Current Analysis

Market Advisory Report:	**Femtocells Circa 2011: Surveying the Ecosystem Players**
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Analytical Summary

This past March, we collaborated with Mobile Europe magazine on a femtocell market primer. Beyond explaining the basics of femtocell technology, the market drivers and would-be pitfalls, we ran a survey of vendors in the space in order to gauge their impressions around issues of market timing, technology evolutions, marketing, applications and the difficulties in taking femtocells commercials.

To be clear, we already had our views on all of these topics. We've talked with operators and watched their marketing enough to know that small cells will play a role in LTE launches. We've worked closely enough with femtocell vendors to form an expectation of when LTE femtocells will be launched – and when LTE femtocell services will surface. We have our own views around Iuh and enterprise femtocells as well.

Regardless, surveys have several distinct benefits; they capture objective opinions from a broad set of industry players – opinions that may not always be shared in face-to-face discussions; they deliver data points around the market's development; when repeated over time, they provide an opportunity to track the market's evolution. To that end, as we approach the end of 2010, we wanted to return to our survey and ask a similar set of ecosystem players a similar set of questions about the development of the femtocell and small cell markets.

The result is added insights into where today's femtocell vendors see the market, how they see it developing, and what they see holding it back.

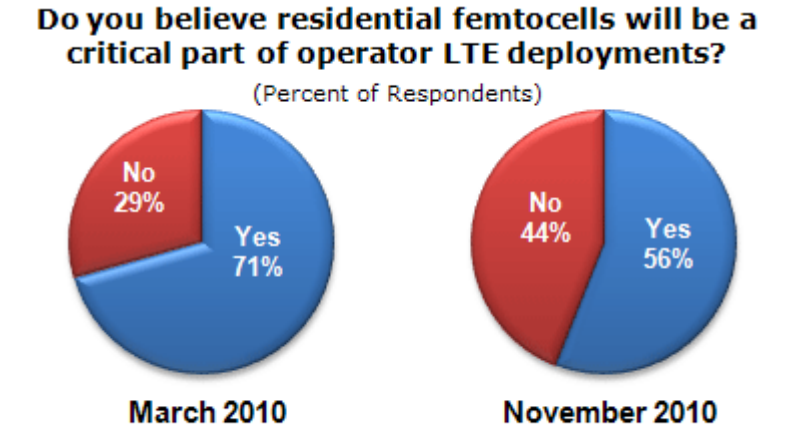
Perspective

Our survey with Mobile Europe in March was conceived to provide an indicative (rather than statistically significant) set of insights into the femtocell ecosystem based on a small sample of key industry players. Our latest survey – conducted in October and the early part of November – carried this forward. Key decision makers (marketing VPs and directors, CEOs, etc.) in the femtocell ecosystem were fielded a Web survey. Roughly 60% of the vendors are involved in the femto core, one-third act as system integrators, half are involved in femtocell acess point development, and 25% are in the silicon space. Some questions were repeated from March, allowing for a comparison. Some new questions were introduced.

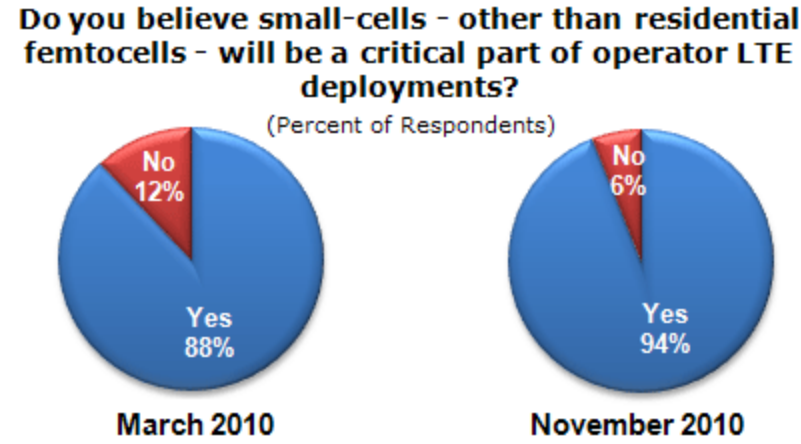
With a fairly small sample size (~20 respondents), it would, again, be difficult to qualify our latest study as statistically significant. The fact the new companies were brought into the process also complicates any certainty around the accuracy of direct comparisons. Ultimately, to the extent that the femtocell ecosystem still includes a relatively small number of firms who are actively involved and shaping the market, our sample captured a majority of the players who matter. More importantly – beyond our own views – it provides another view into the market, a view from people who are, arguably, closest to the market's development.

Small Cells & LTE

In March and November, we kicked off our survey with a discussion of LTE. Mind you, the responses are not operator commitments. Rather, they represent the feedback being received by vendors responsible for making LTE femtocells and small cells a reality.

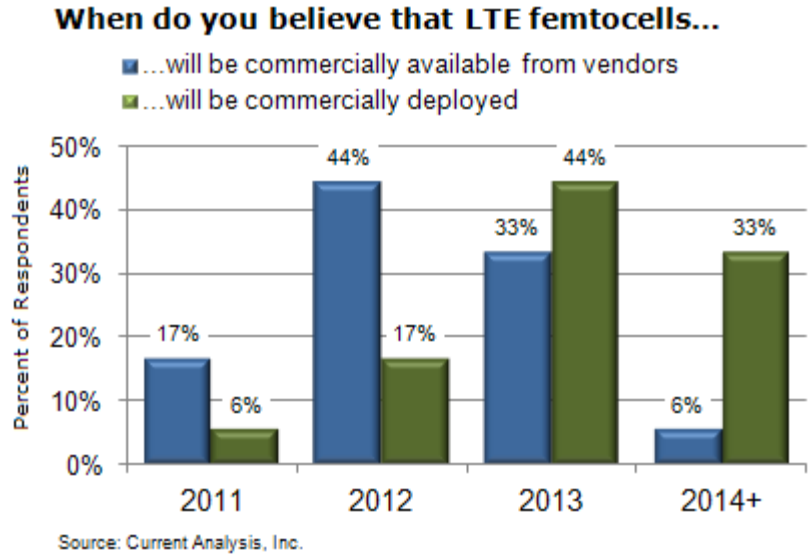


Source: Current Analysis, Inc.



Source: Current Analysis, Inc.

We might question how quickly operators will move on small cell LTE. We might question how broadly they will deploy small cells like picocells or microcells, but operator messaging on LTE small cells has generally been positive, and this is reflected in our ecosystem survey; the vast majority of femtocell vendors see small cells as "critical" to operator LTE launches. Less certain, however, is the role of femtocells in LTE. Here, the opinions were essentially split down the middle – though a slight edge (bias) went to the idea of femtocells playing a major role in LTE deployments. More interestingly, however, is the shift in perceptions from March when 71% of respondents saw a clear, critical role for femtocells in LTE. While not a massive shift (15 percentage points) it does align well with the fact that initial LTE deployments are already underway and LTE femtocells are not yet commercial.



Source: Current Analysis, Inc.

On the topic of commercial LTE femtocell availability, one thing is clear: today's femtocell vendors expect a year delay between product availability and service rollouts. A majority of the vendors surveyed expect commercially

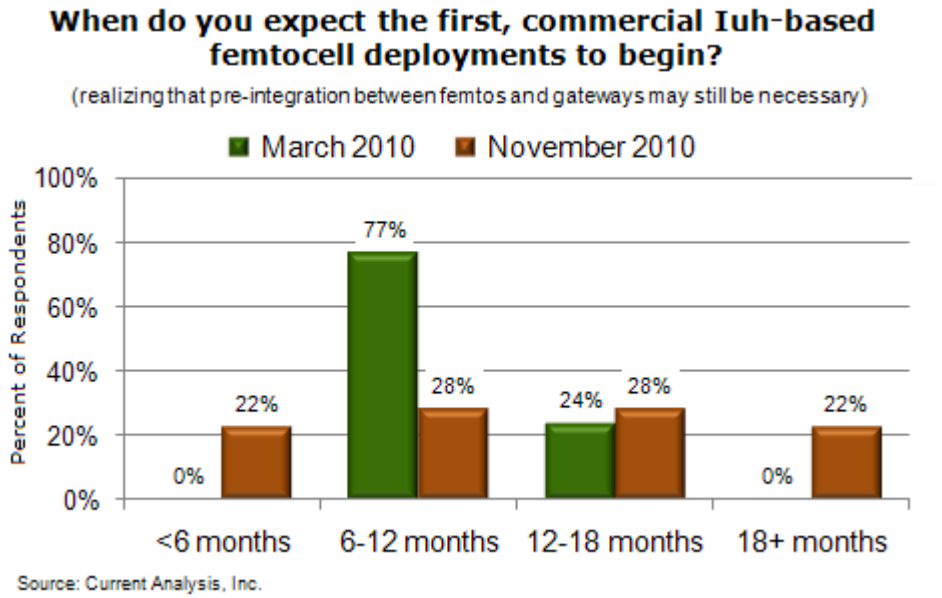
available LTE femtocells in 2012; a vast majority (77%) expects them in the 2012-2013 timeframe. Commercial deployments, then, are expected by a majority in 2013, with a vast majority planning for 2013-2014. More than once, Japan was singled out as an important driver – in line with aggressive moves on LTE in the country and traditional issues with in-building coverage.

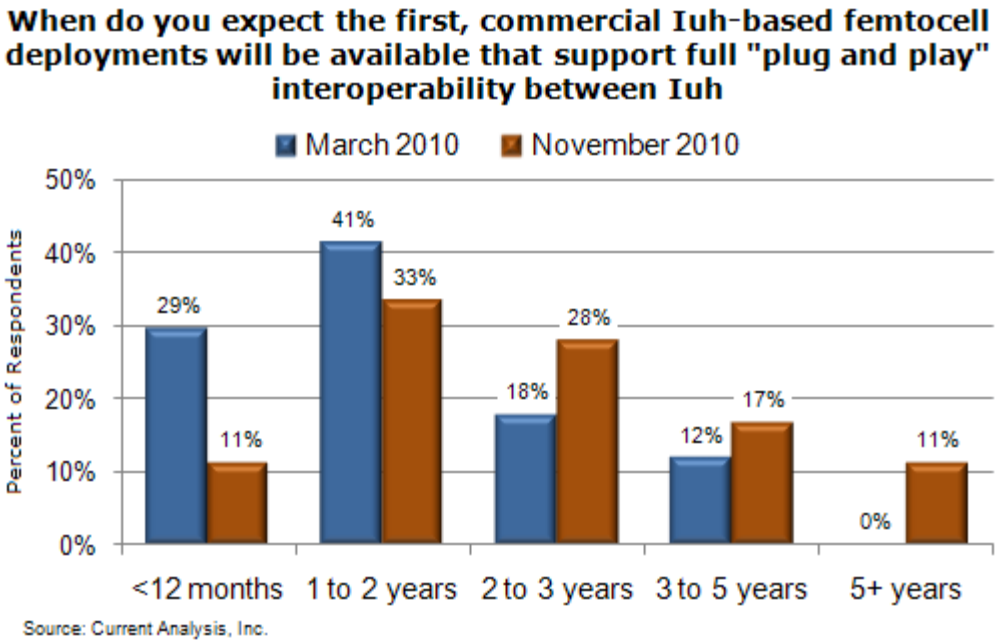
Interestingly, some vendors expect products and launches next year. Even if these are field trials, any service launches would be significant – though they could potentially complicate operator planning around today's generation of 3G femtos.

Network Integration Options

Standards-based methods for integrating femtocells into an operator's network have long been held out as key to the scaling of femtocell services and the delivery of efficiencies which simply aren't possible with proprietary interfaces. Ultimately, the use of standard protocols should even allow plug-and-play architectures where femtocells from various vendors are linked into a femtocell gateway with no need for pre-integration.

In the femtocell space, two protocols get the most attention: the femto-specific Iuh and SI:

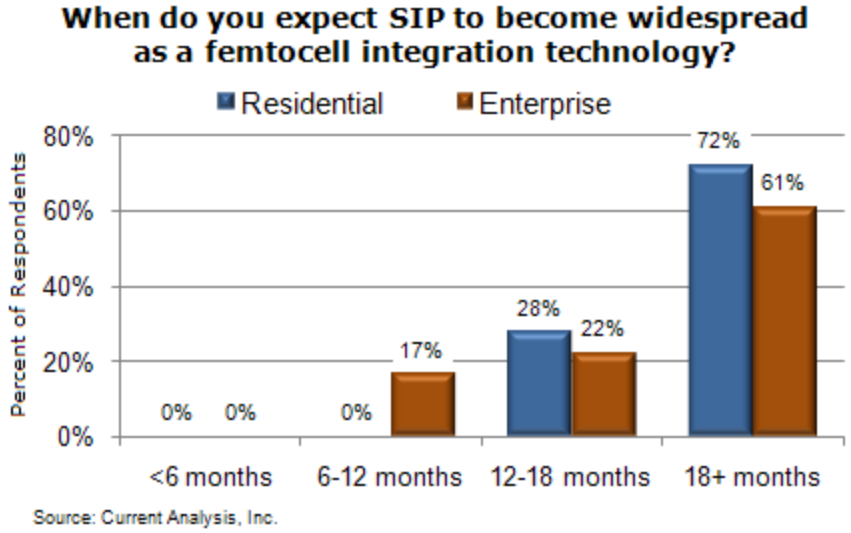




It is important to note that commercial Iuh deployments do not assume a "plug and play" model or interoperability. To that end, many more vendors expect commercial Iuh deployments in the near-term than those expecting full interoperability. The majority of vendors (61%), in fact, expect that it could take up to three years before consumers can expect Iuh to support femtocells which haven't been pre-integrated, and 28% think this could be more than three years away!

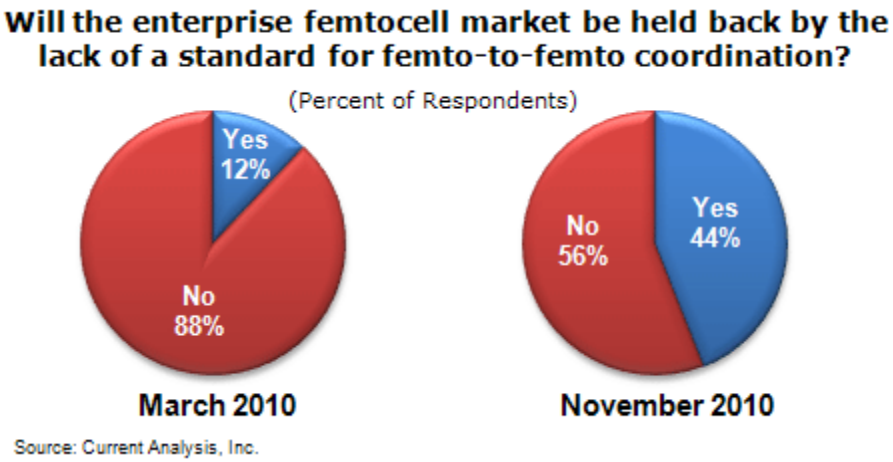
Deployments (without plug and play) are another issue. Though SKT's upcoming launch with Contela is slated to be the first commercial Iuh deployment, most vendors seem more guarded on how quickly Iuh will take hold: half of the responses in our latest survey expect movement within the next year, half think it will take more than a year.

More significant is the change in attitudes in how quickly operators will move on Iuh. From our March to November surveys, the responses generally shifted out in time. In March, only 24% of respondents thought it would take more than 12 months to see Iuh deployments. Seven months later, that number was more than double (50%). In March, the vast majority of responses - 70% - said they saw plug and play Iuh within two years. Seven months later, that number dropped to 44%, a 40% drop. Vendor readiness aside, it's clear that getting operators to move away from solutions (even proprietary ones) that work to something new has proven harder than expected and that operator interest in an ecosystem of off-the-shelf, interoperable, femtocell access points is not a major priority in the near-term, even though all femtocell platforms will need to pre-qualified.



In the CDMA2000 market, SIP has been identified as the standard for femtocell integrations. Focusing on the larger 3GPP opportunity, we asked: When do you expect SIP to become the predominant WCDMA femtocell integration technology - being used for a majority of new launches?

Given the pace at which operators have moved on technologies like IMS and the presence of Iuh, it's not surprising that most vendors expect SIP to lag Iuh by a significant amount of time. Many, in fact, suggested that SIP would never become the "predominant" solution for WCDMA, though views on the enterprise (where SIP is more prevalent) run towards an earlier adoption.

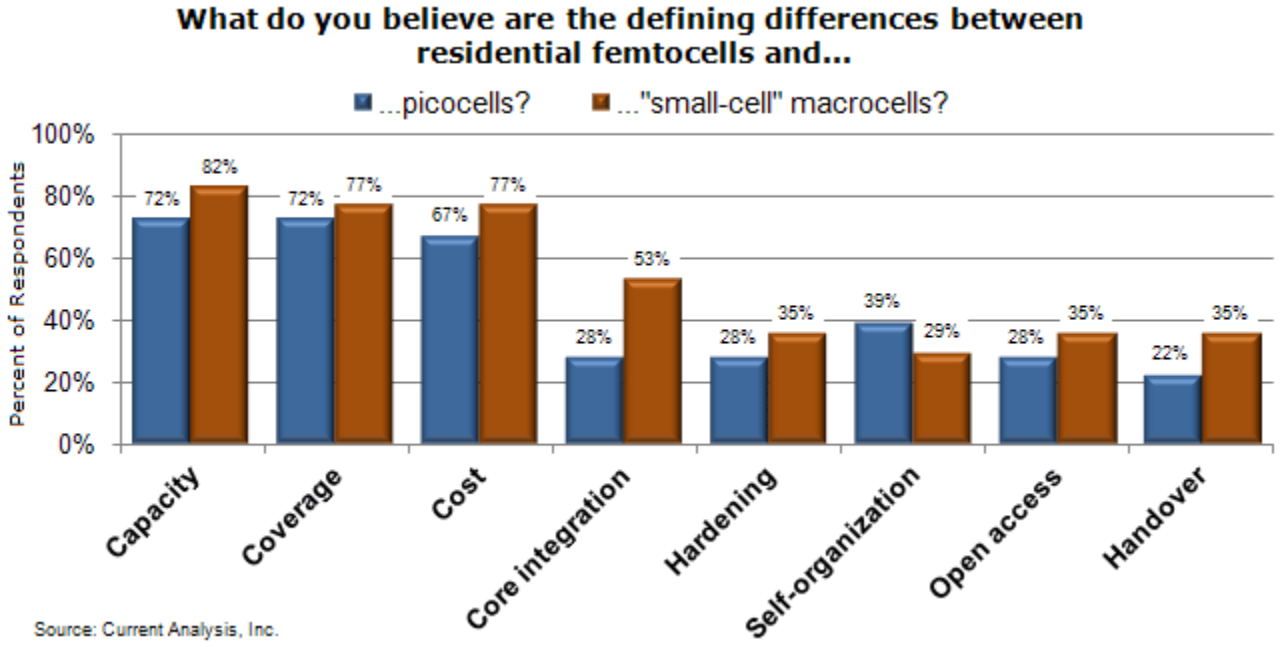


In the enterprise, the other interface to consider is the femto-to-femto link necessary for supporting coordination and handover. Here, no real standard has evolved. We have long argued that this could be an issue for taking the enterprise market forward. Historically, vendors in the space disagreed with our view, arguing that standards weren't needed since no enterprise was likely to mix and match femtocells in a single office from multiple vendors. An even more compelling argument is that the majority of enterprises are small-to-medium businesses which can be easily served by a single femtocell.

Regardless of the arguments, it seems that time has changed several opinions. While most vendors still believe the lack of a standard inter-femtocell coordination technique won't hold back the market, the number of vendors who see the potential for a problem is clearly on the rise.

Marketing & Naming

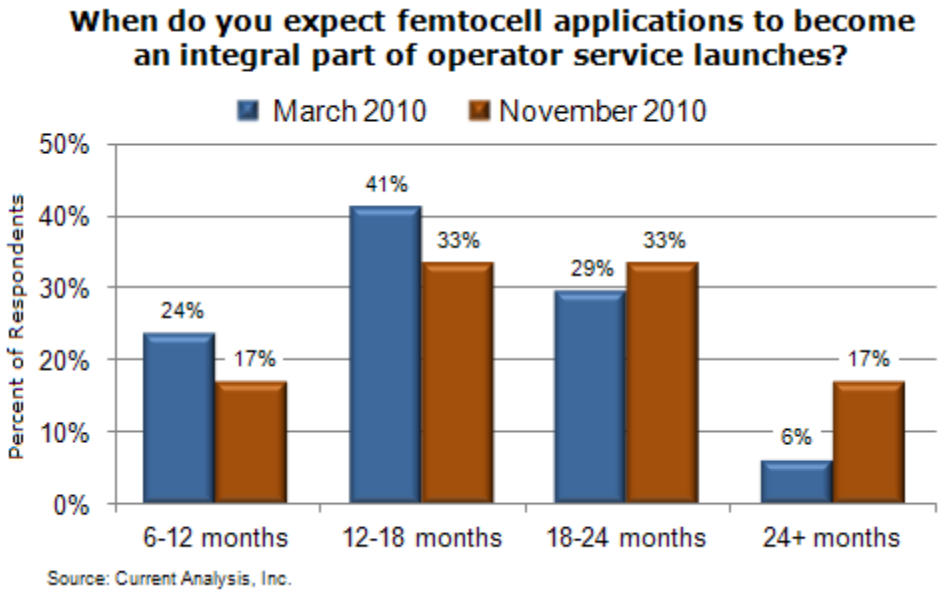
Not long after femtocell R&D began to produce commercial products, vendors began talking about the opportunity for taking these products outdoors, serving users outside the home by delivering higher capacities and broader coverage along with environmental hardening. Various names emerged for these products: Metro Femtos, Super Femtos, and small cells. The Femto Forum seems to favor "Class 3 Femtocell." All of these compete with the traditional operator option for low-capacity, targeted wireless coverage – femtocells.



From a vendor perspective, some consider femtocells as a part of their small cell portfolio. Regardless, the key differences cited between residential femtocells and picos or small-cell macro base stations come down to three basics: coverage, cost and capacity.

Though these are obvious differences, it may be surprising that issues such as self-organization, open access and handover weren't more cited. Publicly, most femtocell vendors – at least those without traditional macrocell businesses – have argued that they see no conflict between their deployment and interference mitigation tools versus the SON tools being rolled out; suggesting that these should be distinct solutions. At the same time, macrocell platforms – and many picocells – will need to be open access, servicing any user on the operator's network. Femtocells shouldn't fall into the same usage scenario. Finally, while it's assumed that operator deployed solutions like picocells and macrocells will need to support both hand-in and hand-out, this won't always be the case with femtocells to the extent that R8 standards support hand-out, not hand-in.

Femtocell Applications



Technical and marketing aspects of the femtocell business aside, femto-zone applications have been proposed as a solution for effectively competing with the wireless broadband functionality of WiFi in the home. In theory, applications that leverage the femtocell's location, presence or access to higher bandwidth at a low-cost tariff can be used to incent users to adopt them over plain WiFi – keeping them tied to the operator's network, but still offloading them from the macro RAN.

Some of these applications have already been rolled out in progressive markets like Japan. More broadly, however, the view on them is relatively pessimistic. This is understandable: APIs are just getting rolled out; beyond APIs, the success of femto-zone applications will depend on an ecosystem of developers; operators are still marketing femtocells for voice coverage, not data applications. Regardless, seven months after our initial survey, the fact that near-term timeframes (six to 12 months, 12 to 18 months) saw fewer responses, while longer term frames got more votes suggests that the rollout of these applications could take some time.

Technical & Business Challenges

No different than any relatively new technology, the femtocell space has faced its share of "teething pains" – obstacles which may not actually hold up service launches, but complicate them and potentially threaten their scale. To this end, we asked our panel: what has been your greatest technical challenge in taking femtocells from initial trials into commercial reality?

As an open-ended question, presenting the results as a share of responses is no easy task. No two responses were necessarily identical. That said, there were clear themes running across the answers.

• Home Networks. While not cited as a ubiquitous sore point, home network issues were called out by about 17% of respondents. These ranged from insufficient throughput to the femtocell device, to router or firewall conflicts. Throughput constraints may only be addressable through operator femtocell service requirements and pricing. Constraints caused by conflicts with home networking gear, however, represent an opportunity for any femtocell vendor who can point to their software as supporting seamless, hassle-free deployments.

• Operations Administration and Management. Like home network challenges, OA&M systems were cited 17% of the time. In particular, integration of femtocells into existing OA&M systems for provisioning may be complicated, especially if elements of the femto core reside within diverse operator business units. In part, this is an operations and coordination issue within the operator. Regardless, if not executed well, the impact is obvious (poor quality and/or rollout).

• End-to-End Systems. You can count OA&M as key to an end-to-end femtocell rollout. Beyond that, however, end-to-end integration difficulties were the most cited technical challenge, including: OSS/BSS, security, integration with legacy operator data systems, gateway-to-core interoperability, etc. Given the number of moving parts required to make a femtocell service work, this shouldn't be surprising. More importantly, it suggests that the femtocell access points themselves have matured nicely and that a role for integrators from a professional

services perspective clearly exists.

• Business Model. Despite a question that asked about "technical" challenges, nearly 40% of responses focused on business challenges such as differentiation against WiFi, scaling for mass market deployment, costs and simply getting operators to move on new services. You might imagine that if the question were asked more broadly, even more people would have cited similar concerns, arguing that business – rather than technical – issues are the greater femtocell challenge.

Near Term Drivers

• Coverage vs. Capacity. Today, the primary value femtocell value proposition being sold by operators is coverage for voice services. A select few – recently including SKT in Korea – have begun to focus on capacity. If the ultimate role of the femtocell is to help operators ensure solid service quality and offload low-value data traffic, marketing will need to shift and follow the lead of those operators leading with capacity and data quality.

• LTE. With LTE services being launched this year, it was only a matter of time before operators began looking for LTE femtocells. Based on the vendors in the market, they're not likely to become a part of operator launches for another two years – with the first commercial LTE femtos appearing in the 2012 – 2013 timeframe. We've already seen femtocell silicon vendors like picoChip discuss their LTE roadmap. To pave the way and help operators plan for in-home LTE, we will, doubtless, see other ecosystem players roll out prototypes and tradeshow demonstrations throughout 2011.

• Indoor or Outdoor. After talking about "metro-femtos" and "outdoor femtocell" applications for some time, a few high profile deployments kicked off this year. Operators, however, will still face confusion over the difference between picocells, microcells and outdoor femtocells. Ultimately, for outdoor applications, self-contained easily deployable product architectures are what operators will be looking for, teamed with capacity and coverage residential femtocells can't deliver.

• Enterprise. Like metro-femtos, enterprise femtocells have been an industry promise and bubbling theme for the last year. Whether or not vendors think that a lack of standards for inter-femto communications will hold back the industry, it's clear that the enterprise will be targeted – based on a heightened demand for data, and typically sketchy coverage. Yet with many technology options facing them, integrator support may be the greatest differentiator versus actual solution merit.

• Applications. Applications complete the trifecta of femtocell topics that were supposed to be big news in 2010 – but never really materialized as promised. Alongside outdoor and enterprise deployments, femto-zone applications were supposed to make femtocells more compelling for end-users. With most operators focused on femtocells for voice coverage, limited commercial progress on data applications isn't surprising. Yet, where the value proposition is clear – making femtocell services more attractive – the focus on applications won't die.

• WiFi. Femtocells in the enterprise and femto-zone applications have a common enemy – WiFi. For data services, WiFi is the de facto wireless solution in the enterprise today. The same holds in the home – hence the need for applications to make femtocells more attractive. As WiFi creeps into more and more devices, WiFi voice offers improve, and software helps to make seamless switching from 3G to WiFi a reality, the competition to femtocells is clear, and not likely to go away.

Competitor Response & Recommendations

• Vendors need to spell out the consumer use case for femtocells versus solutions like WiFi. Femtocell vendors already note that they're facing WiFi as a competitor; this will only intensify with smartphone penetration on the rise. Vendors have traditionally helped their customers understand how to market technologies to the end-user. They must continue to do so with femtocells if they hope to drive sales.

• Femto-zone applications have long been held out as a solution for driving femtocell usage. As LTE comes on-line and the value of 3G's circuit channel is diminished, operators will need compelling femtocell sales stories more than ever if they hope to compete with WiFi (another IP-only service). For this very reason, vendors need to move much more aggressively on the application front, rolling out more than prototypes and samples, but bringing a vision of simple development and discovery to market.

• Femtocell vendors need to move cautiously with LTE development. LTE small cells are clearly important to operators. Many have said they see value in LTE femtocells, and more than half of the vendors surveyed see a role for femtocells in LTE deployments. In the near-term, however, moving quickly on LTE femtocells could drive operators to postpone 3G femtocell deployments, driving out the femtocell revenue opportunity.

• NEC is an exception to the above recommendation; the Japanese vendor needs to highlight its LTE femtocell development plans aggressively. To be sure, NEC has a solid 3G femtocell business, including eight contracts and recently announced plans to sell 3G femtos into India. As a company that has traditionally relied on partners for femtocell access points, however, it needs to begin marketing its homegrown LTE femtocell and end-to-end solution plans in order to ensure their visibility.

• NSN and Ericsson have an opportunity with femtocell OA&M solutions. Both companies have taken a role as femtocell integrators; NSN with its gateway development and partnerships, Ericsson based on femtocelI deployments it has reportedly bid on. Both companies could deliver a better offer if they could address end-to-end femtocell network operations solutions – something that would also play into their well-known professional services expertise.

• Vendors need to begin investigating the potential for convergence between femtocell and macro network SON solutions. Time and again, they have suggested that there is no conflict between the SON used for in-home small cells and their outdoor brethren. While this is likely inaccurate (there is bound to be some overlap that will impact IPR), it's also true that for small cells and femtocells to exist as a macro network underlay, coordination between disparate SON solutions would be in order.

Buyer Actions

• Operators who have launched femtocell services need to consider evolving their offers to focus on capacity as well as coverage. For the most part, operators have sold their femtocell services on the value of better coverage for voice. Leveraging femtocells for data traffic offload (an operator goal), however, will require novel marketing and sales tactics – tactics that will take time to get established.

• Operators need to the lead on femtocell application development. If they believe that femtocells can support network efficiencies and improved service experience, they should want to drive them into the market. Yet where coverage is already sufficient for many users and WiFi competes for data, driving femtocells may be difficult without compelling applications.

• Service providers with femtocell and LTE launch plans in the immediate future need to consider waiting on LTE femtos. They may not be around in the near-term. They won't address voice coverage. Regardless, femtocell vendors will scramble to roll out LTE solutions and they could be easier to deploy given on-going standards work around heterogeneous networks.

• Operators cannot let vendors conflate their small cell and macro network expertise. It will always be possible to leverage femtocell R&D into products aimed at broader, higher-capacity coverage. That said, macro cell products need different operations and even SON tools. It's not always possible to simply slap an enclosure on a femtocell, take it outside and expect solid performance. Provide outdoor performance – ideally tied to expertise with macro cell deployments – is key.

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