

## Service Oriented Telehealth Analysis and Design using Use Case Driven Approach

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**Abstract.** Business processes often depend on supporting software. It can be hard to change large, monolithic programs. There are obstacles to change the business processes to meet new requirements or to take advantage of new business opportunities, unexceptionally in Telehealth that has become the significant instrument to help medic to deliver health service and share information. The easiness among medics and patients in order to communicate and give solution as quick as possible is necessary. We propose service oriented Telehealth architecture named UBTelehealth, which is easier to change, enabling it to avoid penalties, gaining commercial advantage and has better organizational flexibility. Our purpose is to explain the analysis and design of UBTelehealth by illustrating more into services and activities that are represented by Unified Modelling Language Use Case (UMLUC).

**Keywords:** telehealth ; service; UB telehealth ;UMLUC

### 1. Introduction

We are motivated by the increases of health care costs in many countries [5]. Some of developed countries have their problem in aging population [6] while in developing countries has the biggest population in rural area which is relatively underdeveloped and rarely available in terms of health resource and infrastructures. Patients from rural areas have difficulties such as the easiness to take a medical care. In other point, the lack of available medical experts like general doctors and specialist compared with the population of people in developing countries could be an obstacle too. The increase in the use of ICTs to deliver health care has created new terminologies such as Telemedicine and Telehealth, but the boundary between them is not clearly defined. Telehealth though is a more encompassing terminology, which can be defined as, the use of information and communications technology to deliver health services and exchange health information when distance separates the users.

Telehealth, a general term that uses many kind of technologies and telecommunications instruments, need a process to achieve high quality service identification that is introduced as a guideline to an analyst work. Through the analysis of the method basic characteristics and its illustration, we can conclude that the method has several advantages compared to other methods, which are based on business process modeling and enterprise architecture. Recently, when critical care is needed, patients are attached to many mechanical support devices, hence our purpose is to explain the pre-development process and more into services and activities that are represented by UMLUC. By identifying and describing with the full use of information in UC model, we will succeed to convert common usage of UC into services analysis and design in SOA. For the Telehealth modalities like mobile applications, the definition of the underlying service-oriented software architecture must consider the services themselves as user requirements, as well as the mobile operators entry points and the final clients interfaces, and use them to characterize the platform as narrated in [8].

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Fig. 1. UBTelehealth use case

The user actor *Administrators* represents an interface for administrators of business organization that is running *UBTelehealth* whereas the *requester actor*, *Patients* represents an interface for a service requester that possibly come from any external organization. A *requester actor* can be regarded as an interface to an abstract user of the functionality that is exposed as a service; it represents the range of potential customers of the service and the requirements is typically derived from standard service descriptions stored in service repositories. The identification of *requester actors* may take advantage of existing descriptions in the ontology or it may identify new business opportunities. In this case, the ontology would be extended with new business protocols corresponding to the new types of service.

*Telehealth Officers* as *resource actors* and *Doctors* as *service actors* of a UBTelehealth UC are similar to *supporting actors* in traditional use case diagrams in the case that they represent entities to rely on in order to achieve the business goal. The difference is that a *service actor* represents an outsourced functionality which is typically vary from instance to instance, while a *resource actor* is an entity that is statically bound and, hence, is the same for all instances of the UC. *Resource actors* are typically persistent sources/repositories of information. In general, they are components already available to be shared within a UBTelehealth business system.

#### 4. Defining Service Model and its Behaviour

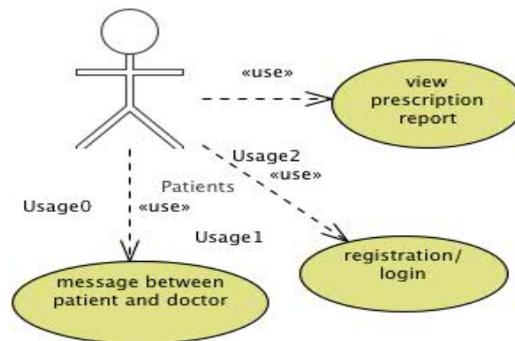


Fig. 2. Patient related use case

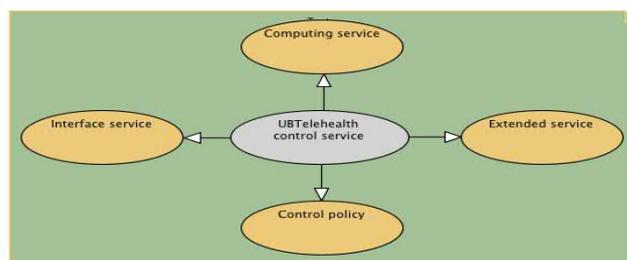


Fig. 3. UBTelehealth service model based on [2]

A patient who registers UBTelehealth and enters his or her account and password is commonly already registered in the UBTelehealth system. The system check the patients’s account and password with database, and send back a page screen to the patients. If the account and password is correct, then the patient can continue his or her next operation, otherwise, repeat previous operation. If the patients can continue his or her operation, he or she should enter search criterion and make a request to the UBTelehealth system that makes response after getting request information. In the process, some control policies will be examined, such as user authority, the levels that he or she can view. Based on (Fig. 2) above, the “Registration/Login”, ”Message between patient and doctor”, and ”View prescription report” UC can be described as follow:

#### 4.1. Primary flow path:

- Patients will view the prescription or carry out messaging with doctor to the system.
- The system checks the session of patients, to validate whether he or she has passed login validation or not.
- The system returns prescription list to patients or allows patients to conduct with doctor for messaging.

#### 4.2. The failure flow path case: the “messaging service” is not open at the time is:

- System displays that the function is not open yet by the time.
- Patients cancel messaging service.

#### 4.3. The alternate flow path case: the patient has not passed login validation is:

- System displays that the patient has not passed login validation, he or she can not do messaging with doctors or view the related prescriptions.
- Patient enters correct account and password and submits for login validation.

In the case no. 2 and 3 conclude they are two extending point derived from no. 1 in primary flow path. Based on the composition services description of the top-level UC (Fig. 3), we use SOAD method to identify the services:

- First, along the UC primary flow path no. 1, we identify Interface Services and Computing Services, such as:

*Name: getPatientId, type: InterfaceService, input: Null,*

*output: UserId, Control Policy: Null*

*Name: getPrescriptionById, type: InterfaceService, input: Null, output: Course, Control Policy: CheckUserAccount*

- Second, along failure path no. 2 and 3, we identify Services as follows:

*Name: displayOpenDate, type: ComputingService,*

*input: Null, output: messaging service open time, Control Policy: Null*

*Name: cancelMessaging, type: InterfaceService, input: Null, output: Null, Control Policy: Null*

## 5. Conclusion

In our work, a service model is designed to facilitate identifying services from UBTelehealth UC, hence we utilize a SOAD method based on UC. Moreover, a process is provided as a guideline to help UBTelehealth analyst to accomplish high quality service identification along with the methodology. Formal or informal service description model is necessary in the analysis phase. At the moment, it is difficult to describe the service with current language, such as Web Service Definition Language (WSDL). Designing an appropriate description language is significant and challenging work in the future [2].

As stated by [11], we wish that our UBTelehealth UC would develop further to embrace other possibilities of UC design. In our work, we have not considered explicitly business UCs [9], which should be given an attention. With respect to configuration and feature interaction problems, we would like to explore the possibility of employing feature modeling [1, 7]. For getting a full use of a feature model, the UC would have to be transformed to include all the possibilities of its configuration space and have them mapped to respective features according to the approach of the superimposed variants [10]. While another line of further work is to execute the development phase. The Control service of UBTelehealth will be realized first based on the identified UBTelehealth UMLUC on top of modifying UC domain activities. The modification of UMLUC is needed along with the dynamic requirement of the system at the moment it is built. The aim is to bridge UBTelehealth system with the actor's needs and usability.

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