

# Delivering connectivity to the edge – and beyond



Andrew Stirling, Larkhill Consultancy Limited





# About Larkhill

- My company, Larkhill, provides strategy and policy advice in Communications – drawing on my background in industry and in regulation
- Over the past twenty years we have helped businesses with strategy and policy aspects of technology innovation. Latterly we've focussed on connecting underserved communities
- Some highlights:
  - We supported BT in evaluating a mobile TV technology
  - We supported Microsoft in helping the introduction of TV white spaces technology in UK/Europe – including leading a major trial in Cambridge
  - We have worked with Microsoft and other industry + academic partners on innovative solutions for rural areas – in Scotland – and more recently in the US







Rural idyll or dead end?



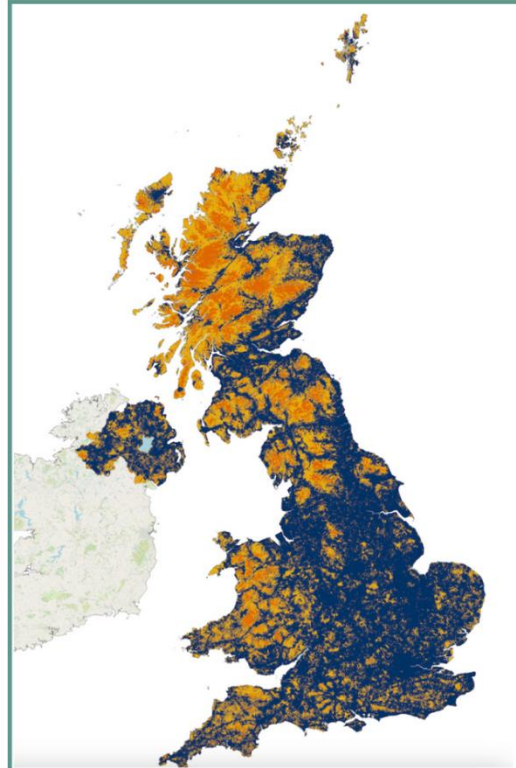
# Mobile coverage maps illustrate the gap(s)

- The Shared Rural Network aims to radically improve coverage – backed by the UK Government and major mobile operators

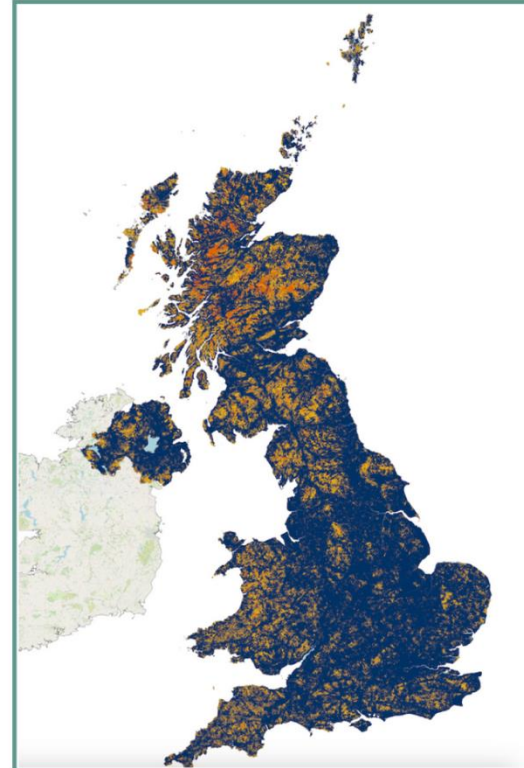
<https://srn.org.uk>

## SHARED RURAL NETWORK Coverage Forecast Improvements in the UK

PRE-SRN



POST-SRN



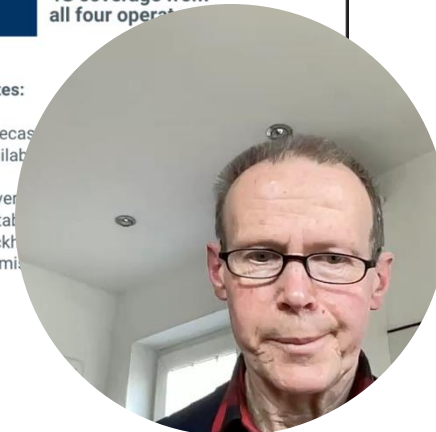
Key:

-  Total not-spots, areas with no 4G coverage from any operator
-  Partial not-spots, areas with 4G coverage from at least one, but not all four operators
-  4G coverage from all four operators

Notes:

Forecast available

Coverage suitable for backhaul permit





# Delivering high quality service to everyone

- People living in rural areas typically face a much longer journey than those in towns, far less easy to fit in a busy day.
- As offices close to reduce costs, more people are encountering the rural access experience.
- What does that look like?
  - OU student (a mum) needed to drive 10 miles to submit work
  - Local garage buying stock online suffered severe disadvantage

Goodbye and Thank you!  
It is with a heavy heart that we have  
doors for the last time.  
Sadly, with the cost of living crisis, ongr



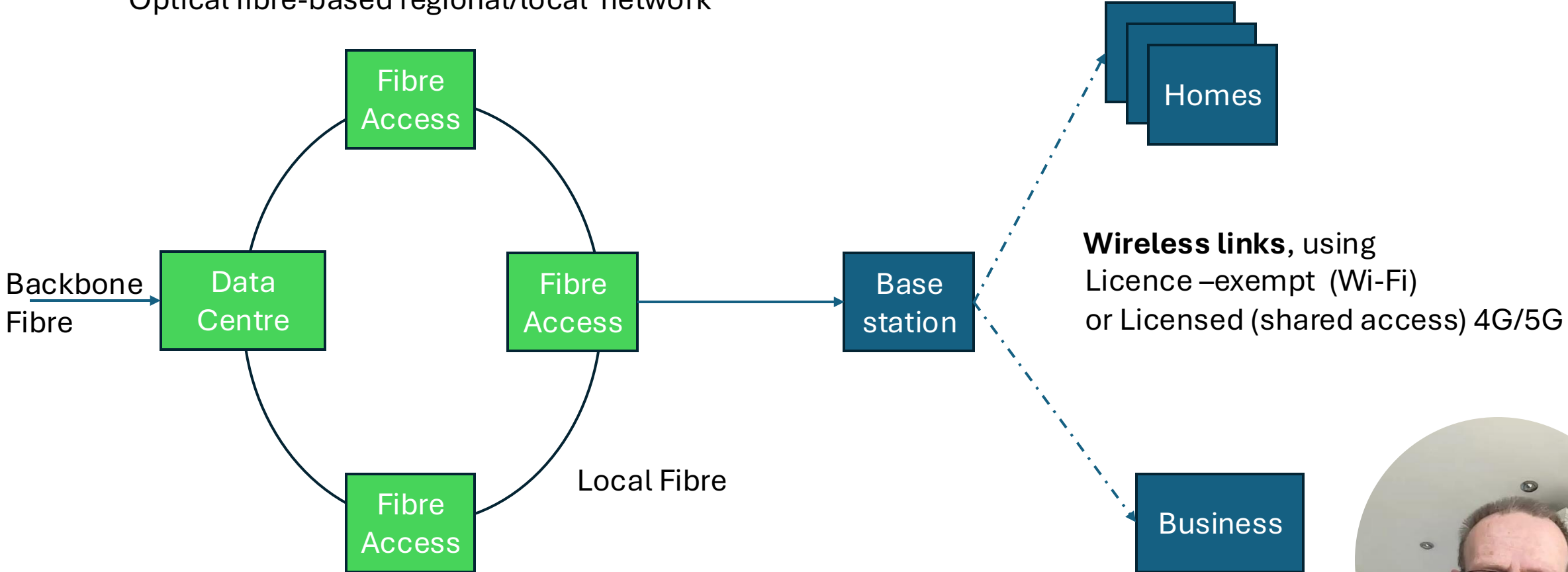
# Hybrid connectivity solutions are helpful in pushing out the edge of coverage

- Optical fibre is increasing available throughout rural areas, but there are many who still lack decent broadband at home or in their office
- Wireless technology helps to bridge the fibre gap
  - Extensions in mobile data coverage are helpful (4G, 5G ...)
  - Fixed wireless access using 4G, 5G and Wi-Fi technology can be helpful in reaching users who have yet to benefit from fibre to the premises
  - We now see equipment [combining these technologies](#), to maximise spectrum access and therefore capacity
  - Satellite connectivity has been improving in performance to the point where those who can afford it can enjoy decent broadband...



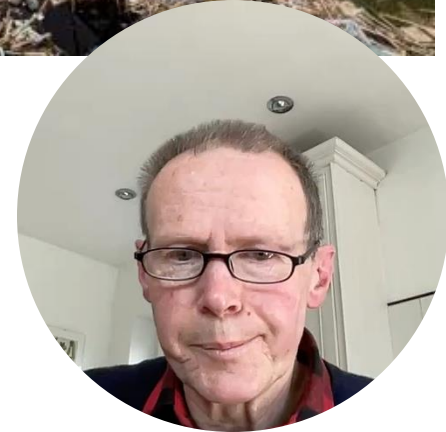
# A hybrid architecture

Optical fibre-based regional/local network



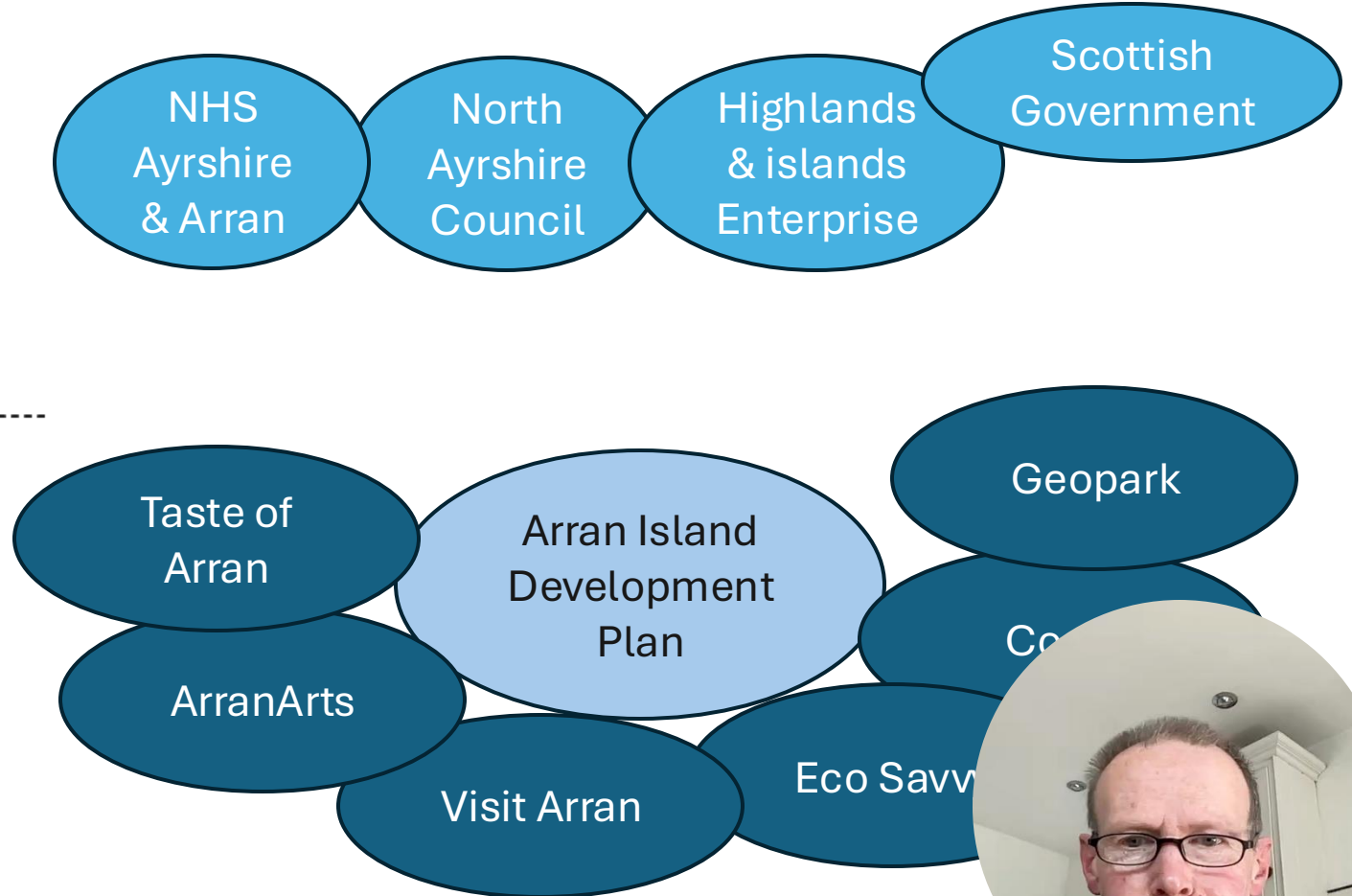
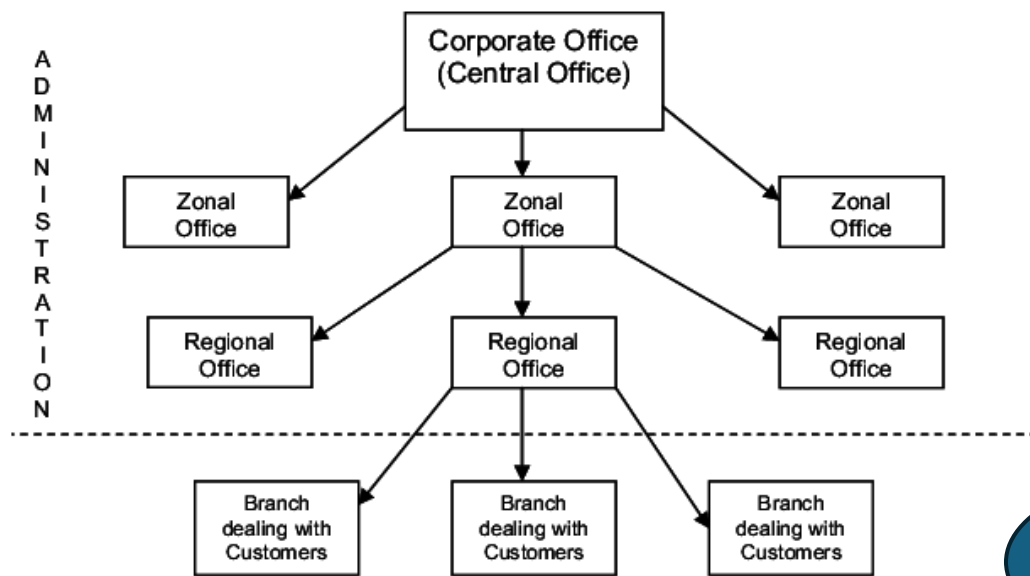
# But we also need to think about resilience

- Communication networks have traditionally been designed with a hierarchy of links from conveniently-sited hubs
- End users in rural areas could be left vulnerable to failure of the intervening links
- Fostering connections between hubs, e.g. creating ring is a way to enable at least partial recovery in the event of a link failure





# Innovation opportunity - through replacing branches with circles of cooperation



“Feels closer to a start-up culture”



# How AI could help – plan/prep/operation

- Extending network coverage can be complex and costly
- AI can improve planning tools, managing the complexity of ‘clutter’
  - Using drones to capture details around the desired deployment site
  - Tapping into specialist databases and combining these with images/scans from the location



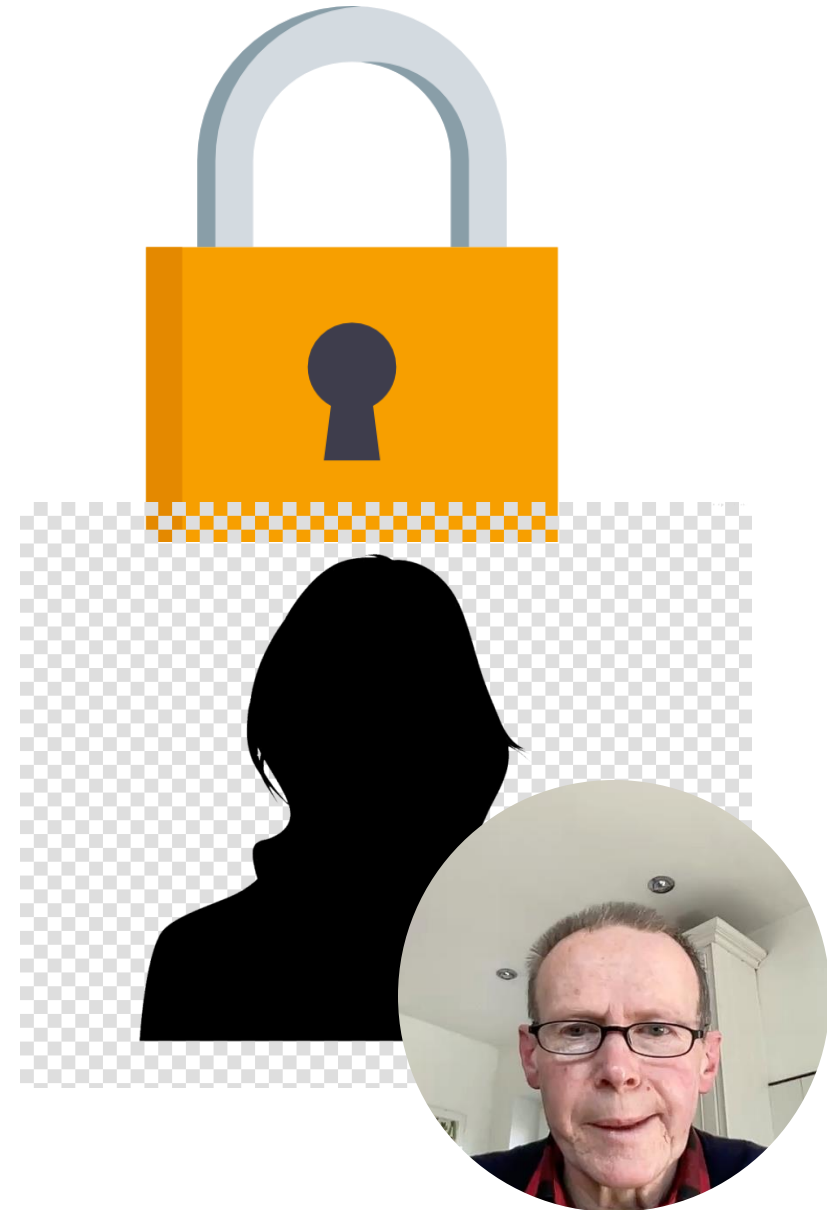
# How AI could help – configuring & operating

- Configuring the network (routers, firewalls etc.) to assist deployment and enable growth in number of user
- Guarding the network – cybersecurity
- Recovering from failures/attacks etc.



# Establishing trust and security

- Security applies to both service provider and end user
- Who are you (really)?
- AI tools can help eg:
  - Monitor network operation/traffic for unusual events
  - Build a more detailed profile of service users, making it harder for identity theft





# AI could support island mode for service delivery

- Much as microgrids for local renewable energy distribution...
- More services need to become capable of island mode operation
- AI can support this – through cloud-based + local hybrid configurations

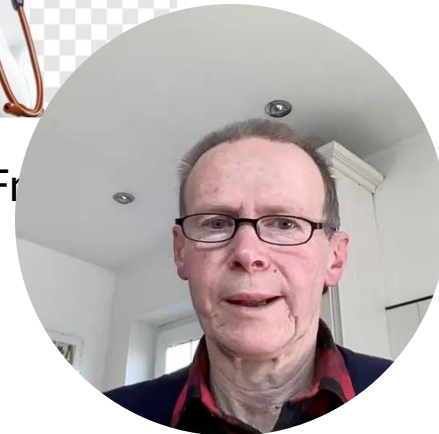


# AI - making services more human (& safer)

- We've all experienced services where the customer seems like a nuisance, to be batted on or back as soon as possible
- There's an opportunity to transform people's experience of online services
- AI technology improvements can help to bridge the digital access gap
- What form of interaction is desired/appropriate?
  - Visual/ audible/ textual?
  - Avatar or an image of real customer service agent – with signing or translation available



Image by xadartstudio on Freepress



# We need to connect things as well as people

- Data retrieval and management of service delivery places special demands on connectivity – Internet of Things (IoT)
- Sensors (and actuators) may be widely distributed in areas not typically covered by e.g. 4G/5G mobile networks
- Dedicated networks can be deployed using licence-exempt spectrum (e.g. LoRa, Bluetooth, Wi-Fi) or special cellular networks (NB-IoT, LTE-M or 5GRedCap for example)



<https://safeguard...nk>



# How might AI help with rural life challenges

- Rural businesses and services have limited resources....
- Artificial Intelligence could help improve service delivery through data harvesting and analysis
- Keeping on top of issues (traffic, environmental ..) across potential large areas with low population density
  - More timely intelligence on floods, fires, road blockages or traffic jams
- Helping local citizens negotiate the complexities of public transport – where aged vehicles, variability of road conditions and weather can conspire...
- Improving service
  - Appropriate sharing of knowledge of individual needs can increase user satisfaction
  - Venue's preparation for particular customer/visitor needs – through advance notice



\* such as though systems such as WelcoMe © from NeateBox



# Affordability is essential, but skills and awareness also have a role in building demand

- Network coverage creates opportunities for services
- But this only helps if users can afford to access the network(s)
- Great efforts were made to improve access for all during the pandemic when there was a radical shift to dependence on online service – in education as well as health
- The Digital Poverty Alliance is a good example of industry cooperation to help everyone get decent access to online services
- Skills and awareness of online services is another helping factor. AI can assist with cost-efficient targeted marketing – including through relevant community groups





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The Isle of Arran, in SW Scotland is a case in point

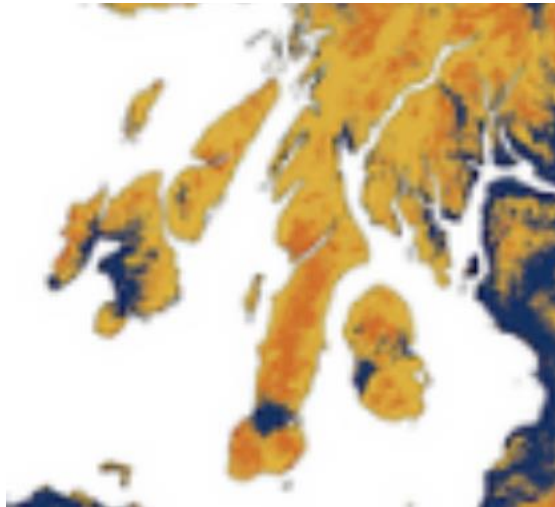




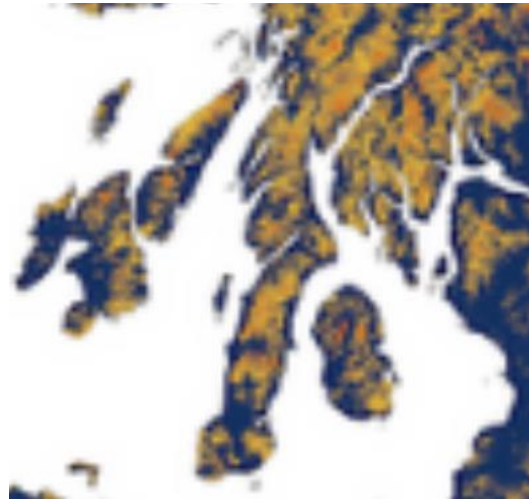


# Mobile coverage is work-in-progress




Pre\_Shared Rural Network



Post SRN



## Key:

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## Notes:

Forecast improvement in availability of EAS

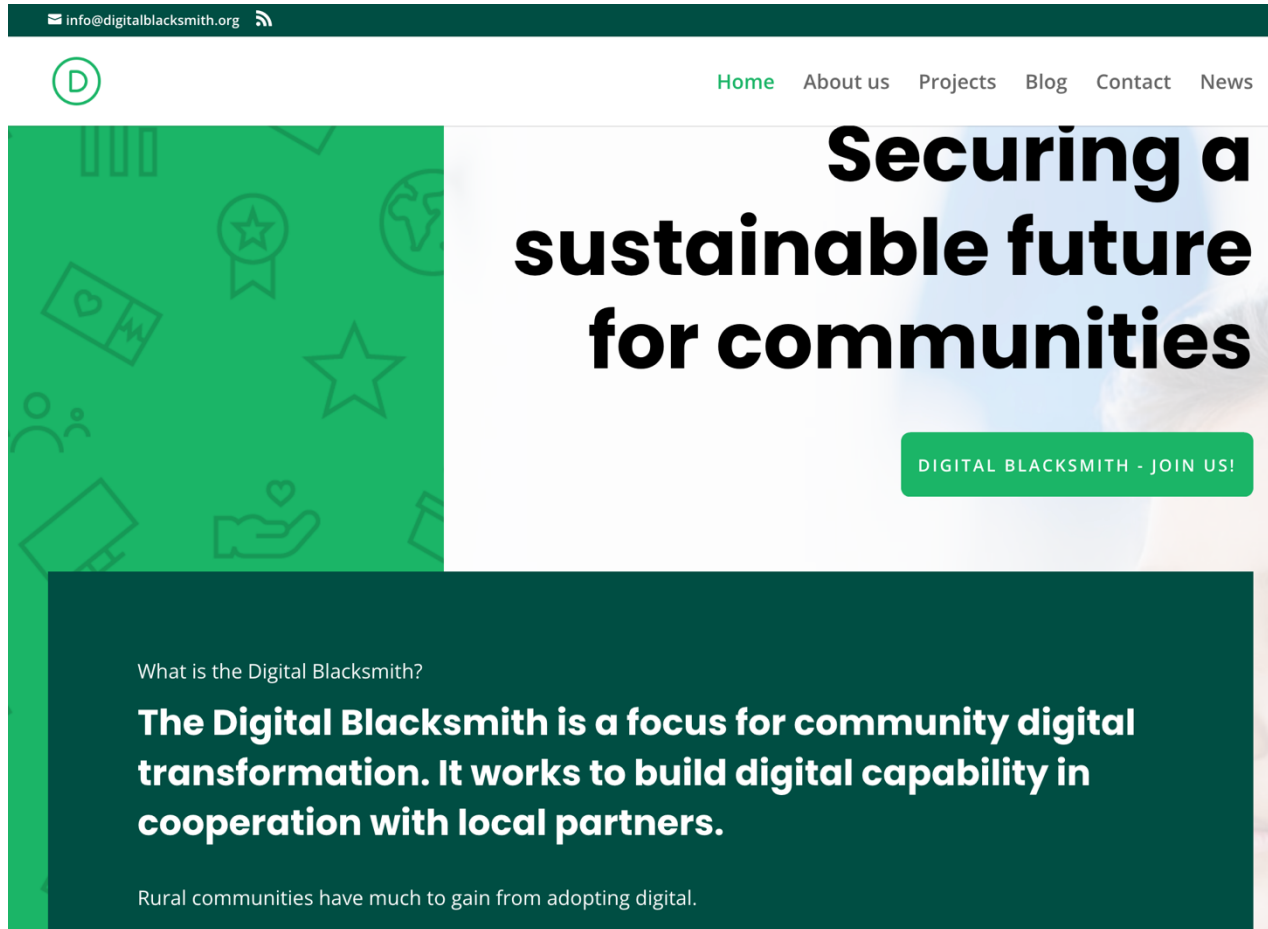
Coverage improvement through suitable site availability, backhaul and permission

Source: Shared Rural Network





# Arran Digital Blacksmith enables innovation at the community level



The screenshot shows the homepage of the Digital Blacksmith website. At the top, there is a dark green header with the email address 'info@digitalblacksmith.org' and a social media icon. Below the header is a navigation menu with links for 'Home', 'About us', 'Projects', 'Blog', 'Contact', and 'News'. The main content area features a large green graphic on the left with various icons representing community, technology, and sustainability. To the right of the graphic, the headline reads 'Securing a sustainable future for communities'. Below the headline is a green button that says 'DIGITAL BLACKSMITH - JOIN US!'. At the bottom of the page, there is a dark green section with the text 'What is the Digital Blacksmith?' followed by a bold statement: 'The Digital Blacksmith is a focus for community digital transformation. It works to build digital capability in cooperation with local partners.' and a smaller line of text: 'Rural communities have much to gain from adopting digital.'

info@digitalblacksmith.org

Home About us Projects Blog Contact News

## Securing a sustainable future for communities

DIGITAL BLACKSMITH - JOIN US!

What is the Digital Blacksmith?

**The Digital Blacksmith is a focus for community digital transformation. It works to build digital capability in cooperation with local partners.**

Rural communities have much to gain from adopting digital.

Examples of current initiatives:

- Island energy usage dashboard
- Storyweb – harvesting and harnessing local culture/history

You can see examples of our work here:

<https://digitalblacksmith.org/projects/>



# Helping the local community

- Events we've organised include:
  - An idea generation evening – based around some extreme (imaginary) scenarios
  - An online seminar about whether Arran could have a digital twin and what that might mean
  - Online safety workshops for P5/S1 school groups
  - Precision agricultural technology briefing for local farmers



# Summing up

- Improving broadband connectivity is an opportunity to improve public services for all, compensating for physical disadvantages of being at the 'edge'
- AI technology advances can help with affordable extension of high-quality service provision to all, but needs:
  - Decent affordable online access (connectivity, devices etc.)
  - Local support – assisting awareness/skills development
  - Organisations to cooperate (circularly rather than hierarchical)
  - Encourage island mode capability – for resilience and innovation



# References

- [Ofcom Nations and Regions infrastructure report – December 2024](#)
- [Digital Poverty Alliance](#) – facilitating affordable access devices, support ..
- [Shared Rural Network](#) – government/industry cooperation to extend mobile coverage

