Mesh networking to fill in wireless gaps

December 15 2005

When wireless networking was first introduced to the public in the late 90s and early 2000s, it received a mixed response. Some were interested in the idea of completely unfettered Internet access throughout a given area. Others wondered, who'd ever want to check their e-mail in the kitchen?

A few years later wireless network technologies have become a staple in many homes and offices. Relatively simple to install and configure right out of the box, this has become an excellent catchall solution for anyone wanting Internet access without wanting to install power or network wiring to a remote location.

Going beyond this, the next generation of wireless systems is set to utilize "mesh networking," a set of technologies designed to route data between relay points that require almost no configuration, are available at minimal cost and can "heal," or fill in, for any relay point along the network that may break down. Unlike traditional networking technologies, which typically distribute a feed from an Internet or server connection from a single source to other devices, mesh-technology devices can provide additional bandwidth to the network they're added to as well as set up their own networks without Internet access.

Bring these technologies outside the typical confines of a home or office, and new uses become apparent. Computer networks can be established by the devices themselves with minimal tinkering, local municipalities can set up city-wide wireless Internet zones, and emergency-management organizations can readily deploy a

communications system capable of repairing itself if part of the network fails.

"The mesh is behind the scenes and is being used for municipal wireless networking deployments," said Phil Belanger, vice president of marketing for BelAir Networks, a wireless-mesh-product vendor, explaining the current role wireless mesh networking currently provides. "Early 2007 will be when it rolls out in devices and the homes.

"Wireless mesh can come into TiVo-type machines. Any device plugged into a power port can become an access point. As wireless clients move around, they can hit the closest mesh point," said Belanger.

Others see the future of wireless mesh technology as serving the outdoor/municipal markets. For less than the cost of reworking a city's infrastructure or purchasing and configuring several store-bought wireless relay devices, engineers can install a small, self-configuring device on a street lamp in under an hour and significantly increase the range of a local wireless Internet network.

"Mesh and online are a natural extension. There's unification between indoor and outdoor wireless and wired and unwired connections. The network doesn't care where you are," said Alan Cohen, senior director of Cisco's wireless networking business unit.

While still a developing technology with a final standard yet to be agreed upon, mesh networking has received accolades from high-profile efforts such as its inclusion in the Nintendo DS handheld game console as well as the announcement of the MIT Media Lab's intentions to incorporate the technology as part of the communications standard for its One Laptop Per Child units, an effort to provide several million laptop computers to children in developing nations. These devices are capable of finding and creating network connections with similar units with

almost no need for user configuration.

"I think there are at least two separate directions this can go in," said professor Raj Rajkumar of Carnegie Mellon University's electrical and computer engineering and computer science departments. "Municipal locations like Philadelphia and other cities are using it to cover a large part of the region. The cost is relatively low, as you don't need broadband lines to each connection. You just install the boxes and they relay off each other.

"Secondly, these access points can enter vehicles. If cars talk to each other, it enables new types of applications," said Rajkumar, who pointed out how vehicles could share movement data and inform the driver of situations such as a nearby car braking sharply, then either warn the driver or assume control to avoid a collision.

After narrowing 20 proposals down to two, representatives from contributing firms and organizations will select the final standard for mesh technology at upcoming 802.11 technology conferences, ensuring the idea meets revised specifications for security and quality of services.