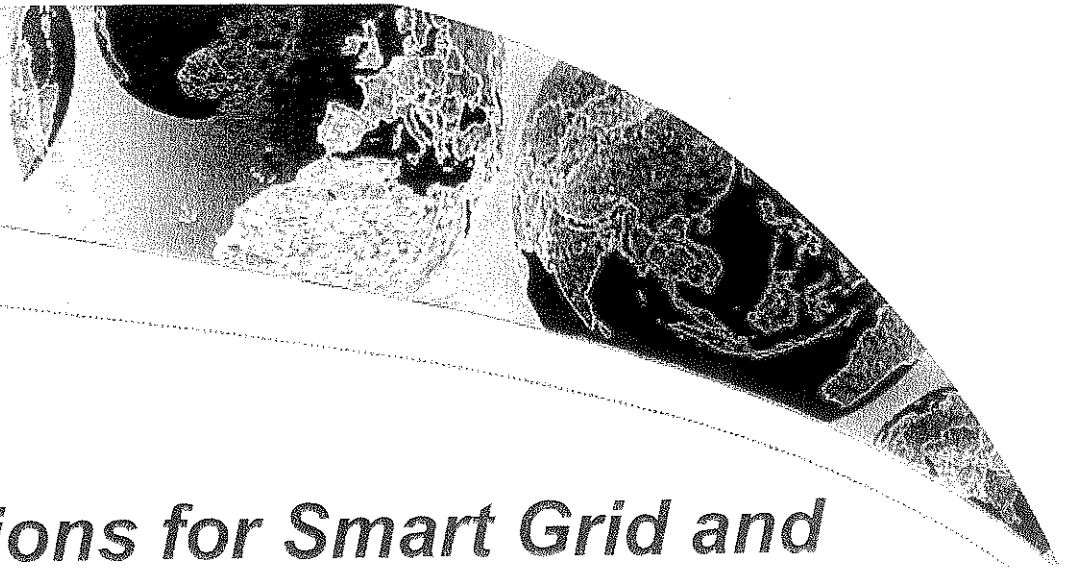
附件 3

ST－PLC 智慧電網

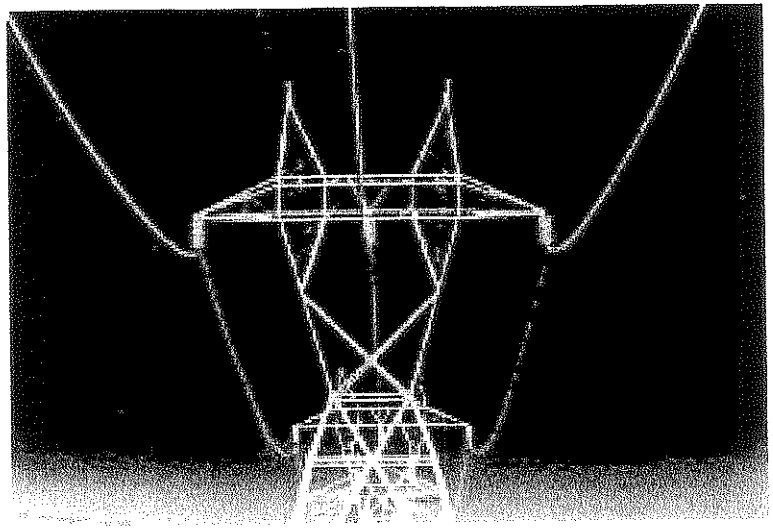
解決方案簡報



ST PLC Solutions for Smart Grid and Command & Control applications

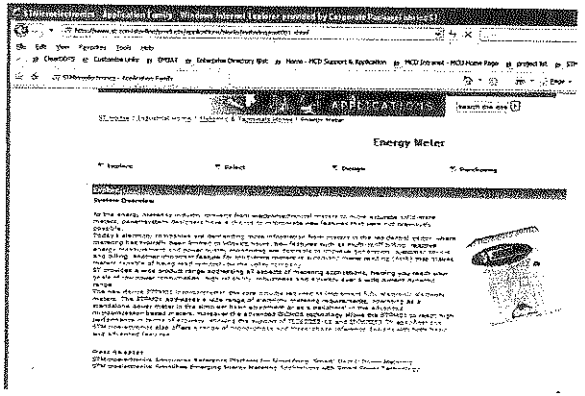
Visit us on www.st.com/powerline

Domenico ARRIGO
INDUSTRIAL Business Unit
Industrial & Power Conversion Division

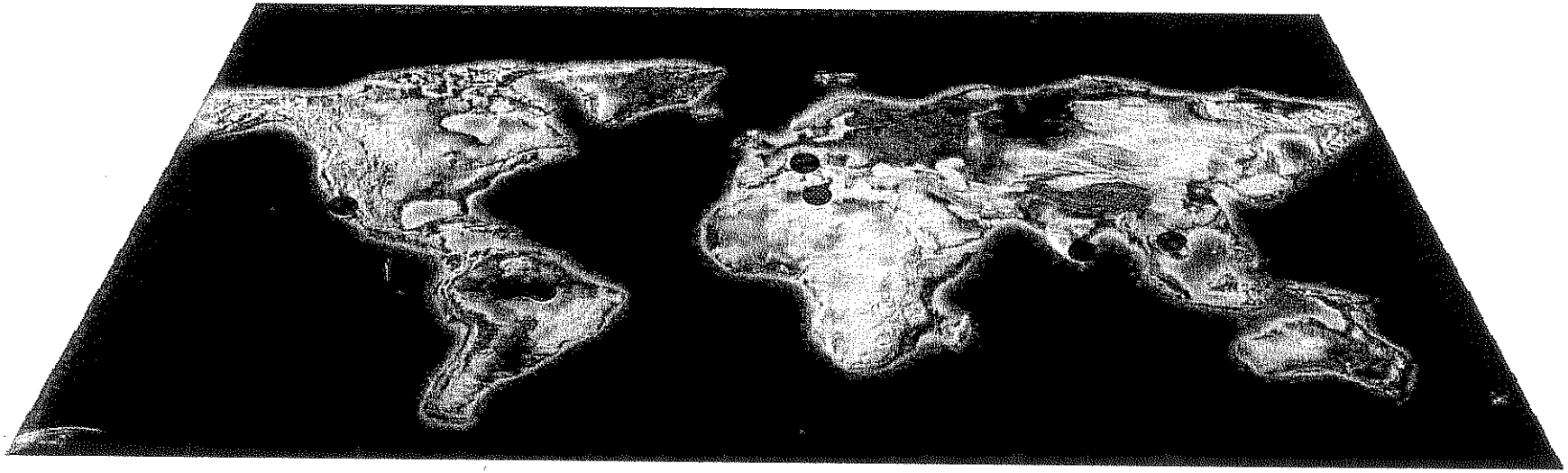


Metering: a ST's Golden Application

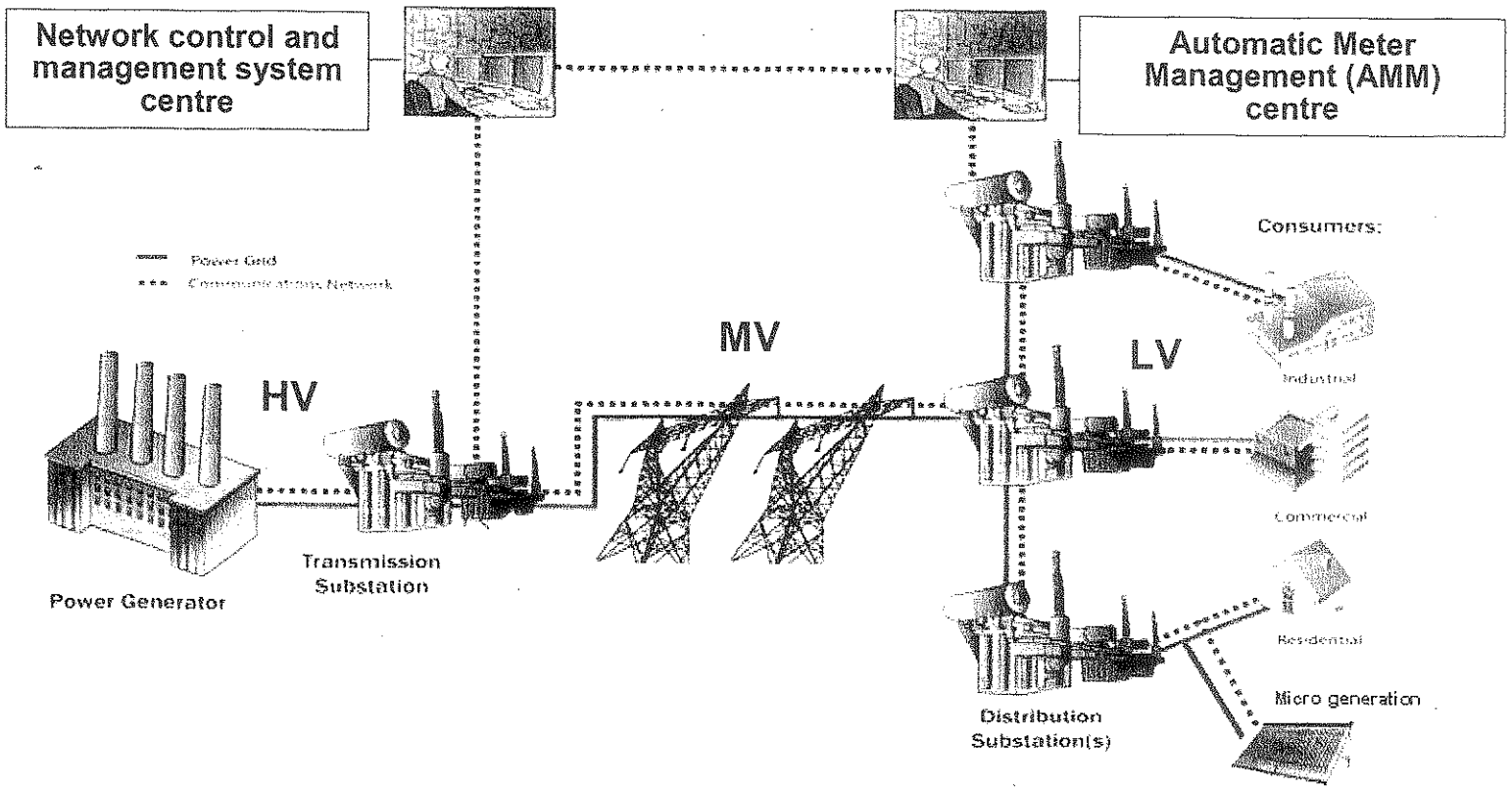
- **> 10 years experience in Metering starting with ASIC**
- **A commitment from ST top management**
  - Focus of the region thru the Competence Centers.
  - Product division are focus on this applications.
- **A wide product portfolio**
  - The right technologies for the metering market
  - A system solution provider
  - One stop shop
  - Committed in long term product family
- **Open to partnership.**



- **www.st.com/metering**



Smart Grid Concept



- Transmission and distribution network (the GRID) is a critical link between power generation and consumers
- Incorporating intelligent sensing and monitoring technologies, IT and communication capabilities to the GRID (Automatic Meter Infrastructure) will satisfy growing demand for improved energy quality and efficiency and high value services to the end user, then making it SMART

What a Smart Grid can do

- Anticipate and instantly respond to poor power quality situations and outages
- Increase security against terrorist attacks or natural disruptions
- Power congestion/collapse prevention and management
- Support widespread use of distributed generation
- Enable consumers to better manage their energy use and reduce associated costs
- Optimize power flows and improve power quality and reliability
- Reduce power waste
- Better balance of distribution and local load
- Accurate infrastructure, equipments and protection devices dimensioning

- Network operators
- Metering operators
- Retailers
- Consumers

How Network operator will benefit..

- **Improved Asset Management**
- **Remote connection and disconnection**
- **Power outage and black outs prevention**
- **Fast fault detection and location**
- **Technical and non technical energy losses detection**
- **Continuous power quality monitoring**

- **Manual meter reading costs avoidance (AMR)**
  - According to some estimate potential saving might be as high as 65%
- **Fast and accurate load profiles and other customer data availability on demand for:**
  - Authorized requests (authority, …)
  - Energy management
  - System modelling
  - Marketing actions

How retailers will benefit...

- **Operational costs reduction:**
  - Bill error disputes reduction
  - Call-centres queries reduction
- **Theft detection**
- **Bad payers management**
  - According to some estimate non technical losses (fraud, missed billing) accounts to up to 3-5% of the total revenue in Western Countries

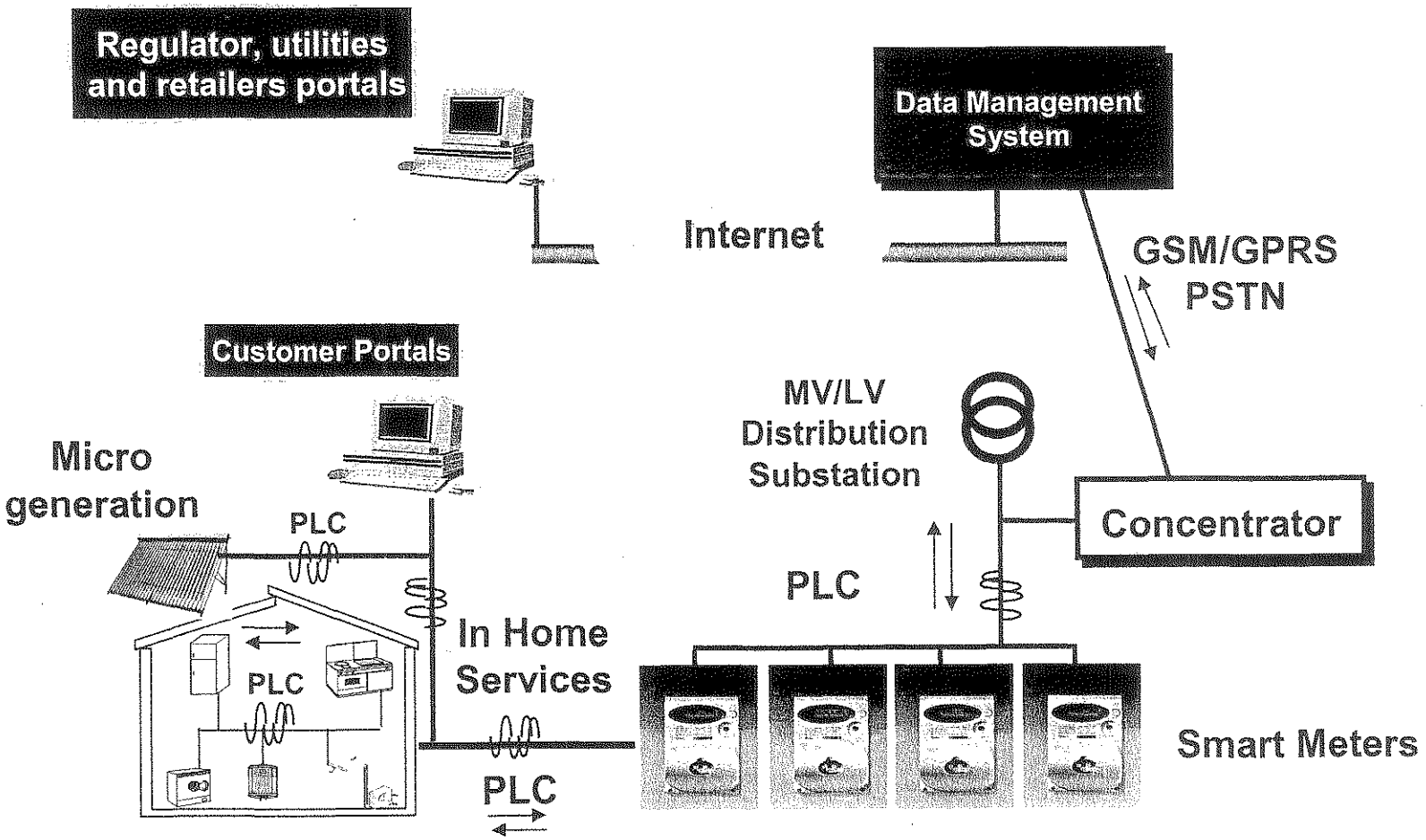
How consumers will benefits...

- **Reduced Energy bill**
- **Accurate and timely bills based on real consumptions**
- **Tailored tariffs options (TOU, dynamic prices)**
- **Prepayment options**
- **Energy pattern impact on bill awareness**
- **Energy saving actions adoption (in response to price signals)**
- **Integration of customer micro generation**
- **Fast contract management**
- **Outage reductions and their fast resolutions**
- **Domotic applications (comfort, security)**
- **Retailers competition and service offer increase**
- **Environmental protection**

Smart Grid enabling technologies

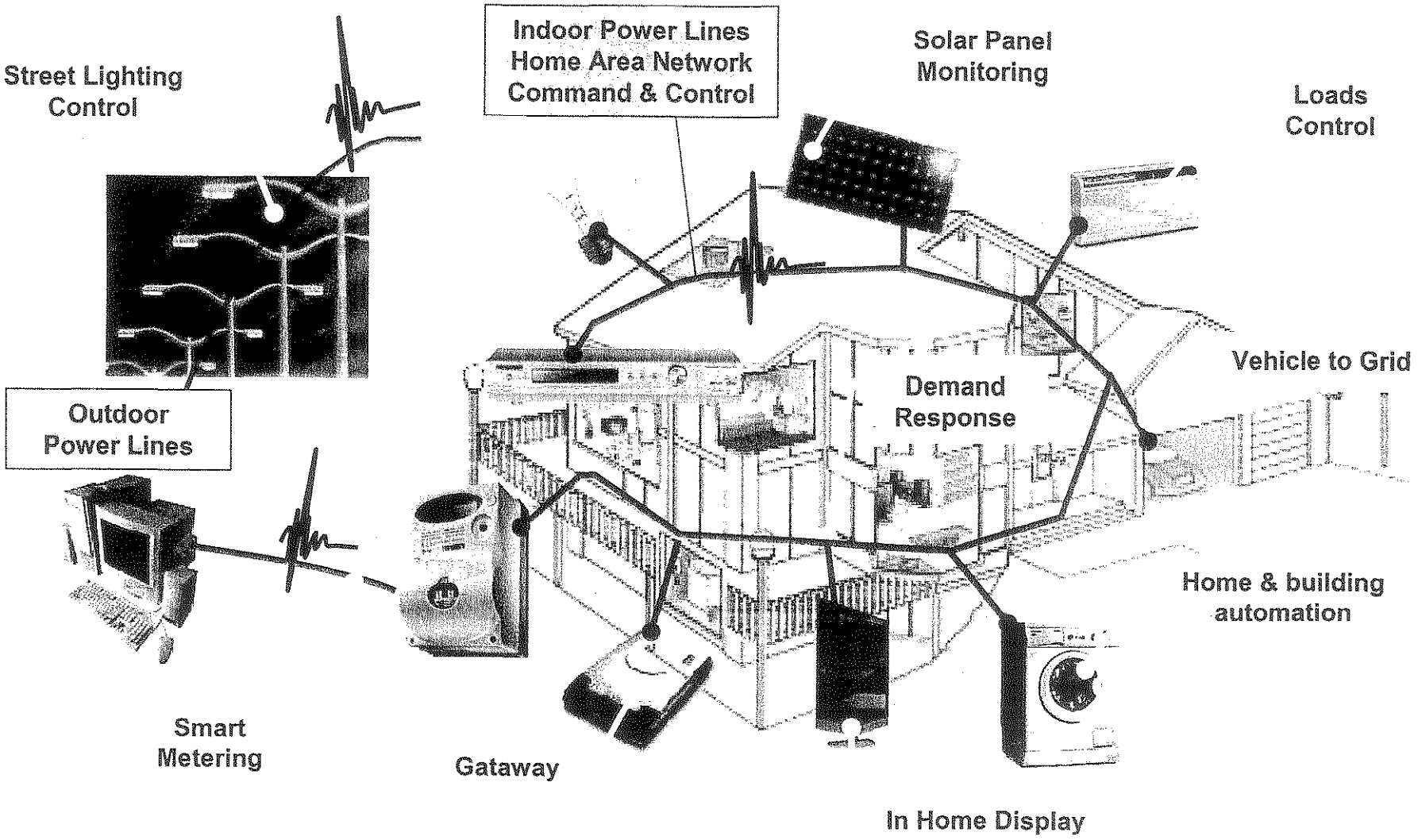
- **The AMM centres manage data from LV distribution consumers. The main AMM building blocks are:**
  - Electronics **smart meters** providing advanced metering functionalities with bidirectional communication to/from data concentrator on one end and consumer premises on the other end.
    - **Narrowband PLC** is the natural communication technology of choice for smart meters: few km range communication, no new wires needed, proven and reliable, low cost.
    - **RF technologies** (LDR, Zigbee) can be a viable alternative in some cases
    - Mixed solution might respond a variety of cases.(Gas, Water Energy metering)
  - **Data concentrators** located at the LV/MV distribution transformer with bidirectional communication functions towards meters on one side and Data Management System on the other side. Traditional WAN communication technologies are used: **GSM, GPRS, PSTN**
  - **Data Management System** with broadband connections (**internet, ethernet**…)
- **The Network control and management system processes the large amount of consumers data coming from AMM systems (mainly via traditional** broadband communication **technologies) as well as direct data from MV and HV networks sensors (using** PLC **or** RF**).**

AMI/AMM concept



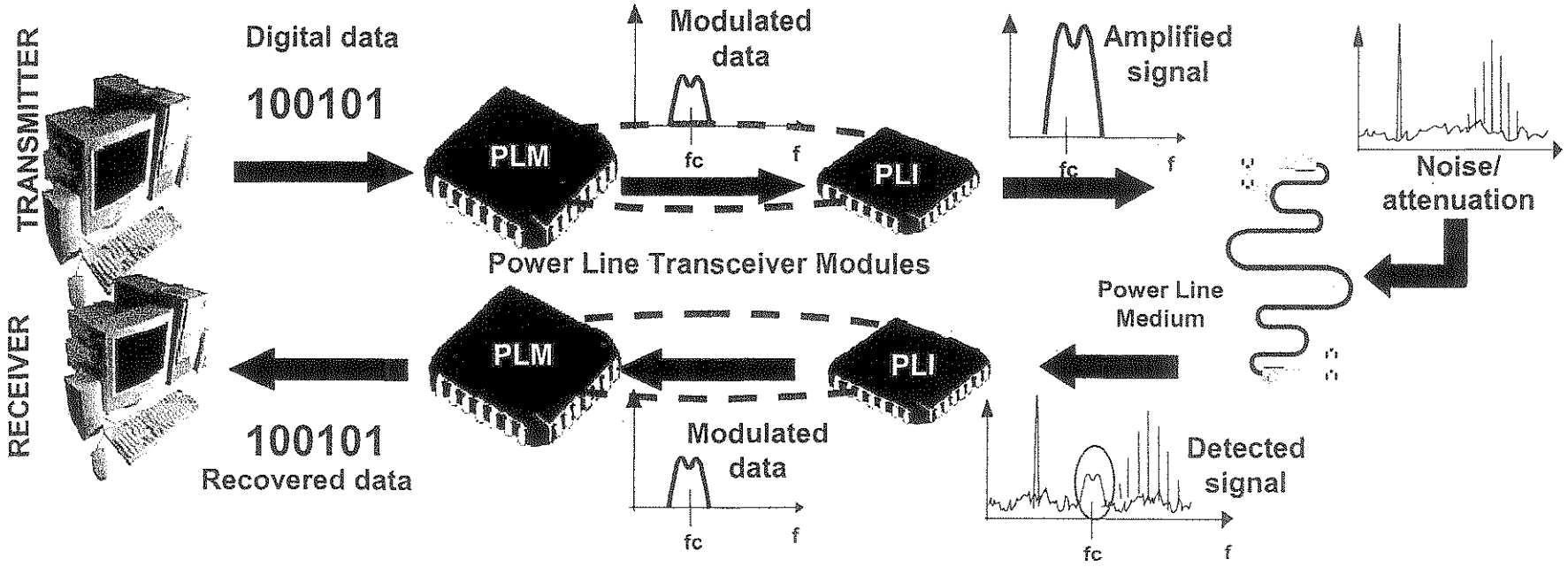
Power Line Communication Concept

- Existing power lines can be exploited as communication bus for command and control and Smart Grid applications requiring no new wires!



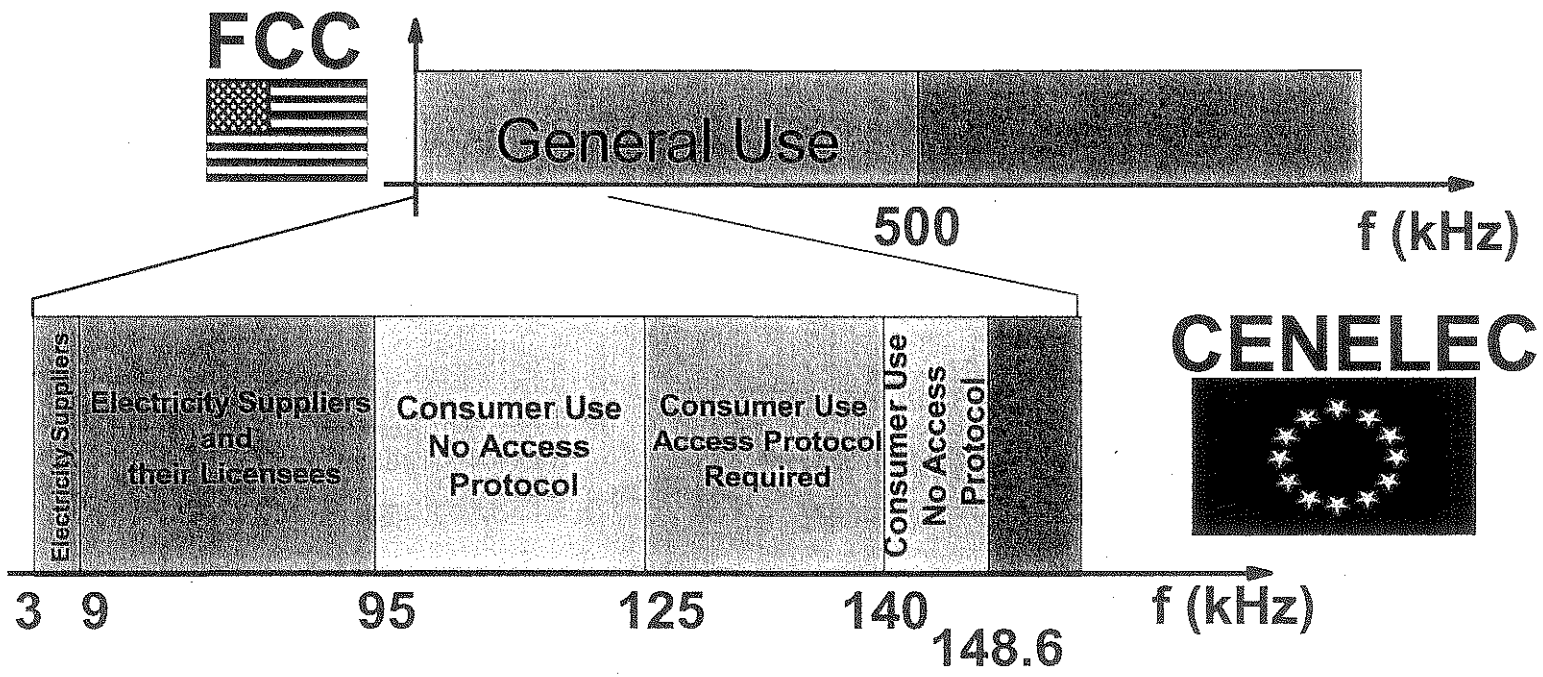
How Power Line Communication works

- Electrical power is distributed at 50Hz/60Hz, so higher frequencies can be used to exchange modulated data over the same medium, according to CENELEC spec.
- Power Line Modems (PLM) make the modulation/demodulation process by converting binary data into high frequency signals and vice versa
- Power Line Interfaces (PLI) conveys the modulated signals over the electrical network and detects arriving signals, making the transmission/reception process
- Power Line Transceiver modules incorporating special PLM and PLI are required for reliable communication over power lines, where strong and unpredictable noise, attenuation and losses are present



PLC International Regulatory Standards

- PLC products must be compliant with general international regulatory norms, like those specified by **FCC** and **CENELEC** committees in US and EU
- These norms impose stringent constraints on communication frequencies usable by PLC nodes and conducted emissions
- **ST Transceivers are compliant with** both **CENELEC** and **FCC** regulations



PLC Modules for AMM systems

Current Requirements

- Monthly readings of billing data (AMR)
- Simple remote management (i.e. connection-disconnection)
- Low bit rate communication (1 kbps range)
- Proprietary communication protocols (regulated monopolist markets)

Future Requirements

- Full Automatic Meter Management capabilities with high value functions (such as micro generation management, demand response management and in home services)
- Frequent readings of large amount of data (load profiles…)
- Higher bit rate communication (10-100 kbps range)
- Open communication protocol (liberalized and fragmented markets)
- Privacy and security (data encryption…)

Why ST is a good partner in Smart Grid ?

- Impedance to our customer is in ST mission

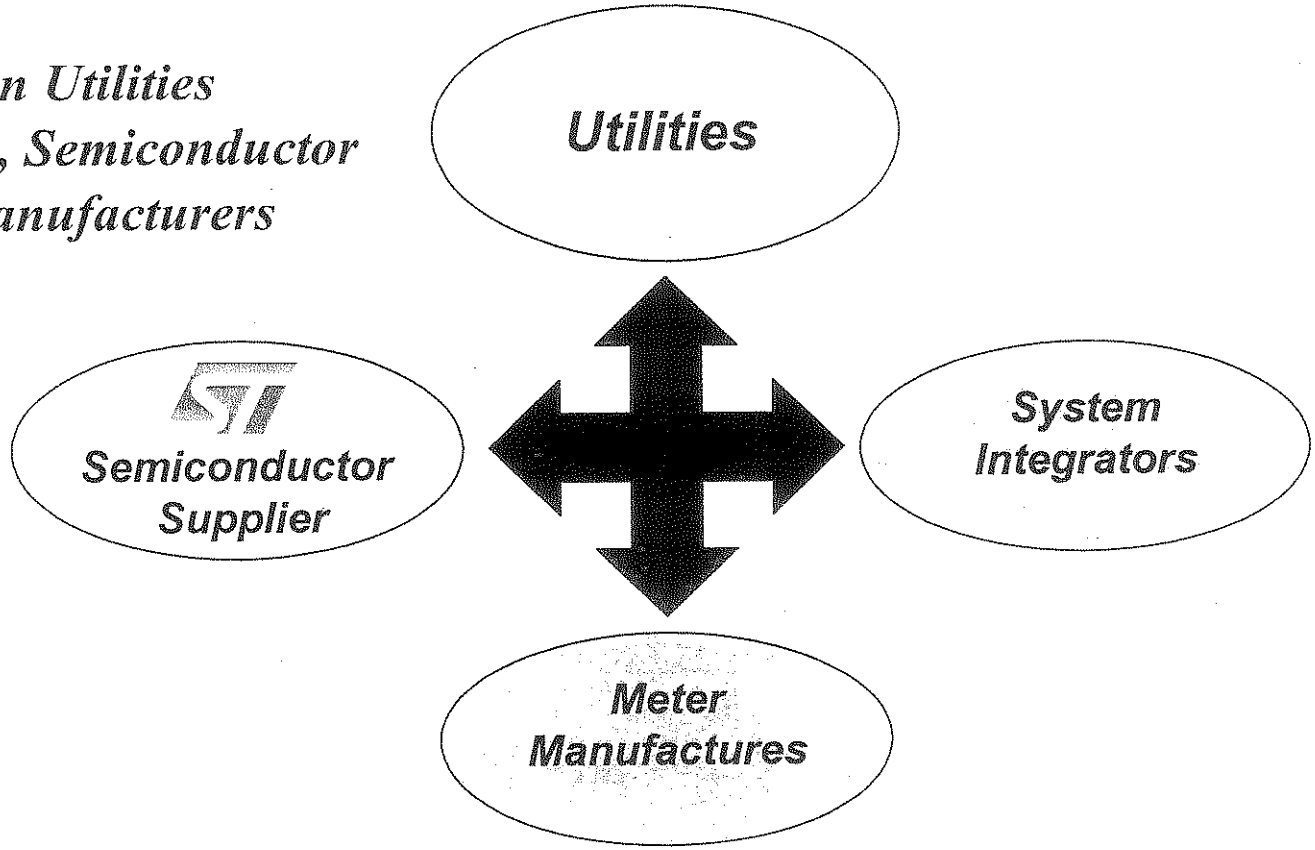
- Trustable Partner and supplier:
  - WW Geographical and Cultural
  - ST financially stable (TOP 5 of the Semiconductor supplier)
  - ST is Already Market Leader
  - Worldwide Product Delivery Capability
  - Capability to provide an IC's solution from the design to the manufacturing

- Technical Solution provider:
  - Metering is one of the TOP 10 Golden Application at ST
  - ST has more than 10 years of experience in designing metering ICs
  - ST is the only one to have all technologies and IP's necessary to make the integration and Application support.
  - A legacy of success with major players
  - ST can partner with other parties like integrators (IBM)

AMR Business Model

- Direct Link between Utility, System integrator and selected Semiconductor supplier allows improving system quality, reducing BOM cost and delivery
- ST offers as qualifying Factors :
  - ✓Reliable Semiconductor vendor
  - ✓Long term presence in the AMR market and strong field based system know-How
  - ✓ Wide system coverage (PLC Transceiver, uP,protections, memories, power management, …)
  - ✓Long running excellence in SoC design brings superior performance \ highest system integration

Direct Link between Utilities System Integrators, Semiconductor Supplier, Meter Manufacturers



ST approach to PLC: to promote open standards and provide royalty free solutions

➢ **ST is a driving technology partner in the most important PLC industrial standardization initiatives:**

➢ **KNX (*www.knx.org*):** the worldwide approved international standard for ***Home and building control***:

- International Standard (ISO/IEC14543-3)
- European Standard (CENELEC EN50090 and CEN EN 13321-1 and 13321-2)
- Chinese Standard (GB/Z 20965)
- ANSI/ASHRAE Standard (ANSI/ASHRAE 135)

➢ **PRIME (*www.iberdrola.es*):** the PLC open specification co-developed with IBERDROLA for ***Smart Metering*** applications

IBERDROLA

➢ **OPEN Meter (*www.openmeter.com*):** the funded European project for ***Multi-utility communication standardization***

OPENmeter
Open Public Extended Network Metering

Some ST public successful examples…

- 2003: ***ENEL*** selects **ST7538** as the communication heart for its breaking-through Automatic Meter Reading (AMR) project

- 2005: The ***LEGRAND*** Home & Building Automation system based on **ST7538** is selected to equip the tenth tallest building in the world located in Singapore ("The Sail at Marina Bay")

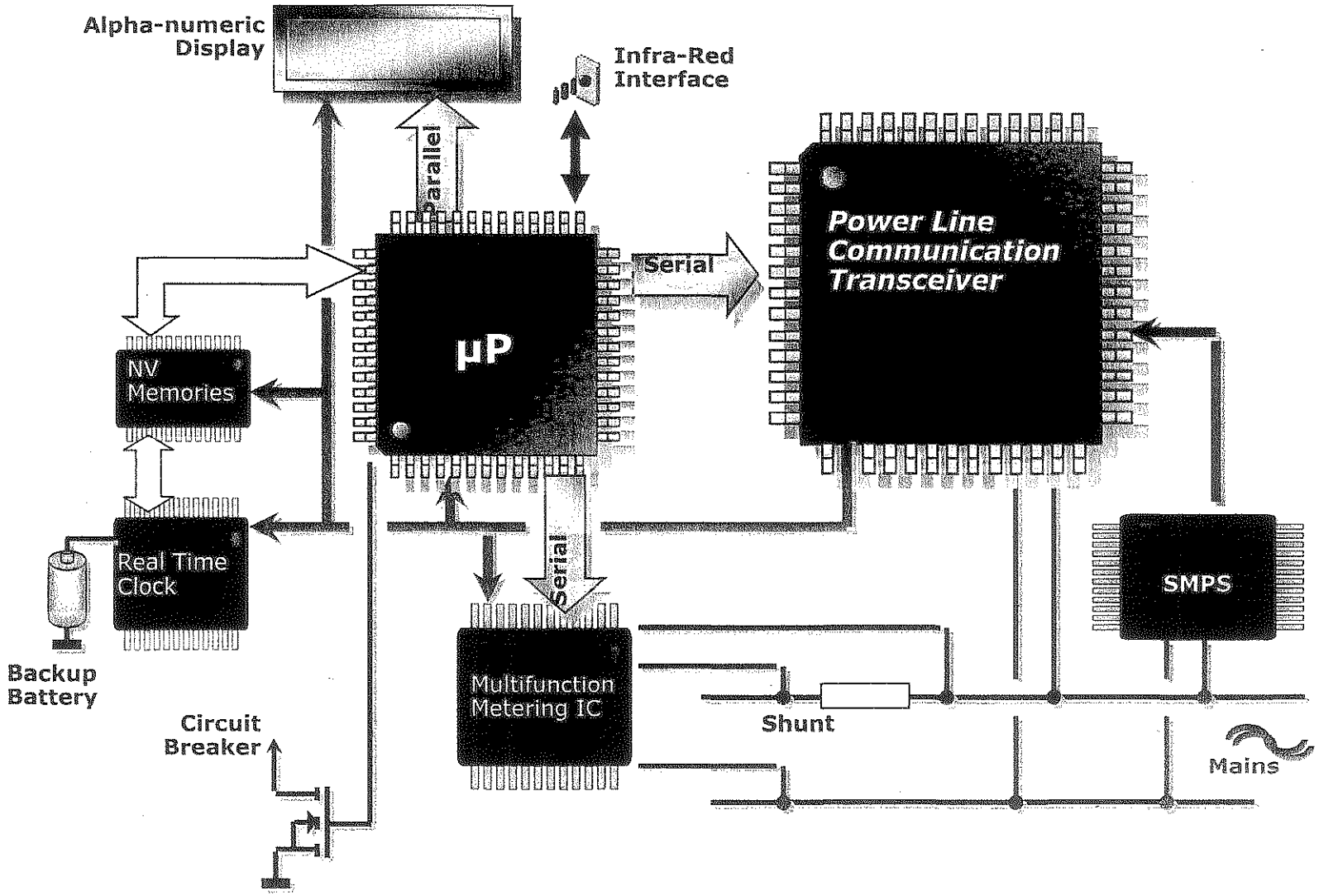
- 2007: ***LANDIS+GYR*** introduces **ST7540** in its new AMM system for large implementation in Rome city for ***ACEA*** utility

- 2007: ***AEM TURIN*** and ***A2A*** utilities adopt IBM and ENEL systems based on **ST7538**

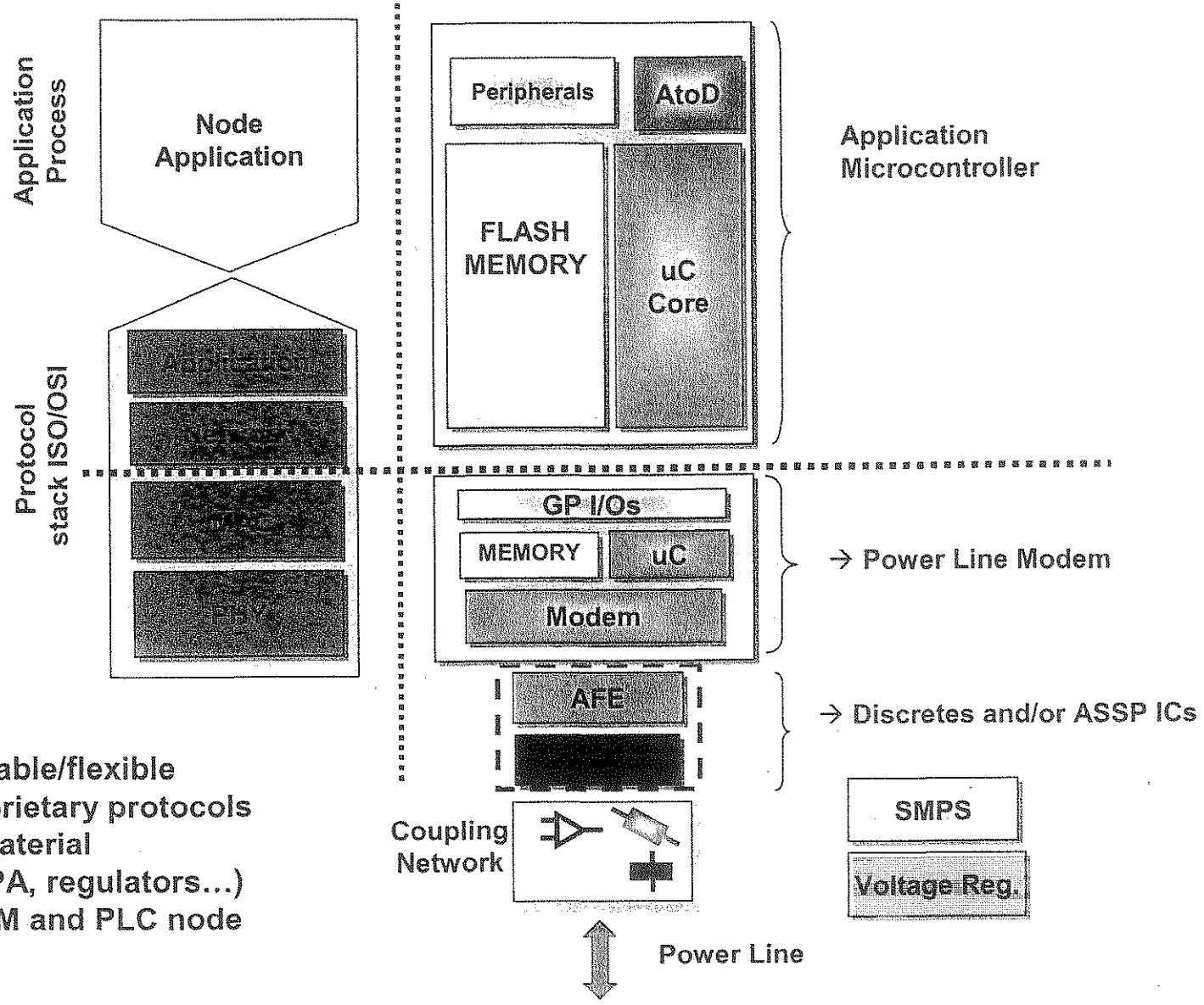
- 2008: **ST7540** used in a big sub-metering project for ***CHINA NATIONAL PETROLEUM CORPORATION***

Several million Power Line Transceivers sold to-date!

Smart Meter Implementation Example

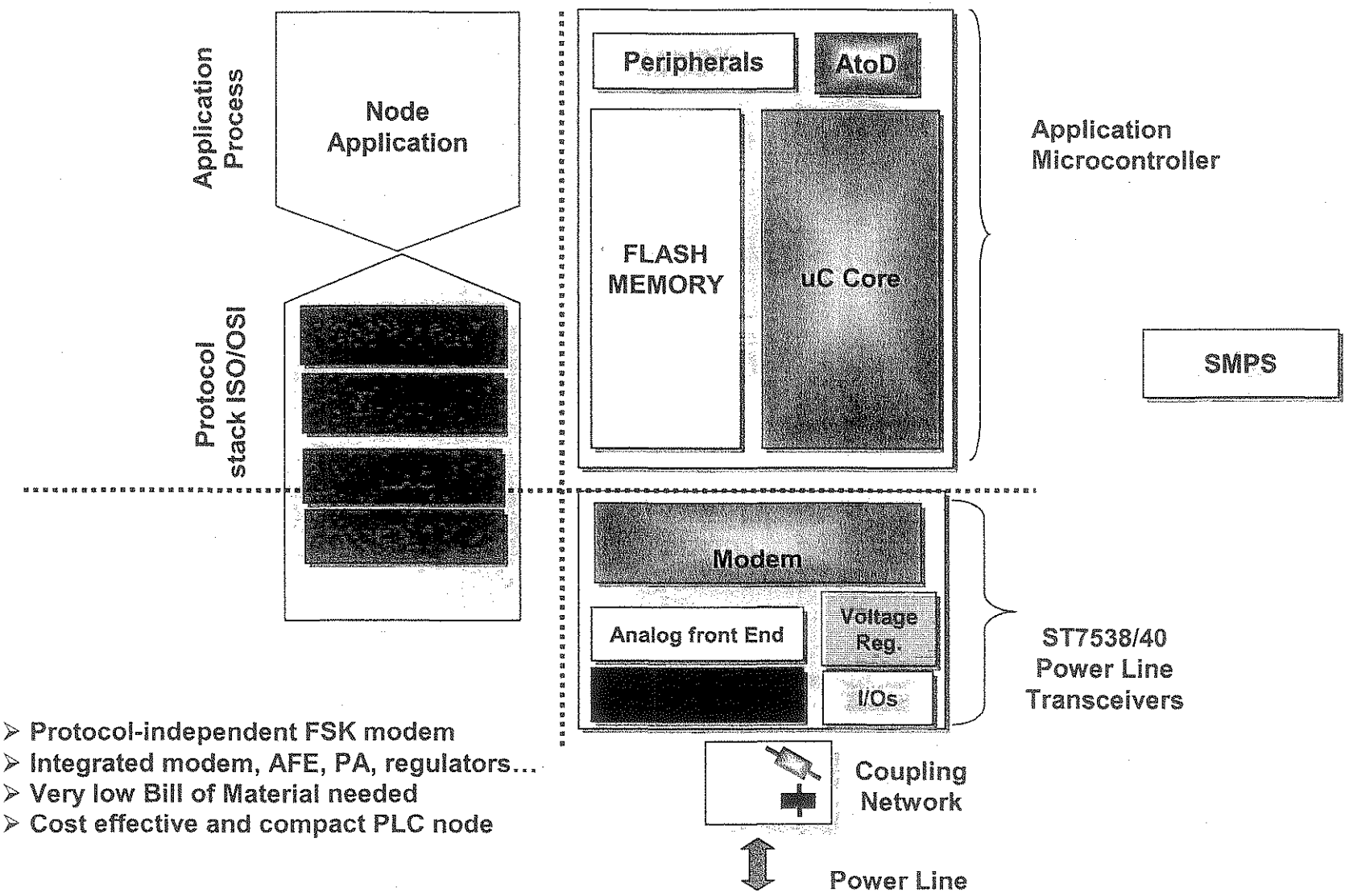


Typical PLC node partitioning (ST competition)



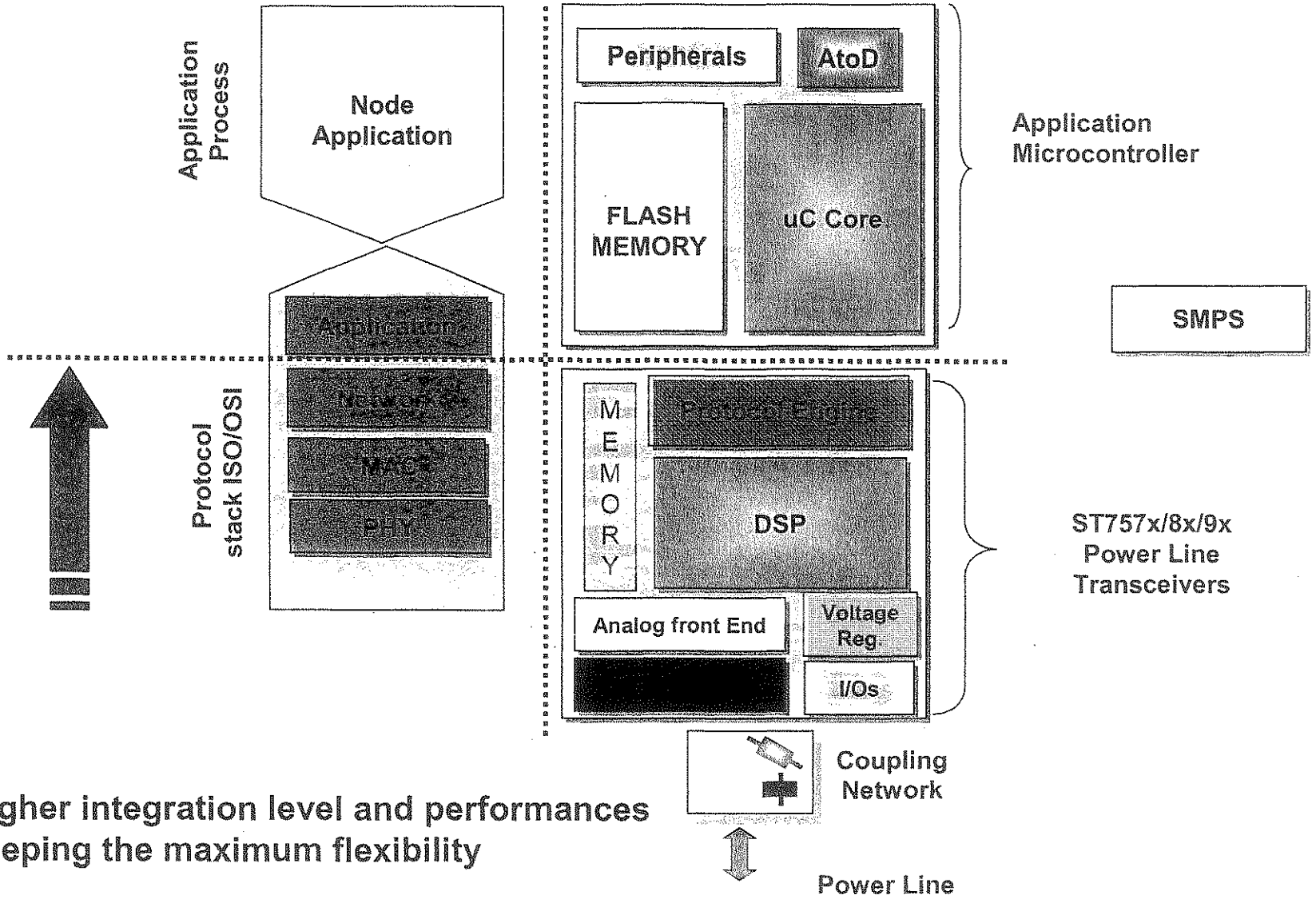
- Not customizable/flexible
- Supplier proprietary protocols
- High Bill of Material (external AFE, PA, regulators…)
- Expensive PLM and PLC node

Typical ST PLC node partitioning state of the art: ST7538-ST7540



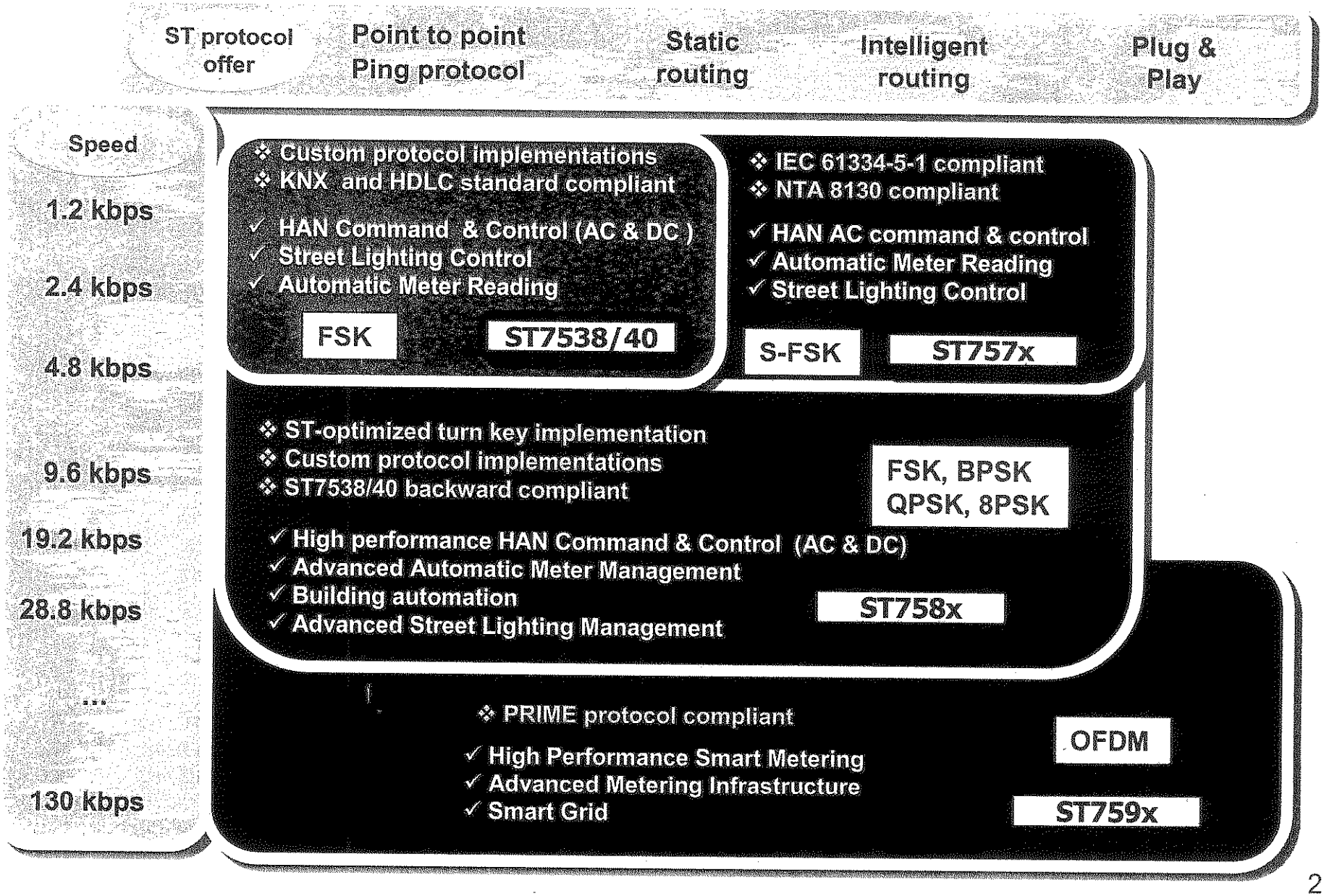
- Protocol-independent FSK modem
- Integrated modem, AFE, PA, regulators…
- Very low Bill of Material needed
- Cost effective and compact PLC node

ST new platform generation
- PLC node partitioning based on ST757x/8x/9x -



Higher integration level and performances keeping the maximum flexibility

ST PLC Products Positioning Summary



New PLC Platform (ST757x-8x-9x) - basic features -

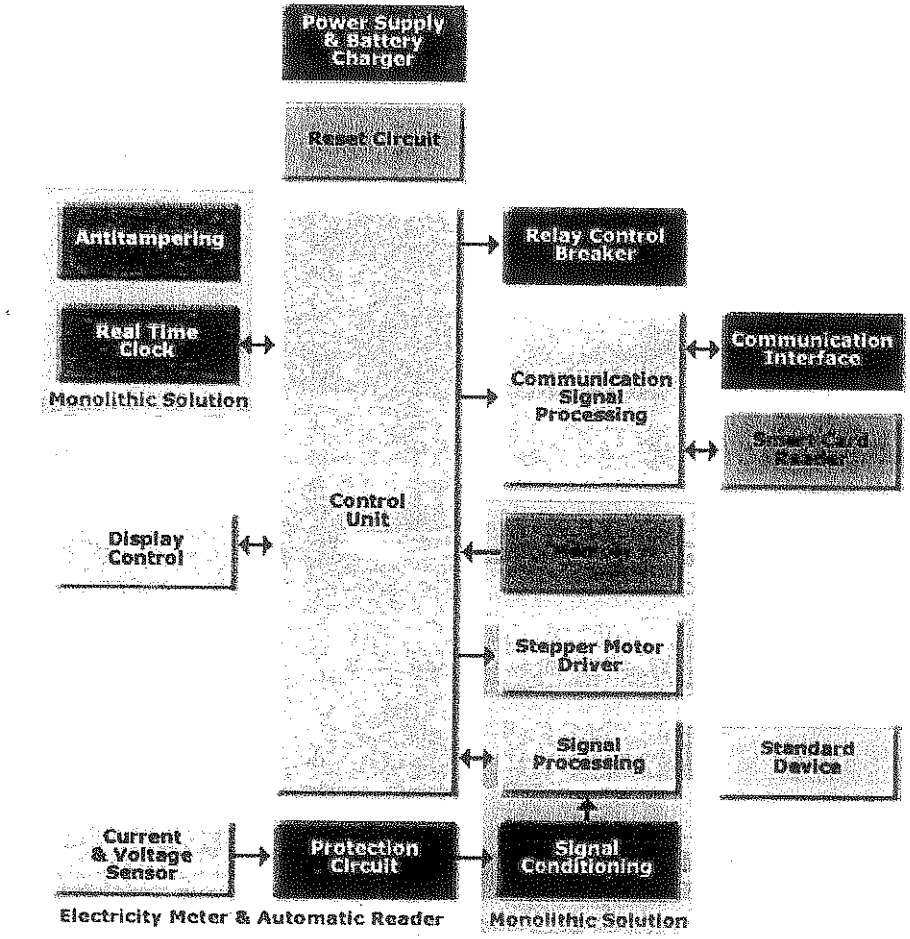
- ***High modularity and flexibility***:
  - ✓ independent application and communication blocks
  - ✓ Suitable for products differentiation and customization
- ***Platform scalability***:
  - ✓ Cost-driven
  - ✓ Performance-driven
  - ✓ Features/integration-driven
- ***Open system*** : no royalties, possible multiple suppliers
- ***Embedded protocol*** selectable at different levels
- ***Low Bill of Material and system cost*** thanks to SOC approach embedding:
  - ✓ ROM and RAM memories for Protocol stack management
  - ✓ DSP Engine for multiple modulations management
  - ✓ Analog Front End
  - ✓ Power Amplifier
  - ✓ Encryption
  - ✓ Auxiliary functions/blocks …

Electrical meter functional blocks:

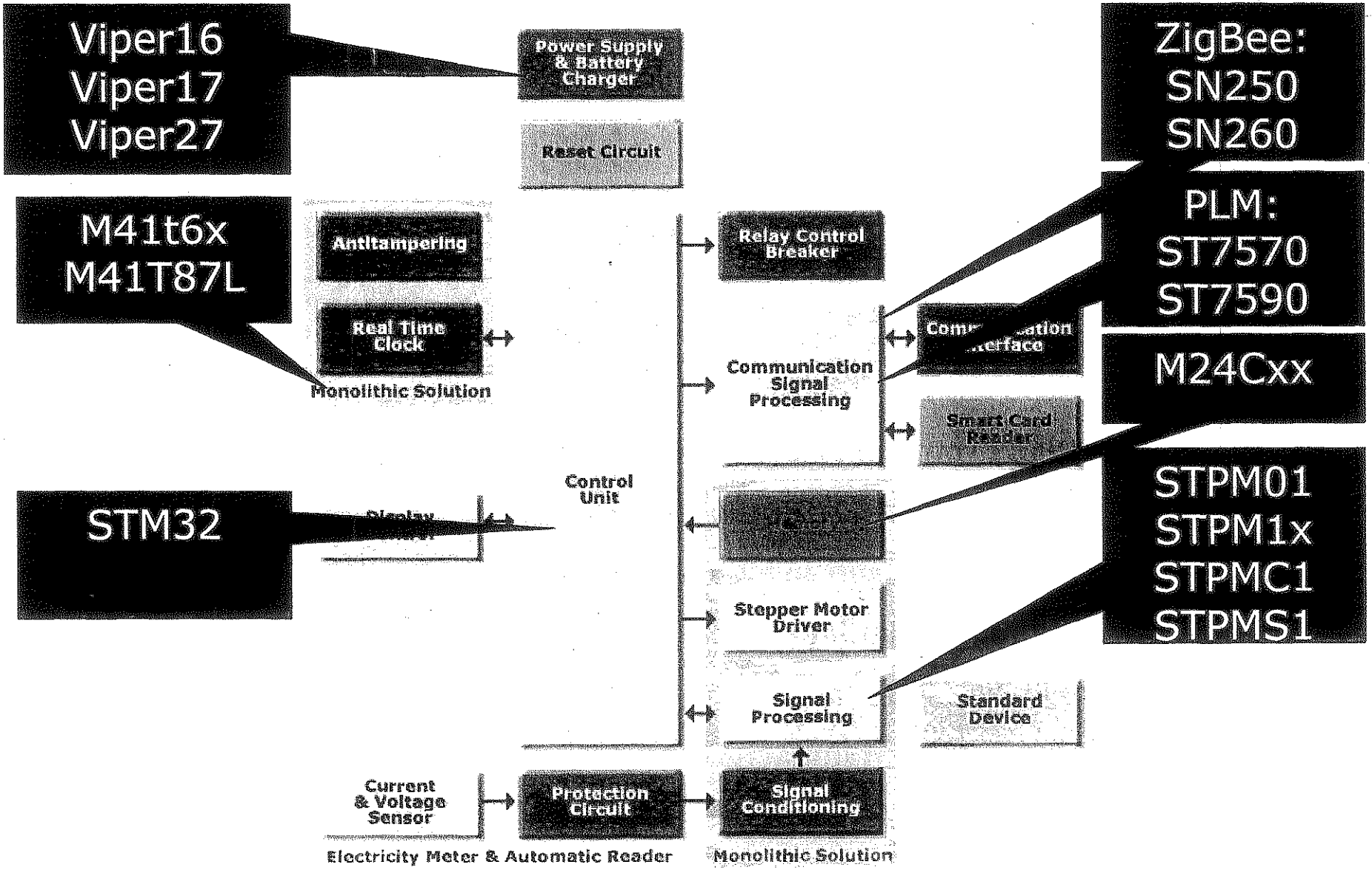
ST CAN OFFER A SOLUTION FOR EACH FUNCTION

+

SERVICES



Electrical meter functional blocks:



Our way of supporting Customers.....

- **Application Designing HW**
  - AFE - Filtering Designing, SMPS
  - Dedicated Hardware Solutions
- **Application Designing SW & FW**
  - For ex. : Ad hoc FEC Algorithm Development and FW implementation
  - For ex. : Ad hoc PC - SW interfaces
- **CTM Application Prototypes Characterization and Validation**
- **Support in the Standards Certification Tests**
- **Lab. Tests and Measurements in ST Labs using ST Equipments**
- **Support to Field Test definitions**
- **Support in the Field test Trials**
- **Technical Support in the Manufacturing Phase (Final Equipment Testing set-ups, debugging, etc..)**
- **Failure Technical Analysis**