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## RAN Special Focus Femtocells - Standard approach set to boost femto market

*Keith Dyer hears that femtocells can have a bright future if vendors can solve several pressing operator requirements*

When an industry body forms with seven founding members, and a year later has over eighty members drawn from operators and vendors, it's reasonable to assume there is something significant going on. When that body starts producing agreements across its members on a common approach to standards within that time frame, then you can certainly assume that the body is more than a talking shop.



This is what happened with the Femto Forum, a body started in the summer of 2007, with just seven members. Clearly, then, the Forum founders had realised that their customers, the operators, required a common approach that would, in the end benefit all.

Of the issues facing operators, one of the key ones was how they would manage the integration and aggregation of femtocells into their core networks. With millions, potentially, of these devices going into people's homes and offices, operators made it clear that it was essential that they had one common interface to manage, no matter who the femtocell supplier was.

So at its plenary meeting in March, operator members agreed the following principles for interoperability on the interface (called the Fa interface) between Femtocell Access Points and Femto Gateways. They agreed there would be:

- a single definition of the Fa interface with specific modules defined for each radio technology to comply with existing standards.
- A "collapsed" architecture where the NodeB/BTS and RNC/BSC functionality will be placed in the Femto Access Point (FAP) to optimize signaling and performance over the broadband connection.
- Interfaces from the Gateway to the core network shall use existing standards.

By making representations and recommendations to industry standards bodies, 3GPP, 3GPP2 and establishing cooperation agreements with the DSL Forum and the GSMA, the result was to adopt a commitments to standardise around the luh interface. This was slightly controversial at the time, as it meant delaying going down a SIP/IMS control path. But with operators delaying their own IMS investments, or at the least taking a piecemeal approach to IMS, this has not been seen as a bar.

Steve Mallinson, ceo, ip.access, says that the critical issue is giving operators a working solution that meets their current and future needs. Although luh standardization is not finished yet, it is only by getting standards into the femtocells area that "we will see big volumes in the long term".

Mallinson says that he thinks the standard may be finalized by the end of the year, with the first compatible products available by mid-2009.

More importantly, Mallinson says, operators want to see that their vendors have a migration path to standards, rather than insist everything they deploy or install from this point on, is fully standards compliant. This allows them to go ahead with their trials, and even commercial launches, without worrying about the standards as they are formed.

The other main area of standards focus within femtocells to date has been in the management of the femtocells themselves.

In July this year, following a plenary meeting in June, the Femto Forum announced its members have agreed to implement the Broadband Forum's TR-069 "CPE WAN Management Protocol". The adoption of this standard is critical because, unlike traditional cellular equipment, femtocells will be deployed in high volumes and installed by the subscriber, so the provisioning and configuration must be completely automated and managed remotely by the mobile operator. The TR-069 protocol standardizes secure CPE auto-configuration practices and incorporates other CPE management functions, including diagnostics and troubleshooting, performance monitoring, and software/image management, into a common framework. Some Femto Forum members have already adopted the protocol into their existing solutions, others will need to do so.

"Femtocells represent a very different approach to mobile network architecture and therefore require a suitably different approach to network management. The similarity to fixed broadband networks is obvious so TR-069, the dominant standard for the management of broadband gateways, is the natural choice," said George Dobrowski, The Broadband Forum's Chairman.

As well as the management of the CPE, there is the question of how femtocells will interact with the macro network itself. Michael Flanagan, CTO, Arieso, points out that in most deployment models, femtocells take advantage of a subscriber-provided backhaul path to provide licensed cellular service in a manner analogous to the commonly used WiFi router. However, the interactions between femtocells and the overlay macro network are critical for the success of future femtocell deployments.

"Widespread femtocell deployments will put additional strain on traditional maintenance, as well as the operation of the macro network," Flanagan says.

"System parameters will routinely need to be updated to account for the addition and deletion of femtocell sites. If the femtocell market lives up to its promise and hype, there will rapidly come a point when it will no longer be physically or financially possible to conduct routine updates of the overlay macro network manually."

At that point, Flanagan says, network operators will need to be able to rely on automated software solutions in order to maintain target quality objectives across multiple service classes. Such solutions will also need to allow the overlay macro network to reconfigure itself automatically in order to respond to the areas that are served by femtocells (or not served, in the cases where femtocells go out of service). Using this kind of software, the macro network will be able to redirect its coverage and capacity to other areas in order to make maximum use of all network resources (including the femtocells).

Flanagan thinks that while the standard model for femtocells is based on the subscriber-driven "pull" of femtocell purchases, new solutions coming to the market will allow for a service-provider-driven "push" of femtocells onto the network. This will enable service providers to identify areas where femtocell additions would most relieve the overlay macro network.

"On their own," Flanagan says, "femtocells could end up causing as many headaches as they promise to solve. In order for femtocells to have a significant, positive impact it is necessary to ensure that the combined macro and femtocell networks are properly optimised and that automation replaces what would otherwise become labour intensive and prohibitively expensive update and configuration activities."

Further challenges lie ahead. Nick Rickard, Product Director in the wireless business group at Alcatel-Lucent, says that quality of service (QoS) cannot be guaranteed, since the femtocell relies on a broadband data connection provided by a third party. It may be necessary for operators to partner with ISPs to provide a guaranteed QoS to the customer, or indeed for operators to become ISPs themselves.

Rickard recognizes that billing can be an issue too, since operators will need to know when a customer is accessing services via the home femtocell or outdoor macro network, especially if enticing 'home zone' tariffs are offered to persuade users to install femtocells. Since users with home broadband connections already receive internet data services for 'free' with their ISP subscription, no operator could reasonably charge extra for data services via a femtocell which uses that 'free' resource.

He also mentions security - since the femtocell uses the internet to connect to the operator's network, robust security measures (i.e. IPsec - IP Security) must be in place to prevent hackers from 'spoofing' the identity of a femtocell and obtaining services for free at someone else's expense. A system also needs to be in place to prevent a customer from taking a femtocell abroad and using it to obtain free "home" calls on a local broadband connection.

Yet, given the progress the Femto Forum, and its members, have made, there's no reason to think these issues cannot be resolved. The vendors involved know they can simply not afford to lose out.

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