



Project Results

MEASURE

A deeper level of software analysis

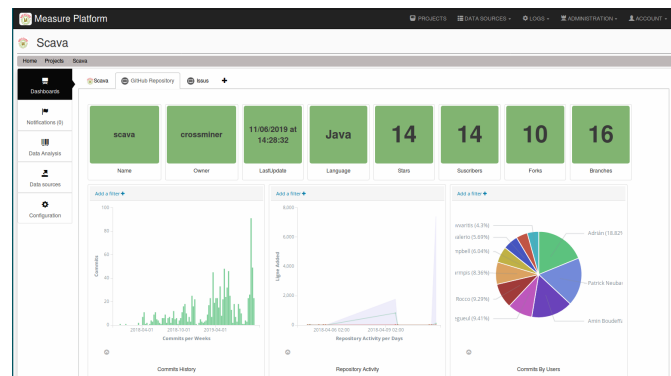
EXECUTIVE SUMMARY

The ITEA project MEASURE increases the quality and efficiency of software engineering via a centralised platform that collects performance metrics from different development phases. By continuously measuring the functioning of systems, software companies can simultaneously improve their products, time-to-market and competitiveness.

PROJECT ORIGINS

As the software industry becomes increasingly saturated and systems become more complex, a key question arises: how can we create products at lower costs and quicker times-to-market without sacrificing quality? Automation is proving difficult to advance as it requires measuring the current performance of systems to a higher level of detail than is currently practised. Additionally, imprecise metrics must be agreed at the start of each project and outputs across projects are often not comparable. For future innovation, existing metrics must be redefined, and new metrics must be created. Due to short development cycles, feedback must also be automated, continuous and visualised for various stakeholders. Using a core metamodel for model-driven engineering, MEASURE can provide this.

MEASURE (Measuring Software Engineering) is a solution to the lack of communication across software lifecycle phases. Designers, developers, testers and project managers all use different tools to collect metrics, none of which offer deep analysis for decision-making. In contrast, the MEASURE platform is centralised and visualises information on metrics-based dashboards that allow links to be made between stakeholders. This approach is modular, extendable and/or domain-specific. Constant data analysis provides real-time recommendations that ensure a swift response to issues that increase costs or delay development. One important innovation has been the creation of a catalogue and database of formally-specified



MEASURE Platform Dashboard example

metrics which can then be reused or combined for complex computations. This was achieved through a common language with enough flexibility for descriptions to be applicable to multiple metrics without creating ambiguity.

TECHNOLOGY APPLIED

Interoperability and extendibility are crucial to MEASURE. As a standardised approach, independent of platform and methodology, the Object Management Group (OMG) Structured Metrics Metamodel (SMM) has been adopted in the form of the modelling tool Modelio and its SMM modelling extension. The SMM standard defines Measures, which are autonomous Java programs that create a link between the MEASURE platform and data sources, such as remote services. Measures that address a functional requirement are called Business Applications.

As data collection algorithms are generic, Measures must be configured to their specific context to begin collecting measurements. Data is stored in a NoSQL database and can be presented to end users via a decision-making platform. This web application organises Measures and Business Applications according to project or development phase and transforms them into charts using integrated visual dashboards. A catalogue of more than 200 of these currently exists, with the option for users to create their own using Modelio. In terms of analytics, all tools are external in order to guarantee interoperability. Deep integration has been achieved through a REST API that allows analysis tools to register to the platform and access Measures. In turn, analysis tools can embed webpages into the platform's web application. This allows for the inclusion of historical values and extendibility to any existing tool.

MAKING THE DIFFERENCE

The software analytics market is expected to grow to USD 11.5 billion in 2023. Through its consortium of commercial tool vendors and open source tool developers, MEASURE makes it easier for businesses to create new models and enter this fast-growing market. Bitdefender has been a particular success story. By using MEASURE to provide enterprise security analytics services for the first time, they estimate a revenue increase of EUR 1.5 million within three years of the project's end. Security analytics was included as an advanced security component in Bitdefender's Gravity Zone solution for the enterprise users as a set of tools to analyse and report suspicious activities using several detection and visualisation capabilities.

MEASURE also has implications beyond industry. During the project, universities used the platform to increase their knowledge base. ICAM, for example, has created 36-hour IoT courses for engineering students. In 2018 and 2019, a total of 56 students followed this course. The University of Bucharest has incorporated the project into a software engineering course involving two postdocs and two PhDs. Also a collaboration with the Aston University and the York University was put in place for the integration of the Hawk measurement tool. Dissemination is ongoing: eighteen conference papers and one journal have been published and a

site for further commercialisation has been created, <http://measure-platform.org/>, including guides for users to integrate the platform. This should lead to the development of an open source community that will enable MEASURE to extend to new and innovative domains.

In addition to the platform itself, ten measurement and analysis tools have already been developed with which companies can accurately evaluate their software engineering environments in real time, conduct root cause analysis for debugging and uncover performance bottlenecks. The analysis tool Stracker, for instance, uses machine learning and forecasting algorithms to predict future software metric values. Softeam used this tool in its case study in which they were able to estimate a budget saving of 5% thanks to earlier uncovering of software problems. Moreover, SMEs that would normally be excluded from such high-level analysis are able to purchase Business Applications which are tailored to their specific functionality. As a result of the project, Softeam has hired two software developers and one salesperson, while Montimage has also hired an additional salesperson. The rest of the consortium are also positive about the benefits: 71.4% of partners expect a development productivity increase of at least 10% and 50% expect a software quality increase of over 15%. As the platform expands with new Measures and tools, this can only increase.

MAJOR PROJECT OUTCOMES

Dissemination

- 18 conference publications & 1 journal: e.g. MeGSuS@ESEM 2016 & 2018, MODELSWARD 2018, ENASE 2018, ICISOFT 2018, MODELS-SAM, TAROT, ICSSEA, ICAM-Russia.
- Product presentations at 7 conferences: e.g. OW2Conf, TAROT, ENASE, MeGSuS, ESEIW.
- Participation in 6 industrial events: Cyber Investors Day, Forum Enterprises, FIC 2019, Mobile world congress, Cloud Expo, European Big Data Value Forum.

Exploitation (so far)

New products:

- Measure Platform: integrated open source solution to address all your requirements related to metrics extraction and data analysis.
- Measurements Tools: large set of domain specific measurement tools addressing network monitoring, IoT devices monitoring and Modelling tool metric extractions.
- Metric Suggester: tool to automatically analyse measurement results of a defined number of metrics in order to suggest a new measurement plan better adapted to the software needs.

New services:

- Deployment and customisation of monitoring solution based on open standard.
- Developments of new Data Analysis services based on the Measure methodology.

Standardisation

- Joined the SMM task force dedicated to standardisation of Metrics modelling.
- Standardisation activities on the ETSI TDL standard to design efficient testing architectures.

ITEA is a transnational and industry-driven R&D&I programme in the domain of software innovation. ITEA is a EUREKA Cluster programme, enabling a global and knowledgeable community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society.

MEASURE 14009

Partners

France

DCNS

ICAM

Institut Mines-Télécom SudParis

Montimage

Softeam

Netherlands

VU University Amsterdam

Romania

Bitdefender

University of Bucharest

Turkey

Ericsson Ar-Ge

TMOB Bilisim

Turkcell Teknoloji

Turkgen

Project start

December 2015

Project end

August 2019

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