Tegola & HUBS

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Tegola: A research project initiated at the University of Edinburgh for research into rural broadband. Tegola was built with a great deal of voluntary effort and provided valuable insights and experience into community broadband

HUBS: a project that grew out of Tegola. Funded by the Carnegie Foundation it provides advice and hands-on help for community broadband projects.

Tegola and Hubs have been supported by:

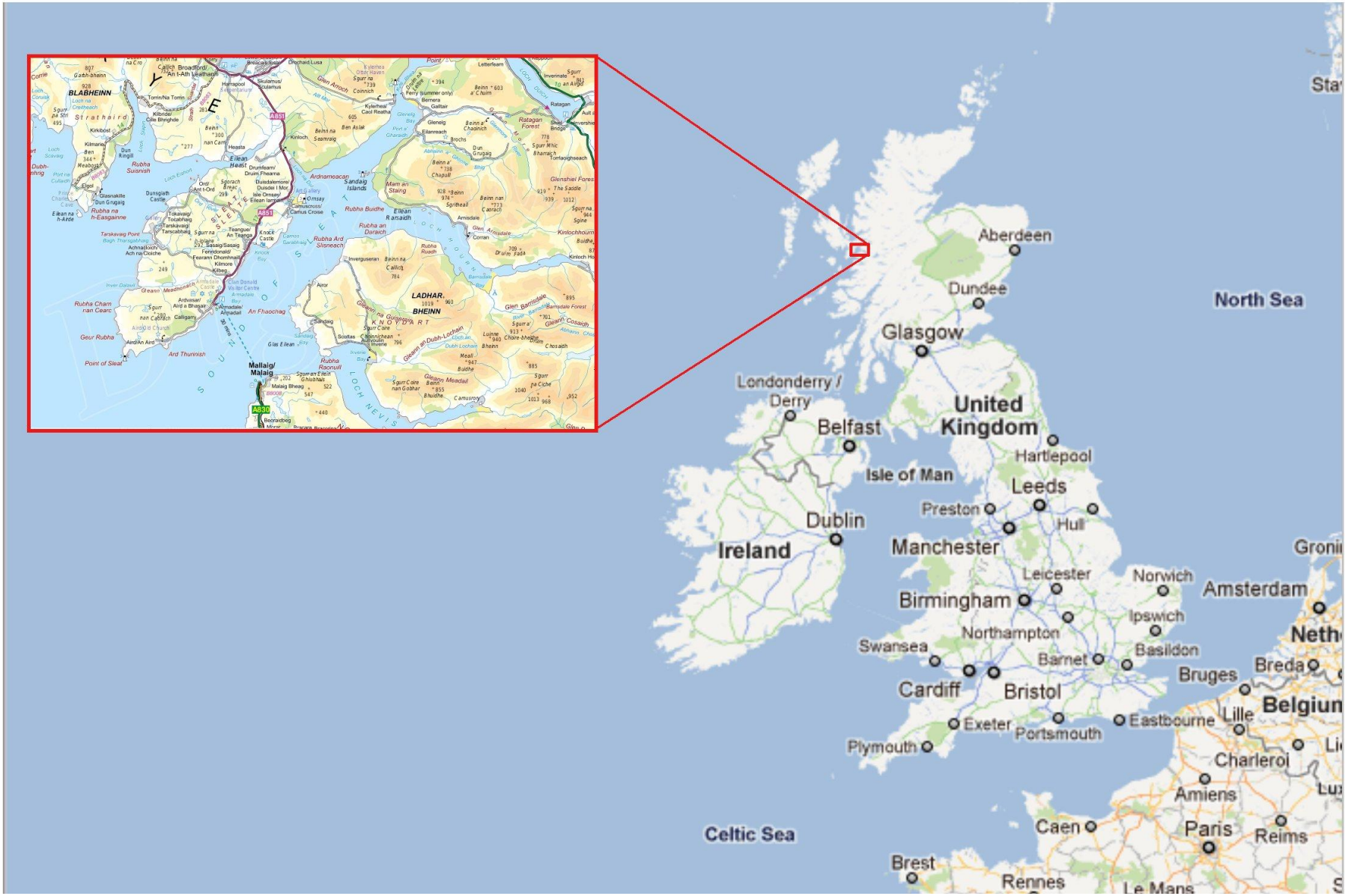
- The University of Edinburgh
- The University of the Highlands and Islands
- Sabhal Mor Ostaig
- The University of Stirling
- Marine Harvest Scotland

Connecting Scotland

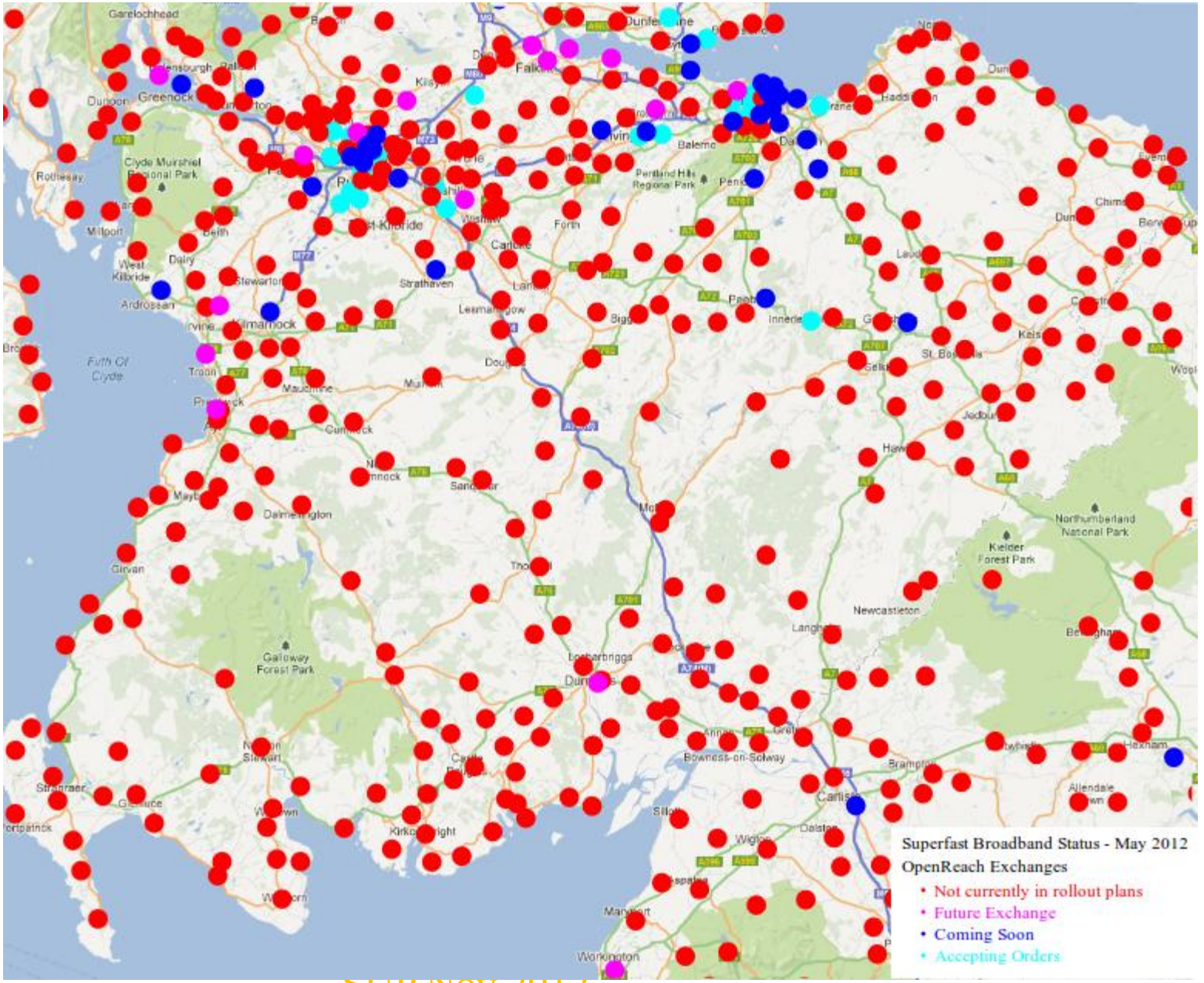
Scottish Executive report, 2001

"*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*".

Loch Hourn and Knoydart – the most remote part of the Scottish mainland, where the task is toughest



Most remote?



SUP Nov 2012

The Tegola Testbed

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

Fortunately, because it is research, we obtained backhaul through the JANET network of UHI at Sabhal Mòr Ostaig (the Gaelic college) on Skye

Research issues:

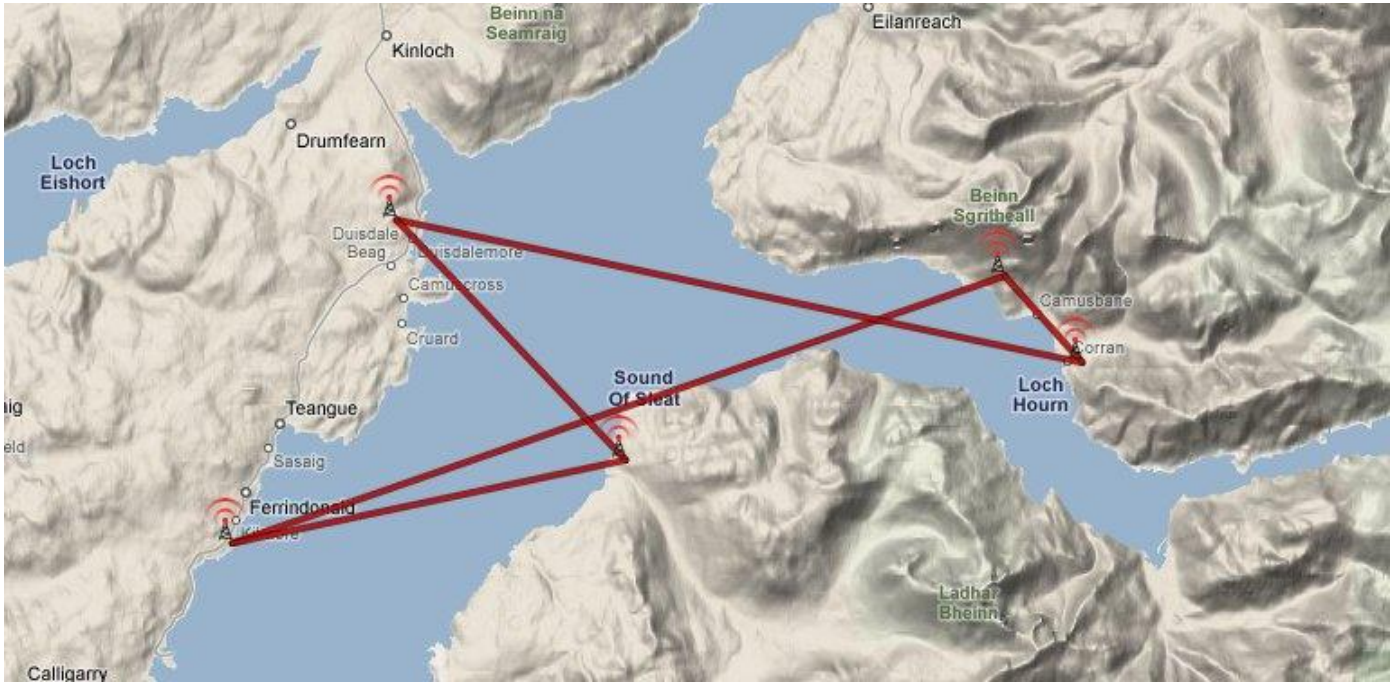
- Network management
- Propagation over water
- Power management
- Mast location planning

We also got a great deal of experience in community broadband


AIRENDALE

Tegola: the network as of 2011

- Running fort 5 years
- Serves about 40 households. Covers Arnisdale, Corran and the NW coast of Knoydart
- Delivers speeds of over 20 Mb/s (limited by backhaul) – symmetrical and low latency . Good VOIP and tele-conferencing



What did we learn?

1. Practical experience

"Masts" need not be masts

"Green" power is neither green nor reliable

2. Cheap to build; easy to maintain

- Fast – capable of delivering ultrafast – over100MB/s
- Modular – “plug-in” components
- Cheap electronics
  - A 20km link: £300; consumer receivers: £60
- Only basic electrical knowledge required locally
  - The “clever stuff” can all be done remotely

3. Communities and local business can deliver where centralised organisations cannot

- People in rural communities are resourceful (they couldn't live there otherwise!)
- Travel costs are minimal
- Relay sites can be negotiated by local agreement

Finlay (now age 12)
our on-site engineer

Local haulage

Moral: Rural broadband need not "far exceed the costs in urban areas."

4. 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

5. Uptake

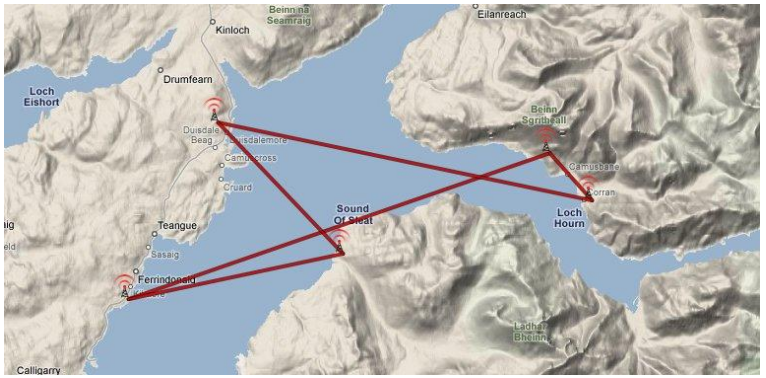
- Only three families have *not* adopted broadband (retired octogenerians)
- Everyone else has, including five retired families with no previous computing experience
- Children teach the oldies

Morals:

- We don't need any more surveys for rural demand!
- No special training is needed for rural areas!

6. Resilience and maintenance

- Built-in redundancy
- Stable power supplies
- Remote configuration



In October 2011, lightning strikes knocked out the telephones to Arnisdale and a wider area. Emergency health services were diverted through Tegola

Moral:

•People immediately become reliant on the network

The Hebnet Network

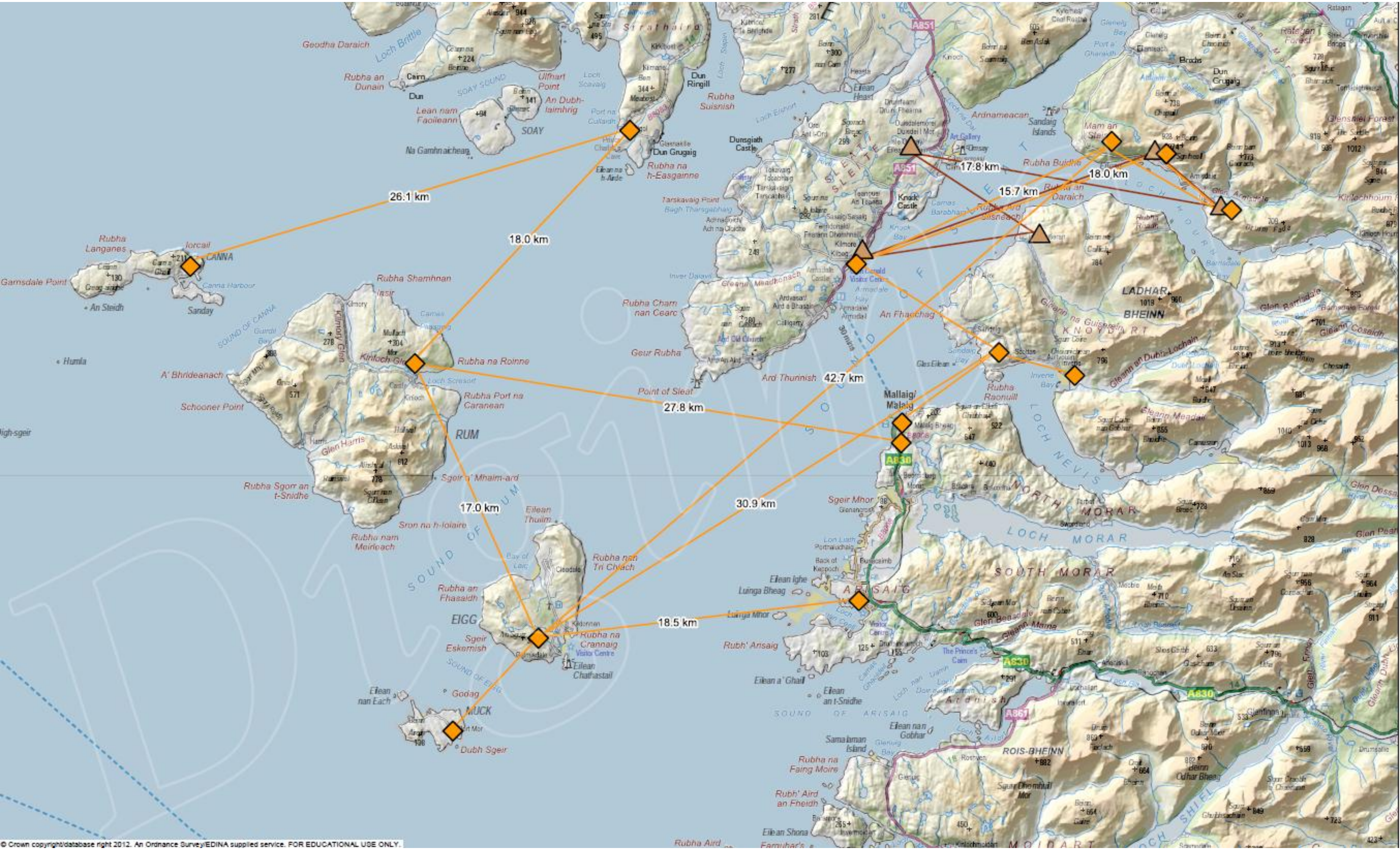
- Copied Tegola design. Now covers 65 subscribers on Eigg Muck and Rum. S Knoydart, Canna and Elgol in 2012-2013.
- Kick-started with a loan of £2,000 worth of kit from UoE and £2,000 from a local councilor. Self-sustaining.
- Delivers 14 times the speed at ½ the cost of heavily subsidised satellite alternative.
- Could carry *ultrafast* broadband (>100Mb/s), but backhaul is via BT lines at Arisaig

Recent history

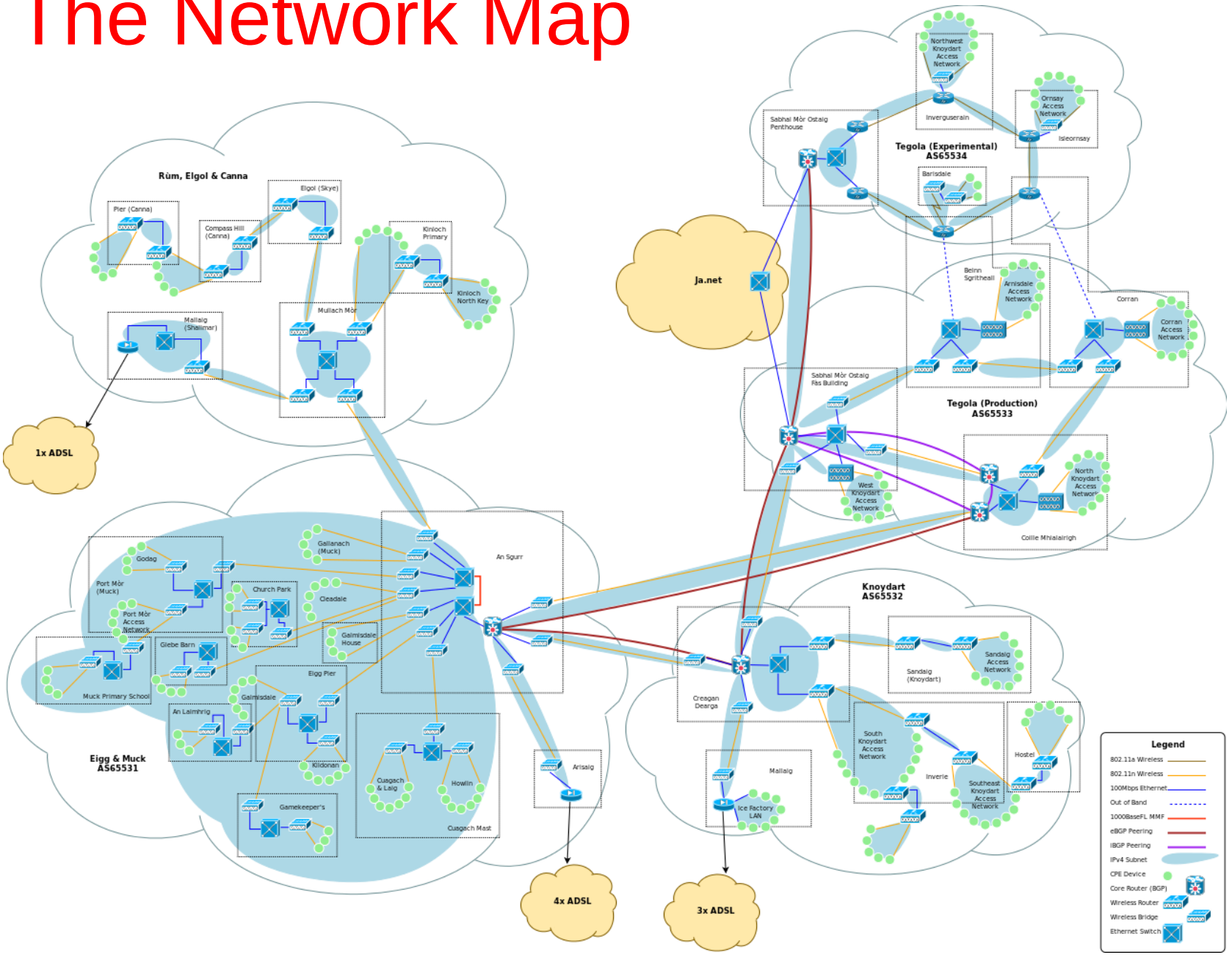
In 2011-2012, a set of fortunate events:

- Tegola wins NextGen challenge award
- JANET relaxed its policies on how universities could use their networks.
- SMO gave us a long-term site for our antennae and continued to provide physical access.
- UHI agreed to purchase extra bandwidth to serve Loch Hourn (Tegola), Hebnet and S. Knoydart
- Marine Harvest agreed to subsidise the cost of that bandwidth
- HUBS was funded (Carnegie Trust) to help other communities

Hebnet+Knoydart+Tegola today



The Network Map



Experience Gained

Network planning
Relay construction
Equipment choice
Power supplies
Monitoring and maintenance
Getting things going

See the HUBS howto pages at www.tegola.org.uk

Things that need to be stressed

- Fast broadband is MORE important in rural areas than urban ones.
- Communities and small local businesses can build out distribution at a fraction of the cost of a centralised organisation.
- Reliability is paramount
- We don't need special help on how to use the internet
- We don't need more surveys for demand.
- We DO need fast, cheap backhaul.

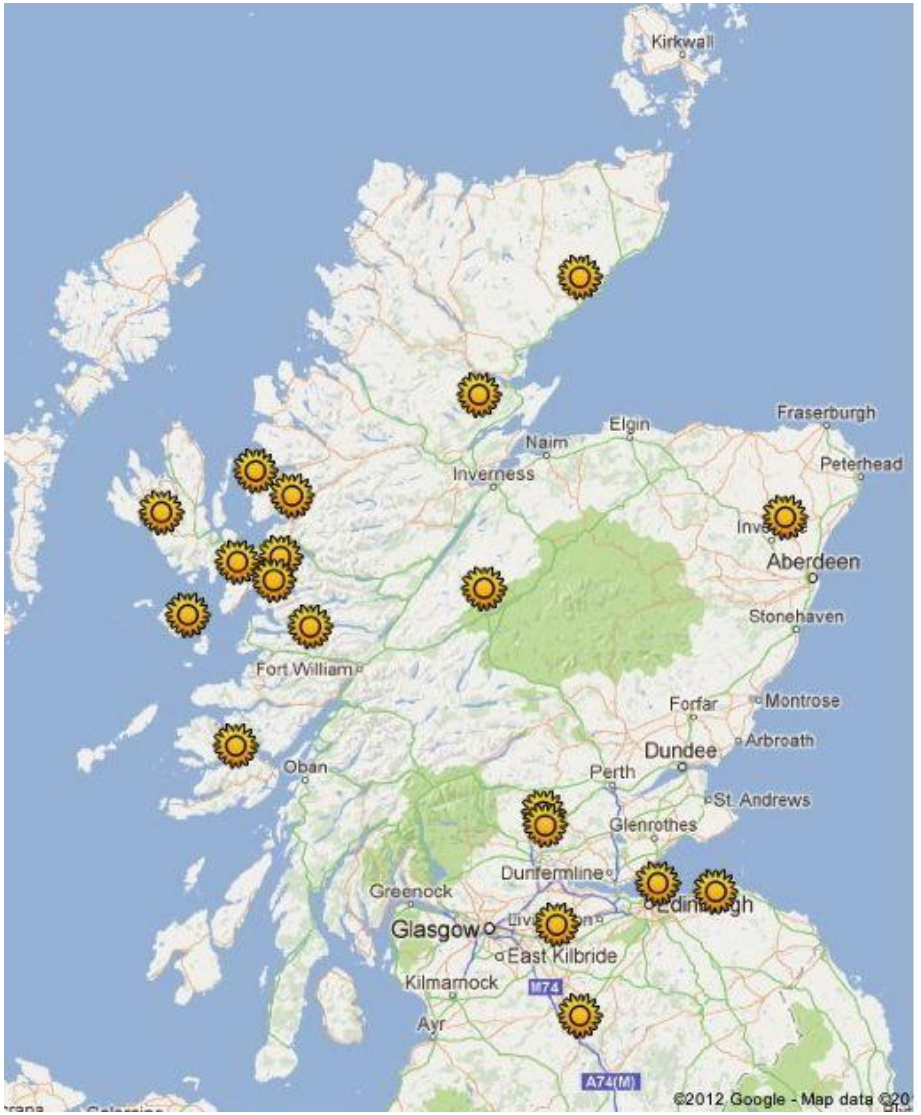
HUBS High-speed Universal Broadand for Scotland

Initiated Summer 2012 with modest funding from Carnegie Foundation as a support organisation for community broadband. Achievements to date:

- Consolidated Tegola, Hebnet and Knoydart into the most remote and largest -- geographically (and numerically?) -- community built network in Scotland
- Combined network provides higher performance and greater reliability
- Currently assisting >15 community projects

Projects helped by HUBS

Project	Region	Date	Status	Notes
Tegola	Loch Hourn, Highland	2007	Fully operational	Initially constructed as an experimental network. Became a model community network.
Hebnet	Small Isles, Highland	2010	Fully operational	Started with substantial help and equipment loan from Tegola
Badenoch Broadband	Laggan, Highland	2010	Fully operational	Advice from Tegola on infrastructure and equipment
Lothian Broadband	Garvald Region, East Lothian	2008	Partly operational	Equipment loan and testing of long distance links
Knoydart Foundation	South Knoydart, Highland	2011	Fully operational	Now combined with Hebnet and sharing infrastructure with Tegola
Kinmuck Community	Kinmuck, Aberdeenshire	2011	Fully operational	Initial stimulus and advice from HUBS
Allanton	Allanton, E. Lothian	2012	Expected 2012	Equipment loan and planning from Hubs
Applecross	Applecross, Highland	2011	Partly operational	Advised by Hebnet
Glenfinnan	Glenfinnan, Highland	2011	Planning	Advised by Hebnet
Mull	Mull, Argyll	2012	Initial planning	HUBS
Achmore	Highland	2012	Initial planning	HUBS
Ardross	Ardross, Highland	2012	Initial planning	HUBS/Hebnet
Sleat Communities	Skye, Highland	2012	Initial planning	HUBS
Talisker	Skye, Highland	2012	Initial planning	HUBS
Helmsdale	Sutherland	2012	Initial planning	HUBS/Hebnet
Blairgowrie	Stirling	2012	Initial planning	HUBS
Sherrifmuir	Stirling	2012	Initial planning	HUBS



More on HUBS

- Organised highly successful community broadband meeting on Skye (>100 people, >20 communities) in Oct 2012
- Tested and developed low-cost networking components
- Provides web pages: resources and community wiki
- Compiling a list of poorly connected/ disconnected communities

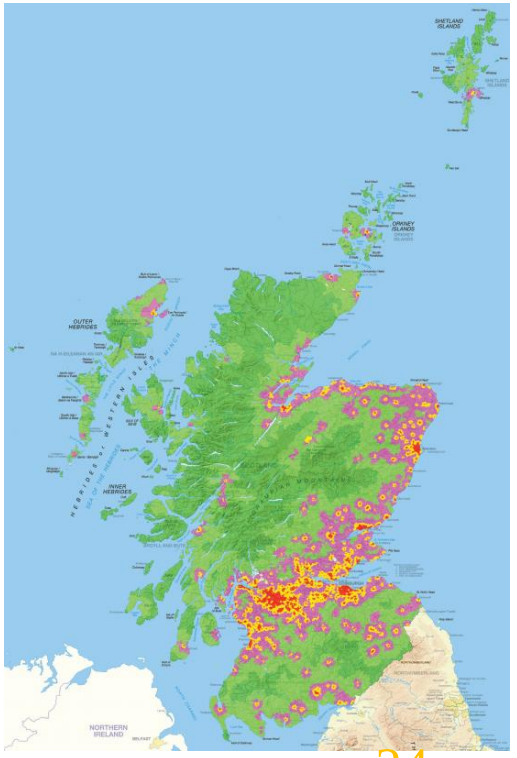
HUBS runs out of funding in early 2013!

Backhaul – the main problem

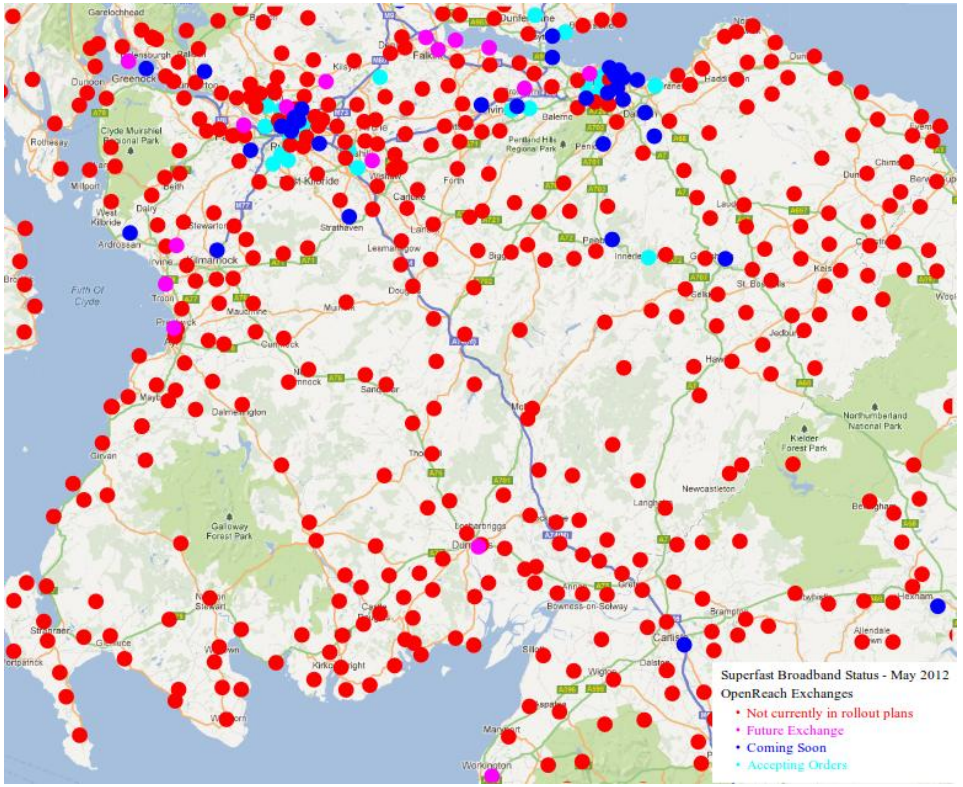
- Short term (2 years): There is wireless backhaul with substantial spare capacity serving governent organisations, but communities can't get at it.
- Long term – there is almost no fibre serving rural Scotland. What is needed is an open-access "digital hub" to serve every community –rural or urban –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

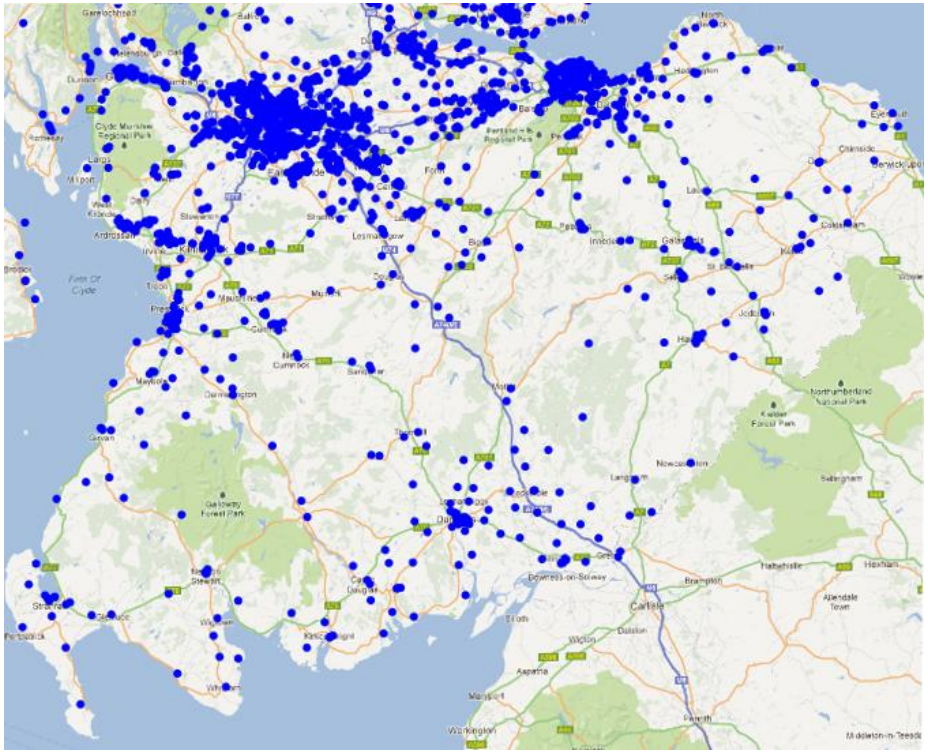
http://www.royalsoced.org.uk/enquiries/Digital_Scotland/index.htm

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



Where to site hubs?





Telephone exhanges or schools?

THANK YOU