3rd ICST Conference on Mobile Networks and Management

Preliminary Conference Program Guide

21–23 September 2011

Aveiro, Portugal

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Welcome to MONAMI 2011!

It is our great pleasure to welcome you to the Third ICST Conference on Mobile Networks and Management (MONAMI 2011) held in Aveiro, Portugal on 21-23 September 2011. The conference offers the opportunity to leading researchers, industry professionals and academics to meet and discuss the latest advances on mobility management, multiaccess and resource management, and network management. Emphasis is put on results related to technologies for true plug-and-play networking, which significantly increase the use of past infrastructure investments and forge the path to future internet solutions. 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. We expect that this third edition will again realize the MONAMI vision of an engaging environment where academia and industry can meet to discuss novel ideas on the future of mobile networks.

The city of Aveiro will provide the right backdrop where the attendees will breathe telecommunications at every step. Aveiro is in the centre of a major region where the sun, the sea and the river please the visitors' sight. It is no wonder that the *ria* and *salinas* have been the traditional visiting card of the town of Aveiro. Originally, the local economy was primarily based on sea-related industries. Today, the area is the center of a range of thriving high-tech industries, such as telecommunications, biochemical, ceramics, and the environment. MONAMI attendees will get a first-hand experience of the Aveiro Telecommunications environment through an organized visit at the Portugal Telecom Inovação Labs, which will host the MONAMI welcome cocktail. Moreover, this year's social event will take place at the Aliança Underground Museum, where the special multi-disciplinary character of the region is displayed at its best.

Due to its strong ties with telecommunications and IT industries, Aveiro was the first Portuguese "Digital City", a concept relying on the usage of information and communication technologies for the creation of a paperless society with active citizen involvement. Instituto de Telecomunicações, which will host MONAMI 2011, is a non-profit joint-venture between academia and telecommunication industrials, located in the campus of the University of Aveiro, and the perfect example of Aveiro's innovation atmosphere.

That said, we trust that you will find more in Aveiro than work. We recommend trying local cuisine which is famous for its seafood dishes. For those with a sweet tooth, try the *ovos moles*, a distinctive delicatessen made by sweetened eggs. This unique sweet in Portugal is now recognized as a typical EU product, along with its typical decorated wooden package, the *barrica*.

We close this short welcome note by acknowledging the enormous effort by all people involved in organizing MONAMI. The team that put together this year's event is large and required the sincere commitment of many folks. Although too many to recognize by name here, their effort should be highlighted. We particularly thank Richard Heffernan for his active, can-do management of all conference matters on behalf of EAI, and Prof. Imrich Chlamtac of CREATE-NET for his continuous support of the conference. Finally we gratefully acknowledge the institutions that have sponsored this event, and have helped to make MONAMI 2011 a reality: ICST, the European Alliance for Innovation, Universidade de Aveiro, Instituto de Telecomunicações and PT Inovação!

We look forward to seeing you in Aveiro!

On behalf of the executive committee,

Kostas Pentikousis
Huawei Technologies
Germany

Rui L. Aguiar
Universidade de Aveiro
Portugal

MONAMI 2011 General Chairs

Welcome from the Technical Program Chairs

On behalf of the Technical Program Committee we are happy to welcome you to MONAMI 2011! The 3rd ICST Conference on Mobile Networks and Management was technically co-sponsored by IEEE Portugal Section and CREATE-NET. We received a great set of submissions covering a wide range of topics in mobile networks and their management that are currently of high interest in the mobile and wireless research community. This year's program features papers on Mobility and Wireless Networks; Mobile Network Services; Network Virtualization, Routing and Self-Management; Security, Services and Context; and Wireless Mesh Networks. We note the increased interest this year in virtualization, management of smart objects and mobile services, alongside the traditional MONAMI topics in mobile and multiaccess networks, self organizing network management, architectures, and service provisioning. After an open call for papers and a thorough peer-review process, 25 papers were selected based on their relevance to the scope of the conference and their technical merit: 20 papers in the regular MONAMI technical sessions and 5 papers in the Future Research Directions (FRD) session. In addition, this year we introduce the MONAMI SmaRT Workshop, which focuses on novel, early-stage work in mobile network smart services and applications. All papers will be orally presented at the conference and are included as full papers in the MONAMI 2011 Proceedings. FRD papers present research directions from five prominent FP7-funded European projects related to management and control of mobile networks, namely SAIL, MEDIEVAL, OneFIT, GEYSERS, and UNIVERSELF. FRD papers were selected after an open call followed by a peer-review process that focused on originality and relevance. Finally, the five SmaRT Workshop papers present novel work on the creation of infrastructure and infrastructureless networks and how new services can be deployed and managed. In total, more than 120 authors from 15 countries contributed to this year's proceedings.

In addition to the oral presentations of the selected papers, the conference program features an exceptional keynote by Dr. John Strassner, CTO Software R&D Laboratory, Huawei, USA, who will present his vision on the management of future mobile networks in a talk entitled "Autonomic Mobile Network and Service Management for the Future Internet". In addition, Dr. Luís Miguel Campos of PDM Group will give a motivating talk, targeting in particular aspiring high-tech oriented entrepreneurs, entitled "The Random Walk Down Venture Capital Land". Of course, in line with the established MONAMI tradition, the conference will open with a world-class tutorial on "Cooperative Wireless Networks", a key topic in modern mobile communications, presented by Dr. Stefan Valentin (Bell Labs, Alcatel-Lucent Deutschland AG) and Dr. Hermann S. Lichte (net mobile AG).

The technical program of MONAMI 2011 would not have been possible without the effort of the entire technical program committee. We are deeply thankful to the TPC members and external reviewers (acknowledged in the following pages) who took significant workload during the paper evaluation process. Their efforts ensured that all submitted papers received a thorough and fair peer evaluation accompanied by constructive comments. We also thank Carlo Giannelli, our Publications Chair, for making sure that the Proceedings CD is assembled with great care, and Jarno Pinola, for keeping the web site always up-to-date.

Finally we would like to welcome you to the conference. By attending MONAMI 2011 you will have the opportunity to learn about the latest results and developments around the world and from top EU projects while networking with top experts in the field. We expect that this year's program will trigger fruitful discussions making the conference once again a very active forum, which fosters future cooperation between the participants.

On behalf of the Technical Program Committee,

Susana Sargento
University of Aveiro, Portugal

Ramón Agüero
University of Cantabria, Spain

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Andreas Roos (DT-Labs, Germany)
Roberto Sanz, Universidad de Cantabria, Spain

Keynote

Thursday 22 September 2011, 9:00 – 10:30

Autonomic Mobile Network and Service Management for the Future Internet

Dr. John Strassner

Chief Technical Officer, Software R&D Laboratory
Huawei, USA

Abstract— Network management: will it be the Ugly Duckling or the Golden Goose of the Future Internet? Most people take network management for granted. Most equipment vendors view it as a cost center, not a profit center. Is it really a surprise that there has been a distinct lack of research on new management approaches? More importantly, managing modern converged networks is challenging on many levels. Different types of networks have different management and operational data that use different control planes. Different vendors describe the same concepts using different incompatible managed objects and use different methods to configure them. Networks must support many different types of applications, which each have different needs of the common infrastructure on which they run. Application response times are becoming more important than an overflowing jitter buffer. Cloud computing has exacerbated these problems in both directions: there is not only a lack of research on cloud management paradigms, but in addition, cloud computing has been server-centric, often viewing the network as a "fat, dumb pipe". This talk will explore how autonomic computing and networking can be used to help solve these problems. Autonomics is more than "just" automating workflows; autonomics seeks to understand *why* a problem occurred and how to prevent it in the future. Autonomics can be used to create a Future Internet architecture that can run in clouds or in a data center, and more importantly, integrate mobile network and service management with managing the rest of the infrastructure in a unified way. Current examples of promising academic and industrial research will be described.

Biography— Dr. John Strassner has over 35 years of experience. He is currently the Chief Technical Officer of the Software R&D Laboratory of the US Division of Huawei, where he leads autonomic system projects for managing cloud, Enterprise, and Service Provider environments. He has served as a Professor of Computer Science and Engineering at the Pohang Univ. of Science and Technology and as a Visiting Professor at Waterford Institute of Technology in Ireland. Before that, he was a Motorola Fellow and Vice President of Autonomic Research at Motorola Labs. Previously, John was the Chief Strategy Officer for Intelliden and a former Cisco Fellow. John is a Distinguished Fellow of the TeleManagement Forum, and is currently the Chairman of the Autonomic Communications Forum. He is the past chair of the TMF's NGOSS SID, metamodel and policy working groups, along with the past chair of several IETF and WWRF groups. He has authored two books, written chapters for 5 other books, and has been co-editor of 5 journals dedicated to network and service management and autonomics. John is the recipient of the IEEE/IFIP Daniel A. Stokesbury memorial award for excellence in network management, the Albert Einstein for innovation in autonomic networking, and has authored over 275 refereed journal papers and publications.

Invited Talk

Friday 23 September 2011, 12:00 – 13:00

The Random Walk Down Venture Capital Land

Dr. Luis Campos

Chief Executive Officer / Head of R&D Department

PDM Group, Portugal

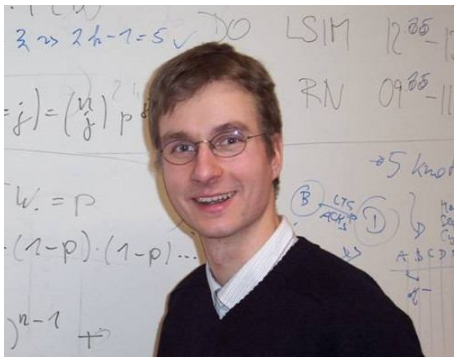
Abstract— We live at a remarkable era, where the confluence of two distinct factors, namely, the ubiquitousness of mobile devices and uninterrupted network connectivity makes it possible for the first time in the history of mankind to connect all human beings at all times. This will change in unpredictable ways, the current models used to finance companies, regardless of size and geographical location. In this talk, we will describe the different paradigms to entrepreneurship on both sides of the Atlantic, both on a conceptual level as well through a set of concrete examples experienced by the speaker over the last 20 years. We analyse the advantages, short term and long term, of each of the paradigms, highlighting both, success stories as well as (many) unsuccessful ones. When a new technology emerges, multiple incarnations suddenly appear (think of the "Cambrian Explosion"). Over time, some will disappear (think of the "Ordovician-Silurian extinction event"). Some will merge. And when the dust finally settles, only a few of the original incarnations will survive (think of "Intel / ARM", as opposed to all other extinct architectures). There is no "sufficient condition" for success to take place, but there is at least one "necessary condition" for it to happen. To be there! Based on the evidence, we speculate that unlike common expectations, technological success, both for Investors and Entrepreneurs, depends on chance as much as any other factor.

Biography— Dr. Luis Miguel Campos has over 20 years of experience in the IT industry, both from the academia and business sides. He is currently the Chief Executive Officer of the PDMFC Group (www.pdmfc.com), where he leads the Research and Development department and supervises the launch of new products. He has helped launch eight start-ups between 2001 and 2010. Some have grown to over 10 MEuros in less than five years. Some have failed. All have taught him something. He worked for the European Commission as an expert evaluator in the area of Information and Communications Technologies within the European Research Framework Program. He participated and/or led six European Research Projects in the last four years, some of which have resulted in successful products which are now available in the marketplace. Dr Luis Miguel Campos received his bachelor in Electric and Electronic Engineering from Instituto Superior Técnico from Lisbon Portugal and his Masters and Ph.D. in Computer Science from University of California Irvine. His research background is in Grid Computing and Autonomous Software Agents. He authored over 25 research publications during his very-short years of academic work. Dr Luis Miguel Campos is a recipient of both the Fulbright Scholarship (US), University of California (US) and Fundação para a Ciência e Tecnologia (Portugal).

Tutorial

Wednesday 21 September 2011, 9:00 – 12:30

Cooperative Wireless Networks: From Theory to Practice



Dr. Stefan Valentin

Bell Labs, Alcatel-Lucent Deutschland

Dr. Hermann S. Lichte

net mobile AG, Germany AG, Germany

Abstract— Currently, industry and academics seeks to understand when cooperative wireless networks perform best, how the performance of cooperative techniques degrades under practical assumptions, and which gains remain if cooperation is integrated into a full wireless system. At the moment, these open questions are a major roadblock in standardization and system design. By answering them, this tutorial provides researchers and engineers with the background and tools to bring cooperative networks into practice, addressing the aspects of technologies and applications, both from the theory and practice point of view.

Tutorial Outline— See www.mon-ami.org/tutorial.shtml

Biographies

Stefan Valentin studied communication technology and electrical engineering at the TU Berlin. Since 2005 he served as a research and teaching associate at the University of Paderborn (Germany) where he received his PhD in Computer Science with "summa cum laude" in 2010. Stefan was invited lecturer at the International Centre of Theoretical Physics (Trieste, Italy) and invited scientist at the Carleton University (Ottawa, Canada). In 2010, he joined Bell Labs in Stuttgart, Germany where he works on cooperative communication and context-aware resource allocation.

Hermann S. Lichte received his PhD in Computer Science from the University of Paderborn in 2011 with "magna cum laude". In his research he investigated the costs of cooperative relaying in wireless multi-hop networks. Hermann now works as an Innovation Manager at net mobile AG in Germany, where he is developing state-of-the-art e-commerce solutions for mobile networks.

Both authors have published widely in the field of cooperative communication, won the ACM SIMUTools best paper award in 2008, and have a remarkable experience in testbed development. Since 2005, Stefan supervised five academic and industrial prototyping projects as well as extensive field tests for cooperative relaying systems and holds several patents in this field. Hermann, has three years experience in prototyping cooperative relaying on Software-defined Radios (SDRs) and on off-the-shelf WLAN adapters. In 2008, both authors demonstrated the world's first cooperative WLAN prototype that reached full IEEE 802.11a/g rates.

Technical Sessions

Wednesday 21 September 2011

Wireless Mesh Networks (14:30-16:30)

Session Chair: Prof. Susana Sargento, University of Aveiro

Discovery mechanisms for wireless mesh networks management architectures

Jose Angel Irastorza, Luis Francisco Diez, Ramon Aguero, Luis Muñoz (University of Cantabria, Spain)

Abstract— The management tasks which have been traditionally employed over traditional wired networks should also play a key role for ensuring the proper operation of the so-called Personal Networks, with certain particular characteristics which make their management quite a complex task. Amongst all the challenges which need to be coped with, there is one which outstands over the rest, being ensuring an autonomous operation, qualifying them as self-* manageable/configurable/... networks. This paper analyzes, over a hierarchical/distributed management architecture, defined to be used over personal networks, the performance of a discovery mechanism by means of which agents are able to locate managers, and associate to them. A complete implementation of the whole architecture has been made in the framework of the ns-2 simulator (based on SNMP), including the mechanisms and procedures required to handle the discovery and association between managers and agents.

Distributed Control and Management of Context-Based Wireless Mesh Networks

Ricardo Matos, Susana Sargento (Instituto de Telecomunicações, University of Aveiro, Portugal)

Abstract— Using the flexibility of Wireless Mesh Networks (WMNs), we provide personalized access for highly dynamic mesh clients by splitting a WMN into several logical networks, each one configured to meet a set of specific levels of users' context demands (context can span from security, mobility, cost, services' requirements). In such approach, users can be grouped according to similarity of their context, and can be associated to the logical networks matching their context, built through virtualization (Virtual Networks - VNs). To break the traditional centralized architectures for the control of nodes and networks, this paper defines a novel context-aware distributed control framework to allow users' associations to fitting VNs, and to create, extend, or remove VNs on-demand to be adapted to the dynamics of WMN environments and mesh clients. Moreover, WMN nodes are endowed with autonomous capabilities that allow them to co-operatively control VN topologies based on indicators of resource availability and users' perceived Quality-of-Experience (QoE).

Protocol for Centralized Channel Assignment in WiFIX Single-radio Mesh Networks

Filipe Teixeira, Tânia Calçada, Manuel Ricardo (INESC Porto, Faculdade de Engenharia, Universidade do Porto, Portugal)

Abstract— A Wireless Mesh Network (WMN) is an effective solution to provide Internet connectivity to large areas and its efficiency may increase if multiple radio channels are used in the mesh backbone. This paper proposes a protocol for centralized channel assignment in single-radio WMNs. This protocol has the capability to discover all the links available between Mesh Access Points (MAPs), independently of the channel they operate. With this information, a network

manager can assign the right channel to each MAP in order to, for instance, maximize the network throughput. The proposed protocol extends WiFIX [1] which is a low overhead solution for implementing IEEE 802.11-based WMNs.

Optimal Relays Deployment for 802.16j Networks

*Mikhail Zolotukhin, Vesa Hytonen, Timo Hamalainen (*University of Jyväskylä, Finland) and *Andrey Garnaev* (University, St. Petersburg, Russia)

Abstract— In this paper, we consider optimal relay station deployment for the IEEE 802.16j networks. IEEE 802.16j is an emerging wireless broadband networking standard that integrates infrastructure base stations with multihop relay technology. The proposed relay deployment mechanism allows us to maximize network capacity for every user or to maximize total network capacity, and, therefore, to reach greater network capacity values while employing smaller number of relay stations. With the proposed approach, the necessary number of relays for a region can be found.

Security, Services and Context (17:00-19:00)

Session Chair: Prof. Hussein Badr, Stony Brook University

Resisting to False Identities Attacks to the Public-Key Management System for Wireless Adhoc Networks

Eduardo da Silva, Renan Fischer e Silva, Luiz Carlos P. Albini (Federal University of Paraná, Curitiba, Brazil)

Abstract— Cryptography is widely known as the best technique to provide security on data communications in all kinds of networks. Cryptographic methods rely on keys to perform their operations, such as encryption, decryption, and signature. In Wireless Ad Hoc Networks (WANETs), key management is a critical service as it must handle all security threats in a self-organized and decentralized way. Several kinds of attacks can compromise the key management on WANETs, such as Sybil and bad mouthing. This article presents the enhanced VKM, called *e*-VKM, a virtualization-based key management system resistant to Sybil and bad mouthing attacks. *e*-VKM is proposed to work on scenarios in which nodes can be preloaded with secure information before joining the system. Examples of these scenarios include but are not limited to sensor networks, meeting conferences, battlefield operations or health care solutions. Results show that *e*-VKM is highly resistant to Sybil attacks and bad mouthing, presenting 100% of resistance even under 20% of attackers.

User Facilitated Congestion and Attack Mitigation

Mursel Yildiz, Ahmet Cihat Toker, Fikret Sivrikaya, Seyit Ahmet Camtepe, Sahin Albayrak (DAI-Labor / Technische Universität at Berlin, Germany)

Abstract— The IEEE Wireless LAN standard has been a true success story by enabling convenient, efficient and low-cost access to broadband networks for both private and professional use. However, the increasing density and uncoordinated operation of wireless access points, combined with constantly growing traffic demands have started hurting the users' quality of experience. On the other hand, the emerging ubiquity of wireless access has placed it at the center of attention for network attacks, which not only raises users' concerns on security but also indirectly affects connection quality due to proactive measures against security attacks. In this work, we introduce an integrated solution to congestion avoidance and attack mitigation problems through cooperation among wireless access points. The proposed solution implements a Partially

Observable Markov Decision Process (POMDP) as an intelligent distributed control system. By successfully differentiating resource hampering attacks from overload cases, the control system takes an appropriate action in each detected anomaly case without disturbing the quality of service for end users. The proposed solution is fully implemented on a small-scale testbed, on which we present our observations and demonstrate the effectiveness of the system to detect and alleviate both attack and congestion situations.

Enabling Continuously Evolving Context Information in Mobile Environments by Utilizing Ubiquitous Sensors

Stefan Forsström, Theo G. Kanter (Mid Sweden University, Sweden)

Abstract—Context-aware applications require local access to current and relevant views of context information derived from global sensors. Existing approaches provide only limited support, because they either rely on a network broker service precluding open-ended searches, or they adopt a presence model which has scalability issues. To this end, we propose a fully distributed architecture employing context user-agents co-located with data-mining agents. These agents create and maintain local schemas using ranking of global context information based on context proximity. Continually evolving context information thus provides applications with current and relevant context views derived from global sensors. Furthermore, we present an evaluation model for assessing the effort required to present local applications with current and relevant contextual views. We show in a comparison with earlier work that the approach achieves the provisioning of evolving context information to applications within predictable time bounds, circumventing earlier limitations.

Service-based Interconnected Networks

Filipe Costa, Rui M. Rocha (Instituto de Telecomunicações, Technical University of Lisbon, Portugal)

Abstract— In an ideal world, service discovery protocols would be available across different wireless networks ensuring that most of the services would be searchable and accessible, anytime, everywhere. Yet, typical service discovery protocols were designed for specific scenarios and not conceived with user mobility in mind, where it would be possible to search for services through whatever access network might be available. To help increase the users' mobility, service-based interconnected networks (SIN) aims to develop an interoperability system between service discovery protocols in a wireless heterogeneous framework for existing protocols and devices. SIN provides the possibility to transparently search and find services across neighbour networks and through several protocols, resulting in gathering all services features. SIN was experimentally evaluated in a test-bed built to exercise a dynamic and pervasive service environment and used to prove the concept of service discovery interworking.

Thursday 22 September 2011

Network Virtualization, Routing and Self-Management (11:00-13:00)

Session Chair: Dr. John Strassner, Software R&D Laboratory Huawei, USA

Nodes Discovery in the In-Network Management Communication Framework

Lucas Guardalben, Tomé Gomes, António Pinho, Paulo Salvador, Susana Sargento (Instituto de Telecomunicações, University of Aveiro, Portugal)

Abstract— The main role of a communication framework in distributed autonomic management is to support the dissemination of management information between network nodes. In distributed autonomic management, each network node intelligently self-adapts its behavior through collaboration and cooperation between the several nodes. In this paper, we propose a set of communication mechanisms between self-managed network nodes, comprehending the several stages of communication, including a bootstrapping, discovery and election of entities, and ensure the base of communication of information between nodes to perform the collaborative decisions and to enforce these decisions. We propose a bootstrapping and discovery mechanism that uses the concept of Hide & Seek, where the entities change their role dynamically according to events in the network, with dynamic probing intervals according to the number of Seekers entering or leaving the network. We compare our discovery approach with current solutions, and we show that our mechanism is more efficient both in terms of control messages overhead and convergence time.

Virtual Network Mapping - An Optimization Problem

Márcio Melo (Instituto de Telecomunicações, University of Aveiro/Portugal Telecom Inovação, Aveiro, Portugal)*, Jorge Carapinha* (Portugal Telecom Inovação, Aveiro, Portugal)*, Susana Sargento* (Instituto de Telecomunicações, University of Aveiro, Portugal), *Luis Torres, Phuong Nga Tran, Ulrich Killat, Andreas Timm-Giel* (Hamburg University of Technology, Germany)

Abstract— Network Virtualization is acclaimed to be a key component for the Future Internet by enabling the coexistence of heterogeneous (virtual) networks on the same physical infrastructure, providing the dynamic creation and support of different networks with different paradigms and mechanisms in the same physical network. A major challengein the dynamic provision of virtual networks resides on the efficient embedding of virtual resources into physical ones. Since this problem is known to be NP-hard, previous research focused on designing heuristicbased algorithms; most of them do not consider a simultaneous optimization of the node and the link mapping, leading to non optimal solutions. This paper proposes an integer linear programming formulation to solve the Virtual Network embedding problem, as a simultaneous optimization of virtual nodes and links placement, providing the optimal boundary for each virtual network mapping. A link-node formulation is used and the multi-commodity ow constrain is applied. In addition, a heuristic algorithm for virtual network embedding is also proposed and compared against the optimal formulation. The performance of the Integer Linear Programming formulation and of the heuristic are evaluated by means of simulation. Simulation experiments show significant improvements of the virtual network acceptance ratio, in average additional 10% of the virtual network requests are accepted when using the proposed formulation, which corresponds, in average, to more 7 virtual networks accommodated on the physical network.

Knowledge Modeling for Conflict Detection in Self-Organized Networks

Vilho Räisänen, Haitao Tang (Nokia Siemens Networks, Finland)

Abstract— In this article, conflict detection between functions in self-organizing networks (SON) is reviewed. SON coordination is of crucial importance to management automation of fourth-generation networks. In particular, conflict detection is studied from knowledge management perspective. The advantages of model-based conflict detection over algorithmic alternatives are analyzed.

Flexible Routing with Maximum Aggregation in the Internet

Pedro Andrés Aranda Gutiérrez (University of Paderborn, Germany)

Abstract— The explosion of the Internet's routing tables has been a concern in the last years. Specially after IANA assigned the last /8 prefixes on the 3rd of February, 2011, two fronts are open

for the Internet community: the growth of the IPv4 routing table due to fragmentation introduced by the last assignments made by RIRs and the strategy to follow for the new IPv6 Internet. This paper analyses the behavior of the IPv4 routing table in the Internet's Default Free Zone in 2010 and presents the evolution and the current status of the IPv6 routing table in the DFZ. This paper also presents a prototype implementation of the routing architecture based on parallel routing tables. This prototype implementation was tested in an emulated environment using Netkit. This implementation demonstrates that parallel routing tables are an easy and clean alternative to current practises in order to avoid routing configurations that intend to have effect on a scoped area of the Internet are leaked outside it. This characteristic makes parallel routing tables a good candidate for Traffic Engineering configurations in IPv6.

Mobility and Wireless Networks (14:30-16:30)

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

IEEE 802.21 MIH-enabled Evolved Packet System Architecture

Frank Juergen Knaesel (Instituto de Telecomunicações, University of Aveiro, Portugal)*, Pedro Neves* (Portugal Telecom Inovação, Aveiro, Portugal)*, Susana Sargento* (Instituto de Telecomunicações, University of Aveiro, Portugal)

Abstract— The main motivation of IMT-Advanced is to enable the mobile users with capacity to handle high data rates and low delay services such as high quality video and online gaming. Two technologies are competing in this field: LTE-Advanced and Mobile WiMAX. Following the Always Best Connected (ABC) paradigm, the integration of these two technologies with legacy ones is imminent. The Evolved Packet Core (EPC) is the 3GPP new core network which aims to integrate 3GPP and non-3GPP access networks through an All-IP core network. The IEEE 802.21 standard is another important contribution, optimizing vertical handovers, by providing a common framework between the data link and network layers. Although the 3GPP has already defined optimized vertical mobility procedures, these are dependent on the technology, and much effort is needed in order to achieve the so desired seamless mobility. In our work, we propose a new mobility architecture and several enhancements on handover signaling to provide seamless mobility between IMT Advanced candidates and legacy wireless technologies. We further compare our proposed mobility framework with current approaches, showing the advantages of the integrated approach.

Mobility Support for Content Centric Networking: Case Study

Yunqi Luo, Jonas Eymann, Kishore Angrishi, Andreas Timm-Giel (Hamburg University of Technology, Germany)

Abstract— Content Centric Networking (CCN) is a new Internet architecture which is based on naming content instead of hosts. It has been shown that CCN can also supports point-to-point conversions, for example voice calls. However, it has not been defined how node mobility can be achieved in such a real-time scenario with strong time constraints. This paper illustrates the arising problems of mobility in CCN for real-time applications and proposes three different solutions. The results and the analyses show that the presented approaches can reduce the delay time and also reduce signaling overhead.

Classification of Hidden Users' Profiles in Wireless Communications

Eduardo Rocha, Paulo Salvador, António Nogueira (Instituto de Telecomunicações, University of Aveiro, Portugal)

Abstract— The Internet can be seen as a mix of several services and applications running on top of common protocols. The emergence of several web-applications changed the users' interaction paradigm by placing them in a more active role allowing them to share photos, videos and much more. The analysis of the profile of each user, both in wired and wireless networks, becomes very interesting for tasks such as network resources optimization, service personalization and security. In this paper, we propose a promiscuous wireless passive monitoring classification approach that can accurately create users' profiles in terms of the used web-applications and does not require authentication with the wireless Access Point. By extracting appropriate layer 2 traffic metrics, performing a Wavelet Decomposition and analyzing the obtained scalograms, it is possible to analyze the traffic's time and frequency components. An appropriate communication profile can then be defined in order to describe this frequency spectrum which is characteristic to each web-based application. Consequently, it is possible to identify the applications that are being used by the different connected clients and build user-profiles. Wireless traffic generated by several connected clients running some of the most significant web-based applications was captured and analyzed and the obtained results show that it is possible to obtain an accurate application traffic mapping and an accurate user profiling

Simulation Framework for the Evaluation of Access Selection Algorithms over Heterogeneous Wireless Networks

Johnny Choque, Ramon Aguero, Luis Muñoz (University of Cantabria, Spain)

Abstract— This work presents the design of a flexible, scalable and easy-to-configure simulation platform, which is primarily conceived so as to evaluate access selection algorithms. As opposed to other similar tools, the simulator offers the possibility to deploy highly configurable scenarios, with various types of users, services, terminals and technologies. It also enables the analysis of large and complex scenarios (comprising many users and access elements), thanks to the abstraction techniques which have been considered during its design phase, without incurring in a high computational overhead. In addition, it can be used to evaluate algorithms using multi-operator strategies, thus leading to multi-access, multi-interface, multi-service and multi-operator scenarios.

Mobile Network Services (17:30-19:00)

Session Chair: Dr. Luis Campos, PDM Group, Portugal

Supporting Multimedia Services in the Future Network with Quality-Oriented Routing

Leandro Alexandre (Federal Institute of Goiás, Brasil)*, Augusto Neto* (Federal University of Ceara, Brasil/Instituto de Telecomunicações, University of Aveiro, Portugal)*, Eduardo Cerqueira* (Federal University of Pará, Brazil)*, Sérgio Figueiredo, Rui L. Aguiar* (Instituto de Telecomunicações, University of Aveiro, Portugal)

Abstract— The increasing demand for real-time multimedia applications targeting groups of users, together with the need for assuring high quality support for end-to-end content distribution, is motivating the scientific community and industry to develop novel control, management and optimization mechanisms with Quality of Service (QoS) and Quality of Experience (QoE) support. In this context, this paper introduces Q-OSys (QoS routing with Systematic Access), a distributed QoS-routing approach for enhancing future networks with autonomous mechanisms orchestrating admission control, per-class overprovisioning, IP Multicast and load-balancing to efficiently support multi-user multimedia sessions. Simulation experiments were carried to show the efficiency and impact of Q-OSys on network resources (bandwidth utilization and packet delay). Q-OSys is also

evaluated from a user point-of-view, by measuring well-known objective and subjective QoE metrics, namely Peak Signal to Noise Ratio (PSNR), Structural Similarity (SSM) Video Quality Metric (VQM) and Mean Opinion Score (MOS).

Quality of Experience Assessment in Internet TV

Joana Palhais (Instituto Superior Técnico - Lisboa, Portugal)*, Rui Cruz, Mario Nunes* (Instituto Superior Técnico - Lisboa/INESC-ID/INOV, Portugal)

Abstract— Nowadays, Service Providers are increasingly concerned about the concept of Quality of Experience (QoE), even more, when talking about Internet TV or WebTV, where no guarantees of delivery are provided. This paper describes the research and the results on the influence of the level of interest (on a particular sport) in the subjective quality assessment of the corresponding broadcasted media. This analysis is motivated by the work being developed in the European Project My-eDirector 2012, which has the capability to cover the London Olympic Games 2011 via the Web. Therefore, a subjective test was prepared and performed where each observer visioned and assessed the perceived video quality of a set of six sports, encoded in four different bitrate/resolution sets. From the analysis of the collected data it is possible to demonstrate that the interest level has a strong influence in the subjective assessment of the video quality. Based on these results, an empiric formula was deduced to estimate the Mean Opinion Source (MOS) as a function of bitrate and interest level.

Efficient Multimedia Content Distribution to Mobile Communities

Filipe Pinto, Alvaro Gomes, Eduardo Sá (Portugal Telecom Inovação, Aveiro, Portugal)

Abstract— Mobile Operators have to meet the growing demand for multimedia services. The Social Networking trend and the Mobile TV are just a few examples of multimedia services that are seriously crowding the operators' infrastructure. Since the content is to be shared by large groups of users it makes sense to use a point-to-multipoint technology to convey the multimedia information. MBMS (Multimedia Broadcast and Multicast Service) and E-MBMS (Evolved MBMS) are the 3GPP systems used to delivery multimedia contents to mobile communities. But these technologies do not support power control which leads to an inefficient data distribution. This paper devises a mechanism that makes possible to reduce the transmitted power enabling an effective multimedia multicast data distribution to mobile groups leading to significant gains on the radio interface on next generation multimedia networks.

On the Management of Prices and Policies for Heterogeneous Access Environments

Javier Baliosian (Universidad de la República, Uruguay)*, Javier Rubio Loyola, Pablo Salazar* (CINVESTAV Tamaulipas, Mexico)*, Ramon Aguero* (Universidad de Cantabria, Spain)*, Joan Serrat* (Universidad Politécnica de Catalunya, Spain)

Abstract— The appearance of new services, as well as the unstoppable increase of the available radio access technologies, leads to a departure from the traditional strategies for the different actors involved in the wireless communications realm. It becomes necessary tackling the design of architecture able to support the new challenges, being a key aspect breaking with some of the traditional solutions, which are unable to cope with the new requirements. One of the most important aspects is to address a holistic design, enforcing an open and flexible cooperation between the different entities, which is not usually possible with patches to the currently available alternatives. This is the framework of the Cognitive and Cooperative Communications and autonomous SErvices Management (C3SEM) project, which is founded on the cooperation and integration of the subjacent communication substratum with the service management architecture. In this paper, we describe one of its current open lines of research, in which we analyze different

price management strategies, since it is sensible to believe that in the mid-term, operators would need to rethink their current strategies, which are mostly based on constant fees.

Friday 23 September 2011

Future Research Directions I (9:30-10:30)

Session Chair: Prof. Ramón Agüero, University of Cantabria

Opportunistic Network Creation Schemes for Capacity Extension in Wireless Access and Backhaul Segments

Marios Logothetis, Vera Stavroulaki, Andreas Georgakopoulos, Dimitrios Karvounas, Nikos Koutsouris, Kostas Tsagkaris, Panagiotis Demestichas (University of Piraeus, Greece)*, Milenko Tosic, Dragan Boskovic* (La Citadelle Inzenjering, Serbia)

Abstract— It is expected that the wireless world will migrate towards an era that will comprise more local/temporary structures which, for instance, can be called Opportunistic Networks (ONs). Operator-governed ONs are dynamically created, temporary, coordinated extensions of the infrastructure. This paper presents an approach for exploiting such ONs in order to extend the capacity in wireless access and backhaul segments for efficient application provisioning, as well as an evaluation of an indicative test case as a proof of concept of the aforementioned approach

Key Function Interfacing for the MEDIEVAL Project Video-Enhancing Architecture

Daniel Corujo (Instituto de Telecomunicações, Universidade de Aveiro, Portugal)*, Carlos J. Bernardos* (Universidad Carlos III de Madrid, Spain)*, Telemaco Melia* (Alcatel-Lucent, France)*, Michelle Wetterwald* (Mobile Communications Dept., EURECOM, France)*, Leonardo Badia* (Consorzio Ferrara Ricerche, Italy)*, Rui L. Aguiar* (Instituto de Telecomunicações, Universidade de Aveiro, Portugal)

Abstract— The FP7 MEDIEVAL project, which started in 2010, has been defining the necessary evolutions over today's mobile Internet architecture, in order to more efficiently support the upcoming growth of video services, in mobile wireless environments. This paper evolves from these initial definitions, by taking into consideration the requirements placed by a core set of next generation video services and defining a global architecture. We describe its main functionalities and subsystems as well as the necessary interfaces, towards the operation of these services in different use cases.

Future Research Directions II (11:00-12:00)

Session Chair: Dr. Kostas Pentikousis, Huawei Technologies

OConS: Towards Open Connectivity Services in the Future Internet

Ramon Aguero (University of Cantabria, Spain)*, Luisa Caeiro, Luis M. Correia, Lucio S. Ferreira* (Technical University of Lisbon, Portugal)*, Marta Garcia-Arranz* (University of Cantabria, Spain)*, Lucian Suciu* (Orange-Labs, France)*, Andreas Timm-Giel* (Hamburg University of Technology, Germany)

Abstract— The recent advances on networking technologies (both at the access and the core realms) together with the ever-increasing requirements of the end-users and their applications/services call for an open approach, yet with a clear migration strategy, so as to avoid

the well-known shortcomings and limitations of clean-slate approaches. These requirements have streamlined the design of a novel (yet not revolutionary) architecture framework based on the identification of functional entities and their interfaces. The most distinguishing feature is its flexibility, allowing its adaptation to already existing protocols/technologies/algorithms as well as to novel solutions.

Coordination of Self-Organizing Network Mechanisms, Framework and Enablers

Laurent Ciavaglia (Alcatel-Lucent, France)*, Zwi Altman* (France Telecom, France)*, Eleni Patouni, Alexandros Kaloxylos, Nancy Alonistioti* (University of Athens, Greece)*, Kostas Tsagkaris, Panagiotis Vlacheas, Panagiotis Demestichas* (University of Piraeus Research Centre, Greece)

Abstract— Future wireless access networks, e.g. LTE and LTE-Advanced, will be empowered by Self-Organizing Network (SON) mechanisms with the objective to increase performance, reduce the cost of operations, and simplify the network management. This article describes a management framework which enables the automatic, policy-driven coordination of SON control functions, and introduces future necessary evolutions that will allow to fully benefiting from the SON paradigm in operational networks.

Coordinating IT and Network Virtualisation to provide Infrastructure as a Service: a GEYSERS approach for the Future Internet

Sergi Figuerola, Joan Antoni Garcia-Espin, Jordi Ferrer, Ester Lopez (Distributed Applications and Networks Area, i2CAT Foundation, Spain)*, Eduard Escalona, Reza Nejabati, Shuping Peng, Dimitra Simeonidou* (University of Essex, United Kindgom)

Abstract— In this article we propose the GEYSERS project approach for Future Internet based on provisioning full infrastructures as a service by using IT and transport network resource virtualization. An overview of the project's architecture is provided that shows the layering scheme empowering the definition of Virtual Infrastructure service. The Logical Infrastructure Composition Layer in the architecture allows for operator-tailored planning of infrastructures, which also allows for a dynamic re-planning of the infrastructure depending on service needs. The rest of the article elaborates on the concept, characteristics and variants for modifying Virtual Infrastructures, as well as their implications.

MONAMI SmaRT Workshop (14:30-16:30)

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

Modelling and Simulating the Trickle Algorithm

Markus Becker, Koojana Kuladinithi, Carmelita Görg (University Bremen, Germany)

Abstract— The Trickle algorithm has proven to be of great benefit to the Wireless Sensor Networking area. It has shown general applicability in this field, e.g. for code distribution to smart objects and routing information distribution between smart objects. Up to now analysis of the algorithm has focused on simulation studies and measurement campaigns. This paper introduces an analytical model for the algorithm's behavior for the time to consistency. The model is compared with simulation results for a set of network topologies and enables to discover efficient settings of the algorithm for various application areas, such as logistics.

Between Simulator and Prototype: Crossover Architecture for Testing and Demonstrating Cyber-Physical Systems

Tomasz Paczesny, Jarosław Domaszewicz, Przemysław Konstańczuk, Jacek Milewski, Aleksander Pruszkowski (Warsaw University of Technology, Poland)

Abstract— Consider the development of a new middleware targeted at cooperating smart objects. Each smart object should have an embedded node connected to the object's sensors and actuators. Building a prototype of such a middleware is inherently labor-intensive, especially when it comes to crossing the cyber-physical boundary, i.e., node-to-object interfacing. Also, soon one needs to be able to validate the middleware's emerging API. Consequently, two separate "products" are usually developed: a programmer-oriented simulator and an actual, node-based prototype. Both are less than perfect for testing and demonstration purposes, and there is hardly any reuse of work invested in producing them. We propose an architecture that enables intermediate, crossover setups combining elements of the simulator and of the prototype. The key idea is system-wide decoupling of the cyber domain from the physical domain, by means of a dedicated entity. The architecture emphasizes incremental formation of testing and demonstration setups, reusability of elements needed to create them, and flexibility in combining those elements. We validate our architecture with a proof-of-concept infrastructure and a number of experimental setups.

Applying Wireless Sensor Networks in Fire Fighting

Chunlei An, Andreas Timm-Giel (Hamburg University of Technology, Germany)

Abstract— Fire fighters often work in dangerous environments, therefore protection is essential. Nowadays fire fighters are equipped with different types of devices, each of which supplies a specific functionality. This paper studies the possibility of integrating some of these functionalities into one intelligent glove, which has a build-in sensor node. Merging different functionalities into one device will reduce the amount of equipment that a fire fighter must carry. The concept of networking the intelligent gloves using Wireless Sensor Networks (WSNs) is validated by doing application requirements analysis, transmission range experiments, and performance evaluations of a dedicated routing protocol. Results show that the IEEE 802.15.4 based WSN is able to be applied in firefighting scenarios.

iVital: A Real Time Monitoring Mobile System for First Responder Teams

Diogo C. Teles, Márcio F. M. Colunas, José M. Fernandes , Ilídio C. Oliveira, João Paulo Silva Cunha (University of Aveiro, Portugal)

Abstract— Every day, thousands of first responders work to save the lives of others, sometimes without the adequate surveillance of health conditions. The VitalResponder is a project that aims at monitoring and control teams of first responders in emergency scenarios, using mobile technologies to capture and use real-time data to support real-time coordination. In this paper we present a system to capture, process, and display the vital signs of team members, which are made available to a first responders' team leader, for coordination and monitoring. The system addresses specific requirements of the field action, such as the mobility of actors, combining two of the most recent mobile technologies: the iPad (for the coordination view) and Android OS-based smartphones (for real-time sensor data acquisition).

Charging Network for Electrical Vehicles

Tiago Pinheiro (INOV/IST-UTL, Portugal), *Mário Nunes* (INOV/INESC-ID/IST-UTL, Portugal), *Martijn Kuipers* (INESC, Portugal)

Abstract— This paper proposes a full EV charging network architecture, based on the current test-pilot of a national energy provider. The Electric Vehicle Charging Station (EVCS) follows a modular approach, allowing multi communication technologies, such as, General Packet Radio Service (GPRS), Wi-Fi and Ethernet. The EVCS was verified both in the functional, as well as in the electrical domain. The prototype implementation of the EVCS is already fully operational and integrated in an energy operator EVCS network.

Conference Venue

Instituto de Telecomunicações, University of Aveiro

The conference will be held in the facilities of the Instituto de Telecomunicações at the University campus.

Traveling to Aveiro

How to reach Aveiro and the conference venue:

From Porto Airport

The train is the most practical means of making the journey to Aveiro. The trip between the airport and the railway station (called Porto-Campanhã), which has direct rail connections to Aveiro, can be made by taxi for around 20 Euros and takes around 30 minutes. A less expensive alternative to reach the station is to use AeroBus (a shuttle bus to the city costing around 2.60 Euros), as far as Avenida dos Aliados and then taking a train from São Bento railway station in the city centre either directly to Aveiro or with a change at Porto-Campanhã. The train journey to Aveiro takes between 40 minutes and 1h15, depending on the type of train used. Information on train prices and timetables are available at www.cp.pt. There are regular trains to Aveiro from Porto. Aveiro railway station is located in the centre of the city (see map of city) about 20 minutes walking distance or 5-minute taxi ride from the University Campus.

At the airport you have a subway line called "E line" or "blue line" that you can use to get to one of the Porto train stations called Campanhã. At this point you can use a train to get to IT as described above. Information on subway prices and timetables are available at http://www.metrodoporto.pt.

At the airport there are various car hire agencies. Follow the signs for the A1 motorway in the direction of Lisbon (there is a toll charge of around 3.15 Euros). Leave the A1 at the exit for Aveiro and take the A25. From the A25 there are two exits to the city, first "Aveiro-Norte" and then some kilometers later there is "Aveiro". This second exit is used for reaching the University of Aveiro. (The University is near the hospital).

From Lisbon Airport

The simplest way of transportation to Aveiro is by train. From the airport to Lisboa-Oriente railway station, the taxi ride takes about 10 minutes and costs around 10 Euros. Alternatively there are

buses (lines 5 and 44). The ticket can be bought on the bus for around 1 Euro. Given the distance between Lisbon and Aveiro, it is best to use the fast train services (Alfa Pendular or Intercidades). The journey will take around 2h30 and a single ticket costs up to about 20 Euros (economy). Information on train prices and timetables are available at http://www.cp.pt.

There are various car-hire agencies at the airport. From the airport, follow the road signs for the A1 motorway in the direction of Porto. Leave the motorway at "Aveiro-Sul/Águeda" (exit 15) and take the EN235 directly to the university campus (located just in front of the hospital). The toll charge for use of the motorway is around 15 Euros and can be paid in cash or with a debit card.

The bus station, called Terminal Rodoviário do Arco do Cego, is on Av. Duque D'Ávila, 12. Timetables and prices can be consulted at http://www.rede-expressos.pt.

From Aveiro Railway Station

Aveiro railway station is located in the centre of the city (see city map) about 25 minutes walking distance or 5-minute taxi ride from the University Campus. To reach the campus you can use any of the following means:

- Minibus: Taking the green line outside the railway station will take you to the campus.
- Taxi: The trip costs around 4 Euros.
- BUGA - Bicicleta de Utilização Gratuita de Aveiro: Free bicycles available everywhere within the city. You can pickup one at the train station and leave it at the campus.

Accommodation

Aveiro has several nice hotels which you can use for your lodging.

Hotel Meliá Ria (****)
Address: Cais da fonte Nova, Lote 5, 3801-200 Aveiro
Webpage: http://www.meliaria.solmelia.com/

Hotel Imperial (***)
Address: R. Dr. Nascimento Leitão, 3810-108 Aveiro
Webpage: http://www.hotelimperial.pt

Hotel As Américas (****)
Address: R. Eng. Von Haff, 20, 3800-176 Aveiro
Webpage: http://www.hotelasamericas.com

Hotel Moliceiro (****)
Address: Rua Barbosa de Magalhães - No 15/17, 3800-154 Aveiro
Webpage: http://www.hotelmoliceiro.com

Hotel Aveiro Center (**)
Address: R. da Arrochela, 6, 3810-052 Aveiro
Webpage: http://www.grupoalboi.com/

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

The conference organizing committee has established an agreement with Hotel Melia Ria (http://www.meliaria.com/en), one of the most interesting hotels in the city, within walking distance from the conference venue and the city center. For making a reservation with our special rate, participants should reserve directly with the hotel, via emailing melia.ria@meliaportugal.com, and indicating the reservation keyword “monami11”.

Practical Information

Aveiro is mostly known for its windy climate. In September, the temperate is between 20 ºC and 25 ºC, and it is usually a good period weather-wise.

The Portugal 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 some taxis.

The electricity supply in Portugal is 220 volts AC 50 HZ. Plugs have 2-pins.

Visit European Comission Home Affairs for information on visa requirements:
http://ec.europa.eu/home-affairs/policies/borders/borders_visa_en.htm.

Welcome Cocktail at PT Inovação

On the first day of the conference (Wednesday, 21 September 2011), PT Inovação will host a guided tour to some of the major Departments and to the Networks Operator Center. Following this organized visit, PT Inovação will kindly invite all MONAMI attendees to this year's Welcome Cocktail.

PT Inovação SA is a technological and engineering services company that is focused on the development of innovative and competitive services and solutions for the international telecommunications market. With a history of more of sixty years pointed by important mark stones on the telecommunications market, namely the launch of the first pre-paid service on a mobile network, PT Inovação is established in Portugal and has commercial and technical representative offices in Angola, Brazil, Morocco, Mozambique, Spain and South Africa. PT Inovação gathers knowledge and generates value for customers by being the leader in the knowledge areas that are strategic for the technological development of network operators and service enabler business.

Social Event at Aliança Underground Museum

On the second day of the conference (Thursday, 22 September 2011), we will have a guided tour to the Aliança Underground Museum.

The Aliança Underground Museum is an exhibition space, displayed along the traditional wine cellars of Aliança Vinhos de Portugal. Contemplating seven private collections, the public has access to diverse dimensions, such as archeology, ethnography, mineralogy, paleontology, and ceramic tiles, covering millions of years. Being part of the great universe of Berardo Collection, these collections are the result of the constant effort of José Berardo in collecting and caring for objects of scientific, artistic, or historical or sentimental importance.

monami 2011
3rd International ICST Conference on Mobile Networks & Management

Program at a Glance

		21 September 2011	22 September 2011	23 September 2011
8:30	Registration	Welcome Address		
9:00		Tutorial (Part I) *Cooperative Wireless Networks: From Theory to Practice*	Keynote *Autonomic Mobile Network and Service Management for the Future Internet* Dr. John Strassner	Best Paper Awards Ceremony *Future Research Directions (I)*
10:30		Coffee Break	Coffee Break	Coffee Break
11:00		Tutorial (Part II) *Cooperative Wireless Networks: From Theory to Practice*	Technical Session *Network Virtualization, Routing and Self-Management*	Technical Session *Future Research Directions (II)* *Invited Talk: The Random Walk down Venture Capital Land* Dr. Luis Campos
13:00		Lunch break	Lunch break	Lunch break
14:30		Technical Session *Wireless Mesh Networks*	Technical Session *Mobility and Wireless Networks*	*MONAMI SmaRT Workshop (I)*
16:30		Coffee Break	Coffee Break	Coffee Break
		Technical Session *Security, Services and Context*	Technical Session *Mobile Network Services*	*MONAMI SmaRT Workshop (II)* Closing Session
19:00		Welcome Reception PT INOVAÇÃO	Social Event ALIANÇA UNDERGROUND MUSEUM	