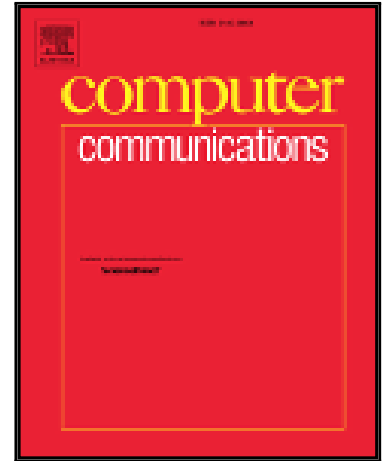


## Accepted Manuscript

A Generalized Quorum System for Asynchronous Sleep Scheduling  
in Multi-Hop Wireless Networks

Amir Hossein Saligheh , Vesal Hakami , Mehdi Dehghan

PII: S0140-3664(17)30661-8  
DOI: [10.1016/j.comcom.2017.06.002](https://doi.org/10.1016/j.comcom.2017.06.002)  
Reference: COMCOM 5516



To appear in: *Computer Communications*

Received date: 24 April 2016  
Revised date: 11 February 2017  
Accepted date: 7 June 2017

Please cite this article as: Amir Hossein Saligheh , Vesal Hakami , Mehdi Dehghan , A Generalized Quorum System for Asynchronous Sleep Scheduling in Multi-Hop Wireless Networks, *Computer Communications* (2017), doi: [10.1016/j.comcom.2017.06.002](https://doi.org/10.1016/j.comcom.2017.06.002)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# A Generalized Quorum System for Asynchronous Sleep Scheduling in Multi-Hop Wireless Networks

Amir Hossein Saligheh

Department of Computer Engineering and Information Technology,  
Amirkabir University of Technology, Tehran, Iran  
amirhosseinsaligheh@aut.ac.ir

Vesal Hakami

Department of Computer Engineering,  
Iran University of Science and Technology, Tehran, Iran  
vhakami@iust.ac.ir

Mehdi Dehghan\*

Department of Computer Engineering and Information Technology,  
Amirkabir University of Technology, Tehran, Iran  
dehghan@aut.ac.ir

## Abstract

It has been shown that quorum systems with rotation closure property can be utilized to enable asynchronous power saving in wireless ad-hoc networks. Moreover, the quorum system characteristics (e.g., cycle length, activity ratio, overlap size) can be exploited to provide for a variety of sleep-scheduling paradigms which differ in terms of their adaptability and symmetry properties. To enable these paradigms, generally requires that the quorum schedules available to the nodes be heterogeneous so that they may pick their schedules in accordance with their roles or instantaneous conditions. Motivated by this heterogeneity requirement, in this paper, we generalize the basic notion of a quorum system into what we refer to as a Multi-Class Quorum System (MCQS). MCQS consists of a set of quorum classes, each of which is basically a quorum system with a guaranteed intra-class overlap size. Also, every two quorum classes have a guaranteed inter-class overlap size. We extend the classical rotation closure property of the quorum systems to guarantee any desirable number of intra- and inter-class overlaps between asynchronous nodes. We show that MCQS gives rise to a unified framework for quorum-based scheduling which can be easily tailored to enable all types of sleep-scheduling paradigms. We propose a binary integer programming (BIP) model to compute instances of MCQS which are optimal in terms of activity ratio. Also, unlike comparable quorum systems in the literature, MCQS is relieved of many restrictions on cycle length and overlap size. As a proof of concept, we study the application of MCQS in the joint problem of Quorum-based Sleep-scheduling and Routing (QSR) in wireless sensor networks (WSNs). We propose a centralized energy-optimal formulation as well as a decentralized algorithm for the QSR problem, and compare their performance through simulations.

Keywords: Asynchronous Sleep Scheduling; Multi-Hop Networks; Quorum; Systems; Wireless Ad-Hoc Networks; Wireless Sensor Networks

## 1. Introduction

---

\* Corresponding author: Mehdi Dehghan, Professor, e-mail address: dehghan@aut.ac.ir, URL: <http://ceit.aut.ac.ir/~dehghan>.  
Postal address: Department of Computer Engineering and Information Technology, Amirkabir University of Technology, PO Box 15875-4413, 424 Hafez Avenue, Tehran, Iran. Tel: +98-2164542749, Fax: +98-2166495521.

Download English Version:

<https://daneshyari.com/en/article/4954308>

Download Persian Version:

<https://daneshyari.com/article/4954308>

[Daneshyari.com](https://daneshyari.com)