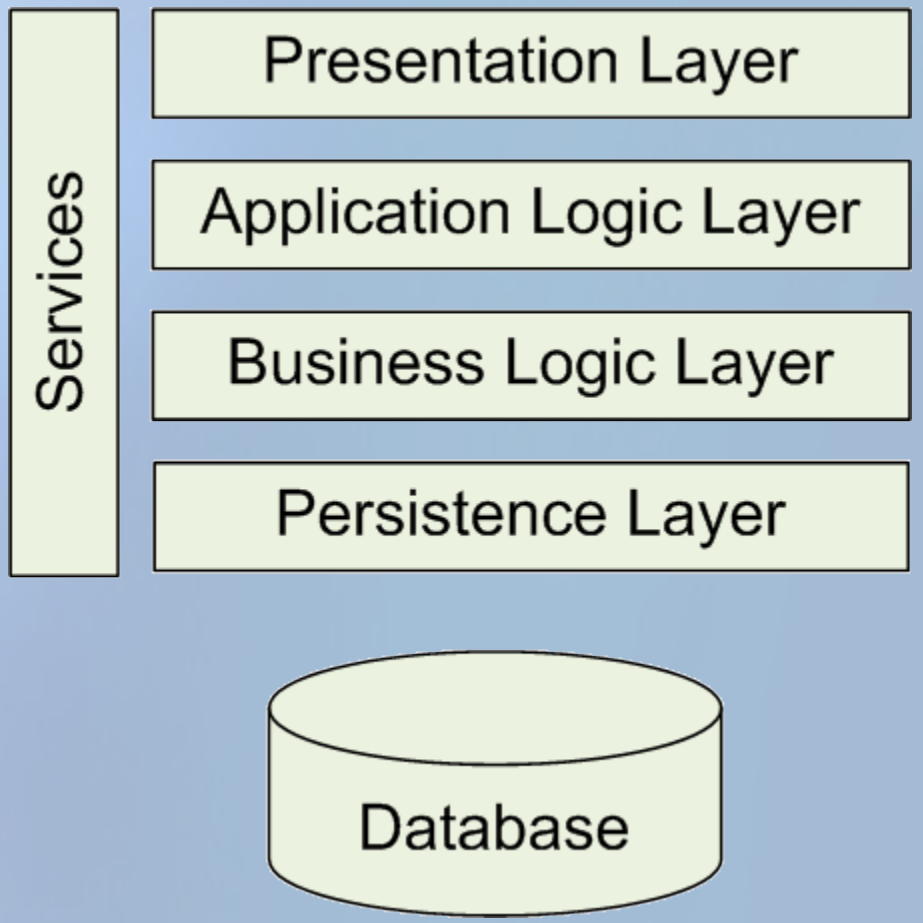
till 1999	Dipl.-Ing. (BA) Computer Science
till 2007	Programmer & System Architect at aperto AG
currently	System Architect at MOTOR-TALK GmbH
furthermore	Writer for c't and iX, JAX-Speaker

Agenda

- Some General Thoughts About Frontend Tests
- WebDriver Concepts & API
- Getting Started
- Examples for Simple Tests
- Best Practices
- Future Prospects

Wherefore Frontend Test?

- Unit Tests
- Functional Tests
- Acceptance Tests
- System Tests



Wherefore WebDriver?

- Cactus
- HttpUnit, HtmlUnit
- Canoo WebTest
- Selenium
- Watir, Watij
- ...

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Therefore WebDriver!

- Java-API
- Simple Java-API
- Support for
  - HtmlUnit
  - Firefox
  - Internet Explorer
  - Safari
  - ...

WebDriver API: Interface WebDriver

Method Summary	
void	close() Close the current window, quitting the browser if it's the last window currently open.
WebElement	findElement(By by) Find the first WebElement using the given method.
java.util.List<WebElement>	findElements(By by) Find all elements within the current page using the given mechanism.
void	get(java.lang.String url) Load a new web page in the current browser window.
java.lang.String	getCurrentUrl() Get a string representing the current URL that the browser is looking at.
java.lang.String	getPageSource() Get the source of the last loaded page.
java.lang.String	getTitle() The title of the current page.
boolean	getVisible() Is the browser visible or not?
WebDriver.Options	manage() Gets the Option interface
WebDriver.Navigation	navigate() An abstraction allowing the driver to access the browser's history and to navigate to a given URL.
void	quit() Quits this driver, closing every associated window.
void	setVisible(boolean visible) Make the browser visible or not.
WebDriver.TargetLocator	switchTo() Send future commands to a different frame or window.

Method Summary

void	`close()` Close the current window, quitting the browser if it's the last window currently open.
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WebDriver.TargetLocator	`switchTo()` Send future commands to a different frame or window.

WebDriver API: Class By

Method Summary	
boolean	equals(java.lang.Object o)
WebElement	findElement(WebDriver driver) Find a single element.
abstract java.util.List<WebElement>	findElements(WebDriver driver) Find many elements.
int	hashCode()
static By	id(java.lang.String id)
static By	linkText(java.lang.String linkText)
static By	name(java.lang.String name)
static By	xpath(java.lang.String xpathExpression)

WebDriver API: Class WebElement

Method Summary	
void	clear() If this element is a text entry element, this will clear the value.
void	click() Click this element.
java.lang.String	getAttribute(java.lang.String name) Get the value of a the given attribute of the element.
java.util.List<WebElement>	getChildrenOfType(java.lang.String tagName) Get the list of child elements that match the given tag name.
java.lang.String	getText() Get the innerText of this element, without any leading or trailing whitespace.
java.lang.String	getValue() Get the value of the element's "value" attribute.
boolean	isEnabled() Is the element currently enabled or not?
boolean	isSelected() Determine whether or not this element is selected or not.
void	sendKeys(java.lang.CharSequence... keysToSend) Use this method to simulate typing into an element, which may set its value.
void	setSelected() Select an element.
void	submit() If this current element is a form, or an element within a form, then this will be submitted to the remote server.
boolean	toggle() If the element is a checkbox this will toggle the elements state from selected to not selected, or from not selected to selected.

Method Summary

void	clear() If this element is a text entry element, this will clear the value.
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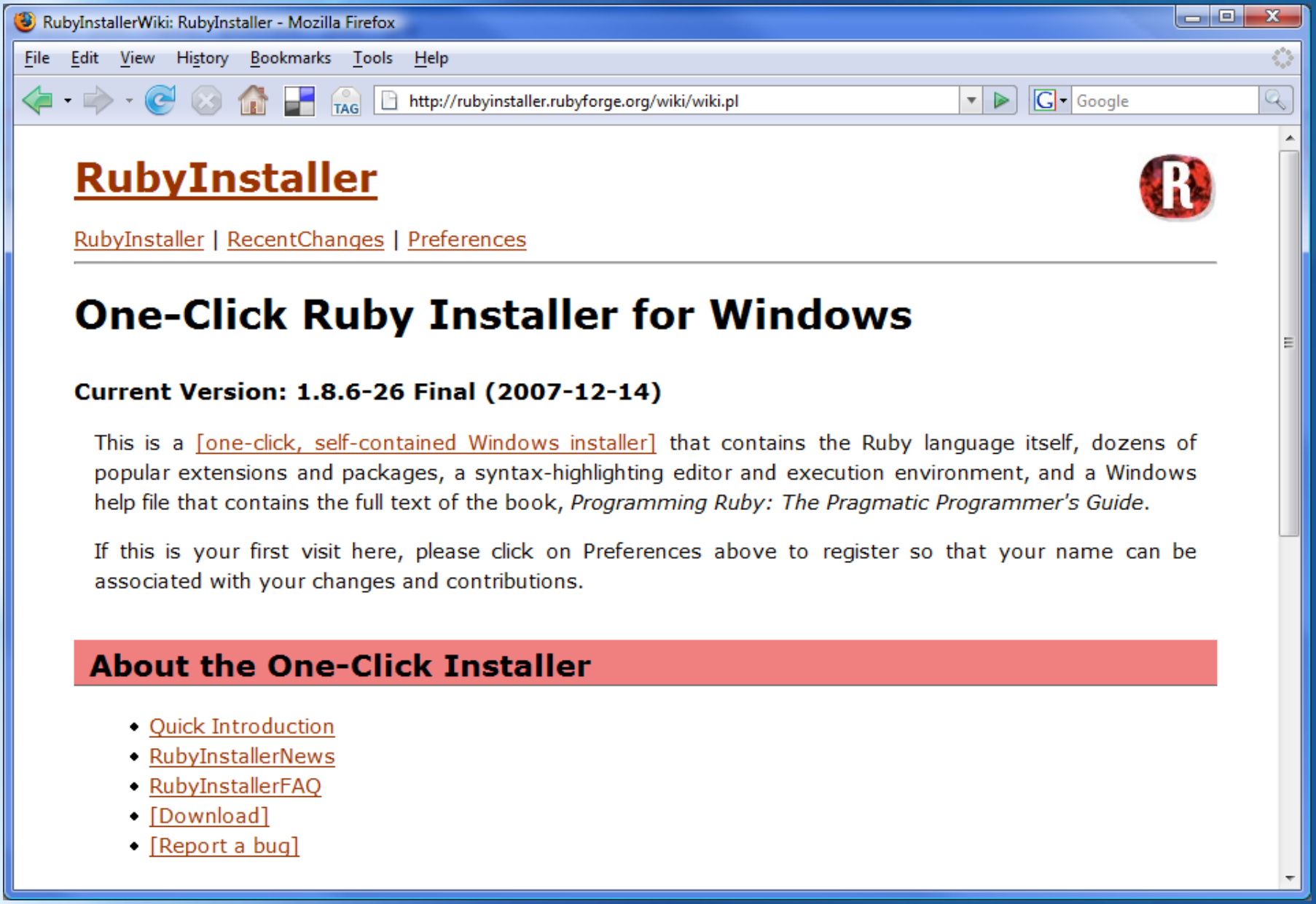
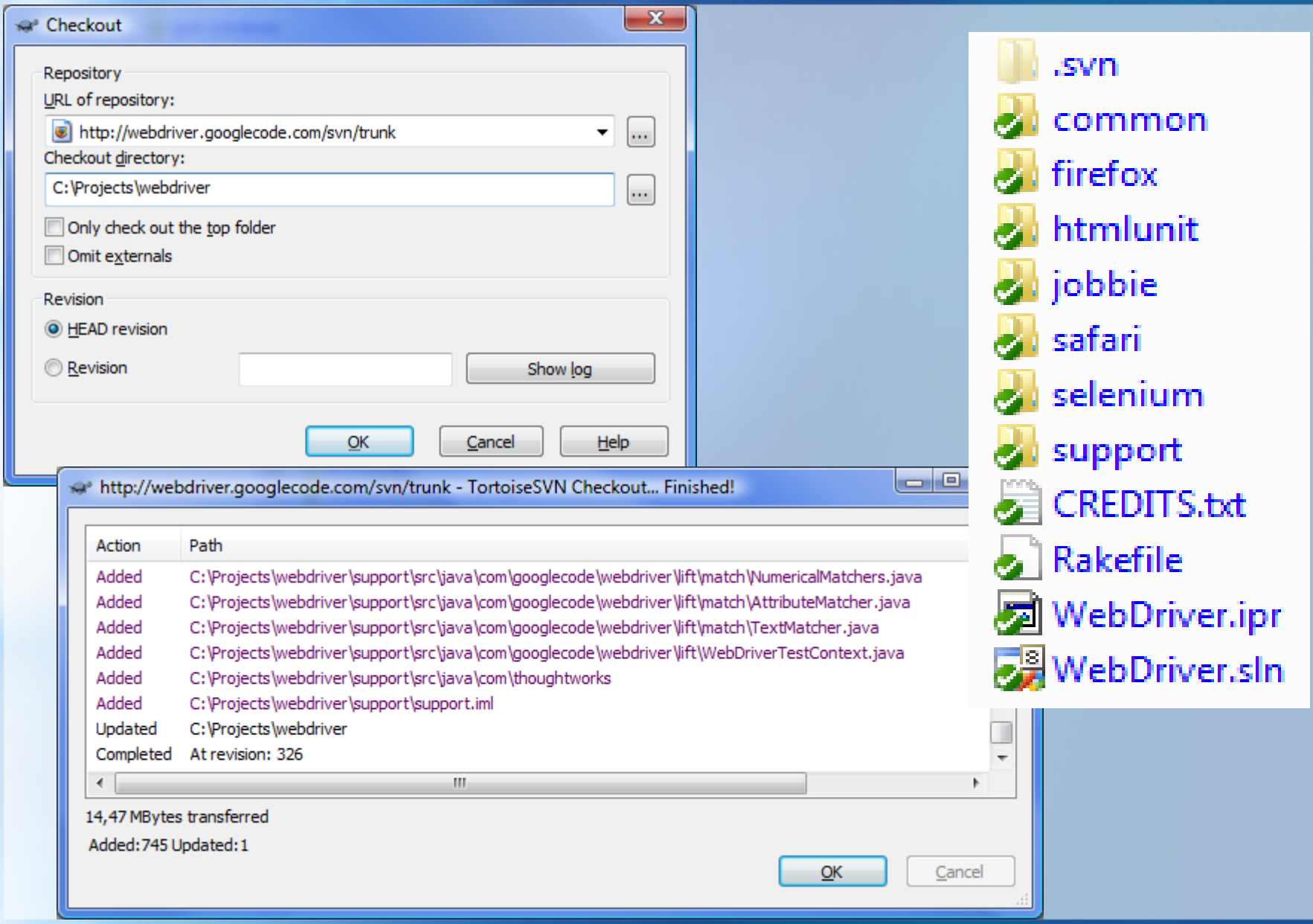
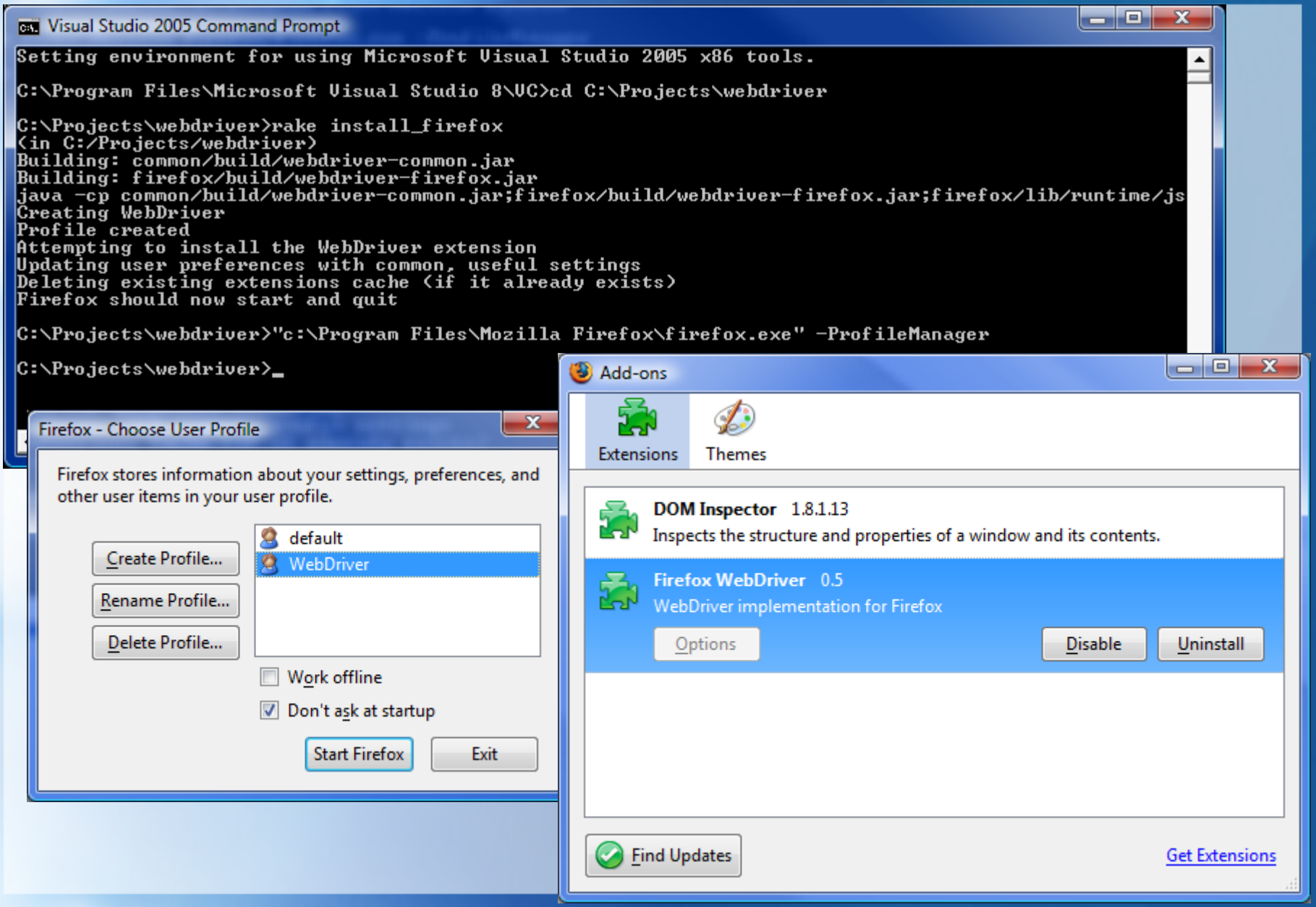
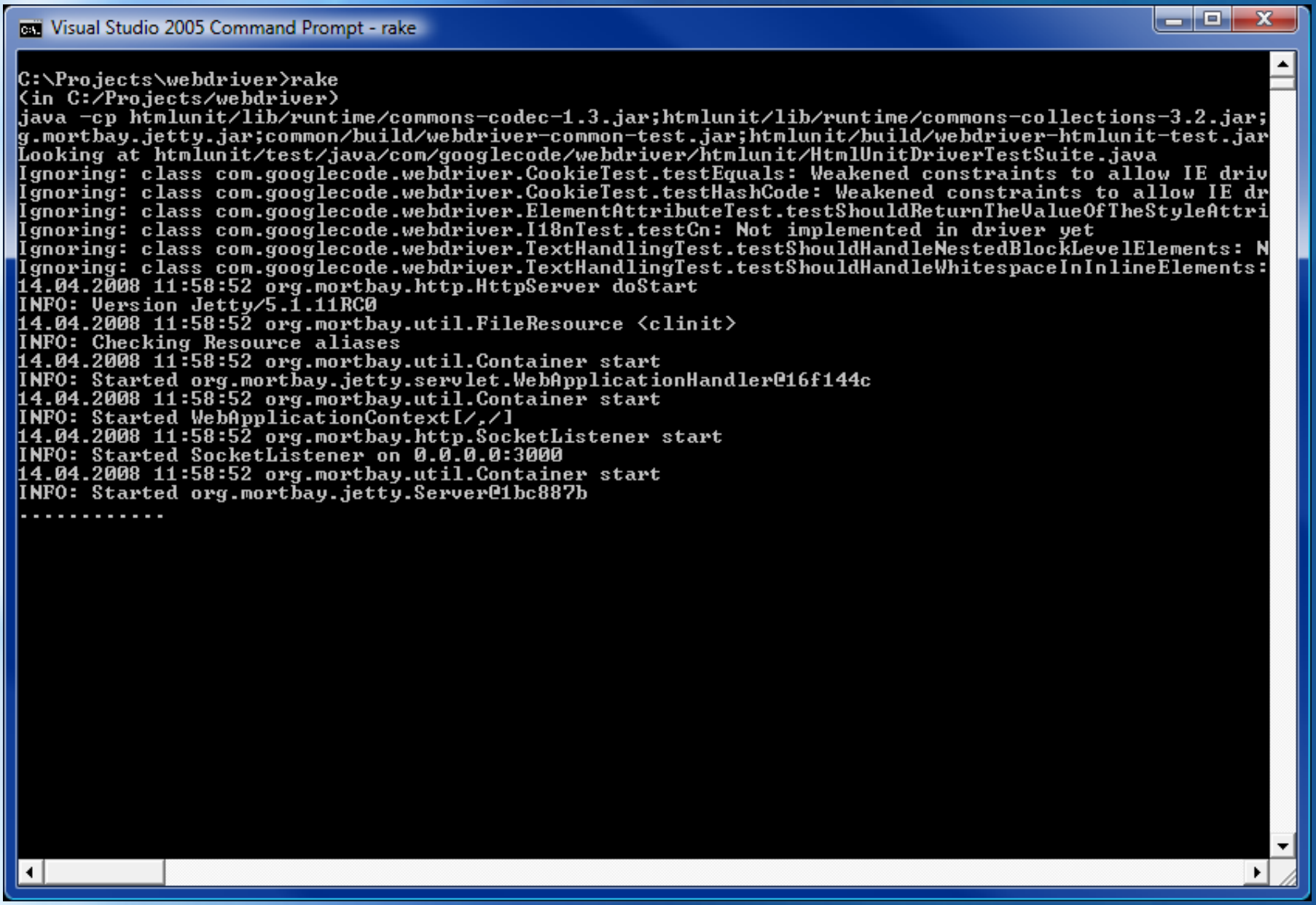
Getting Started

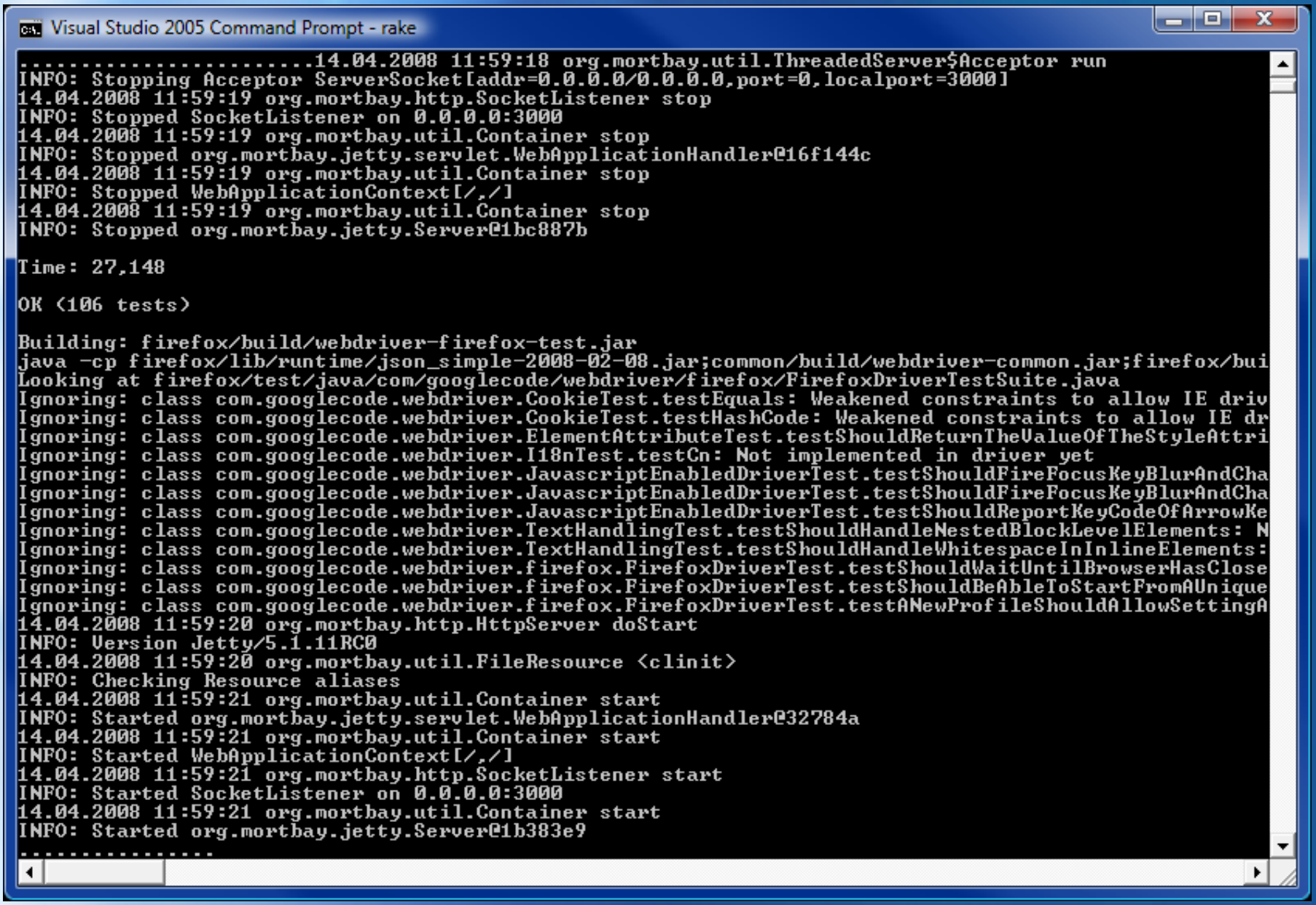
- install Ruby & Rake
- svn checkout / export http://webdriver.googlecode.com/svn/trunk
- rake install_firefox
- rake


RubyInstallerWiki: RubyInstaller - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://rubyinstaller.rubyforge.org/wiki/wiki.pl
Google
RubyInstaller
RubyInstaller | RecentChanges | Preferences
One-Click Ruby Installer for Windows
Current Version: 1.8.6-26 Final (2007-12-14)
This is a [one-click, self-contained Windows installer] that contains the Ruby language itself, dozens of popular extensions and packages, a syntax-highlighting editor and execution environment, and a Windows help file that contains the full text of the book, Programming Ruby: The Pragmatic Programmer's Guide.
If this is your first visit here, please click on Preferences above to register so that your name can be associated with your changes and contributions.
About the One-Click Installer
Quick Introduction
RubyInstallerNews
RubyInstallerFAQ
[Download]
[Report a bug]


Checkout
Repository
URL of repository:
http://webdriver.googlecode.com/svn/trunk
Checkout directory:
C:\Projects\webdriver
Only check out the top folder
Omit externals
Revision
HEAD revision
Revision
Show log
OK
Cancel
Help
http://webdriver.googlecode.com/svn/trunk - TortoiseSVN Checkout... Finished!
Action
Path
Added C:\Projects\webdriver\support\src\java\com\googlecode\webdriver\ift\match\NumericalMatchers.java
Added C:\Projects\webdriver\support\src\java\com\googlecode\webdriver\ift\match\AttributeMatcher.java
Added C:\Projects\webdriver\support\src\java\com\googlecode\webdriver\ift\match\TextMatcher.java
Added C:\Projects\webdriver\support\src\java\com\googlecode\webdriver\ift\WebDriverTestContext.java
Added C:\Projects\webdriver\support\src\java\com\thoughtworks
Added C:\Projects\webdriver\support\support.iml
Updated C:\Projects\webdriver
Completed At revision: 326
14,47 MBytes transferred
Added:745 Updated:1
OK
Cancel
.svn
common
firefox
htmlunit
jobbie
safari
selenium
support
CREDITS.txt
Rakefile
WebDriver.ipr
WebDriver.sln


Visual Studio 2005 Command Prompt
Setting environment for using Microsoft Visual Studio 2005 x86 tools.
C:\Program Files\Microsoft Visual Studio 8\VC>cd C:\Projects\webdriver
C:\Projects\webdriver>rake install_firefox
(in C:/Projects/webdriver)
Building: common/build/webdriver-common.jar
Building: firefox/build/webdriver-firefox.jar
java -cp common/build/webdriver-common.jar;firefox/build/webdriver-firefox.jar;firefox/lib/runtime/js
Creating WebDriver
Profile created
Attempting to install the WebDriver extension
Updating user preferences with common, useful settings
Deleting existing extensions cache (if it already exists)
Firefox should now start and quit
C:\Projects\webdriver>"c:\Program Files\Mozilla Firefox\firefox.exe" -ProfileManager
C:\Projects\webdriver>_
Firefox - Choose User Profile
Firefox stores information about your settings, preferences, and other user items in your user profile.
Create Profile...
Rename Profile...
Delete Profile...
default
WebDriver
Work offline
Don't ask at startup
Start Firefox
Exit
Add-ons
Extensions
Themes
DOM Inspector 1.8.1.13
Inspects the structure and properties of a window and its contents.
Firefox WebDriver 0.5
WebDriver implementation for Firefox
Options
Disable
Uninstall
Find Updates
Get Extensions


Visual Studio 2005 Command Prompt - rake
C:\Projects\webdriver>rake
(in C:/Projects/webdriver)
java -cp htmlunit/lib/runtime/commons-codec-1.3.jar;htmlunit/lib/runtime/commons-collections-3.2.jar;
g.mortbay.jetty.jar;common/build/webdriver-common-test.jar;htmlunit/build/webdriver-htmlunit-test.jar
Looking at htmlunit/test/java/com/googlecode/webdriver/htmlunit/HtmlUnitDriverTestSuite.java
Ignoring: class com.googlecode.webdriver.CookieTest.testEquals: Weakened constraints to allow IE driv
Ignoring: class com.googlecode.webdriver.CookieTest.testHashCode: Weakened constraints to allow IE dr
Ignoring: class com.googlecode.webdriver.ElementAttributeTest.testShouldReturnTheValueOfTheStyleAttri
Ignoring: class com.googlecode.webdriver.I18nTest.testCn: Not implemented in driver yet
Ignoring: class com.googlecode.webdriver.TextHandlingTest.testShouldHandleNestedBlockLevelElements: N
Ignoring: class com.googlecode.webdriver.TextHandlingTest.testShouldHandleWhitespaceInInlineElements:
14.04.2008 11:58:52 org.mortbay.http.HttpServer doStart
INFO: Version Jetty/5.1.11RC0
14.04.2008 11:58:52 org.mortbay.util.FileResource <clinit>
INFO: Checking Resource aliases
14.04.2008 11:58:52 org.mortbay.util.Container start
INFO: Started org.mortbay.jetty.servlet.WebApplicationHandler@16f144c
14.04.2008 11:58:52 org.mortbay.util.Container start
INFO: Started WebApplicationContext[/,/]
14.04.2008 11:58:52 org.mortbay.http.SocketListener start
INFO: Started SocketListener on 0.0.0.0:3000
14.04.2008 11:58:52 org.mortbay.util.Container start
INFO: Started org.mortbay.jetty.Server@1bc887b


Visual Studio 2005 Command Prompt - rake
.....14.04.2008 11:59:18 org.mortbay.util.ThreadedServer$Acceptor run
INFO: Stopping Acceptor ServerSocket[addr=0.0.0.0/0.0.0.0,port=0,localport=3000]
14.04.2008 11:59:19 org.mortbay.http.SocketListener stop
INFO: Stopped SocketListener on 0.0.0.0:3000
14.04.2008 11:59:19 org.mortbay.util.Container stop
INFO: Stopped org.mortbay.jetty.servlet.WebApplicationHandler@16f144c
14.04.2008 11:59:19 org.mortbay.util.Container stop
INFO: Stopped WebApplicationContext[/,/]
14.04.2008 11:59:19 org.mortbay.util.Container stop
INFO: Stopped org.mortbay.jetty.Server@1bc887b
Time: 27,148
OK (106 tests)
Building: firefox/build/webdriver-firefox-test.jar
java -cp firefox/lib/runtime/json_simple-2008-02-08.jar;common/build/webdriver-common.jar;firefox/bui
Looking at firefox/test/java/com/googlecode/webdriver/firefox/FirefoxDriverTestSuite.java
Ignoring: class com.googlecode.webdriver.CookieTest.testEquals: Weakened constraints to allow IE driv
Ignoring: class com.googlecode.webdriver.CookieTest.testHashCode: Weakened constraints to allow IE dr
Ignoring: class com.googlecode.webdriver.ElementAttributeTest.testShouldReturnTheValueOfTheStyleAttri
Ignoring: class com.googlecode.webdriver.I18nTest.testCn: Not implemented in driver yet
Ignoring: class com.googlecode.webdriver.JavascriptEnabledDriverTest.testShouldFireFocusKeyBlurAndCha
Ignoring: class com.googlecode.webdriver.JavascriptEnabledDriverTest.testShouldFireFocusKeyBlurAndCha
Ignoring: class com.googlecode.webdriver.JavascriptEnabledDriverTest.testShouldReportKeyCodeOfArrowKe
Ignoring: class com.googlecode.webdriver.TextHandlingTest.testShouldHandleNestedBlockLevelElements: N
Ignoring: class com.googlecode.webdriver.TextHandlingTest.testShouldHandleWhitespaceInInlineElements:
Ignoring: class com.googlecode.webdriver.firefox.FirefoxDriverTest.testShouldWaitUntilBrowserHasClose
Ignoring: class com.googlecode.webdriver.firefox.FirefoxDriverTest.testShouldBeAbleToStartFromAUnique
Ignoring: class com.googlecode.webdriver.firefox.FirefoxDriverTest.testANewProfileShouldAllowSettingA
14.04.2008 11:59:20 org.mortbay.http.HttpServer doStart
INFO: Version Jetty/5.1.11RC0
14.04.2008 11:59:20 org.mortbay.util.FileResource <clinit>
INFO: Checking Resource aliases
14.04.2008 11:59:21 org.mortbay.util.Container start
INFO: Started org.mortbay.jetty.servlet.WebApplicationHandler@32784a
14.04.2008 11:59:21 org.mortbay.util.Container start
INFO: Started WebApplicationContext[/,/]
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14.04.2008 11:59:21 org.mortbay.util.Container start
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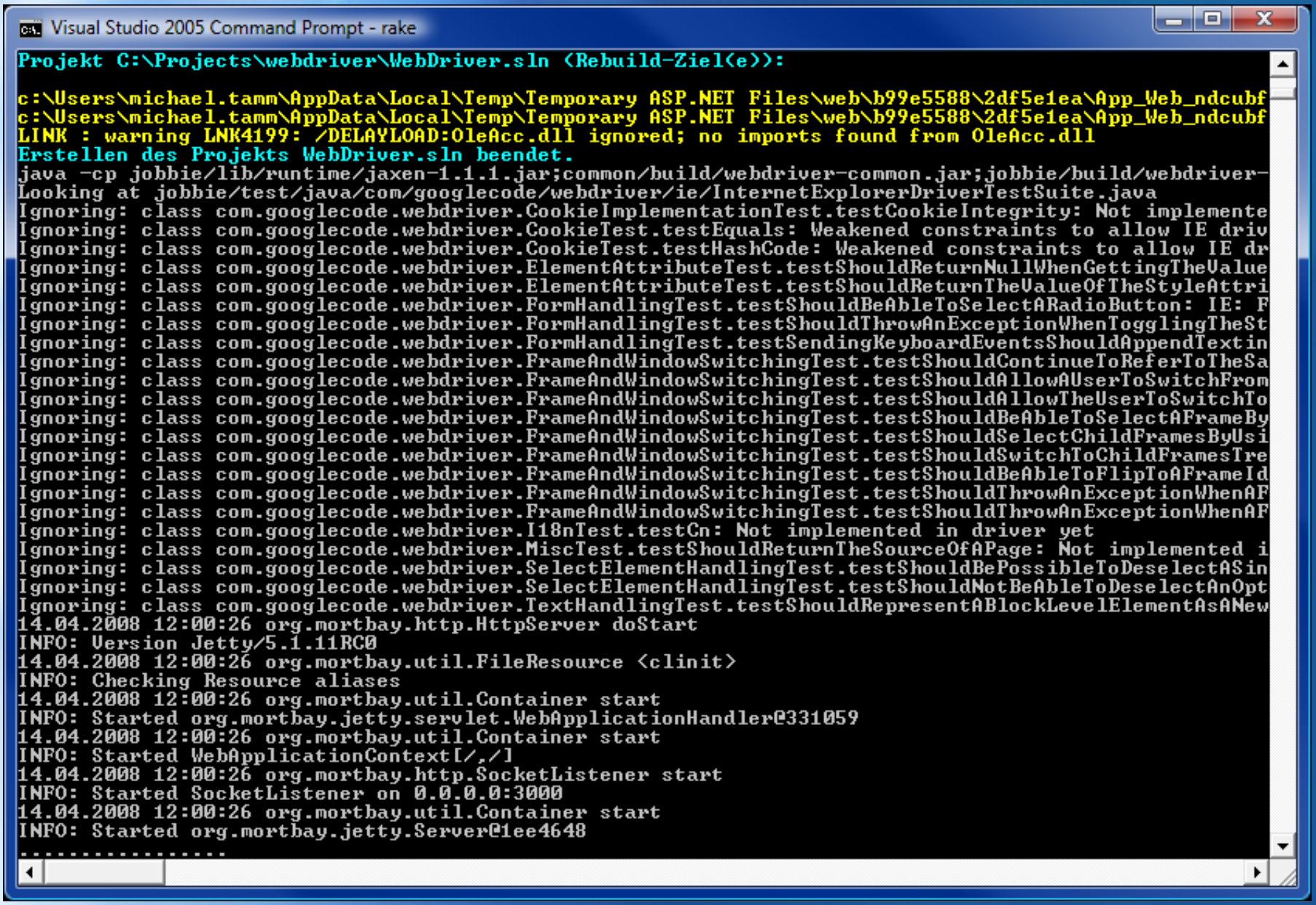
.....


Visual Studio 2005 Command Prompt - rake
Projekt C:\Projects\webdriver\WebDriver.sln (Rebuild-Ziel(e)):
c:\Users\michael.tamm\AppData\Local\Temp\Temporary ASP.NET Files\web\b99e5588\2df5e1ea\App_Web_ndcubf
c:\Users\michael.tamm\AppData\Local\Temp\Temporary ASP.NET Files\web\b99e5588\2df5e1ea\App_Web_ndcubf
LINK : warning LNK4199: /DELAYLOAD:OleAcc.dll ignored; no imports found from OleAcc.dll
Erstellen des Projekts WebDriver.sln beendet.
java -cp jobbie/lib/runtime/jaxen-1.1.1.jar;common/build/webdriver-common.jar;jobbie/build/webdriver-
Looking at jobbie/test/java/com/googlecode/webdriver/ie/InternetExplorerDriverTestSuite.java
Ignoring: class com.googlecode.webdriver.CookieImplementationTest.testCookieIntegrity: Not implemente
Ignoring: class com.googlecode.webdriver.CookieTest.testEquals: Weakened constraints to allow IE driv
Ignoring: class com.googlecode.webdriver.CookieTest.testHashCode: Weakened constraints to allow IE dr
Ignoring: class com.googlecode.webdriver.ElementAttributeTest.testShouldReturnNullWhenGettingTheValue
Ignoring: class com.googlecode.webdriver.ElementAttributeTest.testShouldReturnTheValueOfTheStyleAttri
Ignoring: class com.googlecode.webdriver.FormHandlingTest.testShouldBeAbleToSelectARadioButton: IE: F
Ignoring: class com.googlecode.webdriver.FormHandlingTest.testShouldThrowAnExceptionWhenTogglingTheSt
Ignoring: class com.googlecode.webdriver.FormHandlingTest.testSendingKeyboardEventsShouldAppendTextin
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldContinueToReferToTheSa
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldAllowAUserToSwitchFrom
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldAllowTheUserToSwitchTo
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldBeAbleToSelectAFrameBy
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldSelectChildFramesByUsi
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldSwitchToChildFramesTre
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldBeAbleToFlipToAFrameId
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldThrowAnExceptionWhenAF
Ignoring: class com.googlecode.webdriver.FrameAndWindowSwitchingTest.testShouldThrowAnExceptionWhenAF
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Ignoring: class com.googlecode.webdriver.MiscTest.testShouldReturnTheSourceOfAPage: Not implemented i
Ignoring: class com.googlecode.webdriver.SelectElementHandlingTest.testShouldBePossibleToDeselectASin
Ignoring: class com.googlecode.webdriver.SelectElementHandlingTest.testShouldNotBeAbleToDeselectAnOpt
Ignoring: class com.googlecode.webdriver.TextHandlingTest.testShouldRepresentABlockLevelElementAsANew
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....

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Example 1: Google Search

```
public class GoogleSearch {

    private WebDriver _driver;

    @Before
    public void setUp() {
        _driver = new FirefoxDriver();
        // _driver = new HtmlUnitDriver();
        // _driver = new InternetExplorerDriver();
    }

    @After
    public void tearDown() {
        _driver.close();
    }

    @Test
    public void searchForJaxMichaelTamm() {
        _driver.get("http://www.google.com/ncr");
        _driver.findElement(By.name("q")).sendKeys("Jax Michael Tamm");
        _driver.findElement(By.xpath("//input[@type = 'submit' and @value = 'Google Search']")).click();
        WebElement body = _driver.findElement(By.xpath("/html/body"));
        assertThat(body.getText(), containsString("JAX 2008"));
    }

}
```

Example 2: Google Suggest

```
@Test
public void googleSuggest() throws InterruptedException {
    _driver.get("http://www.google.com/webhp?complete=1&hl=en");
    _driver.findElement(By.name("q")).sendKeys("jav");
    // Give Google Suggest some time to load suggestions ...
    Thread.sleep(500);
    WebElement firstSuggestion =
        _driver.findElement(By.xpath("//table[@id = 'completeTable']//td"));
    assertThat(firstSuggestion.getText(), is("java"));
    firstSuggestion.click();
    assertThat(_driver.getTitle(), is("java - Google Search"));
    WebElement linkToJavaHomepage =
        _driver.findElement(By.linkText("java.com: Hot Games, Cool Apps"));
    linkToJavaHomepage.click();
    assertTrue(_driver.getCurrentUrl().startsWith("http://www.java.com/"));
}
```

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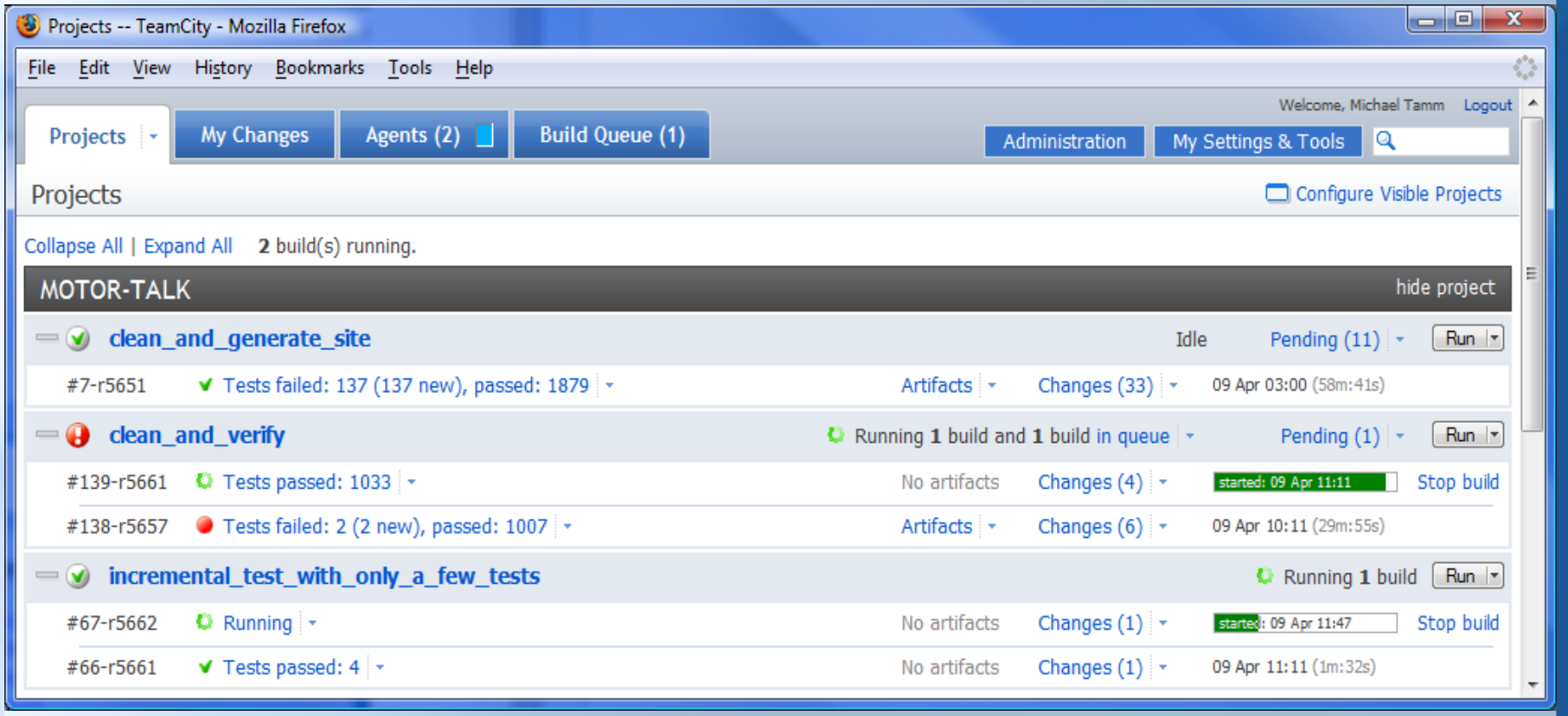
Best Practice

- Jeffrey Fredrick: „The sooner you learn about a problem the cheaper it is to fix, ...“

- Set up a Continuous Integration Server!
- Organize your tests and run fast tests first!

Example 1: TeamCity



Example 2: Maven

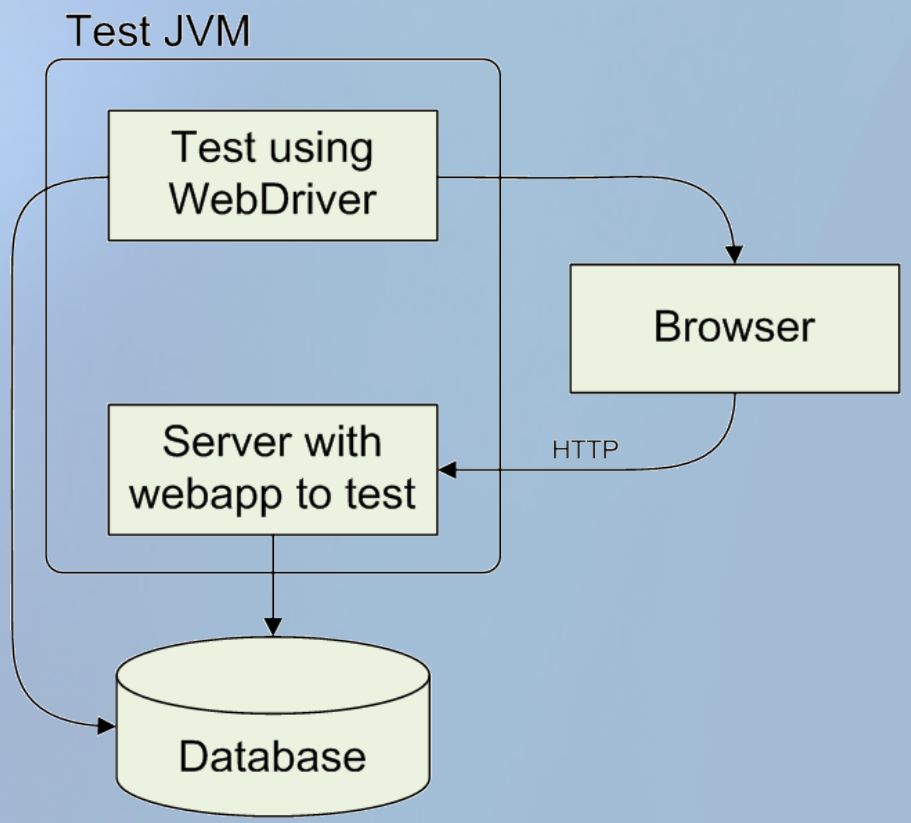
Default Lifecycle

validate	validate the project is correct and all necessary information is available.
generate-sources	generate any source code for inclusion in compilation.
process-sources	process the source code, for example to filter any values.
generate-resources	generate resources for inclusion in the package.
process-resources	copy and process the resources into the destination directory, ready for packaging.
compile	compile the source code of the project.
process-classes	post-process the generated files from compilation, for example to do bytecode enhancement on Java classes.
generate-test-sources	generate any test source code for inclusion in compilation.
process-test-sources	process the test source code, for example to filter any values.
generate-test-resources	create resources for testing.
process-test-resources	copy and process the resources into the test destination directory.
test-compile	compile the test source code into the test destination directory
process-test-classes	post-process the generated files from test compilation, for example to do bytecode enhancement on Java classes. For Maven 2.0.5 and above.
test	run tests using a suitable unit testing framework. These tests should not require the code be packaged or deployed.
prepare-package	perform any operations necessary to prepare a package before the actual packaging. This often results in an unpacked, processed version of the package. (Maven 2.1 and above)
package	take the compiled code and package it in its distributable format, such as a JAR.
pre-integration-test	perform actions required before integration tests are executed. This may involve things such as setting up the required environment.
integration-test	process and deploy the package if necessary into an environment where integration tests can be run.
post-integration-test	perform actions required after integration tests have been executed. This may including cleaning up the environment.
verify	run any checks to verify the package is valid and meets quality criteria.
install	install the package into the local repository, for use as a dependency in other projects locally.
deploy	done in an integration or release environment, copies the final package to the remote repository for sharing with other developers and projects.

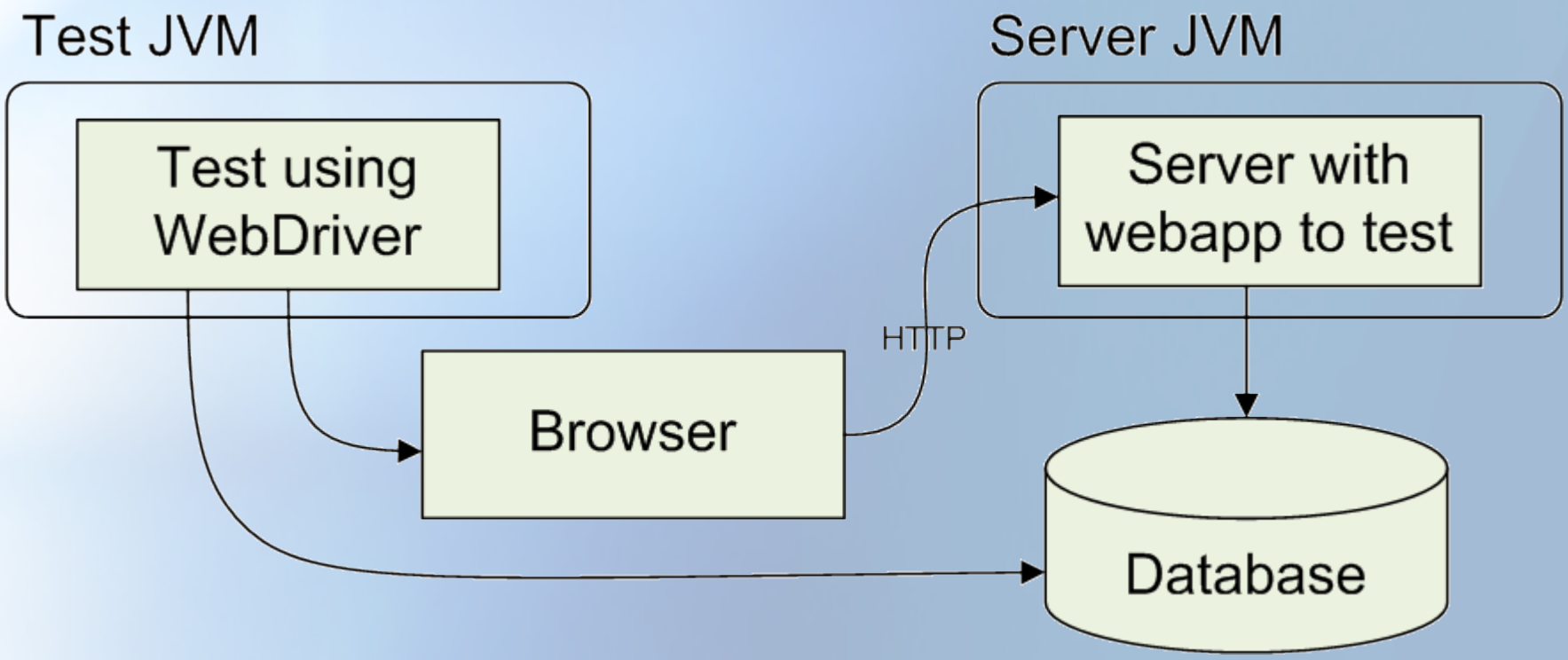
```xml
<!-- See http://maven.apache.org/plugins/maven-surefire-plugin -->
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-surefire-plugin</artifactId>
    <configuration>
        <forkMode>once</forkMode>
        <argLine>-Xmx1500m</argLine>
        <includes>
            <include>**/*Test.java</include>
        </includes>
        <excludes>
            <exclude>**/*PerformanceTest.java</exclude>
            <exclude>**/*FrontendTest.java</exclude>
        </excludes>
    </configuration>
    <executions>
        <execution>
            <id>run_frontend_tests</id>
            <phase>integration-test</phase>
            <configuration>
                <forkMode>once</forkMode>
                <argLine>-Xmx512m -DAbstractWebDriverTest.driverType=HtmlUnit</argLine>
                <includes>
                    <include>**/*FrontendTest.java</include>
                </includes>
                <excludes>
                    <!-- No excludes, but don't remove the <excludes> element, because
                         we need to overwrite the default plugin configuration from above. -->
                </excludes>
            </configuration>
            <goals...>
        </execution>
    </executions>
</plugin>
```

Testenvironment: Strategy 1

- Test sets up DB and starts server
  - Server runs in the same VM as the test, e.g. embedded Jetty or Tomcat
  - Overhead: Startup time of server and webapp



Testenvironment: Strategy 2



Best Practices

- Install the WebDriver Firefox Extension into your default Firefox profile and define the System property

```
webdriver.firefox.useExisting=true
```

- Now you can use Firebug for debugging :)

Best Practices

- Make your tests as readable as possible: Add a DSL like abstraction layer ...

Google Search Refactored

```
public class GoogleSearchRefactored extends AbstractWebDriverTest {

    @Test
    public void searchForJaxMichaelTamm() {
        goTo(GOOGLE_HOMEPAGE);
        enter("Jax Michael Tamm", into(inputField("q")));
        clickOn(button("Google Search"));
        assertThat(currentPage(), containsText("JAX 2008"));
    }

}
```

Actions

```
protected void goTo(EinstiegsSeite einstiegsSeite) {
    _driver.get(einstiegsSeite.getUrl());
}

protected void enter(String value, WebElement inputField) {
    inputField.sendKeys(value);
}

protected void clickOn(WebElement webElement) {
    webElement.click();
}
```

Finders

```
protected WebElement button(String label) {
    try {
        return _driver.findElement(By.xpath("//input[@type = 'submit' and @value = '" + label + "']"));
    } catch (NoSuchElementException e) {
        for (WebElement button : _driver.findElements(By.xpath("//button"))) {
            if (button.getText().equals(label)) {
                return button;
            }
        }
        throw e;
    }
}

protected WebElement inputField(String name) {
    return _driver.findElement(By.name(name));
}

protected WebElement link(String linkText) {
    return _driver.findElement(By.linkText(linkText));
}
```

Matchers

```
protected Matcher<WebDriver> containsText(final String expectedText) {
    return new TypeSafeMatcher<WebDriver>() {
        public boolean matchesSafely(WebDriver driver) {
            return driver.findElement(By.xpath("/html/body")).getText().contains(expectedText);
        }

        public void describeTo(Description description) {
            description.appendText("a page containing \"" + expectedText + "\"");
        }
    };
}
```

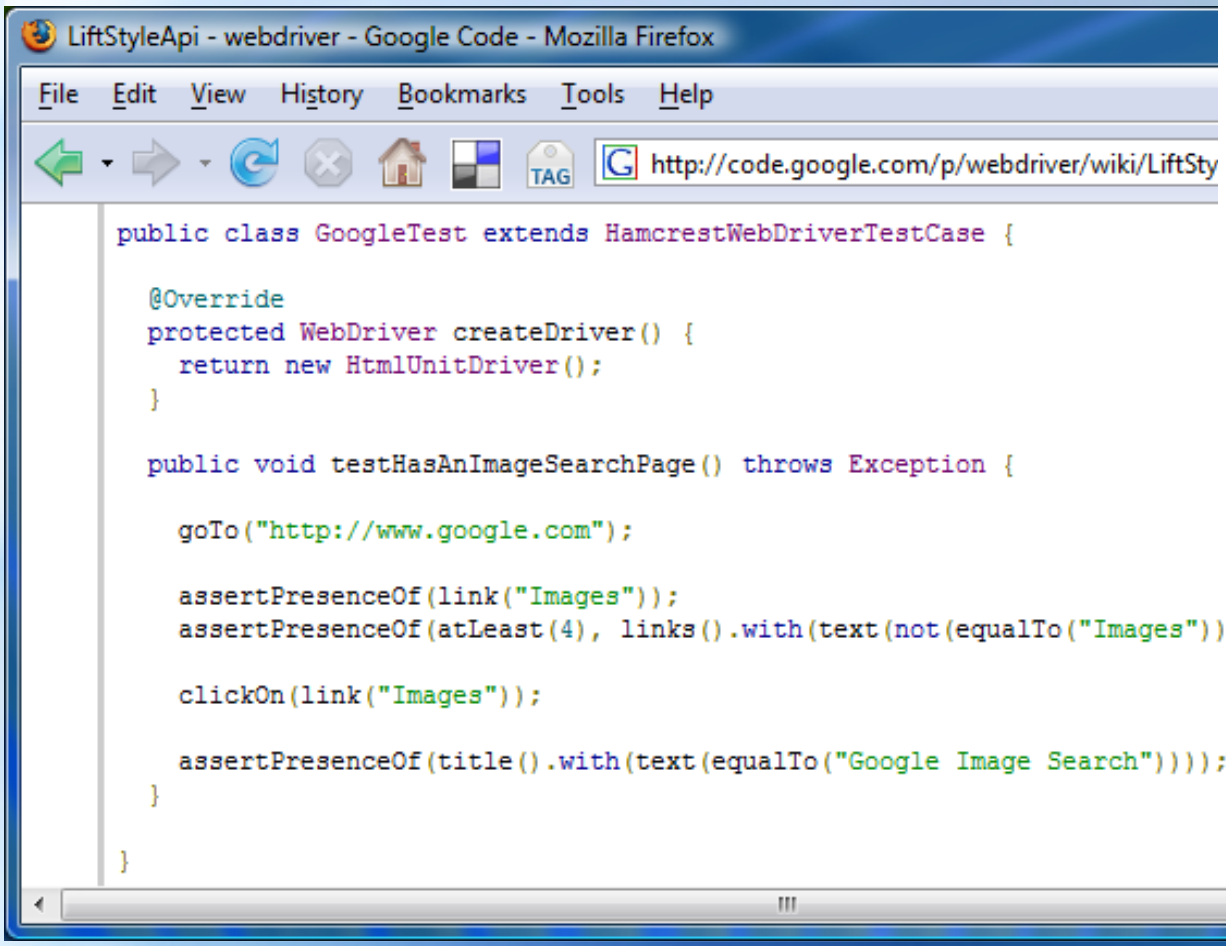
Example 3: Google Image Search

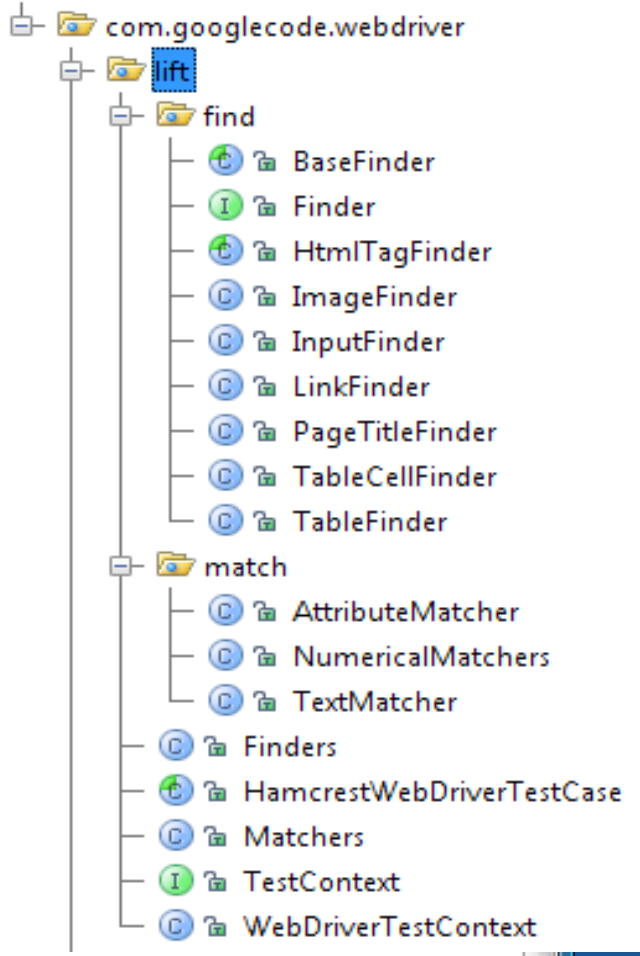
```
public class GoogleImageSearch extends AbstractWebDriverTest {

    @Test
    public void searchForMichaelTamm() {
        goTo(GOOGLE_HOMEPAGE);
        clickOn(link("Images"));
        assertThat(currentPage().getTitle(), is("Google Image Search"));
        enter("Michael Tamm", into(inputField("q")));
        clickOn(button("Search Images"));
        assertThat(currentPage(), containsText("Results 1 - 20"));
    }

}
```

WebDriver LiFT API





Best Practices

- Extract website specific HTML knowledge out of your tests and put it into your abstraction layer

Finders / Selectors / Locators

- By.id, By.name, By.linkText, By.xpath
- Bad XPATH: //table[5]/tbody/tr/td[2]/div/a/b
  - Ugly, unreadable, doesn't convey purpose
  - Breaks easily if the HTML structure changes
- „Good“ XPATH: //div[@id = 'foo']//a
- What if HTML structure changes?
  - How can you find out,
    what was selected before?

forum-40 - Audi Forum & Community - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://localhost:8080/forum/audi-b40.html

This Page Is Valid XHTML 1.0 Transitional!
Disable View Result

MOTOR-TALK

Cockpit | Buddies | Nachrichten (1 neue) | Keine neuen Beiträge
Mein Blog | Hilfe | Abmelden | administrator - sdfsfsdfsdfsdfsdf

Foren | News | Mitglieder | Marktplatz

Suche im Audi Forum | Suchen | Größe S M L

Startseite › Foren › PKW › Audi

Audi

Gelesen

	Beiträge	Themen	Letzter Beitrag
Audi 80, 90, 100, 200 & V8	219	13	04.03.07 11:32 Samuel0815
Audi A2	15	2	Audi-Alu-Kugel 04.03.07 10:27 Audi-Alu-Kugel
Audi A3 & S3	354	21	04.03.07 11:31 firefighter82
Audi A3 8L Bj. '97 - '03	31	4	g-towns-finest 04.03.07 11:27 g-towns-finest
Audi A3 8P & 8PA Bj. ab '04	309	13	ZZ69 04.03.07 11:29 ZZ69
Audi A4, S4 & RS4	574	29	04.03.07 10:54 dib
Audi A4 8D Bj. '95 - '01	184	14	04.03.07 11:28 brainticket999

Audi
80, 90, 100, 200 & V8
A2
A3 & S3
A4, S4 & RS4
A5 & S5
A6, S6, RS6 & allroad
A8 & S8
Q5
Q7
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R8
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Alle News

Fiat Bravo – Fünf Sterne beim Euro NCAP

57 Kommentare

A MOTOR-TALK Test Class

```
public class CockpitNavigationFrontendTest extends AbstractWebDriverTest {

    public void test() {
        // useFirefox();
        goToPage("/");
        loginWith("motortalk", "motortalk");
        clickOn(button("Cockpit").inside(dashBoard()));
        clickOn(link("Profil").inside(navBox("Cockpit")));
        // Test if link of current page is selected ...
        WebElement profilLink = link("Profil").inside(navBox("Cockpit"));
        assertThat(profilLink, hasClass("selected"));
        // Open user profile ...
        clickOn(profilLink);
        assertThat(mainColumn(), containsHeadline("Freiwillige Informationen"));
        // Open edit avatar page ...
        clickOn(link("Benutzerbild").inside(navBox("Profil")));
        assertThat(mainColumn(), containsHeadline("Benutzerbild"));
```

A MOTOR-TALK Test Class

```
public class CockpitNavigationFrontendTest extends AbstractWebDriverTest {

    public void test() {
        // useFirefox();
        goToPage("/");
        loginWith("motortalk", "motortalk");
        clickOn(button("Cockpit").inside(dashBoard()));
        clickOn(link("Profil").inside(navBox("Cockpit")));
        // Test if link of current page is selected ...
        WebElement profilLink = link("Profil").inside(navBox("Cockpit"));
        assertThat(profilLink, hasClass("selected"));
        // Open user profile ...
        clickOn(profilLink);
        assertThat(mainColumn(), containsHeadline("Freiwillige Informationen"));
        // Open edit avatar page ...
        clickOn(link("Benutzerbild").inside(navBox("Profil")));
        assertThat(mainColumn(), containsHeadline("Benutzerbild"));
```

MOTOR-TALK Specific Actions

```
private static final String BASE_URL = "http://localhost:8080";

/** Opens the page at the given path or URL in the browser. */
protected void goToPage(String pathOrUrl) {
    if (_driver == null) {
        init();
    }
    String completeUrl = getCompleteUrl(pathOrUrl);
    _driver.get(completeUrl);
}

/** Adds protocol and host to the given URL, if not already present. */
private String getCompleteUrl(String url) {
    String completeUrl;
    if (url.contains(":")) {
        completeUrl = url;
    } else {
        completeUrl = BASE_URL + url;
    }
    return completeUrl;
}
```

A MOTOR-TALK Test Class

```
public class CockpitNavigationFrontendTest extends AbstractWebDriverTest {

    public void test() {
        // useFirefox();
        goToPage("/");
        loginWith("motortalk", "motortalk");
        clickOn(button("Cockpit").inside(dashBoard()));
        clickOn(link("Profil").inside(navBox("Cockpit")));
        // Test if link of current page is selected ...
        WebElement profilLink = link("Profil").inside(navBox("Cockpit"));
        assertThat(profilLink, hasClass("selected"));
        // Open user profile ...
        clickOn(profilLink);
        assertThat(mainColumn(), containsHeadline("Freiwillige Informationen"));
        // Open edit avatar page ...
        clickOn(link("Benutzerbild").inside(navBox("Profil")));
        assertThat(mainColumn(), containsHeadline("Benutzerbild"));
```

MOTOR-TALK Specific Actions

```
/**
 * Falls ein Benutzer angemeldet ist, wird dieser zunächst abgemeldet,
 * anschließend wird der übergebene Benutzer mit dem übergebebenen Passwort angemeldet.
 */
public void loginWith(String userName, String password) {
    logout();
    element("//div[@id = 'dashboard']//input[@name = 'userName']").setValue(userName);
    element("//div[@id = 'dashboard']//input[@name = 'password']").setValue(password);
    clickOn(button("Login").inside(dashBoard()));
}

/**
 * Falls ein Benutzer angemeldet ist, wird dieser abgemeldet.
 */
public void logout() {
    try {
        clickOn(element("//li[@id = 'logofflink']/a"));
    } catch (NoSuchElementException e) {
        // Ignored.
        setPrintSourceOfCurrentPageOnTearDown(false);
    }
}
```

A MOTOR-TALK Test Class

```
public class CockpitNavigationFrontendTest extends AbstractWebDriverTest {

    public void test() {
        // useFirefox();
        goToPage("/");
        loginWith("motortalk", "motortalk");
        clickOn(button("Cockpit").inside(dashBoard()));
        clickOn(link("Profil").inside(navBox("Cockpit")));
        // Test if link of current page is selected ...
        WebElement profilLink = link("Profil").inside(navBox("Cockpit"));
        assertThat(profilLink, hasClass("selected"));
        // Open user profile ...
        clickOn(profilLink);
        assertThat(mainColumn(), containsHeadline("Freiwillige Informationen"));
        // Open edit avatar page ...
        clickOn(link("Benutzerbild").inside(navBox("Profil")));
        assertThat(mainColumn(), containsHeadline("Benutzerbild"));
```

MOTOR-TALK Specific Finders

```
/**
 * Returns the {@link WebElement} representing
 * the <code>&lt;div></code> for the dash board.
 */
public WebElement dashBoard() {
    return element("//div[@id = 'dashboard']");
}

/**
 * Returns the {@link WebElement} representing
 * the <code>&lt;div></code> element for the
 * navigation box with the given title.
 */
public WebElement navBox(String title) {
    if (title == null) {
        throw new IllegalArgumentException("Method parameter title must not be null.");
    }
    return element("//div[@class = 'box navbox']", containsHeadline(title));
}
```

MOTOR-TALK Specific Finders

```java
/**
 * Returns the first {@link WebElement} which matches the given XPath expression.
 *
 * @throws NoSuchElementException if no matching elements are found
 */
public WebElement element(String xpathExpression) {
    return _driver.findElement(By.xpath(xpathExpression));
}

/**
 * Returns the first {@link WebElement} which matches the
 * given XPath expression and the given matcher.
 *
 * @throws NoSuchElementException if no matching element is found
 */
public <T> WebElement element(String xpathExpression, Matcher<T> elementMatcher) {
    List<WebElement> candidates = _driver.findElements(By.xpath(xpathExpression));
    for (WebElement element : candidates) {
        if (elementMatcher.matches(element)) {
            return element;
        }
    }
    throw new NoSuchElementException("Unable to find element " + xpathExpression + " " + elementMatcher);
}
```

MOTOR-TALK Specific Matchers

```
public class WebDriverMatchers {

    public static <T> Matcher<T> containsHeadline(String text) {
        return new ContainsHeadline<T>(text);
    }

    public static <T, E extends WebElement> Matcher<T> containsLink(String text) {
        return new ContainsLink<T, E>(text);
    }

    public static <T, E extends WebElement> Matcher<T> containsLink(String text, Matcher<E> linkMatcher) {
        return new ContainsLink<T, E>(text, linkMatcher);
    }

    public static <T> Matcher<T> containsText(String text) {
        return new ContainsText<T>(text);
    }

    public static <E extends WebElement> Matcher<E> withText(String text) {
        return new ContainsText<E>(text);
    }
```

```
assertThat(mainColumn(), containsLink("BMW Homepage", withAttribute("href", equalTo("http://www.bmw.de"))));
```

```
assertThat(currentPage(), not(containsText("Ein Fehler ist aufgetreten")));
```

```
assertThat(widgetColumn(), containsElement("span", withText("anonym")));
```

ContainsHeadline Matcher (1/3)

```java
/**
 * Matches if the current page or a certain {@link WebElement} contains
 * a headline with a given text (ignoring whitespaces).
 *
 * @param <T> {@link WebDriver} or {@link WebElement}
 */
public class ContainsHeadline<T> extends BaseMatcher<T> {

    private String _normalizedText;

    public ContainsHeadline(String text) {
        if (text == null) {
            throw new IllegalArgumentException("Constructor parameter text must not be null.");
        }
        _normalizedText = normalizeSpace(text);
    }

    public final boolean matches(Object item) {...}

    public boolean matchesSafely(WebElement webElement) {...}

    public void describeTo(Description description) {
        description.appendText("WebDriver or WebElement containing headline \"" + _normalizedText + "\"");
    }

}
```

ContainsHeadline Matcher (2/3)

```
public final boolean matches(Object item) {
    if (item instanceof WebDriver) {
        WebDriver webDriver = (WebDriver) item;
        return matchesSafely(webDriver.findElement(By.xpath("//body")));
    } else if (item instanceof WebElement) {
        WebElement webElement = (WebElement) item;
        return matchesSafely(webElement);
    } else {
        return false;
    }
}
```

ContainsHeadline Matcher (3/3)

```
public boolean matchesSafely(WebElement webElement) {
    for (int i = 1; i <= 6; ++i) {
        List<WebElement> headlines = webElement.getChildrenOfType("h" + i);
        for (WebElement headline : headlines) {
            String normalizedHeadlineText = normalizeSpace(headline.getText());
            if (_normalizedText.equals(normalizedHeadlineText)) {
                return true;
            }
        }
    }
    return false;
}
```

A MOTOR-TALK Test Class

```
public class CockpitNavigationFrontendTest extends AbstractWebDriverTest {

    public void test() {
        // useFirefox();
        goToPage("/");
        loginWith("motortalk", "motortalk");
        clickOn(button("Cockpit").inside(dashBoard()));
        clickOn(link("Profil").inside(navBox("Cockpit")));
        // Test if link of current page is selected ...
        WebElement profilLink = link("Profil").inside(navBox("Cockpit"));
        assertThat(profilLink, hasClass("selected"));
        // Open user profile ...
        clickOn(profilLink);
        assertThat(mainColumn(), containsHeadline("Freiwillige Informationen"));
        // Open edit avatar page ...
        clickOn(link("Benutzerbild").inside(navBox("Profil")));
        assertThat(mainColumn(), containsHeadline("Benutzerbild"));
```

MOTOR-TALK Specific Finders

```
/**
 * Returns the first <code>&lt;button&gt;</code> element
 * with the given text (ignoring white spaces).
 *
 * @throws NoSuchElementException if no matching
 *         <code>&lt;button&gt;</code> element is found
 */
public WebElementProxy button(String text) {
    return new WebElementProxy(new FindButtonByText(text), body());
}
```

MOTOR-TALK Specific Finders

```
private WebElement findButton(WebElement container) {
    for (WebElement button : container.getChildrenOfType("button")) {
        String normalizedButtonText = normalizeSpace(button.getText());
        // Also find image buttons ...
        if (isBlank(normalizedButtonText)) {
            List<WebElement> images = button.getChildrenOfType("img");
            if (images.size() == 1) {
                WebElement image = images.get(0);
                normalizedButtonText = normalizeSpace(image.getAttribute("alt"));
            }
        }
        if (normalizedButtonText.equals(_normalizedText)) {
            return button;
        }
    }
    return null;
}
```

```java
/**
 * Adds the method {@link #inside} to a {@link WebElement}.
 */
public class WebElementProxy implements WebElement {

    private final WebElementFinder _finder;
    private final WebElement[] _containers;
    private WebElement _element;

    public WebElementProxy(WebElementFinder finder, WebElement... containers) {
        _finder = finder;
        _containers = containers;
    }

    public WebElement inside(WebElement... containers) {
        return _finder.findIn(containers);
    }

    private WebElement getElement() {
        if (_element == null) { _element = _finder.findIn(_containers); }
        return _element;
    }

    public String getText() { return getElement().getText(); }
    public void click() { getElement().click(); }
    public void sendKeys(CharSequence... keysToSend) { getElement().sendKeys(keysToSend); }
```

A MOTOR-TALK Test Class

```
public class CockpitNavigationFrontendTest extends AbstractWebDriverTest {

    public void test() {
        // useFirefox();
        goToPage("/");
        loginWith("motortalk", "motortalk");
        clickOn(button("Cockpit").inside(dashBoard()));
        clickOn(link("Profil").inside(navBox("Cockpit")));
        // Test if link of current page is selected ...
        WebElement profilLink = link("Profil").inside(navBox("Cockpit"));
        assertThat(profilLink, hasClass("selected"));
        // Open user profile ...
        clickOn(profilLink);
        assertThat(mainColumn(), containsHeadline("Freiwillige Informationen"));
        // Open edit avatar page ...
        clickOn(link("Benutzerbild").inside(navBox("Profil")));
        assertThat(mainColumn(), containsHeadline("Benutzerbild"));
```

Agenda

- Some General Thoughts About Frontend Tests
- WebDriver Concepts & API
- Getting Started
- Examples for Simple Tests
- Best Practices
- Future Prospects

The Future

- WebDriver will be part of Selenium 2.0

Questions

Thank You

http://webdriver.googlecode.com/