ITEA 3

Project Results

# SoRTS

## A system of real-time systems for more effective healthcare


### EXECUTIVE SUMMARY

**The goal of the SoRTS project was to develop a System of Real-Time Systems to support healthcare professionals in the transition from invasive, open surgery to minimally invasive, image-guided intervention and treatment (IGIT). The outcome not only boosts the productivity and effectiveness of cancer treatment and reduces patient risk but also significantly lowers healthcare costs through shorter hospital stays and higher throughput.**


### PROJECT ORIGINS

While there have been considerable advances in recent years in the oncological and radiotherapy treatment of cancer, a major challenge still faced by IGIT is the availability of coupled real-time feedback of the imaging and therapy systems during interventions. Essentially, the problem is that the movement of a tumour in the abdomen under the effect of e.g. respiration, risks damaging surrounding tissue, whereas the only imaging modality, MRI, that can visualise the tumour well traditionally has image creation times of minutes. However, the image-based feedback has to be available within a fraction of a second. SoRTS came up with a solution to this problem in the shape of the MR-linac system, which is designed to improve the targeting of tumour tissue while reducing exposure of healthy tissue to radiation, allowing physicians to precisely target a tumour, even when tumour tissue changes shape, location, size or composition during treatment.

### TECHNOLOGY APPLIED

In the SoRTS solution, the imaging and therapy-delivery systems comprise multiple real-time control systems, hosted on separate computers. A Real-time Therapeutic Procedure Supervisor (RTPS) provides the required architecture for adaptive real-time image guided therapies that allows real-time communication and supports heterogeneous algorithms, deployed on heterogeneous high-performance computing hardware including visualisation chains. A distributed architecture with network interfaces for the real-time exchange of information safeguards the integrity of the composing systems such as the imaging system and the therapy system.

The successful technological solution has been built on the power of collaboration between the Dutch, Swedish and Finnish partners in the value chain for state-of-the-art IGIT. The highly advanced, Magnetic Resonance Imaging (MRI) imaging systems of Philips, for example, are made suitable for low latency real-time feedback during image guided interventions while therapy systems, like brachytherapy, linear accelerator (Linac) and high intensity focused ultrasound (HIFU), as provided by Nucletron, Elekta, Philips Finland and UMCU, can destroy malignant tissue via a minimal or non-invasive method. The need to develop and optimise clinical procedures to determine the most effective and efficient usage of automated image guided interventional systems was answered by UMC Utrecht, which validated such procedures in several radiotherapy

ITEA 3

applications. Finally, a Real-time Therapeutic Procedure Supervisor integrated image controlled therapy by independent systems allowed the deployment of specific algorithms developed according to needs of any partner in the chain, without the need to upgrade or replace individual systems.

## MAKING THE DIFFERENCE

The project has provided state-of-the-art technology to Philips MR diagnostic systems and allows the exploitation of real-time motion correction. With the key innovations Philips MRI will sell 50-100 systems in Europe on a new market, meaning an addition of more than 5% to the present MRI market of €4.5 bilion. Philips is preparing a CE-marked compressed-sensing product to be released in June 2017 and aimed at mainstream use. Dutch-based technology integrator Technolution will benefit from its participation in SoRTS by improving its core-business in providing solutions for real-time multi-core hardware for medical and for non-medical applications, with an emphasis on enabling the integration of existing applications with very few adaptations to the new framework.

The Swedish project partner Elekta, which pioneers significant innovations and clinical solutions for treating cancer and brain disorders, Philips and The Christie NHS Foundation Trust in the UK have initiated the installation of an investigational high-field MR-adaptive linear accelerator (MR-linac) system at The Christie. The Christie is the sixth global site to install the MR-linac system. Others include the Netherlands Cancer Institute, the University Medical Centre Utrecht, the University of Texas MD Anderson Cancer Center and the Institute of Cancer Research, working with its clinical partner The Royal Marsden NHS Foundation Trust in London. The more the precision increases, the greater the potential for the system to be used for all the patients at these centres who need to be irradiated.

SoRTS provides the technology basis for more automated image guided therapy products. Not only will this enlarge the customer base for both imaging and therapy systems but it will also extend the market to new applications, because the RTPS developed in SoRTS will enable treatment of tumours in moving organs. Safeguarding component integrity while being integrated on many-core computers is not only relevant for all kind of medical applications, but for every real-time image guided feedback systems, as in security and nano-technology applications.

## MAJOR PROJECT OUTCOMES

### Dissemination

- 14 publications
- 19 presentations at conferences/fairs

### Exploitation (so far)

- Elekta – Atlantic MR-LINAC system, announced in 2015. Six experimental systems at university hospitals. Commercial deliveries expected in 2018.
- Elekta – MR-brachy product, first release end of 2016. In a series of follow-up releases the complete functionality will become available
- Philips – new version of the Ingenia MR systems reducing scan time
- Philips – improved realt-time software for the MR-HIFU product
- Technolution – SigmaXG. Platform for real-time video and data transport, processing and storage

### Standardisation

- Participation in IEC 62926 – Requirements of safety of complex real-time controlled radiotherapy systems for a moving target

*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.*

*https://itea3.org*

# SoRTS

12026

**Partners**

*Finland*

Royal Philips

*The Netherlands*

Elekta

Royal Philips

Technolution

Utrecht University Medical Center (UMC)

*Sweden*

Elekta

**Project start**

January 2014

**Project end**

December 2016

**Project leader**

Frank van der Linden,
Royal Philips

**Project email**

frank.van.der.linden@philips.com

**Project website**

www.sorts.eu