# Network Radio – what's it all about?


PHOTO 1: A typical handheld Network Radio.

## Innovation

Radio amateurs have a long and laudable history of innovation. Whether it be experimenting with the first transatlantic signals or exploring the latest digimodes such as FT8, amateurs have often been at the forefront of taking on board and using new technologies. However, it would also be fair to say that not everyone has welcomed every innovation with open arms.

Many years ago, when transistors were new technology, solid state circuitry took some time to be fully accepted in the hobby. Yet before long, such innovation became commonplace in electronic design, transforming, if nothing else, the physical size of our radios.

## Those darned computers!

Among such examples, arguably a larger amount of suspicion followed the advent of computer technology into amateur radio. The amount of local noise that older computers in particular scattered around the RF spectrum didn't endear them to all of us.

However, computers are so much a part of our everyday lives now that it was inevitable they would find their way into our shacks.

## 21st Century magic

Computers, whether you love or hate them, are indeed 'magical' devices – for DXing they can log on to the DX Cluster and, with a mouse click, tune our transceiver to the far station's frequency, ready to pounce. We use them in other ways too – sending email to set up a sked; eQSLing for verification purposes; we also use them to connect to services like Echolink. And a small USB dongle accessory gives us access to digital modes like D-STAR without buying an expensive transceiver.

## A computer in your pocket?

The technology involved in computing has shrunk dramatically over the years. Android and iOS devices have made the computer truly pocketable and, although we might still refer to such devices as "phones", this is a travesty of the term. Telephony is arguably one of their lowest technological uses.

These small powerhouses are equivalent to desktops of just a few years ago; moreover, they will continue to develop further. Many enterprising amateurs have already written some truly amazing software for them. So perhaps it was no surprise that someone would write software to make such a versatile, internet-connected device suitable to use as a form of two-way radio.

## Business beginnings

In today's global economy, a business might have operatives in several countries who all need to communicate seamlessly. Your local but privatised bin lorry could perhaps be managed from Spain, or maybe an international trucking company wants to be able to talk to its drivers all over Europe without incurring massive call charges. Most versions of private mobile radio (PMR) and its variants are only effective over shorter distances [1], so it would be useless trying to connect a disparate group of employees in that way. However, so-called push-to-talk (PTT) over cellular (PoC) interests the business community because it works via public cellular networks and/or Wi-Fi.

A business user doesn't really care about the underlying infrastructure provided the equipment is easy to use and the costs are reasonable. People are familiar with the form-factor of hand-portable and mobile radios. Some PoC radios – which are, essentially, smartphones in a different shape box – mimic radios (**Photo 1**), so that the changeover is easy for businesses to implement.

## Amateurs get involved…

Any kind of new technology alerts radio amateurs! Before long, some started playing with PoC to see what might be possible. Having a computer in one's pocket is quite an astonishing concept and the possibilities are only constrained by the apps available. If we choose to adapt these devices further, we just need to write software for them.

## Enter Network Radio

The name Network Radio was adopted, because the devices require a network of some kind to operate. Based mostly on the Android operating system, they are disparagingly dismissed as "mobile phones with a PTT button", but they are somewhat more than that description might imply.

Most can operate on a variety of cellular frequencies, typically from 800-2100MHz, but many are also capable of working via Wi-Fi at 2.4 and 5GHz. One can immediately see why some amateurs are suspicious! Here we have a 'radio' that doesn't transmit on amateur frequencies, so what on earth are amateurs actually doing with them?

It's quite simple. Having a fully featured computer in a PTT form-factor, amateurs can now use what *looks* and *feels* like a radio *to access many of our own services*.

## Echolink

Traditionally, Echolink has used a desktop PC for access. Now, an Android app is available so, used with a mobile phone or Network Radio, one can access myriad repeaters and nodes worldwide. Network Radios have a radio form-factor and, importantly, a PTT button. It feels more 'accessible' as a result.

PTT Network Radio is totally different from using a phone. While you can download Echolink and use it on your everyday mobile, it doesn't 'feel' quite like radio, whereas on a Network Radio, it does!



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PHOTO 2: Cricket in 'natural' conditions – it's great in sunny weather.
Image by Acabashi via Wikimedia Commons, CC BY-SA 4.0.

PHOTO 3: 'Man-made' conditions for cricket, ideal for inclement weather. Image by Ben Sutherland via Wikimedia Commons, CC BY 2.0.

You can access the system via your own Wi-Fi or while out and about using cellular coverage, no longer tied to the shack PC.

## International Radio Network

The brainchild of paramedic and computer-hobbyist Gareth Jackson, M6IGJ, the International Radio Network (IRN) was devised as a 'meeting-point' for all kinds of amateur streaming audio, but with an additional option to transmit back into the system. Using a very resilient piece of VoIP software called Teamspeak, IRN has already outgrown its origins and is now part of the 'Worldwide Amateur Radio Guild'.

It is rapidly becoming a valuable resource worldwide wherever amateurs wish to share audio. It also supports multiple stations talking at the same time – not that that is either recommended or encouraged!

## Callsigns at the ready!

For Echolink and IRN an amateur callsign is mandatory. A user may *enter* the system via a network, but could very well *exit* it on amateur-band RF anywhere in the world! There are safeguards to ensure compliance.

IRN allows for non-RF based contacts too and you can find unlicensed people in some groups there with "IRN callsigns" getting to grips with the system, but who are not allowed anywhere near an RF link.

Can anyone else see any implications for amateur radio training here?

## Remote operation

Dave Pick, G3YXM, has set up his handheld Network Radio to act as a remote controller for his two HF stations. Recently, whilst on holiday in Italy, Dave was able to use the Remote Hams 'RCForb' app to operate both his Scottish and Birmingham stations from his handheld's touch screen. By mapping its hardware PTT to the PTT switching at the remote station, it enabled him to keep in touch with his friends on Top Band. All that was required was a network connection.

## Receiving stations

Since a Network Radio is a computer, it is possible to use its browser to access the many online webSDRs, such as Hack Green [2]. You can listen to pretty much anything, eg watch for those sudden 6m openings.

## Even APRS…

The APRSDroid app turns your Network Radio into an APRS Beacon. Since Network Radios (and smartphones) normally have GPS built in, highly accurate and regular beaconing can take place.

## Broadcasts

Access to a Broadcast Radio app means you can tune into pretty much any streaming radio station in the world, something that might be good when our bands are quiet.

One particular nicety is the loudspeaker volume on these devices – loud even in the outdoors. This is another way they differentiate themselves from phones.

## Controversial

There is however a side to Network Radios that some find controversial – "Radio over Internet Protocol" (RoIP). Network Radios can communicate directly to each other, which has led some to declare that using them in this way is not "real amateur radio".

## What is "real" amateur radio anyway?

The problem is that no-one *quite* knows what "real amateur radio" *is* any more. It depends on who you ask that question and what they consider to be amateur radio. If you ask a QRPer or an ATV enthusiast, a PSK user or a contester, or even a CW enthusiast or a microwaver, you are sure to get different and conflicting answers. This is no bad thing – it is only because our hobby is so wide in its appeal that this happens. Not many hobbies are so diverse!

The nub of the problem is the internet. Like it or not, it has changed the rules. It can be argued that it fulfils the criterion of actually being a *form* of propagation in itself. But what do I actually *mean* by that?

## Natural propagation

Google's definition of "propagation" includes the "transmission of motion, light, sound, etc in a particular direction or through a medium." All our amateur signals, from Top Band to microwaves, are intrinsically line-of-sight [3]. We rely on *external* influences to "propagate" signals over greater distances.

Amateur Service signals traditionally rely on *naturally-occurring* phenomena to travel further than they otherwise would. This is why we need international regulation and are granted special privileges.

Depending on the frequency, the means of propagation changes. Below 30MHz we rely generally on ionospheric reflection; as we move towards VHF, the troposphere and E layer play a more important role and meteor scatter is practical; at microwave frequencies, rain-scatter becomes a valid mode of propagation.

But is aircraft scatter propagation 'natural'?

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## Internet propagation

I argue that the internet is *also* a form of propagation. It takes low power signals from devices and enables them to propagate further than would normally be feasible.

The significant difference is that the internet is *man-made,* an *artificial* form of propagation. Furthermore it is 'open' 365 days a year, 24/7, with S9+ signals and no atmospheric noise. Viewed in this way, it might become a little easier to understand why so many under the age of 40 (or even 50!) scratch their collective heads when we extol the virtues of amateur radio to them.

Internet propagation is open to *everyone*, and requires no exam or licence to utilise it.

## An example from another hobby…

Let me try to explain this another way. **Photo 2** shows cricket played in its 'natural habitat' using 'natural phenomena', rather like we would consider natural propagation. But **Photo 3** *also* shows cricket – using a man-made indoor cricket centre.

Do the players in Photo 2 think only *they* are playing 'real' cricket and those in Photo 3 are not playing the game 'correctly'? Are the cricketers in Photo 3 more miserable because they are playing on a man-made surface and indoors? Do you think the advent of indoor cricket centres has helped or hindered enthusiasm for the sport?

The same arguments can apply to 'artificial propagation'.

## Threats and opportunities

You could view this Network Radio 'wave' as a threat to our hobby's existence, or alternatively as an opportunity to be explored and exploited. The two forms of propagation do not *have* to be mutually exclusive – in fact, if we react to internet propagation in too negative a way, we may well completely turn off potential newcomers to our hobby.

## Times have changed

A BBC station took an FM portable radio onto the streets and asked young people what it was and what it did. Few knew – fewer still could actually operate it! Yet this age-group is busy video-chatting to people around the world while Grandad is in the garden shed muttering about how poor the bands are!

This is part of the problem. Most under-40s think of radio as either a push-button or streaming device. They have not experienced a moment of 'magic' on shortwave, listening to far-off signals, as many amateurs have.

Perhaps if we embrace this new phenomenon as an opportunity, Network Radios and internet propagation could help us *attract* people into the hobby

## Zello

The most popular app for RoIP use is Zello. Part PTT app, part social media platform, it works as a kind of 'parallel PTT universe'.

Zello came to prominence during the Florida Hurricanes of 2017. Only around 3% of phone towers went off air in the hurricanes and Zello proved to be one of the most resilient forms of emergency communication for the rescue teams. The number of downloads went through the roof.

Zello can work as a private one-to-one PTT system, but the more exciting part of it for amateurs is that you can create your own 'channels'. These can also be moderated, locked down (or not) to varying degrees and have all the advantages of a digital system – eg all stations visible with descriptions, short messaging and photographic add-ons.

'Network Radios' is a UK-based Zello channel. Inaugurated by Karl Hobson, G1YPQ, it has seen phenomenal growth in a short space of time. There are already two overflow channels and others are in the wings. No-one can speak on the channel unless approved by moderators, who lightly interview potential members – but at the first sign of misbehaviour you are summarily kicked off. If only repeater operators could do that!

As a result, operating practices are exemplary and remind many of bygone days.

Alongside the channels there is a Network Radios Facebook group **[4]** where members communicate via 'normal' social media. It is not uncommon for people to be using both simultaneously. This link across social media channels is familiar to many and very much a 21st century form of 'community building'.

## Hobbyists too…

Unlicensed stations are also to be found here. They are not just 'allowed', but positively *encouraged* to join the group if they have *any* kind of interest in radio.

Some are already studying for their licences, others are PTT-experienced operators who want to interact with us – let me repeat that – they actually *want* to interact with *us*! Furthermore they come from all over the world to join the group. At any time you could hear pretty much any nationality.

## Is it *radio* though?

So is it 'real amateur radio' if amateurs are using Zello channels? If you Google the definition of 'Amateur', you get "a person who engages in a pursuit, especially a sport, on an unpaid basis." 'Amateur' comes from the Latin *amare* meaning 'to love' – in other words, we are people who *love* radio and engage in it as a pastime. Do we only love certain exclusive bands and modes, though? Or do we love radio in all its forms?

## Enjoyment is one key factor

Listening to the Network Radio channels, you find people thoroughly *enjoying* radio as communication. There is a vibrancy that, maybe, yes, comes from its 'newness'. However, "I haven't used a radio for 10 years but I've been here every day for two weeks now" is a not untypical comment.

## Technology creates problems!

Just as people consume broadcast radio today without knowing what frequency they are listening on, we are now using two-way radio in the same way. We should not be surprised at this – it's just a leap forward in technology. This is not to say that 'traditional' amateur radio is sidelined. The two distinct forms of propagation each require different hardware. Perhaps a manufacturer will combine a Network Radio with an HF SDR, making a hybrid? That would be exciting!

## Does any of this matter?

No-one suggests that Network Radios will supplant 'traditional' amateur radio. They are simply different devices for different purposes but with a common theme. Network Radios are great if you cannot erect an antenna, have strong local noise, or maybe live in a retirement flat. But Network Radio is pretty useless at contesting or doing any kind of experimental work on natural propagation.

But I would argue that they *do* have a place in the hobby. Perhaps one day we will look back on the advent of Network Radios and realise it was just another branch of the hobby coming into existence, but one that brought it into the 21st Century in a way we were simply not expecting.

## Finally…

This article is not intended to stir up arguments but to ask you to think creatively about how technology is forcing us to re-think what radio actually *is* in the 21st Century. There are more developments coming and they will continue to challenge our thinking.

I suspect that we will have to either adapt and adopt, or alternatively ignore them – though we run the risk of possible future irrelevance. Surely none of us wants that.

**References**

[1] Wide-area PMR-like solutions exist, generally with proprietary infrastructure and site links

[2] http://hackgreensdr.org:8901/ – free, multi-band SDR that supports multiple simultaneous browser-based users on most platforms

[3] In free space, unaffected by any atmospheric or other effects

[4] https://www.facebook.com/groups/747365082123751/



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