

TELCO SERVICES FOR END CUSTOMERS WITHIN SPANISH PROGRAMMES

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Spain is the eighth largest economy worldwide according to the gross domestic product (GDP) ranking. Among the very large R&D projects in Spain is a new program called CENIT, which funds four-year-projects of €20–40 million budget each, of which at least 25 percent is contracted to public research bodies. CENIT stands for National Strategic Consortia for Technical Research [1]. It finances industrial research projects featuring a strategic dimension, very large size, and long scientific-technical outreach. The projects are oriented to planned research in future technological areas and with international projection, whose target is the generation of new knowledge that can be useful for the creation of new products, processes, or services, or for the integration of strategic interest

technologies, contributing to improve the technological positioning of the Spanish productive sector.

The program has the following priority thematic areas:

- Biomedicine and Health Science (including Biotechnology)
- Food Technologies (including Biotechnology)
- Information and Communication Technologies (ICT)
- Production and Design Technologies
- Environment, Sustainable Development, and Renewable Energies
- New Materials and Nanotechnologies
- Sustainable Mobility (automotive, railway) and Aerospacial
- Security

So far, there have been three calls for proposals, in which a total of around 50 projects worth €1200 million have

been selected. There are 10 projects related to ICT:

- ITECBAN: New information systems for the bank sector
- HESPERIA: security of public spaces
- CDTEAM: multimodal medical imaging
- NANOFARMA: nanotechnologies for health medications (less related to ICT)
- VISION: new-generation video communications
- I3MEDIA: automatic creation and management of intelligent audiovisual contents
- TELMEX: professional mobile broadband communications
- AMIVITAL: personal digital environment for health and welfare
- INREDIS: interfaces for the disabled
- SEGUR@: ICT security
- MARTA: advanced transport networks for mobility and intelligent transport systems (ITS)

Telefonica participates in five ICT projects (coordinates two projects and has very significant participation in the other three), two of them jointly with the University of Valladolid (which also participates in another project).

In this article we describe the CENIT projects in the ICT field related to services in which Telefónica participates: automotive networking (MARTA), ambient intelligence for e-health (AmiVital), and augmented telepresence (VISION). Reference [2] covered the European perspective; this article complements the vision with the Spanish dimension.

MARTA

Vehicular networks and services are becoming a reality, driven by safety requirements and the investments of car manufacturers and public transport authorities. Consequently, much research effort is being put into defining radio technologies (e.g., IEEE802.11p, WAVE: Wireless Access for the Vehicular Environment), network models, and mechanisms (e.g., vehicular ad hoc networks, IEEE802.21 seamless handover), and developing services for the vehicular environment (e.g., the European eCall).

In this context MARTA ([3]) aims to establish the scientific and technological basis and principles for mobility

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VERY LARGE PROJECTS

in the 21st century that allow the ITS sector to respond to the challenges of safety, efficiency, and sustainability both European and Spanish societies are facing nowadays.

MARTA envisions future vehicular services as a mix of safety-related free services, probably mandatory by regulations (e.g., eCall), and added-value services to and for which the customer will subscribe and pay. This approach will help establish smart business models and at the same time increase service acceptance by customers.

The definition of the target service portfolio is done in a two-step process: (1) service analysis, in which both target and existing services are classified, grouped, and analyzed through use cases and user scenarios; and (2) definition of the targeted services. The vehicular services proposed take into account several parameters, which range from potential user interest to technological readiness. Our service portfolio is focused on safety, advanced driver information, and the translation of passenger services from other telco contexts. Some of these services will be implemented and tested experimentally using the novel vehicular communications concepts developed within the project.

The particular requirements of vehicular services make the design and development of an appropriate communication system for this environment a very complex task. A single wireless solution would be ideal to provide onboard nodes with communications, but this is not possible, at least now, because of the special characteristics inherent to the vehicular environment, which include unpredictable network topology changes, high speeds of nodes, variable node density depending on traffic situation or multiple simultaneous accesses to the network, and other issues.

For this reason, wireless nomadic, cellular, ad hoc, and broadcasting technologies will be included in a car gateway to fulfill the requirements of both the services and the environment. This leads to a hybrid node architecture. Such a hybrid node is in charge of communicating with any device in the vehicle and any other node in the surrounding networks: in-vehicle, vehicle-to-vehicle (V2V), vehicle-to-road-infrastructure (V2R), or vehicle to the Internet infrastructure (V2I).

To this end, the hybrid node uses the best choice among the available technologies for every situation. The rationale behind the hybrid node is the always best connected concept: always choose the best communication choice possible or available for the given ser-

vice requirements and user preferences.

The MARTA consortium is composed of over 30 Spanish companies and institutions. Telefónica I+D leads the activities on vehicular communications, and participates actively in the definition and development of novel services for the vehicular environment and also door-to-door mobility, working as well on service prospecting and surveillance, analysis and definition of vehicular services, and the development of new services for the vehicular user. It is also developing a hybrid node for V2V, V2R, and V2I communications, and for in-vehicle communications and equipment integration.

Amivital

Amivital ([4]) aims to develop a new generation of ICT technologies and tools for the modeling, design, implementation, and operation of ambient intelligence (AmI) devices and systems, with the target to provision personal services for independent life, welfare, and health. It is a person-centric solution with the objective of keeping dependent people in their life environ-

ments. The project works in parallel on future research around ambient assisted living (AAL), and short-term anticipation of business models and the application market ecosystem. Amivital is pioneer in the technological research orientation toward the Spanish Dependency Law, and is being aligned with European strategic policies (e.g., i2010 and AAL169). This new AAL service paradigm aims to adopt a new approach that prioritizes the proactivity of the services, representing an intelligent ambiance in which the system collects the necessary knowledge, always having the user at its center.

Fields of application include aging persons' independent life support, remote tracking of persons at home with acute and chronic diseases, dependent persons' support, services for a healthy life related to physical activity and sport, support services for a patient's family and informal caregivers as well as professional caregivers, and the tools and platforms for operation support and service providers management.

The project is structured around the following activities:

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- Strategy and service models: Definition of end users and system actors; definition of service components focused on health and welfare; technological strategy and results viability
- Security: Analysis of the access security, health data transmission, and availability, from both ethical and legal points of view
- Friendly interfaces: Communication design and implementation between users and applications, depending on their different preferences and capacities
- Sensor networks: Provision of biological and ambient intelligent sensors; relevant data reception, classification, and process to be delivered to the platform
- Network and communications architecture: Support of AmI applications integrating home and public sensor networks
- Personal framework tools: For health and welfare help services construction, covering analysis, simulation, construction, and deployment
- Ambient intelligence platform: Software architecture and ambient intelligence platform design for the execution, coordination, and integration of services
- Reference scenarios and applications: Following the actors' model and service components; proof of concept implementation in two different scenarios

The consortium is formed by organizations from different technological fields (telecommunications, hardware, robotics, sensors, etc.) together with end users from the health and social assistance fields. Technically led by Telefonica I+D, the project includes large enterprises such as Siemens and Ericsson, small to medium sized enterprises (SMEs) specialized in ambient intelligent systems (Airzone, Acerca Comunicaciones y Sistemas, EPTRON, and CPI), academic partners (Universities of Madrid-Polytechnic, Málaga, Granada, and Zaragoza), and research institutes (CARTIF and Itaca) as well as medical research centres such as the Rioja Health Foundation, the Health Institute Carlos III, and the University Hospital Puerta de Hierro.

Vision

Vision stands for New Generation Video Communications. Its goal is the attainment of a qualitative advance in audiovisual digital communications so that people in different and separated locations perceive the feeling of a physical meeting. Current communication services (voice and videoconference calls) are frequently insufficient to meet users' requirements. Telepresence, based on

the fact that users need to have the feeling of physically being in the same place, can improve the overall experience. In order to achieve telepresence it is necessary to capture, transmit, and reproduce the whole reality; that is, the three-dimensional visual and aural information from remote scenes. Abilities such as visual contact feeling, which enables non-verbal communication, watching images from any point of view and with depth feeling, real interactivity by means of natural interfaces, no delay in aural and visual response, and so on are needed.

Telepresence differs from virtual presence in the environment, which is simulated in the last case but real in telepresence. Generally, commercial telepresence systems try to offer presence feeling through a telecommunication system, employing formal variables (hardware and software). However, presence is a multidimensional construction in which all variables are related and have mutual influence, so they must be considered together. Among them, technology, content, and context variables are considered external, and user related variables such as demographic, social, and psychological characteristics are internal.

In the project the technologies that allow the development of new advanced high-quality realistic communication systems are investigated, and can be divided into four groups: reality capture, advanced multimedia processing and analysis, communications, and reality presentation technologies.

Reality capture technologies will enable the capture of aural and visual information of the scene, simulating the human eye's acquisition of images. Algorithms and software technologies will be designed to capture three-dimensional scenes by means of multicamera architectures. For real interaction within the scene, signal processing must introduce no additional delay; embedded processing cameras with high-quality features will be designed to process images with real-time restrictions.

Advanced coding systems for new multiview video flows that insert no additional delay will be developed, together with technologies for aggregating different complex video flows for multipoint communications and distributing video flows adapted to home networks.

The communication network is an essential part of the real presence videoconference system, which has strict quality requirements, especially regarding high bandwidth and very low delay. New communication technologies will improve the abilities of current networks for real-time traffic with respect to low-latency transmission, routing,

signaling, quality of service, and network management. The network architecture is based on IP multimedia subsystem (IMS), on which the main features and interfaces are defined, including an optical core.

For the scene reconstruction, rendering technologies will present images and sound exactly representing the captured reality. Mixing technologies will enable the addition of virtual elements to the scene providing advanced interaction capacities that can be applied in collaborative work environments. An intelligent analysis of the scene will allow the recognition of some objects for the execution of advanced system adaptation and customizing functions. Finally, new visualization terminals will present the captured scenes so that the user perception of the scene is similar to his/her perception in the same original place.

Vision started in 2007 and will end in 2010. The consortium comprises three large telecommunication companies, 10 SMEs, and 11 Spanish universities and research centres. A good overview of the project can be found in [5].

Conclusions

In a global research world, frontiers tend to disappear, especially in the 21st century where electronic communications enable fully collaborative research among very distant organizations. Worldwide, top researchers collaborate on a global level, without geographical constraints at the continental level.

At the regional level, in Europe there is a strong push toward the so-called European Research Area, where in addition to European Commission (EC) directly funded programs, national initiatives are moving toward a more integrated approach and strategy with programs such as Eureka, Joint Technology Initiatives, and Article 169 programs. However, purely national initiatives can also play an important role, fully exploiting the advantages related to common cultures, and tractor and multiplicity effects on the national economy. This is effectively the case of the Spanish CENIT program, which fulfills two key requirements for success: fostering the collaboration among private, public, and research sectors; and mobilizing very large budgets in individual projects to guarantee the critical mass required. In addition, national initiatives contribute significantly to the general objective of closing the gap with other countries in which R&D is ahead.

From a project perspective, this article has focused on the ICT research

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thematic area, and particularly in those projects related to services for end customers, particularly those where telcos are playing a leading role, covering topics like automotive communications, healthcare services, and personal communications. Although projects have recently started, and it is still early to show outcomes and results, some promising ideas have been described.

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- [4] Official AMIVITAL site, <http://atc.ugr.es/amivital/>
- [5] Official VISION site, <http://vision.tid.es>

Biographies

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CAROLINA PINART (cpg@tid.es) is a graduate and Ph.D. in telecommunications engineering of the Universitat Politècnica de Catalunya (1999 and 2005). Since September 2007 she is head of the Networked Vehicles Division at Telefónica I+D, Madrid, Spain. Since 1998 she has been working in networking technologies as an undergraduate researcher (Siemens AG, Germany, 1998–1999), consultant (Altran Group, France, 1999–2001) and assistant director (CTTC, Barcelona, 2001–2007). She has participated in 13 R&D projects and has over 35 publications in networking technologies. She has been awarded a Post-Graduate Prize by the Fundació Agrupació Mútua (2003), a Best Ph.D. Dissertation Prize by the Spanish Association of Telecom Engineers (2006), and a post-doctoral fellowship by the Japan Society for the Promotion of Science (2006).

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