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A Policy Based Efficient Handover Mechanism with Mobility Management for 4G/LTE

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ABSTRACT: "The quick expanding populace of clients prompts an exponential increment in activity interest for the celluer system. Offloading activity to the macrocell is turning into the significant worry of administrators. The femtocell is at first known as Home BS (HBS) committed for the private use where just the essential client has the entrance power. It has as of late advanced to the femtocell or little cell that permits the open access of any versatile endorsers (i.e. the indoor little BSs sent by the administrator in the shopping centers). Our paper is centered around such system thus termed as the femtocell and macrocell system where the macrocell covers with the thickly sent little BS. The irregular scope of macrocell causes the expanded enlistment flagging overhead in the femtocell and macrocell system where the thick femtocellls covered with a macrocell are apportioned into little Tracking Areas (TAs). After examination another methodology known as Delay Registration (DR) calculation is proposed for overhead lessening with the cost of sacrificing the movement offloading ability of the femtocell and macrocell in such case. Be that as it may, its achievability is enormously confined on the grounds that its powerful execution requires the precise estimation of the portable station (MS) data. We plan another plan to empower both the low flagging cost area overhaul without the convoluted data estimation and the movement offloading utilizing the between cell handover."

KEYWORDS: Handoff, Femtocell, Macrocell, DR, Long Term Evolution (LET), Mobility Management, Cell association algorithms

I. INTRODUCTION

Recently, with the instantly increase of various mobile users around in the world, total mobile traffics of the whole mobile world are exponentially growing [1]. With over one billion Smartphone's in use around the world today, and with that number expected to double in the next two years, it's no surprise that one of the biggest disappoint in everyday life is dropped calls. Among these users, most of them highly desire high-data-rate and low-delay transmissions and wireless communication systems, the primary challenge is to improve the indoor coverage, capacity increase as well as to provide users the mobile services with highly data rates in a very cost effective way [2].The key feature of the femtocell and Macrocell technology are users require User Equipment (UE) [3]. The deployment cost of the femtocell is very low whereas it provides a high data rate. Thus, the organization of femtocells at a large scale is the ultimate objective of this technology. In Fact, a well-design femtocell & macrocell-integrated network can large amounts of traffic from congested and expensive macrocell networks to femtocell networks [4]. They are connected to the network operator through a backhaul, e.g. Digital Subscriber Line (DSL), optical fibre etc. [5]. In our case, the macrocell will consist of long range base stations (macrocells) that provides cellular coverage to mobile users, while the femtocell will be comprise of short range access points (femtocells) that offer large throughputs and new applications to indoor customers. Making a handoff decision is such an issue where the user has intense power levels ranging from Macro Base Station (MBS) to Femto Base Station (FBS). From a Base Station's (BS) perspective, there may be many users with close SNR values needing service but all users can't be accommodated due to bandwidth limitation. To make

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these decisions, appropriate handoff mechanisms that need to be adapted to fully exploit the benefits of these various scenarios in this network. The discontinuous coverage of femtocell and macrocell causes the increased registration signalling overhead in the femtocell and macrocell network where the dense femtocells overlapped with a macrocell are partitioned into small TAs (Tracking Areas) [1][3].Delay Registration (DR) algorithm is proposal for overhead reduction with the expense of sacrificing the traffic offloading capability of the femtocell in such case. However, its feasibility is greatly restricted because its effective implementation requires the accurate estimation of the mobile station (MS) information. In this paper we design a different scheme to enable both the low signaling cost location update without the complicated information estimation and the traffic offloading using the inter-cell handover. The theoretical analysis and the simulation experiments are conducted for the performance evaluation and DR algorithm in reducing the signaling cost while achieving the better adaptability to the high and diverse mobility environment [7]. We aim at developing a low complexity algorithm with a small dwell time before handing off a macrocell user to a near femtocell and vice-versa. When the number of users in the network is smaller in comparison to the available Femto Base Station (FBS), we invigilate a better performance in reduce unnecessary handoffs and femtocell technology has been propose to offload user data traffic from the macrocell to the femtocell and extend the limited coverage of the mobile communication Network [1].

II. LTE FEMTOCELL ARCHITECTURE

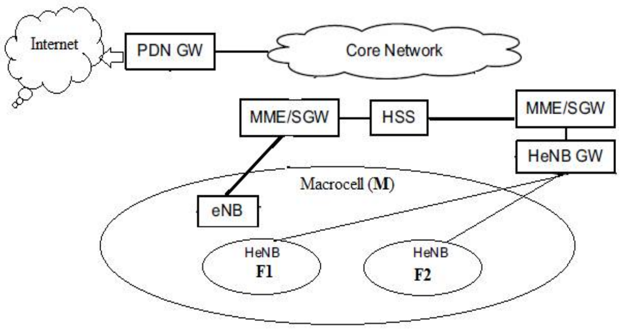

Fig. 1. The femtocell/macrocell network model in LTE system.

In this section presents LTE Femtocell System Architecture t, as depicted in figure 1, for the femtocell/macrocell network based upon the Long Term Evolution (LTE) system in the 3rd Generation Partnership Project (3GPP). The macrocell ***M*** overlays with the femtocells ***F1, F2*** and is connected to the core network (CN) through the mobility management entity (MME) and serving gateway (SGW) by evolved node base (eNB). Herein the eNB is equivalent to the BS and MME is implemented in the single node with SGW. The small Base Station of femtocell is named as home eNB (HeNB) that connects to the CN through the HeNB gateway (HeNB GW) and MME/SGW. The mobile CN connects the Internet with packet data network gateway (PDN GW). The coverage service area of femtocells may be discontinuous.

The cells in LTE are grouped into tracking areas (TAs) each with a unique TA ID (TAI) broadcast by the eNB. The MS can identify which TA it is in with TAI. When moving from one TA to another, the MS reports the TAI of the cell where it resides to the home subscriber server (HSS). The CN queries HSS to obtain the TAI of the called MS and instructs all cells in the TA to page the MS. The call is finally routed to the MS through the cell where the response is launched.

LTE allows the MS to belong to a list of various TAsto avoid the frequent location registration when the MS is “ping-ponging” between two TAs [7]. It however causes the potential heavy burden in the mobility management for the femtocell/macrocell network. Given all the femtocells are assigned with the same TAI but different from macrocell, the huge paging cost is accumulated because the dense femtocell deployment requires the MS searching involving hundreds to thousands of small BSs. If the femtocells are partitioned into small TAs each with the unique TAI, the MS must frequentlyperform TA update to keep the multiple TA associations which generates massive signaling overhead in the location registration.

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There are some efforts on optimizing the mobility management for LTE small cells or Femtocell . Especially, [8] presents a Delay Registration (DR) algorithm to reduce the signaling overhead in the network. It postpones the location registration until a delay timer expires when MS enters the overlapped femtocell. However, the overhead is reduced at the expense of degrading the traffic offload capability. Call arrival rate for each MS must be estimated very accurately for the effective implementation. These requirements restrict its feasibility meanwhile causing more processing load in the CN nodes such as SGW.

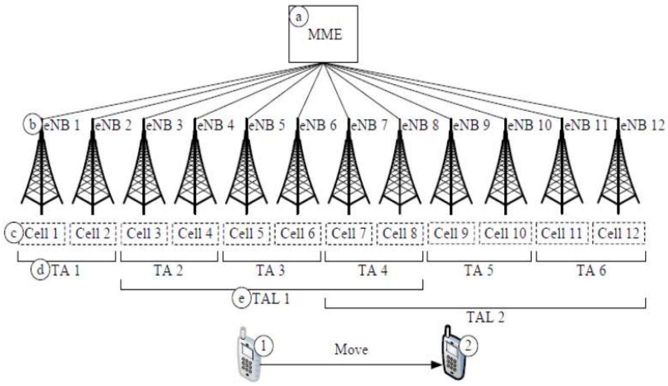

Fig. 2. Mobility Management Architecture for LTE based Networks.

In Long Term Evolution (LTE), the Mobility Management Entity is responsible for the mobility management function in which is connected to a group of evolved Node Base Stations (Fig.(b)). Radio coverage of an eNB is called a cell (Fig (c)). Every cell has a unique cell identity. The cells are group into the Tracking Areas (TAs; e.g., TA 1 contains Cell 1 and Cell 2 in Fig(d)). Every Tracking Areas has a unique Tracking Area identity (TAI). The Tracking areas are further grouped into TA Lists (TALs). In Figure, TAL 1consists of TA 2, TA 3 and TA 4 (Fig (e)).A User Equipment stores (UE) the TAL that includes the TA where the User Equipment (UE) resides. Now, Mobility Management has four key Challenges which are listed are Femtocell characterization / identification, Access Control, Network Discovery, Handover.

III. Related Works

In this section, we discuss earlier work aiming at efficient handoff mechanisms which reduce system latencies and ping pong effect. A combination of received signal strengths from a serving MBS and a target femto base station (FBS) is considered as a parameter for efficient handoff decision. A Different types of access scheme and a femtocell initiated handoff procedure with adaptive threshold were studied in When it comes to making a proper handoff decision, delay time is critical [1][6]. It is not a latency induced by the system but a guard time to check the reliability of a BS [3].

IV. Proposed System Model

A. Assumptions and Equations

Let P_0 be the MBS transmit power and $h_{0,K}$ be the channel gain between the MBS and k-th user. Likewise, P_i and $h_{i,K}$where $i \geq 1$ denote the transmit power of the i-th FBS as well as the channel gain between the i-th FBS and k-th user. We assume an additional white Gaussian noise (AWGN) at Mobile users with power densityσ^2 [1] [3]. The capacity at the k-th user from its serving MBS is given by:

$$C_k = \frac{B}{N_0}\log_2\left(1 + \frac{|h_{0,k}|2\,P_0}{\sigma^2+I_{0,k}}\right)(1)$$

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WhereB is the network bandwidth, N_0 is the number of MBS users, and $I_{0,k} = \sum_{i=1}^{M} |h_{l,k}|^2 P_i$ is the interference from FBS's. We assume the bandwidth is equally allocated to all served users [1] [3]. The capacity at the k-th user from the i-th FBS is given by:

$$C_j = \frac{B}{N_i} \log_2 \left(1 + \frac{|h_{i,j}|2\ P_i}{\sigma^2 + I_{i,j}}\right) (2)$$

Where N_i is the number of users served by the i-th FBS and $I_{i,j} = \sum_{l=1,l=i}^{M} |h_{l,k}|^2 P_i$is the interference from the MBS and other FBS's.

B. Case I : Network Capacity

Initially, our objective is to maximize the total network capacity. By denoting U_i as the set of users connected to the i-th BS, we have $N_i = |N_i|$. Then, by using combination of 1 and 2 , the objective function can be expressed as:

$$\text{Max:} C_{total} = \sum_{i=0}^{M} \frac{B}{N_i} \sum_{j \in U_i} \log_2 \left(\frac{1}{1 - n_{i,j}}\right) \qquad (4)$$

The optimal solution to the problem above is that each BS chooses one user with the highest SINR to connect. This solution is able to achieve the highest network throughput by assigning only one best user to each BS. The rest of users are not allowed to access the network. This solution is unfair and inefficient because only a small portion of users are served. With this scheme, this system can only accommodate at most M + 1 (the number of BS's) users [1].

C. Case II : User assignment

To achieve fairness among users, we divide the bandwidth equally and allocate them to all users connected to the same Base station (BS). Then, a straightforward heuristic solution is proposed that each user j chooses a Base station (BS) with the highest Signal-to-Interference-Plus-Noise Ratio (SINR) to connect. However, this approach may incur the (QoS) problems, especially when all users choose the same Base station (BS) to connect. Each user is assigned with a very small bandwidth which leads to extremely low capacity for each user. On the other hand, the users with low Signal-to-Interference-Plus-Noise Ratio (SINR) from any of Base station (BS)'s may jeopardize the total network throughput. Obviously, blocking these users can improve the total network capacity. To guarantee the minimum QoS requirements of each user and maximize the total network capacity, only users with Signal-to-Interference-Plus-Noise Ratio (SINR) above λ1 are allowed to access network and each Base station (BS) is able to serve at most N_{max}users [1] [3].

Propose workflow chart type in here and Please tell me how manage Mobility Management.

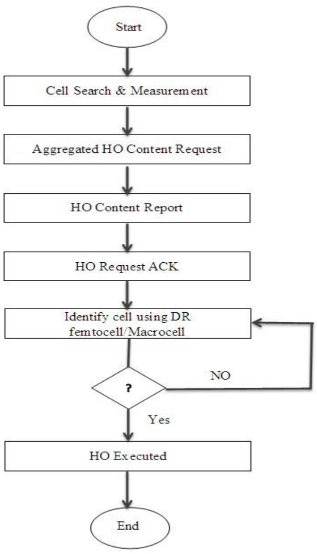

Fig-3 Flow Chart of Propose work

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We proposal a new scheme for low cost management in Femtocell and Macrocell Network and reduce time required for Mobile Station (MS) for find free Femtocell and Marcocell in latency period. so accuracy inter Mobile Station (MS) of power dissipation and energy for node is maintain so signal reach on station on desire latency using DR algorithms.

This section proposes the Delay Registration (DR) algorithm. The DR algorithm is exercised at the MS to determine whether the registration should been performing and modification is requirements at the network side. To simplify our description, we consider the following MS moving behavior: A macrocell overlays with several femtocells. Let Lm be the LAI assigned to the macrocell and Lf be the LAI assigned to the overlapped femtocells. Initially, an MS is in the non-overlapped area in the macrocell, and Lm is the LAI stored in the location database. At time t, the MS moves into the overlapped femtocell (i.e., the MS can also receive Lf) and stays in the overlapped femtocell for tf. At t+tf , the MS moves from the overlapped femtocell into the macrocell, and can no longer receive Lf.

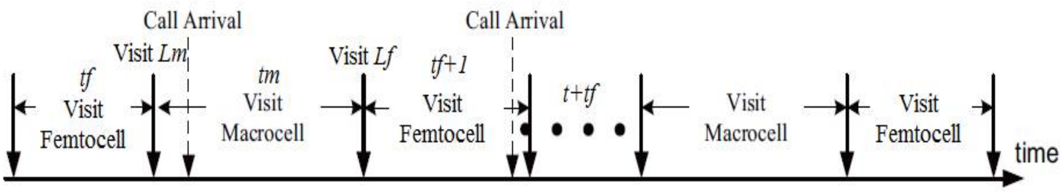

Fig-4 Timing diagram for the switching cell of the Mobile Station's.

According to Proposed Flow Chart Mobility Management by based on LET Networks. So Source to Destination node can communicate and Channel length and maintain using Proposed Policy. In base flow work source to destination flow will work, connect to Target Cell with ongoing call without Disconnecting call and it leave channel or disconnect to Source.It reduces the signaling cost mean while preserving the traffic offload capability of the Femtocell , but require any Modification on the existing networks.

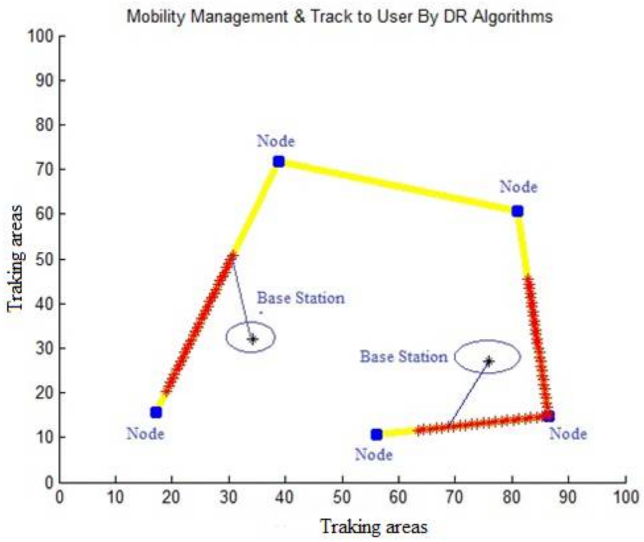

Fig-4 Delay Registration (DR)Algo. Mobility Management TAs Model.

Mobility Management: Aim: Mobility Management is to track where the Subscribers are allowing Call, SMS, and other Mobile phone Services to be delivered to them. Tracking Management is to manage Tracking Area. Tracking Area is designed for UE location management; its function is similar to Location Area (LA) and Routing Area (RA) in 3G network system. TA is designed for meeting to following points.

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- Synchronized the location information of UE with E-UTRAN control node and LTE control node.
- When UE status is idle, the LTE control node is necessary to know UE in which tracking area.
- When core network is intending to page UE, it is necessary to page all tracking areas that UE have been registered.
- Reduced the signaling produced by UE location changed.

Mobility Management for UE between LTE networks indicates mobility management between UMTS/3GPP and LTE. Between 4G LTE/ LTE network systems, the handover is always necessary to reserve resource for target eNB. The Serving-GW is also key part of core network; their functions mainly are to routing and transmit the packet data.

Handoff Schema: The parameters utilized are SINR which is a combined calculate of a wireless channel's quality, fairness as Quality of Services (QoS) which is associated to the later and the guard time Or delay time used for which a Mobile Base Stations or Femto Base Stations maintains a threshold signal to interference plus noise ratio (SINR) before handover. [1]

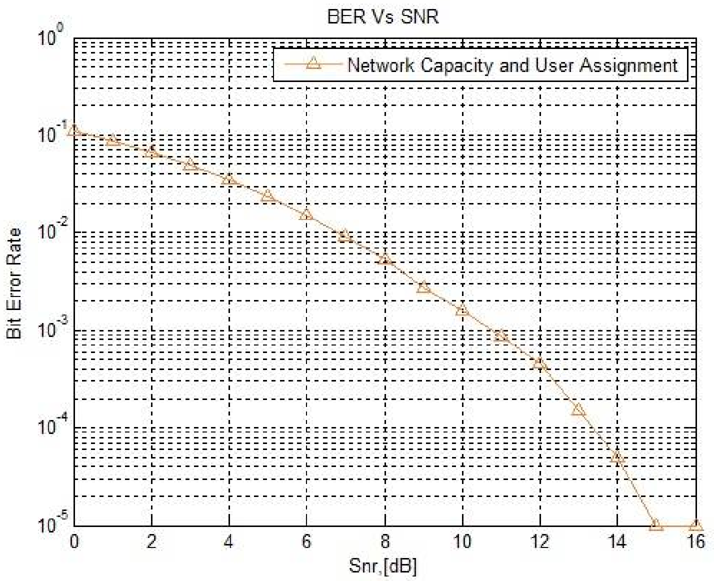

Fig 6 : Network Capacity and User Assignment. (Result)

Case I: Network ability

- Firstly, our purpose is to maximize the whole network capacity.

Case II: User assignment

- Every Each users are separate the bandwidth equally and distribute them to every users connected to the same Base station (BS).

- ***Heuristic Scheme: Opportunistic Users:***This schema serves as a base model to differentiate our proposedSchema 1 & schema 2. Client picks a Femto Base Station offering the best SINR for handoff, an eager instrument. Need for making a handoff choice simply in view of SINR neither considers reasonableness to neither different clients nor general system execution. To consider the decency among clients, we accept the transmission capacity is similarly distributed to all clients associated with the same Base Station. Clients tend to switch between Base station's despite the fact that the administration gave by existing Base Station is adequate and also new clients in the system who load the officially soaked FBS with expansion in associations more thanmaximum clients, diminishing the general system limit. DR algorithm, making a handoff decision is providing reducing unnecessary handoffs.

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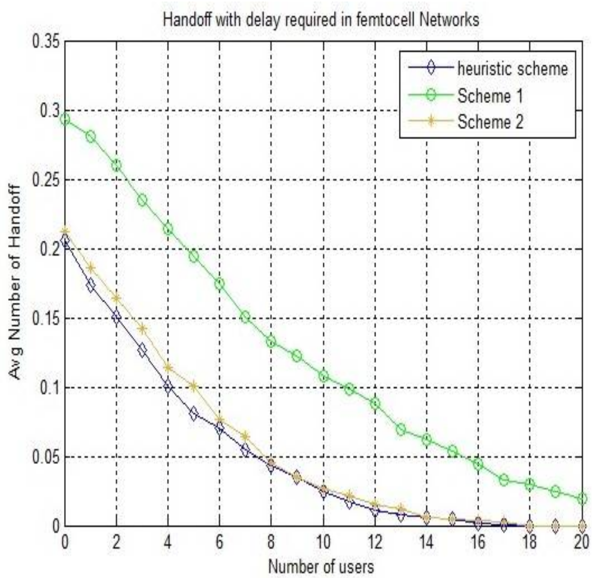

- User Classification
- Blocking users with signal to interference plus noise ratio (SINR) values below decreases the load on individual FBS's as these users try to connecting unnecessarily.
- Using BPSK Modulation method for reduce the NoiseAdditive White Gaussian Noise (AWGN).
- Simple implementation of transmitter and receiver.
- Low-power consumption of transmit power amplifiers.

- ***Handoff Schema 1 – Grouping Users:*** Client order is the subject of this schema where clients inside a scope of SINR qualities are gathered into levels. Grouping users addresses all the issues with heuristic Schema asking a slight trade off in quality gave to each client and in this way expanding the aggregate system limit and client reasonableness.Blocking users with signal to interference plus noise ratio (SINR) values below decreases the load on individual FBS's as these users try to connecting unnecessarily.

- ***Handoff Schema 2 – Dwell Time***: Existing System in Plot the impact of the number of users on the average number of Handoffs.We assume both femtocell-to-macrocell and macrocell-to-femtocell handover requires multiple - times confirmation to prevent temporary visitors. We reduce the number of handovers by adopting two parameters T*m* and T*f*[13].

TABLE I

S.no	**Comparison**		
	Name of Method	**Signaling overhead**	**Offload Traffic**
1	3GPP algorithms [8]	High	High
2	CC algorithms [9]	High	High
3	Optimize Handoff algorithms [1]	High	Medium ~ High
4	DR algorithms [7]	Low	Medium

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V. CONCLUSION

In this paper, we propose another plan for minimal effort area administration in the femtocell and macrocell networek. It refuses the cell reselection from the macrocell to femtocell, but keeps the most reasonable femtocell information accessible at the Mobile Station which is utilized to trigger the handover to femtocell for movement offloading when call arrives. It reduces the signalling cost taken a toll in the interim protecting the movement offload capability of the femtocell, however requires no any alteration on the current network. The performance comparison between our result and another approach termed as DR algorithm is conducted with together the investigation and simulation. The study indicates that our proposal better DR calculation in the cost decrease with the great flexibility to the diverseMobile Stations (MS) conduct in high portability.Our final results are validated against the simulation experiments. Theycan be utilized for the execution assessment on other multitier mobile networks other than the femtocell/macrocell networks.

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