IPL intelligent business®

Case Study: Digital Broadcast Products

Founded in 1979, IPL has a long history of successfully delivering excellent value consultancy and end-to-end software-intensive solutions to both the public and private sectors.

IPL's consultancy is renowned for its quality and value. Our consultants are talented and independent-minded individuals with extensive industry experience. We consistently exceed our clients' expectations through a combination of imaginative thinking, managerial and technical expertise and many years of systems engineering experience.

IPL's track record in end-to-end software solutions development is exceptional. Our proven development methodology allows us to cut through technical complexity, manage risk and completely focus on delivery. We consistently deliver reliable, efficient and accurate systems to a precise schedule.

IPL is an ISO9001:2008/TickIT registered company having a permanent workforce of 250, revenues of ca. £25M p.a. and 40,000 sq ft of secure office space in central Bath.

Broadcast SVT automation

Problem

Faulty digital TV broadcast equipment can lead to extremely costly service interruptions and, if commonplace, lead to viewer churn. For this reason, the equipment manufacturers must thoroughly test their products before delivery to their customers.

After the testing of devices in isolation, it is necessary to advance to System Verification Testing (SVT). This comprises numerous tests, of various types, executed on complex system configurations. Often, multiple test systems must be used to represent many customer installations, either actual or planned. The difficulties associated with this complexity often result in manual SVT.

IPL's expert knowledge of digital television systems led a leading broadcast equipment manufacturer, to ask IPL to develop an automated SVT system; one which would avoid the usual manual process problems which include:

- Unreliable tests, because manual testing can be both subjective and inaccurate (e.g. when using stopwatches to time the fault recovery processes).
- Time and resource hungry manual SVT programmes, often taking months, even when no faults are found.
- Limited SVT coverage, restricted by the time taken to set up and run tests on a variety of SUT configurations.

Overall, the poor quality of manual SVT programmes contributed to an unacceptably high risk of faults reaching the field.

Automation of SVT would allow better control of testing, longer and more comprehensive testing programmes, and reliable test repetition.

Solution

IPL developed an SVT Automation (SVTA) system for the manufacturer. It provides control over the digital TV transport streams received by the System Under Test (SUT), and monitors the outputs for performance and standards compliance.

By interrupting signal paths and power supplies, the SVTA system can simulate SUT failures of various types. In this way it is possible to validate the correct operation of failover facilities and to determine the durations of any detected TV service outages.

The developed SVTA system met the exacting requirement to fully test the n+m redundancy operations of complex systems comprising state-of-the-art equipment such as HD encoders and statistical multiplexers.

Test cases are developed using a graphical user interface to the Test Automation engine. Once a basic test case has been produced, the detailed parameters are determined by SVTA 'training', where sequences are executed on a SUT which is known to be good. Experienced SVT staff then have the opportunity to fine tune the test details (e.g. to adjust test tolerances).

IPL worked closely with the client, ensuring that the project's technical requirements evolved so that they continued to meet the emerging needs of the business. IPL was flexible throughout the project, adapting readily to the client's demanding budget and time constraints.

Benefits

By involving IPL in the SVTA development programme, our client reaped significant benefits in two fields; project delivery and system capability.

Delivery

From the start it was clear that multiple SVTA development phases would be necessary, each of which had to be in accordance with a limited budget and a strict, market driven delivery schedule. To reduce the overall project risk, IPL outlined the full system requirements before beginning development work.

IPL addressed all the complexities of this high risk project by planning an aggressive parallel and flexible approach to requirements analysis and system implementation. With careful control of requirements analysis, structural design and implementation activities, IPL successfully overlapped these two interdependent processes.

Key to the project's success was IPL's ability to;

- appreciate, analyze and refine the customer's stated need;
- form a consolidated set of business requirements;
- develop a coherent and practicable solution architecture;
- consider the technical options;
- deliver a reliable and effective solution, on time and to a fixed price.

Throughout this complex project, with its overlapping implementation phases, IPL continued to manage risk, handle requirements changes and carefully monitor progress against budgets and time scale.

IPL consistently met the client's expectations of time, cost and quality, and delivered all the essential components of the system. At this point it became clear to the client that it now had a tool with substantially greater potential than had previously been envisioned. The customer then revisited the "desirable" features listed in its original concept documents, and realised that IPL's solution architecture formed an ideal foundation for their future implementation.

Capability

The delivered SVTA system allows the client to run extensive and consistent testing with minimal manual interaction.

Where manual SVT is usually limited to the testing of a few TV services, the SVTA system has the ability to test all of the outputs of the SUT. This could include over 100 TV services.

The capacity to dynamically alter the system configuration during a test, which is automated by the SVTA system, as opposed to the previous method of physically adding and removing hardware, hugely increases the speed of test sequences. Combined with the SVTA's designed-in scalability, this gave the client the ability to test multiple customer configurations, however large, in a single unmanned test run.

A further benefit of the system is the ability for equipment to be tested at physically remote locations. Previously the SVT engineer needed physical visibility of all the hardware under test in order to read the status, and to alter the configuration. This can now all be done remotely, which again greatly increases the rate of testing.

The learning mode dramatically decreased the time spent developing tests, when compared with an ordinary scripted automation tool. The ability to edit key parameters in these tests allow them to be used as templates: hundreds of tests can now be run with slightly different key values but following the same sequence, with only minor additional test design effort.

SVT programme durations can now be reduced from months to weeks. Test accuracy and repeatability have increased, and there is now a clear route to significantly reducing the risk of in-the-field faults.

Consequently, product engineering and maintenance costs have been reduced, and customer experience has improved.

Digital TV networks have broadcasting centres, or Head-Ends, populated with large numbers of specialised devices, such as receivers, encoders, multiplexers and modulators.

Chains of equipment form systems, each of which combine a number of TV services as transport streams, and then prepare them for transmission.

Because these systems are critical to the operation of the TV network, they are built to allow for device failures and to continue with little or no effect to TV viewers.

LLOYD'S REGISTER QUALITY ASSURANCE ISO9001 — UKAS MANAGEMENT SYSTEMS 001

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