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GSM Optimization of Coverage Area Using Agilant Tool

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ABSTRACT: This paper involves methods and procedures followed in collection of different quality and capacity parameters in GSM coverage area and post processing of data for identifying the coverage problems in the network.Also to improve the efficiency and Handover between the two mobile users. Handover is the main problem when the user is in the high speed motion. If the Handover starts after the threshold, the connection between the users will be disconnected. If the Handover is established before the threshold, thus leads to multiple Bas stationantennas.

KEYWORDS: *GSM, RPE-LTP,FEC, MAHO*

I.INTRODUCTION

The growth and expansion of cellular and PCS networks continues at a rapid pace throughout the world. To retain existing customers and attract new customers, wireless service providers must maintain the highest quality of service of service throughout their networks. GSM (Global System for Mobile Communication) is the most successful mobile communication system. It is second generation cellular system. There are three version of GSM and each using different carrier frequencies. Origin GSM uses carrier Frequency around 900 MHzGSM –1800 uses carrier frequency around 1800 MHz GSM - 1900 uses carrier frequency around 1900 MHz GSM uses GMSK as a modulation format. GMSK is a variant of MSK. In order totransmit speech signal, it have to be translated in to digital signals. This process should maintain a certain speech quality while keeping the required data rate as low as possible. So RPE-LTP (Regular Pulse Excited with Long Term Prediction) speech coding technique is used. Then it has to be protected by FEC (Forward Error Correction) to maintain the signal quality. Both block codes and convolution codes are used for this purpose in GSM. Since the symbol duration of GSM is shorter than typical channel delay spreads, ISI occurs. Equalization is required to cancel the ISI. In addition to voice communication, some data transmission like SMS and point-to-point data transmission with a data rate of 9.6 Kbits/s were included. So the data transmission is handled in a circuit-switched mode.

II.LITERATURE SURVEY

[1] U.S. Rahman, M.A. Matin, M.R. Rahman "A Practical Approach of Planning and Optimization for efficient usage of GSM Network" – North South University, Bangladesh.

In this paper Planning of wireless networks is vital if operators wish to make full use of the existing investments. This paper deals with a practical approach of radio network planning process for efficient usage of GSM network. The key performance indicator (KPI) and drive test report of a Bangladeshi operator "Teletalk Bangladesh Limited" are used to make proposals on how operators can optimize radio resources as well as provide the required Qos to the subscribers. This study would help to plan operators to enhance coverage, improve quality and increase capacity in the days to come.

[2] JyriHamalainen "Cellular Network Planning and Optimization", Helsinki University of Technology- 2008.

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This paper explains about the frequency bandwidth division for the various services providers and also explains about the frequency reuse for the effective usage. This gives the description about the Traffic Channel, which required for the communication between the users and the accessing the services from the network. This also explain about the interface between the GMS and internet access facility in mobile using GPRS.

III. PROPOSED ALGORITHAM

The common problems in the GSM Networks included are Frequency reuse,Cell dragging, Calldrop, Handover issues.Establishing the GSM setup between the two end user and testing the efficiency and speed of the Handover between the one networks to the other.Improving the efficiency and the strength of the signal.Reducing the noise and the distortion in the environment.Also to record and save the primary and secondary information about the users.

A. Frequency Reuse

To achieve a large coverage area, the BS mounted on a high tower or top of mountain. It was impossible to reuse the same frequencies throughout the system. If anyattempt to reuse the same frequencies, it will leads to the interference. Due to these problems, the number of simultaneous users is severely limited. The Cellular Principle provides the solution to these problems. In a cellular system, the coverage area is divided in to many small areas called “Cells”. Each BS is allocated to each cell. A portion of the channel frequency is allocated to the each base station. A nearby BS are assigned different group of channels, so that the interference between the base stations is minimized. Each and every frequency can be used in multiple cells, but not in every cell. It is only some cells that have a certain minimum distance from each other.

The distance between two cells that can use the same frequency channels is called reuse distance. This distance can be calculated from link budgets. A group of cells are called cluster that all the cells are use different frequencies. Therefore, there can be no co-channel interference within a cluster. The number of cell is a cluster is called cluster size. The cluster size determines the capacity of the cellular system. The cluster are classified into three types: 4 Pattern,7Pattern, 12 Pattern. This pattern defines the number of cells grouped in to the cluster. Example: Assume the total frequency channels is 35, Cluster size = 7 .No. of. Cells/simultaneous users = 35/7No.of. Cells/ Simultaneous users within the cluster is 5

If the cluster size decreases, then the no. of. Cells or simultaneous users will be increases.

B.Cell shape

The process of using the same set of channels to some other cell is called frequency reuse. The actual radio coverage of a cell is known as the footprint. This can be represented by means of geometric shape. I f the circle used to represent coverage area, it cannot fill a area without either gap or overlaps. Thus hexagon is usually considered the basic cell shape.Coverage of large geographical area without any gap or overlap.Whenever we install a tower at center of geographical area, we can cover 3 antennas at 120*. Therefore, the total coverage area is 360*

C.Cell Dragging

When the mobile users is within the one cell range and communicating the other users at the far distance while in the motion at the slow speed. If the user had moved into the other cell range, the communication should be handed over to the new cell region. This is known as the Handover. But when the user is moving at the slow speed, even after moving into the other cell region, the communication link will be received through the previous cell range without performing the handover is known as cell dragging. The user at the far distance requires the timing advance than the user at the nearest to the tower.

D.Call Drop

When the user is communicating while moving at the high speed, then the network should be more effective to perform a handover between the each cell. Since the user is at high speed, the tower BTS changes periodically. If the

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handover is not performing at the threshold time then the call will be terminated. This is known as call drop. This will decrease the efficiency of the network and service provider. This call drop can also due to the poor signal strength and improper coverage area.

E.Handover

If the handover is performed greater than threshold level, then it will leads to the unnecessary handover. This will increases the burden of MSC. If the handover is performed lesser than threshold level, this will not be sufficient to complete a handoff by MSC. Therefore the threshold should be chosen very carefully to meet these requirements.

The time over which a call can be maintained within a cell without handoff is called dwell time. It depends on interference, distance between MS and BS, and other time varying effects.In 1G cellular system, a spare BS is used in each and every cell to determine the received signal strength of mobile users in neighboring cells. The locator receiver is controlled by MSC, and it will send the information to MSC. The MSC will decides whether the handoff is required or not.

In 2G cellular system, handoff decisions are MAHO that means, every MS measures the received power from surrounding BS and it will choose any BS whose received signal strength is larger. MAHO is particularly suitable for microcellular environment where the handoff's are more frequent. To prioritize the handoff, a portion of total available channel is reserved for handoff request. It is called "guard channel concept".Umbrella Cells- wide range of mobile velocities. When the high speed user passes the home coverage area within a seconds, whereas the pedestrian user may never need a handoff during call. This can be overcome by "Umbrella cell approach".

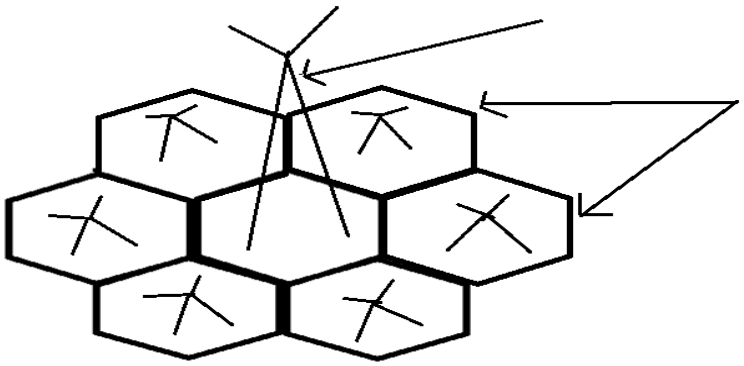

Fig.1 Micro and Macro Cell arrangement

Micro cell can serve the low speed user and the pedestrian user to receive the communication from the network.Macro cell can serve the high speed user, whose passes the each cell within the second to receive the data from the network.

IV. IMPLEMENTATION

When a mobile move from one cell to different cell, while a conversation is in progress, the MSC automatically transfer the call to a new channel belonging to the new base station. The objective of the system is to design in such a way that, the handoff must be performed successfully and reduce the handoff as small as possible. So the threshold level should be choose above the stronger level which is required to get acceptable voice quality. Normally the value is -90 dB m to -100 dB m.$= P hand off – P min usable$should not be too large and too smallIf $ is too large, the unnecessary handoff occurs. This will increases the burden of MSC.If $ is too small, the time is not sufficient to complete a handoff by MSC. Therefore $ is chosen very carefully to meet these requirements.

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A.Reduce time to root cause

AGILENT TEST DRIVE TOOL provides you the full suite of key performance indicators spanning radio and handset environmentWith these KPI's and smart reporting, you can quickly identify anomalies and then drill down to pinpoint the root cause.It will reduce the time required to solve issues leading to greater productivity.

V. SUMMARY RESULTS AND DISCUSSION

This chapter explained about the significance of the drive test and challenges in the drive test. This test analyses the potential problems existing in the system and provides solutions to them before they affect the network performance.

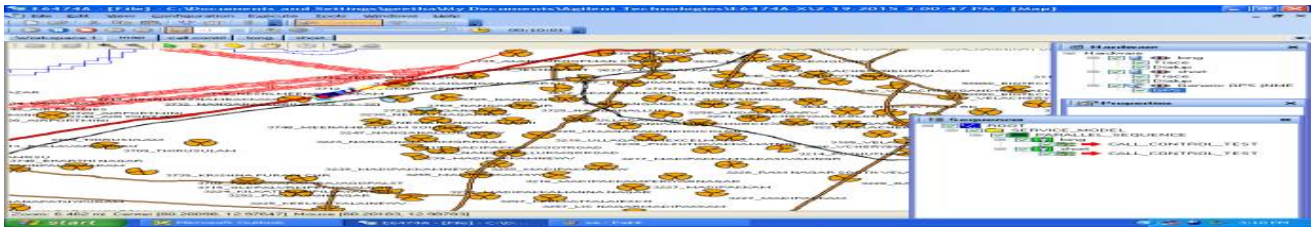

Fig.2 Path Traces During The DriveTest (Car Is Moving)

As the optimization of the network is being carried out by traveling/ moving on the route, the testing equipment's and tools are taken by a vehicle and so got the name as Drive Test. For Optimization purpose, the drive tests are carried out on different occasions.

- Initial network coverage verification and benchmarking
- Verification before and after changes
- Locating and measuring interference
- Locating areas where traffic problems exist
- Locate coverage holes
- Preventive maintenance
- Simultaneous measurements of the other networks

Fig.3 Photo Shot for Path Traces Study during the Driving

Before taking drive test the entire geographical coverage area is divided into three groups as Primary, Secondary and Miscellaneous routes as follows.

- **Primary route(street level)**

- Includes all major roads, highways and wide thoroughfares

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- **Secondary route(street level)**

- Includes all streets, subdivisions and compounds when accessible
- **Miscellaneous routes (in-building and special locations)**

Includes golf courses, beach resorts, shopping malls, department stores, convention centers, hotels and resorts.
And depending upon the different environment (areas), there may be complaint on poor quality, call disconnection etc. for which we have to go for the analysis of data. And the following Data Collection is possible in the drive tests which are essential for network development

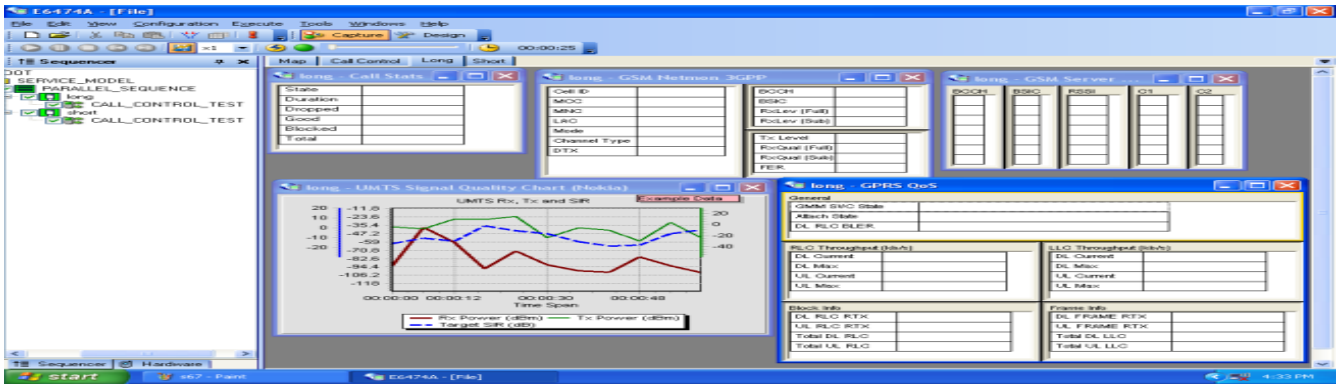

Fig.4Receiver Strength of the Long Call

Reduce time to root cause:

- AGILENT TEST DRIVE TOOL provides you the full suite of key performance indicators spanning radio and handset environment .
- With these KPI's and smart reporting, you can quickly identify anomalies and then drill down to pinpoint the root cause.
- It will reduce the time required to solve issues leading to greater productivity.

VI. CONCLUSION

This method is used improve the efficiency and correct Handover between the end users and increases the data rate transmission between the users.Since GMS is widely used method this will be useful to the all the users to the mobile GSM will not only provide the voice communication but also provide the SMS data transmission and videos can also be transmitted.

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BIOGRAPHY

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