Share

Submission for the 2011 NextGen Challenge Award from the University of Edinburgh

The Challenge

That a broadband divide exists between urban and rural areas in Britain is well recognised. According to BBC and BT estimates, around 2.75-3 million (about 15% of) households in Britain, largely in rural areas, do not have access to basic 2Mbps broadband connections. This number goes up even more if we focus on Scotland with many rural and remote communities in Highlands and Islands still lacking basic broadband. Remoteness, low population density and high deployment costs for prevalent broadband access technologies are among the chief reasons for this disparity. Loch Hourn and Knoydart (the most remote area of the UK mainland) were in this situation. External communication was through very long (>16km) telephone lines. Mobile phone coverage is lacking and even satellite is blocked in some areas. However a number of young families were moving into the area; it was undergoing an economic rebirth. Two rounds of government subsidised schemes failed adequately to address the issue of Internet access. The challenge was to build a cheap, fast and reliable communications network.

The Solution

We have identifed wireless, in particular the remarkably successful WiFi technology, as the cost-effective and quickly deployable solution in comparison with other technology alternatives for rural and remote areas such as the Scottish Highlands and Islands. Starting with wireless links almost 20km long in 2007 and 2008, we have constructed the Tegola network which serves 40 households delivering low-latency broadband with speeds around 20Mb/s (limited by available backhaul). Tegola is, by design, highly reliable. This was demonstrated in October 2011 when many telephone lines were knocked out by lightning strikes. Communities became entirely dependent on the network. Even emergency health services to a broader area were diverted through Tegola. This network doubles as an experimental wireless network for research into technologies for low-cost and robust wireless broadband. Key features of this network include: (1) Wireless links bouncing across water connect the various communities given the rugged terrain. (2) Use of redundancy at every level of the network. (3) Self-powered masts at two elevated sites with combined wind and solar sources to reduce the total number of wireless masts required. (4) Active community involvement in the network deployment and operation.

The Achievement

The Tegola network has had a significant impact on the lives of people in the region it connects, enabling school going pupils to access educational resources from home; helping the elderly stay connected relatives living elsewhere; offering the telecommuting option and allowing people access public services. It has been extremely reliable with downtimes of a few days since it became operational three and half years ago. Our decision to use WiFi has also proven to be right. We have also made important research contributions towards optimising rural wireless networks and we are discussing ways to explicitly incorporate support for tele-health applications. Crucially, Tegola has become a model for community-oriented and sustainable local access network deployment for remote areas. Our work has been widely noticed through presentations in the UK and Scottish Parliaments, media coverage etc. It has motivated several others to build similar community wireless networks on their own. A notable example is the Small Isles network which has been built and run by the resident communities with almost no subsidies. It has been running for over a year and now serves 60 households and delivers speeds 15 times faster at half the subscriber cost of the heavily-subsidised satellite alternative. From a policy impact perspective, the Tegola project was one of the stimuli behind the Royal Society of Edinburgh's Digital Scotland report in 2010, which in turn has led to the current enquiry by the Scottish government into broadband infrastructure in Scotland. It has conclusively demonstrated two things (a) that the demand for and benefits of high-quality broadband are higher in rural areas than in urban and (b) that communities and small local businesses can build and maintain distribution networks at a fraction of the cost for larger Internet service providers.