

Testing Smalltalk AJAX/SJAX Web Applications with Selenium 4

29th ESUG Conference

Novi Sad, Serbia

25th August 2022

Carsten Härle, straightec GmbH

Who am I?

- ▶ Carsten Härle: Founded straighttec GmbH 2000
- ▶ Experience in Smalltalk since 1986
- ▶ IT-Consulting, Software Development, Training and Coaching for OO, eXtreme Programming, Automated Testing, TDD
- ▶ Shrink wrapped product „beno“ in Dolphin Smalltalk for teaching and network management in Schools, Microsoft Certified Product

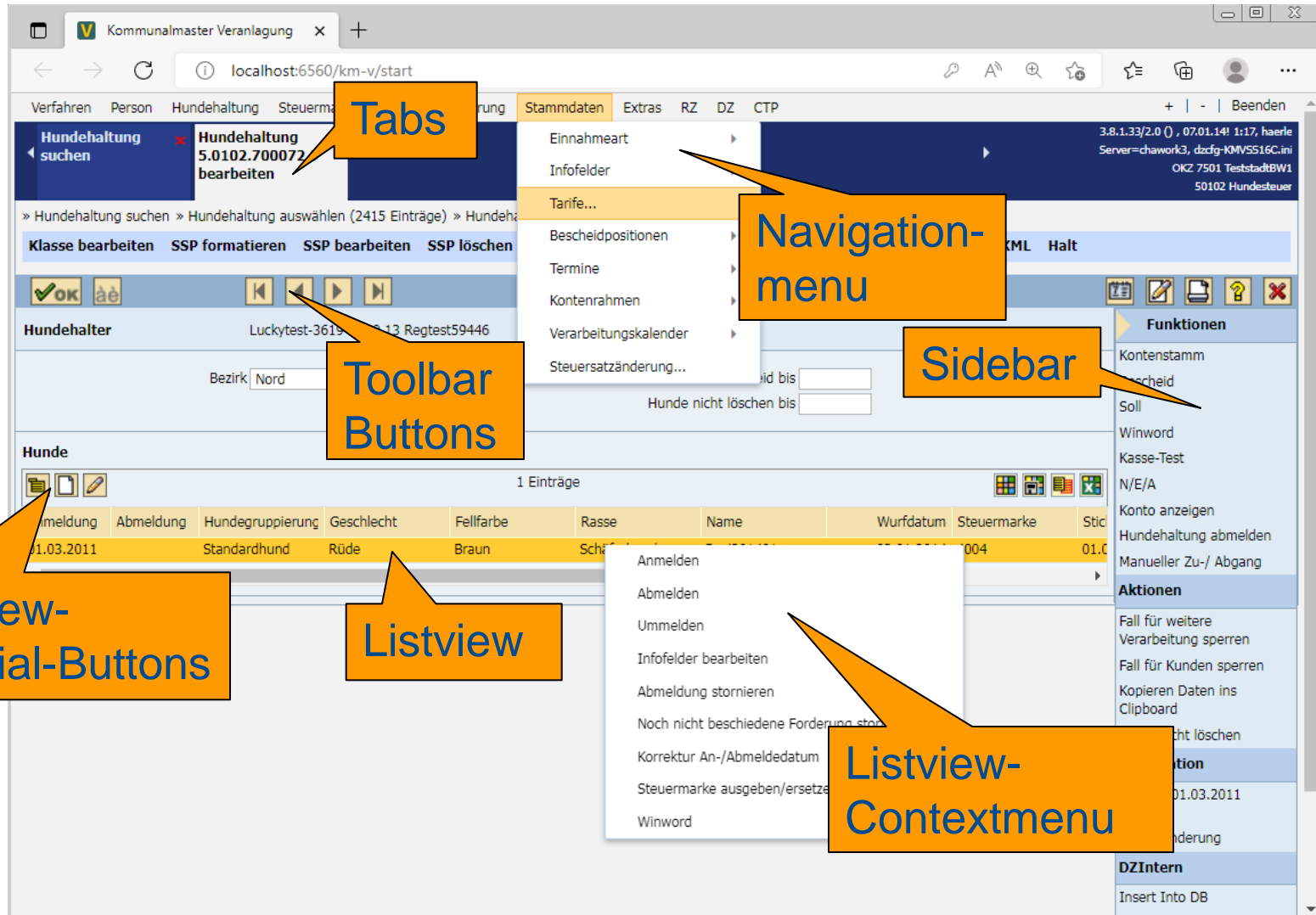
Outline

- ▶ Web Application
- ▶ Requirements for a web test framework
- ▶ Basis Parasol, Improvements, port to VisualWorks
- ▶ Simplified layer
- ▶ Problems and solutions
- ▶ Demos
- ▶ State and Web and Server for a test case
- ▶ Continuous, cooperative Build and Test, VM workers

Web application

- ▶ Project : Tax assesment of regional taxes and fees (dog tax, kindergarden, real estate tax, business taxes, water / wastewater)
- ▶ Started as ObjectStudio Fat-Client
- ▶ Now AJAX rich client web application with about 90% GUI and model code compatiblity to Fat-client system
- ▶ Libraries DHTMLX, Custom Controls, Javascript

UI-Elements



The screenshot shows a web application interface for 'Kommunalmaster Veranlagung'. The interface includes a browser window with the URL 'localhost:6560/km-v/start'. The main content area is divided into several sections:

- Tabs:** Located at the top, showing 'Hundehaltung suchen' and 'Hundehaltung 5.0102.700072 bearbeiten'.
- Navigation menu:** A dropdown menu with options like 'Einnahmeart', 'Infofelder', 'Tarife...', 'Bescheidpositionen', 'Termine', 'Kontenrahmen', 'Verarbeitungskalender', and 'Steuersatzänderung...'.
- Toolbar Buttons:** A set of icons for navigation and actions, including 'OK', 'Abmelden', and 'Suchen'.
- Sidebar:** A vertical panel on the right containing sections for 'Funktionen' (Kontenstamm, Bescheid, Soll, Winword, Kasse-Test, N/E/A, Konto anzeigen, Hundehaltung abmelden, Manueller Zu-/ Abgang) and 'Aktionen' (Fall für weitere Verarbeitung sperren, Fall für Kunden sperren, Kopieren Daten ins Clipboard, etc.).
- Listview-Special-Buttons:** A set of icons for list management, including 'Anmelden', 'Abmelden', 'Ummelden', 'Infofelder bearbeiten', 'Abmeldung stornieren', 'Noch nicht beschiedene Forderung stornieren', 'Korrektur An-/Abmeldedatum', 'Steuermarke ausgeben/ersetzen', and 'Winword'.
- Listview:** A table with columns: 'Anmeldung', 'Abmeldung', 'Hundegruppierung', 'Geschlecht', 'Fellfarbe', 'Rasse', 'Name', 'Wurfdatum', 'Steuermarke', and 'Stic'. The first row shows '01.03.2011', 'Standardhund', 'Rüde', 'Braun', 'Schä...', '...', '...', '004', and '01.0...'.
- Listview-Contextmenu:** A context menu for the listview, containing the same set of actions as the 'Listview-Special-Buttons'.

Requirements for a Web Testing framework

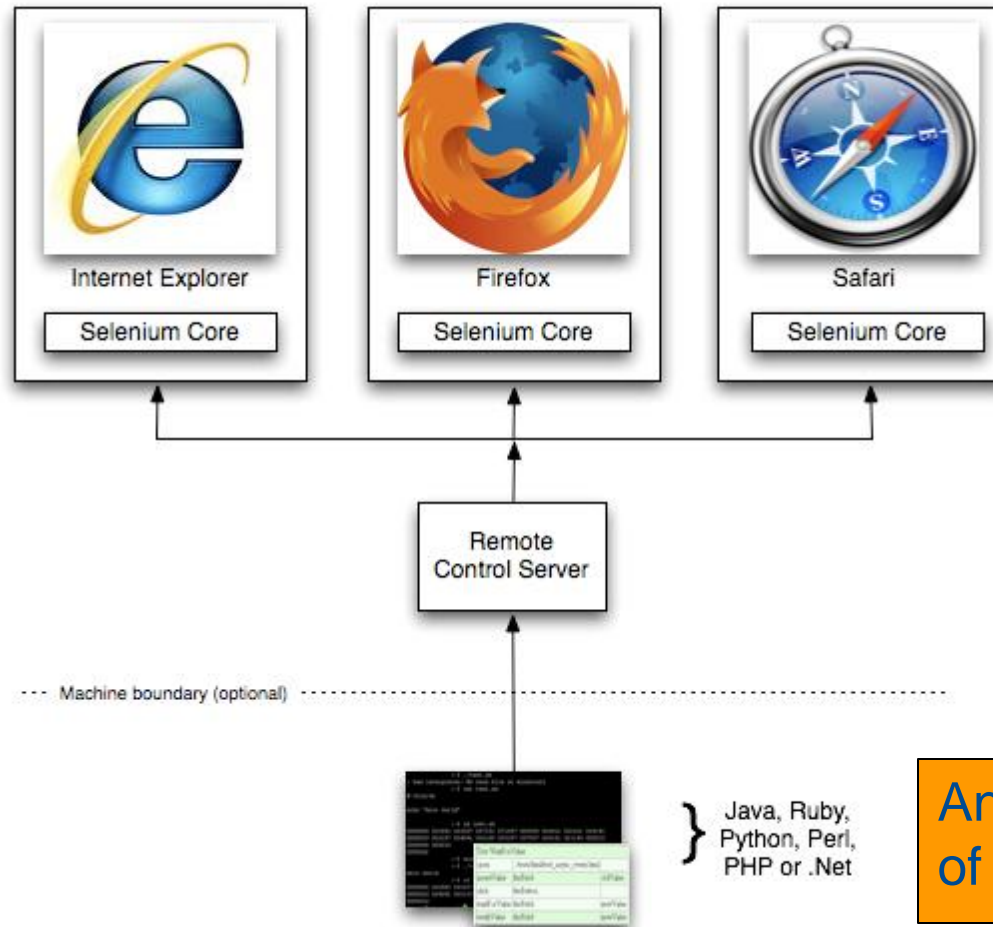
- ▶ Multiple web browsers: IE (deprecated) MS-Edge, Firefox (started with IE6, Firefox 3)
- ▶ Completely scriptable for full automation
- ▶ Automatic waiting for AJAX request termination
- ▶ Automatic Message Box and wait cursor detection
- ▶ Scriptable from Smalltalk, compatible with SUnit
- ▶ Optimal execution times (no unnecessary waits)
- ▶ High level test code (no „technology noise“)
- ▶ Easy to write, read and maintain, usable even by non-programmers

Solution details

- ▶ Selenium 1.0-4.0 as the execution engine
- ▶ SUnit-Integration in Smalltalk
- ▶ Interfaces for custom detection of AJAX request termination
- ▶ Interface for custom MessageBox detection
- ▶ Extended High-Level-Command-Library for short and easy to write and maintainable code
- ▶ Integration with parallel test execution servers
- ▶ based Parasol

Selenium Remote-Control Architecture

Windows, Linux, or Mac (as appropriate)...



And Smalltalk
of course

Parasol implementation: Minimal platform class

- ▶ Have a minimal possible Platform-compatibility class for adapt to different dialects (just 14 methods):
 - ▶ #byteArrayFromBase64String:
 - ▶ #dateAndTimeFromUnixTime:, #unixTimeFromDateAndTime
 - ▶ #ensureSeasideServerRunning
 - ▶ #handleRequest:
 - ▶ #fileDelete:, #fileWrite:contents:
 - ▶ #httpDelete:, #httpGet:, #httpPost:data:timeout:
 - ▶ #jsonRead: , #jsonWrite:
 - ▶ #pngImageFromArray:
 - ▶ #signalException:

Selenium 1 concepts: Commands / Locators

- ▶ Selenium commands are actions on a web element identified by a locator and with an optional parameter
- ▶ Syntax
 - ▶ *selenium action: <Locator>*
 - ▶ *selenium action: <Locator> value: <Parameter>*
- ▶ Examples
 - ▶ *selenium click: #MakeOrder*
 - ▶ *selenium type: #NumberOfItems value: 5*
 - ▶ *selenium select: #Country value: 'Belgium'*
 - ▶ *selenium isElementPresent: #OK*

Selenium concepts: Locators

- ▶ Simple / Built-In
 - ▶ HTML-Id of the Elements
 - ▶ link (E.g. link= 'link=Neu...')
 - ▶ X-Path, CSS-Selectors
- ▶ Problem: Often unreadable and/or indeterministic
 - ▶ selenium click: 'css=body'.
 - ▶ selenium click: 'css=a[title="Grundstück Neu"] > img'.
 - ▶ selenium click: 'id=toolBar.btAbbrechen'.
 - ▶ selenium click: 'css=a[title="Bearbeiten"] > img'.
 - ▶ selenium click: 'id=WebModalMessageBoxButton~OK'.
 - ▶ selenium click: 'id=image_w5R1BYpeaf9Fx'.
 - ▶ selenium click: '//div[@id="tlbObjekte"]/div[2]/table/tbody/tr[2]/td[4]'.

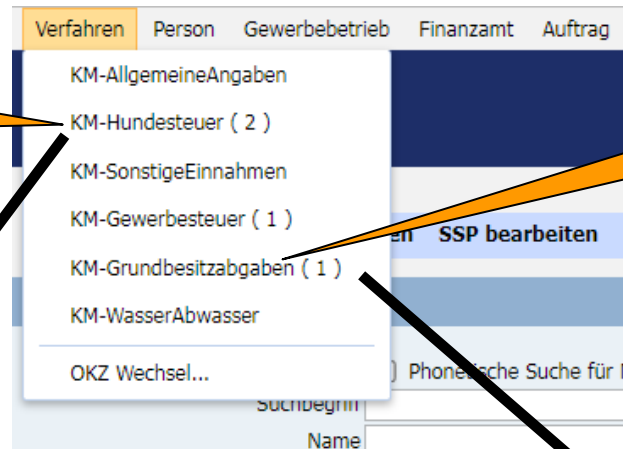
Custom / Complex Locators and Commands

- ▶ Have easy methods to generate Locators
 - ▶ *selenium listView: listViewName row: anInteger*
 - ▶ *selenium listView: listViewName cellText: 'Moby Dick'*
- ▶ Simplified Syntax
 - ▶ Standard: *selenium click: (selenium listView: #Overview row: 1)*
 - ▶ Simplified: *selenium clickListView: #Overview row: 1*
- ▶ Have easy methods for complex interactions / UI items
 - ▶ *selenium clickTreeView: #Overview itemLabelPlus: #('Water' 'Wastewater')*

Sub Applications

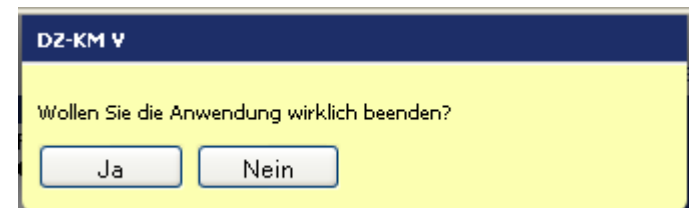
Applikation 1
with 2 windows

Applikation 2
with 1 windows



Complex, high level commands

- ▶ Open context menu of a list and execute menu item
 - ▶ *selenium clickListView: #BookList menuItem: 'Order'*
- ▶ Click in a hierarchical navigation menu
 - ▶ *selenium clickNavigationsmenu: #('Tax Type' 'Dog tax' 'Dog' 'New...')*
- ▶ Confirm message box
 - ▶ *selenium clickMessageBoxYes: 'Order book?'*
 - ▶ Exception if wrong text (e.g. 'Format hard disk?')



Complex, high level commands

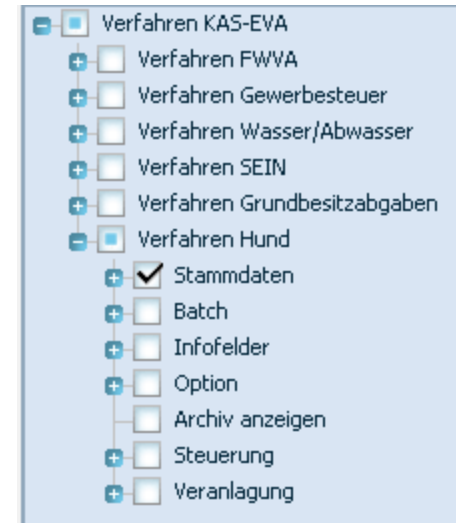
▶ Click button in toolbar

- ▶ *selenium clickToolBarButton: #ok*
- ▶ *selenium clickToolBarButton: #cancel*
- ▶ *selenium clickToolBarButton: #print*



▶ Open subtree in a tree widget

- ▶ *selenium clickTreeView: #myTree itemLabelPlus: 'Tax'*
- ▶ *selenium clickTreeView: #myTree itemLabelMinus: 'Tax'*
- ▶ *selenium clickTreeView: #myTree itemLabel: #('Tax' 'A')*
- ▶ *selenium clickTreeView: #myTree itemLabelCheck: 'Tax'*



Test case example

testAddress

self login.

selenium clickNavigationsmenu: #('Tax Type' 'Dog Tax' 'Dogs' 'Search...').

selenium type: 'AccountNumber' value: 7700020.

selenium clickToolBarButton: #ok.

selenium clickSidebar: 'Account' group: 'Functions'.

selenium clickListView: #table row: 1.

selenium clickListView: #table specialButton: 'Edit'.

selenium clickTab: 'Address'.

selenium clickListView: #Addresses menuItem: 'New'.

selenium typeComboBox: 'Street' value: 'Main street'.

selenium type: 'HouseNumber' value: 1.

selenium clickListView: #Addresses specialButton: 'Apply'.

selenium clickMessageBoxYes: 'Do you want to change the address? '

selenium clickToolBarButton: #ok.

Problem AJAX

▶ Problems

- ▶ No page loads occur (page loading event doesn't fire)
- ▶ AJAX requests are asynchronously and may even occur in parallel or with some delay (`window.setTimeout()`)
- ▶ Result: Test script tries to click on elements not present or clicks before the page or element is fully initialized

▶ Solution

- ▶ Have JavaScript code executed in the browser to detect rendering status and poll before command execution
- ▶ Sometimes framework modifications is necessary

Problem AJAX - Waiting

```
executeWebDriverCommand: aBlock message: aMessage  
self checkUnexpectedMessageBoxForMessage: aMessage.  
aBlock value.  
self waitForWaitCondition
```

```
Selenium class>> waitCondition  
^'return waitCondition == null || waitCondition()'
```

But only if it is not a read command:

```
isReadCommand: aMessage  
^'waitForCondition.*|get.*|is.*' asRegex matches: aMessage selector
```

Problem modal dialog and custom wait modes

▶ Problem

- ▶ Rich AJAX applications often have modal dialog boxes (e.g. Yes/No/OK) or custom wait modes (e.g. „Wait for processing“, animated wait cursors or gray wait screens)
- ▶ Result: Test script doesn't wait and may even interact with elements behind a modal dialog box

▶ Solution

- ▶ Write special JavaScript code to detect wait conditions.
 - ▶ Wait for wait screens with timeout
 - ▶ If modal dialog box jumps in the way, fail with „Unexpected messagebox: <messagebox text>“

Problem modal dialog and custom wait modes

- ▶ Check for a present MessageBox before each action (not being a pure read command)
- ▶ If yes, ensure that either:
 - ▶ Action refers to typical message id elements, like `MessageBoxButtonYes`, `MessageBoxButtonNo`, `MessageBoxButtonOK`
 - ▶ Test code explicitly declares messagebox clicks
selenium clickMessageBox: #Proceed
selenium clickMessageBoxYes: 'Are you sure?'
 - ▶ Test code explicitly declares message interaction by:
selenium messageBoxDuring: [selenium]

Problem: (Custom) disabled input fields

- ▶ Problem
 - ▶ Input fields are disabled or a custom pseudo disablement is used (e.g. another color and attached click handlers)
 - ▶ Result: Test script which doesn't expect disablement , inserts data into these fields
- ▶ Solution
 - ▶ Write special JavaScript code to detect normal or custom disablements and check before value insertion

Other Problems

- ▶ Dynamic list loading
 - ▶ Wait for list to fill
- ▶ Dynamic Droplist loading
 - ▶ Scroll down and wait for list to fill
- ▶ Item to be selected not visible and not rendered
 - ▶ Scroll to the element, wait for rendering, then click
- ▶ EdgeDriver, ChromeDriver needs executable depending from version
 - ▶ Automatically determine version and start it

Demos

- ▶ Application
 - ▶ Demo ComboBox
 - ▶ Demo scrolling
 - ▶ Demo dynamic resize
- ▶ Testing
 - ▶ Demo Testcase running

Access to Smalltalk objects

- ▶ Applications codes runs in the same image as test code
- ▶ Possibility to interfere with application and access, change and create Smalltalk objects
- ▶ Extremely powerful compared to just UI access
- ▶ *testSmalltalkObjects*
self login.
selenium click: #OpenLastBookOrder.
*self assert: (self **activeController** object bookName = 'Moby Dick').*

Continuous Build and Test

- ▶ A central database keeps track of
 - ▶ All test cases
 - ▶ All the test case results
 - ▶ All code versions and environment parameters like database type (Oracle, MSSQL) and browser (Edge, FF)
- ▶ All test case executions of versioned code stored in DB
- ▶ 50 VMs constantly loading code and execute test cases or different versions, databases and browsers
- ▶ Determination of version in which test case failed first

Coordinated Test Results from other VMs

Regressiontest-Runner: 3.8.1.33/2.0

Test definition by class and protocol

All
 Not executed
 Failed
 deaktiviert
 Failed inkl. Vorversionen

Include Passed By Other

Anzahl Versionen

Developer Cheats
 MessageBox Halt
 Error Halt
 Show Creator

Config

#FireFox

dzcfg-KMVSS16C

DB-Version

Cobol-Version

created by

locked by haerle

other Rel.

ORC PA *33
 SSC PA *33
 ORC PA *33
 ORC FA *33, : Exception: TimeoL
 SSC FA *33, : Exception: Could n
 SSC FA *33, : Exception: Messag
 ORC PA *32

passed / failed / selected / total

1 / 0 / 1 / 3608

Standard : DZWebTestsWASSQTP :

Standard, Kern : DZWebKernTestfaelle : **PARTIALLY EXECUTED(1/6)**

ObjectStudio.DZWebKernTestfaelle>>#testGEWSTStandardFall C(haerle, 1746) **PASSED IN 3.8.1.33 WITH dzcfg-KMVSS16C BY Baumsta, DZS20N481 10.08.2022 16:14:49**

ObjectStudio.DZWebKernTestfaelle>>#testGRDSStandardFall C(haerle, 1747) **PASSED**

ObjectStudio.DZWebKernTestfaelle>>#testHUNDStandardFall C(haerle, 1748)

ObjectStudio.DZWebKernTestfaelle>>#testSEINStandardFallFakturierung C(haerle, 1749) **PASSED IN 3.8.1.33 WITH dzcfg-KMVSS16C BY diener, KMVT-W7-19-09 09:08:20**

ObjectStudio.DZWebKernTestfaelle>>#testSSPSyntaxOK C(haerle, 1751) **PASSED IN 3.8.1.33 WITH dzcfg-KMVSS16C BY diener, KMVT-W7-19-05 09 08.2022 16:13:04**

ObjectStudio.DZWebKernTestfaelle>>#testWASSStandardFall C(haerle, 1752) **PASSED IN 3.8.1.33 WITH dzcfg-KMVSS16C BY Baumsta, DZS20N481 09.08.2022 19:20:49**

Standard, KRZ : DZKRZTestCases :

Standard, SAP-Integration : DZSAPWebTestCases :

Testframework : StcTestCaseResult : regression-test

Uncategorized : ContinuationTest :

Uncategorized : DTBASTartAufgabeLaufServiceTests :

Uncategorized : DZCodeTests :

Uncategorized : DZGRDSMeldedatenServiceTests :

Uncategorized : ZTSDZTestServiceTests :

Now testing

Log all test case executions in a database

Testläufe

Config Version Passed Failed Alle

- tester
- bearbeiter
- dbVersion
- cobolVersion

version	testzeit	resultat	meldung	browser	config	dauer	tester	cobolVers
3.8.1.33	10.08.2022 06:40:00	passed		Edge_	dzcfg-KMVOR19	68933	diener, KMVT-W7-18-03	3.8.1.17
3.8.1.33	09.08.2022 19:25:15	passed		FireFox_	dzcfg-KMVSS16	58530	Baumsta, DZS20N481	3.8.1.18
3.8.1.33	09.08.2022 15:09:00	passed		FireFox_	dzcfg-KMVOR19	67975	diener, KMVT-W7-18-06	3.8.1.17
3.8.1.33	09.08.2022 15:03:00	failed	Exception: Timeout., Exception: A handler tried to proceed from a non-pr	FireFox_	dzcfg-KMVOR19	141842	diener, KMVT-W7-18-06	3.8.1.17
3.8.1.33	09.08.2022 13:00:00	failed	Exception: Could not start a new session. Error while creating session v	FireFox_	dzcfg-KMVSS16	26170	diener, KMVT-W7-19-02	3.8.1.17
3.8.1.33	09.08.2022 12:43:00	failed	Exception: Message not understood: #contents.	FireFox_	dzcfg-KMVSS16	4180	diener, KMVT-W7-19-07	3.8.1.17
3.8.1.33	09.08.2022 11:53:00	init		FireFox_	dzcfg-KMVSS16	0	diener, KMVT-W7-19-06	
3.8.1.33	09.08.2022 11:53:00	init		FireFox_	dzcfg-KMVSS16	0	diener, KMVT-W7-19-02	
3.8.1.33	09.08.2022 11:53:00	init		FireFox_	dzcfg-KMVSS16	0	diener, KMVT-W7-19-05	
3.8.1.33	09.08.2022 11:53:00	init		FireFox_	dzcfg-KMVSS16	0	diener, KMVT-W7-19-08	
3.8.1.33	09.08.2022 11:53:00	init		FireFox_	dzcfg-KMVSS16	0	diener, KMVT-W7-19-03	
3.8.1.33	09.08.2022 11:53:00	init		FireFox_	dzcfg-KMVSS16	0	diener, KMVT-W7-19-07	
3.8.1.33	09.08.2022 10:44:00	init		Edge_	dzcfg-KMVOR19	0	diener, KMVT-W7-18-04	
3.8.1.33	09.08.2022 10:44:00	init		Edge_	dzcfg-KMVOR19	0	diener, KMVT-W7-18-02	

Cooperative test fixing

Creator


Locked by Assigned to

```
Standard, Kern : DZWebKernTestfaelle : PARTIALLY EXECUTED(1/6)
ObjectStudio.DZWebKernTestfaelle>>#testGEWSTStandardFall C(haerle, 1746)
ObjectStudio.DZWebKernTestfaelle>>#testGRDSStandardFall C(haerle, 1747) PASSED
ObjectStudio.DZWebKernTestfaelle>>#testHUNDStandardFall C(haerle, 1748) L(Haerle)
ObjectStudio.DZWebKernTestfaelle>>#testSEINStandardFallFakturierung C(haerle, 1749) L(Haerle)
ObjectStudio.DZWebKernTestfaelle>>#testSSPSVStandardFall C(haerle, 1750) L(Haerle)
ObjectStudio.DZWebKernTestfaelle>>#testWMSStandardFall C(haerle, 1751) L(Haerle)
Standard, I : DZWebKernTestfaelle : PARTIALLY EXECUTED(1/6)
Standard, I : DZWebKernTestfaelle>>#testGEWSTStandardFall C(haerle, 1746)
Standard, I : DZWebKernTestfaelle>>#testGRDSStandardFall C(haerle, 1747) PASSED
Standard, I : DZWebKernTestfaelle>>#testHUNDStandardFall C(haerle, 1748) L(Haerle)
Standard, I : DZWebKernTestfaelle>>#testSEINStandardFallFakturierung C(haerle, 1749) L(Haerle)
Standard, I : DZWebKernTestfaelle>>#testSSPSVStandardFall C(haerle, 1750) L(Haerle)
Standard, I : DZWebKernTestfaelle>>#testWMSStandardFall C(haerle, 1751) L(Haerle)
Testframe : DZWebKernTestfaelle : PARTIALLY EXECUTED(1/6)
Testframe : DZWebKernTestfaelle>>#testGEWSTStandardFall C(haerle, 1746)
Testframe : DZWebKernTestfaelle>>#testGRDSStandardFall C(haerle, 1747) PASSED
Testframe : DZWebKernTestfaelle>>#testHUNDStandardFall C(haerle, 1748) L(Haerle)
Testframe : DZWebKernTestfaelle>>#testSEINStandardFallFakturierung C(haerle, 1749) L(Haerle)
Testframe : DZWebKernTestfaelle>>#testSSPSVStandardFall C(haerle, 1750) L(Haerle)
Testframe : DZWebKernTestfaelle>>#testWMSStandardFall C(haerle, 1751) L(Haerle)
Uncategorized : DZGRDSMeldedatenServiceTests :
Uncategorized : ZTSDZTestServiceTests :
```

Lock	stSSPSV
Assign	stWMS
Unlock	
Show lock info	Cases :
Show all locks	ision-tes
in Bearbeitung nehmen	ceTests
zum Test freigeben	

Lock comments

File Edit View Options Help



ObjectStudio.DZWebKernTestfaelle>>#testHUNDStandardFall L(Haerle) C(haerle, 1748) : haerle, chawork3: Fails depending on windows size

Questions?

Thanks for your attention.
Questions?

Contact: Carsten Härle
Email: carsten.haerle@straightec.de

straightec GmbH
Frankfurter Straße 48, 63150 Heusenstamm, Germany
Freephone: 0800 - straightec (0800 - 7872444)
Tel +49 (6104) 60 08-0, Fax +49 (6104) 60 08-29
E-Mail info@straightec.de , Internet <https://www.straightec.de>