RT.net
IT interconnection of radiotherapy institutes

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Introduction

In general, the quality of patient treatment in computer-aided radiotherapy (RT) strongly depends on cooperative medical investigation and consultation across different clinics. A well-established cross-site integration of radio-oncological clinical information systems (ROCIS) enables sharing of scientific data, relevant treatment planning data, clinical expertise and patient-related data. Hence, essential RT tools such as image fusion, dose distribution visualization, target volume definition and image guidance protocol definition are no longer restricted to single clinics and their intramural infrastructure.

However, there is no commercial RT software system available that accomplishes these fundamental requests. Therefore, we propose a concept – **RT.net** – for flexible RT multi-site integration that is based on our in-house developed ROCIS **open-radART**. We outline the basic technical infrastructure and accentuate the resultant potential increase in patient treatment quality.
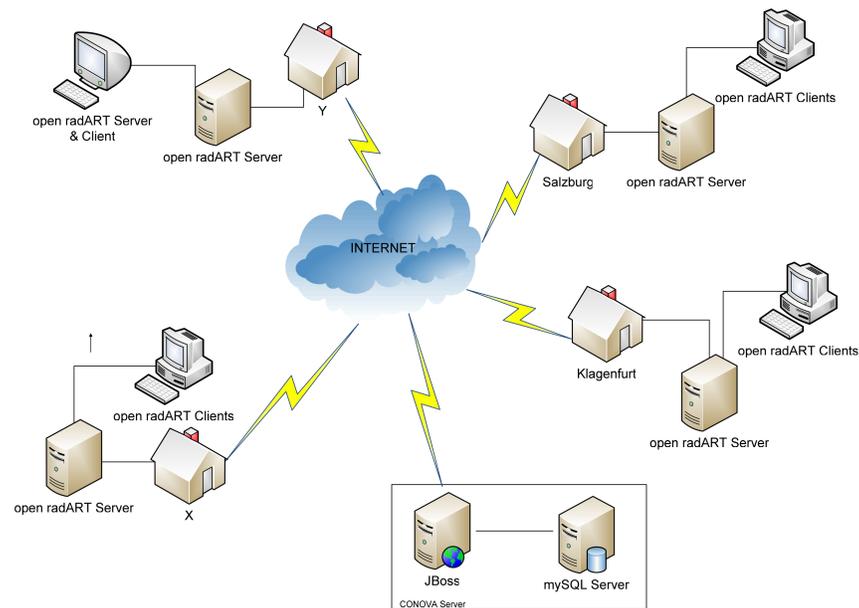

Figure 1: RT.net system architecture.

Clinical Relevance

RT.net offers a general collaboration platform for RT physicians, physicists and scientists. Possibly the mutual exchange of medical findings and RT treatment plans is the most important part of intercommunication. For example, a physician of site A can send all relevant data of a specified patient to site B with a single request. At site B, another physician can suggest modifications to the original treatment plan and send them back to site A. At site A, these modifications (e.g. a corrected clinical target volume) appear as an alternative to the original treatment plan. In case of comparative clinical trials, these alternatives can be analyzed and evaluated.
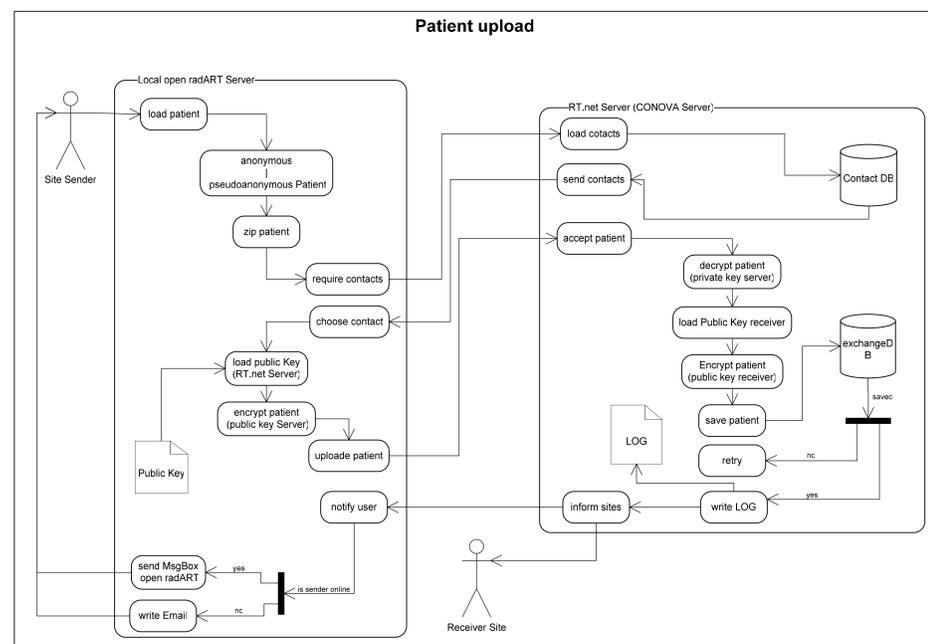

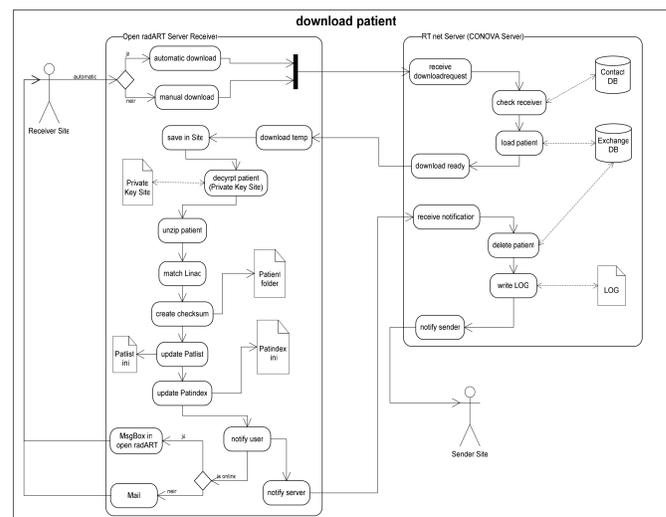**Figure 2:** Workflow for uploading patient data to RT.net server.

Figure 3: Workflow for downloading patient data from RT.net server to another site.

Basic Technical Infrastructure

In general RT.net is based on a valid open-radART installation at each communicating site. Currently, our ROCIS is available for free provided that it is used for research purposes. IT communication between clinical sites is conducted by a dedicated server (RT.net server) as depicted in Figure 1 and 4. This server component runs a central web service that handles a variety of typical open-radART client requests. As shown in Figures 2 and 3, these use-cases are mainly dictated by upload and download of patient data where matching of site-specific linear accelerator data is the most challenging task. Moreover, the RT.net server interface builds on the HTTPS-protocol. Therefore, this approach avoids configuration interventions regarding firewall exceptions and further hospital IT security. As patient data is transferred via the internet, advanced encryption methods are involved to ensure privacy and data security.

Concrete implementations of our approach utilize the approach of Enterprise Java Beans (EJB). For this communication platform technology, the JBoss application server (EJB) must be set up.
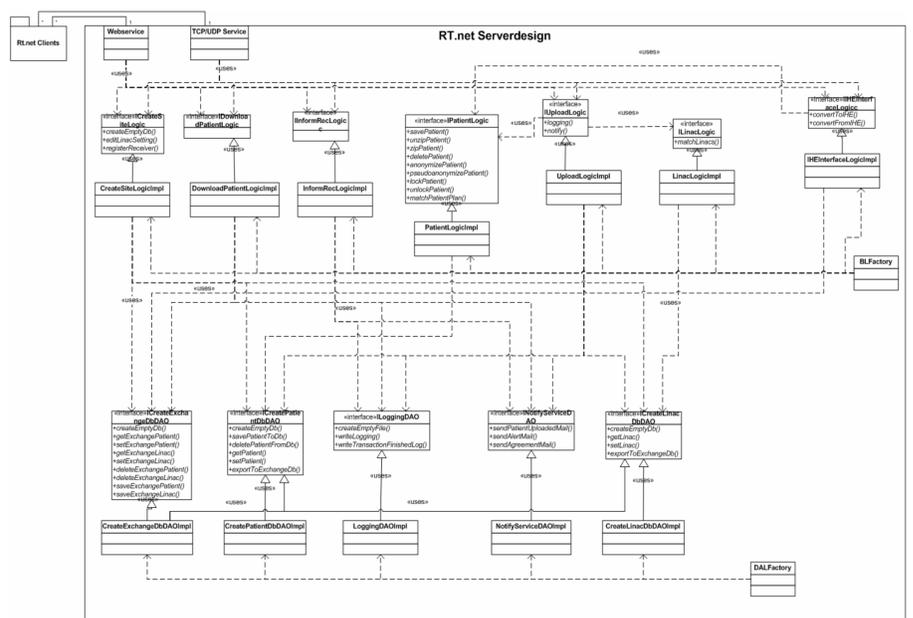

Figure 4: Design of RT.net server

Outlook

We are currently evaluating typical workflow requirements for RT.net in collaboration with the radiotherapy institutions in Feldkirch (A) and Klagenfurt (A) that already use open radART for research purposes. Furthermore, we are gradually implementing the proposed RT.net infrastructure and web services. The medAUSTRON center for ion-therapy and research (Wiener Neustadt, A) is currently building, and will later be operating, a new facility for both proton and carbon-ion treatments. This center is part of a huge worldwide research network. In future, many patients from Austrian radiotherapy institutions will be referred to this center for an additional biologically high-efficient boost treatment. RT.net could establish the communication and data exchange infrastructure for this purpose.