

Universidad Politécnica de Madrid

# Building Internet of the **Future**



UPM vision  
and research  
potencial



POLITÉCNICA

## Content

<b>1</b>	UPM activity-Future Internet	02
<b>a</b>	The Network of the Future	04
<b>b</b>	Internet of Services	06
<b>c</b>	Internet of Things	08
<b>d</b>	Networked Media and 3D Internet	10
<b>e</b>	Internet by and for People	12
<b>f</b>	Future Internet Experimental Facilities	14
<b>2</b>	Projects in FP7 ICT Challenge 1 with UPM participation	16
<b>3</b>	UPM participation in Technology Platforms related to Future Internet	20
<b>a</b>	European Techology Platforms	20
<b>b</b>	Spanish Technology Platforms	20

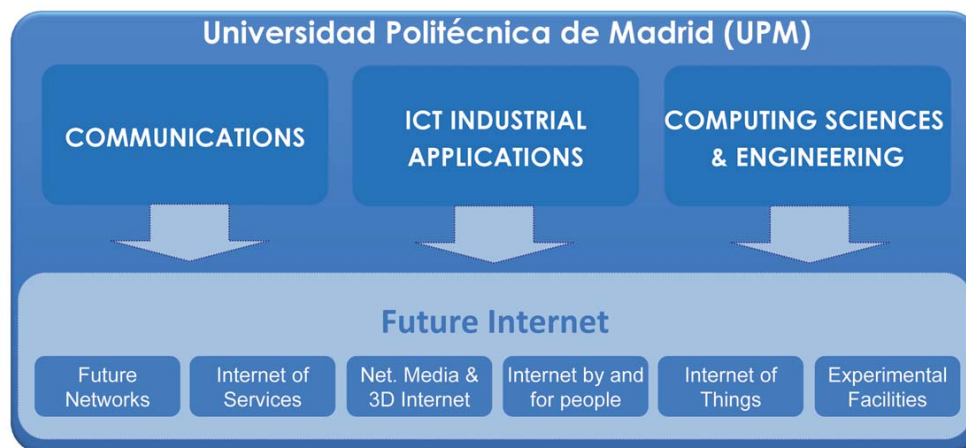
# 1 UPM activity-Future Internet

During the last decade Internet has become an essential part of our society. What was impossible to imagine only fifty years ago now is taken for granted: we are used to be able to communicate with anyone in the world or to have access to any information, anytime, anywhere.

Nowadays, Internet is thought as a concept “by and for people” and is entering not only in individual lives but also into communities and organizations, breaking barriers but at the same time creating new risks.

As a new situation is approaching there surges a need to rethink the concept of the Internet from the scratch, and bring to a new paradigm the convergence of technologies, networks, services and content which are becoming the main protagonist for future developments.

The Universidad Politécnica de Madrid (UPM) is an active player in the new technologies field and its priority is to contribute to the strategy of evolutionary improvement of the current Internet, and to participate in the design of the Internet of the Future to ensure that the needed services will be provided to the new coming generations.



The UPM researchers have proven expertise in research projects at national and international level and the university fosters long-term research partnerships between companies and academics for mutual benefit. In the 6th Framework Programme the UPM researchers took part in 65 Information Society Technology projects. Only during the first two years of the 7th Framework Programme, UPM has taken part in 28 ICT projects, out of which 11 are directly related to the “Future Internet”. These “Future Internet” projects are presented from a full multidisciplinary perspective and cover the six Internet pillars: Network Infrastructure, Internet of Services, Internet of Things, Internet of Knowledge, Internet by and for People and Experimental Facilities.

At national level, UPM maintains a close contact with industry in areas related to Future Internet. This relationship is embodied in the UPM presence in the Spanish Technology Platforms. Specifically UPM belongs to the Governing Boards of the following Platforms: Networked and Electronic Media, Software and Services, Future Internet, Mobility, eSecurity and Embedded Systems.

UPM hosts Engineering Schools of various disciplines, which creates an environment for the convergence of technologies required by Future Internet.

Thanks to this favorable context, Future Internet represents one of the most important research areas at the UPM. The following table summarizes the main figures in relation to the UPM participation in Future Internet projects over the past 4 years:

R&D	Approx. no. of projects
European Programmes	50
National Programmes	200
Contracts with Industry	600
<b>TOTAL</b>	<b>850</b>



The currently existing Internet Infrastructure soon will not be able to cope with future requirements mainly because of the increasing number of users (scalability), the need for higher diversity and number of applications, the scarcity of bandwidth and the inefficient traffic management. A major challenge involves ensuring the reliability, mobility, security, flexibility, bitrate diversity, etc. of the Network Infrastructures.

To achieve these aims, the UPM focuses on the research of new architectures and technologies which could support multiple contents, formats, traffic patterns, service continuity through different multi-domain networks, native mobility and a variety of technologies and access devices. As network resources are planned to be assigned on demand, they will require easily extensible infrastructures, and the use of virtualisation, federation and overlay technologies. An operation environment with a flexible and dynamic network management is required to allow optimum resource assignment and control.

As a result of these efforts, the evolution of Internet is to prompt a new network architecture based on new concepts of connectivity, message routing, network access, addressing, etc. UPM considers necessary the definition, modeling and simulation of new network architectures to support the mobility and diversity of the services, types of traffic, integration of stationary and mobile access into networks (SIP, IMS), etc. Network planning and design is centered on the integral design of multiservice networks, including definition of topologies, dimension of commutation resources, planning of services, architecture of network management and security policies.

We should not forget the important role played by the semantic web in the definition of the new web architectures. In this field UPM is making a great research effort to improve the semantic network necessary to convert it in an extended web in which the information is stored in a way that a fast and easy recovery is possible.





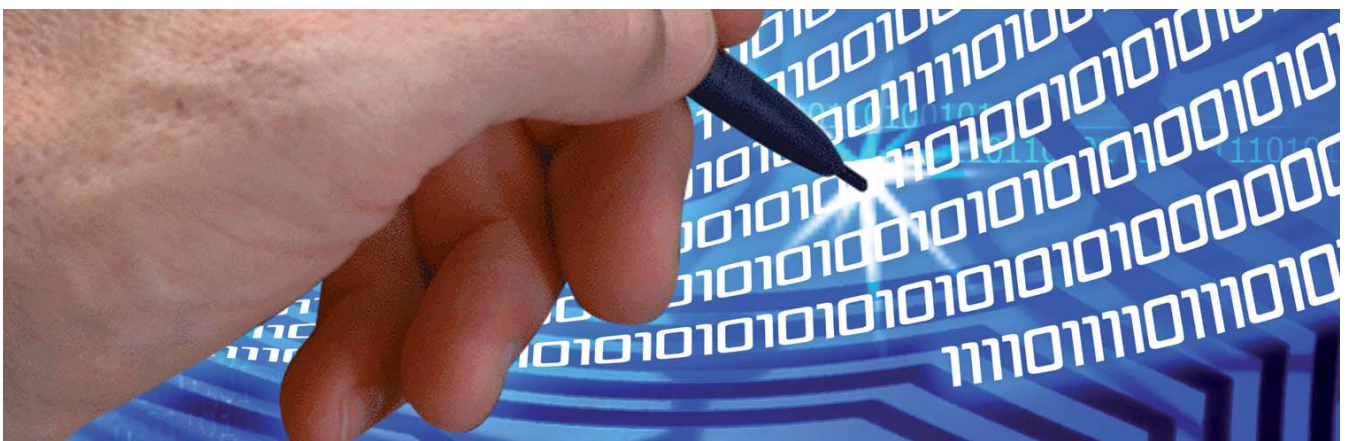
Contact	Email	Web
<b>Telecommunication &amp; Internet Networks and Services Research Group (RSTI)</b>		
<a href="#">Francisco González</a>	<a href="mailto:francisco.gonzalezv@upm.es">francisco.gonzalezv@upm.es</a>	<a href="http://www.dit.upm.es/rsti">www.dit.upm.es/rsti</a>
<b>Signal Processing Applications Group (GAPS)</b>		
<a href="#">Francisco Javier Casajús</a>	<a href="mailto:javier.casajus@upm.es">javier.casajus@upm.es</a>	<a href="http://www.gaps.ssr.upm.es">www.gaps.ssr.upm.es</a>
<b>Radiation Group</b>		
<a href="#">Miguel Calvo</a>	<a href="mailto:miguel.calvo@upm.es">miguel.calvo@upm.es</a>	<a href="http://www.gr.ssr.upm.s/gr_uk.htm">www.gr.ssr.upm.s/gr_uk.htm</a>
<b>Radiocommunication Group</b>		
<a href="#">José M<sup>a</sup> Hernando</a>	<a href="mailto:josemaria.hernando@upm.es">josemaria.hernando@upm.es</a>	<a href="http://www.grc.ssr.upm.es">www.grc.ssr.upm.es</a>
<b>Visual Telecommunications Application Group (G@TV)</b>		
<a href="#">Guillermo Cisneros</a>	<a href="mailto:guillermo.cisneros@upm.es">guillermo.cisneros@upm.es</a>	<a href="http://www.gatv.ssr.upm.es/index_en.htm">www.gatv.ssr.upm.es/index_en.htm</a>
<b>Real-Time Systems and Telematic Services Architecture</b>		
<a href="#">Juan Antonio de la Puente</a>	<a href="mailto:juan.de.la.puente@upm.es">juan.de.la.puente@upm.es</a>	<a href="http://www.dit.upm.es/str">www.dit.upm.es/str</a>
<b>Next Generation Internet</b>		
<a href="#">Juan Quemada</a>	<a href="mailto:juan.quemada@upm.es">juan.quemada@upm.es</a>	<a href="http://internetng.dit.upm.es/english">internetng.dit.upm.es/english</a>
<b>Microwave and Radar Group</b>		
<a href="#">Félix Pérez</a>	<a href="mailto:felix.perez.martinez@upm.es">felix.perez.martinez@upm.es</a>	<a href="http://www.gmr.ssr.upm.es">www.gmr.ssr.upm.es</a>
<b>Image Processing Group (GTI)</b>		
<a href="#">Narciso García</a>	<a href="mailto:narciso.garcia@upm.es">narciso.garcia@upm.es</a>	<a href="http://www.gti.ssr.upm.es">www.gti.ssr.upm.es</a>
<b>Intelligent Systems Group</b>		
<a href="#">Gregorio Fernández</a>	<a href="mailto:gregorio.fernandez@upm.es">gregorio.fernandez@upm.es</a>	<a href="http://www.gsi.dit.upm.es">www.gsi.dit.upm.es</a>
<b>Group for Automation in Signals and Communications (GASC)</b>		
<a href="#">Diego Andina</a>	<a href="mailto:d.andina@upm.es">d.andina@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=09093502">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=09093502</a>
<b>Communication Networks and Services (RSC)</b>		
<a href="#">León Villader</a>	<a href="mailto:leon.vidaller@upm.es">leon.vidaller@upm.es</a>	<a href="http://www.dit.upm.es/imasd">www.dit.upm.es/imasd</a>
<b>Ontology Engineering Group (LIA)</b>		
<a href="#">Asunción Gómez</a>	<a href="mailto:asunciondemaria.gomez@upm.es">asunciondemaria.gomez@upm.es</a>	<a href="http://www.oeg-upm.net">www.oeg-upm.net</a>
<b>Computing Science in Education and Knowledge Transfer</b>		
<a href="#">Ana Gómez Oliva</a>	<a href="mailto:ana.gomez@upm.es">ana.gomez@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=17590301">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=17590301</a>
<b>Radio Engineering Group (GIRA)</b>		
<a href="#">Francisco Javier Ortega</a>	<a href="mailto:franciscojavier.ortega@upm.es">franciscojavier.ortega@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=22222222">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=22222222</a>

In the last decade, Internet underwent a huge evolution, mainly related to services. The concept of Web 2.0, that is, the second generation of Internet is led by the generation of new services such as user-generated contents and services, social networks, collaborative webs, Web-TV, etc., together with growing interactive sets of applications. The new situation has a strong impact on the concept of the end-to-end services at all levels, from the applications up to the networks and their underlying technologies.

As a result, this new way of understanding the concept of Internet causes that the way to provide the services changes. When the provision of software applications is treated as services, the borders of the supplier-client relation get blurred and new players who collaborate with the suppliers in the creation of new applications for the users appear in this emerging new business model. As the complexity of the network increases, the more essential becomes an open architecture to support the future services.

Software as a Service (SaaS) is a recent concept that is rapidly gaining interest among the largest and most important software actors. The SaaS philosophy can go a step further and, in addition to considering the development and provision of software applications in the form of services by a supplier, it considers the creation and the provision of services by third parties, facilitating the creation of true ecosystem-based business services. The latter approach allows service providers to offer a framework to third parties, which can create applications implemented and supported by them.

UPM cooperates with the most important European stakeholders to research topics such as Cloud Computing, Cluster Computing, SOA, SaaS, Middleware Systems, Multilayer Architectures, Grid Computing, Virtual Enterprise Architectures, User-Services Front-Ends, User-Services Interaction, Enterprise Mashups, Global SOA, Mobile Services, etc., all these conserving the most important characteristics of the Internet of the Future: scalability, dependability, availability and reliability.



Contact	Email	Web
<b>Next Generation Internet</b>		
Juan Quemada	<a href="mailto:juan.quemada@upm.es">juan.quemada@upm.es</a>	<a href="http://internetng.dit.upm.es/english">http://internetng.dit.upm.es/english</a>
<b>Telecommunication &amp; Internet Networks and Services Research Group (RSTI)</b>		
Julio Berrocal	<a href="mailto:julio.berrocal@upm.es">julio.berrocal@upm.es</a>	<a href="http://www.dit.upm.es/rsti">www.dit.upm.es/rsti</a>
<b>Real-Time Systems and Telematic Services Architecture</b>		
Juan Antonio de la Puente	<a href="mailto:juan.de.la.puente@upm.es">juan.de.la.puente@upm.es</a>	<a href="http://www.dit.upm.es/str">www.dit.upm.es/str</a>
<b>BABEL Research Group: Programming Languages and Reliable Software</b>		
Juan José Moreno	<a href="mailto:juanjose.moreno@upm.es">juanjose.moreno@upm.es</a>	<a href="http://babel.ls.fi.upm.es">http://babel.ls.fi.upm.es</a>
<b>Communication Networks and Services (RSC)</b>		
Ángel Fernández	<a href="mailto:angel.fernandez.delcampo@upm.es">angel.fernandez.delcampo@upm.es</a>	<a href="http://www.dit.upm.es/imasd">www.dit.upm.es/imasd</a>
<b>Ontology Engineering Group (LIA)</b>		
Oscar Corcho	<a href="mailto:oscar.corcho@upm.es">oscar.corcho@upm.es</a>	<a href="http://www.oeg-upm.net">www.oeg-upm.net</a>
<b>Distributed Systems Labs (LSD)</b>		
Marta Patiño	<a href="mailto:marta.patino@upm.es">marta.patino@upm.es</a>	<a href="http://lsd.ls.fi.upm.es">http://lsd.ls.fi.upm.es</a>
<b>Software Engineering Group</b>		
Natalia Juristo	<a href="mailto:natalia.juristo@upm.es">natalia.juristo@upm.es</a>	<a href="http://grise.ls.fi.upm.es">http://grise.ls.fi.upm.es</a>
<b>Computer Networks &amp; Web Technologies Laboratory</b>		
Javier Soriano	<a href="mailto:javier.soriano@upm.es">javier.soriano@upm.es</a>	<a href="http://conwet.fi.upm.es">http://conwet.fi.upm.es</a>
<b>The Computational logic, Languages, Implementation, and Parallelism Laboratory (CLIP)</b>		
Manuel Hermenegildo	<a href="mailto:manuel.hermenegildo@upm.es">manuel.hermenegildo@upm.es</a>	<a href="http://www.clip.dia.fi.upm.es">www.clip.dia.fi.upm.es</a>
<b>Natural Computing Group</b>		
Juan Bautista Castellanos	<a href="mailto:juan.castellanos@upm.es">juan.castellanos@upm.es</a>	<a href="http://www.lpsi.eui.upm.es/nncg">www.lpsi.eui.upm.es/nncg</a>
<b>Computing Science in Education and Knowledge Transfer</b>		
Ana Gómez Oliva	<a href="mailto:ana.gomez@upm.es">ana.gomez@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIW/EB/Grupo.jsp?idGrupo=17590301">http://meminv.upm.es/giweb/GIW/EB/Grupo.jsp?idGrupo=17590301</a>
<b>System and Software Technology Group</b>		
Juan Garbajosa	<a href="mailto:juan.garbajosa@upm.es">juan.garbajosa@upm.es</a>	<a href="http://syst.eui.upm.es">http://syst.eui.upm.es</a>



“Internet of Things” technologies are those who connect the physical world with the cyberspace in order to support new business solutions. This is foreseen to be achieved through the incorporation of Internet technologies into common objects existing in our daily life. This involves a seamless communication between the objects themselves and between the user and the objects, which provide information about the environment.

This concept is called ambient intelligence. Ambient intelligence implies the natural interaction of the user with the environment, through the use of presence-sensitive and profile-reactive devices that interact with the users and their context.

The UPM vision is to promote the development of devices which allow the physical world information to be transferred into the network so that the real world events can be managed through the Internet. UPM have renowned competences in this topic, including technology advances in: real time localization, context aware management (data acquisition and processing), short range technologies (RFID, NFC, touch computing) and other wide range communication technologies, adhoc sensor networks, sensor and actuators development... all in order to identify the users, their position and context, preferences and desires, and therefore, to provide them with the right information or services in the right moment and in any place, anticipating their needs or demands.

As a result of the technologies covered by the “Internet of Things” a huge amount of data will be digitalized and systems of unification and new regulation policies of data ownership will have to be provided. The UPM research tackles the additional issues arising from the integration of the technology into real life, by working on development of sources of heterogeneous data (such as the secure and soft implementation of the process or the development of data fusion technologies capable of integrating heterogeneous information coming from different sources), or coping with the preparation of mappings and integration of the data bases into networks.

Contact	Email	Web
<b>Applied BioEngineering Group</b>		
Carlos Platero	<a href="mailto:carlos.platero@upm.es">carlos.platero@upm.es</a>	<a href="http://www.elai.upm.es/spain/Investiga/Bioingenieria/bioing.htm">www.elai.upm.es/spain/Investiga/Bioingenieria/bioing.htm</a>
<b>Real-Time Systems and Telematic Services Architecture</b>		
Juan Antonio de la Puente	<a href="mailto:juan.de.la.puente@upm.es">juan.de.la.puente@upm.es</a>	<a href="http://www.dit.upm.es/str">www.dit.upm.es/str</a>
<b>Biomedical Engineering and Telemedicine Centre (GBT)</b>		
Francisco del Pozo	<a href="mailto:francisco.delpozo@upm.es">francisco.delpozo@upm.es</a>	<a href="http://lobezno.gbt.tfo.upm.es/portalGBT/index.php?lang=english">http://lobezno.gbt.tfo.upm.es/portalGBT/index.php?lang=english</a>
<b>Centre for Integral Domotics</b>		
Asunción Santamaría	<a href="mailto:asun.santamaria@upm.es">asun.santamaria@upm.es</a>	<a href="http://www.cedint.upm.es">www.cedint.upm.es</a>

## Group of Connectivity

Jesús Sanz	jesus.sanz@upm.es	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=09094002">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=09094002</a>
------------	-------------------	---

## Data Processing and Simulation Group - Centre for Technology Diffusion (CEDITEC)

José Ramón Casar	joseramon.casar@upm.es	<a href="http://www.ceditec.etsit.upm.es">www.ceditec.etsit.upm.es</a>
------------------	------------------------	--

## Systems and Instruments Integration

Gabriel Sala	gabriel.sala@upm.es	<a href="http://www.ies.upm.es/index.php?id=86">www.ies.upm.es/index.php?id=86</a>
--------------	---------------------	--

## Life Supporting Technologies

M <sup>a</sup> Teresa Arredondo Waldmeyer	mt.arredondo@upm.es	<a href="http://www.lst.tfo.upm.es/principal/index_en">www.lst.tfo.upm.es/principal/index_en</a>
---	---------------------	--

## Ontology Engineering Group (LIA)

Asunción Gómez	asunciondemaria.gomez@upm.es	<a href="http://www.oeg-upm.net">www.oeg-upm.net</a>
----------------	------------------------------	--

## Computer Networks & Web Technologies Laboratory

Javier Soriano	javier.soriano@upm.es	<a href="http://conwet.fi.upm.es">http://conwet.fi.upm.es</a>
----------------	-----------------------	---

## MERCATOR: Geo-Information Technology Group

Miguel Ángel Bernabé	ma.bernabe@upm.es	<a href="http://mapas.topografia.upm.es/grupomercator">http://mapas.topografia.upm.es/grupomercator</a>
----------------------	-------------------	---

## Perception for Computer and Robots

Luis Baumela	luis.baumela@upm.es	<a href="http://www.dia.fi.upm.es/~pcr/index.html">www.dia.fi.upm.es/~pcr/index.html</a>
--------------	---------------------	--

## Autonomous Systems Laboratory

Ricardo Sanz	ricardo.sanz@upm.es	<a href="http://www.aslab.org">www.aslab.org</a>
--------------	---------------------	--

## Industrial Electronics

José Antonio Cobos	ja.cobos@upm.es	<a href="http://www.cei.upm.es">www.cei.upm.es</a>
--------------------	-----------------	--

## Intelligent Control

Agustín Jiménez	agustin.jimenez@upm.es	<a href="http://www.disam.upm.es/control">www.disam.upm.es/control</a>
-----------------	------------------------	--

## Group of Robots and Intelligent Machines

Rafael Aracil	rafael.aracil@upm.es	<a href="http://sade.disam.etsii.upm.es/en">http://sade.disam.etsii.upm.es/en</a>
---------------	----------------------	---

## Robotics & Cybernetics Group

Antonio Barrientos	antonio.barrientos@upm.es	<a href="http://www.robcib.etsii.upm.es">www.robcib.etsii.upm.es</a>
--------------------	---------------------------	--

## Intelligent Agents for Ubiquitous Computing

Francisco Serradilla	francisco.serradilla@upm.es	<a href="http://kirk.eui.upm.es/aicu">http://kirk.eui.upm.es/aicu</a>
----------------------	-----------------------------	---

## System and Software Technology Group

Juan Garbajosa	juan.garbajosa@upm.es	<a href="http://syst.eui.upm.es">http://syst.eui.upm.es</a>
----------------	-----------------------	---

## Group of Sensors and Actuators

Carlos Morón	carlos.moron@upm.es	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=11613001">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=11613001</a>
--------------	---------------------	---

In the same way that contents are a key factor for the network development empowering the Web evolution towards the second generation Internet, the future multimedia Internet becomes a crucial factor for the development of the Future Internet.

One of the priorities on the UPM research agenda is the creation of the infrastructure necessary to deliver the future multimedia contents to be exploited, which does not depend on the device in use.

Consequently, one of the concepts UPM is working on is the migration from the current 2D media contents towards a Web handling 3D contents, generating a fully immersive multisensorial environment to the user, including haptics, smell, etc., thus beyond any 3D audiovisual scenario. Multimedia semantic search engines regarding the mechanisms for automatic indexation of new 2D/3D content types are expected to become one of the key paradigms in the forthcoming decades. 3D graphics, 3D video, their combination and metadata, and its integration in virtual and augmented reality systems are some of the research challenges undertaken by the UPM researchers.

In this context, semantic web technologies will enable reutilization, discovering, selection and automatic or semi-automatic composition of web services, while providing support to its execution and monitoring. These functionalities are enabled by the employment of semantic annotation of web services.

At the same time, virtual reality and virtual environment technologies form the core research activities at UPM. These technologies range from the development of methods, architectures and tools for the intelligent virtual environments, to the analysis and design of Intelligent Virtual Agents in multiagent systems, including the applications that these tools enable (e-learning, e-inclusion, etc.).

Finally, the arrival of Peer-To-Peer (P2P) networks and its expected evolution towards P4P enables the opening of new ways to real time archives sending and the improvement of data transmission capabilities in currently existing networks. Contributing to this challenge, the UPM research aims at obtaining for every item in the value chain, the ability to adapt dynamically the content, to transmit it in a scalable and personalised way and to make the required adaptation of this scalable content independently of the terminal or network supported (PC, IPTV STB, Mobile, etc.).

Contact	Email	Web
<b>Image Processing Group (GTI)</b>		
Narciso García	<a href="mailto:narciso.garcia@upm.es">narciso.garcia@upm.es</a>	<a href="http://www.gti.ssr.upm.es">www.gti.ssr.upm.es</a>
<b>Telecommunication &amp; Internet Networks and Services Research Group (RSTI)</b>		
Raquel Pérez	<a href="mailto:rperez@dit.upm.es">rperez@dit.upm.es</a>	<a href="http://www.dit.upm.es/rsti">www.dit.upm.es/rsti</a>
<b>Next Generation Internet</b>		
Juan Quemada	<a href="mailto:juan.quemada@upm.es">juan.quemada@upm.es</a>	<a href="http://internetng.dit.upm.es/english">http://internetng.dit.upm.es/english</a>
<b>Visual Telecommunications Application Group (G@TV)</b>		
Federico Álvarez	<a href="mailto:federico.alvarez@upm.es">federico.alvarez@upm.es</a>	<a href="http://www.gatv.ssr.upm.es/index_en.htm">www.gatv.ssr.upm.es/index_en.htm</a>
<b>Communication Networks and Services (RSC)</b>		
Carlos Miguel	<a href="mailto:carlos.miguel@upm.es">carlos.miguel@upm.es</a>	<a href="http://www.dit.upm.es/imasd">www.dit.upm.es/imasd</a>
<b>Centre for Integral Domotics</b>		
Asunción Santamaría	<a href="mailto:asun.santamaria@upm.es">asun.santamaria@upm.es</a>	<a href="http://www.cedint.upm.es">www.cedint.upm.es</a>
<b>Optical Engineering Group</b>		
Pablo Benítez	<a href="mailto:pablo.benitez@upm.es">pablo.benitez@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=09091003">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=09091003</a>
<b>Speech Technology Group</b>		
José Manuel Pardo	<a href="mailto:josemanuel.pardom@upm.es">josemanuel.pardom@upm.es</a>	<a href="http://www.gth.die.upm.es">www.gth.die.upm.es</a>
<b>BABEL Research Group: Programming Languages and Reliable Software</b>		
Juan José Moreno	<a href="mailto:juanjose.moreno@upm.es">juanjose.moreno@upm.es</a>	<a href="http://babel.ls.fi.upm.es">http://babel.ls.fi.upm.es</a>
<b>Application of the Information and Communication Technologies to the Education</b>		
José Luis Maté	<a href="mailto:joseluis.mate@upm.es">joseluis.mate@upm.es</a>	<a href="http://decoroso.ls.fi.upm.es">http://decoroso.ls.fi.upm.es</a>
<b>Validation and Business Applications Group</b>		
Jesús Cardeñosa	<a href="mailto:jesus.cardenosa@upm.es">jesus.cardenosa@upm.es</a>	<a href="http://www.vai.dia.fi.upm.es">www.vai.dia.fi.upm.es</a>
<b>Biomedical Informatics Group</b>		
Victor Maojo	<a href="mailto:victormanuel.maojo@upm.es">victormanuel.maojo@upm.es</a>	<a href="http://www.gib.fi.upm.es/GIB/index_en.jsp">www.gib.fi.upm.es/GIB/index_en.jsp</a>
<b>Computing Vision</b>		
José María Sebastián	<a href="mailto:jose.sebastian@upm.es">jose.sebastian@upm.es</a>	<a href="http://www.disam.upm.es/vision">www.disam.upm.es/vision</a>
<b>Electronic and Microelectronic Design Group (GDEM)</b>		
César Sanz	<a href="mailto:cesar.sanz@upm.es">cesar.sanz@upm.es</a>	<a href="http://www.sec.upm.es/gdem/en/index.php">www.sec.upm.es/gdem/en/index.php</a>

Applications have evolved towards collaborative applications in such a way that the social dimension is now more important than the content itself. Therefore the contents and services are generated in a way that all technologies are directed by user's preferences and expectations and are adapted to their behaviour and reactions.

Following this trend the Future Internet is aiming to meet the expectations and needs of common people by facilitating daily tasks of individuals, communities, and organizations and to break the boundaries between the producer and the consumer. This new approach identifies people not only as "consumers" but as a part of a creative flow of knowledge (as producers), so called "prosumers".

Security and trustworthiness of the Web of the future are the prime characteristics which inspire the ICT research at UPM. The communication between different types of devices forces the integration of the security elements in each one, which results in a convergence of different technologies depending on their application modes. For this purpose UPM participates in international research projects such as NEXOF-RA. This project will work on the detection and mitigation of Denegation of Service Attacks and against the fraud in mobile services or in the protection of the service-oriented infrastructures.

Federated identity management technologies will induce better system reliability. Having this in mind the UPM researchers work on the development of technologies for the integration of heterogeneous systems, and on the application of ontologies related to network management and systems security. In the same way, in order to make the network more trustworthy, it is important to increase its ability to respond to attacks or intrusions. To ensure this reaction the automated Incident Response Systems (IRS) is also developed at the UPM.





Contact	Email	Web
<b>Telecommunication &amp; Internet Networks and Services Research Group (RSTI)</b>		
Victor Villagr�	<a href="mailto:victor.villagra@upm.es">victor.villagra@upm.es</a>	<a href="http://www.dit.upm.es/rsti">www.dit.upm.es/rsti</a>
<b>Integrated Systems Laboratory (LSI)</b>		
Carlos Alberto L�pez Barrio	<a href="mailto:c.lbarrio@upm.es">c.lbarrio@upm.es</a>	<a href="http://www.lsi.die.upm.es">www.lsi.die.upm.es</a>
<b>Next Generation Internet</b>		
Juan Quemada	<a href="mailto:juan.quemada@upm.es">juan.quemada@upm.es</a>	<a href="http://internetng.dit.upm.es/english">http://internetng.dit.upm.es/english</a>
<b>Real-Time Systems and Telematic Services Architecture</b>		
Juan Antonio de la Puente	<a href="mailto:juan.de.la.puente@upm.es">juan.de.la.puente@upm.es</a>	<a href="http://www.dit.upm.es/str">www.dit.upm.es/str</a>
<b>Signal Processing Applications Group (GAPS)</b>		
Francisco Javier Casaj�s	<a href="mailto:javier.casajus@upm.es">javier.casajus@upm.es</a>	<a href="http://www.gaps.ssr.upm.es">www.gaps.ssr.upm.es</a>
<b>Communication Networks and Services (RSC)</b>		
Vicente Burillo	<a href="mailto:vicente.burillo@upm.es">vicente.burillo@upm.es</a>	<a href="http://www.dit.upm.es/imasd">www.dit.upm.es/imasd</a>
<b>Distributed Systems Labs (LSD)</b>		
Ricardo Jim�nez Peris	<a href="mailto:ricardo.jimenez.peris@upm.es">ricardo.jimenez.peris@upm.es</a>	<a href="http://lsd.ls.fi.upm.es">http://lsd.ls.fi.upm.es</a>
<b>Quantum Information and Computation Group</b>		
Vicente Mart�n	<a href="mailto:vicente.martin@upm.es">vicente.martin@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=19100507">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=19100507</a>
<b>Cryptology Laboratory</b>		
Jorge D�vila	<a href="mailto:jorge.davila@upm.es">jorge.davila@upm.es</a>	<a href="http://tirnanog.ls.fi.upm.es">http://tirnanog.ls.fi.upm.es</a>
<b>Computer Networks &amp; Web Technologies Laboratory</b>		
Javier Soriano	<a href="mailto:javier.soriano@upm.es">javier.soriano@upm.es</a>	<a href="http://conwet.fi.upm.es">http://conwet.fi.upm.es</a>
<b>BABEL Research Group: Programming Languages and Reliable Software</b>		
Juan Jos� Moreno	<a href="mailto:juanjose.moreno@upm.es">juanjose.moreno@upm.es</a>	<a href="http://babel.ls.fi.upm.es">http://babel.ls.fi.upm.es</a>
<b>Computing Sciencies in Education and Knowledge Transfer</b>		
Jos� Alberto Jaen	<a href="mailto:josealberto.jaen@upm.es">josealberto.jaen@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=05050502">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=05050502</a>
<b>Telematic Systems for the Information and Knowledge Society</b>		
Ana G�mez Oliva	<a href="mailto:ana.gomez@upm.es">ana.gomez@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=17590301">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=17590301</a>
<b>Electroacoustic and Signal Processing</b>		
Jos� Luis S�nchez	<a href="mailto:joseluis.sanchez.bote@upm.es">joseluis.sanchez.bote@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=17590102">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=17590102</a>
<b>Group for Automation in Signals and Communications (GASC)</b>		
Diego Andina	<a href="mailto:d.andina@upm.es">d.andina@upm.es</a>	<a href="http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=09093502">http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=09093502</a>
<b>Visual Telecommunications Application Group (G@TV)</b>		
Jos� Manuel Men�ndez	<a href="mailto:jm.menendez@upm.es">jm.menendez@upm.es</a>	<a href="http://www.gatv.ssr.upm.es/index_en.htm">www.gatv.ssr.upm.es/index_en.htm</a>

Together with the concept of the Future Internet, the European Commission has launched the experimental support network in and beyond Europe. In addition to the currently available means (e.g., GEANT system for Europe), new resources are directed to structure a set of experimental testbeds, such as FIRE, PANLAB, ONELAB, etc., managed by European entities. These labs will allow testing new protocols and services, as well as to generate solutions for the new network architectures.

The new infrastructures must be prepared to test the advanced concept of Future Internet and to validate new developments, concepts and services. In a similar way as the CERN provides support for the advance physics research, a similar infrastructure is required to support the Future Internet, ie. a place where all researchers could test their advances in an environment adapted and adaptable to the new paradigms.

UPM is conscious that experimentally driven research is needed to join the multi-disciplinary, exploratory, and long-term research with technology engineering, large-scale validation, and testing. This has to be built by gradually connecting existing and new testbeds with the emerging Internet technologies.

Having this in mind, UPM is working on the design and development of the tools needed for the creation of virtual networks, such as the use in protocols and application testbeds. UPM tackles basic and applied research related to: development of operational environments; monitoring and testing of service-oriented complex systems; development of generic components of services interfaces supporting different communication protocols.

Moreover, the University has launched, cooperating with most relevant Spanish private stakeholders, a laboratory which simulates a house environment in order to develop ambient intelligence applications. UPM is also involved in the creation of a large European laboratory which will be able to host the Future Internet experiments in line with the research proposed by the European Institute of Innovation and Technology.



Contact	Email	Web
<b>Telecommunication &amp; Internet Networks and Services Research Group (RSTI)</b>		
David Fernández	david.fernandez@upm.es	www.dit.upm.es/rsti
<b>Signal Processing Applications Group (GAPS)</b>		
Francisco Javier Casajús	javier.casajus@upm.es	www.gaps.ssr.upm.es
<b>Communication Networks and Services (RSC)</b>		
Antonio Martínez	antonio.martinez.mas@upm.es	www.dit.upm.es/imasd
<b>Software and Systems Technologies Group</b>		
Juan Garbajosa	juan.garbajosa@upm.es	http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=11612501
<b>BABEL Research Group: Programming Languages and Reliable Software</b>		
Juan José Moreno	juanjose.moreno@upm.es	http://babel.ls.fi.upm.es
<b>Computing applied to Signal and Image Processing</b>		
Pedro Gómez	pedro.gomezv@upm.es	http://meminv.upm.es/giweb/GIWEB/Grupo.jsp?idGrupo=19610501
<b>Next Generation Internet</b>		
Tomás Robles	tomas.robles@upm.es	http://internetng.dit.upm.es/english
<b>Radiation Group</b>		
Miguel Calvo	miguel.calvo@upm.es	www.gr.ssr.upm.es/gr_uk.htm

## 2 Projects in FP7 ICT Challenge 1 with UPM participation

“Pervasive and Trustworthy Network and Service Infrastructures”



**PROJECT: Admire**

**Title:** Advanced Data Mining and Integration Research for Europe

**TOTAL BUDGET:** 3.001.662 M€ **FUNDING SCHEME:** STREP

**Web:** <http://admire1.epcc.ed.ac.uk/>

UPM Principal Researcher: Asunción Gómez Pérez,  
asun@fi.upm.es, +34 91 3367439

**ADMIRE** aims to deliver a consistent and easy-to-use technology for extracting information and knowledge. The project is motivated by the difficulty of extracting meaningful information by data mining combinations of data from multiple heterogeneous and distributed resources. It will also provide an abstract view of data mining and integration, which will give users and developers the power to cope with complexity and heterogeneity of services, data and processes. Project coordinator: University of Edinburgh (UK).



**PROJECT: N4C**

**Title:** Networking for Communications Challenged Communities: Architecture, Test Beds and Innovative Alliances

**TOTAL BUDGET:** 5.011.684 M€ **FUNDING SCHEME:** STREP

**Web:** <http://www.n4c.eu/Home.htm>

UPM Principal Researcher: Santiago Zazo Bello,  
santiago.zazo@upm.es, +34 91 3367366

The target of the **N4C** project is the deployment and testing of ubiquitous and pervasive networking for communications challenged communities in a manner consistent with an overall vision for a future Internet that can encompass not just users and applications in well connected regions, but that can also reach out to rural areas. Project coordinator: Luleå University of Technology (SE).



**PROJECT: AWISSENET**

**Title:** Ad-hoc personal area network and Wireless Sensor SEcure NETWORK

**TOTAL BUDGET:** 1.959.642 M€ **FUNDING SCHEME:** STREP

**Web:** <http://www.awissenet.eu/home.aspx>

UPM Principal Researcher: Francisco Javier Casajús Quirós,  
javier@gaps.ssr.upm.es, +34 91 5495700 (7280)

**AWISSENET** is a project focused on security and resilience across ad-hoc PANs and wireless sensor networks. AWISSENET motivation is to implement and validate a scalable, secure, trusted networking protocol stack, able to offer self-configuration and secure roaming of data and services over multiple administrative domains and across insecure infrastructures of heterogeneous ad-hoc and wireless tiny sensory networks. Project coordinator: Hellenic Aerospace Industry (GR).



#### PROJECT: WHERE

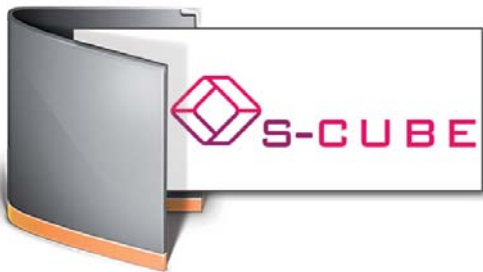
**Title:** Wireless Hybrid Enhanced Mobile Radio Estimators

**TOTAL BUDGET:** 4.046.985 M€ **FUNDING SCHEME:** STREP

**Web:** <http://www.kn-s.dlr.de/where/>

UPM Principal Researcher: Francisco Javier Casajús Quirós,  
javier@gaps.ssr.upm.es, +34 91 5495700 (7280)

The main objective of **WHERE** is to combine wireless communications and navigation for the benefit of future mobile radio systems. The impact will be manifold, such as real time localization knowledge in B3G/4G systems which increase the cellular capacity. GPS as well as the upcoming European Satellite Navigation System Galileo will be supplemented with techniques that improve accuracy and availability of indoor navigation and location based service coverage. Project coordinator: Deutsches Zentrum fuer Luft- und Raumfahrt (DE).



#### PROJECT: S-CUBE

**Title:** Software Services and Systems Network

**TOTAL BUDGET:** 9.964.908 M€ **FUNDING SCHEME:** NoE

**Web:** <http://www.s-cube-network.eu/>

UPM Principal Researcher: Manuel Carro Liñares,  
manuel.carro@upm.es, +34 91 3363747

**S-Cube** will establish an integrated, multidisciplinary, vibrant research community. This will enable Europe to lead the software-services revolution, thereby helping shape the software-service based Internet which is the backbone of our future interactive society. Project coordinator: University of Duisburg-Essen (DE).



#### PROJECT: ROMULUS

**Title:** Domain Driven Design based on Open Source Java Metaframework for Pragmatic Web Development

**TOTAL BUDGET:** 2.179.686 M€ **FUNDING SCHEME:** STREP

**Web:** <http://www.ict-romulus.eu/home>

UPM Principal Researcher: Juan Carlos Dueñas López,  
juancarlos.duenas@upm.es, + 34 91 3366831

The main concept of **ROMULUS** is researching on novel methods for increasing productivity and reliability of web software development, in particularly, focused on Java web development. ROMULUS proposal is based on recognising some of the deficiencies of standard Java Enterprise Edition, and proposing a new paradigm for developing web applications taking advantage of new trends in software engineering, such as domain driven design combined with agile development methodologies, and some of the principles from Ruby on Rails. Project coordinator: GESFOR (ES).





**PROJECT: SEA**

**Title:** SEAmless Content Delivery

**TOTAL BUDGET:** 2.110.745 M€ **FUNDING SCHEME:** STREP

**Web:** <http://www.ist-sea.eu/>

UPM Principal Researcher: José Manuel Menéndez García;  
jmm@gatv.ssr.upm.es, +34 91 91 3367344

**SEA** project aims to offer a new experience of seamless video delivery, maintaining the integrity and wherever applicable, adapting and enriching the quality of the media across the whole distribution chain. SEA aims eventually to provide citizens with the means to offer personalized A/V user-centric services, improving their quality of life, entertainment and safety. Project coordinator: SYNELIXIS (GR).



**PROJECT: ProTest**

**Title:** Property-based Testing

**TOTAL BUDGET:** 2.852.443 M€ **FUNDING SCHEME:** STREP

**Web:** <http://www.protest-project.eu/>

UPM Principal Researcher: Lars-Ake Fredlund,  
fred@babel.ls.fi.upm.es, + 34 91 3366903

**ProTest** will deliver methods and tools to support property-based development of systems. It aims to automate much fault-finding and diagnosis, reducing its cost and improving effectiveness, based on properties of the system (specified by developers) which should always hold. Automated tools will generate and run tests, monitor execution at run-time, and log events for post-mortem analysis. When properties fail, the tools will search for simplest failing cases, and analyse trace and coverage information, to assist speedy diagnosis. Concurrency is a major challenge, which will be addressed in part by integrating model-checking into our tools. Project coordinator: University of Sheffield (UK).



**PROJECT: FAST**

**Title:** Fast and Advanced Storyboard Tools

**TOTAL BUDGET:** 3.683.871 M€ **FUNDING SCHEME:** STREP

**Web:** <http://fast.morfeo-project.eu/>

UPM Principal Researcher: Francisco Javier Soriano Camino,  
javier.soriano@upm.es, + 34 91 3367454

The main objective of **FAST** is to create a new a visual programming environment that will facilitate the development of complex front-end gadgets, involving execution of relatively complex business processes that rely on back-end semantic Web services. Project coordinator: Telefonica I+D (ES).



**PROJECT: NEXOF**

**Title:** NESSI Open Framework

**TOTAL BUDGET:** 4.000.000 M€ **FUNDING SCHEME:** STREP

UPM Principal Researcher: Ricardo Jiménez Peris,  
ricardo.jimenez.peris@upm.es, +34 91 3367452

The overall ambition of **NEXOF** is to deliver a coherent and consistent open service framework, ranging from the infrastructure up to the interfaces with the end users, leveraging research in the area of service-based systems to consolidate and trigger innovation in service-oriented economies. Project coordinator: Engineering – Ingeniería Informática (IT).



**PROJECT: STREAM**

**Title:** Scalable Autonomic Streaming Middleware for Real-time Processing of Massive Data Flows

**TOTAL BUDGET:** 2.609.597 M€ **FUNDING SCHEME:** NoE

Web: <http://www.streamproject.eu/>

UPM Principal Researcher: Ricardo Jiménez Peris,  
ricardo.jimenez.peris@upm.es, +34 91 3367452

A growing number of applications requires the ability to analyze massive amounts of streaming data in real-time. Examples of such applications are: market data feed processing of the output of large scale ad-hoc networks, etc. **STREAM** aims at providing a highly scalable middleware platform to enable a new breed of such applications. Project coordinator: Universidad Politécnica de Madrid (ES).

# 3 UPM participation in Technology Platforms related to Future Internet

## a European Technology Platforms

Member of the Sterring Board



Member



## b Spanish Technology Platforms

Member of the Sterring Board



Plataforma Tecnológica de  
Convergencia hacia Internet  
del Futuro

Member



# UPM European Projects Office

The European Projects Office at the Universidad Politécnica de Madrid is the unit in charge of promoting research activities of the University in order to foster participation of the UPM researchers in the European R&D Programmes such as 7<sup>th</sup> Framework Programme, Competitiveness & Innovation Framework Programme, Joint Technology Initiatives, ERA-NET, initiatives based on article 169 (AAL), EUREKA, COST and ESA contracts.



**POLITÉCNICA**

**Universidad Politécnica de Madrid**  
**European Projects Office**

Ramiro de Maeztu, 7

E-28040 Madrid

Tlf: +34 91 336 36 39

Fax: +34 91 336 59 74

Email: [internacional.investigacion@upm.es](mailto:internacional.investigacion@upm.es)