TALISMAN+: Intelligent System for Follow-Up and Promotion of Personal Autonomy

David Ausín[1], Diego López-de-Ipiña[1], José Bravo[2], Miguel Ángel Valero[3], and Francisco Flórez[4]

[1] Deusto Institute of Technology - DeustoTech, University of Deusto, Avda. Universidades 24, 48007 Bilbao, Spain
[2] MAmI Research Lab - UCLM, Spain
[3] Dep. of Telematic Engineering and Architectures, Universidad Politécnica de Madrid, EUIT Telecomunicación, 28030 Madrid, Spain
[4] Dept. of Computer Technology, University of Alicante, 03080 Alicante, Spain
{david.ausin,dipina}@deusto.es, Jose.Bravo@uclm.es, mavalero@diatel.upm.es, florez@dtic.ua.es

Abstract. The TALISMAN+ project, financed by the Spanish Ministry of Science and Innovation, aims to research and demonstrate innovative solutions transferable to society which offer services and products based on information and communication technologies in order to promote personal autonomy in prevention and monitoring scenarios. It will solve critical interoperability problems among systems and emerging technologies in a context where heterogeneity brings about accessibility barriers not yet overcome and demanded by the scientific, technological or social-health settings.

Keywords: AAL, health, reactive environment, personal autonomy.

1 Introduction

Accessibility describes the degree to which a device or environment can be used by every person. Nowadays, this term is more and more present in our society, as it is considered a fundamental right as expressed by the UN International Convention about People with Disabilities. On the other hand, technology seems to be present in every aspect of our lives, but it is also moving away from or not giving service to those collectives which most need it.

Effective public access to the benefits of emerging technologies in the Information and Knowledge Society is often limited by the diversity of solutions in both the design phase and in the provision and maintenance of services and applications. National and European policies promoting personal autonomy reflect this fact and, paradoxically, people who might benefit most from ICT are excluded from technological opportunities because of problems of interoperability, accessibility, cost-benefit ratio, security or trust and accessibility in their personal surroundings, such as the home. Consequently, the research pursued in TALISMAN+ aims to provide scientific rigor to technologies that support personal autonomy, laying the foundations of a sustainable, efficient and well thought through development, deriving in the promotion of Spanish industrial activity in this area.

J. Bravo, R. Hervás, and V. Villarreal (Eds.): IWAAL 2011, LNCS 6693, pp. 187–191, 2011.

The rest of this paper is organized as follows: Section 2 summarizes work in technologies related to the promotion of personal autonomy. Section 3 describes the objectives of the TALISMAN+ project and how they will be achieved. In section 4 we define a real scenario in which TALISMAN+ may be applied. Section 5 presents our conclusion and future work.

2 Related Work

Previously created context-aware enabling frameworks and architectures have used different approaches in order to promote personal autonomy. Their analysis allows to highlight the following features [1][2] [3] [4] [5]: a) the context model used, b) the capability of the model for dynamic extension, c) its capability to reason over context, d) the availability of centralized elements, e) resource discovery, f) maintenance of a data log and g) the security of sensitive information captured, processed and stored. From the point of view of reasoning, the first four characteristics are crucial in environmental intelligence settings.

Currently, ontologies are the preferred option to model context in Ambient Intelligence [6] although certain drawbacks have been identified: uncertainty management in modeling of context, distributed reasoning and reasoning for limited resource devices.

Personal autonomy expects that a user working in a ubiquitous computing environment should be able to access both the individual services provided by every device and the complex services resulted from the dynamic combination of basic services. In the latter case, the underlying system should automate or assist the user in such composition process. The different available techniques for service composition [7] require interoperability, for example using ontologies OWSL-S and WSMO.

With regards to security of the information captured, stored and managed in monitoring scenarios, the report [8]from the European Network and Information Security Agency (ENISA) defines a framework to identify the main risks associated to e-health in general and information monitoring and management in particular. Some of these risks do only affect to people individually, whilst others affect to all the users. Currently, apart from the mentioned work by ENISA, there are very few mature initiatives which tackle the mentioned problems integrally.

The applicability of frameworks and architectures for e-health or medicine contexts has aroused great interest among researchers. Indeed, the availability of everyday devices is enabling major advances that are making caring tasks easier in different areas. Mei proposed the development of a framework that would depict patients' vital signs [9] and Tadj, with LATIS Pervasive Framework (LAPERF), provided a basic framework and automatic tools for developing and implementing pervasive computer applications[10]. Roy[11] proposes a framework that supports the merge of efficient context-aware data for health applications that are regarded as an ambiguous context. Finally, and more recently, Preuveneers researched how mobile telephone platform can help individuals to be diagnosed with chronic illnesses like diabetes manage their blood glucose levels without having to resort to any additional system apart from the equipment they presently use, or without having to use additional activity [12].

3 TALISMAN+

TALISMAN+ has four objectives:

1. Analyze and operationally validate in real scenarios the impact and reliability of emerging technologies of multi-modal sensorization in order to generate solutions that are transferable to society to adequately provide services of prevention and follow-up in personal surroundings.
2. Design and implement interoperability scenarios at the semantic level that enable efficient and effective convergence of monitoring and service orchestration technologies that support personal autonomy.
3. Establish mechanisms to define profiles and personal social and health care services based on knowledge that enable agents responsible for running prevention and follow-up services to execute already existing or dynamically composed services depending on the goals or contextual needs, to manage crucial and quality information.
4. Create and evaluate in real scenarios a user-oriented framework for providing services and security guarantees that includes interoperable algorithms and components and enables accessible interaction, either local or remote, of the involved stakeholders.

To achieve them, the project is divided in four subprojects:

- *TALISec+*. It is a framework for knowledge based management of accessible security guarantees for personal autonomy. Its objective is to develop and validate a comprehensive framework that includes interoperable modules and procedures for the provision of e-inclusion and e-health services and applications. It would involve in an accessible and noticeable way knowledge-based guarantees of security and reliability for the electronic management of the information exchanged between actors.
- *TALIS+ENGINE*. It provides cooperative and semantic hybrid reasoning for Service Orchestration in Reactive Environment. The practical effectiveness of undertaking semantic service-oriented modelling of an assistive environment with decision making procedures, undertaken by hybrid and cooperative reasoning engine, in the form of service orchestrations responding to the assistive needs of a user.
- *MoMo*. It proposes a "framework" for multiple vital signs monitoring, noninvasive and accessible. It develops a methodology for defining meta-modules to complement the patient monitoring plan or dependent person according to the profile.
- *Vision@home*. The research aims to develop technology infrastructure and based on vision services for monitoring and recognition of the activity carried out by people at their homes considering ethical questions about the privacy of people who are captured with vision devices.

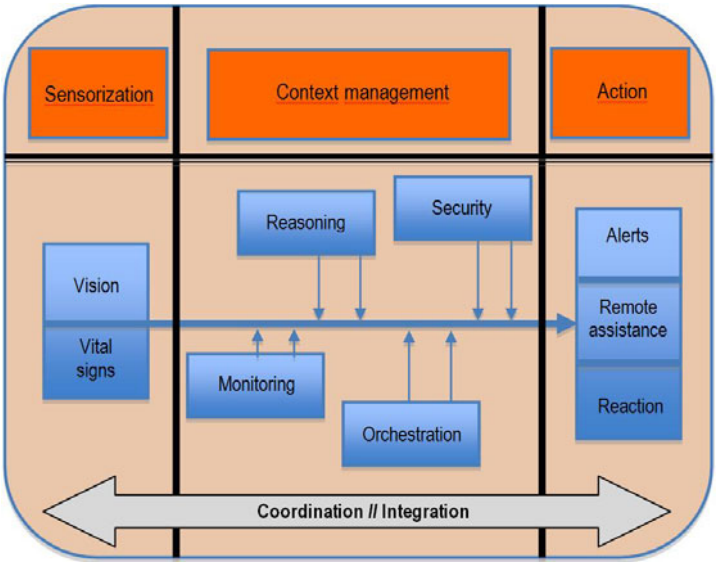

Fig. 1. Logical layers of TALISMAN+

4 TALISMAN+ in Action

Imagine an elderly person with certain level of disability who lives alone and suffers a heart disease. TALISMAN+ may improve his or her quality of life related to healthcare, thanks to:

- *Household activity control.* One of the aims of TALISMAN+ is to get private information about home activity and share it among several devices in order to automatically suggest a response to user's preferences and needs. For example, turning off the water tap when the water level in the bath is higher than a level and there is nobody in the bathroom.
- *Service composition*. In a house, there are several devices which may provide different services. Service composition offers an easy and convenient way to combine them to produce new and more useful aggregated services. For example mixing an external weather forecast with the home's internal temperature and people presence detection to reprogram the air-conditioning system.
- *Health monitoring*. Vital signs monitoring is an important source of information about user's status which allows the system to anticipate a medical emergency such as a heart attack. Anomalous situation detection can give place to the activation of alerting or notification services.
- *Activity recognition*. Vision devices supply information about user activities that can be analyzed to improve context information. An example of an activity that may be recognized and used as context information is sleeping. If a user is sleeping, assisted by TALISMAN+ hybrid reasoning system, media and lighting devices may be automatically switched off or alarm systems triggered in case that the user is sleeping for longer than expected in a non-conventional place at home.

5 Conclusion

TALISMAN+ aims to offer a novel distributed cooperative AAL infrastructure platform offering accessible advances services such activity recognition and health monitoring in order to improve personal autonomy, life quality and care of disabled or/and elderly people. This project financed by the Spanish Ministry of Science and Innovation under grant TIN2010-20510-C04 initiated its work in January 2011 and will implement the objectives and scenario outlined by December 2013.

References

1. Abowd, A.: A conceptual framework and a toolkit for supporting rapid prototyping of context-aware applications
2. Guan, D.W.: Devising a Context Selection-Based Reasoning Engine for Context-Aware Ubiquitous Computing Middleware. In: International Conference on Ubiquitous Intelligence and Computing Hong Kong
3. Baldauf, M., Dustdar, S.: A Survey on Context-Aware Systems. In: Ad Hoc and Ubiquitous Computing, vol. 2
4. Valero, M.A., Vadillo, L.: An implementation framework for smart home telecare services. In: International Conference on Future Generation Communication and Networking
5. López-de-Ipiña, D.A.: Dynamic Discovery and Semantic Reasoning for Nex Generation Intelligent Environments. In: Proceedings of The 4th IET
6. Linnhoff-Popien, T.: A Context Modeling Survey. In: Workshop on Advanced Context Modelling Reasoning and Management (2004)
7. Alamri, A.M.: Classification of the state-of-the-art dynamic web services composition techniques. Int. J. Web and Grid Services
8. European Network and Information Security Agency (ENISA): Identifying emerging and future risks in remote health monitoring and treatment (2009)
9. Mei, H., Wida, I., van Halteren, A., Erfianto, B.: A Flexible Vital Sign Representation Frameywork for Mobile Healthcare. In: Pervasive Health Conference 2006 (2006)
10. Tadj, C.: Context handling in a pervasive computing system framework. In: 3rd International Conference on Mobile Technology, Applications & Systems
11. Roy, N.: A Middleware Framework for Ambiguous Context Mediation in Smart Healthcare Application. In: IEEE International Conference on Wireless and Mobile Computing, Networking and Communications (2007)
12. Preuveneers, D.: Mobile phones assisting with health self-care: a diabetes case study