

Free and Cheap Test Tools

CHEAP AND FREE TEST TOOLS

RANDALL W. RICE, CTAL

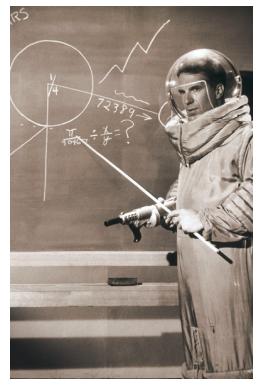
WWW.RICECONSULTING.COM

© 2009 – 2014, Rice Consulting Services, Inc.



AT THE START

- **This will be an interactive session**
 - Some demos and videos
- **Screenshots**
- **Helpful hints**
- **I get no compensation from tool vendors, but I do get review licenses for some of the tools.**



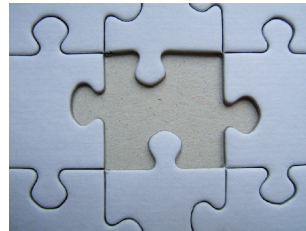
2



Free and Cheap Test Tools

WE CAN'T COVER ALL TOOLS

- **I focus on tools you may not have heard about.**
- **I welcome hearing about free and inexpensive tools you have found helpful.**
 - At the end of each tool type, I'll ask for your suggestions about other tools.



3



CONSTRAINTS

- **You may find it hard to get your management to consider using an open-source or free tool.**
- **Some companies are heavily invested in commercial tools (that may or may not be the best ones for you), so they keep out any other options.**



4



Free and Cheap Test Tools

COMMON ACCEPTANCE ISSUES

- **Security**
 - Code vulnerabilities
- **Vendor uncertainty**
 - Open source has none
 - Small vendors are often acquired
- **Support levels**
- **Future tool direction**
 - Free, paid, or no growth at all



5



A STRATEGY FOR ACCEPTANCE

- **Make the business case in cost vs. benefits.**
 - Also, bring out the reality of having a free tool vs. no tool.
- **Include information about companies like Sun, IBM, and Microsoft that have contributed open-source and free software.**



6



Free and Cheap Test Tools

THINK ABOUT COMMERCIAL TOOLS

- **Security**
 - Do commercial tools have security issues?
- **Vendor certainty**
 - Are larger vendors acquired?
- **Direction of the tool**
 - Do major tools fade away?
- **Support levels**
 - Are major tools well-supported?



7

RICE CONSULTING

WHAT'S THE ANSWER?

- **Keep an open mind.**
- **You can be successful with a wide variety of tools if you get a “best fit” for your needs.**
- **Price is not the best way to determine tool quality or applicability to your needs.**



8

RICE CONSULTING

Free and Cheap Test Tools

EVALUATIONS

- **Regardless of the tool cost or source, you should do a good evaluation and proof of concept.**
- **Even free tools require an investment of time to:**
 - Learn
 - Install
 - Maintain



9



YOUR PERSONAL TOOLKIT

- **As a tester, it's good to have your own set of test tools.**
 - You don't get locked into one tool set.
 - You can learn on your own.
 - You can be a value-added resource in your company concerning test tools.
 - You can take your tools wherever you go!



10



Free and Cheap Test Tools

TOOL TYPES WE WILL COVER

- **Test Design**
- **Test Execution**
- **Test Frameworks**
- **Performance Testing and Monitoring**
- **Test Management**
- **Test Data**
- **Test Evaluation**
- **Defect Tracking**
- **Special Applications – SOA, Load testing, Web testing**

11



TEST DESIGN

- **AllPairs – www.satisfice.com**
- **PICT – www.microsoft.com**
- **PictMaster - <http://en.sourceforge.jp/projects/pictmaster/>**
- **ACTS - www.nist.gov**
- **More at www.pairwise.org**

12



Free and Cheap Test Tools

PICTMASTER

E12 leather, cloth

Item number	Item name	Date
Sub-item number	Sub-item name	Creator

Build Edit Settings

Parameters blue hierarch

color red, blue, green

size small, medium, large

texture smooth, rough

material leather, cloth

© IWATSU System & Software Co., Ltd. Licensed under the Open Software License version 2.1

Windows only, must have PICT installed first

13



PICTMASTER (2)

E13

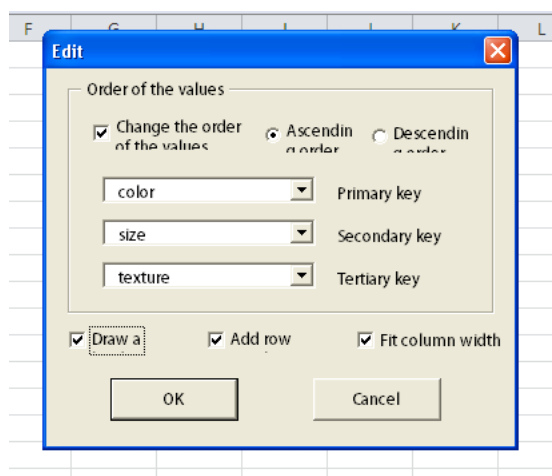
	A	B	C	D	E
1	color	size	texture	material	
2	blue	large	smooth	leather	
3	blue	medium	rough	cloth	
4	blue	small	rough	leather	
5	green	large	smooth	cloth	
6	green	small	smooth	leather	
7	red	large	rough	leather	
8	green	medium	rough	leather	
9	red	medium	smooth	cloth	
10	red	small	rough	cloth	
11					
12					

14



Free and Cheap Test Tools

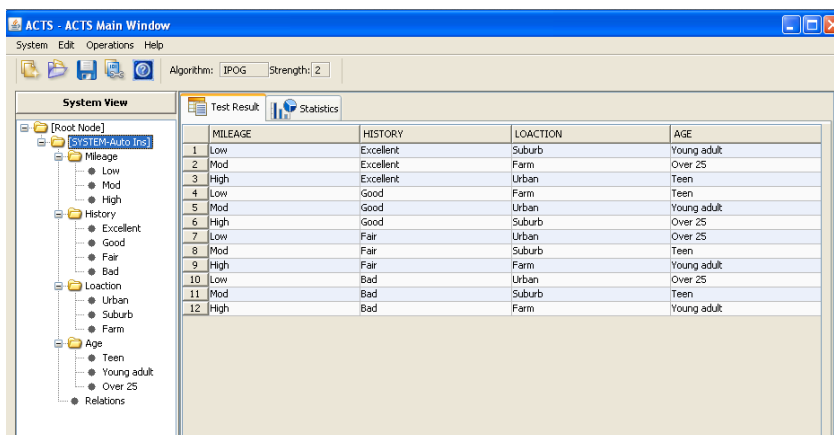
PICTMASTER (3)



15



ACTS

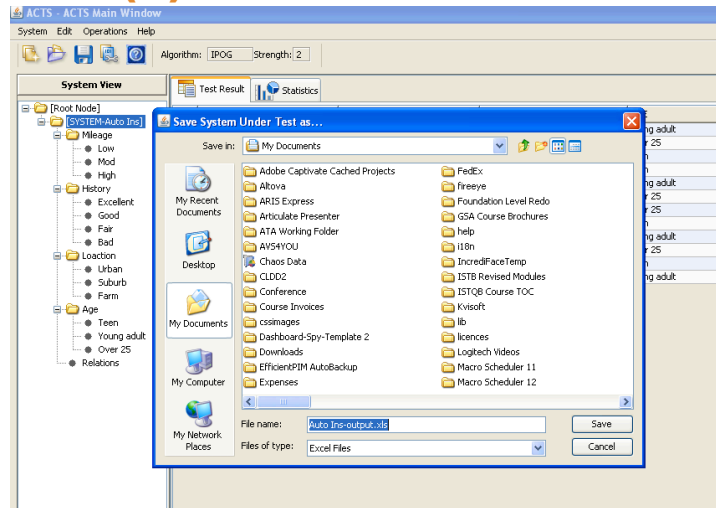


16



Free and Cheap Test Tools

ACTS (2)



17



ACTS (3)

A1		Parameters:						
	A	B	C	D	E	F	G	H
1	Parameters:							
2	Mileage	[Low, Mod, High]						
3	History	[Excellent, Good, Fair, Bad]						
4	Loaction	[Urban, Suburb, Farm]						
5	Age	[Teen, Young adult, Over 25]						
6								
7	Relations:							
8								
9	Test Case	Mileage	History	Loaction	Age			
10								
11	0	Low	Excellent	Suburb	Young adult			
12	1	Mod	Excellent	Farm	Over 25			
13	2	High	Excellent	Urban	Teen			
14	3	Low	Good	Farm	Teen			
15	4	Mod	Good	Urban	Young adult			
16	5	High	Good	Suburb	Over 25			
17	6	Low	Fair	Urban	Over 25			
18	7	Mod	Fair	Suburb	Teen			
19	8	High	Fair	Farm	Young adult			
20	9	Low	Bad	Urban	Over 25			
21	10	Mod	Bad	Suburb	Teen			
22	11	High	Bad	Farm	Young adult			
23								
24								

18



Free and Cheap Test Tools

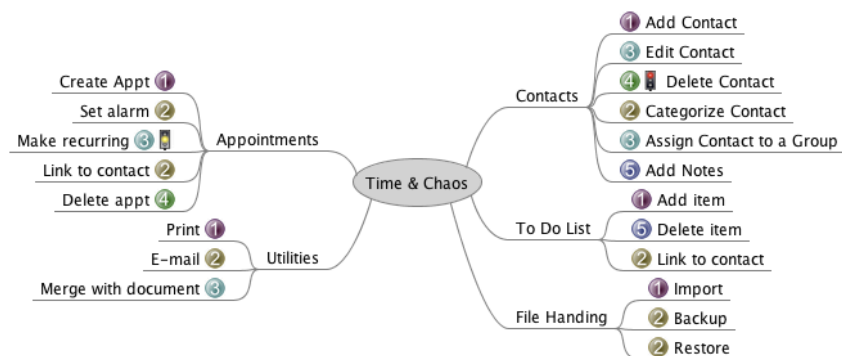
FREE MIND

- **Mind mapping for test case design**
- **Windows, Linux and Mac versions**
- **Open source**
- **freemind.sourceforge.net**

19



FUNCTIONAL DECOMPOSITION WITH FREE MIND



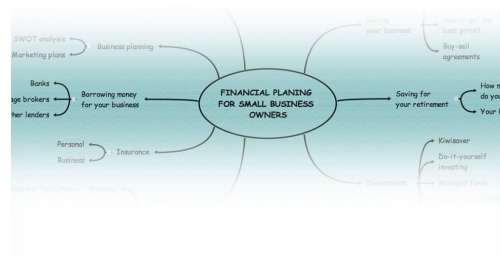
20



Free and Cheap Test Tools

XMIND

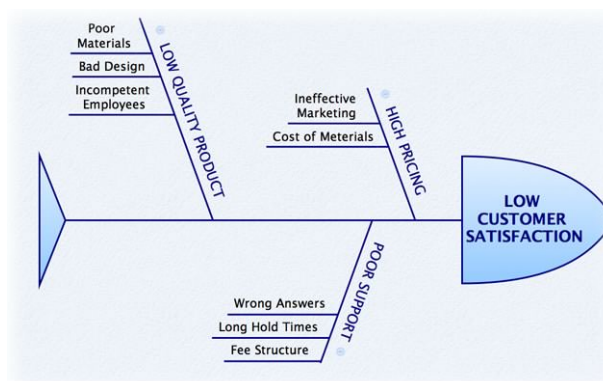
- Xmind is an open source tool for mindmapping, brainstorming and much more.
- Free and Pro versions
- Mac, Windows, Linux
- <http://www.xmind.net/>



21

RICE CONSULTING

XMIND (2)



Fishbone Diagram

22

RICE CONSULTING

Free and Cheap Test Tools

MINIMAL ESSENTIAL TEST STRATEGY (METS)

- **Developed by Greg Paskal**
 - www.gregpaskal.com
- **A way to quickly define features and functions to be tested by levels of criticality.**
- **Test time can be estimated along with potential defect severity.**
- **Also available as an iPhone app.**



25



PHYSICAL ITEMS

- **"Items" to be tested that can be "touched".**
 - Examples: Buttons, web pages, etc.
- **These enable functionality, but are not the functions.**
- **These have attributes at various levels of criticality:**
 - Example: Images
 - Critical: Image is present
 - High: Image is correct
 - Med: Image loads quickly (size)
 - Low: Image is clear



26



Free and Cheap Test Tools

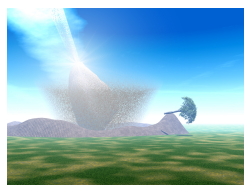
	A	B	C	D	E
1	METS <small>Manual Electronic Test Strategy</small>		Physical Test Grid		
3	Category	Critical	High	Medium	Low
4	Pages	Page completes loading	Loading completes in a reasonable amount of time	Page loading consistent between browser versions	Page loading time reasonable under load
5		Graphics, text and other elements seem to be in correct locations	Page has logical flow	Color contrast issues	
6	Graphics	Graphics loading completely	Graphics completed loading within same time frame	Consistently loading every time	
7		Scaling, cropping or image quality problems	Highly artifact (distorted) image quality	Unpredictable color rendering at various bit depths	Non-browser safe color pallet used
8		Rollover graphics displaying correctly	Graphic rollover state providing correct transition illusion	Preloaders working correctly for quick screen redraw	
9		Graphical text within graphic is legible	Correctly spelled text within graphic		
10	Forms	Dropdown menus are functional	Dropdown menu contains all desired options	Submitted form contains dropdown menu selection(s)	
11			Dropdown items are spelled correctly		
12		Radio Buttons are functional	Radio button effect, turning off related radio buttons is working	Submitted form contains radio button selection	
13			Radio buttons are spelled correctly		
14		Checkboxes are functional	Selection of multiple checkboxes is possible	Submitted form contains checkbox selection(s)	
15			Checkbox text is spelled correctly		
16		Text fields and boxes are functional	Text field and boxes have correctly spelled default text	Text fields allow enough room for a typical data entry	
17				Submitted form contains text field and text box information	

27



PHYSICAL TEST METRICS


- **Shows for each item:**
 - Estimated time required for testing
 - Estimated impact severity



28



Free and Cheap Test Tools

	A	B	C	D	E
1	METS <small>National Essential Testing Strategy</small>	Physical Test Metrics			
3	Test	Category	Importance	Time Required	Potential Severity
4	Page completes loading	Pages	Critical	1	1
5	Graphics, text and other elements are in correct locations	Pages	Critical	2	4
6	Page loading completes in a reasonable time.	Pages	High	1	3
7	Page has intuitive and logical flow.	Pages	High	2	4
8	Page loading is consistent between browser versions	Pages	Medium	3	2
9	Page has color contrast problems.	Pages	Medium	1	4
10	Page loading time reasonable under load.	Pages	Low	60	2
11	Graphics loading completely	Graphics	Critical	1	3
12	Scaling, cropping or image quality problems	Graphics	Critical	1	3
13	Rollover graphics displaying correctly.	Graphics	Critical	2	3

29




FUNCTIONS

- **“Actions” to be tested.**
 - Examples: Create, cancel, query, etc.
- **These are things the application can “do.”**
- **Example: Shopping cart functions**
 - Critical: Can an item be placed into the cart?
 - High: Can multiple items be put into shopping cart?
 - Medium: Do items consistently carry through purchase session?
 - Low: Are related products shown?

30



Free and Cheap Test Tools

	A	B	C	D	E
1	METS Functional Test Grid 				
3	Category	Critical	High	Medium	Low
4	Accounts	Creating an account possible	Can user change account details such as shipping address.	Can user delete an account?	
5		Logging into an account possible.	Can user request forgotten login information?	Does account time out require re-login after specified inaction?	Is the user notified when why they must re-login?
6	Shopping Cart	Can an item be placed into the cart?	Can multiple items be put into shopping cart?	Do items consistently carry through purchase session?	Is tax being calculated correctly?
7		Can an item be removed from the cart?	Does cart reflect removed item correctly	Are removed items affecting the subtotal, total or tax?	
8			Can more than one item be removed at a time?		
9	Product Catalog	Can user get to online catalog?	Does online catalog reflect entire product line?	Can user sort catalog items buy price, size or color?	Does the catalog item reflect the product being sold?
10	Trans- actional	Can user place an order?	Can user back out of an order?	Does using the browser back button effect the order transaction?	Is the user notified when a transaction is complete?
11			Can user save an order for later?	When user comes back to saved order is it accurate in items in cart and pricing?	
12	Search	Can user search from home page?	Do the search results link correctly to the found content?	Is the found content logical to the original search?	Were search results sorted according to the business rules?

31



METRICS

- Based on estimated test time and assessed potential impact severity.
- Items are assessed by:
 - Direct testing
 - Test pertaining to the obvious change or fix.
 - Related testing
 - Test pertaining to areas that may be impacted by the changes made.
 - Regression testing
 - Test you would run on the application regardless of what has changed.

32



Free and Cheap Test Tools

METS FUNCTIONAL TEST METRICS

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	METS <small>Microsoft Excel Test Tool</small> Functional Test Metrics												
3	Test	Category	Importance	Time Required	Potential Severity	Direct Testing	Related Testing	Regression Testing		D	R	B	
4	Creating an account possible	Accounts	Critical	5	1	x				5			
5	Logging into an account possible.	Accounts	Critical	1	1		x				1		
6	Can user change account details such as shipping address.	Accounts	High	5	3		x			5			
7	Can user request forgotten login information?	Accounts	High	5	3		x			5			
8	Can user delete an account?	Accounts	Medium	3	3			x			3		
9	Does account time out require re-login after specified inaction?	Accounts	Medium	10	3		x			10			
10	Is the user notified when why they must re-login?	Accounts	Low	10	4		x			10			
11	Can an item be placed into the cart?	Shopping Cart	Critical	1	1			x				1	
12	Can an item be removed from the cart?	Shopping Cart	Critical	2	2	x				2			
13	Can multiple items be put into shopping cart?	Shopping Cart	High	2	2								
14	Does cart reflect removed item correctly	Shopping Cart	High	3	2								
15	Can more than one item be removed at a time?	Shopping Cart	High	3	4								
16	Do items consistently carry through purchase session?	Shopping Cart	Medium	10	1								

33



METS FUNCTIONAL TEST METRICS (2)

37	Does the download work correctly once on the customers computer?	File Downloading	High	5	1								
38	Is the download easy to locate?	File Downloading	Medium	2	4								
39	Are the file size(s) and operating system requirements correct?	File Downloading	Low	5	4								
40	Can a customer upload a file?	File Uploading	Critical	5	2								
41	Is the upload functionality providing an intact file on the business side once upload is complete?	File Uploading	High	10	2								
42	Is the file correctly reliable back to the originating customer and/or order?	File Uploading	Medium	10	2								
43	Are the upload instructions clear and understandable?	File Uploading	Low	5	4								
44													
45													
46													
47													
48													
49													

Totals		Time	
Quantity			
2	5	2	7 31 4

34



Free and Cheap Test Tools

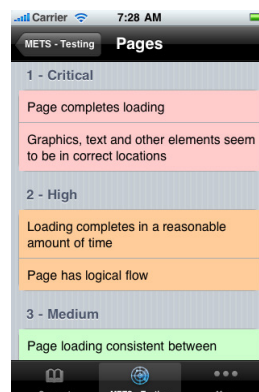
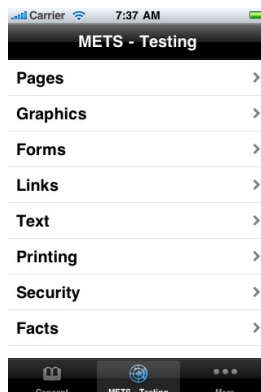
METS TIME BUDGETER

Time Budgeter				
Time available for testing: 4.00				
Description	Budgeted %	Time Budgeted	Time Utilized	Time Still Available
Direct Testing	25%	1.00	0.07	0:53
Related Testing	50%	2.00	0.31	1:29
Regression Testing	25%	1.00	0.04	0:56
Totals	100%	4.00	0.42	

35



METS IPHONE APP



36

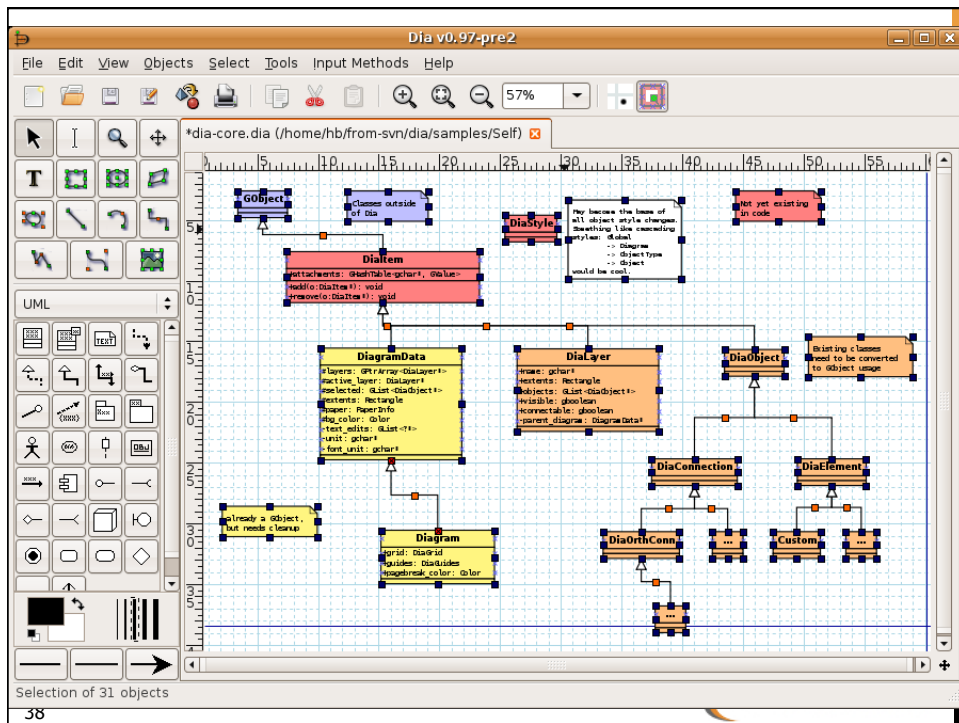


Free and Cheap Test Tools

DIA

- Dia is roughly inspired by 'Visio,' though more geared towards informal diagrams for casual use.
- Open Source
- Has special objects to help draw entity relationship diagrams, UML diagrams, flowcharts, network diagrams, and many other diagrams.
- Can export diagrams to a number of formats, including EPS, SVG, XFIG, WMF and PNG, and can print diagrams (including ones that span multiple pages).
- <http://live.gnome.org/Dia>

37



Free and Cheap Test Tools

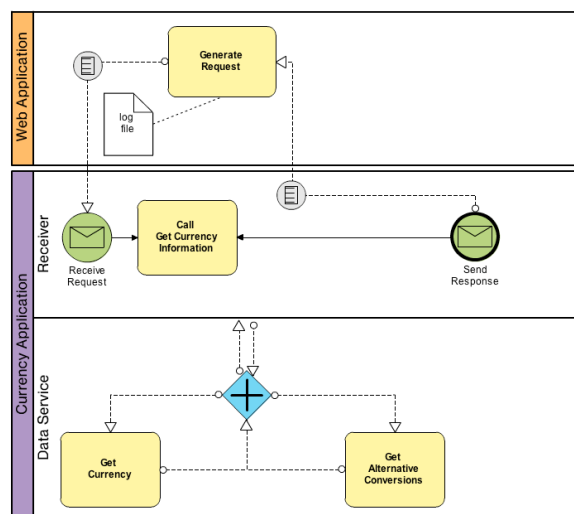
GLIFFY

- **Online diagramming application**
- **Free, standard and pro versions**
 - \$4.95 / month for standard
 - \$9.95 / month for pro
- **www.gliffy.com**

39



BUSINESS PROCESS DIAGRAM CREATED IN GLIFFY



40

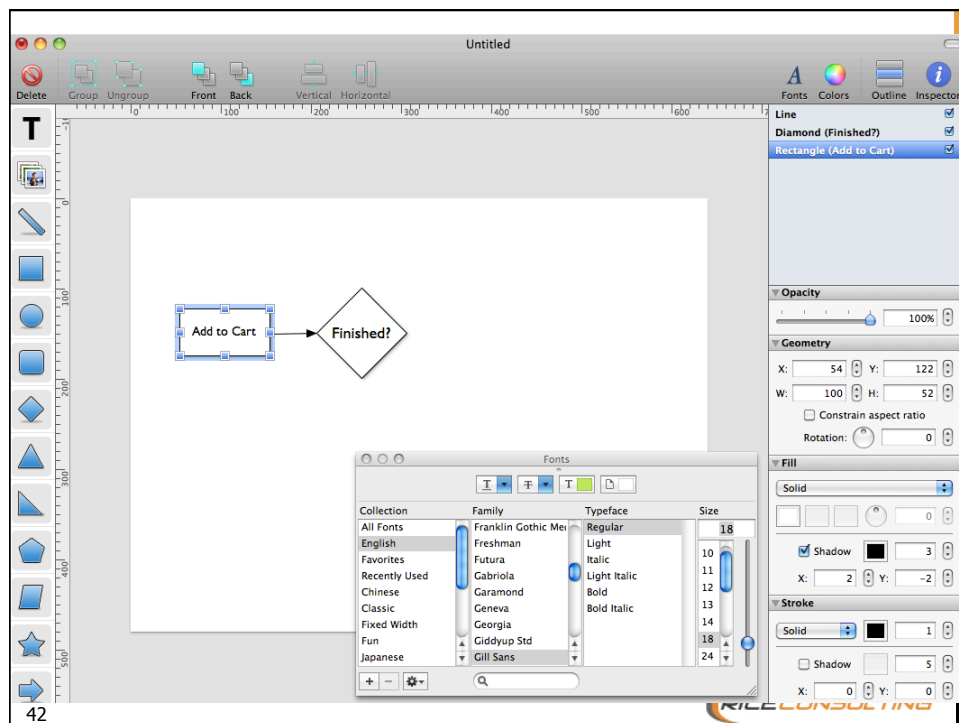


Free and Cheap Test Tools

SHAPES

- Diagramming tool for Mac OS X Snow Leopard
- 4.99
- www.shapesapp.com

41



42

Free and Cheap Test Tools

YED GRAPH EDITOR

- **yEd is a powerful desktop application that can be used to quickly and effectively generate high-quality diagrams.**
- **Create diagrams manually, or import your external data for analysis.**
- **Automatic layout algorithms arrange even large data sets with just the press of a button.**
- **yEd is freely available and runs on all major platforms: Windows, Unix/Linux, and Mac OS.**

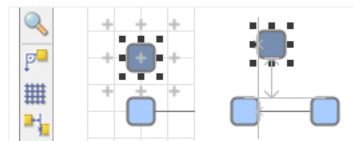
43



YED



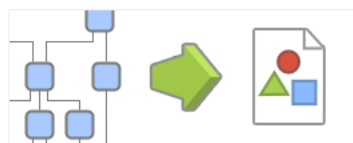
Import your own data from an Excel® spreadsheet (.xls) or XML



Create diagrams with ease via an intuitive user interface.



Automatically arrange your diagram elements.



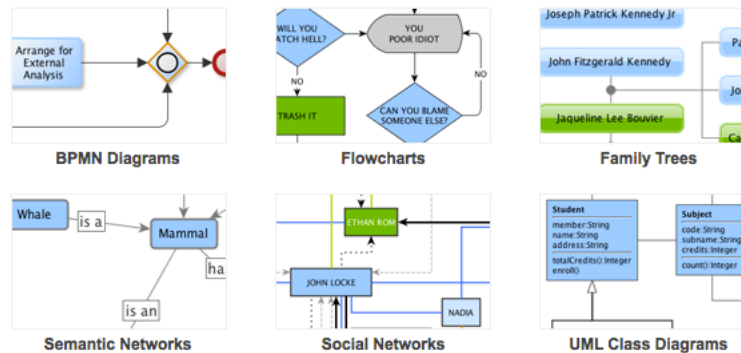
Export bitmap and vector graphics as PNG, JPG, SVG, PDF, SWF

44



Free and Cheap Test Tools

Supported Diagrams



yEd supports a wide variety of diagram types. In addition to the above illustrated types, yEd also supports organization charts, mind maps, swimlane diagrams, Entity Relationship diagrams, and many more.

45



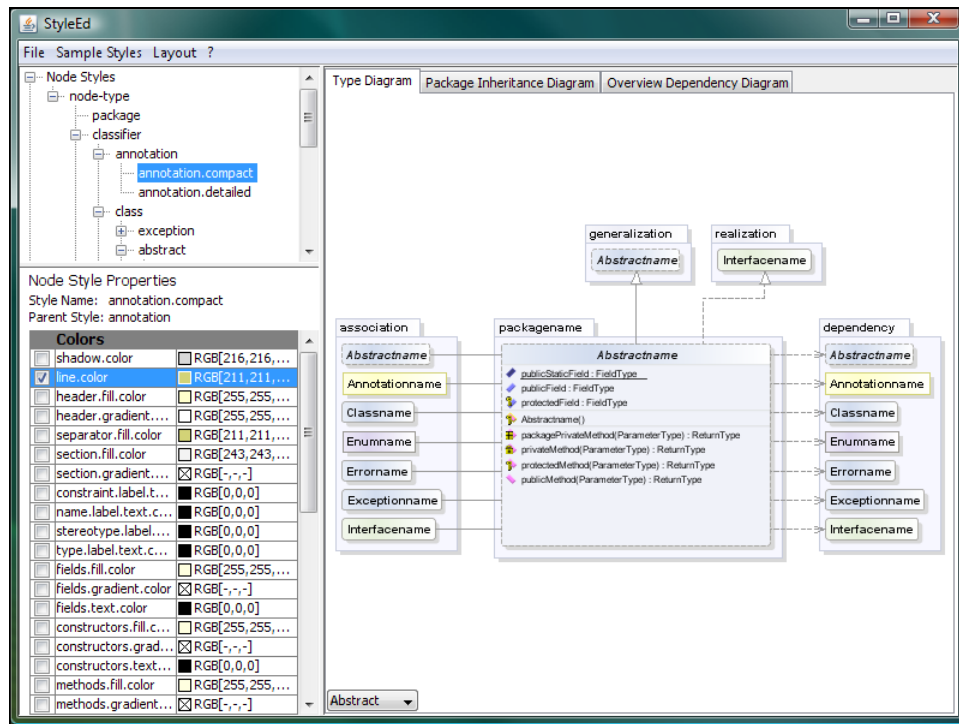
YWORKS UML DOCLET

- **yWorks UML Doclet**, formerly known as **yDoc**, is a **Javadoc™** extension that automatically generates clear and concise UML diagrams from your software project's classes and integrates them into the generated Java API documentation.
- **yWorks UML Doclet** makes use of the world-class layout algorithms provided by our graph visualization library **yFiles** to generate the UML diagrams.

46



Free and Cheap Test Tools

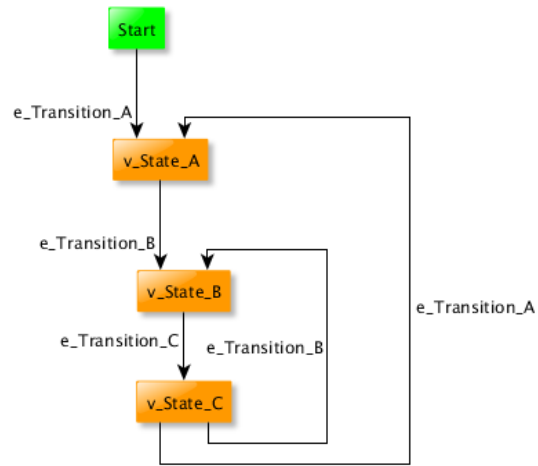


GRAPHWALKER

- <http://graphwalker.org/>
- **GraphWalker is a tool for generating offline and online test sequences from Finite State Machines and Extended Finite State Machines.**
- **The source code is now at github.**
 - <https://github.com/KristianKarl/GraphWalker>

Free and Cheap Test Tools

SIMPLE FINITE STATE MACHINE MODEL



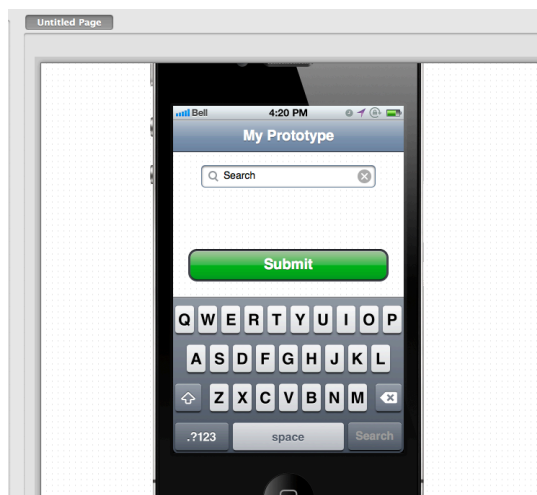
49

RICE CONSULTING

PROTOTYPING TOOLS

Free and Cheap Test Tools

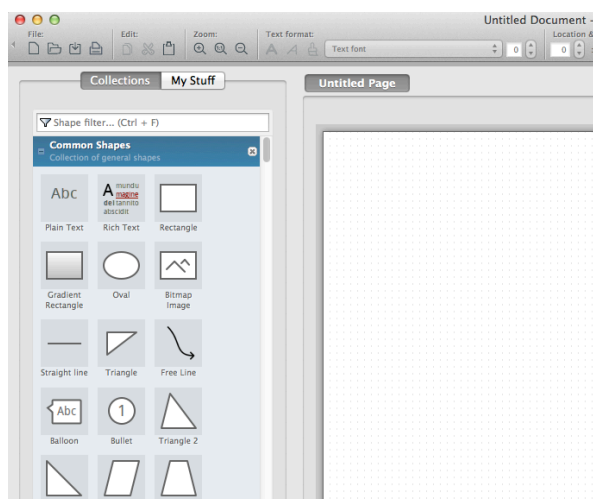
PENCIL



51



PENCIL

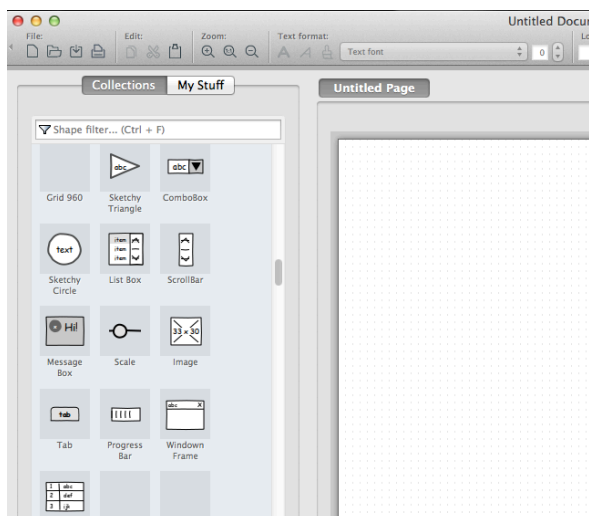


52



Free and Cheap Test Tools

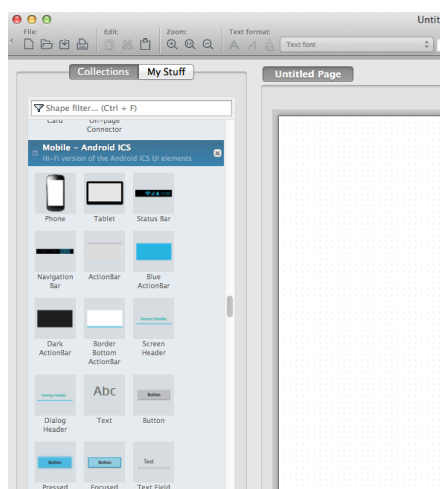
PENCIL



53



PENCIL

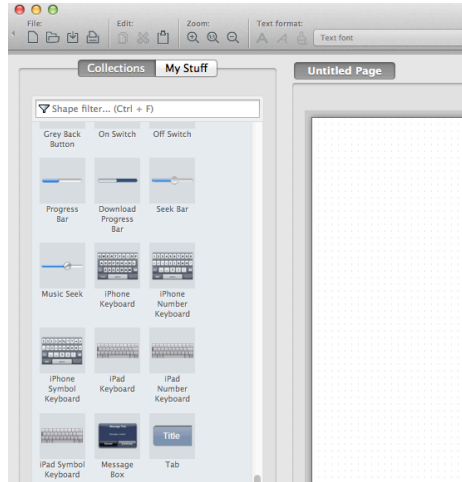


54



Free and Cheap Test Tools

PENCIL



Free
Download at:
<http://pencil.evolus.vn/>
Works on Mac

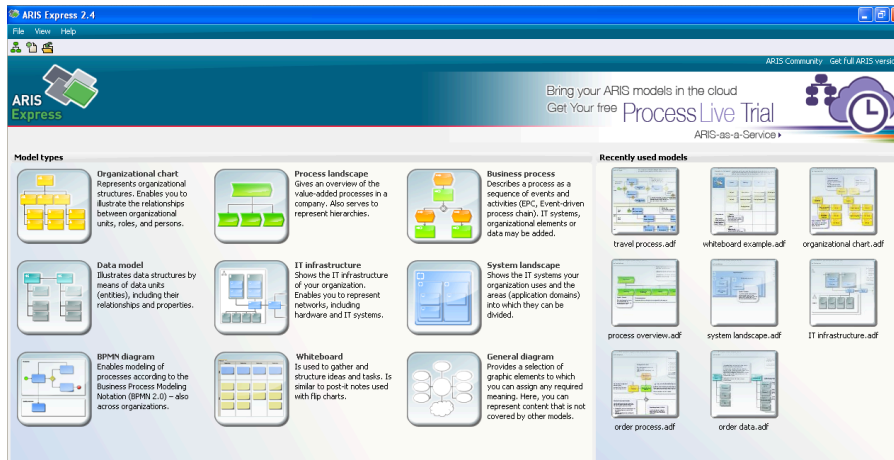
55



BUSINESS PROCESS MODELING

Free and Cheap Test Tools

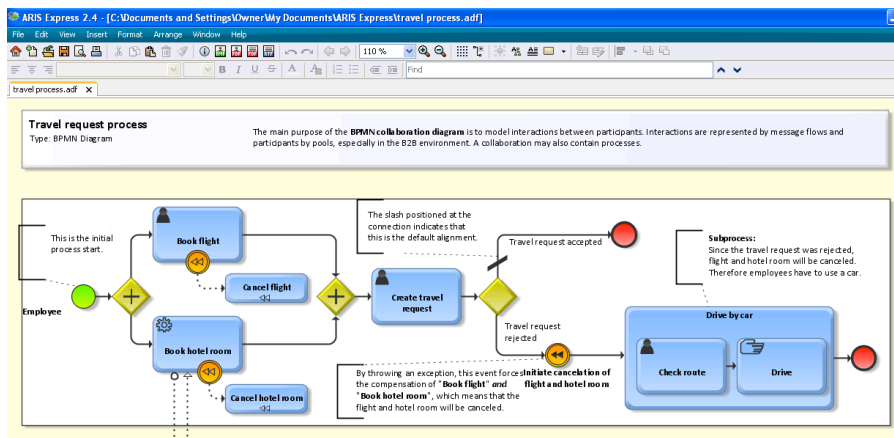
ARIS EXPRESS



57

RICE CONSULTING

ARIS EXPRESS – EXAMPLE TRAVEL PROCESS



58

RICE CONSULTING

Free and Cheap Test Tools

ARIS EXPRESS

- <http://www.ariscommunity.com/aris-express>
- Free
- Good documentation
- Windows only
- Full version available

59



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____

60



Free and Cheap Test Tools

TEST EXECUTION

- **Macro Scheduler**

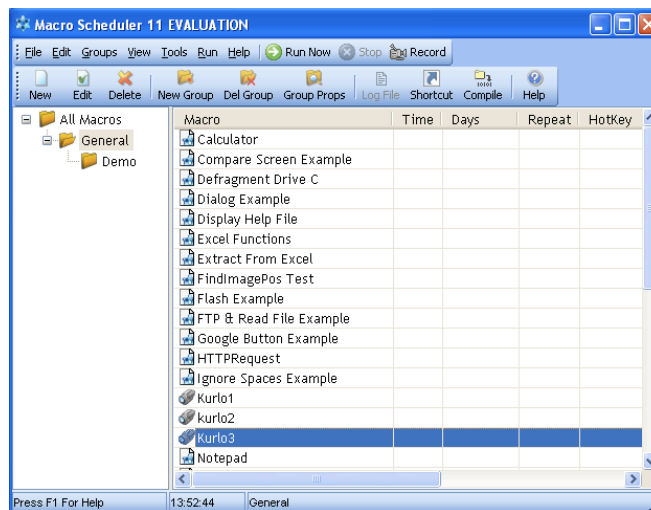
- www.mjtnet.com
- Windows only
- Row/Column oriented
 - Has object recognition for some Windows objects
 - Will execute VB Script
- \$29 to \$195 per individual license
- \$595 for enterprise license
- Like capture/playback, but no comparison features
- Has a very robust scripting language



61



MACRO SCHEDULER MAIN INTERFACE

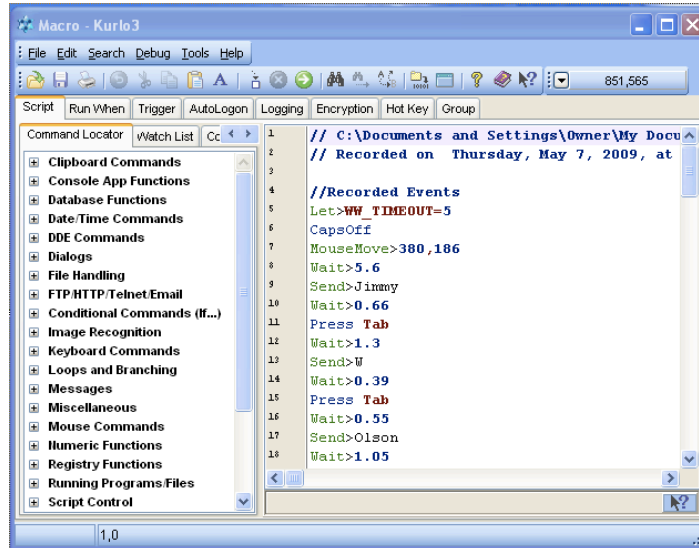


62



Free and Cheap Test Tools

MACRO SCHEDULER SCRIPT EDITOR



63



EXAMPLE SCRIPT (1)

```
1 // C:\Documents and Settings\Owner\
2 // Recorded on Thursday, May 7, 20
3
4 //Recorded Events
5 Let>WW_TIMEOUT=5
6 CapsOff
7 MouseMove>380,186
8 Wait>5.6
9 Send>Jimmy
10 Wait>0.66
11 Press Tab
12 Wait>1.3
13 Send>U
14 Wait>0.39
15 Press Tab
16 Wait>0.55
17 Send>Olson
18 Wait>1.05
19 Press Tab
20 Wait>0.81
21 MouseMove>369,221
22 Wait>0.82
23 LClick
24 Wait>0.16
25 MouseMove>348,246
26 Wait>1.28
```

Row, column

Data

Keystroke

Wait time

64



Free and Cheap Test Tools

EXAMPLE SCRIPT (2)

Object
Recognition

Duplicated
Data

```
50 Wait>0.45
51 LClick
52 WaitWindowOpen>Address Book Required
53 MoveWindow>Address Book Required,420,313
54 ResizeWindow>Address Book Required,307,124
55 Wait>0.06
56 MouseMove>576,409
57 Wait>2.12
58 LClick
59 WaitWindowOpen>Jimmy Olson
60 MoveWindow>Jimmy Olson,246,95
61 ResizeWindow>Jimmy Olson,655,561
62 Wait>0.06
63 MouseMove>644,518
64 Wait>2.8
65 LClick
66 Wait>0.14
67 MouseMove>788,635
68 Wait>1.52
69 LClick
70 WaitWindowOpen>Kurlo
71 MoveWindow>Kurlo,-4,-4
72 ResizeWindow>Kurlo,1032,746
73 Wait>0.06
74 MouseMove>929,750
75 Wait>3.51
```

65



SAMPLE DATA-DRIVEN SCRIPT

Test Data File

Read from file

```
4 //Specify the path of the file here
5 Let>k=1
6 Label>start
7 ReadLn>c:\kurlo.txt,k,line
8 If>line===EOF###,finish ← Loop
9
10 SetFocus>Kurlo
11 MouseMove>69,7
12 Wait>3
13 LClick
14 Press ALT
15 Send>c
16 Release ALT
17 Wait>1.27
18 Press Enter
19 Wait>3.16
20 Send>%line%
21 Wait>1.33
22 Press Tab
23 Wait>1.3
24 Let>k=k+1
25 ReadLn>c:\kurlo.txt,k,line
26 Send>%line% ← Input to screen
27 Wait>0.49
```

66



Free and Cheap Test Tools

SELENIUM IDE

- **Firefox add-on that records clicks, typing, and other actions to make a test, which you can play back in the browser.**
 - Not just a recording tool: it is a complete IDE.
 - You can choose to use its recording capability, or you may edit your scripts by hand.
 - Autocomplete support and the ability to move commands around quickly.
 - <http://seleniumhq.org>

67



SELENIUM IDE FEATURES

- **Easy record and playback**
- **Intelligent field selection will use IDs, names, or XPath as needed**
- **Autocomplete for all common Selenium commands**
- **Walk through tests**
- **Debug and set breakpoints**
- **Save tests as HTML, Ruby scripts, or any other format**

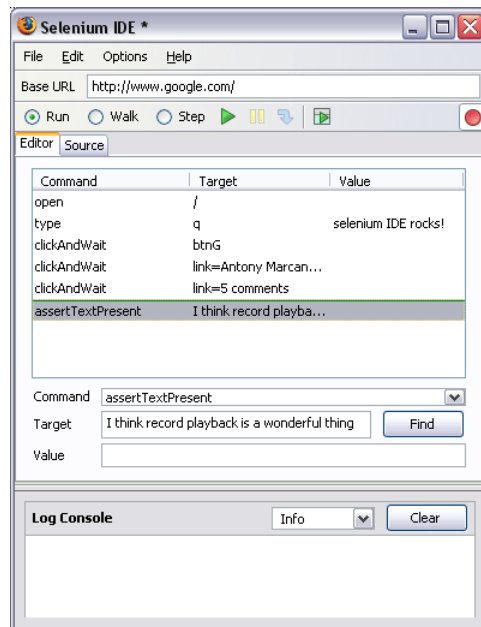
68



Free and Cheap Test Tools

SELENIUM IDE FEATURES (2)

- **Support for Selenium user-extensions.js file**
- **Option to automatically assert the title of every page**
- **NEW! Easy customization through plugins**



69



IMACROS



iMacros for Firefox 7.4.0.8

by iOpus

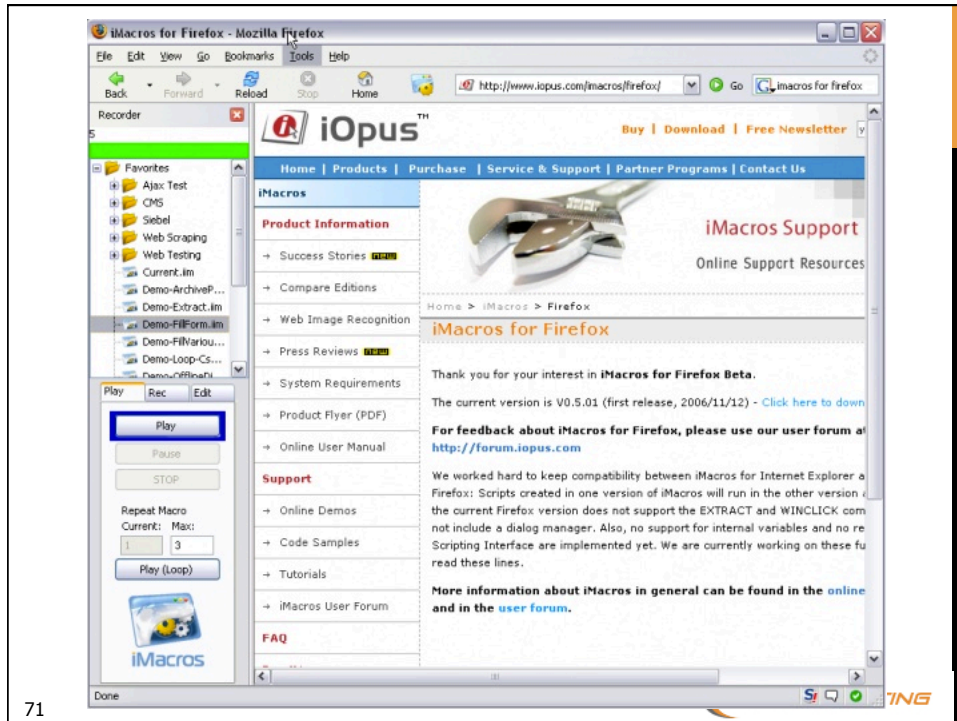
Automate Firefox. Record and replay repetitious work. If you love the Firefox web browser, but are tired of repetitive tasks like visiting the same sites every days, filling out forms, and remembering passwords, then iMacros for Firefox is the solution you've been dreaming of! ***Whatever you do with Firefox, iMacros can automate it.***

[+ Add to Firefox](#)

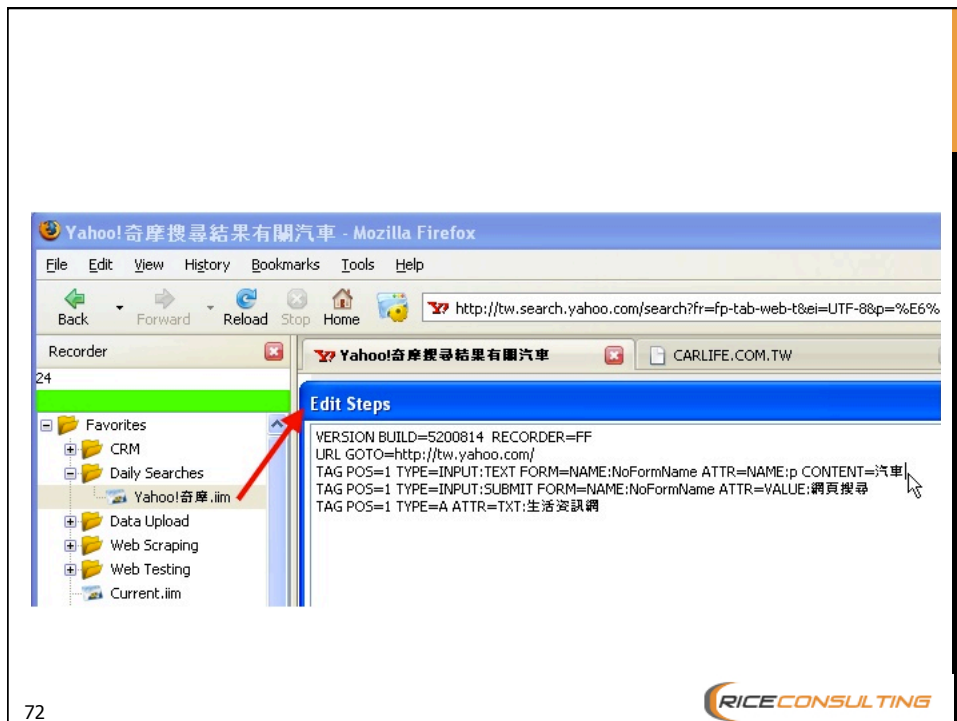
70



Free and Cheap Test Tools

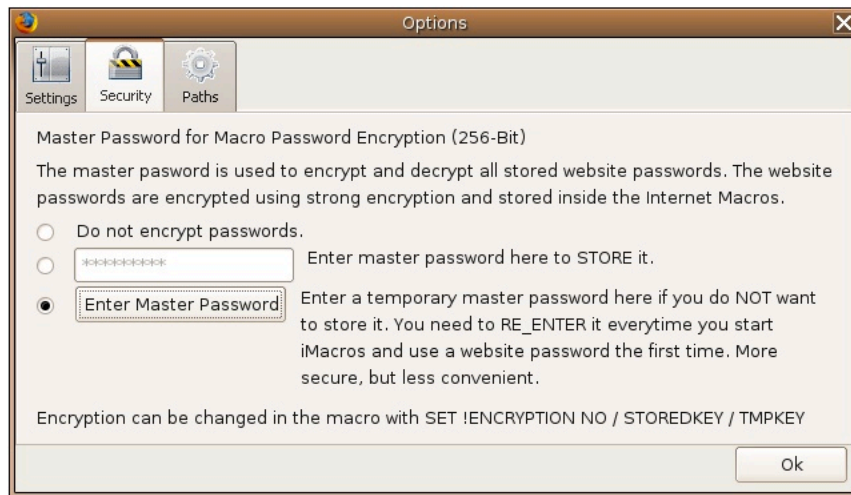


71



72

Free and Cheap Test Tools



73



CUBIC TEST

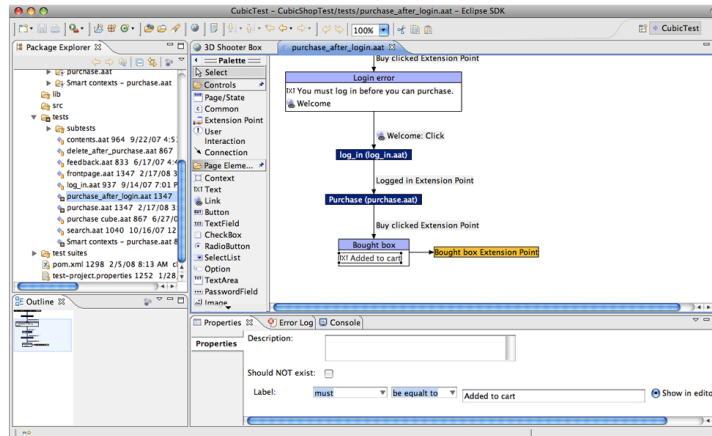
- **CubicTest is a graphical Eclipse plug-in for writing Selenium and Watir tests.**
- **CubicTest's test editor is centered around pages/states and transitions between these pages/states.**
- **CubicTest features an innovative test recorder and test runner based on Selenium RC which are fully integrated with the graphical test editor.**

74



Free and Cheap Test Tools

CUBIC TEST (2)



75



BAD BOY



76



Free and Cheap Test Tools

BAD BOY (2)

- **Record/playback**
- **Free for individuals and deployments of 5 computers or less & not-for-profits**
- **\$45/user license fee otherwise**
- **<http://www.badboy.com.au/>**

77



CUCUMBER

- **Cucumber is a tool that executes plain-text functional descriptions as automated tests.**
- **The language that Cucumber understands is called Gherkin**
- **<http://cukes.info/>**

78



Free and Cheap Test Tools

CUCUMBER LANGUAGE EXAMPLE

```
Feature: Search courses
  In order to ensure better utilization of courses
  Potential students should be able to search for courses

  Scenario: Search by topic
    Given there are 240 courses which do not have the topic "biology"
    And there are 2 courses A001, B205 that each have "biology" as one of the topics
    When I search for "biology"
    Then I should see the following courses:
      | Course code |
      | A001       |
      | B205       |
```

79



SIKULI

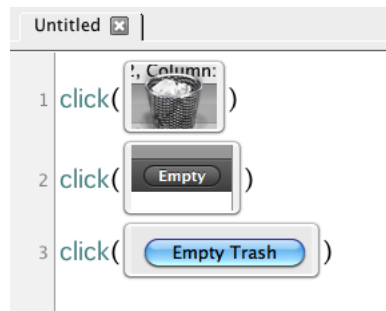
- **Sikuli is an open source visual technology to automate and test graphical user interfaces (GUI) using images (screenshots).**
- **Sikuli includes Sikuli Script, a visual scripting API for Jython, and Sikuli IDE, an integrated development environment for writing visual scripts with screenshots easily.**
- **You can programmatically control a web page, a Windows/Linux/Mac OS X desktop application, or even an iphone or android application running in a simulator or via VNC.**
- **<http://sikuli.org/>**

80



Free and Cheap Test Tools

SIKULI SCRIPTING



81



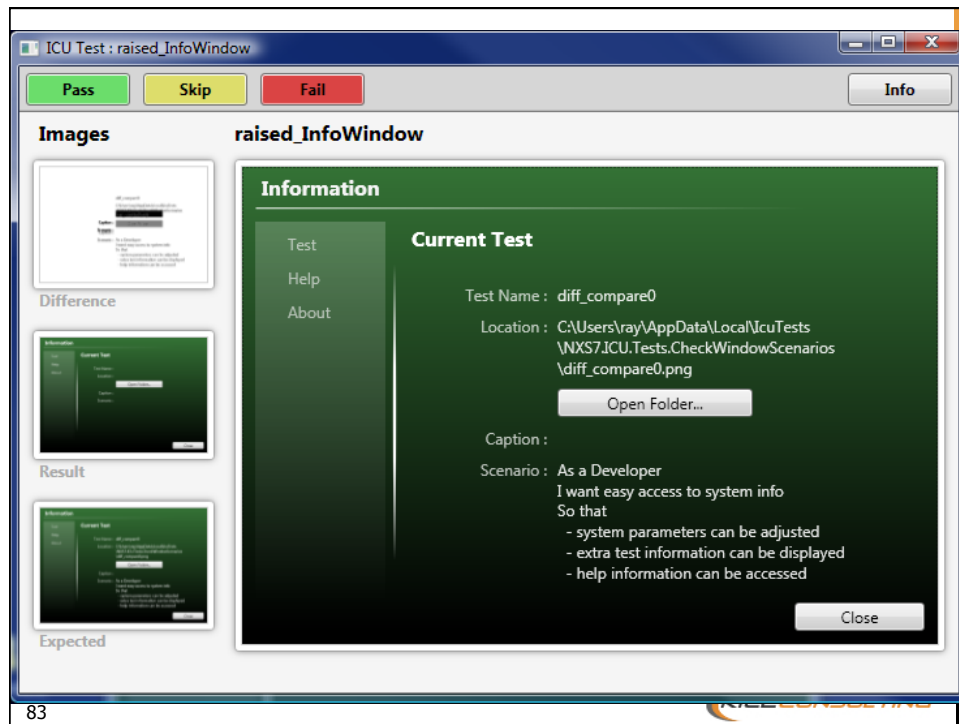
ICUTEST

- **GUI Unit testing for Windows Presentation Foundation**
- **Free**
- **Test Generator is a tool that automatically creates GUI unit tests for your application. Just specify your assembly (executable or DLL) and Test Generator will inspect your assembly for UI components and generate unit tests automatically.**
- **<http://www.nxs-7.com/icu/Default.aspx>**

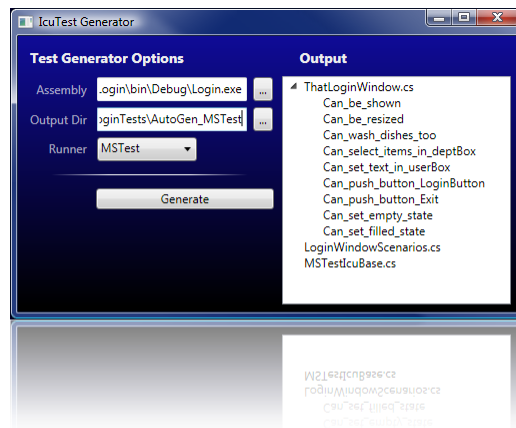
82



Free and Cheap Test Tools



ICUTEST TEST GENERATOR



Free and Cheap Test Tools

FAKE

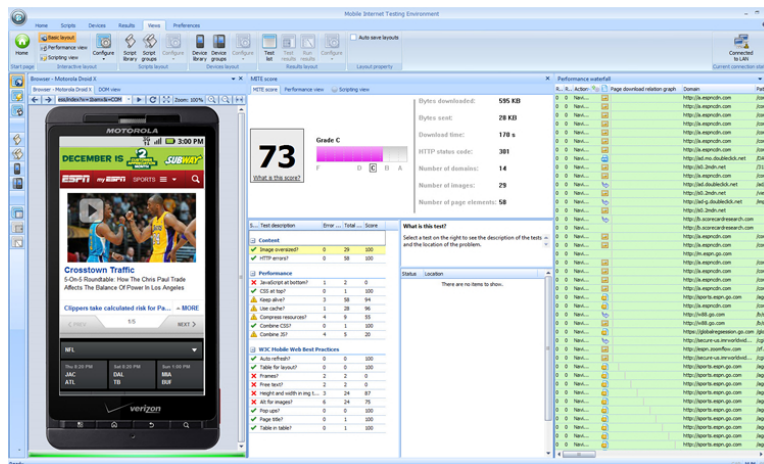
- **Mac OS X Web Test Automation**

- Forms
- Screenshot capture
- Assertions
- Error handling
- **\$29.95**
- **www.fakeapp.com**

85



KEYNOTE MITE



86



Free and Cheap Test Tools

OTHER FREE TEST EXECUTION TOOLS

- **FitNesse** - <http://fitnesse.org>
- **WATIR** - <http://watir.com/>
- **Apodora** - <http://sourceforge.net/projects/apodora/>
- **AutoIT** - <http://www.autoitscript.com/autoit3/index.shtml>
- **Auto Hot Key** – www.autohotkey.com
- **Frankenstein** – <http://frankenstein.openqa.org/>
- **WET** - Commercial grade open source Web automation testing tool - <http://wet.openqa.org>
- **Grease Monkey**
 - <http://testertools.com/browsers-based-tools/grease-monkey-web-testing-tool-with-scripts/>

87



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____

88



Free and Cheap Test Tools

TEST AUTOMATION FRAMEWORKS

- **Our working definition:**
 - A framework is a hierarchical directory that encapsulates shared resources, such as a dynamic shared library, image files, localized strings, header files, and reference documentation in a single package.

89



OPEN SOURCE FRAMEWORKS

- **Open2Test**
 - <http://www.open2test.org>
- **Robot Framework**
 - <http://code.google.com/p/robotframework/>
- **STAF – Software Testing Automation Framework**
 - <http://staf.sourceforge.net/>
- **SAFS - Software Automation Framework Support (SAS)**
 - <http://sourceforge.net/projects/safsdev/>

90



Free and Cheap Test Tools

OPEN2TEST

- **Open2Test is a keyword-driven automation framework that works with HP QuickTest Professional (QTP) and many other test execution tools.**



91



OPEN2TEST (2)

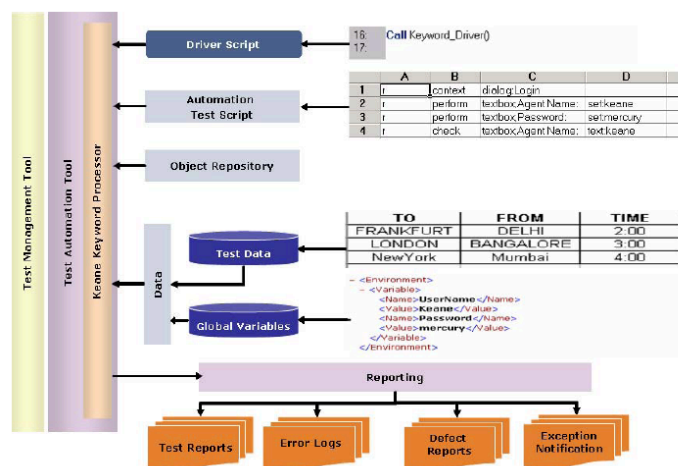
- **Allows testers to develop test cases using Microsoft Excel and a list of keywords.**
- **When the test is executed, the framework processes the Excel workbook and calls functions associated with the keywords entered in the Excel spreadsheet.**

92



Free and Cheap Test Tools

FRAMEWORK ARCHITECTURE



93



OPEN2TEST (3)

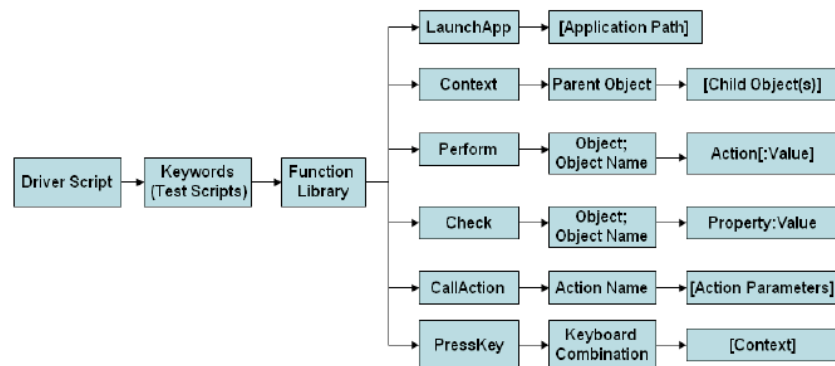
- **These keyword functions in turn perform specific actions against the application under test (AUT).**
 - The framework interprets the keyword and executes a set of statements in the program.

94



Free and Cheap Test Tools

FRAMEWORK FLOW



95



OPEN2TEST (4)

- **With this framework in place, applications can be automated without starting from scratch.**
 - Testers simply use the application independent keywords and create extra application-specific keywords.

96



Free and Cheap Test Tools

OPEN2TEST FEATURES

- **Use of variables**
 - Variables can be defined and used across the generated test script.
- **Conditional checking**
 - Conditional constructs such as 'if' can be implemented using keywords to handle different flows based on various conditions.

97



OPEN2TEST FEATURES (2)

- **Data-driven testing**
 - This framework supports data-driven testing by importing data from an external data sheet.
- **Reports**
 - Customized reporter messages can also be used to perform effective analysis on execution reports.

98



Free and Cheap Test Tools

OPEN2TEST FEATURES (3)

- **Calling functions and reusable actions**
 - Common functions or actions can be triggered through keywords.
- **Keyboard inputs**
 - This plug-in is included to perform keyboard actions on the specified test object.

99



OPEN2TEST FEATURES (4)

- **Date/time functions**
 - The date/time function plug-in is included to perform different operations on date/time.
- **Exception handling**
 - Runtime errors can be effectively handled and reported using this framework.
- **Handling object (Web or windows)**
 - Some operations can be performed on the Web or as a Windows Object using keywords, depending on the execution tool.
- **Learn More at <http://www.open2test.org>**

100



Free and Cheap Test Tools

ROBOT FRAMEWORK

- Robot Framework is a generic test automation framework for acceptance testing and acceptance test-driven development (ATDD).
- Has easy-to-use tabular test data syntax and utilizes the keyword-driven testing approach.
- Can be extended by test libraries implemented either with Python or Java, and users can create new keywords from existing ones using the same syntax that is used for creating test cases.

101



ROBOT FRAMEWORK (2)

Running Keyword Conditionally - Mozilla Firefox

file edit view history bookmarks tools help

file:///tmp/robotframework-2.1/doc/examples/conditional_execution/running_keyword_conditional... behave

Running Keyword Conditionally

Setting	Value	Value	Value	Value
Documentation	Adding conditions to test cases should be avoided if possible. However, sometimes that kind of construct is needed. For this purpose BuiltIn library contains keywords "Run Keyword If" and "Run Keyword Unless" which use is demonstrated in this suite.			

Variable	Value	Value	Value	Value
\$(COUNTRY)	Robotland			

Test Case	Action	Argument	Argument	Argument
Running Test Based On The Condition	[Documentation]	If you change \$(COUNTRY) value or give --variable COUNTRY your_country from command line the test is executed differently than with default value.		
	Run Keyword If	'Robotland' == '\$(COUNTRY)'	Hello World	
	Run Keyword Unless	'Robotland' == '\$(COUNTRY)'	Log	Hello \$(COUNTRY)!

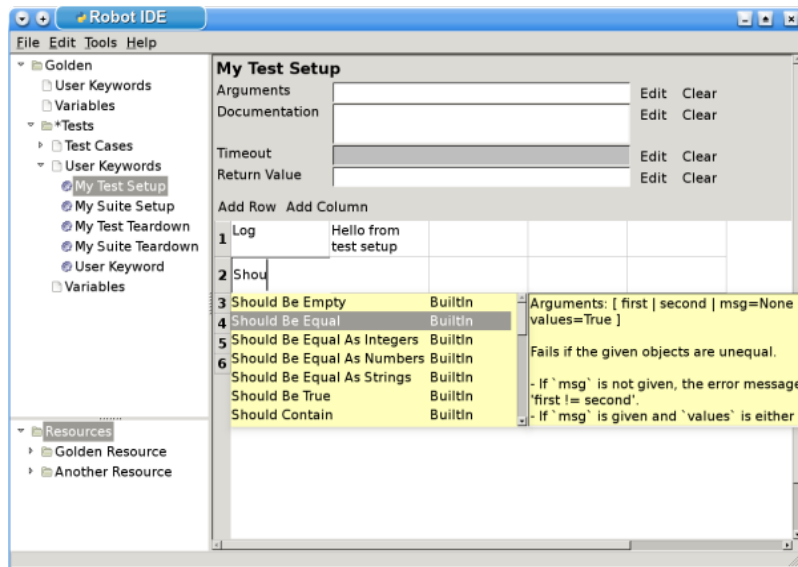
Done

102



Free and Cheap Test Tools

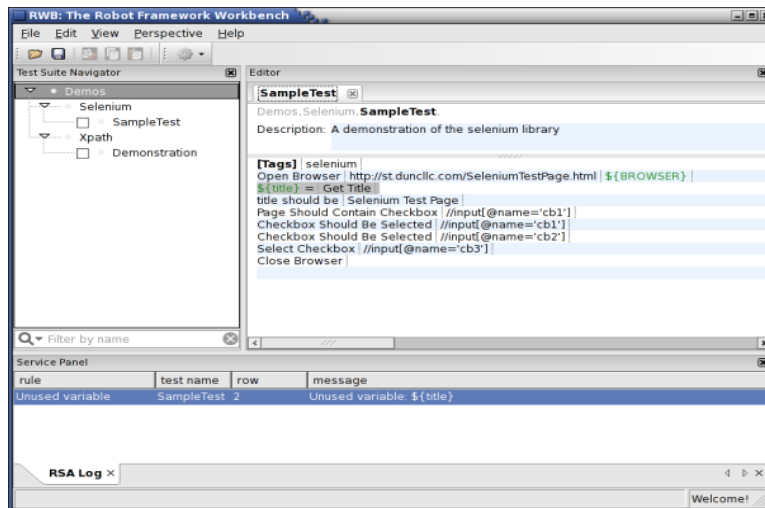
ROBOT FRAMEWORK (3)



103



ROBOT FRAMEWORK (4)



104



Free and Cheap Test Tools

SELENIUM LIBRARY

- SeleniumLibrary is a Robot Framework test library that uses the popular Selenium web testing tool internally.
- It provides a powerful combination of simple test data syntax and support for different browsers.
- In addition to standard web testing, the library also supports testing Adobe Flex/Flash applications.
- <http://code.google.com/p/robotframework-seleniumlibrary/>
- <http://code.google.com/p/robotframework-seleniumlibrary/wiki/Demo>

105



STAF

- The Software Testing Automation Framework (STAF) is an open source, multi-platform, multi-language framework designed around the idea of reusable components, called services (such as process invocation, resource management, logging, and monitoring).
- <http://staf.sourceforge.net/>

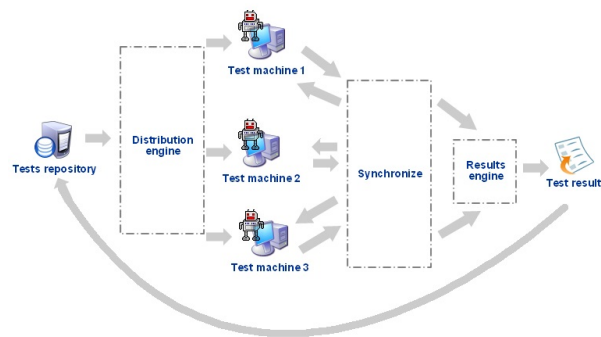
106



Free and Cheap Test Tools

STAF OVERVIEW

- This is simply an overview of this environment framework.
- You can see full documentation at <http://staf.sourceforge.net/>



107



STAF OVERVIEW (2)

- Peer-to-peer pluggable framework geared towards test automation
- History
 - Created at IBM Austin in 1998
 - Corporate funded (via QSE) since 1999
 - Open-sourced (on SourceForge) in 2001
 - Licensed under the Eclipse Public License (EPL) V1.0

108



Free and Cheap Test Tools

STAF OVERVIEW (3)

- **User Community**
 - 240+ IBM teams (world-wide)
 - 220+ external companies
 - 280k+ downloads of STAF and associated plug-ins since 4Q/2001
 - Consistently ranked as one of the Top 50 projects on SourceForge.net

109



STAF OVERVIEW (4)

- **An open source automation framework**
- **A remote test agent to control tests on multiple machines**
- **Designed around the idea of reusable components, called services**
- **Developed by IBM, made open source because of their use in Linux testing**

110



Free and Cheap Test Tools

STAF OVERVIEW (5)

- **Runs as a daemon process, called STAFProc, on each system**
- **Operates in a peer-to-peer environment; in other words, there is no client-server hierarchy.**

111



STAF OVERVIEW (6)

- STAF operates in a peer-to-peer environment; in other words, there is no client-server hierarchy among machines running STAF



112



Free and Cheap Test Tools

STAF OBJECTIVES

- **STAF was designed with the following objectives in mind:**
 - Minimum machine requirements - This is both a hardware and a software statement.
 - Easily useable from a variety of languages, such as Java, C/C++, Rexx, Perl, and Tcl, or from a shell (command) prompt.
 - Easily extendable - This means that it should be easy to create other services to plug into STAF.

113



STAF OBJECTIVES (2)

- **To make it easier to create automated test cases and workloads.**
- **To increase the efficiency, productivity, and quality of your testing by improving your level of automation and reuse in individual test cases as well as the overall test environment.**

114



Free and Cheap Test Tools

STAF AS AUTOMATION TOOLKIT

- **STAF is quick and easy to get started with**
 - Takes less than 3 minutes to get running on most systems
- **STAF is very easy to use**
 - All services have built-in syntax help
 - All services are available from the command line
- **STAF provides many valuable built-in services**
 - Many more are available for download
 - Writing your own services is very straightforward

115



STAF SUPPORTED PLATFORMS

- **STAF is available for the following platforms**
 - Windows: 2000, 2003, XP, Vista, Server 2008 (Intel, AMD64, IA/64)
 - Linux: All platforms (i386, AMD64, IA/64, PPC64, PPC32, zLinux32, zLinux64)
 - AIX 5.1+ (32- and 64-bit)
 - Solaris 2.6+ + (Sparc 32/64, x64, x86)
 - HP-UX 11.00+ (PA-RISC, IA/64)
 - FreeBSD 4.10+
 - Mac OS X 10.4+ (i386, PPC)
 - OS/400 V5R2+
 - z/OS 1.4+ (32- and 64-bit)

116



Free and Cheap Test Tools

STAF SUPPORTED LANGUAGES

- **STAF supports the following languages**
 - Java, C/C++
 - Perl, Python, Tcl, Rexx, Shell-script
 - Ant
 - Command line
- **STAF “feels” the same across all platforms and languages**
- **There is also a command line interface**

117



THE STAF WEB SITE

- **The main STAF web site is**
 - <http://staf.sourceforge.net>
- **From this web site you can:**
 - Submit bugs and feature requests
 - View the STAF source code
 - Download the STAF binary files
 - Download STAF services
 - View STAF documentation
 - Access Mailing Lists to view, search, and post messages (Help, Announcements)
 - Access Forums to view, search, and post messages

118



Free and Cheap Test Tools

Software Testing Automation Framework (STAF)

Welcome to STAF

The Software Testing Automation Framework (STAF) is an open source, multi-platform, multi-language framework designed around the idea of reusable components, called services (such as process invocation, resource management, logging, and monitoring). STAF removes the tedium of building an automation infrastructure, thus enabling you to focus on building your automation solution. The STAF framework provides the foundation upon which to build higher level solutions, and provides a pluggable approach supported across a large variety of platforms and languages.

Latest Releases

- STAF 3.3.1 (September 24, 2008) ([Download](#))
- STAX 3.3.4 (September 24, 2008) ([Download](#))

Other STAF Services (provided separately as "add-ons" to the core STAF services):

- Cron Service 3.3.3 (September 24, 2008) ([Download](#))
- Email Service 3.3.2 (September 24, 2008) ([Download](#))
- Event Service 3.1.2 (September 24, 2008) ([Download](#))
- EventManager Service 3.3.3 (September 24, 2008) ([Download](#))
- FSExt (File System Extension) Service 3.0.1 (February 27, 2008) ([Download](#))
- HTTP Service 3.0.1 (September 24, 2008) ([Download](#))
- NamedCounter Service 3.0.1 (February 27, 2008) ([Download](#))
- Namespace Service 1.0.1 (February 27, 2008) ([Download](#))
- SXE (Staf eXecution Engine) Service 3.0.2 (February 27, 2008) ([Download](#))
- Timer Service 3.0.2 (February 27, 2008) ([Download](#))

STAF can be leveraged to help solve common industry problems, such as more frequent product cycles, less preparation time, reduced testing time, more platform choices, more programming language choices, and increased National Language requirements. STAF can help in these areas since it is a proven and mature technology, promotes automation and reuse, has broad platform and language support, and provides a common infrastructure across teams.

STAX is an execution engine which can help you thoroughly automate the distribution, execution, and results analysis of your testcases. STAX builds on top of three existing technologies, STAF, XML, and Python, to place great automation power in the hands of testers. STAX also provides a powerful monitoring application which allows you to interact with and monitor the progress of your jobs. Some of the main features of STAX are: support for parallel execution, user-defined granularity of execution control, support for nested testcases, the ability to control the length of execution time, the ability to import modules at run-time, support for existing Python and Java modules and packages, and the ability to extend both the STAX language as well as the STAX monitoring application. Using these capabilities, you can build sophisticated scripts to automate your entire test environment, while ensuring maximum efficiency and control.

119



Software Testing Automation Framework (STAF)

Download STAF V3

The latest releases for STAF V3 can be downloaded from this page. If you want to download the latest releases for STAF V2, go to the [Download STAF V2](#) page instead. Earlier releases of STAF can be accessed from the ["See All Releases"](#) page.

See the [STAF V3 History](#) page for STAF V3 history information.

See the [STAF V3 Overview](#) if you are migrating from STAF V2 to get more information on major new enhancements in STAF V3.

See the [Getting Started with STAF V3 Guide](#) for more information about how to get started using STAF V3.

See the [Programmatically retrieving the latest STAF releases](#) page for more information about how to programmatically retrieve the latest STAF releases.

Binaries

The recommended installation method for STAF is to use InstallAnywhere (IA). However, if we haven't yet provided an InstallAnywhere file, use the GNU zipped or compressed tar file, if provided, to do a STAFInst install.

See the [STAF V3 Installation Guide](#) for more detailed instructions for installing STAF V3.

The latest STAF V3 release is STAF V3.3.1. Files which are not at the latest release level are marked with an asterisk (*).

Note that AMD64 is also commonly known as x86-64 or x64 or Opteron 64-bit. AMD64 should not be confused with the Intel Itanium architecture, also known as IA-64, which is not compatible on the native instruction set level with the AMD64 architecture.

Operating System (Architecture)	Java Support	Release	File	File format	File size
Win95/98/Me/NT/2000/XP/2003/Vista/WinSrv2008 (32-bit)	32-bit	3.3.1	STAF331-setup-win32.exe	InstallAnywhere (Bundled JVM)	47M
Win95/98/Me/NT/2000/XP/2003/Vista/WinSrv2008 (32-bit)	32-bit	3.3.1	STAF331-setup-win32-NoJVM.exe	InstallAnywhere (No JVM)	13M
Windows Server 2003/2008 (IA64)	64-bit	3.3.1	STAF331-setup-win64.exe	InstallAnywhere (Bundled JVM)	52M
Windows Server 2003/2008 (IA64)	64-bit	3.3.1	STAF331-setup-win64-NoJVM.exe	InstallAnywhere (No JVM)	15M
Windows Server 2003/2008, Vista (AMD64, aka x64)	64-bit	3.3.1	STAF331-setup-winamd64.exe	InstallAnywhere (Bundled JVM)	54M

120



Free and Cheap Test Tools

PERFORMANCE TESTING & MONITORING TOOLS

- **Paessler Web Server Stress Tool**
- **SmartInspect**
- **loadUI**
- **SOASTA CloudTest Lite**
- **BrowserMob**
- **Chess**

121



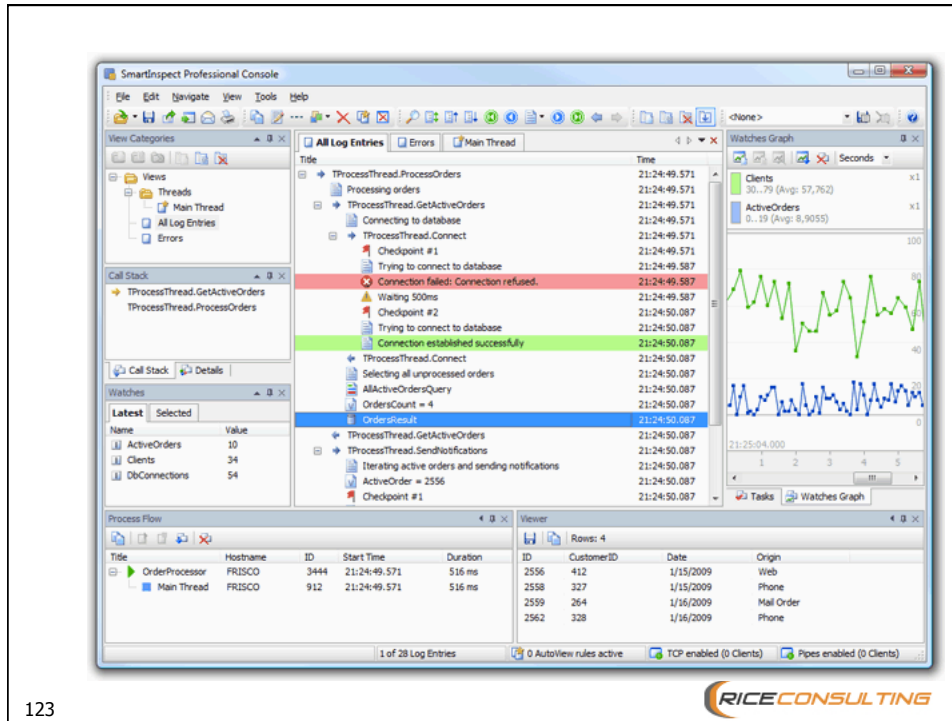
SMARTINSPECT

- **.NET, Java and Delphi logging tool for debugging and monitoring software applications.**
- **Helps identify bugs, find solutions to user-reported issues and gives a precise picture of how software performs in different environments.**
- **One-time license**
 - \$299 single user
- **<http://www.gurock.com/smartinspect/>**

122



Free and Cheap Test Tools



123

RICE CONSULTING

NETWORK MONITORING

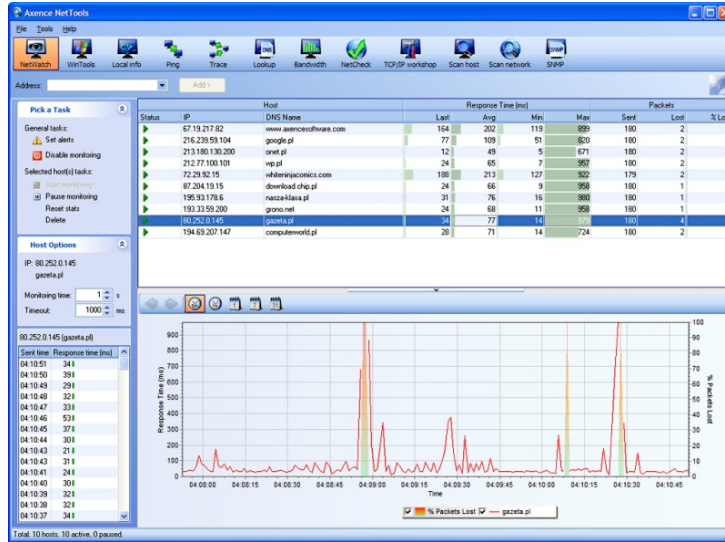
- **Axence NetTools Pro – www.axencesoftware.com**
- **FREE and very comprehensive set of network administration tools:**
 - NetWatch - network monitoring with alerting, real-time & historical charts;
 - WinTools lists exhaustive system information from Windows computers;
 - Port scanner; network scanner;
 - NetStat lists local inbound & outbound connections;
 - TCP/IP workshop for low level service testing; ping; fast traceroute;
 - DNS lookup; bandwidth test tool; SNMP browser and more.

124

RICE CONSULTING

Free and Cheap Test Tools

AXENCE NETTOOLS PRO



125



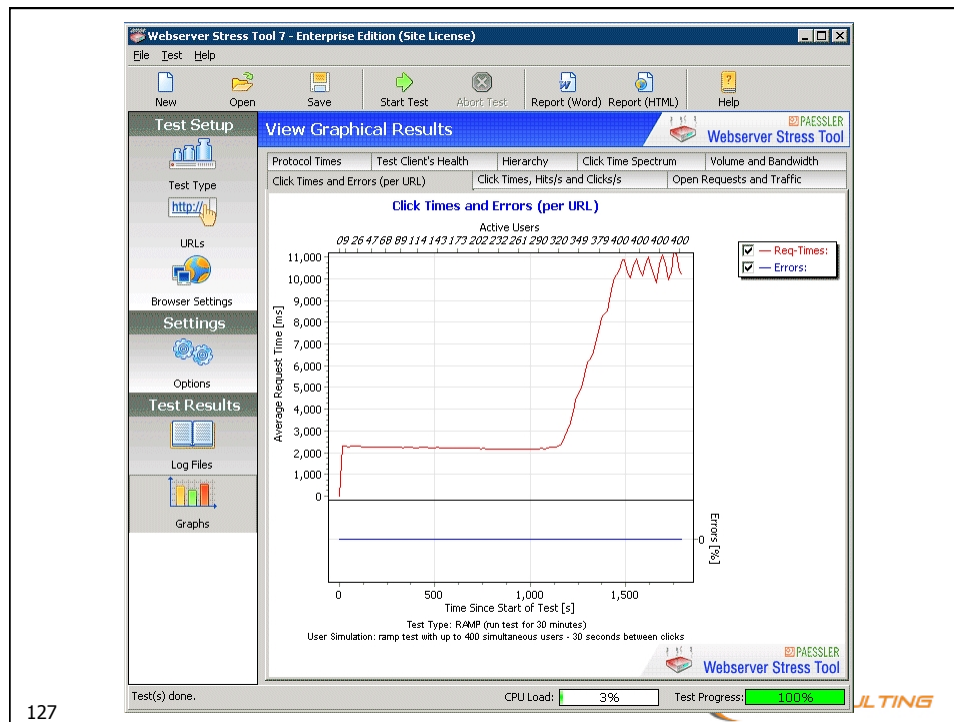
PAESSLER WEB SERVER TEST

- **www.paessler.com**
 - Pro edition single user - \$249
 - 100 Concurrent virtual users
 - Enterprise edition single user - \$750
 - Up to 10,000 concurrent virtual users
 - Enterprise edition 5 user - \$1,449
 - Enterprise edition site license - \$2,895

126



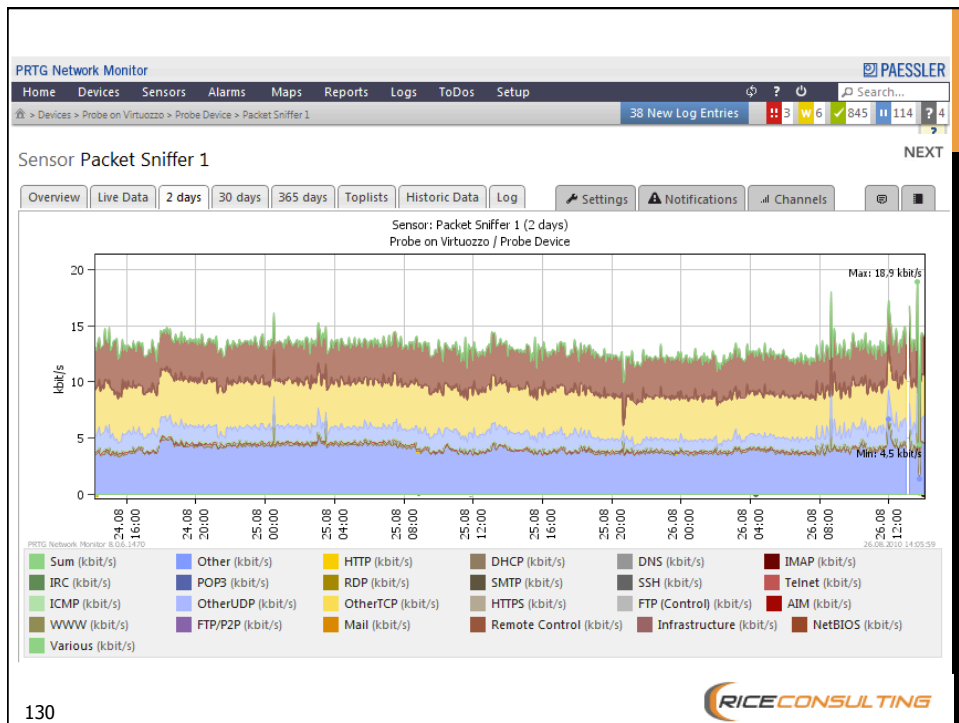
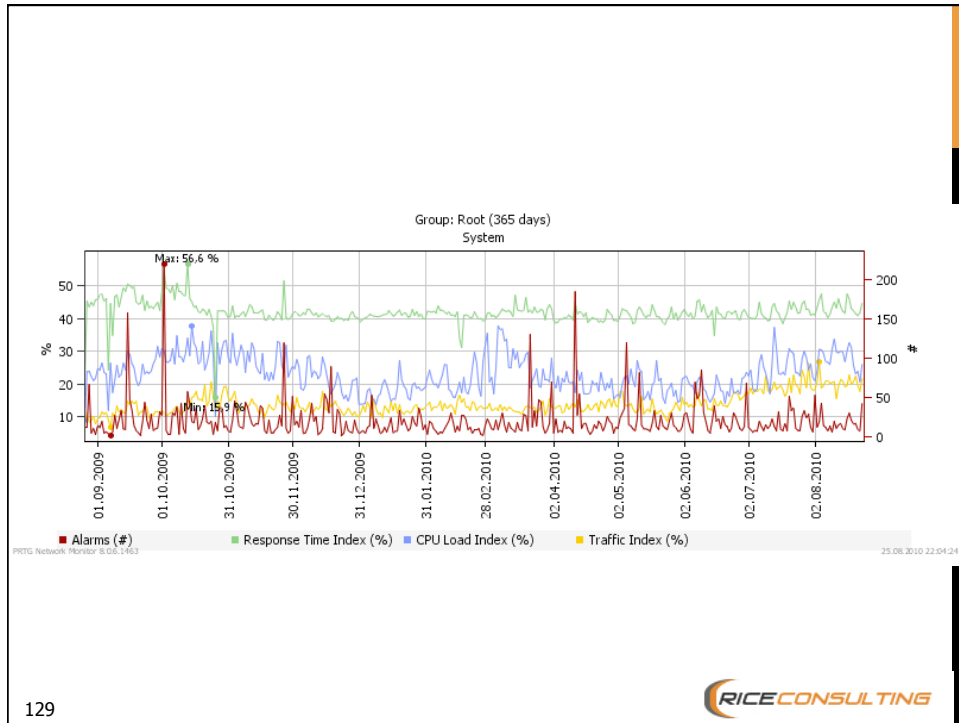
Free and Cheap Test Tools



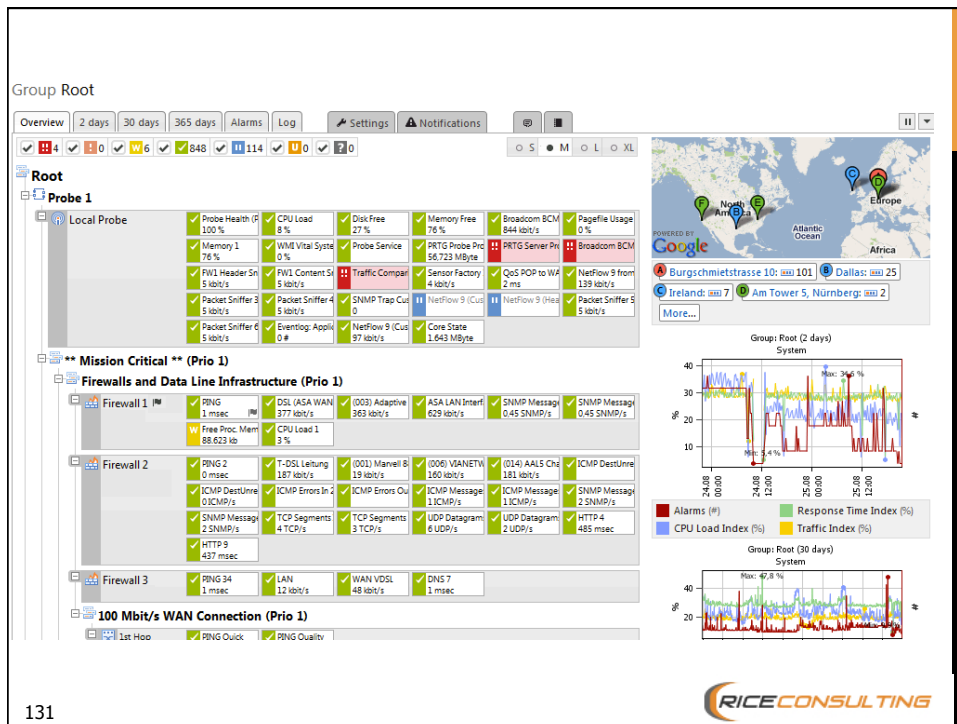
PAESSLER PRTG NETWORK MONITORING

- www.paessler.com
 - Free for up to 10 sensors
 - Up to 100 sensors - \$400
 - Up to 500 sensors - \$1,200

Free and Cheap Test Tools



Free and Cheap Test Tools



Free and Cheap Test Tools

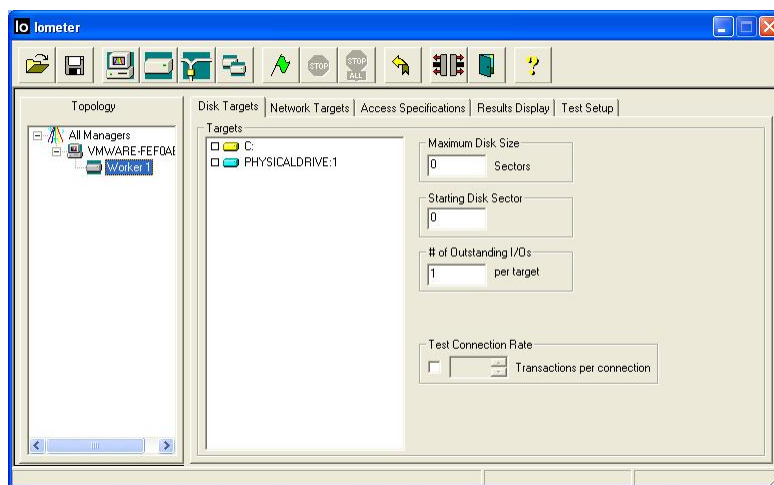
OTHER MONITORING TOOLS

- **PerfMon – Windows**
- **Wireshark**
- **Nagios**
- **Iometer**
 - Iometer is an I/O subsystem measurement and characterization tool for single and clustered systems.
 - It is used as a benchmark and troubleshooting tool and is easily configured to replicate the behavior of many popular applications. One commonly quoted measurement provided by the tool is IOPS.
 - <http://www.iometer.org/>

133



IOMETER



134



Free and Cheap Test Tools

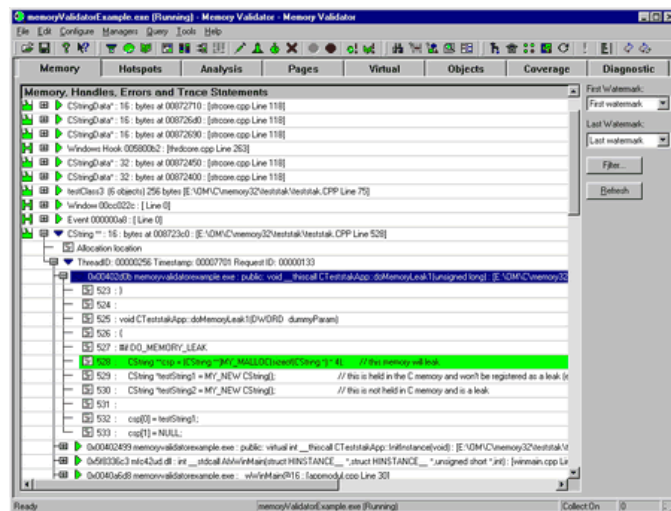
MEMORY TEST TOOLS

- **Memory Validator**
 - The vendor, Software Verification, provides software tools for compiled languages and dynamic languages.
 - The toolset concentrates on the core activities of code coverage, memory leak detection, performance profiling, deadlock detection and flow tracing.
 - Pricing for some products is free, and ranges from \$199 USD to \$695 USD for single-seat suite licensing. (\$4,170 USD for 10 developers)

135



MEMORY VALIDATOR

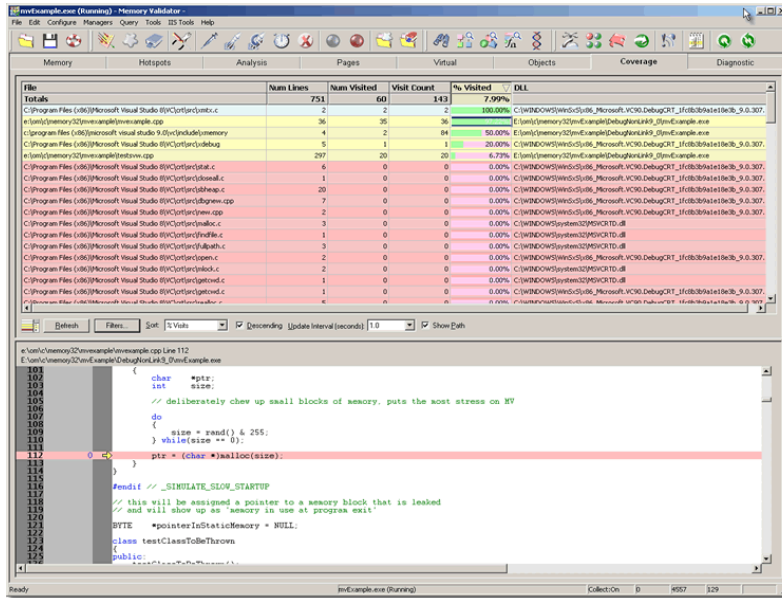


Memory Leaks

136



Free and Cheap Test Tools



Memory Coverage

137



LOADUI

- **loadUI is a free and open source cross-platform Load Testing solution.**
- **With a visual, drag-and-drop interface, it allows you to create, configure and redistribute your Load Tests interactively and in real-time.**

138

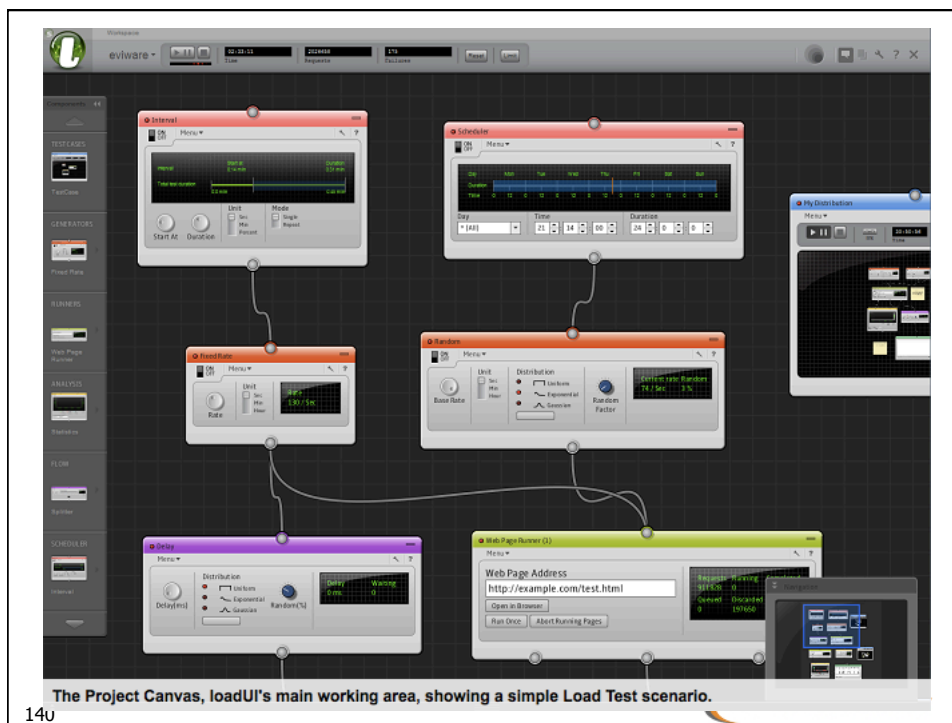


Free and Cheap Test Tools

LOADUI

- **loadUI generates scalable, high-volume and real-world load from any number of local and remote computers.**
- **In a single test environment, loadUI provides complete test coverage and supports all the standard protocols and technologies.**
- **www.smartbear.com**

139

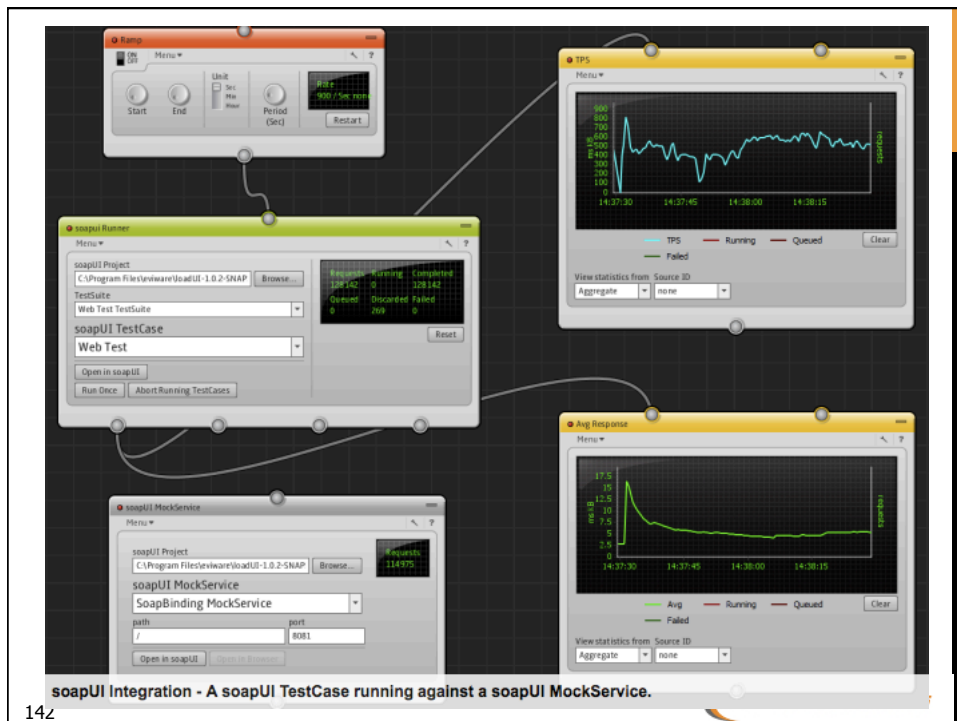


140

Free and Cheap Test Tools



141



142

Free and Cheap Test Tools

Logging of Assertion Failures by connecting the output of an Assertion component to a TableLog.

Period	Value	Tolerance	Max	Assert	Min	Timestamp
0	3387.0	1	1000	TimeTaken	9	1291994848...
0	3405.0	1	1000	TimeTaken	9	1291994849...
0	3405.0	1	1000	TimeTaken	9	1291994849...
0	3405.0	1	1000	TimeTaken	9	1291994849...
0	3405.0	1	1000	TimeTaken	9	1291994849...
0	3485.0	1	1000	TimeTaken	9	1291994849...
0	3395.0	1	1000	TimeTaken	9	1291994849...
0	3395.0	1	1000	TimeTaken	9	1291994849...

A Statistics diagram (graph) that is updated in real-time, and its Settings pane.

Series	Value
Avg	~150
StdDev	~20
TPS	~150
Running	~150
Queued	~150
Failed	~150

Free and Cheap Test Tools



145



146

Free and Cheap Test Tools

SOASTA CLOUDTEST LITE

- **CloudTest® Lite, SOASTA's free downloadable edition, delivers rapid test creation and real-time analytics for functional testing and frequent, lower-scale performance testing throughout the application development life cycle.**
- **Free for 100 virtual users or less**

147



SOASTA CLOUDTEST LITE (2)

- **Build, compose, run and analyze functional and performance tests of any complexity**
- **Validate Web and mobile applications up to 100 simultaneous users**
- **Run tests as often as needed in every phase of development and delivery**
- **Test modern web technologies like HTML5, Flash/Flex and Silverlight as well as SOAP and REST web services**

148



Free and Cheap Test Tools

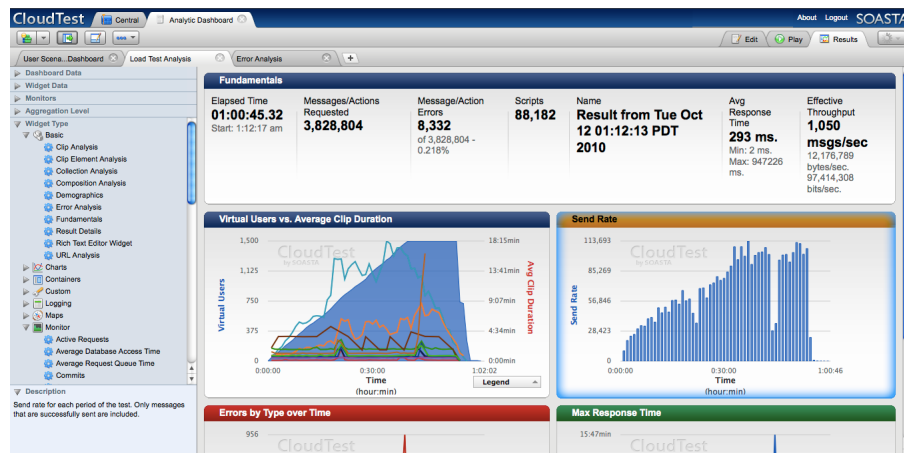
SOASTA CLOUDTEST LITE (2)

- **Analyze end-to-end performance with real-time, in-memory analytics during test execution**
- **Build tests that can be run at large scale with CloudTest On-Demand or other Editions**
- **Evaluate CloudTest for larger scale and broader deployment for your team**
- **<http://www.soasta.com/cloudtest/lite/>**

149



SOASTA CLOUDTEST LITE (3)

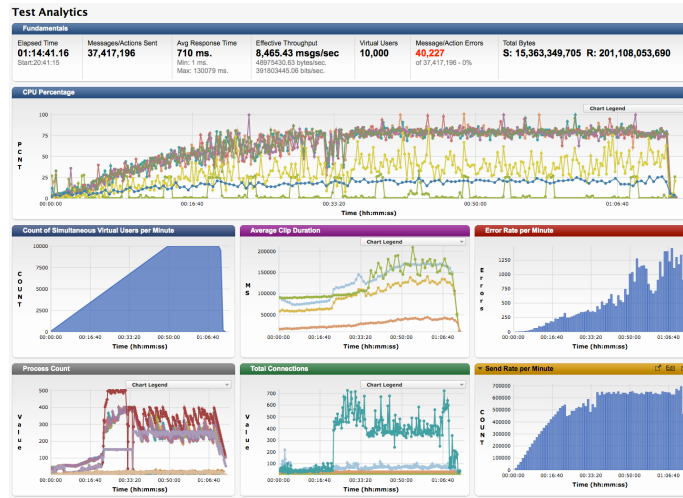


150



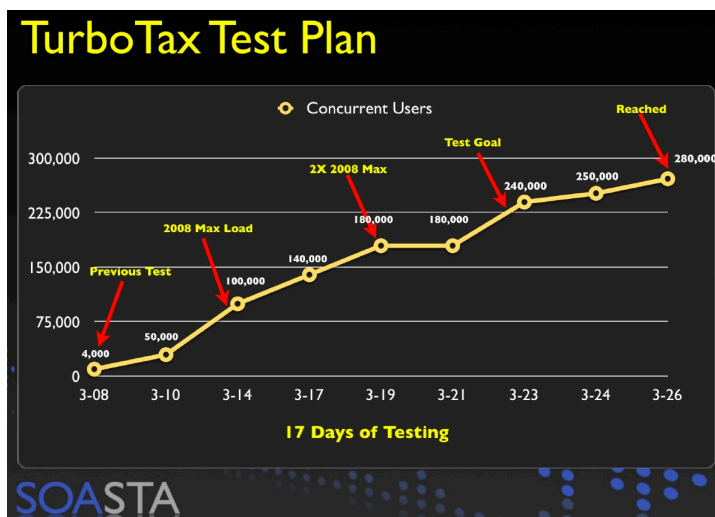
Free and Cheap Test Tools

SOASTA CLOUDTEST LITE (4)



151

SOASTA CLOUDTEST LITE (5)



152

Free and Cheap Test Tools

BROWSER MOB

- **Cloud-based performance testing and monitoring.**
- **Some free plans and open source products**
 - Free – 100 Virtual Users
- **Other plans start at \$49/mo for monitoring and \$499 for performance testing.**
- **<https://browsermob.com/performance-testing>**

153



CHESS

- **Systematic Concurrency-Testing Tool**
- **CHESS is a tool for systematically testing multithreaded code. Given a concurrent test, CHESS systematically drives the test along all possible thread interleavings.**
- **It uses model-checking techniques to explore effectively the enormously large state space of interleavings and provides quantified coverage guarantees.**
- **CHESS can check for assertions, deadlocks, livelocks, and data races.**
- **On finding an error, CHESS can reproduce the thread interleaving that exposed an error.**
- **CHESS is research tool developed by Microsoft Research.**
- **Visit <http://research.microsoft.com/projects/CHESS/> for more information.**

154



Free and Cheap Test Tools

OTHER NOTABLE FREE LOAD TEST TOOLS

- **Apache Jmeter** - <http://jakarta.apache.org/jmeter/>
- **fwptt** - <http://fwptt.sourceforge.net/>
 - For web applications
- **The Grinder** - <http://grinder.sourceforge.net/>
 - For Java applications
- **OpenSTA** - <http://www.opensta.org/>

155



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____

156



Free and Cheap Test Tools

TEST MANAGEMENT

- **Testopia**

- Testopia is a test case management extension for Bugzilla.
- It is designed to be a generic tool for tracking test cases, allowing for testing organizations to integrate bug reporting with their test case run results.
- Though it is designed with software testing in mind, it can be used to track testing on virtually anything in the engineering process.
- <http://sourceforge.net/projects/testopia>

157



Test Run 1: Run 1

» Overview

Plan	Plan Test Version	Start Date
Test Plan	1	2006-03-22 00:00:00 MDT
Product	Product Version	Stop Date
TestProduct		
Manager	Status	Default Tester
Oreg <ghendricks@novell.com>	RUNNING	Oreg <ghendricks@novell.com>

[Create regression test cases](#) [Delete test run](#) [Clone Test Run](#) [Add Test Cases](#) [View Run History](#)

» Tags

CC List	Case Run Status	Tags
a@b.c ghendricks@novell.com a@b.c Remove	'Today': Show 'today' test case logs Passed: Show passed test case logs Failed: Show failed test case logs Total: Show all test case logs % Completed: <div><div></div></div>	Scott Add www [x] see [x] web [x]

» Test Case Run Logs

Case ID	Build	Assigned	Tested by	Close date	Status	Category	Bugs
1	55a	a@b.c	ghendricks@novell.com	2006-04-04 23:06:56	✓	My Cat	0
Summary: FIVE							
Action: TEXT				Effect: MORE TEXT			
Notes: <input type="text"/> Submit ? ✓ ✗ ⚡ ⚡							
Running by me, started at							
Bugs detected: [] NEW Attach a@b.c Assign Classic interface...							

» Reports

[Test log](#) | [Test incident](#) | [Bugs detected in this test run](#) | [Bugs severity status](#) | [Test turnout chart](#)

158



Free and Cheap Test Tools

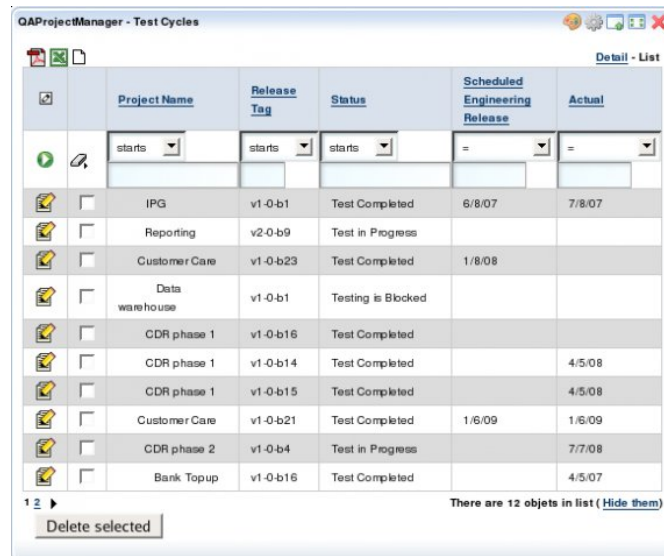
QAMANAGER

- **Web-based application used for keeping track of engineering and customer releases of Software Projects, Resource allocations and related information.**
- **It helps QA Managers to keep track of releases effectively. Powered by OpenXava and Java.**
- <http://sourceforge.net/projects/qamanager>

159



QAMANAGER (2)



QAManager - Test Cycles

Detail - List

	Project Name	Release Tag	Status	Scheduled Engineering Release	Actual
	starts	starts	starts	=	=
	IPG	v1-0-b1	Test Completed	6/8/07	7/8/07
	Reporting	v2-0-b9	Test in Progress		
	Customer Care	v1-0-b23	Test Completed	1/8/08	
	Data warehouse	v1-0-b1	Testing is Blocked		
	CDR phase 1	v1-0-b16	Test Completed		
	CDR phase 1	v1-0-b14	Test Completed		4/5/08
	CDR phase 1	v1-0-b15	Test Completed		4/5/08
	Customer Care	v1-0-b21	Test Completed	1/6/09	1/6/09
	CDR phase 2	v1-0-b4	Test in Progress		7/7/08
	Bank Topup	v1-0-b16	Test Completed		4/5/07

1 2 ▶

Delete selected

There are 12 objects in list (Hide them)

160

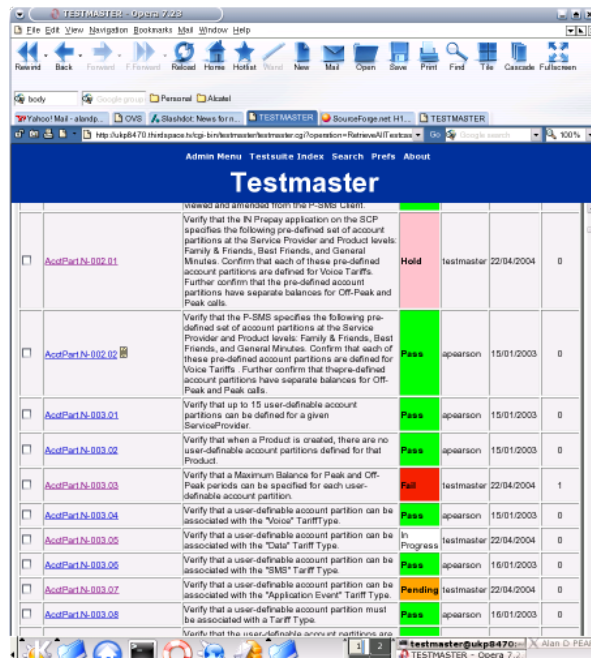


Free and Cheap Test Tools

TESTMASTER

- A test case logging, reporting and test automation tool, much like the commercial product Test Director.
- <http://testmaster.sourceforge.net/>

161



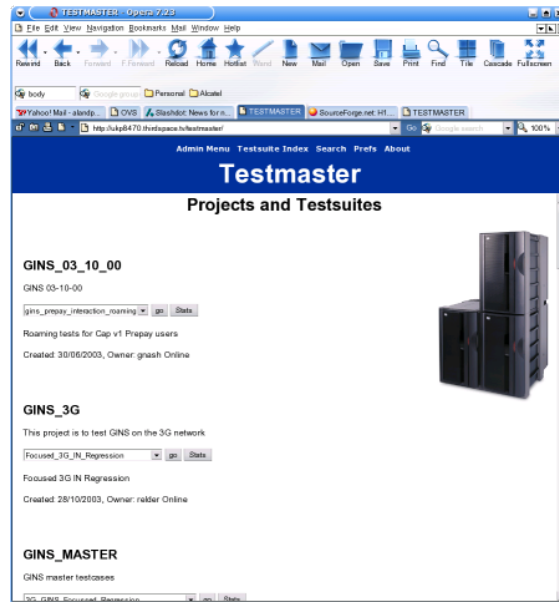
The screenshot shows the Testmaster web application interface. At the top, there is a navigation bar with links: Admin Menu, Testsuite Index, Search, Prefs, and About. Below this is the 'Testmaster' header. The main content area displays a table of test cases. Each row includes a checkbox, a test case ID (e.g., AcctPartN-002.01), a description of the test case, a status (e.g., Hold, Pass, Pending), a user (e.g., testmaster, spearsen), a date (e.g., 22/04/2004, 15/01/2003), and a count (e.g., 0, 1).

<input type="checkbox"/>	AcctPartN-002.01	Verify that the IN Prepay application on the SCP specifies the following pre-defined set of account partitions at the Service Provider and Product levels: Family & Friends, Best Friends, and General Minutes. Confirm that each of these pre-defined account partitions are defined for Voice Tariffs. Further confirm that the pre-defined account partitions have separate balances for Off-Peak and Peak calls.	Hold	testmaster	22/04/2004 0
<input type="checkbox"/>	AcctPartN-002.02	Verify that the P-SMS specifies the following pre-defined set of account partitions at the Service Provider and Product levels: Family & Friends, Best Friends, and General Minutes. Confirm that each of these pre-defined account partitions are defined for Voice Tariffs. Further confirm that the pre-defined account partitions have separate balances for Off-Peak and Peak calls.	Pass	spearsen	15/01/2003 0
<input type="checkbox"/>	AcctPartN-003.01	Verify that up to 15 user-definable account partitions can be defined for a given ServiceProvider.	Pass	spearsen	15/01/2003 0
<input type="checkbox"/>	AcctPartN-003.02	Verify that when a Product is created, there are no user-definable account partitions defined for that Product.	Pass	spearsen	15/01/2003 0
<input type="checkbox"/>	AcctPartN-003.03	Verify that a Maximum Balance for Peak and Off-Peak periods can be specified for each user-definable account partition.	Fail	testmaster	22/04/2004 1
<input type="checkbox"/>	AcctPartN-003.04	Verify that a user-definable account partition can be associated with the "Voice" Tariff Type.	Pass	spearsen	15/01/2003 0
<input type="checkbox"/>	AcctPartN-003.05	Verify that a user-definable account partition can be associated with the "Data" Tariff Type.	In Progress	testmaster	22/04/2004 0
<input type="checkbox"/>	AcctPartN-003.06	Verify that a user-definable account partition can be associated with the "SMS" Tariff Type.	Pass	spearsen	15/01/2003 0
<input type="checkbox"/>	AcctPartN-003.07	Verify that a user-definable account partition can be associated with the "Application Event" Tariff Type.	Pending	testmaster	22/04/2004 0
<input type="checkbox"/>	AcctPartN-003.08	Verify that a user-definable account partition must be associated with a Tariff Type.	Pass	spearsen	15/01/2003 0

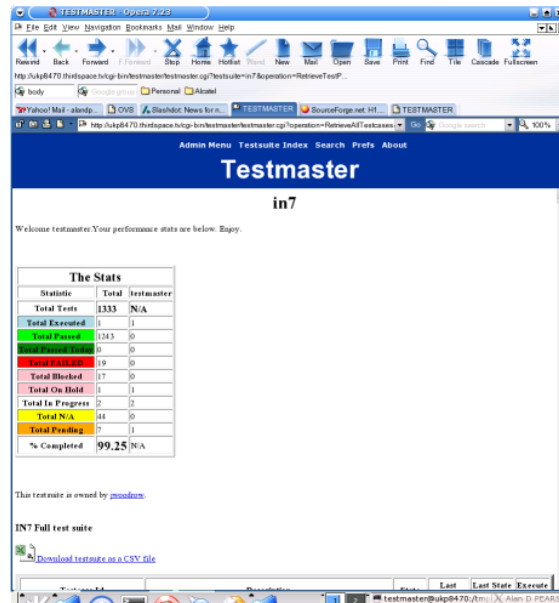
162



Free and Cheap Test Tools



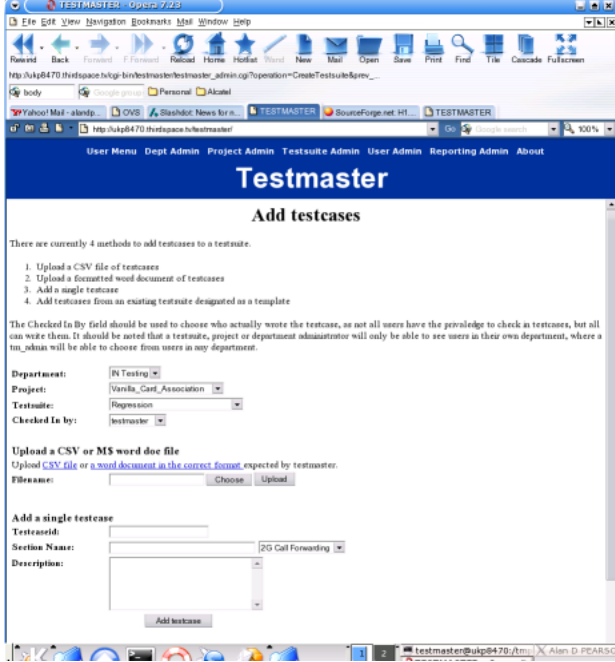
163



164



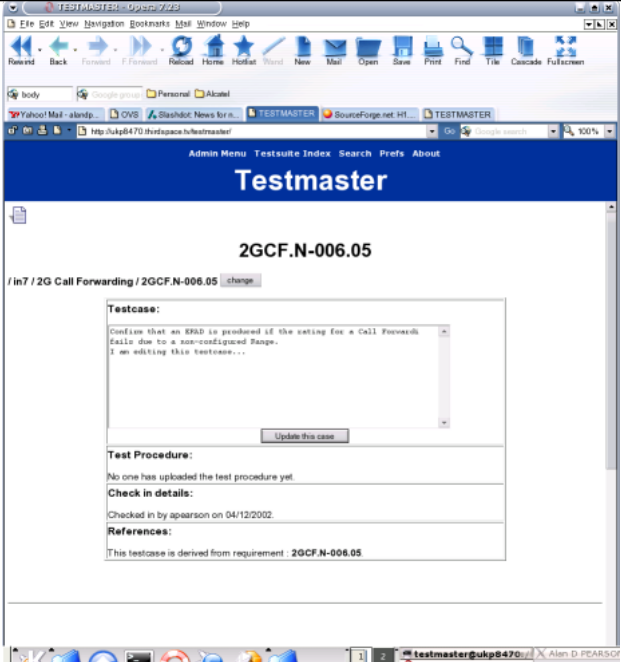
Free and Cheap Test Tools



The screenshot shows the Testmaster web application interface. The top navigation bar includes links for User Menu, Dept Admin, Project Admin, Testsuite Admin, User Admin, Reporting Admin, and About. The main heading is "Testmaster" followed by "Add testcases". Below this, there is a list of four methods to add testcases: 1. Upload a CSV file of testcases, 2. Upload a formatted word document of testcases, 3. Add a single testcase, and 4. Add testcases from an existing testsuite designated as a template. A note states that the "Checked In By" field should be used to choose who actually wrote the testcase, as not all users have the privilege to check in testcases. Below the note are dropdown menus for Department (R Testing), Project (Vanilla_Cart_Association), Testsuite (Regression), and Checked In by (testmaster). There is a section for "Upload a CSV or MS word doc file" with a "Choose" button and an "Upload" button. Another section for "Add a single testcase" includes fields for Testcaseid, Section Name (2G Call Forwarding), and Description, with an "Add testcase" button at the bottom.

165

RICECONSULTING



The screenshot shows the Testmaster web application interface for a specific testcase. The top navigation bar includes links for Admin Menu, Testsuite Index, Search, Profs, and About. The main heading is "Testmaster" followed by "2GCF.N-006.05". Below this, there is a breadcrumb trail: / in7 / 2G Call Forwarding / 2GCF.N-006.05. The "Testcase:" section contains a text area with the following text: "Confirm that an ERSD is produced if the setting for a Call Forward fails due to a non-configured Range. I am editing this testcase...". Below the text area is an "Update this case" button. The "Test Procedure:" section states "No one has uploaded the test procedure yet". The "Check in details:" section shows "Checked in by aparsan on 04/12/2002". The "References:" section states "This testcase is derived from requirement : 2GCF.N-006.05".

166

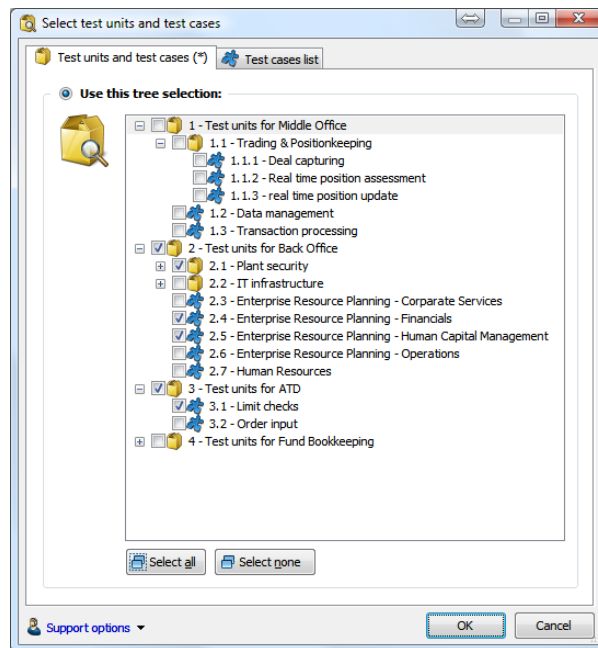
RICECONSULTING

Free and Cheap Test Tools

ZETA TEST

- **Zeta Test is an integrated test management environment that enables you to perform black-box tests, white-box tests, regression tests or change management tests of software applications.**
- **Zeta Test helps you to plan, perform, log, monitor and document the tests, and then to evaluate the test results.**
- **Cost – Free**
- **www.zeta-test.com**

167



168

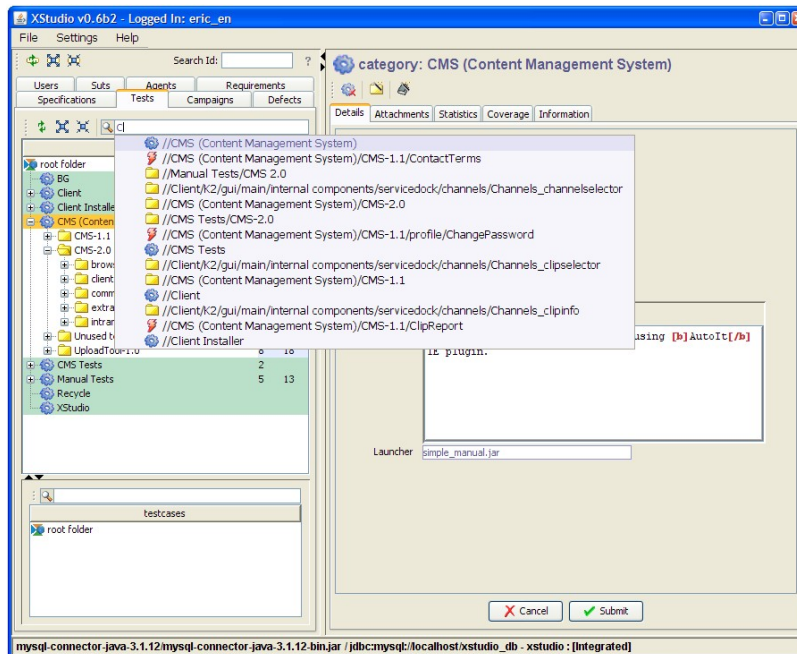


Free and Cheap Test Tools

XQUAL

- Free at <http://www.xqual.com>
- XStudio is a fully-graphical application developed in Java (so theoretically deployable on any OS).
- All of the data are organized within trees for more flexibility.
- Integrated management - All entities involved in the QA/testing projects are managed by XStudio.
 - This makes lots of metrics/statistics/status generation much more easier.

169



170

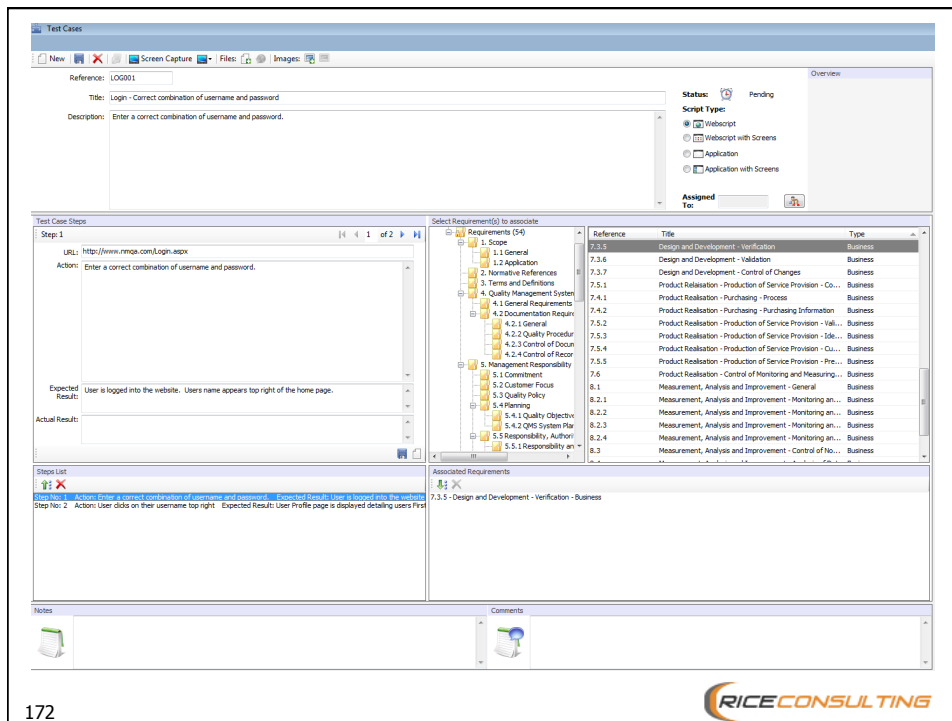


Free and Cheap Test Tools

QA BOOK

- **Windows-based**
- **Allows you to create, edit and manage requirements, test cases, defects, environments, project success criteria, reporting, automated testing and more.**
- <http://www.freetestmanagementtool.com/Free>

171



172



Free and Cheap Test Tools

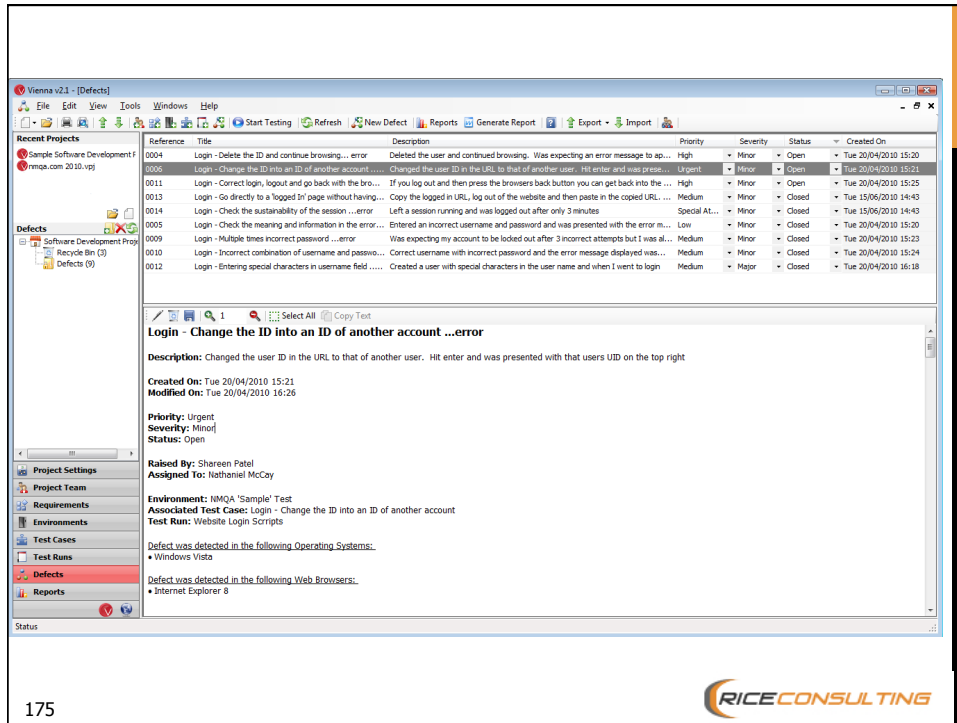
173

RICE CONSULTING

174

RICE CONSULTING

Free and Cheap Test Tools



The screenshot shows the Vienna v2.1 - [Defects] window. The left sidebar contains a tree view with 'Recent Projects' and 'Defects'. The main area displays a table of defects with columns: Reference, Title, Description, Priority, Severity, Status, and Created On. Below the table, the details for a specific defect are shown.

Reference	Title	Description	Priority	Severity	Status	Created On
0004	Login - Delete the ID and continue browsing... error	Deleted the user and continued browsing. Was expecting an error message to ap...	High	Minor	Open	Tue 20/04/2010 15:20
0005	Login - Change the ID into an ID of another account ...	Changed the user ID in the URL to that of another user. Hit enter and was pres...	Urgent	Minor	Open	Tue 20/04/2010 15:21
0011	Login - Correct login, logout and go back with the bro...	If you log out and then press the browsers back button you can get back into the ...	High	Minor	Open	Tue 20/04/2010 15:25
0013	Login - Go directly to a 'logged in' page without having...	Copy the logged in URL, log out of the website and then paste in the copied URL. ...	Medium	Minor	Closed	Tue 13/06/2010 14:43
0014	Login - Check the sustainability of the session ... error	Left a session running and was logged out after only 3 minutes	Special At...	Minor	Closed	Tue 13/06/2010 14:43
0005	Login - Check the meaning and information in the error...	Entered an incorrect username and password and was presented with the error in...	Low	Minor	Closed	Tue 20/04/2010 15:30
0009	Login - Multiple times incorrect password ... error	Was expecting my account to be locked out after 3 incorrect attempts but I was al...	Medium	Minor	Closed	Tue 20/04/2010 15:23
0010	Login - Incorrect combination of username and passwo...	Correct username with incorrect password and the error message displayed was...	Medium	Minor	Closed	Tue 20/04/2010 15:24
0012	Login - Entering special characters in username field ...	Created a user with special characters in the user name and when I went to login	Medium	Major	Closed	Tue 20/04/2010 16:18

Login - Change the ID into an ID of another account ...error

Description: Changed the user ID in the URL to that of another user. Hit enter and was presented with that users USD on the top right

Created On: Tue 20/04/2010 15:21
Modified On: Tue 20/04/2010 16:26

Priority: Urgent
Severity: Minor
Status: Open

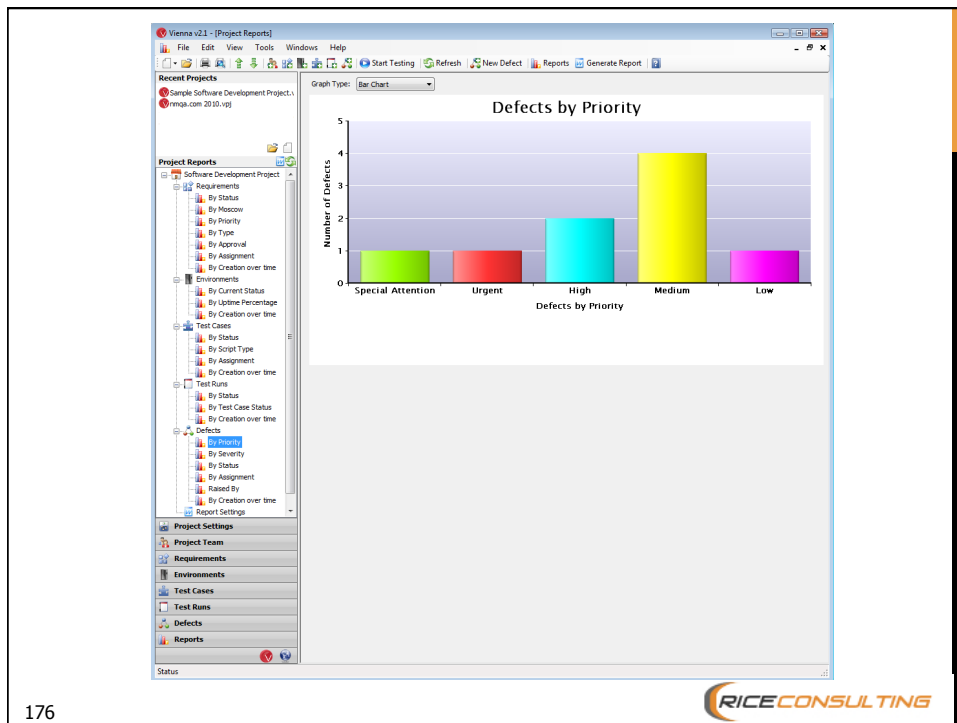
Raised By: Shareen Patel
Assigned To: Nathaniel McCay

Environment: IMQA 'Sample' Test
Associated Test Case: Login - Change the ID into an ID of another account
Test Run: Website Login Scripts

Defect was detected in the following Operating Systems:
 • Windows Vista

Defect was detected in the following Web Browsers:
 • Internet Explorer 8

175

The screenshot shows the Vienna v2.1 - [Project Reports] window. The left sidebar contains a tree view with 'Recent Projects' and 'Project Reports'. The main area displays a bar chart titled 'Defects by Priority'.

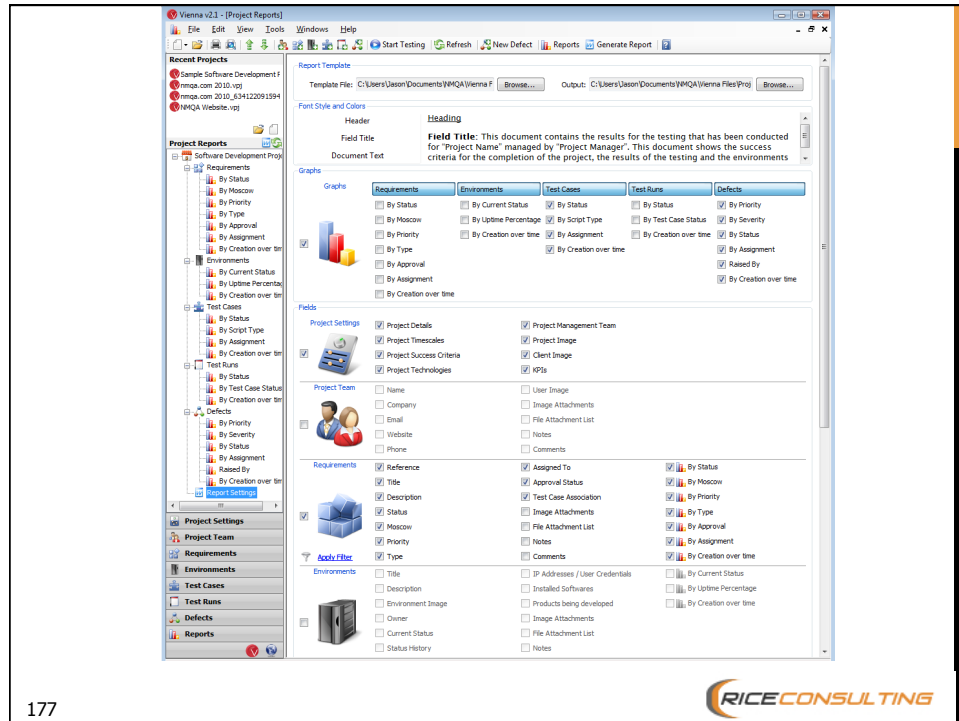
Defects by Priority

Priority	Number of Defects
Special Attention	1
Urgent	1
High	2
Medium	4
Low	1

176



Free and Cheap Test Tools



BROMINE

- **Part of the Selenium suite of tools**
- **Web-based QA tool for Selenium, that enables you to easily run Selenium-RC tests and view the results.**
- **It scales from the single tester that just wants to run some tests without all the hassle to the corporate solution with multiple user-groups and hundreds of test cases.**
- **<http://bromine.seleniumhq.org/>**

178

RICE CONSULTING

Free and Cheap Test Tools

TESTLODGE

- **Online test case management tool, allowing you to manage test plans, test cases and test runs.**
- **4 plans from \$12 to \$99 / month**
- **www.testlodge.com**

179



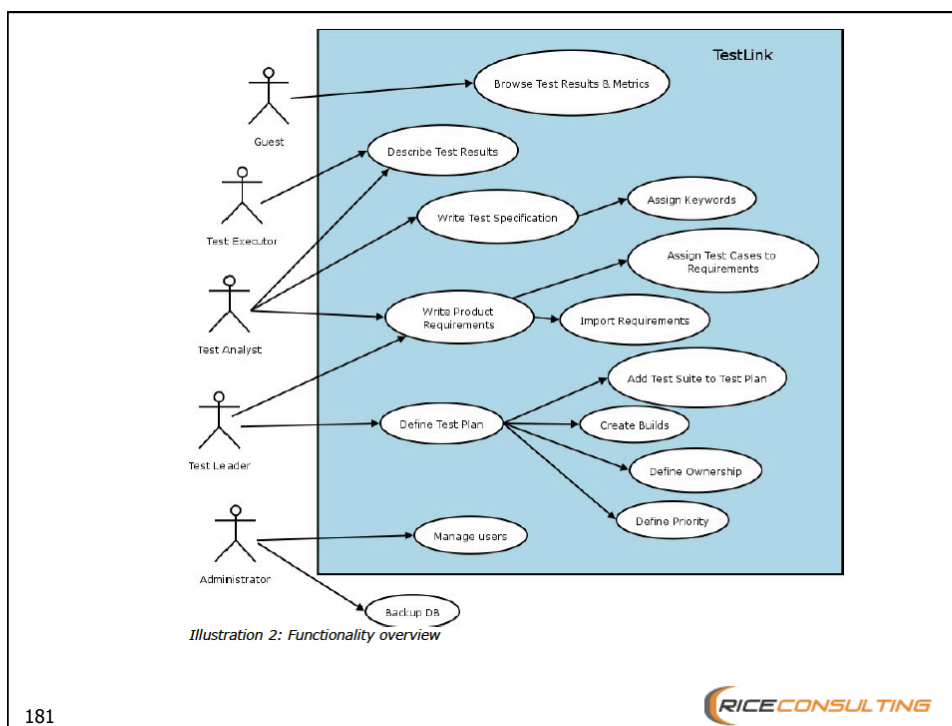
TESTLINK

- **TestLink is web based Test Management system.**
- **The latest documentation is available on www.teamst.org or testlink.sourceforge.net.**
- **<http://www.teamst.org>**

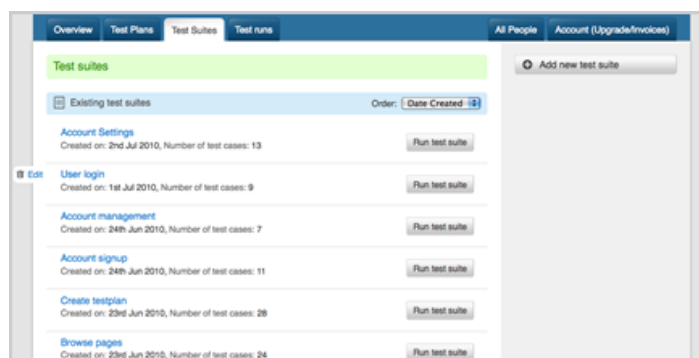
180



Free and Cheap Test Tools

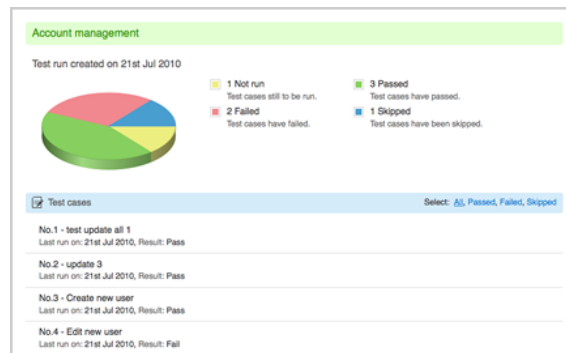


TEST SUITE VIEW



Free and Cheap Test Tools

TEST RUN VIEW



183



TESTRAIL

- **Web-based, hosted on your own server**
- **Track and follow the status of individual tests, milestones and projects with dashboards and activity reports.**
- **One-time licensing**
 - Ranges from \$239 (1 user) to \$7,000 (50 users)
- **<http://www.gurock.com/testrail/>**

184



Free and Cheap Test Tools

Return to Dashboard > Projects (Admin) Janna Garza | Feedback | My Settings | Help | Logout

Spreadsheet

Overview | Todo | Milestones | Test Runs & Results | Test Suites & Cases | Administration

Printing & Export ID: S3 [Icons] Run a Test Edit

Dashboard > Spreadsheet > Test Suites & Cases > Printing & Export

Contains 5 sections with a total of 51 test cases.

Sections & Cases

Test Runs

Add Section Add Test Case

Sections

Sections in this test suite:

- Prerequisites
 - Documentation & Help
 - Licensing & Terms
 - Customization
 - Automation

Prerequisites

- C83 Verify title, sub title and heading styles
- C84 Test add-in installation and verify menu appearance
- C85 Add footnotes to document and verify footnote numbering
- C86 Add and verify Tables of Contents with multi-page document
- C87 Change page color and verify print output
- C88 Export enclosed test document to PDF and verify rendering
- C89 Change document margins and test interoperability with PDF export
- C90 Change text alignment in an inline table
- C91 Verify line spacing on multi-page document
- C92 Test conditional formatting with basic value range
- C93 Format table with built-in style

Add Test Case | Add Subsection

Documentation & Help

- C94 Apply sort routine to complex table with different currencies
- C95 Verify formula rendering with built-in print preview driver
- C96 Verify CSV import with enclosed test data files
- C97 Change document attributes (author, title, organization)
- C98 Print document history and attributes
- C99 Add new review data point (including note)
- C100 Add document footer with page numbers and author
- C101 Add document header with document title
- C102 Change document orientation from portrait to landscape mode

Add Test Case | Add Subsection

RICE CONSULTING

185

Return to Dashboard > Projects (Admin) Janna Garza | Feedback | My Settings | Help | Logout

Presenter

Overview | Todo | Milestones | Test Runs & Results | Test Suites & Cases | Administration

Project Overview Edit

Dashboard > Presenter

In the past 14 days:

- 642 Passed 67% were successful.
- 177 Retest 18% marked a retest.
- 126 Failed 13% were unsuccessful.

Upcoming Milestones

- Release 2.7 Due on 2/13/2010
- Release 2.8 Due on 3/7/2010
- Release 3.0 Due on 3/27/2010

Latest Test Runs

- File Formats By Nemo Hanson on 1/21/2010
- Release Protocol By Nemo Hanson on 1/21/2010
- Tools Integration By Keiko Montoya on 1/21/2010

Activity History | Test Changes

Thursday, January 21, 2010

- Passed Export enclosed test document to PDF and verify rendering Tested by Alexis Gonzalez
- Passed Print document history and attributes Tested by Janna Garza
- Passed Change text alignment in an inline table (completed) Tested by Nemo Hanson
- Retest Verify formula rendering with built-in print preview driver (completed) Marked by Alexis Gonzalez
- Passed Verify line spacing on multi-page document Tested by Lesley Humphrey
- Failed Add and verify Tables of Contents with multi-page document Tested by Alexis Gonzalez

Actions

Create a new milestone, test suite or test run.

Milestones Add | View All

Test Runs Add | View All

Test Suites Add | View All

Todos

Test runs with open tests assigned to you. See all todos

- Release Protocol (2)
- File Formats (2)
- Tools Integration (1)

RICE CONSULTING

186

Free and Cheap Test Tools

TEST RUN

- <http://www.runtestrun.com/>
- Web-based, hosted
- Pricing from \$10/mo (single user) to \$50/mo. (unlimited users)

187



The screenshot displays the Test Run web application interface. At the top, there is a navigation bar with the 'Test Run' logo and links for 'Test Cases', 'Test Plans', 'Reports', 'Account', 'Welcome Byrne', 'Log out', and 'Help'. Below the navigation bar, there are buttons for 'Create Test Case', 'Import/Export', and 'Edit Options', along with a 'Filter by Tag:' input field and a 'Go' button. The main content area shows a table of test cases with columns for ID, Priority, and Summary. Each row includes a checkbox, the ID, priority, a summary link, and 'copy', 'edit', and 'trash' icons.

	ID	Priority	Summary			
<input type="checkbox"/>	103	P1	Verify a failed login	copy	edit	
<input type="checkbox"/>	104	P1	Verify password recovery	copy	edit	
<input type="checkbox"/>	105	P1	Do tutorials appear?	copy	edit	
<input type="checkbox"/>	106	P2	Import test cases into Test Run	copy	edit	
<input type="checkbox"/>	110	P1	Login to Test Run	copy	edit	
<input type="checkbox"/>	111	P1	Verify a failed login	copy	edit	
<input type="checkbox"/>	112	P1	Verify password recovery	copy	edit	
<input type="checkbox"/>	113	P1	Do tutorials appear?	copy	edit	
<input type="checkbox"/>	114	P2	Import test cases into Test Run	copy	edit	
<input type="checkbox"/>	118	P1	Login to Test Run	copy	edit	
<input type="checkbox"/>	119	P1	Verify a failed login	copy	edit	
<input type="checkbox"/>	120	P1	Verify password recovery	copy	edit	
<input type="checkbox"/>	121	P1	Do tutorials appear?	copy	edit	

188



Free and Cheap Test Tools

The screenshot shows the 'Create Test Plan' page in the Test Run application. The page has a blue header with the 'Test Run' logo and navigation links: 'Test Cases', 'Test Plans', 'Reports', 'Account', 'Welcome Byrme', 'Log out', and 'Help'. The main content area is titled 'Create Test Plan' and contains a 'Details' section with input fields for 'Name', 'Description', and 'Due Date'. A 'Create Test Plan' button is at the bottom left. On the right, there is a 'Selected Tags' section with a 'Tags' input field and a list of 'Available tags' including: bar, baz, excel, foo, FP1.0, FP1.1, functional, getting, import, login, new, password, REQ-123, smoke, started, system, test, testrun, user. At the bottom, there are links for 'Company Home', 'Terms of Service', and 'Privacy Policy', along with a copyright notice: '© 2005-2006, Test Run, LLC. All rights reserved.' The Rice Consulting logo is in the bottom right corner.

189

The screenshot shows the 'Verify administrative interactions' page in the Test Run application. The page has the same blue header as the previous screenshot. Below the header, there is a 'Verify administrative interactions' section with a 'New Case' button and a status summary: 'DUE 122 DAYS AGO', '6 passed', '6 not run', '21 blocked', '32 failed', and '17 of 175'. Below this is a 'Showing all test cases' section with a list of test cases and their status. The test cases are:

Test Case	Status
Test if you can add testcases via importing more tags: bar baz foo add a tag	passed
This is a test that has underscores_foo.! more tags: add a tag	failed
Add tags to case during creation. more tags: add a tag	blocked
Test multiple delete on testcases. more tags: add a tag	failed
Verify that one can assign default assignee. more tags: add a tag	passed

The Rice Consulting logo is in the bottom right corner.

190

Free and Cheap Test Tools

The screenshot displays the 'Test Run' dashboard. At the top, there's a navigation bar with links for 'Test Cases', 'Test Plans', 'Reports', 'Account', and a welcome message for 'Byrne' with links for 'Log out' and 'Help'. The main section is titled 'Your Dashboard' and 'Active Test Plans'. It lists four test plans with their respective counts for 'not run', 'blocked', and 'failed' status. A 'Did You Know?' tip explains the use of 'markdown' syntax for test cases. A 'News & Updates' section lists recent events like a service outage and beta updates. The footer includes links to 'Company Home', 'Terms of Service', and 'Privacy Policy', along with a copyright notice for 2005-2008 and the 'RICE CONSULTING' logo.

Test Plan	not run	blocked	failed
Beta Preview of Test Run Version 1.0	29	6	3
Test Run 1.0 Launch	8	1	0
Lorem ipsum dolor sit amet	4	2	2
Release 1.0: testing testplans	4	1	0

© 2005-2008, Test Run, LLC. All rights reserved.

191

RTH - REQUIREMENTS AND TESTING HUB

- **An open source tool for managing requirements and test cases.**
- **Available for download, but seems to be inactive in terms of maintenance.**
- <http://sourceforge.net/projects/rth/>

192



Free and Cheap Test Tools


DEMO - REPORTING

logged in as admin2008-01-31 10:08:50 (CET)Switch ProjectDEMO

Home | Requirements | Test Library | Release | Test Results | Defects | Reporting | Manage | User | Help | Logout

Report Name	Description
Custom Reporting	Create your own customize reports
Test Area	View the number of tests executed by Test Area for a selected Release > Build > TestSet.
Build Status	View the status of all tests for a selected Release > Build.
Failed Verifications	View detailed information on all failed verifications for a selected Release > Build > TestSet.
Requirements Coverage	View the requirements coverage for a selected Release > Build > TestSet.
Test Scope	Information on tests in a selected Release > Build > TestSet. Useful for deciding to signoff on testing.

RTH - Quality Centre
Version 1.6.3
Copyright 2005 - MMV
Please contact the system administrator with any problems [RTH Admin](#)
Time: 0.109461 seconds.



193

DEMO - REQUIREMENTS

logged in as admin2008-01-31 10:08:02 (CET)Switch ProjectDEMO

Home | Requirements | Test Library | Release | Test Results | Defects | Reporting | Manage | User | Help | Logout

Requirements | Folder View | Add Requirement - Record | Add Requirement - File | Notifications

Doc Type: Status: Area Covered: Show: 25 All Versions Latest Version Filter


Functionality: Assigned Release: Priority: Search:

Showing 1 - 3 of 3 [Report to Excel] [First Previous 1 Next Last]

ReqID	Version	Requirement Name	Requirement Detail	Doc Type	Status	Area Covered	Functionality	Locked By	Locked Date
<input type="checkbox"/> 001001	0	Requirement_Record1	System Shall not tip over and die when logging in..	Tech Spec	New	Tests	Permissions;		
<input type="checkbox"/> 001002	0	Sub-Req1	Creating a sub-requirement	Tech Spec		Tests	Run Level;		
<input type="checkbox"/> 001003	0	Sub-Req2	A second sub-requirement	Tech Spec		Tests	Permissions;		

☐ Select All Status: Update:

RTH - Quality Centre
Version 1.6.3
Copyright 2005 - MMV
Please contact the system administrator with any problems [RTH Admin](#)
Time: 0.121701 seconds.



194

Free and Cheap Test Tools

DEMO - TESTS

logged in as admin 2008-01-31 10:09:04 (CET) Switch Project: DEMO

[Home](#) | [Requirements](#) | [Test Library](#) | [Release](#) | [Test Results](#) | [Defects](#) | [Reporting](#) | [Manage](#) | [User](#) | [Help](#) | [Logout](#)

[Test Library](#) | [Add Test](#) | [Test Workflow](#)

Man/Auto: [v] RA Owner: [v] QA Owner: [v] Tester: [v] Show: 25 [v] Filter: [v]
Test Type: [v] Test Area: [v] Test Status: [v] Priority: [v] Search: [v]

Showing 1 - 2 of 2 [Export to Excel] [First Previous 1 Next Last]

	Test ID	Man/Auto	File Type	Auto Pass	Test Name	RA Owner	QA Owner	Tester	Test Type	Test Area	Test Status	Priority
<input type="checkbox"/>	00001	M		No	Demo_Test	admin	admin	qa_user	Regression	Bugs	New	High
<input type="checkbox"/>	00002	M		No	Demo_Test2	qa_user	admin	qa_user	Regression	Bugs	New	Medium

Select All [v] Man/Auto: [v] Update

ETH - Quality Centre
Version 1.6.3
Copyright 2005 - MMV
Please contact the system administrator with any problems [ETH_Admin](#)
Time: 0.09713 seconds.

RICE CONSULTING

195

DEMO - HOME

logged in as admin 2008-01-31 10:09:03 (CET) Switch Project: DEMO

[Home](#) | [Requirements](#) | [Test Library](#) | [Release](#) | [Test Results](#) | [Defects](#) | [Reporting](#) | [Manage](#) | [User](#) | [Help](#) | [Logout](#)

News

Welcome to RTH

This tool has been designed to do the following:

- Store requirements under version control
- Allow attributes to be assigned to every requirement (e.g. priority, risk, estimates, release)
- All requirements to be baselined
- Allow users to relate requirements to other requirements
- Link Tests and Requirements
- Store Test artifacts under version control
- Capture both Manual and Automated Test Results
- Easily link to any web-based Change Control or Bug Tracking system
- Provide reporting on Requirements, Tests, and Test Results

Test Sets - Last Five

TestSetID	Test Set Name	Build Name	Release Name	Tests	Passed	Failed	WIP	Finished : Awaiting Review	Incomplete	Date Received
00001	Regression	Build 1.0	Release 1.0	2	0	1	0	0	0	2005-11-23 23:23:53

Tests - Last Five Modified

Test ID	Test Name	Last Updated By	Last Updated
00002	Demo_Test2	admin	2005-11-23 22:53:50
00001	Demo_Test	admin	2005-11-23 22:37:05

Requirements - Last Five Modified

ReqID	Version	Requirement Name	Last Updated By	Last Updated
00003	0	Sub-Req2	admin	2005-11-23 23:14:24
00002	0	Sub-Req1	admin	2005-11-23 23:00:35
00001	0	Requirement_Record1	admin	2005-11-23 23:06:24

ETH - Quality Centre
Version 1.6.3
Copyright 2005 - MMV
Please contact the system administrator with any problems [ETH_Admin](#)
Time: 0.121789 seconds.

RICE CONSULTING

196

Free and Cheap Test Tools

AXIOM

- **Free**
- **Build and manage requirements and use cases in an agile environment.**
- **Features such as tracing, reporting and history making it effortless to increase software quality and reduce complexity.**
- **www.iconcur-software.com**

197



ICE SCRUM

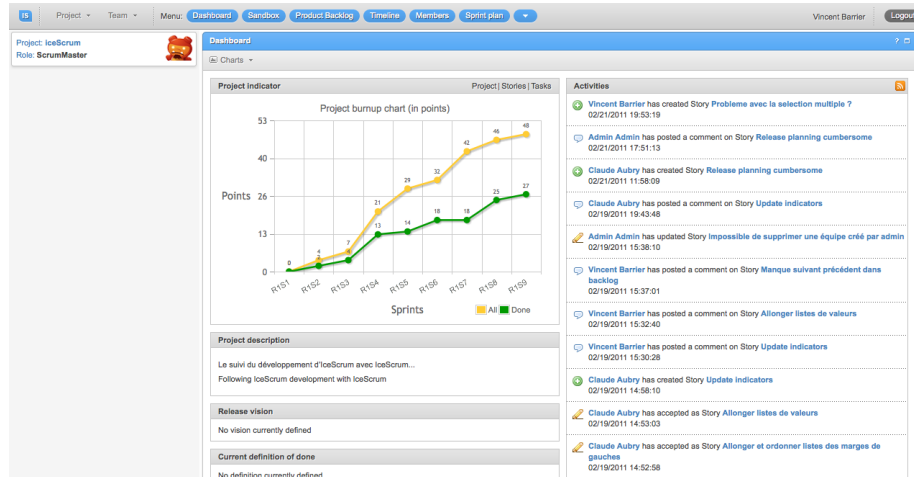
- **Open source**
- **Agile scrum management**
- **Helps in implementing the key agile practices: vision, features, user stories, effort estimation with Planning Poker, task board, etc.**
- **Tracks stories, defects and more.**
- **<http://www.icescrum.org/en/>**

198



Free and Cheap Test Tools

ICE SCRUM (2)

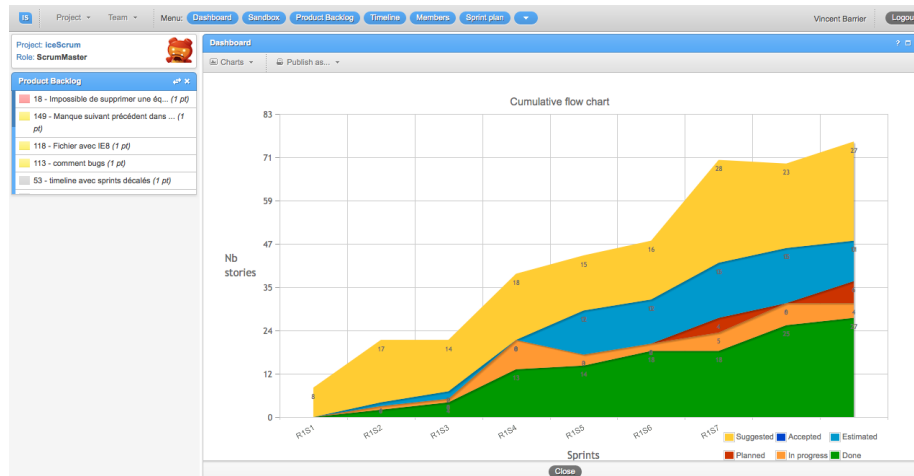


Main Dashboard

199



ICE SCRUM (3)



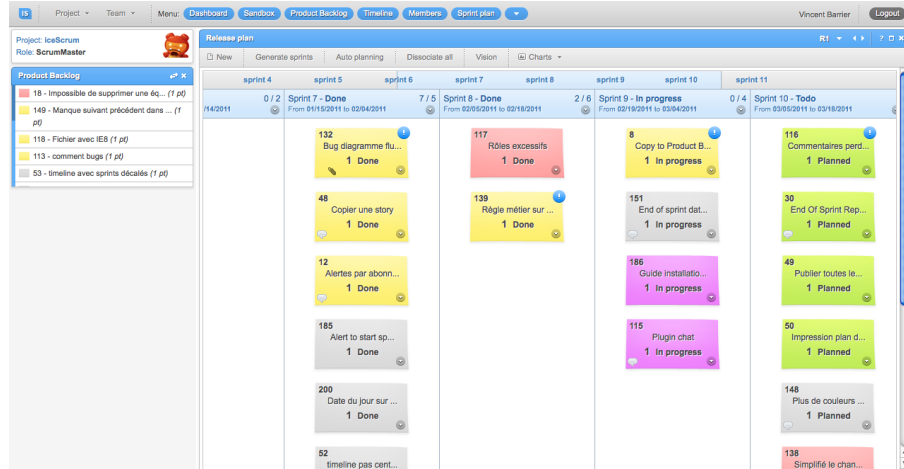
Cumulative Stories

200



Free and Cheap Test Tools

ICE SCRUM (4)



Tasks by Sprint

201



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____
- _____

202



Free and Cheap Test Tools

TEST DATA GENERATION

- **Generatedata.com**
 - www.generatedata.com
 - Creates test data in a variety of forms:
 - Text, cvs, XML, Excel, SQL
 - Free and Cheap Subscriptions Available
- **DBFeeder - Free**
 - Automatically generate test data for Oracle Databases which fits primary and foreign keys of tables.
 - <http://dbfeeder.sourceforge.net/index.html>

203



The screenshot shows the Generatedata.com website. At the top is the logo and navigation tabs: About, Generator (selected), Download, Donate, Log In, and Forums. Below the tabs, there are settings for 'Result type' (HTML, Excel, XML, CSV, SQL), 'Country-specific data' (Canada, Netherlands, UK, US), and 'Number of results' (100). A table with 5 columns (Order, Column Title, Data Type, Examples, Options) is shown. The first four rows are pre-filled: Name, Phone, Country, and Date. The fifth row is empty with a 'Please Select' dropdown. At the bottom, there is a 'Generate' button and an 'Empty Form' button.

Order	Column Title	Data Type	Examples	Options	Help
1	Name	Name	John (Male Name)	MaleName	
2	Phone	Phone/Fax	Canada (1)	1-XXX-XXX-XXXX	
3	Country	Country	No examples available.	No options available.	
4	Date	Date	Jan 1, 2006	From: 06/05/2007 To: 06/05/2009 Format code: M j, Y	
5		Please Select			

Add 1 Row(s) Empty Form

Generate

204



Free and Cheap Test Tools

Name	Phone	Country	Date
Fitzgerald	1-696-847-9724	Uzbekistan	Mar 22, 2009
Harrison	1-616-877-0863	Nigeria	Nov 12, 2007
Tiger	1-632-613-9835	Nepal	Aug 30, 2007
Raja	1-465-605-0566	Iran, Islamic Republic of	Dec 10, 2008
Gavin	1-442-189-9731	Estonia	Aug 5, 2008
Ivan	1-523-879-6151	Romania	Mar 9, 2009
Jonah	1-771-445-7800	Sweden	May 26, 2008
Sawyer	1-975-396-7400	Ecuador	Nov 14, 2008
Raymond	1-189-506-0741	Brunei Darussalam	Sep 26, 2008
Tate	1-797-795-5931	Estonia	Jan 19, 2008
Denton	1-907-919-7187	Poland	Jul 3, 2008
Steven	1-476-897-6663	Iran, Islamic Republic of	Oct 24, 2008
Lucian	1-906-318-5093	Belize	Sep 30, 2007
Bradley	1-382-169-9975	Saudi Arabia	Jul 12, 2007
Oren	1-444-186-6882	Brunei Darussalam	Aug 17, 2008
Yoshio	1-270-201-2305	Indonesia	Mar 21, 2009
Marvin	1-536-394-0384	Guadeloupe	Oct 6, 2008
Paul	1-305-227-1442	Moldova	Sep 27, 2007
Hu	1-487-531-1857	Christmas Island	Jan 16, 2009
Keegen	1-229-172-8024	Cayman Islands	Sep 9, 2008
Kareem	1-230-655-0948	Heard Island and McDonald Islands	Feb 21, 2008
Palmer	1-156-628-1401	Moldova	Mar 21, 2009
Perry	1-447-689-2022	Nepal	Dec 21, 2008
Preston	1-866-250-9555	Colombia	Mar 27, 2008
Tate	1-433-559-2830	Malawi	Jan 13, 2009
Cyrus	1-972-298-9756	Vanuatu	Mar 8, 2008
Benjamin	1-796-458-2926	Iceland	Jan 8, 2008
Phelan	1-666-961-2594	Singapore	Mar 3, 2008

205



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____
- _____

206



Free and Cheap Test Tools

TEST EVALUATION

- **Beyond Compare**
 - www.scootersoftware.com
 - \$30/single user, volume discounts
- **Exam Diff and DiffNow (online)**
 - www.prestosoft.com
 - Free and Pro versions
 - \$35/single user, volume discounts
- **UltraCompare**
 - <http://www.ultraedit.com>
 - Lite and Pro Versions
 - Pro - \$49.95
 - Windows, Mac, Linux

207



TEST EVALUATION (2)

- **WinMerge**
 - <http://winmerge.org>
 - Open Source differencing and merging tool for Windows.
 - Compares both folders and files, presenting differences in a visual text format that is easy to understand and handle.
 - Very useful for determining what has changed between project versions, and then merging changes between versions.
 - Can be used as an external differencing/merging tool or as a standalone application.
- **WinDiff**
 - <http://www.grigsoft.com/download-windiff.htm>
 - Free, Windows only

208

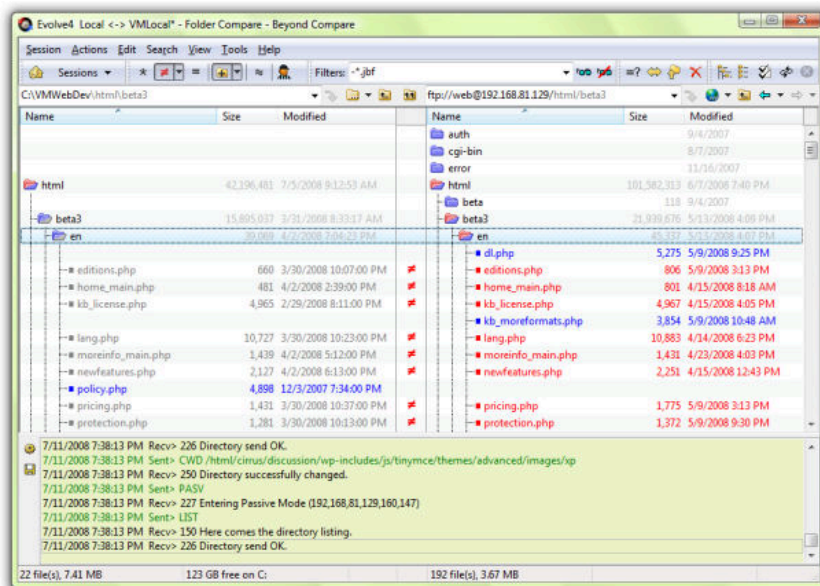


Free and Cheap Test Tools

TEST EVALUATION (3)

- **KDiff3**
 - <http://kdiff3.sourceforge.net/>
 - MS-Windows. Apple Mac OSX binary available
 - Free

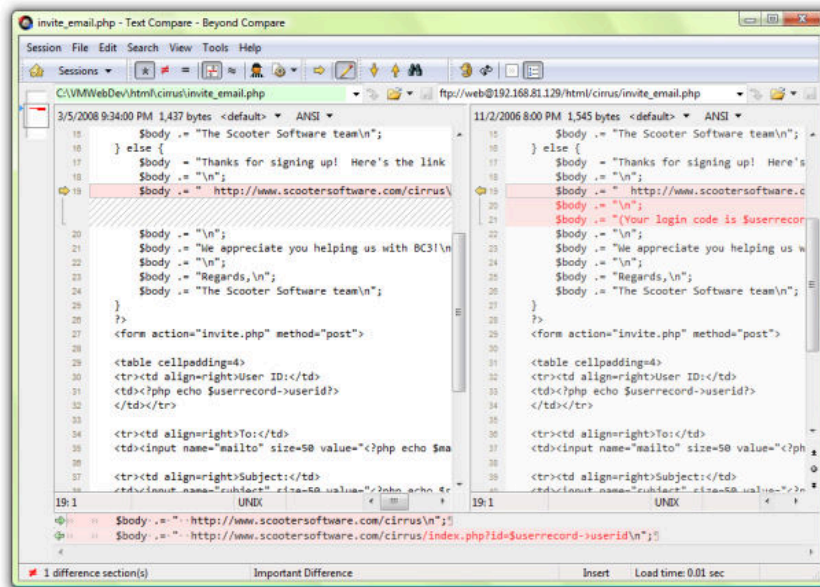
209



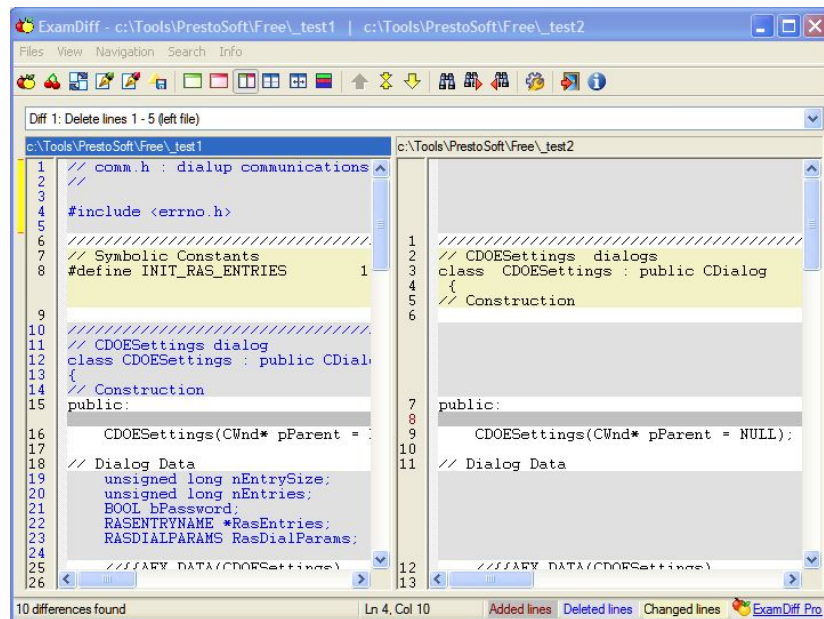
210



Free and Cheap Test Tools



211



212



Free and Cheap Test Tools

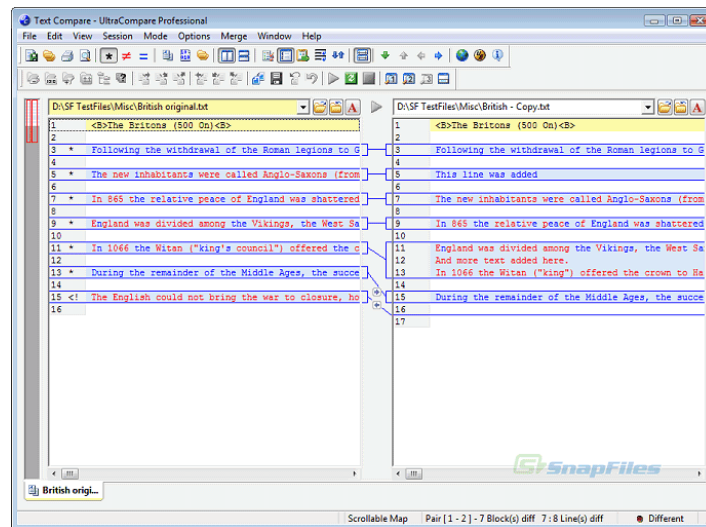
ULTRACOMPARE

- UltraCompare tracks changes and differences between files, directories, Word docs, zip archives;
- Supports both text compare and binary file compare of two or three files/folders at a time.
- Merge differences, find duplicates, edit files, and more.
- Integrates with UltraEdit or UESstudio!

213



ULTRACOMPARE

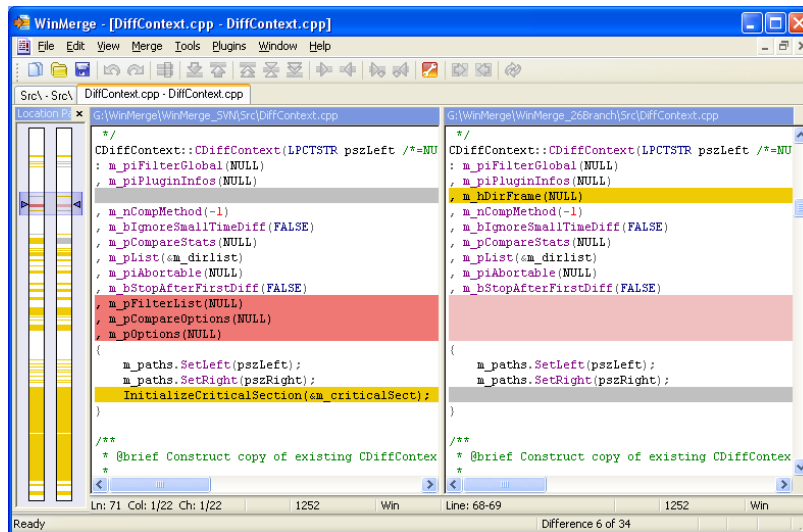


214



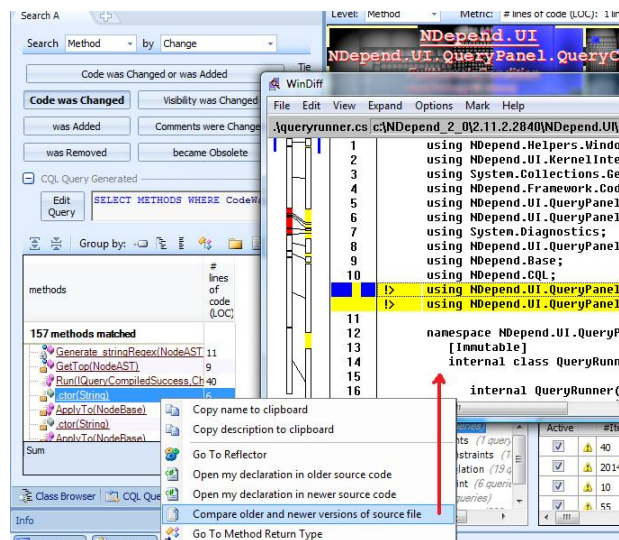
Free and Cheap Test Tools

WINMERGE



215

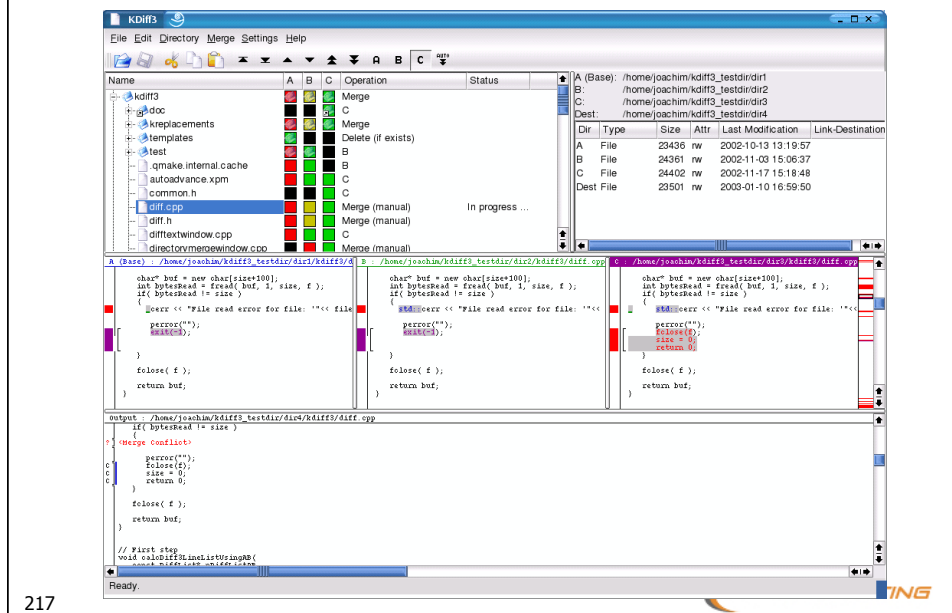
WINDIFF



216

Free and Cheap Test Tools

KDIFF3



217

TEST EVALUATION (4)

- **Windows Media Encoder**
 - Free at www.microsoft.com
 - Captures screen video in wmv format
- **Hypercam**
 - \$30/single user at www.hyperionics.com
 - Captures screen video in avi format
 - Volume discounts
- **Jing**
 - Free
 - www.techsmith.com
- **Skitch (Mac, Free)**
- **Screenr** - <http://www.screenr.com/>
- **Clarify** - <http://www.clarify-it.com/>

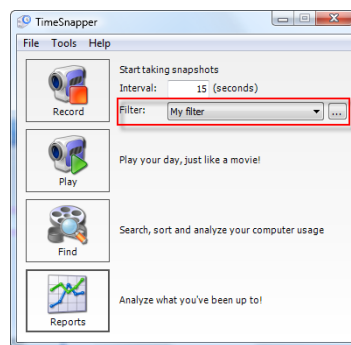
218



Free and Cheap Test Tools

TIMESNAPPER

- **Runs in the background of your computer, taking screenshots of your desktop every few seconds all week long.**



219



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____

220



Free and Cheap Test Tools

DEFECT TRACKING

- **Bugzilla** – free at www.bugzilla.org
- **FlySpray** – Free at www.flyspray.org
- **Many more at:**
 - <http://www.software-pointers.com/en-defecttracking-open-source-tools.html>

221



The screenshot shows a Mozilla Firefox browser window with the address bar displaying http://bugzilla.ravenbrook.com/show_bug.cgi?id=3. The page title is "Bug 3 - New Bugzilla permissions rules not followed - Mozilla Firefox". The main heading is "This is Bugzilla" with "Bugzilla Version 2.18" below it. The bug title is "Bug 3 New Bugzilla permissions rules not followed" and it was last modified on "2004-07-06 15:14". There are links for "Search page" and "Enter new bug". The form fields include: Bug# (3), Product (p4d6), Component (replicator), Status (RESOLVED), Resolution (FIXED), Assigned To (Nick Barnes), Hardware (All), OS (FreeBSD), Version (2.1.2), Priority (P2), Severity (major), Reporter (Gareth Rees), and CC. A URL field is also present. The summary is "New Bugzilla permissions rules not followed". A detailed description follows, mentioning version 2.16.5 and 2.17.7. Below the description is a "Perforce replication" section with a table showing a change log.

Change	Effect	Date	User	Description
104593	closed	2004-07-06 15:33:53	(unknown)	Rewrite can_change_field in dt_bugzilla.py to match CheckCanChangeField in Bugzilla 2.17.7. Conditionalize this code on the Bugzilla version discovered by the bugzilla interface module.

At the bottom, there are links for "Search page", "Enter new bug", and a set of actions: "New", "Search", "Find", "bug #", "Reports", "Requests", "New Account", and "Log In".

222



Free and Cheap Test Tools

Summary: contains all of the words/strings

Classification: **Product:** **Component:** **Version:** **Target:**

Unclassified
Client Software
Components
Server Software
Client Support

addons.mozilla.org
AUS
Bugzilla
Calendar
Camino

*.mozilla.org
API
Accessibility
Account Manager
Add-ons

0.1
0.2
0.3
0.4
0.5

0.007
0.008
0.009
0.010

A Comment: contains the string

The URL: contains all of the words/strings

Whiteboard: contains all of the words/strings

Keywords: contains all of the keywords

Status: **Resolution:** **Severity:** **Priority:** **Hardware:** **OS:**

UNCONFIRMED
NEW
ASSIGNED
REOPENED
RESOLVED
VERIFIED
CLOSED

FIXED
INVALID
WONTFIX
DUPLICATE
WORKSFORME
INCOMPLETE
EXPIRED
MOVED

blocker
critical
major
normal
minor
trivial
enhancement

--
P1
P2
P3
P4
P5

All
DEC
HP
Macintosh
PC
PocketPC
SGI
Sun
Other

All
Windows 95
Windows 98
Windows ME
Windows NT
Windows 2000
Windows XP
Windows Server 2003
Windows Vista

Email Addresses, Bug Numbers, and Votes

Any one of:

☒ the bug assignee
☐ the reporter
☐ the QA contact
☐ a CC list member
☐ a commenter

Any one of:

☒ the bug assignee
☒ the reporter
☒ the QA contact
☐ a CC list member
☐ a commenter

is

Bug Changes

Only bugs changed between:

and Now
(YYYY-MM-DD or relative dates)

where one or more of the following changed:

[Bug creation]
Alias
Assignee
CC list accessible?

MANTIS

- **MantisBT is a free popular web-based bugtracking system.**
- **It is written in the PHP scripting language and works with MySQL, MS SQL, and PostgreSQL databases and a webserver.**
- **<http://www.mantisbt.org/>**

Free and Cheap Test Tools

MANTIS (2)

- MantisBT has been installed on Windows, Linux, Mac OS, OS/2, and others.
- Almost any web browser should be able to function as a client. It is released under the terms of the GNU General Public License (GPL).

225



Mantis

Logged in as: *prescience* 02-04-01 07:08 PST mantis Switch

[Main](#) | [View Bugs](#) | [Report Bug](#) | [Summary](#) | [Account](#) | [Manage](#) | [Edit News](#) | [Docs](#) | [Logout](#)

[All Bugs] [[Reported Bugs](#)] [[Assigned Bugs](#)]

any any any Show: 50 Changed(hrs): 6 Hide Resolved: ☐ Filter

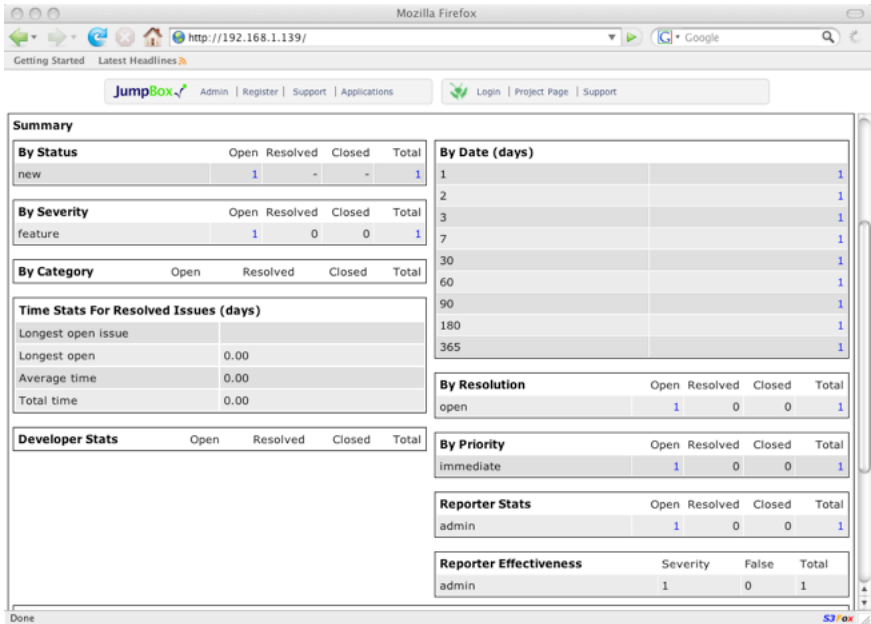
Viewing Bugs

ID	#	Category	Severity	Status	Updated	Summary
0000132		security	tweak	new	02-03	Something that lets you do something you're not suppose to do.
0000130		bugtracker	block	new	02-02	Coucou
0000133	1	bugtracker	major	new	02-03	testing
0000129	2	test	major	feedback	02-02	Catalyst crash Switch 1
0000131		bugtracker	crash	acknowledged	02-03	testing summary
0000064	3	bugtracker	feature	assigned	01-02	user defined fields / projects
0000066	3	bugtracker	feature	assigned	12-27	change to filter select lists on viewview bug pages
0000081	2	bugtracker	feature	assigned	01-22	Remember Previous Entry

226



Free and Cheap Test Tools



The screenshot shows the JumpBox web application interface in a Mozilla Firefox browser. The URL is http://192.168.1.139/. The interface includes a navigation bar with links like 'Admin', 'Register', 'Support', 'Applications', 'Login', 'Project Page', and 'Support'. The main content area displays several summary tables:

- Summary**
 - By Status**

	Open	Resolved	Closed	Total
new	1	-	-	1
 - By Severity**

	Open	Resolved	Closed	Total
feature	1	0	0	1
 - By Category**

	Open	Resolved	Closed	Total
 - Time Stats For Resolved Issues (days)**

Longest open issue	
Longest open	0.00
Average time	0.00
Total time	0.00
 - Developer Stats**

	Open	Resolved	Closed	Total
 - By Date (days)**

1	1
2	1
3	1
7	1
30	1
60	1
90	1
180	1
365	1
 - By Resolution**

	Open	Resolved	Closed	Total
open	1	0	0	1
 - By Priority**

	Open	Resolved	Closed	Total
immediate	1	0	0	1
 - Reporter Stats**

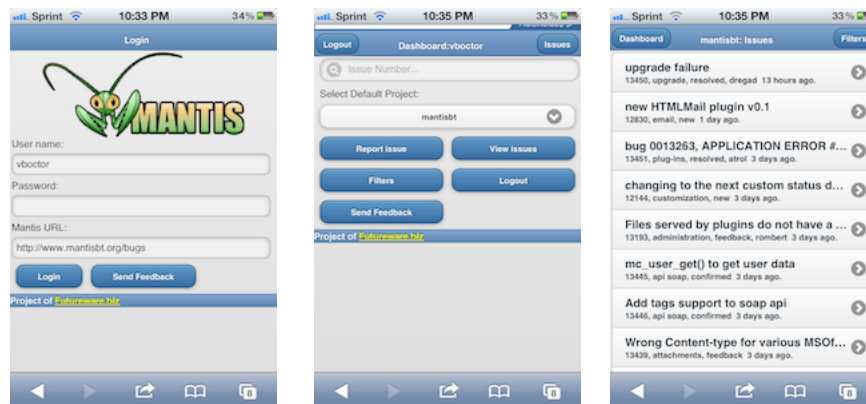
	Open	Resolved	Closed	Total
admin	1	0	0	1
 - Reporter Effectiveness**

	Severity	False	Total
admin	1	0	1

The interface also includes a 'Done' button at the bottom left and a 'RICE CONSULTING' logo at the bottom right.

227

MANTIS MOBILE



The three screenshots show the Mantis Mobile application interface on a smartphone. The first screenshot shows the login screen with fields for 'User name', 'Password', and 'Mantis URL', along with 'Login' and 'Send Feedback' buttons. The second screenshot shows the 'Dashboard' screen with a search bar for 'Issue Number...', a dropdown for 'Select Default Project' (set to 'mantisbt'), and buttons for 'Report Issue', 'View Issues', 'Filters', 'Logout', and 'Send Feedback'. The third screenshot shows a list of issues with details such as 'upgrade failure', 'new HTMLMail plugin v0.1', 'bug 0013263, APPLICATION ERROR #...', 'changing to the next custom status d...', 'Files served by plugins do not have a ...', 'mc_user_get() to get user data', 'Add tags support to soap api', and 'Wrong Content-type for various MSOf...'. Each issue entry includes a brief description and a timestamp.

228

Free and Cheap Test Tools

OTHERS

- Redmine - <http://www.redmine.org/>

229



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____

230

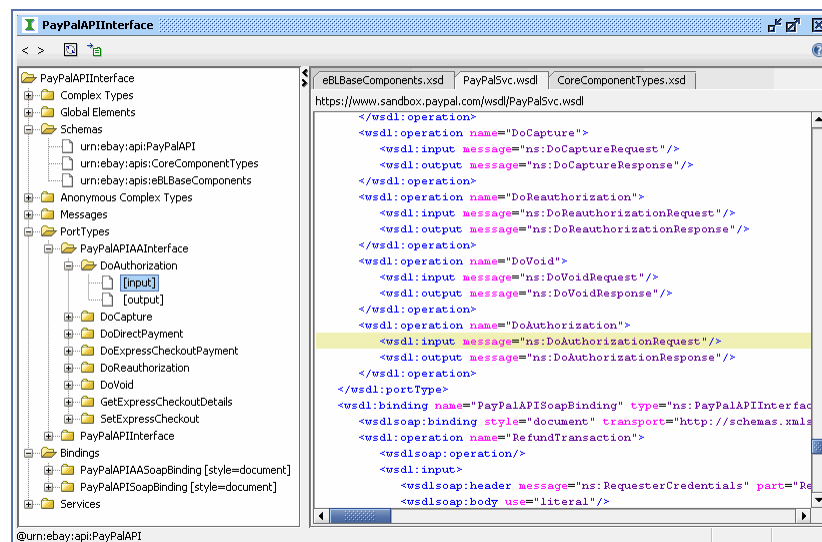


Free and Cheap Test Tools

SOA

- **SoapUI**
 - <http://www.soapui.org/>
 - Free and Pro versions
- **PushToTest**

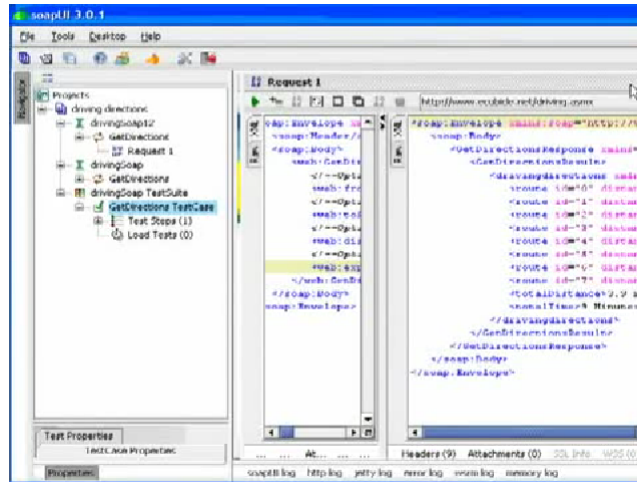
231



232



Free and Cheap Test Tools

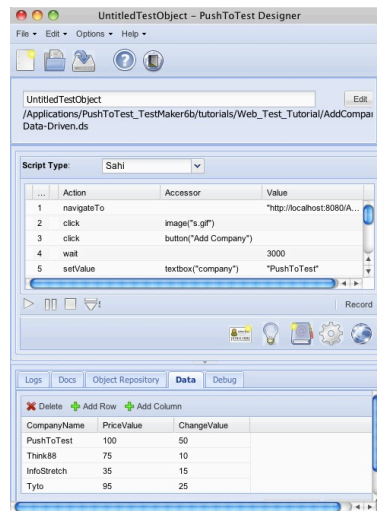


233



PUSHTOTEST

- Tests Web, Rich Internet Applications (RIA, using Ajax, Flex, Flash,) Service Oriented Architecture (SOA,) and Business Process Management (BPM) applications.
- Installs on your desktop, runs tests in grid and cloud environments, and pinpoints root causes and offers mitigation.
- Test scripts can be in Selenium test, Sahi test, soapUI test suite, and unit test written in Java, Ruby, Python, and PHP.
- <http://www.pushtotest.com/>



234



Free and Cheap Test Tools

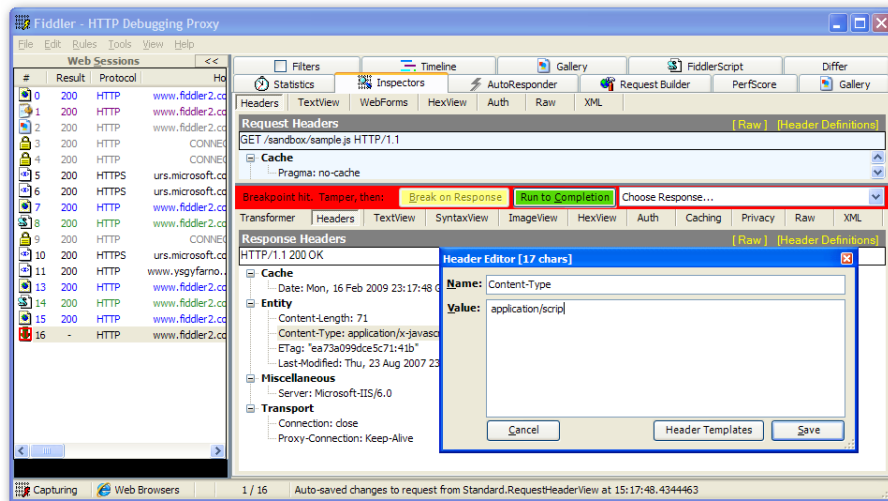
FIDDLER

- **With Fiddler you can easily monitor what's going on under the hood of your HTTP traffic.**
- **You can set breakpoints for certain HTTP requests, you can have it mimic the web server, and it can just function as a proxy, while showing you what's happening.**
- **You can also construct requests in the tool and send that to mimic a client.**

235



FIDDLER (2)

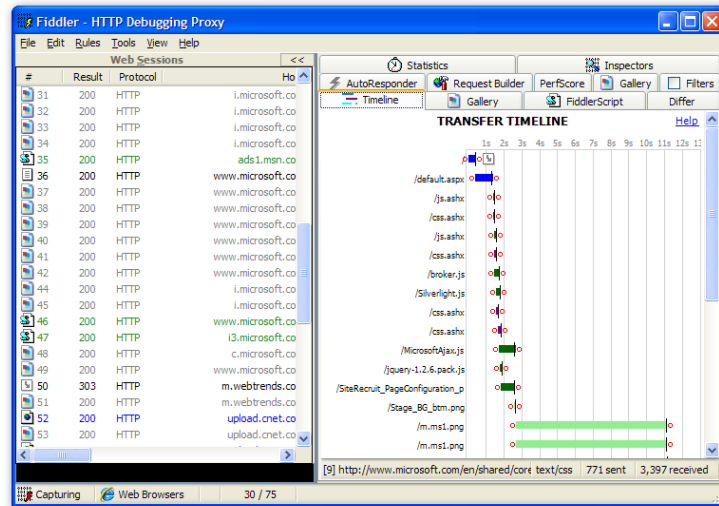


236



Free and Cheap Test Tools

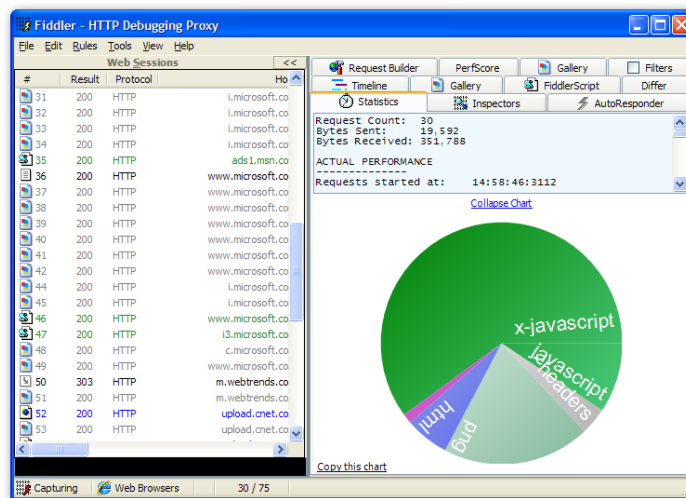
FIDDLER (3)



237



FIDDLER (4)

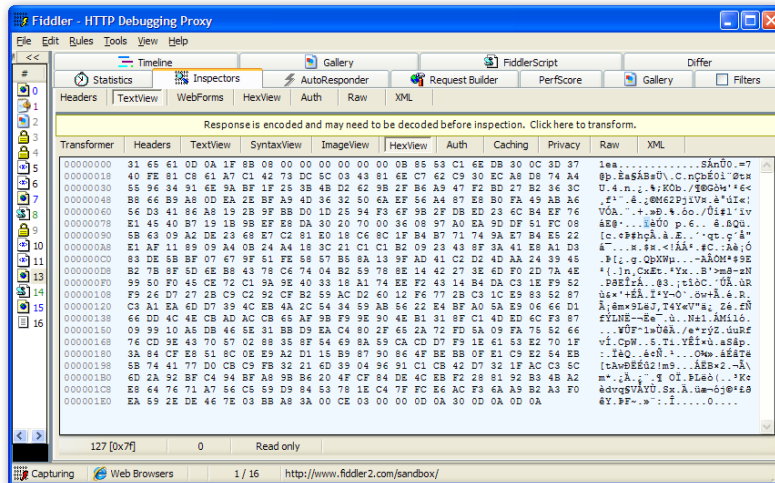


238



Free and Cheap Test Tools

FIDDLER (5)



239



POSTER

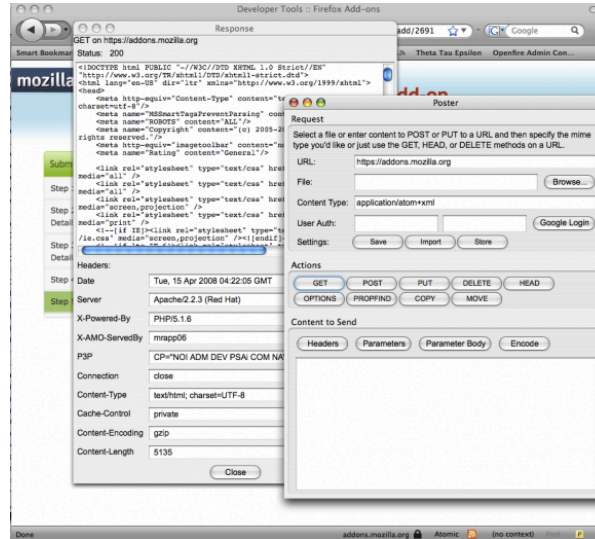
- **Firefox add-on**
 - A developer tool for interacting with web services and other web resources that lets you make HTTP requests, set the entity body, and content type.
 - This allows you to interact with web services and inspect the results.
 - After you install it, just go to Tools->Poster to open the poster window. After that, try a GET or POST on your favorite web service or site.
 - <https://addons.mozilla.org/en-US/firefox/addon/poster/>

240



Free and Cheap Test Tools

POSTER (2)



241



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____

242



Free and Cheap Test Tools

WEB TESTING

- **Link Checkers**
 - Link Tiger – www.linktiger.com
 - Xenu – www.xenu.com
 - X3C - <http://validator.w3.org/checklink>
 - Jspider - <http://j-spider.sourceforge.net/>
 - More at http://www.cryer.co.uk/resources/link_checkers.htm
- **Compliance Checkers**
 - <http://www.thefreecountry.com/webmaster/htmlvalidators.shtml>

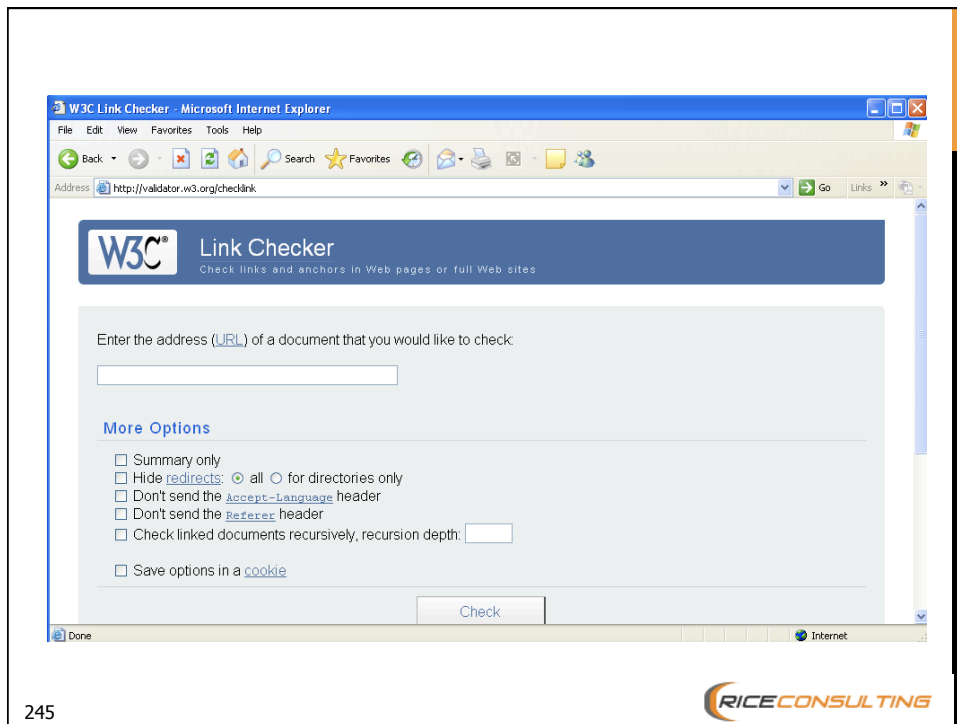
243



244



Free and Cheap Test Tools



CANOO WEB TEST

- **Canoo WebTest is a free Open Source tool for automated testing of web applications in a very effective way.**
- **<http://webtest.canoo.com>**

246



Free and Cheap Test Tools

CANOO WEB TEST SCRIPTING

Simple Google Test in XML

```
<project default="test">
<target name="test">

  <webtest
    name="check that WebTest is Google's top 'WebTest' result">
    <invoke url="http://www.google.com/ncr"
      description="Go to Google (in English)"/>
    <verifyTitle text="Google" />
    <setInputField name="q" value="WebTest" />
    <clickButton label="I'm Feeling Lucky" />
    <verifyTitle text="Canoo WebTest" />
  </webtest>

</target>
</project>
```

247



PEX AND MOLES

- **Isolation and White box Unit Testing for .NET**
 - Pex automatically generates test suites with high code coverage.
 - Allows the stubbing of .NET methods
 - <http://research.microsoft.com/en-us/projects/pex>
 - The Fakes Framework in Visual Studio 11 is the next generation of Moles & Stubs, and will eventually replace it.

	value
1	null
2	**
3	"\0"
4	":"
5	":"

248



Free and Cheap Test Tools

CUITE (CODED UI TEST ENHANCED) FRAMEWORK

- Thin layer developed on top of Microsoft Visual Studio Team Test's Coded UI Test engine.
- Helps reduce code (<10%), increases readability and maintainability, while also providing features for the automation engineer.
- <http://cuite.codeplex.com/>

249



GOOGLE JS TEST

- Fast javascript unit testing framework that runs on the V8 engine, without needing to launch a full browser.
- <http://code.google.com/p/google-js-test/>

250



Free and Cheap Test Tools

GOOGLE JS TEST EXAMPLE

```
RUN      ] UserInfoTest.formatsUSPhoneNumber
OK      ] UserInfoTest.formatsUSPhoneNumber
RUN      ] UserInfoTest.returnsLastNameFirst
er_info_test.js:32
pected: 'Doe, John'
tual:    'John Doe'

FAILED   ] UserInfoTest.returnsLastNameFirst
RUN      ] UserInfoTest.understandsChineseNames
OK      ] UserInfoTest.understandsChineseNames
```

251



REVIEWCLIPSE

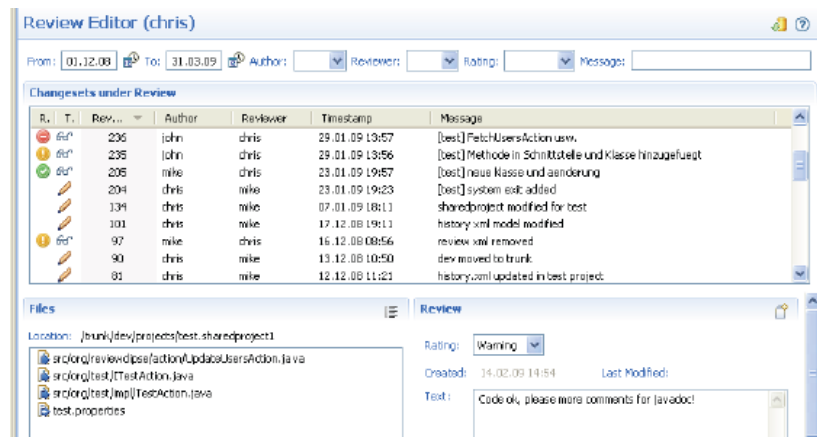
- A Free Continuous Code Review Plugin for Eclipse
- <http://www.inso.tuwien.ac.at/projects/reviewclipse/>

252



Free and Cheap Test Tools

REVIEWCLIPSE SCREENSHOT



253



STATIC ANALYSIS & CODE METRICS

• FindBugs

- Open source program created by Bill Pugh and David Hovemeyer which looks for bugs in Java code.
- It uses static analysis to identify hundreds of different potential types of errors in Java programs.
- <http://findbugs.sourceforge.net/>

254



Free and Cheap Test Tools

COBERTURA






















- **Cobertura is a free Java tool that calculates the percentage of code accessed by tests.**
- It can be used to identify which parts of your Java program are lacking test coverage. It is based on jcoverage.

255



SAMPLE COBERTURA OUTPUT

Coverage Report - All Packages

Package /	# Classes	Line Coverage	Branch Coverage	Complexity
All Packages	55	75%  1625/2175	64%  472/738	2,319
net.sourceforge.cobertura.ant	11	52%  129/248	43%  46/107	1,848
net.sourceforge.cobertura.check	3	0%  0/150	0%  0/38	2,429
net.sourceforge.cobertura.coveragedata	13	N/A	N/A	2,277
net.sourceforge.cobertura.instrument	10	90%  460/510	75%  123/164	1,854
net.sourceforge.cobertura.merge	1	86%  30/35	88%  14/16	5.5
net.sourceforge.cobertura.reporting	3	87%  116/134	88%  48/55	2,892
net.sourceforge.cobertura.reporting.html	4	91%  475/523	77%  116/150	4,444
net.sourceforge.cobertura.reporting.html.files	1	87%  39/45	62%  5/8	4.5
net.sourceforge.cobertura.reporting.xml	1	100%  155/155	95%  11/12	1,524
net.sourceforge.cobertura.util	9	60%  179/297	69%  70/102	2,892
someotherpackage	1	83%  9/9	N/A	1.2

Report generated by Cobertura 1.9 on 6/9/07 12:37 AM.

256



Free and Cheap Test Tools

COBERTURA FEATURES

- Can be executed from ant or from the command line.
- Instruments Java bytecode after it has been compiled.
- Can generate reports in HTML or XML.
- Shows the percentage of lines and branches covered for each class, each package, and for the overall project.

257



COBERTURA FEATURES (2)

- Shows the McCabe cyclomatic code complexity of each class, and the average cyclomatic code complexity for each package, and for the overall product.
- Can sort HTML results by class name, percent of lines covered, percent of branches covered, etc. And can sort in ascending or descending order.
- <http://cobertura.sourceforge.net/>

258



Free and Cheap Test Tools

CCM

- <http://www.blunck.info/ccm.html>
- ccm is a tool that analyzes c/c++, c#, javascript and **TypeScript** code and reports back on Cyclomatic Complexity, a metric introduced by Thomas McCabe back in the mid 70's.
- This metric states the number of independent linear paths through a unit of code and is useful to determine how complex the unit of code is (for this particular tool, a unit is a function or a method).

259



CCM FEATURES

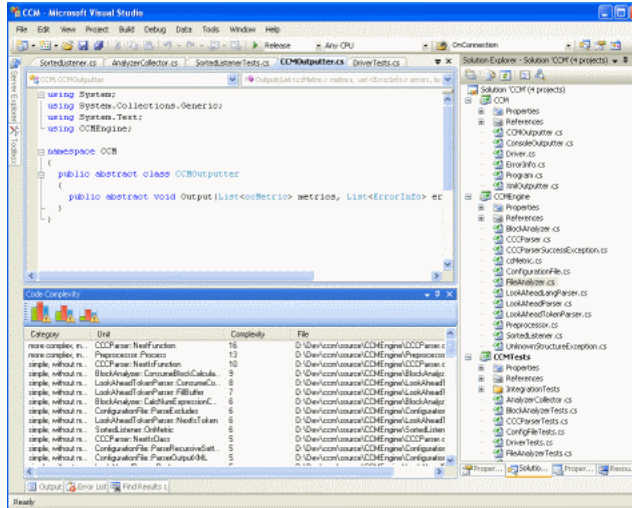
- Analyzes java-script, TypeScript, c, c++ and c# code (*.js, *.cs, *.ts, *.c, *.cpp, *.h, *.hpp)
- Works on both managed and unmanaged code
- Command line version can output into xml, allowing easy integration with your build pipelines and Continuous Integration software
- Visual Studio 2008/2010/2012 integration
- Command line version runs under mono on both Linux and Mac OS X

260



Free and Cheap Test Tools

CCM



261



OTHERS?

- _____
- _____
- _____
- _____
- _____
- _____
- _____

262



Free and Cheap Test Tools

VIRTUAL TEST ENVIRONMENTS

- **<http://www.virtualbox.org/>**
 - Free, open source
 - runs on Windows, Linux, Macintosh and OpenSolaris hosts and supports a large number of guest operating systems including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7), DOS/Windows 3.x, Linux (2.4 and 2.6), Solaris and OpenSolaris, and OpenBSD.

263



VIRTUAL TEST ENVIRONMENTS (2)

- **Windows Virtual PC**
 - Free
 - Windows only
 - www.microsoft.com
- **Spoon.net**
 - <http://www.spoon.net/>
 - Free
 - Web-based

264



Free and Cheap Test Tools

GHOSTLAB

- <http://vanamco.com/ghostlab/>
- Not free, but cheap (\$49/user)
- Multiple browsers supported
- Synchronizes scrolls, clicks, reloads and form input across all connected clients.
- This means what you're testing is not the simple page load, but the full user experience.

265



QUALITY MANAGEMENT

- **SpagoWorld – Spagoworld.org**
 - **Spago4Q** - The free/open source platform to measure, analyze and monitor Quality of products, processes and services
 - **SpagoBI** – Open Source Business Intelligence suite
 - **Spagic** - The free/open source platform for the governance of middleware services and the development of SOA applications
 - **Spago** - The Java Enterprise Framework for the development of web and multichannel applications in SOA environments

266



Free and Cheap Test Tools

SPAGO4Q



267

RICE CONSULTING

ONLINE COLLABORATION TOOLS

- **Web Presentations**
 - Anymeeting.com
 - www.Mikogo.com
 - www.joinme.com
 - www.vyew.com
- **Conference Calls**
 - TalkShoe – www.talkshoe.com
 - Great for distributed teams who want to talk for free.
 - Recordable and private

268

RICE CONSULTING

Free and Cheap Test Tools

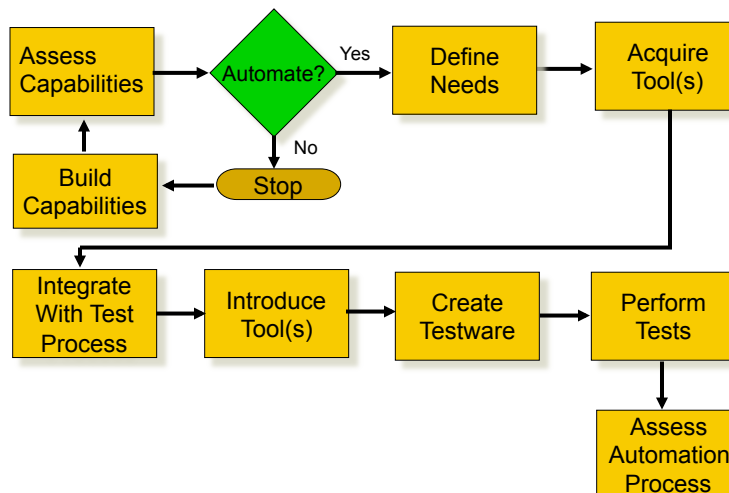
DESIGNING YOUR OWN TEST TOOL FRAMEWORK

- In this final part of the tutorial, we will:
 - Identify your test tool and test automation goals
 - Measureable outcomes
 - ROI goals
 - Identify your current situation
 - Strengths
 - Weaknesses
 - Past experiences
 - Create an integrated test tool framework
 - Identify the process elements needed

269



A PROCESS FRAMEWORK FOR TEST AUTOMATION

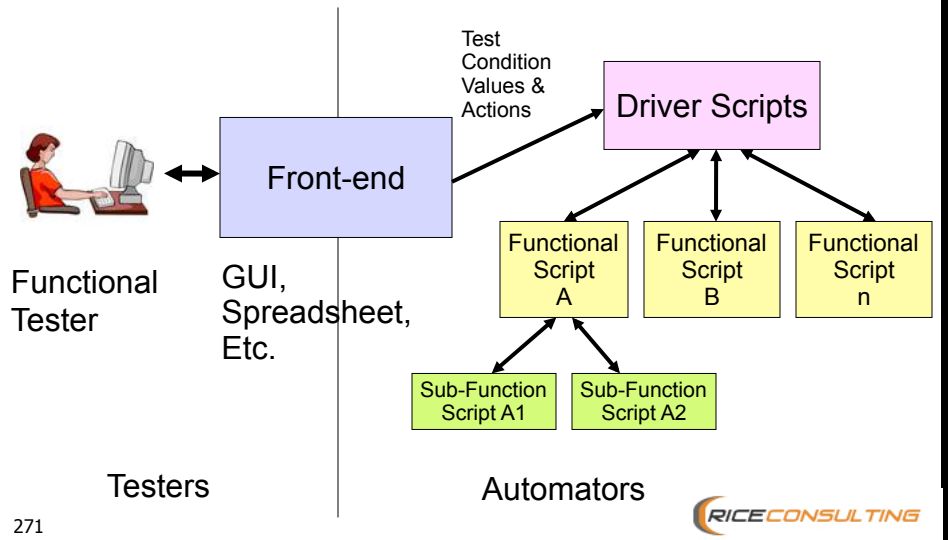


270

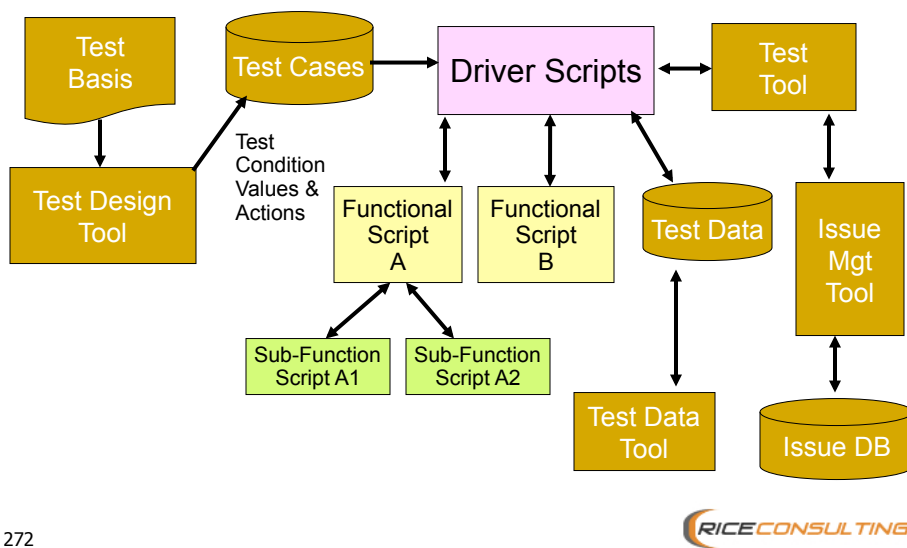


Free and Cheap Test Tools

THE TEST FRAMEWORK AS AN ARCHITECTURAL INTERFACE



INTEGRATION WITH OTHER TYPES OF TEST TOOLS



Free and Cheap Test Tools

SUMMARY

- **These tools can all be helpful in different ways.**
- **With test tools, you don't always get what you pay for, so regardless of the price do a decent evaluation.**
- **Free and cheap tools allow you to obtain and learn tools on your own.**
 - This helps in building your personal tool kit.

273



RESOURCES

- **www.opensourcetesting.org**
- **www.openqa.org**
- **www.testertools.com**
- **<http://www.webappers.com>**
- **<http://www.toolsjournal.com/testing-lists/item/473-top-10-usability-testing-tools-for-your-website>**
- **www.riceconsulting.com/cheaptools.htm**
 - I keep this page updated as I learn of new tools.
 - Let me know if you find a new one!

274



Free and Cheap Test Tools

BIO - RANDALL W. RICE

- Over 35 years experience in building and testing information systems in a variety of industries and technical environments
- ISTQB Certified Tester – Foundation level (CTFL), Advanced Level (CTAL) Full
- Director, American Software Testing Qualification Board (ASTQB)
- Chairperson, 1995 - 2000 QAI's annual software testing conference
- Co-author with William E. Perry, *Surviving the Top Ten Challenges of Software Testing* and *Testing Dirty Systems*
- Principal Consultant and Trainer, Rice Consulting Services, Inc.



275



CONTACT INFORMATION

Randall W. Rice, CTAL
Rice Consulting Services, Inc.
P.O. Box 892003
Oklahoma City, OK 73189
Ph: 405-691-8075
Fax: 405-691-1441
Web site: www.riceconsulting.com
e-mail: rrice@riceconsulting.com



276

