International Journal Of

Recent Scientific Research

ISSN: 0976-3031

Volume: 7(2) February -2016

IMPROVEMENT OF QUALITY OF SERVICE BY OPTIMIZING DIFFERENT KEY PARAMETER INDICATORS FOR LTE NETWORK

Pradeep Ary

THE OFFICIAL PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH (IJRSR)
http://www.recentscientific.com/ recentscientific@gmail.com

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 7, Issue, 2, pp. 9016-9020, February, 2016

International Journal of Recent Scientific Research

REVIEW ARTICLE

IMPROVEMENT OF QUALITY OF SERVICE BY OPTIMIZING DIFFERENT KEY PARAMETER INDICATORS FOR LTE NETWORK

Pradeep Ary

Department of Electronics and Communication Engineering Samrat Ashok Technological Institute Vidisha, India

ARTICLE INFO

Article History:

Received 16th November, 2015
Received in revised form 24th November, 2015
Accepted 23rd January, 2016
Published online 28th February, 2016

Keywords:

Drive test data collection,
LTE, QoS measurement.

ABSTRACT

The area of study proposed in this paper, is the optimization of the Quality of Service (QoS) for Long Term Evolution (LTE) cellular network. Azimuth optimization and tilt optimization are the main rules to optimize the LTE network in order to achieve the best radio environment. The proposed work, handles with parameters such as antenna tilt, azimuths and mobility parameter that affect the Quality of services. The proposed state-of-art improves the quality of services by improving handover success rate. For this, optimization of technical parameter on the basis of drive test key parameter indicators (KPIs) has been proposed. This multi objective optimization for quality of service method is illustrated for industrial LTE -network. The improved QoS is reflected on the basis of improved accessibility, retainability, integrity, handover success rate and throughput per user. The analysis is based on the live data that are collected on commercial LTE cellular network operated by Quadgen Wireless Solution Pvt. Ltd. Bangalore using drive route test and Actix software.

INTRODUCTION

In last decade radio access network have experienced great success. LTE wireless network is new technology in the modern telecommunication field which describes the work by the third generation partnership project (3GPP)[1]. In LTE, spectrum utilization is scalable over blocks of 5, 10, 15, and 20MHz. Block smaller than 5MHz are also supported.

In LTE architecture as shown in figure 1 mobility management entity is responsible for handover, initial cell selection, and reselection for the basis of measurement report and priority basis. LTE wireless network technology support OFDMA and SC-FDMA in downlink and uplink respectively. LTE network uses multiple input multiple output (MIMO) in air interface, which increases data throughput [6]. Handover is a key procedure for ensuring that users can move freely within a network being connected to high quality services. In this article the improved quality of service is obtained by optimizing engineering parameter on the basis of drive test results such as service drop point and handover failure point in current service area. Quality of services for LTE network also optimized to give recommendation on the basis of Reference Signal Received Power (RSRP) diagram. KPIs are a set of selected indicators used for measuring the cellular network performance.

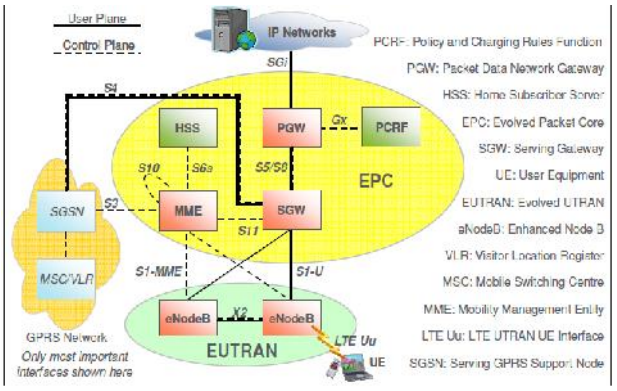

Figure 1 Architecture of LTE network

QoS In General Term

In LTE network quality of service depends on servability performance which relies on service accessibility performance, service retainability performance, and service integrity. For good quality of service continuous coverage must be ensured. The actual coverage must be consistent with the planned one to

Corresponding author:* **Pradeep Ary
Department of Electronics and Communication Engineering Samrat Ashok Technological Institute Vidisha, India

prevent service drops caused by isolated island during handovers.

Defined KPIs Used For QoS

***Accessibility*:** The ability of user to obtain a requested from the network or to able to get contact with the network. Initial evolved radio access bearer (E-RAB) establishment success rate
[%]

$$\text{Accessibility} = \frac{pmRrcConnEstabSucc}{pmRrcConnEstabSuccAtt+pmRrcConnEstabAttReatt} \times \frac{pmS1SigConnEstabSucc}{pmRrcConnEstabSucc} \times \frac{pmErabEstabSuccInit}{pmErabEstabAttInit} \times 100$$

***Retainability*:** The ability of user to retain its requested service once connected for the desired duration.

$$\text{Retainability} = \frac{pmErabRelAbnormalEnbAct+pmErabAbnormalMmeAct}{pmErabRelAbnormalEnb+pmErabRelNormalEnb+pmErabRelMme} \times 100$$

****Mobility*:** The ability of to provide the requested service to the user with mobility.

$$= \frac{pmHoPrepSuccLteIntraF+pmHOPrepSuccLteInterF+pmHoPrepSuccWcdma+pmHoPrepSuccTdScdma}{pmHoPrepAttLteIntraF+pmHoPrepAttLteInterF+pmHoPrepAttWcdma+pmHoPrepAttTdscdma} \times \frac{pmHoExeSuccLteIntraF+pmHOExeSuccLteInterF+pmHoExeSuccWcdma+pmHoExeSuccTdScdma}{pmHoExcAttLteIntraF+pmHoExcAttLteInterF+pmHoExcAttWcdma+pmHoExcAttTdscdma} \times 100)$$

The KPI formula includes Intra Frequency handover (IRAT) where the target and source cell are on the same frequency, Inter Frequency where they are on different frequencies and IRAT handover where the target cell is in another wide code division multiple access (WCDMA) frequency. In this paper it can be customized based on individual HO types.

Mobility and Mobility Parameter

In radio resource control (RRC) connected mode different type of handovers (HOs) is done such as Intra handover, Inter handover and Inter radio access technology (IRAT) handover. In EUTRAN network the triggering mechanism for sending report is event driven. In LTE network five LTE and two IRAT events is present .In this paper the triggering quantity is specified to be RSRP while reported quantity is specified to be RSRP. In idle mode cell selection and cell reselection is done. The different parameter for mobility handover should be correct for better handover success rate and IRAT should be minimum for good quality of service. Neighbour cell optimization must be performed to ensure that user equipment (UE) in idle or connected mode can promptly perform reselection to or be handed over to optimal serving cell. In addition, problem with delay, ping pong and non-logical handovers can be resolved by optimizing coverage, interference and handover parameter [3].

Network Optimizatin Method and Process

RF optimization involves adjustment of azimuths, antenna tilts, antenna height, eNodeB transmit power, and performance parameters. Optimization methods in different standards are similar, But each standard has its own measurement definition. In LTE network optimization first Measurement is performed. Second measurements are used for KPI calculation.

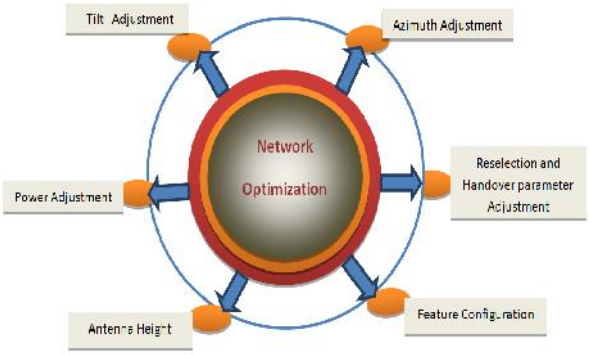

Figure 2 The diagram shows optimization process used for the test

The KPI are compared with the KPI obtain from a LTE network. We recommended different parameter on the basis of drive test result and after analysis of collected data on actix tool. After recommendation implementation we again check the performance of EUTRAN network.

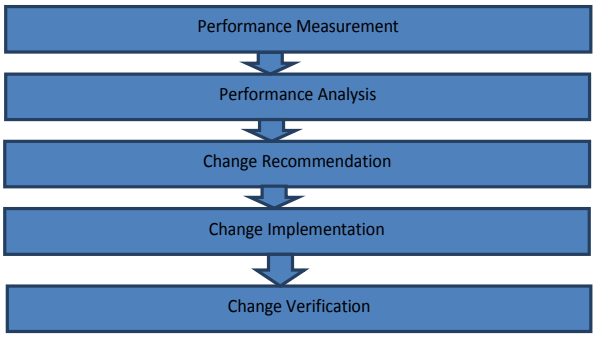

Figure 3 optimization process

For better handover success rate

For better handover success rate analysed the drive route RSRP diagram and recommended for tilt and azimuth to reduce interference and cross coverage.

***Checking handover validity*:** obtain source and target cell using drive test software and then check whether handovers performed between two cells that are geographically for using map information.

***Checking interference*:** check interference in both source and target cells because handover failures may be caused by uplink and downlink interference. To reduce interference, reduce the number of servers covering the same area in order to avoid overlapping.

***Checking coverage*:** Cell range is determined for coverage limited and interference limited scenario. These depend on fading margin, cell edge target throughput, and average network load. Check source and target cells for cross coverage, imbalance between uplink and downlink, and carrier level receive quality and level. Check RSRP at the edge of source and target cell must be acceptable.

Drive Route Test Equipment

Drive test equipment set up software is shown in figure 4. All necessary QoS measurements are collected using specialized software operating on commercial grade drive test equipment. A drive test equipment device contain laptop computer with drive test optimization software, LTE cell phone, and generic global position system (GPS).

Figure 4 QoS test equipment setup

All necessary data for QoS optimization is collected by drive route equipment and processed on actix analysing tool. This equipment is provided by Quadgen wireless solution.

Drive Test Route Test Path

A location of site GNL 06231 is shown in figure5 .Drive test route of site GNL06231 is shown in figure 6.On the basis drive test and performance of measurement data adjust antenna azimuth and tilts to change the distribution of an signal in interfered area by increasing the level of dominant sector and decreasing level of other sector.

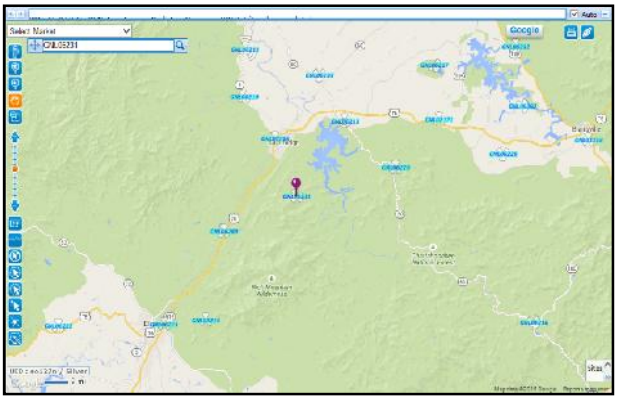

Figure 5 Site GNL 06231 location

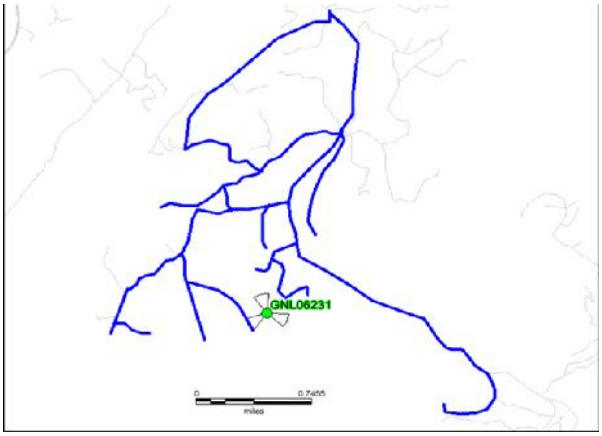

Figure 6 Drive route of site GNL 06231

Parameter Information And Drive Configuration

All parameter information like physical cell identity, bandwidth, sector identity, cell identity, azimuths, and tilts for single carrier and double carrier is shown in table 1 and drive configurations detail shown in table 2 such as uplink and downlink locked to evolved absolute radio frequency channel 650, circuit switched fallback mobility in floating mode and voice over LTE (VOLTE) in floating mode.

Recommanded Tilts And Comparative Chart

Current and recommended tilts for the cell site GNL 06231 for 5MHz single carrier and 5MHz double carrier for all sectors are shown in table 3.

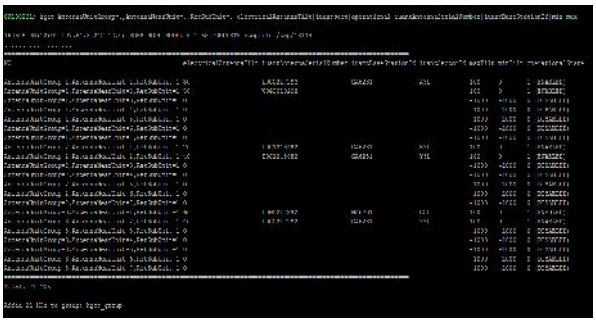

Figure 7 Snap shot of current tilts and azimuth

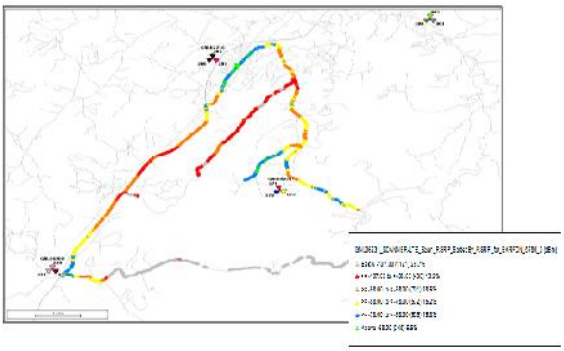

Figure 8 LTE 1C Scanner RSRP Route diagram

PRESENTASION OF RESULT

Results shows for 5 MHz single carrier (1C) and 5MHz double carrier (2C) of three sector of the site are shown in figure 9, figure10, figure11, and figure12.Current tilt is shown in accessibility graph in figure 9 after recommendation accessibility increase of beta-2C and gamma-2C sector and accessibility graph lie above the range 99. Initially Retainability of beta-2C and gamma-2C lied in range of 96 after first recommendation it lied in the range of 98 after final recommendation it lied in the range of 99.5. Initially and after first recommendation IRAT of beta-2C lied in the range of 5.5 and IRAT of gamma-2C sector lied in the range of 11 after final recommendation IRAT of all sector nearby 1%. IRAT shows the handover between different technology and it should be minima for best QoS. Downlink throughput is nearby 10 mbps. Cell subscription capacity is also recommended for beta and gamma sector for single carrier and beta and gaama sector for double carrier.

SUMMARY OF RESULT

The collection of data and drive route test began from 15 April 2015 at 8 PM and ended at 1 AM. The drive test was performed in north Georgia for the site GNL 06231. Current and recommended tilts shown in table 3 and summary of result shown in table 4, overall packet switched (PS) accessibility in the range of 99.67%, and overall PS retainability lied in the range of 99.77%. IRAT is near by 1.02%. Handover success rate is 99.27%. Downlink throughput of all sector lied in the range of 12 mbps. Inter frequency handover in the range of 99.1

Figure 10 Retainability graph

Table 1content of parameter detail

Site ID	Sector ID	PCI	Band	Band width	EARFCN	Antenna radiation center	Azimuth (CIQ)	Tilt 1C	Tilt 2C
GNL06231	GNL06231_2A_1	15	2100	5MHz	2175	150	344	8.0	4.0
GNL06231	GNL06231_2B_1	16	2100	5MHz	2175	150	111	7.0	3.5
GNL06231	GNL06231 _2C_1	17	2100	5MHz	2175	150	235	6.0	3.0

Table 2 drive configuration detail

LTE Scanner	Quad Band Scanner, Scanning LTE ,UMTS and GSM
ATT_Downlink	Locked to EARFCN 650
ATT_Uplink	Locked to EARFCN 650
CSFB MO	Floating Mode
CSFB MT	Floating Mode
VoLTE MO	Floating Mode
VoLTE MT	Floating Mode

CONCLUSION

This paper presents how to optimize industrial LTE network performance by using the key performance indicators (KPIs). Antenna tilt and handover parameter are main parameters for radio frequency optimization and accurate value of antenna tilt and handover parameter must be necessary.

Table 3 measurement of current and recommended tilts

Site	Sector	ITEM	Current	Recommended	Comment
GNL06231	GNL06231_7A_1	EDT	8	9.4	Suggestion for touchdown point of 4.9 Miles
GNL06231	GNL06231_2A_1	EDT	5	6.2	Suggestion for touchdown point of 4.8 Miles
GNL06231	GNL06231_7B_1	EDT	7	8.5	Suggestion for touchdown point of 5.3 Miles
GNL06231	GNL06231_2B_1	EDT	4	5.5	Suggestion for touchdown point of 4.7 Miles
GNL06231	GNL06231_7C_1	EDT	6	10.5	Suggestion for touchdown point of 4.9 Miles
GNL06231	GNL06231_2C_1	EDT	4	7.2	Suggestion for touchdown point of 4.9 Miles

Table 4 result summary

Network KPI	Value
PS Accessibility	99.67%
PS Retainability	99.77%
IRAT %	1.02%
HO Success rate	99.27%
DL throughput	10 mbps
IF HO	99.12%

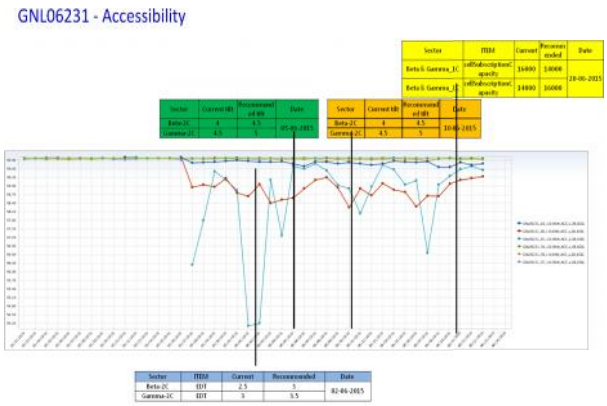

Figure 9 Accessibility graph

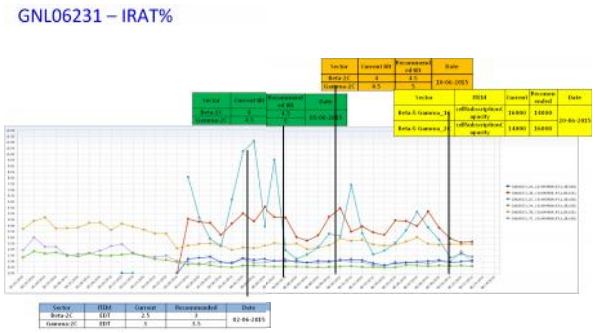

Figure 11 IRAT graph

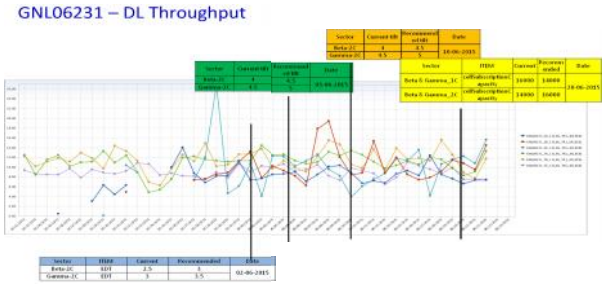

Figure 12 Downlink throughput graph

This paper maintain the RSRP after analyzing the collected data and remove service drop point service drop point and handover failure point after analysing RSRP drive route test. KPI is an evolution criterion that measures the quality of service (QoS). KPIs are the basic unit of measurement for monitoring the QoS. Accessibility shows the performance monitoring and retainability check the radio link failure monitoring. The proposed work improves all KPIs of beta-2C and gamma -2C sector by adjusting antenna tilts. The LTE network optimization framework presented here relies on realistic model for quality of service estimation. Future work will allow comparison of performance of quality of service by optimize the KPIs for LTE network by adjust antenna tilt and engineers parameter.

References

1. "3GPP; Technical Specification Group Radio Access Network; Requirements for E-UTRAN and EUTRAN", 3GPP, March. 2008.[Online]: http://www.3gpp.org/ ftp/Specs/html-info/36-series.htm.
2. F. Gordejuela- sanchez and J. Zhang." LTE Access Network Planning and Optimization: A Service oriented and Technology perspective," presented in Global Telecommunication Conference (GLOBECOM'09), pp. 1-5 , 2009.
3. j. Alonso-Rubio." Self-optimization for handover oscillation control in LTE," presented in network Operation and Management Symposium (NOMS), pp. 950-953, 2010
4. I. Siomina, P. Värbrand, and D. Yuan, "Automated optimization of service coverage and base station antenna configuration in UMTS networks". IEEE Wireless Communications, vol. 13. pp. 16-25, 2006.
5. K. Jaffres-Runser, J. Gorce, and S. Ubeda, "QoS constrained wireless LAN optimization within a multiobjective framework," IEEE Wireless Communication, vol. 13, no. 6, pp. 26--33, December 2006.
6. M. Wernersson, S. W¨aanstedt, and P. Synnergren. Effects of QoS scheduling strategies on performance of mixed services over LTE. In *Proc. of the 18th* IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC '07), 2007
7. N. Wei, A. Pokhariyal, T. B. Sorensen, T. E. Kolding, and P. E. Mogensen. "Performance of MIMO with frequency domain packet scheduling in UTRAN LTE downlink," In *Proc. of IEEE Vehicular Technology Conference (VTC '07-Spring)*, pages 1177–1181, 2007
8. S. Hurley, "Planning Effective Cellular Mobile Radio Networks," *IEEE Trans. Veh. Technol.*, Vol.51, No.2, pp. 243-253, March 2002.
9. Robert Lloyed-Evans, QoS Integrated 3G Networks, Artech house, Inc., 2002 Steffen Sroka, Holger Karl, "Performance Evaluation of a QoS-Aware Handover Mechanism", Proceedings of the Eighth IEEE International Symposium on Computers and Communication (ISCC'03), 2003.

****

How to cite this article:

Pradeep Ary., Improvement of Quality of Service by Optimizing Different Key parameter Indicators for lte Network. *Int J Recent Sci Res.* 7(2), pp. 9016-9020.

TSSN 0976-3031