



monami

**2nd International ICST Conference
on Mobile Networks & Management**

2010

Preliminary Conference Program Guide

22–24 September 2010

Santander, Spain



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Welcome to MONAMI 2010

It gives us great pleasure to welcome you to the Second International ICST Conference on Mobile Networks and Management (MONAMI) held in Santander, Spain on 22-24 September 2010. MONAMI 2010 aims at bringing together top researchers addressing the challenges in the area of Mobile Network Management. This year, the program features papers reporting results from flagship European projects in this research area, such as 4WARD, EARTH, EIPSANS, and SAIL.

Multiaccess and resource management, mobility management, and network management have emerged as core topics in the design, deployment, and operation of current and future networks. Yet, they are treated as separate, isolated domains with very little interaction between the experts in these fields and lack cross-pollination. MONAMI 2010 offers the opportunity to leading researchers, industry professionals, and academics around the world to meet and discuss the latest advances in these areas and present results related to technologies for true plug-and-play networking, efficient use of all infrastructure investments, and access competition. The aim of the forum is to disseminate the latest innovative mobile network solutions for increased competition and cooperation in an environment with a multitude of access technologies, network operators, and business actors.

Santander, a modern cosmopolitan city with a rich historical past, has become in recent years the place chosen by many professional people to celebrate their conventions, congresses and business meetings. The appealing social and cultural background and the city's high-quality service offerings have turned the capital of Cantabria into a city qualified to entice both the traveler who simply comes to explore it on leisure and the professional who arrives in Santander, not only to work but also to enjoy the city's charm, culture, people and atmosphere. The beauty of the environment that surrounds Santander does not leave any of the approaching visitors indifferent. From the beautiful Bay of Santander, considered one of the most beautiful in Spain, bathing the southern area of the city, till the Lighthouse, passing along the majestic *Sardinero* beach, Santander offers one of the best settings in the world to host a conference. In this sense, we have planned for a program which merges the two aspects: high-quality research presentations followed by active discussions with social activities that enable the participants to network while enjoying the beauty of our city.

We look forward to seeing you in Santander!

On behalf of the executive committee,

MONAMI 2010 General Chairs

Kostas Pentikousis
Huawei Technologies European Research Center, Germany

Ramón Agüero
University of Cantabria, Spain

Welcome from the Technical Program Chairs

MONAMI 2010 is covering a range of topics in mobile networks and their management that are currently of high interest in the mobile and wireless research area. In particular, multiaccess networks, along with the associated resource management issues, self organizing network management architectures and service provisioning have emerged as core topics in the design, deployment and operation of current and future networks. After a thorough peer review process, 24 submissions were selected based on their relevance to the scope of the conference and their technical merit. These will all be orally presented during the conference sessions and are included as full papers in the MONAMI 2010 proceedings. Further, five position papers, reporting work in progress and presenting future research directions, were selected after a peer-review process that focused on relevance and originality. The position papers will complement the program and are also included in the conference proceedings. MONAMI adopts a single-track presentation format, which fosters full and active participation by all attendees.

In addition to the oral presentations of the selected papers, the conference program features two keynotes. Professor Joan Serrat of UPC will introduce the C3SEM Project Vision in a talk titled "Service Management in Future Networks". José Manuel Hernández of Telefónica R+D will give the second keynote on "Smart Cities: The Silent IoT Revolution". Last but not least, the conference will open with a world-class tutorial on Machine to Machine (M2M) communications, a topic of active and growing interest, by Mischa Dohler and Jesús Alonso-Zárate.

We acknowledge the vital role that the Technical Program Committee members and referees played during the review process. Their efforts ensured that all submitted papers received thorough and constructive comments during the peer-review evaluation. We also want to thank Carlo Giannelli, our Publications Chair, for making sure that the Proceedings CD is assembled with great care.

Finally we would like to welcome you, the participant, at the conference. By attending MONAMI 2010 you will have the opportunity to network and get informed about the latest results and developments in top EU projects. We expect that this year's program will trigger fruitful discussions making the conference a very active forum, and foster future cooperation between the participants.

On behalf of the Technical Program Committee,

MONAMI 2010 Technical Program Co-Chairs

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University of Cantabria, Spain

Symeon Papavasileiou
National Technical University of Athens, Greece

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Jens Gebert, Alcatel-Lucent Bell Labs, Germany

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Victor Gil, University Carlos III, Spain

Diogo Gomes, Instituto de Telecomunicacoes - University of Aveiro, Portugal)

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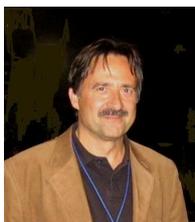
Alessandra Toninelli, University of Bologna, Italy

Fatima Zarinni, Stony Brook University, USA

Keynotes

Thursday 23 September 2010, 9:00 – 10:30

Service Management in Future Networks: The C3SEM Vision



Professor Joan Serrat

Universitat Politècnica de Catalunya, Spain

Abstract—Future Internet services encompass scenarios where highly heterogeneous and free networks supported by Wi-Fi, WiMAX and LTE technologies will compete to grant users access to a plethora of services and applications. In this context, clients will be able to choose the best provider and access technology for the time and place they are trying to connect from. This will foster the settlement of a new and free market of Internet connectivity providers. The C3SEM project is contributing to pave the transition to such scenarios by conceiving enabling service pricing techniques. We understand that using the right pricing strategy, an operator will try to obtain the highest possible revenue while the users will try to get a service that fits their requirements at the minimum possible price. Our approach consists of a distributed, rule-based pricing system that implements a set of intuitive market ideas in the shape of policy-rules to be enforced on the price charged by each provider. Those rules are aimed to improve the quality of service and to increase the global income of a service provider in that world in which users are free to choose every time they connect. Based on disjoint context variables, our rules may easily conflict themselves. Therefore we have envisaged a mechanism based on a proximity metric of the events to the conditions that are fulfilled to solve such conflicts.

In addition, a complementary but different research line is also being explored, namely the need to create virtual infrastructure capable to support the service provider offers with the appropriate QoS levels. This work addresses the need to bridge the gap that has existed for a long time between business and configuration management. Our idea is based on the identification of relevant business indicators, which in turn are used in the process of designing configuration policies to regulate the creation of virtual networks according to the service provider needs.

Biography—Joan Serrat started conducting research in network management in 1995 being involved since then in 15 research projects competitive-funded by the European Union and the Spanish Ministry of Research and Innovation. Currently he is leading the UPC research group in the European Network of Excellence for the Management of Internet Technologies and Complex Services (EMANICS) and in the Autonomic Internet project (Autol) within the 7th FP of the European Union (EU). Professor Serrat is author or co-author of 6 books and around 150 contributions to technical and scientific fora and magazines. He is also contributor to the FIA-MANA initiative of the EU and the contact point of the Telemangement Forum at UPC.

Friday 24 September 2010, 9:00 – 10:30

SmartCities, the Silent IoT Revolution**José Manuel Hernández**

Telefónica R+D, Spain

Abstract—More than half of the world's population lives nowadays in cities. Moreover, this proportion is day by day increasing. Besides, and as urban environments are becoming denser and more complex, cities face problems in many different areas, some of them related to information services, urban mobility, and energy efficiency. Fortunately, it is in the city context where a limited investment in ICT infrastructures can be more easily streamlined, benefiting both citizens and municipalities.

From a practical point of view, a big opportunity lies currently on the utilization of the innovative IoT technologies developed in recent years to improve the quality of life of the citizens. With these principles in mind, a number of initiatives with different multidisciplinary approaches are being currently developed worldwide at different locations. SmartSantander, overviewed in this talk, is one of the most remarkable ones.

Biography—José Manuel Hernández received his Master's degree in Telecommunications Engineering from the University of Madrid (Politécnica) in 1987. In 1985 worked for Alpes Ingenieros S.A. and in 1988 with the Center for Technological and Industrial Development of the Spanish Government. He joined Telefonica I+D in 1990, getting involved in several EU funded projects. In 1998 he took part in the management of TID's Innovation Plan (1998-2001), and coordinated TID participation on several European Programs (IST, Eureka, COST, Telematics, etc.). He was appointed Head of Division in 2001. He has been Secretary of the Permanent Committee on Networks & Services of AHCINET, and representative for Telefonica at the W3C. He is author of over twenty articles and contributions to both national and international magazines and symposiums, has been granted four patents, and was Associated Professor in the Telematics Engineering Department of the Carlos III University of Madrid (2002-2007).

Tutorial

Wednesday 22 September 2010, 9:00 – 12:30

Machine-to-Machine: An Emerging Communication Paradigm



Mischa Dohler and Jesús Alonso-Zárate

CTTC, Spain

Abstract—An unprecedented communication paradigm facilitating the connection between a prior unseen number of devices is currently gripping both industrial as well as academic communities. Referred to as machine-to-machine (M2M) communication, it is essentially composed of three key ingredients: 1) a wireless end-device, 2) an infrastructure-based or infrastructure-less wireless carrier network, and 3) the back-end server network. The gamut of application for such a composite scenario mixing short-range and wide-range communication systems is vast, including e.g. consumer electronics, smart energy, telemetry, health care, industrial control, and general means of boosting the usage of existing telecoms infrastructures by offering communications and connectivity at large. Market prospects of M2M are thus very encouraging, which was estimated at €20bn in 2005 already and is expected to reach €200bn in Q4 2010 connecting more than 100bn communicating devices. The aim of this tutorial is to provide a detailed technical insight into latest key aspects of M2M networks. To this end, we will discuss the heterogeneous set of available end-device technologies applicable to M2M systems. We will then dwell on different approaches to provide the infrastructure of M2M end-devices so that back-end servers can be reached at minimum delay and minimum energy expenditure. The tutorial will be complemented by a discussion on latest standardization efforts pertaining to M2M as well as a thorough summary on open research challenges.

Biographies

Mischa Dohler is now Senior Researcher with CTTC in Barcelona. Prior to this, from June 2005 to February 2008, he has been Senior Research Expert in the R&D division of France Telecom working on cooperative communication systems, cognitive radios and wireless sensor networks. From September 2003 to June 2005, he has been lecturer at King's College London, Centre for Telecommunications Research. At that time, he has also been London Technology Network Business Fellow for King's College London, as well as Student Representative of the IEEE UKRI Section and member of the Student Activity Committee of IEEE Region 8. He obtained his PhD in Telecommunications from King's College London, UK, in 2003, his Diploma in Electrical Engineering from Dresden University of Technology, Germany, in 2000, and his MSc degree in Telecommunications from King's College London, UK, in 1999. Prior to Telecommunications, he studied Physics in Moscow. He has won various competitions in Mathematics and Physics, and participated in the 3rd round of the International Physics Olympics for Germany. In the framework of the Mobile VCE, he has pioneered research on distributed cooperative space-time encoded

communication systems, dating back to December 1999. He has published more than 110 technical journal and conference papers at a citation h-index of 20 and citation g-index of 40, holds several patents, co-edited and contributed to several books, has given numerous international short-courses, and participated in standardisation activities. He has been TPC member and co-chair of various conferences, technical chair of IEEE PIMRC 2008 held in Cannes, France, and is editor for the IEEE Communications Letters, the IEEE Transactions on Vehicular Technology, the IEEE Communications Magazine, the IEEE Wireless Communications, the IET Communications, the Elsevier Physical Communications journal, the EURASIP JWCN journal, the Bentham Science Recent Patents on Computer Science journal, and the International Journal of Parallel, Emergent and Distributed Systems. He is a Senior Member of the IEEE. In addition to being an experienced lecturer in academia (4 years of MSc and BSc courses at King's College London) and industry (7 years at Mobile VCE and 3 years in France Telecom), he has given over 20 international short-courses, such as on UMTS and Beyond, distributed cooperative systems, wireless sensor networks and issues pertaining to the design of the Internet of Things.

Jesús Alonso-Zárate received his M. Sc. and Ph. D degrees in Telecommunication Engineering from the Universitat Politècnica de Catalunya (UPC, Spain) in March 2004 and February 2009, respectively. From 2004 to 2005, he worked as an Information Technology consultant at Everis (former DMR Consulting). In 2005, his Master Thesis was awarded with the Prize to the Best Master Thesis in Multimedia Communications (given by the Colegio Oficial de Ingenieros de Telecomunicacion, Spain) and he was granted by the Centre Tecnològic de Telecomunicacions de Catalunya (CTTC) to obtain the Ph. D. on Signal Theory and Communications at UPC. While completing his Ph. D. degree, he was granted in 2006 by the European Space Agency (ESA) and by the Generalitat de Catalunya to attend the Space Studies Program (SSP'06) at the International Space University (ISU) in Strasbourg, France. He has also been a visiting teacher assistant at the Escola Politècnica Superior de Castelldefels (EPSC) of the UPC during the second semester of 2007. He is now with the CTTC holding a Research Associate position. Since 2009, he has started to take part of Technical Committees for the organization of international conferences and is supervising a number of MSc and PhD students. He has published over 30 scientific papers in renowned international journals and international conferences over the last years and he has also participated in both public funded and industrial research projects. He is also author of a book and three book chapters devoted to wireless communications.

Technical Sessions

Wednesday 22 September 2010

Routing and Virtualization (14:30-16:30)

Session Chair: Prof. Hussein Badr, State University of New York at Stony Brook, USA

Generic Connectivity Architecture for Mobility and Multipath Flow Management in the Future Internet

Amanpreet Singh, Christoph Nass (University of Bremen, Germany), Andreas Timm-Giel (Hamburg University of Technology, Germany), Peter Schefczik, Horst Roessler and Michael Scharf (Alcatel-Lucent Bell Labs, Germany)

Abstract—With the evolution of the Internet, the vast majority of the traffic is generated by information-centric applications, which would benefit from enhanced data transport paradigms. This paper presents the development and implementation of the Generic Connectivity architecture, a new communication flow abstraction that is based on the Generic Path architecture developed within the European Research Project 4WARD. The Generic Connectivity mechanisms allow for a high degree of flexibility by covering both existing and new protocol paradigms, which are particularly beneficial for wireless access networks. This paper shows that the Generic Connectivity architecture can realize new network mechanisms beyond the features of the current Internet protocol architecture. It is thus a promising clean-slate approach for the Future Internet. The relevant aspects of the architecture are implemented with the OMNET++ 4.0 network simulation tool. Using simulations, the advantages of the Generic Connectivity architecture are shown for several new use cases, including an adaptive protocol selection, mobility, multicast and multipath connectivity over heterogeneous wireless networks. Furthermore, it is also demonstrated that the architecture inherently supports guaranteed Quality-of-Service (QoS) agreements and traffic distribution over dynamic channels.

Using BGP-4 to Migrate to a Future Internet

Pedro Andres Aranda Gutierrez (Telefónica Investigación y Desarrollo, Spain), Petteri Poyhonen, (Nokia Siemen Networks, Finland), Luis Enrique Izaguirre Gamir and Francisco Huertas (Telefónica Investigación y Desarrollo, Spain)

Abstract—The Internet has evolved to become one of the most critical communication infrastructures in the planet. And yet, some of its underlying concepts and protocols do not provide the adequate level of reliability for such an essential role in global communications. The inter-domain routing protocol of the Internet, Border Gateway Protocol (BGP-4), is being used with varying degree of success for tasks for which it was not originally designed, such as Traffic Engineering. This paper presents a rationalized view of the different functions implemented by routing nowadays and proposes the use of Autonomous System Compartments. The Autonomous System (AS) Compartments imply a new routing hierarchy over the traditional BGP-4 routing, where specific functionalities like Traffic Engineering can be better controlled and additional routing incentives can be introduced. The FP-7 project 4WARD is working on new communication paradigms for the Future Internet and AS Compartments are a choice to contain the Generic Path (GP) concept developed by it. In order to provide inter-domain capabilities and a migration tool to connect GP islands, the multiprotocol mechanism of the BGP-4 routing is used. This paper presents the AS Compartment concept and the integration of Generic Paths in it, as well as an implementation of the GP-BGP concept for the J-Sim simulator (JSIM) environment.

Revisiting the Impact of Traffic Engineering Techniques on the Internet's Routing Table

Pedro Andres Aranda Gutierrez (University of Paderborn, Germany)

Abstract—This paper studies the effect of simple Traffic Engineering techniques on the size of the Internet's default free routing table. Current best practices for traffic balancing in the Internet are based in disaggregating prefixes that cause an increase in size of the Internet's core routing table. An algorithm to show the impact of these techniques on the growth of the routing table is proposed. This algorithm is applied on routing tables between January 2001 and December 2009 and the results are discussed. Finally an alternative architecture is proposed, which allows Traffic Engineering while keeping the Internet routing table size optimized.

End-to-end Performance Evaluation of Virtual Networks using a Prototype Implementation

Asanga Udugama, Liang Zhao, Yasir Zaki and Carmelita Goerg (University of Bremen, Germany) and Andreas Timm-Giel (Hamburg University of Technology, Germany)

Abstract—Network virtualization is a concept where physical resources are used to create virtual resources that are combined to form virtual networks. As one of the key enablers of the future Internet, network virtualization solves a number of issues associated with today's networks. Concepts of network virtualization that are not restricted to virtualization technology, termed as overall concepts that include roles of parties and deployment aspects are currently being defined in different research activities. An area that lack attention is the evaluation of performance in prototypes that consider these overall concepts of network virtualization. The work presented here discusses and presents the performance in a network virtualization prototype that considers these overall concepts.



Thursday 23 September 2010

Autonomic Networking (11:00-13:00)

Session Chair: Prof. Joan Serrat, Universitat Politècnica de Catalunya, Spain

Addressing Stability in Future Autonomic Networking

Timotheos Kastrinogiannis (Institute of Communications and Computer Systems, National Technical University of Athens, Greece), Nikolay Tcholtchev, Arun Prakash and Ranganai Chaparadza (Fraunhofer FOKUS Institute for Open Communications Systems, Germany), Vassilios Kaldanis (VELTI S.A, Greece) Hakan Coskun (Fraunhofer FOKUS Institute for Open Communications Systems, Germany), Symeon Papavassiliou (Institute of Communications and Computer Systems, National Technical University of Athens, Greece)

Abstract—When considering autonomic networking, where multiple self-* functionalities, in terms of node-wide or network-wide control loops, must operate, interact and proficiently collaborate, stability problems inherently arise due to the distributed nature of the decision making process and autonomic nodes interactions towards enabling various self-* functionalities, along with the stochastic nature of the networking environment. This article provides a systematic, concrete view of stability in autonomic networks design. It aims at identifying and categorizing fundamental autonomic networks' architectural and designing issues that cause or affect stability, highlighting and discussing corresponding solutions and thus, providing theoretic tools for analyzing and treating them. As a reference model we adopt Generic Autonomic Network Architecture (GANA), a holistic framework for autonomic networks engineering.

An Empirical Evaluation of a Shim6 Implementation

John Ronan and John McLaughlin (TSSG, Waterford Institute of Technology, Ireland)

Abstract—Several solutions are proposed to enable scalable multihoming over IPv6. One of these proposals is shim6, a host-based multihoming solution based on the modification of the Internet Protocol stack of the host. This modification adds a layer below the transport protocols but above the forwarding layer. As this approach makes the modification to the network stack transparent, existing applications automatically benefit from shim6 functionality. In this paper we investigate aspects of the performance of the LinShim6 implementation from University Catholique de Louvain. Also, we augmented the LinShim6 implementation to allow external software to control the locators used between hosts.

Future Autonomic Cooperative Networks

Michal Wodczak (Telcordia Technologies, Poland)

Abstract—Both cooperative transmission and autonomic networking have emerged recently as very promising technologies ready to become the key components of the concept referred to as the Future Internet. Cooperative transmission has been one of the hottest research topics lately capitalizing on the exploitation of relay nodes, while autonomic networking is promoting a very desirable vision that networked systems should be able to act as a living organisms and self-configure without any external intervention. This paper promotes the idea of joint approach to both technologies so the end users are benefited in terms of the quality of services they are provisioned.

An Autonomic Monitoring Framework for QoS Management in Multi-Service Networks

Constantinos Marinos, Christos Argyropoulos, Mary Grammatikou, and Vasilis Maglaris (NETMODE, National Technical University of Athens, Greece)

Abstract—Autonomic monitoring procedures in multi-service networks provide not only feedback to end users, but also self-handling monitoring events to network operators. In this work, we present an autonomic monitoring framework for Quality of Service (QoS) management in multi-service networks. Our framework introduces aggregation mechanisms to deal with the excessive number of alarms, triggered in an autonomic networking environment. The proposed framework was assessed via an early prototype, deployed to IPv6 end-sites, distributed across Europe and interconnected via the Internet.

Mobility Management and IEEE 802.21 (14:30-16:30)

Session Chair: Prof. Rui Aguiar, Institute of Telecommunications - University of Aveiro, Portugal

Safetynet version 2, A Packet Error Recovery Architecture for Vertical Handoffs

Henrik Petander (NICTA, Australia) and Emmanuel Lochin (CNRS, LAAS, University of Toulouse, France)

Abstract—Mobile devices are connecting to the Internet through an increasingly heterogeneous network environment. This connectivity via multiple types of wireless networks allows the mobile devices to take advantage of the high speed and the low cost of wireless local area networks and the large coverage of wireless wide area networks. To maximize the benefits from these complementing characteristics, the mobile devices need to be able to switch seamlessly between the different network types. However, the switch between the technologies, also known as a vertical handoff, often results in significant packet loss and degradation of connectivity due to handoff delay and also increased packet loss rate on the border of the coverage area of the networks. In our previous work, we have proposed an inter technology mobility management architecture which addresses the packet losses using selective resending of packets lost during the handoff period. In this paper, we extend the architecture to address packet losses due to wireless errors more efficiently by taking advantage of erasure codes to form redundancy packets. We propose to send these redundancy packets over both links. We show that this proposal reduces both the chances of packet loss and the buffering requirements of the original SafetyNet scheme.

A Mechanism for Vertical Handover Based on SAW Using IEEE 802.21

Jorge Lima de Oliveira Filho and Edmundo Madeira (University of Campinas, Brazil)

Abstract—Nowadays, there is a lot of devices which are able to access wireless networks through a wide range of access technologies. For a device to move among these heterogeneous networks and stay always connected, mechanisms of vertical handover are needed. This paper proposes a handover decision mechanism using the Simple Additive Weighting (SAW) in a heterogeneous wireless network environment using the IEEE 802.21. The proposed mechanism considers user preferences like cost as parameters of the candidate network to choose the best available network. We present some experiments that use a developed simulator to validate our mechanism. The results of these experiments show that the proposed solution distributes better the mobile nodes among the networks.

Proactive Vertical Handover Optimizations in the 3GPP Evolved Packet Core

Marius Corici, Dragos Vingarzan and Thomas Magedanz (Fraunhofer Institute FOKUS, Germany), Cornel Pampu and Qing Zhou (Huawei Technologies European Research Center, Germany)

Abstract—Mobility in a wireless heterogeneous scenario in which the mobile devices are able to connect to more than one access technology available in their vicinity requires a re-consideration of the access network reselection mechanisms as to ensure seamless handovers for real deployments. This paper describes and evaluates a new proactive vertical handover optimization which enables a fast reselection, independent and in addition to the classic proactive procedures. It uses as central concept the separation between the proactive context establishment and the actual handover triggered operations which may be at their turn active or proactive. This concept is exemplified on the 3GPP Evolved Packet Core and evaluated on a minimal prototype implementation.

Key Distribution Mechanisms for IEEE 802.21-Assisted Wireless Heterogeneous Networks

Fernando Bernal-Hidalgo, Rafael Marin-Lopez and Antonio Fernando Gomez-Skarmeta (University of Murcia, Spain)

Abstract—In recent years there has been a significant growth in the deployment of heterogeneous wireless technologies. Due to its diversity, new multi-interface terminals have appeared and pose new challenges to mobility management and security in wireless networks. In order to achieve a solution to these new challenges several standardisation groups are working to provide solutions that enable a seamless handoff in heterogeneous wireless networks by reducing the latency to obtain network access. In particular, the standardisation task group IEEE 802.21a is studying new media-independent services that allow a secure handoff process as well as mechanisms to reduce the latency during network access control after a mobile handoff. In this article, we analyse, three well-known key distribution mechanisms, in the context of IEEE 802.21a, for secure handover and how these mechanisms can help to reduce the network access time after a handoff in IEEE 802.21-assisted networks.

Wireless Network Management (17:00-19:00)

Session Chair: Prof. Andreas Timm-Giel, Hamburg University of Technology, Germany

Energy Efficiency of Dynamic Interface Selection Mechanisms in Wireless Ad-hoc Networks

Luis Sanchez, Jorge Lanza and Luis Muñoz (University of Cantabria, Spain)

Abstract—Energy efficiency is critical to ensuring scalability, embedding, and portability of emerging computing and communication systems. It is of particular interest in the design of mobile computing systems because of the limitations in energy and power availability. This paper presents and compares in terms of energy efficiency two strategies for the dynamic selection of the outbound interface on multi-radio devices in wireless ad-hoc networks. Findings from the studies show that intelligent selection of communication interface in heterogeneous ad-hoc networks leads to more efficient use of the energy consumed while assuring the quality of service parameters necessary for the correct provision of applications running on top of wireless ad-hoc mobile networks.

Ubiquitous Computing by Utilizing Semantic Interoperability with Item-level Object Identification

Janne Takalo-Mattila, Jussi Kiljander, Matti Eteläperä and Juha-Pekka Soininen (VTT Technical Research Centre of Finland, Finland)

Abstract—This paper presents a novel approach for utilizing item-level object identification in ubiquitous computing environment where the interaction between devices is based on semantic information interoperability. The paper also presents novel methods for human-machine interaction. In our approach we give a unique identifier for objects in the environment and combine the knowledge of the object identity with information from other sources by utilizing semantic information interoperability. The approach utilizes Smart-M3 interoperability solution for sharing semantic information between heterogeneous devices and RFID-technology for identifying physical objects in the environment. In order to demonstrate the use item-level tagging with semantic interoperability we have implemented a Smart Greenhouse demonstrator that consists of several smart devices and tagged objects.

Manager Selection over a Hierarchical/Distributed Management Architecture for Personal Networks

Jose Angel Irastorza, Ramon Agüero and Luis Muñoz (University of Cantabria, Spain)

Abstract—This paper addresses forthcoming wireless communication scenarios, where the personal network concept is believed to play a fundamental role; more specifically, the management framework for such network deployments is studied. It is well known that management tasks are mandatory in order to ensure the correct operation of any type of communication infrastructure. In spite of having been the focus of several works, traditional management architectures, usually based on a centralized model, are not suitable for the particular characteristics of personal networks and their underlying multi-hop topologies. A hierarchical/distributed approach is proposed in this work, which also analyzes different strategies to optimally select the nodes taking the manager role. In order to assess the benefits and drawbacks of these mechanisms, a proprietary simulator was developed, and different metrics were studied (probability for a node to take part on the management architecture, number of hops needed to reach a manager, and fairness of the distribution of the management burden). A novel heuristic is proposed to enhance one of the analyzed strategies, and it is shown to outperform the rest of algorithms.

OLSRp: Predicting Control Information to Achieve Scalability in OLSR Ad Hoc Networks

Esunly Medina, Roc Meseguer (Universitat Politècnica de Catalunya, Spain), Carlos Molina (Universitat Rovira i Virgili, Spain) and Dolors Royo (Universitat Politècnica de Catalunya, Spain)

Abstract—Scalability is a key design challenge that routing protocols for ad hoc networks must properly address to maintain the network performance when the number of nodes increases. We focus on this issue by reducing the amount of control information messages that a link state proactive routing algorithm introduces to the network. Our proposal is based on the observation that a high percentage of those messages is always the same. Therefore, we introduce a new mechanism that can predict the control messages that nodes need for building an accurate map of the network topology so they can avoid resending the same messages. This prediction mechanism, applied to OLSR protocol, could be used to reduce the number of messages transmitted through the network and to save computational processing and energy consumption. Our proposal is independent of the OLSR configuration parameters and it can dynamically self-adapt to network changes.

Friday 24 September 2010

Future Research Directions (11:00-13:00)

Session Chair: José Manuel Hernández, Telefónica R+D, Spain

Scenarios, Research Issues, and Architecture for Ubiquitous Sensing

Theo G. Kanter, Victor Kardeby, Stefan Forsstrom, and Jamie Walters (Mid Sweden University, Sweden)

Abstract—This paper describes research issues and work-in-progress concerning ubiquitous sensing. We present scenarios where current approaches are deficient in addressing the needs for ubiquitous sensing in services and applications on the Future Internet, involving the massive sharing of information from sensors via heterogeneous networks. We propose an information-centric architecture for realtime ubiquitous sensing which capitalizes on the proposed locator/identifier split, thus extending the Network of Information (NetInf) approach. From this we identify challenges for which we present work-in-progress within the framework of the EU-funded MediaSense project. First, we integrate sensors as addressable objects, exposed by means of sensor gateways and relocatable abstract interfaces. Sensor information is thus made available to applications solely based on identity. Second, sensor information is made available in a distributed datamodel towards search and browse. Finally, we evaluate the effectiveness of the architecture in proof-of-concept applications for intelligent commuting, environmental monitoring, and seamless media transfer, utilizing two different sensor platforms.

Challenges for Cloud Networking Security

Peter Schoo, Volker Fusenig (Fraunhofer Institute for Secure Information Technology, Germany), Victor Souza (Ericsson, Sweden), Marcio Melo (Portugal Telecom Inovacao, Portugal), Paul Murray (HP Labs, United Kingdom), Herve Debar, Houssemed Medhioub and Djamel Zeghlache (IT Telecom Sudparis, France)

Abstract—Cloud computing is widely considered as an attractive service model since the users commitments for investment and operations are minimized, and costs are in direct relation to usage and demand. However, when networking aspects for distributed clouds are considered, there is little support and the effort is often underestimated. The project SAIL is addressing cloud networking as the combination of management for cloud computing and vital networking capabilities between distributed cloud resources involved to improve the management of both. This position paper presents new security challenges as considered in SAIL for ensuring legitimate usage of cloud networking resources and for preventing misuse.

Video-Enhancing Functional Architecture for the MEDIEVAL Project

Daniel Corujo and Rui L. Aguiar (University of Aveiro, Portugal), Albert Banchs (IMDEA Networks, Spain), Telemaco Melia (Alcatel-Lucent Bell Labs, Germany), Michelle Wetterwald (EURECOM, France), and Leonardo Badia (Consorzio Ferrara Ricerche, Italy)

Abstract—The MEDIEVAL project aims to leverage today's Internet with the necessary fabric to provide optimized video services in a mobile wireless world. It is expected that video traffic will surpass Peer-to-Peer (P2P) in volume in the coming years, and thus novel mechanisms and techniques need to be provided to better suite its unique requirements. This article describes the key functional elements of the MEDIEVAL architecture, which provides a video-aware networking

core coupled with abstracting interfaces which cater to service and access technology specific requirements, aiming to enable efficient video transport and novel video service development.

EARTH: Paving the Way for Future Energy Efficient Broadband Wireless Networks

Luis Sanchez (TTI, Spain), Oliver Blume (Alcatel-Lucent Bell Labs, Germany), Manuel Gonzalez (TTI, Spain), Gergely Biczók (Budapest University of Technology and Economics, Hungary), Dieter Ferling (Alcatel-Lucent Bell Labs, Germany), and István Gódor (Ericsson Magyarország Kft, Hungary)

Abstract—Currently, the vast majority of mobile subscribers rely on second-generation mobile technologies, but service providers are investing into aggressive rollouts of mobile broadband networks to deliver a fully-featured wireless Internet. While the main focus in research has been put on enhancing the capacity of this kind of networks, very little has been done regarding their energy efficiency. On the other hand, rising energy cost and growing awareness of climate issues require a shift of focus. The EARTH (Energy Aware Radio and networking Technologies) project addresses this by investigating and proposing effective mechanisms to drastically reduce energy wastage and improve energy efficiency of mobile broadband communication systems, without compromising system capacity and users' perceived quality of service. In this paper we sketch the main research approaches taken within the project in order to fulfill this objective. First, the methodologies to evaluate the energy efficiency of cellular networks, as well as the respective energy efficiency metrics are presented. Afterwards, the proposed solutions are described; within EARTH a holistic approach is being used so that advances in radio components, radio network technologies and advanced network management protocols are exploited jointly, resulting in combined gains that enable an expected power consumption reduction by 50%.

A New Perspective on Mobility Management: Scenarios and Approaches

Tiago Condeixa, Alfredo Matos, Ricardo Matos, Susana Sargento (Institute of Telecommunications, University of Aveiro, Portugal), and Rute Sofia (INESC Porto, Portugal)

Abstract—Currently and in the future, users demand for ubiquitous network connection to interact with the world. Moreover, the mobile devices are increasingly widespread and are better equipped in terms of access connections and services support. Mobility management is therefore an intrinsic feature of mobile networks; however, it is not yet ready to support the so called User-provided networks (UPNs), where the network elements can be devices controlled by regular users, or providers, and share subscribed access. In these scenarios, mobility has to be rethought to consider user-centric approaches. This paper discusses the efficiency and applicability of current mobility assumptions in user-centric scenarios, discussing their requirements and solutions addressing several types of networks that may exhibit user-centric characteristics. It also identifies the fundamentals of a user-centric mobility management architecture able to efficiently deal with the dynamicity of the aforementioned scenarios.

Multiaccess Selection (14:30-16:30)

Session Chair: Prof. Susana Sargento, Institute of Telecommunications - University of Aveiro, Portugal

Optimum Selection of Access Networks within Heterogeneous Wireless Environments Based on Linear Programming Techniques

Johnny Choque, Ramon Agüero, Eva-Maria Hortiguela and Luis Muñoz (University of Cantabria, Spain)

Abstract—In this work we analyze the possibilities which are brought about by the use of linear programming techniques in the framework of access selection procedures within heterogeneous wireless network environments. We present a tool which has been designed and implemented (based on the GLPK package) to tackle this problem. This tool, starting from a particular network model, can be used to retrieve the optimum assignment of access elements. To fulfil this goal, we introduce a flexible cost (utility) function, which allows modulating the relevance given to the different aspects which could be taken into consideration while deciding the access alternative to be used: connection with a preferred operator, minimizing the number of handovers, or link quality, amongst others. Afterwards, the tool is used to study a set of canonical access selection strategies, so as to establish the combination of parameters which might lead to better performances.

On the Empirical Analysis of Handover Latency Reduction by Means of Multi-RAT Devices: A Prototypical approach

David Gomez, Ramon Agüero (University of Cantabria, Spain), Jesús Herrero, Bruno Cendón (TST Sistemas, Spain) and Luis Muñoz (University of Cantabria, Spain)

Abstract—In this paper we present an fully empirical assessment of the possibilities which are brought about by an architecture able to handle multiple wireless access technologies. Heterogeneity is believed to play a key role in forthcoming communication scenarios and therefore some entities able to appropriately tackle the new challenges are deemed necessary. Although reaching the Always Best Connected paradigm has gathered the interest of the scientific community, many of the existing works are descriptive (architectural papers) or based on simulation and/or emulation. In this paper we go a step beyond this and starting from the architecture proposed in the Mobilia Celtic project, we deploy a real platform to showcase two illustrative handover examples, triggered either by the end-user and the network. Additionally, we use the same platform to quantitatively analyze the enhancement which the use of multi-RAT devices may provide, in terms of the handover latency reduction.

On the Performance of Static Inter-cell Interference Coordination in Realistic Cellular Layouts

David Gonzalez G, Mario Garcia-Lozano, Silvia Ruiz and Joan Olmos (Universitat Politecnica de Catalunya, Spain)

Abstract—Effective interference management has been recognized by the industry and standardization bodies as a key enabler for 4G systems. This work is about static Inter-Cell Interference Coordination for OFDMA based cellular networks such as LTE. The majority of previous ICIC studies, both theoretical and simulation-based, have been conducted considering synthetic and/or small cellular layouts. In this work, the performance of static ICIC strategies in non-regular cellular layout is studied introducing some related RRM functions in the methodology.

The overall performance assessment gives special attention to the efficiency vs. fairness tradeoff and the elements associated to it. Results show that the design of suitable and effective ICIC schemes for realistic cellular networks can not be done by simply extending classical approaches.

Location Based Ubiquitous Context Exchange in Mobile Environments

Stefan Forsstrom, Victor Kardeby, Jamie Walters and Theo Kanter (Mid-Sweden University, Sweden)

Abstract—Context-aware applications and services require ubiquitous access to context information of users. The limited scalability of centralized servers used in the provisioning of context information mandates the search for scalable peer-to-peer protocols. Furthermore, unnecessary signaling must be avoided in large-scale context networks, when location-based services only require nodes in a certain area with which to communicate context. To this end, we propose a lightweight model for composing and maintaining unstructured location-scoped networks of peer-to-peer nodes, which gossips in order to ensure quality of service for each user. The model is implemented in a prototype application running in a mobile environment, which is evaluated with respect to real-time properties. This model can also be extended to include more context dimensions, other than location.

Wireless Networks (17:00–19:00)

Session Chair: Prof. Theo G. Kanter, Mid Sweden University, Sweden

Maximum Sum-Rate Interference Alignment Schemes for the 3-user Deterministic MIMO Channel

Oscar Gonzalez and Ignacio Santamaria (University of Cantabria, Spain)

Abstract—Closed-form solutions exist for the interference alignment (IA) problem in the multiple-input multiple-output (MIMO) interference channel when there are exactly $K=3$ users. Specifically, when each user wishes to send d streams and is equipped with $N=2d$ antennas at both sides of the link, a finite number of IA solutions exist. Exploiting this observation, in this paper we find the maximum sum-rate solution by exhaustive search over the finite set of IA solutions and evaluate its performance. As an alternative, the solution that maximizes the received sum-power in the interference free subspace is also considered. Simulation results show the improvement achieved by both IA strategies in comparison with the conventional scheme proposed by Cadambe and Jafar, which randomly picks one of the IA solutions. Furthermore, the impact of channel correlation in these interference management techniques has also been studied.

A Novel LTE Wireless Virtualization Framework

Yasir Zaki, Liang Zhao, Carmelita Goerg (University of Bremen, Germany), and Andreas Timm-Giel (Hamburg University of Technology, Germany)

Abstract—Network virtualization is one of the topics that recently have been receiving attention in the research community. It is becoming evidently clear that network virtualization will be a major player in the shaping of the Future Internet. Many research projects around the world are studying different aspects of network virtualization: some are focusing on resource virtualization like Node, Server and Router virtualization; while others are focusing on building a framework to setup virtual networks on the fly based on the different virtual resources. In spite of all that work, we still think that one very important piece of the puzzle is still missing that is “Wireless Virtualization”. According to the best of our knowledge, the virtualization of the wireless medium has not yet received the appropriate attention it is entitled to, and there has been very small work done in that

field. This is why this paper is proposing a framework for the virtualization of the wireless medium. This framework is proposed to virtualize mobile communication systems so that multiple operators can share the same physical resources. We mainly focus on the Long Term Evolution (LTE) but the framework can also be generalized to fit any other wireless system.

Accurate Modelling of OFDMA Transmission Technique using IEEE 802.16m Recommendations for WiMAX Network Simulator Design

Marco Miozzo and Faouzi Bader (CTTC, Spain)

Abstract—Worldwide Interoperability for Microwave Access (WiMAX) is the name selected by WiMAX Forum for referring to the standard defined by the IEEE 802.16 task force. The standard introduces several interesting novelties both from PHY and MAC perspective which lead to a complex architecture. In order to understand and investigate its potentialities, analysis is needed. Due to its intrinsic complicated architecture nature, mathematical models may be only applied to portion of the whole system. The same has done for simulation with link level, system and network simulators. However, the new research requirements impose that the model has to be more comprehensive as possible, in order to take care of all the interactions, from physical to application layer. In this paper we propose a novel library for the Miracle extension for ns2 simulator in which, by means of link-to-system mapping (LSM) techniques, the level of details in the PHY layer to be simulated is tunable in order to take in consideration its important phenomena in a network simulator.

A Simulation Implementation of the LTE-Uu Interface Datalink Layer in OMNeT++

Mohammad Arouri, Ziyad Atiyeh, Anas Mousa, Amna Eleyan (Computer Systems Engineering Department, Birzeit University, Palestine), and Hussein Badr (Department of Computer Science, State University of New York at Stony Brook, USA)

Abstract—The 3rd Generation Partnership Project (3GPP)'s Long Term Evolution (LTE) standards define the next major step in the evolution of cellular systems towards higher data rates, low latency, and greater spectral efficiency. This occurs in the context of a System Architecture Evolution (SAE) that specifies a packet-switched IP architecture for both voice and data transmission. We present a simulation implementation of a key component of the overall LTE-SAE: the L2 (Datalink) layer of the LTE-Uu interface between mobile User Equipment (UE) and a base station eNodeB. The simulation is developed for the INET Framework of OMNeT++ 4.0, an open-source computer-network simulation environment, and implements the Packet Data Convergence Protocol (PDCP), Radio Link Control (RLC), and Medium Access Control (MAC) layers of the LTE-Uu. The implementation is extensible, and is intended to serve as a publicly-available, open-source platform for further simulation development of various aspects of LTE-SAE.

Conference Venue

Edificio I+D+i Ingeniería de Telecomunicaciones, University of Cantabria

The conference will be held at the recently opened (2009) *Telecommunications Engineering Research, Development and Innovation Building*. The building is located on the main campus area of University of Cantabria, in Plaza de la Ciencia (Castros Avenue). This location is privileged, as it is within walking distance (approx. 15 min) from the famous “Sardinero” beach area. Public transportation is also available. You can find the bus stop for lines Number 4 and 7 just in front of the Plaza.



Traveling to Santander

There are several alternatives to reach Santander. The city airport, Santander-Parayas (SDR), is connected (on a daily basis) with the two most important Spanish airports: Madrid-Barajas (MAD) and Barcelona-El Prat (BCN), both of which are very well connected with a large number of European, US and Asian cities through major carriers such as Iberia and British Airways. The duration of the domestic flight from either MAD or BCN to SDR is about one hour. Other domestic connections are also available. In addition, RyanAir provides some direct, low-cost flights that connect Santander with several European airports, namely London-Stansted (STN), Brussels-Charleroi (CRL), Dublin (DUB), Dusseldorf-Weeze (NRN), Frankfurt-Hahn (HHN), Milan-Bergamo (BGY), Pisa (PSA), and Rome-Ciampino (CIA). Please double check current timetables and offers. Once you arrive at Santander airport, the best way to reach the city is by taxi. The taxi ride should cost no more than 30 Euros

Another alternative to reach Santander is going to Bilbao Airport (BIO), which is about 115 km from Santander (approx. 1 hour and 15 minutes drive). The Bilbao Airport has direct flights to several European airports, such as Paris-Charles de Gaulle (CDG), London-Heathrow (LHR), Frankfurt-International (FRA), Brussels-National (BRU), Milan-Malpensa (MXP), and Dusseldorf (DUS). Other connections are also available. From Bilbao Airport, you can reach Santander either by taking a taxi directly to Santander (approx. cost: 150 Euros), or via public transport. From the airport go to the Bilbao bus station (Termibus), where you can take a bus to Santander. The trip from Bilbao airport to Termibus will cost around 35 Euros by taxi; or with if you opt for public transport, the city bus ticket is approx. 10 euros. There are several buses from Bilbao to Santander

(at least one per hour). Finally, you can rent a car and drive along the A8 highway to from Bilbao to Santander.

Accommodation

The following hotels offer a special price for conference attendees. In order to receive the discount, indicate that you are attending the MONAMI conference when making your reservation. All hotels are at the *Sardinero* (beach) area and within walking distance (less than 20 minutes) from the conference venue. Public transportation from the hotels to the conference venue is also available: simply take bus number 4 or 7 from the closest bus stop to the hotel of your choice.

Hotel Chiqui (***) , Avda. García Lago Avenue, 9, Santander

Webpage: <http://www.hotelchiqui.com>

Hotel Hoyuela (****) , Avda. de los Hoteles, 7, Santander

Webpage: <http://www.gruposardinero.com/hotelhoyuela-i/index.htm>

Hotel Santemar (****) , c/ Joaquín Costa, 28, Santander

Webpage: <http://www.hotelsantemar.com/>

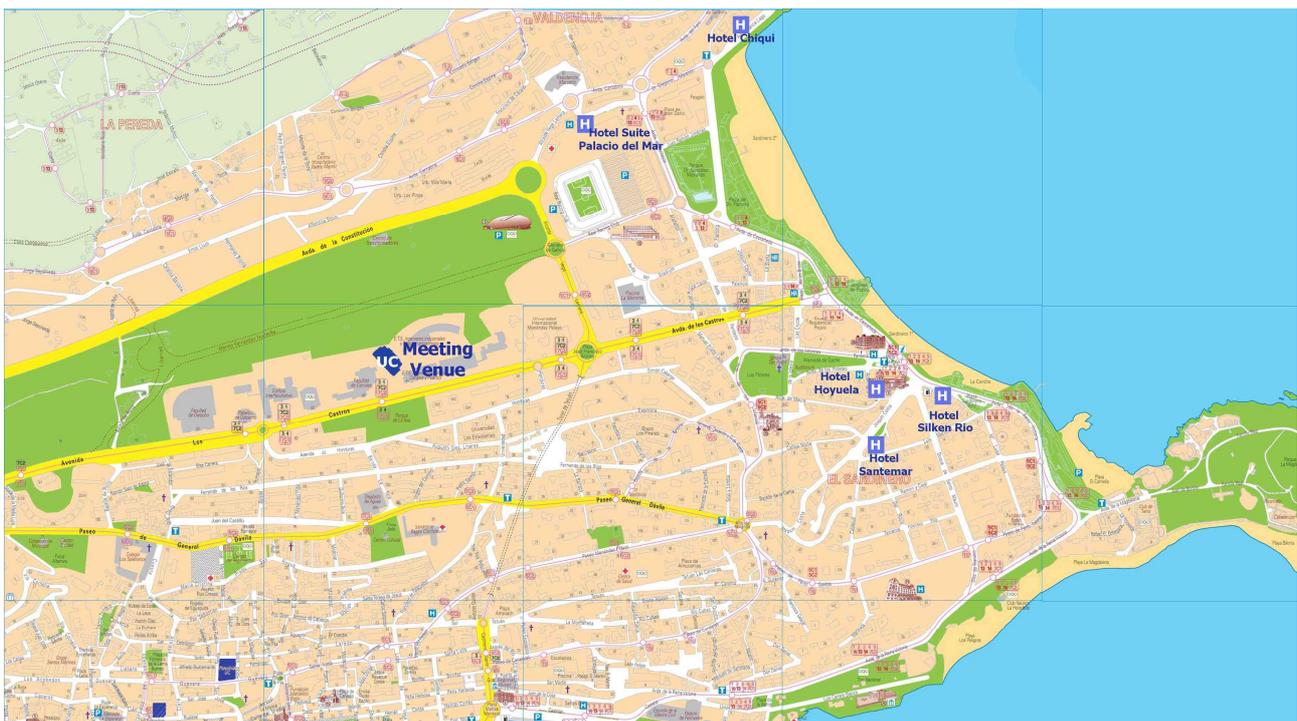
Hotel Silken Rhio (****) , Avda. Reina Victoria, 153, Santander

Webpage: <http://www.hoteles-silken.com/hotel-rio-santander/en/>

Hotel Suite Palacio del Mar (****) , Avda. Cantabria, 5, Santander

Webpage: <http://www.hotel-palaciodelmar.com/>

The following map shows all aforementioned hotels and the conference venue. See also the interactive map at www.mon-ami.org/venue.shtml.



Practical Information

The moderate climate of Santander is what many people would consider to be perfect when it comes to overall temperatures. The summers in Santander are sunny and warm, without being overly hot and humid, and the winter months remain mild and relatively free of frosty weather.

However, it is fair to say that Santander is also known for its rather rainy climate, and this can often quite literally put a dampener on sightseeing plans. In September, the temperature is between 18 °C and 23 °C, and it is usually a good period weather-wise.

Spain currency is the Euro. In addition, regular credit cards are usually accepted everywhere, although this is not the case in the public transportation system and in some taxis.

The electricity supply in Spain is 220 volts AC 50 HZ. Most plugs have 2-pins.

Spain belongs to the Schengen area. There are special VISA requirements for some countries. Detailed information is available at www.mon-ami.org/venue.shtml.



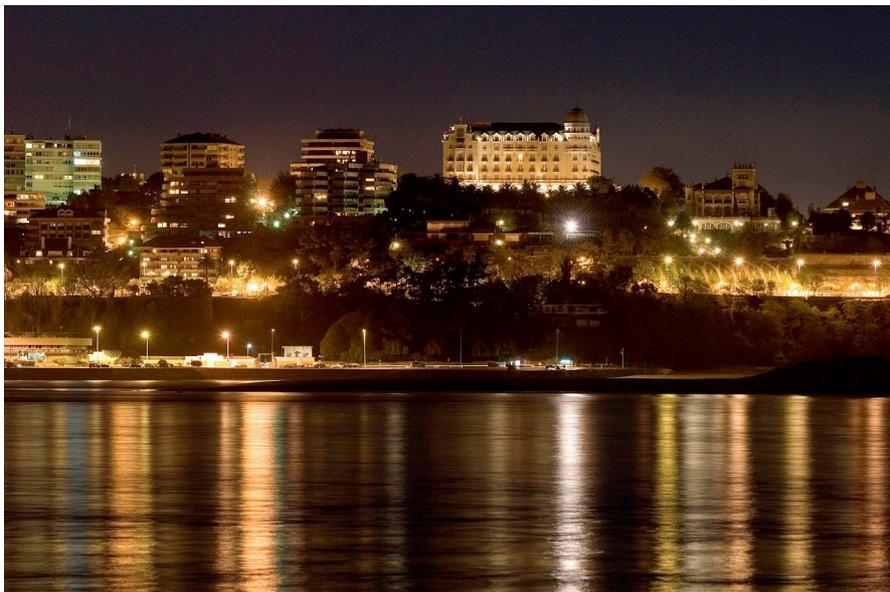
Social Events

In addition to high-quality technical discussions, the MONAMI 2010 is aiming at offering an exciting set of social activities, to enrich the social networking of those attending the conference. Below you can find some details about the planned activities.

Welcome Reception and Santander Bay Boat Trip Networking Event

On Wednesday, 22 September 2010, we will have the conference welcome reception right after the technical sessions conclude. Afterwards, we will head towards the Santander marina, where we will take a vessel to enjoy a trip around Santander's bay, which is reckoned of one of the most beautiful bays all over the world.

For more information about the vessel visit www.cantabriainfinitamar.es



Visit to Magdalena Palace and Dinner at El Nuevo Molino

On the second day of the conference (Thursday, 23 September 2010), we will have a guided tour to Magdalena Palace, which is one of Santander's most emblematic places. It is placed at the Magdalena Peninsula and was used by the Royal Family as their summer residence from 1913 to 1930. At the moment belongs to Santander city hall, and has undergone a complete rehabilitation. It is used for conferences and meetings, and was declared "historical artistic monument" in 1993. It is one of the most visited places all over Santander.



After the visit, we will head towards the reputable "El Nuevo Molino" restaurant, where we will enjoy a fantastic dinner in a very good and quiet atmosphere, in Puente Arce, a village located about 20 km from Santander.

Program at a Glance

	22 September 2010	23 September 2010	24 September 2010
8:30	Welcome and Logistics		
9:00	Tutorial (Part I) <i>M2M Communication</i>	Keynote <i>Service Management in Future Networks</i> Professor Joan Serrat (UPC)	Keynote <i>SmartCities, the Silent IoT Revolution</i> José Manuel Hernández (Telefonica)
10:30	Coffee Break	Coffee Break	Coffee Break
11:00	Tutorial (Part II) <i>M2M Communication</i>	Technical Session <i>Autonomic Networking</i>	Technical Session <i>Future Research Directions</i>
13:00	Lunch break	Lunch break	Lunch break
14:30	Technical Session <i>Routing and Virtualization</i>	Technical Session <i>Mobility Management and IEEE 802.21</i>	Technical Session <i>Multiaccess Selection</i>
16:30	Welcome Reception and Santander Bay Boat Trip Networking Event	Coffee Break	Coffee Break
		Technical Session <i>Wireless Network Management</i>	Technical Session <i>Wireless Networks</i>
19:00		Social Event Visit to Magdalena Palace and Dinner at <i>El Nuevo Molino</i> in Puente Arce	Awards Ceremony and Closing Session

Registration