
WHITEPAPER

Customer Insights: A European Pay-TV Operator's Transition to Test Automation



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1. Customer Overview

This whitepaper explores how a major European Pay-TV operator has automated its Digital TV receiver testing, successfully reduced its test cycle effort, and improved overall platform reliability. This operator uses Accenture StormTest for test automation in its Development, QA, and Integration teams.

Before the introduction of StormTest, this customer relied exclusively on manual testing. It executed 4,500 test cases per test cycle, with each test case testing a particular piece of functionality.

Test automation was introduced gradually: three developers were assigned to the automation of tests, initially using three StormTest HV16s. The HV16 model allows simultaneous independent testing of sixteen devices supporting simultaneous access from multiple developers and testers.

The progress made by these developers and the success of these initial tests ultimately resulted in the automation of 1,300 tests of the 4,500. This saved 60 person days from the 181 person days required for a manual test cycle execution, representing a 33% time saving.

The test cycle size has subsequently increased to 5,500 tests. With the use of automation a full test cycle now takes just 97 person-days effort. In real terms this means half the numbers of testers are required to execute a test cycle which has increased in coverage by 1,000 test cases.

"Saved 60 person days from the 181 person days required for a manual test cycle execution"

Table 1: Progress automating the testing process.

	Baseline	Year 1	Year 2
#Tests total	4,500	4,500	5,500
#Automated tests	-	1,300	2,600
#Days effort to run all tests	181	124	97

2. Case Study Details

When transitioning from manual to automated testing, there are a number of prerequisites that must in place to have a high performance test automation program.

2.1 Customer's approach to Test Automation

The operator spent significant effort in the beginning developing a reliable, expandable test framework, tailored to their needs. It took the operator approximately six months to scope out its test framework, and familiarize the team with StormTest and its capabilities. Once that initial work was completed, quick progress was made over the next 6 months.

2.2 Planning for success

Once a team and framework have been established, where next should effort be concentrated? A priority for this customer was the management of navigation and OCR and Color analysis. In their opinion, this is the foundation for repeatability, and accuracy of results.

The operator uses color analysis and OCR to determine all screens and outcomes (no bitmap comparison was used, although StormTest does offer this capability). While all regions referenced by name are stored in a configuration module, the menu options and settings are stored in a tree structure, which makes it possible for all navigation and changing settings to be calculated from the tree.

"Quick progress was made over the next 6 months, with the team creating 1700 test scripts"

2.3 Managing the navigation

2.3.1 Library management and region definition

Referencing what is actually on the screen is a critical requirement for test automation. Instead of putting all region coordinates in the code, the operator stores coordinates and regions in a central configuration file.

Regions stored in this configuration module are referenced by name (unique name), while all menu options and settings are stored in a tree structure.

Referencing regions by a unique name / identifier facilitates the handling of change: requiring a single update from the central configuration file. This approach is essential when testing and validating thousands of scripts across multiple platforms.

2.3.2 Navigating to and referencing settings

Region co-ordinates are stored in one location and referenced by name, while navigation key presses are calculated from a tree structure. Having the menu navigation stored in a tree structure allows the script to calculate the location of any menu item directly from the tree structure and hence find out what key presses are necessary to get there. The script either needs to deduce where in the navigation tree structure the Set-Top Box (STB) is currently (using compare color or a similar approach), or else it can always return to a known 'home' location in the tree.

This versatile approach means that changes to any menu in the application can be catered for by changing a single file. The logic to navigate the menu is no-longer embedded in the test scripts.

For example, if a test implies to go the Settings menu and change the Language options to Italian, the location of these elements and the path to get to them can be calculated directly from the tree, independent of the actual test.

"Changes to any menu in the application can be catered for by changing a single file"

2.4 OCR and Color Analysis

Description of implementation and use

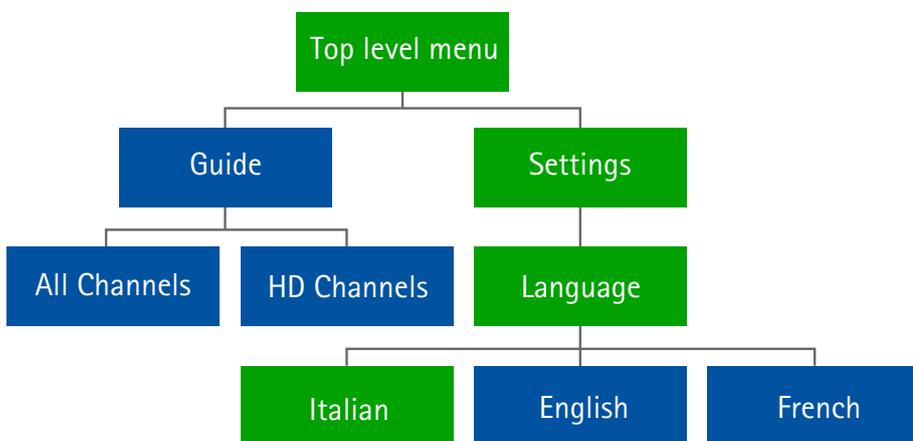
The operator uses OCR coupled with color analysis to determine which screen in the application the STB is currently displaying. The operator has concluded that by using StormTest's OCR and color analysis they can determine exactly which screen is displayed and also extract any information they require from that screen.

This customer uses OCR at a rate of about 200 million characters per month and through the implementation of techniques mentioned further in this document, they find the OCR functionality as provided by StormTest to be very reliable.

Colors are defined that are used throughout the interface; their UIs use just 24 different colors. For example, the color "Orange" is defined as its composite RGB values.

NOTE: This approach is a practical way of handling change: if all elements in the EPG shaped with a particular color were changed, the only modification required is a change to the representative color definitions in the script.

Figure 1: Tree structure example



2.4.1 Application example: checking the recordings

In order to check the recording functionality, the operator checked the status of recordings in the "recordings management" screen of its EPG. On that screen, they checked if a particular region was colored in red, which indicated that a recording was ongoing. The customer considers this method to be quicker and easier than bitmap recognition or bitmap comparison, and to be capable of handling pretty much all the on-screen elements.

2.4.2 Enhancements brought to OCR

Some screen text can be problematic to OCR accurately. To enhance the results of OCR and color analysis for some elements, the operator recommended trying several approaches including:

Application of filters

Filtering the colors of the section of the image can improve accuracy. The operator found that for their application, filtering out the green component gave the most reliable results, especially when the element was highlighted.

Figure 2: Application of Filters example



Trimming

Defining the region to be only as large as the biggest piece of text in the region improves OCR accuracy. When trying to OCR small text that is inside a big region, trimming the image to the size of the text improves OCR accuracy.

Figure 3: Application of trimming to improve OCR accuracy



Use of an accumulated image

When dealing with a television and capturing a screen image via the SCART connection, there is a high probability that the image would be affected by shimmering. To overcome this, the operator used an average of the images obtained through the accumulation of a number of screen captures, thus statistically improving the reliability of OCR.

Use of hints

Hints in the form of a string, list, regular expression or a combination will improve accuracy, checking it again and again until the OCR engine retrieves the expected/correct value. Hints may be used on a region or on a one-off basis, and should be checked as long as the result is not valid.

An application example of this is the date checking through OCR functionality. The operator receiver devices would provide the date under five different formats (e.g. DD/MM/YYYY; DD/MM/YY etc.), which made it quite difficult to retrieve the expected value first time right. The developers used a regular expression to address this challenge.

"Represents a 62% saving over the previous manual approach to non-functional testing"

3. Impact of Automation

This Pay-TV operator's Development and QA teams rely on StormTest to carry out functional testing, non-functional testing as well as reliability testing of the STB firmware, while the Integration team uses it for sanity testing and quality trending analysis.

Test automation has enabled the operator to reduce the amount of person-days effort required to execute a cycle.

From a starting point of no test automation, 1,300 tests of the 4,500 were automated. This saved 60 person days from the 181 person days required for a manual test cycle execution, representing a 33% time saving.

As the test cycle size subsequently increased to 5,500 tests, automation has successfully reduced the full test cycle to just 97 person-days effort. In real terms this means half the numbers of testers are required to execute a test cycle which has increased in coverage by 1,000 test cases.

Testing is also more reliable since more tests are carried out in a more accurate way. More tests lead to more results, and more results allow the identification and correction of more failures, thus building significantly more robust platform releases.

The operator has been relying on StormTest to test the speed and performance of the Set-top Box, i.e. to calculate how well the GUI and the STB performs from a customer experience perspective.

Before the introduction of Development Center, all 336 tests were carried out manually by one person, involving the tester manually calculating how many frames it took for the change to be executed. These tests took 8 Man Days to run, with a tester having to manually configuring the recordings following a tedious process creating back to back recordings using two tuners, swapping channels after every second event for 1 day, and so on. The tester then had to check that the box recorded each program correctly.

With the introduction of StormTest, thousands of recordings can be created and checked every day in a much more accurate and reliable way, with three person days of effort – which represents a **62% saving** over the previous manual approach to non-functional testing.

Each day, the integration team runs an automated suite of sanity tests on the new build. The results obtained are then compared with those from the day before, in order to make sure that there is no drop in quality.

Through these quality trends obtained with StormTest, the integration team is forced to fix issues in the build before it comes into test, consequently reducing the test effort needed afterwards and improving release reliability.

“Before automation, PVR testing required a 2-week test cycle with 18 testers. A year after the introduction of automation, a test cycle is carried out with 10 testers”

Table 2: Performance testing time savings

	Before StormTest	StormTest
Total Number of tests	336	336
Number of manual tests	336 (8 person days)	81 (2 person days)
Number of automated tests	0	255 (1 person days)
Number of results per test	1	5 results per test for automated tests

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About Accenture

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