

# techSTRATEGY

## Femtocells Suit Up For Work

*Enterprise service draws nearer, but cost and integration issues remain*

Femtocells are edging closer to the office. The technology provides a path to fixed-mobile convergence, in which one wireless phone can be used in the office and on the road.

Femtocells are small cellular base stations that are installed in homes and offices and connect to a service provider's network via broadband. They work with any kind of cell device and use the same standards and protocols as external "macro" cells. When users are indoors, their cell phones or data cards connect to the femtocell instead of searching for an external base station. Calls get smoothly handed off between inside and outside cells as the user moves.

New standards, increasing vendor support, and new heavier-duty networks make femto more suitable for enterprise use. The questions now are how businesses will integrate femtocells, and how quickly. The answers will depend on the emphasis operators place on business deployments and how attractive they can make the price.

Although femtocells are simple architecturally, enterprise femto networks are not. For network operators, management of femtocells, including cell provisioning and traffic prioritization, must be handled carefully. Customers must plan femtocell placement to avoid interference and may need to address issues with Wi-Fi and finicky VPN configurations in their existing networks.



Verizon's Wireless Network Extender

### The Essentials

#### ENTERPRISE FEMTOCELL NETWORKS

#### PROS

- > Enables workers to have a single phone number that works in the office as well as on the road
- > Seamless handoffs between cells
- > Femtocells will work with any cellular device
- > Low up-front cost for small businesses

#### CONS

- > Cell management is difficult
- > Quality of service is lacking
- > High up-front implementation costs
- > Lack of flexibility in changing providers

Furthermore, the costs of a large-scale deployment will be much higher than a consumer plan, because businesses require higher quality of service from their Internet service

providers, and providers must be able to carry more data as well as voice.

#### Loud And Clear

A femtocell's backhaul connection is via the customer's Internet connection, be it DSL, cable modem, T1, or fiber. The femtocell uses the Internet to communicate with a femto gateway managed by the ISP. This central gateway connects to the cellular operator core network, and the femtocells look like so many additional base stations on the operator network. A central configuration server performs management and security functions, including femtocell configuration.

Femtocells transmit at very low power levels—typically tens of milliwatts versus multiple watts for a large cell—so the same frequencies can be reused from one building to the next, and fewer users share bandwidth. This will mean a huge difference for data throughput. With mobile broadband traffic expected to more than double every year for the next five years (as projected in Cisco's "Approaching The Zettabyte Era" white paper), any capacity relief will be crucial to keep WANs humming.

New standards will aid network interoperability. Mobile specifications group 3GPP recently approved a



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standardized core network interface that's based on existing circuit-switched and packet-switched base-station-to-core-network standards. This interface will standardize communications between femtocells and the femtocell gateway.

Industry associations such as the Femto Forum also are weighing in. Femto Forum members have agreed to use the Broadband Forum's TR-069 CPE WAN management protocol—the same protocol used for DSL equipment—to manage customer femtocells in real time.

### Who's Doing It

As more vendors offer femtocell devices, more operators are ramping up femto networks. Sprint launched its Airave femtocell program, now a nationwide service, in September 2007. However, Airave is voice-oriented and doesn't support the high-speed EV-DO data service, considered a key enabler of enterprise femtocell networks.

AT&T is validating High Speed Packet Access (HSPA) femtocells, with broader scale deployment slated for the second quarter of 2009. AT&T is working with Cisco and Cisco's partner IP.access on a home integrated gateway. Meanwhile, Verizon has announced its CDMA femtocell product, called Wireless Network Extender, and also is considering femtocells to ac-

### The Short List

PROVIDERS  
AND FEMTOCELL  
PLANS

**AT&T** Working with Cisco/IP.access on femtocell gateway; testing HSPA network

**Comcast** Has said it will deploy WiMax femtocells, is leveraging cable network

**Sprint** Airave network is up and running

**Verizon** Offers Wireless Network Extender CDMA femtocell; femtocells may be part of LTE cellular technology rollout

### DIG DEEPER

**Safer Sound And Data** Securing an IP PBX?

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company its LTE rollout. Comcast, as part of its investment in Clearwire, has indicated it will deploy WiMax femtocells, leveraging its cable network for backhaul.

The Verizon and Comcast developments highlight the use of femtocells with emerging wireless technologies where wide area deployment will be limited for some time. The theory is that users may tolerate wide area coverage limitations if they can get the service in key locations. Alcatel-Lucent, Cisco, Ericsson, Huawei, and Nokia Siemens Networks are some of the bigger vendors targeting this space, while the list of smaller specialists includes Airvana, AirWalk Communications, AirWave, IP.access, RadioFrame, and Ubiquisys. Expect major consumer networking gear players, such as Linksys (Cisco), Netgear, Sagem, Thomson, 2Wire, and Comtrend, to get in on the act.

Small offices and home offices will likely leverage consumer-oriented solutions, just as they do today with Wi-Fi access points. But now Alcatel-Lucent, AirWalk, Tango Networks, and Tata Systems, among others, are targeting the enterprise space. Enterprise systems are more complicated because most businesses want systems that integrate with their existing PBXs and IP-PBXs—which are anything but standardized in their interfaces.

Policy management in enterprise-oriented femtocell systems will allow organizations to enforce rules such as keeping on-campus calling local to the enterprise network and controlling which users have access to long-distance networks, conferencing, messag-

ing, and short-code dialing. Enterprise femtocells will support a larger number of simultaneous callers (e.g., 16 instead of four) and will enable a single number for both desk phones and mobile phones, along with PBX features such as abbreviated dialing from the mobile phone and a single voice mailbox. However, such tight integration will require specialized gateways between the enterprise PBX that communicate with matching gateways in the operator network.

Quality of service will be needed to provide voice priority, and this will be problematic if there's a separate Wi-Fi access point soaking up capacity on the ISP connection. Trials already have shown this to be a concern. The quality of the broadband Internet connection will be paramount, because good voice quality will require low latency and few dropped packets, neither of which is guaranteed by ISPs today.

### Small Cells, Big Headaches

Management is perhaps the biggest issue that operators will face as enterprise femto networks come online. Operators today manage tens of thousands of cell sites, but femtocells will number in the millions, and each one will need to be provisioned correctly and given ongoing firmware updates.

Interference management for femtocells also will be complex. Operators will have to decide whether to dedicate radio channels to femtocells in a coverage area, or to use the same frequencies as the WAN.

Finally, although businesses will likely tolerate higher prices than consumers, operators will need to offer enterprise femtocell networks at a reasonable price point—possibly in the \$500 range, similar to enterprise Wi-Fi APs.

—Peter Rysavy

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IMPACT ASSESSMENT		phone options are available everywhere.
	● BENEFIT	● RISK
<b>IT organization</b>	●●●●○   IT staff benefits from improved indoor coverage within the organization, one phone number for both cellular and office phones, and potentially lower cellular bills.	●●●●○   The technology is relatively immature. Early adopters must carefully consider cell placement and work with their providers to ensure quality of service for both data and voice.
<b>Business organization</b>	●●●●○   A femto network makes cell phones a seamless extension of business phone systems. Femto	will also allow higher-speed data throughput without battering the WAN.
●●●●○   Larger businesses will face complex integration of	femto with existing PBX systems. Businesses also have to commit to a cellular operator, and changing providers will be difficult.	<b>Business competitiveness</b>
●●●●○   One phone	number for desk/mobile will make it easier for clients and customers to reach your staff. Improved mobile broadband performance will improve data transfer rates, working more effectively with a company if it relocates, but cell	