Femtocells

Personal Wireless Base Stations

Fixed Mobile Convergence (FMC)

CellStrat Consulting Services
Atlanta, GA, USA

v1.0
Created: 05/05/2008
Femtocells

Femtocell is a small cellular base station meant to boost service quality and provide value added services within a home or a small business. It connects to the service provider’s network via broadband (such as DSL or cable); current designs typically support 2 to 5 mobile phones in a residential setting. A Femtocell essentially routes mobile calls over the internet.

A Femtocell allows service providers to extend service coverage indoors, especially where access would otherwise be limited or unavailable. This is true in many homes where wireless signal cannot reach inside or there is poor signal strength due to security or physical obstructions. Femtocells are considered an important element of Fixed Mobile Convergence (FMC). Traditional Fixed Mobile convergence requires use of dual mode (WiFi) handsets but with Femtocell, ordinary cellphones can be used for FMC.

One of the most significant advantages of Femtocell for the wireless operator is that by directing home mobile calls on the internet, operators can free up the wireless network. In emerging markets, wireless network congestion rates point to the idea that Femtocells would be a boon in such locations.

On the promise of Femtocells, one can think of them as essentially “mobile taking on WiFi”. Femtocells essentially route mobile calls on the IP network.

From a wireless perspective, typically Femtocells pack high-speed 3G technology or High Speed Download Packet Access (HSPDA) inside, which can have download speeds of up to 7 Mbps, similar to many home broadband offerings.

Femtocell Adoption

According to ABI research, by 2011, there will be 102 million Femtocell users.

The femtocell market represents a semiconductor opportunity that could show a compound growth rate of 138 percent over the next four years and reach $1.5 billion by 2012, according to market research group Forward Concepts.

The market researchers also suggest global femtocell equipment revenues will grow at a CAGR of 126 percent from 2008 to $4.9 billion in 2012. Western Europe will be the largest market, driving 32 percent of the revenue, followed by North America with a 22 percent share. They add that femtocell integrated home gateway shipments are projected to exceed 23 million units in 2012, passing stand-alone femtocells for over half of the market.
Forward Concepts estimates femtocells will capture the dominant Fixed Mobile Convergence (FMC) market share by 2010, as UMA (Universal Mobile Access) is deemed to be a transitional technology and cellular carriers will ultimately transition to IMS-enabled femtocells. However, they caution the most significant technical challenge for femtocell operators will be RF interference which will require proper frequency planning by the operators.

Some prominent Femtocell equipment vendors are ip.access, Samsung, Ubiquisys and Airwalk. Interestingly, Ubiquisys received a venture investment from none other than Google. The search company participated in a $25 million round of funding for Ubiquisys Ltd., a femtocells vendor in Swindon, U.K. Technology venture funds Accel Partners, Atlas Venture and Advent Venture Partners LLP also invested. Conversely, in Jan 2008, Cisco Systems said Wednesday that is has invested in a U.K.-based ip.access.

In essence, there is fairly large Femtocell adoption and several vendors who have jumped on the bandwagon. Below, we examine some advantages of why Femtocell is gaining ground in the FMC world.

**Advantages of Femtocells**

Advantages for wireless operators:

a) Free wireless network and reduce network congestion  
b) New revenue opportunities for operators.  
c) Reduce cell towers capital expenditures.  
d) Create buddy lists in Femtocell (list of authorized Femtocell users) to share the Femtocell base station with the designated user base.

Advantages for customers:

a) Better coverage  
b) Make free calls by routing wireless traffic onto the internet.  
c) Home Zone pricing (discounted compared to regular wireless pricing)  
d) Works with all mobile handsets - no need for expensive dual-mode WiFi handsets.

**Femtocell limitations**

Femtocells suffer from several critical issues which vendors and operators are still trying to resolve fully. Unless these issues are resolved somehow, Femtocell adoption faces some challenges.
E-911 compliance / location detection

In developed countries, laws require that wireline stations broadcast their location to allow 911 emergency management services to pinpoint the user location. Femtocells do not have a way to broadcast their location when routing a call over the home IP network. Only way out is a GPS transmitter attachment to a Femtocell station which some vendors are trying. But this strategy is inherently faulty as Femtocells are typically used in areas where wireless signal or GPS signals cannot reach (e.g., basements). Also cell site triangulation, the other way to detect a cell phone location, does not work for a Femtocell as Femtocell is meant to work in areas where cell site signals cannot reach.

Femtocell – macro site handover

Carriers and equipment vendors are still struggling to achieve a seamless handover to and fro between a Femtocell and a regular cell site. There are issues related to signal interference, capacity and IP integration.

Frequency overlap

With Femtocells in an area and the users’ ability to randomly place them at various locations, Femtocells may overlap or interfere with the regular cell site signals.

User authentication

With a Femtocell, an unauthorized neighbor may latch onto the Femtocell just like in case of WiFi today. This may lead to various kinds of unauthorized usage, network intrusion and other such issues. Vendors are trying to resolve this using a buddy list maintenance in a Femtocell so that only authorized users can use a particular Femtocell.

Multiple Standards

Another challenge for femtocell deployment is the fact that no one has yet developed a single architecture that the industry can use as its standard. There have been “a plethora” of models that have been designed based on SIP, UMA and other mobile architectures. “There are around 13 different architectures that have been proposed at the Femto Forum,” says Manish Singh, vice president of field engineering for Continuous Computing, a provider of femtocell software and integrated systems for telecom network infrastructure. “If this isn't resolved, it will translate to market fragmentation”.

Unless the Femtocell issues are resolved in a robust manner, the widespread use of Femtocell may remain muted. Both technology vendors and operators have a challenge in resolving these issues in order to leverage this new revenue stream and what could turn out to be a compelling new communication system.
Femtocells vs WiFi Access Points

The table below demonstrates how Femtocells fare against a WiFi-based FMC environment.

<table>
<thead>
<tr>
<th></th>
<th>Femtocell</th>
<th>WiFi (Dual Mode Handset)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typically Used In</td>
<td>Homes, Hotels, Buildings, Basements where cellular signal is weak or non-existent</td>
<td>Any location where WiFi is available</td>
</tr>
<tr>
<td>Equipment</td>
<td>Femtocell Base Station</td>
<td>WiFi Access Point or WiFi router</td>
</tr>
<tr>
<td>Backhaul</td>
<td>IP network</td>
<td>IP network</td>
</tr>
<tr>
<td>Handsets</td>
<td>All handsets</td>
<td>Dual-Mode Handsets</td>
</tr>
<tr>
<td>Pros</td>
<td>Better cellular coverage. Works with all handsets, create buddy lists - drive VAS and social aspect</td>
<td>Widely deployed technology</td>
</tr>
<tr>
<td>Cons</td>
<td>Signal interference with macro towers, handover to macro tower not robust, multiple standards</td>
<td>Needs expensive dual-mode handsets</td>
</tr>
<tr>
<td>Equipment Cost</td>
<td>Expensive Femtocell Base Stations</td>
<td>Cheap WiFi Access routers. Dual Mode handsets may be expensive.</td>
</tr>
<tr>
<td>E-911 support</td>
<td>Available. But needs GPS attachments to Femtocell for location broadcast to back office.</td>
<td>Industrial-grade solution not available</td>
</tr>
<tr>
<td>Availability</td>
<td>In USA, Sprint has deployed Femtocells; AT&amp;T, Verizon and T-Mobile are also testing Femtocells.</td>
<td>Widely deployed</td>
</tr>
</tbody>
</table>

This table above indicates that Femtocells are actually highly compelling alternatives to a WiFi based FMC environment due to a number of factors. Some prominent advantages of Femtocells include the idea that all current handsets work with these innovative devices. As well FMC itself is compelling idea simply because it de-congests the wireless network thereby freeing it up to serve a larger percentage of population which needs wireless service in the general space outside of buildings and homes.
CellStrat is a full service management consulting and system integration firm helping clients in areas of mobile strategy, mobile applications and mobile marketing. CellStrat assists firms in understanding the new wireless standards, mobile enablement of their workforce, development of a powerful mobile marketing strategy, implementing mobile banking and payment solutions.

For a custom analysis of your mobile business environment, your mobile strategy and development of mobile applications within your business setting, please feel free to contact us at contact@cellstrat.com or call us at (678) 643-6750.