ITU Kaleidoscope 2013
Building Sustainable Communities

Wrap-up Session Summary
of the fifth Kaleidoscope conference
(panel with session chairs)

Wrap-up Session Chair: Mostafa Hashem Sherif, AT&T, USA;
Kaleidoscope 2013 Steering Committee member

Kyoto, Japan
22-24 April 2013

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Paper 1 – Sustaining life during the early stages of disaster relief with a Frugal Information System: Learning from the Great East Japan Earthquake. *[nominated for award]*
Mihoko Sakurai, Jiro Kokuryo (Keio University, Japan); Richard Watson (University of Georgia, USA); Chon Abraham (College of William and Mary, USA)

Paper 2 A Model for Creating and Sustaining Information Services Platform Communities: Lessons learnt from Open Source Software.
Sulayman K Sowe, Koji Zettsu, Yohei Murakami (National Institute of Information and Communications Technology, NICT, Japan)

Paper 3 Security technologies for the protection of critical infrastructures - ethical risks and solutions offered by standardization.
Simone Wurster (Technische Universität Berlin, Germany)

Session 1, Infrastructures and platforms to support communities
Session Chair: Muthoni Masinde, Central University of Technology, South Africa

Kyoto, Japan
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Paper 1

Sustaining life during the early stages of disaster relief with a Frugal Information System: Learning from the Great East Japan Earthquake.

- For systems meant to safe lives immediately after devastating disasters resilience is critical
- To achieve this, the paper proposes a "Frugal IS" (*minimal resources*) design
- Characteristics (versatility, familiarity & minimal resources) of mobile devices makes them ideal for implementing Frugal IS; they support Ubiquity, Universality, Uniqueness & Unison
- Illustrated using the March 11 '11 Japan tsunami

Paper 2

A Model for Creating and Sustaining Information Services Platform Communities: Lessons learnt from Open Source Software

- ❑ The paper proposes the use of FOSS to address the gap between the design or infrastructure requirements of Information Service Platforms (ISPs) and community involvements.

- ❑ Leverages on characteristics of FOSS communities to create sustainable ISP communities

- ❑ This is a research project in the Laboratories of NICT, Japan; driven by Cloud Platform Community Vision

Paper 3

Security technologies for the protection of critical infrastructures – ethical risks and solutions offered by standardization

❑ The paper discusses and analyses various security standards with the focus on reduction of ethical and privacy-specific risks

❑ Identifies the need for standards for 'Semi-Public' areas to address the challenges of ensuring security and privacy

❑ Used a survey in the German Security Research Program, to identify technology-specific standards (in Europe) for reducing ethical risks

Conclusions/Recommendations

- Mobile devices form potential infrastructure for building innovative solutions for sustainable communities for survivability
  - May not be adequate on their own; need support from other technologies
- The infrastructures must be accompanied by standards to ensure both security and privacy.
  - The standards must address specific technologies, cultures and contexts
- FOSS concepts, applied within cloud computing can create sustainable ISPs communities
  - To become a reality, more structured ways of managing their operations (releases, privacy etc) are needed

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Paper 1 – Invited paper Visible light communication using sustainable LED lights - **Shinichiro Haruyama** (Keio University, Japan)

Paper 2 Selecting the best communication service in future network architectures - **Rahamatullah Khondoker** (University of Kaiserslautern & Fraunhofer Institute of Secure Information Technology, Germany); Paul Mueller (University of Kaiserslautern, Germany); Kpatcha Bayarou (Fraunhofer Institute for Secure Information Technology, Germany)

Paper 3 Using the RFID Technology to Create a Low-Cost Communication Channel for Data Exchange - Ivan Farris, **Antonio Iera**, Silverio Carlo Spinella (University Mediterranea of Reggio Calabria, Italy)

Paper 4 Non-Directed Indoor Optical Wireless Network with a Grid of Direct Fiber Coupled Ceiling Transceivers for Wireless EPON Connectivity - **Dimitar Kolev**, Kazuhiko Wakamori (Waseda University, Japan); Takahiro Kubo, Takashi Yamada, Naoto Yoshimoto (NTT Corporation, Japan)

Session 2, Future communication services to sustain communities
Session Chair: Ved P. Kafle, NICT, Japan

**Kyoto, Japan
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Paper 1 – Invited Paper
Visible light communication using sustainable LED lights

- ❑ Discussed the use of visible light (white light) for personal area communications (since white light emitting diodes have become common; can transmit data at 1000Mbps upto 1km – it's becoming a promising technology).

- ❑ Location-based services are best VLC applications by using LED and line of sight commun., e.g. indoor navigation for visually-impaired people or shoppers in supermarkets, infrastructure health/condition monitoring, augmented reality

- ❑ Standardization candidates: VLC transmission technology, Modulation, etc.

Paper 2
Selecting the best communication service in future network architectures

❑ Discussed problems caused by random addition of (multi-layer dependent) new functions to the Internet architecture.

❑ Proposed service oriented network architecture (SONATE) for selection and composition of suitable services (protocols) on the fly (i.e. if policy or app requirements change the service compositions are also changed dynamically).

❑ Standardization candidates: Description language to describe communication services, Methodology for service selection, Pair-wise prioritization

Paper 3
Using the RFID technology to create a low cost communication channel for data exchange

❑ Discussed different applications of RFID, e.g. sensing/actuating, tracking objects, environment monitoring, energy management.

❑ Proposed to define a new data format and application format interface (AFI) for user bank (512bit memory) to accommodate new services e.g. readers exchange data with RFID using residual memory, store data in RFID and retrieve later, in addition to conventional tracking or locating services.

❑ Standardization candidates: Data format, AFI, Interoperability with ISO/IEC 15962

Paper 4
Non-directed indoor optical wireless network with a grid of direct fiber coupled ceiling transceivers for wireless EPON connectivity

- ❑ Studied performance of optical wireless communication between ceiling module (CM) and mobile ONU in EPON as an alternate technology of PON fiber links.

- ❑ Developed a theoretical model for SNR for providing reliable speed of up to 100Mbps, can cover 2-4m in diameter, while keeping SNR above a threshold.

- ❑ Lower power consumption than RF as no signal conversion occurs

- ❑ Compatible with EPON std, but need to develop new stds for wireless net, uplink wavelength

Conclusions/Recommendations (1/2)

- Observation: all four papers discussed innovative and interesting ideas –
  - Two papers discussed new technology utilizing light (visual and infrared) communications to replace RF or fiber links (thus lowering tx power, link-cost, setup hurdles)
  - Remaining one paper discussed a flexible framework for selecting suitable network service components on the fly, while the other discussed approaches to utilizing extra memory space in RFID for new services.

Conclusions/Recommendations (2/2)

❑ Recommendations

  ❑ Paper 1 can be discussed in ITU-T SG15 for standardizing VLC modulation or tx technology

  ❑ Paper 2 can be discussed in ITU-T SG13 for standardizing the network service components, their representation/description, API, etc. as Future Network architecture items.

  ❑ Paper 3 can be discussed in IoT and M2M communications related SG (e.g. SG11, SG13), IoT-GSI.

  ❑ Paper 4 can be discussed in ITU SG15 for standardizing tx technology of infrared light to/from fiber to space.

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Paper 1 Implementation Roadmap for Downscaling Drought Forecasts in Mbeere Using ITIKI *[nominated for award]* **Muthoni Masinde** (Central University of Technology, South Africa); Antoine Bigomokero Bagula (University of Cape Town, South Africa); Nzioka Muthama (University of Nairobi, Kenya)

Paper 2 A Sustainable Integrated-Services Community Learning Center - **Prasit Prapinmongkolkarn**, Supavadee Aramvith, Chaodit Aswakul, Anegpon Kuama, Sucharit Koontanakulvong (Chulalongkorn University, Thailand); Ekachai Phakdurong (THAICOM PLC, Thailand)

Session 3, Supporting remote communities
Session Chair: Eva Ibarrola, University of the Basque Country, Spain

Paper 1
Implementation Roadmap for Downscaling Drought Forecasts in Mbeere Using ITIKI

- ITIKI (*Information Technology and Indigenous Knowledge with Intelligence*) framework and prototype was presented.
  - A bridge that integrates indigenous drought forecasting approach into the scientific drought forecasting approach.

- Roadmap of ITIKI implementation project, started in August 2012, was described.
  - The "reconciliation" between data from IK and scientific forecasting has been found to be very effective.

  - ✓ *Contribution to standards*
  - ✓ *Time to "conciliate" IK & EDI*
  - ✓ *Continuity of IK between generations*

Paper 2
A Sustainable Integrated-Services Community Learning Center

❑ A model of sustainable integrated-services community learning center in Thailand was presented.

   ❑ Combines the community internet, telehealth/telemedicine, distance learning and facility and flood/natural disaster within the same unified management paradigm.

   ❑ Enhancement in the education of people by bridging the digital divide in the Universal Service Obligation (USO) schemes in Thailand.

      ✓ *How to keep this going? Who will make the investments?*

      ✓ *How to recruit people to operate the applications in the centers?*

Conclusions/Recommendations

- ❏ Both papers show the importance of taken into account the human knowledge, feelings, needs and aptitudes when developing sustainable systems.

- ❏ Both of them should make an effort for developing their systems based in standards so they can be also deployed in other countries/regions with similar problems.

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Paper 1 –System design and numerical analysis of adaptive resource discovery in wireless application networks *[nominated for award]* **Wei Liu**, Takayuki Nishio, Ryoichi Shinkuma (Kyoto University, Japan)

Paper 2 Design and Implementation of virtualized ICT resource management system for carrier network services toward Cloud computing era. *[nominated for award]* **Yoshihiro Nakajima**, Hitoshi Masutani, Wenyu Shen, Osamu Kamatani, Masaki Fukui (NTT Network Innovation Laboratories, Japan); Hiroyuki Tanaka, Katsuhiro Shimano (NTT, Japan); Ryutaro Kawamura (Cyber Solutions Laboratories, NTT corporation, Japan)

Paper 3 Harmonized Q-Learning For Radio Resource Management In LTE Based Networks - **Dhananjay Kumar** (Anna University, India); Kanagaraj Nachimuthu Nallasamy (Alcatel-Lucent India Limited, India); Sri Lakshmi (Anna University MIT Campus, India)

Session 4 – Resource discovery and management
Session Chair : Mitsuji Matsumoto, Waseda University, Japan

Paper 1

System Design and numerical analysis of adaptive resource discovery in wireless application networks

- ❑ This paper introduces an **energy efficient adaptive resource discovery method** to discover available resources in the surrounding nodes, in wireless application networks.

- ❑ Theoretical analysis and heuristic method (**centralized or flooding mode**) were discussed.

- ❑ **Questions were concentrated on selection mechanism in the surrounding nodes.**

- ❑ In order to optimize other metrics, **Response Time** or **Resource Information Availability evaluation are needed.**

Paper 2
Design and Implementation of virtualized ICT resource management system for carrier network services toward Cloud computing era

- **Virtualized ICT resource management system** with a virtualized ICT information model that expresses the relationship and mapping between physical and virtual resources was designed and implemented.

- A **demonstration** under **a disaster recovery scenario** confirmed the flexible operation, capability.

- **Questions were concentrated on** the necessity of many current aspects of devices, software, processing power, alert information in virtual networks emergency in the virtualized systems.

- Future work: implementation and Standardization.

Paper 3
Harmonized Q-Learning For Radio Resource Management In LTE Based Networks

- **Harmonized Q-Learning(HQL) algorithm** is proposed for LTE based Cognitive Radio Networks.
- Resource allocation problem is formulated for multi agent scenario.
- At the simulation for the observed throughput using HQL algorithm is significantly high.
- Future work is to implement HQL algorithm in LTE-A simulation environment and Time complexity analysis

Conclusions/Recommendations

❑ Three papers were presented related to Resource discovery and management.

❑ Most of the papers show the resource discovery and management possibility and capabilities considering the future network environment. Power consumption, new service inclusion, etc. were discussed.

❑ Especially second paper proposed standardization on virtualized ICT resource information model.

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Paper 1 – Invited paper Hybridcast: a new media experience by integration of broadcasting and broadband - **Hisayuki Ohmata**, Masaru Takechi, Shigeaki Mitsuya, Kazuhiro Otsuki, Akitsugu Baba, Kinji Matsumura, Keigo Majima, Shunji Sunasaki (NHK, Japan)

Paper 2 Standard-based Publish-Subscribe Service Enabler for Social Applications and Augmented Reality Services *[nominated for award]* Rodríguez Rocha (Politecnico di Torino, Italy); **Boris Moltchanov** (Telecom Italia, Italy)

Paper 3 QoXphere: A New QoS Framework for Future Networks *[nominated for award]* **Eva Ibarrola**, Eduardo Saiz, Luis Zabala, Leire Cristobo (University of the Basque Country, Spain); Jin Xiao (University of Waterloo, Canada)

Paper 4 Telebiometric Information Security and Safety Management *[nominated for award]* **Phillip H Griffin** (Booz Allen Hamilton, USA)

Session 5, Supporting future applications
Session Chair: Mostafa Hashem Sherif, AT&T, USA

Paper 1 – Invited Paper
Hybridcast: a new media experience by integration of broadcasting and broadband

- ❑ Hybridcast is a service platform from NHK that integrates traditional TV broadcasting with the Internet
- ❑ It can be seen as an evolution of IPTV architecture to include content manipulation, such as
  - ❑ Multilingual closed caption
  - ❑ Sign language animation
  - ❑ Social TV
  - ❑ Multiangle camera views
- ❑ Hybridcast is using the HTML5 application environment
- ❑ On-going standardisation of the architecture covers signalling formats, receiver's middleware and APIs
- ❑ Japanese standard will be different from the European Standard (HbbTV)

Paper 2

Standard-based Publish-Subscribe Service Enabler for Social Applications and Augmented Reality Services

- ❑ Publish/Subscribe Generic Enabler is a feature of the Context Management Platform (from Telecom Italia).

- ❑ The platform is based on open standards:
  - ❑ Open Mobile Alliance's (OMA) Next Generation Service Interface (NSGI)
  - ❑ ContextML: an XML-based language to represent contextual information
  - ❑ CQL (Contextual Query Language) for information retrieval systems
  - ❑ FI-WARE Generic Enablers for future internet applications

Paper 3

QoXphere: A New QoS Framework for Future Networks

- The definition of QoS should be expanded to take into account different aspects of future networks:
  - Intrinsic QoS
  - Perceived QoS
  - Assessed QoS
  - Business QoS
- QoXphere is a preliminary proposal for a framework that takes into account all these aspects

Paper 4

Telebiometric Information Security and Safety Management

- Securing biometric messages needs standard small, fast, efficient signature and encryption algorithms

- The cryptographic message syntax should be based on ISO/IEC Standards | ITU-T Recommendations

- A new *SigncryptedData* type must be based on ISO/IEC 29150 techniques

Conclusions/Recommendations

- Future networks and services call for standardising the soft aspects of telecommunications, such as
  - Representation of contextual information
  - Receiver middleware
  - Information retrieval
  - Overall service quality
  - Security
- There may be multiple local/regional standards depending on the context

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Paper 1 – Invited paper Open Standards: a Shrinking Public Space in the Future Network Economy? - **William Melody** (LIRNE.NET, Aalborg University Copenhagen, Denmark)

Paper 2 Innovation Management of Electrical Vehicle Charging Infrastructure Standards in the Sino-European Context. *[nominated for award]* **Martina Gerst**, Xudong Gao (Tsinghua University, P.R. China)

Session 6, Standardisation Issues
Session Chair: Kai Jakobs, RWTH Aachen University, Germany

Kyoto, Japan
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Paper 1 – Invited Paper
Open Standards: a Shrinking Public Space in the Future Network Economy?

- ❑ Co-ordination of SSOs from different sectors (and with different traditions) is called for.

- ❑ Communities need to get involved in standardisation.

- ❑ Increasingly generic IPR is (mis-)used to stake claims and to manipulate markets.

- ❑ Patent validity should be limited to 3 – 5 years in the ICT sector.

Paper 2
Innovation Management of Electrical Vehicle Charging Infrastructure Standards in the Sino-European Context

- ❑ International developments need international (open) standards.

- ❑ (National) solo attempts may in fact establish barriers to innovation.

- ❑ The prospect of quick marketability influences standardisation (and standards).

- ❑ All stakeholders should be involved to identify all relevant requirements.

- ❑ Don't forget the importance of certification (in some sectors).

Conclusions/Recommendations

Two papers from very different perspectives. Yet, both agree that

- ❑ "All stakeholders" should have a say in ICT standards setting – including 'non-standard' stakeholders (e.g. NGOs, end-users).

- ❑ Integration of (standards from) different sectors and of the underlying standardisation activities are necessary to solve future problems.

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Paper 1 An Analytical Evaluation of Energy Consumption in Cooperative Cognitive Radio Networks - **Mahdi Pirmoradian**, Olayinka Adigun, Christos Politis (Kingston University of London, United Kingdom)

Paper 2 Solar-Powered Cell Phone Access Point for Cell Phone Users in Emerging Regions - **Takuya Kato**, Yoshihiro Kawahara (The University of Tokyo, Japan)

Paper 3 Proposal of a Sub-Lambda Switching Network and its Time-Slot Assignment Algorithm for Network with Asynchronous Time-Slot Phase - **Keisuke Okamoto** (Kyoto University, Japan); Atsushi Hiramatsu (NTT, Japan)

Session 7, Energy Issues
Session Chair: Yoshikazu Ikeda, Otani University, Japan

Paper 1

An Analytical Evaluation of Energy Consumption in Cooperative Cognitive Radio Networks

- ❑ Energy consumption of each cognition phase at the secondary user is mathematically analyzed and obtained.

- ❑ The numerical results show the various interactions between the secondary network size, availability of appropriate spectrum holes.

- ❑ The total energy consumption for different states of the cognitive radio network is under discussion.

Paper 2
Solar-Powered Cell Phone Access Point for Cell Phone Users in Emerging Regions

- Simulation results on the surplus power distribution generated for an access point to cell phone users in emerging regions
  - Proposed an energy-proportional server cluster to ensure computational resources for information services, e.g. for charging
  - Prototype system with low-power and off-the-shelf devices cuts energy consumption in the frequently observed idle state by 50% compared with an existing server cluster

Paper 3
Proposal of a Sub-λ Switching Network and Time-Slot Assignment Algorithm

❑ Sub-λ switching network with fine granularity and low cost/power consumption is proposed

❑ Novel time-slot assignment algorithm using multi-time-slot bonding technique and delay-shift packing technique with global-time-based delay

❑ Utilization of link capacity be improved by 45% compared with the conventional method.

Conclusions/Recommendations

❑ Variety of ideas are presented and discussed for Building Sustainable Communities, e.g. power savings and charging, efficient sub-Lambda photonic switching scheme.

  ❑ Cognitive Radio Network should have useful capabilities and sustainability. Further study is needed for its sustainable performances.

  ❑ In emerging rural area, cheap cell phone charging scheme and low power servers are important in order to identify further common solutions.