

# Home area networks – what technologies are there in 2010

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# What is required of a home area network?

## 1. It works!

- a. It transmits required data from the meter to the Display
- b. It can link the smart meters in the same property, and allow exchange of relevant information (electricity, gas)
- c. It can be used to 'talk' with other appliances

## 2. It works in all building types

- a. Is there a HAN technology that can be guaranteed to work in all building situations?

## 3. Is it interoperable with other Home based communications technologies?

- a. Can one protocol be used by the meters/displays and all other appliances
- b. Or can the meter/display HAN protocol 'talk' with a different HAN used for appliances – bridging technologies

#### 4 Is the data transmitted safe?

- a. What guarantees can be made that data transmitted using a HAN is kept confidential to the customer or utility?
- b. Can the same HANs in neighbouring properties interfere, or interfere with existing networks

#### 5 Is the technology future proof

- a. Can the HAN operate over the lifetime of the metering assets? 10-15 years?

#### 6 Is the HAN covered by European standards

- a. Is it covered by European or world standards now?
- b. Is there is a route map for the development of standards?

# The likely solution (H Porter views)

## 1. **It works!**

There are many solutions that have been demonstrated to provide the level of performance required, but wireless solutions would seem to be more fit for purpose

## 2 **It works in all building types**

Wireless solutions are unlikely to work in all property types and configurations in the UK

Wired solutions should work in all properties

## 3 **Is it interoperable with other Home based communications technologies?**

Examples and demonstrations show that 'Bridging technologies' can make most HAN protocols 'talk' with others

- 4 Is the data transmitted safe?
- 5 Is the technology future proof
- 6 Is the HAN covered by European standards

Each HAN protocol will cover these issues in different ways . The proponents of each already have solutions to each issue, and all are working towards enduring solutions for the market

# Ideal solution

- There is likely to be a default wireless solution used in the majority of domestic property installations
- There needs to be default wired solution for the situations when wireless is inappropriate
- Both of these default solutions must be interoperable with home displays and have the capability to communicate with all meter types and all types of appliances
- Both solutions must be covered by European standards by the time of mass roll out

# Examples

- BEAMA has arranged for there to be a number of examples of HAN technologies today
- We believe each meets the basic requirements of the smart meter roll out
- Some are primarily wireless, some primarily wired
- All are already covered in standards, or have a roadmap for their development

# KNX

- Recent developments
  - Extended to cover all media: r.f., powerline, twisted pair, IP
  - Extended with Easy installation mode; simplified installation process
- Incorporates M-Bus



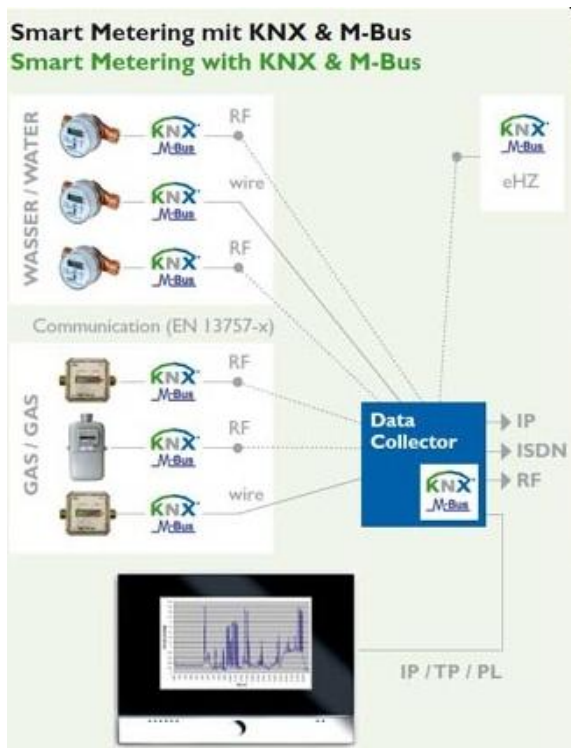
**KNX** is approved as  
European Standard (CENELEC EN 50090 and CEN EN 13321-1).  
International Standard (ISO/IEC 14543-3).  
Chinese Standard (GB/Z 20965).  
US Standard (ANSI/ASHRAE 135).

**KNX** is the global standard for home and building control with:  
A single, manufacturer independent design and commissioning tool ([ETS](#)).  
A complete set of supported [communication media](#) (TP, PL, RF and IP).  
A complete set of supported [configuration modes](#) (system and easy mode).

This standard is based upon more than 20 years of experience in the market including its predecessors, EIB, EHS and BatiBUS. Over 200 [member](#) companies worldwide from different application domains have almost 7000 **KNX** [certified](#) product groups in their catalogues. The [KNX Association](#) has partnership agreements with more than 30,000 [installer](#) companies in 100 countries and more than 60 technical [universities](#) as well as over 150 [training centres](#).



# KNX Metering



## KNX In the Home

Synco living –  
the energy-efficient home  
automation system

Simply beautiful and  
beautifully simple

Answers for infrastructure.

SIEMENS



# ZigBee

- ZigBee comprises two parts
  - Transport layer- IEEE 802.15.4
  - Application layer – Smart Energy Profile (SEP)
- These don't have to be linked
- ZigBee is being proposed for adoption by CENELEC TC 294 and development as a European Standard – the proposal is expected to go out for vote soon
- Under active development for smart metering



**ZigBee®**

Control your world

# ZigBee Alliance Overview

- **Organized as an independent, neutral, nonprofit corporation in 2002 for WSN Standards Development**
- **Result: ZigBee enables the “Internet of Things”**
- **Open and global-- ~ 400 companies worldwide**
- **Activities include:**
  - Open Standards for wireless sensor and control
  - Product Certification and compliance programs
  - Branding, market development and user education
- **Only Standard which meets key network requirements for an IoT**
  - Self organizing, self configuring, self healing mesh networks, low cost, low energy consumption, scalable to very large sizes, high levels of security, based on open global standards



Control your world

# ZigBee Smart Energy Profile



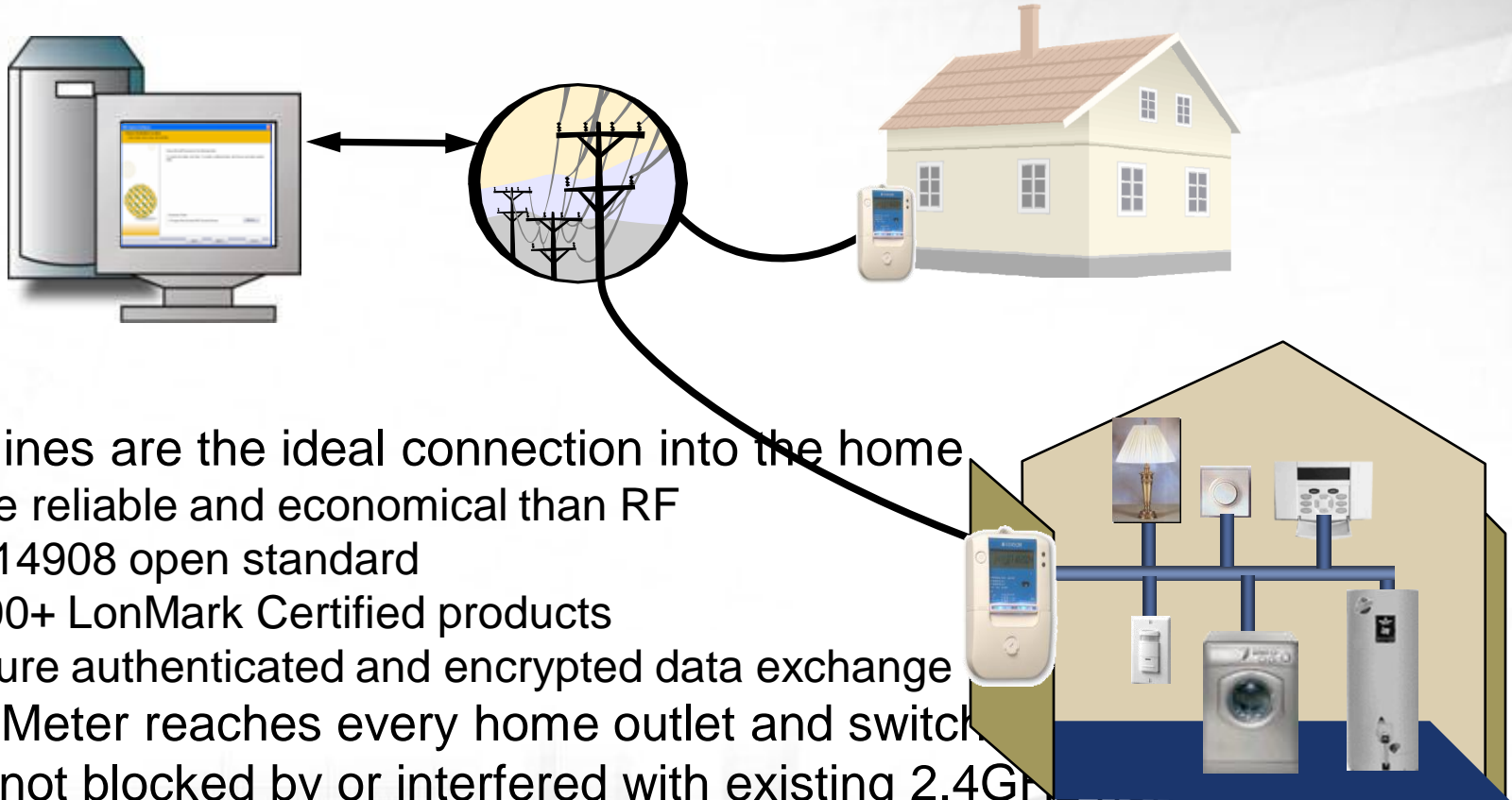
- **ZigBee Smart Energy Profile - Supported Features Include:**
  - Basic metering [measurements, historical info, etc]
  - Demand Response (DR) and Load Control
  - Pricing [multiple units & currencies, price tiers, etc.]
  - Text messages
  - Device support for Programmable Communicating Thermostats (PCTs), Load Controllers, Energy Management Systems, In Home Displays (IHDs), etc.
  - Security to allow consumer only, utility only, or shared networks
  - Support for water and gas
- **Deployment**
  - More than 40 million ZigBee-enabled meters under contract
  - ~100 certified Smart Energy products (Meters, IHDs, TStats, etc.)
- **Standards**
  - European Standards Organisations/Int'l standards adoption
    - CEN – TC294 – New Work Item Proposed and in progress
    - CENELEC TC205, ETSI M2M – in progress, expect closure soon
    - IEC – liaison with TC57 in progress
  - Ongoing feature management/enhancements – multi-fuel, prepay, EV, etc.
  - SE 1.1 enhancements in final approval process (updates, over-the-air support, price additions)



# LonWorks

- Actively being developed for the Dutch smart metering programme – NES
- Used in a number of European trials and roll outs throughout Europe
- LonWorks as a HAN is covered by European Standards

# Extending Into the Home



- Power lines are the ideal connection into the home
  - More reliable and economical than RF
  - EN 14908 open standard
  - 1,000+ LonMark Certified products
  - Secure authenticated and encrypted data exchange
- PLC in Meter reaches every home outlet and switch
- PLC is not blocked by or interfered with existing 2.4GHz
- PLC is not subject to RF multi-path fading in fixed point communication
- PLC can be used to bridge to home gateway and RF devices inside the home
- The NES network provides a low-cost, universal, bi-directional communications

# Z-Wave

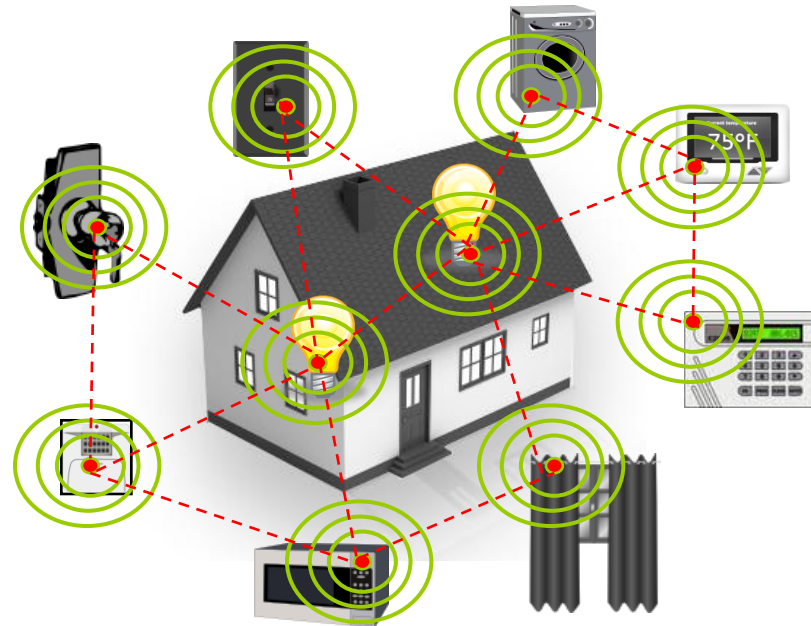
- Widely used in a number of markets
- Examples in the UK for controlling home appliances
- Used in the Danish smart metering schemes



# Tailored for the Home



- **RF solution in single chip**
  - Sub – 1GHz
  - Frequency Agility
  - Rich set of peripherals
  - Multi speed: 40... 100 kbps
  - Low communication latency
- **Wireless Mesh Networking**
  - Every node is a repeater
  - Extremely robust
  - Self healing
- **Extremely simple setup**
  - Plug & Play
  - Versatile support of installation tools
- **Ultra low power**
  - Ideal for battery powered sensors
  - Battery-to-Battery networks
- **Interoperable**
  - Across SW and HW generations
  - Fully backwards compatible
  - Proven Device and Command Classes
  - Comprehensive certification program



## UMI (pronounced “You Me”) is an open standard with free specifications for 3 interfaces in smart metering equipment

- UMI = Universal Metering Interface
- 3 UMI specifications for :
  - Module interface, based on 10-IDC.
  - Opto interface, based on EN62056-21 (FLAG Port).
  - Security interface, based on ECC-256 (asymmetric) and AES-128 (symmetric).
- UMI specifications define mechanical, electrical, link and application layers.
- UMI specifications and trademarks are free to use.
- UMI is agnostic to the physical layer or data objects chosen for PDA (installation engineer), HAN or WAN.
- UMI meters can be smart-ready (choose comms, security, data objects and application later).



*Elster BU Gas uses UMI ...*



**Come and see UMI in Demo Room 6**

# M/441 and European Standards

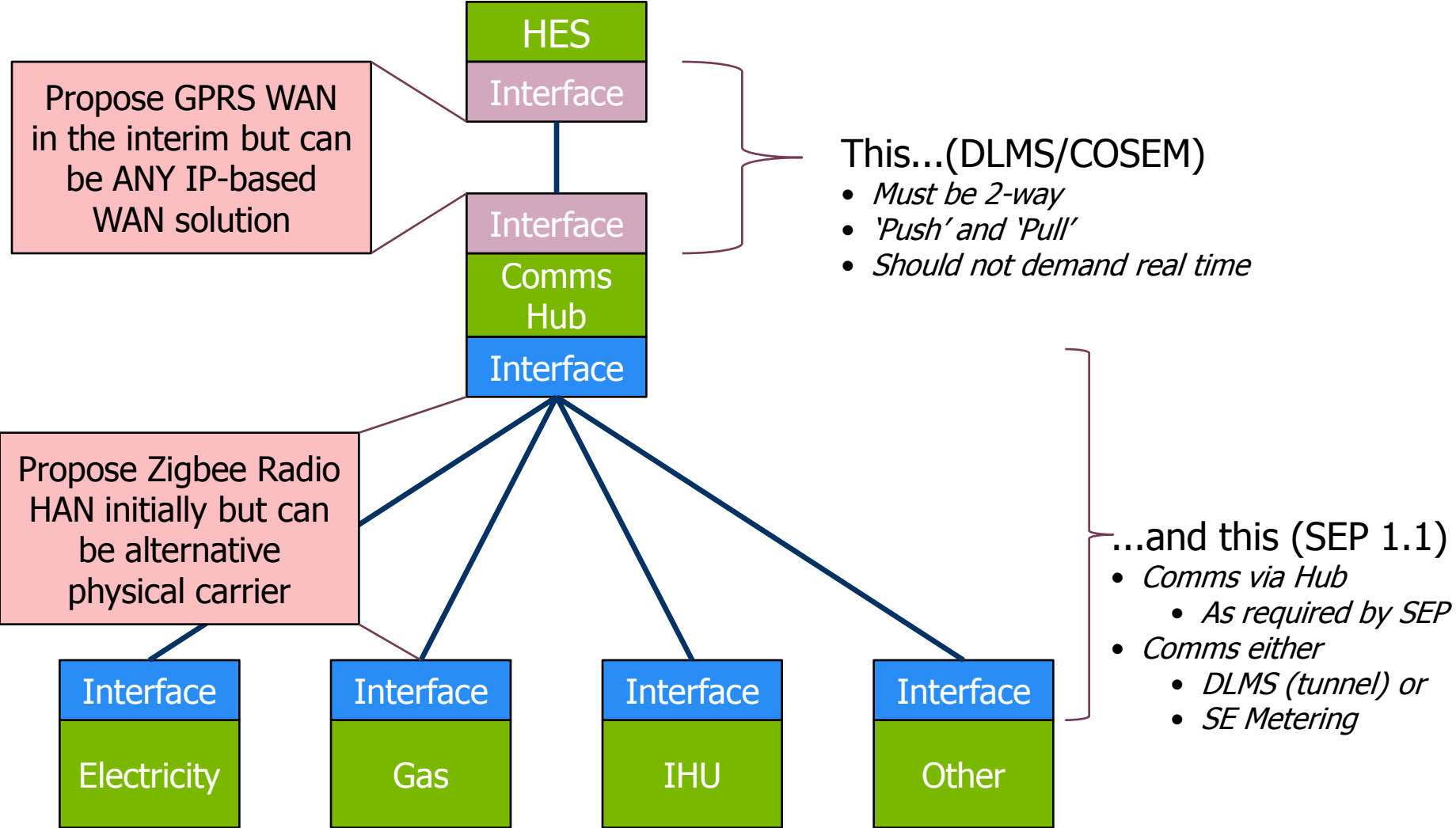
- Any Home Area networks used in the UK roll out will have to comply with European standards
  - If the solution does not already comply, it will need to before roll out
- The Work carried out under Standards Mandate 441 covers the Home Area network
- A number of HAN technologies are already covered under 3 main committees:
  - CEN TC 205
  - CENELEC TC 57
  - CENELEC TC 294
- There is an acceptance that there will be a number of different protocols and solutions for different European markets, but these can be accepted by the Standards community – and we think the Commission...

# Industry Initiatives

There are a number of industry initiatives across Europe aiming to produce solutions that deliver interoperability. Some are developing solutions for the HAN, some for WANs, and others both. Most of the following are demonstrated today.

- UK SMIP – This is collaboration for the UK developed by Elster, Landis+Gyr and Secure
- IDIS – developed by 3 manufacturers mainly for the French market, Landis+Gyr, Itron, Iskraemeco
- NES – Dutch specification using Echelon technology
- MUC – German utility specification – a number of companies involved – Sagem hear today
- SIPCos – RWE initiated HAN technology
- PRIME – PLC WAN consortium – Southern Europe focus
- OpenMeter –European funded project developing PLC solutions for the WAN

# UK SMIP Defines ONLY What Must Be Defined: Interfaces...

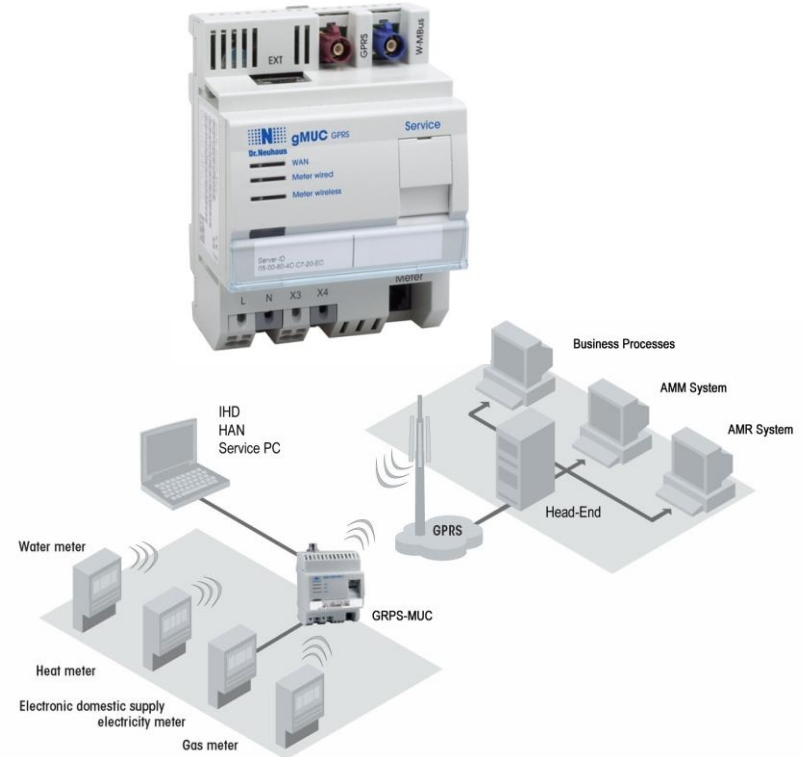


# NES: Beyond AMR

- NES is a platform for utility applications
  - **Open**
    - Based on open, internationally recognized standards
      - EN 14908, SOAP/XML, TCP/IP, M-Bus, etc.
  - **Bi-directional**
    - Each metering point is a fully accessible network node
  - **Extensible**
    - Supports remote functionality upgrades
    - Natively supports the popular pulse and M-Bus standards
    - Designed to grow to carry value added services over the same infrastructure
      - Consumer applications (C-band)
        - In-home display, prepayment, appliance monitoring and control, etc.
      - Commercial applications (A-band)
        - Vending machine monitoring and control
        - Street lighting (A or C)
  - Room

## gMUC completes MUC portfolio

- Dr. Neuhaus has completed its Multi Utility gateway portfolio for smart metering (now already 7 different standard versions available) with the
  - gMUC GPRS and the
  - gMUC LAN / DSL
- For HAN integration it offers already W-MBUS, Ethernet and RS232/RS485, ZigBee & Z-wave are possible
- Flexible meter communication towards DLMS, 1107, W-MBUS and SML meters (e, g & w)
- Long list of supported and tested meters available
- Easy AMI integration with XML over http(s)
- Proven technology: Already more then 50.000 MUCs deployed in diverse pilots and tests in Germany, Austria, Belgium, Spain, Netherlands, France



# Interoperability in the home

- One of the expected uses of any Home Area network is to 'talk' with other appliances, controls and building services in the home
- It is possible in new built homes all will be enabled to talk using the same HAN, but
- in existing homes – all 25 million of them – it cannot be expected that existing or even new appliances, controls and other equipment will be enabled for the same HAN
- Therefore there needs to be interoperability between different HAN protocols
- Bridging methods can be used to enable a full range of different smart appliances to operate with smart metering HANs
- These can also be designed to work on wireless , wired and mixed solutions
- Two example follow:



# System Components

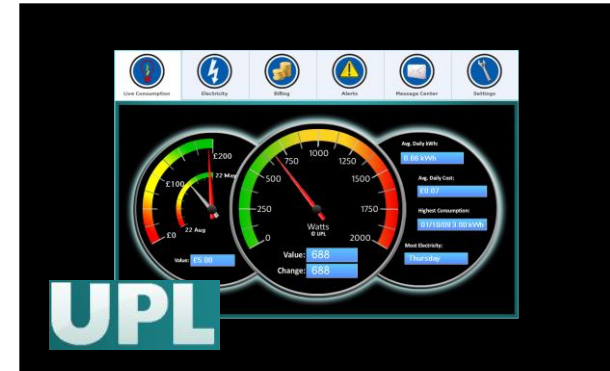


Metering



## SMART Acton

Data Presentation  
& Display



Communication Hub  
& User Interaction



Appliances



Lighting

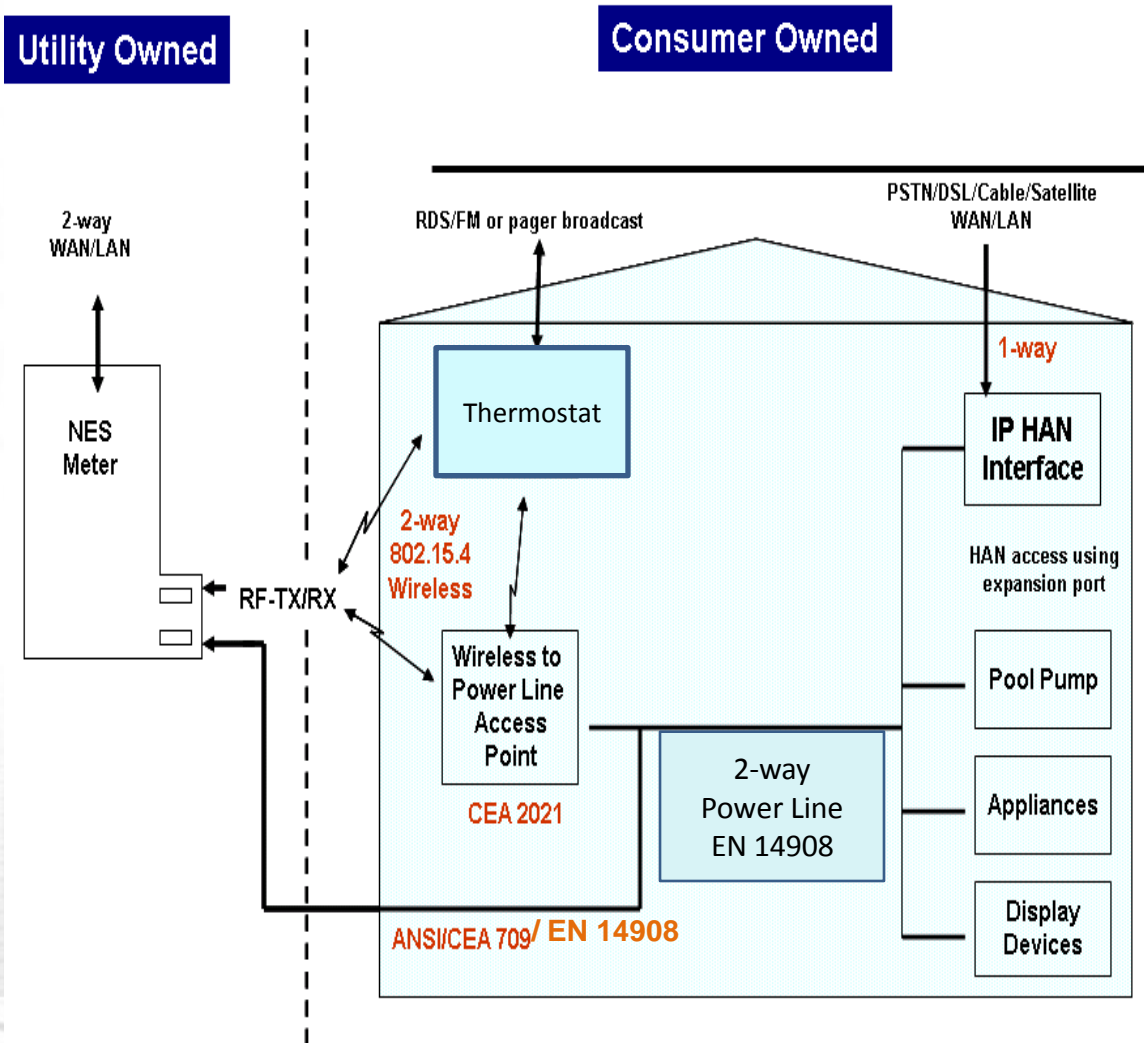


Heating



# Multiple HAN Technologies

## AMI-HAN Interface



# What Manufacturers Need

- Manufacturers need clear and complete specifications to work from
- All HANs will have to be tailored to UK market requirements so they can't be ready until the specification is fixed
- The likely 'default' solutions will need to be tested for performance
  - An understanding where each technology will and won't work is very important
  - Testing of solutions may be the only way to obtain this information
  - Must end up with laboratory based compliance tests
- There may be a need for compliance methodologies developed to ensure consistent performance

# What Next

- Hopefully all attendees today will be better informed about Home Area Networks
- Understand that technologies can and do work now in 2010
- Have gained an understanding of which technologies are best suited for the UK , and those which are covered by European standards.
- The SMDC and OFGEM can now use this information to make clear recommendations to the Government as to how they can and should decide on the correct solutions for UK roll out.