Hindawi Publishing Corporation
Journal of Electrical and Computer Engineering
Volume 2013, Article ID 328395, 2 pages
http://dx.doi.org/10.1155/2013/328395

Editorial

Resource Allocation in Communications and Computing

Yi Su,[1] Fangwen Fu,[2] and Shuo Guo[3]

[1] *Qualcomm Incorporated, Santa Clara, CA 95051, USA*
[2] *Intel Incorporated, Folsom, CA 95630, USA*
[3] *University of Minnesota at Twin Cities, Minneapolis, MN 55455-0213, USA*

Correspondence should be addressed to Yi Su; yis@qualcomm.com

Received 29 August 2012; Accepted 29 August 2012

Communication networks and computing systems have demonstrated their importance in the past few decades as a fundamental driver of economic growth. Over the years, they have not only expanded in their sizes, such as geographical area and number of terminals, but also in the variety of services, users, and deployment environments. The purpose of resource allocation in such environments is to intelligently assign the limited available resources among terminals/clients in an efficient way to satisfy end users' service requirements.

With the dramatic developments and fast evolution of communication networks and computing systems, resource allocation continues to be the fundamental challenge, because better quality of service is required with the increasing demand for bandwidth-hungry and/or computation-intensive services. In particular, it has to cope with various new emerging system architectures, such as cognitive networks, mesh networks, multihop networks, peer-to-peer networks, multistandard networks, cloud computing systems, and data centers, distributed intelligence in a multitude of devices operating autonomously enables shifting traditional centralized allocation mechanisms into fully distributed solutions. In recent years, many tools including optimization theory, control theory, game theory, and auction theory have been employed to model and solve a variety of practical resource allocation problems. Therefore, resource allocation in communication networks and computing systems is a pressing research topic that has huge applications. It is imperative to develop advanced resource allocation techniques for ensuring the optimal performance of these systems and networks.

The goal of this special issue is to bring together the most updated research contributions in this area. Indeed, we see a wide range of new analytical techniques and novel application scenarios emerging as evidenced in the papers presented here. The nine accepted papers are relevant to resource allocations optimizations in orthogonal frequency division multiplexing (OFDM-) based communication systems, cognitive radio, satellite communications, grid computing, and network virtualization.

J. Y. Baudais et al. in "*Robustness maximization of parallel multichannel systems,*" study bit-loading solutions of both robustness optimization problems over independent parallel channels. Their investigation is based on analytical approach, using generalized Lagrangian relaxation tool, and on greedy-type algorithm approach. The asymptotic convergence of both robustness optimizations is proved for both analytical and algorithmic approaches. They also link the SNR-gap maximization problem to the conventional power minimization problem and prove that the duality does not hold in all cases. In nonasymptotic regime, they show that the resource allocation policies can be interchanged depending on the robustness measure and the operating point of the communication system. They propose a low-complexity resource allocation algorithm based on the analytical approach, which leads to a good tradeoff between performance and complexity.

C. Guéguen and S. Baey, in "*Comparison study of resource allocation strategies for OFDM multimedia networks,*" present and compare the main OFDM scheduling techniques used for multimedia services in multiuser OFDM wireless networks. They study the influence of bandwidth granularity on the resource allocation strategies performances. They show that

bandwidth granularity is of major importance for determining the application range of advanced OFDM scheduling techniques.

M. H. Ahmed et al. in "*Analytical evaluation of the performance of proportional fair scheduling in OFDMA-based wireless systems,*" evaluate the performance of proportional fair (PF) scheduling in orthogonal frequency division multiple access (OFDMA) wireless systems. They investigate a two-dimensional (time slot and frequency subcarrier) PF scheduling algorithm for OFDMA systems and evaluate its performance analytically and by simulations. They derive approximate closed-form expressions for the average throughput, throughput fairness index, and packet delay. Computer simulations show good accuracy of the analytical expressions.

A. Maiga et al. in "*Bitrate optimization with MMSE detector for multicast LP-OFDM system,*" propose a new resource allocation algorithm with minimum mean square error (MMSE) detector for multicast linear precoded (LP) OFDM systems. They propose to jointly use the LP-OFDM modulation technique and an adaptation of the OFDM-based multicast approaches to exploit the transmission link diversities of users and improve both the bit rate and the fairness among multicast users.

S. Romaszko and P. Mahonen, in "*A rendezvous protocol with the heterogeneous spectrum availability analysis for cognitive radio ad hoc networks,*" look into a new challenge problem of rendezvous (RDV) protocol in cognitive radio ad hoc networks (CRANs). In such a frequently changing environment, licensed holders channel occupancy, and heterogeneous spectrum availability result in a need of on-demand searching for a control traffic channel by CR users in order to be able to initiate a communication and methods guaranteeing that all nodes meet periodically in reasonable periods of time should be advocated. They evaluate a torus quorum system (QS) and difference set (DS) based rendezvous protocol (MtQS-DSrdv) and show that the nodes meet multiple times on different channels in a period, which increases the chance of successful establishment of a real communication.

A. Alsarhan and A. Agarwal, in "*Optimizing spectrum trading in cognitive mesh network using machine learning,*" propose a reinforcement learning (RL) model in a cognitive wireless mesh network for licensed users (primary users, PUs) to maximize the revenue of renting surplus spectrum to unlicensed users (secondary users, SUs). They use RL extract the optimal control policy that maximizes the PUs' profit continuously over time. The extracted policy is used by PUs to manage renting the spectrum to SUs, and it helps PUs to adapt to the changing network conditions. They also propose a new distributed algorithm to manage spectrum sharing among PUs to maximize the total revenue and utilize spectrum efficiently.

S. Wayer and I. Reichman, in "*Resource management in satellite communication systems-heuristic schemes and algorithms,*" study the challenging resource allocation problem in satellite communication due to the high cost of frequency bandwidth. They define a satisfaction measure to estimate the allocation processes and carry out resource management according to the requests of subscribers, their priority levels, and assured bandwidths.

M. Abouelela and M. El-Darieby, in "*Multi-domain hierarchical resource allocation for grid applications,*" propose a hierarchical-based architecture as well as multidomain hierarchical resource allocation approach for geographically distributed applications in grid computing environments. They perform the resource allocation in a distributed way among different domains such that each participant domain keeps its internal topology and private data hidden while sharing abstracted information with other domains. The proposed algorithm jointly schedules computing and networking resources while optimizing the application completion time taking into account data transfer delays.

A. Razzaq et al. in "*Virtual network embedding: a hybrid vertex mapping solution for dynamic resource allocation,*" investigate the problem of virtual network embedding (VNE) in the context of network virtualization. They analyze two existing vertex mapping approaches and propose a new vertex mapping approach which minimizes complete exhaustion of substrate nodes while still providing good overall resource utilization. They also investigate under which circumstances the proposed vertex mapping approach can provide superior VN embedding properties.

Before closing this editorial, we would like to thank those who contributed significantly behind the scene towards the success of this special issue. We hope that you will enjoy reading this Special Issue devoted to the exciting fast-evolving field of resource allocation in communications and computing as much as we have done.

Yi Su
Fangwen Fu
Shuo Guo