# ELECTRICAL AUTOMATION SYSTEMS TOWARDS INTELLIGENT AND ENERGY EFFICIENCY APPLICATIONS

Musse Mohamud Ahmed

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# APPLICATIONS

**Musse Mohamud Ahmed**

Electrical and Computer Engineering Department,
The Faculty of Engineering, IIUM

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Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

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# CHAPTER 18

# ZIGBEE APPLICATIONS TO WIRELESS COMMUNICATION SYSTEMS

Hikma Shabani, Musse Mohamud Ahmed, Sheroz Khan and Rashid A. Saeed

*Department of Electrical and Computer Engineering, Faculty of Engineering*
*International Islamic University Malaysia*

## 18.1 Introduction

ZigBee is the global wireless language connecting different devices to work together and enhance everyday life. The ZigBee Alliance (www.ZigBee.org) is a global ecosystem of companies creating wireless solutions for use in energy management and efficiency, home, commercial and industrial applications. It is the only global wireless communications standard enabling the development of easily deployable, low-cost, low power monitoring, and control products [1]

ZigBee's origins date only from 1998 when Motorola started work on this type of low power mesh networking. The IEEE 802.15.4 standard was based on Motorola's mid-2001 proposal and was ratified in May 2003. Phillips, Motorola, Invensys, Honeywell, and Mitsubishi joined together and formed the ZigBee Alliance in mid-U302 to develop and promote this technology and leverage the standard. Ember, Freescale and Samsung joined as promoters later. They worked together on defining the network, security and application layers of the ZigBee specification, which was ratified in December 2004. There are now well over 100 affiliate members of the ZigBee Alliance representing semiconductor manufacturers, technology development companies, OEMs, end user companies and systems integrators [2]

IEEE Std 802.15.4 defines the physical layer (PHY) and medium access control (MAC) sublayer Specifications for low-data-rate wireless connectivity with fixed, portable, and moving devices with no battery or very limited battery consumption requirements typically operating in the personal operating space (POS) of 10 m. It is foreseen that, depending on the application, a longer range at a lower data rate may be an acceptable tradeoff. Two different device types can participate in an IEEE 802.15.4 network; a full-function device (FFD) and a reduced-function device (RFD). The FFD can operate in three modes serving as a personal area network (PAN) coordinator, a coordinator, or a device. An FFD can talk to RFDs or other FFDs, while an RFD can talk only to an FFD. An RFD is intended for applications that are extremely simple, such as a light switch or a passive infrared sensor; they do not have the need to send large amounts of data and may only associate with a single FFD at a time. Consequently, the RFD can be implemented using minimal resources and memory capacity.

ZigBee is composed of three kinds of devices: ZigBee coordinator, ZigBee router, and ZigBee end device. ZigBee coordinator is responsible for initializing, maintaining, and