RF measurement and key performance analysis of 3G Technology for coverage improvement

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ABSTRACT The present paper is about the radio network optimization and post processing for 3rd Generation UMTS The aim of thesis is to improve quality of service in 3G network. . To get better performance of the UMTS, the system must be optimized frequently. The optimization must able to increase the efficiency, Reduces system noise,Improves uplink sensitivity, Maximize the utility of the available network resources.Ultimately ensure minimum blocking/dropping in order to provide better Quality of Services to guarantee significant network performance.

KEYWORDS : RF measurement, optimization, Key Performance analysis, coverage improvement

I. INTRODUCTION

The mobile communication industry is currently shifting its focus from second (2G) generation towards the third and third(3G) towards fourth(4G) generation . The shift is not only related to the evolution of the (radio) access technology, but also to the vision of the development of service provisioning and service demands, customer expectations and customer differentiation. Furthermore, the operators' role is also changing: one can distinguish between service provider (virtual operator) and network operator, carrying the responsibility of the infrastructure and leasing airtime for service providers. The acceleration of the number of users of mobile communication technology is very fantastic. The acceleration of users growth must be supported with a good service and high customers satisfaction. The changes of customer numbers, the surrounding environment architecture, the condition of devices, and network capacity determine the performance of services. To improve the grade of services, improve capacity, and enhance the coverage, providers should perform network optimization.

OBJECTIVES

To achieve system network performance levels to a certain set standard try as well as to try and meet the expectation of subscribers in terms of coverage and quality of service. QoS measurements are very important for quality assurance and also have hight cost and effort. QoS has many performance attributes. The Operator consider QoS to mantain the continual optimality.

BACKGROUND

The acceleration of the number of users of mobile communication technology is very fast. The acceleration of user's growth must be supported with a good service and high customer's satisfaction. The changes of customer numbers, the surrounding environment architecture, the condition of devices, and network capacity determine the performance of services. To improve the grade of services, improve capacity, and enhance the coverage, providers should perform network optimization more efficiently.

FORMAL DEFINITION

The main aim of the system is to optimize system network so that key performance of the system can be improved and high quality of service can be achieved.

PROPOSED TECHNIQUE

The Drive Test is a test performed in cellular networks regardless of technology (GSM, CDMA, UMTS, LTE). Means collecting data on vehicle movement. Sometime also collect data by walking areas of interest. The analysis of drive test is fundamental for the work of any professional in the field of IT and Telecom comprising two phases: data collection and data analysis. Although through the analysis of KPI's we can identify problems such as dropped calls, among others,

the drive tests allow a deeper analysis in field. Identifying areas of each sector of coverage, interference, evaluation of network changes and various other parameters. The main types of Drive Test are Performance Analysis, Integration of New Sites and change parameters of Existing Sites, Benchmarking/Comparative Drive Test,SCFT(Single Cell Functionality Test) and Cluster Drive Test.

PROPOSED MATHODOLOGY OF EVALUATION

The main goal is to collect test data, but they can be viewed / analyzed in real time (Live) during the test, allowing a view of network performance on the field. Data from all units are grouped by collection software and stored in one or more output files. The minimum required to conduct a drive test, simplifying, is a mobile device with software to collect data and a GPS. Currently, there are already cell phones that do everything. They have a GPS, as well as a collection of specific software. This activity is typically delivered through "Drive tests" which consist in the collection of Network KPIs by a mobile team equipped with measurement tools. The post processing task follows closely and aims delivering a summary report of the measurements. It outlines thematic maps and various statistics in order to provide the optimization engineer with a fair image of network quality presented in an easy manner enabling him at a glance to identify potential areas of network performance improvement. Reporting is a process to show the summary of the performance parameters in a drive test result. The parameters usually called by KPI (Key Performance Indicators). In general, KPI is divided in two types, events KPIs and radio KPIs. Examples of events KPIs are Drop Call Rate, Call Setup Success Rate, Handover Success Rate, etc.

PROPOSED TOOLS TO BE USED

Proposed system will need hardware tools dongle, scanner, Mobile, GPS, Inverter for drive test. Software needed for analysis are TEMS investigation, MapInfo professional, TEMS Discovery.

. BLOCK DIAGRAM

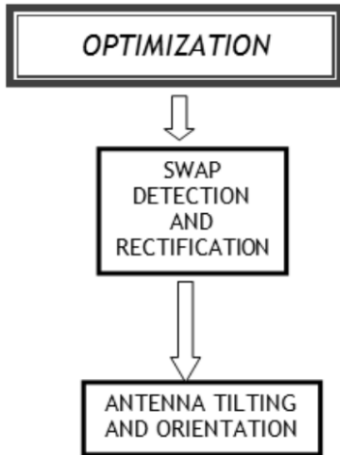**Figure 1. Equipments set up for Drive test**

OPTIMIZATION

⇩

SWAP
DETECTION
AND
RECTIFICATION

⇩

ANTENNA TILTING
AND ORIENTATION

Figure 2. Optimization Process

POST PROCESSING

⬇

MapInfo Professional
TEMS discovery

⬇

KPI ANALYSIS
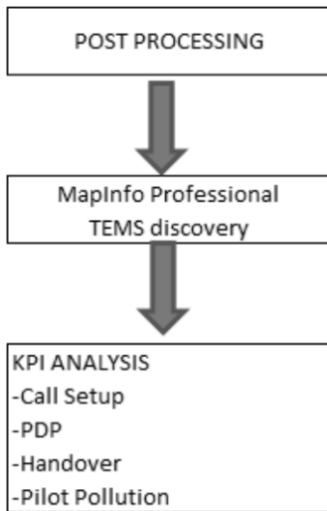-Call Setup
-PDP
-Handover
-Pilot Pollution

Figure 3. Post Processing(KPI Analysis)

PROPOSED EXPERIMENTAL SET UP

The first stage of optimization process is measuring the RF parameters in the WCDMA. The process of measurement is called drive test. The objective of drive test is to get the data from network. In some location additional walk test should be carried out where micro layer is not deployed by operator. After post processing optimization process of network is start. When optimization is done drive test is repeated.

I.   EXPECTED OBSERVATION

Key Performance Indicator	Test Method	Description	Targets
RF Coverage KPI's			
Ec/Io	Drive test in Cell Coverage Area	for respective clutter(>-12)	
RSCP	Drive test in Cell Coverage Area	As per planning guideline (> -75)	
Pillot Pollution	Drive test in Cell Coverage Area		<=3 for >= 95% samples
3G CS 12.2 kbps voice AMR	- Drive Test	Call Setup Success Rate	MOC >= 99%
HSDPA	- Drive Test		>= 98.5%
HSUPA	- Drive Test		>= 98.5%

Drop Call Rate			
3G CS 12.2 kbps voice AMR	a) Drive Test	Drop Call Rate	< = 1%
PS/HS Drop call rate	a) Drive Test	Drop Call Rate	< = 1.5%
Mobility			
Soft handover success rate CS(voice)	Drive Test:Voice	Measures successful link additions/removals from active set	> = 98%
Soft handover success rate PS	Drive Test:PS	Packet Switch Intra-NodeB Softer Handover Success Rate	> = 98%
Multi RAB call(CS & PS) HOSR	Drive Test:CS & PS	Simultaneous CS voice or video and packet data.	> = 97%
Voice 3G-2G HO (3G-2G IRAT)	a) Field Survey (Drive Test)	Voice 3G-2G iRAT Handover Success Rate	Success Rate >=97.5%
3G --> 2G IRAT CELL CHANGE (HSDPA)	a) Field Survey (Drive Test)	PS Hard Handover Success Rate(Both ways 3G-2G & 2G-3G))	Success Rate >=97%
2G-3G cell re-selection	a) Field Survey (Drive Test)	Idle Mode, iRAT cell re-selection	< 4 sec
2G-3G PS hndover (Static Test)	a) Field Survey (Drive Test)	IRAT success at 2g to 3g	<=12s, Average of all samples

I.   CONCLUSION

After studying research papers it can be conclude that by repatative process of optimization and network analysis good quality network is achived. By measuring RSCP, EC/NO, HSDPA, HSUPA and another Key performance Indicators like CSSR, CCSR optimization plan made and executed. Post processing should be done accurately so network preformance can be diognize and network is improved as expected targets from operator and customres.

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