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Wi-Fi versus the Femtocell

Cell phones are all around us, and the towers that serve them seem to be everywhere. Yet despite the ubiquitous presence of these things, many users complain of lousy coverage when they are at home.

Lack of inside coverage is not much of a problem if, when going indoors, you end your cell phone call and pick up a landline phone. While switching phones may be acceptable to those of us accustomed to wired telephones, a new generation of mobile-centric users may want more.

When a wireless company has a hole in their coverage area, the customary way to fix it is to install a new cell site. These sites adorn many hilltops, as well as rooftops, water towers, and other structures. In a residential neighborhood, finding a suitable site can be difficult. Besides the problem of finding property to lease, tower owners must deal with homeowners concerned about the aesthetics of the site, and other RF energy factors.

With site selection established, the wireless company then must deal with the time and expense of construction. They will then pay ongoing expenses of site maintenance, and leased telecommunications facilities linking the site to their network. Addition of enough outdoor cell sites in order to improve indoor coverage could prove to be quite difficult and costly.

One solution a wireless provider may employ to help overcome all of these problems is the Femtocell. A Femtocell is a very small version of the larger cell site, and operates in the same RF spectrum as the cellular network to which it is associated. Installed INSIDE the premises of a cell customer, this tabletop unit uses the customer's existing data telecommunications facilities to communicate with the cellular network.

Cable's high-speed data networks provide an excellent path over which the Femtocell may communicate with its network. Phone company DSL networks also work well with Femtocells. Femtocells are compatible with any existing cellular phone operating on the associated network. Other than the Femtocell base unit, no special equipment in the home is necessary. The Femtocell can relay cellular data transmissions, however the Femtocell will not carry the signals from any existing Wi-Fi based equipment that a customer may own. The Femtocell base stations are also expensive, especially when compared to consumer-grade Wi-Fi equipment.

An alternative technology to Femtocells is available, and embraced by at least one Cellular operator in the U.S. – UMA (Unlicensed Mobile Access). UMA involves a software client in the phone, capable of communicating with the Cellular Switch via IP over a Wi-Fi connection. The function is similar to Femtocell technology, but has the

advantage of not requiring a specialized Femtocell base station in the customer's home – a standard Wi-Fi access point will do, and can also support the customer's existing Wi-Fi equipment.

A disadvantage: the solution requires specialized handsets that include not only Wi-Fi radios but also UMA client software.

Cell phones with built-in Wi-Fi radios are becoming widely available, and many of these are able to run UMA client software. Today's Wi-Fi phones currently have handicaps in battery life compared to their cellular-only counterparts, however with advanced battery technologies and power-saving Wi-Fi radio access methods, that handicap is shrinking.

If a Cable Operator wanted to become more involved with Fixed Mobile Convergence (FMC) they would need to find technologies to use since typically, unless already a cellular carrier, they would not have allowable access to cell spectrum. While Femtocells may not be an option, there other FMC options that an interested company could pursue using unlicensed Wi-Fi networks.

Instead of a UMA Client, controlled by a Cellular Operator's switch, the dual mode phone could be equipped with a SIP/Cellular client. The client is able to measure the relative quality and availability of the Wi-Fi and Cellular signals. It sends calls to the Cable Operator's voice infrastructure when connected via Wi-Fi, and to a Cellular Company infrastructure when not. The Cable Operator also must install a host server in its network, with which the mobile clients communicate. Of course, in order to make calls when off-network, an account with the cell company will be required. This brings us to some more definitions:

"Loosely Coupled" – The Cable (or other landline) provider's infrastructure is used separately from the Cellular infrastructure, and may be called as a "two-number solution". The cable operator has no relationship with the cell operator – each customer handles his or her own cell account. Subscriber authentication on each network is distinct and separate. Call hand-off (if available), also known as "voice call continuity" or VCC, is based on an elaborate method of creating new call legs anchored on one of the two networks. Incoming calls to one number may be forwarded to the number on the "anchor" network. The presentation of outbound Caller ID is also problematic: In order for the number displayed to equate with the converged number the customer desires people to call, outbound Cellular calls first be passed through the anchor landline network (or vice-versa).

"Tightly Coupled" – There is a relationship between the Cell provider and Cable provider. The two networks can signal one another to facilitate subscriber authentication or call hand-off, using techniques developed for conventional cellular technology. IMS (IP Multimedia Subsystem) may play a role in facilitating these hand-offs, however conventional SS7-based techniques will also work. This method is also known as a "single-number solution".

Providers are in the process of testing “Loosely Coupled” and/or “Tightly Coupled” techniques in the laboratory.

Beyond the highly technical matters involved in Voice Call Continuity, other ways could prove attractive to couple a wireless voice/data service with Cable’s wire line offerings. For example, an integrated video platform could enable mobile customers to access their Cable Video Service on their handset, whether connected via a Cellular or Wi-Fi network. Video calls from a camera-equipped handset to a SIP-based videophone client on a Cable network are another near-term possibility.

Simple user-friendly features such as a single voicemail box to check, and a single address book to keep up, could be even more important to customers than improved radio coverage. Uncomplicated features would also be easier to implement and maintain.

While we can be confident that Cable will have a role in the FMC world, the endeavor could follow many possible directions.