

Mesh Radio

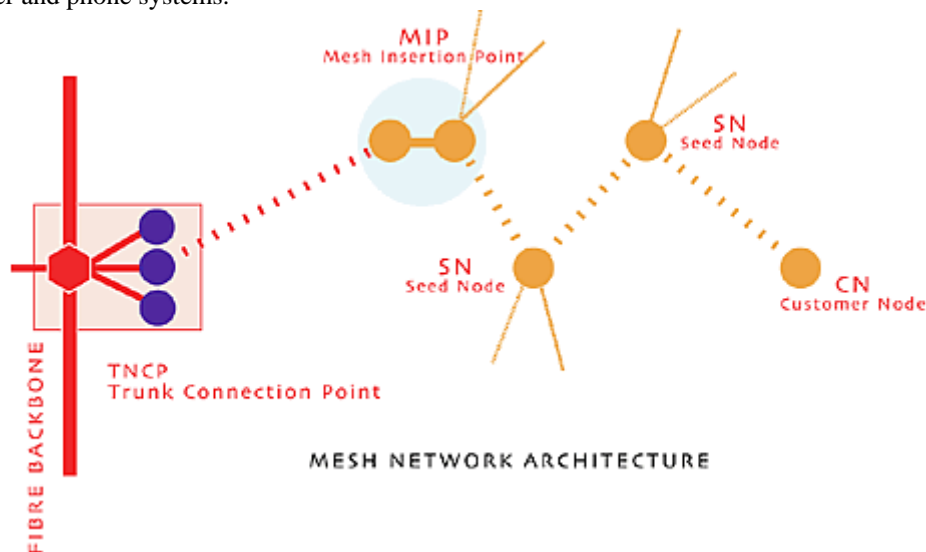
What it is and what it can do

Mesh Radio is a recently developed way of providing broadband access for residential and small to medium sized business customers.

Mesh radio uses a highly innovative approach to designing radio access networks. Instead of using a central base station to serve all customers within a radius of a few kilometres, it makes every customer's equipment capable of providing service to its neighbours. New customers do not need to be able to 'see' a central base station – they only need to 'see' an existing customer's antenna.

The technique has been pioneered by Radiant Networks, based near Cambridge, UK and Caly Networks in Sunnyvale, California. The architecture of Radiant's **MESHWORKS™** solution is shown in the figure below. Trunk Network Connection Points (TNCPs) link the radio access Mesh to the trunk communications network. Each of these TNCPs will serve a number (typically 3 or 4) of Mesh Insertion Points (MIPs). These consist of a standard Customer Node (CN), which can set up connections to other customers, and equipment for multiplexing the signals to and from that customer node onto a link to the TNCP.

A Customer Node is installed at each customer's premises. It not only provides service for that customer but also handles transit traffic from other customers. It consists of an outdoor radio unit and an indoor 'service presentation unit' that provides the interface between the Mesh and the customer's computer and phone systems.



(Courtesy of Radiant Networks plc)

The Mesh will also include a number of Seed Nodes (SNs). These are the same as the Customer Nodes, except that there are no customers connected to them. The operator installs them at strategic locations to extend coverage to a larger number of potential customers. They therefore act only as transit nodes (repeaters), and not as either sources or sinks of network traffic.

The role of a Seed Node is to establish a path back to an MIP (perhaps via other SNs). It therefore must have at least one line of sight to a MIP or another seed. Seed Nodes should also have high visibility, so that a small number of seeds cover the maximum number of potential customers as soon as the Mesh opens for business. Radiant has developed planning algorithms and tools to dimension mesh networks so that operators can cover the maximum number of customers with the minimum number of MIPs and SNs.

Key Messages for SMEs

- Mesh radio is an innovative approach to delivering broadband access to residential and small business customers
- Network operators are testing the technology under operational conditions
- Commercial services could be available in two or three years

The peak data rate is 25Mbit/s (duplex) and the system is designed to guarantee at least 2Mbit/s to every subscriber simultaneously, even at extremely high subscriber densities. It can provide the customer with access to:

- Trunk Telephony (E1 or T1).
- Fast IP services (Ethernet and USB interfaces).
- Data rates of up to 25 Mbit/s.

Advantages and disadvantages

Mesh radio works on the principle that every customer's installation is an active node of the network. This active customer node contains an integrated switch, which can set up circuits to any other customer node using point-to-point radio links. The signals hop from customer to customer via a series of these links until they reach a point where the Mesh is connected to the trunk communications network.

The Mesh is more than the sum of its parts. Because there are many ways to interconnect any set of nodes and the Mesh is able to choose between them, it is a very robust network. It can select paths in order to:

- Route around obstacles.
- Avoid parts of the Mesh that are already fully loaded with traffic.
- Minimise radio interference between the individual nodes.
- Provide redundant routings to guarantee very high levels of service availability.

Radiant claims that the **MESHWORKS**TM technology can connect residential and small business customers at a cost of less than €1,000 per customer and that the technology offers operators scalable, low-cost roll out and 'organic' on-demand growth of the network.

However, the technology is really most effective at very high subscriber densities, where the multiple routings and spectral efficiency allow it to deliver high-capacity and high-quality services to all customers. On 'Day 1' an operator will have to install a network of Seed Nodes covering prospective customers. Clusters of paying customers need to spring up rapidly around these Seed Nodes if network investment is to be truly proportional to demand for services.

What to buy

Mesh radio is a very new technology and nobody is yet offering large scale services based on it. There are, however, a number of trials and pilot services being run in Europe and the USA.

Radiant supplied BT with **MESHWORKS**TM technology for a trial of Mesh Radio during 2002. The trial served around 100 homes in the Cardiff area of South Wales, offering interactive TV and high-speed Internet access to selected households.

The company also worked with STAR 21 Networks on a trial in Germany. The initial phase, in Frankfurt, provided broadband capacity to STAR 21 offices and selected end-users to demonstrate high-bandwidth services and multimedia applications. The technology is also being tried out in the USA, via Radiant's partner Tradewinds Network Services.

If these trials are successful, commercial services could be rolled out fairly rapidly - say in two or three years. This assumes that regulators will allow the spectrum allocated for broadband radio access to be used in this way and that network operators can identify enough clusters of customers to kick-start the service.

Questions to ask suppliers

The principal question is obviously when is there likely to be a service in your area. However, once network operators have published details of their proposed services and tariffs, you will also want to know:

- What speeds can be delivered and what downstream and upstream bit rates do you guarantee?
- How big is the equipment and what power supply does it need?
- Will you install and maintain the equipment for me?
- What changes will need to be made to my computer(s) in order to connect to the service?

- Will the service be as reliable as my existing telephone service?
- Can I easily upgrade to a higher speed service?
- How quickly will you respond to reports of faults?



The customer's indoor unit



A mesh radio antenna



The antenna installed at a customer's home

Pictures courtesy of Radiant networks plc