

**Eighth ITU Kaleidoscope Academic
Conference**

“ICTs for a Sustainable World”

Bangkok, Thailand, 14-16 November 2016

Final Report

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1. ITU Kaleidoscope 2016 overview

The [ITU Kaleidoscope conference 2016](#) (K-2016) was held at the IMPACT Exhibition Center in Bangkok, Thailand, co-located with [ITU Telecom World](#).

Over 120 delegates from 31 countries participated in the conference. Some **photos** are available on the [ITU Flickr](#).

The event was technically co-sponsored by the Institute of Electrical and Electronics Engineers ([IEEE](#)) and IEEE Communication Society ([IEEE ComSoc](#)).

K-2016 partnering organizations supported the promotion of the conference: [Waseda University](#) (Japan), Institute of Electronics, Information and Communication Engineers of Japan ([IEICE](#)), Institute of Image Electronics Engineers of Japan ([I.I.E.E.J.](#)), European Academy for Standardization ([EURAS](#)), [University of the Basque Country](#) (Spain), [Chair of Communication and Distributed Systems](#) at RWTH Aachen University (Germany), [Chulalongkorn University](#) (Thailand), [University of Geneva](#) (Switzerland), [Royal Holloway - University of London](#) (United Kingdom), and [UNESCO Chair in ICT4D](#).

A 10 month, substantial preparatory process was required for this Kaleidoscope edition. This process involved the efforts and collaboration of four [TSB staff](#), a [Steering Committee](#) of four members (SC), and a [Technical Programme Committee](#) of 87 members (TPC), all internationally recognized ICT experts from academia, research institutes and the private sector.

Special thanks go to Bundhit Eua-arporn (President, Chulalongkorn University, Thailand), Kaleidoscope 2016 General Chairman; to the Technical Programme Committee Chairman, Kai Jakobs (RWTH Aachen University, Germany), for ensuring transparency through the double-blind peer-review process, and to the Steering Committee members: Christoph Dosch (ITU-R Study Group 6 Chairman; IRT GmbH, Germany); Kai Jakobs; Takuro Sato (Waseda University, Japan); and Mostafa Hashem Sherif (AT&T, USA).

Alessia Magliarditi, ITU Kaleidoscope Coordinator, chaired the meeting of the Award Committee members which selected the winners of the awards for best papers. The Award Committee was composed of five conference attendees: Martin Adolph (Engineer, Telecommunication Standardization Bureau, ITU), Antoine Bagula (University of The Western Cape, South Africa), Caitlin Bentley (Royal Holloway - University of London, United Kingdom), Mitsuji Matsumoto (Waseda University, Japan; former Kaleidoscope Steering Committee member) and Mostafa Hashem Sherif. At the [ceremony](#), Alessia announced the winners of the best paper awards and the recipients of the Young Author Recognition whose certificates were kindly delivered by [Chaesub Lee](#) (Director, Telecommunication Standardization Bureau, ITU) and Pomthong Malakul Na Ayudhaya (Vice President for Academic Affairs, on behalf of Bundhit Eua-arporn, President of Chulalongkorn University, Thailand, and ITU Kaleidoscope 2016 General Chairman). At the [closing session](#), the TSB Director gave his closing remarks and Alessia presented some highlights

of the conference and thanked all the people that contributed to its success, in particular Erica Campilongo and Martin Adolph from the ITU Telecommunication Standardization Bureau.

2. Conference programme

The opening ceremony included welcome remarks from Virasak Kittivat (Principal Advisor for Foreign Affairs, Ministry of Digital Economy and Society, Thailand) and Supot Tiarawut (Advisor to the President, on behalf of Bundhit Eua-arporn, President of Chulalongkorn University, Thailand, and ITU Kaleidoscope 2016 General Chairman); and opening address by the Director of the Telecommunication Standardization Bureau (TSB/ITU), Chaesub Lee.

After the opening, Reinhard Scholl, (Deputy to the Director, Telecommunication Standardization Bureau, ITU) introduced a keynote speech on “[*The convergence on communication and machine learning.*](#)” by [Thomas Wiegand](#) (Executive Director, Fraunhofer Heinrich Hertz Institute; Chair, Image Communication, TU Berlin).

The research areas of Machine Learning and Communication are converging. Topics like video encoding and 5G mobile communication are significantly enhanced when being combined with advanced machine learning methods. Common tasks in these communication areas are greatly improved by combining them with machine learning based prediction and classification methods. In his keynote speech, Thomas Wiegand presented a method for explaining classification results obtained by Deep Neural Networks, in order to better understand decisions resulting from machine learning approaches.

Two additional **keynote speeches** were included in the programme:

1. *Decoupling economic growth from carbon emission growth.*

[Hossein Moiin](#) (Executive Vice President and Chief Technology Officer for Nokia Mobile Networks, Nokia Corporation, Finland)

In his keynote summary, Hossein Moiin presented Nokia’s views on how industry, policy makers and international organizations, like ITU, can work together to combat climate change and to ensure the sustainable use of natural resources.

Networks evolution, fuelled by the growing traffic volumes, gives the ICT industry an opportunity for continuous improvement of network level energy efficiency. Nokia is committed to design solutions to minimize the energy consumption of tomorrow's networks.

2. *Important considerations for environmentally sustainable broadcasting: the British broadcasting corporation experience.*

[Simon Tuff](#) (British Broadcasting Corporation, London, United Kingdom)

Many people recognise the important role broadcasters have in providing people with an understanding of environmental issues through programmes and other content. However,

broadcasters themselves also have a significant impact on the environment through the process of content creation and distribution.

In his keynote paper, Simon Tuff presented the challenges for sustainable TV broadcasting and explored how the BBC is becoming a more sustainable organization, whilst guarding its independence and maintaining its impartiality.

In addition to the keynote speeches, the programme included **two invited papers**. The first invited paper entitled “*Ageing, well-being and technology: from quality of life improvement to digital rights management. A French perspective.*” [[Presentation](#)] addressed the need to find a balance between the use of technology for improving life quality of elderly people and the management of the related digital rights. It was authored and presented by [Nathalie Devillier](#) (Grenoble Ecole de Management, France).

[Luca Chiaraviglio](#) (CNIT/University of Rome Tor Vergata, Italy) presented his invited paper on “*5G in rural and low-income areas: are we ready?*” [[Presentation](#)], co-authored with Nicola Blefari-Melazzi (CNIT/University of Rome Tor Vergata, Italy), William Liu; Jairo A. Gutierrez (AUT, New Zealand), Jaap Van De Beek (Lulea University of Technology, Sweden), Robert Birke, Lydia Chen (IBM Research, Switzerland), Filip Idzikowski (Faculty of Electronics and Telecommunications, Poznan University of Technology, Poland), Daniel Kilper (The University of Arizona, USA), Paolo Monti (KTH Royal Institute of Technology, Sweden), Jinsong Wu (University of Chile, Chile). This second invited paper considered the possibility of deploying 5G networks in rural and low-income zones.

83 papers from 23 countries were submitted for review, 25 of which were accepted for publication and presentation (19 in the lecture sessions, 6 in the poster session) from 21 countries (almost all from academia circles – only 3 from industry).

All continents were represented in the conference programme. The invited paper on “*5G in rural and low-income areas: are we ready?*”, in particular, brought together a team of authors from three continents: Europe, Asia-Pacific, and Americas.

The research results submitted are related to various ITU activities, including security-, privacy-, and trust-enhancing technologies; software-defined everything in a multi-vendor market; architecture for machine-oriented communications such as M2M, IoT, sensor networks; quality of service, quality of experience, performance; disaster relief systems, network resilience and recovery; network access and neutrality; cloud computing; multimedia; ageing and ambient assistive living; technology-enhanced learning; green ICT; smart cities; e-health; privacy, big data; artificial intelligence; robots and drones; economic models and the role of ICT in sustainable development; conformance and interoperability aspects; strategies for integrating sustainable development into standardization and international public policy; etc. As in previous editions of the conference, a number of papers address radio-related issues such as 3G/4G/5G mobile, optical fiber and cable, spectrum management and sharing.

Presenters made reference to ITU Recommendations (ITU-T Y.3033; ITU-Y.1540; ITU-T X.1303; ITU-T X.509; ITU-T X.500; ITU-T Q.731.3; ITU-T. Q.3960; ITU-T Q.81.1; ITU-T Q.951.3; ITU-T H.264; ITU-T I.251.3; ITU-T G.1000; ITU-T G.1030; ITU-T G.1031, ITU-T F.742; ITU-T J.247; ITU-T J.149; ITU-T. P.910; ITU-T. P.911; ITU-T. P.912; ITU-T. P.913; ITU-T P.915; draft Recommendation ITU-T Q.Int_speed_test; draft Recommendation ITU-T Y.IoTnetwork-reqts; ITU-R Recommendations); technical reports (Technology Watch Report on “Standards for technology-enabled learning”; Technology Watch Report on “Tactile Internet”); study group activities (ITU-T Study Groups 5, 11, 13 and 20); focus group activities (ITU-T Focus Group on Bridging the Gap: From Innovation to Standards; ITU-T Focus Group on Smart Sustainable Cities); ITU-T Kaleidoscope Proceedings; ITU Facts and Figures; etc.

An overview of Kaleidoscope papers and a mapping of papers and ITU activities (i.e. Study Groups, Focus Groups, etc.) will be prepared for the next meeting of the ITU Telecommunication Standardization Advisory Group (TSAG), and also for the ITU Radiocommunication Advisory Group (RAG) and the ITU Telecommunication Development Advisory Group (TDAG).

Representatives of **eight ITU academia members** submitted papers to the conference (four of which were included in the conference programme): Universitaria Agustiniana, (Colombia); Berlin University of Technology (Germany); University of the Basque Country (Spain); Chulalongkorn University (Thailand).

The authors of the award winning papers shared the prize fund of 6,000 CHF.

- **1st prize** (3,000 CHF): *Intricacies of implementing an ITU-T X.1303 cross-agency situational-awareness platform in Maldives, Myanmar, and the Philippines.* [[Presentation](#)]

Authors: Biplov Bhandari; Angga Bayu Marthafifsa; Manzul Kumar Hazarika (Asian Institute of Technology, Thailand); Francis Boon; [Nuwan Waidyanatha](#); Lutz Frommberger (Sahana Software Foundation, USA).

Abstract: Maldives, Myanmar, and the Philippines are vulnerable to natural disasters. Sendai Framework of Action calls for risk reduction by implementing early warning systems. A prevailing challenge is for authorities to coordinate warnings across disparate communication systems and autonomous organizations. Cross-Agency Situational-Awareness platforms and the ITU-T X.1303 Common Alerting Protocol (CAP) interoperable data standards presents themselves as solution for diluting the inter-agency rivalries and interconnection disparities. The Sahana Alerting and Messaging Broker (SAMBRO) was designed to overcome these issues by providing a Common Operating Picture and a platform for all Stakeholders to share early warnings. To that end, the CAP-on-a-MAP project is implementing SAMBRO and the CAP standard along with the policies and procedures in the Maldives, Myanmar and Philippines. The project is applying an agile development methodology with a design, build, test, and redesign strategy for implementing the cross-agency situational-awareness and warning system in the respective countries. This paper discusses the country context implementation challenges and discusses strategies fostered through

the introduction of the CAP content standard for warning system designers to consider for overcoming similar challenges.

- **2nd prize** (2,000 CHF): *Toward authenticated caller ID transmission: the need for a standardized authentication scheme in Q.731.3 calling line identification presentation.* [[Presentation](#)]

Authors: [Huahong Tu](#); Adam Doupé; Ziming Zhao; Gail-Joon Ahn (Arizona State University, USA).

Abstract: The rising prevalence of phone fraud is hurting consumers and businesses. With about a half million reports each year in the United States, phone fraud complaints have more than doubled since 2013. In the current calling line identification presentation scheme, the caller ID is trivially spoofed. Scammers are using spoofed caller IDs to trick their victims into answering unwanted calls and further a variety of scams. To provide a solution to this problem, this paper proposes an authentication scheme that provides the possibility of a security indicator for the current Q.731.3 calling line identification presentation supplementary service. The goal of this proposal is to help prevent users from falling victim to phone impersonation scams, as well as provide a foundation for future defences to stop unwanted calls based on the caller ID information. This work will help to guide the future development of a standardized scheme in authenticating SS7 identities.

- **3rd prize** (1,000 CHF): *Space division multiplexing technology: next generation optical communication strategy.* [[Presentation](#)]

Authors: [Kazuhide Nakajima](#); Takashi Matsui; Kotaro Saito; Taiji Sakamoto; Noriyuki Araki (NTT Corporation, Japan).

Abstract: Space division multiplexing (SDM) is expected to be a key technology both for dealing with the future capacity crunch facing traditional single-mode fibre (SMF) and for realizing a sustainable optical network that can accommodate the various data streams originating from, for example, future 5G communication, the Internet of things (IoT), and machine to machine (M2M) networks. This paper describes the potential of SDM as regards optical fibre and cable technology. We focus on the potential of multi-core fibre (MCF), and investigate the reality of MCF based SDM optical wiring as the first example of an SDM application taking the latest research and development into consideration. Finally, we show that MCF based SDM optical fibre cable will be a promising technology for next generation optical networks, and the key technology behind MCF based SDM optical wiring is ready for discussion as the near future standard.

Alongside the winners of cash prizes, **four** entrants received **Young Author Recognition Certificates:** Kotaro Suzuki (Iwate Prefectural University, Japan), Biplov Bhandari (Asian Institute of Technology, Thailand), Huahong Tu (Arizona State University, USA), and Eneko Atxutegi (University of the Basque Country-UPV/EHU, Spain).

For the fifth time at Kaleidoscope, a short “Fast-forward Poster Preview” session, chaired by Martin Adolph, in the conference plenary gave more prominence to poster presenters. Presenters had 2 minutes and not more than 2 PowerPoint slides each to pitch their research and to stir the participants’ interest in the following **poster session**. The poster session was held at the Kaleidoscope Exhibit, which was located within the ITU-T Standards for Global ICTs pavilion at the ITU Telecom World Exhibition space.

At the Kaleidoscope Exhibit, the [Local Universities Exhibit](#) was also organized to allow Universities from the Asia-Pacific region to present their research projects and literature on how ICTs and international standards can help achieve the United Nations Sustainable Development Goals (SDGs).

- Exhibitors: Chulalongkorn University (Thailand), Nanyang Technological University (Singapore), and Waseda University (Japan).
- Guest exhibitor: Universidad Distrital Francisco Jose de Caldas (Colombia).

The Kaleidoscope Steering Committee decided to give a **special mention** to Prof. Giovani Mancilla and his students Sebastian Martinez, Jonathan Cubides and Dora Ines Moreno (Universidad Distrital Francisco José de Caldas, Colombia) for their project *Reducing Digital Divide – applying ICT for better lives in poor communities - Methodology* (GIDENUTAS – Research and Development Group in New Technologies for Social Applications) that was presented at the Kaleidoscope Exhibit. The project aims at reducing the digital divide in Colombia, by uncovering the potentials and fostering the use of ICTs for social good in poor and marginalized communities.

All papers presented at the conference are included in the Conference Proceedings, which are freely available for download on the Kaleidoscope 2016 webpage. They will be also listed in the IEEE *Xplore* digital library.

Programme, presentations, abstracts and biographies are available [online](#).

Relevant recommendations and conclusions from the technical sessions, as drafted and presented by the Session Chairs, are available online in PDF format on the programme webpage, [Wrap up session](#).

The sixth edition of the [Jules Verne’s corner](#) (JVC) was entitled “**Artificial Intelligence (AI) for a sustainable future: friendly companion or threatening conqueror?**”.

With recent advances in AI, machines are gaining the ability to learn, improve and make calculated decisions in ways that will not only enable them to perform tasks previously thought to rely on human experience and ingenuity, as well as to solve problems involving a large amount of data and lots of variables too complex for humans to perceive.

Adding knowledge and reasoning to existing applications, AI technology is creating enormous opportunities for beneficial influences on society, such as improving human decision-making capabilities in regard to uncertainty and other complexities.

JVc was moderated by [Stephen Ibaraki](#) (Founding Chair Global Industry Council, Vice-chair IP3 Board, International Federation for Information Processing, Austria). After a brief introduction on the topic, he invited the panelists, [Malavika Jayaram](#) (Executive Director, Digital Asia Hub, Hong Kong, China), [Sauvik Banerjee](#) (Global CTA & Innovation Lead, Digital Business Services, Asia Pacific & Japan, SAP) and [Prabhas Chongstitvatana](#) (Professor, Department of Computer Engineering, Chulalongkorn University, Thailand) to imagine the potential of today's AI and articulate visions of its potential applications that could help address environmental, economic, and societal challenges concerning sustainable development and a sustainable future.

All participants received a CD which included an electronic version of the proceedings. The electronic versions of the proceedings is available [here](#).

3. Next Kaleidoscope

Information will be made available soon [here](#).