

# The Next Wave of Sensors towards the True IoT

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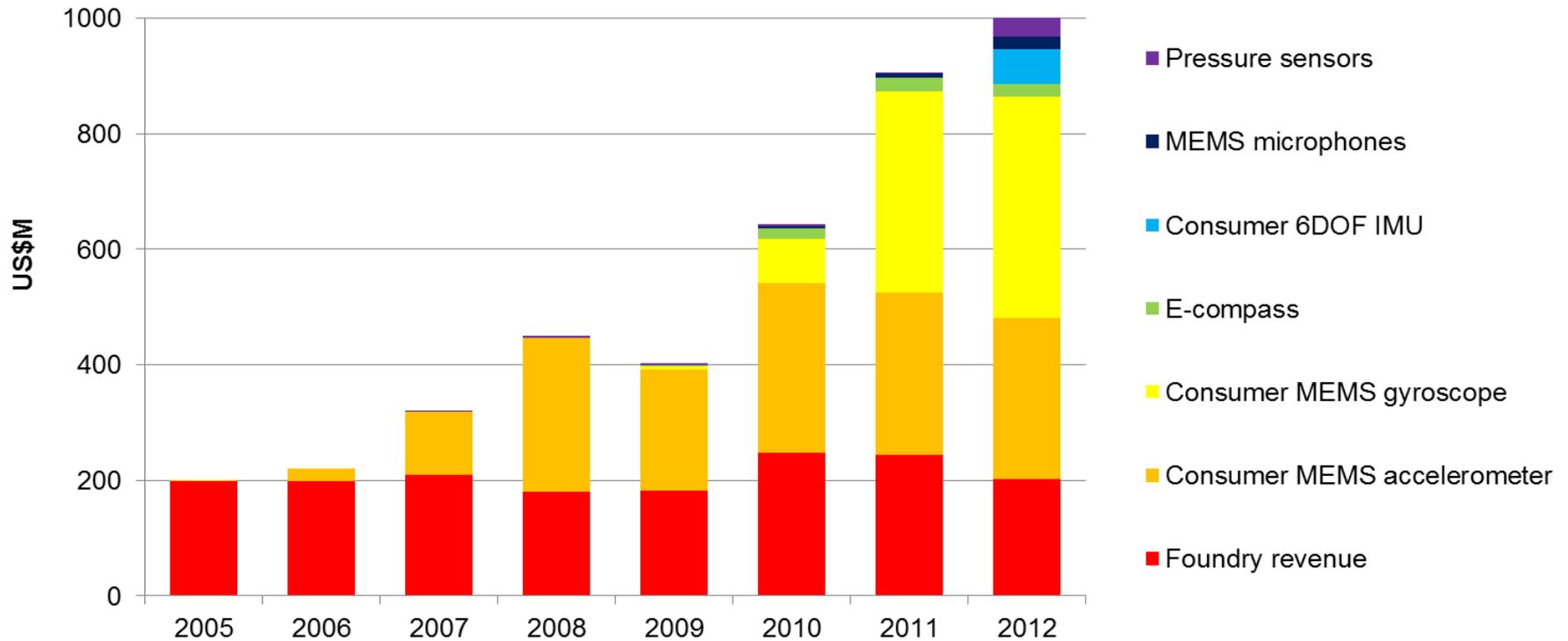
- ST driving the Revolution
- MEMS & Sensors for Augmented Applications
- Building Blocks and Examples
- Conclusion



# ST driving the Sensor Revolution

# ST Leading the Global MEMS World with a Rainbow of Products

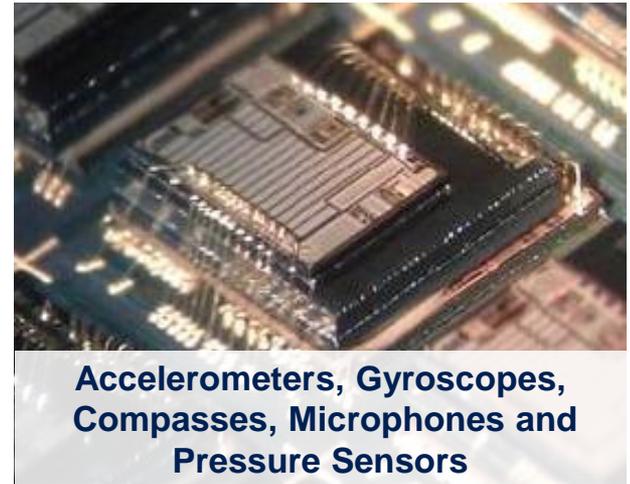
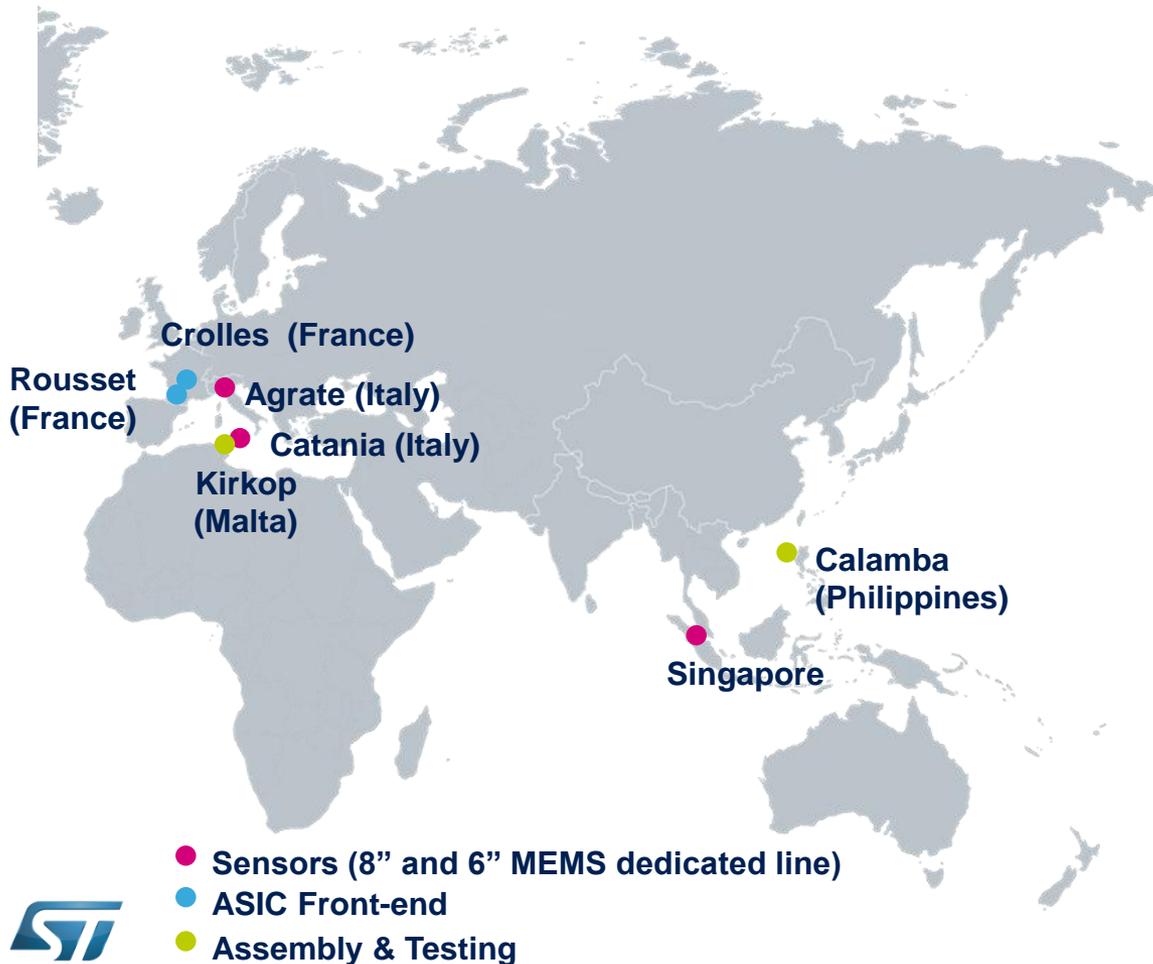
### 2005 – 2012 STMicroelectronics revenue estimation



**First MEMS company to reach \$1,000M!**

# Almost One ST MEMS Shipped per Person in the World

Outstanding Global Manufacturing Capability with Dual Sourcing



4 Billion units of Sensors



3.2 Billion units of Inkjet Printheads



# MEMS & Sensors for Augmented Applications

# Sensing the World

7

- Humans interact with the environment through their senses
- Sensors can **enrich human interaction** with the surroundings
- Sensors **create a more interactive and immersive world**

Hear

Taste

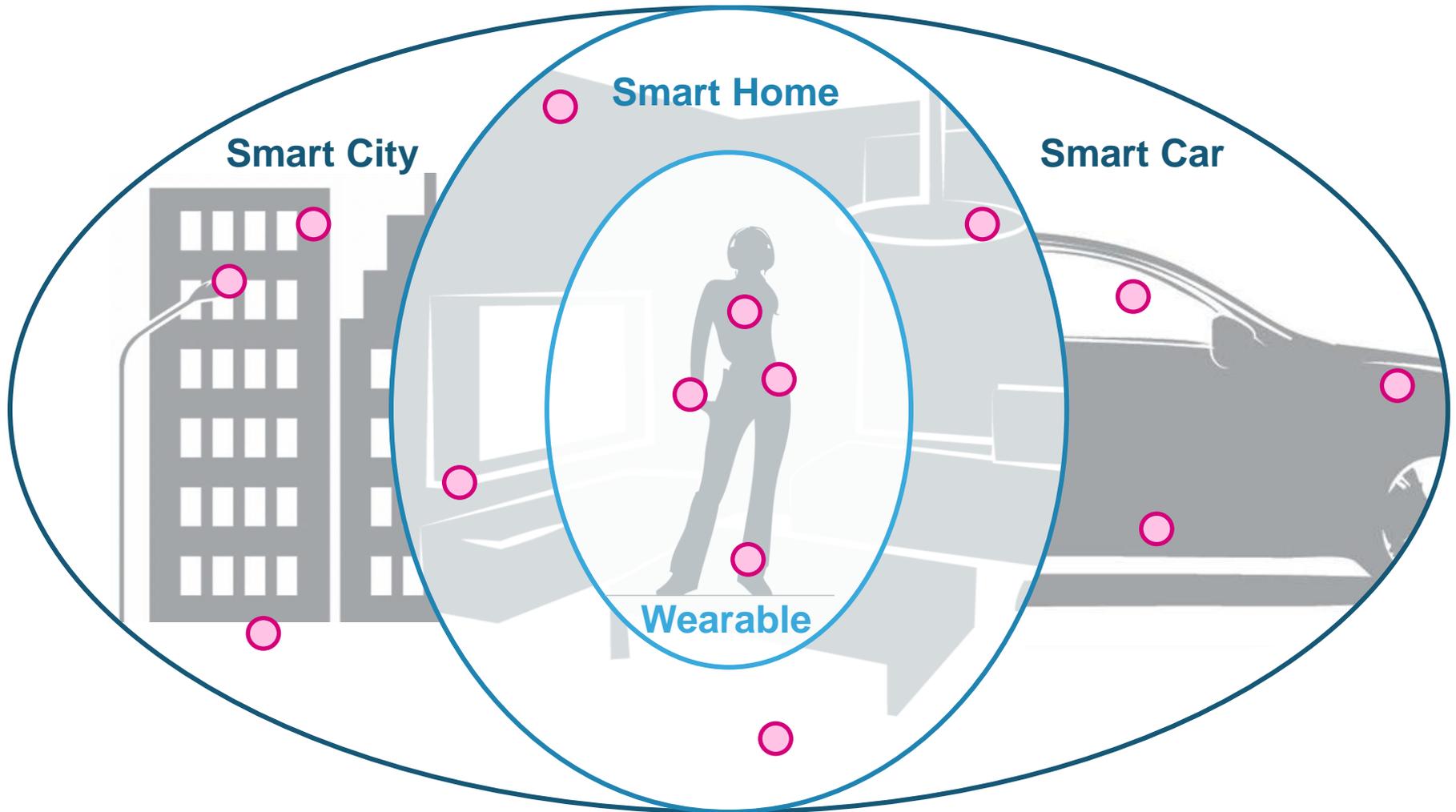
Smell

Touch  
& Feel

See



# Sensors Around Us



# Sensors are Already Here...



Smart Watch



Activity Monitor



Heart Monitor



Sports



Accessories



Glasses & Goggles



Weather Station



Toys & Games



Metering & resource saving



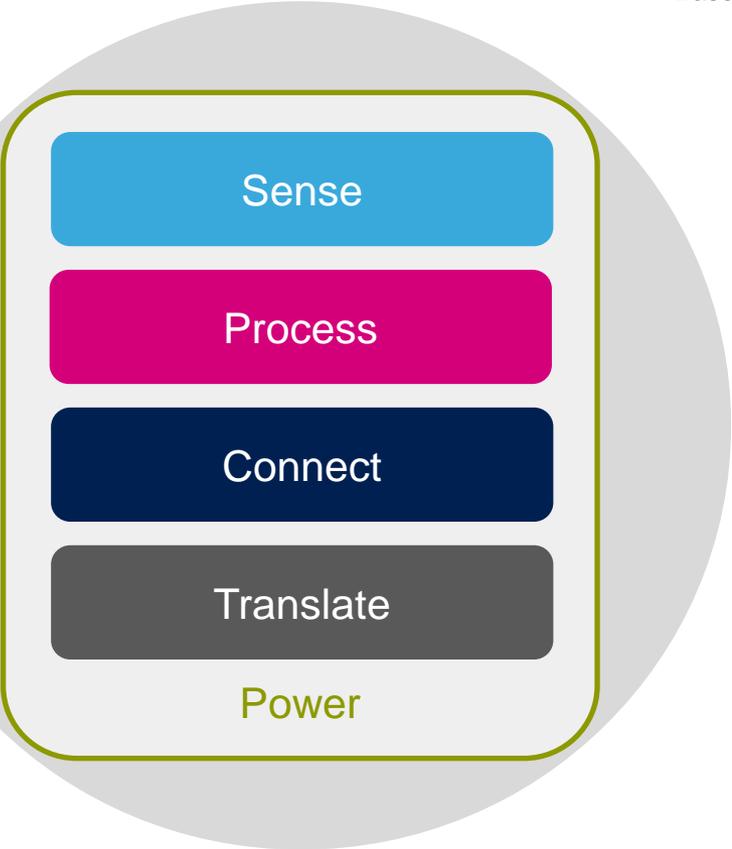
Wellness

# Adding Sensors to Everyday Objects

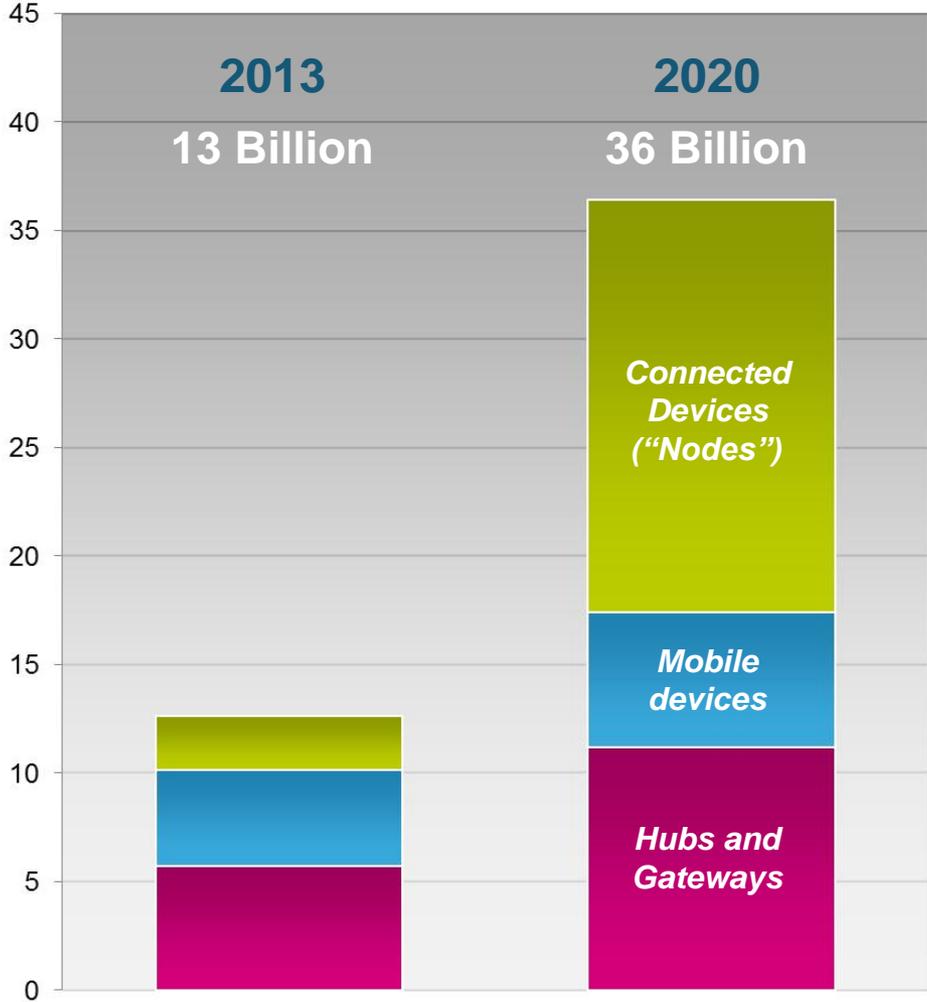
A simple approach for motion sensors..



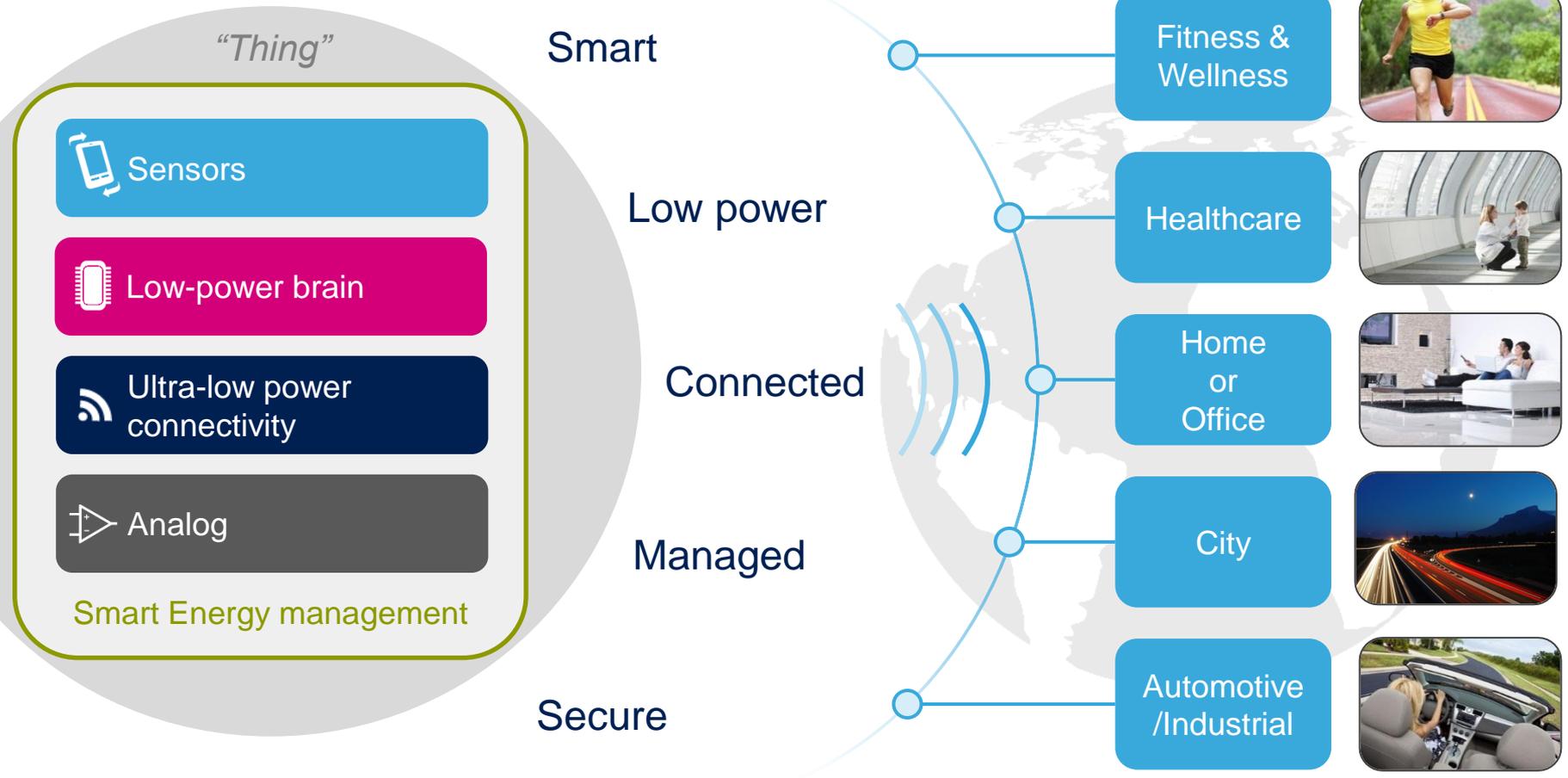
# The Opportunity



Billion Units  
Installed  
Base



# Paving the Road to a “Trillion Sensors”







# Building Blocks for Smart and Augmented Applications

# How will Sensors Change the World?

## Smart City

- Reduce traffic congestion
- Better use of resources
- Improve security



## Smart Car

- Reduce emissions
- Increase safety
- Save fuel



## Smart Home

- Make entertainment more interactive and immersive
- Increase comfort
- Save energy



## Healthcare

- Empower patients
- Help physicians monitor and diagnose remotely



## Fitness & Wellness

- Help to lead healthier lives
- Optimize sports performance
- Early warning of illness



# The Building Blocks

## Sensors & Actuators



Motion  
MEMS



Environmental  
Sensors



MEMS  
microphones



Touch Sensor



Micro-actuators



Proximity sensor



Image sensors

## Brain



Low-power brain



Sensor fusion

## Communication

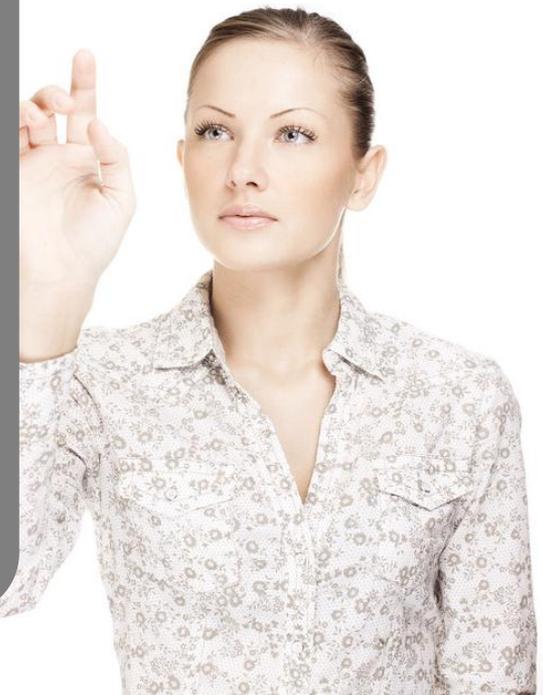


Ultra-low power  
connectivity

## Interfaces



Analog



# Sensors for Smart City

Making cities smarter, safer and more efficient



  
Temperature, Humidity & Gas sensors  
Air quality monitoring, gas leak detection

  
Optical, sound sensors  
Smart Street lights

  
Optical sensors  
Free parking slot detection

  
Pressure sensor  
Water pipe monitoring for leakage and maintenance

# Sensors for Smart Car

Enabling a safer, easier, and richer driving experience

 *Inertial modules*  
**Vehicle positioning and location**

 *Temperature, humidity and gas sensors*  
**Air conditioning and air quality control**

 *Motion & pressure sensors*  
**Side-impact airbags**

 *Gas sensors, temperature sensor*  
**Engine and transmission controls**

 *Image sensors*  
**Object detection & vision enhancement**

 *Accelerometers and gyroscope*  
**Chassis controls**



# Sensors for Smart Home

Improve  
quality of life  
Save energy  
Entertain



  
*Gas and optical sensors*  
**Home safety and security**

  
*Motion, optical & sound sensors*  
**Interactive and immersive  
entertainment experiences**

  
*Environmental sensors*  
**Home control and  
automation**

  
*Environmental sensors*  
**Optimized energy  
management**

Empowering patients  
Improving healthcare quality & affordability

 *Gas sensors*  
**For asthma prevention** (air quality, pollen count)

 *Inertial modules*  
**For activity monitoring in Alzheimer, Obesity or sleep disorders**

 *Pressure sensor*  
**In the eye for Glaucoma diagnostic**

 *Chemical sensors & analog*  
**For blood analysis and ECG**

 *Chemical sensors and actuators*  
**Glucose monitoring & Insulin nano pump for diabetics**



Fitness & optimized sports performance  
Early warning of illness

 *UV Sensor*  
**Monitoring of exposure to sun**

 *Inertial modules*  
**Activity monitoring & positioning**

 *Analog sensors*  
**For heart monitoring**

 *Temperature and humidity*  
**Real time monitoring & dosage**

 *Inertial modules, Pressure sensors*  
**Optimized sport technique, impact monitoring**



# MEMS & Sensors Offering by ST

## Mobile & Consumer

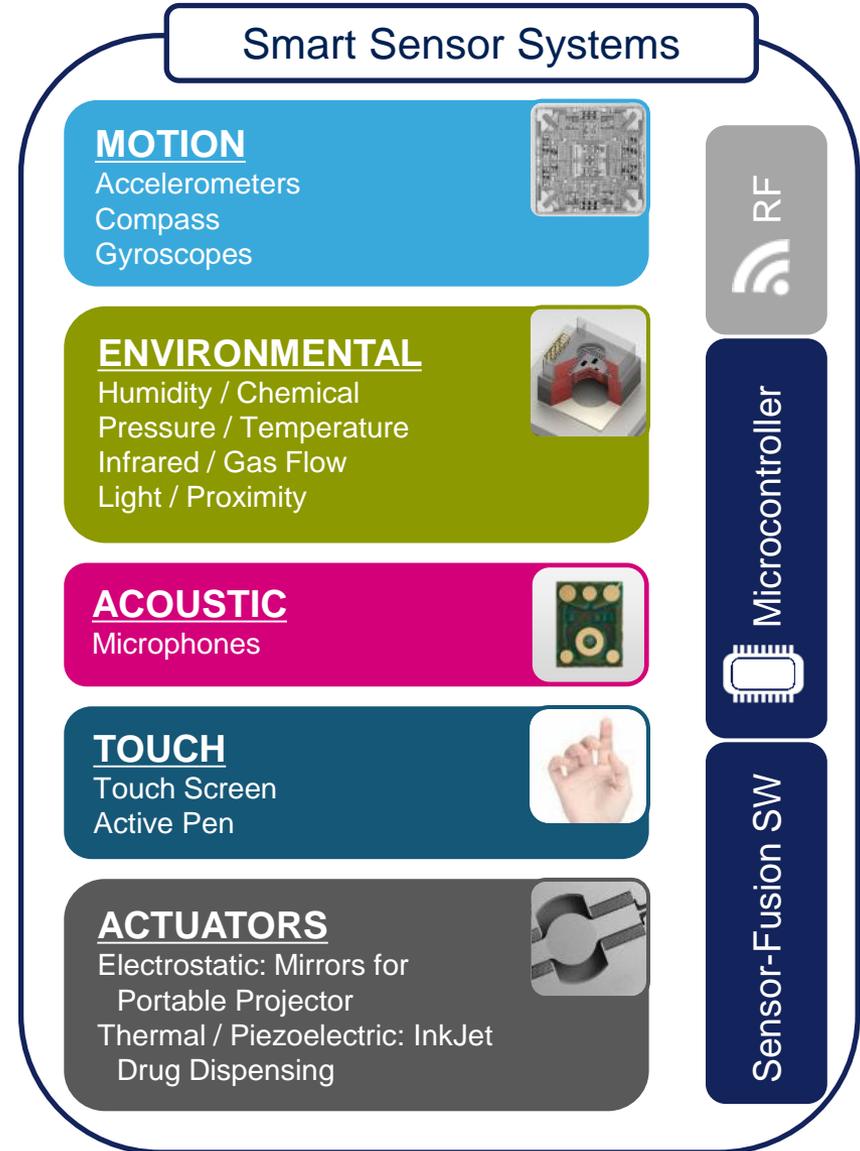
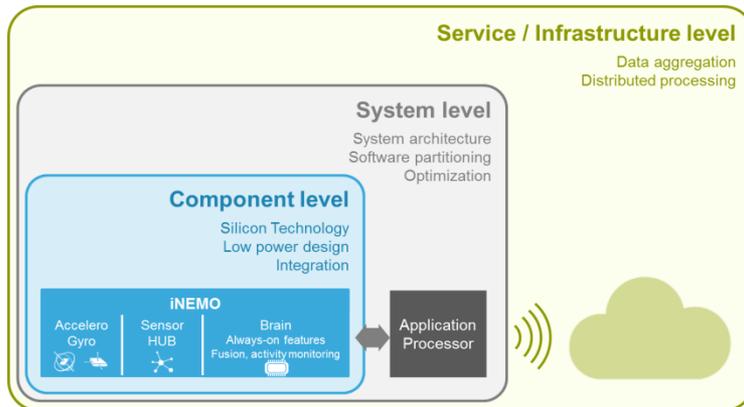
- Leading supplier of MEMS for mobile and consumer applications

## New markets

- Fitness & Wearable
- The Internet of Things

## Automotive

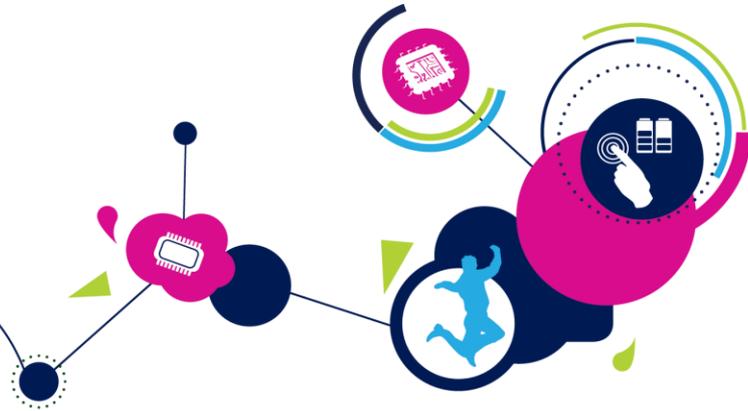
- Addressing the market for assisted guidance, personal safety & comfort



# MEMS & Sensors for a New World

- MEMS & sensors have already enabled radical changes in the way humans and technology interact
- We've only scratched the surface
- Potential for smart systems to positively impact our world is huge
- There are still many challenges to be overcome but there are great opportunities

# Thank You!



ST stands for  
**life.augmented**