A New Method of Macro- to- Femtocell Handover Process

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Abstract

A femtocell is a very little, low-power cellular base station, normally used for providing network in small area such as home or small business. The main target of Femto Access Points (FAPs) is to minimize the handover target of macro-to-femto and femto-to-femto in LTE based Macro-Femto Heterogeneous Networks. In cellular communications, the word handover or handoff is the process of conveying an ongoing call or data session from one station connected to the core network to another station, move through the coverage area of cellular system. The coverage area of femtocellis narrow about 15 meters to 30 meter, and Handover is obviously based on mobile User Equipment (UE) speed for handover between macrocell-to-femtocell and femtocell-to-femtocell. In the prevailing networks, for handover procedure, based on serving Base Station will adopt the cell selection based on mostly the signal strength of the neighbouring femtocells. This information can be measured from the corresponding UE. In this paper, we consider in cooperation with the Received Signal Strength and Cell Load of the target Femtocells which making the Handover decision alone. This proposed method handles the macro-femto heterogeneous network that decreases the number of handover FAPs to avoid handover to overloaded femtocells and also reduce the number of handovers. The FAP improve the 3G capacity and speed of bundled services.

Keywords: *Femtocells, User Equipment, Hand over or Hand off, Soft and Hard Handover, Hand-in and Hand-off, Femto Access Points and macrocell-to-femtocell, femtocell-to-femtocell .*

I. INTRODUCTION

The femtocell networks are most powerful technologies to handle the constantly increasing demand of wireless applications for the future wireless communications. Nowadays users required higher data rates in wireless networks which create demand on network providers. To satisfy these upcoming demands by using Voice over IP (VoIP), extreme broadband access, real-time and streamed multimedia, gaming services and severalother such eventsneed increased bandwidth for flawless communication.

Various new technologies are being familiarized with higher data rates among that Femtocells are widely deployed in many areas which are most popular one in recent times. The most significantbenefitsfemtocell networks are divesting huge traffic from the exclusive cellular networks,its deployment cost also very less and use of same frequency as that of cellular networks. Thus, the placement of femtocells in large scale is the ultimate goal for this technology.

In cellular network Femtocellsare operated as a licensed spectrum. The femtocell does not required ant special modifications it was controlled by the service provider's core network, and it operates with standard mobile phones. However, the recycle of the licensed cellular spectrum needs interference management between the femtocells and the umbrella macrocell. Such coordination requires a backhaul network technology such as fiber, DSL, or WiMAX to connect femtocell to the operator's core network. When a wandering subscriber arrives home, their phone will sense poor macrocell coverage and automatically hand over to the femtocell, passing across calls in progress in a similar fashion to macrocell handovers.

II. LTE BASED COGNITIVEFEMTOCELL NETWORK

The large deployment of femtocells faced numerous challenges. Handover is one foremost challenge among some other challenges. There are three types of handovers happened in dense femtocells environment. The macrocell to femtocell handover also named as Hand-in, femtocell-to-macrocell handover and femtocell-to-femtocell handover also termed as Hand-off. Femtocell-to-Macrocell handover does not suffer from extra challenges. Though, the macrocell-to- femtocell and femtocell-to-macrocell handovers face some difficulties including the selection of appropriate femtocell for handover and the optimal neighbor femtocell list for the handover. Here we discuss with the issue of handling appropriate neighbor femtocell list for Hand-in and Hand-off.

The coverage area of femtocell is narrow about 15 meters to 30 meter, and Handover is obviously based on mobile User Equipment (UE) speed for handover between macrocell-to-femtocell

and femtocell-to-femtocell.A cognitive femtocell network includes of differenttypes of Base Stations (BS): femto BS, macro BS and also encompassesfemto group. Femto group covers the set of femtocells which covers the specific region. In a cognitive femto network, due to the small coverage radius and some of the cells being open access, interference caused is higher and hence, handover is one of the most challenging issues.

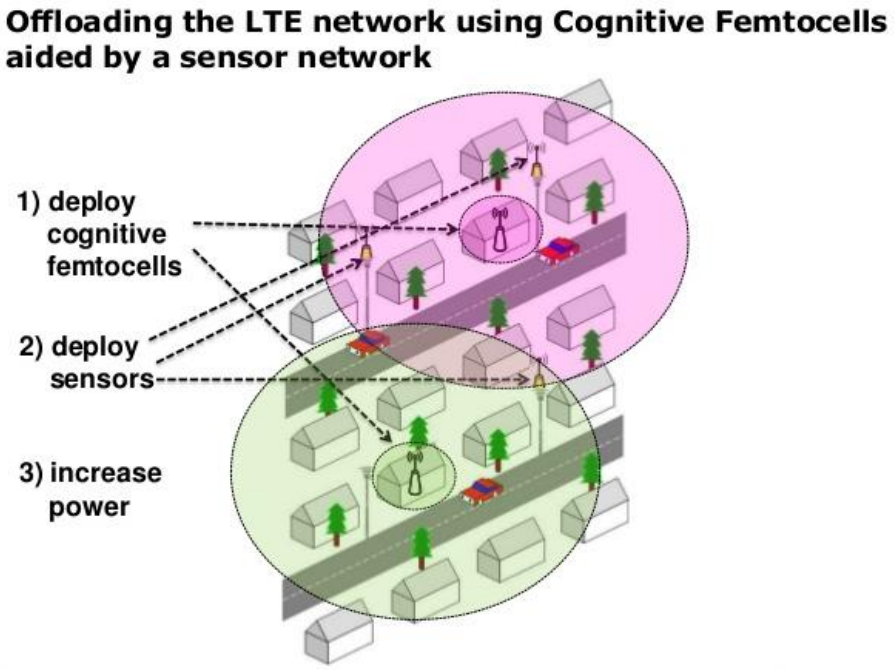

Fig. 1 Cognitive Femtocell Network

III. FEMTOCELL - TO – MACROCELL HANDOVER ALGORITHM

In femto-to-femto handover techniques cell selection is an imperative function. The main goal of the handover management is to find the accurate target femtocell while reducing the number of unnecessary handovers, bending overloaded femtocells and choosing appropriate target FAP.

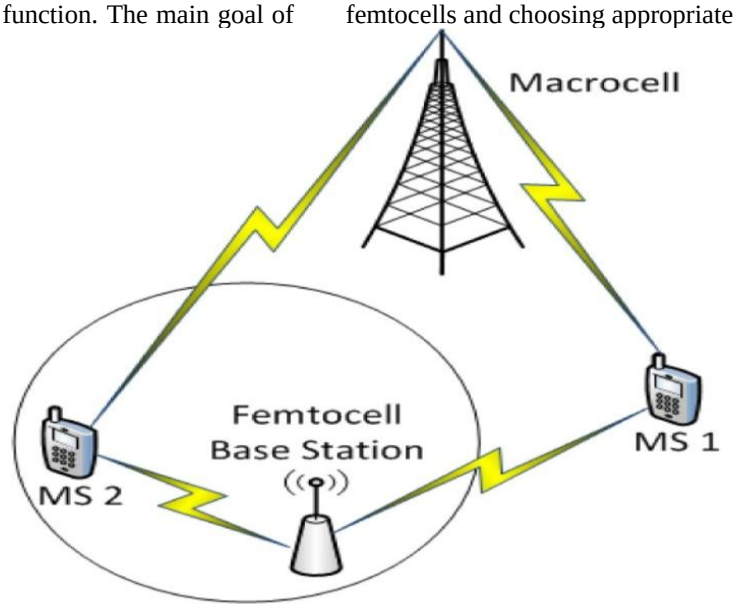

Fig. 2 Femtocell Handover Strategy

There are three modes area used to access the Femto Network by the femto subscriber. Such as Open Access Mode, Closed Access Mode and Hybrid Access. In open access mode, access is providing to all subscribers, and it works as a normal macrocell base station. In closed access mode, the femto will deliver the services only to organized UEs.

A. Hand-in and Hand-out Procedure:

Hand-in occurs when a UE is moving from macrocellreporting area into FAP coverage area and it is one of most difficult handover situation compared to other handovers. During this condition mobile station or user equipment should be select the right target FAP midst the hundreds of FAPs list.

In this handover situation UE changes from allocated FAP to macrocell H (e) NB. This setup does not pose many problems as associated to the Hand-in procedure. Because the target cell is macro, there is no choice other than macrocell network and its procedure seems like handover from one base station to another base station. In this handover, one of the issues is to keep the handover time to be very small.

In case of handover, the target macrocell has the signal strength should be stronger or better than the serving femtocell and the desire UE will directly get connected to it. There is no other complex interface calculation and authentication as in case of the Hand-in procedure.

B. Hand over or Hand-off Procedures:

Hand over also called as Inter-femto handover, since the handover will happens between a targets FAP to another FAP within a group. In this situation, UE shifts from one femtocell reporting area to another femtocell reporting area. In case of Hand-off setup, UE will be facing more number of target FAPs list, when serving mobile station is out of service. It is alike to Hand-in procedures.

In above paragraph we simply described about hand in, hand off and hand over process these are the fundamental issue with target FAPs list, this segment designates the concept of proposed pseudo code which has optimization algorithm to minimize target FAPs list. Consider in Fig. 3, initially the mobile user is connected to node B (e)NB.It measures the signal energy in the desire FAP from UE. When the signal strength decreases, hand-in (or hand-off) will take place to suitable target H(e)NB. Radio Network Controller (RNC) sends the handover request to the Femtocell Access Point (AP). The UE will scan the neighbour target FAPs and sends their information to serving (e)NB periodically in the measurement report. Then the FAP send the authorization request to RNC. After getting the handover response message from the FAP the RNC send Link setup request it shown in fig. 3. RNC form the physical channel reconfiguration setup then automatically handover the signal from the neibouring nodes.

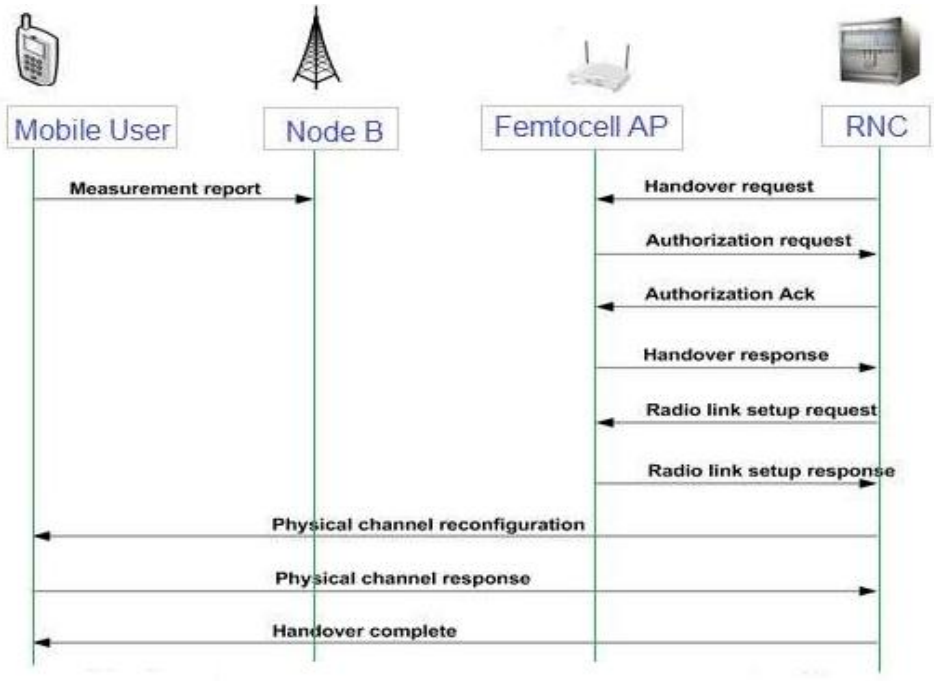

Fig 3. Handover from Macrocell to Femtocell

IV. CONCLUSION

The wide area deployment of femtocell has significant challenges to handover the signals to neibouring cellswithin the same coverage area. Because this network has small number of neighbor femtocells in the neighbor femtocell list.The smaller number of entries in the neighbor Femto list reduces the power consumption for scanning many FAPs and also decreases the MAC overhead.In this paper, describes a new technique to minimize the target FAPs and decrease number of handovers by selecting the best target FAP among the neighbour FAPs list. During the handover technique, the Radio

Network Controller and Femtocell Access Point handles the handover procedure, UE measures the available Femtocell in the neibouring FAP area.

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