

# **2014 IEEE World Forum on Internet of Things**

## **(WF-IoT 2014)**

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## Program

### **Tutorial: Application Architectures for Internet of Things: State-of-the-art and Research Directions**

Internet of Things (IoT), aims at enabling interactions between devices ranging from wireless sensors/actuators to smart meters, with little or no human intervention. This tutorial proposes an overview of IoT application architectures and discusses the related research issues. It comprises two parts. In the first part, we give background information. The standard system architectures proposed so far for IOT (e.g. ETSI M2M architecture, Wimax M2M architecture) are introduced along with the standard communications and networking technologies (IEEE 802.15.4, Zigbee, 6LoWPAN) on which they rely. We also discuss concrete IOT application use cases, gives insights in the application architecture related - challenges, and derive requirements. In the second part, the body of knowledge in application architectures is reviewed in light of the requirements. The review includes the middleware proposed so far (e.g. RESTful Web services based - middleware). It also includes the applications layer protocols being developed (e.g. IETF CoAP) for IOT. In addition the emerging cloud architectures (e.g. virtualization architectures for cost efficient IoT application provisioning) and 4G Evolved Packet Core (EPC) architectures (e.g. differentiated QoS architectures for IoT applications) are introduced. Concrete use cases are presented for illustration purpose. Strengths and weaknesses are assessed. Related research directions are identified.

### **Tutorial: IoT/M2M Service Platforms and Related International Standards**

The need for a common service platform for IoT/M2M applications is becoming increasingly critical. Though many IoT/M2M services, such as smart home, smart energy, eHealth and connected vehicle, already exist for several years, they involve complex effort in design and development of underlying network control such as authentication, access control, information storage and retrieval, device connection and application logic. To make it worse, this effort is often tied to a specific type of device, network, and application in a vertical market. Consequently, the same or similar effort needs be repeated again when developing the IoT/M2M services with a different type of device, network, or application. This tutorial addresses this critical need of the IoT/M2M. We will first introduce to the audience the current landscape and new trends of the IoT/M2M, then articulate the needs and requirements of a common IoT/M2M platform. In order for such a common service platform to be useful, an international standard is required to facilitate interoperability and build economies of scale. Thus, we will give a survey of the effort in international standards for IoT/M2M common service platforms. Finally, we will present the experiments of developing IoT/M2M applications over a standard common service platform at NCTU.

### **Tutorial: The Convergence of Social Networks and the Internet of Things: Opportunities Technologies, and Challenges**

This Tutorial focuses on the convergence of the Internet of Things (IoT) and Social Network paradigms towards the deployment of a social network wherein things establish social links as humans do. This concept is fast gaining ground as demonstrated by scientific studies and commercial platforms developed by companies, such as Ericsson, Evrythng and Paraimpu. The tutorial addresses the scalable discovery and search of Things and relevant services, privacy and security of information handled by Things, heterogeneity of Things, interactions among heterogeneous Internet resources, and new communication paradigms applicable to the Internet of trillions of objects. In this context, social networks provide powerful solutions to create a social structure among members that guarantees network navigability and enables effective service discovery while guaranteeing scalability. The social links also constitute a remarkable basis for the management of the Things trustworthiness. Additionally, the social network is proven to be a very influential way for making visible each node in a network of trillions of members. Within the Tutorial, all the different aspects of the cited topic will be thoroughly addressed by finalizing them to the constitution of the background for the definition of new paradigms for data networking in the future Internet.

### **Opening Ceremony (Olympia)**

### **Keynote (Olympia): Paving the Way to Internet of Things**

The advent of low-cost, low-profile electronic components is rendering more objects around us to gain intelligence and the ability to communicate via the Internet, hence the Internet of Things (IoT). Business analysts estimate that up to a trillion devices will be equipped with connectivity by 2020, contributing to IoT market potential in the range of tens of trillion of dollars. Meanwhile, Samsung has been driving the IoT revolution through innovations in key components such as CPU, flash, and wireless network equipments for LTE and Wi-Fi. Moreover, Samsung remains one of the leading providers for devices such as Smartphones, Smart TVs, and Wearables, which collectively represent a significant portion of the "Things". For vertical market solutions, Samsung is actively involved across a wide spectrum of topics such as Smart home, Connected cars, Connected health, Digital signage, and Smart retail.

In this talk, we will first assess the current IoT technology, identify key issues and challenges and conclude by illustrating the future R&D direction.

## Keynote (Olympia): Internet of Things: Journey to Success

Tens of billions of interconnected devices by 2020, a prediction that is both exciting and challenging that provides rich opportunities for innovation. The technology industry at large is mobilizing and realizing a greater vision for Internet of Things, one that encompasses sensing and sensing platforms, mobile and fixed gateways, analytics and big data, security, manageability, and interoperability. To realize this vision, we need to innovate in many disciplines and drive for common frameworks and standards. This talk will focus on IoT technology innovation challenges and opportunities for this segment of the embedded market.

## Lunch (Arirang, 2F)

## Experiments - Platforms

### ***Challenges From the Identities of Things***

Ingo Frieze (Deutsche Telekom Laboratories, Germany); Jörg Heuer (Deutsche Telekom Laboratories, Germany); Ning Kong (CNNIC, P.R. China)  
pp. 1-4

### ***The Internet of Things as Greenfield Model***

Helmut Zuerner (Verizon, Germany)  
pp. 5-9

### ***Design and Implementation of a WiFi Sensor Device Management System***

Xuejun Cai (Ericsson, Sweden); Yan Wang (Ericsson Communications Co. Ltd., P.R. China); Xiuyong Zhang (Ericsson, P.R. China); Lu Luo (Ericsson China Communications Company Ltd., P.R. China)  
pp. 10-14

### ***Horizontal M2M Platforms Boost Vertical Industry: Effectiveness Study for Building Energy Management Systems***

Martin Floeck (NEC Laboratories Europe, Germany); Apostolos Papageorgiou (NEC Laboratories Europe, Germany); Anett Schülke (NEC Laboratories Europe, Germany); JaeSeung Song (Sejong University, Korea)  
pp. 15-20

### ***Using Unity 3D to Facilitate Mobile Augmented Reality Game Development***

Sung Lae Kim (Ajou University, Korea); Teemu H Laine (Ajou University, Korea); Hae Jung Suk (Ajou University, Korea); Joonas Westlin (Ajou University, Korea); Jun Mo Jung (Ajou University, Korea); Jeong Hwa Kang (Ajou University, Korea)  
pp. 21-26

## Management of IoT Systems

### ***A Standard Compliant Security Framework for IEEE 802.15.4 Networks***

Giuseppe Piro (Politecnico di Bari, Italy); Gennaro Boggia (Politecnico di Bari, Italy); Luigi Alfredo Grieco (Politecnico di Bari, Italy)  
pp. 27-31

### ***Low-Power Semantic Fault-Detection in Multi-Sensory Mobile Health Monitoring Systems***

Vishwa Goudar (University of California, Los Angeles, USA); Miodrag Potkonjak (University of California at Los Angeles, USA)  
pp. 32-36

***Pseudo Random Number Generator and Hash Function for Embedded Microprocessors***

Hwajeong Seo (Pusan National University, Korea); Jongseok Choi (PUSAN, Korea); Hyunjin Kim (Pusan National University, Korea); Taehwan Park (Pusan National University, Korea); Ho Won Kim (Pusan National University, Korea)  
pp. 37-40

***Bridging SCADA Systems and GI Systems***

Simon Back (Salzburg University of Applied Sciences, Austria); Simon Kranzer (Salzburg University of Applied Sciences, Austria); Thomas Heistracher (Salzburg University of Applied Sciences, Austria); Thomas Lampoltshammer (University of Salzburg, Austria)  
pp. 41-44

***Decentralized Fault Tolerance Mechanism for Intelligent IoT/M2M Middleware***

Penn Su (National Taiwan University, Taiwan); Chi-Sheng Shih (National Taiwan University, Taiwan); Jane Hsu (National Taiwan University, Taiwan); Kwei Jay Lin (University of California, Irvine, USA); Yu-Chung Wang (National Taiwan University, Taiwan)  
pp. 45-50

***Towards the Era of Wireless Keys: How the IoT Can Change Authentication Paradigm***

Vitaly Petrov (Tampere University of Technology, Finland); Sviatoslav Edelev (University of Goettingen, Germany); Maria Komar (Yaroslavl State University, Russia); Yevgeni Koucheryav (Tampere University of Technology, Finland)  
pp. 51-56

## Web of Objects

***Short Paper: MPOT: 3D Mote Placement Optimization Tool for Wireless Sensor Networks***

Tamer Ali (Cairo University, Egypt); Rabie Ramadan (Cairo University, Egypt); Mohamed Khairy (Elec. and Comm. Dept., Faculty of Eng., Cairo Univ, Egypt)  
pp. 57-58

***Short Paper: Mote Deployment Algorithms in 3D WSNs***

Rabie Ramadan (Cairo University, Egypt); Tamer Ali (Cairo University, Egypt); Mohamed Khairy (Elec. and Comm. Dept., Faculty of Eng., Cairo Univ, Egypt)  
pp. 59-60

***Short Paper: Object Collaboration Model to Create Joint Knowledge in WoO Environment***

Sang Hum Lee (Hankuk University of Foreign Studies, Korea); Il Young Chong (Hankuk University of Foreign Studies, Korea)  
pp. 61-62

***Short Paper: Context-aware Adaptive Streaming in Web of Objects Environments***

Dongchil Kim (Kwangwoon University, Korea); Dooyeol Yun (Kwangwoon University, Korea); Kwangsue Chung (Kwangwoon University, Korea)  
pp. 63-64

***Short Paper: WoO Approach General Overview. Business Context, Innovative Features and Proposed Framework***

Mihaela Brut (Therisis, Thales Services S.A., France); Patrick Gatellier (Therisis, Thales Services S.A., France); Il Young Chong (Hankuk University of Foreign Studies, Korea)  
pp. 65-66

## Coffee Break

## Challenge on IoT, IPv6 and Smart Objects: An EU and Korean perspective

***A Decentralized Approach for Security and Privacy Challenges in the Internet of Things***

Antonio Fernando Skarmeta Gomez (University of Murcia, Spain); José Luis Hernandez Ramos (University of Murcia, Spain); María Victoria Moreno Cano (University of Murcia, Spain)  
pp. 67-72

**A Process-Based Internet of Things**

Socrates Varakliotis (University College London, United Kingdom); Peter Kirstein (University College London, United Kingdom); Antonio J. Jara (HES-SO, Switzerland); Antonio Fernando Skarmeta Gomez (University of Murcia, Spain)  
pp. 73-78

**Designing IoT Architecture(s) - A European Perspective**

Srdjan Krco (DunavNET & University of Belgrade, Faculty of Organizational Sciences, Serbia); Boris Pokric (DunavNET, Serbia); Francois Carrez (University of Surrey, United Kingdom)  
pp. 79-84

**Semantic Open IoT Service Platform Technology**

Dong-Hwan Park (Electronics and Telecommunications Research Institute, Korea); HyoChan Bang (ETRI, Korea); Cheol Sig Pyo (ETRI, Korea); Soon Ju Kang (Kyungpook National University, Korea)  
pp. 85-88

**OpenIoT: An Open Service Framework for the Internet of Things**

Jaeho Kim (Korea Electronics Technology Institute, Korea); Jang-Won Lee (Yonsei University, Korea)  
pp. 89-93

## Discovery and Positioning

**Sensor Discovery and Configuration Framework for the Internet of Things Paradigm**

Charith Perera (The Australian National University & Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia); Prem Prakash Jayaraman (CSIRO, Australia); Arkady Zaslavsky (CSIRO, Australia); Dimitrios Georgakopoulos (CSIRO, Australia); Peter Christen (The Australian National University, Australia)  
pp. 94-99

**Exploring the Use of DNS as a Search Engine for the Web of Things**

Andreas Kamilaris (University of Cyprus, Cyprus); Koula Papakonstantinou (University of Cyprus, Cyprus); Andreas Pitsillides (University of Cyprus, Cyprus)  
pp. 100-105

**Semantic Positioning Via Structured Sparsity Models**

Giuseppe Destino (CWC, University of Oulu, Finland); Davide Macagnano (Centre for Wireless Communications, University of Oulu, Finland)  
pp. 106-110

**An Online Sequential Extreme Learning Machine Approach to WiFi Based Indoor Positioning**

Han Zou (EXQUISITUS, Centre for E-City, School of Electrical and Electronics Engineering, Nanyang Technologic & Berkeley Education Alliance for Research in Singapore Limited, Singapore); Hao Jiang (Nanyang Technological University, Singapore); Xiaoxuan Lu (Nanyang Technological University, Singapore); Lihua Xie (University of Nanyang Technological University, Singapore)  
pp. 111-116

**Indoor Positioning: a Key Enabling Technology for IoT Applications**

Davide Macagnano (Centre for Wireless Communications, University of Oulu, Finland); Giuseppe Destino (CWC, University of Oulu, Finland); Giuseppe Abreu (Jacobs University Bremen, Germany)  
pp. 117-118

**Performance Evaluation and Optimization of Neighbor Discovery Implementation Over Contiki OS**

Mohamed Seliem (Cairo University, Egypt); Khaled Elsayed (Cairo University, Egypt); Ahmed Khattab (Cairo University, Egypt)  
pp. 119-123

**Localization with Heterogeneous Information**

Davide Macagnano (Centre for Wireless Communications, University of Oulu, Finland); Giuseppe Destino (Centre for Wireless Communications, University of Oulu, Finland); Giuseppe Abreu (Jacobs University Bremen, Germany)  
pp. 124-129

## Societal Impacts

### ***Learning From Tracking Waste: How Transparent Trash Networks Affect Sustainable Attitudes and Behavior***

David Lee (Massachusetts Institute of Technology & Senseable City Lab, USA); Dietmar Offenhuber (Massachusetts Institute of Technology, USA); Assaf Biderman (MIT, USA); Carlo Ratti (Massachusetts Institute of Technology, USA)  
pp. 130-134

### ***Improve the Sustainability of Internet of Things Through Trading-based Value Creation***

Charith Perera (The Australian National University & Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia); Arkady Zaslavsky (CSIRO, Australia)  
pp. 135-140

### ***User Role in IoT-based Systems***

María Victoria Moreno Cano (University of Murcia, Spain); José Luis Hernandez Ramos (University of Murcia, Spain); Antonio Fernando Skarmeta Gomez (University of Murcia, Spain)  
pp. 141-146

### ***A Framework for Evaluating Internet-of-Things Platforms: Application Provider Viewpoint***

Oleksiy Mazhelis (University of Jyväskylä & University of Jyväskylä, Finland); Pasi Tyrväinen (University of Jyväskylä, Finland)  
pp. 147-152

### ***Techno-economic Feasibility Analysis of Constrained Application Protocol***

Mahya Ilaghi Hosseini (Aalto University, Finland); Tapio Levä (Aalto University, Finland); Miika K.T. Komu (Helsinki University of Technology, Finland)  
pp. 153-158

### ***Human Data Interaction in IoT: The Ownership Aspect***

Afra Mashhadi (Bell Laboratories, Ireland); Fahim Kawsar (Bell Labs & Lancaster University, Belgium); Utku Günay Acer (Alcatel-Lucent Bell Laboratories, Belgium)  
pp. 159-162

## Welcome Reception (Olympia)

## Poster Presentations: Services

### ***Short Paper: Vehicle Emission Control in Smart Cities***

Milos Tesanovic (Fujitsu Laboratories of Europe Ltd., United Kingdom); Sunil Vadgama (Fujitsu Laboratories of Europe Ltd, United Kingdom)  
pp. 163-164

### ***Short Paper: Surveillance System with Light Sensor***

Hwajeong Seo (Pusan National University, Korea); Jongseok Choi (PUSAN, Korea); Hyunjin Kim (Pusan National University, Korea); Taehwan Park (Pusan National University, Korea); Ho Won Kim (Pusan National University, Korea)  
pp. 165-166

### ***Short Paper: Affect Classification of Web Comportments***

Fatima Isiaka (University of Manchester, United Kingdom); Adamu Mailafiya Ibrahim (University of Leeds, United Kingdom)  
pp. 167-168

### ***Short Paper: Using BSN for Tele-Health Application in Upper Limb Rehabilitation***

Benedict Tan (HutCabb Consulting, Singapore); Oliver Tian (Singapore Industrial Automation Association & HutCabb Consulting, Singapore)  
pp. 169-170

### ***Short Paper: Calory Battle AR: An Extensible Mobile Augmented Reality Exergame Platform***

Joonas Westlin (Ajou University, Korea); Teemu H Laine (Ajou University, Korea)  
pp. 171-172

**Short Paper: Sensors Data Fusion for Smart Cities with KNIME: A Real Experience in the SmartSantander Testbed**

Antonio J. Jara (HES-SO, Switzerland); Dominique Genoud (Hesso//Wallis - IIG, Switzerland); Yann Bocchi (Haute Ecole Spécialisée de Suisse Occidentale, Switzerland)  
pp. 173-174

## Poster Presentations: Technology - Network

**Short Paper: A Human Mobility Pattern-based Routing Protocol for Delay Tolerant Networks**

Junyeop Lee (Yonsei University, Korea); Sun Kyum Kim (Yonsei University, Korea); JinHee Jo (Yonsei University, Korea); JiHyeun Yoon (Yonsei University, Korea); SungBong Yang (Yonsei University, Korea)  
pp. 175-176

**Short Paper: Wireless Sensor Network Management for Sustainable Internet of Things**

Jaewoo Kim (Yonsei University, Korea); Seok Yu (Yonsei University, Korea); Jaiyong Lee (Yonsei University, Korea)  
pp. 177-178

**Short Paper: Study on Cognitive Radio in IEEE 802.15.4 Wireless Sensor Networks**

Chi-Ming Wong (Jinwen University of Science and Technology, Taiwan); Wen-Pin Hsu (Chung Chou University of Science and Technology, Taiwan)  
pp. 179-180

**Short Paper: Overcoming IoT Fragmentation Through Standard Gateway Architecture**

Romano Fantacci (University of Florence, Italy); Tommaso Pecorella (Università di Firenze & CNIT, Italy); Roberto Viti (Università degli Studi di Firenze & CNIT - Consorzio Nazionale Interuniversitario per le Telecomunicazioni, Italy); Camillo Carlini (Telecom Italia, Italy)  
pp. 181-182

**Short Paper: Time-dependent Power Load Disaggregation with Applications to Daily Activity Monitoring**

Hao Song (Toshiba Research Europe Limited, United Kingdom); Georgios Kalogridis (Toshiba Research Europe Ltd, United Kingdom); Zhong Fan (Toshiba Research Europe, United Kingdom)  
pp. 183-184

**Short Paper: Design of a Dielectrophoresis-based Portable Device for Monitoring Pollution in Water Deposits**

Martha S Lopez-de la Fuente (Universidad de Monterrey, Mexico)  
pp. 185-186

## Poster Presentations: Technology - Software

**Short Paper: More Than the End to Information Overflow - How IBM Watson Will Turn Upside Down Our View on Information Devices**

Stefan Holtel (BrightONE, Germany)  
pp. 187-188

**Short Paper: Seamless File Sharing for Android Device**

Minseok Jeon (Yonsei University, Korea); Sun Kyum Kim (Yonsei University, Korea); JiHyeun Yoon (Yonsei University, Korea); JinHee Jo (Yonsei University, Korea); SungBong Yang (Yonsei University, Korea)  
pp. 189-190

**Short Paper: A Model Based Framework for Effective Web of Things Development**

Roberto Manione (Media on Line, Italy)  
pp. 191-192

**Short Paper: A Scripting-Free Control Logic Editor for the Internet of Things**

Markus Jung (Vienna University of Technology, Austria); Esad Hajdarevic (Vienna University of Technology, Austria); Wolfgang Kastner (TU Vienna (Wien), Austria); Antonio J. Jara (HES-SO, Switzerland)  
pp. 193-194

**Short Paper: Semantic URI-based Event-driven Physical Mashup**

Sejin Chun (Yonsei University, Korea); Jooik Jung (Yonsei University, Korea); Xiongnan Jin (Yonsei University, Korea); Gunhee Cho (Yonsei University, Korea); Jinho Shin (Department of Computer Science, Yonsei University, Korea); Kyong-Ho Lee (Yonsei University, Korea)  
pp. 195-196

**Short Paper: Harmonizing Heterogeneous Components in SeSaMe**

Luciano Baresi (Politecnico di Milano, Italy); Guinea Sam (Politecnico di Milano, Italy); Adnan Shahzada (Politecnico di Milano, Italy)  
pp. 197-198

## Keynote (Seoul): Orchestrating the Smarter Planet in the World of Internet of Things

The introduction of pervasive and ubiquitous instrumentation within a smarter planet and internet of things leads to unprecedented real-time visibility of the power grid, traffic, transportation, water, oil & gas, and personal health. Interconnecting those distinct physical, people, and business worlds through ubiquitous instrumentation, even though still in its embryonic stage, has the potential to unleash a planet that is much greener, more efficient, more comfortable, and safer.

In this talk, we will describe the opportunities and challenges after applying intelligence on interconnected and instrumented worlds and call out the system of systems trend on interconnecting these distinct but interdependent worlds. It has become increasingly crucial that digital representations of these distinct worlds (a.k.a. models) need to be created as a pre-requisite in order to assess the complexity, maneuver through uncertain environments and eventually achieve the predicted outcome.

The starting point of such an Internet of Things solution is always the real world itself - whether it is smarter grids, buildings, supply chains or water systems. The instrumentation provides a mechanism to facilitate high-fidelity capture of the real world into the observed world, which is often based on models of the real world. These digital representations (or models) facilitate stitching together or assimilating the data captured from the instrumented world and enable interpolation and extrapolation of those areas where data were not available or contaminated. In many cases, these models allow the generation of the most plausible hypothesis to explain the available information. From these models, the expected outcome is generated through simulation and/or predictive analysis. The course of actions based on the models are then taken for command and control (or actuating) the real world.

A smarter planet solution requires optimal or near optimal orchestration of the control flow and information flow. The "music notes" of the orchestration really came from the behavior models assimilated from the real-world information. Consequently, developing models at the behavior levels is often necessary to facilitate the optimal orchestration of the generation, management, and continuous assurance of the business outcome.

## Experiments - Radio

**UHF RFID Transmission with Soft-Input BCH Decoding**

Daniel Merget (Technische Universität München, Germany); Grzegorz Smietanka (Technical University Dortmund, Germany); Jürgen Götze (TU Dortmund University, Germany)  
pp. 199-202

**Comparison of IEEE 802.15.4e MAC Features**

Jianwei Zhou (Texas Instruments Inc., USA); Arifon Xhafa (Texas Instruments Inc., USA); Ramanuja Vedantham (Texas Instruments Inc., USA); Ryan Nuzzaci (Texas Instruments Inc., USA); Arvind Kandhalu (Texas Instruments, USA); Xiaolin Lu (Texas Instruments, Inc., USA)  
pp. 203-207

**Peer to Peer Signal Strength Characteristic Between IoT Devices for Distance Estimation**

JoonYoung Jung (ETRI, Korea); Dong-oh Kang (ETRI, Korea); Chang Seok Bae (ETRI, Korea)  
pp. 208-211

**Analytical Model of Adaptive CSMA/CA MAC for Reliable and Timely Clustered Wireless Multi-hop Communication**

Rajavaraprasad Yerra (IIT Hyderabad & Mhrd, India); Pachamuthu Rajalakshmi (Indian Institute of Technology Hyderabad, India)  
pp. 212-217

**An Empirical Path Loss Model for Wireless Sensor Network Deployment in a Sand Terrain Environment**

Abdulaziz Alsayyari (Florida Institute of Technology, USA); Ivica N. Kostanic (Florida Institute of Technology, USA); Carlos Otero (Florida Institute of Technology, USA); Mohammed Almeer (Florida Institute of Technology, USA); Kusay Rukieh (Florida Institute of Technology, USA)



## Internet of Vehicles

### ***On the Suitability of Device-to-Device Communications for Road Traffic Safety***

Abdelmajid Khelil (Huawei European Research Center, Germany); David Soldani (Huawei Technologies Duesseldorf GmbH & European Research Centre, Germany)  
pp. 224-229

### ***A Networking Perspective on Self-Organizing Intersection Management***

Christoph Sommer (University of Innsbruck, Austria); Florian Hagenauer (University of Innsbruck, Austria); Falko Dressler (University of Innsbruck, Austria)  
pp. 230-234

### ***Connected Vehicle Safety - Science, System, and Framework***

Kuan-Wen Chen (Intel-NTU Connected Context Computing Center, Taiwan); Hsin-Mu Tsai (National Taiwan University, Taiwan); Chih-Hung Hsieh (Intel-NTU Connected Context Computing Center, Taiwan); Shou-De Lin (National Taiwan University, Taiwan); Chieh-Chih Wang (National Taiwan University, Taiwan); Shao-Wen Yang (Intel Corporation, Taiwan); Shao-Yi Chien (National Taiwan University, Taiwan); Chia-Han Lee (Academia Sinica, Taiwan); Yu-Chi Su (National Taiwan University, Taiwan); Chun-Ting Chou (National Taiwan University, Taiwan); Yuh-Jye Lee (National Taiwan University of Science and Technology, Taiwan); Hsing-Kuo Pao (National Taiwan University of Science and Technology, Taiwan); Ruey-Shan Guo (National Taiwan University, Taiwan); Chung-Jen Chen (National Taiwan University, Taiwan); Ming-Hsuan Yang (University of California, Merced, USA); Bing-Yu Chen (National Taiwan University, Taiwan); Yi-Ping Hung (National Taiwan University, Taiwan)  
pp. 235-240

### ***Internet of Vehicles: From Intelligent Grid to Autonomous Cars and Vehicular Clouds***

Mario Gerla (University of California at Los Angeles, USA); Eun-Kyu Lee (UCLA, USA); Giovanni Pau (UPMC - LIP6 & UCLA, USA); Uichin Lee (KAIST, Korea)  
pp. 241-246

### ***Trustworthy Communications in Vehicular Ad Hoc Networks***

Serna Jetzabel (Technical University of Catalonia, Spain); Roberto Morales (Universitat Politècnica de Catalunya, Spain); Manel Medina (Technical University of Catalonia, Spain); Jesus Luna (Barcelona Digital CT, Spain)  
pp. 247-252

## Standards 1

### ***Opportunity and Strategy for Future IoT Business***

Myung Keun Lee (SKT, Korea)

### ***Panel: Standardization Activities in the IoT Universe***

Mary Nielsen (IEEE Standards Association, USA)

## Lunch (Café, 1F)

## Poster Display (Athens)

## Critical Services

### ***Adaptive Rule Engine Based IoT Enabled Remote Health Care Data Acquisition and Smart Transmission System***

Malyala Pavana Ravi Sai Kiran (IIT Hyderabad, India); Pachamuthu Rajalakshmi (Indian Institute of Technology Hyderabad, India); Krishna Bharadwaj (IIT Hyderabad, India); Amit Acharyya (IIT HYDERABAD, India)

***When Devices Become Collaborative. Supporting Device Interoperability and Behaviour Reconfiguration Across Emergency Management Scenario***

Mihaela Brut (Therisis, Thales Services S.A., France); Patrick Gatellier (Therisis, Thales Services S.A., France); Ismail Salhi (Université Paris-Est, France); Sylvain Cherrier (Université Paris-Est, France); Yacine Ghamri-Doudane (University of la Rochelle, France); David Excoffier (Sogeti High Tech, France); Nicolas Dumont (Thales Communications and Security, France); Mario Lopez Ramos (Thales Communications and Security, France)

pp. 259-264

***Cardea: Cloud Based Employee Health and Wellness, an Integrated Wellness Application with a Wearable Device and the HCM Data Store***

Elizabeth Lingg (Oracle, USA); Garrett Leone (Oracle, USA); Kent Spaulding (Oracle, USA); Reza B'Far (Oracle, USA)

pp. 265-270

***A Cost Effective and Sustainable Relief Material Supply Visibility System for Devastated Areas***

Shigeya Suzuki (Keio University, Japan); Yuki Sato (Keio University, Japan); Takehiro Yokoishi (Keio University, Japan); Jin Mitsugi (Keio University, Japan)

pp. 271-276

## Platforms

***A Quality-based Semantic Service Broker Using Reachability Indexes***

Yenting Lee (Oakland University, USA); Chingseh Wu (Oakland University, USA)

pp. 277-282

***A Semantic Service Creation Platform for Social IoT***

Maria Victoria Beltran (Institut Telecom, France); Antonio M. Ortiz (Institut Mines-Telecom, Telecom SudParis, France); Dina Hussein (Institut Mines-Telecom, Telecom SudParis, France); Noel Crespi (Institut Mines-Télécom, Télécom SudParis, France)

pp. 283-286

***A Survey of Internet-of-Things: Future Vision, Architecture, Challenges and Services***

Dhananjay Singh (Hankuk University of Foreign Studies, Korea); Gaurav Tripathi (Bharat Electronics Limited, India); Antonio J. Jara (HES-SO, Switzerland)

pp. 287-292

***Internet of Things for Designing Smart Objects***

Daniele Mazzei (University of Pisa, Italy); Gabriele Montelisciani (University of Pisa, Italy); Gualtiero Fantoni (University of Pisa, Italy); Giacomo Baldi (Errequadro Srl, Italy)

pp. 293-297

***Dynamic Services Selection Approach for the Composition of Complex Services in the Web of Objects***

Amal Kouicem (Laboratory of Medical Computing (LIMED), University of Bejaia, 06000 Bejaia, Algeria, France); Abdelghani Chibani (LISSI Lab., France); Abdelkamel Tari (Bejaia University, Algeria); Yacine Amirat (University of Paris 12, France); Zahir Tari (RMIT University, Australia)

pp. 298-303

***A Big Data Correlation Orchestrator for Internet of Things***

Mohammad Mozumdar (California State University, Long Beach, USA); Amir Shahbazian (California State University at Long Beach (CSULB) & Linkviva, USA); Nhat-Quang Ton (CSULB, USA)

pp. 304-308

## Standards 2

***IoT-Based Smart Green City Technology***

Daekyo Jung (Korea Telecom, Korea)

***Panel: Convergence of Smart Home and Building Architectures***

Oleg Logvinov (STMicroelectronics, USA)

**IEEE-SA: the Platform for the 21st Century**  
Bruce Kraemer (IEEE-SA President-Elect, USA)

## Coffee Break

## Mobile Networks

### **Analyzing the Overload of 3GPP LTE System by Diverse Classes of Connected-Mode MTC Devices**

Oleg Dementev (Tampere University of Technology, Finland); Olga Galinina (Tampere University of Technology, Finland); Mikhail Gerasimenko (Tampere University of Technology, Finland); Tuomas Tirronen (Ericsson Research, Finland); Johan Torsner (Ericsson Research, Finland); Sergey Andreev (Tampere University of Technology, Finland); Yevgeni Koucheryavy (Tampere University of Technology, Finland)  
pp. 309-312

### **Class Based Dynamic Priority Scheduling for Uplink to Support M2M Communications in LTE**

Mukesh Giluka (Indian Institute Of Technology Hyderabad, India); Nitish Rajoria (IIT Hyderabad, India); Ashish C Kulkarni (Visvesvaraya Technological University & PES Institute of Technology Bangalore, India); Vanlin Sathya (Indian Institute of Technology Hyderabad, India); Bheemarjuna Reddy Tamma (IIT Hyderabad, India)  
pp. 313-317

### **White Space Radio: Towards an Active Database-Centred Topology**

Odysseas Pappas (University of Bristol, United Kingdom); Tom Barratt (University of Bristol, United Kingdom); Michael Collett (University of Bristol, United Kingdom); Kibrom Gebremicael (University of Bristol, United Kingdom); Paul Worgan (University of Bristol, United Kingdom)  
pp. 318-322

### **Delivering Uniform Connectivity and Service Experience to Converged 5G Wireless Networks**

Sergey Andreev (Tampere University of Technology, Finland)  
pp. 323-324

## Standards 3

### **3D Medical Standard: Over the Horizon**

Young Lae Moon (IEEE Working Group Practical Applications of 3D Medical Modeling, Korea)

### **Where Are the Business Opportunities in IoT?**

Gary Stuebing (Cisco, USA)

### **Internet of Things and its Growing Business**

Michimasa Aramaki (Panasonic, Japan)

### **Sensors and the Internet of Things Can Help Us Live Longer**

Oleg Logvinov (STMicroelectronics, USA)

## Transport and Energy Management

### **Study on the Reduction Effect of Traffic Accident by Using Analysis of Internet Survey**

Masahiro Miyaji (Aichi Prefectural University & InfoTOYOTA, LTD, Japan)  
pp. 325-330

### **Multi-Player Gaming in Public Transport Crowd: Opportunities and Challenges**

Saumay Pushp (KAIST, Korea); Chi Harold Liu (IBM Research, P.R. China); Fangming Liu (Huazhong University of Science and Technology, P.R. China); Junehwa Song (KAIST, Korea)  
pp. 331-336

***A Modular Framework for Cost Optimization in Smart Grid***

Muhammad Raisul Alam (Carleton University, Canada); Marc St-Hilaire (Carleton University, Canada); Thomas Kunz (Carleton University, Canada)  
pp. 337-340

***Controlling Electric Vehicle Charging in the Smart Grid***

Wang Xiang (Carleton University, Canada); Thomas Kunz (Carleton University, Canada); Marc St-Hilaire (Carleton University, Canada)  
pp. 341-346

***Application of RFID Technology and the Maximum Spanning Tree Algorithm for Solving Vehicle Emissions in Cities on Internet of Things***

Chi-Man Vong (University of Macau, Macao); Pak-Kin Wong (University of Macau, Macao); Zi-Qian Ma (University of Macau, Macao); Ka-In Wong (University of Macau, Macao)  
pp. 347-352

***Design and Implementation of Vehicle Tracking System Using GPS/GSM/GPRS Technology and Smartphone Application***

SeokJu Lee (Kettering University, USA); Girma Tewolde (Kettering University, USA); Jaerock Kwon (Kettering University, USA)  
pp. 353-358

***Developing a NovaGenesis Architecture Model for Service Oriented Future Internet and IoT: An Advanced Transportation System Scenario***

Antonio M Alberti (National Institute of Telecommunications, Brazil); Dhananjay Singh (Hankuk University of Foreign Studies, Korea)  
pp. 359-364

## Banquet (Olympia)

19:00 - 19:20 SK Telecom's IoT Biz and R&D: Realizing a Smarter World

IoT is comprised of smart machines interacting and communicating with other machines, objects, environments and infrastructures and then will encompass all aspects for our lives. As a result huge volumes of data are being generated, and that data being processed into useful actions that can make our lives much easier and safer. It requires total convergence of overall technologies-from sensing, embedded processing and connectivity to platform software and applications in order to become a reality. IoT also has a highly fragmented market, especially hundreds of IoT-related applications being considered and identified by different industries: Automotive & Transportation, Wellness & Care, Moving Asset, Facility & Building, Utility & Energy, Safety & Security, Commerce Retail, Consumer Electronics, and Environment & Agriculture. For a wide variety of these services IoT requires low energy consumption, cost-effectiveness, quality and reliability as well as sophisticated processing that can track of all of connected devices, communicate with them and translate their functionality into useful applications. More than all, full security is essentially needed across the entire signal path. All these requirements mean no one company can develop full solutions. IoT-based innovations will require a broad, rich ecosystem of partner companies working together to bring IoT services to the market. Regarding these points SK telecom's IoT Biz strategy and R&D status will be addressed in this talk.

## IoT and Cloud Computing

***Interoperability Enhancement for Virtualization of Sensors for Smart Cities***

Hiroyuki Maeomichi (NTT Network Innovation Laboratories, Japan); Akihiro Tsutsui (NTT Network Innovation Laboratories, Japan)  
pp. 365-366

***Abstracting IoT Devices Using Virtual Machine for Wireless Sensor Nodes***

Takayuki Suyama (NTT Communication Science Laboratories, Japan); Yasue Kishino (NTT Communication Science Laboratories, Japan); Futoshi Naya (NTT Communication Science Laboratories, Japan)  
pp. 367-368

***ClouT: Cloud of Things for Empowering the Citizen Clout in Smart Cities***

Kenji Tei (National Institute of Informatics, Japan); Levent Gurgen (CEA French Alternative Energies and Atomic Energy Commission, France)  
pp. 369-370

**Monitoring Dependability of City-scale IoT Using D-Case**

Hideyuki Tokuda (Keio University, Japan); Takuro Yonezawa (Keio University, Japan); Jin Nakazawa (Keio University, Japan)  
pp. 371-372

**Sharing User IoT Devices in the Cloud**

Yazid Benazzouz (CEA-LETI, France); Christophe Munilla (CEA-LETI, France); Ozan Gunalp (CEA-LETI, France); Mathieu Gallissot (CEA-LETI, France); Levent Gurgun (CEA French Alternative Energies and Atomic Energy Commission, France)  
pp. 373-374

**IoT and Cloud Convergence: Opportunities and Challenges**

MD Abdur Rahim (Create-Net International Research Centre, Italy); Raffaele Giaffreda (Create-Net, Italy)  
pp. 375-376

## Service Scenarios and Platforms

**An Infrastructure for Robotic Applications as Cloud Computing Services**

Carla Mouradian (Concordia University, Canada); Fatima Zahra Errounda (Concordia University, Canada); Fatna Belqasmi (Concordia University, Canada); Roch Glitho (Concordia University, Canada)  
pp. 377-382

**Objects That Agree on Task Frequency in the IoT: a Lifetime-Oriented Consensus Based Approach**

Giuseppe Colistra (University of Cagliari, Italy); Virginia Pilloni (University of Cagliari, Italy); Luigi Atzori (University of Cagliari, Italy)  
pp. 383-387

**User-centric Service Environment for Context Aware Service Mash-up**

Hoan Suk Choi (Hanbat National University, Korea); Jun-Young Lee (Hanbat National University, Korea); Na-Ri Yang (Hanbat National University, Korea); Woo-Seop Rhee (Hanbat National University, Korea)  
pp. 388-393

**Ubiquitous Clerk and Virtual Planning Office**

Shunsuke Fujita (Saitama University, Japan); Takaaki Hasegawa (Saitama University, Japan); Tetsuya Manabe (Saitama University, Japan)  
pp. 394-399

**An Integrated Device and Service Discovery with UPnP and ONS to Facilitate the Composition of Smart Home Applications**

Jin Mitsugi (Keio University, Japan); Yuki Sato (Keio University, Japan); Miyuki Ozawa (Keio University, Japan); Shigeya Suzuki (Keio University, Japan)  
pp. 400-404

## Social IoT

**Network Navigability in the Social Internet of Things**

Michele Nitti (University of Cagliari, Italy); Luigi Atzori (University of Cagliari, Italy); Irena Pletikosa Cvijikj (ETH Zürich, Switzerland)  
pp. 405-410

**Semi-autonomous, Context-Aware Agent Using Behaviour Modelling and Reputation Systems to Authorize Data Operation in the Internet of Things**

Bertrand Copigneaux (Inno TSD, France)  
pp. 411-416

**Towards Zero-Configuration in Device Collaboration Using Device Sociality**

Jang-Ho Choi (Electronics and Telecommunications Research Institute, Korea); Kyuchang Kang (ETRI, Korea); Dong-oh Kang (ETRI, Korea); Sangkeun Yoo (ETRI, Korea); Chang Seok Bae (ETRI, Korea)

## Routing / Protocols

### ***An Inter-Device Communication Protocol for Modular Smart-Objects***

Riccardo Brama (CMC Labs, Italy); Piergiuseppe Tundo (CMC Labs, Italy); Armando Della Ducata (CMC Labs, Italy); Angelo Malvasi (CMC Labs, Italy)  
pp. 422-427

### ***A Secure Multi-Hop Routing for IoT Communication***

Ruen Chze Loh (Nanyang Polytechnic, Singapore); Siew Leong Kan (Nanyang Polytechnic, Singapore)  
pp. 428-432

### ***Towards Synchronous Deterministic Channels for the Internet of Things***

Wilfried Steiner (TTTech Computertechnik AG, Austria); Flavio Bonomi (IoXWorks, Inc., USA); Hermann Kopetz (Technical University of Vienna, Austria)  
pp. 433-436

### ***Fault-Tolerant RPL Through Context Awareness***

Bassam Sharkawy (Cairo University, Egypt); Ahmed Khattab (Cairo University, Egypt); Khaled Elsayed (Cairo University, Egypt)  
pp. 437-441

### ***IoT Routing Architecture with Autonomous Systems of Things***

Soochang Park (Institut Mines-Télécom, Télécom SudParis, France); Noel Crespi (Institut Mines-Télécom, Télécom SudParis, France); Hosung Park (Chungnam National University, Korea); Sang-Ha Kim (Chungnam National University, Korea)  
pp. 442-445

### ***Low Power Routing and Channel Allocation Method of Wireless Video Sensor Networks for Internet of Things (IoT)***

HyungWon Kim (Chungbuk National University & College of Electrical and Computer Engineering, Korea)  
pp. 446-451

### ***Deployment Adviser Tool for Wireless Sensor Networks***

Amarlingam Madapu (IIT HYDERABAD, India); Adithyan I (Indian Institute Of Technology Hyderabad, India); Pachamuthu Rajalakshmi (Indian Institute of Technology Hyderabad, India); Yasutaka Nishimura (KDDI R&D Laboratories Inc., Japan); Masaya Yoshida (KDDI R&D Laboratories Inc., Japan); Kiyohito Yoshihara (KDDI R&D Laboratories Inc., Japan)  
pp. 452-457

### ***A Novel Anti-collision Scheme for RFID Systems***

Shoufeng Wang (China Mobile Group Design Institute Co., Ltd., P.R. China); Dongchen Zhang (CCMC, P.R. China); Xiaoyan Xu (CCMC, P.R. China); Shumeng Shi (CCMC, P.R. China); Tinglan Wang (CMCC, P.R. China)  
pp. 458-461

### ***Depth First Forwarding for Low Power and Lossy Networks: Application and Extension***

Jiazi Yi (LIX, Ecole Polytechnique, France); Thomas Heide Clausen (Ecole Polytechnique, France); Ulrich Herberg (Fujitsu Laboratories of America, USA)  
pp. 462-467

## Energy

### ***Leveraging Human Gait Characteristics Towards Self-Sustained Operation of Low-Power Mobile Devices***

Vishwa Goudar (University of California, Los Angeles, USA); James B Wendt (UCLA, USA); Miodrag Potkonjak (University of California at Los Angeles, USA); Zhi Ren (University of California, Los Angeles, USA); Paul Brochu (University of California, Los Angeles, USA); Qibing Pei (University of California, Los Angeles, USA)  
pp. 468-473

**Portable Low-Power IR-UWB System**

Choi Look Law (Nanyang Technological University, Singapore)  
pp. 474-478

**Sensor Dispatching Methods for Gathering Data in Rechargeable Wireless Mobile Sensor Networks**

Shih-Chang Huang (National Formosa University, Taiwan); Hong-Yi Chang (National Chiayi University, Taiwan); Jen-Yi Pan (National Chung Cheng University, Taiwan)  
pp. 479-484

**A SystemC-Based Framework for the Simulation of Appliances Networks in Energy-Aware Smart Spaces**

Alessandro Nacci (Politecnico di Milano, Italy); Giovanni Bettinazzi (Politecnico di Milano, Italy); Christian Pilato (Politecnico di Milano, Italy); Vincenzo Rana (Politecnico di Milano, Italy); Marco D Santambrogio (MIT & Politecnico di Milano, USA); Donatella Sciuto (Politecnico di Milano, Italy)  
pp. 485-490

**Adaptive Radio Duty Cycling in ContikiMAC: Proposal and Analysis**

Moataz Youssef (Cairo University & VALEO, Egypt); Khaled Elsayed (Cairo University, Egypt); Ahmed H. Zahran (Nile University, Egypt)  
pp. 491-495

**Novel Sampling Algorithm for Levy-Walk Based Mobile Phone Sensing**

Thejaswini M (IIT Hyderabad, India); Pachamuthu Rajalakshmi (Indian Institute of Technology Hyderabad, India); Uday B Desai (IIT Hyderabad, India)  
pp. 496-501

## Software Architectures

**WirelessCHARM: An Open System Low Cost Wireless Marshalling Module for Industrial Environments**

Song Han (University of Connecticut, USA); Thomas Lin (AwiaTech Corporation, USA); Deji Chen (Emerson Process Management, USA); Mark Nixon (Emerson Process Management, USA)  
pp. 502-505

**Knowledge Request-Broker Architecture: A Possible Foundation for A Resource-Constrained Dynamic and Autonomous Global System**

Hamed Khandan (RIKEN Advanced Institute for Computational Science, Japan); Kenji Ono (RIKEN Advanced Institute for Computational Science, Japan)  
pp. 506-507

**A Scalable Distributed Architecture Towards Unifying IoT Applications**

Chayan Sarkar (Delft University of Technology, The Netherlands); Akshay Uttama Nambi (TU Delft, The Netherlands); R Venkatesha Prasad (TU Delft, India); MD Abdur Rahim (Create-Net International Research Centre, Italy)  
pp. 508-513

**An IoT Gateway Centric Architecture to Provide Novel M2M Services**

Soumya Kanti Datta (EURECOM, France); Christian Bonnet (EURECOM, France); Navid Nikaein (Eurecom, France)  
pp. 514-519

**Improving Energy Efficiency in IoT with Re-configurable Virtual Objects**

Matti Eteläperä (VTT Technical Research Centre of Finland, Finland); Massimo Vecchio (Create-Net, Italy); Raffaele Giaffreda (Create-Net, Italy)  
pp. 520-525

**Making IT All Work Together**

Ian Thomas (Fujitsu Enabling Software Technologies, United Kingdom); Sebastien Ziegler (Mandat International, Switzerland); Cedric Crettaz (Mandat International, Switzerland); Lou Fedon (RunMyProcess, France); Sébastien Gaïde (RunMyProcess, France)  
pp. 526-531



## Lunch (Arirang, 2F)

## Experiments - Technologies

### ***Fault-recovery and Coherence in Internet of Things Choreographies***

Sylvain Cherrier (Université Paris-Est, France); Yacine Ghamri-Doudane (University of la Rochelle, France); Stephane Lohier (University of Paris-Est, France); Gilles Roussel (Université Paris-Est, France)  
pp. 532-537

### ***Cognitive Management Framework for Internet of Things - A Prototype Implementation***

Swaytha Sasidharan (Create-Net & Create-Net, Italy); Andrey Somov (CREATE-NET, Italy); Abdur Rahim (CREATE-NET, Italy); Raffaele Giaffreda (Create-Net, Italy)  
pp. 538-543

### ***DPWSim: A Simulation Toolkit for IoT Applications Using Devices Profile for Web Services***

Son N. Han (Institut Mines-Telecom, Telecom SudParis, France); Gyu Myoung Lee (Institut TELECOM, TELECOM SudParis, France); Noel Crespi (Institut Mines-Télécom, Télécom SudParis, France); Van Luong Nguyen (Institut Mines-Telecom, Telecom Sudparis, France); Heo Kyoungwoo (ETRI, Korea); Mihaela Brut (Therisis, Thales Services S.A., France); Patrick Gatellier (Therisis, Thales Services S.A., France)  
pp. 544-547

### ***An Implementation of Light-Weight Compression Algorithm for Wireless Sensor Network Technology in Structure Health Monitoring***

Chia-Hao Hsu (National Taiwan University, Taiwan); Chih-Ting Lin (National Taiwan University, Taiwan); Hui Ping Tserng (Department of Civil Engineering, National Taiwan University, Taiwan); Jen-Yu Han (Department of Civil Engineering, National Taiwan University, Taiwan)  
pp. 548-552

### ***Undervolting in WSNs - A Feasibility Analysis***

Ulf Kulau (Technische Universität Braunschweig, Germany); Felix Büsching (Technische Universität Braunschweig, Germany); Lars C Wolf (Technische Universität Braunschweig, Germany)  
pp. 553-558

## Semantic / Analytic for IoT

### ***Enrich Machine-to-Machine Data with Semantic Web Technologies for Cross-Domain Applications***

Amelie Gyrard (Eurecom, France); Christian Bonnet (Institut Eurecom, France); Karima Boudaoud (University of Nice Sophia Antipolis, France)  
pp. 559-564

### ***ANGELS for Distributed Analytics in IoT***

Arijit Mukherjee (Tata Consultancy Services, India); Himadri Sekhar Paul (Tata Consultancy Services, India); Swarnava Dey (Tata Consultancy Service Limited, India); Ansuman Banerjee (Indian Statistical Institute, India)  
pp. 565-570

### ***Multi-resolution Data Communication in Wireless Sensor Networks***

Frieder Ganz (Centre for Communication Systems Research, University of Surrey, United Kingdom); Payam Barnaghi (University of Surrey, United Kingdom); Francois Carrez (University of Surrey, United Kingdom)  
pp. 571-574

### ***A Unified Semantic Knowledge Base for IoT***

Akshay Uttama Nambi (TU Delft, The Netherlands); Chayan Sarkar (Delft University of Technology, The Netherlands); R Venkatesha Prasad (TU Delft, India); MD Abdur Rahim (Create-Net International Research Centre, Italy)  
pp. 575-580

## Closing Ceremony (Seoul)