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The universAAL framework for user interaction in multimedia AAL spaces

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THE UNIVERSAAL FRAMEWORK FOR USER INTERACTION IN MULTIMEDIA AAL SPACES

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Draft PAS	**Report on voting**
100/2189/PAS	100/2228/RVD

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INTRODUCTION

Ambient Assisted Living (AAL) strives to ensure the independence, safety, wellbeing and autonomy of users by using ICT, including multimedia systems and equipment and audio / video communication, for creating intelligent living environments that react to the needs of users by providing relevant assistance. Such intelligent environments can be labelled as AAL Spaces, which are characterized by a number of devices that can be stationary, mobile or embedded within other objects. Multiple users can find themselves in an AAL space simultaneously, possibly moving around within the AAL space, and entering and leaving it dynamically. These characteristics introduce new challenges when it comes to handling interaction with users in AAL spaces.

With the assumption that people are surrounded by highly distributed systems of networked interactive devices, AAL intensifies the paradigm shift from Human-Computer Interaction (HCI) to Human-Environment Interaction (HEI). One of the main challenges of HEI is to keep the multiplicity of functional units hidden to humans while making the functionality provided by them easily available based on natural ways of interaction. Instead of controlling each device separately, users should be able to interact with a whole device ensemble as one single unit and articulate goals instead of looking for functionality at the level of each single device separately (Figure 1).

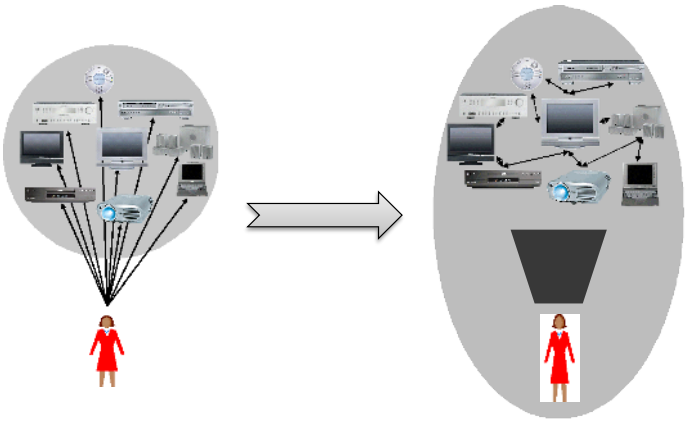

Figure 1 – Paradigm shift from HCI to HEI

Another important challenge for designers and developers of systems in AAL spaces is that interaction with applications can take place through a variety of devices at different locations with different capabilities in terms of serving a single user privately or not, supported modalities, modality-specific parameters such as screen size and resolution, power consumption, etc., which implies the need in AAL spaces to logically separate the application layer from the presentation layer (Figure 2).

Consequently, applications have to use abstract user interfaces that are device-, modality-, and layout-neutral and allow to postpone the rendering of the user interface to the execution-time, which makes it possible to interact with users in a personalized and situation-aware way. The separation of concerns also facilitates the creation of clean programming interfaces based on an open and flexible architecture that have to enable the plug-and-play of both applications and user interaction handlers (UI handlers), and allows UI handlers to serve arbitrary applications.

The resulted openness complements the openness supported by IEC 62481-2 that enables the sharing of multimedia content and streams within an ensemble of devices. It adds the

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perspective of *sharing the input and output channels provided by those devices*[1] to the DLNA perspective of content sharing.

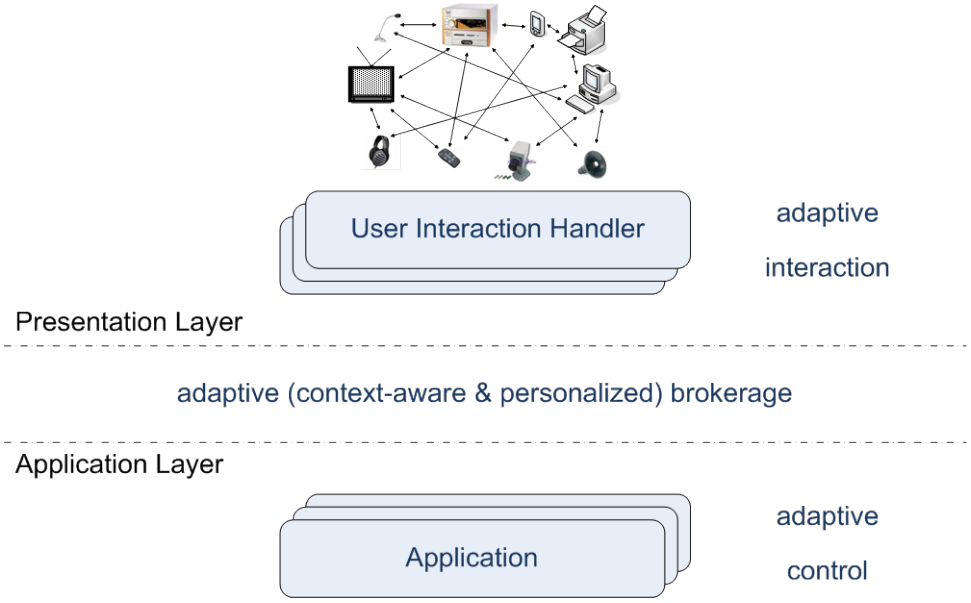

Figure 2 – logical separation of application and presentation layers

[1] This understanding of the term I/O channel is based on the actual roles of devices that enable interaction with human users: a display provides a visual output channel, a loudspeaker, an audio output channel, and a microphone, an audio input channel.

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THE UNIVERSAAL FRAMEWORK FOR USER INTERACTION IN MULTIMEDIA AAL SPACES

1 Scope

This Publicly Available Specification (PAS) specifies a framework for adaptive handling of explicit interaction among humans and AAL spaces. This is based on a differentiation between explicit and implicit interaction as a consequence of the paradigm shift from Human-Computer Interaction to Human-Environment Interaction, further explained in the definition of the latter term.

As a framework, a main subject matter of the specification is the identification of relevant areas for further standardization, thereby also looking at the interrelationships among the identified areas. The PAS also provides a first extensible specification in some of those areas.

The proposed UI framework has been derived from the logical separation of application and presentation layers as depicted by Figure 2, and encompasses the following elements (Figure 3):

- Analysis of the relationships between UI handlers and I/O devices without specifying possible languages, models, or abstract APIs for interaction with these devices, as there are certain international standardization activities that go in this direction[2];
- the language and model for describing application-specific dialogs / user interfaces as part of UI requests made by applications to the UI framework;
- the adaptation concept and parameters needed to achieve adaptive UI and the way they affect UI requests; and
- Protocols used by the UI framework to broker between UI handlers and applications as pluggable components.

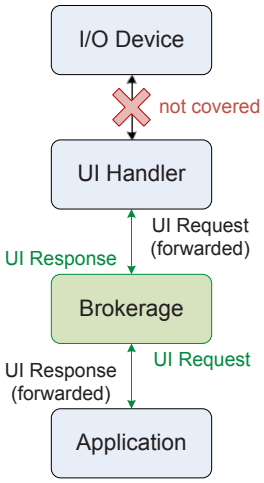

Figure 3 – The scope of the specified UI framework marked by the green colour

2 For example [3] on representing user input coming from input devices.

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2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62481-2, *Digital living network alliance (DLNA) home networked device interoperability guidelines – Part 2: DLNA media formats*

ISO/IEC Guide 71:2001, *Guidelines for standards developers to address the needs of older persons and persons with disabilities*

ISO 9241-11:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) – Part 11: Guidance on usability*

ISO 9241-110:2006, *Ergonomics of human-system interaction - Part 110: Dialogue principles*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms and definitions apply.

3.1 Terms and definitions

3.1.1
ambient assisted living
AAL
products, services, environments and facilities used to support those whose independence, safety, wellbeing and autonomy are compromised by their physical or mental status

Note 1 to entry: In this PAS, AAL refers to the usage of ICT, including multimedia systems and equipment and audio / video communication, for creating intelligent living environments that react to the needs of users by providing relevant assistance.

[SOURCE: ISO/IEC GUIDE 71:2001]

3.1.2
AAL service user
person who interacts with an AAL system or is connected with an AAL system

3.1.3
AAL space
denotes a smart environment that provides AAL services to its users

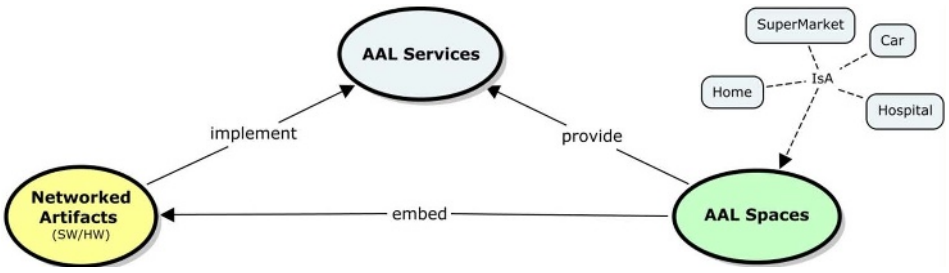

Figure 4 – The notion of AAL spaces

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3.1.4
channel
denotes the bridging passage that smart environments need between the physical world and the virtual realm (Figure 5). Channels are realized by devices. Depending on the kind of channel opened, a channel might be called a sensing channel (realized by sensors), an acting channel (realized by actuators), an input channel (realized by microphones, keyboards, etc.), or an output channel (realized by displays, loudspeakers, etc.). The latter two types of channels might be referred to as I/O channels

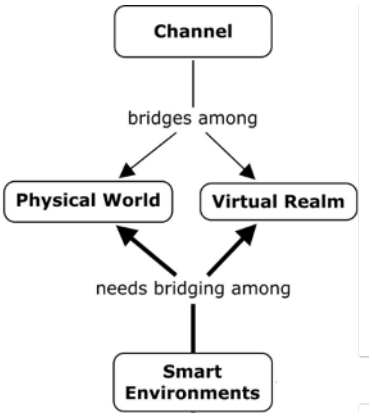

Figure 5 – The need of smart environments to utilize channels for bridging between the physical world and the virtual realm

3.1.5
human-environment interaction
interaction in smart environments is generally divided into two major areas: implicit and explicit interaction

Implicit interaction is mostly about using sensing channels for observation of happenings, with or without involvement of humans, in order to recognize in the background relevant situations to which the environment might be able to react in a desired way.

Explicit interaction, on the contrary, is about situations in which a human user seeks the dialog with the environment or vice versa, for instance when the user instructs that the brightness of the TV should be increased or when the environment notifies the user that it is time to take a certain medicine. Explicit interaction takes place by utilizing input and output channels provided by I/O devices.

3.1.6
I/O device
an abbreviation for input and / or output device. A device that provides an input and / or output channel for facilitating explicit interaction between a smart environment and its human users. Input devices, such as a microphone, a keyboard, or a mouse, can capture an instruction or response that is provided by a human user and represent it in terms of data in the virtual realm (Figure 6). Upon receive of data within the virtual realm that is intended to be presented to human users, output devices, such as displays and loudspeakers, can make it perceivable to the addressed humans

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