3G CLUSTER OPTIMIZATION

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ABSTRACT

Most of the telecommunication service providers in Sri Lanka consider Network Optimization to improve their service better than other service provider's service. Network Optimization is very important in the Radio Frequency (RF) division in Mobitel Telecom, because this has close relationship with the customer satisfaction. Third Generation (3G) cluster optimization was done for Mobitel 3G sites in the areas from Negombo to Morattuwa Mobitel 3G sites. The aim of the work was to ensure that the Mobitel has more 3G strength than its competitor service providers. In this research, mainly five issues were to be solved. They were site coverage issue, site quality issue, swap issue, HSDPA throughput issue and HSUPA throughput issue. Pre-drive test was made to identify the issue. Then analyzing was done to find the optimization to be done for the 3G sites. After analyzing, analysis report was submitted to Huawei, the intermediate company. Then the analyzed report was approved by Huawei. Then cluster optimization was done for a cluster. The antenna's tilt and azimuth were adjusted and also height of the antenna was adjusted in cluster optimization. In post drive testing, the previous issues were checked whether they were solved or not. After doing all these methods, final report was submitted to Huawei and it was approved by Huawei. After the approval, cluster optimization of one cluster was completely successful. The same procedure was adopted for other cluster optimization as well. From this research, a solution was found for Mobitel 3G cluster problem and the entire target KPI of the Mobitel 3G cluster of the considered area were achived.

Keywords: Telecommunication, Third Generation (3G), Cluster Optimization, Radio Frequency (RF), Drive Testing (DT)

1. INTRODUCTION

Mobitel is one of the most famous mobile service providers in Sri Lanka. It is occupying a main role among mobile service providers. Mobitel service provider selected Western province of Sri Lanka to launch their project of optimizing clusters. Mobitel divided the particular area of Western province into 30 clusters. Each cluster contains roughly 20 sites.

The boundary of the north part of the area is Poruthota in Negombo, south part of the area is Koralawella in Morattuwa, and east part of the area is Yakkala in Gampaha.

In this project, six out of the thirty clusters were considered for cluster optimization. Especially cluster optimization of 3G areas were done to identify the weak coverage, bad Ec/Io (ratio of the received energy per chip (= code bit) and the interference level) areas and improve the quality & coverage of those respective sites. These clusters are situated in Kalubowila, Kodagama and Koralawella which are the boundaries of north, east, and south part of that area respectively.

The motivation for conducting this optimization is to ensure that the particular 3G sites of the considerable area has more strength than the other service providers 3G sites of the areas and increase the throughput of the site. The main objective of this research is to identify weak coverage, bad Ec/Io areas and improve the quality & coverage. That was obtained after thoroughly optimize all the clusters.

2. EXPERIMENTAL

There are several different techniques used to optimize the telecommunication sites. The optimization techniques differ from each and every service provider's preferences. The service provider's preferences depend on their customer satisfaction. But all of them are trying to pass entire target KPI of their network.

Key performance indicator (KPI) is a measure of performance. Such measures are commonly used to help an organization define and evaluate how successful it is, typically in terms of making progress towards its long-term organizational goals[1].

Main things to check earlier with Pre Drive Test as the target KPIs

- Neighbor missing issues
- Pilot Pollution issues
- Coverage issues
- Feeder Swap / Cross Feeder issues
- Data Throughputs issues
- Abnormal Events as call Drop , HO failures , HO delays, Block calls ... etc

2.1. Cluster Optimization

2.1.1. Objectives

- Identify weak coverage, bad Ec/Io areas and improve the quality, coverage and need to pass the entire target KPI of the network. Each improvement should be justified with the changes made in the network.

- Improvement can be claimed only under similar conditions and same method of plots.

- Results claimed should be reproducible during pre-drive under similar conditions.

2.1.2. Scope of Work

- Pre Drive Test needs to do in routs which were given by the service provider.
- Prepare the cluster optimization report with optimization suggestion.
- Antenna optimization with DT for abnormal area. All the changes should be recorded with the photos and need to show the improvement after optimization.
- Final Drive Test need to do as requested method.

2.2. Methodology

Sixteenth cluster was considered for comprehension of how to optimize clusters. The optimization of all clusters includes same methodology.

The main part of the cluster optimization is considering the target KPI including Call Setup Success Rate (CSSR), Successful Call Rate (SCR), Call Drop Rate (CDR) & Handover Success Rate and need to pass these entire KPIs[2].

The 3G Cluster Test Methods and Test Items are given below in Table 1. And the Criteria of Drive Test are also given below.

2.2.1. Criteria of Drive Test

A drive test system is set up to evaluate the statistical call data. Drive test shall be terminated at the point of RxLev -110 dBm is detected. Events should be included in drive test plots.

- Idle mode drive test (Dual mode) should be performed
- Dedicated mode drive test should be performed for both short call(Dual mode) and long call(3G only mode)
- HSDPA data session drive test should be performed (3G only)

- HSUPA data session drive test should be performed (3G only)

2.2.2. 3G Cluster Test Methods and Test Items

Table 1: Test Method & Item Details

Categories	Test Item	Evaluation Object
Idle Mode	RSCP	Cluster
	Ec/N0	Cluster
Voice Long Call	RSCP	Cluster
	Ec/N0	Cluster
	Handover Success Rate	Cluster
	No. of dropped calls	Cluster
Voice short Call	Ec/N0	Cluster
	Call setup success Rate	Cluster
	Call drop rate	Cluster
	IRAT Handover success rate	Cluster
Video Short Call	Function	Cluster
Data Calls	Call setup success Rate	Cluster
	Call drop rate	Cluster
	Handover success rate	Cluster
	IRAT Handover success rate	Cluster
	Average HSDPA throughput	Cluster
	Average HSUPA throughput	Cluster

3. RESULTS AND DISCUSSION

The final outcome of this research is to prepare final report about 3G cluster optimization. This final report had to be submitted to Huawei which is the intermediate company. Huawei

decides KPI as pass or not. A report which contained results of optimization of six clusters was submitted. The report showed desired outcome for all clusters.

3.1. Final KPI Summary of a Cluster

As per table 2 given below, Call Setup Success Rate (CSSR) is 97.315% before the KPI improvement. After the KPI improvement Call Setup Success Rate is 99.130%. From these data, the Call Setup Success Rate has increased. Call Drop Rate (CDR) before the KPI improvement is 0.671% and the Call Drop Rate after the KPI improvement is 0.026%. So the Call Drop Rate has decreased. HSDPA and HSUPA Throughputs have also increased after the KPI improvement as well as the Call Setup Success Rate.

CSSR = (No. of call attempt – No. of call fail) / No. of call attempt[3]

CDR = No. of call fail / No. of call attempt[3]

Table 2: KPI Results of a Cluster

	Key Performance Indicator	KPI before improvement	KPI after improvement	Remark
	Call Setup Success Rate			
Accessibility	Voice	(149-4)/149 97.315%	(115-1)/115 99.130%	
	Call Drop Rate			
Retain ability	Voice	1/(149) 0.671%	3/(115) 0.026%	
	Handover Success Rate			
Mobility	Soft Handover Success Rate(Voice)	100%	100%	
HSDPA	Average DL Throughput (kbps)	1747.35	2081.509	
HSUPA	Average UL Throughput (kbps)	658.6890	1794.977	

As per table 3 given below, azimuth of the antennas was not adjusted; it is same as before & after adjust of the sites. But some of the Electrical tilt and Mechanical tilt of the antennas were changed after optimizing.

3.2. Final Optimization Summary of a Cluster

Table 3: Optimization Results of a Cluster

Site ID	Optimization reason	Antenna Height	Longitude	Latitude	Before adjust			After adjust			Status
					Azimuth	E-tilt	M-tilt	Azimuth	E-tilt	M-tilt	
ZDEH12	Pilot Pollution	25m	79.8728	6.82086	0/120/240	2/2/2	0/0/0	0/120/240	2/4/2	0/0/0	done
ZMRT24	Pilot Pollution	18m	79.8833	6.79259	0/120/240	4/4/4	0/0/0	0/120/240	4/6/4	0/0/0	done
ZMRT06	low coverage	12m	79.8775	6.78739	60/140/350	NA	3/3/3	60/140/350	NA	0/0/0	done
ZDEH13	Pilot Pollution	12m	79.8826	6.82502	10/140/240	4/4/4	0/0/0	10/140/240	4/4/3	0/0/0	done
ZDEH09	Pilot Pollution	20m	79.8755	6.83202	0/160/240	5/5/5	0/0/0	0/160/240	5/3/5	0/0/0	done
ZMRT12	Pilot Pollution	18m	79.888	6.80608	0/120/240	6/6/6	0/0/0	0/120/240	4/6/4	0/0/0	done

4. CONCLUSIONS

The main outcome of this research was optimizing 3G clusters and found the problems and issues in the clusters. To solve the problems, at first pre drive test was done and identified the issues. After analyzing, the analyzed report was handed-over and got approval. Then cluster optimization was done for each and every cluster by adjusting tilt, azimuth and height of the antennas. Post drive test was made to check the previous issues were solved or not. As a result all the clusters were optimized in correct methodology and final report was prepared for each and every cluster. Mobitel also can use this same methodology of cluster optimization of 3G and 4G sites for their researches, in future too.

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