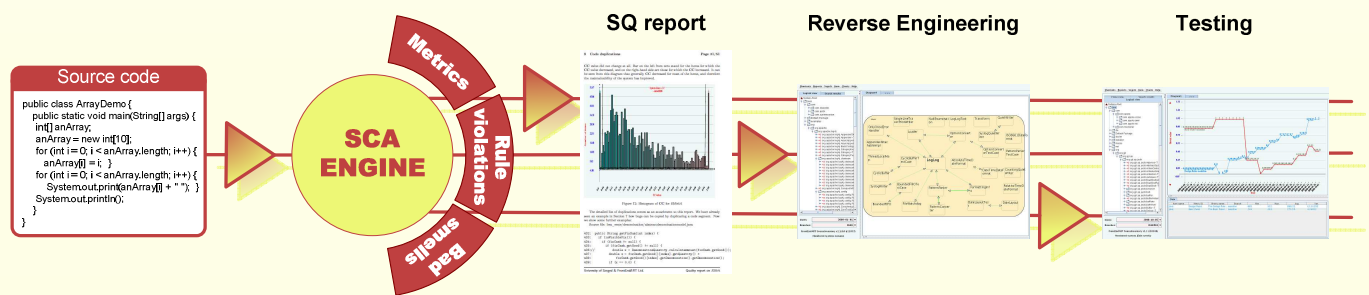


Automated Source Code Analysis

A new innovative approach to software quality management concentrates on the core of the IT product, namely the source code. Through Source Code Analysis (SCA) identification of bugs, other coding rule violations, bad smells (problematic code sections) and metric measurement of software quality can all be attained easily. The specialized SCA engine we use enables an automated examination of the software's innermost parts which usually remain hidden to users lacking a high level programming and specific software design knowledge.

Our Services



Software Quality Report: First we scan and analyze the code of the client-appointed software using the SCA engine. Based on the results we prepare a comprehensive written software quality report by comparing different aspects of the source code with a benchmark database containing results from numerous assessment projects. The report also gives an insight into design problems, bugs, coding problems and code duplications. The major aspects of our analysis are the followings:

Basic code metrics: The SCA engine prepares powerful statistics on source code attributes such as Size, Complexity, Cohesion, Inheritance and Coupling.

Rule violation detection: An extensive set of coding rules is integrated into the SCA engine. The engine's own internal programming rules (developed by programmers with years of coding experience) are complemented by external rules of the open source community. These sets are expandable on demand with organization or software specific program code standards such as naming convention, code security and coding style infringements. By scanning the source code with the SCA engine, we generate warning lists of these rule violations which may indicate bugs and/or bottlenecks.

Bad smell identification: A wide range of coding behavior is described in scientific publications as having high probability of evolving with low effectiveness or even erroneous operation (i.e. copy & paste programming). The SCA engine we use is designed to identify and report a high variety of such code segments.

Reverse Engineering Support: Using nothing but the source code, we identify the design entities of a program with the SCA tool, and then chart the relationships between them. After the completion of this automatic process the information can then be viewed in UML format and graphically displayed to show the software's basic system design. This constitutes invaluable information to IT experts and can greatly speed up the reverse engineering process.

Complementary Testing Services: The SCA tool we use is also designed to support our client's testing & acceptance processes in a useful way.

Automated source code testing: By integrating the SCA engine into the testing process, we can continuously identify significant ascent/decline of metrics, rule violations and bad smells. Think of it as receiving a simplified quality report for every software version. This gives direct and constant feedback on software quality to developers and organizations alike. If quality thresholds are defined, automatic alerts can be also sent whenever quality is below expectations.

Measuring test case coverage: The SCA engine can track executed code branches during software use. Using an online listener, if all available test cases are run, we can evaluate and measure the percentage of code the testing activities cover. This lets us measure and assess the risk level of going live with current test case coverage.

Source code alteration: The SCA engine saves all loaded code versions and analysis results. By comparing two software versions we can identify source code alterations on a function level. Using this information a test manager can create a more efficient and targeted test plan by selecting test cases which verify the changes in the code.

About our SCA tool

Our software quality services are based on a toolset named Columbus founded on methodology conceived by the University of Szeged's Software Engineering Department. The software is currently developed and distributed by FrontEndART Ltd (www.frontendart.hu). This application enables the parsing, internal representation and exporting of information extracted from different source files. After source code interpretation, queries can be carried out through a browser-based user interface to study different aspects of the source code. With the help of the Columbus program SCA based quality management can be fully automated by customized report generation and forwarding.

The tool was originally developed for and used by Nokia. Since then Columbus has grown into a standardized product with enhanced functionality and ever-growing programming language interpretation capabilities. Other well known organizations such as Openoffice.org, the Mozilla community, Erste Bank Hungary, Lombard Ltd. have all successfully used this tool to improve the quality and dependability of their software.

Basic components and capabilities of Columbus

Basic services

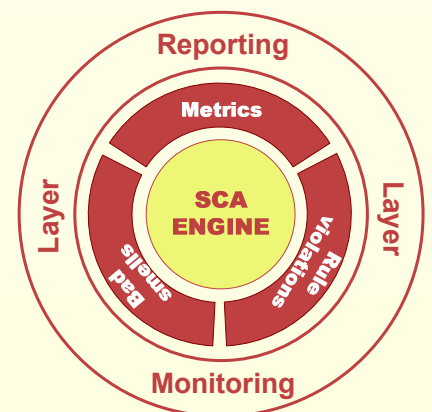
- Basic Software Metrics – Metrics measure complexity, size, cohesion, inheritance and coupling attributes of the software
- Rule violation detection – Warning list generation for both internal and external coding rule, naming convention, code security and coding style infringements
- Bad smell identification – Identification of code parts with a high probability of evolving with low effectiveness (i.e. copy & paste)

Reporting layer

- GUI supported query execution for all basic service-related quality issues
- Graphical display of how selected quality values change between software versions
- Function for saving custom query scenarios
- Possibility to quickly view source code sections identified as problematic or faulty

Monitoring layer

- Automatic generation of customized software quality reports and forwarding via email
- Automatic notification when quality threshold limits are reached
- Continuous measurement and monitoring of custom software through the integration of Columbus and a version control system
- System administration functionality (users, rights, basic settings)



Our SCA engine currently supports:
C, C#, C++, Java, PL/SQL, SQLJ

Case studies

Source code quality improvement OpenOffice

A project supported by the EU for analyzing, improving and monitoring the quality of OpenOffice source code. More than 5 million program lines and 330 thousand functions were automatically analyzed. The applied methods included the analysis of source code and the extraction of information from which standard metrics like cohesion and coupling were calculated. The problematic code fragments were refactored by the developers to obtain better quality code. The resulting patches were contributed back to the OpenOffice community. The built solution is still used to continually scan and monitor software quality.

Software quality monitoring system Evosoft Ltd.

In order to fulfill the need to gain constant feedback on the software quality of developer releases, the developer company integrated the Columbus toolset into their version control system. This allowed the lead designer to control and monitor the changes in the source code, to view rule violations, possible bugs throughout the releases. The system also sent preset reports to specified email addresses for each new version of the software. By using the monitoring system, automated source code analysis was integrated into the fundamental development process of the company.

Quality management utilization study Erste Bank Hungary Ltd.

After realizing the business benefits of source code analysis, the bank decided to strengthen the control over software quality through the use of the SCA tool. They needed an action plan for SCA implementation on all levels of software-related processes. Based on a comprehensive audit, a study was prepared to point out utilization possibilities of the SCA tool and to define long term plans on how to achieve different levels of software quality management. As part of a pilot project a software quality report was prepared for the bank's most business-critical branch front-end system.

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