

# E-Inclusive Videoconference Services in Ambient Assisted Living Environments

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**Abstract.** The Neighbourhood Virtual Community (NVC) service, developed in the context of the ambient intelligence (AmI) project called PERSONA, copes with the need of seniors and impaired persons to remotely interact with relatives, friends, doctors and assistants in a comfortable way. In this paper we the NVC service in the context of the PERSONA Platform.

**Key words:** ambient assisted living, social community, videoconference

## 1 Introduction

In the ambient intelligence (AmI) context [7], the European Commission recently started the Ambient Assisted Living (AAL) technology and innovation funding programme, aiming at extending the time older and impaired people can live in their home environment by increasing their autonomy and assisting them in carrying out activities of daily living, feeling included, secure, protected and supported.

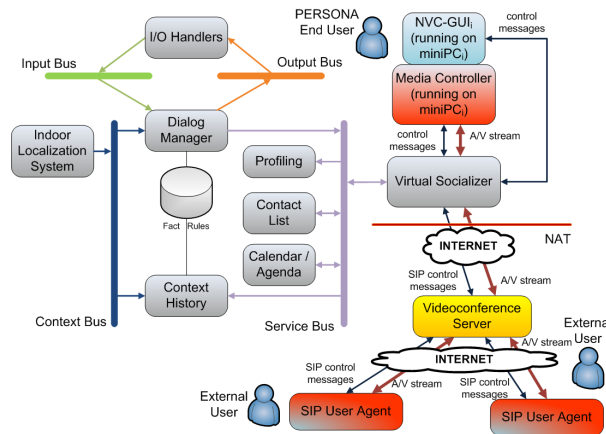
In this paper we illustrate the Neighbourhood Virtual Community (NVC) AAL Service, developed in the context of EU FP6 project PERSONA [9]. This work stems from a cooperation between the PERSONA project and the University of Parma which has a significant expertise on the design and deployment of IP-based multimedia systems. The NVC copes with the need of seniors and impaired persons to remotely interact with relatives, friends, doctors and assistants. The Virtual Socializer is the specific application components developed in the context of this AAL Service. Great emphasis was placed on usability, *i.e.* user interfaces are simple and very user-friendly.

The NVC AAL Service provides a new way of interacting with the environment and the resources of the virtual communities the user belongs to. Thanks to the complete integration with the advanced PERSONA middleware (which manages a large number of different software and hardware components), the NVC AAL Service is able to provide users with multiple assisted high-level services which couple communication capabilities to home automation and social interaction.

The use of videoconferencing systems to support elderly people (and carers) in their homes as well as in senior facilities has been reported in the literature [5]. In the pilot study described in [8], videoconferencing between senior homes and a calling center has been extensively utilized and appreciated by elderly users and by their professional carers. Other studies assessed the feasibility of delivering care through ISDN-based videoconferencing to senior care facilities [4]. Videoconference-based physiotherapy for senior citizens has been presented and evaluated in [2]. In our view, the Neighbourhood Virtual Community service presented in this paper provides a better value to elderly persons than standard videoconference tools because of its integration with a rich middleware for Ambient Assisted Living.

## 2 Neighbourhood Virtual Community service

Figure 1 shows the "subset" of the PERSONA architecture which realizes the Neighbourhood Virtual Community (NVC): platform components, buses and service-providing application components.

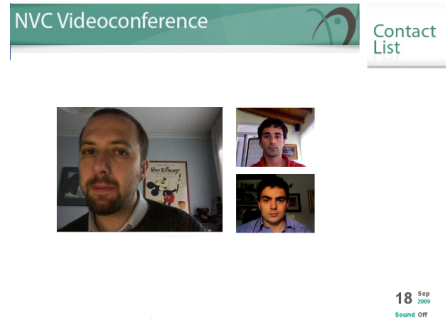


**Fig. 1.** The NVC components integrated with the PERSONA Platform.

The *Virtual Socializer (VS)* component is an enhanced SIP user agent, *i.e.* a logical entity at videoconference endpoints capable of initiating and answering SIP calls between peers. SIP (Session Initiation Protocol) is the IETF (Internet Engineering Task Force) signaling standard (RFC 3261) for managing multimedia and other application session initiation, particularly IP phone calls or videoconferences. For the implementation of the Virtual Socializer component we chose MjSip [6], which is a complete Java-based implementation of a SIP stack. It provides in the same time the API and implementation bound together into the MjSip packages. MjSip is available open source under the terms of the GNU GPL license (General Public Licence).

The *Videoconference Server* mixes audio streams of videoconference participants and sends mixed audio and multiple video streams to destination endpoints (Virtual Socializer components if participants are in PERSONA environments, or generic SIP user agents in any other case).

The *NVC-GUI* is a graphical user interface (fig. 2) which allows the user to manage videocalls, chats, and social networking tools. Due to the complexity of managed multimedia items, the NVC-GUI is a standalone GUI and it is not based on PERSONA I/O handlers.



**Fig. 2.** Screenshots of the NVC-GUI component.

The *Media Controller (MC)* is the software component that transmits user input (audio from a microphone, video from a camera) to the Videoconference Server (through the Virtual Socializer component), and outputs decoded incoming audio/video streams to suitable devices (TV/Monitor, loudspeakers). The Media Controller is based on Java Media Framework API (JMF), which enables audio, video and other time-based media to be added to applications and applets built on Java technology.

Multiple  $\langle NVC-GUI, MC \rangle$  pairs might be placed around the house, the active one being chosen by the VS depending on user location. This is one of the novel scenarios addressed by the PERSONA project to the purpose of improving the comfort of the user at home. In details, the Indoor Localization System (ILS) detects in which room the user is, using wireless beacons placed in the house receiving a signal from a bracelet carried by the user. When the user moves to a new room, the ILS publishes a notification on the context bus. The Virtual Socializer, that subscribed for user location contextual information, receives the notification and, if a call or chat is active, eventually involves the media controller that runs in the room where the user has moved (by redirecting media flows).

We emphasize that the actions performed by the Virtual Socializer are under the control of a set of rules that take into account the profile of the end user which is managed by the Profiling component of the PERSONA Platform. Such component provides: (1) operations registered to the service bus that can be called by applications in order to access profiling data, and (2) operations pro-

vided to the output bus as an adaptation engine. Profiling parameters are either static or dynamic (their values may change over time depending on the situation - they are kept up-to-date by the Situation Reasoner, according to a set of rules). By leveraging upon the Profiling component and other PERSONA services such as the ILS and the Activity Monitor, the NVC behavior and actions (*e.g.* call answering) can be highly personalized on the basis of call information (caller info, date/time, . . .), user preferences as well as current location and activity.

### 3 Conclusions and Future Work

The paper presented the Neighbourhood Virtual Community service developed for the EU project PERSONA to improve the inclusion, safety and comfort of senior and impaired citizens. Implementation and testing of the NVC service in the pilot site of "Cooperativa Bucaneve" in Bardi (Italy) is currently underway. Usability assessment will be performed by means of user questionnaires as well as through interpretation of extensive data logging.

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