Test Smarter, Finish Faster

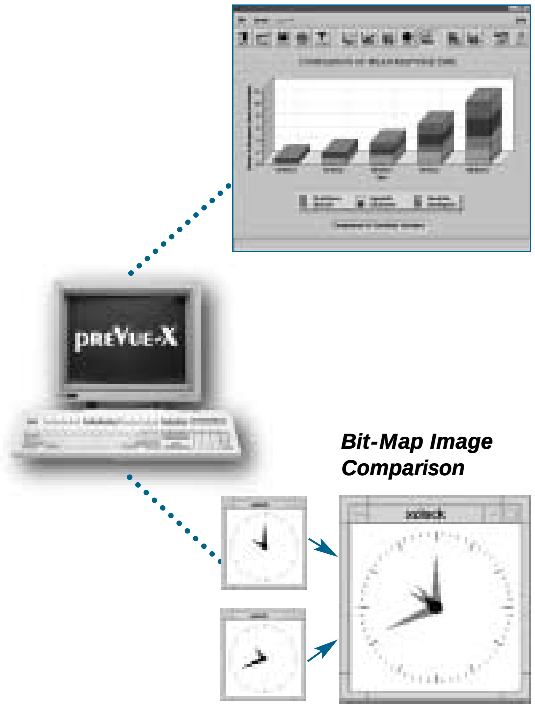
Rational preVue-X

Rational preVue-X Overview

Rational® preVue-X is an X Window testing tool that ensures your applications and systems deliver the performance and quality your customers expect. By automating both GUI regression testing and performance testing, preVue-X provides a total solution for successful deployment of your X Window applications.

Unlike other X testing tools, preVue-X uses a non-intrusive approach to testing that requires no changes to your applications or X libraries. This “black box” approach allows you to “test what you ship” and enables preVue-X to work in any X Window environment with any GUI development kit and any version of X.

Rational preVue-X tests your applications and systems by emulating the activities of one or multiple users in test scripts. These test scripts are automatically generated by preVue-X by recording or “capturing” the user’s interactions with the application(s) being tested. Single-user test scripts can be played back to fully exercise and test the quality of your application. Multiple-user test scripts allow you to test the performance of your application under large user loads.



preVue-X automates both quality and performance testing

The results of these test runs are provided in a comprehensive set of reports, graphs, and log files. Rational preVue-X allows you to quickly analyze the behavior of your applications and pinpoint any quality or performance problems. By uncovering problems before your users see them, preVue-X helps to lower your cost and reduce your risk in deploying applications and systems.

Test Generation

The test generation process with Rational preVue-X begins with recording user inputs and application responses. The preVue-X Capture utilities record or “capture” the user’s interaction with the application being tested. The watch utility within Capture records the interaction it observes in log files which serve as input into other preVue-X functions.

Rational preVue-X operates at the X protocol level between your X server and your X client applications. It operates independently of your graphical user interface (Open Look, Motif, CDE, and so on), development toolkits, and network. During recording, preVue-X automatically captures all user interactions with the application, including mouse movements, button clicks, keystrokes, and think time delays.

As part of the recording process, you can add comments or other annotations to the script. In addition, you can insert start times and stop times to define custom time measurement blocks. A recording session can also be automatically split into multiple test scripts or appended to an existing script.

Once a recording session is completed, Rational preVue-X’s automated test script gen-

HIGHLIGHTS

A single tool for both GUI and performance testing

Non-intrusive approach lets you “test what you ship”

Tests all versions of UNIX, X server, GUI toolkits, etc.

Automatically generates test scripts reproducing user inputs and system responses

Rational®
the software development company

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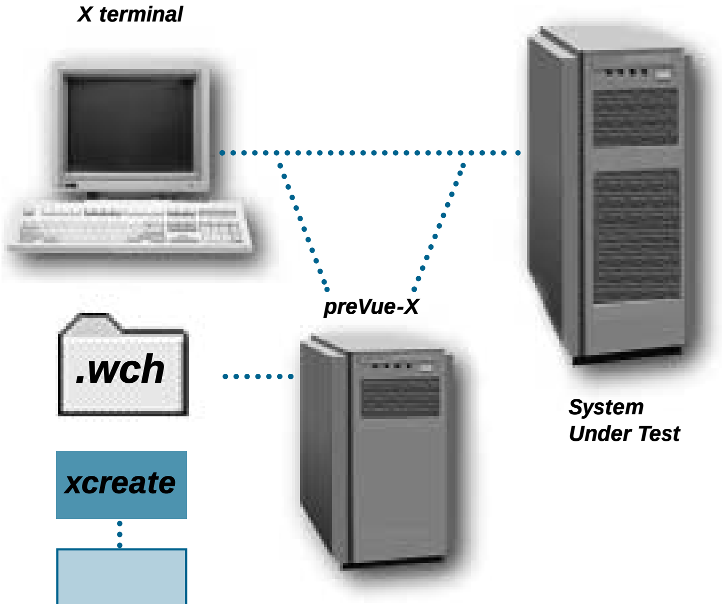
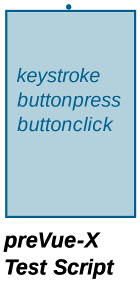




erator, xcreate, uses the recorded data to develop an easy-to-read test script. When played back, this script creates inputs to the application so authentically that the application cannot distinguish between the emulated users and actual users sitting at X workstations or X terminals.

Rational preVue-X test scripts use the VU scripting language. Test scripts are ASCII files which can be easily modified with any text editor to add specific VU commands, such as looping constructs or multi-user synchronization.

Powerful Scripting Language

The VU language used by Rational preVue-X is a flexible, C-like language that provides fundamental programming features such as data typing, control structures, user-defined subroutines, I/O facilities, and library routines. It also provides advanced features required for automated testing, such as send features to submit user commands to the system being tested, and receive features to receive and evaluate the system responses. In addition, VU provides environment variables for flexible control of the emulated user's environment, such as typing speeds and think times.

VU's support for shared variables provides a convenient and efficient method for synchronization and run-time control of multi-user activity. Shared variables also make it easy for emulated users to pass information to each other during a test run.

VU's emulation commands make it easy to understand and edit generated test scripts. User actions generate VU emulation commands such as keystroke, keypress, buttonclick, buttonrelease, and so on.

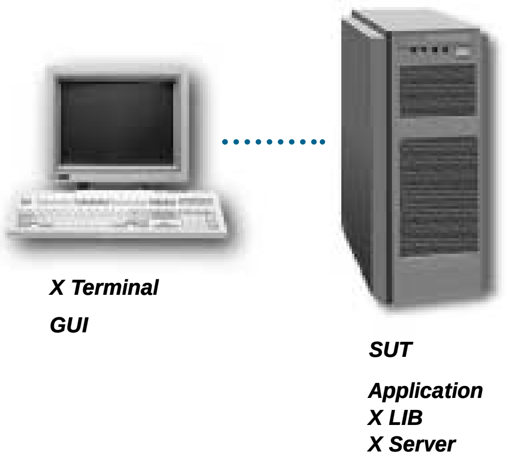
VU is a flexible language that provides access of C data and functions from the VU language, as well as direct access to the C language environment. Because the high-level VU language is compiled into an efficient, machine-independent executable format, Rational preVue-X gives you the benefits of portability and extensive run-time error checking that native C does not offer.

preVue-X test scripts are easy to read and edit.

Flexible and Comprehensive Testing

Test scripts generated by Rational preVue-X are unaffected by changes to the location of buttons or fields within the GUI from one application version to the next. This "geometry independence" eliminates the need to update test scripts for regression testing as the application's GUI changes between versions. Your test engineers can focus on executing tests and analyzing results rather than maintaining test scripts.

Rational preVue-X automatically generates test scripts with geometry independence through its object-based motion technology. This technology provides a variety of methods for tracking the movement of objects within a GUI screen, so mouse movements and button clicks are not tied to a particular location on the screen during playback.



preVue-X Provides Comprehensive Test Coverage

Many other X testing tools achieve geometry independence through an approach known as “widget awareness.” Like Rational preVue-X, widget-aware tools allow test scripts to be independent of the location of objects or widgets within the application GUI. However, widget aware tools achieve this independence through special libraries which must be compiled with your application. preVue-X’s non-intrusive technology requires no changes to your application and no custom X libraries, so you can “test what you ship.” With preVue-X, your test scripts are also insensitive to changes in the development tools used to build your applications.

Rational preVue-X provides more comprehensive test coverage than typical widget-aware tools which bypass the X server and send events directly to the application. preVue-X generates keystrokes and mouse events that allow the X server to perform its normal X event processing. As a result, your entire user interface, along with your application and X libraries, can be tested with preVue-X.

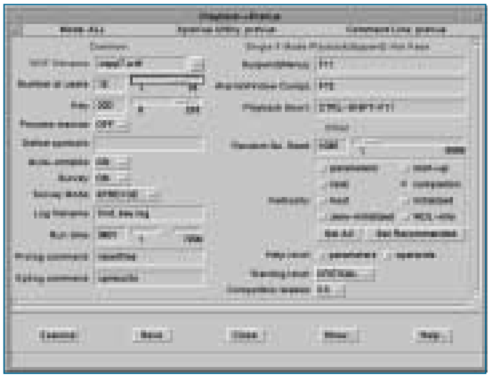
Test Script Coordination

Playback of Rational preVue-X test scripts is controlled and defined by the Workload Description File (WDF). The WDF defines the emulation session’s characteristics. Once a suite of test scripts is created, the WDF provides a flexible way to control its execution. By making simple modifications to the WDF, the tester can completely change the test suite. Since one command initiates the entire workload, playback execution is also simplified.

The WDF provides a mechanism for the tester to define and document multi-user tests. With the WDF, you can define how many users to emulate, how each user will connect to the system under test, and what work each user will perform. In addition, you can specify initialize values for shared variables, how much data to keep from a test run, and where to store the results.

One of the most important features of the WDF is assigning test cases to users. Rational preVue-X provides you with very flexible and realistic task scheduling. Task mixes can be made from a user-defined distribution. Execution of tasks can be in sequential, repetitive, or random order to avoid “lock-stepping” situations during your test runs.

Tasks can be assigned to individual users or groups of users. User groups can be defined to correspond to functional groups associated with the workload you are modeling.



The playback screen provides a single menu for setting the parameters of your test run.

Test Playback

Rational preVue-X has two playback modes: real server and pseudoserver. These two modes can be used individually or in combination to provide flexibility in emulating real-world workloads.

Real server playback uses an X server display for each emulated user. By using the actual X server display, you get the most accurate playback possible and reduce the overhead on the Rational preVue-X host system.

If your test workload requires a large number of users, then having an actual X server display for each user can become costly and difficult to manage. For such situations, Rational preVue-X provides a pseudoserver playback option. Pseudoserver playback replaces the physical X server displays with a “virtual” software-only X server. Multiple users can be emulated from a single system.

The VU language combines the capabilities of a standard high-level programming language with extensions specific to test design:

global events

shared variables

X protocol emulation commands

user think time distribution algorithms

arithmetic and assignment variables

conditional execution structures

looping structures

break and continue statements

user-defined subroutines

file inclusion and macro definition

arrays

external C linkage

automatic memory allocation/deallocation

pattern matching

random number generation

reading and printing data

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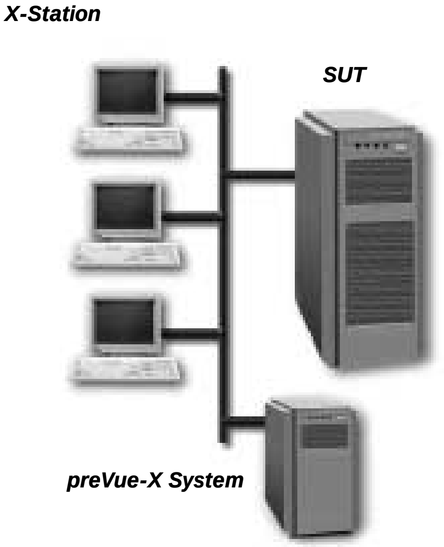
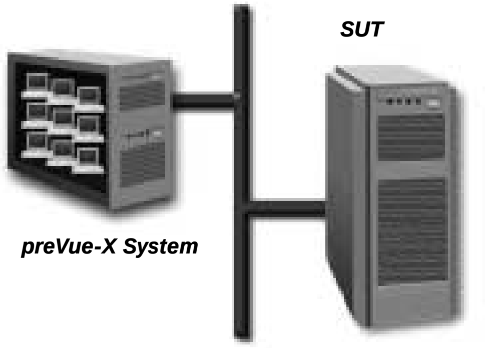


Real Server Playback



Pseudoserver Playback

The Rational preVue-X pseudoserver is based on X Window Release 6 (MIT X11R6). It will also support X client applications built with previous X Window releases. To accurately mimic the physical X server with which the script was recorded, the preVue-X pseudoserver automatically configures itself to match the characteristics of this X server using detailed information extracted during the script recording process. This self-configuration capability results in more accurate X server emulation by preVue-X compared to tools which merely emulate a generic X server.

Rational preVue-X allows you to combine real server playback and pseudoserver playback in the same multi-user test run. This combined playback provides the advantage of visually monitoring the user session in progress on one or more actual X server displays, while reducing the hardware required to emulate large numbers of users.

Test Monitoring

Rational preVue-X provides a variety of capabilities that let you monitor the status of a test run while it is executing. The Survey function provides a dynamically updated summary of the status of all emulated users as they execute their assigned tasks. The current state of each user (thinking, typing, waiting for response, etc.) is displayed in this summary view. You can also zoom in on a particular user to view the actual execution of each command line in the script for that user.

Other options provide control over the test session, including suspending and resuming individual users, changing the value of shared variables, terminating the emulation session, and single-step debugging capabilities.

The Rational preVue-X Softscreen capability provides the ability to remotely monitor any emulated user's screen activity without requiring dedicated hardware. This provides visual confirmation of the status of any selected user and can be invoked any time during the playback session.

The Redisplay capability of Rational preVue-X also allows you to visually view a test run without actually running the test over again. If a test fails during an overnight run, you can quickly review the events leading up to the failure and determine its cause.

```
preVue RUN STATUS: 00:02:47 [illegible]
TOTALS:   5 Users,   5 Active,   0 Suspended [illegible]

ZOOM Disabled

Command:
```

preVue-X's survey function allows you to view the status of all users and zoom in on individual user scripts as they execute.

Advanced Regression Testing Capabilities

Rational preVue-X automates the regression testing phase of your development cycle and results in a more efficient and reproducible testing process. Your test engineers can focus on test planning and design, rather than manual "button banging." You can execute weeks of testing overnight and conserve valuable system resources during peak usage hours. preVue-X enables you to deliver higher quality software with tremendous time and cost savings.

In addition to its general test script recording and playback capabilities, Rational preVue-X also contains specific features for effective regression testing of your applications. Multiple validation techniques allow you to test your application at different levels.

Rational preVue-X's bit image comparison capability allows you to view captured images, obtain information about them, and highlight differences between "expected" images and "actual" images. This graphical comparison supports partial window dumps and partial image comparisons. You can also mask out portions of images to exclude from comparisons.

Rational preVue-X validates textual strings with no limit to their size and independent of their font. It also synchronizes and validates pop-up menus in your application and works with multiple windows with the same name, such as help boxes.

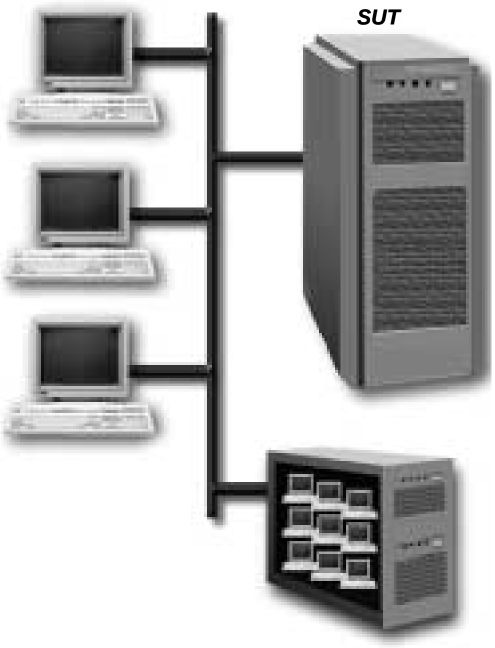
Most test tools only confirm that a response either passed or failed a validation test. Only Rational preVue-X provides the information necessary to determine the potential cause of a failure by looking at the X protocol sent to the X display. This detailed X protocol level information is invaluable for developers doing application debugging.

Advanced Performance Testing Capabilities

Testing your application under large multi-user loads can ensure that response times will meet user expectations, as well as uncover software defects that do not appear during single-user testing. Rational preVue-X's WDF makes it easy to define and schedule multi-user test runs. preVue-X also provides advanced features designed specifically for automated performance testing. These features include:

- Automated Synchronization: preVue-X automatically generates synchronization points from the recorded activity of users. These synchronization points ensure that inputs (keystrokes, motions, and button clicks) will not be sent to the system until the applications being tested are ready to accept them. For example, the test script will not start typing a file name to open before the "File Open" dialog box appears. Other test tools require you to manually edit your scripts to achieve such synchronization.
- Automated Timestamping: preVue-X automatically timestamps responses from the application under test.
- Multi-User Coordination: preVue-X allows you to easily coordinate the activities of multiple users. The wait function will limit access to shared system resources and hold all other users from executing tasks until an event specified by you has occurred.

Multi-user Test Environment



preVue-X makes it easy to conduct large multi-user performance tests

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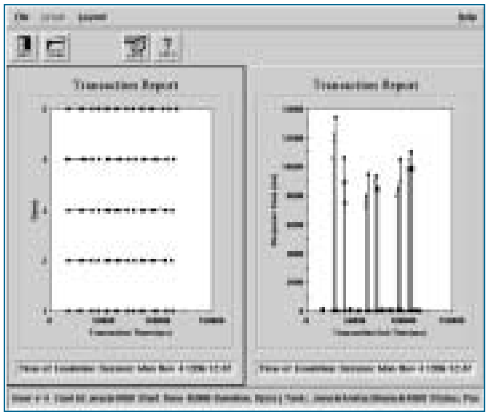
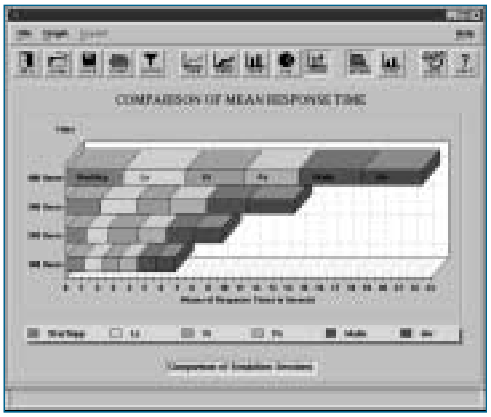


preVue-C/S's transaction reports allow you to view detailed user and transaction information at any point in time.



Comparison of response times for a varying number of users lets you see how your system scales.

Test Results

When Rational preVue-X emulation sessions have completed, a variety of analysis tools are available to interpret your test results. Comprehensive reports and graphs summarize results in easy-to-understand formats. Detailed log files and error files are also provided to allow you to trace user requests and response data when performance or quality issues occur.

Rational preVue-X reports provide information on:

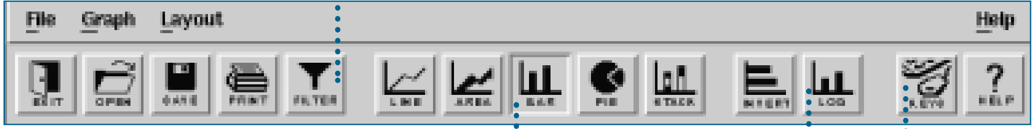
- The degree to which actual responses correspond to expected responses
- Response time statistics
- All window images compared during the test run
- Comparing performance data across multiple test runs
- Individual transaction or user response times
- User-emulation workload characteristics
- Error and warning messages

A variety of performance graphs make it easy to visually view and manipulate your test results. You can interactively change the style of graphs (e.g. bar charts, pie charts, etc.), as well as the data to be included in the graphs. Rational preVue-X also allows you to zoom in on portions of a graph, switch between linear and log scales, and view labels for each data point. preVue-X gives you the ability to tailor each performance graph to meet your particular needs and preferences.

You can also easily export Rational preVue-X test results to your favorite word processing or spreadsheet programs.

Test Result

Interactively select data to include in graph



The graphing toolbar makes it easy to interactively analyze your test results.

Automatically switch between graph styles

Switch between linear and log scales

Use keys to allow you to zoom in on portions of graphs, view data labels, etc.

Virtual preVue Option

Virtual preVue emulates the activities of many users when a single system large enough to support the test is not available. Virtual preVue allows the tester to apply a large workload across several networked systems, providing a single interface to a “virtual” test system. The “virtual” system is capable of emulating large numbers of users.

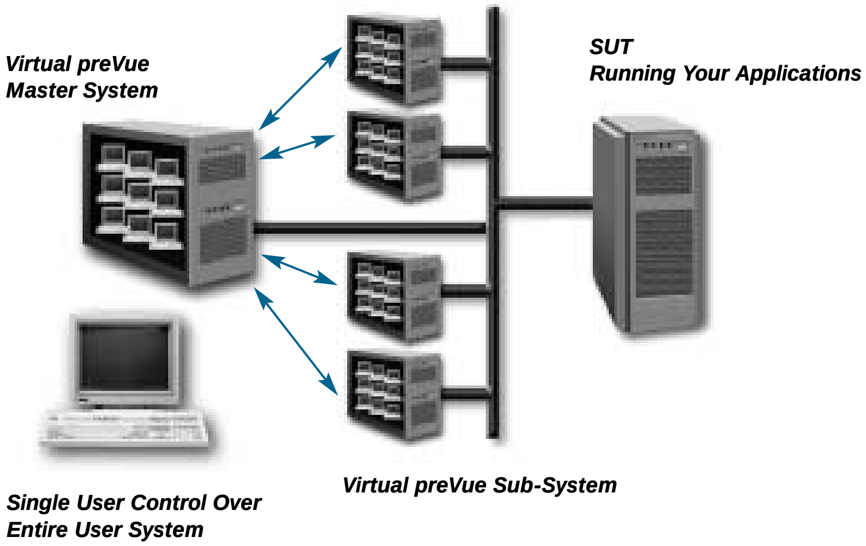
Virtual preVue consists of one Master host and any number of Virtual hosts that drive emulated users. The Master host delivers tests to the individual Virtual hosts, and then coordinates their playback. After the tests have been executed, test data is gathered and passed back to the Master host for incorporation into the test results. This minimizes overhead traffic put on the network during test execution.

With the Virtual preVue option:

- One Workload Description File describes the distribution of users across the Master and Virtual hosts
- A single Survey utility monitors all emulated users regardless of physical location
- Coordination of user events and shared variables is transparent to the physical location of the emulated user.

Virtual preVue is completely integrated with Rational preVue-X. All preVue-X utilities are available when you extend your system to include Virtual preVue.

Virtual preVue System Layout


Virtual preVue
Master System
SUT
Running Your Applications
Single User Control Over
Entire User System
Virtual preVue Sub-System