

AALIANCE

Ambient Assisted Living Roadmap



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AALIANCE AMBIENT ASSISTED LIVING ROADMAP

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AALIANCE Ambient Assisted Living Roadmap

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AALIANCE – The European Ambient Assisted Living Innovation Platform

The Coordination Action AALIANCE – funded by the European Commission, DG Information Society and Media, within the 7th Framework Programme – focuses on Ambient Assisted Living (AAL) solutions based on advanced ICT technologies for the areas of ageing at work, ageing at home and ageing in the society.

AALIANCE will:

- provide a framework for stakeholders, led by the industry, for the definition of research and development priorities, timeframes and action plans on strategically important issues in the field of Ambient Assisted Living;
- play a key role in ensuring an adequate focus of research funding for AAL, in fostering effective public-private partnerships and in developing a European research policy, in particular in focusing on FP7 and on current activities launched by EU member states (AAL Joint Programme).

Therefore the immediate objectives of AALIANCE consist of:

- setting-up a sustainable network – starting with 14 partners to be extended to approx. 35 – involving companies as technology providers and systems integrators, service providers, research organisations and user associations;
- coordinating the various activities of the European industry and research institutions in the field of Ambient Assisted Living;
- preparing and maintaining a R&D roadmap and strategic research agenda (SRA) for AAL with a mid to long perspective;
- defining standardisation requirements;
- providing recommendations for a European RTD policy on Ambient Assisted Living;
- supporting European and national entities in increasing the political awareness and in intensifying activities for the enhancement of new AAL technologies.

These activities are expected to strengthen the Ambient Assisted Living value chain in Europe, to reinforce the position of providers of Ambient Assisted Living solutions in Europe and to address one of the most promising markets of the industrialised countries.

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Foreword

The emerging demographic change towards an ageing population is introducing drastic changes into our society.

We therefore need to find ways to motivate and assist older people to stay active for longer in the labour market, to prevent social isolation and promote societal inclusion and finally to help people stay independent for as long as possible.

Information and Communication Technologies (ICT) can play a major role in order to help achieve the above goals. ICT can help elderly individuals to improve their quality of life, stay healthier, live independently for longer, and counteract reduced capabilities which are more prevalent with age. ICT can enable them to remain active at work or in their community. To achieve these goals, we need appropriate policies that will help promote introduction of such solutions for improved quality of life for elderly people and their carers, strongly increased efficiency of our care systems while creating fantastic new global market opportunities for European industry.

In response to these challenges and opportunities, the European Commission has launched an Action Plan for Ageing Well in the Information Society which includes measures to: Raise awareness and share good practice; Build consensus via stakeholder cooperation; Promote policies to stimulate innovation in the public sector and to overcome technical and regulatory barriers to market development; Accelerate take-up and innovation; Boost research and innovation.

As a result, between now and 2013, the EU and Member States, and the private sector will invest more than € 1 billion in research and innovation for ageing well: some € 600m in the Ambient Assisted Living Joint Programme, an expected € 400m in the EU's 7th framework programme and so far more than € 60m on large scale pilot projects in the EU's ICT Policy Support Programme.

I therefore welcome very much this initiative of the AALIANCE innovation platform on ICT for Ageing Well. A strong common vision, a corresponding roadmap, strategic research and innovation agenda across all relevant stakeholders is essential to ensure that the investments will bring forward relevant ICT solutions for Ageing Well.

The European Commission will use this document and further AALIANCE developments as a key input to help define future strategies and the direction of EU funding schemes that can provide support to the stakeholders in this domain.

I strongly encourage the whole community to contribute to make this vision come through for the benefit of Europe.

Florin Lupescu
Director,
ICT addressing Societal Challenges,
DG Information Society and Media,
European Commission

Executive Summary

New European population projections for 2008–2060, published by the European Office for Statistics, have recently underlined that the number of elderly persons will quickly increase. From 2015 on, deaths are projected to outnumber births in the EU27 and almost three times as many people will be 80 or more in 2060¹. This demographic development and the ageing of the European population will lead to a growing number of older people living alone and in need of (intensive) care, to an ageing workforce in general and to more financially well-appointed and wealthy senior citizens ready to enjoy their third age. These will spend money on products securing and enhancing their wealth, safety and security and will have significant entertainment and communications needs. Considering that this trend will also be accompanied by a rapid growth in the number of persons with physical disabilities, it is clear that the problem of care and assistance to these persons will become more and more important both from a social and an economic point of view. These societal trends will lead to dramatic challenges for the healthcare and care systems, state pensions schemes and employers alike, but at the same time they will offer innovation and business opportunities for technology providers in the field of innovative ICT-enabled assisted living or “ambient assisted living” (AAL). AAL refers to intelligent systems of assistance for a better, healthier and safer life in the preferred living environment and covers concepts, products and services that interlink and improve new technologies and the social environment.

It aims at enhancing the quality of life (the physical, mental and social well-being) for everyone (with a focus on elder persons) in all stages of their life. AAL can help elder individuals to improve their quality of life, to stay healthier and to live longer, thus extending one’s active and creative participation in the community.

Currently there is a vast number of (more or less linked) European and national research activities in the field of AAL involving various technology areas and innovative technology approaches. There is missing however a common vision of AAL that provides and defines the necessary future R&D steps and projects on the way to Ambient Assisted Living. In order to close this gap the AALIANCE project – “The European Ambient Assisted Living Innovation Alliance” – was funded within the specific programme “Cooperation” and the research theme “ICT” of the 7th European Framework Programme. It aims at developing such a roadmap and strategic guidance for short-, mid- and long-term R&D approaches in the context of AAL related. The roadmap for AAL and its main concepts will be presented in this document. The first part of this document firstly describes the main trends towards AAL, analysed from a demographic, economic and technological point of view, and the barriers for their deployment, identified for each stakeholder of AAL, i.e. users and caregivers (primary stakeholders), organisations offering services (secondary stakeholders), organisations supplying goods and services (tertiary stakeholders) and organisations analysing the economical and legal context of AAL (quaternary stakeholders). Starting with the identification of the needs of elderly people to live independently in different contexts and of the necessary technological support, the field of AAL is grouped in three principal application domains.

¹<http://europa.eu/rapid/pressReleasesAction.do?reference=STAT/08/119&format=HTML&aged=0&language=EN&guiLanguage=en>

These argumentations will be described in detail in the second part of the roadmap. More precisely, AAL has firstly to be distinguished from more traditional forms of (ICT enabled) assistive technologies by emphasizing the important role of ambient intelligence in AAL technologies. These technologies have to be embedded (non invasive or invisible devices, distributed throughout the environment or directly integrated into appliances or furniture), personalized (tailored to the users' needs), adaptive (responsive to the user and the user's environment) and anticipatory (anticipating users' desires as far as possible without conscious mediation). Ambient intelligence therefore refers to electronic environments that are sensitive and responsive to the presence of people. Ambient intelligence covers both the concept of ubiquitous computing and intelligent social user interface. It accommodates the following needs: to offer a secure environment and peace of mind, to select food and drink I like within the constraints of my diet, to stay in touch with friends and family who also give me reassurance and to organize and receive healthcare in my home. In conclusion, Ambient Assisted Living is the utilization of ambient intelligence in the respective social domains of ageing at home and abroad, ageing in society, ageing at work². However, taking the aspect of ambient intelligence in AAL seriously, one has to be aware that – in reality – a person using AAL traverses multiple physical spaces (room, home, car, workplace, shops, out-doors) and virtual spaces (e-shopping, gaming, chatting, searching for or planning activities) throughout the day, depending on current activity or focus. Therefore, the distinction between different domains can only be a logical, not a practical one.

The third part of the document will also provide a broad and detailed description of the technologies, on which the applications and functionalities of the previous domains are based. They are grouped in:

- Sensing: anything and anywhere: in-body or on-body, in-appliance or on-appliance or in the environment (home, outdoor, vehicles, public spaces, etc.).
- Reasoning: aggregating, processing and analysing data, transforming it into knowledge within different and often cross-connected spaces (body, home, vehicle, public spaces).
- Acting: automatic control through actuators, feedback (e. g. information, suggestions, guidance) – local or remote (e. g. call centre), instantaneous (e. g. in the case of alarms) or delayed (e. g. in the case of trend information and lifestyle recommendations), to relevant participants using personalised multi-modal interfaces, possibly across multiple spaces.
- Interaction: intelligent interaction with systems and services is a very important aspect for applications and will have specific requirements in order to cope with the abilities of users.
- Communication: sensors and actuators are connected to one or more reasoning systems that in turn might be connected (even dynamically, e. g. a person moving from home to a vehicle and then to some public space) to other reasoning systems, possibly with their own sensors and actuators.

Finally this document will revolve around the system integration and interoperability, i.e. how to compose an AAL system. In AAL these different functions, provided by a

² Following the terminology used in the European action plan for “Aging well in the Information Society”.

heterogeneous set of disciplines (e.g. advanced human/machine interfaces, sensors, microelectronics, software, web & network technologies, energy generation or harvesting, control technologies, new materials and robotics), have to be integrated in a system that offers applications and services in a user-centred way. While ICT-enabled products in the field of walking aids or telemonitoring could be developed along already existing technological paths in the field of gerontechnology, more ambitious AAL solutions raise specific challenges regarding system integration and the design hierarchy. In AAL system integration is dependent not only on technical and functional integration factors, but has to take into account user needs and user knowledge. This could lead to a situation where the systems design can not be fully defined as long as the applications have not been defined on a basic level by the users themselves. This emphasises the importance of user involvement and user perspective in AAL-related research and innovation activities which have already been tackled by a number of R&D projects. On the other hand, a common AAL platform based on selected standards which allow the interoperability of applications and services could be the basis for 3rd party service development and provision, and could stimulate the development of products at an early stage and the establishment of value chains that put into effect the business opportunities within AAL. The contradiction between a user-centred system design and the need for a common application platform approach might turn out to be the central contradiction and challenge for AAL in the years ahead.

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1. Introduction

In this document a roadmap on AAL, produced by the AALIANCE project, is presented. The document is the result of a collaboration of experts in different domains. During the process we started with an inventory of ideas and developed a number of scenarios around application domains. Enabling technologies have been identified and structured in technology categories. This resulted in a document that should be considered as a technology roadmap.

Other roadmap activities in this area exist:

- CAPSIL is developing a roadmap and Wiki for EU research to achieve effective and sustainable solutions to independent living based on an in-depth analysis of clinical requirements and the ICT scenarios developed or under development in the EU, as well as the US and Japan.
- SENIOR is providing a systematic assessment of the social, ethical and privacy issues involved in ICT and Ageing, in order to plan strategies for governing technology trends according to EU legal and ethical standards.
- ePAL is developing a strategic research roadmap focused on inducing new ways towards a balanced active life for retiring and retired professionals while promoting a new notion of the silver economy with a wide societal impact.

In addition some other relevant roadmaps exist:

- ITEA Roadmap for Software-Intensive Systems and Services, Edition 3 Released in February 2009. The ITEA Roadmap 3 is an open and structured vision of future uses of ICT and of ICT-based services, and thus a tool for anticipating technology changes in software-related businesses. It demonstrates the potential of ITEA 2 to contribute significantly to European industrial competitiveness and societal well-being over the coming years. The document explains the general evolutions in Software-intensive Systems and Services, and identifies major roadblocks. As such, it serves as a tool to position R&D and innovation projects, and to create innovation partnerships. For generic topics related to “Services, system and software construction” and “Intermediation and basic services” domains as well as “Engineering technologies” we refer to this document.
- Roadmaps on robotics:
 - From Internet to Robotics (US) by CCC.
 - EURON roadmap on Robotics.

1.1. Structure of the Roadmap

Following this introduction about the scope of AAL, some trends in AAL will be presented from different perspectives, to which will be added some observation of barriers for deployment. This will be followed by a detailed discussion of the application domains - AAL4persons (Chapter 2), AAL@community (Chapter 3), AAL@work (Chapter 4) - and a detailed presentation of the enabling technologies -

sensing, reasoning, acting, interaction and communication - (Chapter 5). The final chapter will present a way to set up an AAL system (Chapter 6).

1.2. Roadmapping Process

A selected methodology and a well organized process of technological roadmapping are fundamental to develop a valuable guide lines for identifying critical technologies, technology gaps and ways to leverage R&D investments.

AAL is a broad domain, potentially crossing each aspect and environment of everyday life. Until today, no common view exists of what Ambient Assisted Living is, but specific technologies and application domains have been thoroughly described during the last ten years, and many technology and research roadmaps have been developed that partially overlap with AAL as well. For this reason, the first necessary step of the AALIANCE road mapping work was to define the general AAL domain, identifying what falls in the main focus of AAL (i.e. applications and systems, in relationship with a small set of large application domains) and what is relevant for AAL, but needs to be left out of the main focus (i.e. enabling technologies, in most cases already examined and included in other roadmaps by other groups).

All partners contributed to this step, by identifying relevant state-of-the-art surveys, existing technological and research roadmaps, market analyses in the field of AAL and, more generally, of ICT applications and systems for quality of life.

Single scenarios were hierarchically decomposed, in order to identify single behaviours (i.e. specifications of the AAL system reaction to a specific event or pattern of events), and functions.

The tree-like decomposition of scenarios in behaviours and functions was a process that presented a high risk of combinatorial explosion (and a subsequent impossibility to manage its complexity), unless it was subject to one or more “filtering” operations, aimed at clustering and merging items whenever possible, and at pruning less relevant ones.

Starting from a comparative analysis of some of the most relevant technological roadmaps published during the last ten years, the AALIANCE Consortium defined a methodological approach for roadmap in the field of Ambient Assisted Living, based on four main phases:

1. Setting the scene (Figure 1)

- Identification of AAL application domains and technology axis.
- State of the Art overview per domain and technology axis.

2. 1st level analysis (Figure 1)

- Plotting visionary scenarios.
- Pruning.
- Identification of the necessary enabling technologies.

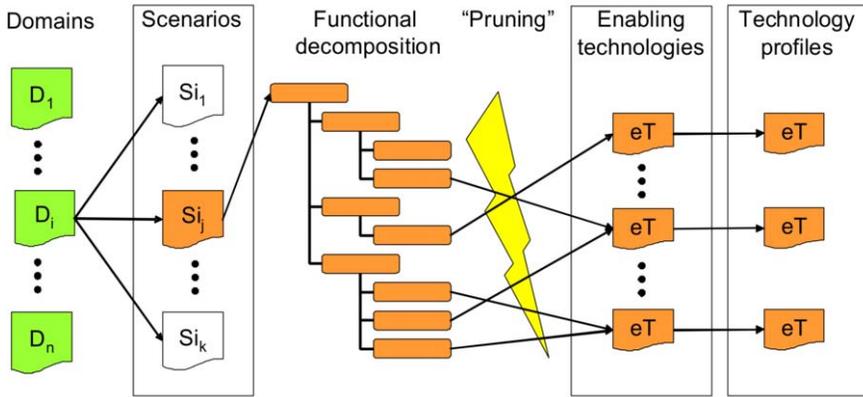


Figure 1. The AALIANCE Roadmapping methodology: phases 1 and 2

3. 2nd level analysis (Figure 2)

- Identification of current and future barriers to development
- Drawing “rough” Roadmaps of enabling technologies

4. Merging and Consolidation (Figure 2)

- Drawing Scenario roadmaps
- Merging Scenario Roadmaps into Domain roadmaps
- Exploring synergies and cross-contamination and consolidating AAL roadmap

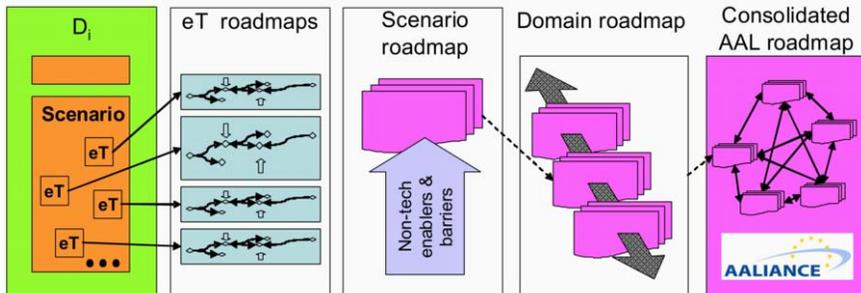


Figure 2. The AALIANCE Roadmapping methodology: phases 3 and 4

More details on the steps of AALIANCE roadmap can be found in deliverable D2.3, in which workshops and brain storming meetings are widely described.

1.3. Scope of AAL

After the conducted researches it has become clear that there is no common view about the precise definition of Ambient Assisted Living (AAL). In this introduction, we will sketch a view on AAL as it has developed within the project during its first year.