

Wind River UX Test Development Kit for Android

Wind River UX Test Development Kit for Android is an Eclipse-based test authoring environment that enables the rapid creation of automated test scripts for Android devices. UX Test Development Kit has been built from the ground up to offer automated testing capabilities that replace human efforts. Tests developed using UX Test Development Kit automatically manipulate a device under test just like a real user would through Android's user interface.

The automated execution of these tests provides a significant reduction (up to 70%) of time spent during the manual testing cycles of complex Android software stacks. UX Test Development Kit tests automate the interaction with applications and web pages exposed through the native Android browser.

The Wind River UX Test Development Kit authoring environment includes an innovative wizard mechanism to rapidly create new test scripts and a built-in software agent that automatically detects and incorporates run-time support on the device under test. In addition, the kit includes out-of-the-box sample tests that can be adapted to

cover new and customer-specific use cases. Using a runner mechanism, all the developed tests can be integrated into an automated test execution framework, such as Wind River Framework for Automated Software Testing (FAST).

Challenges of Testing the Android User Experience

Testing the interaction with various graphical user interface (GUI) elements exposes mobile devices to the following challenges: limited screen resolution, touch-triggered events, and alternative input methods such as onscreen keyboards or accelerometers. Because of the inherent limitations of manual testing for an ever increasing volume of applications, there is a strong need for automated testing.

The Android operating system offers two different approaches for testing the application layer: the Android Instrumentation Framework and the Android Monkey Tool. Instrumentation refers to the ability to monitor and diagnose an application by inserting tracking routines and event logs into the code. It also includes debugging techniques and performance counters that enable measurement capabilities

and control of testing behaviors. Although the Monkey Tool is mainly used for application stress testing, it can be utilized to generate random user events including clicks, touches, or gestures as well as a number of other system level events. Both approaches available in the Android SDK provide basic testing functionality yet show notable limitations when reproducing real-world use-case scenarios.

The UX Test Development Kit Agent utilizes the Android Monkey Tool to intelligently interact with the device by identifying the user interface elements from the Android Hierarchy Viewer. It also ensures the correct behavior and state for the applications running on the device under test, including the following:

- Verification of data handling (e.g., input/output data)
- Action sequence (e.g., entering data into a web page form)
- States (e.g., application loaded in background)
- Display of windows and dialogs (e.g., status bar notifications)

These capabilities offer a great range of flexibility in obtaining a wide variety of real-world test scenarios. The objective is to simulate user interactions and verify the correct behavior to discover possible deviations from expected results, which might be classified as bugs. This means better quality for your product at half the cost when compared to manual testing efforts that are very error prone and hardly reproducible.

Table of Contents

Challenges of Testing the Android User Experience	1
Reusable Tests and Test Components	2
Test Assets	2

Custom User Interface Testing.....	3
Test Log Analyzer and Navigator	4
Automated Execution of Tests	4
Professional Services.....	5

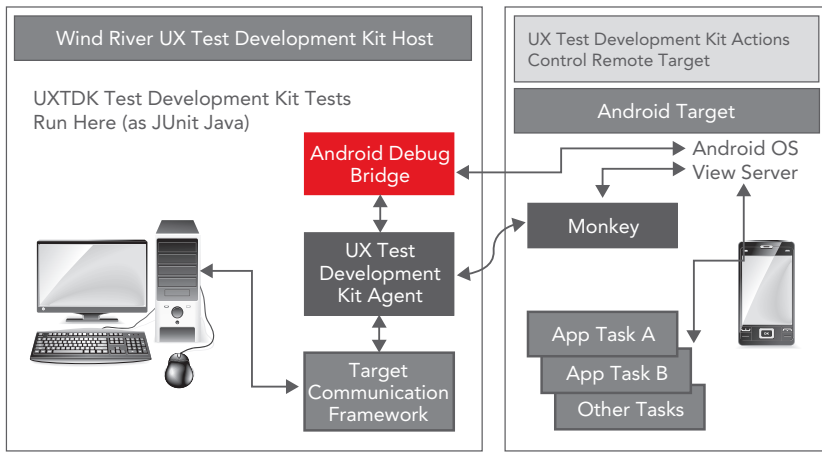


Figure 1: Wind River UX Test Development Kit for Android overview

Reusable Tests and Test Components

Tests developed using Wind River UX Test Development Kit target ideal abstract applications on a layered approach. An ideal abstract application refers to operations such as Add a Contact, Delete a Contact, and Edit an Existing Contact. Great time savings and efficiency are realized by leveraging the reference methods already implemented by Wind River and available through the Application Abstraction Layer. So the effort spent toward building test scripts covering new use cases decreases by as much as

70%. Abstraction provides a single interface to different implementations.

By providing different test components as assets, Wind River UX Test Development Kit splits the test authoring effort in various versions of the same application; similar applications provided by a multitude of vendors; or differing versions of the same platform. This way, the high level of reusability of UX Test Development Kit's test components allows the delivery of quality products while achieving a short time-to-market window.

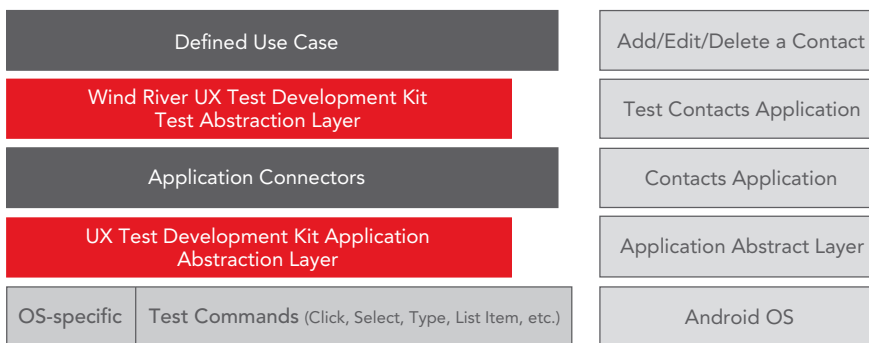


Figure 2: Wind River UX Test Development Kit for Android test layers architecture

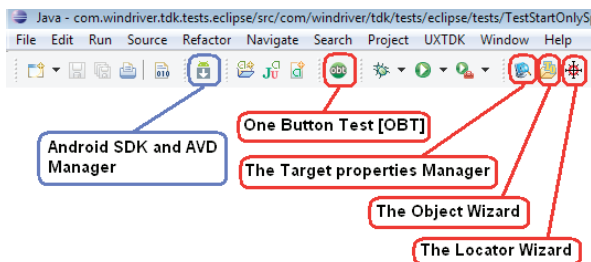


Figure 3: Wind River UX Test Development Kit cockpit inside Eclipse

UX Test Development Kit's layered testing approach overcomes limitations of existing application and UI test frameworks such as the following:

- Capture/replay functionality with no advanced debugging and issue tracking capabilities
- Non-reusability for different versions of the same application
- Non-reusability for different device-under-test specifications (e.g., display resolution)

UX Test Development Kit offers a unique approach to real-world UX testing by making the UI elements accessible for validation and manipulation from automated test scripts.

Wind River UX Test Development Kit also supports parallelizing tests including those across multiple targets, automating use cases and scenarios. It is also able to simulate virtually all user interactions with the target:

- Clicking widgets in the UI
- Dragging graphical elements
- Reading the contents of the UI elements
- Typing entries on a physical or virtual keyboard

This is a comprehensive way of replicating and automating the Android user experience while interacting with various graphic interface elements.

Test Assets

Wind River UX Test Development Kit for Android offers abstract tests for standard Android applications:

- Alarm clock
- Browser
- Calculator
- Calendar
- Camera
- Clock
- Contacts
- Email
- Media player
- Messaging
- Notepad

It also references sample scripts for market applications such as Google Maps, Facebook, and Twitter.

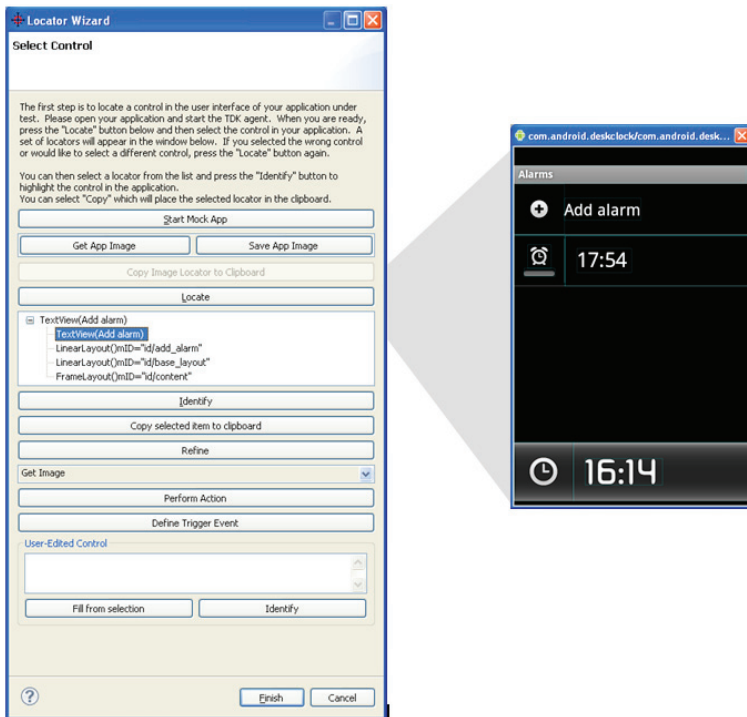


Figure 4: Object locator wizard

Each abstraction has one or two test cases that cover standard scenarios. An abstraction can be used to make more tests based on your requirements and use cases.

Custom User Interface Testing

By breaking the tests into layers and modules, Wind River UX Test Development Kit can be used to test a customized user interface by reusing a number of existing assets created for the standard implementation. The action of reading or setting a field simply involves the creation of a view that includes that particular field. This means clicking to expose that view. For example, while installing new applications, the position of a specific application within the menu is changed. UX Test Development Kit tests will identify the new location by automatically exposing the view that contains the required application launcher, without having to change the test code. Additional actions may be required to expose that specific field; some scrolling may be needed or a button or even several buttons may

need to be manipulated to “create” the field in the target view. For example, to set an alarm using the Android alarm clock application, it is necessary to click Add Alarm followed by the Set button in the new pop-up window.

To implement a field setting, the abstract application process uses map data (locators) to link abstract field names to actual supported fields in the target contacts. The map data is compiled by the Wind River UX Test Development Kit Agent through the process of reviewing the target application during authoring. The Agent relies on the use of information such as the field name or the field node location. During the development of a new use case, the look of a specific target screen/view can be saved. This will allow the agent locators to be associated to the user interface as it was at the point of initial authoring. For example, a locator for an Android contact, Home Phone, first locates the Phone entries. Then it proceeds to find a text box widget that is located to the right of the Home selector in the same node tree as Phone. The UX Test

Development Kit Agent constructs these locators automatically:

UX Test Development Kit Locator: Phone Window Decor View → Frame Layout → Linear Layout → Text View (Add Alarm)

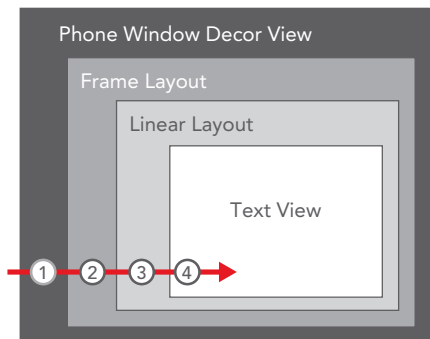


Figure 5: How Wind River UX Test Development Kit constructs a locator for a specific Android GUI element (text view, button, checkbox, etc.)

Wind River UX Test Development Kit test scripts can be adapted to a new user interface, with minimal changes to the agent-generated locator, not to the tests themselves. If the user interface has changed to display information on different views, the implementation code may have to change. This is typically the case when introducing a new UX Test Development Kit view object and its corresponding map. The object would need to implement the elements of the abstract operations that it supports.

Custom applications may also provide entirely new capabilities beyond those defined in the corresponding Wind River UX Test Development Kit abstractions. For example, a custom contacts application might only use drag-and-drop while adding a new contact, in comparison with the standard implementation that uses a long-click. In this case, the test author can introduce and implement new abstract operations or applications. Newly developed tests would be needed to fully utilize the new operations.

Newly created tests will leverage the extensive support of widgets and tests already available within Wind River UX Test Development Kit. In many cases, the new implementations can make use of existing reference methods and source code. This in turn yields lower costs for test creation, usage, and maintenance.

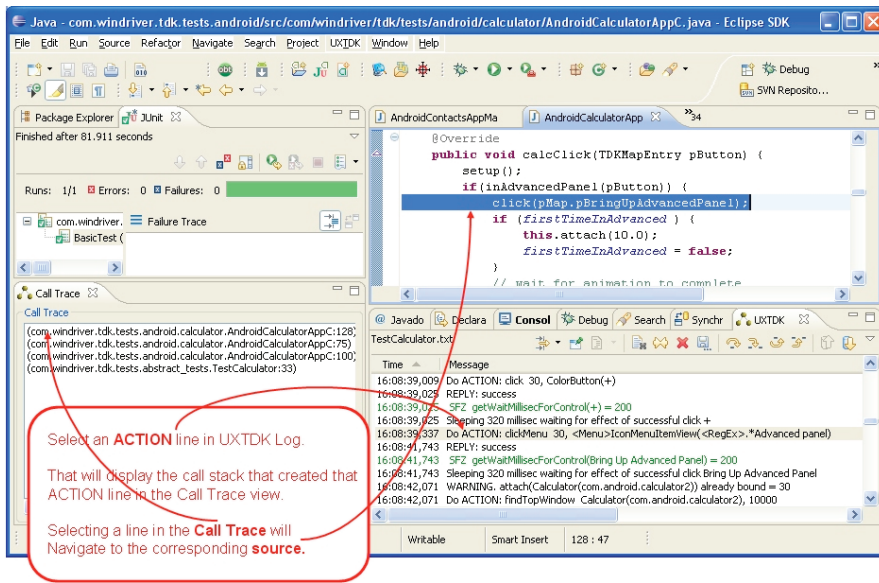


Figure 6: Debugging tests using Wind River UX Test Development Kit's Log Analyzer and Navigator feature

Test Log Analyzer and Navigator

Wind River UX Test Development Kit offers comprehensive information-logging functionality during test execution through the Test Log Analyzer and Navigator. This feature offers the capability of analyzing the log and highlighting the actions or errors, specifying the exact line of source code inside the test script. Navigating in between lines and double-clicking an action or error makes the debugging process easier and more intuitive.

If the test is executed inside an automated test execution engine, the log generated can be easily dragged and dropped into the Wind River UX Test Development Kit log window. This allows users to easily debug and test prior logs or those from other locations.

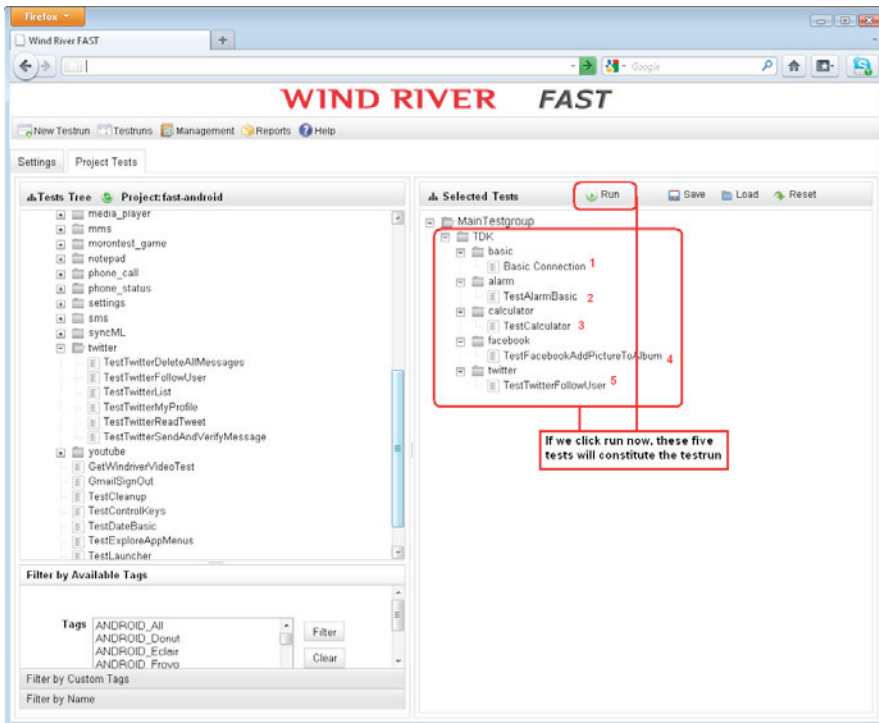


Figure 7: Automatic execution of Wind River UX Test Development Kit authored tests within Wind River Framework for Automated Software Testing (FAST)

Automated Execution of Tests

Test scripts authored using Wind River UX Test Development Kit are fully managed and automatically executed using Wind River Framework for Automated Software Testing (FAST) for Android.

FAST automates the complex software testing required for embedded devices. It is designed to accept the results of a build, execute tests from different sources, archive the relevant artifacts, and report the results, all in an automated way. To learn more about FAST, go to www.windriver.com/products/mobile-linux/fast.html.

Wind River UX Test Development Kit interacts with FAST through a feature called One Button Test. This allows users to build and automatically execute a suite of UX Test Development Kit tests on a FAST server. The FAST server can be located remotely, so the tests can be executed without using local resources. This will save resources in the test

authoring process by allowing test developers to automatically validate and debug their work on a real device with one click.

Professional Services

As a CMMI Level 3–certified organization, Wind River Professional Services offers extensive experience in mobile systems integration. Wind River applies expertise in user interface design, multimedia support, power management, and fast boot to provide

services tailored to the needs of mobile device development and testing, including subsystem optimization, services integration, and application migration.

To learn more or to request an evaluation version of Wind River UX Test Development Kit, visit www.windriver.com/solutions/mobile-devices/. To have a representative contact you, call 800-545-9463 or write to inquiries@windriver.com.

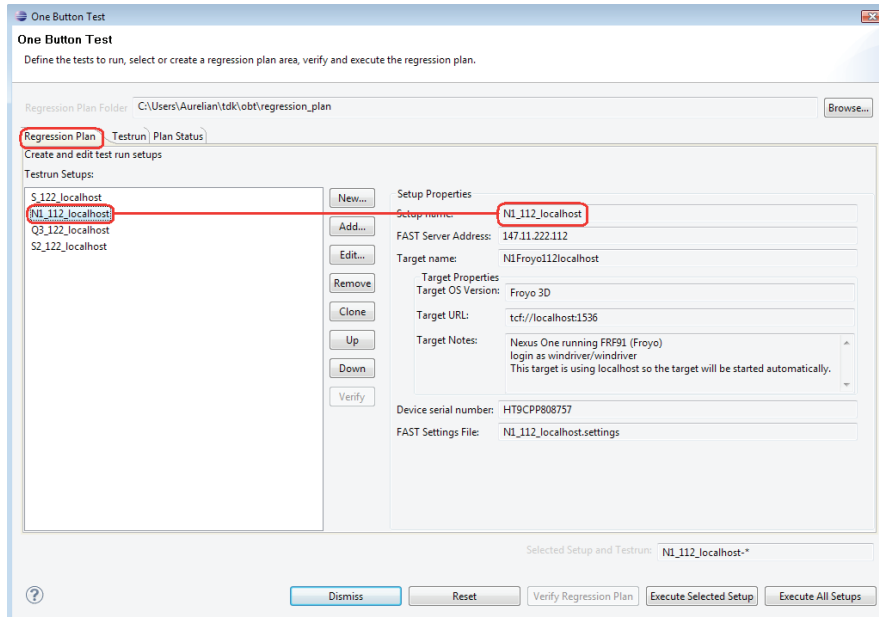


Figure 8: One Button Test feature