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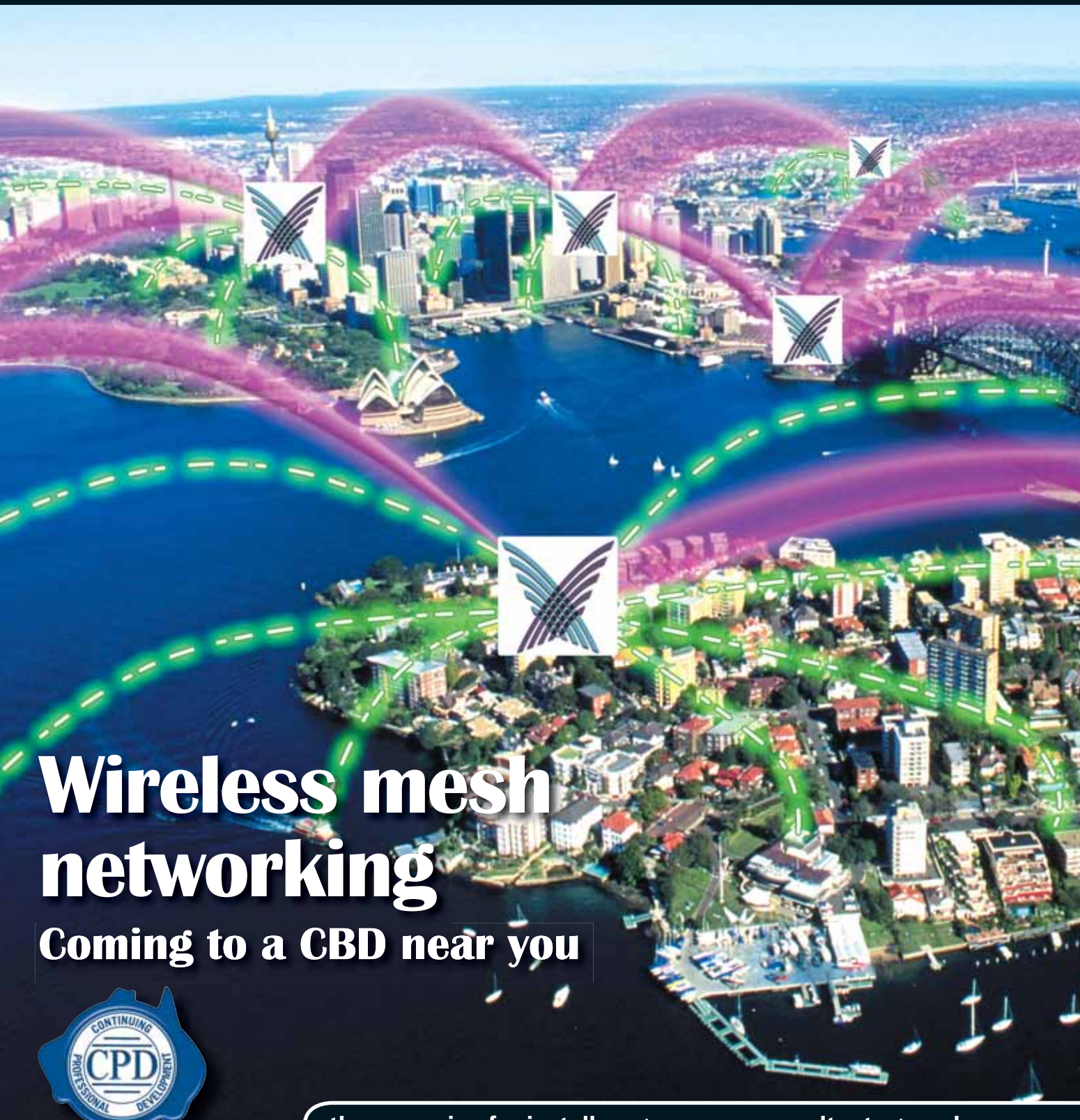

Wireless mesh networking

Coming to a CBD near you

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When everything just meshes

Imagine a world in which light poles, vehicles, handheld devices and temporary 'scatter' nodes make up an all-over, high-speed network. Ross Chiswell can.

A wireless mesh network could be on its way to a city near you this year. In 2005 we saw a lot of development of mesh technologies by a range of vendors and their use particularly in the United States for community or city-wide networks.

For example, the city of Tempe, Arizona, uses about 400 Strix nodes to cover an area of more than 100km². And the city of Chaska, Minnesota, uses 230 Tropos nodes to cover a 40km².

These networks are being used to provide mobile Internet access at speeds faster than DSL. The Strix-based network is also being used to support VoIP.

Two approaches

One of the interesting points brought out by the article I read on these networks is the number of feeder links that need to be connected at various points of the mesh to supply it with bandwidth. Once the mesh has been established these feeder links connect to the mesh as backhaul or gateway points to the outside world.

In the above cases the Tropos network had 36 T1 (1.5Mbps) uplinks, and the Strix mesh had seven T3 (45Mbps) uplinks.

The Strix mesh was able to aggregate the bandwidth required and use larger, less expensive per megabyte uplinks, because its mesh nodes have the ability to support multiple radios for mesh interconnections. The Tropos nodes support only one radio.

The single-radio approach means the cost of the node is cheaper. However, it affects latency because the single radio node can either transmit or receive signals at any one time. The multi-radio node can transmit and receive packets at the same time.

Mesh networking uses wireless nodes, like this one hanging from a pole, to provide wireless LAN coverage and wireless backhaul. The nodes interconnect to form a self-healing network or mesh that can support mobile data access, voice, cameras down a street, around a campus or over a whole city or community.

Hence the need for more uplink connection points in a single-radio node mesh to reduce the number of hops and, therefore latency, before the packet leaves the mesh.

For more background on this area please see my article 'To mesh or not to mesh' in the October/November 2005 issue of Cabling Connection, or the article 'The rewards and perils of meshing with Wi-Fi' by Andy Dornan that can be found at http://www.itarchitect.com

City, suburbs and the bush

In 2006 we are going to see more mesh networks being built in conjunction with wireless broadband point-to-multipoint networks to provide the uplink, backhaul or gateway connection points all over Australia for residential Internet access in rural and regional communities.

In suburbia we may see the use of mesh networks to reach residential customers in ADSL black spots, as deploying wireless broadband is very cost effective.

In the heart of cities mesh networks will also exist, but for reasons other than just Internet access. If our Australian Communications and Media Authority (ACMA) eventually follows the US and releases 4.9GHz band for the support of public safety and homeland security-based networks, then mesh systems using these frequencies will be established.

Multi-radio capable products from

companies like Motorola, Proxim and Strix that can support the 4.9GHz band will be used to establish blanket mesh network coverage over large city areas for use by emergency services, security cameras and various government or council agencies.

This not only makes sense from a public safety perspective but mesh technology is also an ideal approach for the topography of a city and how the emergency services could use the technology.

A demonstration

In Adelaide recently I was able to see a live mesh installation using Motorola's Motomesh product to demonstrate how the technology could be used in a city environment.

As the pictures accompanying this article show, the mesh node points were hung off light poles along city streets or over the edge of heritage buildings. A number of locations also had Internet protocol cameras installed or used Motorola's Canopy point-to-multipoint product for backhaul.

Some additional mesh nodes were installed in vehicles and even in a helicopter to demonstrate how mobile access and remote cameras could be supported.

One of the reasons mesh products are so good for deployment in a city is the number of light poles or other suitable structures for deploying mesh nodes. The nodes can then connect security cameras or use another frequency to provide wireless LAN type access around the node point. This could be provided using 2.4GHz, or with proprietary 4.9GHz wireless client products from Motorola.

Once the mesh is in place, vehicles can be fitted with a mesh node. As they drive around the city, automatically connecting to different nodes, a high-speed link is always available in the vehicle. ➤

Mesh products are ideal for deployment in cities because of the large number of suitable structures, such as light poles.

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Installations like these require people with cabling and electrical skills. The nodes on the poles are powered by the electrical service on the light pole itself.

And because the vehicle itself is a mesh node it becomes a relay point for handheld devices used in the area of the vehicle.

Motorola's Mesh Enabled Architecture means that even handheld devices become mesh nodes or router points.

Always connected

The demonstration in Adelaide was able to show vehicles moving around the mesh and providing connectivity to handheld devices or cameras. It also demonstrated the capability of a helicopter being able to connect to the network while flying over the mesh network, sending live images back from the onboard camera.

The mesh could also support ad hoc placement of cameras for events to provide additional security for the community. And fire brigade crews could drop portable mesh points when entering buildings to maintain connectivity while inside.

If all emergency vehicles were fitted with mesh nodes then even when they were away from the actual mesh network they could form their own portable network to transfer information or share any available backhaul connection.

Products operating in the 4.9GHz band will give emergency services the control and security they must have for such a network. The ability to support 5.8GHz and 2.4GHz will provide backhaul options and the flexibility to communicate with all the wireless LAN devices.

This in turn means that products supporting multiple radio cards, like Motorola's Motomesh (up to four radios) and Strix's OWS (up to six radios), are going to be best suited to these applications.

Who installs it?

The mesh was designed by people with radio frequency knowledge, but this type of installation requires people with cabling and electrical knowledge. The nodes on light poles are powered by the electrical service on the light pole itself.

There are existing power points for things like Christmas decorations, but most of the mesh systems in the US use adapters to take power directly from the light pole.

This is another area of opportunity for the cabling industry to become the installation partner or provider for city-wide mesh networks. Organisations with the vision to obtain the necessary training will reap the financial rewards as this market develops.

If you would like more information on the training and knowledge required for working in this space, or some contacts you could partner with in your area, please email me and I will point you in the right direction. ■

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