



# INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 4, Issue 4)

Available online at: [www.ijariit.com](http://www.ijariit.com)

## Implementation of femtocell in cellular phones

Ashishkumar Saiwal

[ashishkumar.saiwal@ves.ac.in](mailto:ashishkumar.saiwal@ves.ac.in)

Vivekanand Education Society's  
Institute of Technology,  
Mumbai, Maharashtra

Digvijay Mhasaye

[digvijay.mhasaye@ves.ac.in](mailto:digvijay.mhasaye@ves.ac.in)

Vivekanand Education Society's  
Institute of Technology,  
Mumbai, Maharashtra

Nishi Tiku

[nishi.tiku@ves.ac.in](mailto:nishi.tiku@ves.ac.in)

Vivekanand Education Society's  
Institute of Technology, Mumbai,  
Maharashtra

### ABSTRACT

*In rural areas, it makes difficult to provide proper coverage to every subscriber. Consequently, loss of signal happens and signal strength decreases. This decreases the quality of voice and video communication and slows down high-speed services. As a remedy femtocell came into the picture. In this paper, we have emphasized on the advantages of a femtocell, its working principle and various technical and commercial aspects.*

**Keywords:** Femtocell, Cellular, 4G lite, Technical challenges, Spectrum, Femto, Picocell, Mobile, Microcell

### 1. INTRODUCTION

Femtocell is new is a wireless technology that improves the cellular reception inside home building or office. The device that resembles a wireless router, acts as a repeater. The device is used to communicate with a mobile phone and converts voice calls into voice over IP packets (VoIP). The packets are then transmitted over a broadband connection to the mobile operator servers.

Femtocells are compatible with CDMA 2000, WiMAX or UMTS mobile telephony services using the provider's own licensed spectrum to operate.

Consumer Femtocells will support not more than four active users where enterprise-grade femtocells can support up to 16 active users.

#### 1.1 Types of femtocell

There are three types of femtocells-

##### i. Domestic

- It is a 4 channels unit.
- It can handle four concurrent voice calls; other many more mobile phones can be attached as a standby.

##### ii. Enterprise

- It is a somewhere larger device.
- It can handle 8-32 concurrent channels.
- It is used in heavily congested areas.

##### iii. Metro-Femto

- It is completely a new concept.

- Here operator themselves can implement large no. of the femtocell in highly saturated traffic areas in low-cost solution.
- This is used in 4G LTE technology which will come out in next 2 to 3 years.

### 2. CURRENT SCENARIO

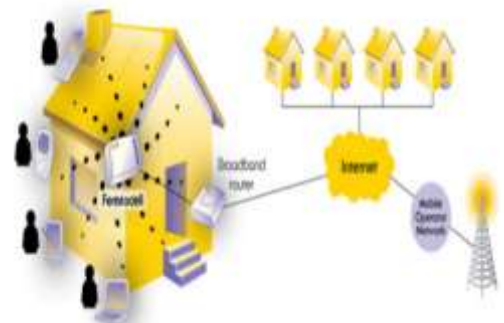


Fig. 1: Network diagram

At present “small cells” term used to describe the cell size, where a macro cell that which cell split into a number of smaller cells with transmit power reduction, known as microcells, and having a radius of several hundred meters in its nature. Simultaneously, cellular repeaters or “boosters” were being investigated as an alternative to small base stations. These re-radiating devices were intended to help improve the signal quality in poor coverage regions while reducing cost by not requiring a wireline backhaul. However, their reuse of the licensed spectrum for backhaul limited the achievable throughput, and hence these repeaters were neither helpful to the system capacity nor simple to deploy. In the 1990s, a precursor to cellular Pico cells began to appear with cell sizes ranging from tens to about one hundred meters.

### 3. NEW SYSTEM MECHANISM

#### 3.1 Femtocell and Microcell Interfacing

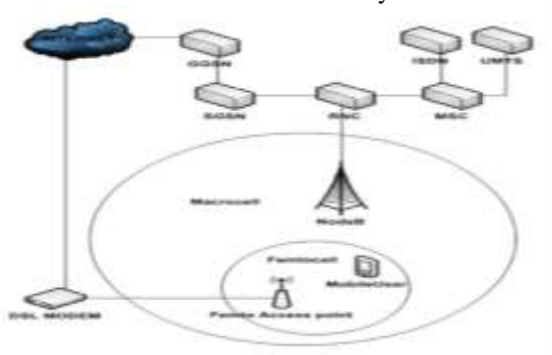
##### Working of Femtocell

Femtocell is a part of the mobile operator network, they are located at a business or in the home. The 3G cell is a completer and its functionality site has been miniaturized onto a chip, which looks and operates like access point of the Wi-

Fi, and is connected through broadband DSL back to the mobile operator's network. A femtocell can easily be installed at a home and is connected to main power. A standard broadband (typically DSL) IP connection through the mobile operator's core network. Voice calls, text messages, and data services are provided by the same systems. Femtocells can also operate at very low radiation power levels and should have a range of 200 meters like (50 mill watts peak output during the call and much lower when in an idle state).

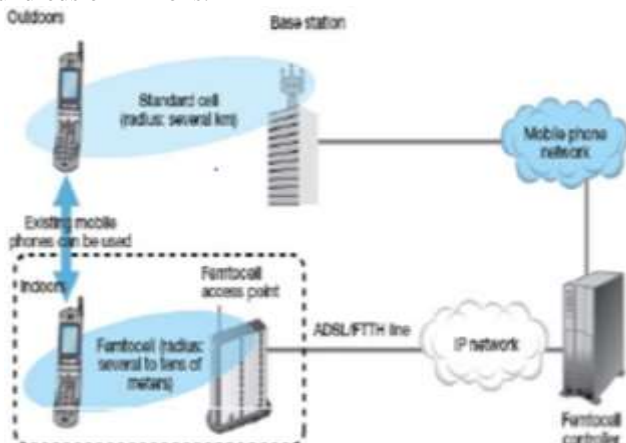
The signal does not travel through the walls, but this is also a benefit because it will allow the frequency to be reused for the other calls in the building which is nearby. The users that walk outside or out of range, their calls are handed over automatically to the external mobile network.

The 3G standard phone can be used on the femtocell but it should be permitted by the mobile operator. Unlike the Wi-Fi access points, the 3G Femtocells are operated using the licensed spectrum and hence must be supplied and operated in conjunction with the mobile operator. The battle is most likely to be between the modified 3G RAN (which some RAN Network vendors are keen to promote because it reuses their existing RNC products) versus UMA has the new, custom-designed systems which is architected to handle the much larger number of cells and IP connectivity.



SIP-based solutions may be of interest where the user wants to bypass the network operator. When registered handsets enter the range of a femtocell, handing over to the femtocell network is done automatically, such that calls are channeled through the broadband connection.

One femtocell can support up to 5 mobile handsets. Femtocell technology, which is another block in the Fixed-Mobile Convergence concept, is still in its early days and it is receiving fierce competition from UMA and Wi-Fi technologies. For instance, one might ask why to invest in femtocells when a cheap Wi-Fi router can do the work with a Wi-Fi supporting handset, given that handsets supporting Wi-Fi are becoming more common and are being shipped by hundreds of millions.



#### 4. ADVANTAGES

- A Femtocell is used for compensating poor cellular coverage inside the homes – in some places.
- A Femtocell can also give lower call charges while the caller calling from home, using the Femtocell as it directly connects to the core network through the internet.
- The voice calls/data calls through the Femtocells are encrypted and the cell phones automatically switch over to the Femtocells when they come in their range – eg. in homes, where they are installed.
- Femtocell units can handle up to three or four simultaneous calls, from the same operator, depending on the model. They can operate with normal cellphones, without any enhancements.
- Femtocell units can help related cellular services like 3G by offering a better speed and data rate when inside buildings, where the coverage and data rate is generally lesser than outside.
- Low cost.
- Power consumption is very low.
- Services are localized.

#### 5. SOME TECHNICAL ISSUES

- Interference** – It can interfere with the outdoor macro cell and cause a performance problem. So, for this reason, many people are not using the femtocell. After the extensive test, most operators now agree that this is a manageable issue.
- Emergency Calls** – When making a call through a femtocell, it must be connected through an answering point and the location of the femtocell must be accurately reported. Again procedures & processes solve this problem.
- Access Control** – Access control has been used to limit the permitted mobiles allowed to use individual femtocells.
- Handover** – The call in progress which is transferred into or out of the femtocell has generally supported when leaving your home whereas existing system won't allow in-progress calls to be transferred into the femtocell.

#### 6. CONCLUSION

In this paper, we tried to find out the various technical and commercial aspects of femtocell and its importance and significance to enhance the coverage area of 3G & cellular network. Though it has various technical challenges, it is now widely accepted as a home-based localized service. In respect of cost also, it will get reduced in near future due to competition among various companies.

Most importantly due to its “plug and play” nature, the user needs not to spend extra time to install and operate. Now for upcoming 4G LTE network, metro femto-cell technique which is completely a new concept will be used.

#### 7. REFERENCES

- [1] Cisco, “Cisco visual networking index: Global mobile data traffic forecast update, 20102015,” White paper, Feb. 2011.
- [2] D. Kilper, G. Atkinson, S. Korotky, S. Goyal, P. Vetter, D. Suvakovic, and O. Blume, “Power trends in communication networks,” IEEE J.Sel. Topics Quantum Electron., vol. 17, no. 2, pp. 275 –284, Mar.-Apr.2011.

- [3] V. Chandrasekhar, J. G. Andrews, and A. Gatherer, "Femtocell networks: a survey," IEEE Commun. Mag., vol. 46, no. 9, pp. 59–67, September 2008.
- [4] H. Claussen, L. T. W. Ho, and L. G. Samuel, "An overview of the femtocell concept," Bell Labs Technical Journal, vol. 13, no. 1, pp.221–245, May 2008.
- [5] Informa Telecoms & Media, "Femtocell Market Status," Femtoforumwhitepaper, 2011.
- [6] "Wifi and femtocell integration strategies 2011-2015," Juniper Research White paper, <http://www.juniperresearch.com/>, Mar. 2011.
- [7] A. Stocker, "Small-cell mobile phone systems," IEEE Trans. Veh.Technol., vol. 33, no. 4, pp. 269 – 275, Nov. 1984.
- [8] E. Quinn, "The cell enhancer," in Proc. IEEE Vehicular TechnologyConference, vol. 36, May 1986, pp. 77 – 83.
- [9] E. Drucker, "Development and application of a cellular repeater," inProc.IEEE Vehicular Technology Conference, Jun. 1988, pp. 321 –325.