Chapter 1

Introduction

This technical report is prepared in the Net4Care project. See (Christensen and Hansen 2010) for detail on purpose and scope of the architecture description.

In this report, we analyse the following existing telemedical applications:

- Egenjournal/myRecord (Research project)
- Viewcare ALS/KOL (Commercial)
- Telekat\textsuperscript{1}

The analyses have taken place through interviews with developers/architects/project managers of the applications.

\textsuperscript{1}Information is incomplete for the Telekat system.
Chapter 2

Egenjournal/myRecord

The myRecord is a web-based system developed in the CITH project\(^1\) to support Implantable Cardioverter-Defibrillator (ICD) patients and the distributed and heterogeneous group of healthcare professionals that take care of them by enabling their interaction with healthcare professionals, their interaction with other ICD patients, and their personal interpretation of their condition (Andersen, Bjørn, Kensing, and Moll 2010). Figure 2.1 shows the main actors in the use of myRecord. RH implants and regularly (every 3 months) controls the ICDs. BBH and other hospitals perform medical control of the patients (every 3 months).

Figure 2.1: myRecord triangle of actors. Bold lines show collaborations focused on in myRecord. In the CITH project, communication from RH to BBH and others is done via a resume. This is to be included in the production version of myRecord.

Figure 2.2 shows the main user interface of the application and also the main functions of myRecord. These are:

\(^1\)http://www.cith.dk
Figure 2.2: myRecord user interface (taken from Andersen et al. (2010))

Oversigt (“Overview”) ...

Aftaler (“Appointments”) Patients are able to provide detail on their condition (e.g., well being) before ICD control or medical appointments. ICD control appointments are made with RH every 3 months and are performed by telemedical monitoring of ICD data (except every 48 months where the patient meets physically at RH). Medical appointments are made with BBH where patients and doctors meet physically.

Logbog (“Log book”) In their log book, patients are able to write logs and classify the log entries.

Medicinprofil (“Medicine profile”) The medicine profile enables patients to enter which medicine they have actually taken (in contrast to what was prescribed)

pBoks (“Patient Box”) Similar to the Danish “eBoks”, the pBoks is intended to provide a storage of healthcare-related documents for the patient

Netværk (“Network”) Patients are able to share information (if they desire) with other patients
Beskeder ("Messages") This allows patients to send messages to other patients and to healthcare professionals.

2.1 Architectural Requirements

**Modifiability** Ideally, myJournal should integrate with a large number of systems internal to RH and BBH. (Moll and Kensing 2009), e.g., identify 14 such systems at RH.

**Usability** It is assumed that patients are familiar with web technology (including using a browser)

**Availability** Delivery of ICD data is safety critical and should be highly available when measured. However, ICD reading is performed by external systems and is outside the scope of myRecord.

**Security** Patients must be able to decide which parts of their data is private. Access by healthcare professionals to myRecord data must follow available security regulations.

**Performance** Performance is not critical; patient have direct phone numbers to RH and BBH if needed.

2.2 System Context

Figure 2.3 shows the (intended) system context of myRecord. ICD monitoring is done by a separate, external system at the patient home. Telemonitoring of ICD data is then done by RH. An example of this is the Medtronic ICD for which the “CareLink” system provides telemonitoring.

2.3 Deployment View

Currently, myRecord is a standalone system with no integration with external systems. It is, however, fully functional as such and has seen use by up to 50 patients.

Figure 2.4 shows the current deployment of myRecord (details to be discussed with Jonas/Tariq).
Figure 2.3: System Context. Gray boxes show intended (but not yet realized) system interactions. Interactions by hospital personel with external systems not shown.

Figure 2.4: myRecord current deployment.
Chapter 3

Viewcare ALS/KOL

Amyothropic lateral sclerosis (ALS) is a progressive, fatal, neurodegenerative disease with most patients dying after two to three years of respiratory compromise and pneumonia.

KOL (Kronisk Obstruktiv Lungesygdom) is a chronic disease affecting the lungs and the patients’ ability to breathe. It is often known as smokers’ lungs.

At Region Midt a telemedical solution is provided for ALS patients and their next of kin to support staying in the home as long as possible to increase life quality for the patient and lower burden on the hospital\(^1\). The system is offered for KOL patients also. The system is provided by the company Viewcare\(^2\).

The ALS system consists of a local computer with attached 26 inch touch sensitive monitor and its main function is allowing video conferencing at any time with clinicians at the hospital. The home system also contains equipment for biometric measurements of the patient’s respiratory functions (Spirometer) and pulse and oximeter measuring equipment to allow clinicians to diagnose conditions quickly. Figures 3.2 and 3.3 show the setup.

The basic functionality is

- Video conferencing. The patient requests it by pressing a ‘make call’ button on the client computer’s touch sensitive screen. The request initiates a phone call to the clinician on duty that may either handle the request as a regular phone call; initiate a video conference (a message on the patient’s client tells the conference will begin within 10 minutes); or forward the call to the next clinician in the chain.

- Patient side measuring of biometric data (pulse, blood oxygen saturation, respiration flow rate) that are uploaded and stored at Viewcare’s

\(^1\) As of meeting May 2011 we have been informed that ALS patients are no longer offered this solution. KOL patients, however, are still using it.

\(^2\) http://www.viewcare.com/
datacenter.

- Shared desktop allowing patient and clinician to view the same set of applications. All applications run at Viewcare servers using Citrix.

- Simple set of medical measuring applications. These are available from a control panel on which each application is launched by pressing a color coded button, see figure 3.1. A typical application is marked 'Pulsoxymeter' and allows the clinician to measure the patient’s pulse and blood oxygen saturation which then stored and displayed as values and/or plotted into a time series graph with previous measurements.

- Clinician’s client can control the patient’s clients in all respects (window layout, luminosity, etc.) whereas the only interaction possible at the patient’s client is pressing the ‘make call’ button as well as operating the measuring equipment.

This setup makes the Viewcare system versatile to cover a large number of different diseases. The images in Figures 3.2 and 3.3 are from a news flash on KOL patients.

Figure 3.1: Viewcare medical applications are launched from a button panel.

3.1 Architectural Requirements

Usability The patient’s client is extremely simple and suitable for weak patients: almost all actions are made from the clinician’s client. The
clinician’s client is also simple with a button panel both for controlling the sessions as well as launching medical applications.

**Availability** The availability of the system is important as weak and elderly people should not be worried about technical issues. A major issue here is the throughput and availability of the broadband connection (Stage 2010).

**Reliability** Similar concerns as above.

**Performance** Video conferencing must be of sufficient quality to make speech easily understandable and secondary video quality of sufficient quality.

### 3.2 CC View

Usability, availability and reliability are achieved by a very centralized architecture, see Figure 3.4, in which all core functionality is handled by a central servers hosted by Viewcare, making both the patient’s and clinician’s clients very slim.

The patient’s client only contains components for videoconferencing, a window showing the shared desktop, and a component that interface the biometric sensors’ device drivers. The latter can upon request from the central medical application make a measurement, marshal it into a proprietary format, and send it to the central application.
The clinician’s side contains the video and shared desktop component and in addition a session control component that can initiate the video call, and control the screen layout and characteristics of the patient’s screen. It also contains the list of patients in order to select which patient’s session is used.

The server contains a database having proprietary schemas, no attempt has been made to enforce standard formats. The Citrix server runs the applications for handling patient data, request and store measurements, as well as visualize data as graphs etc.

No attempt has been made to integrate with EHR or GP systems as there is no business case. Thus if the clinician wants to record data from a session, this is done manually, typically by copy and paste of screen captures.

### 3.3 Deployment View

The ALS/KOL system is a stand alone system (in the sense that it is not integrated with other health care IT systems) with computing nodes in the homes, at Viewcare, and at the hospital. A deployment view is show in Figure 3.5.

### 3.4 Module View

Not known but the developers stated that they reuse as much public available software units as possible as they emphasized their competitive edge is on assembling usable systems with high availability, not in particular implementation techniques.

Specifically the video conferencing component is a commercial one (even
though the company originally had developed the market’s best video conferencing software themselves) and graph plotting software is an open source package.

On important aspect of the system is the special developed wireless router that can group from 3–6 SIM cards from different vendors and combine these multiple transport channels into a single software network channel with much better throughput and higher availability.

Figure 3.4: Component-Connector view of the Viewcare system.
Figure 3.5: Deployment view of the ALS system.
Chapter 4

Telekat

The Telekat project is also focussed on KOL patients.

Disclaimer: Due to incomplete access to architectural information, the description below is based only on public available information

4.1 Architectural Requirements

Incomplete.

4.2 Deployment View

Incomplete. Figure 4.1 is a best effort attempt at the deployment architecture based on information from a flyer. However, the information has not been confirmed.
Figure 4.1: Telekat deployment

