Smart Client Electronic Health Record System

The client was a West European organization in health care sector providing services to healthcare practitioners, healthcare institutions, mutual insurance organizations and government. They have expertise in e-Health integration and project management areas for healthcare IT-projects.

The Vision

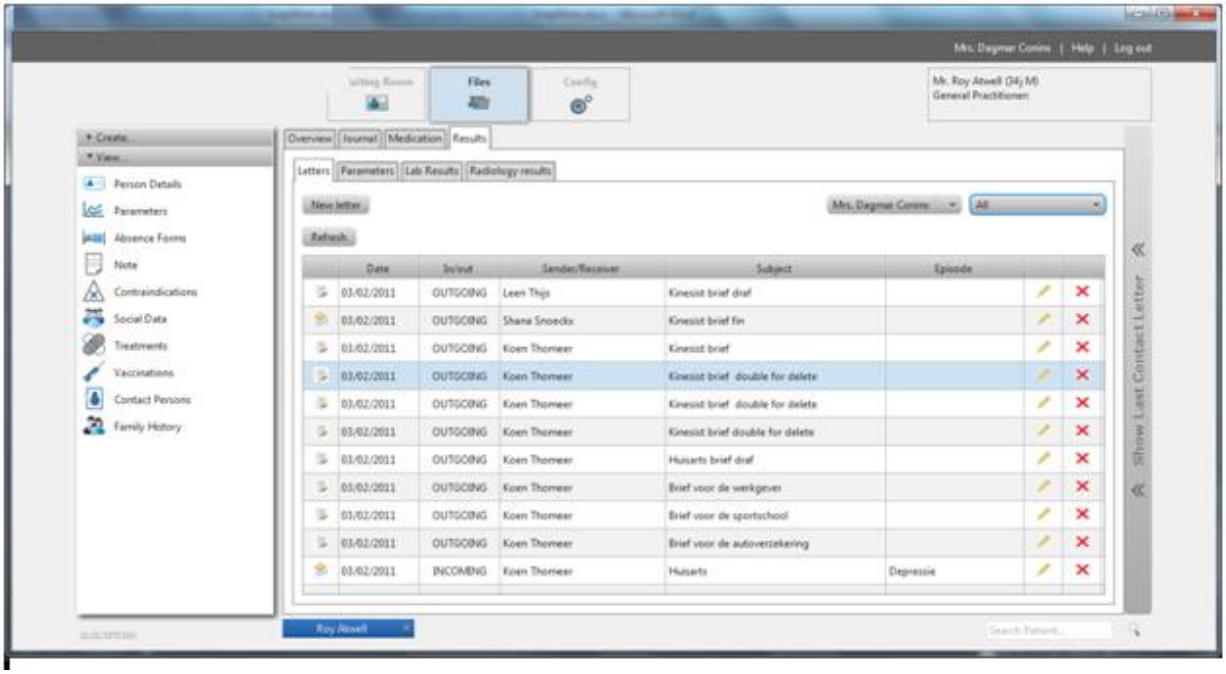
To develop an Electronic Health Record System targeted on large Hospitals, small clinics and individual doctors in Belgium primarily, that will allow them to capture patient episode, along with all associated patient records, treatment history, prescriptions, medications, summary of care. The product development has been conceptualized with the guidelines taken from CCHIT requirements. Although this product has not been targeted for US market, there is a long term goal of launching this application in other countries including USA.

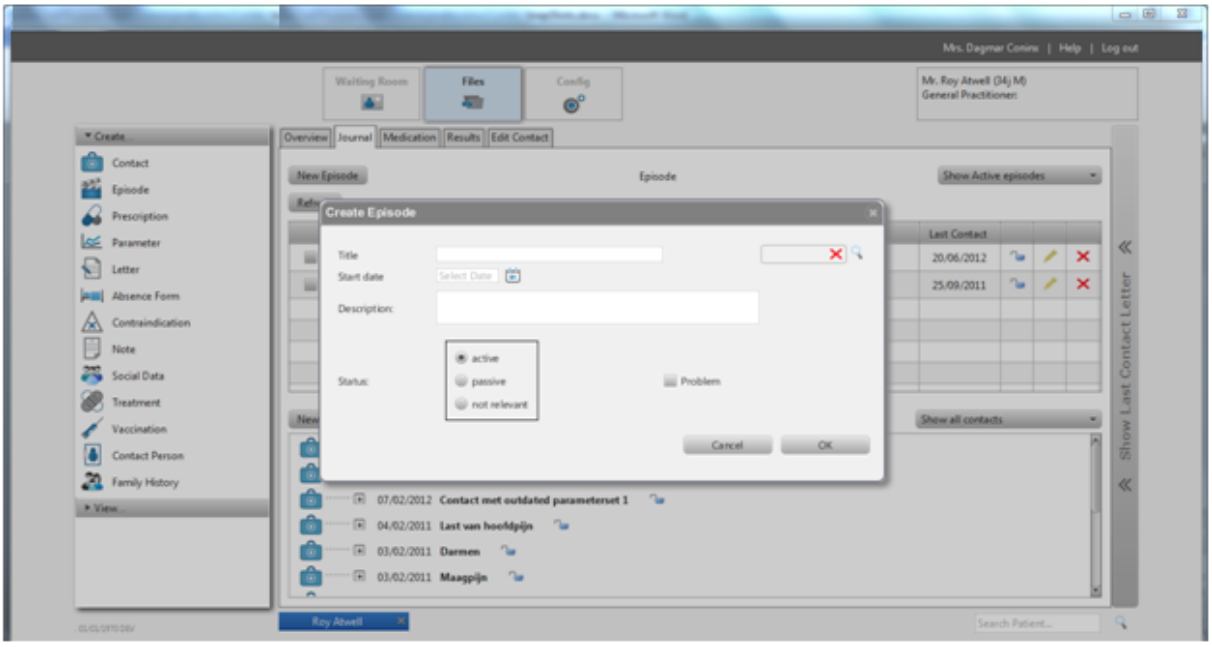
Application Overview

Patients across the country, who visits the hospitals, provide their medical history to the doctors, which are captured in the application. This application hence acts as a centralized place which is being used by doctors to access patient info and update other patient specific info. The core of the EHR system was handling following major components:

- Patient Registration
- Episode Management
- Prescription Management
- Medication Management
- Parameter Management
- Family History
- Medical History
- Social Data
- Treatment Management
- Vaccination

- Result Management
    - Lab result
    - Radiology Result
- Referral Letter/ Attestation
- Sick Leave
- Contra-Indication
- Memo
- Contact Person
- Log Book





The application has been developed as a Java based client server application. The client in this case is a smart desktop application with the ability to maintain the records in offline mode. The application also has the capability to communicate messages internally between applications in specified regulatory format, KMEHR, which is the format defined by Belgium Healthcare Telematics Commission, enabling the exchange of structured clinical information. The application also complies with standard regulation requirements with respect to patient information privacy, unauthorized access and confidentiality of such records. Application protects against data loss by providing full logging, reporting and audit trail capabilities.

Technologies and Tools

JavaFx: With JavaFx, developers could preserve existing investments by reusing Java libraries in their applications. They can even access native system capabilities, or seamlessly connect to server-based middleware applications.

Spring: The use of Spring provided a powerful and flexible collection of technologies which could improve enterprise Java application development. Its data access framework could help to address common difficulties developers face when working with databases in applications. Also the Spring Framework is the only framework available in Java which offers managed data access environments outside of an application server or container.

Ms SQL Server: MS SQL Server was used as a relational database to address business challenges with enhancements and improvements.

Mongo DB: MongoDB was used as a file system for load balancing and data replication features over multiple machines for storing files.

Challenges and Solutions

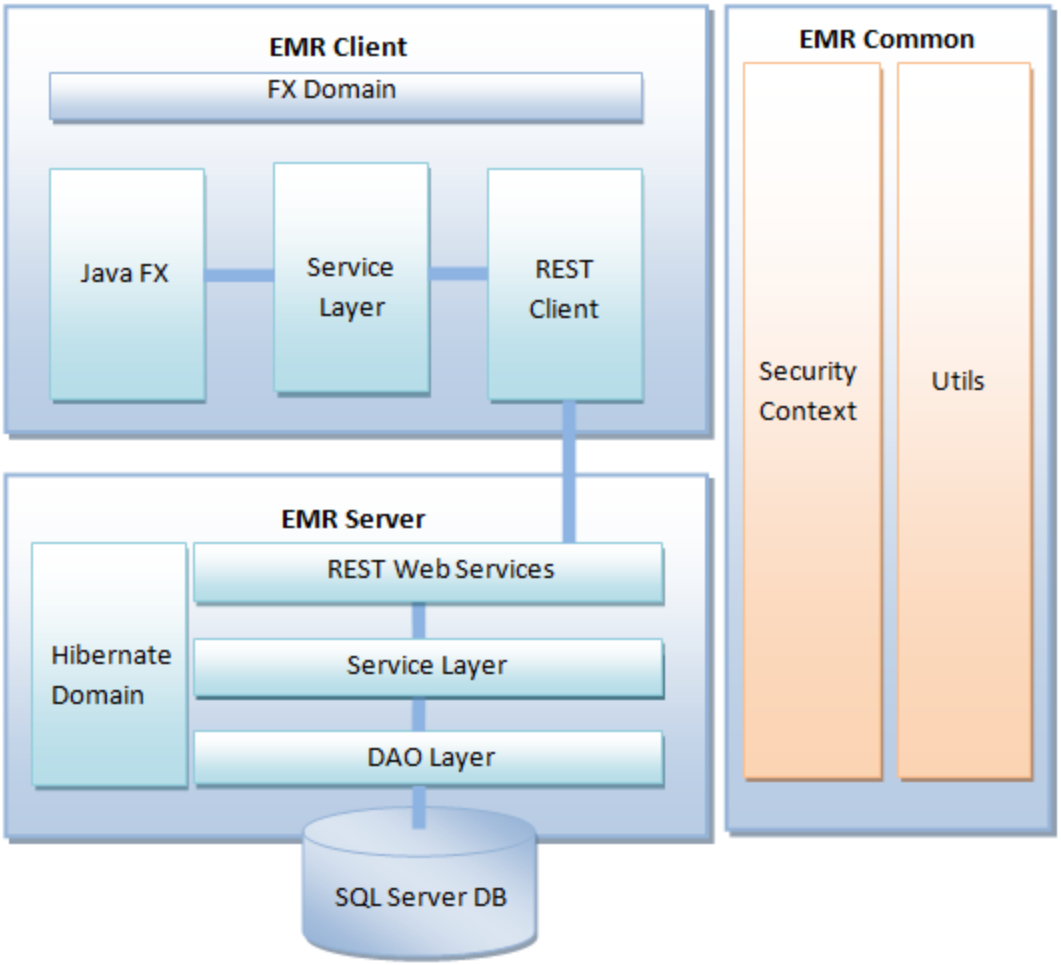
Challenges faced by the team were as follows:

- Comprehensive software design to minimize procedural and prescription errors, so as to improve overall patient safety in the healthcare environment.
- To show a huge potential for cost savings and decreasing workplace inefficiencies.

The team provided with Use Centered Design (UCD) to evaluate usability and user experience of EHR. Usability has the strong inverse relationship with error rate and user fatigue whereas directly it can be related to user satisfaction and clinical productivity. The challenges were met successfully to develop the desired application. With approached solution ideas it was possible to quickly streamline patient care processes to realize greater control, increased productivity and improved accuracy within their departments, throughout their facilities and across the organization. Protection, privacy, security of patient related information and critical organizational policies were taken care of while planning the solution. Our solutions has helped our client to reduce costs, respond rapidly to market needs, enhance service levels and mitigate risk with customizable solutions.

Solution Architecture

As the EHR system consists of huge information the focus was on reducing information overloading by providing summary with drill down options wherever possible. A study of resource availability was carried out to develop the desired system. The consistent efforts were put to implement the REST-style architectures which consist of clients and servers. The evaluation also included whether the technology needed for the proposed system can be optimally implemented or not. The increased accuracy for clinical decision making and reduce task completion time for users were the crucial areas while defining the solution approach. The reliability and performance factors were analyzed, for the successful development of the application. The solution architect team analyzed the problems, requirements, scenarios, risks, constraints, and proposed integration solution. The growing number of waiting lists, rising pressure on medical professionals and accountability for medical negligence were the concern areas while developing the system so that the growing
database could be retained. The architecture diagram shown below gives the overview of the application developed.



Business Benefits

- Compared to paper records, utilizing an Electronic Health Record (EHR) system is a rapid and efficient method to preserve critical medical information associated with patient records
- It provides comprehensive clinical history of the patient which enables a doctor to provide treatment and procedures correctly with improved decision making
- Helped healthcare practices to reduce the healthcare cost with improved care coordination
- Integrates vital information into a comprehensive clinical information repository
- Improves quality and convenience of patient care
- Cost reductions, combined with a reduction in patient care errors, eventually resulted in lower malpractice premiums, less litigation fees, and substantial cost savings.
- Lower operational costs for healthcare providers and risks associated with patient care
- Ensured adherence to regulatory conformance which are impacting the way healthcare is delivered
- KMEHR enabled the exchange of structured clinical information
- Performing usability evaluation with efficient system was possible with CCHIT usability testing parameters

Bottom Line

e-Zest with its years of experience in building healthcare applications has demonstrated technical and domain expertise in successful execution of such projects.