Effective downlink scheduler of LTE-Advanced Architecture against Cancellation of Network Interference

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Abstract

Long-term evolution represents an emerging technology that promises a broadband and ubiquitous Internet access. In this paper, we propose a quality-of-service (QoS) aware packet scheduler for real-time downlink communications. A novel redundancy elimination and outage inference cancellation scheduler technique is proposed by incorporating code-division multiple-access (CDMA)-based systems, Multi carrier frequency-division multiple access and time division multiple-access. The model exploits network information towards aggregating the carrier information for downlink transmission through elimination of redundant data request and network outage node propagating in the network. The propose model is effective a packet scheduling model under the modulation and coding scheme constraint, which is proved to be NP-hard. Greedy-based scheme is proposed to maximize the system throughput while maintaining proportional fairness of radio resource allocation among all UEs. Simulation results demonstrate the effectives of the proposed model on scheduling the UE to the effective resources compared with existing state of art approaches. The proposed model proves to be effective in terms of QOS factors such as Throughput, packet delivery ratio and network overhead.

Keywords: LTE-Advanced, C-RAN, Energy Efficient, Jitter Efficient, Quality of Service

I.INTRODUCTION

Long Term Evolution Networks have become one of the fundamental aspects for today's cutting-edge wireless technologies [1]. LTE made use of a new system architecture combined with enhanced radio access technology. It divided network functions such as modulation, header compression and handover to the radio access network, while others such as charging, mobility management to the core network [2]. LTE requirements are meant in relation to UTRA nomenclature. Energy Efficiency is a major problem considered by mobile users and operators. It is getting even more exigent with the rocketing progression of the wireless standards and data hungry multimedia services [3]. From the user's viewpoint, the EE problem is perceived as the insistent need of having today's smart cell phones with longer battery lifetime than what the current battery technology is delivering while maintaining the increasing processing power needs.

In this paper, we propose a quality-of-service (QoS) aware packet scheduler for real-time downlink communications through redundancy elimination and outage inference cancellation scheduler technique to improve the bandwidth efficiency [4]. In addition, Greedy-based scheme is proposed to maximize the system throughput while maintaining proportional fairness of radio resource allocation among all UEs with strict packet delay constrainst [5].

The remaining paper is summarized into sections as related work on LTE Network and Jitter and Energy Efficient Scheduling technique in the section 2, describing the proposed methodology in the section 3. Experimental analysis in section 4 and finally conclusion of the paper is presented in the section 5

II.RELATED WORK

This section discusses about the energy efficient user equipment modelling technique for LTE network on various constrainst of uplink and downlink scheduling.

A. Queuing Analysis of Two-Hop Relay Technology in LTE/LTE-A Networks

Queuing modeling of a two-hop wireless relay network and carry out performance analysis of end-to-end packet delay is performed. In the two-hop wireless relay network, two groups of wireless nodes (WNs) and a single relay node (RN) are considered. A Poisson packet arrival process and IEEE 802.11 distributed coordination function are assumed in the network for the network traffic model and for regulating the nodes' access to the shared channel, respectively [6]

B. Improving control performance by minimizing jitter in RT-WiFi networks

The jitter-free packet scheduler is used to improve the control performance in a mobile system. A flexible real-time high-speed wireless communication platform called RT-WiFi. RT-WiFi currently provides up to 6 kHz sampling rate and deterministic timing guarantee on packet delivery [7]. RT-WiFi network manager design and efficient solutions for two fundamental RT-WiFi network management problems has been considered. To improve control performance in networked control systems, RT-WiFi network manager is designed to generate data link layer communication schedule with minimum jitter under both static and dynamic network topologies for downlink scheduling to the channel for transmission

III.PROPOSED MODEL

This section discusses about the design and implementation of the proposed redundancy and inference elimination model for downlink scheduling of LTE network on basis on subchannel allocation and dual decomposition models.

A. Network model

Network Module of LTE-A is configured for heterogeneous QoS traffic requirement on UE connection by meeting the bandwidth specification [8]. UE connection additionally configured on aspects of rate, delay, jitters and average throughput. The packet scheduler is configured using a scheduler controller. The figure 1 represents the architecture of the proposed work.

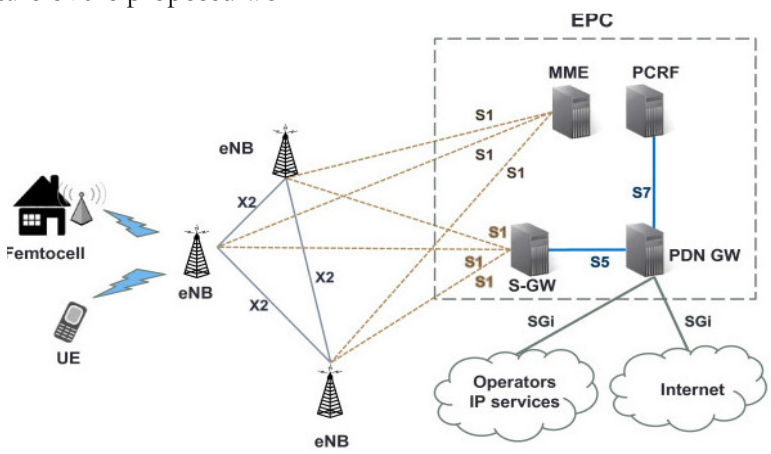

Fig 1. Architecture of the proposed model

B. **Cloud Radio Access Network**

Cloud Radio Access Network (C-RAN) is expected to be a candidate of next generation access network techniques that can solve operators' puzzle. C-RAN is consists of a physical plane, control plane and a service plane. BS computational resources into a central pool; the radio frequency signals from geographically distributed antennas are collected by remote radio heads (RRHs) and transmitted to the cloud platform through an optical transmission network (OTN)[9].

C. Utility based Scheduling

The utility-based approach uses the packet scheduler which implements different resource allocation algorithms to send active connection to the UE located within the cell coverage area. The classes which are widely adopted are: average throughput, rate-constrained and delay-constrained [10].

Algorithm: Downlink Scheduling between UE

Iteration I= 0
For (I=0;I< Node Length, I++)
Resource Scheduling ()
If (Packet Size < Node Density)
Allocate the packet to the node
Else Iterate
Allocate the packet to the New node
If (Bandwidth used for Route Request > Average Transmission Time of the node)
Eliminate the Route request
Else
Process the Route Request for the Data Transmission from packet frame to nodes

End

IV.EXPERIMENTAL RESULTS

The simulation analysis of the downlink scheduling model against the uplink scheduling approaches through different optimization conditions on various performances metric such as throughput, Energy utilization, Network overhead and Jitter will be carried out using Network animator model designed using Dotnet technology. The Node positioning and its propagation is described in the user interface. The user interface is used developed on the visual studio IDE and dynamic node behavioural information and its properties are stored in data base.

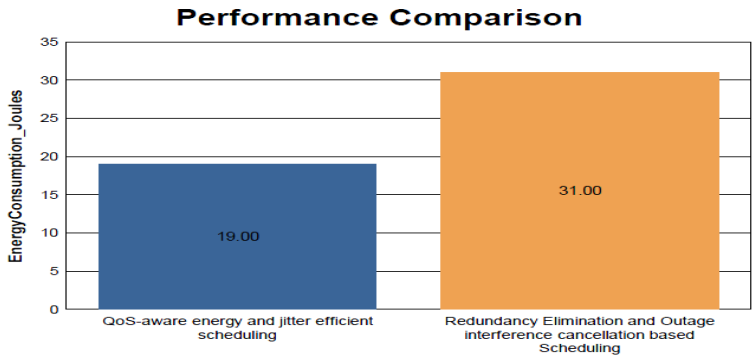

Fig 2. Performance Analysis of the Downlink scheduler in terms of Energy Consumption

The proposed scheme tends to statistically bound the jitter performance and ensure meeting a fixed threshold. In this threshold is set to the highest possible value which corresponds to the conventional delay metric function originally used by the downlink scheduler

TABLE 1
Performance Evaluation of the Downlink Scheduler

Technique	Throughput In mbps	Network Overhead in mb	Packet Delivery Ratio in mbps	Energy Consumption in joules
QoS-aware energy and jitter efficient scheduling – Existing	96.23	20	33	19
Redundancy Elimination and Outage interference cancellation based Scheduling – Proposed	98.23	16	44	31

The EE and throughput performances were also substantially improved for the rate sensitive and best-effort traffics Table 1 and figure 2 provides the performance evaluation of the downlink scheduler on various measures. Finally, since employing the utility-based prioritization scheme, all the proposed schedulers showed high degree of intra-class fairness for each of the considered traffic classes.

V.CONCLUSION

We design and implemented the quality-of-service (QoS) aware packet scheduler for real-time downlink communications through redundancy elimination and outage inference cancellation scheduler. The proposed model used code-division multiple-access (CDMA)-based systems, Multi carrier frequency-division multiple access and time division multiple-access. The network information towards aggregating the carrier information for downlink transmission under the utility based scheduling under static and dynamic network condition is carried out. The elimination of redundant data request and network outage is achieved on each node of the LTE-A propagating C-RAN Model. Simulation results prove the effectives of the proposed model on scheduling the downlink frequencies to UE. It is found to be effective resources scheduler compared with existing state of art approaches.

REFERENCE

[1] Q. Leng, Y. H. Wei, S. Han, A. K. Mok, W. Zhang, and M. Tomizuka, "Improving control performance by minimizing jitter in RT-WiFi networks," in IEEE Real-Time Systems Symposium, Dec. 2014, pp. 63–73.

[2] A. Mukhopadhyay and G. Das, "A proposal for WLAN-EPON integration that reduces video traffic jitter in presence of mixed traffic," in IEEE International Conference on Advanced Networks and Telecommunications Systems, Nov. 2016, pp. 1–6.

[3] L. Ortiz, "Methods and systems for jitter minimization in streaming media," Jul. 28 2009, US Patent 7,567,509. [Online]. Available: https://www.google.com/patents/US7567509

[4] L. Ortiz, "Methods and systems for jitter minimization in streaming media," Jul. 28 2009, US Patent 7,567,509. [Online]. Available: https://www.google.com/patents/US7567509

[5] D. C. Verma, H. Zhang, and D. Ferrari, "Delay jitter control for realtime communication in a packet switching network," in Proceedings of TRICOMM'91, pp. 35–43, Apr. 1991.

[6] C. Rosado-Sosa and I. Rubin, "Jitter compensation scheduling schemes for the support of real-time communications," IEEE Int.Conf. on Commun., vol. 2, pp. 885–890, June 1998.

[7] F. P. Zhang, O. W. W. Yang, and B. Cheng, "Performance evaluation of jitter management algorithms," Canadian Conference on Electrical and Computer Engineering, vol. 2, pp. 1011–1016, May 2001.

[8] B. Rong, Y. Qian, M. H. Guiagoussou, and M. Kadoch, "Improving delay and jitter performance in wireless mesh networks for mobile IPTV services," IEEE Trans. Broadcast., vol. 55, no. 3, pp. 642–651, Sept. 2009.

[9] T. Zhao, J. Wu, S. Zhou, and Z. Niu, "Energy-delay Tradeoffs of Virtual Base Stations with a Computational-resource-aware Energy Consumption Model," in Proc. IEEE International Conference on Communication Systems (ICCS), Australia 2014.

[10] M. J. Neely and S. Supittayapornpong, "Dynamic markov decision policies for delay constrained wireless scheduling," IEEE Trans. Autom. Control, vol. 58, no. 8, pp. 1948–1961, Aug. 2013.