QoS AND MOBILE TECHNOLOGIES

EDITORS:

AISHA-HASSAN ABDALLA HASHIM

OMER MAHMOUD

RASHEED SAEED

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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

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CHAPTER 23

SMART GRID COMMUNICATION

HIKMA SHABANI, MUSSE MOHAMUD AHMED, RASHID A. SAEED

Electrical and Computer Engineering Department Kulliyah of Engineering, IIUM

23.1 INTRODUCTION

The rapidly growing populations over the past decades have generated increasing demands for abundant, sustainable, and clear electric energy on a global basis. The increasing electricity demand, together with the complex and nonlinear nature of the electric power distribution network, has caused serious network congestion issues which have become the main causes of several major blackouts that happened in recent years. In addition to the overstressed situations, the existing power grid also suffers from the lack of pervasive and effective communications, monitoring, fault diagnostics, and automation, which further increase the possibility of region-wide system breakdown due to the cascading effect initiated by a single fault[1].

Therefore, to tackle these challenges, a new concept of next generation electric power system *"a Smart grid"*, which refers to a modernization of the electricity delivery system, has emerged. In smart grid, the electricity delivery system monitors, protects and automatically optimizes the operation of its interconnected elements from the central or power plant to customers (residential and industrial user automation systems) through the high-voltage/medium-voltage transmission networks and the low-voltage distribution system.

In smart grid, reliable and online information become the key factor for reliable delivery of power from generation units to end users. The impact of equipment failures, capacity limitations, and natural accidents and catastrophes which cause power disturbances and outages, can be largely avoided by online power system condition monitoring, diagnostics, and protection. Hence, several wired and wireless communication technologies are available for smart grid. However, the advanced wireless systems offer the benefits of inexpensive products, rapid deployement, low cost installations, widespread access which wired technologies cannot provide [2]. In Fig 23.1, the conventional electrical network and ICT network is illustrated and the potential bridge for the two network is shown to be represented by smart grid.

Therefore, the collaborative and low-cost nature of wireless sensor networks (WSNs) bring significant advantages over traditional communication technologies used in today's electric power systems. Hence, WSNs provide a feasible and cost-effective sensing and communication solution for remote system monitoring and diagnosis systems. Efficient monitoring systems constructed by large-scale deployment of smart sensor nodes can provide complete information on the conditions of system components,