

Dice



DICE will define a quality-aware model-driven framework for developing Big data applications. The project will offer a novel UML profile and tools to help software designers continuously enhance quality of data-intensive software systems, focusing on reliability, efficiency and safety characteristics.

AT A GLANCE

Project title:

Developing Data-Intensive Cloud Applications with Iterative Quality Enhancements

Project coordinator

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Partners from:

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Institute e-Austria Timisoara (RO)
XLAB (SL)
Flexiant Limited (UK)
Athens Technology Center (GR)
PRODEVELOP (ES)
Netfective Technology (FR)
Universidad de Zaragoza (ES)

Duration:

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Total cost:

€ 3.95 M

EC Contribution:

€ 3.95 M

Programme:

Horizon 2020

Further information:

Website: <http://www.dice-h2020.eu>
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Context

Recent years have seen the rapid growth of interest for cloud applications built on top of Big data technologies such as MapReduce/Hadoop, NoSQL databases, cloud-based storage, and stream processing systems. However, there is a shortage of models, methods and tools to analyze, predict and guarantee efficiency, reliability and safety in data-intensive software systems.

Objectives

DICE will define a novel framework for quality-driven development of Big data applications. The DICE methodology will cover quality assessment, architecture enhancement, continuous testing and agile delivery, relying on principles of the emerging DevOps paradigm. Specifically, DICE aims at:

- Tackling skill shortages and learning curves in quality-driven development and Big data technologies through open source development tools, models, and methods.
- Shortening the time to market for data-intensive applications that meet quality requirements, reducing costs for independent software vendors (ISVs) and increasing value for end-users.
- Reducing the number and the severity of quality incidents by iteratively learning the quality-levels at runtime

of the application at runtime, feeding this information back to developers.

To achieve these goals, DICE will offer a model-driven engineering (MDE) framework for Big data applications based on UML. The framework will feature a quality engineering tool chain for simulation and verification of efficiency (cost and performance), reliability, and safety properties of the application. Using a DevOps-inspired approach, the DICE framework will deeply analyze monitoring data collected during testing and operation with the goal of automatically identifying quality anomalies and anti-patterns in the architecture design. This will help developers to understand the root-causes of quality incidents. The DICE framework will be evaluated in three industrial demonstrators in the areas of news and media, maritime operations, and legacy e-government software systems.

Solution

The DICE framework will feature several novel models, methods and tools:

- *DICE profile*: a MDE profile to develop Big data applications and annotate their quality requirements;
- *DICE IDE*: an integrated development environment to accelerate coding and application design;
- *Quality analysis tools*: a set of tools for quality-aware decision-making via simulation, verification and numerical optimization methods;
- *Iterative quality enhancement tools*: an engine that will continuously detect quality outliers from monitoring data and provide recommendations on possible architectural enhancements.
- *Deployment and testing tools*: tools

and recipes supporting delivery, configuration, continuous integration, quality- and unit-testing.

A summary view of the project methodology is shown below, highlighting in red some of the key components of the framework and the main innovations compared to standard MDE approaches.

Expected Impact

DICE will deliver innovative development methods and tools to strengthen the competitiveness of small and medium European ISVs in the market of business-critical data-intensive applications. The barriers that DICE will break are the shortage of methods to express data-aware quality requirements in model-driven development and the ability to consistently bring these requirements forward throughout the tool-chain of quality analysis, testing, and deployment.

Tackling these barriers will realize the breakthrough of accelerating the development of business-critical data-intensive applications, by fostering shorter development, deployment and testing cycles. This will increase the competitiveness of the European software engineering industry, especially of small and medium ISVs that cannot afford dedicated quality teams.

End-users of DICE will be primarily software engineers and architects in small and medium ISVs with knowledge of UML, but without advanced expertise in quality engineering. The goal is to put these end-users in condition to perform advanced quality engineering of Big data products.

