

***Can you hear me now?***

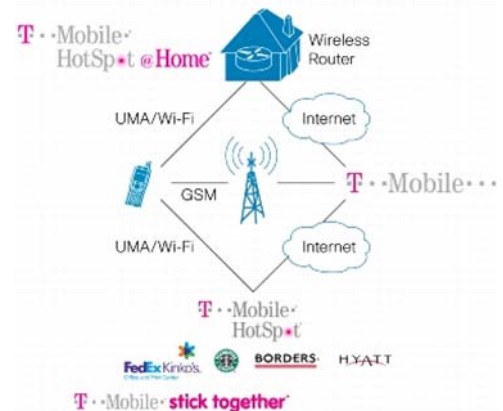
The holiday shopping season is upon us, and the deluge of new mobile phones has begun with the introduction of the BlackBerry Storm & Bold, the Google Android G1, the ever-popular iPhone 3G, and coming soon, the Nokia N97. They are equipped with the latest touch screens, browsers, games, maps, and widgets. But what good are all these features if you can't get a signal from inside your home or office? Indoor wireless coverage is still a major issue with all wireless carriers as infrastructure capabilities and capacity have not kept pace with mobile consumers' demand for ubiquitous coverage and greater bandwidth.

According to CTIA, minutes of use and the number of SMS messages have increased by 77% and 927% within the last three years, respectively, while the number of cell sites has only increased by 24% over the same time period, albeit tower growth has been restricted by zoning restrictions. Moreover, the percentage of wireless-only U.S. households has increased from 7.7% in 2005 to 15.8% in 2008 (see table below). As more people replace their fixed line phones with a mobile plan, this poses a large public safety issue.

Wireless Statistics	June 2008	June 2005	% change
Wireless-only households	15.8%	7.7%	100%
Annualized minutes of use	2.23 trillion	1.26 trillion	77%
Monthly SMS Messages	74 billion	7.2 billion	927%
Cell sites	220,472	178,025	24%

Source: CTIA

Today, most cellular traffic is relayed by outdoor communication towers. However, wireless carriers are developing alternative ways to take advantage of fixed broadband connectivity in homes and offices (DSL, cable, T1) to offload data capacity from congested outdoor cellular networks, improve indoor coverage for seamless voice calls, and enable high speed wireless



Source: Cisco and T-Mobile

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...ways to take advantage of fixed broadband connectivity...to offload data capacity from cellular networks, improve indoor coverage...is called fixed mobile convergence (FMC).

data connections for faster web browsing. This trend is called fixed mobile convergence (FMC).

In the U.S., there have been two FMC deployments by the wireless carriers. T-Mobile launched its service called HotSpot@Home in the summer of 2007. The service allows users to place calls or access the Internet over a Wi-Fi network. A T-Mobile subscriber buys a wireless router and sets up a Wi-Fi hotspot in his or her home. When the person is at home, the call goes over the unlicensed mobile access (UMA) network (aka T-Mobile HotSpot), then routed to the Internet via the fixed broadband connection without touching the cellular network. Once out of range of the hotspot, the calls go over the standard GSM network (see chart above). Such subscribers are required to use a dual mode GSM/Wi-Fi compatible handset. T-Mobile has partnered with retailers and public venues such as Starbucks and airline lounges to offer T-Mobile branded hotspots outside of the home where Wi-Fi calls can also be made. Subscribers benefit from increased indoor coverage, while T-Mobile benefits from less traffic clogging up its GSM network and saves them substantial cost of having to increase the number of cells in its network.

...femto cells are miniature "fill-in" sites to expand the capacity of a wireless network

Sprint launched a second FMC solution this summer called AIRAVE available only in select areas. AIRAVE is slightly different because it uses a technology called "femto cell" rather than Wi-Fi. A femto cell device is a small cellular base station or a miniature indoor cell tower that boosts the cellular signal for indoor use (see picture to the right). Each base station can support up to 3 mobile phones. The calls are still routed through the fixed broadband connection in the home rather than the cellular network. The main difference is that T-Mobile's service uses unlicensed Wi-Fi signals while Sprint's femto cells use licensed cellular spectrum to connect calls between handsets and the base station. In other words, femto cells are miniature "fill-in" sites to expand the capacity of a wireless network, and a unique advantage to femto cell is that you do not need a dual-mode handset like the Wi-Fi solution.



Source: Samsung

Last month, Verizon confirmed plans to launch its FMC service in early 2009. They are using Samsung's femto cell base station, so we expect it will be very similar to Sprint's AIRAVE. AT&T has not

announced any definitive plans, but there are rumors that they picked ip.access, a UK company backed by Cisco, Intel, Motorola, and Qualcomm, for its femto cell base station. A table of each carrier's FMC solution is shown below.

	<b>AT&amp;T</b>	<b>Verizon</b>	<b>Sprint</b>	<b>T-Mobile</b>
Launch date	na	Early 2009	August 2008	June 2007
Service name	na	na	AIRAVE™	HotSpot@
FMC type	Femto Cell*	Femto Cell	Femto Cell	Wi-Fi / UMA
Base station	Ip.access*	Samsung UbiCell	Samsung UbiCell	Linksys
Handsets	na	na	all Sprint	only dual mode
Phones / base	na	na	Up to 3	Up to 5
* not confirmed; na – not available				

...more and more capable networks using converging technologies will fill wireless gaps.

It will be interesting to see the cable companies' response to wireless companies using cable lines to offload cellular traffic. Sprint's recent deal with Clearwire (see related article in this issue) to develop a nationwide mobile WiMax service could be a harbinger of this competitive dynamic. Strategic investors in Clearwire include leading cable companies, Comcast and Time Warner. They can use Clearwire's WiMAX network to compete directly with the wireless companies. As part of this deal, Comcast fought for 5MHz of spectrum across the U.S. to be set aside solely for WiMax femto cells, which can be used to offer a wireless service.

Whether Wi-Fi and femto cell solutions will be widely accepted by consumer and enterprises is yet to be seen. There are other wireless solutions such as distributed antenna systems that are trying to address the last mile problem particularly in the enterprise, and technical hurdles such as frequency interference and management need to be addressed. In any case, the added competition will most certainly be good for consumers as more and more capable networks using converging technologies will fill the wireless gaps. We expect indoor wireless coverage to continue to improve over the next couple years, and finally we can all say, "Yes! I can hear you now!"

By Kuni Takahashi  
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