## INNOVATION REPORT

# A vision of personalised connected living based on real people insights

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*Within the next decade, as digital technologies become increasingly pervasive, we may find ourselves living with almost invisible, intelligent interactive systems – an 'ambient intelligence' – that will form a part of our everyday existence. The implications of this development are far-reaching for individuals, businesses and communities. Ambient intelligence could lead to great opportunities. But, as with all new technologies, we know that the technology itself is neither good nor bad; it is how we might use it that makes the difference. The main challenge now is to guarantee that new ambient intelligence technologies are appropriate, sustainable and meet people's individual and social needs.*

The ITEA AMEC project envisages a paradigm shift in which everyday products will become inter-connected, building embedded, intelligent and interactive systems together with seamless interfaces to back-end Internet services in which the user takes a central place. From a technological point of view, the project concerns itself with enabling convergence and interoperability between traditional consumer electronics networks, the personal computer (PC) and the Internet, emerging domotic networks, and the fast moving space of mobile networks and devices. From an end-user point of view, the AMEC project also concerns itself with people's emerging behaviours, with real, latent and unmet needs as well as people's everyday frustrations and concerns about technology, and their aspirations for a better lifestyle.

AMEC puts forward the belief that domestic consumer electronics systems of the near future will behave more like an ecosystem – or ecology – of products and services, than a well-defined complete system. AMEC set out to explore how an adaptive and intuitive to use ambient ecology of digital products, content, applications and services can support domestic life in the connected home of the future.

The project chose to address this challenge through two parallel but interwoven approaches:
1. Making people, human desires and needs the starting point as well as the means to guide technology development; and
2. Developing an architectural environment to enable the creation of digital ecologies in an easy and flexible manner.

Finally, the project aims to bring research to innovation. Therefore the project was steered throughout with a strong business focus, including a thorough inventory of exploitable assets and the preliminary development of product propositions and plans suitable for transfer to business.

## People research at the fuzzy front end

One of the major accomplishments of the project has been the development of a methodology for people-driven innovation, which has been entitled the 'multiple-encounter approach' (MEA). The aim of the methodology is help understand what people want and need in order to incorporate this into the development of early experience demonstrators that represent ambient ecologies of the future.

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The methodology consists of an integration of socio-cultural, ethnographic research as well as concept and experience testing at people's homes. The approach involves multiple encounters with people, face to face and online, so that we can implicate people throughout the whole creation process and thus make the process people-driven rather than technology-driven.



*Multiple-encounter approach*
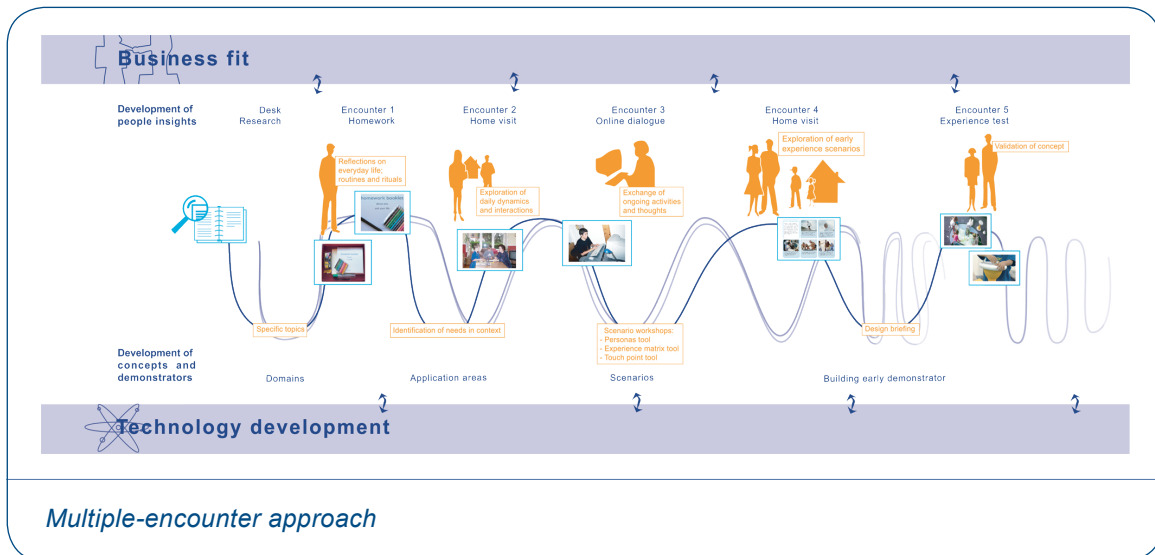
By embracing such methodologies, companies can distinguish themselves by providing people with solutions that add value to their lives. The challenges overcome by the MEA are to:

- Facilitate an on-going dialogue with people;
- Enable a co-creative process; and
- Incorporate the people knowledge in the innovation process.

Critical to the success of the process is the ability to translate user insights – non-obvious discoveries – into application scenarios. The MEA must therefore be viewed as an integral component of a creative process encompassing traditional techniques such as brainstorming, role play and story telling.

## The AMEC framework

To unify and to establish seamless integration of many different platforms and interoperability of various products from different networks requires a large consensus. Many multicompany consortia including ePerSpace, TEAHA and MediaNet have been formed to deal with the development of cross-platform operating systems and middleware frameworks.

AMEC has developed its own middleware based on the application scenarios derived from the creative process. In the AMEC scenario development, this framework resides on a domestic server, Microsoft Media Centre, set-top box or PC-based platform.

The AMEC framework distinguishes itself through its interoperability across all forms of domestic networked products, including its ability to support products referred to as AMEC nodes which have little or no intelligence, such as light bulbs, thermostatic controls and domestic appliances like smart refrigerators. The AMEC framework is naturally open and extensible as well as featuring a smart, easy application development capability suitable for third parties. The AMEC framework has also been developed to be compliant with all relevant standards including .NET architecture and .NET remoting, XML, J2ME, J2EE, Jini, RSS, and Twain and SOA. The framework also supports UPnP and HAVI.

The AMEC framework
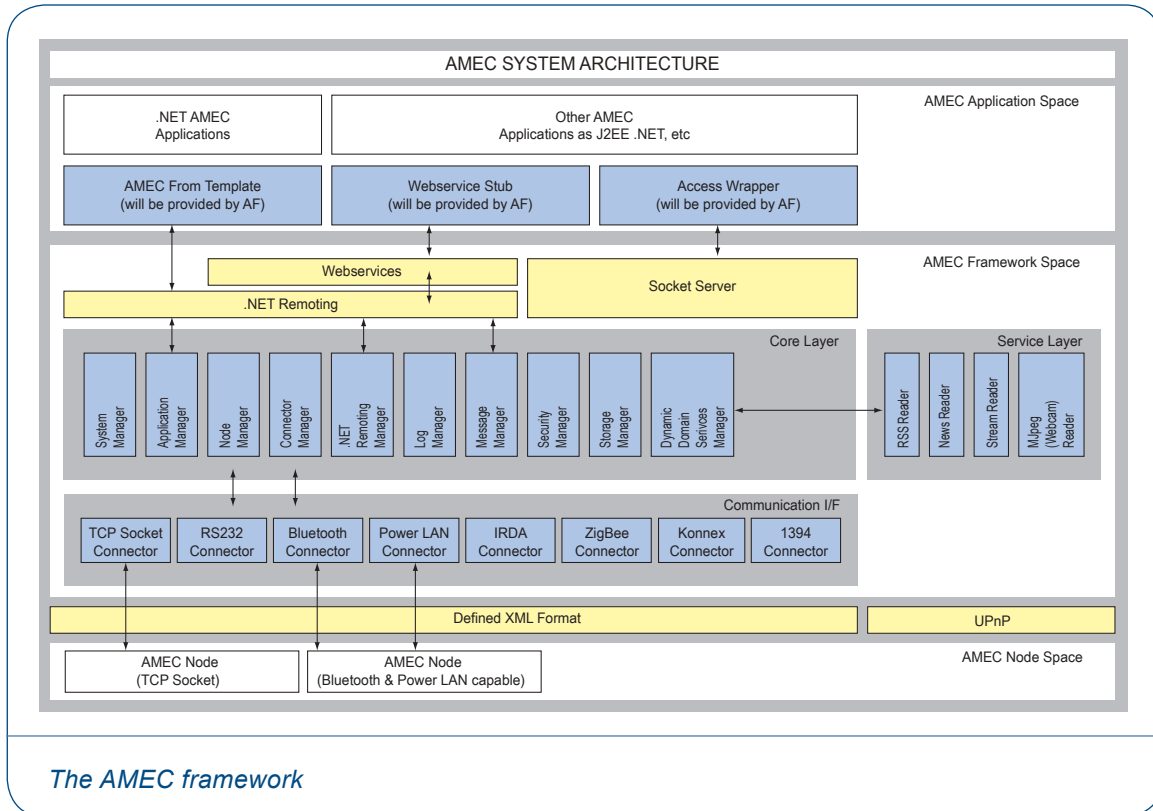
AMEC has supported the development of an application ontology and knowledge base. An ontology is a data model that represents a set of concepts within a domain and the relationship between those concepts. In the AMEC scenarios, a number of applications were defined, specifically the AMEC Cooking Assistant and the AMEC Shopping Assistant, that have given rise to ontological descriptions. The use of these ontologies within the project helped maintain a common vision and understanding of the AMEC scenarios as well as providing further support for the interoperability between the heterogeneous components within the emerging ecology. Moreover, the AMEC framework supports ontology-driven applications that can automatically reason and adapt according to changing scenarios.

## AMEC demonstrators

Everyday people are not naturally expecting that their future homes will feature seamless connectivity and interoperability between diverse devices. If anything, most people cannot imagine a different future; most like to hold on to traditional domestic values and prefer not to change their everyday domestic rituals and patterns of behaviour. Traditional user research methodologies tend only to help uncover people's existing frustrations with current products. Whilst AMEC certainly does not ignore the simple frustrations of overly complex products, the MEA research methodology has enabled us to co-develop a number of possible scenarios for a potential future of connected living and ultimately to test these concepts with the same end users.

A series of demonstrators has been developed that exhibits the potential of connectivity between different devices, digital content, applications and services. The finally assembled ambient ecology consists of ten different devices plus a conventional TV, which is used as an entry point to the domestic server on which resides the AMEC framework. Devices range in functional complexity from the multicolored SenseLamp and AmbiLamp, the single function OpenFrames through the Smart

Refrigerator and LifeBook to a number of richer applications running on a personal digital assistant (PDA) or smart phone. Differing use scenarios can be played out on the demonstrators, based on two distinctly different user personas developed from the MEA. An important aspect is that all the devices are intended to operate as stand-alone items. Devices that enter the ecology are enabled via the AMEC framework to enter into or collaborate in the various connected applications and scenarios.



SenseLamp

AmbiLamp

Shopping Assistant

ShareSpace

Media Canvas

SmartFridge

uWand

Open Frames

LifeBook

TouchLink

Cooking Assistant

*AMEC ecology*

In one use scenario, the Alexandra persona browses all manner of broadcast and locally stored digital content via the Lifestyle HomeMenu on her TV / domestic server. Alexandra 'decorates' her home with the same digital content using a pointing-enabled 'uWand' remote control. Family photos and videos can be transferred using a pointing gesture from the TV to a number of 'OpenFrame' devices spread throughout her home. A favourite piece of music can be drawn to the AmbiLamp, which translates this into electronic candlelight, which flickers to the mood of the music. Alexandra is also able to browse a catalogue of on-line information web services that have been optimised for use on a TV. In one example, she can view a blog posted by her daughter and she is able to assign a collection of images from this blog to playback as a slideshow – with accompanying ambi-light – on her wall-mounted ImageFrame.

In another scenario, the Simone persona uses a personal channel within her HomeMenu, which then synchronises its content with her portable LifeBook. Via the simple user interface, Simone is able to curl up and browse the contents of her LifeBook in an intimate manner. The LifeBook also contains the Cooking Assistant application, which enables her to browse interesting recipes from the Internet and place these according to profiles of her family members into a weekly planner. The same application can check on the ingredients in the smart refrigerator and suggest alternatives as well as exporting its data as a shopping list to a smart phone or PDA. The Shopping Assistant application sees the Joel persona entering the supermarket, providing access to the exported shopping list and being

navigated through the store as well as being offered new alternatives as well as special promotions based on the contents of the list.

The AMEC demonstrators have been developed as tangible prototypes with the interactions and the user interfaces implemented according to the scenarios. A major objective has been to make the demonstrators as convincing and experiential as possible to be able to evaluate results with end users. Whilst some aspects of the demonstrators involve simulations, other aspects are technically enabled and seamlessly blended. The AMEC framework running on a background PC facilitates the interconnectivity.

## Exploitation

User-experience testing proved very positive with many of the demonstrators. An interesting proof was that the Simone persona was able to understand and appreciate the products and services offered to Alexandra whereas Alexandra herself, having a lower affinity with technology was able to identify with the simplicity of the scenario designed around herself but found Simone's connected scenario to be much too complex to deal with.

AMEC is a pre-competitive research project that explores the potentiality of ambient ecologies. The output of the project has ultimately been broken down into a total of 26 different exploitable assets ranging from new product, application and service propositions to separable user interface elements or interaction principles. It also encompasses the development of new tools and methodologies as well as discernable knowledge contribution to vision and thought leadership. Additionally, a number of patents have been filed as well as contributions made to new and existing standards. It is impossible to say that any of the final demonstrators are intended to be developed into commercial products; obviously certain aspects of some products are intended to be developed further. A significant number of the product propositions have been developed into preliminary business cases suitable for pitching ideas as new ventures. Tangible value has also been attributed to each of the various exploitable assets, together with initial plans for next steps in the process of bringing the ideas presented towards innovation.

## Conclusion

A number of propositions arising out of AMEC will be taken further into innovation and pre-development activities with the ultimate objective of creating new business. This is not the end of AMEC however. The vision set forth in ambient ecologies remains in need of further development. Ecologies of connected devices, content, applications and services need to learn further how to adapt, how to reshape or even evolve in order to offer sustainable value. Lastly, we return to the end users, who should ultimately be enabled to shape their own ecologies around themselves, defining the relationships and the interactions between differing devices. In our vision, people should ultimately be free to select, tailor and enjoy their digital media and connected experiences to suit best their unique situations.