

Implementation of Femtocell Concept in Cellular 3G Network and Study of Technical and Commercial Viability

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Abstract: In metropolitan cities of high rise buildings with over populations and congested areas make 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 emphasised on the advantages of femtocell, its working principal and various technical and commercial aspects.

Keyword: Femtocell, 3G, Cellular, 4G LTE, Technical challenges, Cost.

I. INTRODUCTION

Femtocell - a wireless access point that improves cellular reception inside a home or office building.

The device which resembles a wireless router, essentially acts as a repeater. The device communicates with 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, Wi MAX or UMTS mobile telephony services using the provider's own licensed spectrum to operate. Typically consumer oriented femtocells will support no more than four active users where enterprise grade femtocells can support upto 16 active users.

II. LITATURE SURVEY

The name femtocell was derived from "cellular" and "femto", a metric prefix that stands for 10⁻¹⁵ th or one-quadrillionth, six order of magnitude smaller than nano. Femto cell were originally called 'access point base station'.

The development of femtocells is credited, in part, to the work of a skunk works team at Motorola in the UK, where they created the world's smallest full power UMTS base station.

III. WHAT IS FEMTOCELL BASICALLY?

- Mobile phone base station for home/office-connects via broadband internet.
- Provides excellent coverage/capacity.

IV. WHAT PROBLEM DO THEY SOLVE?

Femtocell solves three different problems –

[1] **Coverage-** If the coverage is poor indoors, we locate femtocells inside the property which ensures that we will get up to 5 bar reception inside the house.

[2] **Capacity** - Now-a-days mobile phone network are becoming congested with high levels of data traffic because some 40% of mobile phone usage is indoors. If femtocells are installed, they can offload a large no. of capacity from the network.

[3] **Application** – Thirdly application can be provided because femtocell knows your presence, location, contacts .This can alive your mobile phone to present a different menu when you are at home for example.

V. TYPES OF FEMTOCELL

There are three types of femtocells –

[1] **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.

[2] **Enterprise** –

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

[3] **Metro-Femto** –

- It is completely a new concept.
- Here operator themselves can implement large no. of 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.

VI. HOW DO FEMTOCELLS WORK?

- Fundamentally they are normal mobile phone base stations and they operate in the same frequencies in same techniques and using same signalling protocols.
- The mobile phone signals are converted and sent via broadband internet connection through the femto gate way.
- This converts to some 100-200 thousand femto cells and convert the traffic into the same format, this is provided through radio network controller to outdoor cell size.
- Voice services continue to be provided by same MSC or Mobile Switching Centre.
- And Data services by same GSM or GPRS service node that is used for services in the existing outdoor network.
- In this way you can talk whether you are in indoor or outdoor.

VII. SOME TECHNICAL ISSUES

- **Interference** – It can interfere with the outdoor macro cell and cause performance problem. So for this reason many people are not using the femtocell. After 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.

VIII. PLUG AND PLAY FEATURE

- Femtocell is a 'plug and play' device which does not require any installation.
- Basically a person who does not have any knowledge about femtocell can operate it easily.
- For this reason an intelligence system is built in the architecture of femtocell so that it can self-organise itself and can change itself as the environment changes and it can also detect some fault if happens.

IX. SOME MORE ADVANTAGES OF FEMTOCELL

- Better cellular coverage with higher data rate.
- Low cost.
- Power consumption is very low.
- Services are localised.

- As per demand, operator can place the femtocell to receive the better coverage.

X. HOW DO THEY COST?

	Strint	Verizon	ATT Wireless	T-Mobile
Product	Airave	Wireless Extender	3G Microcell	Hotspot at home
Basic Price	\$99	\$249	\$149	\$40
Ongoing fees	\$5/month	None	None	None
Unlimited Calls	\$10/month	NA	\$20/month Free with ATT landline/DSL	\$10/month
Service	Voice / SMS	Voice /SMS	Voice / SMS/inter net upto 3 Mbit/sec	Voice/S MS/Inter net
Technology	2G CDMA	2G CDMA	3G UMTS	UMA Wi-Fi

Prices are about to reduce further due to competition.

XI. 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 localised 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.

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