

Introduction

The Home Area Network (HAN) is a critical part of the smart metering programme. As these HAN devices are to be connected into every home in Great Britain, the HAN must be both reliable and secure in order to provide the consumer with a top class user experience, and to ensure the cost of support and repair stays within reasonable bounds.

Home Networking

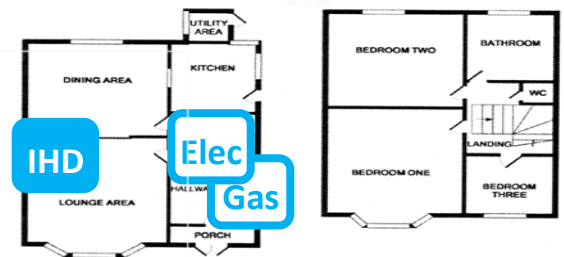
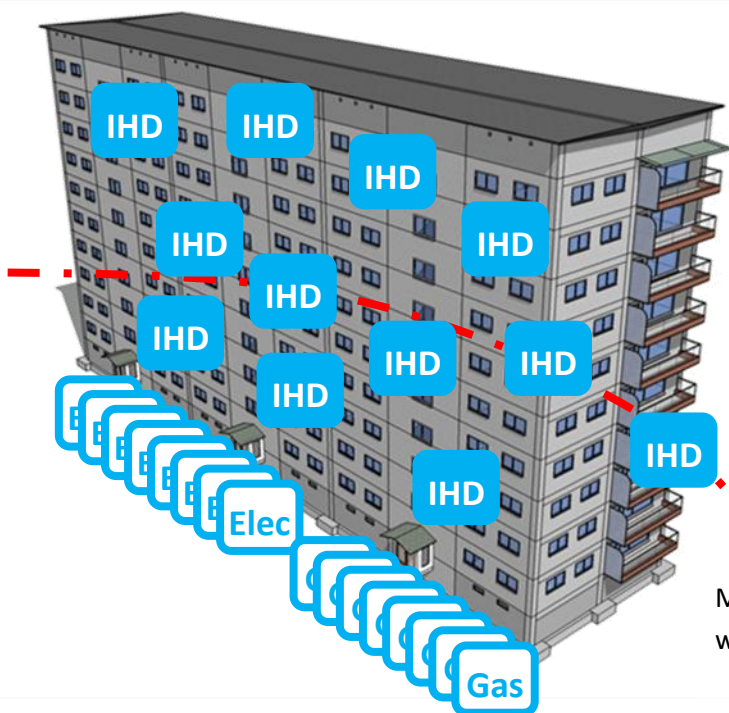
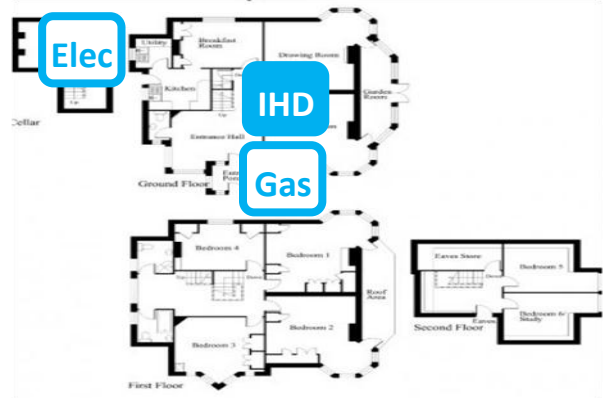
Home networking has become prevalent in the consumer home over the past decade, fuelled by the growth of the internet and the availability of broadband allowing consumers to consume multiple types of media in multiple different formats. The majority of UK consumer home networks tend to utilise wireless, however Powerline and CAT5 (cable) solutions are also reasonably commonplace.

Home network growth, focused on media, is primarily driven by the need for mobility of the device within the home (such as laptops and smart phones), and a need for attaining high bandwidths required for media distribution within the confines of the home environment. These devices have the luxury of either being directly powered or regularly charged.

In contrast the requirements for a smart metering Home Area Network (HAN) differ from that of a standard consumer network; the data rates required are minimal in comparison to streaming media, however the range and transmission success rate are key. Additionally, it is not always possible to power each device from the mains; gas and water meters cannot be mains powered for safety reasons and due to their location, therefore any solution must be capable of running on batteries for anything up to 15 years.

Location of meters

Gas and electricity meters are typically located in cupboards under the stairs, utility rooms or on the exterior wall of the property; it is not uncommon to find them in harder to reach locations such as basements or outbuildings. Water meters will often be located in the driveway or even under the pavement outside of the property. In the worst cases such as high rise flats, meters may be located several tens of meters away in basements or locked in secure risers.



Maximum range of wireless link

Interference and installation issues

Conventional WIFI in the UK operates in an unregulated spectrum band at 2.4GHz (868MHz is also unregulated); the very fact that the band is unregulated means anyone can develop products which utilise the spectrum. This has both contributed to the success of WIFI but also means that any wireless device is susceptible to interference from any other device using the same frequency. In a typical consumer home broadband routers, ZigBee devices, TV senders, microwaves and baby monitors, to name but a few, can all cause interference. Additionally the construction materials used in building the property, thickness of walls, and even damp in walls can cause degradation of WIFI signal.

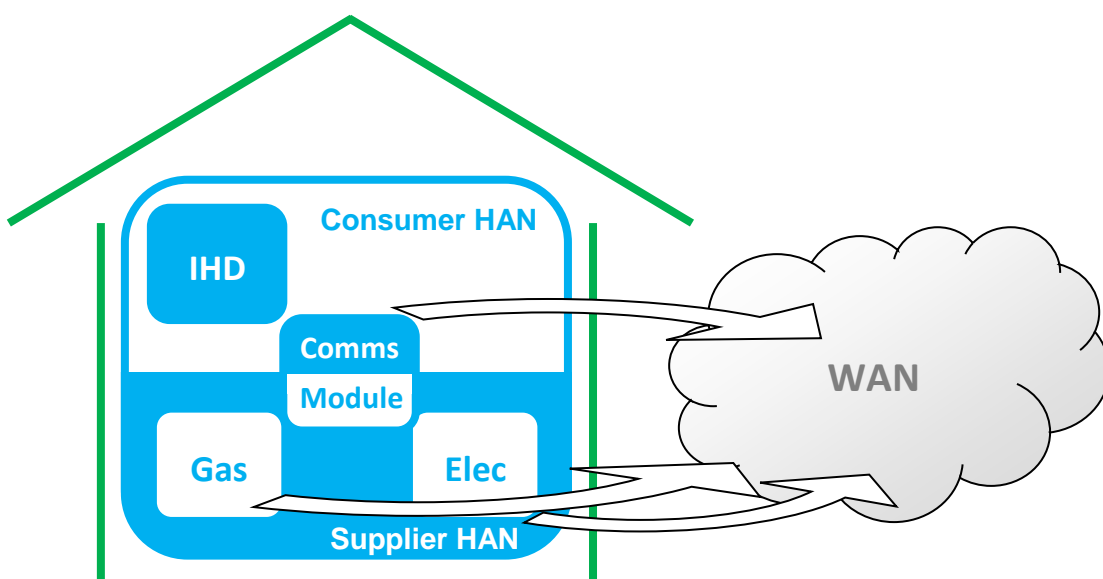
Powerline is not free from interference, despite being a wired technology. Powerline works by injecting signal onto the electrical wires within the home. Any other device which produces noise in the same frequency range, or blocks the signal, can cause a problem; surge protectors, switch mode power supplies (mobile phone chargers etc.) and even low energy light bulbs have all been found to cause problems. There are also multiple

standards of Powerline which are incompatible, if two competing devices are plugged into the same home, neither will work. Powerline has also been known, in certain circumstances, to interfere with some regulated radio frequencies, such as HAM Radio, and ADSL2+. With relatively low volumes in the consumer domain presently this isn't a major issue, however if every home in the country hosted a Powerline network the issues are likely to be compounded.

Full wired solutions such as CAT5 or Plastic Optical Fibre (POF), are not without their own problems. Whilst neither is insusceptible to nor cause interference to other networks, installing cables between meters is an extremely costly task. Cabled solutions are generally unacceptable to the consumer if they involve unsightly cable running around skirting boards and over architraves. Accessing meters in difficult locations would also require walls to be drilled, further adding to the expense.

Smart Reach HAN

The proposed SmartReach solution splits the HAN into two segments which are separated by a comms gateway; the **Supplier HAN** which carries the communications to and from smart meters, and the **Consumer HAN** which exposes the metrology information to the consumers via the In Home Display (IHD). There is no single networking solution which is guaranteed to work in 100% of consumer homes, at the price point required, for either the supplier or consumer HAN. For this reason SmartReach is proposing that all meters which aren't hardwired to the comms module have the ability to communicate directly to the WAN. For HAN communications a modular solution is desirable, allowing the installer to choose the technology which offers the optimum network performance for the install premises. This gives the added benefit of enabling the networking technology to be changed, or upgraded, at a future date without the need to completely replace the comms gateway and / or the smart meters. In the ideal situation, the smart meters are co-located in an area like the cupboard under the stairs.



Where a physical connection is not practical or possible, for instance where the gas meter is located on an exterior wall, a wireless connection will be employed. For gas, the preference is to use a licensed spectrum wireless communications method such as long range radio to create a HAN channel which would utilise the same network card as the WAN communications (but operating at a different frequency). The HAN channel would reuse the same network card in the meters which is utilised for WAN traffic for remote meters, operating on a different frequency band and at a lower power output to allow communication back to the comms gateway. This re-use of the single long range radio communications board, rather than reliance on a second WIFI technology, reduces the overall cost of the solution. Additionally because this operates within a regulated spectrum band(s), the likelihood of interference from other devices is removed.

In the worst case scenario, where both the electricity and gas meters are in locations unsuitable for the comms gateway, the comms gateway will be positioned at a suitable location in the premises and be powered consumer side (it is assumed the energy retailer will make tariff concessions to pay for the powering of this device). Communication between the gas meter and the comms gateway will again utilise the HAN channel; due to the frequency of updates for electricity, the HAN channel is unsuitable for electricity readings, for this reason either ZigBee or Powerline will be used (based on the best technology for that location).

Need for open standards

Due to the volume of devices involved, and the number of 3rd parties who may be required to interact with the HAN it is imperative that open, standard, interfaces and technologies are used. Both at the application layer enabling access to the metrology data and the physical connection layer, facilitating connection between modules.

Conclusion

It is impossible to take a 'one size fits all' approach to the networking technology in the HAN; the UK housing stock is so varied that there will always be a sizeable proportion of homes which cause problems for any home networking solution. It is this final segment of 'difficult' residences which are likely to cause the bulk of the cost, both in terms of setup and support for the HAN. Utilising a standards based, modular solution offers the ability to select the best HAN technology for the premises at install time and supports both the ability to upgrade the networking module at a future date as required, and for consumers to move to other Energy Retailers who have chosen a different technology for their consumer HAN devices.

The potential for transient interferers to degrade or block the signal between meters and the comms gateway or IHD support the need for meters to have the ability to communicate both on the HAN to supply metrology data to the consumer and direct to the WAN which is supported by the SmartReach proposal. This architecture has the added advantage of being more tamper proof and offers the ability for Energy Retailers to continue to collect meter readings and administer their meters even if the consumer decides to unplug devices on the Consumer HAN.

Any supplier choosing not to offer a range of Home Area Networking capabilities, which rely solely on unlicensed spectrum run the substantial risk of their HAN solution suffering interference in a large proportion of premises which will lead to spiralling support costs and extremely poor consumer experience.

For further Information please contact

Jo Wright	jo.wright@bt.com	+44 (0)7834 303642
Paul Robson	paul.robson@bt.com	+44 (0)7764 339274