Testbench 2.0
User manual

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Definitions

@build@
: Build identifier of format YYYYMMDDHHmm

@version@
: Version identifier with version information + build eg. 2.0.0.development.@build@

Console
: Console is used for the Hub Console that shows information about the Hub and Remote Controller statuses. The console is found at `http://{HUB_ADDR}:4444/console`

Grid
: Grid consists of a Hub and one or more Remote Controls.

Hub
: The hub controls Remote Control resource allocation for tests.

IDE
: See. Testbench IDE

Remote Control
: Remote Control executes the test commands and controls browsers during tests.

Testbench IDE
: The Testbench IDE is the Firefox extension used for recording and editing test cases.

Overview

What is Testbench

Testbench is an environment used for automated user interface regression testing of Vaadin applications on multiple platforms and browsers.

Testbench enables you to run tests on the UI after a build and catch problems created by changes done to the business logic. This helps you to catch problems that affect the UI functionality before it becomes a real problem.

Typical Testbench setup

The typical setup for a Testbench environment consists of

1. Build server used to build, launch and test the application.
2. Machine with Firefox + Testbench IDE for creating tests.
3. One machine running Grid Hub.
4. One or more machines running Grid Remote Controls.

Machines for Hub, Remote Controls and test creation may be the same machine.

Testbench parts.

- Firefox extension Testbench-ide-@build@.xpi
- vaadin-testbench-@version@.jar
- Testbench Grid (includes Hub and Remote Control)

Testbench requirements

For recording and playback using IDE
- Firefox 3 or newer

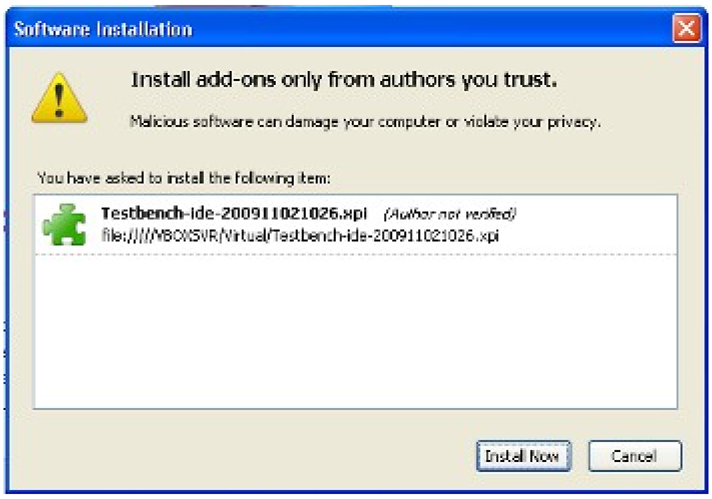
For running tests
- Java JDK 1.5 or newer
- Installed browsers
- Apache Ant or a way to run Ant script is recommended

How to install Testbench

Simple setup for recording

After extracting the files from vaadin-testbench-@version@.zip enter the testbench-ide directory.

Open Firefox and either drag the Testbench-ide-@build@.xpi to the Firefox window or open it from the [File] menu. This will ask if you want to install the Testbench IDE extension.
Note that because Testbench IDE is built on the Selenium IDE extension installation will overwrite an installed Selenium IDE extension and any old Testbench IDE.



Software Installation

Install add-ons only from authors you trust.

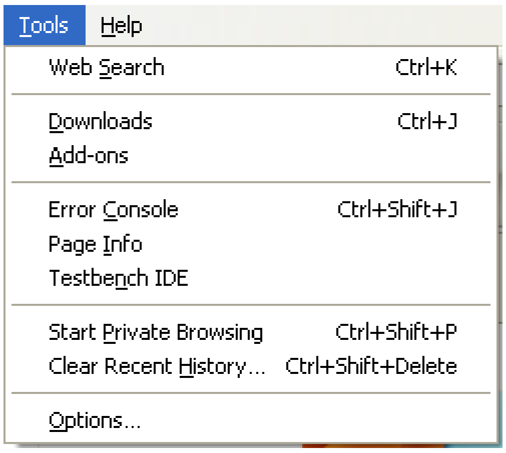
Malicious software can damage your computer or violate your privacy.

You have asked to install the following item:

Testbench-ide-200911021026.xpi *(Author not verified)*
file:////VBOXSVR/Virtual/Testbench-ide-200911021026.xpi

After Firefox has restarted navigate to a Vaadin application eg.
http://demo.vaadin.com/colorpicker

Open [Testbench IDE] from the [Tools] menu and record a small test.


Tools
Help
Web Search Ctrl+K
Downloads Ctrl+J
Add-ons
Error Console Ctrl+Shift+J
Page Info
Testbench IDE
Start Private Browsing Ctrl+Shift+P
Clear Recent History... Ctrl+Shift+Delete
Options...

Open an empty tab or window and press ▶ to check that the test works.

Save the test as a .html file with [Save Test Case] from the [File] menu to example/testscripts/ (Testbench uses html notation for the test files)

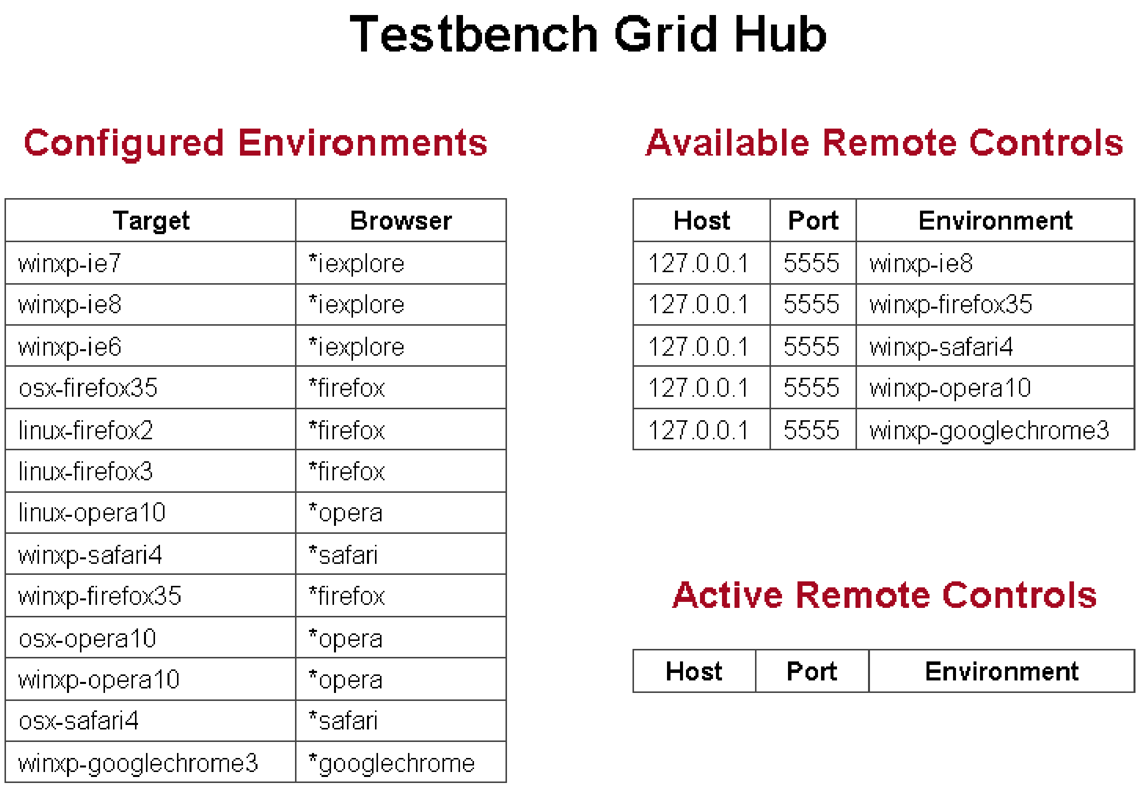
Simple setup for playback on local machine

The hub and remote control are setup so that they can be run on the local machine just by first starting the hub with /grid/hub/hub.bat and then the remote control with /grid/remote-control/rc.bat (hub and rc under linux).

Navigate to grid/hub/ and run hub.bat to start the hub on port 4444.

Then go to grid/remote-control/ and run rc.bat to start the remote control on the local machine and have it connect to the hub.

Check that remote control registered correctly by opening `http://localhost:4444/console`



Testbench Grid Hub

Configured Environments

Target	Browser
winxp-ie7	*iexplore
winxp-ie8	*iexplore
winxp-ie6	*iexplore
osx-firefox35	*firefox
linux-firefox2	*firefox
linux-firefox3	*firefox
linux-opera10	*opera
winxp-safari4	*safari
winxp-firefox35	*firefox
osx-opera10	*opera
winxp-opera10	*opera
osx-safari4	*safari
winxp-googlechrome3	*googlechrome

Available Remote Controls

Host	Port	Environment
127.0.0.1	5555	winxp-ie8
127.0.0.1	5555	winxp-firefox35
127.0.0.1	5555	winxp-safari4
127.0.0.1	5555	winxp-opera10
127.0.0.1	5555	winxp-googlechrome3

Active Remote Controls

Host	Port	Environment

Next run the ant script in the example/ directory. The script will convert, compile, run the recorded test and give a brief output on test success or failure.

Setting up the grid

The grid consists of 2 parts.

1. Hub (Handles communication between remote controls and test application)
2. Remote-Control (Actual execution of test commands)

Configuring the hub

For the Hub port and environments can be easily defined in `grid_configuration.yml`

- name:	“”	represents the Target value in the console and
browser:	“”	is the browser run by this target.

The name can be defined as anything, but may not contain a [,] as the remote control environment string is parsed by [,].

The supported browser strings are defined at the end of this document.

Configuring the remote control

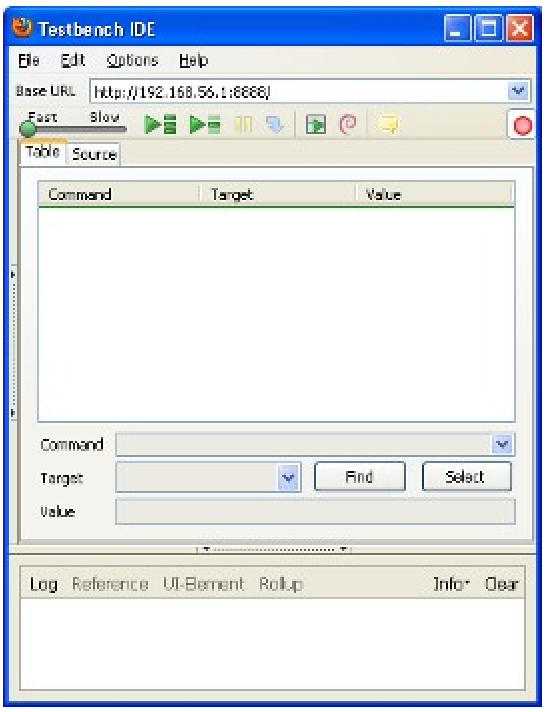
The remote control is configured in the script (rc or rc.bat).

`HOST`	- should be the address of this remote control
`HUBURL`	- is the address to the hub
`ENVIRONMENT`	- defines environments/browsers supported by this remote control
`PORT`	- is the port that this remote control listens to
`USEREXTENSIONS`	- defines where user-extensions.js is located

The environment variable should match one or more of the ones defined in the hub console.

How to record test cases

Test cases are recorded using the Testbench IDE.



Open the page for which you want to make the test and launch the IDE from the [Tools] menu.

Recording will be automatically enabled when the program launches. This is marked by the ● button.

Recording:

Testbench will record appropriate commands as the user navigates the application while recording is enabled. (note. Passwords are also recorded in plain text as they do not differ from normal text input)
Changing tabs or open windows is not recomended while recoding is on, as any clicks made will be recorded.

After finishing the recording it is advisable to playback the test with ▶ to see that it works and no faulty commands are found.

If the test works correctly the test should be saved as a .html file with [Save Test Case] from the [File] menu (ctrl+s). HTML file format is used because the IDE saves the test case in XHTML format. (Also the default files that are searched when running tests as JUnit tests with the ant script is *.html)

Special commands

Comparing screenshot images: [screenCapture]

In the right click menu, option **screenCapture** will record an event that will take a screenshot of the desktop, crop out the canvas and compare the result to a reference image if one is available. If no referense image is available it will save this screenshot and fail the test at the end.
(note that screenshots are not taken and compared in the IDE, only when using a remote control)

For the **screenCapture** command the Value field can be used to define a identifier string for the screenshot. If left empty the identifier will be a running number starting from 1 for each test. Using an ID for the screenshot is more reliable than the numbers if the test changes and new screenshots are added.

The naming convention of screenshots is automated and has the following format.
`NameOfTest_OperatingSystem_BrowserName_BrowserMajorNumber_Identifier.png`

Recording ToolTips: [showTooltip]

Clicking will enable recording of a tooltip by hovering until a tooltip appears and then moving the mouse away from the element. This will record a showTooltip command and disable the tooltip button.

Connecting tests together: [includeTest]

Testbench has the capability to connect tests together. This is done by adding a command **includeTest** where the Value is the path to the test to insert. Target test will be added in full at the position with **includeTest**. **IncludeTest** only works when converting to JUnit test using **`com.vaadin.testbench.util.TestConverter`**.

IDE buttons:

The **Find** button will highlight the target element on the page where as the **Select** button will allow changing the target of selected command to the next target found for the next click with the mouse. **Select** will stop bubbling of events for most Vaadin components, so selection of new target will not cause an actual click for most Vaadin components.

Editing test cases

To edit a test case open the test case in the IDE, as this is the simplest way to edit tests.

Command fields can be changed by selecting target command and then changing the wanted field. (Command, Target or Value)

New commands can be inserted by right clicking and selecting [Insert New Command] and comments with [Insert New Comment].

Note that new command and new comment will be added on the place that is selected and move the selected command down.

Faulty test cases:

Test cases may become faulty due to intentional changes to the application. Normally it involves changes in elements so that the Testbench element locator can't find the correct element. (refer to known problems)

If the problem is that an element can't be found press ▶ to playback the test and find the problem position and check with the **Find** button that the element can't be found (eg. It's not a problem with timing that the element just isn't available yet). Re-selecting the element is simplest with the **Select** button that will update the target.

How to playback a test case

From the IDE

Open wanted test in the IDE with [Open...] from the [File] menu (if not testing an already open test).

Press the ▶ button to playback the test. Playback will disable recording and run the currently open/selected test.

The command execution speed on playback can be controlled with the slider. Slowing down the execution speed on IDE playback is helpful when confirming the correctness of a test sequence.

As a JUnit test

The recommended way to run JUnit tests is to use the Ant Script in the examples directory. This will convert, compile and run the test(s).

Tests can also be played back using the hub and running the test as a JUnit test.

Converting tests can be done in two ways.

One is to use `TestConverter` from the vaadin-testbench jar from the commandline or with the create-tests target in the Ant script.

```
com.vaadin.testbench.util.TestConverter [OUTPUTDIR BROWSERS HTMLTestFiles]
```

OutputDir	defines where the generated Java JUnit files should be saved
Browsers	defines target environments separated by a comma (environments need to be found in hub targets)
HTMLTestFiles	target test files locations separated by a space

When compiling the JUnit tests you need to add the vaadin-testbench-@version@.jar and lib/junit-*.jar into your build path. (These are also needed for running the test)

When running the JUnit test case 3 system property values need to be specified.

```
-Dcom.vaadin.testbench.tester.host="localhost"
-Dcom.vaadin.testbench.deployment.url="http://demo.vaadin.com/"
```

`-Dcom.vaadin.testbench.screenshot.directory`=”screenshot”

Values given are for the example within the package using the grid on local machine.

Another is to export the test to vaadin format. From the IDE select:
File → Export Test Case As → Vaadin Format – TestBench.

This will create a .java JUnit file out of the currently open test. (Some things need to be changed by hand in the .java file like screen shot names, test will use Firefox for the test and includeTest will not include the target test)

Note. Browser tests will not be able to run if no remote control has registered target environment.

How to setup test machines

Setting up a test machine consists of

```
1.   Install/confirm Java 1.5 JRE (or newer)
2.   Install browsers to use on machine
3.   Copy grid to test machine and edit remote-control run script
4.   Set browser settings
5.   Set OS settings
```

Edit remote control run script

After copying the grid package (or just the remote-control if another machine is running the hub) the run script needs to be changed.

If the hub is running on the same machine as the remote control then only the `ENVIRONMENT` needs to be defined with proper environment targets for this remote controller as localhost.

For remote controllers running on other machines the `HOST`, `HUBURL` and `ENVIRONMENT` variables need to be defined.

`HOST`	- The address of this remote control
`HUBURL`	- The address to the hub
`ENVIRONMENT`	- Environments/browsers supported by this remote control

Browser settings

Turn off popup blockers for all browsers.
[Internet Explorer - Tools → Pop-up Blocker → Turn Off Pop-up Blocker]
[Safari - Edit → Block Pop-up Windows]

Turn off default browser checks for all browsers.

Operating system settings

Windows:
Disable error reporting in case a browser crashes.

```
 1.  Open control panel → System
 2.  Select ”Advanced” tab
 3.  Select ”Error reporting”
 4.  Check that ”Disable error reporting” is selected
 5.  Check that ”But notify me when critical errors occur” is not selected
```

Notes for using screenshots

Disable the auto-hide function for the toolbar. (Windows)
Check that the toolbar is either locked or unlocked on all test machines. (Windows)
Diable cursor blinking.
    Windows: [Control panel → Keyboard → Cursor blink rate → none]
Turn on "Allow active content to run in files on My Computer" under Security settings on IE.

Use same resolution on all test machines and check that the maximized window is always the same size.

Configure the browser in the same manner (same toolbars visible etc.)

Turn off software that may suddenly popup a new window.

Disable cursor blinking for less false fails.

How to integrate Testbench with a build system

An example using Apache Ant can be found in the example directory. The example Ant script should be runnable if the hub and remote control have been started. The sample test will fail on the first run because there are no referense images.

Using Testbench with a build system.

The build system needs to take the following steps after finishing the build to run tests.

```
1.   Start server for testing (needs to be reachable by test machines)
2.   Convert HTML test to Java Junit tests using TestConverter
3.   Compile created Java Junit tests
4.   Remove old error screens for screenshot directory
5.   Run compiled Junit tests
6.   Remove temporary files (source and compiled java files)
```

Start server. (example assumes Jetty is used)

Create a WAR package of the application(s). Example of creating a war file using ant script:

```
<war destfile=”example.war” webxml=”./WebContent/WEB-INF/web.xml”>
  <fileset dir=”./src/possible_html_files”>
  <lib dir=”thirdparty/libs><exclude name=”not_needed.jar”/></lib>
  <classes dir=”./build/” />
</war>
```

Copy war file to $JETTY_HOME/webapps/example.war

Start a server so that the program to be tested is accessible from the test machine(s).
```
java -jar start.jar
```

Application should now be deployed at http://BUILD_SYSTEM_ADDRESS:8080/example/ if example configuration has been used.

Note that the deployment url/ip and port may change, but context path needs to stay the same as the one recieved when recording tests.

Convert HTML tests

Run **`com.vaadin.testbench.util.TestConverter [OUTPUTDIR BROWSERS HTMLTestFiles]`**

OutputDir	defines where the generated Java JUnit files should be saved
Browsers	defines target environments separated by a comma
HTMLTestFiles	target test files locations separated by a space

Compile JUnit tests

Compile the java files created during the previous step.

Remove old error screens

If there are any error screens from a prevoius run remove these so they don't mix with possible ones from this run.

Run Junit tests

Define required system property values to the java virtual machine.

`-Dcom.vaadin.testbench.tester.host`
= Hub address without the port definition eg. ”localhost”

`-Dcom.vaadin.testbench.deployment.url`
= Base url of test application eg. ”http://demo.vaadin.com/”

`-Dcom.vaadin.testbench.screenshot.directory`
= Base directory for reference and error images

Optional system property values that can be used are.

`-Dcom.vaadin.testbench.screenshot.softfail`
= if ”true” lets the test run to finish even if errors are found for screenshots

`-Dcom.vaadin.testbench.screenshot.reference.debug`
= if ”true” creates extra output for debuging purposes

Remove temporary files

Clean away created files that are not needed anymore. (the .java and .class files)

Stop server

After tests have completed stop the server and remove application data from the webapps/ directory.

Handling of reference screenshots

For reference screenshots the best place to have them would be in the version control repository. This way users and the build server will have the latest references for their use. (note that both build server and users will need access to the repository)

Updating references

Updating references on a users own machine only requires the user to copy over the correct/new screenshots from the errors/ directory to the references/ directory.

If using a repository, the images need to be copied the same way, but also the references/ directory need to be committed to the repository.

Supported browser strings

- `*firefoxproxy`
- `*firefox`
- `*chrome`
- `*firefoxchrome`
- `*firefox2`
- `*firefox3`
- `*iexploreproxy`
- `*safari`
- `*safariproxy`
- `*iehta`
- `*iexplore`
- `*opera`
- `*piiexplore`
- `*pifirefox`
- `*konqueror`
- `*mock`
- `*googlechrome`

Known issues

waitForVaadin doesn't always wait on the first command if the command is run before testbench hooks to the application are set on load.

At the moment playback for modifier+arrow key only works in Firefox and InternetExplorer.

Tests with RichTextFields do not work.

Jetty Configuration example

```
<?xml version="1.0"?>
<!DOCTYPE Configure PUBLIC "-//Mort Bay Consulting//DTD Configure//EN"
"http://jetty.mortbay.org/configure.dtd">

<Configure id="Server" class="org.mortbay.jetty.Server">
    <Call name="addConnector">
      <Arg>
          <New class="org.mortbay.jetty.nio.SelectChannelConnector">
            <Set name="port">8080</Set>
          </New>
      </Arg>
    </Call>

    <Set name="handler">
      <New id="Handlers" class="org.mortbay.jetty.handler.HandlerCollection">
         <Array type="org.mortbay.jetty.Handler">
        <Set name="handlers">
           <Item>
             <New id="Contexts"
class="org.mortbay.jetty.handler.ContextHandlerCollection"/>
           </Item>
         </Array>
        </Set>
      </New>
    </Set>

    <Call name="addLifeCycle">
      <Arg>
        <New class="org.mortbay.jetty.deployer.WebAppDeployer">
          <Set name="contexts"><Ref id="Contexts"/></Set>
          <Set name="webAppDir"><SystemProperty name="jetty.home"
default="."/>/webapps</Set>
          <Set name="parentLoaderPriority">false</Set>
          <Set name="extract">true</Set>
          <Set name="allowDuplicates">false</Set>
        </New>
      </Arg>
    </Call>
</Configure>
```