بسم الله الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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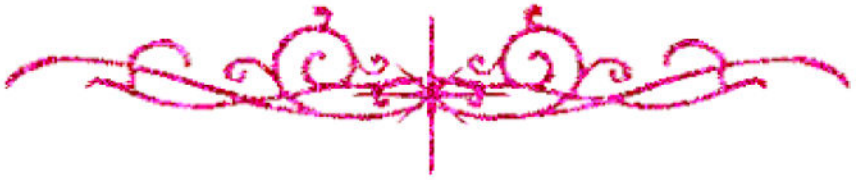

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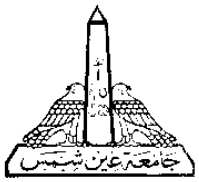


AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electronics Engineering and Electrical Communications

An LTE-based Smart Grid System for Renewable Energy Utilization Management

A Thesis submitted in partial fulfilment of the requirements of the degree of

Master of Science in Electrical Engineering

(Electronics Engineering and Electrical Communications)

by

Mariam EL-Hussien Ibrahim Mahmoud

Bachelor of Science in Electrical Engineering

(Electronics Engineering and Electrical Communications)

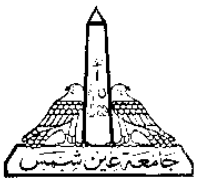
Faculty of Engineering, Misr International University, 2012

Supervised By

Prof. Hani Fikry Ragai

Assoc. Prof. Yasser Samy Gadallah

Cairo - (2019)



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Date:24 March 2019

Statement

This thesis is submitted as a partial fulfilment of Master of Science in Electrical Engineering Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Thesis Summary

Renewable energy generation facilities are usually located in areas far away from regular urban infrastructure e.g. in deserts. The management and control of such facilities within the smart grid are controlled by an intermediate supervisory controller that decides the time of using certain sources to balance demand and generation of the electricity. For this to occur, a communication system needs to be used to ensure the robust exchange of the necessary control and management messages among the constituent elements.

In this thesis, a Long Term Evolution (LTE)-based priority- and delay-oriented multicast scheduling technique has been proposed that is designed specifically for smart grid management purposes and needs. Evolved Multimedia Broadcast Multicast service (eMBMS) is used to ensure that the renewable energy sources are coordinated in performing the same action within a certain time constraint to avoid shortages in the system. The proposed technique has been evaluated and compared with other general purpose multicast scheduling techniques. The schedulers are evaluated using the deadline missing percentage and throughput as the performance metrics.

Simulation results showed that the proposed scheduler offers an enhanced performance over other techniques in scheduling smart grid traffic while maintaining good performance for other real-time traffic within the network. In addition, the proposed technique improves the deadline missing percentage by 50% over the general-purpose multicast techniques as far as smart grid traffic is concerned. Moreover, it performs approximately 18% better than the general purpose techniques with other real-time network traffic. Hence, the regular network traffic is not affected negatively by the way the new technique handles the smart grid traffic.

Keywords:

Smart Grid, Scheduling, LTE, eMBMS, RES

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