

Mesh Networks – Promise & Practice

The major requirements to establish a mesh network are 802.11-compliant radios and appropriate software or firmware for mesh protocols. There are a number of proprietary and public domain standards available but, as yet, no ISO standards.

In theory, every node on a mesh would be able to automatically recognize its place in the mesh and function accordingly.

There is some confusion about mesh networks and ad hoc networks. Although the two terms are often used interchangeably, they're not the same.

Ad hoc networks allow any authorized device to automatically become a node on a wireless network. This concept does not suggest peer-to-peer networking and usually requires each device to connect to a fixed access point (AP).

Mesh network definitions do not suggest that they're dynamic -- that is, that they allow anyone to become a member of the network automatically.

Many developers, however, see the merger of mesh networking and ad hoc networking as a logical step. As a result, you will continue to see these definitions merging and evolving over time. But, until then, it's important to remember that they are really different concepts.

So much for the long-term promise. Now for the reality, at least the “current” reality.

In the near term, the most promising application of mesh networks is to provide wireless backhaul for WiFi wireless LANs (WLANs). Today, it's relatively easy to establish "hot zones" for WLANs but every AP is typically connected directly to a wireline LAN. For storage yards and other outdoor facilities, providing wireline LAN connection to WiFi APs can be costly and complicated. Another problem is that, for remote locations, backhaul to the gateway may involve the expense of T1 or other leased lines.

Mesh networks can provide the answer to both issues by extending the wireless network all the way back to the host gateway. All a fixed location mesh network node needs is power -- and that power can come from a wall plug or even solar panels.



The ideal situation is to have overlapping mesh nodes with line-of-sight to serve as repeaters for each "cell" in the mesh. This provides redundancy and lowers latency times (time waiting for the network to respond).

There are several versions of wireless mesh networks: single, dual and multiple radio configurations.

In single radio configurations, the same frequency is used to both receive and transmit. The limitation here is that latency times go up significantly as traffic increases.

In dual radio configurations, different frequencies are used to receive and transmit node-to-node. Obviously, this increases bandwidth and improves response time.

In multiple radio configurations, each node communicates with the next on a unique frequency, thereby further decreasing latency.

It should be noted that for every node the signal passes through back to the wireline AP or gateway, there's some lag time induced. Each "hop" increases this lag so planning is still important.

Is there a mesh in your future? Probably. The big question is whether you will need it sooner or later. Today's expectation is that you will have additional, proven options for mesh networks in logistics applications available to you by early 2006.