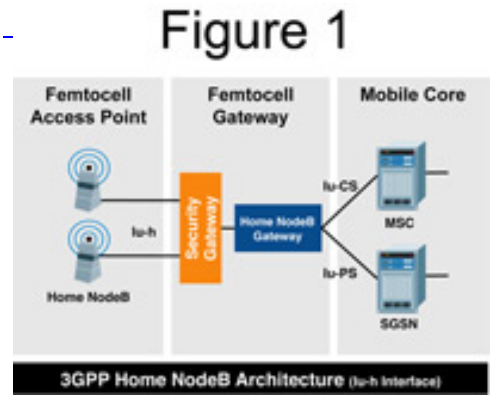
Femto Mass Market Mobilization

By Todd Mersch, Continuous Computing

So here we are in the second half of 2008 &#151 why are femtocells not more widely deployed in our homes? When are we finally going to get five bars in the family room? And what's keeping us from quicker YouTube downloads in our kitchens?



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I mean really, people, what's the hold-up with femtocells? Just kidding, folks. My feigned impatience is a tongue-in-cheek poke at one of the most promising and talked-about technologies of the year. And yet here we are, 18 months after the market first awoke to this fabulous opportunity, devoid of any real femtocell deployments, save a few isolated trials. In fact, many analysts and vendors now present 2010 as the "year of mass market femtocells." Ugh, that's a year and a half from now!

So, truly, what is keeping the home base station from hitting operators' storefronts this holiday season?

Deep breath. Before diving into the details, we need to level-set on the unique requirements for mass market introduction of any new technology within a mobile network, illuminating that femto deployment really is moving forward quickly relative to other "next generation" technologies. Take 3G for example: The technology worked and spectrum investments had been made a full decade before major deployments began to take hold. In comparison, femto is surging ahead at a breakneck pace, covering nearly the same distance in about a third of the time. That's progress.

For any mobile technology deployment, the key questions that need to be addressed include the following:

&#149Is the technology proven? Not only does the solution need to work, it needs to integrate into existing equipment and business processes.

&#149Can we manage it? A management nightmare translates into escalating costs and poor customer satisfaction &#151 hardly the objective.

&#149Can we bill for it? Before a carrier defines the consumer business model, it needs to determine the details of an accurate and flexible billing system.

How Do Femtocells Stack Up?

In the last 12 months, we have seen a substantial amount of progress in the femtocell space. First, the Femto Forum has established itself as a powerful and results-oriented consortium that is making tangible progress on key technical challenges like interference mitigation and device management. Bravo.

Second, this consortium has coalesced around a standard femtocell architecture from an initial assortment of over a dozen different choices (see Figure 1). This is major progress in only a short amount of time, and it hints at the potential still yet to come.

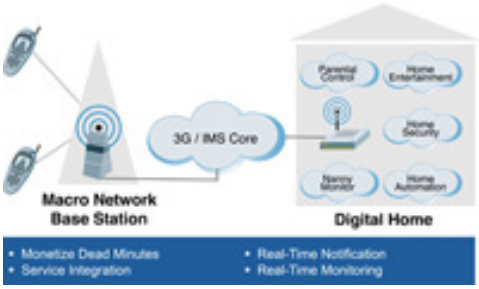
Third, femtocells are being put into consumers' homes (albeit not nearly as fast as this future customer would prefer!). In the United States, for example, Sprint is extending its AirRave consumer trials nationwide, and in Japan, a key mobile operator, Softbank, has announced concrete plans to launch its femtocell service in January 2009. So the work is already done and it's now time to open up the marketing floodgates, right?

Well, not so fast. Despite rapid progress, femtocells still face obstacles that must be overcome before the big deluge. Indeed, femtocell systems need to progress from "adequate and proprietary" to "optimal and open." The industry must complete standards definition work spanning from architecture down to the protocols in order to ensure interchangeability and economies of scale. Furthermore, the next tier of deployment issues must be addressed, including device management, Business Support System (BSS) integration, interference minimization and handover issues. So let's take a look.

Herding Cats (in the Home)

Mobile operators are in the business of delivering wireless services by deploying large scale base stations and high-end central office equipment. That's what they do. Beyond activation and authentication, carriers traditionally leave management of the consumer device (i.e., the mobile phone) to the customer.

Figure 2



[2]

This same strategy cannot be applied to femtocells. To be successful, femtocell installation will need to be a “zero-touch” experience for the consumer, similar to that of a cable modem or a WiFi router. As such, defining an effective femtocell management scheme involves identifying a protocol for reliable transport, defining a common data model for the management information, and defining the network functions to support the management plane. This approach needs to support configuration as well as performance, fault and event management. Complicated stuff, but the Femto Forum is making large strides by leveraging TR-069 and other “field-proven” device management ideas, and the industry is sure to converge on a comprehensive, widely-supported solution soon.

Billing, Interference and Handover

In addition to evaluating business models for best exploiting the femtocell opportunity, operators are also toiling to determine how to ensure that those “yet to be defined” models will actually be implemented. BSS integration is a difficult task, especially so when multiplied by the expected volumes and innovative services envisioned for femtocell deployments (See Figure 2).

These are difficult challenges for early femtocell deployments, particularly because BSS integration is not being dealt with on an industry-wide basis, leaving each operator to work with its vendors independently to define, design and implement its own scalable and flexible approach. The gaps still need to be closed.

Minimizing radio inference and ensuring seamless handover continue to be areas of focus for the femtocell community. A mobile operator simply cannot deploy femtocells en masse unless there is an effective and proven interference management plan. To date, interference is being managed in a multitude of divergent approaches across the various femtocell vendor solutions. As with early femtocell architectures, convergence is needed to get the collective market to move forward, and the Femto Forum offers the right venue in which to discuss, debate and decide. Stay tuned.

Lastly, femtocell handover presents another difficult challenge, requiring the femto to be aware of the surrounding macro network and to interface with the mobile core via the Femtocell Gateway. Many handover-related issues have been resolved by leveraging and enhancing existing handover-related signaling procedures from the 3GPP standards. However, new issues tend to crop up including “ping-ponging” which refers to a series of unnecessary and core network clogging handovers

between femtocells in a closely quartered high-volume femtocell deployment (i.e., urban apartment complex). Operator trials are flushing out the bugs, and they are driving rapid resolutions.

Femto's Future

Despite having to overcome the many challenges of a new technology, 3G femtocells are being trialed throughout the world and deployments are under way. In comparison to the pace of previous mobile system technology rollouts, the deployment of femtocell is happening very quickly, and considerable progress is being made to solve each of the issues above. We will continue to read about operators' femtocell deployments during the next 18 months, and then one day, we'll look around and realize that widespread femto availability is already upon us.

But then what? What comes after the 3G femtocell? (Remember, I'm an impatient guy!)

Here's a hint: LTE. Long Term Evolution is the next generation mobile network of choice throughout the global operator community, and LTE Femtocells promise to be the next big thing in indoor wireless broadband.

Alas, that is a topic for another article. The LTE Femtocell opportunity is too big, too transforming and ultimately too important to relegate to just a few sentences at the end of this piece. Suffice it to say, though, that the underlying demand for femtocells will exist a long, long time, and we're just getting started on an exciting journey into the future. But until then, you're going to have to wait for my next femtocell article. Don't worry, the wait won't be long, because we're moving fast!

About the Author

Todd Mersch is senior product line manager for Continuous Computing.

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