

Communication Solutions for Smart Gas Meters and Energy Efficient Embedded Services (ME³GAS)



ME³gas

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Outline

- ▶ setup of the ME³GAS project
- ▶ communication architectures for smart metering & smart grid applications
- ▶ communication protocols for smart metering & smart grid applications
- ▶ solutions for ME³GAS
- ▶ outlook

setup of the ME³GAS project (1)

- ▶ ME³GAS - MEEEGAS ('mi:gas): *Smart Gas Meters & Middleware for Energy Efficient Embedded Services*
- ▶ objective: to put consumers in control of their energy efficiency and appliances at home.
- ▶ Directive 2006/32/EC
 - ▷ Energy-Use Efficiency and Energy Services
- ▶ improvement of the overall energetic efficiency
- ▶ availability of energy oriented services to customers
- ▶ more accurate control of home appliances
- ▶ monitor energy consumption
- ▶ save energy – reduce CO₂

setup of the ME³GAS project (2)

- ▶ development of a completely new generation of smart gas meters
 - ▷ based on embedded electronics, communications and the remote management of a shut-off valve,
 - ▷ offer a whole range of added values:
 - ▶ management of multiple tariffs,
 - ▶ remote gas cut off,
 - ▶ security alarms,
 - ▶ absolute index,
 - ▶ temperature correction
- ▶ Both the new meters and the architecture and protocols will constitute the ME³GAS Advanced Metering & Middleware Infrastructure (AMMI)
 - ▷ use of Hydra (LinkSmart) service-oriented middleware for embedded systems
 - ▷ aimed to residential & commercial consumers
 - ▷ broad intelligent platform
 - ▶ semantic annotation
 - ▶ device discovery
 - ▶ context awareness
 - ▶ quality of service
 - ▶ security

setup of the ME³GAS project (3)

- ▶ ARTEMIS JU 2009 Call
 - ▷ ME³ (MEEE) consortium for *Middleware for Energy Efficient Embedded Services*
 - ▷ METGAS consortium for *Smart Gas Meters For Open Communication Architecture And Energy Oriented Services*
- ▶ merge these two submissions & cover two of the three horizontal technology layers, i.e.
 - ▷ *Reference Design and Architectures (RDA)*
 - ▷ *Seamless Connectivity and Middleware (SCM)*
- ▶ addresses ARTEMIS sub-programmes
 - ▷ ASP7 (*Embedded technology for sustainable urban life*) and
 - ▷ ASP3 (*Smart environments and scalable digital services*).
- ▶ address Industrial Priorities
 - ▷ 3.1.1 *Reference designs and architectures*
 - ▷ 3.1.2 *Seamless connectivity and middleware.*

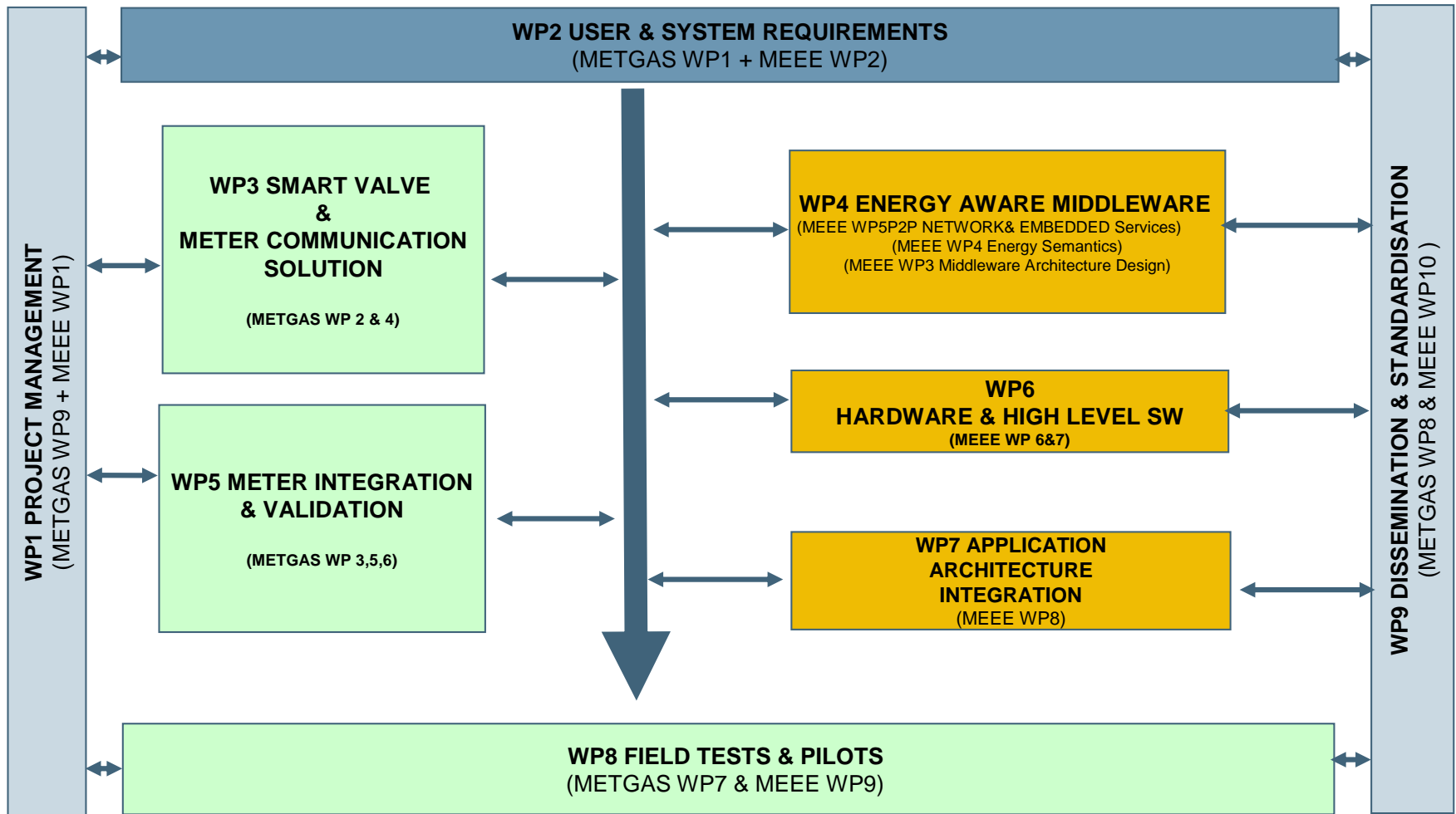
setup of the ME³GAS project (4)

- ▶ Project period is from May 2010 till Apr 2013
- ▶ total project budget of around 15.7 Mio €
- ▶ 15 partners from 6 European countries
- ▶ covering a large part of the energy provision value chain.

The screenshot shows the website www.me3gas.eu with a navigation menu on the left containing 'Artemis Programme', 'Project Results', and 'Contact'. The main content area displays a table of project partners with columns for LOGO, NAME, CODE, and COUNTRY.

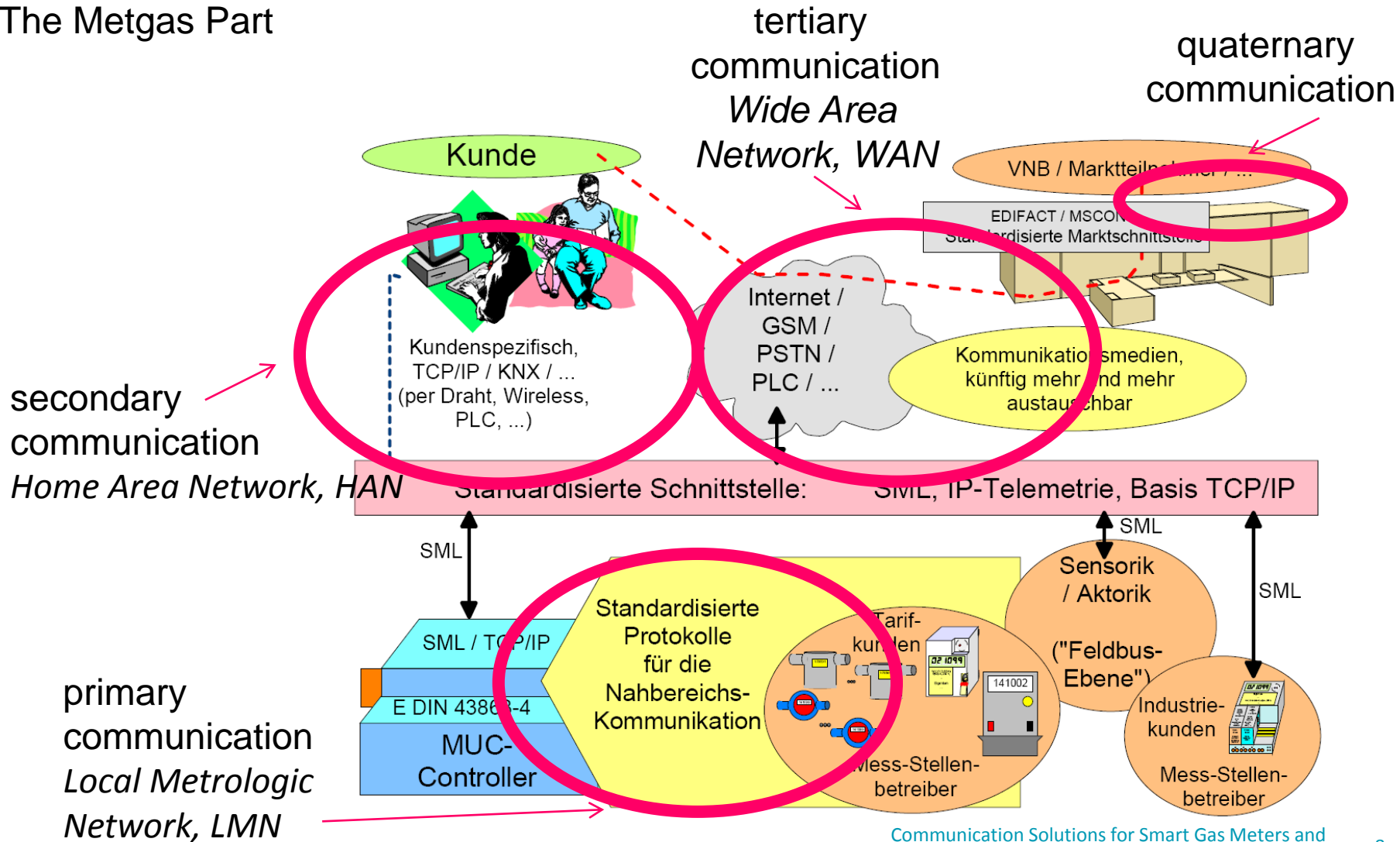
LOGO	NAME	CODE	COUNTRY
	Gas Natural SDG, S.A	GN	Spain
	CNet Svenska AB	CNet	Sweden
	Tyndall National Institute	TNI	Ireland
	Sensing Control Systems SL	SENSE	Spain
	Resourcekraft	RK	Ireland
	Arup	ARUP	Ireland
	Kromschroeder S.A.	KROMS	Spain
	Societa Italiana per il Gas P.A.	ITALGAS	Italy
	Itron Deutschland	ITRON	Germany
	Elster GMBH	ELSTER	Germany
	Steinbeiss Innovation Centre for Embedded Design and Networking	SIZEDN	Germany
	Sistemas Avanzados de Control	SAC	Spain
	Swedish Institute of Computer Science AB	SICS	Sweden
	Thyia Tehnologije d.o.o.	THYIA	Slovenia
	Communications Research Labs AB	CRL	Sweden

setup of the ME³GAS project (5)



communication architectures for smart metering & smart grid applications

The Metgas Part



communication protocols for smart metering & smart grid applications (1)

► provided in-depth technology scouting and training

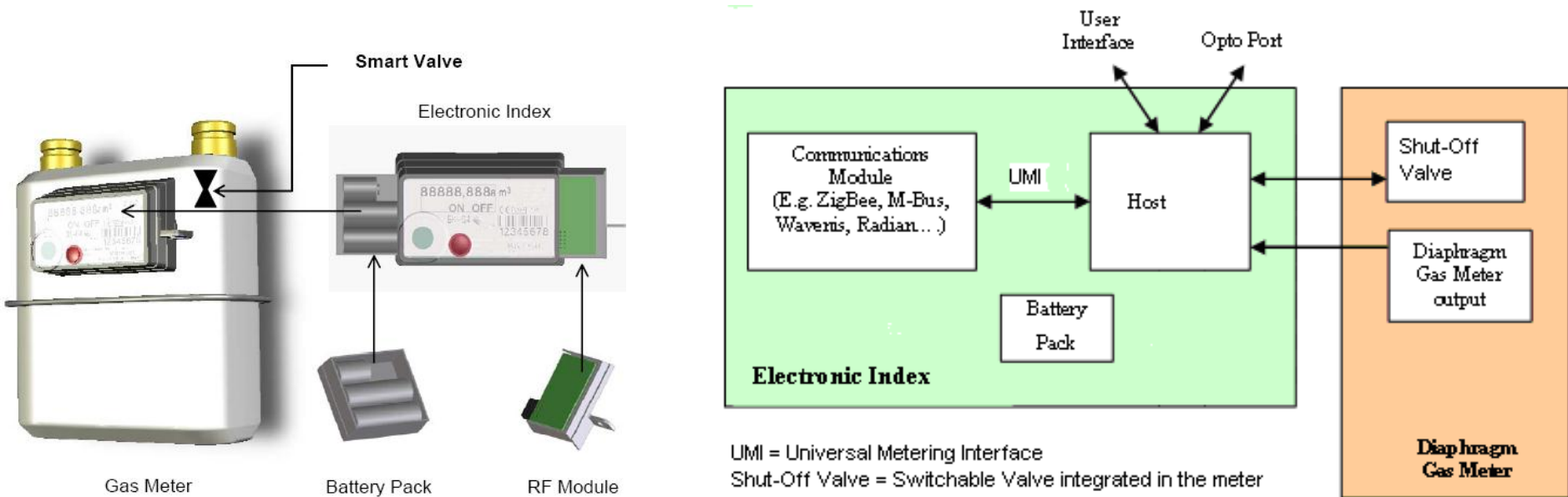
3	ZigBee over IEEE 802.15.4™	3.4.1	General Architecture
3.1	Introduction.....	3.4.2	Topologies
3.1.1	Background.....	3.4.3	Frame Format.....
3.1.2	Standardization Bodies and Consortia	3.4.4	Dynamic Routing.....
3.1.2.1	IEEE802.15.4.....	3.4.5	IP compatibility.....
3.1.2.2	ZigBee Alliance	3.5	Application Layer.....
3.1.2.3	Partnerships	3.5.1	General Architecture
3.1.3	Target applications.....	3.5.2	Application Profiles
3.2	Physical Layer.....	3.5.3	Granularity of Application Profiles
3.2.1	Channel Allocation	3.6	System parameters
3.2.2	Modulation Techniques	3.6.1	Overall system design.....
3.2.3	Interference Issues.....	3.6.2	Security Integration.....
3.2.3.1	Interference Issues in 868/915 MHz	3.6.3	Hardware solutions.....
3.2.3.2	Interference Issues in 2.4 GHz	3.6.3.1	Chips.....
3.2.4	Range Issues	3.6.3.2	Modules.....
3.2.4.1	Range Issues in 868/195 MHz.....	3.6.4	Software Solutions
3.2.4.2	Range Issues in 2.4 GHz.....	3.6.5	Simulation Support
3.2.5	Additional Services	3.6.6	Platform Design
3.3	Data Link Layer	3.6.7	Overall complexity.....
3.3.1	General Architecture	3.6.8	Cost issues.....
3.3.2	Topologies	3.7	Legal Issues.....
3.3.3	Medium Access Control	3.7.1	Openness of standard
3.3.4	Frame Format.....	3.7.1.1	IEEE802.15.4.....
3.3.5	Addresses	3.7.1.2	ZigBee
3.3.6	Security.....	3.7.2	Certification Programs
3.3.7	Throughput Analyses	3.7.3	Patent Claims.....
3.4	Network Layer	3.8	Future development
		3.8.1	IEEE802.15.4.....
		3.8.2	ZigBee
		3.9	SWOT-Analysis.....
		3.9.1	Introduction.....
		3.9.2	Technical Aspects
		3.9.3	Marketing-related Aspects

communication protocols for smart metering & smart grid applications (2)

- ▶ Three protocols in major focus
 - ▷ Wireless M-Bus, including
 - ▶ OMS application protocols
 - ▶ new derivatives, incl.
 - ▷ c-mode for higher flexibility and interoperability
 - ▷ n-mode in 169Mhz for increased output power → increased intrinsic range
 - ▷ ZigBee, including
 - ▶ ZigBee Smart Energy (ZSE) Profile v1 and v2
 - ▶ IP-routing
 - ▶ network management
 - ▷ GPRS for direct communication between meter and backend
 - ▶ use of M2M-protocols and products
 - ▶ support of energy-optimized operation modes

solutions for ME³GAS (1)

- ▶ block diagram of the new ME³GAS meters and associated embedded electronics



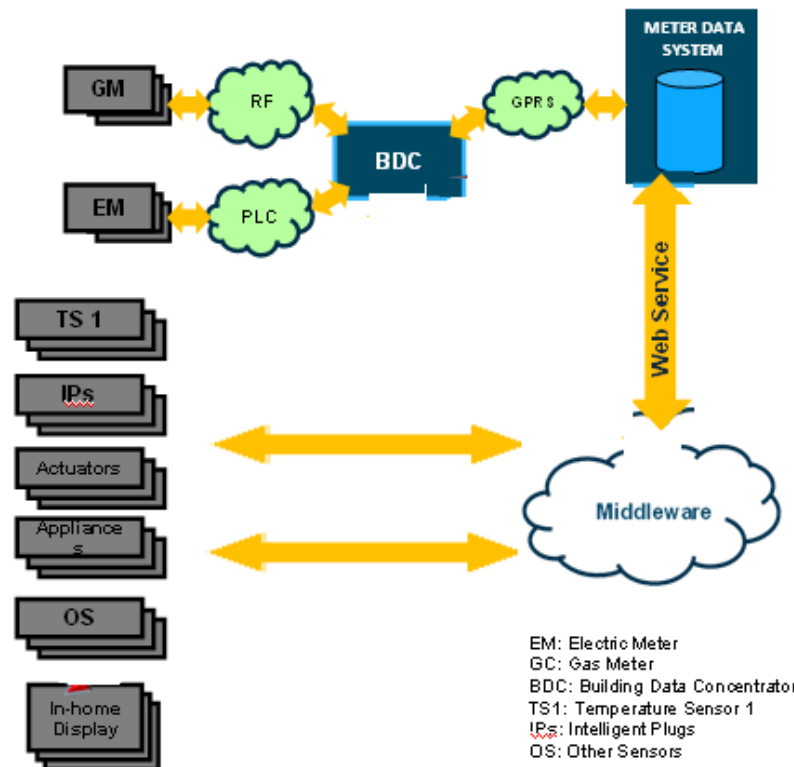
solutions for ME³GAS (2)

▶ network architecture for smart metering (METGAS) and HAN (MEEE) integration

▷ field test

▷ security issues

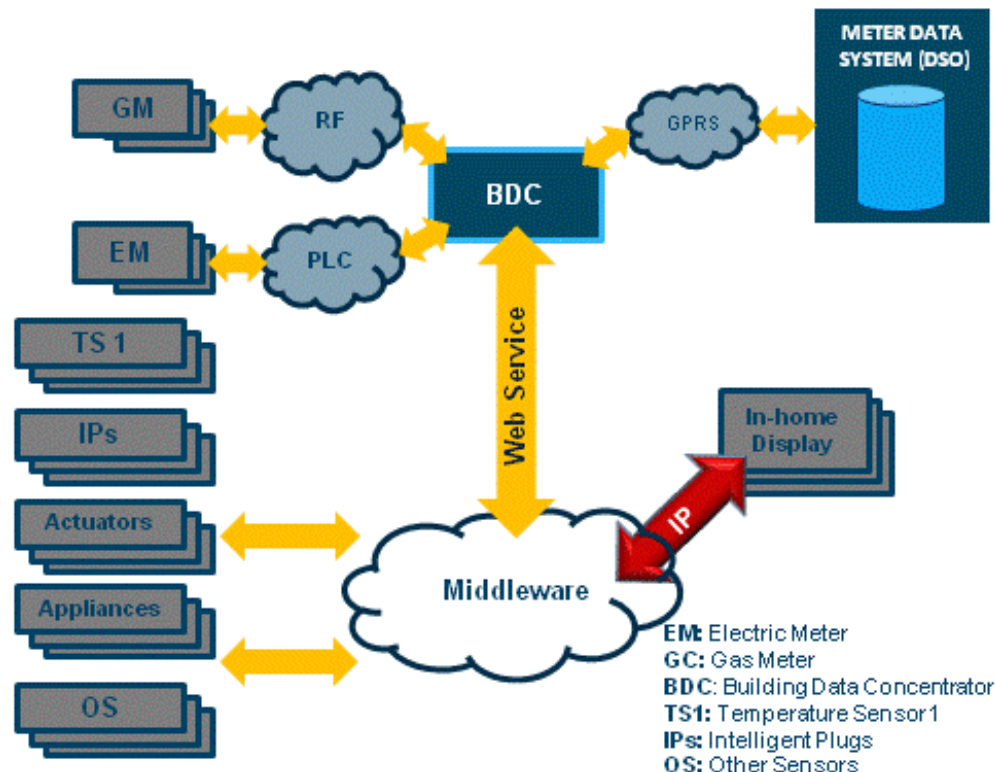
▶ BSI discussion



solutions for ME³GAS (3)

▶ network architecture for smart metering (METGAS) and HAN (MEEE) integration

▶ proof of concept



solutions for ME³GAS (3)

Standardization

- ▶ An enormous number of standardization efforts are currently carried out in the European Union and in its member states.
- ▶ ME³GAS will also contribute to the standardization work in the smart metering field
 - ▷ mainly under the M/441 mandate of the EC
- ▶ Two recent national elements play a major role in this process.
 - ▷ Italy is especially active in paving the way for a roll-out of smart gas meter systems.
 - ▷ The Italian Authority for Electrical Energy and Gas (AEEG) in its Resolution ARG 155-08 declared that starting from January 1st, 2010 a “roll out” plan must be initiated for the updating of all meters installed on the natural gas distribution network.

solutions for ME³GAS (3)

Standardization

- ▶ The AEEG assigns Comitato Italiano Gas (CIG) the task of preparing the technical regulations. These drafts are prepared as technical specification (TS) of the Ente Nazionale Italiano di Unificazione (UNI).
- ▶ Up to now, the CIG has prepared the following drafts, which have relevance for the communication systems:
 - ▶ UNI/TS 11291-1 (*General characteristics of the remote management system*),
 - ▶ UNI/TS 11291-6 (Requirements for meters less than 10 m³/h; less than group < G10),
 - ▶ UNI/TS 11291-8 (*Protocols and communication media used in the remote management system*), and
 - ▶ UNI/TS 11291-9 (*Interoperability tests*).
- ▶ In Germany, the Federal Office for Information Security (Bundesamt für Sicherheit in der Informationstechnik, BSI) is working on a Technical Directive 03109 for the “Secure Implementation of Intelligent Measurement Systems”

Outlook for ME³GAS

- ▶ lab tests or proof of concept in 2012
 - ▷ In Cork (Ireland) a LAB set-up shall be strived
 - ▷ development of a ZigBee Building Data Concentrator (BDC)
 - ▷ strong collaboration of “MEEE” and “METGAS” – harmonized middleware interface for BDC
- ▶ field tests in 2012/2013
 - ▷ pilot city & environment planned by Italgas and by Gaz Natural in Italy gas meters (i.e. GPRS/DLMS + ZigBee)
 - ▷ field test conditions under specification
 - ▷ to verify communication characteristics
- ▶ further dissemination
 - ▷ World Gaz Congress 2012 Kuala Lumpur

ME3 gas

<http://www.me3gas.eu>



Thank you for your attention!

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