



IoT as Enabling Technology for Smart Cities Panel PANEL SESSION @ IEEE RTSI

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IoT Ecosystem



Apps



Cloud Storage



Google



Access & Services

- Media
- Advertising
- Google
- Facebook

Sensors + RF + MCU

- Gyroscope
- eCompass
- Accelerometer
- Environment sensor

End Applications

- Watch
- Glasses
- Band
- And more.....

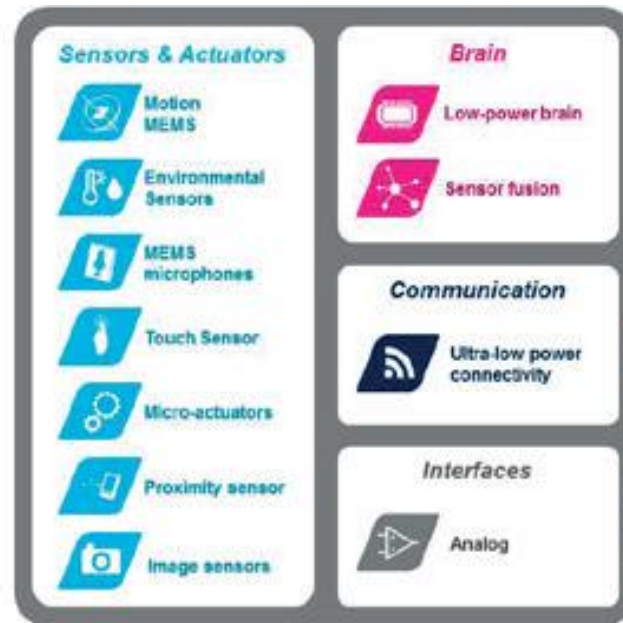
Smart System = Sensor + Brain + RF;

IoT = Smart Systems + @

ST'S ECO-SYSTEM FOR IoT

With one of the broadest portfolios using state-of-the-art technology in the semiconductor industry, **ST provides all the building blocks for IoT :**

- **Sensors and Actuators***,
- **Amplifiers,**
- **Low-power microcontrollers***,**
- **Power management,**
- **Security IP,**
- **Analog,**
- **Connectivity****



* environment, motion, acoustic, lighting, microactuators – electrostatic, thermal.

** IoT wireless Gateway solutions (Wireless Gateway: WiFi, BT and BlueNRG,RF SubGhz- MESH- 6LoWPAN,NFC)

*** DSP: STM32 , Cortex



Investing in RF has significant potential for growth

Ultra-low power connectivity

BlueNRG

- Introduced an upgrade to our energy-efficient Bluetooth Smart network processor running the Bluetooth 4.1 protocol stack

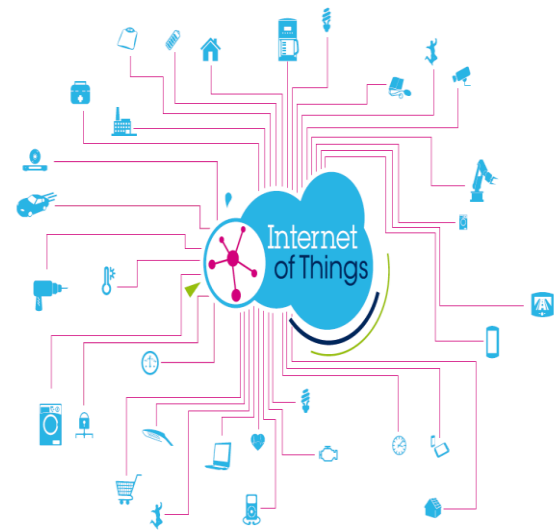


SPIRIT

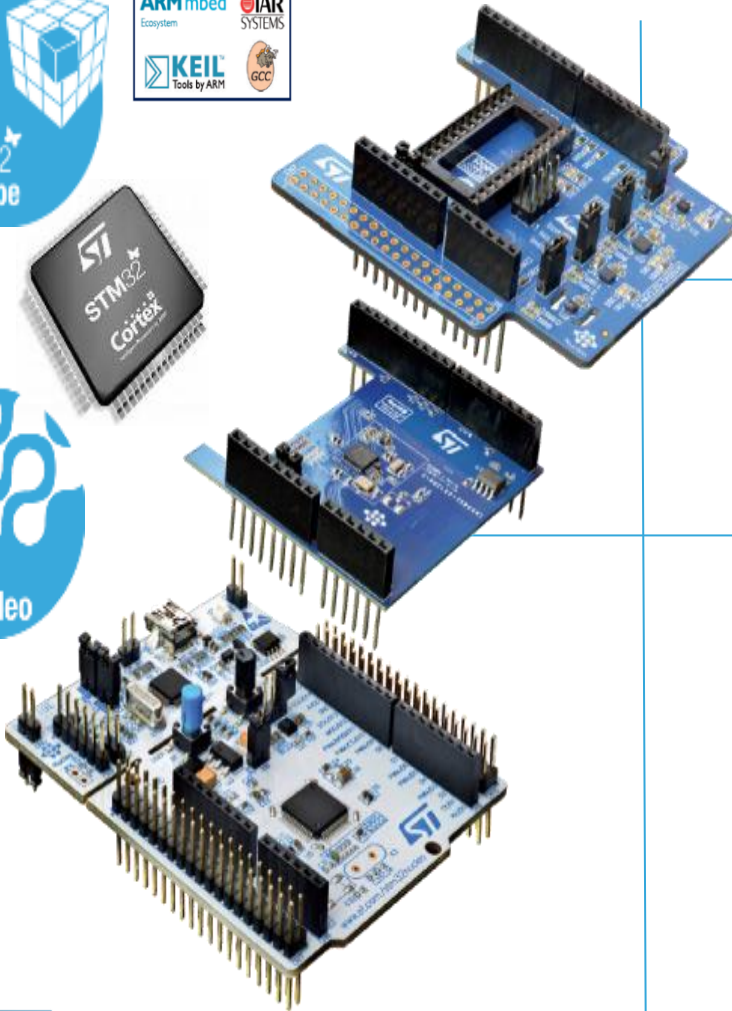
- Very low power RF transceiver for SubGHz license-free ISM and SRD bands



IoT devices for **Smart Me** and **Smart Home** need both Bluetooth Smart and subGhz radio



Easy access to portfolio for Developers: Fast Prototyping



Open Software

- License SW for single-use on specific target hardware (STM32 Nucleo Development Board)
- Click through license on website





ST is investing in analog and has significant potential for growth

- Wide range of analog products needed by our customers to complete product design
- Opportunities to design-in alongside flagship solutions
- Push through distribution and online channels to increase market reach
- Target application marketing for wearable devices

Analog

Operational amplifiers

Large portfolio of highly power-efficient op amp in tiny packages

Analog switches

Compact single and dual switches for audio and USB

Current sensors

High accuracy current measurement for contactless battery chargers

Battery gas gauges

Low-power gas gauge providing very accurate battery life indicators

Audio amplifiers

High-efficiency Class D and G amplifiers for headsets and speakers

Smart reset

Customizable products providing safe and convenient reset

Ultra-sound Pulsers

Highly-integrated ultrasound pulser ICs with four or eight independent channels.

IoT and Automotive: ST offer

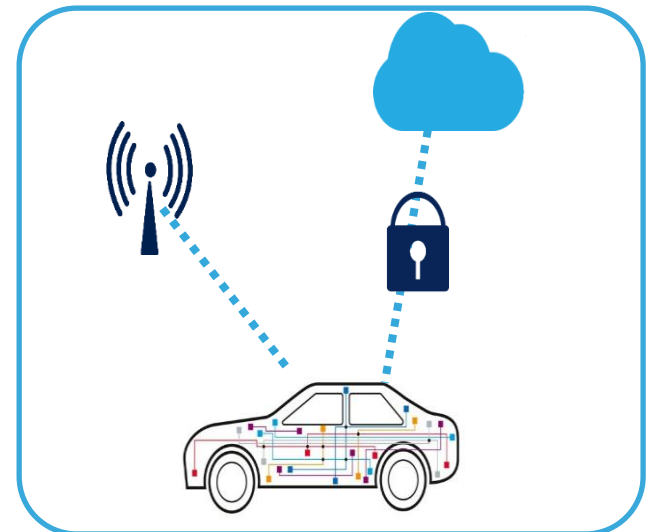
Positioning

- More than 15 years presence in automotive with leading-edge, proprietary solutions for positioning and telematics
- First on the market with a multi-constellation autonomous receiver covering GPS/USA, GALILEO/Europe, GLONASS/Russia, BEIDOU/China single chip solution (Teseo III)
- Multiple wins for navigation systems and entry level telematics box at major Tier-ones in Europe, China and Korea



In-vehicle Telematics

- Optimized 32-bit dual core Cortex-M connectivity processor with independent subsystem to access safely to car communication network
- Multiple win in telematics box with major European and Chinese telematics vendors



The Enabling Factors of Smart Systems

Silicon Technologies

- Moore's Law: Miniaturization
- More than Moore: Functionalities
- 3D Structure : i.e. MEMS
- Through-Silicon Vias

New Materials

- Getters
- Polymers
- Shape Memory Alloy
- Piezoelectric (PZT)
- SiC & GaN
- Graphene

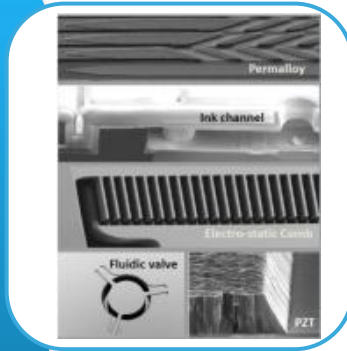
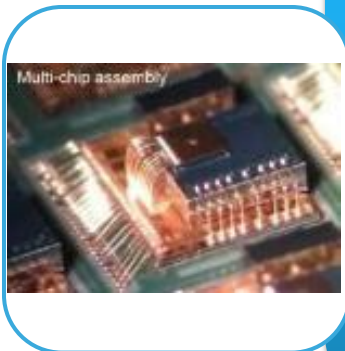
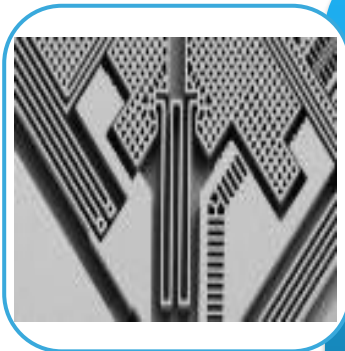
Heterogeneous Integration

- Wafer Level Packaging (Staked Multi Dice)
- New interconnections (Bondless, Sintering, Cu on Cu)
- Smart System In Package (SiP)

- Orientation & Localization Algorithms
- Embedded Predictive & Reactive Capabilities

Package

IPs & Software





Customers Expectations

- **Energy Management and Harvesting,**
- **Efficient Power Consumption,**
- **System Architecture optimization**
- **Robustness of the devices**

1. Application driven design

- fill the gap between the PCB level modelling and simulation and the components at board level, in order to facilitate the application biased system design;

2. Design space exploration via high level smart system simulation (Architecture – Multi Domain)

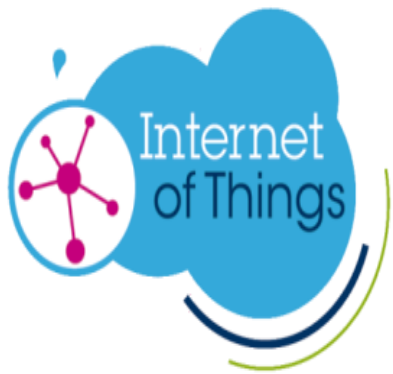
- innovative modelling and abstraction techniques to be extended to the non-functional properties of the device, such as power and thermal simulations; this with the aim to augment the Smart System Integration capabilities and consequent devices miniaturization;

3. Enhance the Design Robustness (Analog)

- by simulating the PV aware models of some critical blocks at transactional level taking into account the MIN/MAX variations;

4. Multi-physics simulation solutions. (Package/ All Domains)

5. PowerMoS: Device – Package Co-Design (Analog)



THANK-YOU