Machine Learning for Code Analysis at the Federal Employment Agency

Capgemini

Client:
FEA
(Federal Employment Agency)

Country:
Germany

> *"Capgemini's approach of using machine learning for static code analysis has enabled us to further improve our quality assurance. Thanks to the tool, we can now identify errors in new code on the basis of verified source codes, even if no corresponding rule for this error has been manually defined in advance."*
>
> **Thomas Paal**
> Business Unit Leader
> Federal Employment Agency

Successful Code Analysis using Machine Learning at the Federal Employment Agency (FEA)

The Situation

2005 HARTZ IV – Law for the Labour Market Reform

Starting point for the consolidation of unemployment and social benefits

4,9 million unemployed

The responsibility of FEA is to ensure that unemployment benefits are paid on time and correctly.

2018 The system used by the FEA for the calculation and payment of about 25 billion Euros in unemployment benefits per year consists of about 800,000 lines of code and performs millions of transactions each month.

Client Challenges/Business Needs

Prior to each update, conventional quality control methods thoroughly test the software. However, even for advanced developers, there are errors that are hard to identify using standard code review methods.

Tests cover only a majority of the code and these errors often reside in the remaining percent of code.

The Federal Employment Agency has very high quality requirements and already uses static code analytics tools. They analyze code against pre-defined rules. If a rule is violated, it is potentially a code error. However, this means that only errors that violate existing rules can be found. It is therefore difficult to identify complex problems and solve them without hotfixes.

Solution-at-a-glance

Together with the FEA IT systems integrator and the University of Potsdam, Capgemini developed a machine learning-based, static code analysis tool to find patterns and rules for error-free code in a code base.

On the one hand, more errors are identified and corrected, but above all this happens before they occur and can cause damage.

The Federal Employment Agency can now identify code errors more easily during testing.

Results

Optimized quality assurance

- Identification of code patterns and software errors
- Identification of useful rules that affect functional and non-functional requirements
- Avoidance of hotfixes

The Benefit

- Increased security of the system
- Enhanced Efficiency
- Avoidance of similar issues in the future
- Software failures are prevented

The Future

Machine Learning offers considerable potential for efficiency and quality improvement in the future!

The Collaborative Approach

Together with the FEA, IT systems integrator and a group of students of the Chair of Business Informatics, Processes and Systems at the University of Potsdam, Capgemini has founded a research group for machine learning in static code analysis. The concept of the Collaborative Business Experience™ is a central component of the corporate philosophy and is intended to support business processes and innovations through a collaborative and people-centred approach. In this case, every second week there was a telephone exchange with all participants on how additional patterns and association rules could be found in the code and used for better error detection.

About Capgemini

A global leader in consulting, technology services and digital transformation, Capgemini is at the forefront of innovation to address the entire breadth of clients' opportunities in the evolving world of cloud, digital and platforms. Building on its strong 50-year heritage and deep industry-specific expertise, Capgemini enables organizations to realize their business ambitions through an array of services from strategy to operations. Capgemini is driven by the conviction that the business value of technology comes from and through people. It is a multicultural company of 200,000 team members in over 40 countries. The Group reported 2017 global revenues of EUR 12.8 billion.

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