Write Once, Test Everywhere
The Challenge of Cross Platform GUI Test Automation

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Overview

- Quality First Software GmbH
- Cross Platform Development
- Java GUI Technologies: Web, AWT, Swing, SWT
- GUI Testing in General
- GUI Test Automation, its ROI and Cross-Platform Aspects
- Available Automation Tools
- Specifics of Swing Test Automation
- Specifics of SWT Automation
- Results
- Questions...

Quality First Software GmbH

- Established 2001
- Primary product: ***qftestJUI*** – The Java GUI Testtool
- Employees: 5
- Based near Munich
- Committed to quality
- Focus on Java and test automation
- Over 200 customers worldwide in all kind of business categories

References


IBM
hp
invent
bea
AGFA
Agfa
ESO
PHILIPS
tarent
UFA
CURSOR
SOFTWARE AG
océ
TROPOS
networks
softface
Zend
The php Company

Wanted: Swiss Distributor

Cross Platform GUI Development

- Windows is still the predominant target platform.
- Various non-Java GUI toolkits available, tcl/tk, gtk, qt, wxWindows...
- Java drastically simplifies cross platform development.
- Java IDEs are themselves available on multiple platforms.
- „Write once, run everywhere“ implies „Write once, test everywhere“.
- Programmer's paradise becomes tester's hell...

Java GUI Technologies: Web

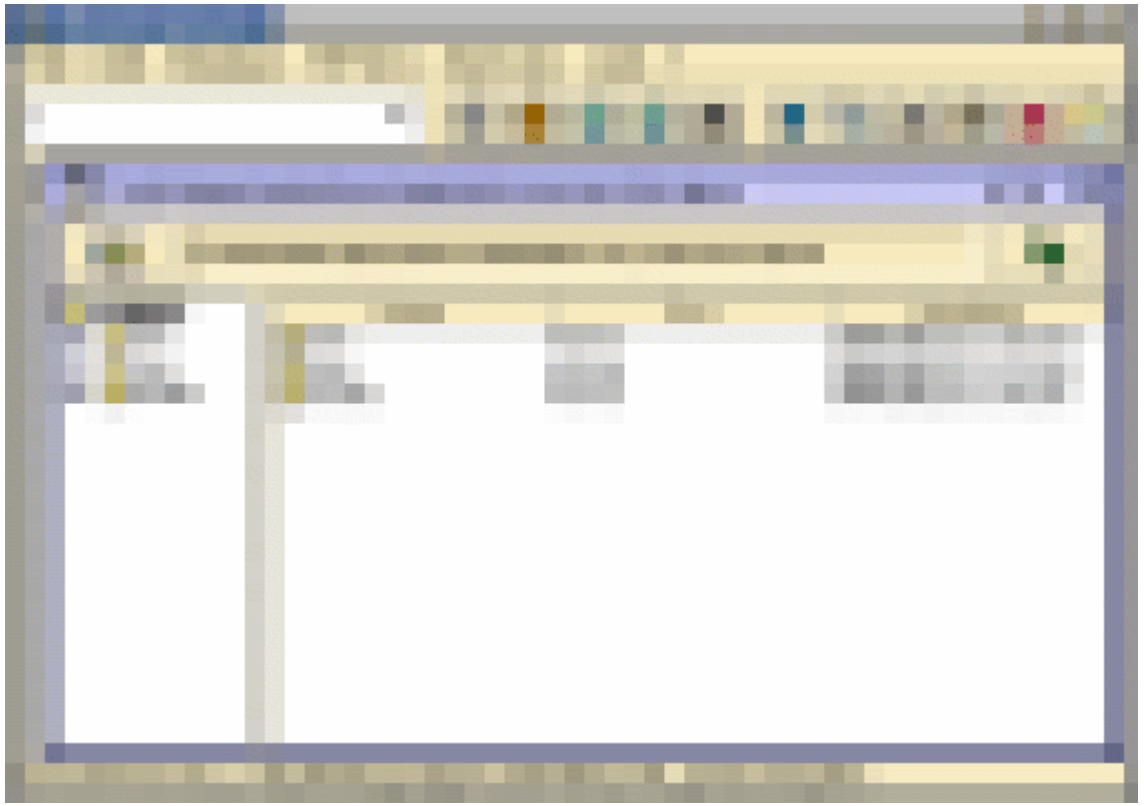
- Server side Java, client side HTML and Javascript.
- Very portable
- No deployment effort.
- Limited functionality (thin client).
- Browser compatibility issues.

Java GUI Technologies: AWT (Abstract Widget Toolkit)

- Very limited set of components.
- Terrible look and feel (Bild?).
- Heavyweight, waste of resources.
- Neither true native nor common cross-platform look and feel.

Java GUI Technologies: Swing

- Built on top of a thin layer of AWT.



Java GUI Technologies: Swing

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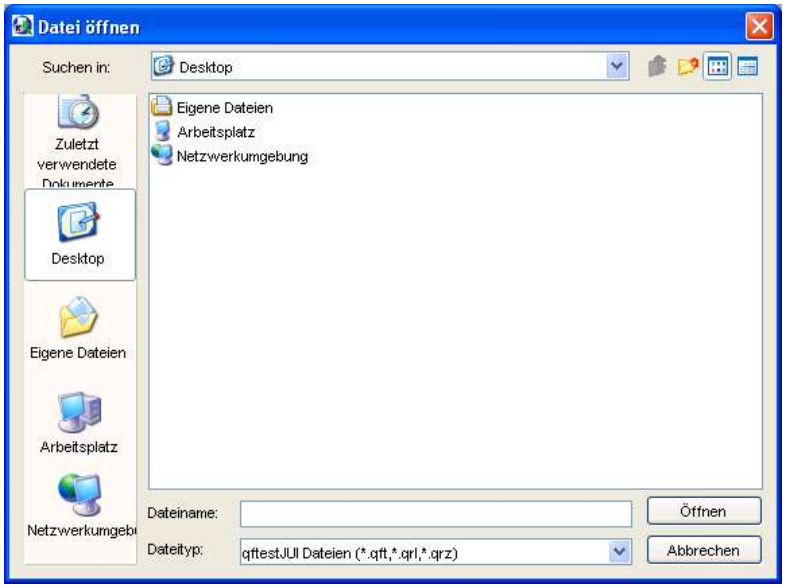
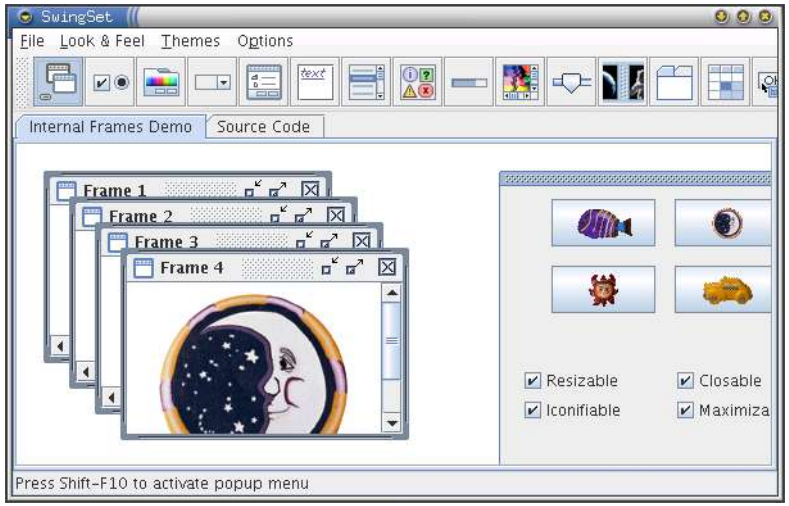




Java GUI Technologies: Swing

- Built on top of a thin layer of AWT.
- Various look and feel variants. Current versions are very close to native look.
- Older versions were slow and bloated, performance of current versions is very good except for start-up.
- Rich set of components and features, flexible architecture, highly extendable, mature.

Java GUI Technologies: SWT (Standard Widget Toolkit)

- Implemented as a thin layer on top of native GUI toolkits.
- Modelled very closely after Win32 API, not consequently object oriented.
- Initially, only few systems were supported to varying degrees. Today widely applicable, Windows, Unix and Mac OS X versions quite mature.
- Feature set not as complete as Swing, harder to extend.
- Enormous momentum due to Eclipse and the Rich Client Platform.

Swing Best cross-platform toolkit in terms of supported platforms, coherent behaviour and extensibility.

SWT Best platform integration and highest performance.

GUI Testing in General

- Unit tests are very important, but test isolated subsystems, typically at class level.
- Integration tests that test subsystems in combination are difficult to set up.
- Neither are a substitute for system tests.
- GUI Tests don't test ***the GUI***, but the system as a whole ***through the GUI***.
- GUI Tests operate from the point of view of the end user.
- In a cross-platform situation, complete system tests should be run on all target platforms.

GUI Test Automation

- Manual GUI testing is time consuming and tedious.
  ⇒Automation has a high potential for savings.

Who should automate tests?

ROI for GUI Test Automation

	Manual	Automation	Influencing Factors
Preparations	Test planning Provisions for testing environment		
Determining Test-cases	Analysis of business cases		
Test development	Preparation of instructions for testers ☺☺	Development of test-cases with test tool	Complexity or ease of use of the tool Possibilites for reuse
Documentation	Test-plans correlate with test instructions	Generated from test-cases	
Test Management	Maintenance of documents	Management of test-suites, scripts and data	Format of test-suites, scripts and data
Test Execution	Slow, high costs for multiple testers and associated hardware	Automatic, fast, optimal use of available hardware ☺☺	Quality and reliability of test execution engine
Management of Results	Manual entries for test-results	Automatic report generation ☺	Quality of reports
Maintenance of Tests	Changes to test-instructions only if use-cases change fundamentally ☺☺	Adaptation to changes in the GUI	Quality of component recognition, adaptability to GUI changes, support for modularization

Influence of Cross-Platform Aspects on the ROI for GUI Test Automation

	Manual	Automation without cross-platform support	Automation with cross-platform support
Preparations			
Determining Test-cases			
Test development	Adaptation of instructions for platform-dependent test-cases	Development of test-cases for each platform	Adaptation of test-cases that are platform-dependent, provision of platform-dependent data
Documentation		Different formats for doc-umentation	
Test Management	Maintenance of documents	Separate management of test-suites and data for each tool	Management of platform-dependent aspects in a single code-base
Test Execution	Multiplied by number of platforms	Multiplied by number of platforms	Multiplied by number of platforms
Management of Results		Different report formats of separate tools	
Maintenance of Tests		Adaptation to changes in the GUI for each tool	Adaptation to changes in the GUI required only once

Benefits of Cross-Platform Test Automation

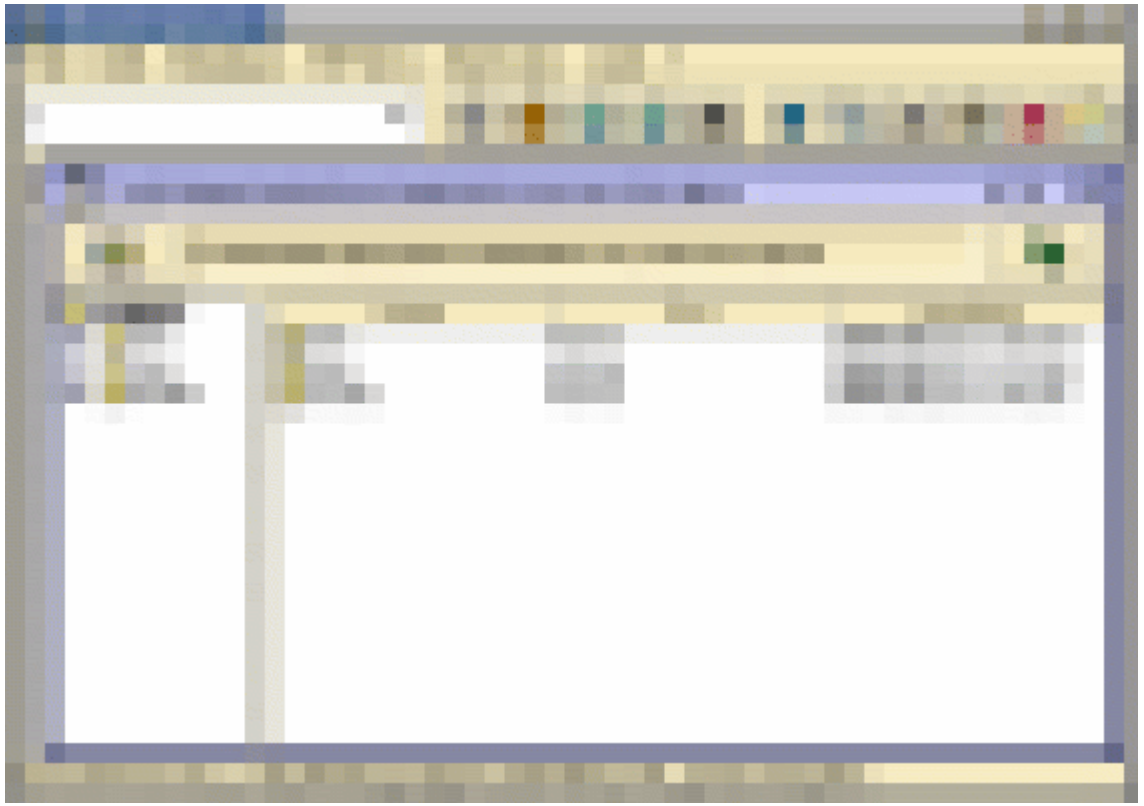
- Reduced costs for tools, only one tool is required.
- Reduced overhead, only one tool has to be learned.
- Drastically reduced effort for test development.
- Tests are easier to maintain in a single test codebase.
- After changes to the application that break tests, only one set of tests needs to be updated.
- No tendency to favour one platform.
- Increased potential for saving compared to manual testing.

Available Automation Tools

- Web:
  - Until recently all tools were based on Internet Explorer. Now ***AdventNet QEngine*** and ***Selenium*** also support Mozilla and Firefox on Unix.
- AWT/Swing:
  - ***qftestJUI*** is the only true cross platform tool.
  - Windows based test tools like ***WinRunner*** (now QuickTest Professional), ***Rational Robot*** (now XDE) , ***Silktest*** have Java plugins that can drive the SUT on non-windows systems.
- SWT:
  - We're working on it. Windows based tools can be used, but to limited extent.

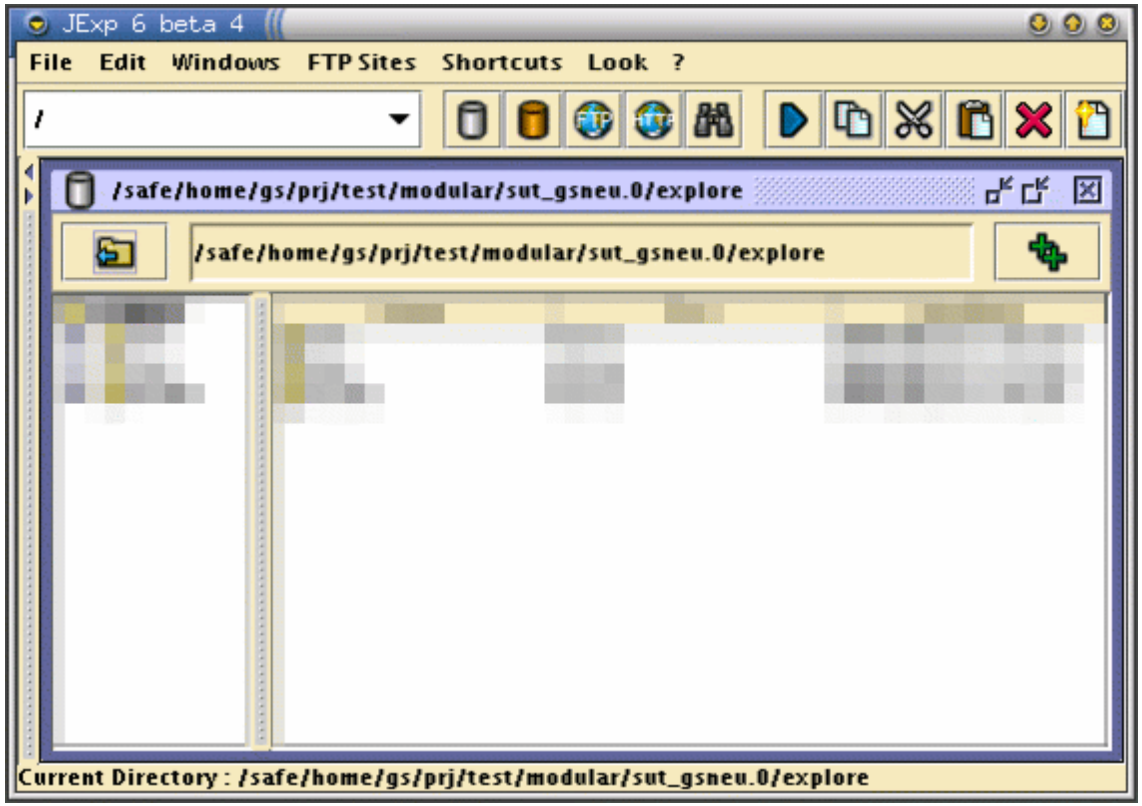
Specifics of Swing Test Automation

- Component structure is invisible from the Operating System.



Specifics of Swing Test Automation

- Sub-items of complex components are just „rendered data“.



Specifics of Swing Test Automation

- Subtle differences in Look&Feel implementations:
  - Different classes -> Abstraction to Look&Feel independent base class
  - Different component layout, e.g. JComboBox
    Windows: 

    Linux: 

  - Different timing dependent on Look&Feel, e.g. MultiClickThreshold in GTK.

Specifics of Swing Test Automation

- Benefits for testing:
  - Java reflection makes internals of the application accessible which improves component recognition.
  - Very high level of control thanks to Java Event Queue.
  - Testing independent of „hard“ events at Operating System level which are easily interfered with.

Specifics of SWT Test Automation

- On each platform, only the absolute minimum of interfaces required for the programmer are implemented. No support for testing or accessibility.
- Widget and Event Loop implementations are different on each platform.
- No common layer of abstraction between the native toolkit and the public API.
- Test engines for each system have to be implemented very close to the native toolkit. This is possible only by extending SWT itself.

Results

- GUI Test Automation has high potential for savings, provided that tool support is adequate.
- Cross-platform test requirements increase both potential gains and requirements on automation tools.
- Many test tools are available for web client testing, but practically all support Internet Explorer only.
- For Java and Swing, excellent test tools are available, though qftestJUI is the only true cross-platform tool.
- For Java and SWT the situation is difficult. Several vendors are working on SWT automation, though QFS is probably alone in its cross-platform approach.

Thank you for your attention!

Questions?