Broadband for remote rural areas: the technical issues

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Thanks to: Mino Bernardi, Mahesh Marina, Michael Fourman, the IT people at UHI, and the residents of Arnisdale, Corran and NW Knoydart

A Promise

“We will start where the task is toughest, if we are to ensure no part of Scotland misses out: the Highlands and Islands and the South of Scotland”.

Connecting Scotland Scottish Executive report, 2001

Frustration

Six years later – no broadband. Why?

Basic facts about broadband

From the backhaul (the broadband "grid" or the gas main) – usually at the telephone exchange

- Copper cable
  - < 1 mile, 8-20 Mbs
  - 1-5 miles, 512 Kbs – 8Mbs
  - > 5 miles, forget it – even dial-up may not work
- Optic fibre – wonderful
- Satellite, expensive & horrible latency
- Wireless?

The simple message: if there are more than a few hundred metres of copper in your backhaul connection, you'll *never* get super-fast broadband

Some rough statistics

24 full-time residences; 16 part-time and holiday lets

2000: 3 children

2010: 14 children

5 New houses and 5 substantial conversions in 2000-2010

4 local employers (wind energy, fish farm, hotel, local estates)

Local businesses: organic farming, prawn fishing, tourism, photography, web design, cruises, ferry service.

Several part-time residents who can work locally provided they have internet

Campaigns to SG, BT etc had dubious results!

legal expert OLLIE MISHCON answers your motoring questions

A BLOW TO SEX DRIVE

BAD SIGNS OF THESE TIMES

WE'VE WAITED 6YRS TO GET ALL WIRED UP

Village hit by internet rage

Villagers in Arnisdale still have trouble getting on the internet while Peter Bowman (right) is leading the battle to get them a broadband link

EXCLUSIVE

By GAIL SMITH

SIX years ago it was the remote village singled out to demonstrate Scotland's determination to bring broadband to the remotest part of the country.

'I have to drive 30 minutes to a friend's house just to check my emails'

MURDERED IN ITALY..MEREDITH, 21

I FOUND HER BODY . THERE WAS BLOOD ALL OVER..IT WAS HORRIFIC

Tells of grim discovery

A Chance Encounter

Mahesh Marina

Mino Bernardi

Could we use commodity hardware to build effective long-distance wireless distribution?

The Tegola Testbed

Dedicated to research into high-speed, low cost rural broadband

Fortunately, because it is research, we could obtain backhaul through the Janet network at UHI

Research issues:

- Network management
- Propagation over water
- Power management
  - (for self-powered relays)
- Mast location planning

Tegola: the current network

- Serves about 40 households
- Covers Arnisdale, Corran and the NW coast of Knoydart (most inaccessible place in mainland Scotland)
- Delivers speeds of up to 25 Mb/s (limited by backhaul) – symmetrical and low latency
- “Loop” configuration increases reliability
- Cost of deployed kit < £8k (much of it on power generation)

Rural communities need broadband more than urban communities!

- People want internet for business
  - proportion of small businesses *higher* than in urban areas.)
- Greater reliance on on-line shopping.
- Other forms of communication may not work
  - telephone, radio, TV, mobiles
- Alternative to libraries, cinemas, etc.
- Education.
  - High-school pupils on Eigg can lose 3 weeks a year due to bad weather.
- “Distance” communications. Don't underestimate their social importance, especially for the oldies!
- Telemedicine?

Willie Sandaig “teleconferences” with his grandchildren in New Zealand

Finlay, in Arnisdale, keeps in touch with his pal Sam in Worcester

Wireless is cheap, fast and easy to deploy

In the past three years there has been a dramatic drop in the cost of wireless equipment

- Fast – capable of delivering superfast –100MB/s
- Modular – “plug-in” components
- Cheap electronics
  - A 20km link: £400
  - Consumer receivers: £70
- Only basic electrical knowledge required locally
  - The “clever stuff” can all be done remotely
- Easily reconfigurable
  - No need to dig up roads if things change
  - Masts can be moved

The Eigg pilot project now serves 20 households. Total material cost £5,000 Compare with £17,000 SG subsidy for very low quality satellite.

We also got some practical experience

"Masts" need not be masts

"Green" power is neither green nor reliable

Communities and local business can deliver where centralised organisations cannot

- Rural communities are resourceful
- Travel costs are minimal
- Mast sites can be negotiated by local agreement

Finlay (now age 11)
our on-site engineer

Various transportation systems

Where we are

- Tegola has been up and running for three years.
- Despite student experiments and “west highland engineering” it has delivered reliability, speed and quality of service that would be the envy of most people in cities.
- It has been copied (Eigg Pilot) and other extensions and copies are under way (Rum, Muck, Canna, S. Knoydart, Laggan...)
- *We would love to see it being used for new applications, e.g. telemedicine.*

Proposed L. Hourn – Knoydart – Small Isles network

What next? How can more of rural Scotland benefit?

First, some serious misconceptions

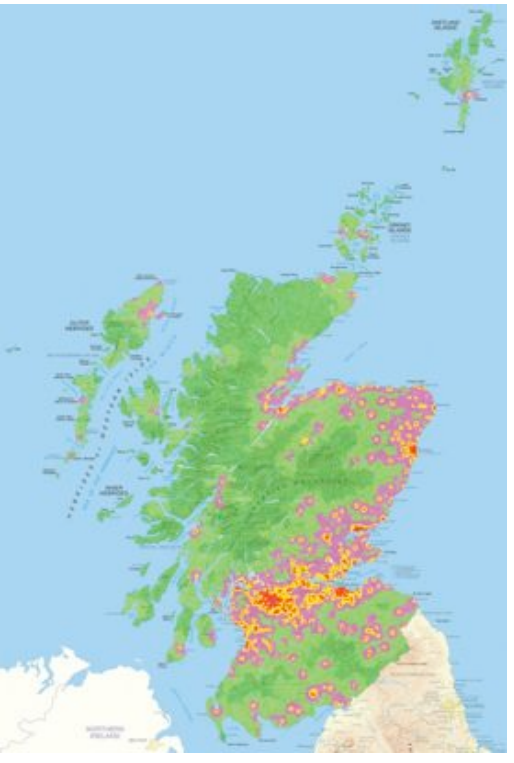
- Rural distribution can be solved with satellite and existing copper.
  - No! Good teleconferencing requires speed, symmetry and low latency
- We need to persuade rural communities that they need broadband.
- We need more surveys to assess the rural demand
- "The costs of deploying next generation broadband in rural areas will far exceed the costs in urban areas." *Scotland's Digital Future: A Strategy for Scotland* (SG 2011)

Backhaul – the main problem

- Short term (2 years): There is wireless backhaul with substantial spare capacity serving government, but communities can't get at it.
- Long term – there is almost no fibre serving rural Scotland. What is needed is an open-access "digital hub" to serve every community – rural or urban – in Scotland. See the Fourman report:

http://www.royalsoced.org.uk/enquiries/Digital_Scotland/index.htm

"We recommend that every community of 2,000 people ... should be reached by a digital hub"



Summary:

- The technology is already cheap, fast and easy to deploy
  - our research is aimed at making it even faster, cheaper and easier
- The rural need for superfast broadband is greater than the urban need.
- Communities or local businesses can deploy rural broadband where central organisations cannot
- The critical issue is backhaul
- We would *love* to collaborate with projects (e.g. telemedicine), which our network will support.