Extending DMR wireless range dramatically

The migration from traditional analogue 2-way radios to the brave new world of digital technology is happening right now and well under way.

This requires both investments and a new way of thinking, but the rewards more than justify both the investments and the task of acquiring new skills.

Apart from fundamental advantages, such as improved audio quality and greatly extended battery life, the software defined digital technologies open the doors to a fair new world of sensible, down to earth functionalities.

This adds a new value to the ROI from the days of analogue radios. One feature in particular puts powerful repeaters into use in a whole new way.

Voting receivers extend range

Earlier this year Motorola Solutions came up with a simple, yet ingenious solution to a traditional challenge in the design and implementation of wireless networks for 2-way digital radios.

Basically the problem is the great difference in transmission power and subsequently reach and coverage between handheld radios and repeaters.

The footprint produced by a 100W digital repeater may be as great as 100 km in radius. In this case a mobile radio some 30-40 km away is within reach. But the handheld radio is invisible to the repeater, as long as the small 5W unit is unable to bounce the handshake back to the repeater, much less return any voice communication.

In a digital world, this may render a strong repeater useless, and reduce the effective range to that of the weakest transmitter in the network, usually a handheld radio.

Motorola's answer to this problem is to distribute a number of repeaters within the footprint of the main repeater and assign them one task only: to pick up transmissions from mobile radios and forward their broadcast signals to the main repeater via IP.

The IP connection will usually be in the form of microwave PTP links. The distributed repeaters will usually be 30W units operating in receive-only mode.

> **"**
> **… you may say the voting system makes your handheld radio simulate 100W …**

Roaming made possible

Vehicles and personnel roaming around in the countryside with a mobile radio, within the reach of a powerful voting repeater placed high on an elevated spot, may now move freely and stay in full 2-way mode. A grid of distributed repeaters will pick up their homebound traffic and feed it to the voting repeater, which will then give priority to the most powerful of the receiving carriers.

Plainly speaking, you may say the voting system makes your handheld devices simulate 100W transmitting power.

Apart from the voting software, all the equipment needed is standard MOTOTRBO hardware, produced by Motorola Solutions.

The scenario above describes a single site only, but a large one, serviced by a 100W repeater. This site may be replicated and the sites can be interlinked.

Using appropriate Motorola software packages and licenses, multiple sites may work as one or may be addressing the users group-wise across sites.

Hundreds of mobile units, moving freely about within large areas, can have seamless 2-way communication, all within reasonable budgets thanks to the TDMA standard and Motorola's way of implementing it.

Strictly TDMA

The solution built around a "voting repeater" will work within a TDMA/DMR environment, as offered by the MOTOTRBO range of digital 2-way radios by Motorola.

Thus another argument is thrown into the battle between the two open standards – TDMA, used by the market leading Motorola, and FDMA used by brands such as Kenwood and Icom.

Each of these have advantages and disadvantages. To many, the deciding difference is the fact that whereas FDMA systems must be licensed for each individual frequencies, the TDMA user simply leverages his already licensed channel by dividing it into time slots. One frequency will carry two conversations simultaneously, both in direct mode and utilising the repeater.

This adds up to more capacity for less investments, in favour of the TDMA standard.