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TECHNICAL REPORT

colour inside

Use cases related to ambient assisted living (AAL) in the field of audio, video and multimedia systems and equipment

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USE CASES RELATED TO AMBIENT ASSISTED LIVING (AAL) IN THE FIELD OF AUDIO, VIDEO AND MULTIMEDIA SYSTEMS AND EQUIPMENT

FOREWORD

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IEC TR 62907, which is a technical report, has been prepared by technical area 16: Active assisted living (AAL), accessibility and user interfaces, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
100/2263/DTR	100/2340/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

This Technical Report (TR) captures the results of a use case input process that began with the call for contributions of AAL use cases on 2012-06-06. The current document reflects contributions and discussions by IEC TC 100 national mirror committees, user organizations and the ITU-T Focus Group on Audio Visual Media Accessibility. This Technical Report also contains material gathered from reports, AAL research projects and group output from the IEC TC 100 AAL stage 0 project team meetings in October 2012 (Berlin), June 2013 (London) and September 2013 (Shenzhen). In total, seventeen use cases were submitted.

To start the project, a survey was designed and distributed to the IEC TC 100 P-members to collect Ambient Assisted Living (AAL) use cases. The use case submissions consisted of the title of the use case, a description and the origin of the use case. Also incorporated is the relevance of the use case within the scope of IEC TC 100. These are mainly activity based AAL use cases providing a user experience perspective from those who want to operate AV and multimedia equipment or access AAL services. The use case template helped to group and categorize the use cases according to the identified user requirements and experience of usability barriers faced by users. Understanding the usability barriers made it easier to identify categories and highlight use case commonalities. Where multiple use cases fall in the same category and had overlapping items, they were consolidated into one extended use case. All selected use cases have real-world validity. Gaps were filled by adding extra use cases and future developments were also considered. Usability barriers and functional requirements were extracted from the use cases and recommendations given for future standardization items related to AAL.

There is a natural mapping from the user experience based use cases to the clustered technical use cases, where specific technical and functional requirements are expressed.

The following national committees, liaison organizations and EU research projects contributed use cases on Ambient Assisted Living:

a) IEC TC 100 P-members China, Germany, Japan, UK and U.S.;

b) the European Blind Union;

c) the ITU-T Focus Group Audio Visual Media Accessibility;

d) and the EU Research Projects GUIDE, Persona, universAAL and AALIANCE.

Technological advances have enormous potential to make the society more inclusive by providing AAL solutions. The key issues relevant for IEC TC 100 which need to be addressed include barriers to accessibility and usability, and interoperability and personalization to ensure wide adoption.

This TR extracts and applies the user needs and accessibility principles published in ISO/IEC Guide 71.

The target audience for the TR includes:

- AAL service users who can understand how their AAL needs and their usability requirements are considered by an AAL service provider.
- AAL service providers who can learn about users AAL needs, and accessibility and usability issues, and can also learn how to operate AAL systems.
- AAL application developers who can develop AAL applications according to the needs of the AAL service users.
- CE and ICT device manufacturers who want to know what are the AAL needs of the users and what barriers elderly people and people with disabilities face which are related to the accessibility of interfaces and content.
- Administrations and government authorities that have to act as AAL service users and AAL regulators.

USE CASES RELATED TO AMBIENT ASSISTED LIVING (AAL) IN THE FIELD OF AUDIO, VIDEO AND MULTIMEDIA SYSTEMS AND EQUIPMENT

1 Scope

This Technical Report comprises seventeen use cases for Ambient Assisted Living submitted to IEC between June 2012 and September 2013.

The initial objective of this Technical Report is the identification of AAL scenarios and use cases based on real-world applications and requirements. Use cases are a well-known tool for expressing requirements at a high level with real-life relevance. The use cases provide a practical context for considerations on interoperability and standards based on user experience. They make it clear where existing standards can be further used and highlight where standardisation work is needed.

The use cases are based on the identified requirements of elderly people and people with disabilities. The use case scenarios demonstrate both the usability barriers and functional requirements. In addition, the accessibility principles developed in ISO/IEC Guide 71 were applied.

A further objective of this report is to highlight potential areas for standardisation in the AAL environment to ensure ease of operation and interoperability with a focus on specific aspects relating to audio, video and multimedia equipment.

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.

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

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1
accessibility
usability of a product, system, service, environment or facility by people with the widest range of capabilities

Note 1 to entry: Although "accessibility" typically addresses users who have a disability, the concept is not limited to disability issues.

[SOURCE: ISO TS 16071:2003, 3.2]

3.1.2
ambient assisted living
product, service, environment or facility used to support those whose independence, safety, well-being and autonomy are compromised by their physical or mental health

Note 1 to entry: The definition of AAL in the German VDE-AR-E 2757-1:2013-05 is: “concepts, products and services that combine technologies and social environment with the goal of improving the quality of life for people”.

Note 2 to entry: Various discussions on the definition of AAL and accessibility are bundled in Annex A. Annex A highlights some of the thinking of identifying the boundaries and overlaps of AAL and accessibility.

Note 3 to entry: See also ISO/IEC Guide 71.

3.1.3
impairment
problem in body function or structure such as a significant temporary or permanent deviation or loss of abilities

Note 1 to entry: For example, an impairment can be due to injury, or permanent, slight or severe and can fluctuate over time. In particular, deterioration may occur due to ageing.

Note 2 to entry: Body function can be a physiological or psychological function of a body system. Body structure refers to anatomical parts of the body such as organs, limbs and their components.

[SOURCE: ISO/IEC Guide 71:2001, 3.4, modified – Text of definition converted into note and adapted.]

3.1.4
disability
umbrella term for impairments, activity limitations and participation restrictions denoting the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors)

Note 1 to entry: In this Technical Report, disability can be a restriction or development difference that results in an individual having a different set of abilities and preferences compared to the average. This can result in barriers to access and participation where systems, services and products are not designed to accommodate the different abilities and means for interaction that result from these differences. These can include physical, sensory, and cognitive or developmental disabilities.

[SOURCE: ISO 9999:2011, 2.8, modified – Note added for the purposes of this Technical Report.]

3.1.5
usability
extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

Note 1 to entry: Usability emphasizes that a system, product or service has to be easy for someone to use, e.g. its use needs to be intuitive, efficient, and comfortable. Notably, the term “usability” is defined more narrowly than “accessibility” since it limits applicability to “specified users.”

Note 2 to entry: See also ISO/IEC Guide 71:2001 and ISO 9241-11:1998.

[SOURCE: ISO 26800:2011, 2.9, modified – Note has been changed and more reference documents have been cited.]

3.1.6
user
person who interacts with the product, service or environment

Note 1 to entry: Adapted from ISO 9241-11:1998.

[SOURCE: ISO/IEC Guide 71:2001, 3.6]

3.1.7
user accessibility need
something, in addition to task-based needs, that is identified as necessary so that a system is accessible to diverse users in diverse contexts

3.1.8
user need
prerequisite identified as necessary for a user, or a set of users, to achieve an intended outcome, implied or stated within a specific context of use

Note 1 to entry: It might not be possible to meet all user needs.

[SOURCE: ISO/IEC 25064:2013, 4.19, Examples and notes have been omitted, but a new note has been added.]

3.1.9
user interface
all components of an interactive system (software or hardware) that provide information and/or controls for the user to accomplish specific tasks with the interactive system

[SOURCE: ISO 9241-110:2006, 3.9, modified – Definition, instead of "and controls" stated "and/or controls".]

3.1.10
diverse users
individuals with differing functional needs related to their use of a system

Note 1 to entry: Functional needs can result from individuals differing in their sensory/perceptual, physical, and cognitive or intellectual characteristics and abilities. Functional needs vary over time and across contexts.

3.1.11
diverse contexts
differing physical, environmental, economic, social, and cultural conditions

3.1.12
systems
combination of one or more products, services, built environments with which the user interacts

Note 1 to entry: Such systems are frequently also referred to as solutions.

3.1.13
application
program or group of programs designed for end users

3.1.14
use case
detailed description of a single activity in a business process that identifies data inputs and outputs, performance/timing requirements, the handling of error conditions and interfaces with external applications

Note 1 to entry: Use cases generally contain self-monitoring, self-testing and self-organizing elements.

[SOURCE: See ISO/IEC 19762-1:2008, 01.05.13, modified – Note has been added.]

3.1.15
ambient assisted living use case
description of a hypothetically possible situation or series of events where AAL concepts, products and services may improve the quality of life

Note 1 to entry: The aim is to pictorially describe a field of problems in a way that the artificial situation makes AAL approaches to solutions evident in their temporal, spatial as well as technical dimension.

3.1.16
audio description
additional audible narrative, interleaved with the dialogue which describes the significant aspects of the visual content of audio-visual media that cannot be understood from the main soundtrack alone

Note 1 to entry: Audio description is sometimes called video description in the U.S.A. This Technical Report uses the term audio description throughout.

3.1.17
subtitle
textual presentation of the dialogue (and frequently additional auditory information), typically shown at the bottom of the screen

Note 1 to entry: Subtitles can be a textual rendering in the same language as the spoken dialogue, or can provide a written translation in a different language. In some parts of the world subtitles are called "(closed) captions", and subtitling is referred to as "(closed) captioning". This Technical Report uses the term subtitles throughout.

3.1.18
audio subtitle
textual presentation of the dialogue, typically for subtitle-translated programmes, read out aloud in a spoken voice for viewers with vision or reading disabilities

Note 1 to entry: In some countries it is called bilingual broadcasting or spoken subtitle.

3.1.19
hybrid EPG
EPG that shows both past content as well as content available now and in future

Note 1 to entry: For UK equipment, this functionality is covered in D-Book 7.

3.1.20
service
operation or function that an object or user performs upon request from another object or user

Note 1 to entry: The “objects” addressed by this definition usually are technical function blocks.

[SOURCE: IEC 62026-3:2008, 3.1.44, modified – Definition, "or user" added at the end and a note added.]

3.1.21
service
intangible product that is the result of at least one activity performed at the interface between the supplier and customer

[SOURCE: ISO/IEC 19796-1:2005, 2.25].

3.1.22
AAL service
action or function of an AAL system creating an added value for customers without involving a service provider

3.1.23
AAL service
operation or function of an AAL system or connected with an AAL system

EXAMPLE 1 Configuration and maintenance of AAL systems.

EXAMPLE 2 Assistant systems to support the home and living environment.

Note 1 to entry: AAL systems can offer an alternative and convenient access to services. An AAL service may consist of several individual services.

3.1.24
AAL service user
person who interacts with an AAL system or is connected with an AAL system

3.1.25
content creator
individuals, groups of people or a company that create content in the broadest sense for consumption on a connected TV, including the service provider of the broadcast service

3.1.26
telehealthcare
form of assistance for persons or patients in which a telemonitoring system is used for telemedical examination, diagnosis and monitoring and/or for the determination of relevant health parameters by bridging the space or time distance and by forwarding the information to an evaluating party

Note 1 to entry: Telehealthcare ranges from a simple phone call between two professionals in health care services to advanced applications such as remote controlled operations using robotics.

3.1.27
telemonitoring
telemedical examination, diagnosis and monitoring of patients by their doctor in charge or by a telemedical care centre

Note 1 to entry: Telemonitoring requires that special medical, technological, logistical, data-security related and legal conditions be met.

3.1.28
telemonitoring system
remote recording of vital and environmental data (e.g. blood pressure, blood glucose, weight, ECG) in the home or mobile environment of a patient by his or her doctor in charge or by a telemedical care centre

Note 1 to entry: The objective of the system is to provide optimum care for users at all times without having to make long trips to see a doctor.

3.1.29
health service
effect of a service provision process to prevent and cure diseases and to restore the best possible individual state of health

3.1.30
vitality value
patient-related vital data measurement, measured by devices connected to the patient or collected otherwise by the patient

EXAMPLES: pulse rate, blood glucose level, blood pressure and body temperature.

Note 1 to entry: See also ISO/IEEE 11073-10201:2004.

3.1.31
patient
person whose condition requires the need for intervention of medical care personnel

3.2 Abbreviations

For the purpose of this document, the following abbreviations apply.

AAL	Ambient Assisted Living
AD	Audio Description
ALS	Amyotrophic Lateral Sclerosis

API	Application Programming Interface
app	Application
AS	Audio Subtitle
ASR	Automatic Speech Recognition
CE	Consumer Electronics
CTV	Connected Television
DECT	Digital Enhanced Cordless Telecommunications
DVD	digital video disc
ECG	Electrocardiography
e.g.	for example
EPG	Electronic Programme Guide
etc.	et cetera
EU	Europe
FCC	United States Federal Communications Commission
HCI	Human Computer Interaction
Html	Hypertext Markup Language
ICT	Information and Communication Technology
i.e.	id est, that is to say
I/O device	Input/Output device
IP	Internet Protocol
IR	Infrared
ITU	International Telecommunication Union
ITU-T	ITU Telecommunication Sector
PC	Personal Computer
RF4CE	Radio Frequency for Consumer Electronics
RFID	Radio Frequency Identification
TR	Technical Report
SAP	Secondary Audio Programme
SS	Spoken Subtitle
STB	Set top box
TabIO	Tablet and multi-touch interface
telco	telecommunications company
TTS	Text to Speech
TV	Television
UI	User Interface
UIA	User Initialization Application
UK	United Kingdom
USA	United States of America
USB	Universal Serial Bus
VHS	Visual Human Sensing

4 Use case scenarios

4.1 General

The use case scenarios are intended to illustrate the most typical AAL use cases related to audio, video and multimedia systems and equipment, but are not meant to be an exhaustive list of realizations within an AAL environment. It can be a generic use case in the style of universAAL or a user scenario which has to do with content accessibility and the problems of human interaction – or lack thereof – that result from incompatible abilities and preferences between the parties, e.g. a deaf person using the telephone, or a blind person missing out on visual cues who both need information presented in an alternative format.

NOTE Use case, user story, use case template and functions are also described in the German AAL Standardisation Roadmap published by VDE and DKE.

4.2 Enabling functions

4.2.1 Summary

Below is a summary of those use case scenarios described as a set of elementary enabling functions. The use case scenarios are described as user based experiences and basic applications.

NOTE The following enabling functions and spatial aspects refer to the report of the IEC SG 5 “Modelling Team” dated 17 October 2013. IEC SG 5 was transferred into IEC SEG AAL in January 2014.

4.2.2 Interaction with humans (Monitoring)

Denotes all direct interaction of or through AAL system elements with humans, such as measurements in or on the body (e.g. vital signs, position, movement and acceleration), personal care (e.g. hair combing, shaving, feeding support), human control of operations (e.g. pressing alarm button, viewing and operating all sorts of interfaces), etc.

4.2.3 Social participation

Denotes all audio-visual interaction both artificially generated or with other humans, or even animals, through the AAL system, such as consumption of audio-visual content, personal care (e.g. hair combing, shaving, feeding support).

4.2.4 Physical interaction with human environment (assistance systems)

Denotes all direct physical interaction of or through AAL system elements with the human environment, and thus includes tele-operated or autonomously operating appliances (interaction with systems or machines). Thus it includes machineries, e.g. vacuum cleaner, robot making the bed, cooking aids, door and light switches, etc., but it excludes digital / virtual interactions (data acquisition, steering actuators).

4.2.5 Data acquisition

Denotes all data acquisition through sensors (gathering the data), but also the interaction between data entry in the human interface (which is interaction with humans) and the further processing (which is any one of the items below).

4.2.6 Mechatronics and control

Denotes local control loops including mechatronics, e.g. to automatically steer a robot arm or moving aid to a certain position, to balance a 2-wheel vehicle, manoeuvre a wheel chair up the stairs, or open an automated door.

4.2.7 Data aggregation and storage

Denotes all content-agnostic data handling, such as storage, communication, aggregation of data, etc.

4.2.8 Defined function control and support

Denotes all digital and physical activity in immediate support of any given single AAL function: e.g. sending a reminder that the medication has not yet been fully taken today, dispatching a task for a house robot to vacuum clean the living room, turning on the lights upon detection that it is getting dark.

4.2.9 Complex cross-function service control and support

Denotes all tactical level coordination necessary to perform composed, more complex functions in a meaningful manner: e.g. the (guided, semi-automated or fully autonomous) verification of fridge content followed by assembling a shopping list followed by dispatching tele-shopping orders and printing a shopping list for human shopping by the assisted person or an assistant, etc.

4.2.10 Integral service programmes

Denotes all overall level coordination necessary to perform structured groups of services over longer time spans in a meaningful manner. This would include the assessment what services an AAL service user needs, the customization of the services to-be-provided from an available “menu” over a future period, alignment with the individual and with any relatives or friends about these programmes, planning and arranging for digital and / or physical aids or infrastructure to be delivered and installed, etc., or at public building or higher domain levels the planning for those groups that need to be served (as opposed to individuals).

Any selected case consists of a series of these enabling functions working in conjunction towards the fulfilment of that particular use case. These enabling functions can take place in one or across / between several application environments.

4.3 Spatial aspects and application environment

4.3.1 General

In addition to being described as a set of elementary enabling functions, some use cases express the relevance of spatial and location contexts. Aspects of this can include differences between near and far location (and anything in between) or the difference between local and remote scenarios, or aspects of a solution that are either local or remote.

4.3.2 Body and personal (aura)

Denotes the immediate area around the body and would thus include devices like sensors and actuators worn in or on the body and also personal devices typically carried and used by one individual, such as music player, smartphone, tablet, etc. The sensory abilities of a person have to be considered. The issues that people with sight or hearing loss face are often quite different from the barriers caused by physical disabilities. There are, however, clear crossovers with some cognitive disabilities in terms of barriers experienced and their impact. They cover two fairly distinct issues: interface accessibility, i.e. being able to operate the system versus content accessibility in the broadest sense, this includes not just consumption of content, but also the communication between people or between users and service providers.

4.3.3 Home

Denotes the private, hence highly customizable indoor area where the AAL service user lives, alone or with friends, relatives or room-mate(s) and would thus include dedicated infrastructure aimed to support those individuals. It would include infrastructure and devices

(including mainstream solutions) such as home wireless networks, routers, gateways and concentrators, audio-video aids (microphones, cameras, screens, speakers, head sets, headphones, etc.), in-house only vehicles and walking / moving aids, in-house only appliances and robots, connected TVs, monitoring and security means, medical aids (e.g. blood pressure devices).

4.3.4 Personal vehicle

Denotes all personal vehicles, e.g. normal cars, motor cycles or vehicles designed for elderly people, whether hand-operated (stability aids) or engine powered (electrical bicycles and scooters).

4.3.5 Public buildings

Denotes all other relevant in-door environments (so “public” refers to access, not to ownership here). These are not customizable but instead will be equipped for generic support of the common denominator of user groups, and they would thus include generic infrastructure aimed to support a large variety of individuals typically visiting any particular place, e.g. at an airport, in a shopping centre, city hall or metro station.

4.3.6 Global

Denotes all the space outside populated areas as well as all outdoor and on the move spaces in a populated area, including public transport, e.g. in a train, at the country side, on a ship, in a park or on a street.

4.4 AAL stakeholders and actors

4.4.1 Explanation of terms

In the following sub-clauses, terms relating to AAL stakeholders and actors are explained. These stakeholders, individuals and/or organizations, play a role in the provision and/or consumption of AAL. The range of persons, groups and organizations is indicated that are involved in, or affected by, AAL issues and solutions.

NOTE Transfer of the NIST model of Cloud Actors to AAL Actors, refer to NIST Cloud Computing Collaboration Site (see Bibliography).

4.4.2 AAL solution/service user

A person or organization that holds the business relationship with, and uses the service from, an AAL solution/service provider.

4.4.3 AAL service provider

A person, organization or entity responsible for making a service available to an AAL service user. Some examples chosen are the AAL service provider builds the software platform, manages the technical infrastructure for providing the service and provides services at agreed upon service levels. The AAL service provides also protects the security and privacy of the AAL service user.

4.4.4 AAL auditor

An organization that can conduct independent assessment of AAL services, information system operations, performance and security of an AAL implementation. It can evaluate the service provided by an AAL service provider in terms of security controls, privacy impact, performance, etc.

4.4.5 AAL broker

The integration of AAL services can be too complex for an AAL user. The AAL broker manages the use, performance and delivery of an AAL provider directly and negotiates relationships between AAL service providers and AAL service users.

4.4.6 AAL carrier

The AAL carrier ensures connectivity and transport between the AAL service users and AAL providers through network, telecommunications and other access devices. AAL service users can obtain AAL services through network access devices, e.g. computers, notebooks, smartphones, tablets or connected TVs.

4.4.7 AAL application developer

A person, organisation or entity that designs and implements the application component of an AAL solution.

NOTE In some cases, the application can be the complete AAL solution. At present, most applications rely to some extend on network services for their operation.

5 Use case template

5.1 Template

A template was designed to allow easier correlation of the user requirements between use cases to highlight commonalities and differences. Selected use cases were summarized in a template which contained the following elements, also described in Annex B.

The first use case described below is focused on the improvement of user interfaces of connected TVs and easy home network implementations.

5.2 Description of the use case

Connected TVs are more complex than traditional televisions. Users frequently experience usability barriers as a result of complex navigation, different user interfaces and the lack of a consistent user experience, such as finding and controlling access services, such as audio description, subtitling, clean audio and sign language.

5.3 Name of the use case

The name of the use case is the improvement of the user interface of connected TVs and easy home network setup.

5.4 Name of author(s) or committee

The use case was submitted by the European Blind Union.

5.5 Scope and objectives of use case

The scope and objectives of the use case are described according to the enabling functions, spatial aspects and application environment (see 4.1 and 4.2).

- Daily life support; Social Interaction; Active Ageing; Safety, security and privacy at home.
- Define the requirements and functionality of IP home network setup and use of connected TVs.
- Improve the UI usability of connected TVs.
- Develop guidelines for easy home networking implementations, because the complexity of IP home network setup is a barrier for many AAL service users.

- Define a common framework and application environment to deliver accessibility services on a connected TV using mainstream external connectivity.

5.6 Short description

Current connected TV implementations, in their own right as well as components within home AAL solutions, are frequently considered poor in terms of general usability as well as with regard to accessibility for disabled people. Usage data backs up this view (e.g. DTGS2012 and PLEE2012). Home networking and user interface usability and accessibility are the main problem areas. There is scope for standardisation to provide functional specifications in support of usability and to exploit connected TVs' external connectivity features to enhance accessibility by means of companion devices and applications.

5.7 Complete description

Television is the most prevalent technology service used around the globe. Connected TV makes the television experience richer and adds a host of new features and facilities. In addition, because connected TVs are in essence computing platforms as well as networked devices, they can act as display units and/or connectivity hubs for all types of other solutions, including AAL services and products.

However, even more so than for legacy televisions, the connected TV UIs have limitations in terms of the accessibility features they can offer to specialised audiences, such as blind people and those with severe physical disabilities. Amongst the evidence is the observation that even though about 25 % of UK households now have a connected TV equipped with an internet connection for streaming content compared to about 11 % of households who have media players on a tablet, the consumption of broadcast content through the tablet version is four times as high as on a connected TV, indicating that many people don't actually connect their connected TVs to a network. General user feedback frequently reports poor usability of connected TVs while user groups, especially those representing people with disabilities, continue to highlight accessibility and usability barriers. There is therefore scope for use case, gap analysis and guidelines work to define the requirements and functionality for easy home networking – easy set up and use of a device – and for exploiting mainstream external connectivity functions (including APIs) to further improve the accessibility and usability of connected TVs.

Because many AAL activities focus on medical, well-being and monitoring, there is scope for connected TVs and other consumer equipment to support AAL services. In the past, medical services via linear TV had the problem of no return path to the service, but with connected TVs that are connected to the internet and with the availability of accessories such as remote media controllers, gesture based remotes and Skype cameras, a return path is now commonly available. Again, there is scope for defining a common framework and an application environment to facilitate such applications.

Since connected TVs by definition expose functionality over the home network as part of their intrinsic design, there is scope to harness these features for the delivery of improved usability and external accessibility solutions. An example of the former is the use of tablet and smartphone applications or USB based HCI devices to facilitate text entry and navigation while an example of the latter would be a talking command and control application on a tablet to allow blind people to control a connected TV. Another example would be simplified controllers for older people on a suitable secondary device, addressing both reduced mobility and dexterity problems as frequently observed amongst such an audience. Similarly, connected TVs can be used to deliver more accessible manuals and other guidance for a range of applications.

The external connectivity of connected TVs offers a great opportunity to deliver external accessibility solutions by means of applications running on other devices such as tablets and allowing for instance blind AAL service users to operate their TV through a TTS based smartphone or tablet app, and also elderly people with diminished sight, and perhaps dexterity problems, to control their TV with a more accessible remote control app on a tablet.

One could also deliver additional content, including access services in this way including via out of band delivery scenarios (for instance for closed sign language interpretation on a separate screen). Finally, connected TVs can be key components for other AAL solutions and as such their interface accessibility, content (information and communication) accessibility and connectivity to assistive technologies are all relevant.

5.8 Accessibility barriers for users

Connected TVs are more complex than traditional televisions. Users frequently experience usability barriers as a result of complex navigation, confusing technologies and language in the user interface, fragmentation of content, for example where linear content is found, navigated and controlled in a different part of the UI compared to catch-up content from the same provider and complexities of home networking.

Some manufacturers already have remote apps for their connected TVs, but these are not designed for accessibility and because there is no widely adopted standard for command and control that external accessibility and usability solutions can use, there is an interoperability problem for such applications as well as a problem of interfaces and functionality. For instance, there is no benefit in having an external control API as an application which a blind AAL service user could use offering an external speaking solution if the API has no function to turn on/off the AD for a programme.

Current connected TV implementations do not provide a unified model for finding, navigating and controlling different types of content (linear versus catch-up and on-demand) and require users to switch to different functions depending on what they want to watch and whether or not it is past, current or future scheduled content. For instance, a user wanting to watch BBC 2 as currently broadcast would use a part of the UI associated with linear broadcasting functions, including the EPG, whereas to view a past programme, the user needs to switch to an embedded media player which is quite different in terms of navigation and control from the linear parts of the system. Some manufacturers have started to implement hybrid EPGs in a more consistent way, but this remains incomplete as a solution and users continue to be confused by the range of embedded media players and interactive menus from a host of service providers, all using a different UI and frequently not offering a consistent user experience, including with regard to finding and controlling access services (audio description, subtitling, clean audio, sign language, etc.).

5.9 Which technologies need to be supported

These include command and control APIs and IP based home networking implementations on the receiver and additional required AAL technologies may be required.

5.10 Which standards are needed to meet identified requirements

A functional specification for the command and control API in support of accessibility solutions and guidelines for easy home networking implementation is required. Home networking is a mainstream and general purpose aspect of making connected products function correctly. It is not directly an AAL service but provides the necessary infrastructure. Additional standardisation to support specific AAL services may be required.

5.11 Actors: people, systems, applications, databases, the power system, and other stakeholders

5.11.1 Connected TV AAL user

The AAL service user makes use of the connected TV for content consumption and/or interaction with AAL services. The connected TV provides the access platform that offers linear and on-demand content, has computing capabilities and can connect to a home network. The features of the connected TV are broadband internet protocol connectivity, home network awareness and a standardized application environment. Tablets, smartphones and notebooks act as interfaces and/or secondary display devices for connected TVs.

5.11.2 Connected TV AAL service provider

A provider of services that monitor and assist people with daily activities, healthcare, wellbeing, citizenship and social interactions.

5.11.3 Connected TV AAL broker

The AAL broker ensures that a set of components works together to implement a given AAL solution. A connected TV can be one of these components.

6 Use case clustering

6.1 Criteria

The criteria for the clustering of use cases were real-world applicability and the requirements for audio, video and multimedia devices delivering the AAL service and their user interfaces. It is important to note that the use cases selected identified usability barriers and defined functional requirements.

The use case scenarios are not strictly independent and can semantically overlap. This overlap is not a problem, since the objective is to identify use case commonalities.[1]

6.2 Communication and social interaction use case scenario

Denotes all systems for social interaction, use of the internet and networking as well as the potential for knowledge transfer.

– Connected TV USE CASE (provided by the European Blind Union)

  Connected TV is already part and parcel of daily life in many developed countries and the use of connected TV facilities to support assisted living/accessibility technologies is now gradually appearing in real-world applications. Therefore, connected TV has direct accessibility/usability aspects (i.e. pertaining to the “proper” usage of CTVs in the consumption of broadcast content) as well as an indirect role (in providing part of the infrastructure for AAL solutions, as a display function, but also as a hub for other components of a solution). In both cases connected TVs address interface and content accessibility issues, even if in the indirect model the connected TV is only used as one of the components to deliver a certain AAL service.

  The basic functions and user interfaces of connected TVs, tablets and portable multimedia devices have to be defined. Usability and accessibility need to be considered. More and more connected TVs, tablets and portable multimedia devices use a smart operation system and touch technology. Most of them do not provide effective functions and user interfaces for all AAL service users. For an elderly user the operation of those products is difficult, e.g. selection of a file on the network or finding an IPTV channel. At the same time, many smart CE devices provide Wi-Fi connection. However, users with no ICT background may not easily setup a home network and use related functions in their home.

6.3 Entertainment use case scenario

Relates to the consumption of all AAL services and audio visual content.

– Ubiquitous in-house electronics and installations USE CASE (provided by Germany)

The ubiquitous in-house electronics and installations scenario builds up the ambience by using intelligent lighting and music control, home automation systems, sensors, situational awareness, media equipment, localization, automatic detection of new components and by integrating these with the home network. All in-house assistance systems adapt domestic

[1] The use case scenarios are based on the discussion in IEC SG 5 AAL and were modified according to the scope of TC 100.

lighting conditions to suit the requirements and preferences of the users. Music can accompany the users as they move around different areas in the house.

– Electronic programme guide USE CASE (provided by the US)

  The electronic programme guide (EPG) is an important feature in most digital set-top boxes used to access multichannel video programme distributors (cable, satellite and telco.). Some televisions also have built-in EPGs. The EPG enhances the user's ability to search and find the wide array of video programming available. Current EPGs are not easily accessible to users who are blind or visually impaired due to their graphics-rich user interface. Furthermore, visual acuity diminishes with age and it becomes more difficult for elderly users to read small print. It is useful for elderly users that they can change the font size on the TV screen, such as for the menu and EPG. It is also a helpful feature for amblyopic users. In addition, if the TV has a text-to-speech function and reads out the EPG content, elderly and visually impaired users have easy access to the TV programme information.

  The EPG is quickly becoming an essential feature to ensure users can access the full range of programmes offered by their video service provider. Without an EPG, finding desired programmes, and identifying programmes of potential interest to the user, would be virtually impossible given the large quantity of available programmes and channels. Users who are blind or visually impaired often cannot access the EPG. The highly visual nature of the EPG interface is an additional barrier to the blind or visually impaired.

  Content providers, distributors, and television and set-top box manufacturers will benefit from identification of the essential characteristics of an audio-enabled EPG. Best practices for implementation of audio-enabled EPGs have to be established. Further, access to the audio-enabled EPG feature has to be consistent to ensure ease-of-use by users regardless of the manufacturer or the video service provider.

  Many elderly and people with a variety of impairments may find using the EPGs difficult if they cannot manipulate the remote control effectively.

– Audio Description and Audio Subtitles USE CASE (provided by the US and ITU-T FG AVA)

  Audio description is audio-narrated descriptions of a video programme's key visual elements which makes video programming more accessible to users who are blind or visually impaired. Access to the audio description features of a television or set-top box by users who are blind or visually impaired needs to be simplified.

  Today audio description is provided through the TV or set-top box "secondary audio" feature, which some remote controls identify as "SAP" or "secondary audio programme." The secondary audio may also be identified as a foreign language, such as "Spanish" or "SPA," because it is also used to provide foreign language translations of native language video programming. Depending upon the video programme being viewed, when listening to the secondary audio, users may hear the primary audio with audio description, foreign language translation, a duplicate of the primary audio, or silence. As the audio description feature expands across more programming and distributors, easy access to the feature by the blind or visually impaired will become increasingly important.

– Digital apparatus GENERIC USE CASE (provided by the US)

  A digital apparatus is designed to receive or playback video programming transmitted in digital format simultaneously with sound, including digital formats using Internet Protocol. The control of appropriate built-in apparatus functions is not accessible to and usable by users who are blind or visually impaired, or do not have fine movement or cognitive impairments. Digital apparatus with built in displays or intended to be connected to a display device frequently include on screen text menus or displays that are used to select or navigate various features of the apparatus that facilitate recording or playback of digital programming or control of accessibility related features. These on screen menus are frequently not accessible to users who are blind or visually impaired.

  Digital apparatus frequently includes on-screen displays in the form of graphics or text that facilitates the playback or recording of digital programming and other associated features.

  This may be in the form of DVD player / recorder or similar apparatus that displays a graphic indicating if the device is playing, fast forwarding, rewinding, or recording video programming. Similarly, apparatus may include accessibility features that allow a user to

turn on or control features such as subtitles or audio descriptions. These features and indicators need to be made accessible to users who are blind or visually impaired.

6.4 Daily life support use case scenario

Includes all techniques and systems which help and support the user during daily life, such as a managing system, a calendar or reminder or other support systems.

– Electronic butler USE CASE (provided by Germany)

The electronic butler scenario as an intelligent diary makes use of video telephone systems, sensors, home automation systems, remote management, video conference systems, terminals, electronic butler, VR fitness room, communication and telemonitoring. The AAL service user is connected with a video communication system that helps the user to stay in touch with friends and family and contact the doctor while the virtual butler manages the diary, provides advice on everyday matters and checks installed building services technology. Via remote servicing, the virtual butler is reconfigured and updated every six months.

6.5 Safety, security and privacy at home use case scenario

Includes all technical support including fall detection and prevention, ambient sensors or actuators, alarm systems and localization. This subclause describes user experiences using AAL services while meeting security requirements. With requirements and patterns defined, real-world scenarios are illustrated with AAL security provisions in action. The scenarios cover a range of application types, deployment models, patterns and roles.

– “Happy sensor” USE CASE (provided by Japan)

The lighting unit with a motion sensor is connected to the cordless phone (base unit) by the DECT (Digital Enhanced Cordless Telecommunications) standard wireless system. The base unit makes a call and informs about the number of detection to the telemonitoring family at the preset time automatically.

In the ‘absence mode’, if the motion sensor detects the coming and going of the person, a warning light flashes and a warning sound beeps. This enables the family members to monitor the AAL user remotely.

NOTE This AAL product was introduced in January 2013.[2]

6.6 Monitoring, healthcare and wellbeing use case scenario

Encompasses medical compliance as well as telemonitoring (system) in addition to prevention and motivation aspects.

– Telemonitoring USE CASE (provided by Germany)

The AAL service user lives in an intelligent apartment equipped with a telemonitoring system that monitors the vital signs. Via a video conference link, doctors' appointments and physiotherapeutic treatments can be carried out. The identification, location of the user and fall detection and management of vital signs are all possible. The telemonitoring system consists of video call systems, medical equipment, conference systems, monitoring systems of vital signs and whether medication has been taken.

– Telemonitoring with Connected TV USE CASE (provided by Japan)[3]

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2 See http://pioneer.jp/press/2013/0117-2.html (in Japanese only).

3 See the following references (in Japanese only):
For USE CASES 1 and 2:
http://www.sharp.co.jp/corporate/news/110615-a.html.
For USE CASE 3:
http://www.city.kitamoto.saitama.jp/shisei/news/mimamori.htm
http://www.sharp.co.jp/corporate/news/130913-a.html

Monitoring of the vital signs of a connected TV AAL service user. The concept is to monitor the AAL service user's health status via the connected TV at home by establishing a communication link between the user and the health care provider. The current TV sets provide data to make the necessary action or not. When the power switch and channel selection of the connected TV are operated, this information is sent by email to the registered email address on a cell phone or PC of the health care provider or family members. This means the connected TV user is alive and active. This service is already in practical use in Japan (refer to Figure C.1).

An email is also transmitted when the power switch of the TV set is not used for 24 h. This may mean that the AAL user needs assistance or their health condition has deteriorated. The health care provider has to make a call or visit to the AAL user. This service is already in practical use in Japan (refer to Figure C.2).

Information, e.g. local weather on the residential area, is transmitted and displayed on the connected TV set automatically. The TV user can answer a question by remote control. After the field trial conducted in Kitamoto-city Japan from July to September 2012, this service is now in operation in Japan (refer to Figure C.3).

– Using smart devices to assist with long term health care USE CASE (provided by Japan)

Smart devices support the provision of long term health care of people in order to reduce health care costs and improve their wellbeing. AAL users are encouraged to regularly do their walking exercise. According to a report of the Ministry of Health, Labour and Welfare, every 10 000 steps of a user can reduce medical costs by 14 Japanese Yen.

By downloading a specialized application, each user's smartphone can become a pedometer, allowing the number of steps taken each day to be recorded automatically simply by carrying the smartphone (refer to Figure D.1).

The application can also record the user's weight and blood pressure. Recorded data can later be examined in graphical form. Similar applications in other countries allow AAL users to exchange information on their wellbeing with health service providers.[4]

– Healthy lifestyle service package USE CASE (universAAL)

The AAL user can decide to use different interaction channels and/or different flavors of the same interaction channel completely separately from the functionalities provided by different applications. He can decide separately on the most preferred way of interaction (graphical, voice, gesture, etc.) and most convenient applications.

The AAL service user is supervised by a telemonitoring system which controls his health and diet status. The "Healthy Lifestyle Service Package" is provided by an AAL service provider. It consists of sensors installed across the house to monitor the actions related to cooking, sedentary life, level of activity, etc. Health care personnel supervise the ongoing care of the AAL service user by sending advice and questions about the health and vital signs.

The AAL service user signs a service level agreement with an AAL service provider. The AAL service provider installs the software and sensors in the home of the AAL service user and also delivers supporting devices. The data collected from the sensors and other privacy data is only evaluated by health care personnel. By using non-intrusive mechanisms the health care personnel provides recommendations related to the activities of the AAL service user. Messages, e.g. shopping lists, are sent which have to be confirmed by the AAL service user with a touch-sensitive screen located in the kitchen. If it is detected that audio interaction is more appropriate for the AAL service user then the interaction can change to a different interaction mode, e.g. a graphical user interface. The AAL service user may also use voice and speak commands instead of touch screens.

Location sensors ensure to locate the AAL service user around the house. Appropriate interaction modality is used or just the user can switch the output location from the previous screen to the screen in the vicinity, thus enabling the "follow me" scenario.

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4 See http://www.fujitsu.com/global/news/pr/archives/month/2013/20130416-02.html (in English) and http://pr.fujitsu.com/jp/news/2013/04/16-1.html (in Japanese).

When the AAL service user is familiar with the "Healthy Lifestyle Service Package", the AAL service package can be enhanced by new functionalities, e.g. an application that motivates the user not to spend so much time watching TV at home, but instead to be more active. The new application is installed by the AAL service provider and makes use of the graphical user interface. Since the AAL system's framework enables decoupling of the application and the presentation components, the AAL service user can add or remove applications separately without being concerned that some beneficial applications are lost if a different interface is chosen.

JEITA submitted a number of AAL use cases which were announced recently in Japan.

– Health care services for healthy seniors (elderly users) USE CASE (provided by Japan)

  These recently announced AAL services provide daily support services for elderly users who live in their own home:

  - casual watching (telemonitoring) by the family through tablet devices;
  - health management services connected to body and health measurement equipment with Bluetooth interface;
  - communication means and various services to improve the quality of life;
  - life support services in connection with a community.

  NOTE This service started in autumn 2013.[5]

– 24 h e-telemonitoring (e-mimamori) assist service USE CASE (provided by Japan)

  This non-intrusive telemonitoring service for elderly users respects the privacy and mental burden on the AAL user.

  NOTE The service was introduced in September 2011.[6]

– Cooperation of body composition monitor and TV USE CASE (provided by Japan)

  The data measured by the body composition monitor is transferred to the TV by Bluetooth communication and the measurement results are displayed on the TV screen. The data is composed of the eight measurement results, for example weight, body fat percentage, muscle mass and BMI. The data storage function in the TV enables to compare the daily changes of body weight, body fat percentage, etc.

  NOTE The product was introduced in July 2013.[7]

6.7 Active aging use case scenario

Includes all topics concerning the agile and active aging, e.g. learning, the work environment and processes, exercises and information needed for an active aging.

– Nutritional Advisor (multimodality and high configurability) USE CASE (provided by universAAL)

  The AAL service user is able to initially configure his/her user preferences related to nutritional aspects. These preferences are stored in a platform component dealing with the user profile. That information is used by the "user interaction framework" to apply its intelligence. The platform offers different ways to allow input of information into the system: Wizard based using window based forms (graphical oriented), wizard based using speech generation and voice recognition (voice oriented), or a combination of graphical interface, gesture and voice recognition (multimodal).

– Nutritional advisor" (Adaptation to context and preferences) USE CASE (provided by universAAL)

5 See http://www.toshiba-sol.co.jp/industry/senior/index_j.htm (in Japanese)
6 See http://jpn.nec.com/healthcare/catalog/emimamori.html (in Japanese).
7 See http://www.mitsubishielectric.co.jp/home/ctv/feature/wellness.html (in Japanese).

When the AAL service user makes breakfast, the system suggests the shopping list for the current week on the TV in the kitchen. It catches the users' attention by making a sound or just blinking lights at the display. The system knows from the user profile that the last time he/she shopped was three days ago. The AAL service user may confirm that he/she has read the message using different ways such as touch a button on the screen, saying "Thank you", shaking an object. The system may communicate to the user recommendations and advice from the nutritionist. Depending on the user profile and user preferences the system displays the information using the appropriate interaction mechanism. For instance, when the user enters the living room a digital photo frame displays the message "Don't forget to drink water. Today it's going to be over 35 °C".

A second example is that certain messages might be private. The system can decide to use a more private modality to forward the message to the AAL service user, i.e. if the user listens to music with earphones, the system uses that specific mechanism to communicate that specific message.

A third example is the AAL service user may look at a display in the kitchen for a certain recipe. Then the user moves to the living room in order to take a book from the shelf. The system is aware of that movement and might display the same recipe on the TV placed in the living room. This "follow me" scenario is supported by the underlying capacities of the platform.

6.8 Mobility use case scenario

Encompasses all systems which are useful for mobile processes, e.g. mobility aid, safety and security on the move, transport or information of outdoor conditions.

– Cognitive disabled user USE CASE (provided by Japan)

  The AAL service user with cognitive disabilities is supported by using RFID and sensor technology including bio-feedback, localization and web-based services. Accessibility and daily routine is supported. The AAL service user with cognitive disabilities may need a mobile assistance system when using public transport for going shopping. This eases the burden on family members using web-based services such as a family organizer to schedule excursions, shopping trips, etc.

7 Common application requirements derived from the use cases

7.1 Background

According to Andrushevich et al. (see Bibliography) AAL environments are full of human attention-demanding applications. The introduction of wireless solutions in the assisted living area brings significant advantages in terms of reduced staffing, observation reliability and response time for treatments, etc. To effectively support e.g. an elderly person in their daily life, it is valuable to know more about their current condition and behaviour in general. The assisted home has to be aware of its inhabitant. Depending on the context, it may be able to provide the services they need, learn from their actions, detect any abnormal situation and act accordingly.

Andrushevich's article identifies some typical application requirements.

7.2 Information assistant

Providing information and services that an AAL service user may need in his/her current situation, e.g. instructions to take medication in the morning.

7.3 Intelligent behaviour of the environment

An AAL environment learns from user's actions and provides appropriate functions at the appropriate time. Automatic sequence of familiar actions is developed. Example: getting up in the morning – lights on bedroom, blinds up, turn on radio, lights on bathroom.

7.4 Anticipate emergency situations

Based on changes in the behaviour of the user or changing physiological data it is possible to provide an early indication of dangerous situations and initiate preventive measures. Example: to inform medical personnel if blood pressure is beyond pre-set norms of this user.

7.5 Recognition of emergency situations

Intelligent environments recognize unusual situations and act accordingly and promptly. Example 1: an environment recognizes that residents are not getting up in the morning as usual at a specific time and derive and immediate emergency situation. Example 2: Fall detection.

7.6 Security and privacy

Elderly users need and want security, especially if they are increasingly restricted physically and/or mentally. Example: recognize an unlocked door or allow remote monitoring before a door is opened or turn on external lights to illuminate a visitor.

8 Definition of common frameworks

8.1 Summary

The below use case scenarios analyse the different aspects of user interaction in AAL environments, mostly with a focus on adaptability and multimodality. This view is complemented in a definition of common frameworks of concepts which respect the more generalized, open and distributed nature of AAL spaces. Some examples of these frameworks are described in the following chapters.

8.2 PERSONA Project

According to the PERSONA Project (see Bibliography EU-FP integrated project PERSONA) users can provide text input by talking, typing, writing or pointing and selecting available text. Graphical input can be produced by drawing with possibility of embedding handwriting. Finally, signs and signals can be provided by pointing to, touching, pressing, holding, moving or turning things, to name a few, as well as by gestures. The system output is perceived by humans in various ways. Text output can be perceived by hearing and reading (through seeing) and pictures and graphical signs just through seeing and touching. It seems that all other output types can be abstracted as signals and signs. They can be acoustic, visual (change of colour and form or, in case of light sources, light intensity and blinking state), haptic (through things that are able to vibrate, change their temperature, or produce opposite pressure, to name a few), olfactory (through things able to produce smell), or gustatory (if any, then probably through tiny stimuli installed in the mouth).

Input by the user is normally captured with the help of devices like a microphone for capturing voice, a camera for capturing gesture, or other devices, such as a mouse, a keyboard, or a remote control that work in the context of a display.

8.3 universAAL user interaction framework

The same openness provided by the DLNA specifications to enable the sharing of multimedia content and streams among, for instance, a TV, a Hi-Fi, a DVD player, and a notebook, is also needed in the AAL spaces of the future (e.g. a smart home or car) in order to enable a new user experience based on the paradigm of human-environment interaction in general. However, the perspective would not be "content sharing" any more, but sharing the input and output channels provided by those devices in the smart space, when considering a display as a visual output channel, a loudspeaker as an audio output channel, and a microphone as an audio input channel, according to their actual roles.

Companies that are experts in the provision of attractive and intuitive user interfaces can then provide a new type of software components that

- manage the input and output channels made available by the devices in the environment, and
- support the handling of user interaction for arbitrary applications.

As a result,

- devices can be focussed on their actual capabilities and provide them in terms of services to the environment, and
- a separation between the application and presentation layers will become possible that facilitates personalization and context-aware adaptation by dividing the adaptation tasks in a natural way between the three parties: applications, user interaction (UI) handlers, and the brokerage mechanism residing in-between.

By introducing the above concepts, the universAAL user interaction framework empowers ICT manufacturers to cope with the accessibility and adaptability challenges in the AAL domain more efficiently and effectively.

8.4 GUIDE Project

GUIDE aims to promote the use of TV based applications for AAL service users. To reach the AAL service user, instead of relying on new interaction devices, GUIDE opts for interaction modalities that are already familiar to the target population: speech and gesturing. This multimodal interaction scenario might demand a set of skills from its users, not for the interaction itself, but for the setting up and configuration. GUIDE includes the possibility to adapt its features and their operation parameters. Even though GUIDE is based on adaptive multimodal interaction, it demands the least possible changes to the current TV based application development methodologies and technologies. Applications will still be developed in the same fashion. GUIDE then introduces an interaction layer between the application and its user, responsible for presenting the application's contents adapted to its user, but also responsible for translating the natural inputs from the user to an application understandable format. AAL application developers will still develop their applications considering a TV screen as the output device, and a remote control as the input device. Users will be able to consume content in the most adequate modalities for them and with presentations adapted to their capabilities, and also interact through speech and gesturing (pointing or tablet based gestures) besides the remote control.

To be able to generate, in execution time, this adapted multimodal interaction experience, GUIDE needs to know its users. Knowledge about users is gathered as a two-step process. The first step happens the first time a user interacts with the platform and is the user initialization application (UIA). This application is executed whenever GUIDE detects a previously unknown user. The UIA serves two purposes: collecting enough information about the user; presenting to the users how the GUIDE system will allow them to interact with a TV. Under the guise of this tutorial purpose, new users will try out the different interaction modalities available to them while GUIDE collects information regarding their abilities. Also, while offering the users the opportunity to personalize their presentation settings (e.g. by asking to select which font size or colours they prefer) GUIDE learns something about their perceptual abilities. The second step is a constant monitoring of the user interaction, allowing to detect requests for presentation changes or difficulties felt in specific interaction scenario, that are immediately used to update the current knowledge about the user (i.e. the user model).[8]

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8 Source

www.guide-project.eu
https://guide.igd.fraunhofer.de/confluence/display/GUID/Multi-modal+adaptation

There are a number of AAL projects, but these three are considered to have a direct relation to this Technical Report, for the following reasons:

- Most projects require smart home technologies, Smart TV/STB, sensors connected to external networks via a home gateway.
- Potentially new terminals relating to gaming, telecare, etc. suitable for “elderly” and projects often invoke need for special interfaces suitable for the elderly.
- Some specific instances of voice control, touch screens, new interactive devices that are simple to use and offer simple access to web, social networks, etc.
- Some EU-funded research is targeted at robotics for rehabilitation and independent living.

For a complete overview of European projects with implications for this Technical Report refer to the Bibliography.

NOTE 1 EU-funded research into robotics for rehabilitation and independent living. The projects are funded under the Seventh (FP7: 2007-2013) Framework Programmes for Research and Technological Development and the AAL Joint Programme, November 2012.

NOTE 2 Overview of running EU-funded projects in the area of ICT for Ageing Well. The projects are funded by the ICT Policy Support Programme under the Competitiveness and Innovation Framework Programme (CIP), and the Seventh (FP7: 2007-2013) Framework Programmes for Research and Technological Development.

9 User needs and accessibility principles

9.1 Application of principles

This Technical Report extracts and applies the accessibility principles published in ISO/IEC Guide 71. The intent of presenting these accessibility principles is to identify important user accessibility needs. These accessibility principles are not requirements. Rather they are goals to work towards achieving. ISO/IEC Guide 71 presents these principles as an aid in identifying user accessibility needs that can be used by standards developers to help develop appropriate accessibility-related requirements and recommendations to incorporate within their standards.

9.2 User-focused principles

User-focused principles emphasize the individual users who have accessibility needs.

A system is suitable for the widest range of users if it meets the needs of user populations with the widest range of characteristics, capabilities and tasks. This involves identifying the user population and providing for their needs, including, but not limited to, users differing in their sensory/perceptual, physical, and cognitive/intellectual characteristics and abilities (such as: elderly users; young users (where appropriate); users with different temporary or permanent specific needs as well as users limited by their environment.

A system conforms to user expectations if it is predictable on the user's experience, the context of use and/or on commonly accepted conventions.

A system supports personalisation if users can modify its operations, interactions, content, and/or components to suit their individual preferences, capabilities and tasks. Individualisation involves providing users with choice in their methods of interacting with a system (including alternative sets of operations / interactions, alternate modalities of interacting / operating, and/or cognitive strategies). It is important to select the appropriate alternatives (which meet the needs of different groups of users) and then to provide accessible means for users to select the alternatives (that best meet their needs).

9.3 Interaction-focused principles

Interaction-focused principles emphasize the individual interactions (including the sharing of information content and functionality). Interaction-focused accessibility principles include approachability, perceivability, understandability and controllability.

A system is approachable if diverse users can access it to accomplish the task.

A system is perceivable if users can sense the information and functionalities it presents. This principle recognizes that making use of multiple modalities (e.g. visual, auditory, tactile, olfactory) can provide perceivability for more diverse users in diverse contexts.

A system is understandable if its information and functionalities are clear to the user.

A system is controllable if the user is able to initiate and carry out interaction(s) towards accomplishing a task.

9.4 Task-focused principles

Task-focused principles emphasize the ability for interactions to achieve intended accomplishments.

A solution is usable if it supports the user in the completion of the task with effectiveness, efficiency and satisfaction.

A system is error tolerant if despite predictable errors, the intended task can be achieved with either no, or minimal, corrective action by the user. A system is error tolerant when it detects when errors have been made, it is able to undo actions (where possible), can be reset to its original condition and provides guidance on how to recover from errors.

A system provides compatibility if it allows diverse users to use other systems to interact with it to accomplish the task.

9.5 System-solution-focused principles

System-solution-focused principles emphasize technical issues which could impact upon achieving accessibility.

A system provides equitable use if it accomplishes the same tasks for all users: in an identical manner whenever possible; in an equivalent manner when not.

A system provides compatibility if it allows diverse users to use other systems to interact with it to accomplish the task.

It is recognized that several overlaps occur when applying the principles. There is also the possibility of trade-offs between principles. How to best meet the user accessibility need is the objective to identify requirements and recommendations of standards developers.

10 Usability and accessibility barriers of AAL service users as demonstrated in the connected TV scenario

Current connected TV implementations do not provide a unified model for finding, navigating and controlling different types of content (linear versus catch-up and on-demand) and require users to access to different functions depending on what they want to watch and whether it is past, current or future scheduled content.

Users frequently experience usability barriers as a result of complex navigation, confusing technologies and jargon in the user interface, fragmentation of content, such as where linear content is found, navigated and controlled in a different part of the UI compared to catch-up content for the same provider and complexities of home networking.

Blind or visually impaired users require equivalent access to programme guide content that today is exclusively available in visual form. Without access to the information contained in EPGs, blind or visually impaired users cannot enjoy the same benefits of multichannel video programming as the general population.

Blind or visually impaired users require equivalent access to video programme. Without easy access to audio descriptions of a video programme, blind or visually impaired users cannot enjoy the same benefits of video programming as the general population.

Blind or visually impaired users are unable to fully utilize features of a digital apparatus such as playback, and recording of video programming when the controls for these features are presented using on screen graphics or text. Controlling accessibility related features, such as subtitles and audio descriptions, can be similarly difficult when the controls for these features are embedded in on-screen menus.

Users with hearing loss face significant barriers to telecommunication solutions and television. A very similar case as to the one set out for blind people applies to deaf people when it comes to CTV, albeit that for people with hearing loss the content accessibility issue is the primary concern, whereas interface accessibility tends to be far less of a problem in CTV for this user group.

The adaptations of CTVs for users with specific impairments are often beneficial to elderly users who are experiencing gradual degradation of their abilities.

The operation of devices and systems was considered as a major accessibility barrier, e.g. video call systems, conference systems, telemonitoring systems, PDAs, butler and touch screens. The supporting technologies identified were audio- and video-technology, ICT as well as home automation and robotics.

11 User interface considerations of product and service design

11.1 Summary

Features that make products and services usable for users with disabilities can also make them convenient and easy to use for everyone else. This is particularly helpful when users have temporary difficulties, such as lost glasses, a broken leg or a journey with a pram/stroller or bulky luggage. Increased accessibility and usability often result, therefore, in better products and services for all.

The way of interacting with the AAL system that works for the individual (including activating and de-activating built-in accessibility features) and the way to provide assistance in identifying available options for interacting with the AAL system shall be considered in the early product and service design process. Speed of response, personalization and adaptation of user interfaces according to the preferences of the AAL user are key features. However, personalization may itself present an accessibility barrier. For example, a user could be overwhelmed by too many choices and customization options.

Content providers, distributors, and television and set-top box manufacturers have to provide alternate navigation and presentation options for EPGs and menus. Access to the information conveyed by EPGs may be enhanced by multiple solutions. Text-to-speech conversion or another means of audio interface with set-top boxes and televisions may offer solutions to this need. The use of specifically designed assistive devices (such as screen readers), are another potential solution. In addition guidance on how existing audio interfaces can be

designed, implemented and utilized to enhance accessibility and provide compatibility with assistive devices may be explored.

Digital television supports multiple audio streams. Television receivers may be able to locate and select, or help users select, the audio stream containing video description. Enabling the video description feature should be simple and intuitive. Content providers, distributors, and television and set-top box manufacturers will benefit from identification of the best practices for the discovery of the video description audio stream by the receiver. Further, access to the video description feature should be consistent to ensure ease-of-use by users regardless of the manufacturer or the video service provider.

When considering accessibility, the following issues, at a minimum, need to be considered if on-screen text menus or other visual indicators built into the apparatus are used to access the functions relating to video recording, playback, or related features:

a) such functions shall be accompanied by audio output that is either integrated or peripheral to the apparatus, so that such menus or indicators are accessible to, and usable by, users who are blind or visually impaired in real-time, and

b) the apparatus has to include built in access to those subtitles and audio description features through a mechanism that is reasonably comparable to a button, key, or icon designated for activating the subtitles or accessibility features.

The FCC's Video Programming and Emergence Access Advisory Committee WG4 (see Bibliography) on user interfaces (VPAAC WG4 report April 9 2012, see Bibliography) identified eleven essential functions that shall be made accessible and usable by individuals with disabilities.

The eleven essential functions are:

- Power On / Off
- Volume Adjust and Mute
- Channel / Program Selection
- Display Channel / Program Information
- Configuration – Setup
- Configuration – CC Control
- Configuration – CC Options
- Configuration – Video Description Control
- Display Configuration Info
- Playback Functions
- Input Selection

"…digital apparatus…[must] be designed, developed, and fabricated so that control of appropriate built-in apparatus functions are accessible to and usable by individuals who are blind or visually impaired" where "Digital Apparatus" is a device designed to receive or play back video programming transmitted in digital format simultaneously with sound. "Digital Apparatus" does not include navigation devices (e.g. STBs). Indeed only some STBs have to be compliant whereas all digital apparatus must comply."

NOTE 2 Since the writing of this Technical Report, the U.S. Federal Communications Commission is considering regulations regarding which product categories will be governed by the "digital apparatus" rules found in the Twenty-First Century Communications and Video Accessibility Act of 2010 (Section 204) and which product categories will be governed by the "navigation devices" rules (Section 205).

11.2 universAAL project (supporting rich human computer interaction)

Users are able to interact with the AAL system with different means (gesture, voice touch, etc.) even simultaneously. The system is able to choose the best communication means

according to the preferences of the user or the context of use (i.e. the location, the available devices, type of impairment, etc.).

The user interface for the AAL service user is a critical issue that is related to their acceptance of the system. It is especially critical in complex systems like AAL systems. universAAL enables the creation of a rich variety of different configuration and personalization options, where not only the background colour can be personalized but, for instance, how many interaction mechanisms the user wants to/can use simultaneously, and by using which devices located across the home, depending on the users' contexts. The final result of rich human computer interaction will be that users receive feedback seamlessly by the environment (with the minimum effort for them) and also can easily provide information into the system, or interact with it in the better and more natural way for them.

From developers' viewpoint, they will be able to use any available modality in the environment where the system is deployed (the AAL Space) since the presentation layer and the business logic of the applications are completely decoupled by means of a language to define the interaction which is independent from the interaction modality.

11.3 GUIDE project

The GUIDE includes support for several input and output UI components. Some have been the result of integration efforts of existing technology, while others were developed in the scope of the project. All the components presented below are currently supported by the GUIDE framework.

– Remote control – Gyroscopic remote control

  The remote control is the most commonly used modality to control any kind of devices, especially the ones running on a TV such as the television set itself, the DVD player, the stereo system or any box plugged to the TV set. However, if most of the time the AAL service user manages to use this controller following only the common sense, it often appears as a really complex tool that makes the navigation really arduous. That is why a gyroscopic feature has been added to make the navigation more intuitive and thus improve the usability of the remote control using the pointing functionality.

  To implement this gyroscopic feature the infrared communication has been replaced by the RF4CE communication in order to avoid the constraints on the distance and on the direction between the remote control IR emitter and the receiver. It is based on radio technology and allows an instant answer after a really reliable wireless omni-directional intercommunication between the remote control and the receiver.

– Visual human sensing and gesture control

  The GUIDE visual human sensing (VHS) is a user interface (UI) component that uses visual sensing to recognize properties of the user and support gesture based interaction. The VHS receives images from a camera and range sensors attached and performs computer vision processing to detect, track and analyze humans, body parts and their activities in a scene.

  The VHS provides the following functionality to the GUIDE framework:

  - recognizing presence of a user;
  - detection and tracking of user's body (→ user location) and body parts (→ hands for cursor control, head for face recognition and head gestures);
  - recognition of simple hand and head gestures (wiping, hand waving, head shaking and nodding, etc.);
  - face recognition (→ automatic user login and profile selection).

– Spatial audio and speech recognition

  The audio input component of GUIDE is a UI component that allows convenient control of applications by voice. It is connected to the GUIDE framework and delivers recognized voice commands by the AAL service user. The component basically consists of a recording module and a module for automatic speech recognition (ASR). It performs

microphone beamforming on a microphone array to avoid inconvenient "close-miking" (amplifying) at the AAL service user. By “steering” the array to individual AAL service users they can be recorded spatially separated, and further, it suppresses reverberation and environmental noise in a typical living room scenario.

– Tablet and multi-touch interfaces

  The tablet and multi-touch interface (TabIO) aims at making available the advantages of multi-touch technology that has been widely accepted by users of all ages. Within GUIDE, the tablet furthermore is able to act as a second audio-visual IO device, providing for instance a speech input channel for those users that own a tablet and a regular TV.

  In order to support multiple tablet architectures and take account of the web-centric approach to multimodal adaptation in GUIDE, the TabIO is developed based on a web-centric approach. To run the visual output, the embedded Web browser needs to be integrated with the framework. To have a “short connection” with the framework processing components (instead of for instance processing HTML code or abstract UI representations on the STB), a stripped down version of the GUIDE framework is run on the device itself. Furthermore, the TabIO contributes to the multimodal ensemble of UI components by providing its other sensor outputs, for example position, direction, acceleration, rotation and type of microphone as inputs to the GUIDE core.

  One of the output modalities of GUIDE is the virtual character. The Virtual Character is adaptable to the user profile, in order to optimize the communication between the system and the user.

– Assistive user interface technology

  Many physically challenged users cannot interact with a computer through a conventional keyboard and mouse. For example, spasticity, amyotrophic lateral sclerosis (ALS), and cerebral palsy can confine movement to a very small part of the body. Two possible solutions for these users will be eye gaze tracking based input system and scanning system. Eye gaze tracking based system alleviates the use of mouse and keyboard and enables the user to control the mouse pointer using only eye gaze. Scanning is the technique of successively highlighting items on a computer screen and pressing a switch when the desired item is highlighted.

  The users can switch to the scanning system by giving a key press anytime during eye tracking. When they look at the target, the button (or pointer) appears near or on the target. At this point, the user is supposed to press a key to switch back to the scanning system for homing and clicking on the target. The technique is less strenuous than the only eye gaze based interfaces because users can switch back and forth between eye gaze tracking and scanning which gives rest to the eye muscles.

12 Analysis of standards

12.1 Role of standards

Standardization can greatly influence system designs and can therefore contribute significantly to reducing existing usability and accessibility barriers and minimizing the introduction of new barriers (source ISO/IEC Guide 71).

It is important for standards' developers to recognize that no two users have exactly the same abilities. The differences in abilities among users can be influenced by both internal and external factors. The internal factors are specific to each user. The external factors are related to the particular characteristics of a specific activity and the environment in which the activity occurs. Standards developers need to understand that barriers in the environment can contribute to user's functional impairments.

System features that make products and services more usable for users with disabilities can also make them more convenient and easier to use for everyone else. Providing accessible features is particularly helpful when users have temporary difficulties or when environmental conditions are unfavourable, such as dim lighting, loud background noise, or busy activity among users nearby.

Addressing users' functional needs earlier rather than later in the design process enables manufacturers to design and produce products that more users can use more easily and fully.

In addition, it is important that mainstream systems are designed to be compatible with the various types of assistive technologies often used by older users and users with disabilities. Assistive technology, in the form of equipment, software and services, is available to meet a variety of needs of older users and users with disabilities.

Increasingly, products are based on a relatively small set of general-purpose packet data technologies (Internet Protocol). Equally, solutions are increasingly networked and designed to communicate with other solutions or with information systems. This creates an opportunity to improve the accessibility and usability of a wider range of solutions by harnessing such already present connectivity for the purpose of linking the solution with external assistive services or products.

However, this will require standardisation of connectivity protocols in such a way that allows assistive technology solutions to interoperate. This model also addresses the situation where it may not be practically and economically viable for manufacturers of mainstream products and services to integrate all possible aspects of accessibility directly into their solution, especially where very specialised user needs shall be accommodated. Furthermore, users may already have specialized, possibly bespoke, user interfaces that address their specific needs, but can only be implemented if there is a standardised means to connect these specialised solutions to the mainstream product or service.

There are a number of AAL roadmaps and inventories of standards available, but most of them are generic and out of the scope of this Technical Report. The German AAL roadmap was an important input[9] with respect to this Technical Report. It is expected that many more reports, e.g. modelling of AAL systems and assessment of current standardisation and identification of gaps will be the result of the German AAL activities (see reference link in Bibliography).

The AALIANCE project has extracted a repository of standards related to AAL (Annex E). The AALIANCE project is a coordination action funded in the European Union's 7th Framework Programme, focussing on Ambient Assisted Living (AAL) solutions based on advanced ICT technologies for ageing and wellbeing of elderly people in Europe. One of the project's main objectives is to build consensus upon upcoming research priorities, standardization and certification needs in the AAL sector, to be published in the AALIANCE AAL roadmap and strategic research agenda. As a first step AALIANCE2 collected relevant European and international standards and regulations in the field of AAL.

12.2 Standards gaps in the field of audio, video and multimedia equipment

There are several facets of AAL that are candidates for standardization. AAL is a very broad topic. Accessibility and supporting elderly people to stay independent longer has a clear overlap with AAL. Which aspect is more important to the elderly than accessibility issues. This could be declining health, age-related disabilities and mobility. The AAL term is not widely used worldwide, therefore there is no globally clear distinction between AAL and accessibility issues in many of the use cases submitted for International Standardization. This Technical Report identifies where requirements to support AAL allow to focus on accessibility barriers and the emerging AAL environments in the U.S., Asia and Europe.

This Technical Report is based on the use cases provided in response to the survey, and these were predominantly focused on connected TV. Some other use cases also describe AAL applications, e.g. independent living, daily life support, telemonitoring and health care. In this area more work is required to define AAL applications which are being explored and will

9 IEC SMB SG 5 profited to a great extent from the German AAL activities.

impact the IEC work, especially with respect to standardization requirements of interoperability and interconnectivity.

Standards are already available in support of many of the functions and requirements for AAL. While many of these standards were developed in support of accessibility technologies, such as those designed for web services and the internet, they also support the functions and requirements of AAL. Other standards are now being developed to specifically support AAL functions and requirements.

Much of the CTV related work is going on in different places, but accessibility and usability is often not in the primary scope. Functional specifications can help industry in understanding the user requirements as well as how to address them. An agreement on a set of key accessibility features to support consistent interfaces of CTV and IP based delivery of access services. Manufacturers should also add accessibility scope to companion device application designs, because many CTV solutions already work with secondary devices.

12.3 Conclusions and recommendations

In the area of AAL and accessibility the following conclusions can be drawn. Functional specifications which are generic guidelines will help industry in understanding the user needs as well as how to address them. Improved usability and accessibility are vital for older and disabled consumers, but they also bring benefits to any user. Manufacturers could also consider adding support for accessibility in the design of companion device applications.

The development of functional specifications which focus on accessibility and usability of TVs and connected TVs and control of access to, and consumption of, digital content through the TV in close partnership between industry and user groups may be considered. A comprehensive set of accessibility requirements can be developed which addresses the following issues and can follow IEC 62731:2013 (Text-to-speech for television) as a model, as it is a functional specification and not prescriptive.

Functional specifications or guidelines should be developed as stated below.

- To define the user needs, especially the needs of the elderly, visually and hearing impaired users and to provide guidance on how they can be addressed, e.g. by best practices.
- To simplify accessibility of electronic programme guides by users who are blind or visually impaired.
- To describe the essential characteristics of an audio-enabled EPG.
- For text-to-speech conversion of EPGs.
- For use of existing audio interfaces with assistive technology.
- To describe the essential characteristics of audio outputs for on screen displays used to control playback, recording, and associated functions for video programming.
- For accessing subtitles and audio descriptions by an easily identifiable button, key, or icon.
- For the discovery of the audio description audio stream by the receiver in a common format worldwide (e.g. in the U.S., ATSC standards for digital television transmission and CEA-CEB21, Recommended Practice for Selection and Presentation of DTV Audio).

Whilst TVs remain the most common device for watching TV and other video content in the home, particularly by elderly users, the increasing convergence of technology and spread of personal devices from smart phones and tablets to e-readers means that many of the issues identified above will also be relevant to the accessibility of these other devices. E-book readers offering an audio output to blind and visually impaired people shall be able to provide an accessible interface to such users for search and discovery, control, etc. As home networks connect more devices with more interface options users of all ages need simple set

up and control to allow them to make use of current technology in the way that suits them best.

Also the ITU Focus Group on Audio Visual Media Accessibility[10] has provided significant background to the needs and strategies for making AV more accessible and that current regulations are also requiring manufacturers and broadcasters to address this. There is not the same push for regulation in the other AAL areas, we have initiatives referring to long term health care, telemonitoring, supporting patients to stay independent at home etc., but we do not have regulations like the FCC video requirements.

In future standardisation work, the potential role of connected TVs not just as an entertainment device but also as the "intelligent hub/home gateway" needs to be considered. The use cases identified other requirements which are relevant for the ambient assisted living functionality, e.g. daily life support, telecare, telemonitoring, well-being and independent living of elderly people.

Further work in the AAL area in conjunction with the recently standardised universAAL framework and requirements being identified in the IEC System Evaluation Group AAL[11] is planned to be done.

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10 See http://www.itu.int/en/ITU-T/focusgroups/ava/Pages/default.aspx and http://www.itu.int/en/irg/ava/Pages/default.aspx

11 Now IEC System Committee AAL.

Annex A
(informative)

Draft definitions of AAL and accessibility (source: JEITA)

A.1 Overview

It was observed that defining the terms accessibility and AAL, the classification of people and users under certain headings or identifying where the boundaries and overlaps between any of these lie, is fraught with questions and that there is no agreement between stakeholders on the detail of all of this. This annex illustrates some of the thinking on this topic by providing the discussion documents of the Japanese National Committee.

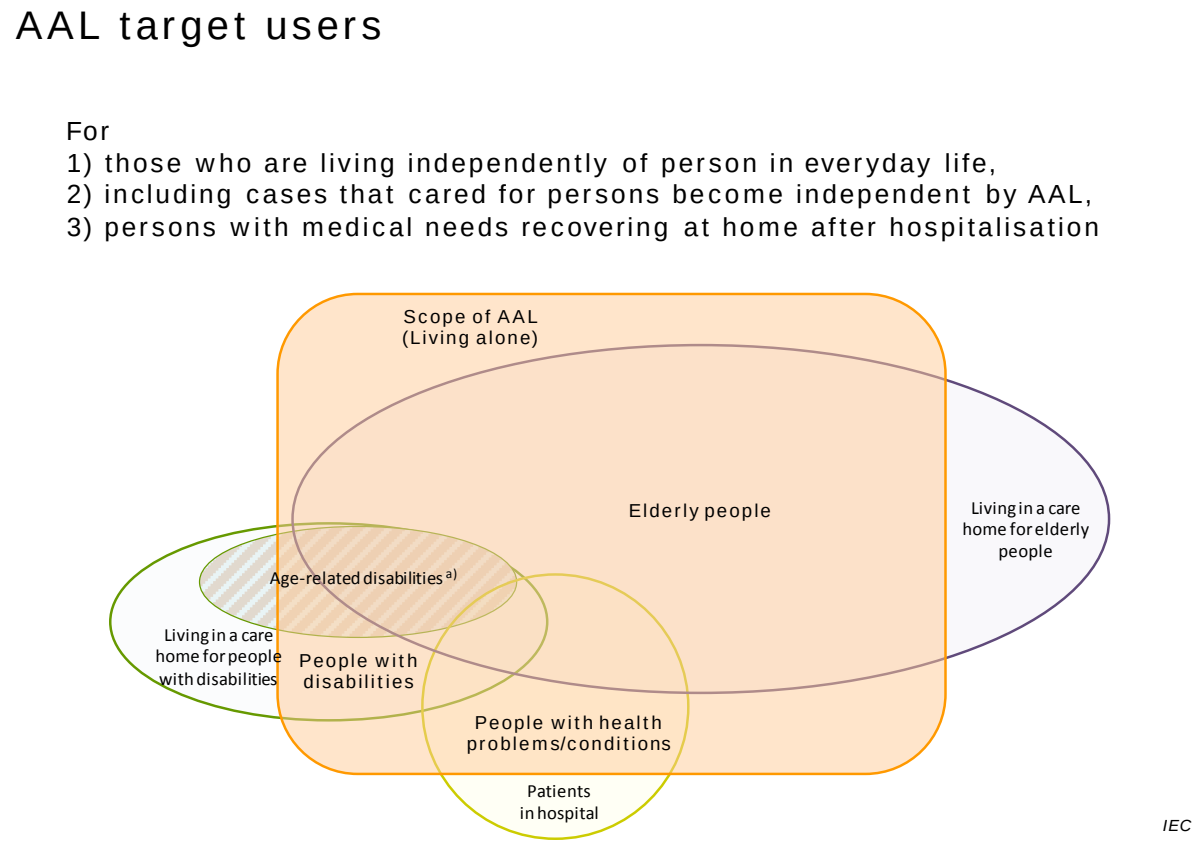
a) Age-related hearing loss is the most common case.

Figure A.1 shows a diagram of AAL target users. They include those who are:

a) independent in everyday life;

b) persons in need of care, but who become independent by AAL;

c) persons with medical needs recovering at home after hospitalization.



a) Age-related hearing loss is the most common case.

Figure A.1 – Scope of AAL

Figure A.2 gives a classification of the life situation.

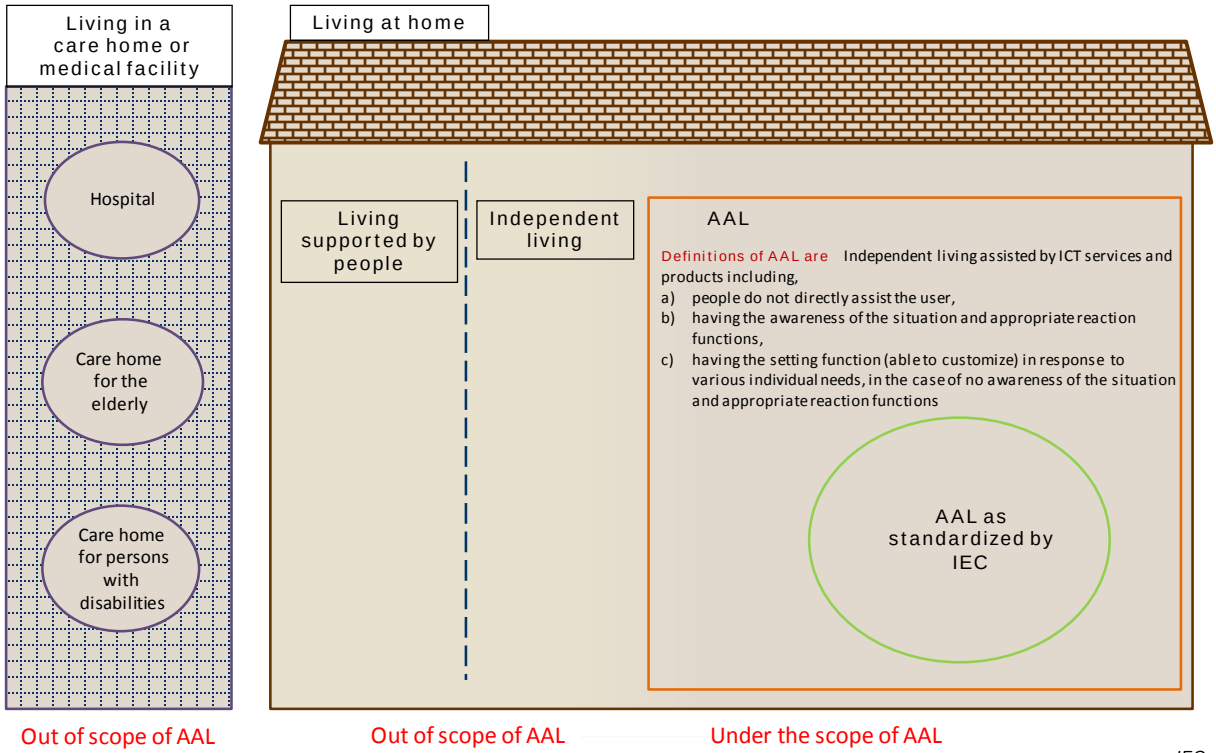


Figure A.2 – Classification by life situation

Figure A.3 shows a USE CASE mapping for AAL.

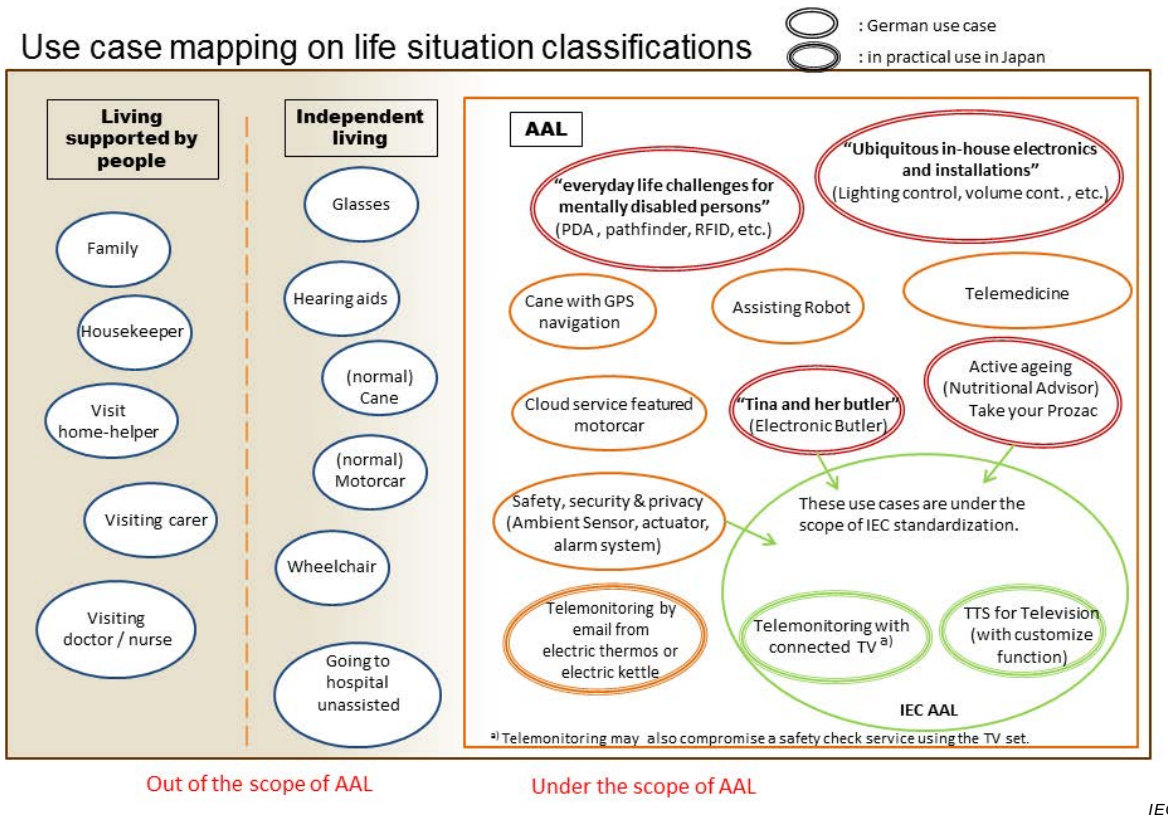


Figure A.3 – Use case mapping under AAL

Figure A.4 shows functional consiterations for AAL.

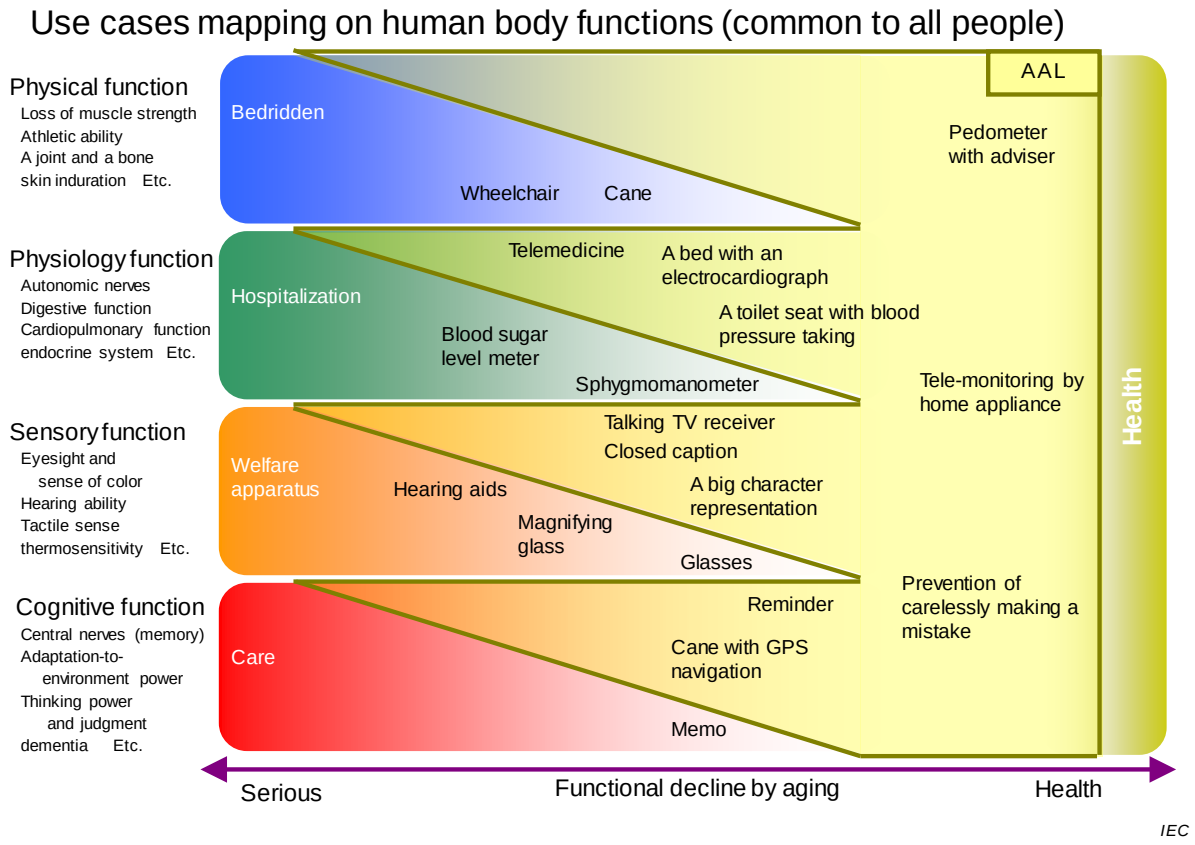


Figure A.4 – Functional considerations under AAL

Figure A.5 shows products and services for AAL.

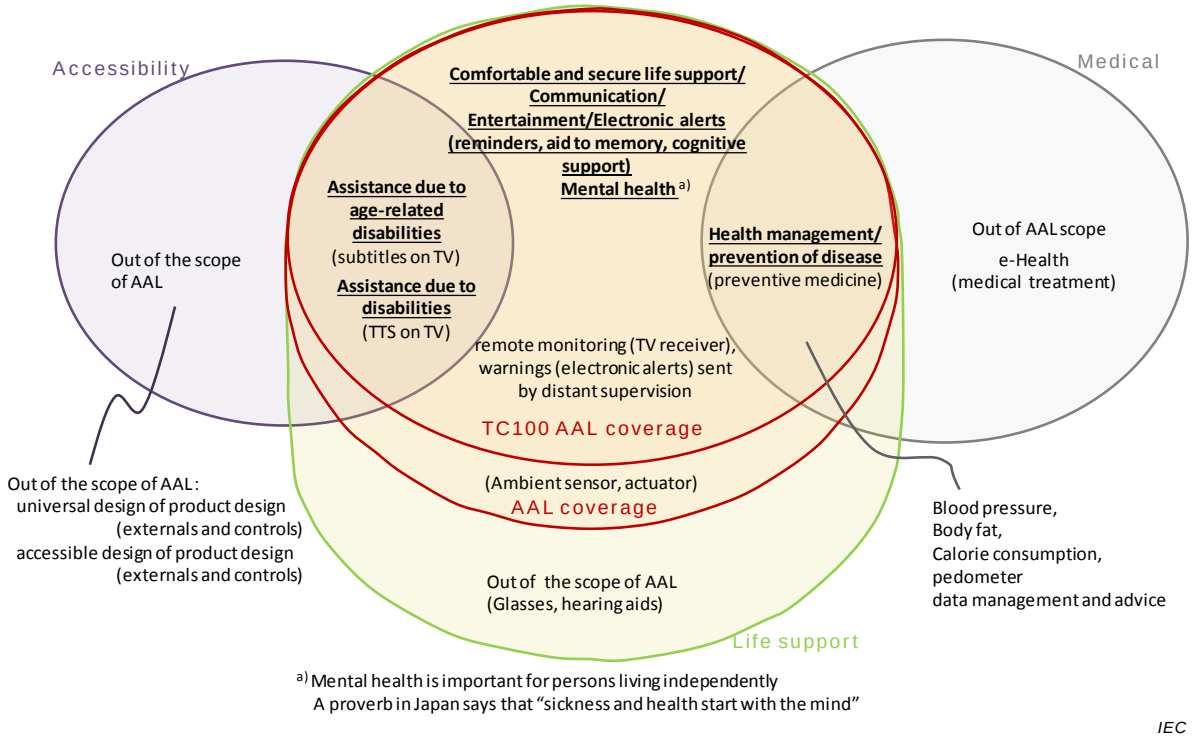


Figure A.5 – Products and services under AAL

A.2 Summary of AAL

A.2.1 User in AAL scope

The users are defined in a) Age-related hearing loss is the most common case.

Figure A.1 and include

- independently living persons in everyday life,
  - including cases that cared for persons become independent by AAL,
- persons with medical needs recovering at home after hospitalization.

A.2.2 Definition of AAL

Persons living independently as shown in Figure A.2 and Figure A.3. They are assisted by ICT services and products including,

a) people do not directly assist the user,

b) having the situation awareness and appropriate reaction functions,

c) having the setting function (able to customize) in response to various individual needs, in the case of no awareness of the situation and appropriate reaction functions.

Excluding

– universal design of product design (externals and controls),

– accessible design of product design (externals and controls).

- Example (1) Health care provider can ask the user by sending the message "*are you fine?*" through a connected TV.
- Example (2) The connected TV can tell whether or not the user is alive by switching the TV set ON/OFF.

- Example (3) TTS (Text-to-speech) can customize the read-out function ON/OFF and speech-rate.

A.2.3 AAL as considered in this Technical Report[12] and entire AAL

The following aspects are included in AAL.

- AAL is a life support for ageing people and people with health problems aided by ICT.
- AAL has an overlap area concerning accessibility and medical care.
- However, the purposes and goals of AAL, accessibility and medical care are not the same.
- AAL (as covered by IEC[12]) is part of the entire AAL, and it is specified by using the AV multimedia devices.

Two considerations have to be taken care of

a) that there are similar use cases some of which belong to the scope of TC 100 some don't. They are classified in accordance with the type of products.
   - Example TeleMonitoring using a connected TV versus using electric thermos or an electric kettle.

b) on the other hand, even if use cases, as shown in Figure A.4 are out of the scope of IEC standardization[12], International Standards for I/O devices/systems may be developped in the future.

[12] AAL as standardised by TC 100.

Annex B
(informative)

Use case template (source: IEC SG 5 AAL)

B.1 Name of use case

ID	Domain role See Annex A	Function see Annex B	Name of use case

B.2 Version management

Changes / Version	Date	Name Author(s) or committee		Approval Status draft, for comments, for voting, final

B.3 Basic information to use case

Source(s) / Literature	Link	Conditions (limitations) of use

Maturity of use case – in business operation, realized in demonstration project, realised in R&D, in preparation, visionary
Generic, regional or national relation
View – Technical / Business/…
Further keywords for classification

B.4 Scope and objectives of the use case

Scope and objectives of the use case and "AAL-theme" (see also Annex C)

B.5 Narrative of use case

Narrative of use case
Short description – max. 3 sentences
Complete description

B.6 Actors: People, systems, applications, databases, the power system, and other stakeholders

Actor name	Actor type	Actor description	Used technology

B.7 Issues: Legal contracts, legal regulations, constraints and others

Issue – here specific ones	Impact of issue on use case	Reference – law, standard, others

B.8 Referenced standards and / or standardization committees (if available)

Relevant standardization committees	Standards have to be considered in the use case	Standard status

B.9 Relation with other known use cases

Known use case	Source	UC Status
	…	

B.10 General remarks

General remarks

Annex C
(informative)

Telemonitoring USE CASE provided by Japan

Figure C.1, Figure C.2, Figure C.3 show various conditions of USE CASE telemonitoring of vital signs with connected TV, as already in practical use in Japan.

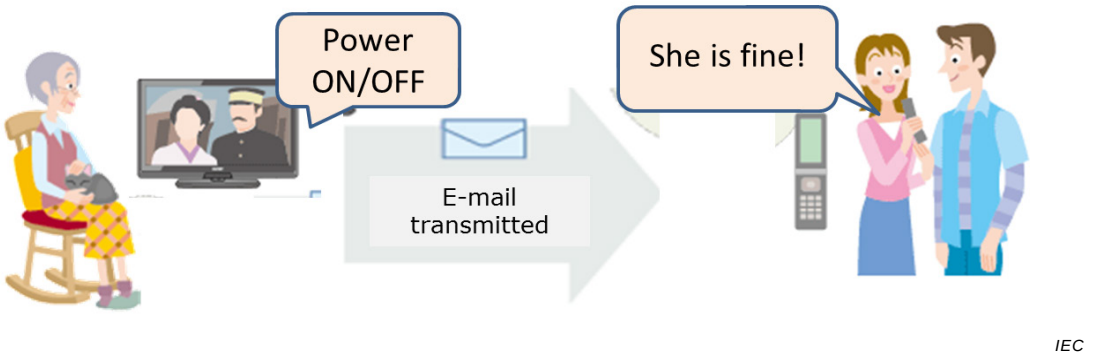


Figure C.1 – Telemontoring of vital signs with connected TV – Power ON/OFF

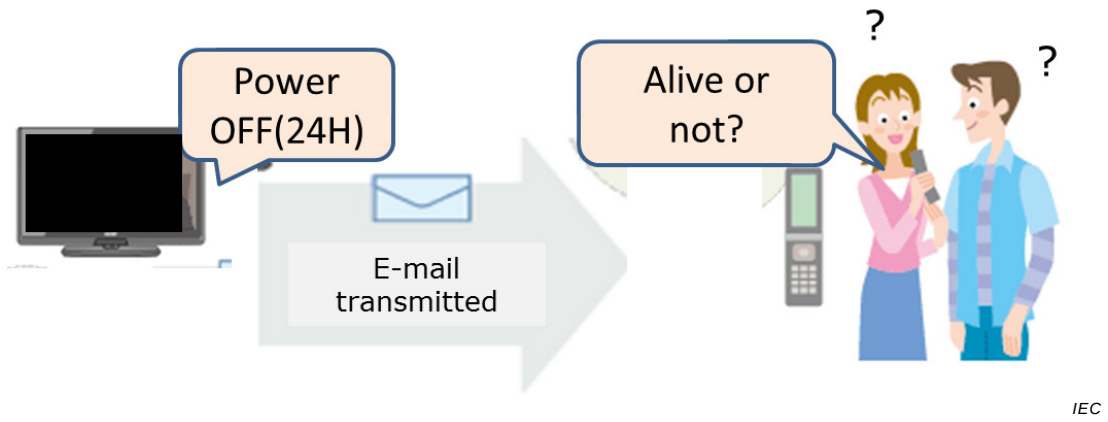


Figure C.2 – Telemonitoring of vital signs with connected TV – Power OFF

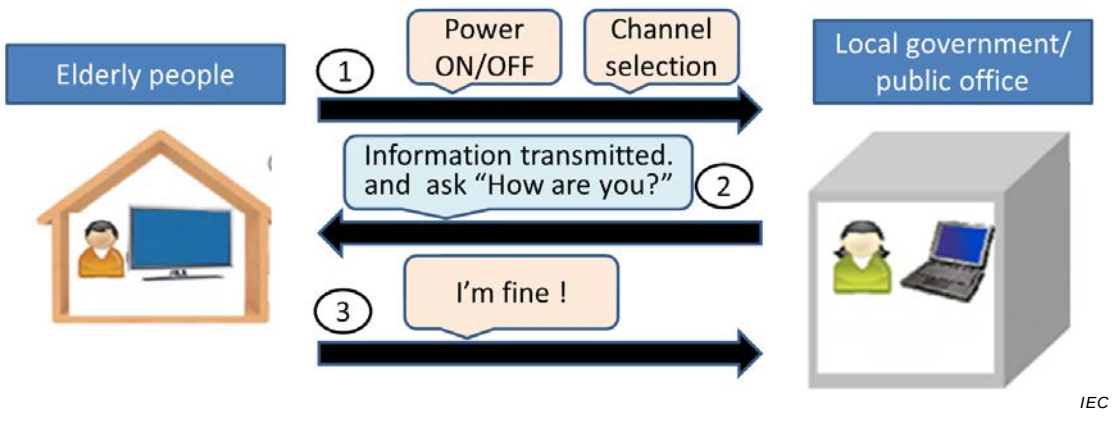


Figure C.3 – Telemonitoring of vital signs with connected TV – Answers to questions

Annex D
(informative)

Health use case provided by Japan

Figure D.1 shows an example of a Japanese USE CASE using smart devices to promote health.

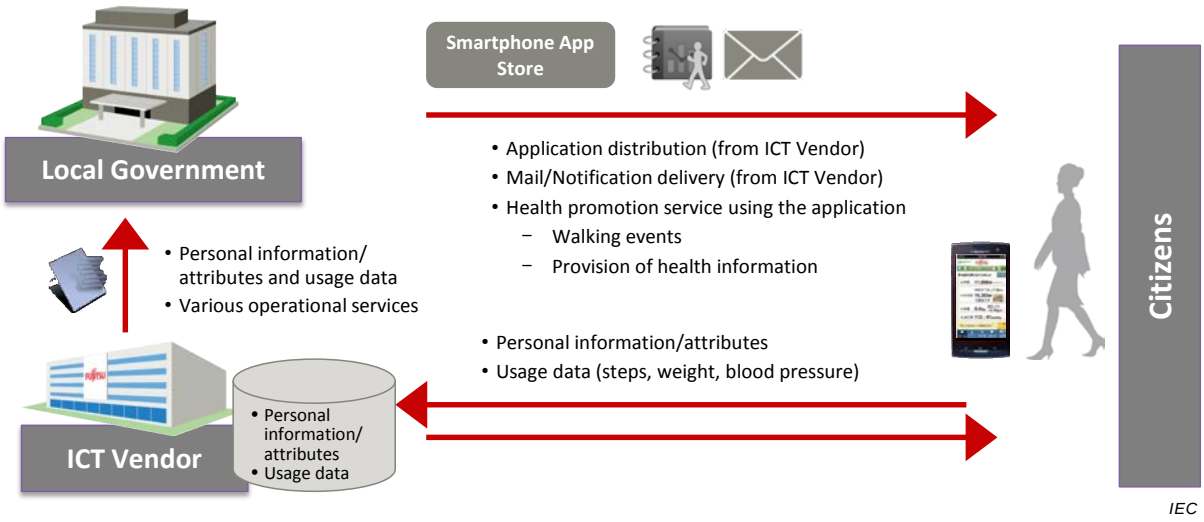


Figure D.1 – Pedometer application for smartphone

Annex E
(informative)

Standards Repository
List of standards with relevance for AAL standardization

E.1 General

The following information has been extracted from the AALIANCE Project.

E.2 Software Infrastructure for AAL/Middleware

- universAAL
- OpenRemote
- openHAB
- URC: Universal Remote Console

E.3 Networks and buses

E.3.1 Human body communication

- IEC 62779 (all parts), *Semiconductor devices – Semiconductor interface for human body communication*[13]

E.3.2 Wireless protocols for mobile applications

- CoAP: Constrained Application Protocol
- DECT: Digital Enhanced Cordless Telecommunications
- IPv6: Internet Protocol Version 6
- ISO/IEC 14443 (all parts), *Identification cards – Contactless integrated circuit cards – Proximity cards*
- NFC: Near Field Communication
- RFID (ISO/IEC 18000 (all parts), *Information technology – Radio frequency identification for item management*)
- WLAN (IEEE 802.11x (WLAN): *IEEE Standard for Information technology – Telecommunications and information exchange between systems Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications)*

E.3.3 (Wireless) Personal area networks

- IEEE 802.15.4: *IEEE Standard for Local and metropolitan area networks – Part 15.4: Low-Rate Wireless Personal Area Networks* (Basis for ZigBee,ISA100.11a, WirelessHART, MiWi)
- 6LoWPAN: IPv6 for Wireless Personal Area Networks
- Bluetooth
- IEEE 802.15.1 (Bluetooth)
- BT-LE: Bluetooth Low Energy
- MiWi

13 To be published.

- ZigBee

E.3.4 Communication protocols

- TCP/IP: Transmission Control Protocol/Internet Protocol
- UDP: User Data Protocol
- General Purpose Protocols
- Control
  - DPWS: Devices Profile for Web Services
  - SIP: Session Initiation Protocol
  - UPnP: Universal Plug and Play
- Addressing
  - SSDP: Simple Service Discovery Protocol
  - Zeroconf: Zero Configuration Networking
- Management
  - CWMP: Customer Premises Equipment Wan Management Protocol
  - DHCP: Dynamic Host Configuration Protocol
  - DNS: Domain Name System
  - DDNS: Dynamic Domain Name System
  - LDAP: Lightweight Access Protocol
  - NAT-PMP: NAT Port Mapping Protocol
  - UPnP: Universal Plug and Play
  - OMA DM: OMA – Device Management
  - SNMP: Simple Network Management Protocol
  - SysLog: System Log
- File System
  - AFP: Apple Filing Protocol
  - NFS: Network File System
  - SMB: Server Message Block
  - WebDAV: Web-based Distributed Authoring and Versioning
  - DCE/DFS: DCE/RPC – Distributed Computing Environment / Distribuited File System
- Streaming
  - AirPlay
  - RTP: Real-Time Transport Protocol
  - RTSP: RealTime Streaming Protocol
  - RTMP: RealTime Messaging Protocol
- Ad-hoc Networks
  - DPWS: Devices Profile for Web Services
  - UPnP: Universal Plug and Play
- Home Appliances
  - DLNA: Digital Living Network Alliance
  - HomePNA: HomePNA Alliance
  - Home Plug
  - ISO/IEC 18012 (all parts), *Information technology – Home electronic system – Guidelines for product interoperability*

– UPnP: Universal Plug and Play

E.4 File formats and persistent data structures

NOTE many file formats and audio/video encodings not covered here are described in the Wikipedia lists of file formats and codecs.

E.4.1 General purpose

– Codecs
– List of file name extensions
– Image formats
  - BMP: Windows Bitmap
  - GIF: Graphics Interchange Format
  - JPEG
  - PNG: Portable Network Graphics
  - RAW
  - TIFF: Tagged Image File Format
– Video formats
  - AVI: Audio Video Interleave
  - FLV: Flash Video
  - H.264/MPEG-4 AVC/ ISO/IEC 14496-10, *Information technology – Coding of audio-visual objects -- Part 10: Advanced Video Coding*
  - MPEG-1/ ISO/IEC 11172 (all parts), *Information technology – Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s*
  - MPEG-2
  - MPEG-4/ ISO/IEC 14496 (all parts), *Information technology – Coding of audio-visual objects*
  - MPEG-7
  - MPEG-21/ ISO/IEC 21000 (all parts), *Information technology – Multimedia framework (MPEG-21)*
  - MPEG-H/ HEVC/ H.265
  - Quicktime
  - RealVideo
  - WMV: Windows Media Video
– Audio formats
  - AAC: Advanced Audio Coding
  - GSM: Global System for Mobile Communications
  - ISDN: Integrated Services Digital Network
  - MIDI: Musical Instrument Digital Interface
  - MP3: MPEG-1 Audio Layer 3
  - RealAudio
  - RIFF WAVE: Resource Interchange File Format WAVE
  - Vorbis (Ogg Vorbis)
  - WMA: Windows Media Audio
– eBook formats

- ePUB
- iba
- ibooks

– Other structured formats
  - SMIL: Synchronized Multimedia Integration Language

– Character Sets
  - ASCII: American Standard Code for Information Interchange; ISO 646, *Information Processing – ISO 7-bit coded character set for information interchange*
  - Codepage Windows-1252
  - Codepage 437
  - Codepage 850
  - ISO 2022, *Information technology – Character code structure and extension techniques*
  - ISO 8859 (all parts), *Information technology – 8-bit single-byte coded graphic character sets*
  - Teletext; ETS 300 706 – Enhanced Teletext specification
  - Unicode; ISO 10646, *Information technology – Universal Coded Character Set (UCS)*

E.4.2 Terminologies and Semantics

– Languages for Knowledge Representation
  - OWL: Web Ontology Language
  - RDF: Resource Description Framework
  - RDFS: RDF Schema

E.4.3 Integration Profiles

– DLNA: Digital Living Network Alliance

E.4.4 User Interfaces: Usability, Ergonomics, Design for All

– IEC 62366, Medical devices – Application of usability engineering to medical devices
– ISO 11064 (all parts), Ergonomic design of control centres
– ISO 14915 (all parts), Software ergonomics for multimedia user interfaces
– ISO 9241 (all parts), Ergonomics of Human-system interaction
– ETSI EG 202 116, Human Factors – Guidelines for ICT products and services "Design for all"
– ETSI EG 202 416, Human Factors (HF) – User Interfaces – Setup procedure design guidelines for mobile terminals and services
– ETSI EN 300 175-1, Digital Enhanced Cordless Telecommunications (DECT) – Common Interface (CI) – Part 1: Overview
– ETSI TS 102 511, Human Factors (HF) – AT Commands for Assistive Mobile Device Interfaces
– HSS: U.S. Department of Health and Human Services: Research – based Web Design & Usability Guidelines
– IEC TR 62678, Audio, video and multimedia systems and equipment activities and considerations related to accessibility and usability
– ISO 20282 (all parts), Ease of operation of everyday products
– ISO/IEC 25051, Software engineering – Systems and software Quality Requirements and Evaluation (SQuaRE) – Requirements for quality of Ready to Use Software Product (RUSP) and instructions for testing (former ISO 12119)

- ISO/IEC 24786, Information technology – User interfaces – Accessible user interface for accessibility settings
- ISO/IEC 25010, Systems and software engineering – Systems and software Quality Requirements and Evaluation (SQuaRE) – System and software quality models (former ISO 9126)
- ISO/IEC Guide 71, Guidelines for standards developers to address the needs of older persons and persons with disabilities
- ISO/IEC 13818 (all parts), Information technology – Generic coding of moving pictures and associated audio information
- ISO/IEC TR 19765, Information technology – Survey of icons and symbols that provide access to functions and facilities to improve the use of information technology products by the elderly and persons with disabilities
- ISO/IEC TR 19766, Information technology – Guidelines for the design of icons and symbols accessible to all users, including the elderly and persons with disabilities
- ISO TR 22411, Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities
- W3C Recommendation 17 December 2002: User Agent Accessibility Guidelines 1.0

E.4.5 Specifications and standards for operator models

E.4.5.1 Quality management systems for AAL

- DIN SPEC 77002, Ambient Assisted Living (AAL) – Requirements for AAL services
- DIN SPEC 91280, Ambient Assisted Living (AAL) – Classification of Ambient Assistant Living services in the home environment and immediate vicinity of the home
- DIN SPEC 91300, Guide for the development of a business model for home related services

E.4.5.2 Other relevant standards and certifications

- ISO 9999, Assistive products for persons with disability – Classification and terminology

E.4.6 Localization

E.4.6.1 Indoor Localization

- IEEE 802.15.1 (Bluetooth)
- BT-LE: Bluetooth Low Energy
- IFC: Industry Foundation Classes
- UWB: Ultra-wideband technology

E.4.6.2 Smart Home

- CWA 50487:2005, SmartHouse Code of Practice
- ISO 16201:2006, Technical aids for persons with disability – Environmental control systems for daily living

E.4.7 Accessibility

- IEC TR 62678, Audio, video and multimedia systems and equipment activities and considerations related to accessibility and usability
- ISO/IEC TR 29138 (all parts), Information technology -- Accessibility considerations for people with disabilities
- M 376, European Commission Standardization Mandate M 376, Phase 2: European Accessibility Requirements for Public Procurement of Products and Services in the ICT Domain

- M/420, Standardisation mandate to CEN, CENELEC and ETSI in support of European accessibility requirements for public procurement in the built environment
- United Nations Convention on the Rights of Persons with Disabilities
- WHO Age-friendly Environments Programme

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IEC 62731, *Text-to-speech for television – General requirements*

ISO/IEC 19762-1:2008, *Information technology – Automatic identification and data capture (AIDC) techniques – Harmonized vocabulary – Part 1: General terms relating to AIDC*

ISO/IEC 19796-1:2005, *Information technology – Learning, education and training – Quality management, assurance and metrics – Part 1: General approach*

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*

ISO TS 16071:2003, *Ergonomics of human-system interaction – Guidance on accessibility for human-computer interfaces* (withdrawn)

ISO 25064:2013, *Systems and software engineering – Software product Quality Requirements and Evaluation (SQuaRE) – Common Industry Format (CIF) for usability: User needs report*

ISO 26800:2011, *Ergonomics – General approach, principles and concepts*

ISO/IEEE 11073-10201:2011, *Health informatics – Point-of-care medical device communication – Part 10201: Domain information model*

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Freyer, Louise: *Audio Description and Audio Subtitling, Who needs it*, Goldsmiths, University of London, December 2011

In the United States implementation of accessible User Interfaces will be guided by the *Twenty-First Century Communications and Video Accessibility Act of 2010*, signed October 8, 2010 and implementing rules to be established by the Federal Communications Commission

AALIANCE2 Project Next Generation European Ambient Assisted Living Innovation Alliance: Online Repository of existing standards and certifications in AAL and related areas for the R&D community – Snapshot

The German AAL Standardisation Roadmap published by VDE and DKE in January 2012 http://www.dke.de/de/std/AAL/Documents/German%20AAL%20Standardization%20Roadmap.pdf

The following application guides are feeding into the 2nd German roadmap. In particular application guides (2, 3 and 4 are in English):

- VDE-AR-E 2757-1:2013-01 Terms and definitions
- VDE-AR-E 2757-2:2011-08 Service Staying at Home – Requirements for suppliers of combined services

- VDE-AR-E 2757-3:2012-01 Staying at home service – Criteria for the selection and installation of AAL components
- VDE-AR-E 2757-4:2012-01 Staying at home service – Quality criteria for providers, services and products of Ambient Assisted Living (AAL)
- VDE-AR-M 3756-1:2009-10 Quality management for Telemonitoring in medical applications
- VDE-AR 2750-**200** Approach to the classification of medical devices and the selection of conformity assessment procedure

ISO/IEC JTC1 Special Working Group Accessibility N 485 Accessibility related standards and specifications

NIST CCSRWG 2012/010 NIST Cloud Computing Standards Roadmap Working Group Accessibility, terms, references and definitions

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UK Digital TV Usability and Accessibility Guidelines ("U-Book")

DTGS2012: Daniel Danker (BBC) at DTG Summit 2012: "Me and My TV – How Can we Connect?" on the complexity of Smart TVs and related aspects. Includes evidence of current problems,
http://www.bbc.co.uk/blogs/bbcinternet/2012/03/red_button_connect_tv_simple.html

PLEE2012: Paul Lee, Director, Deloitte Research, Global Technology, Media and Telecommunications, at DTG Summit 2012: *"Social, search and the schedule: how will technology disrupt TV?"*: in the UK 90.8% of TV viewing was live TV in 2011

The EU-FP6 integrated project PERSONA with Grant Agreement no. 045459 ran from 1-Jan-2007 to 31-Oct-2010

The EU-FP7 integrated project universAAL <www.universaal.org> with Grant Agreement no. 247950 that started on 1-Feb-2010 and is planned to finish by 31-Jan-2014

The GUIDE Project has received funding from the European Commission's Seventh Framework Programme (FP7/2007-2013) under the Grant agreement no.248893, <http://www.guide-project.eu/index.php?mainItem=Project&subItem=Home>. The detailed description of multimodal interaction can be found at
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