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WARNING: Significant portions of this document are auto-generated by StarUML[1] an Open Source UML / MDA tool. If you want to modify any section of this document you need to either a.) modify the UML source file, and/or b.) modify the Microsoft Word template used by StarUML's Generator function. Contact the editor for copies of both files.

NOTICE: This document complements those available at http://www.ieee2407.org/documents.html and elsewhere:
- http://www.ieee2407.org/files//Lacal_032006_06.ppt
- http://www.ieee2407.org/files//Lacal_032006.ppt
- http://www.ieee2407.org/files//Lacal_032006_Scope_03.ppt
- http://www.ieee2407.org/files//PHI_3.04.pdf
- http://www.ieee2407.org/files//PHI_FAQ_10.pdf
- http://www.ieee2407.org/files//PHI_Next_Steps_06.pdf
- http://lacal.net/files/hs/HealthSmart_M.pdf

Please read these files first and only then this document. Thanks.

Executive Summary

This document outlines specific Use Cases for the IEEEP2407 standard group. The purpose of this document is to facilitate the development of a Reference Implementation of a Free/Open Source Software IEEEP2407-compliant system.

An open question at this time is whether we should target a specific disease to further define and refine the Use Cases. For example, to target information- and processes-heavy[2] diseases such as Cystic Fibrosis or autism.

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[1] Available at http://staruml.sourceforge.net/en/

[2] By "information- and processes-heavy" I mean those diseases where the afflicted person and his/her caregivers need to search, analyze, and manage massive amounts of information about the disease and its effects. Some of that information includes: tracking of encounters with providers; management of medications usage and compliance; administration of payments and reimbursements; analysis of research and published materials relevant to the patient's disease. In the case of CF, please see http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1290129

Table of Contents

Table of Tables

Table of Figures

Acronyms and Definitions

This section defines the acronyms and terms used throughout this document.

Term	Meaning
Actor (within a UML framework)	An actor is something or someone who supplies a stimulus to the system. It can also be thought of as something the system requires in order to function. Without a customer (an actor) in a restaurant, the process of ordering food cannot begin. In addition to actors there also exist primary actors. Primary Actors interact directly with a system to achieve their goals. Supporting actors may be humans or systems called in to support the Primary Actor. Stakeholders can also be modeled as actors. They do not directly interact with the system but they are affected by the success of Primary Actor interactions. We differentiate active actors, who initiate interactions with a system, and passive actors, who are targets of requests or who are activated by the system.[3]
F/OSS	Free and Open Source Software, also F/OSS or FOSS, is software which is liberally licensed to grant the right of users to study, change, and improve its design through the availability of its source code. F/OSS is generally synonymous with free software and open source software, and describes the same licenses, culture, and development models.[4]
OOA&D	Object Oriented Analysis and Design Over the past decade, Object Oriented Analysis and Design (OOA&D) has become the dominant software development paradigm. With it has come a major shift in the thought processes of all involved in the software development life cycle. Programming language support for objects began with Simula 67, but it was the emergence in the 1980's of hybrid languages, such as C++, Ada and Object Pascal that allowed OOA&D to take off. These languages provided support for both OO and procedural programming. Object Oriented programming became mainstream. An OO system is designed and implemented as a simulation of the real world using software artifacts. This premise is as powerful as it is simple. By using an OO approach to design a system can be designed and tested (or more correctly simulated) without having to actually build the system first.[5]
Reference Implementation	In computing, a reference implementation (or, infrequently, sample implementation) is a software example of a standard for use in helping others implement their own versions of the standard. A standard is much easier to understand with a working example in hand. The purpose of a reference implementation is generally to increase awareness and familiarization of the spec within the development community. While it is entirely possible for RI software to serve in the academic cause of pure knowledge, on a more pragmatic level they are generally intended to familiarize the market with a spec so that developers will be more likely to purchase or develop commercial implementations of the spec.[6]
Role (within a UML framework)	

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[3] Source : http://en.wikipedia.org/wiki/Actor_%28UML%29
[4] Source : http://en.wikipedia.org/wiki/F/OSS
[5] Source : http://argouml.tigris.org/documentation/defaulthtml/manual/ch01.html#s2.ooad
[6] Source : http://en.wikipedia.org/wiki/Reference_implementation

Use Case	In software engineering, a use case is a technique for capturing the potential requirements of a new system or software change. Each use case provides one or more scenarios that convey how the system should interact with the end user or another system to achieve a specific business goal. Use cases typically avoid technical jargon, preferring instead the language of the end user or domain expert. Use cases are often co-authored by Business Analysts and end users.[7]
UML	The Unified Modeling Language (UML) is a non-proprietary, object modeling and specification language used in software engineering. UML is a general-purpose modeling language that includes a standardized graphical notation that may be used to create an abstract model of a system, sometimes referred to as the UML model. UML may be considered as an extensible modeling language since it offers a profile mechanism to customize the language. If a concept you need is not present in the base language, you may introduce it by defining a stereotype. The semantics of extension by profiles has been improved with the UML 2.0 major revision.[8]
XMI	XML Metadata Interchange (XMI) is the standard for saving the meta-data that make up a particular UML model.

Table 1: Acronyms and Definitions.

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[7] Source: http://en.wikipedia.org/wiki/Use_Case
[8] Source: http://en.wikipedia.org/wiki/Unified_Modeling_Language

Version History

Throughout the document the editor readily acknowledges all the comments, criticisms, and suggestions for improvement he has received. Any and all remaining errors are solely the editor's fault.

01: José C. Lacal 06/30/2006
02: José C. Lacal 07/03/2006
03: José C. Lacal 07/04/2006
04: José C. Lacal 07/05/2006
05: José C. Lacal 07/06/2006 (First public release for comments).
06: José C. Lacal 07/07/2006 (Second public release for comments).
07: José C. Lacal 07/10/2006
08: José C. Lacal 09/22/2006 Revised entire document.
09: José C. Lacal 10/03/2006 (Third public release for comments).
10: José C. Lacal 01/18/2007 (Fourth public release for comments).

Introduction

This section outlines the purpose of this document and explains the methodology used herein.

Objective

This document is part of the project to develop Personalized Health Informatics ("PHI") standards, now labeled IEEEP2407. This document will serve as a repository to provide a high-level overview of what an IEEEP2407-compliant system should look like. This document will be freely available and distributed for comments. And it will be used as a tool to keep all volunteers focused on end goal, and to clarify interfaces.

NOTICE: You might want to take a free on-line tutorial on developing and using Use Cases.[9]

Reference Implementation

These Use Cases will guide the team to design, develop, deploy, debug, and distribute a reference implementation of a PHI-compliant system using 100% F/OSS.

Design

The IEEEP2407 standard will be designed through direct and constant interaction with all stakeholders on a global basis. The use of this design methodology (free access to source code; all development conducted in the public eye; frequent releases; heavy end-user interaction) is expected to lead to much more robust, secure, and effective systems.

Also, the extensive use of modeling tools (such as UML) should make it easier to share documentation with non-technical stakeholders.

Develop

Work on the IEEEP2407 standard will be conducted in parallel with the development of a F/OSS "Reference Implementation" software package of the standard, and with the target end users providing direct, constant, and valuable guidance to the development of both deliverables from the start.

Deploy

Interested parties will be invited to download, install, and test the Reference Implementation software package at no cost. It is expected that individuals, institutions, and even government organizations might see the availability of this free Reference Implementation as an inducement to offer services to Consumers.

Debug

End-users and other stakeholders (health workers; physicians; etc.) are expected to actively "test-run" the deployments of Reference Implementation to make sure the software (and the underlying IEEEP2407 standard itself) meet the needs and requirements of the target end-users.

We want to generate a new dynamic: as the standard is developed, it will be implemented in the Reference Implementation, giving all stakeholders a say in the process. Stakeholders' feedback will then brought back into both the standards process as well as the reference implementation development. Loop endlessly.

Distribute

The finished IEEEP2407 standard (as well as all the intermediate documents) will be freely available through the working group's website at http://www.IEEE2407.org

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[9] "Specifying Functional Requirements With Use Cases." Available at http://www.cragsystems.co.uk/SFRWUC/index.htm

Also, the entire source code of the F/OSS reference implementation, and all documentation, will also be freely available. F/OSS is highly relevant in LDCs and other resource-constrained settings (such as academic and medical institutions; NGOs; etc.).

What is the rationale for using this standard development model?
- Traditionally, standards are driven by vendors interested in promoting a chosen (their own) technology.
- The model proposed above will allow all stakeholders outside vendors to drive the standards-development process to better meet the stakeholders' needs, not just those of vendors.
- This proposed model could lead to a virtuous circle: once the standard is ratified, a solid, free, 100% standard-compliant reference implementation is made available; and stakeholders embrace the standard because they were directly involved (and consulted) in the development of the standard. And service providers can immediately use the reference implementation to offer commercial services that are standards-compliant, with the knowledge that stakehodlers already approve of such standard.

Use Case Numbering Convention

These are the conventions used to number each Use Case.

UC_xyzz_aa	
X (Activity)	"1" Create "2" Manage "3" Review "4" Upload "5" Query "6" \<TBD> "7" \<TBD> "8" \<TBD> "9" Actor is passive (system drives actions)
Y (Stakeholder)	"1" Community "2" Family "3" Individual "4" Provider "5" \<TBD> "6" \<TBD> "7" \<TBD> "8" \<TBD> "9" Target is the system
zz	Auto increment number, from 01 to 99
aa	Version number (if greater than 0, initial version)

Table 2: Use Case Nomenclature.

Color Table

For completeness, these are the custom colors used in StarUML's Use Case file.

Function	Color scheme (using RGB values)
Create xx Profile	207 / 233 / 214
Manage xx Profile	187 / 214 / 253
External Databases	252 / 186 / 254
Monitor xx	254 / 136 / 80
Record Storage	202 / 248 / 201
Health Data	238 / 233 / 130

Figure 1: UML Color Table.

Reference Implementation Overview

This section outlines a potential scenario for the Reference Implementation software system.

Offer Consumer the ability to host and manage her Health Data in any participating Health Data Hosting Service Providers:

1. Consumer opens a Health Data Account with a Health Data Hosting Service Provider. On-line, at a retailer.
2. Consumer works with retail staffer to scan paper-based health records into the Consumer's Health Data Account at the chosen Health Data Hosting Service Provider. (Alternatively, Consumer uses own scanner).
3. Consumer defines access rights: who, what, when can view/post/edit.
4. Providers are increasingly using industry standards (CCR, HL7) to exchange data amongst them.
5. Upon Consumer's request, and approval, a Provider (physician, pharmacy, hospital, etc.) will upload data to, or query data from, the Consumer's Health Data Account.
6. Consumer will maintain an accurate, updated subset of her Health Data Account in a portable device for emergency use, to physically share her Health Data with Providers.
7. Over The Air ("OTA") provisioning services could securely manage the digital content in the mobile device.
8. Consumer will have complete control over her family's health information, wherever she is.
9. [Implicit] Consumer should be able to move her Health Data across Health Data Hosting Service Providers.
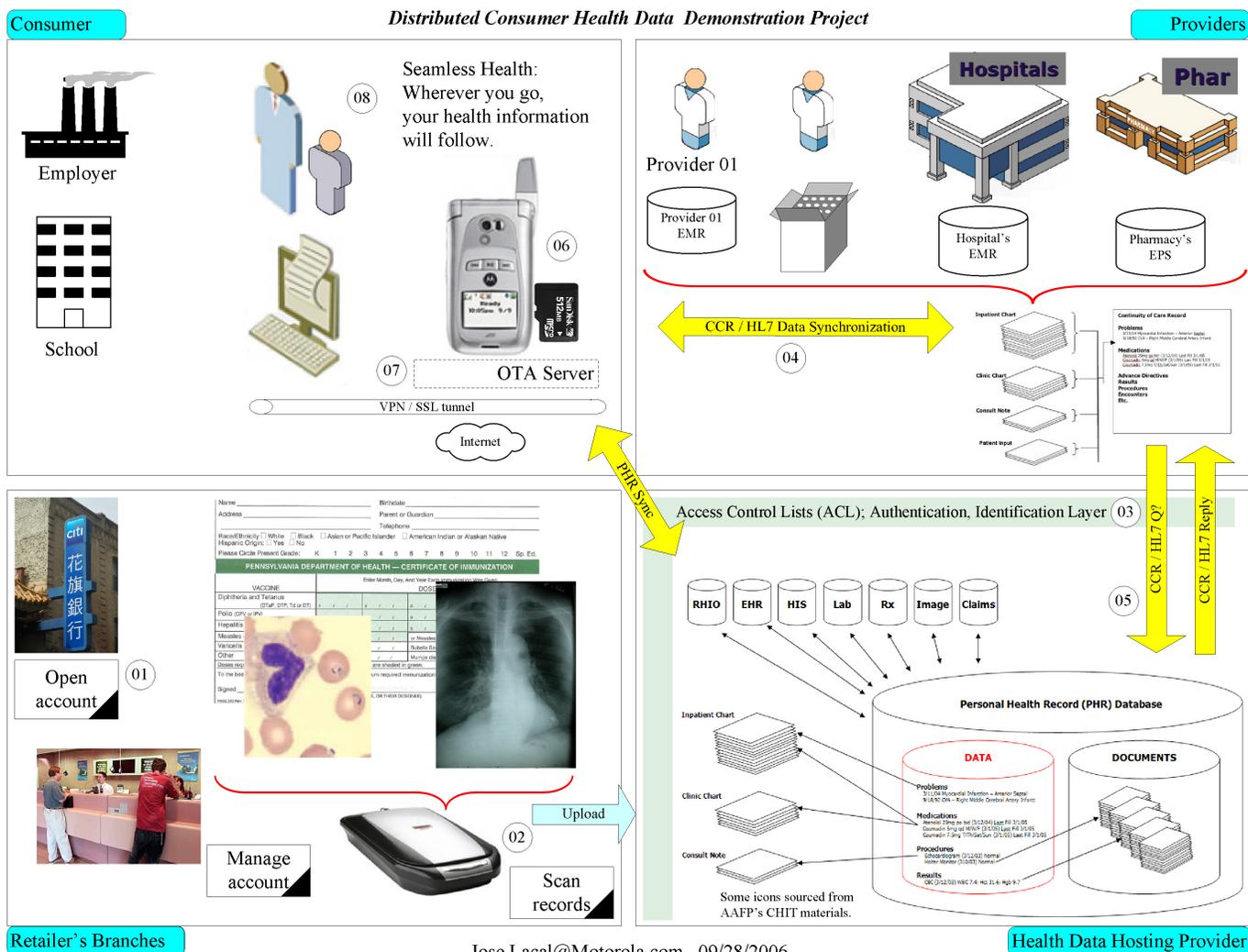
Figure 2: Distributed Consumer health Data Demonstration Project.

Diagrams

This section contains the diagrams generated by StarUML.

PHI Use Case Diagram
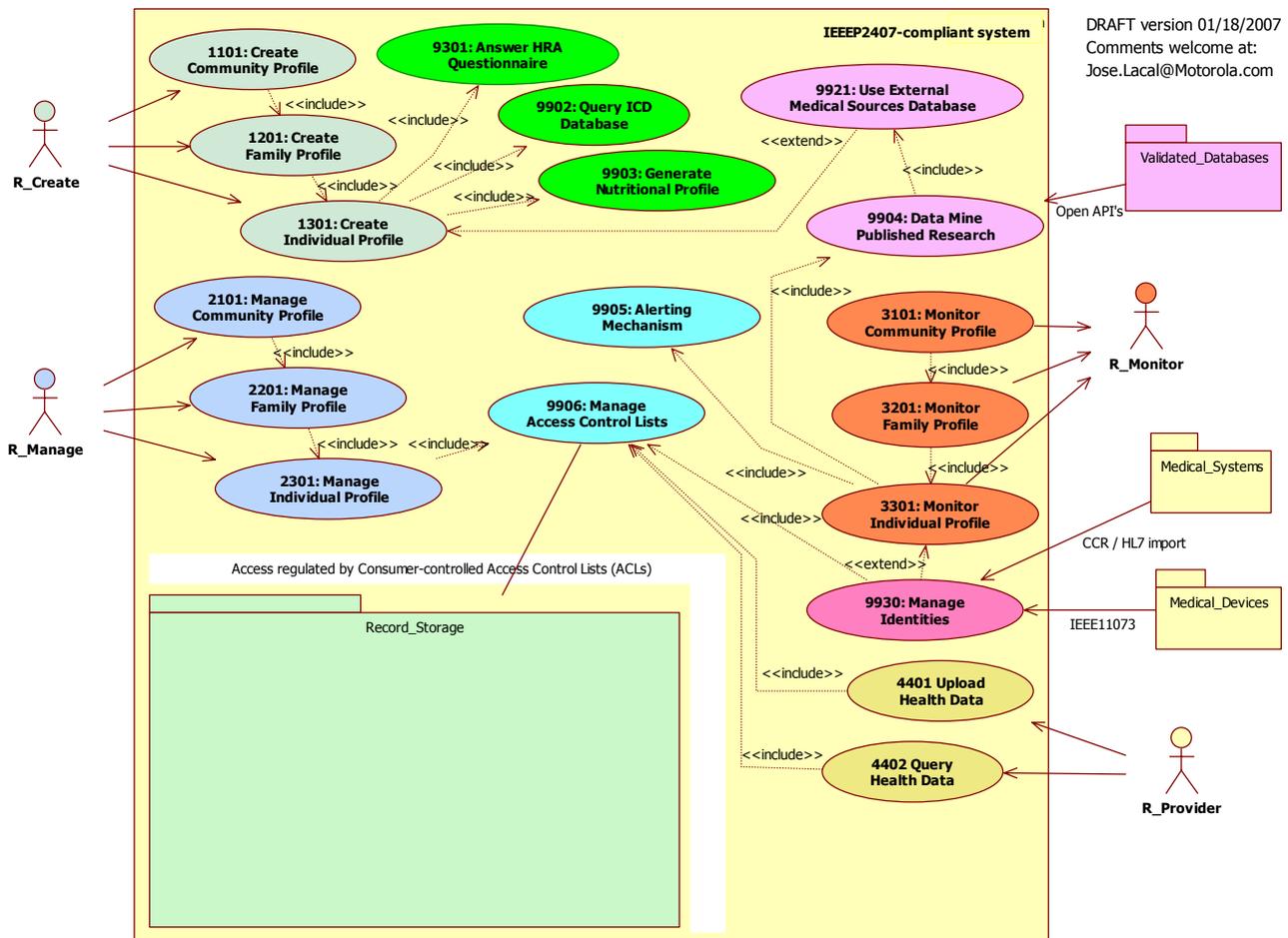
Figure 1 – Use Case Diagram of PHI

PHI_1 Use Case Diagram

Detailed analysis of the process for creating Individual, Family, and Community profiles.
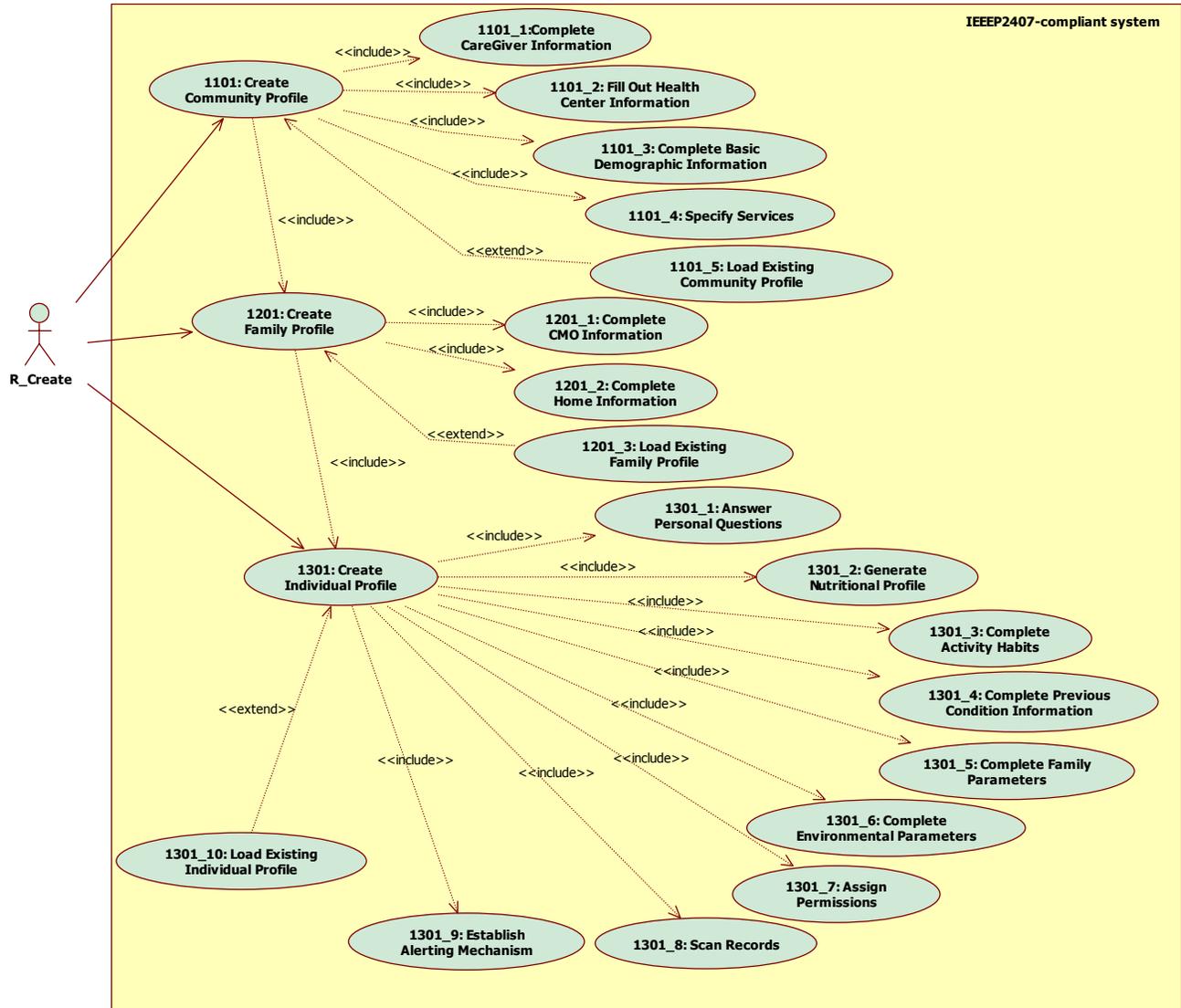
Figure 2 – Use Case Diagram of PHI_1

Main Component Diagram

Component Diagram

Figure 3 – Component Diagram of

Figure 4 – Component Diagram of Main

Actor and Role Specification

This section presents detailed information about each actor, and about the different roles those actors could take in the system.

Actors are Different and Separate From Roles[10]

Mr Southerby as CEO needs access to management information. Fred Smith as Order Entry Clerk needs to enter orders. Sometimes Mr Southerby may need to enter an order when Fred isn't there. That doesn't mean that we draw an arrow between Mr Southerby and the Enter Order use case. Entering orders is not the role of the CEO. This is Mr Southerby taking on the role of Order Entry Clerk, a mapping which occurs when Mr Southerby logs on and is granted access to the Enter Order use case by security settings defined by the system administrator.

Ultimately an actor has no properties other than its links to use cases. It is a logical set and nothing more. When naming actors we need to think of the role that a person takes on rather than their title. Most job titles involve the putting on of a number of different hats in different situations. So name the actor with the role rather than the job title if there is any confusion. Think hats!
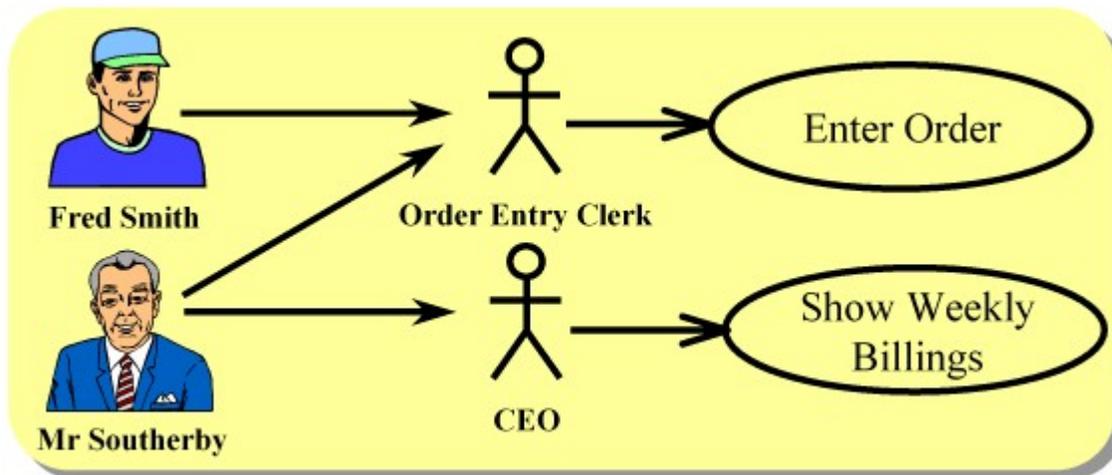
Figure 3: Actors as Roles.

List of Actors

Please notice: actors do not interact with the system. Roles do (see below).

Actor	Definition
Caregiver	The Note: "Self" is also a caregiver (for oneself).
Guardian	
Guardian, secondary	• Divorced, non-custodial parent • Secondary, or non-caregiver relative or interested individual (trust or bank employee; government agency; court-appointed attorney)
Health Engineer, Community (HCE)	
Health Engineer, Personal (PHE)	
Provider	
System Administrator.	

Table 3: List of Actors.

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[10] Source: http://www.cragsystems.co.uk/SFRWUC/index.htm, item 1.7

R_Create

Description

Comment by Adrian Gropper [agropper@gmail.com] on 07/07/2006.

In the real-world, many encounters Create a new User from the institution's point of view. In a PHI-compliant world, the User would show up at a genetic testing lab and expect the clerk to identify me in a way that respects my privacy and assures me of total control and informed consent relative to Record Locator Services.

Alias

Default :: Alias

Semantics

UMLActor :: Default :: Semantics

Usage

UMLActor :: Default :: Usage

Requirements

UMLActor :: Default :: Requirements

Implementation

UMLActor :: Default :: Implementation

R_Manage

Description

Alias

Semantics

Usage

Requirements

Implementation

R_Monitor

Description

Alias

Semantics

Usage

Requirements

Implementation

R_Provider

Description

Alias

Semantics

Usage

Requirements

Implementation

Use Case Specifications

This section..

1101: Create Community Profile

Documentation

A "community" is defined as a group of families and individuals under the care of a single practitioner. For example: a nurse might be responsible to provide care to one or more individuals across one or more families.

Special Requirements

- None

Semantics

The caregiver creates a community profile

Usage

Joao, the "Ave Maria" school principal in Morro do Borel, Tijuca at Rio de Janeiro, wants to make health accessible for the poor people of the neighborhood. He opens a communitary account in a nearby bank. There, he is well instructed about all the benefits and potential of the PHI system and offer him any assistant he could require. When he returns school, he logs into a dashboard and start completing forms. He will create family profiles as well as indivual ones.

Requirements

Specify the Create Community Profile use case.

Implementation

Flow of Events

Basic Flow

- 1. The caregiver selects "Create Community Profile".
- extension point: existing Community Profile
- 2. include (1101_1: Complete CareGiver Information)
- 3. include (1101_2: Fill out Health Center Information)
- 4. include (1101_3: Complete Basic Demographic Information)
- 5. include (1101_4: Specify Services)
- 6. For each family:
- 6.1. include (1201: Create Family Profile)
- 7. The system displays the community profile information to the caregiver.

- 8. The system requests the caregiver to accept the community profile information.
- 9. The caregiver accepts the community profile information.
- 10. The system storages the community profile information.

Alternative Flow

- 1. The first alternative flow begins at any time.
- 1.1. The caregiver cancels profile creation.
- 2. The second alternative flow begins after step 8. of the basic flow.
- 2.1. The caregiver rejects the community profile information.
- 2.2. The system allows the caregiver to edit the wrong information.
- 2.3. The caregiver changes the information.

Pre-Conditions

- The consumer must be logged on to the system

Post-Conditions

- A community profile is created

Extension Points

- existing Community Profile

1101_1:Complete CareGiver Information

Documentation

This use case will allow caregiver to answer few personal questions.

Some questions to ask:

Name/Surname

Sex (M/F)

Date of Birth

Race

Marital Status

Socio-Economic Level

Diseases

Alcohol Consumption

Tobacco Use

Physical Activities

Dietary Habits

Eating habits

Profession

With all these information, the system will make the caregiver profile. This is very important becouse she/he will provide care to one or more individuals across different families.

Special Requirements

■   None

Semantics

The caregiver answers personal questions

Usage

Joao starts answering personnal questions, as well as forms concerning activity habits, diseases, dietary habits, etc. He realizes he will be the caregiver or community health advocate of many people and he is willing to make a good job.

Requirements

Identify and specify all possible use cases necessary to create a community profile.

Implementation

Flow of Events

Basic Flow

- 1. The system asks the caregiver personal questions.
- 2. The caregiver answers those personal questions.
- 3. The system checks all mandatory fields are completed.
- 4. If all mandatory fields are completed
- 4.1.The system displays the caregiver information.
- 4.2.The system requests the caregiver to accept the information.
- 4.3. The caregiver accepts her information.
- 5. Else
- 5.1. The system displays the missing fields to be completed.
- 5.2. Repeat from 2.

Alternative Flow

- None

Pre-Conditions

- 1. The caregiver has selected "Create Community Profile"
- 2. Is the first time the caregiver creates the community profile.

Post-Conditions

- The caregiver answered personal questions

Extension Points

- None

1101_2: Fill Out Health Center Information

Documentation

This use case allow the caregiver to complete basic Health Center's information.

Some questions to ask:

- Location of the health center or communitarian schools (most health centers will be located in medically underserved areas).

- Amount of people that could be taken care there.

Special Requirements

- ■

Semantics

The caregiver fills out the Health Center Information form

Usage

Joao must also complete some Ave Maria's school information. He starts putting its location: 1820 Belo Horizonte St., Morro do Borel, Tijuca, Rio de Janeiro. Also he establishes the number of people that can assist there: 20.

And all other relevant school information.

Requirements

Identify and specify all possible use cases necessary to create a community profile.

Implementation

Flow of Events

Basic Flow

- ■   1. The system asks the caregiver for health center information.
- ■   2. The caregiver provides that information.
- ■   3. The system checks all mandatory fields are completed.
- ■   4. If all mandatory fields are completed
- ■   4.1.The system displays the health center information.
- ■   4.2.The system requests the caregiver to accept the information.

- ■   4.3. The caregiver accepts the information.
- ■   5. Else
- ■   5.1. The system displays the missing fields to be completed.
- ■   5.2. Repeat from 2.

Alternative Flow
- ■

Pre-Conditions
- ■   1. The caregiver has selected "Create Community Profile".
- ■   2. Is the first time the caregiver creates the community profile.

Post-Conditions
- ■   The health center information form is filled out

Extension Points
- ■

1101_3: Complete Basic Demographic Information

Documentation

This use case will allow caregiver to complete basic demographic information on populations served, such as race/ethnicity, socio-economic level, etc.

Special Requirements

- None

Semantics

The caregiver completes basic demographic information on the population served.

Usage

Joao, gives a quick reference of the demographic conditions on populations served. Latin and african american people will mostly be under his care, with extremely low income resources.

Requirements

Identify and specify all possible use cases necessary to create a community profile.

Implementation

Flow of Events

Basic Flow

- 1. The system asks the caregiver for basic demographic information on populations served.
- 2. The caregiver provides that information.
- 3. The system checks all mandatory fields are completed.
- 4. If all mandatory fields are completed
- 4.1.The system displays the demographic information.
- 4.2.The system requests the caregiver to accept the information.
- 4.3. The caregiver accepts the information.
- 5. Else
- 5.1. The system displays the missing fields to be completed.
- 5.2. Repeat from 2.

Alternative Flow

- None

Pre-Conditions

- 1. The caregiver has selected "Create Community Profile".
- 2. Is the first time the caregiver creates the community profile.

Post-Conditions

- The basic demographic information on populations served is completed.

Extension Points

- None

1101_4: Specify Services

Documentation

This use case will allow caregiver to specify the different services the community center will provide.

An example could be Transportation Sevices that will promote access to health care.

The center can have for example a "van" that could be the transportation method for poor individuals to go to the center twice a week.

Also the Resources available (for example number of PC's) and the internet access availability.

The center will set fees for these services adjusted upon patients' ability to pay.

Special Requirements

- None

Semantics

The caregiver specifies the communitary center services.

Usage

Joao writes the benefits and services the school will provide. There's a mini bus with a capacity for 20 people. There will be transportation to the school every Tuesday and Friday, as well as in any emergency situation.There are also 8 PC's available, but only 5 are connected to internet.

Requirements

Identify and specify all possible use cases necessary to create a community profile.

Implementation

Flow of Events

Basic Flow

- 1. The system asks the caregiver for communitary center services specifications.
- 2. The caregiver provides that information.
- 3. The system checks all mandatory fields are completed.
- 4. If all mandatory fields are completed
- 4.1.The system displays the communitary center services information.
- 4.2.The system requests the caregiver to accept the information.

- ■   4.3. The caregiver accepts the information.
- ■   5. Else
- ■   5.1. The system displays the missing fields to be completed.
- ■   5.2. Repeat from 2.

Alternative Flow
- ■ None

Pre-Conditions
- ■   1. The caregiver has selected "Create Community Profile".
- ■   2. Is the first time the caregiver creates the community profile.

Post-Conditions
- ■ The communitary center services are specified.

Extension Points
- ■ None

1101_5: Load Existing Community Profile

Documentation

This use case will allow caregiver to use her previous health databases.

If caregiver changes of datahosting service provider, she won't need to create all the community profile again (more tedious). She will just consult her previous datahosting service provider database and load all that information into the new one, with all the medical records, results of laboratory analysis and data collected by medical devices.

See Use External Medical Sources Database use case to identify the communication protocols or standards required to connect to those databases.

Special Requirements

■   None

Semantics

The caregiver loads the community profile from her previous DataHosting Service Provider.

Usage

Joao decides to change of DataHosting Service Provider. He realizes Citibank is the provider that reaches most of his expectations. So he goes to a nearby Citi branch and opens an account. One hour later, when he arrives school, he logs into the dashboard and instead of creating the community profile again, he simply clicks on an option "Load Existing Profile", he selects his previous DataHosting Service Provider, and "Woila", all the records are loaded.

Requirements

Identify and specify all possible use cases necessary to create a community profile.

Implementation

Flow of Events

Basic Flow

■   1. The caregiver selects to use other datahosting service provider database to create a community profile.

■   2. The system asks the caregiver to enter the specific database.

■   3. The caregiver enters the details of her previous datahosting service provider database.

■   4. The system interchanges the information between DataHosting Service Providers.

Alternative Flow

- 1. The alternative flow begins after step 2. on the basic flow.
- 1.1. The caregiver enters an invalid DataHosting Service Provider database.
- 1.2. The system asks the caregiver to enter it again.
- 1.3. The caregiver enters the correct one.

Pre-Conditions

- 1. The caregiver has selected "Create Community Profile".
- 2. The caregiver has changed her DataHosting Service Provider.

Post-Conditions

- A community profile is loaded

Extension Points

- None

1201: Create Family Profile

Documentation

Define Family Unit

a.) Consumer for individual / family

b.) Caregiver for individual / family

c.) Community worker for individual / family

Special Requirements

- None

Semantics

The CMO creates a family profile

Usage

Jane, mother of three young kids, tired of having her childs sick, decided to focus on keeping them healthy and preventing from illnesses. On the way to work, she drives up to a CitiBank and opens a Health Data Account for her family. She receives a username and password. As soon as she arrives home, she connects to internet and logs on to a dashboard with the UID and password received.

Once in the system, she selects the "Create Family Profile" option and start answering questions of all her family members. She is now the "defacto" Chief Medical Officer (CMO) at home and will guard her family health. She will be able to create the individuals profiles of each family member.

Requirements

Specify the Create Family Profile use case.

Implementation

Flow of Events

Basic Flow

- 1. The CMO selects "Create Family Profile".
- extension point: existing Family Profile
- 2. include (1201_1: Complete CMO Information)
- 3. include (1201_2: Complete Home Information)
- 3. For each family member:

- 3.1. include (1101: Create Individual Profile)
- 4. The system displays the family profile information to the CMO.
- 5. The system requests the CMO to accept the family profile information.
- 6. The CMO accepts the family profile information.
- 7. The system storages the family profile. information.

Alternative Flow

- 1. The first alternative flow begins at any time.
- 1.1. The CMO cancels profile creation.
- 2. The second alternative flow begins after step 5. of the basic flow.
- 2.1. The CMO rejects the community profile information.
- 2.2. The system allows the CMO to edit the wrong information.
- 2.3. The CMO changes the information.

Pre-Conditions

- The consumer must be logged on to the system

Post-Conditions

- A family profile is created

Extension Points

- existing Family Profile

1201_1: Complete CMO Information

Documentation

This use case will allow CMO (Chief Medical Officer) to answer some personal questions.

Some questions to ask:

Name/Surname

Sex (M/F)

Date of Birth

Race

Marital Status

Socio-Economic Level

Diseases

Alcohol Consumption

Tobacco Use

Physical Activities

Dietary Habits

Eating habits

Profession

Job

With all these information, the system will make the CMO profile. This is very important becouse she/he will provide care to her/his family.

Special Requirements

■　None

Semantics

The CMO completes her personal information

Usage

Jane starts creating her personal profile, answers questions concerning dietary habits, socio-economic level, diseases, etc. She fills out the form as accurate and complete as possible 'cos she knows the importance of her role (CMO).

Requirements

Identify and specify all possible use cases necessary to create a family profile.

Implementation

Flow of Events

Basic Flow

- ■ 1. The system asks the CMO for her personal information.
- ■ 2. The CMO provides that information.
- ■ 3. The system checks all mandatory fields are completed.
- ■ 4. If all mandatory fields are completed
- ■ 4.1.The system displays the CMO information.
- ■ 4.2.The system requests the CMO to accept her information.
- ■ 4.3. The CMO accepts her information.
- ■ 5. Else
- ■ 5.1. The system displays the missing fields to be completed.
- ■ 5.2. Repeat from 2.

Alternative Flow

- ■ None

Pre-Conditions

- ■ 1. The CMO has selected "Create Family Profile".
- ■ 2. Is the first time the CMO creates her family profile.

Post-Conditions

- ■ The CMO personal information is completed

Extension Points

- ■ None

1201_2: Complete Home Information

Documentation

This use case will allow CMO (Chief Medical Officer) to complete relevant home information such as:

- Location

- How many people live there ?

- How many smokers ?

- Home air quality ?

- Who usually cooks and what ?

- Who eats ?

Special Requirements

- None

Semantics

The CMO completes home information

Usage

Jane completes relevant home parameters such as Home Location: 124 Ocean Drive, South Beach, Florida. She answers some cooking habits questions: she cooks at home, mostly meat at lunch and vegetables at dinner, usually fruits at desert. She tries to mantain a balanced diet to mantain her children healthy but they not always eat at home.

Requirements

Identify and specify all possible use cases necessary to create a family profile.

Implementation

Flow of Events

Basic Flow

- 1. The system asks the CMO for few home parameters.

- 2. The CMO provides that information.

- 3. The system checks all mandatory fields are completed.

- 4. If all mandatory fields are completed

- 4.1.The system displays the home information.

- 4.2.The system requests the CMO to accept the information.

- 4.3. The CMO accepts her information.

- 5. Else

- 5.1. The system displays the missing fields to be completed.

- 5.2. Repeat from 2.

Alternative Flow
- None

Pre-Conditions
- 1. The CMO has selected "Create Family Profile".

- 2. Is the first time the CMO creates her family profile.

Post-Conditions
- The home information is completed

Extension Points
- None

1201_3: Load Existing Family Profile

Documentation

This use case will allow CMO to use her previous health databases.

If CMO changes of datahosting service provider, she won't need to create all her family profile again (more tedious). She will just consult her previous datahosting service provider database and load all that information into the new one, with all the medical records, results of laboratory analysis and data collected by medical devices.

See Use External Medical Sources Database use case to identify the communication protocols or standards required to connect to those databases.

Special Requirements

- None

Semantics

The CMO loads the family profile from her previous DataHosting Service Provider.

Usage

Jane changes her Data Hosting Service Provider. She opens a new account in other retailer. And then she simply loads her family profile she's already created with her previous provider into the new one. She is really happy with this possibility to decide which provider offer the more benefits to her requirements.

Requirements

Identify and specify all possible use cases necessary to create a family profile.

Implementation

Flow of Events

Basic Flow

- 1. The CMO selects to use other datahosting service provider database to create a family profile.
- 2. The system asks the CMO to select the specific database.
- 3. The CMO enters the details of her previous datahosting service provider database.
- 4. The system interchanges the information between DataHosting Service Providers.

Alternative Flow

- 1. The alternative flow begins after step 2. on the basic flow.
- 1.1. The CMO enters an invalid DataHosting Service Provider database.
- 1.2. The system asks the CMO to enter it again.
- 1.3. The CMO enters the correct one.

Pre-Conditions

- 1. The CMO has selected "Create Family Profile"
- 2. The CMO has changed her DataHosting Service Provider.

Post-Conditions

- A family profile is loaded

Extension Points

- None

1301: Create Individual Profile

Documentation

Inside each family, there are several individuals.

Create a biological, physical, and medical profile for each individual.

Questions to ask:

Sex (M/F) => sex-specific parameters

Age => age-specific parameters

Race => race-specific parametrs

Family history => family-specific parameters

Weights

Height

  => Compute BMI

    => Weight-specific parameters

Previous conditions

  => ICD-9 query

  => condition-specific parameters

Tobacco use => tobacco-specific issues

Socio-Economic Level

Marital Status

Health Index (self-reported)

Physical Activity Index

Issues

Environment

These questions and branching logic are already available from Health Risk Assessment documents.

The end goal is to generate an XML-based profile that allows the system to conduct data mining based on the elements highlighted in the profile.

>> Narrate a story! <<

277.39

Other amyloidosis

Hereditary cardiac amyloidosis

Inherited systemic amyloidosis

Neuropathic (Portuguese) (Swiss)

amyloidosis

Secondary amyloidosis

>> Output: an XML-based Personal Profile file.

? Extend the CCR template?

Special Requirements

- None

Semantics

The consumer creates an individual profile

Usage

Mary, a single middle thirties woman, encouraged by her friend Jane who strongly recommended the PHI system, opens an Individual Health account at Citibank. She is instructed to enter her UID and password in a secure web page and to Create her Individual Profile. She is so excited about the idea of controlling her medical records that, as soon as she arrives home, she starts creating her profile.

Requirements

Specify the Create Individual Profile use case.

Implementation

Flow of Events

Basic Flow

- 1. The consumer selects "Create Individual Profile".
- extension point: existing Individual Profile
- 2. include (1301_1: Answer Personal Questions)
- 3. include (1301_2: Generate Nutritional Profile)
- 4. include (1301_3: Complete Activity Habits)
- 5. include (1301_4: Complete Previous Condition Information)
- 6. include (1301_5: Complete Family Parameters)
- 7. include (1301_6: Complete Environmental Parameters)
- 8. include (1301_7: Assign Permissions)

- 9. The system displays the individual profile information to the consumer.
- 10. The system requests the consumer to accept the individual profile information.
- 11. The consumer accepts the individual profile information.
- 12. The system storages the individual profile information.

Alternative Flow
- 1. The first alternative flow begins at any time.
- 1.1. The consumer cancels profile creation.
- 2. The second alternative flow begins after step 10. of the basic flow.
- 2.1. The consumer rejects her profile information.
- 2.2. The system allows the consumer to edit the wrong information.
- 2.3. The consumer changes the information.

Pre-Conditions
- The consumer must be logged on to the system

Post-Conditions
- An individual profile is created

Extension Points
- existing Individual Profile

1301_10: Load Existing Individual Profile

Documentation

This use case will allow consumer use her previous health databases.

If consumer changes of datahosting service provider, she won't need to create all her profile again (more tedious). She will just consult her previous datahosting service provider database and load all that information into the new one, with all her medical record, results of laboratory analysis and data collected by medical devices.

See Use External Medical Sources Database use case to identify the communication protocols or standards required to connect to those databases.

Special Requirements

■   None

Semantics

The consumer loads the individual profile from her previous DataHosting Service Provider.

Usage

Mary moves to New York and wants to change her Data Hosting Service Provider. She now has the possibility to load her previous profile.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

■   1. The consumer selects to use other datahosting service provider database to create an individual profile.

■   2. The system asks the consumer to select the specific database.

■   3. The consumer enters the details of her previous datahosting service provider database.

■   4. The system interchanges the information between DataHosting Service Providers.

Alternative Flow

■   1. The alternative flow begins after step 2. on the basic flow.

- ■   1.1. The consumer enters an invalid DataHosting Service Provider database.
- ■   1.2. The system asks the consumer to enter it again.
- ■   1.3. The consumer enters the correct one.

Pre-Conditions

- ■   1. The consumer has selected "Create Individual Profile"
- ■   2. The consumer has changed her DataHosting Service Provider.

Post-Conditions

- ■   An individual profile is loaded.

Extension Points

- ■   None

1301_1: Answer Personal Questions

Documentation

This use case will allow the consumer to answer few personal questions in order to create her individual profile

Questions to ask:

Name/Surname

Sex (M/F)

Date of Birth

Race

Marital Status

Socio-Economic Level

Heallth Provider

Special Requirements

- None

Semantics

The consumer answers personal questions

Usage

Mary answers few personal questions to start creating her profile such as:

Name: Mary Joan

Surname: Branaghu

Sex: Female

Date of Birth: 2/2/1971

Social-Economic Level: High

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

- 1. The system asks the consumer personal questions.
- 2. The consumer answers those personal questions.
- 3. The system checks all mandatory fields are completed.
- 4. If all mandatory fields are completed
- 4.1.The system displays the consumer personal information.
- 4.2.The system requests the consumer to accept the information.
- 4.3. The consumer accepts her information.
- 5. Else
- 5.1. The system displays the missing fields to be completed.
- 5.2. Repeat from 2.

Alternative Flow

- None

Pre-Conditions

- 1. The consumer has selected "Create Individual Profile".
- 2. Is the first time consumer creates her individual profile.

Post-Conditions

- The consumer answered personal questions

Extension Points

- None

1301_2: Generate Nutritional Profile

Documentation

This use case will allow consumer to answer some questions about her dietary habits as well as her physical condition.

The end goal is to create a Nutritional Profile for an Individual

Some questions to ask:

Weight (kilograms, pounds)

Height (centimeters, feet, inches)

Cholesterol

Blood Presure

Tobacco use

Alcohol Consumption

Eat Breakfast?

Eat 3-4 meal each day?

Eat Grain Products, Vegetables & Fruit, Milk Products, Meat & Alternatives?

The system will calculate for example the BMI (body mass index) which is measure of body fat based on height and weight for both men and women.

Underweight = < 18.5

Normal Weight = 18.5 - 24.9

Overweight = 25 - 29.9

Obesity = BMI of 30 or more

Based on each invividual's needs, the system will perform a data mining from for example USDA National Nutrient Database to find the best nutritional guidelines.

Special Requirements

■   None

Semantics

The consumers answers questions about her physical condition

Usage

Mary completes her dietary habits as well as physical condition. She smokes aproximately 30 cigarettes a day (quite a lot). She weights 42 kgm and her height is 1.75 m. She eats too much fast food, and exceptionally vegetables and fruits. She doesn't like milk, instead she drinks water.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow
- 1. The system asks the consumer questions about her physical condition as well as nutrition habits.
- 2. The consumer answers those questions.
- 3. The system checks all mandatory fields are completed.
- 4. If all mandatory fields are completed
- 4.1.The system displays the consumer physical condition information and eating habits.
- 4.2.The system requests the consumer to accept the information.
- 4.3. The consumer accepts the information.
- 5. Else
- 5.1. The system displays the missing fields to be completed.
- 5.2. Repeat from 2.

Alternative Flow
- None

Pre-Conditions
- 1. The consumer has selected "Create Individual Profile".
- 2. Is the first time consumer creates her individual profile.

Post-Conditions
- Consumer's nutritional profile is generated

Extension Points
- None

1301_3: Complete Activity Habits

Documentation

This use case will allow consumer to answer some questions about her daily Physical Activities.

Questions to ask:

Sports? Which one?

Walk rather than riding a car?

Activities that keep you flexible (stretching, yoga, etc)?

Activities that keep you strong (resistance exercises, lifting, gardening, etc)

Job?

Based on each invividual's needs, the system will search the best dietary guidelines.

Special Requirements

■ None

Semantics

The consumer answers questions about her daily physical activities

Usage

Mary completes her physical activities. Sports: tennis and golf. She usually walks 3 km per day. Every Tuesday she goes to yoga and on weekends she enoys keeping her garden beatiful.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

■ 1. The system asks the consumer questions about her activity habits.

■ 2. The consumer answers those questions.

■ 3. The system checks all mandatory fields are completed.

■ 4. If all mandatory fields are completed:

■ 4.1.The system displays the consumer activity habits information.

- 4.2.The system requests the consumer to accept that information.
- 4.3. The consumer accepts the information.
- 5. Else
- 5.1. The system displays the missing fields to be completed.
- 5.2. Repeat from 2.

Alternative Flow
- None

Pre-Conditions
- 1. The consumer has selected "Create Individual Profile".
- 2. Is the first time consumer creates her individual profile.

Post-Conditions
- The consumer answered activity habits questions

Extension Points
- None

1301_4: Complete Previous Condition Information

Documentation

This use case will allow consumer to specify her previous diseases.

Some question to ask:

- Diseases

- Age at first diagnose

- Treatment

- Rehabilitation

- Allergies

The system will use ICD-9-CM databases to code and classify all surgical, diagnostic and therapeutic procedures.

Special Requirements

- None

Semantics

The consumer answers questions about her previous conditions

Usage

Mary specifies her previous diseases and the age at first diagnose. When she was 14, she used to cough, had fever, shortness of breath, and chest pain. Physicians detected that she had pneumonia and gave her the appropiate treatment. She needed to take antibiotics and must avoid cigarette or other tobacco smoke while she was recovering from this respiratory illness.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

- 1. The system asks the consumer questions about her previous conditions.
- 2. The consumer answers those questions.

- 3. The system checks all mandatory fields are completed.
- 4. If all mandatory fields are completed:
- 4.1.The system displays the consumer previous condition information.
- 4.2.The system requests the consumer to accept that information.
- 4.3. The consumer accepts the information.
- 5. Else
- 5.1. The system displays the missing fields to be completed.
- 5.2. Repeat from 2.

Alternative Flow

- None

Pre-Conditions

- 1. The consumer has selected "Create Individual Profile".
- 2. Is the first time consumer creates her individual profile.

Post-Conditions

- The consumer answered previous condition questions

Extension Points

- None

1301_5: Complete Family Parameters

Documentation

This use case will allow consumer to answer some questions about her family members health parameters.

Questions to ask:

Family Members:

- Father (lives, if not specify cause of death)

- Mother(idem)

- GrandParents(idem)

Optionals:

- Sisters (idem)

- Brothers (idem)

- Sons (idem)

- Halfsisters (idem)

etc.

Also, the consumer must answer questions about their most relevant diseases (cancer, diabetes, etc) and preferently the age at first diagnose.

With this information, the system will evaluate any genetic predispositions to disease.

Special Requirements

■   None

Semantics

The consumer answers questions about her family

Usage

Mary also completes a form with her family members paramenters. As she is single, she only fills out the part of parents and grandparents.

Her father passed away in 2004 from a lung cancer, he was a heavy smoker. Her mom is healthy, she had a breast cancer in 2001 but she survived. Both of her grandparents died of natural causes at an elderly age.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

- 1. The system asks the consumer questions about her family.
- 2. The consumer answers those questions.
- 3. The system checks all mandatory fields are completed.
- 4. If all mandatory fields are completed:
- 4.1.The system displays the consumer family information.
- 4.2.The system requests the consumer to accept the information.
- 4.3. The consumer accepts that information.
- 5. Else
- 5.1. The system displays the missing fields to be completed.
- 5.2. Repeat from 2.

Alternative Flow

- None

Pre-Conditions

- 1. The consumer has selected "Create Individual Profile".
- 2. Is the first time consumer creates her individual profile.

Post-Conditions

- The consumer answered family questions

Extension Points

- None

1301_6: Complete Environmental Parameters

Documentation

This use case will allow consumer to create her environmental profile.

Questions to ask:

- Home Address

- School / University Address

- Workplace Address

- Country/Region

With all these items, the system will be able to generate an Environmental Profile for the individual and alert her of possible environmental risks (rain, air pollution, etc).

Special Requirements

■ None

Semantics

The consumer answers questions about her environment

Usage

Mary completes her home location as well as places she often visists. She lives in Richmond, Virginia. She works 8 hours per day at downtown. She is doing a Master in Businness Administration at University of Richmond.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

■ 1. The system asks the consumer questions about her environment.

■ 2. The consumer answers those questions.

■ 3. The system checks all mandatory fields are completed.

■ 4. If all mandatory fields are completed:

- 4.1. The system displays the consumer environment information.
- 4.2. The system requests the consumer to accept the information.
- 4.3. The consumer accepts the information.
- 5. Else
- 5.1. The system displays the missing fields to be completed.
- 5.2. Repeat from 2.

Alternative Flow
- None

Pre-Conditions
- 1. The consumer has selected "Create Individual Profile".
- 2. Is the first time consumer creates her individual profile.

Post-Conditions
- The consumer answered environmental questions

Extension Points
- None

1301_7: Assign Permissions

Documentation

This use case will allow consumer to establish the different permissions certain people will have to manage her individual profile.

There are read only, write only and read/write permissions.

The end goal is to create access control list (ACL).

See Manage Access Control Lists use case.

Special Requirements

■

Semantics

The consumer assigns permissions to manage her individual profile

Usage

She decides who will be able to see this information. Only she and physicians will have reading/writing access rigths. Her mother will be able to read the information but not editing option.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

■ 1. The system asks the consumer which person will have access to manage her individual profile.

■ 2. The consumer completes the "authorization" form.

■ 3. The system checks all mandatory fields are completed.

■ 4. If all mandatory fields are completed:

■ 4.1.The system displays the access list permissions.

■ 4.2.The system requests the consumer to accept the information.

■ 4.3. The consumer accepts the information.

■ 5. Else

- ■ 5.1. The system displays the missing fields to be completed.
- ■ 5.2. Repeat from 2.

Alternative Flow
- ■

Pre-Conditions
- ■ 1. The consumer has selected "Create Individual Profile".
- ■ 2. Is the first time consumer creates her individual profile.

Post-Conditions
- ■ An access control list (ACL) is created.

Extension Points
- ■

1301_8: Scan Records

Documentation

This use case will allow consumer to scan documents alone or with the help of retailer's staff in order to digitalized her paper-based health records.

The consumer will be able to scan any document she considers important about her previous health treatments, from simple doctor's prescriptions to complex brain biopsy or x-rays.

Special Requirements

◼ None

Semantics

The consumer scans her paper-based records

Usage

During her life, Mary visited many hospitals and physicians from different states. She always keep with the prescriptions, x-rays, biopsies, etc. Nowadays, she can digitalize those paper-based records to enlarge her clinic history. And she does it.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

◼ 1. The consumer scans her paper-based records.

◼ 2. The consumer uploads the scanned records into the system.

Alternative Flow

◼ None

Pre-Conditions

◼ 1. The consumer has selected "Create Individual Profile".

◼ 2. Is the first time consumer creates her individual profile.

Post-Conditions

- Paper-based records are scanned and stored into the system.

Extension Points

- None

1301_9: Establish Alerting Mechanism

Documentation

This use case will allow consumer to decide how the system will send her the alerts.

Those alerts could be:

- Passively: only when Consumer logs in to Dashboard

- Actively: to mobile devices (cell phone, PDA's, etc.)

See Alerting Mechanism use case.

Special Requirements

- None

Semantics

The consumer sets her alerting mechanism

Usage

Mary specifies how she prefers to be contacted by the system. As she is not much at home, she decides the system sends the alerts to her mobile phone.

Requirements

Identify and specify all possible use cases necessary to create an individual profile.

Implementation

Flow of Events

Basic Flow

- 1. The system asks the user about the alerting mechanism she prefers.
- 2. The consumer establishes the alerting mechanism she will receive (passively or actively).

Alternative Flow

- None

Pre-Conditions

- 1. The consumer has selected "Create Individual Profile".

- 2. Is the first time consumer creates her individual profile.

Post-Conditions

- An alerting mechanism is established.

Extension Points

- None

2101: Manage Community Profile

Documentation

* Add, delete, edit familes.

* Manage ACLs.

Special Requirements

■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow

■

Alternative Flow

■

Pre-Conditions

■

Post-Conditions

■

Extension Points

- ■

2201: Manage Family Profile

Documentation

    * Add, delete, edit individuals.

    * Manage ACLs.

Special Requirements
    ■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
    ■

Alternative Flow
    ■

Pre-Conditions
    ■

Post-Conditions
    ■

Extension Points

- ■

2301: Manage Individual Profile

Documentation
* Manage ACLs.

Special Requirements
- ■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
- ■

Alternative Flow
- ■

Pre-Conditions
- ■

Post-Conditions
- ■

Extension Points
- ■

3101: Monitor Community Profile

Documentation

    * Results of Data Mining

    * Present dashboard

    Roles and Actors

    * Community Health Engineer (CHE) Monitors Community

Special Requirements
    ■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
    ■

Alternative Flow
    ■

Pre-Conditions
    ■

Post-Conditions

- ▪

Extension Points

- ▪

3201: Monitor Family Profile

Documentation

* Results of Data Mining

* Present dashboard

Special Requirements

■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow

■

Alternative Flow

■

Pre-Conditions

■

Post-Conditions

■

Extension Points

- ■

3301: Monitor Individual Profile

Documentation

* Results of Data Mining

* Present dashboard

Once a personal profile has been created for a target user

The end goal is for the system to provide the Guardian or caregiver actors with a complete guide as to how best to treat the target user.

Relevant and actionable information.

Prevention information.

Roles and Actors

* Child / caregiver caring for elder

* Consumer for self

* Personal Health Engineer (PHE)

monitoring an individual

Special Requirements
- ▪

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
-

Alternative Flow
-

Pre-Conditions
-

Post-Conditions
-

Extension Points
-

4401 Upload Health Data

Documentation

A Provider, once authorized by the Consumer, will be able to upload information into the Consumer's database using industry standards (CCR, HL7, others).

Special Requirements

- ■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow

- ■

Alternative Flow

- ■

Pre-Conditions

- ■

Post-Conditions

- ■

Extension Points

- ■

4402 Query Health Data

Documentation

A Provider, once authorized by the Consumer, will be able to access and query the Consumer's database.

It is crucial to understand that the Consumer will be solely responsible to grant access to her Health Data.

Special Requirements
-

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
-

Alternative Flow
-

Pre-Conditions
-

Post-Conditions
-

Extension Points

- ■

9301: Answer HRA Questionnaire

Documentation

Health Risk Assessment Templates

Sources:

http://www.mcare.org/include/template.cfm?ID=1009

Special Requirements
- ■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
- ■

Alternative Flow
- ■

Pre-Conditions
- ■

Post-Conditions
- ■

Extension Points
-

9902: Query ICD Database

Documentation

This Use Case provides an interface to the ICD database.

ICD-9-CM

[http://www.cdc.gov/nchs/about/otheract/icd9/abticd9.htm]

The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) is based on the World Health Organization's Ninth Revision, International Classification of Diseases (ICD-9). ICD-9-CM is the official system of assigning codes to diagnoses and procedures associated with hospital utilization in the United States. The ICD-9 is used to code and classify mortality data from death certificates.

The ICD-9-CM consists of:

* a tabular list containing a numerical list of the disease code numbers in tabular form;

* an alphabetical index to the disease entries; and

* a classification system for surgical, diagnostic, and therapeutic procedures (alphabetic index and tabular list).

The entire ICD-9-CM database is available for free download.

[ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/ICD9-CM/2005/]

ICD-10

The Tenth Revision (ICD-10) differs from the Ninth Revision (ICD-9) in several ways although the overall content is similar: First, ICD-10 is printed in a three-volume set compared with ICD-9's two-volume set. Second, ICD-10 has alphanumeric categories rather than numeric categories. Third, some chapters have been rearranged, some titles have changed, and conditions have been regrouped. Fourth, ICD-10 has almost twice as many categories as ICD-9. Fifth, some fairly minor changes have been made in the coding rules for mortality.

[http://www.cdc.gov/nchs/about/major/dvs/icd10des.htm]

Special Requirements
■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
- ■

Alternative Flow
- ■

Pre-Conditions
- ■

Post-Conditions
- ■

Extension Points
- ■

9903: Generate Nutritional Profile

Documentation

This Use Case will allow User to create or edit a Nutritional Profile for an Individual.

The US Department of Agriculture provides freely-available data sources with the following information:

* NDB_No: 5-digit Nutrient Databank number that uniquely identifies a food item

* FdGrp_Cd: 4-digit code indicating food group to which a food item belongs

* FdGrp_Desc: Name of food group

* Food Description: Description of food item

USDA National Nutrient Database for Standard Reference - Release 18

[Available at http://www.ars.usda.gov/Services/docs.htm?docid=8964]

Release 18 of the USDA National Nutrient Database for Standard Reference: look up the nutrient content of 7,146 different foods.

USDA Database for the Added Sugars Content of Selected Foods.

[Nutrient Data Laboratory; Beltsville Human Nutrition Research Center (BHNRC); Agricultural Research Service (ARS); U.S. Department of Agriculture (USDA); Release 1, February 2006. Available at http://www.nal.usda.gov/fnic/foodcomp/Data/add_sug/addsug01.pdf]

The table contains carbohydrate, total sugar, and added sugar values for 2,038 foods across 23 food groups. The carbohydrate and total sugar values are taken directly from the USDA National Nutrient Database for Standard Reference, release 18 (SR).

A Microsoft Excel version of this report can also be downloaded.

[Available at http://www.nal.usda.gov/fnic/foodcomp/Data/add_sug/addsug01.xls]

Special Requirements
- ■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
- ▪

Alternative Flow
- ▪

Pre-Conditions
- ▪

Post-Conditions
- ▪

Extension Points
- ▪

9904: Data Mine Published Research

Documentation

Open Access Journals

PLoS

Available at http://www.plos.org/

The Public Library of Science (PLoS) is a nonprofit organization of scientists and physicians committed to making the world's scientific and medical literature a public resource.

Directory of Open Access Journals

Available at http://www.doaj.org/

The Directory of Open Access Journals service covers free, full text, quality-controlled scientific and scholarly journals. The project aims to cover all subjects and languages. There are now 2,298 journals in the directory. Currently 654 journals are searchable at article level. As of 07/2006, 101,536 articles are included in the DOAJ service.

There is a content search interface available at http://www.doaj.org/findarticles

Or, to extract information more dynamically, PHY systems will use the Open Archives Initiative Protocol for Metadata Harvesting ("OAI-PMH").

Available at http://www.openarchives.org/OAI/openarchivesprotocol.html

OAI-PMH provides an application-independent interoperability framework based on metadata harvesting. There are two classes of participants in the OAI-PMH framework:

• Data Providers administer systems that support the OAI-PMH as a means of exposing metadata

• Service Providers use metadata harvested via the OAI-PMH as a basis for building value-added services

http://www.openarchives.org/OAI/2.0/guidelines.htm

Implementation Guidelines

http://www.openarchives.org/OAI/2.0/guidelines-harvester.htm

Implementation Guidelines for the Open Archives Initiative Protocol for Metadata Harvesting

Guidelines for Harvester Implementers

PubMed

Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?DB=pubmed

Please review the details of the Entrez Programming Utilities

Available at http://eutils.ncbi.nlm.nih.gov/entrez/query/static/eutils_help.html

PubMed Central utilizes the OAI interface as well.

More information available at http://www.pubmedcentral.nih.gov/about/oai.html and http://www.pubmedcentral.nih.gov/about/openftlist.html

OAI Access to PubMed Central Records

The PubMed Central OAI service (PMC-OAI) provides access to metadata of all items in the PubMed Central (PMC) archive, as well as to the full text of a subset of these items.

PMC-OAI is an implementation of the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH), a standard for retrieving metadata from digital document repositories. Visit the Open Archives Initiative site for more information about the protocol and other activities of the OAI group.

PubMed Central makes the full content of a large number of journals freely available for download.

See full list at http://www.pubmedcentral.nih.gov/about/openftlist.html

Guidelines Mining

Guidelines Clearinghouse

*** Centers for Disease Control and Prevention ***

Questions You May Want to Ask Your Child's Audiologist
http://www.qualitytools.ahrq.gov/summary/summary.aspx?view_id=1&doc_id=9290

Questions You May Want to Ask Your Child's Ear, Nose, and Throat (ENT) Doctor

http://www.qualitytools.ahrq.gov/summary/summary.aspx?view_id=1&doc_id=9289

Questions You May Want to Ask Your Child's Speech-Language Pathologist

http://www.qualitytools.ahrq.gov/summary/summary.aspx?view_id=1&doc_id=9291

The Cochrane Library

No one can keep up to date with the relevant evidence in their field of interest. The major bibliographic databases cover less than half the world's literature and are biased towards English language publications. Of the evidence available in the major databases, only a fraction can be found by the average searcher. Textbooks, editorials and reviews which have not been prepared systematically may be unreliable. Much evidence is unpublished, but unpublished evidence may be important. More easily accessible research reports tend to exaggerate the benefits of interventions.

The Cochrane Library solves many of these problems. Published on a quarterly basis and made available both on CD-ROM and the Internet (see 'How to get access'), it is the best single source of reliable evidence about the effects of health care.

Cochrane reviews

Cochrane reviews are based on the best available information about healthcare interventions. They explore the evidence for and against the effectiveness and appropriateness of treatments (medications, surgery, education, etc) in specific circumstances.

The complete reviews are published in The Cochrane Library which is available by subscription, either on CDROM or via the Internet. You should be able to browse the Cochrane Library at your nearest medical library if you don't have your own subscription. The Cochrane Library is published four times a year. Each issue contains all existing reviews plus an increasingly wider range of new and updated reviews. It is published and distributed by Wiley InterScience and is also distributed by a number of other Distribution Partners. It is not available for sale from Cochrane Centres.

Available at http://www.cochrane.org/reviews/clibintro.htm

A summary of the evolution of The Cochrane Library is available at http://www.update-software.com/publications/Cochrane/history.pdf

BioMed Central

http://www.biomedcentral.com/home/

This is publisher of over 150 Open Access scientific journals.

Future Interfaces to Implement

Create specific "connectors" for each of the above data repositories to perform the required data mining.

The PHI-compliant system must be flexible enough to accommodate these "data mining connectors" to be able to extract data from additional sources of validated information.

The software development community should be free and capable to develop additional "data mining connectors" to their own chosen sources of data.

Z39.50 Standard

Industry standards such as the Z39.50 standard [http://en.wikipedia.org/wiki/Z39.50] used in the publishing industry. A more recent version of that protocol is that referred to as the "Bath Profile." [Available at http://www.collectionscanada.ca/bath/bp-current.htm]

.. 1. Introduction to the Profile

This document identifies a subset of specifications from the Z39.50 Information Retrieval Protocol (ANSI/NISO Z39.50/ISO 23950) for use in Z39.50 client and server software. Conformance to this profile's specifications will improve international or extranational search and retrieval among library catalogues, union catalogues, and other electronic resource discovery services worldwide…

2. Purpose and Scope

The purpose of the Bath Profile is to identify those features of the Z39.50 standard that are required to allow effective use of Z39.50 software in a range of library applications, including search and retrieval of bibliographic data from library catalogues; transfer of holdings information; cross-domain searches between libraries, museums and archives; updating union catalogues; item ordering and document delivery.

.. 3. Functional Requirements

This section identifies the functional requirements informing the Z39.50 specifications in this release. These requirements focus on search and retrieval between library catalogues, the search and retrieval of bibliographic holdings information, and cross-domain search and retrieval for resource discovery. The requirements detailed in the sections below comprise three Functional Areas:

* Functional Area A for Basic Bibliographic Search & Retrieval, with Primary Focus on Library Catalogues

* Functional Area B for Bibliographic Holdings Search & Retrieval

* Functional Area C for Cross-Domain Search & Retrieval.

Fedora

Available at http://www.fedora.info/

"Fedora open source software gives organizations a flexible service-oriented architecture for managing and delivering their digital content. At its core is a powerful digital object model that supports multiple views of each digital object and the relationships among digital objects. Digital objects can encapsulate locally-managed content or make reference to remote content. Dynamic views are possible by associating web services with objects. Digital objects exist within a repository architecture that supports a variety of management functions. All functions of Fedora, both at the object and repository level, are exposed as web services. These functions can be protected with fine-grained access control policies.

This unique combination of features makes Fedora an attractive solution in a variety of domains. Some examples of applications that are built upon Fedora include library collections management, multimedia authoring systems, archival repositories, institutional repositories, and digital libraries for education."

Special Requirements
■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
- ■

Alternative Flow
- ■

Pre-Conditions
- ■

Post-Conditions
- ■

Extension Points
- ■

9905: Alerting Mechanism

Documentation

This Use Case will process the information generated by the system and will inform the User that some of such information is ready for the User's review.

* Passively (only when User logs in to Dashboard)

* Actively to mobile device, if requested

Special Requirements
■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
■

Alternative Flow
■

Pre-Conditions
■

Post-Conditions

▪

Extension Points

▪

9906: Manage Access Control Lists

Documentation

Access Controls Lists ("ACLs") are used to used to manage a matrix of user, role, and access rights to each section of the system. ACLs can also provide increased granularity by allowing the assignment of access rights on a per individual basis, beyond the traditional role-based access control process.

* Manage users

* Manage roles

* Manage ACLs

Access Control Lists imply that some people and institutions might not need to even know that I visited the genetic testing lab in D. For the rest, the user needs to manage, who can know that I visited the lab in C, who can see the result of the test, how much of the result they can see and finally how I, the user, will be notified that they looked.

[Comment by Adrian Gropper [agropper@gmail.com] on 07/07/2006.]

Special Requirements
■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
■

Alternative Flow
- ▪

Pre-Conditions
- ▪

Post-Conditions
- ▪

Extension Points
- ▪

9921: Use External Medical Sources Database

Documentation

This UC will allow the system to access and retrieve information collected and/or stored by external medical systems. For example:

* An individual's medical record stored in outside systems (using existing standards such as HL7 or ASTM CCR).

* Results of laboratory analysis

* Data collected by medical devices (using existing standards such as IEEE1073).

It is important to identify the specific communication protocols / standards required by the PHI-compliant system to connect to such source of information (preferably suing existing standards).

The entries in this library will be grouped by section:

* Medical records

* Medical devices

* Laboratory analysis

This library should be language- and country-specific to allow system administrator to customize such library to the system user's local needs.

Special Requirements
■

Semantics

Usage

Requirements

Implementation

Flow of Events

Basic Flow
- ▪

Alternative Flow
- ▪

Pre-Conditions
- ▪

Post-Conditions
- ▪

Extension Points
- ▪

9930: Manage Identities

Documentation

The purpose of this Use Case is to "map" the multiple identities a consumer might have on external systems.

Comment by Adrian Gropper [agropper@gmail.com] on 07/07/2006.

..the diagram needs to be expanded to show the role of user-centered identity management, institutional federation and other Web privacy and security practices that impact interoperability.

In my opinion, to put the user in control, the PHI standard needs to accommodate both vendor _and_ institutional neutrality. Too many standards presume an institutional affiliation and this assumption turns the person into a patient. To drive its adoption by the various institutions, I believe the PHI standard must recognize that in the real world an empowered user deals with institutions under various identities and allows these identities to be correlated at some risk and subject to some perceived reward such as a lower mortgage rate.

In PHI, the user's interaction with external vendors, services and institutions will probably need a mechanism to protect identity, avoid unwarranted correlations and facilitate informed consent. Where are the institutional boundaries (e.g.: firewalls) in the diagram or the proposed PHI standard?

Special Requirements
  ▪

Semantics

Usage

For example, Consumer Joe Smith might have an account with more than 01 external systems. Each of those external systems has a separate (most likely different) identification account number ("identity") for Joe Smith.

Requirements

The system should be able to represent itself to outside systems as the Consumer.

Open items:

* how to handle security, identity management?

* mapping of Liberty Alliance and similar efforts?

Implementation

Scenario:

* Joe has an account in Systam A, under username "JSmith"

* Joe has a separate account in external System B under username "JoeSmith"

* This Use Case will allow an IEEE(2407-compliant system to connect to both System A and System B _on behalf of_ Joe Smith to retrieve his information from both systems.

Flow of Events

Basic Flow
- ■

Alternative Flow
- ■

Pre-Conditions
- ■

Post-Conditions
- ■

Extension Points
- ■

Appendix A: Introduction to UML.

This section provides a brief introduction to the Unified Modeling Language ("UML"). UML will be used extensively throughout this document, and throughout the development of the reference implementation of the PHI system.

[NOTE: The material below is extracted from an excellent document by Sinan Si Alhir.[11]]

> The UML is an evolutionary general-purpose, broadly applicable, tool-supported, and industry-standardized modeling language for specifying, visualizing, constructing, and documenting the artifacts of a system-intensive process. The language is broadly applicable to different types of systems (software and non-software), domains (business versus software), and methods and processes. The UML enables and promotes (but does not require nor mandate) a use-case-driven, architecture-centric, iterative, and incremental process that is object oriented and component based. The UML enables the capturing, communicating, and leveraging of knowledge: models capture knowledge (semantics), architectural views organize knowledge in accordance with guidelines expressing idioms of usage, and diagrams depict knowledge (syntax) for communication.
>
> ..Models are complete abstractions of systems. Models are used to capture knowledge (semantics) about problems and solutions. Architectural views are abstractions of models. Architectural views are used to organize knowledge in accordance with guidelines expressing idioms of usage. Diagrams are graphical projections of sets of model elements. Diagrams are used to depict knowledge (syntax) about problems and solutions.
>
> Within the fundamental UML notation, concepts are depicted as symbols and relationships among concepts are depicted as paths (lines) connecting symbols.
>
> ..Use Case Diagrams
> To successfully apply use case diagrams, we must first understand the types of elements used in use case diagrams.
>
> *Actors*
> Actor classes are used to model and represent roles for "users" of a system, including human users and other systems. Actors are denoted as stick person icons.
> ..*Use Cases*
> Use case classes are used to model and represent units of functionality or services provided by a system (or parts of a system: subsystems or classes) to users… Use case classes have use case instances or objects called scenarios that represent specific interactions. Scenarios represent a singe sequence of messages and actions.
> .. *Relationships*
> Association relationships between actor classes and use case classes are used to indicate that the actor classes participate and communicates with the system containing the use case classes.
>
> ..Use Cases
> When modeling use cases, we ought to be aware of the following guidelines:
> * Use cases should be named using verb-noun phrases.
> * Use cases should be described, indicating how they are started and end, any conditions that must be satisfied before the use case starts (pre-conditions), any conditions that must be satisfied when the use case ends (post-conditions), the sequence of exchanged messages and performed actions, the data exchanged, and any non-functional characteristics (reliability, performance, supportability, etc. constraints). This description may be captured using text and other UML diagrams.
> * Use cases define the scope of a system and define the functionality provided by the system and those elements on which the system depends in order to provide the functionality…
> * Use cases should facilitate actors in reaching their goals. Use cases are system functionality or responsibilities (requirements) that actors use in order to reach or satisfy their goals. Use cases are not simply actor goals…
> * Use cases should facilitate the architecture of a system. Use cases may be organized and partitioned using includes, extends, and generalization relationships to identify, extract, and manage common, optional, and similar functionality…

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[11] Source: "Understanding Use Case Modeling," available at http://www.methodsandtools.com/PDF/DMT0100.pdf (p. 10-16). Sinan's personal website is available at http://home.comcast.net/~salhir/

- Use cases provide flexibility and power throughout the life-cycle process. They provide the freedom to work with a use case as a whole or any subset of a use case via scenarios…
- Use cases may be used as the basis for planning. Time and resource estimates may be associated with use cases…
- Use cases may be used as the basis for analysis, design, and implementation..
- Use cases may be used as the basis for testing…
- Use cases may be used as the basis for documentation since use cases capture how users will use the system.

UML Based Processes for OOA&D[12]

It is important to understand that UML is a notation for OOA&D. It does not prescribe any particular process. Whatever process is adopted, it must take the system being constructed through a number of phases.

- **Requirements Capture**. This is where we identify the requirements for the system, using the language of the problem domain. In other words we describe the problem in the "customer's" terms.
- **Analysis**. We take the requirements and start to recast them in the language of a putative solution -the solution domain. At this stage, although thinking in terms of a solution, we ensure we keep things at a high level, away from concrete details of a specific solution—what is known as abstraction.
- **Design**. We take the specification from the Analysis phase and construct the solution in full detail. We are moving from abstraction of the problem to its realization in concrete terms.
- **Build Phase**. We take the actual design and write it in a real programming language. This includes not just the programming, but the testing that the program meets the requirements (verification), testing that the program actually solves the customer's problem (validation) and writing all user documentation.

UML Tools

Software developers interested in a set of F/OSS UML tools might want to consider using ArgoUML[13] or StarUML[14], both are excellent (and free) F/OSS UML modeling tools.

NOTICE: All Use Cases for the PHI reference implementation will be developed using UML. Below please find an example of a UML-based Use Case developed using UML.
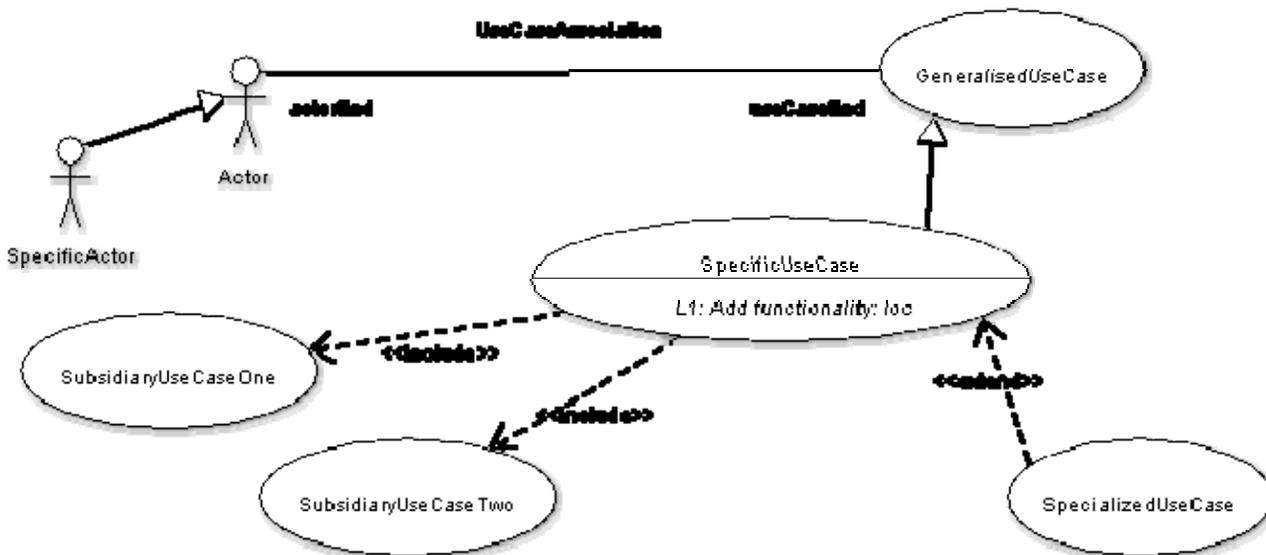

Figure 4: Possible Artifacts on a UML Use Case Diagram.[15]

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[12] Source: http://argouml.tigris.org/documentation/defaulthtml/manual/ch02s03.html
[13] Available at http://argouml.tigris.org/
[14] Available at http://www.staruml.com
[15] Source: http://argouml.tigris.org/documentation/defaulthtml/manual/ch16.html#d0e13806

You might want to read a good UML book or tutorial.[16]

Appendix B: A Development Process Using ArgoUML[17]

Requirements Capture
Our requirements capture will use the UML concept of Use Cases. Starting with a Vision Document we will see how Use Cases can be developed to describe all aspects of the system's behavior in the problem domain.

Analysis
During the analysis stage, we will introduce the UML concept of classes to allow us to build a top level view of the objects that will make up the solution—sometimes known as a concept diagram. We will introduce the UML sequence diagram and statechart diagram to capture requirements for the overall behavior of the system. Finally we will take the Use Cases from the requirements capture stage, and recast them in the language of the solution domain. This will illustrate the UML ideas of stereotyping and realization.

Design
We use the UML package diagram to organize the components of the project. We then revisit the class diagram, sequence diagram and statechart diagram, to show how they can be used recursively to design the complete solution. During this part of the process, we need to develop our system architecture, to define how all the components will fit together and operate. Although not strictly part of our process, we'll look at how the UML collaboration diagram can be used as an alternative to, or to complement the sequence diagram. Similarly we will look at the UML activity diagram as an alternative or complement to the statechart diagram. Finally we shall use the UML deployment diagram to specify how the system will actually be realized.

Build
UML is not really concerned with code writing. However at this stage we will show how ArgoUML can be used for code generation. We will also look at how the UML Use Case Diagram and Use Case Specification are invaluable tools for a test program.

Cognitive Psychology and ArgoUML[18]

2.4.1.1. Theory
ArgoUML is particularly inspired by three theories within cognitive psychology: i) reflection-in-action, ii) opportunistic design iii) and comprehension and problem solving.

2.4.1.1.1. Reflection-in-Action
This theory observes that designers of complex systems do not conceive a design fully-formed. Instead, they must construct a partial design, evaluate, reflect on, and revise it, until they are ready to extend it further.
As developers work hands-on with the design, their mental model of the problem situation improves, hence improving their design.

2.4.1.1.2. Opportunistic Design
A theory within cognitive psychology suggesting that although designers plan and describe their work in an ordered, hierarchical fashion, in reality, they choose successive tasks based on the criteria of cognitive cost.
Simply stated, designers do not follow even their own plans in order, but choose steps that are mentally least expensive among alternatives.

2.4.1.1.3. Comprehension and Problem Solving
A design visualization theory within cognitive psychology. The theory notes that designers must bridge a gap between their mental model of the problem or situation and the formal model of a solution or system.
This theory suggests that programmers will benefit from:

---

[16] A free UML tutorial is available at http://www.cragsystems.co.uk/uml_tutorial_download.htm
[17] Source: http://argouml.tigris.org/documentation/defaulthtml/manual/ch02s03.html
[18] Source: http://argouml.tigris.org/documentation/defaulthtml/manual/ch02s04.html

- Multiple representations such as program syntactic decomposition, state transitions, control flow, and data flow. These allow the programmer to better identify elements and relationships in the problem and solution and thus more readily create a mapping between their situation models and working system models.
- Familiar aspects of a situation model, which improve designers' abilities to formulate solutions.

Vision Document[19]

Typical sections of this document would be as follows.

- **Summary**. A statement of the context, problem and solution goals.
- **Goals**. What are we trying to achieve (and how do we wish to achieve it).
- **Market Context or Contractual Arrangements**. For a market led development, this should indicate target markets, competitive differentiators, compelling events and so forth. For a contractual development this should explain the key contractual drivers.
- **Stakeholders**. The users (in the widest sense) of the system. Many of these will map in to actors, or control equipment that maps into actors.
- **Key Features**. At the very highest level what are they key functional aspects of the problem/desired solution. These will largely map down to the use cases. It is helpful to give some prioritization here.
- **Constraints**. A high level view of the non-functional parameters of the system. These will be worked out in detail in the supplementary requirements specification.
- **Appendix**. A listing of the actors and use cases that will be needed to meet this vision. It is useful to link to these from the earlier sections to ensure comprehensive coverage.

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[19] Source : http://argouml.tigris.org/documentation/defaulthtml/manual/ch03s03.html

Appendix C: Additional Resources

This is a list of additional resources that might be of interest to readers of this document.

- Introducing SPARQL: Querying the Semantic Web.
  http://www.xml.com/pub/a/2005/11/16/introducing-sparql-querying-semantic-web-tutorial.html
- UML Tutorials:
  http://bdn.borland.com/article/images/31863/usecase.html
  ftp://ftp.software.ibm.com/software/rational/web/whitepapers/2003/intro_rdn.pdf
  http://www-128.ibm.com/developerworks/rational/library/769.html

Structured Analysis[20]

In structured analysis there are three orthogonal views:
- The functional view, made up of data flow diagrams, is the primary view of the system. It defines what is done, the flow of data between things that are done and provides the primary structure of the solution. Changes in functionality result in changes in the software structure.
- The data view, made up of entity relationship diagrams, is a record of what is in the system, or what is outside the system that is being monitored. It is the static structural view.
- The dynamic view, made up of state transition diagrams, defines when things happen and the conditions under which they happen.
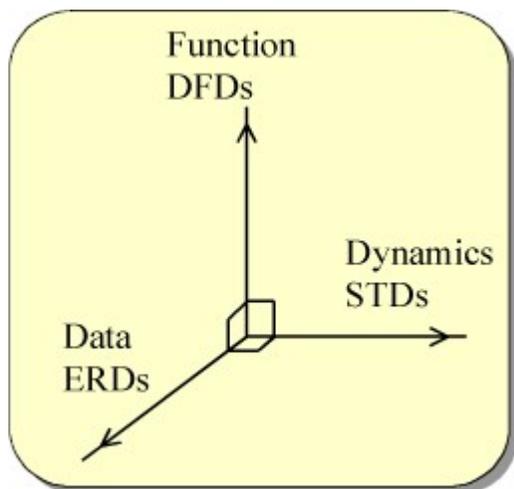
Figure 5: Axis of Structured Analysis.

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[20] Source: http://www.cragsystems.co.uk/ITMUML/index.htm; item 1.4

Appendix D: Identity Management.

..the diagram needs to be expanded to show the role of user-centered identity management, institutional federation and other Web privacy and security practices that impact interoperability.

In my opinion, to put the user in control, the PHI standard needs to accommodate both vendor _and_ institutional neutrality. Too many standards presume an institutional affiliation and this assumption turns the person into a patient. To drive its adoption by the various institutions, I believe the PHI standard must recognize that in the real world an empowered user deals with institutions under various identities and allows these identities to be correlated at some risk and subject to some perceived reward such as a lower mortgage rate.

In PHI, the user's interaction with external vendors, services and institutions will probably need a mechanism to protect identity, avoid unwarranted correlations and facilitate informed consent. Where are the institutional boundaries (e.g.: firewalls) in the diagram or the proposed PHI standard?[21]

Figure 6: Adrian Gropper's Version of Use Cases.

..I've edited the diagram to reflect four separate institutional domains that involve identity and could benefit from federation:

A - An external medical system is external by definition. This for example could be a service of the pharmacy chain that monitors grandma's smart pillbox.

B - An external service such as ePCRN bridges the user's PHI-compliant system to clinical trials and published data sources.

---

[21] Comment by Adrian Gropper [agropper@gmail.com] on 07/07/2006.

C - In the real-world, many encounters Create a new User from the institution's point of view. In a PHI-compliant world, the User would show up at a genetic testing lab and expect the clerk to identify me in a way that respects my privacy and assures me of total control and informed consent relative to Record Locator Services.

D - Access Control Lists imply that some people and institutions might not need to even know that I visited the genetic testing lab in D. For the rest, the user needs to manage, who can know that I visited the lab in C, who can see the result of the test, how much of the result they can see and finally how I, the user, will be notified that they looked.

Appendix E: Proposed Development Model

It is proposed that the PHY reference implementation will include the following element:
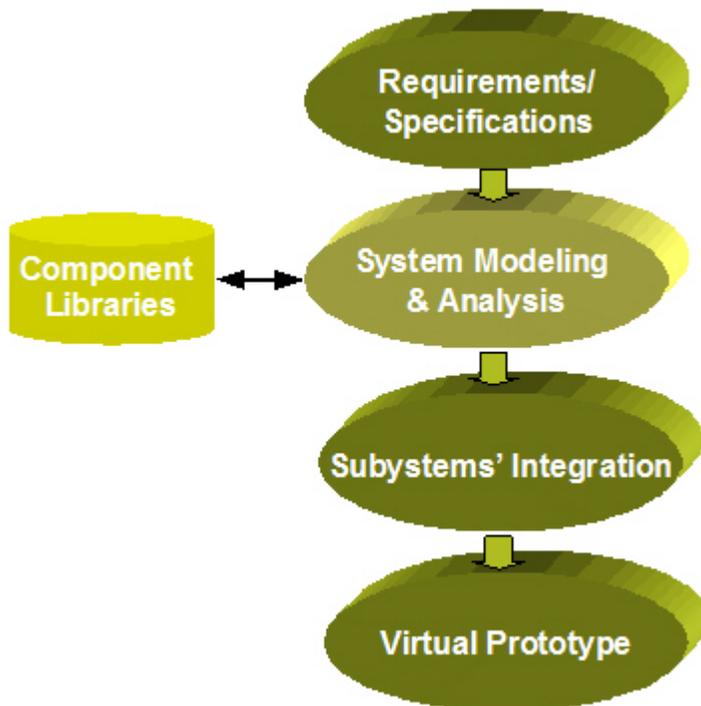
Figure 7: Requirements to Prototype Process.[22]

Develop a methodology and tools that help translate product requirements to architectural requirements without the need for extensive and time consuming simulations.

Build a three-level (user, architect, and programmer) component library of system components commonly used in building applications, algorithms, and architectures.

Development Process

[NOTE: Some ideas presented in this section were generated based on a discussion with Hari Kalva, Ph.D.[23]]

Given the variety of individuals participating in this project, the project will segment the required activities to allow each paticipant to be able to contribute the most to the project. These are some of the roles that participants in the project can assume:

User Role

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[22] From materials developed by Ionut Cardei, Assistant Professor at Florida Atlantic University.
http://www.cse.fau.edu/~icardei/
[23] Assistant Professor in the Dept. of Computer Science and Engineering at Florida Atlantic University.
http://www.cse.fau.edu/~hari

- Requirements
- Validation
- Testing

Architect Role

- Design components
- Design and test interfaces

Programmer Role

- Create software, modules
- Conduct software-level testing

f.) >> Create "user animations:" turn UML Use Cases, and Operating Cases, into "animations" to allow target stakeholders to "experience" the system and provide feedback on it. <<
* Explore conversion tools: UML to XMI

- - -

g.) Test-driven Design Methodology

 + Start very small, design the core elements of the entire system.
 + Test those core elements:
  IF fail predictably:
  {
   * Code to address the failures
   * Re-test
  }
  ELSE: add incremental functionality

Index