AMbient COmmunication and Sense Of Presence

D8.2 – System Package

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Document History

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V0.1	Tero Kivimäki (TUT)	01.04.2013	Initial version
V0.2	Tero Kivimäki (TUT)	03.04.2013	Sections 3.1-3.5
V0.3	Tero Kivimäki (TUT)	04.04.2013	Table of technical AMCOSOP documents

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1 Scope of the Document

This document gives the high level description of the software implementation of the whole AMCOSOP system. More detailed technical description of the implementation as well as user manuals can be found from technical documents that are referred from this document and are listed in the table below.

Table I. Technical AMCOSOP documents.

| Document	Description
D2.3 System Definition	Defines the AMCOSOP system in terms of hardware, software and functionalities
D3.2 Home Terminal Specification	Description of the software in the Home Terminal and the Home Gateway
User Manual for AMCOSOP Home Terminal Device and Application	Instructions for the end users how to use the Home Terminal.
D4.1 Service Platform Design Report	Description of the AMCOSOP Service Platform architecture including secondary user web and smart phone applications
D4.2 Service Platform Development and Testing	Detailed description of the implementation of the AMCOSOP Service Platform including secondary user web and smart phone applications
User Manual for AMCOSOP Mobile Client Application	Instructions for the end users how to use the smart phone application.

2 Introduction

AMCOSOP provides its users a sense of presence of their family, friends, and health care personnel, i.e. a so-called safety net (Figure 1). The system encourages people to stay in contact with other people by providing availability information of possible and known communication partners. This way the system promotes to maintain its users' social connections with their safety-net.
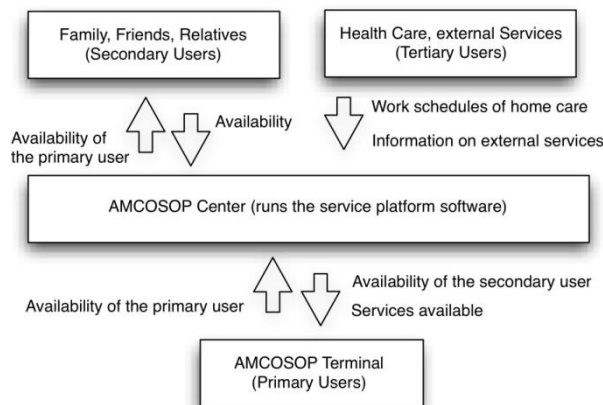
Figure 1. AMCOSOP Infrastructure and Users.

3 System Architecture and Components

The AMCOSOP system will provide elderly users the ability to stay connected with their personal safety-net by a Home Terminal device, which is a touch screen computer with a user interface designed specifically for the elderly using large screen elements and intuitive controls and features. The Home Terminal's main function is to communicate presence and availability information. However, in addition the terminal can communicate auxiliary information such as pictures or messages.
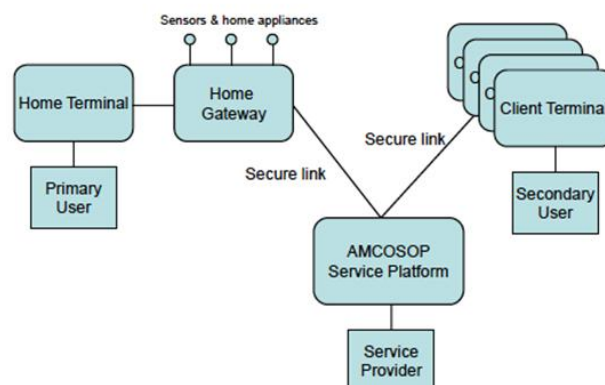
Figure 2. AMCOSOP System Components.

The Home Terminal, connected to a Primary User (elder) in Figure 2, can also be used to access services offered by third parties. These services could be for example healthcare providers, personal services such as hairdressers, or community services such as meal orders.

The Home Terminal is only a small part of the system although it is the main part seen by the elderly users. It is connected to a gateway component which acts as a proxy and as a cache and feeds the data to the Home Terminal. The gateway's main responsibility is to handle connected devices or sensors, local end of services and communications between the home terminal and the AMCOSOP server.

All AMCOSOP gateways are connected to the AMCOSOP Service Platform. The Service Platform manages the flow of user information between different clients, provides services for the gateways and offers user interfaces for the users in the safety network of the elderly, for the health care professionals and also for external user interfaces.

For secondary users (relatives and friends of the elderly) a web based user interface accessible to any device capable of displaying HTML-pages is provided. Also there is a smart phone application taking advantage of smart phone features such as profile and GPS. The smart phone application uses these features to provide automated presence information decreasing the user's burden of keeping the presence information up to date.

More detailed system design can be found from the document "System Definition".

3.1 Home Terminal

The Home Terminal is the user interface for elderly users. By using it primary users can easily check the information like status, activity, mood and location of the contacts in their social network. They are also able to send messages to their contacts. The design of the user interface is based on the fact that the users will be elderly people that might not have any experience in using computers.

The AMCOSOP system is implemented with Java. The user interface is implemented with JavaFX 2.0 extension [1] for rich user experience, which is very important for user-centred software. AMCOSOP uses a number of well-established technologies for communication. This makes it easy to expand functionality, create new terminal devices or services, and use third party tools for development. The communication between Home Terminal and Service platform is handled through two protocols: the status updates and contact management is managed through XMPP protocol [5], for which we use the Smack library [2]. Services, rosters and value lists are received through a REST-interface as XML-documents

The Home Terminal application runs on an ASUS touch screen All-in-One-PC ET1611 with Microsoft Windows 7 operating system.

The following sub-sections introduce the different views oft he HomeTerminal. Technical specification of the implementation of the HomeTerminal can be found from the document "Home Terminal Specification", and instructions on how to use the software can be found from the document "User Manual for AMCOSOP Home Terminal Device and Application".

3.1.1 Home View

The Home view of the Home Terminal can be seen in Figure 3. The contacts of the primary user are displayed as photographs, where the size of the photograph displays the availability of the contact; a large picture means that the person is able and willing to communicate, whereas the small picture states the person is not currently available for communication. The exclamation markover the contact's photograph tells when a new message has arrived from the contact in question. The primary user may mark the contacts that are more intimate than others. The contacts may be filtered based on the given intimacy as well as based on the availability. User Details view, shown in Figure 4, is opened by touching the picture of the contact. From that view the status, activity, mood and location of the person in question can be seen. Also messages sent and received are displayed and it is possible to send new messages to that person from the view.
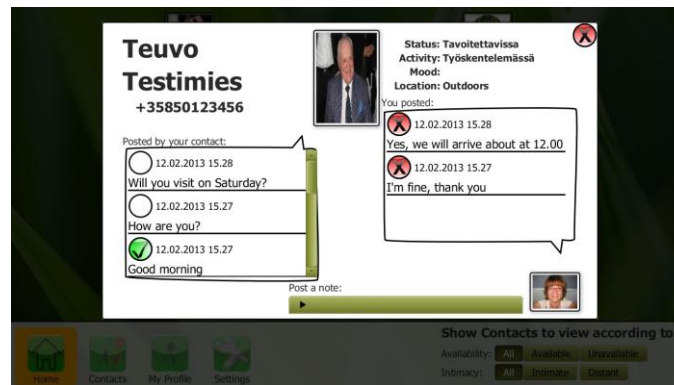

Figure 3. Home view.

Figure 4. User Details view.

3.1.2 Contacts View

From the Contacts view it is possible to set the intimacy value, which classifies the contacts to either intimate or distant. Furthermore, the ordering in which the contacts are displayed may be set by dragging the contact photographs to desired locations. In addition contacts may be removed by using the delete mode selection which can be seen on the down right corner of the Figure 5.
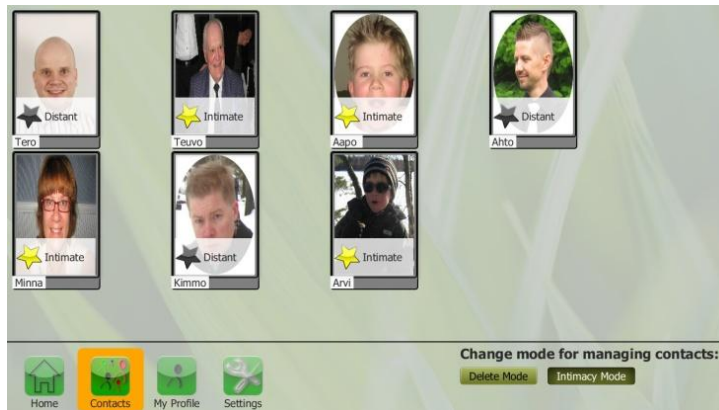
Figure 5. Contacts view.

3.1.3 My Profile View

Values for own status, activity, mood and location are set from My Profile view, shown in Figure 6. Predefined values can be selected from a dropdown list which also includes a choice not to show any value. The list opens when a user is touching the bar under the title. In addition, personal details, like addresses or telephone numbers may be changed from this view.

Figure 6. My Profile view.

3.1.4 Settings View

Settings view provides possibility to change the display contrast and the size of the text font. The Settings view is shown in Figure 7. Sound effects may be turned on or off. The background image shown in the Home view may be changed from four possible photographs. Furthermore, the terminal may be switched off by touching the shut down button.

Figure 7. Settings view.

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3.1.5 Services View

From the Services view the received service messages can be seen. The subjects of the messages that are not yet been read are shown with yellow background. The content of the message can be seen by selecting the message from the service message list. By using the Manage Services selection, which can be seen on the down right corner of the Figure 8, the service providers from which the user is willing to receive service messages can be selected. The implementation details of the Service feature are described in the document "Service Implementation Report".
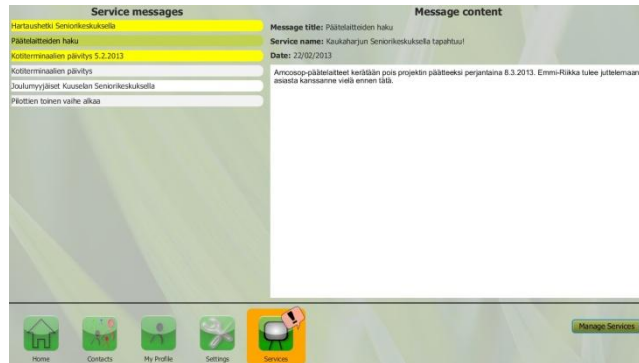

Figure 8. Services view.

3.2 Home Gateway

The Home Gateway is an independent component which functions between the AMCOSOP Service Platform and the Home Terminal. The Home Gateway receives user- and message data from the Service Platform and offers this information forward to the Home Terminal in native Java classes. It also acts as a cache for status information.

The Home Gateway consists of an RMI API [3] which is used for communication with the Home Terminal. The Home Gateway contains an XMPP [5] client for sending and receiving status, mood, activity and other context information to or from the Service Platform. It also uses web services with ReST [6] interfaces for receiving information from the Service Platform, such as user information and third party services. It also uses a small HSQLDB database [7] for the cached information and a HTTP proxy for external services. The Home gateway also has a Sensor API which allows sensors to be connected to it. Sensors could be used to enhance any number of services. Technical specification of the implementation of the Gateway can be found from the document "Home Terminal Specification".

3.3 Service Platform

The Service Platform is the central component of the AMCOSOP architecture which manages all the requests between primary and secondary users and handles the content provided by tertiary users. The AMCOSOP Service Platform consists of six basic components which are depicted in Figure 9.
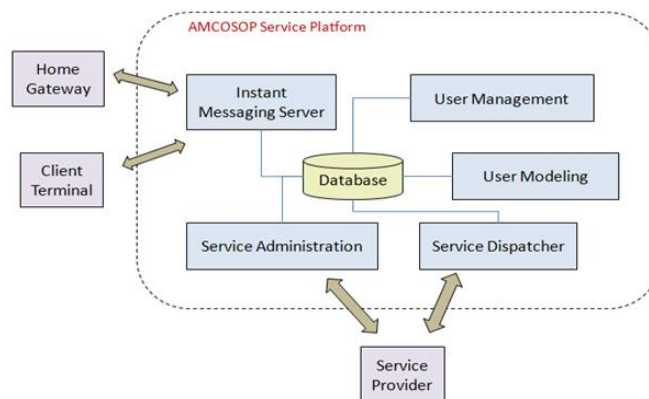

Figure 9. AMCOSOP Service Platform.

The basic components of the AMCOSOP Service Platform are:

- **Database**: It stores all the information about primary, secondary and tertiary users (e.g., profile information, users' status, information about services provided by tertiary users). The database is based on the open-source relational database management system PostgreSQL [8].
- **User Management Component**: It refers to a Web application that manages all the users' information that is stored in the database. The technologies used for the development of this component are Java Database Connectivity, JavaServer Pages and Javascript.
- **Instant Messaging Server**: It handles the communication between the primary users and the secondary users that belong to their safety-net. The communication between the Service Platform and the endpoints is performed with the use of the Extensible Messaging and Presence Protocol (XMPP) [5], an open Extensible Markup Language (XML) protocol for real-time messaging, presence and request-response services.
- **User Modeling Component**: It models all the information concerning users (e.g., status information, location information). It consists of a Web Service implemented with the use of REST (Representational State Transfer) technology [9]-.
- **Service Administration Component**: It handles the services that are provided by the tertiary users.
- **Service Dispatcher**: It deals with dispatching data and message originating from the tertiary users to the rest of the users.

Moreover, attention is paid to security related issues. Security plays an important role in the AMCOSOP architecture, since private data and messages are exchanged between communication end-points. The fact that elderly is a user group of AMCOSOP makes things more serious, in terms of privacy and security concerns. At the application level, all users of the AMCOSOP system are authenticated with a username and password. Since AMCOSOP enables the transmission of personal messages between users, such as status and location information, one of the best ways to ensure that such transmission is as secure as possible is to encrypt the messages. AMCOSOP uses instant messaging clients and servers that are compatible with some of the major networks that apply encryption to the instant messaging traffic. Encrypted connections are established between the users' terminals and the service platform. The use of Secure Sockets Layers (SSL) - a commonly used protocol for managing the security of a message transmission on the Internet - is considered to ensure secure communication between the server and the users' terminals. Technical specification of the design and implementation of the Service Platform can be found from the documents "Service Platform Design Report" and "Service Platform Development and Testing".

3.4 Secondary User Mobile Application

The main features of the Mobile Application (a.k.a MobSOP) are setting status, mood, activity and location and showing the same information from the people in the user's social network.

MobSOP provides a possibility to track the user's location by using the GPS of the smart phone. The user can name locations that are visited frequently and allow MobSOP to automatically send the location information to the AMCOSOP Service Platform.

MobSOP is implemented by using Qt framework [4], which is a crossplatform framework that provides a large collection of libraries and functions to be used to implement applications to mobile platform. The primary target device for MobSOP is Nokia C7, but it works in all Symbian^3 devices with a touch screen. MobSOP has been tested with Nokia C7 and Nokia E7 devices. An example view of the application can be seen in Figure 10. Instructions how to use the application can be found from the document "User Manual for AMCOSOP Mobile Client Application", and the technical details of the implementation from the document "Service Platform Development and Testing".
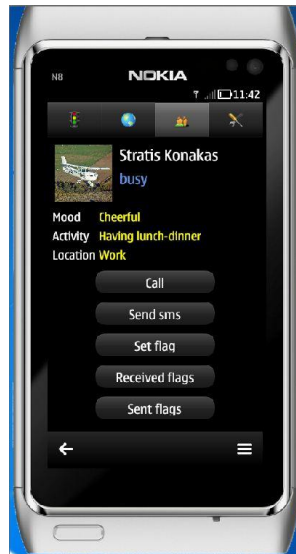
Figure 10. MobSOP User Details View.

3.5 Secondary User Web Application

In addition to the abovementioned Mobile Application, AMCOSOP secondary users are also able to access the Web Client application via any PC/computer or smartphone, mobile phone and PDA using any of the major Web browsers. Moreover, the Web User Interface is designed so as to be usable particularly on smartphones, mobile phones and PDAs which have a smaller screen (compared to that of a PC/desktop).
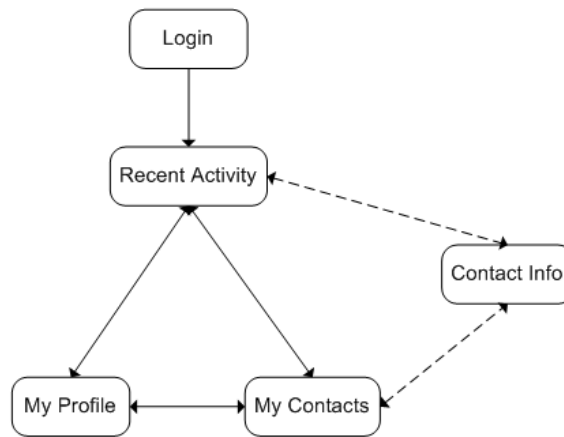

Figure 11: Pages Transition Graph of Secondary User Web Application.

The Secondary User Web Client Application provides two main functionalities to the AMCOSOP secondary users:

- Interaction with primary users
- Access to their profile and status

This application has five main pages, whose Transition Graph is depicted in Figure 11 and an example page can be seen in Figure 12.
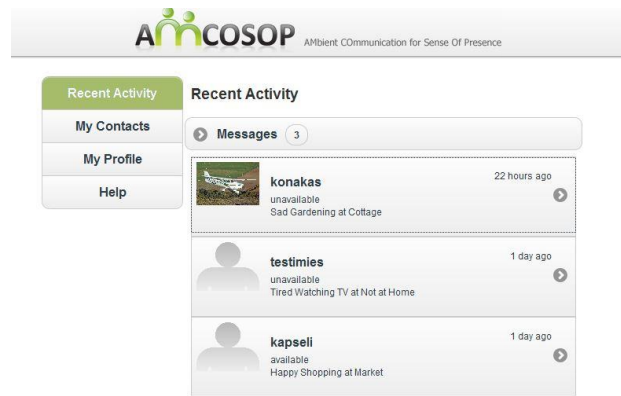
Figure 12. Web Application Recent Activity Page.

The secondary user web application was implemented using Microsoft ASP.NET MVC 3 (http://www.asp.net/mvc), which is part of Microsoft .NET 4.0 [10]. The user interface was built using jQuery Mobile [11].

The Web Client application has been tested with several different smartphones supporting Web browsing, such as Blackberry, iPhone and HTC, allowing so multi-vendor compatibility.

Technical specifications of the design and implementation of the Web application can be found from the documents "Service Platform Design Report" and "Service Platform Development and Testing".

4   References

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[5]   XMPP home page. Available at http://xmpp.org
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[10]   Microsoft .NET 4.0. Available at http://www.microsoft.com/net
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