

2016 IEEE 3rd World Forum on Internet of Things (WF-IoT 2016)

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Monday, December 12, 09:00 - 09:30

Opening Ceremony

Room: Grand Ballroom D

Monday, December 12, 09:30 - 10:30

Keynote: Internet of Things

Dr. Vinton G. Cerf, Google

Room: Grand Ballroom D

A wave of new, programmable, networkable devices is coming and with it, a wide range of serious considerations ranging from access control to safety and privacy, scaling and ease of use. The designers of these devices will do well to take into account long-term considerations relating to safe software updates to backward compatibility as new devices join older ones in residential and commercial/industrial settings. We have already seen the risks these devices pose in network space with the DDOS attacks against DYN via botnetted webcams (doesn't that sound like 1984-speak?). As engineers, we will have a lot to answer for if we don't do a better job of design and implementation.

Monday, December 12, 10:30 - 11:00

DARPA Announcement

Trung Tran, DARPA

Room: Grand Ballroom D

Monday, December 12, 11:00 - 11:30

Coffee Break

Monday, December 12, 11:30 - 13:30

Exhibition

Room: Grand Ballroom Foyer

Industry Forum Panel: IPv6-based IoT Deployment Around the World

Industry forum panel

Prof. Umar Garba Danbatta

Room: Grand Ballroom D

Chair: Latif Ladid (University of Luxembourg / IPv6 Forum, Luxembourg)

Session Objective

This session will attract speakers from the 5 Continents to outline the deployment efforts of IPv6-based IoT research and best practices. The deployment in different countries is taking different shapes and forms considering the differing continental user requirements at this stage of deployment. This session will try to harmonize and draw a common road map for deployment of IoT networking capabilities and architectural definitions to make sure "Internet of Things" are scalable, inclusive of several communication media, secure, future proof and viable for businesses and end-users.

Each representative will be asked to research his continent to outline the various IoT initiatives and industry showcases and various user requirements, challenges, security and privacy issues and obstacles that could enrich the discussion in this worldwide IoT session.

Industry Panel

Chair: Latif LADID, President, IPv6 Forum, Chair IEEE IoT subcommittee

The African Perspective: Prof. Umar Garba Danbatta, FNSE executive Vice Chairman & CEO, Nigerian Communications Commission

The North American Perspective: Geoff Mulligan, Founder & President, IPSO Alliance

The USG Perspective: Dr. Peter Tseronis, Founder and CEO, Dots and Bridges, Former Chair USG IPv6 Task Force

The Latin American Perspective: Rosa Delgado, Chair, Peru IPv6 Council

The European Perspective: Yanick Pouffary, Chair, IPv6 Ready and Enable Program, Vice Chair ETSI IP6 ISG

About the IPv6 Forum

IPv6 Forum is a world-wide consortium of international Internet service providers (ISPs) and National Research & Education Networks (NRENs), with a mission to promote IPv6 by improving market and user awareness, creating a quality and secure New Generation Internet and allowing world-wide equitable access to knowledge and technology. The key focus of the IPv6 Forum today is to provide technical guidance for the deployment of IPv6. IPv6 Summits are organized by the IPv6 Forum and staged in various locations around the world to provide industry and market with the best available information on this rapidly advancing technology. Please visit <http://www.ipv6forum.com>

Keynote Speaker

Prof. Umar Garba Danbatta, FNSE Executive Vice Chairman & CEO, Nigerian Communications Commission

Developing and Enabling Policy & Regulatory Framework for Internet of Things (IoT) Advocacy in Emerging Markets in Africa

The dynamic and blossom telecommunications industry has shifted from voice dominant to data driven services. This has created challenges for more capacity and effective service delivery. The Nigerian Communications Commission (NCC) has developed regulatory framework that are energetic to the current and future anticipated challenges. The foremost regulatory instruments that support data driven services (such as Internet of Things (IoT), Internet of Everywhere (IoE), Smart Cities, e-commerce, e-education and e-health are: * Licensing the Infracos (Infrastructure Companies) * Licensing and auctioning of new spectrum * Re-planning of existing spectrum bands * Sustainable Government Initiatives

This has indicated the capability and capacity of the NCC in re-shaping and enhancing the industry to support multiple data driven services.

Special Session: Mobile Edge Computing for Consumer Internet of Thing and Emerging Technologies for Software Defined Internet of Things

Dr. Thomas M. Coughlin

Room: Grand Ballroom C

Chair: Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France)

The current activities in Internet of Things (IoT) are focused on architectures & protocols for efficient interconnection of things, infrastructure deployment and creation of value-added services. These activities are largely aided by cloud computing platforms which supports data analysis, management, repository, middleware, APIs etc. But cloud based IoT deployments faces challenges for supporting real time IoT services and providing better consumer experience. Responding to these consumer needs, we have started witnessing a paradigm shift. The capabilities of cloud computing platforms are being pushed to the edge of the networks paving way for Mobile Edge Computing (MEC). Due to dense geographical distribution, proximity to end-users, support for high mobility and open platform, MEC can support applications and services with ultra-low latency and improved QoS. Thus MEC is becoming an important enabler of consumer centric IoT applications and services that demand real-time operations. Standard development organizations like ETSI have also recognized the benefits IoT & MEC can bring to the consumers. Potential applications for MEC enabled IoT include smart mobility, emergency response, smart cities, video and location based analytics, edge caching and environmental monitoring. This session is proposed and organized by IEEE Consumer Electronics Society Future Directions Committee on IoT.

Special Session Keynote

The Memory of Cars

Automobiles are becoming rolling applications platforms needing computing power, networking to other cars and the cloud as well as digital memory and storage. This talk will look at the requirements for memory as well as digital storage in automotive entertainment and navigation systems, including expectations for cars with driver assist features, security features and autonomous driving. The evolution of memory and storage technology are key drivers for creating the deep learning capabilities required for the car of tomorrow and will create new storage hierarchies in automobiles, in edge networks and in the cloud.

Special Session.1 11:30 Energy Efficient Event-Based Networking for the Internet of Things

Panayiotis Kolios, Georgios Ellinas, Christos Panayiotou and Marios Polycarpou (University of Cyprus, Cyprus)
pp. 1-6

Special Session.2 12:10 Computation Offloading and Resource Allocation for Low-power IoT Edge Devices

Farzad Samie (Karlsruhe Institute of Technology (KIT), Germany); Vasileios Tsoutsouras (National Technical University of Athens, Greece); Lars Bauer (Karlsruhe Institute of Technology (KIT), Germany); Sotiris Xydis and Dimitrios Soudris (National Technical University of Athens, Greece); Joerg Henkel (Karlsruhe Institute of Technology, Germany)
pp. 7-12

Special Session.3 12:50 A Privacy Framework for the Internet of Things

Peter Corcoran (National University of Ireland, Galway & National University of Ireland Galway, Ireland)
pp. 13-18

Technical Session: e-Health and e-Wellness

Room: Grand Ballroom E

Chair: Antonio Puliafito (University of Messina, Italy)

- Technical Session.1 11:30 A Novel Indoor Healthcare with Time Hopping-based Visible Light Communication**
Jinyoung An (Pukyong National University & Daeyeon Campus, Korea); Wan Young Chung (Pukyong National University, Korea)
pp. 19-23
- Technical Session.2 12:00 Sequential Decision-Making in Healthcare IoT: Real-Time Health Monitoring, Treatments and Interventions**
Daphney-Stavroula Zois (University at Albany, SUNY, USA)
pp. 24-29
- Technical Session.3 12:30 Always Connected: The Security Challenges of the Healthcare Internet of Things**
Patricia Williams (Flinders University, Australia); Vincent McCauley (Emerging Systems – Telstra Health, Australia)
pp. 30-35
- Technical Session.4 13:00 Dynamic Bluetooth Beacons for People with Disabilities**
Alexandre Alapetite (Alexandra Institute, Denmark); John Hansen (Technical University of Denmark, Denmark)
pp. 36-41

Technical Session: IoT Enabling Technologies - Protocols

Room: Grand Ballroom A

Chair: Mengchu Zhou (New Jersey Institute of Technology, USA)

- Technical Session.1 11:30 SRUP: The Secure Remote Update Protocol**
Andrew Poulter, Steven Johnston and Simon Cox (University of Southampton, United Kingdom)
pp. 42-47
- Technical Session.2 11:54 JetNet: A Proposed Protocol for Reliable Packet Delivery in Low-Power IoT Applications**
Justin Goins (Oregon State University, USA); Ankur Guha Roy (Oregon State University); Kartikeya Mayaram (Oregon State University, USA); Terri Fiez (Oregon State University)
pp. 48-53
- Technical Session.3 12:18 Transfer Protocols of Tiny Data Blocks in IoT and Their Performance Evaluation**
Tetsuya Yokotani and Yuya Sasaki (Kanazawa Institute of Technology, Japan)
pp. 54-57
- Technical Session.4 12:42 Towards Interoperable, Cognitive and Autonomic IoT Systems: An Agent-based Approach**
Claudio Savaglio and Giancarlo Fortino (University of Calabria, Italy); Mengchu Zhou (New Jersey Institute of Technology, USA)
pp. 58-63
- Technical Session.5 13:06 Event Management for Simultaneous Actions in the Internet of Things**
Masayuki Otani, Toru Ishida, Yohei Murakami and Takao Nakaguchi (Kyoto University, Japan)
pp. 64-69

Technical Session: IoT Testbedding and Experimental Result

Room: Grand Ballroom B

Chair: Ricardo Neisse (European Commission Joint Research Centre, Italy)

- Technical Session.1 11:30 Unified IoT Ontology to Enable Interoperability and Federation of Testbeds**
Rachit Agarwal (Inria Paris, France); David Gómez (Universidad de Cantabria, Spain); Tarek Elsaleh (University of Surrey, United Kingdom); Amelie Gyrard (Insight Center for Data Analytics, National University of Galway, France); Jorge Lanza and Luis Sanchez (University of Cantabria, Spain); Nikolaos Georgantas and Valerie Issarny (INRIA, France)
pp. 70-75
- Technical Session.2 11:54 Development and Field Experiment of Wide Area Wi-SUN System Based on IEEE 802.15.4g**
Kentaro Mochizuki, Kentaro Obata, Keiichi Mizutani and Hiroshi Harada (Kyoto University, Japan)
pp. 76-81
- Technical Session.3 12:18 Data-driven Ecosystems in Smart Cities: A Living Example From Seestadt Aspern**
Deepak Dhungana, Gerhard Engelbrecht and Josiane Xavier Parreira (Siemens AG Austria, Austria); Andreas Schuster (Aspern Smart City Research GmbH & Co KG (ASCR), Austria); Danilo Valerio (Siemens AG, Austria); Roman Tobler (Wiener Netze GmbH, Austria)
pp. 82-87
- Technical Session.4 12:42 iQAS: An Integration Platform for QoI Assessment as a Service for Smart Cities**
Antoine Auger (ISAE-SUPAERO & Université de Toulouse, France); Ernesto Exposito (University of Pau and Adour Countries, LIUPPA Laboratory, France); Emmanuel Lochin (ISAE-SUPAERO & Université de Toulouse, France)
pp. 88-93
- Technical Session.5 13:06 Location-Based Services on a Smart Campus: A System and A Study**
Alexandr Petcovici (University of Alberta, Canada); Eleni Stroulia (University of Alberta, Canada, Canada)
pp. 94-99

Tutorial: Five Years of Research and Innovation Experience in IoT: Lessons Learnt DOs and DON'Ts

Raffaele Giaffreda

Room: Grand Ballroom F

This tutorial will present lessons learnt in the past 5 years of R&D in the domain of Internet of Things and it will be structured in three main parts (research, development and business) reflecting and sharing the personal journey of the presenter in this exciting field. More in detail, the first part will consist on current research challenges for integrating the powerful monitoring capabilities of IoT with cognitive systems that can transform such data into knowledge using machine learning. The second part will illustrate what it takes to transform research ideas and demo prototypes into viable solutions that address real market needs, focusing on the creation of an IoT based eHealth platform for the remote monitoring of elderly and cognitively impaired people. The third part will focus on the business part of IoT. It will share the experience gathered from initiating technology transfer activities targeted at creating a viable go-to-market strategy for a particular asset that, within the scenes set by the previous two tutorial parts, aims at addressing various IoT problems such as interoperability, scalability and privacy within a viable business context.

Workshop: MARTCPS Models at Runtime & Networked Control for Cyber Physical Systems

Room: Grand Ballroom G

Chair: Hausi A Muller (University of Victoria & Faculty of Engineering, Canada)

MARTCPS is about engineering of cyber physical systems (CPS) through models at runtime and networked control. CPS are distributed, software-intensive smart systems that control—through feedback loops—tightly integrated computational and physical components. To support automated reasoning about dynamic system uncertainty and variability—and assurance in turn, a key strategy is to support continuous validation through models at runtime (MART).

Workshop.1 11:30 A Rigorous and Efficient Run-time Security Monitor for Real-time Critical Embedded System Applications

Muhammad Taimoor Khan (University of Klagenfurt, Austria); Dimitrios Serpanos (University of Patras, Greece); Howard Shrobe (MIT, USA)
pp. 100-105

Monday, December 12, 13:30 - 14:30

Lunch Break

Monday, December 12, 14:30 - 16:30

Exhibition

Room: Grand Ballroom Foyer

Industry Forum Panel: IPv6 IoT InterOp-Ware

Room: Grand Ballroom D

Chair: Latif Ladid (University of Luxembourg / IPv6 Forum, Luxembourg)

Session Objective

This session will attract experts from the IPv6 Ready Logo Committee, Consumer Electronics Association and the new F-InterOp project discuss and define a new set of online testing tools for the Internet of Things, including for interoperability tests, conformance tests, scalability tests, Quality of Service (QoS) and Quality of Experience (QoE) tests, and Energy efficiency tests.

The IPv6 Ready Logo program plans to introduce a new IPv6 IoT program to test IoT devices depending on defined RFCs in this area.

F-Interop is directly supporting IoT standardization and intends to enable closer cooperation with the industry, through a close collaboration with standards development organizations, including ETSI, oneM2M and W3C, - and be researching and developing online certification and labelling mechanisms. F-Interop will enable an easier participation of researchers and industry in the standardization process.

This effort will try to harmonise and draw a common worldwide interOp-Wareforf IoT networking capabilities and architectural definitions to make sure "Internet of Things" are scalable, inclusive of several communication media, secure, future proof and viable for businesses and end-users.

Each panelist will be asked to research his field to outline the various IoT initiatives and industry showcases and various user requirements, challenges, security and privacy issues and obstacles that could make enrich the discussion in this worldwide IoT session. Panel Session

Chair: Latif LADID, President, IPv6 Forum, Chair IEEE IoT subCommittee

The IPv6 UNH IoL Ready Logo Programs: Timothy Winter, IPv6 Ready Logo Executive, IoL

The Consumer Electronics Association (CEA) Perspective: John Brzozowski, John, Chief Architect, IPv6 and Fellow Comcast, cochair CES WG

The FCC Perspective: Julius Knapp, Chief, Office of Engineering & technology

F-Interop Perspective: Sebastien Ziegler, CEO, Mandat Int'l, Technical Coordinator, Finterop

The IPv6 IoT Ready Logo Program: Yanick Pouffary, Chairperson, IPv6 Logo Programs

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Special Session: Military Applications of IoT

Room: Grand Ballroom C

Chairs: Peter Lenk (NATO, United Kingdom), Konrad Wrona (NATO Communications and Information Agency, The Netherlands)

Modern military operations are conducted in a complex, multidimensional, highly dynamic and disruptive environment sometimes with unanticipated partners and irregular adversaries. In today's scenarios military commanders operate under strong time pressures and high operational tempo. Commanders have increasingly limited time to obtain an accurate assessment of the situation, to assess potential courses of action, and to make decisions. Furthermore, they need to draw from all possible sources to ensure that the most complete and relevant picture can be created of the situation, in near real-time, and understand the implications of their decisions and courses of action.

One response to these challenges is to introduce the concept of Internet of Things (IoT) into the military domain. The Internet of Things is extensively developed world-wide with a focus on civilian applications. IoT is a paradigm that considers pervasive presence of a variety of smart things/objects in the environment. By means of wireless and wired connections, they are able to interact and cooperate with each other to create new applications/services in order to reach common goals. Objects/things make themselves recognizable and can behave intelligently by making context related decisions thanks to information aggregation and sharing with other objects. Furthermore, they can be components of complex services. However, the integration of heterogeneous sensors and systems diverse in technology, environmental constraints, and levels of fidelity is a challenging issue not only for the military organizations.

Modern military equipment is expected to be increasingly armed with processing and communication capabilities, which can be employed to inspect or modify the status of the equipment. To some extent, the equipment could be regarded as sensors or actuators and integrated into the rest of the military information infrastructure. Physical and virtual military things have identities, physical attributes, virtual personalities, use intelligent interfaces, and should be seamlessly integrated into the military information network. In order to accomplish full integration, the relevant security mechanisms, protocol adaptations, and scalability properties must be provided. The possible outcome of this integration is a wider set of sensors and information for use in situation awareness applications, medical information applications, transport and logistics applications, etc.

Special Session.1 14:30 Mobile Platform for Threat Monitoring in Wireless Sensor Networks

Krzysztof Lasota and Piotr Bazydło (Research and Academic Computer Network, Poland); Adam Kozakiewicz (Research and Academic Computer Network & Warsaw University of Technology, Poland)
pp. 106-110

Special Session.2 15:10 Leveraging Internet of Things Within the Military Network Environment - Challenges and Solutions

Mauro Tortonesi, Alessandro Morelli and Marco Govoni (University of Ferrara, Italy); James Michaelis (United States Army Research Laboratory, USA); Niranjana Suri (US Army Research Laboratory (ARL) & Florida Institute for Human & Machine Cognition (IHMC), USA); Cesare Stefanelli (University of Ferrara, Italy); Stephen Russell (United States Army Research Laboratory, USA)
pp. 111-116

Special Session.3 15:50 Integrating Some Security and Fault Tolerant Techniques for Military Applications of Internet of Things

Zbigniew Zielinski, Jan Chudzikiewicz, Janusz Furtak and Paweł Głębocki (Military University of Technology, Poland)
pp. 117-122

Technical Session: IoT Design Principals and Best Practices

Room: Grand Ballroom B

Chair: John Strassner (Huawei, USA)

Technical Session.1 14:30 Charging Architecture for M2M Communications

Fuchun Joseph Lin and Bo-Yan Chen (National Chiao Tung University, Taiwan); Bo Ting Lin and Wan Hsun Hu (Billing Information Laboratory of Chunghwa Telecom Laboratories, Taiwan)
pp. 123-128

Technical Session.2 14:54 Harnessing the Flow of Ecological Data Across Networks, Middleware, and Applications

Jiannan Zhai (Florida Atlantic University, USA); Chuck Cook, G. Smith and Vamsi Gondi (Clemson University, USA); Jason Hallstrom (Florida Atlantic University, USA); Christopher Post and Gene Eidson (Clemson University, USA)
pp. 129-134

Technical Session.3 15:18 Connecting the Internet of Things Rapidly Through a Model Driven Approach

Ferry Pramudianto (North Carolina State University, USA); Markus Eisenhauer (Fraunhofer FIT, Germany); Djamel Hadj Sadok (Federal University of Pernambuco, Brazil); Carlos Kamienski (Universidade Federal do ABC, Brazil)
pp. 135-140

Technical Session.4 15:42 *Applicability of Commodity, Lowcost, Single Board Computers for Internet of Things Devices*

Steven Johnston, Mihaela Apetroaie-Cristea, Mark Scott and Simon Cox (University of Southampton, United Kingdom)
pp. 141-146

Technical Session.5 16:06 *Exposing Bluetooth Lower Layers for IoT Communication*

Ahmed Salem and Tamer Nadeem (Old Dominion University, USA)
pp. 147-152

Technical Session: IoT Enabling Technologies

Room: Grand Ballroom A

Chair: William Tonti (IEEE, USA)

Technical Session.1 14:30 *Improving User Interactions with Constrained Devices in the Web of Things*

Floris Van den Abeele, Enri Dalipi, Ingrid Moerman and Piet Demeester (Ghent University - iMinds, Belgium); Jeroen Hoebeke (Ghent University - imec, Belgium)
pp. 153-158

Technical Session.2 14:54 *EC-IoT: An Easy Configuration Framework for Constrained IoT Devices*

Enri Dalipi and Floris Van den Abeele (Ghent University - iMinds, Belgium); Isam Ishaq (Al-Quds University, Palestine); Ingrid Moerman (Ghent University - iMinds, Belgium); Jeroen Hoebeke (Ghent University - imec, Belgium)
pp. 159-164

Technical Session.3 15:18 *Neighbor Discovery Algorithms for Friendship Establishment in the Social Internet of Things*

Roberto Girau, Salvatore Martis and Luigi Atzori (University of Cagliari, Italy)
pp. 165-170

Technical Session.4 15:42 *Decentralized Coordination of Dynamic Software Updates in the Internet of Things*

Martin Weißbach (Technische Universität Dresden, Germany); Nguonly Taing (Royal University of Phnom Penh, Cambodia); Markus Wutzler, Thomas Springer and Alexander Schill (Technische Universität Dresden, Germany); Siobhán Clarke (Trinity College Dublin, Ireland)
pp. 171-176

Technical Session.5 16:06 *Obtaining Accurate Trajectories From Repeated Coarse and Inaccurate Location Logs*

Ryosuke Okuda (Kobe Institute of Computing & Graduate School of Information Technology, Japan)
pp. 177-181

Technical Session: IoT Security and Privacy - Networks

Room: Grand Ballroom E

Chair: Alexandros Fragkiadakis (Institute of Computer Science, FORTH, Greece)

Technical Session.1 14:30 *IoT Security Attacks Using Reverse Engineering Methods On WSN Applications*

Mauricio Tellez Nava (Verizon Enterprise, USA); Samy S. El-Tawab and M. Hossain Heydari (James Madison University, USA)
pp. 182-187

Technical Session.2 14:54 *Modeling a node capture attack in a secure Wireless Sensor Networks*

Meriem Smache (École des Mines de Saint-Étienne & Gridbee Communications, France); Assia Tria (French Alternative Energies and Atomic Energy Commission, France); Nadia El Mrabet (École des Mines de Saint-Étienne, France); Javier Gil Quijano (French Alternative Energies and Atomic Energy Commission, France); Emmanuel Riou and Gregory Chaput (Gridbee Communications, France)
pp. 188-193

Technical Session.3 15:18 *Enhancing Connected Car Adoption: Security and Over The Air Update Framework*

Muzaffar Khurram and Hemanth Kumar (IBB Consulting Group, USA)
pp. 194-198

Technical Session.4 15:42 *Dynamic Semantic Interoperability of Control in IoT-based Systems: Need for Adaptive Middleware*

Swarup Kumar Mohalik (Ericsson Research, India); Nanjangud Narendra (Ericsson, USA); Badrinath Ramamurthy, Mahesh Babu Jayaraman and Chakri Padala (Ericsson, India)
pp. 199-203

Technical Session.5 16:06 *SQenIoT: Semantic Query Engine for Industrial Internet-Of-Things Gateways*

Charbel El Kaed (Digital Services Platform-Innovation & Schneider Electric, USA); Imran Khan (Schneider Electric Industries SAS, France); Hicham Hossayni (Orange Applications For Business & Schneider-Electric, France); Philippe Nappey (Schneider Electric, France)
pp. 204-209

Tutorial: Development of IoT-based Applications for Smart Cities

Prof. Carlos Alberto Kamienski

Room: Grand Ballroom F

Cities are becoming smarter as new technologies, such as IoT, are increasingly used for providing a variety of services and applications. In order for IoT-enabled services for Smart Cities to become reality, application development must be made easy. Currently, many software components have to be engineered from scratch to address fragmentation issues, thus requiring huge amounts of efforts, as developers must have a deep understanding of the technologies, the new application domain, and the interplay with legacy systems. This tutorial will synthesize key advances in this area, such as the use of context-aware management, mixed-criticality systems, data management and communication issues for IoT.

Also, this tutorial will approach different issues related to the development of applications for smart cities, such as software architectures and middleware, and will discuss lessons learned from a theoretical and also hands-on perspective.

Finally, it will introduce some current research challenges in this area.

Workshop: MARTCPS Models at Runtime & Networked Control for Cyber Physical Systems

Room: Grand Ballroom G

Chair: Hausi A Muller (University of Victoria & Faculty of Engineering, Canada)

MARTCPS is about engineering of cyber physical systems (CPS) through models at runtime and networked control. CPS are distributed, software-intensive smart systems that control—through feedback loops—tightly integrated computational and physical components. To support automated reasoning about dynamic system uncertainty and variability—and assurance in turn, a key strategy is to support continuous validation through models at runtime (MART).

Workshop.1 14:30 Challenges in Physical Modeling for Adaptation of Cyber-Physical Systems

Ivan Ruchkin, Selva Samuel and Bradley Schmerl (Carnegie Mellon University, USA); Amanda Rico (Carthage College & Carnegie Mellon University, USA); David Garlan (Carnegie Mellon University, USA)
pp. 210-215

Workshop: Ubiquitous Sensing and Actuation (UbSA) via the Internet of Things

Room: Regency Ballroom B

Chair: Glenn A. Fink (Pacific Northwest National Laboratory, USA)

Recently, integration of Internet of Things (IoT) and cloud paradigms has emerged as a way to provide Sensing and Actuation as a Service (SAaaS). But advances in privacy and security make it possible to go further and distribute SAaaS systems geographically and across multiple organizations. We call this evolution of SAaaS Ubiquitous Sensing and Actuation (UbSA).

An example UbSA system might comprise a set of actuators in a factory that are dynamically driven by sensors distributed throughout the world to produce highly desirable/fashionable goods. Another example might be a public transportation system where weather, road use, and driver information helped decide variable speed limits on roads throughout a municipal area. A third example is a retail system would gather anonymous information from customers' locations and prior purchases to automatically price goods for sale, issue coupons, and arrange advertisement. UbSA could be applied to smart cities, cyber security, manufacturing, and many other areas.

To realize the benefits promised by dynamic UbSA systems, we need ways to orchestrate devices owned by multiple persons and organizations into unified sensing and actuation infrastructures that can equitably exchange data while preserving the security of devices and privacy of the subjects or owners of that data. Situational awareness and privacy must coexist. Higher-level services composed from SAaaS systems must provide coordination, information assurance, and privacy for large groups of micro-devices and their owners. This broad vision calls for new technologies, management techniques, and policies for dynamic collaboration and sharing.

Workshop.1 14:30 Differentially Private Distributed Sensing

Glenn A. Fink (Pacific Northwest National Laboratory, USA)
pp. 216-221

Workshop.2 15:10 IoT-Cloud Authorization and Delegation Mechanisms for Ubiquitous Sensing and Actuation

Dario Bruneo (Universita di Messina, Italy); Salvatore Distefano (University of Kazan, Russia); Francesco Longo (Universita di Messina, Italy); Giovanni Merlino and Antonio Puliafito (University of Messina, Italy)
pp. 222-227

Workshop.3 15:50 VOLTTRON™: Using Distributed Control and Sensing to Integrate Buildings and the Grid

Jereme Haack (Pacific Northwest National Laboratory, USA); Bora Akyol (Pacific Northwest Labs, USA); Craig Allwardt, Srinivas Katipamula, Zachary Beech, Robert Lutes, Joseph Chapman and Kyle Monson (Pacific Northwest National Laboratory, USA)
pp. 228-232

Monday, December 12, 16:30 - 17:00

Coffee Break

Monday, December 12, 17:00 - 19:00

Exhibition

Room: Grand Ballroom Foyer

Industry Forum Panel: The Challenges in Automating, Controlling and Regulating Complex Systems Using IoT Technologies: Machines, Robots, Buildings, Factories, Vehicles and More Industry Forum

Room: Grand Ballroom D

Chairs: Martin Burns (National Institute of Standards and Technology, USA), Jacques Durand (Fujitsu North America, USA)

Session Objective

A complex system is defined here as requiring the coordination of a rich set of interdependent often real-time controls, the processing of a rich set of sensory inputs with contextual data, and advanced logic between inputs and controls that would typically require a significant level of expertise if performed by humans. Cars, buildings, medical equipment, robots, factory equipment, cities are examples of these.

The panelists are expected to address one or more of the following questions:

Q1: What is the rationale for enabling such controls with IoT technologies and where does IoT add value? What is the business case?

Known objectives have been: * optimizing energy consumption * reducing latency between physical systems input & control * unreliability of human control * adaptability to a variety of challenging and unpredictable situations * improving scale, reliability and safety

Q2: What are the challenges to overcome for IoT technologies in such systems and what is the current status on their solutions?

Some of the known challenges are:

- enabling reliable and timely decision-making loops
- enabling human intervention and take over
- encoding, access and scope of domain knowledge required, contextual data
- reliability, verifiability and certification of embarked software
- fault recovery and resilience
- accuracy of time stamped event and measurement records

Q3: What are the IoT technologies that are or will become critical for such systems? Candidates are:

- networks and communication
- analytics, deep learning
- reliable SCADA and sensors
- embarked software & firmware, and their platforms
- semantic models
- role based authorization

Q4: What are the desired architectures? How open and evolvable should they be? What concept of "platform" is appropriate here? (e.g. platform for developing automotive apps).

- should the application logic be local, or remote?
- should the knowledge be opaque, or intelligible to humans?

Panel Session

Assuming a 90 minute duration, the panel and subject will be introduced by a 10 minute presentation from the chair, in order to state the scope and general issues at hand. Then each panelist will be given 10 minutes maximum each to state his/her position. The above general questions (in panel description) will serve as guidelines for panelist presentations. Finally the floor will be open to questions/comments from the audience.

Panelists

- Kazunori Iwasa, smart buildings project lead (Fujitsu)
- Soumya Kanti Datta, Research Engineer and Co-Founder of Future Tech Lab (Eurecom)
- Stan Schneider, CEO (Real Time Innovations - RTI)
- Hiroshi Yamamoto, Distinguished Engineer & Global Electronics Industry CTO (IBM)
- Said Tabet, IoT lead for Machine Learning pilots (EMC/DELL)
- Sameer Joshi, IoT Practice co-lead (Infosys)

Special Session: Military Applications of IoT

Room: Grand Ballroom C

Chairs: Peter Lenk (NATO, United Kingdom), Konrad Wrona (NATO Communications and Information Agency, The Netherlands)

Modern military operations are conducted in a complex, multidimensional, highly dynamic and disruptive environment sometimes with unanticipated partners and irregular adversaries. In today's scenarios military commanders operate under strong time pressures and high operational tempo. Commanders have increasingly limited time to obtain an accurate assessment of the situation, to assess potential courses of action, and to make decisions. Furthermore, they need to draw from all possible sources to ensure that the most complete and relevant picture can be created of the situation, in near real-time, and understand the implications of their decisions and courses of action.

One response to these challenges is to introduce the concept of Internet of Things (IoT) into the military domain. The Internet of Things is extensively developed world-wide with a focus on civilian applications. IoT is a paradigm that considers pervasive presence of a variety of smart things/objects in the environment. By means of wireless and wired connections, they are able to interact and cooperate with each other to create new applications/services in order to reach common goals. Objects/things make themselves recognizable and can behave intelligently by making context related decisions thanks to information aggregation and sharing with other objects. Furthermore, they can be components of complex services. However, the integration of heterogeneous sensors and systems diverse in technology, environmental constraints, and levels of fidelity is a challenging issue not only for the military organizations.

Modern military equipment is expected to be increasingly armed with processing and communication capabilities, which can be employed to inspect or modify the status of the equipment. To some extent, the equipment could be regarded as sensors or actuators and integrated into the rest of the military information infrastructure. Physical and virtual military things have identities, physical attributes, virtual personalities, use intelligent interfaces, and should be seamlessly

integrated into the military information network. In order to accomplish full integration, the relevant security mechanisms, protocol adaptations, and scalability properties must be provided. The possible outcome of this integration is a wider set of sensors and information for use in situation awareness applications, medical information applications, transport and logistics applications, etc.

Special Session.1 17:00 Security Techniques for the WSN Link Layer Within Military IoT

Janusz Furtak, Zbigniew Zielinski and Jan Chudzikiewicz (Military University of Technology, Poland)
pp. 233-238

Special Session.2 17:40 Data-centric Security in Military Applications of Commercial IoT Technology

Konrad Wrona (NATO Communications and Information Agency, The Netherlands); Bogdan Vasilache (NATO Communication and Information Agency); Angel de Castro (NATO Communication and Information Agency, The Netherlands)
pp. 239-244

Special Session.3 18:20 Approach Towards Application of Commercial off-the-Shelf Internet of Things Devices in the Military Domain

Manas Pradhan (Fraunhofer FKIE, Germany)
pp. 245-250

Technical Session: Cyber-Physical Systems

Room: Grand Ballroom B

Chair: Aaron E Cohen (US Naval Research Laboratory, USA)

Technical Session.1 17:00 We Hear Your Activities Through Wi-Fi Signals

Fang-Jing Wu and Gürkan Solmaz (NEC Laboratories Europe, Germany)
pp. 251-256

Technical Session.2 17:24 Adaptive Building-Skin Components as Context-Aware Nodes in an Extended Cyber-Physical Network

Alexander Liu Cheng (Delft University of Technology & Universidad Tecnológica Equinoccial, The Netherlands); Henriette Bier (Delft University of Technology, The Netherlands)
pp. 257-262

Technical Session.3 17:48 Event-Based Sensor Service Composition

Junta Koyama and Yohei Murakami (Kyoto University, Japan); Donghui Lin (Kyoto University); Toru Ishida (Kyoto University, Japan)
pp. 263-264

Technical Session.4 18:12 Internet of Things Based Framework for Trajectory Tracking Control

Nishchal K Verma, Narendra Dhar, Aniket Kar and Raghav Dev (Indian Institute of Technology Kanpur, India); S S Farhad Nawaz (NIT Tiruchirappalli, India); Al Salour (The Boeing Company, USA)
pp. 265-270

Technical Session.5 18:36 Dynamic Sample Rate Adaptation for Long-Term IoT Sensing Applications

Ulf Kulau (Technische Universität Braunschweig, Germany); Johannes van Balen and Sebastian Schildt (TU Braunschweig, Germany); Felix Büsching and Lars C Wolf (Technische Universität Braunschweig, Germany)
pp. 271-276

Technical Session: IoT Enabling Technologies - Networks

Room: Grand Ballroom A

Chair: Luigi Atzori (University of Cagliari, Italy)

Technical Session.1 17:00 Human-Motion Based Transmission Power Control in Wireless Body Area Networks

Garrett Newell and Gustavo Vejarano (Loyola Marymount University, USA)
pp. 277-282

Technical Session.2 17:24 Mobile Phone Based Acoustic Localization Using Doppler Shift for Wireless Sensor Networks

Amarlingam Madapu (IIT HYDERABAD, India); P Rajalakshmi (Indian Institute of Technology Hyderabad, India); Navroz Charania (IIT Hyderabad, India)
pp. 283-288

Technical Session.3 17:48 Compressed Sensing for Different Sensors: A Real Scenario for WSN and IoT

Amarlingam Madapu (IIT HYDERABAD, India); P Rajalakshmi (Indian Institute of Technology Hyderabad, India); Durga Prasad K v v (IITH, India); Pradeep Mishra (Indian Institute of Technology Hyderabad, India)
pp. 289-294

Technical Session.4 18:12 Rapid Group Key Creation for Expanding Mesh Networks

William Oxford (Rubicon Labs, Inc., USA); Rod Schultz and Julia Cline (Rubicon Labs. Inc., USA)
pp. 295-300

Technical Session.5 18:36 Guard Time Optimisation and Adaptation for Energy Efficient Multi-hop TSCH Networks

Georgios Z. Papadopoulos (Télécom Bretagne / Institut Mines-Télécom, France); Alexandros Mavromatis and Xenofon Fafoutis (University of Bristol, United Kingdom); Nicolas Montavont (Institut Mines Telecom / Telecom Bretagne, France); Robert J Piechocki, Theo Tryfonas and George Oikonomou (University of Bristol, United Kingdom)
pp. 301-306

Technical Session: IoT Security and Privacy - Architectures & Deployments

Room: Grand Ballroom E

Chair: David W Kravitz (DarkMatter, USA)

Technical Session.1 17:00 Recommendations for securing Internet of Things devices using commodity hardware

Steven Johnston, Mark Scott and Simon Cox (University of Southampton, United Kingdom)
pp. 307-310

Technical Session.2 17:24 Practical Limits of the Secret Key-Capacity for IoT Physical Layer Security

George Margelis, Xenofon Fafoutis, George Oikonomou, Robert J Piechocki and Theo Tryfonas (University of Bristol, United Kingdom); Paul Thomas (University of Bristol, Afghanistan)
pp. 311-316

Technical Session.3 17:48 Nonce-based Authenticated Key Establishment over OAuth 2.0 IoT Proof-of-Possession Architecture

Renzo Navas, Manuel Lagos and Laurent Toutain (Telecom Bretagne, France); Kumaran Vijayasankar (Texas Instruments, USA)
pp. 317-322

Technical Session.4 18:12 Black Routing and Node Obscuring in IoT

Shaibal Chakrabarty (US-Ignite, USA); Daniel W Engels (Southern Methodist University, USA); Monica John (Southern Methodist University)
pp. 323-328

Technical Session.5 18:36 Moving Target Defense for Internet of Things Using Context Aware Code Partitioning and Code Diversification

Kaleel Mahmood (University of Connecticut & United Technologies Research Center, USA); Devu Shila (United Technologies Research Center, USA)
pp. 329-330

Workshop: MARTCPS Models at Runtime & Networked Control for Cyber Physical Systems

Room: Grand Ballroom G

Chair: Hausi A Muller (University of Victoria & Faculty of Engineering, Canada)

MARTCPS is about engineering of cyber physical systems (CPS) through models at runtime and networked control. CPS are distributed, software-intensive smart systems that control—through feedback loops—tightly integrated computational and physical components. To support automated reasoning about dynamic system uncertainty and variability—and assurance in turn, a key strategy is to support continuous validation through models at runtime (MART).

Workshop.1 17:00 Using Data Prediction Techniques to Reduce Data Transmissions in the IoT

Gabriel Martins Dias and Boris Bellalta (Universitat Pompeu Fabra, Spain); Simon Oechsner (Universitat Pompeu Fabra, Germany)
pp. 331-335

Monday, December 12, 18:00 - 20:30

Innovating Forward Together - Technology, Passion, Purpose and Pride (A Special IEEE Women Engineering Event)

Room: Regency Ballroom B

Tuesday, December 13

Tuesday, December 13, 09:00 - 10:00

Keynote: A New World of Threats, Vulnerabilities and Opportunities

Dr. Taher Elgamal, Salesforce

Room: Grand Ballroom D

This talk will outline the issues that we will have to deal with in protecting a highly connected world. Devices at home, at the work place and everywhere else will open many new opportunities to advance our environments and businesses. However, there is a lot more to be done to protect our citizens and businesses from a new set of threats and vulnerabilities that will affect the overall security of the new connected society.

Tuesday, December 13, 10:00 - 11:00

Keynote: Making Sense of the IoT Protocols and Alliances

Mr. Geoff Mulligan, LoRa Alliance

Room: Grand Ballroom D

The IoT is a hot, hyped buzzword - but it has the potential to impact the globe in so many ways. After all, we are all here at this conference. But the downside of all the attention is a land rush to lay some claim to the IoT landscape. New protocols and new alliances appear to pop up every day. It is important to use a critical lens when planning the path forward for IoT technologies. Protocols and Alliance will come and go over the course of the next few years while the IoT grows to meet its potential. Lets take some time to take a look at that landscape today and peer into the future potential for this thing called the IoT.

Tuesday, December 13, 11:00 - 11:30

Coffee Break

Tuesday, December 13, 11:30 - 13:30

Exhibition

Room: Grand Ballroom Foyer

Industry Forum Panel: IoT Security & Privacy

Room: Grand Ballroom D

Chair: Antonio Fernando Skarmeta Gomez (University of Murcia, Spain)

Session Objective

IoT will allow people and objects in the physical world as well as data and virtual environments to interact with each other so as to create smart environments such as smart transport systems, smart cities, smart health, smart energy, etc., as part of a prosperous digital society. IoT is likely to improve the quality of people's lives, create new markets and new jobs, increase economic growth and be an impetus for competition.

However, IoT raises important questions and introduces new challenges for the security of systems and processes and the privacy of individuals. Some IoT applications are tightly linked to sensitive infrastructures and strategic services such as the distribution of water and electricity and the surveillance of assets. Other applications handle sensitive information about people, such as their location and movements, or their health and purchasing preferences. Confidence in and acceptance of IoT will depend on the protection it provides to people's privacy and the levels of security it guarantees to systems and processes.

IoT will enable objects to become active participants: these objects will be able to recognize events and changes in their environment and to sense and react autonomously without human intervention. Introducing objects into the control processes makes IoT security very difficult to address. Indeed, the Internet of Things is a complex system in which people interact with the technological ecosystem based on smart objects through complex processes. The interactions of these four IoT components: persons, intelligent objects, technological ecosystem, and processes highlight a systemic and cognitive dimension to the security of IoT. The interaction of people with the technological ecosystem requires the protection of their privacy. Similarly, their interaction with control processes requires to guaranteeing their safety. Processes must ensure their reliability and realize the objectives for which they are designed.

The move towards a greater autonomy for objects will bring the security of technologies and processes and the privacy of individuals into sharper focus. Furthermore, in parallel with the increasing autonomy of objects to perceive and act on the environment, IoT security should move towards a greater autonomy in perceiving threats and reacting to attacks.

This industry forum session aims to bring together state-of-the-art contributions on Internet of Things Security and Privacy: * design methods of secure IoT applications and architectures * security attacks detection * prevention and counter measures

Topics of Interest

- Methods for secure by design IoT
- Methods for IoT security analysis and audit
- Privacy and anonymization techniques in IoT
- Secure cloud of things
- Trust management architectures
- Lightweight security solutions
- Authentication and access control in IoT
- Identification and biometrics in IoT
- Liability and policy enforcement in IoT
- Virtualization and auto-immunity of smart objects
- Security of Big Data in IoT
- Cyber physical systems security
- Cyber attacks detection and prevention

- Ethics and legal considerations in IoT

Panel

Chair: Prof. Dr. Antonio, Skarmeta, co-Chair, IEEE COMSOC IOT & 5G subCommittees, TPC Chair, WF-, University of Murcia, Spain

Following expert panelists will be invited:

- Joe Klein, CEO, Disrupt6, Dulles, Virginia, USA
- Yoshihiro Ohba, Toshiba, Japan
- Daniel Engels, Prof at SMU in Dallas, Texas, USA and a CRFID DL on Security and Privacy in an Internet of Things World
- Deborah Cooper, Member of NoVA Section, former president of Computer Society and division director, USA
- L. Jean Camp, Professor, School of informatics; Indiana university, USA

Special Session: Signal Processing for Internet of Things

Room: Grand Ballroom C

Chair: Kumar Yelamarthi (Central Michigan University, USA)

While the world of IoT begins to shape, the need for cheap, fast, low power and intelligent signal processing algorithms and systems emerges as a critical requirement. Such algorithms place great challenges on the overall system design because of the intrinsic limitations of the IoT. The aim of this special session is to provide a platform for researchers and designers to share and show case their original works on signal processing for present and even future Internet of Things. In addition, it will discuss the current open research challenges in IoT signal processing, to stimulate new research approaches and directions in this field.

Special Session.1 11:30 Power Efficient Compressive Sensing for Continuous Monitoring of ECG and PPG in a Wearable System

Venkat Natarajan and Apoorv Vyas (Intel Technology India Private Limited, India)
pp. 336-341

Special Session.2 12:10 Parallelization in Software Systems Used in Wireless Sensor Networks and Internet of Things

Md Sayedul Aman, Kumar Yelamarthi and Ahmed Abdelgawad (Central Michigan University, USA); Saleh M.A. Alnaeli (University of Wisconsin-Fox Valley, USA)
pp. 342-347

Special Session.3 12:50 Vulnerable C/C++ Code Usage in IoT Software Systems

Saleh M.A. Alnaeli and Melissa Sarnowski (University of Wisconsin-Fox Valley, USA); Md Sayedul Aman, Ahmed Abdelgawad and Kumar Yelamarthi (Central Michigan University, USA)
pp. 348-352

Special Session: Social Internet of Things (SIoT)

Room: Grand Ballroom G

Chair: Luigi Atzori (University of Cagliari, Italy)

The Social Internet of Things (SIoT) (<http://social-iot.org>) refers to the convergence of the Internet of Things and Social Networking paradigms for the creation of social networks in which things are nodes that establish social links as humans do. This concept is fast gaining ground thanks to the benefits deriving from the potentials of the social networks within the IoT domain, such as: simplification in the navigability of a dynamic network of billions of objects, robustness in the management of the trustworthiness of objects when providing information and services, efficiency in the dynamic discovery of services and information.

The preliminary results achieved in this field are encouraging but significant efforts are still needed to develop concrete solutions. Indeed, the application of the SIoT concepts to real data, i.e., mobility patterns and interactions among objects in real applications, needs to be extended to different scenarios to evaluate the benefits in terms of network navigability and service discovery. Additionally, the intelligence that the objects should be equipped with to implement the social behaviour is sometimes excessive given the devices computation capabilities, so that different levels of social behaviour should be defined according to the device characteristics. The effectiveness of the social-based trust evaluation also needs a more precise modelling of the expected malicious behaviour of nodes in the IoT.

Special Session.1 11:30 ASSIST: An Agent-Based SIoT Simulator

Panagiotis Kasnesis (National Technical University of Athens, Greece); Lazaros Toumanidis (Piraeus University of Applied Sciences, Greece); Dimitris Kogias (Piraeus University of Applied Science, Greece); Charalampos Z Patrikakis (Piraeus University of Applied Sciences (TEI of Piraeus) & Computer Networks & Services Research Team (CONSERT), Greece); Iakovos S. Venieris (National Technical University of Athens, Greece)
pp. 353-358

Special Session.2 12:00 Exploitation of Social IoT for Recommendation Services

Yasir Saleem and Noel Crespi (Institut Mines-Télécom, Télécom SudParis, France); Mubashir Husain Rehmani (COMSATS Institute of Information Technology & UPMC Sorbonne Universités Laboratoire LIP6-CNRS, France); Rebecca Copeland (Telecom SudParis (TSP) & Core Viewpoint Limited, United Kingdom); Dina Hussein and Emmanuel Bertin (Orange Labs, France)
pp. 359-364

Special Session.3 12:30 *iSapiens: A Platform for Social and Pervasive Smart Environments*

Fanco Cicirelli (CNR - National Research Council, Italy); Antonio Guerrieri (ICAR-CNR, Italy); Giandomenico Spezzano (CNR-ICAR, Italy); Andrea Vinci (ICAR-CNR, Italy); Orazio Briante (University Mediterranea of Reggio Calabria, Italy); Giuseppe Ruggeri (University of Reggio Calabria, Italy)
pp. 365-370

Special Session.4 13:00 *Searching the Social Internet of Things by Exploiting Object Similarity*

Michele Nitti and Virginia Pilloni (University of Cagliari, Italy); Daniel D Giusto (University of Cagliari & CNIT, Italy)
pp. 371-376

Technical Session: IoT Enabling Technologies - Communications

Room: Grand Ballroom A

Chair: Hausi A Muller (University of Victoria & Faculty of Engineering, Canada)

Technical Session.1 11:30 *Pull Support for IoT Applications Using Mobile Access Framework WebMaDa*

Corinna Schmitt and Claudio Anliker (University of Zurich, Switzerland); Burkhard Stiller (University of Zürich & ETH Zürich, TIK, Switzerland)
pp. 377-382

Technical Session.2 11:54 *Signal-to-Noise Ratio Measurements for IoT Communications with Quantum Tunneling Reflectors*

Francesco Amato (Georgia Institute of Technology, USA); Gregory Durgin (Georgia Tech, USA)
pp. 383-388

Technical Session.3 12:18 *Reconfigurable Dual Mode IEEE 802.15.4 Digital Baseband Receiver for Diverse IoT Applications*

Mohammed Abdullah Zubair (IIT Hyderabad, India); Ajay Kumar Nain (Indian Institute of Technology Hyderabad, India); Jagadish Bandaru (IITH, India); P Rajalakshmi (Indian Institute of Technology Hyderabad, India); Uday B Desai (IIT Hyderabad, India)
pp. 389-394

Technical Session.4 12:42 *An AllJoyn to CoAP Bridge*

David Costa, Enzo Mingozzi, Giacomo Tanganelli and Carlo Vallati (University of Pisa, Italy)
pp. 395-400

Technical Session.5 13:06 *Efficient Proxying of CoAP Observe with Quality of Service Support*

Giacomo Tanganelli, Carlo Vallati and Enzo Mingozzi (University of Pisa, Italy); Matthias Kovatsch (ETH Zurich, Switzerland)
pp. 401-406

Technical Session: IoT Societal Impacts

Room: Grand Ballroom B

Chair: Mirko Alexander Presser (Aarhus University, Denmark)

Technical Session.1 11:30 *Understanding User Privacy in Internet of Things Environments*

Hosub Lee and Alfred Kobsa (University of California, Irvine, USA)
pp. 407-412

Technical Session.2 11:54 *Adaptive Environments for Enabling Senior Citizens: An Holistic Assessment Tool for Housing Design and IoT-based Technologies*

Matteo Zallio and Damon Berry (Dublin Institute of Technology, Ireland); Niccolò Casiddu (University of Genoa, Italy)
pp. 413-418

Technical Session.3 12:18 *A Framework of Scalable QoE Modeling for Application Explosion in the Internet of Things*

Yasuhiro Ikeda and Shouji Kouno (NTT, Japan); Akihiro Shiozu (NTT Corporation & NTT Network Technology Laboratories, Japan); Katsunori Noritake (NTT, Japan)
pp. 419-423

Technical Session.4 12:42 *Easing IoT Application Development Through DataTweet Framework*

Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France); Christian Bonnet (Institut Eurecom, France)
pp. 424-429

Technical Session: Semantic Technologies and Collective Intelligence

Room: Grand Ballroom E

Chair: Thomas Coughlin (Coughlin Associates, USA)

Technical Session.1 11:30 *WOTS2E: A Search Engine for a Semantic Web of Things*

Andreas Kamilaris (Insight Centre for Data Analytics & National University of Ireland, Galway, Ireland); Semih Yumusak (National University of Ireland, Galway, Ireland); Muhammad Intizar Ali (Insight Centre for Data Analytics, Ireland)
pp. 430-435

Technical Session.2 12:00 *Agri-IoT: A Semantic Framework for Internet of Things-enabled Smart Farming Applications*

Andreas Kamlaris (Insight Centre for Data Analytics & National University of Ireland, Galway, Ireland); Muhammad Intizar Ali (Insight Centre for Data Analytics, Ireland); Francesc X. Prenafeta-Boldú (GIRO Joint Research Unit IRTA-UPC, Spain)
pp. 436-441

Technical Session.3 12:30 *The Role of an IoT Platform in the Design of Real-time Recommender Systems*

Sangwhan Cha, Marta Padilla Ruiz, Monica Wachowicz, Loc Hoang Tran, Hung Cao and Ikechukwu Maduako (University of New Brunswick, Canada)
pp. 442-447

Technical Session.4 13:00 *Contextualised Service Delivery in the Internet of Things*

Ali Yavari, Prem Jayaraman and Dimitrios Georgakopoulos (RMIT University, Australia)
pp. 448-453

Tutorial: CDSA and BSON: The Two Key Enablers of Lean, Elastic and Proactive Wireless Networks Needed for Future IoT

Dr. Ali Imran and Prof. Muhammad Ali Imran

Room: Grand Ballroom F

Realization of an all-encompassing IoT supporting 5G network hinges on enablers that can make the future wireless networks lean, elastic and proactive. This tutorial will provide a novel prospective on how the road towards an IoT supporting networks can be paved from the crossroads of: Control and Data Plane Split Architecture (CDSA) based RAN and Big Data Enabled SON (BSON). The presenters of this tutorial are authors of seminal papers on CDSA and BSON and are leading several international projects in this space. Leveraging this experience, the overarching goal of this tutorial is to discuss answers to following questions:

1. What requirements of IoT call for a paradigm shift from conventional cellular architecture and design?
2. What characteristics these requirements induce in design space of an IoT supporting wireless network, e.g., 5G?
3. How a system design based on CDSA and BSON can ensure a network that can support range of IoT applications?
4. What is dark data and how it can act as key enabler to implement CDSA and BSON to support IoT?
5. How does a CDSA and BSON based system design fare in terms of different KPIs against a conventional design such as HetNet for supporting IoT?

Tuesday, December 13, 13:30 - 14:30

Lunch Break

Tuesday, December 13, 14:30 - 16:30

Exhibition

Room: Grand Ballroom Foyer

Industry Forum Panel: IoT and Low Power Wide Area Networks (LPWAN)

Room: Grand Ballroom D

Chair: Geoff Mulligan (Proto6, USA)

Session Objectives

One of the missing pieces for the IoT is ubiquitous low cost low power wide area connectivity. Within the past 18 months new technologies have come onto the scene and dubbed LPWAN - Low Power Wide Area Networks. There are a few different types of radio technologies being deployed today to meet the needs of this IoT connectivity.

This session will take an in depth look at the LoRa Networking technology. LoRa is a radio and protocol specification that uses a sub-1GHz radio in the ISM band and an open networking specification to provide low power (5-10 years), wide area (1-10KM), low cost (less than \$10 modules) connectivity. The panel will take a look at real world network deployments around the world and the ecosystem of available hardware and software. The session will also include a presentation about an openly available LoRa Network deployed in and around Washington DC.

Topics of Interest

- What are LPWANS
- Introduction to LoRa and LoRaWAN
- LoRa - an open business model
- Real world deployments
- Trade-offs with other LPWAN tech
- Country wide deployments (Europe, US, Korea)
- A Live and OPEN LoRa network in WDC

Panel Moderator: Geoff Mulligan, WFIOT General Chair, Creator 6lowpan, Chairman LoRa Alliance

Panelists:

- Alex Khorram - Comcast
- Joseph Scott Kubes - Orbiwise
- Lawrence Latham - Everynet
- Greg Toth - IoT DevLabs

Technical Session: Big Data and IoT Data Analytics - S1

Room: Grand Ballroom B

Chairs: Satish Chikkagoudar (Pacific Northwest National Laboratory, USA), Vincenzo Piuri (Università degli Studi di Milano, Italy)

Technical Session.1 14:30 *Adapting Sampling Interval of Sensor Networks Using On-Line Reinforcement Learning*

Gabriel Martins Dias (Universitat Pompeu Fabra, Spain); Maddalena Nurchis (University of Pompeu Fabra UPF, Spain); Boris Bellalta (Universitat Pompeu Fabra, Spain)
pp. 454-459

Technical Session.2 14:54 *Marginal Distribution Clustering of Multi-variate Streaming IoT Data*

Daniel Puschmann (University of Surrey & Institute for Communication Systems, United Kingdom); Payam Barnaghi and Rahim Tafazolli (University of Surrey, United Kingdom)
pp. 460-465

Technical Session.3 15:18 *Realtime Big Data Analytics for Event Detection in Highways*

Hamzeh Khazaei (University of Toronto, Canada); Rodrigo Veleza and Marin Litoiu (York University, Canada); Ali Tizghadam (TELUS & University of Toronto, Canada)
pp. 466-471

Technical Session.4 15:42 *Namatad: Inferring Occupancy from Building Sensors Using Machine Learning*

Matthew Tolentino, Anindya Dey, Bob Landowski, Xiao Ling, Adnan Syed, Yuewen Zheng, David Anderson and Kim Stuart (University of Washington, USA)
pp. 472-477

Technical Session.5 16:06 *Physical-Cyber-Social Similarity Analysis in Smart Cities*

Nazli Farajidavar (University of Surrey, United Kingdom); Sefki Kolozali (King's College London, European Union & MRC-PHE Centre for Environment & Health, United Kingdom); Payam Barnaghi (University of Surrey, United Kingdom)
pp. 478-483

Technical Session: IoT Enabling Technologies - Platforms

Room: Grand Ballroom A

Chair: Ting Zou (Philips Lighting, USA)

Technical Session.1 14:30 *Do "Web of Things Platforms" Truly Follow the Web of Things?*

Andreas Kamlaris (Insight Centre for Data Analytics & National University of Ireland, Galway, Ireland); Muhammad Intizar Ali (Insight Centre for Data Analytics, Ireland)
pp. 484-489

Technical Session.2 14:54 *Enabling IoT Automation Using Local Clouds*

Jerker Delsing (Lulea University of Technology, Sweden); Jens Eliasson and Jan van Deventer (Luleå University of Technology, Sweden); Hasan Derhamy (Lulea University of Technology, Sweden); Pal Varga (Budapest University of Technology and Economics, Hungary)
pp. 490-495

Technical Session.3 15:18 *LAMEN: Towards Orchestrating the Growing Intelligence on the Edge*

Ahmed Salem and Tamer Nadeem (Old Dominion University, USA)
pp. 496-501

Technical Session.4 15:42 *SPOT: A Smartphone-Based Platform to Tackle Heterogeneity in Smart-Home IoT Systems*

Mo Mahdi Moazzami (Samsung Research America, USA); Guoliang Xing (Michigan State University, USA); Daisuke Mashima (Advanced Digital Sciences Center, Singapore); Wei-Peng Chen (Fujitsu Laboratories of America, USA); Ulrich Herberg (Independent Researcher, USA)
pp. 502-507

Technical Session: Smart Cities and Smart Building Automation

Room: Grand Ballroom E

Chair: Sye Loong Keoh (University of Glasgow, Singapore)

Technical Session.1 14:30 *Building Management Insights Driven by a Multi-System Semantic Representation Approach*

Charbel El Kaed (Digital Services Platform-Innovation & Schneider Electric, USA); Brett Leida (Schneider Electric & EcoBuildings, USA); Tony Gray (Schneider Electric, Canada & Power Solutions, USA)

pp. 508-513

Technical Session.2 14:54 Energy Efficient IoT-Based Smart Home

Laila Salman (ANSYS Inc. & ANSYS Canada Ltd, Canada); Safa Salman, Saeed Jahangirian, Mehdi Abraham and Fred German (ANSYS Inc., USA); Charlotte Blair (IEEE Connecticut Section, USA); Peter Krenz (ANSYS Inc., USA)
pp. 514-517

Technical Session.3 15:18 Deploying IoT Devices to Make Buildings Smart: Performance Evaluation and Deployment Experience

Xiangyu Zhang, Rajendra Adhikari, M. Pipattanasomporn, Murat Kuzlu and Saifur Rahman (Virginia Tech, USA)
pp. 518-523

Technical Session.4 15:42 SenSquare: a Mobile Crowdsensing Architecture for Smart Cities

Federico Montori, Luca Bedogni, Alain Di Chiappari and Luciano Bononi (University of Bologna, Italy)
pp. 524-529

Technical Session.5 16:06 Biotechnology and Internet of Things for Green Smart City Application

Pavel Gotovtsev and Andrey Dyakov (Kurchatov Institute, Russia)
pp. 530-534

Tutorial: Compressive Sensing - A Game-Changing Technology for Energy-Efficient IoT Sensor Networks

Dr. Venkat Natarajan and Apoorv Vyas

Room: Grand Ballroom F

Explosion in sensor technologies & ubiquitous sensing in IoT applications has resulted in massive amounts of data being generated that need to be effectively managed. Compressive Sensing is an emerging technology that promises to efficiently manage the data deluge by advanced signal processing theory that directly seeks out the information content of a signal avoiding any redundant measurements whatsoever. Compressive Sensing is considered to be highly promising for a wide range of IoT applications such as smart cities, smart wearables, wireless sensing, communication networks, imaging etc.

The tutorial includes the following topics: 1. Theory, formulations & mechanics of Compressive Sensing 2. Practical embodiments of Compressive Sensing in smart wearables applications (e.g. smartwatch) on a body sensor network to minimize MCU power consumption and radio throughput to increase node battery life 3. Application of Compressive Sensing for energy-efficient data aggregation from spatially-distributed sensor nodes for different IoT WSN topologies, including joint optimization of sensing and routing layers for improved network power-efficiencies

Workshop: User-Centric Security, Privacy and Interoperability in the Context of Internet of Things and Smart Cities

Dr. David Kravitz

Room: Grand Ballroom G

Chair: Antonio Fernando Skarmeta Gomez (University of Murcia, Spain)

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Moreover, Trust in the IoT world is also a challenging issue that only recently has attracted the attention of the research community. There are many open questions regarding "how trustworthy are the IoT systems in smart cities?", "why should I trust a smart city application?", "are the devices providing reliable information?", "when I need to get some information from a smart city application, and how can I be ensured that this information is timely and accurate?", "will my private information be openly distributed to anyone without my consent?". It can be easily seen that citizens may be reluctant to use smart city systems because they do not trust them. Thus, IoT-based systems have to prove their trustworthiness to the citizens and provide the citizens clear and visible indicators of trust. In addition, which design approaches should be proposed and adopted to enhance the secure interoperability and trust among the many different systems and services, which compose a smart city?

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Workshop.1 14:30 A Pragmatic Approach to Solving IoT Interoperability and Security Problems in an eHealth Context

Raffaele Giuffreda, Luca Capra and Fabio Antonelli (CREATE-NET, Italy)
pp. 535-540

Workshop.2 15:10 ARMOUR: Large-Scale Experiments for IoT Security & Trust

Salvador Pérez, Juan A. Martinez and Antonio Fernando Skarmeta Gomez (University of Murcia, Spain); Márcio Mateus and Bruno Almeida (Unparallel Innovation, Lda, Portugal); Pedro Malo (Universidade Nova de Lisboa & Uninova, Portugal)
pp. 541-546

Workshop.3 15:50 A Trust-Based Scheme Employing Evidence Reasoning for IoT Architectures

Alexandros Fragkiadakis and Elias Z. Tragos (Institute of Computer Science, FORTH, Greece)
pp. 547-552

Tuesday, December 13, 16:30 - 17:00

Coffee Break

Tuesday, December 13, 17:00 - 19:00

Exhibition

Room: Grand Ballroom Foyer

Industry Forum Panel: Best Practices in Industrial IoT Cybersecurity

Room: Grand Ballroom E

Chair: Francis Cianfrocca (Bayshore Networks, USA)

Session Objective

This session will describe Industrial Internet security best practices that can move an organization from vulnerable to secure. The presentation will examine the challenges of IT/OT convergence with real-life stories from the field, describing actual Industrial Internet security projects and lessons learned. These use cases enable benefits such as reduced costs and improved efficiency, protection of field industrial devices from local and Internet-based attack, safe and secure third-party access to local OT/ICS devices and data, and aggregation and analysis of big data to create visibility and insight to operations such as:

- Discrete & Process Manufacturing
- Energy, Oil & Gas
- Medical
- Critical Infrastructure
- Smart Cities

The presentation will highlight:

- IT/OT convergence cyber security apertures
- Overview of best practices for Industrial IoT cyber security, including efforts at the Industrial Internet Consortium (IIC)
- Operational policies that define how organizations manage OT assets and processes
- Security policies that define how an organization protects physical OT assets and business processes from being compromised
- Safety policies that define how organizations manage OT assets and processes to ensure the safety of employees, customers, the public, and the environment
- Use cases, including data centers, building automation systems, critical infrastructure, and medical

Panel

Chair: Francis Cianfrocca, Founder & Chief Scientist, Bayshore Networks

Panelists:

- Hamed Soroush, Senior Research Security Engineer, Real-Time Innovations(RTI)
- Marc Jones, Director of Federal Outreach, Consortium for IT Software Quality

Industry Forum Panel: IoT: A Great Opportunity for Emerging Economies? Industry Forum

Room: Grand Ballroom C

Chair: Farouk Kamoun (SESAME University, Tunisia)

Panel Members

1. Dr. A Carlos Kamienski, Federal University of ABC (UFABC), Santo André, Brazil
2. Dr. Vyas Apoorv, Systems Engineer Signal and Systems Lab, Wireless Communications Research, Intel Labs, India Technology India Pvt. Ltd., Bangalore, India 560103
3. Dr. Venkat Natarajan, Senior Staff Engineer, Signal and Systems Lab, Wireless Communications Research, Intel Labs, India Technology India Pvt. Ltd., Bangalore, India
4. Mrs. Rosa Delgado, International ICT Consultant, Peru
5. Prof. Nishchal Verma, Associate Professor, Department of Electrical Engineering, IIT Kanpur, India

Motivation & Objectives

IoT is foreseen as a technology with great potential for boosting emerging economies. It's key for emerging countries and particularly developing countries to use IoT to leapfrog the huge gap in many areas. As a matter of fact, emerging countries face many challenges in the areas of transport, health, security, water collection and distribution, natural disaster management, pollution control and monitoring, etc.

One of the major problems is the lack of data to facilitate decision making, planning and monitoring. Iot can bring fast and low cost solutions. Consequently many questions arise: which sectors can benefit most from the deployment of IoT? What are the most promising applications? Which technology and what kind of infrastructure should be deployed? It is necessary to adopt a shared infrastructure or allow for isolated approaches? Is the legal framework adequate for the deployment and use of IoT? Is it necessary to adopt experimental approaches (living labs) or engage more firmly in real operations? How about human resources and capacity building?

In this panel we shall review various experiences from emerging countries, share experiences, best practices and appreciate how the above issues have been tackled or could be best tackled in the future. Discussions should also shed some light on appropriate strategies, pilot projects at sectoral or country level. The panel should come up with recommendations on the way to go.

Format

- Panelists will be invited to present their country's strategy and/or experience in the use of IoT and lessons learned. 7 to 10 minutes each
- Questions from the floor and discussions
- Reply from panelists
- Second set of questions and comments from the floor
- Panelists reactions and recommendations on the way to go

Technical Session: Big Data and IoT Data Analytics - S2

Room: Grand Ballroom B

Chair: Soumya Kanti Datta (EURECOM & Co-Founder, Future Tech Lab, France)

Technical Session.1 17:00 *Improving Fast Velocity and Large Volume Data Processing in IoT/M2M Platforms*

Pohan Peng and Fuchun Joseph Lin (National Chiao Tung University, Taiwan)
pp. 553-558

Technical Session.2 17:30 *Monitoring Data Stream Reliability in Smart City Environments*

Daniel Kuemper (University of Applied Sciences Osnabrück, Germany); Marten Fischer (University Osnabrueck, Germany); Thorben Iggena and Ralf Tönjes (University of Applied Sciences Osnabrück, Germany); Elke Pulvermueller (University Osnabrueck, Germany)
pp. 559-564

Technical Session.3 18:00 *Event Model to Facilitate Data Sharing Among Services*

Olivera Kotevska (NIST, USA & University of Grenoble Alpes, France); Judith Gelernter (NIST, USA); Ahmed Lbath (University of Grenoble Alpes, France)
pp. 565-572

Technical Session.4 18:30 *A Distributed In-network Indexing Mechanism for the Internet of Things*

Yasmin Fathy, Payam Barnaghi, Shirin Enshaeifar and Rahim Tafazolli (University of Surrey, United Kingdom)
pp. 573-578

Technical Session: IoT Enabling Technologies - Architectures

Room: Grand Ballroom A

Chair: Jereme Haack (Pacific Northwest National Laboratory, USA)

Technical Session.1 17:00 *Distributed Live Data Search Architecture for Resource Discovery on Internet of Things*

Takashi Ikebe and Hirofumi Noguchi (NTT, Japan); Naoto Hoshikawa (NTT Network Service Systems Laboratories & NTT, Japan)
pp. 579-584

Technical Session.2 17:24 *An Object Detection Acceleration Framework Based on Low-Power Heterogeneous Manycore Architecture*

Fang Gao, Zhangqin Huang, Zheng Wang and Shulong Wang (Beijing University of Technology, P.R. China)
pp. 585-590

Technical Session.3 17:48 *Decomposition-compensation Approach to Microcloud-based IoT Infrastructure Management*

Oleksandr Rolik (National Technical University of Ukraine "Kyiv Polytechnic Institute", Ukraine); Eduard Zharikov, Sergii Telenyk and Maxim Yasochka (National Technical University of Ukraine "Kyiv Polytechnic Institute", Ukraine)
pp. 591-596

Technical Session.4 18:12 *A Semantic Interoperability Architecture for Internet of Things Data Sharing and Computing*

John Strassner (Huawei, USA); Wael Diab (Huawei Technologies, USA)
pp. 597-602

Technical Session.5 18:36 *Adapting Processor Architectures for the Periphery of the IoT Nervous System*

Paul G. Flikkema (Northern Arizona University, USA); Bertrand Cambou (Northern Arizona University & Northern Arizona University, USA)
pp. 603-608

Workshop: User-Centric Security, Privacy and Interoperability in the Context of Internet of Things and Smart Cities

Panel on Security and Privacy in IoT

Room: Grand Ballroom G

Chair: Antonio Fernando Skarmeta Gomez (University of Murcia, Spain)

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Workshop.1 17:00 SandUSB: An Installation-Free Sandbox for USB Peripherals

Edwin Loe and Hsu-Chun Hsiao (National Taiwan University, Taiwan); Tiffany Kim (HRL Laboratories, USA); Shao-Chuan Lee (National Taiwan University, Taiwan); Shin-Ming Cheng (National Taiwan University of Science and Technology, Taiwan)
pp. 609-614

Workshop.2 17:40 Security Certification and Labeling in Internet of Things

Antonio Fernando Skarmeta Gomez (University of Murcia, Spain); Gianmarco Baldini (Joint Research Centre - European Commission, Italy); Ricardo Neisse (European Commission Joint Research Centre, Italy); Bruno Legeard (SmarTesting, France); Elizabeta Fournieret (Smartesting, France); Franck Le Gall (Easy Global Market, France)
pp. 615-620

Workshop.3 18:20 Traffic Forensics for IPv6-Based Wireless Sensor Networks and the Internet of Things

Vijay Kumar, George Oikonomou and Theo Tryfonas (University of Bristol, United Kingdom)
pp. 621-626

Tuesday, December 13, 19:00 - 21:00

Gala Dinner

Keynote: Adam DROBOT, Chair IEEE IoT Initiative

Room: Grand Ballroom D

Wednesday, December 14

Wednesday, December 14, 09:00 - 10:00

Keynote: The Internet: How the Most Useful Tool in History Became a Dangerous Place and How We Can Reclaim It

Dr. Paul Mockapetris, Threatstop

Room: Grand Ballroom D

Wednesday, December 14, 10:00 - 11:00

Keynote: Calculating Consensus Reality For an Internet of Trust

Mr. Pindar Wong, VefiFi Ltd

Room: Grand Ballroom D

Wednesday, December 14, 11:00 - 11:30

Coffee Break

Wednesday, December 14, 11:30 - 13:30

Exhibition

Room: Grand Ballroom Foyer

Industry Forum Panel: IoT Governance in the USA - Policy Challenges & Issues

Room: Grand Ballroom F

Chairs: Russell Harrison (IEEE-USA, USA), Maura Moran (IEEE-USA Vice President for Government Relations, USA)

Session Host: IEEE-USA Government Relations Council

Session Sponsor: IEEE Future Directions

Session Chairs/Moderators/Facilitators:

- Russ Harrison, IEEE-USA Director Government Relations - see profile at <https://www.ieeeusa.org/about/profiles.asp#russ>
- Maura Moran, IEEE-USA Vice President for Government Relations - see profile at <http://sites.ieee.org/wie-forum-usa-east/speakers/maura-k-moran/>

Panel Members

- Jean Camp, Professor at the School of Informatics and Computing, Indiana University and Chair, IEEE-USA Committee on Communications Policy - see profile at https://www.soic.indiana.edu/all-people/profile.html?profile_id=178
 - Roger Oliva, IEEE-AESS Board of Governors and Immediate Past Chair, IEEE-USA Committee on Transport and Aerospace Policy - see profile at <http://ieee-aess.org/contact/roger-oliva>
 - Lee Stogner, Managing Principal of the Vincula Group, and Member, IEEE-USA Committee on Transport and Aerospace Policy - see bio at http://ewh.ieee.org/conf/isgt/2012/bio_files/LeeStogner.htm
 - William (Bill) Tonti, Sr. Director, IEEE Future Directions.
 - Jeffrey (Jeff) Voas, Computer Scientist at the National Institute of Standards and Technology (NIST), Member, IEEE IOT Initiative and Past President of the IEEE Reliability Society - see bio at <https://www.nist.gov/people/jeff-voas>

Technical Session: Automotive & Intelligent Transport

Room: Grand Ballroom A

Chair: Mengchu Zhou (New Jersey Institute of Technology, USA)

Technical Session.1 11:30 A Novel IoT Access Architecture for Vehicle Monitoring System

Shulong Wang (Beijing University of Technology, P.R. China); Yibin Hou (Embedded Software and Systems Institute of BJUT, P.R. China); Fang Gao (Beijing University of Technology); Xinrong Ji (Beijing University of Technology, P.R. China)
pp. 627-630

Technical Session.2 11:54 Estimating Travel Speed Via Sparse Vehicular Crowdsensing Data

Cheng Wang and Zhenzhen Zhang (Tongji University, Shanghai, P.R. China); Mengchu Zhou (New Jersey Institute of Technology, USA); Lu Shao (Tongji University, P.R. China)
pp. 631-636

Technical Session.3 12:18 Smart Car Parking System Prototype Utilizing CCTV Nodes

Muftah Fraifer and Mikael Fernström (IDC-CSIS-UL)
pp. 637-642

Technical Session.4 12:42 Parking-Stall Vacancy Indicator System, Based on Deep Convolutional Neural Networks

Sepehr Valipour (University of Alberta); Mennatullah Siam (University of Alberta, Canada); Eleni Stroulia (University of Alberta, Canada, Canada); Martin Jagersand (University of Alberta, Canada)
pp. 643-648

Technical Session.5 13:06 Real-time Traffic-based Routing, Based on Open Data and Open-Source Software

Diego Serrano (University of Alberta, Canada); Maria Teresa Baldassarre (University of Bari, Italy); Eleni Stroulia (University of Alberta, Canada, Canada)
pp. 649-653

Technical Session: Consumer Electronics and Assisted Living

Room: Grand Ballroom B

Chair: Raffaele Giaffreda (CREATE-NET, Italy)

Technical Session.1 11:30 Personalized Ambience: An Integration of Learning Model and Intelligent Lighting Control

Xiangwei Yin (University of Glasgow, United Kingdom); Sye Loong Keoh (University of Glasgow, Singapore)
pp. 654-659

Technical Session.2 11:54 *An IoT System to Estimate Personal Thermal Comfort*

Emil Laftchiev (Mitsubishi Electric Research Labs (MERL), USA); Dan Nikovski (MERL, USA)
pp. 660-665

Technical Session.3 12:18 *Situation Awareness in a Smart Home Environment*

Shu-Yun Lee and Fuchun Joseph Lin (National Chiao Tung University, Taiwan)
pp. 666-671

Technical Session.4 12:42 *Software Defined Connected Prosumer Communities*

Charalampos Chelmiss (University at Albany, SUNY, USA); Rajgopal Kannan and Viktor K. Prasanna (University of Southern California, USA)
pp. 672-673

Technical Session.5 13:06 *Near-Field Communication Sensors and Cloud-Based Smart Restaurant Management System*

Hassain Saeed, Mostafa Shabka, Ali Shouman, Mais Elfar, Shikharesh Majumdar and Chung-Horng Lung (Carleton University, Canada)
pp. 674-679

Technical Session: IoT Security and Privacy - Devices

Room: Grand Ballroom C

Chair: Zbigniew Zielinski (Military University of Technology, Poland)

Technical Session.1 11:30 *IoT Inter-Security Domain Trust Transfer and Service Dispatch Solution*

Andreea Ancuta Corici, Marc Emmelmann, Ranjan Shrestha and Marius Corici (Fraunhofer FOKUS, Germany); Thomas Magedanz (Fraunhofer Institute FOKUS / TU Berlin, Germany); Jingjing Luo (Fraunhofer FOKUS, Germany)
pp. 680-685

Technical Session.2 11:54 *A PUF-Based Paradigm for IoT Security*

Tarek Idriss and Haytham Idriss (University of Louisiana at Lafayette, USA); Magdy Bayoumi (University of Louisiana, USA)
pp. 686-691

Technical Session.3 12:18 *An Overview on Delegated Authorization for CoAP*

Victoria Betran (Universidad de Murcia, Spain); Antonio Fernando Skarmeta Gomez (University of Murcia, Spain)
pp. 692-696

Technical Session.4 12:42 *A Reliable Covert Channel over IEEE 802.15.4 using Steganography*

Ajay Kumar Nain (Indian Institute of Technology Hyderabad, India); P Rajalakshmi (Indian Institute of Technology Hyderabad, India)
pp. 697-702

Tutorial: Intelligence At the EDGE: Using Mobile Edge Computing to Deliver Consumer Centric IoT Services

Soumya Kanti Datta

Room: Grand Ballroom E

This tutorial highlights the challenges of cloud based IoT platforms that include supporting ultra-low latency and high mobility consumer IoT services. To mitigate these challenges, the industry is exploring edge computing (EC) as an alternative. Proximity to consumers, dense geographical distribution, support for mobility and availability of many powerful devices (e.g. smartphone, raspberry pi) are enabling the industry to utilize EC for video distribution, consumer IoT, localized analytics, edge caching of data, augmented reality and more. Connected vehicles scenarios will be utilized to further illustrate the requirements, architecture and building blocks of EC. The purpose of the tutorial is to highlight the intelligence at the edge and how it can be utilized to deliver consumer centric IoT services.

Workshop: IoT as Driver for the Co-Created Smart City

Room: Grand Ballroom G

Chair: Mirko Alexander Presser (Aarhus University, Denmark)

In recent years, the Internet of Things (IoT) has emerged in ever more communities, and is now beginning to make traction in Maker (self-taught tinkerers) oriented communities as well. Similar movements are happening in the Smart City domain, and it is now interesting to look at how the two terms collide. A natural consequence is that it is important to investigate how IoT tools and enablers are actually being developed and used by diverse communities. IoT is no longer for the selected few, since Makers, and even non-tech people are engaging with IoT on a daily basis (in the Smart City), and they want to be able to exploit the endless possibilities that lie within this domain. The term developer is no longer describing an exclusive group of people, with special competencies or technical backgrounds. The definition of a developer is broadening, and anyone can more or less see themselves as Smart City application creators. This shift can be seen when looking at communities like Arduino and Processing. These communities have made technology widely accessible, and now most people can develop rather complex systems with minimum efforts. The natural question is then to ask how we can develop IoT tools that foster usage on different levels without excluding experts or Makers. If IoT tools are too simple experts will not use them, and freedom is lost. If tools are too complex, Makers cannot use them.

In this session the focus is on co-creating smart cities. This domain is relevant since cities worldwide are rapidly changing into smart interconnected systems, both from a technological and a mindset perspective. Cities are being instrumented with new technologies every day, and citizens are trying to keep up with

the new abilities technology brings to the table. Now that cities are becoming intertwined complex ecosystems, it is time to investigate how to empower citizens to take active part in shaping the Smart City through IoT.

The format of the workshop will be to present different views on co-creation and citizen driven IoT development in Smart Cities. The aim is to develop a joint understanding of common success stories and differences based on regional and cultural differences and approaches. Emphasis will be put on how to enable citizens, and primarily Makers, to utilize IoT tools and infrastructures.

Workshop.1 11:30 Knowledge Co-creation in the OrganiCity: Data Annotation with JAMAiCA

Aikaterini Deligiannidou (Computer Technology Institute and Press Diophantus, Greece); Dimitrios Amaxilatis (Computer Technology Institute and Press Diophantus & University of Patras, Greece); Georgios Mylonas (Computer Technology Institute & Press Diophantus, Greece); Evangelos Theodoridis (Intel UK, United Kingdom)
pp. 703-708

Workshop.2 12:00 OppNet: Enabling Citizen-Centric Urban IoT Data Collection Through Opportunistic Connectivity Service

Fengrui Shi (Imperial College London, United Kingdom); Usman Adeel (Intel UK Ltd, United Kingdom); Evangelos Theodoridis (Intel UK, United Kingdom); Mo Haghghi (Intel, United Kingdom); Julie McCann (Imperial College London, United Kingdom)
pp. 709-714

Workshop.3 12:30 Drone-based Reconstruction for 3D Geospatial Data Processing

Jason Renwick (The University of the West Indies & IBM, Trinidad and Tobago); Levente Klein and Hendrik Hamann (IBM TJ Watson Research Center, USA)
pp. 715-720

Workshop.4 13:00 Game Theoretic and Auction-based Algorithms Towards Opportunistic Communications in LPWA LoRa Networks

Mo Haghghi (Intel, United Kingdom); Zhijin Qin (Imperial College London, United Kingdom); Davide Carboni and Usman Adeel (Intel UK Ltd, United Kingdom); Fengrui Shi (Imperial College London, United Kingdom)
pp. 721-726

Wednesday, December 14, 13:30 - 14:30

Closing Ceremony