



Increase throughput
Meet release deadlines
Improve the reliability of services

RELIABLE DVB/STB TESTING SERVICES

Our testing centre offers various service packages with an option of payment per test plan execution or permanent tester allocation.

We use highly specialized tools - high-end equipment, and in-house developed requirement/test management system Intent+.

Our testing processes are unambiguous with clearly defined tasks/responsibilities for everyone involved in the testing process.

We have a large knowledge base accumulated through years-long experience in the DTV industry and skilled test technicians. We offer pre-defined, easy-to-tailor test suites for each customer. They are reusable and easily extendable, and mostly available as fully automatized and ready to be used once the product has reached a required stability level. Our test suites fully cover the extensive DVB/STB requirements.

Reporting on the current state of testing is available in real-time. Comparisons of the test results with the same of previous software releases are also available.

We also provide pre-certification test suites for Dolby Digital, MHEG, NORDIG, HbbTV, DLNA, and CI+.



PROJECT STARTUP AND WORKFLOW

A project starts with a setup of initial requirements and tests in one of the two available modes: using customer's assets or RT-RK defined requirements and tests.

When using customer's assets we:

- Create a new project by importing the requirements and tests
- Together we will analyze and refine the assets to define starting points

- We may fill-in gaps in the assets from our extensive base of tests and requirements
- Customer pays one time setup costs and the additional assets we provide

When we define requirements and tests for the customer:

- We inquire about the device and software needing testing
- In a matter of days, we create an initial VTP/ requirement specification from our extensive test/ requirement base
- Our expert team refines the starting points with the customer
- Customer pays one time setup & assets costs

The customer selects one of the two available test execution packages: testing on demand or continuous testing. Testing on demand is suitable for a customer that doesn't need permanent allocation of a test team. The test plan and execution are scheduled 5 days in advance. The payment is per test plan execution, the next test run is performed when the customer needs it, and the idle time is not paid.

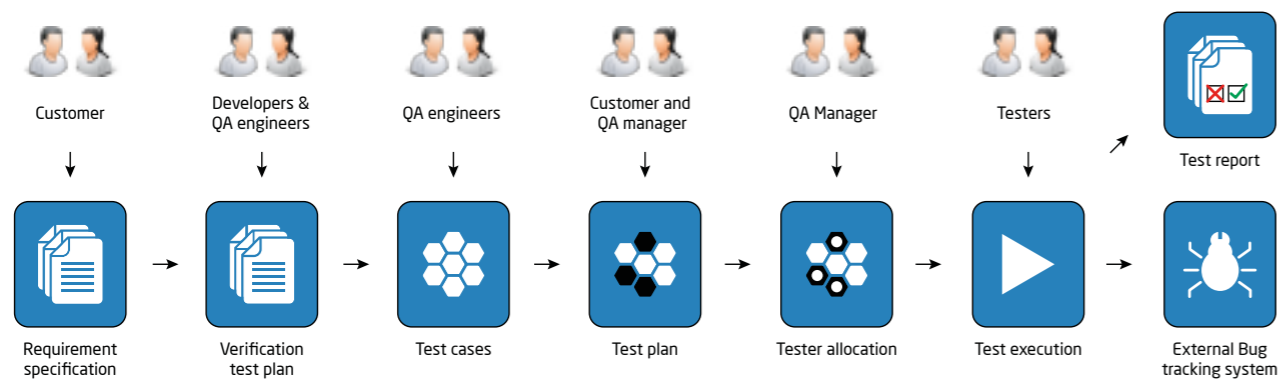


CONTINUOUS TESTING

To start continuous testing Device Under Test and Verification Test Plan, based on provided/our assets and refined to executable test cases, are needed.

The continuous testing cycle comprises of:

- Generation of Test Plans for each test run
- Assignment of test cases to test technicians
- Test execution
- Test result reporting, issue logging



THE TOOLS WE USE

The testing processes are fully covered by the in-house developed, self contained, web-based end-to-end Test/



Continuous testing is suitable for a customer with frequent releases that needs continuous testing. In this case, RT-RK fully allocates technicians to the customer's project. The course of testing can be tracked through our Intent+ platform in real time.

The customer has a full access to Intent+, specialized requirement and test management platform:

- Full set of reports is just a click away at any point of time
- Through Intent+ the customer can actively modify tests and tests plans
- Intent+ offers a full integration with the Redmine platform
- The results of testing automatically reflect in a customer's issue tracking tool
- Issue tracking adapters allow us to quickly integrate into any other customer issue tracking platform

Requirement Management solution Intent+ which:

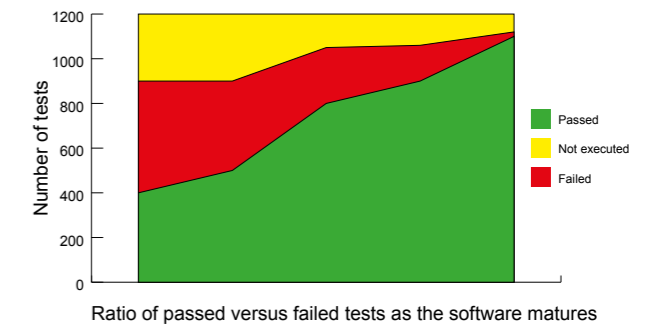
- Combines and links: requirements, tests, test plans, reports, and test equipment at one place
- Provides a complete environment for testing, result management, and reporting
- Provides integration with 3rd party issue tracking systems

The unit of execution is a test plan which is created as a

TEST REPORTING AND DOCUMENTING

Test reports available at any point in time. Each report provides both executive summary and details. Regression can be tracked over different test runs. VTP/Requirement specifications are exportable to PDF or Word document at any time.

subset of all available tests. Once the test plan is created, test suites are assigned to their HW configurations and users who execute them. Technicians manually execute test cases by following steps with detailed instructions from Intent+. The time needed to execute every test case is recorded, testing is integrated with the issue tracking system, and the issues are automatically updated by Intent+ based on the test results.



EXECUTION TRACKING

Our testers use high-end test equipment and assets (signal modulators, specific test streams from our extensive stream base, etc.)

As the customer has full access to the Intent+ platform, testing progress can be tracked live.

Averagely, 50 to 75 manual tests are executed per day per test station (depending on the test suite and stability of Device Under Test).

We constantly monitor testing progress, test execution time and identify bottlenecks of every tester.

COST ESTIMATION

The tools we use allow us to measure test execution times. Based on average test execution times, we can predict execution time for each test plan. Even from a brief description of the customer's product and its features we

can estimate typical test plan size. Based on the test plan size, we can estimate quotes per test run, which simplifies planning the test budget.

EXAMPLE - FUNCTIONAL TEST SUITE FOR ANDROID STB

For this SBT, test suite of 1122 test cases is executed. Cost per run is calculated using the given formula:

$$\text{Cost per run} = \frac{1122 * 100}{60^{**}} = 1870 \text{ €}$$

**-average number of tests executed per tester daily

Test type	No. of tests
Audio	98
Video	27
Front end	28
Zapping	49
Service list	55
Subtitles	24
Android applications	74
Network	18

Test type	No. of tests
Bluetooth	13
IFS	62
External devices support	20
EPG	99



ANDROID

Test type	No. of tests
RCU key functionality	54
Date and time	15
Factory reset	5
Software upgrade	4
Boot	8

EXAMPLE - TESTING OF A TEATRO 2.0 STB

For this SBT, test suite of 1049 test cases is executed.
Cost per run is calculated using the given formula:

Test type	No. of tests
Media center	302
Performance	23
VOD	89
Robustness	43
First time installation	7
Front panel	5

$$\text{Cost per run} = \frac{1049 * 100}{60^{**}} = 1748 \text{ €}$$

**-average number of tests executed per tester daily

Test type	No. of tests
Audio	26
Video	6
Front end	43
Zapping	32
Service list	33
EPG	136
PVR	35
External devices support	14
Software upgrade	21
Picture-in graphics (PiG)	3
Operational modes	17
Date and time	7
UI	202
Multimedia	14
Subtitles	14

Test type	No. of tests
Factory reset	2
Input and output interfaces	20
Response	24
Robustness	19
Smart card	6
Project specific	375
CAK 7.x / DLK 1.1 / IMCL	61
CAK 7.x / DLK 1.0 / IMCL	60
OTA - based on OTV1 Upgrade spec.	1
DDM	48
DAL	205



PROJECT CLOSING

On project closing we deliver:

- The complete requirement specification in a Word/ PDF document
- VTP with the full set of test cases used in the project
- If needed, requirement specification and VTP may be exported to other suitable formats (XLS, XML, etc.)
- Archive of all the reports generated during project lifetime
- Project is archived and stored on our secure servers for a possible follow-up

ABOUT RT-RK

RT-RK is a service provider and product development company in the fields of consumer electronics, communications and multimedia. The company shares revenue from engineering services, integration of own IP blocks, and sales of products. RT-RK IPs are:

- Complete TV SW stack and multimedia solutions, according to European and US standards - www.iwedia.com
- Home automation line of products - www.oblo.rs
- Consumer products testing tools - www.bbt.rs

GOAL

Our goal is to establish new collaborations with companies within our standard business models:

- Near-shore development center
- Project based cooperation

RT-RK Institute for Computer Based Systems

Web: www.rt-rk.com

