

Meshing communications

© Communications News 2006

Wireless mesh networking is all about bringing the Internet to places where wires cannot go, or where the cost of installing a wired backhaul is prohibitive. These networks provide high speed wireless data communications between Wifi (Wireless Fidelity) networks and broadband, wired networks.

Wireless mesh networks are therefore an option for metropolitan networks covering whole cities, for campus environments at universities or on large business sites, remote sites, and places such as large warehousing units where installing multiple wired access points is not an option.

Cisco announced its wireless mesh network, the Cisco Aironet 1500 series Outdoor Mesh AP, in November last year. It is available in the US now and is under trial in Europe this year. Andy Oldfield, manager of wireless technology marketing at Cisco, states that Cisco's offering is finding traction in the enterprise space in the US. "Anywhere you need a hot zone but it's prohibitive to put in a wired infrastructure, is where we're finding mesh's drivers. These are places like airport terminals, large storage areas, and listed buildings. This market is poised to boom," Oldfield continues. "Companies are looking for more business and productivity gains. All the stars are lining up for wireless mesh networks."

Wireless mesh networks have been around for a while, but over the past 12 months the concept appears to have taken off. Nortel announced the availability of its Wireless Mesh Network Solution in October last year. This product runs on the 802.11b protocol and is also compatible with 802.11g, while its transit link runs on 802.11a.

Stephane Le Dreau, business leader for wireless broadband solutions for EMEA at Nortel, explains the wireless mesh popularity: "Wireless mesh has taken off because of the technological factor, where technology has caught up with the idea; wireless modems are relatively inexpensive and Wifi is embedded in many devices now, including dual more GSM/WiFi mobile phones. Also, a lot of carriers have realised that a WiFi strategy presents a good business case. The 2.4 Gigahertz and 5.8GHz bands are unlicensed, so it's cheaper for an operator to deploy a service."

Wireless mesh networks can be pure WiFi, running radio frequency transmissions instead of wired transmissions, and can include WiMax for

the wireless backhaul. They have no centralised access points, and once set up, look and react pretty much like the Internet. Wireless mesh networks are self configuring and self healing and are massively scalable. They use wireless nodes to provide users with access to a virtual wireless backbone, which if necessary connects at some point in its topology to a wired access point to the internet.

Nodes send and receive messages and act as routers for their neighbours. A node in a wireless mesh network will scan for three neighbouring nodes when it is switched on and will choose the one that offers it the best quality connection, remembering the second best node connection as back up in case the first choice node link deteriorates. When the node receives a packet of information, it sends it to its first choice neighbour node, which sends it to its first choice neighbour, and so on, hopping the message through the mesh to its destination or a wired access point, whereupon the message enters the internet and gets on its way.

There are two main types of wireless mesh networks; those that can be termed static, and those that can be called dynamic. Static wireless mesh networks consist of nodes that do not move position and wired access points that provide the access to the Internet. More and more nodes can be added to the network to enlarge its geographic reach and its capacity. A static network will tend to run on one of the 802.11 WiFi protocols.

Dynamic wireless mesh networks are networks on the go, with nodes able to transmit while moving at over 50 miles per hour. WiFi tends to disintegrate at around 50 kilometres per hour, so a dynamic wireless mesh network can run on the military protocol, Quad Channel Military Radio, QCMR. This protocol also enables users of the network to become nodes. These client nodes are the devices used to interact with the network, so in a military situation the soldiers themselves become nodes. This means the dynamic wireless mesh network will never run out of capacity; as users on the network increase, the capacity and reach extend exponentially. The downside to QCMR is the node cost; a QCMR-based network node is around the £300 mark, significantly more than an 802.11 node at around £15.

Rick Rotondo is Motorola's director of marketing for the Mesh Networks product group. He states: "Every user makes the network grow stronger. The users act as router repeaters, so you're adding infrastructure as you add users. This is also why the Internet has become infinitely scaleable. You're building the internet as you join it, and it's the same for a dynamic wireless mesh network."

Mesh Networks is a company that Motorola acquired around 12 months ago that actually developed wireless mesh. It won a tender from the US Defence Advanced Research Project Agency (Darpa) to develop a battlefield communications network (Darpa was the creator of the Internet). This had to include voice, video and data over broadband capability with built in location positioning that did not rely on GPS, as GPS requires line of sight to work and being out of sight is quite important for soldiers that wish to have a long career.

While there is currently no standard protocol for wireless mesh networks, by 2008 there hopefully will be. The 802.11 Task Group is working on a proposal for 802.11 TGs, or 802.11s as it is also called. Once released, this protocol will provide a wireless distribution system for access points that will make deployment of wireless mesh networks much cheaper. Donald Eastlake, chair of the Mesh Networking Task Group S at IEEE, says: "Mesh networking is an exciting area that will improve the performance and usability of WiFi networks. We are meeting to decide on the merger or selection between two proposals, the first and currently most popular being Simple Efficient Extensible Mesh (SEE Mesh) backed by the likes of Intel and Texas Instruments, and the other, the Wi-Mesh Alliance proposal."

However, Brian Jackson, the director of Now Wireless, warns network managers: "When 802.11s launches, mesh will become a much more standard way of deploying networks. But it will be harder to manage; with a mesh, you have no idea how things are being routed. You will have anamorphous connections, so security will be more difficult as your network becomes more like the Internet." He adds: "It will be secured by 802.11i+ though, which is what all business level networks have to use."

Network managers need to look out for wireless mesh networks that are easy to look after. Rotondo says: "One of the overlooked components in mesh networking is the management system. You need one that is highly automated, that allows you to do over the air software upgrades, plus intelligent automated upgrades. The management system has to be self healing and self optimising. It needs to be self organising, and you need to look at the speed in which a node can reroute; rerouting needs to happen in fractions of a second or the network will downgrade."

The future of the companies behind wireless meshing is going to be about consolidation and niche operation, according to Ian Keene, research vice president at Gartner. He says: "There is no market leader in this area at all right now. But going forward, companies will see increased competition from larger vendors. I see smaller businesses continuing to be successful though in military and defence, working on

niche contracts, plus wireless mesh for the home which will shape up as a future market space."