

Developing rural broadband services in Scotland

Background

There is a quiet revolution that is taking place in the provision of rural broadband. An increasing number of communities are building their own distribution networks. In the last three years, community projects have been responsible for over 1000 connections, and this number is likely to double next year. Much of this has taken place without government funding. Often the communities are so small that their success goes unnoticed. A map of a federation of community networks that has spontaneously developed over the past three years in the West Highlands is an example of what communities can achieve.

This note outlines how the Scottish Government can build on this revolution to promote the development of rural community networks. Even with very conservative estimates, at least half million people in Scotland will be left with broadband services that fall far short of the superfast standard under current plans. Such people, most of them living in rural and dispersed communities, need better rather than worse access to broadband services so as to minimise the effects of isolation and to provide cost-effective public services.

Under its Step Change program the Scottish Government has awarded contracts to BT to upgrade exchanges and cabinets throughout Scotland to provide access to superfast broadband - at least 24 megabits per second (Mbps) - to 90-95% of all premises by the end of 2017. This will be achieved primarily by laying fibre optic cables to cabinets and relying upon the existing telephone network for local distribution. The technology – known as FTTC – works well in urban areas and compact villages but the service deteriorates rapidly at distances of more than 1 km from the cabinet.

At the same time, there is a Universal Service Commitment to provide a minimum of 2 Mbps to all premises by the end of 2017. There is no agreement about how this will be achieved since the majority of the premises affected are located in very rural areas at considerable distance from existing exchanges or cabinets. Further, 2 Mbps was a bare minimum for an adequate broadband service 3 years ago and is fast being overtaken by changes in technology and expectations, especially looking 3-4 years ahead. Developments in education and health care provided over broadband connections will require much higher speeds, especially in rural areas.

This note focuses on the provision of broadband services in rural areas, especially for localities and premises that do not receive a service up that meets the Universal Service Commitment. Four years is a long time to wait for those whose only options are a broadband service of less than 0.5 Mbps or a satellite service. Satellite broadband is expensive, sometimes unreliable and incapable of supporting critical applications. The communities affected are widely dispersed but they are becoming increasingly unhappy at the apparent neglect of their circumstances and the focus on more urban parts of Scotland.

The basic model is simple, reliable and inexpensive and it uses well-proven technology. A small wireless antenna is used to connect premises to a community node which is, in turn, connected to transmission links to one of the national data networks (backhaul). A distribution system of this kind can support broadband services of 8 – 50 Mbps provided that the capacity of the backhaul is sufficient. Once the community nodes are provided, additional premises can be connected on a DIY basis. Routine setup, maintenance and administration can easily be performed by someone with average computer skills, so that overheads can be kept to a minimum.

So what are the requirements to roll out this model throughout rural Scotland?

Community backhaul

The critical constraint today is access to backhaul at reasonable cost. If this is available, experience shows that communities can, and will, develop their own local distribution networks. Too often, however, the necessary backhaul is not available or is too expensive while there is no clarity on when and how something more appropriate will be delivered.

Current arrangements rely upon backhaul provided via leased lines which involve heavy installation costs plus a minimum regulated rental of £500 per month (incl VAT). Allowing for other operating costs, a minimum of 100 subscribers is required to cover such a commitment. The alternative of relying upon bonded ADSL or FTTC lines is unsatisfactory, since these are not configured to handle the load generated by 20 to 50 subscribers.

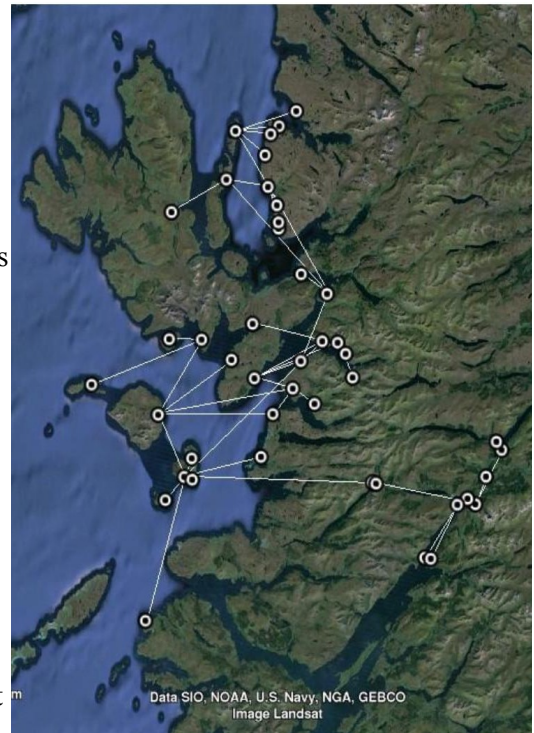
Solving this problem requires a commitment by the Scottish Government to use the resources under its control to ensure that (a) communities can access existing infrastructure on reasonable terms, and (b) any remaining gaps in the network are filled within the period covered by the Step Change program.

The Scottish Government is funding a part of the cost of upgrading a large number of BT telephone exchanges and cabinets throughout Scotland under the Step Change program. There should be a minimum and non-negotiable requirement that BT must provide Ethernet access services on standard (regulated) terms at any exchange or cabinet that has benefited from this program. This will go a long way to provide backhaul for dispersed communities within range of upgraded exchanges. At a modest cost the Step Change program could ensure that every telephone exchange in Scotland is upgraded to offer Ethernet access services, which would fill in many of the gaps in access to backhaul.

In addition, the Scottish Government is a key purchaser of backhaul to serve schools, health facilities, etc through the current Pathfinder network and the new Scottish Wide Area Network (SWAN) which is being procured. By allowing community networks to access this contracted backhaul it can promote the development of distribution systems linked to nodes located at community centres and schools, thereby increasing utilisation of the infrastructure and strengthening community ties.

Finally, backhaul involves more than the provision of physical links. Suppliers of leased lines provide a variety of ISP services to their customers such as traffic monitoring and management, covering transmission and peering charges, allocating IP addresses, etc. These services are essential but go beyond the technical capacity of most community networks. Bundling them with leased lines is an expensive way of providing such ISP services. Instead, a better approach will be to develop a cooperative that operates as an ISP for community networks. The recurrent costs of providing the services can be covered by a (relatively low) charge per subscriber, just as with consumer or business ISPs, but resources will be required to cover the setup costs of the cooperative ISP.

In facilitating access to backhaul for community networks, the primary role of the Scottish Government is to ensure that existing programs and contracts are structured in a way that will maximise opportunities for community networks to access existing infrastructure. Small amounts of additional resources may be required to fill in gaps and to support the setup up of a cooperative ISP, but such support should greatly reduce the potential cost of meeting the Universal Service Commitment for premises not covered by the BT contract under the Step Change program.



Wireless relays and links being developed by communities in the Highlands and Islands

Community funding

The second barrier to the development of community networks concerns funding for investment in setting up systems. Experience has shown that small networks – serving 10-20 subscribers – can be established entirely by a combination of self-help and limited technical support. The latter can be provided by the cooperative ISP. However, it is more difficult to get medium and larger networks off the ground because the initial investment in one or more community nodes is greater. This is where Community Broadband Scotland (CBS) should be playing a more effective role.

There are various models for the development and operation of community networks.

- The community sets up and runs the whole network themselves with a small amount of external help.
- The community to some degree subcontracts the design and construction of the network, but takes over the running and maintenance.
- The community underwrites the costs incurred by an external contractor to design, build and operate the network.

The first of these models is by far the cheapest and fastest to deploy, but not always possible if local expertise is not available. The second option is also relatively inexpensive and is more appropriate for networks of more than 50 or so subscribers. Yet, CBS funding has been pushing communities towards the third model, which is notoriously prone to failure. Either contracts do not attract bidders or the contractor loses interest and abandons the project. The reason lies in the nature of community networks. They are widely dispersed, there are few economies of scale and they are located in areas where technical skills are limited and may not be available to external contractors.

Experience has shown that the most effective way to get a network up and running is to develop a pilot, which can usually be installed at minimal cost, and then build out once the feasibility has been established and the community gets first-hand knowledge of how the network works. On the other hand, the cost of even a limited design study, necessary for the tender process of the third model, can easily exceed the capital cost of building a network to serve 20-30 subscribers.

Much of the problem lies in the financial arrangements envisaged by CBS. Traditional public procurement operates on the assumption that funds are disbursed against invoices submitted for work that has already been undertaken. This assumes that the organisation responsible for a community network has sufficient working capital to see it through the inevitable delays that occur in both construction and authorising payment of invoices. However, community networks do not have access to this level of working capital and the financing model is entirely unsuitable for networks that rely heavily on self-help.

There is an alternative model, known as output-based assistance, which has been developed and works well for funding community projects in both developed and developing countries. It is accepted by public funding agencies, so that it should be consistent with Scottish Government procurement rules. For a community network funds would be provided in two forms.

- An initial disbursement to provide working capital that will be used to build the core infrastructure of the network, including the community node(s) and the link to backhaul, plus a pilot phase of 5-10 connections. This advance payment can be recovered by deductions from the subsequent disbursements.
- An agreed sum per 5 or 10 connections with disbursement based upon the provision of documentation which demonstrates that the additional connections are operational.

While reasonable financial and other procedures must be followed, the process of applying for assistance and disbursements from CBS must be proportionate to the relatively small sums provided for each project. If CBS persists with an approach that is both bureaucratic and costly it will push up the unit costs that are incurred per connection and reduce the number of communities that can be supported with the limited funds that are available.

Urgency

Members of our communities recognise that major government programs have to be phased for efficient implementation. However, it appears that there is a failure to respond to the fundamental difference between an absence of any reasonable broadband service and service that is adequate but limited. Communities with no service are put at the end of the queue with primary attention being given to locations with adequate service that are easy to upgrade.

This approach is neither equitable nor economically efficient. The restrictions caused by the absence of basic broadband services hinder the development of small business and a range of self-help activities. It imposes additional costs on educational and health service. In contrast, the administrative and financial costs of ensuring that all rural communities are covered by a basic broadband service should be trivial if an approach based on the community initiatives described in this note was adopted and implemented as a matter of urgency.

There is no requirement either to slow up the implementation of the Step Change program, but equally there is no excuse for giving the lowest priority to addressing the provision of basic broadband service in small dispersed communities whose circumstances have been neglected over the last decade. Any evaluation of CBS – and, indeed, the Step Change program – should be based on a simple criterion: how many communities and people have shifted from very limited or no provision of broadband services to a minimum of, say, 8 Mbps by the end of September 2014?

Peter Buneman, Loch Hourn Broadband Cooperative (Tegola) [peter@arnisdale.org]
Gordon Hughes, Stobo-Dawyck Community Network [chair.mslcc@gmail.com]

Amanda Burgauer, Chair, B4GAL Community Broadband
Alistair Fleming, Director, Badenoch Broadband and Comms CiC
Phil Game, Achmore CMNet
Anne Graham, Allanton Rural Broadband
Simon Helliwell, Director, HebNet CiC
Alison MacLeod, Applecross Community Company
David Newton, Knoydart Foundation
Chris Pellow, Locheilnet
Graham Porteous, Caleycom Kinmuck Broadband
Ian Smith, Lothian Broadband Limited
Stephen Smith, Secretary, Tomintoul and Glenlivet Development Trust
John Williams, Director, Heriot Community Broadband Company

The authors would like to thank Professor Michael Fourman and William Waites of the University of Edinburgh for their constructive comments.

12 October 2013