Our goal is to provide low-cost high-quality **broadband** wireless access to people in **remote communities**.

www.**tegola**.org.uk

The current status of our research:

☑ In less than a year, we engineered a platform based on commodity hardware to:
- enable very long-distance wireless links (~20km).
- achieve high reliability via judicious use of redundancy to cope with intermittent power sources, etc.

☐ We are developing software to ease the deployment and operation of community-owned broadband wireless access networks.

☐ We are designing self-powered wireless relays for places with no electricity supply.

☐ We are finding low-cost solutions to achieve robust communication over time-varying wireless links (e.g., due to tides).

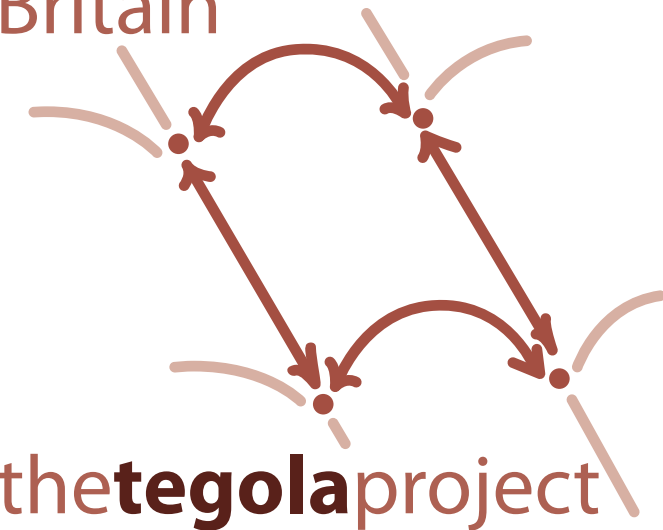☐ We are enabling efficient and adaptive use of limited wireless spectrum.

THE UNIVERSITY OF EDINBURGH

School of **informatics**

UHI Millennium Institute

Sabhal Mòr Ostaig
Colaiste Ghàidhlig na h-Alba

High-speed **Broadband** for the most **remote communities** of Britain

the**tegola**project

*Giacomo Bernardi
Peter Buneman
Mahesh Marina*

Although there are claims that **99% of the UK population** has access to Broadband, for rural communities this is often the lowest quality, well below the "Digital Britain" target. Moreover, speed and quality of service are especially important for rural areas where other forms of communication are often deficient.

Tegola is a collaborative project between the **University of Edinburgh's School of Informatics** and the **UHI Millennium** Institute which aims to develop new technologies to bring high-speed, affordable broadband to remote communities.

We have found that **high-quality broadband is especially important for rural areas** for a number of reasons:
• Voice over IP is needed when there is no mobile coverage and poor landine quality.
• Internet radio and video are needed when conventional radio and TV coverage is poor.
• Teleconferencing is needed for remote work. We have found a surprising uptake by the older generation to keep in touch with their families.
• Video is needed for remote education and tele-medicine.

All these services require both speed and quality of service; **in fact we believe that the "Digital Britain" target of 2Mbs is far too low for rural communities**. Moreover, it is important to recognize that provisioning broadband access in rural areas is inherently different from that in urban areas because:
• Low population density and scattered users.
• Large distance from phone exchanges and the Internet backbone.

• Difficult terrain for any wire-based broadband technology.
• On the positive side, **community-based deployments** are possible.
• **Access to backhaul** is a key issue.

The Tegola network, besides serving as a research testbed, provides remote communities in the most remote part of the UK mainland, an area around Loch Hourn and Knoydart on the Scottish Highlands, with faster speeds than in most cities:
• **High speeds:** 20+ Mbps, ten times more than the "Digital Britain" target.
• **Low equipment cost:** ~£80 per subscriber using commodity wireless hardware.
• **High reliability.**
• **Lower latency** than DSL and satellite solutions.

The network is being regularly used by 35-40 households and currently consists of:
• 5 node backhaul 5.8 GHz Wi-Fi long distance directional mesh (ring) with co-located access points (APs) to connect individual communities.
• 17 mesh-capable rooftop devices deployed within the communities.
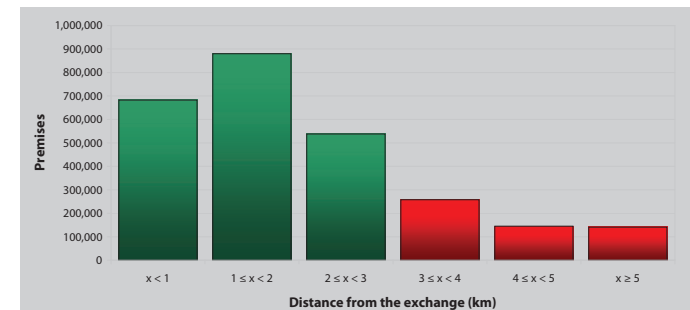
20% of Scottish premises are more than 3km from an exchange: they **are unlikely to get 2Mbps** (the **"Digital Britain"** target).