بسم الله الرحمن الرحيم

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شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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In the name of Allah, the Entirely Merciful, the Especially Merciful.

"My Lord, enable me to be grateful for Your favor which You have bestowed upon me and upon my parents and to do righteousness of which You approve. And admit me by Your mercy into [the ranks of] Your righteous servants."

The Holy Quran,

Sura: An-Naml, Aya (19).

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List of Abbrevations

1G	The First Generation of Cellular Systems
2G	The Second Generation of Cellular Systems
3G	The Third Generation of Cellular Systems
3GPP	Third Generation Partnership Project
4G	The Fourth Generation of Cellular Systems
5G	The Fifth Generation of Cellular Systems
AMPS	Advanced Mobile Phone System
CDMA	Code Division Multiple Access
EDGE	Enhanced Data-rate for GSM Evolution
ETSI	European Telecommunications Standards Institute
FDD	Frequency Division Duplex
GPRS	General Packet Radio Service
LTE	Long Term Evolution
LTE-A	Long Term Evolution Advanced
MATLAB	Matrix Laboratory
MIMO	Multiple Input Multiple Output
OFDMA	Orthogonal Frequency Division Multiple Access
PC	Personal Computer
QoE	Quality of Experience
QoS	Quality of Service
RB	Resource Block
RF	Radio Frequency
RRH	Remote Radio Head
TDMA	Time Division Multiple Access
TTI	Transmission Time Interval
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
WCDMA	Wideband Code Division Multiple Access

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Abstract

With the emerging of fifth generation (5G) wireless networks, industry and academia have been working on introducing powerful processing algorithms for massive data traffic, while providing ubiquitous connectivity and supporting plentiful applications with different quality of service (QoS) demands. As the experimental deploying and running for 5G networks in some countries (e.g., USA, China, England, France, ...etc) has been initiated recently, more drastic improvements need to be made in cellular network architecture and related processing algorithms to meet the expectations of new generation investors and customers. Some of these expectations (but not limited to) include massive data rates, huge capacity and coverage, diminished latency and improved quality of service (QoS). Fortunately, incorporating the Cloud Computing technology into the 5G radio access network (RAN) layer will contribute in making the management and processing of user data faster and more reliable than conventional 4G networks.

One of the issues that usually concerns cellular network operators is the cell-edge problem, where users existed at the edge of the cell, i.e., far away from the radio transceiver tower - known as base station (BS) - typically experience a low signal-to-interference-plus-noise-ratio (SINR), which leads to considerably low achievable throughputs and data rates. Increasing the BS transmit power in an attempt to improve the cell-edge users' experience is typically limited by the anticipated of inter-cell-interference (ICI) among the adjacent cells. Hence, the need for smart solutions is crucial to deal with this issue. Another issue that network operators must handle is the traffic variations throughout the network area which change in a time-geometry manner based on the daytime (i.e., day or night) and cell/area type (i.e., business, residential, entertainment ... etc). As a result, network cell resources maybe insufficient or dissipated according to the density of the area that each cell serves.

In this thesis, a new scheduling technique has been developed to increase the probability of assigning the available resource blocks (RBs) to the cell-edge users so that their achieved throughput would increase. A performance comparison with state-of-the-art schedulers indicates that our proposed scheduling mech-

anism leads to a significant improvement in the average throughput for cell-edge users, with petty performance regression for cell-center users. On another front, a novel load-aware, network-centric, dynamic clustering (LANCDC) algorithm is proposed to increase the system performance in loaded cell-edge areas. To the best of our knowledge, LANCDC is the first network-centric clustering algorithm that adapts to spatio-temporal variations in user-density across the network. Our simulation experiments indicate that LANCDC outperforms state-of-the-art user-centric algorithms, especially in terms of user throughput and power savings.

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