IHE NETHERLANDS

INTEGRATING THE HEALTHCARE ENTERPRISE
SUCCESS STORY
RADIATION ONCOLOGY COLLABORATION IN MASSACHUSETTS GENERAL HOSPITAL

APRIL 2019

MASSACHUSETTS GENERAL HOSPITAL

ICT

SUCCESS SNAPSHOT
Massachusetts General Hospital (MGH), Boston, MA, United States of America
ICT Group N.V., Barendrecht, The Netherlands

CHALLENGES
1) Data management for the radiotherapy specialisation
2) Workflow management for planning/scheduling and radiation
3) Integration of new proton radiation device into existing environment

SOLUTIONS
The entire solution has been developed as a Service-Oriented-Architecture based on the Enterprise Service Bus (ESB) and database technology created by InterSystems

IMPLEMENTED IHE INTEGRATION PROFILES
IHE-RO Integrated Positioning and Delivery Workflow (IPDW)
IHE-RO Basic RT Objects Interoperability (BRTO-II)
IHE RAD Scheduled Work Flow

RESULTS
1) Flexible workflow in which the workflow must have modelling capabilities
2) Data management model compatible with the DICOM second-generation course model
3) Service-Oriented-Architecture to quickly link applications and functionalities
4) Interface with a proton radiation device (IHE-RO IPDW)
5) Big-data environment to support research applications

ABOUT THE PARTNERS

Established in 1811, Massachusetts General Hospital (MGH) is the largest and oldest teaching and research hospital affiliated with Harvard Medical School. MGH is a leader in the development of new therapies, having been one of the first hospitals in the world to treat patients with proton therapy.

ICT Group N.V was established in 1978 and develops highly advanced software solutions for a variety of sectors and industries. ICT currently employs more than 1,400 professionals who work hard every day to develop solutions that improve the world. Interoperability is one of the areas of expertise of the various DICOM, HL7 and IHE taskforces within ICT Group's Healthcare division.

PROJECT

Situation at start of project
Modern radiation therapy is a complex and data-driven medical discipline. We are currently also seeing an increase in the use of innovative technologies in this field, which has resulted in a wide variety of software applications that must be able to work together in synergy in order to be able to treat patients. MGH is no exception in this regard.

The current architectures rely on a monolithic model to which new features are added all the time.
Due to this increasingly complex and larger model, the various manufacturers are finding it more challenging to integrate their systems. A recent example at MGH involves the commissioning of a new proton therapy device.

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Desired situation

State-of-the-art systems should be equipped to easily facilitate new features and applications within a platform in order to optimise the process and implement innovations. In addition, the mass of data would have to be managed and be integrated into the various process steps in order to prevent inefficiencies and errors, based on the IHE-RO Basic Radiation Therapy Objects (BRTO-II) profile.

A Service-Oriented-Architecture in which clinical functionalities are divided into services would be ideal. These services must be linked through an Enterprise Service Bus (ESB) and integrated into IHE profiles.

One example is the integration of the CT scanner for creating the planning CT through the IHE RAD Scheduled Workflow (SWF) profile. The solution must perform the following tasks: 1) manage the workflow; 2) manage the data and 3) provide service interfaces.

ACTION PLAN

On the strength of its many years of experience in DICOM and IHE, ICT Healthcare was hired as a consultant by MGH. The first step was to conduct an in-depth analysis of various workflows and make an inventory of the various systems. This analysis resulted in a design intended to support MGH's large multi-modality radiation oncology department through a Service-Oriented-Architecture and using standardised interfaces.

The next stage involved a development process where, in creating the data model and specifying the interfaces, the team incorporated the latest developments in DICOM-RT and the profiles specified by IHE and IHE-RO in particular. IHE-RAD-SWF is used to link the imaging devices, while DICOM-UPS serves to link the signing software.

A Domain-Specific Language has been developed in order to record the data and model the workflows.

The use of the IHE-specified interfaces then makes it easy to link new systems.

Additional modules, user interfaces and links were created once the first stage was completed, including an advanced treatment scheduling module. More important, however, is the link created with the new proton radiation device based on the IHE-RO Integrated Postioning and Delivery Workflow (IPDW) profile, one of the newer IHE-RO profiles.

RESULT

The project has resulted in a Service-Oriented-Architecture which serves as the main source of information provision in MGH's Radiation Oncology department. This facility is able to schedule and facilitate proton therapy treatments and communicate directly with the radiation device through the IHE-RO-IPDW profile.

The system also manages all the other steps involved in the treatment, being equipped with a fully configurable DICOM Unified Procedure Step (UPS), Modality Worklist (MWL), HL7 interface, IHE-RO-IPDW, IHE-RAD-SWF and various non-standard interfaces in order to connect MGH's systems and in-house tools to the system.

In addition, a workflow manager was created to manage the overall clinical process. The workflow manager is used to model the workflow itself, the task transition conditions, and the data interaction with the service. This ensures a secure and efficient workflow.

All data is aggregated and stored in a consistent record with the DICOM second-generation course record compatible model, using the IHE-RO-BRTO-II profile. This ensures that the clinical operation is now completed smoothly from start to finish. At the same time a big-data environment is created of consistent data, which can be used to develop new paradigms.

> While radiation therapy is a relatively small discipline, it is highly complex and urgently needs a technology to convert the massive amount of data produced into a smooth and efficient workflow in order to be able to use the devices (which tend to be costly). ICT has the knowledge and expertise needed to provide the right solutions based on international standards.
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https://ict.eu/case/managing-the-workflow-of-radiation-therapy-at-mgh-massachussetts-general-hospital/

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