



## Why Femtocells?

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3G femtocell solutions are finding new homes for the wireless base station in the consumer's home or office. Femtocells could revolutionize cellular service with cell phone traffic riding on the consumer's broadband line. The race against competing dual mode WiFi phone technology is on.

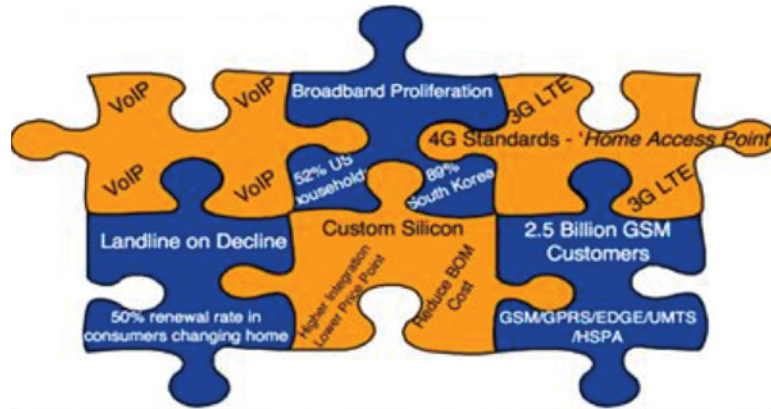
The 3Cs – coverage, churn and capacity – are stifling 3G adoption. 3G suffers from inadequate indoor signal penetration, leading to poor coverage in the indoor environment where consumers spend two-thirds of their time. Poor coverage diminishes the quality of voice and video applications and slows down high-speed data services. Dropped calls and time-consuming downloads lead to customer churn as consumers, who expect high quality of service, pick up their landline phones or switch to other mobile carriers in search of uninterrupted voice calls, clear video images and faster downloads. Churn is a two-pronged sword, costing carriers both in lost revenue from high paying 3G customers - about \$100/month Average Revenue per User (ARPU) - and in new customer acquisition cost, about \$400 per customer.

To keep customers satisfied, 3G carriers have increased capacity through the construction of additional macro cell sites. This strategy is becoming much less attractive. Site acquisition costs are exorbitant and continue to mount as space on viable towers and buildings fills up, landlords exact high rents, and regulators impose onerous permitting requirements. Public opposition to the building of large-

scale base stations is increasingly common. Acquiring a site is only half the battle: sophisticated base station equipment must then be purchased, installed, insured, operated and maintained. The net present value (NPV) of a cell site in the UK is estimated to be \$500K. Carriers thus face a serious dilemma: improve coverage and avoid revenue hits from churn by adding new cell sites, but then risk profit misses caused by higher capital expenses and operating expenses.

Because of these challenges, femto solutions are finding new homes in the consumer's home or office. A femtocell is a small box that plugs into the user's existing broadband Internet connection and works with existing mobile handsets. Femtocells are low power devices combining NodeB and RNC functionality, and are self-configuring to minimize interference. Operating as an extension of the carrier's existing network, femtocells enable more comprehensive coverage inside buildings and also at the far edge of the network.

By raising the bar in indoor environments and in far-flung locations, such as the suburbs, femtocell technology enables carriers to enjoy some immediate benefits, such as fixed mobile substitution in which consumers stop picking up their landline phones and use more mobile minutes, thereby driving incremental ARPU. Second, satisfied customers tend to stay with



Femtocells: Key pieces of the puzzle

their existing provider and are more likely to sign up for new services, which accelerates 3G adoption and HSPA subscription, leading to additional ARPU. One of the biggest benefits for any operator is "stickiness." With better coverage, carriers are able to capture more of the landline minutes that are up for grabs and form stronger relationships with high-value customers, resulting in higher revenues. "Femtocells allow carriers to price cellular data services in the home aggressively, with the ultimate goal of shaping consumer behavior," states ABI Research principal analyst Stuart Carlaw. Finally, femtocells create pull for new customer acquisitions as carriers will offer bundled "family-based tariff plans" in which all members of the family enjoy unlimited mobile minutes at home for a fixed monthly fee.

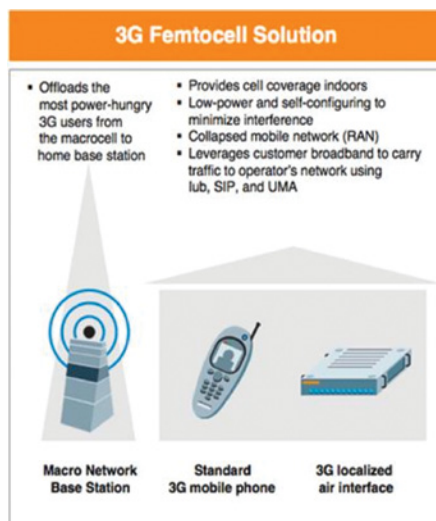
Femtocells produce cost savings as well for the carriers. Consumer's home in essence becomes a cell site and there is no site acquisition costs involved. The customer pays for the backhaul by using their existing broadband line. And not to forget the electricity bills, which is a large OpEx item for a cell site, that consumer pays. Femtocells also allow the carrier to offload their existing macro-cell networks. Macro cellular network resources that otherwise are tied to handle user's mobile calls, SMS, etc. are now freed up as that traffic is now handled by the

femtocell. These distinct advantages on both sides of the ledger make femtocell a compelling technology choice.

### Key Pieces of the Femtocell Puzzle

Elements supporting the widespread adoption of femtocell technology are falling into place. Femtocell is not new; the idea has been around since the early days of the wireless networks. However, what was missing before is now a reality: Voice over IP, which enables the transfer of voice over the IP network. Another separate but equally important factor supporting large-scale femtocell deployment is broadband proliferation. Fifty-three percent of U.S households have a broadband connection and the percentage is higher in other countries such as South Korea where 89 percent of homes are served. Existing broadband connections form the backhaul to efficiently carry the mobile traffic out from consumer's home to the wireless core network.

Thanks to Moore's law, custom integrated silicon parts for femtocells are now readily available in the market. The integrated silicon parts provide compute, DSP, encryption and other key functions required by a wireless base station and having one part drives the bill of materials (BOM) cost down for building an economically viable wireless home base station.



Landline connections are on the decline and provide opportunity for fixed mobile substitution. There are more than 2.5 billion wireless users worldwide; the economy-of-scale needed to drive the cost down for femtocell is in place. And peering into the future 3G LTE network roll outs might start with femtocells first followed by a macro cellular network build out.

## Femtocell vs UMA

Femtocells have certain advantages over unlicensed mobile access (UMA) and other dual-mode Fixed Mobile Convergence (FMC) solutions. All the necessary components for femtocell deployment are present in many homes and offices today: a standard 3G

mobile phone and an IP broadband connection to backhaul traffic to the operator's network. Unlike WiFi, the consumer need not upgrade to an expensive, power-hungry, dual-mode handset. With femtocell, any existing 3G handset will work seamlessly. UMA uses unlicensed spectrum which makes it prone to interference and can deteriorate the quality of voice. Femtocells on the other hand use licensed spectrum and provides standard UMTS or CDMA2000 interface; they leverage the robust channel structures and deliver good quality voice with improved coverage. Seamless handoff from macro cellular network to femtocell and vice versa is already in place as the existing mobile core network is leveraged to deliver this function.

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