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THE EFFECT OF INCREASE CELL CAPACITY DURING HANDOVER PROCESS IN MOBILE COMMUNICATION IN 4G NETWORK

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ABSTRACT

One of the most important challenges in mobile wireless networks communications is unavailability of enough channel to accommodate incoming handover calls. Handover in 4G network occurs when a device moves from the cell coverage serving it towards another; a process where the user established session must not be interrupted due to this cell change. to provide full mobility with steady signal strength, together with minimum degradation of quality of service, this journal is based on improving handover probability in mobile 4G network by modulation of the cell to get more cell. with a steady signal quality .Handoff simply is the procedure of providing the connection to the backbone network while a mobile terminal or subscriber moves across the boundaries of coverage of the wireless points of connection without being disconnected due to poor signal strength. This research work was carried out on mobile telecommunication of Nigeria (MTN) within eight different base stations. In this research work, lots of measures was taking into consideration to remedy the situation. An extensive drive test was carried out which actually showed us some handoff issue or problems on the network. and an enhanced cognitive radio model was developed coupled with an algorithm which was used to enhanced signal quality. A compares was carried and we found out that a great improvement was achieved by using the enhanced cognitive radio network. to monitor the signal quality and cell utilization and expansion.

KEY WORD: Mobile WiMAX, Matlab, cognitive radio, Channels, Base station, Handover, reinforcement learning

INTRODUCTION

1.1 BACKGROUND OF STUDY

Worldwide Interoperability for Microwave Access (WiMAX) is a wireless communication technology, which plays the best competitive role in the present world(Shivi and Qamar, 2016). WiMAX is a promising technology for achieving the highspeed data capacity and spectral efficiency requirements for wireless communication system. Rapid growth of wireless applications and services has made spectrum scarcity problem in the limited spectrum. Cognitive radio (CR) is an emerging technology attempting to resolve this problem through improved utilization of spectrum(Amzad*et al*, 2015). Channel allocation scheme is an important requirement in WiMAX for increasing utilization of spectrum.Cognitive Radio is founded to be the best solution which can work for the conflicts between spectrum underutilization and growing demand for spectrum.

Mobile WIMAX supports two types of handover at the link layer, i.e., inside a network. Hard handover is the default handover mechanism in a WIMAX network and soft handover is the optional handover mechanism. Hard handover is a Break-before-make procedure whereas soft handover is a Make-before-break procedure. Macro-diversity handover (MDHO) and Fast Base Station Switching (FBSS) are the soft handover mechanism in mobile. Both these handovers follows the initial scanning phase and the final actual handover phase. During the scanning phase the MS scans the neighboring base station for finding the target base station. Once the target base station is selected the actual handover process is performed and MS is connected to the new target base station. Obviously this has been a very big problem in our communication network since the insection of mobile communication because often time there is always break in transmission during the process and subscribers suffer a lot because of the handover failures experience during this process. Because of all these challenges it now lead me in bringing a new technique to improve on this network, that has bring about the increase in cell capacity with cognitive radio technology with reinforce learning that will monitor the environment and select the target base station to reduce ping pong during handover in 4G network which is used to proffer solution to the problem, or the ugly situation.

2: RELATED WORKS

2.1 . BACKGROUND AND RELATED WORKS

To improve the capacity of cellular networks, 3GPP considered a number of technologies including multiple inputs multiple outputs (MIMO), mm-wave communication and heterogeneous networks (HetNets) in 4g Advanced and beyond. Among the various technologies, heterogeneous networks have been adapted as key technology to provide services a massive number of users are comprised of different types of small cells with different capabilities. These include Remote Radio Head (RRH), Pico eNB etc. These low power small cells can reduce the load of the macro cells and increase user coverage at the same time. However, introducing of these small cells can arise in increased interference with mobility Coordinated multipoint and dual connection of two promising techniques to overcome these issues.

The eNBs of each of these clusters exchange information with one another and jointly process signals. Furthermore, multiple User Equipments (UEs) can receive their signals simultaneously from one or more transmission points in a coordinated or joint processing manner. They also analyze CoMP schemes and the deployment architectures as well as the benefits and drawbacks of them, we present dynamic coordinator based CoMP control architecture for reducing signaling overhead and feedback latency. Dual connectivity as we stated earlier, is another promising technology to increase the user throughput as well as to achieve the mobility enhancement. In dual connectivity, UEs can connect two or more eNBs simultaneously in control plane and data plane. 3GPP in suggested three deployment scenarios for heterogeneous networks for further studies.

Amzad et.al, (2015) investigated the performance of allocation of channels scheme namely Reserved Channel and Non Prioritized Scheme in WiMAX network. Their results were compared in terms of failure in handover, forced terminal probability, probability of incomplete calls, and probability of blocked calls.

They thereby proposed new channel allocation scheme namely Cognitive Radio Based Channel Scheme (CRBCS) for improving utilization of radio spectrum. The planned arrangement makes use of cognitive radio technology. From the simulation result for CRBCS channel allocation scheme, it was observed that the performance variables gave average values. Malathy and Muthuswamy (2016) presented a work using a buffer regime using guard channels such that, both new calls and handover calls are queued. With regard to this, a certain sum of guard channels is kept for handover calls and when the new calls are full, a channel from the guard channels is used. Mostafa Zaman Chowdhury (2018) used a control admission call which is on allocation of bandwidth adaptively for a wireless mobile system network using adaptive bandwidth allocation technique, for multi-class services in non - wired networks. The idea behind the proposed scheme is that, when available bandwidth is low, the scheme releases some bandwidth from already admitted non-real-time calls, as to accommodate new and handover calls. More bandwidth is released to support handover calls over new calls. Thus, the scheme results in higher priority for the handover calls over the new calls. The author has shown that the proposed scheme is quite effective in reducing the HCDP without sacrificing the bandwidth utilization. While the proposed scheme blocks more new calls instead of dropping handover calls, the scheme also decreases the number of handovers and the intermediate call time, as compared to the non-prioritized bandwidth-adaptive scheme. Compared to the A QoS handover priority scheme, our scheme provides better bandwidth utilization and less forced call termination probability. With the proposed scheme, the network operators would have the opportunity to control the minimum QoS level for each of the traffic classes, the desired level of HCDP and the new call blocking the likelihood of occurrence.

This research focused on problems found in cause of study, to achieve less unwanted delays, decrease number of scanning in neighbour base stations (NBSs) and reduce handover failure rates by increasing the cell capacity through modulation of channel. This will help to increase the number of channels in any base station. This forms the research gap

3 METHODOLOGY

3.1:RESEARCH METHODOLOGY

As presented previously in the earlier section, the key drive of this research is to improve handover in a mobile wimax network in Nigeria environment by reducing unnecessary scanning to the target base station. Handover method proposed based on enhanced cognitive radio network scheme in WiMAX network. The proposed method relies on a simple management scheme by utilizing all the idle channel, as well as faulty channel in the WiMAX network. On the other hand, the enhanced cognitive radio network will select the idle channel as wells as faulty channel for an effective hand over process. Therefore, WiMAX provider needs to learn and adapt the enhanced cognitive radio parameter to the environment for effective performance.

3.1.2 Measurement of Received Signal Strength (RSSI)

Received Signal Strength Indicator **(RSSI)** is a Radio-Frequency (RF) term. It is a measure of the power level that a RF device, such as Wimax, WiFi or 3G, 4G client, is receiving from the radio infrastructure at a given location and time, it is usually invisible to a user of a receiving device, but directly know to user of the wireless network of IEEE 802.11,IEEE 802.16 family. The higher the RSSI value, the stronger the signal, in that case for the meaningful good quality signal subtraction of noise on the line from signal power gives a better quality and stable signal. The RSS is build and used internally in a mobile communication network to ascertain when the amount of radio energy in the channel is below a certain threshold Signal, is a measure of signal strength relative to background noise. The ratio is usually measured in decibels (dB). The actual purpose of doing this is to know the received signal level threshold of the network

The channel allocated within that BS is may be over utilized or underutilize. From this analysis it has form my basis of the research work where I need to use the technique to see how to solve the problem.

The Figure 3.1 below shows the call procedure and the analysis of message sequence for each of the blocks. The experimental analysis was carried out for each of the blocks in a real call scenario near the site having wimax network. After analyzing message sequence of each stage, Drop call analysis was carried out. Drop call analysis was done by studying where exactly in the area call faced a drop and hence specific reason for the drop and also the suggested solution of the same. After analyzing the whole call scenario, average throughput and peak throughputs for both UL and DL were measured. However, there were also call drops on stream and videos during the drive and analysis of the result. Hopefully when the technique is applied during simulation, hopefully a better result will be achieved

3.2: ANALYSIS OF PHYSICAL LAYER MESSAGE SEQUENCE FOR CALL PROCEDURE

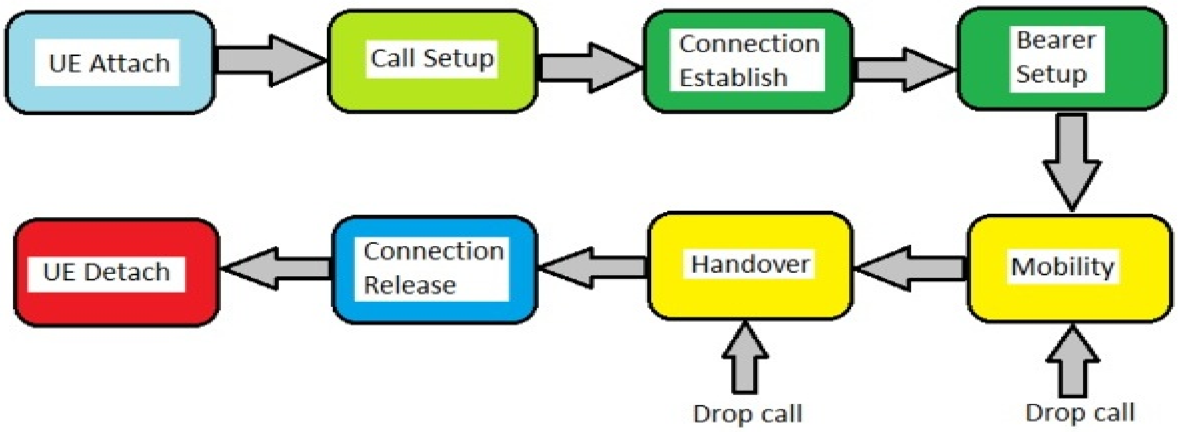

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Figure. 3.1: Control Plane Call Procedure

The physical layer in a communication network handles the transmission rate to improve the flow of data between the sender and the receiver. From fig 3.1 above when the user equipment is attached, the call sets up and get established with the receiver. On mobility leaving the current base station to the next base station handover sets up. And when it fails to connect to the next base station due to attenuation caused by either fading or unavailability of channels the call drops. In that case handover is not completed. So there is need to develop a model that will remedy the situation as we progress.

3.3 ALGORITHM DEVELOPED FOR INCREASING CELL CAPACITY TO ELIMINATE PING PONG

An algorithm developed as presented in figure 3.2 for increasing cell capacity to eliminate ping pong, this is shown below ..

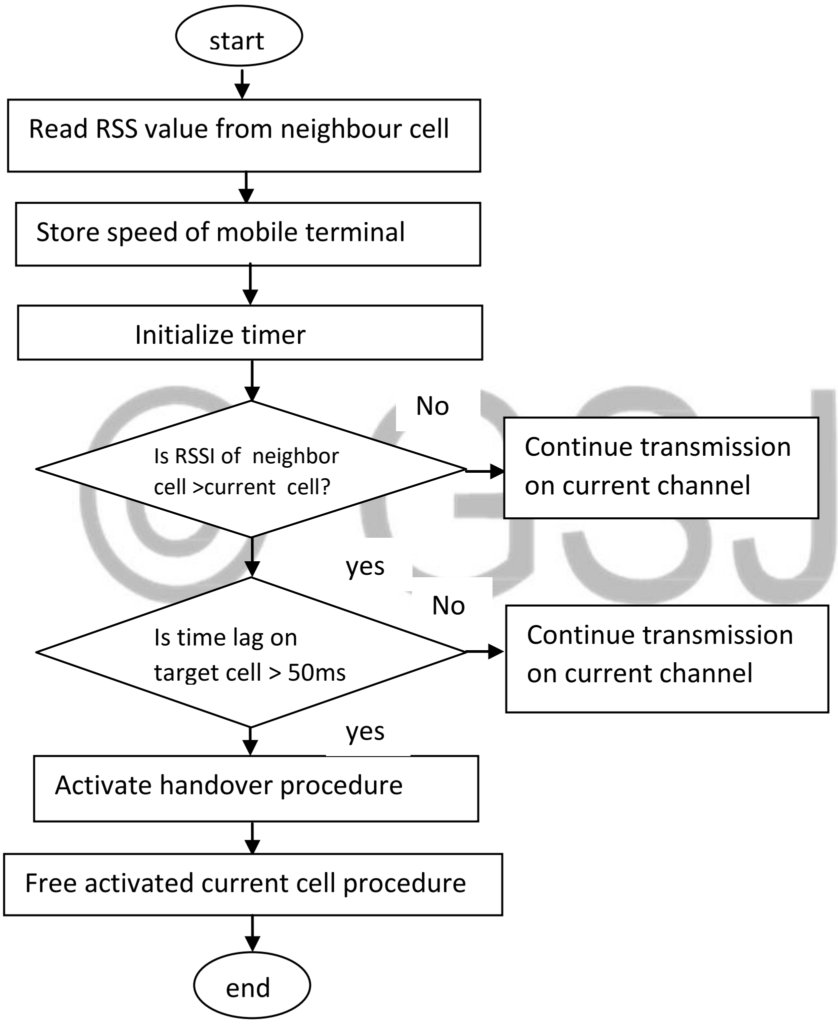

Figure 3.2 Flow chart for increasing cell capacity to eliminate ping pong

3.4 DEVELOPMENT OF A MATHEMATICAL MODEL THAT WILL ENHANCED HANDOVER IN WIMAX NETWORK

System Model

As shown in Figure 3.3, the proposed algorithms are divided into three stages. In the first stage, based on the user's preferences,RSS is selected to predict the target BS. using enhanced cognitive radio. In the next stage, modified multiple criteria with handover thresholds in (enhanced cognitive radio) algorithm with reinforce learning technique to selects the most appropriate BS that has the best signal strength within the wimax technology, which satisfies the user's preferences. Finally, RFL learning technique will decreases the ICI and CCI interferences from the surrounding BSs.

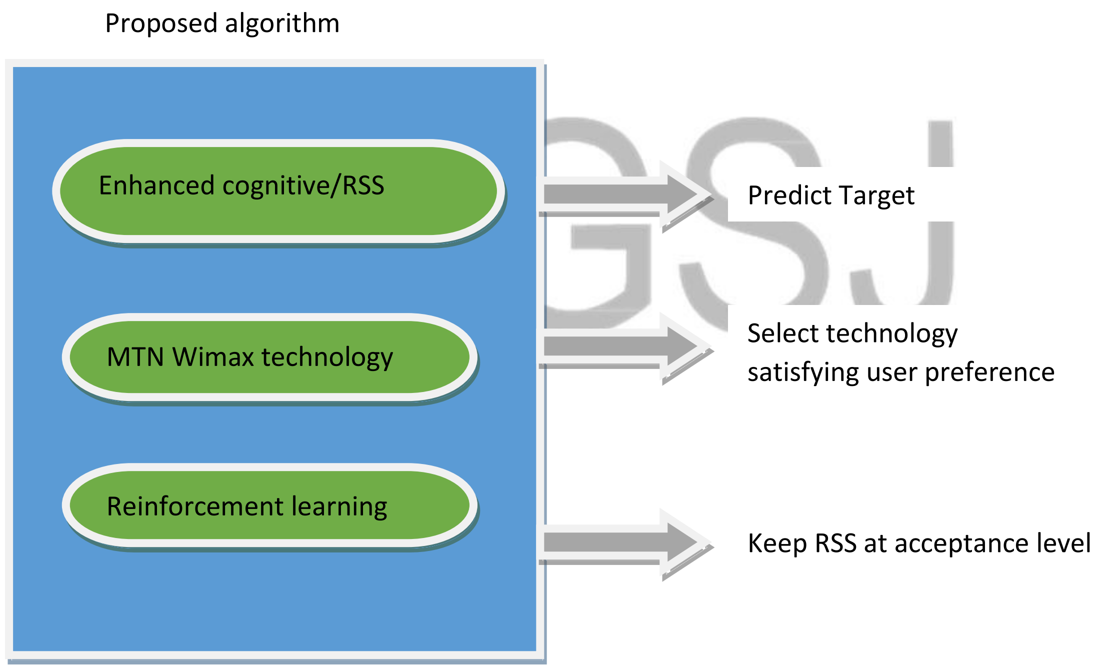

Figure: 3.3 THE SYSTEM MODELLING

3.5 PREDICTION APPROACHES OF THE TARGET BS

Due to the random movement of the MS, its suggestion list combines 2 possible BSs as a target BS. Each BS has a WIMAX technology; thus, the MS should go through 8 options as a searching process for the optimal connection for high and lower order frequencies as follows(1,wimax),(2, wimax),(3, wimax) (8,Wimax) . The introduction of RFL approaches significantly reduces the suggestion list to a maximum of two BSs with eight possibilities. Therefore, at least 60% of the search process is reduced out of the calculations. Consequently, a sharp decrease in probability of connection loss, prediction time, and system complexity is observed. In the following subsections, two efficient approaches are proposed, namely, enhanced cognitive and novel RSS predict approaches.

The enhanced cognitive approach is subject to MS' behavior, such as angle of movement, cross-distance, and velocity. Once the MS', RSS reaches the trigger threshold level -89dBM (trigger threshold is the proposed virtual RSS level located at level +5 dBm higher than handover threshold), the Enhanced cognitive radio device is activated through RFL to determine the current coordination in the layout of three dimensions (latitude (x), longitude (y), and ellipsoid height (z)). Then, the coordination is kept updating up to n -time intervals. n is the range between the trigger and handover threshold). For each coordination measurement, the crossed distance is calculated as the difference between the current and previous MS' location during one time interval (1). Also, the angle of movement is determined based on the x -axis as 0-degree:

$$D(n)=((x(n)-X(n-1))^2+(y(n)-y(n-1))^2+(z(n)-z(n-1))^2)^{1/2} \text{ ---------------------------------------(1)}$$

Where D(n) is the MS crossed distance, (x(n-1), y(n-1), Z(n-1)) is the MS coordination at n-1 times interval, and (x(n), y(n), z(n)) is the MS coordination at n time- interval

The MS velocity (v) is the MS crossed distance divided by the required time to cross it (t) (2):

$$V= \frac{D(n)}{t} \text{ ---(2)}$$

By calculating the movement angle, crossed distance, and velocity, the next BS is predicted accurately. The main enhancements added to GPS approach are power consumption and prediction cost along with high prediction accuracy, since the GPS device is activated during -time intervals (between the trigger and handover thresholds) instead of keeping the GPS device on all the time.

3.6: RSS APPROACH

The main objective of the novel RSS approach is to foretell the target BS in lower cost, in a simpler and faster way than the existing algorithms. It does not require any additional information, neither from the BS nor from the MS. MS' RSS is measured frequently for n-time intervals (from trigger to handover thresholds) from all surrounding BSs. Then, the highest RSS accumulative value is set as the target's BS. The robustness of the approach is that, it takes n-RSS measurements instead of one RSS measurement, so, even if the interferences blur the prediction decision for a while, the target BS keeps maintaining the highest RSS accumulative value which is higher than others. The RSS is calculated as the following:

$RSS_i (MS) = PT_i + GR + GT_i - Pl_i - LT_i - LR$,---(3)

$tarBS_i = MAX \sum_{J=I}^{n} \sum_{i=I}^{n} RSSij(MS)$,---(4)

where RSSi (MS)represents the RSS received at the MS from BS, the transmission powers of (BS_i),(PT_i) GR, and GT are the antenna gain of both MS and , respectively, PL is the path loss between BS_i and MS, LR and LT are the thermal receivers noise in both MS and BS_i , respectively, $tarBS_i$ represents the target base station *i*,n is the time interval between the trigger and handover threshold, J is the interval time index, and N is the total number of BSs.

3.7: HANDOVER RSS THRESHOLD AND TRIGGERED RSS THRESHOLD CALCULATIONS

While the MS is moving across cells, it keeps tracking the RSS' serving BS. Once it equals the RSS trigger threshold level, the selection process of the most appropriate target technology starts. If the MS' RSS of technology k at serving BS is less than the handover threshold and the MS' RSS of technology k at target BS*y* is bigger than or equal to the handover threshold, then the RSS condition is satisfied:

$|RSS_{m,k,x} < RSS_{th,x}|$,

$|RSS_{m,k,x} \geq RSS_{th,x}|$,---(5)

where is $RSS_{m,k,x}$ is RSS received at the MS_m from the technology k at service BS_x , and RSS $_{m,k,y}$ is RSS received at the MS_m from the technology k at target BS_y, while $RSS_{th,x}$ and $RSS_{th,y}$ are the handover thresholds for the service BS_x and target BS_y, respectively. To increase the accuracy of handover and trigger thresholds for both serving and target BSs, a self-learning algorithm is developed, as shown below:

$\text{RSS}_{\text{th,x}} = \frac{1}{r} x \sum_{i=1}^{1} (RSS_{m,x,k})$

$\text{RSS}_{\text{th,y}} = \frac{1}{r} x \sum_{i=1}^{1} (RSS_{m,y,k})$--(6)

Where r is the number of previous handover processes that occur between the serving BS_x and target BS_y, i is the index of the handover event, and RSS^im,y,k and are the RSS measurements at the MS_m from the serving BS_x and target BS_y, respectively, at handover event.

The self-learning algorithm enhanced cognitive radio triggered when signal strength drops below -89dBm handover events to another base station occurs, and then it keeps calculating and updating the threshold values of serving and target BSs up to n-time intervals. The main enhancement added by self-learning algorithm cognitive radio is the determination of the most accurate handover over time and trigger threshold values experimentally, which helps to prevent the sudden disconnections, especially in a high attenuation area, since the threshold values are set to be dynamically adopted with the surrounding area.

3.8: DEVELOPMENT OF A SIMULINK MODEL FOR A WIMAX RADIO NETWORK

Figure 3.4 and 3.5 are the developed WiMAX and cognitive radio Simulink models of the network showing the integration of the enhanced cognitive radio system. This was carried out using Matlab 2018 model that supports the enhanced cognitive radio Network. In this case two Simulink models were developed one is a Simulink model for Wimax and the other is Simulink model for Wimax with enhanced cognitive radio

This was used to carry out a simulation to evaluate the system performance when compared to the conventional Handover mechanism with enhanced cognitive radio network technology results are shown in chapter four as we progress

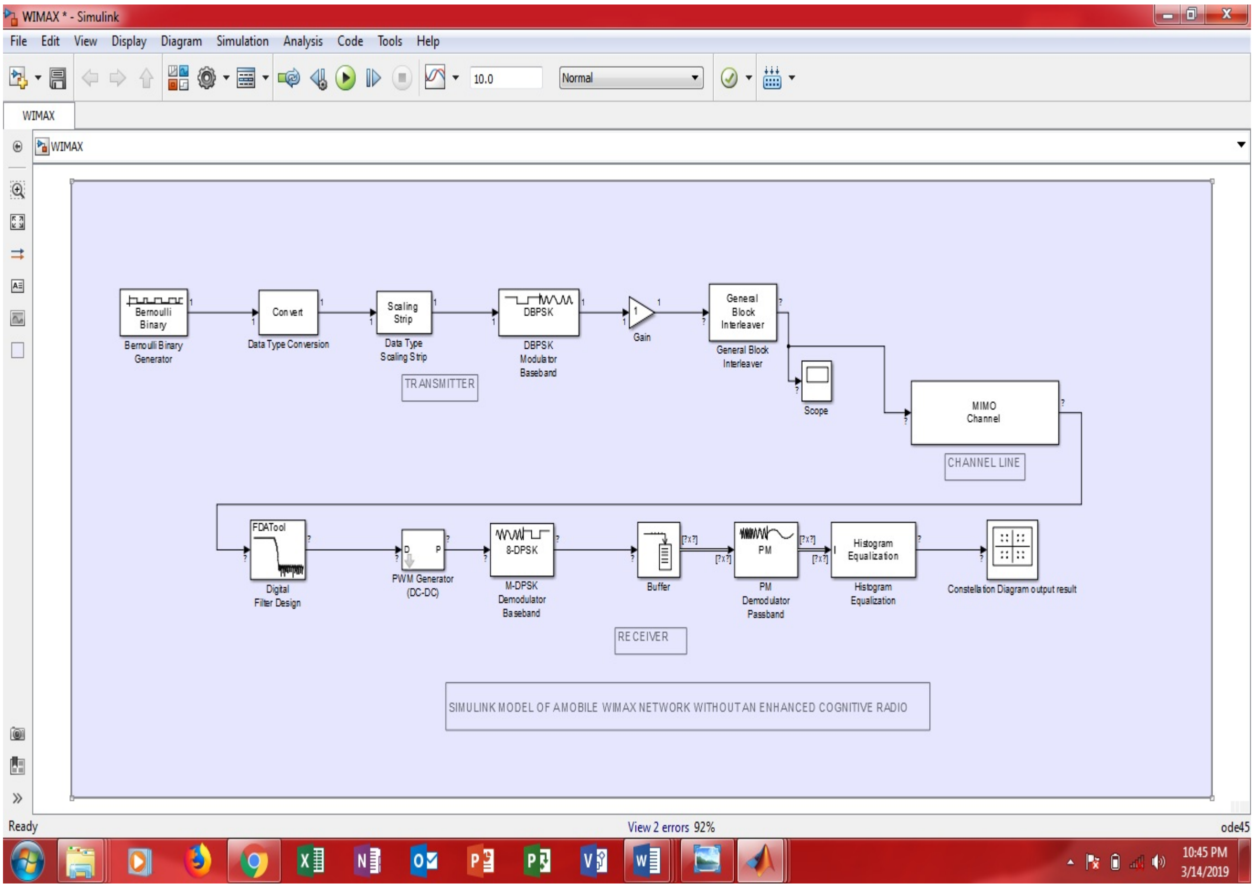

Fig. 3.4 A Wimax Simulink model

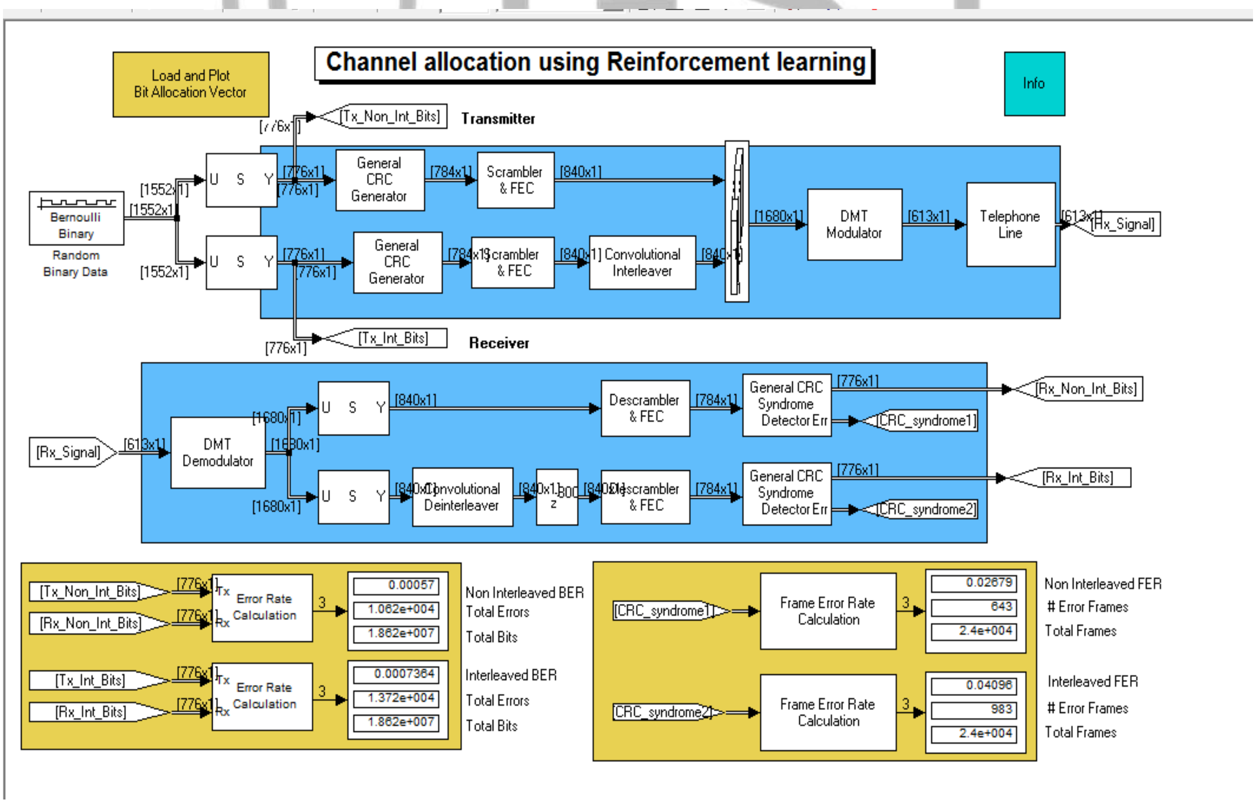

Fig. 3.5 A Developed wimax Simulink with an enhanced cognitive radio model

3.8.1 DETAILS OF THE SIMULINK MODELS AND ITS BLOCK FUNCTIONS

From the simulink model , the signal is digitalize into 16bits,but is divided into 8bits this is to enable cognitive radio to search faster within the 256 channels that make up the 8bits and will not cause a delay.

Demodulation re-assign the carrier frequency back to the modulating frequency. The frequency of the original signal .while Modulation assign a carrier frequency to the selected channel frequency which will be transferred to the mobile network

MODULATION: this is the process of converting data into radio waves by adding information to an electronic or optical carrier signal

SCRAMBLER. Its function is to re-arrange the bits in the order in which it is transmitted

FORWARD ERROR CORRECTION FEC. Its function is to correct the error before it is transmitted.

CONVOLUTION. It signifies how frequency range is divided into sub carrier

COGNITIVE RADIO. This is the multiplexer, it searches for so many channels and select the best one from the entire cell.

OFDM: it is a good expandability of bandwidth, it allows you to use the same frequency spectrum within a short distance.

CIRCLE REDUNDANCY CODE :this generates a code to detect errors

Co - channel are channels that are using the same frequency spectrum

SCRABLER	FEC: FORWARD ERROR CORRECTION	CRC: Circle redundancy check	The cognitive radio multiplexer

4 SIMULATION

4.1 PARAMETERS FOR SIMULATION

Various parameters have been used in all simulation scenarios to analyze the handover behavior under specific circumstances both homogeneously and heterogeneously. The simulation parameters that are used in this research are listed in Table 4.1. During the simulation, all nodes start performing handover from 0 second until the time of simulation ends (25s).

Performance can be analyzed using parameters like throughput, Handover latency, and average end- to-end delay.

Table 4.1: Simulation Parameter

Parameter	**Value**
Traffic	Constant Bit Rate (CBR)
Simulation area	1500x1500 m
Speed	0-10mps, 0-20mps
FFT	1024
Channel frequency	2.4 GHZ
Channel Bandwidth (MHZ)	20
Frame Duration (ms)	20
BS Transmitted Power (dbm)	20
SS Transmitted Power (dbm)	20
Antenna Type	Omni-directional
Base Station Antenna Height	32 m
MS Antenna Height	1.5 m
Neighbour BS Scanning RSS Trigger	-76
Handover RSS Trigger(dBm)	-69 to -75
Cyclic Prefix Factor	8
Service Flow Timeout Interval	15 seconds
Simulation Time	500 Seconds
No of packet sent	30

4.2: Simulation Results

In this simulation, various performance of WiMAX handover is used Matlab simulator. The proposed scheme focused on improving the handover performance firstly in terms of reducing the scanning situations, hence reducing handover time (delay) and in choosing the best target base station (TBS) for handover.

This section explains the simulation results of the proposed handover techniques (Enhanced Cognitive Radio based Handover Technique) and compare it with the result of the network characterized. The proposed scheme focused on improving the handover performance firstly in terms of reducing the scanning situations, hence reducing handover time (delay) and in choosing the best TBS for handover.

Table 4.2: Showing result of a wimax network on handover drop calls (HODC) with enhanced cognitive radio and without enhanced cognitive radio.

SITE	Without ECR	With ECR
RV0100H	26	5
RV0020H	23	5
RV0522H	38	3
RV0643H	23	2
RV0095H	24	3
RV0708H	21	2
RV0073H	25	3
RV0111H	26	2

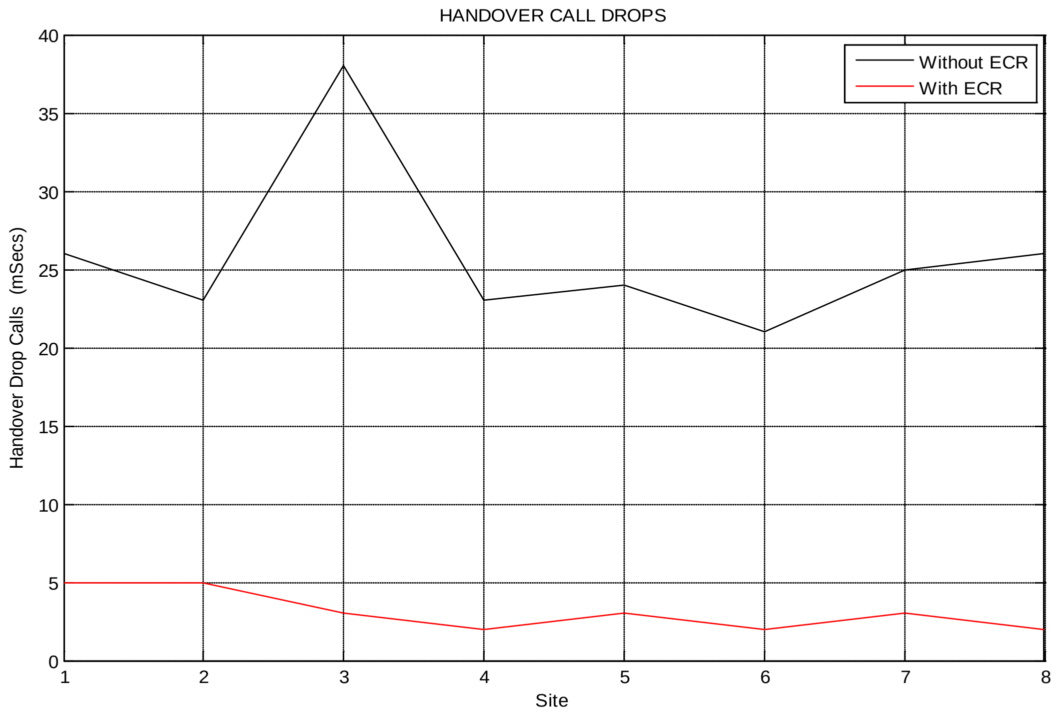

Figure 4.1:A simulated graph showing handover drop calls(HODC) with enhanced cognitive radio and without enhanced cognitive radio

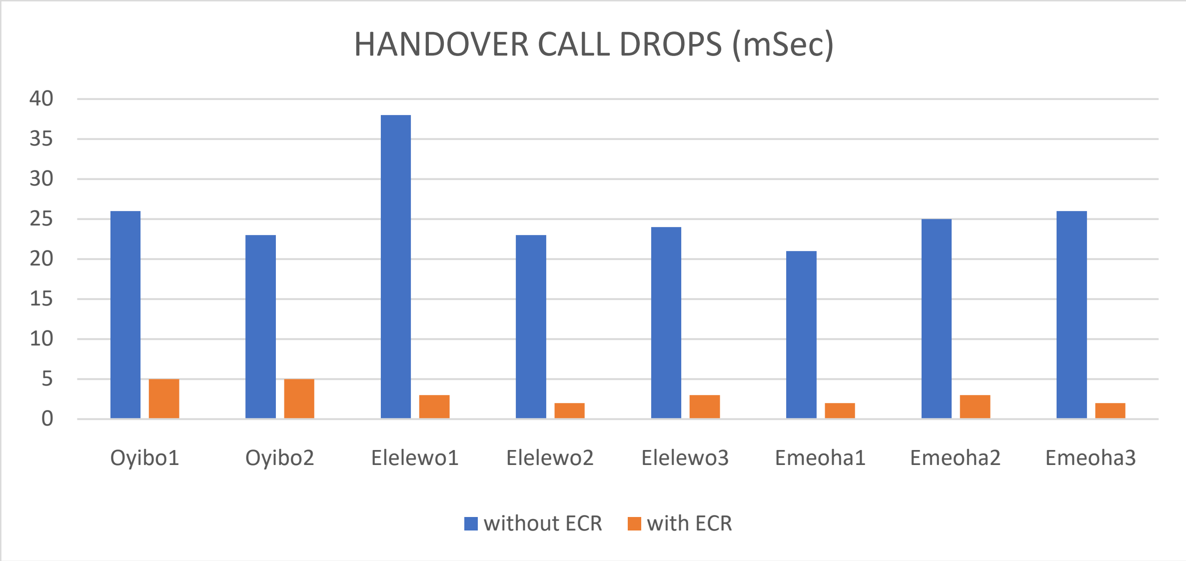

Figure 4.2:ABar graph showing handover drop calls(HODC) with enhanced cognitive radio and without enhanced cognitive radio

From the simulated model of WiMAX network as shown in table 4.2. The percentage handover drops calls using enhanced cognitive radio-based handover technique was presented. The simulation graph was also presented in figures 4.1 and 4.2 respectively. Results show that with the enhanced cognitive radio the handover drop calls was reduced within the range of 1.31-6.57 (s) compare to the empirical result that ranged between 21.12-35.83 (s) which show a good reduction in the percentage handover drop calls of 5.25% against 14.71%. This shows that with enhanced cognitive radio (ECR) percentage handover drop calls is reduced to the barest minimum

Table 4.3: Showing result of a wimax network on handover delay (HOD) with enhanced cognitive radio and without enhanced cognitive radio.

SITE	Without ECR	With ECR
RV0100H	10.63	6.65
RV0020H	10.44	0.66
RV0522H	16.32	0.92
RV0643H	10.30	1.19
RV0095H	10.25	3.40.
RV0708H	10.32	2.06
RV0073H	10.00	4.32

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RV0111H	10.47	0.06

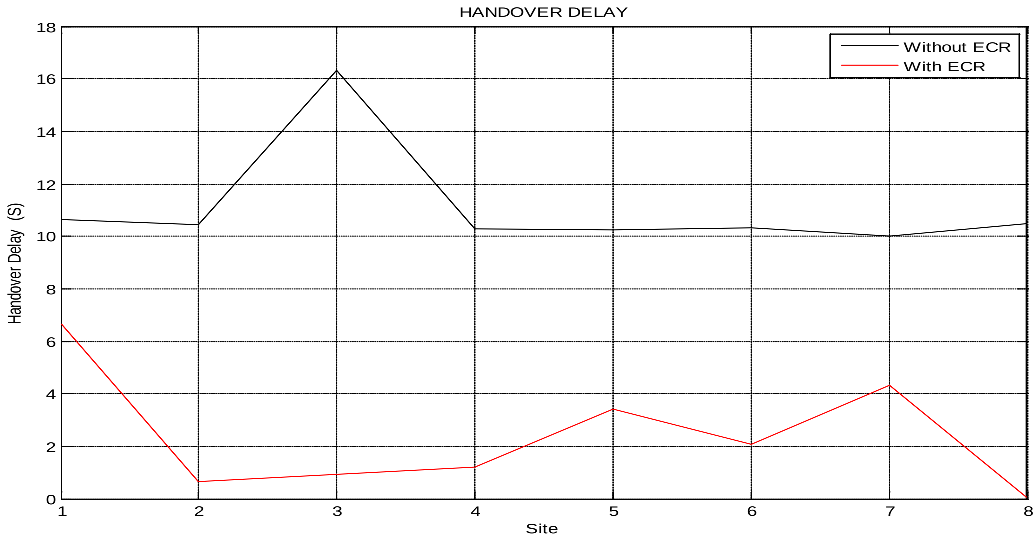

Figure 4.3: A simulated graph showing percentage handover Delay (HOD) with enhanced cognitive radio and without enhanced cognitive radio

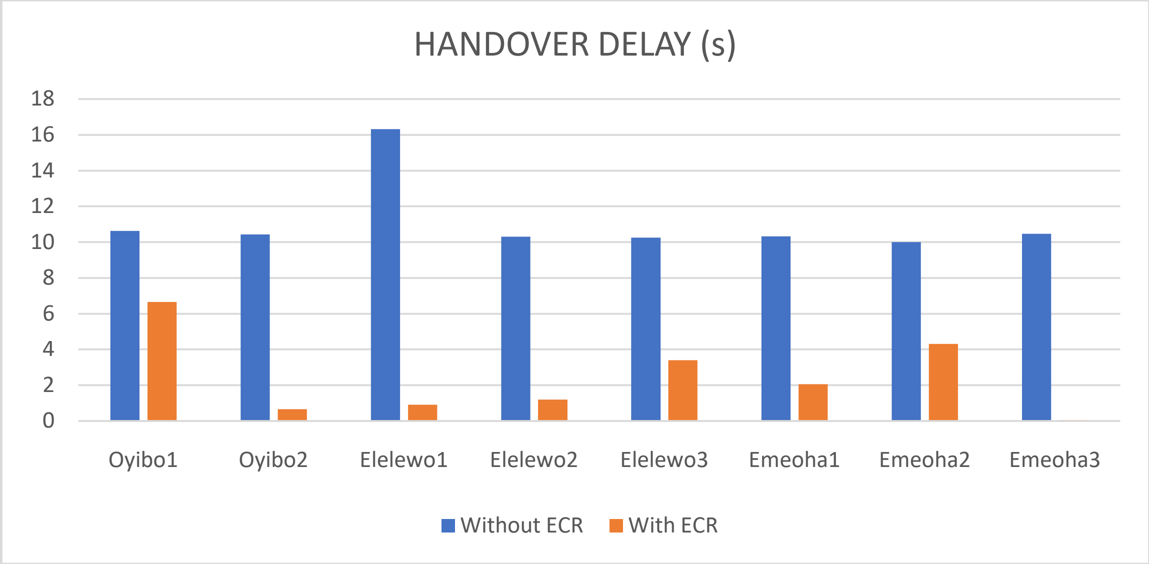

Figure 4.4: A Bar graph showing percentage handover Delay (HOD) with enhanced cognitive radio and without enhanced cognitive radio

From Table 4.3 It is observed that the handover delay using enhanced cognitive radio-based handover technique was presented. The simulation graph and bar graph was also presented in figures 4.3 and 4.4 respectively. Results show that with the enhanced cognitive radio the handover delay was reduced within the range of 0.06-6.56(S) compare to the empirical result that ranged between 10.00-16.32 (S) which show a good reduction in the handover delay. This shows that with enhanced cognitive radio (ECR) handover delay is significantly reduced in comparison with the empirical approach. However, The performance rating of the proposed technique was high and a improvement was achieved

Table 4.4: Showing result of a wimax network on handover call service rate (HOCSR) with enhanced cognitive radio and without enhanced cognitive radio.

SITE	Without ECR	With ECR
RV0100H	0.0171	0.88
RV0020H	0.0184	0.698
RV0522H	0.0152	0.72
RV0643H	0.0142	0.58
RV0095H	0.0167	0.41
RV0708H	0.0158	0.55
RV0073H	0.0165	0.50
RV0111H	0.0137	0.66

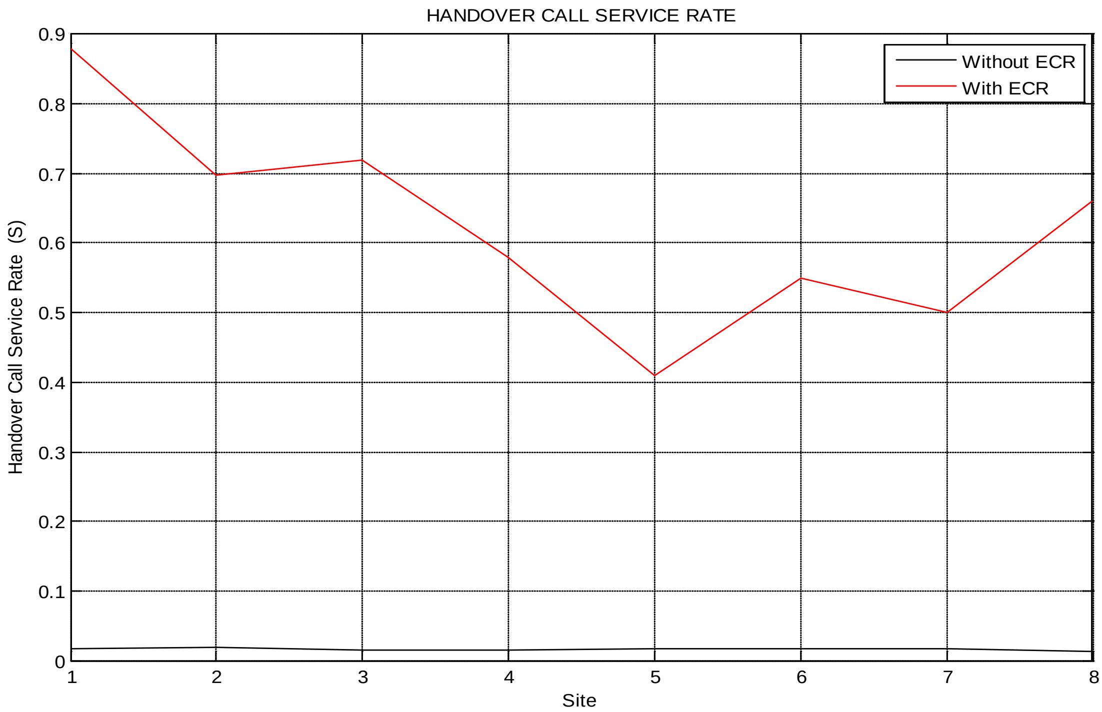

Figure 4.5: A simulated graph showing handover call service rate (HOCSR) with enhanced cognitive radio and without enhanced cognitive radio

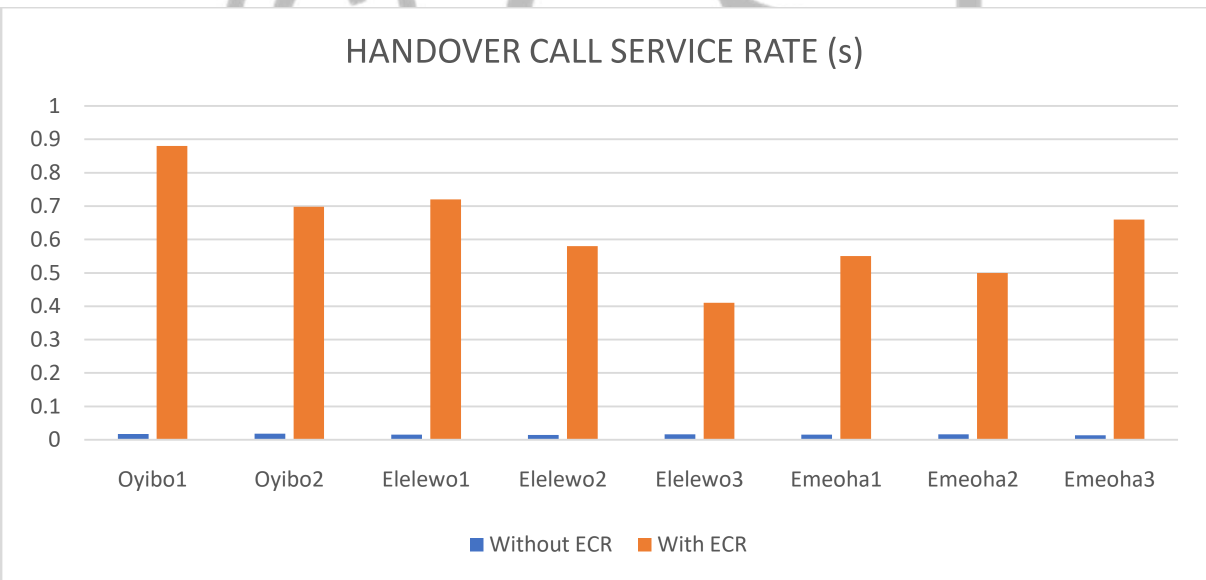

Figure 4.6 A bar chart representing handover call service rate with enhanced cognitive radio and without enhanced cognitive radio

On the handover call service rate results as presented in table 4.4, it is observed that with enhanced cognitive radio there was increase in the handover call service rate. Furthermore, the simulation graphs are as shown in figures 4.5 and 4.6 respectively. From the obtained

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results, the enhanced cognitive radio technique presented a high percentage handover call service rate (between 0.329 – 0.373 (s)) against that of the empirical result that ranged between 0.0137 – 0.0184 (s). From these results, it can be deduced that with enhanced cognitive radio (ECR) percentage handover call service rate significantly increased in comparison with the empirical approach. This thereby making the enhanced cognitive radio (ECR) a preferred technology for handover analysis.

Table 4.5: Showing result of a WiMAX network on channel utilization (CU) with enhanced cognitive radio and without enhanced cognitive radio.

SITE	Without ECR	With ECR
RV0100H	78.00	83
RV0020H	85.00	86
RV0522H	79.00	84
RV0643H	83.00	83
RV0095H	87.00	89
RV0708H	86.00	90
RV0073H	83.00	86
RV0111H	84.00	85

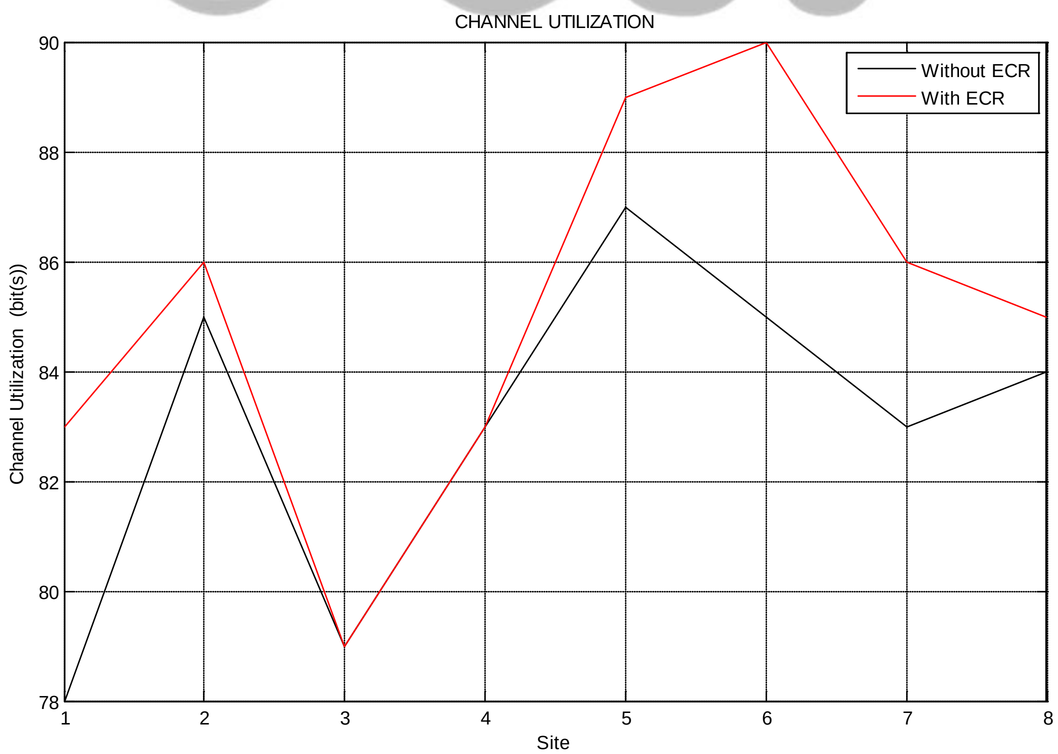

Figure 4.7: A simulated graph showing channelutilization (CU) with enhanced cognitive radio and without enhanced cognitive radio

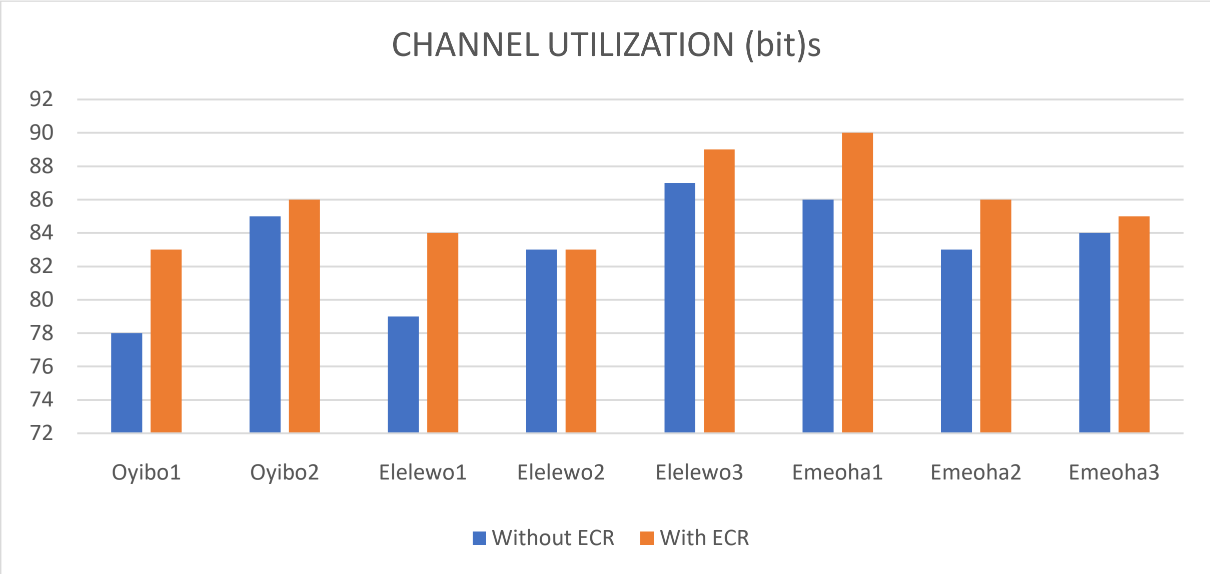

Figure 4.8: A Bar graph showing channelutilization (CU) with enhanced cognitive radio and without enhanced cognitive radio

According to table 4.5, the percentage channel utilization results using enhanced cognitive radio-based handover technique and empirical approach was presented. The simulation graph was also presented as shown in figures 4.7 and 4.8 respectively. From these results the enhanced cognitive radio presented relatively better percentage channel utilization as all the channels was optimal utilized compared to the empirical result obtained.

CONCLUSION AND RECOMMENDATION

The study is on improving handover in mobile WiMAX radio Network with cognitive radio technology. One of the factors responsible in poor degradation of a network is poor signal quality and unavailability of channels during handover. These hand over failures can occurs at any given time mostly during Christmas, Sala, convocation ceremony, matriculation, in fact almost every festive period. An empirical field measurement was carried out to determine the level of signal from (MTN) mobile telecommunication of Nigeria, the received signal strength, data, handover failures, data rate were all collected. And a model was developed through MATLAB Simulink showed from the models that the Network operators still need to improve on the network performance to guarantee good services, and also if a

100% compliance from NCC standard will be applied or implemented there will be a reduce handover failures in our mobile radio communication network. However, observation made shows that the main aim of the network operators is to accumulate more subscribers without even considering the side effect of it to their subscriber.

REREFERENCE

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