CANTATA

QA SYSTEMS
The Software Quality Company

SECTOR
IT & Telco

Case Study

DR. KEIL INFORMATIONSTECHNIK GmbH & Co. KG

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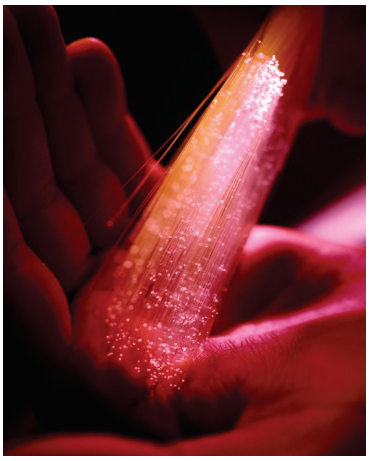

ABOUT THE COMPANY

Dr. Keil Informationstechnik offers high quality services for the implementation of their customers' IT plans.

The company sees itself as one source for consulting, software development and application management.

For more than 20 years, leading companies have chosen Dr. Keil Informationstechnik. Customers are found in numerous sectors, including:

- Telecommunications
- Automotive
- Banks / Insurance

"Reliability, reliability and more reliability!"

Background

Dr. Keil Informationstechnik GmbH & Co KG is a leading consulting and software firm. Their client (who cannot be named for commercial reasons) is one of the world's largest suppliers of telecommunication equipment. With a global customer database, they sell to national PTTs and other network providers, offering a variety of services, ranging from hardware components, to complete turnkey systems. The products offered cover both fixed and mobile networks.

One of the most significant elements of these large-scale systems is the administration module which controls user access to the network. It was agreed that this module in the client's system required a major revision and as such, a project was design that aimed to create the new release.

Reliability

At the top of the list of customer requirements was "***Reliability, reliability and more reliability!***". The maximum downtime permitted with this system was 0.5 hours per year; this precise limitation forced the highest possible emphasis on testing. Everything, from the lowest level software unit, to the fully integrated equipment, had to go through a rigorous program of testing to ensure that the necessary reliability was 'built in'.

Dr. Keil Informationstechnik appointed Michael Zeiner as in charge of software testing. The system was to be implemented with Client-Server architecture and the language to be used was C++. The software testing had to cover a wide spectrum of activities, from the unit/class level and up to the subsystem and system levels. The job was further complicated by the need to test many different types of components, including algorithmic functions and methods, interfaces for an OO database and GUI classes, that deal with user interaction. Additionally, the company needed to consider testing the interaction between clients and servers, under varying loads.

The immediate challenge Zeiner faced involved defining a set of standards for the different tasks and choosing the tools that would allow them to be carried out in an efficient way. Cantata was selected as a possible candidate and, within six months, proved so effective that it was adopted as the main software test tool. According to Zeiner, the key aspect of its functionality that led him to choose the tool was Cantata's versatility: although procured mainly to help with unit testing, **the tool proved flexible to the point where it could be used for numerous other testing tasks**.

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Why Unit and Integration Test?

Coverage Was Key

Zeiner was familiar with the key coverage principles. He knew that 90% of the code in any system can be tested (i.e. 90 % statement coverage) in half the available time, and that the remaining time should be spent chasing the last development. Nevertheless, in the case of finite state driven software, this last fraction of the code is involved in approximately 45% of all possible states the software under test may reach.

Although the developers wanted to stop testing at the 90% statement level ('as almost all the code is working'), Zeiner determined that their integrity requirements demanded a much higher level of coverage. The results provided in Cantata's coverage reports convinced the project leaders to insist on continuing testing, so as to reach the goals for decision coverage - 97% and Boolean coverage - 70%.

From Unit to Cluster Test

Having used Cantata to test code at the class level, the need to start testing at a more functional level arose. The problem of stubbing C++ classes was a severe one, and this affected all types of components, whether algorithmic or those providing user or database interfaces. The team looked, therefore, for a way of getting both the benefit of test depth, as that of "classic" isolation testing, and of testing the special features of OO code (derivation, containment, messages, notifications, etc.).

The solution was to define clusters of typically 2 - 10 classes, and objects that could be seen as functionally coherent , i.e. working on the same functional task. These clusters were then tested independently of other clusters. By sensible selection of objects to go into each cluster, it was possible to make the number of stubs required perfectly manageable. By implementing intelligent interfaces to these stubs, it was even possible to test other cluster objects and so, quite a few errors were discovered without any additional effort.

GUI and Database Objects

In addition to testing the traditional algorithmic objects, Cantata also helped with checking the graphical user interface components and database objects. This was done by sending, receiving and checking messages and notifications, all from within the Cantata test scripts. A similar method was also used to test at the Client/Server level: tests were written to test both the server and the client, with test scripts used to simulate the other party. Using this technique, it was possible to test the server under load from several simulated clients with scripts behaving as the clients. According to Zeiner, "*The client felt like it was being served by its real server. The test cases came from the specification of the functionality of the server.*" Cantata also allowed for load and performance tests: "*Without Cantata scripts we would have had to use more than one tool, or much more work would have been necessary, or probably both.*"

Companies in the IT & Telco sector perform unit and integration tests to make their testing more efficient.

Reduce Commercial Risk

> Increase software quality by thorough unit testing to prevent impacts on corporate and brand reputation

> Use state of the art testing to prevent against fitness for purpose litigation

> Systems are too complex to thoroughly test, so they are decomposed into testable units

"Without Cantata scripts we would have had to use more than one tool, or much more work would have been necessary"

Minimize Overall Testing Cost

> Testing code earlier is cheaper (less re-work costs)

> Most effective use of testing resources (unit tests do not have to wait for system builds)

> Increases overall software quality (more thorough testing is possible at unit level)

All case study text has been approved by the relevant customer.
QA Systems acquired the Cantata business taking over all development, support and sales from IPL in March 2012.
Cantata is the extension of the Cantata++ tool.

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