

FEMTOCELL IN PAKISTAN: PROBLEMS, COVERAGE, ADVANTAGES AND DISADVANTAGE

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FemtoCell is a new technology which will replace the macrocell. It is a fantastic approach to overcome the problem of mobile signals in homes or basements. This technology is used to power up the signals on the place where signals are giving the problem. Femtocell is the home based technology. In Pakistan, it is supposed to be deployed soon but there are some problem is faced by PTA (Pakistan Telecom Authority). Radio frequency is not free for Femtocell; it will always be purchase if anyone wants FemtoCell technology. In this paper, an analysis is made on the problems PTA is facing regarding the deployment of FemtoCell, coverage of Femtocell within Pakistan; and also the advantages and disadvantages of Femtocell are also explained.

Keywords: *Femtocell, Femtocell in Pakistan, deployment of Femtocell, advantages of Femtocell and disadvantages of FemtoCell, FemtoCell vs. macro cell, and coverage of FemtoCell.*

INTRODUCTION:

Femtocell is a wireless access point. That is used to improve the reception of cellular communication inside the home and buildings. This is a small device in the shape of router or it

can be like a VOIP repeater. This device converts all the calls into VOIP packets and these packets are transmitted via Broadband connection to the mobile operators. This technology is compatible with CDMA2000, WIMAX or UMTS mobile technology. During recent years cellular network companies face numerous challenges when it comes to provide an effective coverage with high speed data rates to indoor users. Traditional macro base stations (BTS) provide limited coverage to indoor subscribers because they operate on high frequencies which reduce their ability to penetrate walls of those users who reside in deep urban environment. To overcome this problem Femtocell can be installed in user home premises replacing traditional BTS [1]. FemtoCells are small low powered base stations, which provide radio coverage to the mobile users in an indoor environment. These are installed in an indoor area by the end user just like a Wi-Fi router and provide almost all of the cellular functionalities to the end users [2].

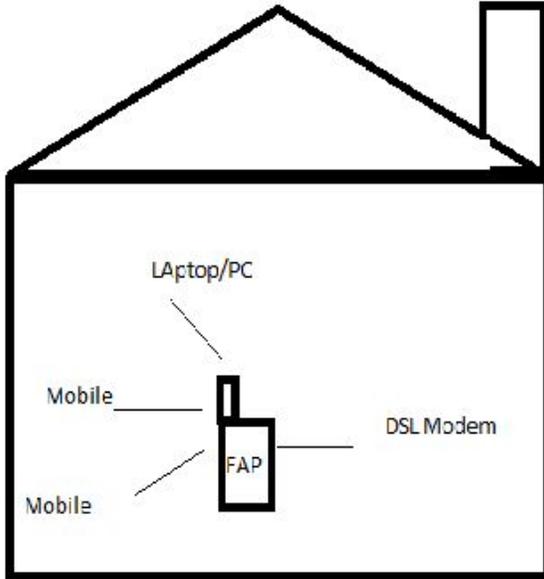


Fig1. Femtocell in home

The 3rd Generation Partnership Project (3GPP) has following considerations for FemtoCell:

1. As FemtoCell will be installed on user premises so its size should be compact and its operating power must be small which should not affect user in term of electricity bill.
2. FemtoCells have small transmitting power ranging from 10 to 100 mW which is also lesser than Wi-fi whose transmitting power is approximately 1W. Moreover, user's cell phone will also operate on lesser power levels for uplink as compared to traditional BTS scenario.
3. Femtocell can support up to six users simultaneously maintaining high QOS.
4. Femtocell installation procedure will be user friendly. It will help network operators to eliminate the need of sending installation team whenever new Femtocell is installed by user.

5. Femtocell will operate on same license plan as on which network service provider operates.
6. Cell phone which are going to be served by Femtocell will be completely identical to the one serviced by traditional BTS [1].

This Paper will consist of three categories; first will Coverage of Femtocell, Second will Advantages and Disadvantages of Femtocell and Third will be Conclusion of discussion.

I. MATERIALS AND METHODS

The Big issue of Femtocell is coverage; it covers only 4 to 16 users, which is very low from macrocell. FemtoCells are deployed within a macrocell in an ad hoc fashion and any user can deploy FemtoCells in its home and even can move FemtoCells from one location to another. Therefore, it is a challenging problem for operators to manage radio resources dynamically [3]. It also requires efficient self organizing techniques to make sure it is aware of its surrounding environment and should have distributed optimizing techniques to mitigate any interference. Furthermore, in case of dense co channel Femtocell deployment where spectrum shortage may occur, it is also desirable for the Femtocell to have the functionality of opportunistic spectrum access [3]. PTA is to planning for deployment of Femtocell in Pakistan to improve the indoor signal quality for voice and data both. It also provide wireless data on low cost in Pakistan. DSL will be use to connect Femtocell with core network.

10-30 meter is normal coverage for FemtoCell which is very low from macrocell. 10 to 100mW is access point which provides coverage of mobile and capacity over internet backhaul. DSL

or FTTH broadband internet connections are used for backhaul to the operator's core network.

The big issue of Femtocell deployment is license concern due to split regulatory regime. This thing is not allowing PTA to give license of Femtocell to any single Telecom Company. That's why PTA asked to Telecom companies to decide among their selves that who will be the owner of Femtocell by mutual agreement. After deciding owner Femtocell will be deployed.

According to the PTA report 60% Pakistanis are using voice and data services via mobile or DSL. However, issue of poor quality of signals in homes or building can usually concern to the end-user who want high data rate with low cost. PTA also claims that Femtocell is best for operators to provide better communication in indoor environment. After deployment of Femtocell, it will be possible to provide high data rate with low cost to indoor consumers which is not possible with macrocell.

II. RESULTS

Every technology has some advantages and disadvantages. Similarly Femtocell also has.

Advantages

There are some advantages as listed:

- FemtoCell is used through a licensed spectrum.
- It can also detect the neighborhood FemtoCell as macro cell.
- It can adjust the transmission power up or down because of short range and inbuilt intelligence
- It is cheap to implement in home or office.
- It gives high data rate with low cost.

- It has the capacity to limit the user's log on. This is to restrict the coverage.
- It is attractive to implement in home or office.

Disadvantages

There are some disadvantages as listed:

- It cannot stay alone; it needs DSL for connecting the core network.
- It is problematic because there is difference between DSL and mobile network.
- Interface could be the problem.
- Femtocell is not efficient in self organizing capabilities.
- Data security is also an issue because after all data will transmitted over the internet. Data can be hacked.

In Pakistan, Femtocell is very useful especially in the villages. In villages, there is always issue of poor quality of mobile signals and data. Femtocell is very helpful to overcome this problem. In Northern area of Pakistan, we can also take advantages of Femtocell. Short coverage is very useful in that area because valleys has group of houses which can be easily covered by Femtocell.

In Pakistan, to implement Femtocell in above mentioned areas, it is necessary to provide DSL connections which are not done yet by PTCL. This is a big issue because Femtocell cannot deploy without DSL.

III. DISCUSSION

What is FemtoCell? It is a wireless device which provide high data rate and voice quality by using spectrum bands. It is short range device like router. It is good for indoor consumers. In

Pakistan it can be best for ruler and northern areas where Quality of cellular phone is big problem. Advantage of Femtocell is cheap in implementation but high in quality with security issue and depending on DSL. For further research simulation of Femtocell in Pakistan is opened.

Abbreviations

PTA- Pakistan Telecom Authority

DSL-Digital Subscriber Line

FTTH- Fiber To The Home

BTS- Base Transceiver Station

VOIP-Voice Over Internet Protocol

Qos- Quality of service

UMTS- Universal Mobile Telecommunication System

CDMA- Code Division Multiple Access

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