Smart Energy involving Smart Generation, Grid, Storage, and Consumptions is the Key for Sustainability

By Saraju P. Mohanty

We can observe that the word "smart" being used in multiple contexts, granularity, and entities from devices, systems, to bigger physical entities. For example, smart phone, smart car, smart healthcare, smart city, are being used in various contexts. So, question arise: What is "smart"? Does smart mean compact? Does smart mean efficient? Does smart mean fast? Does smart mean intelligent? What is it? Probably the adjective "smart" being used in various contexts for various reasons? In 2018 summer I served on a panel titled "What Makes Smart Cities Smart?", at the 3rd Zooming Innovation in Consumer Electronics International Conference (ZINC) held at Novi Sad, Serbia. As far as I remember I defined it as the ability to gather information from the data and signals, and act based on the that information. I have been thinking since then on this topic. I am going to deliver a keynote in December 2018 at the 4th IEEE International Symposium on Smart Electronic Systems to be held at Hyderabad, India. I envision based on the ongoing trends of electronics that the smart electronic systems (aka smart electronics or smart consume electronics) can be Energy-Smart, Security-Smart, and Response-Smart. Energy-Smart ensures that energy consumption of electronics is optimal for longer battery life and smaller energy bills. Security-Smart ensures the security, privacy, or protection of electronic systems as well as that of the data or media that these systems capture, process, or store. Response-Smart can be defined to accurate sensing, intelligent processing to retrieve knowledge or information from the data, and accurate actuation or response based on the information. There is a need for new hardware, firmware, middleware, and software research that interacts with each other for efficient realization of smart electronic systems or smart consumer electronics. This 2nd issue (March issue) of 2019 has been dedicated to a Smart Energy. We may recall that we defined Smart Cities in July 2016 issue of our CE magazine as follows: *Smart City is a city connecting the physical infrastructure, the information-technology infrastructure (ICT), the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city to enhance Livability, Workability, and Sustainability*. Smart City is a very large abstraction made up of Smart Components using Smart Technologies. Smart Components are Cyberphysical Systems (CPS) which are physical systems made smart by using Internet-of-Things (IoT) and bigdata analytics through Artificial Intelligence (AI). At a higher level of granularity Smart Energy, Smart Healthcare, Smart Transportation, and Smart Infrastructure, are considered as various components of Smart Cities.

The current issue of CE magazine is dedicated to Smart Energy (aka Internet of Energy). What is Smart Energy then? We can define it as follows: it is quality, sustainable, uninterrupted energy with minimal carbon footprint. However, it has different components as the next detailed level of granularity including: Smart Generation, Smart Grid, Smart Storage, and Smart Consumptions. Smart generation may involve generation from different sources conventional (fossil) to renewable (solar and air) and even mixed-energy forms (smartly generating from multiple different sources as per the energy demand). Smart grid is transmission and distributions of energy is efficient and resilient fashion from generation to destinations (i.e. to the consumers). Smart storage may involve storing of energy in various forms conventional battery, smart battery, and other possible forms. Smart consumption is also important for smart energy. It may be noted that it is consumption i.e. demand of consumers for energy which triggers generation. So consumption of energy in a smart way at home, individual consumer electronics like smart phones, home appliances, and industrial infrastructures can be effective. The IoT play an important role in smart energy which include the following: (1) management of energy usage, (2) power generation dispatch for solar, wind, etc., (3) better fault-tolerance of the grid, (4) better load forecasting, (5) services for plug-in electric vehicles (PEV), and (6) enhancing consumer relationships.

NEWS – GENERAL

Brain Data Bank Competition in Xian, China - 2018: This discusses the activities of the IEEE CE society brain initiative activities at the 9th bi-annual Conference on Brain-Inspired Computing Systems (BICS) held on 7-8 July, 2018.

Young Professionals Events at ICCE - Berlin 2018: This presents Young Professionals activities which took place during ICCE Berlin 2018 (GCCE) which is annually held in Berlin.

NEWS – CONFERENCES

IEEE International Conference on Consumer Electronics - Taiwan 2018: This presents a technical overview of ICCE Taiwan 2018 which was held during 19-21 May 2018 at Taichung, Taiwan.

IEEE International Conference on Video and Audio Signal Processing in the Context of Neurotechnology 2018: This presents a technical overview of the 3rd Conference on Video and Audio Signal Processing in the Context of Neurotechnology (SPCN) which was during May 29 - June 1, 2018, at St. Petersburg, Russia.

ARTICLES – GENERAL

A Review of Security Analysis for Electronic Power Systems: This cover theme article presents a comprehensive survey of the major aspects of security evaluation of a power system realized as a cyber-physical, in other words a smart grid.

These cyber-physical components of the grid increase the security risk and initiate new vulnerabilities in the power system. This paper presents a comprehensive survey of the major aspects of security evaluation of a power system

SoC-Based Self-Equalization for Imbalance Battery Pack in Energy Storage Management System: This cover theme article presents a converter equalizer circuit and a self-equalization algorithm for balancing of cells in a battery pack for more efficient battery pack in an energy storage management system.

Smart Load Node for Non-Smart Load under Smart Grid Paradigm: This cover theme article introduces an approach for efficient operation of non–smart consumer appliances when drawing energy from a smart grid.

Designing a Blockchain-based IoT infrastructure with Ethereum, Swarm and LoRa: This article presents a IoT infrastructure with blockchain based data storage and manage in a distributed denial of services (DDOS) resistant system.

Antecedents Affecting Consumer Trust towards Adopting Internet of Things enabled Products: This article a model for consumer trust to capture influencing parameters to provide a guide to consumer to adopt IoT based electronic products.

Web Services in the IoT and Smart Cities: A study on Web Service classification: This article presents a trip planning based case study for understanding the role of web services in smart cities.

An Enhanced Cubic mapping Scheme for Video/Image-Based Virtual-Reality Scenes: This article presents a gradually-varied sampling method to generate panoramic video for uniform pixel generation.

Media streaming on resource-constrained devices without third-party servers - A case study on a smartphone and Chromecast using P2PSP: This article presents a low-cost Peer-to-Peer (P2P) technology suitable for broadcasting real-time events among low-end devices without using third-party media servers.

Mobile Banking - Malware Threats and Security Solutions: This article presents trend of mobile banking from various security threats and corresponding security solutions.

ECOSECURITY - An Edge Computing enabled Secure and Efficient Data Exchange Architecture for Energy Internet: In this article a secure and efficient data exchange has been proposed for edge computing.

Multi-Bands Orthogonal Wavelet Division Multiplexing: Complexity and Power Peaks Enhancement: This article investigates the effects of power efficiency and frame error rates on the peak-to-average power ratio in multiband orthogonal frequency division multiplexing wireless communications.

REGULAR COLUMNS

Bits Vs. Electrons - Seeing the Light - Properties of 400-800 Terahertz Radios: This article presents the prospects of using light as a communication medium and using the ideas for radio waves.

Storage - IEEE IRDS Guides Industry on Technologies that will Drive Consumer Storage: This article presents the activities of the IEEE International Roadmap for Devices and Systems (IRDS) for storage industry trends.

Hardware Matters - Multi-Level Watermark for Protecting DSP Kernel used in CE Systems: This article presents a hybrid architectural and register-transfer level watermarking of digital signal processing cores.

Energy & Security Matters - Towards the Vision of All Electric Vehicles in a Decade: This cover theme article discusses various aspects of charging of the Battery Electric Vehicle (BEV) including charging technology and battery technology.

CTA Insights - Consumer Technology Market Past and Present: This article presents an overview of the trend of the consumer technology.

SOCIOECONOMIC IMPACT

Consumer Electronic Instrument Search and Seizure at the Border: This article presents perspectives of search and seizure of consumer electronic instrument at the various International borders.

SPECIAL SECTION

This special section titled “Special Section: Intelligent Systems for Healthcare” presents selected articles which present various advances in research related to smart healthcare. I would like to thanks the Guest Editor for all the hard work for this special section which will be a good reading for CE magazine readers.

LOOKING FORWARD

I hope this issue dedicated to Smart Energy helps a wider set of CE community to advance their knowledge. I also hope more and more themes will be covered in future in this CE magazine on the latest hot topics with the help of editorial board and authors around the globe.