



Project Results

MEDUSA

Real-Time Collaboration through the Cloud for Acute and Non Acute Medical Situations

Executive summary

The ITEA 2 MEDUSA project enhances the quality of diagnosis and decision-making in acute and/or critical situations in a patient's condition by introducing the integrated combination of three new healthcare service concepts – advanced imaging, secure virtual workspaces and medical diagnosis support – which is a quite new approach. It paves the way for new, commercial services in the European healthcare business by offering a combination of advanced real-time image processing, real-time decision support, secure and rapid exchange of massive data sets within virtual collaborative workspaces.

Project origins

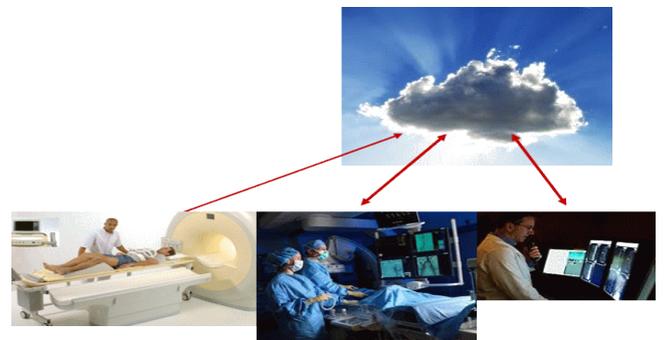
Nowadays, the sources and the typologies of medical knowledge involved in patient treatment and follow-up are growing exponentially, enabling us to boost the wellbeing and life expectancy of the European population. This growing knowledge comes hand in hand with high levels of specialisation and an increasing need for information about a patient's condition. In critical situations the missing piece in the puzzle is an intelligent, virtual collaborative workspace that enables physicians, wherever they are, to consult with each other, respond to each other's diagnoses and arrive at a collective, responsible decision on the treatment, thereby minimising the attendant risks for the patient. MEDUSA addressed these issues by linking the required medical expertise within a virtual collaborative workspace for diagnosis with medical protocol support, in which quality, real-time availability and privacy protection are key features.

Technology applied

The added value of a virtual collaborative environment and the application of innovative solutions were illustrated through three use cases. The first addressed acute trauma care, in which time and the immediate availability of specialised expertise are crucial. By enabling

remote collaboration

MEDUSA addresses the main bottlenecks in the current diagnosis process: real-time and continuous transmission of sensor data from the ambulance to trauma specialists in the hospital, real-time interpretation of these data to enable a more specific and objective diagnosis (based on legally approved medical protocols), the secure and fast exchange of images, and advanced image processing as a service to regional hospitals. In the second use case of an acute ischemic stroke, consultation among a team of experts is made possible through the use of remote collaboration technology while all the required image data, image data processing and communications between the experts are made available by MEDUSA technology and can be accessed by authorised physicians for a fast and well-informed decision. Since a decision can be taken while minimising patient and physical data transportation, this saves valuable time, and money, in the end. In the third use case, cancer treatment, a crucial step in radiation oncology is the delineation of the areas to be irradiated (tumours) and to



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preserve organs at risk. Thanks to MEDUSA, the experts can access remotely the contouring application, manage information from multi-modality imaging and collaborate in real-time on the patient case. Additional use cases on virtual microscopy, post-traumatic coma assistance and cross-disciplinary medical meetings were also considered in the project.

Making the difference

The MEDUSA project provides solutions to on-demand, high-performance image processing, all of which share the common cloud-based framework. Furthermore, MEDUSA produced compression-based techniques for optimised image transfer and image processing in addition to advanced processing capabilities to extract required information from the images to optimise

treatment and clinical decision support. The decision support functionality also provides doctors in a collaborative session with alerts about dangerous trends in a patient's condition. These trends are captured by sensors on the patient that are connected to the cloud through mobile applications to be interpreted in real time by rules defined in approved medical protocols.

NICo-Lab, an AMC (University Medical Centre in Amsterdam) spin-off for automated neurovascular image analysis supporting multi-centre trials, has been created to leverage market access for the MEDUSA cutting-edge research results. In the area of medical system end-to-end protection, an overall security architecture meeting privacy requirements in virtual medical collaborative workspaces has been defined. It includes resources ensuring authentication, confidentiality, integrity, availability and content tracking. MEDUSA relies on an infrastructure as service (IaaS) coupled with a dynamic Cloud management system that allows the optimum deployment and execution of application components.

Both legacy (mono-platform) and cloud-based applications can be deployed in the MEDUSA virtual collaborative space, thanks to optimised, cross-standard virtualisation solutions. uStartApp, an IMT spin-off, was created to offer the market advanced cross-standard solutions for building, in only 10 clicks, a SaaS offer around legacy medical applications. Furthermore, during the course of the MEDUSA project Philips developed infrastructure as a service (IaaS) for future products. For instance, the already existing IntelliSpace Discovery product, targets academic hospitals worldwide to support the fast, solid development of new medical algorithms and prototypes that can be easily and quickly integrated in new Philips products. By the end of 2020 Philips expects to support 140 applications annually for prototypes developed by academic hospitals. MEDUSA helped identify the boundaries for the product requirements, providing insight into relevant business models and jointly validating the development cycle for clinical prototypes.

Major project outcomes

Dissemination

- 22 journal articles; 1 book chapter; 5 international conferences; 16 oral presentations; 1 white paper
- 1 HDR Thesis, 1 defended and 3 on-going PhD thesis

Exploitation (so far)

- **IntelliSpace Discovery product from Philips, targeting academic hospitals. It supports fast and solid development of new medical algorithms and prototypes**
- **Atos/Bull delivers hardware security modules to the cloud domain. This allows to embed a signed full user environment the HSM market**
- **Improvements on the decision support in the Accolade product of Sopheon**
- **A consolidated Use it Cloud solution from Prologue for cloud management, enriched for the healthcare domain, and sold in partnership with infrastructure providers or as an independent subscription-based platform**

Standardisation

- ISO/IEC JTC 1/SC 29/WG 11 (MPEG) on "Collaborative Binary Formats for Scenes" and on "User Description"
- Cross-standard actions between ISO and W3C

Spin-offs

- uStartApp; facilitates SaaS creation for legacy applications
- NICo-Lab; Cloud based high throughput image analysis for clinical trial support

ITEA is the EUREKA Cluster programme supporting innovative, industry-driven, pre-competitive R&D projects in the area of Software-intensive Systems & Services (SiSS). ITEA stimulates projects in an open community of large industry, SMEs, universities, research institutes and user organisations. As ITEA is a EUREKA Cluster, the community is founded in Europe based on the EUREKA principles and is open to participants worldwide.

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Project start

January 2013

Project end

December 2015

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