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# Femtocell Technology

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## Abstract

Femtocell is a small cellular base station, designed for use in residential or enterprise. Connects to the service provider's network via broadband.Femtocell is one type of Indoor network which provide the wireless access within the particular area. Femtocells ensure that carefully planned cellular networks which may connect anespecially of the citizens to the Internet and with one another. In this paper femtocells has such network which maintains the specialty of the data transfer through the network will femtocells prove more trouble than they are worth, femtocells just an exciting but Minimum stage of network evolution that will beimproved Wireless offloading, new backhaul regulations and/or pricing, or other unforeseen technological developments? This paper overviews the history of femtocells, demystifies their key aspects, and provides a preview of the next few years' acceleration towards small cell technology. This paper reports, we also position and introduce the articles that headline this special issue.

**Keywords—** Femtocell,Spectrum,Femto, Pico cell,Mobile, Microcell.

## Introduction

Femtocell acquired the name because they are much smallerthan the standard cellular to wrens each of Femtocells works with the major wirelesstelecommunications standard and connects userswith cellular provider via broadband Internet links. Mobile cellular and also 3G networks normally acquire poor penetration and reception in certain areas, like indoors. This decreases the quality of voice and video communication and slows down high-speed services.

A femtocell is a small device that is used to improve wireless coverage over a small area, mostly indoor. It is a small cellular base station it also called a wireless access point and that connects to a broadband Internet connection and also broadcasts it into radio waves in its area of coverage. For mobile handsets can handle phone calls through the femtocell, with the broadband

Internet connection. femtoMention a division that is mathematically represented by 10 raised to the power of -15

### 1.1 Introduction to Femtocell cellular networks

A femtocell is a simple low-power low-cost base station which is installed at the user's sidethat provides local access to the network that is some cellular technology (2G, 3G, 4G) .A femtocell has an IP backhaul connection with the main purpose of the network through the localbroadband access the user already has common situations.It is proposed that in a small basis, users will start installing their own femtocells in theirareas, offices, etc. ABI Research predicts 102 million FC users worldwide with over 32million. It is important to note that this represents an estimate of 3 to 4 users as per femtocell. That not much bigger than the widely used wirelessaccess points, these femtocells are designed with a target cost of about 200$, so they can be offered by the majority, hence a wide deployment is possible.

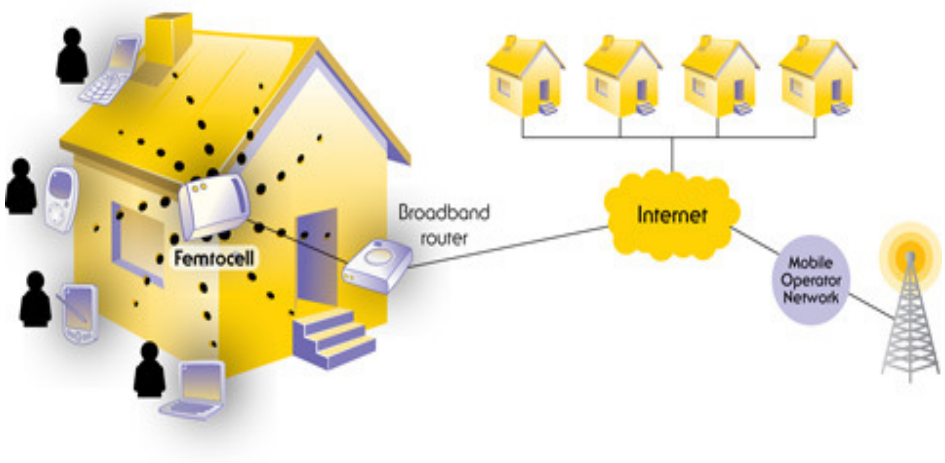


**Figure: Network architecture of a cellular deployment with femtocells**

## LITERATURE SURVEY

Following are the terminologies needed to be discussed referring to Femtocell Technology

### 1 Early Origins

Firstly in a metropolitan area, “small cells” term used to describe the cellsize, where a macro cell that which cell split into a numberof smaller cells with transmit power reduction, known as microcells, and having a radius ofseveral hundred meters in its nature.Simultaneously, cellular repeaters or “boosters” were beingin vest gated as an alternative to small base

stations.These re-radiating devices were intended to help improve thesignal quality in poor coverage regions, while reducing costsby not requiring a wire line backhaul. However, their reuseof the licensed spectrum for backhaul limited the achievablethroughput, and hence these repeaters were neither helpful tothe system capacity nor simple to deploy.In the 1990s, a precursor to cellular Pico cells began toappear with cell sizes ranging from tens to about onehundred meters.

### 2 The Birth of Modern Femtocells

New thinking on the deployment cost aspectsof small cell deploymentand configuration of cellularsystems began to address the operational. These techniques have beenapplied successfully to special Femtocells where cost issuesare amplified within the special network. A femtocell is especially different than thetraditional small cells in their autonomousand self-accuracy. Additionally, the backhaul interface back tothe cellular network – which is IP-based and likely supportsa lower rate and higher latency than the standard interfaceconnecting macro and picocells – mandates the use offemtocell gateways and other new network infrastructure toappropriately route and serve the traffic to and from what willsoon be millions of new base stations.Perhaps more important than the need to provide cellularcoverage infill for residential use, the mobile data explosiondiscussed in the Section I has mandated the need for a newcellular architecture with at least an order of magnitude morecapacity.

### 3 Modern Femtocell Research

There is a growing nature of research on femtocells, ofwhich we briefly reportsome notable early results which were extended to self-optimization strategies and multipleantennas shortly afterward. On the presented side,early model included new mathematical models and analysis, specifically looking at the uplinkinterference problem in CDMA-based networks with closedaccess.

The special model and approach was conducted with downlink and with multiple antennas. Other early worksuggested adaptive access control to mitigate thecross-tier interference problem, which was given further attention in investigated the reverselink capacity of femtocells, modeling inter-cell interference as increasing ability of the femtocell technology and the presented network accessibility. This work was extended inwhich developed new analytical techniques to improvethe optimization for WCDMA femtocellsystems.Several papers have also considered interference coordinationin OFDMA based networks, including co-channel interference management.

## Motivation

#### Interference in Femtocell deployments

This approach is followed throughout this project for the actual subcarrier allocation at each Microcell and Femtocell. The complexity of the interference problem increases domestically and new strategies have to be designed for the prosperous performance of technology under the systematic view. If encounters three extradegrees of complexity in the interference problem. Focusing on the Uplink, there is interferencegenerated by the Microcell users in the nearby of a femtocell.

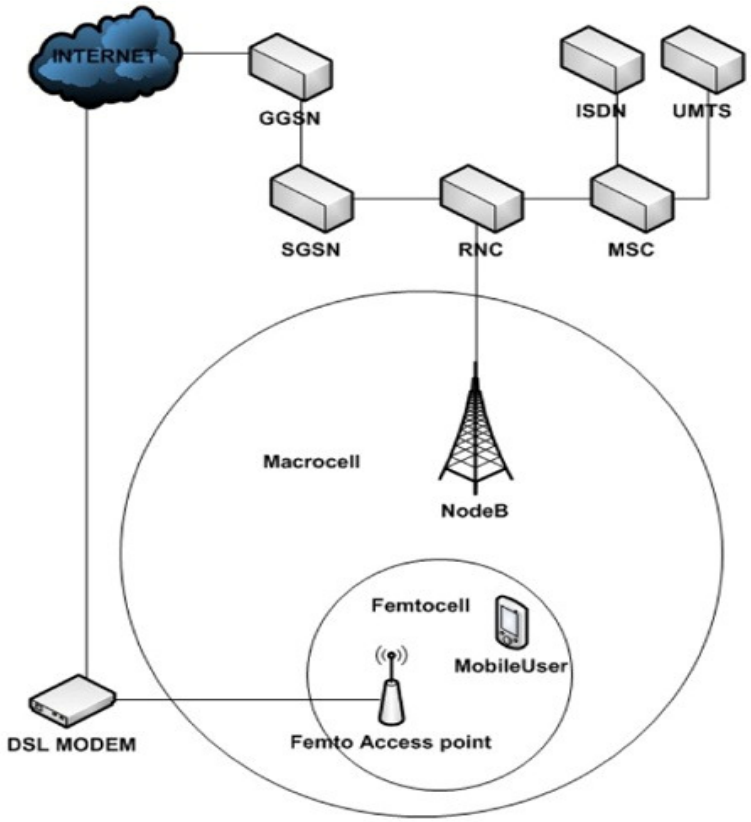


**Fig: Femtocell and Microcell Interfacing**

States that, in order to guarantee close to 100 percent coverage, elaborated furtherInterference strategies have to be applied. Fractional frequency reuse (FFR) is mentioned as apossible solution, but good synchronization is essential for its implementation, and as alreadymentioned, that is not always possible when dealing with femtocells

## Implementation Steps

### 1.Mobile sensing Femtocell networks

In this section I proceed to propose some algorithms and strategies in which a network provider could take advantage of the large amount of “voluntary” sensors that can be used to

tosynchronizeFemtocell networks and to mitigate the interference in this kind of two-tierdeployments.

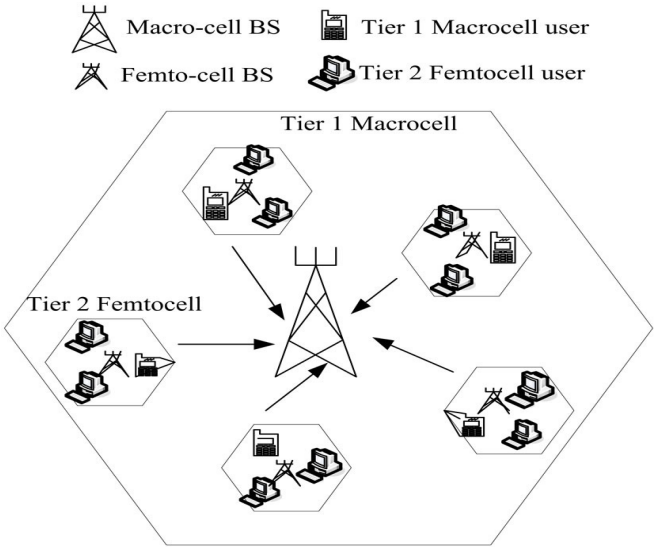


**Figure: Femtocell and Microcell sensing**

### 2.Femtocell coverage control

A Femtocell has already mentioned that the user installed low-power low-range base station in thepremises to provide wireless coverage to referenced areas. That provides the big issue to highlight those femtocells foremitting in licensed spectrum,so that it uses more strict protocol for that particular task to make sure that a given femtocell radiates only in a geographicalarea where the network provider owns the spectrum, which are equippedwith a GPS receiver. As in this way the system guarantiesthat radiatinguser is in an authorized area.

It may be locking a GPS signal and rather challenging as located indoors, so this forces the userto place the femtocell next to a window, for example. And there it might still be challenging toacquire the signal.That proposes a simple algorithm that would mitigate this problem and very likely completely solve it.

### 3.Femtocell synchronization

For the Femtocell network and the access of network to note that synchronization provides a big issue expanding the service for particular user in the indoor area, which can be further applications to gathering the locationand GPS signal from a specialized group of mobile sensors or smart phones in the vicinity of the femtocell.This allows a veryaccurate timing acquisition of the system's clock under which the whole network functions.Femtocells, despite being low-power access points in the user's premises, are still a small scaleof a regular microcell base station, so they require very accurate synchronization.

### 4.Frequency allocation in OFDMA-based access networks

It may not be to maintain work done in subcarrier allocation for OFDMA-based femtocells networks, it is very important to note that most of the privaciesassume that the spectrum ispartitioned in two segments so macrocells and femtocell, which do not share any frequencies. That meansoverall possible subcarriers are to be used a portion of them is proposed for microcell users and especially the rest isassigned to femtocell users. In the spectrum division is optimized to maximize the Area SpectralEfficiency. The ratio between the numbers of subcarriers allocated for femtocell users and the total number ofavailable subcarriers.

Spectrum splitting allocation strategies achieve good results and interference should be mitigatedbut one main drawback is arrived that they present very low spectral efficiency. From this work we providea simpleinterference mitigation strategy which invokes a reuse of the spectrum access points.

## Benefits

The femtocell technology provides the better coverage of network which mostly used in networking and makes them perfect of their scale.Femtocell has the higher capacity to organize the cellular network and handle the network.In the form of mobile communication the femtocells technology mostly work for such an environment for producing the lower transmission power and has to be good quality.For the actual handset type the network must be provide the prolong handset battery life.For the mobile user the Femtocell network provide the range anywhere for the mobile calling.

## Conclusion

In this paper the introduction on femtocell cellular networks and Location-Based Mobile Sensing analyze the specialty of the network and the accessibility.Femtocells are on a road to nowhere Unsatisfactory coverage and the increasing number of high-data-rate application are two driving forces for femtocell development Femtocells have the potential to provide highquality network access to indoor users at low cost Improve coverage Provide huge capacity gain. In this paper it concluded that the service for the indoor user within the particular area and permission of the user to access the services from the service provider.

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