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 Nuclertron, 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
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SoRTS
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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
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MAJOR PROJECT OUTCOMES

Dissemination
- 14 publications
- 19 presentations at conferences/fairs

Exploitation (so far)
- 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 real-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

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