

Smart Grid/Metering Solution

Yvon Gourdou
FAE Training, Oct 2011
Version 1.2



Visit us on www.st.com/metering

- Purpose : review the smart grid / metering applications requirements and the ST solutions to answer them.
- At the end of this training, you will be able to describe the metering application and options of implementation. You will know how and why ST products fit in the application versus the different cases.

- 1) Metering market overview and application technical requirements.
- 2) The Meter architecture : one or 2 microcontroller. Why?
 - The advantage of STM32 family.
- 3) Power and network quality measurement
 - (STPM01, 10 and C1 + S1)
- 4) The concentrator, MUC core : SPEAR310
- 5) Power Line Communication : the main communication medium for Smart Grid in EU.
- 6) ZigBee for HAN
- 6) Specific technical requirement for the SMPS in metering & the ST solutions

Warm up game



- What are the metering manufacturers and electricity utilities in you region\ country?
- France
- Germany
- Spain
- Portugal
- UK
- Italy
- Sweden
- Finland
- Norway
- Poland
- Slovenia
- Cz
- Slovakia
- Lithuania
- Belgium
- Austria
- Israel
- Turkey
- Republic of South Africa
- Russia

What is Smart Grid?






- **Smart Grid** is the control of the Grid i.e.: the distribution network, its input (production of energy) and output (consumption) to guaranty its security and optimize the asset, the consumption and footprint. It has impact on :
 - **Smart Metering** : Control the meter infrastructure (change tariff, contract, reseller of electricity and distribute the information in the home)
 - **Grid control** : (pure **Smart Grid**), control of the Distribution network, load balance, outage discrovery, quality of service control.
 - **Smart Building**: control the building resources (heating, air conditioning, lighting, Energy production...) according to the utility requirements thru tariffs of consumed and produced energy.
 - **Smart home** : control the home appliances, resources, e- Vehicle
 - **e-mobility** : Charge and discharge of electrical Vehicle to avoid pick of consumption or to sutain pick of consumption.

The applications in the smart grid



STMicroelectronics motto :
one-stop shop supplier for each Smart Grid applications

-  Smart Grid + eMobility
-  Smart home
-  renewable

consumer electronic

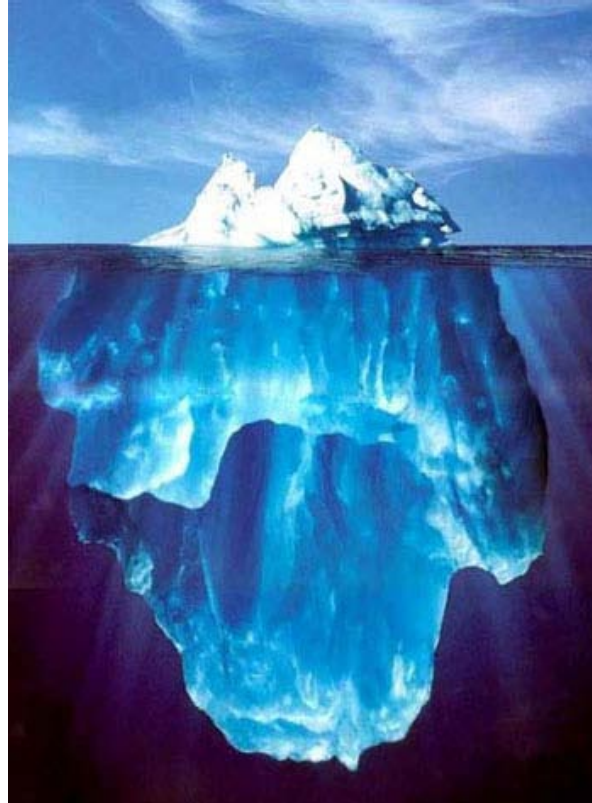
WW Market Overview



- Electricity Meter Market is rising fast driven by
 - Advanced (high-end) meters & Smart Grid deployments (*)
 - Regulation in EU, Stimulus packet in USA and Strong economic growth in Emerging market (i.e. Asia and India) and rising energy consumption - electricity crisis prevention...
- What is come first for biz
 - Smart Metering and AMI is NOW.
 - >300Mu in EMEA
 - Smart Grid: existing today, will grow
 - Smart Building. DIN meters, Smart Plug, central ctr system
 - Smart Home: pushed by Time of Used.

Significant Electricity Meter Markets

6 Key players in EMEA – electricity meter manufacturers : Landis & Gyr, ITRON, Elster, Sagem, ENEL (*), ISKRAEMECO

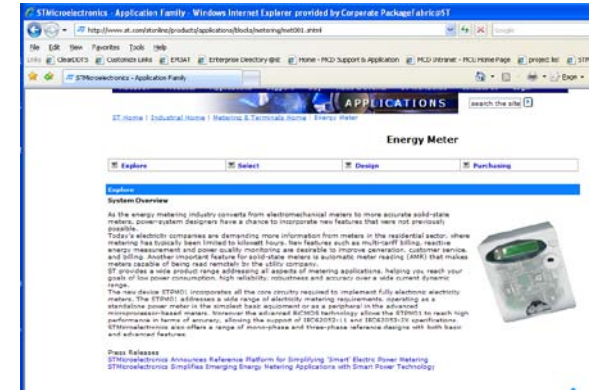


•In EMEA there is more than 80 meter manufacturers!

Why ST:



- **20+ years experience in Metering starting with ASIC and standard products**
- **A commitment from ST top management on metering**
 - => Focus on Market and Customer thru the Competence Centers.
 - => Product division are focus on delivering product for metering segment.
- **A wide product portfolio**
 - The right technologies for the metering market
 - A system solution provider
 - One stop shop supplier
 - Committed in long term product family
- **Research of long term partnership.**



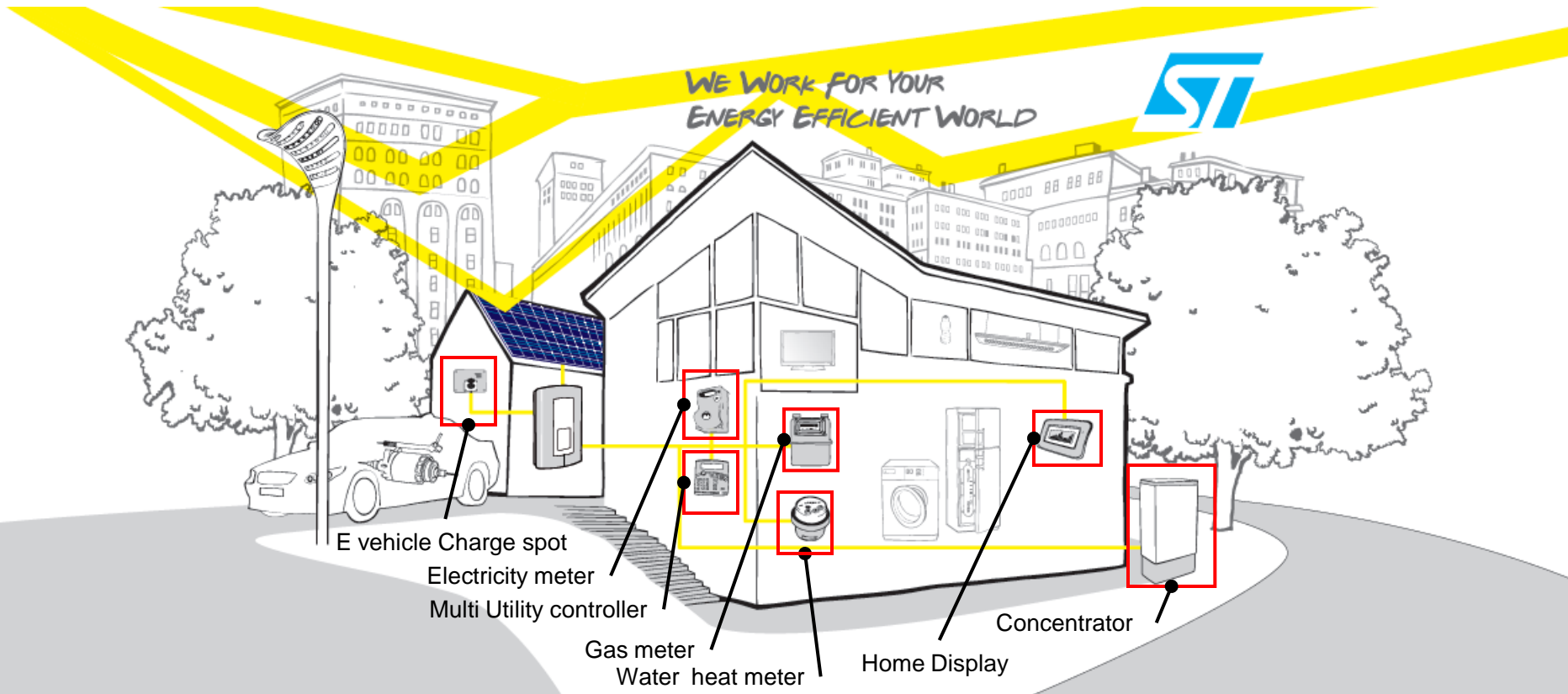
➤ www.st.com/metering



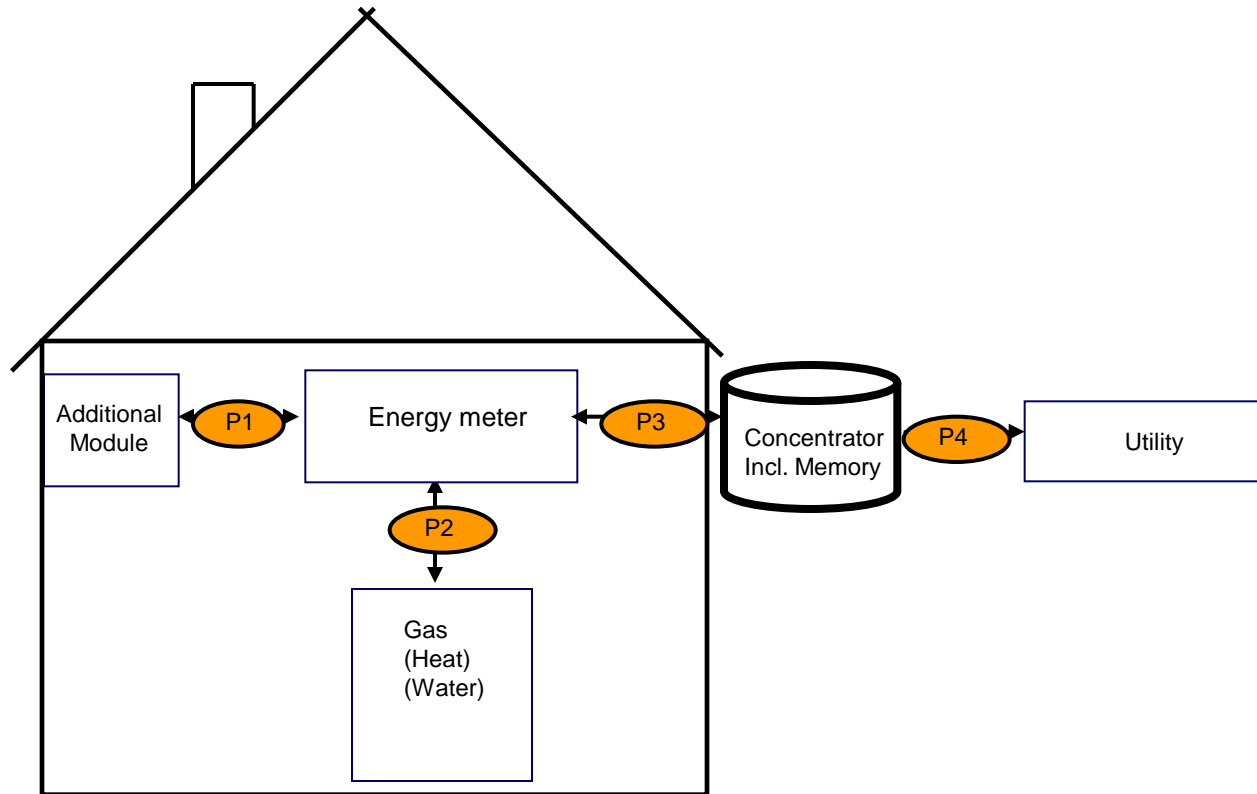


Smart meter system and application architecture

Smart Metering application



Photovoltaic, and home + Building automation (load Management) are part of ST focus too. they are covered by dedicated Competence Center (CC) in synergy with the metering CC



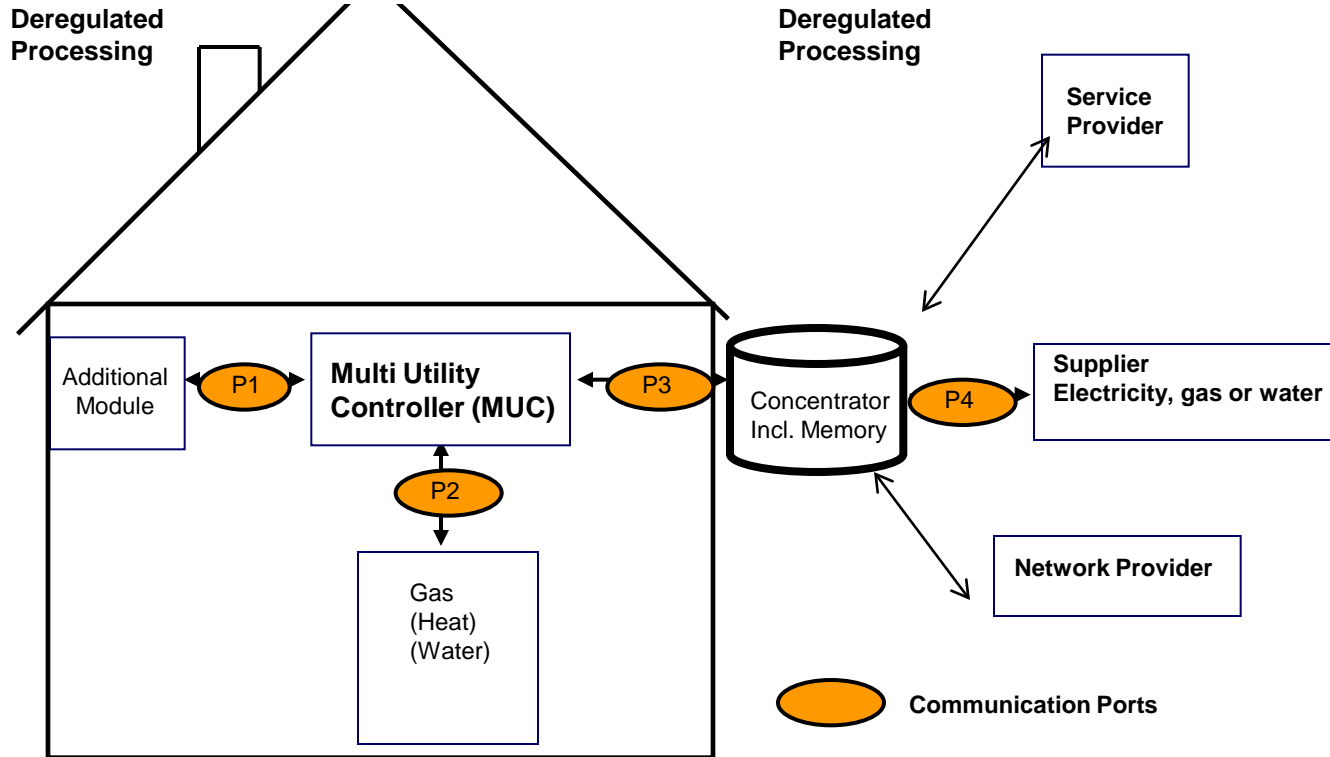
- P1 : ZigBee (in UK), M-Bus Wireless or proprietary (EU), Euridis in F.
- P2 : M-BUS Wired (UK, Ger.), and Wireless. Ethernet with Energy meter (in Germany only)
- P3 : PLM S-FSK, OFDM (F, Sp, Ger), PSK (Sp) ; GPRS w/o concentrator (No), Wireless (USA, Australia...)
- P4 : GPRS and ADSL

Smart Metering system Schematic overview

OPTION 2 : The M.U.C.

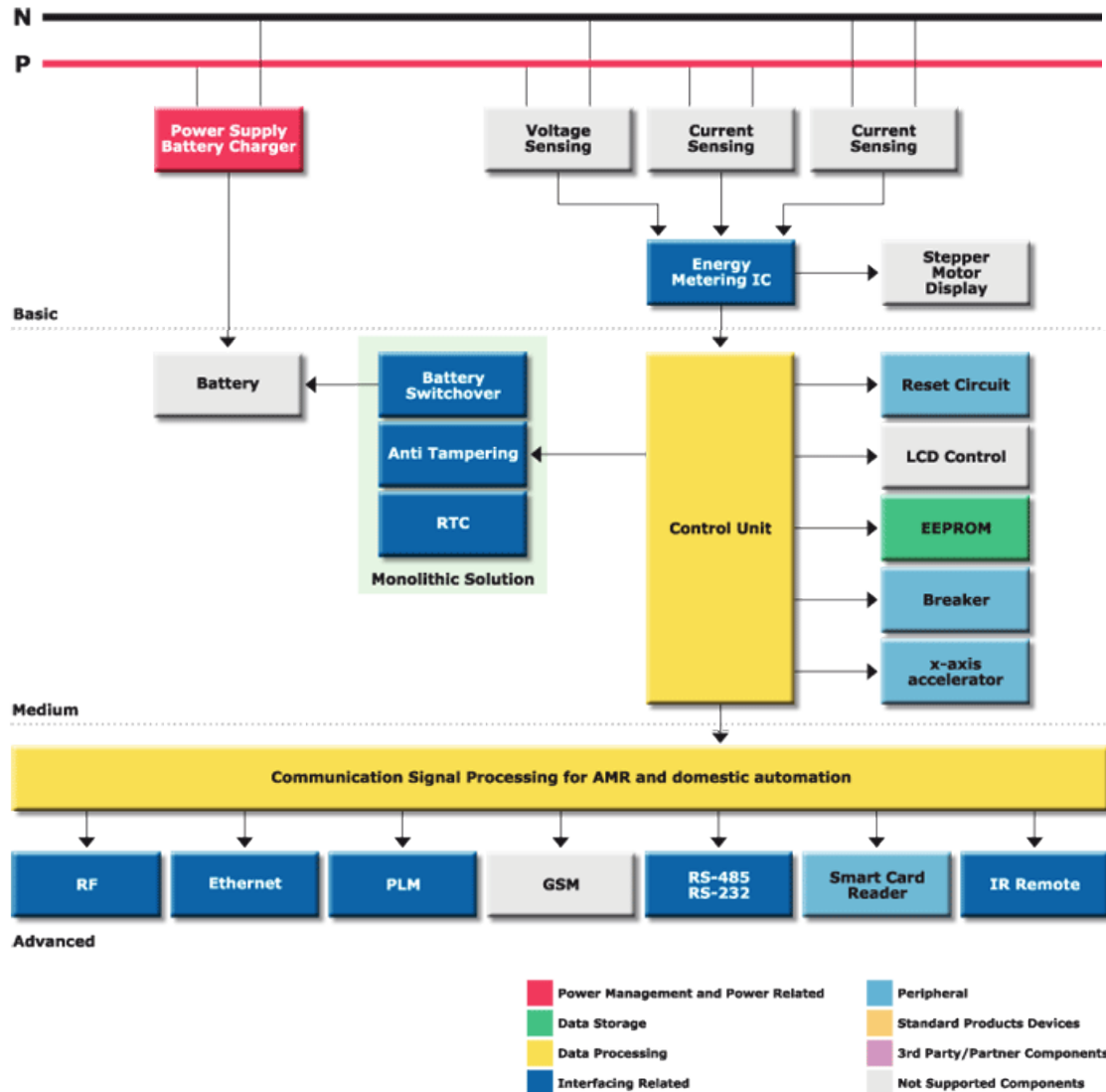


topology solution based on NTA standard (NL).
Equivalent for Germany and UK

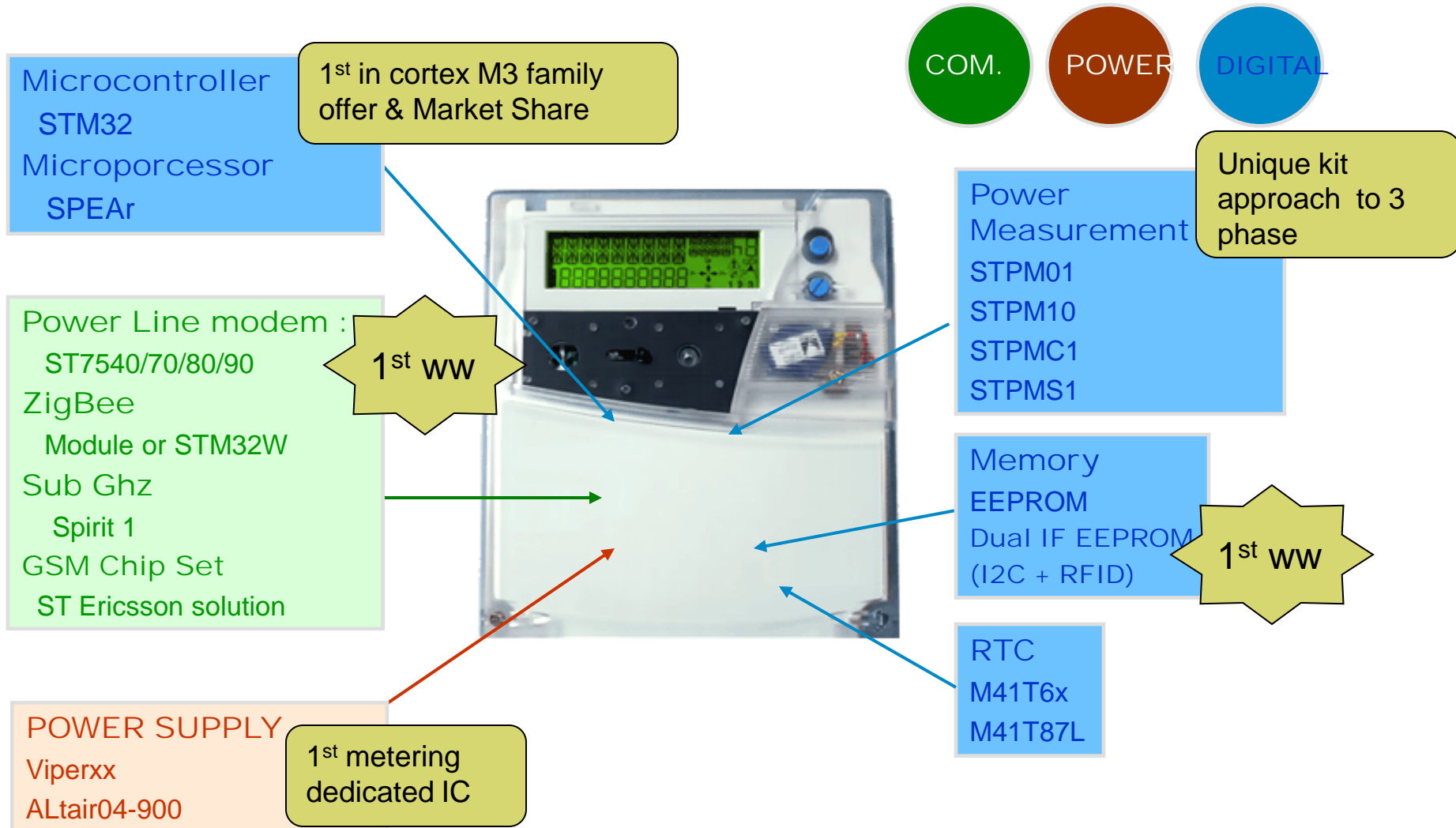


- P1 : ZigBee (in UK), M-Bus Wireless or proprietary (EU), Euridis in F.
- P2 : M-BUS Wired (UK, Ger.), and Wireless. Ethernet with Energy meter (in Germany only)
- P3 : PLM S-FSK, OFDM (F, Sp, Ger), PSK (Sp) ; GPRS w/o concentrator (No), Wireless (USA, Australia...)
- P4 : GPRS and ADSL

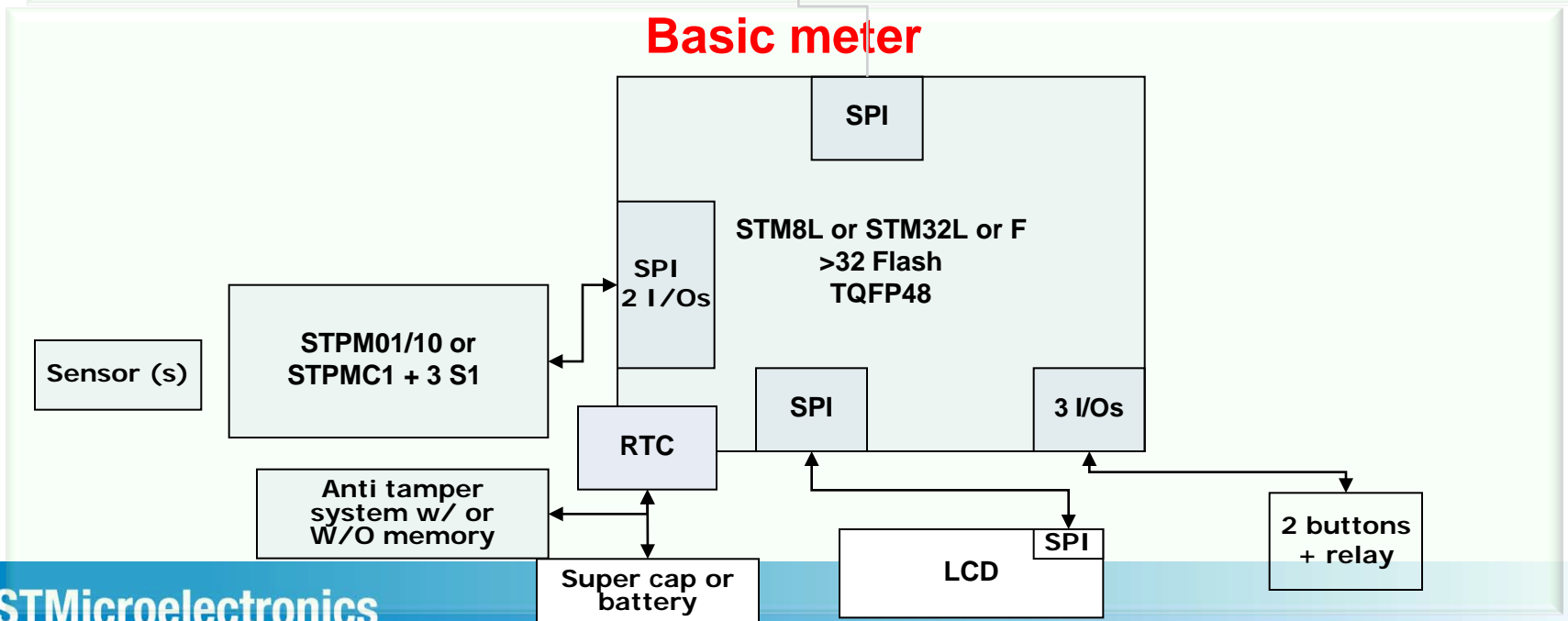
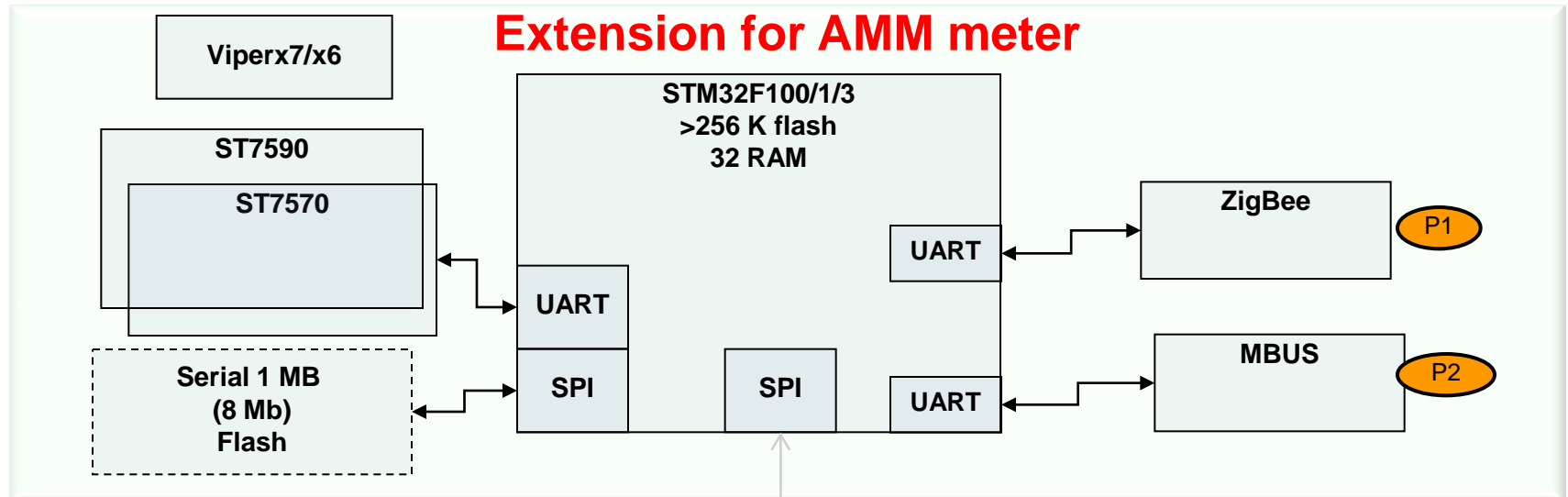
E-meter Functional blocks



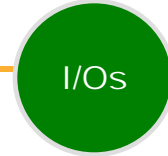
ST Kit for E- Meter



Energy meter with Communication



Commodities Kit for Electricity Meter



POWER SUPPLY
Turbo II diodes:
STTH8R06D/ STTH8L06D
STTH5R06D/STTH5L06D
STTH110
150V Schottky:
STPS1150
STPS2150
Linear regulator
L78xx

ESD for display
ESDA6V1-5W6

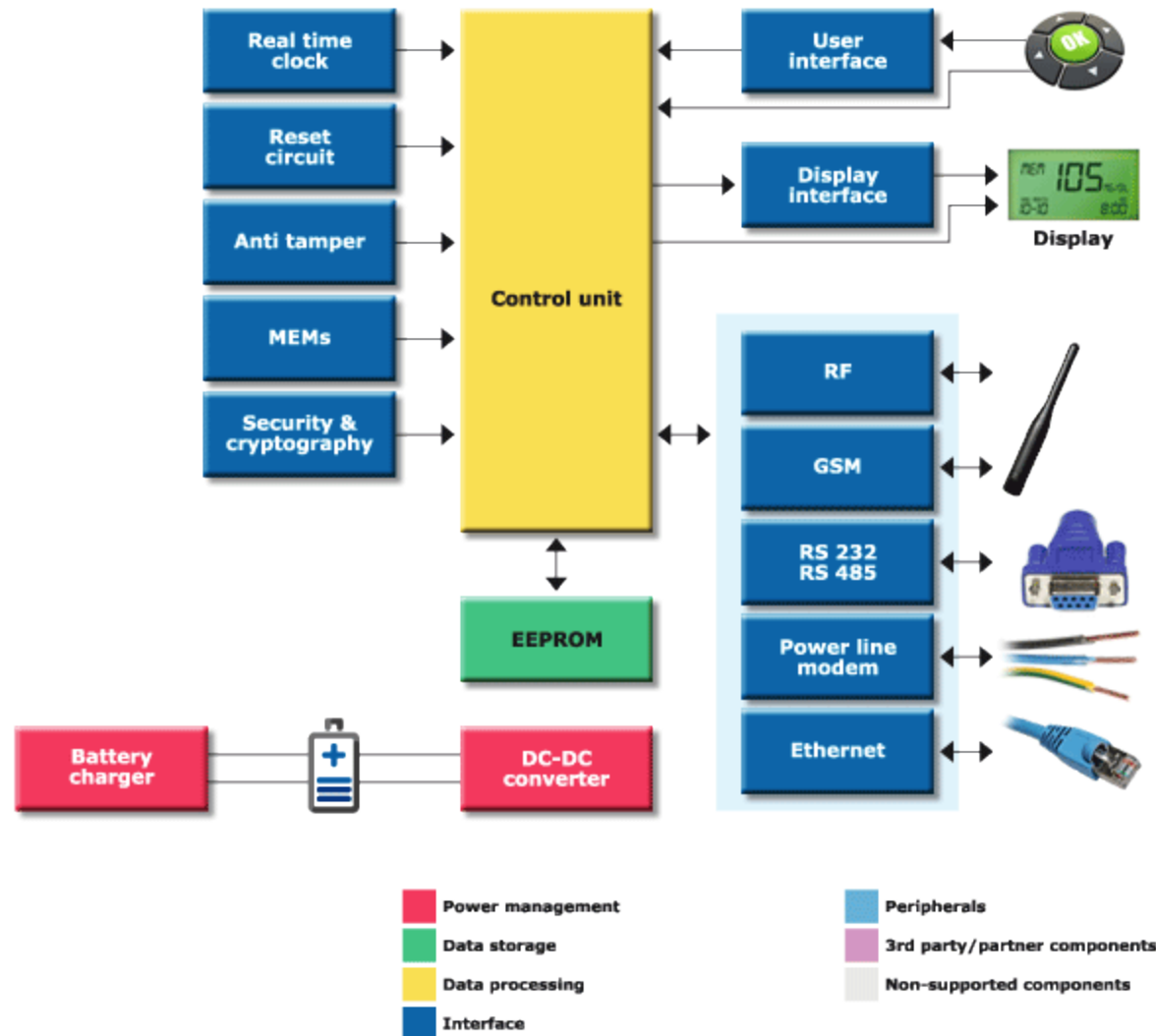


**PROTECTION /
VOLTAGE REFERENCE**
Transils:
P6KExx, SM6Txx, SMBJxx
SM15Txx, SMCJxx
BZW06xx, BZW50xx

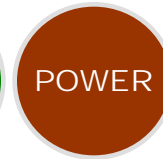
REVERSE BATTERY
Schottky diodes:
STPS1L60 / STPS0560Z

ESD PROTECTION
RS232 / 422
ESDA25B1+ESDA25SC6

Concentrator and MUC Functional blocks



ST Kit for Concentrator and MUC

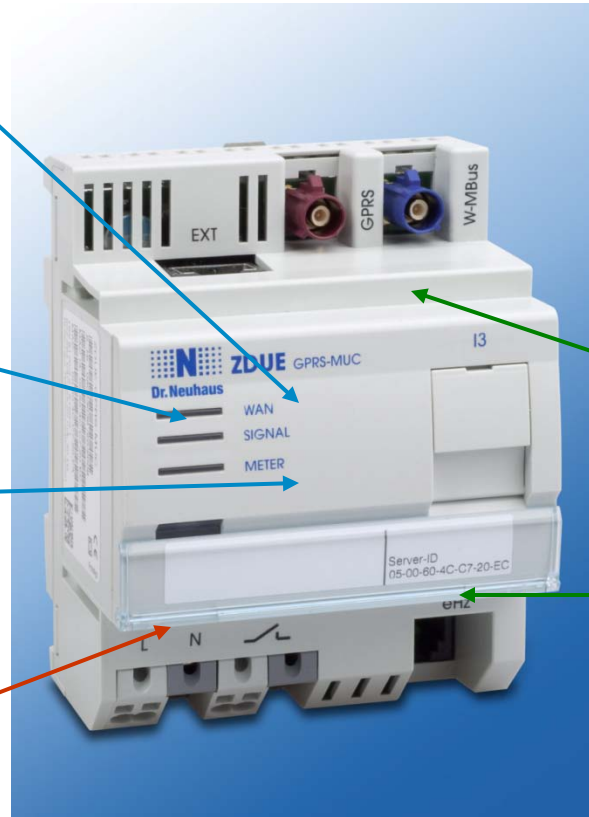


Microprocessor
SPEAr
Microcontroller
STM32F2xx

RTC
M41T6x
M41T87L

Memory
EEPROM

POWER SUPPLY
Viperxx
ALtair04-900



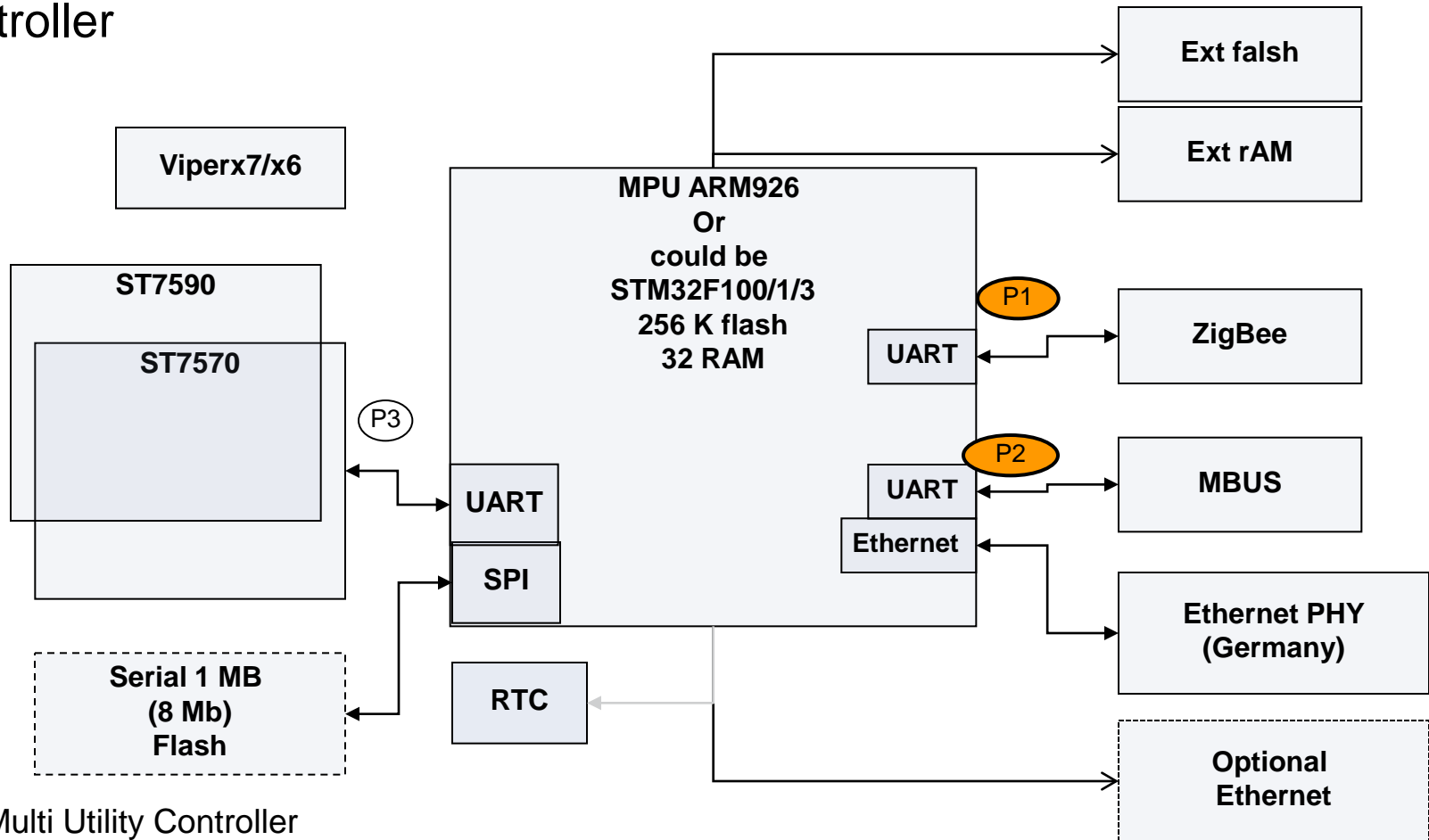
Power Line modem :
ST7540/70/80/90
ZigBee
Module or STM32W
Sub Ghz
Spirit 1
GSM Chip Set
ST Ericsson solution
Ethernet Phy
ST802RT

* Picture of a MUC from DNT

MUC* and Concentrator

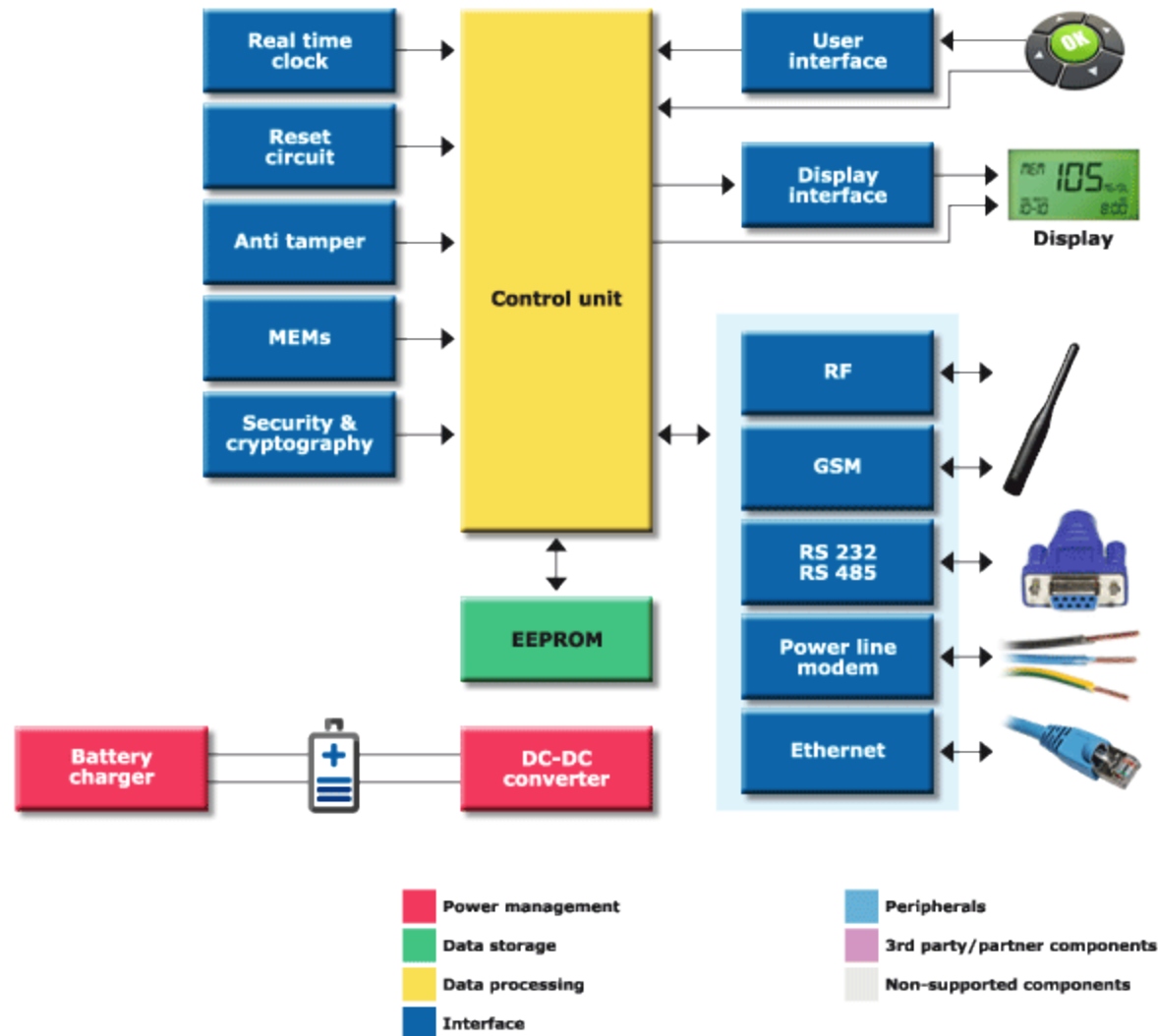


In case the utility delivers multi energy : Electricity and water in Germany (or Elec and Gas in UK) it is sometime chipper to have a deported concentrator or communication unit called MUC: Multi Utility Controller



* MUC: Multi Utility Controller

Home display and gateway functional blocks



ST Kit for Home display \ gateway



COM.

POWER

DIGITAL

Microprocessor
SPEAr

RTC
M41T6x
M41T87L

Memory
EEPROM

POWER SUPPLY
DC/DC converter

Microcontroller
STM32F2xx

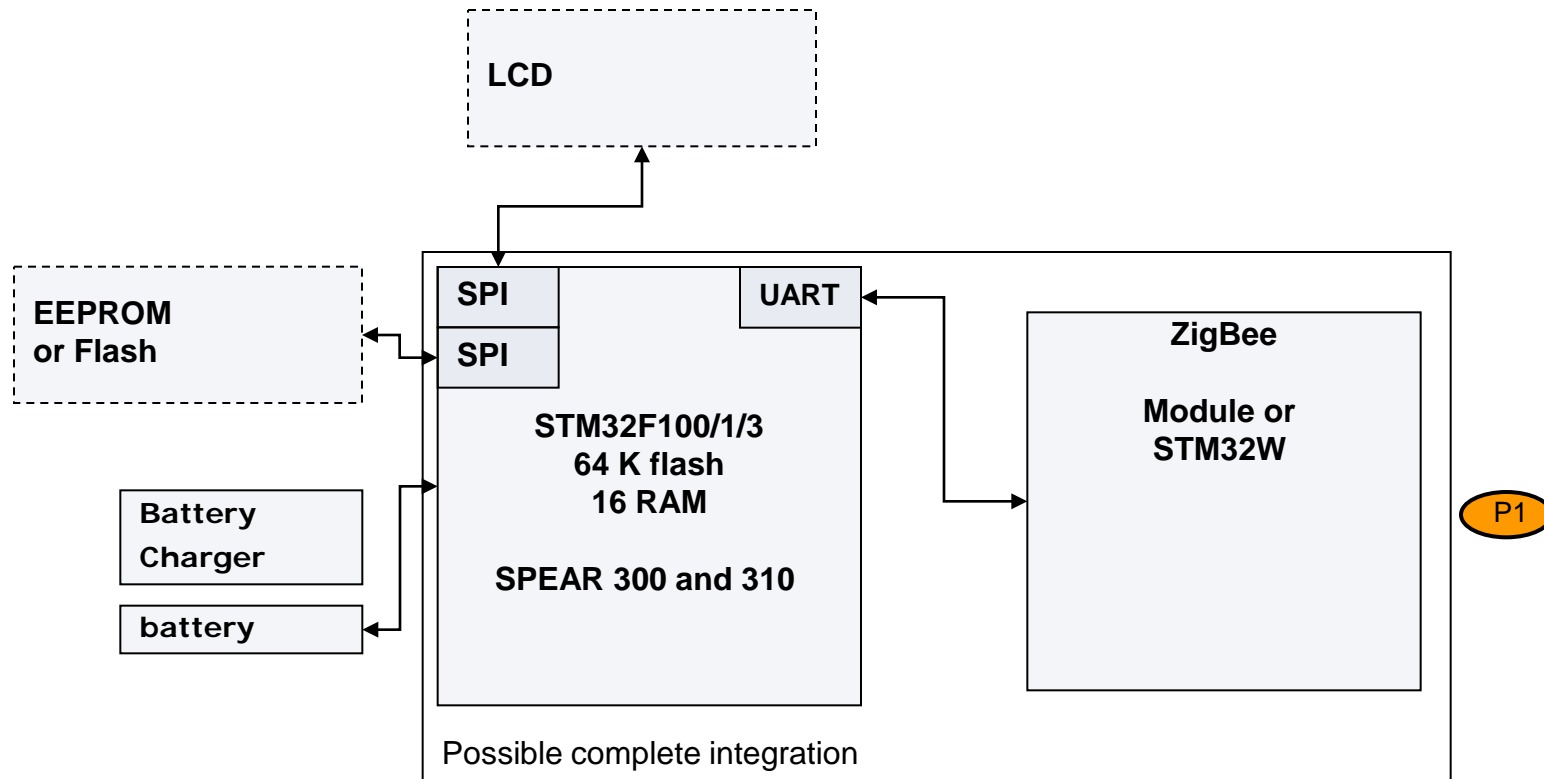


ZigBee
Module or STM32W
Sub Ghz
Spirit 1
GSM Chip Set
ST Ericsson solution
Ethernet Phy
ST802RT

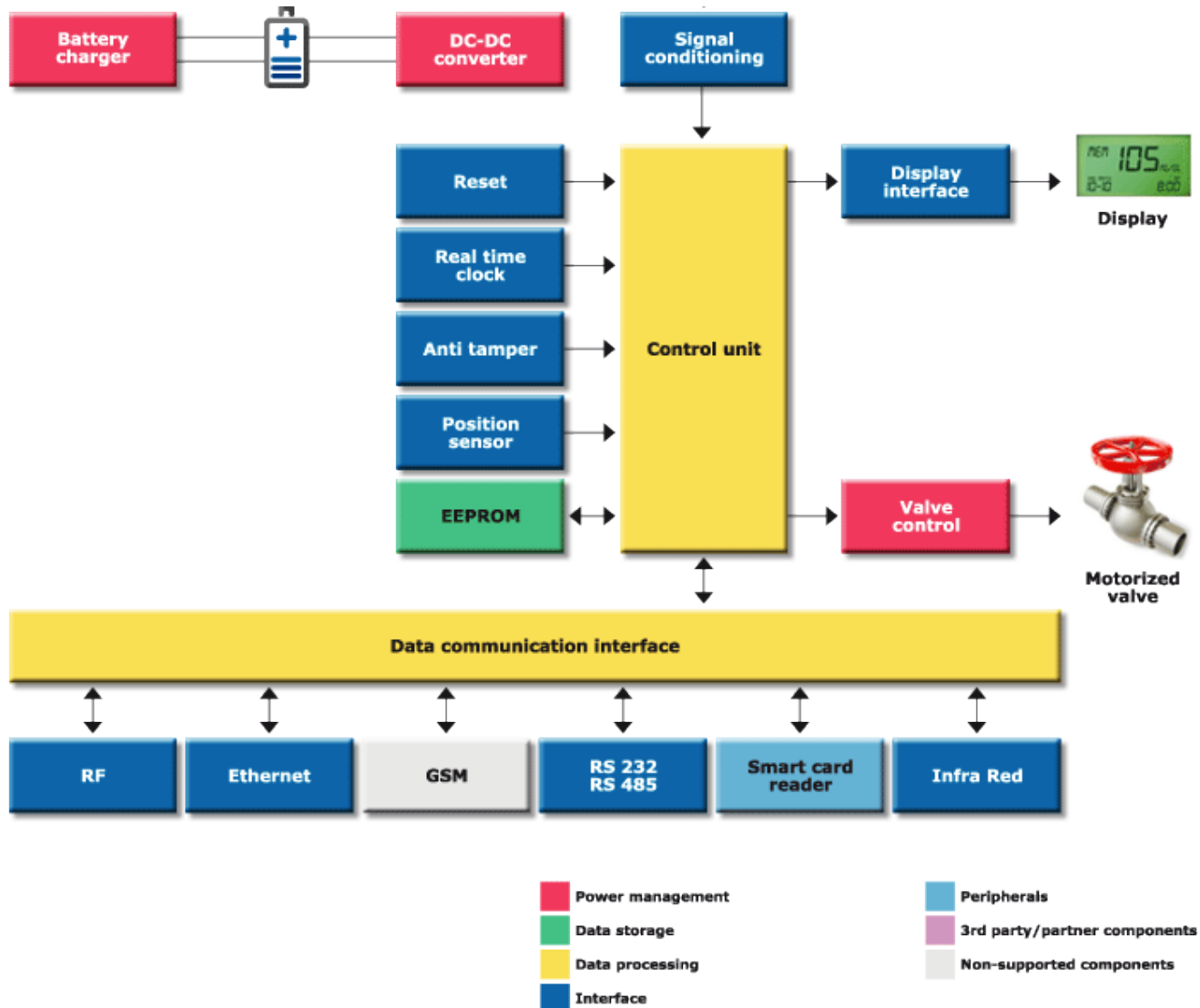


- Picture of Cisco Energy Display
- Picture Of L+G Eco meter

Home Display



Gas meter functional blocks



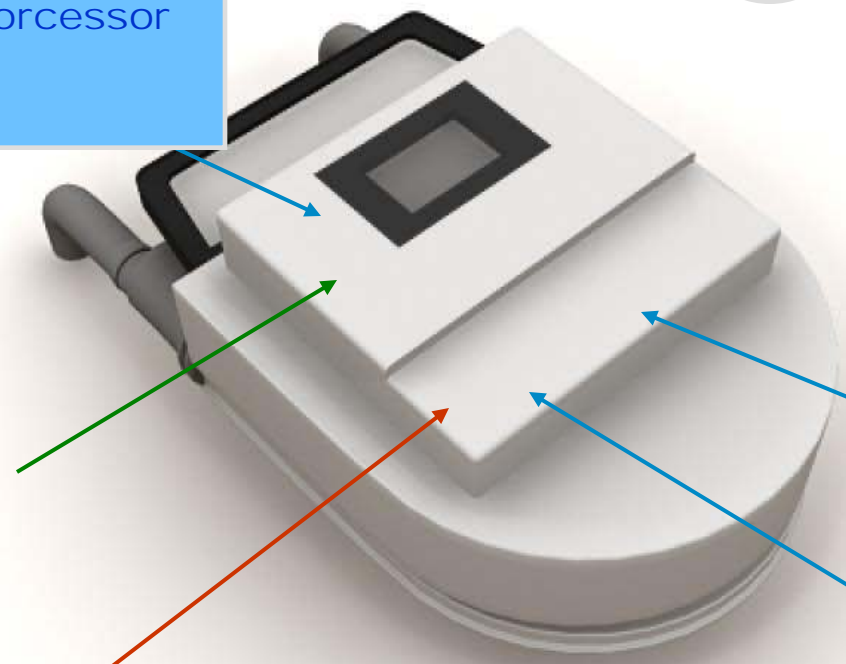
ST Kit for water and Gas Meter



Ultra low power Microcontroller
STM8L and STM32L
Micro controller and Porcessor
for Hubs
STM32F and SPEAr

ZigBee
Module or STM32W
Sub GHz
SPIRIT 1
GSM Chip Set
ST Ericsson solution

POWER SUPPLY
LDO



Memory
EEPROM
Dual interface
EEPROM

RTC
M41T6x
M41T87L

Why ST product for Smart Grid apps.



- Measurement AFE for Electrical meter. Advanced and disruptive single phase and 3 phase solutions with a clear leadership reference.
- Microcontroller : STM32: The most advanced and wider Cortex M3 Micro Portfolio WW. Ultra low power sub families taking leadership position.
- Power Line Communication: ST is the number 1 in Metering PLC WW
- Microprocessor Unit (MPU) : tuned family for metering concentrator, MUC and high –end home display.
- EERPOM: WW number 1
- ZigBee: State of the art Modules and integrated solutions
- Aux. Power supply : Best in class product offer with unique dedicated integrated solution with 900V break down voltage
- Commodities : Reference wide rang supplier

ST offers a unique mix of qualifying factors :

- **Reliable and independent Semiconductor vendor**
- **World wide support and supply chain to any subcontractor**
- **Wide electronic meter system coverage with a complete kit of advanced semiconductor devices**
- **Ability to identify, support and adapt to market evolution trends and changes**
- **ST approach is to promote open standards and provide cost effective royalty-free solutions**
- **Long term presence in the smart Grid market and strong field based system know-How**

Too answer your MCU needs



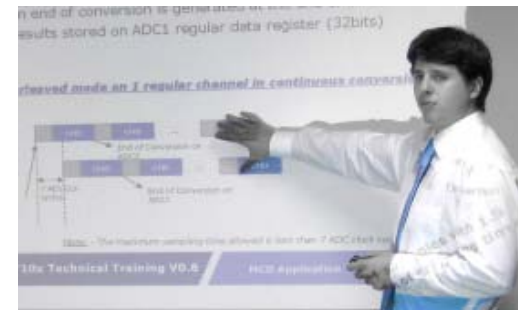
- Would you like an effective Hot line?
 - Provide technical product and tools support to selected CTM projects.
 - Our Engagement
 - An E-Mail Acknowledge time of 1 hour (>95%)
 - A solution in one workday, if the problem is known (>95%)
 - A follow up for new issues, status of issue will be reported via Email.
- Deep Technical Trainings on:
 - STM32 (3 days)
 - STM8S (3 days)
 - Advanced C (2 days)
 - Extensive Hands-on exercises included
- Do you need extra resources: Application SW Development
 - Partial or complete SW development for selected Customer.
 - SW conversion / porting from competitor's micros to ours
 - Application SW validation has to be done with or by Customer.



T.O.M.A.S.

gets you over

Hot Line Service Center



T.O.M.A.S.

shows the way

Training Service Center



- Smart Grid CC
 - Metering AFE, PLC and Smart Grid System questions
- Connectivity CC
 - ZigBee : module SN250 260 and STM32W, Dual Interface EEPROM
- Power Management CC
 - SMPS : viper, Altair04-900, L65xx.....

- www.st.com/metering
- Block diagram, datasheet, User manual, demo board, reference SW, flyer and brochure...