ARC '18

مؤتمر مؤسسة قطر
السنوي للبحوث

QATAR FOUNDATION
ANNUAL RESEARCH CONFERENCE

البحث والتطوير: التركيز على
الأولويات، وإحداث الأثر

R&D: FOCUSING ON PRIORITIES,
DELIVERING IMPACT

20-19 مـــارس
19-20 MARCH

مؤسسة قطر
Qatar Foundation
لإطلاق قدرات الإنسان.
Unlocking human potential.

Computing & Information Technology - Poster Display

http://doi.org/10.5339/qfarc.2018.ICTPD766

Coexistence of IEEE 802154g and WLAN

Saad Mohamed Shalbia*, Ridha Hamila, Naofal Al-Dhahir

Qatar University
* saad.shalbia@qu.edu.qa

The aging electric grid was established hundred years ago when electricity needs were simple. The power plants were centralized and most homes had only small energy demands such as few lamps and radios. The grid role was to carry electricity from utilities to consumers' homes. This limited one way interaction makes it difficult for the grid to respond to the sudden changes and higher demands of energy of the 21st century. The smart grid (SG) is a two-way network that allows to exchange electricity and information through the same network between the utility and its customers by installing real time sensors that collect data about ever-changing power consumption. It is an integrated network of communications, automated control, computers, and tools operating together to make the grid more efficient, reliable, secure and greener. SG integrates more technologies such as wind, solar energy and plug-in electric vehicles (PEV). SG will replace the aging electric grid; homes and utilities can better communicate with each other to manage electricity usage by measuring the consumer's consumption instantaneously through a smart meter utilities. As we mentioned before, SG infrastructure enables efficient integration of PEV which may play an important role in balancing SG during critical peak or emergency time by injecting more power to the grid. Two way dialogue facilities service where plug-in hybrids (PHEV) communicate with the grid to obtain information about grid demands whether it will supply the grid with power or charge batteries from the grid. This needs a modern wireless communication network. IEEE 802.15.4g was introduced as a standard for smart utility network (SUN) to enable communication between different parts of SG. IEEE 802.15.4g works in different frequency bands, our work concentrates on 2.4 GHz ISM (Industrial, Scientific and Medical), which is unlicensed band and overcrowded with many devices from other standards, e.g. ZigBee, Bluetooth and wireless local area network (WLAN). The SUN desired signal may overlap with

دار جامعة حمد بن خليفة للنشر
HAMAD BIN KHALIFA UNIVERSITY PRESS

Cite this article as: Shalbia S et al. (2018). Coexistence of IEEE 802154g and WLAN. Qatar Foundation Annual Research Conference Proceedings 2018: ICTPD766 http://doi.org/10.5339/qfarc.2018.ICTPD766.

other interfering signal working in the same band, and thus will hinder the receiver's ability to extract the proper signal; this called coexistence problem. Thus, in this contribution the coexistence mechanism is investigated thoroughly in order to improve the performance. SUN has been studied and investigated considering signal attenuation due to path loss in the presence of additive interference and white Gaussian noise at the receiver. The effect of packet length on packet error rate (PER) is researched to find the optimum packet length that achieves the maximum effective throughput for the network in coexistence with the WLAN interfering packets. Though, employing longer packet length results in higher effective throughput, leading to higher PER as many interferers collide with the desired packet. Conversely, using shorter packet length provides lower PER with higher overhead due to packet header and preample, reducing the throughput. Simulation showed that, as signal to interference noise ratio (SINR) increases, longer packet length can be used, to achieve maximum throughput. Moreover, multipath Rayleigh fading channel has also been introduced along minimum mean square error (MMSE) equalization as an interference mitigation technique. Simulation showed that MMSE achieves good performance and improves PER in coexistence of WLAN interfering system.