Les composants du M2M et des Smarts Grids : évolutions et perspectives

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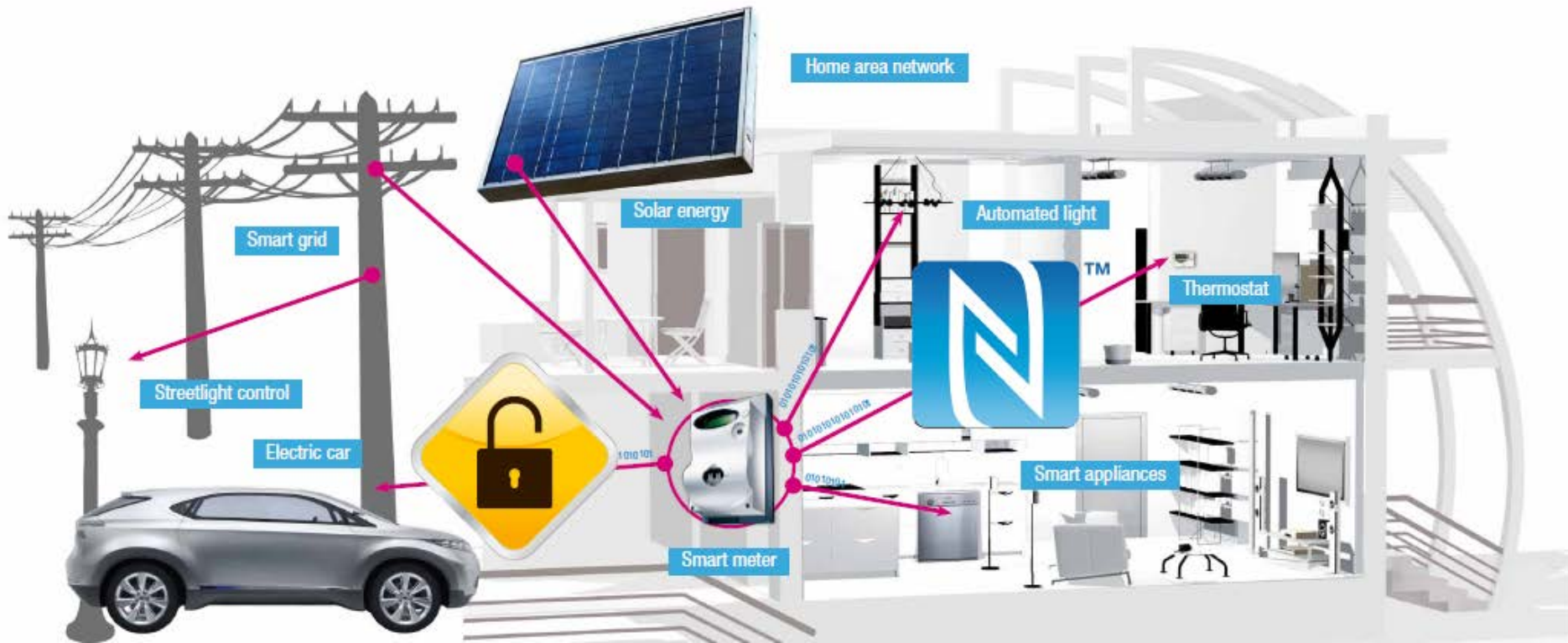
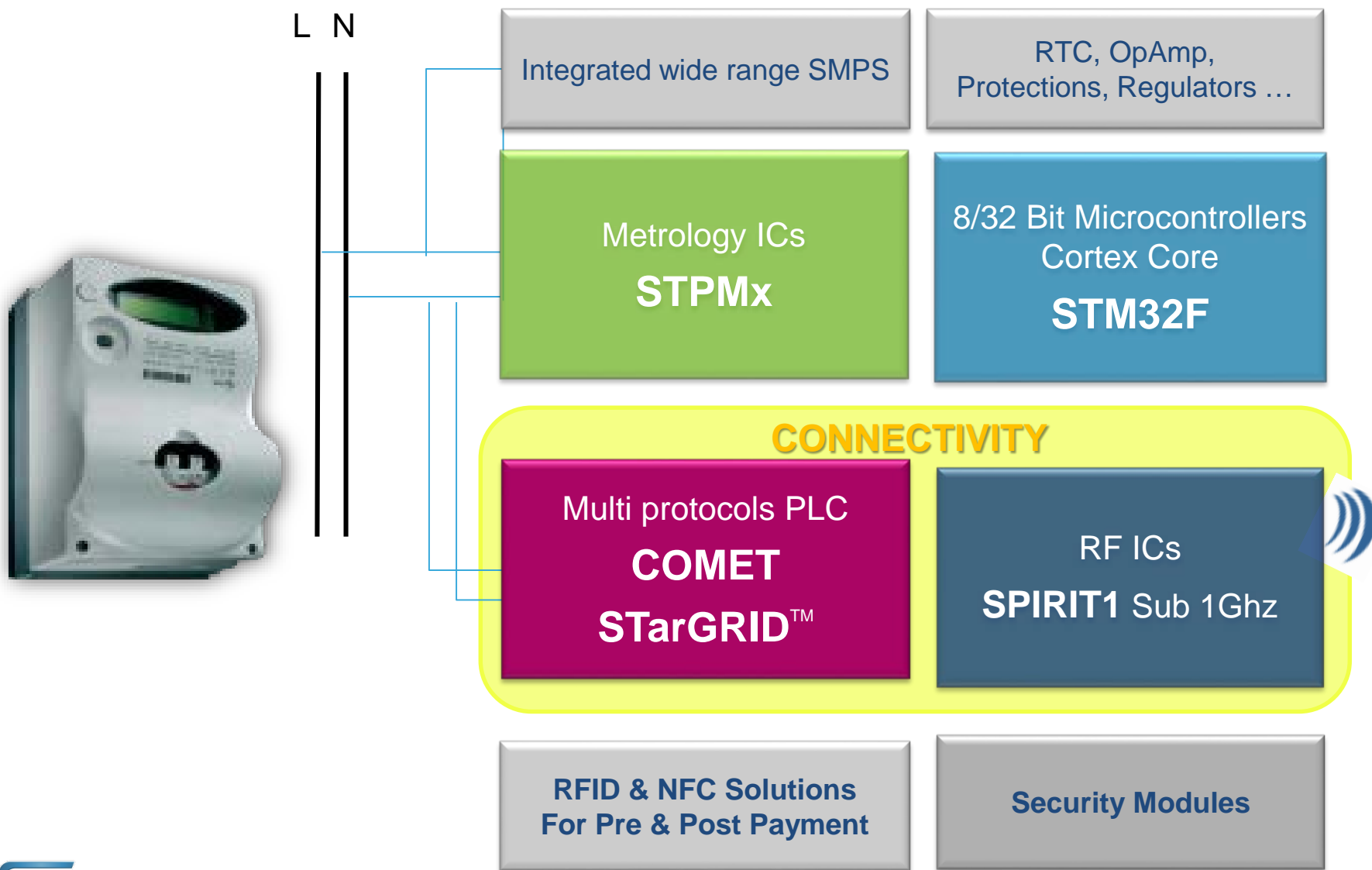*Chira.vinci@st.com*

OCOVA Forum, Gap 16/17 Sept 2014

Home area network

Smart grid

Solar energy

Automated light

TM

Thermostat

Streetlight control

Electric car

Smart appliances

Smart meter

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ST as one stop supplier for Smart Meters

L N

Integrated wide range SMPS

RTC, OpAmp, Protections, Regulators …

Metrology ICs
STPMx

8/32 Bit Microcontrollers Cortex Core
STM32F

CONNECTIVITY

Multi protocols PLC
COMET STarGRID™

RF ICs
SPIRIT1 Sub 1Ghz

RFID & NFC Solutions For Pre & Post Payment

Security Modules

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ST Position in Smart Meters

Enel
L'ENERGIA CHE TI ASCOLTA.

endesa
Dirección General de Comunicación

meters AND m**o**re
OPEN TECHNOLOGIES

> 35Mu

IBERDROLA

PRIME ALLIANCE

> 1Mu

eRDF
ÉLECTRICITÉ RÉSEAU DISTRIBUTION FRANCE

G3-PLC Alliance

- Market Leadership and in-field experience
  - **40Mu+** Meters proven PLC technology in 20years+
  - Extensive Meters&More and PRIME deployments

- Leading role in Standardization Organisms & Partnership with Smart Grid Leaders

- Complete Metering ICs offer fitting different architectures needs and evolution

- Innovation with future proof IPs, technologies, hw and firmware integrated solutions
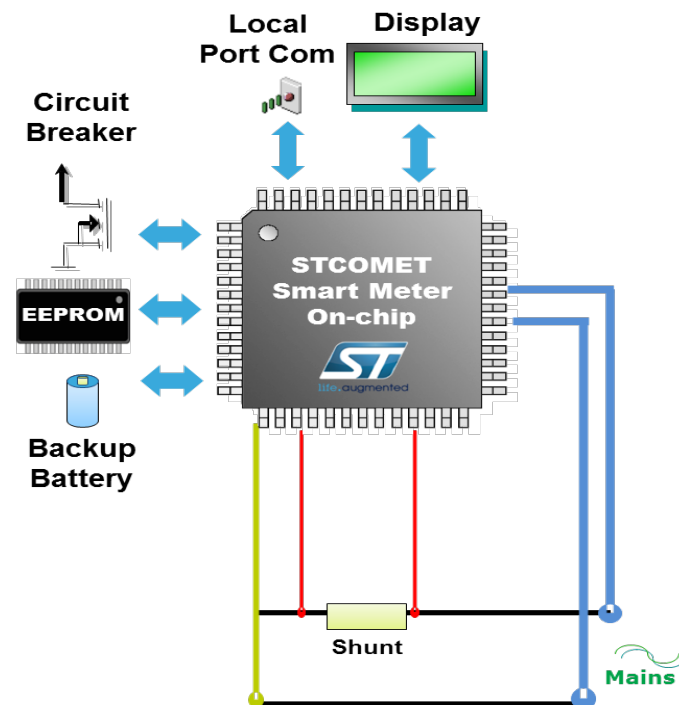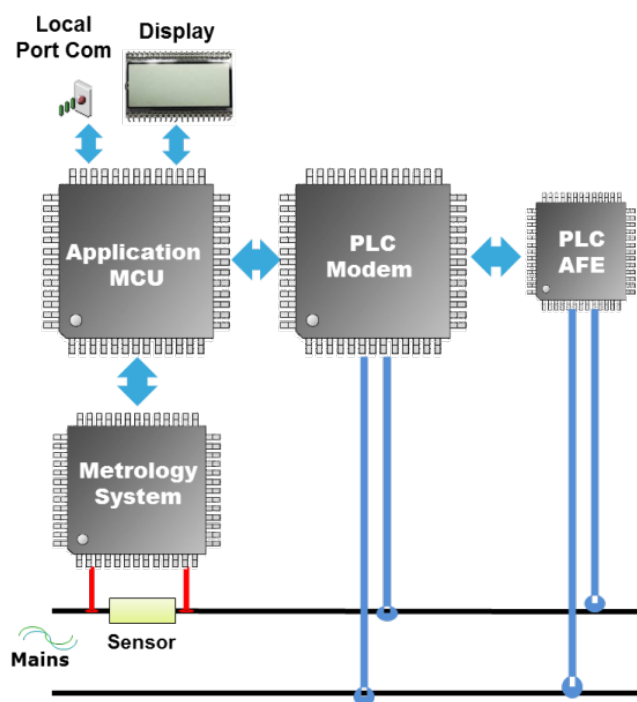
Key market standard and ST deployments

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Smart Meters SoC Evolution

From multiple highly complex and specialized chipset ..

… to STCOMET fully integrated System on Chip

- **Compact, low consumption, cost efficient**

- **Re-programmable PLC for protocol updates**

- **Embedded Metrology**

STCOMET Smart Meter SoC

- ## Power Line Modem – Multi protocols
  - Dedicated Reprogrammable DSP free Cortex M4 to application use
  - Integrated RX/ Tx AFE and Line Driver
  - CENELEC A , FCC, ARIB Bands, 500kbps

- ## Application Engine Cortex M4 Core
  - Cortex-M4 Core @96MHz, FPU
  - 1MB Flash & 128kB RAM embedded memories

- ## Energy Metering embedded
  - > Class 0.2 Meter requirements
  - 3 Independent 24-bit ADC (Vp, Ip, In)
  - Embedded Metrology DSP
  - Active, Reactive, Apparent, RMS values calculation
 - Instantaneous values and power quality parameters

G1, G3, PRIME, Meters & More, P1901.2, …
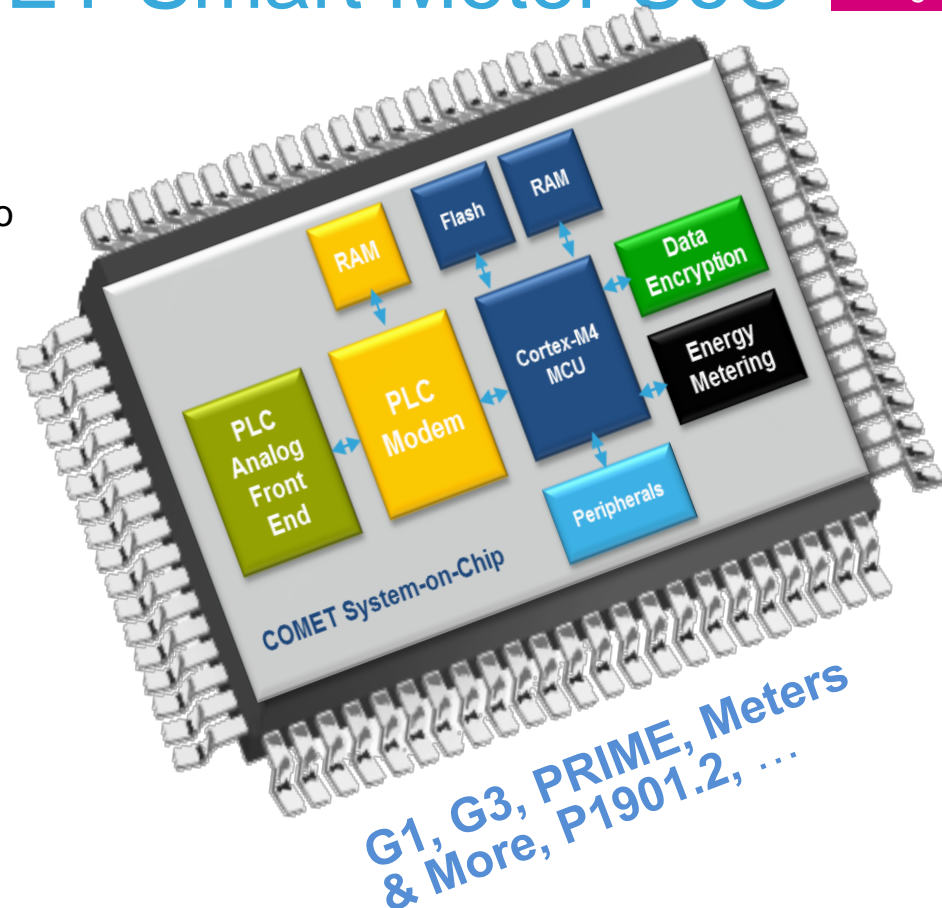
- ## Embedded Security Engine
  - AES 128/192/256, Advanced mode (GCM, CCM, ECB, GMAC…)
  - ISO7816 USART IF for Secure Element

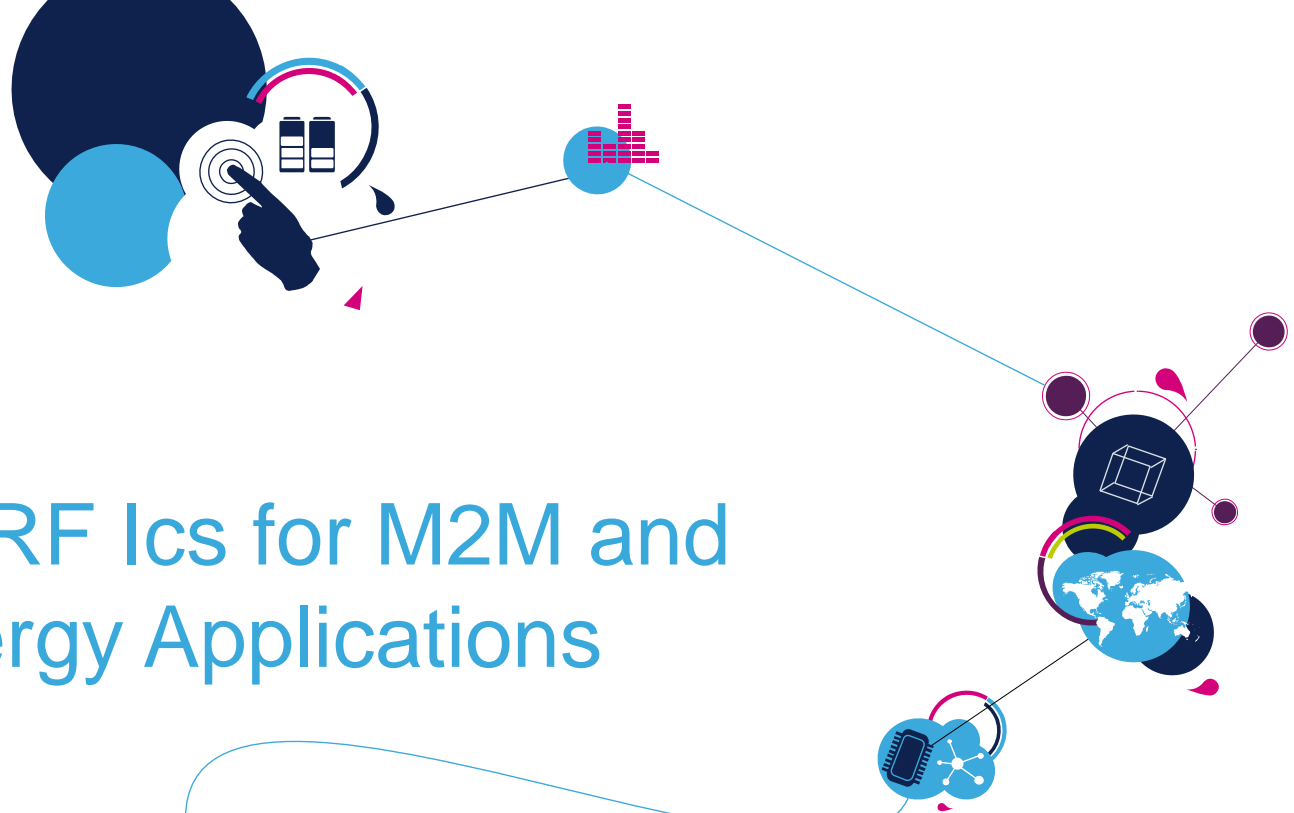❖ **SOGRID** targets a full eco-system for Grid Monitoring and Control, introducing PLC communication at Medium Voltage Level

- **COMET in Smart Meters – LV Grid**

- **COMET in Smart Sensors (FCC Band) – MV Grid for peak prevention and outage fast management**

Final Pilot : May 2015 - September 2015
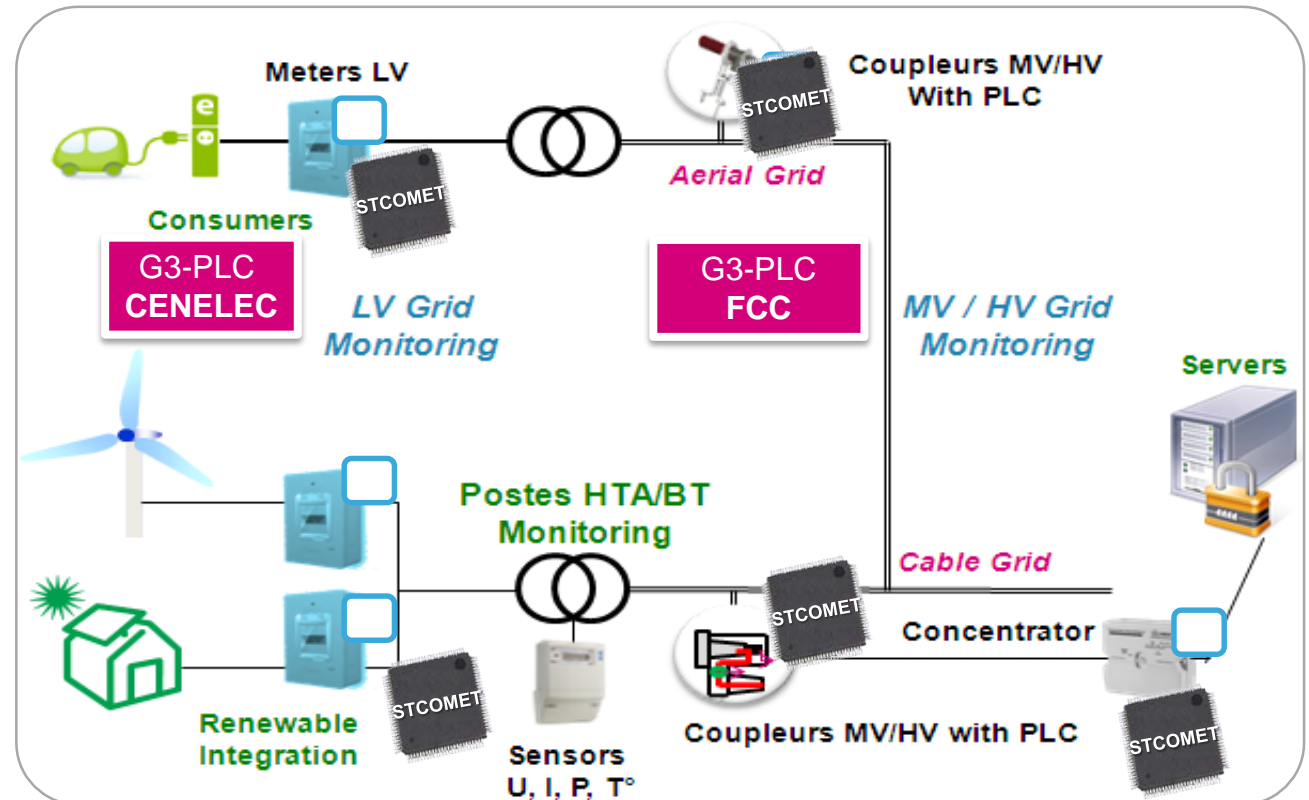
Sensors and RF Ics for M2M and for Smart Energy Applications

ST Sensors Offer and evolution

ST offers numerous possibilities of combinations to complete Sensor solutions

Accelerometer (m/s²)
Senses the linear acceleration, tilt (Portrait/landscape), shocks, Free fall, direction detection, vibrations, linear displacement

Gyroscope (°/s, dps)
Measure complex motion accurately in free space, tracking the position and rotation of a moving object

Magnetometer (gauss)
Senses the magnetic field, compass , to provide absolute position
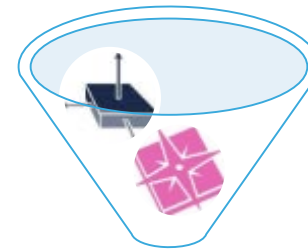
Environmental sensors
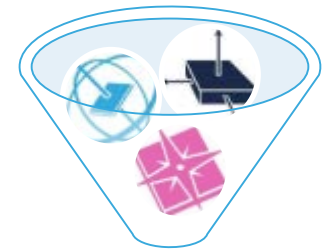Measures Env conditions such as pressure (mbar), humidity (%), UV, …

6-axis IMU

E-compass

>9-axis Sensing

3-axis earth magnetic field
3-axis linear acceleration
3-axis angular rate

Sensor fusion algorithm

Quaternions
Heading
Pitch, roll and yaw
Linear acceleration
Gravity

Deliver accurate and reliable motion-sensing information

6-axis solution for **activity trackers**

E-compass solution for **outdoor activities**

>9-axis solution for **IoT**

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ST Wireless Offer Summary

RF Modules

- ❑ **WIFI Modules**
- ❑ **Bluetooth Modules**

RF Chip Set

- ❑ **Sub 1 GHz RF ICs**
- ❑ **2.4GHz BlueNRG**

- Smart Plugs & Energy Gateways

- Intelligent lighting & shadowing systems

- Gas & Water Meters

- Distributed sensors network

RF Sub 1GHz transceiver: SPIRIT1

- Large Frequency bands: 150 up to 956 MHz
- Modulation schemes: FSK, GFSK, MSK, OOK and ASK
- Air data rate from 1 to 500 kbps
- Programmable channel spacing :12.5 kHz min
- Frequency Hopping & Antenna diversity algorithm
- AES 128-bit encryption co-processor
- **ST Stack + Wireless M-Bu + 6LoWPAN support**

Power consumption

RF performances

SW Flexibility

- 9mA in RX
- 18mA @ +10dBm
- < 1µA sleep mode (register retention)

- -121dBm @1,2Kbps RX sensitivity
- +16dBm max (boost) programmable output power
- < 1msec transition time (SDN to RF)

- Packet handler, Sniff mode, CSMA/CA
- Fully SW flexible : Several stacks + custom SW

BALUN companionchip for SPIRIT1

IPAD^{TM} technology Ics : Integrating high-quality RF passive components on a single glass substrate compacts matching components
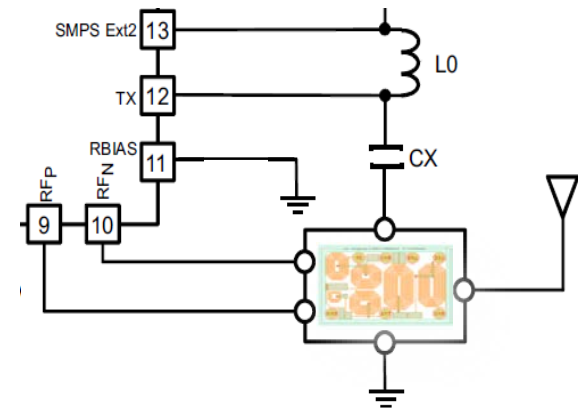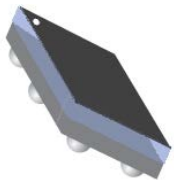

16 passives - 7.5mm²
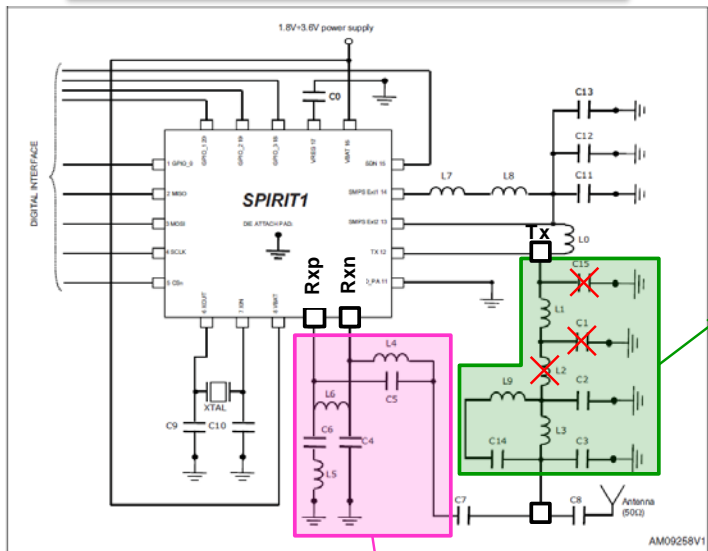
1 package - 2,8mm²

filter

balun

BALUN 868MHz & 433MHz

Technology on glass
70% PCB space saving
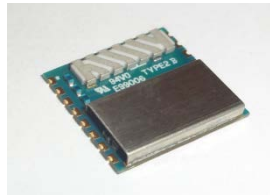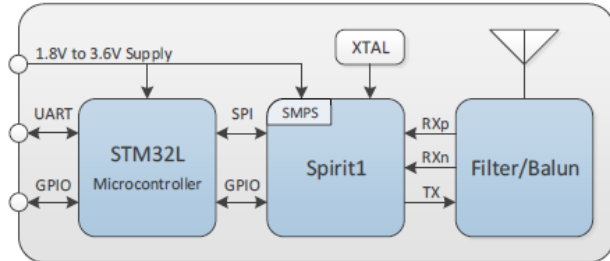**Faster Time to market**
High Reliability
Improved RF solution

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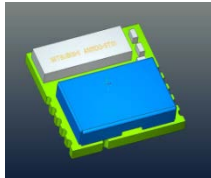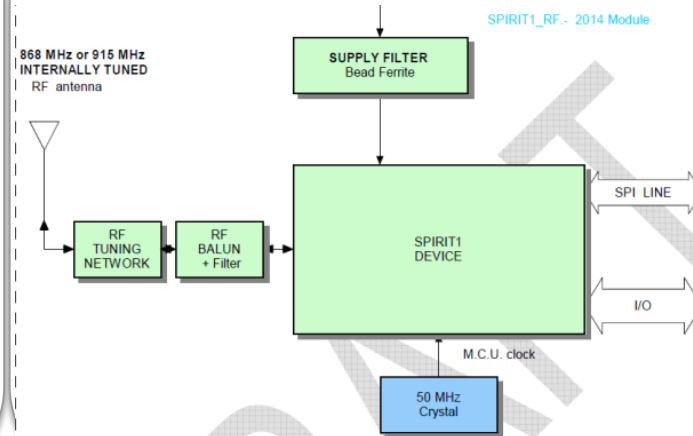# ST RF Sub-1GHz modules

Module with MCU (SP1ML)

14 x 13,4mm

Module without MCU (SP1GRF)

11,5 x 13,5 mm

Certification

Flexibility

- **Plug & play** increasing time-to-market
- **RF certification** included
- **MCU embedded** option for SW integration

ST BlueNRG and proprietary profiles

- **Available profiles**

  - Alert Notification, Blood Pressure, Find Me, HID over GATT, Health Thermometer

  - Heart Rate, Phone Alert Status, Proximity, Scan Parameters, Time Profile, Glucose
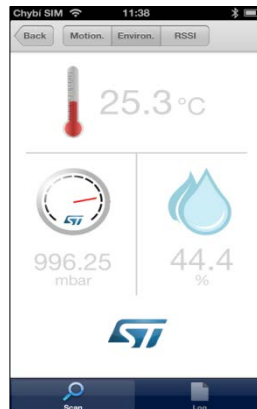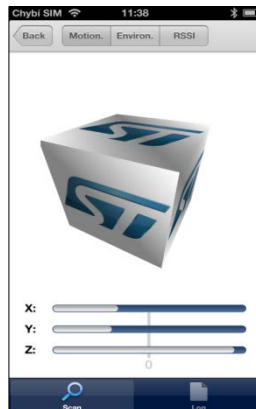
- **Proprietary profile: Sensor demo**

  - **Acceleration Service**

    Acceleration characteristic value
    Free Fall characteristic

  - **Environmental Service**

    Temperature characteristic
    Android available

Sensors
- LPS25H Barometer
- HTS221 Humidity Sensor
- LIS3DH Accelerometer
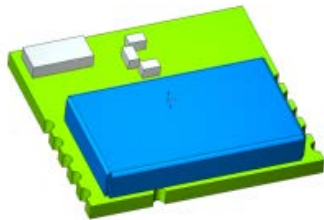
SOON

Bluetooth Modules

V4.0 Single-Mode Low Energy

SPBTLE-RF

V4.0 Dual -Mode Low Energy

SPBT2932

11.6 mm x 13.5 mm

- BlueNRG + 32 MHz Crystal + Balun (BALF-NRG) +Surface mount Antenna
- SPI vs. external MCU Microcontroller
- Very Compact : 11.5 x 13.5 x 2 mm
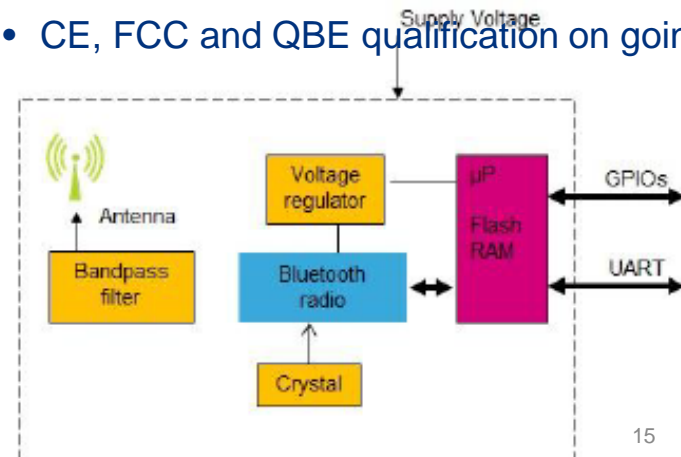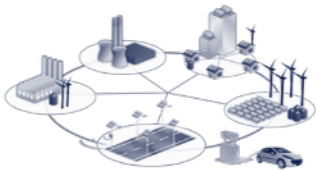- FCC and CE certified
- QDID Qualified listing

- RF Dual Mode Module ONLY
- Dual Mode Radio + Crystal + Surface mount Antenna + MCU
- Embedding BT v4.0 Classic & Low Energy
- CE, FCC and QBE qualification on going

Supply Voltage

Antenna

Bandpass filter

Bluetooth radio

Voltage regulator

μP Flash RAM

GPIOs

UART
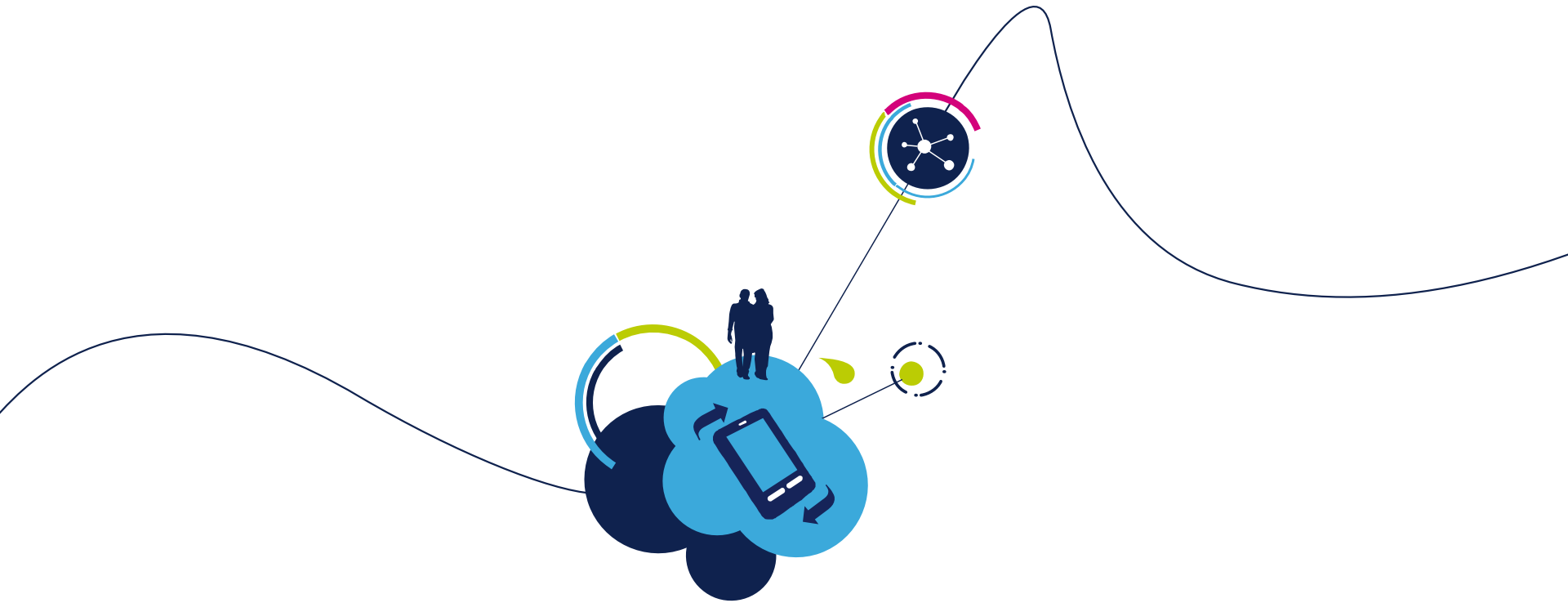
Crystal

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Conclusions

Smart Grid

$6B TAM in 2016
CAGR 13-16: +14.2%

Key Applications:
Smart Metering, Renewable Energy, Energy Saving, Power Conversion, HEV-EV, LED Lighting

- ST has a global products offer for Smart Meters and Smart Grid new markets

- ST PLC proven experience is a base for fast market needs adaptation and innovation, where integration, consumption and cost are increasing requirements

- ST portfolio on Sensors, embedded MCU and RF provides a wide bricks offer for innovation in Smart Energies with both discrete and integrated solutions

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Thank you